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NISSAN

ALMERA CLASSIC

MODEL B10 SERIES

NISSAN EUROPE S.A.S.

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QUICK REFERENCE INDEX

GENERAL INFORMATION — GI
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ENGINE MECHANICAL (QG16) — EM
ENGINE LUBRICATION & COOLING SYSTEMS (QG16) — LC
ENGINE CONTROL SYSTEM (QG16) — EC
ACCELERATOR CONTROL, FUEL & EXHAUST SYSTEMS (QG16) — FE
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MANUAL TRANSAXLE — MT
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FRONT AXLE & FRONT SUSPENSION — FA
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RESTRAINT SYSTEM — RS
BODY & TRIM — BT
AIR CONDITIONER — AC
LAN SYSTEM — LAN
AUDIO & VIDEO — AV
ELECTRICAL SYSTEM — EL
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FOREWORD

This manual contains maintenance and repair procedures for NISSAN ALMERA CLASSIC, model B10 series.

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

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

IMPORTANT SAFETY NOTICE

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

NISSAN EUROPE S.A.S.

Service Engineering Section

Paris, France

SECTION **AC**

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Precautions

SRS Airbag • Pretensioner Seatbelt

WARNING:

- **To install/remove the SRS airbag, pretensioner seatbelt system related components and harness, turn the ignition switch "OFF", disconnect the battery terminals and wait over 3 minutes. (This is to discharge all the remaining electricity in the airbag sensor unit's auxiliary power circuit.)**
- **Do not use air impact or electrical tools when installing/removing the components.**
- **Do not use any hand-held tools for harness used in SRS airbag and pretensioner seatbelt systems. Be careful with the harness not to tangle with or interfere with other components.**
- **Do not use any electrical test equipments such as circuit tester when inspecting the SRS airbag and pretensioner seatbelt circuit while installed unless the Service Manual instructs to do so. (The weak current in the tester can cause the SRS airbag to operate.)**
- **Do not insert any foreign materials such as a screwdriver in the airbag module and pretensioner seatbelt connector in order to prevent unintended operation due to static electricity.**
- **The harnesses used in SRS airbag and pretensioner are covered with yellow insulation for easy identification.**
- **Refer to "RS Restraint System" in this Service Manual for safe airbag system service information.**

A/C Refrigerant HFC134a Handling

- Always use HFC134a as A/C refrigerant. If CFC12 is used, it may damage the compressor due to bad lubrication.
- Handle the A/C refrigerant according to label on the service can. If not properly handled, it can be exploded causing frostbite and loss of eyesight.
- Do not inhale the A/C refrigerant. It can damage your eye, nose and throat.
- HFC134a generates poisonous gas when expose to high temperature. Do not get it near to fire or so. Properly ventilate while service.

Compressor Oil

- To meet the characteristics of the A/C refrigerant, synthetic oil is using for the compressor. There are 2 types of compressor oils to meet 2 different compressors. Always use the below designated compressor oil.

  For QG engine: NISSAN A/C System Oil Type R or NISSAN A/C System Oil Type S (Rotary type compressor)
- If the rotary type compressor oil (NISSAN A/C System Oil Type R) and swash plate compressor oil (NISSAN A/C System Oil Type S) are not properly used, compressor durability will be deteriorated. And if you use compressor oil for CFC12 (mineral fluid), the compressor gets damaged due to lack of lubrication.
- Compressor oil for HFC134a is high moisture-absorbent. Please follow the precautions noted below.
  - When cooler cycle components were removed, seal the opened hole with a cap or vinyl tape to separate from air.
  - When installing the cooler cycle components, keep the sealing just before to installation.
  - When the compressor oil can was used, close the cap right away and separate from air.
- Do not inhale the compressor oil vapor. It may stir your eyes, nose and throat.
- Compressor oil for HFC134a damages styrofoam and painted surfaces (except for heat treated paint coat). So be careful not to stain the oil in the vehicle.

Tube Connection

The new tubing method (axial seal type) is used for all cooler cycle connections except for below location.

- Between the expansion valve and evaporator

O-Ring Part Number

Connection Method	Location		Bore
Axial Seal Type	Heater & cooling unit	Inlet	ϕ8
		Outlet	ϕ16
	Compressor	Inlet	ϕ19
		Outlet	ϕ12
	Condenser	Inlet	
		Outlet	ϕ8
	Liquid tank	Inlet	ϕ8
		Outlet	
Conventional Type	Expansion valve	Inlet	ϕ16
		Outlet	

Precautions for Cooler Cycle Service

- Always obey the below items and label instructions during cooler cycle service.

Refrigerant (HFC134a) capacity	550 ± 50 g
Compressor oil capacity	180 cm^3

- After removing the tubes, seal the opening with a cap or vinyl tape right away to prevent any dust or vapor entrance.
- Always use torque wrench or backup wrench when installing the tubes.
- When installing the A/C to the vehicle, perform the tube installation as the last stage. Also, do not open the sealing caps until just before to the installation of tubes or other components.
- When the components are stored in a cold place, adjust the temperature of then to working place before removing the sealing caps. This is to prevent moistening of the components.
- Completely remove moisture from the cooler cycle before recharging the A/C refrigerant.
- O-ring on the cooler cycle should be replaced with new if removed.
- Apply compressor oil at the O-ring when installing the tubes. However, be careful not to apply onto the threads.
  For QG Engine: NISSAN A/C System Oil Type R (for rotary type compressor)
- Completely seat the O-ring against tube bead.
- Be careful not to damage the O-ring or tubes when installing the O-ring.
- Connect the tube until it clicks. After then, tighten the nuts or bolts with hands firmly.
  Check if the O-ring is properly seated.
- After connecting the tubes, check for any A/C refrigerant leakage at the connections. Disconnect the tubes when leakage is found and replace the O-ring, then tighten the connection to the specified torque.

Precautions for Compressor Service

- Seal all openings to prevent any dust or vapor entrance.
- When the compressor is removed, the oil may enter into low-pressure space. So, place it in the same direction as it is installed on the vehicle.
- When the compressor is replaced, adjust the compressor oil level. Refer to “Compressor Oil” (AC-8).

- Keep the clutch and pulley surfaces clean. If the surface is stained with oil, wipe it out with a clean and wet cloth.
- When the compressor service is completed, rotate the compressor shaft with hand to both directions at least 5 times. This is to lubricate the compressor inside. After installing the compressor, operate the compressor with idling speed for about 1 hour.

Precautions for Service Equipment

REFRIGERANT-RECOVERY STATION

Follow the manufacturer's instructions for station handling and maintenance. Use only designated refrigerant.

ELECTRONIC LEAK DETECTOR

Follow the manufacturer's instructions for detector handling and maintenance.

FLUIDS AND REFRIGERANT

Item	Application	Use	Remark
Refrigerant can	All	Charging refrigerant	
NISSAN A/C System Oil Type R 40 cm^3	QG engine	Adding compressor oil	DHC

Refrigerant System

Refrigerant Cycle

REFRIGERANT CYCLE

The refrigerant returns to the compressor through compressor, condenser, liquid tank and evaporator. The refrigerant evaporation inside the evaporator is controlled by the expansion valve.

FREEZING PROTECTION

The compressor operates so that it can maintain the evaporator temperature to the specified range. If the evaporator temperature goes under the specified value, then the auto amp stops the compressor. Also, if the evaporator temperature goes above the specified value, then the auto amp operates the compressor.

Refrigerant System Protection

REFRIGERANT PRESSURE SENSOR

- The A/C refrigerant system is protected from high or low pressure by the refrigerant pressure sensor on the condenser.
- When abnormal pressure in the cooler cycle (approx. more than 2.7 Mpa [28 kgf/cm^2•G] or less than 0.14 Mpa [1.4 kgf/cm^2•G]) is detected, the refrigerant pressure sensor stops the compressor.

  NOTE:

  - **The value in the parenthesis means gage pressure.**

Compressor Oil

Oil Level Adjustment

The compressor oil circulates in the system with refrigerant. When cooler cycle component is replaced or large amount of refrigerant is leaked, the compressor oil should be added. It is important to maintain proper oil level and if not properly maintained, the following troubles may occur.

- Lack of oil: Compressor sticks
- Excessive oil: Lack of cooling capacity (Due to lack of heat exchange)

  Oil specification (QG engine): NISSAN A/C System Oil Type R (Rotary type compressor)

Oil Return Operation

Adjust oil level as follows.

1. A/C System Inspection

1. Inspect if A/C system is normally operating.
2. Inspect if large amount of refrigerant or oil is leaked.

   Inspection results are OK?

   OK → Go to No. 2

   NG → Go to No. 3

2. Oil Return Operation

1. Start the engine and maintain the following conditions.
   - Engine RPM: Idle to 1,200 RPM
   - A/C or AUTO switch: ON
   - Fan speed: High
   - Set temperature: Full hot
2. Run the engine for about 10 minutes.
3. Stop the engine.

CAUTION:

- **When refrigerant or oil is leaked a lot, do not perform the oil return operation.**

  → Go to No. 3

3. Compressor Inspection

Replace the compressor?

YES → Go to “Oil Level Adjustment When Compressor is Replaced” (AC-57).

NO → Go to No. 4

4. Other Components Inspection

Replace other components? (evaporator, condenser, liquid tank or refrigerant or oil)

YES → Go to “Oil Level Adjustment When Other Components are Replaced” (AC-57).

NO → Perform performance check. Refer to “PERFORMANCE CHECK” (AC-31).

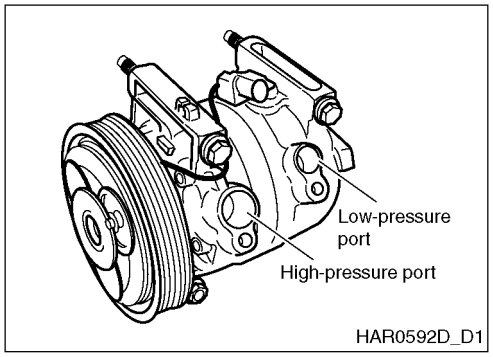
Oil Level Adjustment When Other Components Are Replaced

Add oil to the compressor using the high-pressure port as below. The "α" stands for oil volume that has released with refrigerant when removing refrigerant.

Replacing Component	Adding Capacity
Evaporator	75 + α cm^3
Condenser	35 + α cm^3
Liquid tank	10 + α cm^3

CAUTION:

- **When several components are replaced, do not refill refrigerant and oil respectively.**
  Example: Evaporator and liquid tank refill (cm^3) = 75 + 10 + α



Oil Level Adjustment When Compressor is Replaced

1. Drain the compressor oil from the high-pressure port and low-pressure port and measure the volume. (The low-pressure port has a valve inside. Press it with a minus (-) screwdriver to drain the compressor oil.)
2. Drain the compressor oil from the new compressor as below. The "α" stands for oil volume that has released with refrigerant when removing refrigerant.

   Oil volume (cm^3) drained from new compressor
   = Oil capacity of new compressor (180) - Drained oil from removed compressor - Remaining oil inside the compressor (20) - α
   = 160 - Drained oil from removed compressor - α

AUTO A/C System

General

- The auto A/C system detects interior temperature, ambient air temperature, intake air temperature and sunload using in-vehicle sensor, ambient sensor and sunload sensor. It compares and calculates the detected value and set temperature by temperature control lever. Then it controls outlet air temperature, fan speed, air outlets and air intake door to maintain the set temperature.

Setting the Difference Between the Set Temperature and Control Temperature

GENERAL

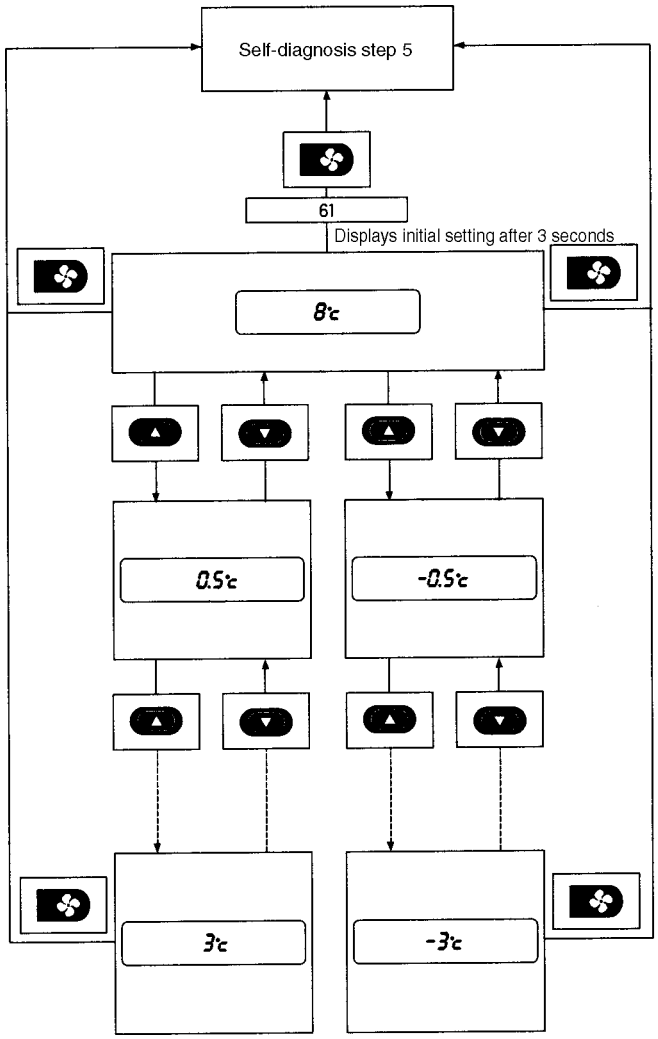
- If an occupant feels that the outlet air temperature is different from the set temperature, the control temperature of the auto amp can be changed to be as set temperature (displayed temperature).

SETTING PROCEDURE

1. Press the fan switch from the self-diagnosis step 5 and switch into temperature setting (setting the difference between the set temperature and control temperature).
2. “61” comes on the display and start to set after about 3 seconds.
3. The displayed temperature will increase/decrease by 0.5°C every time pushing the temperature control button (HOT) or (COLD). The temperature can be adjusted between +3°C ~ -3°C.

REFERENCE:

- **When the temperature is lowered by -3°C while the displaying (set) temperature is 25°C, the auto amp will control the temperature to 22°C (25 - 3 = 22), the lower temperature than displayed temperature.**



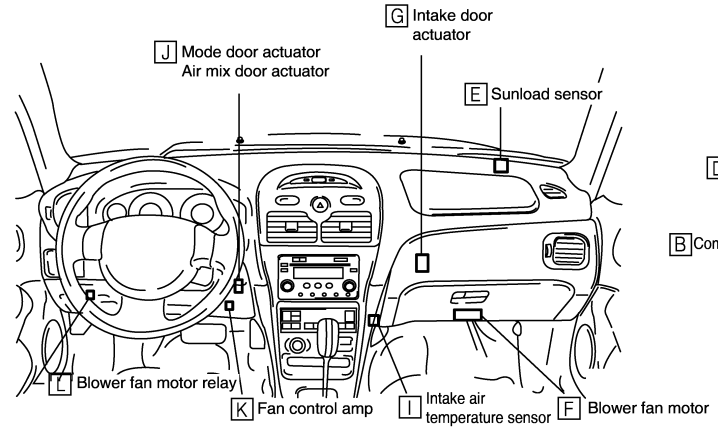
Trouble Diagnosis

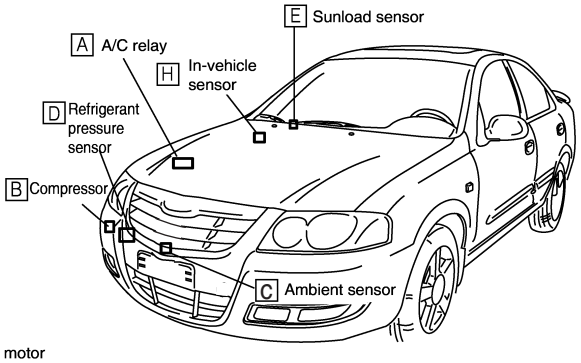
Trouble Diagnosis by Symptoms

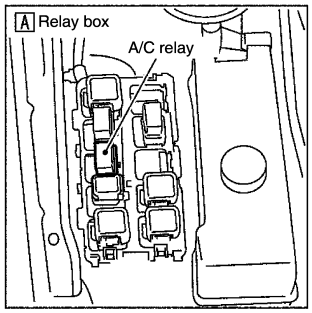
Symptom		Operation check	Trouble Route	Possible cause
No air from the vent No change in air volume		Check blower fan motor operation Refer to “Blower Fan Motor System” (AC-27).	Blower fan motor route	● Defective blower fan motor ● Defective fan control amp ● Defective blower fan motor relay
		Above conditions are normal	Auto amp route	Defective auto amp
Bad temperature control	Common (Check this item for the following 3 symptoms)	Check air mix door actuator installation	Air mix door route	● Bad installation of air mix door lever ● Defective air mix door system (broken or locked)
		Set the temperature control button to 18°C and 32°C, then check full stroke operation of air mix door	Air mix door actuator route	Refer to “Air Mix Door Actuator System” (AC-31)
		Failure detected in self-diagnosis step 2	● Sensor route ● Air mix door actuator route	● Defective sensor ● Bad sensor harness ● Defective air mix door actuator ● Bad air mix door actuator harness
		No failure detected in self-diagnosis step 2	Mode door actuator route	Refer to “Mode Door Actuator System” (AC-31).
	No cold air (Fan speed is normal)	Check operation of magnet clutch under AUTO switch ON	Magnet clutch route	Refer to “Magnet Clutch System” (AC-29).
		● Check refrigerant level ● Check performance	Cooler cycle	Refer to “Performance Inspection” in “Bad Cooling” (AC-31).
		Above conditions are normal	Auto fan route	Defective auto amp
	No hot air (Fan speed is normal)	Blower fan motor doesn’t change	Coolant route	● Defective cooling system ● Clogged heater hose or heater core
		Above condition is normal	Auto fan route	Defective auto amp
	Interior temperature is much different with set temperature	Blower fan motor doesn’t change	Blower fan motor route	Refer to “Blower Fan Motor System” (AC-27).
		Aspirator does not intake air even at fan speed 4	Aspirator route	● Defective aspirator ● Peeled or broken aspirator duct
		Above conditions are normal	Auto amp route	Defective auto amp
Air outlet does not change		Check mode door operation (Manual)	Mode door route	● Defective mode door link and bad installation of mode door lever ● Defective mode door system (broken or locked)
		Failure detected in self-diagnosis step 3	Mode door actuator route	Refer to “Mode Door Actuator System” (AC-31).
		Above conditions are normal	Auto amp route	Defective auto amp

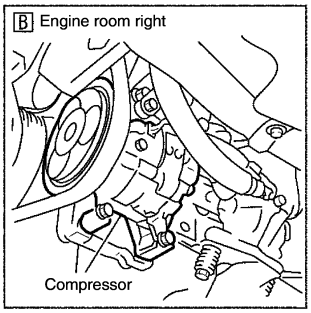
Symptom	Operation check	Trouble Route	Possible cause
Air outlet does not change	Check intake door operation (Manual)	Intake door route	● Bad installation of intake door lever ● Defective intake door system (broken or locked)
	Failure detected in self-diagnosis step 3	Intake door actuator route	Refer to “Intake Door Actuator System” (AC-31).
	Above conditions are normal	Auto amp route	Defective auto amp
	Check AQS sensor operation	AQS sensor route	Defective AQS sensor

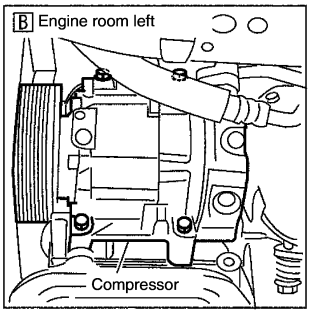
Components Location

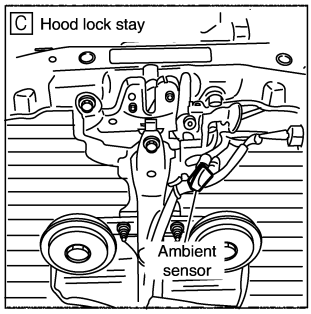


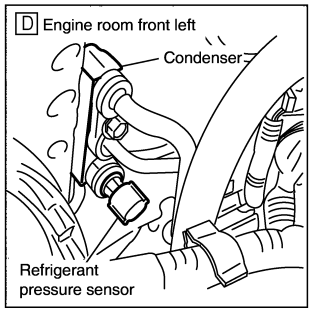


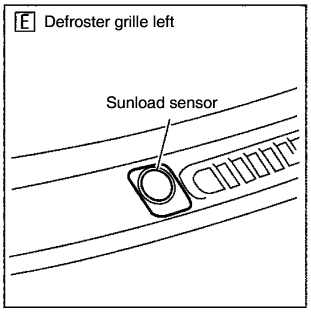


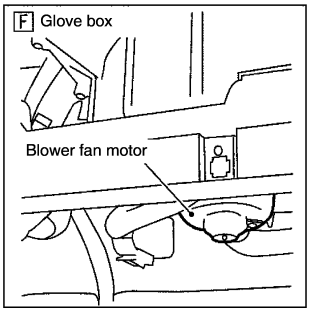


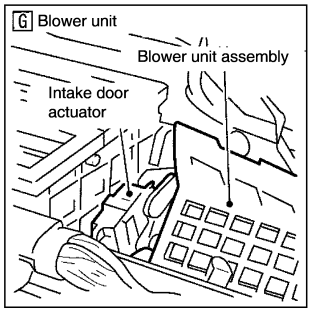


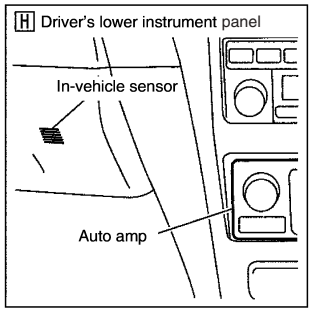


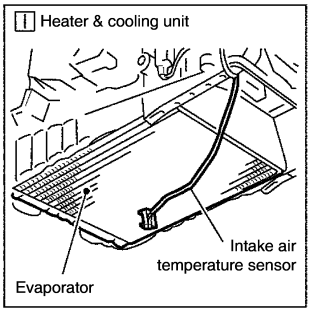


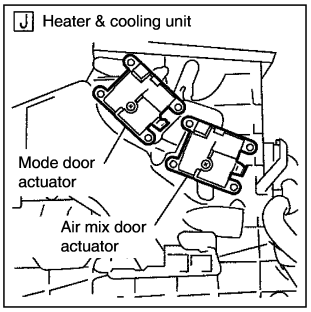


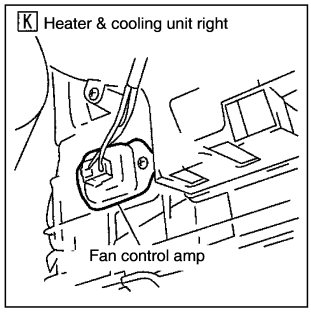


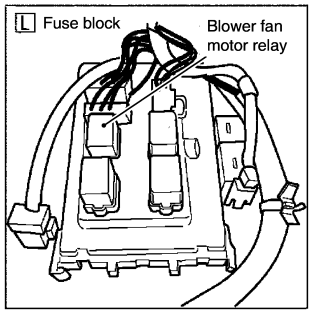












Reference:
The meter receives the compressor ON signal value and the fan ON signal value through the CAN communication to the engine control unit and sends the signal to the AC control unit.

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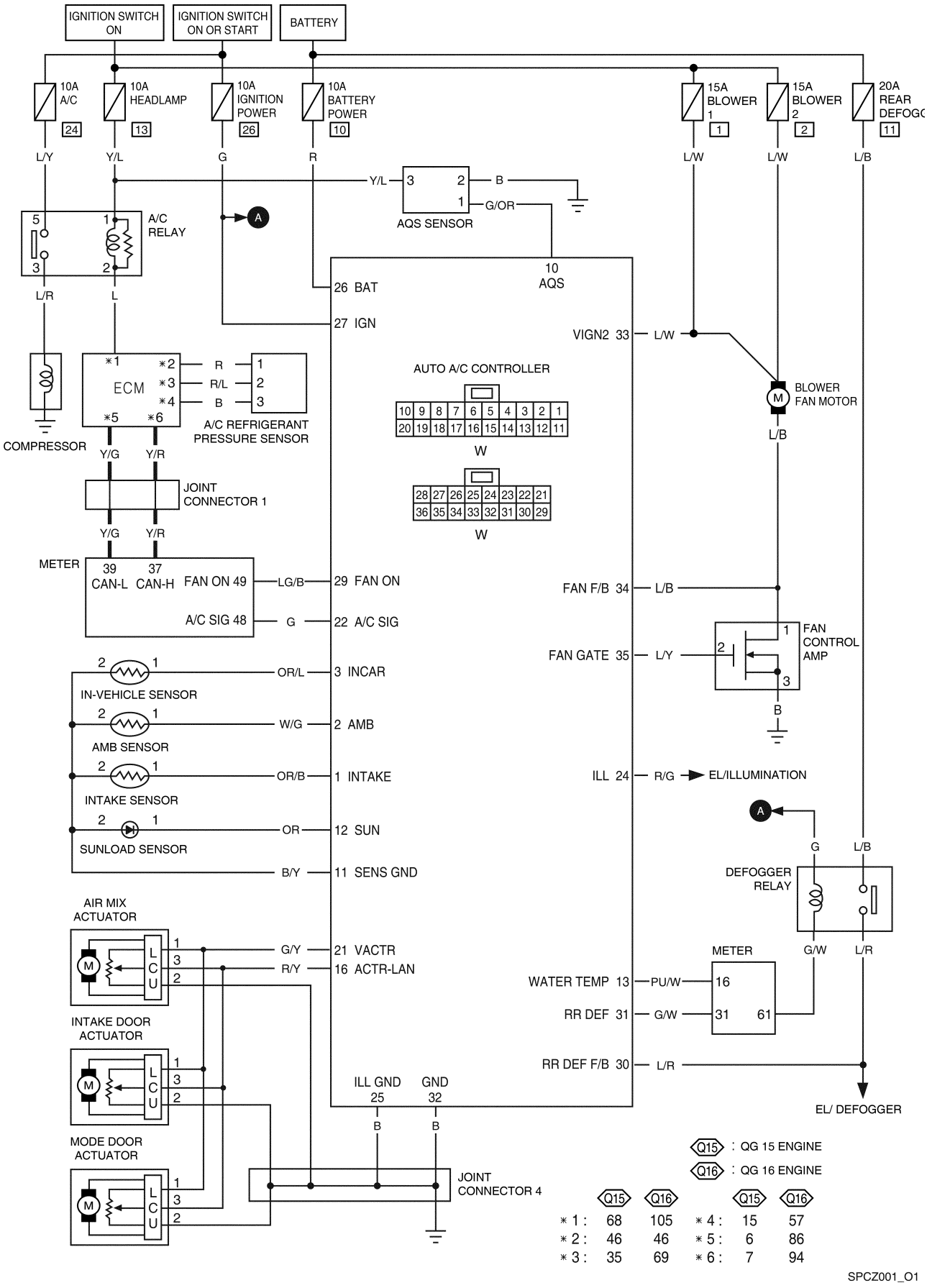
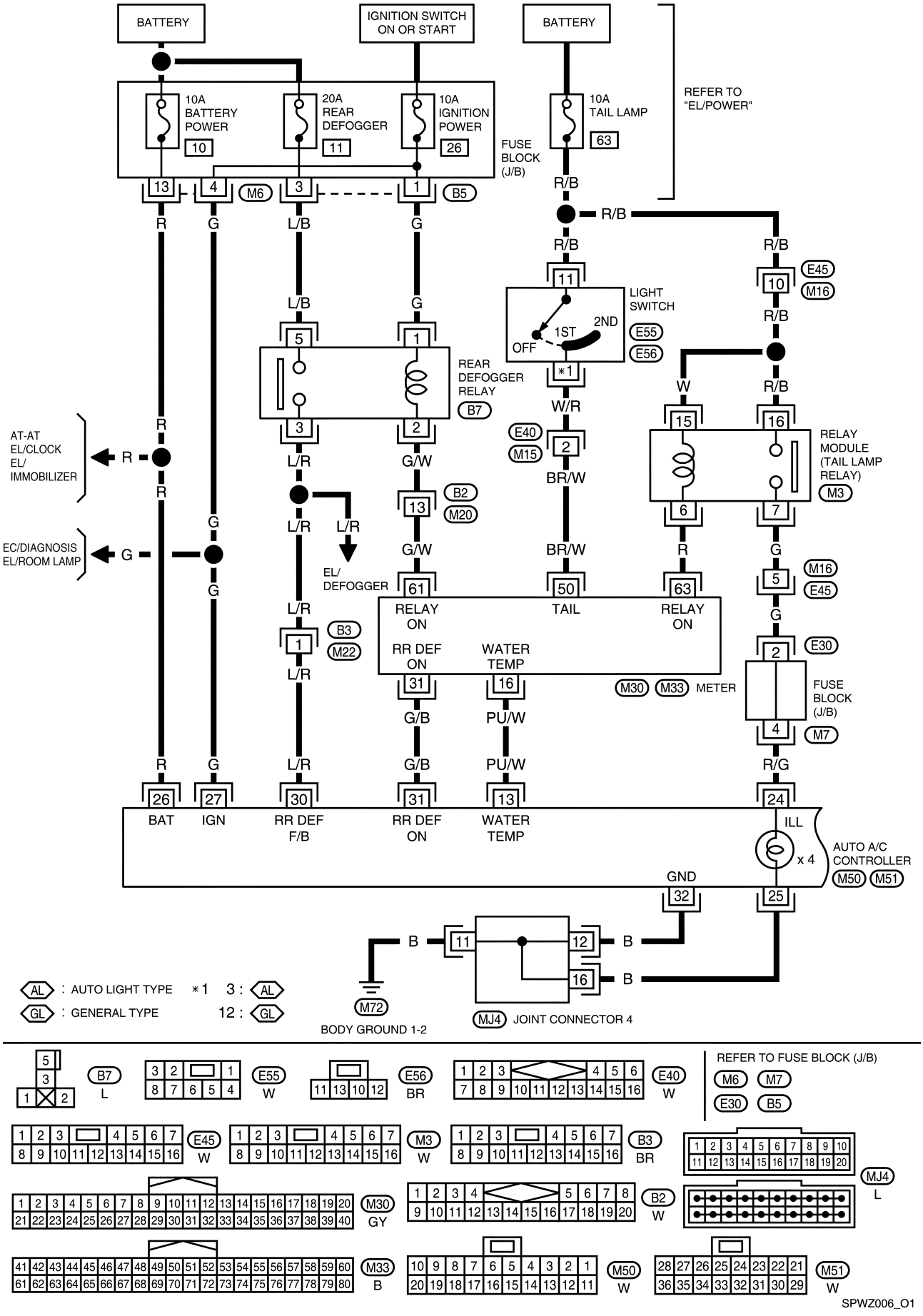
Circuit Diagram



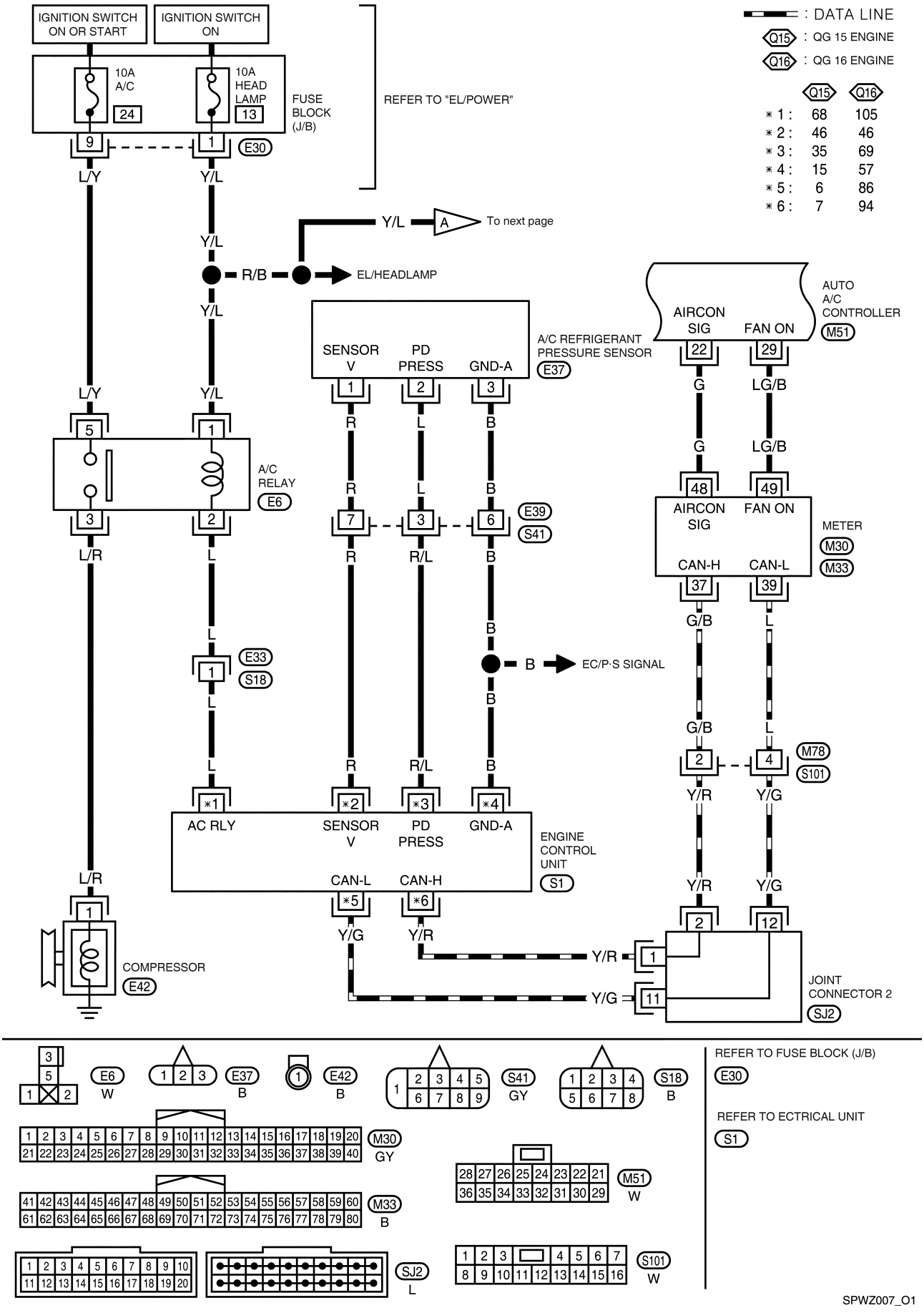
Wiring Diagram

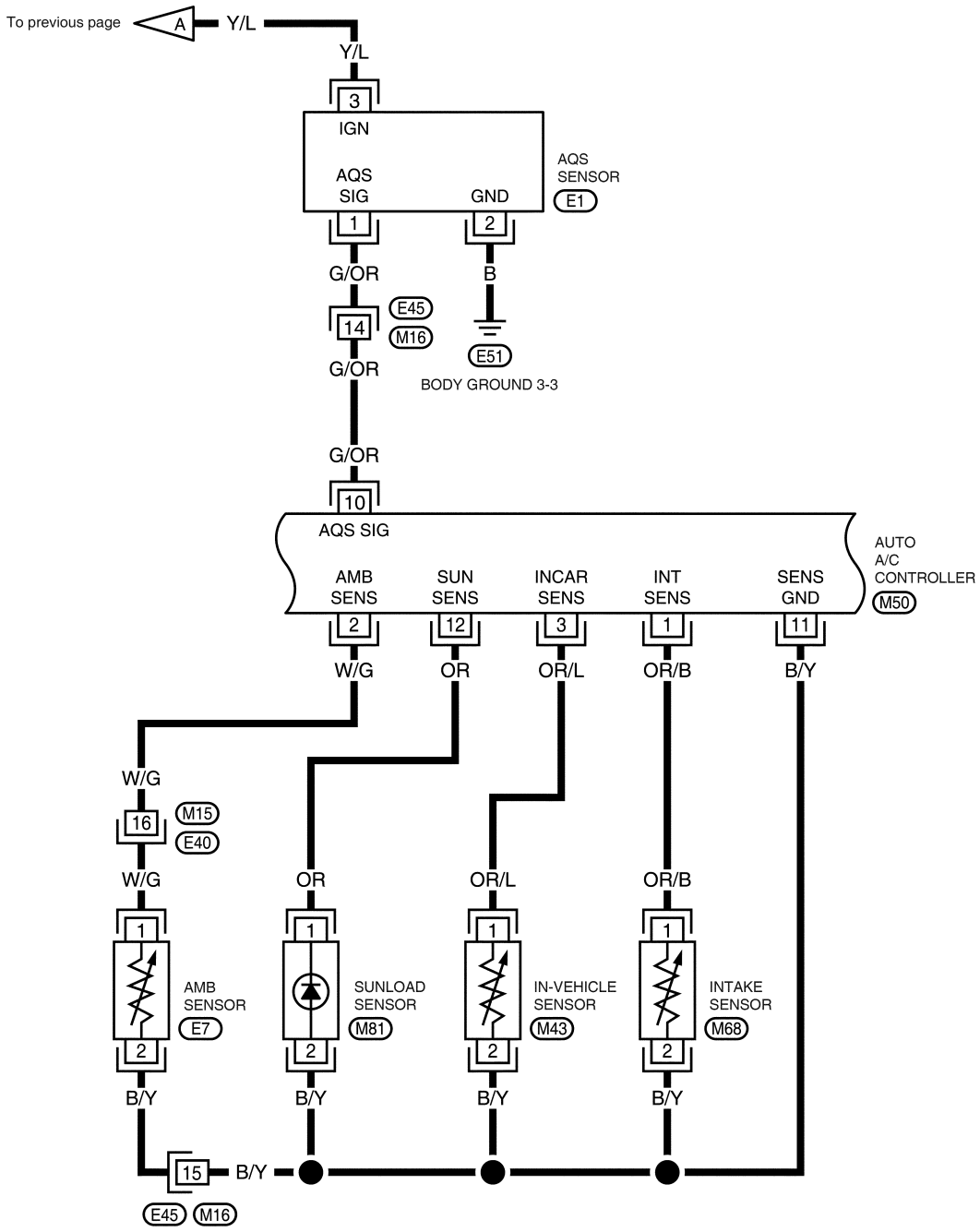
AC/AUTO A/C- 01

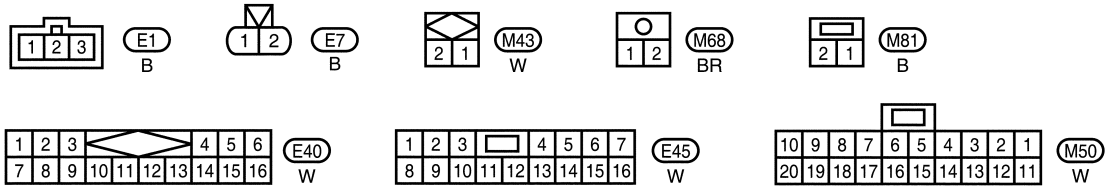


Wiring Diagram

AC/AUTO A/C- 02



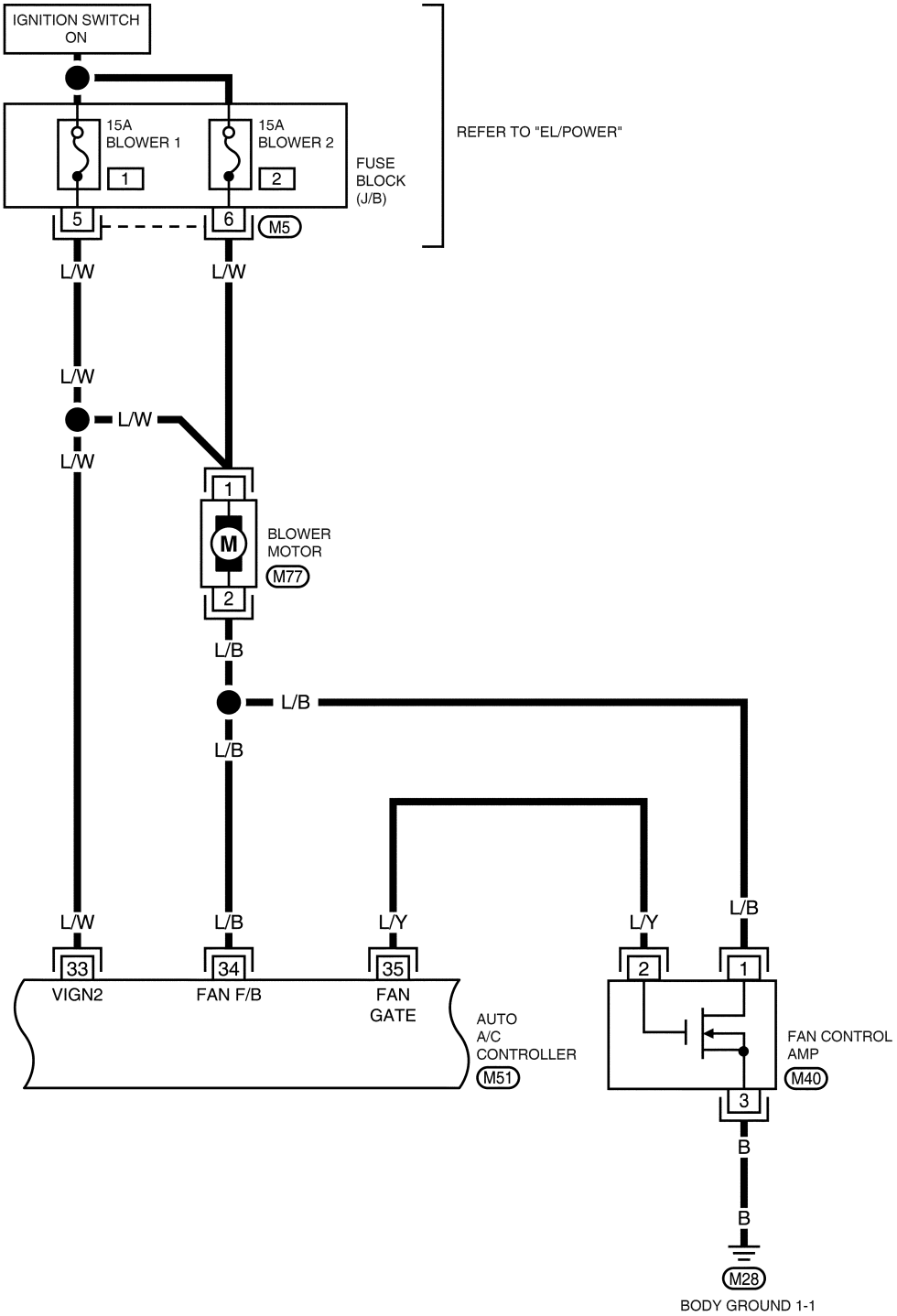

To previous page
A
Y/L
Y/L
3
IGN
AQS SIG
GND
AQS SENSOR
E1
1
2
G/OR
B
E45
14
M16
E51
G/OR
BODY GROUND 3-3
G/OR
10
AQS SIG
AUTO A/C CONTROLLER
M50
AMB SENS
SUN SENS
INCAR SENS
INT SENS
SENS GND
2
12
3
1
11
W/G
OR
OR/L
OR/B
B/Y
W/G
16
M15
E40
W/G
OR
OR/L
OR/B
1
2
AMB SENSOR
E7
SUNLOAD SENSOR
M81
IN-VEHICLE SENSOR
M43
INTAKE SENSOR
M68
B/Y
B/Y
B/Y
B/Y
15
B/Y
E45
M16

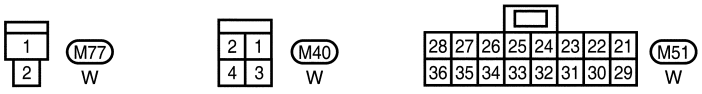

E1
B
E7
B
M43
W
M68
BR
M81
B
E40
W
E45
W
M50
W

SPWZ008_O1

Wiring Diagram

AC/AUTO A/C- 04

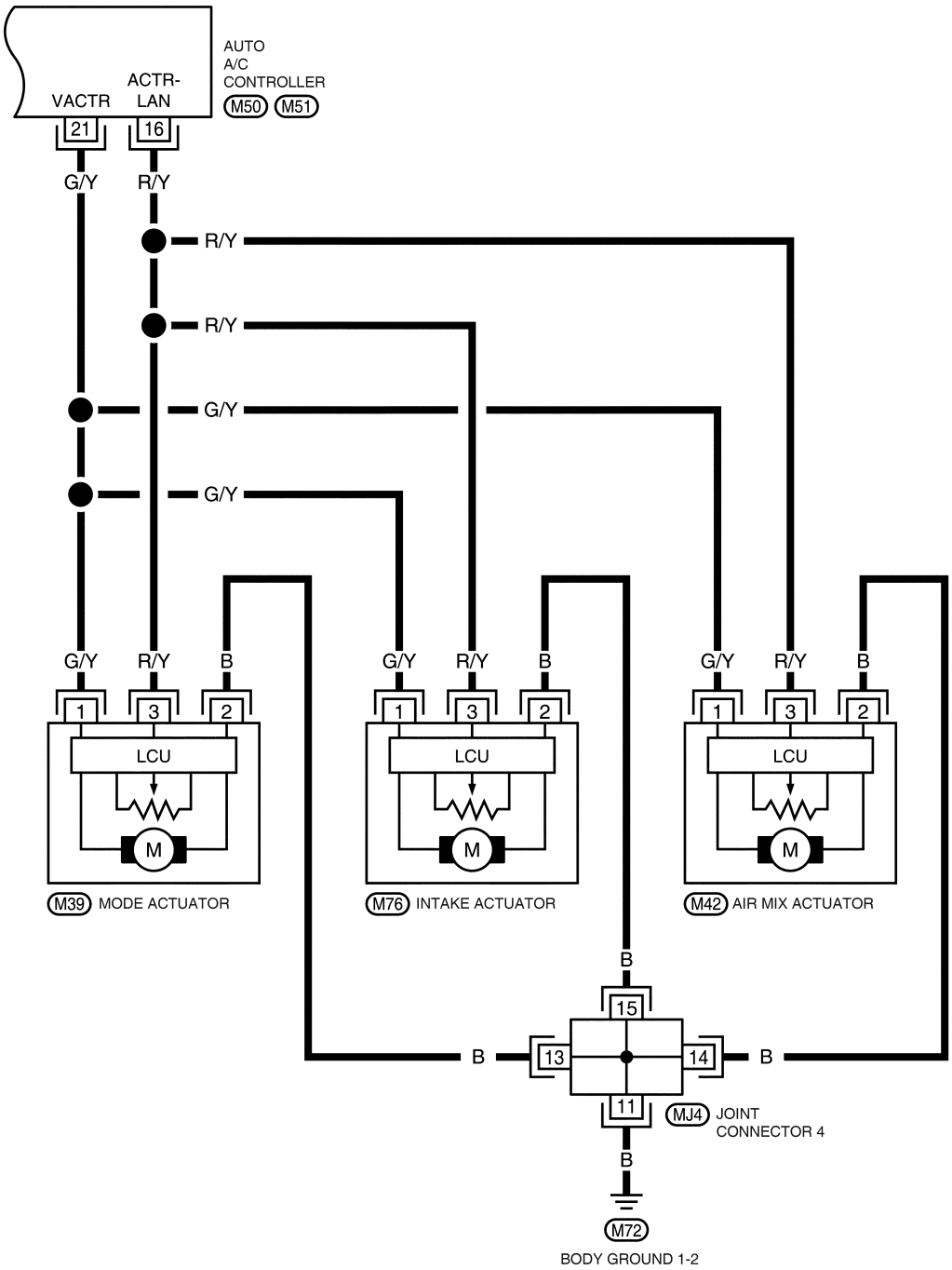


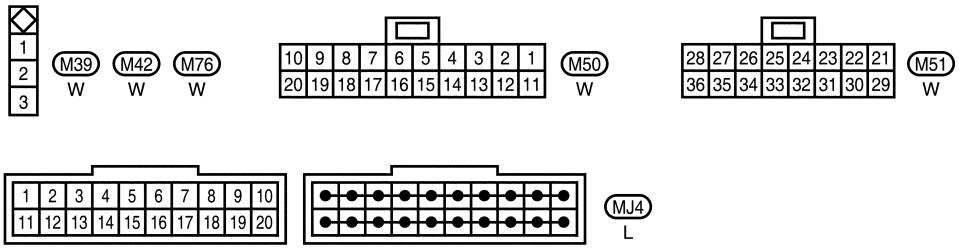


REFER TO FUSE BLOCK (J/B)

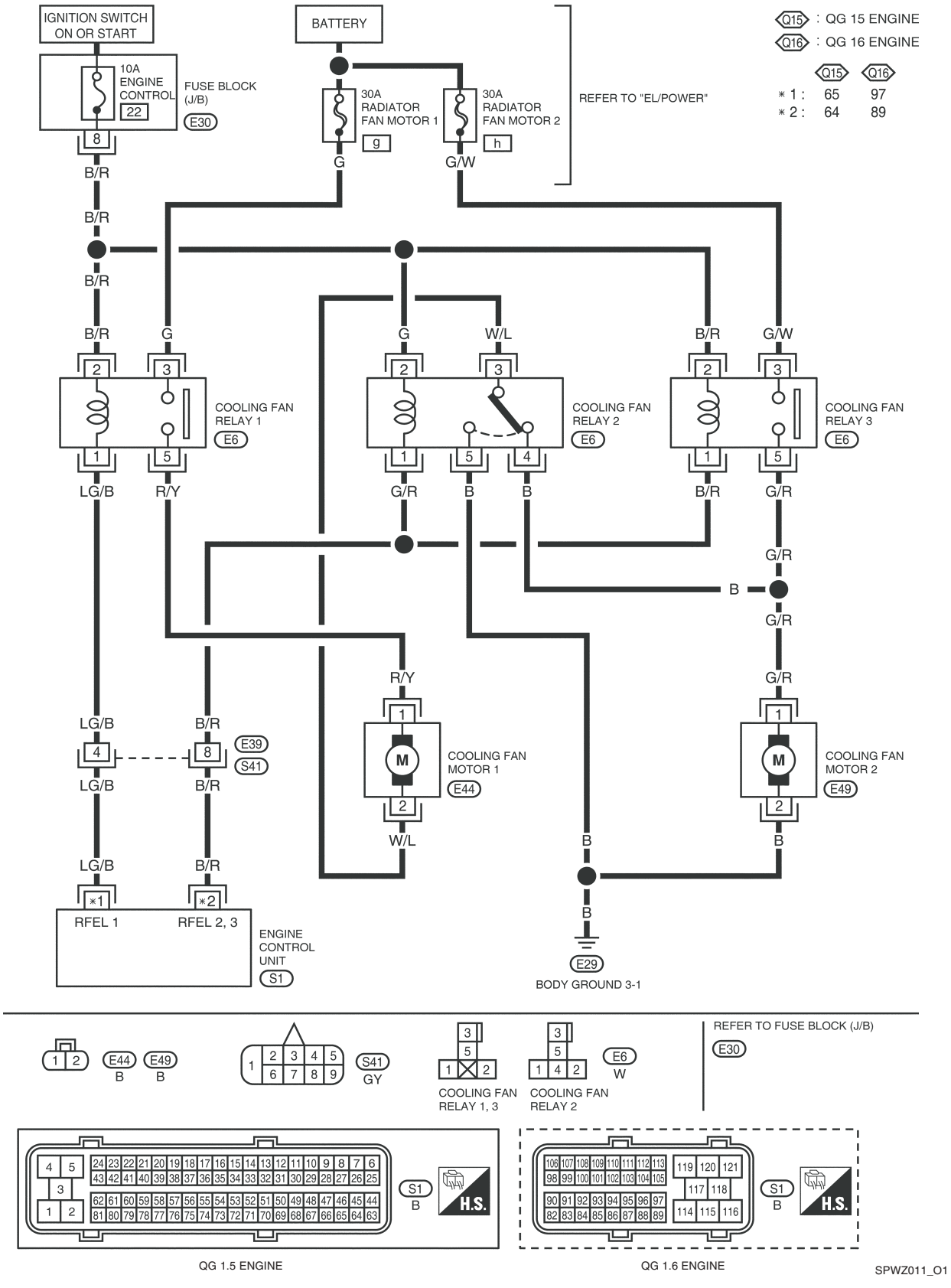
M5

SPWZ009_O1


AUTO
A/C
CONTROLLER
M50
M51
VACTR
ACTR-
LAN
21
16
G/Y
R/Y
R/Y
R/Y
G/Y
G/Y
G/Y
R/Y
B
1
3
2
LCU
M
M39 MODE ACTUATOR
M76 INTAKE ACTUATOR
M42 AIR MIX ACTUATOR
B
15
13
14
11
MJ4 JOINT
CONNECTOR 4
M72
BODY GROUND 1-2

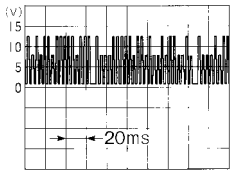

M39
M42
M76
W
M50
M51
MJ4
L

SPWZ010_O1


IGNITION SWITCH ON OR START
BATTERY
10A ENGINE CONTROL 22
FUSE BLOCK (J/B) E30
30A RADIATOR FAN MOTOR 1 g
30A RADIATOR FAN MOTOR 2 h
REFER TO "EL/POWER"
Q15 : QG 15 ENGINE
Q16 : QG 16 ENGINE
Q15 Q16
*1 : 65 97
*2 : 64 89
B/R
G
G/W
W/L
COOLING FAN RELAY 1 E6
COOLING FAN RELAY 2 E6
COOLING FAN RELAY 3 E6
LG/B
R/Y
G/R
B
E39
S41
COOLING FAN MOTOR 1 E44
COOLING FAN MOTOR 2 E49
*1
*2
RFEL 1
RFEL 2, 3
ENGINE CONTROL UNIT S1
E29
BODY GROUND 3-1
REFER TO FUSE BLOCK (J/B) E30
COOLING FAN RELAY 1, 3
COOLING FAN RELAY 2
QG 1.5 ENGINE
QG 1.6 ENGINE
H.S.
SPWZ011_O1

Auto Amp Input/Output Signal Standards

STANDARDS

Terminal No.	Signal	Measurement		Standard (V)
		Key switch	Operation	
27	IGN power	ON	-	Approx. 12
26	Battery power (for memory)	OFF	-	Approx. 12
32	Ground	ON	-	Approx. 0
22	Compressor ON signal	ON	Compressor: ON	Approx. 0
			Compressor: OFF	Approx. 4.8
21	Actuator drive power	ON	-	Approx. 12
3	In-vehicle sensor signal	-	-	Note 1
12	Ambient sensor signal	-	-	Note 2
2	Sunload sensor signal	-	-	Note 3
25	Illumination ground	ON	Light switch: Stage 1	Approx. 0
24	Illumination	-	Light switch: Stage 1	Approx. 12
16	LAN signal	ON	-	Note 4: Approx. 5.7  HAK0652D_D1
35	Fan control amp control signal	ON	Fan speed: Manual speed 1, 2, 3	Approx. 2.5 - 3.0
			Fan speed: Manual speed 4	Approx. 9.0
34	Blower fan motor voltage feedback	ON	Fan speed: Manual speed 1	Approx. 8
29	Fan ON signal	ON	Blower fan: ON	Approx. 0
			Blower fan: OFF	Approx. 4.8
33	Blower motor power feedback	ON	-	Approx. 12
13	Thermal transmitter signal	-	-	Note 5
11	Sensor ground	ON	-	Approx. 0
1	Intake air temperature sensor signal	-	-	Note 6
10	AQS sensor	ON	Within 30 seconds after IGN ON (for heating)	Approx. 5

NOTE 1: Refer to “In-Vehicle Sensor” (AC-26).
NOTE 2: Refer to “Ambient Sensor” (AC-26).
NOTE 3: Refer to “Sunload Sensor” (AC-26).
NOTE 4: The value obtained by a tester.
NOTE 5: Refer to “COMBINATION METER - TROUBLE DIAGNOSIS” (EL-105).
NOTE 6: Refer to “Intake Air Temperature Sensor” (AC-27).

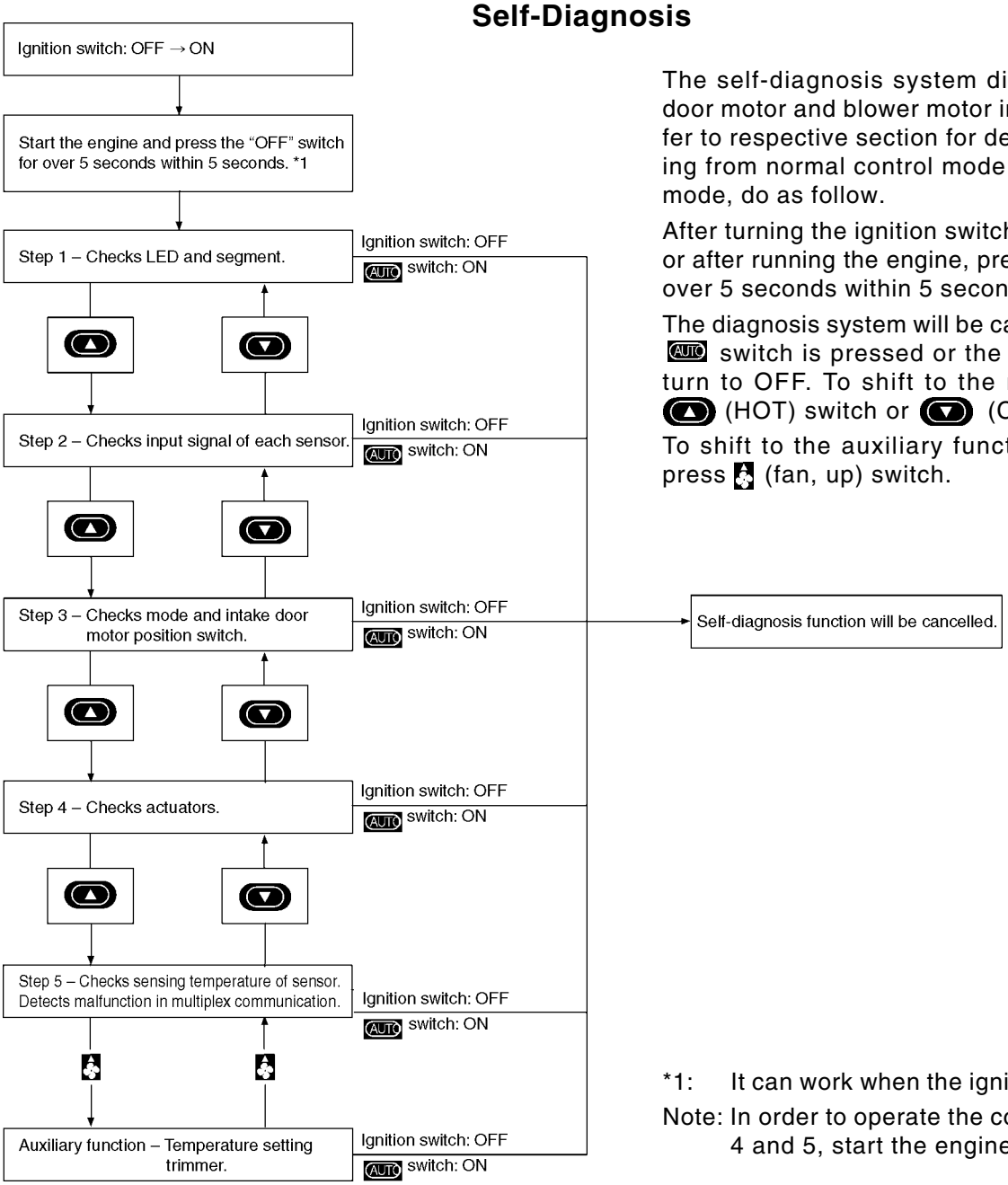
Self-Diagnosis Function

GENERAL

- There are 5 steps in self-diagnosis. Each sensor will be checked for normal operation and then determined control signal will be sent to each output device to check for its operation.

	Step 1	Step 2	Step 3	Step 4	Step 5
Diagnosing item	Checks indicator lights	Checks each sensor	Checks each door position	Checks each output device	Checks each sensor's recognizing temperature
Diagnosing component	Indicator lights	● Ambient sensor ● In-vehicle sensor ● Sunload sensor ● Air mix PBR	● Mode door actuator ● Intake door actuator	● Mode door actuator ● Intake door actuator ● Air mix door actuator ● Blower fan motor ● Compressor	● Ambient sensor ● In-vehicle sensor ● Intake air temperature sensor

Self-Diagnosis



The self-diagnosis system diagnoses sensor, door motor and blower motor in the system. Refer to respective section for details. When shifting from normal control mode to self-diagnosis mode, do as follow.

After turning the ignition switch from OFF to ON or after running the engine, press OFF switch for over 5 seconds within 5 seconds.

The diagnosis system will be cancelled when the AUTO switch is pressed or the ignition switch is turn to OFF. To shift to the next step, press ▲ (HOT) switch or ▼ (COLD) switch.

To shift to the auxiliary function from step 5, press ▲ (fan, up) switch.

*1: It can work when the ignition switch is ON.

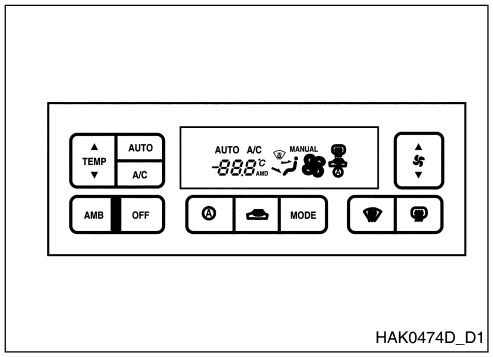
Note: In order to operate the compressor in step 4 and 5, start the engine.

PROCEDURE

1. Activating Temperature Control Mode

1. Place the temperature control button to full cold.
2. Turn the ignition switch from OFF to ON or start the engine. Press “OFF” switch for over 5 seconds within 5 seconds.

   → Go to No. 2



2. Step 1: Turning on of display and indicator lights

Checks all switches on the controller and LCDs.

When normal: All indications are turned on.

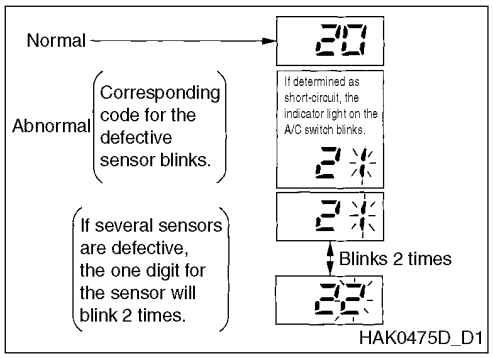
When abnormal: The troubling section does not turn on.

Indicator lights are normal?

OK → Go to No. 3

NG → Defective switch LEP or LCDs

(Replace auto amp)



3. Step 2: Checking respective sensors

1. Increase the set temperature and then shift to step 2.
2. Diagnosis results comes on after displaying “2”.

   When normal: Displays “20”.

   When abnormal: Defective sensor position comes on.

Inspection results are normal?

OK → Go to No. 5

NG → Go to No. 4

4. Checking Defective Sensor

If defective, the corresponding code number of the sensor and actuator blinks. If determined that sensor and actuator circuit is shorted, the LED on the A/C switch blinks. If several sensors and actuators are defective, the corresponding code number of the sensor and actuator blinks 2 times respectively.

Code No.	Corresponding sensor	Malfunction conditions		Reference
21	Ambient sensor	Below 0.49 V	More than 4.84 V	"Ambient Sensor" (AC-26)
22	In-vehicle sensor	Below 0.49 V	More than 4.84 V	"In-Vehicle Sensor" (AC-26)
24	Intake air temperature sensor	Below 0.31 V	More than 3.65 V	"Intake Air Temperature Sensor" (AC-27)
25	Sunload sensor	More than 48.8 W/m² (42 Kcal/m²)	More than 1639.5 W/m² (1410 Kcal/m²)	"Sunload Sensor" (AC-26)
26	Air mix PBR	PBR opening: Less than 5 %	PBR opening: More than 95 %	"Air Mix Door Actuator System" (AC-31)

Example: In case of ambient sensor open circuit, the auto amp recognizes ambient air as extreme condition (below -43.8°C) and then controls towards heating.

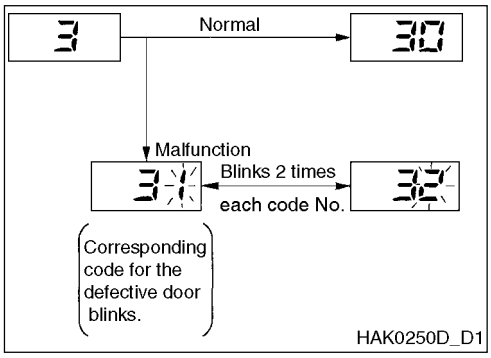
CAUTION:

- **The sunload sensor may make faulty determination during evening or under indoor due to lack of light intensity.**

Inspection results are OK?

OK → Go to No. 5

NG → Corresponding sensor is defective



5. Step 3: Checking mode door and intake door position

1. Press (HOT) switch 2 times to shift into step 3.
2. Diagnosis results comes on after displaying "3".

   When normal: Displays "30".

   When abnormal: The corresponding code number of the door which has different position will blink. If several doors have different positions, the corresponding code number of the door will blink 2 times respectively. When a door position is wrong, mode door actuator or intake door actuator is defective.

CAUTION:

- **If the battery voltage goes under 12 V while diagnosing in step 3, the actuator speed slows down and it may be determined as defective even under normal operation. Perform the diagnosis while engine running.**

Inspection results are OK?

OK → Go to No. 6

NG → Corresponding mode door actuator or intake door actuator is defective

6. Step 4: Checking each output device

1. Press (HOT) switch 3 times to shift into step 4.
2. Each time the (DEF) switch is pressed, the display changes among 42, 43, 44, 45, 46 and 41.
3. Following the chart below, check the discharging air temperature, blower motor voltage, compressor operation and air distribution. Visually check each operation, inspect by touching air outlet and for noise.

Code No.		41	42	43	44	45	46
Output device	Mode door	VENT	B/L	B/L	FOOT	D/F	DEF
	Intake door	Recirculation	Recirculation	20 % fresh air	Fresh air	Recirculation	Recirculation
	Air mix door	Full cold	Full cold	Full hot	Full hot	Full hot	Full hot
	Blower fan motor	Approx. 4.5 V	Approx. 10.5 V	Approx. 8.5 V	Approx. 8.5 V	Approx. 8.5 V	Approx. 12 V
	Compressor	ON	ON	OFF	OFF	ON	ON

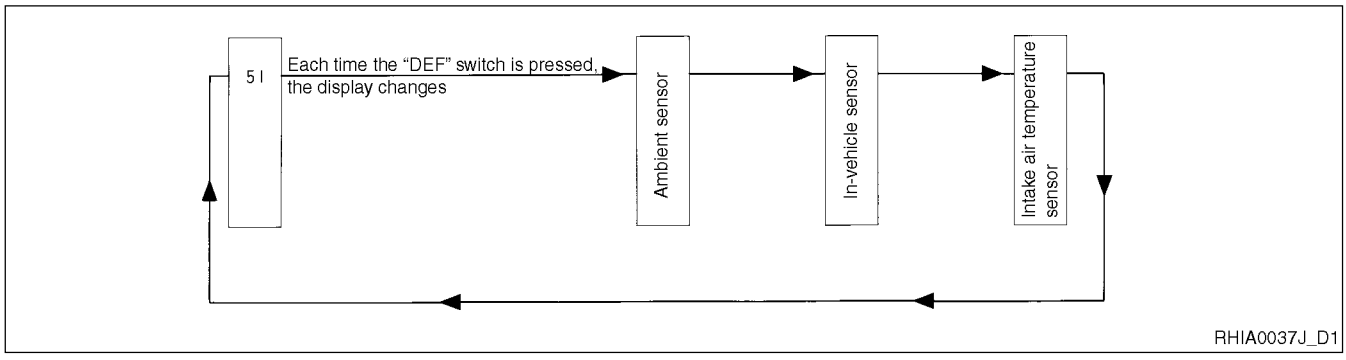
Inspection results are OK?

OK → Go to No. 7

NG →
- Air outlet does not change: Refer to “Mode Door Actuator System” (AC-31).
- Intake door does not change: Refer to “Intake Door Actuator System” (AC-31).
- Blower fan motor does not operate: Refer to “Blower Fan Motor System” (AC-27).
- Magnet clutch does not operate: Refer to “Magnet Clutch System” (AC-29).
- Discharging air temperature does not change: Refer to “Air Mix Door Actuator System” (AC-31).

7. Step 5: Displaying temperature detected by sensor

1. Press (HOT) switch 4 times to shift into step 5.
2. Each time the (DEF) switch is pressed, the display changes from temperature that detected by ambient sensor, temperature that detected by in-vehicle sensor, temperature that detected by intake air temperature sensor to “51”.



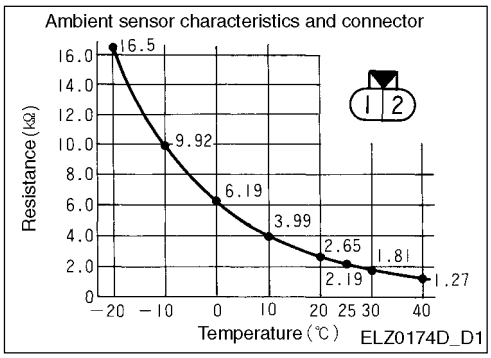
CAUTION:

- **Temperature detecting range of the sensor is -30°C ~ 55°C.**

Inspection results are OK?

OK → End

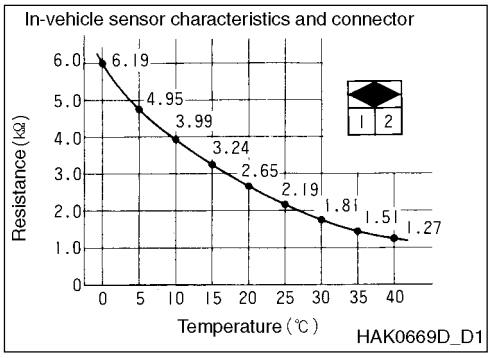
NG →
- Defective ambient sensor: Refer to “Ambient Sensor” (AC-26).
- Defective in-vehicle sensor: Refer to “In-Vehicle Sensor” (AC-26).
- Defective intake air temperature sensor: Refer to “Intake Air Temperature Sensor” (AC-27).



Ambient Sensor

AMBIENT SENSOR INSPECTION

Remove the connector and measure the resistance between the ambient sensor terminal No. 1 and No. 2.



In-Vehicle Sensor

IN-VEHICLE SENSOR INSPECTION

Remove the connector and measure the resistance between the in-vehicle sensor terminal No. 1 and No. 2.

Sunload Sensor

INSPECTION PROCEDURE

1. Power Inspection

After turning the key switch ON, remove the sunload sensor connector and measure the voltage between the terminal No. 1 and body ground.

Terminal No. 1 and body ground: Approx. 5 V

Inspection results are OK?

OK → Go to No. 2.

NG → Go to No. 4.

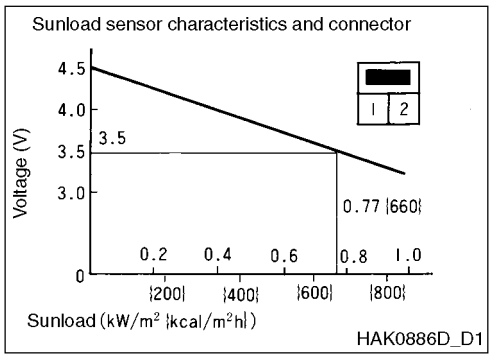
2. Circuit Inspection

1. Remove the auto amp connector.
2. Check the continuity between the sunload sensor terminal No. 2 and auto amp terminal No. 11.

Is there continuity?

OK → Go to No. 3.

NG → Repair the harness or connector.



3. Sunload Sensor Inspection

Measure the voltage between the auto amp terminal No. 12 and body ground.

REFERENCE:

- **While indoors, measure the voltage by moving around a 60 W light.**
- **On a sunny day, the sun load will be around 767 W/m² (660 kcal/m²•h).**

Inspection results are OK?

OK → 1. Replace the auto amp.
2. Perform the self-diagnosis step 2 and check if normal. Refer to “Self-Diagnosis Function” (AC-22).

NG → 1. Replace the sunload sensor.
2. Perform the self-diagnosis step 2 and check if normal. Refer to “Self-Diagnosis Function” (AC-22).

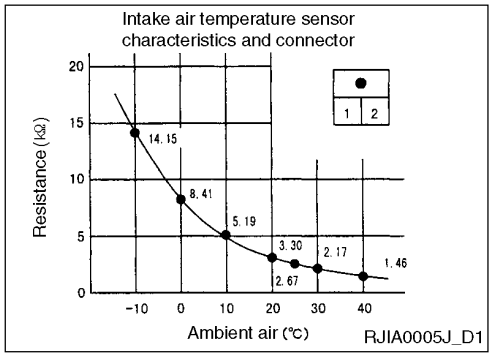
4. Circuit Continuity Inspection

1. Remove the auto amp connector.
2. Check the continuity between the sunload sensor terminal No. 1 and auto amp terminal No. 12.

Is there continuity?

OK → 1. Replace the auto amp.
2. Perform the self-diagnosis step 2 and check if normal. Refer to “Self-Diagnosis Function” (AC-22).

NG → Repair the harness or connector.



Intake Air Temperature Sensor

INTAKE AIR TEMPERATURE SENSOR INSPECTION

Remove the connector and measure the resistance between the intake air temperature sensor terminal No. 1 and No. 2.

Blower Fan Motor System

INSPECTION PROCEDURE

Symptom: Blower fan motor operates abnormally

1. Blower Fan Motor Relay Inspection

Check the continuity between terminals No. 3 and No. 5 when applied 12 V on the blower fan motor relay terminal No. 1 and No. 2 after removing the blower fan motor relay.

Inspection results are OK?

OK → Go to No. 2.

NG → Replace the blower fan motor relay.

2. Auto Amp Output Inspection

Measure the voltage change between the fan control amp terminal No. 1 and No. 2 by changing fan speed from 1 to 4 after turning the key switch ON.

	1	2	3	4
Terminal No. 1	Approx. 8 V	Approx. 5.5 V	Approx. 3 V	Approx. 0 V
Terminal No. 2	Approx. 2.5 - 3.0 V			Approx. 9.0 V

Inspection results are OK?

OK → Go to No. 2.

NG → Go to No. 3.

3. Fan Control Amp Inspection

1. Remove the fan control amp connector.
2. Check the continuity between the fan control amp terminal No. 2 and No. 3.

Is there continuity?

OK → Go to No. 3.

NG → ● Replace the fan control amp.

● Check if the blower fan motor is locked or shorted.

4. Blower Fan Motor Inspection

Remove the blower fan motor connector. Short the blower fan motor terminal No. 2 and apply 12 V on the terminal No. 1 to check the motor operation.

Inspection results are OK?

NG → Replace the blower fan motor.

Magnet Clutch System

INSPECTION PROCEDURE

1. Magnet Clutch Inspection

Remove the compressor connector. Check the magnet clutch operation by applying 12 V on the compressor terminal No. 1.

1 ~ Body ground: Power voltage

Inspection results are OK?

OK → Go to No. 2.

NG → Replace the magnet clutch.

2. A/C Relay Inspection

Check the continuity between the terminal No. 3 and No. 5 when 12 V is applied on A/C relay terminal No. 1 and No. 2.

Is there continuity?

OK → Go to No. 3.

NG → Repair the harness or connector.

LAN System

Symptom:

One or all of the mode door actuator, intake door actuator, air mix door actuator is not operating normally.

INSPECTION PROCEDURE

1. Auto Amp Power Circuit Inspection

Measure the voltage between auto amp terminal No. 21 and body ground.

21 ~ Body ground: Power voltage

Inspection results are OK?

OK → Go to No. 2.

NG → Replace the auto amp.

2. Auto Amp Signal Circuit Inspection

Check the output wave of auto amp terminal No. 16. Refer to “Auto Amp Input/Output Signal Standards” (AC-21).

Inspection results are OK?

OK → Go to No. 3.

NG → Replace the auto amp.

3. Actuator Power Circuit Inspection

Measure the voltage between corresponding actuator's terminal No. 1 and body ground.

1 ~ Body ground: Power voltage

Inspection results are OK?

OK → Go to No. 4.

NG → Repair the harness or connector.

4. Actuator Signal Circuit Inspection

Check the output wave of the corresponding actuator's terminal No. 2. Refer to "Auto Amp Input/Output Signal Standards" (AC-21).

Inspection results are OK?

OK → Go to No. 5.

NG → Repair the harness or connector.

5. Actuator Ground Circuit Inspection

Check the continuity between the corresponding actuator's terminal No. 2 and body ground.

Inspection results are OK?

OK → Go to No. 6.

NG → Repair the harness or connector.

6. Actuator Operation Inspection.

Remove the corresponding actuator connector and then check the actuator operation by reconnecting.

Inspection results are OK?

OK → Bad actuator connector connection.

NG → Go to No. 7.

7. Intake Door Actuator Abnormal Signal Inspection

1. Remove all intake, air mix, mode door actuator connectors.
2. Connect the air mix and mode door actuator connectors.
3. Check the mode door and air mix door actuator operation.

Inspection results are OK?

OK → Replace the intake door actuator.

NG → Go to No. 8.

8. Air Mix Door Actuator Abnormal Signal Inspection

1. Remove all intake, air mix, mode door actuator connectors.
2. Connect the intake and mode door actuator connectors.
3. Check the intake and mode door actuator operation.

Inspection results are OK?

OK → Replace the air mix door actuator.

NG → Go to No. 9.

9. Mode Door Actuator Abnormal Signal Inspection

1. Remove all intake, air mix, mode door actuator connectors.
2. Connect the intake and air mix door actuator connectors.
3. Check the air mix and intake door actuator operation.

Inspection results are OK?

OK → Replace the mode door actuator.

NG → Replace the auto amp.

Intake Door Actuator System

Symptoms

- The intake door does not change.
- The intake door motor does not operate normally.

INSPECTION PROCEDURE

Symptoms

- The intake door actuator does not operate normally.
- Refer to “LAN System” (AC-29).

Mode Door Actuator System

INSPECTION TIPS

Symptoms

- The air outlet does not change.
- The mode door actuator does not operate normally.

Refer to “LAN System” (AC-29).

Air Mix Door Actuator System

INSPECTION TIPS

Symptoms

- Discharging air temperature does not change.
- The air mix door actuator does not operate.

Refer to “LAN System” (AC-29).

Air Mix Door Actuator PBR System

INSPECTION TIPS

Symptoms

- Open or short in PBR circuit.
- Refer to “LAN System” (AC-29).

Bad Cooling

PERFORMANCE CHECK

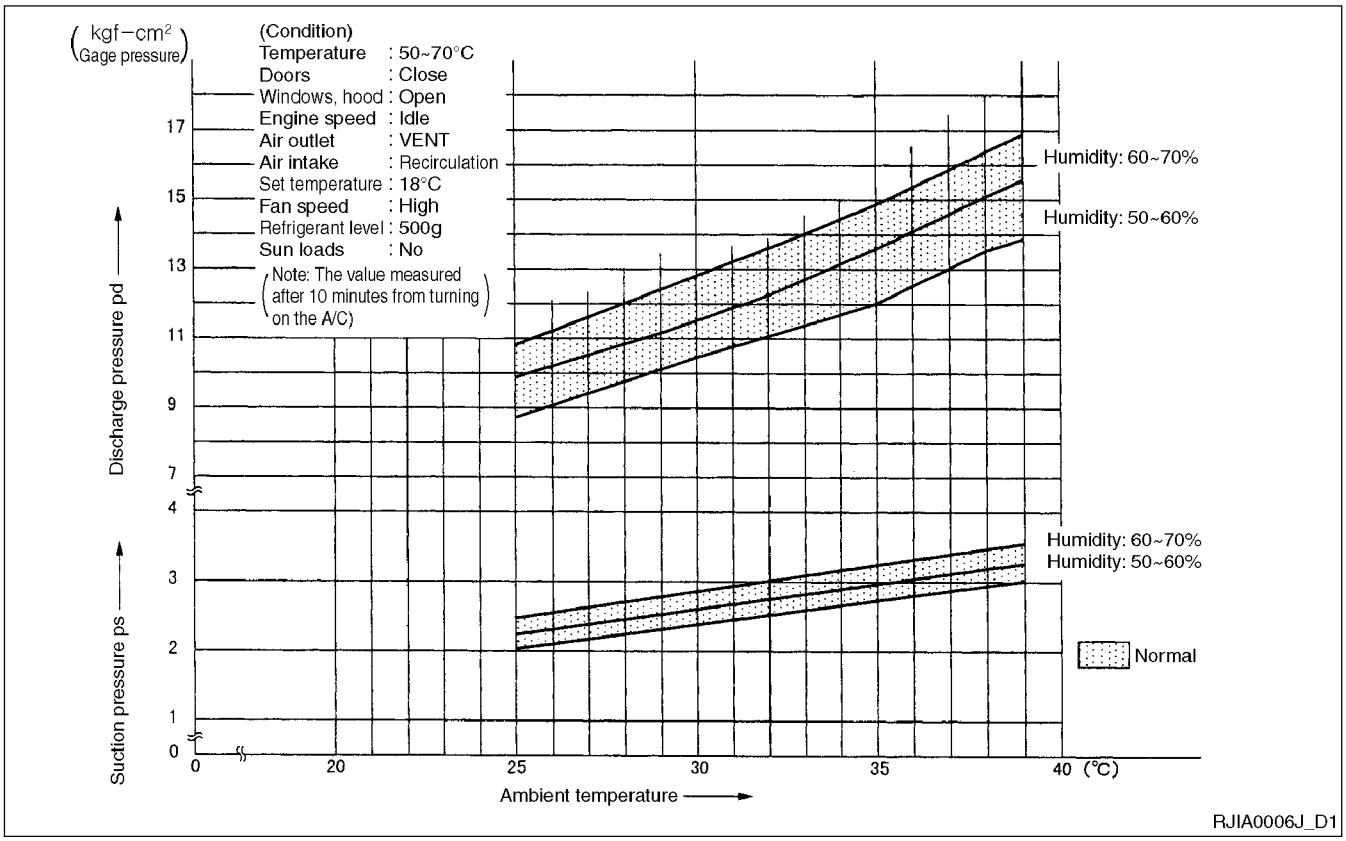
INSPECTION PROCEDURE

1. Connect the manifold gage to the vehicle’s cooler cycle (service valve).
2. Install a wet and dry thermometer to the aspirator (below the glove box) in the blower unit and a thermometer at the right side of the center vent.
3. Start the engine to warm up the system.
4. After warming up the engine, check if the engine speed is in specified RPM.

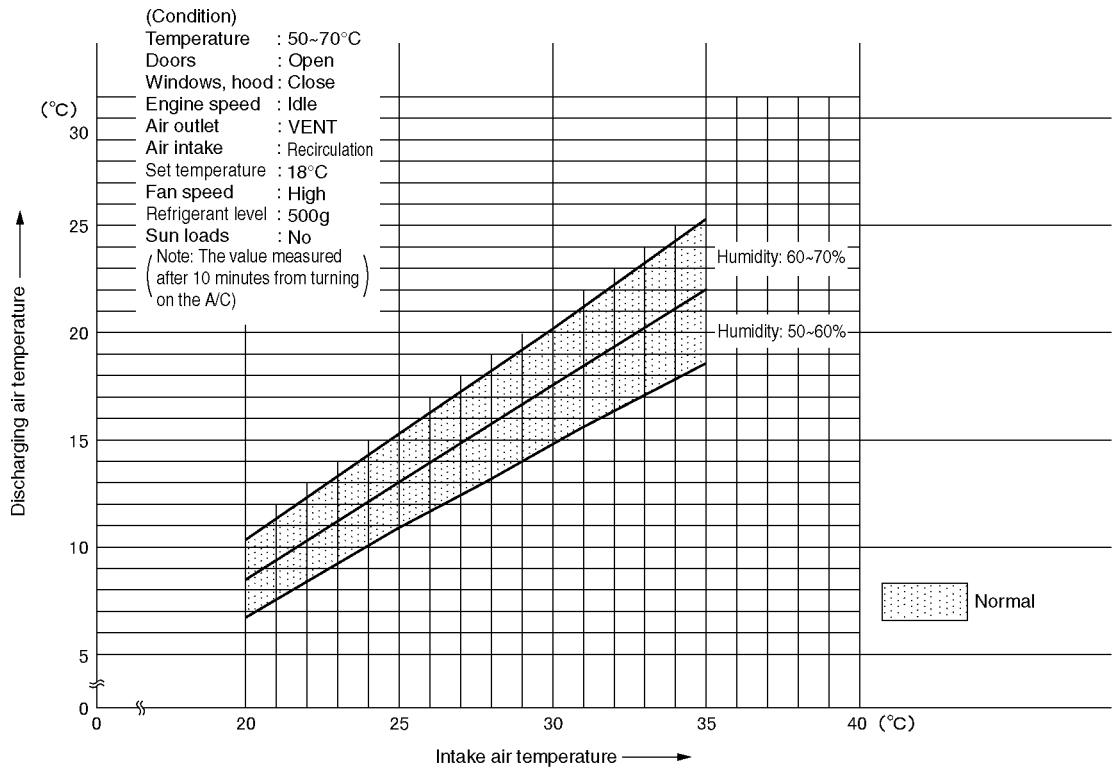
5. Operate the compressor and then set to the below conditions by using controller.
   Fan Speed: Hi
   Air intake mode: Recirculation
   Air outlet: VENT(Ventilator)
   Set temperature: Full cold
6. Open the hood and all door windows but close all doors.
7. Maintain this condition until cooler cycle stabilizes (about 10 minutes).
8. Idle the engine.
9. Measure the aspirator's temperature and humidity, air outlet temperature and high and low pressure of the cooler cycle. And then judge the system by combining them with "Ambient Air Temperature–Pressure Characteristics" and "Intake and Discharge Air Temperature Characteristics".

PERFORMANCE CURVE

Ambient air temperature - pressure characteristics



INTAKE AND DISCHARGE AIR TEMPERATURE CHARACTERISTICS



Trouble Diagnosis Using Gage Pressure

Connect the manifold gage to the cooler cycle (service valve) then isolate defective component and possible cause by reading cooler cycle pressure.

Symptoms	Cycle Status	Possible Cause	Remedy
Both low and high pressures are high	When poured water to condenser, it returns to normal	Bad cooling of condenser ● Bad operation of radiator and condenser fan ● Bad installation of air guide ● Dirty or clogged condenser fin	● Repair or replace the defective components ● Clean and repair the condenser fin
		Overcharged refrigerant	Evacuate refrigerant and then recharge to the specified value
	When compressor is stopped, the pressure drops to 2 kg/cm^2 and then decreases gradually	Air in the cooler cycle	Evacuate refrigerant and then recharge to the specified value
	Frost is formed in the low-pressure pipe or low-pressure pipe is colder than the evaporator outlet	Excessive opening of the expansion valve (Excessive flow of refrigerant)	Replace the expansion valve
High pressure is extremely high	Temperature is different on where high-pressure pipe is damaged or clogged	High-pressure pipe between the compressor and condenser is damaged or clogged	Repair or replace the defective components

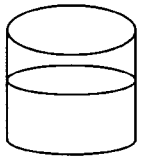
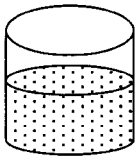
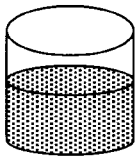
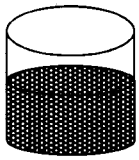
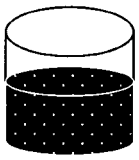
Symptoms	Cycle Status	Possible Cause	Remedy
Both low and high pressures are low (Sometimes, even negative value)	Evaporator outlet is not cold Frost is formed at the evaporator inlet	Clogged expansion valve ● Gas leak at temperature detecting section ● Clogged by foreign particles	Remove foreign particles at expansion valve or replace the unit
	Temperature differences in the liquid tank outlet pipe. Frost is formed in the liquid tank	Bad liquid tank (Clogged strainer)	Replace the liquid tank
	Frost is formed in the evaporator	Clogged or damaged evaporator fins	Repair or replace
		Lack of air flow	Replace the blower unit
	Slight temperature differences in the compressor high-pressure and low-pressure pipes	Lack of refrigerant	● Inspect for refrigerant leakage ● Evacuate refrigerant and then recharge to the specified value
Sometimes high-pressure is low and low-pressure becomes negative	Sometimes the evaporator outlet is not cold Sometimes frost is formed in the evaporator inlet	Water in the cooler cycle (Clogged due to moisture formed by the expansion valve)	Evacuate refrigerant and then recharge to the specified value after dehumidifying. Always replace the liquid tank
High-pressure is low and low-pressure is high	When compressor is stopped, both pressures become to the same value at once No temperature differences between the high-pressure and low-pressure pipes	Bad compressor (Bad compression) ● Damaged or broken valve ● Bad gasket	Replace the compressor

Compressor Trouble Diagnosis

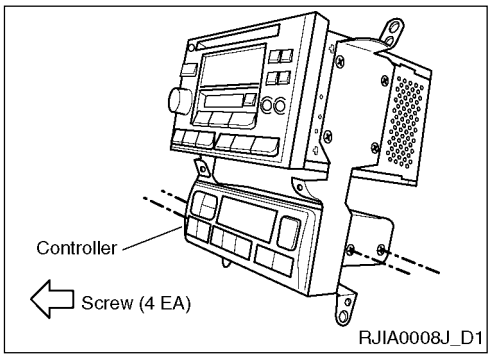
When compressor assembly is defective (noise, bad cooling), diagnose as below.

Symptoms	Object	Method	Result	Remedy
Noise occurs from compressor assembly while A/C ON	Pressure in the cooler cycle	Inspect using manifold gage	-	Recharge to the specified value
			-	Replace compressor only
	Inspect compressor oil status	Determine after draining compressor oil	Determine by referring "AC-35"	Determination 1: Replace compressor only Determination 2: Replace compressor and liquid tank
Bad cooling (Note 1)	Compressor assembly	Check compressor operation. If burnt or stuck, determine after draining compressor oil		
	Pressure in the cooler cycle	Inspect using manifold gage. If pressure difference between the high-pressure and low-pressure is small, determine after draining compressor oil		
Discharging temperature temporarily increases while driving (Note 2)	-	-	-	Replace compressor only

Note 1: Perform the inspection according to symptom diagnosis.

Compressor oil contamination				
				
Clear No foreign particles	Gray but near clear No foreign particles	Light gray No foreign particles	Gray Foreign particles	Black Foreign particles
Determination 1			Determination 2	HAK0874D_D1

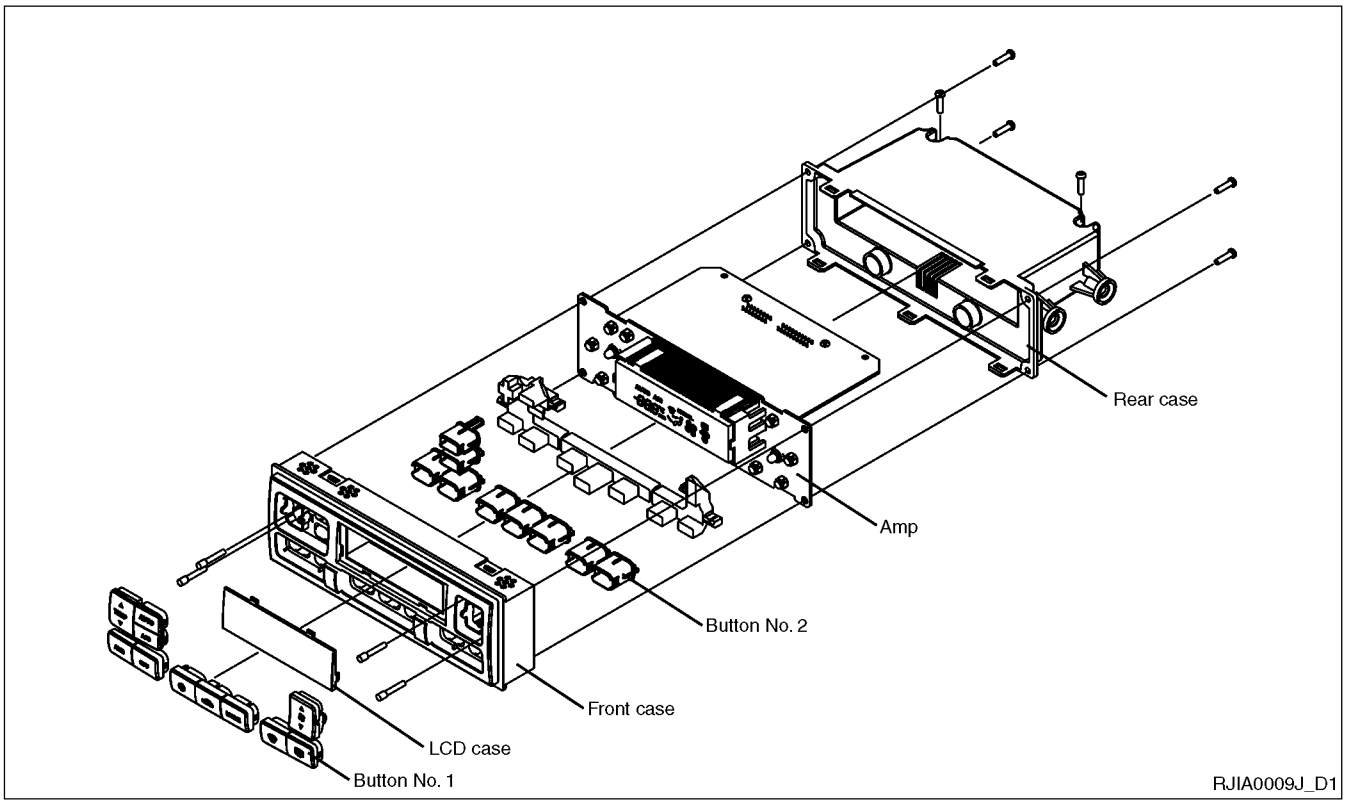
Controller



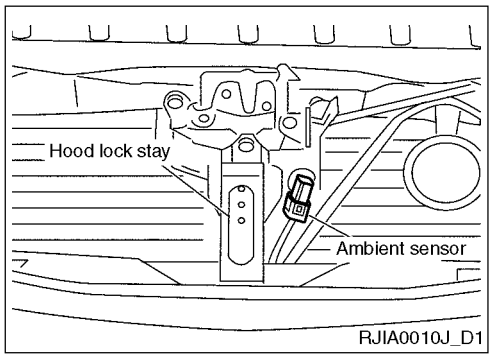
Removal • Installation

1. Remove the audio assembly.
2. Remove the controller.

Disassembly • Assembly



Ambient Sensor



Removal • Installation

REMOVAL

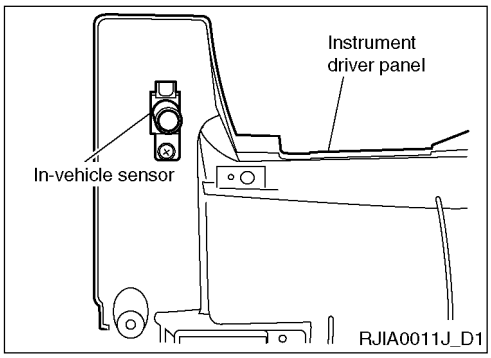
FRONT

1. Remove the radiator grille. Refer to “FRONT GRILL” (BT-22).
2. Remove the ambient sensor.

INSTALLATION

Install in the reverse order of removal.

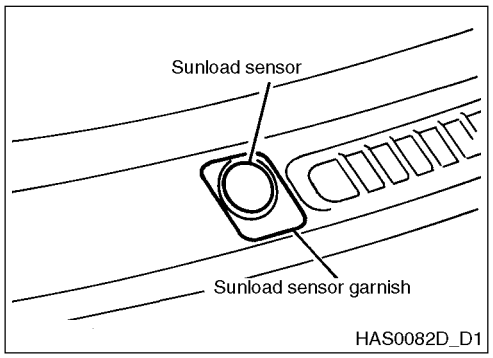
In-Vehicle Sensor



Removal • Installation

1. Remove the instrument lower driver panel.
2. Remove the in-vehicle sensor.

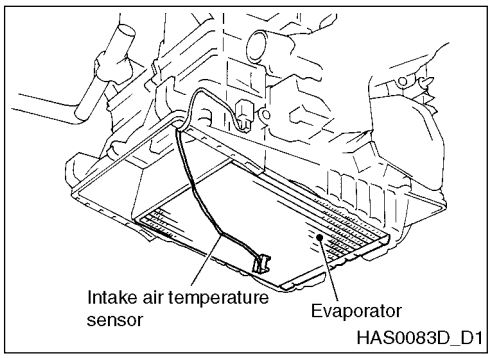
Sunload Sensor



Removal • Installation

1. Remove the sunload sensor garnish.
2. Remove the sunload sensor.

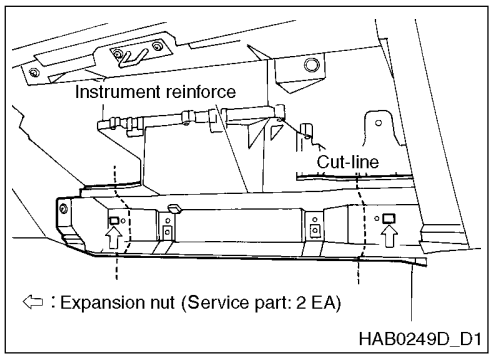
Intake Air Temperature Sensor

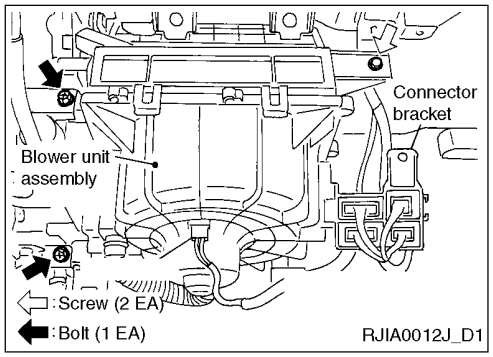


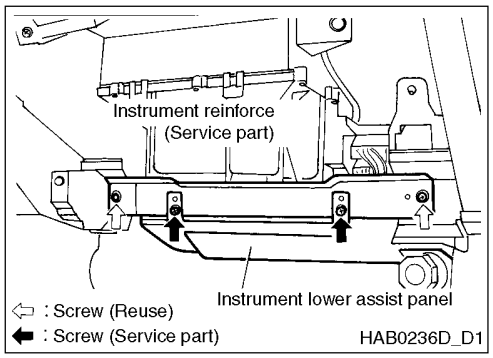
Removal • Installation

1. Remove the heater and cooling unit assembly lower case.
2. Remove the intake air temperature sensor.

Blower Unit Assembly







Removal • Installation

REMOVAL

1. Remove the glove box assembly.
2. Pry off the glove box cover and instrument lower assist panel.
3. Cut the instrument reinforce following the cut-line and smoothen the edges.
4. Remove the intake door actuator connector.
5. Remove the connector and connector bracket from blower fan motor.
6. Remove the 2 screws and 1 bolt and then remove the blower unit.

CAUTION:

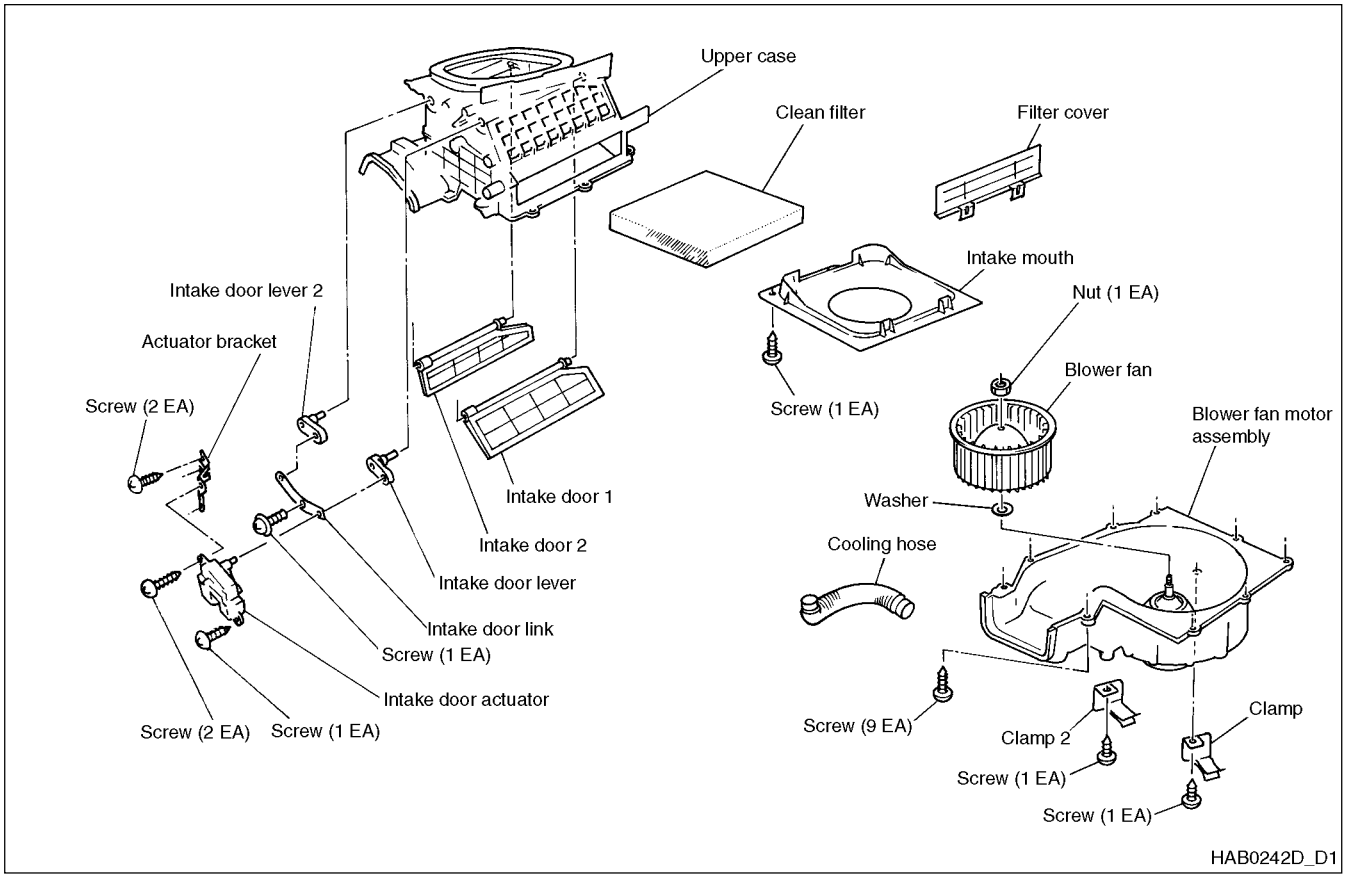
- **Push the blower unit towards the left and pull out the 2 positioning pins, then remove downwards.**

REMOVAL

CAUTION:

- **Install the instrument reinforce (service part).**
- **Check if 2 positioning pins are securely located.**

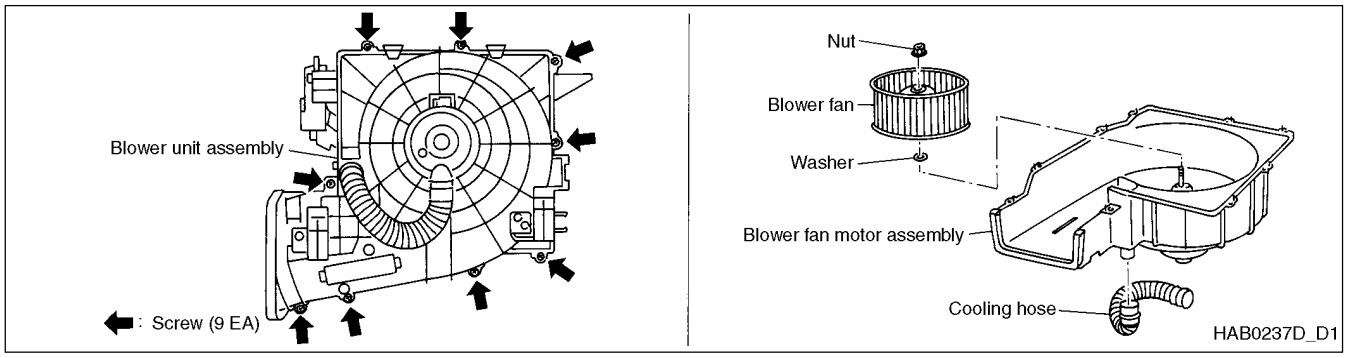
Disassembly • Assembly



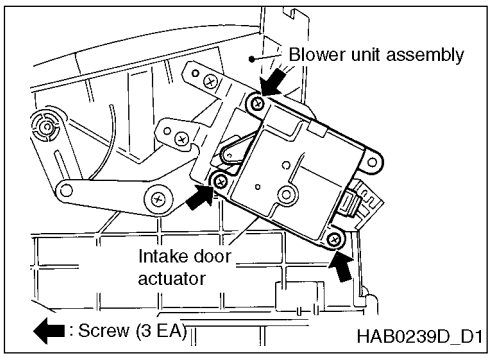
Blower Fan Motor

Removal • Installation

1. Remove the blower unit assembly.



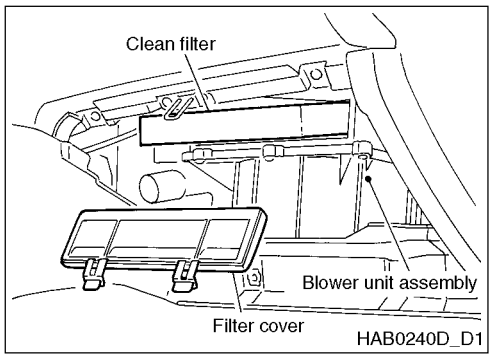
Intake Door Actuator



Removal • Installation

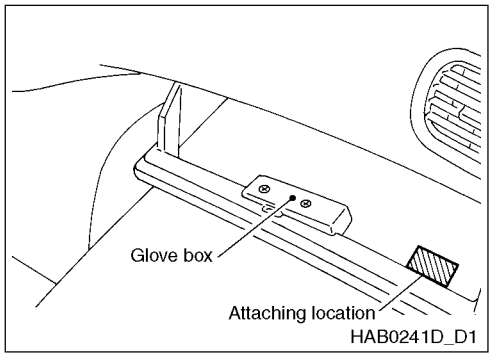
1. Remove the blower unit assembly.
2. Remove the intake door actuator.

Clean Filter



Removal • Installation

1. Remove the glove box.
2. Remove the clean filter.

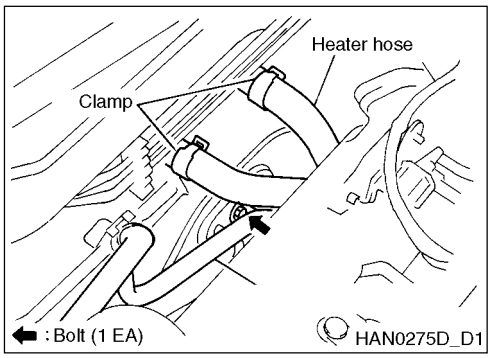


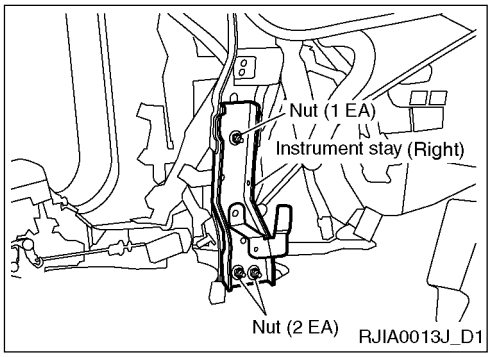
Replacement

Clean filter replacement: Refer to MA section.

- Record on the label and attach to the illustrated location on the glove box.

Heater & Cooling Unit Assembly





Removal • Installation

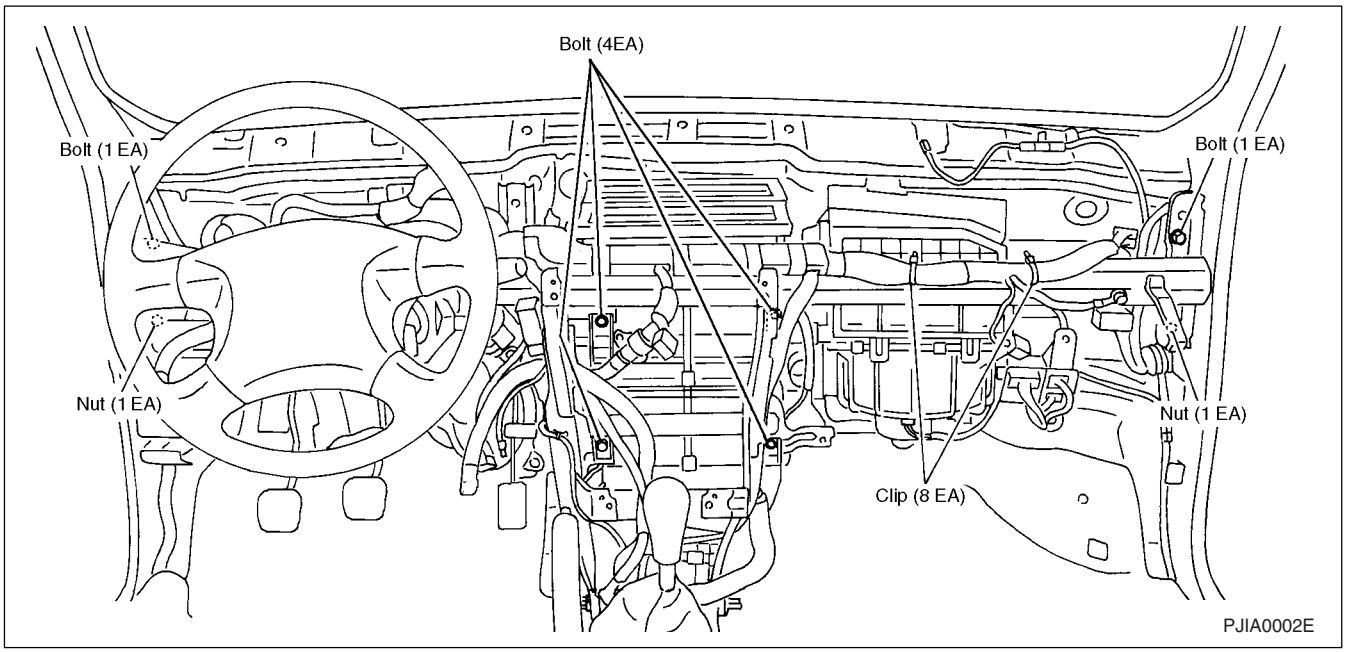
REMOVAL

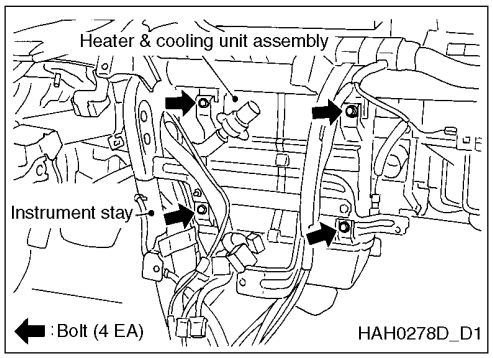
1. Trap the refrigerant using a refrigerant-recovery station (for HFC134a).
2. Drain the engine coolant.
3. Disconnect the low-pressure flexible hose and high-pressure pipe from the evaporator.
4. Remove the heater hose from the heater core.

CAUTION:

- **Some coolant will leak when removing the heater hose.**
- **Block the coolant inlet/outlet on the heater core with a cloth.**

5. Remove the instrument assembly.
6. Remove the blower unit assembly.
7. Remove the clip from vehicle harness and remove the instrument stay (right: 4 nuts, left: 3 nuts).



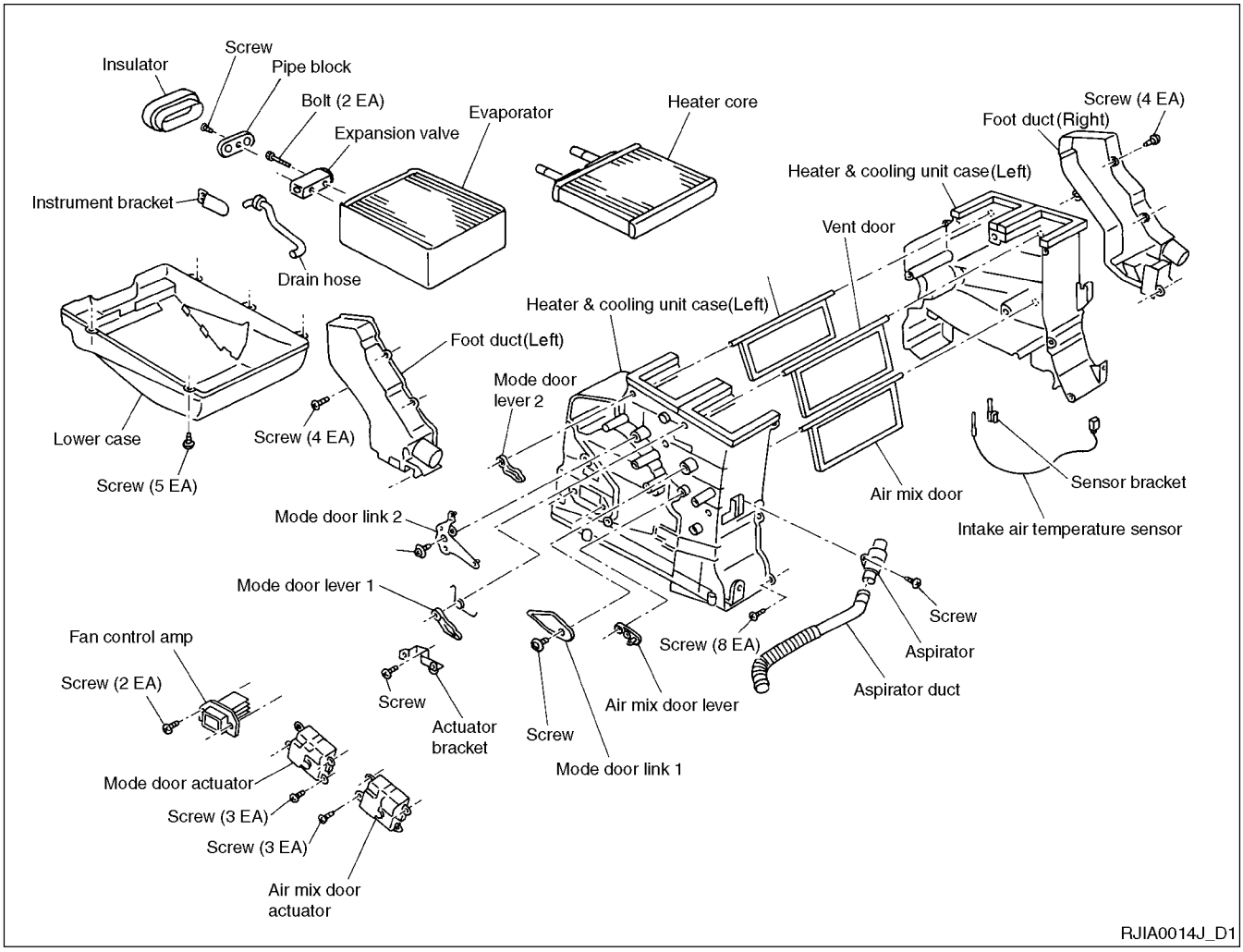


8. Remove the heater & cooling unit assembly mounting bolts.
9. Remove the steering member and the heater & cooling unit assembly.

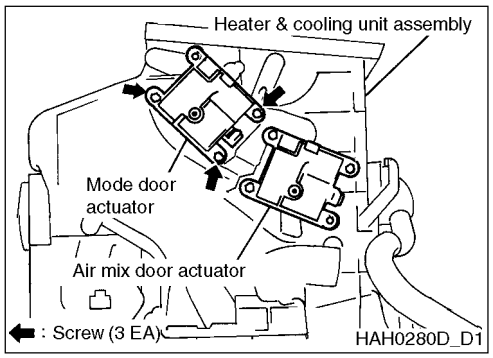
Installation

1. Install the heater & cooling unit assembly.
   Heater & cooling unit assembly mounting bolt
   Tightening torque: 5.98 - 7.64 N•m (0.61 - 0.78 kgf-m)
2. Reverse the removal steps 3~7 to install.
   Steering member mounting nuts and bolts
   Tightening torque: 10.87 - 13.72 N•m (1.1 - 1.4 kgf-m)
3. Refill the engine coolant.
4. Recharge the refrigerant using a refrigerant-recovery station (for HFC134a).

Disassembly • Assembly



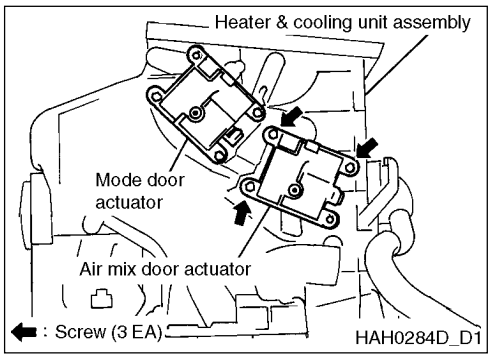
Mode Door Actuator



Removal • Installation

1. Remove the instrument lower driver panel.
2. Remove the mode door actuator.

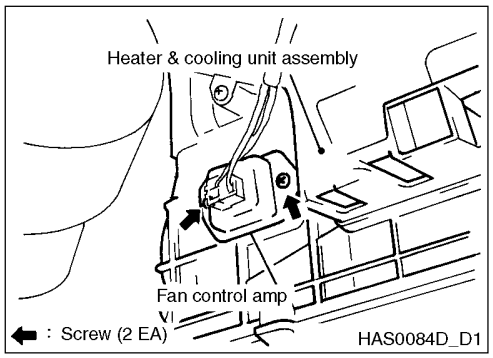
Air Mix Door Actuator



Removal • Installation

1. Remove the instrument lower driver panel.
2. Remove the air mix door actuator.

Fan Control Amp



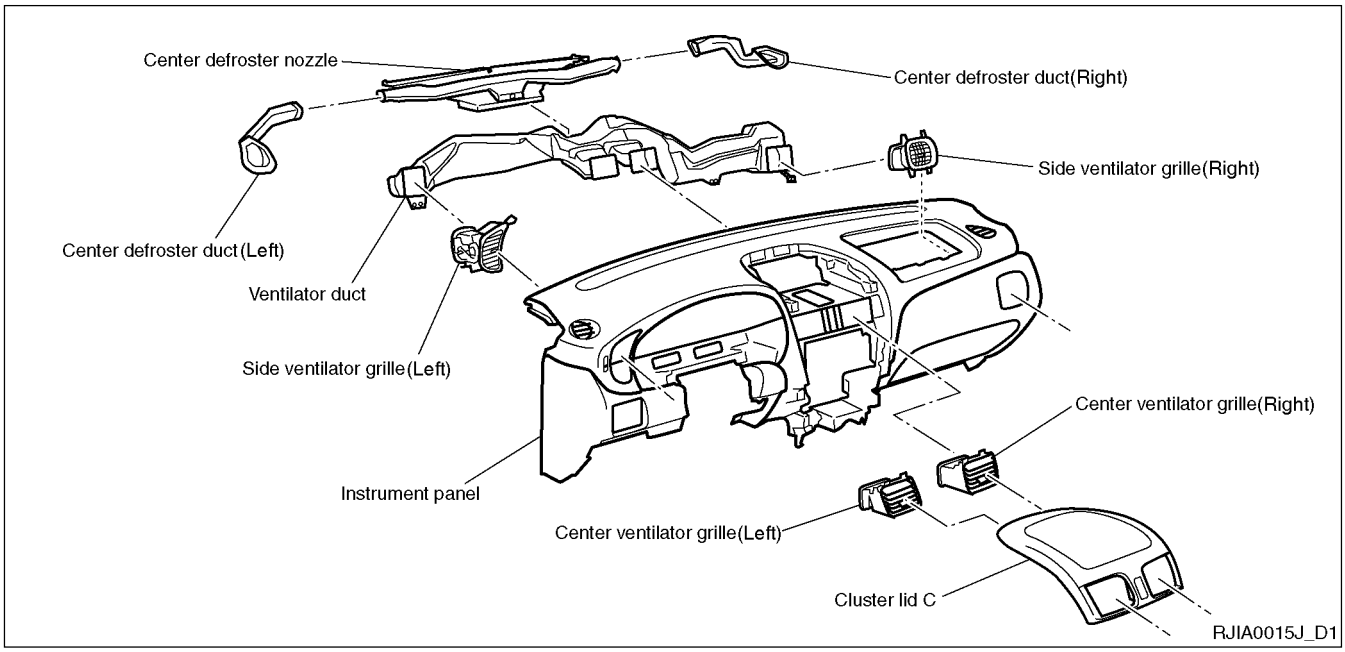
Removal • Installation

1. Remove the glove box.
2. Remove two fixing screws.
3. Remove the fan control amp.

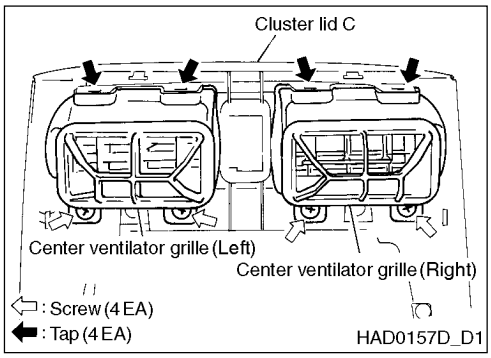
Duct and Grille

Removal • Installation

Ventilator duct, Defroster nozzle and duct

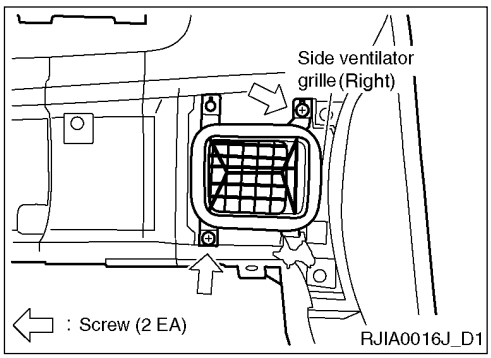


1. Remove the instrument panel.



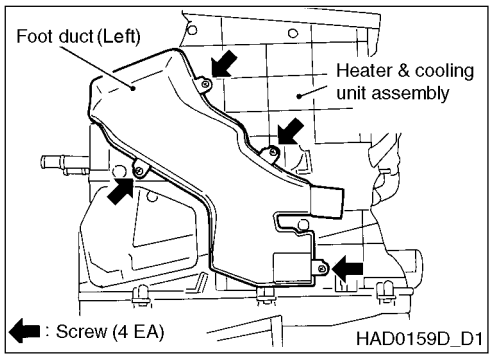
Center Ventilated Grille

1. Remove the cluster lid C.
2. Remove the center ventilator grille.



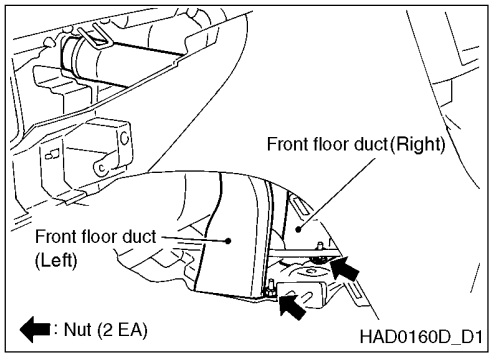
Side Ventilator Grille

1. Remove the instrument panel.
2. Remove the side ventilator grille.



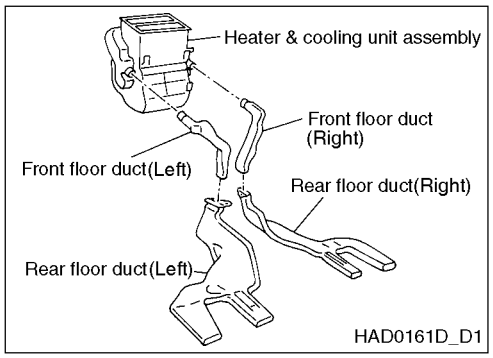
Foot Duct

1. Remove the heater & cooling unit assembly.
2. Remove the foot duct.



Blower Duct

1. Remove the instrument lower cover and glove box.
2. Remove the instrument lower driver panel.
3. Remove the console and instrument stay (left).
4. Remove the front blower duct (left and right).
5. Remove the rear blower duct mounting nuts.
6. Remove the front seat, front kicking plate and dash side finisher.



7. Strip the blower trim from both sides of the vehicle and remove the rear blower duct (left and right).

Fluids and Refrigerant

Item	Application	Use	Remark
Refrigerant can	All	Charging refrigerant	
NISSAN A/C System Oil Type R 40 cm^3	QG engine	Adding compressor oil	DHC

Refrigerant System

Refrigerant Cycle

REFRIGERANT CYCLE

The refrigerant returns to the compressor through compressor, condenser, liquid tank and evaporator. The refrigerant evaporation inside the evaporator is controlled by the expansion valve.

FREEZING PROTECTION

The compressor operates so that it can maintain the evaporator temperature to the specified range. If the evaporator temperature goes under the specified value, then the auto amp stops the compressor. Also, if the evaporator temperature goes above the specified value, then the auto amp operates the compressor.

Refrigerant System Protection

REFRIGERANT PRESSURE SENSOR

- The A/C refrigerant system is protected from high or low pressure by the refrigerant pressure sensor on the liquid tank.
- When abnormal pressure in the cooler cycle (approx. more than 2.7 Mpa [28 kgf/cm^2•G] or less than 0.14 Mpa [1.4 kgf/cm^2•G]) is detected, the refrigerant pressure sensor stops the compressor.

NOTE:

- **The value in the parenthesis means gage pressure.**

Compressor Oil

Oil Level Adjustment

The compressor oil circulates in the system with refrigerant. When cooler cycle component is replaced or large amount of refrigerant is leaked, the compressor oil should be added. It is important to maintain proper oil level and if not properly maintained, the following troubles may occur.

- Lack of oil: Compressor sticks
- Excessive oil: Lack of cooling capacity (due to lack of heat exchange)

Oil specification: NISSAN A/C System Oil Type R (rotary type compressor)

Oil Return Operation

Adjust oil level as follows.

1. A/C System Inspection

1. Inspect if A/C system is normally operating.
2. Inspect if large amount of refrigerant or oil is leaked.

Inspection results are OK?

OK → Go to No. 1

NG → Go to No. 3

2. Oil Return Operation

1. Start the engine and maintain the following conditions.
   - Engine RPM: Idle to 1,200 RPM
   - A/C switch: ON
   - Fan speed: High
   - Set temperature: Full hot
2. Run the engine for about 10 minutes.
3. Stop the engine.

CAUTION:

- **When refrigerant or oil is leaked a lot, do not perform the oil return operation.**
  → Go to No. 3

3. Compressor Inspection

Replace the compressor?

YES → Go to “Oil Level Adjustment when Compressor is Replaced” (AC-57).

NO → Go to No. 4

4. Other Components Inspection

Replace other components? (evaporator, condenser, liquid tank or refrigerant or oil)

YES → Go to “Oil Level Adjustment when Other Components are Replaced” (AC-57).

NO → Perform performance check. Refer to “PERFORMANCE CHECK” (AC-31).

Oil Level Adjustment when Other Components are Replaced

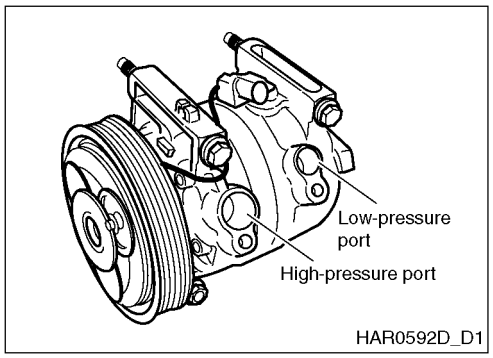
Add oil to the compressor using the high-pressure port as below.

The "α" stands for oil volume that has released with refrigerant when removing refrigerant.

Replacing Component	Adding capacity
Evaporator	75 + α cm^3
Condenser	35 + α cm^3
Liquid tank	10 + α cm^3

CAUTION:

- **When several components are replaced, do not refill refrigerant and oil respectively.**
  Example: Evaporator and liquid tank refill (cm^3) = 75 + 10 + α



Oil Level Adjustment When Compressor is Replaced

1. Drain the compressor oil from the high-pressure port and low-pressure port and measure the volume. (The low-pressure port has a valve inside. Press it with a minus (-) screwdriver to drain the compressor oil.)
2. Drain the compressor oil from the new compressor as below. The "α" stands for oil volume that has released with refrigerant when removing refrigerant.

   Oil volume (cm^3) drained from new compressor

   = Oil capacity of new compressor (180) - Drained oil from removed compressor - Remaining oil inside the compressor (20) - α

   = 160 - Drained oil from removed compressor - α

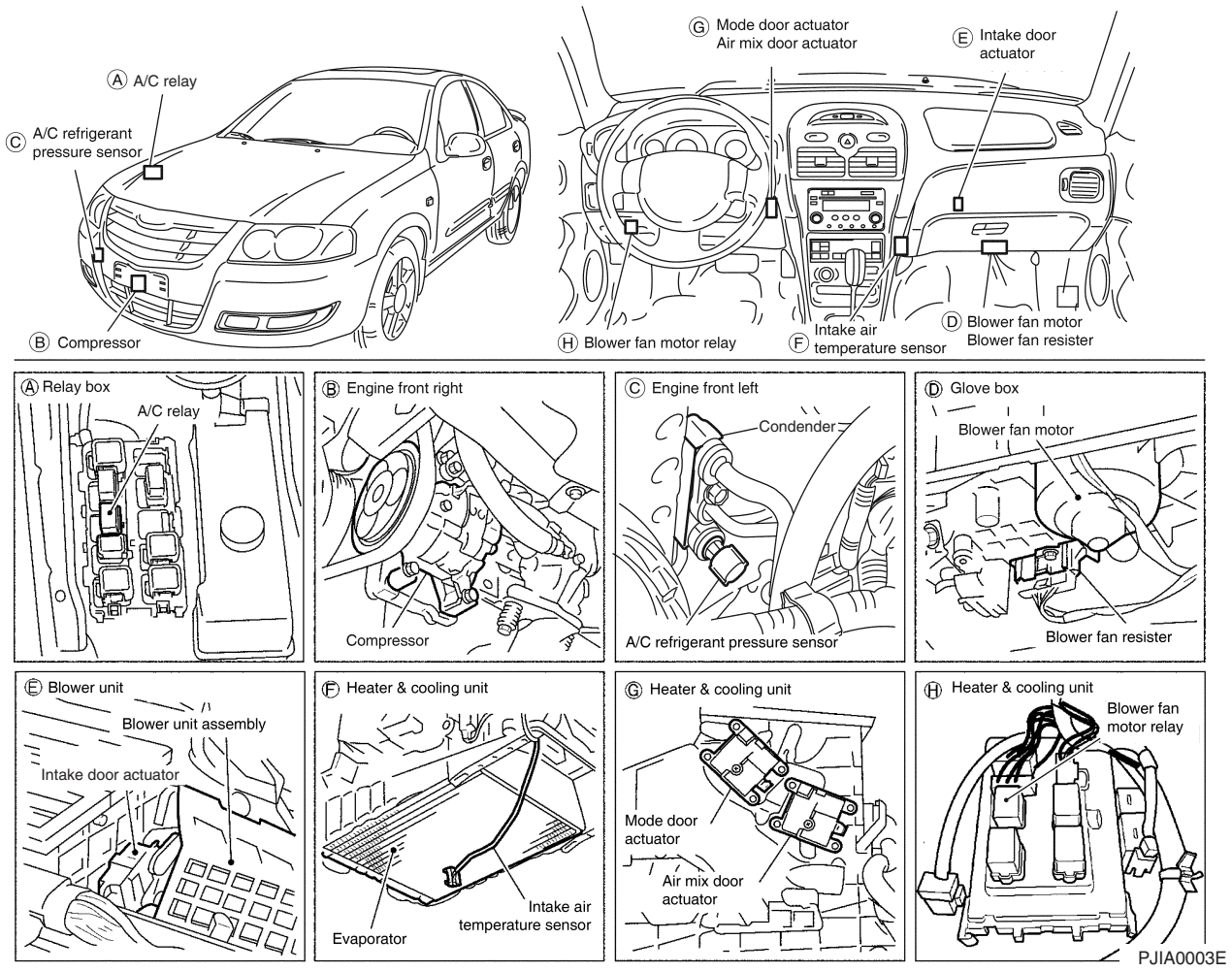
Trouble Diagnosis

Troubleshooting Procedure

TROUBLE DIAGNOSIS BY SYMPTOMS

Symptom		Operation Check	Trouble Route	Possible Cause
No air from the vent No change in air volume		Check blower fan motor operation Refer to “Blower Fan Motor System” (AC-27)	Blower fan motor route	Defective blower fan motor
Bad temperature control	Common (Check this item for the following 2 symptoms)	Check if air mix door operates in full stroke by moving temperature control lever	Air mix door route	● Bad installation of air mix door lever ● Defective air mix door system (broken or locked) Refer to “Air Mix Door Actuator System” (AC-31).
	No cold air (Fan speed is normal)	Check operation of magnet clutch under fan switch and A/C switch ON	Magnet clutch route	Refer to “Magnet Clutch System” (AC-29).
		● Check refrigerant level ● Check performance	Cooler cycle	● Defective sensor ● Defective sensor harness ● Defective air mix door actuator ● Defective air mix door actuator harness
	No hot air (Fan speed is normal)	Heater core inlet/outlet hoses are not hot while heating	Coolant route	● Defective cooling system ● Clogged heater hose or heater core
Air outlet does not change		Check if mode door moves in full stroke by operating mode switch	Mode door route	● Bad installation of mode door lever ● Defective mode door system (broken or locked) Refer to “Mode Door Actuator System” (AC-31).
Air outlet does not change		Check if intake door moves in full stroke by operating REC switch	Intake door route	● Bad installation of intake door lever ● Defective intake door system (broken or locked) Refer to “Intake Door Actuator System” (AC-31).

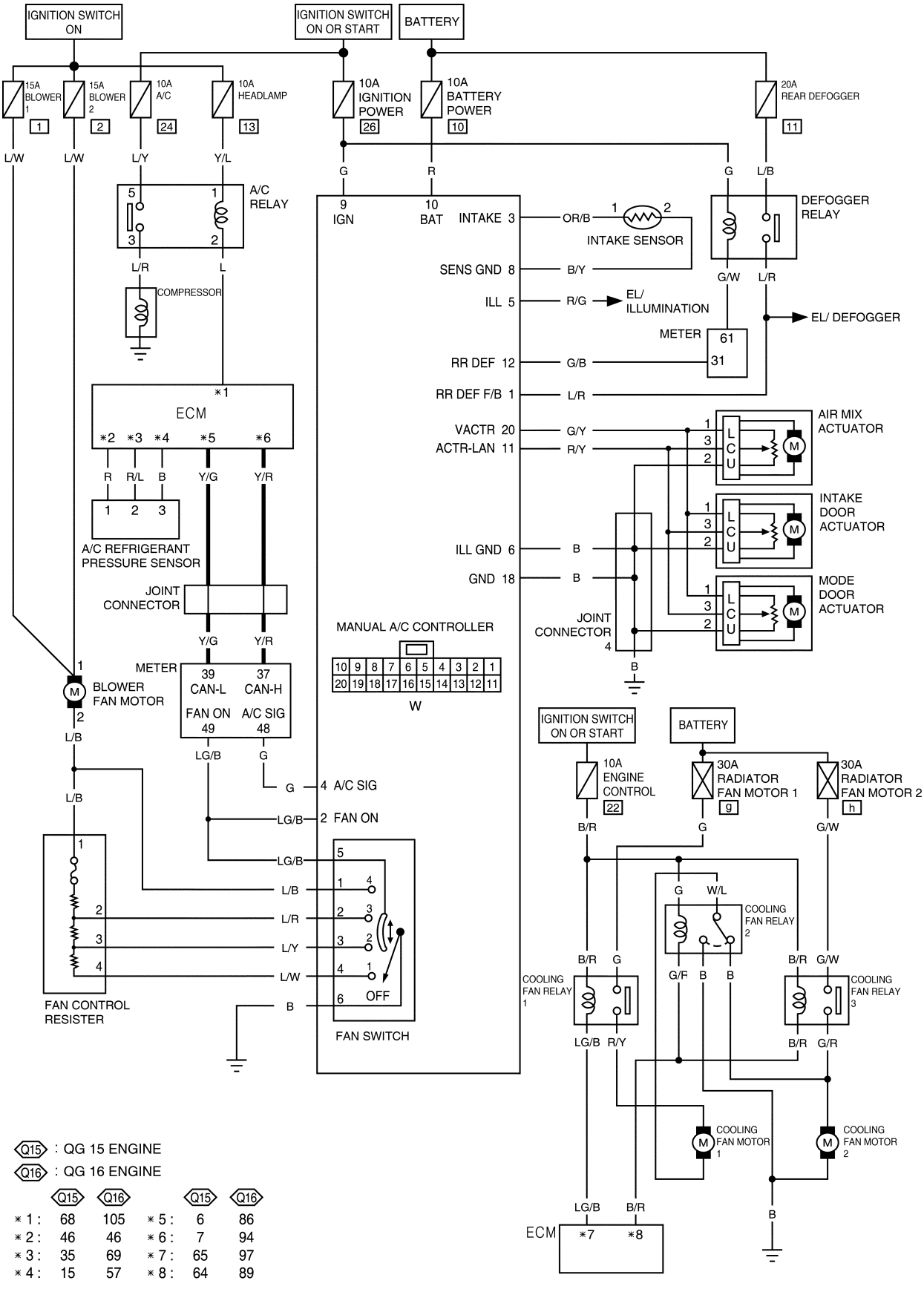
Components Location



Reference:

- **The meter receives the compressor ON signal and the fan ON signal through the CAN communication from engine control unit and sends the signals to the AC control unit.**

Circuit Diagram



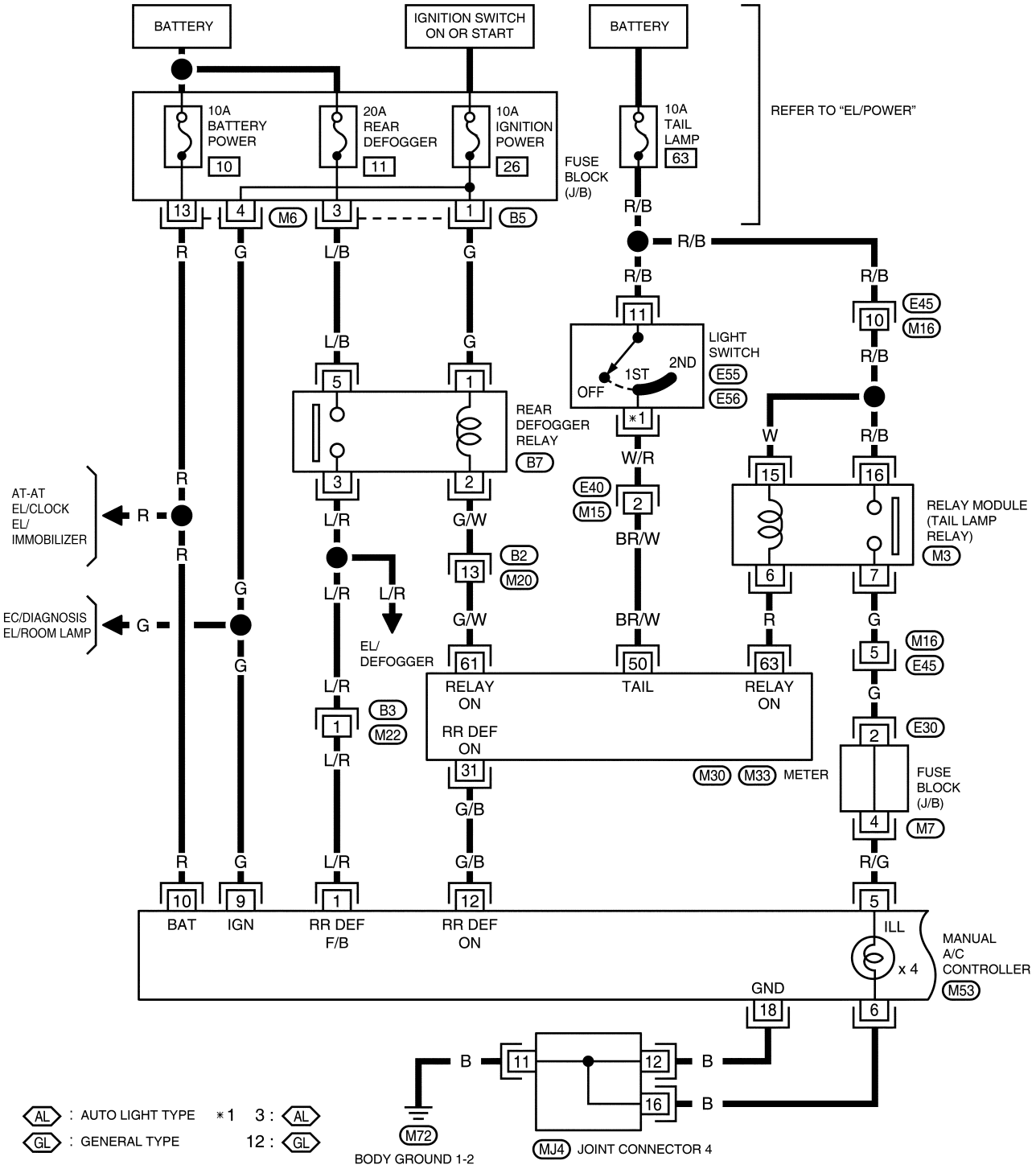
Q15 : QG 15 ENGINE
Q16 : QG 16 ENGINE

	Q15	Q16		Q15	Q16
∗1 :	68	105	∗5 :	6	86
∗2 :	46	46	∗6 :	7	94
∗3 :	35	69	∗7 :	65	97
∗4 :	15	57	∗8 :	64	89

SPCZ002_O1

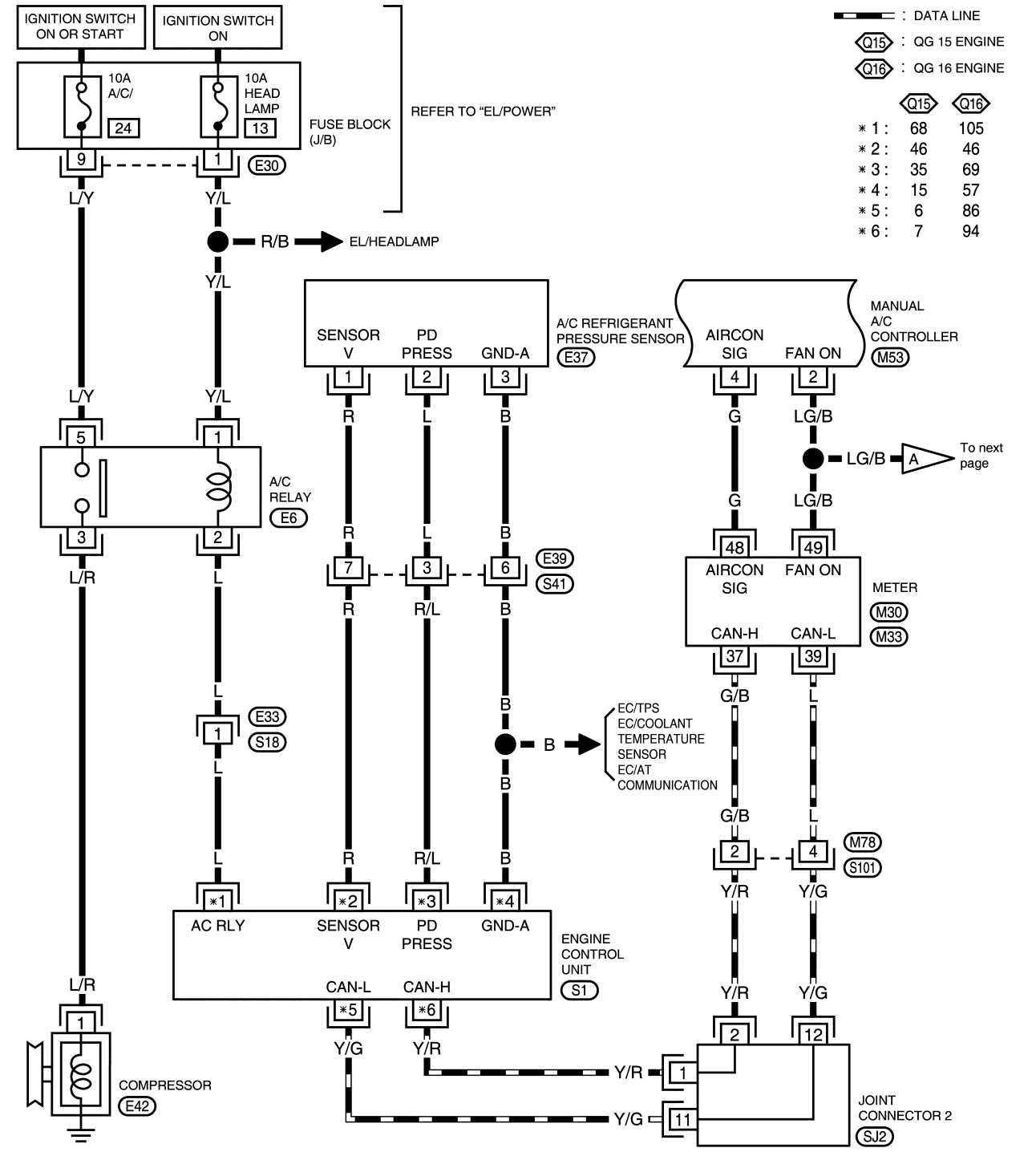
Wiring Diagram

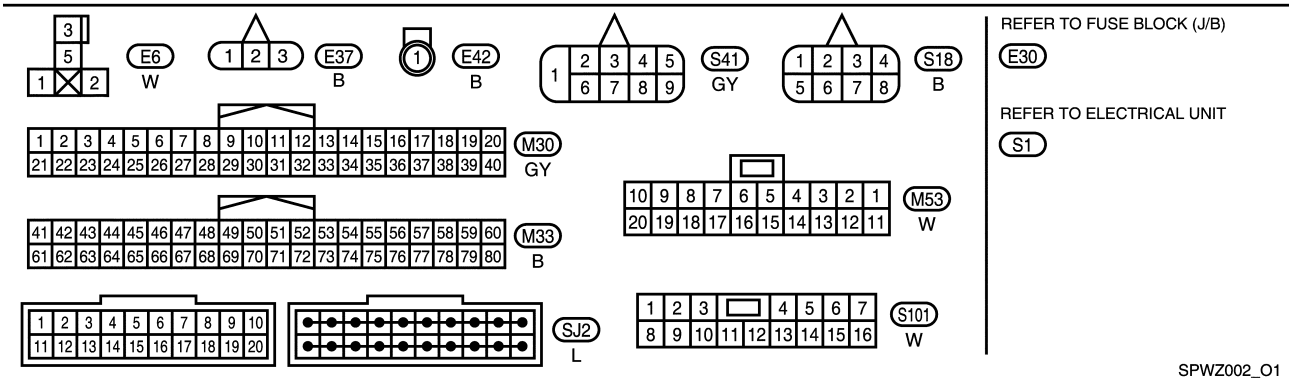
AC/MANUAL A/C-01



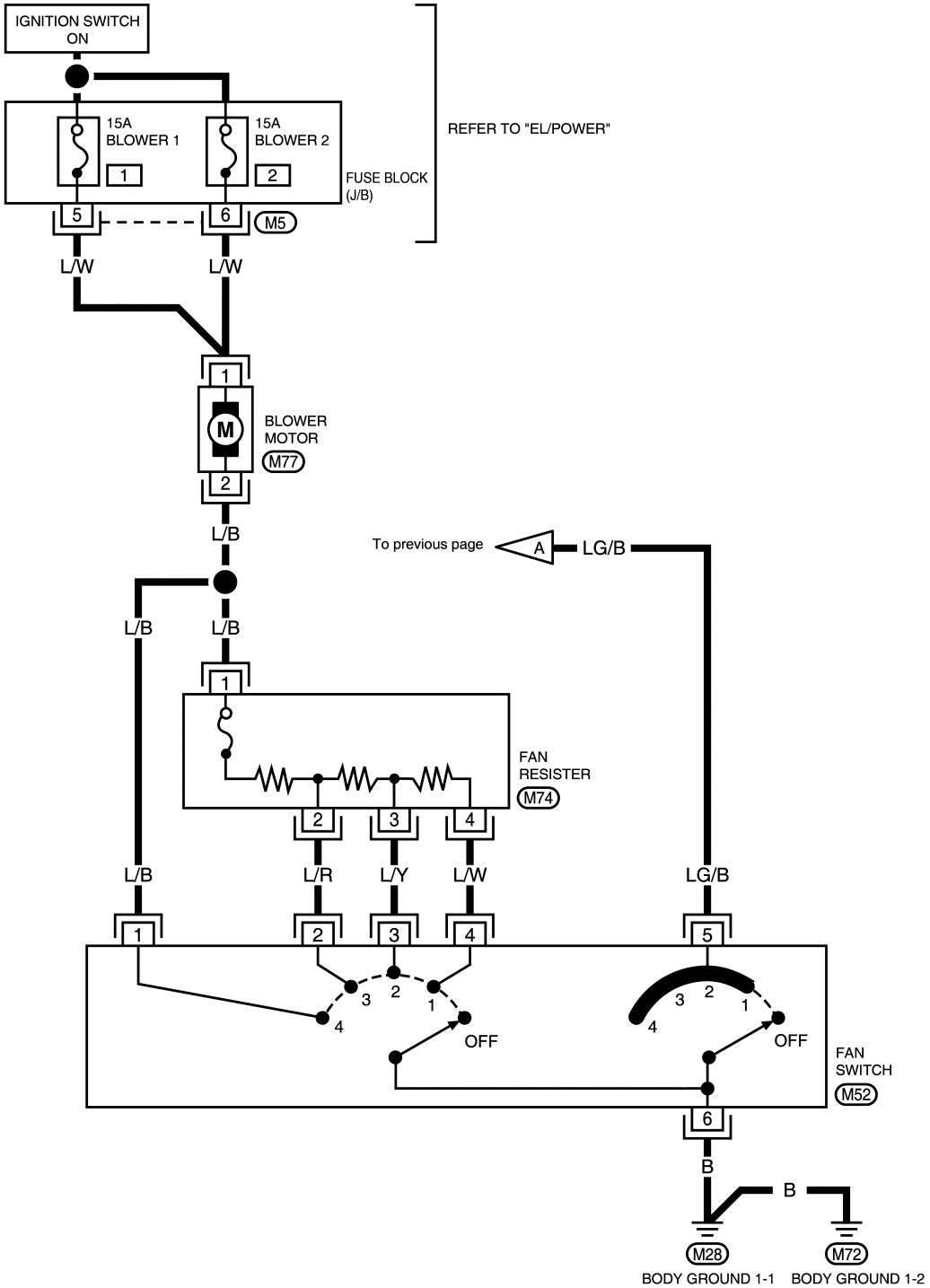
Wiring Diagram

AC/MANUAL A/C-02

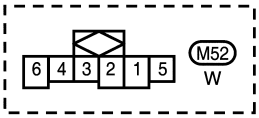


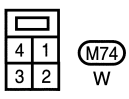


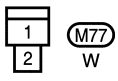
SPWZ002_O1



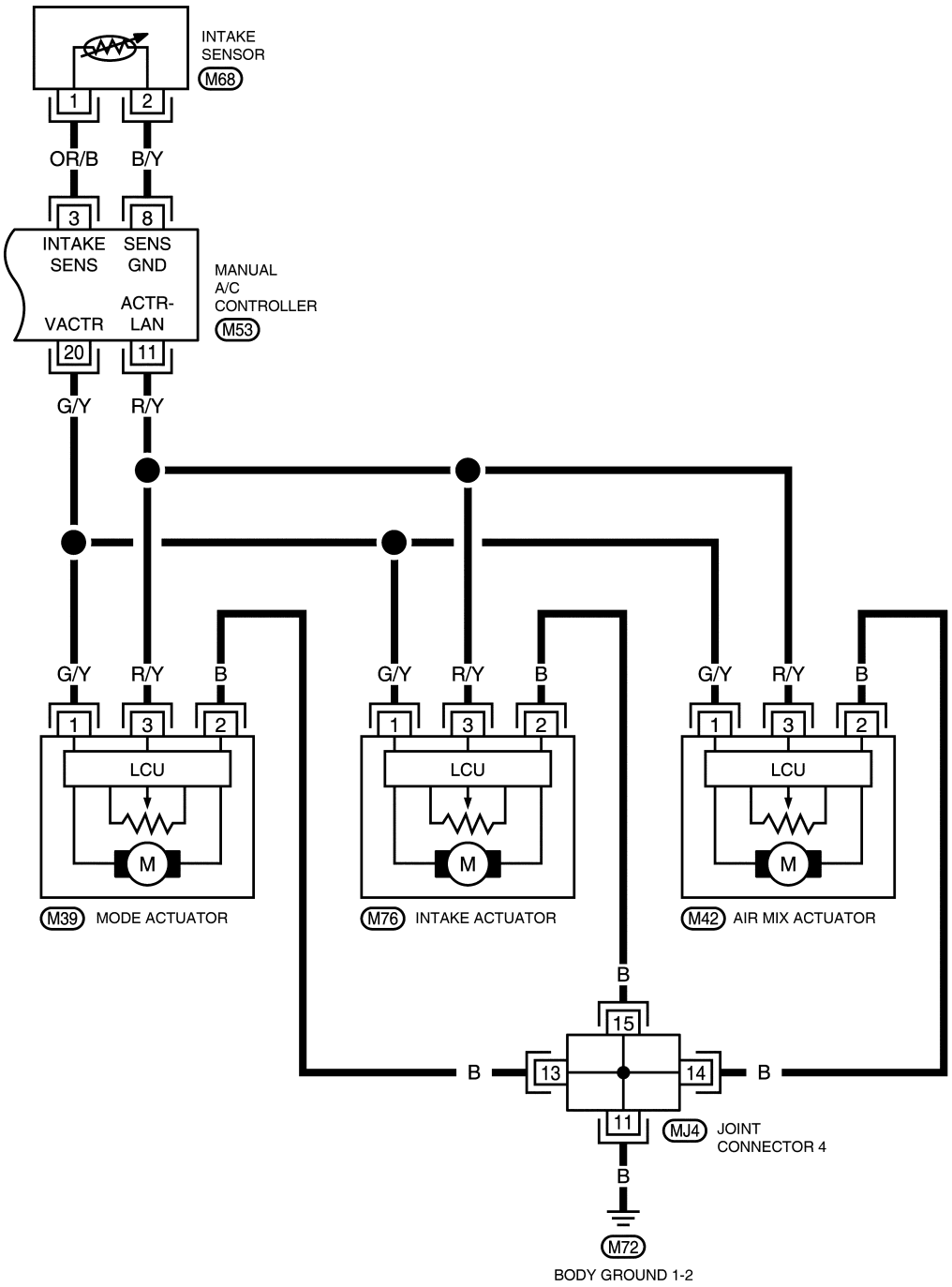
REFER TO FUSE BLOCK (J/B)
M5

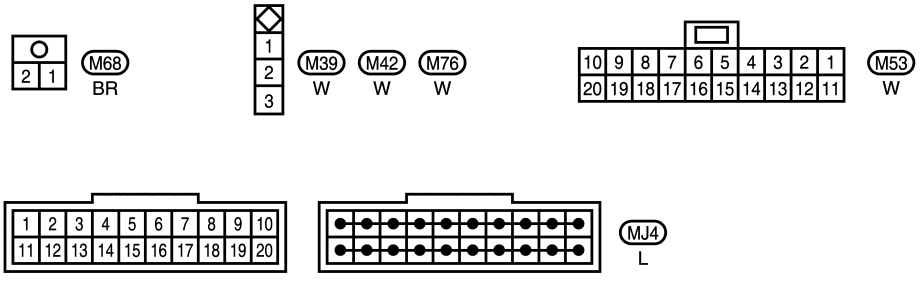




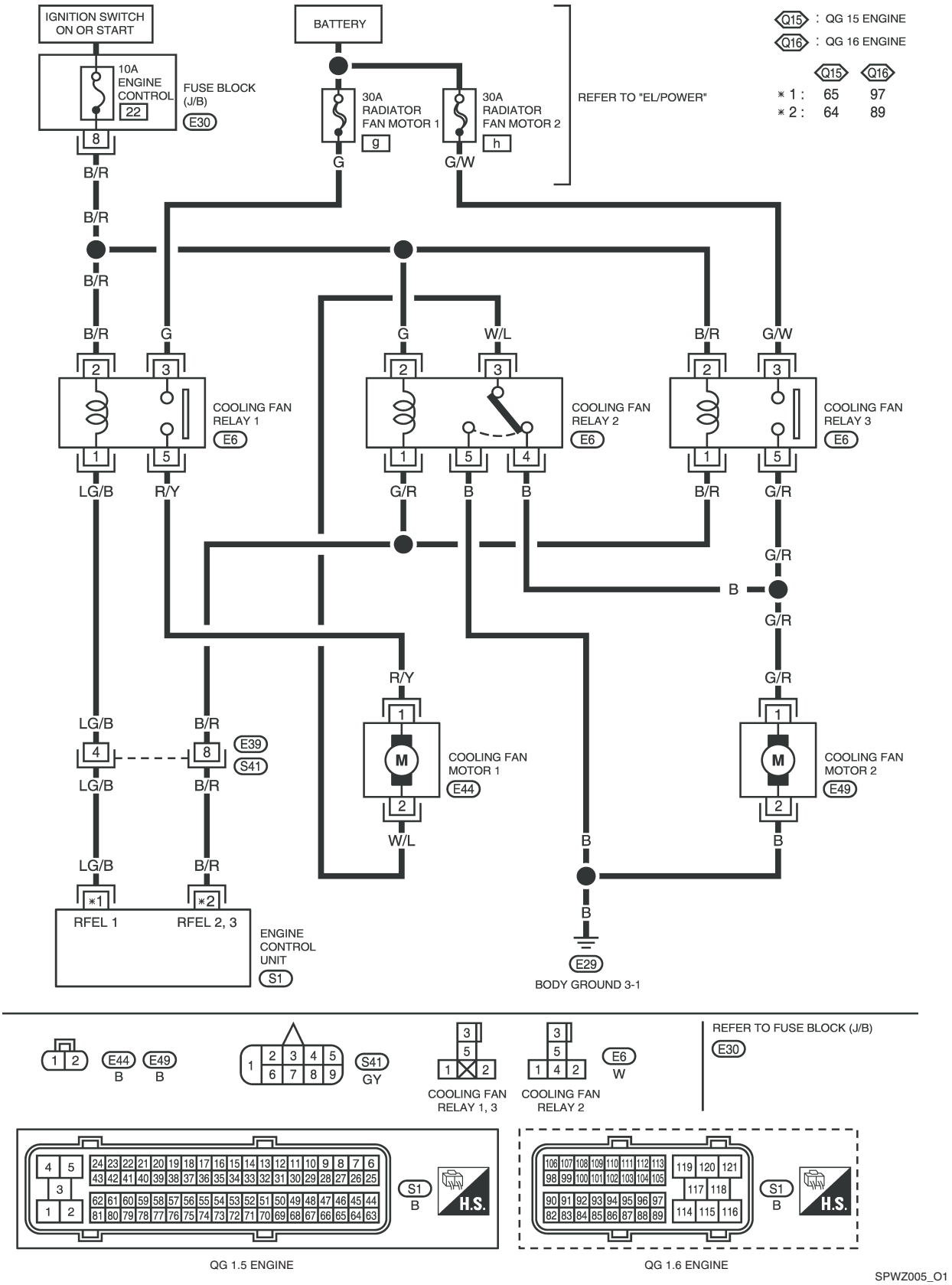


SPWZ003_O1


INTAKE SENSOR
M68
1
2
OR/B
B/Y
3
8
INTAKE SENS
SENS GND
ACTR-LAN
VACTR
MANUAL A/C CONTROLLER
M53
20
11
G/Y
R/Y
G/Y
R/Y
B
1
3
2
LCU
M
M39 MODE ACTUATOR
M76 INTAKE ACTUATOR
M42 AIR MIX ACTUATOR
B
15
13
14
11
MJ4 JOINT CONNECTOR 4
M72
BODY GROUND 1-2


M68
BR
M39
M42
M76
W
M53
MJ4
L

SPWZ004_O1


IGNITION SWITCH ON OR START
BATTERY
10A ENGINE CONTROL 22
FUSE BLOCK (J/B) E30
30A RADIATOR FAN MOTOR 1 g
30A RADIATOR FAN MOTOR 2 h
REFER TO "EL/POWER"
Q15 : QG 15 ENGINE
Q16 : QG 16 ENGINE
Q15 Q16
*1 : 65 97
*2 : 64 89
COOLING FAN RELAY 1 E6
COOLING FAN RELAY 2 E6
COOLING FAN RELAY 3 E6
COOLING FAN MOTOR 1 E44
COOLING FAN MOTOR 2 E49
E39 S41
ENGINE CONTROL UNIT S1
RFEL 1
RFEL 2, 3
E29
BODY GROUND 3-1
E44 B
E49 B
S41 GY
COOLING FAN RELAY 1, 3
COOLING FAN RELAY 2
E6 W
REFER TO FUSE BLOCK (J/B) E30
S1 B
H.S.
QG 1.5 ENGINE
QG 1.6 ENGINE
SPWZ005_O1

Controller Input/Output Signal Standards

STANDARDS

Terminal No.	Signal	Measurement		Standard (V)
		Key switch	Operation	
9	IGN power	ON	-	Approx. 12
10	Battery power	OFF	-	Approx. 12
18	Body ground	ON	-	Approx. 0
4	Compressor ON signal	ON	Compressor: ON	Approx. 0
			Compressor: OFF	Approx. 4.8
20	Actuator drive power	ON	-	Approx. 12
8	Sensor ground	ON	-	Approx. 0
3	Intake air temperature sensor standard voltage	-	-	Note 1
6	Illumination ground	-	-	Approx. 0
5	Illumination power	ON	Light switch: Stage 1	Approx. 12
2	Fan ON signal	ON	Blower fan: ON	Approx. 0
			Blower fan: OFF	Approx. 4.8
11	LAN signal	ON	-	Approx. 5.7 (Note 2)

NOTE 1: Refer to “Intake Air Temperature Sensor” (AC-27).
NOTE 2: The value obtained by a tester.

Blower Fan Motor System

INSPECTION PROCEDURE

Symptom: Blower fan motor does not operate.

1. Blower Fan Motor Relay Inspection

- Check the relay operating sound after applying 12 V on the blower fan motor relay terminal No. 1 and No. 2.
- Check the continuity between terminals No. 3 and No. 5.

Inspection results are OK?

OK → Go to No. 2.
NG → Replace the blower fan motor relay.

2. Blower Fan Motor Inspection

Check the blower fan motor operation after applying 12 V on the blower fan motor terminal No. 1 and No. 2.

Inspection results are OK?

OK → Go to No. 3.
NG → Replace the blower fan motor.

3. Blower Fan Resister Inspection

Check the continuity between blower fan resister terminal No. 1 and No. 2, 3, 4.

Inspection results are OK?

OK → Go to No. 4.

NG → Replace the blower fan resister.

4. Blower Fan Switch Inspection

Remove the fan switch and check the continuity between fan switch terminal No. 5 and No. 1, 2, 3, 4, 6.

Inspection results are OK?

OK → End.

NG → Replace the fan switch.

Magnet Clutch System

INSPECTION PROCEDURE

1. Magnet Clutch Inspection

Remove the compressor connector. Check the magnet clutch operation by applying 12 V on the compressor terminal No. 1.

Inspection results are OK?

OK → Go to No. 2.

NG → Replace the magnet clutch.

2. A/C Relay Inspection

Check the continuity between the terminal No. 3 and No. 5 when 12 V is applied on A/C relay terminal No. 1 and No. 2.

Is there continuity?

OK → Go to No. 5.

NG → Replace the A/C relay.

LAN System

Symptom:

One or all of the mode door actuator, intake door actuator, air mix door actuator is not operating normally.

INSPECTION PROCEDURE

1. Controller Power Circuit Inspection

Measure the voltage between controller terminal No. 20 and body ground.

20 ~ Body ground: Power voltage

Inspection results are OK?

OK → Go to No. 2.

NG → Replace the controller.

2. Controller Signal Circuit Inspection

Check the output wave of the controller terminal No. 6. Refer to “Controller Input/Output Signal Standards” (AC-66).

Inspection results are OK?

OK → Go to No. 3.

NG → Replace the controller.

3. Actuator Power Circuit Inspection

Measure the voltage between corresponding actuator’s terminal No. 1 and body ground.

1 ~ Body ground: Power voltage

Inspection results are OK?

OK → Go to No. 4.

NG → Repair the harness or connector.

4. Actuator Signal Circuit Inspection

Check the output wave of the corresponding actuator’s terminal No. 3. Refer to “Controller Input/Output Signal Standards” (AC-66).

Inspection results are OK?

OK → Go to No. 5.

NG → Repair the harness or connector.

5. Actuator Ground Circuit Inspection

Check the continuity between the corresponding actuator’s terminal No. 2 and body ground.

Inspection results are OK?

OK → Go to No. 6.

NG → Repair the harness or connector.

6. Actuator Operation Inspection.

Remove the corresponding actuator connector and then check the actuator operation by reconnecting.

Inspection results are OK?

OK → Bad actuator connector connection.

NG → Go to No. 7.

7. Intake Door Actuator Abnormal Aignal Inspection

1. Remove all intake, air mix, mode door actuator connectors.
2. Connect the air mix and mode door actuator connectors.
3. Check the mode door and air mix door actuator operation.

Inspection results are OK?

OK → Replace the intake door actuator.

NG → Go to No. 8.

8. Air Mix Door Actuator Abnormal Signal Inspection

1. Remove all intake, air mix, mode door actuator connectors.
2. Connect the intake and mode door actuator connectors.
3. Check the intake and mode door actuator operation.

Inspection results are OK?

OK → Replace the air mix door actuator.

NG → Go to No. 9.

9. Mode Door Actuator Abnormal Signal Inspection

1. Remove all intake, air mix, mode door actuator connectors.
2. Connect the intake and air mix door actuator connectors.
3. Check the air mix and intake door actuator operation.

Inspection results are OK?

OK → Replace the mode door actuator.

NG → Replace the controller.

Intake Door Actuator System

Symptoms

- The intake door does not change.
- The intake door motor does not operate normally.

INSPECTION TIPS

Symptoms

- The intake door actuator does not operate normally.
- Refer to “LAN System” (AC-29) for inspection details.

Mode Door Actuator System

INSPECTION TIPS

Symptoms

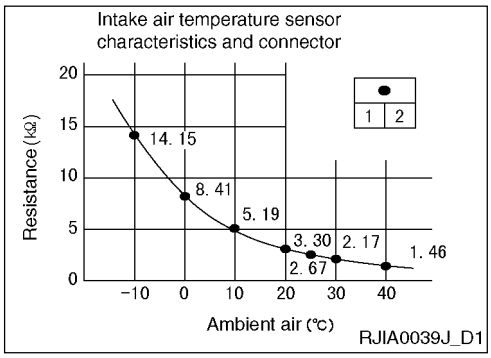
- The air outlet does not change.
- The mode door actuator does not operate normally.
  Refer to “LAN System” (AC-29) for inspection details.

Air Mix Door Actuator System

INSPECTION TIPS

Symptoms

- Discharging air temperature does not change.
- The air mix door actuator does not operate.
  Refer to “LAN System” (AC-29) for inspection details.



Intake Air Temperature Sensor System

INTAKE AIR TEMPERATURE SENSOR INSPECTION

Measure the resistance between the intake air temperature sensor terminal No. 1 and No. 2.

Bad Cooling

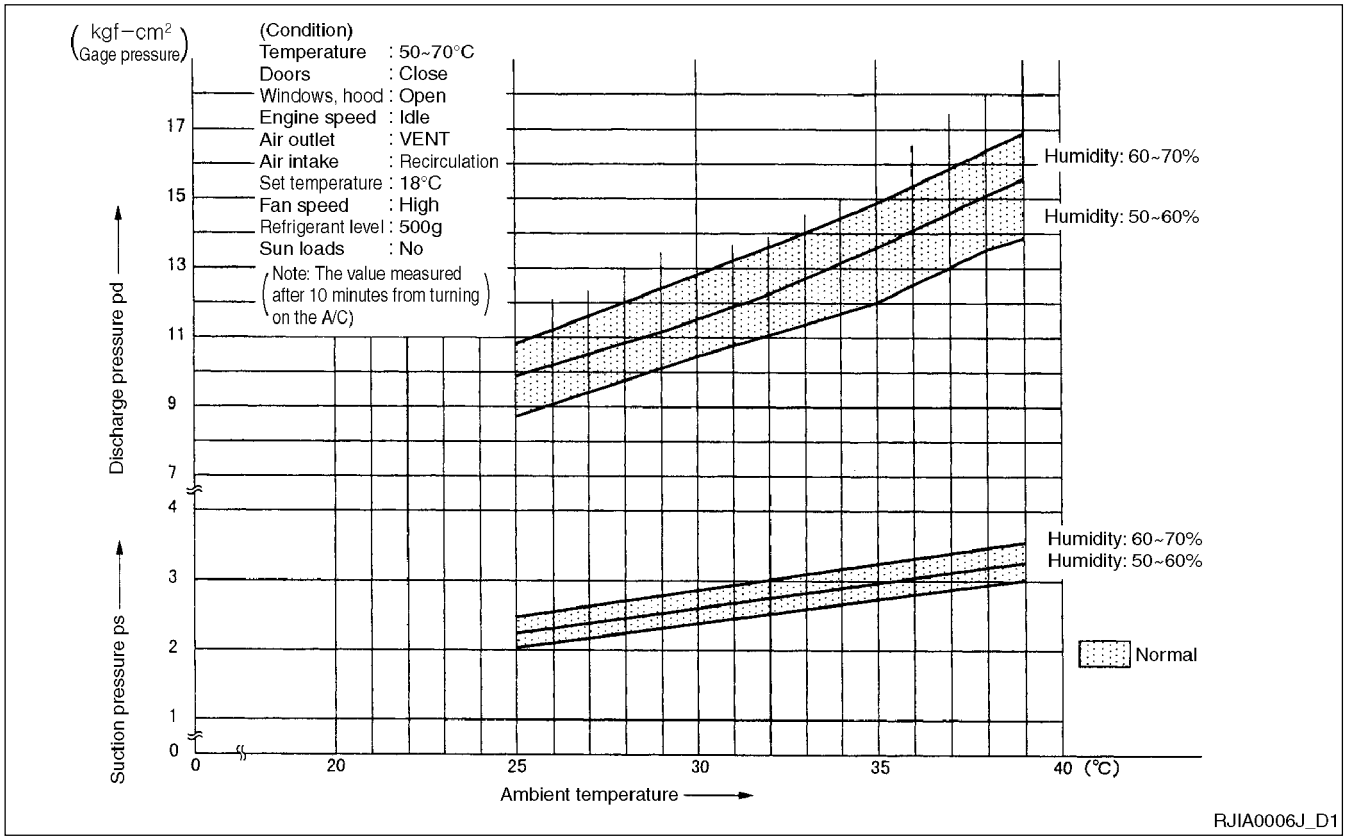
PERFORMANCE CHECK

INSPECTION PROCEDURE

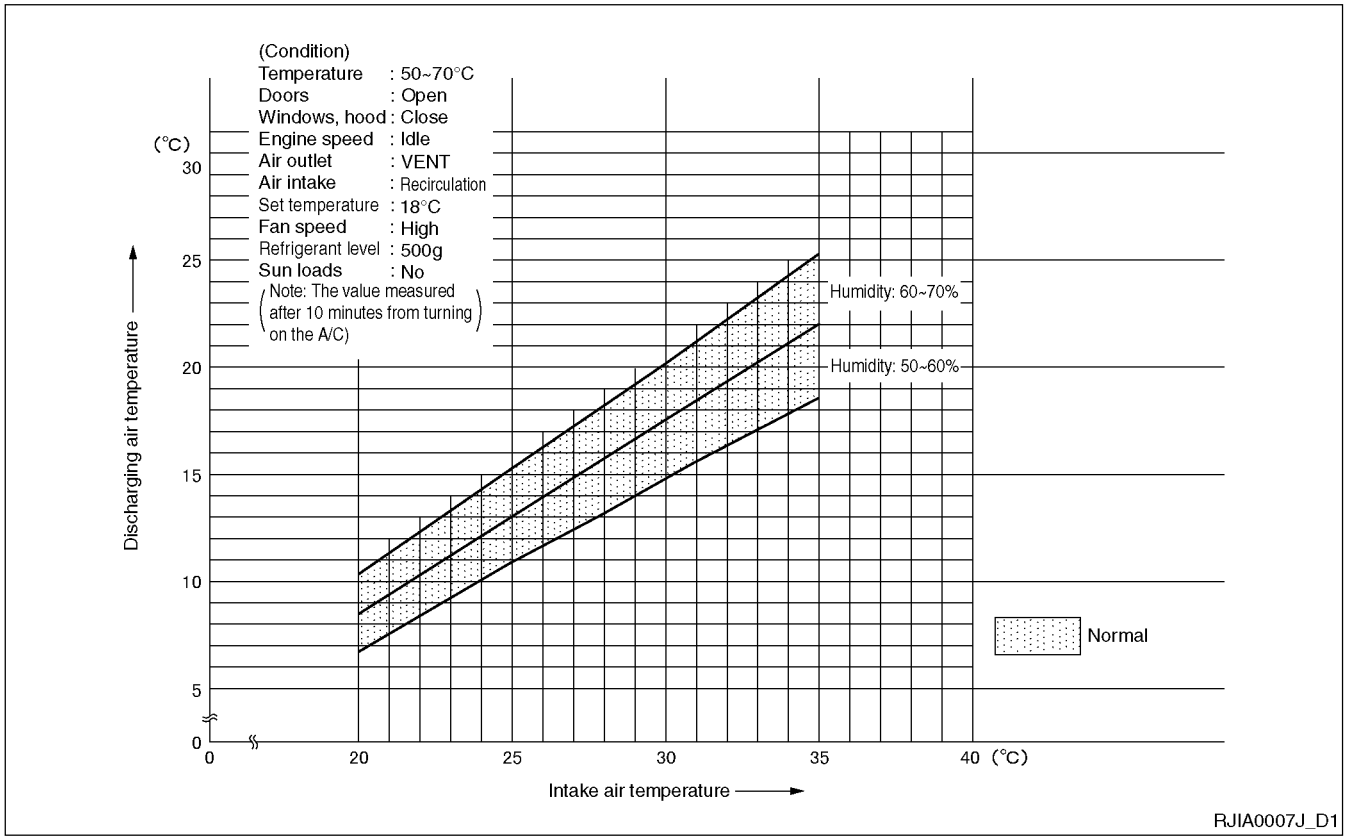
1. Connect the manifold gage to the vehicle's cooler cycle (service valve).
2. Install a wet and dry thermometer to the aspirator (below the glove box) in the blower unit and a thermometer at the right side of the center vent.
3. Start the engine to warm up the system.
4. After warming up the engine, check if the engine speed is in specified RPM.
5. Operate the compressor and then set to the below conditions by using controller.
   Fan Speed: Hi
   Air intake mode: Recirculation
   Air outlet: VENT (Ventilator)
   Set temperature: Full cold
6. Open the hood and all door windows but close all doors.
7. Maintain this condition until cooler cycle stabilizes (about 10 minutes).
8. Idle the engine.
9. Measure the aspirator's temperature and humidity, air outlet temperature and high and low pressure of the cooler cycle. And then judge the system by combining them with "Ambient air temperature-pressure characteristics" and "Intake and discharge air temperature characteristics".

Performance Curve

AMBIENT AIR TEMPERATURE-PRESSURE CHARACTERISTICS



INTAKE AND DISCHARGE AIR TEMPERATURE CHARACTERISTICS



Trouble Diagnosis Using Gage Pressure

Connect the manifold gage to the cooler cycle (service valve) then isolate defective component and possible cause by reading cooler cycle pressure.

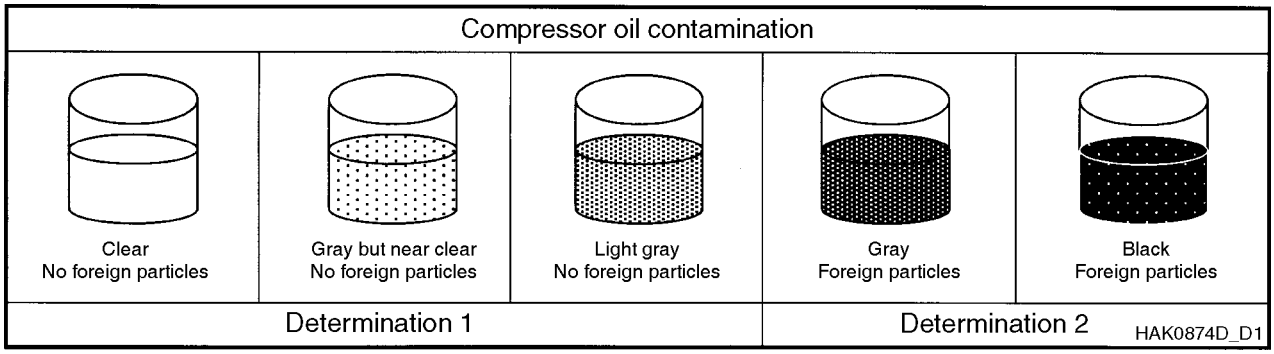
Symptoms	Cycle Status	Possible Cause	Remedy
Both low and high pressures are high	When poured water to condenser, it returns to normal	Bad cooling of condenser ● Bad operation of radiator and condenser fan ● Bad installation of air guide ● Dirty or clogged condenser fin	● Repair or replace the defective components ● Clean and repair the condenser fin
		Overcharged refrigerant	Evacuate refrigerant and then recharge to the specified value
	When compressor is stopped, the pressure drops to 2 kg/cm^2 and then decreases gradually	Air in the cooler cycle	Evacuate refrigerant and then recharge to the specified value
	Frost is formed in the low-pressure pipe or low-pressure pipe is colder than the evaporator outlet	Excessive opening of the expansion valve (Excessive flow of refrigerant)	Replace the expansion valve
High pressure is extremely high	Temperature is different on where high-pressure pipe is damaged or clogged	High-pressure pipe between the compressor and condenser is damaged or clogged	Repair or replace the defective components
Both low and high pressures are low (Sometimes, even negative value)	Evaporator outlet is not cold Frost is formed at the evaporator inlet	Clogged expansion valve ● Gas leak at temperature detecting section ● Clogged by foreign particles	Remove foreign particles at expansion valve or replace the unit
	Temperature differences in the liquid tank outlet pipe. Frost is formed in the liquid tank	Bad liquid tank (Clogged strainer)	Replace the liquid tank
	Frost is formed in the evaporator	Clogged or damaged evaporator fins	Repair or replace
		Lack of air flow	Replace the blower unit
	Slight temperature differences in the compressor high-pressure and low-pressure pipes	Lack of refrigerant	● Inspect for refrigerant leakage ● Evacuate refrigerant and then recharge to the specified value
Sometimes high-pressure is low and low-pressure becomes negative	Sometimes the evaporator outlet is not cold Sometimes frost is formed in the evaporator inlet	Water in the cooler cycle (Clogged due to moisture formed by the expansion valve)	Evacuate refrigerant and then recharge to the specified value after dehumidifying. Always replace the liquid tank
High-pressure is low and low-pressure is high	When compressor is stopped, both pressures become to the same value at once No temperature differences between the high-pressure and low-pressure pipes	Bad compressor (Bad compression) ● Damaged or broken valve ● Bad gasket	Replace the compressor

Compressor Trouble Diagnosis

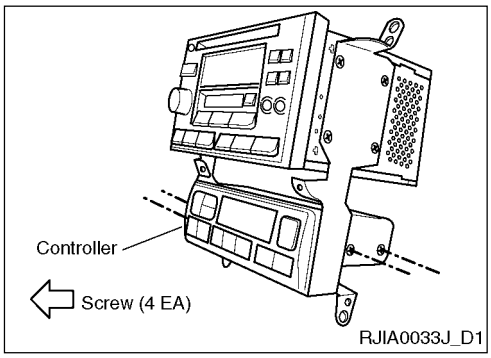
When compressor assembly is defective (noise, bad cooling), diagnose as below.

Symptoms	Object	Method	Result	Remedy
Noise occurs from compressor assembly while A/C ON	Pressure in the cooler cycle	Inspect using manifold gage	-	Refill refrigerant as required
			-	Replace compressor only
	Inspect compressor oil status	Determine after draining compressor oil	Determine as per below illustration	Determination 1: Replace compressor only Determination 2: Replace compressor and liquid tank
Bad cooling (Note 1)	Compressor assembly	Check compressor operation. If burnt or stuck, determine after draining compressor oil		
	Pressure in the cooler cycle	Inspect using manifold gage. If pressure difference between the high-pressure and low-pressure is small, determine after draining compressor oil		

NOTE 1: Perform the inspection according to symptom diagnosis.

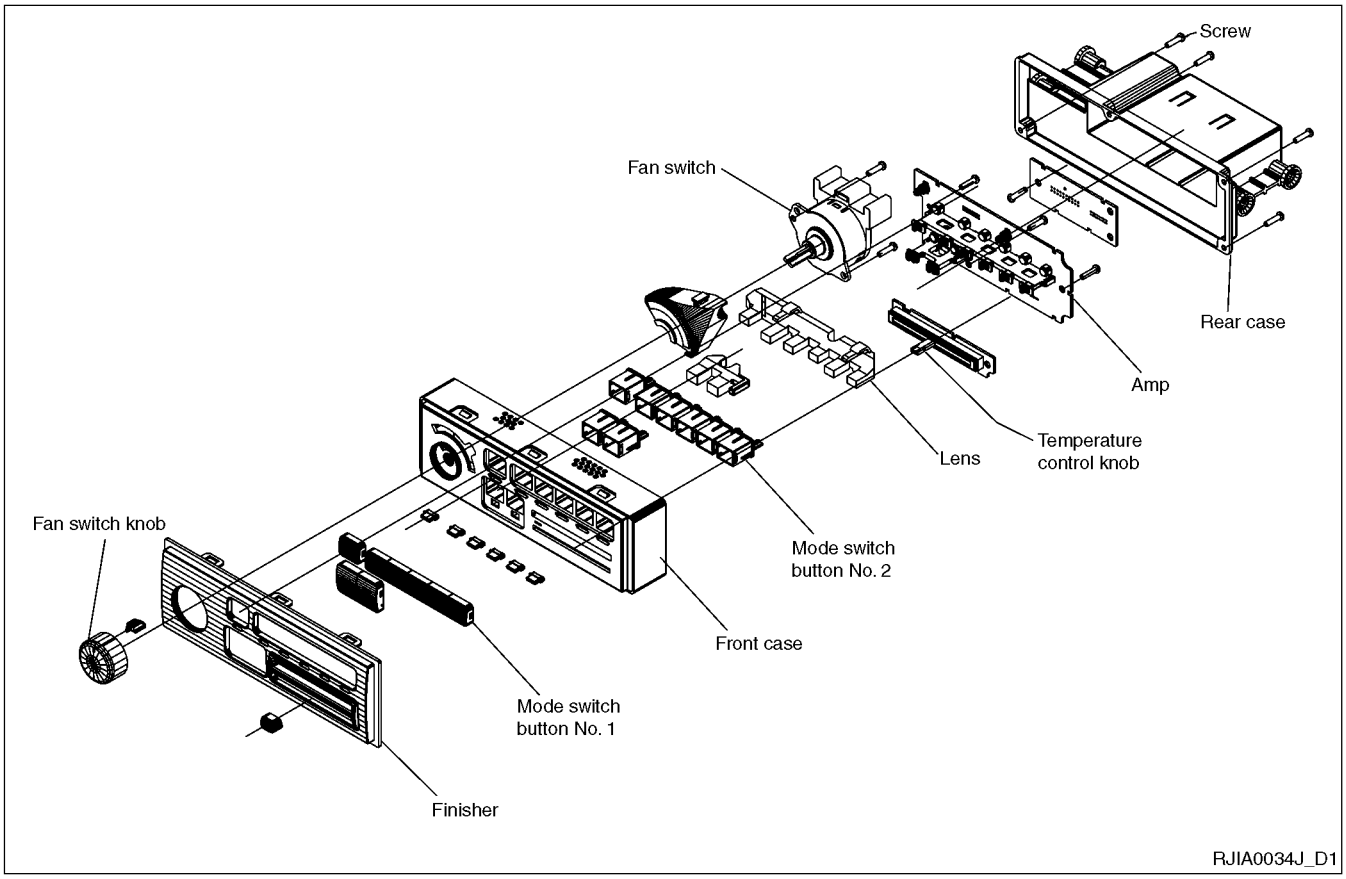


Controller

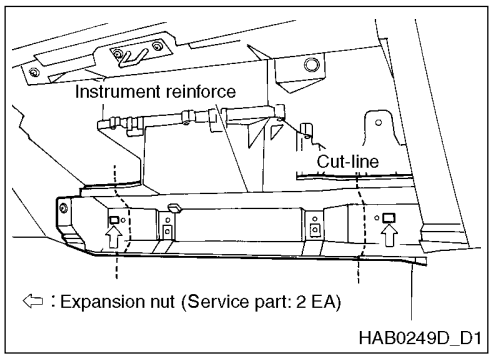


Removal • Installation

1. Remove the audio assembly.
2. Remove the controller.



Blower Unit Assembly



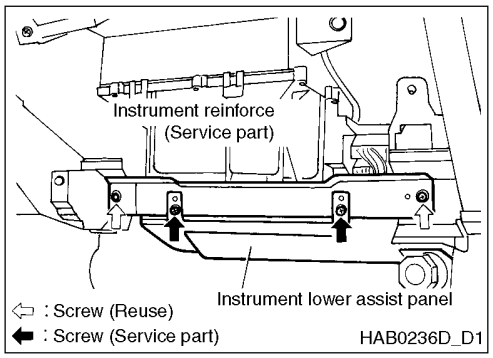
Removal • Installation

REMOVAL

1. Remove the glove box assembly.
2. Pry off the glove box cover and instrument lower assist panel.
3. Cut the instrument reinforce following the cut-line and smoothen the edges.
4. Remove the blower fan resister, intake door actuator and blower fan motor connectors.
5. Remove the connector bracket from blower unit.
6. Remove the 2 screws and 1 bolt and then remove the blower unit.

CAUTION:

- **Push the blower unit towards the left and pull out the 2 positioning pins, then remove downwards.**

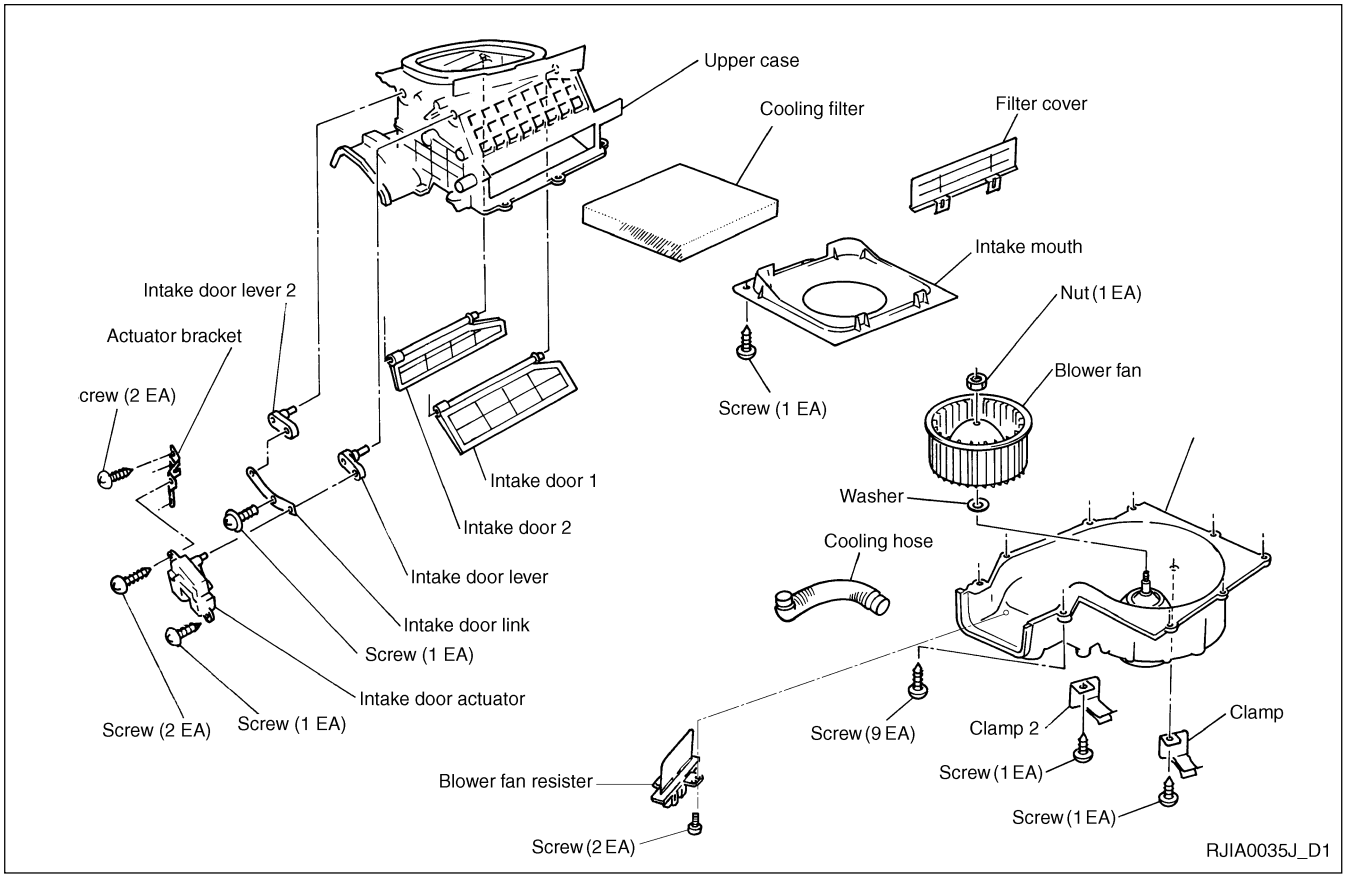


REMOVAL

CAUTION:

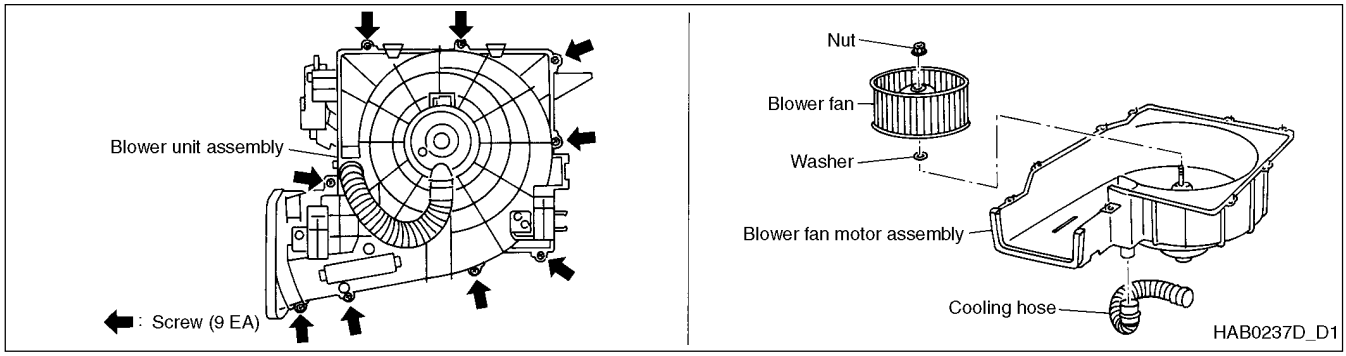
- **Install the instrument reinforce (service part).**
- **Check if 2 positioning pins are securely located.**

Disassembly • Assembly



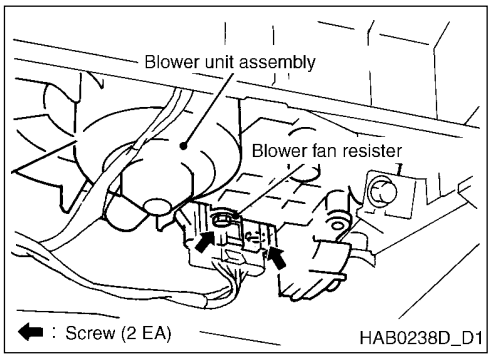
Blower Fan Motor

Removal • Installation



1. Remove the blower unit assembly.

Blower Fan Resister



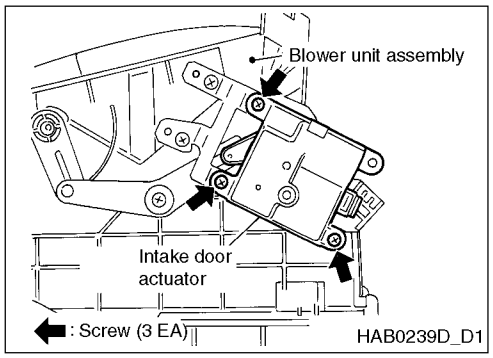
Removal • Installation

1. Remove the glove box assembly.
2. Remove the blower fan resister.

CAUTION:

- **If the blower fan resistor's temperature fuse is out, then inspect the blower fan motor and harness, then replace the blower fan resistor with new. Never try to repair the temperature fuse.**

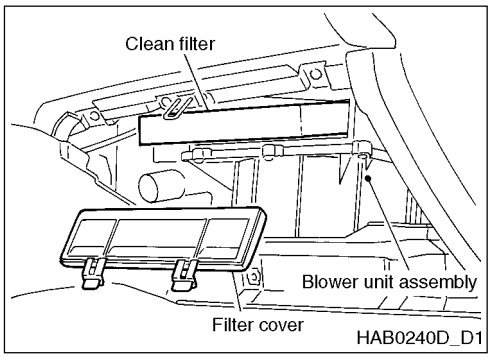
Intake Door Actuator



Removal • Installation

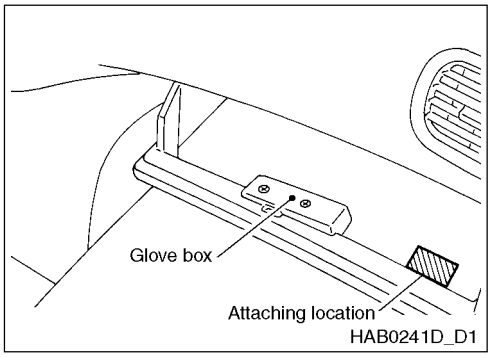
1. Remove the blower unit assembly.
2. Remove the intake door actuator.

Clean Filter



Removal • Installation

1. Remove the glove box.
2. Remove the clean filter.

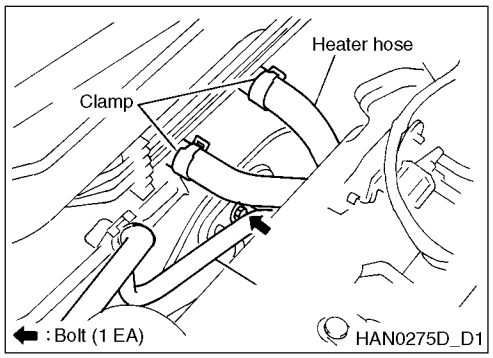


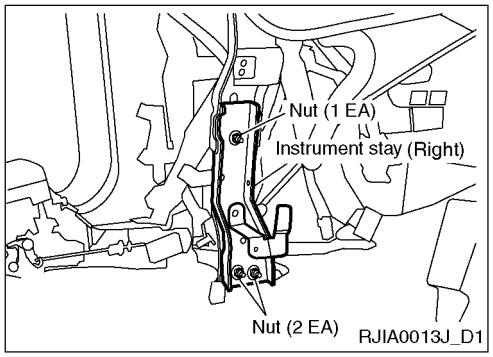
Replacement

Clean filter replacement: Refer to MA section.

- Record on the label and attach to the illustrated location on the glove box.

Heater & Cooling Unit Assembly





Removal • Installation

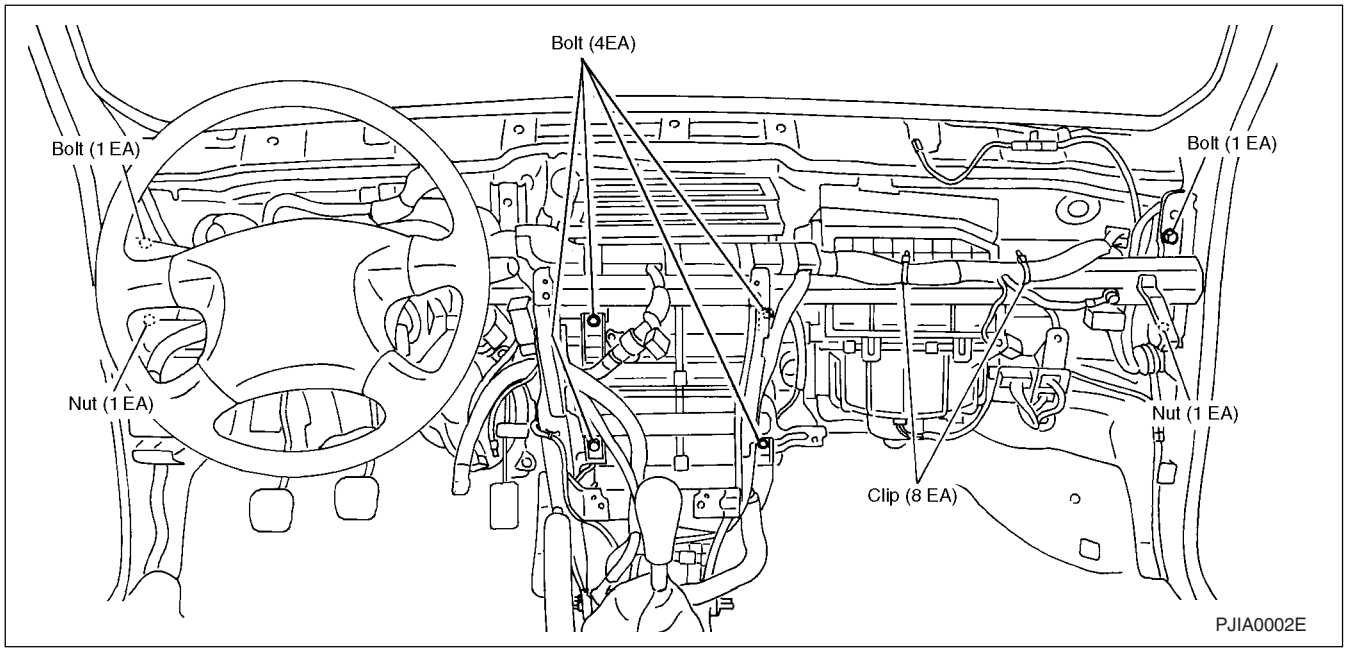
REMOVAL

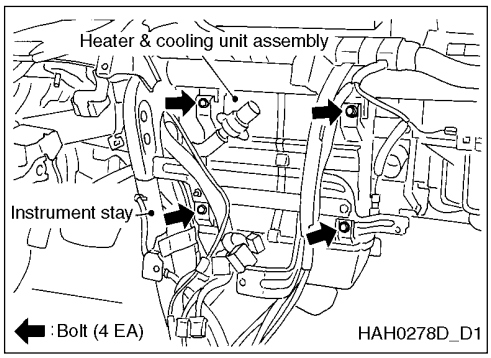
1. Trap the refrigerant using a refrigerant-recovery station (for HFC134a).
2. Drain the engine coolant.
3. Disconnect the low-pressure flexible hose and high-pressure pipe from the evaporator.
4. Remove the heater hose from the heater core.

CAUTION:

- **Some coolant will leak when removing the heater hose.**
- **Block the coolant inlet/outlet on the heater core with a cloth.**

5. Remove the instrument assembly.
6. Remove the blower unit assembly.
7. Remove the clip from vehicle harness and remove the instrument stay.



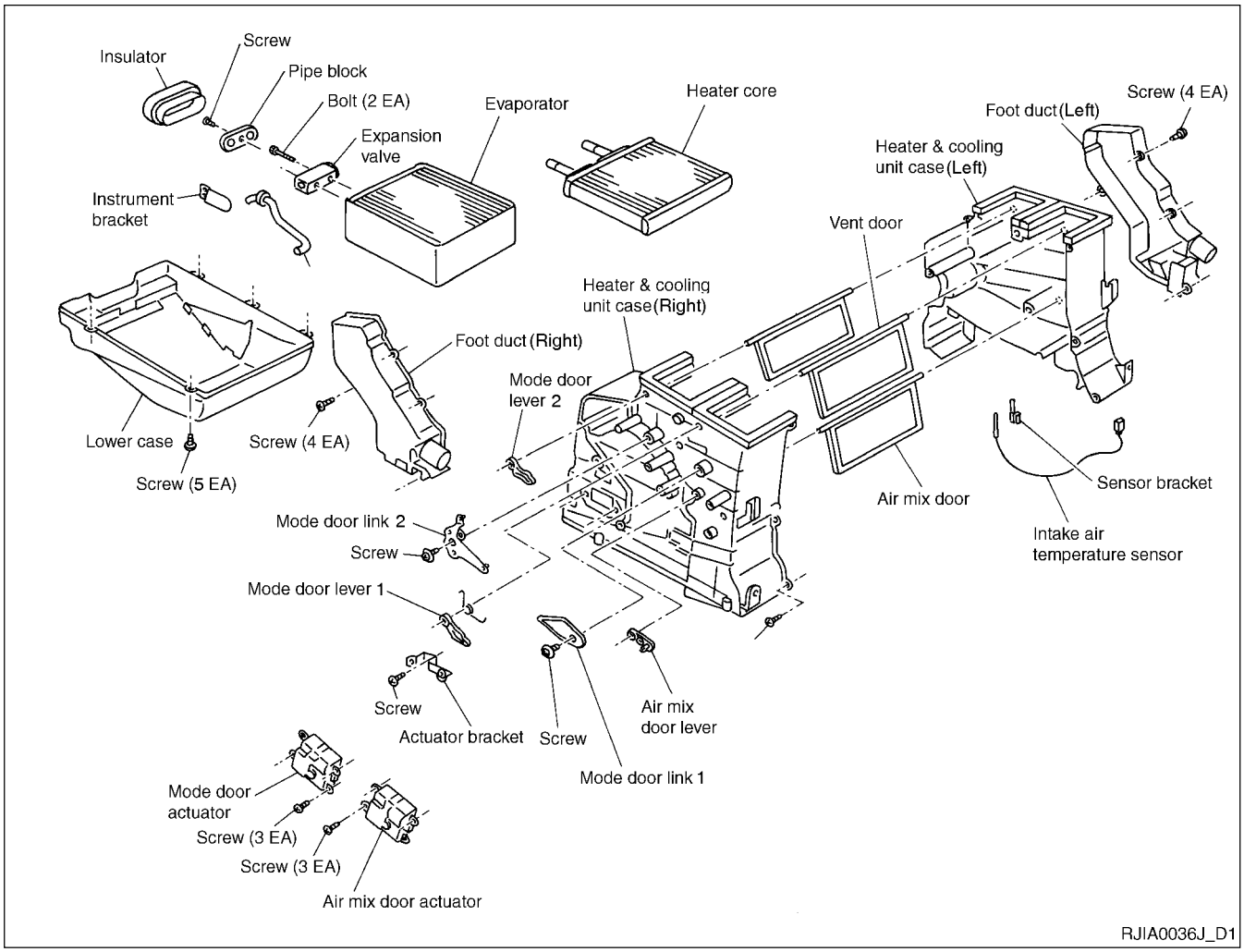


8. Remove the heater & cooling unit assembly mounting bolts.
9. Remove the steering member and the heater & cooling unit assembly.

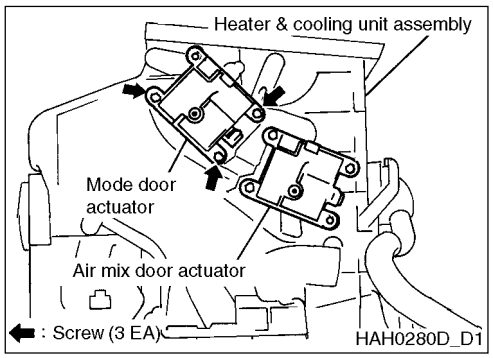
Installation

1. Install the heater & cooling unit assembly.
   Heater & cooling unit assembly mounting bolt
   Tightening torque: 5.98 - 7.64 N•m (0.61 - 0.78 kgf-m)
2. Reverse the removal steps 3~7 to install.
   Steering member mounting nuts and bolts
   Tightening torque: 10.87 - 13.72 N•m (1.1 - 1.4 kgf-m)
3. Refill the engine coolant.
4. Recharge the refrigerant using a refrigerant-recovery station (for HFC134a).

Disassembly • Assembly



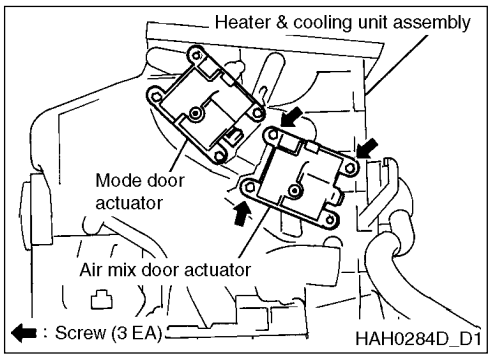
Mode Door Actuator



Removal • Installation

1. Remove the clutch pedal bracket (M/T vehicles).
2. Remove the mode door actuator.

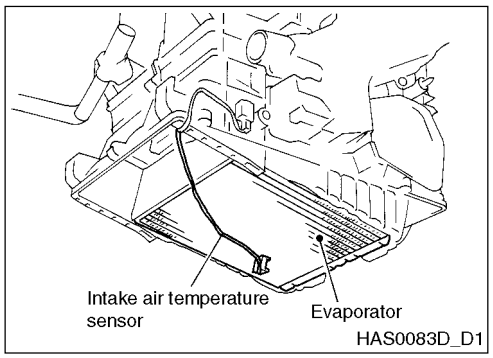
Air Mix Door Actuator



Removal • Installation

1. Remove the instrument lower driver panel.
2. Remove the air mix door actuator.

Intake Air Temperature Sensor



Removal • Installation

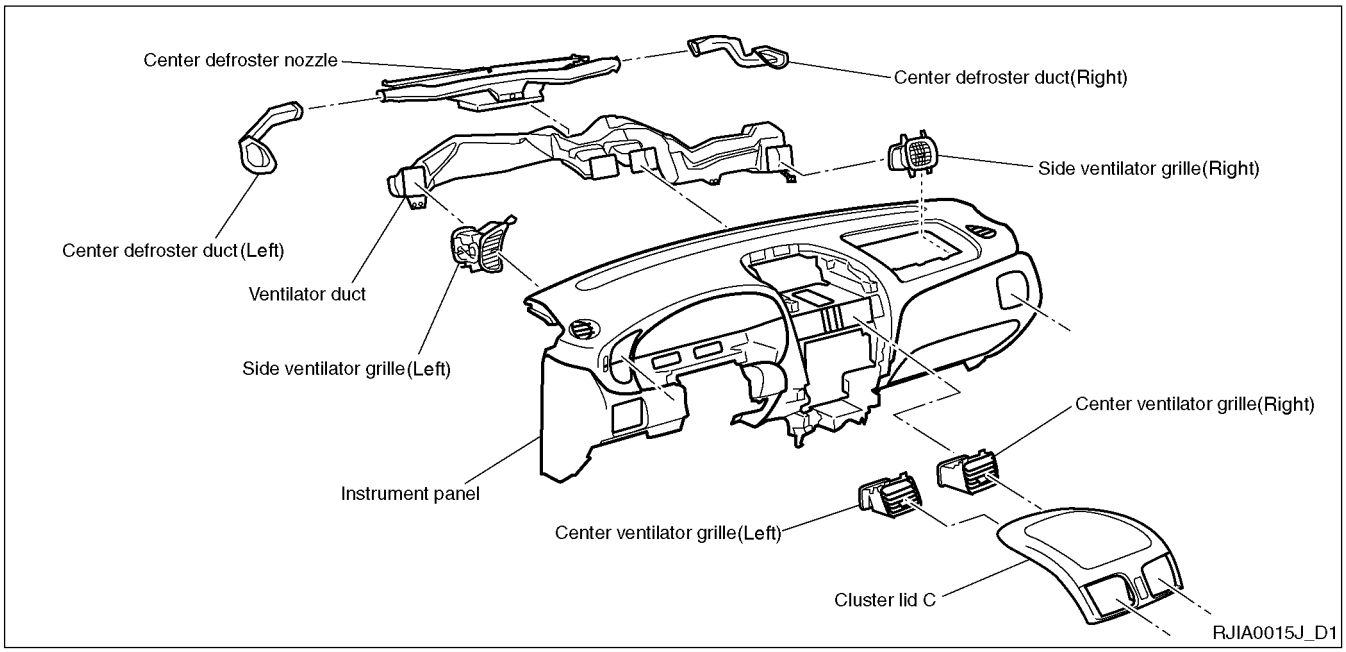
1. Remove the heater and cooling unit assembly lower case.
2. Remove the intake air temperature sensor.

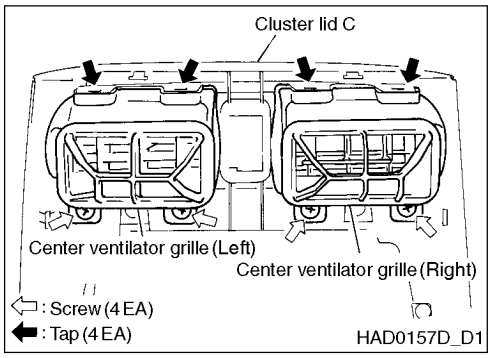
Duct and Grille

Removal • Installation

Ventilator duct, Defroster nozzle and duct

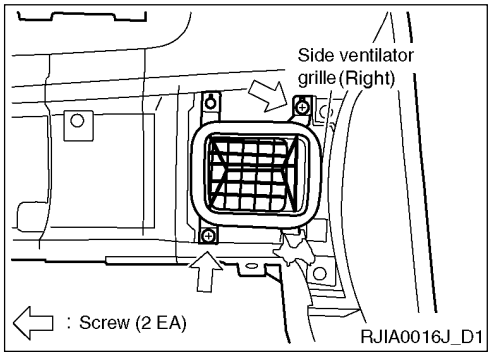
1. Remove the instrument panel.





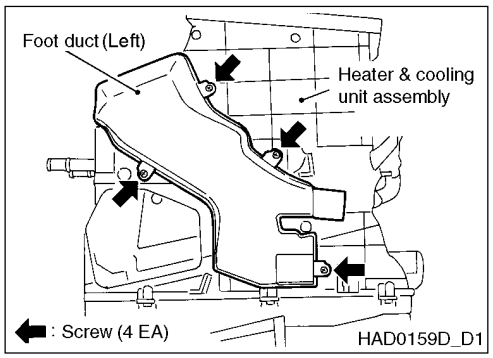
Center Ventilated Grille

1. Remove the cluster lid C.
2. Remove the center ventilator grille.



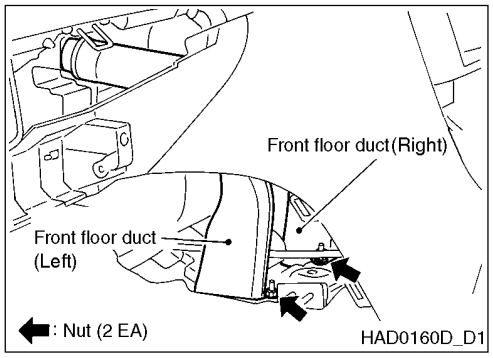
Side Ventilator Grille

1. Remove the instrument panel.
2. Remove the side ventilator grille.



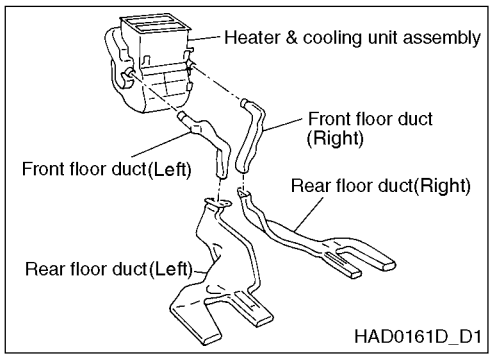
Foot Duct

1. Remove the heater & cooling unit assembly.
2. Remove the foot duct.



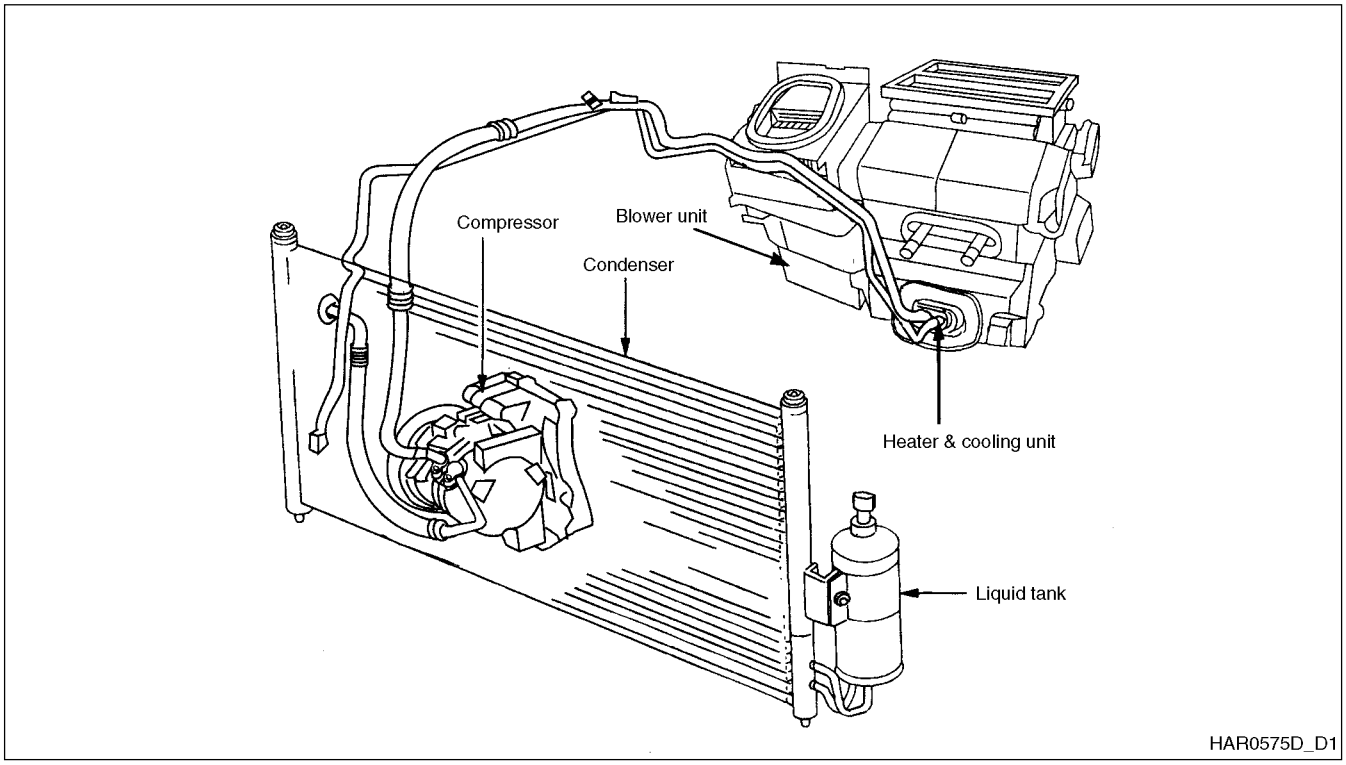
Blower Duct

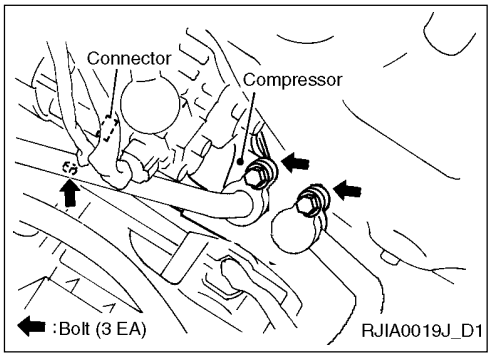
1. Remove the instrument lower cover and glove box.
2. Remove the instrument lower driver panel.
3. Remove the console.
4. Remove the instrument stay (left).
5. Remove the front blower duct (left and right).
6. Remove the rear blower duct mounting nuts.
7. Remove the front seat, front kicking plate, footrest and dash side finisher.
8. Strip the blower trim from both sides of the vehicle and remove the rear blower duct (left and right).



Cooler Cycle

Components Diagram





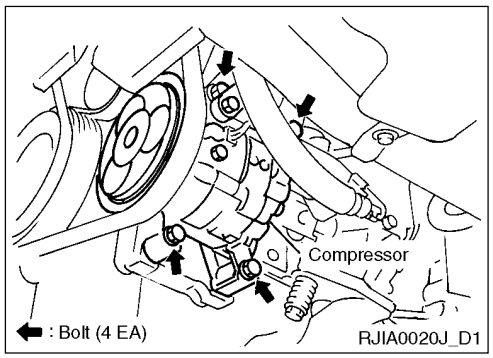
Removal • Installation of Compressor

REMOVAL

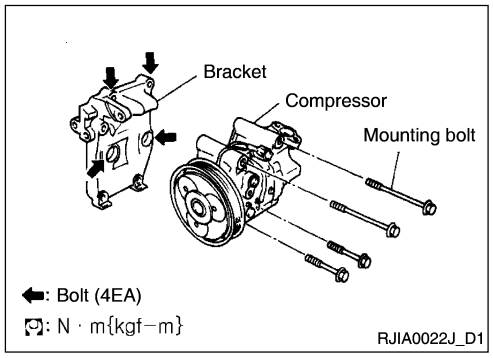
1. Trap the refrigerant using a refrigerant-recovery station (for HFC134a).
2. Remove the compressor connector.
3. Remove the engine under cover (right).
4. Remove the A/C compressor and alternator belt.
   Refer to “BELTS” (QG-15: EM-10).
5. Disconnect the high-pressure and low-pressure flexible hoses from compressor.

CAUTION:

- **Block the pipe’s connection with a cap or vinyl tape to prevent air contacts.**



6. Remove the compressor mounting bolts.
7. Remove the compressor from underneath the vehicle.



INSTALLATION

CAUTION:

- **Replace the high-pressure and low-pressure flexible hose O-rings with new and apply compressor oil.**
- **Perform the compressor and alternator belt tension adjustment after installation.**
- **Check for refrigerant leakage while charging.**

Compressor mounting bolts

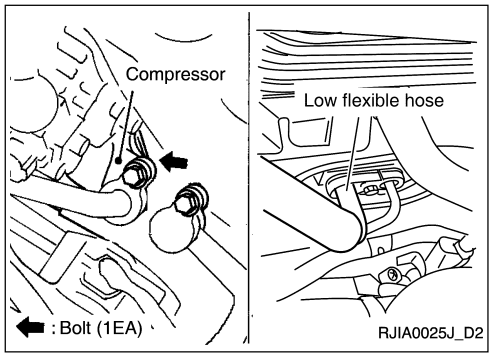
Tightening torque: 44.1 - 51.9 N•m (4.5 - 5.3 kgf-m)

High-pressure flexible hose mounting bolts and nuts

Tightening torque: 7.8 - 19.6 N•m (0.8 - 2.0 kgf-m)

Low-pressure flexible hose mounting bolts and nuts

Tightening torque: 7.8 - 19.6 N•m (0.8 - 2.0 kgf-m)



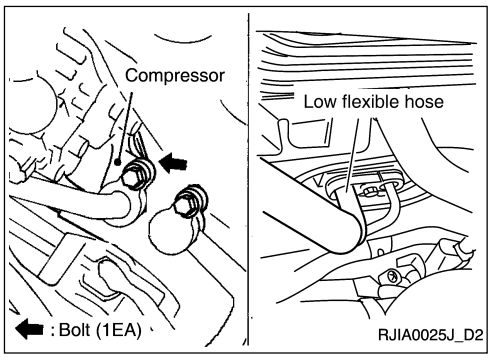
Removal • Installation of Low-Pressure Flexible Hose

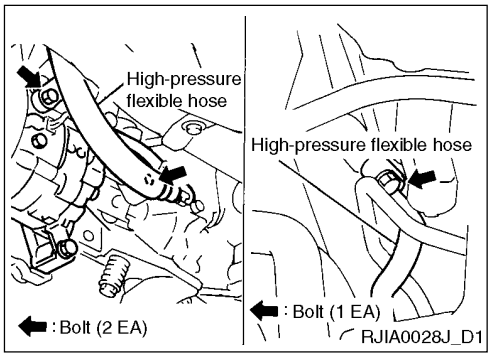
REMOVAL

1. Trap the refrigerant using a refrigerant-recovery station (for HFC134a).
2. Remove the low-pressure flexible hose bracket mounting bolt.
3. Remove the low-pressure flexible hose clip.
4. Remove the low-pressure flexible hose mounting bolt's connection.

CAUTION:

- **Block the pipe's connection with a cap or vinyl tape to prevent air contacts.**





INSTALLATION

CAUTION:

- **Replace the low-pressure flexible hose O-ring with new and apply compressor oil.**
- **Check for refrigerant leakage while charging.**

Low-pressure flexible hose and high-pressure pipe mounting bolts (to evaporator)

Tightening torque: 2.9 - 5.9 N•m (0.29 - 0.6 kgf-m)

Low-pressure flexible hose mounting bolts and nuts (to compressor)

Tightening torque: 7.85 - 19.6 N•m (0.8 - 2.0 kgf-m)

Removal • Installation of High-Pressure Flexible Hose

REMOVAL

1. Trap the refrigerant using a refrigerant-recovery station (for HFC134a).
2. Remove the pipe clip.
3. Remove the high-pressure flexible hose bracket mounting bolt.
4. Remove the high-pressure flexible hose mounting bolt and remove the high-pressure flexible hose.

CAUTION:

- **Block the pipe's connection with a cap or vinyl tape to prevent air contacts.**

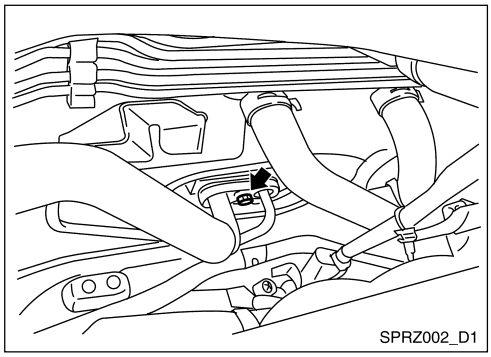
INSTALLATION

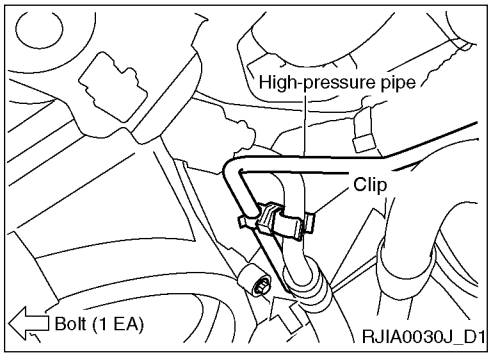
CAUTION:

- **Replace the high-pressure flexible hose O-ring with new and apply compressor oil.**
- **Check for refrigerant leakage while charging.**

High-pressure flexible hose mounting bolt

Tightening torque: 7.8 - 19.6 N•m (0.8 - 2.0 kgf-m)





Removal • Installation of High-Pressure Pipe

REMOVAL

1. Trap the refrigerant using a refrigerant-recovery station (for HFC134a).
2. Remove the high-pressure pipe clip.
3. Remove the low-pressure flexible hose.
4. Remove the high-pressure pipe mounting bolt and remove the high-pressure pipe.

CAUTION:

- **Block the pipe's connection with a cap or vinyl tape to prevent air contacts.**

INSTALLATION

CAUTION:

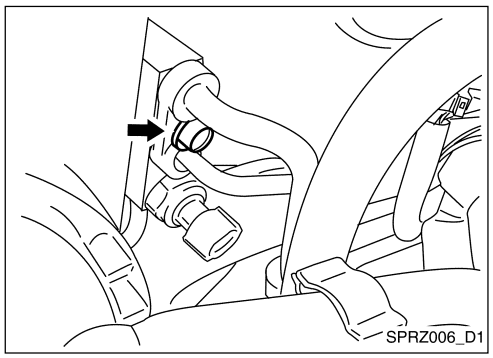
- **Replace the high-pressure pipe O-ring with new and apply compressor oil.**
- **Check for refrigerant leakage while charging.**

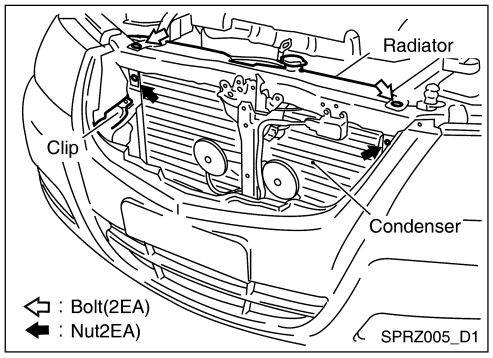
High-pressure pipe mounting bolt (to condenser and evaporator)

Tightening torque: 2.9 - 5.9 N•m (0.29 - 0.6 kgf-m)

Low-pressure flexible hose mounting nut

Tightening torque: 2.9 - 5.9 N•m (0.29 - 0.6 kgf-m)





Removal • Installation of Condenser

REMOVAL

1. Trap the refrigerant using a refrigerant-recovery station (for HFC134a).
2. Disconnect the high-pressure flexible hose and high-pressure pipe from the compressor.

CAUTION:

- **Block the pipe's connection with a cap or vinyl tape to prevent air contacts.**

3. Remove the radiator mounting bracket.
4. Remove the condenser bracket mounting nuts.
5. Remove the radiator from the lower mounts and then lean it against the engine. Remove the condenser with the liquid tank from between the radiator and the radiator core support.

CAUTION:

- **Be careful not to damage the fins of the condenser and radiator core.**

6. Remove the liquid tank.

INSTALLATION

CAUTION:

- **Replace the high-pressure pipe and high-pressure flexible hose and condenser pipe (liquid tank outlet) O-rings with new and apply compressor oil.**
- **Check for refrigerant leakage while charging.**

High-pressure flexible hose mounting bolts

Tightening torque: 7.8 - 19.6 N•m (0.8 - 2.0 kgf-m)

High-pressure pipe mounting bolts

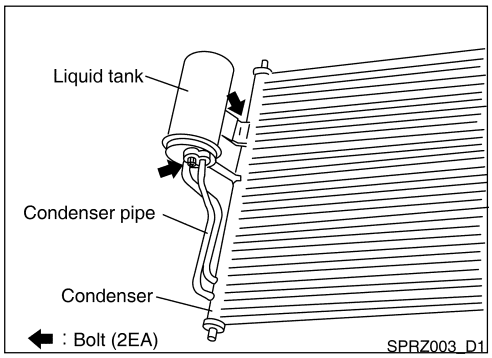
Tightening torque: 2.8 - 5.9 N•m (0.29 - 0.6 kgf-m)

Condenser pipe installation bolts (liquid tank outlet)

Tightening torque: 2.8 - 5.9 N•m (0.29 - 0.6 kgf-m)

Condenser mounting bolts

Tightening torque: 3.8 - 4.5 N•m (0.39 - 0.46 kgf-m)



Removal • Installation of Liquid Tank

REMOVAL

1. Trap the refrigerant using a refrigerant-recovery station (for HFC134a).
2. Remove the condenser.
3. Remove the liquid tank mounting bolt.
4. Remove the condenser pipe mounting bolt and remove the liquid tank.

CAUTION:

- **Block the pipe's connection with a cap or vinyl tape to prevent air contacts.**

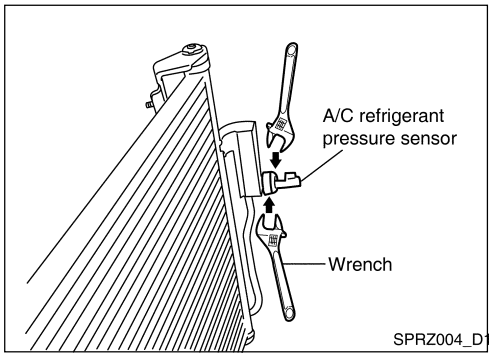
Installation

CAUTION:

- **Replace the condenser pipe O-ring with new and apply compressor oil.**
- **Check for refrigerant leakage while charging.**

Condenser pipe mounting bolt

Tightening torque: 2.9 - 5.9 N•m (0.29 - 0.6 kgf-m)



Removal • Installation of A/C Refrigerant Pressure Sensor

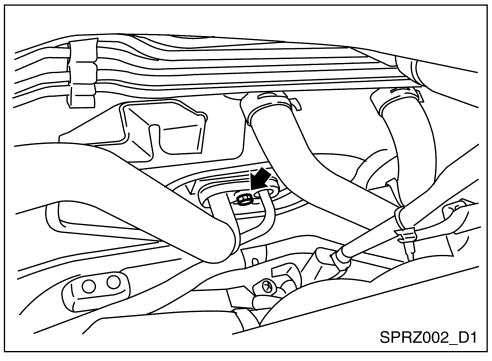
1. Remove the liquid tank.
2. Tighten the liquid tank on the vise and remove the A/C refrigerant pressure sensor.

CAUTION:

- **Wrap the liquid tank with a cloth to prevent from damage.**
- **Apply compressor oil to refrigerant pressure sensor O-ring section.**

A/C refrigerant pressure sensor

Tightening torque: 9.8 - 11.7 N•m (1.0 - 1.2 kgf-m)



Removal • Installation of Evaporator

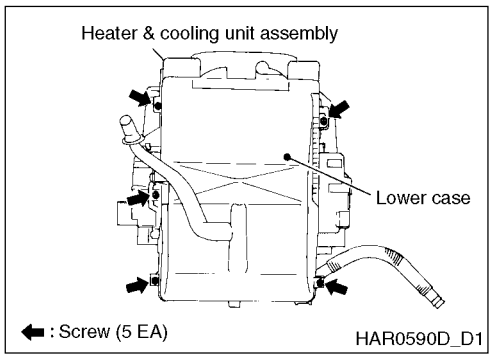
REMOVAL

1. Trap the refrigerant using a refrigerant-recovery station (for HFC134a).
2. Disconnect the low-pressure flexible hose and high-pressure pipe from the evaporator.
3. Remove the insulator cover and remove the insulator.

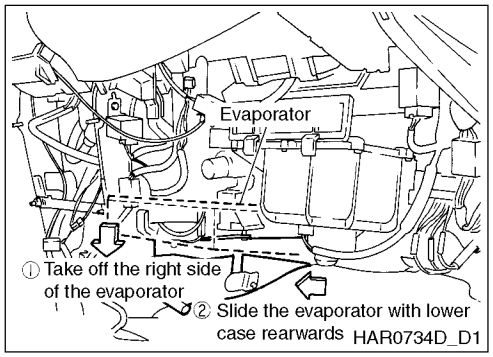
CAUTION:

- **Block the low-pressure flexible hose and high-pressure pipe connections with a cap or vinyl tape to prevent air contacts.**

4. Remove the instrument lower cover.
5. Remove the front blower duct (left) (If equipped for freezing area).



6. Remove the drain hose and lower case mounting screws.



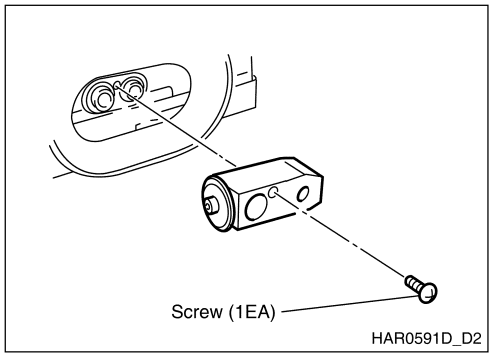
7. Lower the rear part of the evaporator and put it aside rearwards of the vehicle with the lower case.
8. Remove the lower case.
9. Disconnect the intake air temperature sensor's thermistor from the evaporator
10. Push the evaporator towards vehicle front and remove downwards.

INSTALLATION

CAUTION:

- **Replace the low-pressure flexible hose and high-pressure pipe O-rings with new and apply compressor oil.**
- **Mark the mounting location of the intake air temperature sensor's thermistor.**
- **Do not rotate the termistor when removing/installing the intake air temperature sensor.**
- **Install the evaporator so that the pipe block comes out towards engine room.**

Removal • Installation of Expansion Valve



1. Remove the insulator cover.
2. Remove the insulator.
3. Remove the pipe block and expansion valve.

Expansion valve mounting bolt

Tightening torque: 2.9 - 5.0 N•m (0.30 - 0.50 kgf-m)

AUTOMATIC TRANSAXLE

SECTION AT

GI
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Precautions

Caution

- Always use “Genuine NISSAN ATF Matic Fluid D or equivalent” as ATF.
- Apply Genuine NISSAN ATF Matic Fluid D or equivalent on the O-rings and oil seals.
- Choose clean location for operation and perform the disassembly operation in limited space as much as possible.
- Wipe out all sand and mud on the unit surfaces using a steam or white gasoline before disassembly and be careful not to let them enter into the unit during disassembly and assembly. (Do not let steam enter into the transaxle to wipe the rubber material components with gasoline.)
- Remove the torque converter from the unit and drain the ATF after cleaning.
- Check for any damages, deformations or wear at component exterior after disassembly. Replace with new component(s) if necessary.
- Replace the gasket, O-ring, D-ring and lip seal at each disassembly.
- Tighten the bolts from the center to outer edge diagonally in 2 to 3 turns. Be sure to follow the instructions if the sequence is specified.
- Be careful not to damage the mating surfaces.
- Use paper towel during operation.
- Use bare hands or vinyl gloves for disassembly and assembly operation.
- Do not use cotton gloves or cloth dusters to prevent the waste thread to get into the system.
- Check the assembling direction for thrust bearing races and perform the operation after applying the vaseline to fit correctly.
- Observe the specified torque during assembly. Always apply new Genuine NISSAN ATF Matic Fluid D or equivalent or vaseline on the components.
- Follow the local laws and regulations for wasting or cleaning the used fluids after ATF change.

Preparation

Special Service Tools

Item	Description
Drift ST35325000 KV31103000	Installing differential oil seal
ST2505S001 Oil pressure gauge set ST25051001 Oil pressure gauge ST25052000 Hose ST25053000 Joint pipe ST25054000 Adapter ST25055000 Adapter	Measuring line pressure
Pressure output plug wrench ST25480000	Remove fluid pressure detection plug
Drift ST33200000	Installing differential side bearing inner races

Item	Description
Clutch spring compressor KV31103200	Removing and installing each clutch return spring
Pin punch ST23540000	Installing parking rod plate and manual plate retaining pins
Pin punch KV32101000	Removing and installing pinion mate shaft lockpin
ST3306S001 Differential side bearing puller set ST33051001 Puller ST33061000 Adapter	Removing differential side bearing inner races
Puller KV381054S0	● Removing idler gear bearing outer race ● Removing differential side oil seals ● Removing differential side bearing outer races ● Removing output shaft outer race
Puller ST27180001	Removing idler gear and output gear
Puller ST30031000	Removing reduction pinion gear bearing inner race
Drift ST35272000	● Installing reduction pinion gear bearing inner race ● Installing idler gear bearing inner race ● Installing output gear bearing inner race
Drift ST37830000	Installing idler gear bearing outer race
Drift ST30633000	Installing differential side bearing outer race
Drift ST35271000	Installing idler gear and output gear
Drift ST33400001	Installing oil pump oil seal and output gear outer race
Preload adapter KV38105710	Measuring clearance between side gear and differential case
Drift KV40104840	Installing output shaft bearing outer race

Automatic Transaxle Fluid (ATF)

Change

- For ATF change, fill the new fluid to the charging pipe during idle and at the same time drain the fluid from the radiator cooler hose return side.
- If the drained fluid color becomes similar with the new fluid, end the process. The amount of new fluid should be 3 to 5 % of the specified capacity.

ATF specification: Genuine NISSAN ATF Matic Fluid D or equivalent

Specified capacity: Approx. 7.0 liters

CAUTION:

- **Use "Genuine NISSAN ATF Matic Fluid D or equivalent" for RE4F03B as an ATF. If other company's ATF is used or mixed with other fluids, it may cause deteriorated performance.**
- **Use a paper towel and do not use cloth with fluff.**
- **Always inspect the ATF level after change.**

Change Interval

Normal conditions: Replace during disassembly

Severe conditions: Refer to MA section.

REFERENCE:

- **Use the ATF tester for change determination under severe conditions.**

Clean zone: Normal

Yellow zone: Change right away

Red zone: Change

Inspection

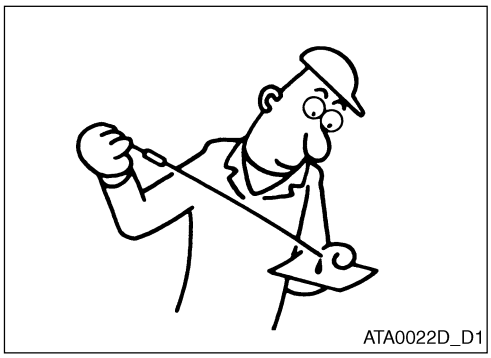
FLUID LEVEL INSPECTION

For level inspection, follow the steps below to be in the "HOT" range (ATF temperature: 50 - 80°C).

1. Warm up the engine and drive for approx. 10 minutes. (When ambient temperature is 20°C, the ATF temperature usually increases to approx. 50 - 80°C with 10 minutes of driving).
2. Park the vehicle on the level ground.
3. Securely apply the parking brake.
4. At engine idle, select the lever from "P" to "1" while stepping on the brake pedal.
5. Check if the ATF level is at fluid level gauge's "HOT" range in "P" or "N" position.

CAUTION:

- **When it is needed to inspect the ATF level at low ATF temperature (30 - 50°C) or changing ATF, adjust the fluid level to the "COLD" level first and check again the ATF level to be the HOT range.**
- **Use a paper towel when wiping out the ATF from the fluid level gauge.**
- **Securely fasten the fluid level gauge to the charging pipe with a stopper.**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CONDITION INSPECTION

ATF Condition	Possible Cause	Required Operation
Varnishing (It becomes tacky as varnish)	The clutch and band are burning	Change the ATF and inspect for any defects in A/T assembly or vehicle (such as harness wire and cooler pipe)
Milky white or dark while	Water mixed	Change ATF and inspect for any water inflow
Metal particles much mixed	The moving parts of the A/T is wearing out too much	Change ATF and inspect for any A/T bad operation

A/T System

Shift Mechanism

COMPONENTS AND OPERATION

		Reverse clutch (R/C)	High clutch (H/C)	Forward clutch (F/C)	Overrun clutch (O/C)	Band servo			Forward one-way clutch (F/O C)	Low one-way clutch (L/O C)	Low and reverse brake (L&R/B)	Remarks
						2nd apply	3rd release	4th apply				
P												Park
R		□									□	Reverse
N									■	■		Neutral
※3	1st			□	◘				■			Automatic shift
D	2nd			□	⊡				■			1 ↔ 2 ↔ 3 ↔ 4
	3rd		□	□	⊡	※1 ▣	▣					
	4th		□	▣		※2 ▣	▣	□				
3	1st			□	◘				■	■		Automatic shift
	2nd		□	□	⊡	□			■			1 ↔ 2 ↔ 3
	3rd			□	⊡				■			
2	1st			□	□	□			■	■		Automatic shift
	2nd			□	□				■			1 ↔ 2 ← 3
	3rd		□	□	□	※1 ▣	▣		■			
1	1st			□	□				■	■	□	Automatic shift
	2nd			□	□				■			1 ← 2 ← 3
	3rd		□	□	□	※1 ▣	▣		■			

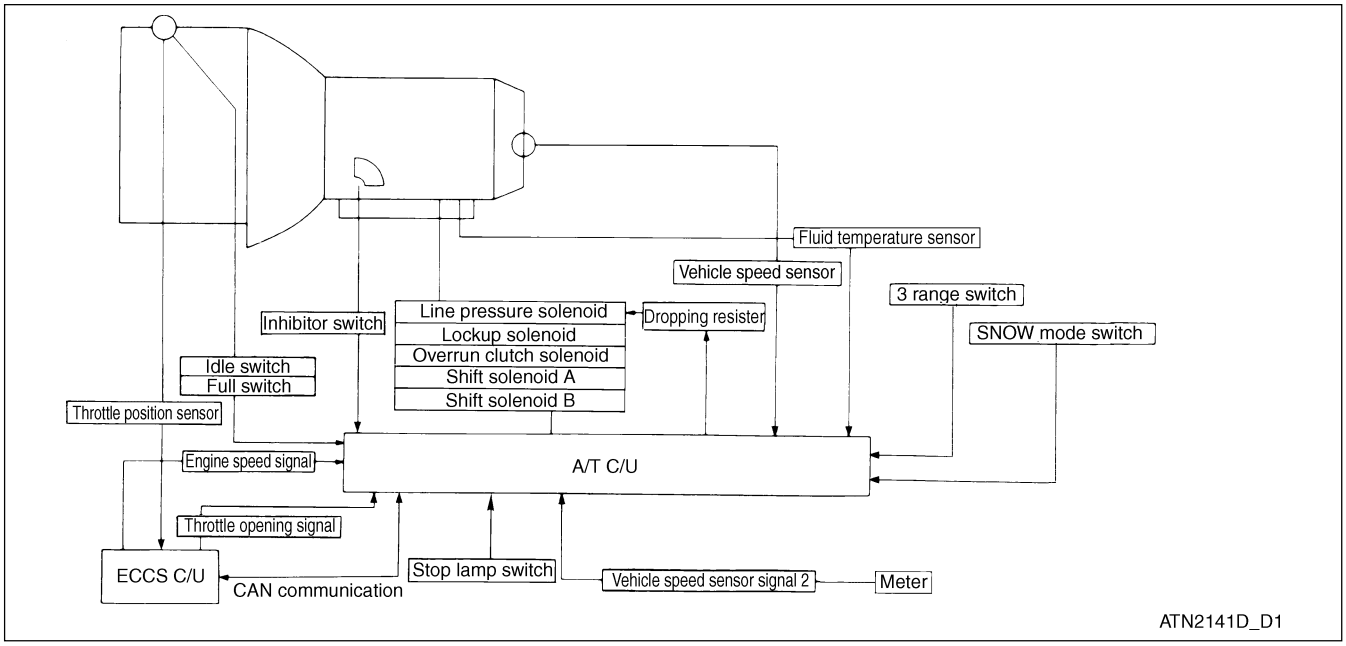
※1: Oil pressure is applied to both 2nd “apply” side and 3rd “release” side of band servo piston. However, brake band does not contract because fluid pressure area on the “release” side is greater than that on the “apply” side.

※2: Fluid pressure is applied to 4th “apply” side in condition “※1” above, and brake band contracts.

※3: A/T will not shift to 4th when overdrive switch is set in “OFF” position (3rd).

□ Tightens.
■ Operates under accelerating condition.
▣ Operates but not work for power transmission.
◘ Engages by less than set accelerator travel, but not work for engine brake.
⊡ Engages by less than set accelerator travel and work for engine brake.

Control System Diagram



Remarks on Fail-Safe Function

The A/T control unit has an electronic fail-safe. This allows the vehicle to be driven even if a major electrical input/output device circuit is damaged. Under fail-safe, the vehicle always runs in third gear with shift lever position of 1, 2 or D, customer may say “sluggish, poor acceleration”. When fail-safe operation occurs the next time the ignition key is turned to the ON position, the O/D OFF indicator light will blink for approx. 8 seconds. {Refer to “Self-Diagnosis” (Without Using CONSULT-II) (AT-53)}.

Fail-safe may activate without electrical circuit damages if the vehicle is driven under extreme conditions (such as excessive wheel spins and emergency braking immediately afterwards). In this case, turn ignition key OFF for 5 seconds and then ON to recover normal shift pattern. The blinking of the O/D OFF indicator light for about 8 seconds will appear only once and be cleared. The customer may resume normal driving conditions by chance. Always follow the “Diagnosis Program”. When self-diagnosis is operated, the following results will occur.

At first, damage is indicated at the vehicle speed sensor 1 or 2. When performing the self-diagnosis again after sensor inspection, nothing will be indicated.

Trouble Diagnosis

Fail-Safe Function

- When defect is found at sensors and solenoids, it allows driving under the fail-safe function as below.

VEHICLE SPEED SENSOR

- Two vehicle speed sensor signals are input from the vehicle speed sensor 1 (revolution sensor) installed to the transaxle and the vehicle speed sensor 2 from the meter control unit inside the combination meter. Therefore, it is possible to drive the vehicle in normal condition even though one of the systems is malfunctioning.

THROTTLE POSITION SENSOR

- It calculates the accelerator opening by the idle switch and full switch and then controls the line pressure as below if the throttle sensor is malfunctioning.

Idle switch	Full switch	Line pressure	Accelerator
-	"ON"	Max. pressure	Throttle position 4 / 8
"OFF"	"OFF"		Throttle position 2 / 8
"ON"	"OFF"	Min. pressure	Throttle position 0 / 8

INHIBITOR SWITCH

- When multiple signals are inputted to the A/T control unit from the inhibitor switch, A/T control unit determines the priority of the selector lever position as D, N, R, 2, 1 in order.

  But, while resuming normal operation, 4th gear is prohibited and actual vehicle driving conditions will be as chart below because the control valve's fluid pressure circuit is converted to manual valve by the selector lever position.

Actual selector position	Input signal of the inhibitor switch	Vehicle driving status
P range	"P" and other range signals	P
R range	"R" and other range signals	R
D range	"N" and other range signals	N
D 3 range	"D" and other range signals	$D_1 \leftrightarrow D_2 \leftrightarrow D_3$
2 range	"2" and other range signals (except for "1" range signal)	$2_1 \leftrightarrow 2_2 \leftrightarrow 2_3$
	"2" and "1" range signals	$2_1 \leftarrow 2_2$
1 range	"1" and other range signals (except for "1" range signal)	$1_1 \leftrightarrow 1_2 \leftrightarrow 1_3$
	"1" and "2" range signals	$1_1 \leftarrow 1_2$

SHIFT SOLENOID A AND B

- When the solenoid is defective, the gear position will as below so that the normal driving is possible.

Selector position	When normal			When solenoid A is defective			When solenoid B is defective			When solenoid A & B are defective		
	A	B	Gear	A	B	Gear	A	B	Gear	A	B	Gear
D range	●	●	1st	-	● → x	3rd	● → x	-	3rd	-	-	3rd
	x	●	2nd	-	● → x		x	-		-	-	
	x	x	3rd	-	x		x	-		-	-	
	●	x	4th	-	x		● → x	-		-	-	
3 range	●	●	1st	-	● → x		● → x	-		-	-	
	x	●	2nd	-	● → x		x	-		-	-	
	x	x	3rd	-	x		x	-		-	-	
2 range	●	●	1st	-	● → x		● → x	-		-	-	
	x	●	2nd	-	● → x		x	-		-	-	
	x	x	3rd	-	x		x	-		-	-	
1 range	●	●	1st	-	● → x		● → x	-		-	-	
	x	●	2nd	-	● → x		x	-		-	-	
	x	x	3rd	-	x		x	-		-	-	

● : Continuity x : No continuity - : When defective

LINE PRESSURE SOLENOID

- When solenoid signal is inputted in the A/T control unit, it turns the line pressure solenoid “OFF” and increases the line pressure to maximum.

LOCKUP SOLENOID

- When defective solenoid signal is inputted in the A/T control unit, it turns the lockup solenoid “OFF” and releases the lockup.

OVERRUN CLUTCH SOLENOID

- When defective solenoid signal is inputted in the A/T control unit, it turns the overrun clutch solenoid “OFF” and allows engine brake while decelerating by operating the overrun clutch.

Trouble Diagnosis Procedure

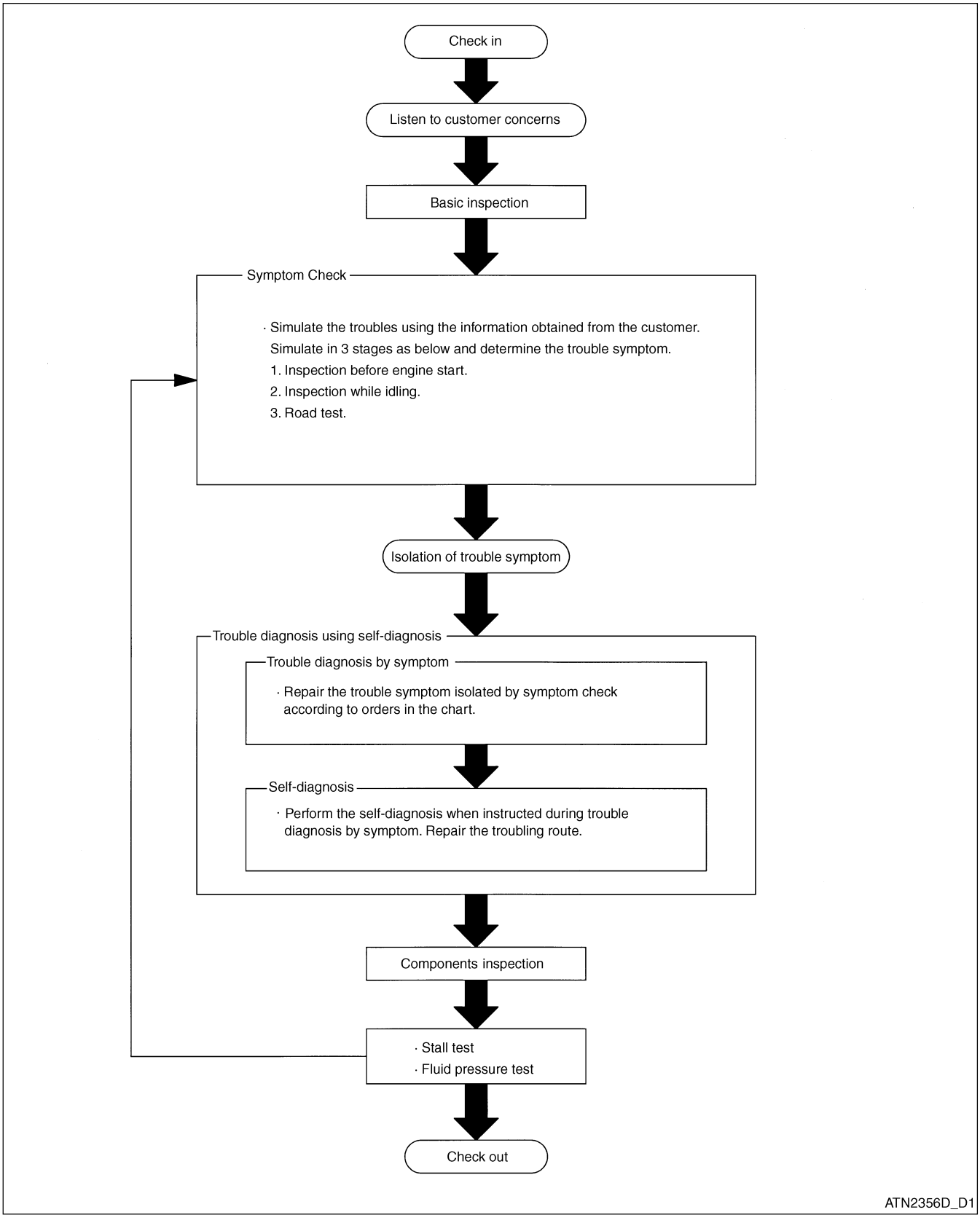
In order to perform the trouble diagnosis quickly and accurately, it is important to properly understand the defective symptoms. The same trouble symptom may be understood differently according to customers. It is necessary to understand the details of trouble symptoms and occurrence for customer’s complaints.

For proper troubles diagnosis, use the “Trouble Sheet” and “Diagnosis Sheet”.

INTRODUCTION

- A/T control unit receives signals from vehicle speed sensor, throttle position sensor or inhibitor switch and controls the shift and the lockup by the solenoid valves. When A/T is operating, input and output signals should always be accurate and stable. For normal operation of the A/T system, all valves including solenoid valves should be in good state.
- Intermittent troubles are more difficult than continuous troubles to be diagnosed. Intermittent troubles can be caused by electrical bad connections or defective wirings. In those cases, check the related circuits thoroughly but be carefully not to change components by misjudgment.
- It is impossible to find the accurate cause of trouble only by visual inspection. In this case, perform the road test by connecting CONSULT-II or circuit tester according to “Diagnosis Flow”.
- Before starting inspection, listen to customer complaints especially for the drivability troubles. In case of intermittent trouble, there could be information for proper diagnosis.
- Determine the troubling conditions by using “Diagnosis Sheet”.
- First of all, start to diagnose from the basic components or sections. If so, electronic control vehicle’s drivability problems can be diagnosed more easily.

Diagnosis Flow



DIAGNOSIS SHEET

Customer Information

Key Points

- What - Vehicle and engine model
- When - Date, frequency
- Where - Road conditions
- Conditions - Driving conditions, circumstances
- How - Symptoms

Customer Name	Vehicle Model	VIN
A/T Model	Engine	Mileage (km)
Incident date	Registered date	Check-in date
Frequency	☐ Continuous ☐ Under certain conditions ☐ Intermittent (Times/Day)	
Symptoms	☐ Vehicle does not move. (☐ Any position ☐ Particular position)	
	☐ No up-shift (☐ 1st → 2nd ☐ 2nd → 3rd ☐ 3rd → O/D)	
	☐ No down-shift (☐ O/D → 3rd ☐ 3rd → 2nd ☐ 2nd → 1st)	
	☐ Lockup malfunction	
	☐ Shift point too high or too low	
	☐ Shift shock and slip (☐ N → D ☐ Lockup ☐ D1 → D2 ☐ N → R)	
	☐ Noise or vibration	
	☐ No kickdown	
	☐ No shift pattern changes when range is changed	
	☐ Others	
A/T CHECK indicator	Blinks for approx. 8 seconds	
	☐ Stays ON	☐ Does not come ON

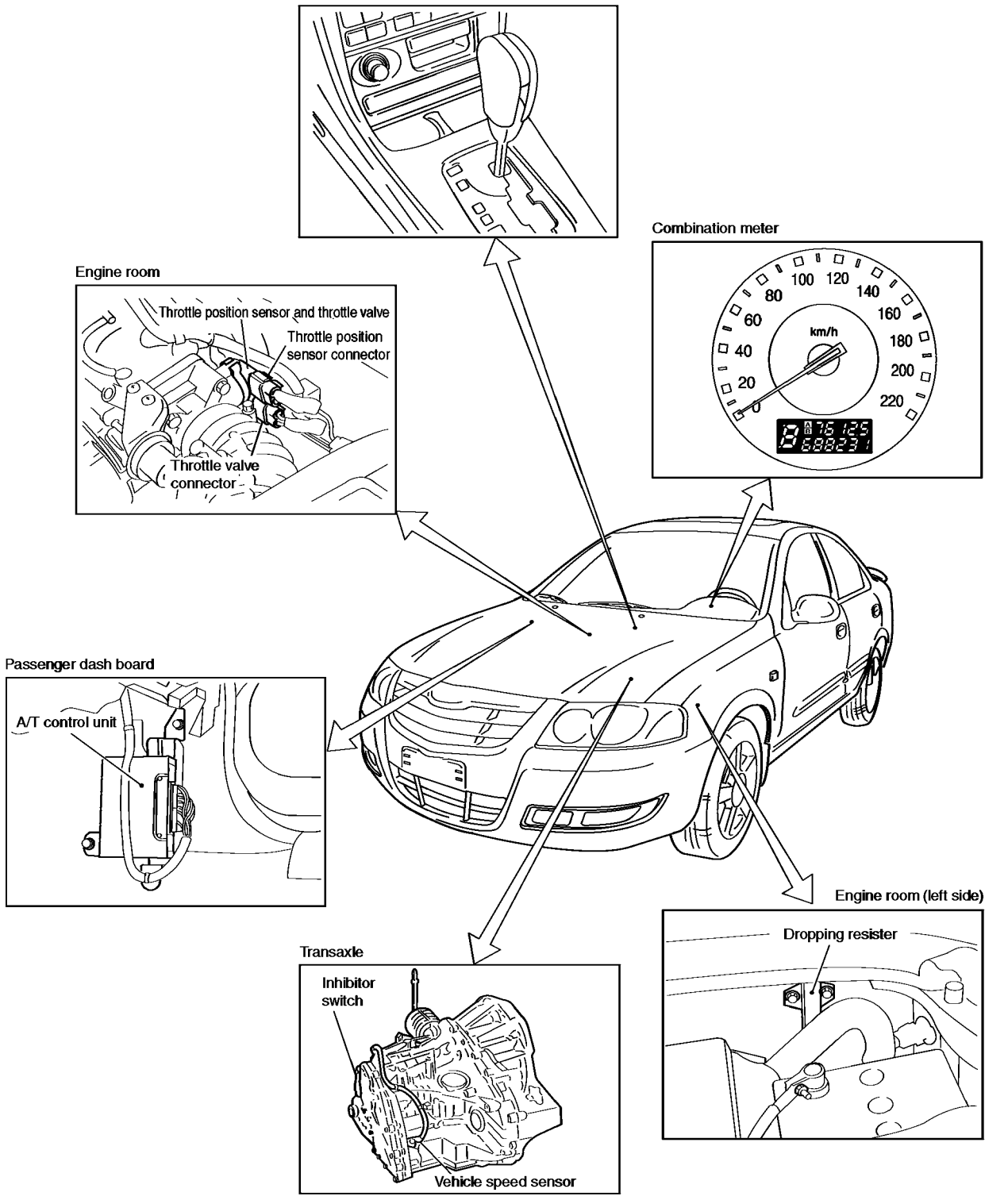
Diagnosis Sheet

1	☐ Read the fail-safe remarks and listen to customer complaints			(AT - 10)
2	☐ Check ATF			(AT - 25)
		☐ Leakage (Repair the defective part) ☐ Condition ☐ Level		
3	☐ Stall test and line pressure inspection			(AT - 25), (AT - 27)
		☐ Stall test		
			☐ Torque converter one-way clutch ☐ Reverse clutch ☐ Forward clutch ☐ Overrun clutch ☐ Forward one-way clutch	☐ Low and reverse brake ☐ Low one-way clutch ☐ Engine ☐ Low line pressure ☐ Remove the high clutch and brake band
		☐ Line pressure inspection - Defective component		

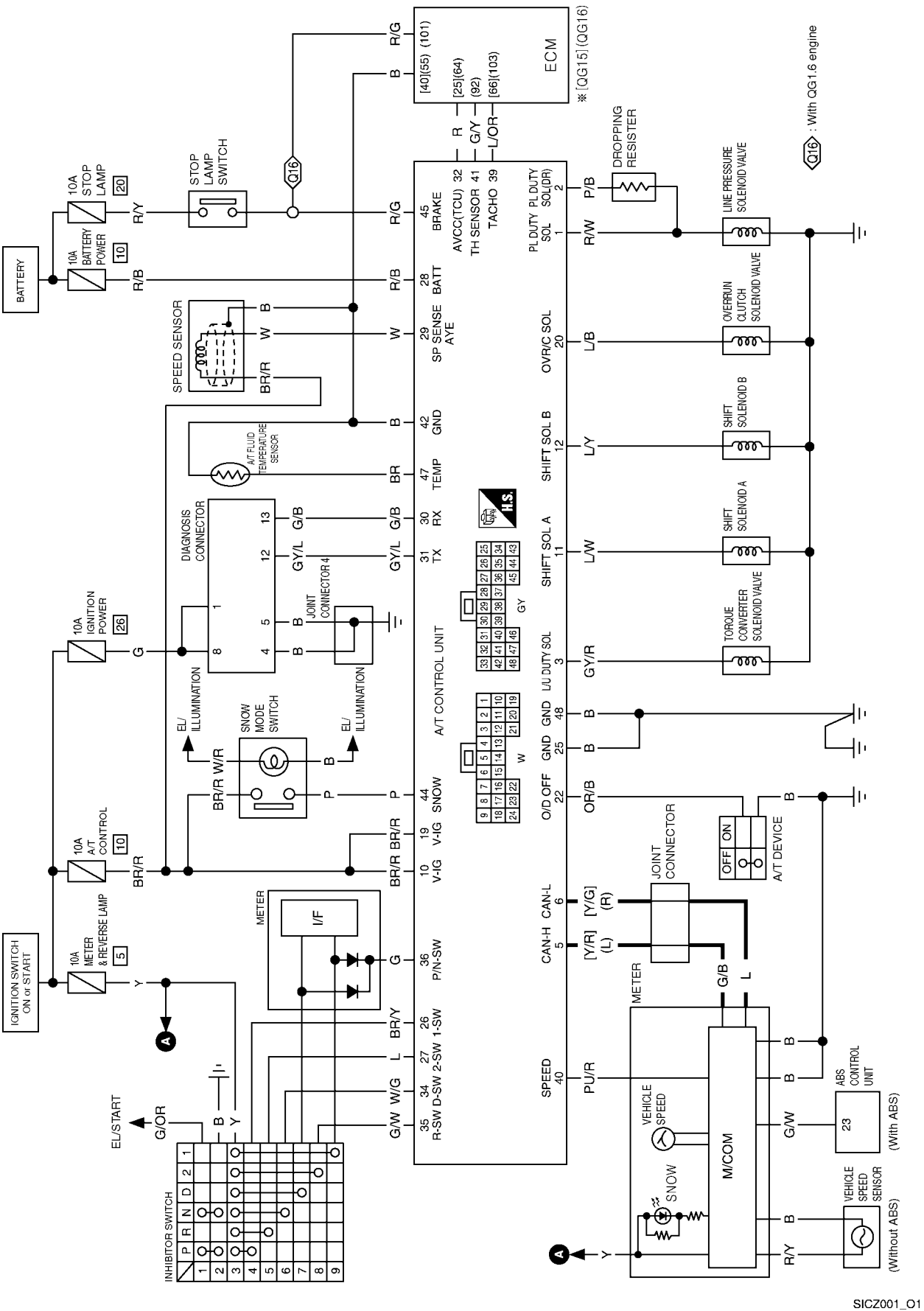
4	☐ Perform all road tests and mark on the required procedures			(AT - 29)
	4.1	Inspection before engine start ☐ Perform self-diagnosis - Mark on the detected items		(AT - 30)
			☐ Inhibitor switch ☐ Fluid temperature sensor ☐ Vehicle speed sensor-1 (A/T) ☐ Engine speed signal ☐ Lockup solenoid valve ☐ Line pressure solenoid ☐ Shift solenoid valve A ☐ Shift solenoid valve B ☐ Throttle position sensor ☐ Overrun clutch solenoid valve ☐ Inhibitor switch, O/D switch, idle switch and full switch ☐ Fluid temperature sensor and A/T control unit power ☐ Vehicle speed sensor 2 (Meter) ☐ Battery ☐ Others	
	4.2	Inspection during idle		(AT - 30)
		☐ A/T CHECK indicator light does not come on ☐ Engine does not start at “P” or “N” range ☐ Vehicle moves in “P” range when pushed ☐ Vehicle moves in “N” range ☐ Too much shock when shifting from “N” range to “P” range ☐ Cannot reverse in “R” range ☐ Cannot go forward in “D”, “2”, “1” range		
	4.3	Road test		(AT - 32), (AT - 34), (AT - 36)
		Part 1		
		☐ Does not start from “D1” ☐ No shift from “D1” to “D2”. Or no kickdown from “D4” to “D2” ☐ No shift from “D2” to “D3” ☐ No shift from “D3” to “D4” ☐ No lockup ☐ Lockup is not continued ☐ Lockup does not release ☐ Engine speed does not drop to idle RPM		
		Part 2		
		☐ Does not start from “D1” ☐ No shift from “D1” to “D2”. or No kickdown from “D4” to “D2” ☐ No shift from “D2” to “D3” ☐ No shift from “D3” to “D4”		

		Part 3 ☐ No shift from “D4” to “D3” when the shift lever is moved to “3” ☐ Engine speed does not drop to idle RPM ☐ No shift from “D3” to “D2” when selector lever is moved from “3” to “2” ☐ No shift from “D2” to “D1” when selector lever is moved from “2” to “1” ☐ No engine brake ☐ Mark on the item detected while self-diagnosis	
		☐ Inhibitor switch ☐ Fluid temperature sensor ☐ Vehicle speed sensor 1 (A/T) ☐ Engine speed signal ☐ Lockup solenoid valve ☐ Line pressure solenoid ☐ Shift solenoid valve A ☐ Shift solenoid valve B ☐ Throttle position sensor ☐ Overrun clutch solenoid valve ☐ Inhibitor switch, O/D switch, idle switch and full switch ☐ Fluid temperature sensor and A/T control unit power ☐ Vehicle speed sensor 2 (Meter) ☐ Battery Others	
5	☐ Inspect each systems detected as NG during self-diagnosis and repair or replace the defective component		
6	☐ Perform the inspection before driving and mark on the required item		(AT - 29)
7	☐ Perform the “Diagnosis Flow” for the remaining NG items and repair or replace the defective component. Refer to “Diagnosis by Symptoms” chart (The chart also contains other symptoms and inspection procedure).		(AT - 39)
8	☐ Erase the self-diagnosis results from the A/T control unit		(AT - 51) (AT - 54)

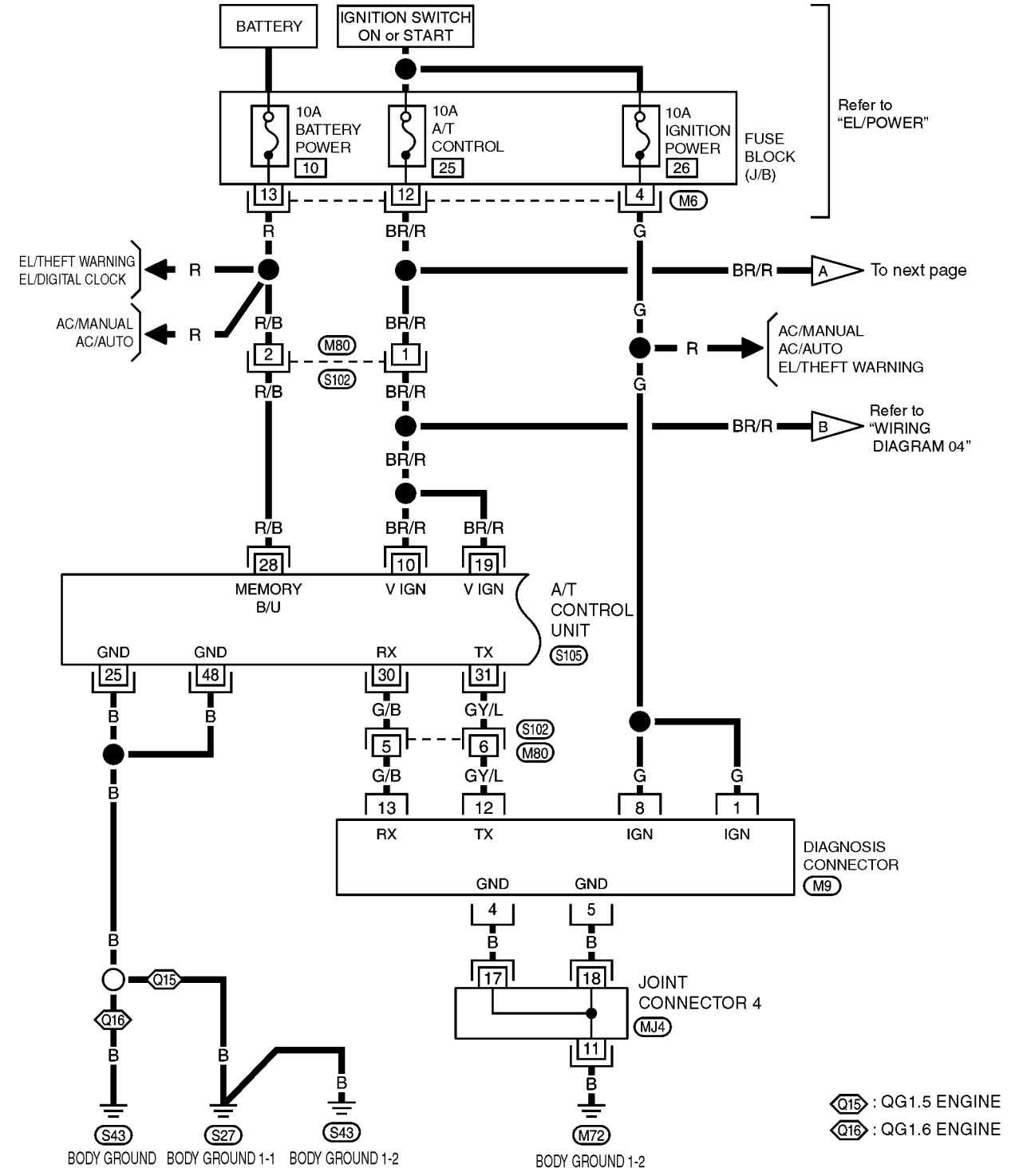
Components Location

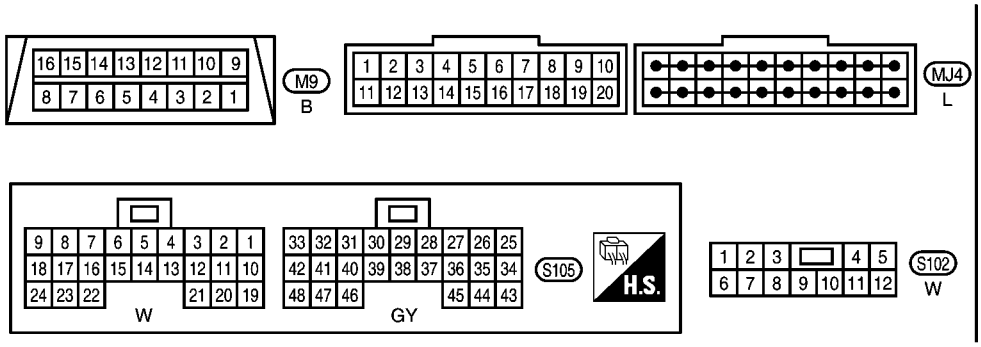


Circuit Diagram



Wiring Diagram





Refer to "FUSE BLOCK (J/B)"
M6

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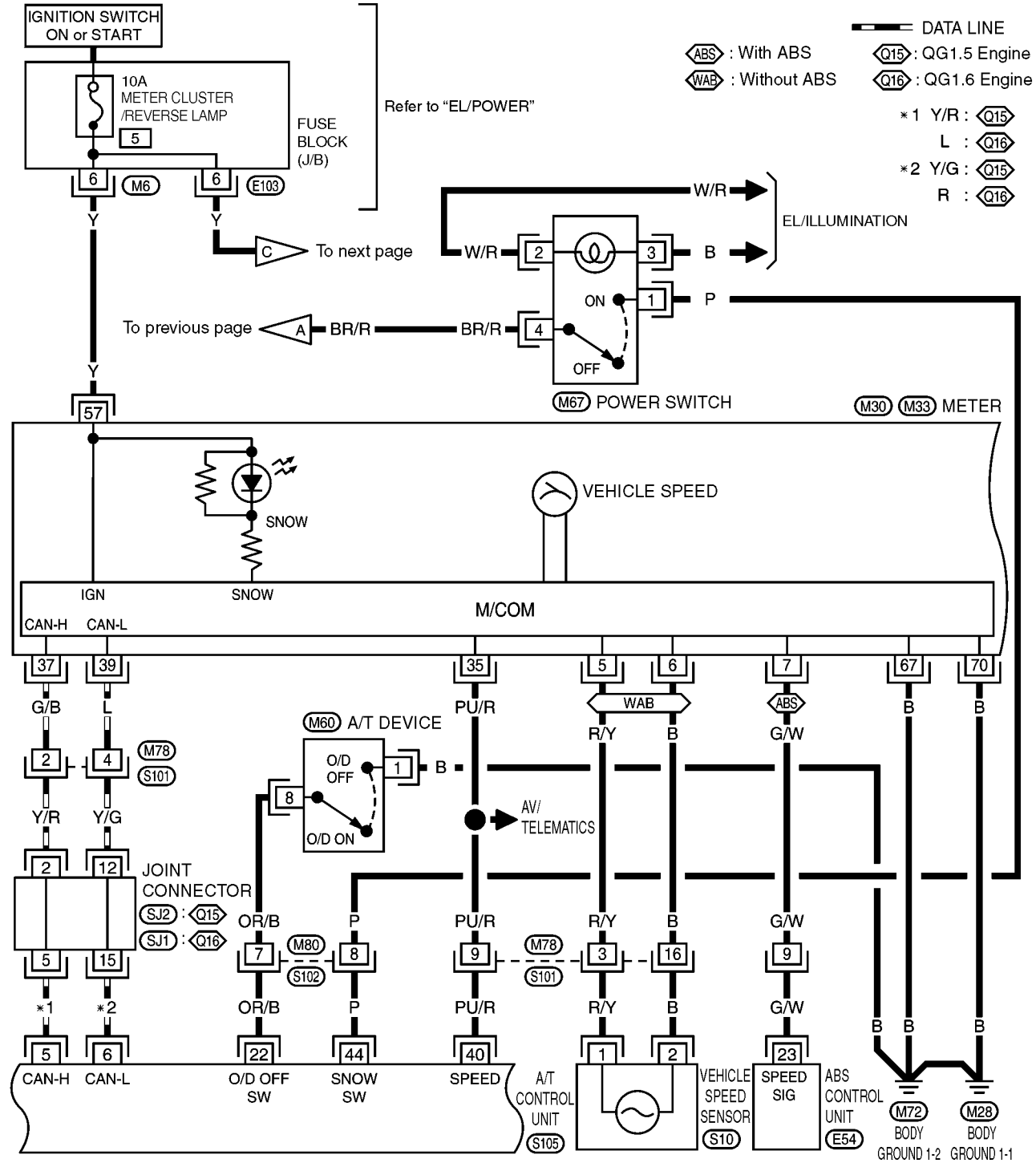
Wiring Diagram



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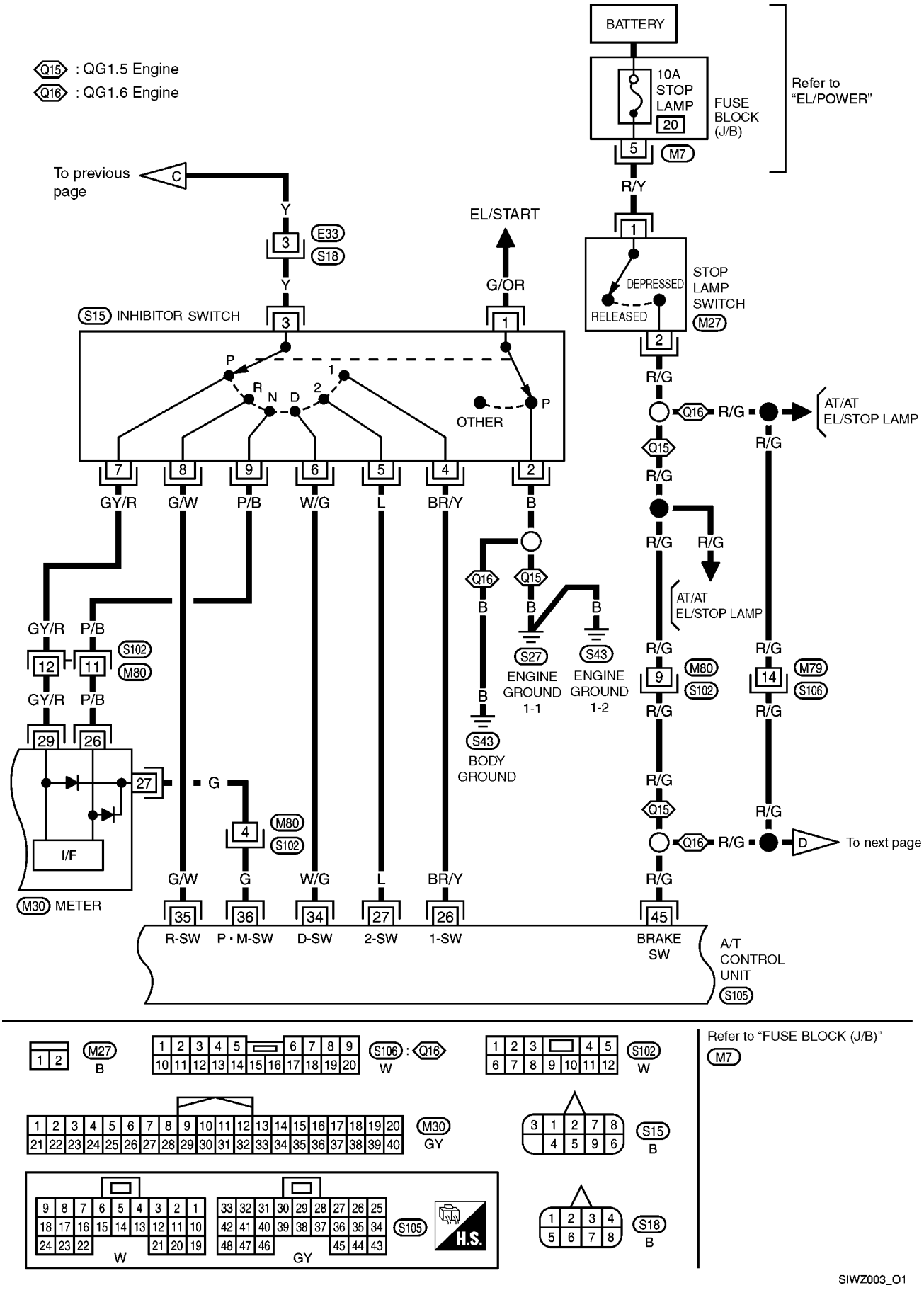
Wiring Diagram



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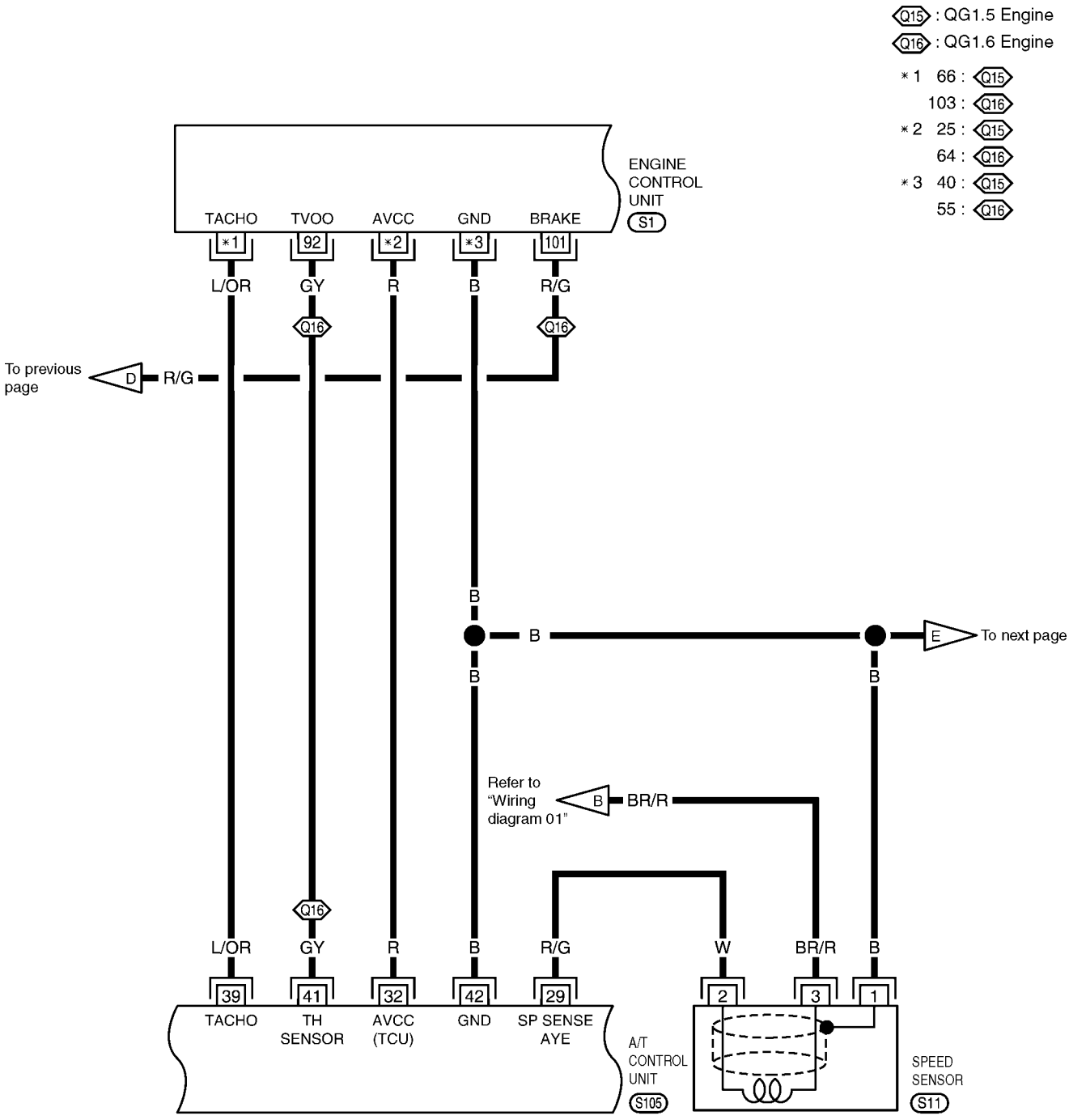
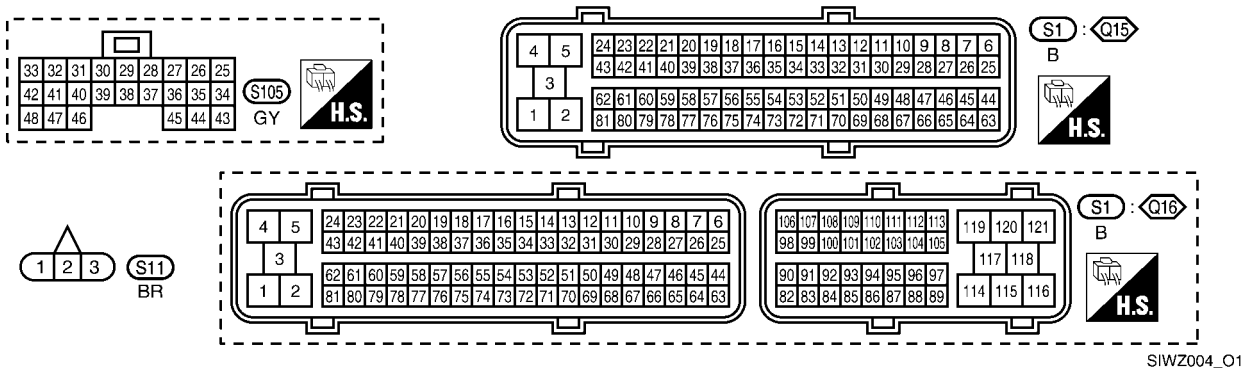
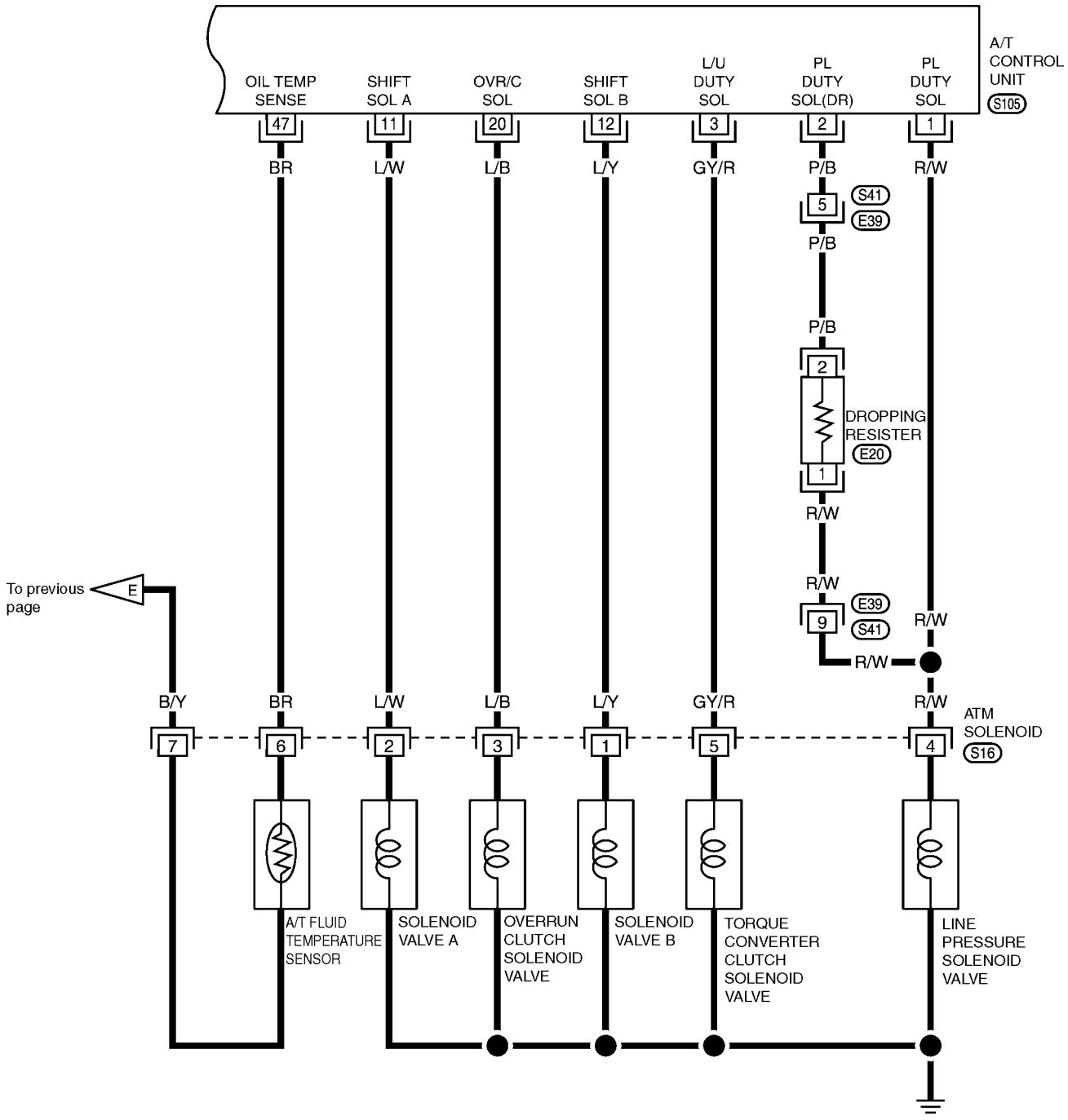
Wiring Diagram

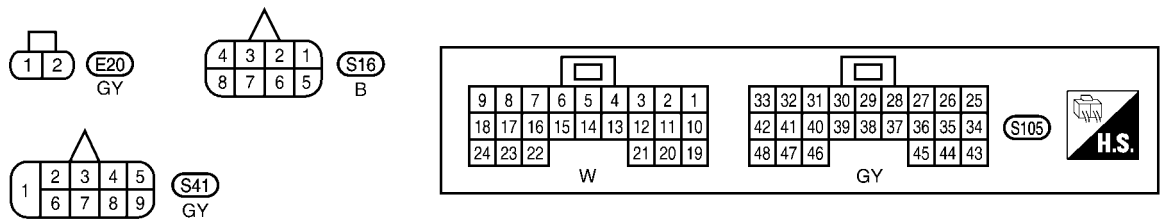




SIWZ004_O1

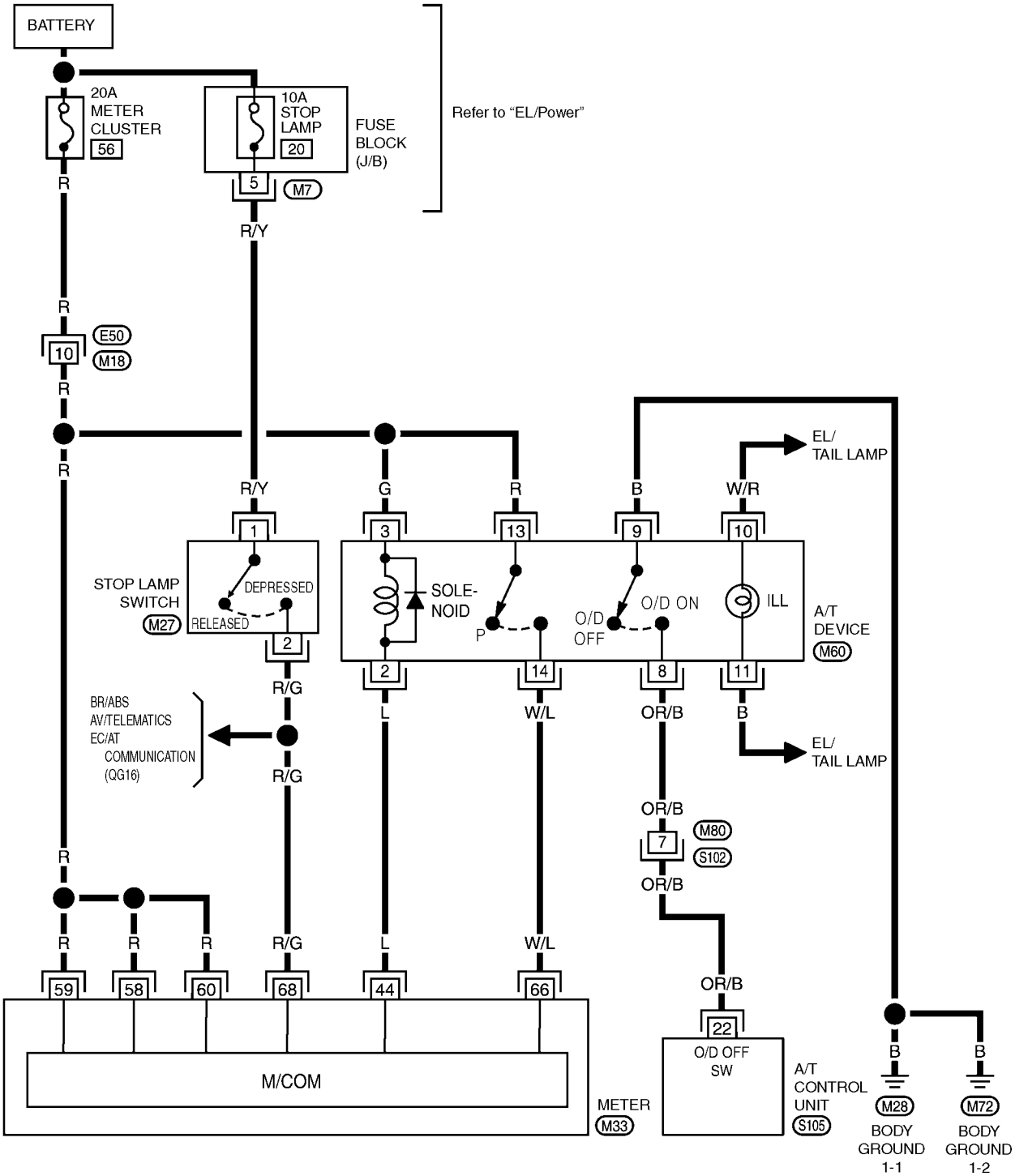
Wiring Diagram

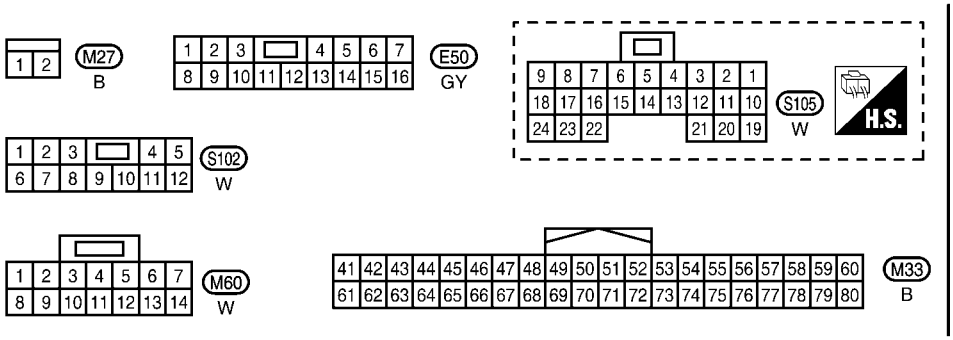




SIWZ005_O1

Wiring Diagram — AT/AT-DEVICE





Refer to "FUSE BLOCK (J/B)" M7

SIWZ006_O1

Preliminary Inspection

ATF INSPECTION

LEAKAGE AND FLUID LEVEL

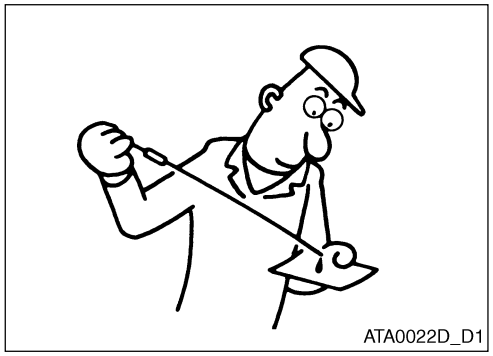
- Inspect the leakage and fluid level.

  For level inspection, follow the steps below to be in the “HOT” range (ATF temperature: 50 - 80°C).

1. Warm up the engine and drive for approx. 10 minutes. (When ambient temperature is 20°C, the ATF temperature usually increases to approx. 50 - 80°C with 10 minutes of driving).
2. Park the vehicle on the level ground.
3. Securely apply the parking brake.
4. At engine idle, select the lever from P to 1 while stepping on the brake pedal.
5. Check if the ATF level is at fluid level gauge’s HOT range in P or N position.

CAUTION:

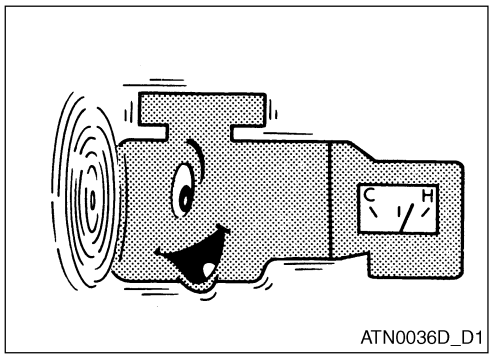
- **When it is needed to inspect the ATF level at low ATF temperature (30 - 50°C) or changing ATF, adjust the fluid level to the COLD level first and check again the ATF level to be the HOT range.**
- **Use a paper towel when wiping out the ATF from the fluid level gauge.**
- **Securely fasten the fluid level gauge to the charging pipe with a stopper.**


ATA0022D_D1

CONDITION

Inspect the ATF condition

ATF Condition	Possible Cause	Required Operation
Varnishing (It becomes tacky as varnish)	The clutch and band are burning	Change the ATF and inspect for any defects in A/T assembly or vehicle (such as harness wire and cooler pipe)
Milky white or dark while	Water mixed	Change ATF and inspect for any water inflow
Metal particles much mixed	The moving parts of the A/T is wearing out too much	Change ATF and inspect for any A/T bad operation



ATN0036D_D1

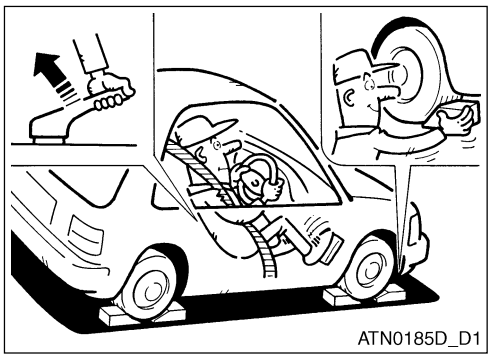
STALL TEST

Test Procedure

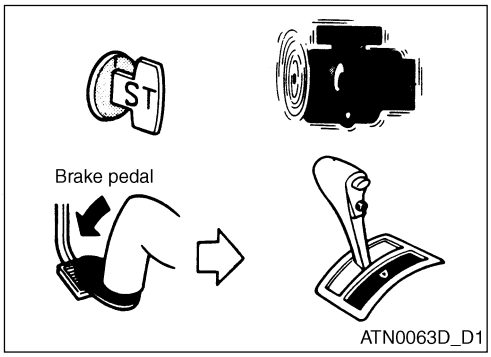
1. Inspect the engine oil level. Add if necessary.
2. After approx. 10 minutes of driving, warm up the engine until ATF reaches 50 - 80°C. Add ATF if necessary.

CAUTION:

- **When ambient temperature is 20°C, the ATF temperature usually increases to approx. 50 - 80°C with 10 minutes of driving.**

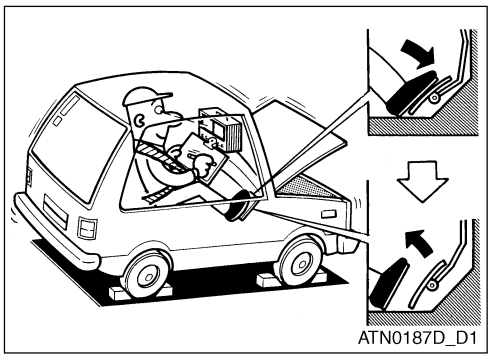

ATN0185D_D1

3. Securely apply the parking brake and block the wheel rotation.



ATN0063D_D1

4. Start the engine and place the selector lever to D while depressing the brake pedal.


ATN0187D_D1

5. Slowly depress the accelerator pedal while depressing the brake pedal.
6. Read stall RPM quickly and then release the accelerator pedal immediately.

CAUTION:

- **Do not depress the accelerator pedal for more than 5 seconds during the test.**

7. Move the selector lever to N.
8. Cool off the ATF.

CAUTION:

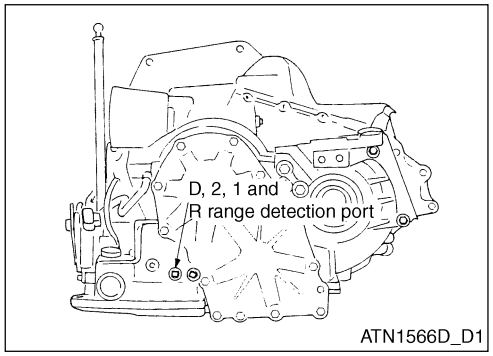
- **Idle the engine for at least 1 minute.**

Standard value: 2,300 - 2,700 RPM

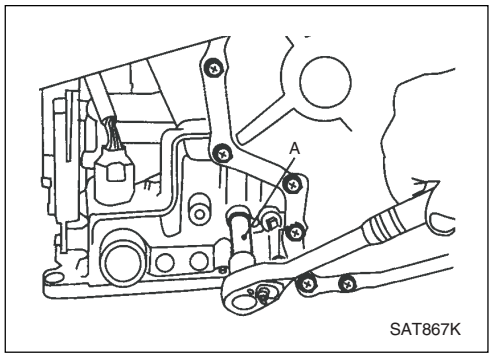
Defective Section

	Selector Lever Position				Possible Trouble Cause
	D	1	2	R	
Stall test	H	H	H	O	● Forward clutch ● Forward one-way clutch ● Low one-way clutch
	O	O	O	H	● Low reverse brake ● Reverse clutch
	L	L	L	L	● Torque converter one-way clutch
	H	H	H	H	● Line pressure route (low line pressure) and [forward clutch, low one-way clutch, forward one-way clutch] ● Line pressure route (low line pressure) and [reverse switch, forward clutch] ● [Forward clutch, low one-way clutch, forward one-way clutch] and [reverse clutch, forward clutch] ● Line pressure route (low line pressure), [forward clutch, low one-way clutch, forward one-way clutch] and [reverse clutch, forward clutch]
	O	O	O	O	● Clutches and brakes are normal except for high clutch, brake band and overrun clutch (However, the state of high clutch, brake band and overrun clutch cannot be determined by the stall test)

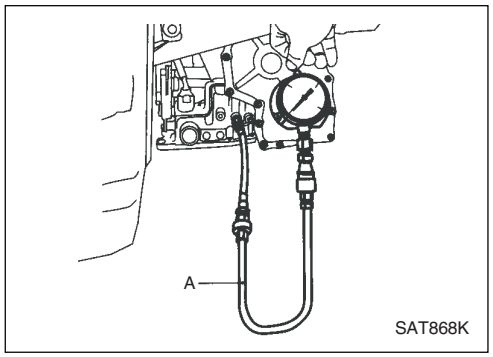
O: Less than standard stall RPM. H: Stall RPM is higher than standard value. L: Stall RPM is lower than standard value.



ATN1566D_D1



SAT867K



SAT868K

Line Pressure Test

LINE PRESSURE DETECTING PORT

Test Procedure

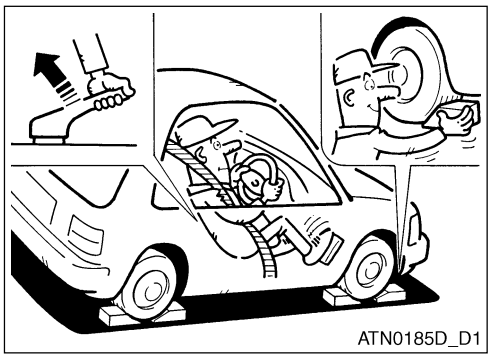
1. Inspect the engine oil level. Add if necessary.
2. After approx. 10 minutes of driving, warm up the engine until ATF reaches 50 - 80°C. Add ATF if necessary.

CAUTION:

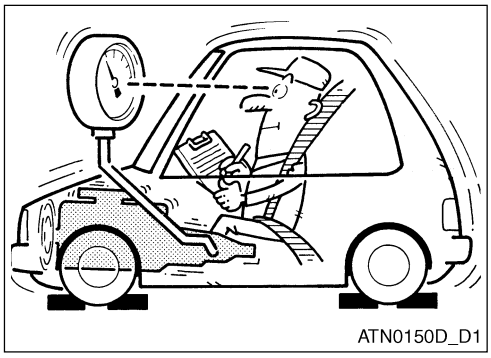
- **When ambient temperature is 20°C, the ATF temperature usually increases to approx. 50 - 80°C with 10 minutes of driving.**

3. After warming up the A/T, remove the fluid pressure detection plug (A: ST25480000).

4. Install the oil pressure gauge (A: ST2505S001).


ATN0185D_D1

4. Securely apply the parking brake and block the wheel rotation.


ATN0150D_D1

5. Start the engine and measure the line pressure during idling and stall test.

CAUTION:

- **Securely depress the brake pedal during measurement.**
- **Refer to "Stall Test" (AT-25) when measuring the line pressure during stall test.**

6. After the measurement, install the fluid pressure detection plug and tighten to the specified torque.

Tightening torque: 5.0 - 6.8 N•m (0.5 - 0.7 kgf-m)

CAUTION:

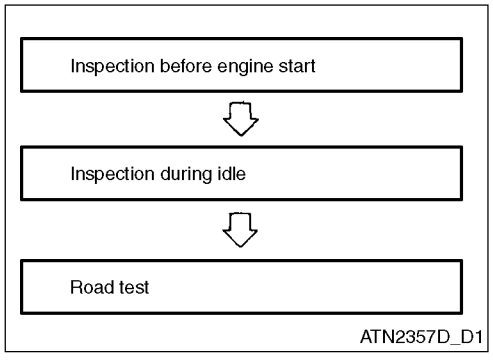
- **Do not reuse the detection plug.**

LINE PRESSURE STANDARD VALUE

Engine Speed	Drive Type	Engine Model	Model No.	Line Pressure (MPa {kgf/cm^2})	
				R range	D, 2, 1 range
While idling	Front wheel drive	QG15DE	3AX65	0.78 {7.9}	0.50 {5.1}
While stall test	Front wheel drive	QG15DE	3AX65	1.74 {17.8}	1.12 {11.4}
				1.81 {18.5}	1.17 {11.9}

Trouble Location

Results		Possible Troubles
During idling	Low in all ranges (P, R, D, 2, 1)	It is presumed to have defect in pressure supply system and low output of oil pump. For example: ● Worn oil pump ● Sticks in pressure regulator valve or plug, or worn spring ● Fluid pressure leakage in the oil strainer → oil pump → pressure regulator valve circuit ● Low engine idle RPM
	Low in a certain range	It is presumed to be the fluid pressure leakage in a certain range system and circuit after the pressure has supplied from the manual valve. The line pressure is low in R and 1 range when leakage is at low reverse brake system but the P, N, D, 3 and 2 ranges are normal.
	High	It is presumed to have defective sensors and defective pressure regulating function. For example: ● Defective throttle position sensor ● Defective fluid pressure sensor ● Bad operation of line pressure solenoid (stuck in OFF state, filter loading and open circuit) ● Pressure modifier valve stick ● Pressure regulator valve and plug stick
During stall test	Fluid pressure does not increase more than at idle	It is presumed to have defective sensors and defective pressure regulating function. For example: ● Defective slot sensor ● Defective A/T control unit ● Bad operation of line pressure solenoid (stuck in ON state, short circuit) ● Pressure regulator valve and plug stick ● Pressure modifier valve stick ● Pilot valve stick and pilot filter loading
	Pressure increases but not in standard value	It is presumed to have defectives common pressure system and sensors and defective pressure regulating function. For example: ● Defective slot sensor ● Bad operation of line pressure solenoid (stuck, filter loading) ● Pressure regulator valve and plug stick ● Pressure modifier valve stick and worn spring ● Pilot valve stick and pilot filter loading
	Low in a certain range	It is presumed to be the fluid pressure leakage in a certain range system and circuit after the pressure has supplied from the manual valve. The line pressure is low in R and 1 range when leakage is at low reverse brake system but the P, N, D, 3 and 2 ranges are normal.



ROAD TEST

General

- Inspect the A/T performance in general through road test and analyze the trouble cause.
- Perform the road test in 3 stages as below.

1. Inspection before engine start (Refer to “Inspection Before Engine Start” (AT-30)).
2. Inspection during idle (Refer to “Inspection During Idle” (AT-30)).
3. Road test.
   - Inspect all items from part 1 to part 3.

(Refer to “Road Test Part 1” (AT-32), “Road Test Part 2” (AT-34) and “Road Test Part 3” (AT-36)).

- Before road test, make sure of the test procedure and items.
- Test all inspection items until the symptom is found. Perform the NG items again after completion of road test.

Inspection before Engine Start

1. A/T CHECK INDICATOR LIGHT

1. Park the vehicle on the level ground.
2. Select P range.
3. Wait approx. 5 seconds after turning the key switch OFF.
4. Turn the key switch “ON”. (Do not start the engine.)

Does the A/T CHECK indicator light on for approx. 2 seconds?

YES → Go to No. 2.

NO → Stop the road test and go to “A/T CHECK Indicator Light does not Come On” (AT-84).

2. A/T CHECK INDICATOR LIGHT

Does the A/T CHECK indicator light turn on for approx. 8 seconds?

YES → Perform the self-diagnosis and record the NG items on the diagnosis sheet. (Refer to “Self-Diagnosis” (Without Using CONSULT-II) (AT-53))

NO → 1. Turn the key switch “OFF”.
2. Perform the self-diagnosis and record the NG items on the diagnosis sheet. (Refer to “Self-Diagnosis” (Without Using CONSULT-II) (AT-53))
3. Go to “Inspection During Idle” (AT-30).

Inspection During Idle

1. ENGINE STARTING

1. Park the vehicle on the level ground.
2. Select P range.
3. Turn the key switch OFF.
4. Turn the key switch START.

Does the engine start?

YES → Go to No. 2.

NO → Stop the road test and go to “Engine does not Start in P and N” (AT-85).

2. ENGINE STARTING

1. Place the key switch to ACC.
2. Select R range for D, 1 and 2.
3. Turn the key switch “START”.

Does the engine start at all ranges?

YES → Stop the road test and go to “Engine does not Start in P and N” (AT-85).

NO → Go to No. 3.

3. P RANGE FUNCTION

1. Select P range.
2. Turn the key switch OFF.
3. Release the parking brake.
4. Push the vehicle forward or backward.
5. Apply the parking brake.

Does the vehicle move when pushed?

YES → Mark on the “Vehicle moves in P range when pushed” in the diagnosis sheet and continue the road test.

NO → Go to No. 4.

4. N RANGE FUNCTION

1. Start the engine.
2. Select N range.
3. Release the parking brake.

Does the vehicle move?

YES → Mark on the “Vehicle moves in N range” in the diagnosis sheet and continue the road test.

NO → Go to No. 5.

5. SHIFT SHOCK

1. Apply the parking brake.
2. Select R range.

Is there great shock when shifting from N to R?

YES → Mark on the “Too much shift shock when shifting from N range to R range” in the diagnosis sheet and continue the road test.

NO → Go to No. 6.

6. R RANGE FUNCTION

Release the brake for approx. 4 - 5 seconds.

Does the vehicle go reverse?

YES → Go to No. 7.

NO → Mark on the “Cannot reverse in R range” in the diagnosis sheet and continue the road test.

7. D, 3, 2, 1 RANGE FUNCTION

Inspect if the vehicle goes forward at D, 3, 2, 1 range.

Does the vehicle go forward at D, 3, 2, 1 range?

YES → Go to Road test Part 1 (AT-32), Part 2 (AT-34)and Part 3 (AT-36).

NO → Mark on the “Cannot go forward in D, 3, 2, 1 range” in the diagnosis sheet and continue the road test.

Road Test Part 1

ROAD TEST PART 1

1. DRIVING OFF AT D1

1. Drive for approx. 10 minutes to raise the engine oil and ATF temperature to the operating temperature.

   Proper ATF temperature: 50 - 80°C

2. Park the vehicle on the level ground.
3. Select P range.
4. Start the engine.
5. Select D range.
6. Press the accelerator pedal halfway to accelerate.

   When using CONSULT-II

   Read the gear position.

Does it start from “D1”?

YES → Go to No. 2.

NO → Mark on the “Does not start from D1” in the diagnosis sheet and continue the road test.

2. SHIFT UP D1 TO D2

Press the accelerator pedal halfway and inspect if shifts up (D1 to D2) in proper speed.

- Refer to “Shifting Speed” (AT-38).

When using CONSULT-II

Check the gear position, throttle opening and vehicle speed.

Does it shift up from D1 to D2 with proper speed?

YES → Go to No. 3.

NO → Mark on the “No shift from D1 to D2” or “No kickdown from D4 to D2” in the diagnosis sheet and continue the road test.

3. SHIFT UP D2 TO D3

Press the accelerator pedal halfway and inspect if shifts up (D2 to D3) in proper speed.

- Refer to "Shifting Speed" (AT-38).

When using CONSULT-II

Check the gear position, throttle opening and vehicle speed.

Does it shift up from D2 to D3 with proper speed?

YES → Go to No. 4.

NO → Mark on the "No shift from D2 to D3" in the diagnosis sheet and continue the road test.

4. SHIFT UP D3 TO D4

Press the accelerator pedal halfway and inspect if shifts up (D3 to D4) in proper speed.

- Refer to "Shifting Speed" (AT-38).

When using CONSULT-II

Check the gear position, throttle opening and vehicle speed.

Does it shift up from D3 to D4 with proper speed?

YES → Go to No. 5.

NO → Mark on the "No shift from D3 to D4" in the diagnosis sheet and continue the road test.

5. LOCKUP

Press the accelerator pedal halfway and inspect if shifts up (D4 to D4 lockup) in proper speed.

- Refer to "Shifting Speed" (AT-38).

When using CONSULT-II

Check the throttle opening and vehicle speed when the lockup duty is 94 %.

Does it lock up with proper speed?

YES → Go to No. 6.

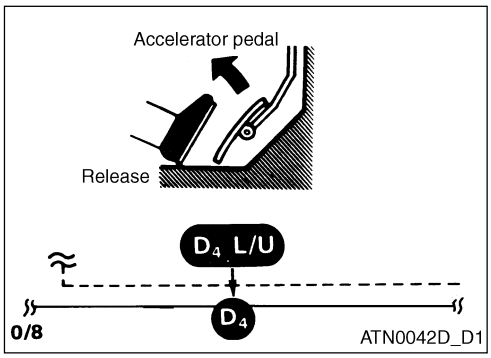
NO →

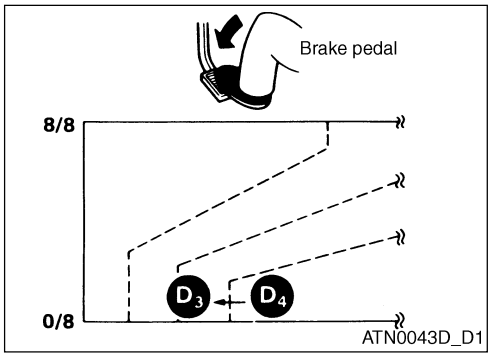
6. MAINTAINING LOCKUP STATE

Does the lockup state continue for more than 30 seconds?

YES → Go to No. 7.

NO → Mark on the "Lockup is not continued" in the diagnosis sheet and continue the road test.





7. LOCKUP RELEASE

Release the accelerator pedal.

Does the lockup release by releasing the accelerator pedal?

YES → Go to No. 8.

NO → Mark on the “Lockup does not release” in the diagnosis sheet and continue the road test.

8. SHIFT DOWN D4 TO D3

Decelerate by lightly depressing the brake pedal.

When using CONSULT-II

Check the gear position and engine speed.

Does the engine speed drop smoothly to the idle RPM when shifted down from D4 to D3?

YES → 1. Park the vehicle.

2. Go to “Road Test 2” (AT-34).

NO → Mark on the “Engine speed does not drop to idle RPM” in the diagnosis sheet and continue the road test.

Road Test Part 2

ROAD TEST PART 2

1. DRIVING OFF AT D1

1. Select “D” range.
2. Press the accelerator pedal halfway to accelerate.

When using CONSULT-II

Read the gear position.

Does it start from D1?

YES → Go to No. 2.

NO → Mark on the “Does not start from D1” in the diagnosis sheet and continue the road test.

2. SHIFT UP D3 TO D4 AND SHIFT DOWN D4 TO D3

1. Accelerate up to 80 km/h.
2. Release the foot from the accelerator pedal and then quickly press the pedal.

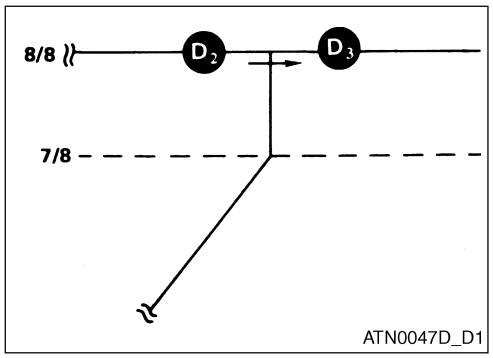
   When using CONSULT-II

   Check the gear position and throttle position.

Does it shift down from D4 to D2 immediately when depress the accelerator pedal?

YES → Go to No. 3.

NO → Mark on the “No shift from D1 to D2” or “No kickdown from D4 to D2” in the diagnosis sheet and continue the road test.



3. SHIFT UP D2 TO D3

Press the accelerator pedal fully and inspect if shifts up (D2 to D3) in proper speed.

- Refer to “Shifting Speed” (AT-38).

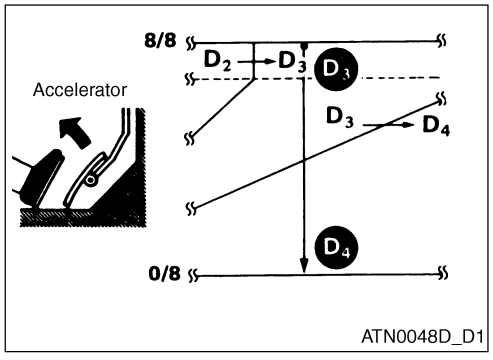
When using CONSULT-II

Check the gear position, throttle opening and vehicle speed.

Does it shift up with proper speed?

YES → Go to No. 4.

NO → Mark on the “No shift from D2 to D3” in the diagnosis sheet and continue the road test.



4. SHIFT UP D3 TO D4 AND ENGINE BRAKE

Release the accelerator pedal when shifted from D2 to D3.

Does the engine brake work after shifting up from D3 to D4?

YES → 1. Park the vehicle.

2. Go to “Road Test Part 3” (AT-36).

NO → Mark on the “No shift from D3 to D4” in the diagnosis sheet and continue the road test.

Road Test Part 3

ROAD TEST PART 3

1. SHIFT DOWN D4 TO D3

1. Select D range.
2. Accelerate up to D4 with half-throttle.
3. Release the accelerator pedal.
4. Switch the shift lever to “3” range while driving in D4.

   When using CONSULT-II

   Check the gear position and vehicle speed.

Does it shift down from D4 to D3?

YES → Go to No. 3.

NO → Mark on the “No shift from D4 to D3 when shift lever is moved from D to 3” in the diagnosis sheet and continue the road test.

2. ENGINE BRAKE

Does the vehicle decelerate due to engine brake?

YES → Go to No. 4.

NO → Mark on the “Engine speed does not drop to idle RPM” in the diagnosis sheet and continue the road test.

3. SHIFT DOWN D3 TO 2_2

Move the selector from 3 to 2 while driving in D3 (“3” range).

When using CONSULT-II

Check the gear position.

Does it shift down from D3 to 2_2?

YES → Go to No. 5.

NO → Mark on the “No shift from D3 to 2_2 when selector lever is moved from 3 to 2” in the diagnosis sheet and continue the road test.

4. ENGINE BRAKE

Does the vehicle decelerate due to engine brake?

YES → Go to No. 6.

NO → Put a checkmark at “The engine RPM does not drop to idle” in diagnosis sheet and continue the road test.

5. SHIFT DOWN 2_2 TO 1_1

Select 1 while driving in 2_2.

When using CONSULT-II

Check the gear position.

Does it shift down from 2_2 to 1_1?

YES → Go to No. 7.

NO → Mark on the “No shift from 2_2 to 1_1 when selector lever is moved from 2 to 1” in the diagnosis sheet and continue the road test.

6. ENGINE BRAKE

Does the vehicle decelerate due to engine brake?

YES → 1. Stop the vehicle.

2. Perform the self-diagnosis. Refer to “Self-Diagnosis” (Without Using CONSULT-II) (AT-53).

NO → Mark on the “No engine brake” in the diagnosis sheet and continue the road test.

Shifting Speed

Engine Model	QG16DE					
Model No.	3AX65					
Throttle opening (Accelerator opening)	Vehicle speed (km/h)					
	“D1” to “D2”	“D2” to “D3”	“D3” to “D4”	“D4” to “D3”	“D3” to “D2”	“D2” to “D1”
Throttle opening (Accelerator opening 8/8)	50 - 58	100 - 108	162 - 170	158 - 166	92 - 100	41 - 49
Throttle opening (Accelerator opening 4/8)	25 - 33	51 - 59	122 - 130	70 - 78	40 - 48	5 - 13

Lockup Speed

Drive type		Front wheel drive
Engine model		QG16DE
Model No.		3AX65
Vehicle speed when engaging (km/h)	At closed throttle	48 - 56
	At half-throttle	141 - 149
Vehicle speed when releasing (km/h)	At closed throttle	45 - 53
	At half-throttle	109 - 117

- The lockup speed is in D4 position.
- The closed throttle is that the idle switch is OFF when accelerator opening is less than 1/8.
- When the accelerator opening is 4/8, it will be half-throttle.

Trouble Diagnosis by Symptoms

The number in the diagnostic item column means inspection order. Inspect in order from the No. 1.

Symptom	Conditions	Diagnostic Item	Ref. Page
Bad starting in N or P range	On-vehicle condition	1. Key switch and starter	-
		2. Control cable adjustment	(AT-120)
		3. Inhibitor switch adjustment	(AT-123)
Engine starts other than N or P range	On-vehicle condition	1. Control cable adjustment	(AT-120)
		2. Inhibitor switch adjustment	(AT-123)
Transaxle noise in P or N range	On-vehicle condition	1. ATF level	(AT-7)
		2. Line pressure inspection	(AT-27)
		3. Throttle position sensor adjustment	(EC-76) (EC-114)
		4. Vehicle speed sensor 1 and 2	(AT-55) (AT-57)
		5. Engine revolution signal	(AT-74)
	Unit assembly	6. Oil pump	(AT-131)
		7. Torque converter	(AT-131)
Parking is not available in P range Parking condition is not released in other ranges	On-vehicle condition	1. Control cable adjustment	(AT-120)
	Unit assembly	2. Parking components	(AT-133)
Drives in N range	On-vehicle condition	1. Control cable adjustment	(AT-120)
	Unit assembly	2. Forward clutch	(AT-132)
		3. Reverse clutch	(AT-132)
		4. Overrun clutch	(AT-132)
Driving in R range (D, 3, 2, 1 range driving is possible) Clutch Slip Very bad acceleration	On-vehicle condition	1. Control cable adjustment	(AT-120)
		2. Line pressure inspection	(AT-27)
		3. Line pressure solenoid	(AT-76)
		4. Control valve assembly	(AT-121)
	Unit assembly	5. Reverse clutch	(AT-132)
		6. High clutch	(AT-132)
		7. Forward clutch	(AT-132)
		8. Overrun clutch	(AT-132)
		9. Low and reverse clutch	(AT-132)
Braking occurs in R range	On-vehicle condition	1. ATF level and condition	(AT-7)
		2. Control cable adjustment	(AT-120)
		3. Line pressure test	(AT-27)
		4. Line pressure solenoid	(AT-76)
		5. Control valve assembly	(AT-121)
	Unit assembly	6. High clutch	(AT-132)
		7. Brake clutch	(AT-132)
		8. Forward clutch	(AT-132)
		9. Overrun clutch	(AT-132)

Symptom	Conditions	Diagnostic Item	Ref. Page
Too much shock (N → D)	On-vehicle condition	1. Engine idle RPM	(EC-11)
		2. Throttle position sensor adjustment	(EC-11) (EC-114)
		3. Line pressure test	(AT-27)
		4. Fluid temperature sensor	(AT-71)
		5. Engine revolution signal	(AT-74)
		6. Line pressure solenoid	(AT-76)
		7. Control valve	(AT-121)
		8. Accumulator N-D	(AT-121)
	Unit assembly	9. Forward clutch	(AT-132)
Cannot drive in D, 2 range (OK in 1, R rage)	On-vehicle condition	1. Control cable adjustment	(AT-120)
	Unit assembly	2. Low one-way clutch	(AT-132)
Cannot drive in D, 3, 2, 1 range (OK in R range) Clutch Slip Very bad acceleration	On-vehicle condition	1. ATF level and condition	(AT-7)
		2. Line pressure test	(AT-27)
		3. Line pressure solenoid	(AT-76)
		4. Control valve assembly	(AT-121)
		5. Accumulator N-D	(AT-121)
	Unit assembly	6. Reverse clutch	(AT-132)
		7. High clutch	(AT-132)
		8. Forward clutch	(AT-132)
		9. Forward one-way	(AT-132)
		10. Low one-way clutch	(AT-132)
Clutch and brake slips while drive off	On-vehicle condition	1. ATF level and condition	(AT-25)
		2. Control cable and adjustment	(AT-120)
		3. Throttle position sensor adjustment	(EC-76) (EC-114)
		4. Line pressure test	(AT-27)
		5. Line pressure solenoid	(AT-76)
		6. Control valve assembly	(AT-121)
		7. Accumulator N-D	(AT-121)
	Unit assembly	8. Forward clutch	(AT-132)
		9. Reverse clutch	(AT-132)
		10. Low reverse brake	(AT-132)
		11. Oil pump	(AT-131)
		12. Torque converter	(AT-131)
Excessive creep	On-vehicle condition	Engine idle RPM	(EC-11)
No creep	On-vehicle condition	1. ATF level and condition	(AT-25)
		2. Line pressure test	(AT-27)
		3. Control valve assembly	(AT-121)
	Unit assembly	4. Forward clutch	(AT-132)
		5. Oil pump	(AT-131)
		6. Torque converter	(AT-131)

Symptom	Conditions	Diagnostic Item	Ref. Page
D1 → D2 bad shifting	On-vehicle condition	1. Inhibitor switch	(AT-123)
		2. Control cable adjustment	(AT-120)
		3. Shift solenoid valve A	(AT-63)
		4. Control valve assembly	(AT-121)
		5. Vehicle speed sensor 1 and 2	(AT-55) (AT-57)
	Unit assembly	6. Brake band	(AT-132)
D2 → D3 bad shifting	On-vehicle condition	1. Inhibitor switch	(AT-123)
		2. Control cable adjustment	(AT-120)
		3. Shift solenoid valve B	(AT-65)
		4. Control valve assembly	(AT-121)
		5. Vehicle speed sensor 1 and 2	(AT-55) (AT-57)
	Unit assembly	6. High clutch	(AT-132)
		7. Brake band	(AT-132)
D3 → D4 bad shifting	On-vehicle condition	1. Inhibitor switch	(AT-123)
		2. Control cable adjustment	(AT-120)
		3. Shift solenoid valve A	(AT-63)
		4. Vehicle speed sensor 1 and 2	(AT-55) (AT-57)
		5. Fluid temperature sensor	(AT-71)
	Unit assembly	6. Brake band	(AT-132)
High shifting points during D1 → D2, D2 → D3, D3 → D4 shifts	On-vehicle condition	1. Throttle position sensor adjustment	(EC-73) (EC-114)
		2. Vehicle speed sensor 1 and 2	(AT-55) (AT-57)
		3. Shift solenoid valve A	(AT-63)
		4. Shift solenoid valve B	(AT-65)
Directly shifts from D1 to D3	On-vehicle condition	1. ATF level and condition	(AT-25)
		2. Accumulator S/R	(AT-121)
	Unit assembly	3. Brake band	(AT-132)
Engine stalls in R, D, 3, 2, 1 range	On-vehicle condition	1. Engine idle RPM	(EC-11)
		2. Lockup solenoid valve	(AT-69)
		3. Control valve	(AT-121)
	Unit assembly	4. Torque converter	(AT-131)
Too much shock in D1 → D2 shift	On-vehicle condition	1. Throttle position sensor adjustment	(EC-73) (EC-114)
		2. Line pressure test	(AT-27)
		3. Accumulator S/R	(AT-121)
		4. Control valve assembly	(AT-121)
		5. Fluid temperature sensor	(AT-71)
	Unit assembly	6. Brake band	(AT-132)

Symptom	Conditions	Diagnostic Item	Ref. Page
Too much shock in D2 → D3 shift	On-vehicle condition	1. Throttle position sensor adjustment	(EC-73), (EC-114)
		2. Line pressure test	(AT-27)
		3. Control valve assembly	(AT-121)
	Unit assembly	4. High clutch	(AT-132)
		5. Brake band	(AT-132)
Too much shock in D3 → D4 shift	On-vehicle condition	1. Throttle position sensor adjustment	(EC-73), (EC-114)
		2. Line pressure test	(AT-27)
		3. Control valve assembly	(AT-121)
	Unit assembly	4. Brake band	(AT-132)
		5. Overrun clutch	(AT-132)
No shocks in D1 → D2 shift or clutch slips	On-vehicle condition	1. ATF level and condition	(AT-25)
		2. Throttle position sensor adjustment	(EC-73), (EC-114)
		3. Line pressure test	(AT-27)
		4. Accumulator S/R	(AT-121)
		5. Control valve assembly	(AT-121)
	Unit assembly	6. Brake band	(AT-132)
No shocks or slips in D2 → D3 shift	On-vehicle condition	1. ATF level and condition	(AT-25)
		2. Throttle position sensor adjustment	(EC-73), (EC-114)
		3. Line pressure test	(AT-27)
		4. Control valve assembly	(AT-121)
	Unit assembly	5. High clutch	(AT-132)
		6. Brake band	(AT-132)
No shocks or slips in D3 → D4 shift	On-vehicle condition	1. ATF level and condition	(AT-25)
		2. Throttle position sensor adjustment	(EC-73), (EC-114)
		3. Line pressure test	(AT-27)
		4. Control valve assembly	(AT-121)
	Unit assembly	5. High clutch	(AT-132)
		6. Brake band	(AT-132)
Braking occurs during D1 → D2 shift	On-vehicle condition	1. ATF level and condition	(AT-25)
	Unit assembly	2. Reverse clutch	(AT-132)
		3. Low and reverse clutch	(AT-132)
		4. High clutch	(AT-132)
		5. Low one-way clutch	(AT-132)
Braking occurs during D2 → D3 shift	On-vehicle condition	1. ATF level and condition	(AT-25)
	Unit assembly	2. Brake band	(AT-132)
Braking occurs during D3 → D4 shift	On-vehicle condition	1. ATF level and condition	(AT-25)
	Unit assembly	2. Overrun clutch	(AT-132)
		3. Low one-way clutch	(AT-132)
		4. Reverse clutch	(AT-132)

Symptom	Conditions	Diagnostic Item	Ref. Page
Low max. speed Bad acceleration	On-vehicle condition	1. ATF level and condition	(AT-25)
		2. Inhibitor adjustment	(AT-123)
		3. Shift solenoid A	(AT-63)
		4. Shift solenoid B	(AT-65)
		5. Control valve	(AT-121)
	Unit assembly	6. Reverse clutch	(AT-132)
		7. High clutch	(AT-132)
		8. Brake band	(AT-132)
		9. Low and reverse brake	(AT-132)
		10. Oil pump	(AT-131)
		11. Torque converter	(AT-131)
D4 → D3 bad shifting	On-vehicle condition	1. ATF level and condition	(AT-25)
		2. Throttle position sensor adjustment	(EC-73), (EC-114)
		3. Overrun clutch solenoid valve	(AT-67)
		4. Shift solenoid A	(AT-63)
		5. Line pressure solenoid	(AT-76)
		6. Control valve assembly	(AT-121)
	Unit assembly	7. Low and reverse brake	(AT-132)
		8. Overrun clutch	(AT-132)
D3 → D2 or D4 → D2 bad shifting	On-vehicle condition	1. ATF level and condition	(AT-25)
		2. Throttle position sensor adjustment	(EC-73), (EC-114)
		3. Shift solenoid A	(AT-63)
		4. Shift solenoid B	(AT-65)
		5. Control valve assembly	(AT-121)
	Unit assembly	6. High clutch	(AT-132)
		7. Brake band	(AT-132)
D2 → D1 or D3 → D1 bad shifting	On-vehicle condition	1. ATF level and condition	(AT-25)
		2. Throttle position sensor adjustment	(EC-73), (EC-114)
		3. Shift solenoid A	(AT-63)
		4. Shift solenoid B	(AT-65)
		5. Control valve assembly	(AT-121)
	Unit assembly	6. Low one-way clutch	(AT-132)
		7. High clutch	(AT-132)
		8. Brake band	(AT-132)
Shifting shocks during deceleration when accelerator pedal is released	On-vehicle condition	1. Throttle position sensor adjustment	(EC-73), (EC-114)
		2. Line pressure test	(AT-27)
		3. Overrun clutch solenoid valve	(AT-67)
		4. Control valve assembly	(AT-121)
High shifting points during D4 → D3, D3 → D2, D2 → D1 shifts	On-vehicle condition	1. Throttle position sensor adjustment	(EC-73), (EC-114)
		2. Vehicle speed sensor 1 and 2	(AT-55), (AT-57)

Symptom	Conditions	Diagnostic Item	Ref. Page
Kickdown does not occur on the kickdown range in D4 when accelerator pedal is depressed	On-vehicle condition	1. Throttle position sensor adjustment	(EC-73), (EC-114)
		2. Vehicle speed sensor 1 and 2	(AT-55), (AT-57)
		3. Shift solenoid A	(AT-63)
		4. Shift solenoid B	(AT-65)
Kickdown occurs or engine overruns under out of kickdown range in D4 when accelerator pedal is depressed	On-vehicle condition	1. Vehicle speed sensor 1 and 2	(AT-55), (AT-57)
		2. Throttle position sensor adjustment	(EC-73), (EC-114)
		3. Shift solenoid A	(AT-63)
		4. Shift solenoid B	(AT-65)
D4 → D3 shift is too fast or slips when shifted by depressing accelerator pedal	On-vehicle condition	1. ATF level and condition	(AT-25)
		2. Throttle position sensor adjustment	(EC-73), (EC-114)
		3. Line pressure test	(AT-27)
		4. Line pressure solenoid valve	(AT-76)
		5. Control valve assembly	(AT-121)
	Unit assembly	6. High clutch	(AT-132)
		7. Forward clutch	(AT-132)
D4 → D2 shift is too fast or slips when shifted by depressing accelerator pedal	On-vehicle condition	1. ATF level and condition	(AT-25)
		2. Throttle position sensor adjustment	(EC-73), (EC-114)
		3. Line pressure test	(AT-27)
		4. Line pressure solenoid valve	(AT-76)
		5. Shift solenoid valve A	(AT-63)
		6. Control valve assembly	(AT-121)
	Unit assembly	7. Brake valve	(AT-132)
		8. Forward clutch	(AT-132)
D3 → D2 shift is too fast or slips when shifted by depressing accelerator pedal	On-vehicle condition	1. ATF level and condition	(AT-25)
		2. Throttle position sensor adjustment	(EC-73), (EC-114)
		3. Line pressure test	(AT-27)
		4. Line pressure solenoid valve	(AT-76)
		5. Control valve assembly	(AT-121)
		6. Fluid temperature sensor	(AT-71)
	Unit assembly	7. Brake band	(AT-132)
		8. Forward clutch	(AT-132)
		9. High clutch	(AT-132)

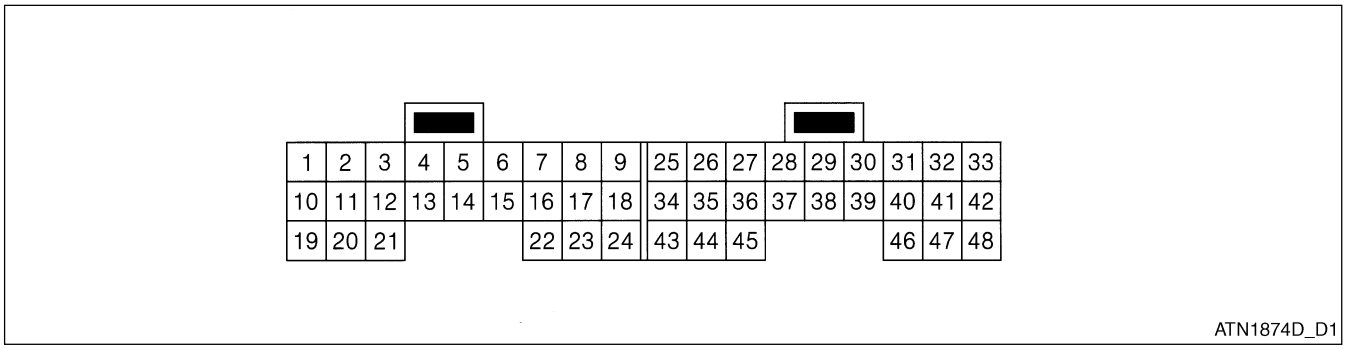
Symptom	Conditions	Diagnostic Item	Ref. Page
D4 → D1 or D3 → D1 shift is too fast or slips when shifted by depressing accelerator pedal	On-vehicle condition	1. ATF level and condition	(AT-25)
		2. Throttle position sensor adjustment	(EC-73), (EC-114)
		3. Line pressure test	(AT-27)
		4. Line pressure solenoid valve	(AT-76)
		5. Control valve assembly	(AT-121)
	Unit assembly	6. Forward clutch	(AT-132)
		7. Forward one-way clutch	(AT-132)
		8. Low one-way clutch	(AT-132)
Cannot drive in all ranges	On-vehicle condition	1. ATF level and condition	(AT-25)
		2. Control cable adjustment	(AT-120)
		3. Line pressure test	(AT-27)
		4. Line pressure solenoid valve	(AT-76)
	Unit assembly	5. Oil pump	(AT-131)
		6. High clutch	(AT-132)
		7. Brake band	(AT-132)
		8. Low and reverse brake	(AT-132)
		9. Torque converter	(AT-131)
		10. Parking linkage	(AT-133)
Transaxle noise in D, 3, 2, 1, R range	On-vehicle condition	1. ATF level and condition	(AT-25)
	Unit assembly	2. Torque converter	(AT-131)
D3 → 2_2 shift is bad when shifted into 2 range	On-vehicle condition	1. Inhibitor switch adjustment	(AT-123)
		2. Throttle position sensor adjustment	(EC-73), (EC-114)
		3. Overrun clutch solenoid valve	(AT-67)
		4. Shift solenoid A	(AT-63)
		5. Shift solenoid B	(AT-65)
		6. Control valve assembly	(AT-121)
		7. Control cable adjustment	(AT-120)
	Unit assembly	8. Brake band	(AT-132)
		9. Overrun clutch	(AT-132)
2_2 → 3_3 shift occurs in 2 range	On-vehicle condition	1. Inhibitor switch adjustment	(AT-123)
Bad engine brake in 1 range	On-vehicle condition	1. Inhibitor switch adjustment	(AT-123)
		2. Control cable adjustment	(AT-120)
		3. Throttle position sensor adjustment	(EC-73), (EC-114)
		4. Vehicle speed sensor 1 and 2	(AT-55), (AT-57)
		5. Shift solenoid A	(AT-63)
		6. Control valve assembly	(AT-121)
		7. Overrun clutch solenoid valve	(AT-67)
	Unit assembly	8. Overrun clutch	(AT-132)
		9. Low and reverse brake	(AT-132)
1_1 → 2_2 shift occurs in 1 range	On-vehicle condition	1. Inhibitor switch adjustment	(AT-123)
		2. Control cable adjustment	(AT-120)

Symptom	Conditions	Diagnostic Item	Ref. Page
$1_2 \rightarrow 1_1$ shift occurs in 1 range	On-vehicle condition	1. Inhibitor switch adjustment	(AT-123)
		2. Vehicle speed sensor 1 and 2	(AT-55), (AT-57)
		3. Shift solenoid A	(AT-63)
		4. Control valve assembly	(AT-121)
		5. Overrun clutch solenoid valve	(AT-67)
	Unit assembly	6. Overrun clutch	(AT-132)
		7. Low reverse brake	(AT-132)
Too much shift shock during $1_2 \rightarrow 1_1$ shift in 1 range	On-vehicle condition	1. Control valve assembly	(AT-121)
	Unit assembly	2. Low reverse brake	(AT-132)
Transaxle overheating	On-vehicle condition	1. ATF level and condition	(AT-25)
		2. Engine idle RPM	(EC-11)
		3. Throttle position sensor adjustment	(EC-73), (EC-114)
		4. Line pressure test	(AT-27)
		5. Line pressure solenoid valve	(AT-76)
		6. Control valve assembly	(AT-121)
	Unit assembly	7. Oil pump	(AT-131)
		8. Reverse clutch	(AT-132)
		9. High clutch	(AT-132)
		10. Brake band	(AT-132)
		11. Forward clutch	(AT-132)
		12. Overrun clutch	(AT-132)
		13. Low and reverse brake	(AT-132)
		14. Torque converter	(AT-131)
ATF leaks during driving White smoke from the exhaust pipe	On-vehicle condition	1. ATF level and condition	(AT-25)
	Unit assembly	2. Reverse clutch	(AT-132)
		3. High clutch	(AT-132)
		4. Brake band	(AT-132)
		5. Forward clutch	(AT-132)
		6. Overrun clutch	(AT-132)
		7. Low and reverse brake	(AT-132)
Odor in the fluid charging pipe	On-vehicle condition	1. ATF level and condition	(AT-25)
	Unit assembly	2. Torque converter	(AT-131)
		3. Oil pump	(AT-131)
		4. Reverse clutch	(AT-132)
		5. High clutch	(AT-132)
		6. Brake band	(AT-132)
		7. Forward clutch	(AT-132)
		8. Overrun clutch	(AT-132)
		9. Low and reverse brake	(AT-132)

Symptom	Conditions	Diagnostic Item	Ref. Page
Bad lockup in the torque converter	On-vehicle condition	1. Throttle position sensor adjustment	(EC-73), (EC-114)
		2. Vehicle speed sensor 1 and 2	(AT-55), (AT-57)
		3. Inhibitor switch adjustment	(AT-123)
		4. Engine speed signal	(AT-74)
		5. Fluid temperature sensor	(AT-71)
		6. Line pressure test	(AT-27)
		7. Lockup solenoid valve	(AT-69)
		8. Control valve	(AT-121)
	Unit assembly	9. Torque converter	(AT-131)
Clutch piston slips in torque converter	On-vehicle condition	1. ATF level and condition	(AT-25)
		2. Throttle position sensor adjustment	(EC-73), (EC-114)
		3. Line pressure test	(AT-27)
		4. Lockup solenoid valve	(AT-69)
		5. Line pressure solenoid valve	(AT-76)
		6. Control valve assembly	(AT-121)
	Unit assembly	7. Torque converter	(AT-131)
Lockup point is too high or too low	On-vehicle condition	1. Throttle position sensor adjustment	(EC-73), (EC-114)
		2. Vehicle speed sensor 1 and 2	(AT-55), (AT-57)
		3. Lockup solenoid valve	(AT-69)
		4. Control valve assembly	(AT-121)
A/T does not shift to D4 while driving with shifting from “3” to “D”	On-vehicle condition	1. Throttle position sensor adjustment	(EC-73), (EC-114)
		2. Inhibitor switch adjustment	(AT-123)
		3. Vehicle speed sensor 1 and 2	(AT-55), (AT-57)
		4. Shift solenoid valve A	(AT-63)
		5. Overrun clutch solenoid valve	(AT-67)
		6. Control valve assembly	(AT-121)
		7. Fluid temperature sensor	(AT-71)
		8. Line pressure test	(AT-27)
	Unit assembly	9. Brake band	(AT-132)
		10. Overrun clutch	(AT-132)
Engine stalls in R, D, 3, 2, 1 range	On-vehicle condition	1. ATF level and condition	(AT-25)
		2. Lockup solenoid valve	(AT-69)
		3. Shift solenoid B	(AT-65)
		4. Shift solenoid A	(AT-63)
		5. Control valve assembly	(AT-121)

A/T Control Unit Input/Output Signal Standards

A/T CONTROL UNIT TERMINAL ARRANGEMENT



REFERENCE VALUE

Standard value by CONSULT-II

Item	Value	Measurement
THRTL POS SEN	Approx. 0.5 - 4.0 V	Accelerator pedal fully closed - fully opened
FLUID TEMP SE	Approx. 1.5 - 0.5 V	A/T fluid: Approx. 20 - 80°C
LINE PRES DTY	29 % - 94 %	Low line pressure - high line pressure
TCC S/V DUTY	9 % - 94 %	Released lockup - engaged lockup

STANDARD VALUE BY CIRCUIT TESTER

Terminal No.	Item	Operation or Conditions		Standard Value
1	Line pressure solenoid	Key switch ON	Release the accelerator pedal after engine warming up	Approx. 1.5 - 3.0 V
			Fully depress the accelerator pedal after engine warming up	Approx. 0 V
2	Line pressure solenoid (Dropping resistor information)		Release the accelerator pedal after engine warming up	Approx. 4 - 14 V
			Fully depress the accelerator pedal after engine warming up	Approx. 0 V
3	Lockup solenoid	When driving	With lockup	Approx. 8 - 15 V
			Without lockup	Approx. 0 V
5	Engine & A/T integrated control signal DT1	-		⎯⎯⎯
6	Engine & A/T integrated control signal DT2			
7	Engine & A/T integrated control signal DT3			
8	Engine & A/T integrated control signal DT5			
9	Engine & A/T integrated control signal DT4			
10	Power	Turn the key switch ON		Power voltage
		Turn the key switch OFF		Approx. 0 V

Terminal No.	Item	Operation or Conditions		Standard Value
11	Shift solenoid A	When driving	When solenoid A is operating (D1 or D4 driving)	Power voltage
			When solenoid A is not operating (D2 or D3 driving)	Approx. 0 V
12	Shift solenoid B		When solenoid B is operating (D1 or D2 driving)	Power voltage
			When solenoid B is not operating (D3 or D4 driving)	Approx. 0 V
13	O/D OFF indicator light	Key switch ON	O/D OFF indicator light: ON	Approx. 0 V
			O/D OFF indicator light: OFF	Power voltage
16	Idle switch		Release the accelerator pedal after engine warming up	Power voltage
			Depress the accelerator pedal after engine warming up	Approx. 0 V
17	Full switch		Depress the accelerator pedal over one-half after engine warming up	Power voltage
			Release the accelerator pedal after engine warming up	Approx. 0 V
19	Power	Turn the key switch ON		Power voltage
		Turn the key switch OFF		Approx. 0 V
20	Overrun clutch solenoid	When driving	When the overrun clutch solenoid is operating	Power voltage
			When the overrun clutch solenoid is not operating	Approx. 0 V
22	O/D "OFF" switch (A/T device)	Key switch ON	When O/D is ON (Contact point: OFF)	Power voltage
			When O/D is OFF (Contact point: ON)	Approx. 0 V
25	Ground		-	Approx. 0 V
26	Inhibitor 1 range switch		Selector lever: 1 range	Power voltage
			Selector lever: Other than 1 range	Approx. 0 V
27	Inhibitor 2 range switch		Selector lever: 2 range	Power voltage
			Selector lever: Other than 2 range	Approx. 0 V
28	Power (Backup)	Turn the key switch ON		Power voltage
		Turn the key switch OFF		Power voltage
29	Vehicle speed sensor 1 (Output shaft revolution sensor)	When driving at 20 km/h, use the pulse frequency measurement function of the CONSULT-II* Caution: Always connect the diagnosis data link gauge at the vehicle's diagnosis connector *: This item cannot be measured by the circuit tester.		Approx. 150 Hz
30	Self-diagnosis (RX) signal	-		-
31	Self-diagnosis (TX) signal	-		-
32	Sensor power	Turn the key switch ON		Approx. 4.5 - 5.5 V
		Turn the key switch OFF		Approx. 0 V
34	Inhibitor D range switch	Key switch ON	Selector lever: D range	Power voltage
			Selector lever: Other than D range	Approx. 0 V
35	Inhibitor R range switch		Selector lever: R range	Power voltage
			Selector lever: Other than R range	Approx. 0 V
36	Inhibitor N, P range switch		Selector lever: N, P range	Power voltage
			Selector lever: Other than N, P range	Approx. 0 V

Terminal No.	Item	Operation or Conditions		Standard Value
39	Engine revolution signal	-		
40	Vehicle speed sensor 2 (Vehicle speed signal on the meter)	When moving the vehicle more than 1 m at 2 - 3 km/h		Intermittently changing between approx. 0 - 4.5 V
41	Throttle position sensor signal	Key switch ON	Depress the accelerator pedal after engine warming up	The voltage increases by depressing the pedal. When fully closed: Approx. 0.5 V When fully opened: Approx. 4.0 V
42	Sensor ground		-	Approx. 0 V
45	Stop lamp switch		Depress the brake pedal	Power voltage
			Release the brake pedal	Approx. 0 V
47	Fluid temperature sensor		When approx. 20°C	Approx. 1.5 V
			When approx. 80°C	Approx. 0.5 V
48	Ground		-	Approx. 0 V

CONSULT-II Function

GENERAL

- CONSULT-II displays the solenoid's operating timing, that is, the electrical shift timing and lockup timing. Thus when there is a certain difference between the actual shift timing by gear shifting shock (or engine RPM change) and the shift timing displayed on CONSULT-II, it is considered that the device components (including the fluid pressure circuit) except the solenoid and sensor components are defective. In this case, inspect the device components using proper trouble diagnosis procedures.
- There is a difference between the gear shifting point (gear position) displayed by CONSULT-II and shift patterns in the service manual. This is due to the following reasons.

※ There are some allowances in actual shifting patterns.

※ The shift pattern in the Service Manual shows the starting point of the gear shift but CONSULT-II shows the gear position when the gear shift is completed.

※ The shift solenoid A and B display (ON and OFF) in CONSULT-II changes at gear shift starting point and the gear position display changes when the control unit calculates that the gear shift has completed.

CAUTION:

- **"Function Check Support" can be selected from CONSULT-II's diagnosis mode but normally not in use.**

SELF-DIAGNOSIS

Operation procedure

- Refer to separate CONSULT-II operation manual for details.

1. Turn the key switch OFF.
2. Connect the CONSULT-II connector to the vehicle's diagnosis connector.
3. Start the engine.
4. Select "START (X-BADGE VHCL)", "A/T" and "SELF-DIAG RESULTS" in order from CONSULT-II.
5. The self-diagnosis result is displayed.

DISPLAY LIST

Defective Item	Failure Detecting Conditions	Check Point When Defective
CAN COMM CIRCUIT	● When malfunction is detected in CAN communication line	Refer to LAN Section
VHCL SPEED SEN • A/T	● When vehicle speed sensor 1 signal is not inputted due to open circuit ● When abnormal signal is inputted while driving ● When abnormal signal is inputted from vehicle speed sensor 2 until drive off after key switch turned ON	Vehicle speed sensor 1 route
VHCL SPEED SEN • MTR	● When vehicle speed sensor 2 signal is not inputted due to open circuit ● When abnormal signal is inputted while driving	Vehicle speed sensor 2 route
THROTTLE POSI SEN	● When the throttle position sensor signal voltage is abnormally high ● When the throttle position sensor signal voltage while idle switch OFF or wheel switch ON is abnormally low	Throttle position sensor route
SHIFT SOLENOID/V A	● When regular voltage is not present at the solenoid due to open or short circuit	Shift solenoid A route
SHIFT SOLENOID/V B		Shift solenoid B route
OVERRUN CLUTCH S/V		Overrun clutch solenoid route
T/C CLUTCH SOL/V		Lockup solenoid route
LINE PRESSURE S/V		Line pressure solenoid route
BATT/FLUID TEMP SEN	● When the supply voltage to the control unit is abnormally low while driving ● When the fluid temperature signal voltage is abnormally high while driving (The ATF temperature is abnormally low) Caution: There are no functions that can memorize the defect during key switch ON	Fluid temperature sensor route Control unit power route Throttle position sensor - power route
ENGINE SPEED SIG	● When the engine speed is abnormally low while driving	Engine speed signal route
INITIAL START	● When the function such as self-diagnosis memory is stopped when power is not supplied to the control unit due to battery removal	
CONTROL UNIT (RAM)	● When defect is detected in the control unit's memory (RAM)	
CONTROL UNIT (ROM)	● When defect is detected in the control unit's memory (ROM)	

ERASING SELF-DIAGNOSIS RESULTS

- When trouble code is indicated in both ECCS control unit and A/T control unit, delete the trouble code from both control units following the procedure below.

1. When the key switch is ON after repair operation, turn it OFF and wait at least 5 seconds, then turn it ON (Do not start the engine).
2. Turn on CONSULT-II and press "A/T".
3. Press "SELF-DIAG RESULTS".
4. Press "ERASE".
5. Press "ENGINE".
6. Press "SELF-DIAG RESULTS".
7. Press "ERASE".

DATA MONITOR

Operation procedure

- Refer to separate CONSULT-II operation manual for details.

1. Turn the key switch OFF.
2. Connect the CONSULT-II connector to the vehicle's diagnosis connector.
3. Start the engine.
4. Select "START (X-BADGE VHCL)", "A/T" and "DATA MONITOR" in order from CONSULT-II.

DISPLAY LIST

Item (Unit)	Monitor Item Selection			Remark
	TCM INPUT SIGNALS	MAIN SIGNALS	SELECTION FROM MENU	
VHCL/S SE - A/T (km/h)	○		△	
VHCL/S SE - MTR (km/h)	○		△	Error occurs at under vehicle speed of 10 km/h and does not indicate 0 km/h when stopped
THRTL POS SEN (V)	○		△	
FLUID TEMP SE (V)	○		△	
BATTERY VOLT (V)	○		△	
ENGINE SPEED (RPM)	○	○	△	0 is not indicated when engine stopped. This is not a defect.
TURBINE REV (RPM)	○		△	The turbine sensor is not installed but it is indicated.
OVERDRIVE SW (ON-OFF indicator)	○		△	When the O/D switch is turned ON, the switch contact point is OFF. Thus OFF is indicated.
PN POSI SW (ON OFF)	○		△	
R POSITION SW (ON-OFF)	○		△	
D POSITION SW (ON-OFF)	○		△	
2 POSITION SW (ON-OFF)	○		△	
1 POSITION SW (ON-OFF)	○		△	
ASCD - CRUISE (ON-OFF)	○		△	The ASCD is not installed but it is indicated.
ASCD - OD CUT (ON-OFF)	○		△	
KICKDOWN SW (ON-OFF)	○		△	The kickdown switch is not installed but it is indicated.
POWERSHIFT SW (ON-OFF)	○		△	The POWER switch is not installed but it is indicated.
CLOSED THL/SW (ON-OFF)	○		△	Idle contact point of the throttle valve switch.
W/O THRL/P - SW (ON-OFF)	○		△	Full contact point of the throttle valve switch.
*SHIFT S/V A (ON-OFF)			△	The check signal condition (re-input signal) of the control unit's control signal output is indicated. ON or OFF does not change when the solenoid is in open or short circuit.
*SHIFT S/V B (ON-OFF)			△	

Item (Unit)	Monitor Item Selection			Remark
	TCM INPUT SIGNALS	MAIN SIGNALS	SELECTION FROM MENU	
*OVRRUN/C S/V (Overrun clutch solenoid) (ON-OFF)			△	
HOLD SW (ON-OFF)	○		△	
BRAKE SW (ON-OFF)	○		△	Stopper lamp switch
GEAR		○	△	The gear position recognized by the control unit. It is renewed after completion of gear shift.
SLCT LVR POSI		○	△	The range position recognized by the control unit. Under fail-safe operation, the measured value used for controlling is indicated.
VEHICLE SPEED		○	△	The speed recognized by the control unit.
THROTTLE POSI		○	△	The accelerator opening recognized in the control unit. Under fail-safe operation, the measured value used for controlling is indicated.
LINE PRES DTY		○	△	The control signal output of the control unit.
TCC S/V DUTY		○	△	
SHIFT S/V A (ON-OFF)		○	△	
SHIFT S/V B (ON-OFF)		○	△	
OVERRUN/C S/V (Overrun clutch solenoid) (ON-OFF)		○	△	
SELF-D DP LMP (ON-OFF)		○	△	
TC SLIP RATIO			△	
TC SLIP SPEED (rpm)			△	
Voltage (V)			△	Indicates measured voltage
Hertz (Hz)			△	Indicates measured pulse
DUTY-HI (%)			△	
DUTY-LOW (%)			△	
PLS WIDTH-HI (msec)			△	
PLS WIDTH-LOW (msec)			△	

○: Standard △: Optional selection

SELF-DIAGNOSIS (WITHOUT USING CONSULT-II)

General

- When defect occurs in electrical system, the O/D OFF indicator light turns ON for 2 seconds and flashes for 8 seconds if the key switch is turned ON. If normal, it turns ON for 2 seconds. To locate the defective location, self-diagnosis starting number is inputted. Then the defect information is outputted and O/D OFF indicator light flashes to indicate the defective location.

SELF-DIAGNOSIS

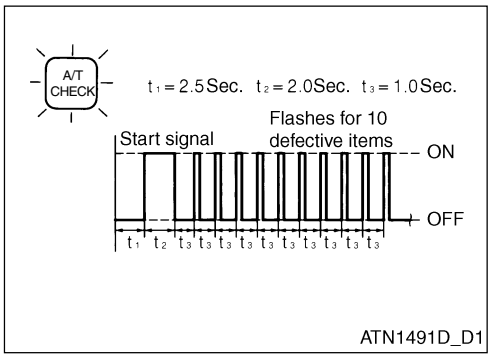
Operation procedure

1. Warm up the engine.

2. Place the selector lever to D range.
3. Turn the key switch ON.
4. Place the selector lever to D range and turn the brake switch ON within 2 seconds after turning the key switch ON.
5. Place the selector lever to 2 range and turn the brake switch OFF.
6. Place the selector lever to 1 range and turn the brake switch ON.
7. Fully depress the accelerator and then fully release.
8. The A/T CHECK indicator light flashes and the self-diagnosis gets started.

CAUTION:

- **After performing the above procedures for the first time, the A/T CHECK indicator light might flashes rapidly and the self-diagnosis does not get started. In this condition, turn the key switch "OFF", wait for approximately 10 seconds and then perform the 2-8 steps above again.**



A/T CHECK indicator light operation

- When defective, the light-on time for specific route is indicated longer.

Light ON order	Trouble Route
1	Vehicle speed sensor 1
2	Vehicle speed sensor 2
3	Throttle position sensor
4	Shift solenoid A
5	Shift solenoid B
6	Overrun clutch solenoid
7	Lockup solenoid
8	Fluid temperature sensor, control unit and throttle position sensor power
9	Engine revolution signal
10	Line pressure solenoid
11	Inhibitor switch, O/D switch, idle switch and full switch

※ Under the following cases it repeats in 4 Hz: Bad memory lockup power, when A/T control unit is replaced, when battery was disconnected for a long time, or battery performance is deteriorated.

Erasing self-diagnosis results

- For easy diagnosis of intermittent troubles, the control unit stores trouble information frequently during operation. This memory will not be erased even the key switch is turn ON and OFF several times. However, it will be erased if turns the key switch OFF after performing the self-diagnosis or by using CONSULT-II.

Vehicle Speed Sensor 1 (Output Shaft Revolution Sensor) System

Inspection Procedure

1. VEHICLE SPEED SENSOR 1 (OUTPUT SHAFT REVOLUTION SENSOR)

- Refer to “Components Inspection” (AT-56).

Inspection results are OK?

OK → When using CONSULT-II: Go to No. 2.

NG → Repair or replace the vehicle speed sensor 1 (Output shaft revolution sensor).

2. INPUT SIGNAL (WHEN USING CONSULT-II)

When using CONSULT-II

1. Start the engine.
2. Select TCM INPUT SIGNALS from DATA MONITOR.
3. Check the vehicle speed sensor and A/T vehicle speed while driving. Inspect if the value changes during vehicle acceleration or deceleration.

Inspection results are OK?

OK → Go to No. 3.

NG → Inspect below items.

- Open or short circuit in the main harness between the A/T control unit, ECCS control unit and vehicle speed sensor 1 (Output shaft revolution sensor).
- Refer to ECCS control unit’s ground circuit “POWER SUPPLY CIRCUIT FOR ECM” (QG16: EC-75).
- Remove the terminal from the connector housing and inspect for looseness, bends, or damages.

3. CHECK AFTER REPAIR

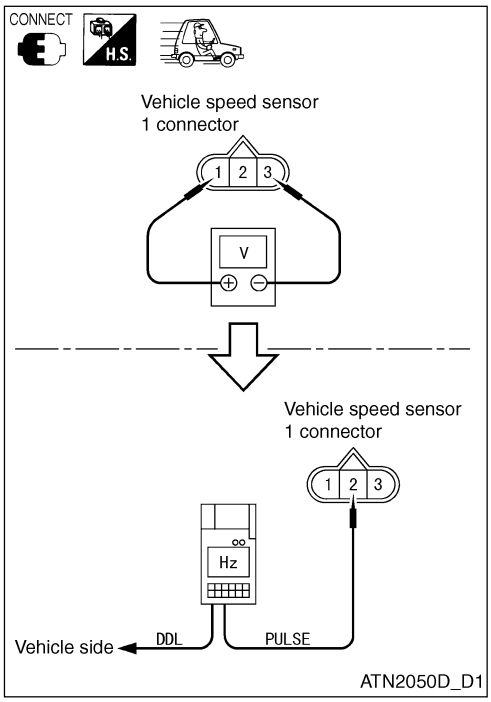
After driving for a while, perform the self-diagnosis again and check if still defective.

- Refer to “CONSULT-II Function” (AT-50) and “Self-Diagnosis (Without Using CONSULT-II)” (AT-53).

Inspection results are OK?

OK → End.

NG → 1. Inspect the A/T control unit’s input and output signal.
2. If NG again, re-inspect if connector’s pin terminals have defective contacts.



Component Inspection

VEHICLE SPEED SENSOR 1 (OUTPUT SHAFT REVOLUTION SENSOR)

- While the vehicle is lifted, drive the front wheels. Check if there is power voltage (12 V) between the vehicle speed sensor 1 connector terminal No. 1 and No. 3, then check frequency of the terminal No. 2 using CONSULT-II pulse frequency meter.

CAUTION:

- **Connect the diagnosis data link cable to the vehicle.**

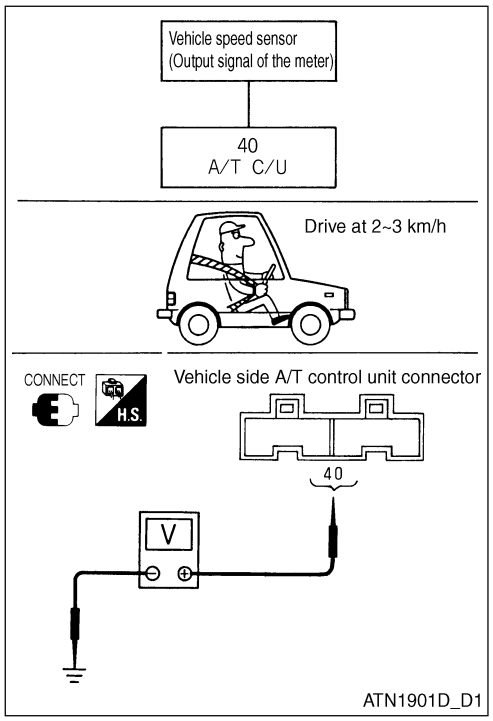
When driving at 20 km/h: Approx. 150 Hz

Vehicle Speed Sensor 2 System

A/T Control Unit Input/Output Signal Standard

The value data is the reference value from the circuit tester.

Terminal No.	Item	Conditions	Standard
40	Vehicle speed sensor 2	Driving at least 1 m at 2 - 3 km/h	Intermittently changes between approx. 0 - 4.5 V



Inspection Procedure

1. INPUT SIGNAL

When using CONSULT-II

1. Start the engine.
2. Select TCM INPUT SIGNALS from DATA MONITOR.
3. While driving, check the vehicle speed sensor 2 and vehicle speed on the meter. Check if the value changes during vehicle acceleration or deceleration. (The vehicle speed sensor 2 meter indicates 5 km/h when stopped.)

Without using CONSULT-II

1. Start the engine.
2. While driving at least 1 m at 2 - 3 km/h, measure the voltage between the A/T control unit connector terminal and ground.

Voltage: Intermittently changes between approx. 0 - 4.5 V

Inspection results are OK?

OK → Go to No. 2.

NG → Inspect below items.

- Inspect the connection between the vehicle speed sensor 2 and meter control unit.
- Open or short circuit in the main harness between the A/T control unit and vehicle speed sensor.
- Inspect the connector housing for terminal disconnection, looseness, twists or fallen.

2. CHECK AFTER REPAIR

After driving for a while, perform the self-diagnosis again and check if still defective.

- Refer to “CONSULT-II Function” (AT-50) and “Self-Diagnosis (Without Using CONSULT-II)” (AT-53).

Inspection results are OK?

OK → End.

NG → 1. Inspect the A/T control unit’s input and output signal.
2. If NG again, re-inspect if connector’s pin terminals have defective contacts.

Component Inspection

METER CONTROL UNIT

Refer to “COMBINATION METER - TROUBLE DIAGNOSIS” (EL-69).

Throttle Position Sensor System

CONSULT-II Data Monitor Display

The value data is the reference value.

Monitor Item	Condition	Standard Value
THRTL POS SEN	Accelerator fully closed	Approx. 0.5 V
	Accelerator fully opened	Approx. 4.0 V

A/T Control Unit Input/Output Signal Standards

The value data is the reference value from the circuit tester.

Terminal No.	Item	Condition	Standard
16	Switch	When the accelerator pedal is released after warming up	Power voltage
		When the accelerator pedal is depressed after warming up	Approx. 0 V
17	Full switch	When the accelerator pedal is depressed over one-half after warming up	Power voltage
		When the accelerator pedal is released after warming up	Approx. 0 V
32	Sensor (Power)	-	Approx. 4.5 - 5.5 V
41	Throttle position sensor	When the accelerator pedal is depressed slowly after warming up (When fully opened, it increases by the voltage value)	Fully closed: Approx. 0.5 V Fully opened: Approx. 4.0V
42	Sensor ground	-	-

Inspection Procedure

1. SELF-DIAGNOSIS (ENGINE)

Perform the self-diagnosis on engine control.

- Refer to “CONSULT- II Function” (QG16: EC-60).

Inspection results are OK?

OK → ● When using CONSULT-II: Go to No. 2.
● When without using CONSULT-II: Go to No. 3.

NG → Check the DTC detected item. Refer to “Index for DTC” (QG16: EC-11).

2. INPUT SIGNAL (WHEN USING CONSULT-II)

When using CONSULT-II

1. Turn the key switch ON (Do not start the engine).
2. Select TCM INPUT SIGNALS from DATA MONITOR.
3. Measure the voltage for the “THRT POS SEN” (When accelerator pedal is fully opened, it increases by the voltage value).
   Accelerator fully closed: Approx. 0.5 V
   Accelerator fully opened: Approx. 4.0 V

Inspection results are OK?

OK → Go to No. 4.

NG → ● Inspect if open or short circuit in the main harness between the A/T control unit and ECCS control unit for the throttle position sensor route.
● Inspect for terminal fall out, looseness, twist or damages from the connector housing.

3. INPUT SIGNAL (WITHOUT USING CONSULT-II)

Without using CONSULT-II

1. Turn the key switch ON (Do not start the engine).
2. Slowly depress the accelerator pedal and measure the voltage between the A/T control unit terminals (When fully opened, the voltage increases).

   Accelerator fully closed: Approx. 0.5 V

   Accelerator fully opened: Approx. 4.0 V

Inspection results are OK?

OK → Go to No. 5.

NG → ● Inspect if open or short circuit in the main harness between the A/T control unit and ECCS control unit for the throttle position sensor route.

● Inspect for terminal fall out, looseness, twist or damages from the connector housing.

4. THROTTLE VALVE SWITCH (IDLE SWITCH/FULL SWITCH) CIRCUIT

When using CONSULT-II

1. Turn the key switch ON (Do not start the engine).
2. Select TCM INPUT SIGNALS from DATA MONITOR.
3. Slowly depressing and releasing the accelerator pedal, check if the idle switch and full switch signals are properly displayed.

Condition	Data Monitor	
	CLOSED THL/SW	W/O THRL/P - SW
Accelerator pedal is not depressed	ON	OFF
Accelerator pedal is fully depressed	OFF	ON

Inspection results are OK?

OK → Go to No. 6.

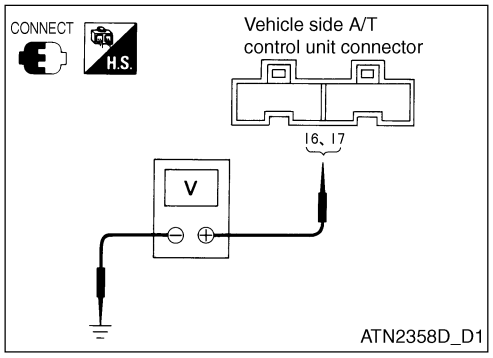
NG → Inspect below items.

- Refer to "Throttle Valve Switch" (AT-62).
- Open or short circuit at the main harness between the key switch and throttle valve switch.
- Open or short circuit at the main harness between the throttle valve switch and A/T control unit.

5. THROTTLE VALVE SWITCH (IDLE SWITCH/FULL SWITCH) CIRCUIT (WITHOUT USING CONSULT-II)

Without using CONSULT-II

1. Turn the key switch ON (Do not start the engine).
2. Select the input items.
3. Fully depressing and releasing the accelerator pedal, measure the voltage between the A/T control unit terminal and ground. (Perform after warming up.)



Condition	Voltage	
	Terminal No. 16	Terminal No. 17
Accelerator pedal is not depressed	Power voltage	Approx. 0 V
Accelerator pedal is fully depressed	Approx. 0 V	Power voltage

Inspection results are OK?

OK → Go to No. 6.

NG → Inspect below items.

- Refer to "Throttle Valve Switch" (AT-62).
- Open or short circuit at the main harness between the key switch and throttle valve switch.
- Open or short circuit at the main harness between the throttle valve switch and A/T control unit.

6. CHECK AFTER REPAIR

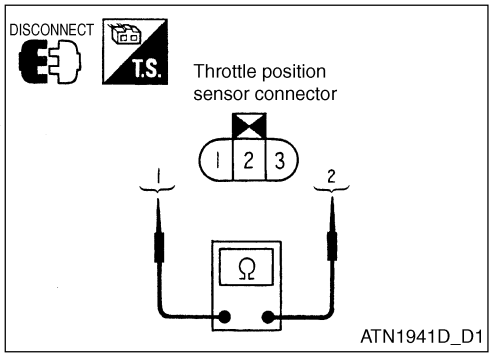
After driving for a while, perform the self-diagnosis again and check if still defective.

- Refer to "CONSULT-II Function" (AT-50) and "Self-Diagnosis (Without Using CONSULT-II)" (AT-53).

Inspection results are OK?

OK → End.

NG → 1. Inspect the A/T control unit's input and output signal.
2. If NG again, re-inspect if connector's pin terminals have defective contacts.



Components Inspection

THROTTLE POSITION SENSOR

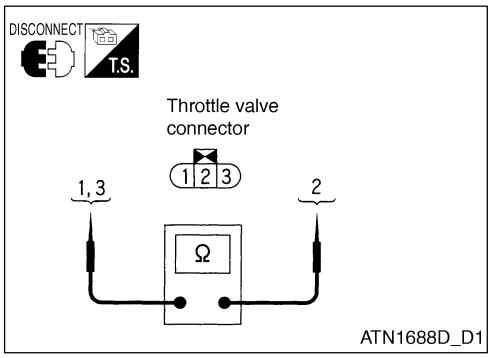
- Measure the resistance between the throttle position sensor connector terminals.

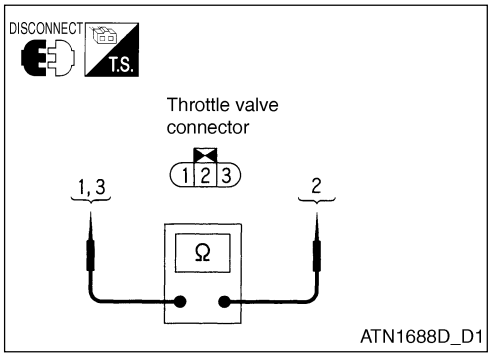
Accelerator pedal is not depressed: Approx. 0.8 kΩ

Accelerator pedal is fully depressed: Approx. 4.6 kΩ

CAUTION:

- **The resistance increases as depresses further.**





THROTTLE VALVE SWITCH

Valve Switch

- Check continuity between the terminal No. 1 and No. 2.
  Accelerator pedal is not depressed: Continuity
  Accelerator pedal is fully depressed: No continuity
- Refer to "Throttle Valve Closed Position Learning" (QG16: EC-23

Full Switch

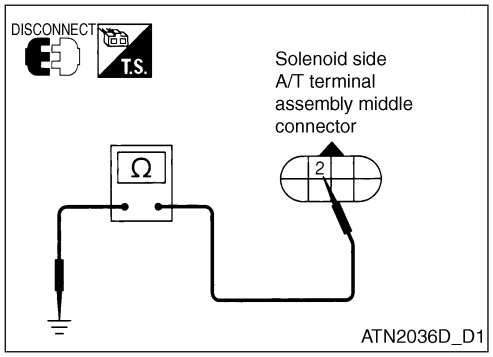
- Check continuity between the terminal No. 2 and No. 3.
  Accelerator pedal is not depressed: No continuity
  Accelerator pedal is fully depressed: Continuity

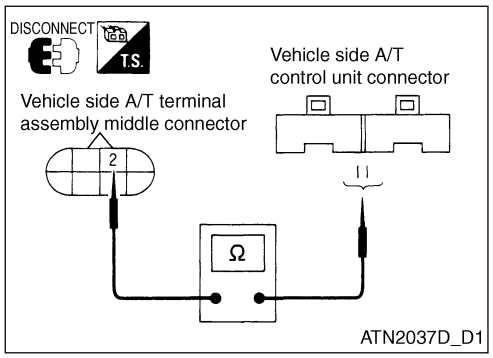
Shift Solenoid A System

A/T Control Unit Input/Output Signal Standards

The value data is the reference value from the circuit tester.

Terminal No.	Item	Condition	Standards
11	Shift solenoid A	Shift solenoid A operates (While driving in D1 or D4)	Power voltage
		Shift solenoid A does not operate (While driving in D2 or D3)	Approx. 0 V





Inspection Procedure

1. GROUND CIRCUIT

1. Turn the key switch OFF.
2. Remove the A/T terminal assembly middle connector inside the engine room.
3. Check the resistance between the connector terminal and ground.

   Resistance: Approx. 20 - 30 Ω

Inspection results are OK?

OK → Go to No. 2.

NG → 1. Remove the control valve assembly. Refer to "Removal • Installation" (AT-121).
2. Inspect below items.
   - Shift solenoid A (Refer to "Components Inspection" (AT-64)).
   - Open or short circuit in A/T terminal assembly.

2. POWER CIRCUIT

1. Turn the key switch OFF.
2. Remove the A/T control unit connector.
3. Check for continuity between the terminals.
4. Inspect for any short circuit in between the harness and ground power.
5. Install the removed components.

Inspection results are OK?

OK → Go to No. 3.

NG → Repair the open circuit in the harness and connector and short circuit in ground and power.

3. CHECK AFTER REPAIR

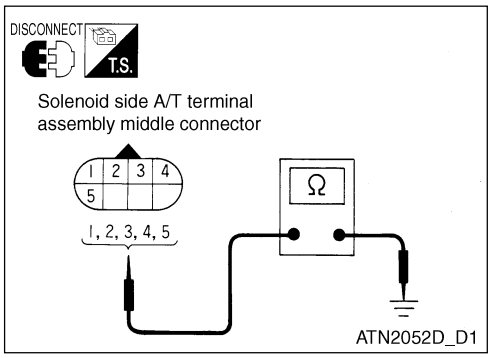
After driving for a while, perform the self-diagnosis again and check if still defective.

- Refer to "CONSULT-II Function" (AT-50) and "Self-Diagnosis (Without Using CONSULT-II)" (AT-53).

Inspection results are OK?

OK → End.

NG → 1. Inspect the A/T control unit's input and output signal.
2. If NG again, re-inspect if connector's pin terminals have defective contacts.



Component Inspection

SHIFT SOLENOID A

- Refer to "Removal • Installation" (AT-121) in "Control Valve • Accumulator" for removal.

Resistance

Check the resistance between the terminals.

Solenoid Valve	Terminal No.		Resistance
Shift solenoid valve A	2	Ground	Approx. 20 - 30 Ω

Operation

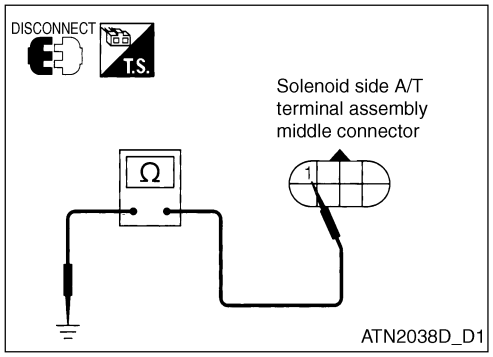
- Apply battery voltage between the terminal and ground and check for operation sound of the solenoid valve.

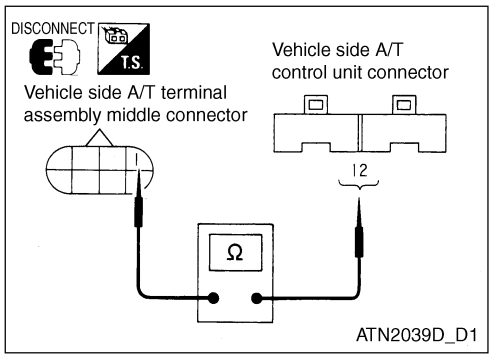
Shift Solenoid B System

A/T Control Unit Input/Output Signal Standards

The value data is the reference value from the circuit tester.

Terminal No.	Item	Condition	Standard
12	Shift solenoid B	Shift solenoid B operates (While driving in D1 or D2)	Power voltage
		Shift solenoid B does not operate (While driving in D3 or D4)	Approx. 0 V





Inspection Procedure

1. GROUND CIRCUIT

1. Turn the key switch OFF.
2. Remove the A/T terminal assembly middle connector inside the engine room.
3. Check the resistance between the connector terminal and ground.

   Resistance: Approx. 5 - 20 Ω

Inspection results are OK?

OK → Go to No. 2.

NG → 1. Remove the control valve assembly. Refer to "Removal • Installation" (AT-121).
2. Inspect below items.

- Shift solenoid B (Refer to "Component Inspection" (AT-66)).
- Open or short circuit in A/T terminal assembly.

2. POWER CIRCUIT

1. Turn the key switch OFF.
2. Remove the A/T control unit connector.
3. Check for continuity between the terminals.
4. Inspect for any short circuit in between the harness and ground power.
5. Install the removed components.

Inspection results are OK?

OK → Go to No. 3.

NG → Repair the open circuit in the harness and connector and short circuit in ground and power.

3. CHECK AFTER REPAIR

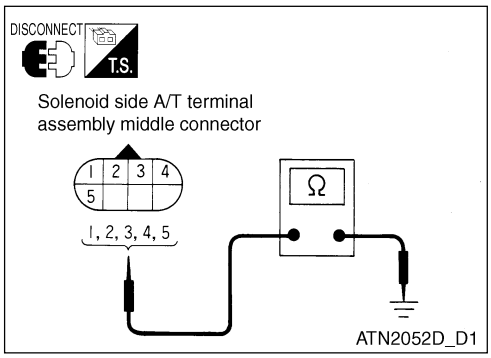
After driving for a while, perform the self-diagnosis again and check if still defective.

- Refer to "CONSULT-II Function" (AT-50) and "Self-Diagnosis (Without Using CONSULT-II)" (AT-53).

Inspection results are OK?

OK → End.

NG → 1. Inspect the A/T control unit's input and output signal.
2. If NG again, re-inspect if connector's pin terminals have defective contacts.



Component Inspection

SHIFT SOLENOID B

- Refer to "Removal • Installation" (AT-121) in "Control Valve • Accumulator" for removal.

Resistance

Check the resistance between the terminals.

Solenoid Valve	Terminal No.		Resistance
Shift solenoid valve B	1	Ground	Approx. 5 - 20 Ω

Operation

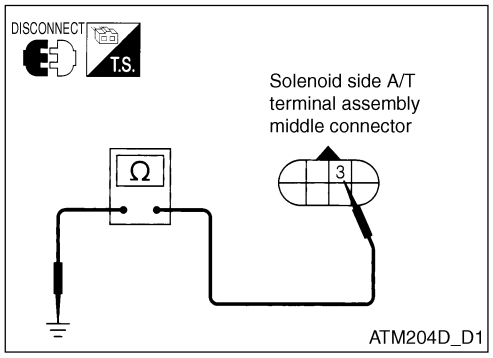
- Apply battery voltage between the terminal and ground and check for operation sound of the solenoid valve.

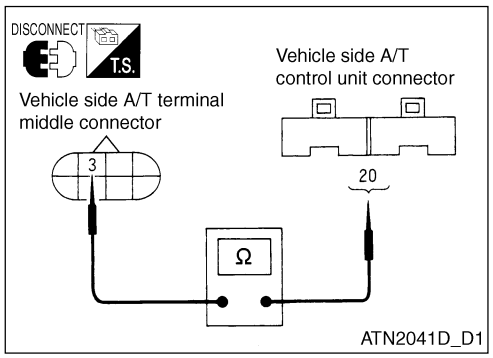
Overrun Clutch Solenoid System

A/T Control Unit Input/Output Signal Standards

The value data is the reference value from the circuit tester.

Terminal No.	Item	Condition	Standards
20	Overrun clutch solenoid valve	Overrun clutch solenoid valve operates	Power voltage
		Overrun clutch solenoid valve does not operate	Approx. 0 V





Inspection Procedure

1. GROUND CIRCUIT

1. Turn the key switch OFF.
2. Remove the A/T terminal assembly middle connector inside the engine room.
3. Check the resistance between the connector terminal and ground.

   Resistance: Approx. 20 - 30 Ω

Inspection results are OK?

OK → Go to No. 2.

NG → 1. Remove the control valve assembly. Refer to "Removal • Installation" (AT-121).
2. Inspect below items.

- Overrun clutch solenoid valve (Refer to "Component Inspection" (AT-68)).
- Open or short circuit in A/T terminal assembly.

2. POWER CIRCUIT

1. Turn the key switch OFF.
2. Remove the A/T control unit connector.
3. Check for continuity between the terminals.
4. Inspect for any short circuit in between the harness and ground power.
5. Install the removed components.

Inspection results are OK?

OK → Go to No. 3.

NG → Repair the open circuit in the harness and connector and short circuit in ground and power.

3. CHECK AFTER REPAIR

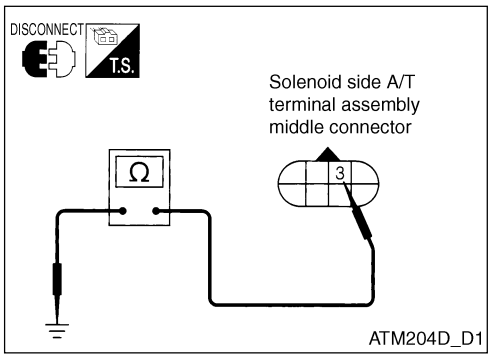
After driving for a while, perform the self-diagnosis again and check if still defective.

- Refer to "CONSULT-II Function" (AT-50) and "Self-Diagnosis (Without Using CONSULT-II)" (AT-53).

Inspection results are OK?

OK → End.

NG → 1. Inspect the A/T control unit's input and output signal.
2. If NG again, re-inspect if connector's pin terminals have defective contacts.



Component Inspection

OVERRUN CLUTCH SOLENOID VALVE

- Refer to "Removal • Installation" (AT-121) in "Control Valve • Accumulator" for removal.

Resistance

Check the resistance between the terminals.

Solenoid Valve	Terminal No.		Resistance
Overrun clutch solenoid valve	3	Ground	Approx. 20 - 30 Ω

Operation

- Apply battery voltage between the terminal and ground and check for operation sound of the solenoid valve.

Lockup Solenoid System

CONSULT-II Data Monitor Display

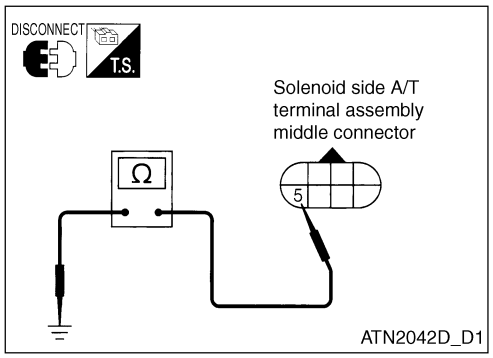
The value data is the reference value.

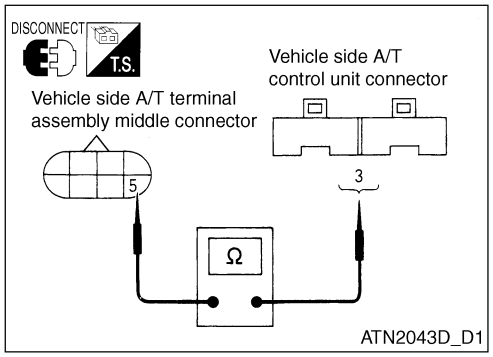
Monitor Item	Condition	Standard Value
TCC S/V DUTY	Lockup released	9 %
	Lockup engaged	94 %

A/T Control Unit Input/Output Signal Standards

The value data is the reference value from the circuit tester.

Terminal No.	Item	Condition	Standard
20	Lockup solenoid valve	Under lockup	Approx. 8 - 15 V
		Without lockup	Approx. 0 V





Inspection Procedure

1. GROUND CIRCUIT

1. Turn the key switch OFF.
2. Remove the A/T terminal assembly connector inside the engine room.
3. Check the resistance between the connector terminal and ground.

   Resistance: Approx. 5 - 20 Ω

Inspection results are OK?

OK → Go to No. 2.

NG → 1. Remove the oil pan. Refer to "Control Valve • Accumulator" (AT-121).
2. Inspect below items.

- Lockup solenoid valve (Refer to "Component Inspection" (AT-70)).
- Open or short circuit in A/T terminal assembly.

2. POWER CIRCUIT

1. Turn the key switch OFF.
2. Remove the A/T control unit connector.
3. Check for continuity between the terminals.
4. Inspect for any short circuit in between the harness and ground and power.
5. Install the removed components.

Inspection results are OK?

OK → Go to No. 3.

NG → Repair the open circuit in the harness and connector and short circuit in ground and power.

3. CHECK AFTER REPAIR

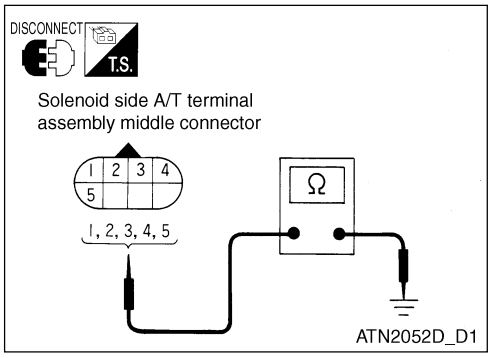
After driving for a while, perform the self-diagnosis again and check if still defective.

- Refer to "CONSULT-II Function"(AT-50) and "Self-Diagnosis (Without Using CONSULT-II)" (AT-53).

Inspection results are OK?

OK → End.

NG → 1. Inspect the A/T control unit's input and output signal.
2. If NG again, re-inspect if connector's pin terminals have defective contacts.



Component Inspection

LOCKUP SOLENOID VALVE

- Refer to "Removal • Installation" (AT-121) in "Control Valve • Accumulator" for removal.

Resistance

Check the resistance between the terminals.

Solenoid Valve	Terminal No.		Resistance
Lockup solenoid valve	5	Ground	Approx. 5 - 20 Ω

Operation

- Apply battery voltage between the terminal and ground and check for operation sound of the solenoid valve.

CONSULT-II Data Monitor Display

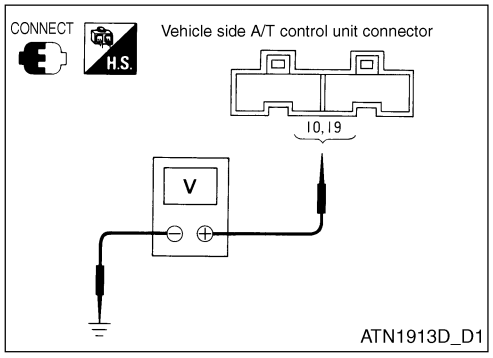
The value data is the reference value.

Monitor Item	Condition	Standard Value
FLUID TEMP SE	A/T fluid temperature: Approx. 20°C	Approx. 1.5 V
	A/T fluid temperature: Approx. 80°C	Approx. 0.5 V

A/T Control Unit Input/Output Signal Standards

The value data is the reference value from the circuit tester.

Terminal No.	Item	Condition	Standards
10	Power	Turn the key switch ON	Power voltage
		Turn the key switch OFF	Approx. 0 V
19	Power	The same as terminal No. 10	
28	Power (Memory backup)	Turn the key switch OFF	Power voltage
		Turn the key switch ON	Power voltage
42	Ground (Fluid temperature sensor)	-	Approx. 0 V
47	Fluid temperature sensor	A/T fluid temperature: Approx. 20°C	Approx. 1.5 V
		A/T fluid temperature: Approx. 80°C	Approx. 0.5 V



Inspection Procedure

1. A/T CONTROL UNIT POWER

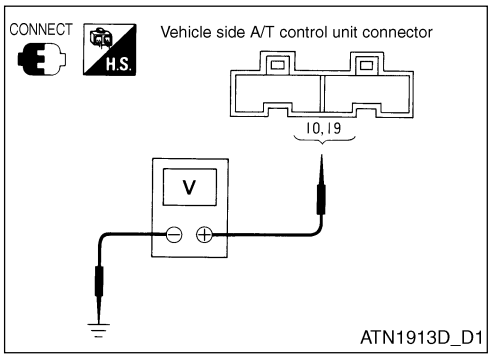
1. Turn the key switch ON (Do not start the engine).
2. Measure the voltage between the A/T control unit connector terminal and ground.
   Voltage: Power voltage
3. Turn the key switch OFF.
4. Measure the voltage between the A/T control unit connector terminal and ground.
   Voltage: Power voltage

Inspection results are OK?

OK → Go to No. 2.

NG → Inspect below items.

- Open or short circuit in main harness between the key switch and A/T control unit.
- Refer to “POWER SUPPLY ROUTING” (WH-147), “FUSE BLOCK-JUNCTION BLOCK (J/B)” (WH-183).



2. FLUID TEMPERATURE SENSOR AND A/T TERMINAL ASSEMBLY

1. Turn the key switch OFF.
2. Remove the A/T terminal assembly middle connection in the engine.
3. Measure the resistance between the connector terminals.
   Resistance: 2.5 kΩ (Fluid temperature: Approx. 20°C)
   : 0.3 kΩ (Fluid temperature: Approx. 80°C)
4. Install the removed components again.

Inspection results are OK?

OK → ● When using CONSULT-II: Go to No. 3.
● Without using CONSULT-II: Go to No. 4.

NG → 1. Remove the oil pan (Refer to "Control Valve • Accumulator" (AT-121)).
2. Inspect below items.
● Fluid temperature sensor (Refer to "Component Inspection" (AT-73)).
● Open or short circuit in A/T terminal assembly.

3. INPUT SIGNAL FROM THE FLUID TEMPERATURE SENSOR (WHEN USING CONSULT-II)

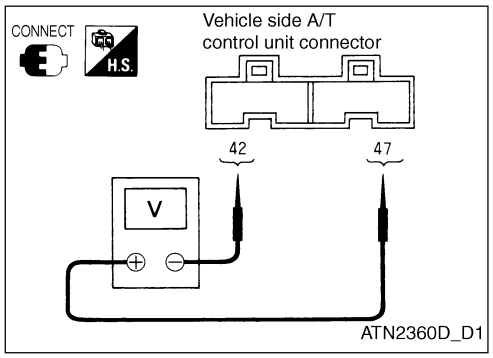
When using CONSULT-II

1. Start the engine.
2. Select TCM INPUT SIGNALS from DATA MONITOR.
3. Measure the voltage in the fluid temperature sensor.
   When cold (Fluid temperature: Approx. 20°C): Approx. 1.5 V
   When warm (Fluid temperature: Approx. 80°C): Approx. 0.5 V

Inspection results are OK?

OK → Go to No. 5.

NG → Inspect below items.
● Open or short circuit in the main harness between the A/T control unit, ECCS control unit and A/T terminal assembly.
● Refer to ECCS control unit ground circuit ("POWER SUPPLY CIRCUIT FOR ECM" (QG16: EC-75).



4. INPUT SIGNAL FROM THE FLUID TEMPERATURE SENSOR (WITHOUT USING CONSULT-II)

Without using CONSULT-II

1. Do not start the engine.
2. Warming up the system, measure the voltage between the A/T control unit connector terminal and ground.
   When cold (Fluid temperature: Approx. 20°C): Approx. 1.5 V
   When warm (Fluid temperature: Approx. 80°C): Approx. 0.5 V
3. Turn the key switch OFF.
4. Remove the A/T control unit connector.
5. Check for continuity between the connector terminal and ground.

Inspection results are OK?

OK → Go to No. 5.

NG → Inspect below items.

- Open or short circuit in the main harness between the A/T control unit, ECCS control unit and A/T terminal assembly.
- Refer to ECCS control unit ground circuit "POWER SUPPLY CIRCUIT FOR ECM" (QG16: EC-75).

5. CHECK AFTER REPAIR

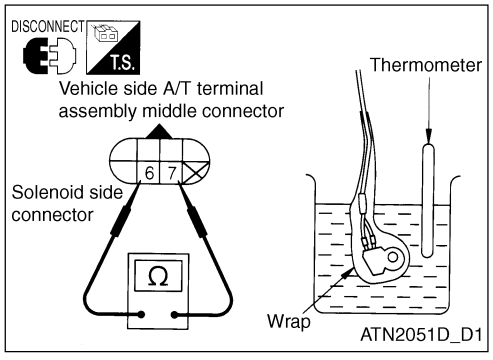
After driving for a while, perform the self-diagnosis again and check if still defective.

- Refer to "CONSULT-II Function" (AT-50) and "Self-Diagnosis (Without Using CONSULT-II)" (AT-53).

Inspection results are OK?

OK → End.

NG → 1. Inspect the A/T control unit's input and output signal.
2. If NG again, re-inspect if connector's pin terminals have defective contacts.



Component Inspection

FLUID TEMPERATURE SENSOR

- Refer to "Removal • Installation" (AT-121) in "Control Valve • Accumulator" for removal.
- Inspect the resistance between the terminals by varying the temperature as shown in the illustration.
  Approx. 20°C: Approx. 2.5 kΩ
  Approx. 80°C: Approx. 0.3 kΩ

Engine Circuit Signal System

Inspection Procedure

1. ENGINE SELF-DIAGNOSIS

Inspect the ignition signal circuit by ECCS control unit self-diagnosis.

Inspection results are OK?

OK → ● When using CONSULT-II: Go to No. 2.
● Without using CONSULT-II: Go to No. 3.

NG → Inspect the ignition signal circuit (Refer to ""DTC P0350 Ignition Signal Primary" (QG16: EC-118).

2. INPUT SIGNAL (WHEN USING CONSULT-II)

When using CONSULT-II

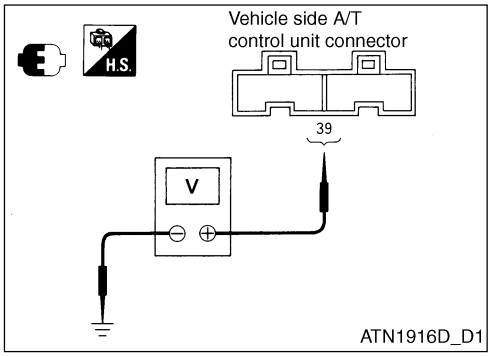
1. Start the engine.
2. Select TCM INPUT SIGNALS from DATA MONITOR.
3. Inspect if the engine RPM changes according with the accelerator pedal opening while looking at the engine RPM (When engine stopped, it indicates 0 RPM, but this is not malfunction).

Inspection results are OK?

OK → Go to No. 4.

NG → Inspect below items.

● Open or short circuit in the harness between the A/T control unit and ECCS control unit.



3. INPUT SIGNAL (WITHOUT USING CONSULT-II)

Without using CONSULT-II

1. Start the engine.
2. Measure the voltage between the A/T control unit connector terminal and ground.

   At idle: Approx. 0.5 - 1.5 V

Inspection results are OK?

OK → Go to No. 4.

NG → Inspect below items.

● Open or short circuit in the harness between the A/T control unit and ECCS control unit.

4. CHECK AFTER REPAIR

After driving for a while, perform the self-diagnosis again and check if still defective.

- Refer to "CONSULT-II Function" (AT-50) and "Self-Diagnosis (Without Using CONSULT-II)" (AT-53).

Inspection results are OK?

OK → End.

NG → 1. Inspect the A/T control unit's input and output signal.
2. If NG again, re-inspect if connector's pin terminals have defective contacts.

Line Pressure Solenoid System

CONSULT-II Data Monitor Display

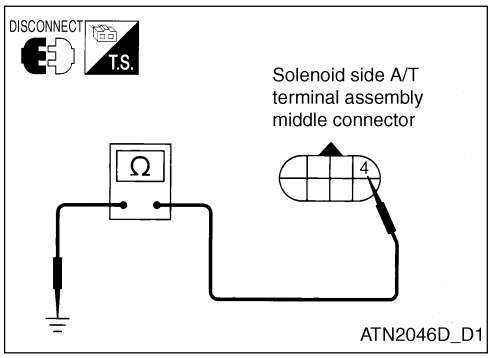
The value data is the reference value.

Monitor Item	Condition	Standard Value
LINE PRES DTY	Low line pressure	29 %
	High line pressure	94 %

A/T Control Unit Input/Output Signal Standards

The value data is the reference value from the circuit tester.

Terminal No.	Item	Condition	Standards
1	Line pressure solenoid valve	When accelerator pedal is released after engine warm up	Approx. 1.5 - 3.0 V
		When accelerator pedal is fully depressed after engine warm up	Approx. 0 V
2	Line pressure solenoid valve (Via dropping resistor)	When accelerator pedal is released after engine warm up	Approx. 4 - 14 V
		When accelerator pedal is fully depressed after engine warm up	Approx. 0 V



Inspection Procedure

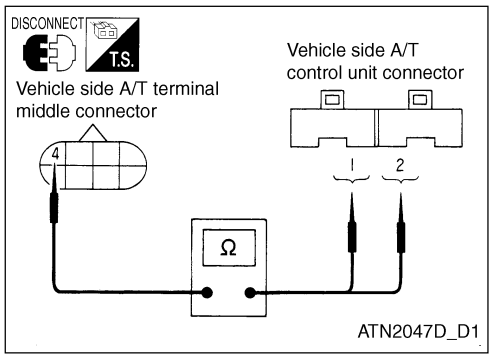
1. GROUND CIRCUIT

1. Turn the key switch OFF.
2. Remove the A/T terminal assembly middle connection in the engine.
3. Measure the resistance between the connector terminals.
   Resistance: Approx. 2.5 - 5.0 Ω

Inspection results are OK?

OK → Go to No. 2.

NG → 1. Remove the control valve assembly. (Refer to "Removal • Installation" (AT-121)).
2. Inspect below items.
   - Line pressure solenoid (Refer to "Component Inspection" (AT-77)).
   - Open or short circuit in A/T terminal assembly.



2. POWER CIRCUIT

1. Start the engine.
2. Remove the A/T control unit connector.
3. Measure the resistance between the terminals.

Resistance

Terminal No. 2 - No. 4: Approx. 12 Ω

Terminal No. 1 - No. 4: Approx. 0 Ω

Inspection results are OK?

OK → Go to No. 3.

NG → Inspect below items.

- Dropping resistor (Refer to "Component Inspection" (AT-77)).
- Open or short circuit of the main harness between the A/T control unit terminal No. 1 & 2 and the A/T terminal assembly.

3. CHECK AFTER REPAIR

After driving for a while, perform the self-diagnosis again and check if still defective.

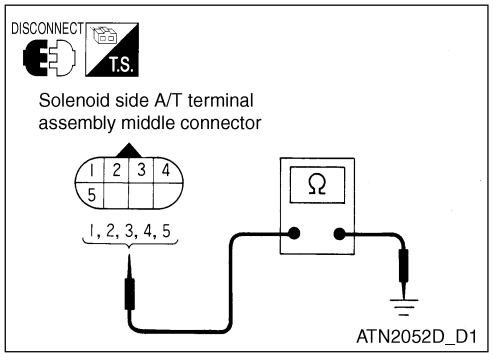
- Refer to "CONSULT-II Function" (AT-50) and "Self-Diagnosis (Without Using CONSULT-II)" (AT-53).

Inspection results are OK?

OK → End.

NG → 1. Inspect the A/T control unit's input and output signal.

2. If NG again, re-inspect if connector's pin terminals have defective contacts.



Component Inspection

LINE PRESSURE SOLENOID

- Refer to "Removal • Installation" (AT-121) in "Control Valve • Accumulator".

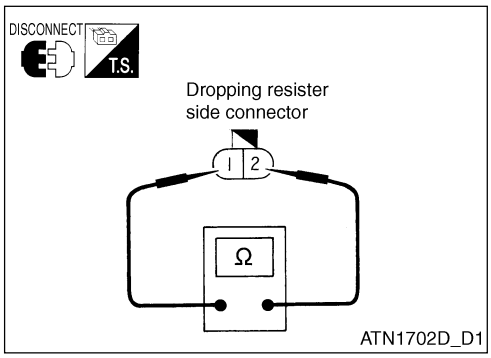
Resistance

Measure the resistance between the terminals.

Solenoid Valve	Terminal No.		Resistance
Lockup solenoid valve	4	Ground	Approx. 2.5 - 5.0 Ω

Operation

- Apply battery voltage between the terminal and ground and check for operation sound of the solenoid valve.



DROPPING RESISTOR

- Measure the resistance between the terminals.
  Resistance: Approx. 12 Ω

Inhibitor Switch, O/D Switch, Idle Switch and Full Switch Systems

Inspection Procedure

1. INHIBITOR SWITCH CIRCUIT (WHEN USING CONSULT-II)

When using CONSULT-II

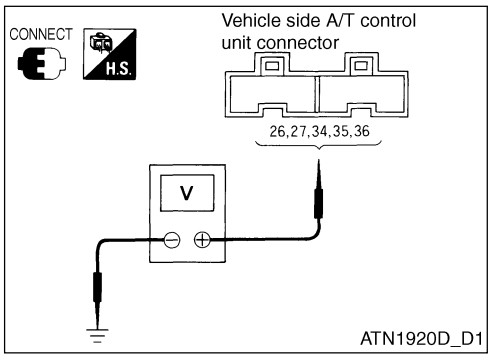
1. Turn the key switch ON (Start the engine).
2. Select TCM INPUT SIGNALS from DATA MONITOR.
3. By moving the selector lever to P, R, N, D, 3, 2, and 1, check if the value on the display identical with selected position (At P range, the N range switch comes ON).

Inspection results are OK?

OK → Go to No. 3.

NG → Inspect below items.

- Open or short circuit in the main harness between the key switch and inhibitor switch.
- Inhibitor switch (Refer to “Component Inspection” (AT-82)).
- Open or short circuit in the main harness between the inhibitor switch and A/T control unit.
- Diode (P, N position).



2. INHIBITOR SWITCH CIRCUIT (WITHOUT USING CONSULT-II)

Without using CONSULT-II

1. Turn the key switch ON (Do not start the engine).
2. By moving the selector lever to P, R, N, D, 2, and 1, measure power between the A/T control unit connector terminal and ground.

Voltage

B: Power voltage

O: Approx. 0 V

Range	Terminal				
	36	35	34	27	26
P, N	B	0	0	0	0
R	0	B	0	0	0
D	0	0	B	0	0
2	0	0	0	B	0
1	0	0	0	0	B

Inspection results are OK?

OK → Go to No. 4.

NG → Inspect below items.

- Inhibitor switch (Refer to "Component Inspection" (AT-82)).
- Open or short circuit in the main harness between the key switch and inhibitor switch.
- Open or short circuit in the main harness between the inhibitor switch and A/T control unit.
- Diode (P, N position).

3. O/D SWITCH CIRCUIT (WHEN USING CONSULT-II)

When using CONSULT-II

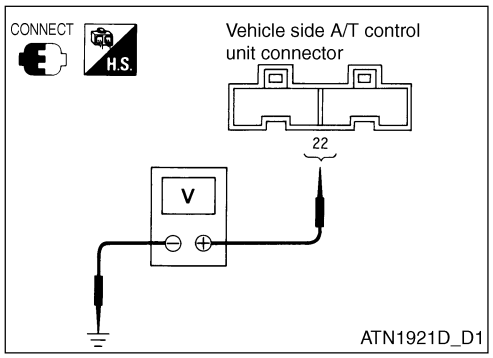
1. Turn the key switch ON (Do not start the engine).
2. Select TCM INPUT SIGNALS from DATA MONITOR.
3. Check if the lever switch indicator on the display changes ON and OFF when moving the shift lever from 3 to D. (When the shift lever is in 3, it displays as "ON" and When the shift lever is in D, it displays as "OFF".)

Inspection results are OK?

OK → Go to No. 5.

NG → Inspect below items.

- O/D switch (Refer to "Component Inspection" (AT-82)).
- Open or short circuit in the main harness between the A/T control unit and O/D switch.
- Open or short circuit in the main harness O/D switch ground circuit.



4. O/D SWITCH CIRCUIT (WITHOUT USING CONSULT-II)

Without using CONSULT-II

1. Turn the key switch ON (Do not start the engine).
2. By turning ON and OFF the O/D switch, measure the voltage between the A/T control unit connector terminals and ground.

   O/D switch ON: Power voltage

   O/D switch OFF: Approx. 0 V

Inspection results are OK?

OK → Go to No. 6.

NG → Inspect below items.

- O/D switch (Refer to "Components Inspection" (AT-82)).
- Open or short circuit in the main harness between the A/T control unit and O/D switch.
- Open or shirt circuit in the main harness O/D switch ground circuit.

5. THROTTLE VALVE SWITCH CIRCUIT (WITHOUT USING CONSULT-II)

Without using CONSULT-II

1. Turn the key switch ON (Do not start the engine).
2. Select TCM INPUT SIGNALS from DATA MONITOR.
3. By operating accelerator pedal, check if the idle switch and full switch properly turns ON and OFF.

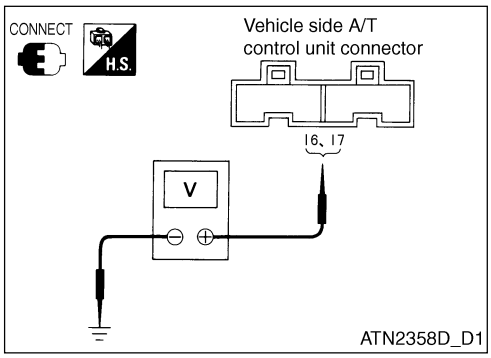
Accelerator Pedal Operation	Monitor Item	
	CLOSED THL/SW	W/O THRL/P - SW
When released	"ON"	"OFF"
When fully depressed	"OFF"	"ON"

Inspection results are OK?

OK → Go to No. 7.

NG → Inspect below items.

- Throttle valve switch (Refer to "Components Inspection" (AT-82)).
- Open or short circuit in the main harness between the key switch and throttle valve switch.
- Open or short circuit in the main harness between the throttle valve switch and A/T control unit.



6. THROTTLE VALVE SWITCH CIRCUIT (WITHOUT USING CONSULT-II)

Without using CONSULT-II

1. Turn the key switch ON (Engine warmed up/Do not start the engine).
2. By operating accelerator pedal, measure the voltage between the A/T control unit connector terminal and ground.

Accelerator Pedal Operation	Voltage	
	Terminal No. 16	Terminal No. 17
When released	Power voltage	Approx. 0 V
When fully depressed	Approx. 0 V	Power voltage

Inspection results are OK?

OK → Go to No. 7.

NG → Inspect below items.

- Throttle valve switch (Refer to "Components Inspection" (AT-82)).
- Open or short circuit in the main harness between the key switch and throttle valve switch.
- Open or short circuit in the main harness between the throttle valve switch and A/T control unit.

7. CHECK AFTER REPAIR

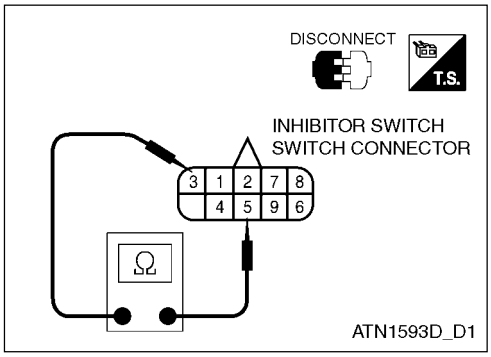
After driving for a while, perform the self-diagnosis again and check if still defective.

- Refer to "CONSULT-II Function" (AT-50) and "Self-Diagnosis (Without Using CONSULT-II)" (AT-53).

Inspection results are OK?

OK → End.

NG → 1. Inspect the A/T control unit's input and output signal.
2. If NG again, re-inspect if connector's pin terminals have defective contacts.



Component Inspection

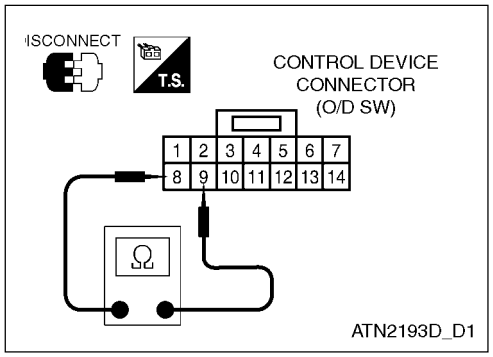
INHIBITOR SWITCH

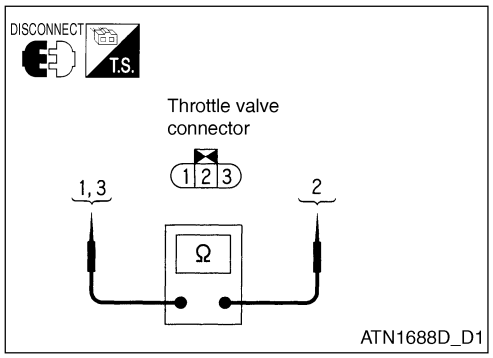
1. By moving the selector lever, check the continuity between the inhibitor switch connector terminals.

Range Position	Terminal No.	Continuity
P	1 - 2, 3 - 7	● No continuity if not the selected position
R	3 - 8	
N	3 - 9	
D	3 - 6	
2	3 - 5	
1	3 - 4	

2. If NG, re-inspect while control cable removed. Refer the step 1.
3. If inspection becomes OK after removing the cable, adjust the control cable. (Refer to "Adjustment During Installation" (AT-120))

4. If still NG after removing the cable, remove the inhibitor switch and check for continuity between the inhibitor terminals. Refer to the step 1.
5. If OK after removing the inhibitor switch, inspect the inhibitor switch. (Refer to "Inhibitor Switch" (AT-123)).
6. If still NG after removing the inhibitor switch, then replace the inhibitor switch.





O/D SWITCH

- Check the continuity between the terminals.

Range	Continuity
3	No continuity
D	Continuity

THROTTLE VALVE SWITCH

Idle switch

- Check the continuity between the terminal No. 1 and No. 2.

Accelerator Pedal Operation	Continuity
Released	Continuity
Depressed over one-half	No continuity

- Refer to "Throttle Position Sensor Adjustment" (QG:15 EC-114), "Throttle Valve Closed Position Learning" (QG16: EC-23).

FULL SWITCH

- Check the continuity between the terminal No. 2 and No. 3.

Accelerator Pedal Operation	Continuity
Released	No continuity
Depressed over one-half	Continuity

Trouble Diagnosis by Symptoms

A/T CHECK Indicator Light does not Turn ON

SYMPTOM

A/T CHECK indicator light does not turn on for approx. 2 seconds after turning the key switch ON.

INSPECTION PROCEDURE

1. A/T CONTROL UNIT POWER

1. Turn the key switch ON (Do not start the engine).
2. Measure the voltage between A/T control unit terminal and ground.
   Voltage
   Terminal No. 10, 19, and 29 - Ground: Power voltage
3. Turn the key switch OFF.
4. Measure the voltage between A/T control unit terminal and ground.
   Voltage
   Terminal No. 28 - Ground: Power voltage
   Terminal No. 10 and 19 - Ground: Approx. 0V

Inspection results are OK?

OK → Go to No. 2.

NG → Inspect below items.

- Open or short circuit in the main harness between the key switch and A/T control unit.
- Key switch and fuse.

2. A/T CONTROL UNIT GROUND CIRCUIT

1. Turn the key switch OFF.
2. Remove the A/T control unit connector.
3. Check the continuity between the terminal No. 25, 28 and the ground.
4. If OK, then check if the harness is shorted to the ground and power.

Inspection results are OK?

OK → Go to No. 3.

NG → Repair the short circuit between the harness and connector ground and power.

3. A/T CHECK INDICATOR LIGHT CIRCUIT

1. Turn the key switch OFF.
2. Check the resistance between the A/T control unit connector terminal No. 10 and No. 13.
   Resistance: 50 - 100 Ω
3. Install all removed components.

Inspection results are OK?

OK → Go to No. 4.

NG → Inspect below items.

- A/T CHECK indicator light: Refer to "COMBINATION METER - TROUBLE DIAGNOSIS" (EL-69).
- Open or short circuit in the main harness and fuse between the key switch and O/D OFF indicator light.
- Open or short circuit in the harness between the O/D OFF indicator light and A/T control unit.

4. CHECK AFTER REPAIR

Re-inspect if symptoms occur again.

Inspection results are OK?

OK → Inspection results.

NG → 1. Inspect the A/T control unit's input and output signal.
2. If NG again, re-inspect if connector's pin terminals have defective contacts.

Engine does not Start in P and N Ranges

SYMPTOM

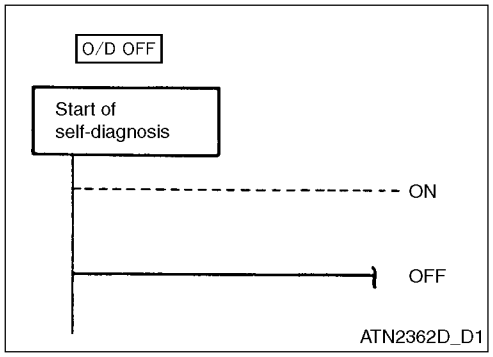
- Engine does not start in P and N ranges.
- Engine does not start in D, 3, 2, 1, and R ranges.

INSPECTION TIPS

1. INHIBITOR SWITCH CIRCUIT

When using CONSULT-II

Check if the inhibitor switch circuit trouble is displayed in TCM INPUT SIGNALS from DATA MONITOR.



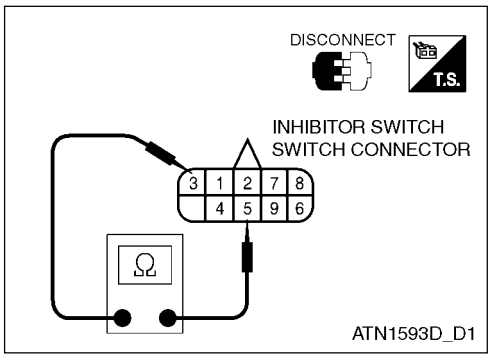
Without using CONSULT-II

From the results of self-diagnosis, check if the inhibitor switch circuit trouble is indicated.

Inspection results are OK?

OK → Inspect the inhibitor switch circuit.

NG → Go to No. 2.



2. INHIBITOR SWITCH

Inspect for any open or short circuit between the inhibitor switch connector terminals.

- Refer to “Inhibitor Switch” (AT-82).

Inspection results are OK?

OK → Go to No. 3.

NG → Replace the inhibitor switch.

3. STARTER

Inspect the starter system. Refer to respective “Wire Diagram”.

Inspection results are OK?

OK → End.

NG → Repair or replace the defective component(s).

The Vehicle Moves in P Range when Pushed

SYMPTOM

While in P range, the vehicle moves when pushed without engaging the parking apparatus.

INSPECTION TIPS

1. PARKING APPARATUS

Inspect the parking apparatus.

- Refer to “Standard Model” (AT-132).

Inspection results are OK?

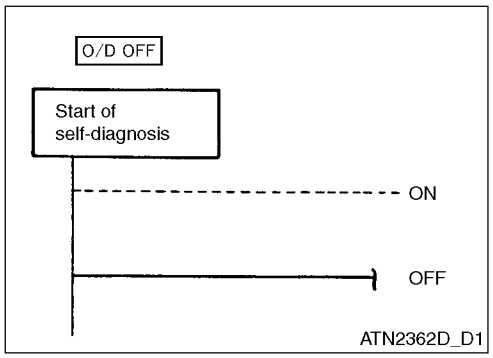
OK → End.

NG → Repair or replace the defective component(s).

The Vehicle Drives in N Range

SYMPTOM

The vehicle drives forward or backward in N range.



INSPECTION TIPS

1. INHIBITOR SWITCH CIRCUIT

When using CONSULT-II

Check if the inhibitor switch circuit trouble is displayed in TCM INPUT SIGNALS from DATA MONITOR.

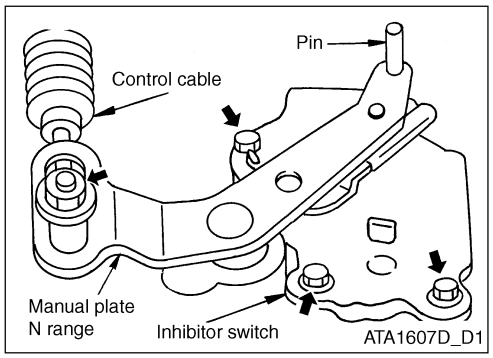
Without using CONSULT-II

From the results of self-diagnosis, check if the inhibitor switch circuit trouble is indicated.

Inspection results are OK?

OK → Inspect the inhibitor switch circuit.

NG → Go to No. 2.



2. CONTROL VALVE

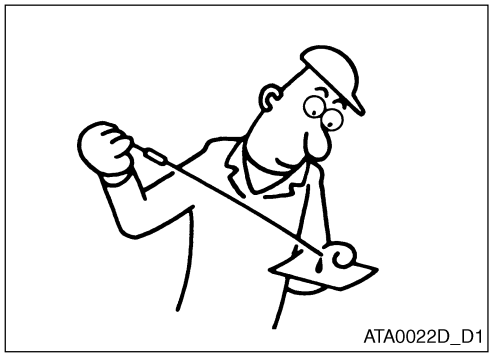
Inspect the control valve.

- Refer to "Shift Control System" (AT-119).

Inspection results are OK?

OK → Go to No. 3.

NG → Adjust the control cable. (Refer to "Shift Control System" (AT-119))



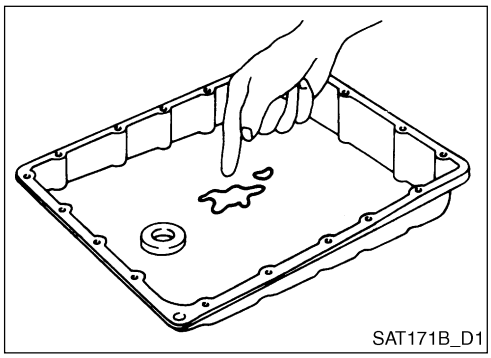
3. A/T ATF LEVEL

Re-inspect the A/T ATF level.

Inspection results are OK?

OK → Go to No. 4.

NG → Add A/T fluid.



4. A/T ATF CONDITION

1. Remove the oil pan.
2. Inspect the A/T fluid condition.

Inspection results are OK?

OK → Go to No. 5.

NG → 1. Disassemble the A/T.
2. Inspect below items.
- Forward clutch assembly
- Overrun clutch assembly
- Reverse clutch assembly

5. CHECK AFTER REPAIR

Re-inspect if symptom occur again.

Inspection results are OK?

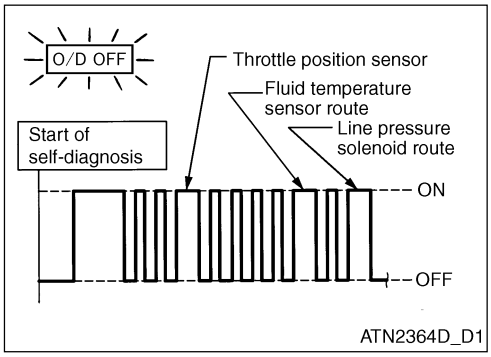
OK → End.

NG → ● Inspect the A/T control unit's input and output signal.
● If NG again, re-inspect if connector's pin terminals have defective contacts.

Too much Shift Shock when Shifting from N to R Range

SYMPTOM

There is high shift shock when shifting from N to R range.



INSPECTION TIPS

1. SELF-DIAGNOSIS RESULTS

Does the self-diagnosis results indicate the fluid temperature sensor, line pressure solenoid valve and the lock sensor?

YES → Inspect the trouble system. Refer to "Fluid Temperature Sensor System and A/T Control Unit Power System" (AT-71), "Line Pressure Solenoid System" (AT-76) and "Throttle Position Sensor System" (AT-59).

NO → Go to No. 2.

2. THROTTLE POSITION SENSOR

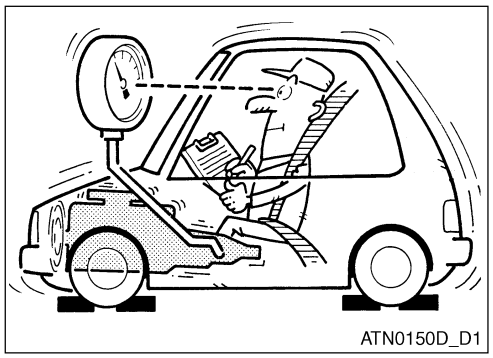
Inspect the throttle position sensor.

- Refer to "Throttle Position Sensor System" "DTC P0122, P0123 Throttle Position Sensor-2 Circuit" (QG16: EC-148).

Inspection results are OK?

OK → Go to No. 3.

NG → Repair or replace the throttle position sensor.


ATN0150D_D1

3. LINE PRESSURE

Check the line pressure during idle in D range.

- Refer to "Line Pressure Test" (AT-27).

Inspection results are OK?

OK → Go to No. 4.

NG → 1. Remove the control valve assembly. (Refer to "Removal • Installation" (AT-121))
2. Inspect below items.
   - Line pressure control valve (pressure regulator valve, pressure modify valve, pilot valve and pilot filter).
   - Line pressure solenoid valve.

4. CHECK AFTER REPAIR

Re-inspect if symptoms occur again.

Inspection results are OK?

OK → End.

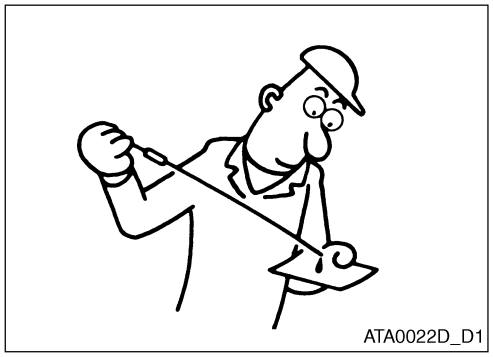
NG → 1. Inspect the A/T control unit's input and output signal.
2. If NG again, re-inspect if connector's pin terminals have defective contacts.

The Vehicle cannot Drive in R Range or Extremely Bad Acceleration

SYMPTOM

The vehicle has no creep effect in R range. Or extremely bad acceleration.

INSPECTION TIPS


ATA0022D_D1

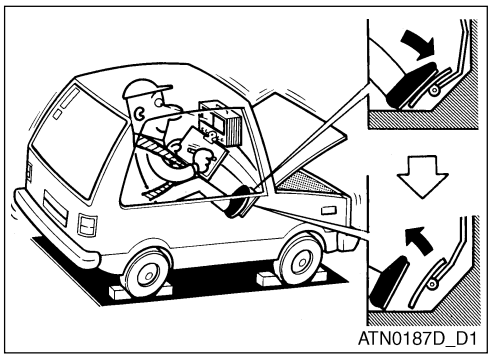
1. A/T FLUID LEVEL

Re-inspect the A/T fluid level.

Inspection results are OK?

OK → Go to No. 2.

NG → Add ATF.


ATN0187D_D1

2. STALL TEST

Inspect the stall RPM in 1 and R range.

- Refer to "Stall Test" (AT-25).

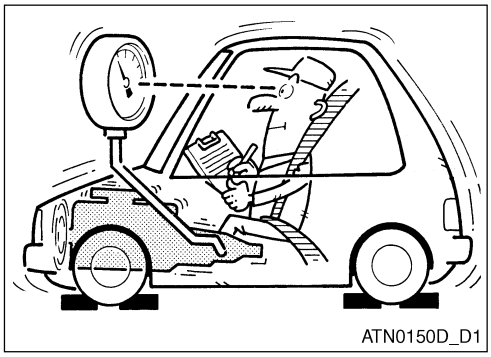
Inspection results are OK?

OK → Go to No. 3.

NG 1 → When OK in 1 range and NG in R range

1. Remove the control valve assembly. (Refer to "Removal • Installation" (AT-121))
2. Inspect below items.
   - Line pressure control valve (pressure regulator valve, pressure modify valve, pilot valve and pilot filter)
   - Line pressure solenoid valve
3. Disassemble the A/T.
4. Inspect below items.
   - Oil pump assembly
   - Torque converter
   - Reverse clutch assembly
   - High clutch assembly

NG 2 → Go to No. 6 if NG in 1 and R ranges.


ATN0150D_D1

3. LINE PRESSURE

Inspect the line pressure during idle in R range.

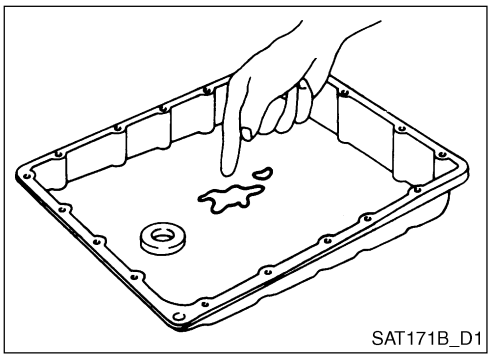
- Refer to "Line Pressure Test" (AT-27).

Inspection results are OK?

OK → Go to No. 4.

NG → 1. Remove the control assembly. (Refer to "Removal • Installation" (AT-121))

2. Inspect below items.
   - Refer to line pressure control valve (pressure regulator valve, pressure modify valve, pilot valve and pilot filter)
   - Line pressure solenoid valve
3. Disassemble the A/T.
4. Inspect below items.
   - Oil pump



4. A/T FLUID CONDITION

1. Remove the oil pan.
2. Inspect the A/T fluid condition.

Inspection results are OK?

OK → Go to No. 5.
NG → Go to No. 6.

5. CHECK AFTER REPAIR

Re-inspect if symptom occurs again.

Inspection results are OK?

OK → End.
NG → 1. Inspect the A/T control unit's input and output signal.
2. If NG again, re-inspect if connector's pin terminals have defective contacts.

6. DETECTING DEFECTIVE ITEMS

1. Remove the control valve assembly. (Refer to "Removal • Installation" (AT-121))
2. Inspect below items.
   - Line pressure control valve (pressure regulator valve, pressure modify valve, pilot valve and pilot filter).
   - Disassemble the A/T.
3. Disassemble the A/T.
4. Inspect below items.
   - Oil pump assembly
   - Torque converter
   - Reverse clutch assembly
   - High clutch assembly
   - Low and reverse brake assembly
   - Low one-way clutch

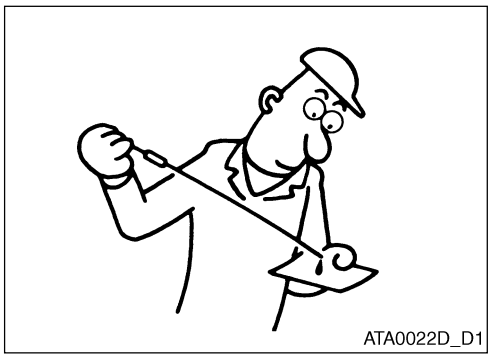
Inspection results are OK?

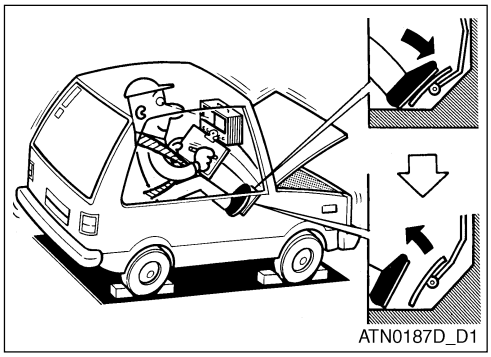
OK → Go to No. 5.
NG → Repair or replace the defective component(s).

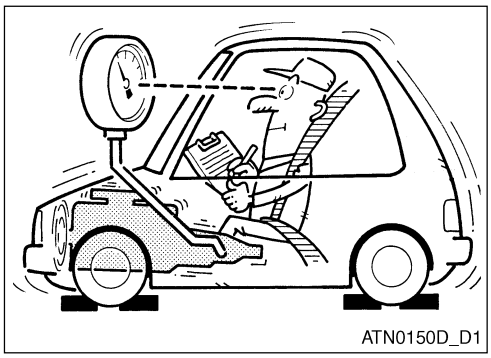
The Vehicle cannot Drive in D, 3, 2, 1 Range or Extremely Bad Acceleration

SYMPTOM

The vehicle has no creep effect in D, 3, 2, 1 range.


ATA0022D_D1


ATN0187D_D1


ATN0150D_D1

INSPECTION TIPS

1. A/T FLUID LEVEL

Re-inspect the A/T fluid level.

Inspection results are OK?

OK → Go to No. 2.

NG → Add A/T.

2. STALL TEST

Inspect the stall RPM in D range.

- Refer to "Stall Test" (AT-25).

Inspection results are OK?

OK → Go to No. 3.

NG → Go to No. 6.

3. LINE PRESSURE

Inspect the line pressure during idle in D range.

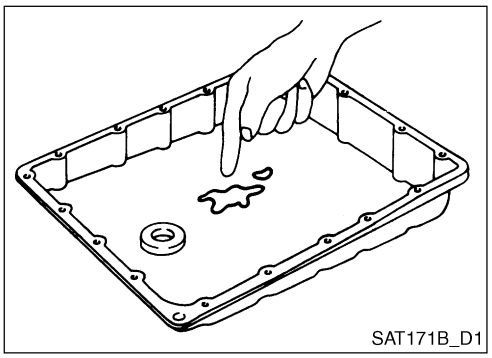
- Refer to "Line Pressure Test" (AT-27).

Inspection results are OK?

OK → Go to No. 4.

NG → 1. Remove the control assembly. (Refer to "Removal • Installation" (AT-121))

2. Inspect below items.
   - Line pressure control valve (pressure regulator valve, pressure modify valve, pilot valve and pilot filter)
   - Line pressure solenoid valve
3. Disassemble the A/T.
4. Inspect below items.
   - Oil pump


SAT171B_D1

4. A/T FLUID CONDITION

1. Remove the oil pan.
2. Inspect the A/T fluid condition.

Inspection results are OK?

OK → Go to No. 5.
NG → Go to No. 6.

5. CHECK AFTER REPAIR

Re-inspect if symptom occurs again.

Inspection results are OK?

OK → End.
NG → 1. Inspect the A/T control unit's input and output signal.
2. If NG again, re-inspect if connector's pin terminals have defective contacts.

6. DETECTING DEFECTIVE ITEMS

1. Remove the control valve assembly. (Refer to "Removal • Installation" (AT-121))
2. Inspect below items.
   - Line pressure control valve (pressure regulator valve, pressure modify valve, pilot valve and pilot filter)
   - Line pressure solenoid valve
3. Disassemble the A/T.
4. Inspect below items.
   - Oil pump assembly
   - Forward clutch assembly
   - Forward one-way clutch
   - Low one-way clutch
   - Low and reverse brake assembly
   - Torque converter

Inspection results are OK?

OK → Go to No. 5.
NG → Repair or replace the defective component(s).

The Vehicle does not Start from D1

SYMPTOM

The vehicle does not start from D1 in road test part 1.

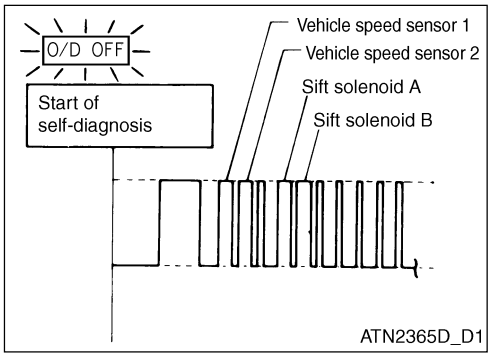
INSPECTION TIPS

1. SYMPTOM CHECK

Is there creep effect in R range?

OK → Go to No. 2.

NG → Go to "The Vehicle cannot Drive in R Range or Extremely Bad Acceleration" (AT-89).



2. SELF-DIAGNOSIS RESULTS

Does the self-diagnosis results indicate the vehicle speed sensor 1 (Output shaft revolution sensor), shift solenoid A and B or vehicle speed sensor 2 after road test?

YES → Inspect the trouble system. Refer to "Vehicle Speed Sensor 1 (Output Shaft Revolution Sensor) System" (AT-55), "Shift Solenoid A System" (AT-63), "Shift Solenoid B System" (AT-65) and "Vehicle Speed Sensor 2 System" (AT-57).

NO → Go to No. 2.

3. THROTTLE POSITION SENSOR

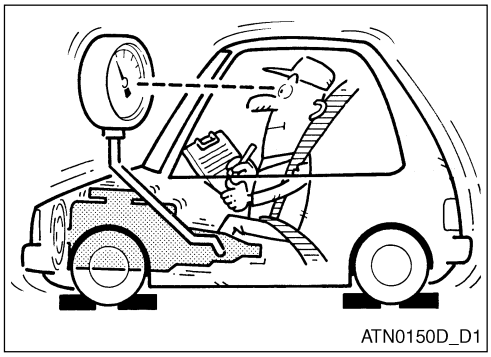
Inspect the throttle position sensor.

- Refer to "Throttle Position Sensor System" (QG:15 EC-73), "DTC P0122, P0123 Throttle Position Sensor-2 Circuit" (QG16: EC-148).

Inspection results are OK?

OK → Go to No. 3.

NG → Repair or replace the throttle position sensor.



4. LINE PRESSURE

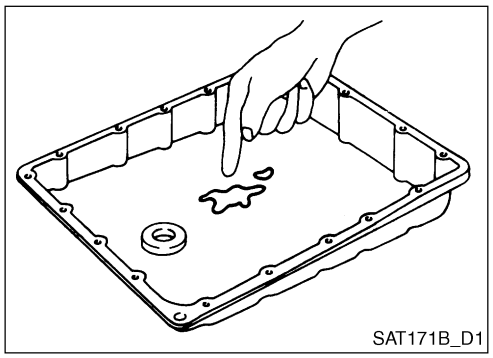
Check the line pressure under throttle point in D range.

- Refer to "Line Pressure Test" (AT-27).

Inspection results are OK?

OK → Go to No. 5.

NG → Go to No. 8.


SAT171B_D1

5. A/T FLUID CONDITION

1. Remove the oil pan.
2. Inspect the A/T fluid condition.

Inspection results are OK?

OK → Go to No. 6.
NG → Go to No. 8.

6. DETECTING DEFECTIVE ITEMS

1. Remove the control valve assembly. (Refer to "Removal • Installation" (AT-121))
2. Inspect below items.
   - Sift valve A
   - Sift valve B
   - Sift solenoid A
   - Sift solenoid B
   - Pilot valve
   - Pilot filter

Inspection results are OK?

OK → Go to No. 7.
NG → Repair or replace the defective component(s).

7. CHECK AFTER REPAIR

Re-inspect if symptom occurs again.

Inspection results are OK?

OK → End.
NG → 1. Inspect the A/T control unit's input and output signal.
2. If NG again, re-inspect if connector's pin terminals have defective contacts.

8. DETECTING DEFECTIVE ITEMS

1. Remove the control valve assembly. (Refer to "Removal • Installation" (AT-121))
2. Inspect below items.
   - Sift valve A
   - Sift valve B
   - Sift solenoid A
   - Sift solenoid B
   - Pilot valve
   - Pilot filter
3. Disassemble the A/T.
4. Inspect below items.
   - Forward clutch assembly
   - Forward one-way clutch
   - Low one-way clutch
   - High clutch assembly
   - Torque converter
   - Oil pump assembly

Inspection results are OK?

OK → Go to No. 7.

NG → Repair or replace the defective component.

Does not Shift from D1 to D2 in D Range. Does not Kickdown from D4 to D2

SYMPTOM

While in D range, it does not shift from D1 to D2. Also, it does not kickdown from D4 to D2 when fully depressing the accelerator pedal.

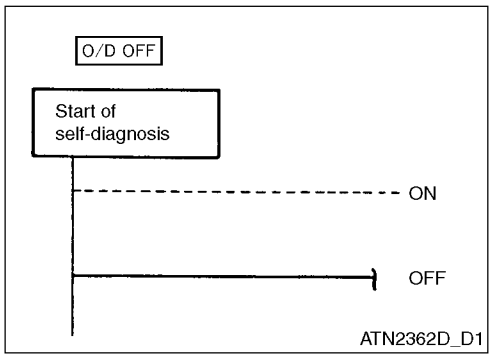
INSPECTION TIPS

1. SYMPTOM CHECK

Is there creep effect in D, 3, 2, and 1 range and can start from D1 during the road test?

YES → Go to No. 2.

NO → Go to "The Vehicle cannot Drive in D, 3, 2, 1 Range or Extremely Bad Acceleration" (AT-91) or "The Vehicle does not Start from D1" (AT-93).



2. INHIBITOR SWITCH CIRCUIT

When using CONSULT-II

Check if the inhibitor switch circuit trouble is displayed in TCM INPUT SIGNALS from DATA MONITOR.

Without using CONSULT-II

From the results of self-diagnosis, check if the inhibitor switch circuit trouble is indicated.

Inspection results are OK?

OK → Inspect the inhibitor switch circuit.

NG → Go to No. 3.

3. VEHICLE SPEED SENSOR 1 (OUTPUT SHAFT REVOLUTION SENSOR) AND VEHICLE SPEED SENSOR 2 CIRCUIT

Inspect the vehicle speed sensor 1 (Output shaft revolution sensor) and vehicle speed sensor 2 circuit.

- Refer to "Vehicle Speed Sensor 1 (Output Shaft Revolution Sensor) System" (AT-55) and "Vehicle Speed Sensor 2 System" (AT-57).

Inspection results are OK?

OK → Go to No. 4.

NG → Repair or replace the vehicle speed sensor 1 (Output shaft revolution sensor) and vehicle speed sensor 2.

4. THROTTLE POSITION SENSOR

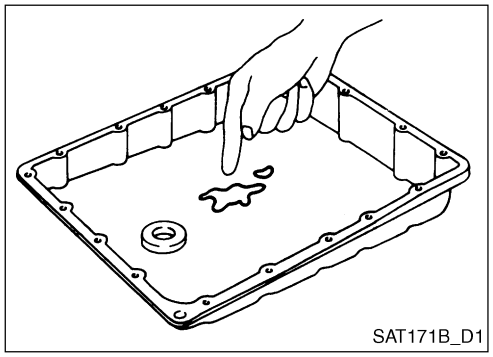
Inspect the throttle position sensor.

- Refer to "DTC P0122, P0123 Throttle Position Sensor-2 Circuit" (QG16: EC-148).

Inspection results are OK?

OK → Go to No. 5.

NG → Repair or replace the throttle position sensor.



5. A/T FLUID CONDITION

1. Remove the oil pan.
2. Inspect the A/T fluid condition.

Inspection results are OK?

OK → Go to No. 6.

NG → Go to No. 8.

6. DETECTING DEFECTIVE ITEMS

1. Remove the control valve assembly. (Refer to "Removal • Installation" (AT-121))
2. Inspect below items.
   - Sift valve A
   - Sift solenoid A
   - Pilot valve
   - Pilot filter

Inspection results are OK?

OK → Go to No. 7.

NG → Repair or replace the defective component(s).

7. CHECK AFTER REPAIR

Re-inspect if symptom occurs again.

Inspection results are OK?

OK → End.

NG → 1. Inspect the A/T control unit's input and output signal.
2. If NG again, re-inspect if connector's pin terminals have defective contacts.

8. DETECTING DEFECTIVE ITEMS

1. Remove the control valve assembly. (Refer to "Removal • Installation" (AT-121))
2. Inspect below items.
   - Sift valve A
   - Sift solenoid A
   - Pilot valve
   - Pilot filter
3. Disassemble the A/T.
4. Inspect below items.
   - Servo piston assembly
   - Brake band
   - Oil pump assembly

Inspection results are OK?

OK → Go to No. 7.

NG → Repair or replace the defective component.

Does not Shift from D2 to D3 in D Range

SYMPTOM

While driving to specified speed, it does not shift from D2 to D3

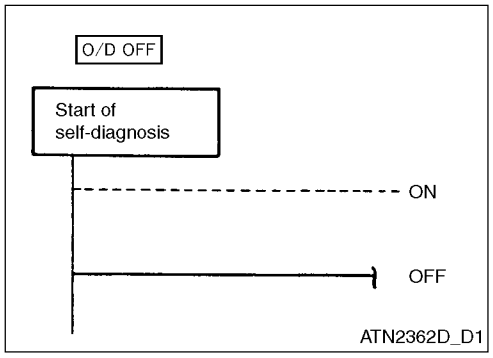
INSPECTION TIPS

1. SYMPTOM CHECK

Is there creep effect in D, 3, 2, and 1 range and can start from D1 during the road test?

YES → Go to No. 2.

NO → Go to "The Vehicle cannot Drive in D, 3, 2, 1 Range or Extremely Bad Acceleration" (AT-91) or "The Vehicle does not Start from D1" (AT-93).



2. INHIBITOR SWITCH CIRCUIT

When using CONSULT-II

Check if the inhibitor switch circuit trouble is displayed in TCM INPUT SIGNALS from DATA MONITOR.

Without using CONSULT-II

From the results of self-diagnosis, check if the inhibitor switch circuit trouble is indicated.

Inspection results are OK?

OK → Inspect the inhibitor switch circuit.

NG → Go to No. 3.

3. THROTTLE POSITION SENSOR

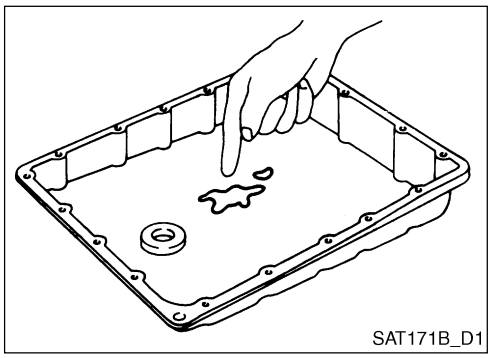
Inspect the throttle position sensor.

- Refer to "DTC P0122, P0123 Throttle Position Sensor-2 Circuit" (QG16: EC-148).

Inspection results are OK?

OK → Go to No. 4.

NG → Repair or replace the throttle position sensor.


SAT171B_D1

4. A/T FLUID CONDITION

1. Remove the oil pan.
2. Inspect the A/T fluid condition.

Inspection results are OK?

OK → Go to No. 5.
NG → Go to No. 7.

5. DETECTING DEFECTIVE ITEMS

1. Remove the control valve assembly. (Refer to "Removal • Installation" (AT-121))
2. Inspect below items.
   - Sift valve B
   - Sift solenoid B
   - Pilot valve
   - Pilot filter

Inspection results are OK?

OK → Go to No. 6.
NG → Repair or replace the defective component(s).

6. CHECK AFTER REPAIR

Re-inspect if symptom occurs again.

Inspection results are OK?

OK → End.
NG → 1. Inspect the A/T control unit's input and output signal.
2. If NG again, re-inspect if connector's pin terminals have defective contacts.

7. DETECTING DEFECTIVE ITEMS

1. Remove the control valve assembly. (Refer to “Removal • Installation” (AT-121))
2. Inspect below items.
   - Sift valve B
   - Sift solenoid B
   - Pilot valve
   - Pilot filter
3. Disassemble the A/T.
4. Inspect below items.
   - Servo piston assembly
   - High clutch assembly
   - Oil pump assembly

Inspection results are OK?

OK → Go to No. 6.

NG → Repair or replace the defective component.

Does not Shift from D3 to D4 in D Range

SYMPTOM

- While driving to a specified speed, it does not shift from D3 to D4.
- When A/T does not get warmed up, it does not shift from D3 to D4.

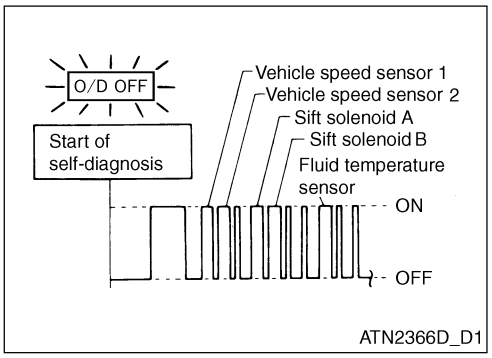
INSPECTION TIPS

1. Symptom Check

Is there creep effect in D, 3, 2, and 1 range and can start from D1 during the road test?

YES → Go to No. 2.

NO → Go to “The Vehicle cannot Drive in D, 3, 2, 1 Range or Extremely Bad Acceleration” (AT-91) or “The Vehicle does not Start from D1” (AT-93).



2. SELF-DIAGNOSIS RESULTS

When using CONSULT-II

After the road test, check if the self-diagnosis results indicate the following trouble items.

- Inhibitor switch
- O/D OFF switch
- Fluid temperature sensor
- Vehicle speed sensor 1 (Output shaft revolution sensor)
- Shift solenoid A and B
- Vehicle speed sensor 2

Inspection results are OK?

YES → Inspect the defective system. (Refer to “Inhibitor Switch, O/D Switch, Idle Switch and Full Switch System” (AT-79), “Fluid Temperature Sensor System and A/T Control Unit Power System” (AT-71), “Vehicle Speed Sensor 1 (Output Shaft Revolution Sensor) System” (AT-55), “Shift Solenoid A System” (AT-63), “Shift Solenoid B System” (AT-65), and “Vehicle Speed Sensor 2 System” (AT-57))

NO → Go to No. 3.

3. Throttle Position Sensor

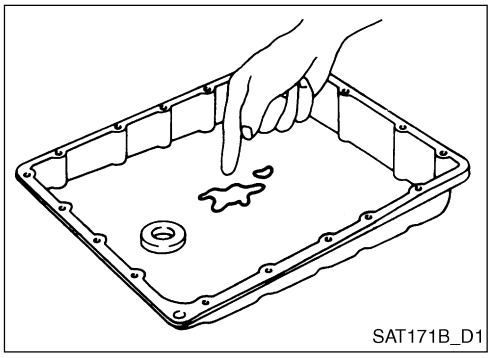
Inspect the throttle position sensor.

- Refer to “DTC P0122, P0123 Throttle Position Sensor-2 Circuit” (QG16: EC-148).

Inspection results are OK?

OK → Go to No. 4.

NG → Repair or replace the throttle position sensor.



4. A/T Fluid Condition

1. Remove the oil pan.
2. Inspect the A/T fluid condition.

Inspection results are OK?

OK → Go to No. 5.

NG → Go to No. 7.

5. Detecting Defective Items

1. Remove the control valve assembly. (Refer to “Removal • Installation” (AT-121))
2. Inspect below items.
   - Sift valve B
   - Sift solenoid B
   - Pilot valve
   - Pilot filter

Inspection results are OK?

OK → Go to No. 6.

NG → Repair or replace the defective component(s).

6. Check After Repair

Re-inspect if symptom occurs again.

Inspection results are OK?

OK → End.

NG → 1. Inspect the A/T control unit’s input and output signal.
2. If NG again, re-inspect if connector’s pin terminals have defective contacts.

7. Detecting Defective Items

1. Remove the control valve assembly. (Refer to "Removal • Installation" (AT-121))
2. Inspect below items.
   - Sift valve B
   - Sift solenoid B
   - Pilot valve
   - Pilot filter
3. Disassemble the A/T.
4. Inspect below items.
   - Servo piston assembly
   - High clutch assembly
   - Oil pump assembly

Inspection results are OK?

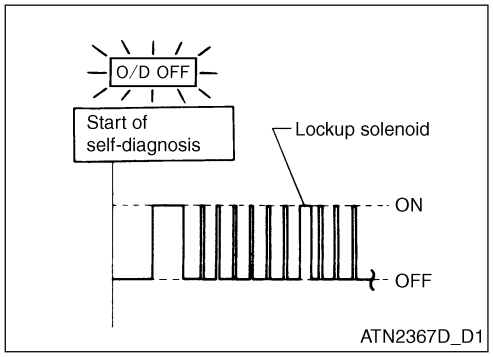
OK → Go to No. 6.

NG → Repair or replace the defective component.

Does not Lockup

SYMPTOM

While driving to a specified speed, it does not lockup.



INSPECTION TIPS

1. Self-Diagnosis Result

Does the self-diagnosis results indicate the defect in the lockup solenoid valve circuit?

YES → Inspect the lockup solenoid valve circuit. (Refer to "Lockup Solenoid System" (AT-70).)

NO → Go to No. 2.

2. Throttle Position Sensor

Inspect the throttle position sensor.

- Refer to "DTC P0122, P0123 Throttle Position Sensor-2 Circuit" (QG16: EC-148).

Inspection results are OK?

OK → Go to No. 3.

NG → Repair or replace the throttle position sensor.

3. DETECTING DEFECTIVE ITEMS

1. Remove the control valve assembly. (Refer to "Removal • Installation" (AT-121))
2. Inspect below items.
   - Lockup control valve
   - Torque converter relief valve
   - Pilot valve
   - Pilot filter

Inspection results are OK?

OK → Go to No. 4.

NG → Repair or replace the defective component.

4. CHECK AFTER REPAIR

Re-inspect if symptom occurs again.

Inspection results are OK?

OK → End.

NG → 1. Inspect the A/T control unit's input and output signal.
2. If NG again, re-inspect if connector's pin terminals have defective contacts.

Does not Maintain the Lockup State

SYMPTOM

The lockup condition does not continue for more than 30 seconds.

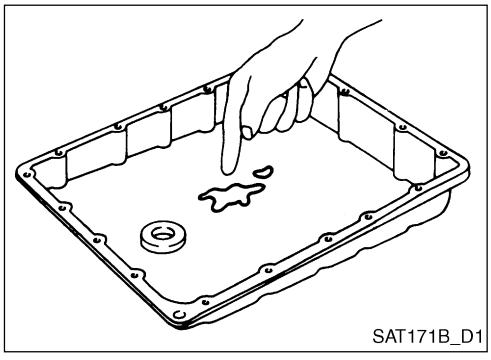
INSPECTION TIPS

1. SELF-DIAGNOSIS RESULT

Does the self-diagnosis result indicate the defect in the engine revolution signal circuit?

YES → Inspect the engine revolution signal circuit. (Refer to "Engine Revolution Signal Circuit" (AT-74))

NO → Go to No. 2.


SAT171B_D1

2. A/T FLUID CONDITION

1. Remove the oil pan.
2. Inspect the A/T fluid condition.

Inspection results are OK?

OK → Go to No. 3.

NG → Go to No. 5.

3. DETECTING DEFECTIVE ITEMS

1. Remove the control valve assembly. (Refer to "Removal • Installation" (AT-121))
2. Inspect below items.
   - Lockup control valve
   - Pilot valve
   - Pilot filter

Inspection results are OK?

OK → Go to No. 4.

NG → Repair or replace the defective component.

4. CHECK AFTER REPAIR

Re-inspect if symptom occurs again.

Inspection results are OK?

OK → End.

NG → 1. Inspect the A/T control unit's input and output signal.
2. If NG again, re-inspect if connector's pin terminals have defective contacts.

5. DETECTING DEFECTIVE ITEMS

1. Remove the control valve assembly. (Refer to "Removal • Installation" (AT-121))
2. Inspect below items.
   - Lockup solenoid valve
   - Pilot valve
   - Pilot filter
3. Disassemble the A/T.
4. Inspect below items.
   - Oil pump assembly
   - Torque converter

Inspection results are OK?

OK → Go to No. 4.

NG → Repair or replace the defective component.

Lockup does not Release

SYMPTOM

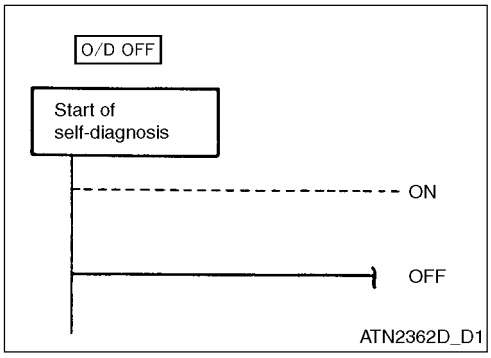
Lockup does not release even when the accelerator pedal is released.

INSPECTION TIPS

1. THROTTLE VALVE SWITCH (IDLE SWITCH/FULL SWITCH) CIRCUIT.

When using CONSULT-II

Check if throttle valve switch circuit defect is displayed in TCM INPUT SIGNALS from DATA MONITOR. Refer to "Inhibitor Switch, O/D Switch, Idle Switch and Full Switch System" (AT-79).



Without using CONSULT-II

Check if idle switch circuit defect is displayed as a result of self-diagnosis.

Inspection results are OK?

OK → Inspect the idle switch circuit. Refer to "Inhibitor Switch, O/D Switch, Idle Switch and Full Switch System" (AT-79).

NG → Go to No. 2.

2. CHECK AFTER REPAIR

Re-inspect if symptom occurs again.

Inspection results are OK?

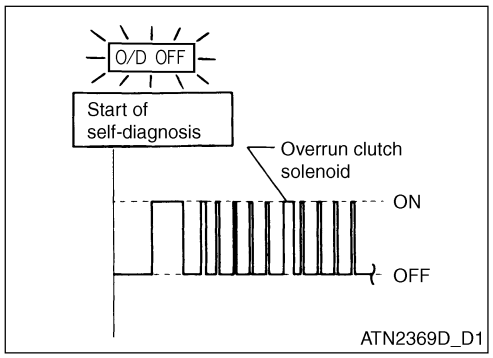
OK → End.

NG → 1. Inspect the A/T control unit's input and output signal.
2. If NG again, re-inspect if connector's pin terminals have defective contacts.

Engine Speed does not Drop to Idle RPM when Decelerating in D Range (D4 → D3)

SYMPTOM

- When accelerator pedal is released from D4 to D3, the engine speed does not return to idle RPM smoothly.
- The engine brake does not work when shifted to 3.
- The engine brake does not work when shifted from D to 2 range.



INSPECTION TIPS

1. SELF-DIAGNOSIS RESULT

Does the self-diagnosis result display defect in the overrun clutch solenoid valve circuit?

YES → Inspect the overrun clutch solenoid valve circuit. (Refer to "Overrun Clutch Solenoid System" (AT-67))

NO → Go to No. 2

2. THROTTLE POSITION SENSOR

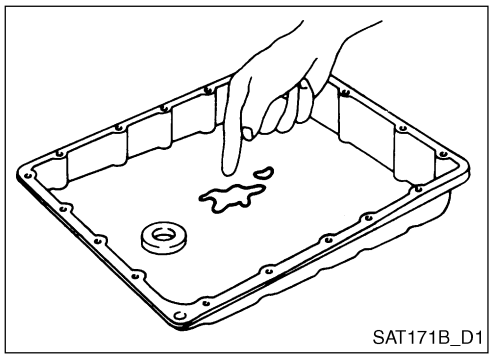
Inspect the throttle position sensor.

- Refer to "DTC P0122, P0123 Throttle Position Sensor-2 Circuit" (QG16: EC-148).

Inspection results are OK?

OK → Go to No. 3.

NG → Repair or replace the throttle position sensor.



3. A/T FLUID CONDITION

1. Remove the oil pan.
2. Inspect the A/T fluid condition.

Inspection results are OK?

OK → Go to No. 4.

NG → Go to No. 6.

4. DETECTING DEFECTIVE ITEMS

1. Remove the control valve assembly. (Refer to "Removal • Installation" (AT-121))
2. Inspect below items.
   - Overrun clutch control valve
   - Overrun clutch reducing valve
   - Overrun clutch solenoid valve

Inspection results are OK?

OK → Go to No. 5.

NG → Repair or replace the defective component.

5. CHECK AFTER REPAIR

Re-inspect if symptom occurs again.

Inspection results are OK?

OK → End.

NG → 1. Inspect the A/T control unit's input and output signal.
2. If NG again, re-inspect if connector's pin terminals have defective contacts.

6. DETECTING DEFECTIVE ITEMS

1. Remove the control valve assembly. (Refer to "Removal • Installation" (AT-121))
2. Inspect below items.
   - Overrun clutch control valve
   - Overrun clutch reducing valve
   - Overrun clutch solenoid valve
3. Disassemble the A/T.
4. Inspect below items.
   - Overrun clutch assembly
   - Oil pump assembly

Inspection results are OK?

OK → Go to No. 5.

NG → Repair or replace the defective component.

Does not Shift from D4 to D3 in D Range under When Shifted from D to 3

SYMPTOM

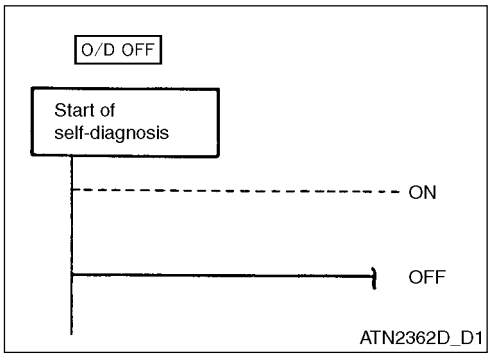
When shifted from D to 3, it does not shift from D4 to D3.

INSPECTION TIPS

1. O/D SWITCH CIRCUIT

When using CONSULT-II

Check if O/D switch circuit defect is displayed in TCM INPUT SIGNALS from DATA MONITOR. Refer to "Inhibitor Switch, O/D Switch, Idle Switch and Full Switch System" (AT-79).



Without using CONSULT-II

Check if O/D switch circuit defect is displayed as a result of self-diagnosis.

Inspection results are OK?

YES → Inspect the O/D switch circuit. Refer to "Inhibitor Switch, O/D Switch, Idle Switch and Full Switch System" (AT-79).

NO → Go to "Does not Shift from D2 to D3 in D Range" (AT-98).

Does not Shift from D3 to 2_2 when Selector Lever is Moved from D Range to 2 Range

SYMPTOM

It does not shift from D3 to 2_2 when selecting 2 range from D range.

INSPECTION TIPS

1. INHIBITOR SWITCH CIRCUIT

When using CONSULT-II

Check if inhibitor switch circuit defect is displayed in TCM INPUT SIGNALS from DATA MONITOR. Refer to "Inhibitor Switch, O/D Switch, Idle Switch and Full Switch System" (AT-79).

Without using CONSULT-II

Check if inhibitor switch circuit defect is displayed as a result of self-diagnosis (O/D OFF indicator does not come on).

Inspection results are OK?

YES → Inspect the inhibitor switch circuit. Refer to "Inhibitor Switch, O/D Switch, Idle Switch and Full Switch System" (AT-79).

NO → Go to "Does not Shift from D1 to D2 in D Range. Does not Kickdown from D4 to D2" (AT-96).

Does not Shift from 2_2 to 1_1 when Selector Lever is Moved from 2 Range to 1 Range

SYMPTOM

It does not shift from 2_2 to 1_1 when selecting 1 range from 2 range.

INSPECTION TIPS

1. INHIBITOR SWITCH CIRCUIT

When using CONSULT-II

Check if inhibitor switch circuit defect is displayed in TCM INPUT SIGNALS from DATA MONITOR. Refer to "Inhibitor Sswitch, O/D Switch, Idle Switch and Full Switch System" (AT-79).

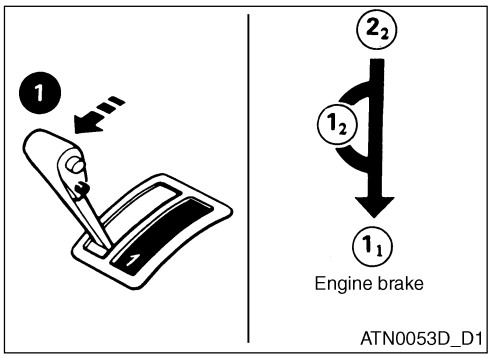
Without using CONSULT-II

Check if inhibitor switch circuit defect is displayed as a result of self-diagnosis (O/D OFF indicator does not come on).

Inspection results are OK?

YES → Inspect the inhibitor switch circuit. Refer to "Inhibitor Switch, O/D Switch, Idle Switch and Full Switch System" (AT-79).

NO → Go to No. 2.



2. CHECK AFTER REPAIR

Re-inspect if symptom occurs again.

Inspection results are OK?

OK → End.

NG → 1. Inspect the A/T control unit's input and output signal.

2. If NG again, re-inspect if connector's pin terminals have defective contacts.

No Engine Brake in "1" Range

SYMPTOM

Engine brake does not work when shifting from 2_2 (1_2) to 1_1.

INSPECTION TIPS

1. CHECK AFTER REPAIR

Is there creep effect in R range?

YES → Go to "Engine Speed does not Drop to Idle RPM when Decelerating in D Range (D4 → D3)" (AT-106).

NO → Go to "The Vehicle cannot Drive in R Range or Extremely Bad Acceleration" (AT-89).

Cannot do Self-Diagnosis

SYMPTOM

A/T CHECK indicator circuit is normal, but indicator light does not come on when self-diagnosis is performed.

INSPECTION TIPS

1. INHIBITOR SWITCH CIRCUIT (WHEN USING CONSULT-II)

When using CONSULT-II

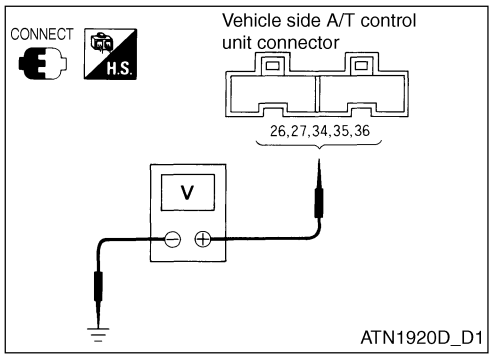
1. Turn the key switch ON (Do not start the engine).
2. Select TCM INPUT SIGNALS from DATA MONITOR.
3. By moving the selector lever to P, R, N, D, 2, and 1, check if the value on the display identical with selected position (At P range, the N range switch comes ON).

Inspection results are OK?

OK → Go to No. 3.

NG → Inspect below items.

- Inhibitor switch (Refer to "Component Inspection" (AT-114))
- Open or short circuit in the main harness between the key switch and inhibitor switch.
- Open or short circuit in the main harness between the inhibitor switch and A/T control unit.
- Diode (P, N position).



2. INHIBITOR SWITCH CIRCUIT (WITHOUT USING CONSULT-II)

Without using CONSULT-II

1. Turn the key switch ON (Do not start the engine).
2. By moving the selector lever to P, R, N, D, 2, and 1, measure voltage between the A/T control unit connector terminal and ground.

Voltage

B: Power voltage

O: Approx. 0 V

Range	Terminal				
	36	35	34	27	26
"P", "N"	B	0	0	0	0
"R"	B	B	0	0	0
"D"	0	0	B	0	0
"2"	0	0	0	B	0
"1"	0	0	0	0	B

Inspection results are OK?

OK → Go to No. 4.

NG → Inspect below items.

- Inhibitor switch (Refer to "Component Inspection" (AT-114)).
- Open or short circuit in the main harness between the key switch and inhibitor switch.
- Open or short circuit in the main harness between the inhibitor switch and A/T control unit.
- Diode (P, N position).

3. O/D SWITCH CIRCUIT (WHEN USING CONSULT-II)

When using CONSULT-II

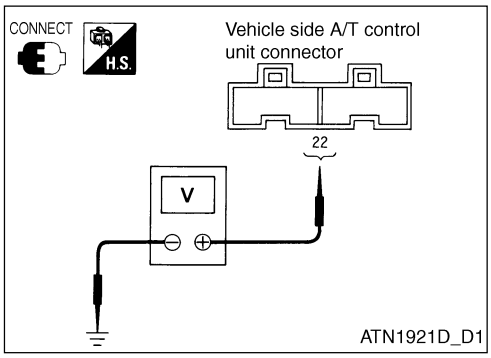
1. Turn the key switch ON (Do not start the engine).
2. Select TCM INPUT SIGNALS from DATA MONITOR.
3. Check if the shift indicator on the display changes ON and OFF when shifted from 3 to D. (When the shift lever is in 3, it displays as “ON” and when the shift lever is in D, it displays as “OFF”.)

Inspection results are OK?

OK → Go to No. 5.

NG → Inspect below items.

- O/D switch (Refer to “Component Inspection” (AT-114)).
- Open or short circuit in the main harness between the A/T control unit and O/D switch.
- Open or short circuit in the main harness O/D switch circuit.



4. O/D SWITCH CIRCUIT (WITHOUT USING CONSULT-II)

Without using CONSULT-II

1. Turn the key switch ON (Do not start the engine).
2. By turning ON and OFF the O/D switch, measure the voltage between the A/T control unit connector terminals and ground.

   D range: Battery voltage

   3 range: Approx. 0 V

Inspection results are OK?

OK → Go to No. 6.

NG → Inspect below items.

- O/D switch (Refer to “Components Inspection” (AT-114)).
- Open or short circuit in the main harness between the A/T control unit and O/D switch.
- Open or shirt circuit in the main harness O/D switch circuit.

5. THROTTLE VALVE SWITCH CIRCUIT (WHEN USING CONSULT-II)

When using CONSULT-II

1. Turn the key switch ON (Do not start the engine).
2. Select TCM INPUT SIGNALS from DATA MONITOR.
3. By operating accelerator pedal, check if the accelerator pedal switch and full switch properly turns ON and OFF on the display.

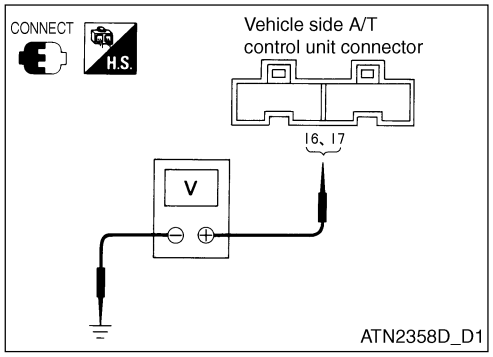
Accelerator pedal operation	Monitor Item	
	CLOSED THL/SW	W/O THRL/P - SW
When released	"ON"	"OFF"
When fully depressed	"OFF"	"ON"

Inspection results are OK?

OK → Go to No. 7.

NG → Inspect below items.

- Throttle valve switch (Refer to "Components Inspection" (AT-114)).
- Open or short circuit in the main harness between the key switch and throttle valve switch.
- Open or short circuit in the main harness between the throttle valve switch and A/T control unit.



6. THROTTLE VALVE SWITCH CIRCUIT (WITHOUT USING CONSULT-II)

Without using CONSULT-II

1. Turn the key switch ON (Engine warmed up/Do not start the engine).
2. By depressing the accelerator pedal, measure the voltage between the A/T control unit connector terminal and ground.

Accelerator pedal operation	Voltage	
	Terminal No. 16	Terminal No. 17
When released	Power voltage	Approx. 0 V
When fully depressed	Approx. 0 V	Power voltage

Inspection results are OK?

OK → Go to No. 7.

NG → Inspect below items.

- Throttle valve switch (Refer to "Components Inspection" (AT-114)).
- Open or short circuit in the main harness between the key switch and throttle valve switch.
- Open or short circuit in the main harness between the throttle valve switch and A/T control unit.

7. CHECK AFTER REPAIR

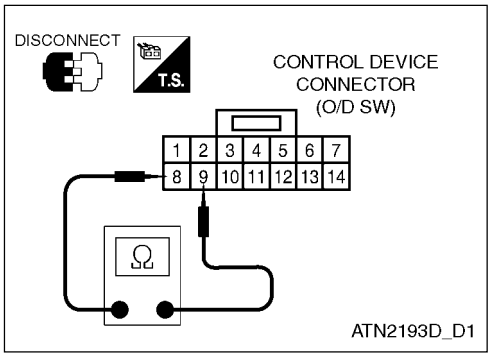
After driving for a while, perform the self-diagnosis again and check if still defective.

- Refer to "CONSULT-II Function" (AT-50) and "Self-Diagnosis (Without Using CONSULT-II)" (AT-53).

Inspection results are OK?

OK → End.

NG → 1. Inspect the A/T control unit's input and output signal.
2. If NG again, re-inspect if connector's pin terminals have defective contacts.

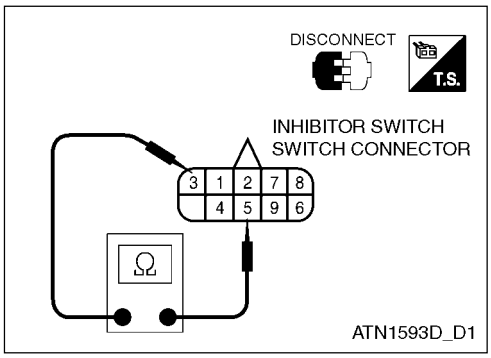


COMPONENT INSPECTION

O/D switch

- Check continuity between terminals.

Switch Position	Continuity
ON	No continuity
OFF	Continuity



INHIBITOR SWITCH

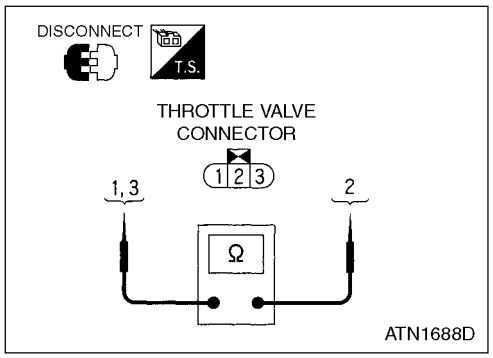
1. By moving the selector lever, check the continuity between the inhibitor switch connector terminals.

Range Position	Terminal No.	Continuity
"P"	1 - 2, 3 - 7	Continuity ● No continuity if not the selected position
"R"	3 - 8	
"N"	3 - 9	
"D"	3 - 6	
"2"	3 - 5	
"1"	3 - 4	

2. If NG, re-inspect while control cable removed. Refer the step 1.
3. If inspection becomes OK after removing the cable, adjust the control cable. (Refer to "Adjustment During Installation" (AT-120))
4. If still NG after removing the cable, remove the inhibitor switch and check for continuity between the inhibitor terminals. Refer to the step 1.
5. If OK after removing the inhibitor switch, adjust the inhibitor switch. (Refer to "Inhibitor Switch" (AT-123)).
6. If still NG after removing the inhibitor switch, then replace the inhibitor switch.

THROTTLE VALVE SWITCH

Idle switch



- Check continuity between the terminal No. 1 and No. 2.

Accelerator pedal operation	Continuity
Released	Yes
Depressed over one-half	No

- Refer to "Throttle Valve Closed Position Learning" (QG16: EC-23).

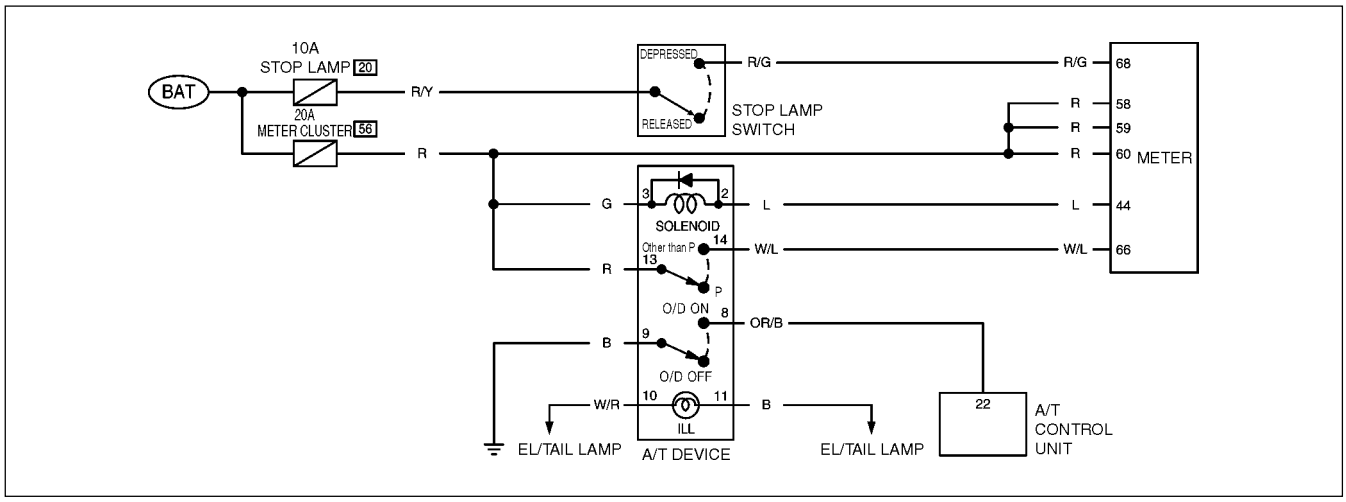
Full Switch

- Check continuity between the terminal No. 2 and No. 3.

Accelerator pedal operation	Continuity
Released	No
Depressed over one-half	Yes

A/T Shift Lock does not Work Properly

CIRCUIT DIAGRAM



SYMPTOM

- The selector lever does not move from P range to other ranges while the key switch ON and brake pedal depressed.
- The selector lever moves from P range to other ranges while the key switch ON and brake pedal not depressed.
- The selector lever moves from P range to other ranges without the key in the key cylinder.
- The key cannot be removed in P range. The key can be removed other than P range.

INSPECTION TIPS

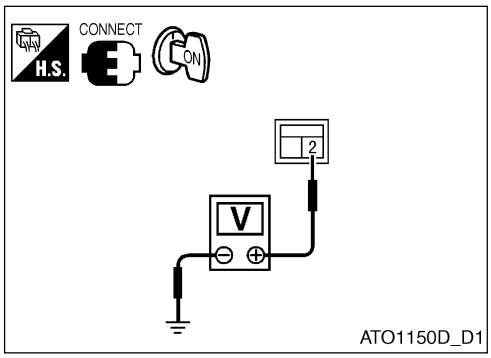
1. SELECTOR LEVER POSITION

Inspect for any damages in shift control system and inhibitor switch. Also inspect if the control cable is properly adjusted.

Inspection results are OK?

OK → Go to No. 3.

NG → Repair the defective component. (Refer to "Shift Control System" (AT-119) and "Inhibitor Switch" (AT-123).)



2. POWER

1. Turn the key switch ON (Do not start the engine).
2. Measure the voltage between the stop lamp switch connector terminal and ground.

   Terminal No. 1 - Ground : Battery voltage

Inspection results are OK?

OK → Go to No. 3.

NG → Inspect below items.

- Open or short circuit in the harness between the battery and stop lamp switch.
- Fuse
- Key switch

3. Measure the voltage between the control device terminal No. 3, 13 and ground.

   Terminal No. 3 - Ground : Battery voltage

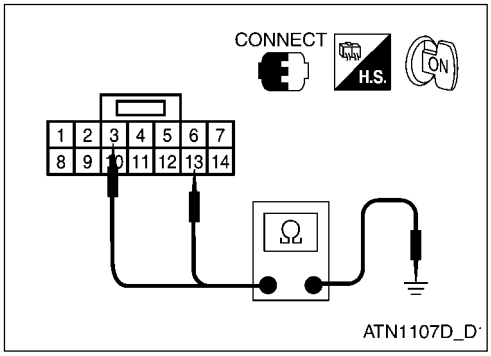
   Terminal No. 13 - Ground : Battery voltage

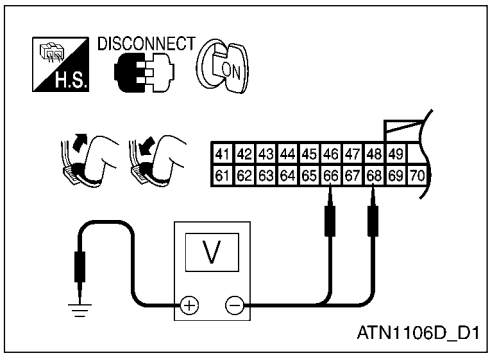
Inspection results are OK?

OK → Go to No. 3.

NG → Inspect below items.

- Open or short circuit in the harness between the battery and stop lamp switch.
- Fuse





3. INPUT SIGNAL (METER)

Turn the key switch ON (Do not start the engine).

- Measure the voltage between the meter terminal No. 68 and ground.

  Voltage

  When depress the brake pedal: Power voltage

  When release the brake pedal: Approx. 0 V
- Measure the voltage between the meter terminal No. 66 and ground.

  Voltage

  When the shift lever is in P: Approx. 0 V

  When the shift lever is in other than P: Power voltage

Inspection results are OK?

OK → Go to No. 4.

NG → Inspect below items.

- Open or short circuit in the harness between the meter terminal No. 68 and stop lamp switch terminal No. 2.
- Open or short circuit in the harness between the meter terminal No. 66 and control device terminal No. 14.
- Stop lamp switch.

4. SHIFT LOCK SOLENOID

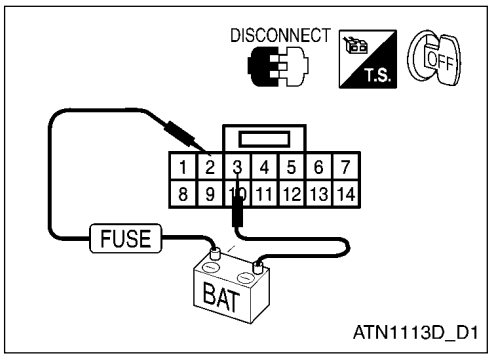
Inspect the shift solenoid.

- Refer to "Shift Lock Circuit Diagram" (AT-126).

NG → Repair the shift lock solenoid.

5. CHECK AFTER REPAIR

1. Connect the shift lock harness connector to its original position.
2. Turn the key switch from OFF to ON (Do not start the engine).
3. Check if the shift lock is operating properly by depressing and releasing the brake pedal.
4. If NG, re-inspect if connector's pin terminals have defective contacts.



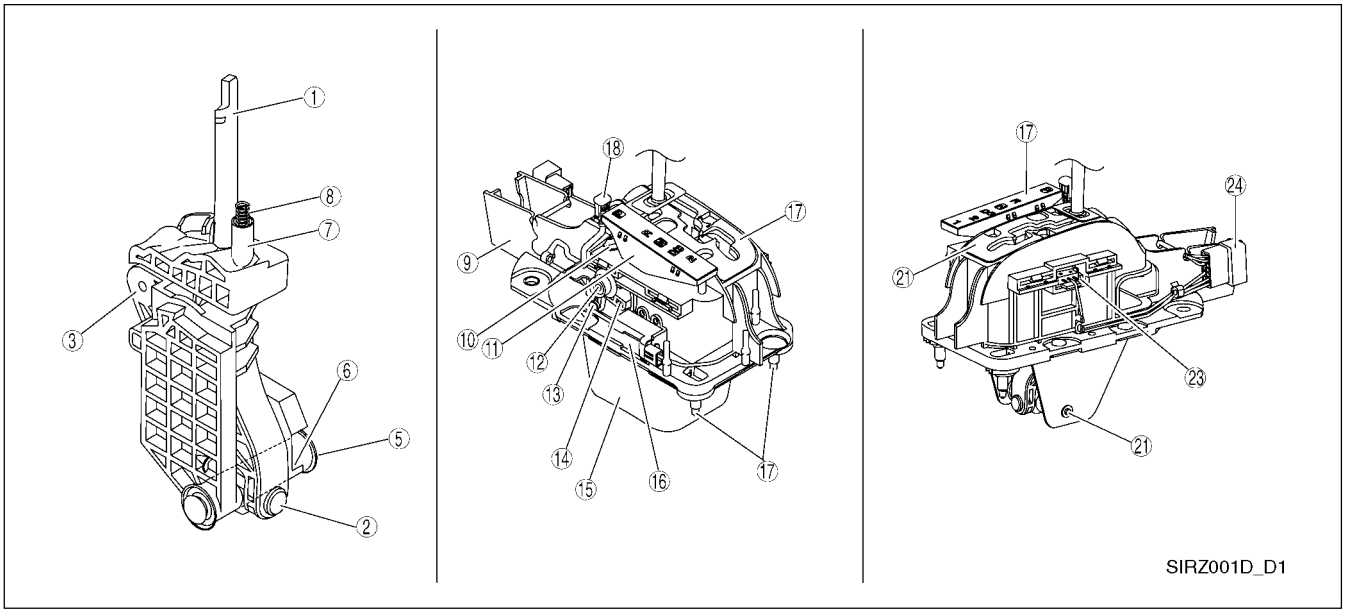
COMPONENTS INSPECTION

Shift solenoid

- Inspect the operation of the shift lock solenoid in the control device by applying the battery power.

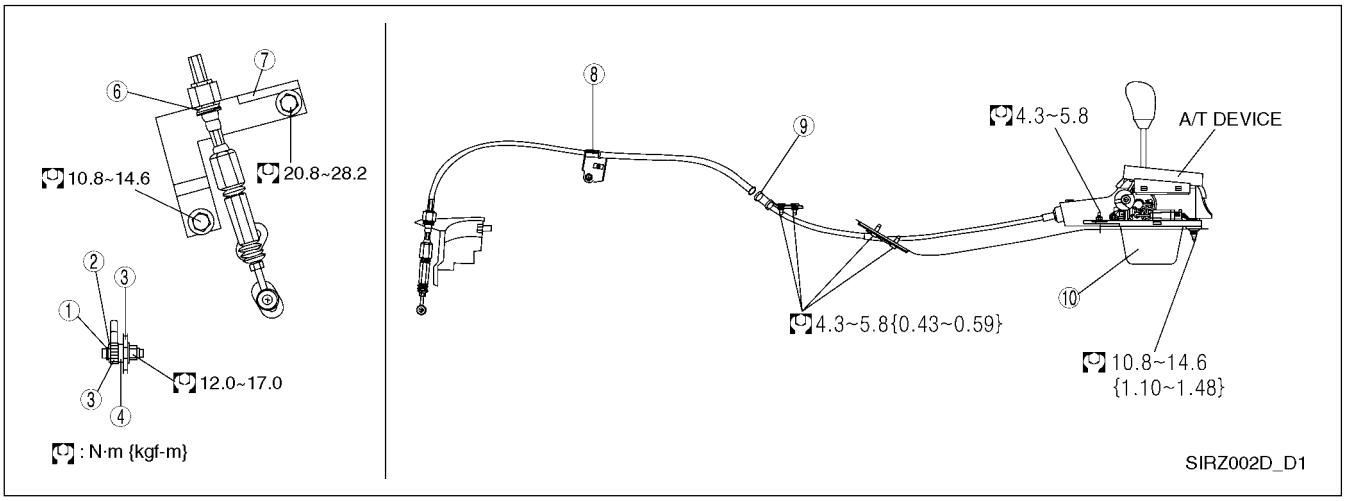
Shift Control System

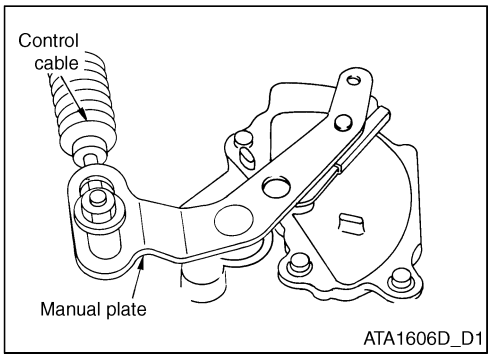
Removal • Installation of Control Device



① Shift lever
② Yoke assembly
③ Cable bracket assembly
④ E-ring
⑤ Slide bush
⑥ Center pivet pin
⑦ Detention plunger assembly
⑧ Detention plunger spring
⑨ Housing assembly
⑩ Bulb assembly
⑪ Bulb box
⑫ P-N stopper lock pin
⑬ P-N stopper damper
⑭ P-N stopper
⑮ Dust cover
⑯ Solenoid assembly
⑰ Location bolt
⑱ Damper gate
⑲ Manual release lever
⑳ Plate position
㉑ Slide
㉒ E-ring
㉓ O/D switch mounting bracket
㉔ Switch/Wire/Connector assembly

Removal • Installation of Control Cable





Adjustment During Installation

1. Tighten the lock nut connecting the manual plate and the control cable, and leave the control cable free.
2. Place the manual plate and inner accelerator lever to P position.

CAUTION:

- **Rotate the wheel more than 1/4 and apply the back lock.**

3. Hold the end of the control valve and press 2 or 3 times, then press with a force of approx. 9.8 N (1 kgf). Then release the hand and temporarily tighten with lock nuts while control cable is free.
4. Then tighten the control cable lock nut to the specified torque below.

   Tightening torque:

   11.76 - 16.6 N•m (1.2 - 1.7 kgf-m)

CAUTION:

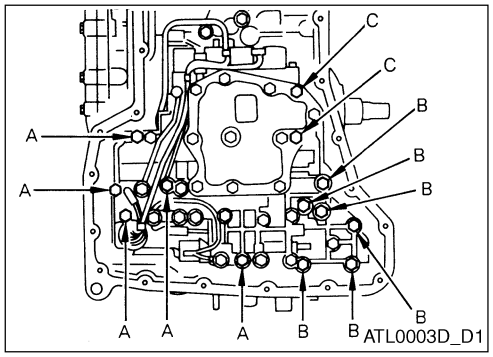
- **Hold the manual plate securely while tightening.**

Control Valve and Accumulator

Removal • Installation

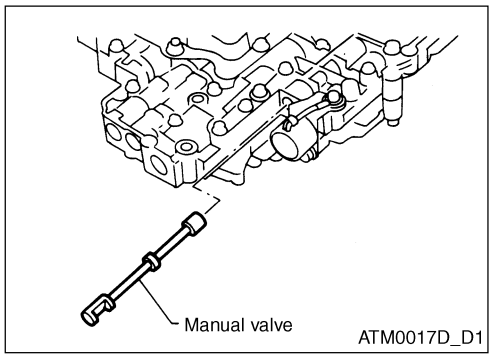
REMOVAL

1. Drain the ATF.
2. Remove the oil pan and gasket.
3. Disconnect the A/T terminal assembly middle connector.
4. Remove the stopper ring from the terminal and insert the terminal into the transaxle accelerator case with fingers.



5. Remove the control valve mounting bolt.

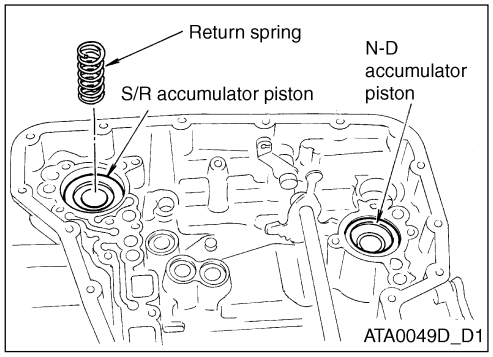
Bolt Symbol	A	B	C
Bolt length (mm)	40.0	33.0	43.5
Quantity	5	6	2



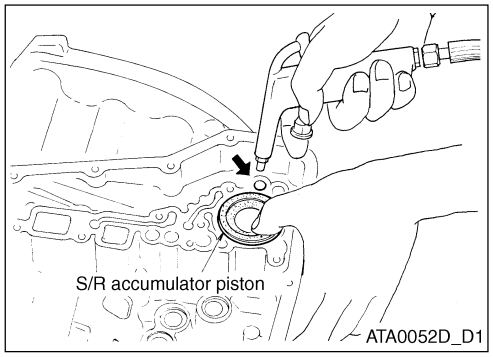
6. Remove the control valve assembly from the transaxle assembly.
7. Remove the manual valve from the control valve assembly.

CAUTION:

- **Be careful not to drop the manual valve.**



8. Remove the return springs from the S/R accumulator piston.

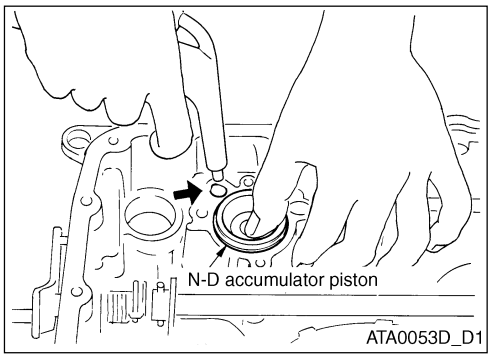


9. Blow the air into a hole as shown in the illustration and remove the S/R accumulator piston from the transaxle case.

CAUTION:

- **If air is blown too strongly, the accumulator piston and fluid may splatter. Thus slowly fill in the air by protecting them with paper towel.**
- **Cover the removed accumulator piston with a paper towel.**

10. Remove the O-ring from the S/R accumulator piston.



11. Blow the air into a hole as shown in the illustration and remove the N-D accumulator piston and return spring from the transaxle case.

CAUTION:

- **If air is blown too strongly, the accumulator piston and fluid may splatter. Thus slowly fill in the air by protecting them with paper towel.**
- **Cover the removed accumulator piston with a paper towel.**

12. Remove the O-ring from the N-D accumulator piston.

INSPECTION AFTER REMOVAL

- Inspect the valves and valve body mating surfaces for any damages or scratches.
- (Check the accumulator piston and transaxle case moving surfaces for any damages.)

INSTALLATION

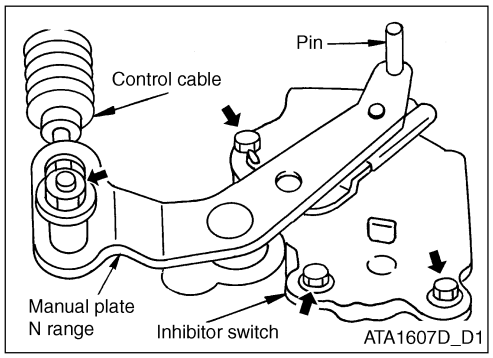
Install in the reverse order of removal by cautioning as below.

- Use a new O-ring during accumulator piston installation.
- Always replace the oil pan mounting bolts with new and tighten to the specified torque.

  Tightening torque:

  6.8 - 8.8 N•m (0.7 - 0.9 kgf-m)

Inhibitor Switch



Removal • Installation

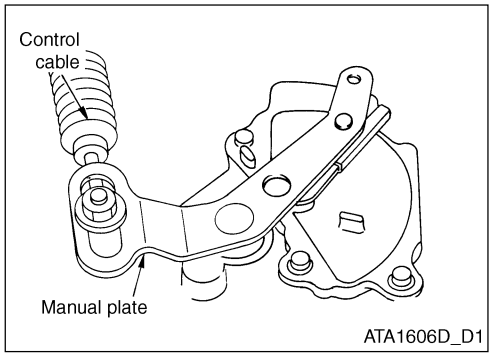
- During installation, insert the pin in the adjusting hole in inhibitor switch and manual plate. Adjust the position in N range.
- When installing the inhibitor switch, tighten to the specified torque.

  Specified torque:

  2.55 - 3.92 N•m (0.26 - 0.4 kgf-m)
- Check the continuity in the inhibitor switch after installation.

A/T Position Inspection

1. By operating the selector lever, be sure to get rid of “abnormal hardening”, “interference”, “noise” and “looseness”.
2. The selector lever must feel good and the locating position must be identical to the position indicator and transaxle assembly.
3. Each position should be moved as shown in the illustration.
4. When pressing the select button by not exerting too much force at the selector lever front and rear, there should be no interference in button operation.
5. The reverse lamp turns on in R range.
6. The engine starts in P or N ranges but not in other ranges.
7. The transaxle completely locks in P range.



A/T Position Adjustment

1. Release the lock nut that connecting the manual plate and the control valve so that the control valve moves freely.
2. Position the manual plate and interior selector lever to P range.

CAUTION:

- **Rotate the wheel more than 1/4 and apply the back lock.**

3. Hold the end of the control valve and press 2 or 3 times, then press with a force of approx. 9.8 N (1 kgf). Then release the hand and temporarily tighten with lock nuts while control cable is free.
4. Then tighten the control cable lock nuts to the specified torque.

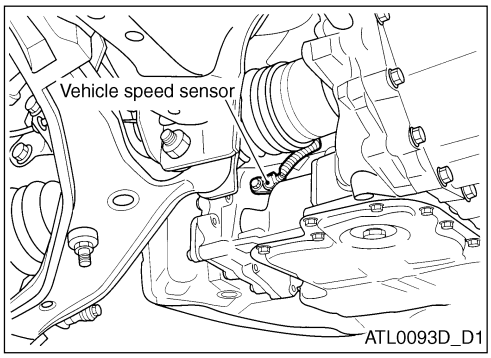
   Tightening torque:

   11.76 - 16.66 N•m (1.2 - 1.7 kgf-m)

CAUTION:

- **Hold the manual plate securely while tightening.**

Vehicle Speed Sensor 1 (Output Shaft Revolution Sensor)



Removal • Installation

REMOVAL

- Remove the vehicle speed sensor 1 (Output shaft revolution sensor).

INSTALLATION

- Install in the reverse order of removal by cautioning as below.

  Tightening torque:

  4.9 - 6.86 N•m (0.5 - 0.7 kgf-m)

CAUTION:

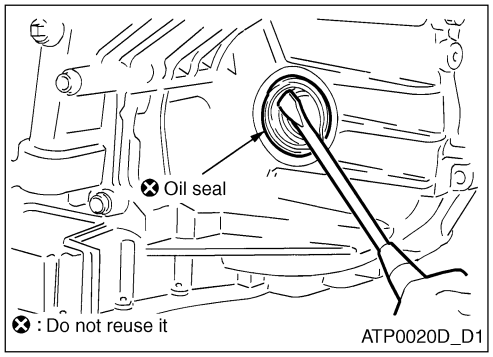
- **Do not reuse the O-ring. Replace it with new.**

Side Oil Seal

Removal • Installation

REMOVAL

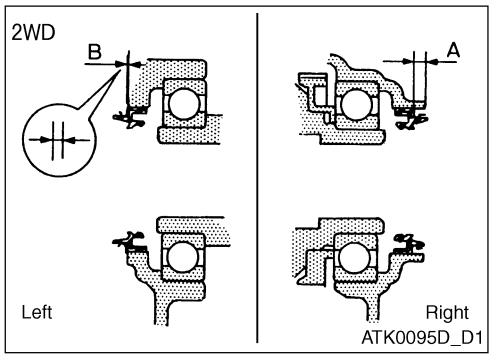
1. Remove the drive shaft from the transaxle assembly.



2. Remove the oil seal using a minus (-) screwdriver.

CAUTION:

- **Be careful not to damage the case surface while oil seal removing.**



INSTALLATION

1. Using a drift (special tool), hit the oil seal from the case surface to be the value A and B.

REFERENCE:

- **The value is based on the oil seal moving direction.**

Value A: 5.5 - 6.5 mm from the case surface
Value B: Within 0 ± 0.5 mm from the case surface

Drift

Application	Drift
Transaxle case side (Left)	KV311 03000
Converter housing side (Right)	ST35325000

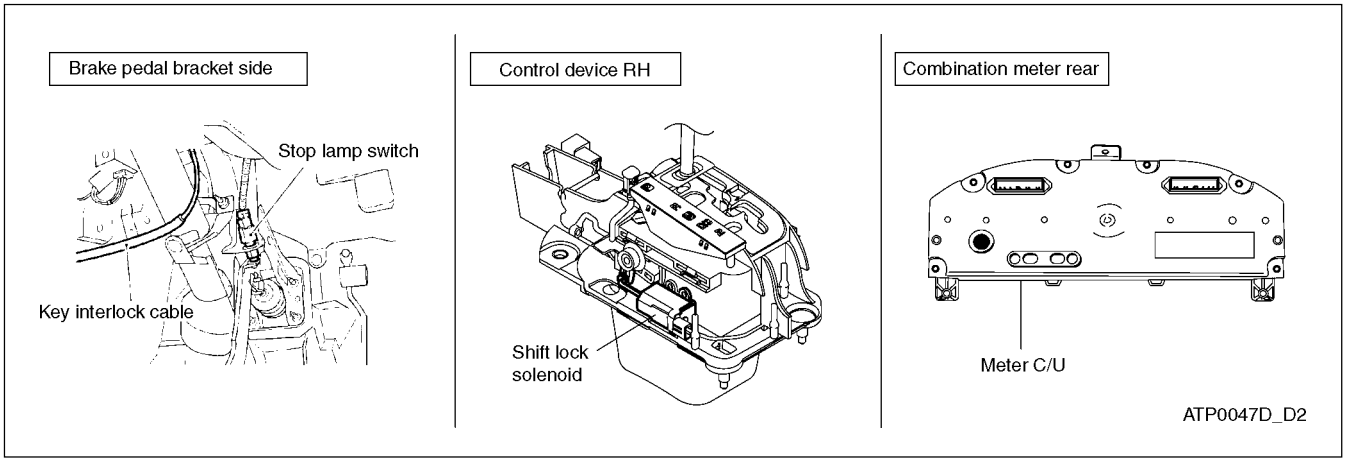
CAUTION:

- **Apply Genuine NISSAN ATF Matic Fluid D or equivalent at the oil seal surface during oil seal installation.**
- **Do not reuse the oil seal. Replace it with new.**

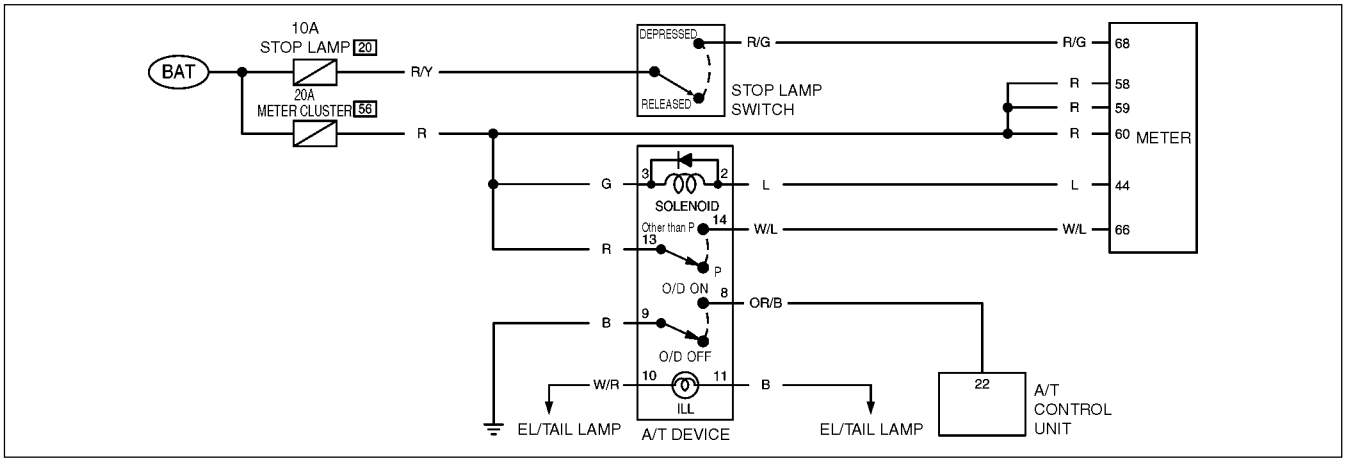
2. Install in the reverse order of removal and inspect the fluid level after installation.

Shift Lock System

Components Location



Shift Lock Circuit Diagram



1. P-lock Function

   It is a function that inhibits the gear shift from “P” to other positions unless depressing the brake pedal and the ignition switch ON.

2. N-lock Function

   The gear cannot be shifted from “N” to “R” when the vehicle speed exceeds 14 km/h. The gear can be shifted from “N” to “R” when the vehicle speed is less than 8 km/h.

3. 3-minute Timer Function

   The gear can be shifted from “N” to “P” within 3 minutes after turning the ignition switch “OFF”.

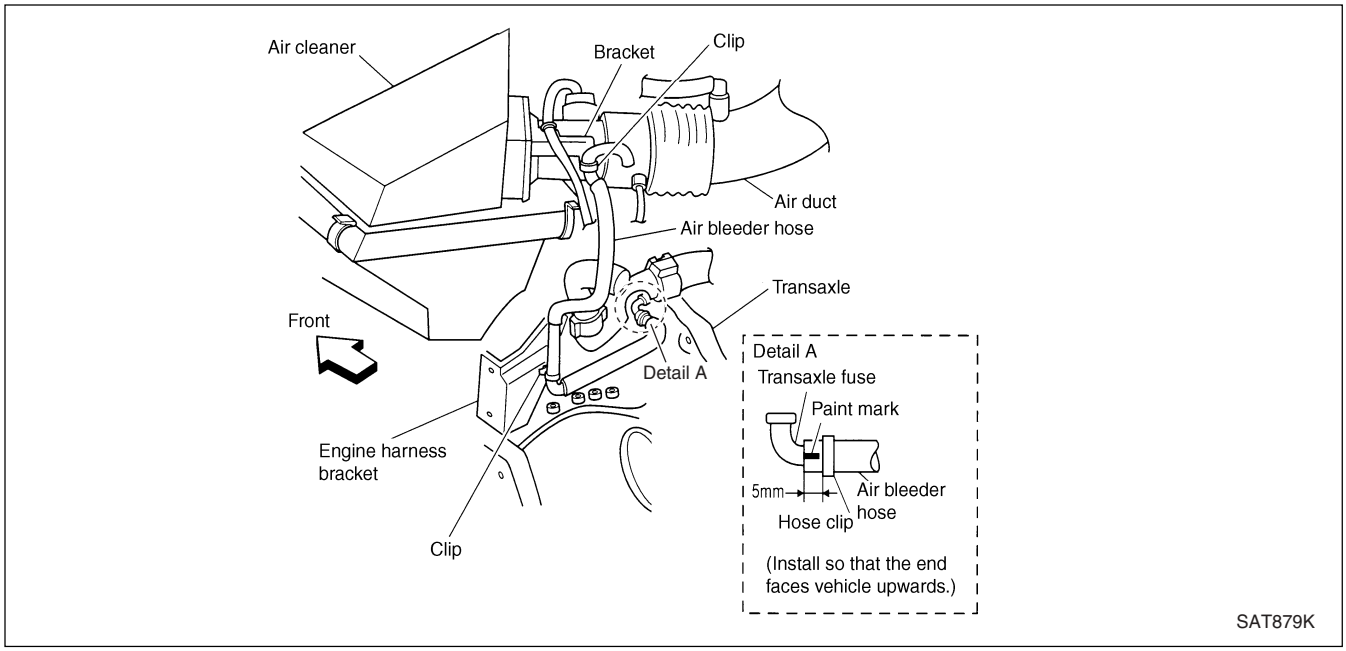
CAUTION:

The “N” position includes “N”, “D”, “3”, “2” and “1”.

Air Bleeder Hose

Removal • Installation

Refer to the illustration for air bleeder hose removal.

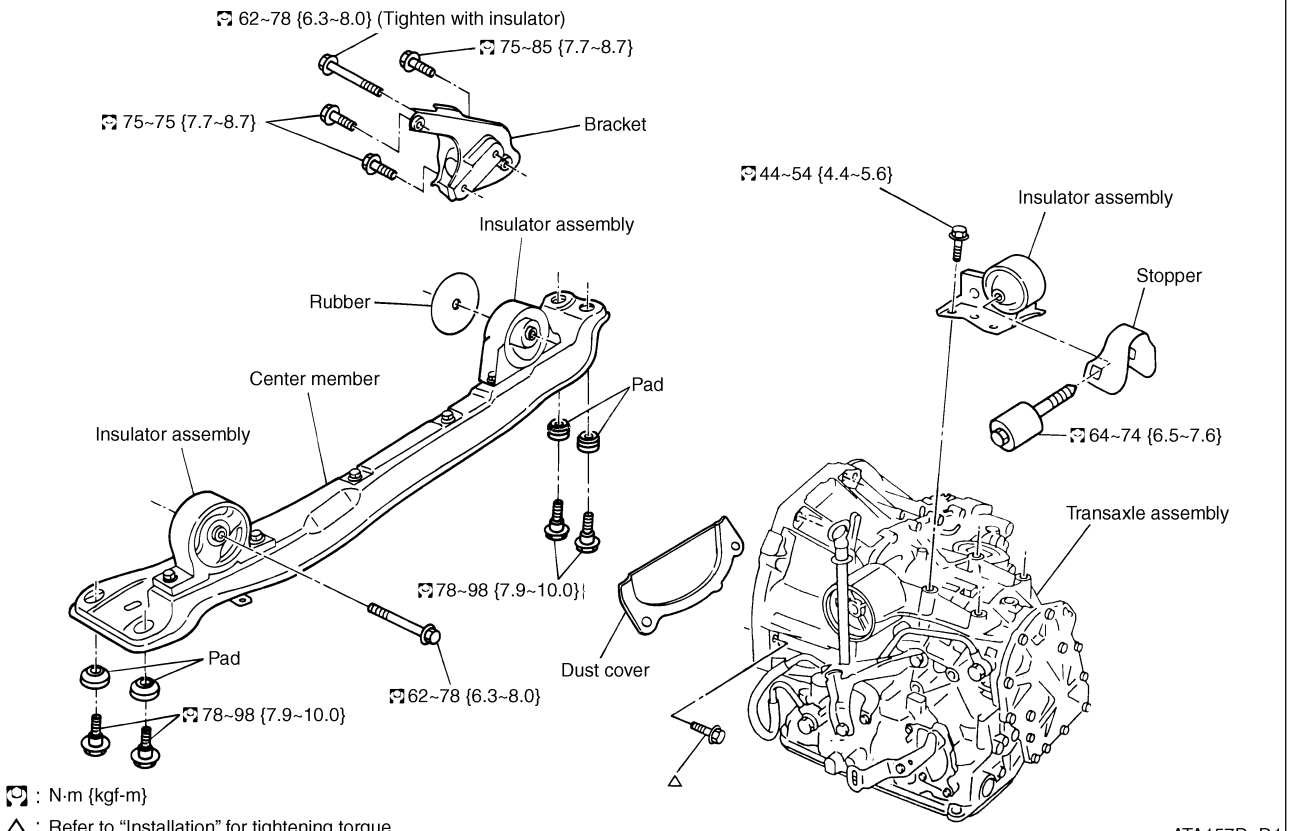


CAUTION:

- **Be sure not to have any disconnections, crushing or clogging during air bleeder hose installation.**
- **Insert the hose securely until it touches the R section on the transaxle fuse.**

Transaxle Assembly

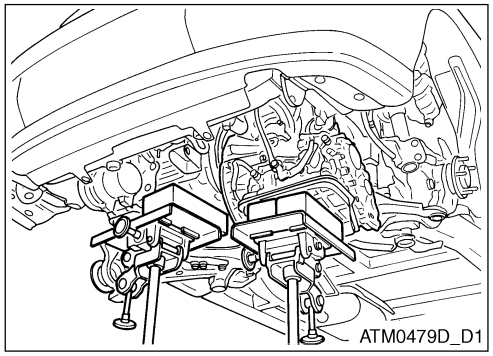
Removal from the Vehicle



Removal • Installation

REMOVAL

1. Remove the battery, air cleaner and air duct.
2. Remove the air bleeder hose.
3. Remove the inhibitor switch, control valve, vehicle speed sensor for the speedometer, vehicle speed sensor 1 and ground connectors and harnesses.
4. Remove the control cable from the transaxle.
5. Remove the front exhaust tube and drive shaft.
6. Remove the oil cooler hose.
7. Remove the starter motor.
8. Set the transmission jack at the transaxle.


ATM0479D_D1

CAUTION:

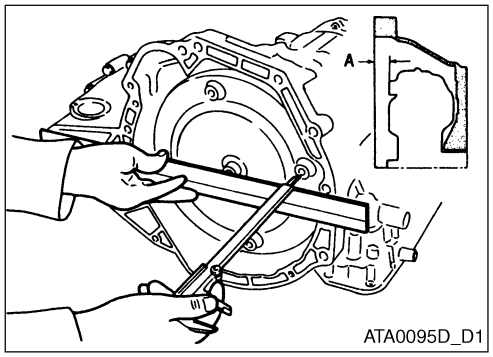
- **Be careful not to touch the drain plug while setting the transmission jack.**

9. Remove the center member, engine insulator and engine mount bracket.
   - Refer to “Removal • Installation” (QG16: EM-56).
10. Remove the dust cover from the converter housing.
11. Rotate the crankshaft and remove the 4 mounting holders in the drive plate and torque converter.

CAUTION:

- **When rotating the crankshaft, rotate towards the right when viewed from the front of the vehicle.**

12. Set the transmission jack to the engine.
13. Remove the transaxle mounting bolts from the engine.
14. Remove the transaxle from the vehicle.



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INSPECTION

Torque converter installation inspection

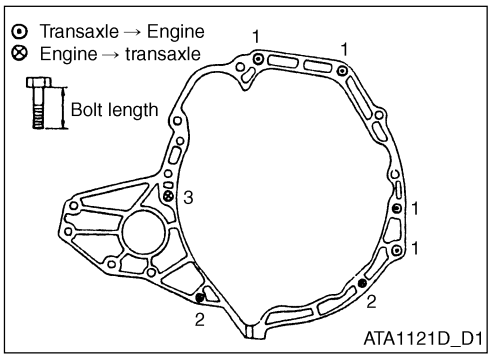
- After inserting the torque converter into the transaxle, inspect if the clearance A is within the standard value.

  Clearance A: More than 21.1 mm

INSTALLATION

Install in the reverse order of removal by cautioning as below.

- While installing the transaxle to the engine, tighten the mounting bolts as specified.



Bolt No.	1	2	3
Quantity	4	2	1
Bolt length (mm)	50	25	30
Tightening torque (N•m {kgf-m})	31 - 41 (3.1 - 4.1)	16 - 20 (1.6 - 2.1)	31 - 40 (3.1 - 4.1)

※ : Tighten the bolt No. 2 with gusset.

Engine gusset cylinder block side mounting bolts

Vehicle front (engine right) gusset mounting bolts

Bolt length: 20 mm

Tightening torque:

31 - 40 N•m (3.1 - 4.1 kgf-m)

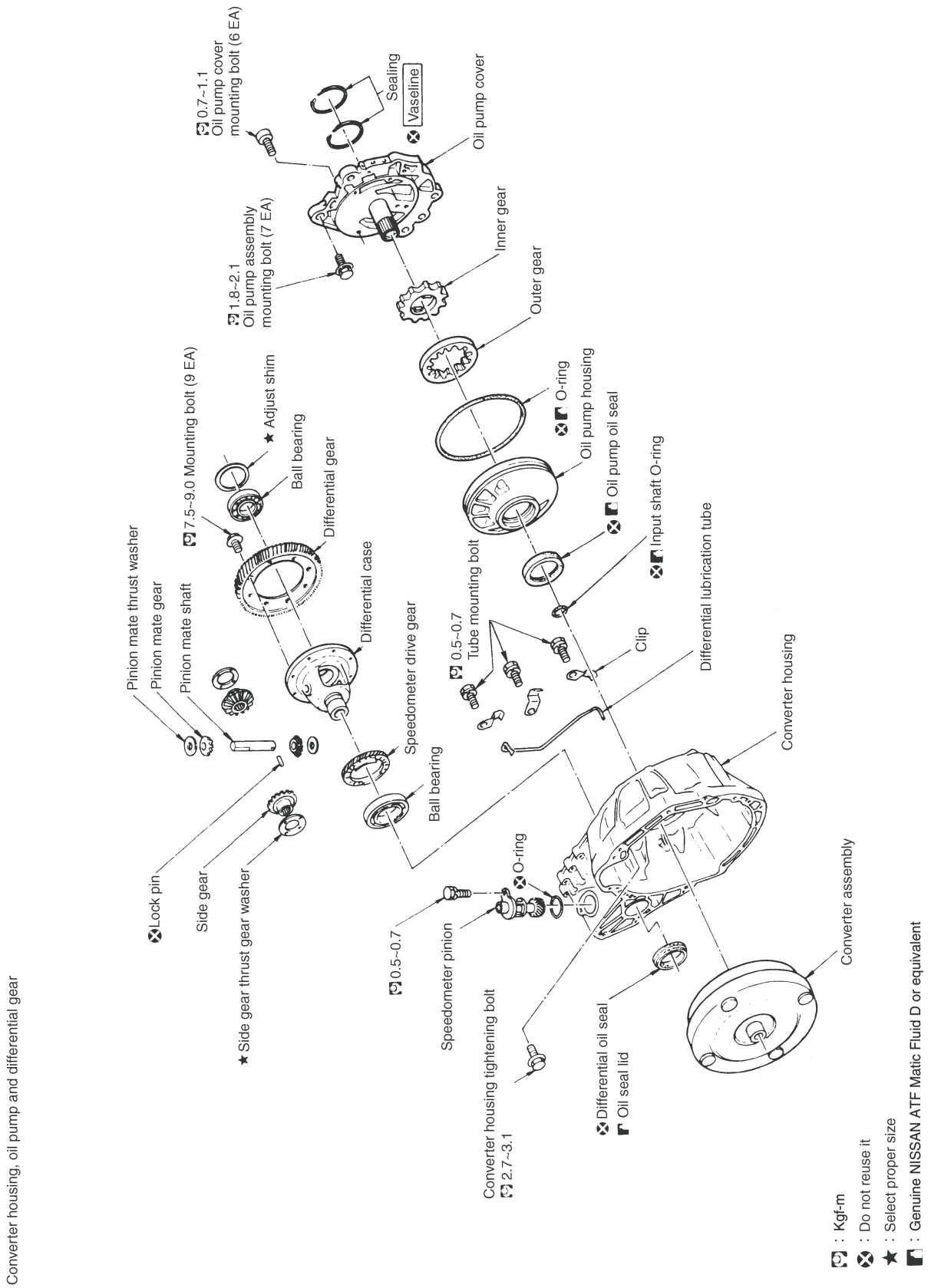
Vehicle rear (engine left) gusset mounting bolts

Bolt length: 16 mm

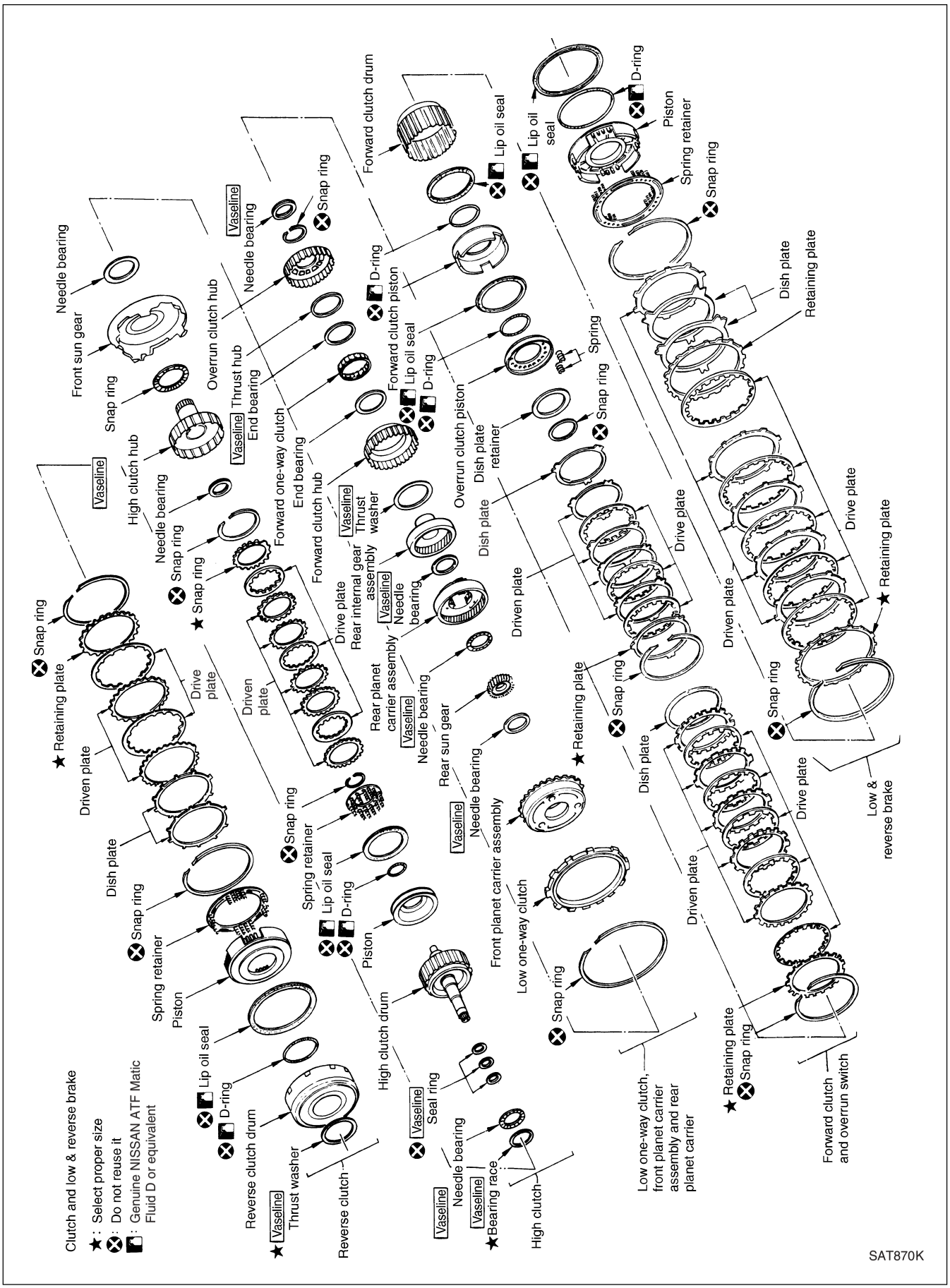
Tightening torque:

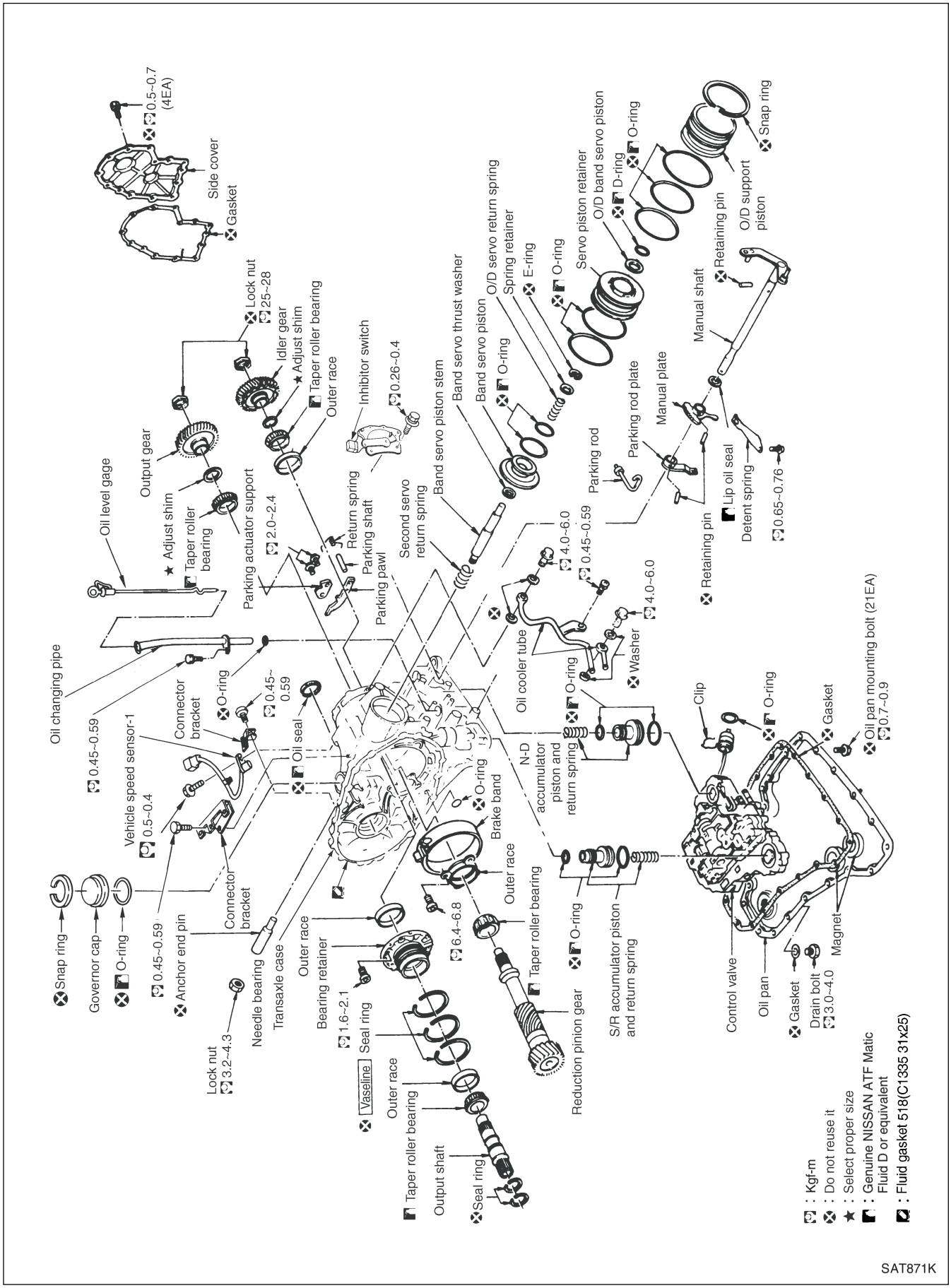
16 - 20 N•m (1.6 - 2.1 kgf-m)

Standard Model

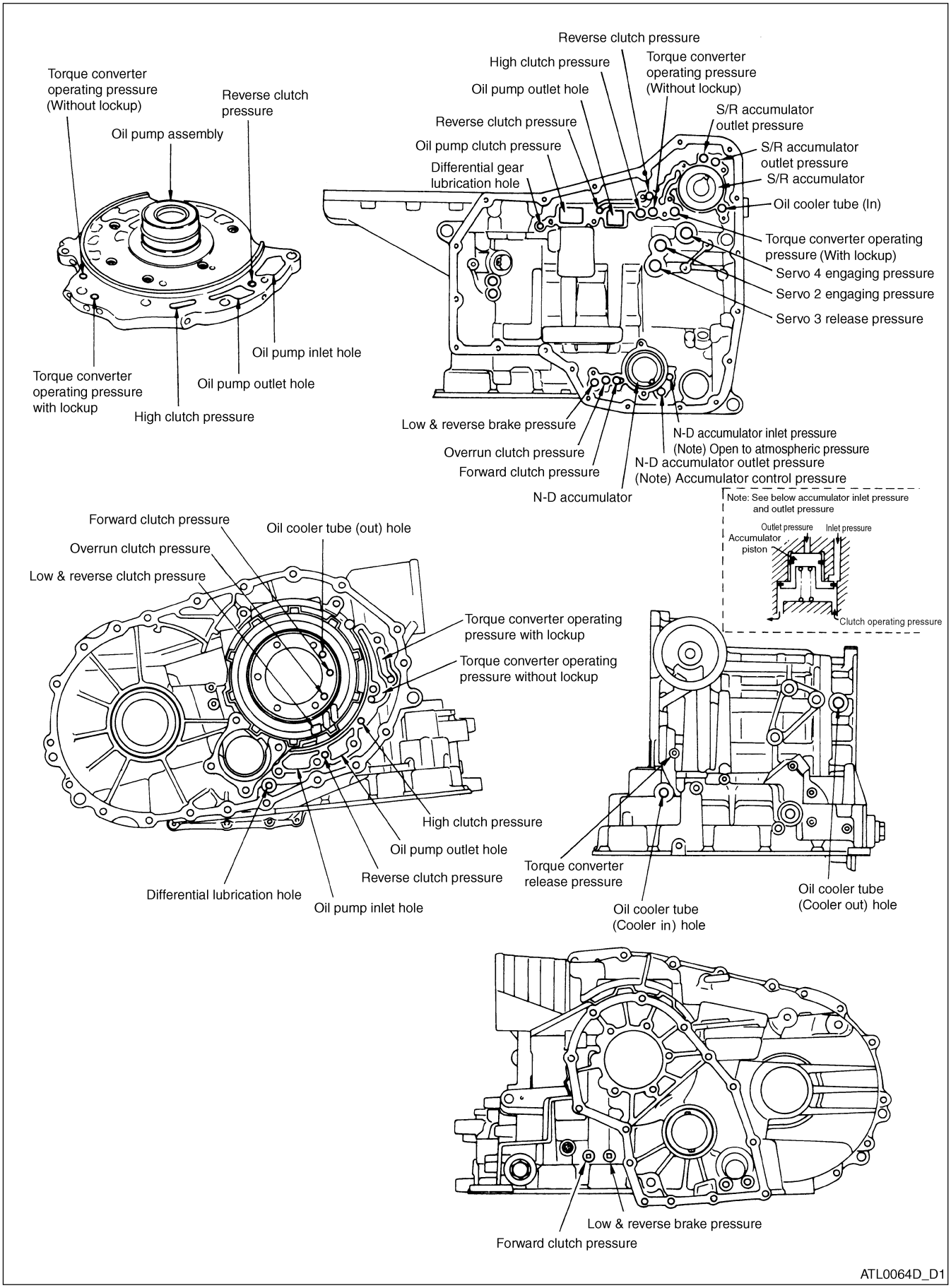


Standard Model




Side cover
Gasket
0.5~0.7 (4EA)
Lock nut
25~28
Idler gear
Adjust shim
Taper roller bearing
Outer race
Inhibitor switch
0.26~0.4
Output gear
Adjust shim
Taper roller bearing
Oil level gage
Parking actuator support
2.0~2.4
Return spring
Parking shaft
Parking pawl
Second servo return spring
Band servo piston stem
Band servo thrust washer
Band servo piston
O-ring
O/D servo return spring
Spring retainer
E-ring
O-ring
Servo piston retainer
O/D band servo piston
D-ring
O-ring
Snap ring
O/D support piston
Retaining pin
Manual shaft
Manual plate
Parking rod plate
Parking rod
Lip oil seal
Detent spring
0.65~0.76
Retaining pin
Oil changing pipe
0.45~0.59
Vehicle speed sensor-1
0.5~0.4
Connector bracket
O-ring
0.45~0.59
Oil seal
Oil cooler tube
4.0~6.0
0.45~0.59
Washer
4.0~6.0
O-ring
N-D accumulator piston and return spring
Clip
O-ring
Gasket
Oil pan mounting bolt (21EA)
0.7~0.9
Snap ring
Governor cap
O-ring
0.45~0.59
Anchor end pin
Connector bracket
Lock nut
3.2~4.3
Needle bearing
Transaxle case
Outer race
Bearing retainer
1.6~2.1
Seal ring
Vaseline
Outer race
Taper roller bearing
Output shaft
Seal ring
6.4~6.8
O-ring
Brake band
Outer race
Taper roller bearing
O-ring
Reduction pinion gear
S/R accumulator piston and return spring
Control valve
Oil pan
Gasket
Drain bolt
3.0~4.0
Magnet
: Kgf-m
: Do not reuse it
: Select proper size
: Genuine NISSAN ATF Matic Fluid D or equivalent
: Fluid gasket 518(C1335 31x25)
SAT871K

Fluid Pressure Circuit Hole



Adjust Shim, Neutral Bearing, Thrust Washer and Snap Ring Location - Standard Model

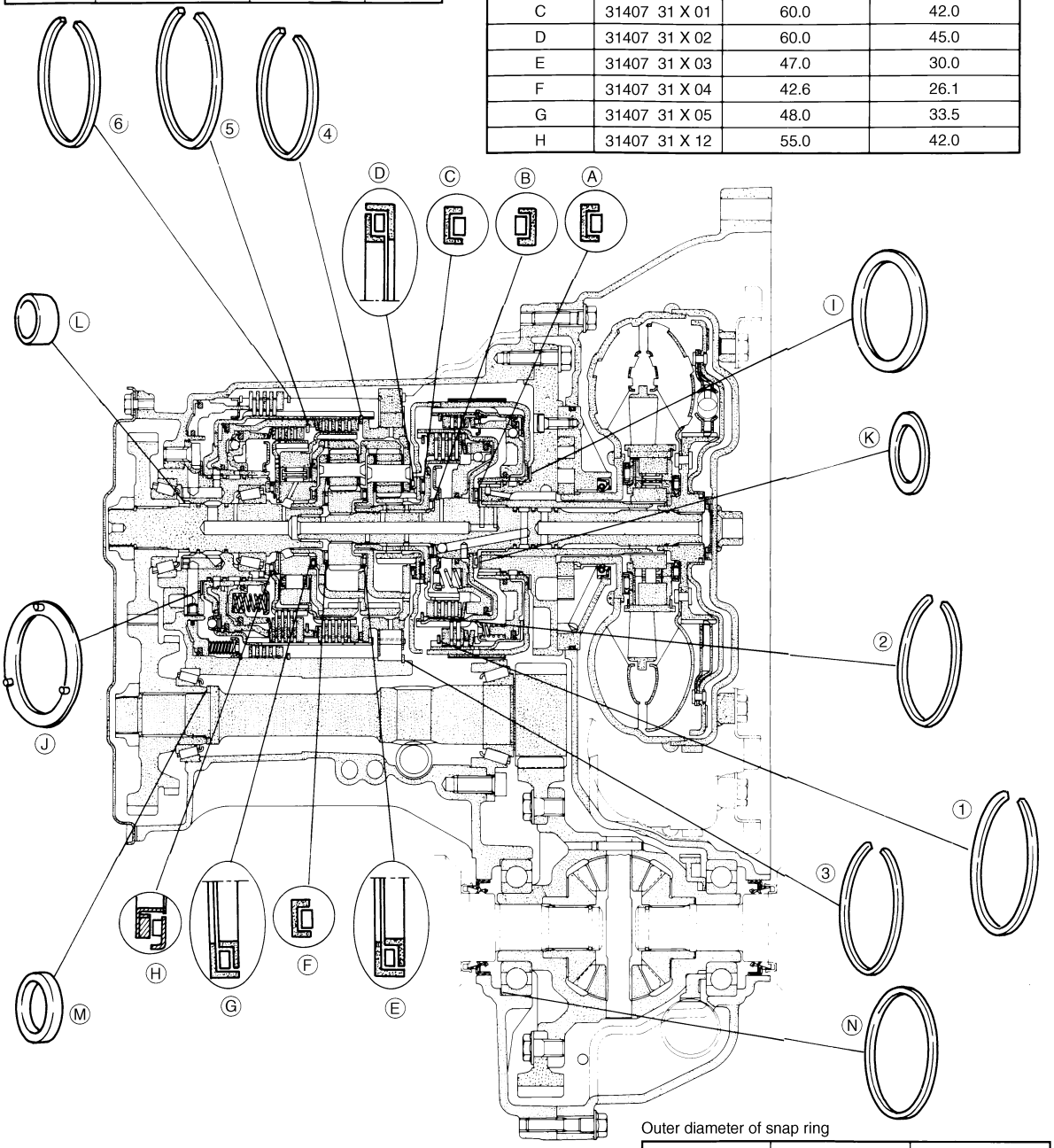
REFERENCE:

- **The vehicle with QG15DE engine is equipped with standard model.**

Item No.	Part No.	Outer Diameter: mm	Color
Ⓘ	★31508 31 X 10~	72.0	Black
Ⓙ	31508 31 X 09	78.5	

Inner diameter & outer diameter of neutral bearing

Item No.	Part No.	Outer Diameter: mm	Inner Diameter: mm
A	31407 31 X 10	47.0	32.0
B	31407 31 X 11	35.0	20.1
C	31407 31 X 01	60.0	42.0
D	31407 31 X 02	60.0	45.0
E	31407 31 X 03	47.0	30.0
F	31407 31 X 04	42.6	26.1
G	31407 31 X 05	48.0	33.5
H	31407 31 X 12	55.0	42.0



Bearing race and inner diameter & outer diameter of adjuster

Item No.	Part No.	Outer Diameter: mm	Inner Diameter: mm
Ⓚ	★31435 31 X 01~	48.0	33.0
Ⓛ	★31437 31 X 16~	29.0	25.0
Ⓜ	★31438 31 X 16~	34.3	26.0
Ⓝ	★38457 M8001~	79.5	72.0

Outer diameter of snap ring

Item No.	Outer Diameter: mm	Inner Diameter: mm
①	31506 31 X 06	142.0
②	31506 31 X 08	113.0
③	31506 31 X 11	162.4
④	31506 31 X 05	135.4
⑤	31506 31 X 03	126.0
⑥	31506 31 X 16	162.3

★ : Select proper size

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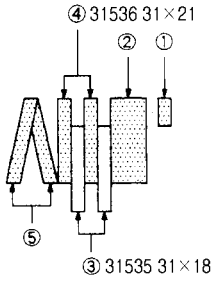
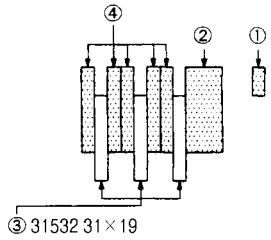
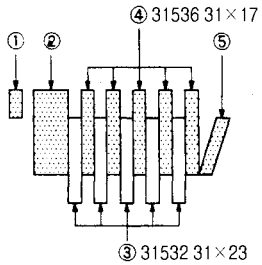
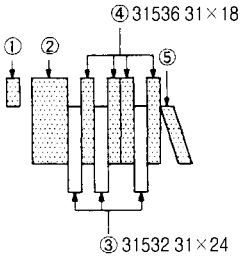
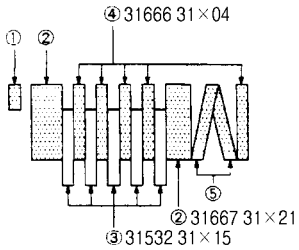
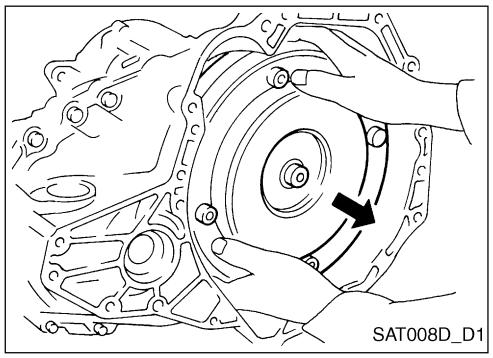
Clutch and Brake Specification

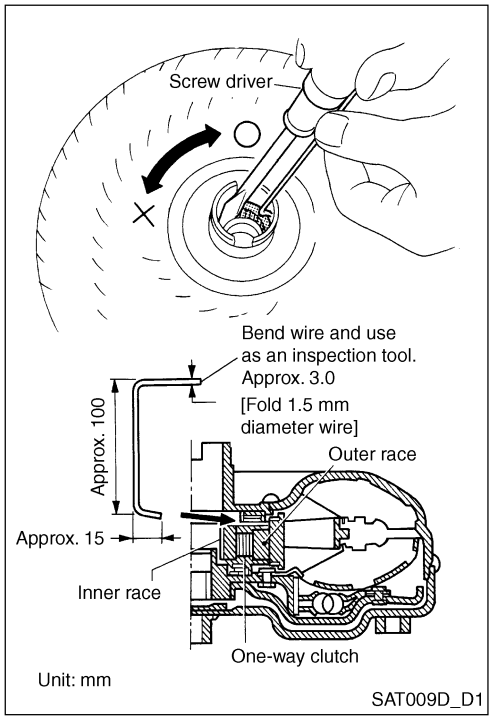
Reverse Clutch		High Clutch		Forward Clutch	
Overrun Clutch		Low & Reverse Clutch		① Snap ring ② Retaining plate ③ Drive plate ④ Driven plate ⑤ Dish plate ※ (Drive/Driven) SCIA0137J_D1	

Disassembly

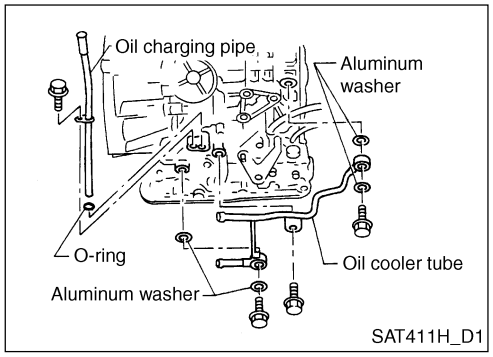


DISASSEMBLY

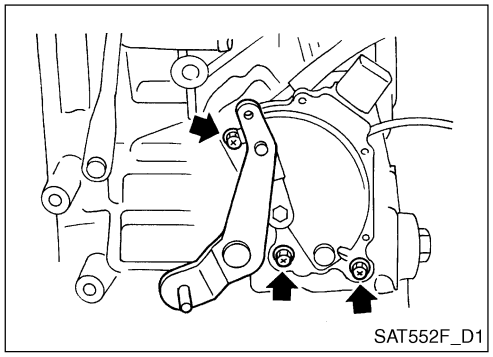
1. Drain the ATF.
2. Remove the torque converter.



3. Inspect the one-way clutch of the torque converter using the inspection tool as in the illustration.
   a. Insert the inspection tool to the groove in the bearing support that is integrated in the one-way clutch out race.
   b. Hold the bearing support with the inspection tool and rotate the one-way clutch spline with a minus (-) screwdriver.
   c. Inspect if the inner race rotates clockwise only. If not, replace the torque converter assembly.

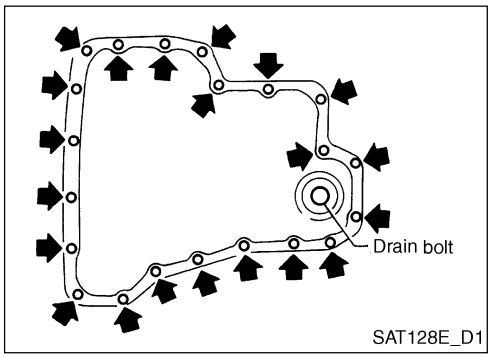


4. Remove the oil charging pipe and oil cooler tube.

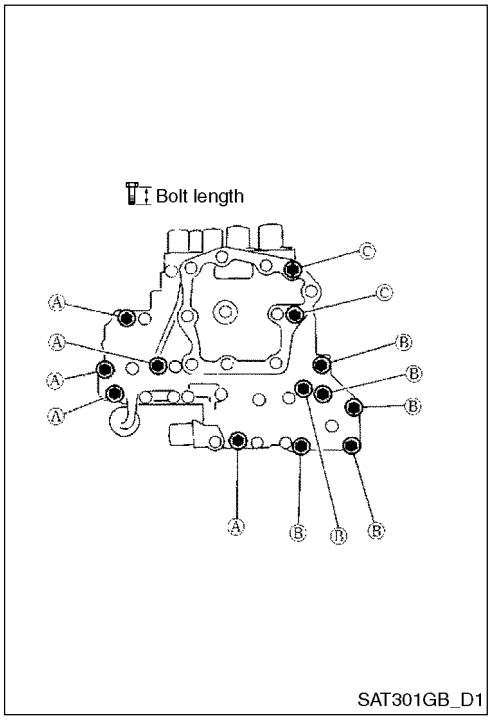


5. Place the manual lever to P.
6. Remove the inhibitor switch.

Disassembly (Continued)

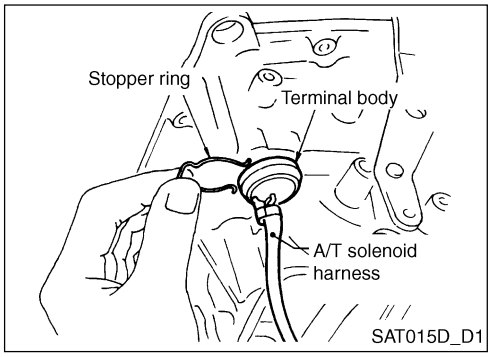


7. Remove the oil pan and gasket.
   - Do not reuse the oil pan bolt.
8. Inspect is there are any foreign particles that may induce trouble in the oil pan. If the ATF color is very dark, or has burnt smell or contains foreign particles, replace the frictional component (clutch and band). The gluey varnishing (hard to wipe out) is formed. The varnish sticks to the valve, servo and the clutch and may disturb the pump to generate pressure.

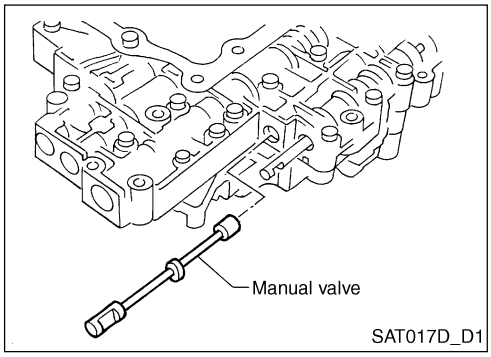


9. Remove the control valve assembly following the below order.
   a. Remove the control valve assembly mounting bolt “A”, “B” and “C”.

Bolt symbol	A	B	C
Bolt length	40	33	43.5
Bolt quantity	5	6	2

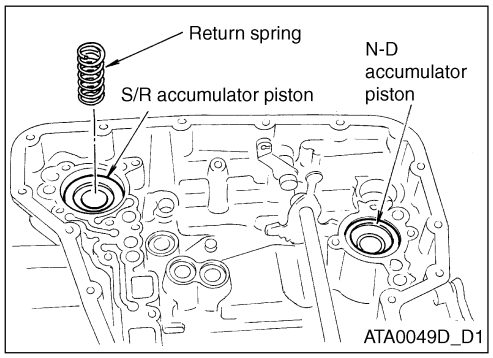


   b. Remove the stopper ring from the terminal body.
   c. Push the terminal body inside the transaxle case and pull out the solenoid harness.

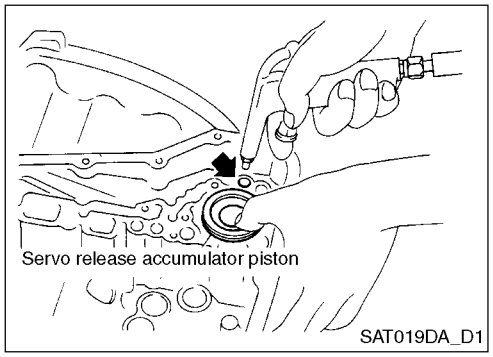


10. Remove the manual valve from the control valve assembly.

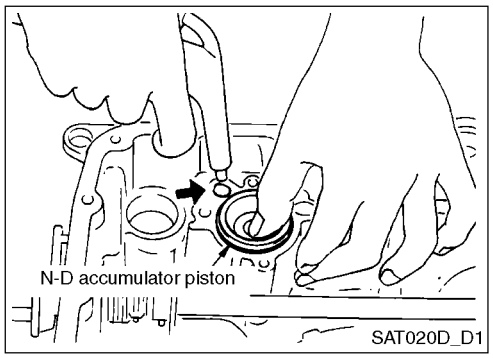
Disassembly (Continued)



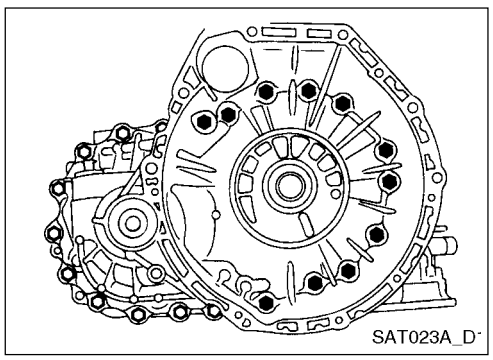
11. Remove the return spring from the servo release accumulator piston.



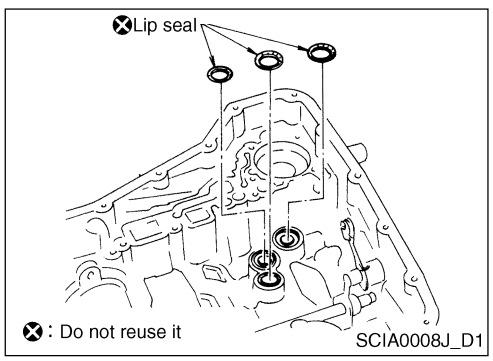
12. Disconnect the servo release accumulator piston with compressed air.
13. Remove the O-ring from the servo release accumulator piston.



14. Remove the N-D accumulator piston and return spring with compressed air.
15. Remove the O-ring from the N-D accumulator piston.

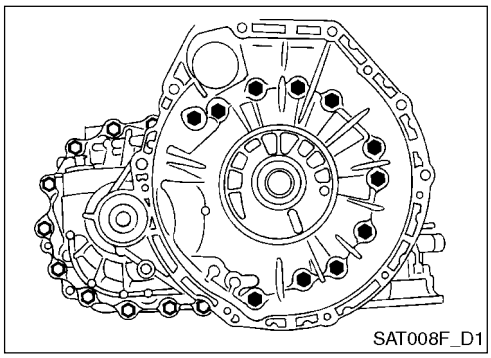


16. Inspect for any damages in the contact surfaces of accumulator piston and transaxle case.
17. Inspect for any damages and free height of accumulator return spring.

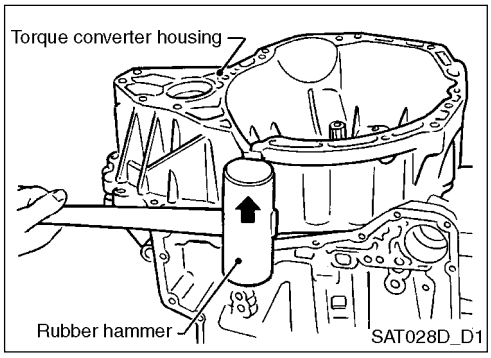


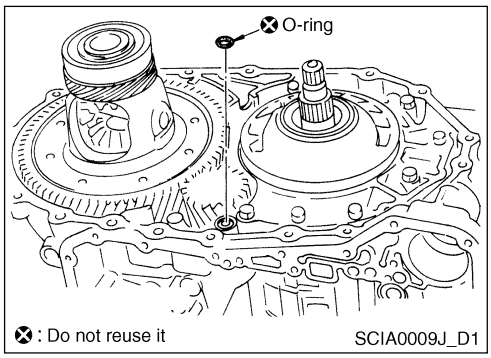
18. Remove the lip seal from the band servo oil port.

Disassembly (Continued)

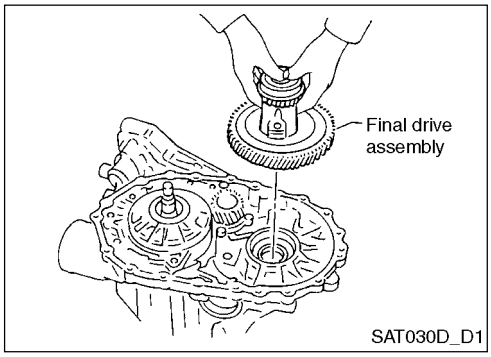


19. Remove the torque converter housing according to following order.
    a. Remove the torque converter housing mounting bolts.
    b. Remove the torque converter housing by lightly tapping it.

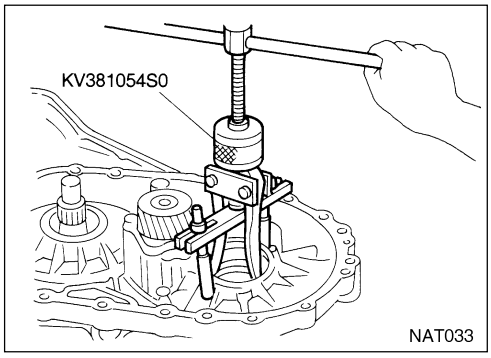




    c. Remove the O-ring from the differential oil port.

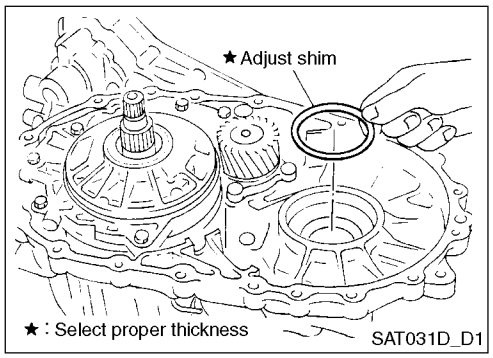


20. Remove the final drive assembly from the transaxle case.

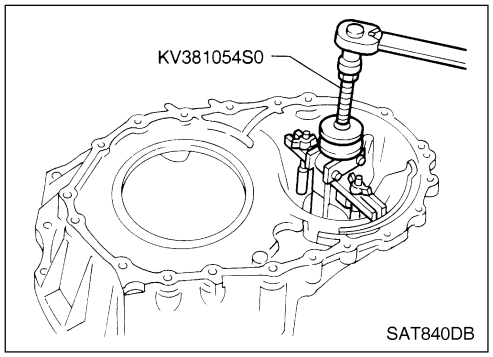


21. Remove the differential side bearing outer race from the transaxle case.

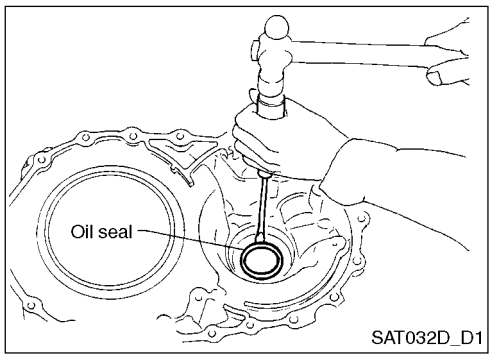
Disassembly (Continued)



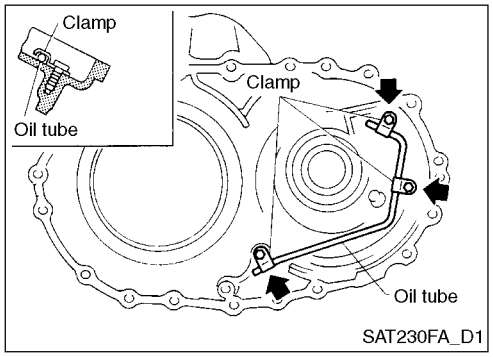
22. Remove the differential side bearing adjust shim from the transaxle case.



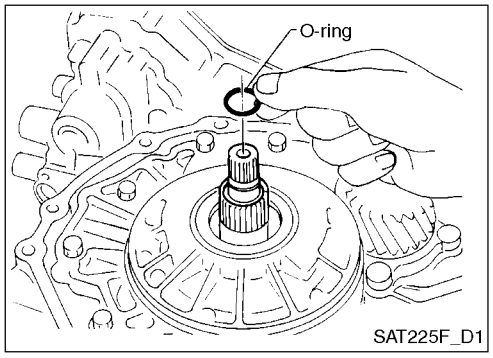
23. Remove the converter housing differential side bearing outer race.



24. Remove the oil seal from the converter housing using a screwdriver.
    - Be careful not to damage the case.

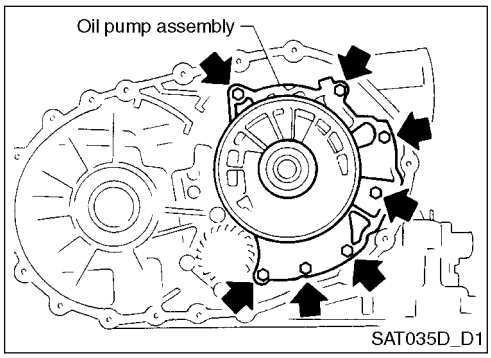


25. Remove the oil tube from the converter housing.

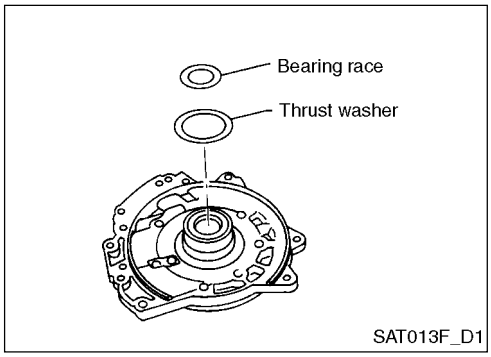


26. Remove the oil pump according to following order.
    a. Remove the O-ring from the input shaft.

Disassembly (Continued)

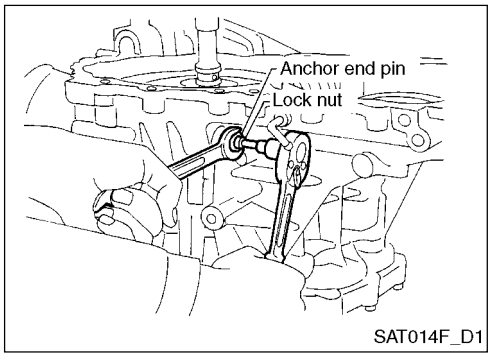


b. Remove the oil pump assembly, baffle plate and gasket from the transaxle case.

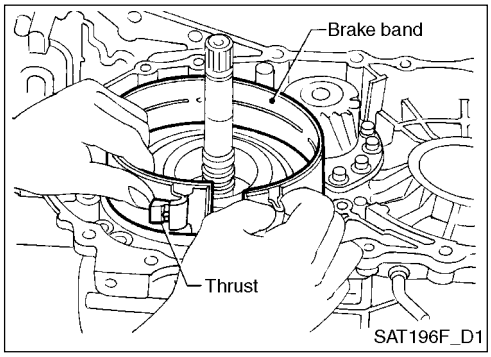


c. Remove the bearing race and thrust washer from the oil pump assembly.

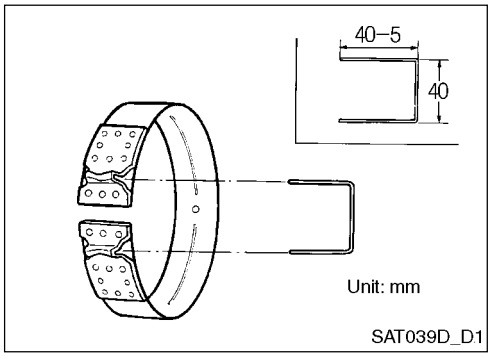
27. Remove the brake band according to following order.



a. Release the band servo anchor end pin rearwards by loosening the lock nut.



b. Remove the thrust and brake band from the transaxle case.

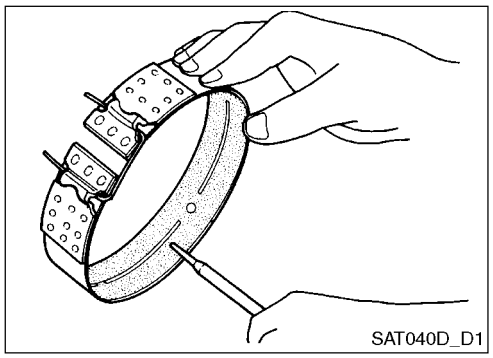


CAUTION:

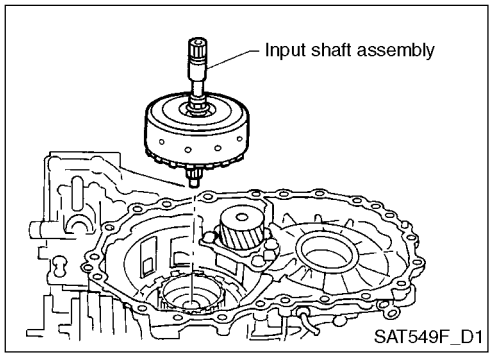
- **Do not stretch the flexible band to prevent the brake linings from cracks or peels. Hold the brake band with a clip as in the illustration during removal.**

  Place the clip to its original position after removing the brake band.

Disassembly (Continued)

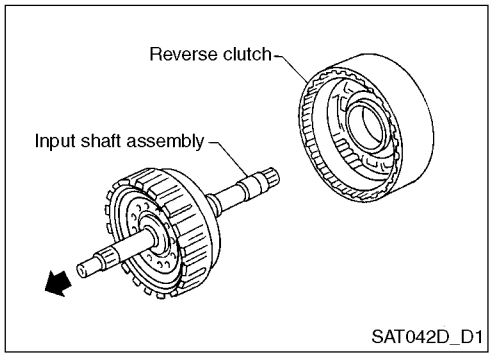

SAT040D_D1

c. Inspect the brake band surface for any damages, cracks, wear and burns.



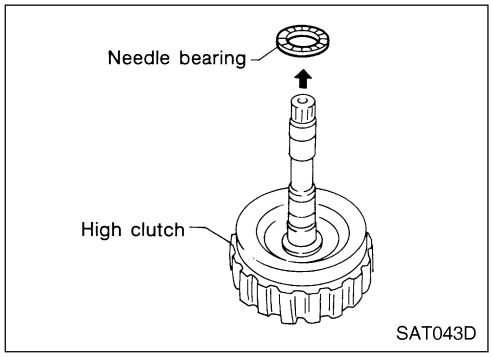
SAT549F_D1

28. Remove the input shaft assembly (High clutch) and reverse clutch according to following order.
    a. Remove the input shaft assembly (High clutch) with the reverse clutch.



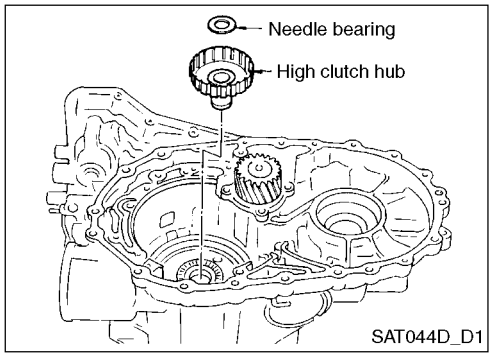
SAT042D_D1

b. Remove the input shaft assembly (High clutch) from the reverse clutch.



SAT043D

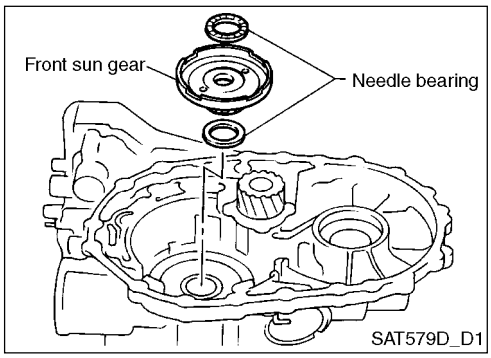
c. Disassemble the needle bearing from the high clutch drum and inspect for any damages or wear.



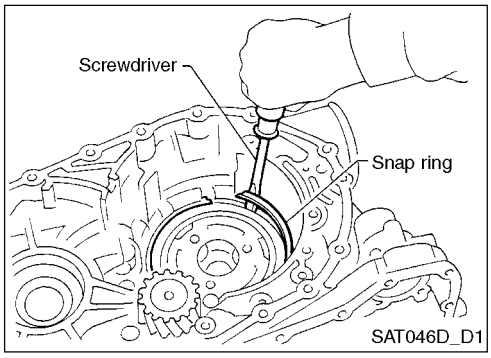
SAT044D_D1

d. Remove the high clutch hub and needle bearing from the transaxle case and inspect the high clutch hub and needle bearing for any wear or damages.

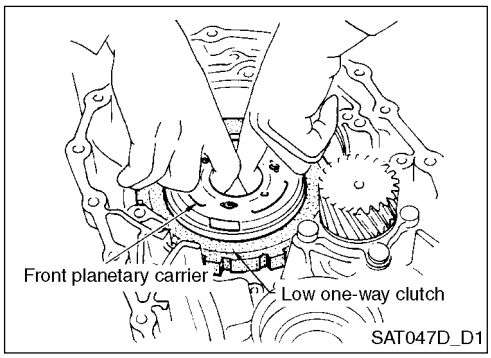
Disassembly (Continued)



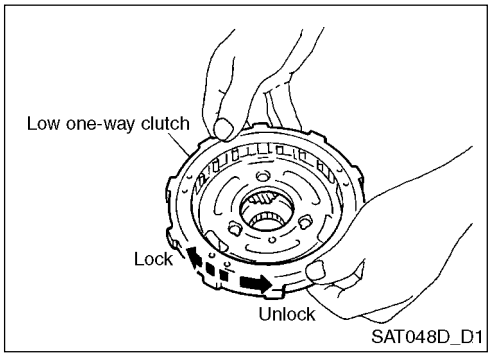
29. Remove the front sun gear and needle bearing from the transaxle case and inspect the front sun gear and needle bearing for any damages or wear.



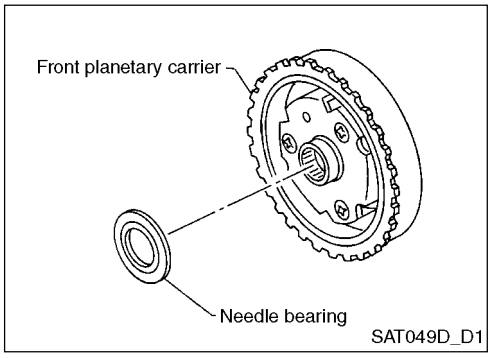
30. Remove the snap ring using a minus (-) screwdriver and remove the low one-way clutch and front planetary carrier assembly according to following order.



a. Remove the front planetary carrier with the low one-way clutch.

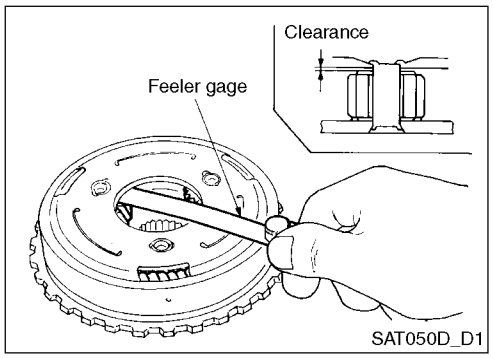


b. Inspect if the low one-way clutch rotates in the arrow direction and locks in the opposite direction.
c. Remove the low one-way clutch from the front planetary carrier by rotating in the loosening direction.



31. Remove the needle bearing from the front planetary carrier.

Disassembly (Continued)



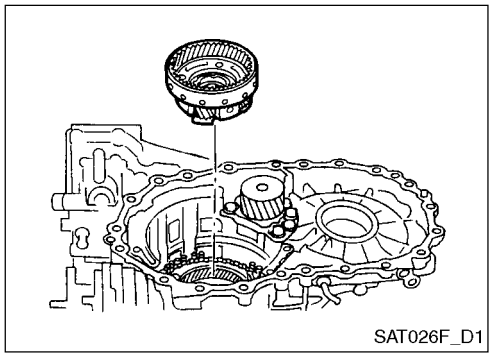
a. Inspect the one-way clutch and needle bearing for any damages or wear using the front planetary carrier.

b. Measure the clearance between the pinion washer and planetary carrier using a feeler gage.

Specified value:
0.15 - 0.70 mm (0.0059 - 0.0276 in)

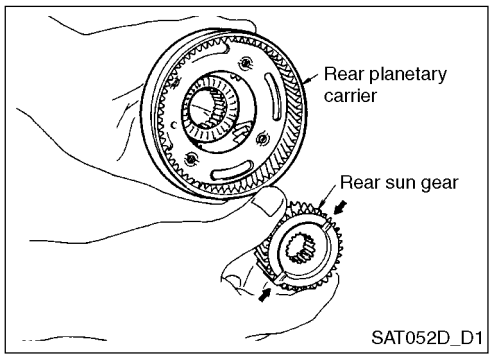
Allowed value:
0.80 mm (0.0315 in)

If the clearance exceeds the allowed value, replace the front planetary carrier.

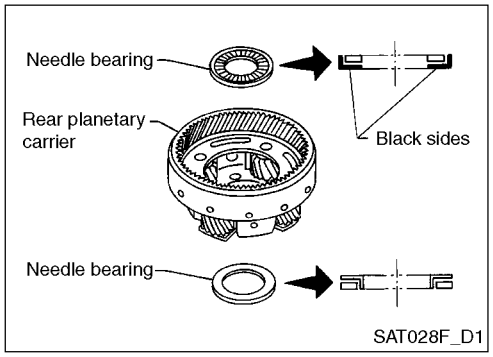


32. Remove the rear sun gear and rear planetary carrier assembly using the following procedure.

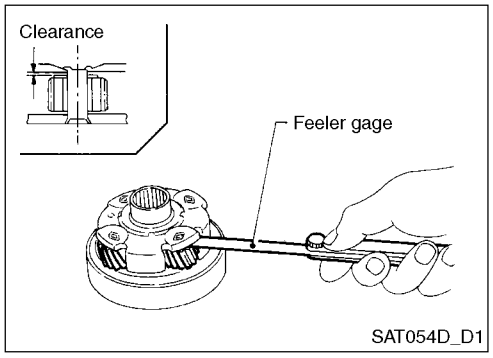
a. Remove the rear planetary carrier assembly from the transaxle carrier.



b. Remove the rear sun gear from the rear planetary carrier.



c. Remove the needle bearing from the rear planetary carrier assembly.

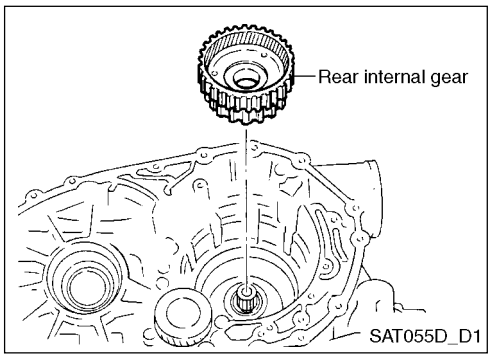


d. Inspect the rear planetary carrier, rear sun gear and needle bearing for any wear and damages.

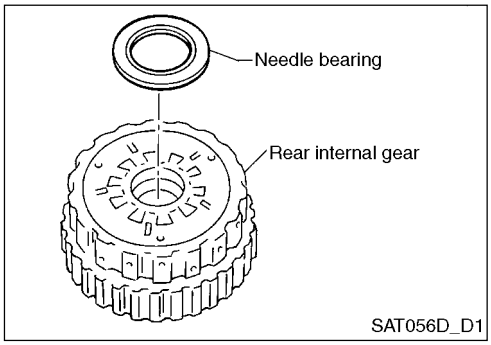
e. Measure the clearance between the pinion washer and rear planetary carrier.

If the clearance exceeds the allowed value, replace the rear planetary carrier.

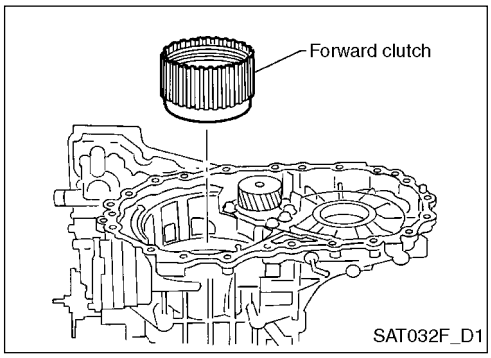
Disassembly (Continued)



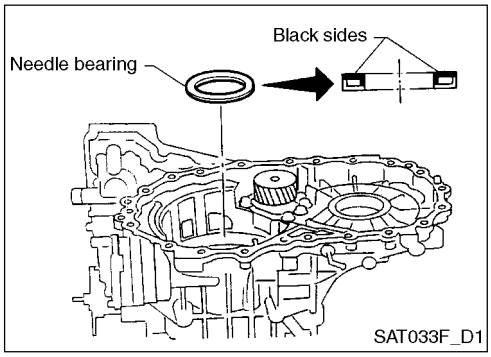
33. Remove the rear internal gear from the transaxle case.



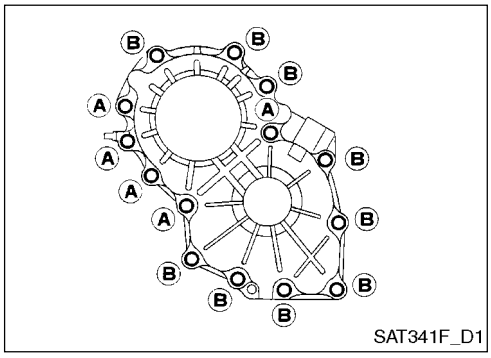
34. Remove the rear internal gear and forward clutch hub from the transaxle case.
35. Remove the needle bearing from the rear internal gear.
36. Inspect the needle bearing for any damages and wear.



37. Remove the forward clutch assembly from the transaxle case.

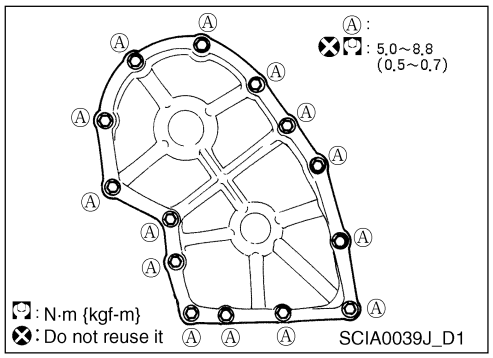


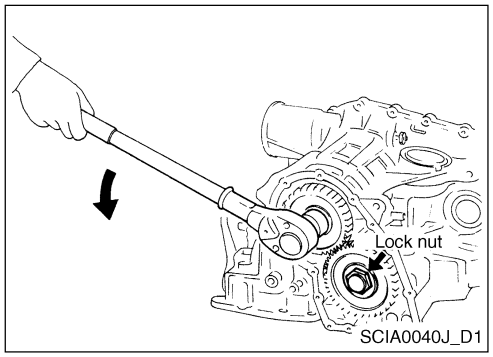
38. Remove the needle bearing from the transaxle case.



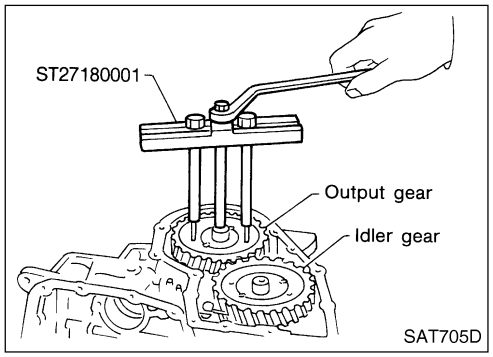
39. Remove the output shaft assembly according to following order.
    a. Remove the side cover bolt.
        - Do not mix the bolts “A” and “B” each other.
        - Always replace the “A” bolt with seal ring bolt.

Disassembly (Continued)

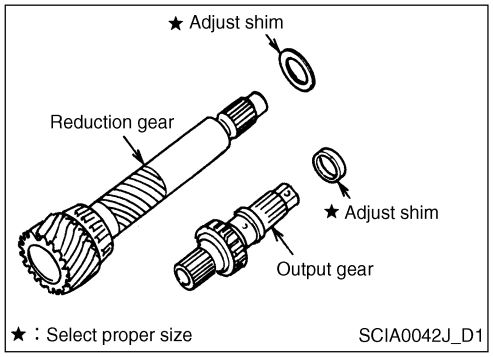




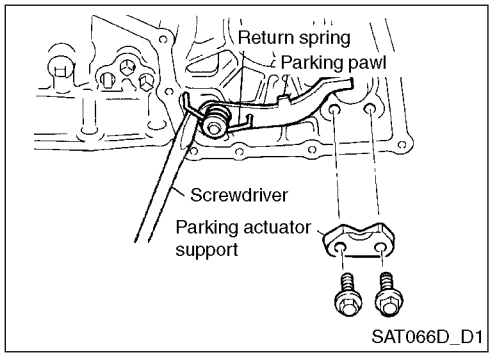
40. Remove the output shaft and reduction pinion gear according to following order.
    a. Put the manual shaft at P range and hold the idle gear using a parking pawl.
    b. Remove the output gear and idle gear lock nut.



    c. Remove the output gear and idle gear using the puller.
    d. Remove the adjust shim from the output shaft and reduction pinion gear.

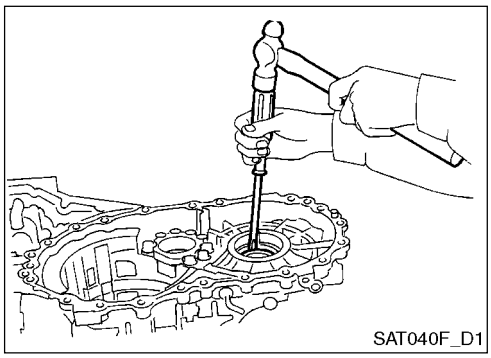


    e. Remove the reduction pinion gear.
    f. Remove the adjust shim from the reduction pinion gear.

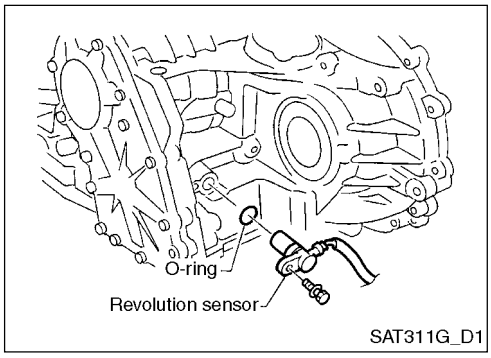


41. Remove the return spring from the parking shaft with a screwdriver.
42. Pull out the parking shaft from the transaxle case and remove the parking pawl.
43. Inspect the parking pawl and shaft for any damages or wear.
44. Remove the parking actuator support from the transaxle case.
45. Inspect the parking actuator support for any damages or wear.

Disassembly (Continued)


SAT040F_D1

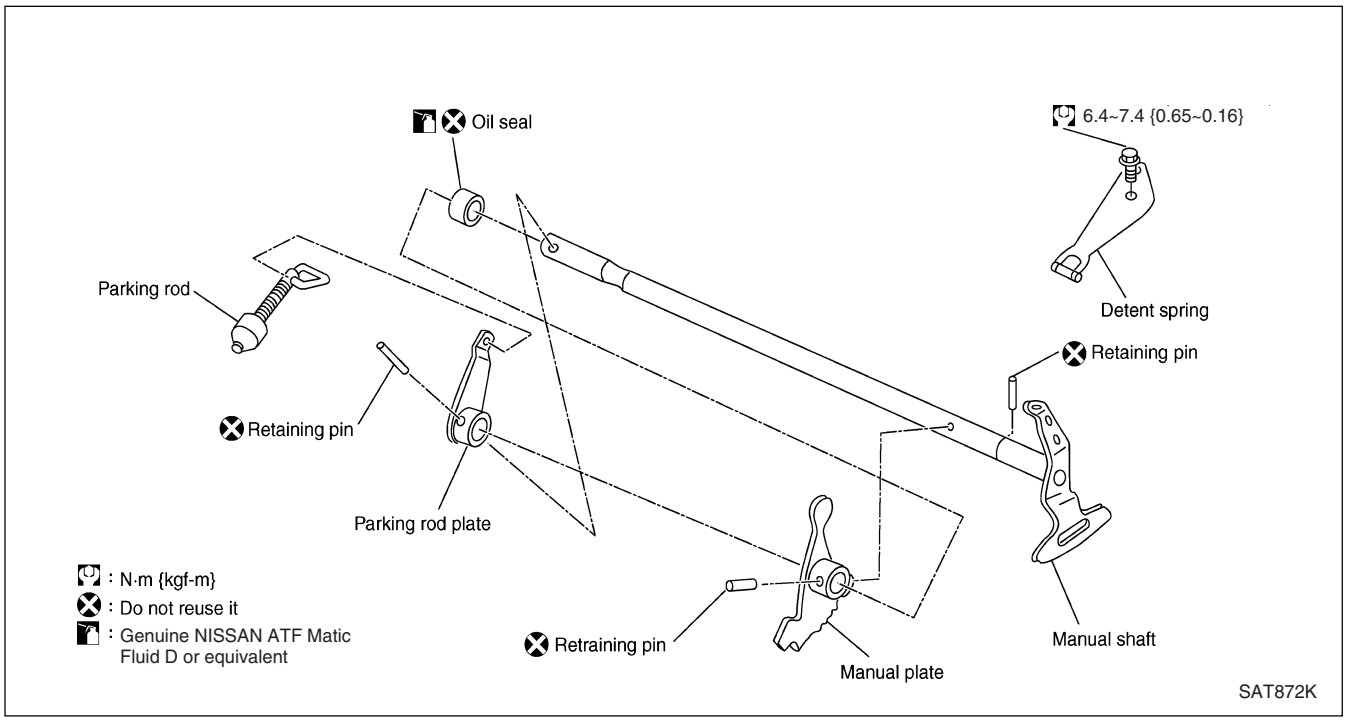
46. Remove the side oil seal from the transaxle case with a screwdriver.

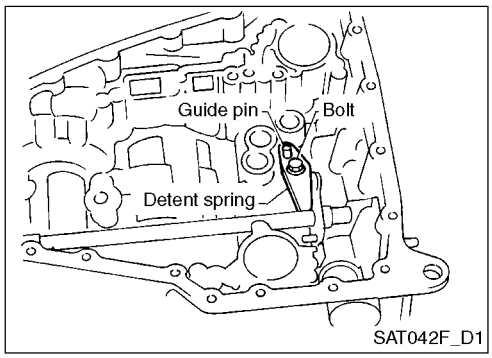


SAT311G_D1

47. Remove the revolution sensor from the transaxle case.

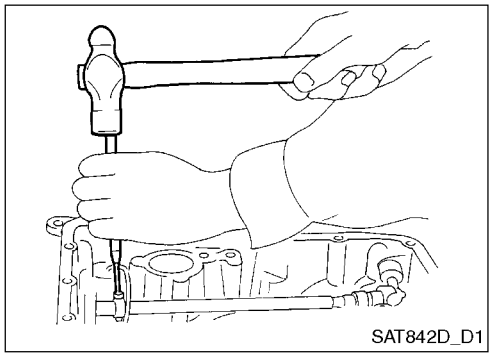
Manual Shaft



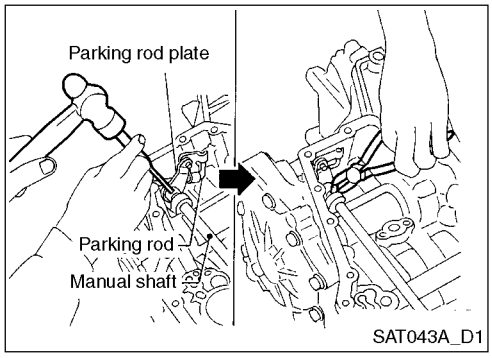


REMOVAL

1. Remove the detent spring from the transaxle case.

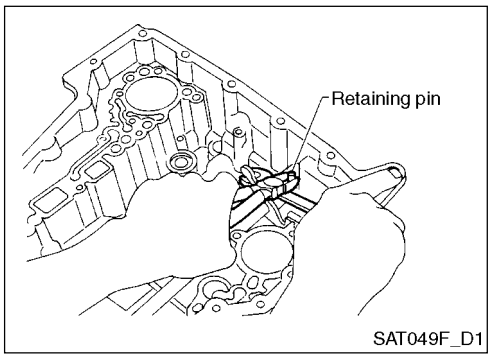


2. Remove the manual plate retaining pin.

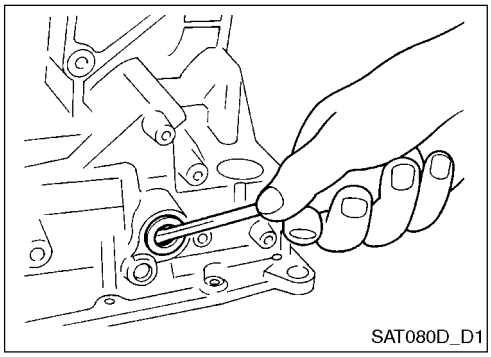


3. Remove the parking rod plate retaining pin.
4. Remove the parking rod plate from the manual shaft.
5. Remove the parking rod from the transaxle case.

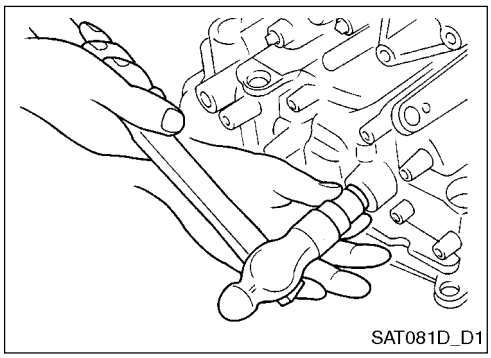
Manual Shaft (Continued)



6. Pull out the manual shaft retaining pin.
7. Remove the manual shaft and manual plate from the transaxle case.



8. Remove the manual shaft oil seal.

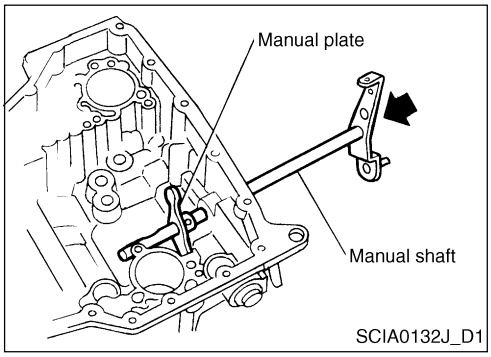


INSPECTION

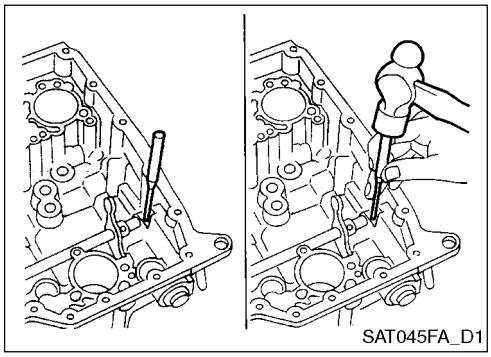
- Inspect each component for wear and damage. Replace if necessary.

INSTALLATION

1. Install the manual shaft oil seal.
   - Apply the ATF on the oil seal outer.

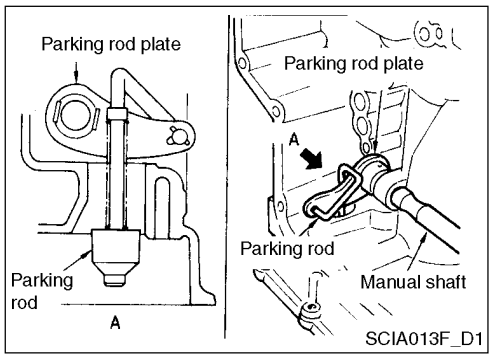


2. Install the manual shaft and manual plate.

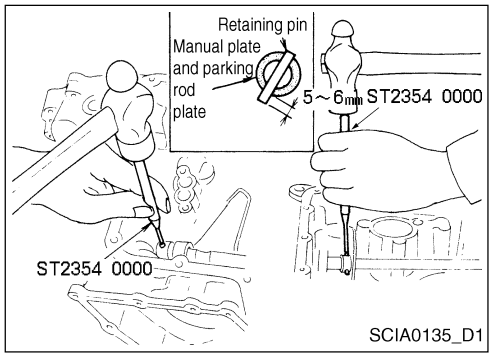


3. Align the manual shaft groove with the transaxle case hole.
4. Install the manual shaft retaining pin to the bottom of the hole.

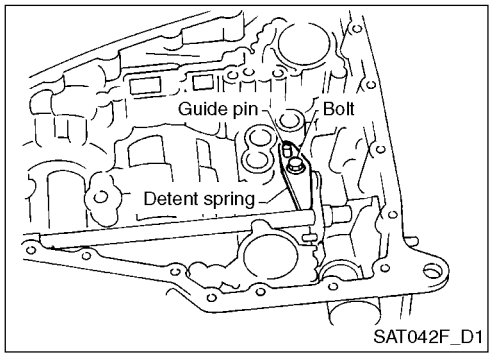
Manual Shaft (Continued)



5. Assembly the parking rod to the parking rod plate and install the manual shaft.



6. Press in the retaining pin into the manual plate and parking rod plate using a pin punch so that its end comes out approx. 5 - 6 mm.



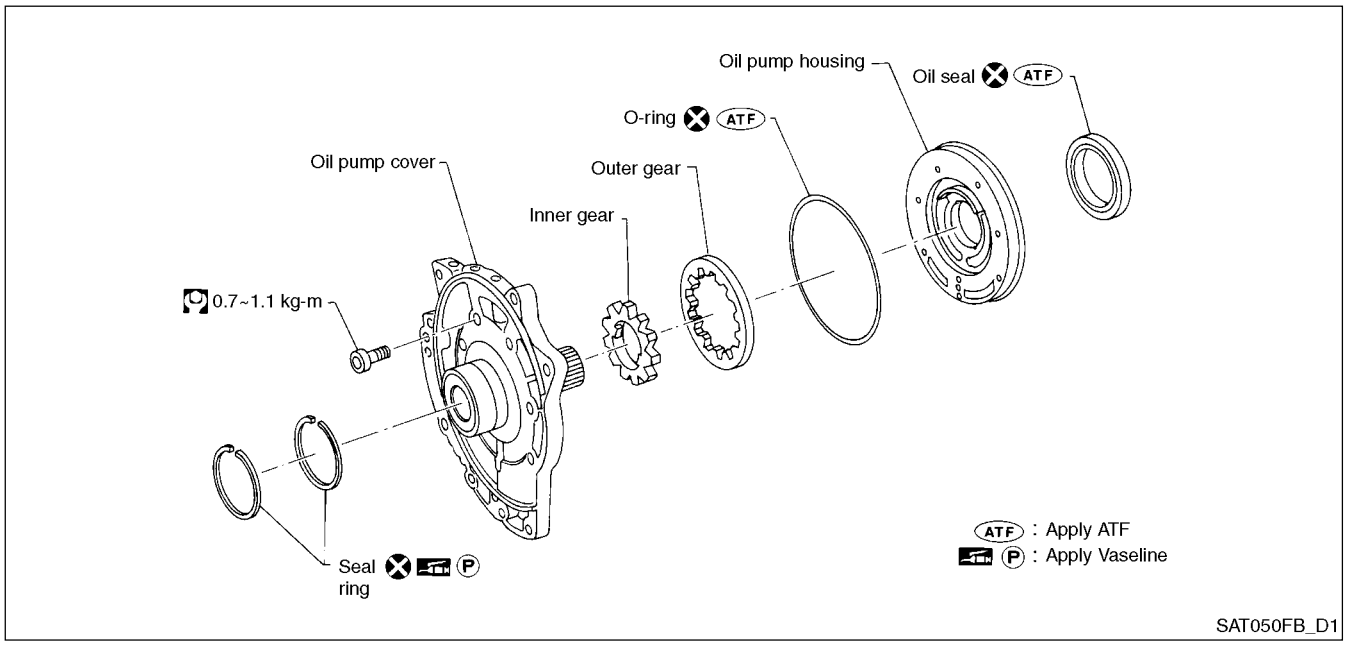
7. Install the detent spring properly on to the guide pin. Tighten the mounting bolts to the specified torque.

Mounting bolt:

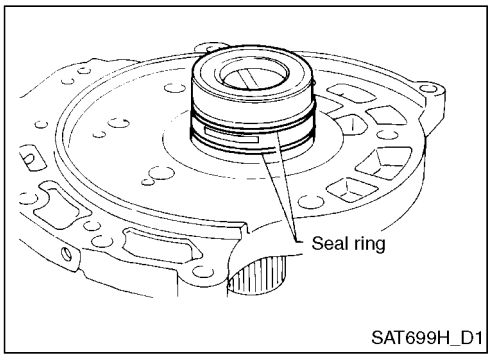
6.4 - 7.4 N•m (0.65 - 0.76 kgf-m)

Oil Pump

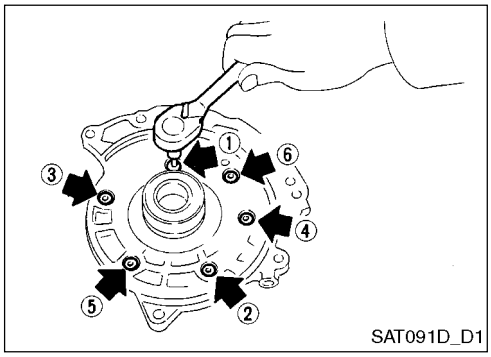
DISASSEMBLY



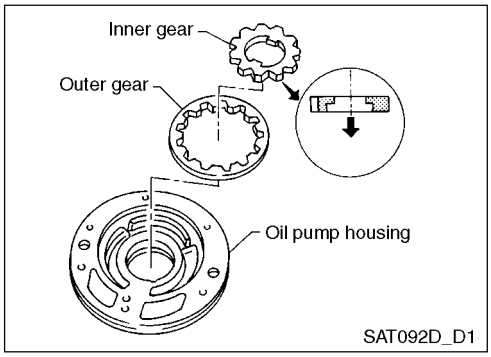
Oil Pump (Continued)



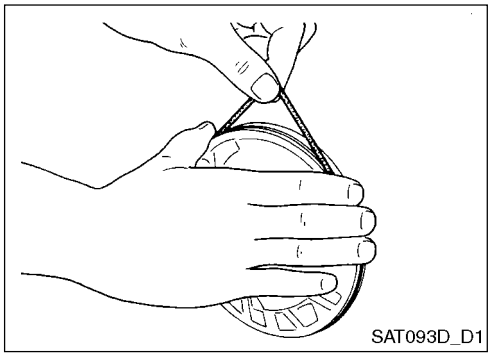
1. Remove the seal ring using a hook.



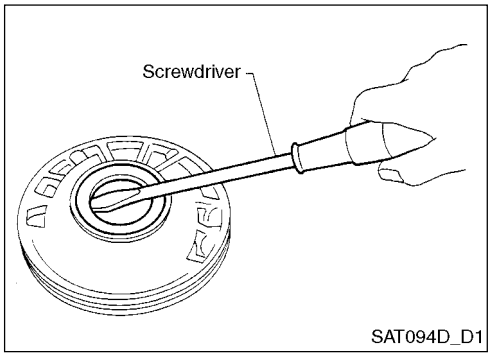
2. Loosen the bolts in crisscross sequence and then remove the oil pump cover.



3. Remove the inner and outer gear from the oil pump housing.

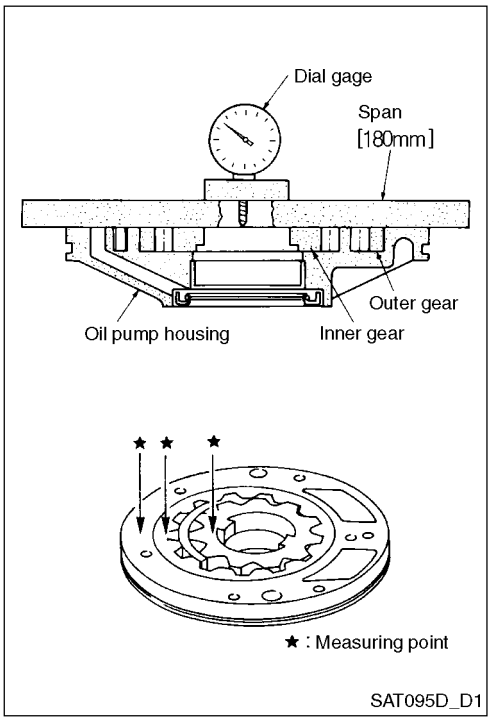


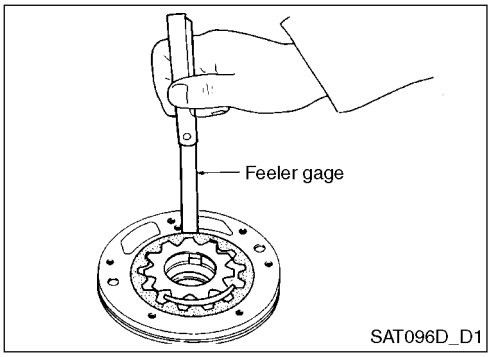
4. Remove the O-ring from the oil pump housing.

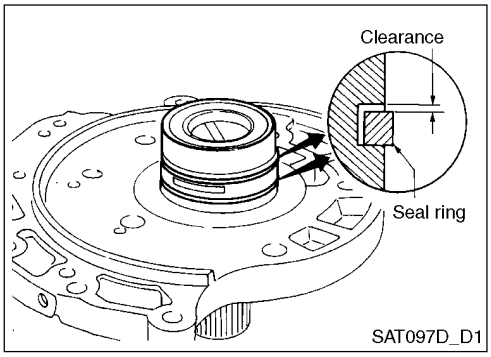


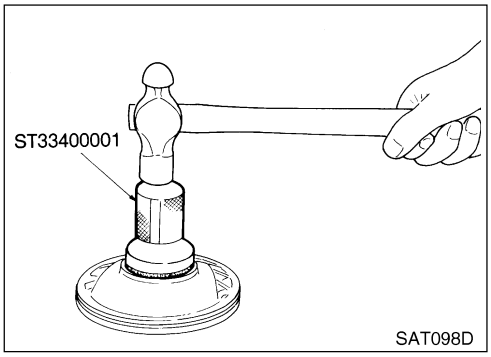
5. Remove the oil pump housing oil seal.

Oil Pump (Continued)









INSPECTION

Oil pump housing, oil pump cover, inner gear and outer gear

- Inspect for wear and damages.

SIDE CLEARANCE

- Measure the side clearance between the oil pump housing end and inner & outer gears. For oil pump diameter, measure at least 4 points. The measured maximum value should be within the specified value.

Model	RE4F03B
Standard clearance	0.02 - 0.04 mm

- If the clearance is smaller than the specified value, select the outer gear and inner gear as a set and then make them to be within the specified value.

INNER AND OUTER GEAR

- If the clearance is over the standard value, then replace the oil pump assembly except for the oil pump cover.
- If not within the allowed limit values, replace the oil pump assembly except for the oil pump cover.
- Measure the clearance between the outer gear and oil pump housing.

Model	RE4F03B
Standard clearance	0.08 - 0.15 mm
Allowed limit	0.15 mm

SEAL RING CLEARANCE

- Measure the clearance between the seal ring and ring groove.

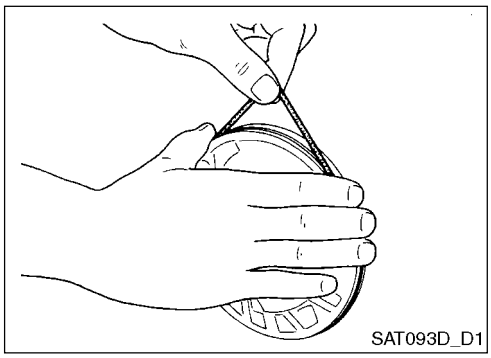
  Standard clearance: 0.1 - 0.25 mm

  Allowed limit: 0.25 mm
- If not within the allowed limit, replace the oil pump cover assembly.

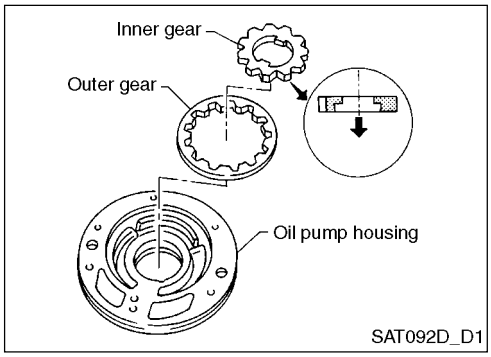
ASSEMBLY

1. Install the oil seal to the oil pump housing.

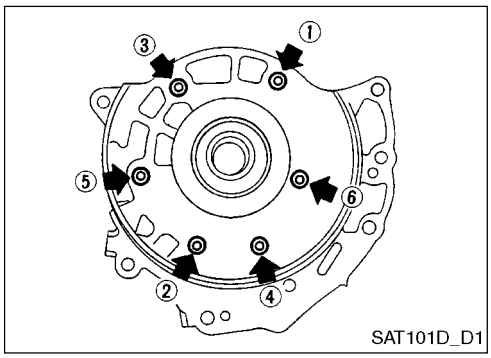
Oil Pump (Continued)



2. Install the O-ring to the oil pump housing.
   - Apply the ATF to the O-ring.



3. Install the inner and outer gears on the oil pump housing.
   - Be careful with the inner gear direction.

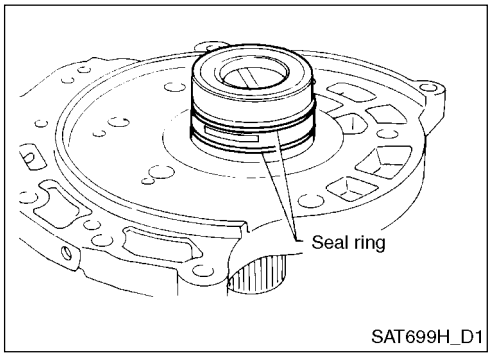


4. Install the oil pump cover to the oil pump housing.

   Cover the oil pump cover's spline with the masking tape to protect the seal. Place the oil pump cover assembly on the oil pump housing assembly and then remove the masking tape. Tighten the bolt in crisscross sequence.

   Tightening torque:

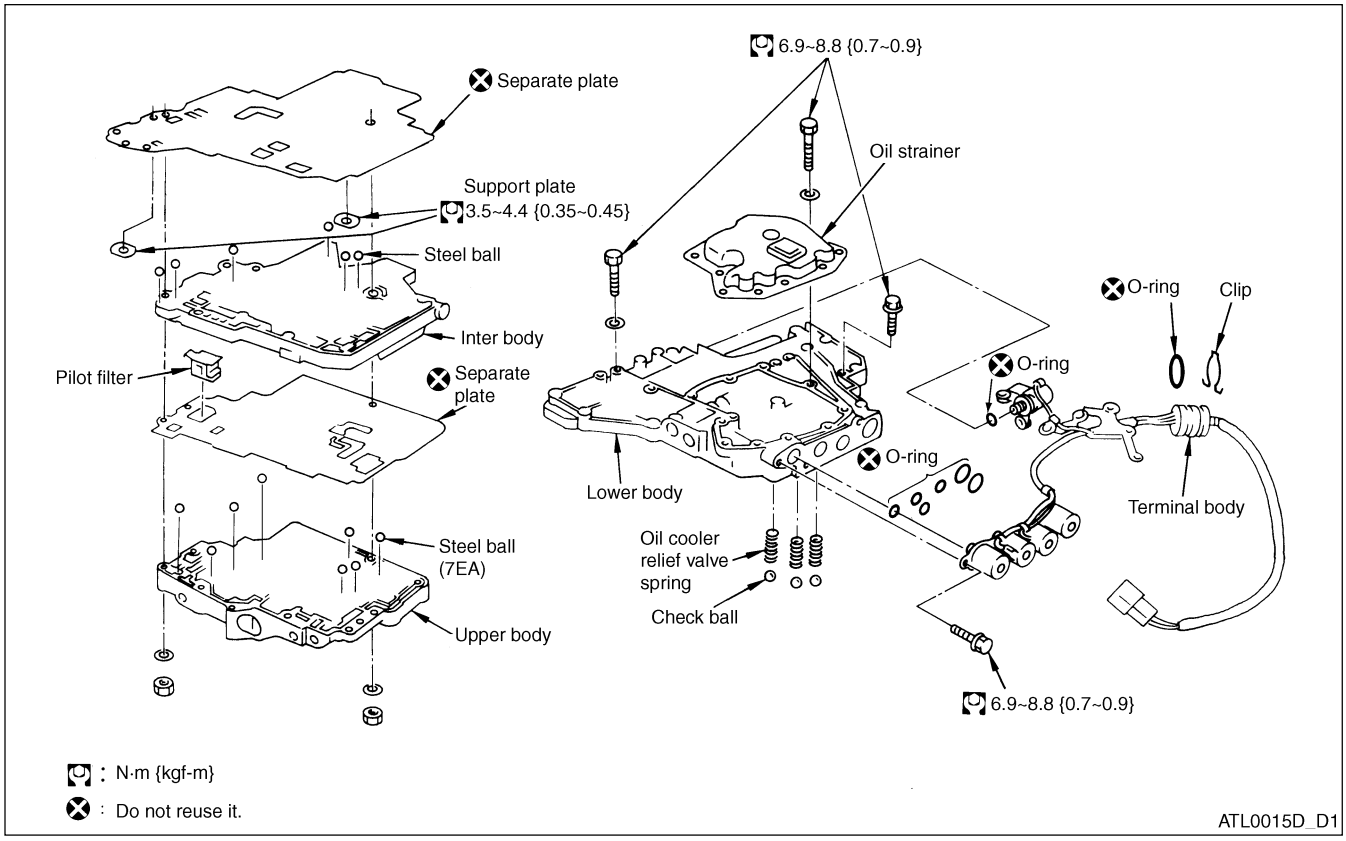
   0.7 - 1.1 kgf-m



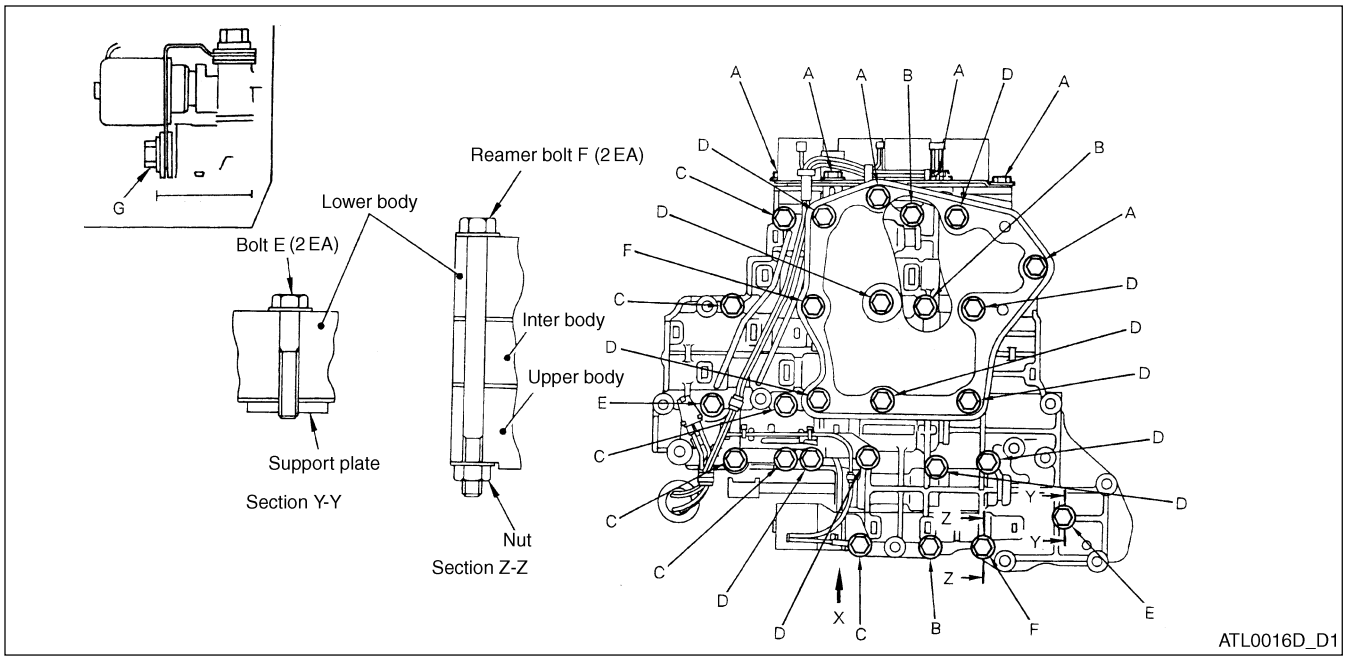
5. Apply the Vaseline on the ring groove and install the new seal ring carefully.
   - Do not over stretch the seal ring during installation. The ring may be deformed.

Control Valve Assembly

Disassembly • Assembly



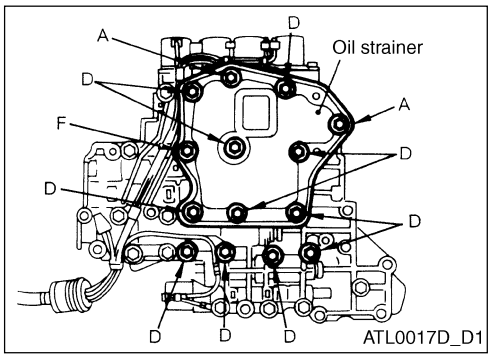
DISASSEMBLY



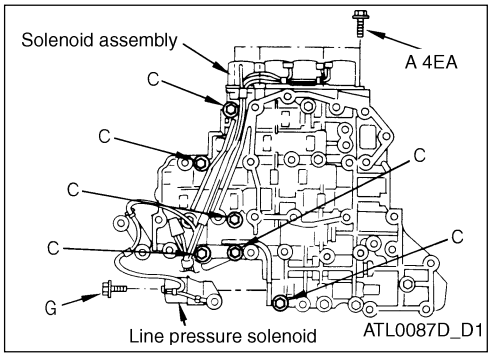
1. By facing the upper body downwards, remove the bolts A - G (31 EA), reamer bolt F (2 EA), nuts (2 EA) and support brake (2 EA) according to following order and then disassemble the upper body, inter body and lower body.

Bolt symbol	A	B	C	D	E	F	G
Bolt length (mm)	13.5	58.0	40.0	66.0	33.0	78.0	18.0
Quantity	6	3	6	11	2	2	1

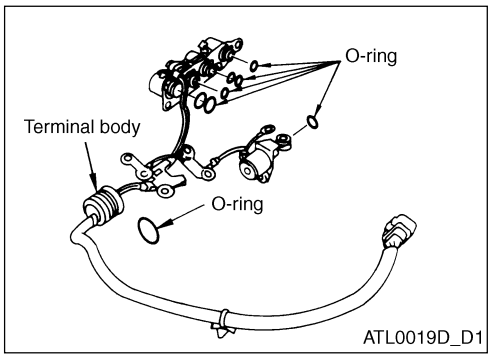
Control Valve Assembly (Continued)



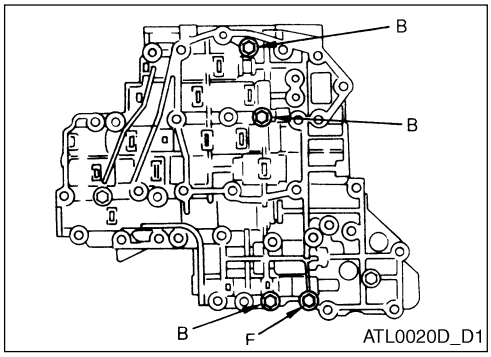
2. Remove the oil strainer by removing bolt A (2 EA), bolt D (11 EA), reamer bolt F (1 EA) and nut (1 EA).



3. Remove the solenoid assembly by removing the bolt A (4 EA), bolt C (6 EA) and bolt G (1 EA).



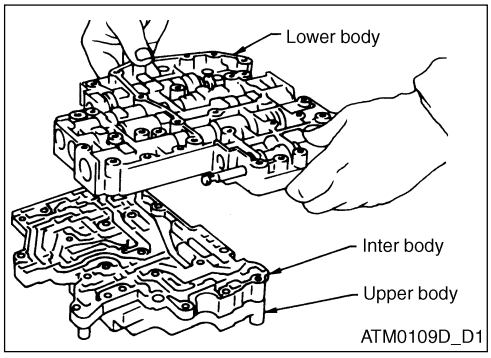
4. Remove the O-ring from the solenoid assembly and terminal body.



5. Remove the bolt B (3 EA), reamer bolt F (1 EA) and nut (1 EA) by pressing the upper body, inter body and lower body with hand not to be dropped.

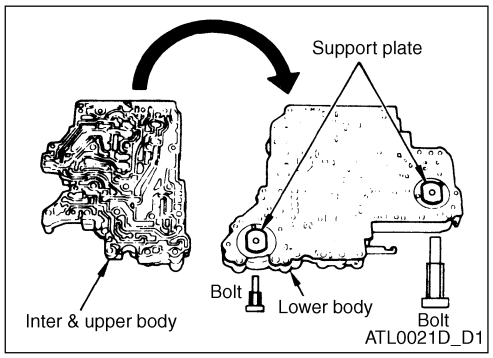
CAUTION:

- **When the upper body and inter body falls apart, steel balls may fall and get lost. Thus, remove the bolt by facing the upper body downwards.**

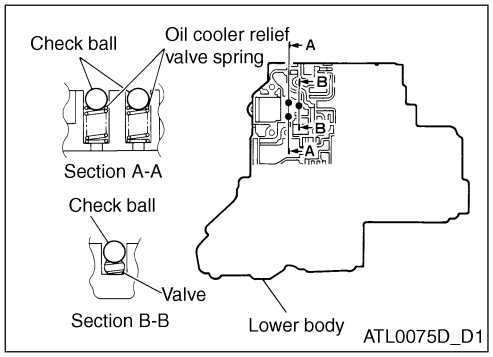


6. Remove the lower body from the inter body.

Control Valve Assembly (Continued)



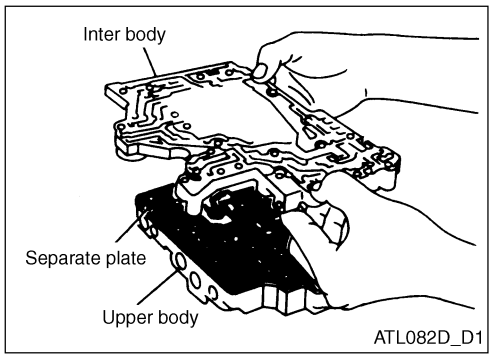
7. Release the bolt E (2 EA) by turning the lower body upside down as in the illustration and remove the support plate.
8. Remove the separate plate from the lower body.



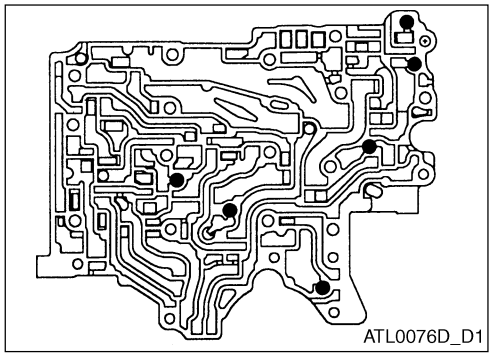
9. Remove the check ball (3 EA), oil cooler relief valve spring (2 EA) and valve spring (1 EA) from the location in the illustration.

CAUTION:

- **Be careful not to lose the check ball, oil cooler relief valve spring and valve spring.**



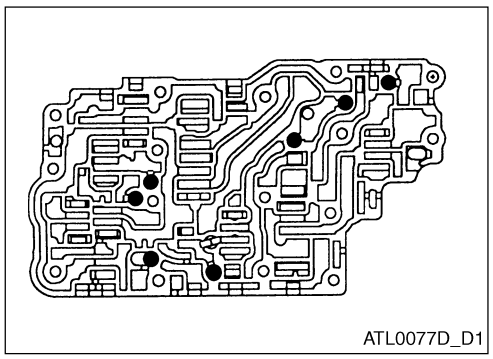
10. Remove the inter body from the upper body.



11. Check if the inter body's steel ball goes into the location in the illustration and remove the steel ball from the inter body.

CAUTION:

- **Be careful not to lose the steel ball.**

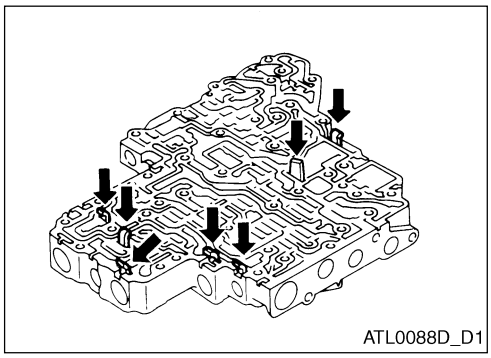


12. Check if the upper body's steel ball goes into the location in the illustration and remove the steel ball from the upper body.

CAUTION:

- **Do not lose the steel ball.**

Control Valve Assembly (Continued)

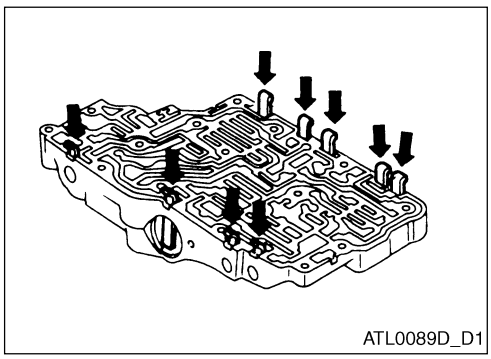


INSPECTION AFTER DISASSEMBLY

Lower body and upper body

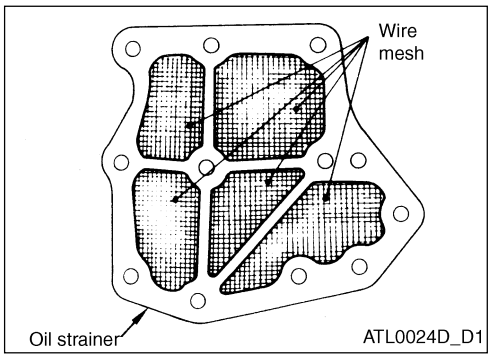
- Check if the retainer plate is attached in the illustrated location of the lower body.

  Retainer plate quantity: 7 EA



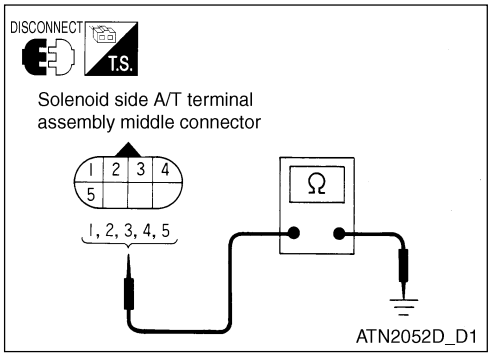
- Check if the retainer plate is attached in the illustrated location of the upper body.

  Retainer plate quantity: 9 EA



Oil strainer

- Inspect for any damages in the oil strainer's wire mesh.

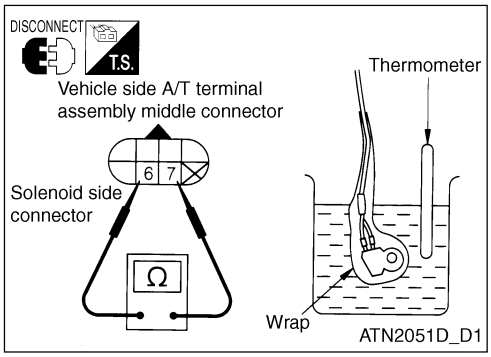


SOLENOID VALVE

- Measure the resistance between the solenoid terminals using a circuit tester.

Inspection standard value

Solenoid	Terminal No	Resistance
Solenoid A	2 ~ Solenoid case	Approx. 20 - 30 Ω
Shift solenoid B	1 ~ Solenoid case	Approx. 5 - 20 Ω
Overrun clutch solenoid	3 ~ Solenoid case	Approx. 20 - 30 Ω
Line pressure solenoid	4 ~ Ground terminal	Approx. 2.5 - 5.0 Ω
Lockup solenoid	5 ~ Solenoid case	Approx. 5 - 20 Ω



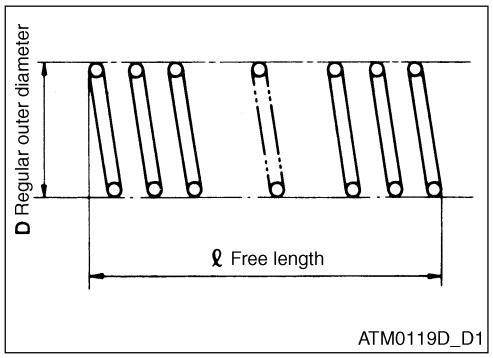
FLUID TEMPERATURE SENSOR

- Place the fluid temperature sensor into water as in the illustration. Measure the resistance between the terminal No. 6 and No. 7 by changing the water temperature.

Standard value

Water temperature	Resistance
20°C	Approx. 2.5 kΩ
80°C	Approx. 0.3 kΩ

Control Valve Assembly (Continued)

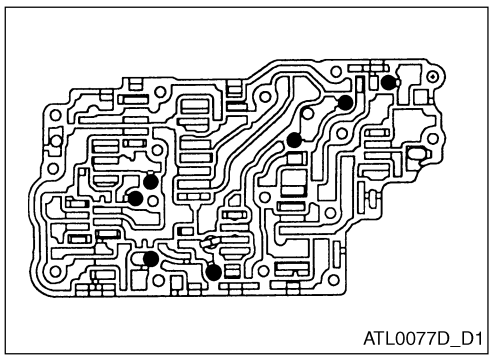


OIL CLUTCH RELIEF VALVE SPRING

- Inspect the measuring location in the illustration and replace if damaged, deformed or worn.

Inspection standard

Part No.	Length	Outer Diameter
31872 31 X 00	17.02 mm	8.0 mm



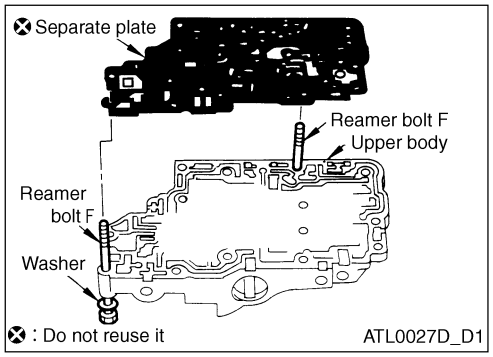
ASSEMBLY

1. Install the upper body, inter body and lower body according to below order.
   a. By facing the upper body fluid circuit surface upwards, install the steel ball in the location in the illustration.

   Steel ball quantity: 7 EA

REFERENCE:

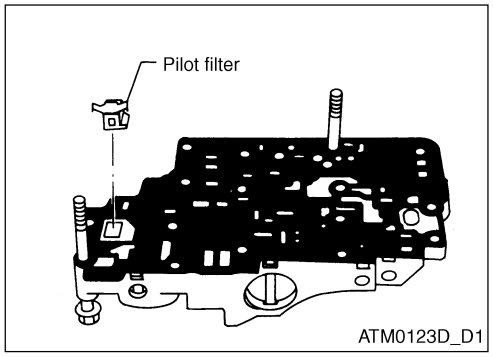
The steel ball is the same as the inter body's steel ball.



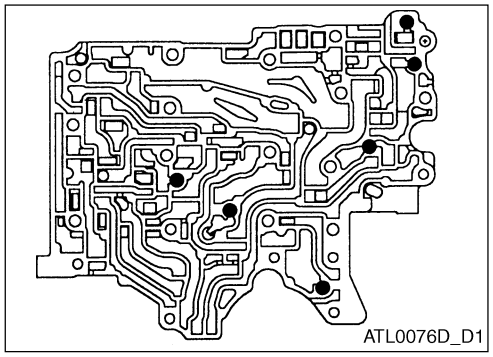
   b. Install the reamer bolt F (2 EA) in the illustrated location from the lower of the upper body and install the separate plate by aligning it to the upper body's reamer bolt hole.

CAUTION:

- **The separate plate cannot be reused. Do not reuse.**
- **Remove the reamer bolt F after installing the lower body since it is being used as a guide.**



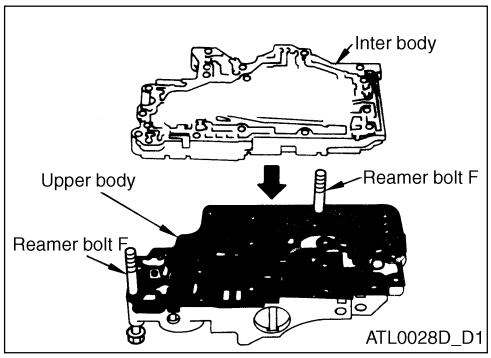
   c. Install the pilot filter in the illustrated location.



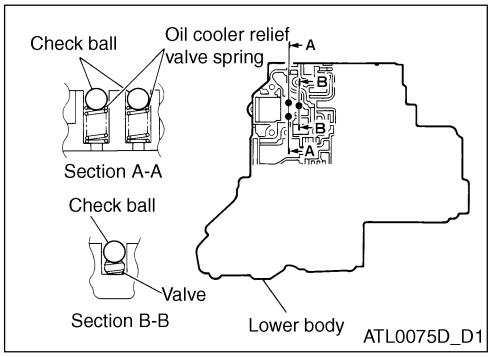
   d. By facing the inter body's lower body mating surface upwards, install the steel ball as shown in the left illustration.

   Steel ball quantity: 6 EA

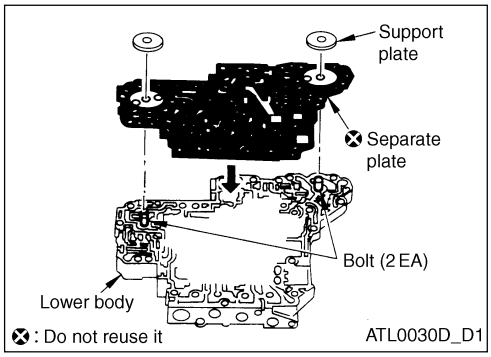
Control Valve Assembly (Continued)



e. Install the inter body by aligning it to the upper body's reamer bolt F.



f. Install the valve clamp (1 EA), oil cooler relief valve spring (2 EA) and check ball (3 EA) to the illustrated location in the lower body.

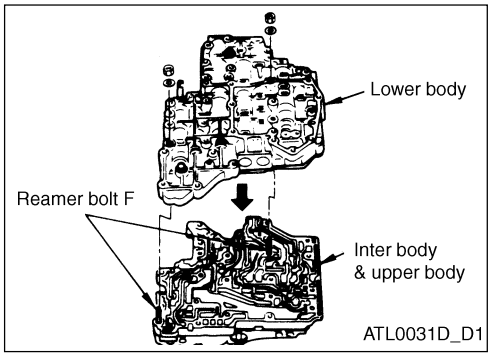


g. Install the support plate fixing bolt E (2 EA) at the illustrated location in the lower body from the bottom. Then install the select plate by aligning it to the lower body's bolt E.

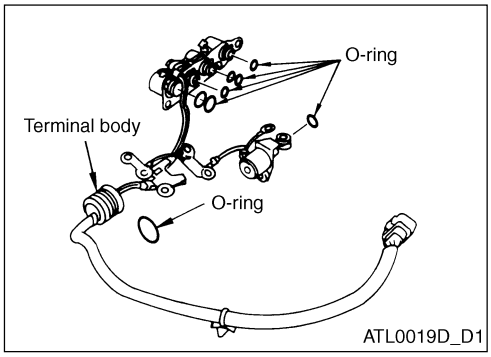
CAUTION:

- **The separate plate cannot be reused. Do not reuse.**

h. Tighten the support plate temporarily with bolt E (2 EA).



i. Install the lower body by aligning it to the inter body's reamer bolt F and temporarily tighten the reamer bolt F (2 EA) with the nut.



2. Apply the Genuine NISSAN ATF Matic Fluid D or equivalent to the new O-ring and install it to the solenoid and terminal body.

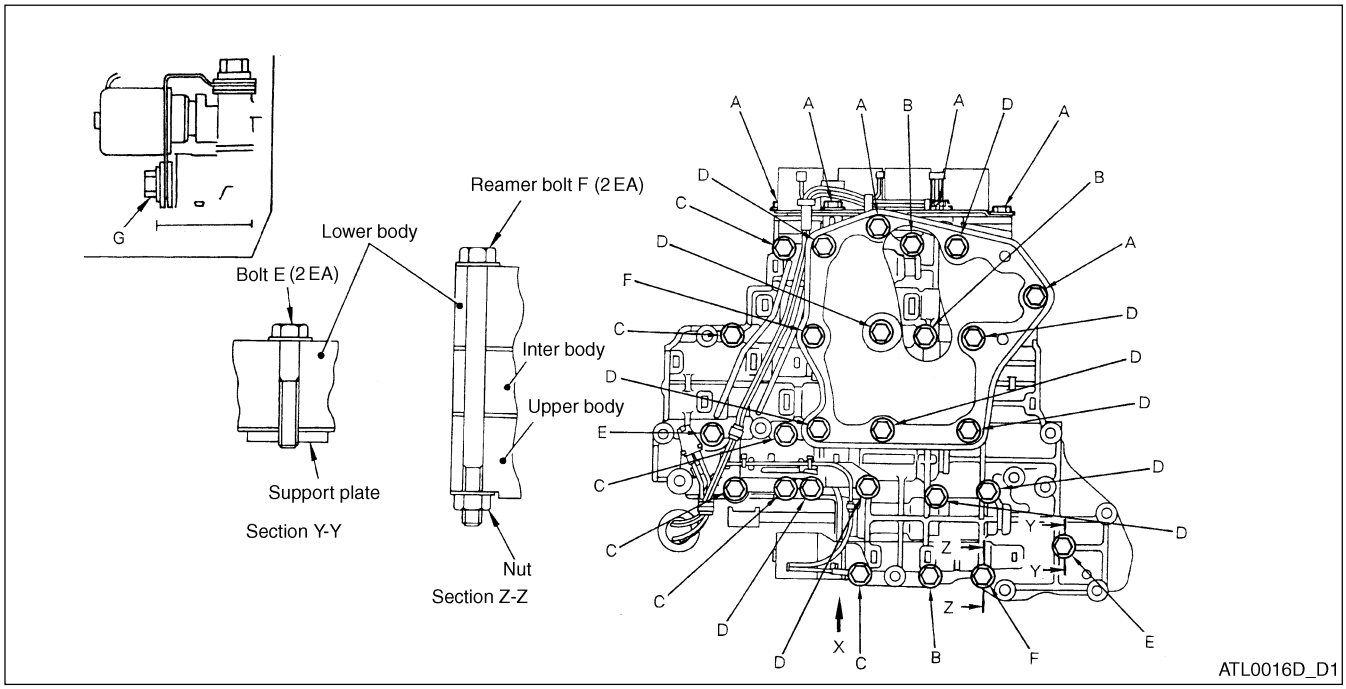
CAUTION:

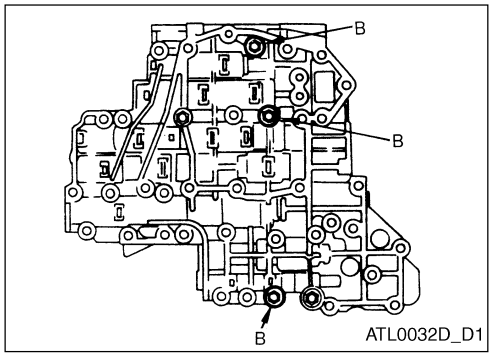
- **The O-ring cannot be reused. Do not reuse.**

Control Valve Assembly (Continued)

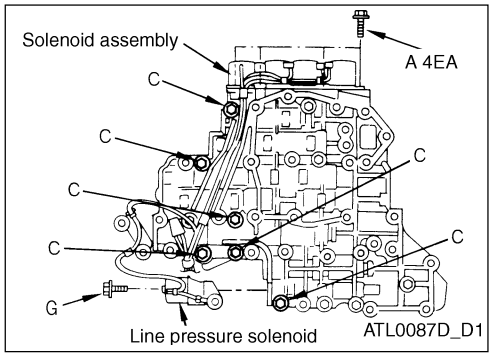
3. Install the mounting bolt according to following order and tighten to specified torque.

Bolt symbol	A	B	C	D	E	F	G
Length (mm)	13.5	58.0	40.0	66.0	33.0	78.0	18.0
Quantity	6	3	6	11	2	2	1
Tightening torque (kg•m)	Bolt symbol E: 0.35 - 0.45 Other than bolt symbol E: 0.7 - 0.9						



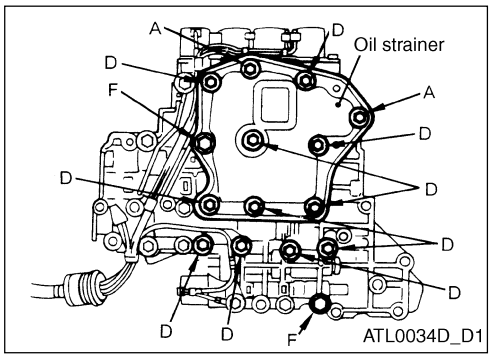


a. Install the illustrated bolt B (3 EA) and tighten to specified torque.



b. Install the solenoid assembly to the lower body. Install the bolt A (4 EA), bolt C (6 EA) and bolt G (1 EA) and tighten to specified torque.

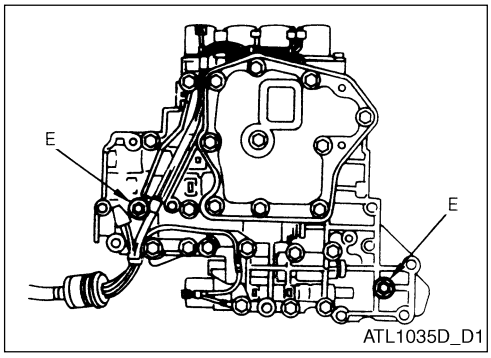
Control Valve Assembly (Continued)



c. Install the oil strainer at the illustrated location. Install the bolt A (2 EA), bolt D (11 EA), reamer bolt F (2 EA) and nut (2 EA) and tighten to specified torque.

CAUTION:

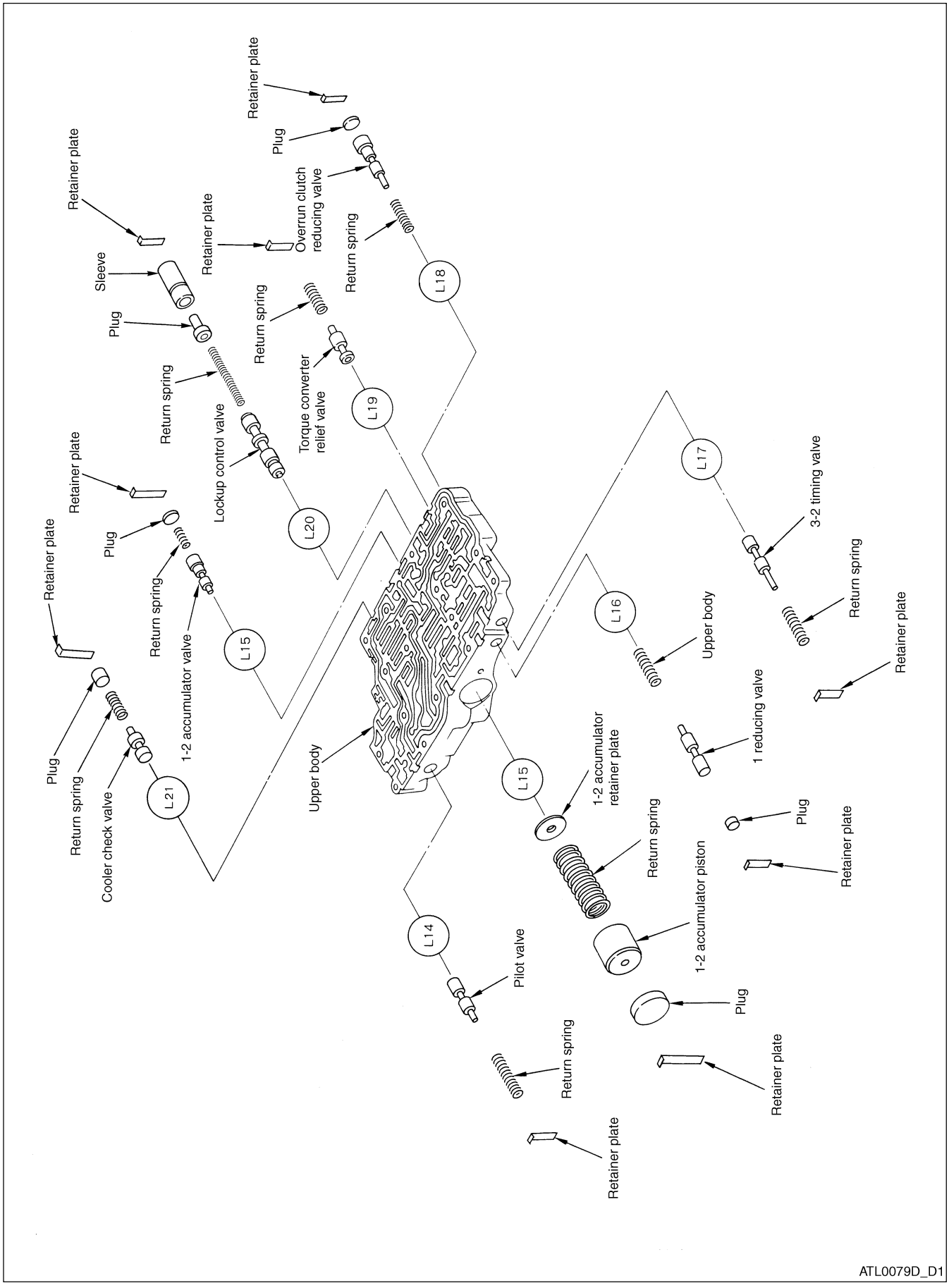
- **Remove the reamer bolt F (2 EA) used as a guide from the upper body and then install from the lower body side.**



d. Tighten the support plate mounting bolts E (2 EA) to specified torque.

Control Valve Upper Body

Disassembly • Assembly



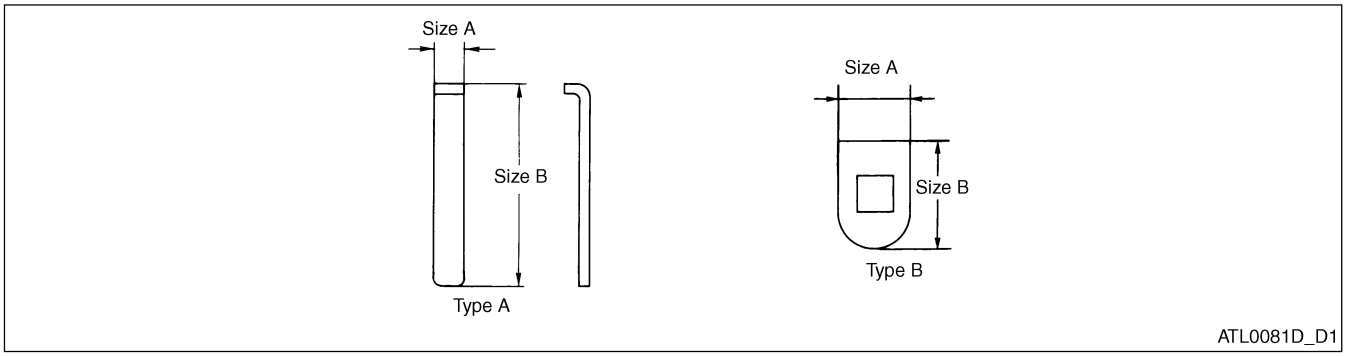
Control Valve Upper Body (Continued)

Location	Spring name	Free length (l)	Outer diameter (D)	Wire diameter (d)	No. of action coils (Direction)	Part number
L14	Pilot valve spring	38.98	8.9	1.2	15.94 (Left)	31742 3AX03
L15	1-2 accumulator valve spring	55.66	19.5	1.5	9.86 (Left)	31742 3AX09
	1-2 accumulator piston spring	20.5	6.95	0.45	7.47 (Left)	31742 3AX00
L16	1 reducing valve spring	27.0	7.0	0.8	10.7 (Left)	31742 80X05
L17	3-2 timing valve spring	23.0	6.65	0.65	8.5 (Left)	31742 01X00
L18	Overrun clutch reducing valve spring	37.5	7.0	1.1	19.2 (Left)	31742 80X06
L19	Torque converter relief valve spring	33.3	9.0	1.2	12.59 (Left)	31742 3AX04
L20	Lockup control valve spring	53.01	6.5	1.0	34.15 (Left)	31742 3AX02
L21	Cooler check valve clip	28.04	7.15	0.65	11.4 (Left)	31742 3AX05

CONTROL VALVE

Location	Valve name	Overall length (mm)	Part number
L14	Pilot valve	40.0	31772 80X11
L15	1-2 accumulator valve	42.0	31772 3AX01
	1-2 accumulator piston	24.0	31675 3AX00
L16	1 reducing valve	38.5	31772 21X00
L17	3-2 timing valve	38.5	31772 21X00
L18	Overrun clutch reducing valve spring	68.5	31772 80X04
L19	Torque converter relief valve spring	37.5	31780 80X00
L20	Lockup control valve spring	56.5	31832 3AX00
L21	Cooler check valve spring	38.5	31772 21X00

RETAINER PLATE



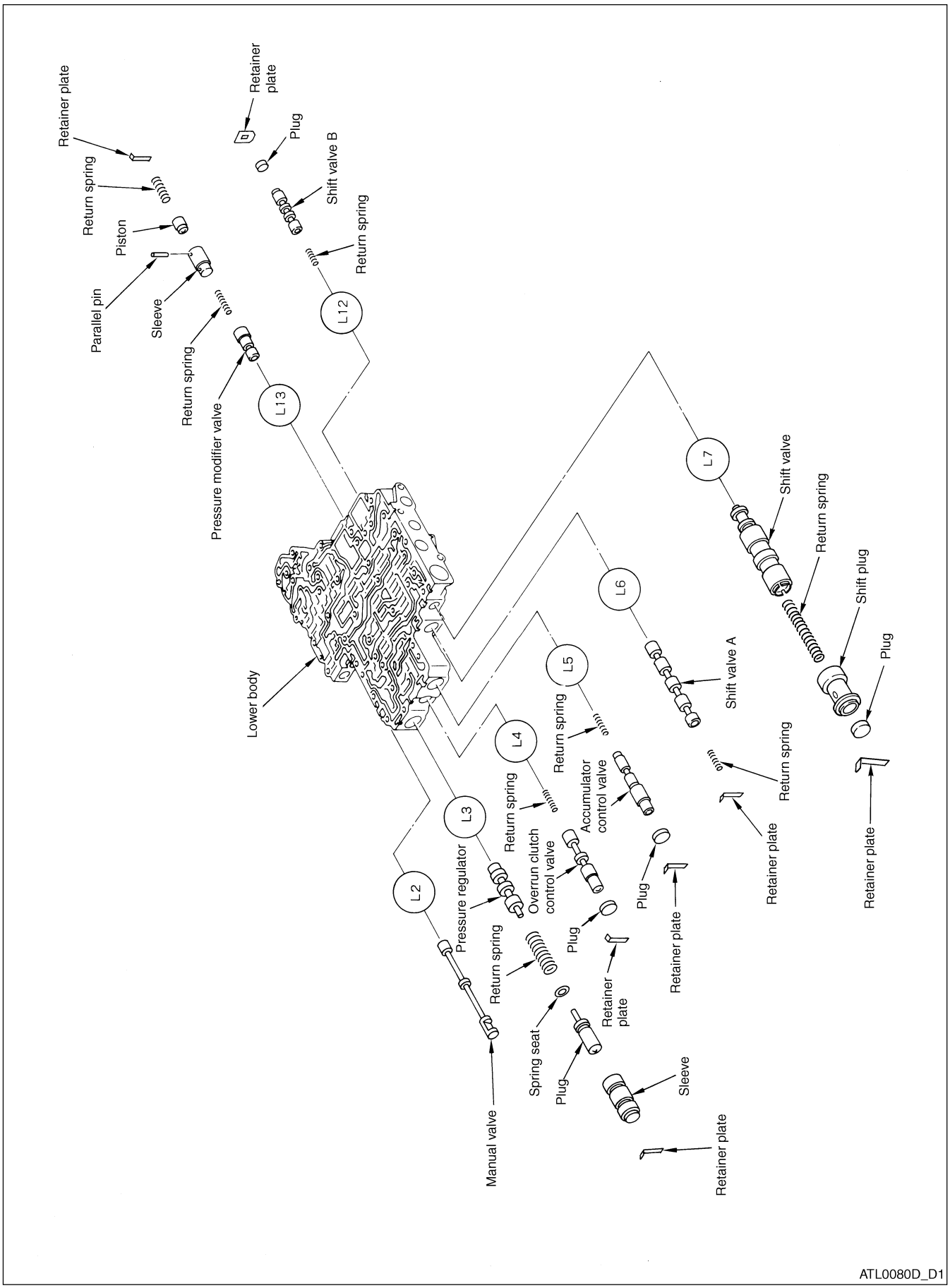
Location	Valve name	Type	Clearance A (mm)	Clearance B (mm)	Part number
L14	Pilot valve	A	6.0	21.5	31742 3AX03
L15	1-2 accumulator valve	A	6.0	40.5	31742 3AX03
	1-2 accumulator piston	A	6.0	40.5	31742 3AX03
L16	1 reducing valve	A	6.0	21.5	31742 3AX03
L17	3-2 timing valve	A	6.0	21.5	31742 3AX03
L18	Overrun clutch reducing valve	A	6.0	24.0	31742 3AX03
L19	Torque converter relief valve	A	6.0	21.5	31742 3AX03

Control Valve Upper Body (Continued)

Location	Valve name	Type	Clearance A (mm)	Clearance B (mm)	Part number
L14	Lockup control valve	A	6.0	21.5	31742 3AX03
L15	Cooler check valve	A	6.0	40.5	31742 3AX03

Control Valve Lower Body

Disassembly • Assembly



Control Valve Lower Body (Continued)

INSPECTION AFTER DISASSEMBLY

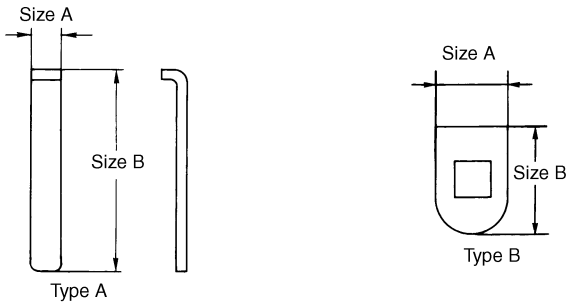
Valve spring

Location	Spring name	Free length (l)	Outer diameter (D)	Wire diameter (d)	No. of action coils (Direction)	Part number
L3	Pressure regulator valve spring	45.0	15.0	1.4	10.42 (Left)	31742 80X03
L4	Overrun clutch control valve spring	21.7	7.0	0.8	8.8 (Left)	31762 80X00
L5	Accumulator control valve spring	20.0	6.5	0.5	10.3 (Left)	31742 80X02
L6	Shift valve A spring	21.7	7.0	0.8	8.8 (Left)	31762 80X00
L7	Shuttle valve spring	51.0	5.65	0.75	27.6 (Left)	31762 41X04
L12	Shift valve B spring	21.7	7.0	0.8	8.8 (Left)	31762 80X00
L13	Pressure modifier valve spring	30.5	9.8	1.3	8.8 (Left)	31742 41X15
	Pressure modifier piston spring	32.0	6.9	0.9	15.5 (Left)	31742 80X16

Control Valve

Location	Valve name	Overall length (mm)	Part number
L2	Manual valve	119.75	31731 31X00
L3	Pressure regulator valve	68.0	31741 80X00
L4	Overrun clutch control valve	73.5	31772 80X00
L5	Accumulator control valve	66.0	31772 80X19
L6	Shift valve A	96.5	31766 80X00
L7	Shuttle valve	59.0	31772 3AX00
L12	Shift valve B	72.5	31766 80X01
L13	Pressure modifier valve	43.5	31751 80X00
	Pressure modifier piston	19.5	31675 41X07

Retainer Plate



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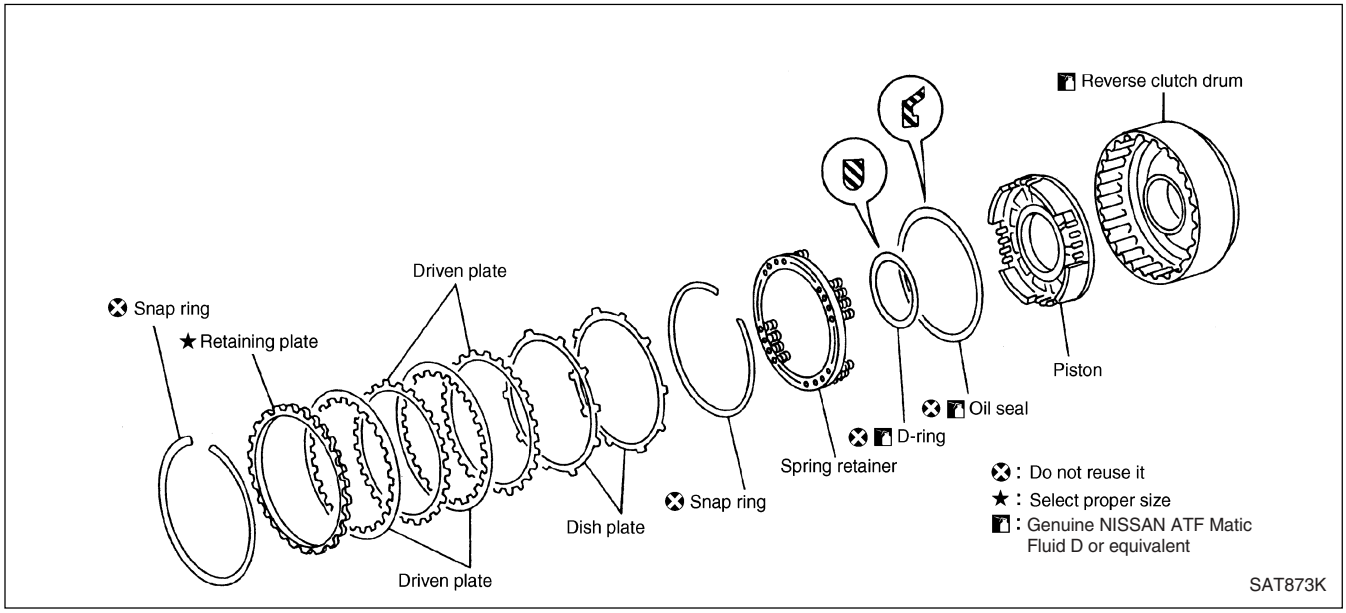
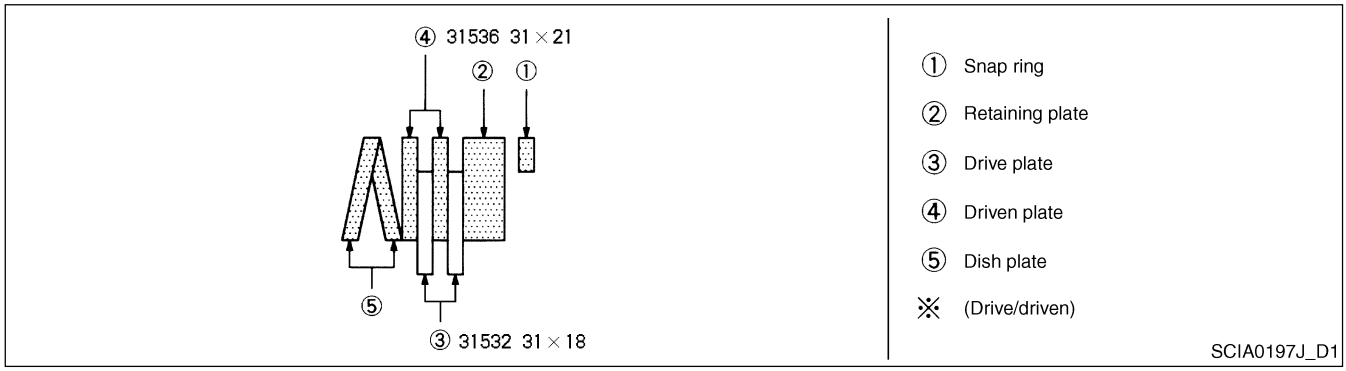
Location	Valve name	Type	Clearance A (mm)	Clearance B (mm)	Part number
L3	Pressure regulator valve	A	6.0	28.0	31743 31X01
L4	Overrun clutch control valve	A	6.0	28.0	31743 31X01
L5	Accumulator control valve	A	6.0	28.0	31743 31X01
L6	Shift valve A	A	6.0	28.0	31743 31X01
L7	Shuttle valve	A	6.0	28.0	31743 31X01

Control Valve Lower Body (Continued)

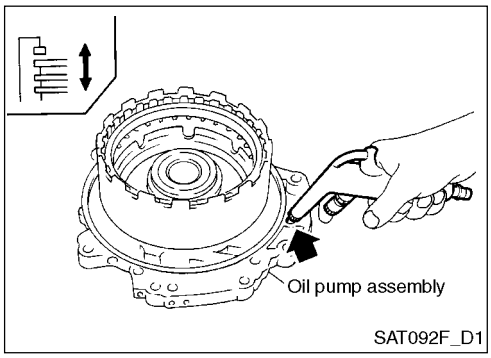
Location	Valve name	Type	Clearance A (mm)	Clearance B (mm)	Part number
L12	Shift valve B	B	17.0	24.0	31743 80X05
L13	Pressure modifier valve	A	6.0	28.0	31743 31X01

Reverse Clutch





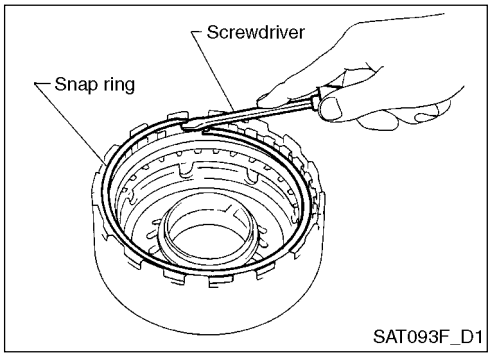
Reverse Clutch (Continued)



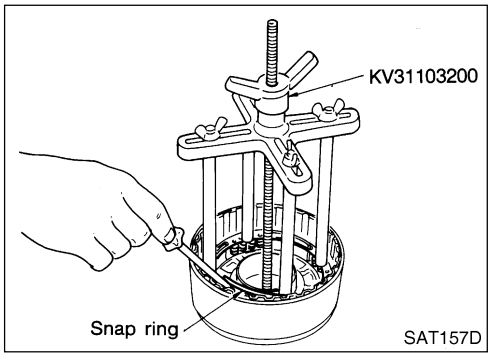
DISASSEMBLY

1. Inspect the reverse clutch operation.

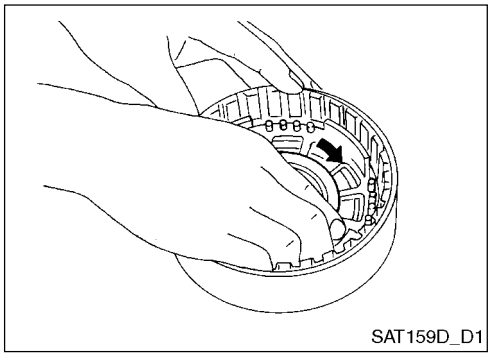
   Install the seal ring to the oil pump cover's drum support and install the reverse clutch assembly. Blow compressed air into the fluid hole. Inspect if the retaining plate moves towards the snap ring. If the retaining plate does not move towards the snap ring, the D-ring or oil seal may be damaged.



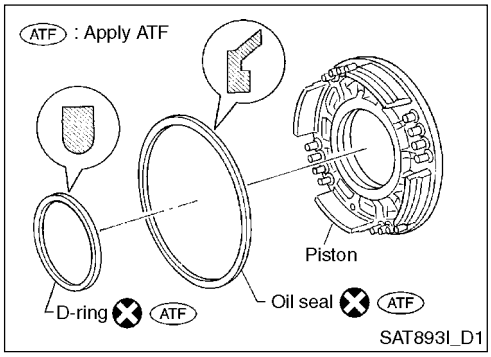
2. Remove the snap ring.
3. Remove the drive plate, driven plate, retaining plate and dish plate.



4. Install the special tool on the spring retainer. Remove the snap ring from the reverse clutch drum by pressing the return spring.
   - Install the special tool on the spring directly.
   - Do not over stretch the snap ring.
5. Remove the spring retainer and return spring.
   - Do not remove the spring from the spring retainer.



6. Remove the piston by rotating the reverse clutch drum.

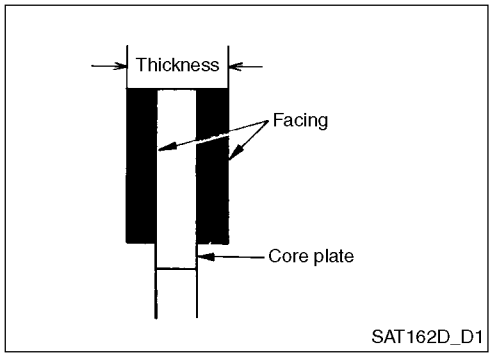


7. Remove the D-ring and oil seal from the piston.

Reverse Clutch (Continued)

INSPECTION

1. Reverse clutch snap ring, spring retainer and return spring
   - Inspect for deformation, aging and damages.
   - Replace if necessary.
   - Replace the spring retainer and return spring as a set.

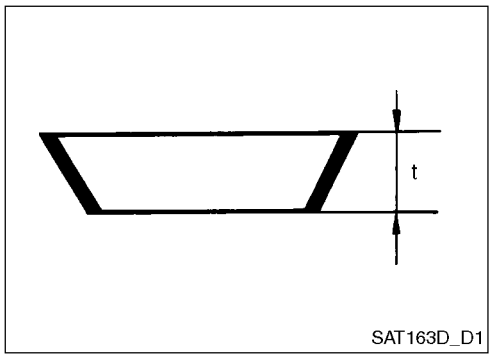


2. Reverse clutch drive plate
   - Inspect the facing for any burns, cracks and damages.
   - Measure the facing thickness.

Drive plate thickness

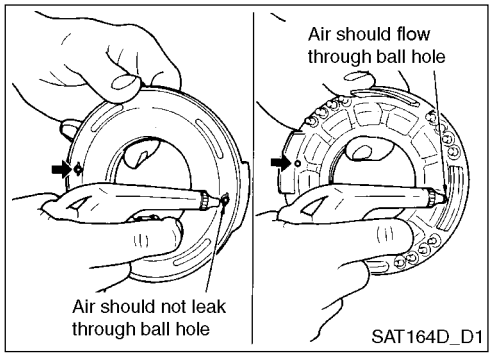
Standard value	2.0 mm
Wear limit	1.8 mm

   - Replace if out of the limit value.



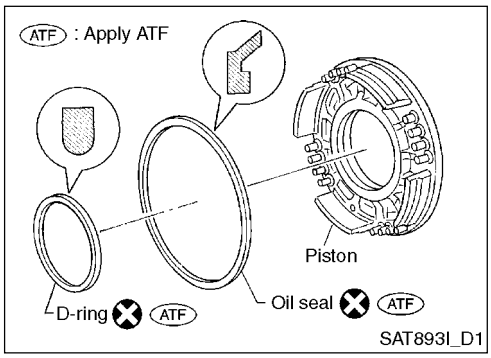
3. Reverse clutch dish plate
   - Inspect for any deformation or damages.
   - Measure the dish plate thickness.

Thickness	“T” 2.8 mm



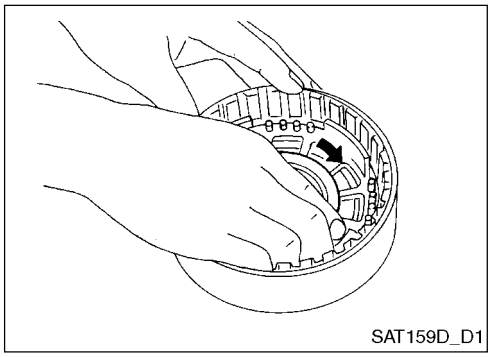
4. Reverse clutch piston
   - The check ball should not be stuck.
   - There should be no air leakage when applying the compressed air at the check ball fluid hole in the opposite side of the return spring.
   - The air must flow the ball when applying the compressed air into the fluid hole at the return spring.

Reverse Clutch (Continued)

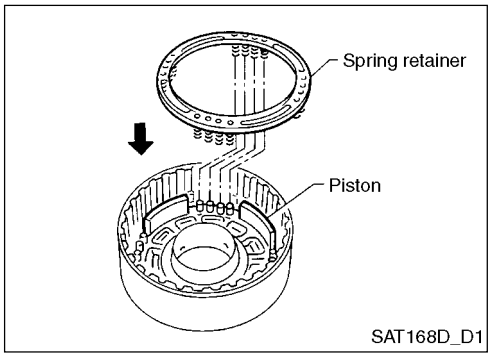


ASSEMBLY

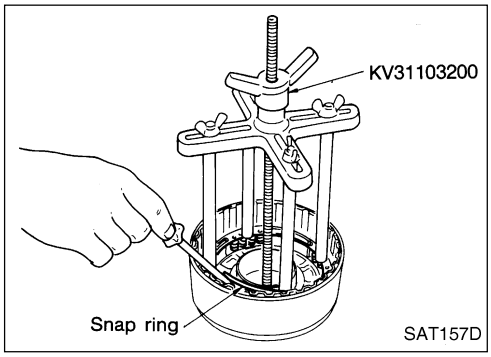
1. Install the D-ring and oil seal on the piston.
   - Be careful of the oil seal direction.
   - Apply the ATF on the oil seal and D-ring.



2. Install the piston assembly by rotating it slowly.
   - Apply the ATF inside the drum.

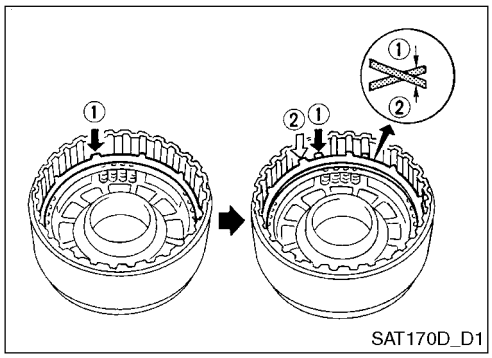


3. Install the return spring and spring retainer on the piston.

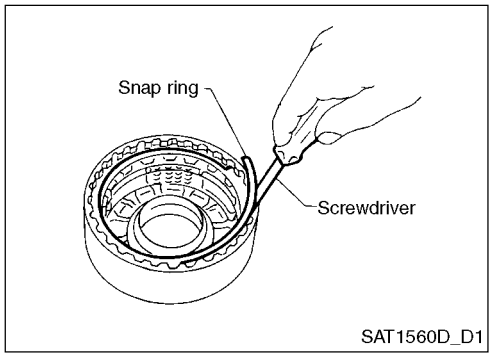


4. Install the special tool on the spring retainer and install the snap ring by pressing the return spring.
   - Install the special tool on the return spring directly.

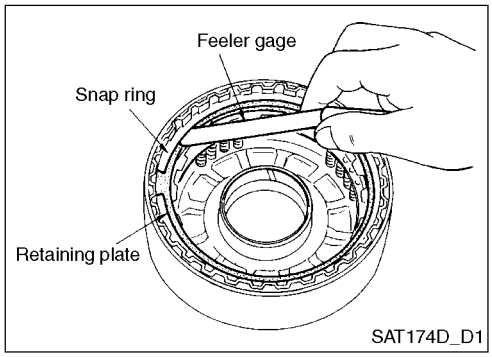
Reverse Clutch (Continued)



5. Install the drive plate, driven plate, retaining plate and dish plate.
   - Do not align two or more dish plate's protrusion.
   - Be careful of the plate order and direction.



6. Install the snap ring.



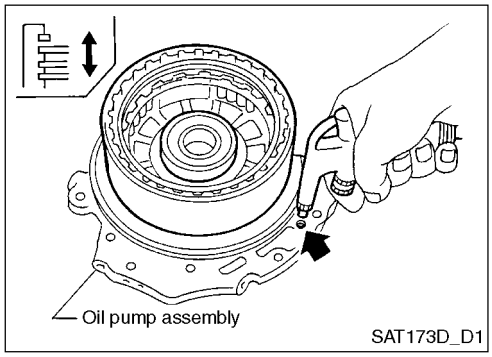
7. Measure the clearance between the retaining plate and snap ring. If the value is out of the allowed limit, select a proper retaining plate.

   Specified clearance:

   Standard: 0.5 - 0.8 mm

   Allowed limit: 1.2 mm

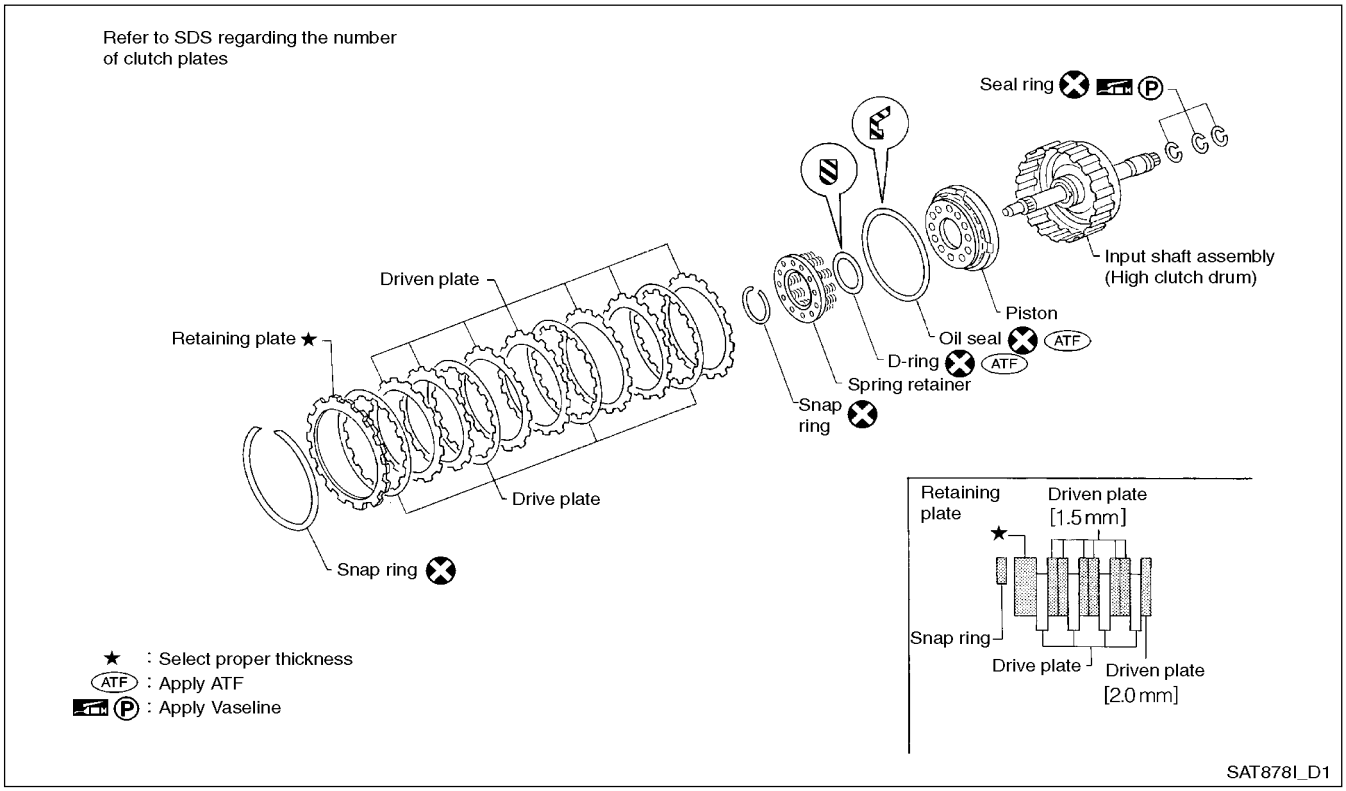
   Retaining plate: Refer "Specifications" (AT-230).

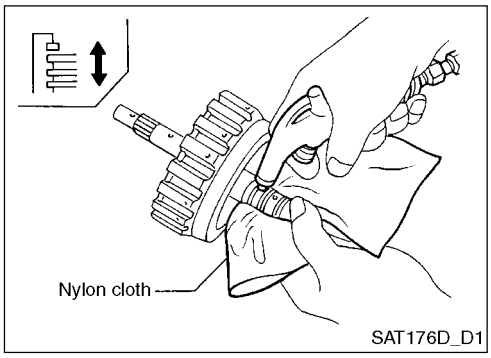


8. Inspect the reverse clutch operation.

   Refer to "Disassembly" in "Reverse Clutch" (AT-170).

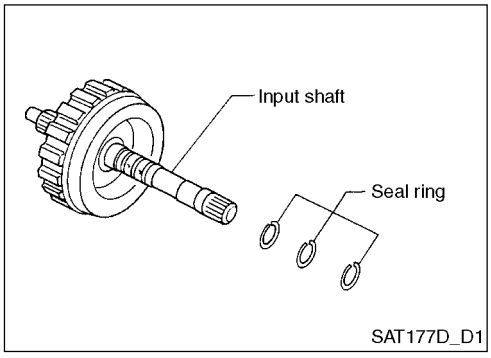
High Clutch



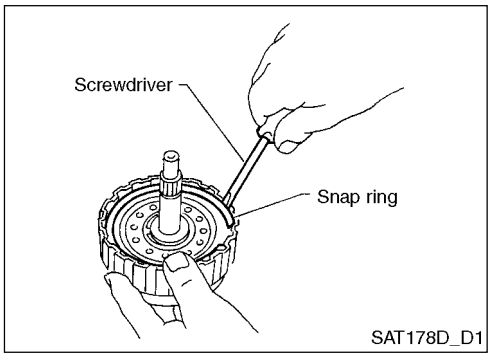


DISASSEMBLY

1. Inspect the high clutch operation.
   a. Blow the compressed air into the input shaft's fluid hole.
      - Cover the opposite hole of the input shaft hole.
   b. Inspect if the retaining plate moves towards the snap ring.
   c. If the retaining plate does not touch the snap ring, the D-ring and oil seal may be damaged or fluid leakage from the piston check ball may be present.

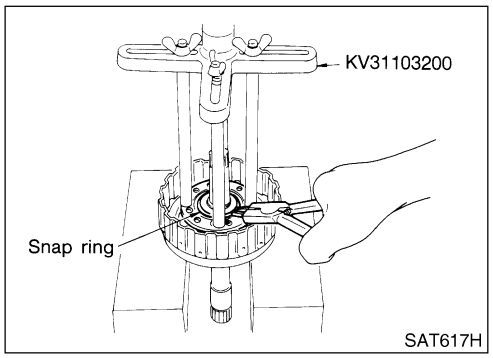


2. Remove the seal ring from the input shaft.
   - Always replace after removal.

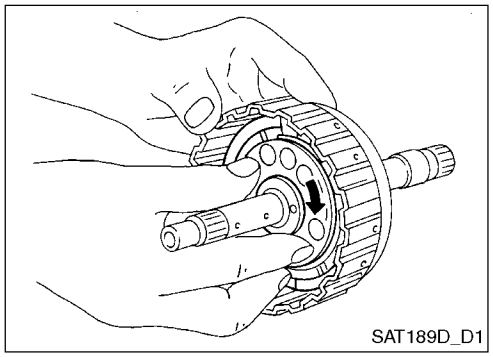


3. Remove the snap ring.
4. Remove the drive plate, driven plate and retaining plate.

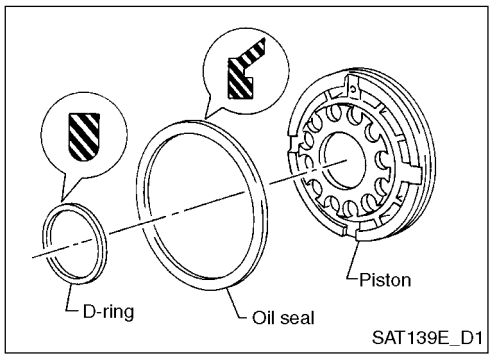
High Clutch (Continued)



5. Install the special tool on the spring retainer and remove the snap ring from the high clutch drum by pressing the return spring.
   - Install the special tool on the spring directly.
   - Do not over stretch the snap ring.
6. Remove the spring retainer and return spring.
   - Do not remove the return spring from the spring retainer.



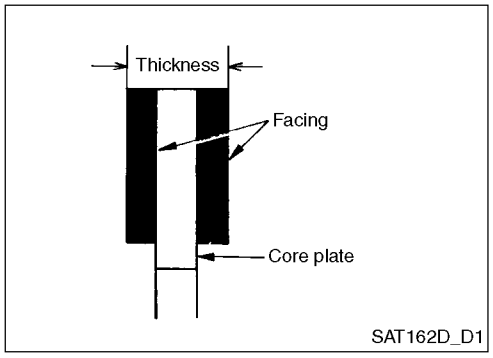
7. Remove the piston from the high clutch drum by rotating the piston.



8. Remove the D-ring and oil seal from the piston.

INSPECTION

1. Reverse clutch snap ring, spring retainer and return spring
   - Inspect for deformation, aging and damages.
   - Replace if necessary.
   - Replace the spring retainer and return spring as a set.



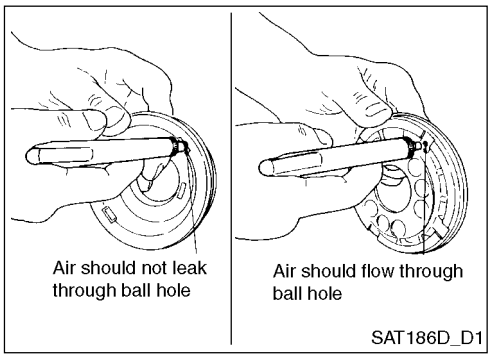
2. High clutch drive plate
   - Inspect for any burns, cracks and damages.
   - Measure the facing thickness.

     Drive plate thickness:

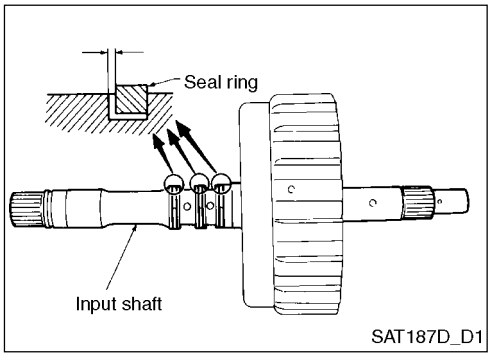
     Standard value: 1.6 mm

     Wear limit: 1.4 mm
   - Replace if out of the limit value.

High Clutch (Continued)



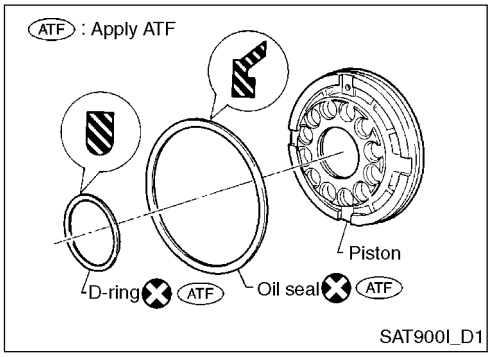
3. High clutch piston
   - The check ball should not be stuck.
   - There should be no air leakage when applying the compressed air at the check ball fluid hole in the opposite side of the return spring.
   - The air must flow the ball when applying the compressed air into the fluid hole at the return spring.



4. Seal ring clearance
   - Install a new seal ring to the input shaft.
   - Measure the clearance between the seal ring and ring groove.

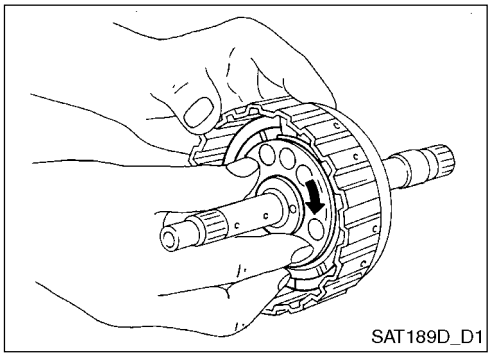
     Standard clearance: 0.08 - 0.23 mm

     Allowed limit: 0.23 mm
   - If the value is out of the limit value, replace the input shaft assembly.

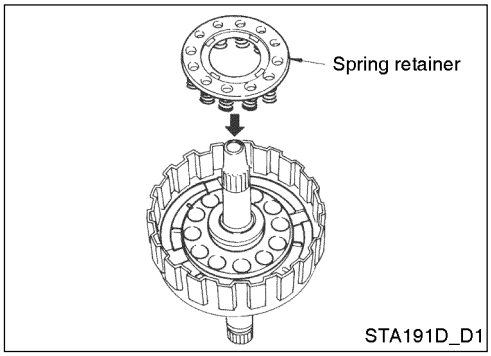


ASSEMBLY

1. Install the D-ring and oil seal to the piston.
   - Be careful of the oil seal direction.
   - Apply the ATF on the oil seal and D-ring.

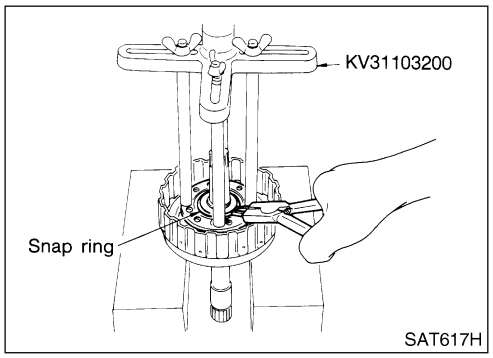


2. Install the piston assembly by rotating it slowly.
   - Apply the ATF inside the drum.

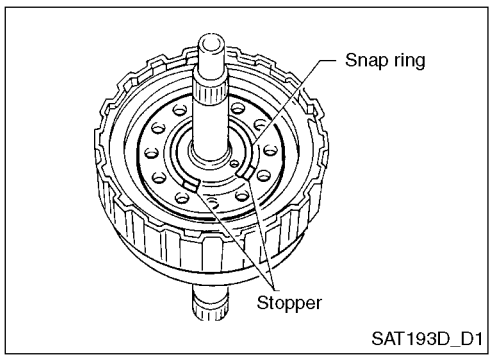


3. Install the return spring and spring retainer on the piston.

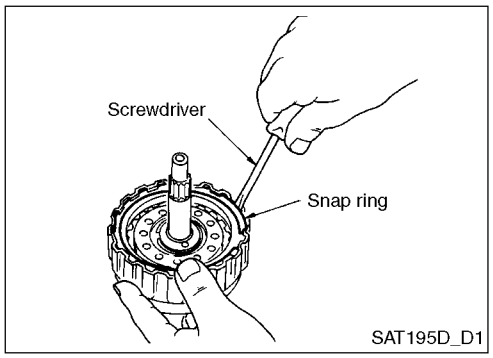
High Clutch (Continued)



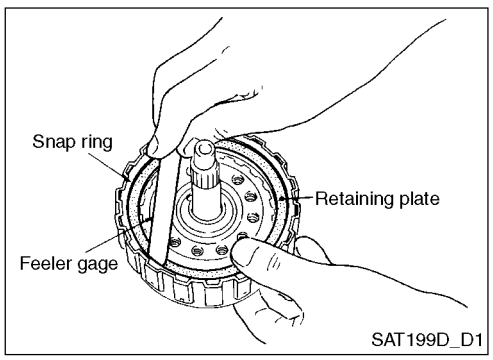
4. Install the special tool on the spring retainer and install the snap ring by pressing the return spring.
   - Install the special tool on the return spring directly.



   - Do not align the snap ring clearance with the retainer stopper.



5. Install the drive plate, driven plate and retaining plate.
   - Be careful of the plate order and direction.
6. Install the snap ring.

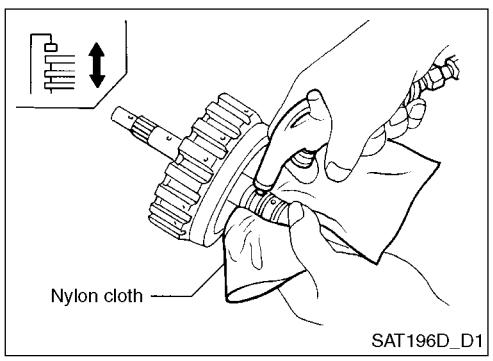


7. Measure the clearance between the retaining plate and snap ring. If the value is out of the limit value, select a proper retaining plate.

Specified clearance

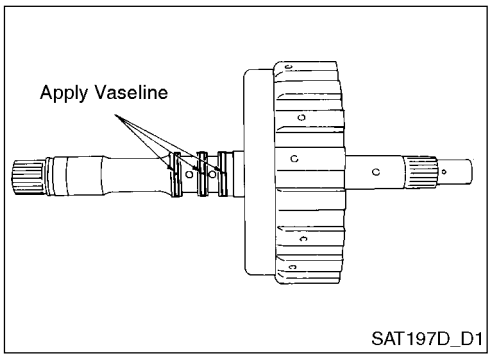
Standard	1.4 - 1.8 mm
Allowed limit	2.6 mm

Retaining plate:
Refer “Specifications” (AT-230).

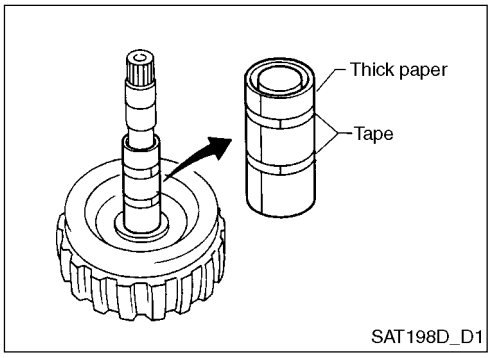


8. Inspect the high clutch operation.
   Refer to “Disassembly” in “High Clutch” (AT-174).

High Clutch (Continued)

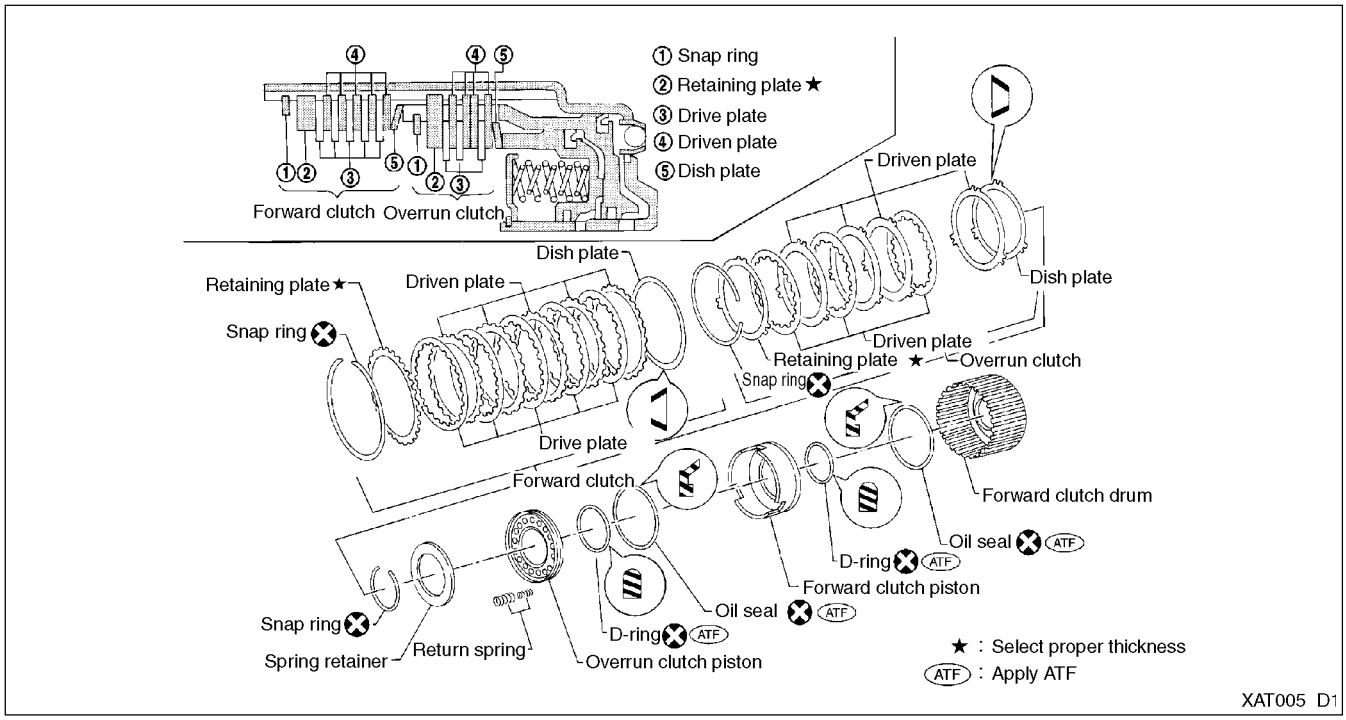


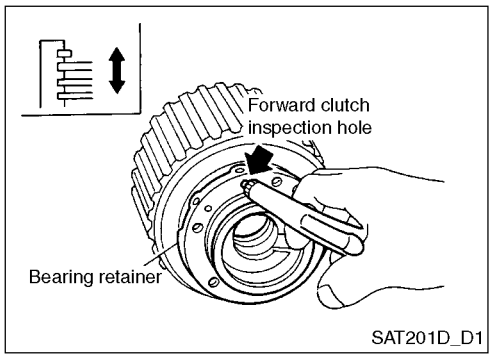
9. Install the seal ring to the input shaft.
   - Apply the Vaseline on the seal ring.

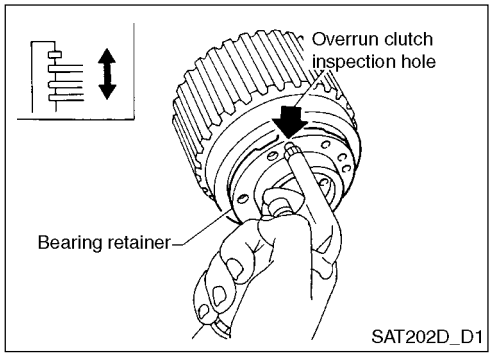


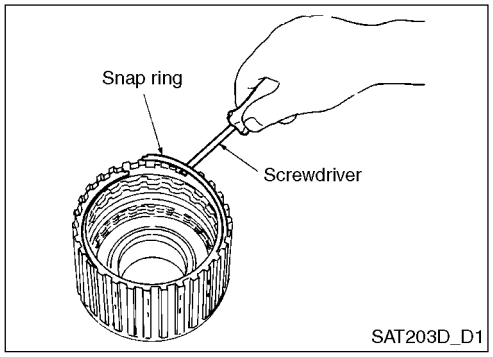
   - Wrap the input shaft seal ring with paper so that it does not unroll.

Forward Clutch & Overrun Clutch





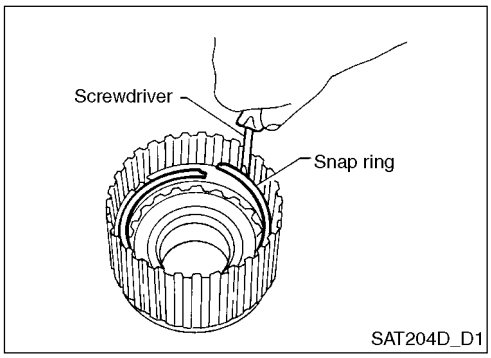




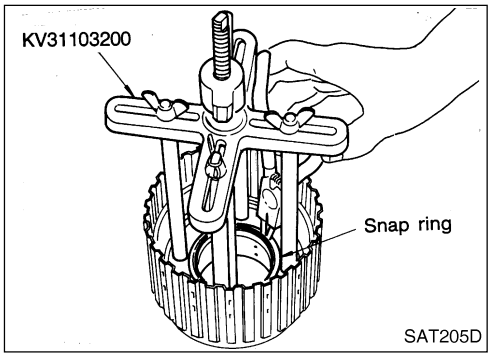
DISASSEMBLY

1. Inspect the forward clutch and overrun clutch operations.
   a. Install the bearing retainer to the forward clutch drum.
   b. Blow the compressed air into the forward clutch drum fluid hole.
   c. Inspect if the retaining plate moves towards the snap ring.
   d. If the retaining plate does not move towards the snap ring, the D-ring and oil seal may be damaged or fluid leakage from the piston check ball may be present.
2. Remove the forward clutch snap ring.
3. Remove the drive plate, driven plate, retaining plate and dish plate from the forward clutch.

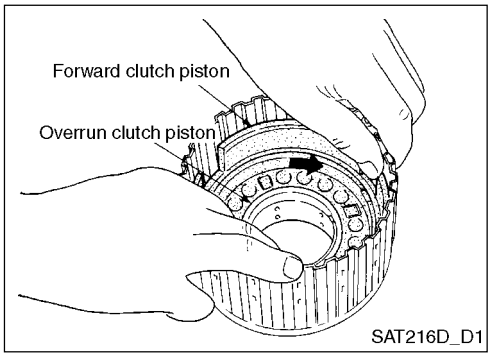
Forward Clutch & Overrun Clutch (Continued)



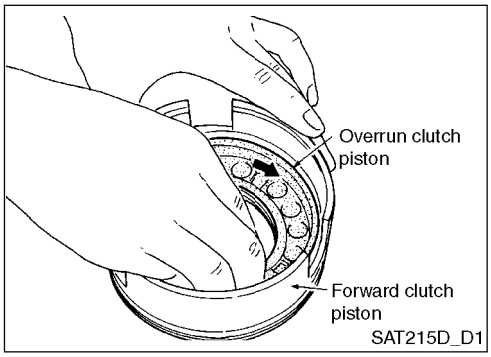
4. Remove the overrun clutch snap ring.
5. Remove the drive plate, driven plate, retaining plate and dish plate from the overrun clutch.



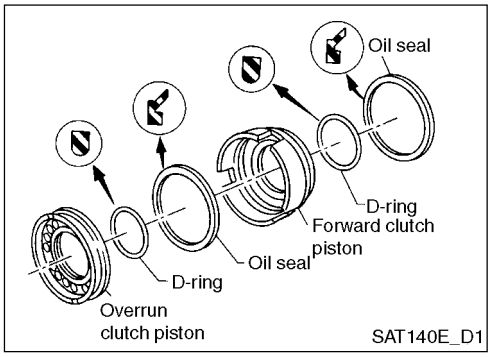
6. Install the special tool to the spring retainer and remove the snap ring from the forward clutch drum by pressing the return spring.
   - Install the special tool on the return spring directly.
   - Do not over stretch the snap ring.
7. Remove the spring retainer and return spring.
   - Do not remove the return spring from the spring retainer.



8. Remove the forward clutch piston with the overrun clutch piston by rotating it in the forward clutch drum.



9. Remove the overrun clutch piston by rotating it from the forward clutch piston.

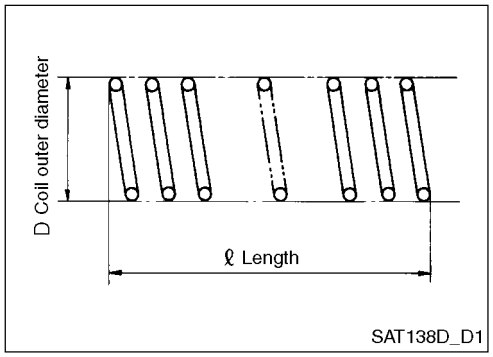


10. Remove the D-ring and oil seal from the forward clutch piston and overrun clutch piston.

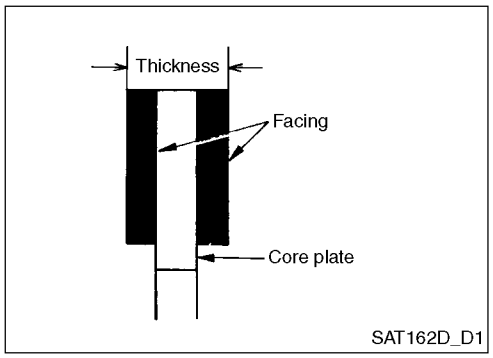
Forward Clutch & Overrun Clutch (Continued)

INSPECTION

1. Snap ring and spring retainer
   - Inspect for deformation, aging and damages.
   - Replace if necessary.
   - Replace the spring retainer and return spring as a set.



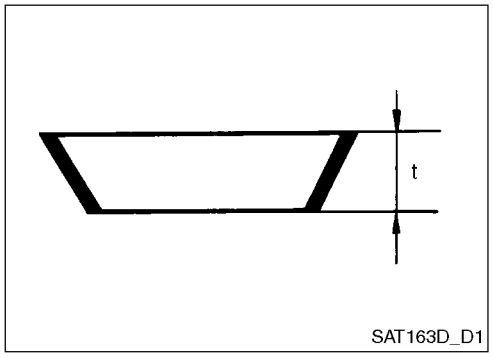
2. Forward clutch and overrun clutch return spring
   - Inspect the facing for any damages and cracks.
   - Measure the free length and outside diameter.
   - Replace if deformed or worn.



3. Forward clutch and overrun clutch drive plate
   - Inspect for facing burns, cracks and damages.
   - Measure the facing thickness.
     Drive plate thickness

Forward clutch	Standard value	1.8 mm
	Wear limit	1.6 mm
Overrun clutch	Standard value	1.6 mm
	Wear limit	1.4 mm

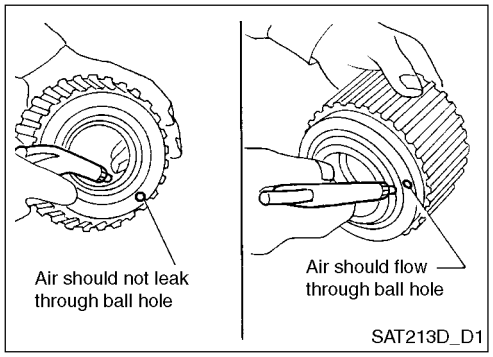
   - Replace if out of the limit value.



4. Forward clutch and overrun clutch dish plate
   - Inspect for any deformation or damages.
   - Measure the dish plate thickness.
     Dish plate thickness “t”

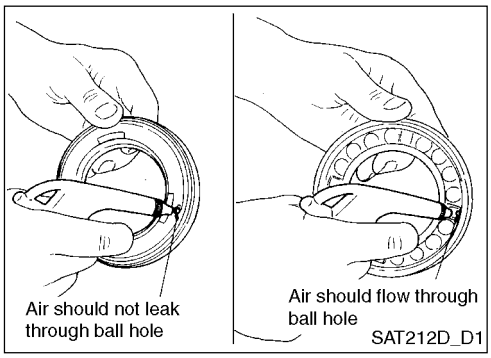
Forward clutch	2.5 mm
Overrun clutch	2.15 mm

   - Replace if deformed or aged.

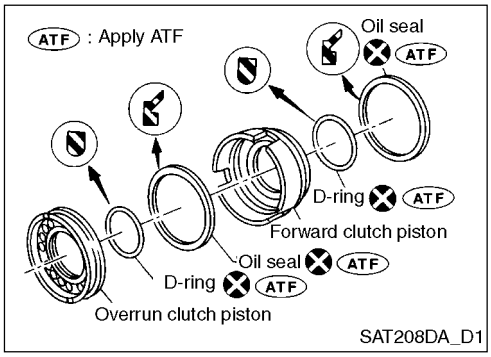


5. Forward clutch drum
   - The check ball should not be stuck.
   - The air must flow the ball when applying the compressed air into the fluid hole from the outer forward clutch drum.
   - There should be no air leakage when applying the compressed into the fluid hole from the inner forward clutch drum.

Forward Clutch & Overrun Clutch (Continued)

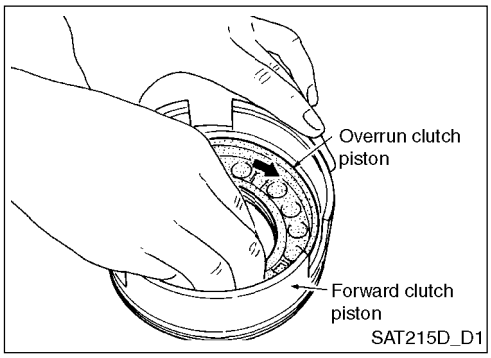


6. Overrun clutch piston
   - The check ball should not be stuck.
   - There should be no air leakage when applying the compressed air at the check ball fluid hole in the opposite side of the return spring.
   - The air must flow the ball when applying the compressed air into the fluid hole at the return spring.

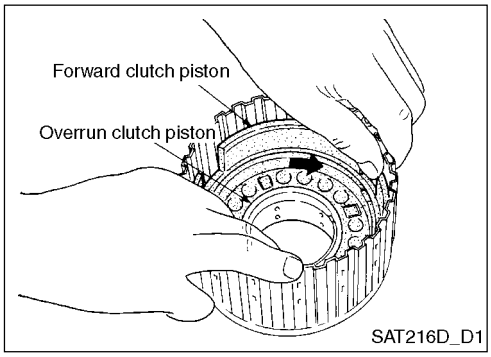


ASSEMBLY

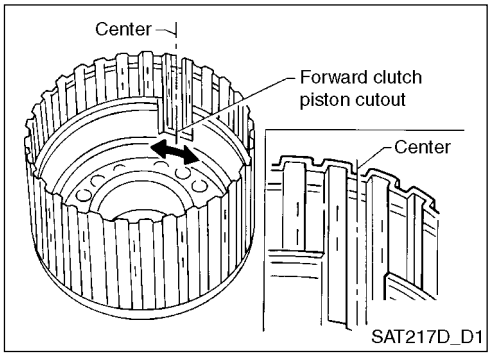
1. Install the D-ring and oil seal to the forward clutch piston and overrun clutch piston.
   - Be careful of the oil seal direction.
   - Apply ATF to both components.



2. Install the overrun clutch piston assembly to the forward clutch piston by rotating it.
   - Apply ATF inside of the forward clutch piston.

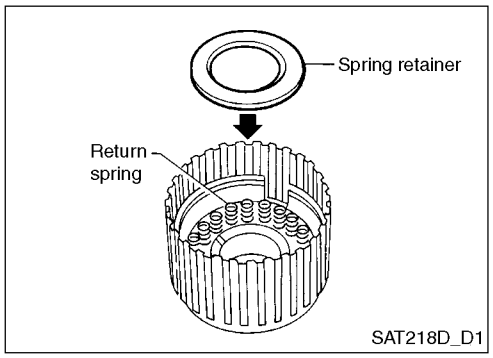


3. Install the forward clutch piston assembly to the forward clutch drum by rotating it slowly.
   - Apply ATF inside of the drum.

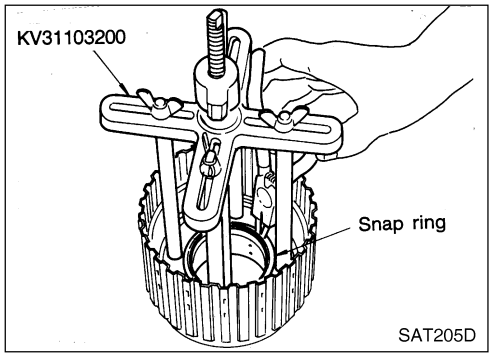


4. Align the forward clutch piston notch with forward clutch drum groove.

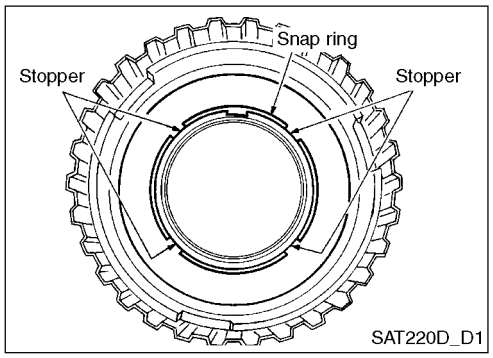
Forward Clutch & Overrun Clutch (Continued)



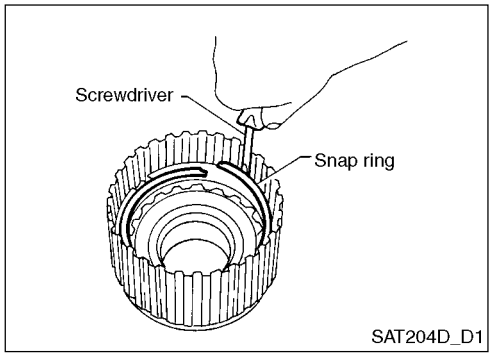
5. Install the return spring to the piston.
6. Install the spring retainer to the return spring.



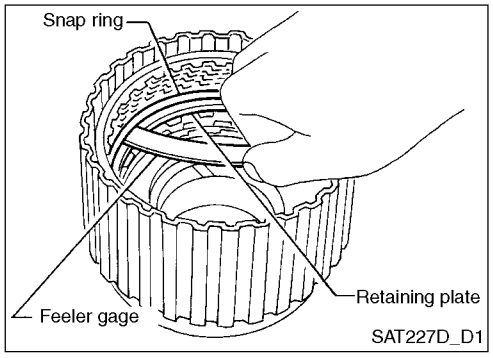
7. Install the snap ring by pressing the return spring after installing the special tool on the spring retainer.
   - Install the special tool on the return spring directly.



   - Do not align the snap ring clearance with the spring retainer stopper.



8. Install the drive plate, driven plate, retaining plate and dish plate of the overrun clutch.
9. Install the overrun clutch snap ring.



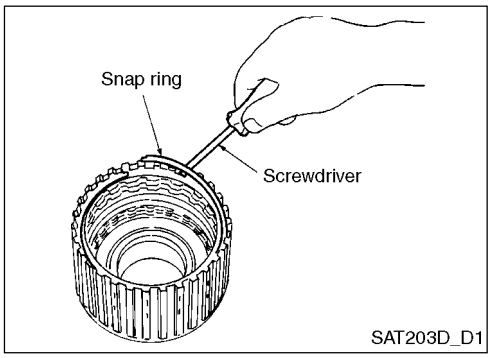
10. Measure the clearance between the overrun clutch retaining plate and the snap ring. If the value is out of the limit value, select a proper retaining plate.

Specified clearance:

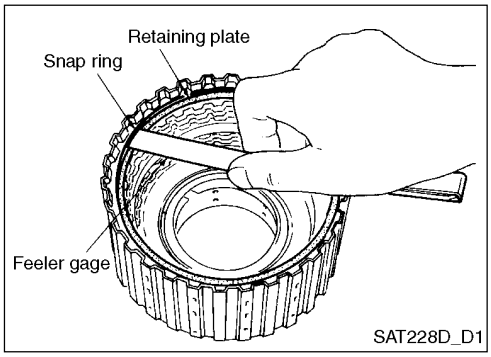
Standard	1.0 - 1.4 mm
Allowed limit	2.0 mm

Overrun plate retaining plate:
Refer to “Specifications” (AT-230).

Forward Clutch & Overrun Clutch (Continued)



11. Install the drive plate, driven plate, retaining plate and dish plate of the forward clutch.
    - Be careful of the plate order and direction.
12. Install the forward clutch snap ring.



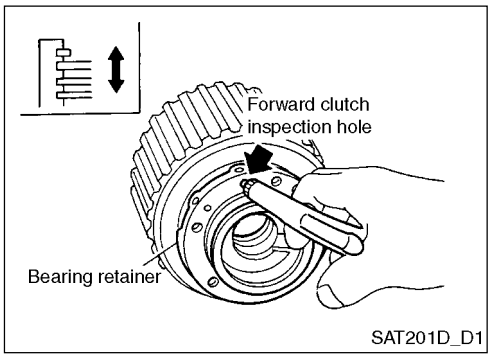
13. Measure the clearance between the forward clutch retaining plate and the snap ring. If the value is out of the limit value, select a proper retaining plate.

    Specified clearance:

Standard	0.45 - 0.85 mm
Allowed limit	1.85 mm

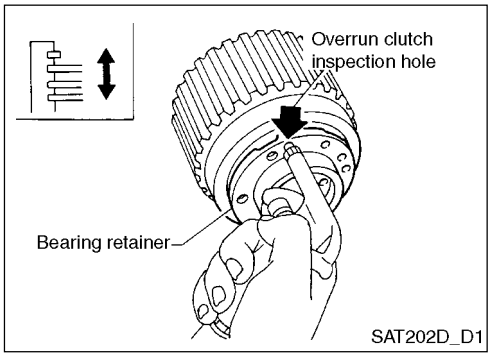
    Forward clutch retaining plate:

    Refer to “Specifications” (AT-230).



14. Inspect the forward clutch operation.

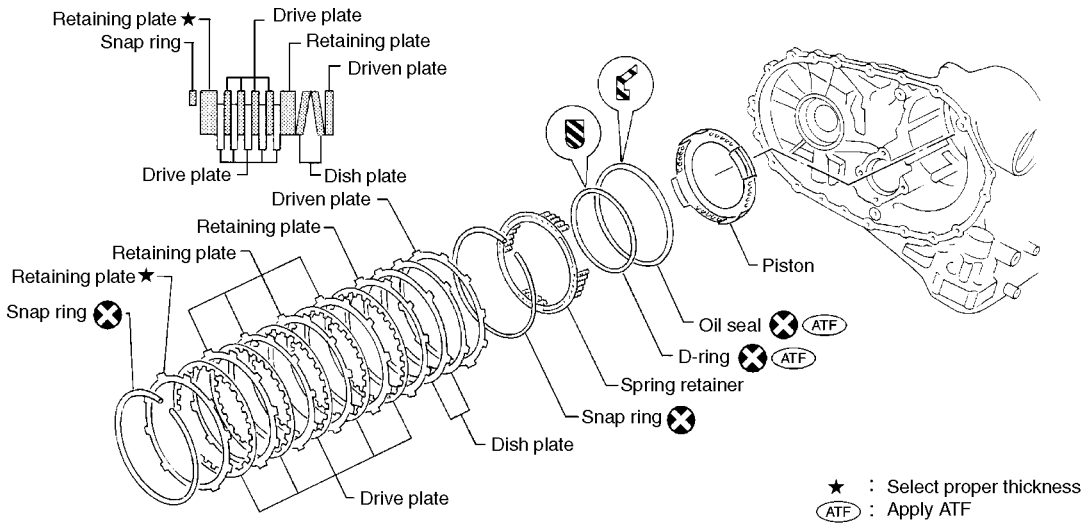
    Refer to “Disassembly” in “Forward Clutch & Overrun Clutch” (AT-179).

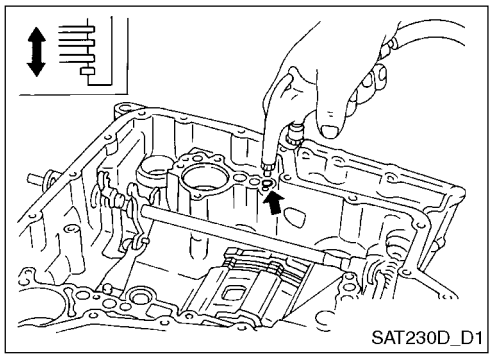


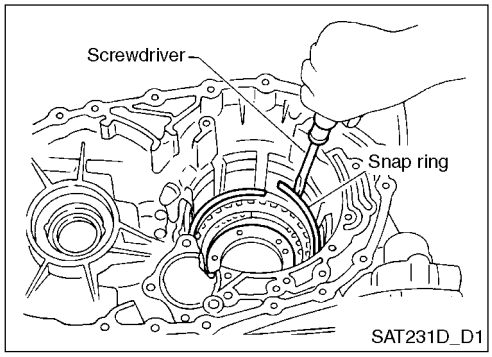
15. Inspect the overrun clutch operation.

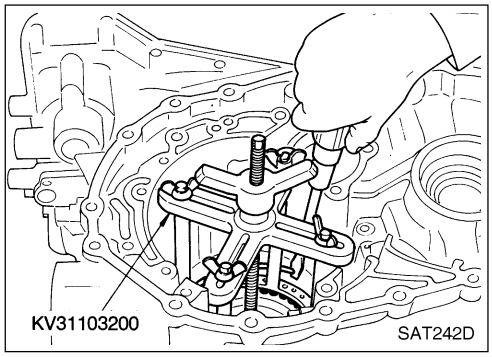
    Refer to “Disassembly” in “Forward Clutch & Overrun Clutch” (AT-179).

Low and Reverse Brake





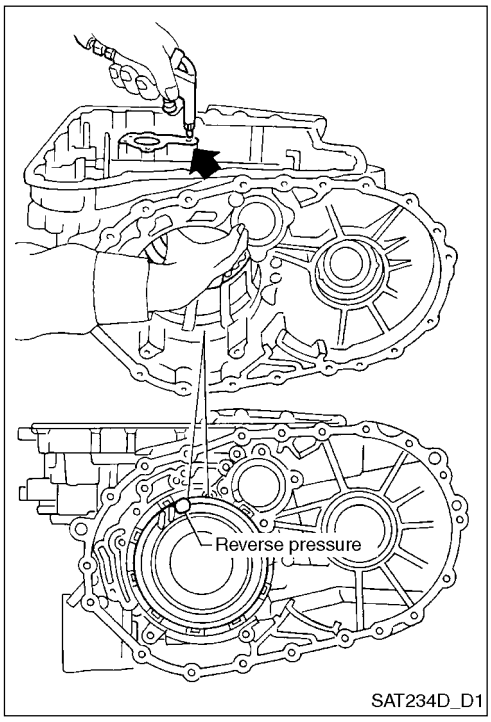




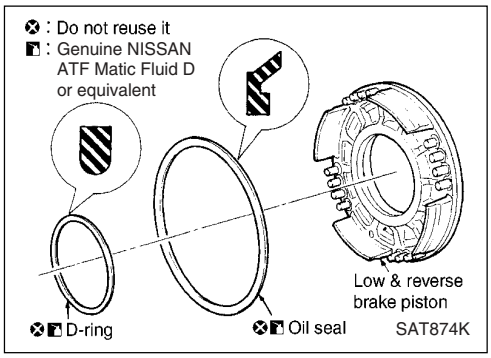
DISASSEMBLY

1. Inspect the low and reverse brake operation.
   a. Blow the compressed air into the transaxle case fluid hole.
   b. Inspect if the retaining plate moves towards the snap ring.
   c. If the retaining plate does not move towards the snap ring, the D-ring or oil seal may be damaged or probable leakage from the piston check ball is present.
2. Stand up the transaxle case.
3. Remove the snap ring.
4. Remove the dish plate, driven plate and retaining plate from the transaxle case.
5. Install the special tool on the spring retainer and remove the snap ring by pressing the return spring.
   - Install the special tool on the return spring directly.
   - Do not over stretch the snap ring.
6. Replace the spring retainer and snap ring.
   - Do not remove the return spring from the spring retainer.

Low and Reverse Brake (Continued)



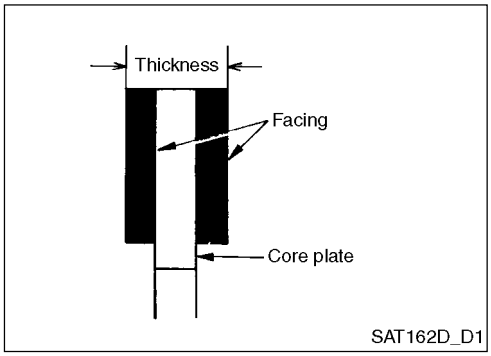
7. Blow the compressed air into the transaxle case fluid hole while holding the piston.
8. Remove the piston from the transaxle case by rotating it.



9. Remove the D-ring and oil seal from the piston.

INSPECTION

1. Low and reverse clutch snap ring, spring retainer and return spring
   - Inspect for any deformation, aging and damages.
   - Replace if necessary.
   - Replace the spring retainer and return spring as a set.



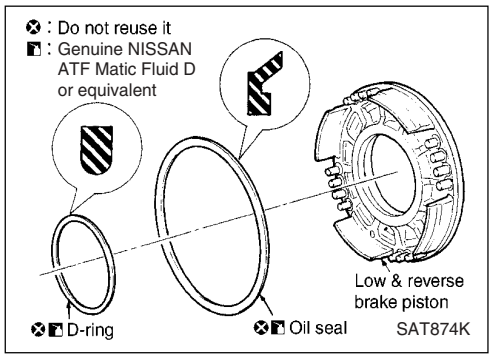
2. Low and reverse brake drive plate
   - Inspect the facing for any burns, cracks and damages.
   - Measure the facing thickness.

     Drive plate thickness

     Standard value: 2.0 mm

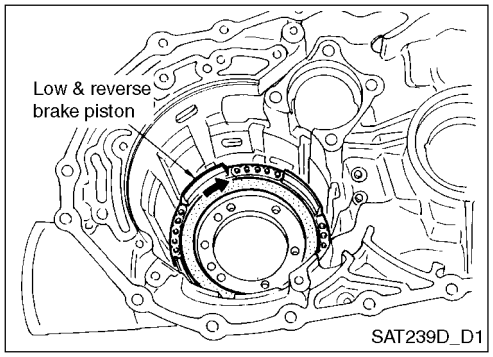
     Wear limit: 1.8 mm
   - Replace if out of the limit value.

Low and Reverse Brake (Continued)

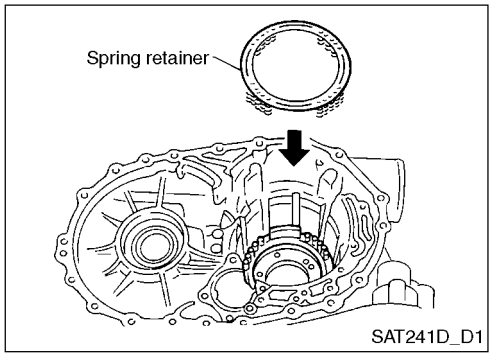


ASSEMBLY

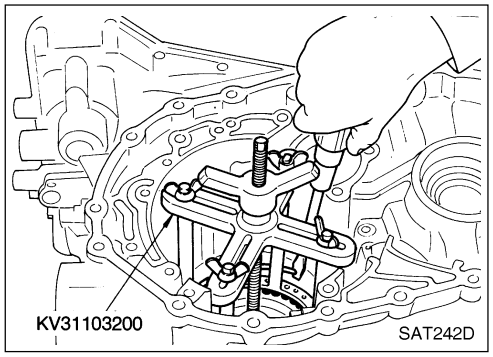
1. Install the D-ring and oil seal to the piston.
   - Be careful of the oil seal direction.
   - Apply ATF to both components.



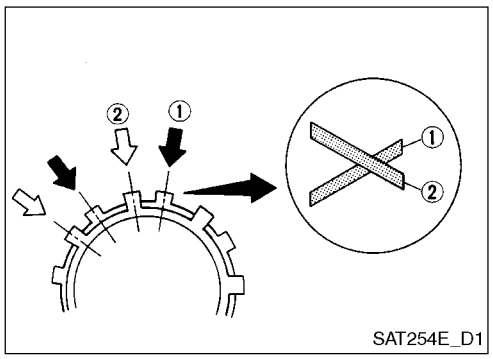
2. Stand up the transaxle case.
3. Install the piston assembly to the transaxle case by rotating it.
   - Apply the ATF inside of the transaxle case.



4. Install the return spring and spring retainer to the piston.

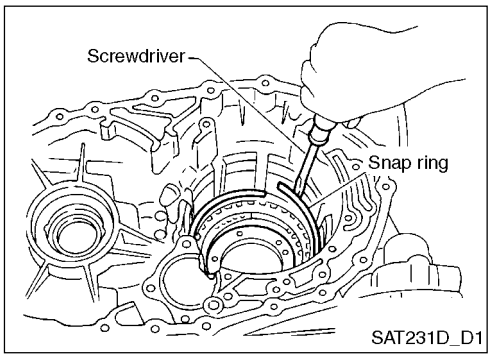


5. Install the snap ring by pressing the return spring.
   - Install the special tool on the return spring directly.

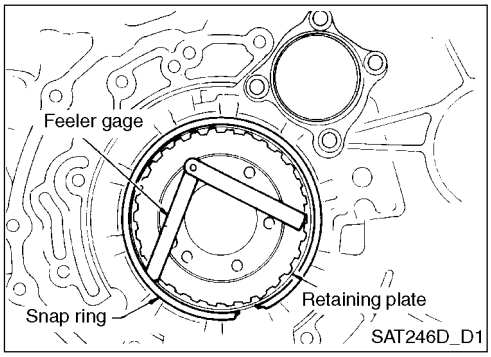


6. Install the drive plate, driven plate, retaining plate and dish plate.
   - Do not align two or more dish plate's protrusion.
   - Be careful of the plate order and direction.

Low and Reverse Brake (Continued)



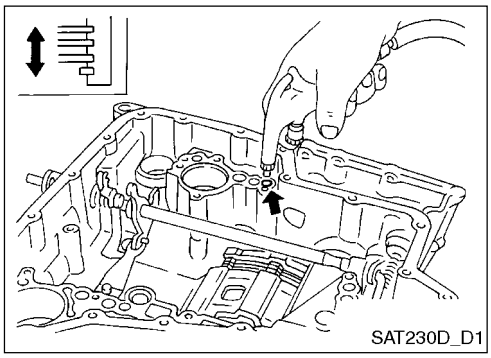
7. Install the snap ring.



8. Measure the clearance between the retaining plate and snap ring. If the value is out of the limit value, select a proper retaining plate (front side).

   Specified clearance: Refer the "Specifications" (AT-230)**.**

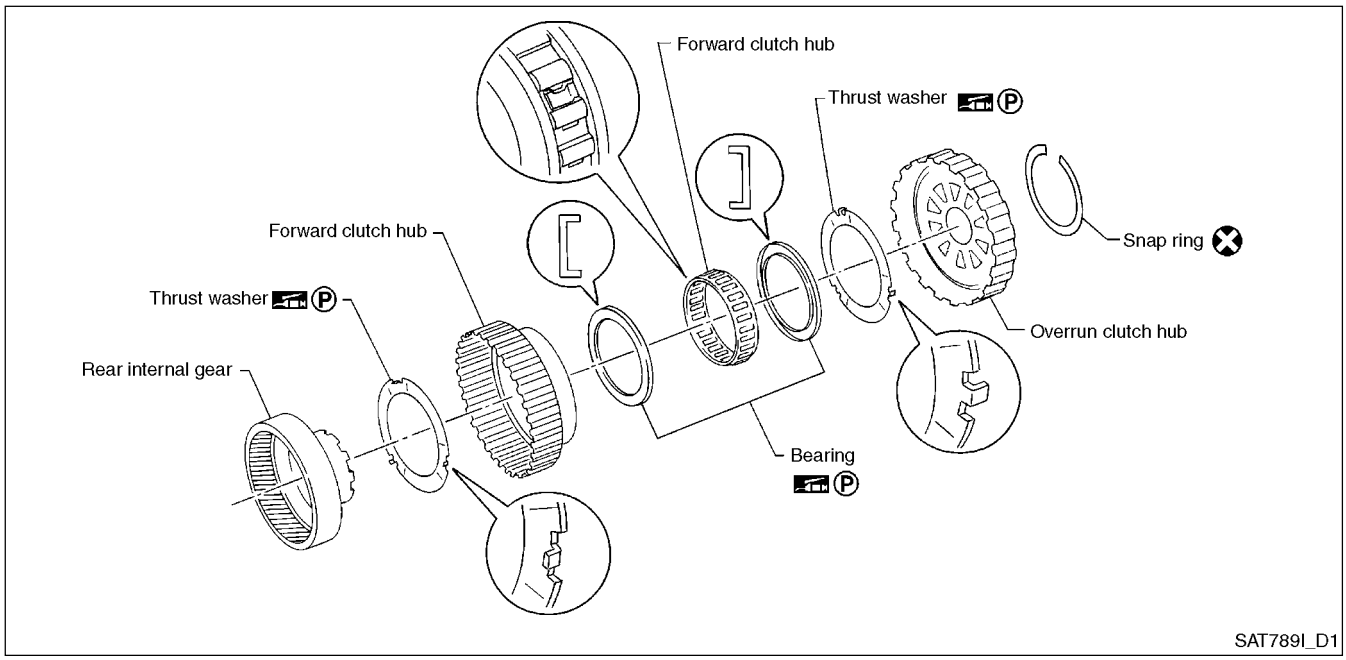
   Retaining plate: Refer the "Specifications" (AT-230)**.**

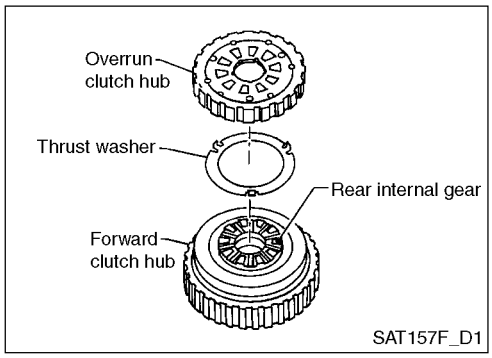


9. Inspect the low and reverse brake operation.

   Refer to "Disassembly" in "Low and Reverse Brake" (AT-185).

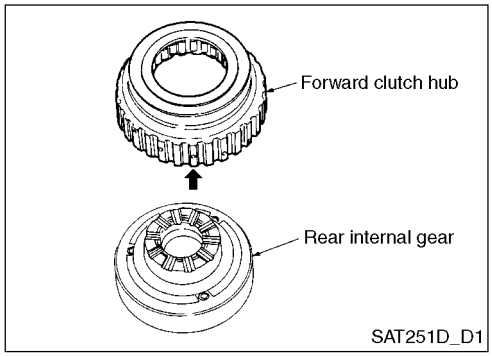
Rear Internal Gear, Forward Clutch Hub and Overrun Clutch Hub



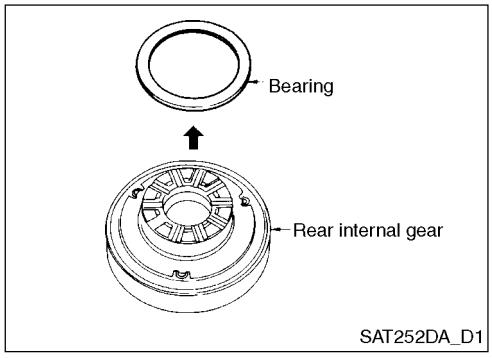


DISASSEMBLY

1. Remove the snap ring from the overrun clutch hub.
2. Remove the overrun clutch hub and thrust washer from the forward clutch hub.

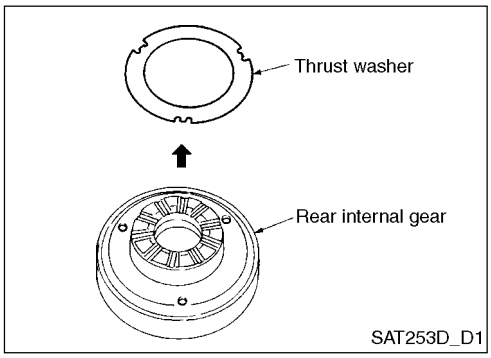


3. Remove the forward clutch hub from the rear internal gear.

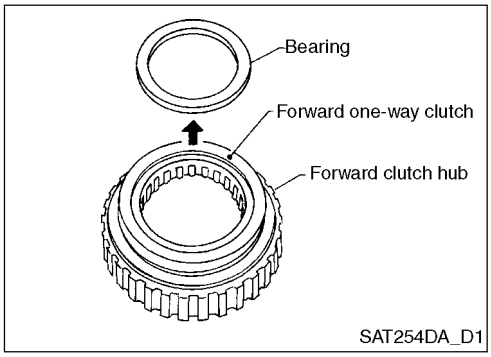


4. Disconnect the bearing from the rear internal gear.

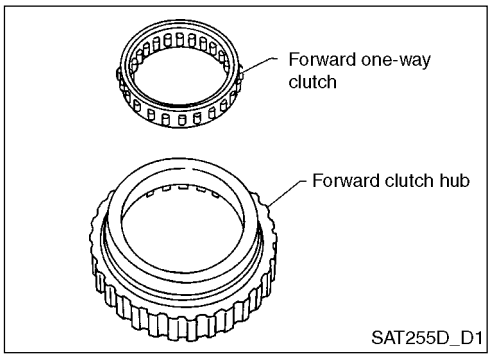
Rear Internal Gear, Forward Clutch Hub and Overrun Clutch Hub (Continued)



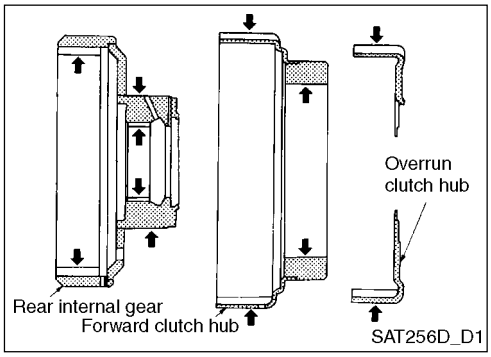
5. Remove the thrust washer from the rear internal gear.



6. Disconnect the bearing from the forward one-way clutch.



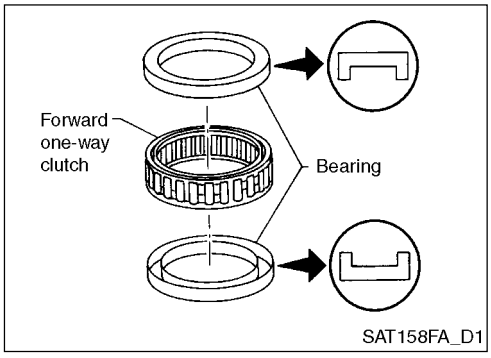
7. Remove the forward one-way clutch from the forward clutch hub.



INSPECTION

Rear internal gear, forward clutch hub and overrun clutch hub.

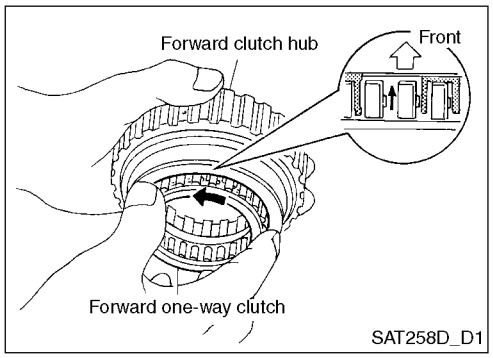
- Inspect the friction surface for any wear or damages.



Bearing and forward one-way clutch.

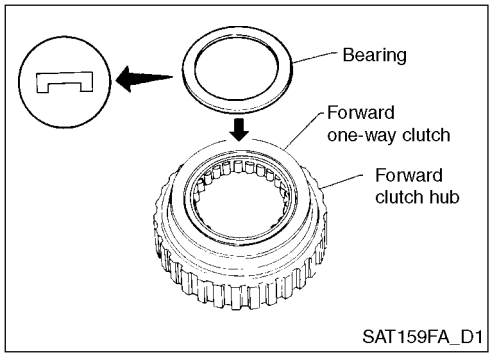
- Inspect the bearing for any deformation and damages.
- Inspect the forward one-way clutch for any wear or damages.

Rear Internal Gear, Forward Clutch Hub and Overrun Clutch Hub (Continued)

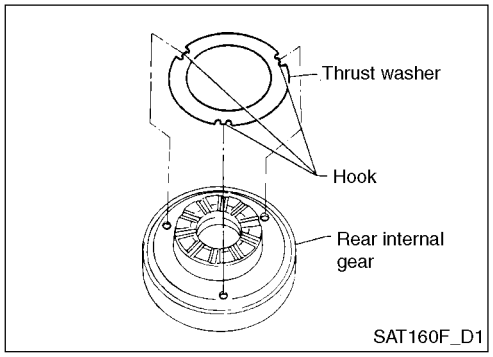


ASSEMBLY

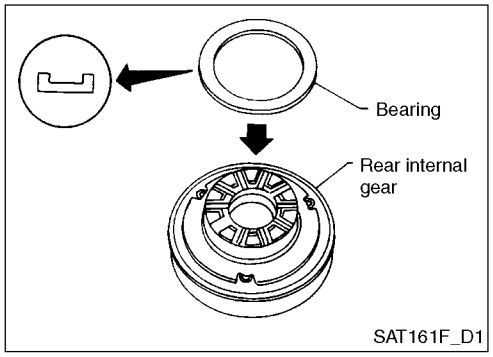
1. Install the forward one-way clutch to the forward clutch.
   - Be careful of the forward one-way clutch direction.



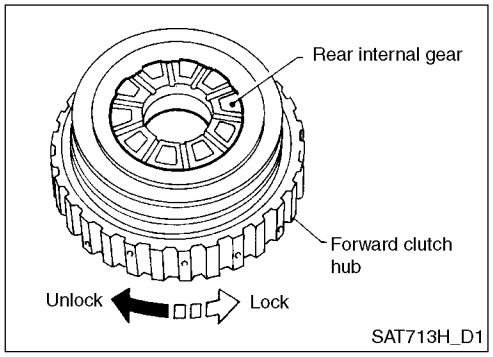
2. Install the bearing to the forward one-way clutch.
   - Apply the Vaseline on the bearing.



3. Install the rear internal gear thrust washer.
   - Apply the Vaseline on the thrust washer.
   - Align the thrust washer hook with the rear internal gear hole.

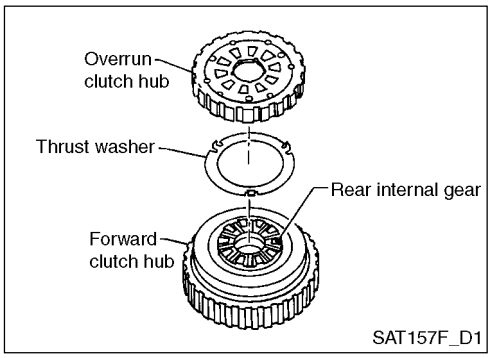


4. Install the bearing to the rear internal gear.
   - Apply the Vaseline on the bearing.

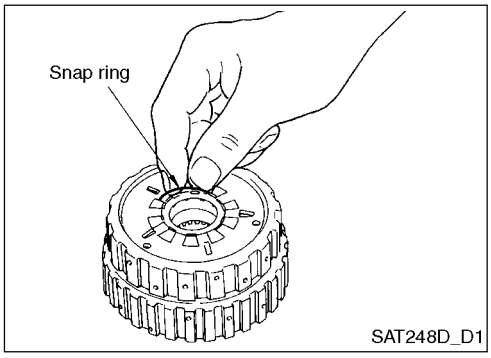


5. Install the forward clutch hub to the rear internal gear.
   - Inspect the forward one-way clutch operation.

Rear Internal Gear, Forward Clutch Hub and Overrun Clutch Hub (Continued)



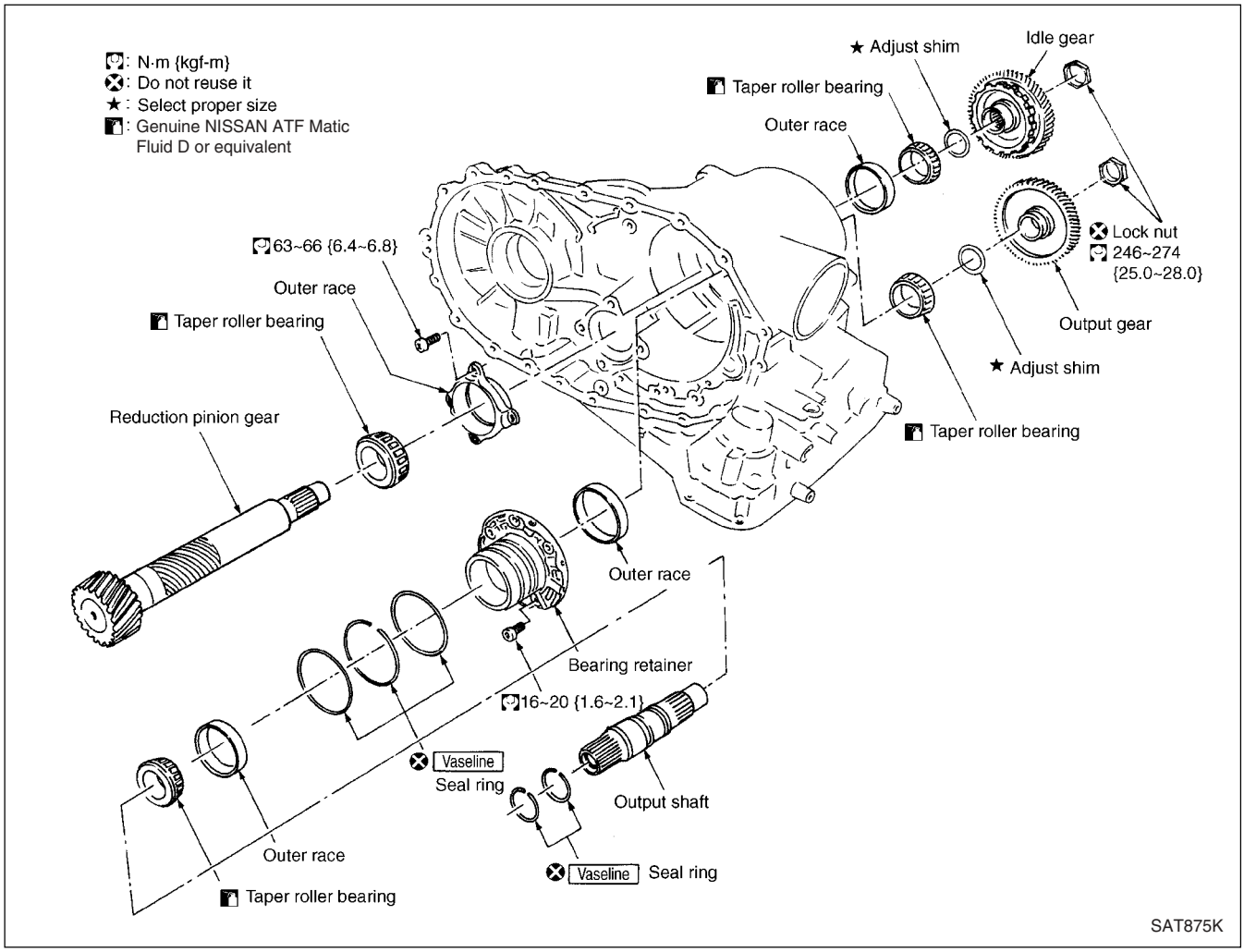
6. Install the thrust washer to the overrun clutch hub.
   - Apply the Vaseline on the thrust washer.
   - Align the thrust washer hook with the rear internal gear hole.
   - Align the rear internal gear protrusion with the overrun clutch hub hole.



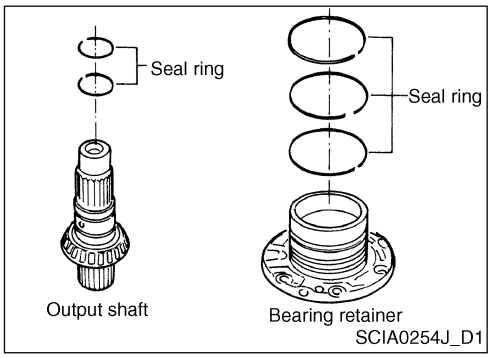
7. Install the snap ring to the rear internal gear groove.

Output Shaft, Idler Gear, Reduction Gear and Bearing Retainer

Disassembly • Assembly

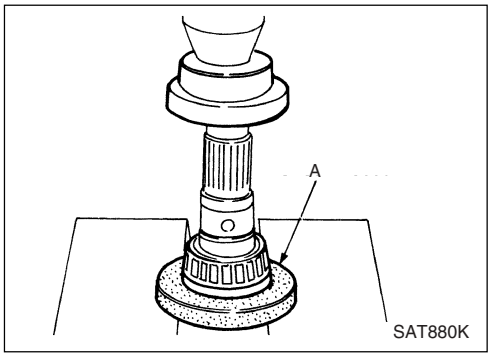


Output Shaft, Idler Gear, Reduction Gear and Bearing Retainer (Continued)

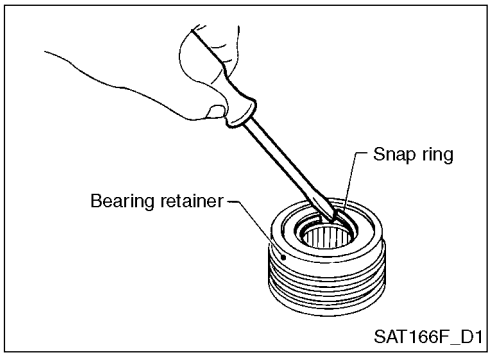


DISASSEMBLY

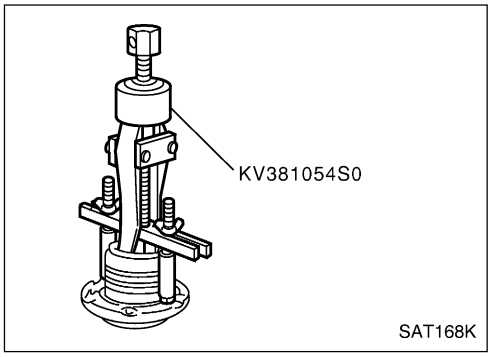
1. Remove the seal ring from the output shaft and bearing retainer.



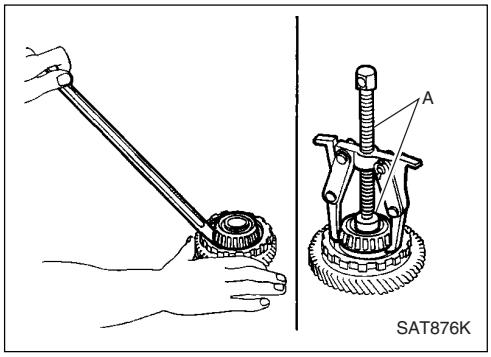
2. Remove the output shaft bearing and outer race using a drift (A: commercial tool).
   - Replace the bearing with new component when removed.
   - Be careful not to damage the output shaft.



3. Disconnect the snap ring from the bearing retainer.

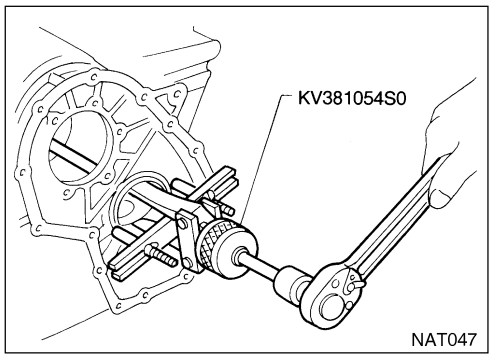


4. Disconnect the outer race from the bearing retainer.

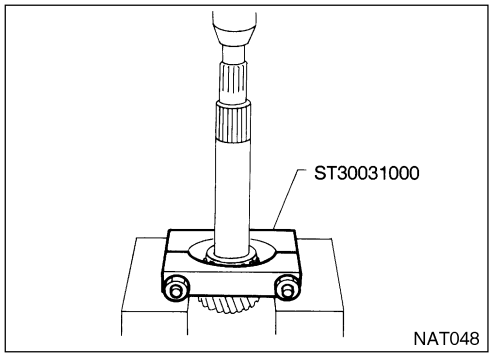


5. Remove the idler gear bearing from the idler gear. Tool A: Commercial service tool

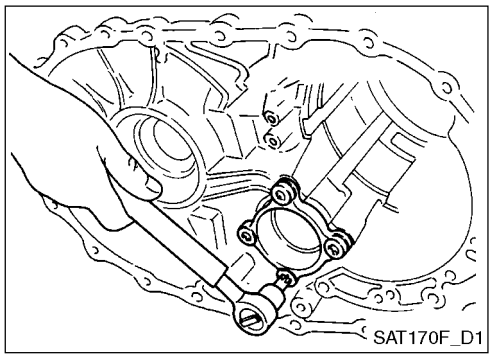
Output Shaft, Idler Gear, Reduction Gear and Bearing Retainer (Continued)



6. Remove the idler gear bearing outer race from the transaxle case.



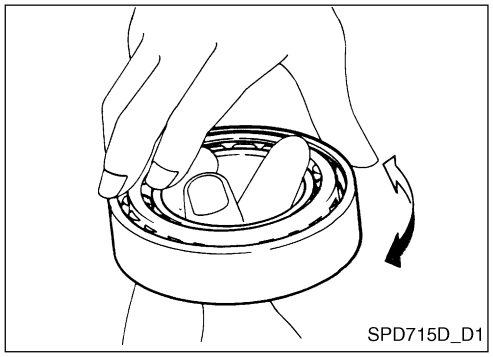
7. Remove the reduction pinion gear bearing inner race from the reduction pinion gear by pushing it.



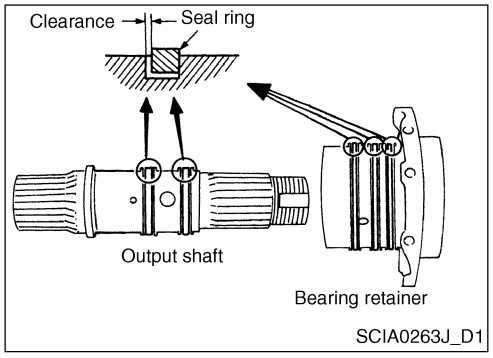
8. Remove the reduction pinion gear bearing outer race from the transaxle case.

INSPECTION

1. Output shaft, idler gear and reduction gear
   - Inspect the shaft for any cracks, wear and bends.
   - Inspect the gear for any wear, chips and cracks.



2. Bearing
   - The bearing should be freely rotating without any noises, cracks, dents and wears.
   - When replacing the taper roller bearing, replace the outer race and inner race as a set.



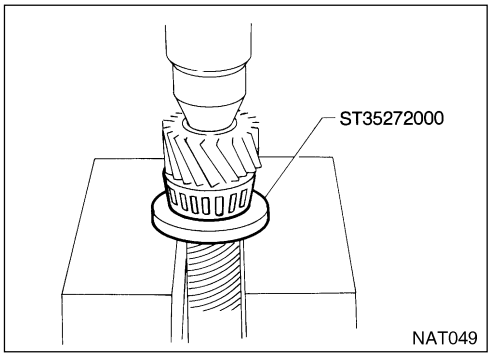
3. Seal ring clearance
   - Install the new seal ring to the output shaft.
   - Measure the clearance between the seal ring and output shaft ring groove.

     Standard clearance: 0.10 - 0.025 mm
     Allowed limit: 0.25 mm
   - If the measured value is not within the limit value, replace the output shaft.
   - Install the new seal ring to the bearing retainer.
   - Measure the clearance between the seal ring and bearing retainer ring groove.

Output Shaft, Idler Gear, Reduction Gear and Bearing Retainer (Continued)

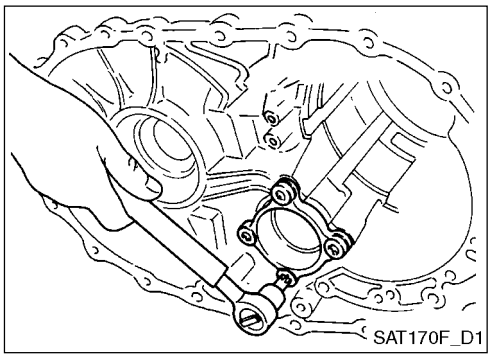
Standard	0.10 - 1.25 mm
Allowed limit	0.25 mm

- If the measured value is not within the limit value, replace the bearing retainer.

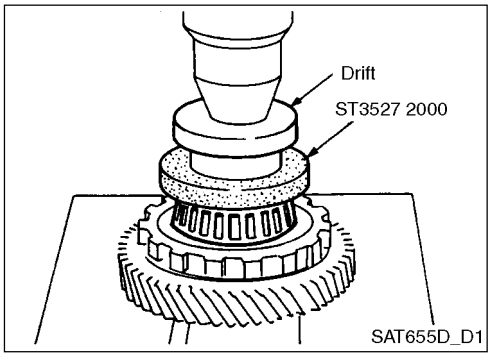


ASSEMBLY

1. Press in the reduction pinion gear bearing inner race to the reduction pinion gear.

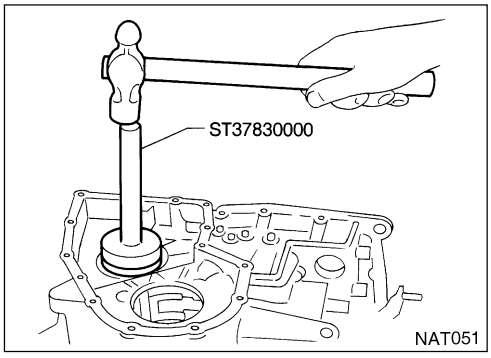


2. Install the reduction pinion gear bearing outer race to the transaxle case.



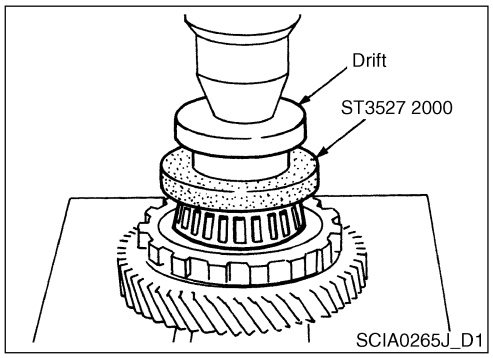
Place the new idle gear and bearing on the idle gear table and insert the bearing with pressure by using the drift.

3. Install the idler gear bearing inner race to the idler gear by pushing it.

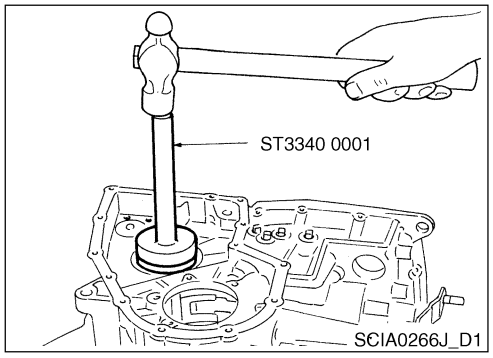


4. Install the idler gear bearing outer race to the transaxle case.

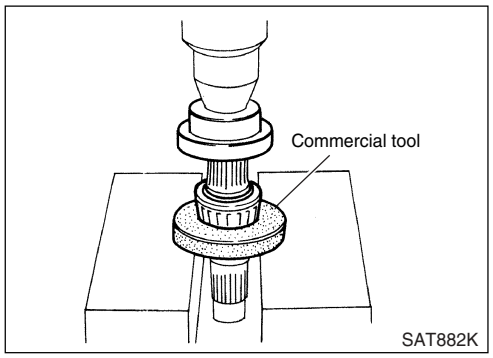
Output Shaft, Idler Gear, Reduction Gear and Bearing Retainer (Continued)



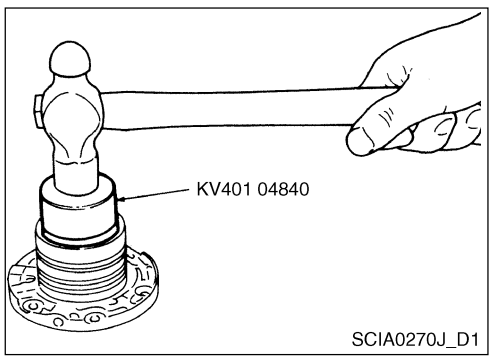
5. Install the output gear bearing.



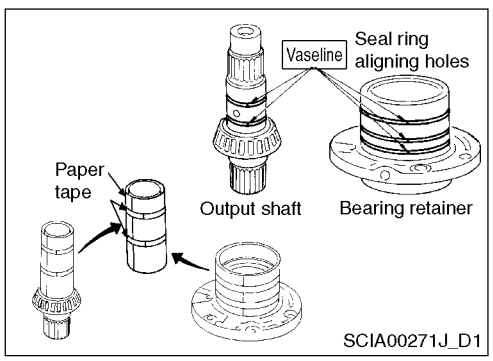
6. Press in the outer race to the bearing retainer.



7. Press in the output shaft bearing.

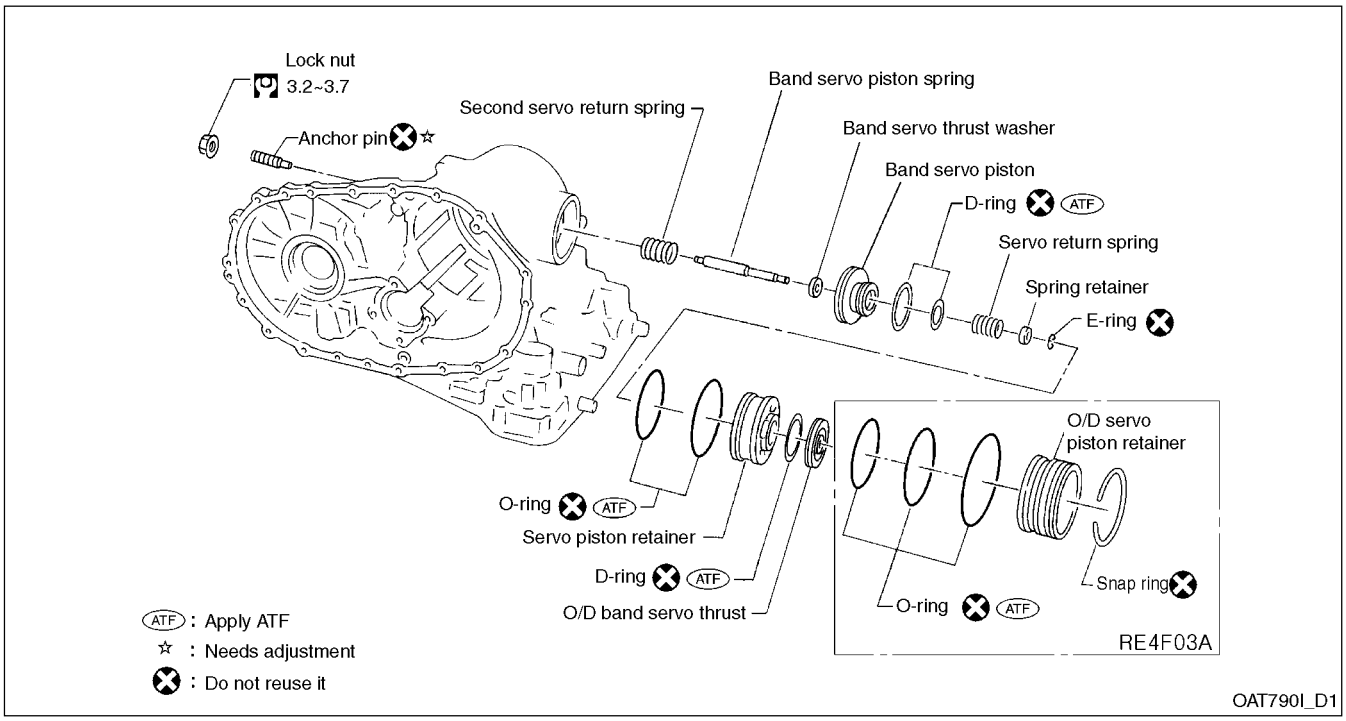


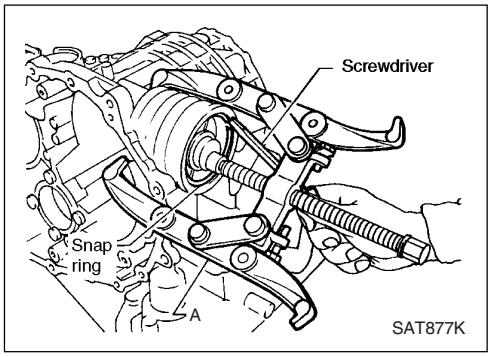
8. Install the outer race to the bearing retainer.



9. After applying the Vaseline on the ring groove, install the new seal ring to the output shaft and bearing retainer carefully.
   - Wrap the input shaft's seal ring with the paper so that it does not unroll.

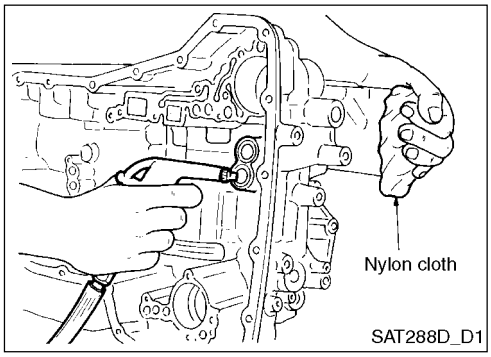
Band Servo Piston Assembly



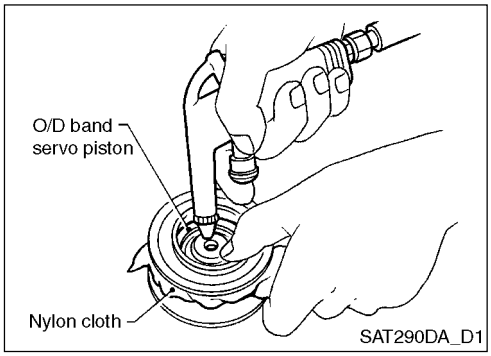


DISASSEMBLY

1. Remove the band servo piston snap ring.
   Tool A: Commercial service tool

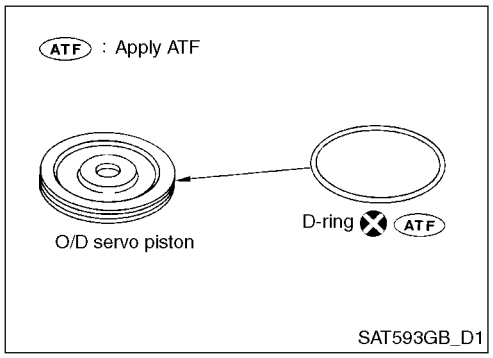


2. Remove the O/D servo piston retainer and band servo piston assembly by blowing the compressed air into the transaxle case fluid hole.
   - Hold the servo piston assembly with a cloth.

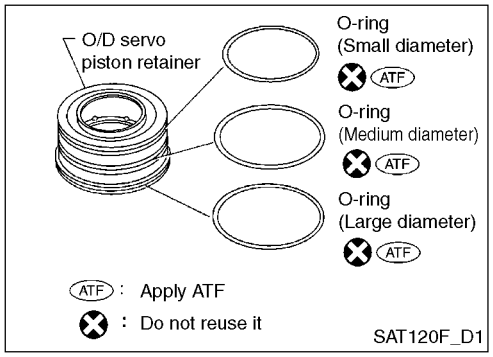


3. Remove the O/D band servo piston from the retainer by blowing the compressed air into the O/D servo piston retainer fluid hole.
   - Hold the O/D servo while blowing the compressed air.

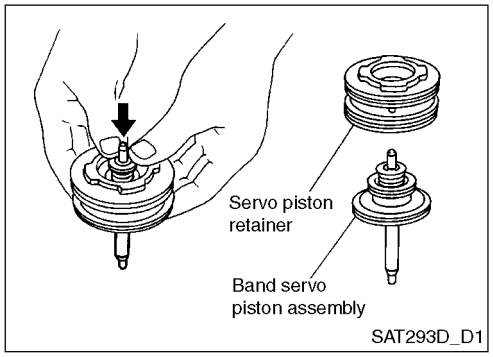
Band Servo Piston Assembly (Continued)



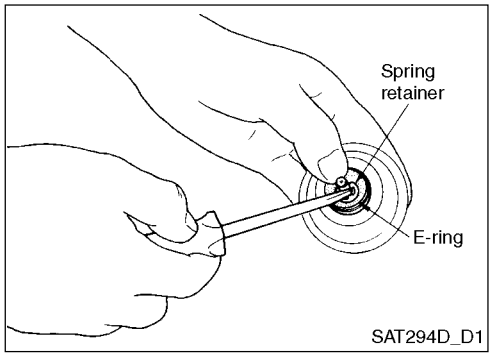
4. Remove the D-ring from the O/D servo piston.



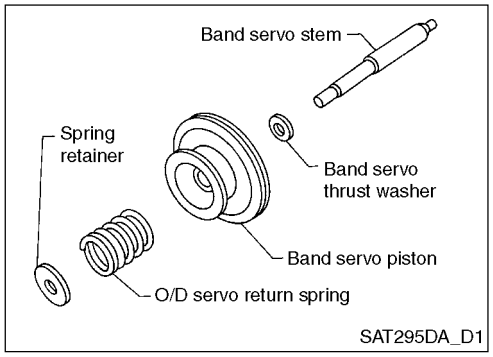
5. Remove the O-ring from the O/D servo piston retainer.



6. Remove the band servo piston assembly by pushing it forward from the servo piston retainer.

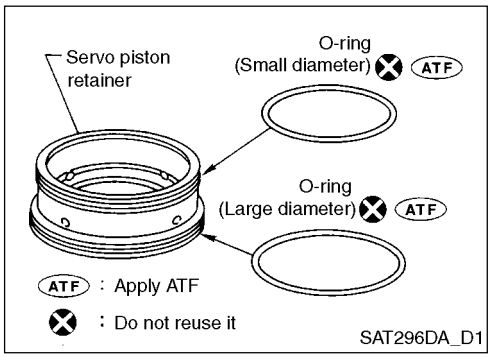


7. Place the piston stem end on a wood block and remove the E-ring while pressing the servo piston spring retainer downward.

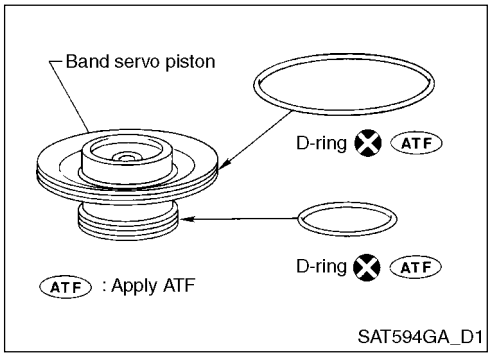


8. Remove the O/D servo return spring, band servo thrust washer and band servo piston stem from the band servo piston.

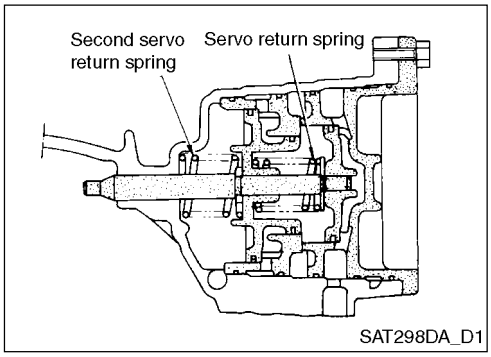
Band Servo Piston Assembly (Continued)



9. Remove the O-ring from the servo piston retainer.

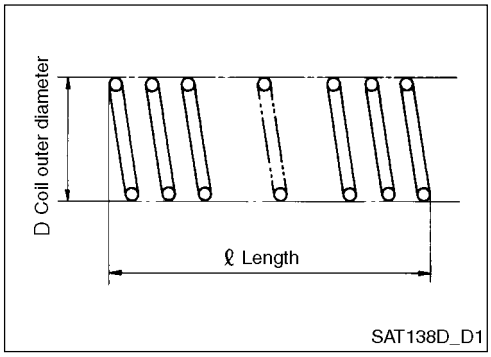


10. Remove the O-ring from the band servo piston.



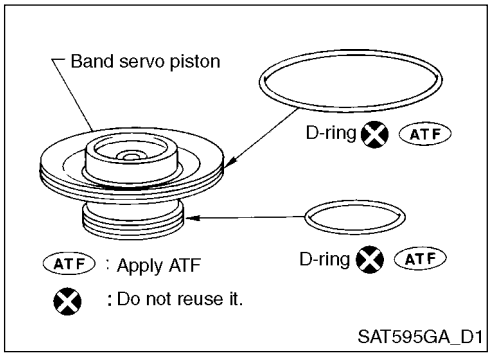
INSPECTION

1. Piston, retainer and piston stem
   - Inspect the surface for any abnormal wear and damages.



2. Return spring
   - Inspect for any deformation or damages.
   - Measure the free length and outer diameter.

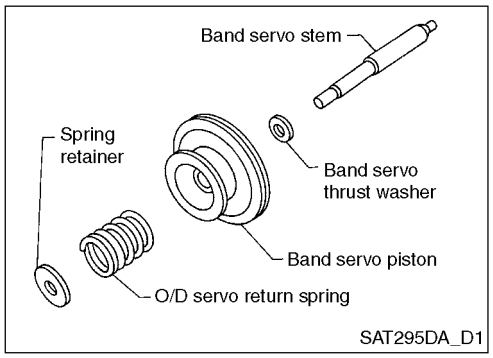
Return spring	Free length
Second servo return spring	32.5 mm
O/D servo return spring	38.52 mm



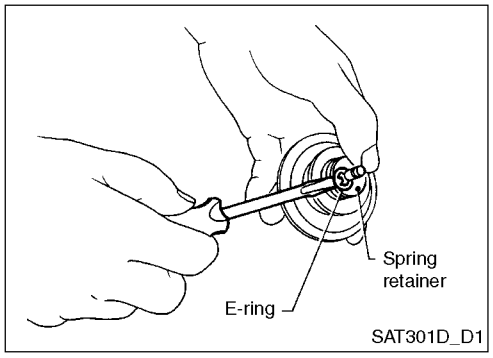
ASSEMBLY

1. Install the D-ring to the servo piston retainer.
   - Apply the ATF to the D-ring.
   - Be careful of the D-ring position.

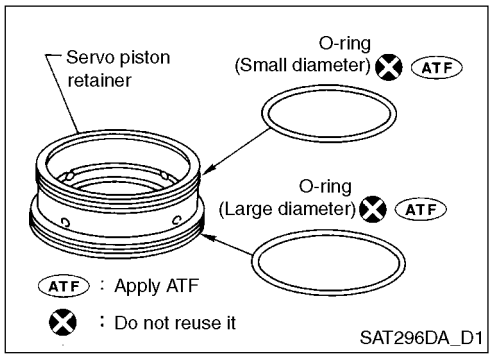
Band Servo Piston Assembly (Continued)



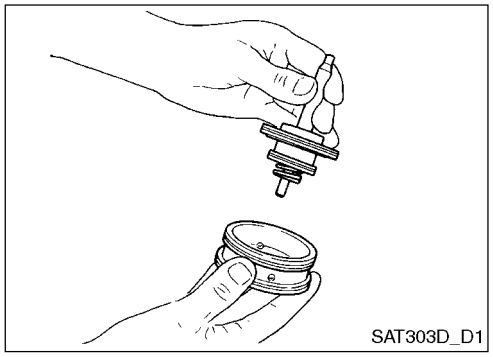
2. Install the band servo piston stem, band servo thrust washer, O/D servo return spring and spring retainer to the band servo piston.



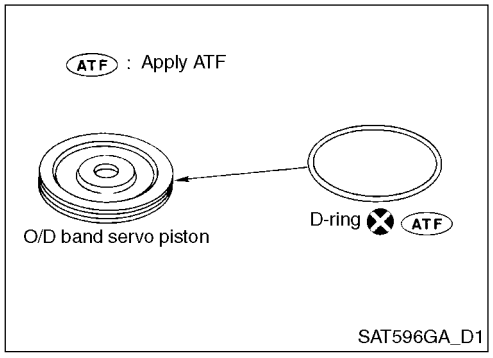
3. Place the piston stem end on a wood block and remove the E-ring while pressing the servo piston spring retainer downward.



4. Install the O-ring to the servo piston retainer.
   - Apply the ATF to the O-ring.
   - Be careful of the O-ring position.

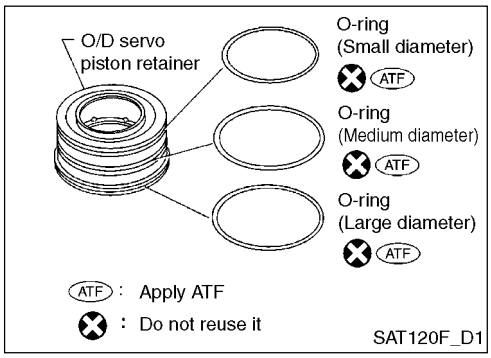


5. Install the band servo piston assembly by pushing it into the servo piston retainer.

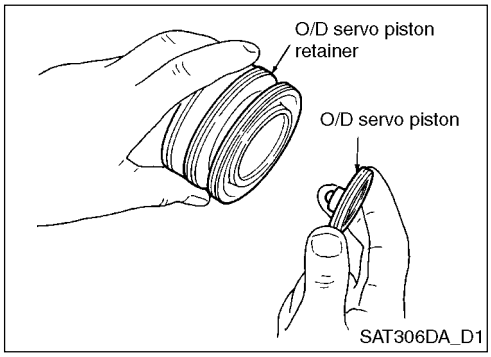


6. Install the D-ring to the O/D band servo piston.
   - Apply the ATF to the D-ring.

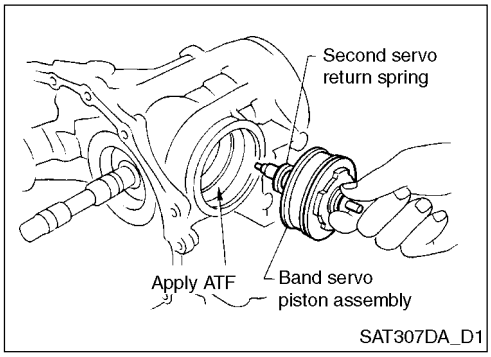
Band Servo Piston Assembly (Continued)



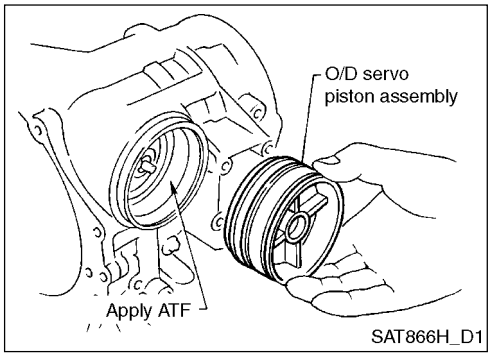
7. Install the O-ring to the O/D servo piston retainer.
   - Apply the ATF to the O-ring.
   - Be careful of the O-ring position.



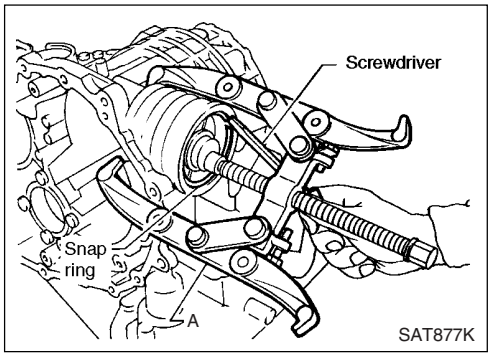
8. Install the O/D band servo piston to the O/D servo piston retainer.



9. Install the band servo piston assembly and second servo return spring to the transaxle case.
   - Apply the ATF to the band servo piston O-ring and transaxle case.



10. Install the O/D servo piston assembly to the transaxle case.
    - Apply the ATF to the band servo piston O-ring and transaxle case.

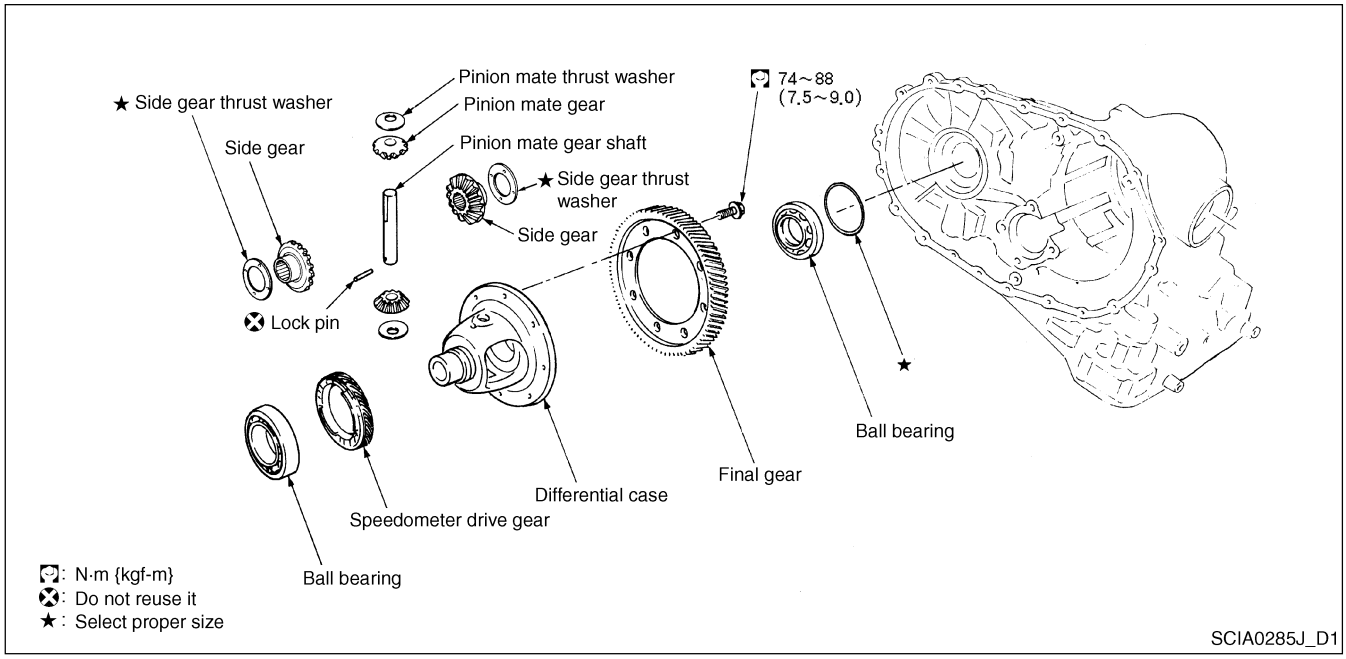


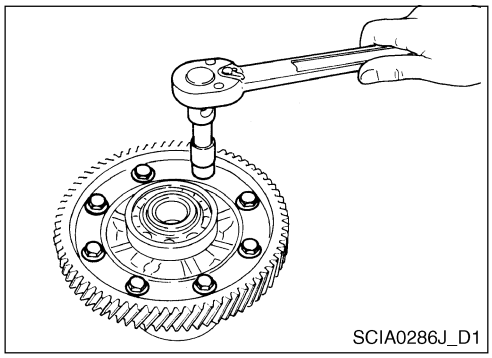
11. Install the band servo piston snap ring to the transaxle case.
    - The snap ring is not reusable. Do not reuse it.

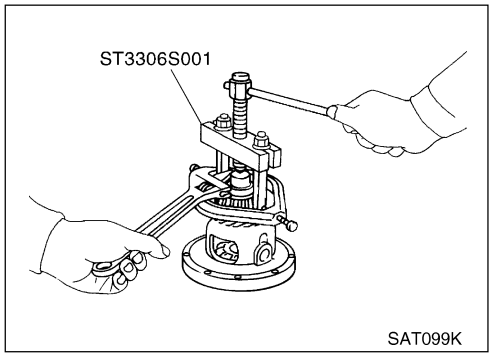
    Tool A: Commercial service tool

Final Drive

FINAL DRIVE





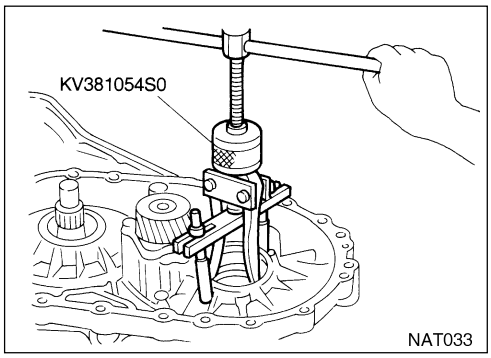


DISASSEMBLY

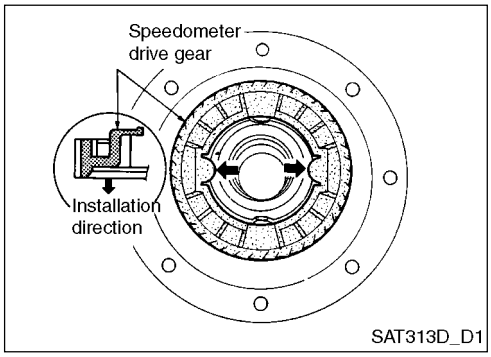
1. Remove the final gear.

2. Remove the differential side bearing by pushing it.
   - Be careful not to mix the left and right bearings each other.

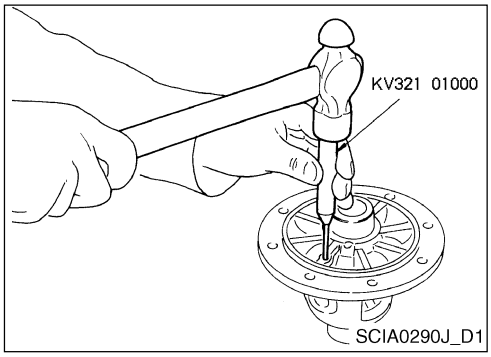
Final Drive (Continued)



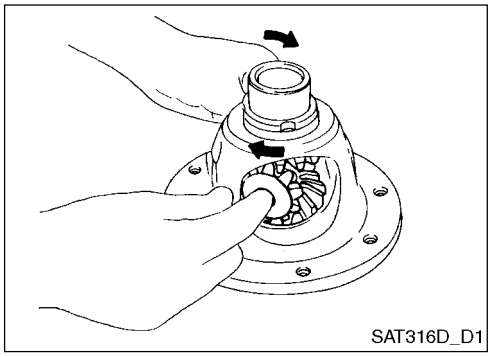
3. Remove the differential side bearing outer race and side bearing adjust shim from the transaxle case.



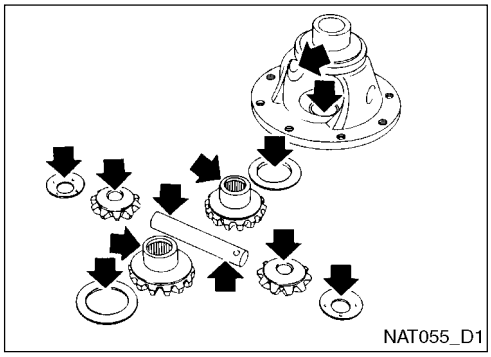
4. Remove the speedometer drive gear.



5. Remove the pinion mate shaft lock pin.



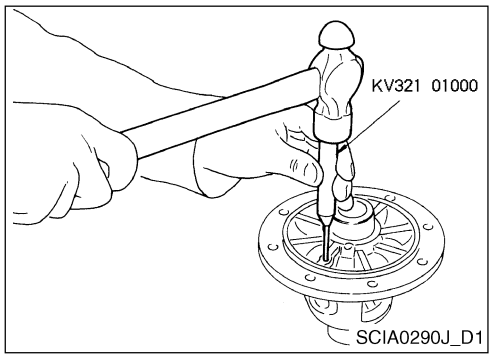
6. Remove the pinion mate shaft from the differential case.
7. Remove the pinion mate gear and side gear.



INSPECTION

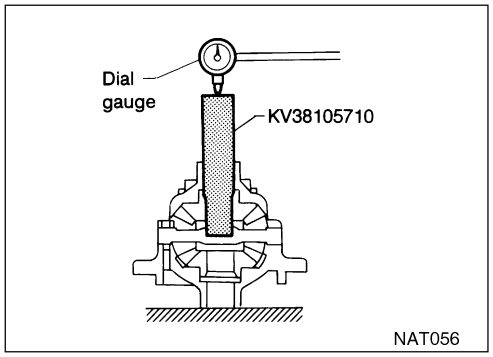
1. Gear, washer, shaft and case
   - Inspect the contact surface of the differential case, side gear, and pinion mate gear.
   - Inspect the washer for any wear.

Final Drive (Continued)



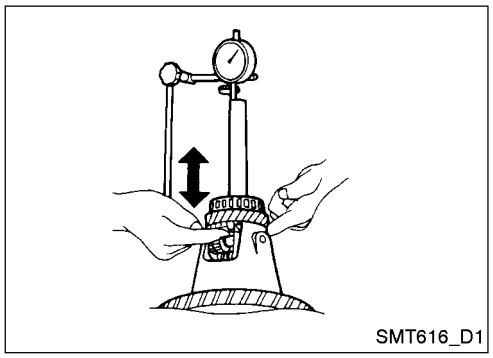
ASSEMBLY

1. Install the side gear and thrust washer to the differential case.
2. Install the pinion mate gear and thrust washer to the differential case by rotating them.
   - Apply ATF to all components thoroughly.



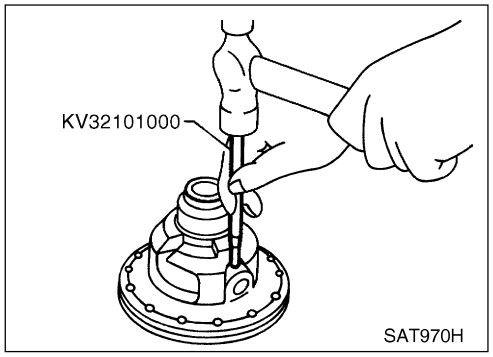
3. Measure the clearance between the side gear and the washer-installed differential case according to below order.
   a. Install the special tool and dial gage to the side gear.
   b. Read the dial gage by moving the side gear up and down.

      Clearance between the side gear and washer-installed differential case: 0.1 - 0.2 mm

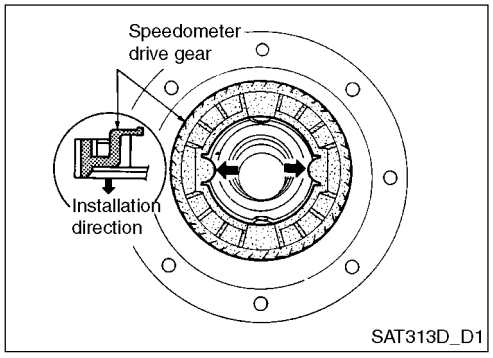


   c. If the value is out of the specified value, adjust the clearance by changing the side gear thrust washer thickness.

      Side gear thrust washer: Refer to “Specifications” (AT-233).

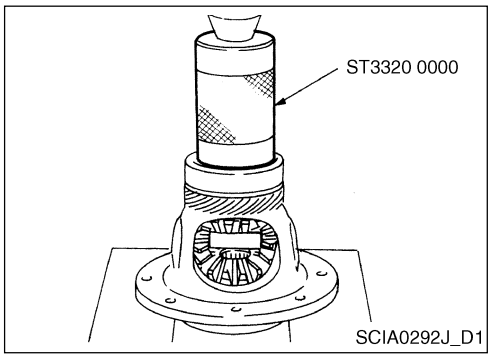


4. Install the lock pin.
   - The lock pin must be of the same height with the case.

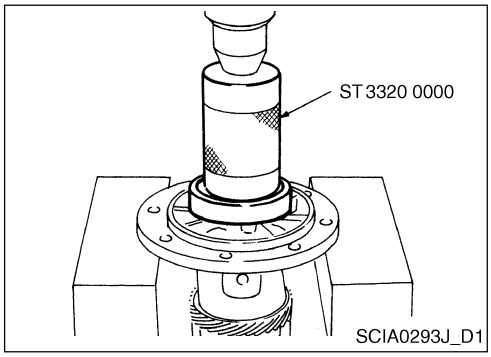


5. Install the speedometer drive gear to the differential case.
   - Adjust the speedometer drive gear protrusion with the differential case groove.

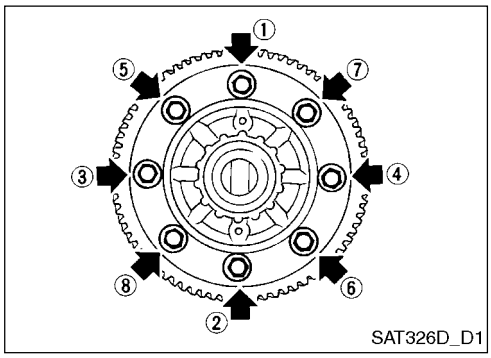
Final Drive (Continued)



6. Press in the right side bearing using a drift.

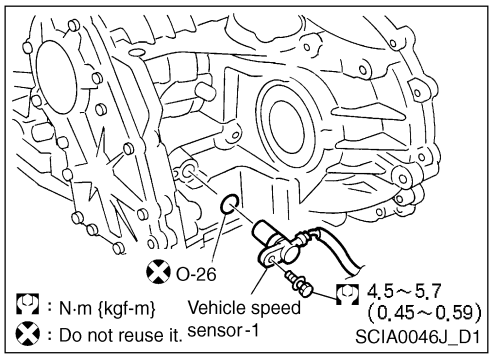


7. Press in the left side bearing using a drift.



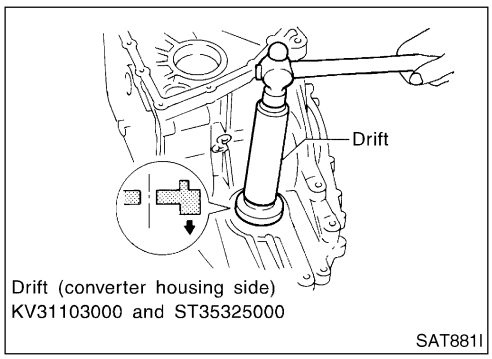
8. Tighten the final gear and mounting bolts according to illustrated sequence.

Assembly

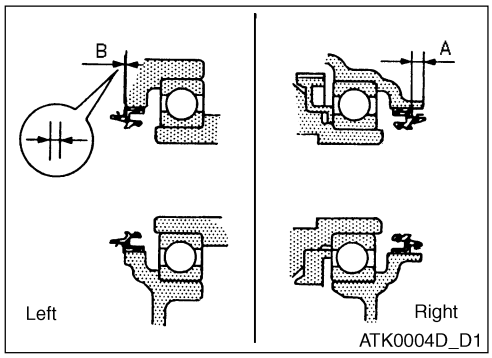


ASSEMBLY

1. Install the vehicle speed sensor.

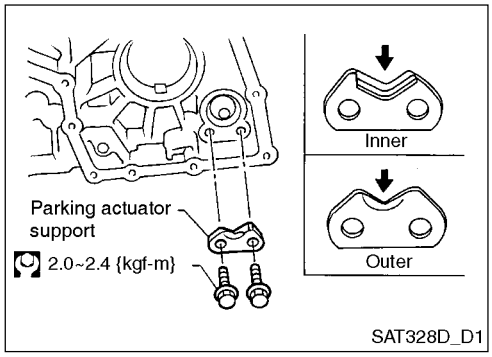


2. Install the differential side oil seal to the transaxle case and converter housing and make the A and B to be within the specified value.

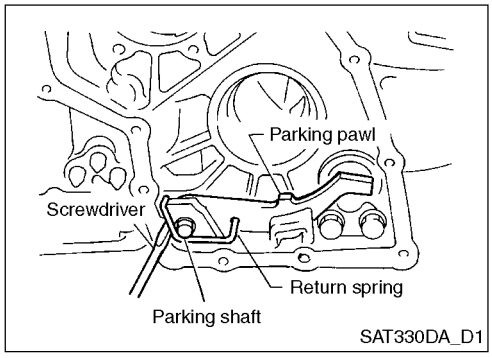


A	B
5.5 - 6.5 mm	-0.5 - 0.5 mm

- Apply the ATF on the oil seal.
- Do not reuse the oil seal.

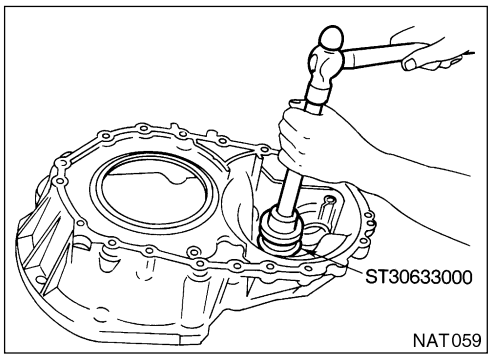


3. Install the parking actuator support to the transaxle case.
   - Be careful of the parking actuator support direction.



4. Install the parking pawl to the transaxle case and fix to the parking shaft.
5. Install the return spring.

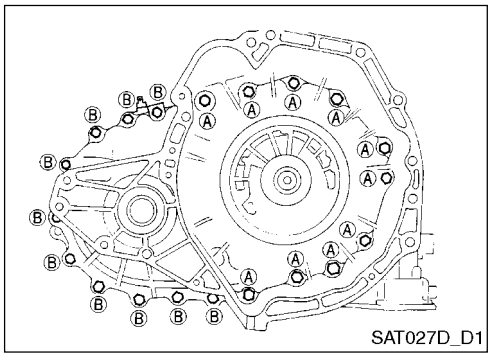
Assembly (Continued)



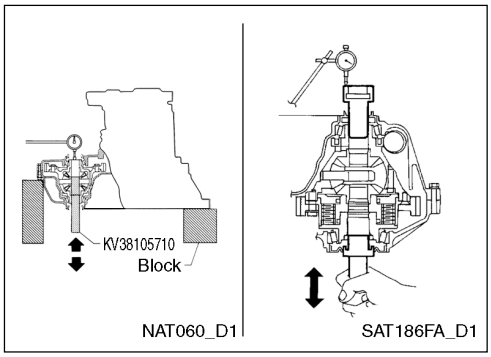
ADJUSTMENT

Differential side bearing freeload

1. Install the differential side bearing outer race to the transaxle case without the adjust shim.
2. Install the differential side bearing outer race to the converter housing.

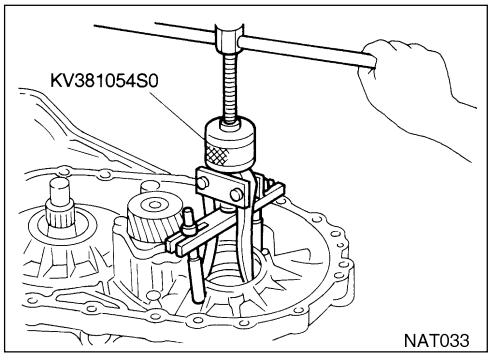


3. Install the final drive assembly to the transaxle case.
4. Install the transaxle case to the converter housing and tighten the transaxle mounting bolts A and B to the specified torque.

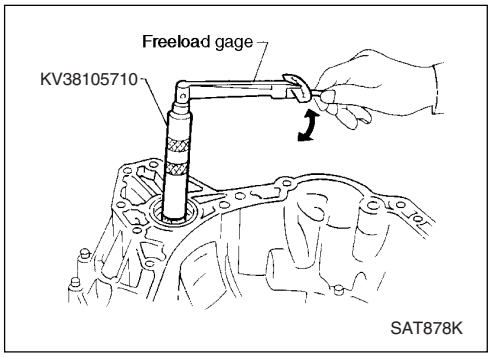


5. Install the dial gage to the transaxle case on the differential case side.
6. Insert the special tool from the converter housing towards the differential side gear side.
7. Read the dial gage by moving the special tool up and down.
8. Select the differential side bearing adjust shim with proper thickness.

   Shim thickness = Dial gage tilting value + Specified bearing freeload.
   Differential side bearing adjust shim: Refer to “Specifications” (AT-233).
   Bearing freeload: 0.04 - 0.09 mm



9. Remove the converter housing from the transaxle case.
10. Remove the final drive assembly from the transaxle case.
11. Remove the differential side bearing outer race from the transaxle case.
12. Install the differential side bearing outer race and shim selected from the “Specifications” to the transaxle case again.
13. Reinstall the converter housing to the transaxle case and tighten the transaxle case mounting bolts to the specified torque.



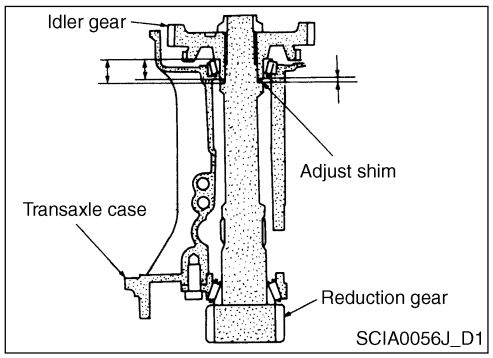
14. Insert the special tool into the differential case and measure the turning torque of the final drive assembly. Insert the special tool into the viscous coupling.
    - While measuring the turning torque, rotate the final drive assembly several times to both directions so that the bearing roller safely seats in its position.

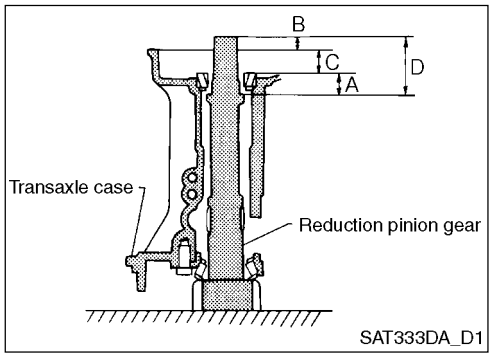
      Final drive assembly (New bearing) turning torque:

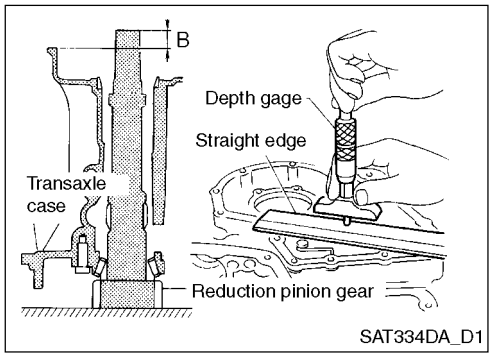
      5.0 - 11 kgf-cm

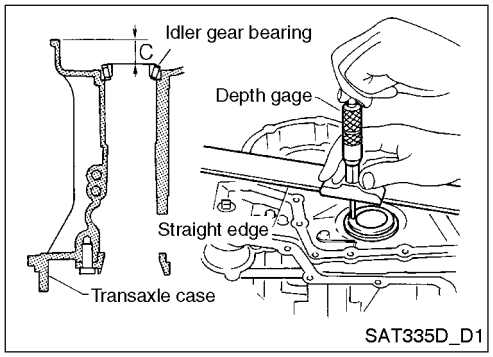
    - When reusing the bearing, the turning torque must be close to the specified torque above.

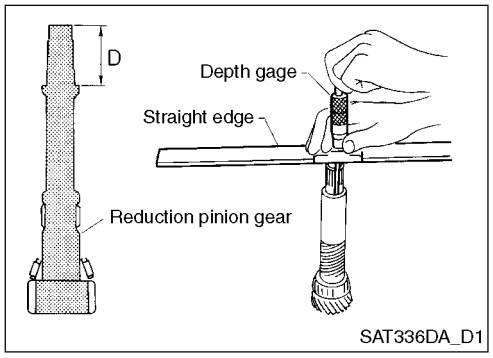
Assembly (Continued)











REDUCTION PINION GEAR BEARING FREELOAD

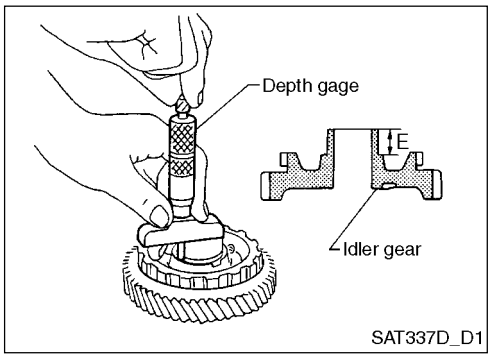
1. Remove the transaxle case and final drive assembly from the converter housing.
2. Select a proper thickness for the reduction pinion gear bearing adjust shim according to below order.
3. Calculate the T1 as below so that the freeload to be the standard value.
   a. T1 (Adjust shim thickness)
      T1 = A - E
      Freeload standard value: 0.11 - 0.68 N•m (0.11 - 0.07 kgf-m)
   b. Place the idler gear bearing on the transaxle case.
   c. Measure the B, C, and D and calculate the A.
      A = B - (B + C)
      A: The distance between the idler bearing inner race surface and reduction pinion gear's adjust shim contact surface.

- Measure the B, which is the distance between the reduction pinion gear end and transaxle case surface.
- Measure B from at least 2 points.

- Measure the C, which is the distance between the idler gear bearing inner race surface and transaxle case surface.
- Measure C from at least 2 points.

- Measure the D, which is the distance between the reduction pinion gear end and reduction pinion gear's adjust shim contact surface.
- Measure D from at least 2 points.
- Calculate A
  A = D - (B + C)

Assembly (Continued)

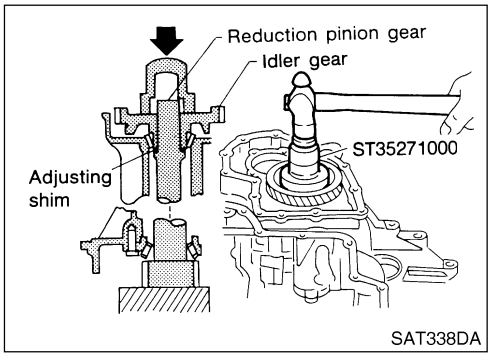


d. Measure the E, which is the distance between the idler gear end and idler gear bearing inner race contact surface.
   - Measure E from at least 2 points.

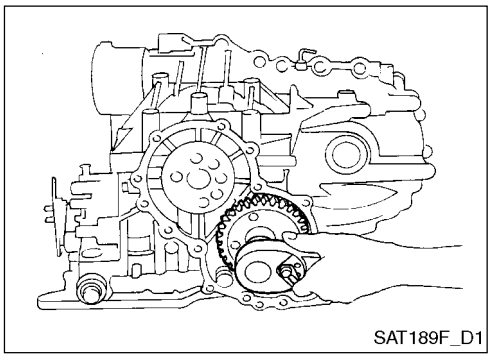
e. Select a proper thickness for the reduction pinion gear bearing adjust shim.

   (Proper shim thickness) = A - E - 0.5 mm

   Pinion gear bearing adjust shim: Refer to “Specifications” (AT-231).

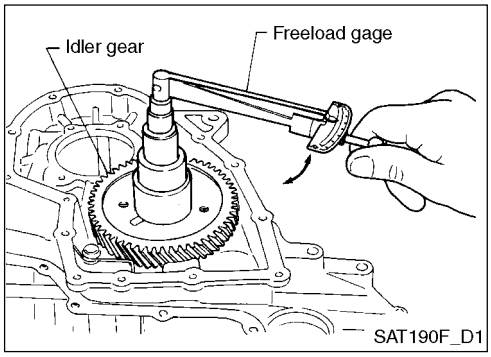


3. Install the reduction pinion gear and reduction pinion gear bearing adjust shim selected in step 2.e to the transaxle case.
4. Press in the idler gear bearing inner race to the idler gear.
5. Press in the idler gear to the reduction pinion gear.
   - Press the idler gear so that it completely touches the adjust shim.
   - If the turning torque exceeds the specified value, increase or decrease the thickness of the reduction pinion gear bearing adjust shim.



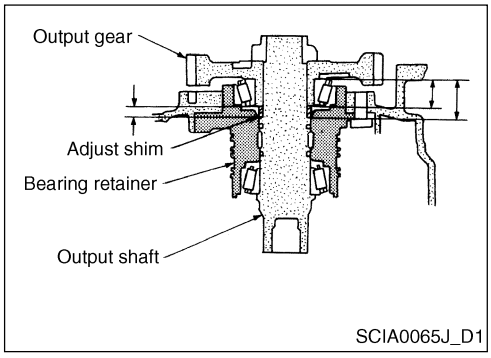
6. Tighten the idler gear lock nut to the specified torque.
   - Lock the idler gear with the parking pawl when tightening the lock nut.
7. Measure the reduction pinion gear’s turning torque.
   - While measuring the turning torque, rotate the reduction pinion gear several times to both directions so that the bearing roller accurately seats on it.

     Reduction pinion gear turning torque: 1.1 - 7.0 kgf-cm



8. Secure the idler gear lock nut as shown in the illustration after properly adjusting the turning torque.

OUTPUT SHAFT BEARING FREELOAD



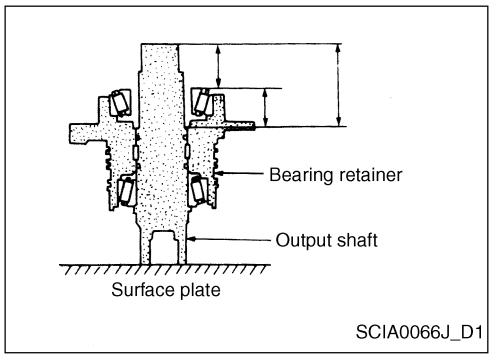
1. Calculate the T2 (Adjust shim thickness) and adjust the freeload to be the standard value.

   T2 = F - I

   Freeload standard value:

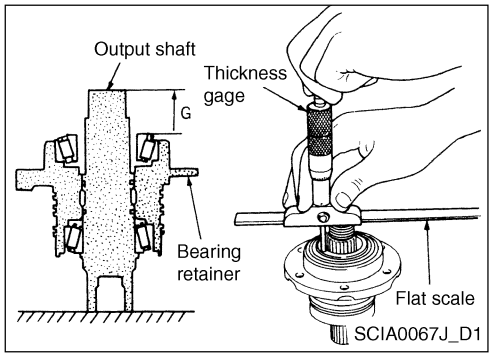
   0.25 - 0.88 N•m (0.025 - 0.09 kgf-cm)

Assembly (Continued)

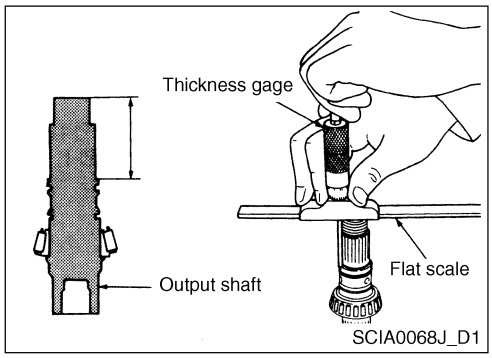


- Set the output shaft onto the bearing retainer and measure the F value to acquire the freeload standard value.
- Let F be the distance between the output gear bearing inner race contact surface and output shaft adjust shim contact surface. The F is calculated as below.

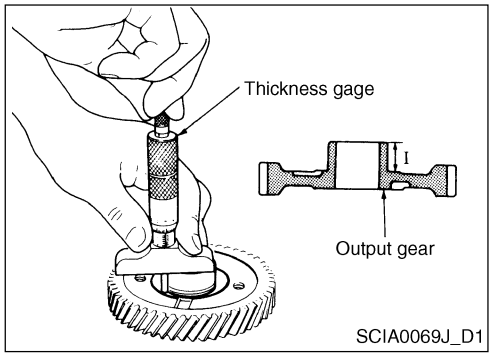
  F = H - G



2. Measure the G from the output shaft surface to the output gear bearing inner race surface.



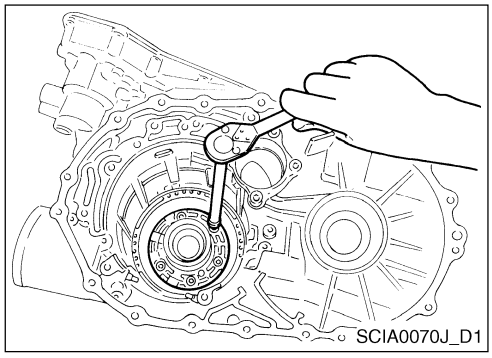
3. Measure the H from output shaft adjust contact surface to upper section.
   - Measure H from at least 2 points and get the mean value.



4. Measure the I-value from output gear bearing contact surface to upper section.
5. Calculate the thickness of the freeload adjust shim and select a proper shim.

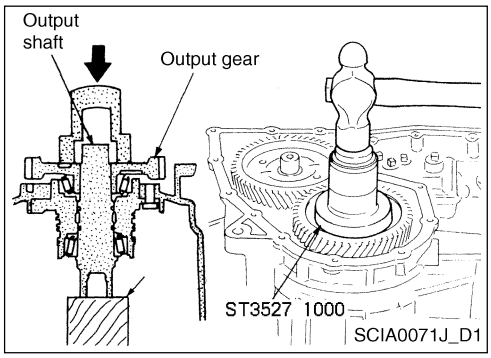
   T2 = F - I - 0.03 ~ 0.08 (Freeload value)

   T2: Shim thickness

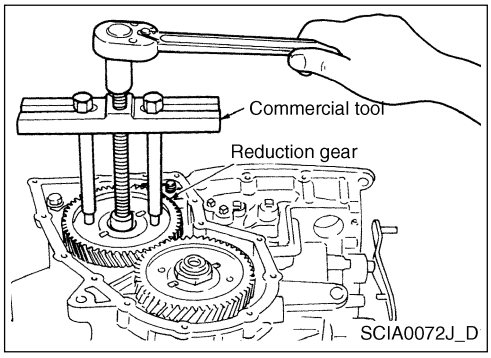


6. Install the bearing retainer to the transaxle and tighten to the specified torque.
7. Install the output shaft and selected shim to the bearing retainer.
   - Be careful not to damage the seal ring.

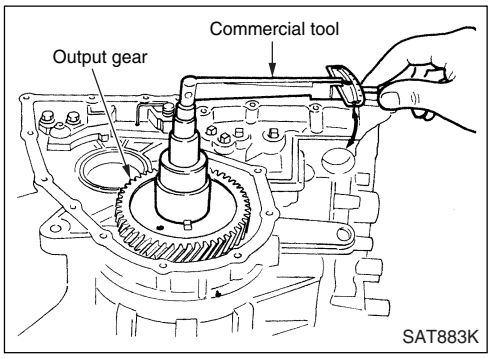
Assembly (Continued)



8. Press in the output gear using a drift.
   - Hold the parking puller reduction gear and tighten the output gear lock nut to the specified torque.



9. In order to measure the output gear unit's freeload, remove the idle gear lock nut and remove the idle gear using the puller.

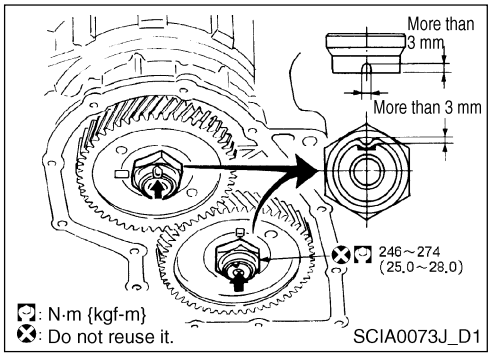


10. Check if the freeload value is within the standard value using the freeload gage.

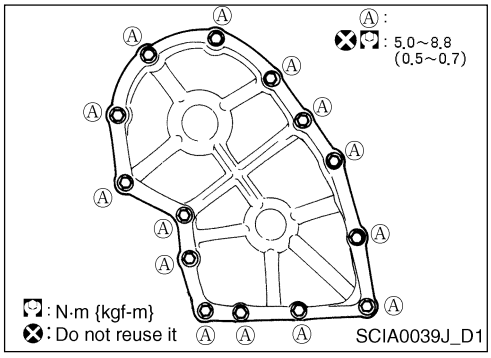
    If exceeds the standard value, re-adjust with the shim.
    - Rotate the output gear thoroughly at least 10 times and measure the freeload.

      Freeload standard value:

      0.25 - 0.88 N•m (0.025 - 0.09 kgf-m)

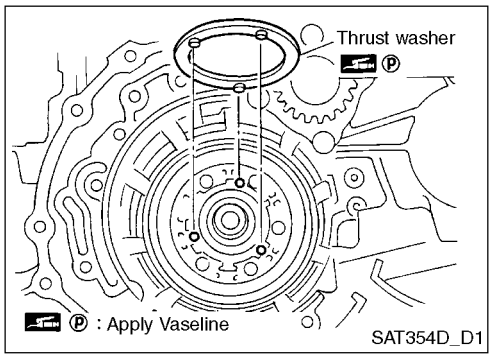


11. After adjusting the freeload, install the idle gear and tighten the lock nut.



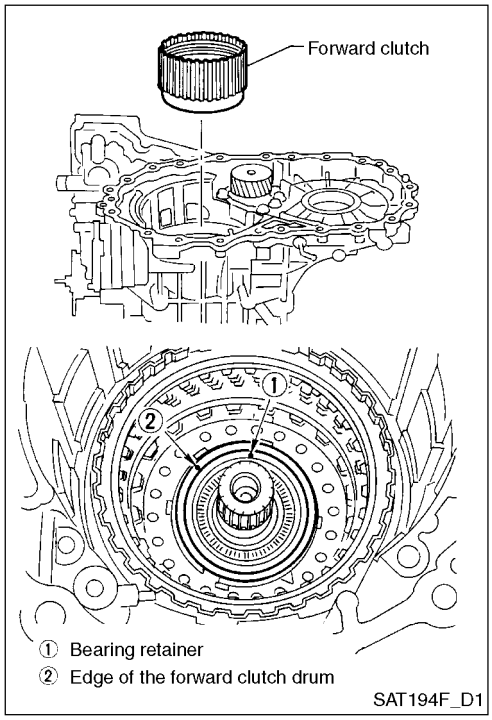
12. Perform punching onto the lock nuts in idle gear and output gear.
    - The lock nuts are not reusable. They should always be replaced.
13. Install the side cover and tighten the mounting bolts to the specified torque.

Assembly (Continued)

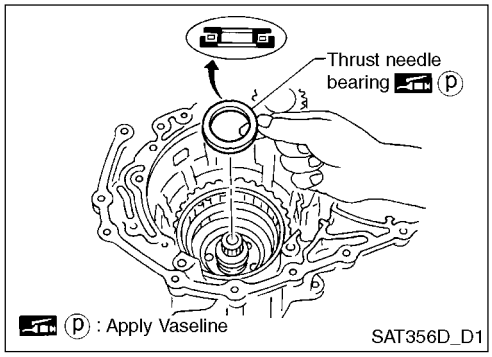


ASSEMBLY

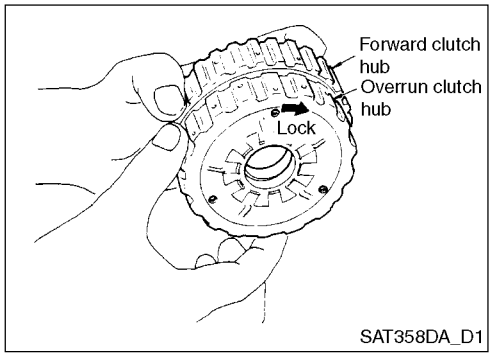
1. Remove the paper covering the bearing retainer.
2. Install the thrust washer to the bearing retainer.
   - Apply the Vaseline on the thrust washer.



3. Install the forward clutch assembly.
   - Align the low and reverse brake drive plate's teeth before installation.
   - The bearing retainer seal ring should not stretch.

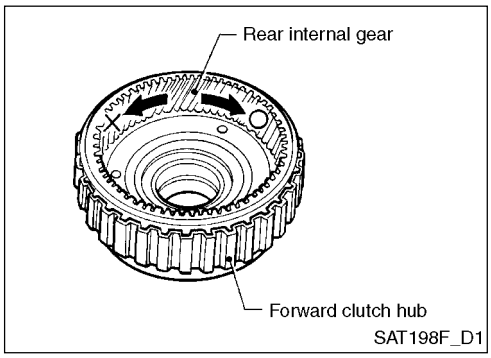


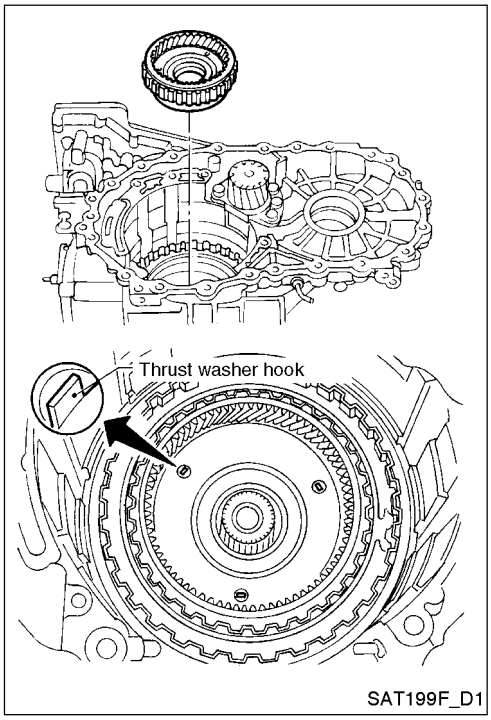
4. Install the thrust needle bearing to the bearing retainer.
   - Apply the Vaseline on the thrust bearing.
   - Be careful of the thrust needle bearing direction.
5. Install the thrust needle bearing to the rear internal gear.
   - Apply the Vaseline on the thrust bearing.
   - Be careful of the thrust needle bearing direction.



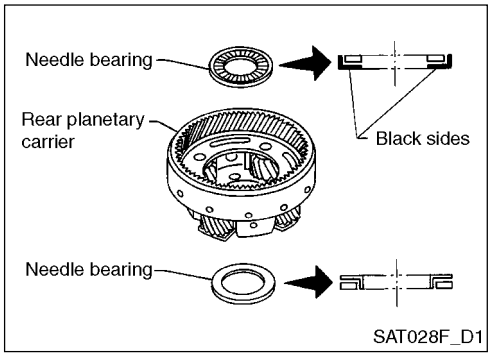
6. Rotate the clutch hub while holding the forward clutch hub.
   Inspect if the locking and unlocking direction of the overrun clutch hub is correct.
   - If not as shown in the illustration, inspect the installation direction of the forward one-way clutch.

Assembly (Continued)

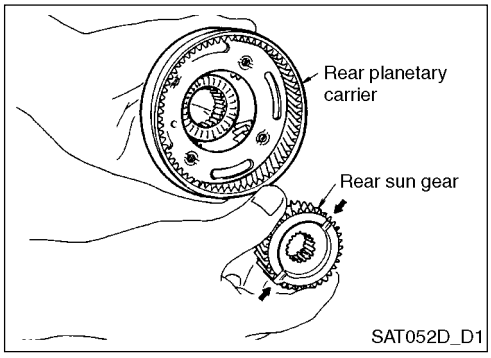




7. Install the forward clutch hub and rear internal gear assembly.
   - Align the forward clutch drive plate teeth before installation.
   - Inspect if the thrust washer's 3 hooks are correctly aligned before installation.

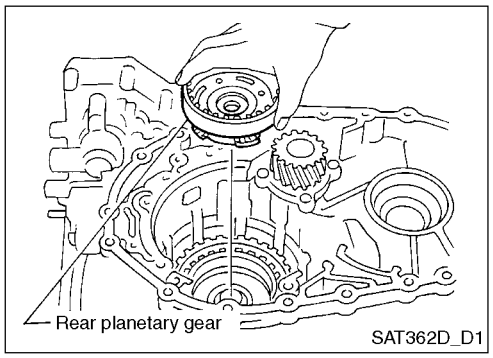


8. Install the needle bearing to the rear planetary carrier.
   - Apply the Vaseline on the needle bearing.
   - Be careful of the needle bearing direction.

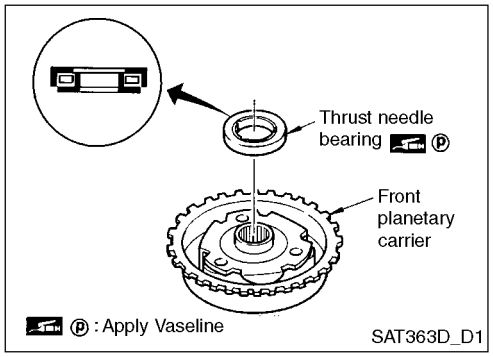


9. Install the rear sun gear to the rear planetary carrier.
   - Be careful of the rear sun gear direction.

Assembly (Continued)

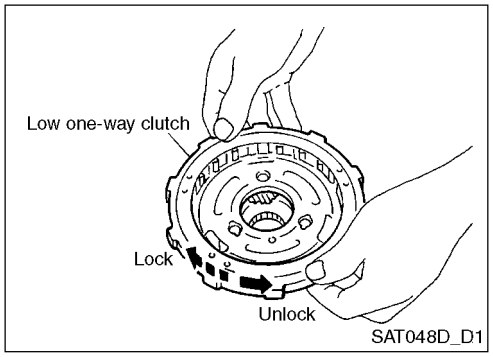


10. Install the rear planetary carrier to the transaxle case.

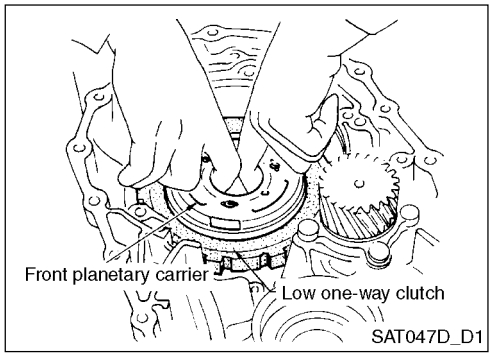


ASSEMBLY

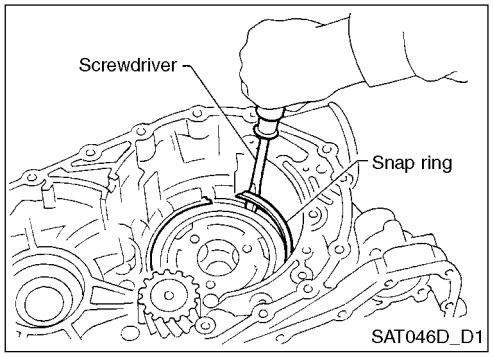
1. Install the thrust needle bearing to the front planetary carrier.
   - Apply the Vaseline on the thrust needle bearing.
   - Be careful of the thrust needle bearing direction.



2. Install the low one-way clutch to the front planetary carrier by rotating the clutch in the arrow direction in the illustration.
3. Hold the front planetary carrier and rotate the low one-way clutch. Inspect the low one-way clutch has correct locking and unlocking direction.

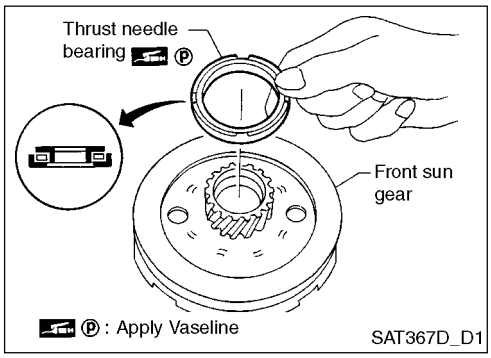


4. Install the front planetary carrier assembly to the transaxle case.

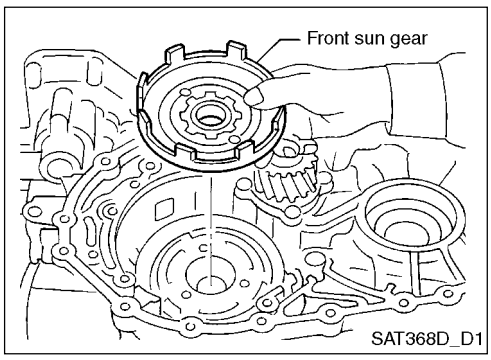


5. Install the snap ring with a screwdriver.
   - If the forward clutch and the bearing are not properly installed, then the snap ring will not match with the transaxle case groove.

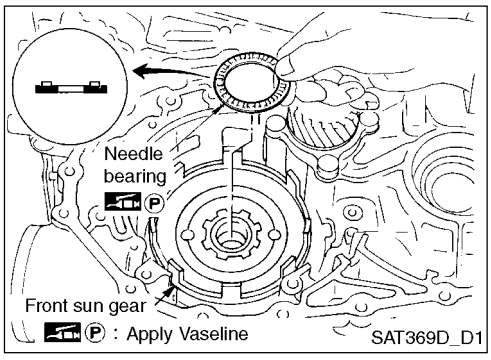
Assembly (Continued)



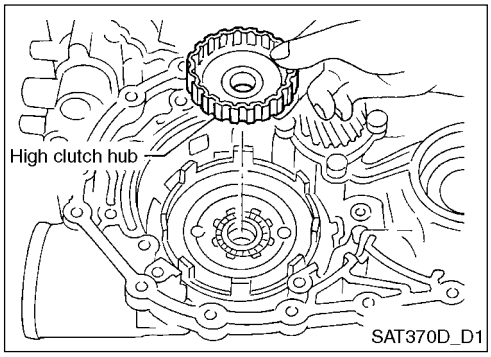
6. Install the needle bearing to the front sun gear.
   - Apply the Vaseline on the needle bearing.
   - Be careful of the needle bearing direction.



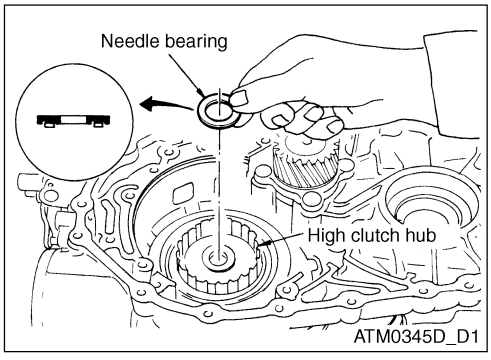
7. Install the front sun gear to the front planetary carrier.



8. Install the needle bearing to the front sun gear.

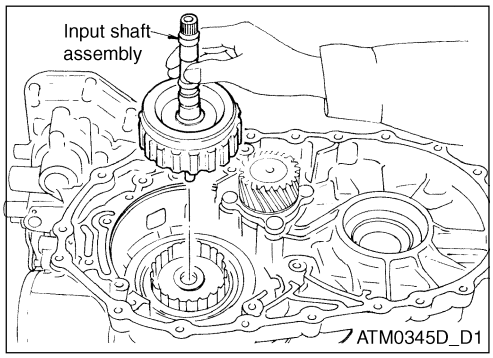


9. Install the high clutch to the front sun gear.
   - Install the needle bearing to the high clutch hub.
   - Be careful of the needle bearing direction.

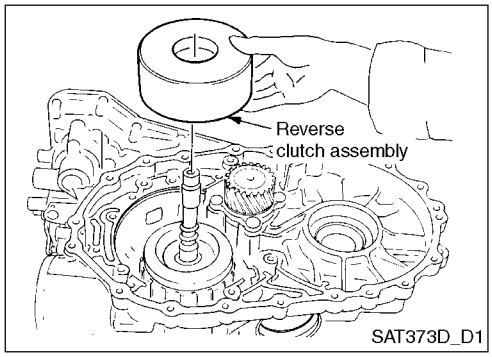


10. Install the needle bearing to the high clutch hub.
    - Apply the Vaseline on the needle bearing.
    - Be careful of the needle bearing direction.

Assembly (Continued)



11. Install the input shaft assembly after removing the paper around it.
    - Align the high clutch drive plate gear direction before installation.



12. Install the reverse clutch assembly.
    - Align the reverse clutch drive plate gear direction before installation.

ADJUSTMENT

When replacing the components listed below, adjust the total endplay and reverse clutch end play.

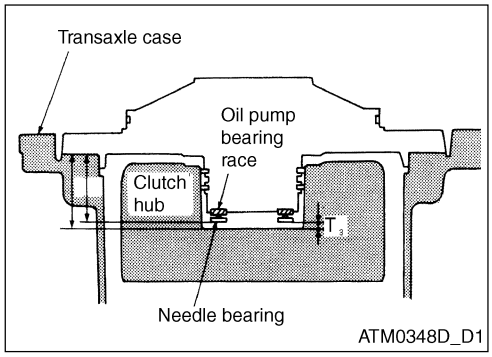
Item	Total endplay	Reverse clutch endplay
Transaxle case	●	●
Overrun clutch hub	●	●
Rear internal gear	●	●
Rear planetary carrier	●	●
Rear sun gear	●	●
Front planetary carrier	●	●
Front sun gear	●	●
High clutch hub	●	●
High clutch drum	●	●
Oil pump cover	●	●
Reverse clutch drum	-	●

TOTAL ENDPLAY

1. Calculate the total endplay T3 using the formula shown below and check if it is within the adjustment standard.

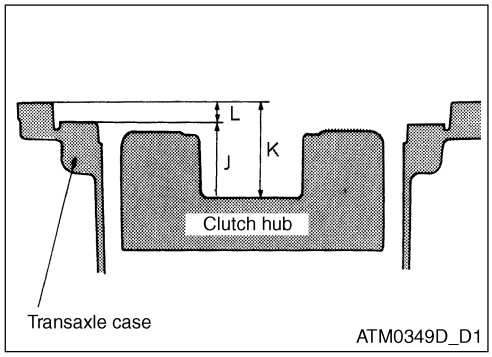
   T3 = J - M

   Total endplay = 0.25 - 0.55 mm

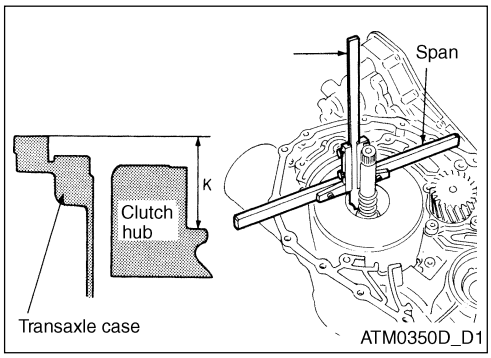


2. Measure the K and L for total endplay.
   - Let J be the distance from the transaxle case oil pump contact surface to the high clutch drum needle bearing contact surface. The J is calculated as below.

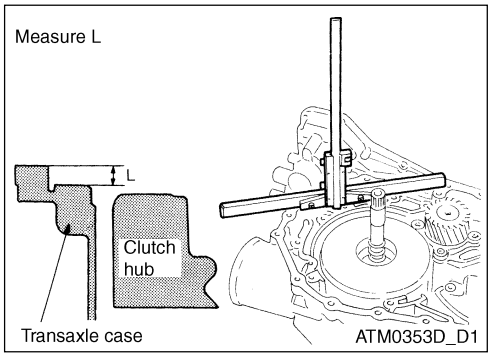
     J = K - L



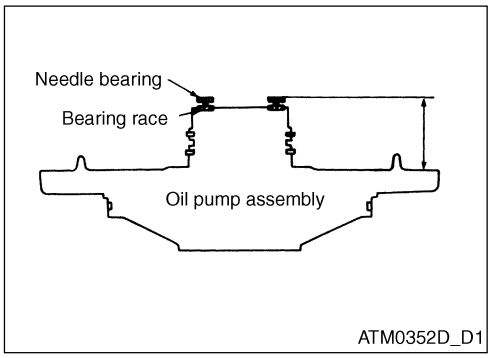
Assembly (Continued)



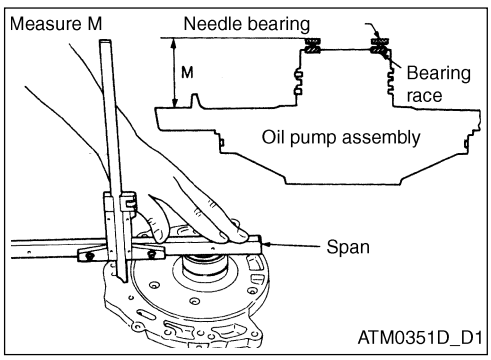
3. Measure the K, which is the distance from the transaxle case upper to the high clutch needle bearing contact surface.



4. Measure the L, which is the distance from the rear of the oil pump in the transaxle case to the case upper.



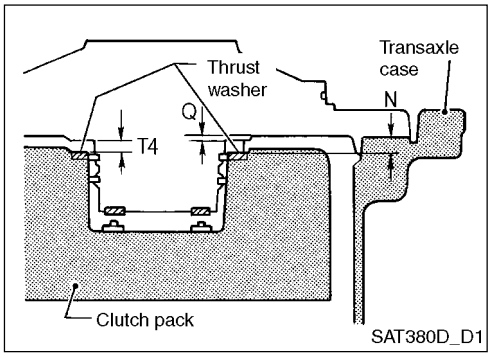
5. Install the Vaseline-applied bearing race and needle bearing to the oil pump assembly.



6. Measure M to calculate the total endplay.
   - Calculate the total endplay and select the bearing race.

     T3 = J - M

     T3 = Total endplay



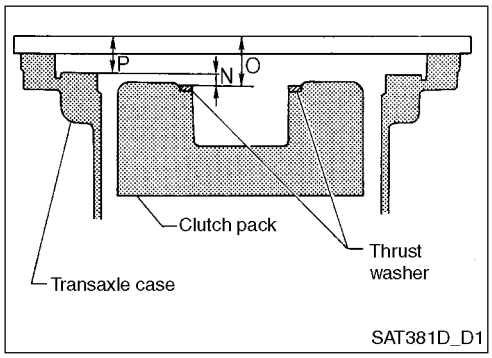
REVERSE CLUTCH DRUM ENDPLAY

- Measure the clearance between the oil pump cover and reverse clutch drum thrust washer.
- Select a proper thickness bearing race for the endplay to be the standard value.

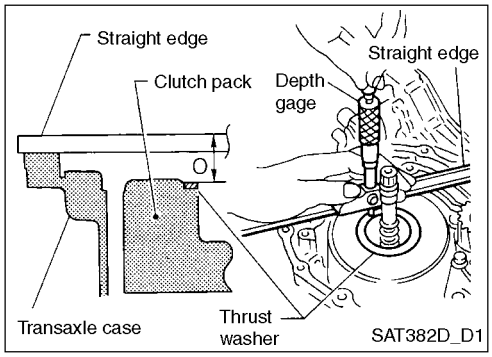
  Reverse clutch drum endplay T4

  T4 = N - Q

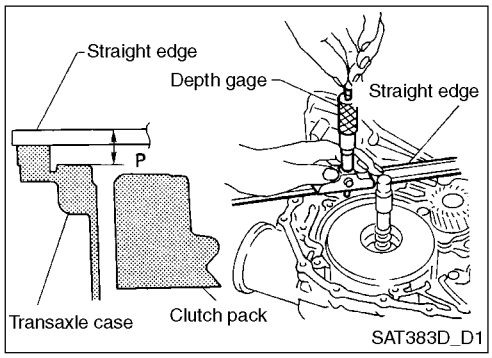
Assembly (Continued)



1. Measure the Q and P and calculate the N.

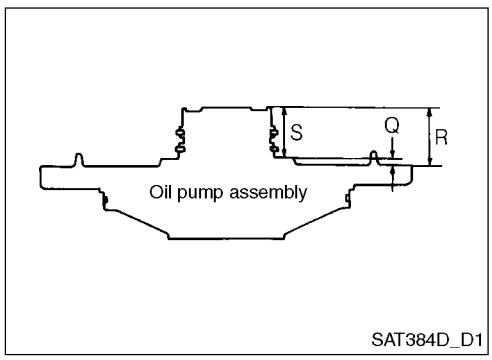


a. Install the thrust washer to the reverse clutch drum.
b. Measure the Q.

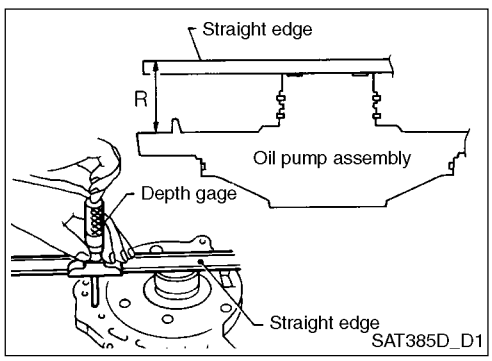


c. Measure the P.
d. Calculate the N.

N: The distance between the transaxle case oil pump installation surface and reverse clutch drum thrust washer.

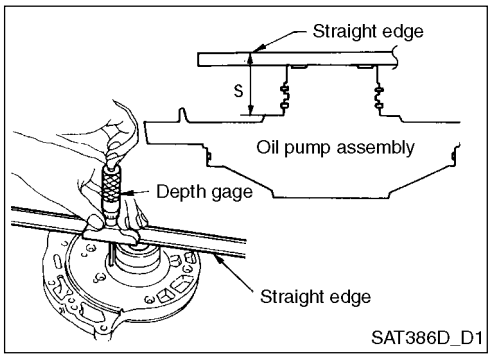


2. Measure the R and S. Calculate the Q.



a. Measure the R.

Assembly (Continued)



a. Measure the S.
b. Measure the Q.

Q: The distance between the transaxle case oil pump installation surface and thrust washer contact surface.

Q = R - S

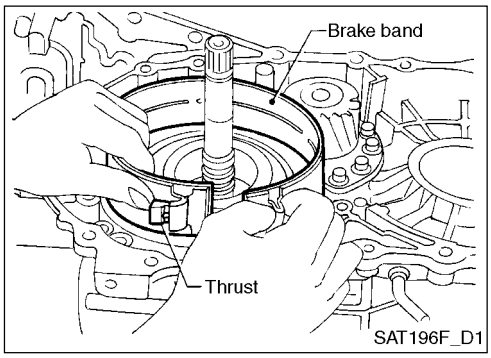
3. Reverse clutch endplay “T1”

T1 = N - Q (Unit: mm)

Reverse clutch endplay	0.65 - 1.00

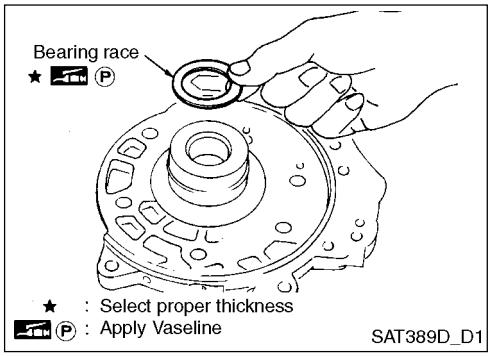
- Select a proper thickness thrust washer so that the reverse clutch endplay to be the standard value.

  Thrust washer: Refer to “Specifications”(AT-232).

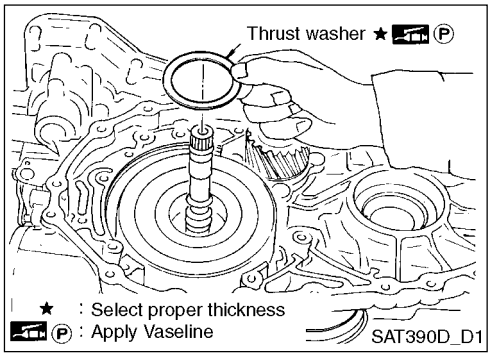


INSTALLATION

1. Install the anchor end pin, washer and lock nut to the transaxle case.
2. Place the brake band and thrust around the reverse clutch drum. Tighten the anchor end pin so that the brake band can evenly tighten around the reverse clutch drum.

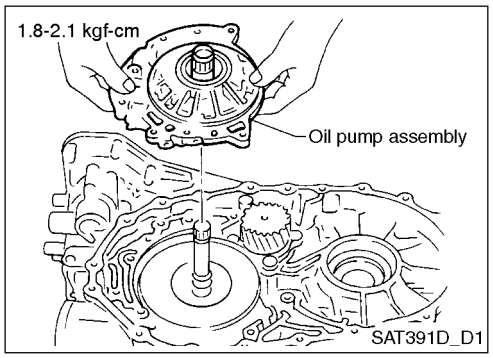


3. Install the bearing race that is selected in the total endplay adjustment step to the oil pump cover.
   - Apply the Vaseline on the bearing race.

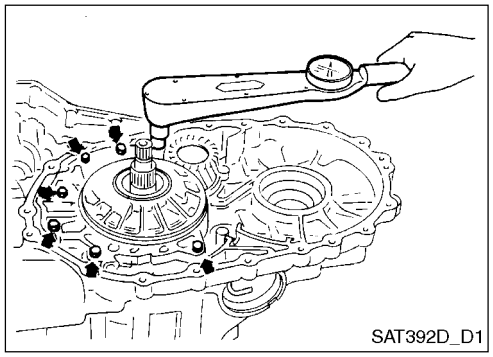


4. Install the thrust washer that is selected in the reverse clutch endplay adjustment step to the reverse clutch drum.
   - Apply the Vaseline on the thrust washer.

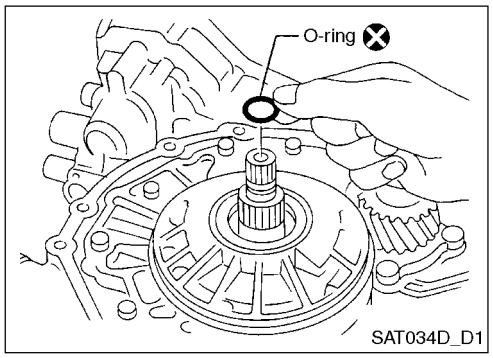
Assembly (Continued)



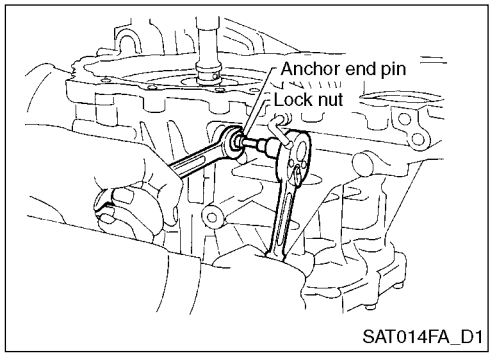
5. Install the oil pump assembly, baffle plate and gasket to the transaxle case.



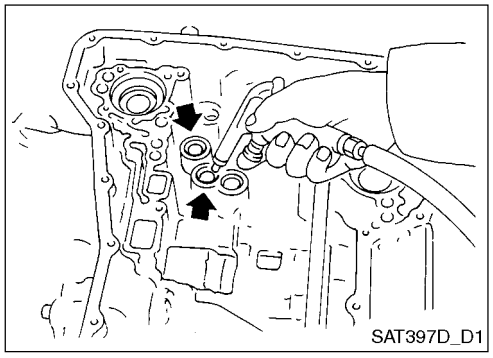
6. Tighten the oil pump mounting bolts to the specified torque.



7. Install the O-ring to the input shaft.
   - Apply the ATF on the O-ring.

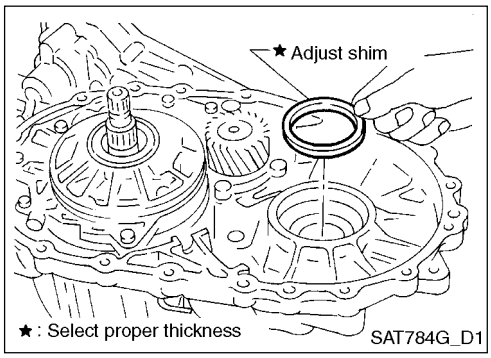


8. Adjust the brake band.
   Tighten the anchor end pin to the specified torque.
   Anchor end pin:
   Specified torque: 0.35 - 0.6 kgf-m
   Reversely rotate the anchor end pin 2 and half times.
   RE4F03A: 2.5 ± 0.125
   RE4F04V: 2.5
   Hold the anchor end pin and tighten the lock nut.
   Lock nut specified torque: 3.2 - 3.7 kgf-m

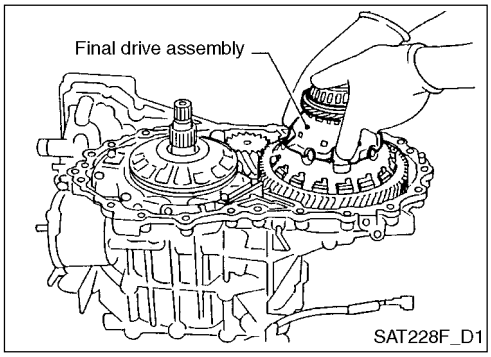


9. Inspect the brake band operation by blowing the compressed air into the transaxle case fluid hole.

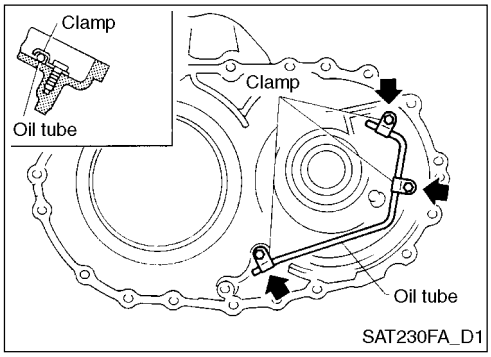
Assembly (Continued)



10. Install the differential side bearing adjust shim that is selected in the final drive end play adjustment step to the transaxle case.

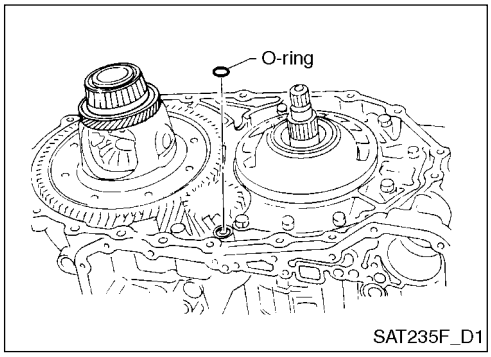


11. Install the final drive assembly to the transaxle case.

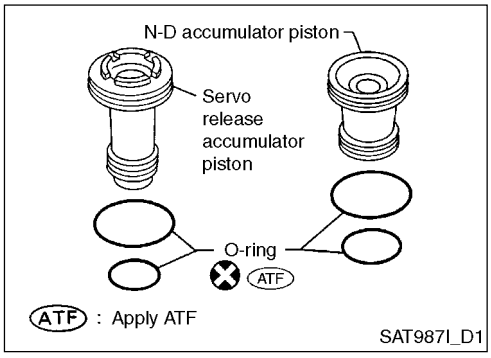


12. Install the oil tube to the converter housing.

Specified torque: 0.5 - 0.7 kgf-m



13. Install the O-ring to the transaxle case differential oil port.

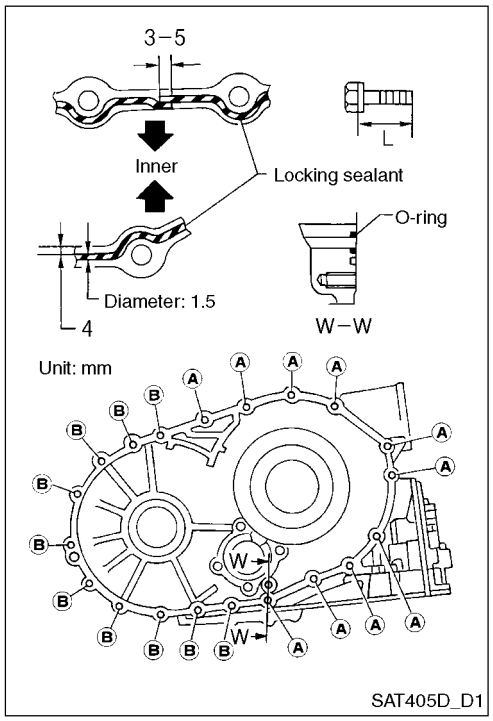


14. Install the accumulator piston.
    a. Inspect the accumulator piston contacting surface for any damages.
    b. Install the O-ring to the accumulator piston.
        - Apply the ATF to the O-ring.

(Unit: mm)

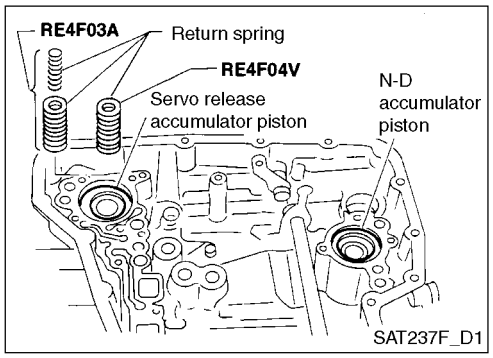
Accumulator	Diameter (Small)	Diameter (Large)
Servo release accumulator	26.9	44.2
N-D accumulator	34.6	39.4

Assembly (Continued)



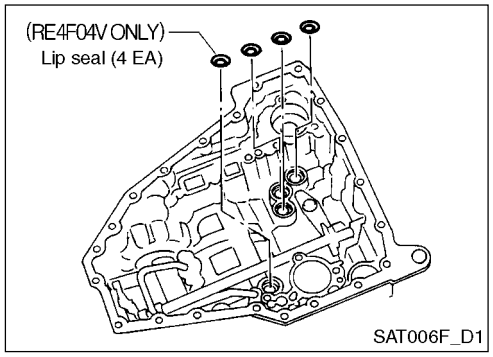
15. Install the O-ring to the transaxle case differential oil port. Install the converter housing to the transaxle case.
    - Apply the locking sealant to the converter housing contacting surface.

Bolt	Length
A	30 mm
B	40 mm



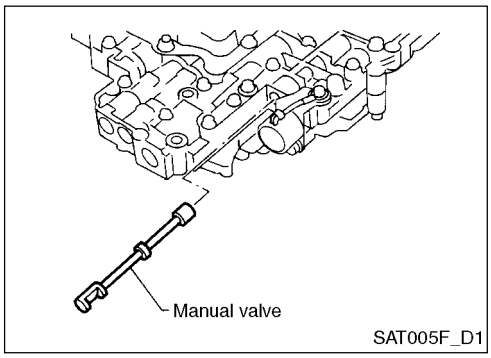
a. Install the accumulator piston and return spring to the transaxle case.
    - Apply the ATF inner of the transaxle case.

    Return spring: Refer to “Specifications” (AT-229).

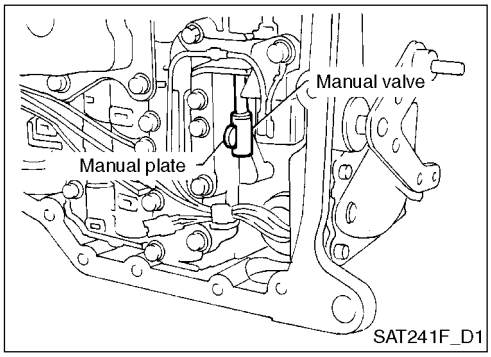


16. Place the lip seal on the transaxle case band servo fluid hole.
    - Apply the Vaseline on the lip seal.

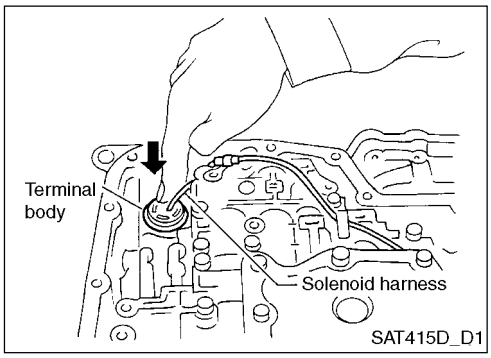
Assembly (Continued)



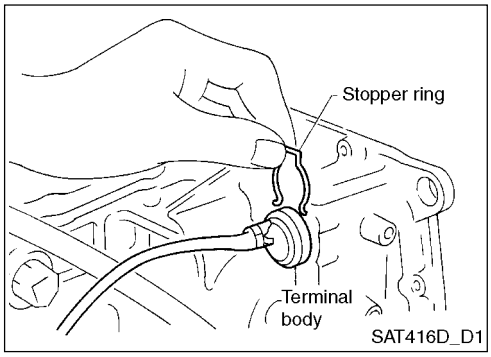
17. Install the control valve assembly.
    a. Insert the manual valve to the valve assembly.
       - Apply the ATF on the manual valve.



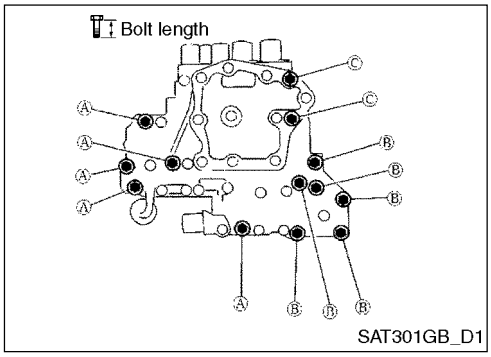
    b. Place the manual shaft to neutral.
    c. Install the control valve assembly to the transaxle case by aligning the manual valve and manual plate.



    d. Pass the solenoid harness through the transaxle case and push the terminal body to the transaxle case.



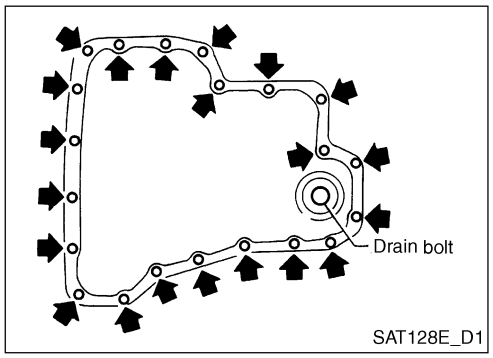
    e. Install the stopper ring to the terminal body.



    f. Tighten the “A”, “B”, and “C”.
       Bolt length, quantity and location.

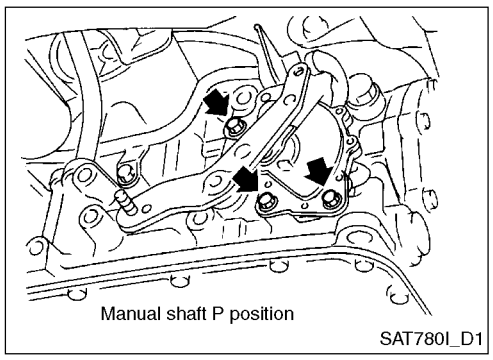
Bolt symbol	A	B	C
Bolt length “1” (mm)	40.4	33.0	43.5
Bolt quantity	5	6	2

Assembly (Continued)

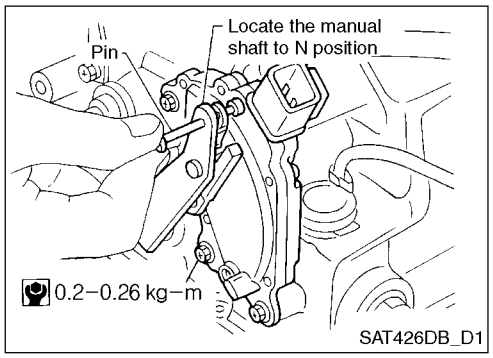


18. Install the oil pan.
    Attach the magnet to the oil pan.
    Install the new oil pan gasket to the transaxle case.
    Install the oil pan to the transaxle case.
    - Replace the oil pan bolt with new sealing bolt.
    - Tighten the 4 bolts crisscross sequence so that the gasket can seat properly.

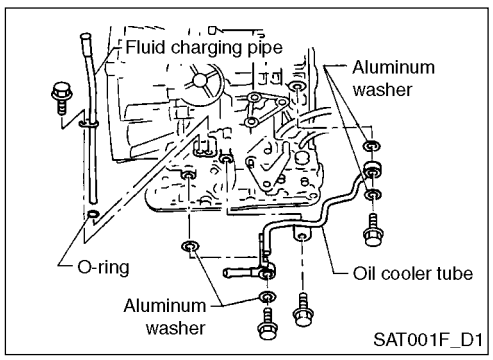
    Tighten the drain plug to the specified torque.



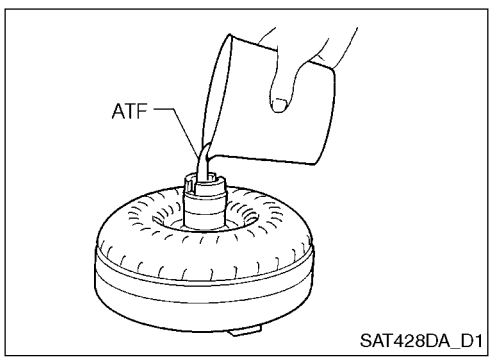
19. Install the inhibitor switch.
    Place the manual lever to P.
    Install the inhibitor switch to the manual shaft temporarily.
    Move the shift lever to N.



20. Insert the 4 mm diameter pin into the adjustment holes in both the inhibitor switch and the manual shaft as perpendicularly as possible.
    Tighten the inhibitor switch mounting bolt.
    After adjusting the inhibitor switch, remove the pin from the adjustment hole.

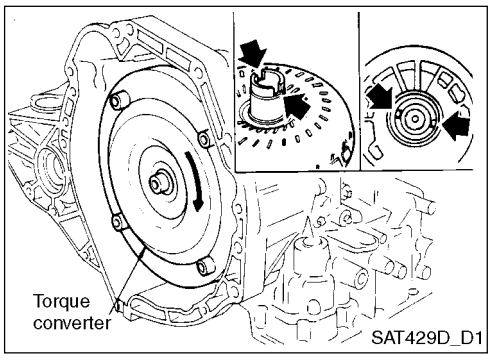


21. Install the fluid charging pipe and oil cooler tube to the transaxle case.

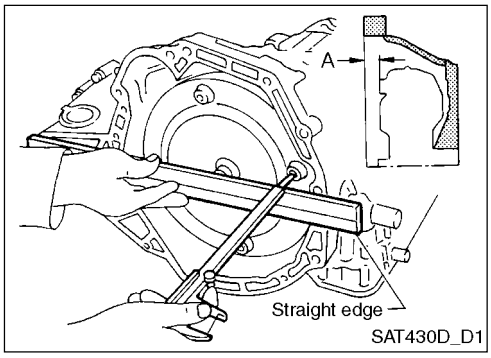


22. Fill the ATF into the torque converter.
    - Approx. 1 liter of ATF is needed for the new torque converter.
    - If the torque converter is already used, add as much as drained.

Assembly (Continued)



23. Install the torque converter while aligning the torque converter notch with the oil pump notch.



24. Measure the distance A and inspect if the torque converter is in its right position.

    Distance A: More than 21.1 mm

GENERAL SPECIFICATIONS

Engine		QG16DE
Auto transaxle model		RE4FO3B
Transaxle gear ratio	1st	2.861
	2nd	1.562
	3rd	1.000
	4th	0.698
	Reverse	2.310
	Final Drive	4.342
Recommended fluid		Genuine NISSAN ATF Matic Fluid D or equivalent
Fluid capacity		7.0 L (7-3/8 US qt, 6-1/8 Imp qt)

SHIFTING SPEED

Throttle pattern	Vehicle speed (km/h)					
Throttle opening (Accelerator opening)	D1 → D2	D2 → D3	D3 → D4	D4 → D3	D3 → D2	D2 → D1
Throttle opening (Accelerator opening: 8/8)	50 - 58	100 - 108	162 - 170	158 - 166	92 - 100	41 - 49
Throttle opening (Accelerator opening: 4/8)	25 - 33	51 - 59	122 - 130	70 - 78	40 - 48	5 - 13

LOCKUP SPEED

Engine model		QG16DE
Model No.		3AX65
Engaging speed (km/h)	Closed throttle	48 - 56
	Half throttle	141 - 149
Release speed (km/h)	Closed throttle	45 - 53
	Half throttle	109 - 117

- The lockup speed is in D4 gear.
- “Closed throttle” means the accelerator opening is less than 1/8 and idler switch is in OFF.
- Under “Half throttle”, the accelerator opening is 4/8.

CONTROL VALVE SPECIFICATIONS

Location		Valve	Overall length (mm)	Part number
Upper Body	L14	Pilot valve	40.0	31772 80X11
	L15	1-2 accumulator valve	42.0	31772 3AX01
		1-2 accumulator piston	24.0	31675 3AX00
	L16	1 reducing valve	38.5	31772 21X00
	L17	3-2 timing valve	38.5	31772 21X00
	L18	Overrun clutch reducing valve	68.5	31772 80X04
	L19	Torque converter relief valve	37.5	31780 80X00
	L20	Lockup control valve	56.5	31832 3AX00
	L21	Cooler check valve	38.5	31772 21X00
Lower Body	L2	Manual valve	119.75	31731 31X00
	L3	Pressure regulator valve	68.0	31741 80X00
	L4	Overrun clutch control valve	73.5	31772 80X00
	L5	Accumulator control valve	66.0	31772 80X19
	L6	Shift valve A	96.5	31776 80X00
	L7	Shuttle valve	59.0	31772 3AX00
	L12	Shift valve B	72.5	31766 80X01
	L13	Pressure modifier valve	43.5	31751 80X00
		Pressure modifier piston	19.5	31675 41X07

CONTROL VALVE SPRING SPECIFICATIONS

Location		Valve	Free length (l)	Outer diameter (D)	Wire diameter (d)	No. of action Coils (Direction)
Upper Body	L14	Pilot valve spring	38.98	8.9	1.2	15.94
	L15	1-2 accumulator valve spring	55.66	19.5	1.5	9.86
		1-2 accumulator piston spring	20.5	6.95	0.45	7.47
	L16	1 reducing valve spring	27.0	7.0	0.8	10.7
	L17	3-2 timing valve spring	23.0	6.65	0.65	8.5
	L18	Overrun clutch reducing valve spring	37.5	7.0	1.1	19.2
	L19	Torque converter relief valve spring	33.3	9.0	1.2	12.59
	L20	Lockup control valve spring	53.01	6.5	1.0	34.15
	L21	Cooler check valve spring	28.04	7.15	0.65	11.4
Lower Body	L3	Pressure regulator valve spring	45.0	15.0	1.4	10.42
	L4	Overrun clutch control valve spring	21.7	7.0	0.8	8.8
	L5	Accumulator control valve spring	22.0	6.5	0.5	10.3
	L6	Shift valve A spring	21.7	7.0	0.8	8.8
	L7	Shuttle valve spring	51.0	5.65	0.75	27.6
	L12	Shift valve B spring	21.7	7.0	0.8	8.8
	L13	Pressure modifier valve spring	30.5	9.8	1.3	8.8
		Pressure modifier piston spring	32.0	6.9	0.9	15.5

ACCUMULATOR

ACCUMULATOR SPRING

Spring name	Free length (mm)
S/R accumulator spring	52.5
N-D accumulator spring	45.0

ACCUMULATOR O-RING

O-ring name	O-ring Inner diameter	
	Large	Small
S/R accumulator O-ring	44.2	26.9
N-D accumulator O-ring	39.4	34.6

BAND SERVO

Anchor end pin tightening torque (Nm (kg•m))	4.0 - 5.8 (0.4 - 0.6)
Number of anchor end pin return (times)	2.5 ± 0.125
Lock nut tightening torque (Nm (kg•m))	32 - 36 (3.2 - 3.7)

BAND SERVO RETURN SPRING

Spring name	Free length (mm)
Second servo spring	32.5
O/D servo spring	38.52

CLUTCH BRAKE

Name		Reverse clutch	High clutch
Drive plate	Quantity	2	3
	Thickness (mm)	2.0	2.0
	Limit value (mm)	1.8	1.8
Driven plate	Quantity	2	5
	Thickness (mm)	2.0	2.0
Clearance	Standard value (mm)	0.5 - 0.8	1.4 - 1.8
	Limit value (mm)	1.2	2.4
Retaining plate		Thickness (mm)	Thickness (mm)
		4.4	3.6
		4.6	3.8
		4.8	4.0
		5.0	4.2
		5.2	4.4
			4.6
			4.8

Name		Forward clutch	Overrun clutch	Low & reverse clutch
Drive plate	Quantity	5	3	5
	Thickness (mm)	1.8	1.6	2.0
	Limit value (mm)	1.6	1.4	1.8
Driven plate	Quantity	5	4	5
	Thickness (mm)	2.0	2.0	2.0
Clearance	Standard value (mm)	1.45 - 0.85	1.0 - 1.4	1.4 - 1.8
	Limit value (mm)	1.85	2.0	2.8
Retaining plate		Thickness (mm)	Thickness (mm)	Thickness (mm)
		3.6	3.6	3.6
		3.8	3.8	3.8
		4.0	4.0	4.0
		4.2	4.2	4.2
		4.4	4.4	4.4
		4.6		4.6

OIL PUMP

Oil pump clearance (mm)	Inner & outer gear and housing	0.02 - 0.04
Clearance between oil pump cover and seal ring (mm)	Standard value	0.1 - 0.25
	Limit value	0.25

PLANETARY CARRIER

Unit: mm (in)

Clearance between the planetary carrier and pinion washer	Standard value	0.15 - 0.70 (0.0059 - 0.0276)
	Limit value	0.80 (0.0315)

INPUT SHAFT

Clearance between the input shaft and seal ring (mm)	Standard value	0.08 - 0.23
	Limit value	0.23

REDUCTION GEAR

Reduction gear turning torque (N•m [kgf-m])	0.11 - 0.68 [0.011 - 0.07]
Reduction gear installation torque (N•m [kgf-m])	246 - 274 [25.0 - 28.0]

REDUCTION GEAR ADJUST SHIM

Thickness (mm)	Thickness (mm)
1.74	2.16
1.78	2.18
1.82	2.20
1.86	2.22
1.90	2.24
1.92	2.26
1.94	2.28
1.96	2.30
1.98	2.34
2.00	2.38
2.02	2.42
2.04	2.46
2.06	2.50
2.08	2.54
2.10	2.58
2.12	2.62
2.14	2.66

OUTPUT SHAFT

Item	Standard value
Clearance between the seal ring and output shaft (mm)	0.1 - 0.25
Taper roller bearing manual torque (N•m [kgf-m])	0.25 - 0.08 [0.025 - 0.09]
Output shaft endplay (mm)	0 - 0.5
Output shaft mounting torque (N•m [kgf-m])	246 - 274 [25.0 - 28.0]

OUTPUT SHAFT ADJUST SPACER

3AX65 Model

Thickness (mm)	Thickness (mm)
6.26	6.78
6.30	6.80
6.34	6.82
6.38	6.84
6.42	6.86
6.46	6.88
6.50	6.90
6.54	6.92
6.58	6.94
6.62	6.96
6.64	6.98
6.66	7.00
6.68	7.02
6.70	7.06
6.72	7.10
6.74	7.14
6.76	7.18
	7.20

BEARING RETAINER

Clearance between the seal rings (mm)	0.1 - 0.25

TOTAL ENDPLAY

Total endplay (mm)	0.25 - 0.55

TOTAL ENDPLAY BEARING RACE

Thickness (mm)	Thickness (mm)
0.6	1.4
0.8	1.6
1.0	1.8
1.2	2.0

REVERSE CLUTCH DRUM ENDPLAY

Reverse clutch drum endplay (mm)	0.25 - 0.55

REVERSE CLUTCH DRUM ENDPLAY THRUST WASHER

Thickness (mm)	Thickness (mm)
0.65	1.4
0.80	1.6
0.95	1.8

FINAL DRIVE

Model No.	3AX65
Side gear washer endplay (mm)	0.1 - 0.2
Ball bearing endplay (mm)	0 - 0.15
Taper roller bearing manual torque (kg•m)	0.05 - 0.11

Differential Thrust Washer
3AX65 Model

Thickness (mm)	Thickness (mm)
0.75 - 0.80	0.90 - 0.95
0.80 - 0.85	0.95 - 1.00
0.85 - 0.90	

3AX66, 3AX67 Model

Thickness (mm)	Thickness (mm)
0.75 - 0.80	0.90 - 0.95
0.80 - 0.85	0.95 - 1.00
0.85 - 0.90	

Differential Side Bearing Adjust Shim
3AX65 Model

Thickness (mm)	Thickness (mm)
0.48	0.80
0.56	0.88
0.64	0.96
0.72	1.04

3AX66, 3AX67 Model

Thickness (mm)	Thickness (mm)
0.40	0.72
0.44	0.76
0.48	0.80
0.52	0.84
0.56	0.88
0.60	0.92
0.64	1.44
0.68	

Installation Torque

N•m (kgf-m)

Installation torque of transaxle - engine	From transaxle to engine	31 - 40 (3.1 - 4.1)
	From engine to transaxle	16 - 20 (1.6 - 2.1)
		31 - 40 (3.1 - 4.1)

DIFFERENTIAL SIDE GEAR CLEARANCE

Clearance between the side gear and differential case	0.1 - 0.2 mm (0.004 - 0.008 inch)

Clearance between the converter housing and torque converter	1.59 mm (0.06259 inch) or more

SHIFT SOLENOID VALVE

Gear	Solenoid A	Solenoid B
1st	ON	ON
2nd	OFF	ON
3rd	OFF	OFF
4th	ON	OFF

RESISTANCE

Shift Solenoid	Resistance	Terminal No.
Shift solenoid A	20 - 30 Ω	2
Shift solenoid B	5 - 20 Ω	1
Overrun clutch solenoid	20 - 30 Ω	3
Line pressure solenoid	2.5 - 5 Ω	4
Torque converter clutch solenoid	5 - 20 Ω	5

ATF TEMPERATURE SENSOR

Auto	Resistance
20°C (68°F)	2.5 kΩ
80°C (176°F)	0.3 kΩ

REVOLUTION SENSOR

Condition	Standard value
Measure the vehicle speed sensor frequency while driving at approx. 20 km/h	Approx. 150 Hz
	Under 1.3 V or over 4.5 V

DROPPING RESISTOR

Resistance	10 - 15 Ω

SECTION **AV**

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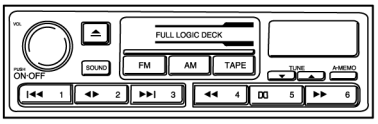
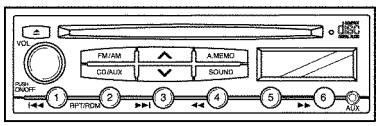
Precautions for Supplemental Restraint System (SRS) “AIR BAG” and “SEAT BELT PRE-TENSIONER”

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

WARNING:

- **To install/remove the SRS airbag, pretensioner seatbelt system related components and harness, turn the ignition switch “OFF”, disconnect the battery terminals and wait over 3 minutes. (This is to discharge all the remaining electricity in the airbag sensor unit’s auxiliary power circuit.)**
- **Do not use air impact or electrical tools when installing/removing the components.**
- **Do not use any hand-held tools for harness used in SRS airbag and pretensioner seatbelt systems. Be careful with the harness not to tangle with or interfere with other components.**
- **Do not use any electrical test equipments such as circuit tester when inspecting the SRS airbag and pretensioner seatbelt circuit while installed unless the Service Manual instructs to do so. (The weak current in the tester can cause the SRS airbag to operate.)**
- **Do not insert any foreign materials such as a screwdriver in the airbag module and pretensioner seatbelt connector in order to prevent unintended operation due to static electricity.**
- **The harnesses used in SRS airbag and pretensioner are covered with yellow insulation for easy identification.**
- **Refer to “RS Restraint System” in this Service Manual for safe airbag system service information.**

Audio Unit

Part number	Model	AUX function
56120-52100	1 DIN AM/FM/TAPE  SQRZ007_D1	-
56120-52100	1 DIN AM/FM/CDP  SQRX001_D1	●

Precautions

- Use neutral detergent when cleaning the LCD display. Never use any organic detergent(such as thinner and gasoline) and chemical detergent.
- Connect/disconnect connectors while the power is turned off.
- Before service, be sure to disconnect the negative (-) terminal of the battery.
- When electrical system is suspicious for trouble symptoms, inspect the fuse, connector open-circuit, terminal dislocation and bad connection first.

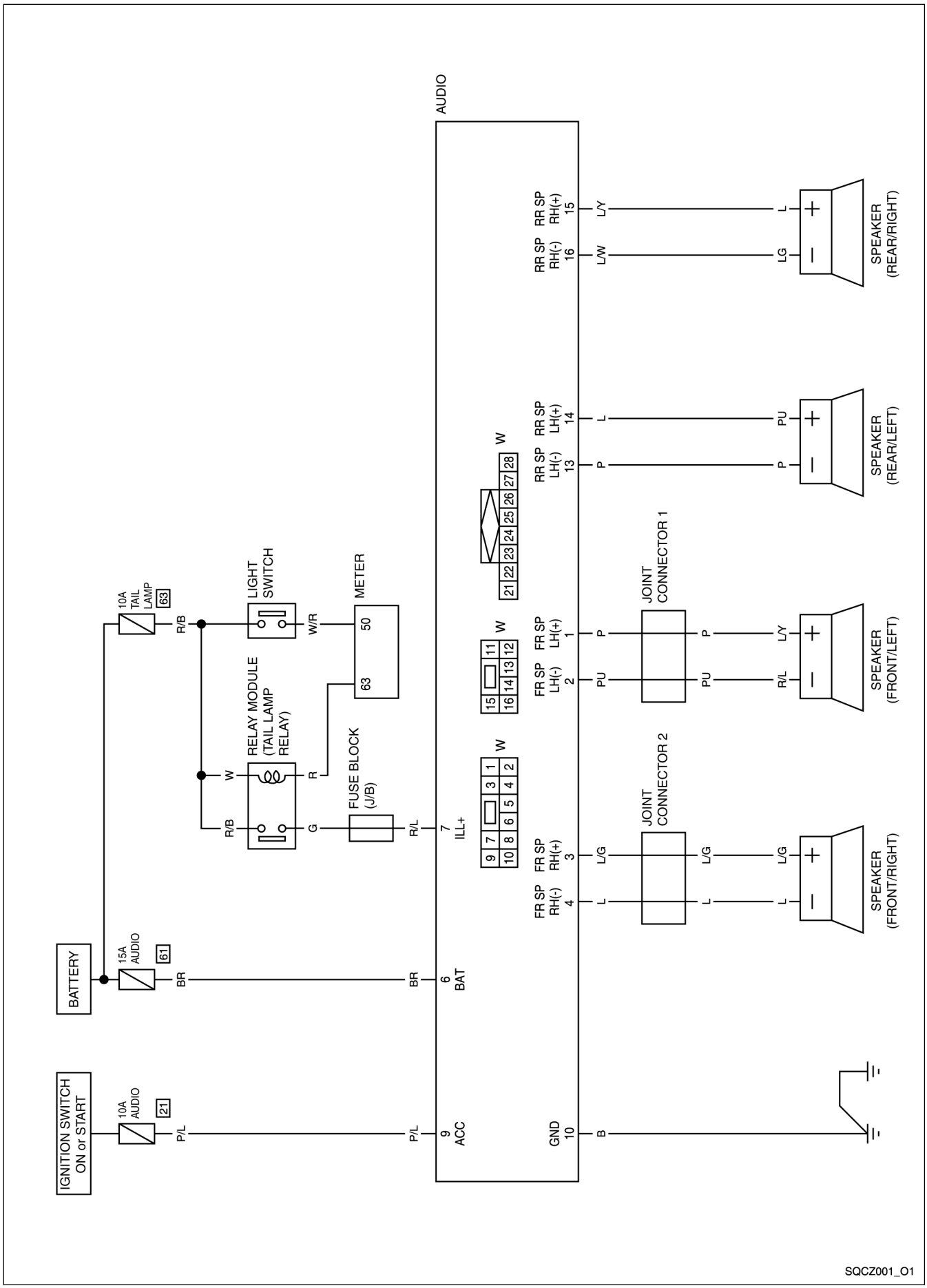
CAUTION:

- **To repair the open-circuit or connector dislocation, refer to AV-5 “Circuit Diagram” and AV-6 “Wiring Diagram”.**

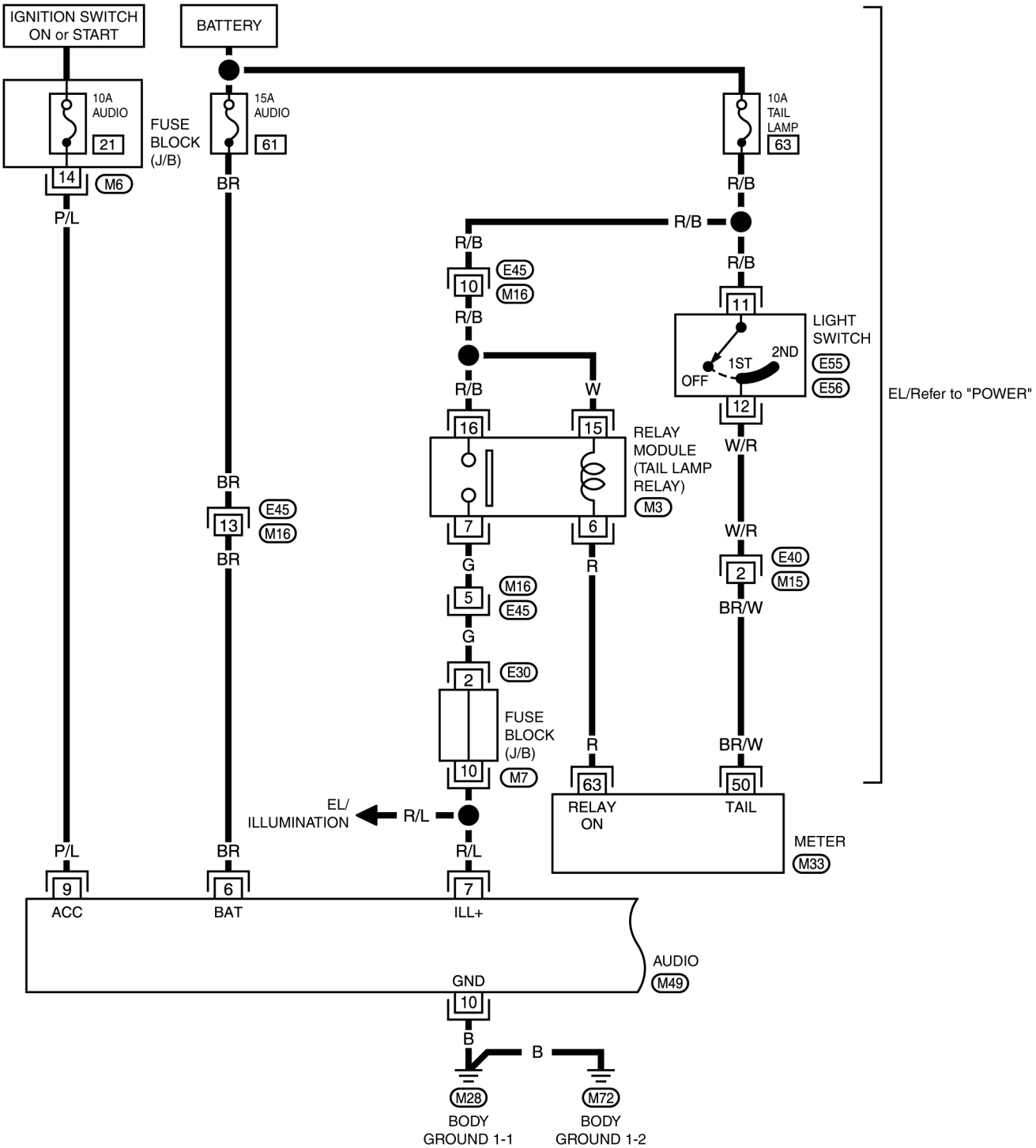
Audio Unit Standard

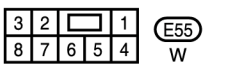
Function		AM/FM radio, CD deck, CD changer, remote control, H/Free function, AUX
Radio	● One-touch memory function allows storing 6 AM stations and 12 FM stations. ● The stations with the strongest signals will automatically be received and set in the radio station memory/calling buttons (1 to 6) in order of the frequency. (AUTO MEMORY) ● Tuning stops automatically when a station is found (SEEK)	
	Tuning	PLL frequency synchronizer system
	Frequency range	AM 531 KHz ~ 1,602 KHz, FM 87.5 MHz ~ 108.0 MHz
	Mid frequency	AM 450 KHz, FM 10.7 MHz
	Usable sensitivity	Below AM 34 dBu (at S/N 20Db), below FM 13 dBu (at S/N 30 Db)
	Automatic stop sensitivity	AM 32 ± 6 dBu, FM 25 ± 6 dBu
Tape	Usable tape	4 track, 2 channel stereo cassette tape play deck
	Speed	-1 ~ +4%
	FF/REW speed	110 sec. (C-60)
	Signal to noise ratio	Normal tape (120us): -45 dB / 52 dB (DOLBY NR ON) Metal tape (70us): -47 dB / 54 dB (DOLBY NR ON)
CD player	● 12 cm compact disk player ● The current track is played repeatedly (REPEAT: RPT) ● All the tracks on the current CD are played in random order (RANDOM: RDM) ● The selected music is played (BOOKMARK). ● Compression file (MP3, WMA) can be played. ● Track up/down ● Shows file structure (folders and file names).	
	Frequency characteristics	17 Hz (6.5 ± 3 dBu), 20 KHz (7.0 ± 3 dBu)
	Signal to noise ratio	Over 70 dB
AUX	● Can connect and play a portable audio system and MP3 player by using AUX port.	
TEL	● Hands-free function and privacy talk function	
Other functions	● Remote control function ● EQ (Classic, Jazz, Rock) control function ● 5.8" FSTN LCD ● Auto power on function ● Rheostatic function for display (12 stages)	
Error notification function	To protect the audio system, the advanced sensor in the system detects errors and notify it to driver.	
Specifications	Load impedance	4 Ω/CH
	OUTPUT	43W × 4CH
	Battery voltage	DC 13.2 V (10.8 V ~ 15.6 V)
	Backup current	Less than 3 mA

Circuit Diagram

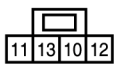


Wiring Diagram

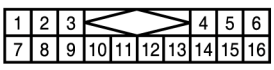




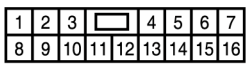
E55
W



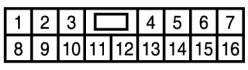
E56
BR



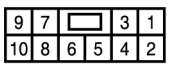
E40
W



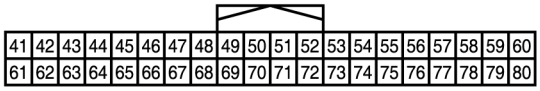
E45
W



M3
W



M49
W

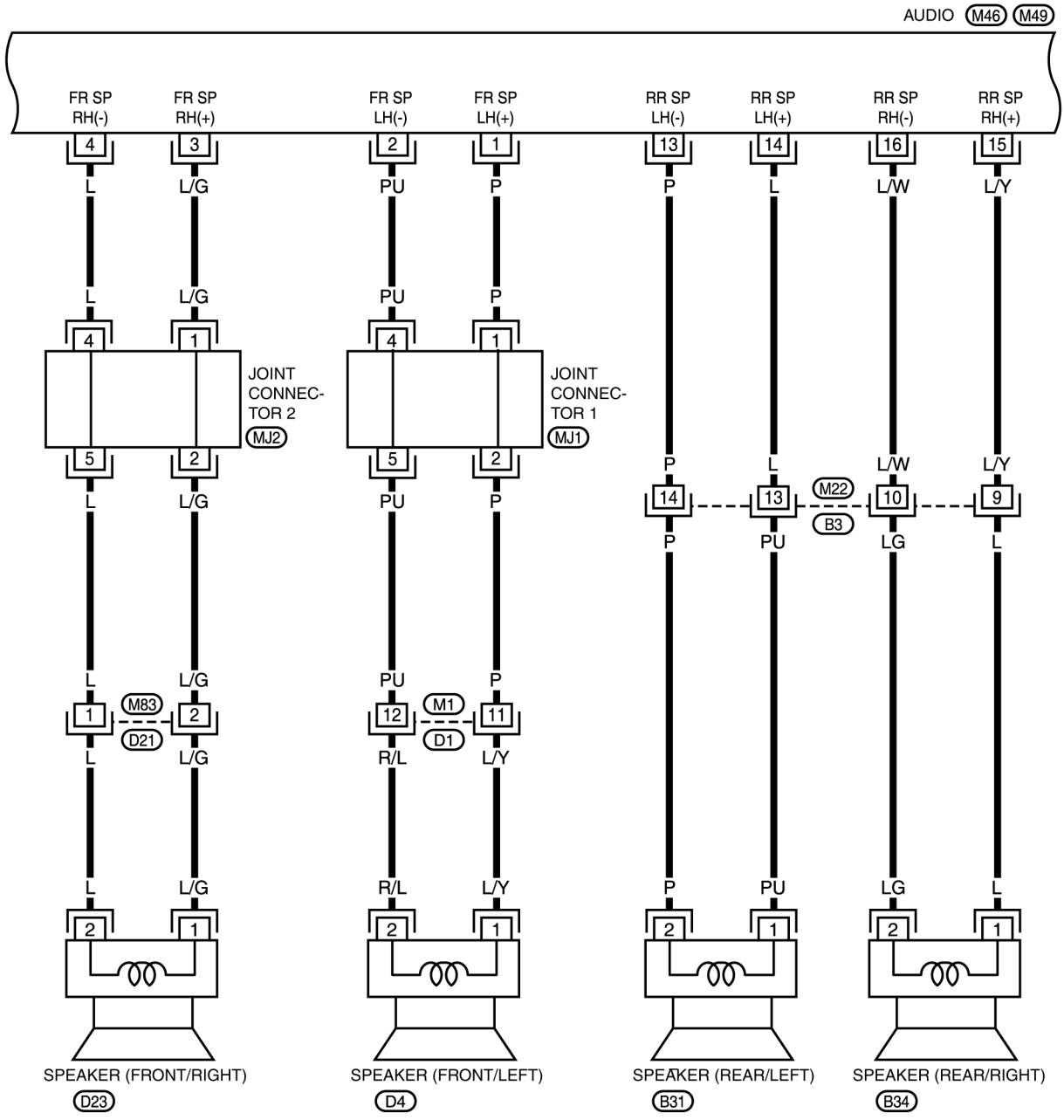


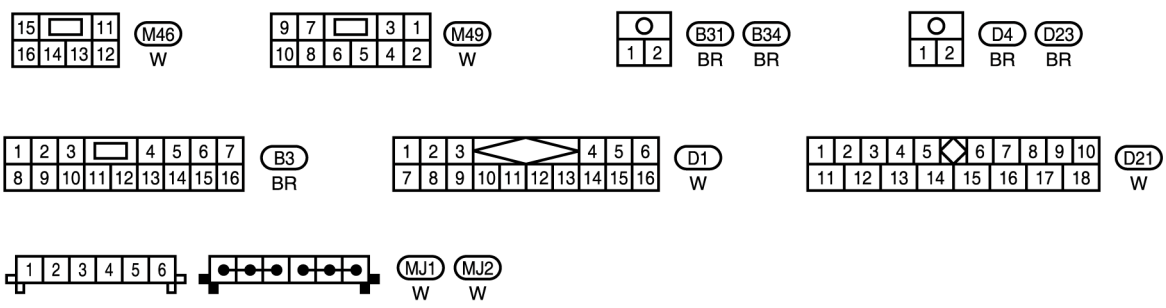
M33
B

Refer to "FUSE BLOCK (J/B)"
M6 M7
E30

SQWZ001_O1

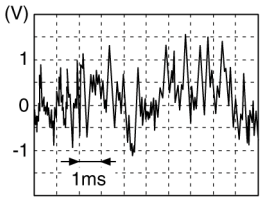
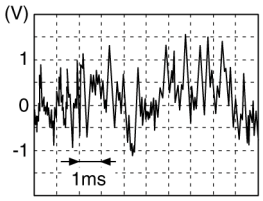
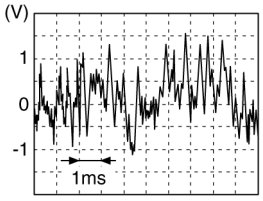
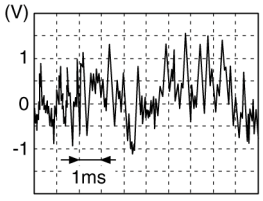
Wiring Diagram





SQWZ002_O1

Terminals and Reference Value for Audio Unit

Terminal (Wire color)		Signal name	Input/ Output signal	Measuring condition		Reference value	Example of symptom
				Ignition switch	Operation or condition		
+	-						
4 (L)	3 (L/B)	Front door speaker (RH)	Output	ON	When receiving audio signal	 SQDX001_D1	No sound from front door speaker RH and tweeter RH.
2 (Pu)	1 (P)	Front door speaker (LH)	Output	ON	When receiving audio signal	 SQDX001_D1	No sound from front door speaker LH and tweeter LH.
6 (BR)	Body ground	Battery power supply	Input	OFF	-	Battery voltage	System does not work properly.
7 (R/L)	Body ground	Illumination signal	Input	ON	lighting switch ON (1st position)	Approx. 12 V	Audio unit illumination does not come on when lighting switch is ON (1st position).
					Lighting switch OFF	Approx. 0 V	
9 (P/L)	Body ground	Ignition switch ACC	Input	ACC	-	Battery voltage	System does not work properly.
10 (B)	Body ground	Ground	-	ON	-	Approx. 0 V	-
14 (L)	13 (P)	Rear door speaker LH	Output	ON	When receiving audio signal	 SQDX001_D1	
15 (L/Y)	16 (L/W)	Rear door speaker RH	Output	ON	When receiving audio signal	 SQDX001_D1	

Trouble Diagnosis

External causes (bad CD or tape) or miss-manipulation makes troubles on the audio system. Check following items fully before service.

Troubles In Radio, Tape and CD - Changer

Symptoms	Check Point	Result	Possible Cause & Remedy
Does not operate at all (No digital display and sound)	Is the ignition switch is in ACC?	No	Turn the ignition switch to ACC
	Is the 10 A (No. “16”, in fuse block) normal?	No	Replace the 10 A fuse (No. “16”, in fuse block)
	Is audio case ground normal?	No	Secure the case ground
	Is there battery voltage (about 12 V) on radio connector terminal No. “6” & “9” when ignition switch is ON?	Yes	Remove and repair the audio
		No	Inspect vehicle power system
No sound	Is the volume at minimum?	Yes	Increase the volume and recheck
	Are BAL and FAD selections at center?	No	Select the center and recheck
	Is there AC voltage at audio connector terminal No. “1”, “2”, “3”, “4”, “13”, “14”, “15” and “16” and is it varies when VOL is changed?	Yes	Check speaker wires and wires between the speaker and audio
		No	Remove and repair the audio
No sound from the rear speaker only	Is FAD selection at center?	No	Select the center and recheck
	Is there AC voltage at audio connector terminal No. “13”, “14”, “15” and “16” and is it varies when VOL is changed?	Yes	Check sub woofer wires and wires between audio unit and sub woofer
		No	Remove and repair the audio
Too noisy Bad sound quality	Are the BASS and TREB VR selections at center?	No	Select the center and recheck
	Is the sound OK when fine speakers are connected to the audio unit output directly?	Yes	Check speaker wires and wires between the speaker and audio unit
		No	Remove and repair the audio

Error Indication

To protect the CD integrated AM/FM audio system, the advanced sensor in the system detects errors and displays the error code on the screen.

If an error code is displayed on the screen, have the system checked at authorized audio service center.

Error	Error code
Temperature error → over 82°C	Error TEMP.
MECH ERROR	ERROR 1
SERVO ERROR	ERROR 2
DISC ERROR	ERROR 3
TIMER ERROR	ERROR 4

Troubles in Radio Only

Symptoms	Check point	Result	Possible cause & Remedy
No sound	Is it tuned at fine station?	Yes	Remove and repair the audio
		No	Tune to fine station and recheck
Too noisy	Is it tuned at fine station?	No	Tune to fine station and recheck
	Is the receiving frequency weak?	Yes	When the vehicle is far away from the broadcasting station, it normally receives weak frequency
	Are there any foreign objects (window tinting film or accessory antenna) on the rear window? (Note 1)	Yes	Reinstall the foreign objects away from the glass antenna
	Is the symptom apparent in a specific region? (Note 2)	Yes	It is not a malfunction because it happens in a specific region.
	Are the antenna cable and radio grounds OK?	Yes	1. Check the antenna 2. Remove and repair the audio
		No	Repair the troubling component
Radio (AM & FM) is noisy while engine running	1. Bad radio ground 2. Loose or out of ground 3. Ignition condenser or rear window defogger noise control condenser 4. Alternator 5. Ignition coil or secondary wire 6. Audio	1. Check radio ground 2. Check or tighten the ground 3. Check ignition condenser or rear window defogger noise control condenser 4. Check alternator 5. Check ignition coil or secondary wire 6. Remove and repair the audio	
Radio (AM & FM) is noisy when other equipment is turned on	1. Bad radio ground 2. Antenna 3. Bad ground of other equipment 4. Defective other equipment	1. Check radio ground 2. Check antenna 3. Check ground of other equipment 4. Replace other equipment	
No preset memories	Is the audio connector terminal No. “6” connection OK?	Yes	It is normal but happens when battery is replaced or audio connectors are reconnected
		No	Secure the terminal connection
No preset memories when ignition switch is turned off	Is the 15 A fuse (No. “31”, in fuse block) normal?	No	Replace 15 A fuse (No. “31”, in fuse block)
	Is there battery voltage (about 12 V) on radio connector terminal No. “6” when ignition switch is ON?	Yes	Remove and repair the audio
		No	Inspect vehicle power system

CAUTION:

1. It causes the glass antenna’s receiving sensitivity to decrease.

2. It is the noise caused by electrical fluctuation such as the fading noise and multi-pass noise; and outer noise such as the train. It is not a malfunction.

- **Fading Noise**

  It is the noise generated when mountains or buildings that cause the changing frequency intensity in narrow spaces intercept the frequency.

- **Multi-pass noise**

  It is the noise generated by the timing difference of the time the frequency reflected from the mountains or buildings reaches the antenna and the time the frequency sent from the broadcaster reaches the antenna.

Troubles in CD Only

Symptoms	Check item
CD cannot be inserted.	● CD ● Audio unit (CD player)
CD cannot be ejected.	
CD cannot be played.	
The sound skips, stops suddenly, or is distorted.	

Noise Inspection

The vehicle itself can be a source of noise if noise prevention parts or electrical equipment is malfunction. Check if noise is caused and/or changed by engine speed, ignition switch turned to each position, and operation of each piece of electrical equipment, and determine the cause.

The source of the noise can be found easily by listening to the noise while removing the fuses of electrical components, one by one.

Type of Noise and Possible Cause

Symptoms		Check item
Occurs only when engine is ON.	A continuous growling noise occurs. The speed of the noise varies with changes in the engine speed.	Ignition condenser
	A whistling noise occurs while the engine speed is high. A booming noise occurs while the engine is running and the lighting switch is ON.	Alternator
The occurrence of the noise is linked with the operation of the fuel pump.		Fuel pump condenser
Noise only occurs when various electrical components are operating.	A cracking or snapping sound occurs with the operation of various switches.	Relay malfunction, radio malfunction
	The noise occurs when various motors are operating.	● Motor case ground ● Motor
The noise occurs constantly, not just under certain conditions.		● Rear window defogger coil malfunction ● Poor ground of antenna amp. or antenna feeder line
A cracking or snapping sound occurs while the vehicle is being driven. (especially when it is vibrating excessively)		● Ground wire malfunction ● Ground due to incorrect installation of parts ● Wiring connections or a short circuit

Power Supply Circuit Check for Audio Unit

1. Check fuse

Check fuses for blown-out.

Unit	Signal	Fuse No.
Audio unit	Battery power supply	61
	Ignition switch ACC or ON	21

REFERENCE:

For mounting locations of fuses and fusible link, refer to "FUSE BLOCK-JUNCTION BLOCK (J/B)" (WH-183).

OK or NG

OK → GO TO 2.

NG → If fuse is blown, be sure to eliminate cause of malfunction before installing new fuse.

Speaker Inspection

1. Disconnect the speaker harness connector.
2. Measure the resistance between the speaker terminal “No. 1” and “No. 2”.
   - The resistance should be 2 - 4 Ω.
3. Momentarily connect the 9-volt battery to the speaker terminal “No. 1” and “No. 2” using the jumper wire.
   - There should be a kind of sparking sound.

Antenna Inspection

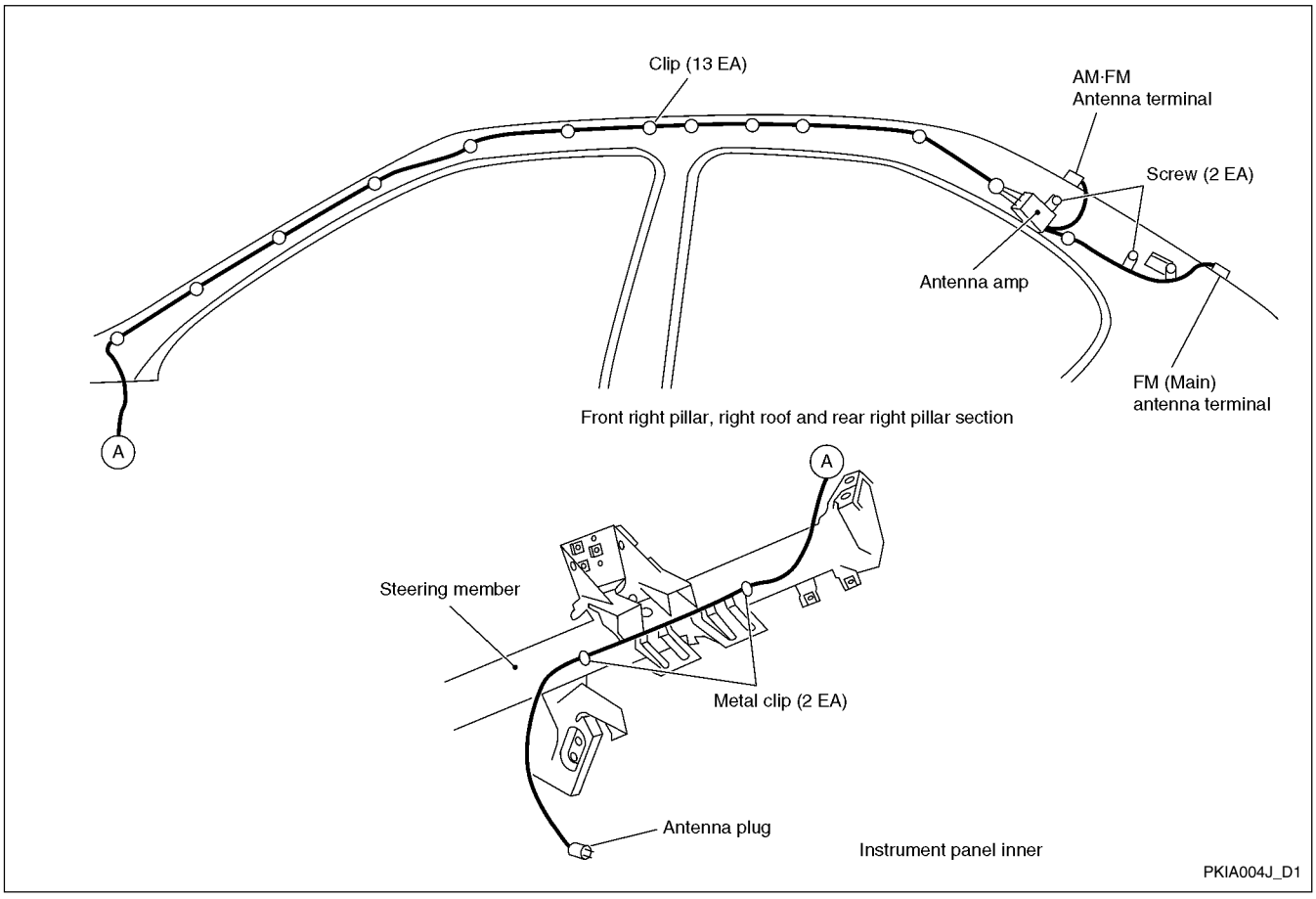
1. Secure the antenna ground using an auxiliary jumper wire.
   - If receiving capacity improves check the antenna ground (body side).

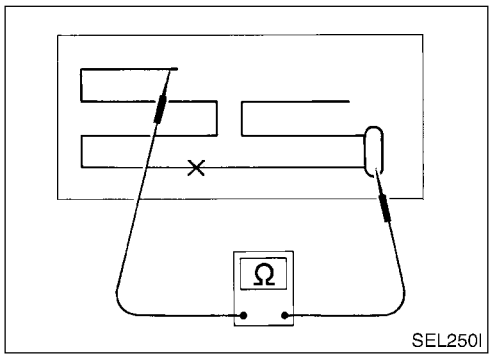
Radio Inspection

Measure every voltage under following conditions.

- Ignition switch ON or ACC.
- Radio ON.
- Connection between the radio and speaker.

Antenna Location

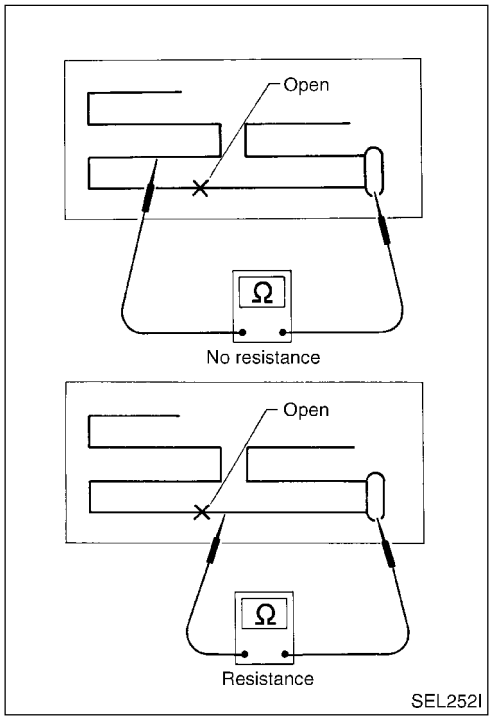




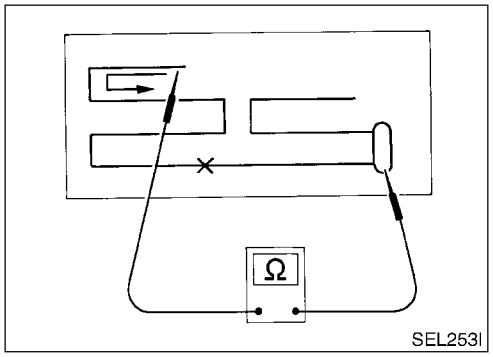
Glass Antenna Repair

OPEN-CIRCUIT INSPECTION

1. Place the circuit tester's probes (resistance mode) at both terminals of the antenna.



2. There will be no resistance if grid is open.

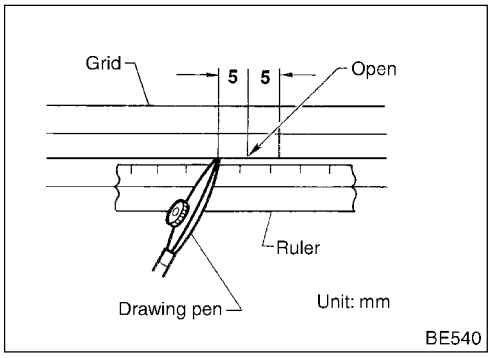


3. In order to locate the open grid, move the probe following the grid lines. When the probe passes through the open grid, the tester needle will shake.

Open-Circuit Repair

REPAIR EQUIPMENT

1. Conductive silver composition
2. 30 cm ruler
3. Drawing pen
4. Dryer
5. Alcohol
6. Cloth

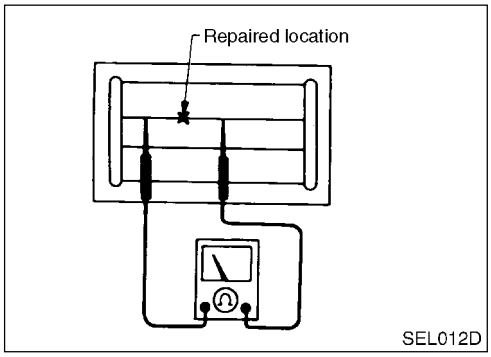


REPAIR PROCEDURE

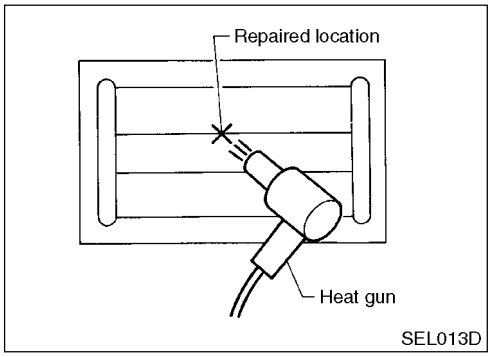
1. Wipe the open grid and clean the surroundings with a cloth dampened in alcohol.
2. Apply a small amount of conductive silver composition to tip of drawing pen.

   Shake silver composition container before use.
3. Place the ruler on the glass following the open grid. Apply the silver composition with drawing pen at the cut location. Overlap about 5 mm on both existing grids.
4. After repairing, check repaired grid for continuity.

This inspection should be performed 10 minutes after the repair.



Do not touch the repaired location while testing.



5. Apply heat at the repaired location for about 20 minutes with a dryer. Maintain the dryer (heat gun) at least 3 cm from the window. If a heat gun is not available, wait about 24 hours.

BRAKE SYSTEM

SECTION **BR**

GI
EM
LC
EC
FE
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SRS Airbag • Pretensioner Seatbelt

The driver's and passenger's SRS (Supplemental Restraint System) airbag that is used with the pretensioner seatbelt system reduces the facial impact of the driver and the passenger during a front collision.

Also, the driver and passenger's SRS side airbag reduces the facial and chest impact during a side impact with the aid of the seatbelt, highly tension body and energy-absorbing door.

The SRS airbag and pretensioner seatbelt system consist of driver's airbag module (center of the steering wheel), passenger's airbag module (in the passenger side instrument panel), front side airbag module (outer side of front seat), pretensioner seatbelt, airbag sensor unit, spiral cable, side sensor and warning light.

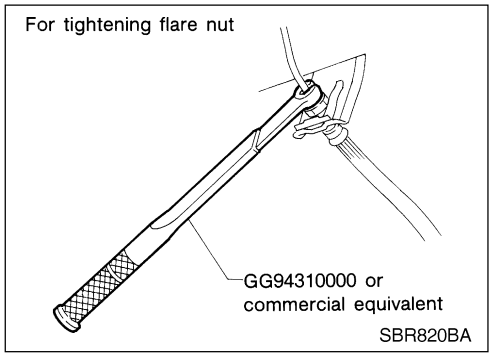
Refer to [RS Restraint System] in this Service Manual for safe airbag system service information.

WARNING:

- **To install/remove the SRS airbag, pretensioner seatbelt system related components and harness, turn the ignition switch "OFF", disconnect the battery terminals and wait over 3 minutes. (This is to discharge all the remaining electricity in the airbag sensor unit's auxiliary power circuit.)**
- **Do not use air impact or electrical tools when installing/removing the components.**
- **Do not use any hand-held tools for harness used in SRS airbag and pretensioner seatbelt systems. Be careful with the harness not to tangle with or interfere with other components.**
- **Do not use any electrical test equipments such as circuit tester when inspecting the SRS airbag and pretensioner seatbelt circuit while installed unless the Service Manual instructs to do so. (The weak current in the tester can cause the SRS airbag to operate.)**
- **Do not insert any foreign materials such as a screwdriver in the airbag module and pretensioner seatbelt connector in order to prevent unintended operation due to static electricity.**
- **The harnesses used in SRS airbag and pretensioner are covered with yellow insulation for easy identification.**
- **Refer to "RS Restraint System" in this Service Manual for safe airbag system service information.**

Brake System

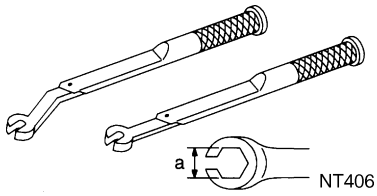
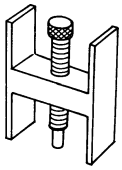
- Remove all brake dust covered on the brake pad, shoes, drum and back plate using a dust collector. Do not scatter the dust using an air blower.
- Use a brake fluid "DOT3" or "DOT4" as a brake fluid.
- Do not reuse the drained brake fluid.
- Be careful not to stain the brake fluid on the painted surface. If stained, wipe out with water immediately.
- Use clean brake fluid when cleaning the brake components such as the master cylinder and disc brake calipers.
- Do not use any mineral oil such as gasoline or kerosene for cleaning. It damages the rubber components.
- Securely tighten the brake tube flare nut with a flare nut torque wrench.
- If oil leakage is found in the main security components, check by disassembling and replace if defective.
- Turn the key switch OFF and disconnect the ABS actuator control unit connector or battery terminal before performing any service operations.
- Always check the torque during brake tube installation.

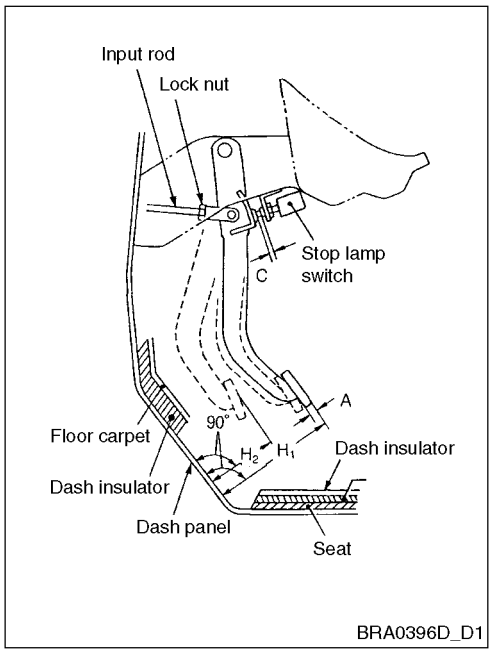


Brake Control

- During ABS operation, brake pedal lightly vibrates and a mechanical noise may be heard. This is normal.
- Just after starting vehicle after ignition switch ON, brake pedal may vibrate or motor operating noise may be heard from engine compartment. This is a normal status of operation check.
- Stopping distance may be longer than that of vehicles without ABS when vehicle drives on rough, gravel, or snow-covered (fresh, deep snow) roads.
- When a malfunction is indicated by ABS or another warning lamp, collect all necessary information from customer (what symptoms are present under what conditions) and check for simple causes before starting diagnostic servicing. Bdsides electrical system inspection, check booster operation, brake fluid level, and oil leaks.
- If tire size and type are used in an improper combination, or brake pads are not Genuine NISSAN parts, stopping distance or steering stability may deteriorate.
- If there is a radio, antenna, or antenna lead-in wire (including wiring) near control module, ABS function may have a malfunction.
- If aftermarket parts (car stereo, CD player, etc.) have been installed, check for incidents such as harness pinches, open circuits, and improper wiring.

Preparation

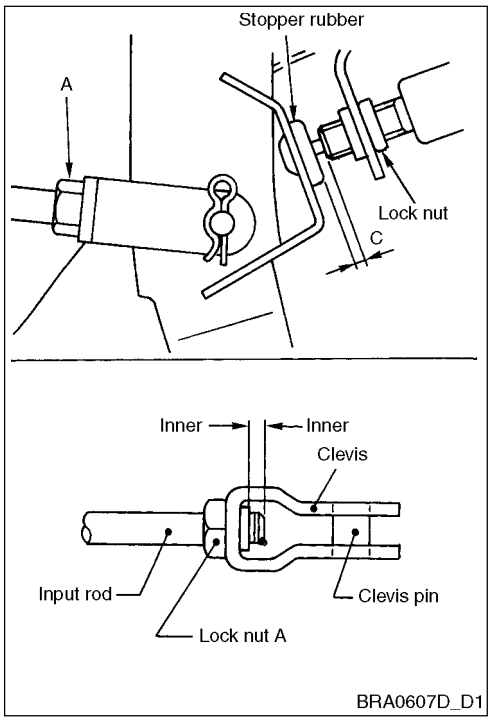
Item	Description	
GG94310000 Flare nut torque wrench a: 10 mm (0.39 in)	 NT406	Removing and installing brake pipe
KV99102000 Output rod gauge	 ZZA0756D	Adjusting brake booster output rod dimensions



On-Vehicle Inspection and Adjustment

Adjust the height from the dash panel to the brake pedal upper surface according to the values below.

H1	Pedal height	M/T	156.0 - 166.0 mm
		A/T	164.9 - 174.9 mm
H2	Pedal height when depressed (While engine running and depressing by force of 490 N (50 kg))	M/T	More than 84.8 mm
		A/T	More than 91.5 mm
A	Pedal free play		3.0 - 11.0 mm
C	Clearance between the stopper rubber and stop lamp switch end		0.3 - 1.0 mm



1. Loosen the lock nut and to loosen the stop lamp switch.
2. Loosen the lock nut A of the input rod and tighten the lock nut A by rotating the input rod and adjusting the pedal to the specified height.

CAUTION:

- **Check if the thread end of the input rod is inside of the clevis.**

Tightening torque: 11.8 - 14.7 N•m (1.2 - 1.5 kgf-m)

3. Push the switch in until the stop lamp switch end touches the stopper rubber while pulling and holding the pedal with hand.
4. Tighten the lock nut while the stopper switch end is inserted into the stopper rubber.

CAUTION:

- **Check if the clearance (C) between the stopper rubber and stop lamp switch end is within the standard value.**

5. Inspect the pedal free play.

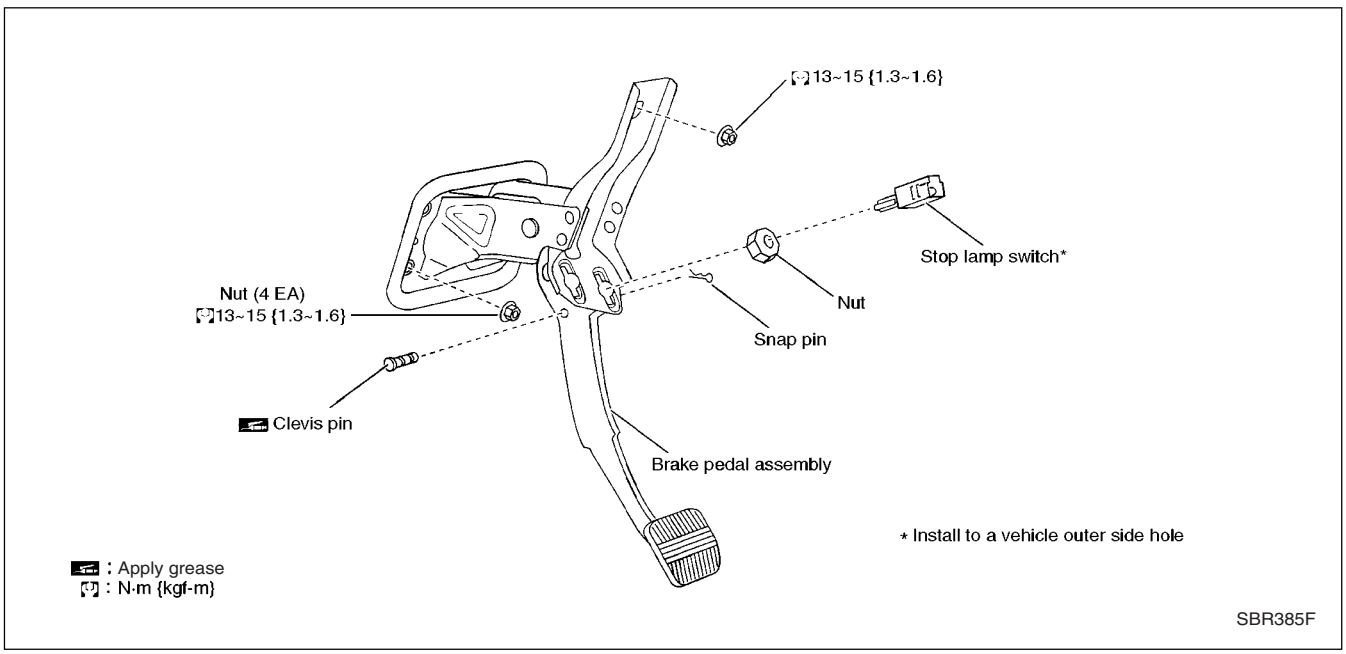
CAUTION:

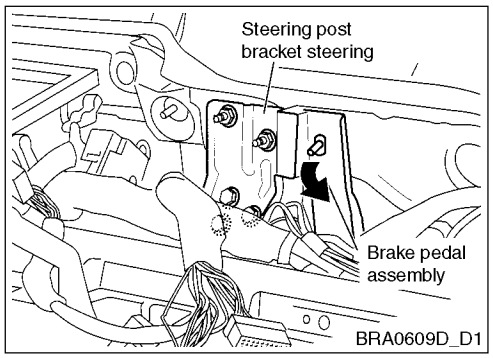
- **Check if the stop lamp is off when releasing the pedal.**

6. Start the engine and inspect the height while depressing the brake pedal.

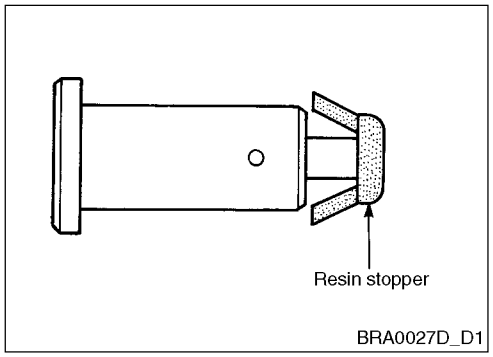
Removal • Installation

COMPONENTS DIAGRAM





1. Remove the steering column assembly from the steering member.
2. Remove the pedal assembly from the vehicle by tilting towards the right avoiding the steering post bracket steering.



INSPECTION AFTER REMOVAL

Regarding the brake pedal, check below items.

- Brake pedal bending.
- Clevis pin deformation.
- Cracks in welding section.
- Crack or deformation in clevis pin stopper.

INSTALLATION

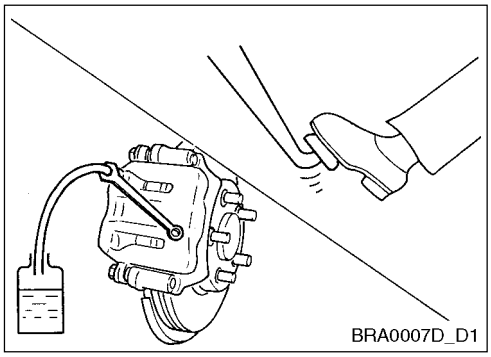
Install in the reverse order of removal by cautioning as below.

- Adjust the brake pedal after installing the brake pedal assembly to the vehicle.

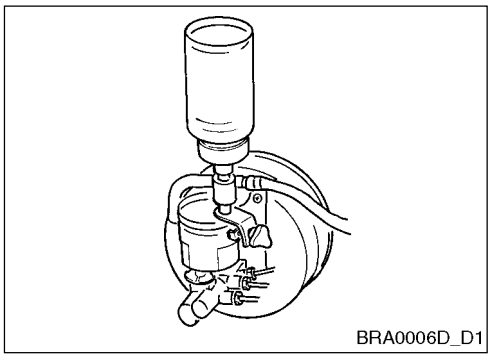
Brake Fluid Change

CAUTION:

- **Use a brake fluid “DOT3” or “DOT4”.**
- **Do not reuse the drained brake fluid.**
- **Do not stain the brake fluid to the painted surface. If stained, wipe out with water immediately to avoid damages in the paint.**


BRA0007D_D1

1. Connect a vinyl tube to the air bleeder.
2. Depress the brake pedal and drain out the brake fluid from the air bleeder for all wheels.
3. Remove the ABS actuator connector while the key switch is OFF.


BRA0006D_D1

4. Check for any foreign particles in the reservoir tank and fill in the new brake fluid.
5. Connect a vinyl tube to the air bleeder.
6. Release the air bleeder and depress the pedal slowly until the full stroke and then release. Repeat this operation until the new brake fluid comes out with 2 to 3 seconds interval and then lock the air bleeder while depressing the brake pedal. Refer to “Air Bleeding” (BR-8) to bleed air.

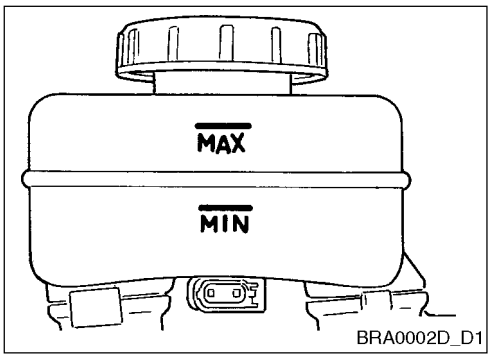
Air Bleeding

CAUTION:

- **Perform the air bleeding while watching the master cylinder fluid level.**

1. Remove the ABS actuator connector while the key switch is OFF.
2. Connect a vinyl tube to the air bleeder.
3. Fully depress the brake pedal 4 to 5 times.
4. Loosen the air bleeder and bleed the air while depressing the brake pedal.
5. Close the air bleeder.
6. Slowly release the brake pedal.
7. Tighten the air bleeder to the specified torque.

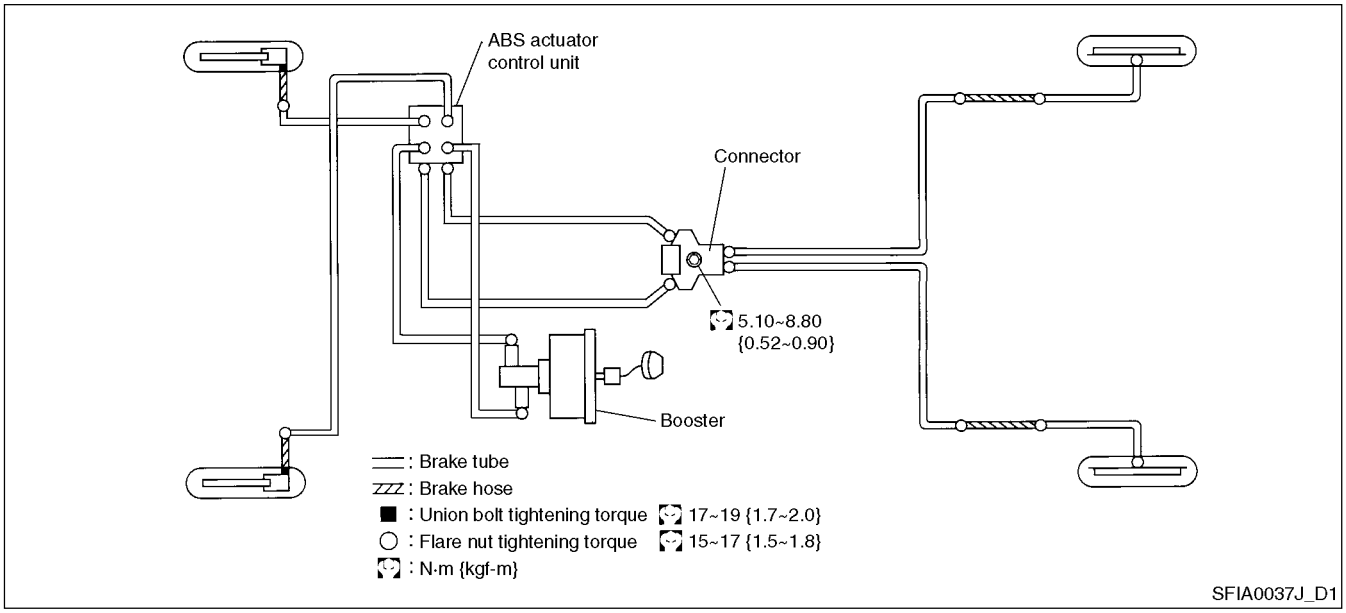
   Tightening torque: 6.9 - 8.8 N•m (0.7 - 0.9 kgf-m)
8. Perform the air bleeding according No. 2 - 7 steps while maintaining the master cylinder reservoir tank level over the half.
9. Perform the air bleeding from right rear wheel, left front wheel and right front wheel in order.
   - Do not loosen the actuator connection while bleeding air.



Fluid Level Inspection

- Check if the fluid level is within the specified range (between MAX and MIN marks).
- Inspect for any leakages around the reservoir tank.
- If the fluid level is extremely low, inspect the brake system for any leakage.
- If the brake warning light does not turn off when releasing the parking brake, inspect the brake system for any leakage.

Brake Hydraulic Line

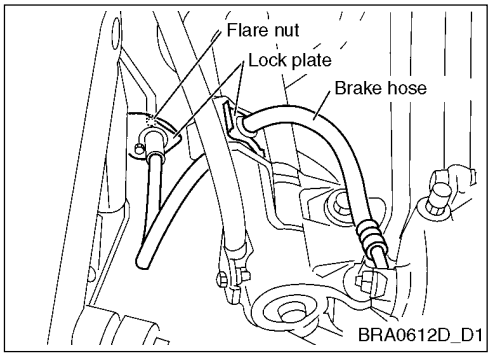


Removal • Installation of Front Brake Piping • Brake Hose

REMOVAL

CAUTION:

- **Do not stain the brake fluid to the painted surface. If stained, wipe out with water immediately to avoid damages in the paint.**
- **Do not bend, twist or pull the brake hose too hard.**
- **Cover the brake fluid line connections to prevent from foreign particles such as dust enter into the connections.**



1. Connect a vinyl tube to the air bleeder.
2. Depress the brake pedal and drain the brake fluid from the air bleeder for all wheels.
3. Remove the brake tube flare nut using a flare nut wrench and disconnect it from the brake hose.
4. Remove the union bolt and disconnect the caliper assembly from the brake hose.
5. Remove the lock plate from the brake tube and strut mounting sections and remove the brake hose.

INSTALLATION

CAUTION:

- **Use a brake fluid “DOT3” or “DOT4”.**
- **Do not reuse the drained brake fluid.**

1. Install the brake hose to the caliper assembly and tighten the union bolt to the specified torque.

CAUTION:

- **Install the brake hose securely to the cylinder body protrusion.**
- **The copper washer of the union bolt cannot be reused. Do not reuse.**

2. Install the brake hose to the strut and fix it to the lock plate.
3. Install the brake hose to the brake tube and fix it to the lock plate by tightening the flare nut with hand as much as possible.
4. Tighten to the specified torque using a flare nut torque wrench.

Tightening torque: 15 - 17 N•m (1.5 - 1.8 kgf-m)

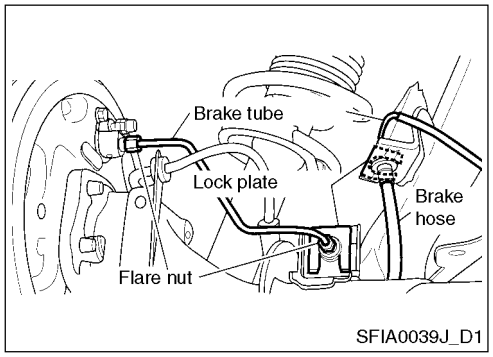
5. Add fluid until new brake fluid comes out from every air bleeders.
6. Perform air bleeding after operation. Refer to “Air Bleeding” (BR-8).

Removal • Installation of Rear Brake Piping • Brake Hose

REMOVAL

CAUTION:

- **Do not stain the brake fluid to the painted surface. If stained, wipe out with water immediately to avoid damages in the paint.**
- **Do not bend, twist or pull the brake hose too hard.**
- **Cover the brake fluid line connections to prevent from foreign particles such as dust enter into the connections.**



1. Connect a vinyl tube to the air bleeder.
2. Depress the brake pedal and drain out the brake fluid from the air bleeder for all wheels.
3. Remove the brake tube flare nut using a flare nut wrench and disconnect it from the brake hose.
4. Remove the lock plate and remove the brake hose from the vehicle.

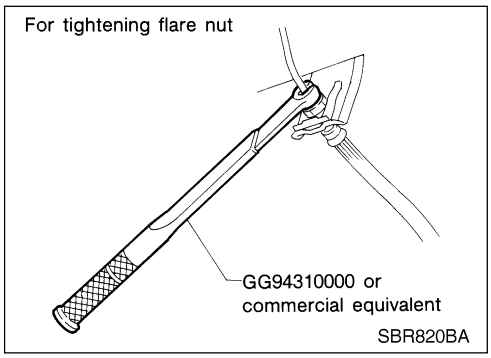
INSTALLATION

CAUTION:

- **Use a brake fluid “DOT3” or “DOT4”.**
- **Do not reuse the drained brake fluid.**

1. Install the brake hose to the brake tube and tighten the flare nut with hand as much as possible.
2. Fix the brake hose to the lock plate and tighten the flare nut to the specified torque using a flare nut torque wrench.

Tightening torque: 15 - 17 N•m (1.5 - 1.8 kgf-m)



3. Add fluid until new brake fluid comes out from every air bleeders.
4. Perform air bleeding after operation. Refer to “Air Bleeding” (BR-8).

INSPECTION

CAUTION:

- **If leakage occurs at connections, tighten again or replace the component if defective.**

1. Inspect the hose, tube and connections for any leakage, damage, twists, deformation, interference with other components and any looseness in connections.
2. Depress the brake pedal with the force of 80 kg while engine running for 5 seconds by checking for any leakages from the components.

Removal • Installation

CAUTION:

- **Do not stain the brake fluid to the painted surface. If stained, wipe out with water immediately to avoid damages in the paint.**

REMOVAL

1. Connect the vinyl tube to the air bleeder.
2. Drain out all brake fluid from every wheel bleeders by depressing the brake pedal and empty the master cylinder.
3. Remove the fluid level sensor harness connector.
4. Disconnect the brake tubes from the master cylinder using a flare nut wrench.
5. Release the mounting nuts and remove the master cylinder assembly from the vehicle.

INSTALLATION

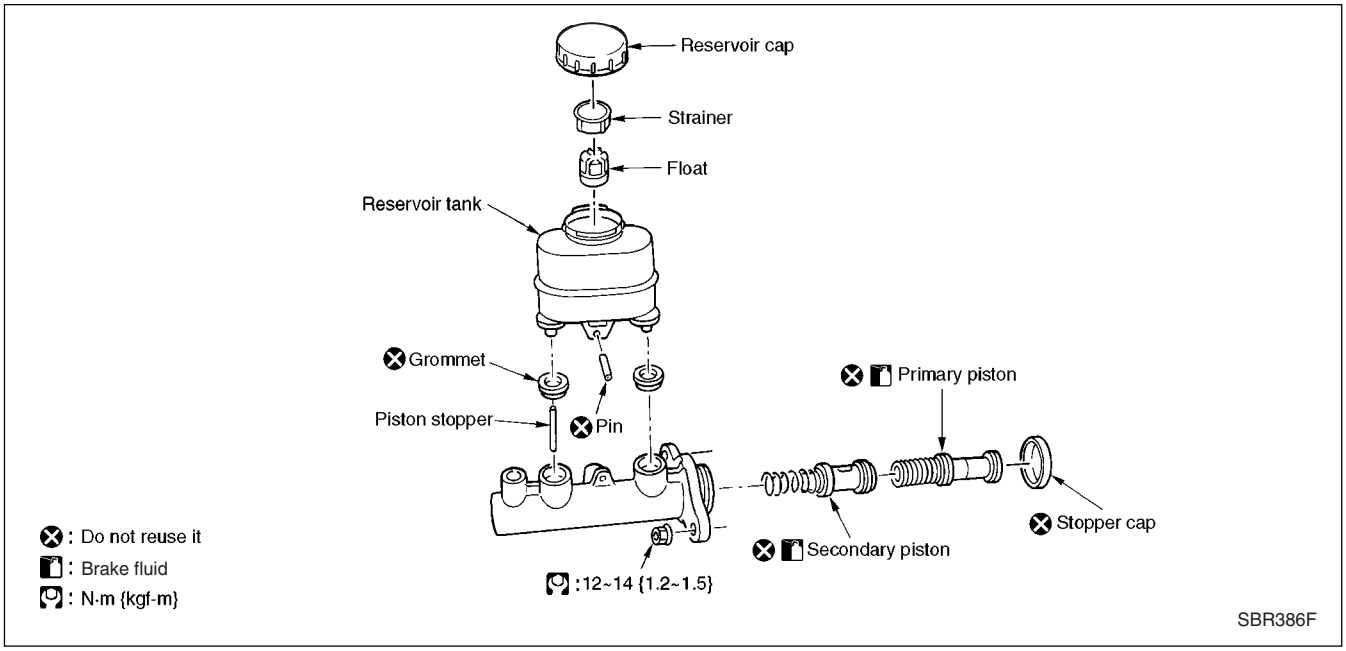
CAUTION:

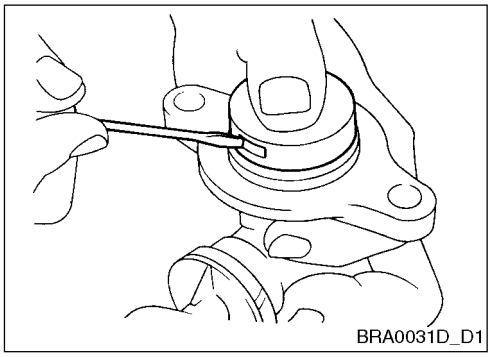
- **Use a brake fluid “DOT3” or “DOT4”.**
- **Do not reuse the drained brake fluid.**

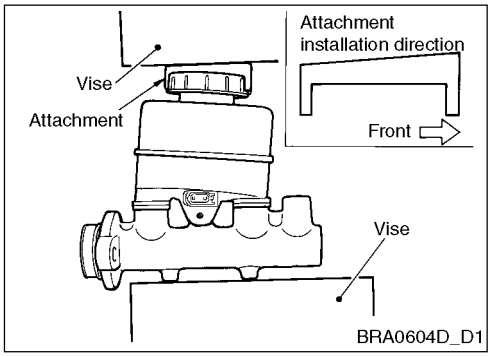
1. Install the master cylinder to the brake cylinder and tighten the mounting nut lightly.
2. Tighten to the specified torque.
   Tightening torque: 15 - 17 N•m (1.5 - 1.8 kgf-m)
3. Fully fill the new brake fluid to the reservoir tank.
4. Block every port of the master cylinder with finger to prevent air inlet.
5. Let a helper depress the brake pedal 4 to 5 times slowly until no more air comes out from the master cylinder. Be careful not to let air go in while releasing the brake pedal.
6. Install the tube to the master cylinder.
7. Tighten the brake tube flare nut to the specified torque using a flare nut torque wrench.
   Tightening torque: 15 - 17 N•m (1.5 - 1.8 kgf-m)
8. Perform air bleeding to the brake system. Refer to “Air Bleeding” (BR-8).

Disassembly • Assembly

DISASSEMBLY DIAGRAM







DISASSEMBLY

1. Remove the stopper cap from the master cylinder by inserting the minus (-) screwdriver to the stopper cap groove. The piston in the master cylinder may spring out during removal, so remove the cap carefully by pushing it.

2. Install the inner cutter attachment to the reservoir cap as shown in the illustration.

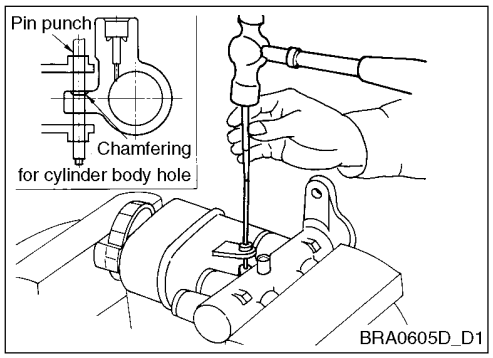
CAUTION:

- **Be careful of the attachment direction when installing it to the reservoir cap.**

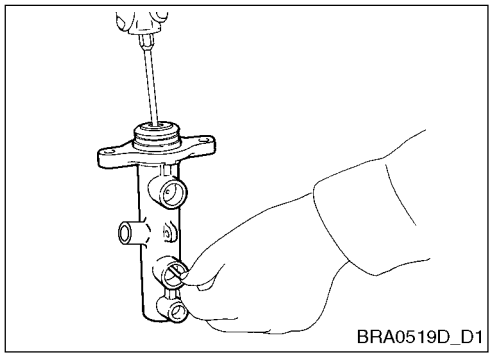
3. Secure the master cylinder assembly on the vise. Tighten the pins so that the reservoir tank and cylinder body mounting pins do not touch the reservoir tank pin insertion port.

CAUTION:

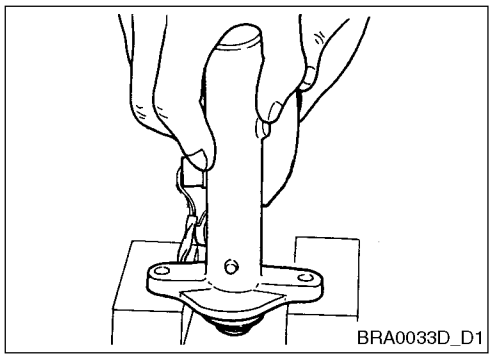
- **Secure to the vise so that the cylinder body pin insertion port surface faces upwards.**
- **Do not excessively tighten the master cylinder assembly with the vise. Or it may be damaged.**



4. Remove the reservoir tank mounting pin using a pin punch (commercial tool, 4 mm dia.).
5. Remove the master cylinder assembly.
6. Remove the reservoir tank from the cylinder body.



7. Push in the piston using a plus (+) screwdriver and remove the piston stopper from the cylinder body.
8. Remove the primary piston assembly carefully without damaging the cylinder inner wall.



9. Remove the secondary piston assembly carefully without damaging the cylinder inner wall by gently tapping the flange with wood or so.

INSPECTION AFTER DISASSEMBLY

Inspect the followings.

MASTER CYLINDER

- Inspect the cylinder inner wall for any damage, wear, rust and pin hole and replace it defective.

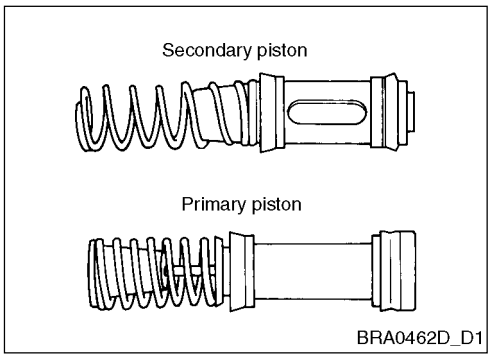
PISTON

- Inspect the piston cup for any deformation or damages and replace if defective.

ASSEMBLY

CAUTION:

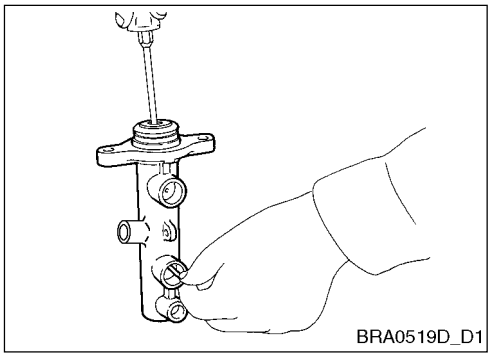
- **Never use any mineral oil such as gasoline or kerosene for cleaning.**
- **Check the cylinder inner walls, piston and cup seals for any foreign particles such as dust and be careful not to be damaged by tools during installation.**
- **Do not drop the components. If dropped, do not reuse the component.**



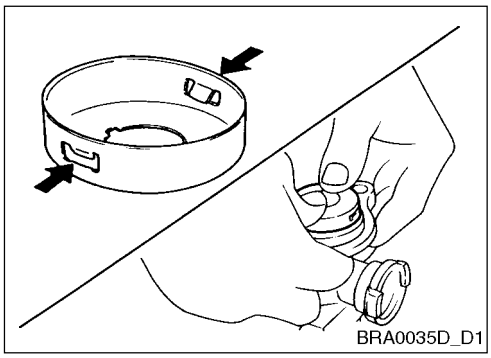
1. Apply the brake fluid “DOT3” or “DOT4” at the cylinder body inner surfaces and piston assembly contacting surfaces. Insert the secondary piston assembly into the cylinder body and then insert the primary piston assembly.

CAUTION:

- **The primary and secondary piston assembly cannot be reused. Do not reuse.**
- **Replace the inner parts as an assembly.**
- **Be careful of the piston cup installation direction and insert it carefully not to be caught by the cylinder inner walls.**



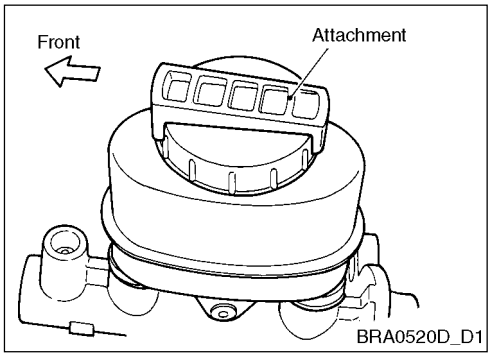
2. Visually check the secondary piston slot from tank boss hole on secondary side in cylinder boy and install the piston stopper.



3. Install the stopper cap. Press the piston with new stopper cap until it firmly seats on the cylinder grooves.

CAUTION:

- **The stopper cap cannot be reused. Do not reuse.**



4. Apply the brake fluid “DOT3” or “DOT4” on the grommet and install it by pushing into the master cylinder.

CAUTION:

- **The grommet cannot be reused. Do not reuse.**

5. Install the inner cutter attachment to the reservoir cap as in the removal.

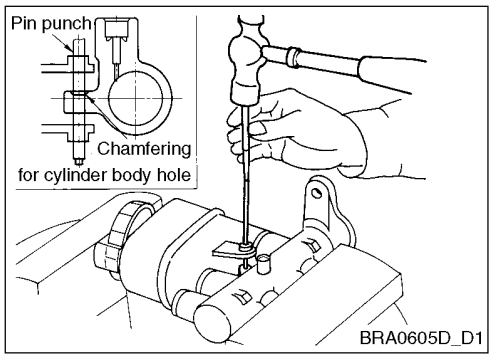
CAUTION:

- **Be careful of the attachment installation direction.**

6. Install the reservoir tank to the cylinder body so that the arrow direction faces front the vehicle and secure by tightening until all the pin inserts are matched.

CAUTION:

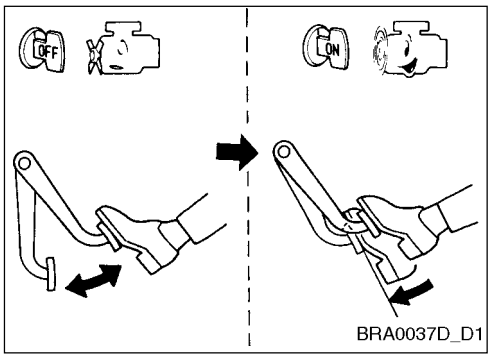
- **Secure to the vise so that the cylinder body pin insertion port surface faces upwards.**
- **Do not excessively tighten the master cylinder assembly with the vise. Or it may be damaged.**

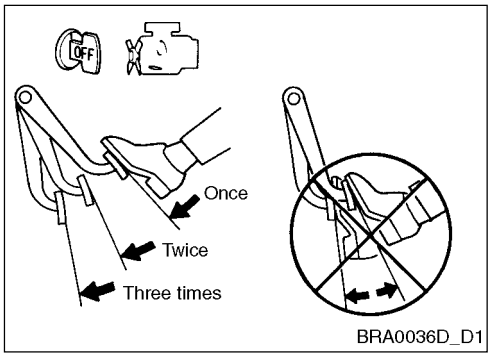


7. Install the reservoir tank mounting pins using a pin punch (commercial tool, 4 mm dia.).

CAUTION:

- **The reservoir tank mounting pin cannot be reused. Do not reuse.**
- **Insert the pin from installation surface on the cylinder body pin insertion hole.**





On-Vehicle Inspection and Service

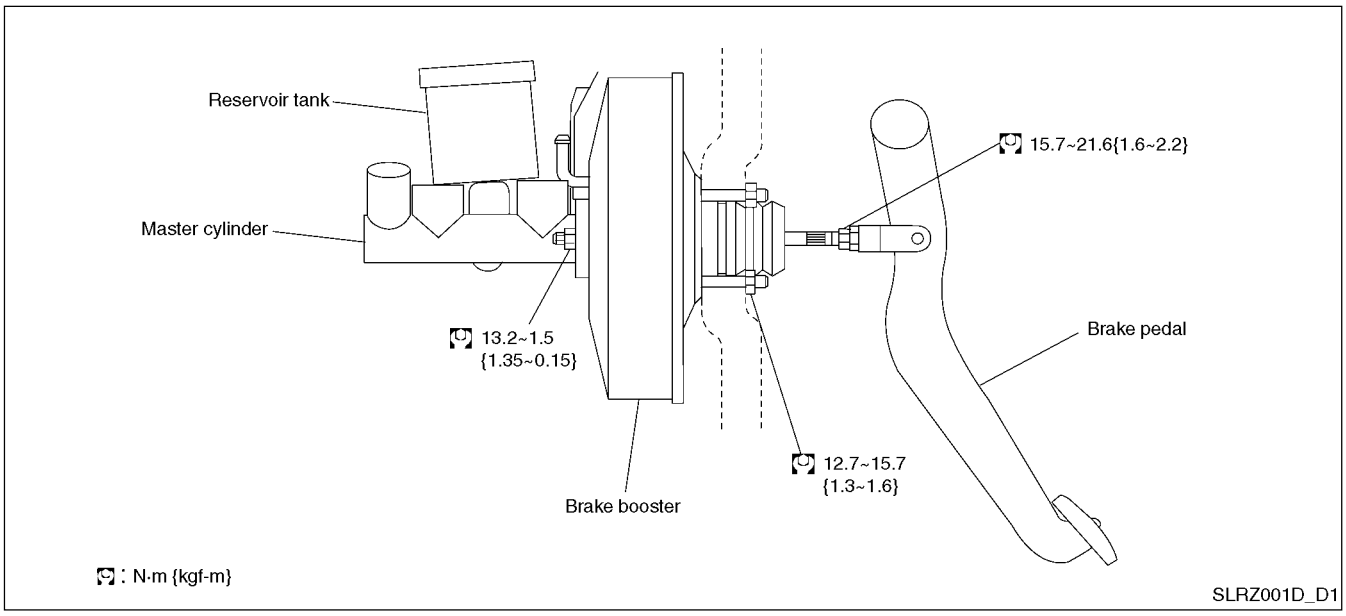
OPERATION INSPECTION

While engine stopped, depress the brake pedal several times in 5 seconds interval until the vacuum pressure becomes the atmospheric pressure conditions. Start the engine while brake pedal fully depressed and inspect if the brake pedal lowers when the vacuum pressure becomes standard value.

AIR INSPECTION

- Apply vacuum pressure to the booster by running the engine in idle for about 1 minute. Stop the engine and inspect if the pedal travel increases as depressing the brake pedal once, twice and tree times in 5 seconds interval.
- Depress the brake pedal while engine running. Then stop the engine while depressing the brake pedal. The pedal should not move at least 30 seconds.

Removal • Installation



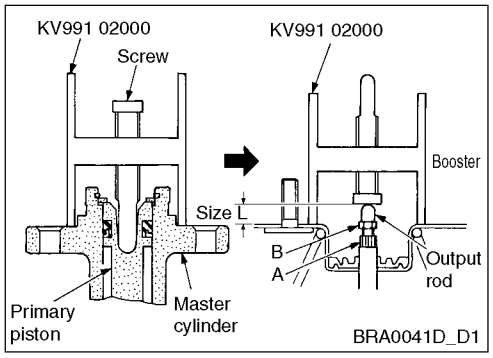
REMOVAL

CAUTION:

- **Be careful not to deform or bend the brake tube while removing the brake booster.**
- **Replace the clevis pin if defective.**
- **Be careful not to damage the brake booster stud bolt threads. If installed abnormally, the threads can be damaged in the dash panel.**
- **Be careful of the check valve directions.**

1. Remove the vacuum pipe from the brake booster.

2. Remove the master cylinder.
3. Remove the clevis pin and snap pin from the vehicle interior and remove the input rod from the brake pedal.
4. Remove the mounting nuts from the brake booster and brake pedal.
5. Remove the booster assembly from the engine room.



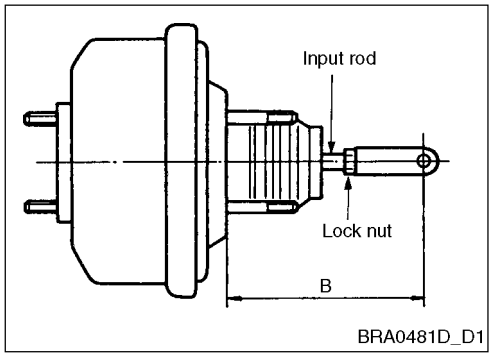
Inspection After Removal

OUTPUT ROD LENGTH INSPECTION

1. Apply -66.7 kPa (-500 mmHg) of vacuum pressure to the booster using a vacuum handy pump.
2. Install the output rod gage (special tool) to the master cylinder and rotate the screw until the gage end touches the primary piston.
3. Secure the A part so that the clearance between the output rod and screw becomes 0 by reversing the output rod gage (special tool). Then adjust from B part.

   Reference value when vacuum pressure is -500 mmHg:

   10.4 mm

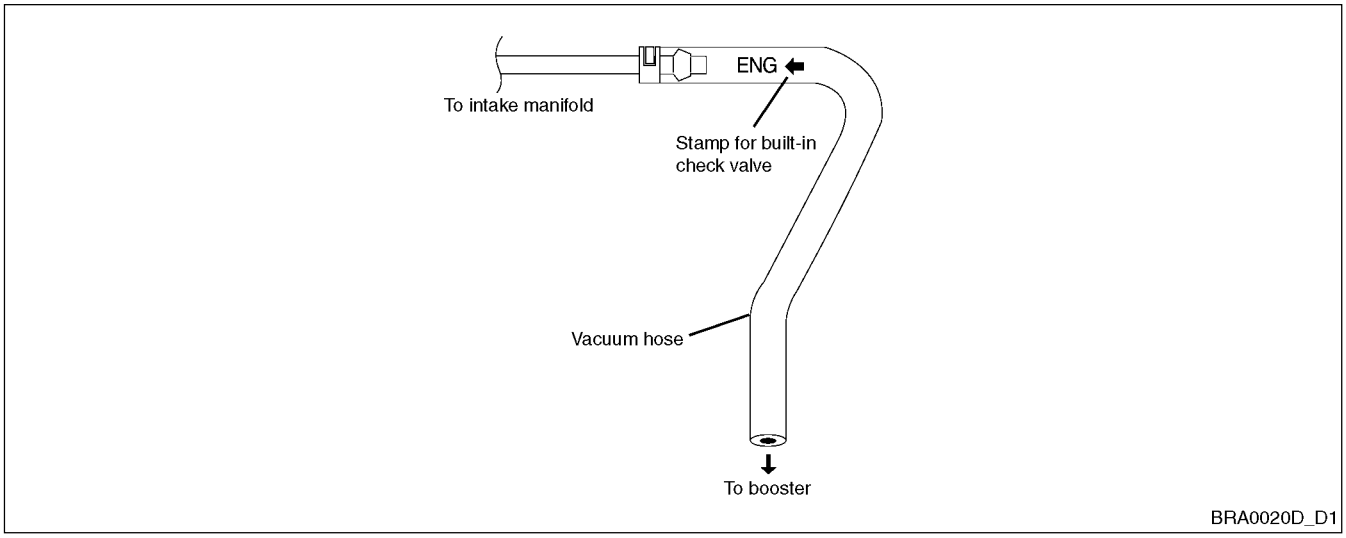


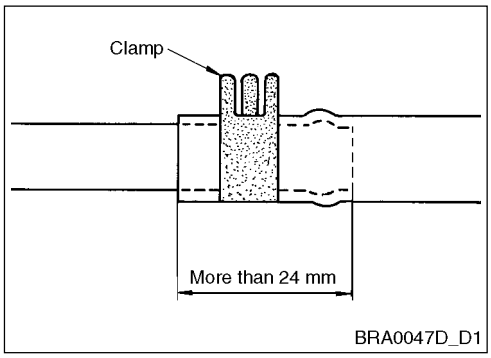
INSTALLATION

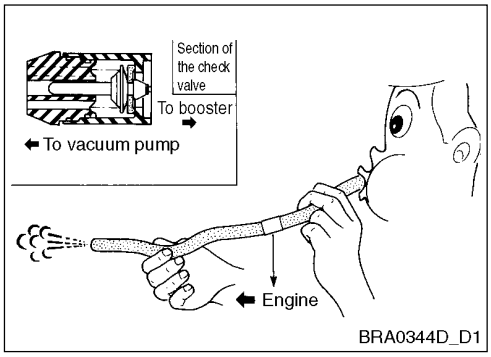
1. Adjust the input rod length by loosening the lock nut so that the value B in the illustration becomes the standard value.

   Standard value B: 127 mm
2. After adjusting the value B, insert the lock nut and install the booster assembly to the vehicle.
3. Connect the brake pedal and clevis on the input rod.
4. Install the pedal assembly mounting nut and tighten to the specified torque.
5. Install the master cylinder to the booster assembly.
6. Adjust the brake pedal height and free play.
7. Tighten the input rod lock nut to the specified torque.
8. Perform the air bleeding. Refer to “Air Bleeding” (BR-8).

Removal • Installation







CAUTION:

- **Perform installation following the installation direction of vacuum hose stamp or label because the check valve is built in the vacuum hose. If installed in the reverse direction, the booster will not operate properly. Be careful not to reverse the direction.**
- **Push the vacuum hose for more than 24 mm.**
- **Do not use any lubricants during installation.**

Inspection

EXTERIOR INSPECTION

Inspect for any wrong installation, damages or quality problems.

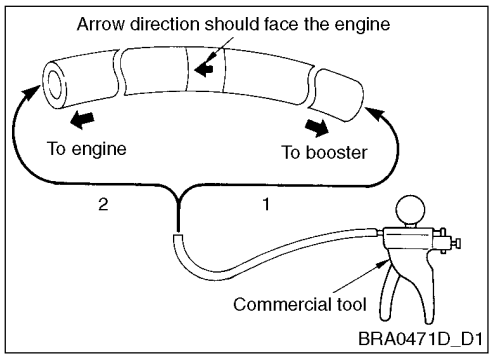
Check Valve Inspection

OPERATION INSPECTION

The check valve is built in the vacuum hose. Thus it is normal if air flows when blown from the booster side and if air does not flow when blown from the opposite side as in the illustration.

CAUTION:

- **If the vacuum hose is defective, replace it with the check valve.**



AIR INSPECTION

Inspect using a vacuum handy pump (commercial tool).

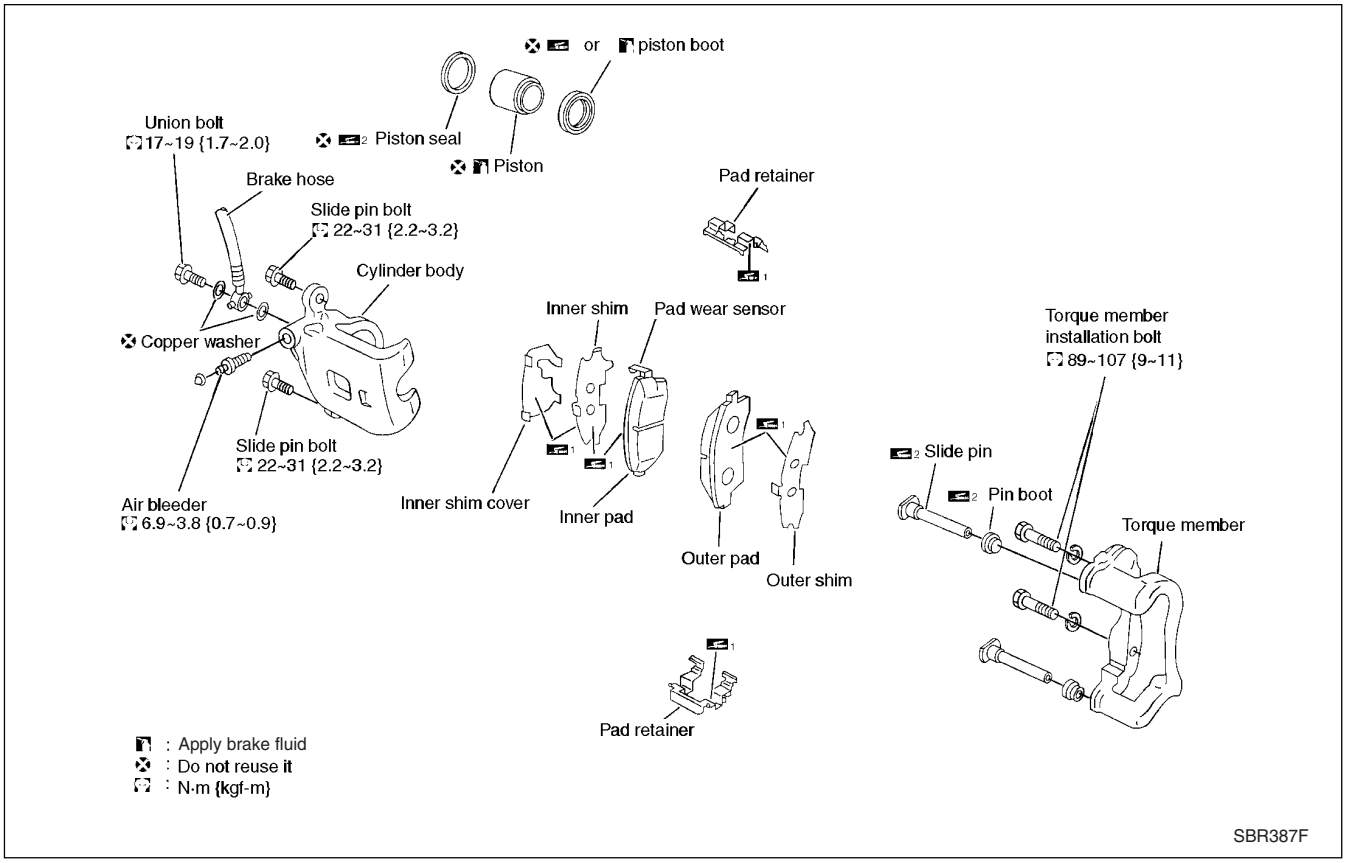
When connected to the booster (1)

The vacuum should leak less than 10mmHg during 15 seconds when -500 mmHg of vacuum is applied.

When connected to the engine (2)

No vacuum pressure.

Components Diagram

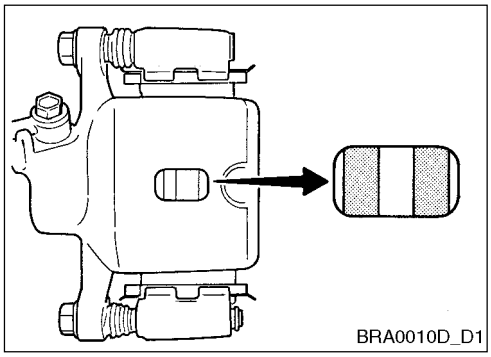


REFERENCE:

- **Remove all brake dust covered on the caliper and pads using a dust collector. Do not scatter the dust using an air blower.**

CAUTION:

- **The piston can suddenly spring out when the cylinder body is removed. So, do not depress the brake pedal.**
- **There is no need to remove the mounting bolts for the torque member and brake hose except for caliper assembly disassembly or replacement. Hang the cylinder body with wire to prevent the brake hose from stretching.**
- **Be careful not to damage the piston boot and stain the brake fluid to the rotor.**
- **Always replace the brake pad with the inner shim, outer shim and shim cover.**



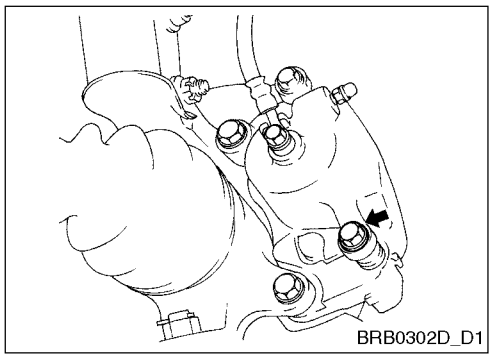
On-Vehicle Inspection and Service

PAD WEAR INSPECTION

Remove the wheels while vehicle is lifted up and inspect the pad thickness through the inspection hole on the cylinder body. Inspect using a scale if required.

Standard thickness: 11 mm

Wear limit: 2.0 mm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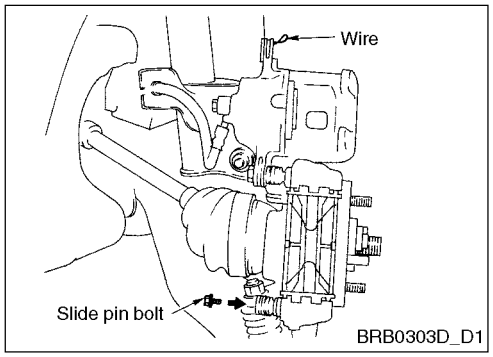

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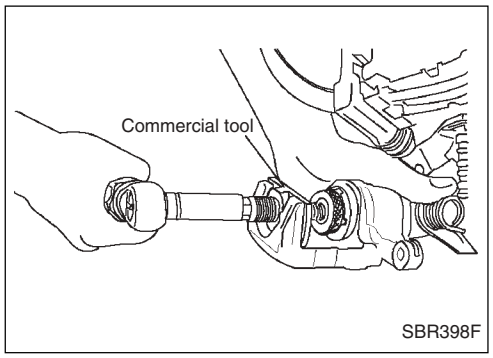


SBR398F

Removal • Installation of Brake Pad

REMOVAL

CAUTION:

- **Always replace the brake pad with the inner shim, outer shim and shim cover.**

1. Remove the cap from the master cylinder reservoir tank.
2. Remove the slide pin bolt (1 EA, underneath).
3. Hang the cylinder body with a wire and remove the pad, pad retainer and the shim.

INSTALLATION

1. Install the inner shim and shim cover to the inner pad and outer shim to the outer pad.
2. Push in the brake piston using the commercial tool, apply the PBC (Poly Butyl Cuprysil) grease or silicone-based grease on the pad section on the pad retainer and install the pad retainer and the pad to the torque member.
3. Install the cylinder body to the torque member.

CAUTION:

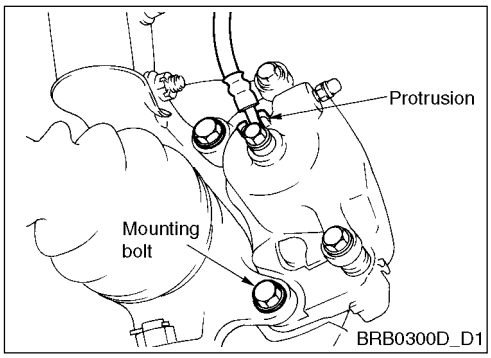
- **While replacing the pad, the brake fluid returns to the master cylinder reservoir tank as pushing the piston to install the pad. Thus be careful of the brake fluid level in the reservoir tank.**

4. Insert the slide pin bolt (1 EA, underneath) and tighten to the specified torque.
5. Inspect the brake operation (slip).

Removal • Installation of Caliper Assembly

REMOVAL

1. Connect the vinyl tube to the air bleeder.
2. Depress the brake pedal and drain out the brake fluid from the air bleeder slowly.



3. Remove the union bolt and torque member mounting bolts and remove the caliper assembly from the vehicle.
4. Remove the disc rotor.

INSTALLATION

CAUTION:

- **Use a brake fluid “DOT3” or “DOT4”.**
- **Do not reuse the drained brake fluid.**

1. Install the disc rotor.
2. Install the caliper assembly to the vehicle and tighten the mounting bolts to the specified torque.

CAUTION:

- **Remove all oil materials from the trailing arm washer contacting surface and caliper assembly contacting surfaces while installing the caliper assembly to the vehicle.**

3. Install the brake hose to the caliper assembly and tighten the union bolts to the specified torque.

CAUTION:

- **The union bolt copper washer cannot be reused. Do not reuse.**
- **Securely install the brake hose to the protrusion on the cylinder body.**

4. Perform the air bleeding. Refer to “Air Bleeding” (BR-8).

Disassembly • Assembly of Caliper Assembly

REMOVAL

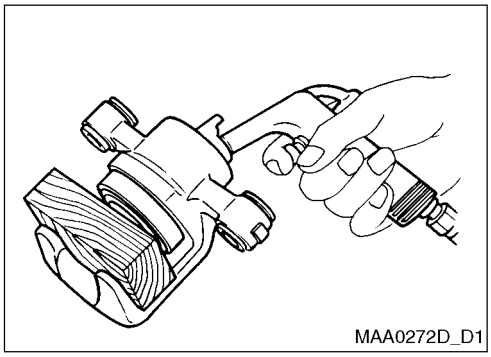
WARNING:

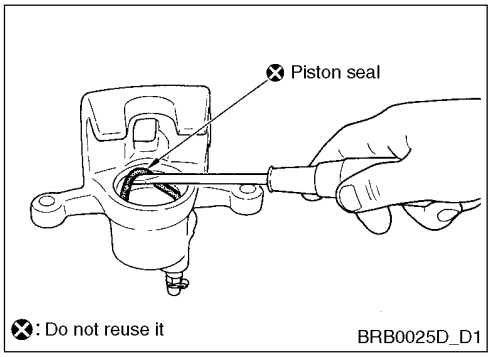
- **Be careful not to catch the finger in the piston.**

CAUTION:

- **Be careful not to scratch the cylinder inner wall.**

1. Insert a wood rod as in the illustration and remove the piston and piston boot by blowing air into the union nut mounting hole.
2. Remove the piston seal using a minus (-) screwdriver.





Caliper Inspection

CYLINDER BODY

CAUTION:

- **Use new brake fluid while cleaning and never use mineral oil such as gasoline and kerosene.**
- **Inspect the cylinder inner wall for rust, wear and damages and replace the cylinder body if defective.**
- **Remove the minute scratches by rust and foreign particles using fine sandpaper. Replace the cylinder body if needed.**

TORQUE MEMBER

Inspect for any wear, crack or damages and replace if defective.

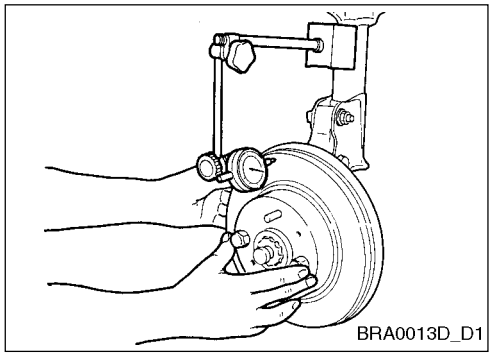
PISTON

CAUTION:

- **Do not use sandpaper for piston surfaces since it has painted.**
- **Inspect the piston surfaces for any rust, wear and damages and replace if defective.**

SLIDE PIN • PIN BOLT • PIN BOOT

Inspect the slide pin and slide pin boot for any wear, damages or cracks and replace if defective.



Run-Out Inspection

1. Fix the disc rotor on the wheel hub using wheel nut (At least 2 points).
2. Measure the run-out using a dial gage.

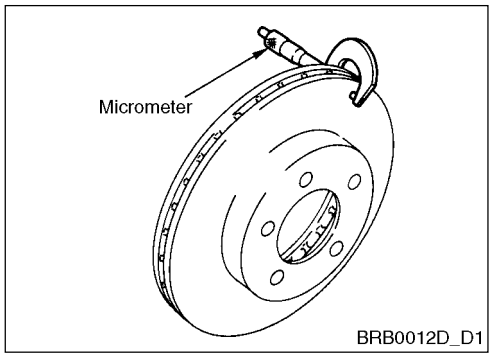
   Measuring point: Within 10 mm from the disc end

   Run-out limit: CL22VK: Less than 0.04 mm

CAUTION:

- **Check if the endplay of the axle is 0 mm before measurement.**

3. If the run-out value is out of the limit, reinstall the disc rotor and wheel hub by changing the locations and find a location with minimum vibration.



THICKNESS INSPECTION

Measure the disc rotor thickness using a micrometer and replace if out of the standard value.

Standard thickness: 22.0 mm

Wear limit: 20.0 mm

Uneven wear limit (When measured 8 points):

Less than 0.02 mm

FRONT DISC GRINDING

CAUTION:

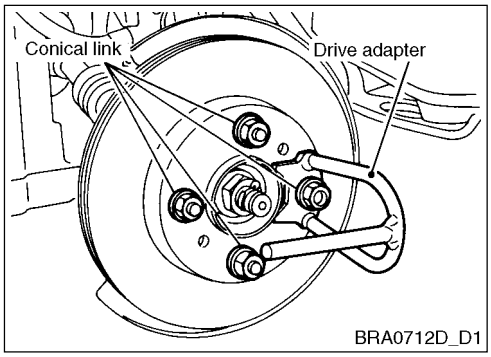
- **Inspect the disc rotor thickness before operation and check if it is over 0.3 mm than wear limit value.**
- **Wear respirator and safety goggles during grinding.**
- **Remove the grinding dust using a dust collector and do not scatter the dust with the air blower.**

- Be careful not to get caught by the rotating parts during operation.

1. Lift the vehicle while gear position at N range. Inspect the wheel bearing for any defect and remove the wheel.
2. Place the brake caliper assembly in location that does not interfere with the steering knuckle.

CAUTION:

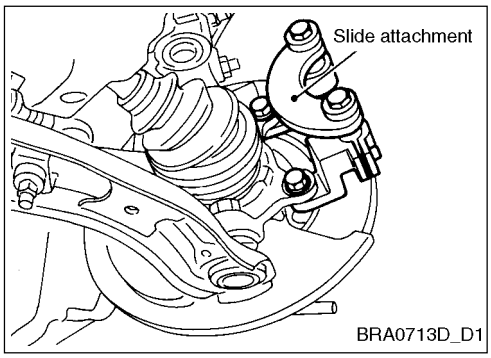
- **Do not depress the brake pedal while the brake caliper is removed.**



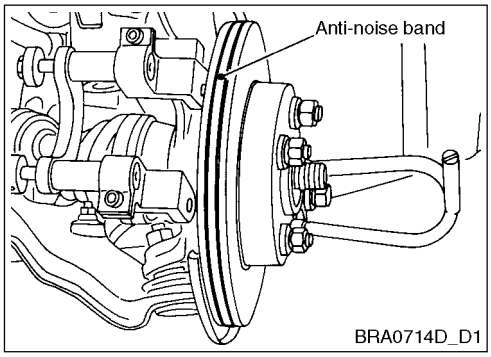
3. Install the drive adaptor (commercial tool) to the disc rotor and tighten using the conical link and wheel nut. Install all wheel nuts at this moment.

CAUTION:

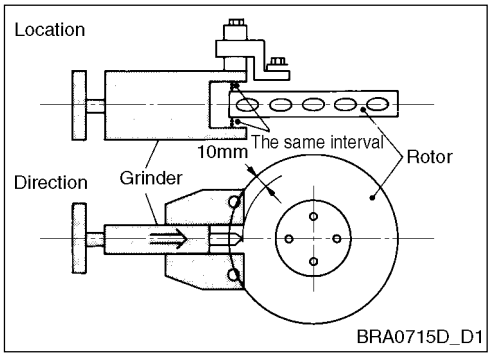
- **When installing the drive adaptor (commercial tool), align with the hub center axle.**



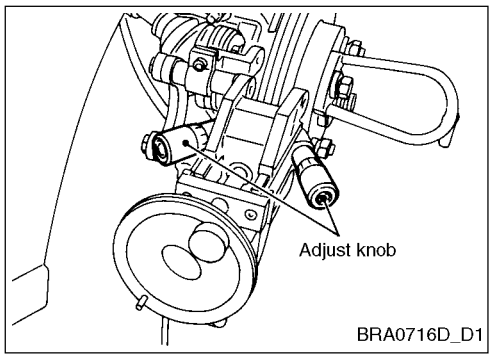
4. Install the slide attachment (commercial tool) to the brake caliper assembling section on the steering knuckle.

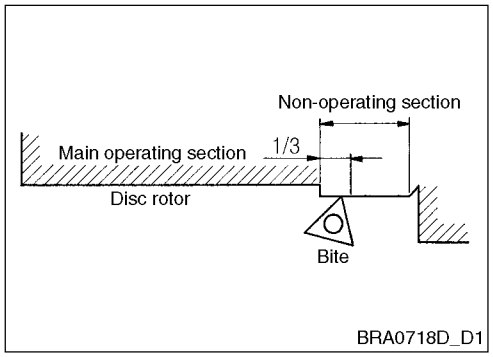


5. Install the rubber band (commercial tool) erases noise at the disc rotor bench.



6. Install the grinder to the disc rotor by cautioning as below.
   - Insert the grinder so that its center matches with the center of the disc rotor.
   - Adjust the operation direction with the disc rotor's rotational axis.





7. Place the grinder within 10 mm from the end of the disc rotor by rotating the adjust knob on the grinder. Perform operation by rotating the disc rotor with the hand.

REFERENCE:

- **When the bite contacts the disc rotor, it generates slight grinding noise.**

8. Move the bite to the grinding start position (1/3 of non-operating section).
9. Install the drive unit (commercial tool) to the drive adaptor (commercial tool).

CAUTION:

- **Adjust (stable rotation) the disc rotor's height and direction so that its axis becomes the same as the rotational axis and motor rotational axis.**

10. By rotating drive unit, grind towards outer direction from where cut 0.05 mm forwards and backwards (1/2 dial movement) by grinder.

CAUTION:

- **Do not cut automatically facing the center from the outer side.**

11. After finishing the front face, grind again facing the outer side by putting the grinder's dial at 0.02 mm (about 1/4 movement).
12. For the last, scrub with No. 500 sandpaper (contact the flat surface) gently for 10 seconds.
13. Check if the run-out is within the limit value when measured within 10 mm from the end of the disc rotor using the dial gage.
14. Remove the disc rotor and remove the grinding dust at the sensor rotor and wheel speed sensor using a dust collector.

CAUTION:

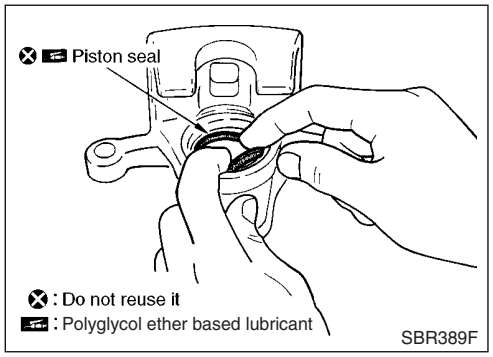
- **Put a alignment mark on the disc rotor and wheel hub when removing the disc rotor.**
- **Do not scatter the dust using the air blower.**
- **The wheel speed sensor has more dust since it is magnetized. So, remove the dust thoroughly.**

15. Remove the anti-noise rubber band from the disc rotor.
16. Install the disc rotor, brake caliper and the wheel.

CAUTION:

- **When installing the disc rotor, align it to alignment mark.**

ASSEMBLY



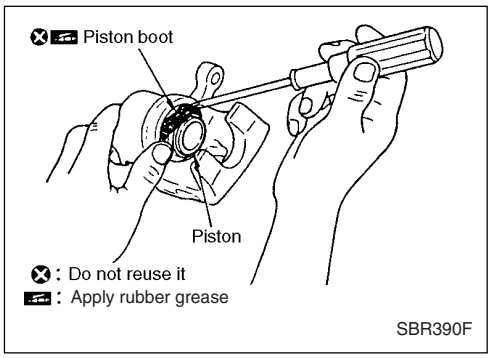
CAUTION:

- **Do not use rubber grease during installation.**

1. Apply the polyglycol ether based lubricant on the piston seal and install it to the cylinder body.

CAUTION:

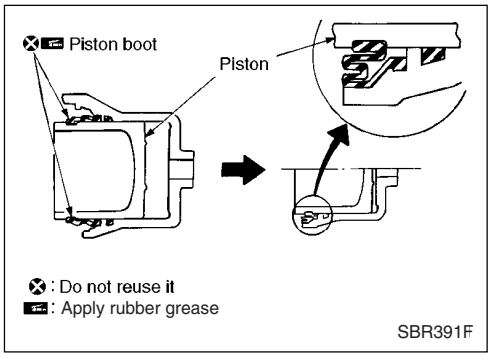
- **The piston seal cannot be reused. Do not reuse.**



2. Apply the rubber grease on the piston boot and install it to the end of the piston and then install the cylinder side surface of the piston boot to the groove in the cylinder body.

CAUTION:

- **The piston boot cannot be reused. Do not reuse.**

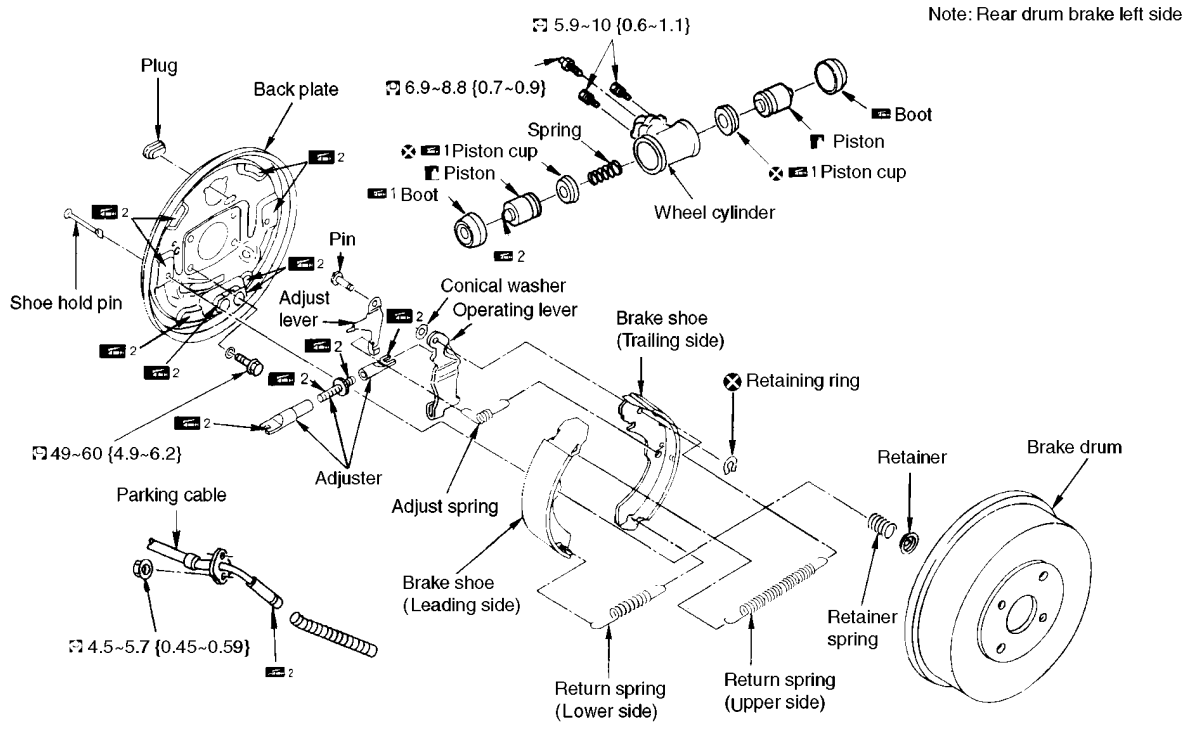


3. Apply the brake fluid “DOT3” or “DOT4” to the piston. Securely install the piston surface on the piston boot to the piston groove by pressing the cylinder body with hand.

CAUTION:

- **During piston installation, uniformly install the piston by changing the pressing locations to not scratch the cylinder inner wall.**

Components Diagram



CAUTION:

- **Remove the dust in the drum and back plate with the dust collector. Do not scatter the dust with air blower.**

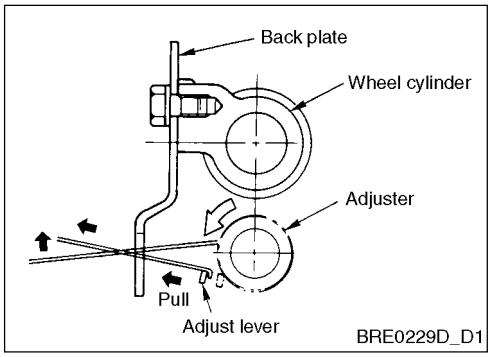
CAUTION:

- **Check if the parking brake lever has released fully.**

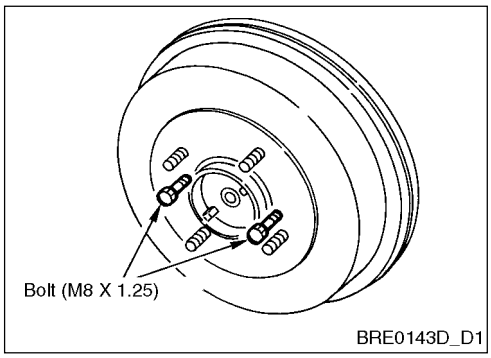
Removal • Installation of Drum Brake Assembly

REMOVAL

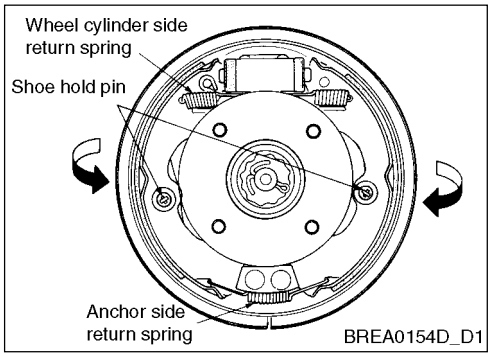
1. Remove the wheel and remove the brake drum after releasing the parking brake lever. Remove as follows when the brake drum does not come out.



   a. Remove the plug. Contract the extended shoe by rotating the adjust assembly wheel toward contraction direction with a screwdriver from adjuster hole (the plug hole beside the wheel cylinder) in the back plate as shown in the illustration.



   b. When the brake drum and wheel hub are stuck to each other, insert 2 bolts (8 mm) in the hole on the drum and tighten them to remove the drum as in the illustration.

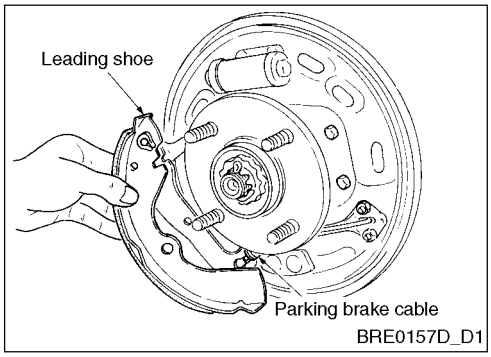


2. Remove the shoe hold pin by pushing and rotating the retainer and remove in the order of leading shoe and trailing shoe. Rotate the shoe in the arrow direction and remove the spring.

CAUTION:

- **Do not damage the wheel cylinder piston boot.**

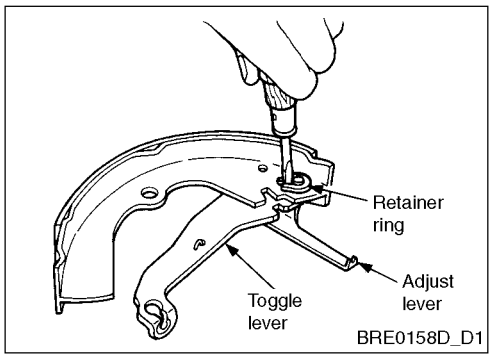
3. Remove the adjuster.



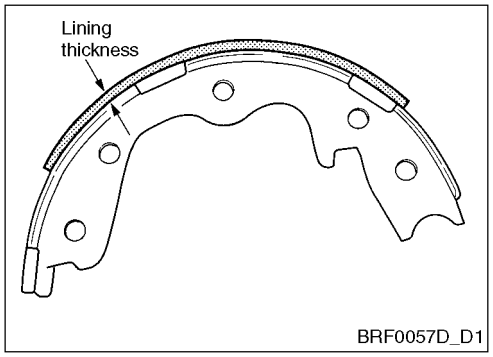
4. Remove the parking brake cable from the toggle lever.

CAUTION:

- **Be careful not to bend the parking cable.**



5. Remove the retaining ring using proper tool. Disconnect the toggle lever from the brake shoe.



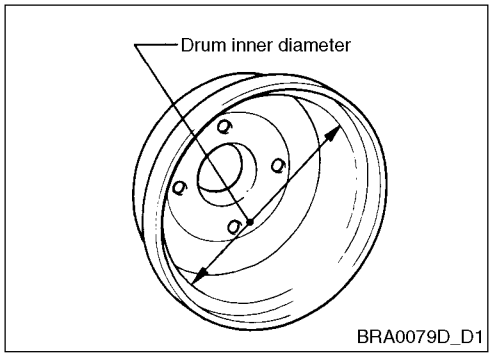
Inspection After Removal

LINING THICKNESS INSPECTION

Inspect the lining thickness with a scale.

Standard value: 4.5 mm

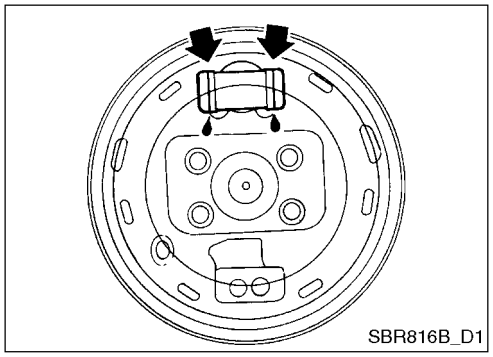
Limit value: 1.5 mm



DRUM INNER DIAMETER INSPECTION

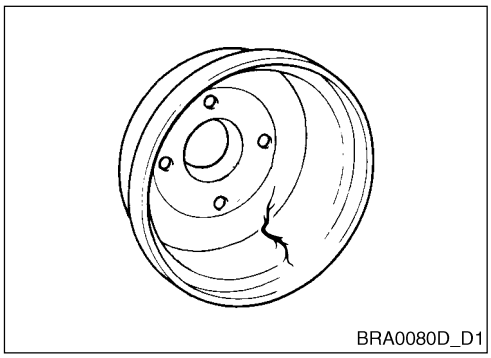
Inspect the drum inner diameter with a vernier caliper.

Standard inner diameter	LT20B	ϕ 203.0 mm
Inner diameter limit	LT20B	ϕ 204.5 mm



WHEEL CYLINDER FLUID LEAKAGE INSPECTION

- Inspect the fluid leakage from the wheel cylinder.
- Inspect for any wear, damage or looseness. Replace if defective.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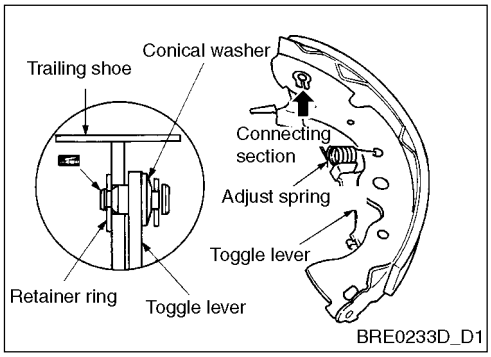
OTHER INSPECTIONS

- Visually inspect the drum for any abnormal wear, cracks or damages.
- Visually inspect the lining for any abnormal wear, damages or come off.
- Are there any defective wear or damage in shoe's main moving part?
- Is the return spring extended too much?
- Is the adjuster operating smoothly?
- Visually inspect the back plate for any damages, cracks or deformations.
- Inspect the back plate if there is any looseness in mounting bolts using a wrench.



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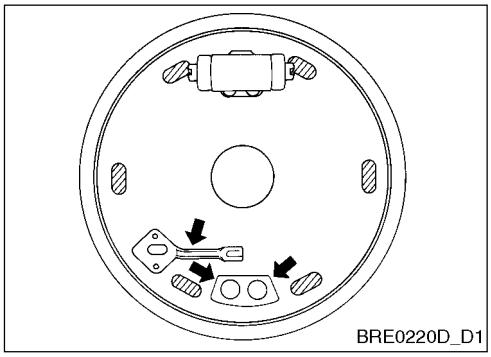

BRE0220D_D1

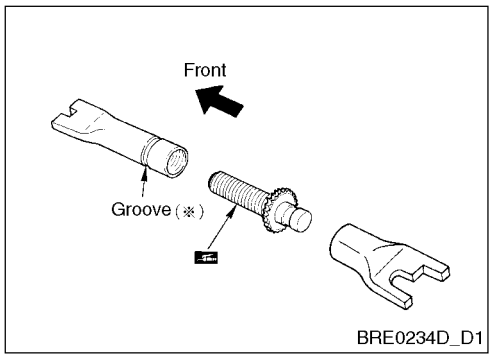
INSTALLATION

1. When the toggle lever is removed, install as in the below order.
   a. Apply the PBC (Poly Butyl Cuprysil) grease or silicone- based grease on the toggle lever's main operating part and install the toggle lever and conical washer to the brake shoe.
   b. Install the retaining ring to the toggle lever and adjust until the mating sections come in proper contact.

CAUTION:

- **The retaining ring cannot be reused. Do not reuse.**

2. Apply the PBC (Poly Butyl Cuprysil) grease or silicone-based grease on the back plate, main moving part of the shoe and the arrowed locations.



3. When the adjuster is disassembled, apply the PBC (Poly Butyl Cuprysil) grease or silicone-based grease on threads and install after checking the differences between the left and right wheels.

LT20B

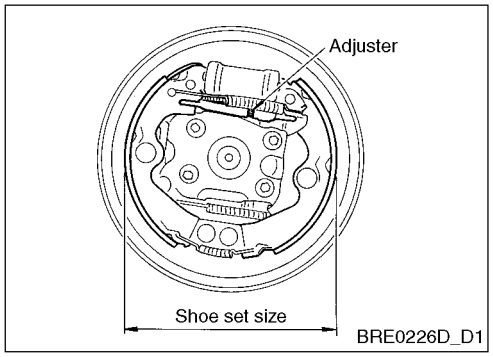
Right rear wheel	Groove (Illustration ※)	No
	Thread direction	Right handed screw
Left rear wheel	Groove (Illustration ※)	Yes
	Thread direction	Left handed screw

4. Connect the parking brake cable to the toggle lever.
5. After installing the removed parts, check if they are installed as specified.

CAUTION:

- **Be careful not to damage the wheel cylinder piston boot.**
- **Be careful of the adjuster assembly directions.**

6. Measure the inner diameter of the drum and adjust the adjuster wider so that the central outer diameter of the shoe is smaller than the inner diameter of the drum by 0.35 - 0.55 mm (LT20B).
7. Install the brake drum.
8. Perform air bleeding when installing a new wheel cylinder or overhauling the wheel cylinder. Refer to “Air Bleeding” (BR-8).
9. Adjust the parking brake. Refer to “Adjustment” (BR-36).



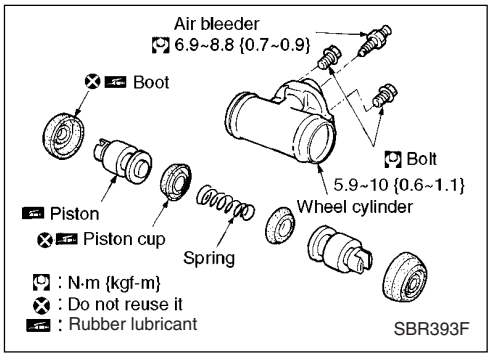
Removal • Installation of Wheel Cylinder

REMOVAL

1. Remove the rear brake shoes.
2. Remove the brake tube from the wheel cylinder.
3. Remove the wheel cylinder mounting bolts and remove it from the back plate.

INSTALLATION

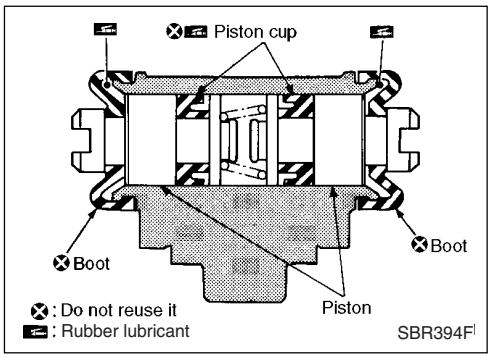
Install in the reverse order of removal and tighten to the specified torque.



Disassembly • Assembly of Wheel Cylinder

DISASSEMBLY

1. Remove the left and right dust boot from the wheel cylinder and remove the piston from the cylinder.
2. Remove the piston cup from the piston.



ASSEMBLY

CAUTION:

- **Do not use any rubber grease during assembly.**

1. Apply the brake fluid on the main moving part of the piston in the wheel cylinder.
2. Apply the rubber lubricant on the cup and the boot and then install as illustrated.

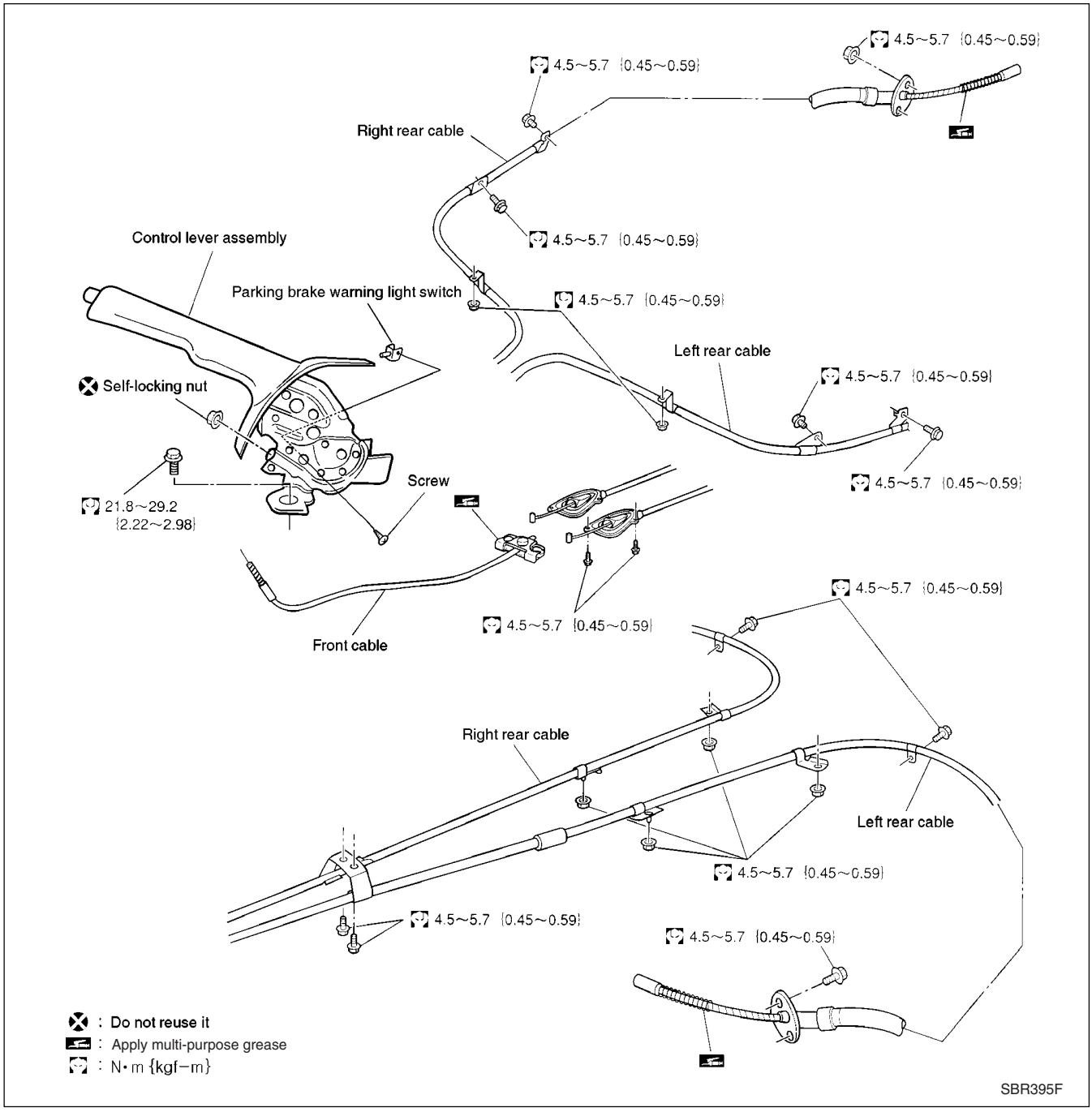
Wheel Cylinder Inspection

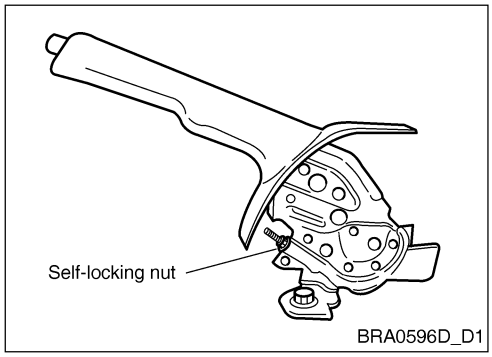
Check the piston, piston cup and cylinder inside wall for any wear, rust or damages. Replace if defective.

CAUTION:

- **Be careful not to damage the cylinder during piston insertion.**

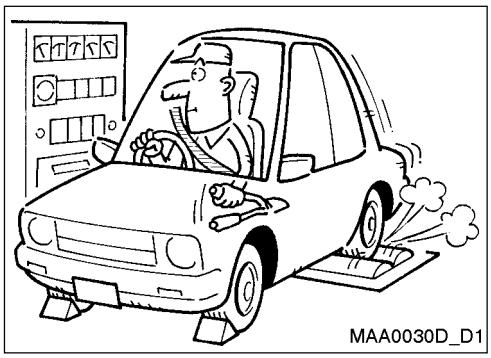
Components Diagram





Removal • Installation

1. Remove the center console.
2. Disconnect the warning light switch connector.
3. Remove the cable mounting bolts. Remove the self lock nut after loosening the cable.
4. Remove the brake shoes if equipped with drum brake and remove the cable from the toggle lever.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Inspection

- When pulled the lever with the force of 20 kg, check if the number of notches (check by the latchet engaging sound) is as per specified.

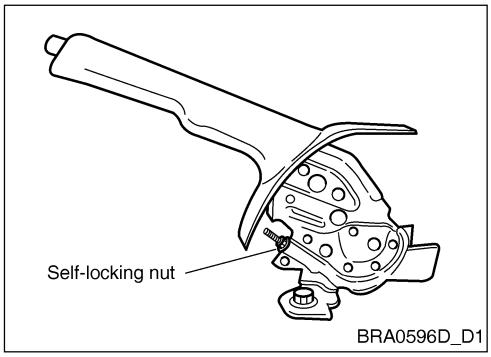
  When pulled: 8 to 9 notches

- Inspect if the rear wheel braking force is within the specified value using a brake tester.

  Braking force: More than 20% of vehicle weight

  Parking lever effort: Less than 40 kg

- Inspect the parking lever assembly for any bents, damages and cracks and replace if defective.
- Inspect the cable and equalizer for any wears and damages and replace if defective.
- Inspect the parking brake warning light switch and replace if defective.
- Inspect all components and check for any deformations and damages by interference with other components and replace if defective.



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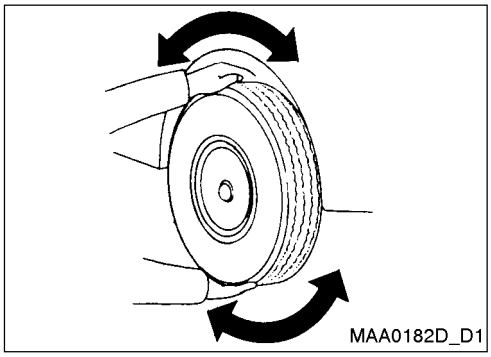
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Adjustment

IF EQUIPPED WITH REAR DRUM BRAKE

1. Loosen the cable sufficiently by rotating the self lock nut using a deep socket wrench and adjust the clearance of the rear shoes by restoring the lever.
2. Repeat the parking lever manipulation until the adjuster sound (“click” sound) disappears.
3. Check for any pulling by rotating the rear wheel.
4. Adjust the cable as below after adjusting rear shoe clearance and without pulling in rear brake.
   a. Pull the lever so that the deep socket can enter.
   b. Insert the deep socket wrench into the open section in the lever and adjust the lever pulling by rotating the self lock nut.

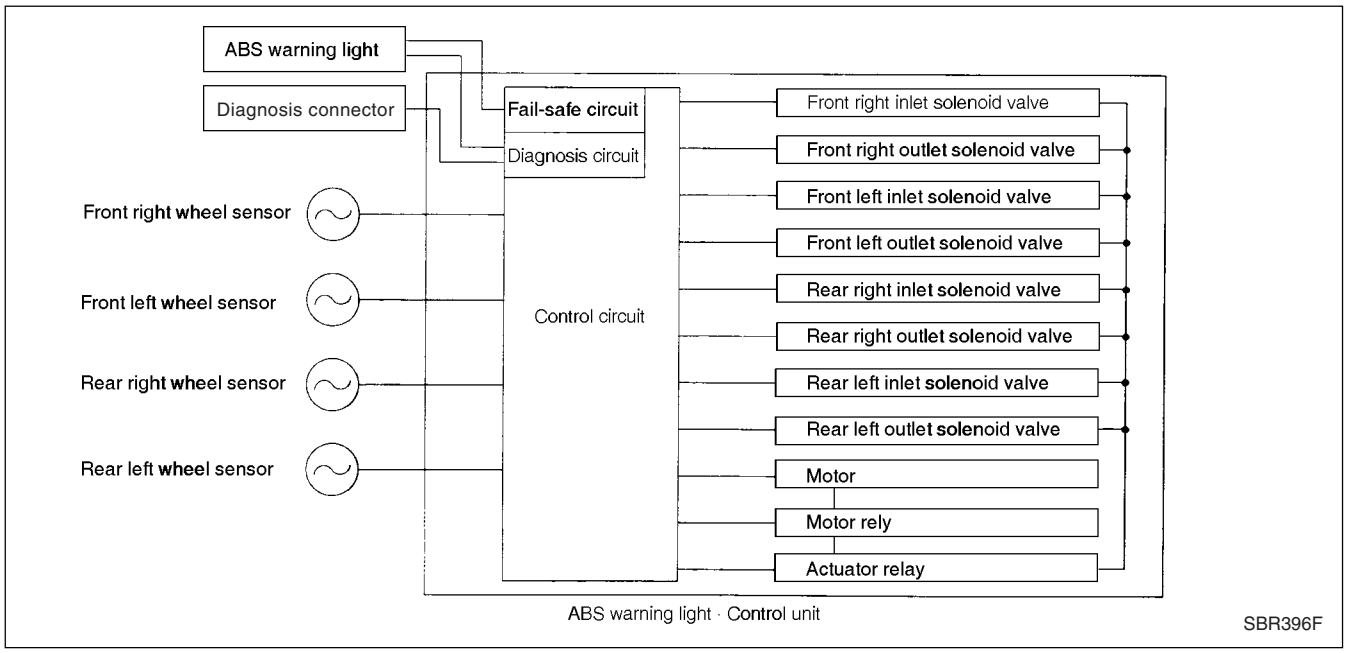
CAUTION:

- **The self lock nut cannot be reused. Do no reuse it after removal.**

   c. Inspect the notch numbers after pulling the lever 3 to 4 times with 20 kg of force.
   d. Check for any rear brake pulling when the lever is fully released.

General

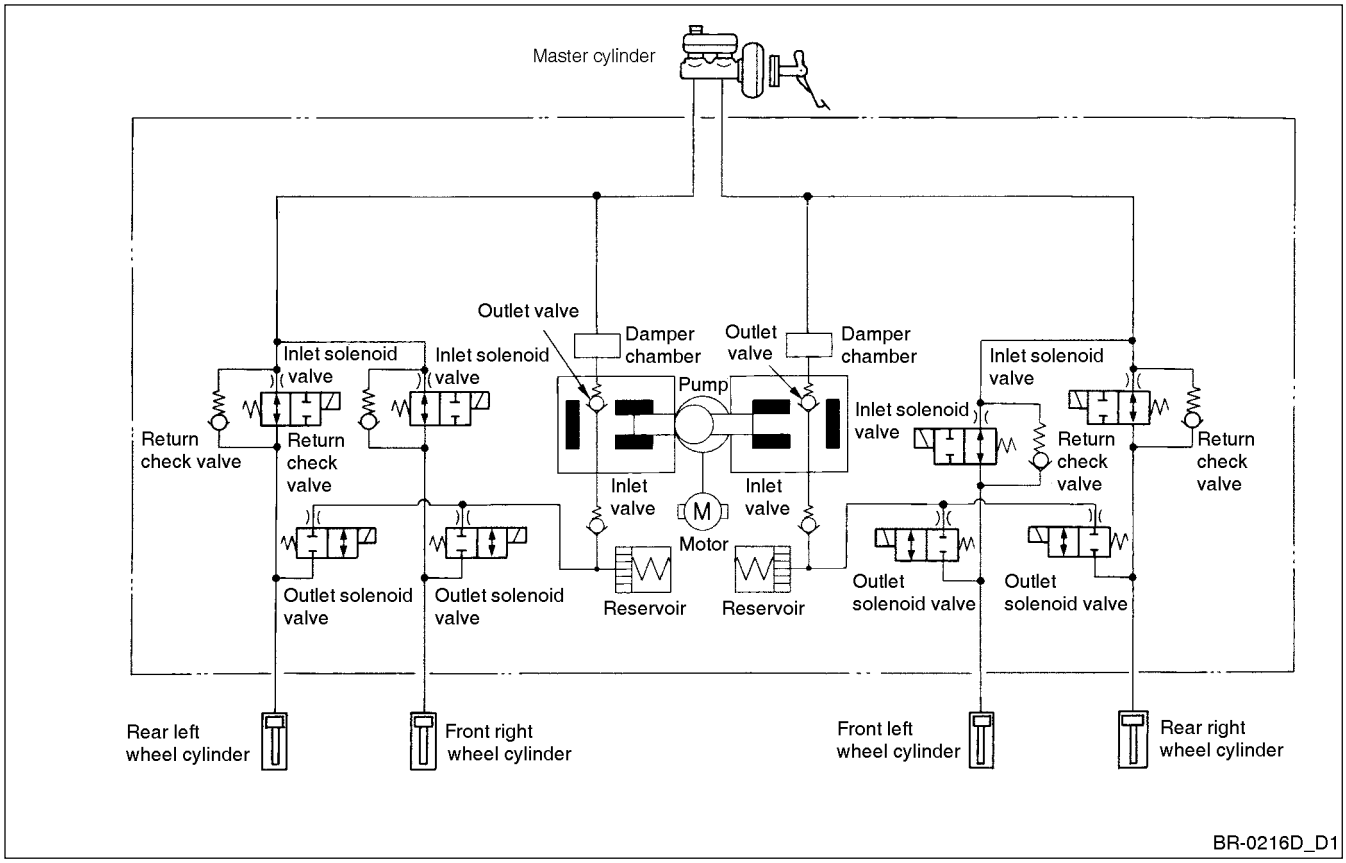
SYSTEM DIAGRAM



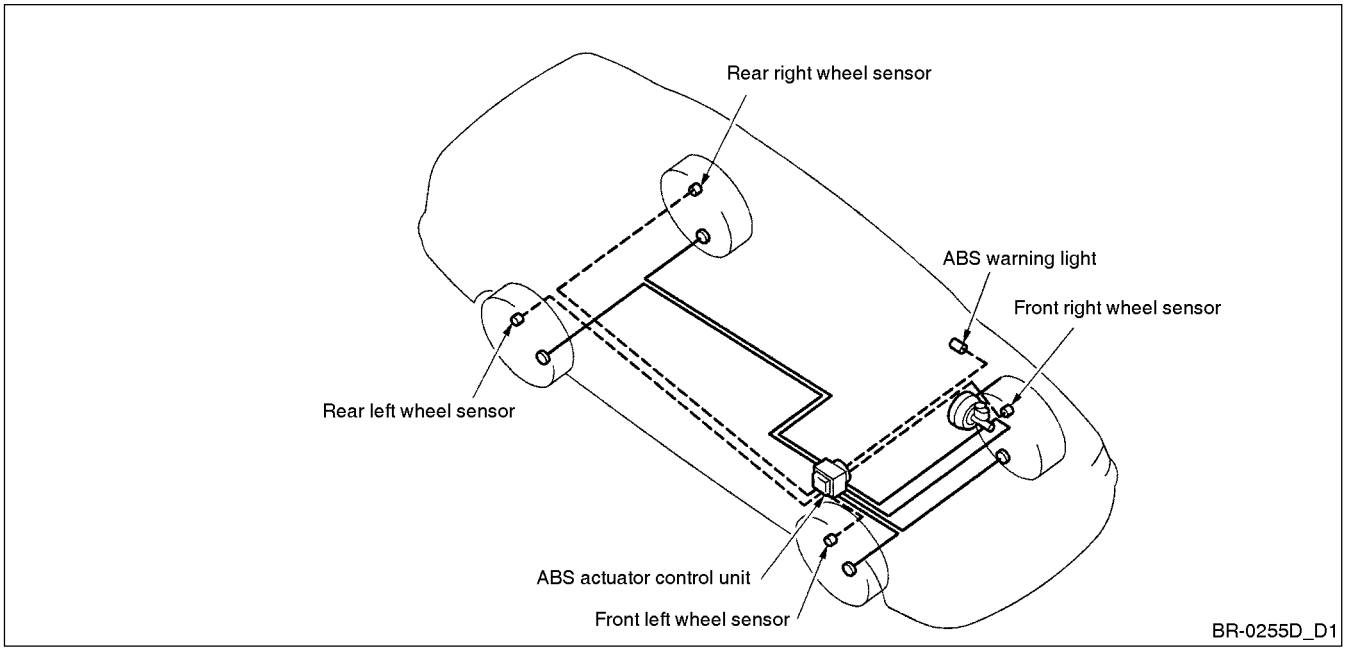
Fail-Safe

When trouble occurs in the ABS system, the “ABS Warning Light” turns on in the meter and the ABS control is suspended simultaneously. So the brake system works as a non-ABS vehicle.

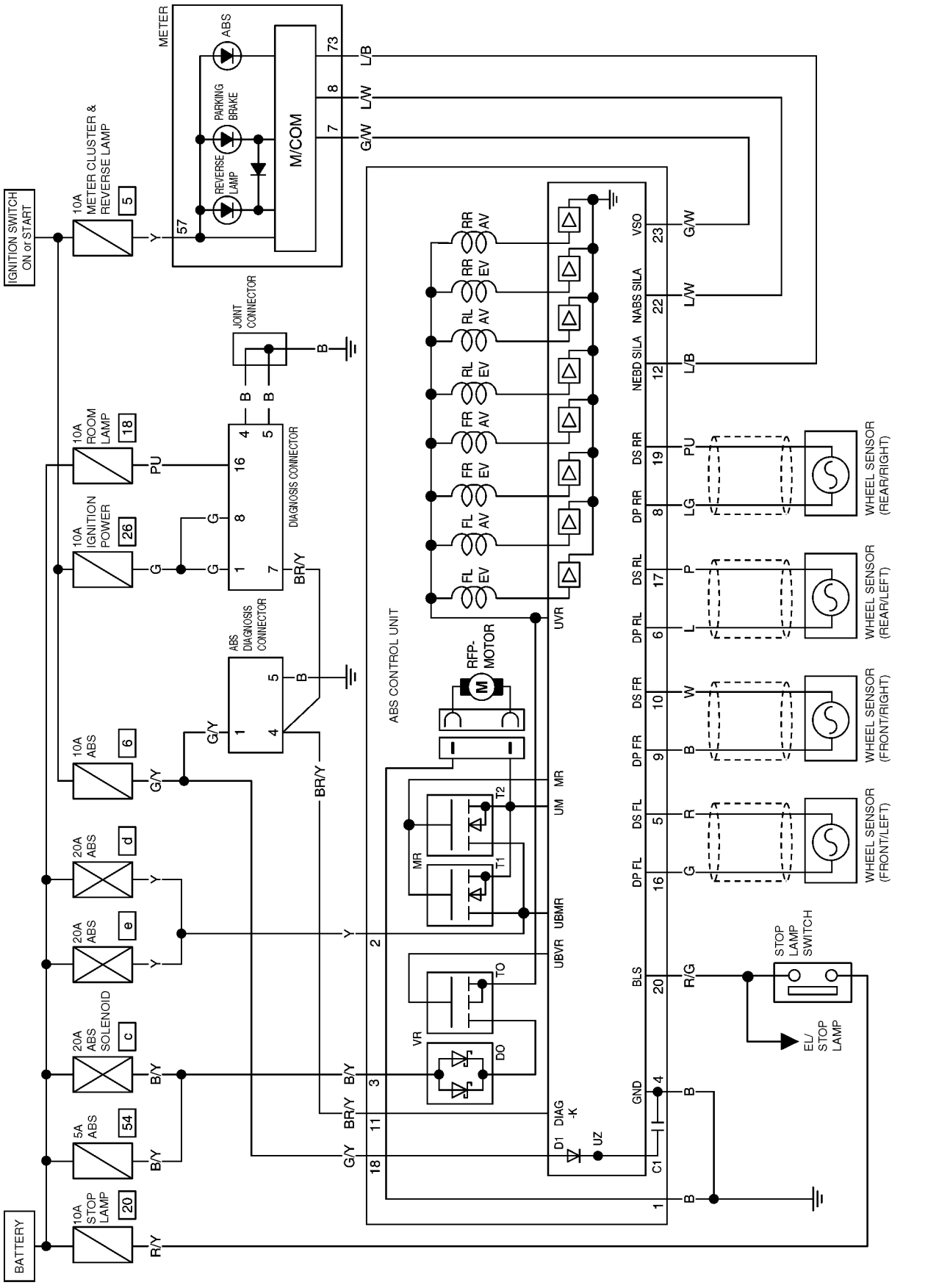
Hydraulic Circuit Diagram



System Components



Circuit Diagram



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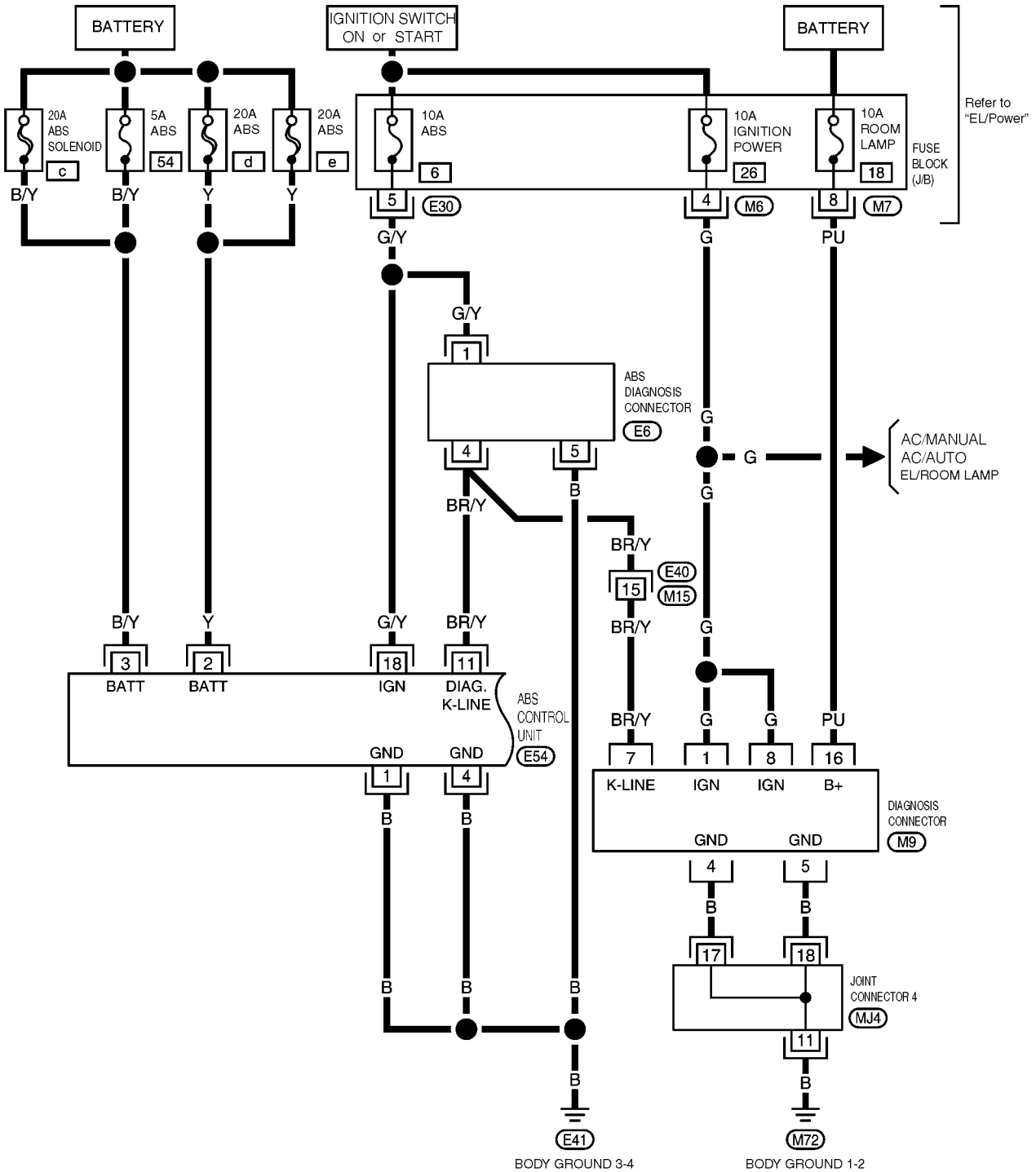
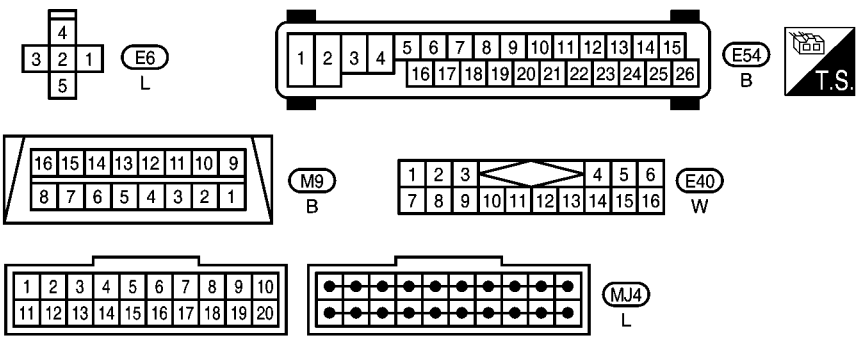
Wiring Diagram

BR/ABS-01

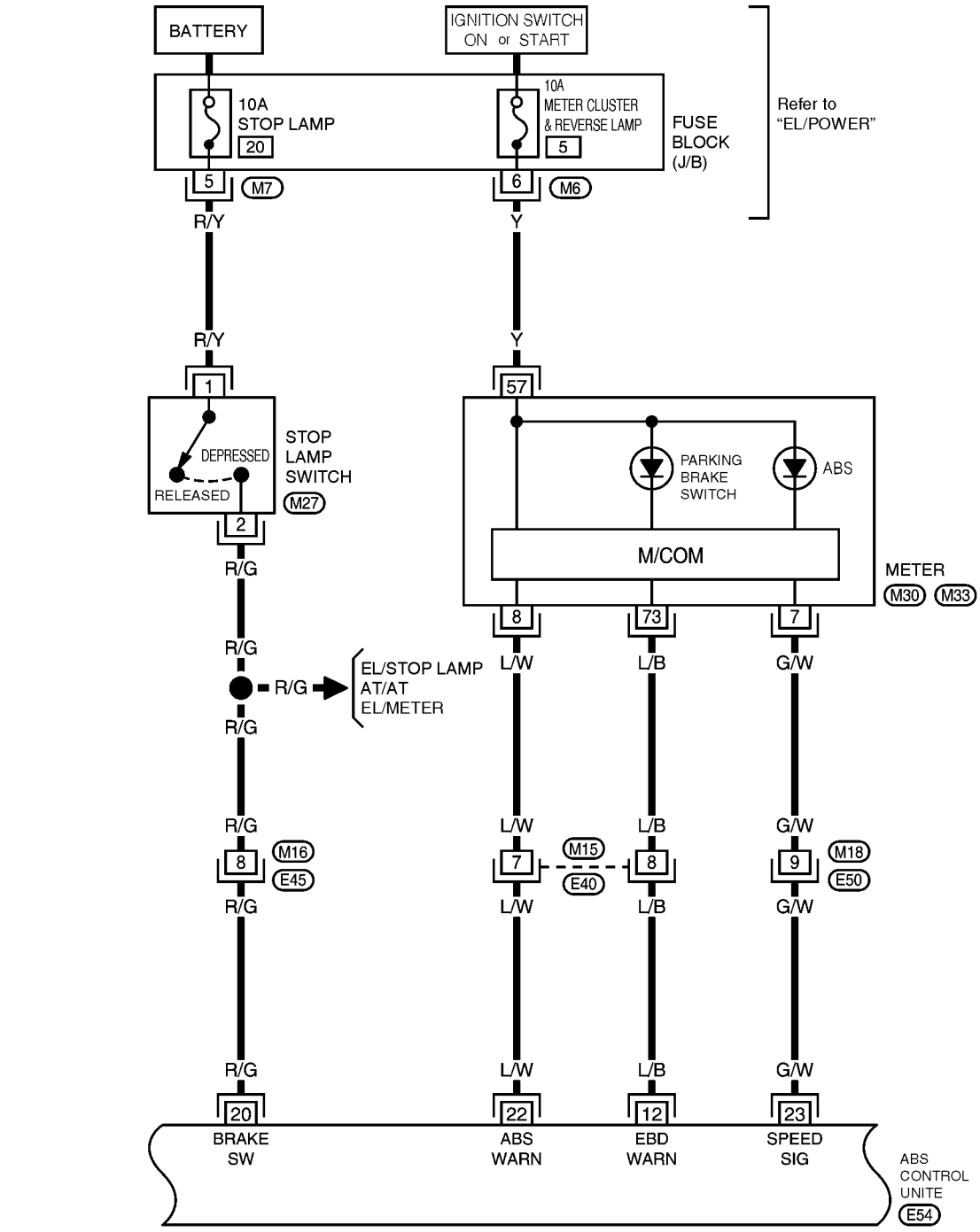


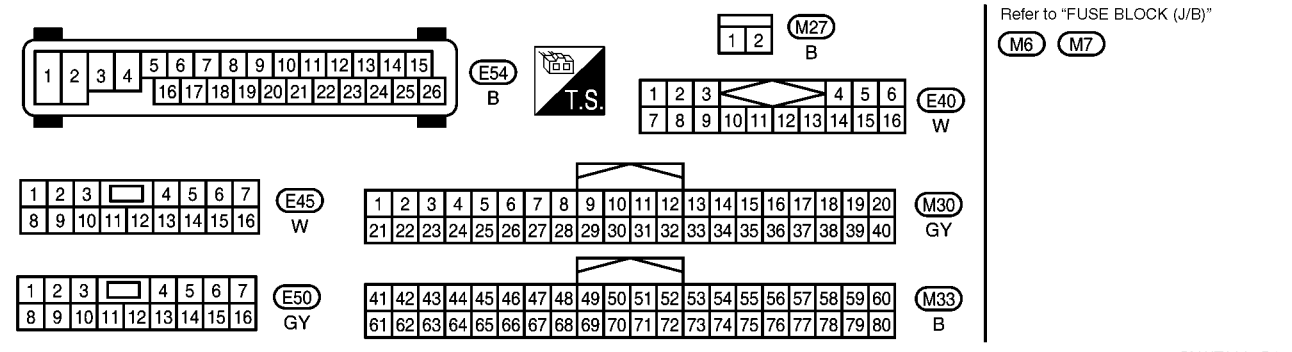


Refer to "FUSE BLOCK (J/B)"
M6 M7
E30

SLWZ001_O1

Wiring Diagram





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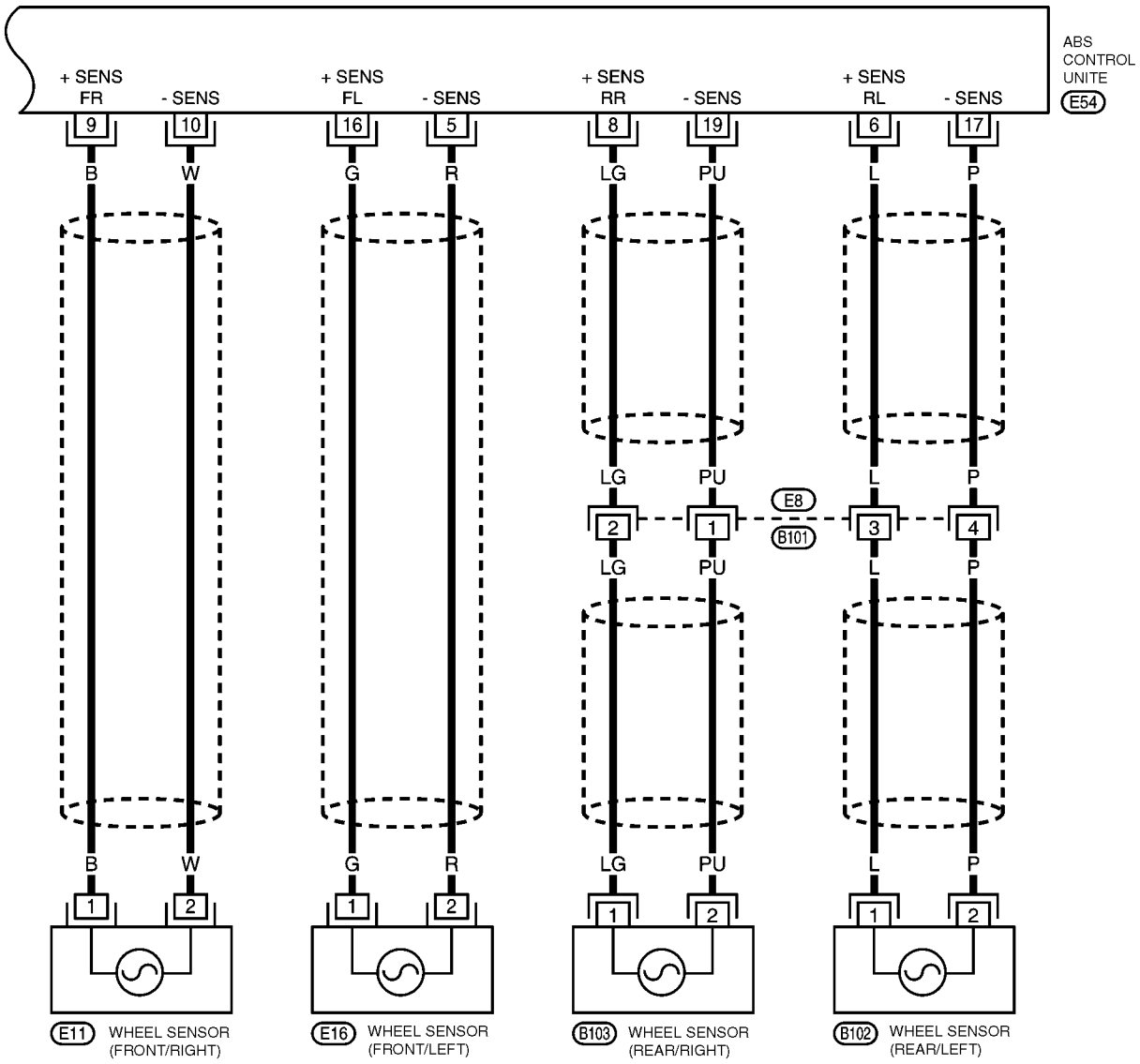
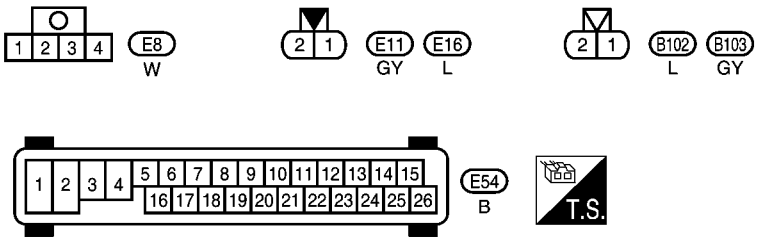
Wiring Diagram

BR/ABS-03





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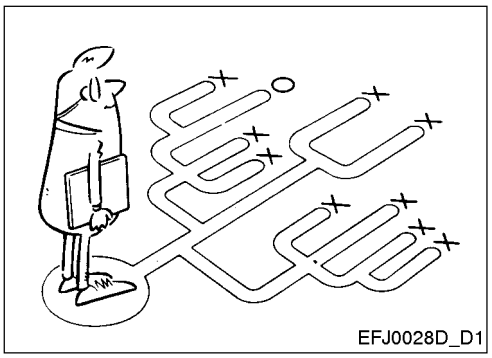
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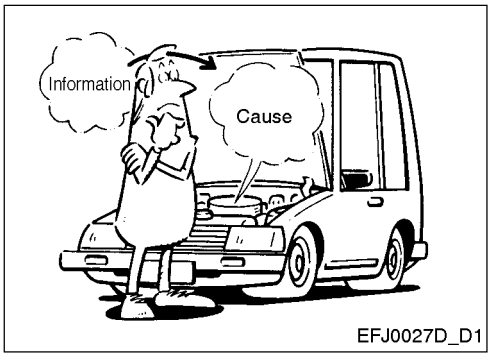

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How to Diagnose

BASIC DIAGNOSIS

- The most important thing for trouble diagnosis is to understand the vehicle's system (control system and mechanical systems) thoroughly.
- Verify the customer's complaints before performing any inspection. In order to do this, you need to duplicate or simulate the symptom and fully understand the symptom. Isolate the possible causes and sometimes checking by riding with the customer may be necessary.

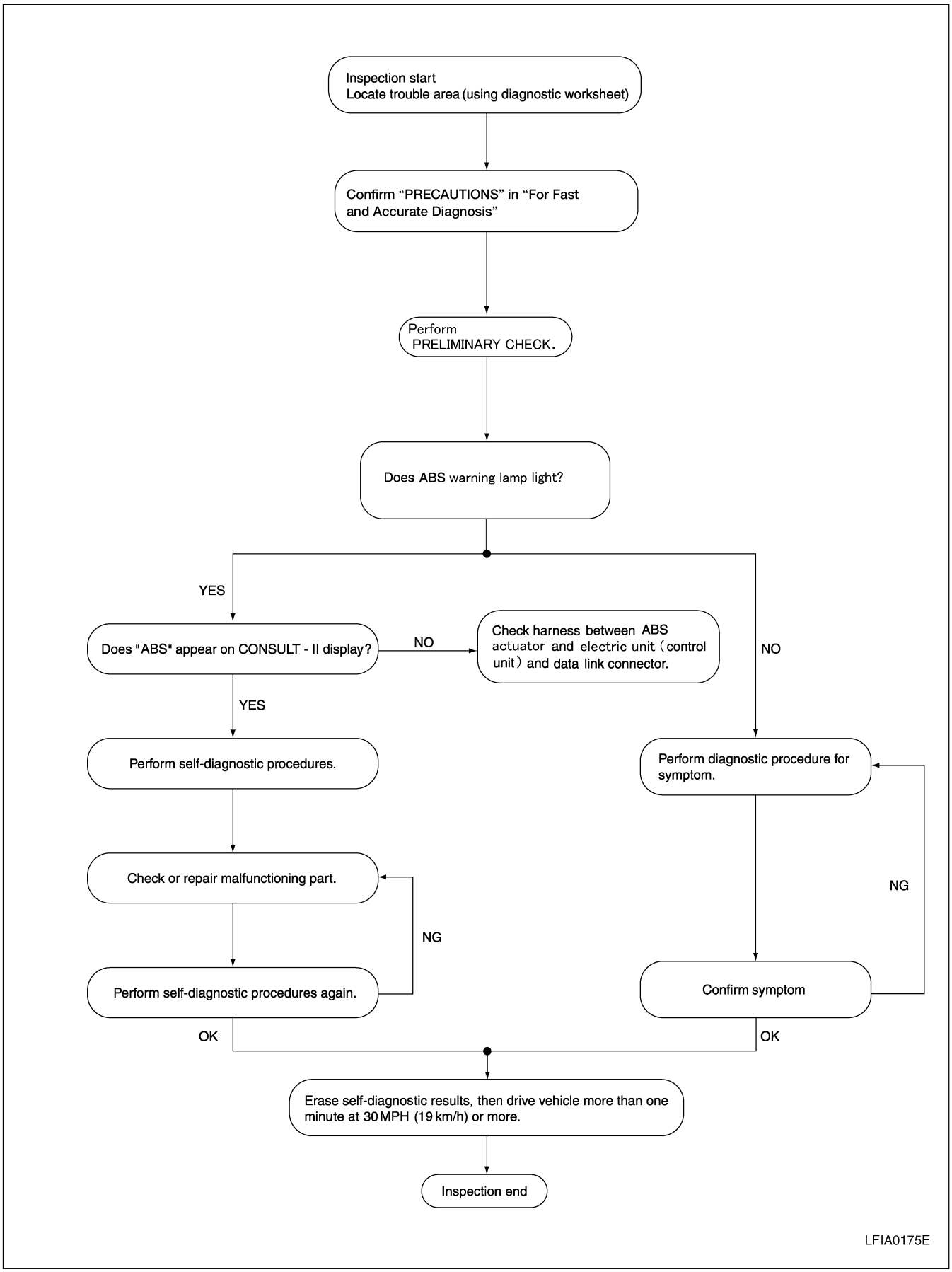
CAUTION:

- **It is dangerous to determine quickly just by listening to the customer's opinion. The customer is not a professional.**

- In order to fix the troubles, you need to first identify the symptoms.

  For the intermittent symptoms, duplicate or simulate them based on questions and answers and previous service data. Sometimes, shaking the harness or connector could be a good way to duplicate or simulate the intermittent symptom. If a technician go on repairing or replacing without identifying symptoms based on his/her own judgment, it will not result in correct or permanent fix.
- Erase the stored memory after finishing the diagnosis.
- For the malfunctions cannot be duplicated, shake the harness and harness connectors with hand to check for any defective contacts or open circuits.
- Read "General Information" before service and follow the general instructions.

Diagnosis Flow



QUESTIONING POINTS	
What	Vehicle and engine model
When	Time and frequency
Where	Road conditions
Conditions	Driving conditions and environment
How	Symptoms

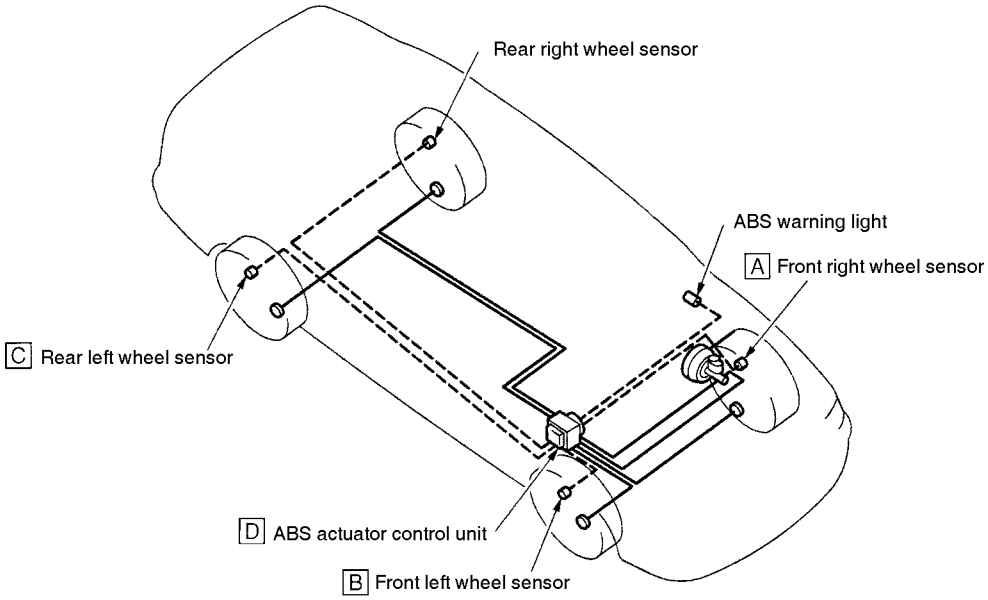
QUESTIONNAIRE

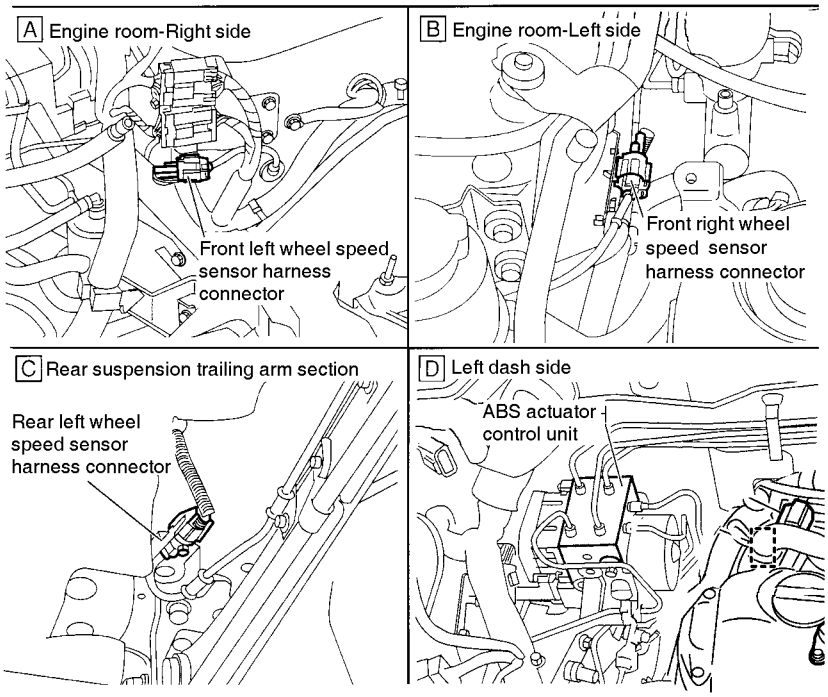
- In order to determine the trouble symptom, it is necessary to ask questions on customer's concern.
- Above questions are very important to identify the symptom and isolate the cause. Use collected information to simulate the trouble symptoms.
- It is good to use the diagnosis sheet to record all information.

DIAGNOSIS SHEET SAMPLE

Customer Name		Registration No.				Registration Year Month Day
Engine No.		Vehicle Type				V.I.N
Check-in Date		Engine Model T/M Type				Mileage (km)
Symptom	☐ Pedal vibration and strange noise	☐ Warning light turns on	☐ Stopping distance is long	☐ Abnormal pedal movement	☐ ABS does not work	☐ ABS works too often
Engine Conditions		☐ When starting ☐ After starting ☐ At above 5000 RPM				
Road Conditions		☐ Road (☐ Snow ☐ Gravel ☐ Others) ☐ Others ☐ Bumpy road				
Driving Conditions		☐ High-speed cornering ☐ Above 10 km/h ☐ Below 10 km/h ☐ Stopped ☐ At idle				
Braking		☐ Gradually ☐ Abruptly				
Others		☐ Too much pedal stroke ☐ ☐				

Components Location





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Control Unit Input/Output Signal Standards (With CONSULT-II)

CAUTION:

- **Control unit displays calculated data. So it may display the normal value even when the output circuit (harness) has short or open circuit.**

Monitor Item	Data monitor		Inspecting item when defective
	Conditions	Reference value when normal	
ABS WARN LAMP (ON-OFF)	Turning ON/OFF of the ABS warning light	Warning light ON (Note 1): ON Warning light OFF (Note 1): OFF	ABS warning light route
STOP LAMP SW	Brake pedal operation	Brake pedal depressed: ON Brake pedal released: OFF	Stop lamp switch and its route (ON-OFF)
MOTOR RELAY (ON-OFF)	Motor relay Motor relay operation	Motor and motor relay operate: ON Motor and motor relay do not operate: OFF	ABS motor and motor relay
ACTUATOR RLY (ON-OFF)	Actuator relay	Actuator relay operate: ON Actuator relay does not operate (Under fail-safe): OFF	ABS actuator
FR LH SENSOR FR RH SENSOR RR LH SENSOR RR RH SENSOR	Wheel speed	Vehicle stopped: 0 [km/h] Vehicle running: Almost in accordance with speedometer display (with in ±10%)	Wheel sensor route
FR RH IN SOL FR LH IN SOL RR RH IN SOL RR LH IN SOL (ON-OFF)	Solenoid operation	Actuator (Under solenoid operation) : ON	ABS solenoid route
FR RH OUT SOL FR LH OUT SOL RR RH OUT SOL RR LH OUT SOL (ON-OFF)		Actuator (Solenoid) does not operate (Vehicle stopped): OFF	
BATTERY VOLT	Power voltage supplied to the control unit (Key switch ON)	Approx. 10 - 16 V	Control unit power route

(Note 1): ABS warning light ON/OFF timing.

Light ON: For about 1 second after the key switch turned ON or when trouble is detected.

Light OFF: About 1 second after the key switch turned ON (When system is normal).

CONSULT-II APPLICATION TO ABS

Item	Self-diagnosis	Data monitor	Active test
FR RH SENSOR	X	X	-
FR LH SENSOR	X	X	-
RR RH SENSOR	X	X	-
RR LH SENSOR	X	X	-
STOP LAMP SWITCH	X	X	-
FR RH IN ABS SOL	X	X	X
FR RH OUT ABS SOL	X	X	X
FR LH IN ABS SOL	X	X	X
FR LH OUT ABS SOL	X	X	X
RR RH IN ABS SOL	X	X	X
RR RH OUT ABS SOL	X	X	X
RR LH IN ABS SOL	X	X	X
RR LH OUT ABS SOL	X	X	X
ACTUATOR RELAY	-	X	X
PUMP MOTOR RELAY	X	X	X
MAIN RELAY	X	-	-
ABS WARNING LAMP	-	X	-
BATTERY VOLTAGE	X	X	-
CONTROLLER FAILURE	X	-	-
ABS SENSOR	X	-	-

X: Applicable
- : Not applicable

Self-Diagnosis

DIAGNOSIS PROCEDURE

1. Perform the “Preliminary Check” (BR-53) after collecting information from the customer.
2. Turn the key switch OFF and connect the CONSULT-II connector to the vehicle’s diagnosis connector.
3. Start the engine and drive for about 1 minute at 30 km/h.
4. Stop the vehicle. Select “START (X-BADGE VHCL)” and “ABS” in order from CONSULT-II while engine running.

CAUTION:

- **When the “START (X-BADGE VHCL)” is selected right after engine start or turning the key switch to ON, the “ABS” may not be display on “SELECT SYSTEM”. In this case, start from the step 2.**

5. The self-diagnosis results will be displayed.
   ※ The current and past troubles will be displayed.
6. Perform the corresponding inspection from display and repair or replace the defective components.
7. After correcting the defect, delete the self-diagnosis results from the control unit by pressing “ERASE”.
   ※ If cannot erase the detected failure, drive the vehicle at 30 km/h and then try “ERASE” again.

CAUTION:

- **If cannot erase the memory, perform step 6.**

8. Check if the warning light is turned off.
9. Test the ABS operation in a safe place after coming out of the diagnosis mode.

CAUTION:

- **The ABS does not work while ABS diagnosis.**

DISPLAY LISTS

Suspect systems	Malfunction detecting condition
FR RH SENSOR-1	Circuit of FR RH wheel sensor is open or shorted.
FR LH SENSOR-1	Circuit of FR LH wheel sensor is open or shorted.
RR RH SENSOR-1	Circuit of RR RH wheel sensor is open or shorted.
RR LH SENSOR-1	Circuit of RR LH wheel sensor is open or shorted.
FR RH SENSOR-2	When there is a sensor power voltage error in the FR RH wheel sensor, and when the control unit cannot recognize sensor pulse because gap between wheel sensor and sensor rotor is large.
FR LH SENSOR-2	When there is a sensor power voltage error in the FR LH wheel sensor, and when the control unit cannot recognize sensor pulse because gap between wheel sensor and sensor rotor is large.
RR RH SENSOR-2	When there is a sensor power voltage error in the RR RH wheel sensor, and when the control unit cannot recognize sensor pulse because gap between wheel sensor and sensor rotor is large.
RR LH SENSOR-2	When there is a sensor power voltage error in the RR LH wheel sensor, and when the control unit cannot recognize sensor pulse because gap between wheel sensor and sensor rotor is large.
ABS SENSOR	When a rotation sensor signal error is detected in one or more of the four wheels, and when operation of one or more of the wheels continues beyond the specified time.
FR RH IN ABS SOL	Displays when control unit detects error in FR RH IN SOL system.
FR LH IN ABS SOL	Displays when control unit detects error in FR LH IN SOL system.
RR RH IN ABS SOL	Displays when control unit detects error in RR RH IN SOL system.
RR LH IN ABS SOL	Displays when control unit detects error in RR LH IN SOL system.
FR RH OUT ABS SOL	Displays when control unit detects error in FR RH OUT SOL system.
FR LH OUT ABS SOL	Displays when control unit detects error in FR LH OUT SOL system.
RR RH OUT ABS SOL	Displays when control unit detects error in RR RH OUT SOL system.
RR LH OUT ABS SOL	Displays when control unit detects error in RR LH OUT SOL system.
MAIN RELAY	Displayed when control unit detects malfunction in solenoid valve relay system.
PUMP MOTOR	Displays when control unit detects errors in motor or motor relay system.
BATTERY VOLTAGE	Battery voltage of control unit is too high.
	Battery voltage of control unit is too low.
STOP LAMP SWITCH	Stop lamp switch circuit is open.
CONTROLLER FAILURE	Processing function of control unit is malfunctioning.

Note 1: The ABS warning light turns ON for 10 to 80 seconds (varies depending on spinning speed) if wheel spins on the slippery road such as snow and rain. However, it is not malfunction.

Note 2: When the ABS warning lamp does not turn off after turning on the key switch after repairing the sensor short circuit, then drive the vehicle for about 1 minute at about 30 km/h. Be sure to check the turning off of the ABS warning light.

Data Monitor

- Refer to CONSULT-II operation manual for data monitor function details.

MONITORING PROCEDURE

1. Turn the key switch OFF.
2. Connect the CONSULT-II connector to the vehicle's diagnosis connector.
3. Turn the key switch ON.
4. Select "START (X-BADGE VHCL)" from the display.
5. Select "ABS" from the display.

CAUTION:

- **When the "START (X-BADGE VHCL)" is selected right after engine start or turning the key switch to ON, the "ABS" may not be display on "SELECT SYSTEM". In this case, start from the step 2.**

6. Select "DATA MONITOR"
7. Press "START" after selecting "ECU INPUT SIGNALS", "MAIN SIGNALS" or "SELECTION FROM MENU" from "SELECT MONITOR ITEM".
8. Perform data monitor.

DATA MONITOR MODE

Monitor Item	Status	Description
FR RH SENSOR	Under driving (All 4 wheels are rotating)	When the speed is the same as the speedometer, then the speed identical to the vehicle speed will be outputted.
FR LH SENSOR		
RR RH SENSOR		
RR LH SENSOR		
STOP LAMP SW	Depress the brake	Pedal depressed: ON Pedal released: OFF
FR RH IN SOL	Engine is running	ABS operates: ON ABS does not operate: OFF **NOTE:** The ABS does not work during diagnosis, so the OFF is normal.
FR RH OUT SOL		
FR LH IN SOL		
FR LH OUT SOL		
RR RH IN SOL		
RR RH OUT SOL		
RR LH IN SOL		
RR LH OUT SOL		
ACTUATOR RLY		Ignition switch ON: ON Ignition switch OFF: OFF
MOTOR RLY	Ignition switch is ON or engine is running	ABS operates: ON ABS does not operate: OFF **NOTE:** The ABS does not work during diagnosis, so the OFF is normal.
BATTERY VOLT		The voltage to the control unit is displayed.
ABS WARN LAMP	Ignition switch ON or engine is running	Warning lamp is turned on: ON Warning lamp is turned off: OFF

Monitor Item	Status	Description
EBD SIGNAL	Engine is running	EBD operates: ON EBD not operate: OFF
ABS SIGNAL	Engine is running	ABS operates: ON ABS not operate: OFF
EBD FAIL SIG	Engine is running	Malfunctions condition: ON Normal: OFF
ABS FAIL SIG	Engine is running	Malfunctions condition: ON Normal: OFF

CAUTION:

- **The ABS does not work during diagnosis.**

Active Test

TEST PROCEDURE

CAUTION:

- **Do not perform the active test while driving.**
- **Check if the air bleeding has completed.**
- **Active test cannot work when ABS warning light is ON.**

1. Connect the CONSULT-II connector to the diagnosis connector and start the engine.
2. Select “START (X-BADGE VHCL)” from the display.
3. Select “ABS”.
4. Select “ACTIVE TEST”.
5. Test item selection screen is displayed.
6. Touch necessary test item.

DISPLAY LISTS

ABS Solenoid Valve

Select “UP (Increase)”, “KEEP (Hold)” or “DOWN (Decrease)” and inspect from the display whether the ABS solenoid valve (inlet and outlet) is working as below.

Operation	ON	OFF
Inlet ABS solenoid valve	Operating	Not operating
Outlet ABS solenoid valve	Operating	Not operating

REFERENCE:

- **When the active test is performed while pedal depressed, the pedal depressing value may change, but it is normal.**
- **If there is no input for 10 seconds from the start of the test, it will automatically turned off.**

ABS MOTOR

Press ON or OFF from the display and inspect if the ABS motor relay operates as below.

Operation	ON	OFF
ABS motor	ON	OFF

REFERENCE:

- **Determine the normal operation of motor with the operating sound and brake pedal vibration during motor operation.**

Preliminary Check

BRAKE FLUID LEVEL • LEAKAGE INSPECTION

1. Inspect the brake reservoir tank's level. If low, add the brake fluid.
2. Inspect the brake piping and ABS actuator surroundings for any leakage. If leakage or spreading is present, inspect the items as below.
   - When the ABS actuator connection is loose, then tighten the piping to the specified torque. Re-inspect for any leakage and check if no leakage is present.
   - When the connection flare nut or ABS actuator bolt is damaged, replace the damaged components. Re-inspect for any leakage and check if no leakage is present.
   - When other than the ABS actuator connections has leakage or spreading, wipe out the leakage or spreading with a clean cloth. Re-inspect for any leakage and replace the components that cause leakage or spreading.
   - When ABS actuator assembly has leakage or spreading, wipe out the leakage or spreading with a clean cloth. Re-inspect for any leakage and replace the ABS actuator control unit if leakage or spreading is present.

CAUTION:

- **The actuator assembly is a non-disassembling component. Do not disassemble.**

POWER SYSTEM TERMINAL LOOSENESS INSPECTION

Check the battery positive (+) terminal, negative (-) terminal and battery ground for looseness.

ABS WARNING LIGHT INSPECTION

1. Check if the ABS warning light turns on when turning the key switch ON. If not ON, then inspect the ABS warning light route.
2. Check if the warning light turns OFF about 3 seconds after turning the key switch ON. If not OFF, then perform the self-diagnosis.
3. Check if the ABS warning light is turned OFF after about 1 minute of driving at about 30 km/h. If the light is still ON, then perform the self-diagnosis.
4. After performing the self-diagnosis, always erase the stored memory.

Wheel Speed Sensor System

INSPECTION TIPS

The defective wheel speed sensor location can be determined by the CONSULT-II self-diagnosis results.

1. START OF INSPECTION

Wheel speed sensor inspection

→ Go to step 2.

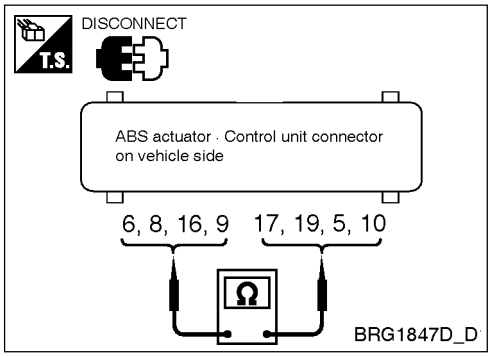
2. CONNECTOR INSPECTION

1. Disconnect the control unit and defective wheel speed sensor connector. Inspect if the terminal has deformed and if the connector is imperfectly connected. Connect the connector.
2. Perform the self-diagnosis.

Does the ABS warning light turn on?

YES → Go to step 3.

NO → End.



3. WHEEL SPEED SENSOR CIRCUIT INSPECTION

1. Disconnect the control unit connector.
2. Measure the resistance between the terminals. (Measure the resistance when rotating the steering wheel from left to right and moving the sensor harness inside the wheel house.)

   Front right side: Terminal No. 9 - No. 10

   Front left side: Terminal No. 16 - No. 5

   Rear right side: Terminal No. 8 - No. 19

   Rear left side: Terminal No. 6 - No. 17

   Resistance

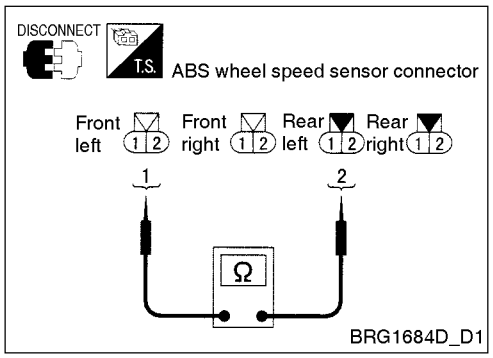
   Front: 1.44 - 1.76 kΩ

   Rear: 1.05 - 1.35 kΩ

Inspection results are OK?

YES → Go to step 5.

NO → Go to step 4.



4. WHEEL SPEED SENSOR INSPECTION

Measure the internal resistance of the wheel speed sensor.

Resistance

Front: 1.44 - 1.76 kΩ

Rear: 1.05 - 1.35 kΩ

Inspection results are OK?

YES → Repair the harness and the connector between the control unit and wheel speed sensor.

NO → Replace the wheel speed sensor.

5. TIRE INSPECTION

Inspect for the tire pressure, wear and size.

Is the tire pressure, wear or size within the standard value?

YES → Go to step 6.

NO → Adjust the air pressure. Or replace the tires.

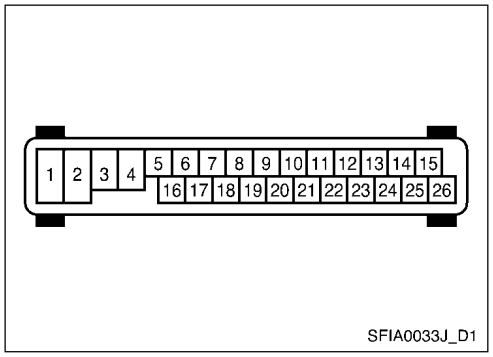
6. SENSOR ROTOR INSPECTION

Inspect the sensor rotor gear for any damages.

Inspection results are OK?

YES → Check the control unit terminal for any damages, and check if the connector is connected properly. Re-connect the connector and re-inspect.

NO → Replace the sensor rotor.



Control Unit Power System

INSPECTION TIPS

Disconnect the ABS actuator control unit connector and inspect the system connections and voltage between vehicle side connector terminals and body ground.

Terminal No.	Signal	Measurement	Value
2, 3, 18	Power	Key switch ON	Power voltage
1, 4	Ground	Key switch OFF	System connection present

ABS Works Frequently

1. START OF INSPECTION

Inspect the braking force distribution.

Inspection results are OK?

YES → Go to step 2.

NO → Inspect the brake system.

2. WHEEL SPEED SENSOR INSPECTION

1. Inspect if the wheel speed sensor's connector has any deformation, and check if the connector is connected imperfectly.
2. Inspect the wheel speed sensor. Refer to "Wheel Speed Sensor System" (BR-54).

Does the wheel speed sensor work properly?

YES → Go to step 3.

NO → Repair.

3. FRONT AXLE INSPECTION

Inspect for any rattling noise in the front and rear axle.

Inspection results are OK?

YES → Perform step 3 "Warning Light Inspection" in "The Brake Pedal Is Abnormal" (BR-57).

NO → Repair.

The Brake Pedal Is Abnormal

1. BRAKE PEDAL STROKE INSPECTION

Inspect the brake pedal stroke.

Is the brake pedal stroke too large?

YES → ● Perform the air bleeding for the brake piping.
● Inspect the brake system.

NO → Go to step 2.

2. CONNECTOR INSPECTION AND PERFORMANCE INSPECTION

Disconnect the ABS actuator control unit connector and inspect if the braking performance is appropriate when ABS is not operating.

Connect the connector after inspection.

Inspection results are OK?

YES → Go to step 3.

NO → Inspect the brake system.

3. WARNING LIGHT INSPECTION

Inspect if the warning light comes on while driving.

Inspection results are OK?

YES → Go to step 4.

NO → Perform self-diagnosis. Refer to “Diagnosis Procedure” (BR-49).

4. WHEEL SPEED SENSOR INSPECTION

1. Inspect if the wheel speed sensor’s connector terminal is deformed or if the connector is imperfectly connected.
2. Inspect the wheel speed sensor. Refer to “Inspection Tips” (BR-54).

Is the wheel speed sensor operating properly?

YES → Inspect if the control unit connector terminal is deformed or if the connector is imperfectly connected. Then connect the connector and re-inspect.

NO → Repair.

Stopping Distance Is Too Long

CAUTION:

- **On the slippery roads, the ABS equipped vehicle may have longer stopping distance then the non-ABS vehicles.**

1. CONNECTOR AND PERFORMANCE INSPECTION

Disconnect the ABS actuator control unit’s connector and inspect the stopping distance while ABS is not operating. Connect the connector after inspection.

Inspection results are OK?

YES → ● Perform the air bleeding for the brake piping.
● Inspect the brake system.

NO → Perform step 3 in “The Brake Pedal Is Abnormal” (BR-57).

ABS Does Not Work

CAUTION:

- **The ABS does not work if driving speed is less than 10 km/h.**

1. WARNING LIGHT INSPECTION

Check the ABS warning light operation.

Does the ABS warning light operate?

YES → Perform self-diagnosis. Refer to “Diagnosis Procedure” (BR-49).

NO → Perform step 3 in “The Brake Pedal is Abnormal” (BR-57).

Pedal Vibration and Noise

CAUTION:

Under gentle braking (just stepping on the pedal), ABS operation and vibration can be felt but it is normal.

- **During shifting or clutch operation.**
- **While driving on slippery roads.**
- **When cornering at a high speed.**
- **When passing through a protrusion or grooved road (more than 50 mm).**
- **When accelerating right after engine starting (approx. over 10 km/h).**

1. START OF INSPECTION

Inspect pedal vibration and noise.

→ Go to step 2.

2. SYMPTOM INSPECTION

Apply the brake and start the engine.

Does the symptom appear when starting the engine?

YES → Perform self-diagnosis. Refer to “Diagnosis Procedure” (BR-49).

NO → Go to step 3.

3. SYMPTOM RE-INSPECTION

Check the symptom when operating the electrical system component (such as headlamp) switch.

Does the symptom occur when operating the electrical system component (such as headlamp) switch?

YES → Go to step 4.

NO → Perform step 3 in “The Brake Pedal is Abnormal” (BR-57).

4. WHEEL SPEED SENSOR INSPECTION

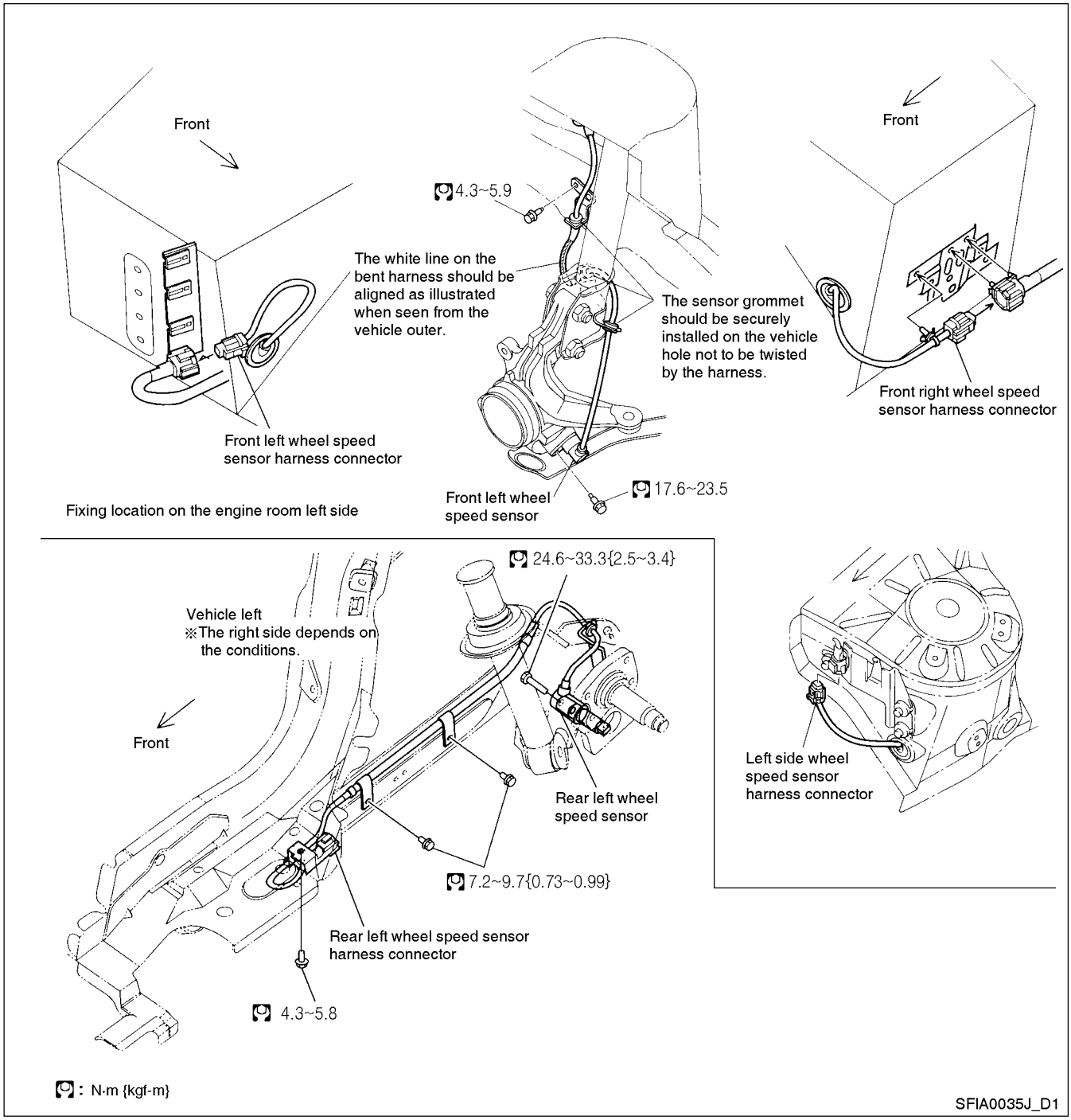
Inspect the wheel speed sensor harness’s shield wire ground. Refer to “Wiring Diagram” for shield wire ground location.

Inspection results are OK?

YES → Inspect if the control unit connector terminal is deformed or if the connector is imperfectly connected. Then connect the connector and re-inspect.

NO → Repair.

Removal • Installation



CAUTION:

- **Be careful not to damage the sensor or rotor gear. During front and rear wheel hub installation, install the wheel speed sensor first to prevent its malfunction by damaged wire.**
- **When removing, try not to rotate the sensor and do not remove by pulling the harness.**
- **During installation, check if there are any foreign metal particles in the sensor pickup location, inside the sensor installation hole, or rotor contact surface. If so, remove all particles and then install. Tighten the mounting bolts and nuts to the specified torque.**

Removal • Installation

REMOVAL

FRONT

1. Remove the drive shaft. Refer to “Removal • Installation” (FA-7).
2. Remove the sensor rotor from the drive shaft. Refer to “Disassembly • Assembly” (FA-9).

REAR

- Remove the wheel hub and remove the sensor rotor. Refer to “Removal • Installation” (RA-4).

INSTALLATION

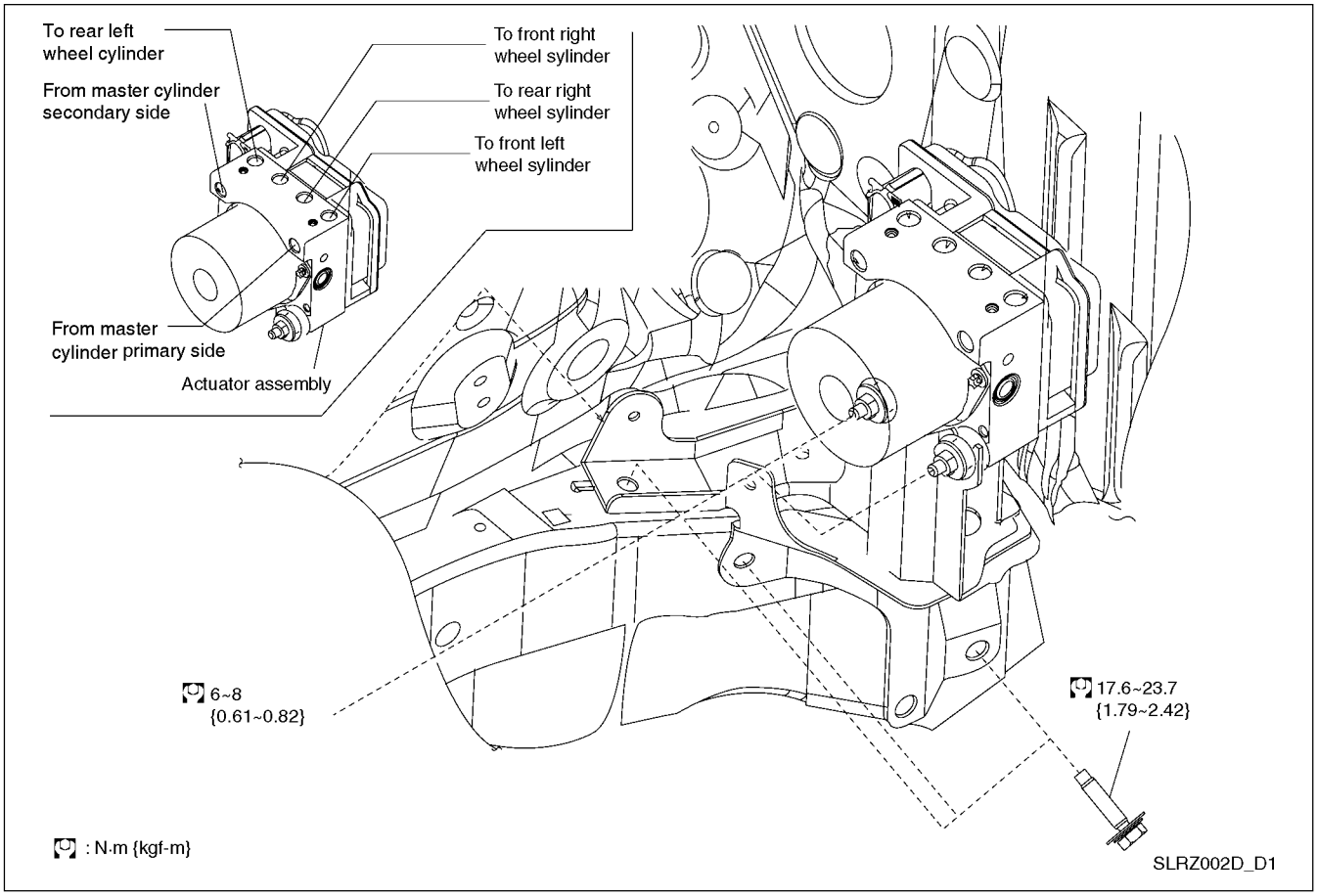
FRONT

1. Install the sensor rotor to the drive shaft. Refer to “Disassembly • Assembly” (FA-9).
2. Install the drive shaft. Refer to “Removal • Installation” (FA-7).

REAR

- Install the sensor rotor to the wheel hub and install to the rear of the vehicle. Refer to “Removal • Installation” (RA-4).

Removal • Installation



REMOVAL

Perform by cautioning as below.

CAUTION:

- **Start the operation after disconnecting the battery terminal.**
- **Use the flare nut wrench for brake tube removal and be careful not to damage the flare nut and brake tube. For installation, tighten to the specified torque using a flare nut torque wrench.**

INSTALLATION

Perform by cautioning as below.

- Tighten the mounting bolts and nuts to the specified torque.
- After finishing the operation, perform air bleeding for the brake piping. Refer to “Air Bleeding” (BR-8).

Brake Operation Conditions

Braking Force

Sum of rear wheels	Over 10 % of the axle loads
Sum of left and right wheels	Over 8 % of the axle loads
Total	Over 50 % of the vehicle curb weight

Brake Pedal

Free play (From the top of the pedal)		3 - 11 mm
Clevis pin cover (From the top of the pedal)		1 - 3 mm
Pedal height (From the upper surface of the dash panel)	M/T	156.0 - 166.0 mm
	A/T	164.9 - 174.9 mm
Pedal height when depressed (Depressing force 490 N (50 kg)) (From the upper surface of the dash panel)	M/T	(84.8 mm)
	A/T	(91.5 mm)
Clearance between the stop lamp switch end and pedal stopper		0.3 - 1.0 mm

Check Valve

Vacuum leakage (Under 66.7 kPa (-500 mmHg) of vacuum pressure)	Less than 1.3 kPa (10 mmHg) of vacuum pressure for 15 seconds

Brake Booster (Vacuum Type)

Vacuum leakage (Under 66.7 kPa (-500 mmHg) of vacuum pressure)	Less than 1.3 kPa (10 mmHg) of vacuum pressure for 15 seconds
Input rod installation standard value	125 mm

Front Disc Brake

Brake Type		CL22VK
Pad	Standard thickness (When new)	11 mm
	Limit value	2 mm
Disc rotor	Standard thickness (When new)	22 mm
	Limit value	20 mm
	Run-out limit	0.4 mm

Rear Drum Brake

Brake Type		LT20B
Lining	Standard thickness (When new)	4.5 mm
	Limit value	1.5 mm
Drum	Standard inner diameter (When new)	ϕ 203.0 mm
	Limit value	ϕ 204.5 mm

Parking Brake

Pulling [By force of 196 N (20 kg)]	8 - 9 notches
Full stroke	18 notches
Brake warning light coming on stroke	Within 1 notch

Tightening Torque

Unit: N•m (kgf-m)

Master cylinder mounting nut	11.8 - 14.7 (1.2 - 1.5)
Front caliper mounting bolt	88.2 - 107.8 (9 - 11)
Brake tube flare nut	14.7 - 17.6 (1.5 - 1.8)

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Precautions

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

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

WARNING:

- **To install/remove the SRS airbag, pretensioner seatbelt system related components and harness, turn the ignition switch “OFF”, disconnect the battery terminals and wait over 3 minutes. (This is to discharge all the remaining electricity in the airbag sensor unit’s auxiliary power circuit.)**
- **Do not use air impact or electrical tools when installing/removing the components.**
- **Do not use any hand-held tools for harness used in SRS airbag and pretensioner seatbelt systems. Be careful with the harness not to tangle with or interfere with other components.**
- **Do not use any electrical test equipments such as circuit tester when inspecting the SRS airbag and pretensioner seatbelt circuit while installed unless the Service Manual instructs to do so. (The weak current in the tester can cause the SRS airbag to operate.)**
- **Do not insert any foreign materials such as a screwdriver in the airbag module and pretensioner seatbelt connector in order to prevent unintended operation due to static electricity.**
- **The harnesses used in SRS airbag and pretensioner are covered with yellow insulation for easy identification.**
- **Refer to “RS Restraint System” in this Service Manual for safe airbag system service information.**

Sealant and Primer Handing

- Use the sealant less than 6 months from the manufacturing date.
- Store the primer and sealant in cool and shaded area.
- Open the primer and sealant container right before using it. Do not reuse the remaining.
- Always shake the primer container before using it. Do not use it if foreign particles are floating on.
- If primer or sealant touches the skin, quickly wipe out with white gasoline and clean with soap.
- In addition to above cautions, always follow the instructions on the container.

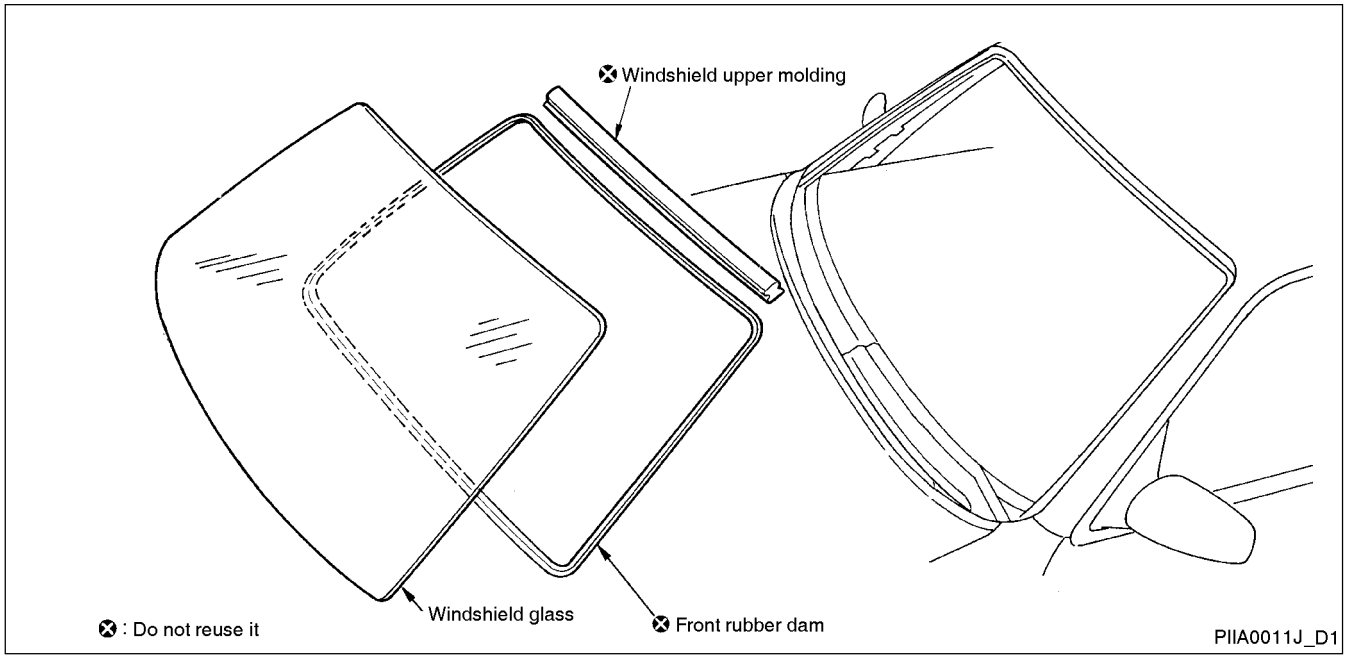
Caution in Service

- Be careful not to damage or deform the components during removal and disassembly. Protect the components that interfere with the other components in service with cloth.
- Protect the components by covering with a cloth or vinyl tape when removing the components using a screwdriver (When removing the components that are engaged each other).
- Store the removed components safely with a cloth.
- Replace the clip if deformed or damaged.
- For the components that are not allowed reuse, always replace them with new if removed.
- Tighten the bolts and nuts to the specified torque.
- After assembling, check if every component operates properly.
- Remove the dirt as follows:
  - If watersoluble: Clean the polluted are with cloth dampened in warm water and wipe out with a soft dry cloth.
  - If oilsoluble: Clean the polluted are with cloth dampened in warm water with mild soap (2 - 3 % of concentration). Remove the soap with cloth dampened in clean water and then wipe out with a soft dry cloth.
- Do not use any organic detergent such as thinner, benzene, alcohol and gasoline.

MEMO:

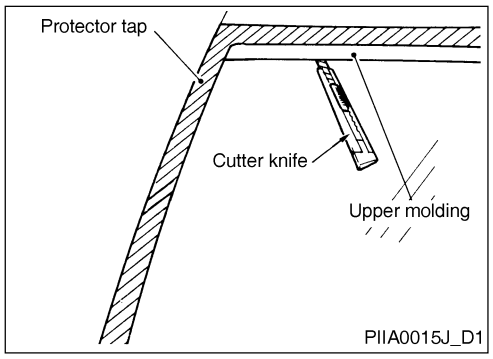
Windshield Glass • Windshield Molding

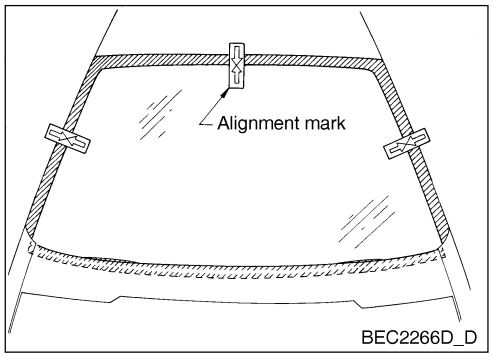
Removal • Installation



REMOVAL

1. Remove the front pillar garnish and head lining front end.
2. Remove the front pillar weatherstrip.
3. Remove the windshield side molding.
4. Remove the cowl top cover.
5. Put the protector tape around the windshield glass to prevent from scratching the body surface.
6. Cut the molding surface using a cutter knife following the glass line.

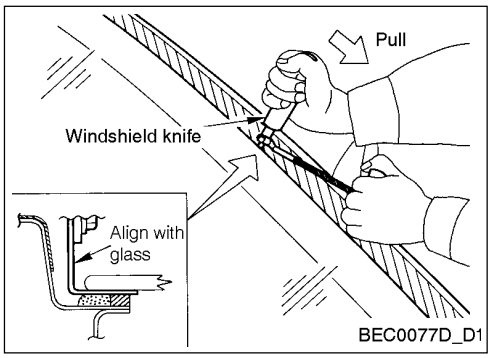




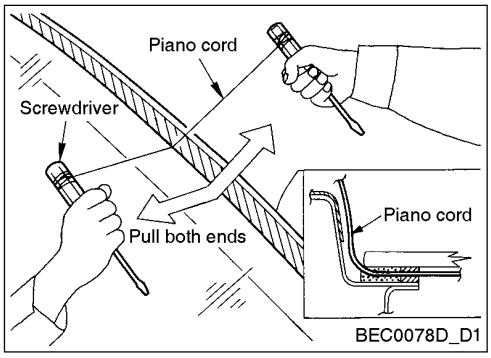
7. Pull out and completely remove the molding remaining at the body flange using pliers.
   - When reusing the windshield glass, put an alignment mark on the body and the glass.
8. Cut the sealant.
   - Perform as below according to using tools.

CAUTION:

- **When reusing the windshield glass, do not use the windshield knife. (Glass may be damaged.)**



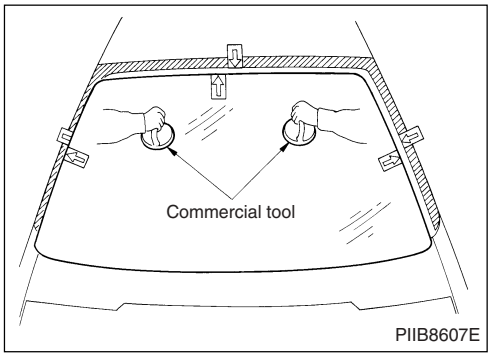
a. When using the windshield knife (When replacing the glass)
   i. Apply some soap solution on the body side sealant for easy windshield knife operation.
   ii. Insert the windshield knife into the sealant and adjust the knife parallel to the glass and cut the sealant by pulling the knife.



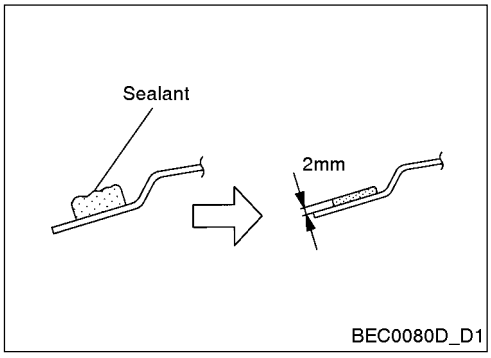
b. When using the piano cord (When reusing the glass)
   i. Perforate a hole using a gimlet or cutter to the glass sealant from the inside of the vehicle.
   ii. Insert the piano cord into the hole from the inside of the vehicle and connect the both cord ends with screwdrivers.
   iii. By pulling the both ends of the piano cord (one inside and one outside of the vehicle), cut the sealant following the glass line.

CAUTION:

- **Strongly contact the piano cord onto the glass edge.**
- **Insert copper plates to prevent the piano cord from touching the instrument panel.**



9. Using the glass holder (commercial tool), remove the glass from the vehicle.

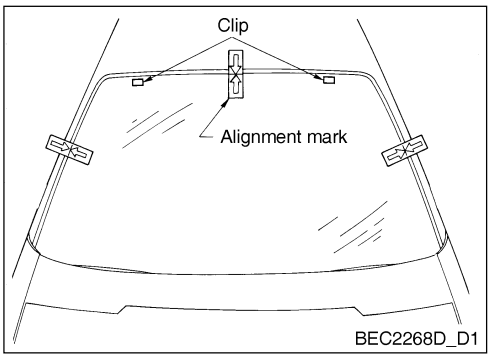


INSTALLATION

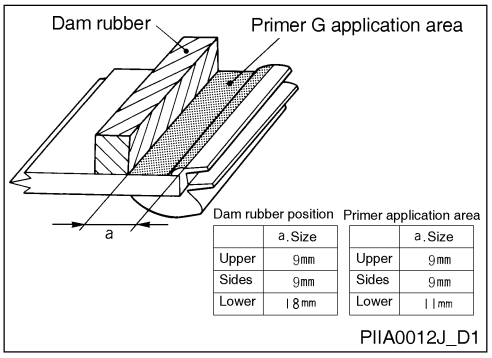
1. Cut the remaining sealant evenly leaving the 2 mm thickness using a knife.

CAUTION:

- **When the body side is damaged, always repair with 2-fluid type urethane paint. Do not use the lacquer paint.**



2. Put the clip to the clip holes on the vehicle.
3. For new glass installation, place the glass onto the vehicle, mark the alignment marks on the body and the glass and remove the glass again.
4. For the reused glass, cut the remainder evenly with a knife.
5. Wipe out the glass's sealant surfaces and upper molding installation surface with white gasoline.



6. Stick the dam rubber on the glass as shown in the illustration by centering center below point.
7. Apply the primer.

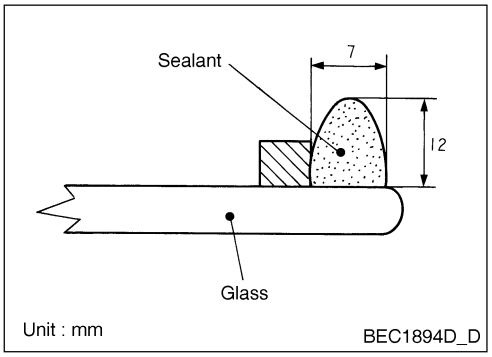
REFERENCE:

- **The primer is very important since it strengthens the sealing effect between the glass and the body surface.**

CAUTION:

- **There are 2 types of primers. Be careful not to confuse between the two.**

  Primer M: For body surface.
  Primer G: For glass.
- Apply the primer G around the glass following the instructions.

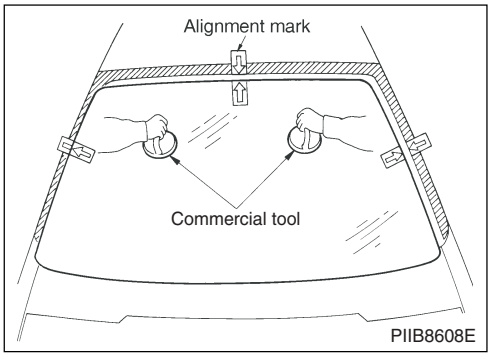


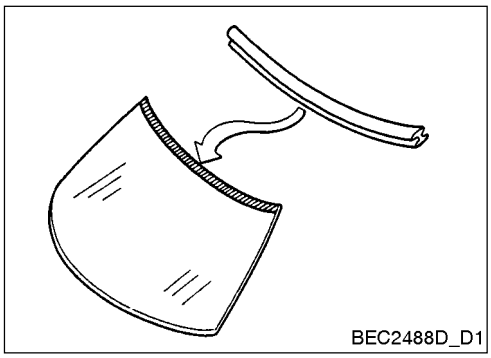
8. Apply the primer M on the vehicle surface.

CAUTION:

- **When primer M stains on the body surface besides the sealant surface, quickly wipe it out with white gasoline.**
- **Insert copper plates to prevent the primer M from touching the instrument panel.**

9. Apply the primer and apply the sealant around the glass within the instructed time on the user's guide.
   - Cut the sealant nozzle end and open it. Then apply with a sealant gun.
10. Install the glass holder (commercial tool) to the glass and install the glass to the vehicle by mating the alignment marks on the body and the glass.
11. Press the glass lightly and completely seat the glass.
12. Make the glass even by removing the slipped out sealant or adding sealant where lacks.





13. Determine the upper molding position and insert and fix the bottom of the molding to the glass.

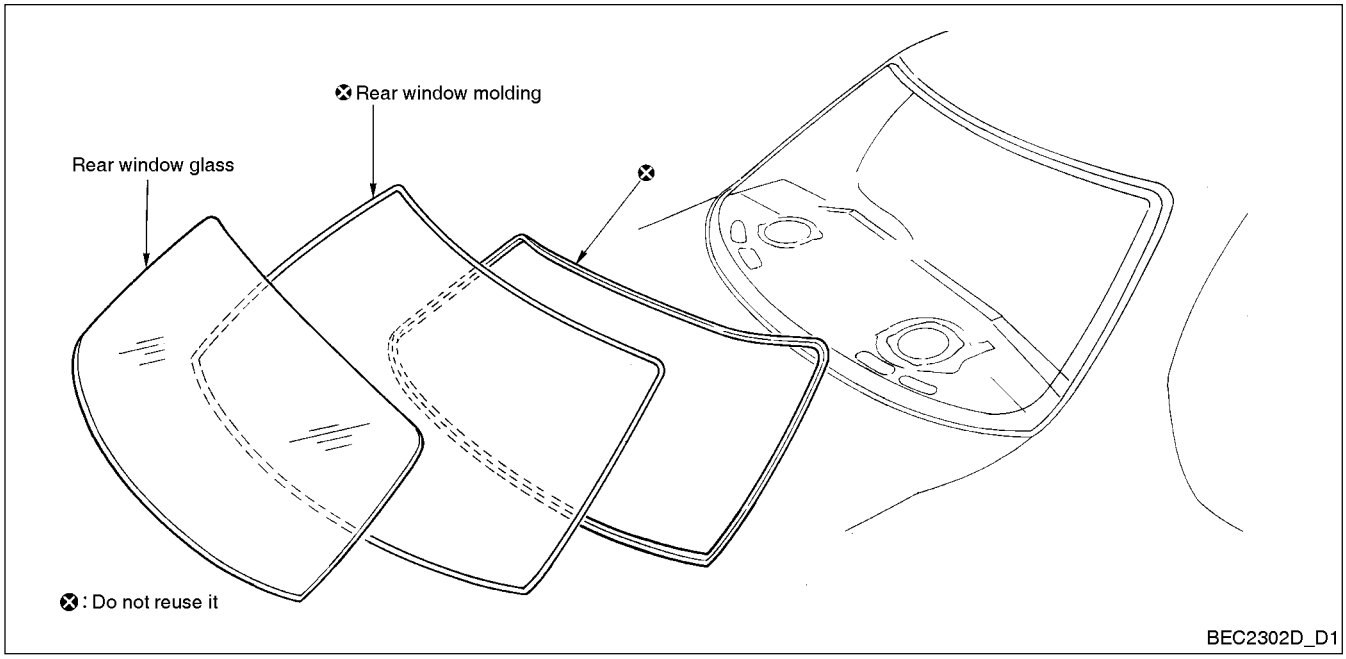
CAUTION:

- **Perform the windshield molding installation before the sealant hardens.**
- **Leave the door glass open until the sealant hardens after installing the glass. Do not drive.**

14. Inspect for any water leakage.
15. Remove the protector tape.
16. Install the removed components.

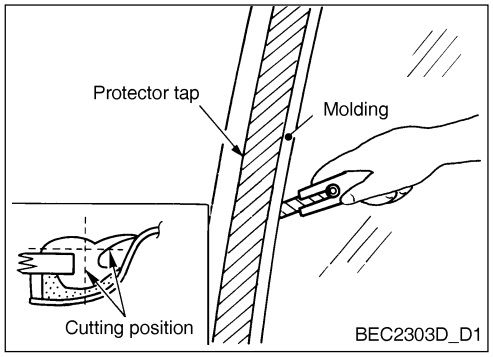
Rear Window Glass • Rear Window Molding

Removal • Installation

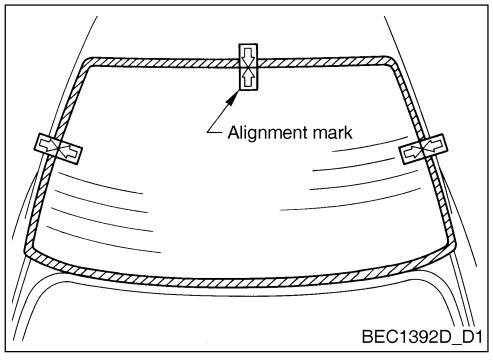


REMOVAL

1. Remove the rear part of the head lining.
2. Remove the rear pillar garnish and rear partial self finisher.
3. Remove the rear defogger and glass antenna connector.
4. Put the protector tape around the rear window glass (molding) not to scratch the body surface.



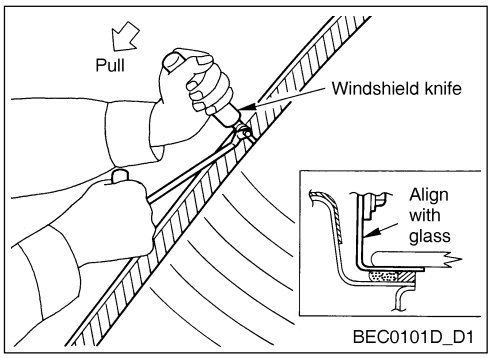
5. Cut the rear window molding using a cutter knife following the glass line.
6. Pull out and completely remove the molding remaining at the body flange.
   - When reusing the rear window glass, put an alignment marks on the body and the glass.



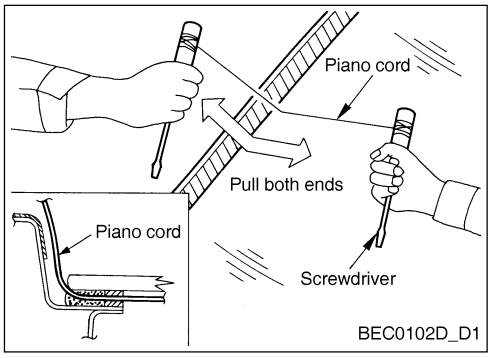
7. Cut the sealant.
   - Cut the 2 upper clips with sealant.
   - Perform as below according to using tools.

CAUTION:

- **When reusing the rear window glass, do not use the windshield knife. (Glass may be damaged.)**



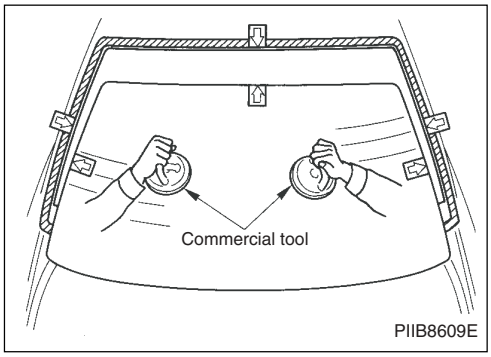
a. When using the windshield knife (When replacing the glass)
   i. Apply some soap solution on the body side sealant for easy windshield knife operation.
   ii. Insert the windshield knife into the sealant and adjust the knife parallel to the glass and cut the sealant by pulling the knife.



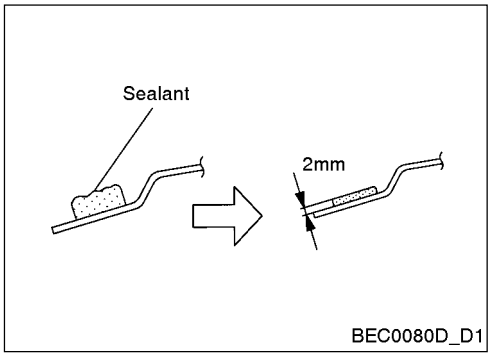
b. When using the piano cord (When reusing the glass)
   i. Perforate a hole using a gimlet or cutter to the glass sealant from the inside of the vehicle.
   ii. Insert the piano cord into the hole from the inside of the vehicle and connect the both cord ends with screwdrivers.
   iii. By pulling the both ends of the piano cord (one inside and one outside of the vehicle), cut the sealant following the glass line.

CAUTION:

- **Strongly contact the piano cord onto the glass edge.**
- **Insert copper plates to prevent the piano cord from touching the instrument panel.**



8. Using the glass holder (commercial tool), remove the glass from the vehicle.



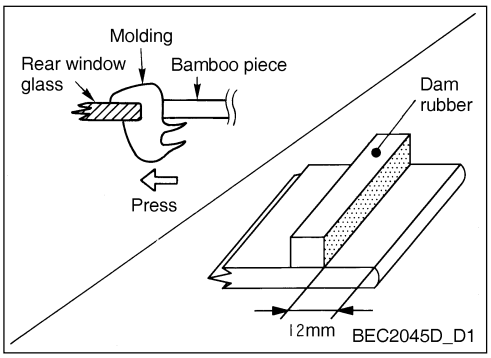
INSTALLATION

1. Cut the remaining sealant evenly leaving the 2 mm thickness using a knife.

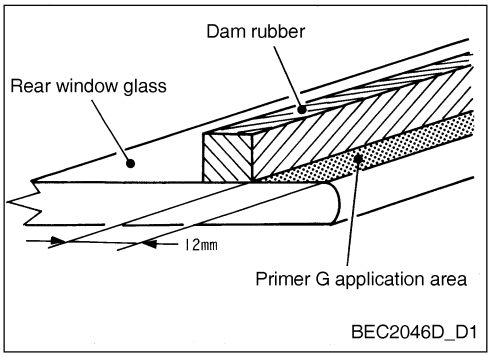
CAUTION:

- **When the body side is damaged, always repair with 2-fluid type urethane paint. Do not use the lacquer paint.**

2. For the reused glass, cut the remainder evenly with a knife.
3. Wipe out the glass's sealant surfaces and surroundings with white gasoline.



4. Stick the dam rubber on the glass sides as shown in the illustration by centering center upper point.
5. Install the rear window molding to the rear window glass and fix the glass by pressing the glass with a bamboo piece.



6. Apply the primer.

REFERENCE:

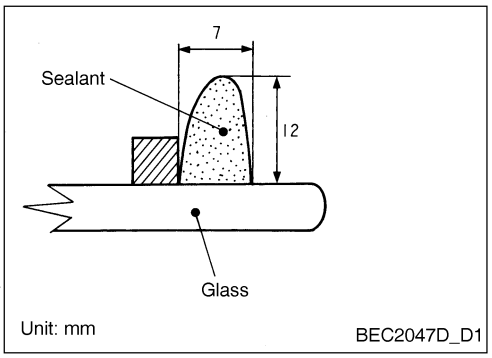
- **The primer is very important since it strengthens the sealing effect between the glass and the body surface.**

CAUTION:

- **There are 2 types of primers. Be careful not to confuse between the two.**

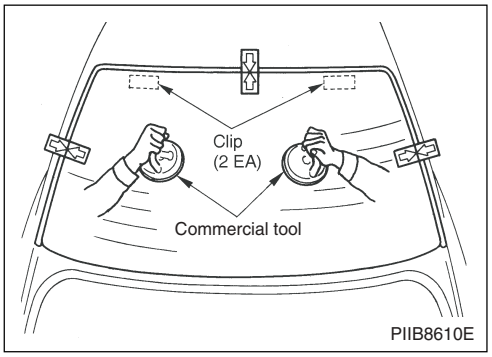
  Primer M: For body surface.
  Primer G: For glass.
- Apply the primer G around the glass following the instructions.

7. Apply the primer M on the vehicle surface.



CAUTION:

- **When primer M stains on the body surface besides the sealant surface, quickly wipe it out with white gasoline.**



8. Apply the primer and apply the sealant around the glass within the instructed time on the user's guide.
   - Cut the sealant nozzle end and open it. Then apply with a sealant gun.
9. Install the glass holder (commercial tool) to the glass and install the glass to the vehicle by mating the upper clip (2 EA) to the body holes. When reusing the glass, install the glass to the vehicle by mating the alignment marks on the body and the glass.
10. Press the glass lightly and completely seat the glass.
11. Make the glass even by removing the slipped out sealant or adding sealant where lacks.

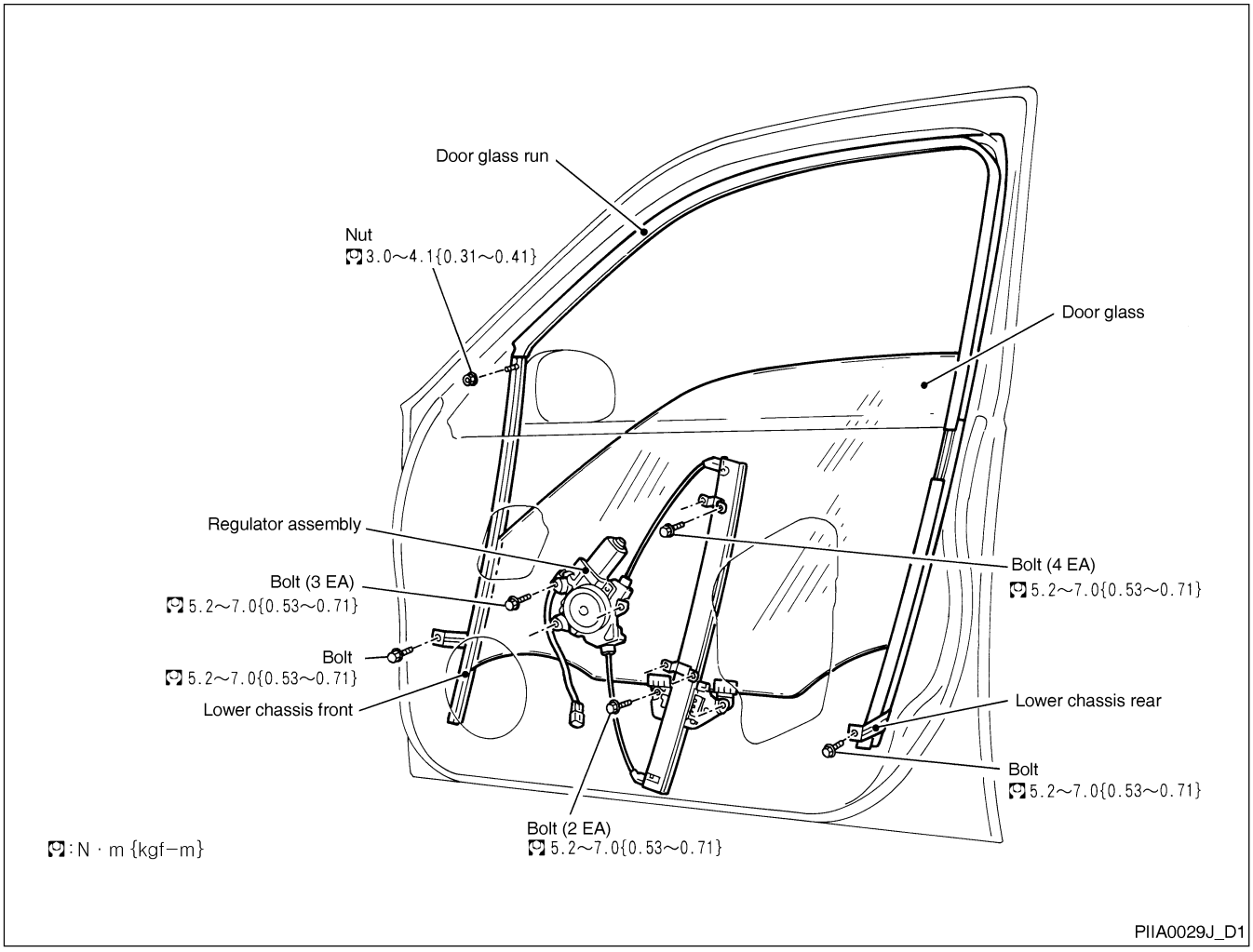
CAUTION:

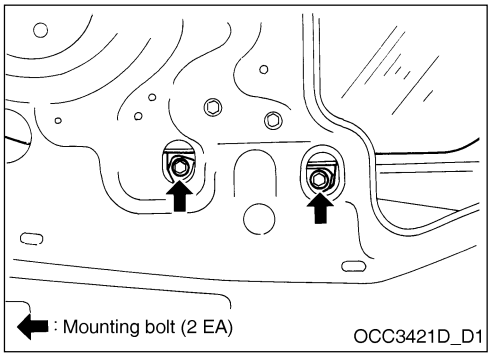
- **Leave the door glass open until the sealant hardens after installing the glass. Do not drive.**

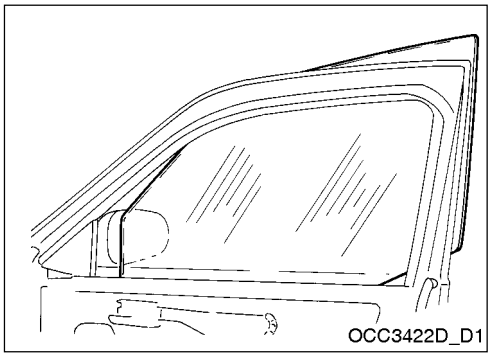
12. Inspect for any water leakage.
13. Remove the protector tape.
14. Install the removed components.

Front Door Glass and Regulator

Removal • Installation





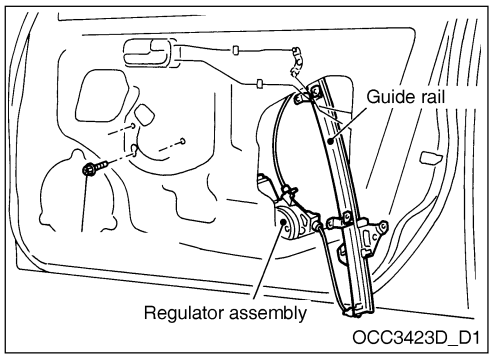


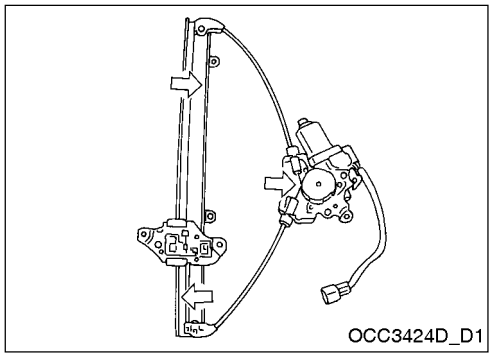
1. Remove the front door finisher.
2. Remove the sealing screen.

REFERENCE:

- **When reusing the sealing screen, cut the butyl tape with a cutter so that the butyl tape remains on the sealing screen.**

3. Operate the power window main switch and adjust the door glass until can see the carrier plate mounting bolt.
4. Remove the carrier plate mounting bolt.
5. Remove the door glass by lifting from the rear end and pulling out towards outside from the chassis.





6. Disconnect the regulator assembly connector.
7. Remove the regulator assembly and guide rail mounting bolts and pull out through the operation hole.

   Installation is in the reverse order of removal.

INSPECTION AFTER REMOVAL

Inspect the regulator assembly for the below items and replace or lubricate if defective.

- Wire wear.
- Regulator deformation.
- Lubrication condition on major moving parts.

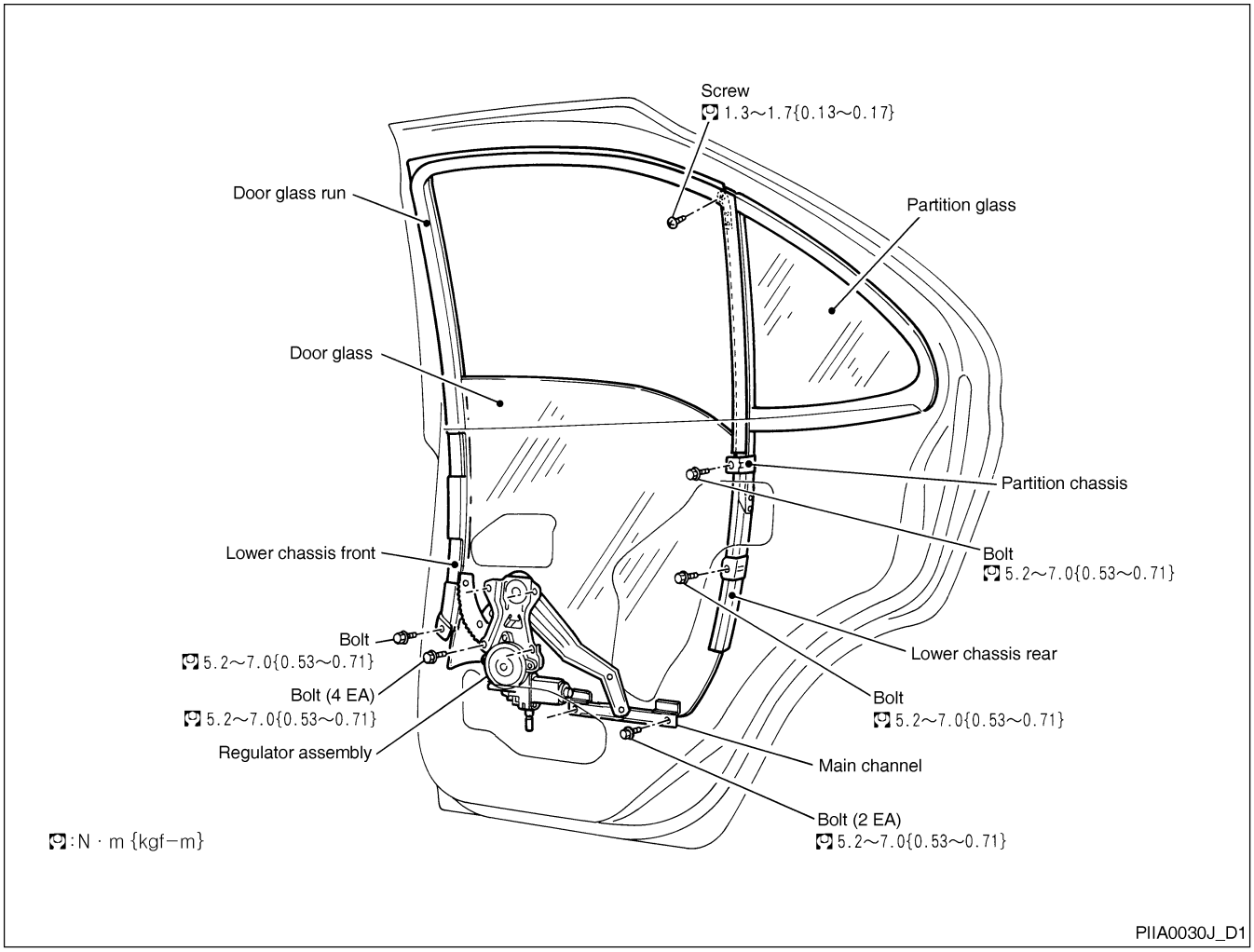
The arrow in the illustration shows the lubrication points.

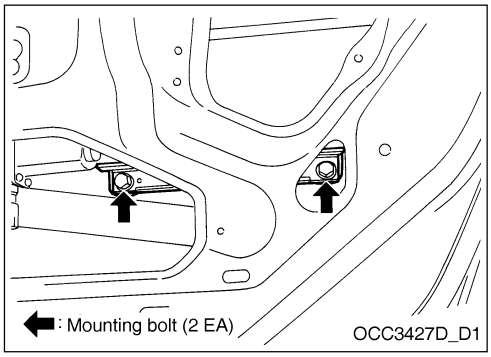
ASSEMBLING DIMENSION INSPECTION

- Check if the glass is securely installed into the glass run groove.
- Check for proper operation by moving the glass up and down.

Rear Door Glass and Regulator

Removal • Installation



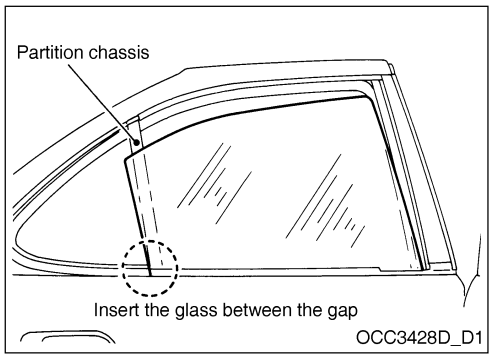


1. Remove the door outside molding.
2. Remove the rear door finisher.
3. Remove the sealing screen.

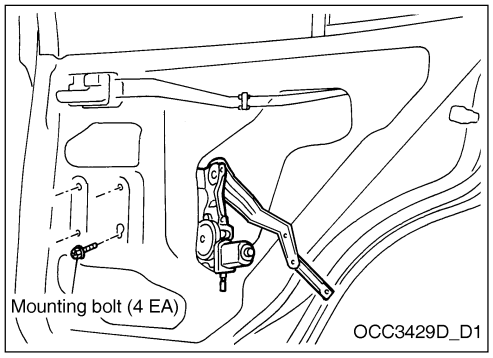
REFERENCE:

- **When reusing the sealing screen, cut the butyl tape with a cutter so that the butyl tape remains on the sealing screen.**

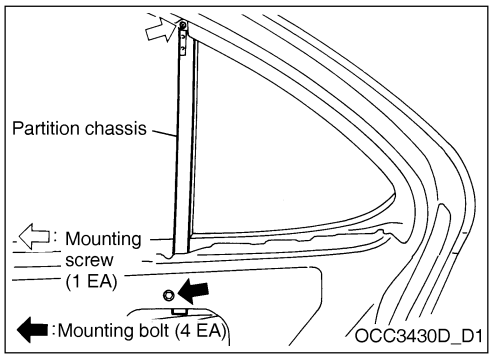
4. Remove the mounting bolts and remove the lower chassis rear towards the bottom.
5. Operate the power window main switch and adjust the door glass until can see the main channel mounting bolts.
6. Remove the main channel mounting bolts.



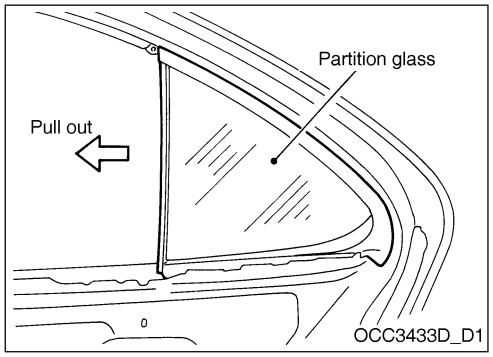
7. Lower the door glass to its bottom and remove the glass from the partition chassis's glass run.
8. Insert the glass in the gap between the partition chassis and door outer panel and remove the glass towards the outside of the door.
9. Disconnect the regulator assembly connector.



10. Remove the regulator assembly mounting bolts and remove it through the operation hole.

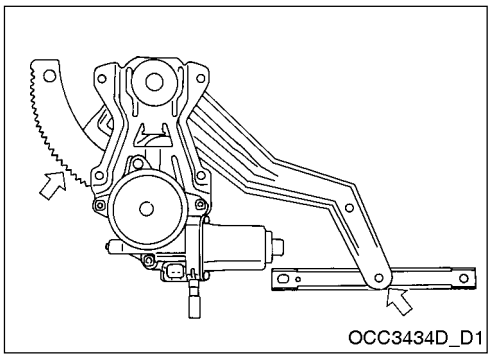


11. Remove the glass run partition chassis.
12. Remove the partition chassis mounting bolts (lower section) and screws (upper section).



13. Remove the partition glass.

Installation is in the reverse order of removal.



INSPECTION AFTER REMOVAL

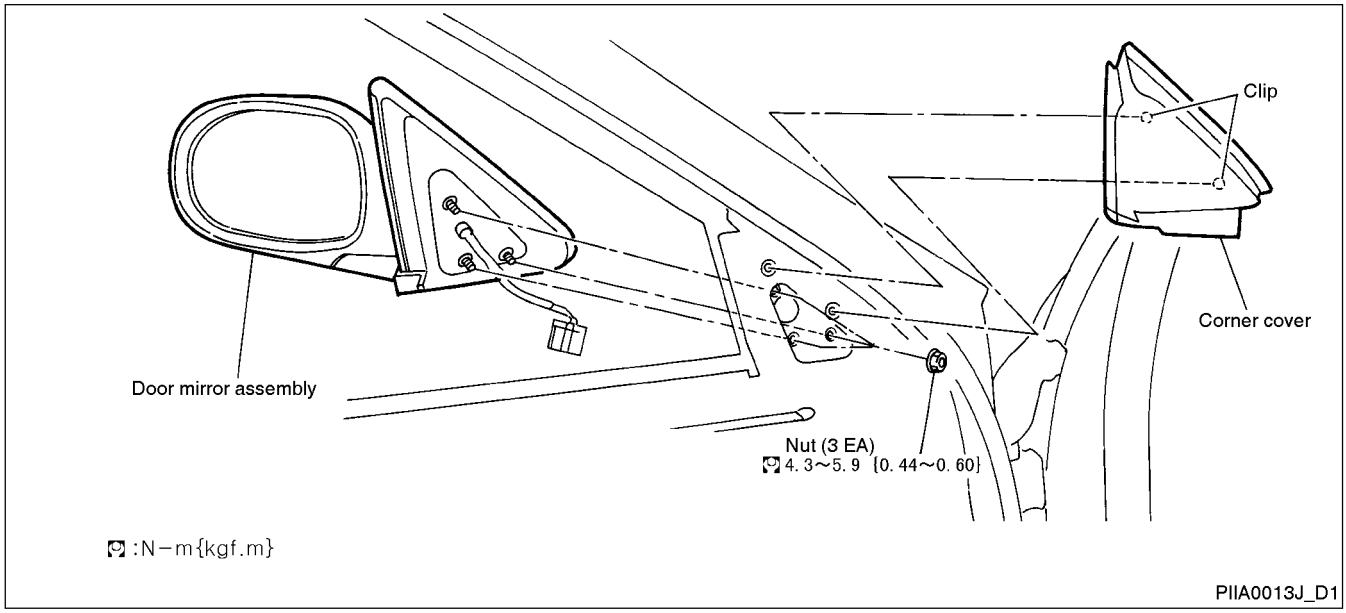
- Inspect the regulator assembly for the below items and replace or lubricate if defective.
  Gear wear
  Regulator deformation
  Spring damage
  Lubrication condition on major moving parts
- The arrow in the illustration shows the lubrication points.

ASSEMBLING DIMENSION INSPECTION

- Check if the glass is securely installed into the glass run groove.
- Check for proper operation by moving the glass up and down.

Door Mirror

Removal • Installation

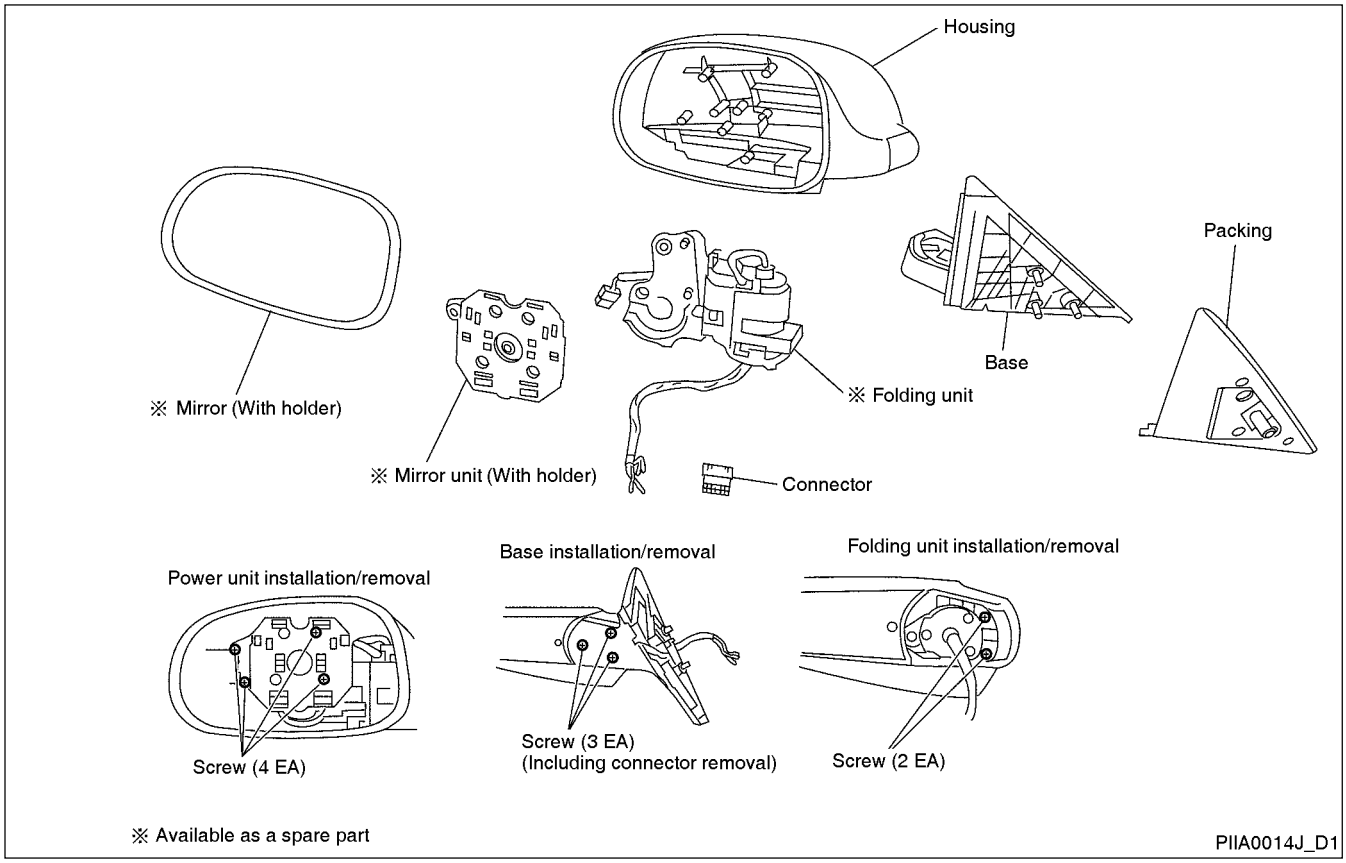


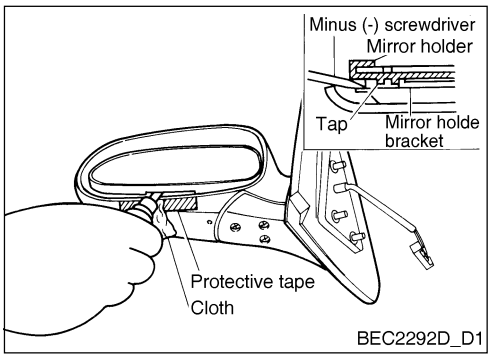
CAUTION:

- **Be careful not to damage the mirror assembly.**

1. Remove the corner cover (Remove it from the upper clip section).
2. Disconnect the door mirror harness connector.
3. Remove the door mirror mounting nuts and remove the door mirror assembly.
   Installation is in the reverse order of removal.

Disassembly • Assembly



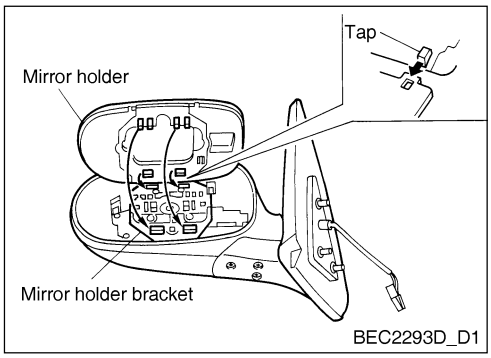


DISASSEMBLY

1. Fold up mirror.
2. Put a protective tape around the mirror body.
3. Insert a small minus (-) screwdriver into the gap between the mirror (mirror holder) and mirror holder bracket as in the illustration. Remove the bottom of the mirror holder by pressing and lifting up the mirror holder mounts (2 points).

CAUTION:

- **When pressing and lifting the mount, do not lift just one location too much. Always lift up 2 locations.**



ASSEMBLY

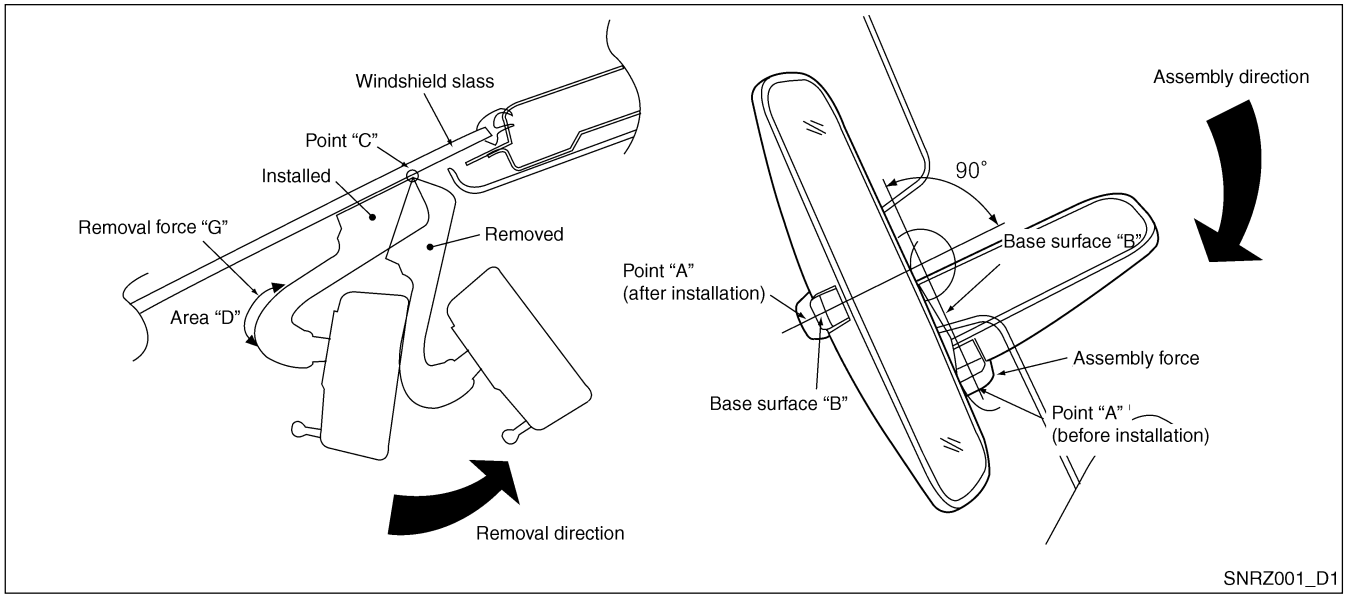
1. Position the mirror holder bracket and mirror body assembly (actuator) horizontal.
2. Install the mirror to the mirror holder bracket by facing the upper part of the mirror mounts forwards and press in the lower part of the mirror until clicks to install.

CAUTION:

- **Check the lower part of the mirror after assembly and make sure that the lower mount (2 locations) is securely installed.**

Inside Mirror

Removal • Installation



REMOVAL

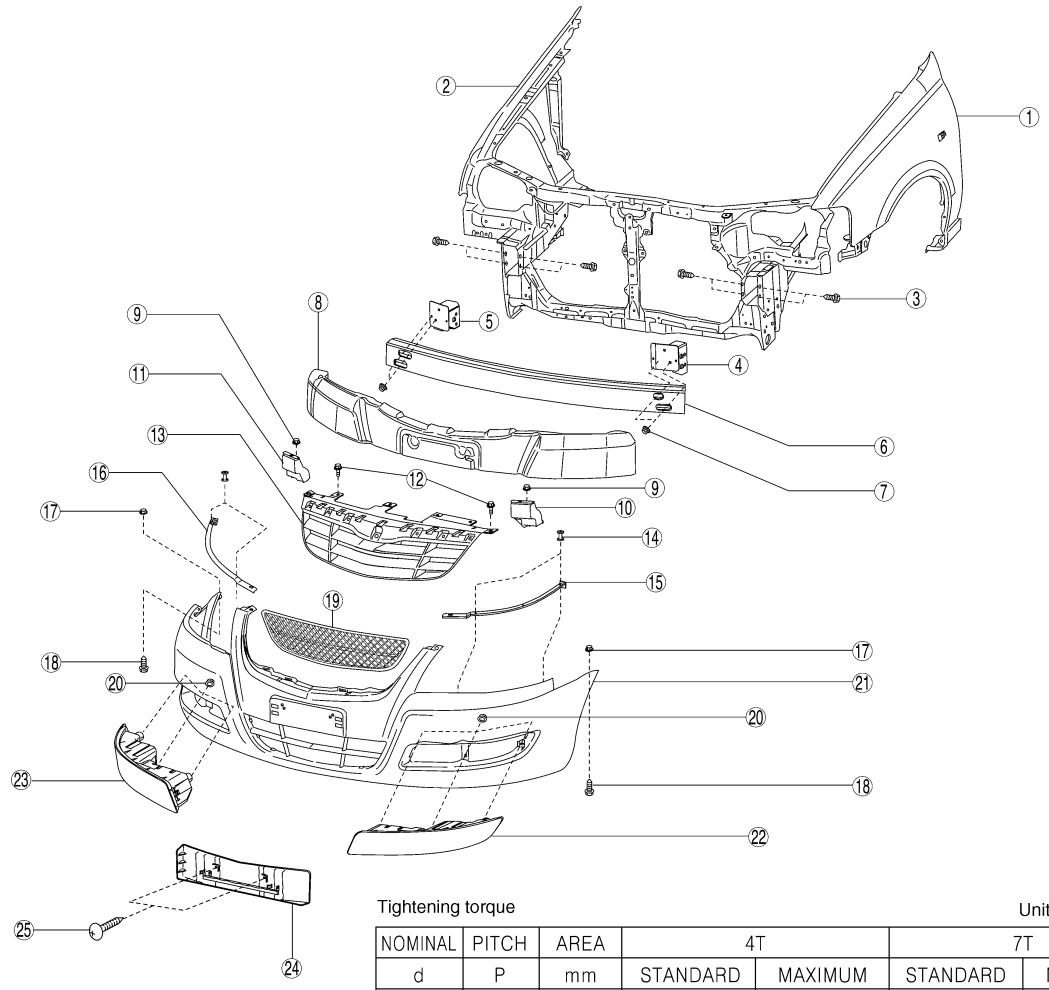
Push “D” area to removal direction.

INSTALLATION

Install the inside mirror to the windshield bracket placing it vertically to the base surface “B” and assemble the inside mirror by rotating it 90° to the assembling direction with the force “F” (less than 147 N).

Front Bumper

Removal • Installation



Tightening torque

Unit: N·m (kgf-m)

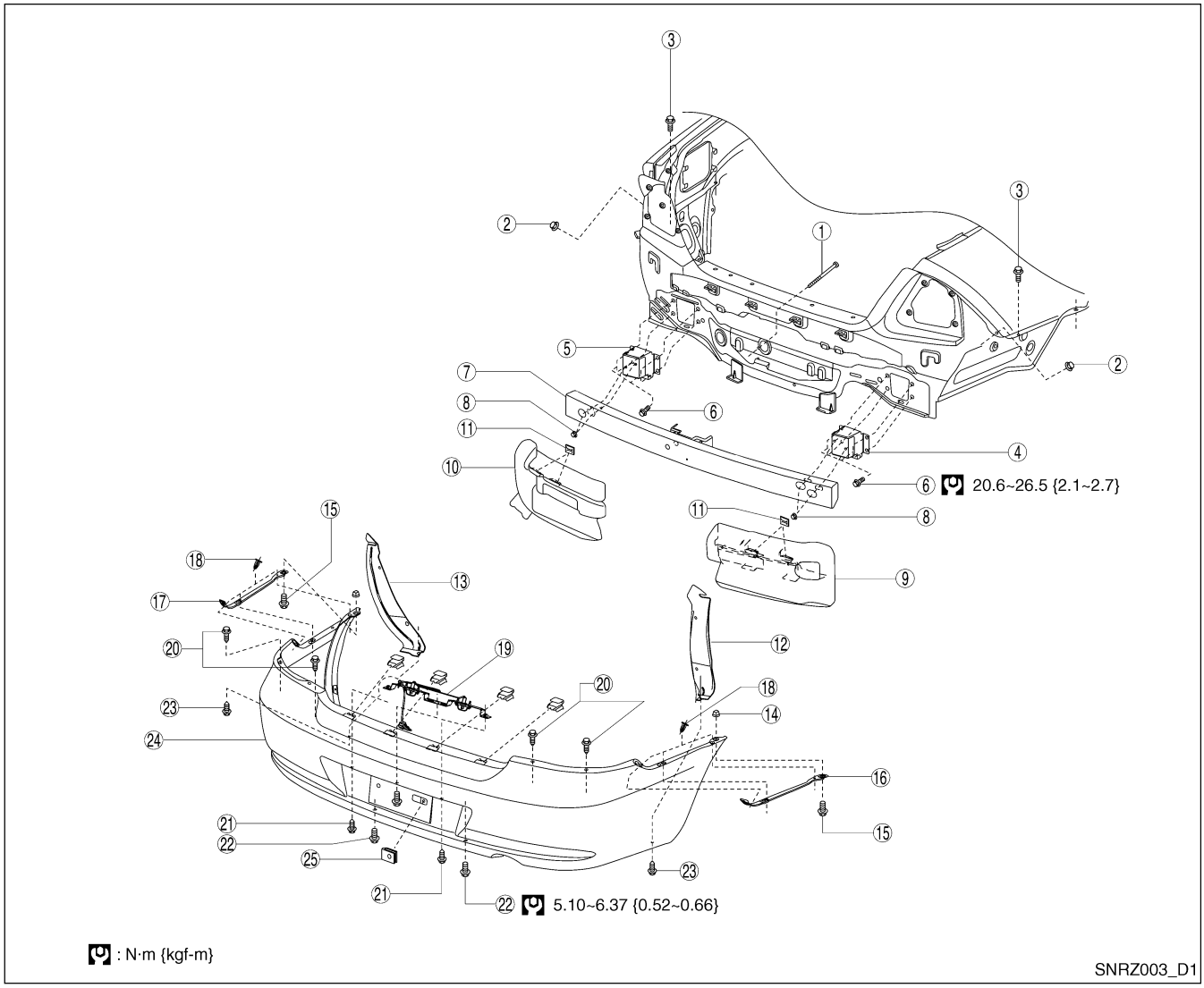
NOMINAL	PITCH	AREA	4T		7T	
d	P	mm	STANDARD	MAXIMUM	STANDARD	MAXIMUM
M5	0.8	14.2	2.94 (0.30)	3.82 (0.39)	5.001 (0.51)	6.37 (0.65)
M6	1.0	20.1	5.10 (0.52)	6.37 (0.66)	8.43 (0.86)	10.8 (1.1)
M8	1.25	36.6	12.7 (1.3)	15.7 (1.6)	20.6 (2.1)	26.5 (2.7)
	1.0	39.2	12.7 (1.3)	16.7 (1.7)	21.6 (2.2)	28.4 (2.9)
M10	1.5	58.0	24.5 (2.5)	31.1 (3.2)	41.2 (4.2)	52.0 (5.3)
	1.25	61.2	25.5 (2.6)	32.4 (3.3)	43.1 (4.4)	54.9 (5.6)

PIIB8642E

① Front fender (LH)
② Front fender (RH)
③ Bolts (8 EA)
④ Front bumper stay (LH)
⑤ Front bumper stay (RH)
⑥ Front bumper beam
⑦ Nuts (4 EA)
⑧ Front bumper energy absorber
⑨ Nuts (4 EA)
⑩ Front bumper bracket (LH)
⑪ Front bumper bracket (RH)
⑫ Clips (2 EA)
⑬ Radiator grille
⑭ Rivets (4 EA)
⑮ Front bumper side bracket (LH)
⑯ Front bumper side bracket (RH)
⑰ Screw grommets (2 EA)
⑱ Screws (4 EA)
⑲ Front fascia low grille
⑳ Nuts (6 EA)
㉑ Front bumper fascia
㉒ Fog lamp (LH)
㉓ Fog lamp (RH)
㉔ License plate
㉕ Screws (2 EA)

Rear Bumper

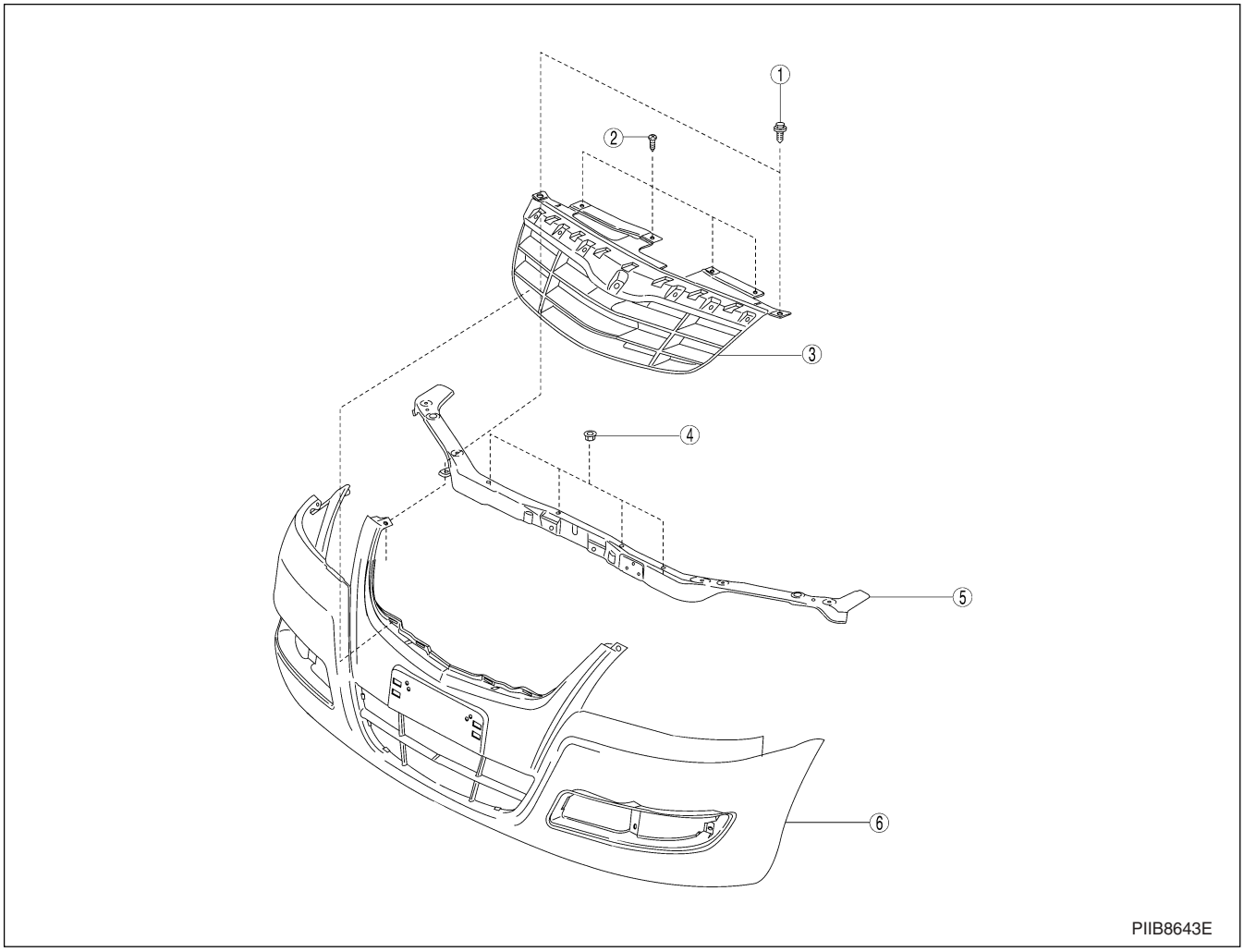
Removal • Installation



① Long bolt
② Nuts (2 EA)
③ Bolts (2 EA)
④ Rear bumper stay (LH)
⑤ Rear bumper stay (RH)
⑥ Bolts (8 EA)
⑦ Rear bumper beam
⑧ Nuts (4 EA)
⑨ Rear bumper energy absorber (LH)
⑩ Rear bumper energy absorber (RH)
⑪ Clip pushes (2 EA)
⑫ Rear bumper closing (LH)
⑬ Rear bumper closing (RH)
⑭ Screw grommets (2 EA)
⑮ Screws (2 EA)
⑯ Rear bumper side bracket (LH)
⑰ Rear bumper side bracket (RH)
⑱ Trim clips (6 EA)
⑲ License plate
⑳ Clips (4 EA)
㉑ Screws (2 EA)
㉒ Screws (2 EA)
㉓ Screws (2 EA)
㉔ Rear bumper fascia
㉕ Spring nut (1 EA)

Front Grille

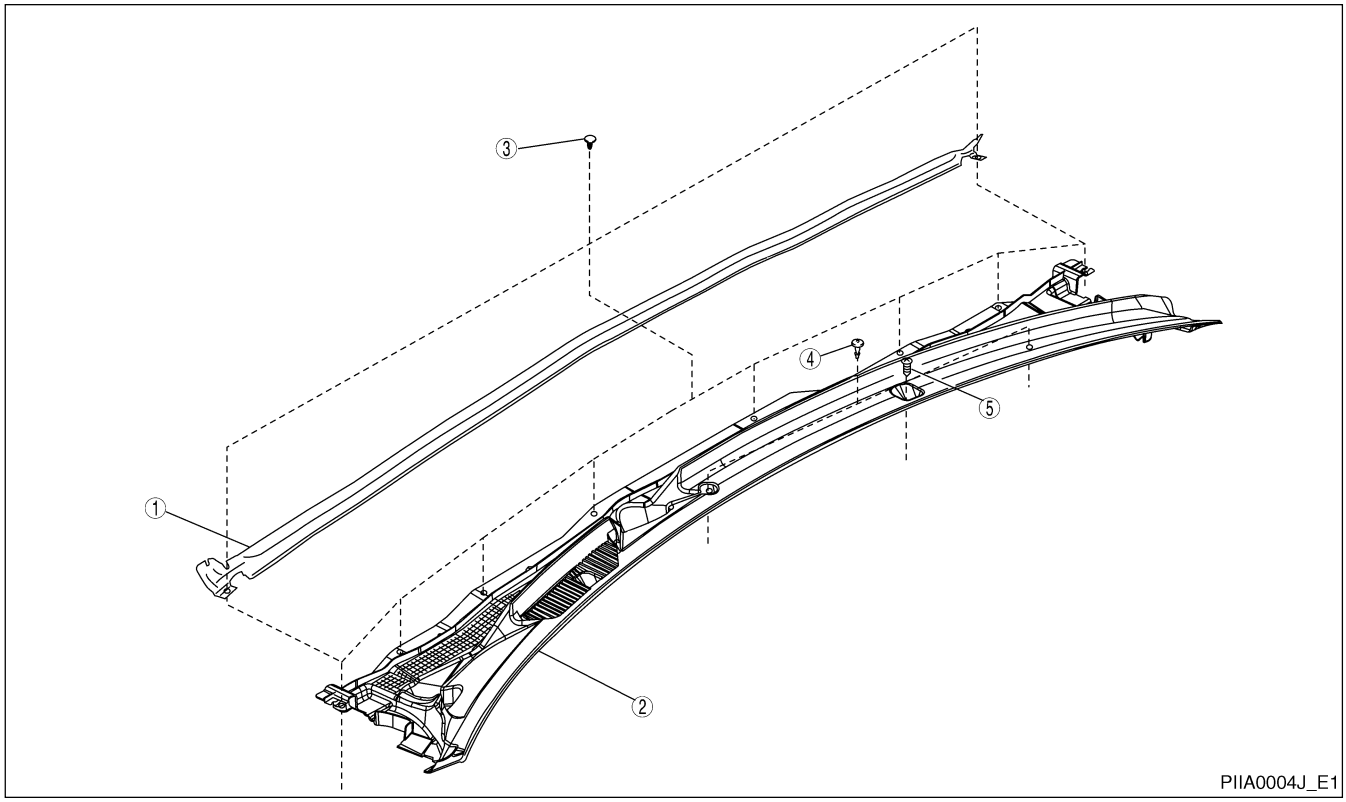
Removal • Installation



① Clips (2 EA)
② Tap screws (4 EA)
③ Radiator grille assembly
④ Screw grommets (4 EA)
⑤ Radiator core support
⑥ Front bumper fascia

Cowl Top Cover

Removal • Installation



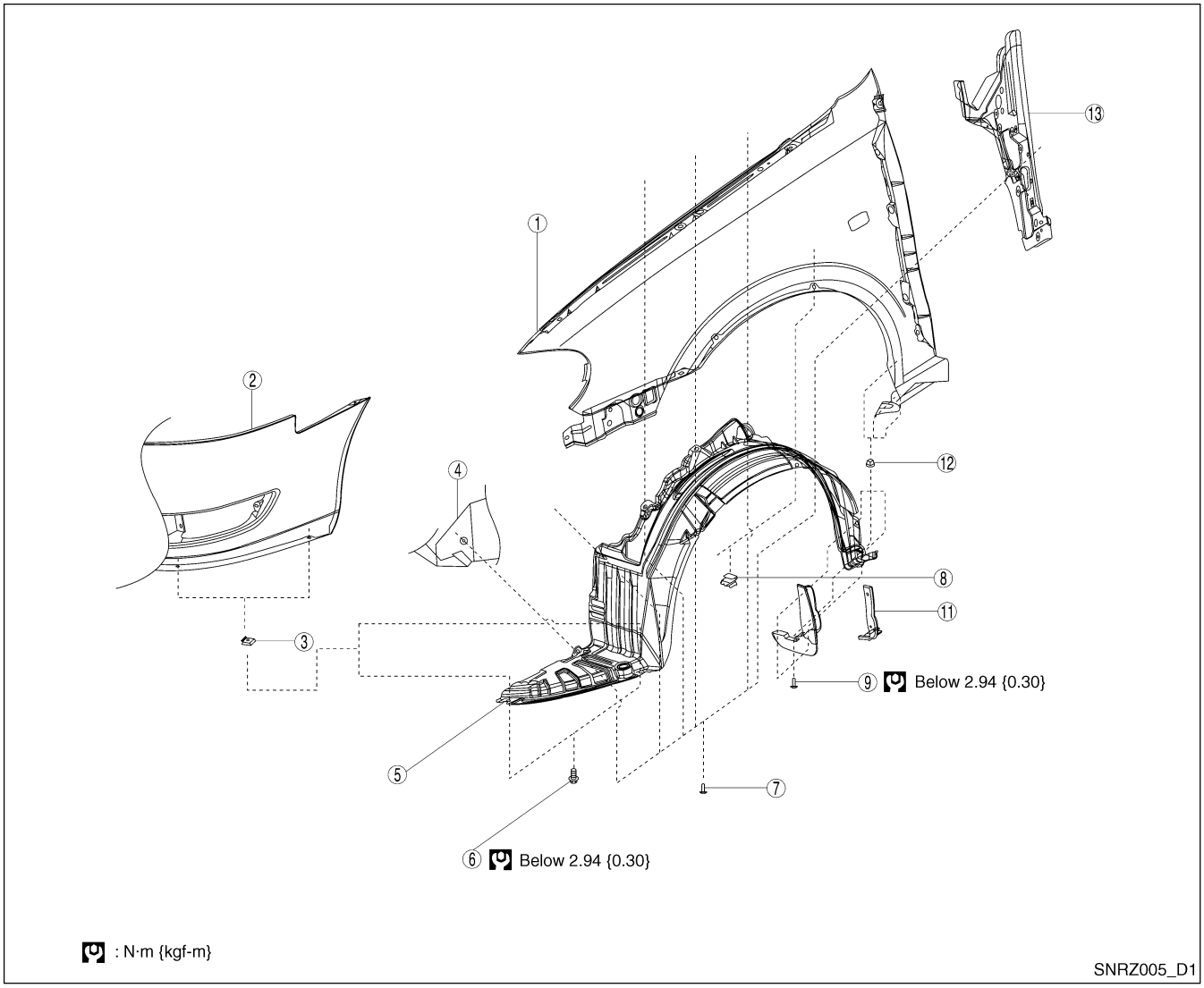
① Cowl top seal rubber
② Cowl top cover
③ Clips (8 EA)
④ Clips (2 EA)
⑤ Screw (1 EA)

ACCOMPANYING WORKS

- Wiper arm removal/installation.
- Windshield side molding removal/installation.

Fender Protector

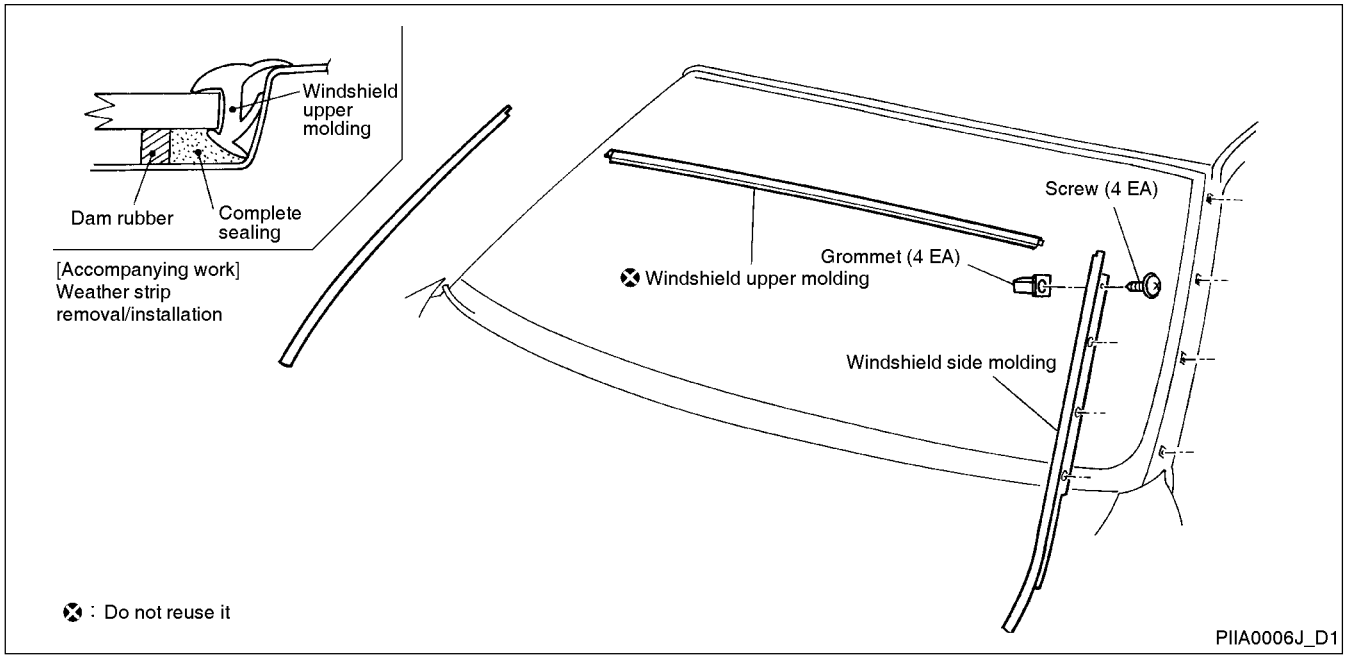
Removal • Installation



① Front fender
② Bumper fascia
③ Clips (R/L: 2 EA)
④ Underside cover
⑤ Fender protector
⑥ Screws (R/L: 2 EA)
⑦ Clips (R/L: 6 EA)
⑧ Clips (R/L: 2 EA)
⑨ Screws (R/L: 3 EA)
⑩ Front mud guard
⑪ Protector chipping
⑫ Screw grommets (R/L: 3 EA)
⑬ Dash side

Windshield Molding

Removal • Installation



(Accompanying work)

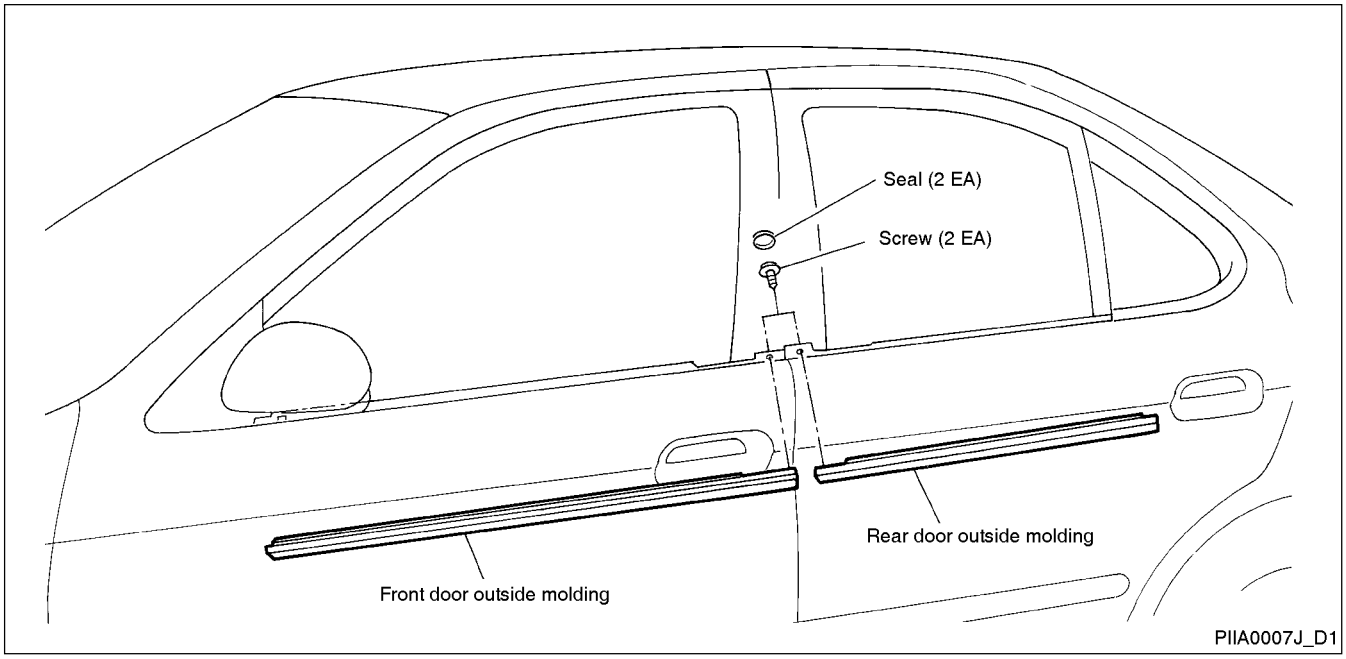
- Weather strip removal/installation (at windshield molding)

CAUTION:

- **The windshield upper molding removal and installation is included in windshield glass assembly.**

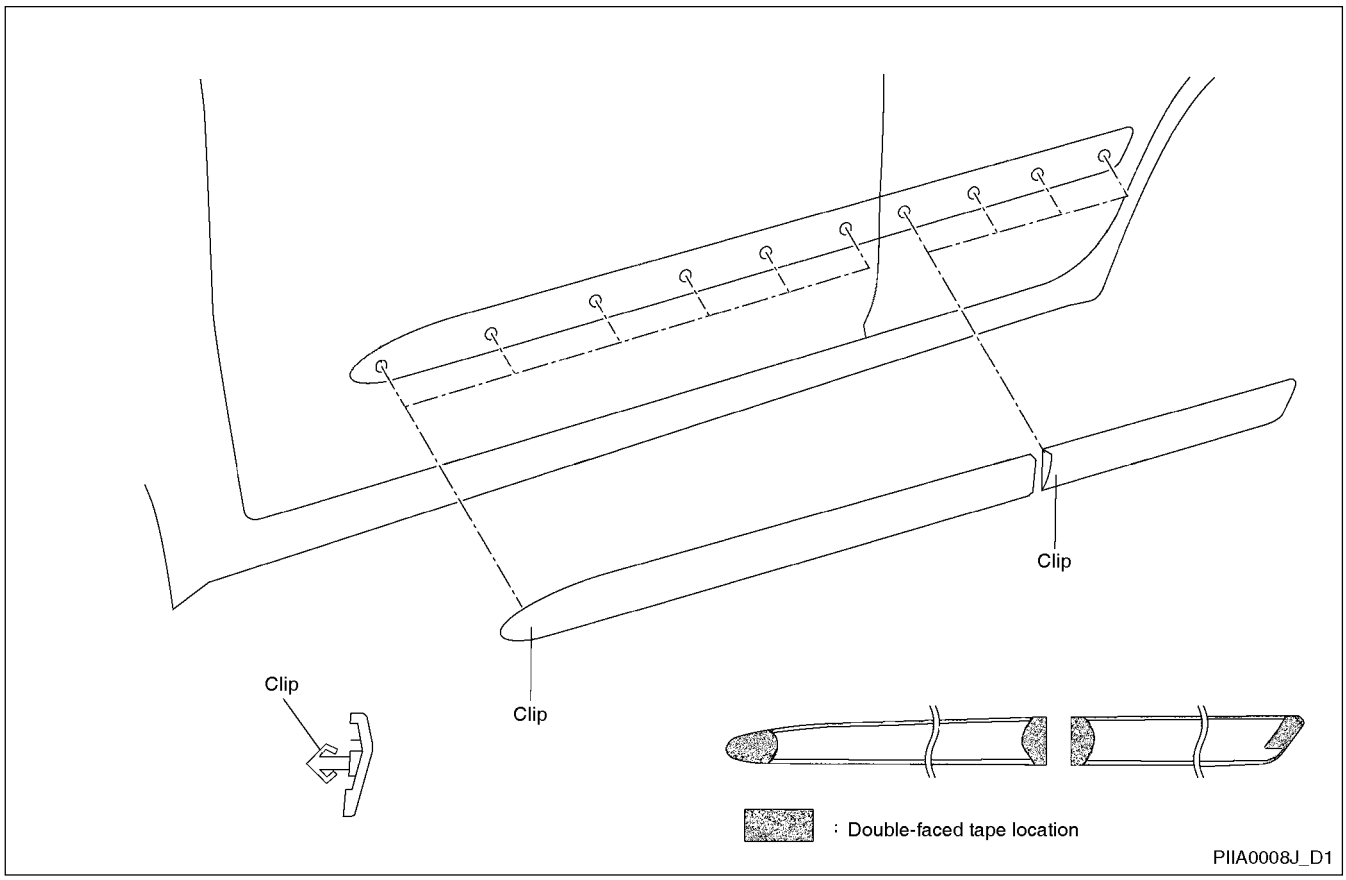
Door Outside Molding

Removal • Installation



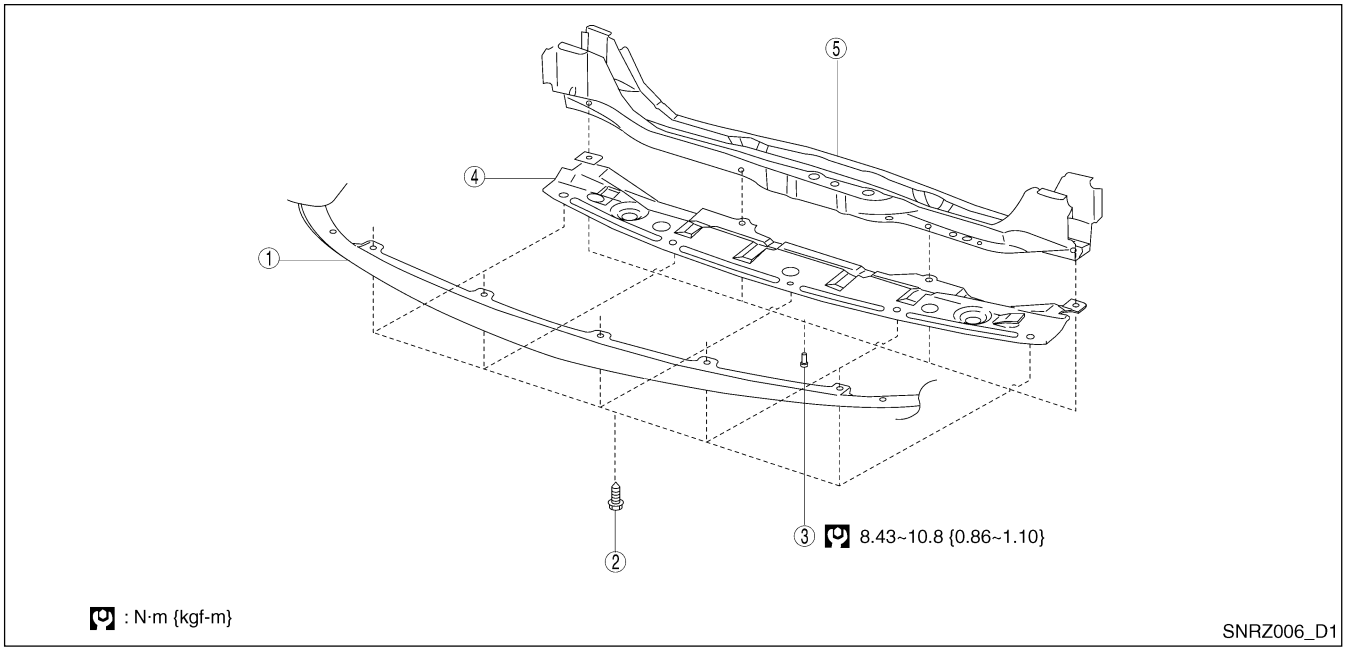
Side Guard Molding

Removal • Installation



Front Bumper Cover

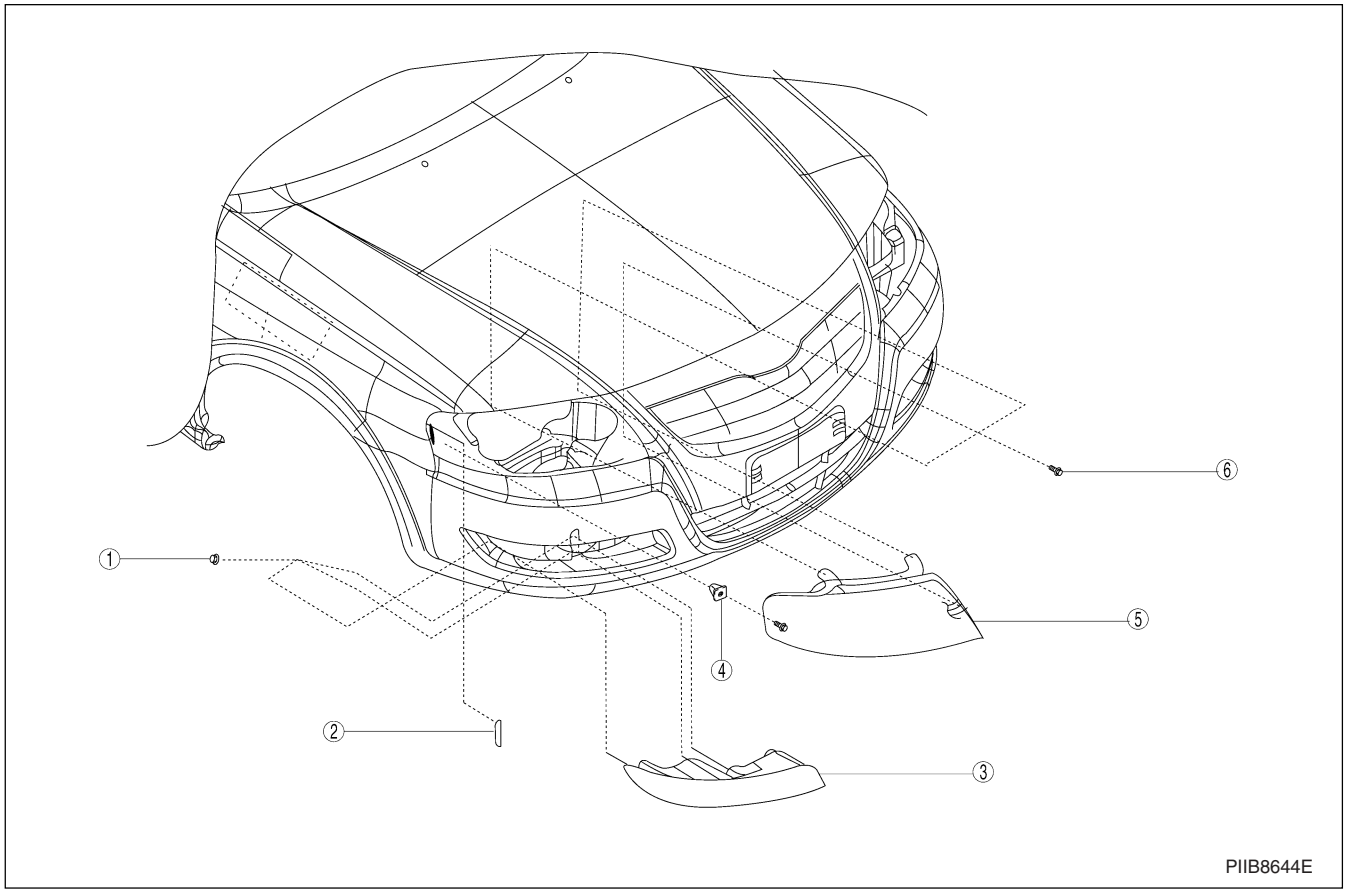
Removal • Installation



① Front bumper fascia
② Clips (5 EA)
③ Screws (4 EA)
④ Front bumper cover
⑤ Radiator core support

Headlamp/Turn Signal Lamp

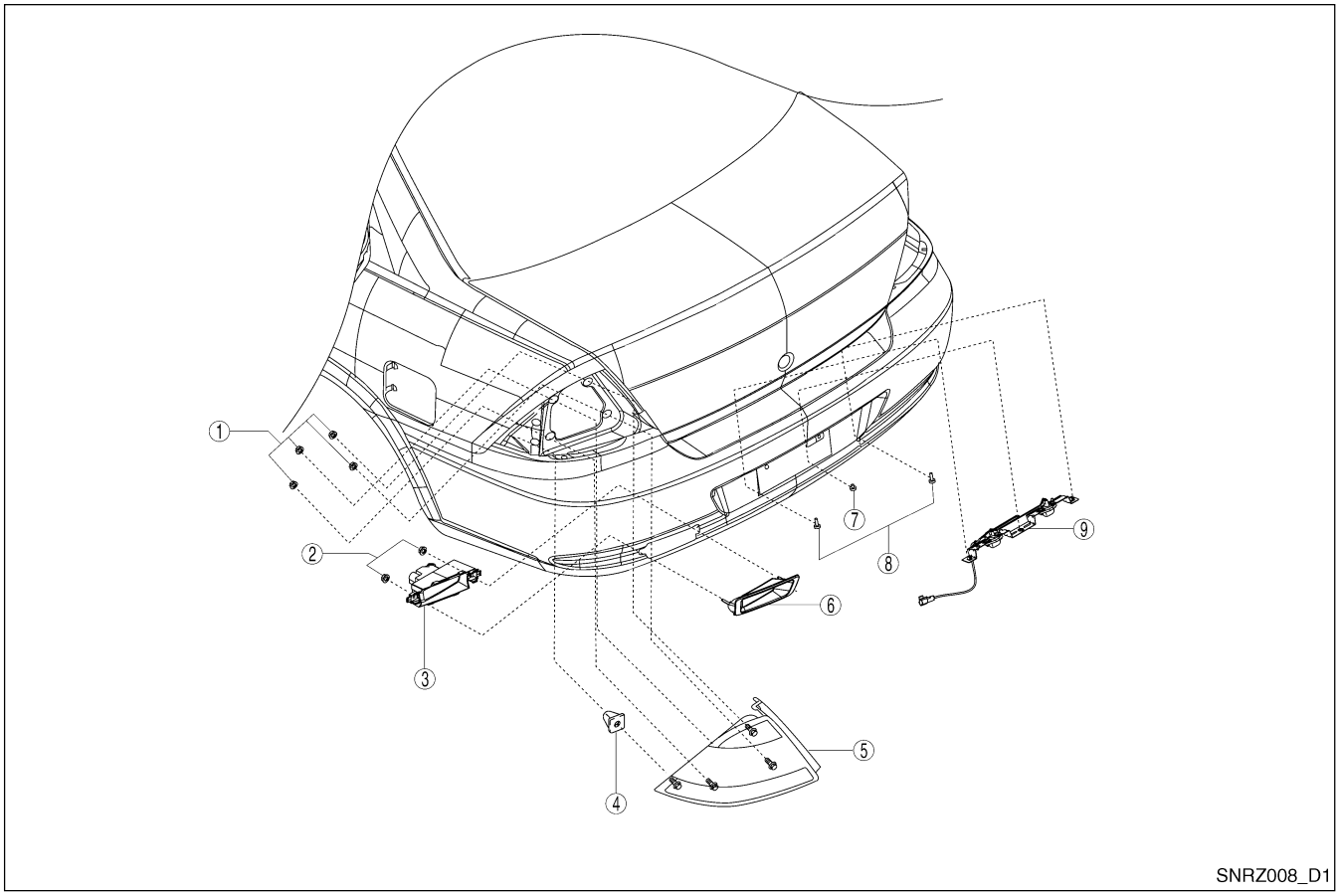
Removal • Installation



① Nuts (3 EA)
② Front fender tape
③ Turn signal lamp assembly
④ Grommet (1 EA)
⑤ Headlamp assembly
⑥ Screws (3 EA)

Rear Combination/Rear Fog Lamp

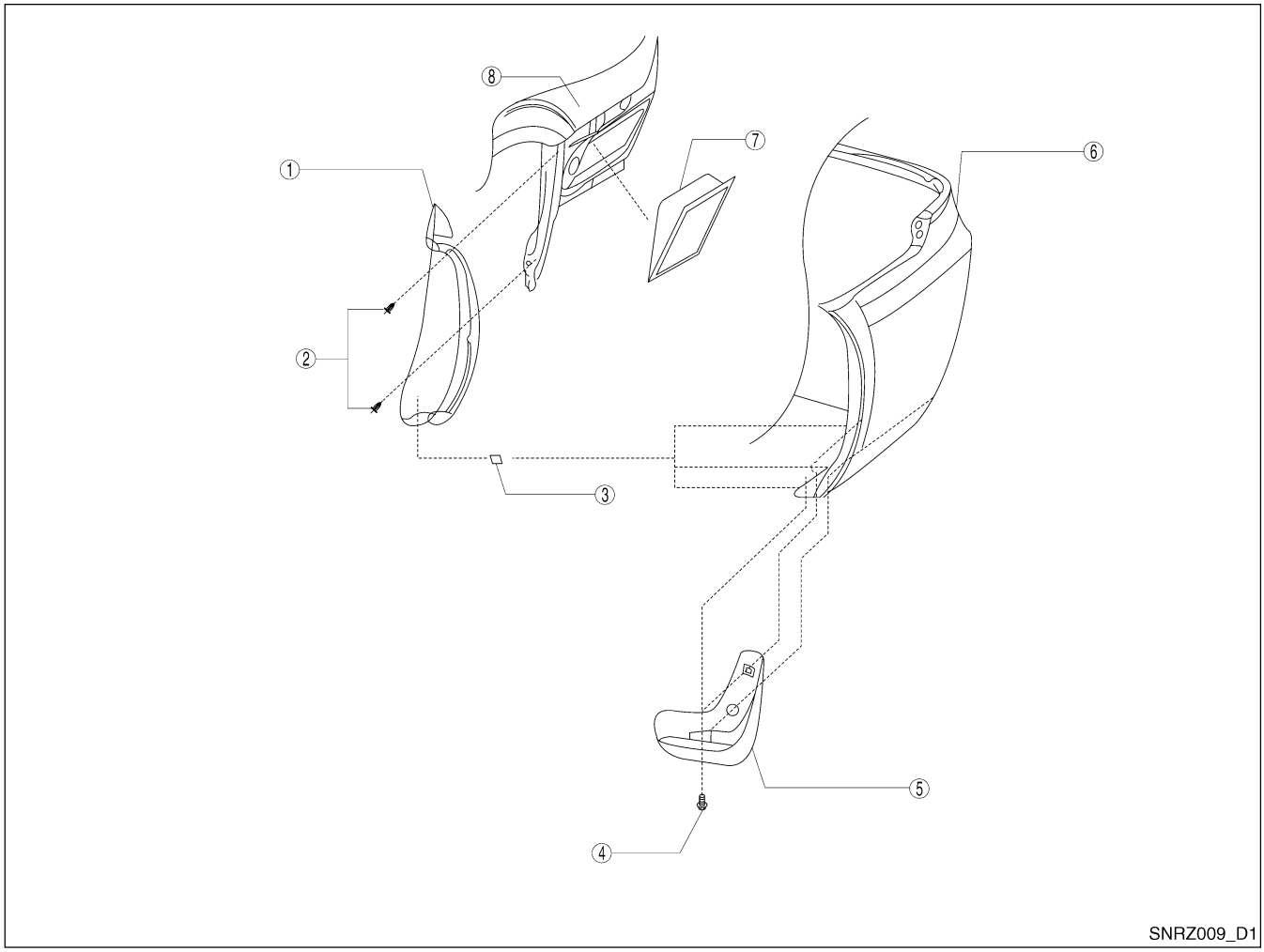
Removal • Installation



① Nuts (4 EA)
② Nuts (2 EA)
③ Rear fog lamp bracket
④ Grommet (1 EA)
⑤ Rear combination lamp assembly
⑥ Rear fog lamp assembly (for export)
⑦ Trim clip
⑧ Screws (2 EA)
⑨ License plate assembly

Rear Mud Guard

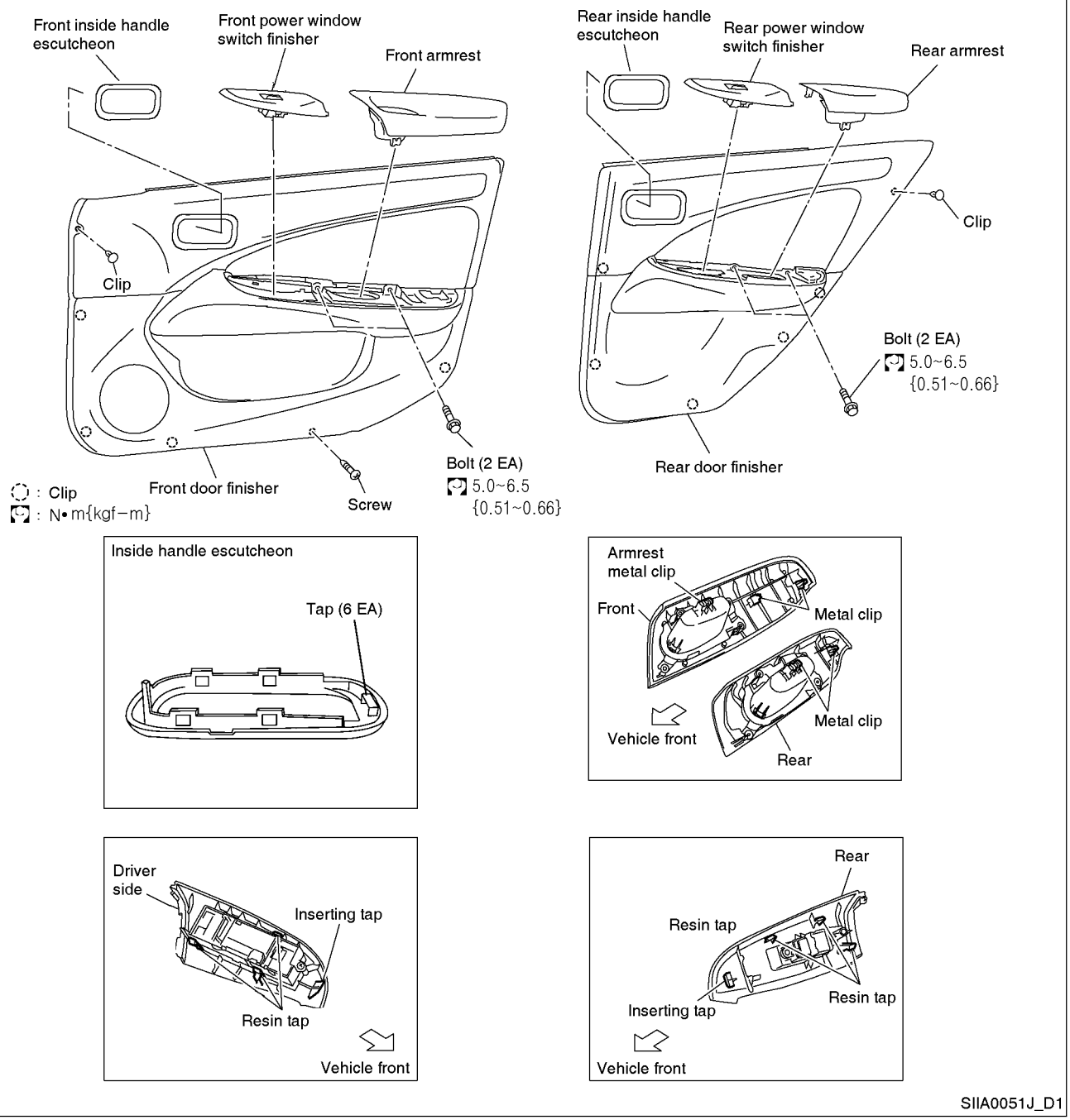
Removal • Installation



① Rear bumper closing
② Trim clips (2 EA)
③ Spring nuts (3 EA)
④ Tap screws (3 EA)
⑤ Rear mud guard
⑥ Rear bumper fascia
⑦ Air draft assembly
⑧ Rear fender

Door Trim

Removal • Installation



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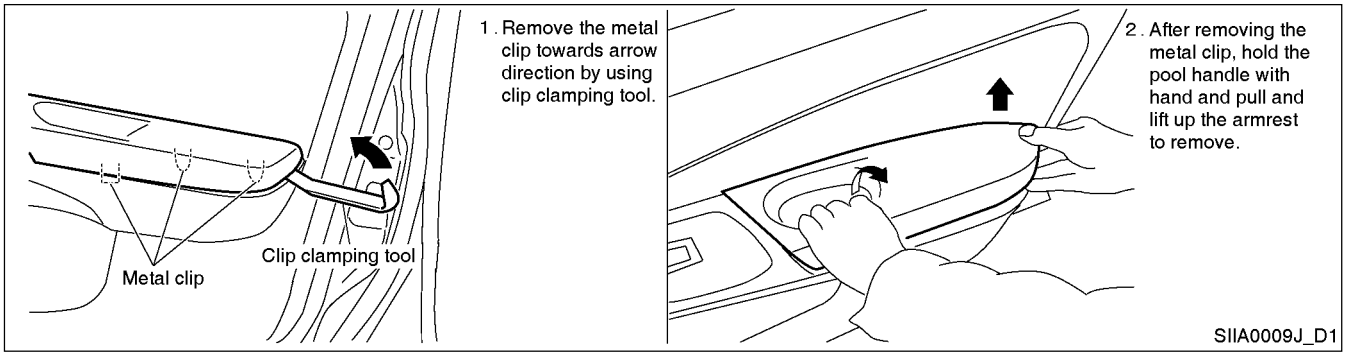
FRONT AND REAR

1. Remove the armrest.



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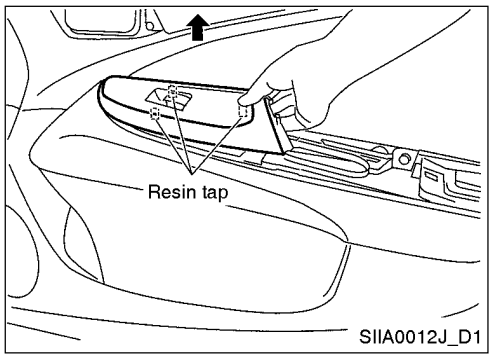
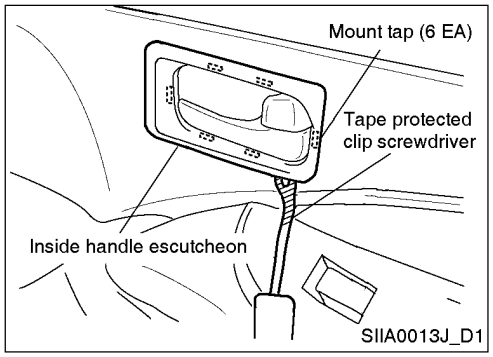
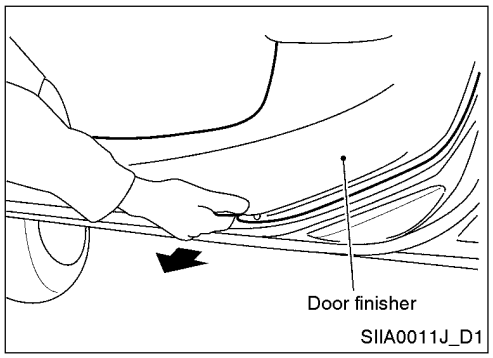


2. Remove the power window switch finisher by holding and lifting up the rear end. Disconnect the power window switch connector.

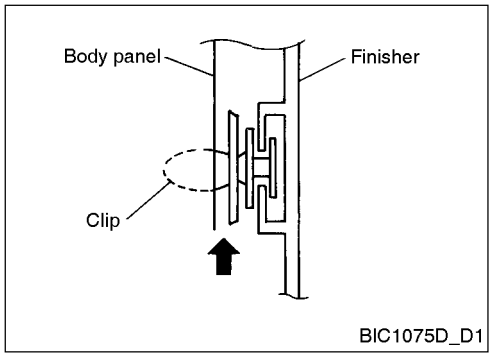


3. Insert a cloth protected minus (-) screwdriver into the gap at the center bottom of the inside handle escutcheon and remove it by disconnecting the 6 connection mounts.



4. Remove the door finisher mounting screws (front door), clip and the bolt.
5. Insert the hand into the door finisher lower opening, pull out and remove the clip.
6. Remove the door finisher by pulling upwards.

Installation is in the reverse order of removal.



REFERENCE:

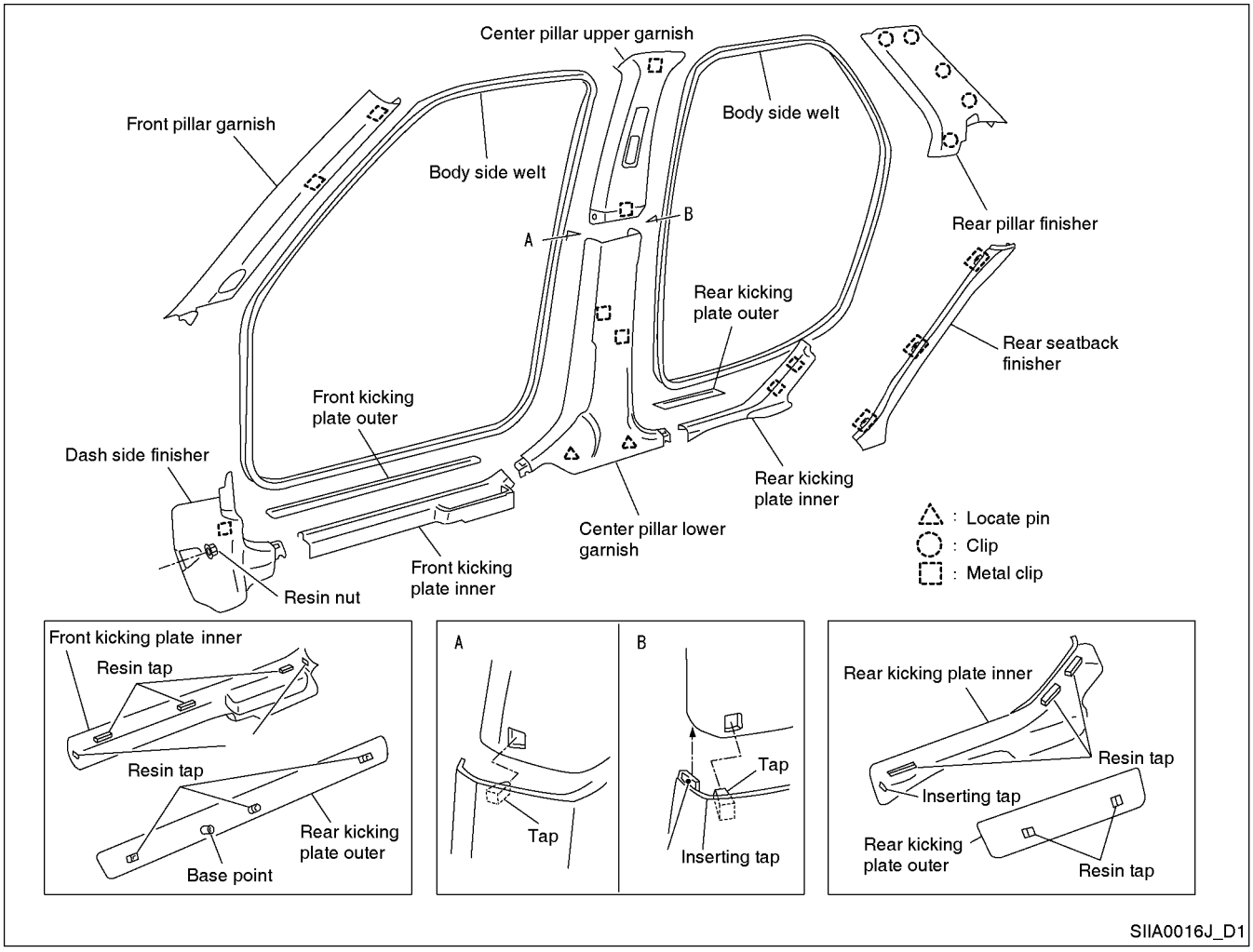
- **Insert the clip driver or clip clamping tool into the arrow location (between the body panel and clip) and remove the finisher.**

CAUTION:

- **During finisher installation, check if the clip is securely inserted into the body panel holes. Then push it in.**

Body Side Trim

Removal • Installation



CENTER PILLAR LOWER GARNISH

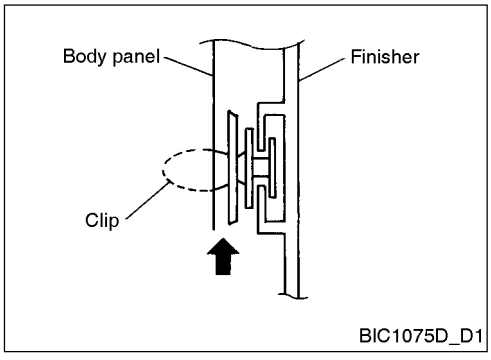
- Front and rear kicking plate inner removal/installation.

CENTER PILLAR UPPER GARNISH

- Seatbelt shoulder anchor removal/installation.
- Front and rear kicking plate inner and center pillar lower garnish removal/installation.

REAR PILLAR FINISHER

- Rear seat removal/installation.



REAR SEATBACK FINISHER

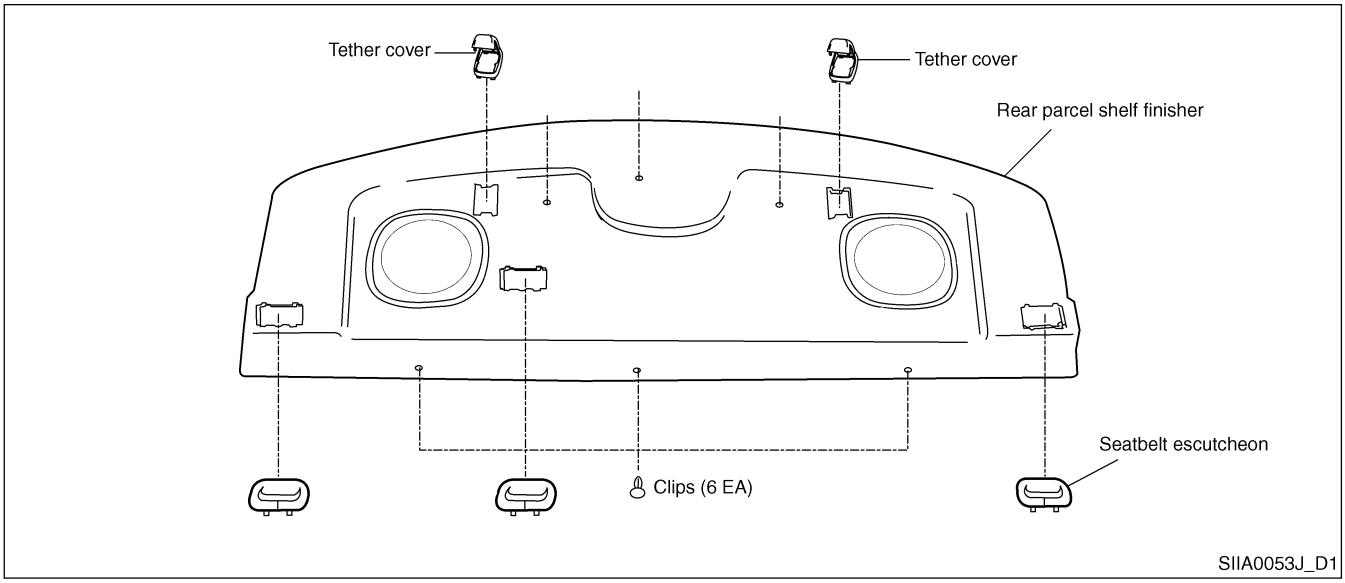
- Rear seat and rear pillar finisher removal/installation.

CAUTION:

- **Insert a cloth protected screwdriver or clip driver into the arrow location (between the body panel and clip) and remove the clip.**
- **During installation, check if the clip is securely inserted into the chassis panel holes. Then push it in.**

Rear Partial Self Finisher

Removal • Installation

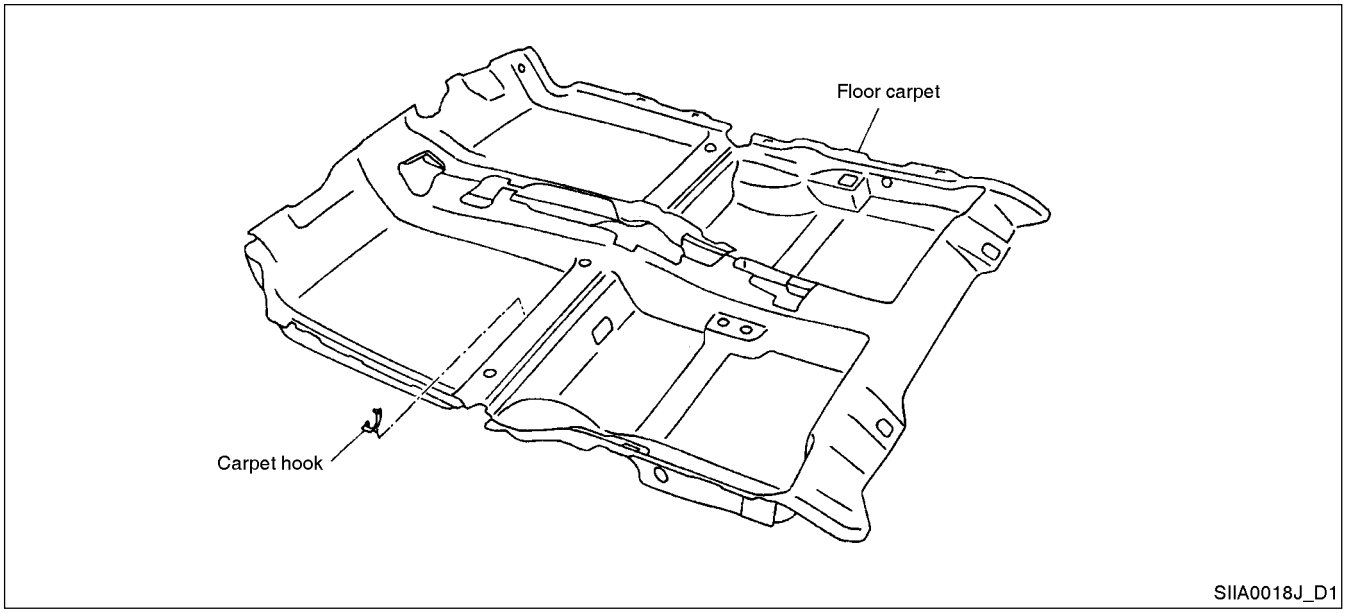


(Accompanying works)

- Rear seat removal/installation.
- Rear pillar finisher removal/installation.
- Rear seatbelt floor anchor bolt removal/installation.

Floor Trim

Removal • Installation

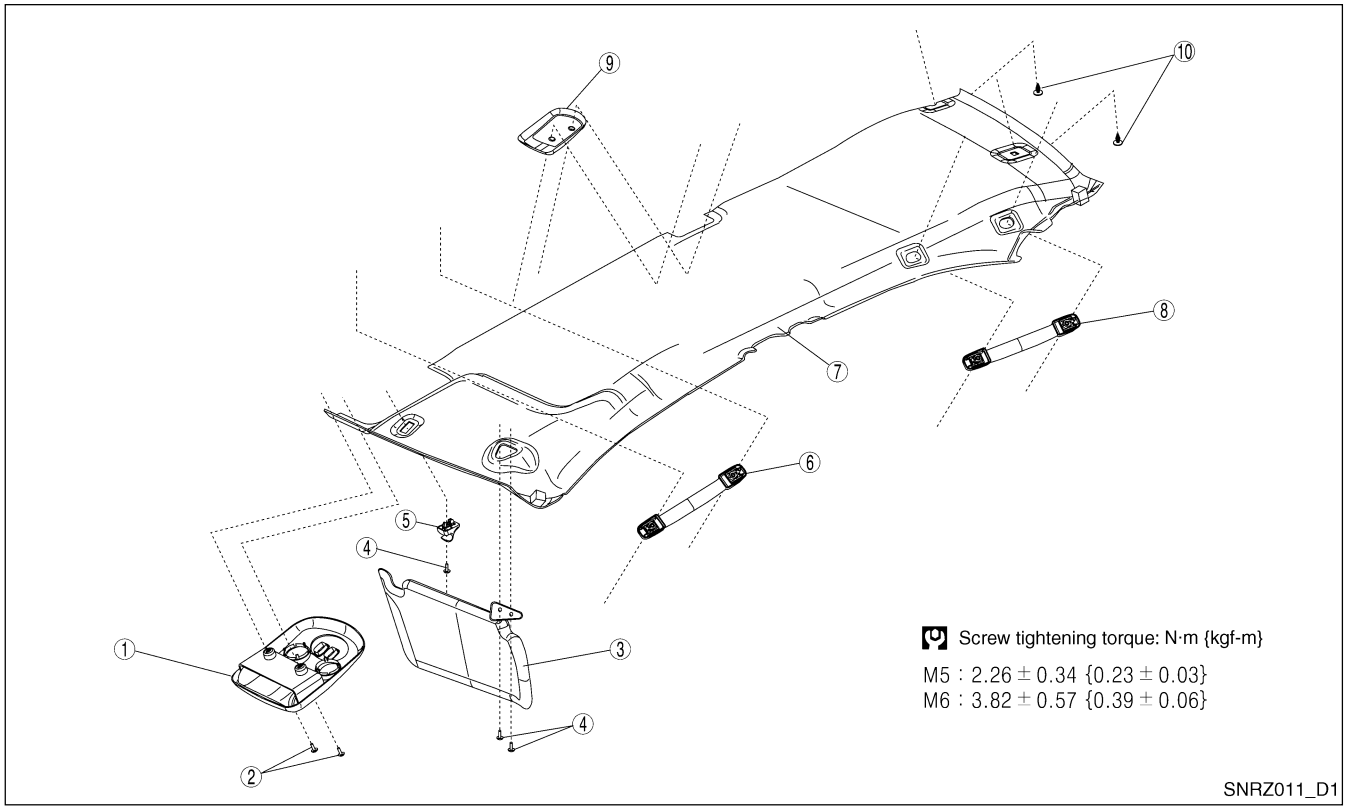


(Accompanying works)

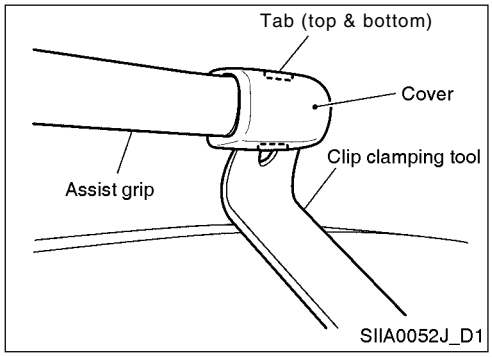
- Front seat and rear seat cushion removal/installation.
- Center console removal/installation.
- Instrument lower cover and instrument lower center panel removal/installation.
- Instrument stay removal/installation.
- Front seatbelt floor anchor bolt removal/installation.
- Front and rear kicking plate inner and body side welt removal/installation.
- Dash side finisher and center pillar lower garnish removal/installation.

Head Lining

Removal • Installation

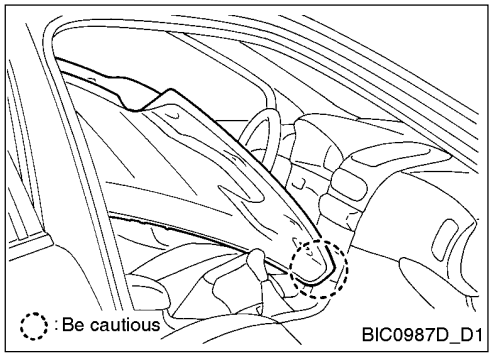


① Map lamp assembly
② Tap screws (2 EA)
③ Sun visor (R/L:1EA)
④ Tap screws (R/L:1EA)
⑤ Sun visor holder (R/L:1EA)
⑥ Assist clip (RH)
⑦ Headlining
⑧ Assist clip (R/L:1EA)
⑨ Room lamp
⑩ Trim clips (3 EA)

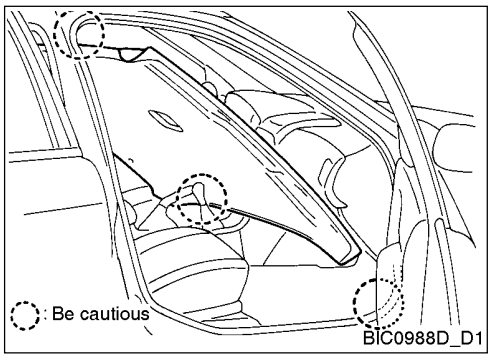


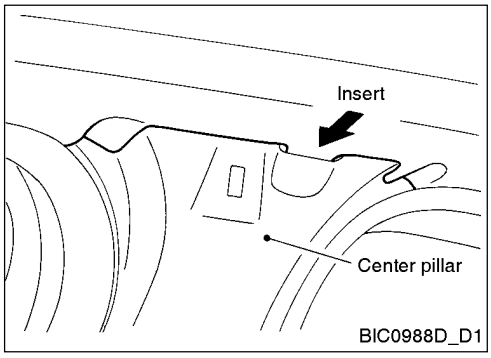
(Accompanying works)

- Center pillar garnish removal/installation.
- Body side welt removal/installation.
- Front pillar and rear pillar finisher removal/installation.
  (Point) Assist grip
- Using the clip clamping tool, remove the assist grip cover's top and bottom mounts. Place it sideways and remove the screws (each 1 EA left and right).



1. Tilt the head lining and pass the right side through in between the shift knob and lower cluster lid C.





2. Remove the head lining from the passenger's door opening.

CAUTION:

- **Two people must work together during removal.**
- **Place a cloth cover around the instrument assembly to prevent from scratching.**
- **Do not excessively bend the head lining.**

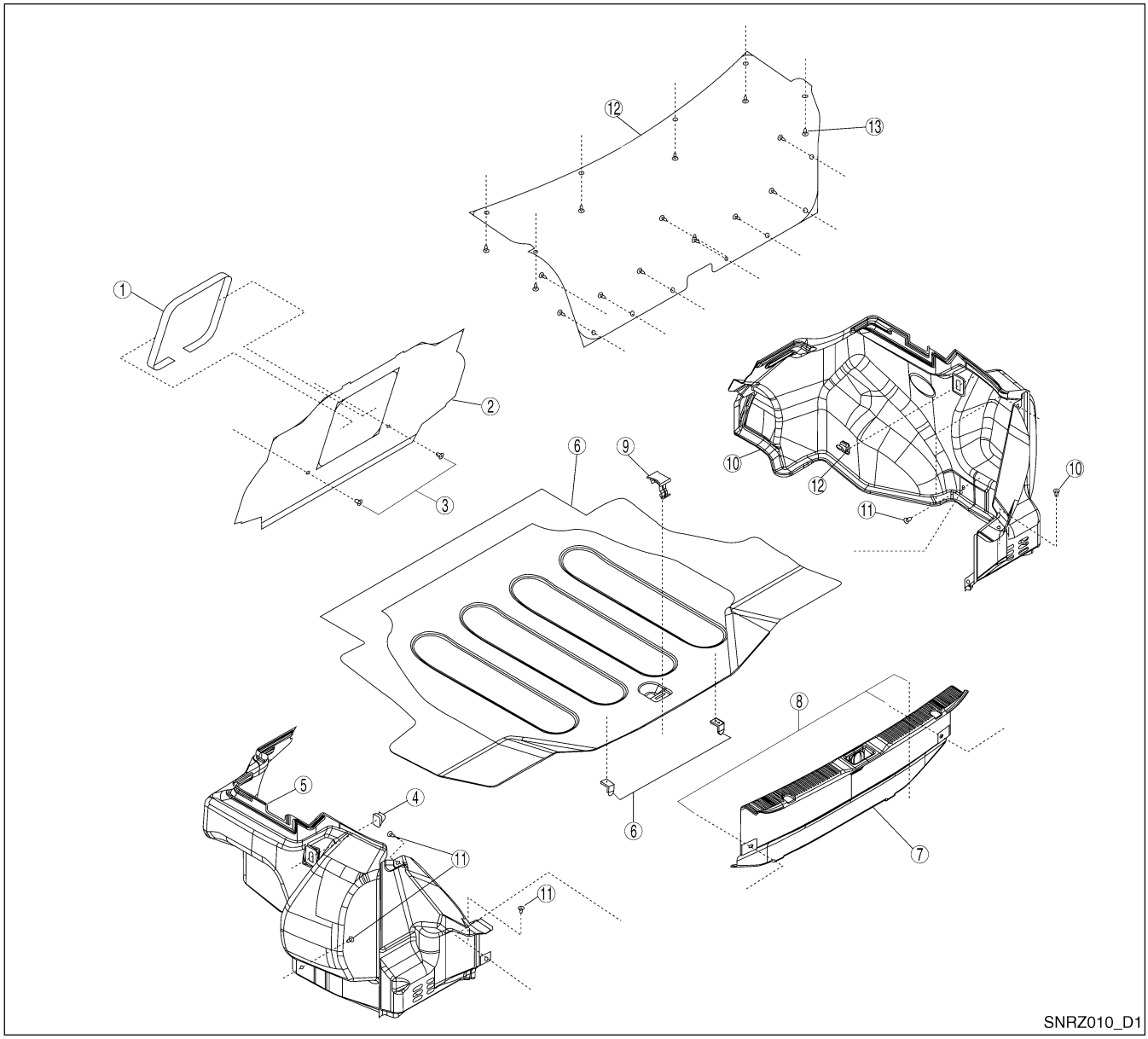
Installation is in the reverse order of removal.

REFERENCE:

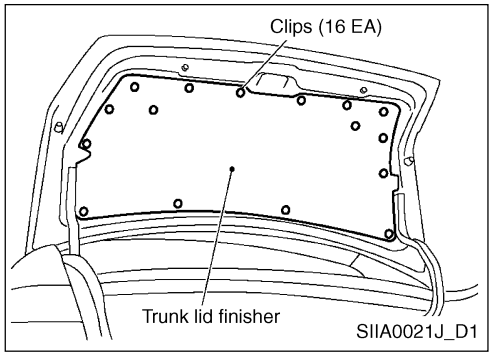
- **Insert into the center pillar upper hole during installation.**

Trunk Trim and Trunk Lid Trim

Removal • Installation

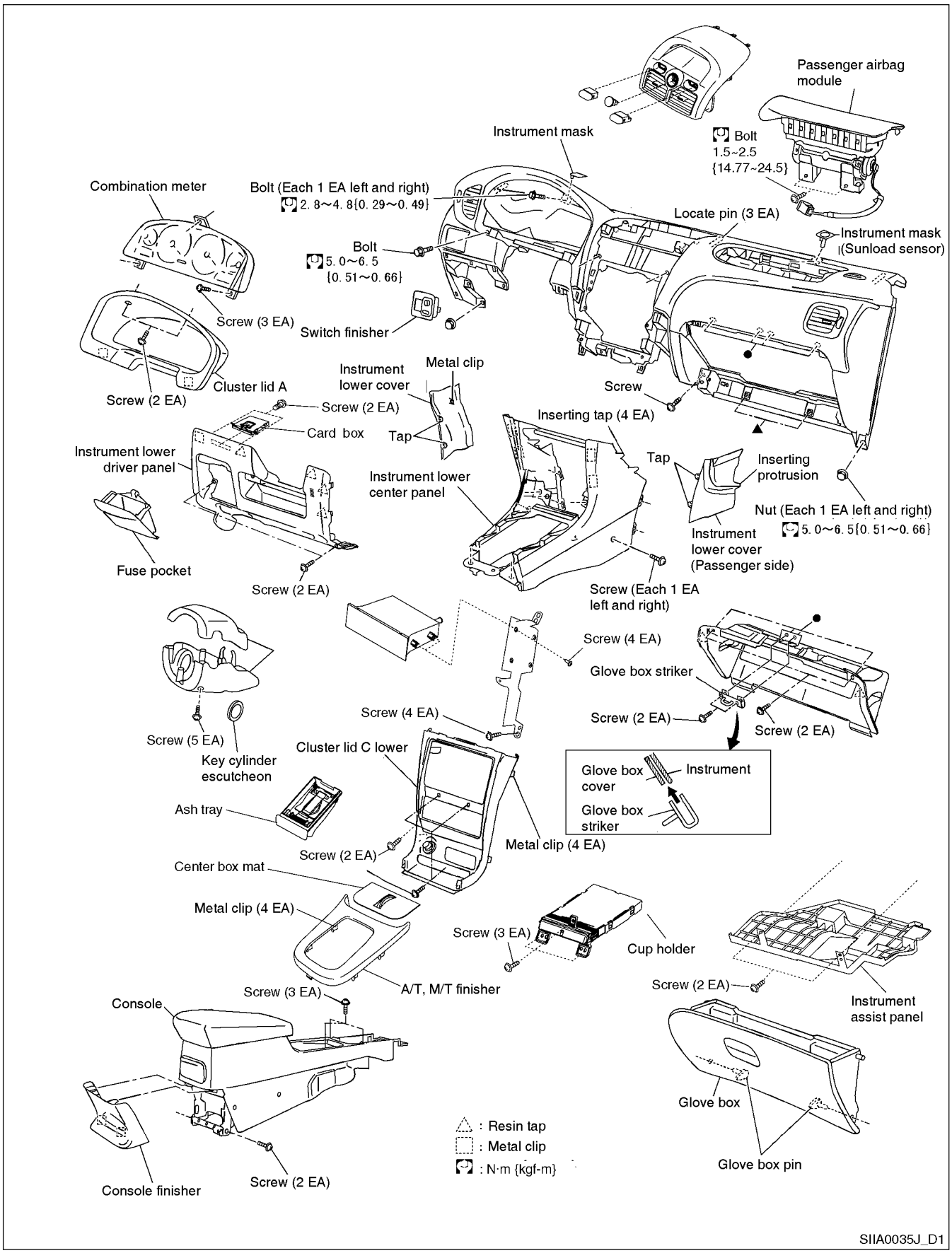


① Rear seatback welt
② Trunk front finisher assembly
③ Trim clips (2 EA)
④ Trunk net hook (2 EA)
⑤ Trunk side finisher (LH)
⑥ Trunk carpet support (2 EA)
⑦ Trunk rear plate
⑧ Trunk trim clip
⑨ Trunk carpet hook (1 EA)
⑩ Trim clips (6 EA)
⑪ Trunk side finisher (RH)
⑫ Trunk lid finisher
⑬ Trim clips (15 EA)



Instrument Assembly

Components Diagram



Removal • Installation

WORK LIST

Item	Instrument panel	Combination meter	Display	Audio	Console
Key cylinder escutcheon	[1]	[1]			
Steering column cover	[2]	[2]			
Light • turn signal switch	[3]	[3]			
Cluster lid A	[4]	[4]			
Combination meter	[5]	[5]			
Instrument lower driver panel	[6]				
Switch finisher	[7]				
A/T (M/T) finisher	[8]			[1]	[1]
Cluster lid C lower	[9]			[2]	
Cluster lid C	[10]		[1]	[3]	
Console	[11]			[4]	[2]
Audio, A/C controller	[12]				
Glove box	[13]				
Instrument lower assist panel	[14]				
Glove box cover	[15]				
Instrument lower cover	[16]				
Instrument center panel	[17]				
Passenger airbag module	[18]				
Instrument mask	[19]				
Front pillar garnish	[20]				
Instrument panel	[21]				

KEY CYLINDER ESCUTCHEON

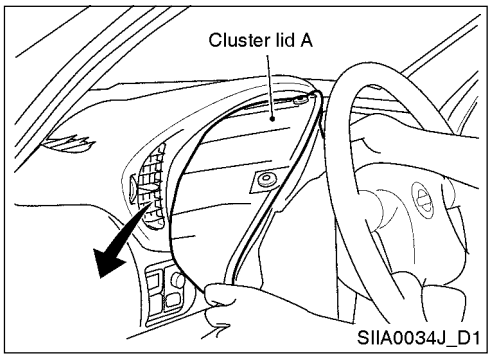
- Remove the key cylinder escutcheon to the outside of the vehicle.

STEERING COLUMN COVER

- Remove the steering column cover (screw: 5 EA).

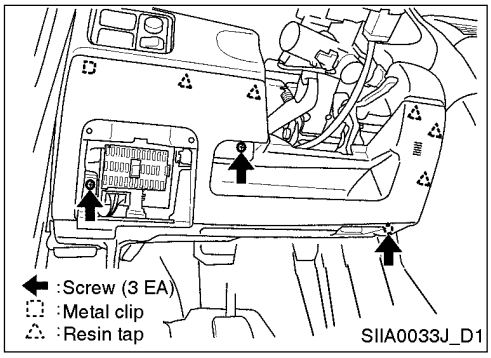
LIGHT • TURN SIGNAL SWITCH

- Remove the light • turn signal switch (screw: 2 EA).



CLUSTER LID A

1. Remove the two crews and remove the metal clip by pulling the cluster lid A forwards.
2. Remove from the right side cautioning with other surrounding components.

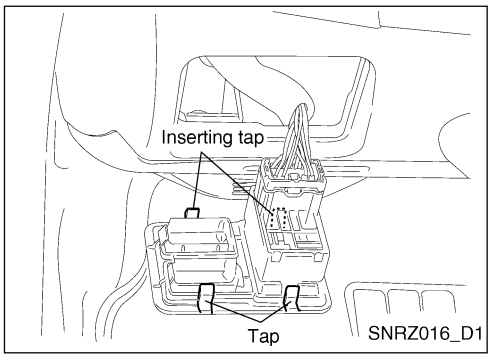


COMBINATION METER

- Remove the 3 screws, disconnect the connector and then remove the combination meter.

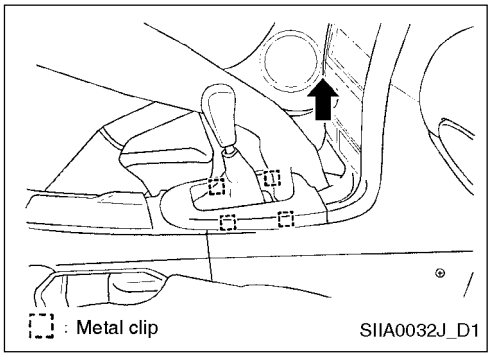
INSTRUMENT LOWER DRIVER PANEL

1. Remove the fuse box lid.
2. Remove the metal clip by pulling the instrument lower driver panel forwards after removing the screw.
3. Remove the two screws from the diagnosis connector mount bracket in the back of the panel.



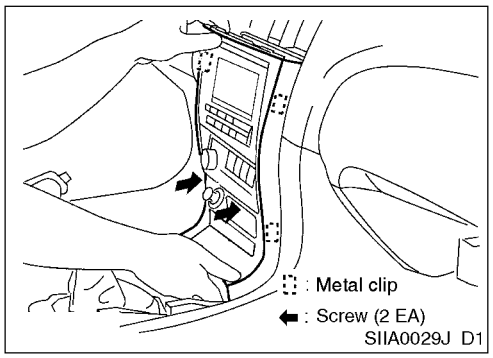
SWITCH FINISHER

- Pull out and remove the top mounts (2 locations) and disconnect all switch connectors.



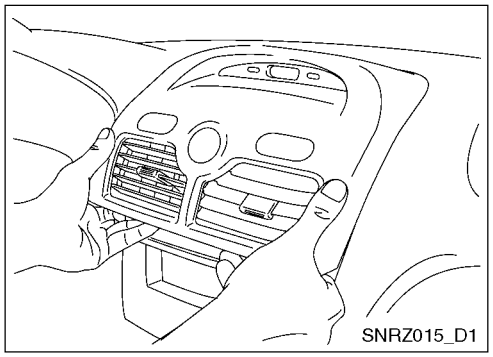
A/T (M/T) FINISHER

- Remove the ashtray and then pull out the finisher.



CLUSTER LID C LOWER

1. Remove the two screws.
2. Insert the hand into the top and bottom of the cluster lid C lower and remove it by pulling it forwards.



AUDIO • A/C CONTROLLER

- Remove the 4 screws and connectors and remove the audio and A/C controller.

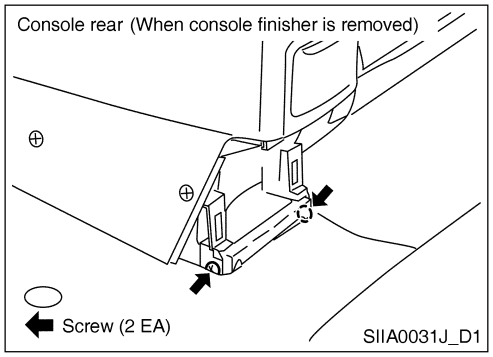
CLUSTER LID C

1. Insert the hand into the lid and pull it forwards.

CAUTION:

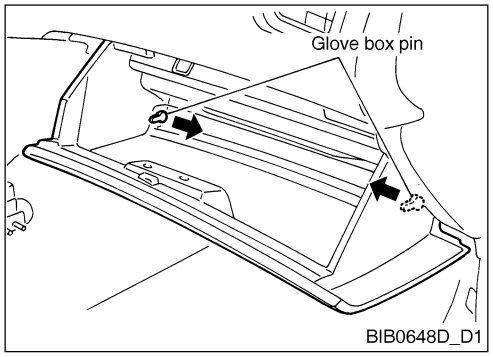
- **Be careful with the hazard switch, door lock switch and snow switch harness.**

2. Disconnect the hazard switch, door lock switch and snow switch connectors.



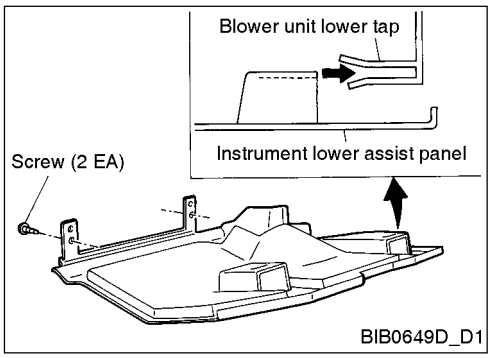
CONSOLE

1. Remove the two screws from the rear of the console.
2. Remove the console center cap and remove the screw (1 EA).
3. Remove the console finisher.
4. Remove the two screws and then remove the console.



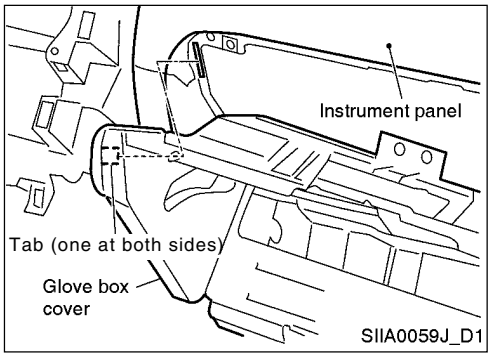
GLOVE BOX

- Open the glove box and remove the glove box pin from the inside.



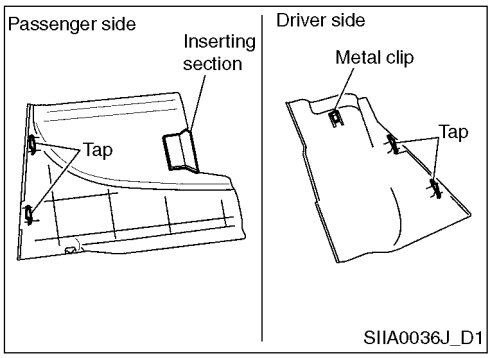
INSTRUMENT LOWER ASSIST PANEL

- Remove the 2 screws. Pull it forwards and remove it from the blower unit lower mount.



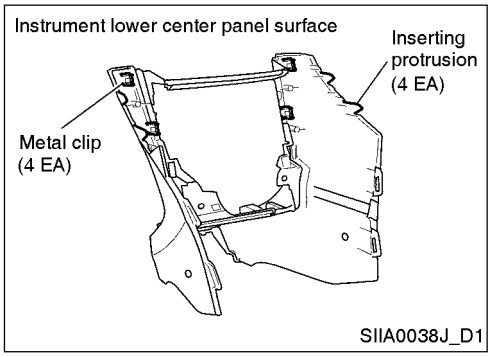
GLOVE BOX COVER

1. Remove the 2 screws and glove box striker (screws: 2 EA). The glove box lamp is installed in all models except for PE model. When removing the lamp, disconnect the lamp connector first.
2. Pull it forwards and remove the mount from the instrument panel.



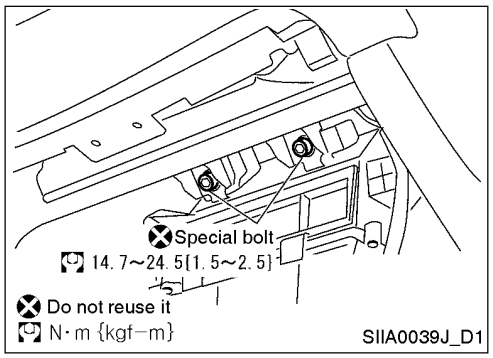
INSTRUMENT LOWER COVER

1. Remove the metal clip and resin mount from the driver's side and remove by pulling towards the driver's seat.
2. Remove the wooden mount from the passenger side and remove by pulling towards the rear of the vehicle.



INSTRUMENT LOWER CENTER PANEL

1. Remove the 2 screws.
2. Disconnect the power outlet harness connector.
3. Pull the instrument lower center panel forwards and remove it after removing the metal clip.



PASSENGER SEAT AIRBAG MODULE

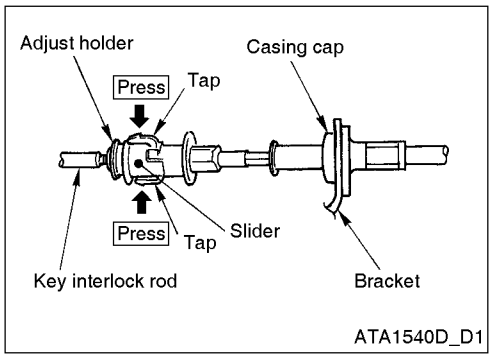
- Remove the special bolt and then remove the passenger side airbag module.
  Refer to “Restraint System”.

INSTRUMENT MASK

- Insert a cloth protected minus (-) screwdriver into the cut portion of the instrument mask end and remove it by releasing the mount.

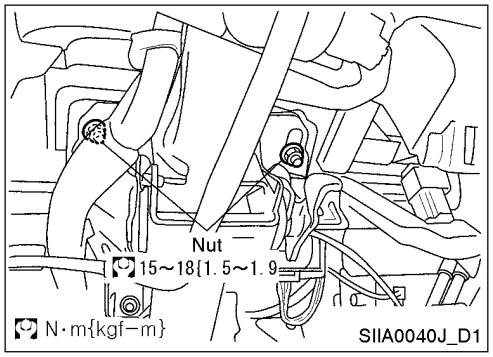
FRONT PILLAR GARNISH

- Pull the front pillar garnish forwards and remove it after removing the metal clip.

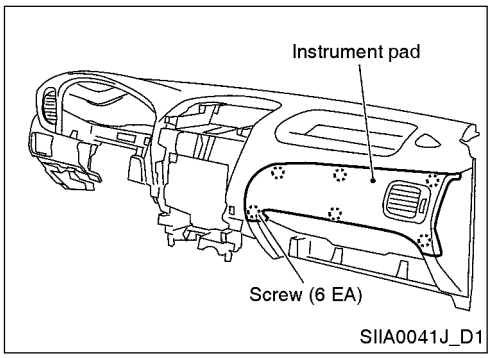


INSTRUMENT PANEL

1. Press the A/T device’s key interlock cable slider mount and push into the casing cap direction , then remove the key interlock rod and adjuster holder.
2. Remove the casing cap from the bracket.



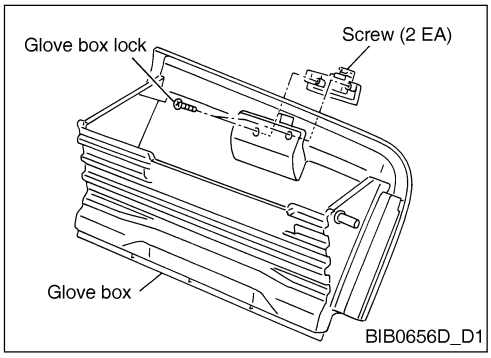
3. Remove the nut and lower down the steering column.
4. Remove the 3 bolts, 2 nuts and 1 screw that holds the instrument panel and remove the instrument panel.



Disassembly • Assembly

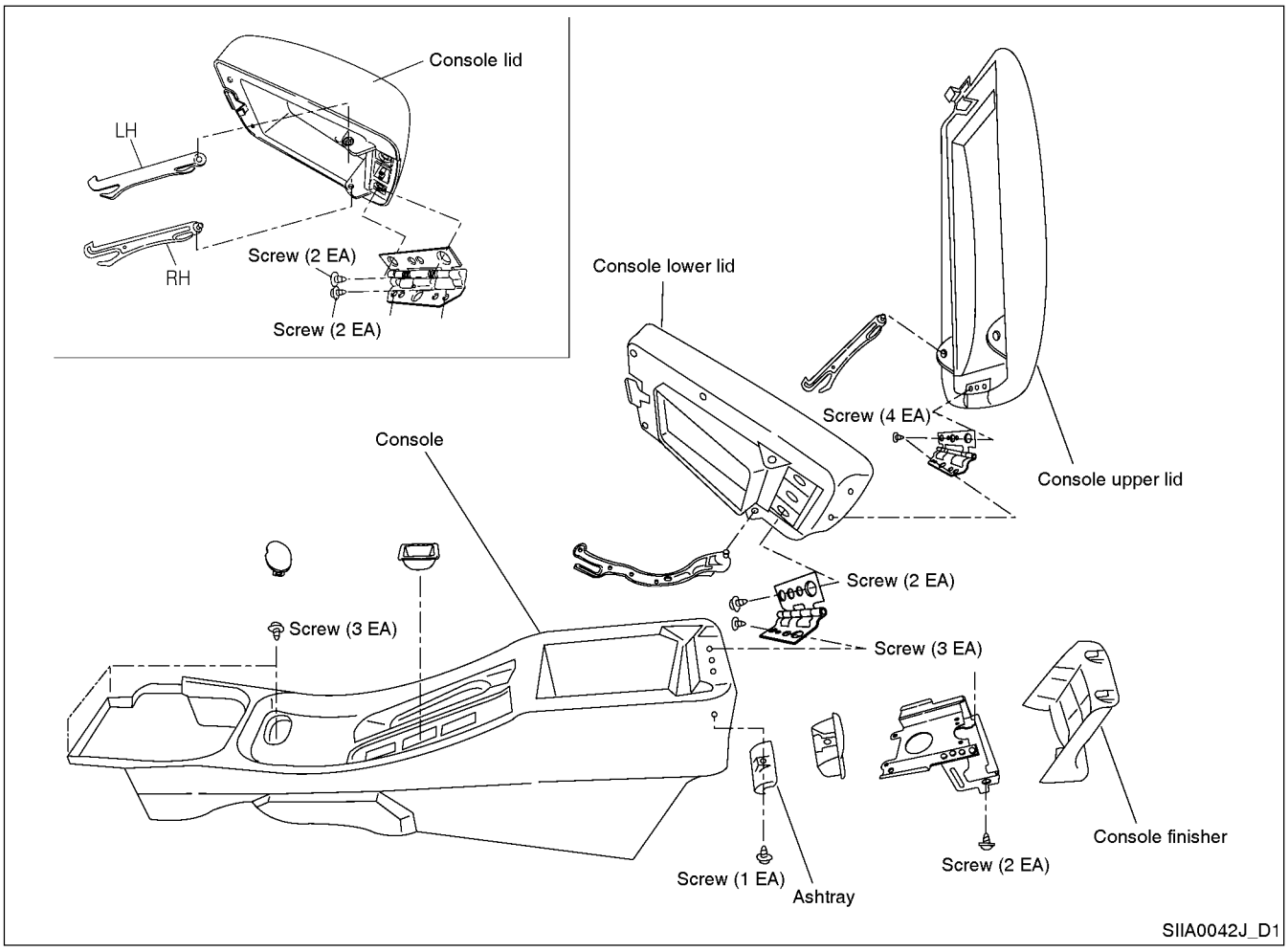
INSTRUMENT PAD

- Remove the 6 screws from the rear of the instrument panel.



GLOVE BOX

- Remove the 2 screws from the inside of the glove box.

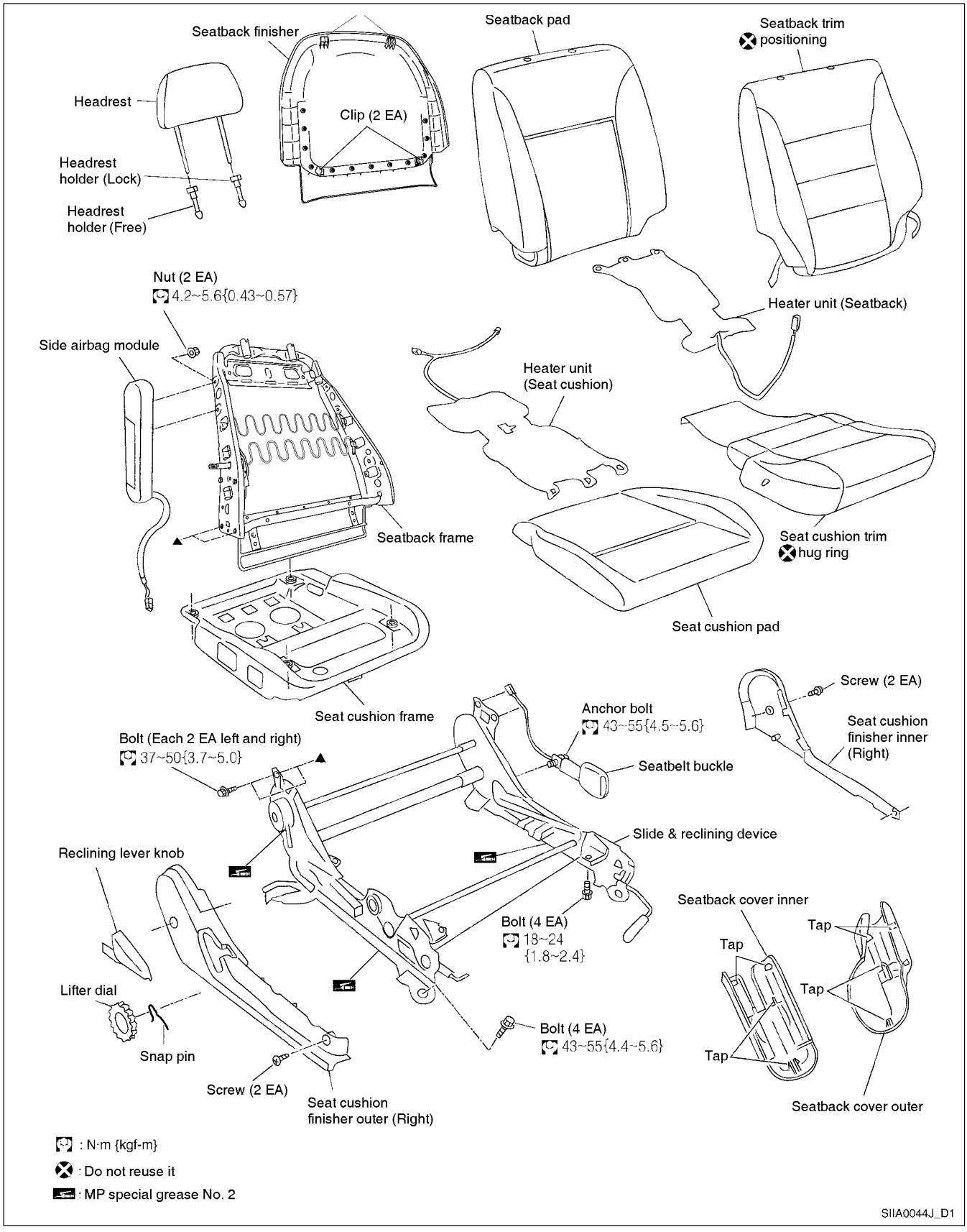


Front Seat

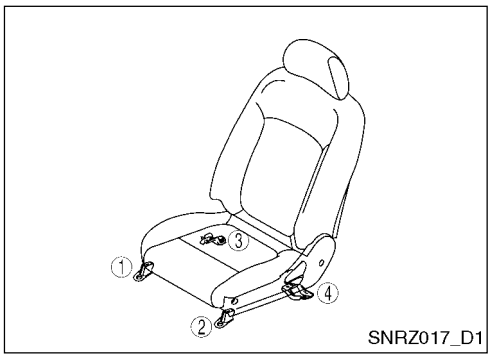
Components Diagram

CAUTION:

- **Protect the locations that interfere during seat removal with a cloth.**

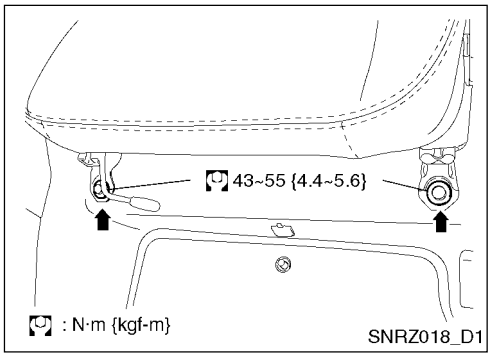


Removal • Installation of Front Seat Assembly

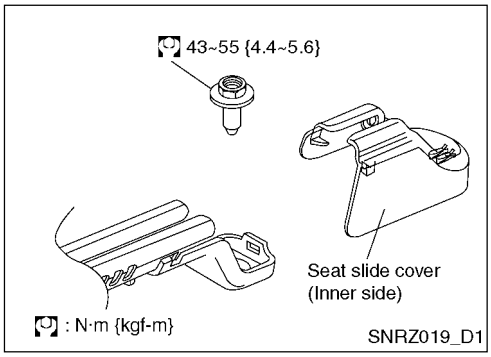


REMOVAL

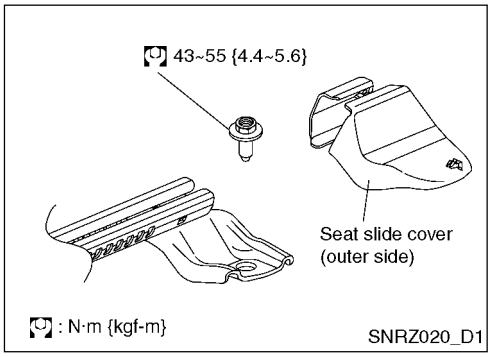
1. Remove the front seat assembly in the order as shown in the figure.



2. Remove two front bolts fixing the front seat.



3. Remove the inner side seat slide cover and mounting bolts.

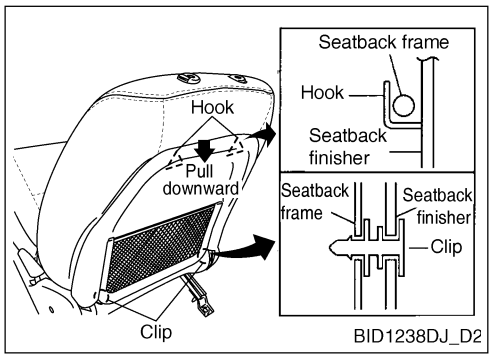


4. Remove the outer side seat slide cover and mounting bolts.

INSTALLATION

Assemble in the reverse order of disassembly.

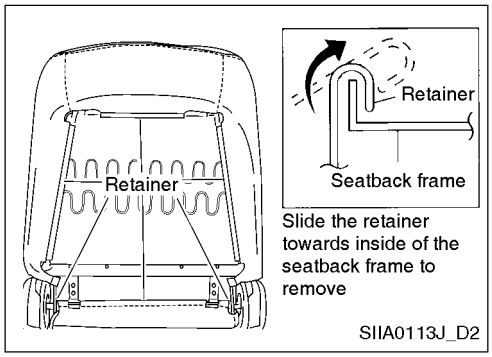
Removal • Installation of Front Seat



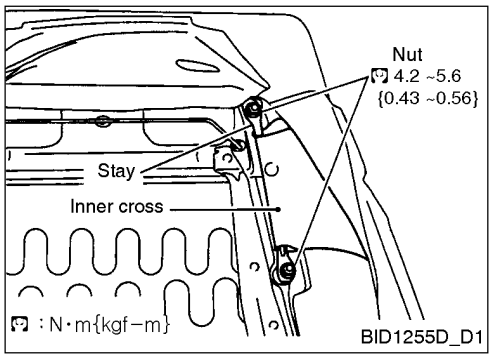
Disassembly • Assembly of Seatback

SEATBACK TRIM (WITH SIDE AIRBAG)

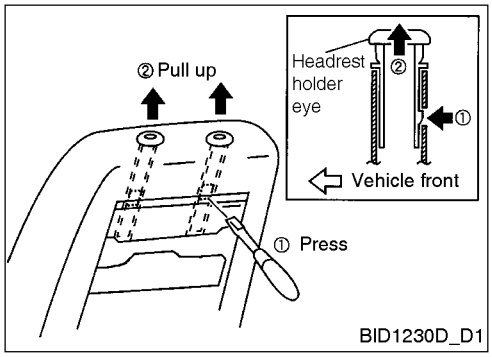
1. Remove the seatback finisher.



2. Remove the retainer.



3. Remove the 2 nuts and remove the inner cross mount stay.



4. Press the headrest holder mounts on the headrest stay pipe's hole from the rear of the seatback. Remove the stopper and lift up the headrest to remove.

CAUTION:

- **Be careful of the headrest holder directions (left & right and forwards & rearwards) during installation.**

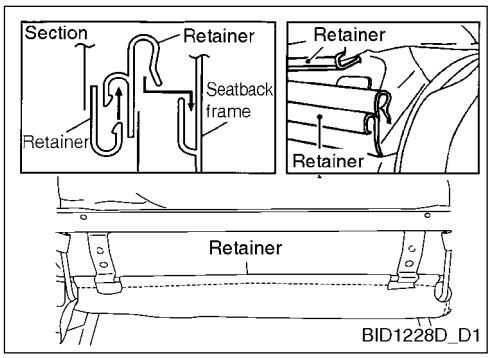
5. Remove the hug ring and separate the pad and trim after removing the seatback.

SEATBACK ASSEMBLY

- To remove the seatback assembly, remove the 4 bolts after step 1 and 2.

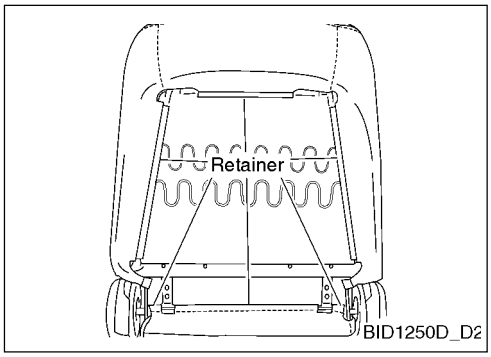
CAUTION:

- **During assembling the seatback frame, check the reclining device's lock in both sides and insert the bolt and then tighten.**

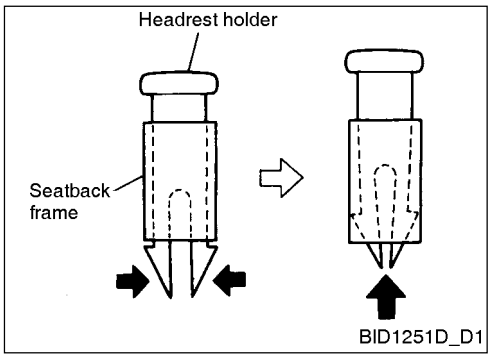


SEATBACK TRIM (VEHICLE WITHOUT SIDE AIRBAG)

1. Remove the retainer from the lower side of the seatback rear.



2. Pry up the trim and remove the retainer from the back and hug rings from the front.



3. Remove the headrest holder mount by holding and pushing it up.

CAUTION:

- **Be careful of the headrest holder directions (left & right and forwards & rearwards) during installation.**

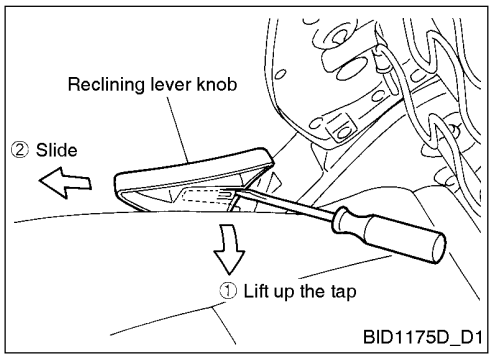
4. Remove the hug ring and separate the pad and trim after removing the seatback.

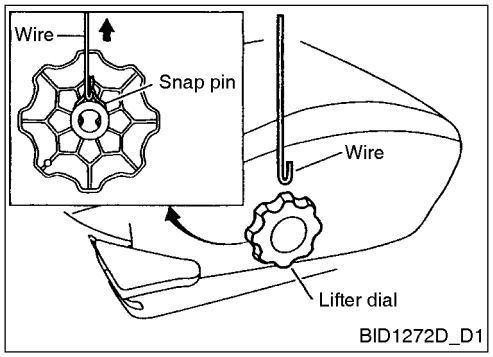
SEATBACK ASSEMBLY

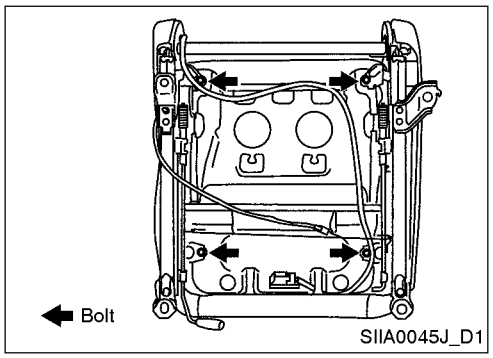
- To remove the seatback assembly, remove the 4 bolts after step 1.

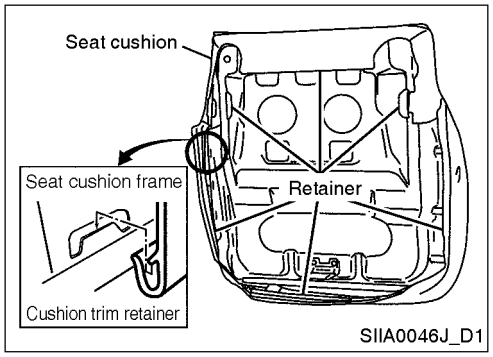
CAUTION:

- **During assembling the seatback frame, check the reclining device's lock in both sides and insert the bolt and then tighten.**









DISASSEMBLY • ASSEMBLY OF SEAT CUSHION TRIM

1. Remove the reclining lever by standing the mount inside and pushing the knob towards the front.

2. Remove the snap ring by hanging a wire and lifting it up and then remove the lifter dial.

3. Remove the seat harness and bolts from the rear of the seat cushion.

CAUTION:

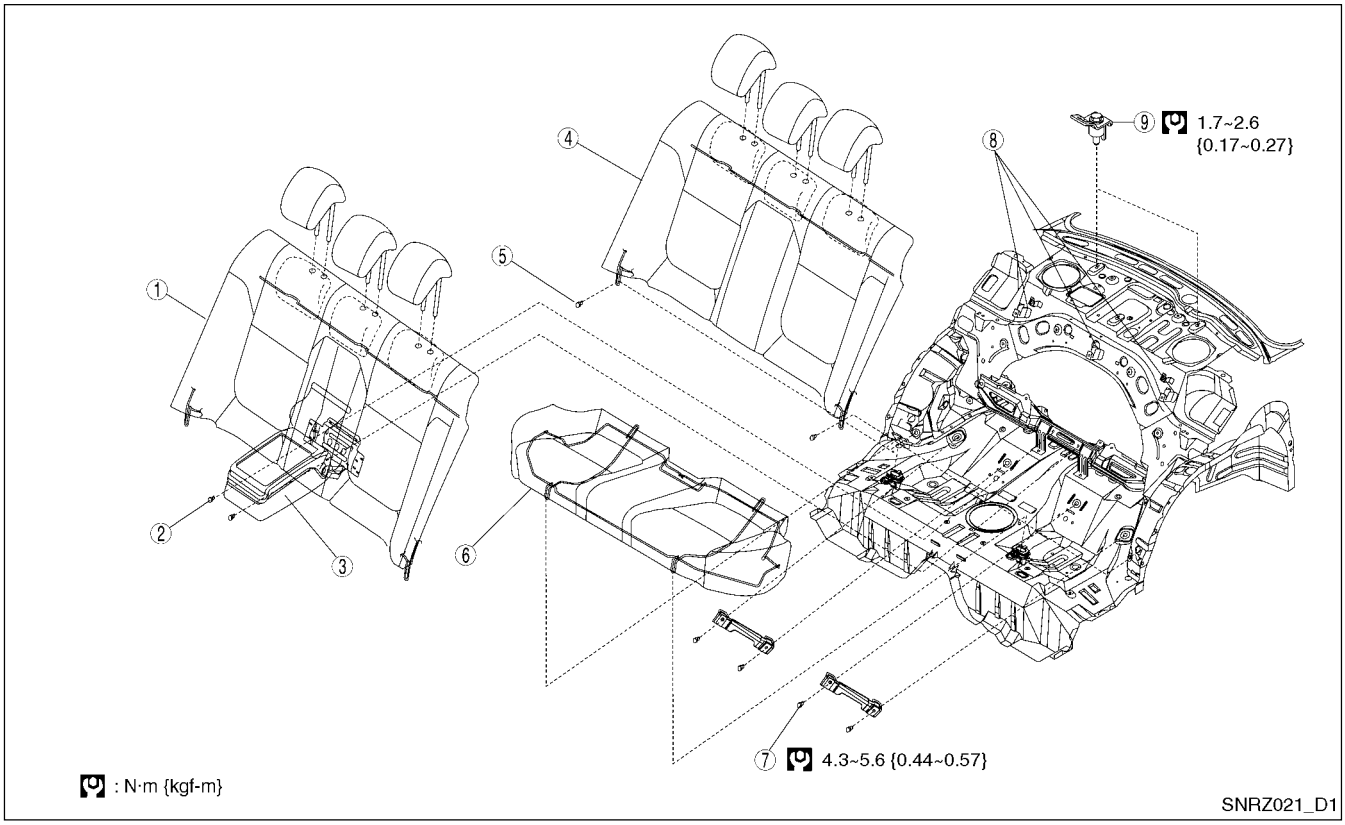
- **For bolt installation, check the slide's lock in both sides and insert the bolt and then tighten.**

4. Remove the retainer on the rear of the cushion.

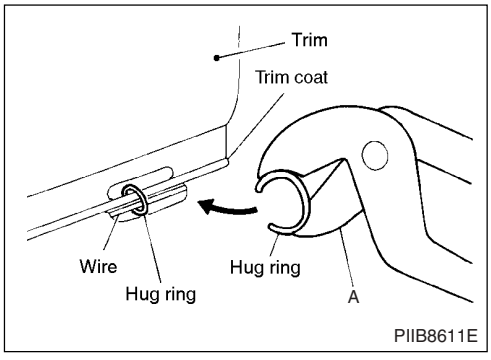
5. Pry up the trim and remove the hug ring.

Rear Seat

Removal • Installation



① Rear seatback assembly (with armrest)
② Tap screws (2 EA)
③ Armrest
④ Rear seatback assembly (without armrest)
⑤ Screw (R/L:1EA)
⑥ Rear seat cushion assembly
⑦ Bolts (4 EA)
⑧ Hook
⑨ Tether anchor plate assembly



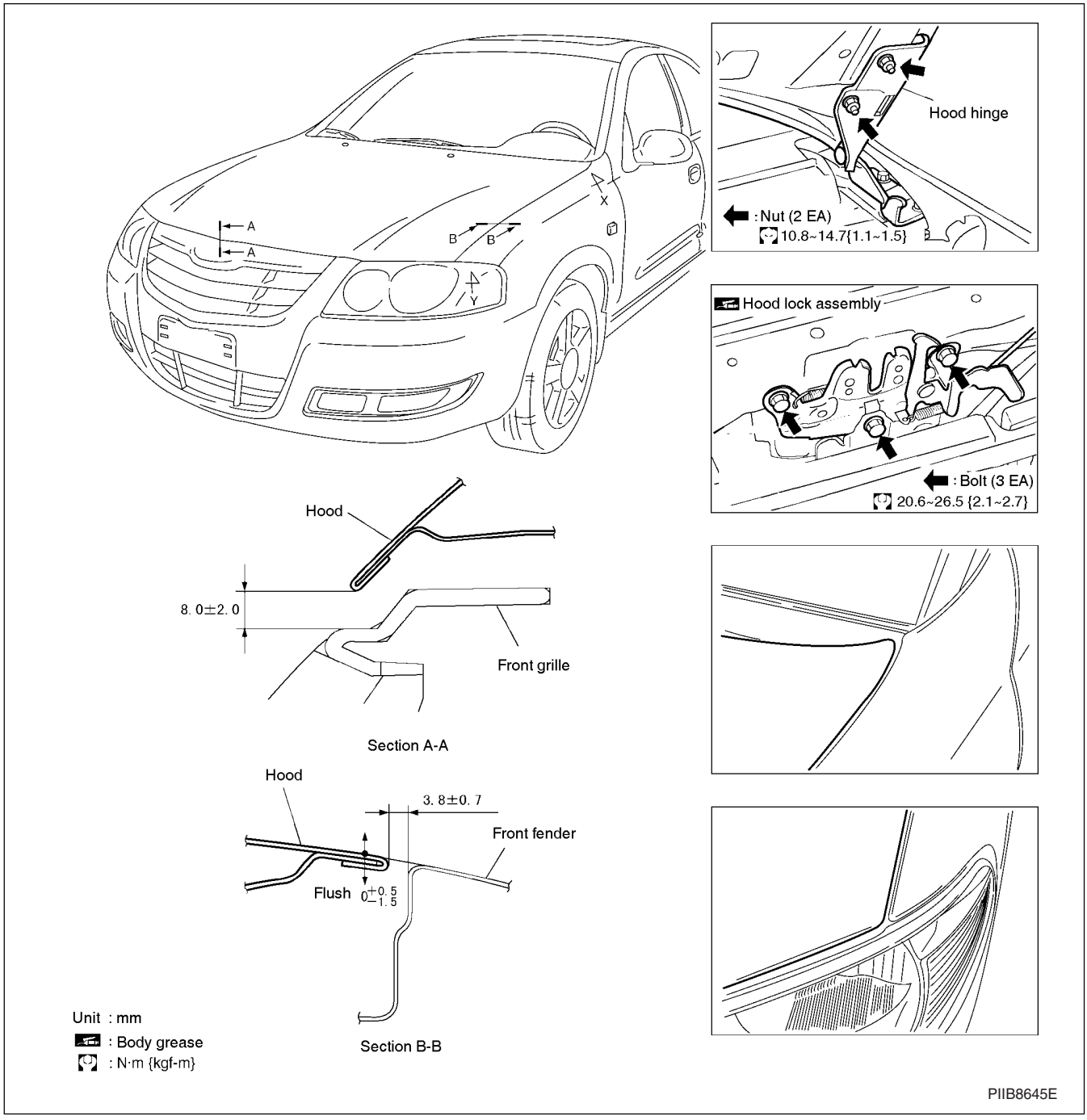
- Secure the pad side wire and trim side wire using the hug ring.

REFERENCE:

- **The hug ring installation is easier if use the hug ring pliers (A: commercial tool).**
- **When installing a new trim, it is easier if put the hug ring locations by referring the old trim.**

Hood

Assembly Dimension Adjustment

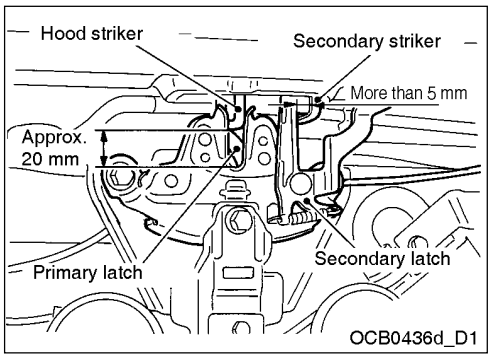


FRONT END HEIGHT ADJUSTMENT, LEFT-RIGHT AND FRONT-REAR GAP ADJUSTMENT

1. Remove the hood lock. Adjust the hood by rotating the bumper rubber so that it becomes 1-1.5 mm lower than the fender.
2. Temporarily install the hood lock and determine the position so that the hood lock engages with the striker. Check if the lock and the striker has any looseness and tighten the lock mounting bolts to the specified torque.

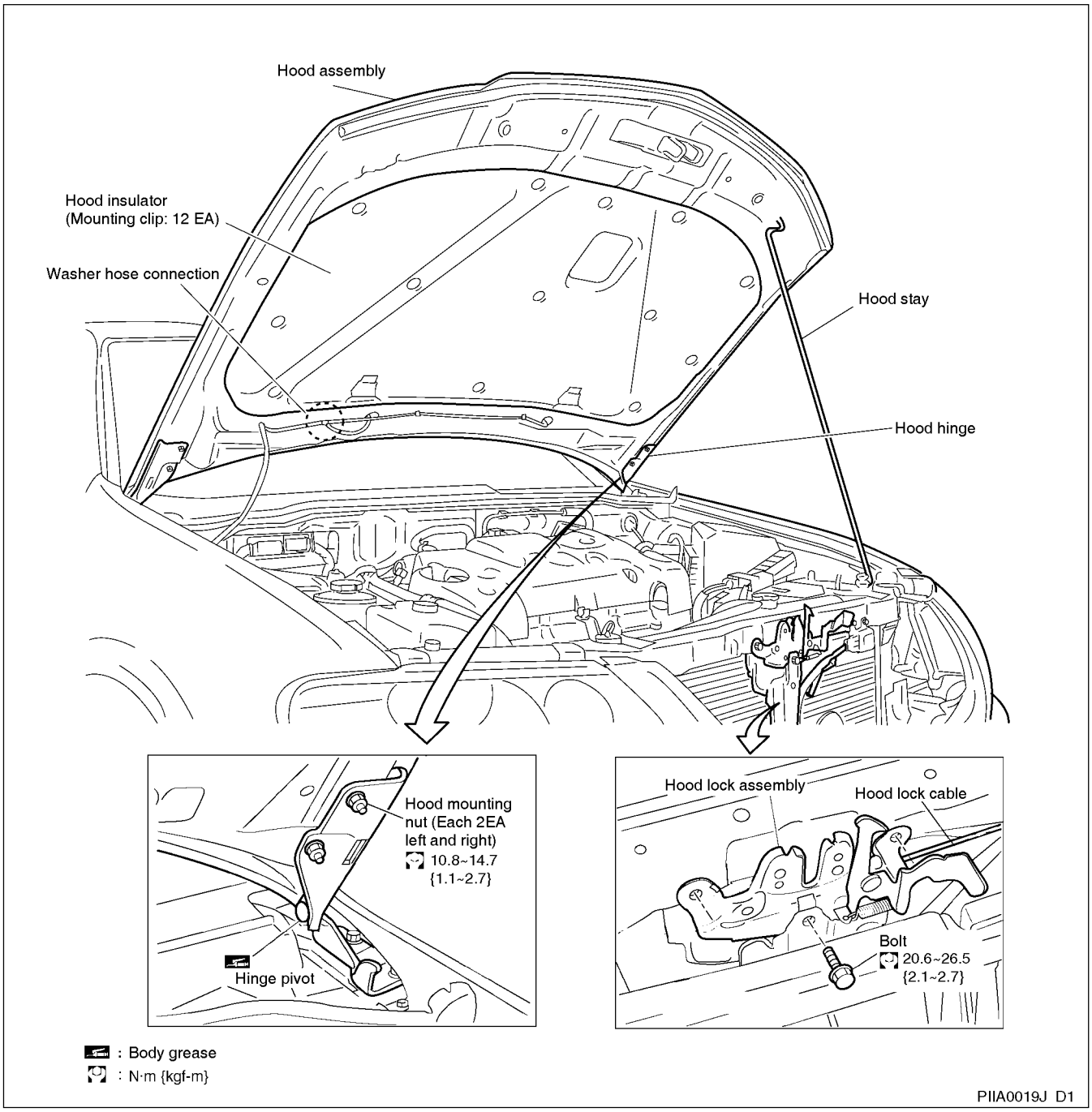
SURFACE DIFFERENCE (FLUSH) ADJUSTMENT

1. Remove the hood lock. Adjust the bumper rubber left and right so that the surface difference between the hood and the fender becomes the plant assembling standard.
2. Install the hood lock. Adjust the hood lock left and right so that the striker and the lock center are perpendicular when viewed from the front.



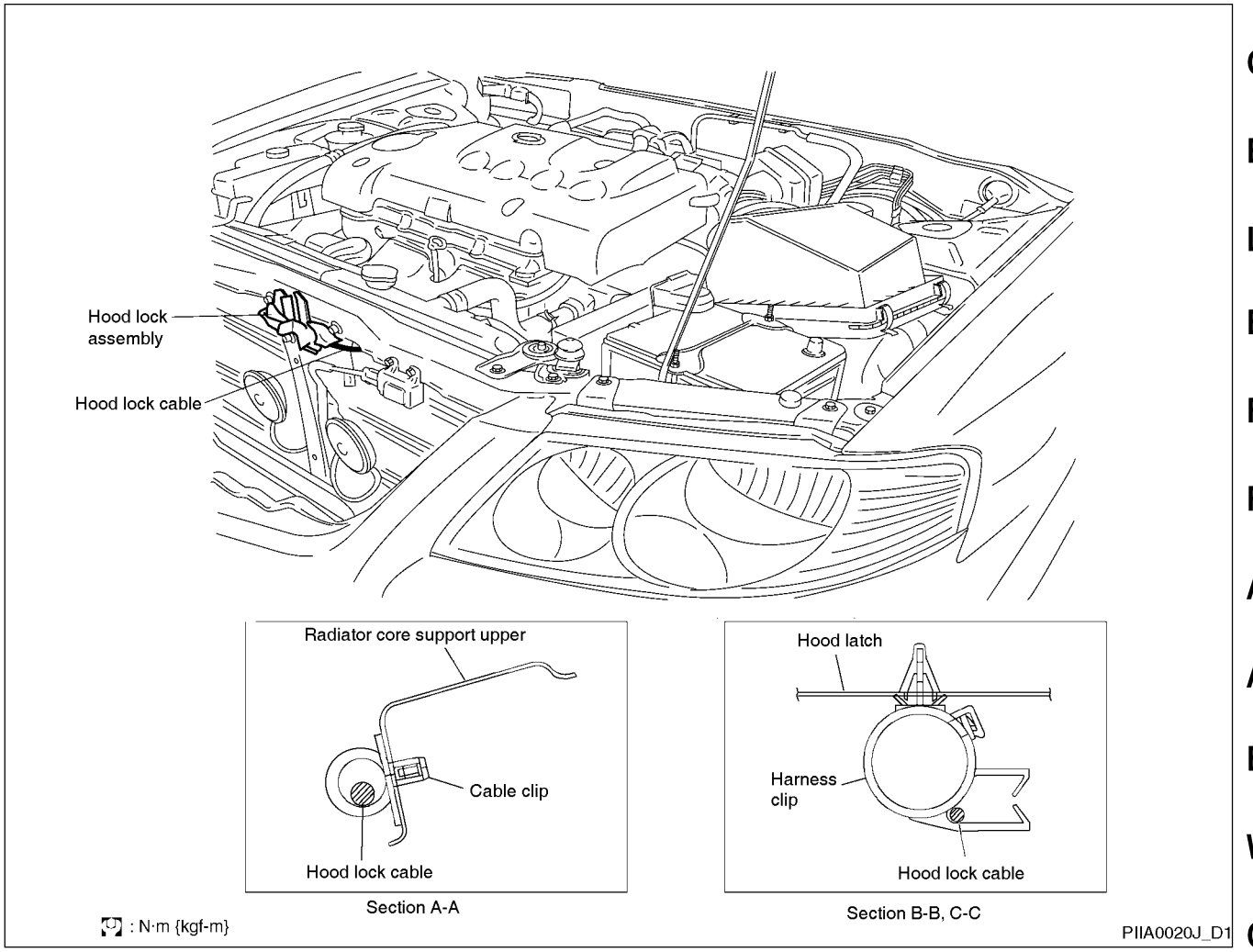
3. Check if the secondary latch engages securely with the secondary striker when drop the hood from 200 mm of height or press the hood with 3 kg of force.
4. Close the hood. Adjust the hood by moving the hood lock up and down so that the striker and the lock are securely engaged.
5. After the adjustment, tighten the lock mounting bolt to the specified torque.

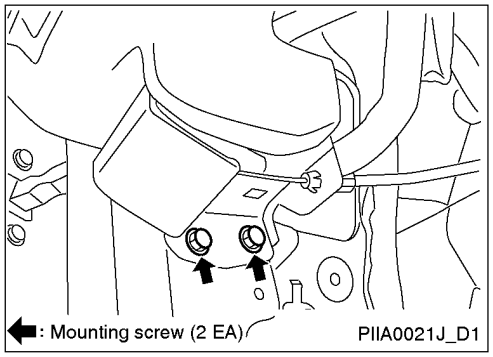
Removal • Installation of Hood Assembly



1. Disconnect the washer hose from the connecting section.
2. Remove the hinge mounting nut from the hood and remove the hood assembly.
   Installation is in the reverse order of removal.

Removal • Installation of Hood Lock Control



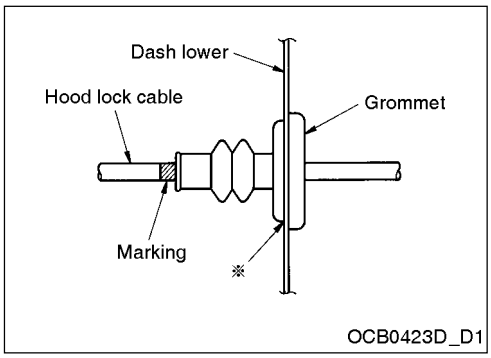


REMOVAL

1. Disconnect the hood lock cable from the hood lock and remove the hood lock cable from the radiator core support upper and hood latch clip.
2. Remove the dash side finisher. Refer to “Removal • Installation” (BT-34) in “Body Side Trim”.
3. Remove the mounting screws and remove the hood opener.
4. Remove the grommet from the dash and pull out towards the inside of the hood lock cable.

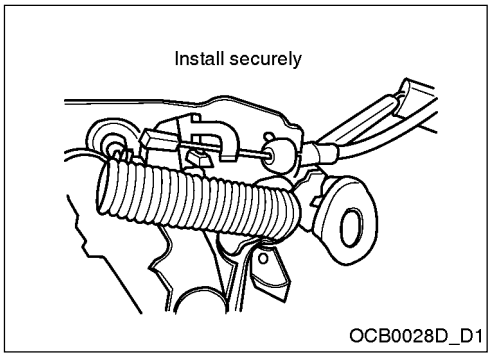
CAUTION:

- **When removing by pulling, be careful not to damage the hood lock cable (surface peeling) by the body hole.**



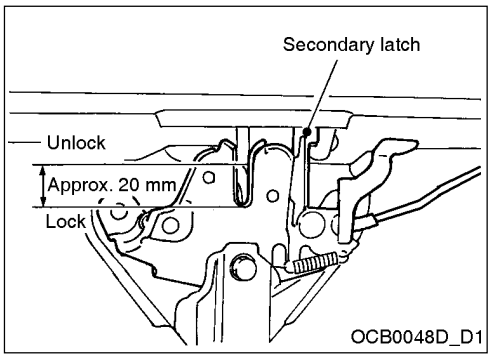
INSTALLATION

1. Push in the hood lock cable with maximum R (over R 100 mm).
2. Check if not escaped from the position determining grommet. Insert the grommet securely into the panel hole.
3. Apply the sealant on the grommet where ※ marked section.



4. Install the cable securely to the lock.
5. Adjust hood lock after installation and check opener for proper operation.

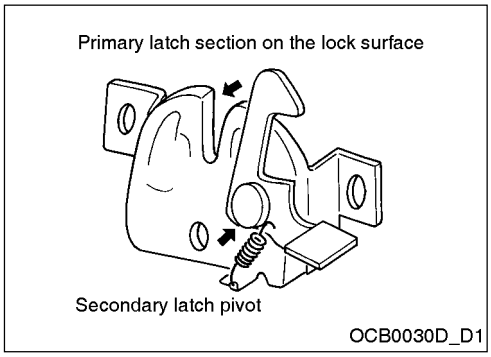
Hood Lock Control Inspection



CAUTION:

- **Replace the hood lock cable if bent or deformed.**

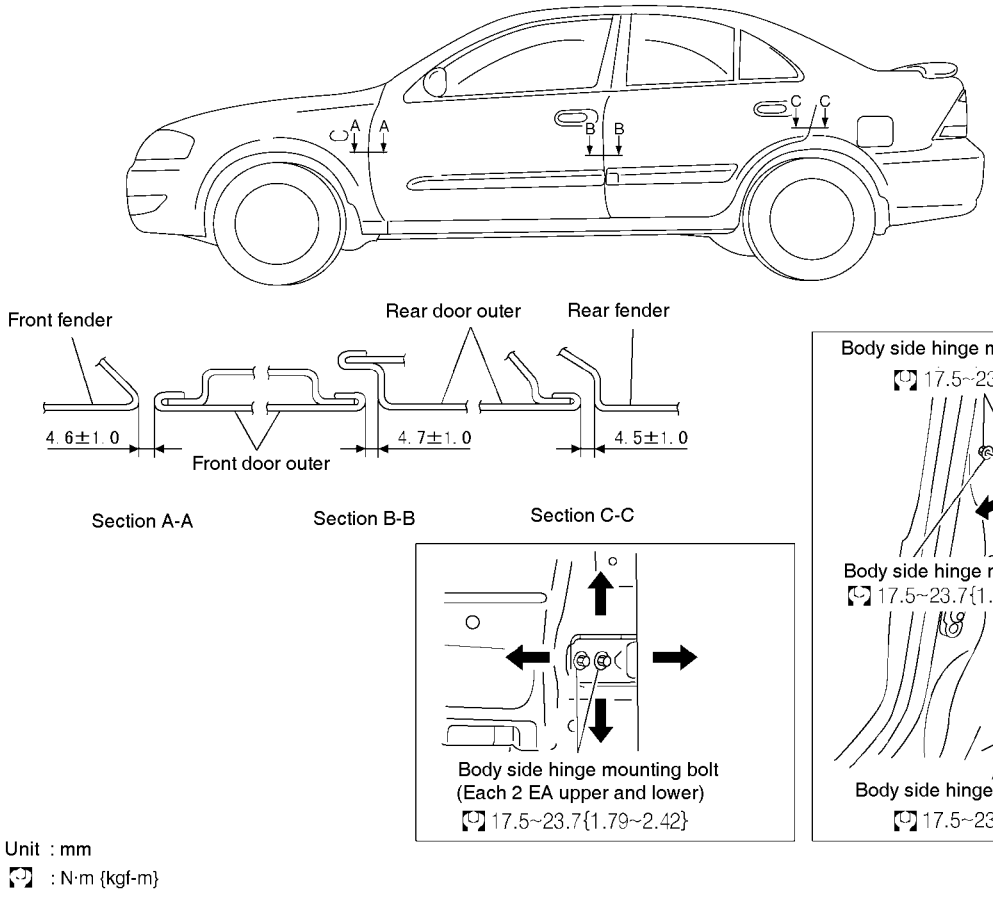
1. Check if the hood lock secondary latch engages securely with the secondary striker only when drop the hood from 200 mm of height.
2. Check if the hood end pops up about 20 mm when pull the hood opener smoothly. Also check if the hood opener returns to the original position.



3. Inspect the lubrication at the hood lock and apply “body grease” to the illustrated positions if necessary.

Door

Door Assembly Dimension Adjustment



Front Door

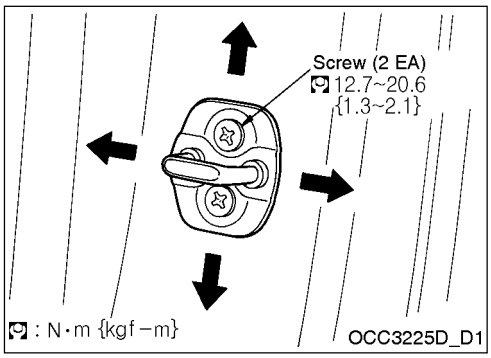
FORE AND AFT GAP AND FRONT END FLUSH ADJUSTMENT

1. Remove the fender protector.
2. Loosen the body side hinge mounting bolt from inside of the fender. Lift up the rear of the front door and perform adjustment.

Rear Door

FORE AND AFT GAP AND FRONT END FLUSH ADJUSTMENT

1. Remove the center pillar upper and lower garnish.
2. Loosen the mounting bolt from outside and mounting nuts from inside. Open the rear door and lift up the rear of the rear door and then perform adjustment.



STRIKER ADJUSTMENT

Adjust the striker so that it becomes parallel with the lock engaging direction.

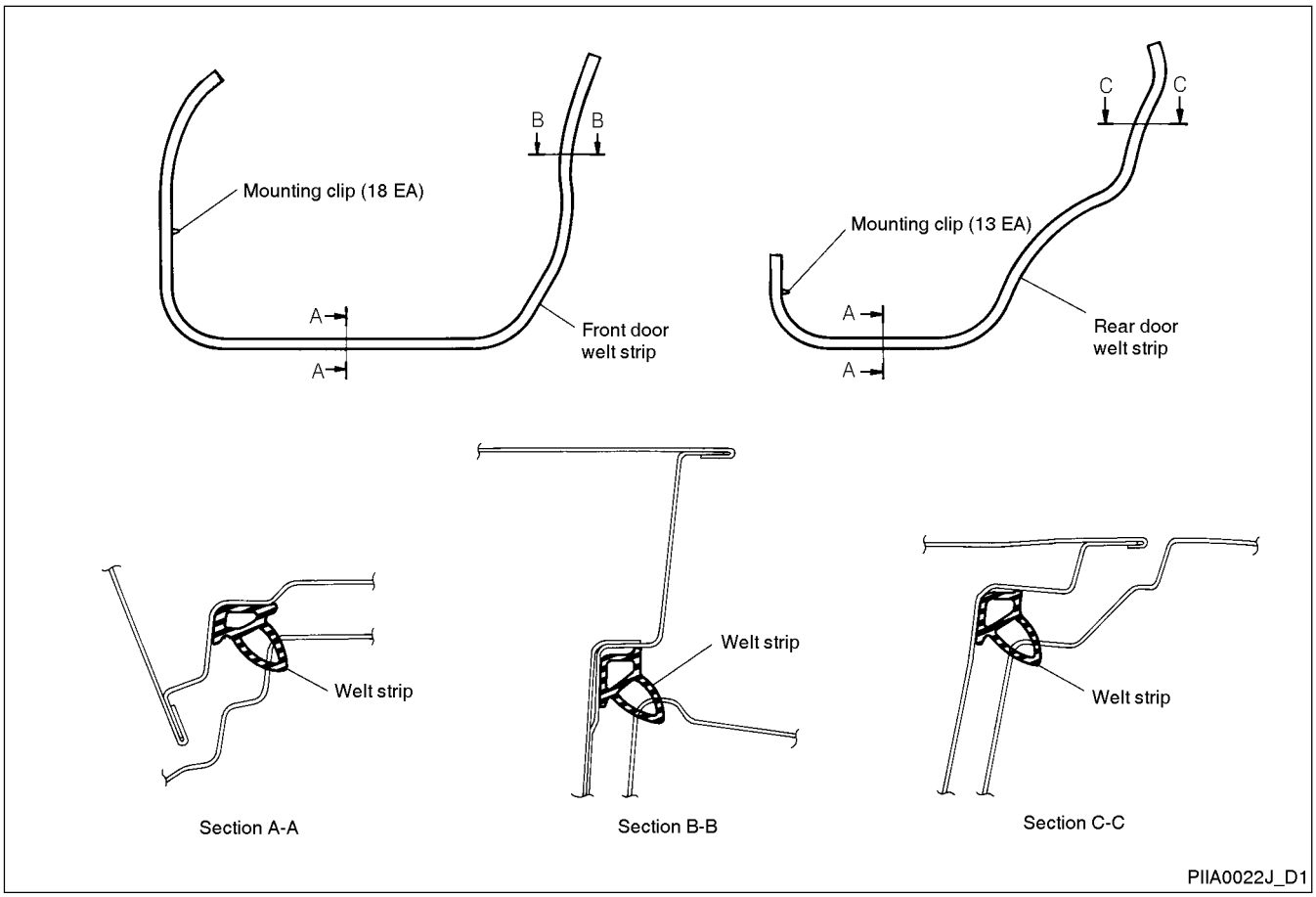
Removal • Installation

CAUTION:

- **While removing/installing the door assembly, secure the door with a cloth-covered jack to prevent from scratching the door and the body panels.**
- **Perform the door assembly dimension adjustment when removing/installing the door assembly.**
- **Inspect the lubrication condition at the hinge pivots and main moving section of the check link. Apply body grease if necessary.**

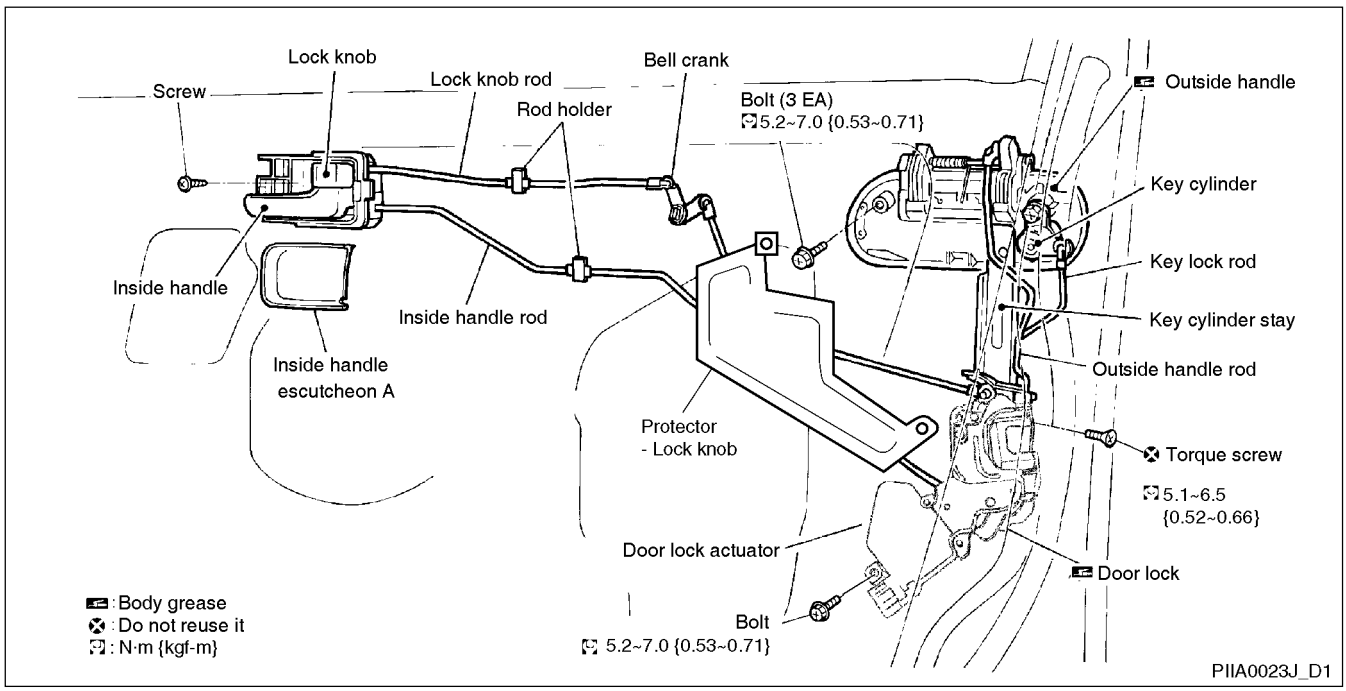
1. Remove the door finisher.
2. Remove the door harness.
3. Remove the mounting bolts and nuts and remove the door assembly. Install in the reverse order of removal and tighten the mounting bolts and nuts to the specified torque.

Door Welt Strip



Front Door Lock

Components Diagram

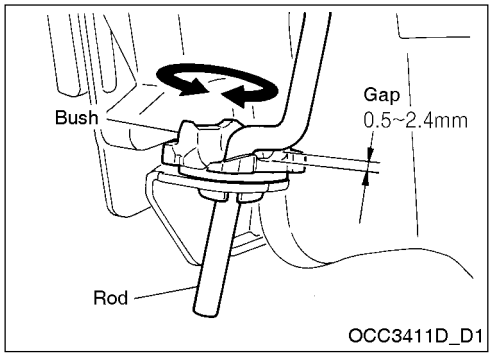


Inspection • Adjustment

1. Remove the front door finisher.
2. Remove the sealing screen.

REFERENCE:

- **When reusing the sealing screen, cut the butyl tape with a cutter so that the butyl tape remains on the sealing screen.**



Outside Handle Rod Adjustment

Adjust by rotating the bush so that the gap between the bush and rod becomes as shown in the illustration.

REFERENCE:

- **Do not let the gap become 0 mm or rod always be pressed.**

Removal • Installation

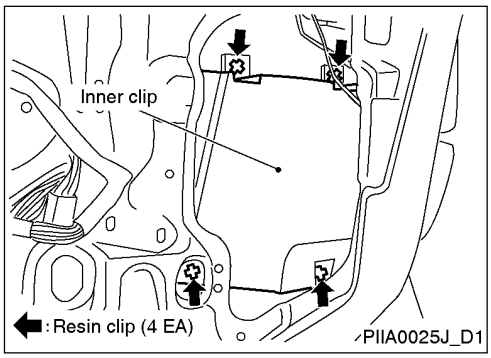
REMOVAL

1. Remove the front door finisher.
2. Remove the sealing screen.

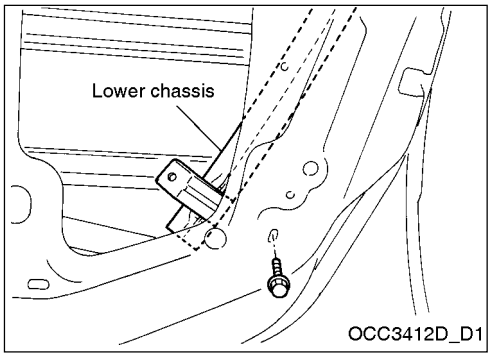
REFERENCE:

- **When reusing the sealing screen, cut the butyl tape with a cutter so that the butyl tape remains on the sealing screen.**

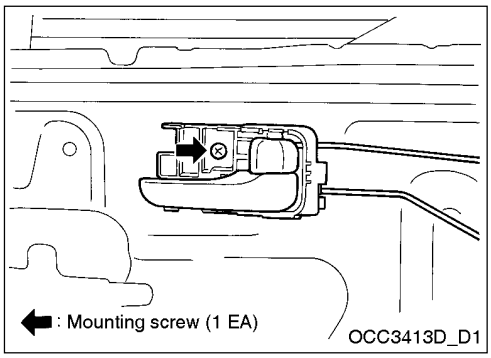
3. Remove the front door glass.



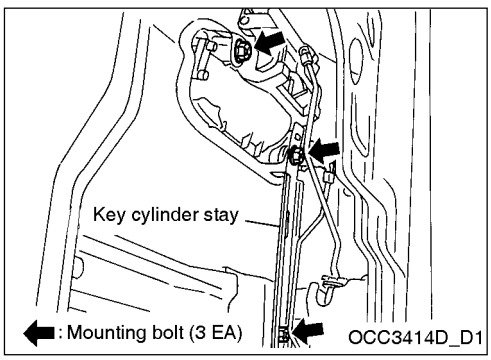
4. Remove the fixing clip and remove the inner pad.



5. Remove the mounting bolts and remove the lower chassis and rear glass as an assembly from the door panel up to the upper part of the door panel.
6. Remove the inside handle escutcheon A.



7. Remove the inside handle mounting screws.
8. Disconnect the lock knob rod connections (2 locations) on the bell crank.
9. Disconnect the inside handle rod (door lock assembly side).
10. Push the inside handle rearwards and remove it from the door panel hole.
11. Remove the rod from the inside handle.
12. Insert the hand into the work hole and disconnect the key lock rod and outside handle rod connections (handle side).



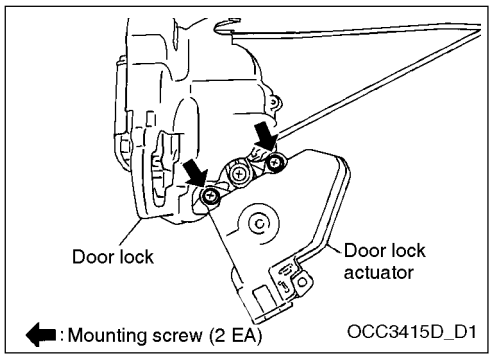
13. Remove the connector on the door lock actuator.
14. Remove the mounting screw and remove the door lock assembly from the work hole.
15. Remove the outside handle and key cylinder stay mounting bolt and remove the outside handle assembly.

INSTALLATION

Install in the reverse order of removal.

CAUTION:

- **During door lock assembly installation, apply the anti-corrosion wax on body side.**
- **To install the rod, rotate the rod holder until each rod clicks.**



Disassembly • Assembly

DISASSEMBLY

CAUTION:

- **Perform the actuator removal/installation after removing the door lock assembly from the vehicle.**

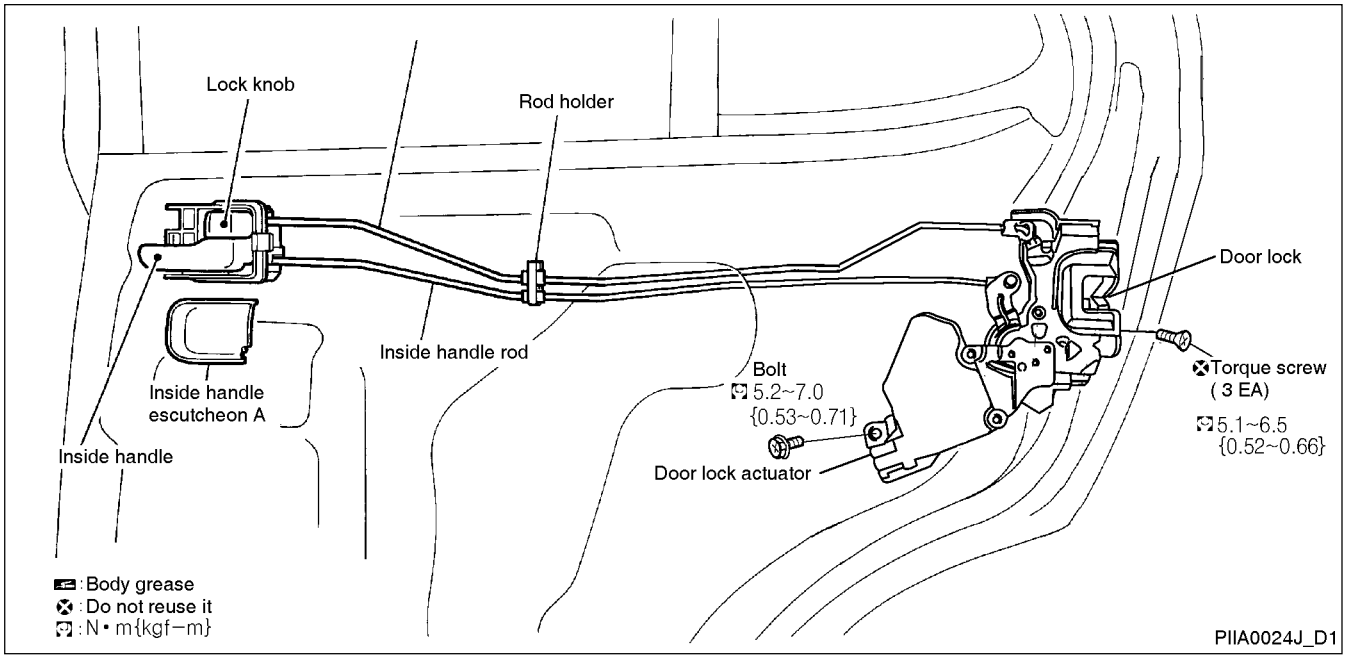
1. Remove the mounting screws and remove the actuator from the door lock assembly.
2. Pull the actuator downward and remove it from the door lock assembly.

ASSEMBLY

1. Insert the actuator pivot into the door lock assembly's knob lever.
2. Locate the lock lever and actuator pivot to lock position and check if it is securely engaged.

Rear Door Lock

Components Diagram

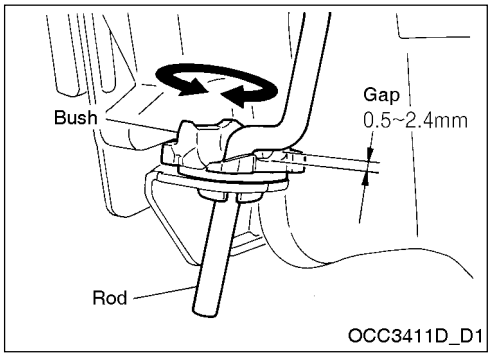


Inspection • Adjustment

1. Remove the rear door finisher. Refer to “Removal • Installation” (BT-32) in “Door Trim”.
2. Remove the sealing screen.

REFERENCE:

- **When reusing the sealing screen, cut the butyl tape with a cutter so that the butyl tape remains on the sealing screen.**



Outside Handle Rod Adjustment

Adjust by rotating the bush so that the gap between the bush and rod becomes as shown in the illustration.

REFERENCE:

- **Do not let the gap become 0 mm or rod always be pressed.**

Removal • Installation

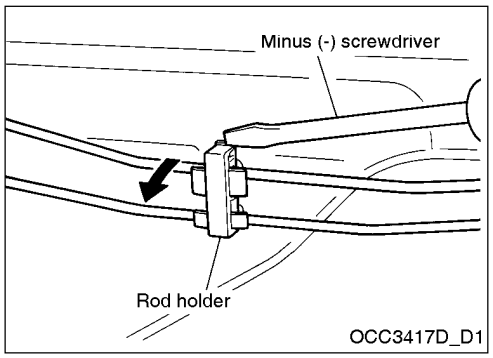
REMOVAL

1. Remove the rear door finisher.
2. Remove the sealing screen.

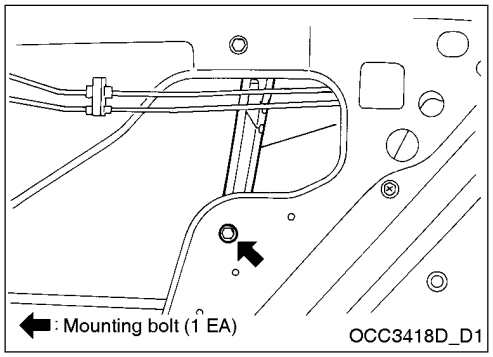
REFERENCE:

- **When reusing the sealing screen, cut the butyl tape with a cutter so that the butyl tape remains on the sealing screen.**

3. Open all rear door glasses.
4. Pull out the inside handle escutcheon A.
5. Remove the inside handle mounting screw.



6. Disconnect the inside handle rod (door lock assembly side).
7. Disconnect the lock knob rod (door lock assembly side).
8. Open the rod holder using a minus (-) screwdriver and remove the rod.
9. Push the inside handle rearwards and remove it from the door panel hole.
10. Remove the rod from the inside handle.



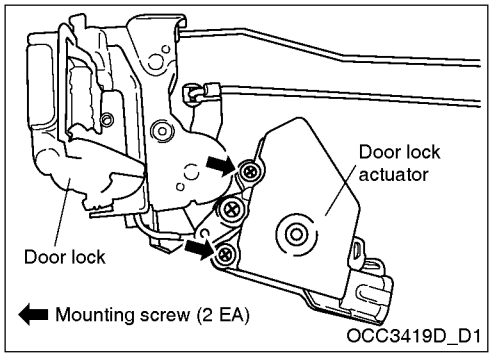
11. Remove the mounting bolts and remove the lower chassis rear by pulling downward.
12. Remove the connector on the door lock actuator.
13. Remove the mounting screws and remove the door lock assembly from the work hole.
14. Remove the mounting bolts and remove the outside handle.

INSTALLATION

Installation is in the reverse order of removal.

CAUTION:

- **During door lock assembly installation, apply the "anti-corrosion wax" on body side.**
- **To install the rod, rotate the rod holder until each rod clicks.**



Disassembly • Assembly

DISASSEMBLY

CAUTION:

- **Perform the actuator removal/installation after removing the door lock assembly from the vehicle.**

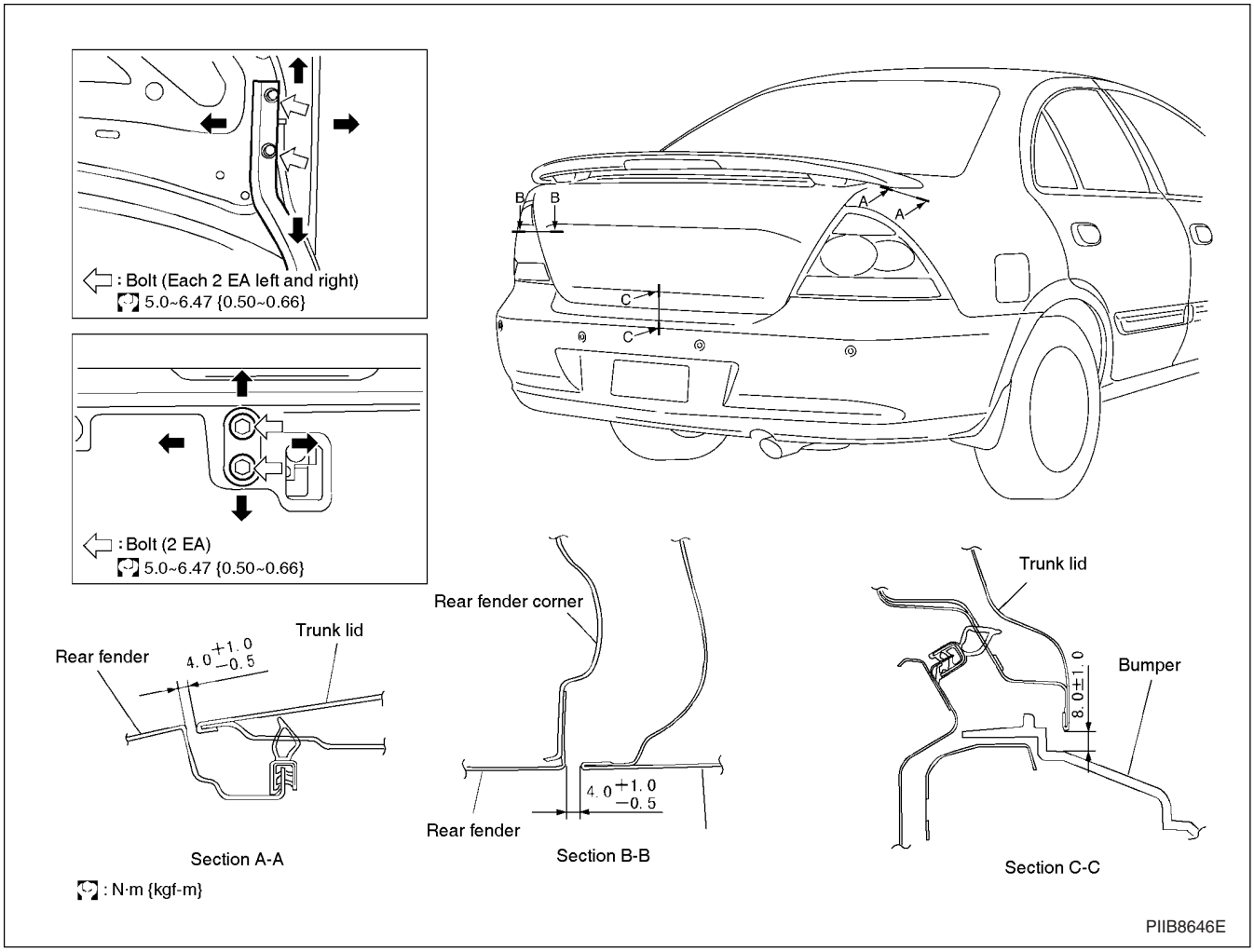
1. Remove the mounting screws and remove the actuator from the door lock assembly.
2. Pull the actuator downward and remove it from the door lock assembly.

ASSEMBLY

1. Insert the actuator pivot into the door lock assembly's knob lever.
2. Locate the lock lever and actuator pivot to lock position and check if it is securely engaged.

Trunk Lid

Assembly Dimension Adjustment



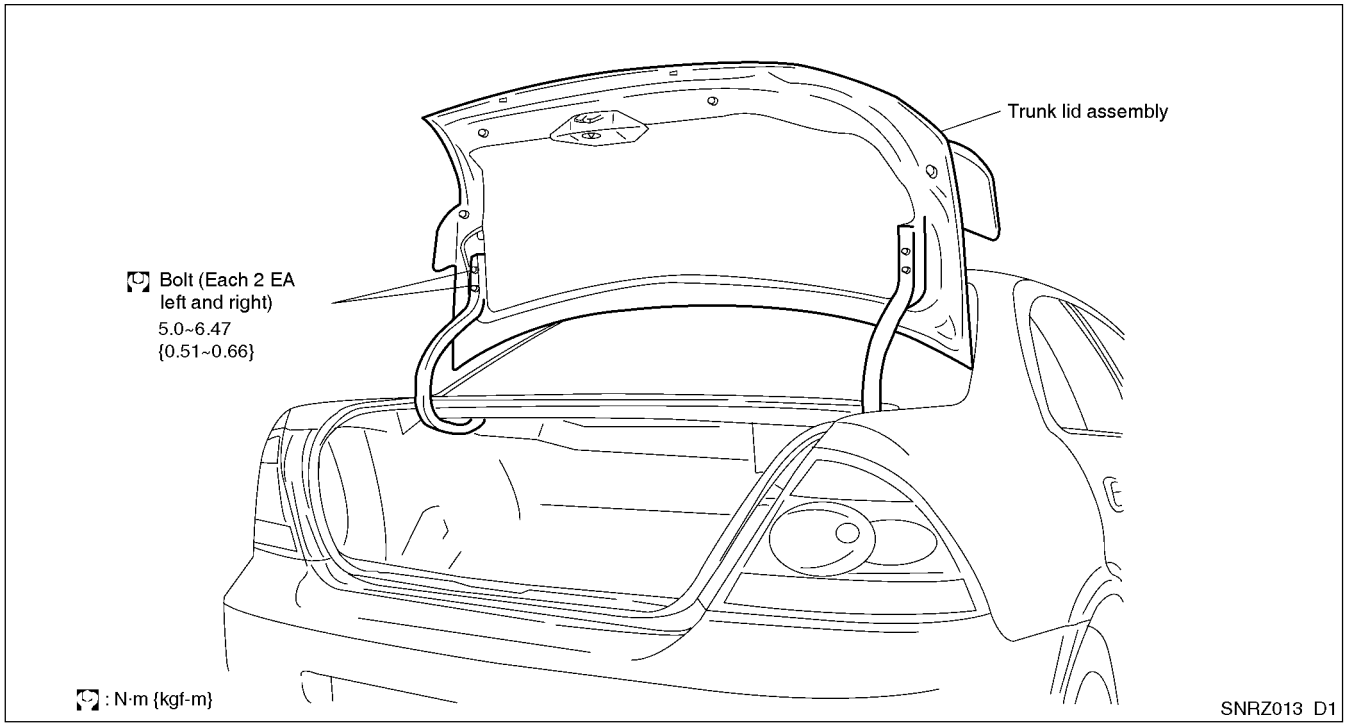
FORE & AFT AND LEFT & RIGHT GAP ADJUSTMENT

1. Remove the striker. Remove the trunk lid hinge mounting bolts and close the trunk lid.
2. After adjusting the gap between the left and right and with the rear window glass, open the trunk lid and tighten the mounting bolts to the specified torque.

SURFACE DIFFERENCE (FLUSH) ADJUSTMENT

1. Remove the striker mounting bolts. Lift the striker and temporarily insert the upper mounting bolts while striker is at the highest point.
2. Lightly close the trunk lid. Open the trunk lid and tighten the striker mounting bolts to the specified torque after adjusting the surface difference (flush).

Removal • Installation of Trunk Lid Assembly

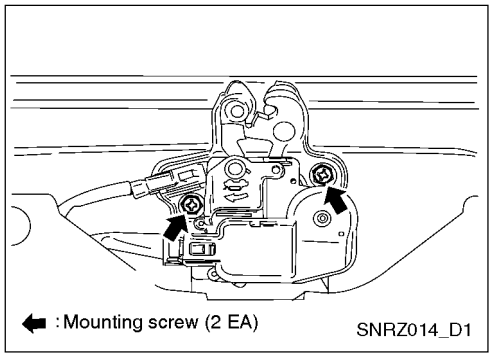


1. Remove all connectors in the trunk lid. Remove all harness clamps and then remove the harness from the trunk lid by pulling it out.
2. Remove the mounting bolts and remove the trunk lid assembly.

CAUTION

- **Apply the anti-corrosion wax on the connection between the trunk lid and hinge.**
- **After tightening the hinge mounting bolts, apply touch-up paint on the bolt heads with the same color.**

Installation is in the reverse order of removal.



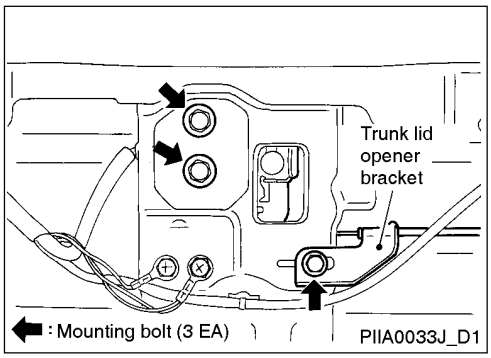
Removal • Installation of Trunk Lid Lock & Striker

LOCK REMOVAL

1. Remove the trunk lid finisher.
2. Remove the trunk lid lock cover.
3. Remove the mounting bolts and remove the trunk lid lock.

STRIKER REMOVAL

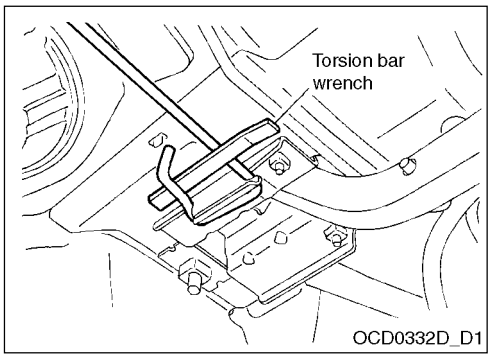
1. Remove the trunk rear plate and trunk rear finisher.



2. Remove the mounting bolts and remove the trunk lid opener bracket.
3. Remove the mounting bolts and trunk room lamp connector and remove the trunk lid striker.
4. Remove the trunk lid opener cable from the trunk lid striker.

LOCK AND STRIKER INSTALLATION

1. After installation, lightly close the trunk lid and adjust the lock and the surface difference.
2. Check the operation after installation.
3. Install the trunk lid lock cover, trunk lid finisher and trunk finisher.



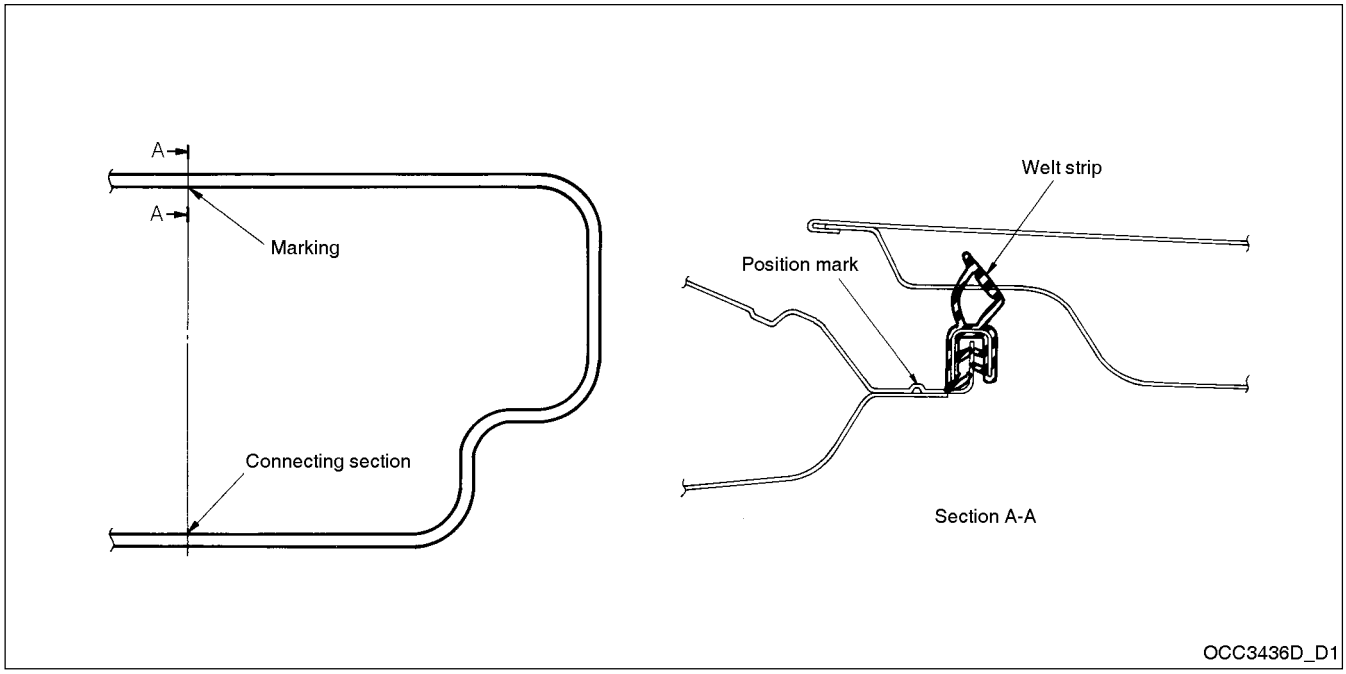
Removal • Installation of Torsion Bar

CAUTION:

- **The folding force of the torsion bar is very strong. Be careful when removing/installing the torsion bar.**
- **Cover the tool with a cloth to prevent from slipping.**

1. Hang the torsion bar wrench onto the torsion bar and remove it by lifting up.

Removal • Installation of Trunk Lid Welt Strip



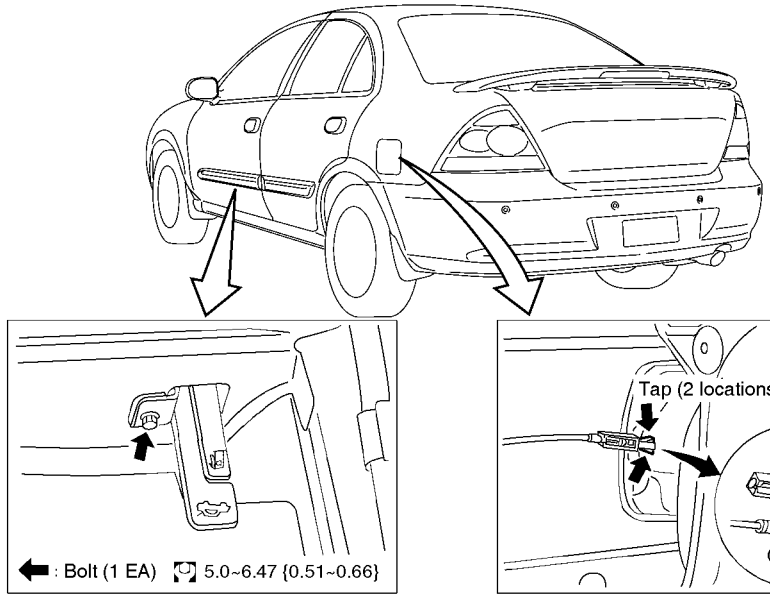
1. Align the welt strip marking to the vehicle center position marking from the front and then install.
2. For the rear, insert the welt strip connections into the center of the striker.
3. After installation, check if the welt strip is not loose by pulling it lightly.

CAUTION:

- **Securely install the each corner and trunk lid rear plate area.**

Trunk Lid & Fuel Filler Lid Opener

Components Location



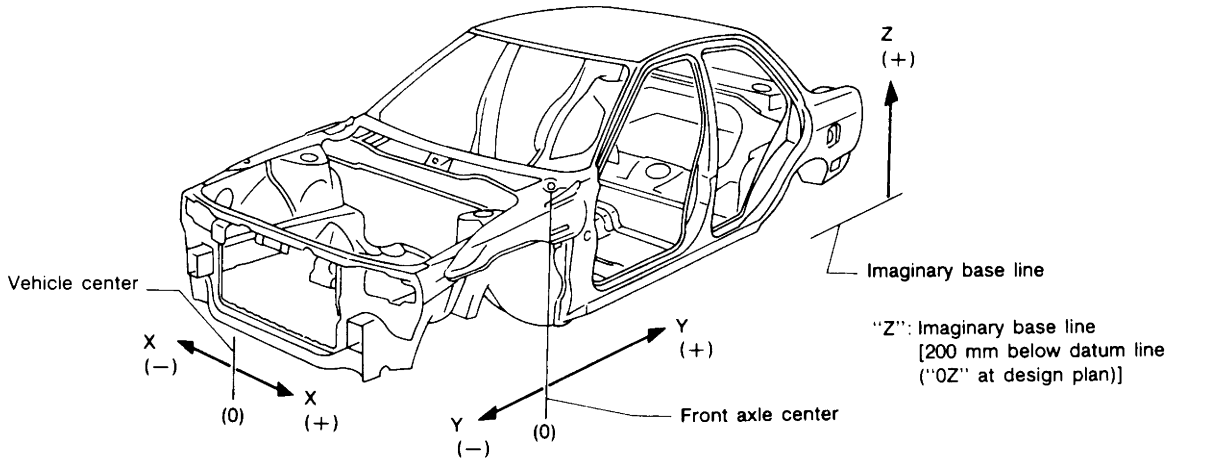
: N·m {kgf-m}

PIIB8647E

Body Alignment

Description

- All dimensions indicated in the figures are actual.
- When using a tracking gauge, adjust both pointers to equal length. Then check the pointers and gauge itself to make sure there is no free play.
- When a measuring tape is used, check to be sure there is no elongation, twisting or bending.
- Measurements should be taken at the center of the mounting holes.
- An asterisk (*) following the value at the measuring point indicates that the measuring point on the other side is symmetrically the same value.
- The coordinates of the measurement points are the distances measured from the standard line of “X”, “Y” and “Z”.



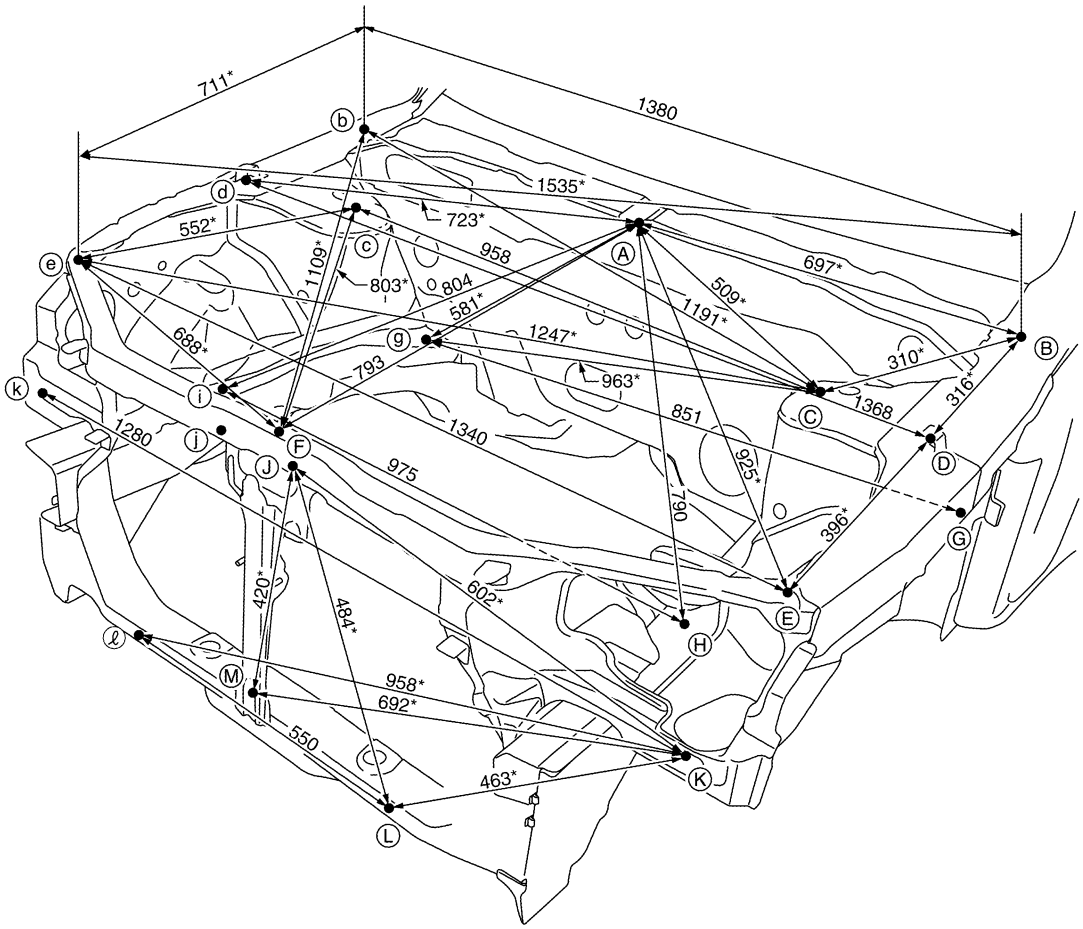
PIIA0104E

Engine Compartment

MEASUREMENT

Figures marked with a (*) indicate symmetrically identical dimensions on both right and left hand sides of the vehicle.

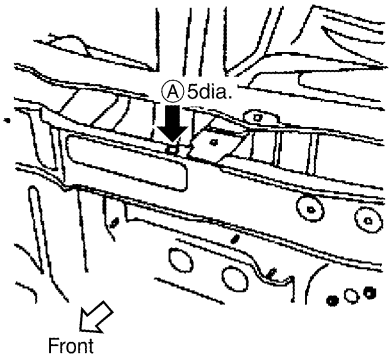
Unit : mm



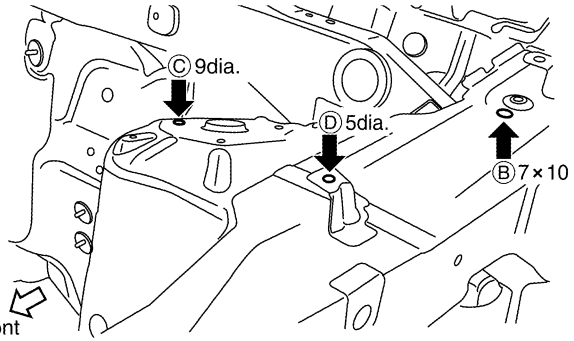
SIIA2617E

MEASUREMENT POINTS

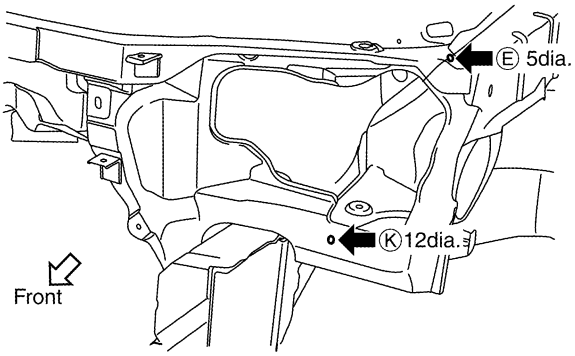
Ⓐ : Cowl top base hole center of center positioning mark (5dia.)



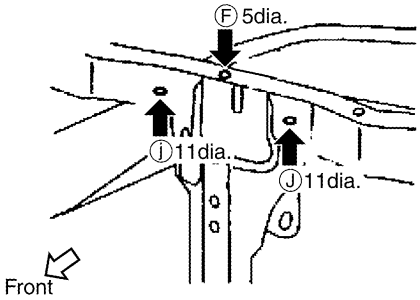
Ⓑ,ⓑ : Front hoodledge reinforcement measuring hole center (7×10)
Ⓒ,ⓒ : Front strut mounting hole center (9dia.)
Ⓓ,ⓓ : Front fender mounting hole center (5dia.)



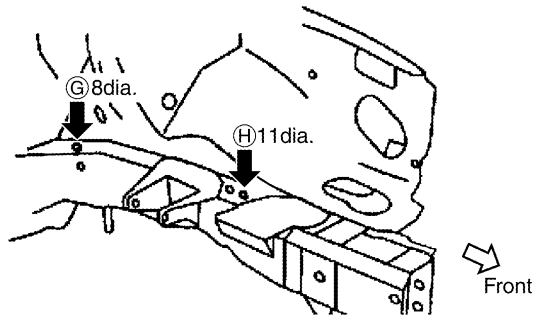
Ⓔ,ⓔ : Front fender mounting hole center (5dia.)
Ⓚ,ⓚ : Radiator core support side base hole center (12dia.)



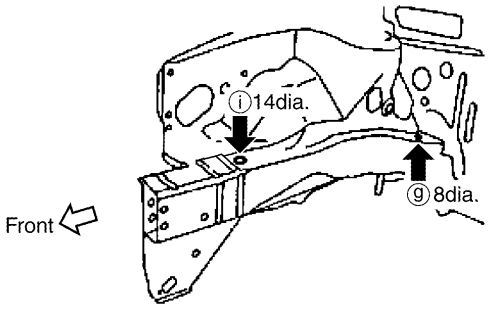
Ⓕ : Upper radiator core support measuring hole center of center positioning mark (5dia.)
Ⓙ,ⓙ : Hood lock mounting hole center (11dia.)



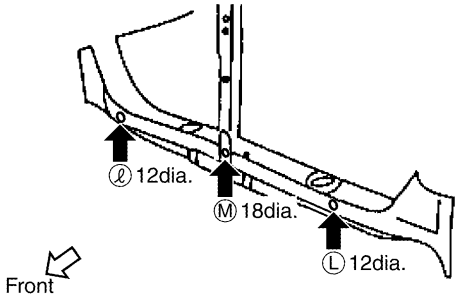
Ⓖ : ABS mounting hole center (8dia.)
Ⓗ : Battery bracket mounting hole center (11dia.)



ⓖ : Front side member measuring hole center (8dia.)
ⓘ : Engine bracket mounting hole center (14dia.)



Ⓛ,ⓛ : Radiator core support lower base hole center (12dia.)
Ⓜ : Hood lock stay measuring hole center of center positioning mark (18dia.)



SIIA2618E

Underbody

MEASUREMENT

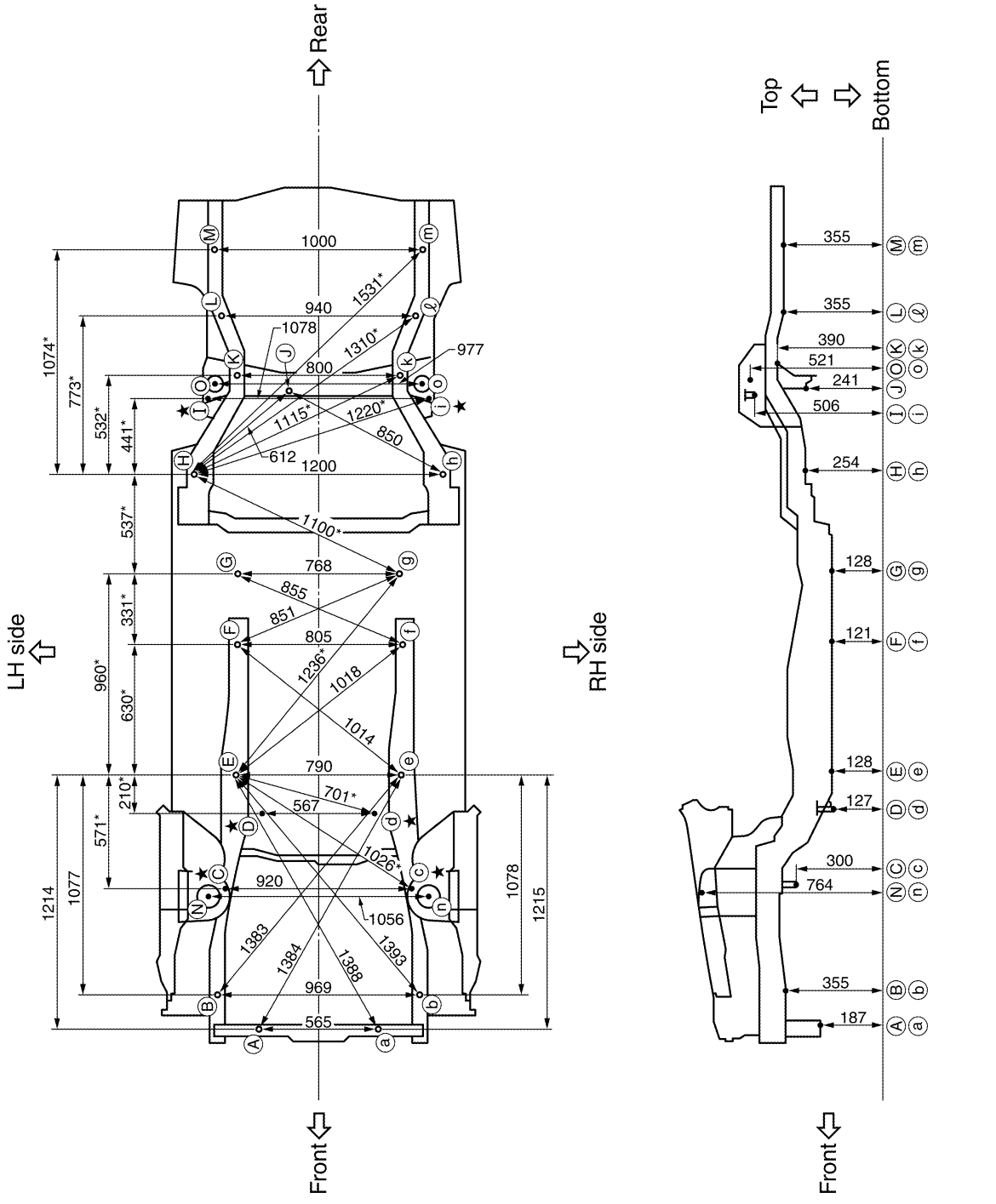
Unit : mm

Figures marked with a (*) indicate symmetrically identical dimensions on both right and left hand sides of the vehicle.

As viewed from underside.

★ : Bolt head

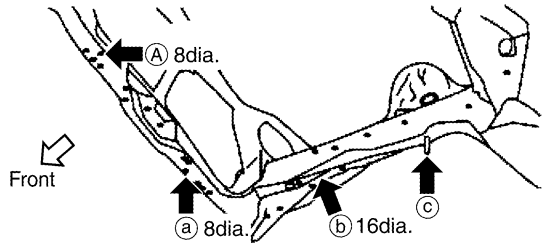
All dimensions indicated in this figure are actual.



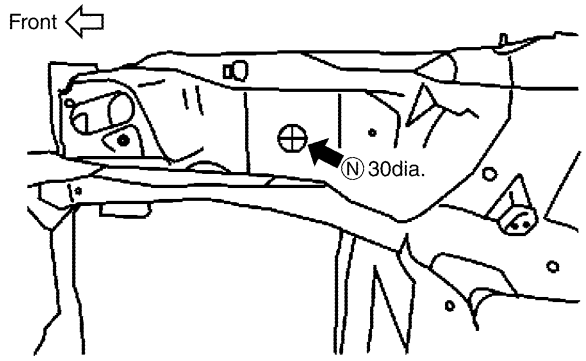
SIIA2619E

MEASUREMENT POINTS

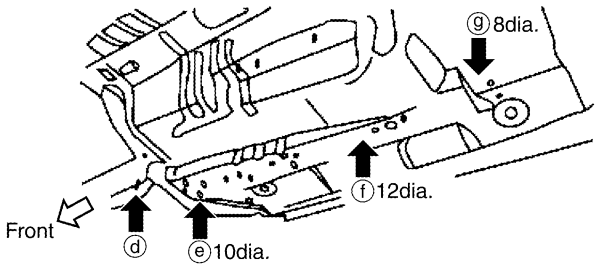
Ⓐ,ⓐ : Lower radiator core support base hole center (8dia.)
Ⓑ,ⓑ : Front side member base hole center (16dia.)
Ⓒ,ⓒ : Front suspension member mounting bolt end



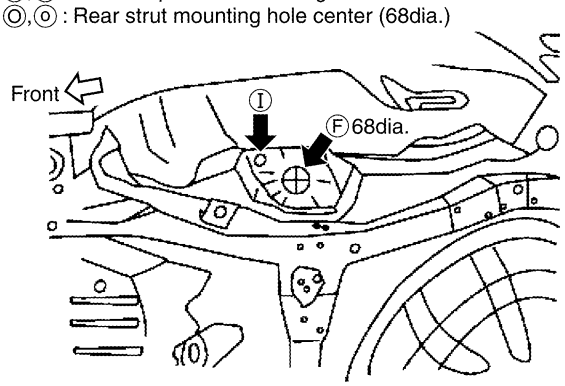
Ⓝ,ⓝ : Front strut mounting hole center (30dia.)



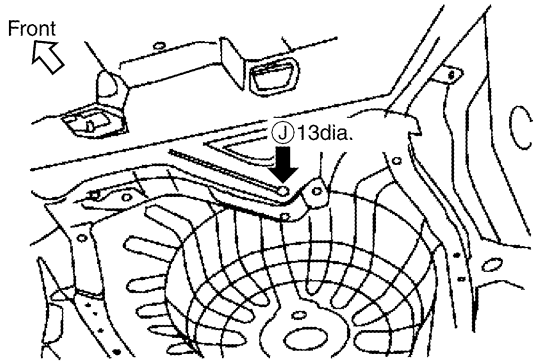
Ⓓ,ⓓ : Front suspention member mounting bolt end
Ⓔ,ⓔ : Front side member base hole center (10dia.)
Ⓕ,ⓕ : Front side member extension base hole center (12dia.)
Ⓖ,ⓖ : Front floor measuring hole center (8dia.)



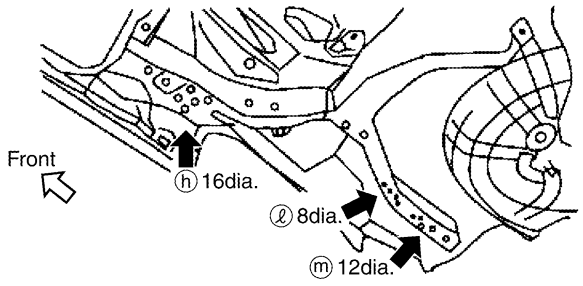
Ⓘ,ⓘ : Rear suspension mounting bolt end
Ⓞ,ⓞ : Rear strut mounting hole center (68dia.)



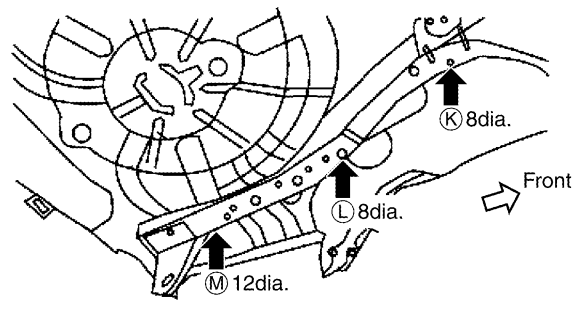
Ⓙ : Lateral link mounting hole center (13dia.)



Ⓗ, ⓗ : Rear side member base hole center (16dia.)
Ⓚ, ⓚ : Rear side member reinforcement base hole center (8dia.)
Ⓜ : Rear side member extension base hole center (12dia.)



Ⓚ,Ⓛ : Rear side member reinforcement base hole center (8dia.)
Ⓜ : Rear side member extension base hole center (12dia.)



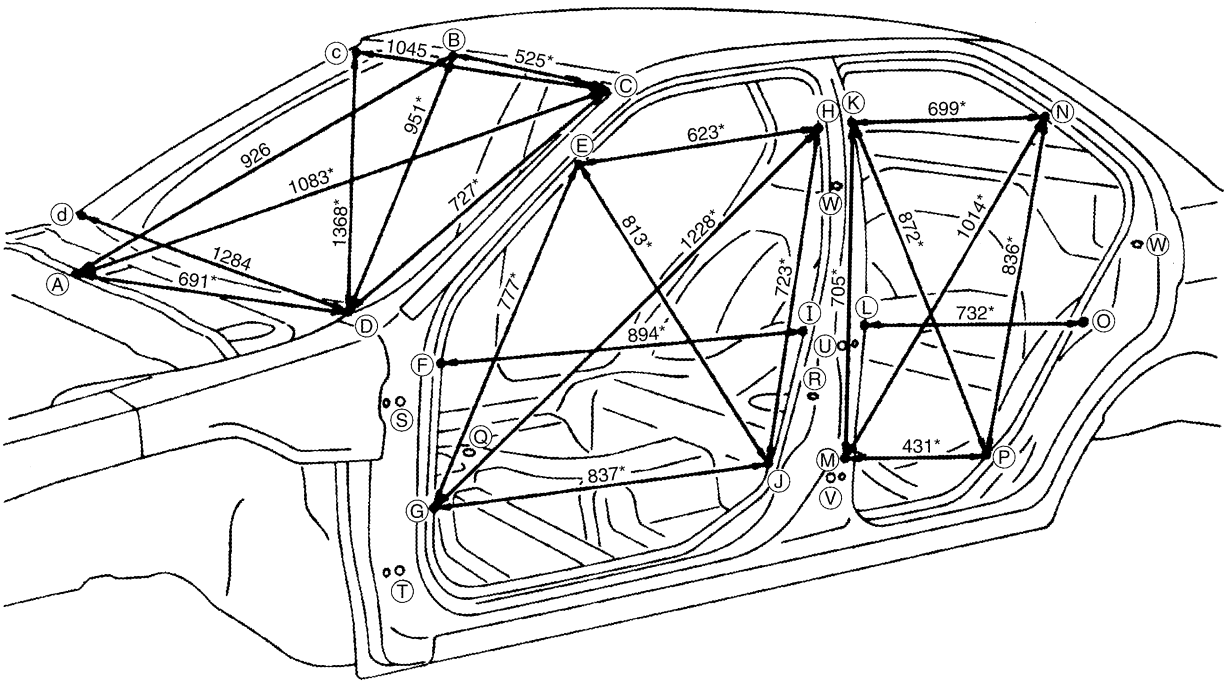
SIIA2620E

Passenger Compartment

MEASUREMENT

Unit : mm

Figures marked with a (*) indicate symmetrically identical dimensions on both right and left hand sides of the vehicle.

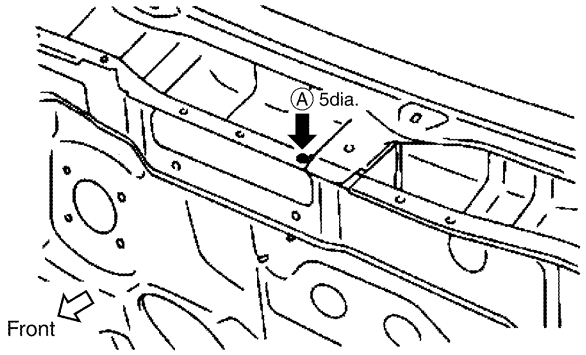


Point	Dimension	Point	Dimension	Point	Dimension
Ⓔ~ⓔ	1,172	Ⓚ~ⓝ	1,375*	Ⓠ~Ⓘ	896*
Ⓔ~ⓖ	1,495*	Ⓛ~ⓛ	1,386	Ⓠ~Ⓙ	785*
Ⓔ~ⓗ	1,324*	Ⓜ~ⓜ	1,396	Ⓡ~Ⓚ	1,006*
Ⓕ~ⓕ	1,374	Ⓜ~Ⓟ	1,462*	Ⓡ~Ⓛ	835*
Ⓖ~ⓖ	1,392	Ⓝ~ⓝ	1,204	Ⓡ~Ⓜ	767*
Ⓖ~ⓗ	1,769*	Ⓝ~Ⓟ	1,544*	Ⓡ~Ⓝ	1,069*
Ⓖ~ⓙ	1,626*	Ⓞ~ⓞ	1,378	Ⓡ~Ⓞ	880*
Ⓗ~ⓗ	1,164	Ⓟ~Ⓟ	1,399	Ⓡ~Ⓟ	709*
Ⓗ~ⓙ	1,466*	Ⓟ~ⓚ	1,545*	Ⓢ~Ⓤ	1,082*
Ⓘ~ⓘ	1,386	Ⓠ~Ⓔ	987*	Ⓢ~Ⓥ	1,102*
Ⓙ~ⓙ	1,396	Ⓠ~Ⓕ	930*	Ⓣ~Ⓤ	1,125*
Ⓚ~ⓚ	1,163	Ⓠ~Ⓖ	864*	Ⓣ~Ⓥ	1,061*
Ⓚ~ⓜ	1,456*	Ⓠ~Ⓗ	1,122*		

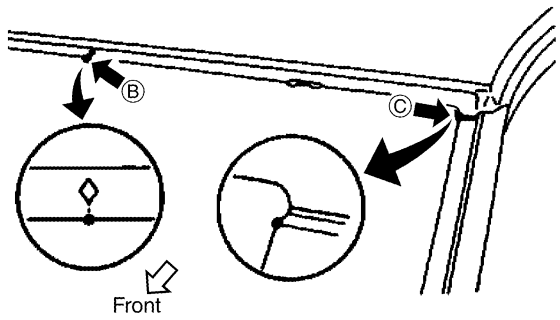
SIIA2621E

MEASUREMENT POINTS

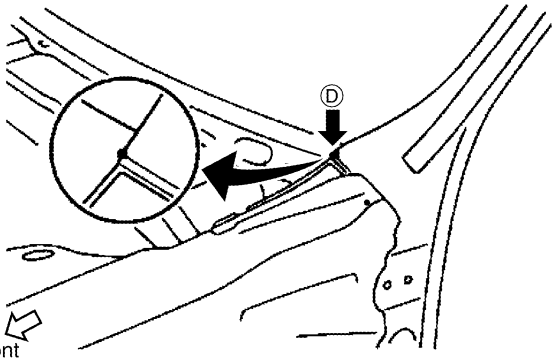
Ⓐ : Cowl top base hole center of center positioning mark (5dia.)



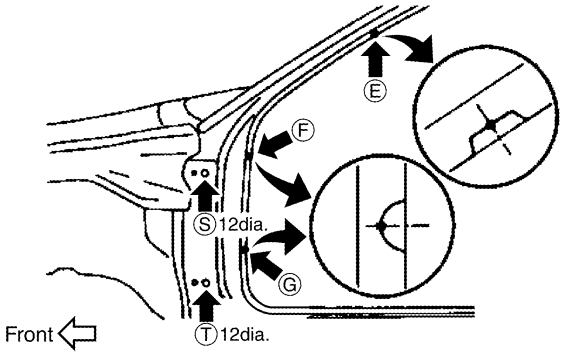
Ⓑ : Roof flange end of center positioning mark
Ⓒ , ⓒ : Front pillar end



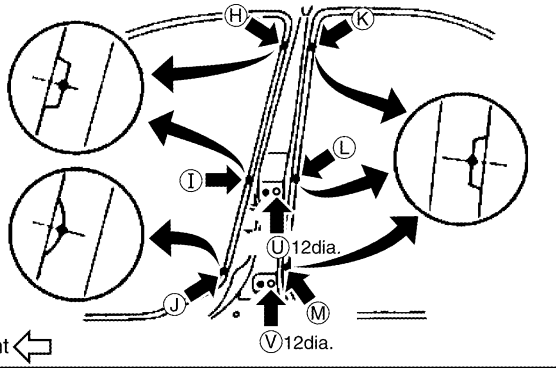
Ⓓ , ⓓ : Front pillar end



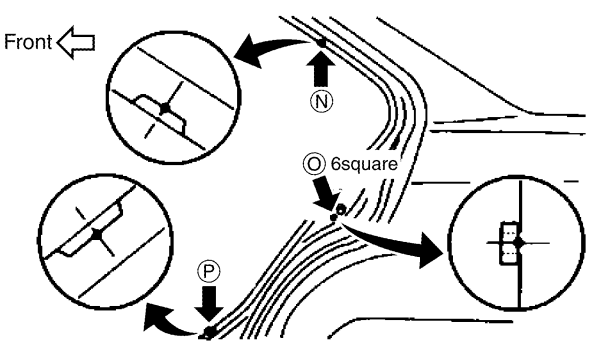
Ⓔ,ⓔ,Ⓕ,ⓕ,Ⓖ,ⓖ: Front pillar indention center
Ⓢ,ⓢ,Ⓣ,ⓣ: Door hinge mounting nut hole center (12dia.)



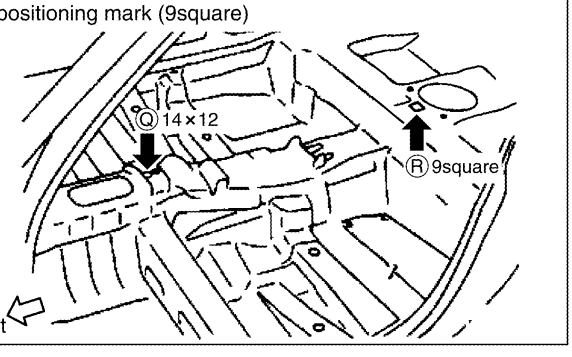
Ⓗ,ⓗ,Ⓘ,ⓘ,Ⓙ,ⓙ,Ⓚ,ⓚ,Ⓛ,ⓛ,Ⓜ,ⓜ : Center pillar indention center
Ⓤ,ⓤ,Ⓥ,ⓥ : Door hinge mounting nut hole center (12dia.)



Ⓝ,ⓝ,Ⓟ,ⓟ : Rear fender indention center
Ⓞ,ⓞ : Door hinge mounting nut hole center (6square)



Ⓠ : Second crossmember hole center of center positioning mark (14×12)
Ⓡ : Rear floor fuel tank cover mounting hole center of center positioning mark (9square)



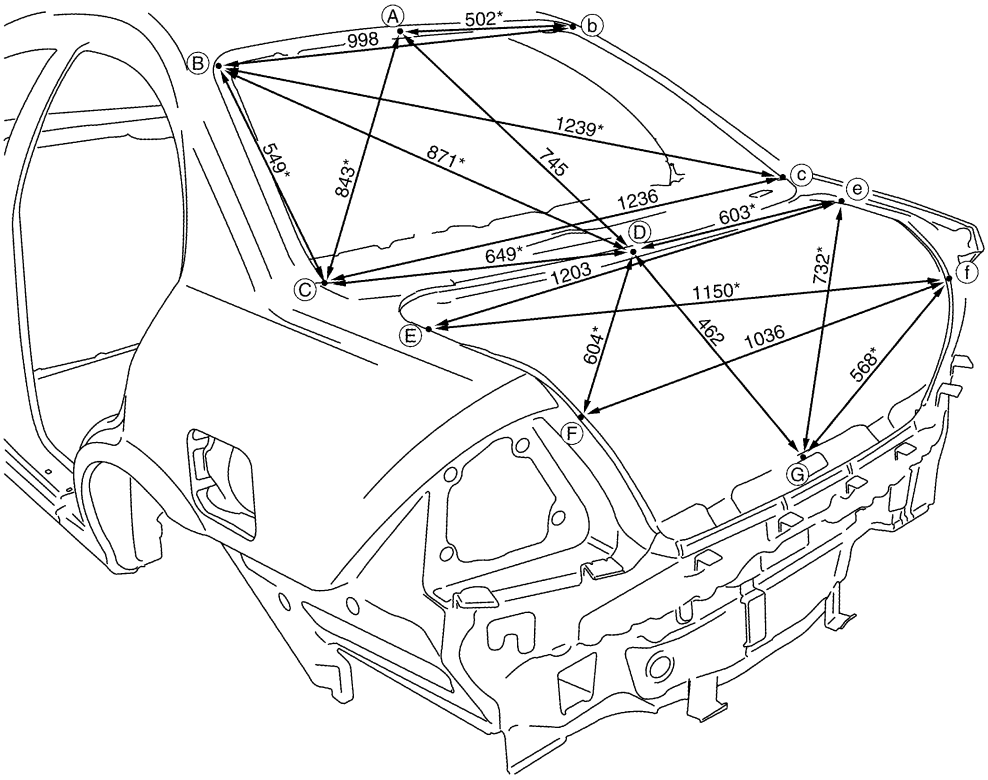
SIIA2622E

Rear Body

MEASUREMENT

Unit : mm

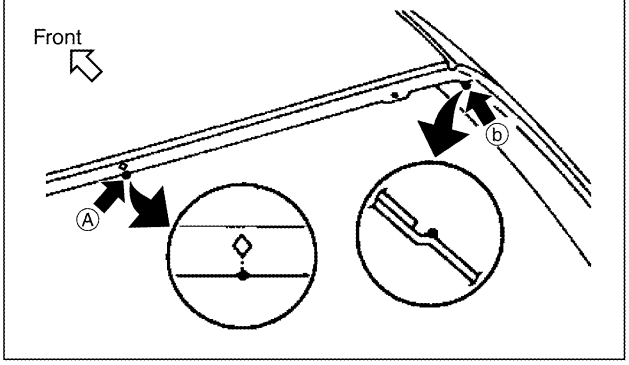
Figures marked with a (*) indicate symmetrically identical dimensions on both right and left hand sides of the vehicle.



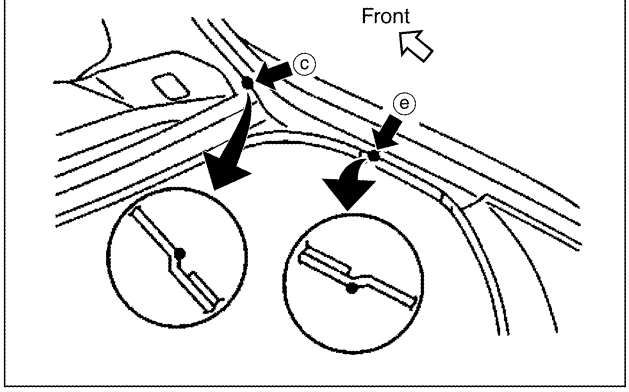
SIIA2623E

MEASUREMENT POINTS

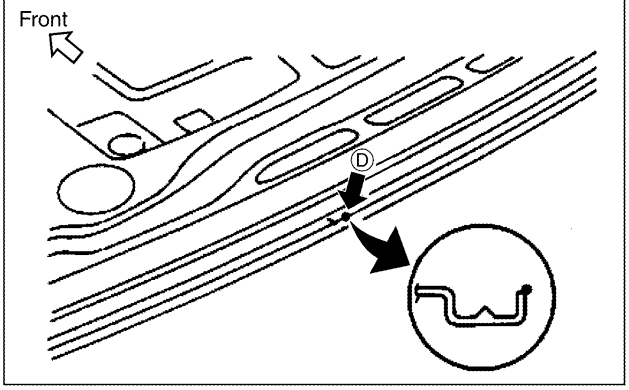
Ⓐ : Roof flange mark end of center positioning mark
Ⓑ , ⓑ : Rear fender end



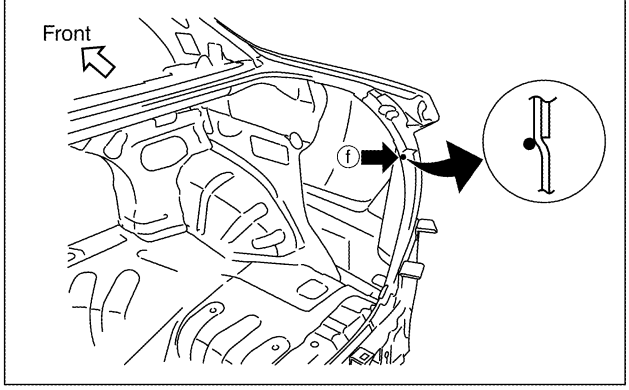
Ⓒ , ⓒ , Ⓔ , ⓔ : Rear fender end



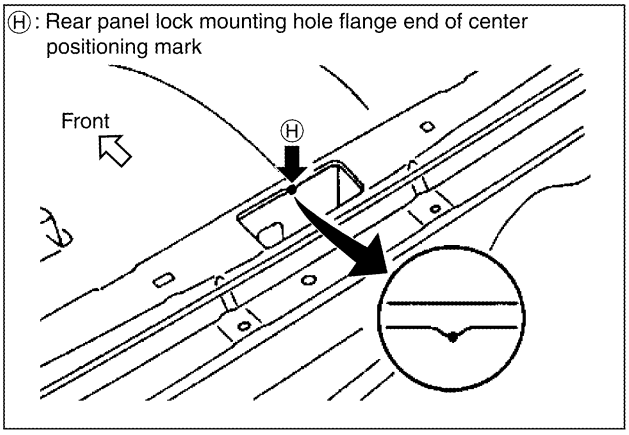
Ⓓ : Rear waist &parcel shelf end of center positioning mark



Ⓕ , ⓕ : Corner rear fender end



Ⓗ : Rear panel lock mounting hole flange end of center positioning mark



SIIA2624E

SECTION **CL**

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Pedal Height Inspection 5
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Air Bleeding 6
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Precaution

Caution

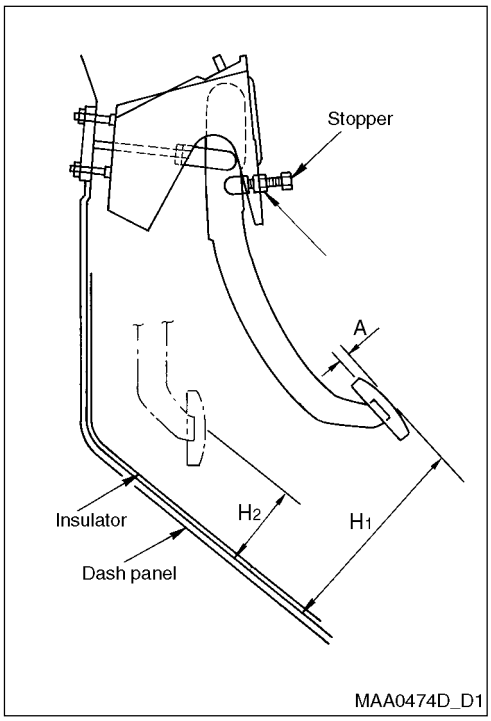
- Use the brake fluid and “DOT3” or “DOT4” for the clutch fluid.
- Do not apply the brake fluid to the component. If applied, immediately wipe it out and clean with water.
- Use a clean brake fluid when cleaning the components such as master cylinder and operating cylinder.
- The use of gasoline or refined oil when cleaning the rubber may deform the rubber characteristics and cause defective operation. Avoid using them.
- Use the pipe nut torque wrench for clutch tube installation.
- When inspecting the clearance between the dash panel clutch pedal, remove the floor carpet before inspection.

Preparation

Special Service Tools

Item	Description	
Diaphragm spring adjusting wrench ST20050240	 ZZA0508D_D1	Clutch cover inspection
Clutch aligning bar ST20610000	 ZZA1178D_D1	Installing clutch disc

Clutch Pedal



On-Vehicle Inspection and Adjustment

HEIGHT ADJUSTMENT

1. Inspect if the clutch pedal height H1 falls under the standard value from the dash panel.

   Pedal height H1: 155 - 166 mm

2. When the pedal height is out of the standard value, loosen the stopper bolt lock nut B and adjust using the stopper bolt.
3. Adjust the pedal height to the standard value and tighten the stopper bolt lock nut B to the specified torque.

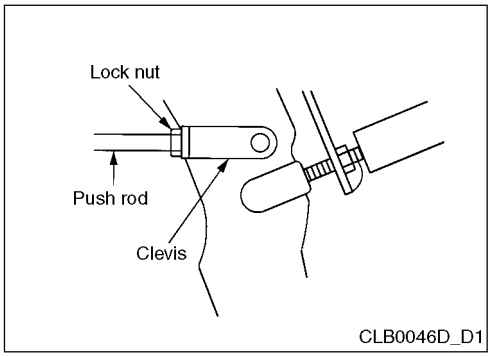
   Tightening torque: 16 - 21 N•m (1.6 - 2.2 kgf-m)

4. Inspect if the freeplay A, from the pedal pad surface, and clutch pedal height H2, when disengaged, falls under the standard value.

   Pedal freepaly A: 9 - 16 mm

   (Clevis pin clearance: 1.0 - 3.0 mm)

   Pedal height H2 when disengaged: More than 86 mm



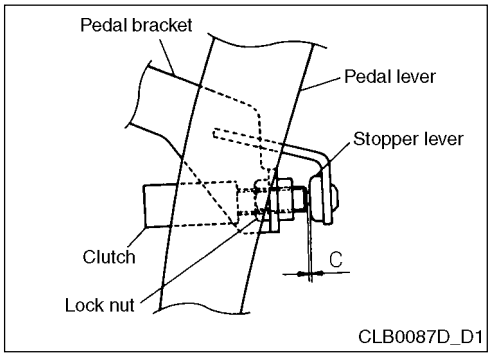
5. When the freeplay A and pedal height H2 are out of the standard value, loosen the lock nut A and adjust by rotating the pushrod.

CAUTION:

- **The threads on the pushrod end should be inside of the clevis.**

6. Tighten the lock nut A to specified torque.

   Tightening torque: 0.8 - 1.1 kgf-m

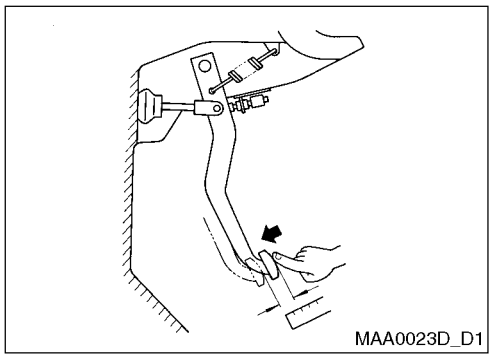


Clutch Switch Position Adjustment

- Adjust the switch position so that the gap between the stopper rubber and clutch switch end becomes gap C while pedal is fully depressed, then tighten the lock nut D.

  Gap C: 0.1 - 1.0 mm

  Tightening torque: 12 - 14 N•m (1.2 - 1.5 kgf-m)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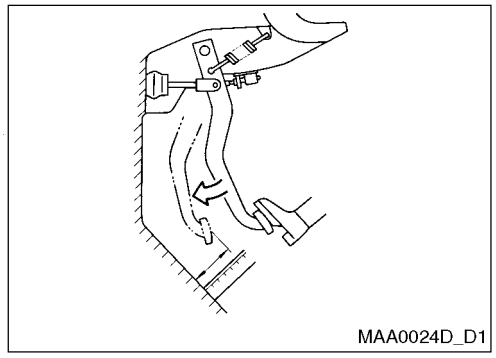
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FREEPLAY INSPECTION

- Push the clutch pedal with hand to the resistance and visually inspect if the freeplay falls within the specified value.

  Pedal freeplay: 9 - 16 mm

PEDAL HEIGHT INSPECTION

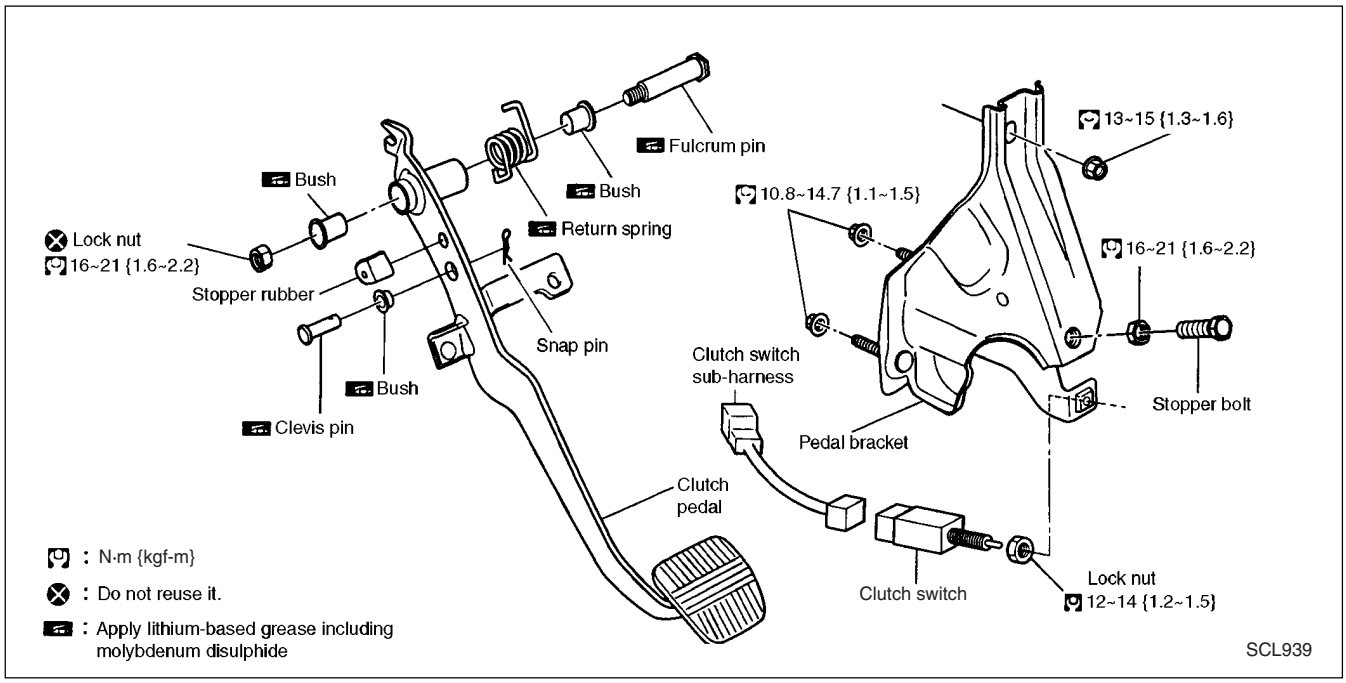
1. Start the engine and stay at idle.
2. Apply the parking brake.
3. Depress the brake pedal.
4. Fully depress the clutch pedal and shift into 1st gear.
5. Visually inspect if the distance between the pedal and dash panel falls within the specified value by slowly releasing the clutch pedal until the clutch starts to engage.

   Pedal height when disengaged: More than 86 mm

REFERENCE:

- **The pedal height while clutch is disengaged and engaged is slightly different. But for the convenience of inspection, let engaged point be the disengaged point.**

Removal • Installation



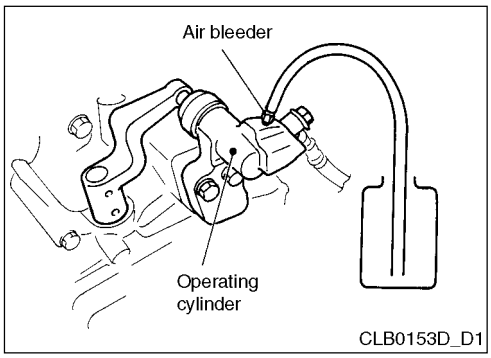
REFERENCE:

- **Tighten the stopper bolt to the specified torque after installing the clutch pedal assembly to the vehicle and adjusting the height.**

INSPECTION AFTER REMOVAL

- Inspect for any bending, damage or welding point splitting in the clutch pedal and replace if any damages.
- Inspect the wear in the return spring and replace if necessary.

Clutch Fluid



Air Bleeding

CAUTION:

- **Be careful not to empty the brake fluid in the reservoir tank.**
- **Be careful not to stain the brake fluid in vehicle surface. If stained, wipe out immediately and wash out.**
- **Use the operating cylinder to bleed air.**

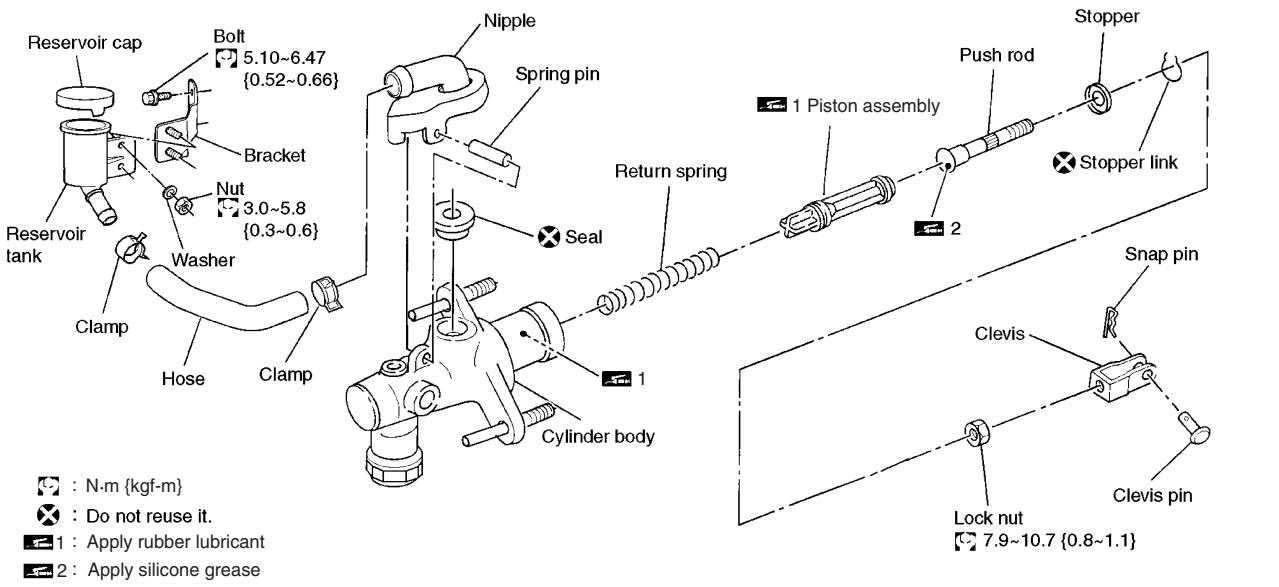
1. Fill the brake fluid.
2. Connect the transparent vinyl hose to the air bleeder.
3. Depress the clutch pedal with full stroke and release the clutch pedal. Repeat it several times with 2 - 3 seconds of interval.
4. Open the air bleeder while depressing the clutch pedal.
5. Close the air bleeder.
6. Release the clutch pedal and wait about 5 seconds.
7. Repeat the steps 3 to 6 until air is released in the clutch fluid.

Air bleeder tightening torque:

5.9 - 9.8 N•m (0.6 - 1.0 kgf-m)

Clutch Master Cylinder

Removal • Installation



REMOVAL

1. Remove the brake fluid in the reservoir tank.

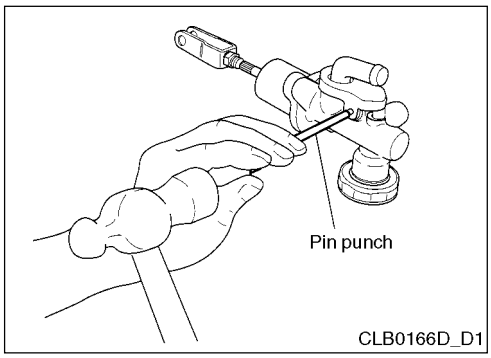
CAUTION:

- **Be careful not to stain the brake fluid at the vehicle surface. If stained, immediately wipe it out and clean with water.**

2. Remove the clutch tube using the pipe nut wrench.
3. Remove the clevis pin and snap pin on the clevis from the vehicle inside and separate it from the clutch pedal.
4. Remove the master cylinder assembly mounting nut and reservoir tank bracket mounting bolts and remove the master assembly from the vehicle.

INSTALLATION

1. Install the clutch nut to the master cylinder and temporarily tighten the flare nut.
2. Install the master cylinder and reservoir tank bracket to the vehicle and tighten the mounting nuts and bolts to the specified torque.
3. Tighten the clutch tube to the specified torque using the pipe nut wrench.
4. Connect the clevis to the clutch pedal and install the clevis pin.
5. Install the snap pin to the clevis pin.
6. After installation, inspect and adjust the pedal height and bleed air from the clutch tube.
   - Refer to "On-Vehicle Inspection and Adjustment" (CL-4) and "Air Bleeding" (CL-6).



Disassembly • Assembly

DISASSEMBLY

1. Remove the spring pin using the long pin punch (commercial tool) and remove the nipple and seal from the cylinder body.
2. Loosen the pushrod lock nut and remove the clevis and lock nut.
3. Remove the stopper ring and stopper and disassembly the push rod from the cylinder body. The piston may bounce out from the master cylinder. So perform the disassembly while pressing the pushrod.
4. Disassemble the piston assembly and return spring from the cylinder body.

INSPECTION AFTER DISASSEMBLY

Inspect the following items and replace if necessary.

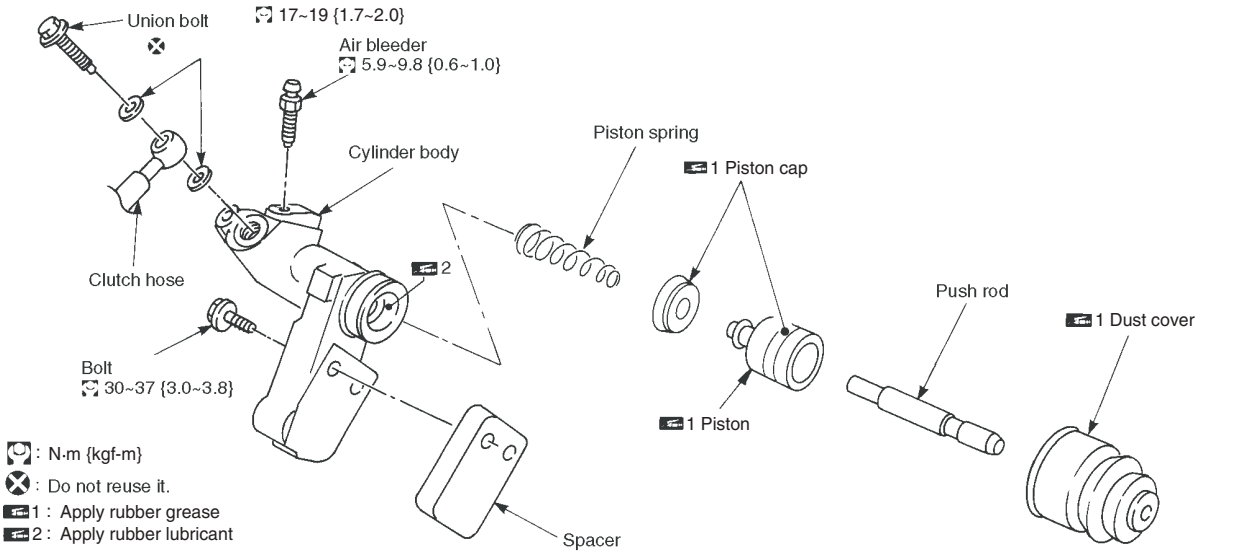
- Damage at cylinder inner walls, foreign particles insertion, wear, rust and pinhole.
- Damage or deformation in the nipple and reservoir tank.
- Spring wear.

ASSEMBLY

1. Apply the lubricant at the cylinder body inner, piston assembly moving sections and piston cup. Insert the piston assembly and return spring to the cylinder body.
2. Apply the silicon grease to the pushrod and install the pushrod. Install the stopper ring by pressing so that the piston assembly does not come out.
3. Install the clevis to the pushrod and tighten the lock nut to the specified torque.
4. Install the seal and nipple to the cylinder body and install the spring pin using the pin punch.

Operating Cylinder

Removal • Installation



REMOVAL

1. Remove the brake fluid.

CAUTION:

- **Be careful not to stain the brake fluid at the vehicle surface. If stained, immediately wipe it out and clean with water.**

2. Disconnect the clutch hose from the operating cylinder.
3. Remove the mounting bolts from the operating cylinder and remove the operating cylinder and the spacer from the vehicle.

INSTALLATION

Install in the reverse order of removal by cautioning as below.

- Install the hose without twists or disconnections.
- After service, perform the air bleeding for the clutch tube.
  Refer to "Air Bleeding" (CL-6).

Disassembly • Assembly

DISASSEMBLY

- Remove the dust cover and push rod. Disassemble the piston, piston cup and piston spring from the cylinder body.

INSPECTION AFTER REMOVAL

Inspect the below items and replace if necessary.

- Damage at cylinder inner walls, foreign particles insertion, wear, rust and pinhole.
- Spring wear.
- Crack or deformation of dust cover.

ASSEMBLY

1. Apply the lubricant on the cylinder body inner and rubber grease on the piston cup and piston, and insert the piston assembly to the cylinder body.
2. Apply the rubber grease to the dust cover and install the pushrod and dust cover.

Clutch Pipe

Removal • Installation

Perform the tube removal/installation cautioning below items.

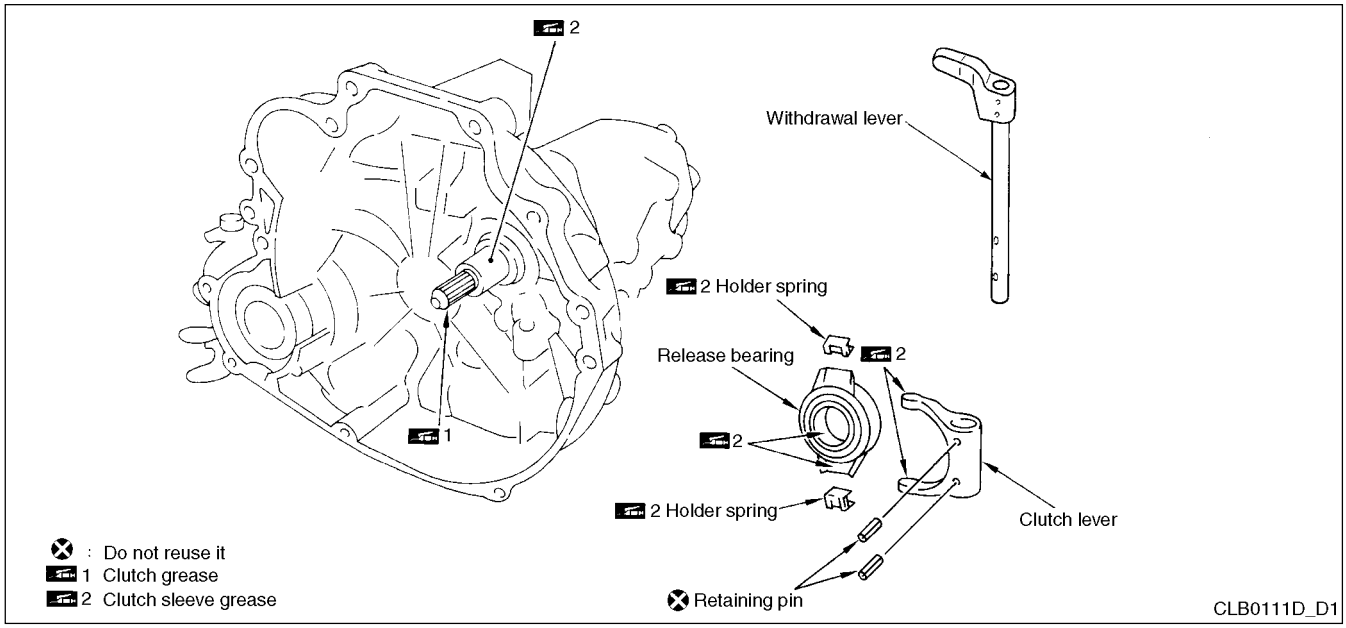
- Be careful not to stain the brake fluid in vehicle surface. If stained, immediately wipe it out and clean with water.
- Install the hose without twists or disconnections. Also, be careful not to damage the clutch hose.
- Tighten the clutch tube flare nut to the specified torque.
  Tightening torque: 14.7 - 17.64 N•m (1.5 - 1.8 kgf-m)

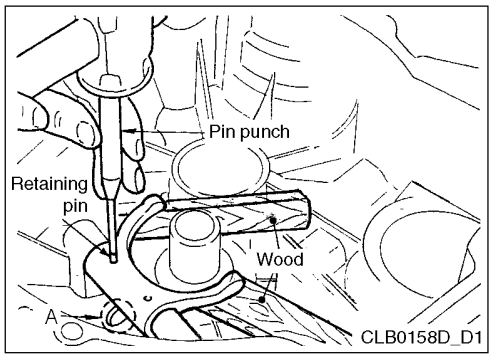
- Tighten the clutch hose union bolt to the specified torque.
  Tightening torque: 16.7 - 19. 6 N•m (1.7 - 2.0 kgf-m)

- After service, perform the air bleeding for the clutch tube.
  Refer to “Air Bleeding” (CL-6).

Clutch Release Mechanism

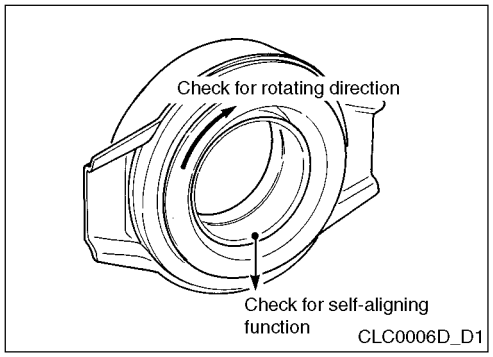
Removal • Installation





REMOVAL

1. Remove the manual transaxle from the vehicle.
   - Refer to "Removal • Installation" (MT-8).
2. Operate the withdrawal lever at the location the release bearing was disconnected and remove the release bearing from the clutch lever.
3. Place a wood at the end of the clutch lever. Adjust the retaining pin location as shown in the illustration and remove the retaining pin using the pin punch.
4. Separate the withdrawal lever and remove the clutch lever.



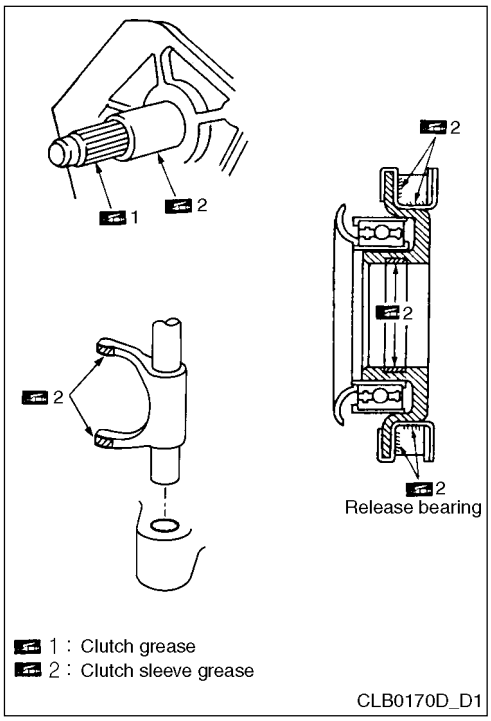
INSPECTION AFTER REMOVAL

- Inspect the release bearing for stick, damage, bad rotation and self-aligning function. Replace if necessary.
- Replace the withdrawal lever if the surface has worn.
- Replace the clutch lever if the contacting surface has worn.

INSTALLATION

CAUTION:

- **Strange noise, bad disengagement and clutch damage may occur if grease is not applied. Be sure to apply it. If too much grease is applied, it may become slippery and may cause vibration. Wipe out the excessive grease.**



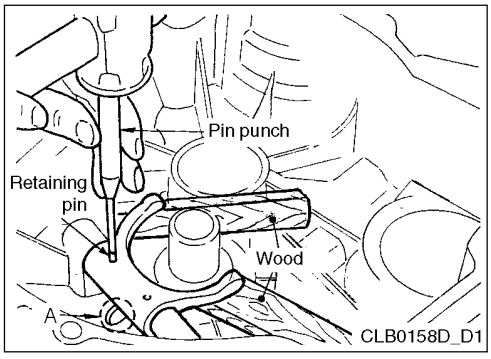
- Be careful not to stain fluid at the clutch disc face, pressure plate surface and flywheel surface.

1. Apply grease at locations specified below.

CAUTION:

- **Wipe out all grease and worn particles in the surfaces to apply the grease.**

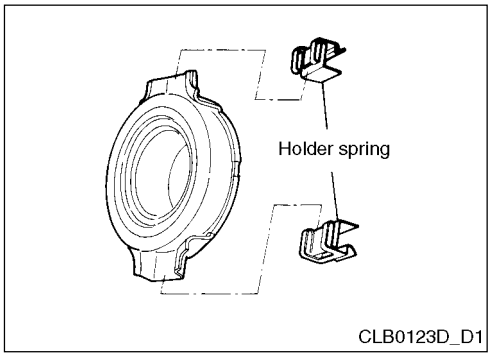
  - Apply the clutch spring grease at the clutch lever and holder spring's moving surfaces for about 1 mm thickness.
  - Apply the clutch sleeve grease at the release bearing inner groove.
  - Lightly apply the clutch sleeve grease at the release bearing's moving surfaces and attach the release bearing. Wipe out the used grease and remove the release bearing.



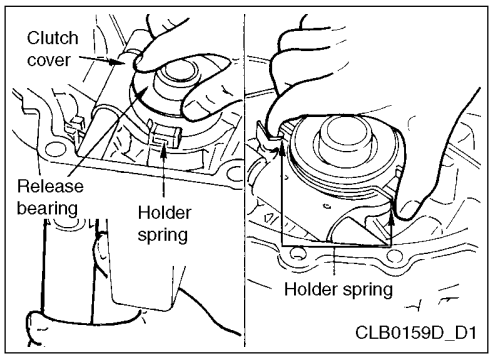
2. Install the clutch lever to the clutch housing and insert the withdrawal lever.
3. Place a wood at the end of the clutch lever. Insert the retaining pin using a pin punch.

CAUTION:

- **The retaining pin cannot be reused. Do not reuse.**



4. Assembly the holder spring to the release bearing as in the illustration.



5. Operate the withdrawal lever with hand and press the holder spring at both sides, then assembly the release bearing to the clutch lever.

CAUTION:

- **Check for a “click” sound when pressing the holder spring at both sides.**

6. Move the withdrawal lever and check if each moving parts are moving smoothly.

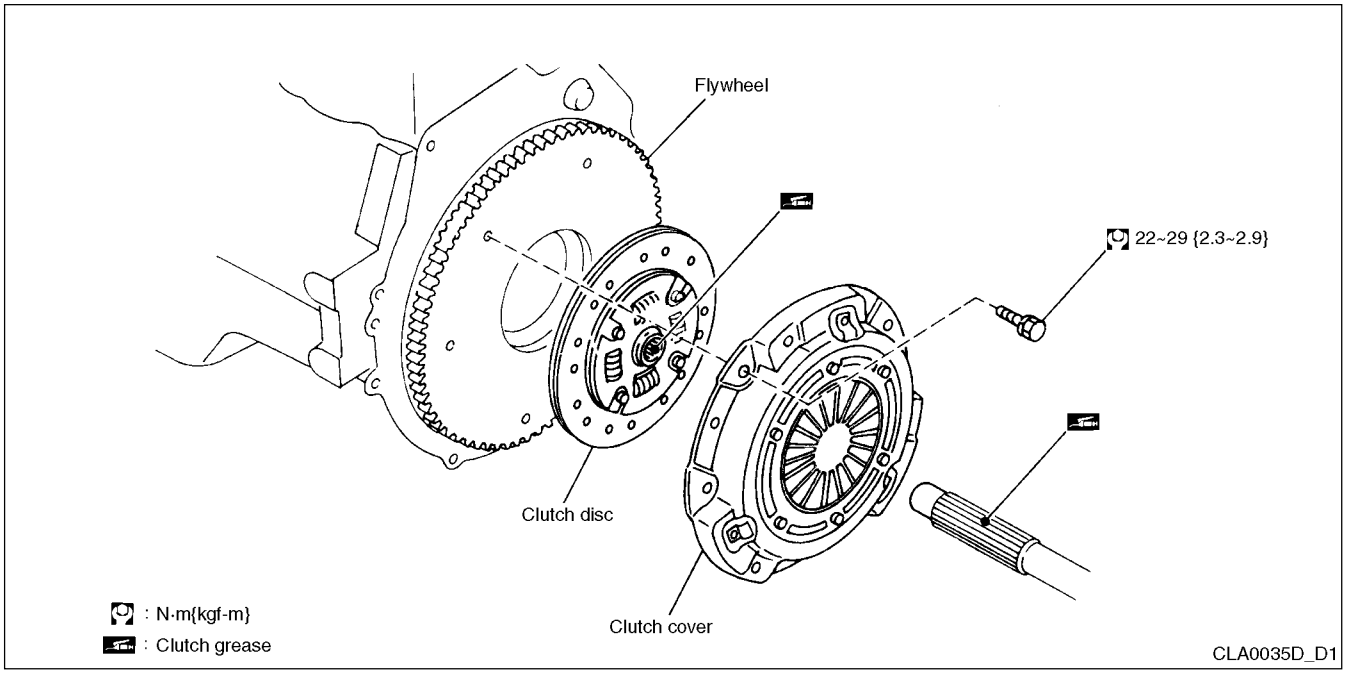
CAUTION:

- **Wipe out the excessive grease.**

7. Install the manual transaxle.
   Refer to “Removal • Installation” (MT-8).

Clutch Disc, Clutch Cover & Flywheel

Removal • Installation

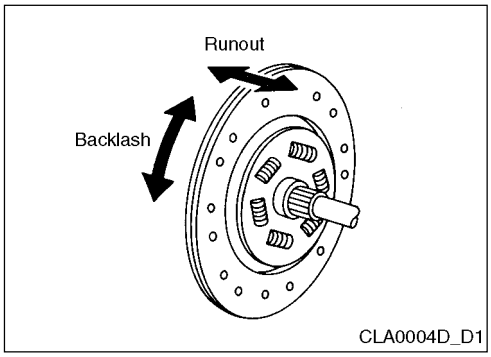


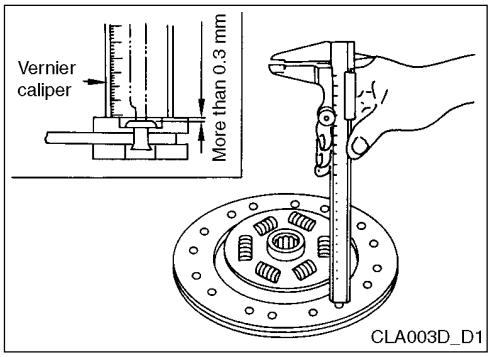
CAUTION:

- **Be careful not to stain any fluid at the clutch disc face, pressure plate and flywheel surface.**

REMOVAL

1. Remove the manual transaxle from the vehicle.
   - Refer to “Removal • Installation” (MT-8).
2. Loosen the clutch cover mounting bolts evenly and remove the clutch cover and clutch disc.





INSPECTION, ADJUSTMENT AFTER REMOVAL

Clutch Disc

- Measure the clutch disc outer runout against the center of the spline. Replace if out of the standard value.

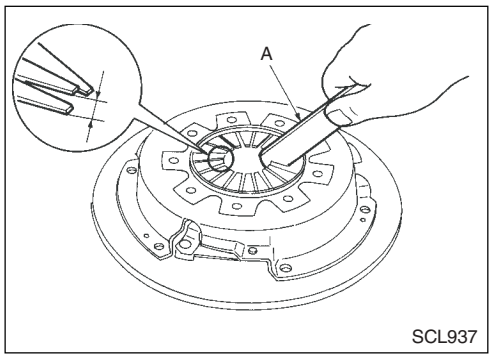
  Runout limit/Measuring radius:
  Less than 1.0 mm/ϕ 190 mm (R95)

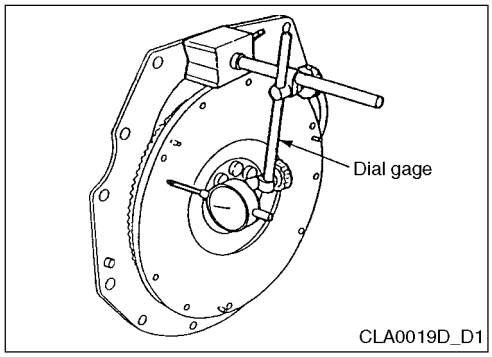
- Measure the backlash on the clutch disc spline and input shaft spline from the outside of the disc and replace if out of the standard value.

  Max. spline backlash: 0.8 mm

- Measure the depth between the clutch disc facing and rivet head using a vernier caliper and replace if measured value is out of the standard.

  Wear limit between the facing and rivet head: 0.3 mm





CLUTCH COVER

Inspect the evenness of the diaphragm spring tips while installed on the vehicle and adjust it using a diaphragm adjust wrench (A: ST20050240) if out of the standard value.

Unevenness limit: 0.7 mm

- Inspect for any wear or damages at the clutch cover fulcrum plate. Replace the clutch cover assembly if defective.

REFERENCE:

- **Fulcrum plate clangs if worn when tap the rivet with a hammer.**
- **Fulcrum plate makes strange noise if worn when shake the cover vertically.**
- If you find any sootiness or discoloration at the clutch cover pressure plate and contacting surfaces on the clutch disc, clean it with sand paper and replace it as an assembly if the surface is distorted or damaged.

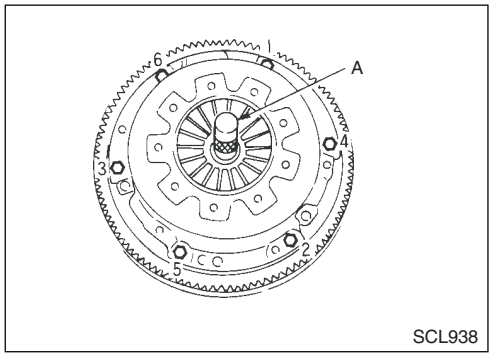
FLYWHEEL RUNOUT

Measure the flywheel runout on the clutch surface using a dial gage and replace it if out of the standard value. Repair it with sand paper if any sootiness or discoloration at the surface.

Flywheel surface runout: Less than 0.15 mm

CAUTION:

- **Perform the measurement at the outer side of the flywheel (on where does not touch any obstacles).**



INSTALLATION

1. Apply the clutch grease at the clutch disc and input shaft spline.

CAUTION:

- **Strange noise, separation and clutch damage may occur if grease is not applied. Be sure to apply it. If too much grease is applied, it may become slippery and may cause vibration. Wipe out the excessive grease.**

2. Install the clutch disc and clutch cover. Temporarily tighten the mounting bolts and install the clutch aligning bar (A: ST20610000).
3. Tighten the clutch cover mounting bolts in 2 stages evenly in the order shown in the illustration.

   Tightening torque:

   Stage 1: 9.8 19.6 N•m (1.0 - 2.0 kgf-m)

   Stage 2: 21.6 - 29.4 N•m (2.2 - 3.0 kgf-m)

4. Install the manual transaxle.
   - Refer to “Removal • Installation” (MT-8).

Service Data

Clutch Pedal

Engine model		QG16DE
Pedal Height when released	(mm)	156 - 166
Pedal Height when disengaged	(mm)	More than 80
Pedal freeplay (Cover of the clevis pin)	(mm)	9 - 16 (1.0 - 3.0)
Clearance between the clutch switch end and stopper rubber	(mm)	0.3 - 1.0

Clutch Disc

Engine model		QG16DE
Size	(mm)	ϕ 215
Wear limit (Depth to rivet head)	(mm)	0.3
Facing runout / Measuring radius	(mm)	Less than 1.0 / ϕ 190 (R 95)
Max. spline backlash	(mm)	0.8

Clutch Cover

Engine model		QG16DE
Size	(mm)	ϕ 215
Diaphragm spring lever height	(mm)	31.0 - 33.0
Unevenness limit of diaphragm spring lever height	(mm)	Less than 0.7

ENGINE CONTROL SYSTEM

SECTION **EC**

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Precautions

Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"

WARNING:

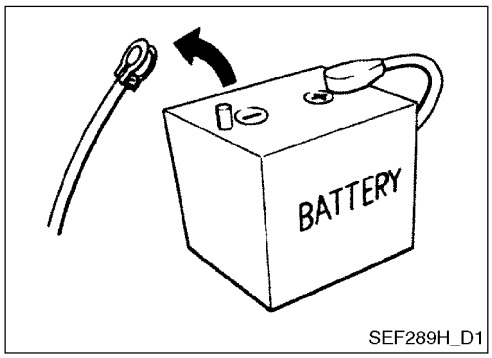
- **To install/remove the SRS airbag, pretensioner seatbelt system related components and harness, turn the ignition switch "OFF", disconnect the battery terminals and wait over 3 minutes. (This is to discharge all the remaining electricity in the airbag sensor unit's auxiliary power circuit.)**
- **Do not use air impact or electrical tools when installing/removing the components.**
- **Do not use any hand-held tools for harness used in SRS airbag and pretensioner seatbelt systems. Be careful with the harness not to tangle with or interfere with other components.**
- **Do not use any electrical test equipments such as circuit tester when inspecting the SRS airbag and pretensioner seatbelt circuit while installed unless the Service Manual instructs to do so. (The weak current in the tester can cause the SRS airbag to operate.)**
- **Do not insert any foreign materials such as a screwdriver in the airbag module and pretensioner seatbelt connector in order to prevent unintended operation due to static electricity.**
- **The harnesses used in SRS airbag and pretensioner are covered with yellow insulation for easy identification.**
- **Refer to "RS Restraint System" in this Service Manual for safe airbag system service information.**

ON BOARD DIAGNOSTIC (OBD) SYSTEM OF ENGINE

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

CAUTION:

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

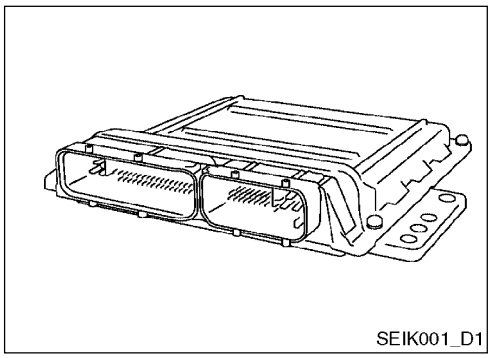


SEF289H_D1

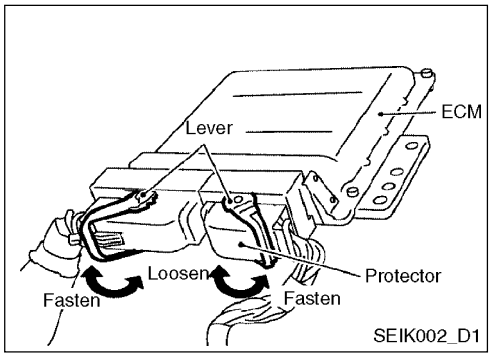
PRECAUTION

- Always use a 12 volt battery as power source.
- Do not attempt to disconnect battery cables while engine is running.
- Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect battery ground cable. Failure to do so may damage the ECM because battery voltage is applied to ECM even if ignition switch is turned off.
- Before removing parts, turn ignition switch OFF and then disconnect battery ground cable.

Precautions (Cont'd)

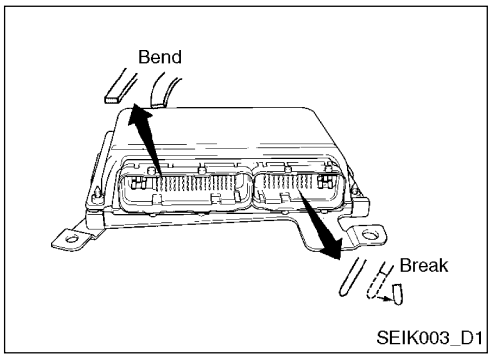

SEIK001_D1

- Do not disassemble ECM.
- If battery cable is disconnected, the memory will return to the initial ECM values. The ECM will now start to self-control at its initial values. Engine operation can vary slightly when the cable is disconnected. However, this is not an indication of a malfunction. Do not replace parts because of a slight variation.



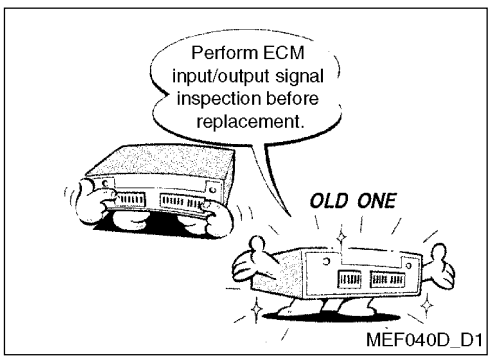
SEIK002_D1

- When connecting ECM harness connector, fasten it securely with a lever as far as it will go as shown at right.



SEIK003_D1

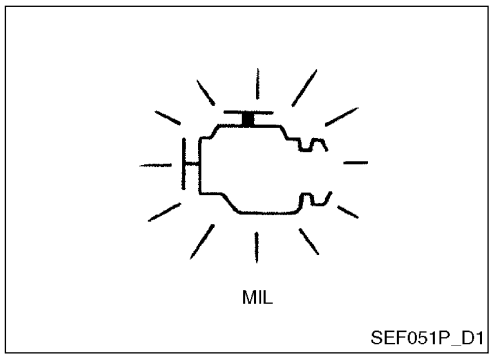
- When connecting or disconnecting pin connectors into or from ECM, take care not to damage pin terminals (bend or break). Make sure that there are not any bends or breaks on ECM pin terminal, when connecting pin connectors.
- Securely connect ECM harness connectors. A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to ICs.
- Keep engine control system harness at least 10 cm (4 in) away from adjacent harness, to prevent engine control system malfunctions due to receiving external noise, degraded operation of ICs, etc.
- Keep engine control system parts and harness dry.
- Before replacing ECM, perform "ECM Terminals and Reference Value" inspection and make sure ECM functions properly. Refer to EC-53, "ECM Terminals and Reference Value".
- Handle mass air flow sensor carefully to avoid damage.
- Do not disassemble mass air flow sensor.
- Do not clean mass air flow sensor with any type of detergent.
- Do not disassemble electric throttle control actuator.
- Even a slight leak in the air intake system can cause serious incidents.
- Do not shock or jar the camshaft position sensor (PHASE), crankshaft position sensor (POS).



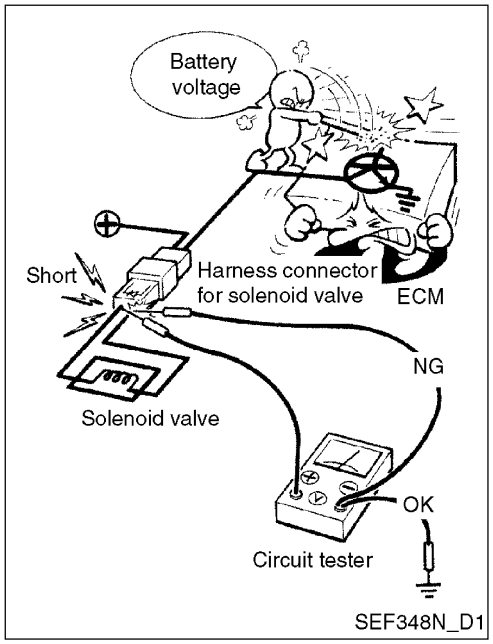
MEF040D_D1

Perform ECM input/output signal inspection before replacement.

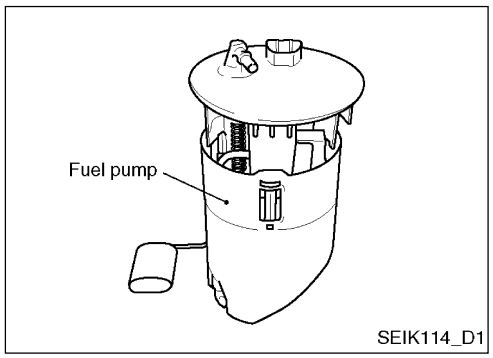
Precautions (Cont'd)



- After performing each TROUBLE DIAGNOSIS, perform DTC Confirmation Procedure or Overall Function Check. The DTC should not be displayed in the DTC Confirmation Procedure if the repair is completed. The Overall Function Check should be a good result if the repair is completed.

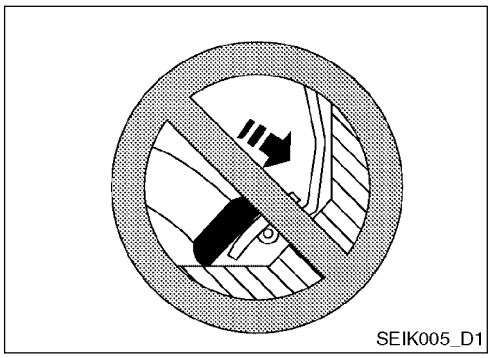


- When measuring ECM signals with a circuit tester, connect a break-out box and Y-cable adapter between the ECM and ECM harness connector.
- When measuring ECM signals with a circuit tester, never allow the two tester probes to contact. Accidental contact of probes will cause a short circuit and damage the ECM power transistor.
- Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

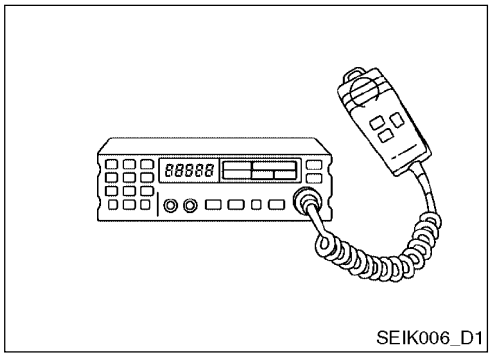


- Do not operate fuel pump when there is no fuel in lines.
- Tighten fuel hose clamps to the specified torque.

Precautions (Cont'd)


SEIK005_D1

- Do not depress accelerator pedal when starting.
- Immediately after starting, do not rev up engine unnecessarily.
- Do not rev up engine just prior to shutdown.


SEIK006_D1

- When installing C.B. ham radio or a mobile phone, be sure to observe the following as it may adversely affect electronic control systems depending on installation location.
  - Keep the antenna as far as possible from the electronic control units.
  - Keep the antenna feeder line more than 20 cm (8 in) away from the harness of electronic controls. Do not let them run parallel for a long distance.
  - Adjust the antenna and feeder line so that the standingwave radio can be kept smaller.
  - Be sure to ground the radio to vehicle body.

Wiring Diagrams and Trouble Diagnosis

When you read wiring diagrams, refer to the following:

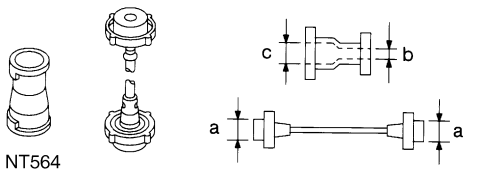
- "HOW TO READ WIRING DIAGRAMS", GI-8
- "POWER SUPPLY ROUTING", EL-5 for power distribution circuit

When you perform trouble diagnosis, refer to the following:

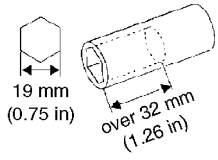
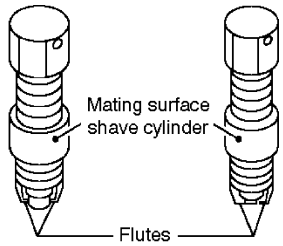
- "HOW TO PERFORM EFFICIENT DIAGNOSES FOR AN ELECTRICAL INCIDENT", GI-14.

Preparation

Special Service Tools

Tool Number and Name	Description	
EG17650301 Radiator cap tester adapter	 NT564	Adapting radiator cap tester to radiator filler neck **a: 28 (1.10) dia.** **b: 31.4 (1.236) dia.** **c: 41.3 (1.626) dia.** Unit: mm (in)

Commercial Service Tools

Tool Number and Name	Description	
Fuel filler cap adapter	 SEIK011_D1	Checking fuel tank vacuum relief valve opening pressure
Socket wrench	 SEIK012_D1	Removing and installing engine coolant temperature sensor
Oxygen sensor thread cleaner	 SECIK014D_D1	Reconditioning the exhaust system threads before installing a new oxygen sensor. Use with anti-seize lubricant shown below. a: 18 mm diameter with pitch 1.5 mm for Zirconia Oxygen Sensor b: 12 mm diameter with pitch 1.25 mm for Titania Oxygen Sensor

MEMO:

Index for DTC

DTC No. Index

NOTE:

- **If DTC U1000 or U1001 is displayed with other DTC, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-81, "DTC U1000, U1001 CAN COMMUNICATION LINE".**

O: Applicable X: Not applicable

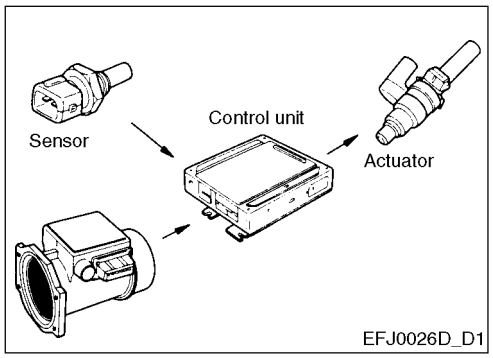
DTC		Items (CONSULT-II Screen Terms)	MIL Lighting Up	Reference Page
CONSULT-II	ECM			
P0000	0000	NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	X	-
U1000	1000	CAN COMM CIRCUIT	X	EC-81
U1001	1001	CAN COMM CIRCUIT	X	EC-81
U0426	0426	-	X	EC-81
P0031	0031	HO2S1 HTR (B1)	X	EC-277
P0032	0032	HO2S1 HTR (B1)	X	EC-277
P0037	0037	HO2S2 HTR (B1)	X	EC-282
P0038	0038	HO2S2 HTR (B1)	X	EC-282
P0102	0102	MAF SEN/CIRCUIT	X	EC-103
P0103	0103	MAF SEN/CIRCUIT	X	EC-103
P0112	0112	IAT SEN/CIRCUIT	X	EC-109
P0113	0113	IAT SEN/CIRCUIT	X	EC-109
P0117	0117	ECT SEN/CIRCUIT	O	EC-113
P0118	0118	ECT SEN/CIRCUIT	O	EC-113
P0122	0122	TP SEN 2/CIRC	X	EC-145
P0123	0123	TP SEN 2/CIRC	X	EC-145
P0132	0132	HO2S1 (B1)	X	EC-247
P0134	0134	HO2S1 (B1)	X	EC-253
P0138	0138	HO2S2 (B1)	X	EC-271
P0171	0171	FUEL SYS-LEAN-B1	X	EC-227
P0172	0172	FUEL SYS-RICH-B1	X	EC-232
P0222	0222	TP SEN 1/CIRC	X	-
P0223	0223	TP SEN 1/CIRC	X	-
P0327	0327	KNOCK SEN/CIRC-B1	X	EC-141
P0328	0328	KNOCK SEN/CIRC-B1	X	EC-141
P0335	0335	CKP SEN/CIRCUIT	X	EC-96
P0340	0340	CMP SEN/CIRC-B1	X	EC-89
P0350	0350	IGN SIGNAL-PRIMARY	X	EC-118
P0500	0500	VEH SPEED SEN/CIRC	X	EC-205
P0550	0550	PW ST P SEN/CIRC	X	EC-243
P0605	0605	ECM	O	EC-309
P0633	0633	-	X	*1
P1065	1065	ECM BACK UP/CIRC	X	EC-85
P1111	1111	INT/V TIM V/CIR-B1	X	EC-209
P1121	1121	ETC ACTR	X	EC-151
P1122	1122	ETC FUNCTION/CIRC	X	EC-153
P1124	1124	ETC MOT PWR	X	EC-160
P1126	1126	ETC MOT PWR	X	EC-160
P1128	1128	ETC MOT	X	EC-166

Index for DTC (Cont'd)

DTC		Items (CONSULT-II Screen Terms)	MIL Lighting Up	Reference Page
CONSULT-II	ECM			
P1217	1217	ENG OVER TEMP	O	EC-127
P1225	1225	CTP LEARNING	X	EC-170
P1226	1226	CTP LEARNING	X	EC-172
P1229	1229	SENSOR POWER/CIRC	X	EC-174
P1805	1805	BRAKE SW/CIRCUIT	X	EC-294
P2122	2122	APP SEN 1/CIRC	X	EC-178
P2123	2123	APP SEN 1/CIRC	X	EC-178
P2127	2127	APP SEN 2/CIRC	X	EC-185
P2128	2128	APP SEN 2/CIRC	X	EC-185
P2135	2135	TP SENSOR	X	EC-192
P2138	2138	APP SENSOR	X	EC-198

*1: If this code is displayed, register ECM to combination meter. Refer to "CONSULT-II OPERATION MANUAL NATS".

Engine Control System



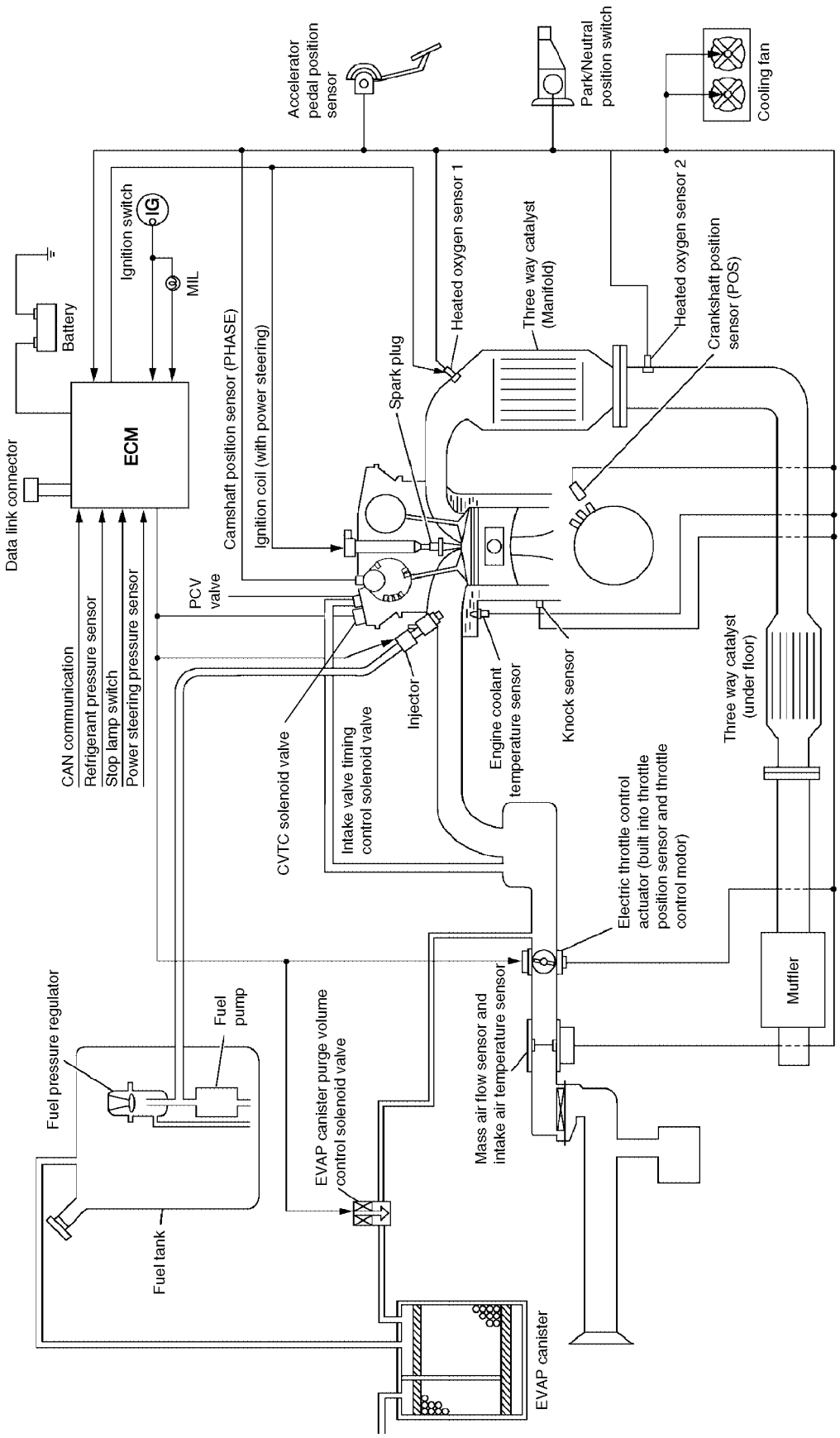
General

The ECCS (Electronic Concentrated engine Control System) controls the fuel injection, ignition timing and idle RPM as one single control unit. CONSULT-II can check and diagnose ECCS functions easily.

ECCS Controls

Control Item	Description
Fuel injection control	● SOFIS control is adopted to enhance responses and exhaust efficiency by optimizing fuel injection amount. ● It improves drivability by performing compensations under extreme conditions such as sudden oxygen changes through oxygen feedback learning control. ● It minimizes exhaust gases by employing the oxygen sensor.
Ignition timing control	● It optimizes the ignition timing at various circumstances by employing the hole IC type crankshaft position sensor. ● It improves ignition performance by employing the DLI (Distributorless Ignition) system that has power transistor integrated ignition coil on each cylinder. ● It optimizes ignition timing by employing the knock control that advances or retards ignition timing according to knocking conditions during different driving conditions and used fuel quality.
Idle RPM control	● It controls idle speed by operating DC motor directly.
Fuel pump drive control	● It controls the fuel pump relay on and off according to engine RPM signals.
A/C cut control	● It minimizes engine load by turning the A/C relay off under high refrigerant pressure and high engine speed.
Radiator fan control	● It controls the radiator fan relay on and off according to vehicle speed, coolant temperature and A/C signal.
Canister purge control	● It performs duty control on the canister according to driving conditions.
Engine and automatic transaxle integrated control	● It minimizes gear shift shock by reducing the engine torque during gear changes.
Fail-safe function	● It allows safety and emergency driving under system defectives.
Diagnosis system	● It corresponds with CONSULT-II for easy diagnosing.

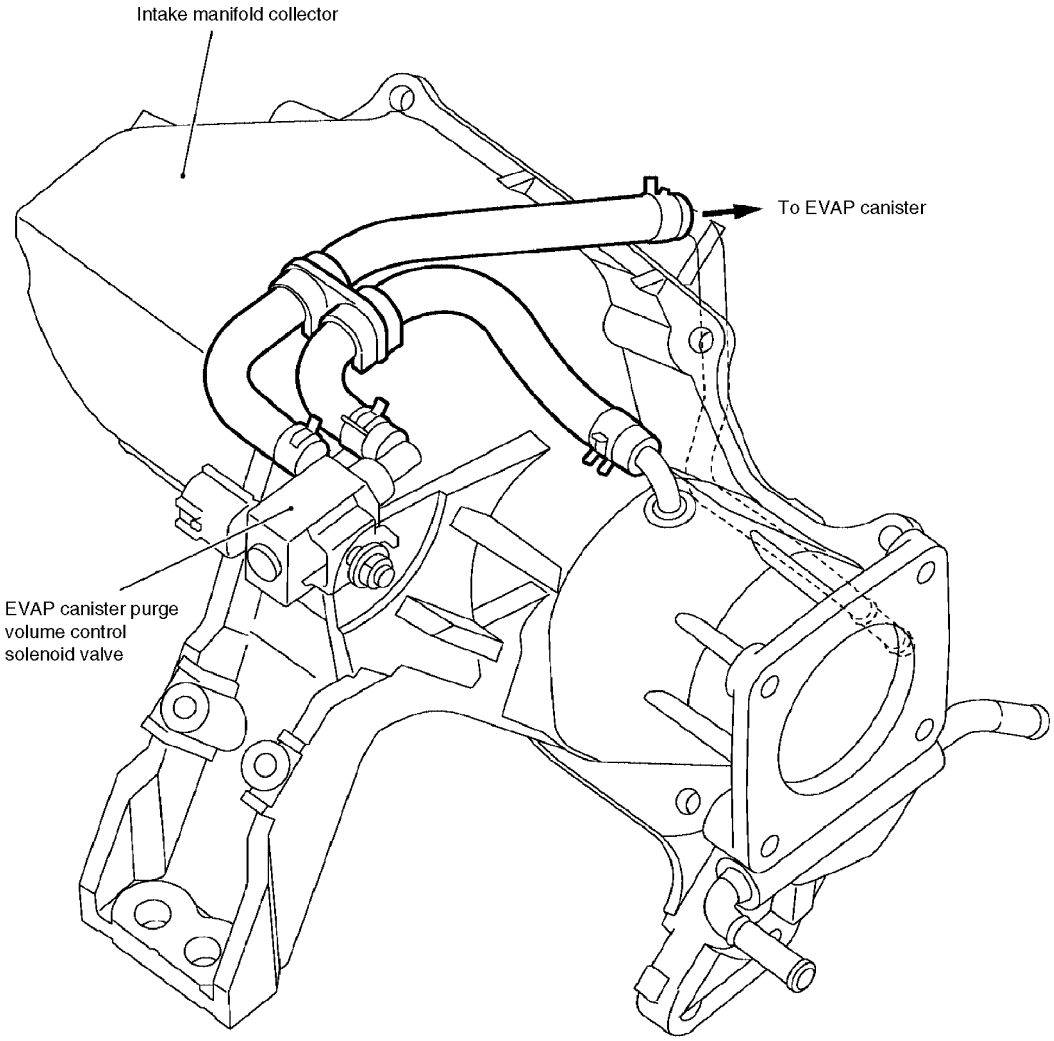
System Diagram



SEIK013_D1

Engine Control System (Cont'd)

Vacuum Hose Drawing



NOTE:

- **Do not use soapy water or any type of solvent while installing vacuum hose or purge hoses.**

Refer to EC-14, "System Diagram" for Vacuum Control System.

Engine Control System (Cont'd)

System Chart

Input (Sensor)	ECM Function	Output (Actuator)
● Camshaft position sensor (PHASE) ● Crankshaft position sensor (POS) ● Mass air flow sensor ● Engine coolant temperature sensor ● Heated oxygen sensor 1 ● Throttle position sensor ● Accelerator pedal position sensor ● Park/neutral position (PNP) switch ● Intake air temperature sensor ● Power steering pressure sensor ● Ignition switch ● Stop lamp switch ● Battery voltage ● Knock sensor ● Refrigerant pressure sensor ● TCM (Transmission control module)*1 ● Air conditioner switch ● Vehicle speed signal ● Electrical load signal	Fuel injection & mixture ratio control	Fuel injectors
	Electronic ignition system	Power transistor
	Fuel pump control	Fuel pump relay
	On board diagnostic system	MIL (On the instrument panel)
	Intake valve timing control	Intake valve timing control solenoid valve
	Heated oxygen sensor 1 heater control	Heated oxygen sensor 1 heater
	EVAP canister purge flow control	EVAP canister purge volume control solenoid valve
	Air conditioning cut control	Air conditioner relay
	Cooling fan control	Cooling fan relays

*1: This input signal is sent to the ECM through CAN communication line.

Multiport Fuel Injection (MFI) System

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM Function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*1 and piston position	Fuel injection & mixture ratio control	Fuel injectors
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Heated oxygen sensor 1	Density of oxygen in exhaust gas		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Park/neutral position (PNP) switch	Gear position		
Knock sensor	Engine knocking condition		
Battery	Battery voltage*1		
Power steering pressure sensor	Power steering operation		
Vehicle speed signal	Vehicle speed		
Air conditioner switch	Air conditioner operation		

*1: The ECM determines the start signal status by the signals of engine speed and battery voltage.

SYSTEM DESCRIPTION

The amount of fuel injected from the fuel injector is determined by the ECM. The ECM controls the length of time the valve remains open (injection pulse duration). The amount of fuel injected is a program value in the ECM memory. The program value is preset by engine operating conditions. These conditions are determined by input signals (for engine speed and intake air) from the crankshaft position sensor (POS), camshaft position sensor (PHASE) and the mass air flow sensor.

Engine Control System (Cont'd)

VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

In addition, the amount of fuel injected is compensated to improve engine performance under various operating conditions as listed below.

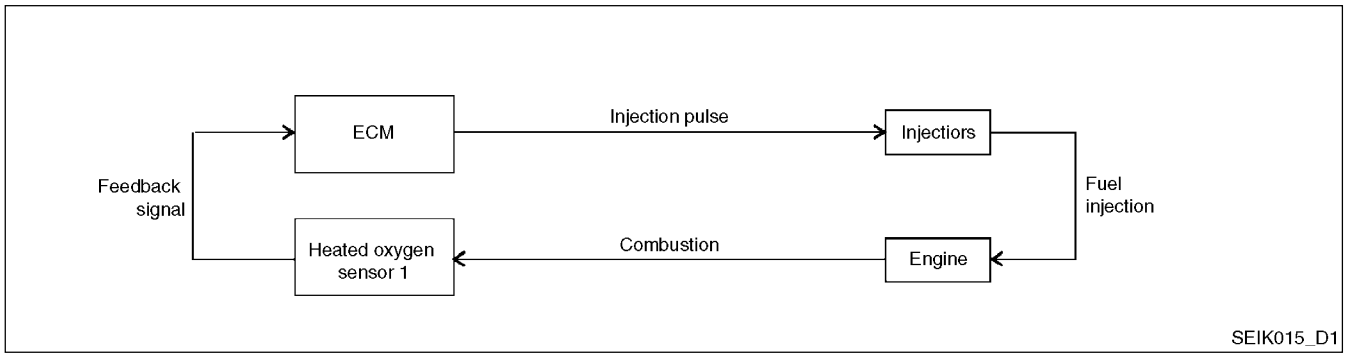
<Fuel increase>

- During warm-up
- When starting the engine
- During acceleration
- Hot-engine operation
- When selector lever is changed from N to D (A/T models)
- High-load, high-speed operation

<Fuel decrease>

- During deceleration
- During high engine speed operation

Mixture Ratio Feedback Control (Closed Loop Control)



The mixture ratio feedback system provides the best air-fuel mixture ratio for driveability and emission control. The three way catalyst (manifold) can then better reduce CO, HC and NOx emissions. This system uses heated oxygen sensor 1 in the exhaust manifold to monitor if the engine operation is rich or lean. The ECM adjusts the injection pulse width according to the sensor voltage signal. For more information about heated oxygen sensor 1, refer to EC-247. This maintains the mixture ratio within the range of stoichiometric (ideal airfuel mixture). This stage is referred to as the closed loop control condition.

OPEN LOOP CONTROL

The open loop system condition refers to when the ECM detects any of the following conditions. Feedback control stops in order to maintain stabilized fuel combustion.

- Deceleration and acceleration
- High-load, high-speed operation
- Malfunction of heated oxygen sensor 1 or its circuit
- Insufficient activation of heated oxygen sensor 1 at low engine coolant temperature
- High engine coolant temperature
- During warm-up
- After shifting from N to D (A/T models)
- When starting the engine

MIXTURE RATIO SELF-LEARNING CONTROL

The mixture ratio feedback control system monitors the mixture ratio signal transmitted from heated oxygen sensor 1. This feedback signal is then sent to the ECM. The ECM controls the basic mixture ratio as close to the theoretical mixture ratio as possible. However, the basic mixture ratio is not necessarily controlled as originally designed. Both manufacturing differences (i.e., mass air flow sensor hot film) and characteristic changes during operation (i.e., injector clogging) directly affect mixture ratio.

Engine Control System (Cont'd)

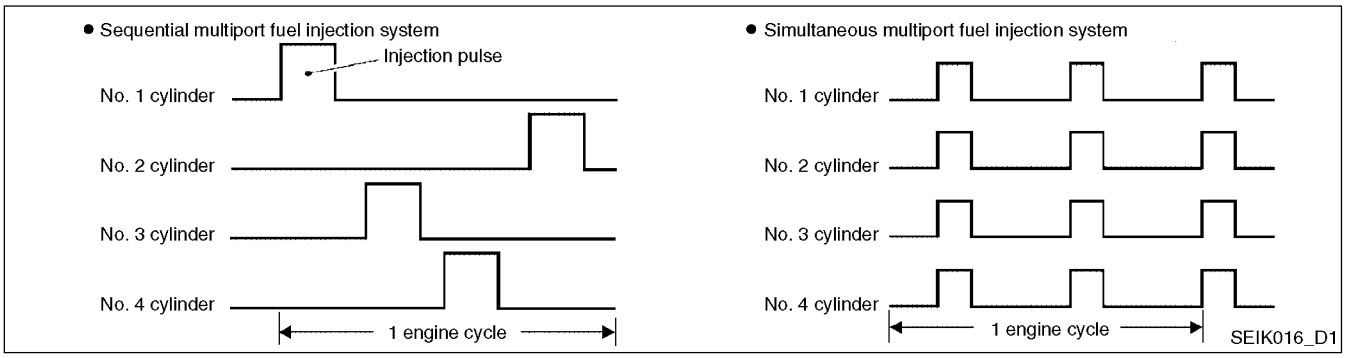
Accordingly, the difference between the basic and theoretical mixture ratios is monitored in this system. This is then computed in terms of "injection pulse duration" to automatically compensate for the difference between the two ratios.

"Fuel trim" refers to the feedback compensation value compared against the basic injection duration. Fuel trim includes short term fuel trim and long term fuel trim.

"Short term fuel trim" is the short-term fuel compensation used to maintain the mixture ratio at its theoretical value. The signal from heated oxygen sensor 1 indicates whether the mixture ratio is RICH or LEAN compared to the theoretical value. The signal then triggers a reduction in fuel volume if the mixture ratio is rich, and an increase in fuel volume if it is lean.

"Long term fuel trim" is overall fuel compensation carried out long-term to compensate for continual deviation of the short term fuel trim from the central value. Such deviation will occur due to individual engine differences, wear over time and changes in the usage environment.

FUEL INJECTION TIMING



Two types of systems are used.

SEQUENTIAL MULTIPORT FUEL INJECTION SYSTEM

Fuel is injected into each cylinder during each engine cycle according to the firing order. This system is used when the engine is running.

SIMULTANEOUS MULTIPORT FUEL INJECTION SYSTEM

Fuel is injected simultaneously into all four cylinders twice each engine cycle. In other words, pulse signals of the same width are simultaneously transmitted from the ECM. The four injectors will then receive the signals two times for each engine cycle. This system is used when the engine is being started and/or if the fail-safe system (CPU) is operating.

FUEL SHUT-OFF

Fuel to each cylinder is cut off during deceleration or operation of the engine at excessively high speeds.

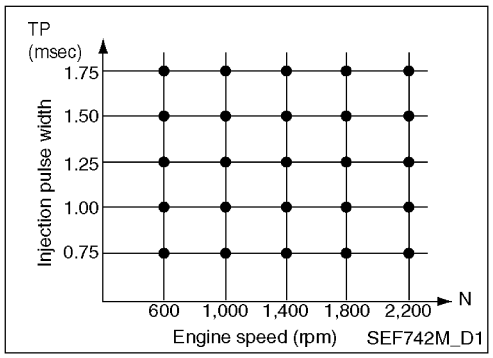
Electronic Ignition (EI) System

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM Function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*1 and piston position	Ignition timing control	Power transistor
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Knock sensor	Engine knocking condition		
Park/neutral position (PNP) switch	Gear position		
Battery	Battery voltage*1		
Vehicle speed signal	Vehicle speed		

*1: The ECM determines the start signal status by the signals of engine speed and battery voltage.

Engine Control System (Cont'd)



SYSTEM DESCRIPTION

The ignition timing is controlled by the ECM to maintain the best airfuel ratio for every running condition of the engine. The ignition timing data is stored in the ECM. This data forms the map shown. The ECM receives information such as the injection pulse width and camshaft position sensor signal. Computing this information, ignition signals are transmitted to the power transistor. e.g., N: 1,800 rpm, Tp: 1.50 msec A °BTDC During the following conditions, the ignition timing is revised by the ECM according to the other data stored in the ECM.

- At starting
- During warm-up
- At idle
- At low battery voltage
- During acceleration

The knock sensor retard system is designed only for emergencies. The basic ignition timing is programmed within the anti-knocking zone, if recommended fuel is used under dry conditions. The retard system does not operate under normal driving conditions. If engine knocking occurs, the knock sensor monitors the condition. The signal is transmitted to the ECM. The ECM retards the ignition timing to eliminate the knocking condition.

Air Conditioning Cut Control

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM Function	Actuator
Air conditioner switch	Air conditioner ON signal	Air conditioner cut control	Air conditioner relay
Throttle position sensor	Throttle valve opening angle		
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*1		
Engine coolant temperature sensor	Engine coolant temperature		
Battery	Battery voltage*1		
Refrigerant pressure sensor	Refrigerant pressure		
Power steering pressure sensor	Power steering operation		
Vehicle speed signal	Vehicle speed		

*1: The ECM determines the start signal status by the signals of engine speed and battery voltage.

SYSTEM DESCRIPTION

This system improves engine operation when the air conditioner is used.

Under the following conditions, the air conditioner is turned off.

- When the accelerator pedal is fully depressed.
- When cranking the engine.
- At high engine speeds.
- When the engine coolant temperature becomes excessively high.
- When operating power steering during low engine speed or low vehicle speed.
- When engine speed is excessively low.
- When refrigerant pressure is excessively low or high.

Engine Control System (Cont'd)

Fuel Cut Control (At No Load and High Engine Speed)

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM Function	Actuator
Park/neutral position (PNP) switch	Neutral position	Fuel cut control	Fuel injectors
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Engine coolant temperature sensor	Engine coolant temperature		
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed		
Vehicle speed signal	Vehicle speed		

SYSTEM DESCRIPTION

If the engine speed is above 3,950 rpm with no load (for example, in neutral and engine speed over 3,950 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed. Fuel cut will operate until the engine speed reaches 1,500 rpm, then fuel cut is cancelled.

NOTE:

- **This function is different from deceleration control listed under. Refer to EC-16, "Multiport Fuel Injection (MFI) System".**

CAN Communication

SYSTEM DISCRIPTION

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

CAM COMMUNICATION UNIT

Go to CAN system, when selecting your car model from the following table.

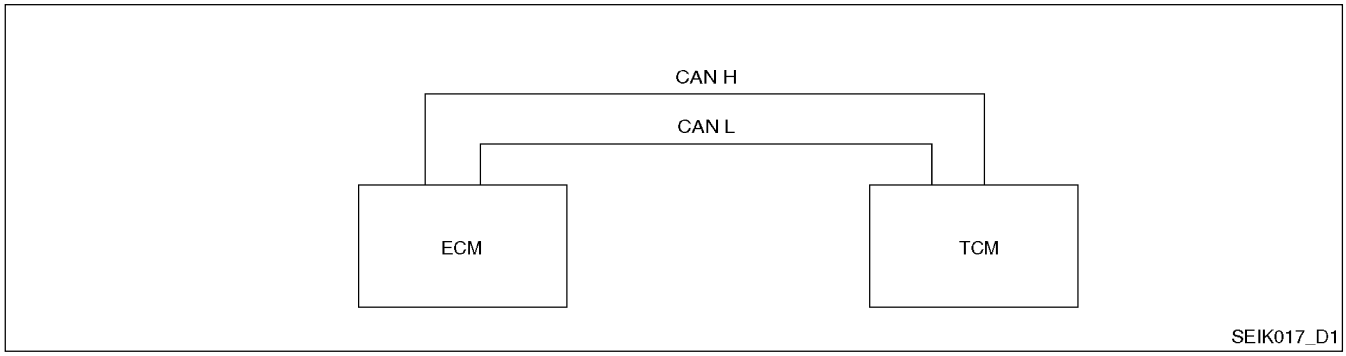
Body Type	Sedan	
Axle	2WD	
Engine	QG16DE (Electric throttle control)	
Transmission	A/T	M/T
CAN communication unit		
ECM (CAN gate 1)	O	*1
ECM (CAN gate 2)	O	

O : Applicable
*1 : Communication cannot be established.

Engine Control System (Cont'd)

A/T Models

SYSTEM DIAGRAM



NPUT/OUTPUT SIGNALCHART

T: Transmit R: Receive

Signals	ECM	TCM
Output shaft revolution signal	R	T
Closed throttle position signal	T	R
Wide open throttle position signal	T	R
Engine and A/T integrated control signal	T	R
	R	T

Basic Service Procedure

Idle Speed and Ignition Timing Check

IDLE SPEED

With CONSULT-II

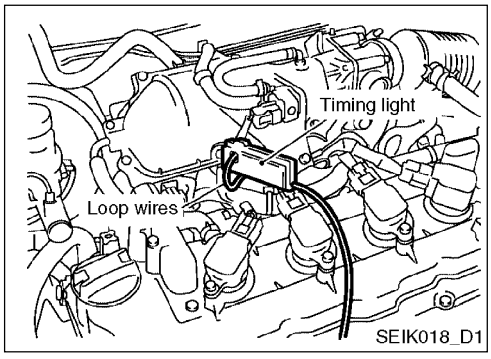
Check idle speed in “DATA MONITOR” mode with CONSULT-II.

Without CONSULT-II

Check the idle speed by installing the pulse type tachometer clamp on the loop wire or on suitable high-tension wire which is installed between No. 1 ignition coil and No. 1 spark plug.

NOTE:

- **For the method of installing the tachometer, refer to EC-22, “IGNITION TIMING”.**

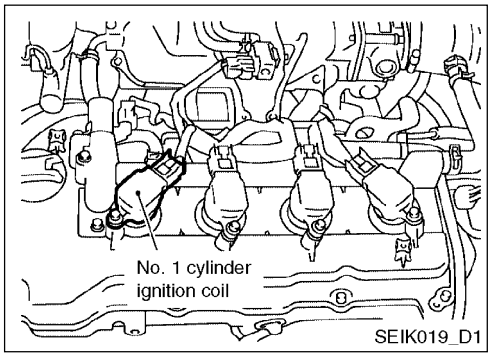


IGNITION TIMING

Any of following two methods may be used.

Method A

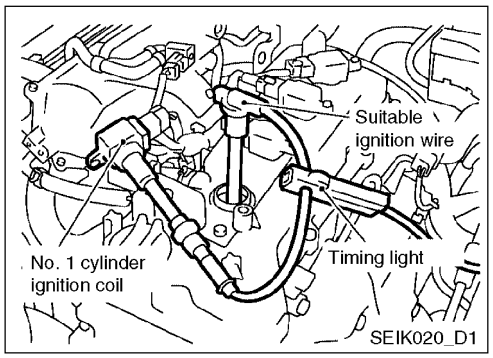
1. Slide the harness protector of ignition coil No. to clear the wires.
2. Attach timing light to the loop wires as shown.
3. Check ignition timing.



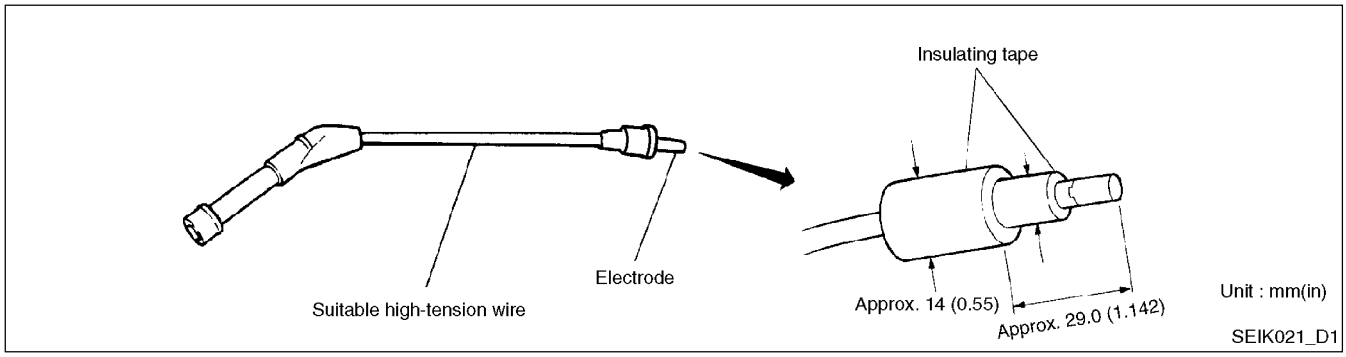
Method B

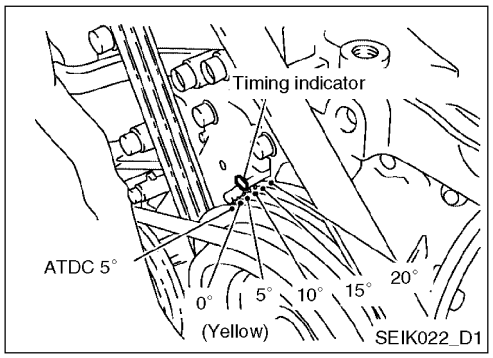
1. Remove No. 1 ignition coil.

Basic Service Procedure (Cont'd)



2. Connect No. 1 ignition coil and No. 1 spark plug with suitable high-tension wire as shown, and attach timing light clamp to this wire.





3. Check ignition timing.

Accelerator Pedal Released Position Learning

DESCRIPTION

Accelerator Pedal Released Position Learning is an operation to learn the fully released position of the accelerator pedal by monitoring the accelerator pedal position sensor output signal. It must be performed each time harness connector of accelerator pedal position sensor or ECM is disconnected.

OPERATION PROCEDURE

1. Make sure that accelerator pedal is fully released.
2. Turn ignition switch ON and wait at least 2 seconds.
3. Turn ignition switch OFF wait at least 10 seconds.
4. Turn ignition switch ON and wait at least 2 seconds.
5. Turn ignition switch OFF wait at least 10 seconds.

Throttle Valve Closed Position Learning

DESCRIPTION

Throttle Valve Closed Position Learning is an operation to learn the fully closed position of the throttle valve by monitoring the throttle position sensor output signal. It must be performed each time harness connector of electric throttle control actuator or ECM is disconnected.

OPERATION PROCEDURE

1. Make sure that accelerator pedal is fully released.
2. Turn ignition switch "ON".
3. Turn ignition switch OFF wait at least 10 seconds.

Basic Service Procedure (Cont'd)

Make sure that throttle valve moves during above 10 seconds by confirming the operating sound.

Idle Air Volume Learning

DESCRIPTION

Idle Air Volume Learning is an operation to learn the idle air volume that keeps each engine within the specific range. It must be performed under any of the following conditions:

- Each time electric throttle control actuator or ECM is replaced.
- Idle speed or ignition timing is out of specification.

PREPARATION

Before performing Idle Air Volume Learning, make sure that all of the following conditions are satisfied.

Learning will be cancelled if any of the following conditions are missed for even a moment.

- Battery voltage: More than 12.9V (At idle)
- Engine coolant temperature: 70 - 95°C (158 - 203°F)
- PNP switch: ON
- Electric load switch: OFF (Air conditioner, headlamp, rear window defogger)
- Steering wheel: Neutral (Straight-ahead position)
- Vehicle speed: Stopped
- Transmission: Warmed-up

For A/T models with CONSULT-II, drive vehicle until "FLUID TEMP SE" in "DATA MONITOR" mode of "A/T" system indicates less than 0.9V.

For A/T models without CONSULT-II and M/T models, drive vehicle for 10 minutes.

Operation Procedure

With CONSULT-II

1. Perform EC-23, "Accelerator Pedal Released Position Learning".
2. Perform EC-23, "Throttle Valve Closed Position Learning".
3. Start engine and warm it up to normal operating temperature.
4. Check that all items listed under the topic PREPARATION (previously mentioned) are in good order.
5. Select "IDLE AIR VOL LEARN" in "WORK SUPPORT" mode.
6. Select a proper mode.
   - Service mode: when changing throttle assembly or ECM
   - Workshop mode: when changing engine assembly
7. Touch "START" and wait 20 seconds.

Basic Service Procedure (Cont'd)

8. Make sure that "CMPLT" is displayed on CONSULT-II screen. If "CMPLT" is not displayed, Idle Air Volume Learning will not be carried out successfully. In this case, find the cause of the incident by referring to the Diagnostic Procedure below.
9. Rev up the engine two or three times and make sure that idle speed and ignition timing are within the specifications.

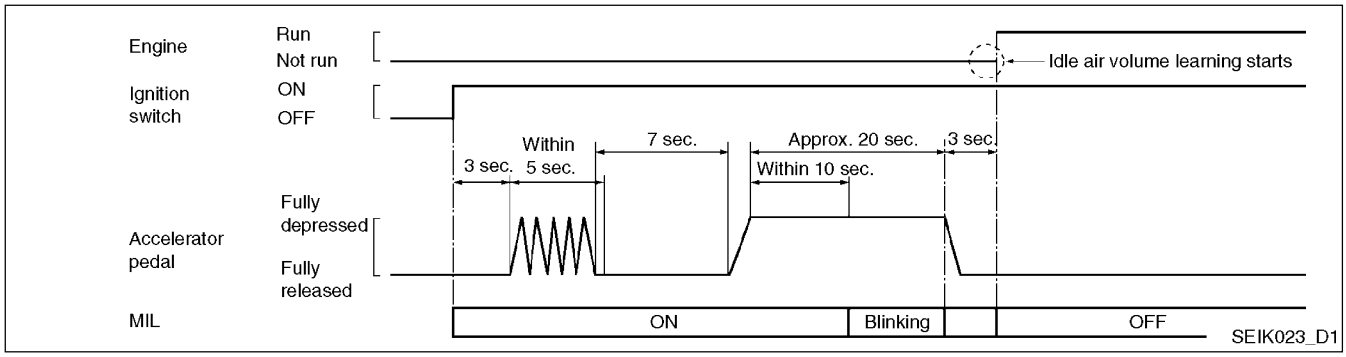
Engine and transmission type		Idle speed (in P or N position)	Ignition timing (in P or N position)
QG16DE	M/T	650 ± 50 rpm	6 ± 2° BTDC
	A/T	700 ± 50 rpm	6 ± 2° BTDC

Without CONSULT-II

NOTE:

- **It is better to count the time accurately with a clock.**
- **It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.**

1. Perform EC-23, "Accelerator Pedal Released Position Learning".
2. Perform EC-23, "Throttle Valve Closed Position Learning".
3. Start engine and warm it up to normal operating temperature.
4. Check that all items listed under the topic PREPARATION (previously mentioned) are in good order.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Confirm that accelerator pedal is fully released, turn ignition switch ON and wait 3 seconds.
7. Repeat the following procedure quickly five times within 5 seconds.
   a) Fully depress the accelerator pedal.
   b) Fully release the accelerator pedal.
8. Wait 7 seconds, fully depress the accelerator pedal and keep it for approx. 20 seconds until the MIL stops blinking and turned ON.
9. Fully release the accelerator pedal within 3 seconds after the MIL turned ON.
10. Start engine and let it idle.
11. Wait 20 seconds.



12. Rev up the engine two or three times and make sure that idle speed and ignition timing are within the specifications.

Engine and transmission type		Idle speed (in P or N position)	Ignition timing (in P or N position)
QG16DE	M/T	650 ± 50 rpm	6 ± 2° BTDC
	A/T	700 ± 50 rpm	6 ± 2° BTDC

Basic Service Procedure (Cont'd)

13. If idle speed and ignition timing are not within the specification, Idle Air Volume Learning will not be carried out successfully. In this case, find the cause of the incident by referring to the "Diagnostic Procedure" below.

DIAGNOSTIC PROCEDURE

If idle air volume learning cannot be performed successfully, proceed as follows:

1. Check that throttle valve is fully closed.
2. Check PCV valve operation.
3. Check that downstream of throttle valve is free from air leakage.
4. When the above three items check out OK, engine component parts and their installation condition are questionable. Check and eliminate the cause of the incident. It is useful to perform EC-69, "CONSULT-II Reference Value in Data Monitor Mode".
5. If any of the following conditions occur after the engine has started, eliminate the cause of the incident and perform "Idle air volume learning" all over again:
   - Engine stalls.
   - Erroneous idle.

Fuel Pressure Check

FUEL PRESSURE RELEASE

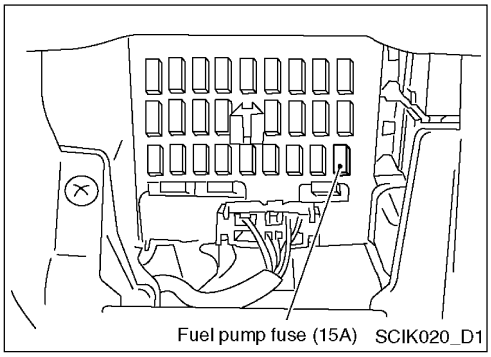
Before disconnecting fuel line, release fuel pressure from fuel line to eliminate danger.

NOTE:

- **Prepare pans or saucers under the disconnected fuel line because the fuel may spill out. The fuel pressure cannot be completely released because QG16DE electric throttle control type models do not have fuel return system.**

With CONSULT-II

1. Turn ignition switch ON.
2. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode with CONSULT-II.
3. Start engine.
4. After engine stalls, crank it two or three times to release all fuel pressure.
5. Turn ignition switch OFF.



Without CONSULT-II

1. Remove fuel pump fuse located in fuse box.
2. Start engine.
3. After engine stalls, crank it two or three times to release all fuel pressure.
4. Turn ignition switch OFF.
5. Reinstall fuel pump fuse after servicing fuel system.

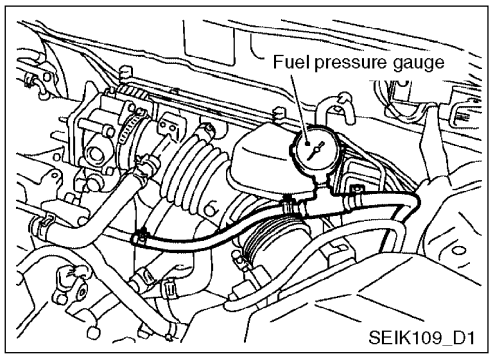
Basic Service Procedure (Cont'd)

Fuel Pressure Check

Before disconnecting fuel line, release fuel pressure from fuel line to eliminate danger.

NOTE:

- **Prepare pans or saucers under the disconnected fuel line because the fuel may spill out. The fuel pressure cannot be completely released because QG16DE electric throttle control type models do not have fuel return system.**
- When reconnecting fuel line, always use new clamps.
- Make sure that clamp screw does not contact adjacent parts.
- Use a torque driver to tighten clamps.
- Use Pressure Gauge to check fuel pressure.



1. Release fuel pressure to zero. Refer to EC-26, "FUEL PRESSURE RELEASE".
2. Install the fuel pressure gauge with the fuel pressure check adapter as shown in the figure.
3. Turn ignition switch ON, and check for fuel leakage.
4. Start engine and check for fuel leakage.
5. Read the indication of fuel pressure gauge.

   At idling: Approximately 350 kPa (3.5 bar, 3.57 kg/cm^2, 51 psi)
6. If result is unsatisfactory, go to next step.
7. Check the following.
   - Fuel hoses and fuel tubes for clogging
   - Fuel filter for clogging
   - Fuel pump
   - Fuel pressure regulator for clogging

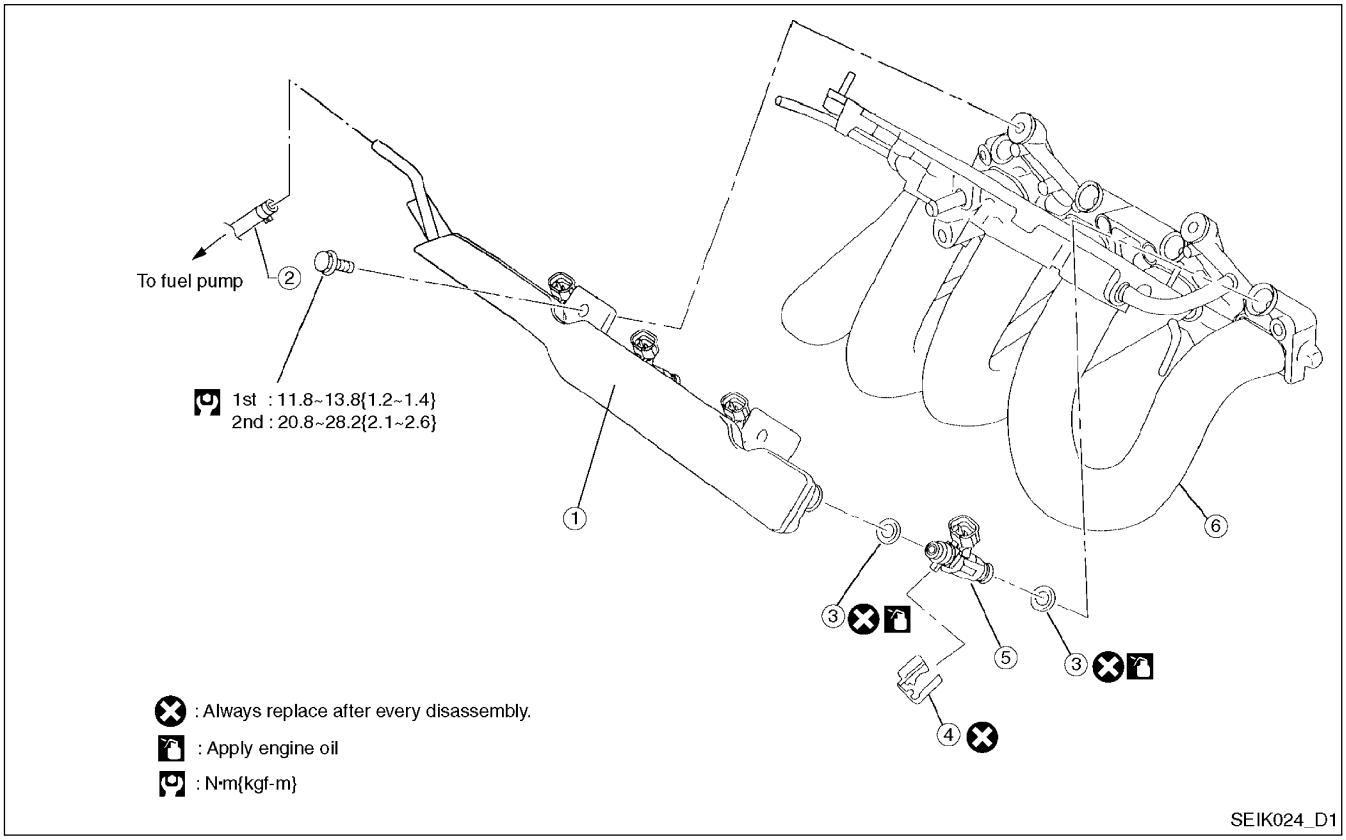
   If OK, replace fuel pressure regulator.

   If NG, repair or replace.

Basic Service Procedure (Cont'd)

Injector

REMOVAL AND INSTALLATION



① Fuel tube
② Fuel feed hose
③ O-ring
④ Clip
⑤ Fuel injector
⑥ Intake manifold

CAUTION:

- **Apply new engine oil when installing the parts that specified to do so in the figure.**
- **Do not remove or disassembly parts unless instructed as shown in the figure.**

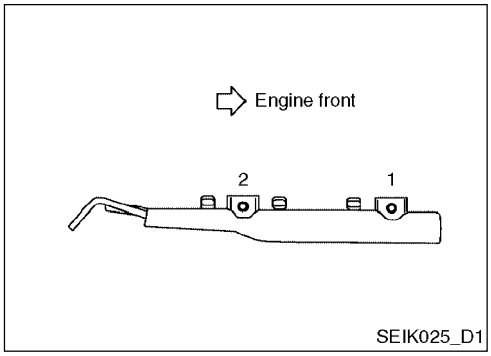
REMOVAL

1. Release fuel pressure. Refer to EC-26, "FUEL PRESSURE RELEASE".
2. Disconnect harness for fuel injector, and move it aside.
3. Remove fuel hose.

CAUTION:

- **After removal, install blind plug to fuel hose to prevent the fuel from draining.**

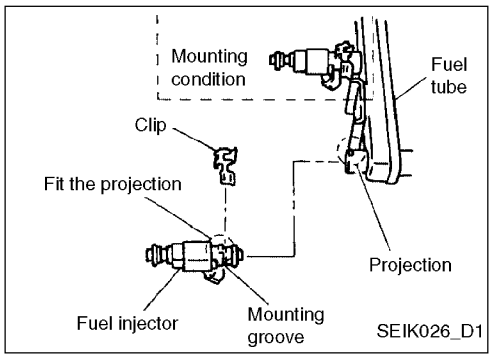
4. Remove fuel tube and injector assembly with the following procedure:
   a) Loosen mounting bolts in reverse order shown in figure.
   b) Pull out fuel injector/fuel tube assembly toward engine rear side.



CAUTION:

- **Do not touch fuel injector nozzle with intake manifold or other parts.**

Basic Service Procedure (Cont'd)



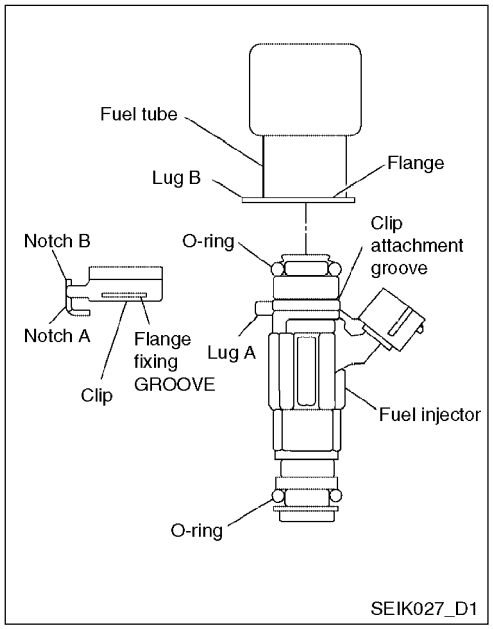
5. Remove fuel injector from fuel tube.
- Release clip and remove it.
- Pull fuel injector straight out of fuel tube.

CAUTION:
- **Be careful not to damage nozzle part.**
- **Avoid any impact such as a dropping.**
- **Do not disassemble or adjust it.**

INSTALLATION

1. When installing O-ring to fuel injector, follow instructions described

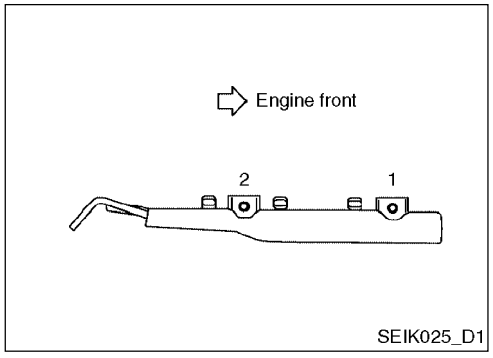
CAUTION:
- **Handle O-ring with bare hands. Never wear gloves.**
- **Lubricate O-ring with new engine oil.**
- **Do not clean O-ring with solvent.**
- **Make sure that O-ring and its mating part are free of foreign material.**
- **Be careful not to scratch it with a tool or fingernails during installation. Also be careful not to twist or stretch O-ring. If O-ring is stretched while being attached, do not insert it into fuel tube immediately.**
- **Insert O-ring straight into fuel tube. Do not angle or twist it.**



2. Install fuel injector to fuel tube with the following procedure.
   a) Insert clip into clip mounting groove on fuel injector.
      - Insert clip so that lug A of fuel injector matches notch A of the clip.

CAUTION:
- **Do not reuse clip. Replace it with a new one.**
- **Be careful to keep clip from interfering with O-ring. If interference occurs, replace O-ring.**

   b) Insert fuel injector into fuel tube with clip attached.
      - Insert it while matching it to the axial center.
      - Insert fuel injector so that lug B of fuel tube matches notch B of the clip.
      - Make sure that fuel tube flange is securely fixed in flange fixing groove on clip.
   c) Make sure that installation is complete by checking that fuel injector does not rotate or come off.



3. Tighten mounting bolts in two steps in numerical order shown in figure.
   1st step: 11.8 - 13.8 N·m (1.2 - 1.4 kg-m, 9 - 10 ft-lb)
   2nd step: 20.8 - 28.2 N·m (2.1 - 2.8 kg-m, 16 - 20 ft-lb)
4. Install fuel feed hose.

CAUTION:
- **Install hose clamp avoiding interference with bulge, and securely tighten it.**

5. Install remaining parts in the reverse order of removal.

Basic Service Procedure (Cont'd)

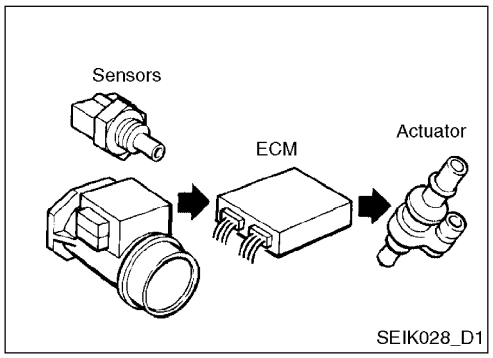
INSPECTION AFTER INSTALLATION

- Check for fuel leakage with following procedure.

1. Turn ignition switch ON (do not start engine), and check connections for leakage by applying fuel pressure to fuel piping.
2. Start engine, and re-check connections for fuel leakage by increasing engine speed.

Trouble Diagnosis

Trouble Diagnosis Introduction



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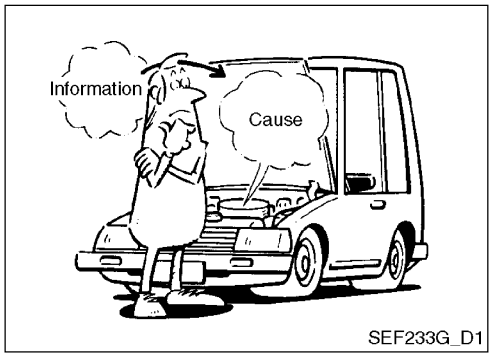

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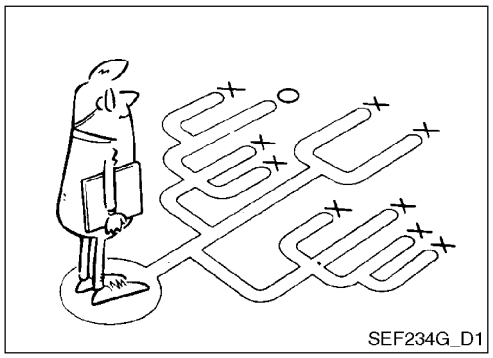
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INTRODUCTION

The engine has an ECM to control major systems such as fuel control, ignition control, idle air control system, etc. The ECM accepts input signals from sensors and instantly drives actuators. It is essential that both input and output signals are proper and stable. At the same time, it is important that there are no malfunctions such as vacuum leaks, fouled spark plugs, or other malfunctions with the engine. It is much more difficult to diagnose a incident that occurs intermittently rather than continuously.

Most intermittent incidents are caused by poor electric connections or improper wiring. In this case, careful checking of suspected circuits may help prevent the replacement of good parts. A visual check only may not find the cause of the incidents. A road test with CONSULT-II or a circuit tester connected should be performed. Follow the Work Flow on EC-32.

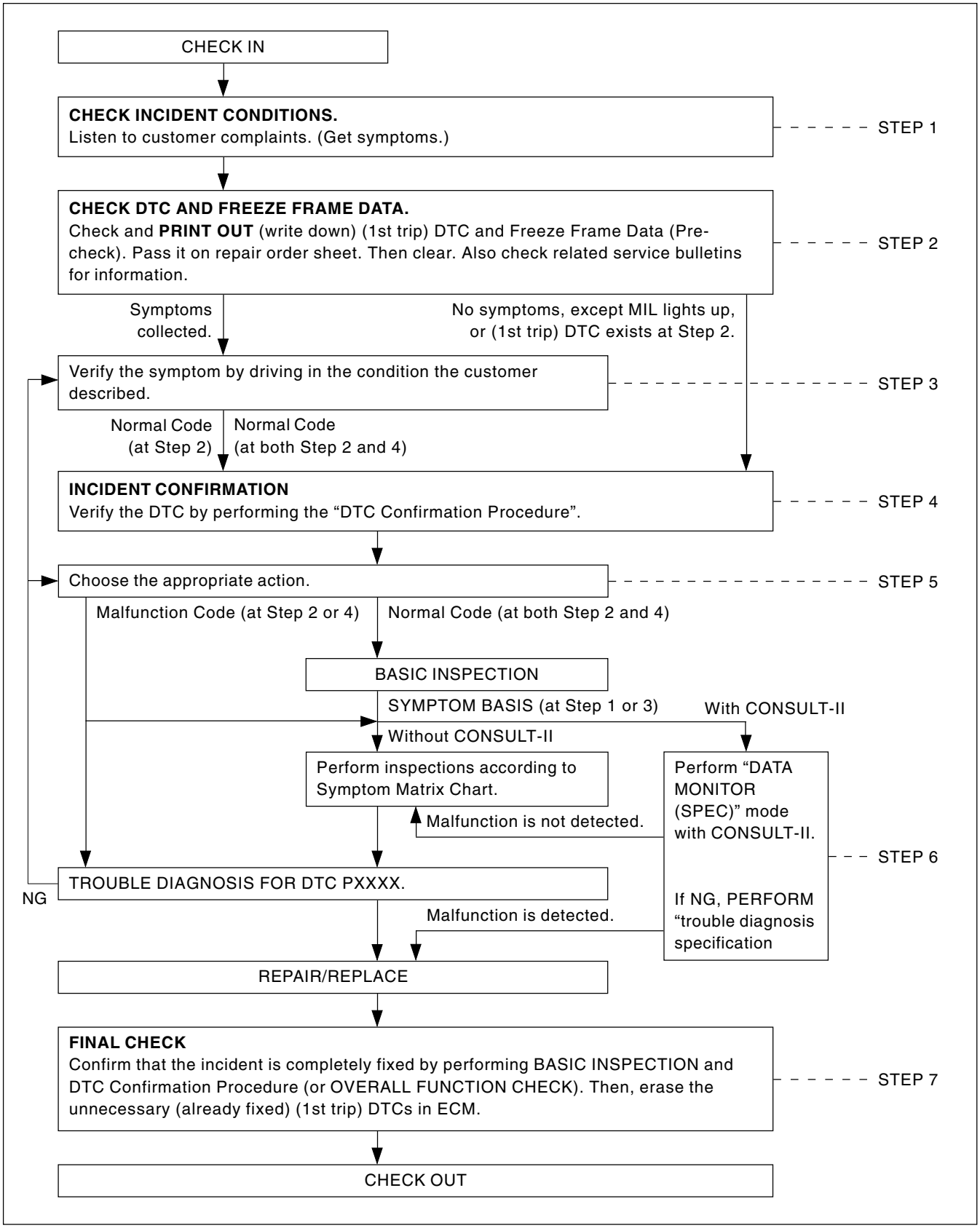
Before undertaking actual checks, take a few minutes to talk with a customer who approaches with a driveability complaint.

The customer can supply good information about such incidents, especially intermittent ones. Find out what symptoms are present and under what conditions they occur. A Diagnostic Worksheet like the example on EC-35 should be used. Start your diagnosis by looking for “conventional” malfunctions first. This will help troubleshoot driveability malfunctions on an electronically controlled engine vehicle.

Trouble Diagnosis (Cont'd)

Work Flow

FLOW CHART



Trouble Diagnosis (Cont'd)

Description for Work Flow

STEP	DESCRIPTION
STEP I	Get detailed information about the conditions and the environment when the incident/symptom occurred using the Worksheet sample, EC-36.
STEP II	Before confirming the concern, check and write down (print out using CONSULT-II) the DTC and the freeze frame data, then erase the DTC and the data. The DTC and the freeze frame data can be used when duplicating the incident at STEP III & IV. If the incident cannot be verified, perform EC-74, "Trouble Diagnosis For Intermittent Incident". Study the relationship between the cause, specified by DTC, and the symptom described by the customer. (The Symptom Matrix Chart will be useful. See EC-44.) Also check related service bulletins for information.
STEP III	Try to confirm the symptom and under what conditions the incident occurs. The DIAGNOSTIC WORK SHEET and the freeze frame data are useful to verify the incident. Connect CONSULT-II to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results. If the incident cannot be verified, perform EC-74, "Trouble Diagnosis For Intermittent Incident". If the malfunction code is detected, skip STEP IV and perform STEP V.
STEP IV	Try to detect the DTC by driving in (or performing) the DTC Confirmation Procedure. Check and read the DTC and freeze frame data by using CONSULT-II. During the DTC verification, be sure to connect CONSULT-II to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results. If the incident cannot be verified, perform EC-74, "Trouble Diagnosis For Intermittent Incide". In case the DTC Confirmation Procedure is not available, perform the Overall Function Check instead. The DTC cannot be displayed by this check, however, this simplified check is an effective alternative. The NG result of the Overall Function Check is the same as the DTC detection.
STEP V	Take the appropriate action based on the results of STEP I through IV. If the malfunction code is indicated, proceed to TROUBLE DIAGNOSIS FOR DTC PXXXX. If the normal code is indicated, proceed to the Basic Inspection. (Refer to EC-38.) If CONSULT-II is available, perform "DATA MONITOR (SPEC)" mode with CONSULT-II and proceed to the EC-69, "CONSULT-II Reference Value in Data Monitor Mode". (If malfunction is detected, proceed to "PERAIR/REPLACE".) Then perform inspections according to the EC-44, "Symptom Matrix Chart".
STEP VI	Identify where to begin diagnosis based on the relationship study between symptom and possible causes. Inspect the system for mechanical binding, loose connectors or wiring damage using (tracing) Harness Layouts. Gently shake the related connectors, components or wiring harness with CONSULT-II set in "DATA MONITOR (AUTO TRIG)" mode. Check the voltage of the related ECM terminals or monitor the output data from the related sensors with CONSULT-II. Refer to EC-53, EC-69. The "Diagnostic Procedure" in EC section contains a description based on open circuit inspection. A short circuit inspection is also required for the circuit check in the Diagnostic Procedure. For details, refer to "Circuit Inspection" in "HOW TO PERFORM EFFICIENT DIAGNOSES FOR AN ELECTRICAL INCIDENT", GI-19. Repair or replace the malfunction parts. If malfunctioning part cannot be detected, perform EC-74, "Trouble Diagnosis For Intermittent Incide".
STEP VII	Once you have repaired the circuit or replaced a component, you need to run the engine in the same conditions and circumstances which resulted in the customer's initial complaint. Perform the DTC Confirmation Procedure and confirm the normal code [DTC No. P0000] is detected. If the incident is still detected in the final check, perform STEP VI by using a method different from the previous one. Before returning the vehicle to the customer, be sure to erase the unnecessary DTC in ECM and TCM (Transmission control module).

Trouble Diagnosis (Cont'd)

KEY POINTS	
WAHT	Vehicle & engine model
WHEN	Date, Frequencies
WHERE	Road conditions
HOW	Operating conditions, Weather conditions, Symptoms

Diagnostic Worksheet

DESCRIPTION

There are many operating conditions that lead to the malfunction of engine components. A good grasp of such conditions can make troubleshooting faster and more accurate.

In general, each customer feels differently about a incident. It is important to fully understand the symptoms or conditions for a customer complaint.

Utilize a diagnostic worksheet like the one on the next page in order to organize all the information for troubleshooting.

Some conditions may cause the MIL to come on steady or blink and DTC to be detected.

Examples:

- Vehicle ran out of fuel, which caused the engine to misfire.
- Fuel filler cap was left off or incorrectly screwed on, allowing fuel to evaporate into the atmosphere.

Trouble Diagnosis (Cont'd)

Worksheet Sample

Customer name MR/MS		Model & Year	VIN
Engine #		Transmission type	Mileage
Incident Date		Manufactured Date	In Service Date
Fuel and fuel filler cap		☐ Vehicle ran out of fuel causing misfire. ☐ Fuel filter cap was left off or incorrectly screwed on.	
Symptoms	☐ Startability	☐ Impossible to start ☐ No combustion ☐ Partial combustion ☐ Partial combustion affected by throttle position ☐ Partial combustion NOT affected by throttle position ☐ Possible but hard to start ☐ Others [ ]	
	☐ Idling	☐ No fast idle ☐ Unstable ☐ High idle ☐ Low idle	
	☐ Driveability	☐ Others [ ] ☐ Stumble ☐ Surge ☐ Knock ☐ Lack of power ☐ Intake backfire ☐ Exhaust backfire	
	☐ Engine stall	☐ Others [ ] ☐ At the time of start ☐ While idling ☐ Wheel accelerating ☐ While decelerating	
Incident occurrence		☐ Just after stopping ☐ While loading ☐ Just after delivery ☐ Recently	
Frequency		☐ In the morning ☐ At night ☐ In the day time	
Weather conditions		☐ All the time ☐ Under certain conditions ☐ Sometimes	
	Weather	☐ Not affected	
	Temperature	☐ Fine ☐ Raining ☐ Snowing ☐ Others [ ]	
Engine conditions		☐ Hot☐ Warm ☐ Cool ☐ Cold ☐ Humid °C ☐ Cold ☐ During warm-up ☐ After warm-up	
Road conditions		Engine speed rpm	
Driving conditions		☐ In town ☐ In suburbs ☐ Highway ☐ Off road (up/down) ☐ Not affected ☐ At starting ☐ While idling ☐ At racing ☐ While accelerating ☐ While cruising ☐ While decelerating ☐ While turning (RH/LH)	
Malfunction indicator lamp		Vehicle speed km/h	
		☐ Turned on ☐ Not turned on	

DTC Inspection Priority Chart

If some DTCs are displayed at the same time, perform inspections one by one based on the following priority chart.

NOTE:

- **If DTC U1000 and/or U1001 is displayed with other DTC, first perform the trouble diagnosis for DTC U1000 and U1001. Refer to EC-81, "DTC U1000, U1001 CAN COMMUNICATION LINE".**

Trouble Diagnosis (Cont'd)

Priority	Detected Items (DTC)
1	● U1000 U1001 CAN communication line ● P0102 P0103 Mass air flow sensor ● P0117 P0118 Engine coolant temperature sensor ● P0122 P0123 P0222 P0223 P1225 P1226 P1229 P2135 Throttle position sensor ● P2122 P2123 P2127 P2128 P2138 Accelerator pedal position sensor ● P0327 P0328 Knock sensor ● P0335 Crankshaft position sensor (POS) ● P0340 Camshaft position sensor (PHASE) ● P0350 ignition signal ● P0500 Vehicle speed sensor ● P0605 ECM
2	● P0132 P0134 Heated oxygen sensor 1 ● P0550 Power steering pressure sensor ● P1111 Intake valve timing control solenoid valve ● P1065 ECM power supply ● P1122 Electric throttle control function ● P1124 P1126 P1128 Electric throttle control actuator ● P1805 Brake switch
3	● P1121 Electric throttle control actuator ● P1217 Engine over temperature (OVERHEAT)

Fail-safe Chart

● When the DTC listed below is detected, the ECM enters the fail-safe mode and the MIL lights up.

<table>
<tr><th>DTC No</th><th>Detected Items</th><th>Engine Operating Condition In Fail-Safe Mode</th></tr>
<tr><td>P0102
P0103</td><td>Mass air flow sensor circuit</td><td>Engine speed will not rise more than 2,400 rpm due to the fuel cut.</td></tr>
<tr><td>P0117
P0118</td><td>Engine coolant temperature sensor circuit</td><td>Engine coolant temperature will be determined by ECM based on the time after turning ignition switch ON or START.
CONSULT-II displays the engine coolant temperature decided by ECM.
<table>
<tr><th>Condition</th><th>Engine coolant temperature decided (CONSULT-II display)</th></tr>
<tr><td>Just as ignition switch is turned ON or Start</td><td>40°C (104°F)</td></tr>
<tr><td>More than approx. 4 minutes after ignition ON or Start</td><td>80°C (176°F)</td></tr>
<tr><td>Except as shown above</td><td>40 - 80°C (104 - 176°F)
(Depends on the time)</td></tr>
</table>
When the fail-safe system for engine coolant temperature sensor is activated, the cooling fan operates while engine is running.</td></tr>
<tr><td>P0122
P0123
P0222
P0223
P2135</td><td>Throttle position sensor</td><td>The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.
The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.</td></tr>
</table>

Trouble Diagnosis (Cont'd)

DTC No	Detected Items	Engine Operating Condition In Fail-Safe Mode
P1121	Electric throttle control actuator	(When electric throttle control actuator does not function properly due to the return spring malfunction:) ECM controls the electric throttle actuator by regulating the throttle opening around the idle position. The engine speed will not rise more than 2,000 rpm.
		(When throttle valve opening angle in fail-safe mode is not in specified range:) ECM controls the electric throttle control actuator by regulating the throttle opening to 20 degrees or less.
		(When ECM detects the throttle valve is stuck open:) While the vehicle is driving, it slows down gradually by fuel cut. After the vehicle stops, the engine stalls. The engine can restart in N or P position, and engine speed will not exceed 1,000 rpm or more.
P1122	Electric throttle control function	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 6.05 degrees) by the return spring.
P1124 P1126	Throttle control motor relay	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 6.05 degrees) by the return spring.
P1128	Throttle control motor	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 6.05 degrees) by the return spring.
P1229	Sensor power supply	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 6.05 degrees) by the return spring.
P2122 P2123 P2127 P2128	Accelerator pedal position sensor	The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

- The fail-safe function also operate when above diagnoses except MIL circuit are detected and demands the driver to repair the trouble.

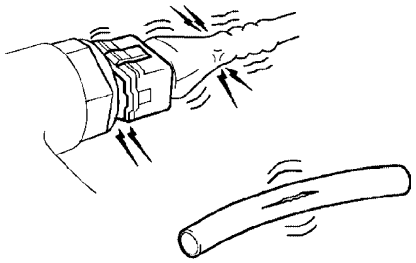
Engine operating condition in fail-safe mode	Engine speed will not rise more than 2,500 rpm due to the fuel cut

Trouble Diagnosis (Cont'd)

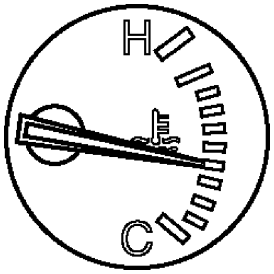
Basic Inspection

1. INSPECTION START

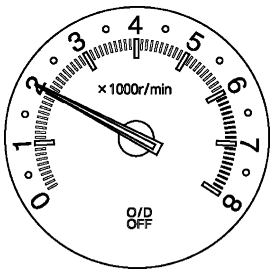
1. Check service records for any recent repairs that may indicate a related malfunction, or a current need for scheduled maintenance.



2. Open engine hood and check the following:
   - Harness connectors for improper connections
   - Wiring harness for improper connections, pinches and cut
   - Vacuum hoses for splits, kinks and improper connections
   - Hoses and ducts for leaks
   - Air cleaner clogging
   - Gasket
3. Confirm that electrical or mechanical loads are not applied.
   - Headlamp switch is OFF.
   - Air conditioner switch is OFF.
   - Rear window defogger switch is OFF.
   - Steering wheel is in the straight-ahead position, etc.



4. Start engine and warm it up until engine coolant temperature indicator points the middle of gauge. Ensure engine stays below 1,000 rpm.



5. Run engine at about 2,000 rpm for about 2 minutes under noload.
6. Make sure that no DTC is displayed with CONSULT-II or ECM.

   OK or NG

   OK >> GO TO 3.

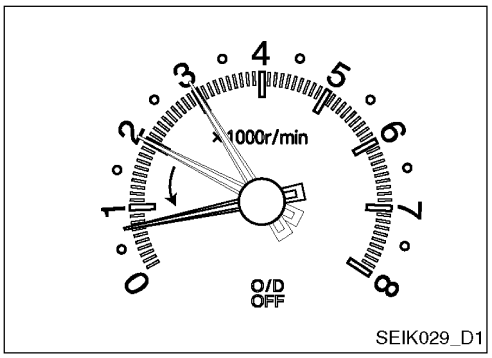
   NG >> GO TO 2.

2. REPAIR OR REPLACE

Repair or replace components as necessary according to corresponding Diagnostic Procedure.

>> GO TO 3.

Trouble Diagnosis (Cont'd)



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3. CHECK TARGET IDLE SPEED

With CONSULT-II

1. Run engine at about 2,000 rpm for about 2 minutes under no-load.
2. Rev engine (2,000 to 3,000 rpm) two or three times under noload, then run engine at idle speed for about 1 minute.
3. Read idle speed in "DATA MONITOR" mode with CONSULT-II.

Engine and transmission type		Idle speed (in P or N position)
QG16DE	M/T	650 ± 50 rpm
	A/T	700 ± 50 rpm

Without CONSULT-II

1. Run engine at about 2,000 rpm for about 2 minutes under no-load.
2. Rev engine (2,000 to 3,000 rpm) two or three times under no-load, then run engine at idle speed for about 1 minute.
3. Check idle speed.

Engine and transmission type		Idle speed (in P or N position)
QG16DE	M/T	650 ± 50 rpm
	A/T	700 ± 50 rpm

OK or NG

OK >> GO TO 10.

NG >> GO TO 4.

4. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Stop engine.
2. Perform EC-23, "Accelerator Pedal Released Position Learning".

>> GO TO 5.

Trouble Diagnosis (Cont'd)

5. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-23, "Throttle Valve Closed Position Learning".

>> GO TO 6.

6. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-24, "Idle Air Volume Learning".

Is Idle Air Volume Learning carried out successfully?

Yes or No

Yes >> GO TO 7.

No >> 1. Follow the instruction of Idle Air Volume Learning.
2. GO TO 4.

7. CHECK TARGET IDLE SPEED AGAIN

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Read idle speed in "DATA MONITOR" mode with CONSULT-II.

Engine and transmission type		Idle speed (in P or N position)
QG16DE	M/T	650 ± 50 rpm
	A/T	700 ± 50 rpm

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.

Engine and transmission type		Idle speed (in P or N position)
QG16DE	M/T	650 ± 50 rpm
	A/T	700 ± 50 rpm

OK or NG

OK >> GO TO 10.

NG >> GO TO 8.

Trouble Diagnosis (Cont'd)

8. DETECT MALFUNCTIONING PART

Check the following.

- Check camshaft position sensor (PHASE) and circuit. Refer to EC-89.
- Check crankshaft position sensor (POS) and circuit. Refer to EC-96.

OK or NG

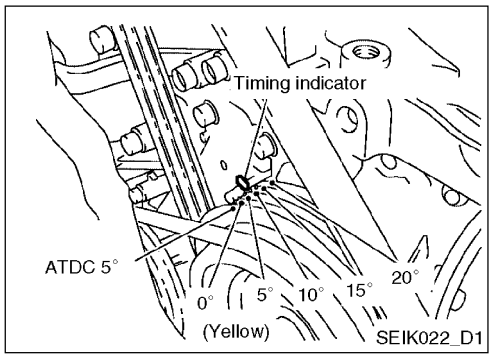
OK >> GO TO 9.

NG >> 1. Repair or replace.
2. GO TO 4.

9. CHECK ECM FUNCTION

1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of an incident, but this is the rarely the case.)

10. CHECK IGNITION TIMING



1. Run engine at idle.
2. Check ignition timing with a timing light.

Engine and transmission type		Idle speed (in P or N position)
QG16DE	M/T	6 ± 2° BTDC
	A/T	6 ± 2° BTDC

OK or NG

OK >> INSPECTION END

NG >> GO TO 11.

11. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Stop engine.
2. Perform EC-23, "Accelerator Pedal Released Position Learning".

>> GO TO 12.

12. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-23, "Throttle Valve Closed Position Learning".

>> GO TO 13.

Trouble Diagnosis (Cont'd)

13. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-23, "Idle Air Volume Learning".

Is Idle Air Volume Learning carried out successfully?

Yes or No

Yes >> GO TO 14.

No >> 1. Follow the instruction of Idle Air Volume Learning.
2. GO TO 4.

14. CHECK TARGET IDLE SPEED AGAIN

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Read idle speed in "DATA MONITOR" mode with CONSULT-II.

Engine and transmission type		Idle speed (in P or N position)
QG16DE	M/T	650 ± 50 rpm
	A/T	700 ± 50 rpm

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.

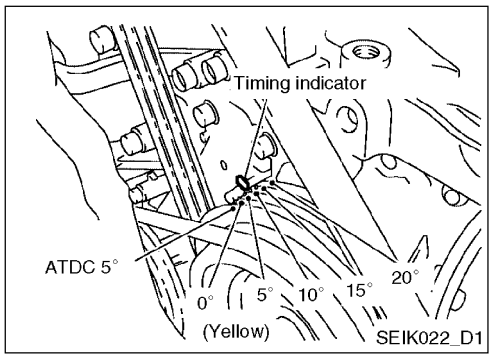
Engine and transmission type		Idle speed (in P or N position)
QG16DE	M/T	650 ± 50 rpm
	A/T	700 ± 50 rpm

OK or NG

OK >> GO TO 15.

NG >> GO TO 17.

Trouble Diagnosis (Cont'd)



15. CHECK IGNITION TIMING AGAIN

1. Run engine at idle.
2. Check ignition timing with a timing light.

Engine and transmission type		Idle speed (in P or N position)
QG16DE	M/T	6 ± 2° BTDC
	A/T	6 ± 2° BTDC

OK or NG

OK >> INSPECTION END

NG >> GO TO 16.

16. CHECK TIMING CHAIN INSTALLATION

Check timing chain installation. Refer to "TIMING CHAIN", (QG16: EM-36).

OK or NG

OK >> GO TO 17.

NG >> 1. Repair the timing chain installation.
2. GO TO 4.

17. DETECT MALFUNCTIONING PART

Check the following.

- Check camshaft position sensor (PHASE) and circuit. Refer to EC-89.
- Check crankshaft position sensor (POS) and circuit. Refer to EC-96.

OK or NG

OK >> GO TO 18.

NG >> 1. Repair or replace.
2. GO TO 4.

18. CHECK ECM FUNCTION

1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of an incident, but this is the rarely the case.)

Trouble Diagnosis (Cont'd)

Symptom Matrix Chart

SYSTEM - BASIC ENGINE CONTROL SYSTEM

		Symptom													Reference Page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Fuel	Fuel pump circuit	1	1	2	3	2		2	2			3		2	EC-237
	Fuel pressure regulator system	3	3	4	4	4	4	4	4	4		4			-
	Injector circuit	1	1	2	3	2		2	2			2			EC-221
	Evaporative emission system	3	3	4	4	4	4	4	4	4		4			EC-313
Air	Positive crankcase ventilation system	3	3	4	4	4	4	4	4	4		4	4		-
	Incorrect idle speed adjustment	3	3				1	1	1	1		1			EC-316
	Electric throttle control actuator	1	1	2	3	3	2	2	2	2	2	2			EC-151
Ignition	Incorrect ignition timing adjustment	3	3				1	1	1	1		1			-
	Ignition circuit	1	1	2	2	2		2	2			2			EC-118
Main power supply and ground circuit		2	2	3	3	3		3	3		2	3			EC-75
Mass air flow sensor circuit		1	1	2	2	2		2	2			2			EC-103
Engine coolant temperature sensor circuit		1	1	2	2	2	3	2	2	3	1	2			EC-113
Throttle position sensor circuit		1	2		2	2	2	2	2		2				EC-145
Accelerator pedal position sensor circuit		3	2	1	2			2							EC-178
Heated oxygen sensor 1 circuit			1	2	3	2			2	2		2			EC-247
Knock sensor circuit			2	2								3			EC-141
Crankshaft position sensor (POS) circuit			2	2											EC-96
Camshaft position sensor (PHASE) circuit			2	2											EC-89
Vehicle speed signal circuit				2	3		3					3			EC-205
Power steering pressure sensor circuit				2				3	3	3	3				EC-243

Trouble Diagnosis (Cont'd)

	Symptom													Reference Page
	HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
ECM	2	2	3	3	3	3	3	3	3	3	3			EC-75
Intake valve timing control solenoid valve circuit	3	3	2		1	3	2	2	2		2			EC-209
PNP switch circuit			3		3	3	3	3	3		3			EC-300
Refrigerant pressure sensor circuit		2				3	3	3	3		4			EC-304
Electrical load signal circuit						3	3	3	3					EC-286
Air conditioner circuit	2	2	3	3	3	3	3	3	3		3		2	EC-304

1 - 6: The numbers refer to the order of inspection.

(continued on next page)

Trouble Diagnosis (Cont'd)

SYSTEM - ENGINE MECHANICAL & OTHER

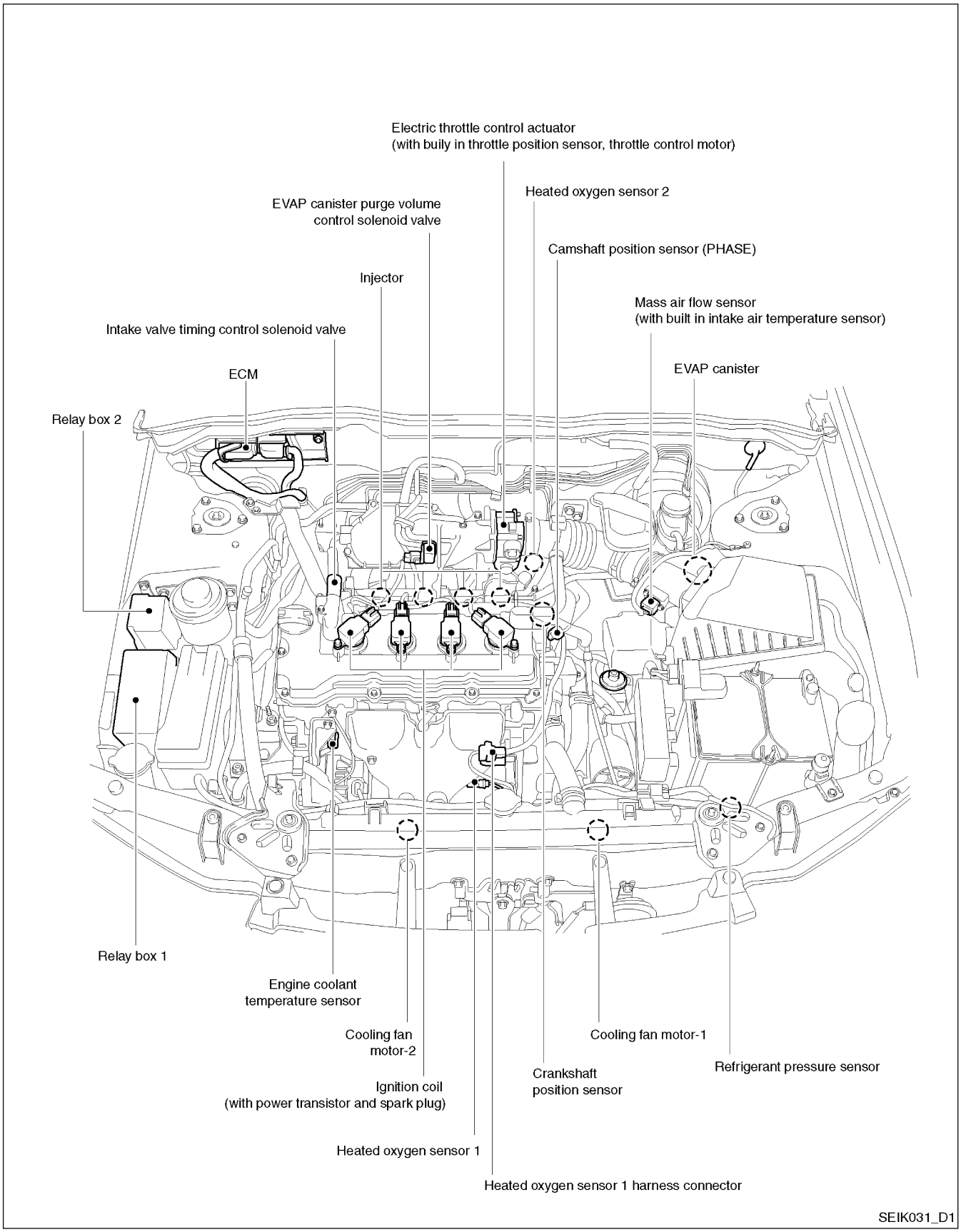
		Symptom													Reference Page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Fuel	Fuel tank	5	5												FE section
	Fuel piping	5	5	5	5	5		5	5			5			
	Vapor lock		5												
	Valve deposit	5	5	5	5	5		5	5			5			
	Poor fuel (Heavy weight gasoline, Low octane)	5	5	5	5	5		5	5			5			
Air	Air duct		5	5		5		5	5			5			
	Air cleaner		5	5		5		5	5			5			
	Air leakage from air duct (Mass air flow sensor - electric throttle control actuator)	5	5	5	5	5	5	5	5	5		5			
	Electric throttle control actuator	5	5	5	5	5	5	5	5	5		5			EM section
	Air leakage from intake manifold/Collector/Gasket	5	5	5	5	5	5	5	5	5		5			-
Cranking	Battery	1	1	1		1		1	1			1		1	
	Alternator circuit	1	1	1		1		1	1			1		1	
	Starter circuit	3													
	Signal plate/Flywheel/Drive plate	6													EM section
	PNP switch	4													AT or MT section
Engine	Cylinder head	5	5	5	5	5		5	5			5			EM section
	Cylinder head gasket	5	5	5	5	5		5	5		4	5	3		
	Cylinder block	6	6	6	6	6		6	6			6	4		
	Piston	6	6	6	6	6		6	6			6	4		
	Piston ring	6	6	6	6	6		6	6			6	4		
	Connecting rod	6	6	6	6	6		6	6			6			
	Bearing	6	6	6	6	6		6	6			6			
	Crankshaft	6	6	6	6	6		6	6			6			

Trouble Diagnosis (Cont'd)

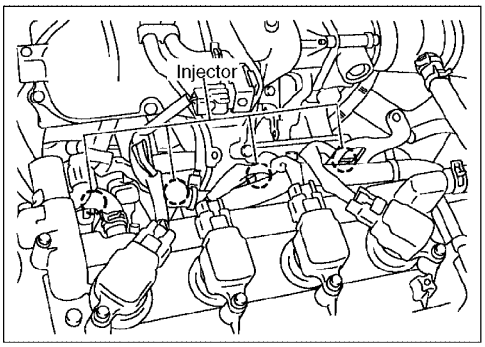
		Symptom													Reference Page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Valve mechanism	Timing chain	5	5	5	5	5		5	5			5			EM section
	Camshaft	5	5	5	5	5		5	5			5			
	Intake valve timing control	5	5	5	5	5		5	5			5			
	Intake valve	5	5	5	5	5		5	5			5	3		
	Exhaust valve	5	5	5	5	5		5	5			5	3		
Exhaust	Exhaust manifold/Tube/ Muffler/Gasket	5	5	5	5	5		5	5			5			FE section
	Three way catalyst	5	5	5	5	5		5	5			5			
Lubrication	Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery Oil level (Low)/Filthy oil	5	5	5	5	5		5	5			5			MA, EM and LC section
	Radiator/Hose/Radiator filler cap	5	5	5	5	5		5	5			5			LC section
Cooling	Thermostat	5	5	5	5	5		5	5		2	5			
	Water pump	5	5	5	5	5		5	5	5	2	5			
	Water gallery	5	5	5	5	5		5	5		2	5			
	Cooling fan	5	5	5	5	5		5	5		2	5			
	Coolant level (low)/Contaminated coolant	5	5	5	5	5		5	5	5	2	5			
		5	5	5	5	5		5	5		2	5			MA section

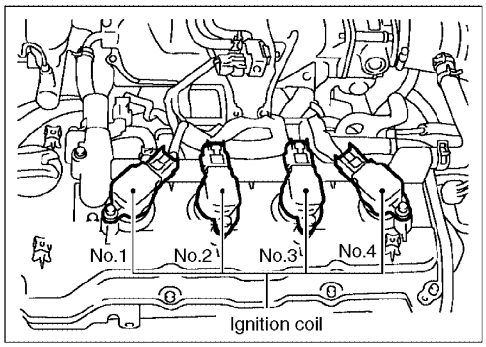
Trouble Diagnosis (Cont'd)

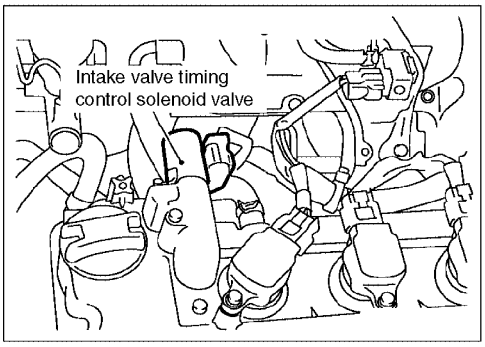
Engine Control Component Parts Location

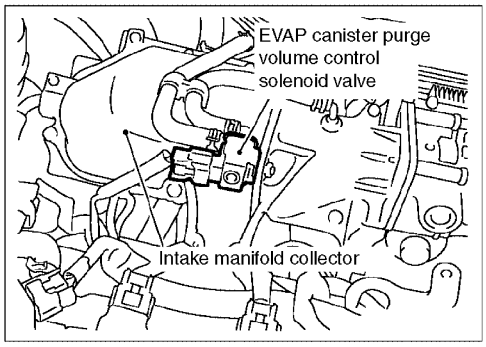


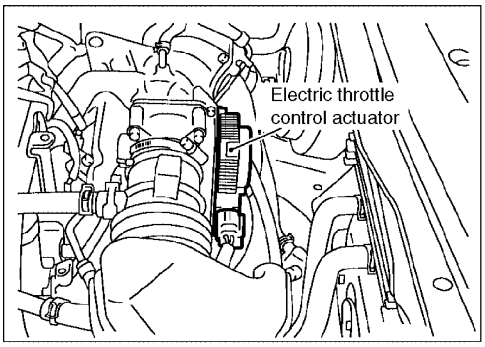
Trouble Diagnosis (Cont'd)

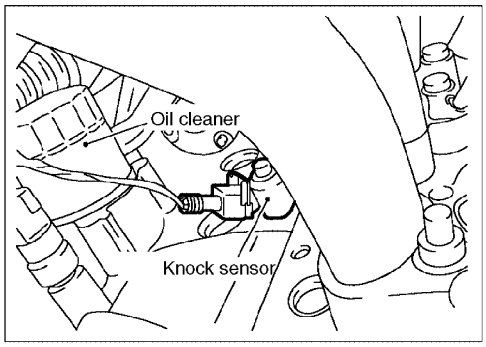


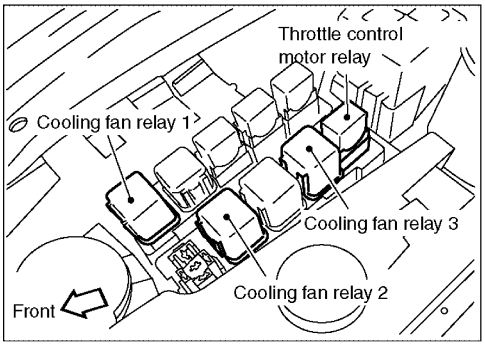


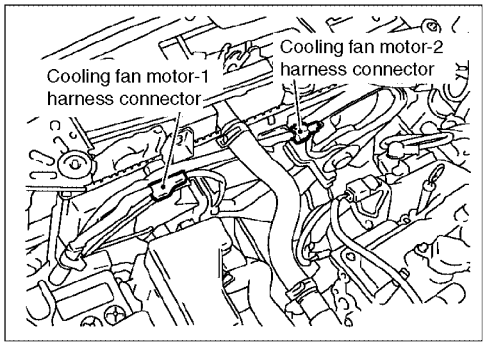












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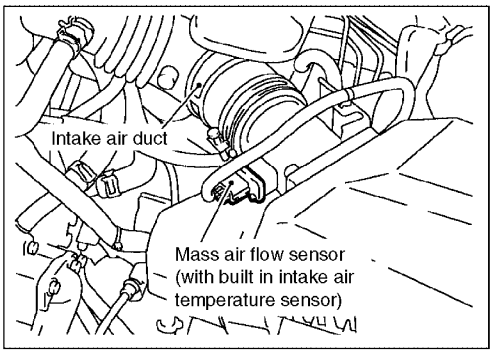
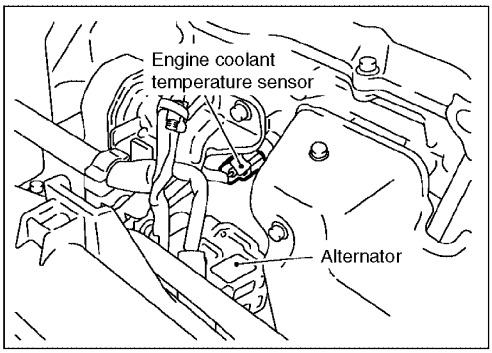
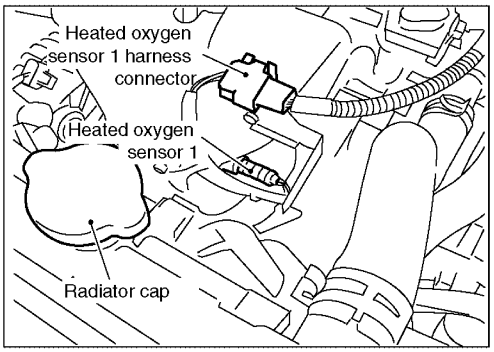
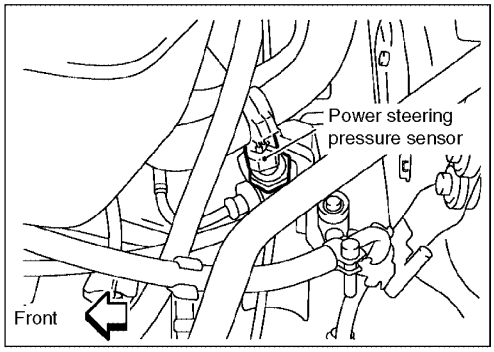
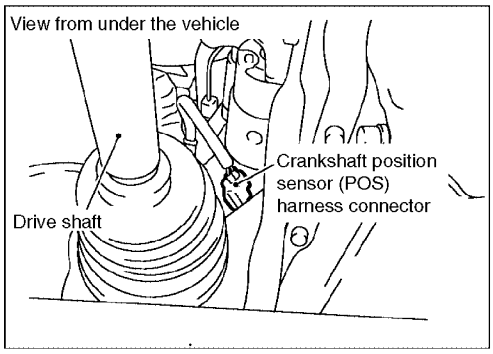
Trouble Diagnosis (Cont'd)

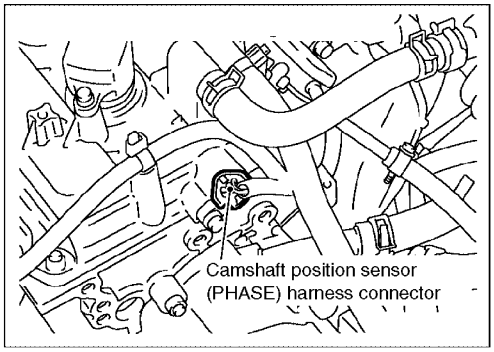


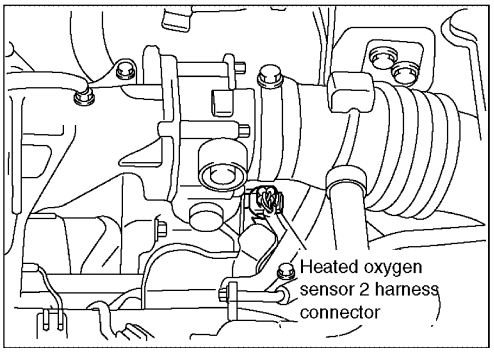


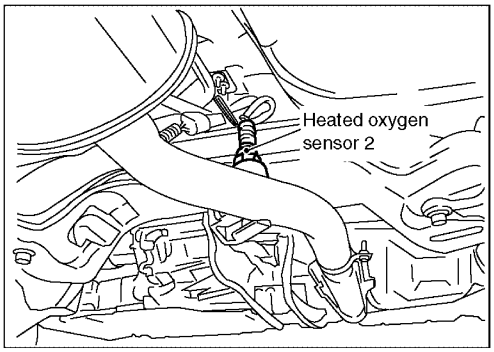












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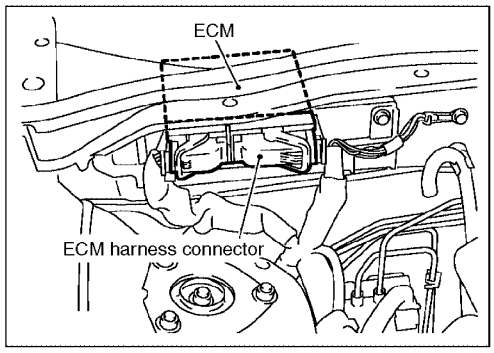
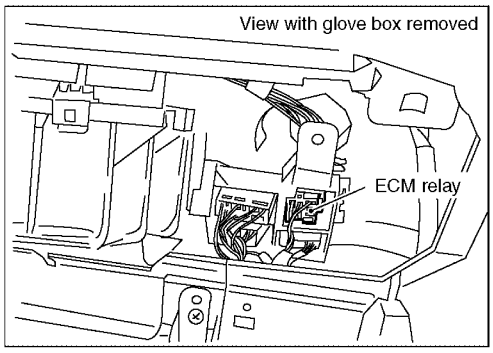
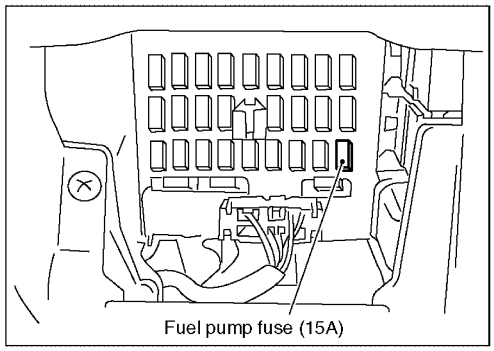
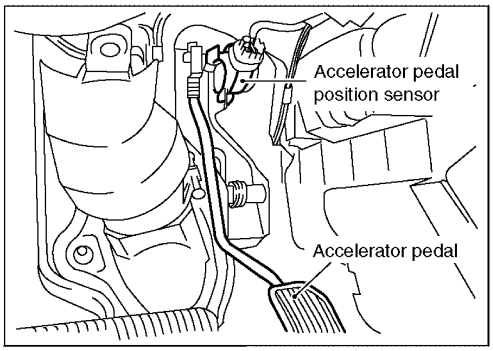
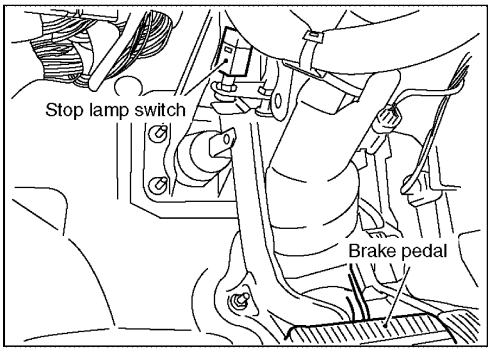
Trouble Diagnosis (Cont'd)

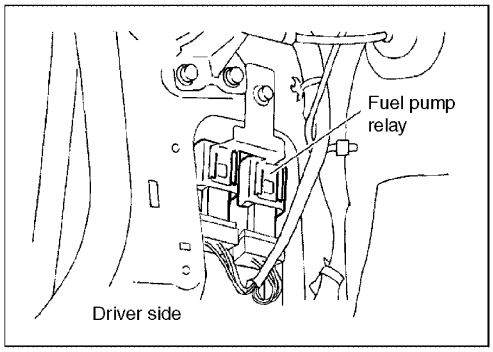


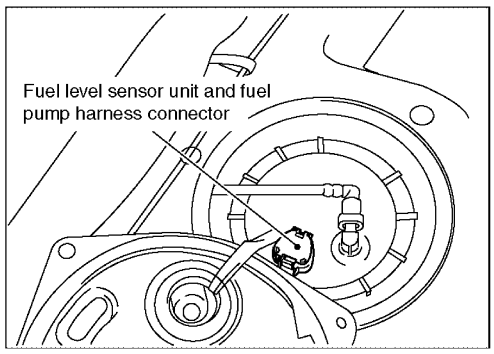


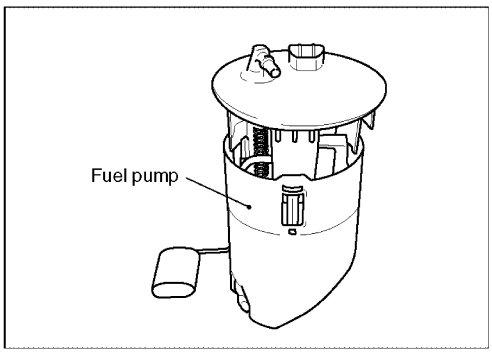






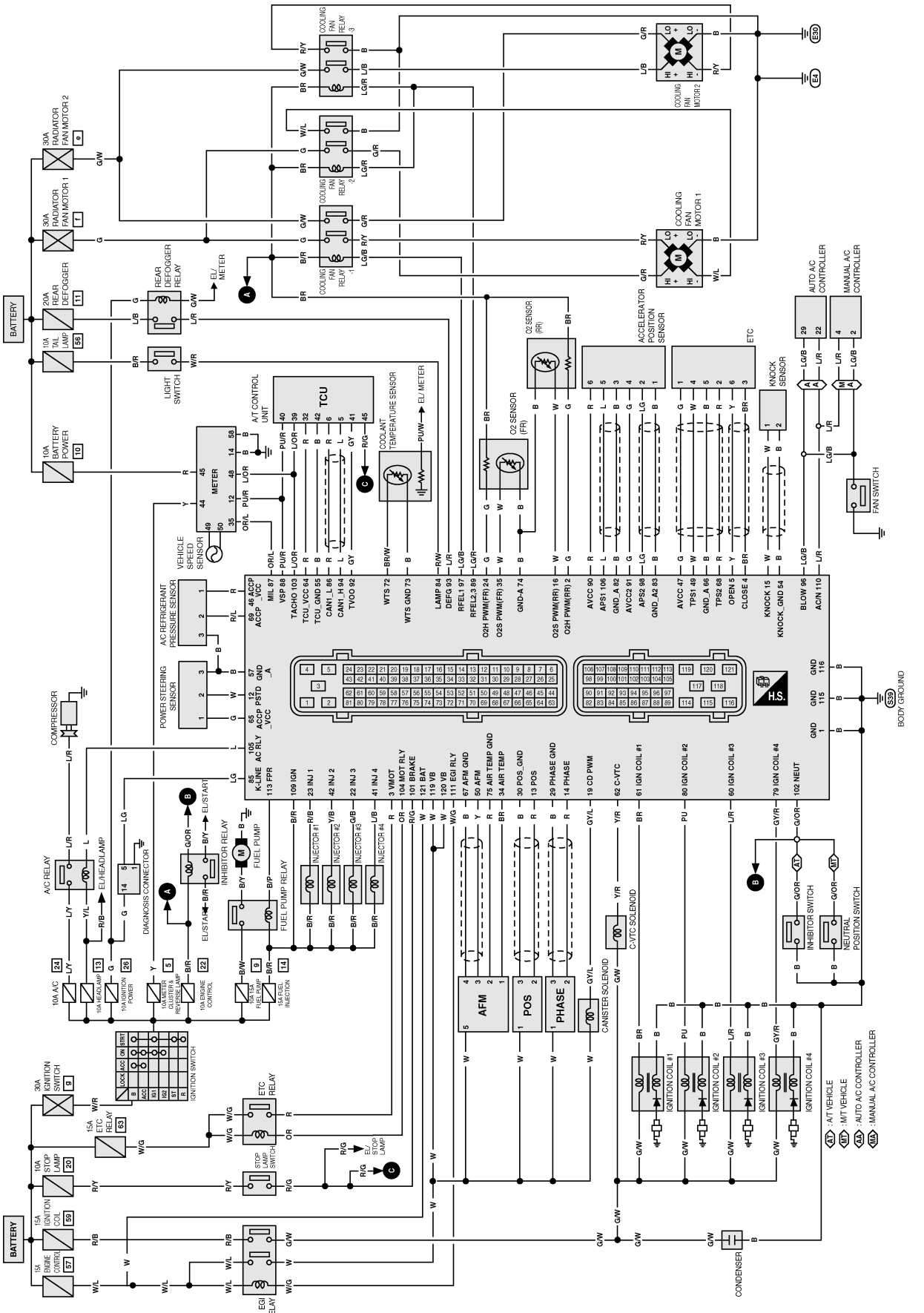






SEIK107_D1

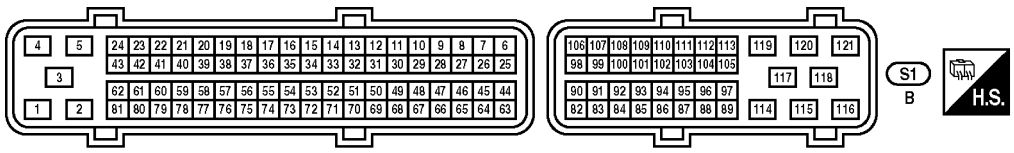
Circuit Diagram



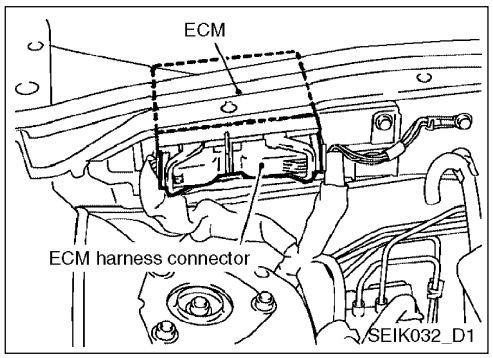
SECK001_D1

Trouble Diagnosis (Cont'd)

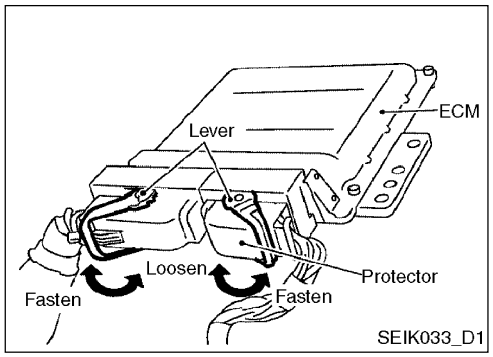
ECM Harness Connector Terminal Layout



SEIK034_D1



SEIK032_D1



SEIK033_D1

ECM Terminals and Reference Value

PREPARATION

1. ECM is located behind in the left side of the cowl top (behind the strut tower).
   For this inspection.
2. Remove ECM harness protector.
3. When disconnecting ECM harness connector, loosen it with levers as far as they will go as shown at right.
4. Connect a break-out box and Y-cable adapter between the ECM and ECM harness connector.
   - Use extreme care not to touch 2 pins at one time.
   - Data is for comparison and may not be exact.

ECM Inspection Table

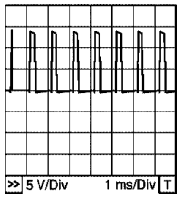
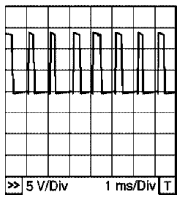
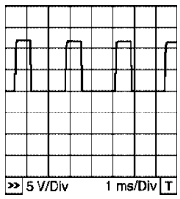
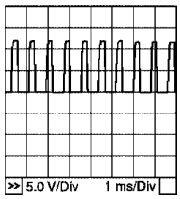
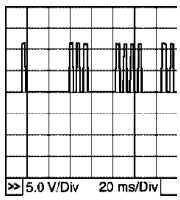
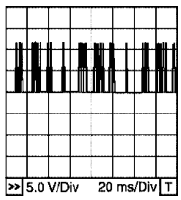
Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-II

CAUTION:

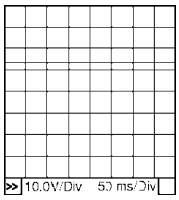
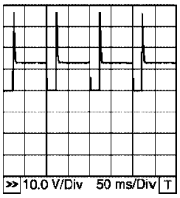
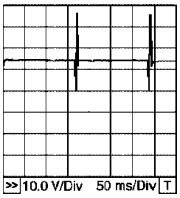
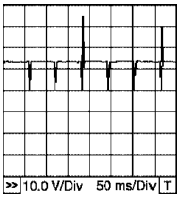
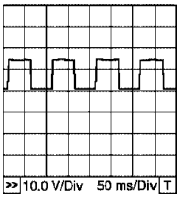
- **Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

Terminal No.	Wire Color	Item	Condition	Data (DC Voltage)
1	B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
3	R	Throttle control motor power supply	**[Ignition switch ON]**	BATTERY VOLTAGE (11 - 14V)

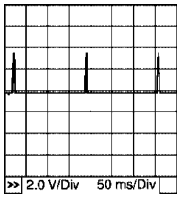
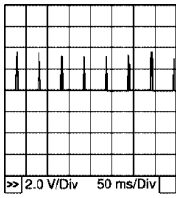
Trouble Diagnosis (Cont'd)

Terminal No	Wire Color	Item	Condition	Data (DC Voltage)
4	BR	Throttle control motor (Close)	**[Ignition switch ON]** ● Engine stopped ● Gear position is 1st (M/T models) ● Gear position is D (A/T models) ● Accelerator pedal is releasing	0 ~ 14 V ★ 
5	Y	Throttle control motor (Open)	**[Ignition switch ON]** ● Engine stopped ● Gear position is 1st (M/T models) ● Gear position is D (A/T models) ● Accelerator pedal is depressing	0 ~ 14 V ★ 
12	W	Power steering pressure sensor	**[Engine is running]** ● Steering wheel is being turned	0.5 ~ 5.0 V
			[Engine is running] ● Steering wheel is not being turned	0.4 ~ 0.8 V
13	R	Crankshaft position sensor (POS)	**[Engine is running]** ● Warm-up condition ● Idle speed	Approximately 3.0 V ★ 
			[Engine is running] ● Engine speed is 2,000 rpm	Approximately 3.0 V ★ 
14	R	Camshaft position sensor (PHASE)	**[Engine is running]** ● Warm-up condition ● Idle speed	1.0 ~ 4.0 ★ 
			[Engine is running] ● Engine speed is 2,000 rpm	1.0 ~ 4.0 ★ 

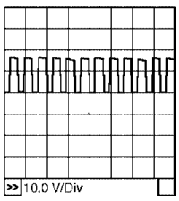
Trouble Diagnosis (Cont'd)

Terminal No	Wire Color	Item	Condition	Data (DC Voltage)
15	W	Knock sensor	**[Engine is running]** ● Idle speed	Approximately 2.5 V
16	W	Heated oxygen sensor 2	**[Engine is running]** ● Idle speed	Approximately 0 ~ 1 V
19	GY/L	EVAP canister purge volume control solenoid valve	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14 V) ★ 
			[Engine is running] ● Engine speed is about 2,000 rpm (More than 100 seconds after starting engine)	Approximately 10 V ★ 
22 23 41 42	G/B R/B L/B Y/B	Injector No. 3 Injector No. 1 Injector No. 4 Injector No. 2	**[Engine is running]** ● Warm-up condition ● Idle speed	BATTERY VOLTAGE (11 - 14 V) ★ 
			[Engine is running] ● Warm-up condition ● Engine speed is 2,000 rpm	BATTERY VOLTAGE (11 - 14 V) ★ 
24	G	Heated oxygen sensor 1 heater	**[Engine is running]** ● Warm-up condition ● Engine speed is below 3,600 rpm	Approximately 7.0 V ★ 
			[Ignition switch "ON"] ● Engine stopped. **[Engine is running]** ● Engine speed is above 3,600 rpm	BATTERY VOLTAGE (11 - 14 V)
29	B	Camshaft position sensor (PHASE) ground	**[Engine is running]** ● Idle speed	Approximately 0 V
30	B	Camshaft position sensor (POS) ground	**[Engine is running]** ● Idle speed	Approximately 0 V

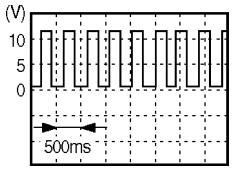
Trouble Diagnosis (Cont'd)

Terminal No	Wire Color	Item	Condition	Data (DC Voltage)
34	BR	Intake air temperature sensor	**[Engine is running]**	Approximately 0 - 4.8 V Output voltage varies with intake air temperature.
35	W	Heated oxygen sensor 1	**[Engine is running]** ● Warm-up condition ● Engine speed is 2,000 rpm	0 - Approximately 1.0 V (Periodically change)
46	R	Sensor power supply (Refrigerant pressure	**[Ignition switch ON]**	Approximately 5 V
47	G	sensor) Sensor power supply	**[Ignition switch ON]**	Approximately 5 V
49	W	(Throttle position sensor) Throttle position sensor 1	**[Ignition switch ON]** ● Engine stopped ● Gear position is 1st (M/T models) ● Gear position is D (A/T models) ● Accelerator pedal fully released	More than 0.36 V
			[Ignition switch ON] ● Engine stopped ● Gear position is 1st (M/T models) ● Gear position is D (A/T models) ● Accelerator pedal fully depressed	Less than 4.75 V
50	Y	Mass air flow sensor	**[Engine is running]** ● Warm-up condition ● Idle speed	Approximately 1.0 - 1.7 V
			[Engine is running] ● Warm-up condition ● Engine speed is 2,500 rpm	Approximately 1.5 - 2.1 V
54	B		**[Engine is running]** ● Idle speed	Approximately 0 V
57	B	Sensor ground (Knock sensor shield circuit) Sensors' ground (Power	**[Engine is running]** ● Warm-up condition ● Idle speed	Approximately 0 V
60 61 79 80	L/R BR GY/R PU	steering pressure sensor/Refrigerant pressure sensor/ASCD steering switch) Ignition signal No. 3 Ignition signal No. 1 Ignition signal No. 4 Ignition signal No. 2	**[Engine is running]** ● Warm-up condition ● Idle speed	Approximately 0 - 0.1 V ★ 
			[Engine is running] ● Warm-up condition ● Engine speed is 2,000 rpm	Approximately 0 - 0.1 V ★ 

Trouble Diagnosis (Cont'd)

Terminal No	Wire Color	Item	Condition	Data (DC Voltage)
62	Y/R	Intake valve timing control solenoid valve	**[Engine is running]** ● Warm-up condition ● Idle speed	BATTERY VOLTAGE (11 - 14 V) ★
			[Engine is running] ● Warm-up condition ● When revving engine up to 2,000 rpm quickly	7 - 10 V ★ 
65	G	Sensor power supply (Power steering pressure sensor)	**[Ignition switch ON]**	Approximately 5 V
66	B	Sensor ground (Throttle position sensor)	**[Engine is running]** ● Warm-up condition ● Idle speed	Approximately 0 V
67	B	Sensor ground (Mass air flow sensor)	**[Engine is running]** ● Warm-up condition ● Idle speed	Approximately 0 V
68	R	Throttle position sensor 2	**[Ignition switch ON]** ● Engine stopped ● Gear position is 1st (M/T models) ● Gear position is D (A/T models) ● Accelerator pedal fully released	Less than 4.75 V
			[Ignition switch ON] ● Engine stopped ● Gear position is 1st (M/T models) ● Gear position is D (A/T models) ● Accelerator pedal fully depressed	More than 0.36 V
69	R/L	Refrigerant pressure sensor	**[Engine is running]** ● Warm-up condition ● Both A/C switch and blower switch are ON (Compressor operates.)	Approximately 1.0 - 4.0 V ★
72	BR/W	Engine coolant temperature sensor	**[Engine is running]**	Approximately 0 - 4.8 V Output voltage varies with engine coolant temperature.
73	B	Sensor ground (Engine coolant temperature sensor)	**[Engine is running]** ● Warm-up condition ● Idle speed	Approximately 0 V
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Warm-up condition ● Idle speed	Approximately 0 V
75	R	Sensor ground (Intake air temperature sensor)	**[Engine is running]** ● Warm-up condition ● Idle speed	Approximately 0 V

Trouble Diagnosis (Cont'd)

Terminal No	Wire Color	Item	Condition	Data (DC Voltage)
82	B	Sensor ground Accelerator pedal position sensor 1)	**[Engine is running]** ● Warm-up condition ● Idle speed	Approximately 0 V
83	B	Sensor ground Accelerator pedal position sensor 2)		
84	R/W	Electrical load signal (Headlamp signal)	Lighting switch is ON	BATTERY VOLTAGE (11 - 14 V)
			Lighting switch is OFF	Approximately 0 V
85	LG	DATA link connector (K-Line)	CONSULT-II is disconnected.	Approximately 0 V
			CONSULT-II is connected.	BATTERY VOLTAGE (11 - 14 V)
86	R	CAN communication line	During communication between ECU and TCU	Approximately 2.3 V
87	OR/L	MIL drive signal	MIL (mulfunction indicator lamp) ON	Approximately 0 V
			MIL (mulfunction indicator lamp) OFF	Approximately 11 - 14 V
88	PU/R	Vehicle speed input signal	● Engine stopped ● Gear position is Neutral (M/T models) ● Gear position is P or N (A/T models) (while turning the wheel)	0 - Approximately 12 V (Periodically change)
			● Lift the drive wheel ● Gear position is any drive gear (M/T models) ● Gear position is D (A/T models)	0 - Approximately 12 V (Periodically change) 
89	LG/R	Cooling fan relay (High)	Cooling fan is operating	Approximately 0 V
			Cooling fan is not operating	BATTERY VOLTAGE (11 - 14 V)
90	R	Sensor power supply (Accelerator pedal position sensor 1)	**[Ignition switch ON]**	Approximately 5V
91	G	Sensor power supply (Accelerator pedal position sensor 2)		
92	GY	Engine and automatic transaxle integrated control	Same with TPS 1 sensor input value	
93	L/R	Electrical load signal (Rear window defogger signal)	Rear window defogger switch is ON	BATTERY VOLTAGE (11 - 14 V)
			Rear window defogger switch is OFF	Approximately 0 V
94	L	CAN communication line	During communication between ECU and TCU	Approximately 2.8 V
96	LG/B	Heater fan switch signal	**[ignition switch ON]** ● Heater fan control switch is ON	Approximately 0 V
			[ignition switch ON] ● Heater fan control switch is OFF	BATTERY VOLTAGE (11 - 14 V)
97	LG/B	Cooling fan relay (Low)	**[Engine is running]** ● Cooling fan is operating	Approximately 1 V
			[Engine is running] ● Cooling fan is not operating	BATTERY VOLTAGE (11 - 14 V)
98	LG	Accelerator pedal position sensor	**[Ignition switch ON]** ● Engine stopped ● Accelerator pedal fully released	Approximately 0.5 V
			[Ignition switch ON] ● Engine stopped ● Accelerator pedal fully depressed	Approximately 2.3 V

Trouble Diagnosis (Cont'd)

Terminal No	Wire Color	Item	Condition	Data (DC Voltage)
101	R/G	Stop lamp switch	**[Ignition switch OFF]** ● Brake pedal fully released	Approximately 0 V
			[Ignition switch OFF] ● Brake pedal fully depressed	BATTERY VOLTAGE (11 - 14 V)
102	G/OR	PNP switch	**[Ignition switch ON]** ● Engine stopped ● Gear position is Neutral (M/T models) ● Gear position is P or N (A/T models)	Approximately 0 V
			[Ignition switch ON] ● Engine stopped ● Except the above gear position	Approximately 5 V
104	OR	Throttle control motor relay	**[Ignition switch OFF]**	BATTERY VOLTAGE (11 - 14 V)
			[Ignition switch ON]	Approximately 0 V
105	L	Air conditioner relay	**[Engine is running]** ● Both A/C switch and blower switch are ON (Compressor operates)	Approximately 0 V
			[Engine is running] ● A/C switch is OFF	BATTERY VOLTAGE (11 - 14 V)
106	L	Accelerator pedal position sensor 1	**[Ignition switch ON]** ● Engine stopped ● Accelerator pedal fully released	0.5 - 1.0 V
			[Ignition switch ON] ● Engine stopped ● Accelerator pedal fully depressed	3.9 - 4.7 V
109	B/R	Ignition switch	**[Ignition switch OFF]**	Approximately 0 V
			[Ignition switch ON]	BATTERY VOLTAGE (11 - 14 V)
110	L/R	Air conditioner switch signal	**[Engine is running]** ● Both A/C switch and blower switch are ON	Approximately 0 V
			[Engine is running] ● A/C switch is OFF	BATTERY VOLTAGE (11 - 14 V)
111	W/G	EGI relay	**[Engine is running]** **[Ignition switch OFF]** ● For a 4 seconds after turning ignition switch OFF	Approximately 0 V
			[Ignition switch OFF] ● More than a 4 seconds passed after turning ignition switch OFF	BATTERY VOLTAGE (11 - 14 V)
113	B/P	Fuel pump relay	**[Ignition switch ON]** ● For 1 second after turning ignition switch ON	Approximately 0 V
			[Engine is running] **[Ignition switch ON]** ● More than 1 second after turning ignition switch ON	BATTERY VOLTAGE (11 - 14 V)

Trouble Diagnosis (Cont'd)

Terminal No	Wire Color	Item	Condition	Data (DC Voltage)
115 116	B B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
119 120	W W	Power supply for ECM	**[Ignition switch ON]**	BATTERY VOLTAGE (11 - 14 V)
121	W	Power supply for ECM (Back-up)	**[Ignition switch OFF]**	BATTERY VOLTAGE (11 - 14 V)

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

CONSULT-II Function

FUNCTION

Diagnostic Test Mode	Function
Work support	This mode enables a technician to adjust some devices faster and more accurately by following the indications on the CONSULT-II unit.
Self-diagnostic results	Self-diagnostic results such as 1st trip DTC, DTCs and 1st trip freeze frame data or freeze frame data can be read and erased quickly.*1
Data monitor	Input/Output data in the ECM can be read.
Data monitor (spec)	Specification with basic fuel schedule, MAS A/F sensor and A/F alpha can be read.
CAN diagnostic support monitor	The results of transmit/receive diagnosis of CAN communication can be read.
Active test	Diagnostic Test Mode in which CONSULT-II drives some actuators apart from the ECMs and also shifts some parameters in a specified range.
Function test	This mode is used to inform customers when their vehicle condition requires periodic maintenance.
ECM part number	ECM part number can be read.

*1: The following emission-related diagnostic information is cleared when the ECM memory is erased.
- Diagnostic trouble codes
- Freeze frame data
- Others

Trouble Diagnosis (Cont'd)

Engine Control Component Parts/Control Systems Application

			Diagnostic Test Mode			
			Work Support	Self-Diagnostic Results DTC*1	Data Monitor	Active Test
ENGINE CONTROL COMPONENT PARTS	INPUT	Crankshaft position sensor (POS)		O	O	
		Camshaft position sensor (PHASE)		O	O	
		Mass air flow sensor		O	O	
		Engine coolant temperature sensor		O	O	O
		Heated oxygen sensor 1, 2		O	O	
		Vehicle speed signal		O	O	
		Accelerator pedal position sensor		O	O	
		Throttle position sensor		O	O	
		Intake air temperature sensor		O	O	
		Knock sensor		O		
		Refrigerant pressure sensor			O	
		Closed throttle position switch (accelerator pedal position sensor signal)		O	O	
		Air conditioner switch			O	
		Park/neutral position (PNP) switch			O	
		Stop lamp switch		O	O	
		Power steering pressure sensor		O	O	
		Battery voltage			O	
		Electrical load signal			O	
		Injectors			O	O
		Power transistor (Ignition timing)		O	O	O
	OUTPUT	Throttle control motor relay		O	O	
		Throttle control motor		O		
		EVAP canister purge volume control solenoid valve			O	O
		Air conditioner relay			O	
		Fuel pump relay	O		O	O
		Cooling fan relay		O	O	O
		Heated oxygen sensor 1 heater		O	O	
		Intake valve timing control solenoid valve		O	O	O

O: Applicable
*1: This item includes DTCs.

Trouble Diagnosis (Cont'd)

CONSULT-II INSPECTION PROCEDURE

1. Turn ignition switch OFF.
2. Connect "CONSULT-II" to data link connector, which is located under the driver's side dash panel.
3 Turn ignition switch ON.
4. Touch "START (X-BADGE VHCL)".
5. Touch "ENGINE".
6. Perform each diagnostic test mode according to each service procedure.

   For further information, see the CONSULT-II Operation Manual.

Trouble Diagnosis (Cont'd)

Work Support Mode

WORK ITEM

Work Item	Condition	Usage
FUEL PRESSURE RELEASE	● FUEL PUMP WILL STOP BY TOUCHING "START" DURING IDLING. CRANK A FEW TIMES AFTER ENGINE STALLS.	When releasing fuel pressure from fuel line
IDLE AIR VOL LEARN	● THE IDLE AIR VOLUME THAT KEEPS THE ENGINE WITHIN THE SPECIFIED RANGE IS MEMORIZED IN ECM.	When learning the idle air volume
SELF-LEARNING CONT	● THE COEFFICIENT OF SELF-LEARNING CONTROL MIXTURE RATIO RETURNS TO THE ORIGINAL COEFFICIENT.	When clearing the coefficient of self-learning control value
V/N REGISTRATION	● IN THIS MODE, V/N IS REGISTERED IN ECM	When registening V/N in ECM
TARGET IDLE RPM ADJ*	● IDLE CONDITION	When setting target idle speed
TARGET IGN TIM ADJ*	● IDLE CONDITION	When adjusting target ignition timing

*: This function is not necessary in the usual service procedure.

Self-diag Results Mode

SELF DIAGNOSTIC ITEM

Regarding items of DTC and DTC, refer to EC-11, "INDEX FOR DTC".

FREEZE FRAME DATA

Freeze Frame Data Item	Unit	Description
DIAG TROUBLE CODE [PXXXX]	-	● The engine control component part/control system has a trouble code, it is displayed as PXXXX. (Refer to EC-11, "INDEX FOR DTC".)
FUEL SYS-B1	-	● "Fuel injection system status" at the moment a malfunction is detected is displayed. ● One mode in the following is displayed. "MODE 2": Open loop due to detected system malfunction "MODE 3": Open loop due to driving conditions (power enrichment, deceleration enrichment) "MODE 4": Closed loop - using oxygen sensor(s) as feedback for fuel control "MODE 5": Open loop - has not yet satisfied condition to go to closed loop
COOLANT TEMP	°C or °F	● The engine coolant temperature at the moment a malfunction is detected is displayed.
L-FUEL TRIM-B1	%	● The long-term fuel trim indicates much more gradual feedback compensation to the base fuel schedule than short-term fuel trim.
S-FUEL TRIM-B1	%	● The short-term fuel trim indicates dynamic or instantaneous feedback compensation to the base fuel schedule.
ENGINE SPEED	rpm	● The engine speed at the moment a malfunction is detected is displayed.
VEHICL SPEED	km/h or mph	● The vehicle speed at the moment a malfunction is detected is displayed.
B/FUEL SCHDL	msec	● The base fuel schedule at the moment a malfunction is detected is displayed.
INT/A TEMP SE	°C or °F	● The intake air temperature at the moment a malfunction is detected is displayed.

Trouble Diagnosis (Cont'd)

Data Monitor Mode

MONITORED ITEM

Monitored Item [Unit]	ECM Input Signals	Main Signals	Description	Description
ENG SPEED [rpm]	O	O	● Indicates the engine speed computed from the signals of the crankshaft position sensor (POS) and camshaft position sensor (PHASE).	● Accuracy becomes poor if engine speed drops below the idle rpm. ● If the signal is interrupted while the engine is running, an abnormal value may be indicated.
MAS A/F SE-B1 [V]	O	O	● The signal voltage of the mass air flow sensor is displayed.	● When the engine is stopped, a certain value is indicated.
B/FUEL SCHDL [msec]		O	● "Base fuel schedule" indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction.	
A/F ALPHA-B1 [%]		O	● The mean value of the air-fuel ratio feedback correction factor per cycle is indicated.	● When the engine is stopped, a certain value is indicated. ● This data also includes the data for the air-fuel ratio learning control.
COOLAN TEMP/S [°C] or [°F]	O	O	● The engine coolant temperature (determined by the signal voltage of the engine coolant temperature sensor) is displayed.	● When the engine coolant temperature sensor is open or short-circuit, ECM enters fail-safe mode. The engine coolant temperature determined by the ECM is displayed.
HO2S1 (B1) [V]	O	O	● The signal voltage of the heated oxygen sensor 1 is displayed.	
HO2S2 (B1) [V]	O		● The signal voltage of the heated oxygen sensor 2 is displayed.	
HO2S1 MNTR (B1) [RICH/LEAN]	O	O	● Display of heated oxygen sensor 1 signal during air-fuel ratio feedback control: RICH... means the mixture became "rich", and control is being affected toward a leaner mixture. LEAN... means the mixture became "lean", and control is being affected toward a rich mixture.	● After turning ON the ignition switch, "RICH" is displayed until air-fuel mixture ratio feedback control begins. ● When the air-fuel ratio feedback is clamped, the value just before the clamping is displayed continuously.
VHCL SPEED SE [km/h] or [mph]	O	O	● The vehicle speed computed from the vehicle speed signal sent from combination meter is displayed.	
BATTERY VOLT [V]	O	O	● The power supply voltage of ECM is displayed.	
ACCEL SEN 1 [V]	O	O	● The accelerator pedal position sensor signal voltage is displayed.	
ACCEL SEN 2 [V]	O			
THRTL SEN 1 [V]	O	O	● The throttle position sensor signal voltage is displayed.	
THRTL SEN 2 [V]	O			

Trouble Diagnosis (Cont'd)

Monitored Item [Unit]	ECM Input Signals	Main Signals	Description	Description
INT/A TEMP SE [°C] or [°F]	O	O	● The intake air temperature (determined by the signal voltage of the intake air temperature sensor) is indicated.	
START SIGNAL [ON/OFF]	O	O	● Indicates [ON/OFF] condition of the starter signal computed from the signals of the crankshaft position sensor (POS), camshaft position sensor (PHASE) and battery voltage.	● After starting the engine, [OFF] is displayed regardless of the starter signal.
CLSD THL POS [ON/OFF]	O	O	● Indicates idle position [ON/OFF] computed by ECM according to the accelerator pedal position sensor signal.	
AIR COND SIG [ON/OFF]	O	O	● Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioner signal.	
P/N POSI SW [ON/OFF]	O	O	● Indicates [ON/OFF] condition from the park/neutral position (PNP) switch signal.	
PW/ST SIGNAL [ON/OFF]	O	O	● [ON/OFF] condition of the power steering oil pressure switch as determined by the power steering oil pressure signal is indicated.	
LOAD SIGNAL [ON/OFF]	O	O	● Indicates [ON/OFF] condition from the electrical load signal. ON... Rear window defogger switch is ON and/or lighting switch is in 2nd position. OFF... Both rear window defogger switch and lighting switch are OFF.	
IGNITION SW [ON/OFF]	O		● Indicates [ON/OFF] condition from ignition switch.	
HEATER FAN SW [ON/OFF]	O		● Indicates [ON/OFF] condition from the heater fan switch signal.	
BRAKE SW [ON/OFF]	O		● Indicates [ON/OFF] condition from the stop lamp switch signal.	
INJ PULSE-B1 [msec]		O	● Indicates the actual fuel injection pulse width compensated by ECM according to the input signals.	● When the engine is stopped, a certain computed value is indicated.
IGN TIMING [BTDC]		O	● Indicates the ignition timing computed by ECM according to the input signals.	● When the engine is stopped, a certain value is indicated.
PURG VOL C/V [%]			● Indicates the EVAP canister purge volume control solenoid valve control value computed by the ECM according to the input signals. ● The opening becomes larger as the value increases.	

Trouble Diagnosis (Cont'd)

Monitored Item [Unit]	ECM Input Signals	Main Signals	Description	Description
INT/V TIM (B1) [CA]			● Indicates [°CA] of intake camshaft advanced angle.	
INT/V SOL (B1) [%]			● The control condition of the intake valve timing control solenoid valve is indicated.	
AIR COND RLY [ON/OFF]		O	● The air conditioner relay control condition (determined by ECM according to the input signals) is indicated.	
FUEL PUMP RLY [ON/OFF]		O	● Indicates the fuel pump relay control condition determined by ECM according to the input signals.	
THRTL RELAY [ON/OFF]		O	● Indicates the throttle control motor relay control condition determined by the ECM according to the input signals.	
COOLING FAN [HI/LOW/OFF]			● Indicates the condition of the cooling fan (determined by ECM according to the input signals). HI... High speed operation LOW... Low speed operation OFF... Stop	
IDL A/V LEARN [YET/CMPLT]			● Display the condition of idle air volume learning YET... Idle air volume learning has not been performed yet. CMPLT... Idle air volume learning has already been performed successfully.	
O2SEN HTR DTY [%]			● Indicates the heated oxygen sensor 1 heater control value computed by the ECM according to the input signals.	
AC PRESS SEN [V]	O		● The signal voltage from the refrigerant pressure sensor is displayed.	

NOTE:

● **Any monitored item that does not match the vehicle being diagnosed is deleted from the display automatically.**

Trouble Diagnosis (Cont'd)

Active Test Mode

TEST ITEM

Test Item	Condition	Judgement	Description
FUEL INJECTION	● Engine: Return to the original trouble condition ● Change the amount of fuel injection using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Harness and connectors ● Fuel injectors ● Heated oxygen sensor 1
IGNITION TIMING	● Engine: Return to the original trouble condition ● Timing light: Set ● Retard the ignition timing using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Perform "Idle Air Volume Learning".
POWER BALANCE	● Engine: After warming up, idle the engine. ● A/C switch OFF ● Shift lever: N (A/T models) Neutral (M/T models) ● Cut off each injector signal one at a time using CONSULT-II.	Engine runs rough or dies.	● Harness and connectors ● Compression ● Fuel injectors ● Power transistor ● Spark plugs ● Ignition coils
COOLING FAN	● Ignition switch: ON ● Turn the cooling fan "ON" and "OFF" with CONSULT-II.	Cooling fan moves and stops.	● Harness and connectors ● Cooling fan relay ● Cooling fan motor
ENG COOLANT TEMP	● Engine: Return to the original trouble condition. ● Change the engine coolant temperature using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Harness and connectors ● Engine coolant temperature sensor ● Fuel injectors
FUEL PUMP RELAY	● Ignition switch: ON (Engine stopped) ● Turn the fuel pump relay "ON" and "OFF" using CONSULT-II and listen to operating sound.	Fuel pump relay makes the operating sound.	● Harness and connectors ● Fuel pump relay
PURG VOL CONT/V	● Engine: After warming up, run engine at 1,500 rpm. ● Change the EVAP canister purge volume control solenoid valve opening percent using CONSULT-II.	Engine speed changes according to the opening percent.	● Harness and connectors ● Solenoid valve
V/T ASSIGN ANGLE	● Engine: Return to the original trouble condition. ● Timing light: Set ● Change intake valve timing using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Harness and connectors ● Intake valve timing control solenoid valve

Trouble Diagnosis (Cont'd)

Real Time Diagnosis In Data Monitor Mode (Recording Vehicle Data)

DESCRIPTION

CONSULT-II has two kinds of triggers and they can be selected by touching "SETTING" in "DATA MONITOR" mode.

1. "AUTO TRIG" (Automatic trigger):
   - The malfunction will be identified on the CONSULT-II screen in real time.

     In other words, DTC/1st trip DTC and malfunction item will be displayed if the malfunction is detected by ECM. At the moment a malfunction is detected by ECM, "MONITOR" in "DATA MONITOR" screen is changed to "Recording Data... xx%" as shown at right, and the data after the malfunction detection is recorded. Then when the percentage reached 100%, "REAL-TIME DIAG" screen is displayed. If "STOP" is touched on the screen during "Recording Data...xx%", "REAL-TIME DIAG" screen is also displayed.

     The recording time after the malfunction detection and the recording speed can be changed by "TRIGGER POINT" and "Recording Speed". Refer to CONSULT-II OPERATION MANUAL.
2. "MANU TRIG" (Manual trigger):
   - DTC/1st trip DTC and malfunction item will not be displayed automatically on CONSULT-II screen even though a malfunction is detected by ECM.

     DATA MONITOR can be performed continuously even though a malfunction is detected.

OPERATION

1. "AUTO TRIG"
   - While trying to detect the DTC/1st trip DTC by performing the DTC Confirmation Procedure, be sure to select to "DATA MONITOR (AUTO TRIG)" mode. You can confirm the malfunction at the moment it is detected.
   - While narrowing down the possible causes, CONSULT-II should be set in "DATA MONITOR (AUTO TRIG)" mode, especially in case the incident is intermittent. When you are inspecting the circuit by gently shaking (or twisting) the suspicious connectors, components and harness in the DTC Confirmation Procedure, the moment a malfunction is found the DTC/1st trip DTC will be displayed. (Refer to "Incident Simulation Tests" in "HOW TO PERFORM EFFICIENT DIAGNOSES FOR AN ELECTRICAL INCIDENT", GI-15.)
2. "MANU TRIG"
   - If the malfunction is displayed as soon as "DATA MONITOR" is selected, reset CONSULT-II to "MANU TRIG". By selecting "MANU TRIG" you can monitor and store the data. The data can be utilized for further diagnosis, such as a comparison with the value for the normal operating condition.

Trouble Diagnosis (Cont'd)

CONSULT-II Reference Value in Data Monitor Mode

REMARKS:

- Specification data are reference values.
- Specification data are output/input values which are detected or supplied by the ECM at the connector.
  Specification data may not be directly related to their components signals/values/operations.
  i.e. Adjust ignition timing with a timing light before monitoring IGN TIMING, because the monitor may show the specification data in spite of the ignition timing not being adjusted to the specification data. This IGN TIMING monitors the data calculated by the ECM according to the signals input from the camshaft position sensor and other ignition timing related sensors.

Monitor Item	Condition		Specification
ENG SPEED	● Run engine and compare CONSULT-II value with the tachometer indication.		Almost the same speed as the tachometer indication.
MAS A/F SE-B1	● Engine: After warming up ● Shift lever: N (A/T models) Neutral (M/T models) ● No-load	Idle	Approx. 0.8 V
		2,500 rpm	Approx. 1.5 - 2.1 V
B/FUEL SCHDL	● Engine: After warming up ● Shift lever: N (A/T models) Neutral (M/T models) ● Air conditioner switch: OFF ● No-load	Idle	1.5 - 3.0 msec
		2,000 rpm	1.2 - 3.0 msec
A/F ALPHA-B1	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	75% - 125%
COOLAN TEMP/S	● Engine: After warming up		More than 70°C (158°F)
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ↔ Approx. 0.6 - 1.0 V
HO2S1 MNTR (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ↔ RICH Changes more than 5 times during 10 seconds.
VHCL SPEED SE	● Turn drive wheels and compare CONSULT-II value with the speedometer indication.		Almost the same speed as the speedometer indication.
BATTERY VOLT	● Ignition switch: ON (Engine stopped)		11 - 14 V
ACCEL SEN1	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.5 - 1.0 V
		Accelerator pedal: Fully depressed	4.0 - 4.8 V
ACCEL SEN2*1	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.3 - 1.2 V
		Accelerator pedal: Fully depressed	3.9 - 4.8 V
THRTL SEN1 THRTL SEN2*1	● Ignition switch: ON (Engine stopped) ● Shift lever: D (A/T models) 1st (M/T models)	Accelerator pedal: Fully released	More than 0.36 V
		Accelerator pedal: Fully depressed	3.9 - 4.8 V
START SIGNAL	● Ignition switch: ON → START → ON		OFF → ON → OFF
CLSD THL POS	● Ignition switch: ON	Accelerator pedal: Fully released	ON
		Accelerator pedal: Slightly depressed	OFF
AIR COND SIG	● Air conditioner switch: OFF	Air conditioner switch: OFF	OFF
	● Engine: After warming up, idle the engine (Compressor operates.)	Air conditioner switch: ON	ON

Trouble Diagnosis (Cont'd)

Monitor Item	Condition		Specification
P/N POSI SW	● Ignition switch: ON	Shift lever: P or N (A/T models) Neutral (M/T models)	ON
		Shift lever: Except above	OFF
PW/ST SIGNAL	● Engine: After warming up, idle the engine	Steering wheel is in neutral position. (Forward direction)	OFF
		Steering wheel is turned.	ON
LOAD SIGNAL	● Ignition switch: ON	Rear window defogger switch is ON and/or lighting switch is in 2nd.	ON
		Rear window defogger switch is OFF and lighting switch is OFF.	OFF
IGNITION SW	● Ignition switch: ON → START → ON		ON → OFF → ON
HEATER FAN SW	● Ignition switch: ON	Heater fan is operating.	ON
	● Engine: After warming up, idle the engine	Heater fan is not operating.	OFF
BRAKE SW	● Ignition switch: ON	Brake pedal: Fully released	OFF
		Brake pedal: Slightly depressed	ON
INJ PULSE-B1	● Engine: After warming up ● Shift lever: N (A/T models) Neutral (M/T models) ● Air conditioner switch: OFF ● No-load	Idle	2.0 - 3.5 msec
		2,000 rpm	1.5 - 3.5 msec
IGN TIMING	● Engine: After warming up ● Shift lever: N (A/T models) Neutral (M/T models) ● Air conditioner switch: OFF ● No-load	Idle	M/T: 6 ± 2° BTDC (QG16DE) A/T: 6 ± 2° BTDC (QG16DE)
		2,000 rpm	25° - 45° BTDC
PURG VOL C/V	● Engine: After warming up ● Shift lever: N (A/T models) Neutral (M/T models) ● Air conditioner switch: OFF ● No-load	Idle	0%
		2,000 rpm	15 - 30%
INT/V TIM (B1)	● Engine: After warming up ● Shift lever: N (A/T models) Neutral (M/T models) ● Air conditioner switch: OFF ● No-load	Idle	-5° - 5°CA
		When revving engine up to 2,000 rpm quickly	Approx. 0° - 30°CA
INT/V SOL (B1)	● Engine: After warming up ● Shift lever: N (A/T models) Neutral (M/T models) ● Air conditioner switch: OFF ● No-load	Idle	0% - 2%
		When revving engine up to 2,000 rpm quickly	Approx. 0% - 60%
AIR COND RLY	● Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON(Compressor operates)	ON

Trouble Diagnosis (Cont'd)

Monitor Item	Condition		Specification
FUEL PUMP RLY	● For 1 seconds after turning ignition switch ON ● Engine running or cranking		ON
	● Except above conditions		OFF
THRTL RELAY	● Ignition switch: ON		ON
COOLING FAN	● Engine: After warming up, idle the engine ● Air conditioner switch: OFF	Engine coolant temperature is 94°C (201°F) or less.	OFF
		Engine coolant temperature is between 95°C (203°F) and 104°C (219°F).	LOW
		Engine coolant temperature is 105°C (221°F) or more	HIGH
O2SEN HTR DTY	● Engine speed: Above 3,600 rpm		OFF
	● Engine coolant temperature when engine started: More than 80° (176°F) ● Engine speed: Below 3,600 rpm		Approx. 50%
AC PRESS SEN	● Ignition switch: ON (Engine stopped)		Approx. 0 V
	● Engine: Idle ● Air conditioner switch: OFF		1.0 - 4.0 V
BRAKE SW1	● Ignition switch: ON	Brake pedal: Fully released	ON
		Brake pedal: Slightly depressed	OFF

*1: Accelerator pedal position sensor 2 signal and throttle position sensor 2 signal are converted by ECM internally. Thus, they differ from ECM terminals voltage signal.

Trouble Diagnosis (Cont'd)

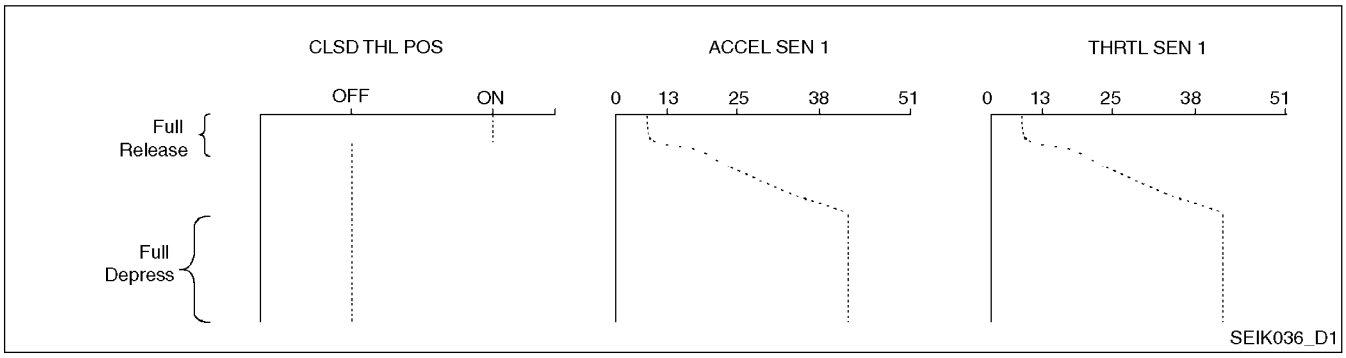
Major Sensor Reference Graph in Data Monitor Mode

The following are the major sensor reference graphs in "DATA MONITOR" mode.

CLSD THL POS, ACCEL SEN 1, THRTL SEN 1

Below is the data for "CLSD THL POS", "ACCEL SEN 1" and "THRTL SEN 1" when depressing the accelerator pedal with the ignition switch "ON" and with selector lever in D position (A/T models) or with shift lever in 1st position (M/T models).

The signal of "ACCEL SEN 1" and "THRTL SEN 1" should rise gradually without any intermittent drop or rise after "CLSD THL POS" is changed from ON to OFF.

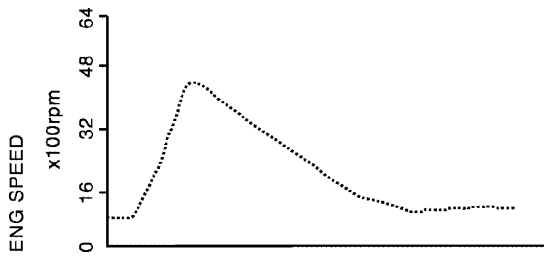


ENG SPEED, MAS A/F SE-B1, THRTL SEN 1, HO2S1 (B1), INJ PULSE-B1

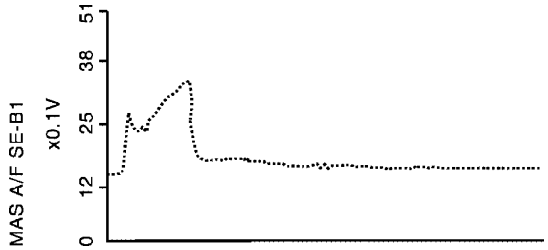
Below is the data for "ENG SPEED", "MAS A/F SE-B1", "THRTL SEN 1", "HO2S1 (B1)" and "INJ PULSE-B1" when revving engine quickly up to 4,800 rpm under no load after warming up engine sufficiently.

Each value is for reference, the exact value may vary.

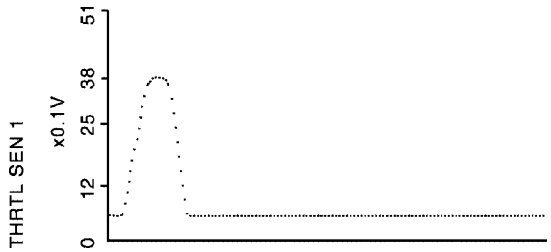
Trouble Diagnosis (Cont'd)



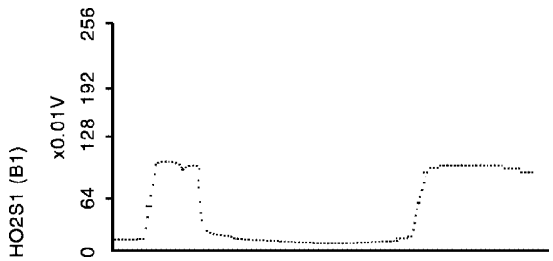
- "ENG SPEED" should increase gradually while depressing the accelerator pedal and should decrease gradually after releasing the pedal without any intermittent drop or rise.



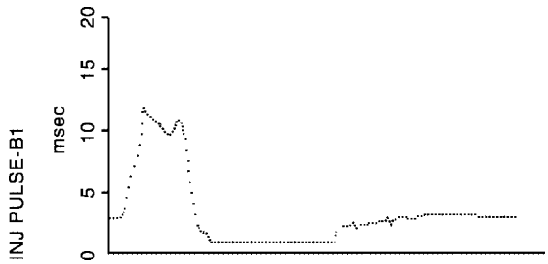
- "MAS A/F SE-B1" should increase when depressing the accelerator pedal and should decrease at the moment "THRTL POS SEN" is closed (accelerator pedal is released).



- "THRTL SEN 1" should increase while depressing the accelerator pedal and should decrease while releasing it.



- "HO2S1 (B1)" may increase immediately after depressing the accelerator pedal and may decrease after releasing the pedal.



- "INJ PULSE-B1" should increase when depressing the accelerator pedal and should decrease when the pedal is released.

Trouble Diagnosis For Intermittent Incident

Description

Intermittent incidents (I/I) may occur. In many cases, the malfunction resolves itself (the part or circuit function returns to normal without intervention). It is important to realize that the symptoms described in the customer's complaint often do not recur on (1st trip) DTC visits. Realize also that the most frequent cause of Intermittent Incident occurrences is poor electrical connections. Because of this, the conditions under which the incident occurred may not be clear. Therefore, circuit checks made as part of the standard diagnostic procedure may not indicate the specific malfunctioning area.

COMMON INTERMITTENT INCIDENT REPORT SITUATIONS

STEP in Work Flow	Situation
II	The CONSULT-II is used. The SELF-DIAG RESULTS screen shows time data other than 0 or [1t].
III	The symptom described by the customer does not recur.
IV	DTC does not appear during the DTC Confirmation Procedure.
VI	The Diagnostic Procedure for PXXXX does not indicate the malfunctioning area.

Diagnostic Procedure

1. INSPECTION START

Erase DTCs.

>> GO TO 2.

2. CHECK GROUND TERMINALS

Check ground terminals for corroding or loose connection.

Refer to "HOW TO PERFORM EFFICIENT DIAGNOSES FOR AN ELECTRICAL INCEDENT", GI-15, "Incident Simulation Tests".

OK or NG

OK >> GO TO 3.

NG >> Repair or replace.

3. SEARCH FOR ELECTRICAL INCIDENT

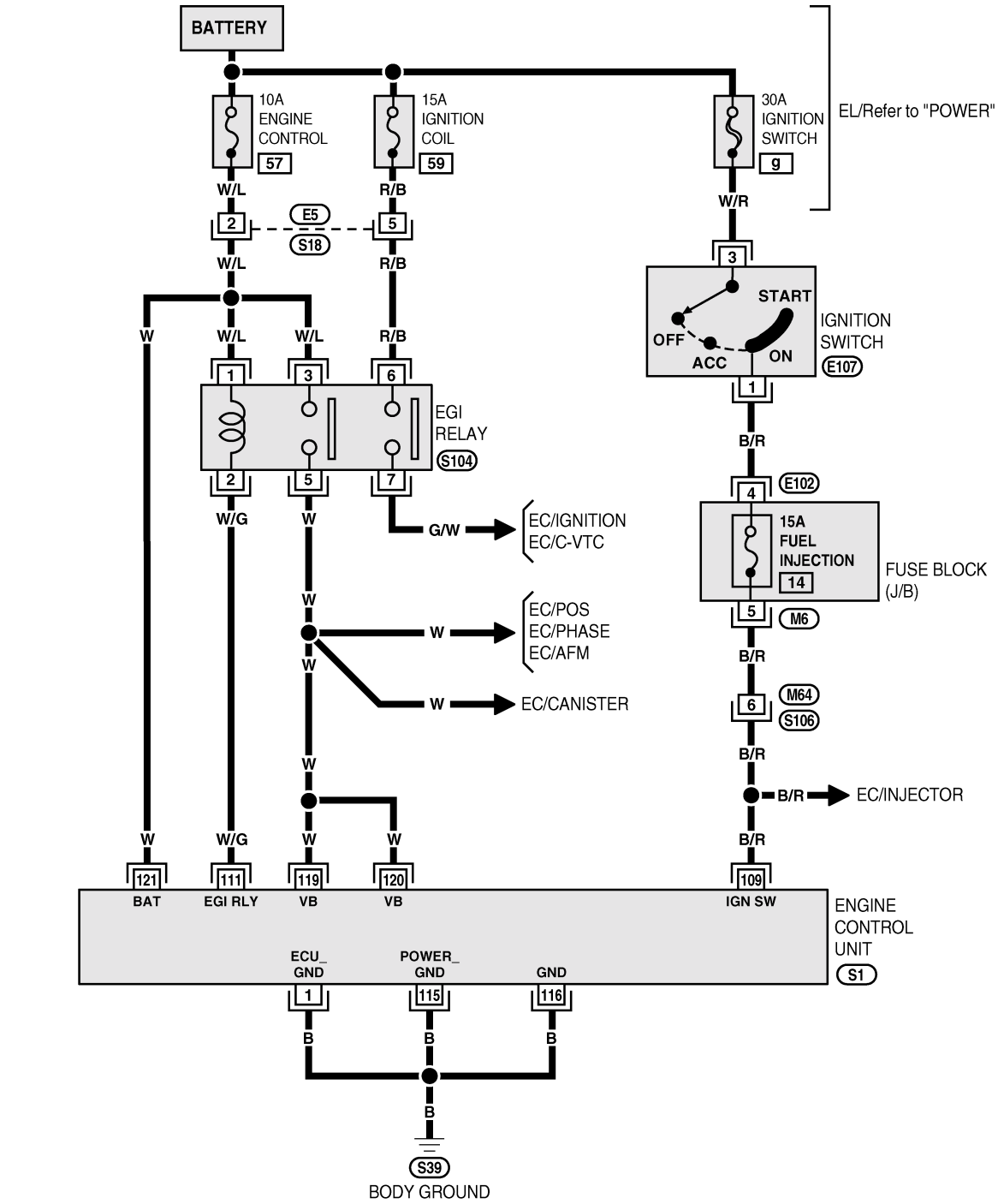
Perform "HOW TO PERFORM EFFICIENT DIAGNOSES FOR AN ELECTRICAL INCIDENT", GI-15, "Incident Simulation Tests".

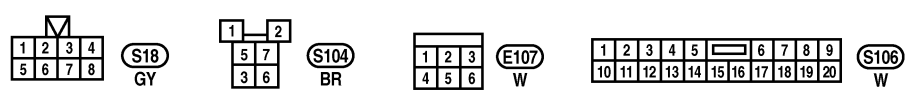
OK or NG

OK >> INSPECTION END

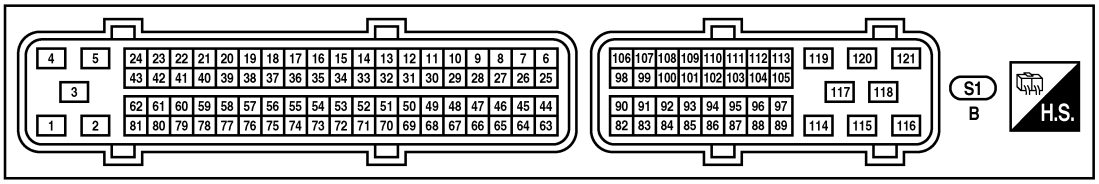
NG >> Repair or replace.

Wiring Diagram





Refer to "FUSE BLOCK (J/B)"
M6 E102



SEWK001_D1

Power Supply Circuit For ECM (Cont'd)

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

Terminal No.	Wire Color	Item	Condition	Data (DC Voltage)
1	B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
109	B/R	Ignition switch	**[Ignition switch OFF]**	Approximately 0 V
			[Ignition switch ON]	BATTERY VOLTAGE (11 - 14 V)
111	W/G	EGI relay (Self shut-off)	**[Engine is running]** **[Ignition switch OFF]** ● For a 4 seconds after turning ignition switch OFF	Approximately 0 V
			[Ignition switch OFF] ● More than a 4 seconds passed after turning ignition switch OFF	BATTERY VOLTAGE (11 - 14 V)
115 116	B B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
119 120	W W	Power supply for ECM	**[Ignition switch ON]**	BATTERY VOLTAGE (11 - 14 V)
121	W	Power supply for ECM (Back-up)	**[Ignition switch OFF]**	BATTERY VOLTAGE (11 - 14 V)

Diagnostic Procedure

1. INSPECTION START

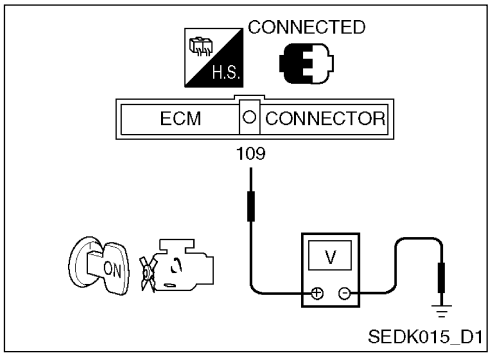
Start engine.

Is engine running?

Yes or No

Yes >> GO TO 10.

No >> GO TO 2.



2. CHECK ECM POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF and then ON.
2. Check voltage between ECM terminal 109 and ground with CONSULT-II or tester.

   Voltage: Battery voltage

   OK or NG

   OK >> GO TO 4.

   NG >> GO TO 3.

Power Supply Circuit For ECM (Cont'd)

3. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector M6
- 10A fuse
- Harness connectors M64, S106
- Harness for open or short between ECM and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT-I

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals 1, 115, 116 and engine ground. Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to power.

OK or NG

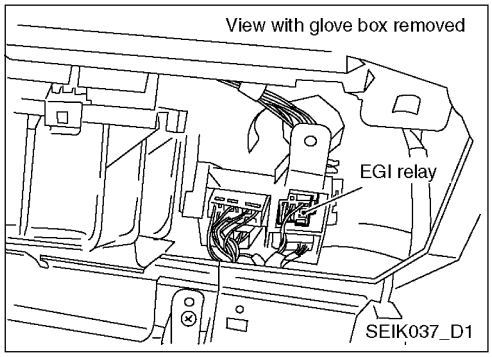
OK >> GO TO 6.
NG >> GO TO 5

5. DETECT MALFUNCTIONING PART

Check the following.

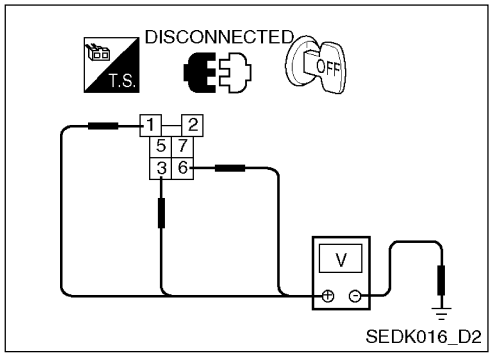
- Harness for open or short between ECM and engine ground.

>> Repair open circuit or short to power in harness or connectors.



6. CHECK ECM POWER SUPPLY CIRCUIT-II

1. Disconnect EGI relay.



2. Check voltage between EGI relay terminals 1, 3, 6 and ground with CONSULT-II or tester.

   Voltage: Battery voltage

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

Power Supply Circuit For ECM (Cont'd)

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E5, S18
- Fusible link and fuse box connectors
- 10A fuse
- 15A fuse
- Harness for open or short between EGI relay and battery.

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 111 and EGI relay terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

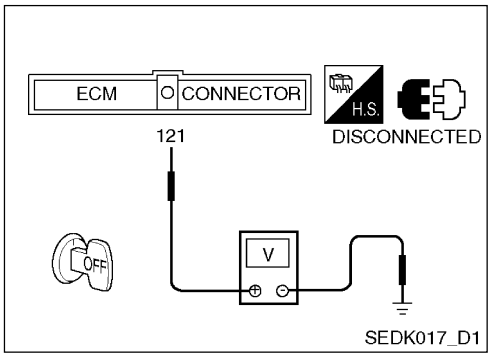
9. CHECK EGI RELAY

Refer to EC-80, "Component Inspection".

OK or NG

OK >> Go to EC-118, "DTC P0350 IGNITION SIGNAL".

NG >> Replace EGI relay.



10. CHECK ECM POWER SUPPLY-III

1. Stop engine.
2. Check voltage between ECM terminal 121 and ground with CONSULT-II or tester.

   Voltage: Battery voltage

OK or NG

OK >> GO TO 12.

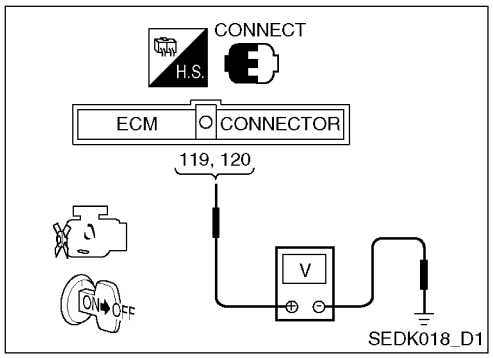
NG >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the harness for open or short between ECM and harness connector S18.

>> Repair harness or connectors.

Power Supply Circuit For ECM (Cont'd)



12. CHECK ECM POWER SUPPLY CIRCUIT-IV

1. Stop engine and wait at least 10 seconds.
2. Turn ignition switch ON and then OFF.
3. Check voltage between ECM terminals 119, 120 and ground with CONSULT-II or tester.

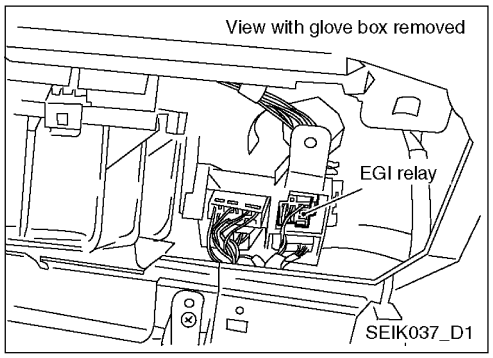
   Voltage: After turning ignition switch OFF, battery voltage will exist for a 4 seconds, then drop approximately 0V.

OK or NG

OK >> GO TO 17.

NG (Battery voltage does not exist.) >> GO TO 13.

NG (Battery voltage exists for more than a few seconds.) >>GO TO 15.



13. CHECK ECM POWER SUPPLY CIRCUIT-IV

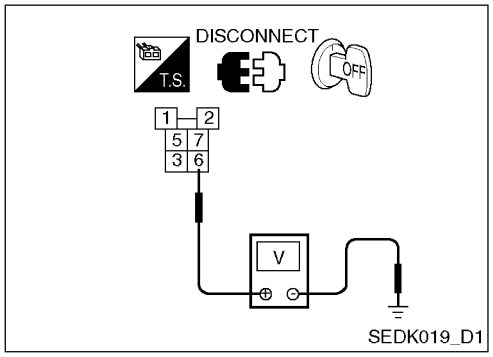
1. Disconnect EGI relay.
2. Check voltage between EGI relay terminal 3 and ground with CONSULT-II or tester.

   Voltage: Battery voltage

OK or NG

OK >> GO TO 15.

NG >> GO TO 14.



14. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between EGI relay and S18

>> Repair open circuit or short to ground or short to power in harness or connectors.

GI EM LC EC FE RS AC AV EL WH CL MT AT FA RA BR ST BT

Power Supply Circuit For ECM (Cont'd)

15. CHECK ECM POWER SUPPLY CIRCUIT-V

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminals 119, 120 and EGI relay terminal 5.
   Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 16.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

16. CHECK EGI RELAY

Refer to EC-80, "Component Inspection".

OK or NG

OK >> GO TO 17.

NG >> Replace EGI relay.

17. CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT-II

1. Check harness continuity between ECM terminals 1, 115, 116 and engine ground.
   Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to power.

OK or NG

OK >> GO TO 19.

NG >> GO TO 18.

18. DETECT MALFUNCTIONING PART

Check the following

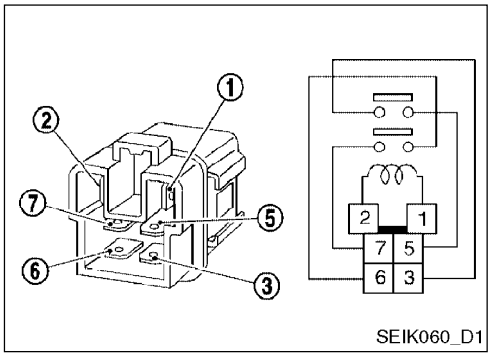
- Harness for open or short between ECM and engine ground

>> Repair open circuit or short to power in harness or connectors.

19. CHECK INTERMITTENT INCIDENT

Refer to EC-74, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".

>> **INSPECTION END**



Component Inspection

EGI RELAY

1. Apply 12V direct current between ECM relay terminals 1 and 2.
2. Check continuity between relay terminals 3 and 5, 6 and 7.

DTC U1000, U1001 CAN Communication Line

Description

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

Each control unit transmits/receives data but selectively reads required data only.

On Board Diagnosis Logic

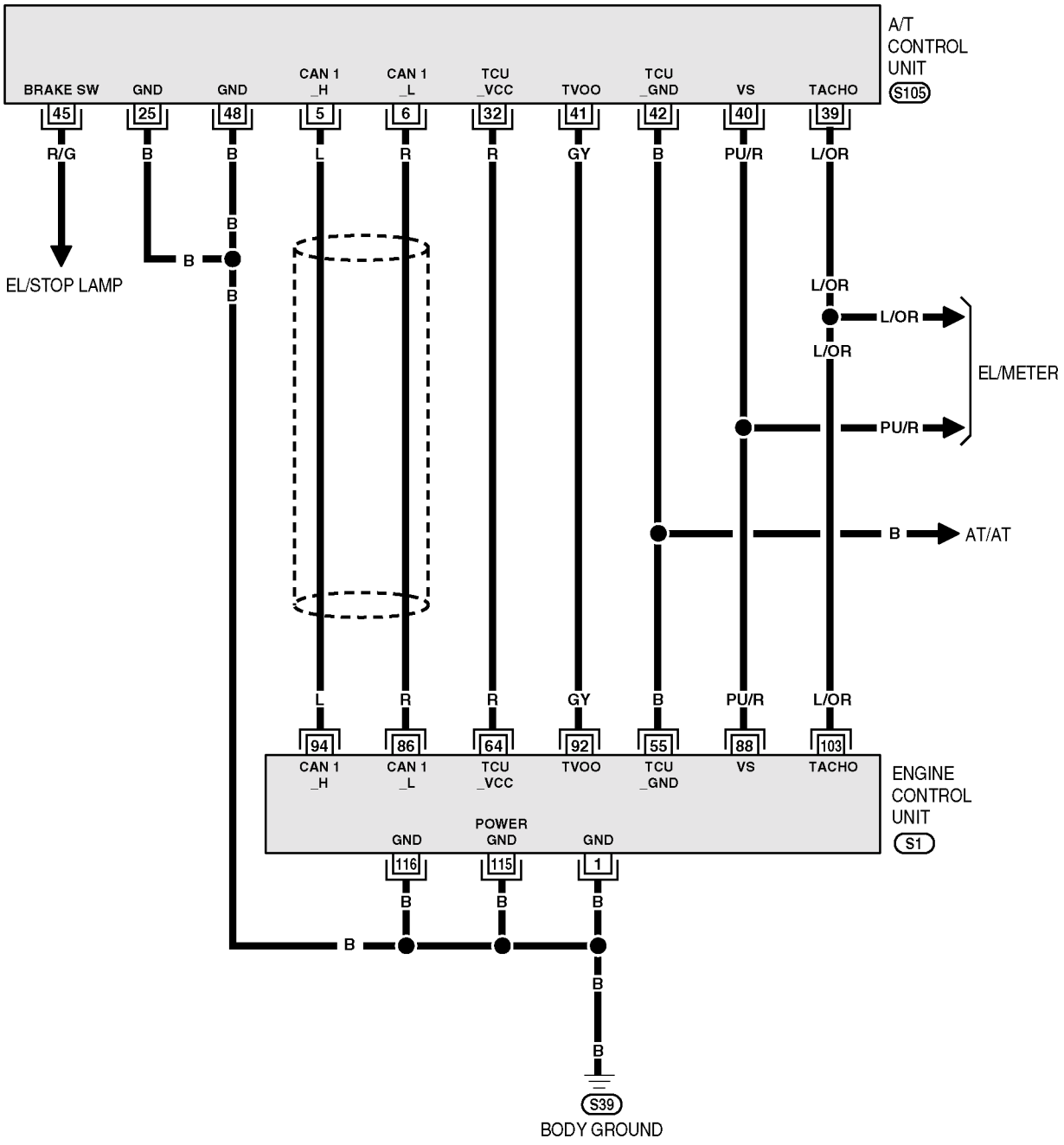
The MIL will not light up for this diagnosis.

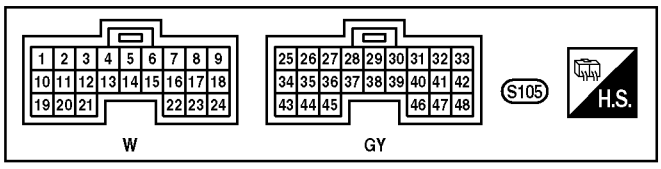
DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
U1000 1000	CAN communication line	● ECM cannot communicate to other control units. ● ECM cannot communicate for more than the specified time.	● Harness or connectors (CAN communication line is open or shorted.)
U1001 1001			
U0426 0426			

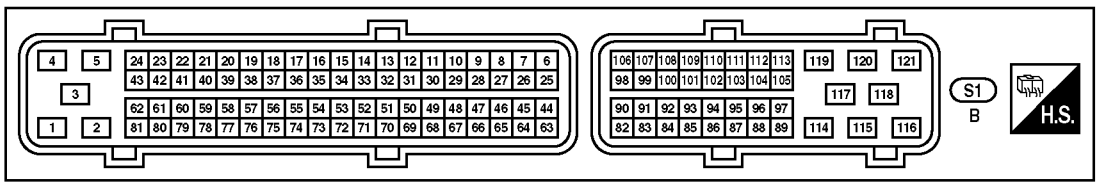
DTC Confirmation Procedure

1. Turn ignition switch ON and wait at least 3 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. If 1st trip DTC is detected, go to EC-83, “Diagnostic Procedure”.

Wiring Diagram — EC/AT Communication







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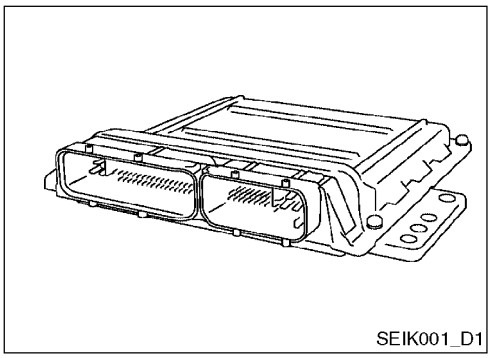
DTC U1000, U1001 CAN Communication Line (Cont'd)

Diagnostic Procedure

GO TO LAN section.

MEMO:

DTC P1065 ECM Power Supply


SEIK001_D1

Component Description

Battery voltage is supplied to the ECM even when the ignition switch is turned OFF for the ECM memory function of the DTC memory, the air fuel ratio feedback compensation value memory, the idle air volume learning value memory, etc.

ECM Power Supply

On Board Diagnosis Logic

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P1065 1065	ECM power supply circuit	ECM back up RAM system does not function properly.	● Harness or connectors [ECM power supply (back-up) circuit is open or shorted.] ● ECM

DTC Confirmation Procedure

NOTE:

- **If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.**

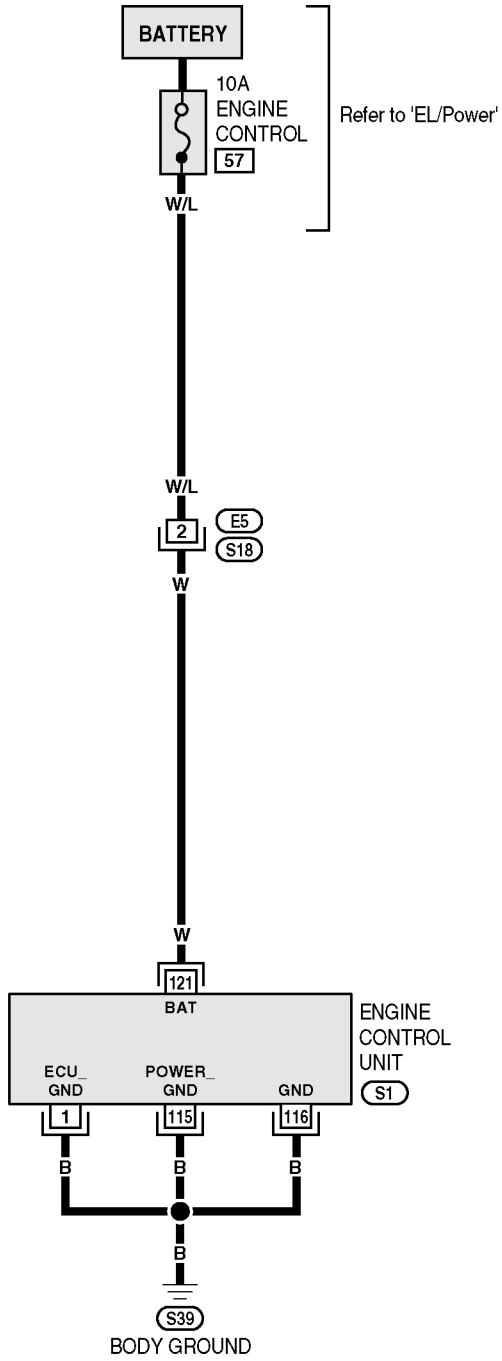
With CONSULT-II

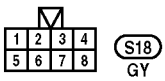
1. Turn ignition switch ON and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. Turn ignition switch OFF, wait at least 10 seconds, and then turn ON.
5. Repeat steps 3 and 4 for 4 times.
6. If 1st trip DTC is detected, go to EC-87, “Diagnostic Procedure”.

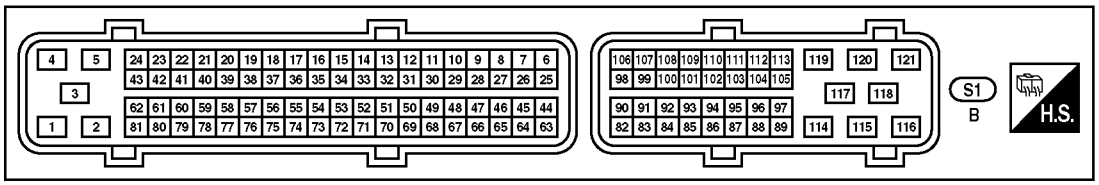
Without CONSULT-II

1. Turn ignition switch ON and wait at least 1 second.
2. Start engine and let it idle for 1 second.
3. Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
4. Repeat steps 2 and 3 for 4 times.
5. Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
6. Perform Diagnostic Test Mode II (Self-diagnostic results).
7. If 1st trip DTC is detected, go to EC-87, “Diagnostic Procedure”.

Wiring Diagram — EC/ECM Power Supply







SEWK027_D1

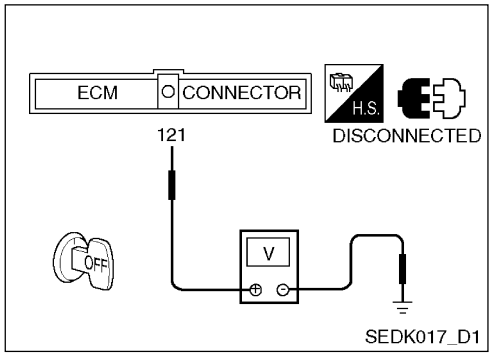
DTC P1065 ECM Power Supply (Cont'd)

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

- **Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

Terminal No.	Wire Color	Item	Condition	Data (DC Voltage)
121	W	Power supply for ECM (Back-up)	**[Ignition switch OFF]**	BATTERY VOLTAGE (11 - 14 V)



Diagnostic Procedure

1. CHECK ECM POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check voltage between ECM terminal 121 and ground with CONSULT-II or tester.

   Voltage: Battery voltage

OK or NG

OK >> GO TO 3.

NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E5, S18
- Fusible link and fuse box connector
- 10A fuse
- Harness for open or short between ECM and battery

>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK INTERMITTENT INCIDENT

Refer to EC-74, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".

OK or NG

OK >> GO TO 4.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

DTC P1065 ECM Power Supply (Cont'd)

4. PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT-II

1. Turn ignition switch ON.
2. Select "SELF DIAG RESULTS" mode with CONSULT-II.
3. Touch "ERASE".
4. Perform DTC Confirmation Procedure.
   See EC-85.
5. Is the DTC P1065 displayed again?

Without CONSULT-II

1. Turn ignition switch ON.
2. Erase the Diagnostic Test Mode II (Self-diagnostic results) memory.
3. Perform DTC Confirmation Procedure.
   See EC-85.
4. Is the DTC P1065 displayed again?

Yes or No

Yes >> GO TO 5.

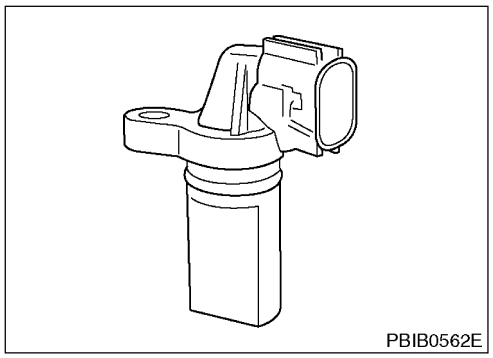
No >> **INSPECTION END**

5. REPLACE ECM

1. Replace ECM.
2. Perform EC-23, "Accelerator Pedal Released Position Learning".
3. Perform EC-23, "Throttle Valve Closed Position Learning".
4. Perform EC-24, "Idle Air Volume Learning".

>> **INSPECTION END**

DTC P0340 Camshaft Position Sensor (PHASE) Circuit


PBIB0562E

Component Description

The camshaft position sensor (PHASE) senses the retraction of intake valve camshaft to identify a particular cylinder. The camshaft position sensor (PHASE) senses the piston position. When the crankshaft position sensor (POS) system becomes inoperative, the camshaft position sensor (PHASE) provides various controls of engine parts instead, utilizing timing of cylinder identification signals.

The sensor consists of a permanent magnet and Hall IC.

When engine is running, the high and low parts of the teeth cause the gap with the sensor to change.

The changing gap causes the magnetic field near the sensor to change.

Due to the changing magnetic field, the voltage from the sensor changes.

On Board Diagnosis Logic

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P0340 0340	Camshaft position sensor (PHASE) circuit	● The cylinder No. signal is not sent to ECM for the first few seconds during engine cranking. ● The cylinder No. signal is not set to ECM during engine running. ● The cylinder No. signal is not in the normal pattern during engine running.	● Harness or connectors (The sensor circuit is open or shorted.) ● Camshaft position sensor (PHASE) ● Camshaft (Intake) ● Starter motor ● Starting system circuit ● Dead (Weak) battery

DTC Confirmation Procedure

NOTE:

● **If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.**

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10.5V with ignition switch ON.

With CONSULT-II

1. Turn ignition switch ON.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Crank engine for at least 2 seconds and run it for at least 5 seconds at idle speed.
4. If DTC is detected, go to EC-92, “Diagnostic Procedure”. If DTC is not detected, go to next step.
5. Maintain engine speed at more than 800 rpm for at least 5 seconds.
6. If DTC is detected, go to EC-92, “Diagnostic Procedure”.

Without CONSULT-II

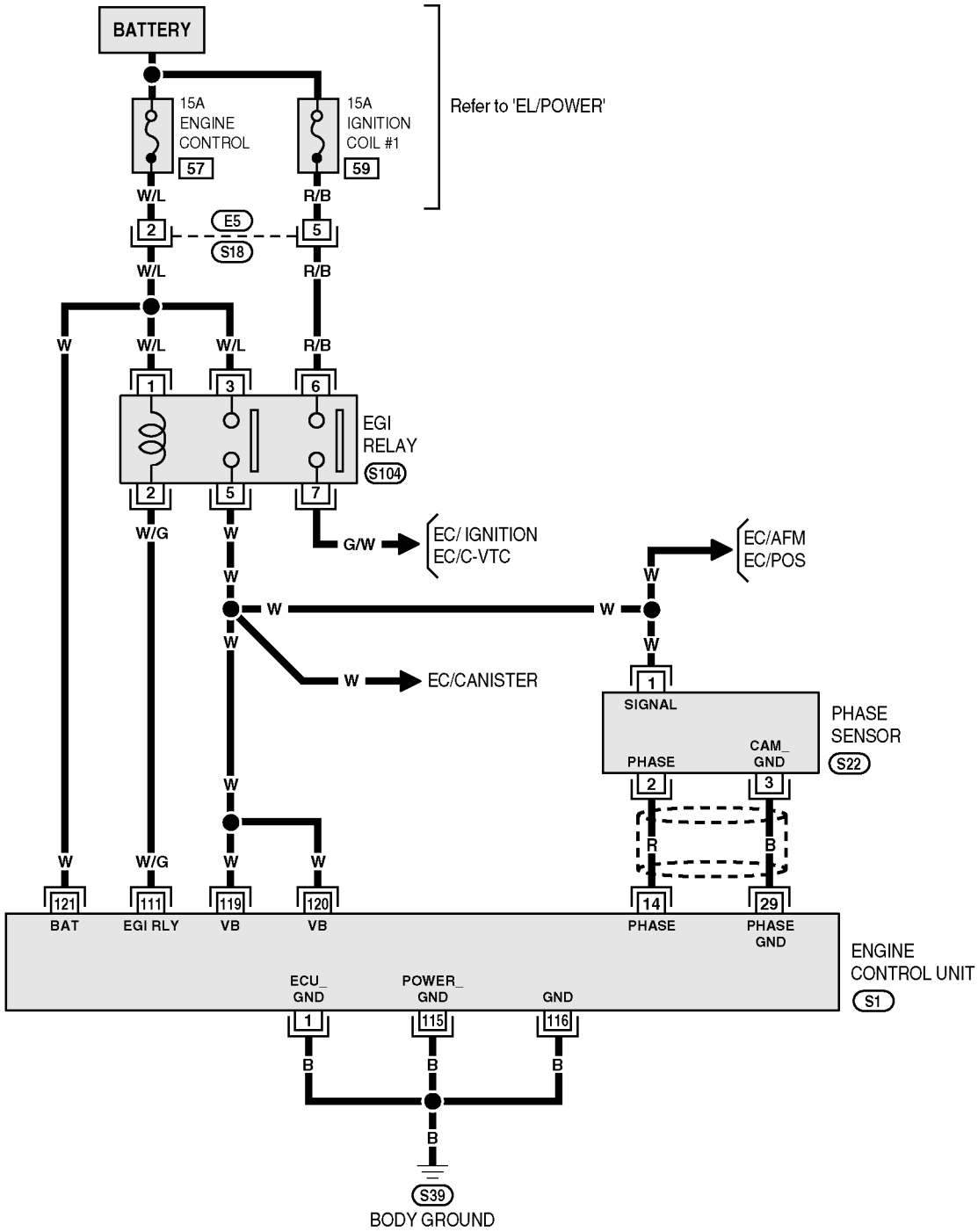
1. Crank engine for at least 2 seconds and run it for at least 5 seconds at idle speed.
2. Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
3. Perform Diagnostic Test Mode II (Self-diagnostic results).
4. If DTC is detected, go to EC-92, “Diagnostic Procedure”. If DTC is not detected, go to next step.

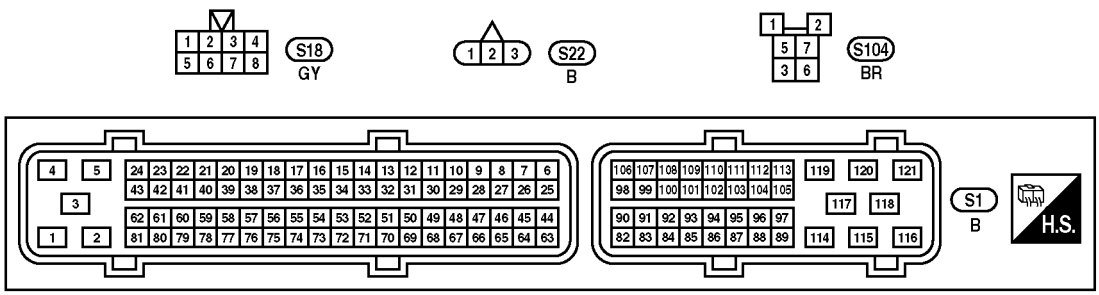
DTC P0340 Camshaft Position Sensor (PHASE) Circuit

5. Turn ignition switch OFF and wait at least 10 seconds.
6. Start engine and maintain engine speed at more than 800 rpm for at least 5 seconds.
7. Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
8. Perform Diagnostic Test Mode II (Self-diagnostic results).
9. If DTC is detected, go to EC-92, “Diagnostic Procedure”.

Wiring Diagram

EC/PHASE





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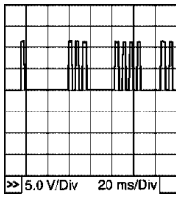
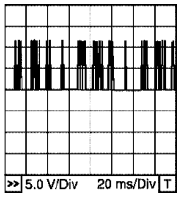
DTC P0340 Camshaft Position Sensor (PHASE) Circuit (Cont'd)

Specification data are reference values and are measured between each terminal and ground. Pulse signal is measured by CONSULT-II.

CAUTION:

- **Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

Terminal No.	Wire Color	Item	Condition	Data (DC Voltage)
14*1	R	Camshaft position sensor (PHASE)	**[Engine is running]** ● Warm-up condition ● Idle speed	1.0 - 4.0 V ★ 
			[Engine is running] ● Engine speed is 2,000 rpm.	1.0 - 4.0 V ★ 
29	B	Camshaft position sensor (PHASE) ground	**[Engine is running]** ● Idle speed	Approximately 0 V

★ : Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

1. CHECK STARTING SYSTEM

Turn ignition switch to START position.

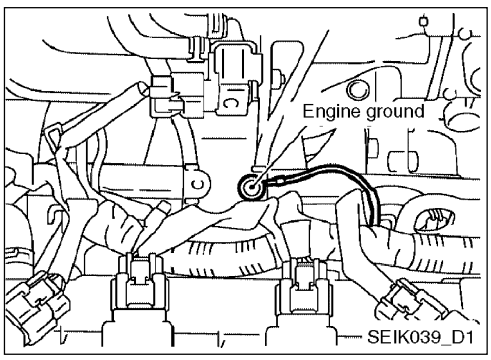
Does the engine turn over?

Does the starter motor operate?

Yes or No

Yes >> GO TO 2.

No >> Check starting system.

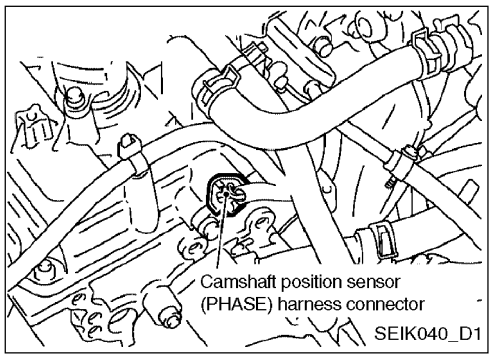


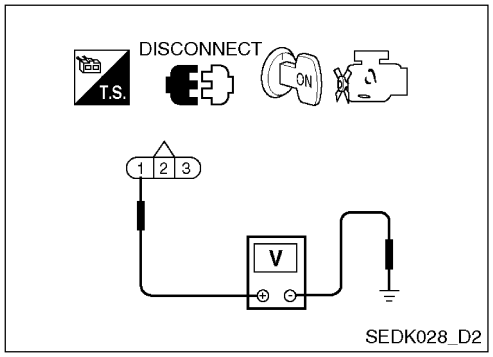
2. RETIGHTEN GROUND SCREWS

1. Turn ignition switch OFF.
2. Loosen and retighten engine ground screws.

>> GO TO 3.

DTC P0340 Camshaft Position Sensor (PHASE) Circuit (Cont'd)





3. CHECK CMP SENSOR (PHASE) POWER SUPPLY CIRCUIT

1. Disconnect camshaft position (CMP) sensor (PHASE) harness connector.
2. Turn ignition switch ON.
3. Check voltage between CMP sensor (PHASE) terminal 1 and ground with CONSULT-II or tester.

   Voltage: Battery voltage
4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.

NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between camshaft position sensor (PHASE) and ECM
- Harness for open or short between camshaft position sensor (PHASE) and ECM relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

DTC P0340 Camshaft Position Sensor (PHASE) Circuit (Cont'd)

5. CHECK CMP SENSOR (PHASE) GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 29 and CMP sensor (PHASE) terminal 3.

   Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK CMP SENSOR (PHASE) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 14 or 13 and CMP sensor (PHASE) terminal 2.

   Refer to Wiring Diagram.

   Continuity should exist.

2. Also check harness for short to ground or short to power.

OK or NG

OK >> GO TO 7.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

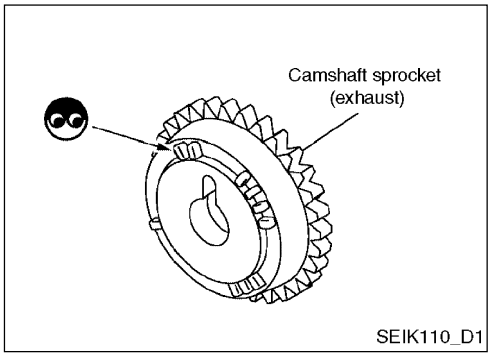
7. CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-95, "Component Inspection".

OK or NG

OK >>GO TO 9.

NG >> Replace camshaft position sensor (PHASE).



8. CHECK CAMSHAFT SPROCKET (EXHAUST)

Check the following.

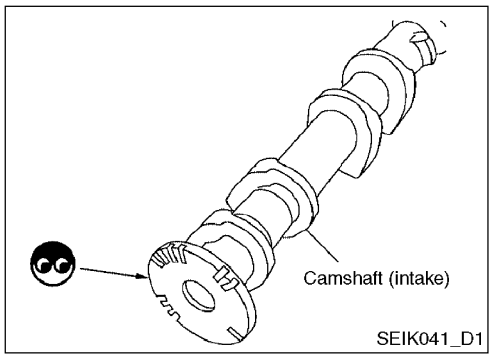
- Accumulation of debris to the signal plate of camshaft sprocket
- Chipping signal plate of camshaft sprocket

OK or NG

OK >> GO TO 10.

NG >> Remove debris and clean the signal plate of camshaft sprocket.

DTC P0340 Camshaft Position Sensor (PHASE) Circuit (Cont'd)



9. CHECK CAMSHAFT (INTAKE)

Check the following.

- Accumulation of debris to the signal plate of camshaft rear end
- Chipping signal plate of camshaft rear end

OK or NG

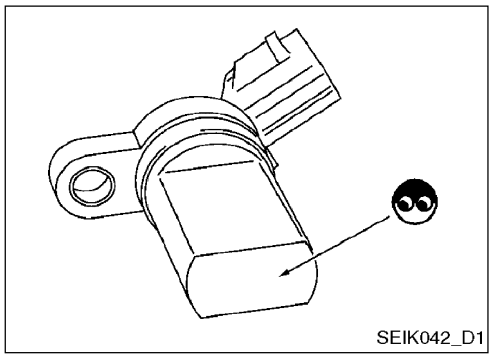
OK >> GO TO 10.

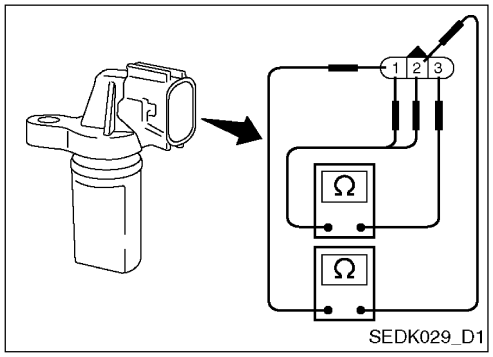
NG >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft.

10. CHECK INTERMITTENT INCIDENT

Refer to EC-74, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".

>>**INSPECTION END**





Component Inspection

CAMSHAFT POSITION SENSOR (PHASE)

1. Loosen the fixing bolt of the sensor.
2. Disconnect camshaft position sensor (PHASE) harness connector.
3. Remove the sensor.
4. Visually check the sensor for chipping.
5. Check resistance as shown in the figure.

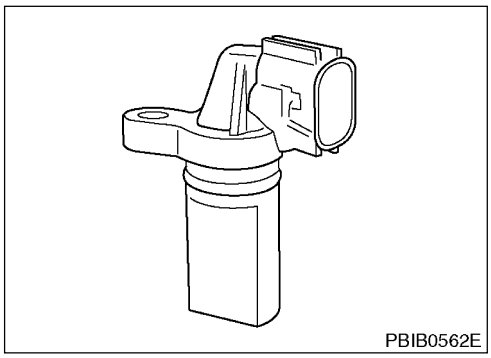
Terminal No. (Polarity)	Resistance Ω [at 25°C (77°F)]
3 (+) - 1 (-)	Except 0 or α
3 (+) - 2 (-)	
2 (+) - 1 (-)	

Removal and Installation

CAMSHAFT POSITION SENSOR (PHASE)

Refer to "CYLINDER HEAD" (QG16: EM-40).

DTC P0335 Crankshaft Position Sensor (POS) Circuit


PBIB0562E

Component Description

The crankshaft position sensor (POS) is located on the cylinder block rear housing facing the gear teeth (cogs) of the signal plate at the end of the crankshaft. It detects the fluctuation of the engine revolution.

The sensor consists of a permanent magnet and Hall IC.

When the engine is running, the high and low parts of the teeth cause the gap with the sensor to change.

The changing gap causes the magnetic field near the sensor to change.

Due to the changing magnetic field, the voltage from the sensor changes.

The ECM receives the voltage signal and detects the fluctuation of the engine revolution.

CONSULT-II REFERENCE VALUE IN DATA MONITOR MODE

Monitor Item	Condition	Specification
ENG SPEED	● Run engine and compare CONSULT-II value with the tachometer indication.	Almost the same speed as the tachometer indication.

On Board Diagnosis Logic

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P0335 0335	Crankshaft position sensor (POS) circuit	● The crankshaft position sensor (POS) signal is not detected by the ECM during the first few seconds of engine cranking. ● The proper pulse signal from the crankshaft position sensor (POS) is not sent to ECM while the engine is running. ● The crankshaft position sensor (POS) signal is not in the normal pattern during engine running.	● Harness or connectors (The sensor circuit is open or shorted.) ● Crankshaft position sensor (POS) ● Signal plate

DTC Confirmation Procedure

NOTE:

● **If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.**

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10.5V with ignition switch ON.

With CONSULT-II

1. Turn ignition switch ON and select “DATA MONITOR” mode with CONSULT-II.
2. Crank engine for at least 2 seconds and run it for at least 5 seconds at idle speed.
3. If DTC is detected, go to EC-99, “Diagnostic Procedure”.

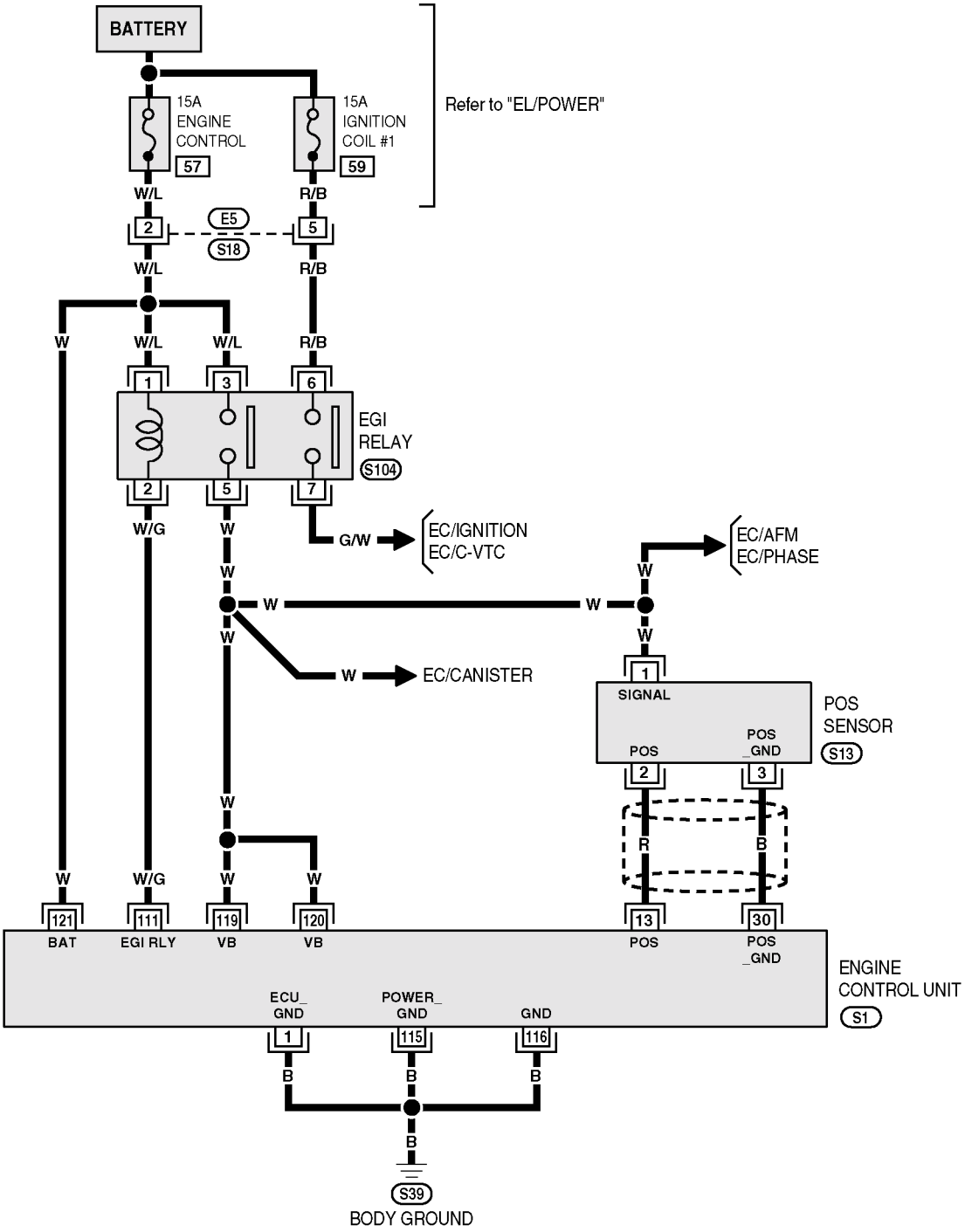
DTC P0335 Crankshaft Position Sensor (POS) Circuit (Cont'd)

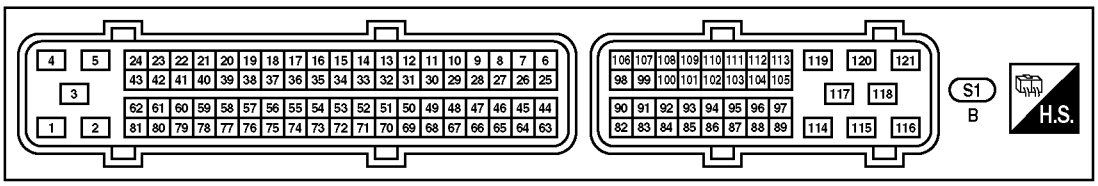
Without CONSULT-II

1. Crank engine for at least 2 seconds and run it for at least 5 seconds at idle speed.
2. Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
3. Perform Diagnostic Test Mode II (Self-diagnostic results) with ECM.
4. If DTC is detected, go to EC-99, "Diagnostic Procedure".

Wiring Diagram

EC/POS





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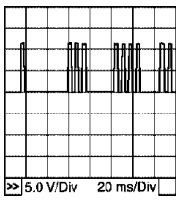
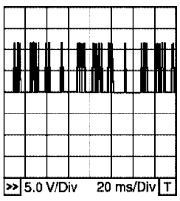
DTC P0335 Crankshaft Position Sensor (POS) Circuit (Cont'd)

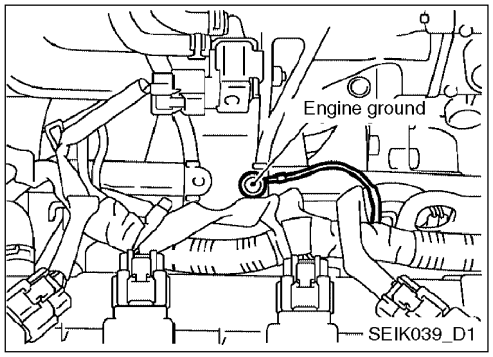
Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-II.

CAUTION:

- **Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

Terminal No.	Wire Color	Item	Condition	Data (DC Voltage)
13	R	Crankshaft position sensor (POS)	**[Engine is running]** ● Warm-up condition ● Idle speed	Approximately 3.0 V ★ 
			[Engine is running] ● Engine speed is 2,000 rpm.	Approximately 3.0 V ★ 
30	B	Crankshaft position sensor (POS) ground	**[Engine is running]** ● Idle speed	Approximately 0 V

★ : Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

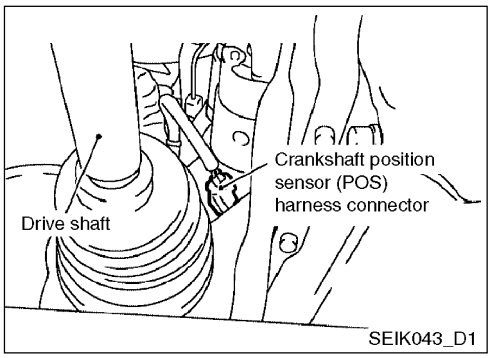


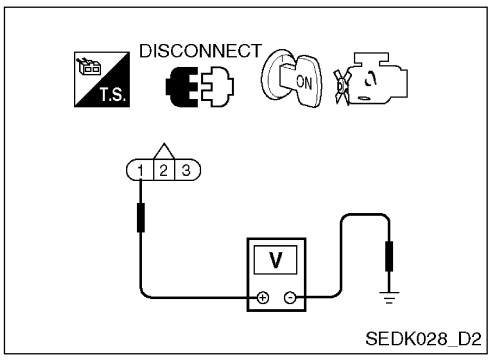
Diagnostic Procedure

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch OFF.
2. Loosen and retighten engine ground screws.
   >> GO TO 2.

DTC P0335 Crankshaft Position Sensor (POS) Circuit (Cont'd)





2. CHECK CKP SENSOR (POS) POWER SUPPLY CIRCUIT

1. Disconnect crankshaft position (CKP) sensor (POS) harness connector.
2. Turn ignition switch ON.
3. Check voltage between CKP sensor (POS) terminal 1 and ground with CONSULT-II or tester.

   Voltage: Battery voltage
4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.

NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between crankshaft position sensor (POS) and ECM
- Harness for open or short between crankshaft position sensor (POS) and ECM relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK CKP SENSOR (POS) GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 30 and CKP sensor (POS) terminal 3.

   Refer to Wiring Diagram.

   Continuity should exist.
4. Also check harness for and short to ground and short to power.

OK or NG

OK >> GO TO 5.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

DTC P0335 Crankshaft Position Sensor (POS) Circuit (Cont'd)

5. CHECK CKP SENSOR (POS) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 13 and CKP sensor (POS) terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to EC-101, "Component Inspection".

OK or NG

OK >> GO TO 7.

NG >> Replace crankshaft position sensor (POS).

7. CHECK GEAR TOOTH

Visually check for chipping signal plate gear tooth.

OK or NG

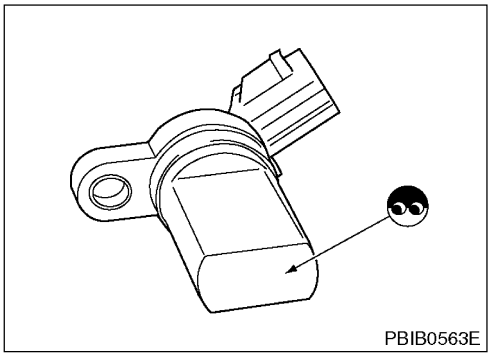
OK >> GO TO 8.

NG >> Replace the signal plate.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-74, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".

>> **INSPECTION END**

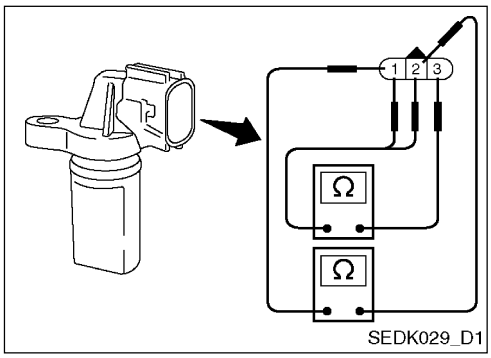


Component Inspection

CRANKSHAFT POSITION SENSOR (POS)

1. Loosen the fixing bolt of the sensor.
2. Disconnect crankshaft position sensor (POS) harness connector.
3. Remove the sensor.
4. Visually check the sensor for chipping.

DTC P0335 Crankshaft Position Sensor (POS) Circuit (Cont'd)



5. Check resistance as shown in the figure.

Terminal No. (Polarity)	Resistance Ω [at 25°C (77°F)]
3 (+) - 1 (-)	Except 0 or α
3 (+) - 2 (-)	
2 (+) - 1 (-)	

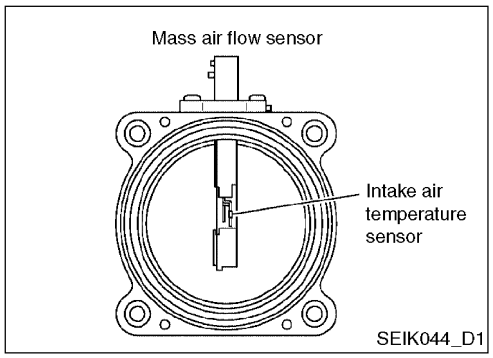
6. If NG, replace crankshaft position sensor (POS).

Removal and Installation

CRANKSHAFT POSITION SENSOR (POS)

Refer to "CYLINDER BLOCK" (QG16: EM-60).

DTC P0102, P0103 Mass Air Flow Sensor Circuit



Component Description

The mass air flow sensor is placed in the stream of intake air. It measures the intake flow rate by measuring a part of the entire intake flow. It consists of a hot film that is supplied with electric current from the ECM. The temperature of the hot film is controlled by the ECM a certain amount. The heat generated by the hot film is reduced as the intake air flows around it. The more air, the greater the heat loss.

Therefore, the ECM must supply more electric current to maintain the temperature of the hot film as air flow increases. The ECM detects the air flow by means of this current change.

CONSULT-II REFERENCE VALUE IN DATA MONITOR MODE

Monitor Item	Condition		Specification
MAS A/F SE-B1	● Air conditioner switch: OFF	Idle	Approx. 0.8 V
	● Shift lever: N (A/T models) Neutral (M/T models)	2,500 rpm	Approx. 1.5 - 2.1 V
	● No-load		

On Board Diagnosis Logic

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P0102	Mass air flow sensor circuit low input	An excessively low voltage from the sensor is sent to ECM when engine is running.	● Harness or connectors (The sensor circuit is open or shorted.) ● Intake air leaks ● Mass air flow sensor
P0103	Mass air flow sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Mass air flow sensor

Fail-Safe Mode

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Detected Items	Engine Operating Condition In Fail-Safe Mode
Mass air flow sensor circuit	Engine speed will not rise more than 2,400 rpm due to the fuel cut.

DTC Confirmation Procedure

NOTE:

- **If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.**

PROCEDURE FOR DTC P0102

With CONSULT-II

1. Turn ignition switch ON.

DTC P0102, P0103 Mass Air Flow Sensor Circuit (Cont'd)

2. Select "DATA MONITOR" mode with CONSULT-II.
3. Start engine and wait at least 5 seconds.
4. If DTC is detected, go to EC-106, "Diagnostic Procedure".

Without CONSULT-II

1. Start engine and wait 5 seconds at most.
2. Tarn ignition switch OFF, wait at least 10 seconds and then turn ON.
3. Perform Diagnostic Test Mode II (Self-diagnostic results).
4. If DTC is detected, go to EC-106, "Diagnostic Procedure".

With CONSULT-II

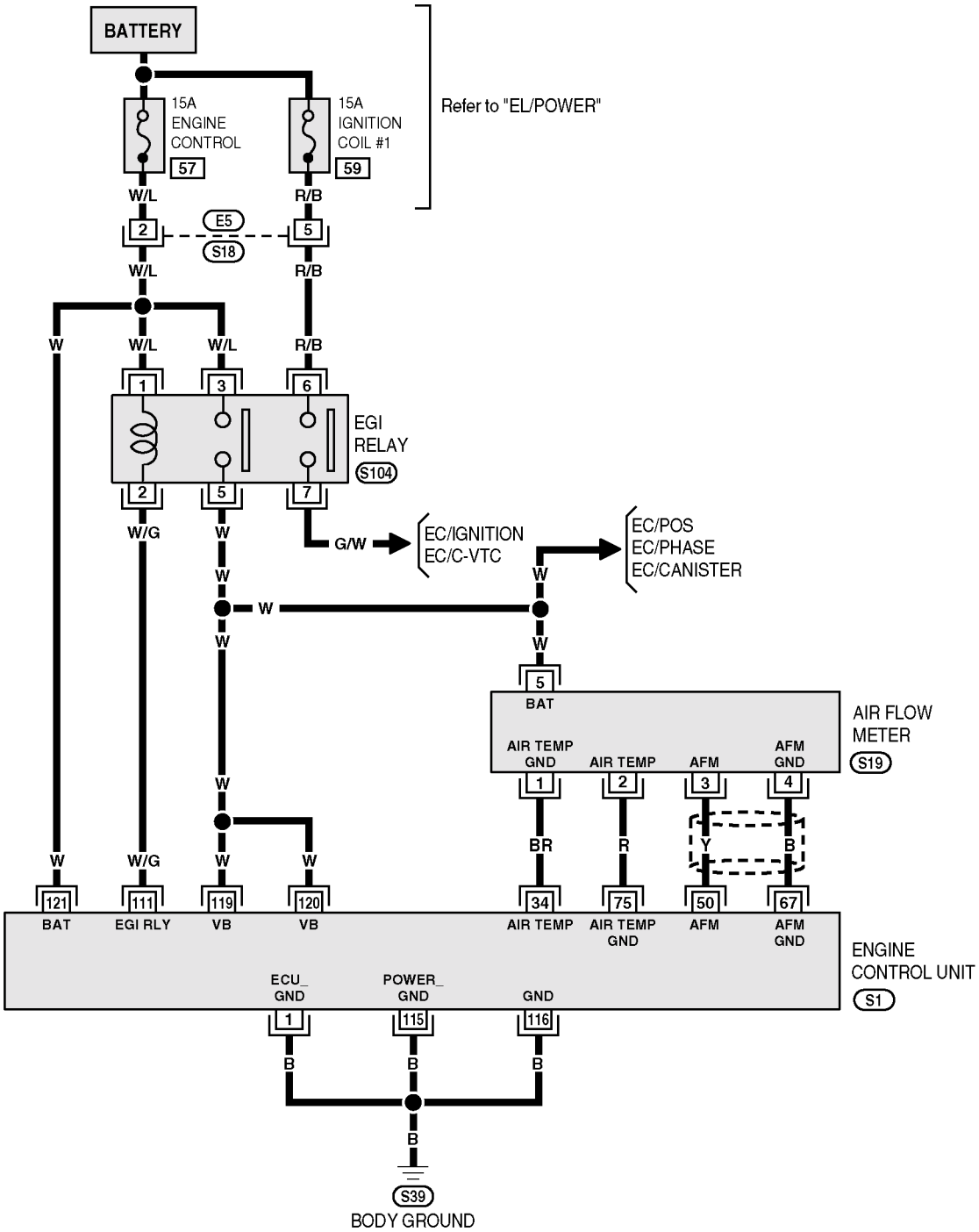
1. Turn ignition switch ON.
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Wait at least 5 seconds.
4. If DTC is detected, go to EC-106, "Diagnostic Procedure".
   If DTC is not detected, go to next step.
5. Start engine and wait at least 5 seconds.
6. If DTC is detected, go to EC-106, "Diagnostic Procedure".

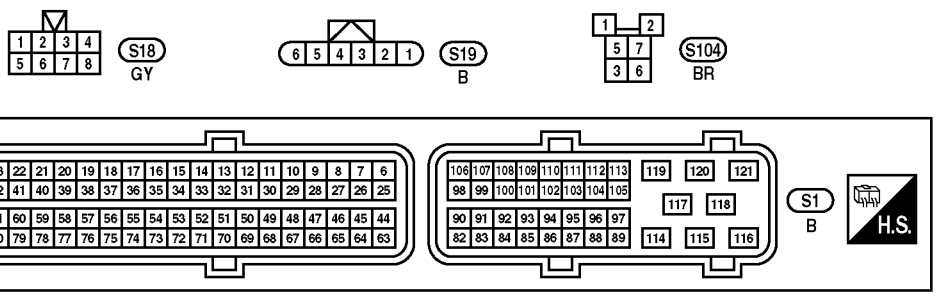
Without CONSULT-II

1. Turn ignition switch ON and wait at least 5 seconds.
2. Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
3. Perform Diagnostic Test Mode II (Self-diagnostic results).
4. If DTC is detected, go to EC-106, "Diagnostic Procedure".
   If DTC is not detected, go to next step.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Start engine and wait at least 5 seconds.
7. Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
8. Perform Diagnostic Test Mode II (Self-diagnostic results).
9. If DTC is detected, go to EC-106, "Diagnostic Procedure".

Wiring Diagram

EC/AFM





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DTC P0102, P0103 Mass Air Flow Sensor Circuit (Cont'd)

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

- **Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

Terminal No.	Wire Color	Item	Condition	Data (DC Voltage)
50	Y	Mass air flow sensor	**[Engine is running]** ● Warm-up condition ● Idle speed	Approximately 0.8 V
			[Engine is running] ● Warm-up condition ● Engine speed is 2,500 rpm.	1.5 - 2.1 V
67	B	Sensor ground	**[Engine is running]** ● Warm-up condition ● Idle speed	Approximately 0 V

Diagnostic Procedure

1. INSPECTION START

Which malfunction (P0102 or P0103) is duplicated?

P0102 or P0103

P0102 >> GO TO 2.

P0103 >> GO TO 3.

2. CHECK INTAKE SYSTEM

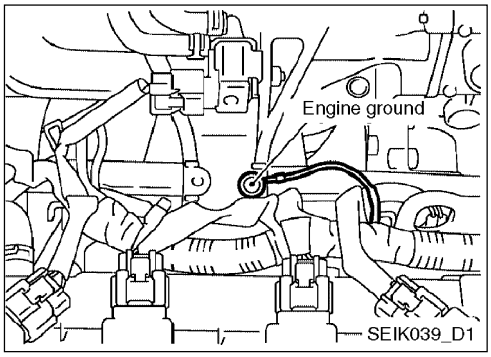
Check the following for connection.

- Air duct
- Vacuum hoses
- Intake air passage between air duct to intake manifold

OK or NG

OK >> GO TO 3.

NG >> Reconnect the parts.

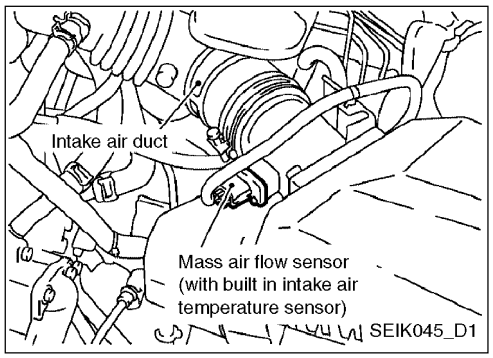


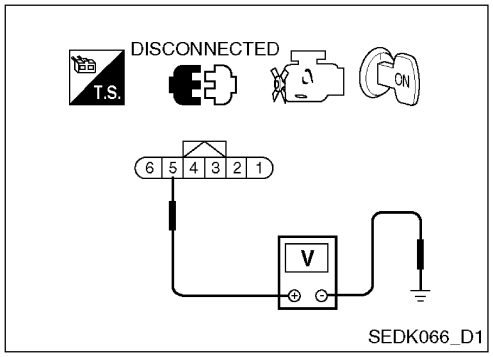
3. RETIGHTEN GROUND SCREWS

1. Turn ignition switch OFF.
2. Loosen and retighten engine ground screws.

>> GO TO 4.

DTC P0102, P0103 Mass Air Flow Sensor Circuit (Cont'd)





4. CHECK MAF SENSOR POWER SUPPLY CIRCUIT

1. Disconnect MAF sensor harness connector.
2. Turn ignition switch ON.
3. Check voltage between MAF sensor terminals 2 and ground with CONSULT-II or tester.

   Voltage: Battery voltage

OK or NG

OK >> GO TO 6.

NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between mass air flow sensor and ECM
- Harness for open or short between mass air flow sensor and EGI relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK MAF SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between MAF sensor terminal 4 and ECM terminal 67.

   Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

DTC P0102, P0103 Mass Air Flow Sensor Circuit (Cont'd)

7. CHECK MAF SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between MAF sensor terminal 3 and ECM terminal 50.

   Refer to Wiring Diagram.

   Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK MASS AIR FLOW SENSOR

Refer to EC-108, "Component Inspection".

OK or NG

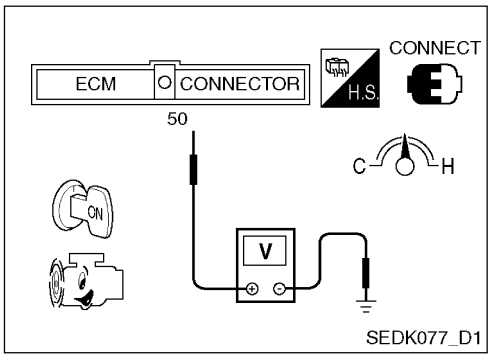
OK >> GO TO 9.

NG >> Replace mass air flow sensor.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-74, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".

>> **INSPECTION END**



Component Inspection

MASS AIR FLOW SENSOR

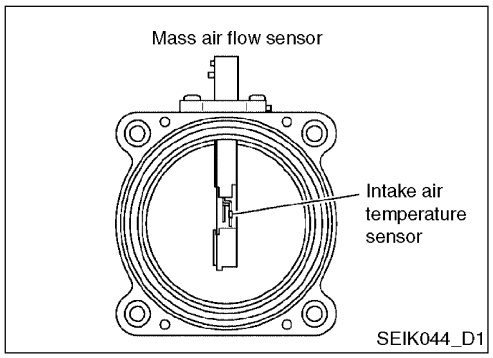
1. Reconnect harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Check voltage between ECM terminal 50 (Mass air flow sensor signal) and ground.

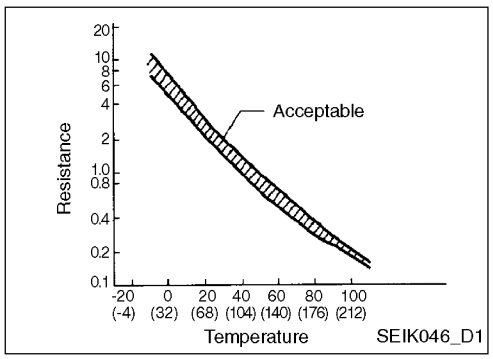
Condition	Voltage V
Ignition switch "ON" (Engine stopped.)	Approx. 0.4
Idle (Engine is warmed-up to normal operating temperature.)	Approx. 0.8
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.5 - 2.1
Idle to about 4,000 rpm*	Approx. 0.8 to Approx. 4.0

*: Check for liner voltage rise in response to engine being increased to about 4,000 rpm.

4. If the voltage is out of specification, proceed the following.
   a) Turn ignition switch OFF.
   b) Disconnect mass air flow sensor harness connector and reconnect it again.
   c) Perform steps 2 and 3 again.
5. If NG, remove mass air flow sensor from air duct. Check hot film for damage or dust.
6. If NG, clean or replace mass air flow sensor.

DTC P0112, P0113 Intake Air Temperature Sensor Circuit





Component Description

The intake air temperature sensor is built into mass air flow sensor. The sensor detects intake air temperature and transmits a signal to the ECM.

The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.

<Reference data>

Intake air temperature °C (°F)	Voltage* V	Resistance kΩ
-10	4.43	7.9 ~ 9.3
25	3.32	1.9 ~ 2.1
80	1.23	0.31 ~ 0.37

*: These data are reference values and are measured between ECM terminal 75 (Intake air temperature sensor) and body ground.

CAUTION:

- **Do not use ECM ground terminals when measuring input/ output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

On Board Diagnosis Logic

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P0112 0112	Intake air temperature sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	• Harness or connectors (The sensor circuit is open or shorted.) • Intake air temperature sensor
P0113 0113	Intake air temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

DTC Confirmation Procedure

NOTE:

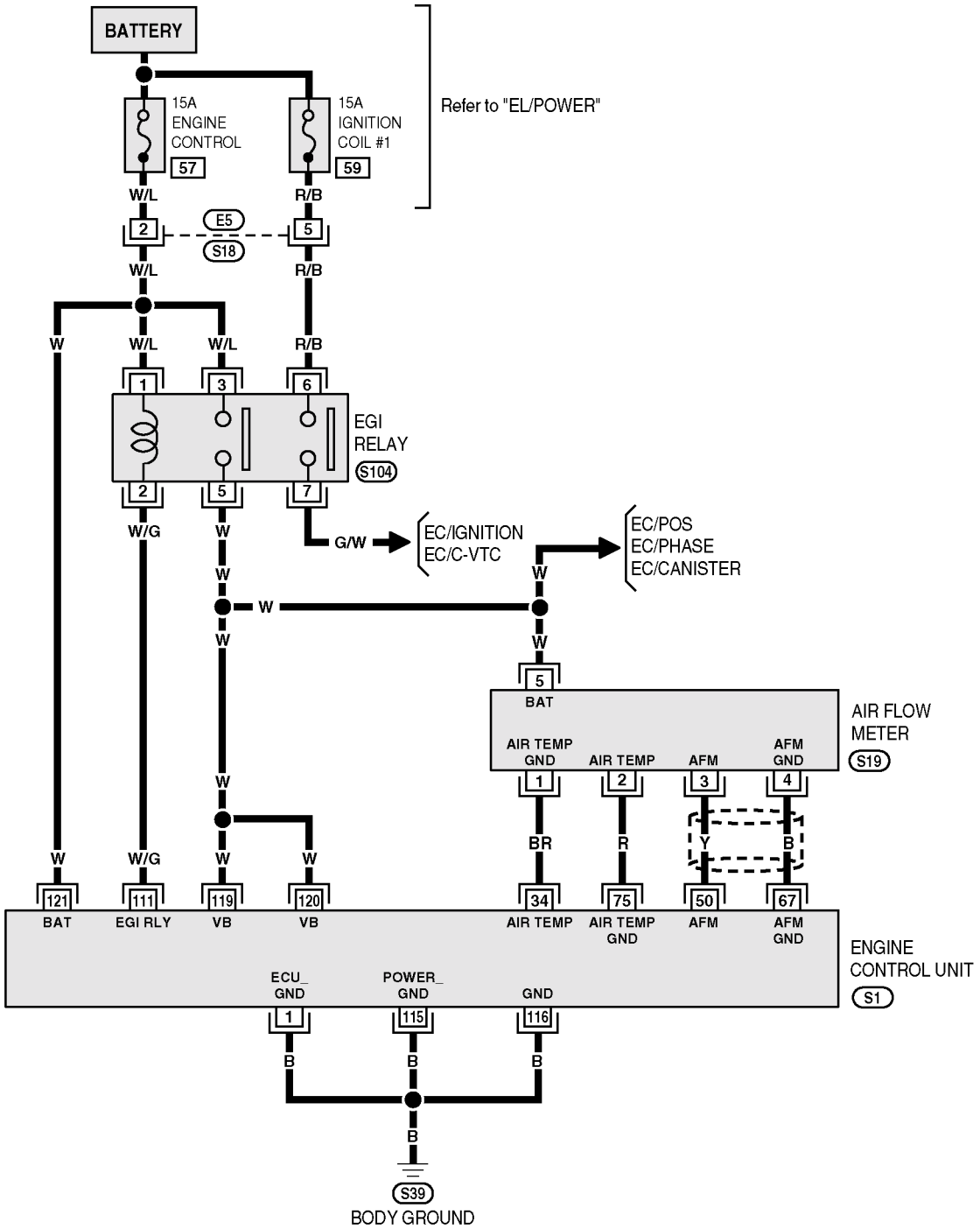
- **If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.**

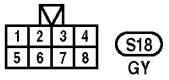
With CONSULT-II

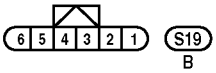
1. Turn ignition switch ON.
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Start engine and wait at least 5 seconds.
4. If DTC is detected, go to EC-111, "Diagnostic Procedure".

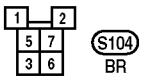
Wiring Diagram

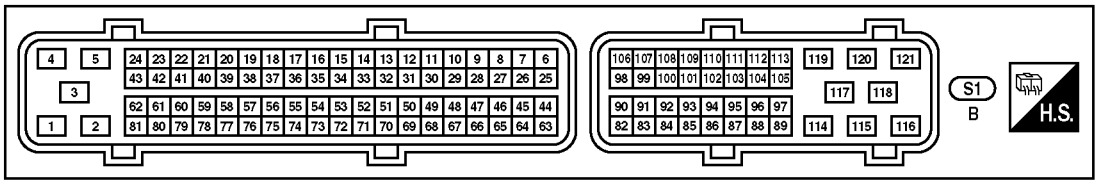
EC/AFM











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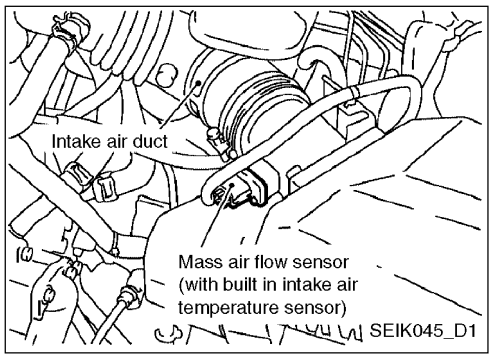
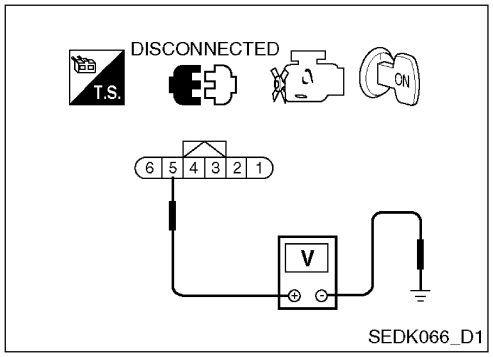
DTC P0112, P0113 Intake Air Temperature Sensor Circuit (Cont'd)





Diagnostic Procedure

1. CHECK INTAKE AIR TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect mass air flow sensor (intake air temperature sensor is built-into) harness connector.
3. Turn ignition switch ON.
4. Check voltage between mass air flow sensor terminal 5 and ground.

   Voltage: Battery voltage

OK or NG

OK >> GO TO 2.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

2. CHECK INTAKE AIR TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 34 and mass air flow sensor terminal 1.

   Refer to Wiring Diagram.

   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK INTAKE AIR TEMPERATURE SENSOR

Refer to EC-112, "Component Inspection".

OK or NG

OK >> GO TO 4.

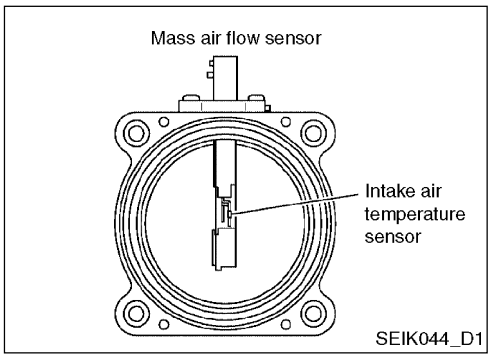
NG >> Replace mass air flow sensor (with intake air temperature sensor).

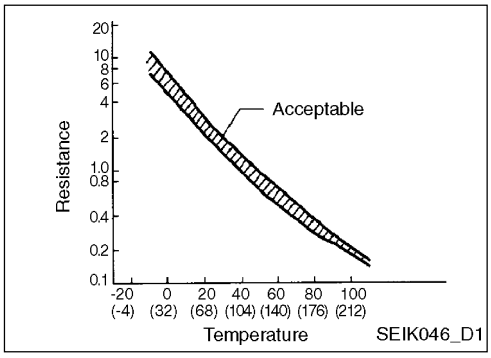
4. CHECK INTERMITTENT INCIDENT

Refer to EC-74, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".

>> **INSPECTION END**

DTC P0112, P0113 Intake Air Temperature Sensor Circuit (Cont'd)





Component Inspection

INTAKE AIR TEMPERATURE SENSOR

1. Check resistance between intake air temperature sensor terminals 1 and 2 under the following conditions.

Intake air temperature °C (°F)	Resistance kΩ
25 (77)	1.94 ~ 2.06

2. If NG, replace mass air flow sensor (with intake air temperature sensor).

CAUTION:

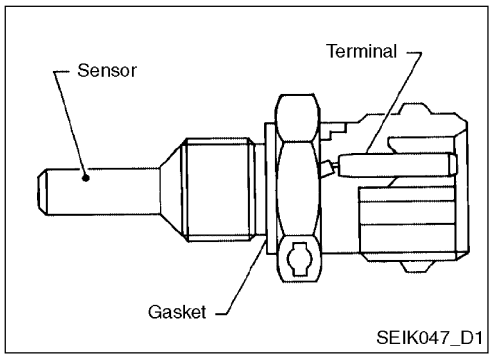
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using oxygen sensor thread cleaner and approved anti-seize lubricant.**

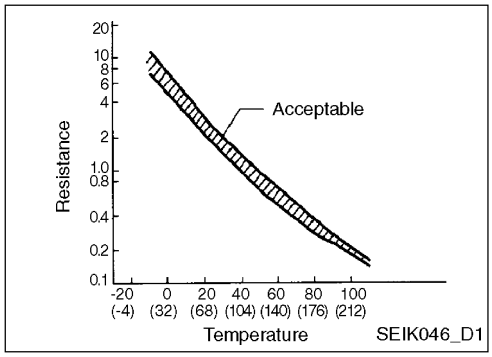
Removal and Installation

MASS AIR FLOW SENSOR

Refer to "Air Cleaner • Air Duct" (QG15: EM-11).

DTC P0117, P0118 Engine Coolant Temperature Sensor Circuit





Component Description

The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.

<Reference data>

Intake air temperature °C (°F)	Voltage* V	Resistance kΩ
-10	4.4	7.0 ~ 11.4
20	3.5	2.1 ~ 2.9
50	2.2	0.68 ~ 1.00
90	0.9	0.236 ~ 0.260

*: These data are reference values and are measured between ECM terminal 72 (Engine coolant temperature sensor) and ground.

CAUTION:

- **Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

On Board Diagnosis Logic

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P0117 0117	Engine coolant temperature sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	• Harness or connectors (The sensor circuit is open or shorted.) • Engine coolant temperature sensor
P0118 0118	Engine coolant temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

Fail-Safe Mode

When the DTC is detected, the ECM enters fail-safe mode and the MIL lights up.

Detected Items	Engine Operating Condition In Fail-Safe Mode	
Engine coolant temperature sensor circuit	Engine coolant temperature will be determined by ECM based on the time after turning ignition switch ON or START. CONSULT-II displays the engine coolant temperature decided by ECM.	
	Condition	Engine coolant temperature decided (CONSULT-II display)
	Just as ignition switch is turned ON or Start	40°C (104°F)
	More than approx. 4 minutes after ignition ON or Start	80°C (176°F)
	Except as shown above	40 - 80°C (104 - 176°F) (Depends on the time)
	When the fail-safe system for engine coolant temperature sensor is activated, the cooling fan operates while engine is running.	

DTC P0117, P0118 Engine Coolant Temperature Sensor Circuit (Cont'd)

NOTE:

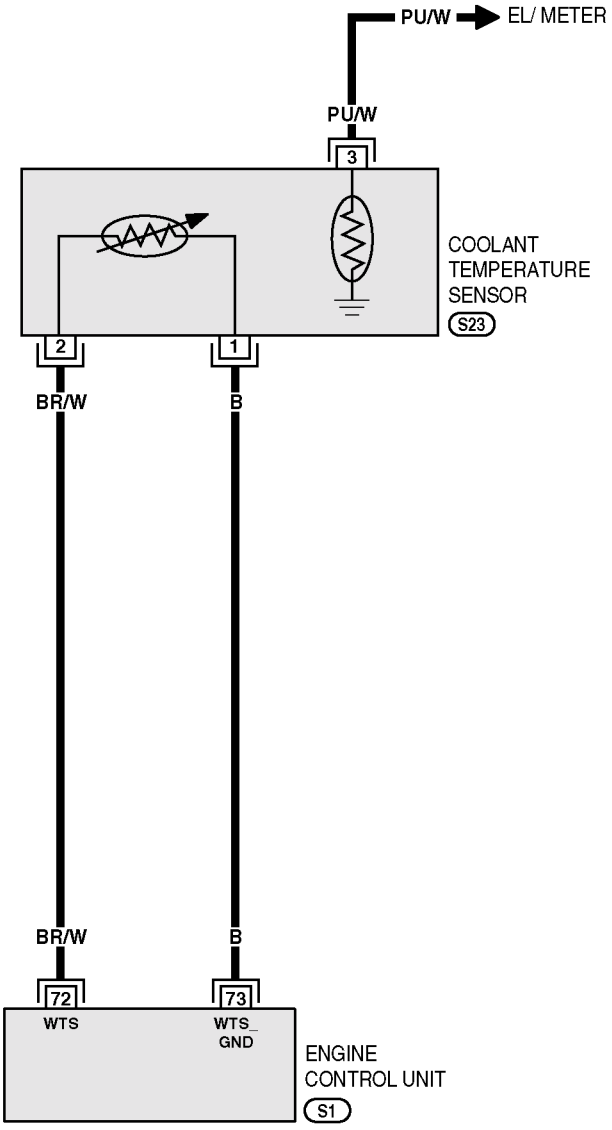
- **If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.**

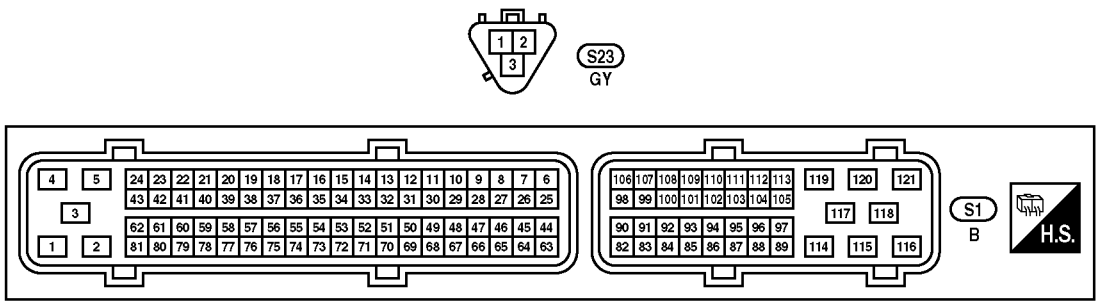
With CONSULT-II

1. Turn ignition switch ON.
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Wait at least 5 seconds.
4. If DTC is detected, go to EC-116, "Diagnostic Procedure".

Without CONSULT-II

1. Turn ignition switch ON and wait at least 5 seconds.
2. Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
3. Perform Diagnostic Test Mode II (Self-diagnostic results).
4. If DTC is detected, go to EC-116, "Diagnostic Procedure".


PU/W
EL/ METER
PU/W
3
COOLANT TEMPERATURE SENSOR
S23
2
1
BR/W
B
BR/W
B
72
73
WTS
WTS_ GND
ENGINE CONTROL UNIT
S1


1 2 3
S23
GY
4 5 3 1 2
24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6
43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25
62 61 60 59 58 57 56 55 54 53 52 51 50 49 48 47 46 45 44
81 80 79 78 77 76 75 74 73 72 71 70 69 68 67 66 65 64 63
106 107 108 109 110 111 112 113
98 99 100 101 102 103 104 105
90 91 92 93 94 95 96 97
82 83 84 85 86 87 88 89
119 120 121
117 118
114 115 116
S1
B
H.S.

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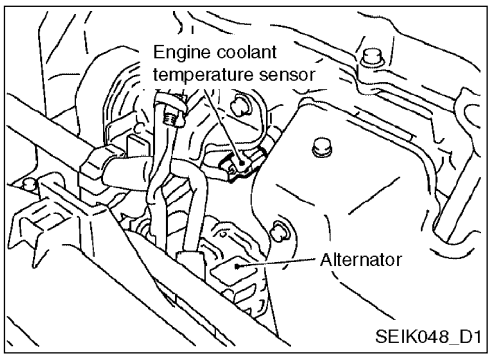
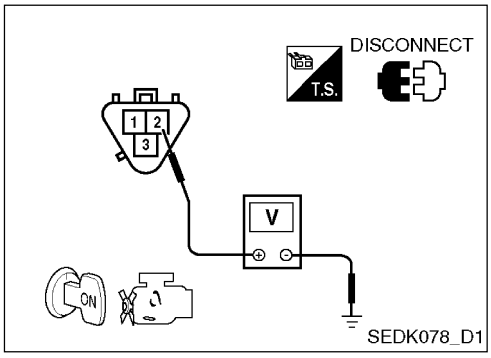
DTC P0117, P0118 Engine Coolant Temperature Sensor Circuit (Cont'd)





Diagnostic Procedure

1. CHECK ECT SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect engine coolant temperature (ECT) sensor harness connector.
3. Turn ignition switch ON.
4. Check voltage between ECT sensor terminal 2 and ground with CONSULT-II or tester.

   Voltage: Approximately 5V

OK or NG

OK >> GO TO 2.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

2. CHECK ECT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECT sensor terminal 1 and ECM terminal 73.

   Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-117, "Component Inspection".

OK or NG

OK >> GO TO 4.

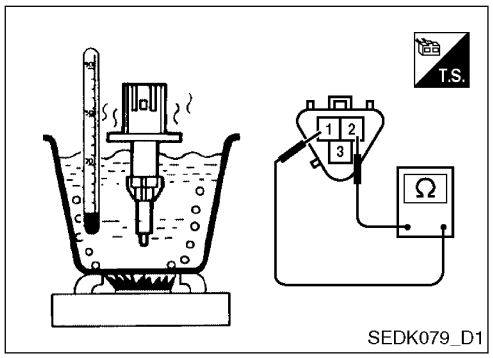
NG >> Replace engine coolant temperature sensor.

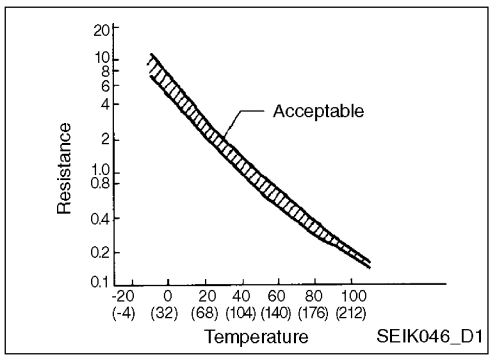
4. CHECK INTERMITTENT INCIDENT

Refer to EC-74, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".

>> **INSPECTION END**

DTC P0117, P0118 Engine Coolant Temperature Sensor Circuit (Cont'd)





Component Inspection

ENGINE COOLANT TEMPERATURE SENSOR

1. Check resistance between engine coolant temperature sensor terminals 1 and 2 as shown in the figure.

<Reference data>

Intake air temperature °C (°F)	Voltage* V	Resistance kΩ
20	3.5	2.1 ~ 2.9
50	2.2	0.68 ~ 1.00
90	0.9	0.236 ~ 0.260

*: These data are reference values and are measured between ECM terminal 72 (Engine coolant temperature sensor) and ground.

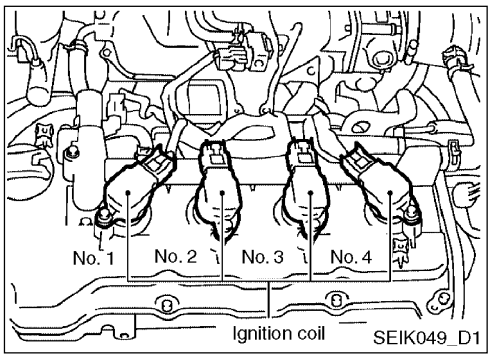
2. If NG, replace engine coolant temperature sensor.

Removal and Installation

ENGINE COOLANT TEMPERATURE SENSOR

Refer to "OUTER COMPONENT PARTS" (QG16: EM-13).

DTC P0350 Ignition Signal Primary



Component Description

IGNITION COIL & POWER TRANSISTOR

The ignition signal from the ECM is sent to and amplified by the power transistor. The power transistor turns on and off the ignition coil primary circuit. This on-off operation induces the proper high voltage in the coil secondary circuit.

On Board Diagnosis Logic

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P0350 0350	Ignition coil primary/secondary circuit	The ignition signal in the primary circuit is not sent to ECM during engine cranking or running.	● Harness or connectors (The ignition primary circuit is open or shorted.) ● Power transistor unit built into ignition coil ● Condenser ● Crankshaft position sensor (POS) ● Crankshaft position sensor (POS) circuit ● Camshaft position sensor (PHASE) ● Camshaft position sensor (PHASE) circuit

DTC Confirmation Procedure

NOTE:

- **If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.**
- **If DTC P0350 is displayed with DTC P0335 or P0340, perform trouble diagnosis for DTC P0335 or P0340 first. Refer to EC-89~96.**

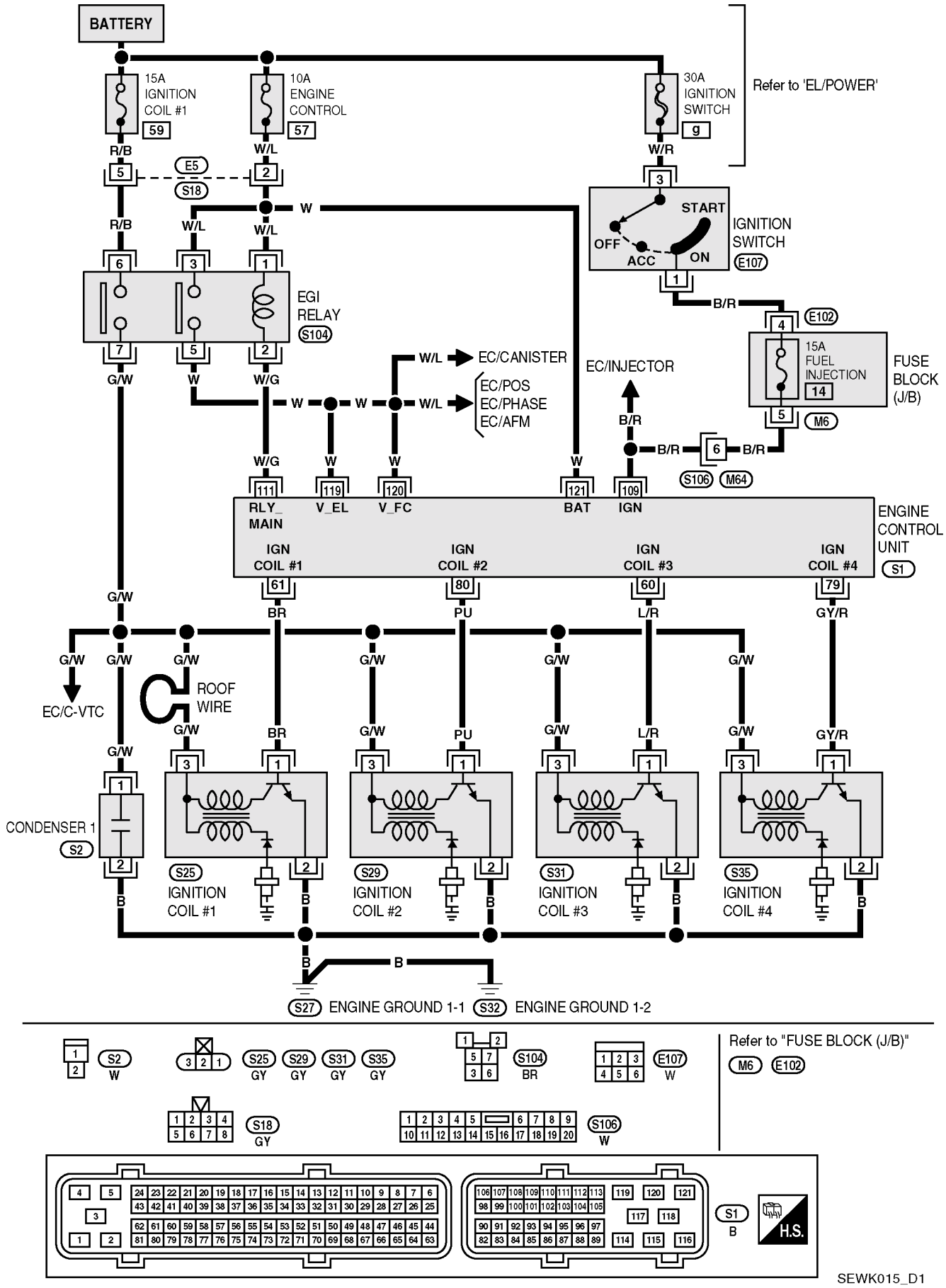
With CONSULT-II

1. Turn ignition switch ON.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine. (If engine does not run, turn ignition switch to START for at least 5 seconds.)
4. If 1st trip DTC is detected, go to EC-121, “Diagnostic Procedure”.

Without CONSULT-II

1. Start engine. (If engine does not run, turn ignition switch to START for at least 5 seconds.)
2. Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
3. Perform Diagnostic Test Mode II (Self-diagnostic results).
4. If DTC is detected, go to EC-121, “Diagnostic Procedure”.

Wiring Diagram EC/Ignition

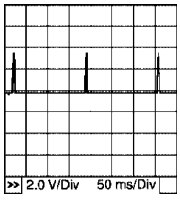
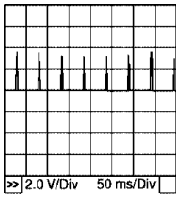
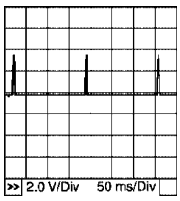
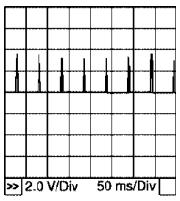


DTC P0350 Ignition Signal Primary (Cont'd)

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

- **Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

Terminal No.	Wire Color	Item	Condition	Data (DC Voltage)
111	W/G	EGI relay	**[Engine is running]** **[Ignition switch OFF]** ● For a 4 seconds after turning ignition switch OFF	Approximately 0 V
			[Ignition switch OFF] ● More than a 4 seconds passed after turning ignition switch OFF	BATTERY VOLTAGE (11 - 14 V)
119 120	W W	Power supply for ECM	**[Ignition switch ON]**	BATTERY VOLTAGE (11 - 14 V)
61 80	BR PU	Ignition signal No. 1 Ignition signal No. 2	**[Engine is running]** ● Warm-up condition ● Idle speed	0 - 0.1 V ★ 
			[Engine is running] ● Warm-up condition ● Engine speed is 2,000 rpm.	0 - 0.2 V ★ 
60 79	L/R GY/R	Ignition signal No. 3 Ignition signal No. 4	**[Engine is running]** ● Warm-up condition ● Idle speed	0 - 0.1 V ★ 
			[Engine is running] ● Warm-up condition ● Engine speed is 2,000 rpm.	0 - 0.2 V ★ 

★ : Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

DTC P0350 Ignition Signal Primary (Cont'd)

Diagnostic Procedure

1. CHECK ENGINE START

Turn ignition switch OFF, and restart engine.

Is engine running?

Yes or No

Yes (With CONSULT-II) >> GO TO 2.

Yes (Without CONSULT-II) >> GO TO 12.

No >> GO TO 4.

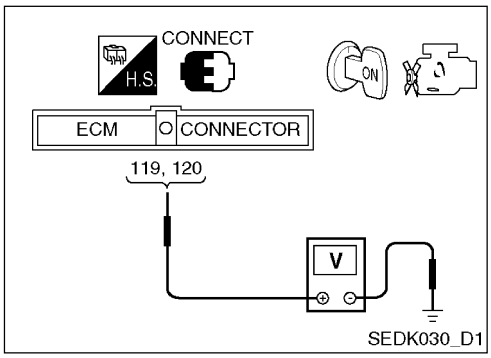
2. SEARCH FOR MALFUNCTIONING CIRCUIT

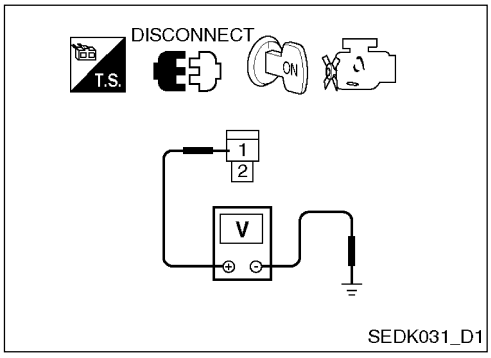
With CONSULT-II

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT-II.
2. Make sure that each circuit produces a momentary engine speed drop.

NG >> GO TO 12.

DTC P0350 Ignition Signal Primary (Cont'd)





3. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-I

1. Turn ignition switch ON.
2. Check voltage between ECM terminals 119, 120 and ground with CONSULT-II or tester.

   Voltage: Battery voltage

OK or NG

OK >> GO TO 4.

NG >> Go to EC-76, "POWER SUPPLY CIRCUIT FOR ECM".

4. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-II

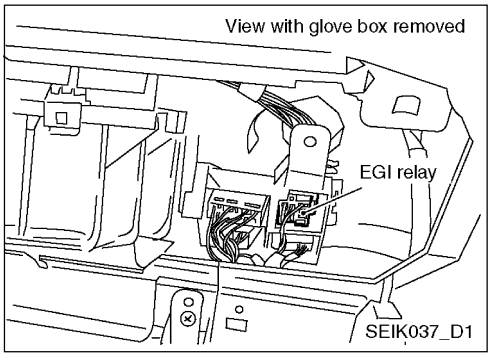
1. Turn ignition switch OFF.
2. Disconnect condenser harness connector.
3. Turn ignition switch ON.
4. Check voltage between condenser terminal 1 and ground with CONSULT-II or tester.

   Voltage: Battery voltage

OK or NG

OK >> GO TO 9.

NG >> GO TO 5.



5. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-III

1. Turn ignition switch OFF.
2. Disconnect EGI relay.
3. Check harness continuity between EGI relay terminal 7 and condenser terminal 1.

   Refer to Wiring Diagram.

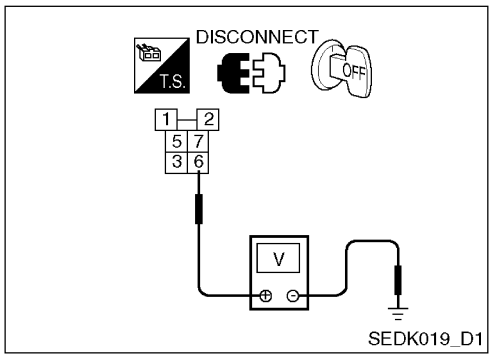
   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

DTC P0350 Ignition Signal Primary (Cont'd)



6. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-IV

Check voltage between ECM relay terminal 6 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 8.

NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E5, S18
- Fusible link and fuse box connector
- 15A fuse
- Harness for open or short between ECM relay and battery

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK EGI RELAY

Refer to EC-125, "Component Inspection".

OK or NG

OK >> GO TO 15.

NG >> Replace EGI relay.

9. CHECK CONDENSER GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect condenser harness connector.
3. Check harness continuity between condenser terminal 2 and ground.
   Refer to Wiring diagram.

   Continuity should exist.
4. Also check harness for short to power.

OK or NG

OK >> GO TO 10.

NG >> Repair open circuit or short to power in harness or connector.

10. CHECK CONDENSER

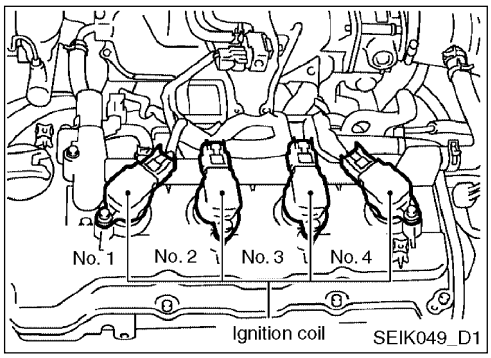
Refer to EC-125, "Component Inspection".

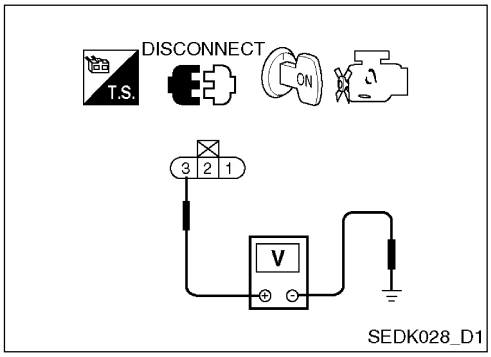
OK or NG

OK >> GO TO 11.

NG >> Replace condenser.

DTC P0350 Ignition Signal Primary (Cont'd)





11. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-V

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Disconnect ignition coil harness connector.
4. Turn ignition switch ON.
5. Check voltage between ignition coil terminal 3 and ground with CONSULT-II or tester.

   Voltage: Battery voltage

OK or NG

OK >> GO TO 12.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

12. CHECK IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Check harness continuity between ignition coil terminal 2 and engine ground.

   Refer to Wiring Diagram.

   Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 13.

NG >> Repair open circuit or short to power in harness or connectors.

13. CHECK IGNITION COIL OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminals 60, 61, 79, 80 and ignition coil terminal 1.

   Refer to Wiring Diagram.

   Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 14.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

DTC P0350 Ignition Signal Primary (Cont'd)

14. CHECK IGNITION COIL WITH POWER TRANSISTOR

Refer to EC-125, "Component Inspection".

OK or NG

OK >> GO TO 15.

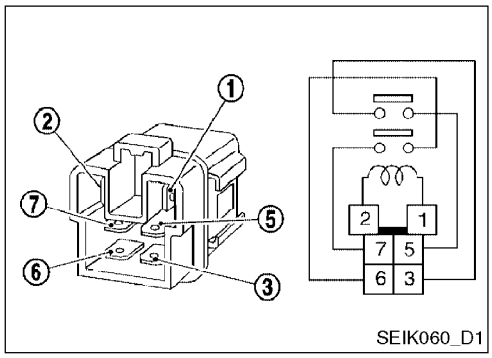
NG >> Replace ignition coil with power transistor.

15. CHECK INTERMITTENT INCIDENT

Refer to EC-74, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".

>> **INSPECTION END**

Component Inspection



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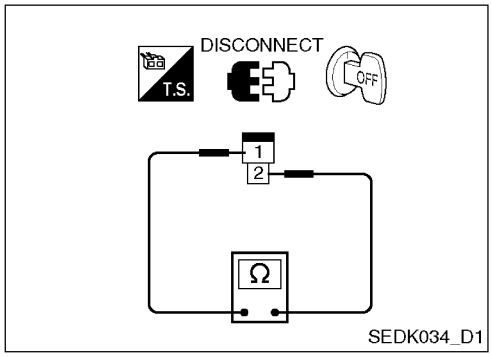
EGI RELAY

1. Apply 12V direct current between EGI relay terminals 1 and 2.
2. Check continuity between EGI relay terminals 3 and 5, 6 and 7.

Condition	Continuity
12V direct current supply between terminals 1 and 2	Yes
OFF	No

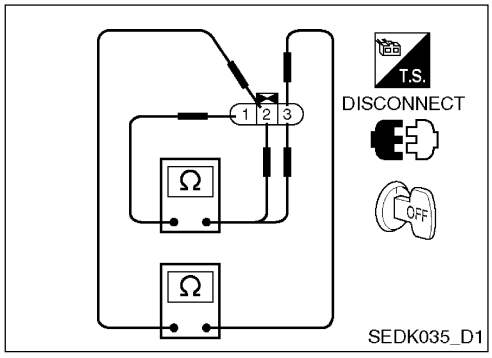
3. If NG, replace EGI relay.



SEDK034_D1

Condenser

1. Turn ignition switch OFF.
2. Disconnect condenser harness connector.
3. Check resistance between condenser terminals 1 and 2.
   Resistance: Above 1 MΩ at 25°C (77°F)



SEDK035_D1

Ignition Coil with Power Transistor

1. Turn ignition switch OFF.
2. Disconnect ignition coil harness connector.
3. Check resistance between ignition coil terminals as follows.

Terminal No.	Resistance Ω [at 25°C (77°F)]
3 and 1	Except 0 or α
3 and 2	Except 0
1 and 2	

DTC P0350 Ignition Signal Primary (Cont'd)

Removal and Installation

Refer to "OUTER COMPONENT PARTS" (QG16: EM-13).

DTC P1217 Engine Over Temperature (Overheat)

System Description

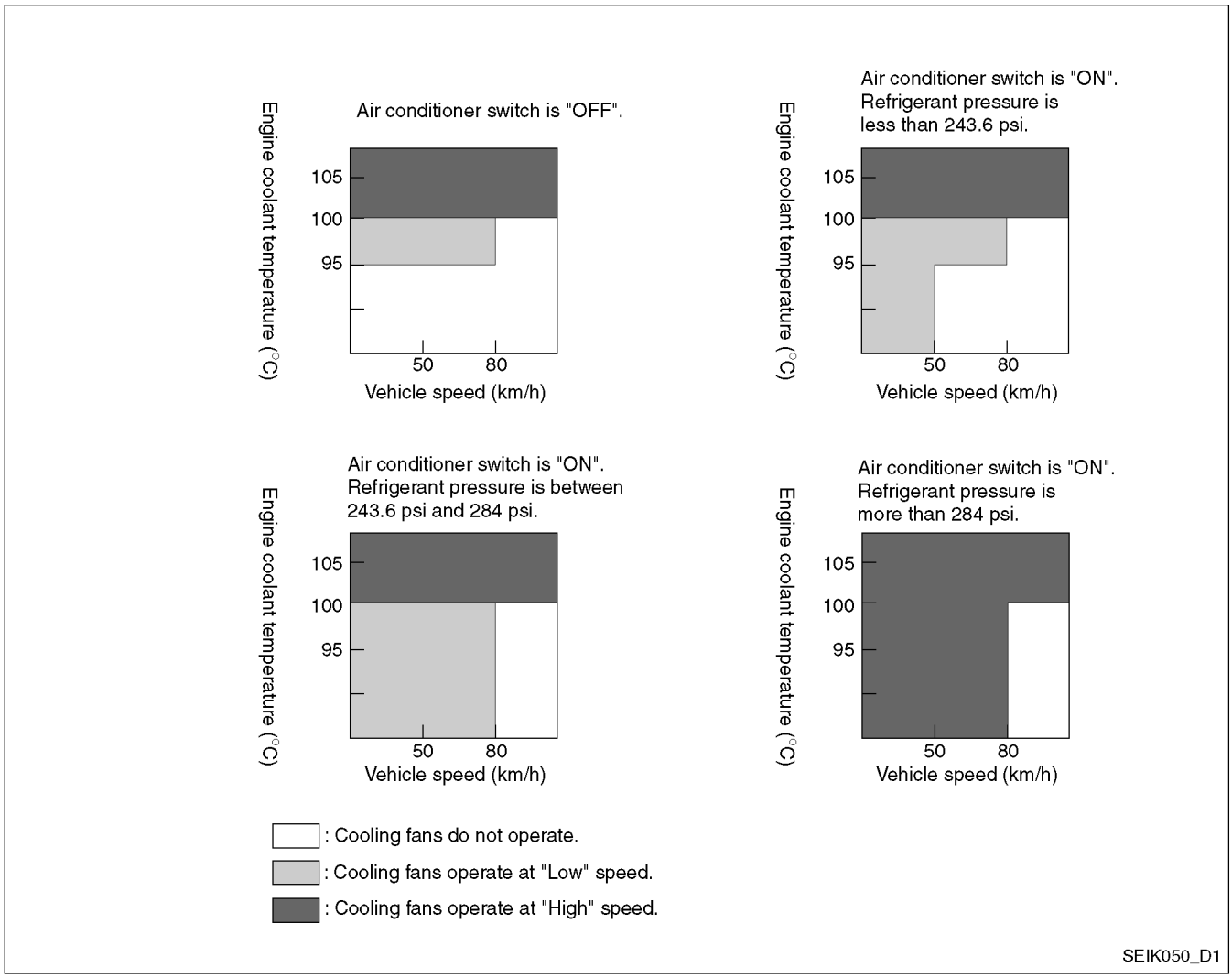
COOLING FAN CONTROL

Sensor	Input Signal to ECM	ECM Function	Actuator
Crankshaft position sensor (POS)	Engine speed*1	Cooling fan control	Cooling fan relay
Camshaft position sensor (PHASE)			
Battery	Battery voltage*1		
Vehicle speed signal	Vehicle speed		
Engine coolant temperature sensor	Engine coolant temperature		
Air conditioner switch	Air conditioner “ON” signal		
Refrigerant pressure sensor	Refrigerant pressure		

*1: The ECM determines the start signal status by the signals of engine speed and battery voltage.

The ECM controls the cooling fan corresponding to the vehicle speed, engine coolant temperature, refrigerant pressure, and air conditioner ON signal. The control system has 3 step control [HIGH/LOW/OFF].

Operation



DTC P1217 Engine Over Temperature (Overheat) (Cont'd)

CONSULT-II REFERENCE VALUE IN DATA MONITOR MODE

Monitor Item	Condition		Specification
AIR COND SIG	● Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor operates)	ON
COOLING FAN	● After warming up engine, idle the engine. ● Air conditioner switch: OFF	Engine coolant temperature is 94°C (201°F) or less.	OFF
		Engine coolant temperature is between 95°C (203°F) and 99°C (210°F)	LOW
		Engine coolant temperature is 100°C (212°F) or more	HIGH

On Board Diagnosis Logic

If the cooling fan or another component in the cooling system malfunctions, engine coolant temperature will rise. When the engine coolant temperature reaches an abnormally high temperature condition, a malfunction is indicated.

THIS SELF-DIAGNOSIS HAS THE ONE TRIP DETECTION LOGIC.

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P1217 1217	Engine over temperature (Overheat)	● Cooling fan does not operate properly (Overheat). ● Cooling fan system does not operate properly (Overheat). ● Engine coolant was not added to the system using the proper filling method. ● Engine coolant is not within the specified range.	● Harness or connectors (The cooling fan circuit is open or shorted) ● Cooling fan ● Thermostat ● Improper ignition timing ● Engine coolant temperature sensor ● Blocked radiator ● Blocked front end (Improper fitting of nose mask) ● Crushed vehicle frontal area (Vehicle frontal is collided but not repaired) ● Blocked air passage by improper installation of front fog lamp or fog lamps. ● Improper mixture ratio of coolant ● Damaged bumper For more information, refer to EC-139, "Main 12 Causes of Overheating".

CAUTION:

- **When a malfunction is indicated, be sure to replace the coolant. Refer to "Coolant Change" (QG15: LC-9). Also, replace the engine oil. Refer to "OIL CHANGE" (QG15: LC-5).**

1. Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute. Be sure to use coolant with the proper mixture ratio. Refer to "Engine Coolant Mixture Ratio" (MA-13).
2. After refilling coolant, run engine to ensure that no water-flow noise is emitted.

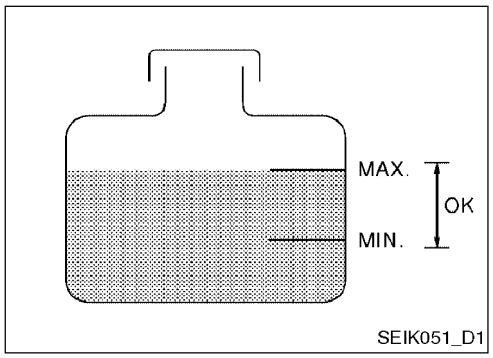
Overall Function Check

Use this procedure to check the overall function of the cooling fan. During this check, a DTC might not be confirmed.

WARNING:

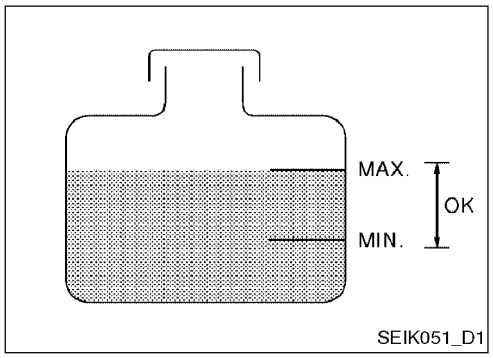
- **Never remove the radiator cap when the engine is hot. Serious burns could be caused by high pressure fluid escaping from the radiator. Wrap a thick cloth around cap. Carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape. Then turn the cap all the way off.**

DTC P1217 Engine Over Temperature (Overheat) (Cont'd)



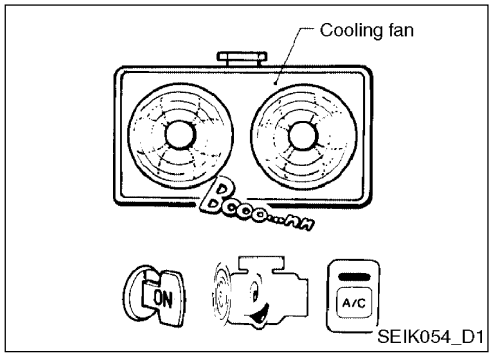
With CONSULT-II

1. Check the coolant level in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level.
   If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to EC-132, "Diagnostic Procedure".
2. Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to EC-132, "Diagnostic Procedure".
3. Turn ignition switch ON.
4. Perform "COOLING FAN" in "ACTIVE TEST" mode with CONSULT-II.
5. If the results are NG, go to EC-132, "Diagnostic Procedure".



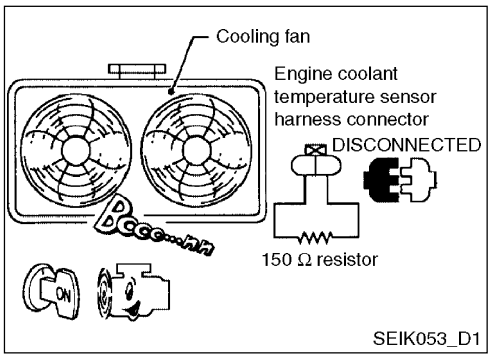
Without CONSULT-II

1. Check the coolant level in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level.
   If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to EC-132, "Diagnostic Procedure".
2. Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to EC-132, "Diagnostic Procedure".
3. Start engine.
   Be careful not to overheat engine.
4. Set temperature control lever to full cold position.
5. Turn air conditioner switch ON.
6. Turn blower fan switch ON.
7. Run engine at idle for a few minutes with air conditioner operating.
   Be careful not to overheat engine.



8. Make sure that cooling fan operates at low speed.
   If NG, go to EC-132, "Diagnostic Procedure".
   If OK, go to the following step.
9. Turn ignition switch OFF.
10. Turn air conditioner switch and blower fan switch OFF.
11. Disconnect engine coolant temperature sensor harness connector.
12. Connect 150Ω resistor to engine coolant temperature sensor harness connector.

DTC P1217 Engine Over Temperature (Overheat) (Cont'd)

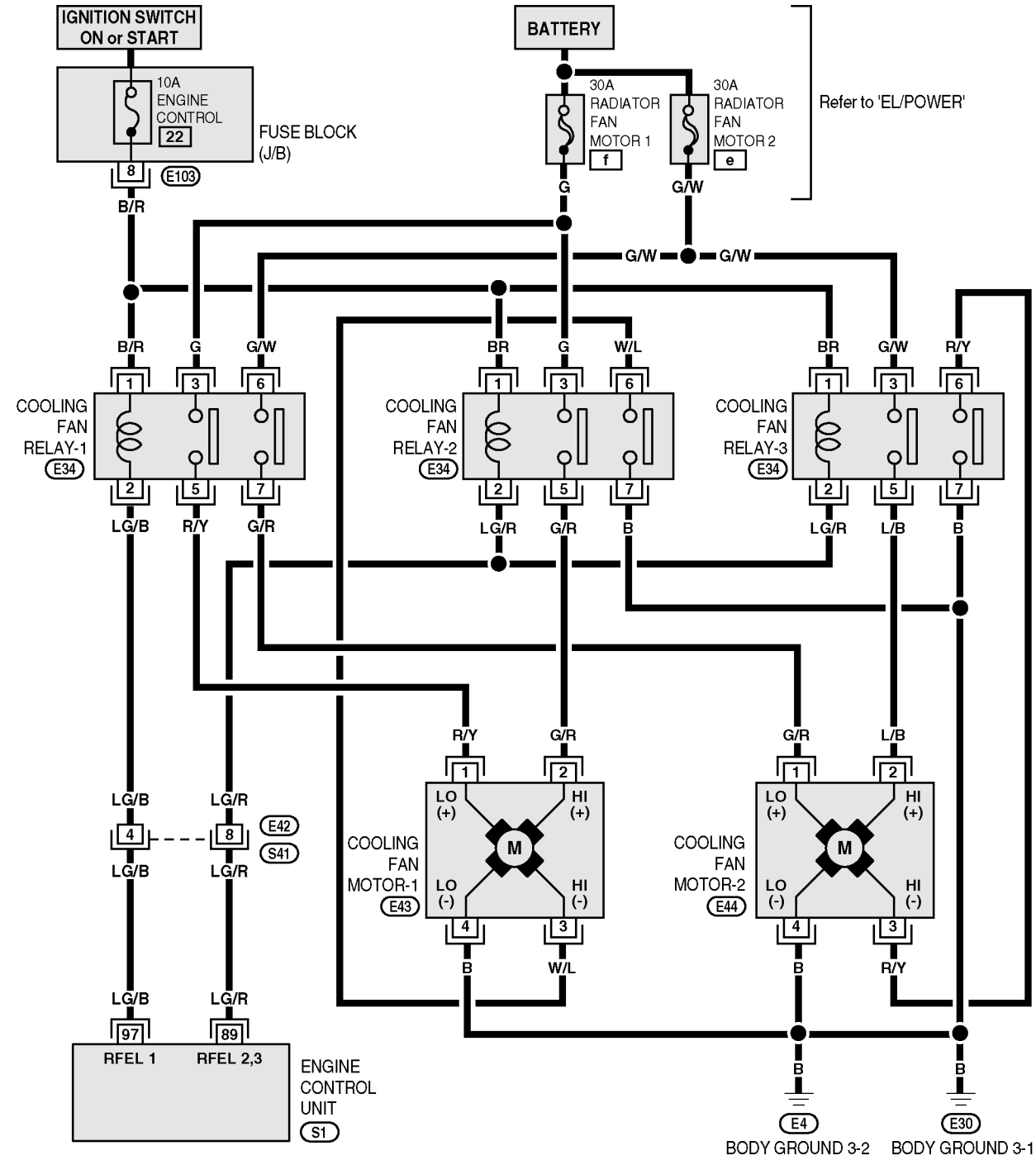


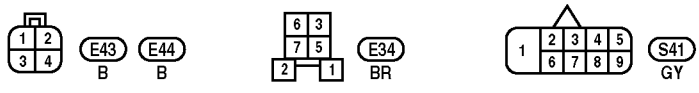
13. Restart engine and make sure that cooling fan operates at higher speed than low speed.

    Be careful not to overheat engine.

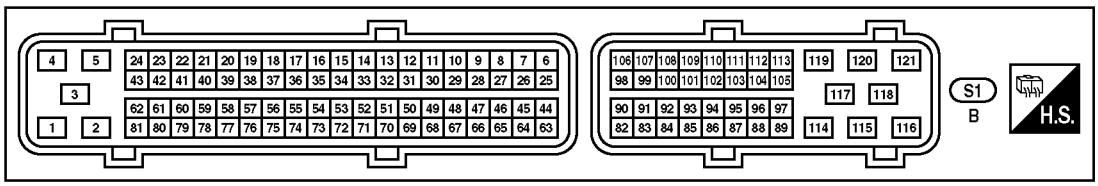
    If NG, go to EC-132, "Diagnostic Procedure".

Wiring Diagram — EC/Cooling Fan





Refer to "FUSE BLOCK (J/B)" E103



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DTC P1217 Engine Over Temperature (Overheat) (Cont'd)

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

- **Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

Terminal No.	Wire Color	Item	Condition	Data (DC Voltage)
89	LG/R	Cooling fan relay (High)	**[Engine is running]** ● Cooling fan is not operating	BATTERY VOLTAGE (11 - 14 V)
			[Engine is running] ● Cooling fan is operating at high speed	Approximately 0 V
97	LG/B	Cooling fan relay (Low)	**[Engine is running]** ● Cooling fan is not operating	BATTERY VOLTAGE (11 - 14 V)
			[Engine is running] ● Cooling fan is operating at low or high speed	Approximately 0 V

Diagnostic Procedure

1. INSPECTION START

Do you have CONSULT-II?

Yes or No

Yes >> GO TO 2.

No >> GO TO 4.

2. CHECK COOLING FAN LOW SPEED OPERATION

With CONSULT-II

1. Start engine and let it idle.
2. Select "COOLING FAN" in "ACTIVE TEST" mode with CONSULT-II and touch "LOW" on the CONSULT-II screen.
3. Make sure that cooling fans-1 and -2 operate at low speed.

OK or NG

OK >> GO TO 3.

NG >> Check cooling fan low speed control circuit. (Go to EC-136, "PROCEDURE A".)

3. CHECK COOLING FAN HIGH SPEED OPERATION

With CONSULT-II

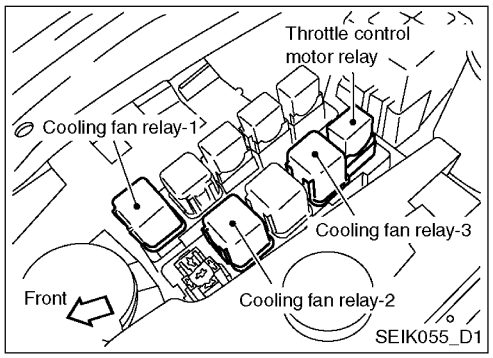
1. Select "COOLING FAN" in "ACTIVE TEST" mode with CONSULT-II and touch "HI" on the CONSULT-II screen.
2. Make sure that cooling fans-1 and -2 operate at higher speed than row speed.

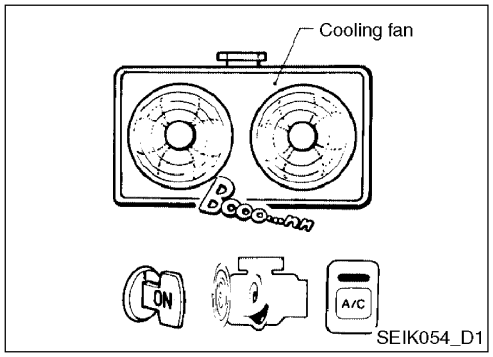
OK or NG

OK >> GO TO 6.

NG >> Check cooling fan high speed control circuit. (Go to EC-138, "PROCEDURE B".)

DTC P1217 Engine Over Temperature (Overheat) (Cont'd)





4. CHECK COOLING FAN LOW SPEED OPERATION

Without CONSULT-II

1. Disconnect cooling fan relays-2 and -3.
2. Start engine and let it idle.
3. Set temperature lever at full cold position.
4. Turn air conditioner switch ON.
5. Turn blower fan switch ON.
6. Make sure that cooling fans-1 and -2 operate at low speed.

OK or NG

OK >> GO TO 5.

NG >> Check cooling fan low speed control circuit. (Go to EC-136, "PROCEDURE A".)

5. CHECK COOLING FAN HIGH SPEED OPERATION

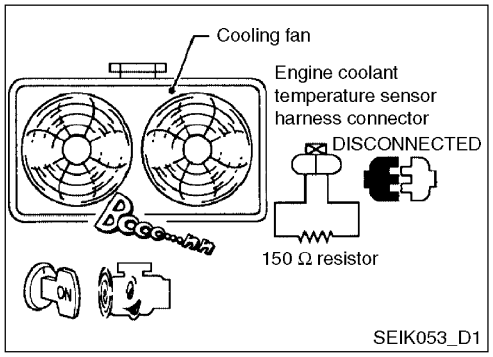
Without CONSULT-II

1. Turn ignition switch OFF.
2. Reconnect cooling fan relays-2 and -3.
3. Turn air conditioner switch and blower fan switch OFF.
4. Disconnect engine coolant temperature sensor harness connector.
5. Connect 150 Ω resistor to engine coolant temperature sensor harness connector.
6. Restart engine and make sure that cooling fans-1 and -2 operate at higher speed than low speed.

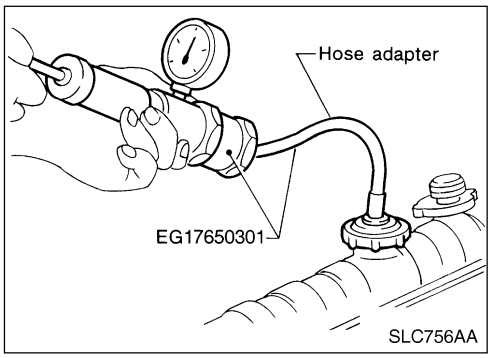
OK or NG

OK >> GO TO 6.

NG >> Check cooling fan high speed control circuit. (Go to EC-138, "PROCEDURE B".)



DTC P1217 Engine Over Temperature (Overheat) (Cont'd)



6. CHECK COOLING SYSTEM FOR LEAK

Apply pressure to the cooling system with a tester, and check if the pressure drops.

Testing pressure: 157 kPa (1.57 bar, 1.6 kg/cm^2, 23 psi)

CAUTION:

- **Higher than the specified pressure may cause radiator damage.**

Pressure should not drop.

OK or NG

OK >> GO TO 8.

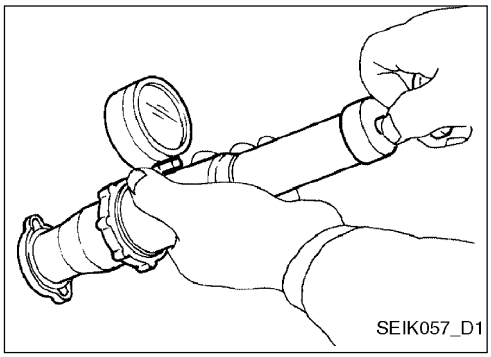
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following for leak.

- Hose
- Radiator
- Water pump

>> Repair or replace.



8. CHECK RADIATOR CAP

Apply pressure to cap with a tester and check radiator cap relief pressure.

Radiator cap relief pressure:
59 - 98 kPa (0.59 - 0.98 bar, 0.6 - 1.0 kg/cm^2, 9 - 14 psi)

OK or NG

OK >> GO TO 9.

NG >> Replace radiator cap.

9. CHECK THERMOSTAT

1. Remove thermostat.
2. Check valve seating condition at normal room temperatures.

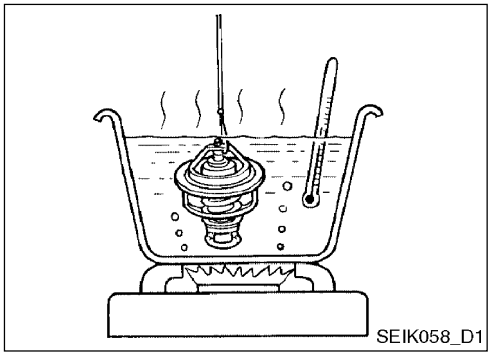
   It should seat tightly.

3. Check valve opening temperature and valve lift.
   Valve opening temperature: 82°C (180°F) [standard]
   Valve lift: More than 8 mm/95°C (0.31 in/203°F)
4. Check if valve is closed at 5°C (9°F) below valve opening temperature. For details, refer to "Thermostat" (QG15: LC-14).

OK or NG

OK >> GO TO 10.

NG >> Replace thermostat.



DTC P1217 Engine Over Temperature (Overheat) (Cont'd)

10. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-117, "Component Inspection".

OK or NG

OK >> GO TO 11.

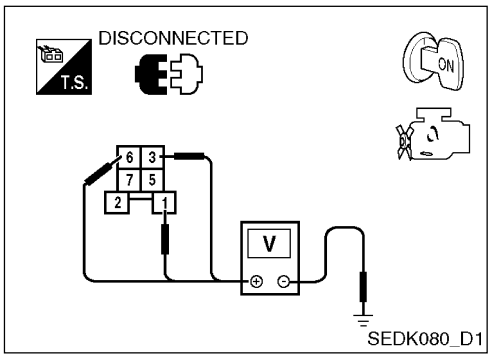
NG >> Replace engine coolant temperature sensor.

11. CHECK MAIN 12 CAUSES

- If the cause cannot be isolated, go to EC-139, "Main 12 Causes of Overheating".

>> **INSPECTION END**

DTC P1217 Engine Over Temperature (Overheat) (Cont'd)



PROCEDURE A

1. CHECK COOLING FAN POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect cooling fan relay-1.
3. Turn ignition switch ON.
4. Check voltage between cooling fan relay-1 terminals 1, 3, 6 and ground with CONSULT-II or tester.

   Voltage: Battery voltage

OK or NG

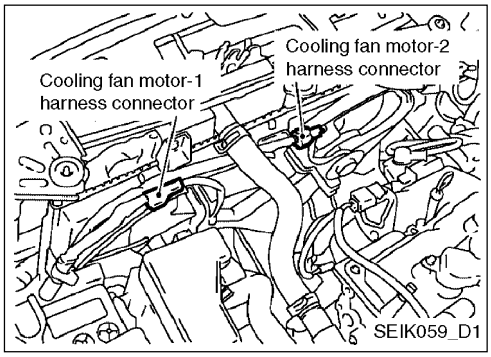
OK >> GO TO 3.

NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

- 10A fuse
- 40A fusible links
- Fuse block (J/B) connector E108
- Fusible link and fuse box connectors
- Harness for open or short between cooling fan relay-1 and fuse
- Harness for open or short between cooling fan relay-1 and battery

>> Repair open circuit or short to ground or short to power in harness or connectors.



3. CHECK COOLING FAN GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect cooling fan motor-1 harness connector and cooling fan motor-2 harness connector.
3. Check harness continuity between cooling fan relay-1 terminal 5 and cooling fan motor-1 terminal 1, cooling fan motor-1 terminal 4 and engine ground. Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to ground and short to power.
5. Check harness continuity between cooling fan relay-1 terminal 7 and cooling fan motor-2 terminal 1, cooling fan motor-2 terminal 4 and engine ground. Refer to Wiring Diagram.

   Continuity should exist.

6. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

DTC P1217 Engine Over Temperature (Overheat) (Cont'd)

4. CHECK COOLING FAN OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 97 and cooling fan relay-1 terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.

NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E42, S41
- Harness for open or short between cooling fan relay-1 and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK COOLING FAN RELAY-1

Refer to EC-140, "Component Inspection".

OK or NG

OK >> GO TO 7.

NG >> Replace cooling fan relay.

7. CHECK COOLING FAN MOTORS-1 AND -2

Refer to EC-140, "Component Inspection".

OK or NG

OK >> GO TO 8.

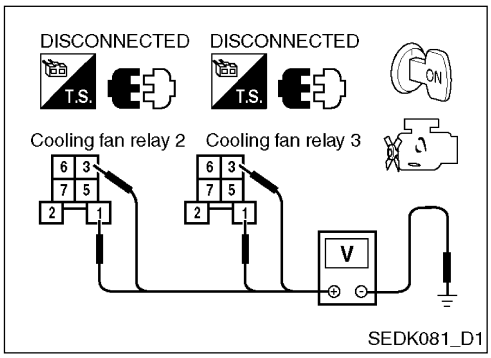
NG >> Replace cooling fan motors.

8. CHECK INTERMITTENT INCIDENT

Perform EC-74, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".

>> **INSPECTION END**

DTC P1217 Engine Over Temperature (Overheat) (Cont'd)



PROCEDURE B

1. CHECK COOLING FAN POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect cooling fan relays-2 and -3.
3. Turn ignition switch ON.
4. Check voltage between cooling fan relays-2 and -3 terminals 1, 3 and ground with CONSULT-II or tester.

   Voltage: Battery voltage

OK or NG

OK >> GO TO 3.

NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between cooling fan relays-2 and -3 and fuse
- Harness for open or short between cooling fan relays-2 and -3 and fusible link

>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK COOLING FAN GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect cooling fan motor-1 harness connector and cooling fan motor-2 harness connector.
3. Check harness continuity between cooling fan relay-2 terminal 5 and cooling fan motor-1 terminal 2, cooling fan relay-2 terminal 6 and cooling fan motor-1 terminal 3, cooling fan relay-2 terminal 7 and engine ground. Refer to Wiring Diagram.

   Continuity should exist.
4. Also check harness for short to ground and short to power.
5. Check harness continuity between cooling fan relay-3 terminal 5 and cooling fan motor-2 terminal 2, cooling fan relay-3 terminal 6 and cooling fan motor-2 terminal 3, cooling fan relay-3 terminal 7 and engine ground. Refer to Wiring Diagram.

   Continuity should exist.
6. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

DTC P1217 Engine Over Temperature (Overheat) (Cont'd)

4. CHECK COOLING FAN OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 89 and cooling fan relay-2 terminal 2, cooling fan relay-3 terminal 2. Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E42, S415
- Harness for open or short between cooling fan relays-2 and -3 and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK COOLING FAN RELAYS-2 AND -3

Refer to EC-140, "Component Inspection".

OK or NG

OK >> GO TO 7.
NG >> Replace cooling fan relays.

7. CHECK COOLING FAN MOTORS-1 AND -2

Refer to EC-140, "Component Inspection".

OK or NG

OK >> GO TO 8.
NG >> Replace cooling fan motors.

8. CHECK INTERMITTENT INCIDENT

Perform EC-74, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".

>> **INSPECTION END**

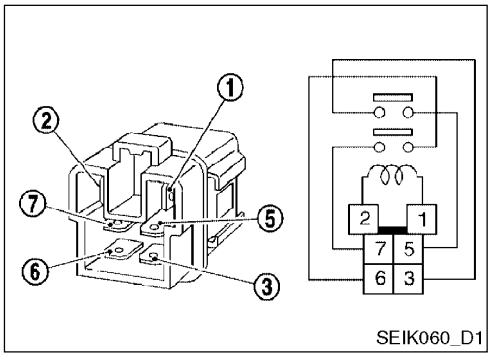
Main 12 Causes of Overheating

Engine	Step	Inspection Item	Equipment	Standard	Reference Page
OFF	1	● Blocked radiator ● Blocked condenser ● Blocked radiator grille ● Blocked bumper	● Visual	No blocking	-
	2	● Coolant mixture	● Coolant tester	50 - 50% coolant mixture	See "Engine Coolant Mixture Ratio" (MA-13).
	3	● Coolant level	● Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	See "Coolant Change"

DTC P1217 Engine Over Temperature (Overheat) (Cont'd)

Engine	Step	Inspection Item	Equipment	Standard	Reference Page
OFF	4	● Radiator cap	● Pressure tester	59 - 98 kPa (0.59 - 0.98 bar, 0.6 - 1.0 kg/cm^2, 9 - 14 psi) (Limit)	See "Radiator Cap Inspection"
ON*2	5	● Coolant leaks	● Visual	No leaks	See "COOLANT LEAK INSPECTION"
ON*2	6	● Thermostat	● Touch the upper and lower radiator hoses	Both hoses should be hot	See "INSPECTION AFTER REMOVAL"
ON*1	7	● Cooling fan	● CONSULT-II	Operating	See trouble diagnosis for DTC P1217 (EC-127).
OFF	8	● Combustion gas leak	● Color checker chemical tester 4 Gas analyzer	Negative	-
ON*3	9	● Coolant temperature gauge	● Visual	Gauge less than 3/4 when driving	-
		● Coolant overflow to reservoir tank	● Visual	No overflow during driving and idling	See " Coolant Change"
OFF*	10	● Coolant return from reservoir tank to radiator	● Visual	Should be initial level in reservoir tank	See " Coolant Change"
OFF	11	● Cylinder head	● Straight gauge feeler gauge	0.1 mm (0.004 in) Maximum distortion (warping)	See "Inspection", (QG16: EM-43).
	12	● Cylinder block and pistons	● Visual	No scuffing on cylinder walls or piston	See "Inspection", (QG16: EM-64).

*1: Turn the ignition switch ON.
*2: Engine running at 3,000 rpm for 10 minutes.
*3: Drive at 90 km/h (55 MPH) for 30 minutes and then let idle for 10 minutes.



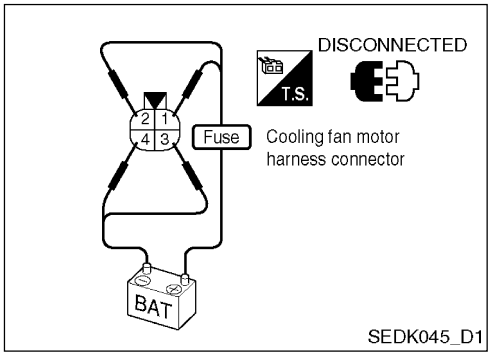
Component Inspection

COOLING FAN RELAYS-1, -2 AND -3

1. Apply 12V direct current between cooling fan relay terminals 1 and 2.
2. Check continuity between cooling fan relay terminals 3 and 5, 6 and 7

Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No

3. If NG, replace relay.



COOLING FAN MOTORS-1 AND -2

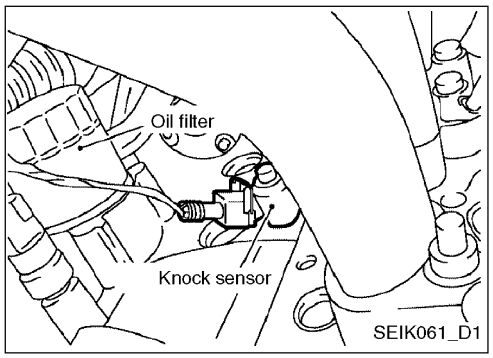
1. Disconnect cooling fan motor harness connectors.
2. Supply cooling fan motor terminals with battery voltage and check operation.

	Speed	Terminals	
		(+)	(-)
Cooling fan motor	Low	1	4
	High	12	34

Cooling fan motor should operate.

3. If NG, replace cooling fan motor.

DTC P0327, P0328 Knock Sensor Circuit



Component Description

The knock sensor is attached to the cylinder block. It senses engine knocking using a piezoelectric element. A knocking vibration from the cylinder block is sensed as vibrational pressure. This pressure is converted into a voltage signal and sent to the ECM.

On Board Diagnosis Logic

The MIL will not light up for this diagnosis.

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P0327 0327	Knock sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Knock sensor
P0328 0328	Knock sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

DTC Confirmation Procedure

NOTE:

● **If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.**

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

With CONSULT-II

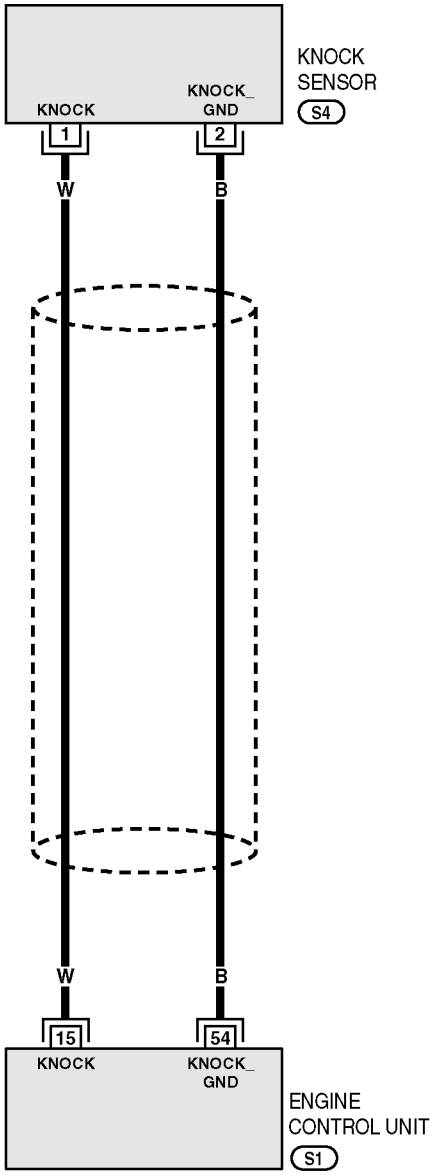
1. Turn ignition switch ON and select “DATA MONITOR” mode with CONSULT-II.
2. Start engine and run it for at least 5 seconds at idle speed.
3. If DTC is detected, go to EC-143, “Diagnostic Procedure”.

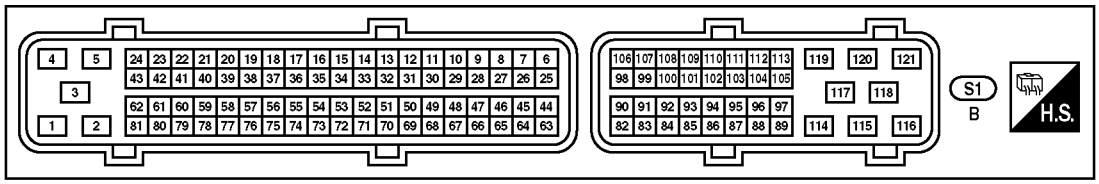
Without CONSULT-II

1. Start engine and run it for at least 5 seconds at idle speed.
2. Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
3. Perform Diagnostic Test Mode II (Self-diagnostic results).
4. If DTC is detected, go to EC-143, “Diagnostic Procedure”.

Wiring Diagram

EC/Knock Sensor





SEWK007_D1

DTC P0327, P0328 Knock Sensor Circuit

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

- **Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

Terminal No.	Wire Color	Item	Condition	Data (DC Voltage)
15	W	Knock sensor	**[Engine is running]** ● Idle speed	Approximately 2.5 V
54	B	Knock sensor ground	**[Engine is running]** ● Idle speed	Approximately 0 V

Diagnostic Procedure

1. CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT-I

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check resistance between ECM terminal 15 and engine ground. Refer to Wiring Diagram.

NOTE:

- **It is necessary to use an ohmmeter which can measure more than 10 MΩ.**

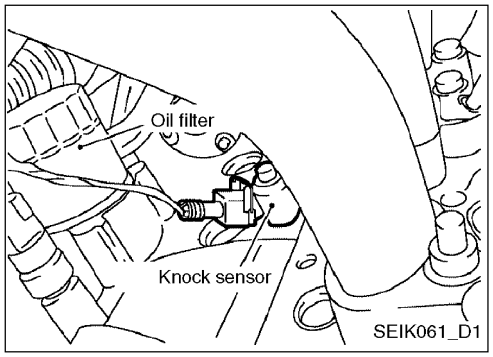
Resistance: Approximately 530 - 590kΩ [at 20°C (68°F)]

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.

NG >> GO TO 2.



2. CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT-II

1. Disconnect knock sensor harness connector.
2. Check harness continuity between ECM terminal 15 and knock sensor terminal 1.
   Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK KNOCK SENSOR

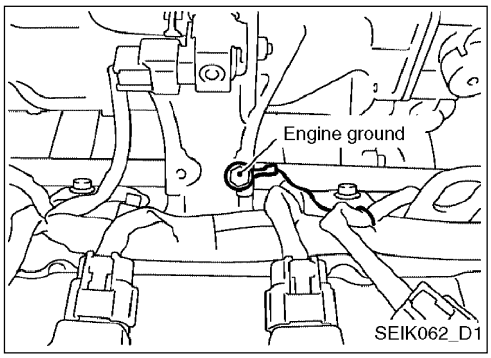
Refer to EC-144, "Component Inspection".

OK or NG

OK >> GO TO 5.

NG >> Replace knock sensor.

DTC P0327, P0328 Knock Sensor Circuit (Cont'd)



4. RETIGHTEN GROUND SCREWS

Loosen and retighten engine ground screws.

>> GO TO 5.

5. CHECK KNOCK SENSOR SHIELD CIRCUIT FOR OPEN AND SHORT

1. Reconnect knock sensor harness connector.
2. Check harness continuity between ECM terminal 54 and engine ground.

   Refer to Wiring Diagram.
3. Also check harness for short to ground and short to power.

OK or NG

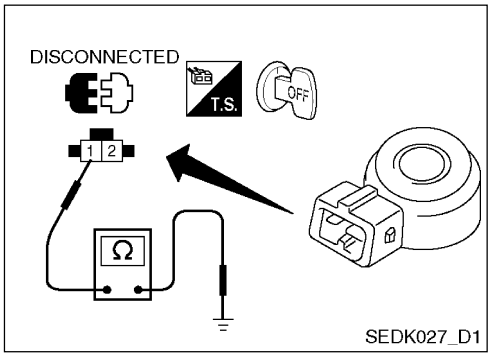
OK >> GO TO 6.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-74, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".

>> **INSPECTION END**



Component Inspection

KNOCK SENSOR

Check resistance between knock sensor terminal 1 and ground.

NOTE:

- **It is necessary to use an ohmmeter which can measure more than 10 MΩ.**

  Resistance: Approximately 530 - 590kΩ [at 20°C (68°F)]

CAUTION:

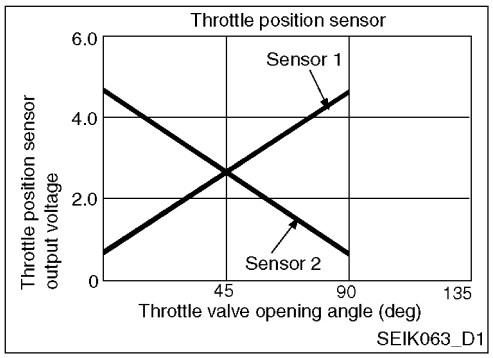
- **Do not use any knock sensors that have been dropped or physically damaged. Use only new ones.**

Removal and Installation

KNOCK SENSOR

Refer to "CYLINDER BLOCK" (QG16: EM-60).

DTC P0122, P0123 Throttle Position Sensor-2 Circuit



Component Description

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

CONSULT-II REFERENCE VALUE IN DATA MONITOR MODE

Monitor Item	Condition		Specification
THRTL SEN1 THRTL SEN2*	● Ignition switch: ON (Engine stopped) ● Shift lever: D (A/T models) 1st (M/T models)	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V

*: Throttle position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

On Board Diagnosis Logic

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P0122 0122	Throttle position sensor 2 circuit low input	An excessively low voltage from the throttle position sensor 2 is sent to ECM.	● Harness or connectors (The throttle position sensor 2 circuit is open or shorted.) ● Electric throttle control actuator (throttle position sensor 2)
P0123 0123	Throttle position sensor 2 circuit high input	An excessively high voltage from the throttle position sensor 2 is sent to ECM.	

Fail-Safe Mode

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Engine Operation Condition In Fail-Safe Mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.
The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

NOTE:

● **If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.**

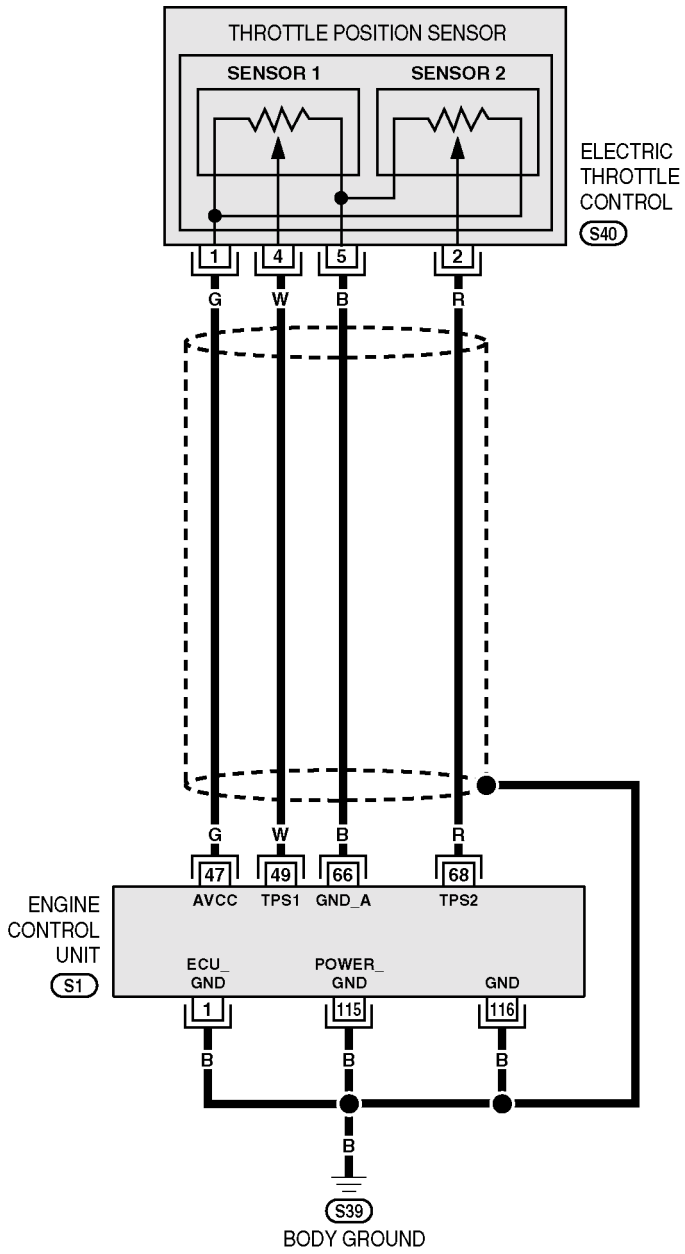
TESTING CONDITION:

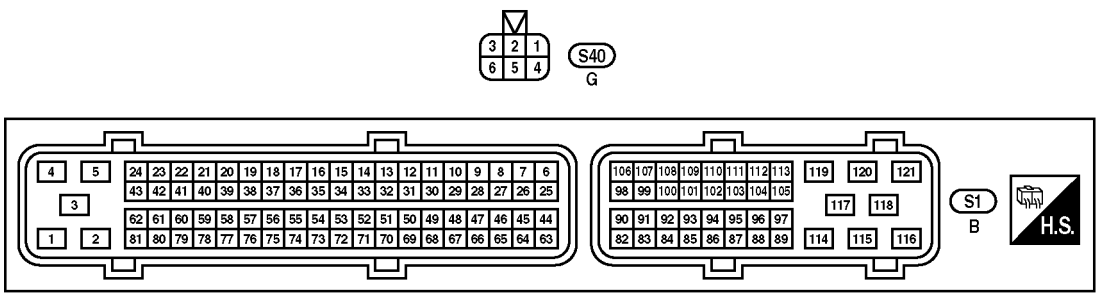
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

DTC P0122, P0123 Throttle Position Sensor-2 Circuit (Cont'd)

With CONSULT-II

1. Turn ignition switch ON.
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-148, "Diagnostic Procedure".


THROTTLE POSITION SENSOR
SENSOR 1
SENSOR 2
ELECTRIC THROTTLE CONTROL
S40
1
4
5
2
G
W
B
R
47
49
66
68
AVCC
TPS1
GND_A
TPS2
ENGINE CONTROL UNIT
S1
ECU_ GND
POWER_ GND
GND
1
115
116
S39
BODY GROUND


S40
G
S1
B
H.S.

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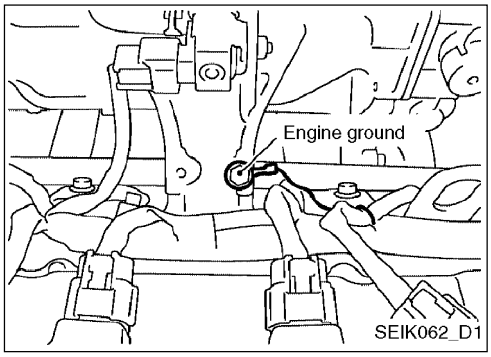
DTC P0122, P0123 Throttle Position Sensor-2 Circuit (Cont'd)

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

- **Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

Terminal No.	Wire Color	Item	Condition	Data (DC Voltage)
47	G	Throttle position sensor power supply	**[Ignition switch ON]**	Approximately 5 V
49	W	Throttle position sensor 1	**[Ignition switch ON]** ● Engine stopped ● Shift lever position is D (A/T models) ● Shift lever position is 1st (M/T models) ● Accelerator pedal fully released	More than 0.36 V
			[Ignition switch ON] ● Engine stopped ● Shift lever position is D (A/T models) ● Shift lever position is 1st (M/T models) ● Accelerator pedal fully depressed	Less than 4.75 V
66	B	Throttle position sensor ground	**[Engine is running]** ● Warm-up condition ● Idle speed	Approximately 0 V
68	R	Throttle position sensor 2	**[Ignition switch ON]** ● Engine stopped ● Shift lever position is D (A/T models) ● Shift lever position is 1st (M/T models) ● Accelerator pedal fully released	Less than 4.75 V
			[Ignition switch ON] ● Engine stopped ● Shift lever position is D (A/T models) ● Shift lever position is 1st (M/T models) ● Accelerator pedal fully depressed	More than 0.36 V

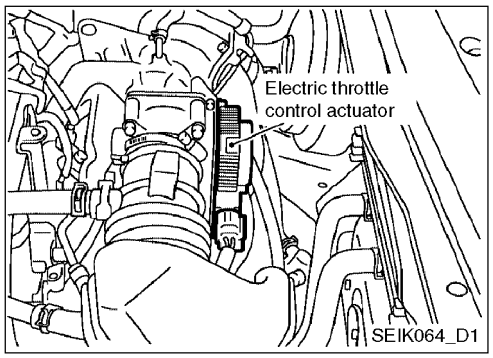


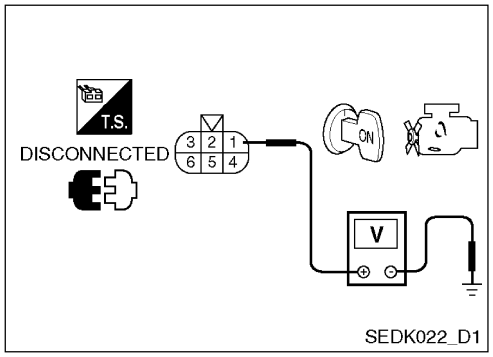
Diagnostic Procedure

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch OFF.
2. Loosen and retighten engine ground screws.
   >> GO TO 2.

DTC P0122, P0123 Throttle Position Sensor-2 Circuit (Cont'd)





2. CHECK THROTTLE POSITION SENSOR 2 POWER SUPPLY CIRCUIT

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch ON.
3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-II or tester.

   Voltage: Approximately 5V

OK or NG

OK >> GO TO 3.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK THROTTLE POSITION SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 66 and electric throttle control actuator terminal 5.

   Refer to Wiring Diagram.

   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK THROTTLE POSITION SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 68 and electric throttle control actuator terminal 2.

   Refer to Wiring Diagram.

   Continuity should exist.
2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

DTC P0122, P0123 Throttle Position Sensor-2 Circuit (Cont'd)

5. CHECK THROTTLE POSITION SENSOR

Refer to EC-150, "Component Inspection".

OK or NG

OK >> GO TO 7.

NG >> GO TO 6.

6. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-23, "Throttle Valve Closed Position Learning".
3. Perform EC-24, "Idle Air Volume Learning".

>> **INSPECTION END**

7. CHECK INTERMITTENT INCIDENT

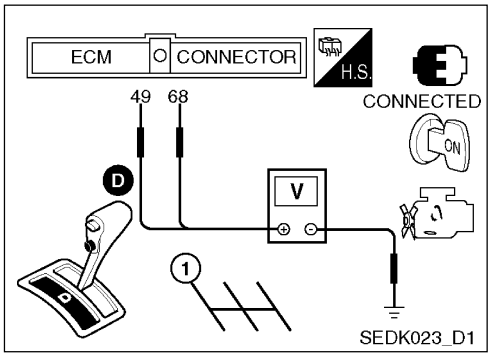
Refer to EC-74, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".

>> **INSPECTION END**

Component Inspection

THROTTLE POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Perform EC-23, "Throttle Valve Closed Position Learning".
3. Turn ignition switch ON.
4. Set selector lever to D position (A/T models) or 1st position (M/T models).
5. Check voltage between ECM terminals 49 (Throttle position sensor 1 signal), 68 (Throttle position sensor 2 signal) and engine ground under the following conditions.



Terminal	Accelerator pedal	Voltage
49 (Throttle position sensor 1)	Fully released	More than 0.36 V
	Fully depressed	Less than 4.75 V
68 (Throttle position sensor 2)	Fully released	Less than 4.75 V
	Fully depressed	More than 0.36 V

6. If NG, replace electric throttle control actuator and go to the next step.
7. Perform EC-23, "Throttle Valve Closed Position Learning".
8. Perform EC-24, "Idle Air Volume Learning".

Remove and Installation

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to "OUTER COMPONENT PARTS" (QG16: EM-12).

DTC P1121 Electric Throttle Control Actuator

Component Description

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc.

The throttle control motor is operated by the ECM and it opens and closes the throttle valve. The throttle position sensor detects the throttle valve position, and the opening and closing speed of the throttle valve and feeds the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

On Board Diagnosis Logic

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition		Possible Cause
P1121 1121	Electric throttle control actuator	A	Electric throttle control actuator does not function properly due to the return spring malfunction.	Electric throttle control actuator
		B	Throttle valve opening angle in fail-safe mode is not in specified range.	
		C	ECM detect the throttle valve is stuck open.	

Fail-Safe Mode

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Detected Items	Engine Operating Condition In Fail-Safe Mode
Malfunction A	The ECM controls the electric throttle actuator by regulating the throttle opening around the idle position. The engine speed will not rise more than 2,000 rpm.
Malfunction B	ECM controls the electric throttle control actuator by regulating the throttle opening to 20 degrees or less.
Malfunction C	While the vehicle is driving, it slows down gradually by fuel cut. After the vehicle stops, the engine stalls. The engine can restart in N or P position, and engine speed will not exceed 1,000 rpm or more.

DTC Confirmation Procedure

NOTE:

- **Perform PROCEDURE FOR MALFUNCTION A AND B first. If the DTC cannot be confirmed, perform PROCEDURE FOR MALFUNCTION C.**
- **If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.**

Procedure for Malfunction A and B

With CONSULT-II

1. Turn ignition witch ON and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Shift selector lever to D position (A/T models), 1st position (M/T models) and wait at least 2 seconds.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Turn ignition switch ON and wait at least 1 second.
6. Shift selector lever to D position (A/T models), 1st position (M/T models) and wait at least 2 seconds.
7. Turn ignition switch OFF, wait at least 10 seconds, and then turn ON.
8. If DTC is detected, go to EC-152, “Diagnostic Procedure”.

Without CONSULT-II

1. Turn ignition switch ON and wait at least 1 second.
2. Shift selector lever to D position (A/T models), 1st position (M/T models) and wait at least 2 seconds.
3. Turn ignition switch OFF, wait at least 10 seconds and then turn ON.

DTC P1121 Electric Throttle Control Actuator (Cont'd)

4. Shift selector lever to D position (A/T models), 1st position (M/T models) and wait at least 2 seconds.
5. Turn ignition switch OFF, wait at least 10 seconds, and then turn ON.
6. Perform Diagnostic Test Mode II (Self-diagnostic results).
7. If DTC is detected, go to EC-152, "Diagnostic Procedure".

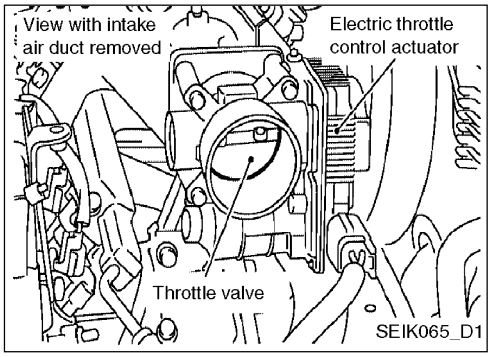
Procedure for Malfunction C

With CONSULT-II

1. Turn ignition switch ON and wait at least 1 second.
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Shift selector lever to D position (A/T models), 1st position (M/T models) and wait at least 2 seconds.
4. Shift selector lever to N or P position.
5. Start engine and let it idle for 3 seconds.
6. If DTC is detected, go to EC-152, "Diagnostic Procedure".

Without CONSULT-II

1. Turn ignition switch ON and wait at least 1 second.
2. Shift selector lever to D position (A/T models), 1st position (M/T models) and wait at least 2 seconds.
3. Shift selector lever to N or P position.
4. Start engine and let it idle for the 3 seconds.
5. Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
6. Perform Diagnostic Test Mode II (Self-diagnostic results).
7. If DTC is detected, go to EC-152, "Diagnostic Procedure".



Diagnostic Procedure

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Remove the intake air duct.
2. Check if a foreign matter is caught between the throttle valve and the housing.

OK or NG

OK >> GO TO 2.

NG >> Remove the foreign matter and clean the electric throttle control actuator inside.

2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-23, "Throttle Valve Closed Position Learning".
3. Perform EC-24, "Idle Air Volume Learning".

>> **INSPECTION END**

Remove and Installation

Refer to "OUTER COMPONENT PARTS" (QG16: EM-12).

DTC P1122 Electric Throttle Control Performance Problem

Description

NOTE:

- **If DTC P1122 is displayed with DTC P1121 or 1126, first perform the trouble diagnosis for DTC P1121 or P1126. Refer to EC-151 or EC-160.**

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc.

The throttle control motor is operated by the ECM and it opens and closes the throttle valve.

The current opening angle of the throttle valve is detected by the throttle position sensor and it provides feedback to the ECM to control the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

On Board Diagnosis Logic

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P1122 1122	Electric throttle control performance problem	Electric throttle control function does not operate properly.	• Harness or connectors (Throttle control motor circuit is open or shorted.) • Harness or connectors (Throttle control motor relay circuit is open or shorted.) • Electric throttle control actuator • Throttle control motor relay

Fail-Safe Mode

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Engine Operating Condition In Fail-Safe Mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 6.05 degrees) by the return spring.

DTC Confirmation Procedure

NOTE:

- **If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.**

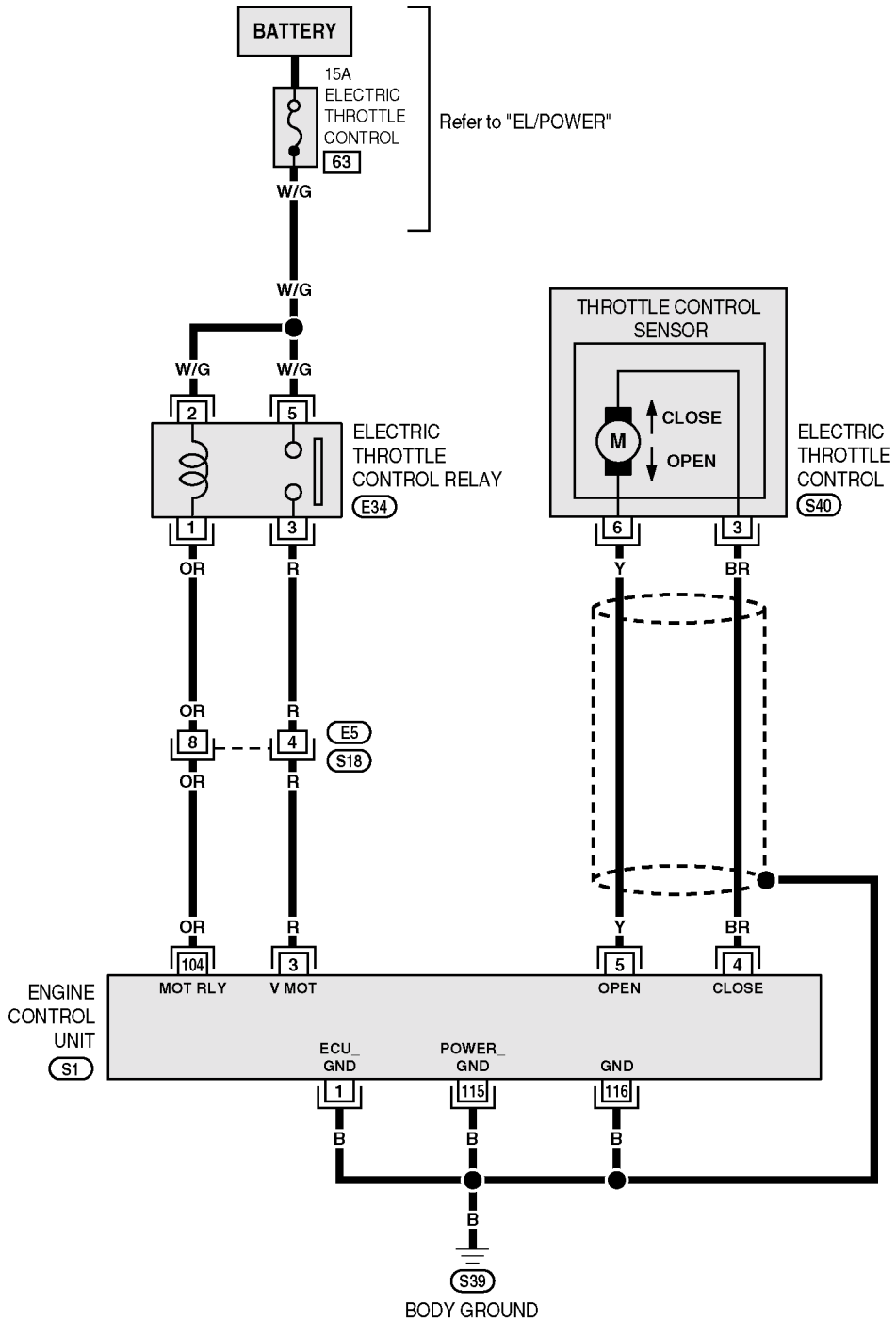
With CONSULT-II

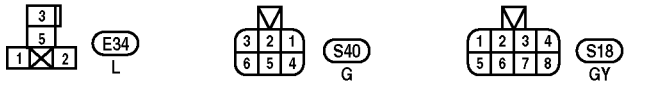
1. Turn ignition switch ON and wait at least 2 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 5 seconds.
4. If DTC is detected, go to EC-155, “Diagnostic Procedure”.

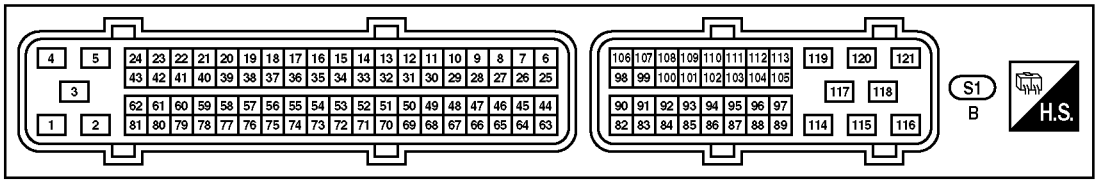
Without CONSULT-II

1. Turn ignition switch ON and wait at least 2 seconds.
2. Start engine and let it idle for 5 seconds.
3. Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
4. Perform Diagnostic Test Mode II (Self-diagnostic results) with ECM.
5. If DTC is detected, go to EC-155, “Diagnostic Procedure”.

Wiring Diagram







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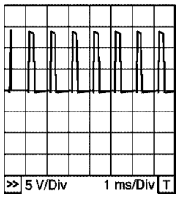
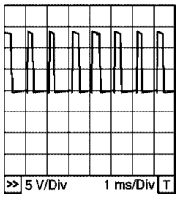
DTC P1122 Electric Throttle Control Performance Problem (Cont'd)

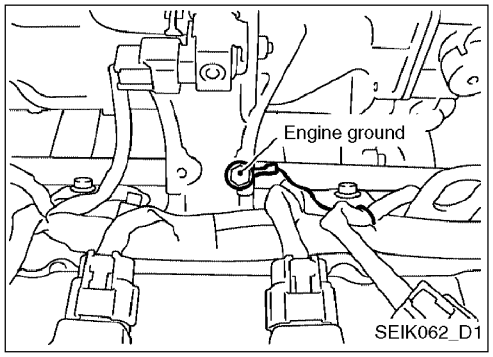
Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-II.

CAUTION:

- **Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

Terminal No.	Wire Color	Item	Condition	Data (DC Voltage)
3	R	Throttle control motor power supply	**[Ignition switch ON]**	BATTERY VOLTAGE (11 - 14 V)
4	BR	Throttle control motor (Close)	**[Ignition switch ON]** ● Engine stopped ● Shift lever position is D (A/T models) ● Shift lever position is 1st (M/T models) ● Accelerator pedal is releasing	0 - 14 V ★ 
5	Y	Throttle control motor (Open)	**[Ignition switch ON]** ● Engine stopped ● Shift lever position is D (A/T models) ● Shift lever position is 1st (M/T models) ● Accelerator pedal is depressing	0 - 14 V ★ 
104	GR	Throttle control motor relay	**[Ignition switch OFF]**	BATTERY VOLTAGE (11 - 14 V)
			[Ignition switch ON]	Approximately 0 V

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

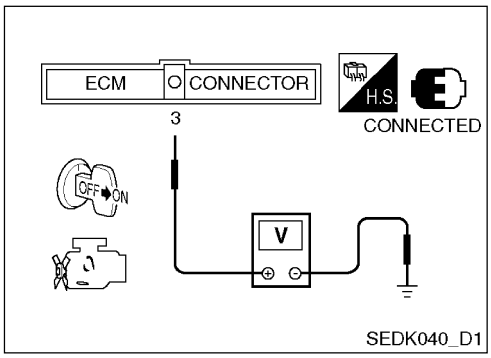


Diagnostic Procedure

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch OFF.
2. Loosen and retighten engine ground screws.
   >> GO TO 2.

DTC P1122 Electric Throttle Control Performance Problem (Cont'd)



2. CHECK THROTTLE CONTROL MOTOR RELAY SIGNAL CIRCUIT

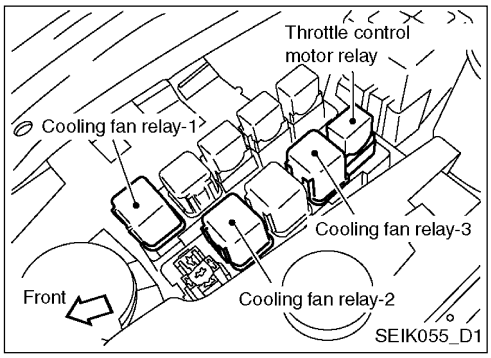
Check voltage between ECM terminal 3 and ground under the following conditions with CONSULT-II or tester.

Ignition switch	Voltage
OFF	Approximately 0 V
ON	Battery voltage (11 - 14 V)

OK or NG

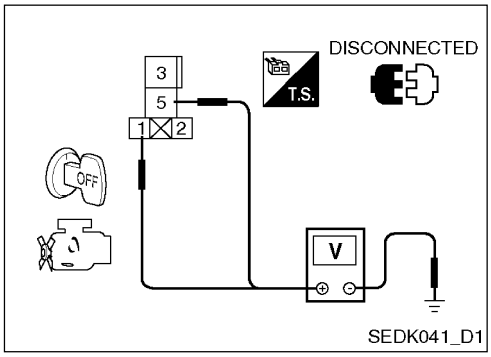
OK >> GO TO 10.

NG >> GO TO 3.



3. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect throttle control motor relay.



3. Check voltage between throttle control motor relay terminals 2, 5 and ground.

Voltage: Battery voltage

OK or NG

OK >> GO TO 5.

NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- 15A fuse
- Fusible link and fuse box connector
- Harness for open or short between throttle control motor relay and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

DTC P1122 Electric Throttle Control Performance Problem (Cont'd)

5. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 3 and throttle control motor relay terminal 3.
   Refer to Wiring Diagram.

   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.

NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E5, S18
- Harness for open or short between ECM and throttle control motor relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK THROTTLE CONTROL MOTOR RELAY OUTPUT SIGNAL CIRCUIT

1. Check continuity between ECM terminal 104 and throttle control motor relay terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.
2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.

NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E5, S18
- Harness for open or short between ECM and throttle control motor relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK THROTTLE CONTROL MOTOR RELAY

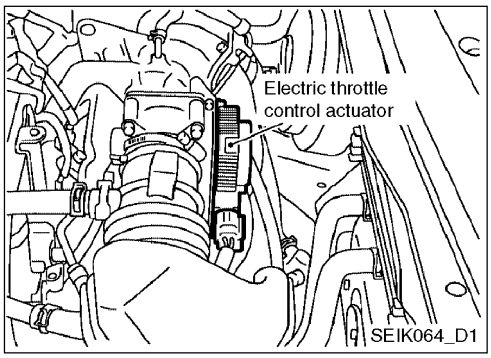
Refer to EC-159, "Component Inspection".

OK or NG

OK >> GO TO 13.

NG >> Replace throttle control motor relay.

DTC P1122 Electric Throttle Control Performance Problem (Cont'd)



10. CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Turn ignition switch OFF.
2. Disconnect electric throttle control actuator harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between the following terminals.

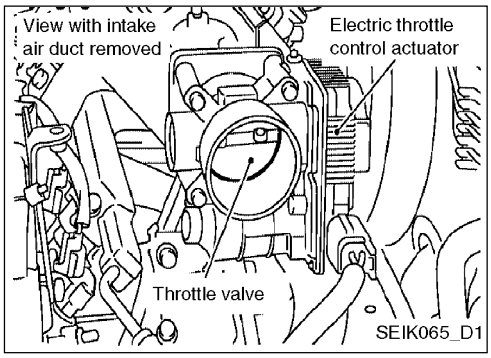
Electric throttle control actuator terminal	ECM terminal	Continuity
3	4	Should exist
	5	Should not exist
6	4	Should not exist
	5	Should exist

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 11.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.



11. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Remove the intake air duct.
2. Check if foreign matter is caught between the throttle valve and the housing.

OK or NG

OK >> GO TO 12.

NG >> Remove the foreign matter and clean the electric throttle control actuator inside.

12. CHECK THROTTLE CONTROL MOTOR

Refer to EC-159, "Component Inspection".

OK or NG

OK >> GO TO 13.

NG >> GO TO 14.

13. CHECK INTERMITTENT INCIDENT

Refer to EC-74, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".

OK or NG

OK >> GO TO 14.

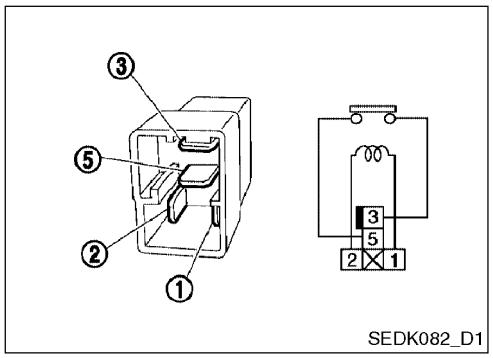
NG >> Repair or replace harness or connectors.

14. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-23, "Throttle Valve Closed Position Learning".
3. Perform EC-24, "Idle Air Volume Learning".

>> **INSPECTION END**

DTC P1122 Electric Throttle Control Performance Problem (Cont'd)



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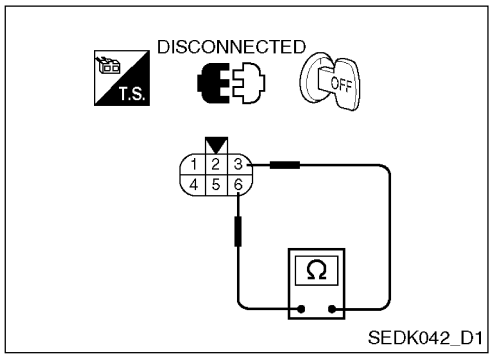
Component Inspection

THROTTLE CONTROL MOTOR RELAY

1. Apply 12V direct current between relay terminals 1 and 2.
2. Check continuity between throttle control motor relay terminals 3 and 5.

Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No

3. If NG, replace throttle control motor relay.



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Throttle Control Motor

1. Disconnect electric throttle control actuator harness connector.
2. Check resistance between throttle control motor terminals 3 and 6.
   Resistance: Approximately 1 - 15 Ω [at 25°C (77°F)]
3. If NG, replace electric throttle control actuator and go to next step.
4. Perform EC-23, "Throttle Valve Closed Position Learning".
5. Perform EC-24, "Idle Air Volume Learning".

Remove and Installation

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to "OUTOR COMPONENT PARTS" (QG16: EM-12).

DTC P1124, P1126 Throttle Control Motor Relay Circuit

Component Description

Power supply for the Throttle Control motor is provided to the ECM via throttle control motor relay. The throttle control motor relay is ON/OFF controlled by the ECM. When the ignition switch is turned ON, the ECM sends an ON signal to throttle control motor relay and battery voltage is provided to the ECM. When the ignition switch is turned OFF, the ECM sends an OFF signal to throttle control motor relay and battery voltage is not provided to the ECM.

CONSULT-II REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

Monitor Item	Condition	Specification
THRTL RELAY	● Ignition switch: ON	ON

On Board Diagnosis Logic

This Self-Diagnosis Has The One Trip Detection Logic.

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P1124 1124	Throttle control motor relay circuit short	ECM detect the throttle control motor relay is stuck ON.	● Harness or connectors (Throttle control motor relay circuit is shorted.) ● Throttle control motor relay
P1126 1126	Throttle control motor relay circuit open	ECM detects a voltage of power source for throttle control motor is excessively low.	● Harness or connectors (Throttle control motor relay circuit is open.) ● Throttle control motor relay

Fail-Safe Mode

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Engine Operating Condition In Fail-Safe Mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 6.05 degrees) by the return spring.

DTC Confirmation Procedure

NOTE:

- **If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.**

Procedure For DTC P1124

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

With CONSULT-II

1. Turn ignition switch ON and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. If DTC is detected, go to EC-163, “Diagnostic Procedure”.

DTC P1124, P1126 Throttle Control Motor Relay Circuit (Cont'd)

Without CONSULT-II

1. Turn ignition switch ON and wait at least 1 second.
2. Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
3. Perform Diagnostic Test Mode II (Self-diagnostic results) with ECM.
4. If DTC is detected, go to EC-163, "Diagnostic Procedure".

Procedure For DTC P1126

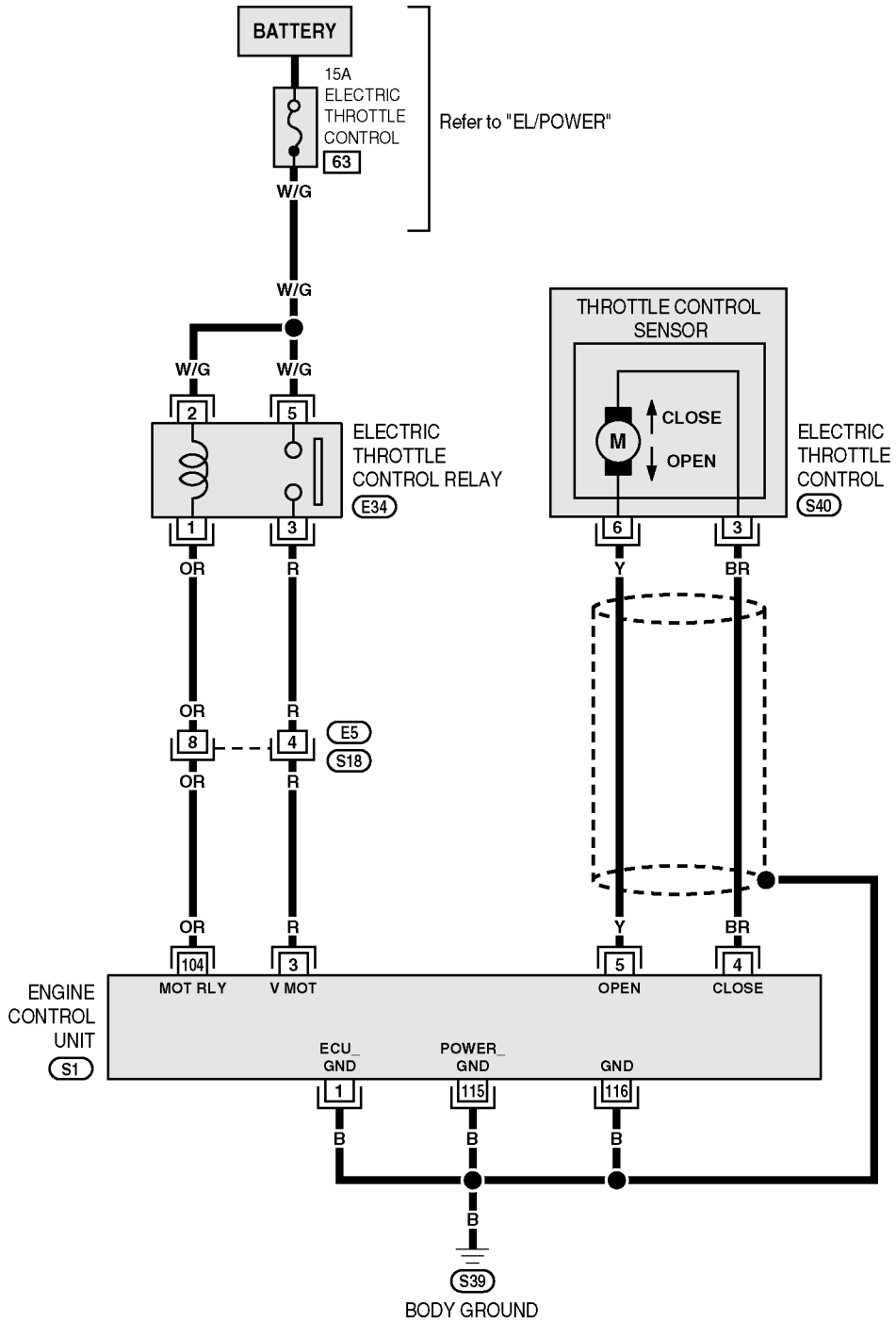
With CONSULT-II

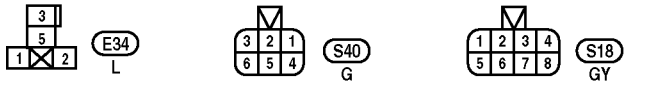
1. Turn ignition switch ON and wait at least 2 seconds.
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Start engine and let it idle for 5 seconds.
4. If DTC is detected, go to EC-163, "Diagnostic Procedure".

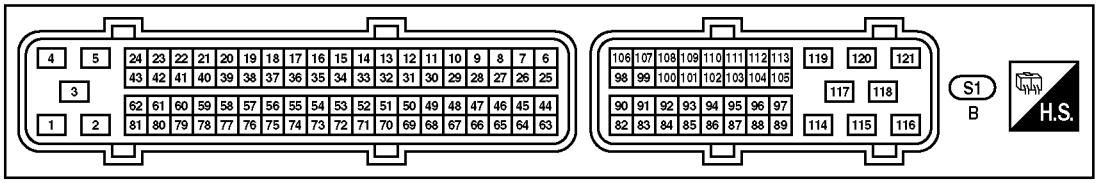
Without CONSULT-II

1. Turn ignition switch ON and wait at least 2 seconds.
2. Start engine and let it idle for 5 seconds.
3. Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
4. Perform Diagnostic Test Mode II (Self-diagnostic results) with ECM.
5. If DTC is detected, go to EC-163, "Diagnostic Procedure".

Wiring Diagram







SEWK010_D1

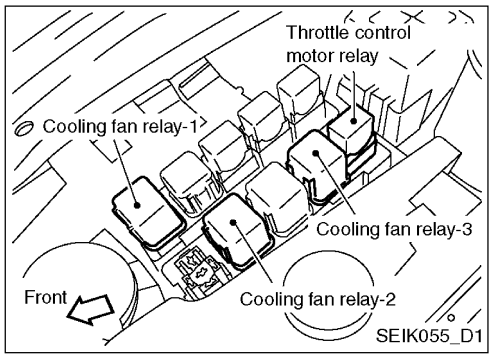
DTC P1124, P1126 Throttle Control Motor Relay Circuit (Cont'd)

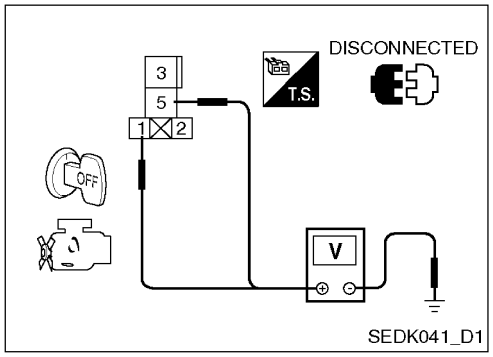
Specification data are reference values and are measured between each terminal and ground.

CAUTION:

- **Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

Terminal No.	Wire Color	Item	Condition	Data (DC Voltage)
104	OR	Throttle control motor relay	**[Ignition switch OFF]**	BATTERY VOLTAGE (11 - 14 V)
			[Ignition switch ON]	Approximately 0 V
3	R	Throttle control motor power supply	**[Ignition switch ON]**	BATTERY VOLTAGE (11 - 14 V)





Diagnostic Procedure

1. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect throttle control motor relay.
3. Check voltage between throttle control motor relay terminals 2, 5 and ground.

   Voltage: Battery voltage

OK or NG

OK >> GO TO 3.

NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- 15A fuse
- Fusible link and fuse box connector
- Harness for open or short between throttle control motor relay and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

DTC P1124, P1126 Throttle Control Motor Relay Circuit (Cont'd)

3. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 3 and throttle control motor relay terminal 3. Refer to Wiring Diagram.

   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.

NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E5, S18
- Harness for open or short between ECM and throttle control motor relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK THROTTLE CONTROL MOTOR RELAY OUTPUT SIGNAL CIRCUIT

1. Check continuity between ECM terminal 104 and throttle control motor relay terminal 1. Refer to Wiring Diagram.

   Continuity should exist.
2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.

NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E5, S18
- Harness for open or short between ECM and throttle control motor relay

>> Repair open circuit or short to ground short to power in harness or connectors.

7. CHECK THROTTLE CONTROL MOTOR RELAY

Refer to EC-165, "Component Inspection".

OK or NG

OK >> GO TO 8.

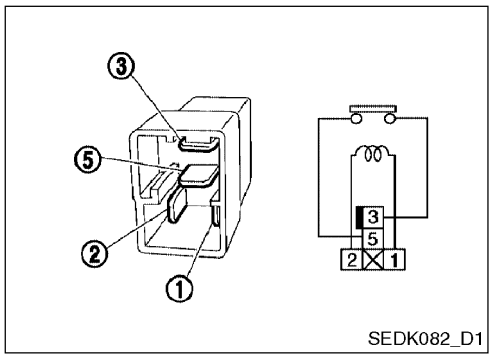
NG >> Replace throttle control motor relay.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-74, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".

>> **INSPECTION END**

DTC P1124, P1126 Throttle Control Motor Relay Circuit (Cont'd)



SEDK082_D1

Component Inspection

THROTTLE CONTROL MOTOR RELAY

1. Apply 12V direct current between relay terminals 1 and 2.
2. Check continuity between throttle control motor relay terminals 3 and 5.

Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No

3. If NG, replace throttle control motor relay.

DTC P1128 Throttle Control Motor Circuit short

Component Description

The throttle control motor is operated by the ECM and it opens and closes the throttle valve.

The current opening angle of the throttle valve is detected by the throttle position sensor and it provides feedback to the ECM to control the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

On Board Diagnosis Logic

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P1128 1128	Throttle control motor circuit short	ECM detects short both circuits between ECM and throttle control motor.	● Harness or connectors (Throttle control motor circuit is shorted.) ● Electric throttle control actuator (Throttle control motor)

Fail-Safe Mode

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Engine operating condition in fail-safe mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 6.05 degrees) by the return spring.

DTC Confirmation Procedure

NOTE:

- **If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.**

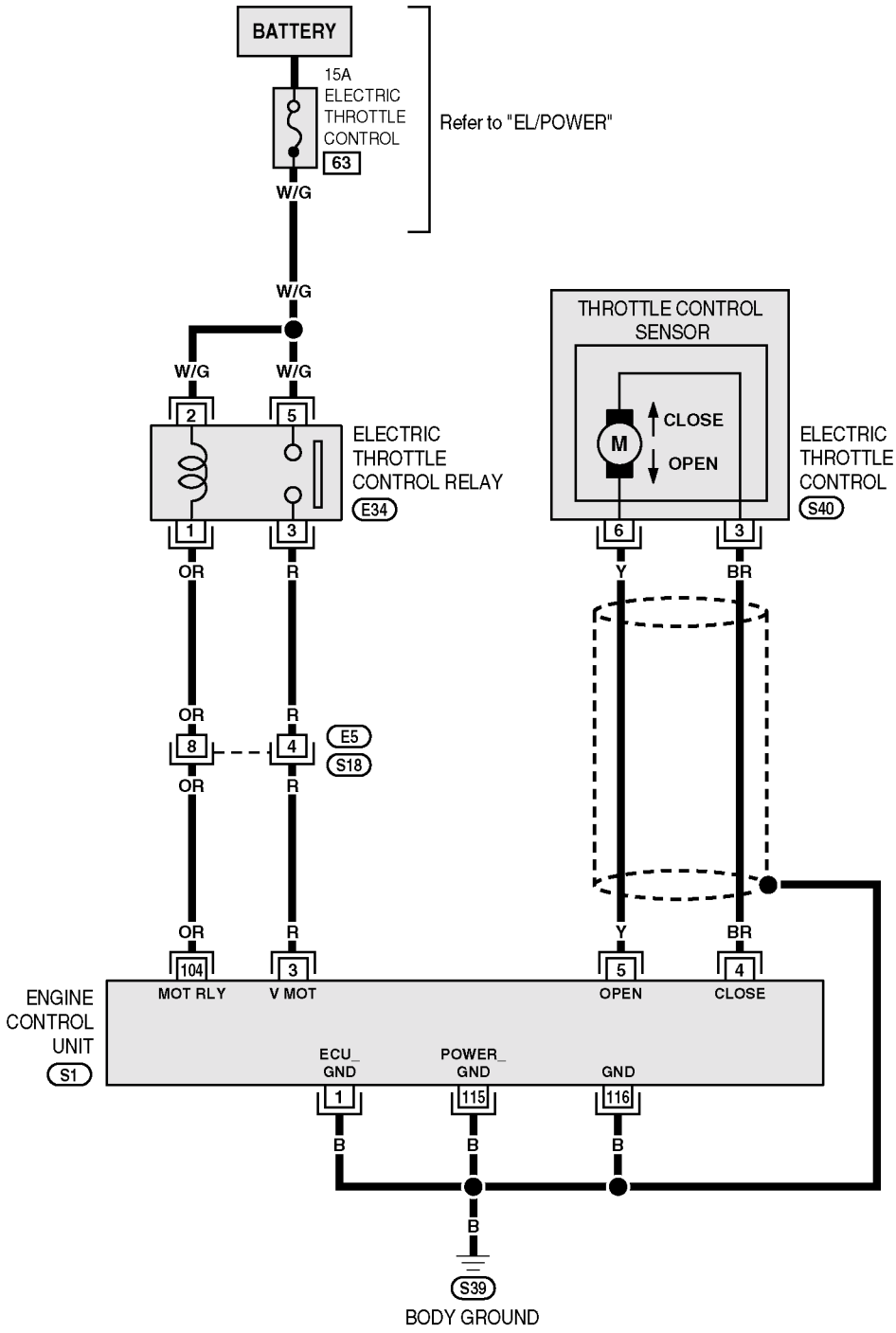
With CONSULT-II

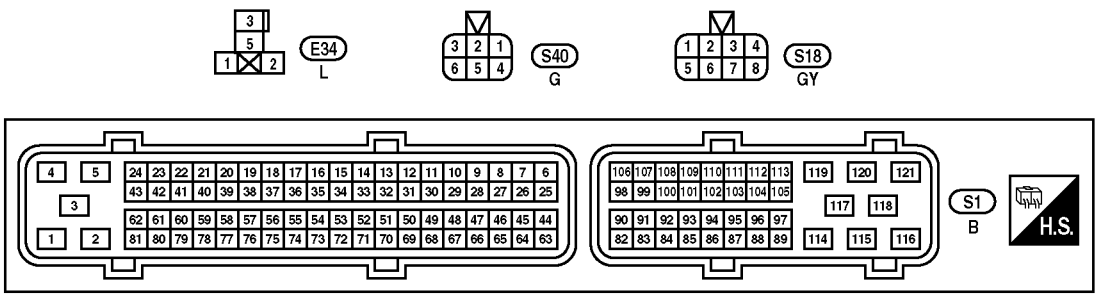
1. Turn ignition switch ON and wait at least 2 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 5 seconds.
4. If DTC is detected, go to EC-168, “Diagnostic Procedure”.

Without CONSULT-II

1. Turn ignition switch ON and wait at least 2 seconds.
2. Start engine and let it idle for 5 seconds.
3. Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
4. Perform Diagnostic Test Mode II (Self-diagnostic results) with ECM.
5. If DTC is detected, go to EC-168, “Diagnostic Procedure”.

Wiring Diagram





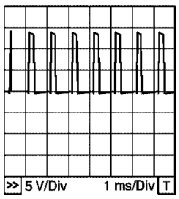
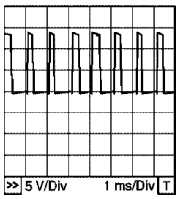
SEWK010_D1

DTC P1128 Throttle Control Motor Circuit short (Cont'd)

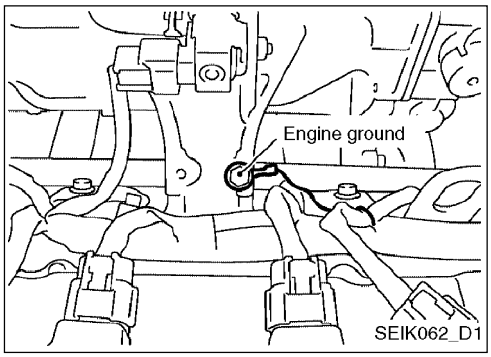
Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-II.

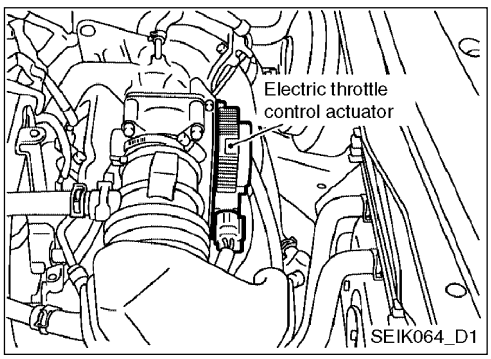
CAUTION:

- **Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

Terminal No.	Wire Color	Item	Condition	Data (DC Voltage)
4	BR	Throttle control motor (Close)	**[Ignition switch ON]** ● Engine stopped ● Shift lever position is D (A/T models) ● Shift lever position is 1st (M/T models) ● Accelerator pedal is releasing	0 - 14 V ★ 
5	Y	Throttle control motor (Open)	**[Ignition switch ON]** ● Engine stopped ● Shift lever position is D (A/T models) ● Shift lever position is 1st (M/T models) ● Accelerator pedal is depressing	0 - 14 V ★ 

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)





Diagnostic Procedure

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch OFF.
2. Loosen and retighten engine ground screws.
   >> GO TO 2.

2. CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Disconnect electric throttle control actuator harness connector.
2. Disconnect ECM harness connector.
3. Check harness continuity between the following terminals.

Electric throttle control actuator terminal	ECM terminal	Continuity
3	4	Should exist
	5	Should not exist
6	4	Should not exist
	5	Should exist

DTC P1128 Throttle Control Motor Circuit short (Cont'd)

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.

NG >> Repair open circuit or short to ground or short to power in harness connectors.

3. CHECK THROTTLE CONTROL MOTOR

Refer to EC-169, "Component Inspection".

OK or NG

OK >> GO TO 4.

NG >> GO TO 5.

4. CHECK INTERMITTENT INCIDENT

Refer to EC-74, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".

OK or NG

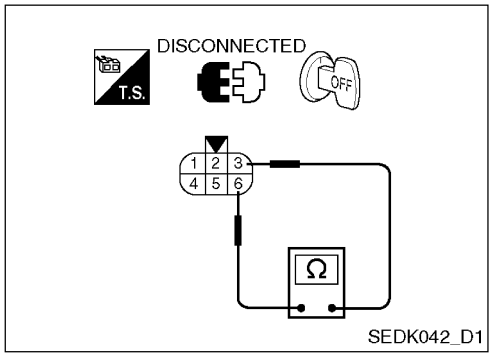
OK >> GO TO 5.

NG >> Repair or replace harness or connectors.

5. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-23, "Throttle Valve Closed Position Learning".
3. Perform EC-24, "Idle Air Volume Learning".

>> **INSPECTION END**



Component Inspection

THROTTLE CONTROL MOTOR

1. Disconnect electric throttle control actuator harness connector.
2. Check resistance between throttle control motor terminals 3 and 6.

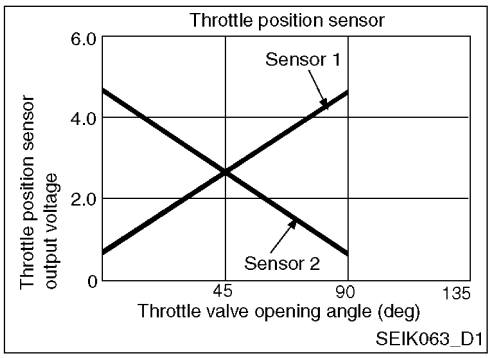
   Resistance:
   Approximately 1 - 15 Ω [at 25°C (77°F)]
3. If NG, replace electric throttle control actuator and go to next step.
4. Perform EC-23, "Throttle Valve Closed Position Learning".
5. Perform EC-24, "Idle Air Volume Learning".

Remove and Installation

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to "OUTOR COMPONENT PARTS" (QG16: EM-12).

DTC P1225 Closed Throttle Position Learning Performance Problem



Component Description

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

On Board Diagnosis Logic

The MIL will not light up for this diagnosis.

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P1225 1225	Closed throttle position learning performance problem	Closed throttle position learning value is excessively low.	● Electric throttle control actuator (Throttle position sensor 1 and 2)

DTC Confirmation Procedure

NOTE:

- **If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.**

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

With CONSULT-II

1. Turn ignition switch ON.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Turn ignition switch OFF, wait at least 10 seconds.
4. Turn ignition switch ON.
5. If 1st trip DTC is detected, go to EC-171, “Diagnostic Procedure”.

Without CONSULT-II

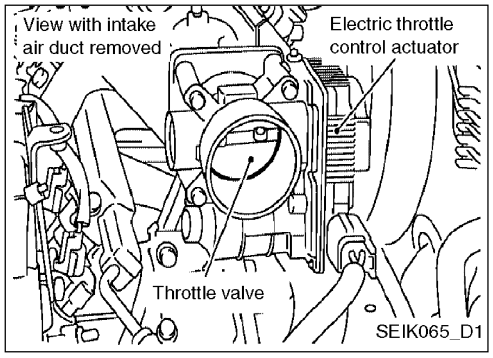
1. Turn ignition switch ON.
2. Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
3. Perform Diagnostic Test Mode II (Self-diagnostic results) with ECM.
4. If 1st trip DTC is detected, go to EC-171, “Diagnostic Procedure”.

DTC P1225 Closed Throttle Position Learning Performance Problem (Cont'd)

Diagnostic Procedure

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch OFF.
2. Remove the intake air duct.



3. Check if foreign matter is caught between the throttle valve and the housing.

OK or NG

OK >> GO TO 2.

NG >> Remove the foreign matter and clean the electric throttle control actuator inside.

2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-23, "Throttle Valve Closed Position Learning".
3. Perform EC-24, "Idle Air Volume Learning".

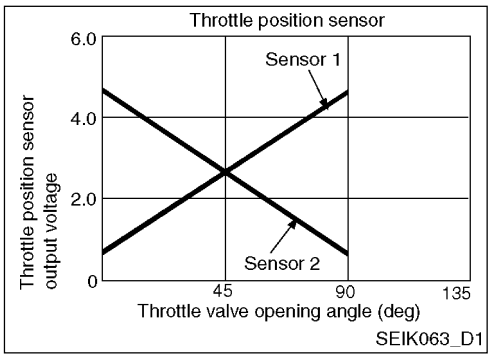
>> **INSPECTION END**

Remove and Installation

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to "OUTOR COMPONENT PARTS" (QG16: EM-12).

DTC P1226 Closed Throttle Position Learning Performance Problem



Component Description

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

On Board Diagnosis Logic

The MIL will not light up for this diagnosis.

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P1226 1226	Closed throttle position learning performance problem	Closed throttle position learning is not performed successfully, repeatedly.	● Electric throttle control actuator (TP sensor 1 and 2)

DTC Confirmation Procedure

NOTE:

- **If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.**

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

With CONSULT-II

1. Turn ignition switch ON.
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Turn ignition switch OFF, wait at least 10 seconds.
4. Turn ignition switch ON.
5. Repeat steps 3 and 4 for 32 times.
6. If 1st trip DTC is detected, go to EC-173, "Diagnostic Procedure".

Without CONSULT-II

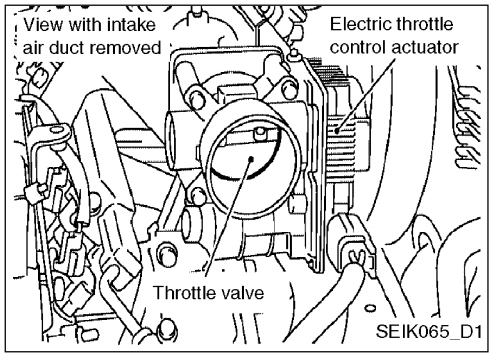
1. Turn ignition switch ON.
2. Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
3. Repeat step 2 for 32 times.
4. Perform Diagnostic Test Mode II (Self-diagnostic results) with ECM.
5. If 1st trip DTC is detected, go to EC-173, "Diagnostic Procedure".

DTC P1226 Closed Throttle Position Learning Performance Problem (Cont'd)

Diagnostic Procedure

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch OFF.
2. Remove the intake air duct.



3. Check if foreign matter is caught between the throttle valve and the housing.

OK or NG

OK >> GO TO 2.

NG >> Remove the foreign matter and clean the electric throttle control actuator inside.

2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-23, "Throttle Valve Closed Position Learning".
3. Perform EC-24, "Idle Air Volume Learning".

>> **INSPECTION END**

Remove and Installation

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to "OUTOR COMPONENT PARTS" (QG16: EM-12).

DTC P1229 Sensor Power Supply Circuit Short

On Board Diagnosis Logic

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P1229 1229	Sensor power supply circuit short	ECM detects a voltage of power source for sensor is excessively low or high.	● Harness or connectors (The TP sensor 1 and 2 circuit is shorted.) ● Electric throttle control actuator (TP sensor 1 and 2)

Fail-Safe Mode

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Engine Operation Condition In Fail-Safe Mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

DTC Confirmation Procedure

NOTE:

- **If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.**

TESTING CONDITION:

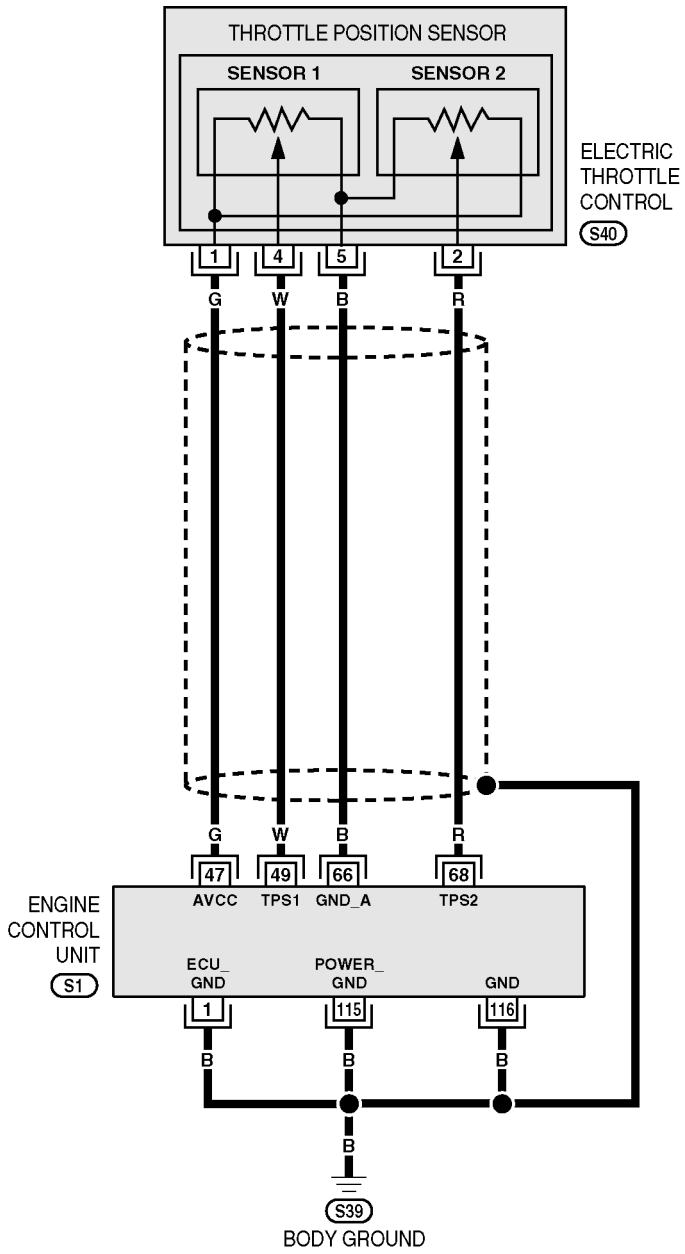
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

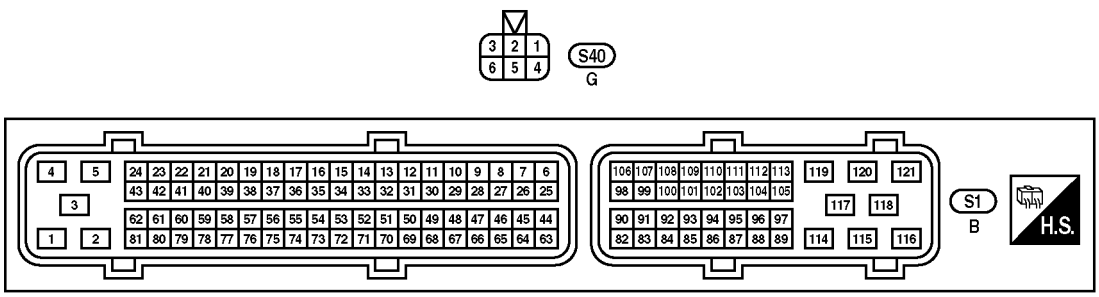
With CONSULT-II

1. Turn ignition switch ON.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-176, “Diagnostic Procedure”.

Without CONSULT-II

1. Start engine and let it idle for 1 seconds.
2. Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
3. Perform Diagnostic Test Mode II (Self-diagnostic results) with ECM.
4. If DTC is detected, go to EC-176, “Diagnostic Procedure”.


THROTTLE POSITION SENSOR
SENSOR 1
SENSOR 2
ELECTRIC
THROTTLE
CONTROL
S40
1
4
5
2
G
W
B
R
47
49
66
68
AVCC
TPS1
GND_A
TPS2
ENGINE
CONTROL
UNIT
S1
ECU_
GND
POWER_
GND
GND
1
115
116
S39
BODY GROUND


S40
G
S1
B
H.S.

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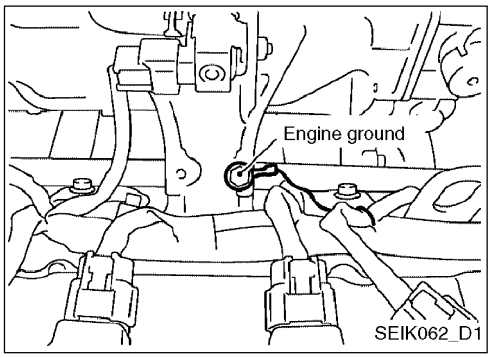
DTC P1229 Sensor Power Supply Circuit Short (Cont'd)

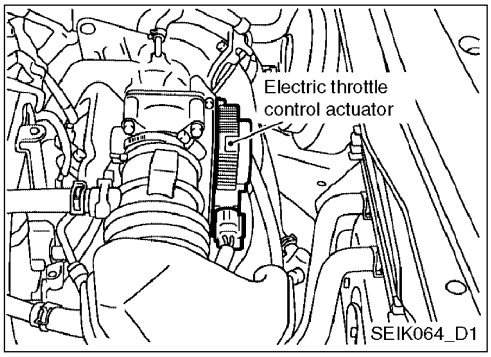
Specification data are reference values and are measured between each terminal and ground.

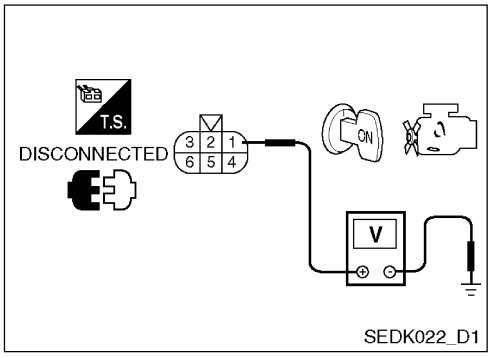
CAUTION:

- **Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

Terminal No.	Wire Color	Item	Condition	Data (DC Voltage)
47	G	Throttle position sensor power supply	**[Ignition switch ON]**	Approximately 5 V







Diagnostic Procedure

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch OFF.
2. Loosen and retighten engine ground screws.

   >> GO TO 2.

2. CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch ON.
3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-II or tester.

   Voltage: Approximately 5 V

OK or NG

OK >> GO TO 4.

NG >> GO TO 3.

DTC P1229 Sensor Power Supply Circuit Short (Cont'd)

3. CHECK SENSOR POWER SUPPLY CIRCUITS FOR SHORT

Check the following.

- Harness for short to power and short to ground between ECM terminal 47 and electric throttle control actuator terminal 1.
- ECM pin terminal.

OK or NG

OK >> GO TO 4.

NG >> Repair short to ground or short to power in harness or connectors.

4. CHECK THROTTLE POSITION SENSOR

Refer to EC-169, "Component Inspection".

OK or NG

OK >> GO TO 6.

NG >> GO TO 5.

5. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.
2. Perform EC-23, "Throttle Valve Closed Position Learning".
3. Perform EC-24, "Idle Air Volume Learning".

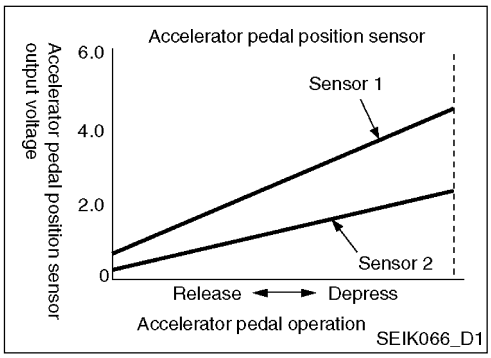
>> **INSPECTION END**

6. CHECK INTERMITTENT INCIDENT

Refer to EC-74, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".

>> **INSPECTION END**

DTC P2122, P2123 Accel Sensor - 1



Component Description

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.

Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM.

In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.

Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.

CONSULT-II REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

Monitor Item	Condition		Specification
ACCEL SEN1	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.5 - 1.0 V
		Accelerator pedal: Fully depressed	4.0 - 4.8 V
ACCEL SEN2	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.3 - 1.2 V
		Accelerator pedal: Fully depressed	3.9 - 4.8 V
CLSD THL POS	● Ignition switch: ON	Accelerator pedal: Fully released	ON
		Accelerator pedal: Fully depressed	OFF

* : Accelerator pedal position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

On Board Diagnosis Logic

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P2122	Accelerator pedal position sensor 1 circuit low input	An excessively low voltage from the accelerator pedal position sensor 1 is sent to ECM.	● Harness or connectors (The accelerator pedal position sensor 1 circuit is open or shorted.)
P2123	Accelerator pedal position sensor 1 circuit high input	An excessively high voltage from the accelerator pedal position sensor 1 is sent to ECM.	● Accelerator pedal position sensor (Accelerator pedal position sensor 1)

Fail-Safe Mode

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Engine Operating Condition In Fail-Safe Mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.
The ECM regulates the opening speed of throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC P2122, P2123 Accel Sensor - 1 (Cont'd)

DTC Confirmation Procedure

NOTE:

- **If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.**

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

With CONSULT-II

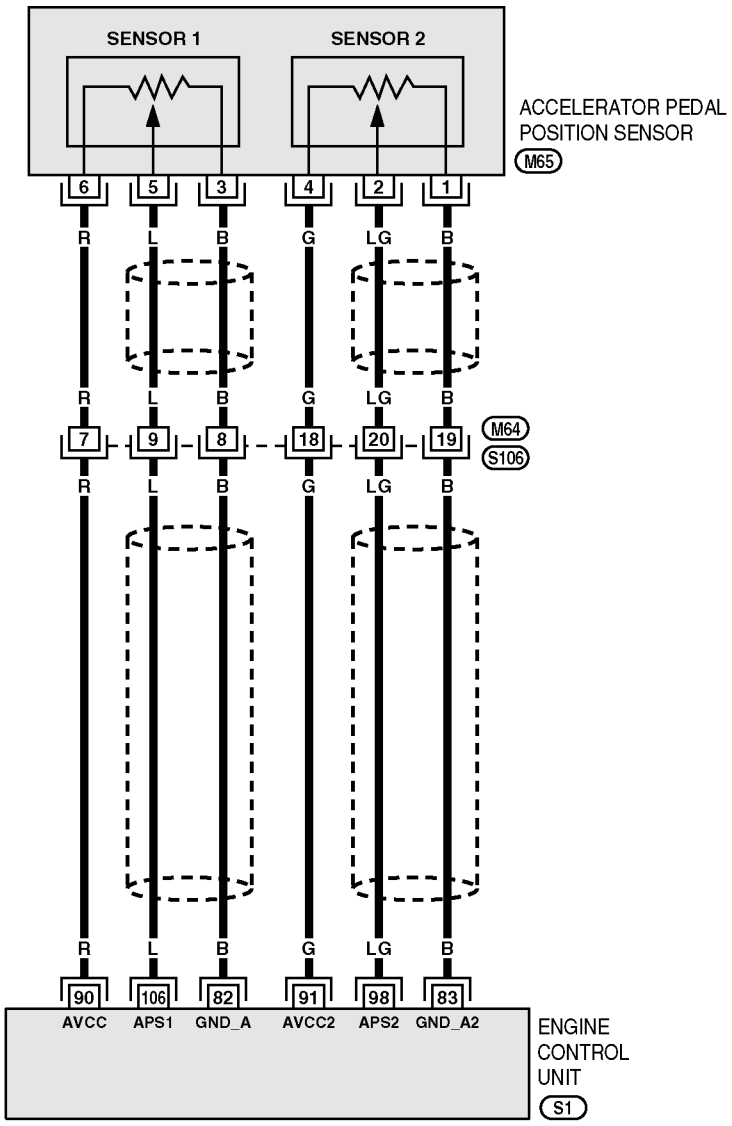
1. Turn ignition switch ON.
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-181, "Diagnostic Procedure".

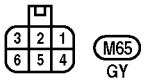
Without CONSULT-II

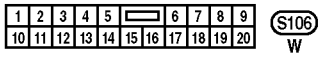
1. Start engine and let it idle for 1 second.
2. Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
3. Perform Diagnostic Test Mode II (Self-diagnostic results) with ECM.
4. If DTC is detected, go to EC-181, "Diagnostic Procedure".

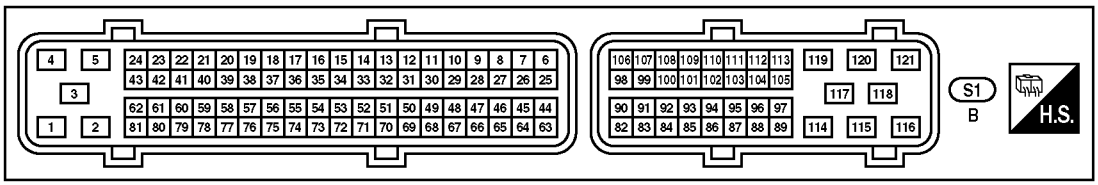
Wiring Diagram

EC/AWJ









SEWK011_D1

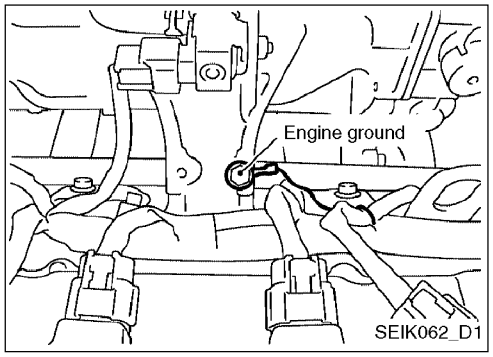
DTC P2122, P2123 Accel Sensor - 1 (Cont'd)

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

- **Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

Terminal No.	Wire Color	Item	Condition	Data (DC Voltage)
82	B	Sensor ground (Accelerator pedal position sensor 1)	**[Engine is running]** ● Warm-up condition ● Idle speed	Approximately 0 V
83	B	Sensor ground (Accelerator pedal position sensor 2)	**[Ignition switch ON]**	Approximately 0 V
90	R	Sensor power supply (Accelerator pedal position sensor 1)	**[Ignition switch ON]**	Approximately 5 V
91	G	Sensor power supply (Accelerator pedal position sensor 2)	**[Ignition switch ON]**	Approximately 5 V
98	LG	Accelerator pedal position sensor 2	**[Ignition switch ON]** ● Engine stopped ● Accelerator pedal fully released	0.15 - 0.6 V
			[Ignition switch ON] ● Engine stopped ● Accelerator pedal fully depressed	1.95 - 2.4 V
106	L	Accelerator pedal position sensor 1	**[Ignition switch ON]** ● Engine stopped ● Accelerator pedal fully released	0.5 - 1.0 V
			[Ignition switch ON] ● Engine stopped ● Accelerator pedal fully depressed	3.9 - 4.7 V



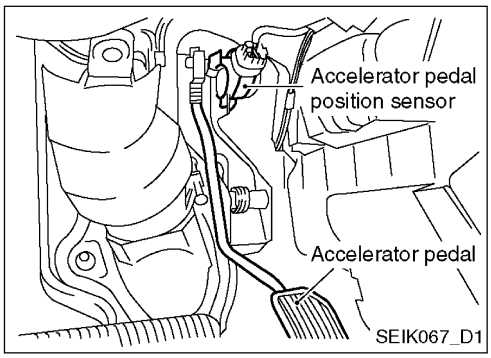
Diagnostic Procedure

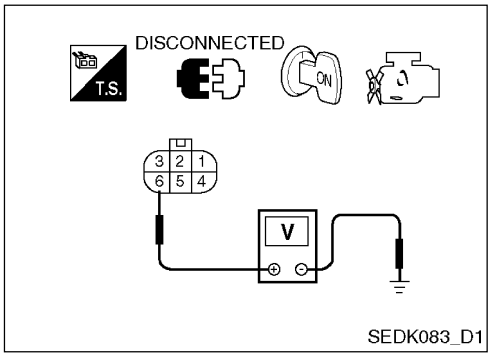
1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch OFF.
2. Loosen and retighten engine ground screws.

>> GO TO 2.

DTC P2122, P2123 Accel Sensor - 1 (Cont'd)





2. CHECK ACCELERATOR PEDAL POSITION SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch ON.
3. Check voltage between accelerator pedal position sensor terminal 6 and ground with CONSULT-II or tester.

   Voltage: Approximately 5V

OK or NG

OK >> GO TO 4.

NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check to following.

- Harness connectors M64, S106
- Harness for open or short between accelerator pedal position sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK ACCELERATOR PEDAL POSITION SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Disconnect TCM harness connector.
4. Check harness continuity between accelerator pedal position sensor terminal 3 and ECM terminal 82, TCM terminal 42. Refer to Wiring Diagram.

   Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.

NG >> GO TO 5.

DTC P2122, P2123 Accel Sensor - 1 (Cont'd)

5. DETECT MALFUNCTIONING PART

Check to following.

- Harness connectors M64, S106
- Harness for open or short between accelerator pedal position sensor and ECM
- Harness for open or short between accelerator pedal position sensor and TCM

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK ACCELERATOR PEDAL POSITION SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 106 and accelerator pedal position sensor terminal 5.
   Refer to Wiring Diagram.
   Continuity should exist.
2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check to following.

- Harness connectors M64, S106
- Harness for open or short between accelerator pedal position sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK ACCELERATOR PEDAL POSITION SENSOR

Refer to EC-184, "Component Inspection".

OK or NG

OK >> GO TO 10.
NG >> GO TO 9.

9. REPLACE ACCELERATOR PEDAL POSITION SENSOR

1. Replace the accelerator pedal position sensor.
2. Perform EC-23, "Accelerator Pedal Released Position Learning".
3. Perform EC-23, "Throttle Valve Closed Position Learning".
4. Perform EC-24, "Idle Air Volume Learning".

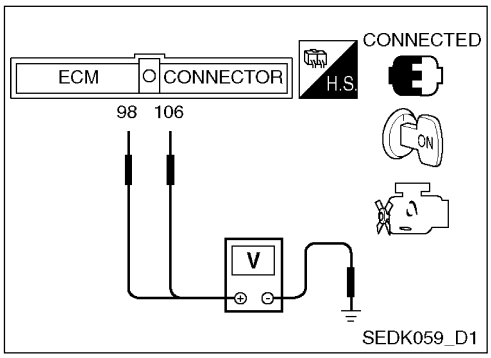
>> **INSPECTION END**

10. CHECK INTERMITTENT INCIDENT

Refer to EC-74, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".

>> **INSPECTION END**

DTC P2122, P2123 Accel Sensor - 1 (Cont'd)



Component Inspection

ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch ON.
3. Check voltage between ECM terminals 106 (accelerator pedal position sensor 1 signal), 98 (accelerator pedal position sensor 2 signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
106 (Accelerator pedal position sensor 1)	Fully released	0.5 - 1.0 V
	Fully depressed	3.9 - 4.7 V
98 (Accelerator pedal position sensor 2)	Fully released	0.15 - 0.6 V
	Fully depressed	1.95 - 2.4 V

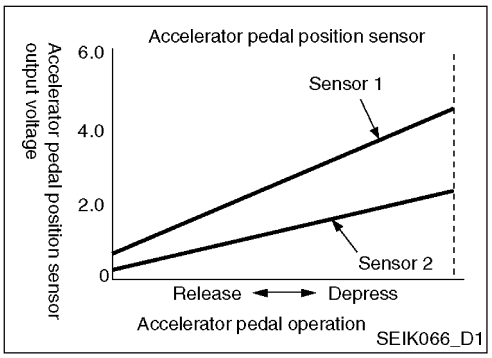
4. If NG, replace accelerator pedal assembly and go to the next step.
5. Perform EC-23, "Accelerator Pedal Released Position Learning".
6. Perform EC-23, "Throttle Valve Closed Position Learning".
7. Perform EC-24, "Idle Air Volume Learning".

Remove and Installation

ACCELERATOR PEDAL

Refer to "ACCELERATOR CONTROL SYSTEM" (QG16: FE-3).

DTC P2127, P2128 Accel Sensor - 2



Component Description

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.

Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM.

In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.

Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.

CONSULT-II REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

Monitor Item	Condition		Specification
ACCEL SEN1	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.5 - 1.0 V
		Accelerator pedal: Fully depressed	4.0 - 4.8 V
ACCEL SEN2	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.3 - 1.2 V
		Accelerator pedal: Fully depressed	3.9 - 4.8 V
CLSD THL POS	● Ignition switch: ON	Accelerator pedal: Fully released	ON
		Accelerator pedal: Fully depressed	OFF

* : Accelerator pedal position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

On Board Diagnosis Logic

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P2127 2127	Accelerator pedal position sensor 2 circuit low input	An excessively low voltage from the accelerator pedal position sensor 2 is sent to ECM.	● Harness or connectors (The accelerator pedal position sensor 2 circuit is open or shorted.)
P2128 2128	Accelerator pedal position sensor 2 circuit high input	An excessively high voltage from the accelerator pedal position sensor 2 is sent to ECM.	● Accelerator pedal position sensor (Accelerator pedal position sensor 2)

Fail-Safe Mode

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Engine Operating Condition In Fail-Safe Mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.
The ECM regulates the opening speed of throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC P2127, P2128 Accel Sensor - 2 (Cont'd)

DTC Confirmation Procedure

NOTE:

- **If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.**

TESTING CONDITION:

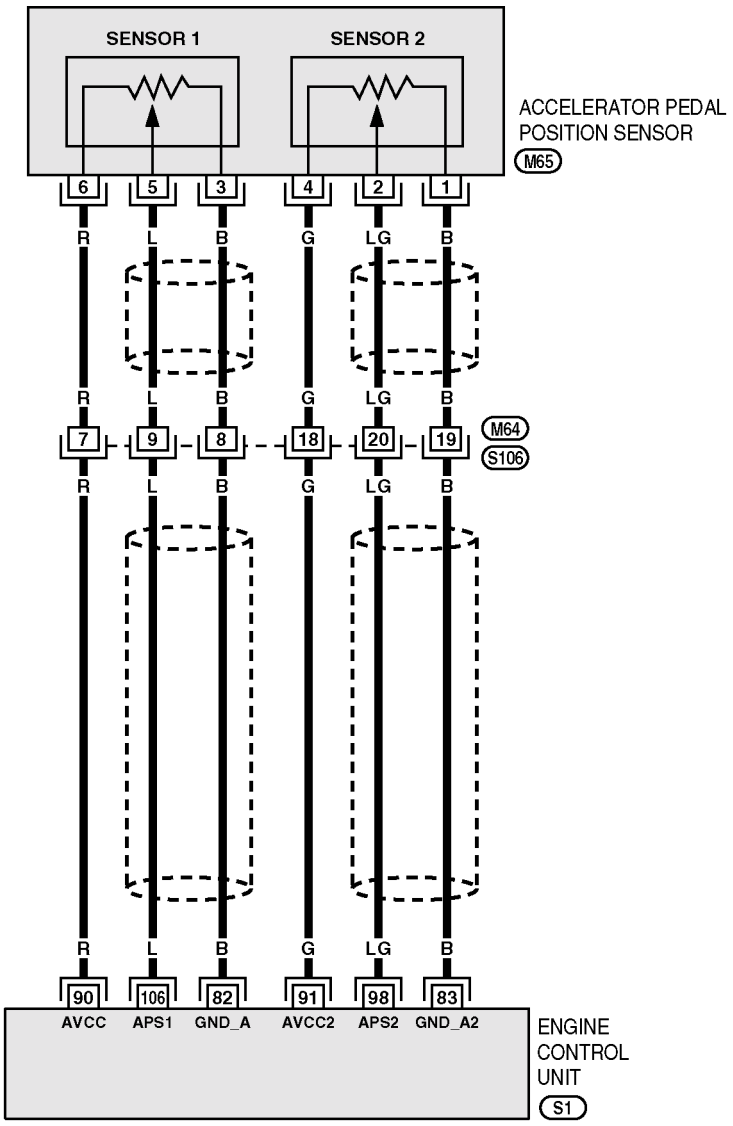
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

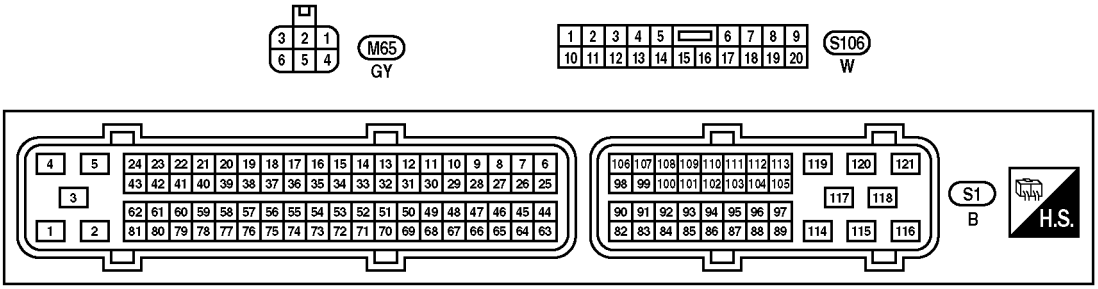
With CONSULT-II

1. Turn ignition switch ON.
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-188, "Diagnostic Procedure".

Without CONSULT-II

1. Start engine and let it idle for 1 second.
2. Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
3. Perform Diagnostic Test Mode II (Self-diagnostic results) with ECM.
4. If DTC is detected, go to EC-188, "Diagnostic Procedure".


SENSOR 1
SENSOR 2
ACCELERATOR PEDAL POSITION SENSOR
M65
6 5 3 4 2 1
R L B G LG B
7 9 8 18 20 19
M64
S106
90 106 82 91 98 83
AVCC APS1 GND_A AVCC2 APS2 GND_A2
ENGINE CONTROL UNIT
S1


M65
GY
S106
W
S1
B
H.S.

SEWK011_D1

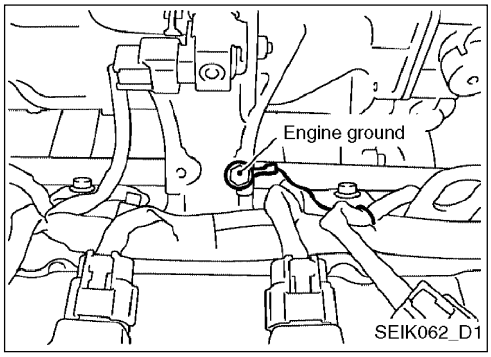
DTC P2127, P2128 Accel Sensor - 2 (Cont'd)

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

- **Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

Terminal No.	Wire Color	Item	Condition	Data (DC Voltage)
82	B	Sensor ground (Accelerator pedal position sensor 1)	**[Engine is running]** ● Warm-up condition ● Idle speed	Approximately 0 V
83	B	Sensor ground (Accelerator pedal position sensor 2)	**[Ignition switch ON]**	Approximately 0 V
90	R	Sensor power supply (Accelerator pedal position sensor 1)	**[Ignition switch ON]**	Approximately 5 V
91	G	Sensor power supply (Accelerator pedal position sensor 2)	**[Ignition switch ON]**	Approximately 5 V
98	LG	Accelerator pedal position sensor 2	**[Ignition switch ON]** ● Engine stopped ● Accelerator pedal fully released	0.15 - 0.6 V
			[Ignition switch ON] ● Engine stopped ● Accelerator pedal fully depressed	1.95 - 2.4 V
106	L	Accelerator pedal position sensor 1	**[Ignition switch ON]** ● Engine stopped ● Accelerator pedal fully released	0.5 - 1.0 V
			[Ignition switch ON] ● Engine stopped ● Accelerator pedal fully depressed	3.9 - 4.7 V

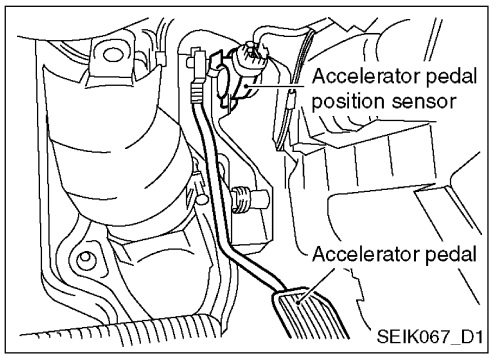


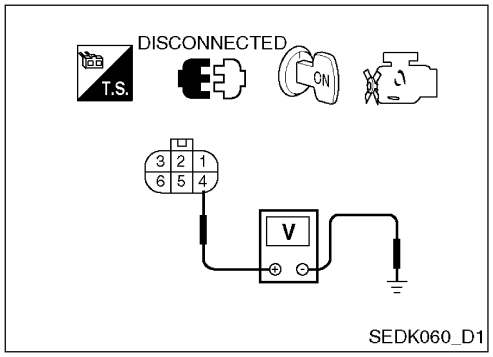
Diagnostic Procedure

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch OFF.
2. Loosen and retighten engine ground screws.
   >> GO TO 2.

DTC P2127, P2128 Accel Sensor - 2 (Cont'd)





2. CHECK ACCELERATOR PEDAL POSITION SENSOR 2 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch ON.
3. Check voltage between accelerator pedal position sensor terminal 4 and ground with CONSULT-II or tester.

   Voltage: Approximately 5V

OK or NG

OK >> GO TO 4.

NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check to following.

- Harness connectors M64, S106
- Harness for open or short between accelerator pedal position sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK ACCELERATOR PEDAL POSITION SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between accelerator pedal position sensor terminal 1 and ECM terminal 83. Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.

NG >> GO TO 5.

DTC P2127, P2128 Accel Sensor - 2 (Cont'd)

5. DETECT MALFUNCTIONING PART

Check to following.

- Harness connectors M64, S106
- Harness for open or short between accelerator pedal position sensor and ECM
- Harness for open or short between accelerator pedal position sensor and TCM

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK ACCELERATOR PEDAL POSITION SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 98 and accelerator pedal position sensor terminal 2.

   Refer to Wiring Diagram.

   Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.

NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check to following.

- Harness connectors M64, S106
- Harness for open or short between accelerator pedal position sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK ACCELERATOR PEDAL POSITION SENSOR

Refer to EC-191, "Component Inspection".

OK or NG

OK >> GO TO 10.

NG >> GO TO 9.

9. REPLACE ACCELERATOR PEDAL POSITION SENSOR

1. Replace the accelerator pedal position sensor.
2. Perform EC-23, "Accelerator Pedal Released Position Learning".
3. Perform EC-23, "Throttle Valve Closed Position Learning".
4. Perform EC-24, "Idle Air Volume Learning".

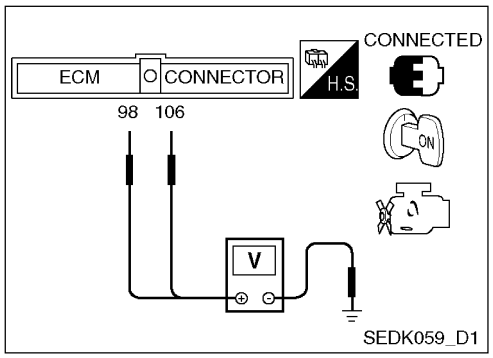
>> **INSPECTION END**

10. CHECK INTERMITTENT INCIDENT

Refer to EC-74, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".

>> **INSPECTION END**

DTC P2127, P2128 Accel Sensor - 2 (Cont'd)



Component Inspection

ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch ON.
3. Check voltage between ECM terminals 106 (accelerator pedal position sensor 1 signal), 98 (accelerator pedal position sensor 2 signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
106 (Accelerator pedal position sensor 1)	Fully released	0.5 - 1.0 V
	Fully depressed	3.9 - 4.7 V
98 (Accelerator pedal position sensor 2)	Fully released	0.15 - 0.6 V
	Fully depressed	1.95 - 2.4 V

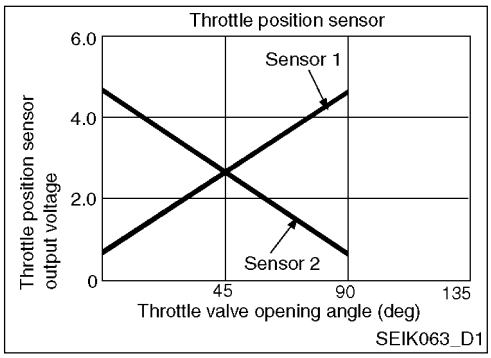
4. If NG, replace accelerator pedal assembly and go to the next step.
5. Perform EC-23, "Accelerator Pedal Released Position Learning".
6. Perform EC-23, "Throttle Valve Closed Position Learning".
7. Perform EC-24, "Idle Air Volume Learning".

Remove and Installation

ACCELERATOR PEDAL

Refer to "ACCELERATOR CONTROL SYSTEM" (QG16: FE-3).

DTC P2135 Throttle Sensor Signal Discordance Problem



Component Description

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

CONSULT-II REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

Monitor Item	Condition		Specification
THRTL SEN1	● Ignition switch: ON (Engine stopped)	Accelerator pedal: Fully released	More than 0.36V
THRTL SEN2*	● Shift lever: D (A/T models) 1st (M/T models)	Accelerator pedal: Fully depressed	Less than 4.75V

*: Throttle position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

On Board Diagnosis Logic

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P2135 2135	Throttle position sensor circuit range/performance problem	Rationally incorrect voltage is sent to ECM compared with the signals from TP sensor 1 and TP sensor 2.	● Harness or connector (The TP sensor 1 and 2 circuit is open or shorted.) ● Electric throttle control actuator (TP sensor 1 and 2)

Fail-Safe Mode

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Engine Operation Condition In Fail-Safe Mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

NOTE:

- **If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.**

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

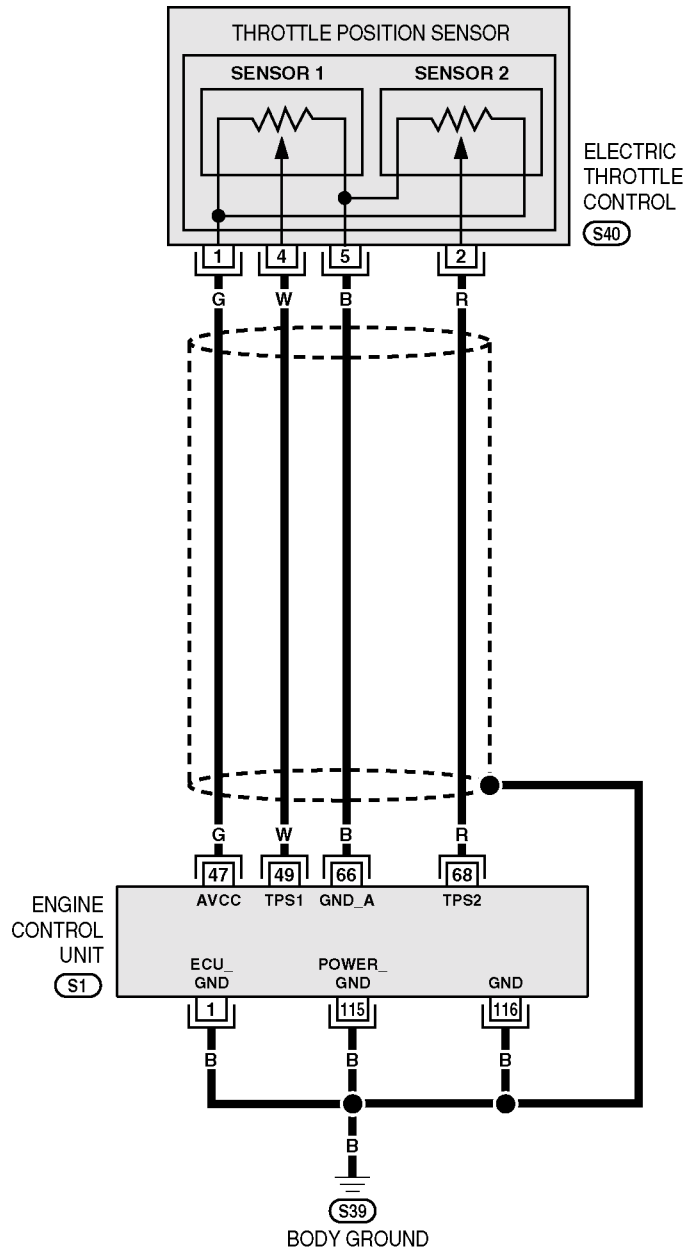
DTC P2135 Throttle Sensor Signal Discordance Problem (Cont'd)

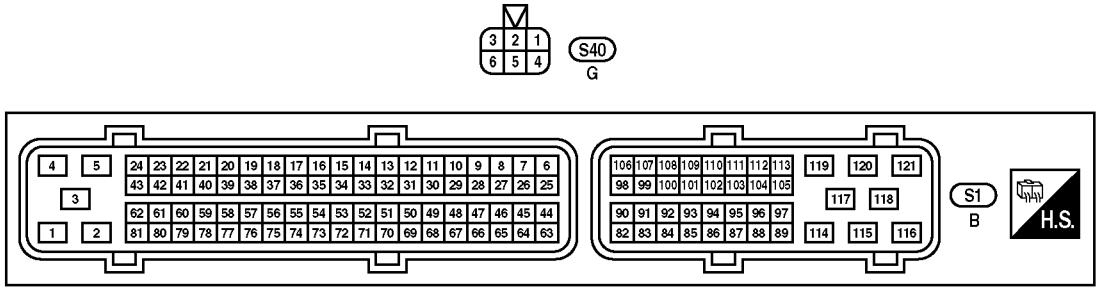
With CONSULT-II

1. Turn ignition switch ON.
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-195, "Diagnostic Procedure".

Without CONSULT-II

1. Start engine and let it idle for 1 second.
2. Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
3. Perform Diagnostic Test Mode II (Self-diagnostic results) with ECM.
4. If DTC is detected, go to EC-195, "Diagnostic Procedure".


THROTTLE POSITION SENSOR
SENSOR 1
SENSOR 2
ELECTRIC
THROTTLE
CONTROL
S40
1
4
5
2
G
W
B
R
G
W
B
R
47
49
66
68
AVCC
TPS1
GND_A
TPS2
ENGINE
CONTROL
UNIT
S1
ECU_
GND
POWER_
GND
GND
1
115
116
B
B
B
B
S39
BODY GROUND


3 2 1
6 5 4
S40
G
4 5
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24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6
43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25
62 61 60 59 58 57 56 55 54 53 52 51 50 49 48 47 46 45 44
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98 99 100 101 102 103 104 105
119 120 121
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90 91 92 93 94 95 96 97
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114 115 116
S1
B
H.S.

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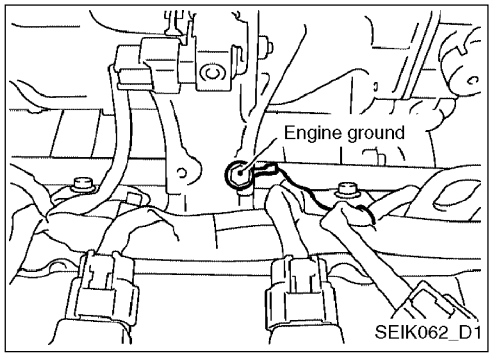
DTC P2135 Throttle Sensor Signal Discordance Problem (Cont'd)

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

- **Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

Terminal No.	Wire Color	Item	Condition	Data (DC Voltage)
47	G	Throttle position sensor power supply	**[Ignition switch ON]**	Approximately 5 V
49	W	Throttle position sensor 1	**[Ignition switch ON]** ● Engine stopped ● Shift lever position is D (A/T models) ● Shift lever position is 1st (M/T models) ● Accelerator pedal fully released	More than 0.36 V
			[Ignition switch ON] ● Engine stopped ● Shift lever position is D (A/T models) ● Shift lever position is 1st (M/T models) ● Accelerator pedal fully depressed	Less than 4.75 V
66	B	Throttle position sensor ground	**[Engine is running]** ● Warm-up condition ● Idle speed	Approximately 0 V
68	R	Throttle position sensor 2	**[Ignition switch ON]** ● Engine stopped ● Shift lever position is D (A/T models) ● Shift lever position is 1st (M/T models) ● Accelerator pedal fully released	Less than 4.75 V
			[Ignition switch ON] ● Engine stopped ● Shift lever position is D (A/T models) ● Shift lever position is 1st (M/T models) ● Accelerator pedal fully depressed	More than 0.36 V



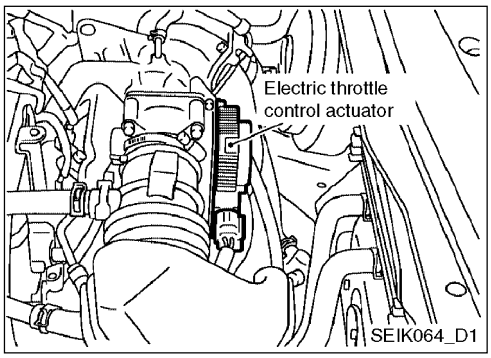
Diagnostic Procedure

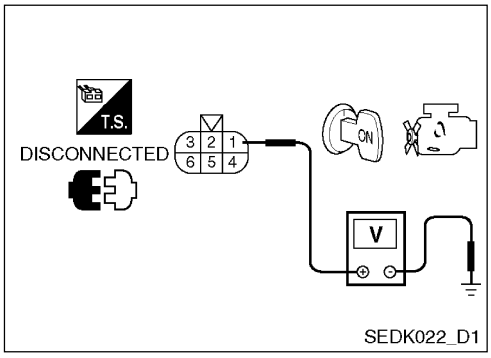
1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch OFF.
2. Loosen and retighten engine ground screws.

>> GO TO 2.

DTC P2135 Throttle Sensor Signal Discordance Problem (Cont'd)





2. CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch ON.
3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-II or tester.

   Voltage: Approximately 5V

OK or NG

OK >> GO TO 3.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK THROTTLE POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 66 and electric throttle control actuator terminal 5.

   Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK THROTTLE POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 49 and electric throttle control actuator terminal 4, ECM terminal 68 and electric throttle control actuator terminal 2.

   Refer to Wiring Diagram.

   Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

DTC P2135 Throttle Sensor Signal Discordance Problem (Cont'd)

5. CHECK THROTTLE POSITION SENSOR

Refer to EC-197, "Component Inspection".

OK or NG

OK >> GO TO 7.

NG >> GO TO 6.

6. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

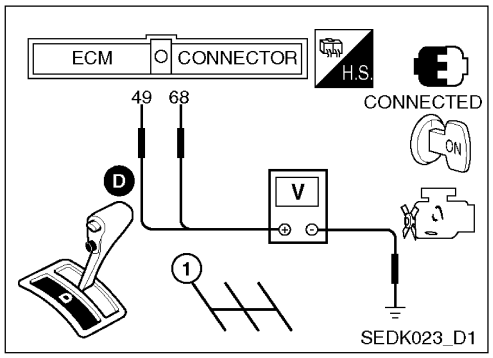
1. Replace the electric throttle control actuator.
2. Perform EC-23, "Throttle Valve Closed Position Learning".
3. Perform EC-24, "Idle Air Volume Learning".

>> **INSPECTION END**

7. CHECK INTERMITTENT INCIDENT

Refer to EC-74, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".

>> **INSPECTION END**



Component Inspection

THROTTLE POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Perform EC-23, "Throttle Valve Closed Position Learning".
3. Turn ignition switch ON.
4. Set selector lever to D position (A/T models) or 1st position (M/T models).
5. Check voltage between ECM terminals 49 (Throttle position sensor 1 signal), 68 (Throttle position sensor 2 signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
49 (Throttle position sensor 1)	Fully released	More than 0.36 V
	Fully depressed	Less than 4.75 V
68 (Throttle position sensor 2)	Fully released	Less than 4.75 V
	Fully depressed	More than 0.36 V

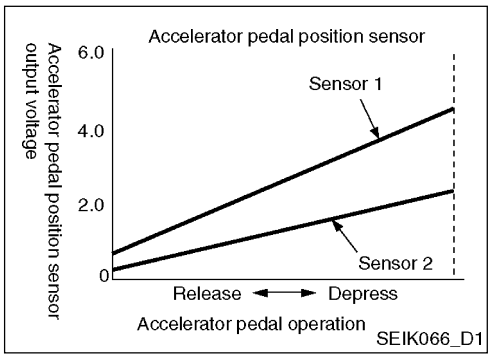
6. If NG, replace electric throttle control actuator and go to the next step.
7. Perform EC-23, "Throttle Valve Closed Position Learning".
8. Perform EC-24, "Idle Air Volume Learning".

Remove and Installation

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to "OUTER COMPONENT PARTS" (QG16: EM-12).

DTC P2138 Accelerator Pedal Position Sensor Circuit Range/ Performance Problem



Component Description

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.

Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM.

In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.

Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.

CONSULT-II REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

Monitor Item	Condition		Specification
ACCEL SEN1	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.5 - 1.0 V
		Accelerator pedal: Fully depressed	4.0 - 4.8 V
ACCEL SEN2	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.3 - 1.2 V
		Accelerator pedal: Fully depressed	3.9 - 4.8 V
CLSD THL POS	● Ignition switch: ON	Accelerator pedal: Fully released	ON
		Accelerator pedal: Fully depressed	OFF

* : Accelerator pedal position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

On Board Diagnosis Logic

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P2138	Accelerator pedal position sensor circuit range/performance problem	Rationally incorrect voltage is sent to ECM compared with the signals from APP sensor 1 and APP sensor 2.	● Harness or connector (The APP sensor 1 and 2 circuit is open or shorted.) ● Accelerator pedal position sensor 1 and 2

Fail-Safe Mode

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Engine Operating Condition In Fail-Safe Mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.
The ECM regulates the opening speed of throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC P2138 Accelerator Pedal Position Sensor Circuit Range/ Performance Problem (Cont'd)

DTC Confirmation Procedure

NOTE:

- **If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.**

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

With CONSULT-II

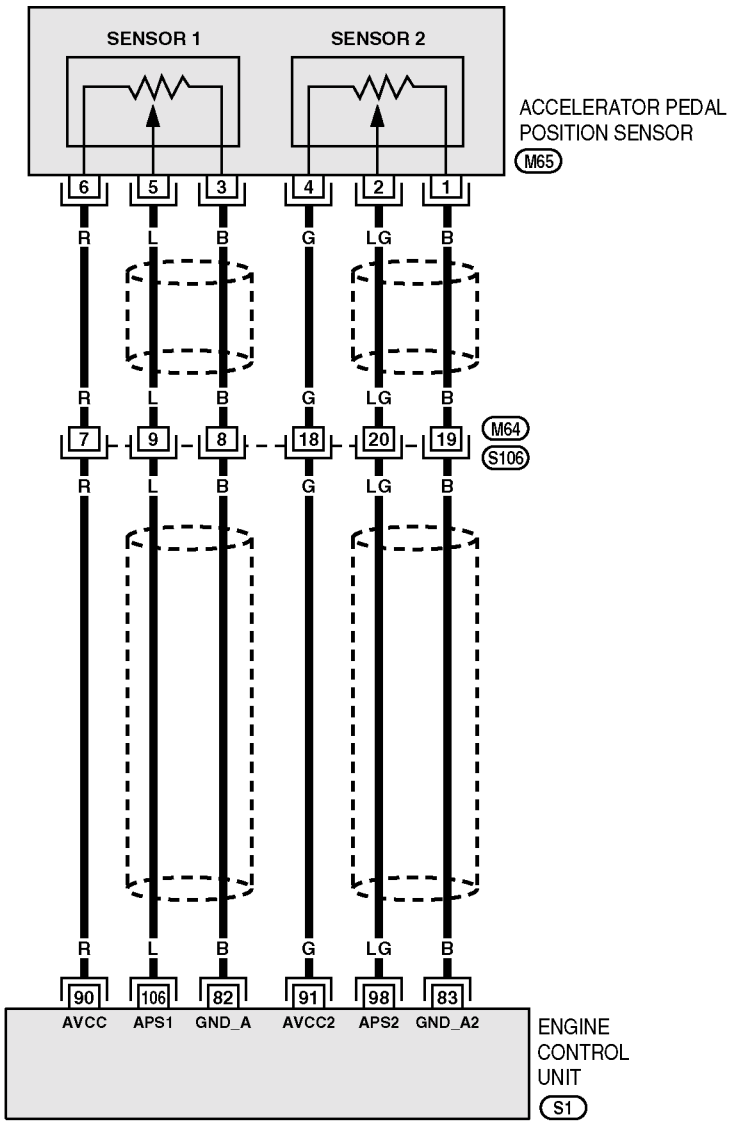
1. Turn ignition switch ON.
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-201, "Diagnostic Procedure".

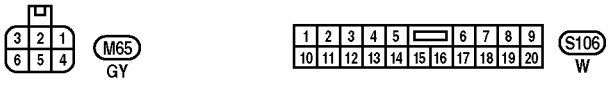
Without CONSULT-II

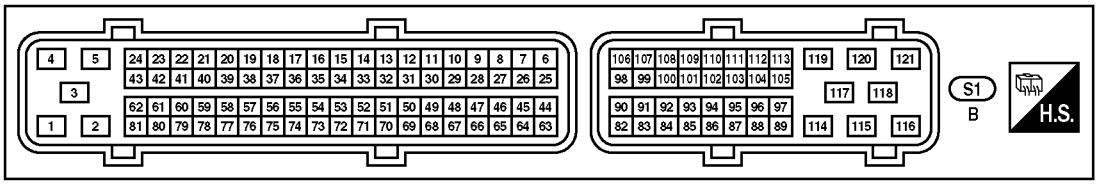
1. Start engine and let it idle for 1 second.
2. Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
3. Perform Diagnostic Test Mode II (Self-diagnostic results) with ECM.
4. If DTC is detected, go to EC-201, "Diagnostic Procedure".

Wiring Diagram

EC/AWJ







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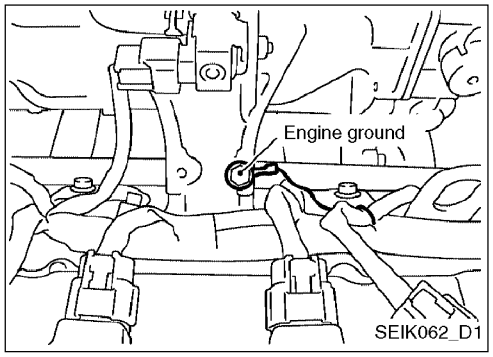
DTC P2138 Accelerator Pedal Position Sensor Circuit Range/ Performance Problem (Cont'd)

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

- **Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

Terminal No.	Wire Color	Item	Condition	Data (DC Voltage)
82	B	Sensor ground (Accelerator pedal position sensor 1)	**[Engine is running]** ● Warm-up condition ● Idle speed	Approximately 0 V
83	B	Sensor ground (Accelerator pedal position sensor 2)	**[Ignition switch ON]**	Approximately 0 V
90	R	Sensor power supply (Accelerator pedal position sensor 1)	**[Ignition switch ON]**	Approximately 5 V
91	G	Sensor power supply (Accelerator pedal position sensor 2)	**[Ignition switch ON]**	Approximately 5 V
98	LG	Accelerator pedal position sensor 2	**[Ignition switch ON]** ● Engine stopped ● Accelerator pedal fully released	0.15 - 0.6 V
			[Ignition switch ON] ● Engine stopped ● Accelerator pedal fully depressed	1.95 - 2.4 V
106	L	Accelerator pedal position sensor 1	**[Ignition switch ON]** ● Engine stopped ● Accelerator pedal fully released	0.5 - 1.0 V
			[Ignition switch ON] ● Engine stopped ● Accelerator pedal fully depressed	3.9 - 4.7 V



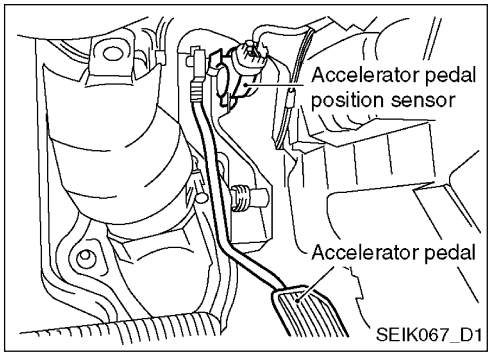
Diagnostic Procedure

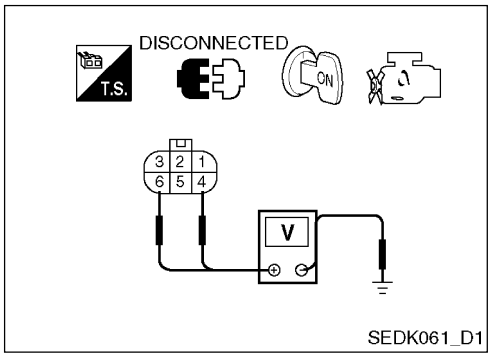
1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch OFF.
2. Loosen and retighten engine ground screws.

>> GO TO 2.

DTC P2138 Accelerator Pedal Position Sensor Circuit Range/ Performance Problem (Cont'd)





2. CHECK ACCELERATOR PEDAL POSITION SENSOR POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch ON.
3. Check voltage between accelerator pedal position sensor terminal 4, 6 and ground with CONSULT-II or tester.

   Voltage: Approximately 5V

OK or NG

OK >> GO TO 4.

NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check to following.

- Harness connectors M64, S106
- Harness for open or short between accelerator pedal position sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK ACCELERATOR PEDAL POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Disconnect TCM harness connector.
4. Check harness continuity between accelerator pedal position sensor terminal 1 and ECM terminal 83, accelerator pedal position sensor terminal 3 and ECM terminal 82, TCM terminal 42. Refer to Wiring Diagram.

   Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.

NG >> GO TO 5.

DTC P2138 Accelerator Pedal Position Sensor Circuit Range/ Performance Problem (Cont'd)

5. DETECT MALFUNCTIONING PART

Check to following.

- Harness connectors M64, S106
- Harness for open or short between accelerator pedal position sensor and ECM
- Harness for open or short between accelerator pedal position sensor and TCM

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK ACCELERATOR PEDAL POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 106 and accelerator pedal position sensor terminal 5, ECM terminal 98 and accelerator pedal position sensor terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check to following.

- Harness connectors M64, S106
- Harness for open or short between accelerator pedal position sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK ACCELERATOR PEDAL POSITION SENSOR

Refer to EC-204, "Component Inspection".

OK or NG

OK >> GO TO 10.
NG >> GO TO 9.

9. REPLACE ACCELERATOR PEDAL POSITION SENSOR

1. Replace the accelerator pedal position sensor.
2. Perform EC-23, "Accelerator Pedal Released Position Learning".
3. Perform EC-23, "Throttle Valve Closed Position Learning".
4. Perform EC-24, "Idle Air Volume Learning".

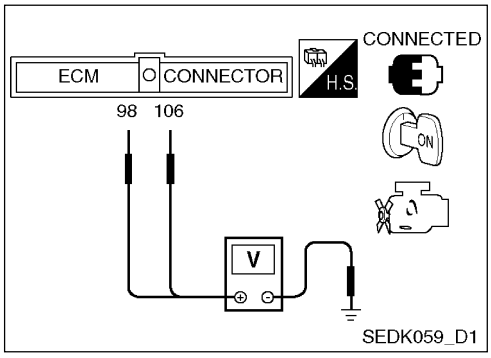
>> **INSPECTION END**

DTC P2138 Accelerator Pedal Position Sensor Circuit Range/ Performance Problem (Cont'd)

10. CHECK INTERMITTENT INCIDENT

Refer to EC-74, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".

>> **INSPECTION END**



Component Inspection

ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch ON.
3. Check voltage between ECM terminals 106 (accelerator pedal position sensor 1 signal), 98 (accelerator pedal position sensor 2 signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
106 (Accelerator pedal position sensor 1)	Fully released	0.5 - 1.0 V
	Fully depressed	3.9 - 4.7 V
98 (Accelerator pedal position sensor 2)	Fully released	0.15 - 0.6 V
	Fully depressed	1.95 - 2.4 V

4. If NG, replace accelerator pedal assembly and go to the next step.
5. Perform EC-23, "Accelerator Pedal Released Position Learning".
6. Perform EC-23, "Throttle Valve Closed Position Learning".
7. Perform EC-24, "Idle Air Volume Learning".

Remove and Installation

ACCELERATOR PEDAL

Refer to "ACCELERATOR CONTROL SYSTEM" (QG16: FE-3).

DTC P0500 Vehicle Speed Sensor

Description

The vehicle speed sensor is installed in the transaxle. It contains a pulse generator which provides a vehicle speed signal to the combination meter. The combination meter then sends a signal to the ECM and TCM.

On Board Diagnosis Logic

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P0500 0500	Vehicle speed sensor	The almost 0 km/h (0 MPH) signal from vehicle speed sensor is sent to ECM even when vehicle is being driven.	● Harness or connectors (The CAN communication line is open or shorted.) ● Harness or connectors (The vehicle speed sensor circuit is open or shorted.) ● Combination meter ● Vehicle speed sensor

DTC Confirmation Procedure

CAUTION:

- **Always drive vehicle at a safe speed.**

NOTE:

- **If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.**

TESTING CONDITION:

Steps 1 and 2 may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

With CONSULT-II

1. Start engine.
2. Read “VHCL SPEED SE” in “DATA MONITOR” mode with CONSULT-II. The vehicle speed on CONSULT-II should exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.
   If NG, go to EC-208, “Diagnostic Procedure”.
   If OK, go to following step.
3. Select “DATA MONITOR” mode with CONSULT-II.
4. Warm engine up to normal operating temperature.
5. Maintain the following conditions for at least 60 consecutive seconds.

ENG SPEED	A/T	More then 1,800 rpm
	M/T	More then 2,100 rpm
COOLAN TEMP/S		70°C (158°F)

DTC P0500 Vehicle Speed Sensor (Cont'd)

B/FUEL SCHDL	A/T	4.3 - 8.7 msec
	M/T	3.7 - 7.1 msec
Selector lever		Suitable position
PW/ST SIGNAL		OFF

6. If DTC is detected, go to EC-208 "Diagnostic Procedure".

Overall Function Check

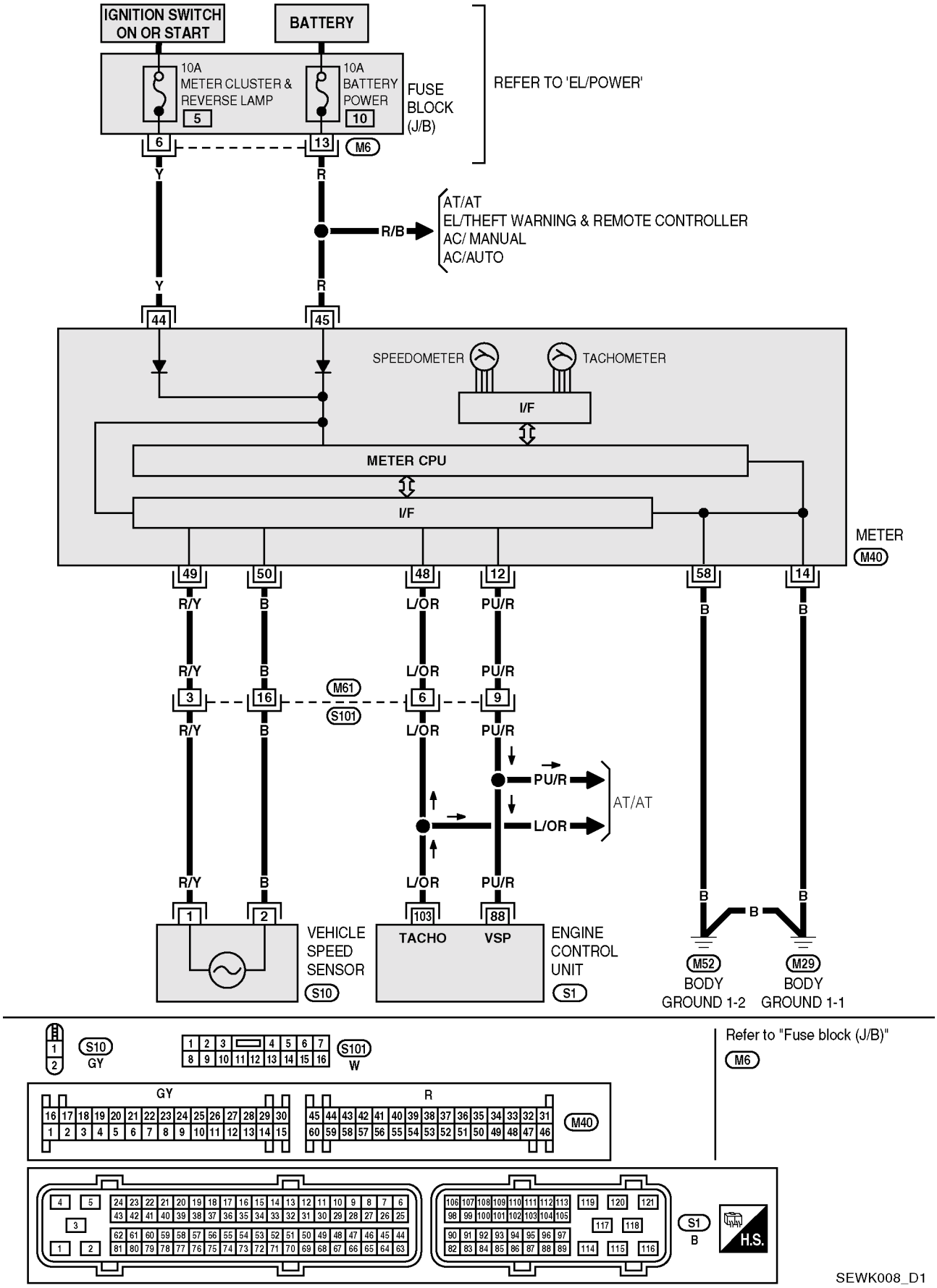
Use this procedure to check the overall function of the vehicle speed signal circuit. During this check, a DTC might not be confirmed.

Without CONSULT-II

1. Lift up drive wheels.
2. Start engine.
3. Read vehicle speed with combination meter.

   The vehicle speed indication should be able to exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.
4. If NG, go to EC-208 "Diagnostic Procedure".

Wiring Diagram — EC/Vehicle Speed Sensor



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DTC P0500 Vehicle Speed Sensor (Cont'd)

Diagnostic Procedure

1. CHECK VEHICLE SPEED SENSOR

OK or NG

OK >> GO TO 2.

NG >> Repair or replace.

2. CHECK COMBINATION METER

Check combination meter function.

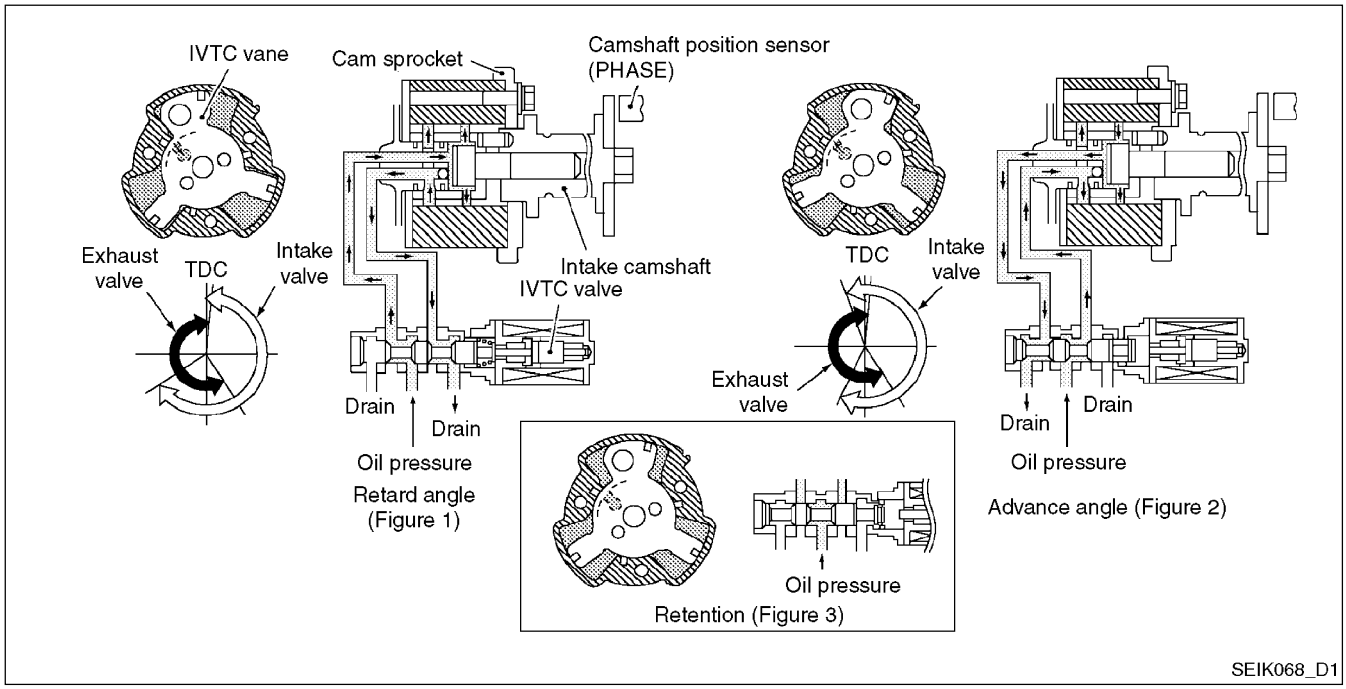
Refer to "COMBINATION METER - TROUBLE DIAGNOSIS" (EL-69).

>> **INSPECTION END**

DTC P1111 Intake Valve Timing Control Solenoid Valve Circuit

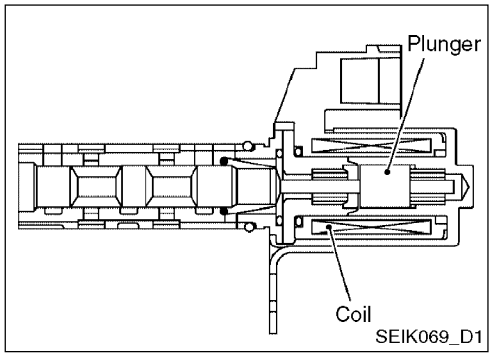
Description

Sensor	Input Signal to ECM	ECM Function	Actuator
Crankshaft position sensor (POS)	Engine speed	Intake valve timing control	Intake valve timing control solenoid valve
Camshaft position sensor (PHASE)	Engine coolant temperature		
Engine coolant temperature sensor	Vehicle speed		
Vehicle speed signal			



This mechanism hydraulically controls cam phases continuously with the fixed operating angle of the intake valve.

The ECM receives signals such as crankshaft position, camshaft position, engine speed, and engine coolant temperature. Then, the ECM sends ON/OFF pulse duty signals to the intake valve timing control solenoid valve depending on driving status. This makes it possible to control the shut/open timing of the intake valve to increase engine torque in low/mid speed range and output in high-speed range.



Component Description

Intake valve timing control solenoid valve is activated by ON/OFF pulse duty (ratio) signals from the ECM.

The intake valve timing control solenoid valve changes the oil amount and direction of flow through intake valve timing control unit or stops oil flow.

The longer pulse width advances valve angle.

The shorter pulse width retards valve angle.

When ON and OFF pulse widths become equal, the solenoid valve stops oil pressure flow to fix the intake valve angle at the control position.

DTC P1111 Intake Valve Timing Control Solenoid Valve Circuit (Cont'd)

CONSULT-II REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

Monitor Item	Condition		Specification
INT/V SOL (B1)	● Engine: After warming up ● Shift lever: N (A/T models) Neutral (M/T models) ● Air conditioner switch: OFF ● No-load	Idle	0% - 2%
		When revving engine up to 2,000 rpm quickly	Approx. 0% - 60%

On Board Diagnosis Logic

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P1111 1111	Intake valve timing control solenoid valve circuit	An improper voltage is sent to the ECM through intake valve timing control solenoid valve.	● Harness or connectors (Solenoid valve circuit is open or shorted.) ● Intake valve timing control solenoid valve

DTC Confirmation Procedure

NOTE:

- **If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.**

With CONSULT-II

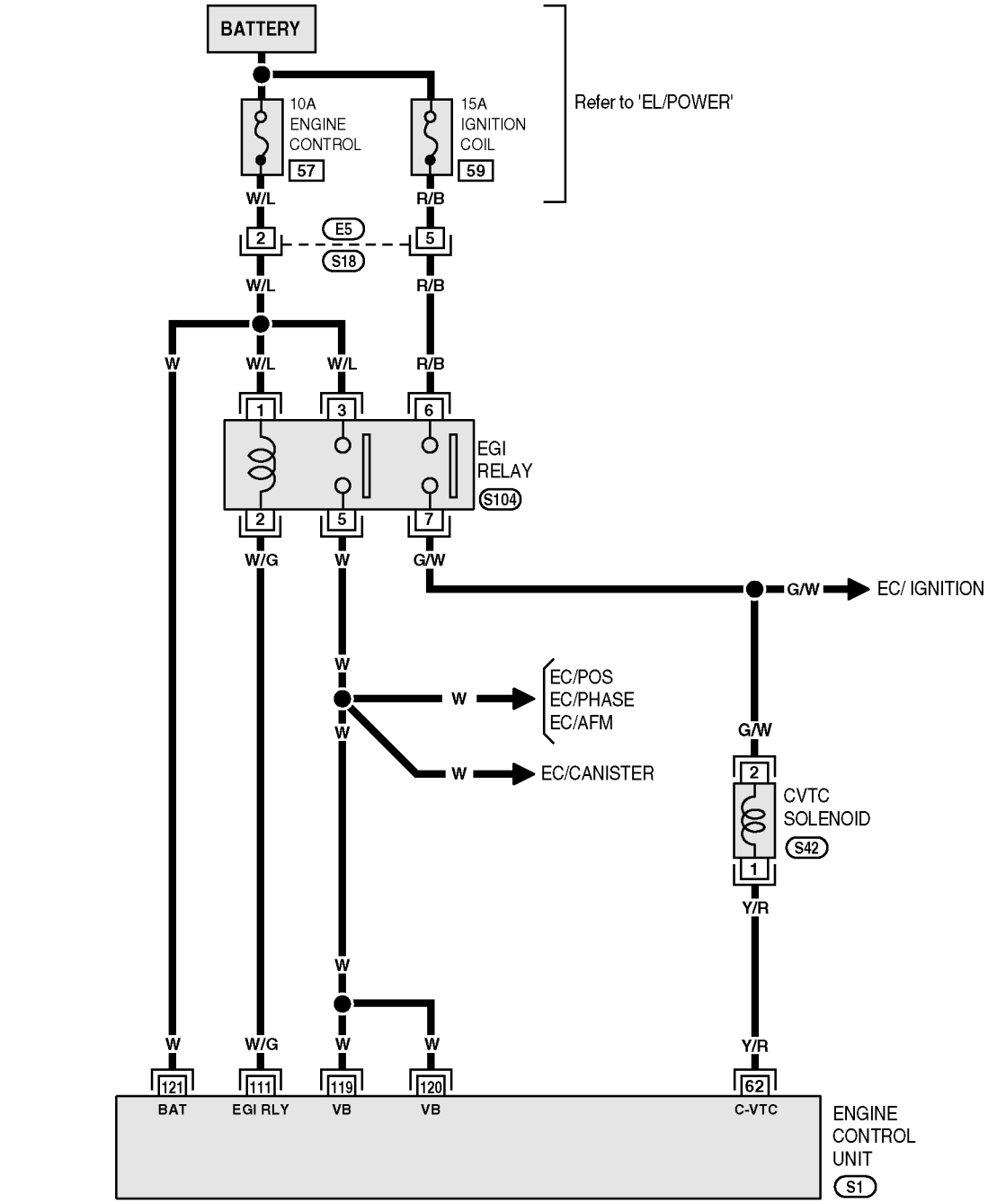
1. Turn ignition switch ON.
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Start engine and let it idle for 5 seconds.
4. If DTC is detected, go to EC-212, "Diagnostic Procedure".

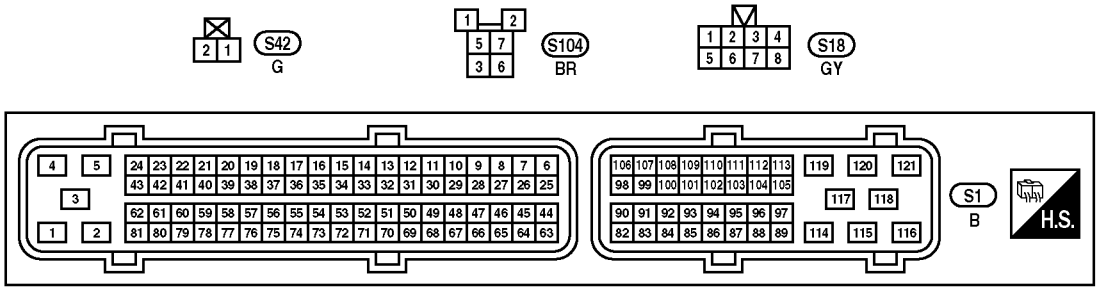
Without CONSULT-II

1. Start engine and let it idle for 5 seconds.
2. Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
3. Perform Diagnostic Test Mode II (Self-diagnostic results) with ECM.
4. If DTC is detected, go to EC-212, "Diagnostic Procedure".

Wiring Diagram

EC/CVTC





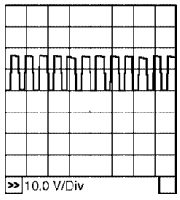
SEWK022_D1

DTC P1111 Intake Valve Timing Control Solenoid Valve Circuit (Cont'd)

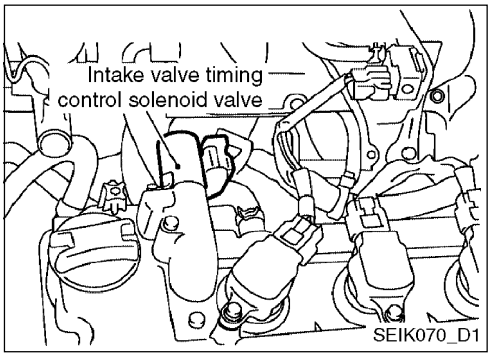
Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-II.

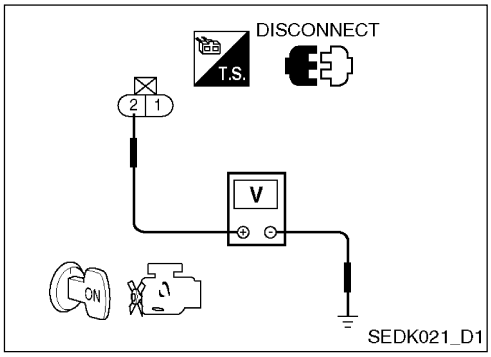
CAUTION:

- **Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

Terminal No.	Wire Color	Item	Condition	Data (DC Voltage)
62	Y/R	Intake valve timing control solenoid valve	**[Engine is running]** ● Warm-up condition ● Idle speed	BATTERY VOLTAGE (11 - 14 V)
			[Engine is running] ● Warm-up condition ● When revving engine up to 2,000 rpm quickly	0 - 0.2 V ★ 

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)





Diagnostic Procedure

1. CHECK IVT CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect intake valve timing control solenoid valve harness connector.
3. Turn ignition switch ON.
4. Check voltage between intake valve timing control solenoid valve terminal 2 and ground with CONSULT-II or tester.

   Voltage: Battery voltage

OK or NG

OK >> GO TO 2.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

DTC P1111 Intake Valve Timing Control Solenoid Valve Circuit (Cont'd)

2. CHECK IVT CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 62 and intake valve timing control solenoid valve terminal 1. Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EC-213, "Component Inspection".

OK or NG

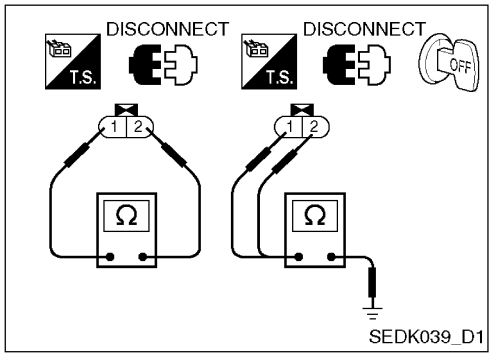
OK >> GO TO 4.

NG >> Replace intake valve timing control solenoid valve.

4. CHECK INTERMITTENT INCIDENT

Refer to EC-74, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".

>> **INSPECTION END**



Component Inspection

INTAKE VALVE TIMING CONTROL SOLENOID VALVE

1. Disconnect intake valve timing control solenoid valve harness connector.
2. Check resistance between intake valve timing control solenoid valve terminals 1 and 2 under the following conditions.

Terminals	Resistance
1 and 2	Approximately 8 Ω at 20°C (68°F)
1 or 2 and ground	8 Ω (Continuity should not exist)

Removal and Installation

INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to "CYLINDER HEAD" (QG16: EM-40).

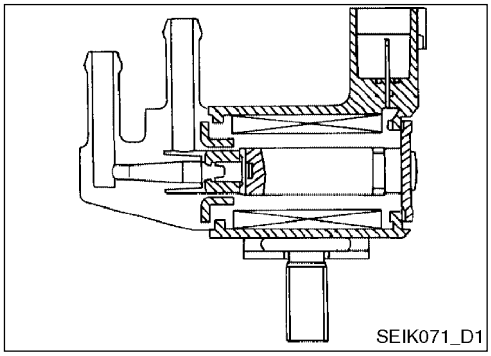
EVAP Canister Purge Volume Control Solenoid Valve

Description

Sensor	Input Signal to ECM	ECM Function	Actuator
Crankshaft position sensor (POS)	Engine speed*2	EVAP canister purge flow control	EVAP canister purge volume control solenoid valve
Camshaft position sensor (PHASE)			
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Battery	Battery voltage*2		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Closed throttle position		
Heated oxygen sensors 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)		
Vehicle speed signal*1	Vehicle speed		

*1: This input signal is sent to the ECM through CAN communication line.
*2: The ECM determines the start signal status by the signals of engine speed and battery voltage.

This system controls flow rate of fuel vapor from the EVAP canister. The opening of the vapor by-pass passage in the EVAP canister purge volume control solenoid valve changes to control the flow rate. The EVAP canister purge volume control solenoid valve repeats ON/OFF operation according to the signal sent from the ECM. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions. When the engine is operating, the flow rate of fuel vapor from the EVAP canister is regulated as the air flow changes.



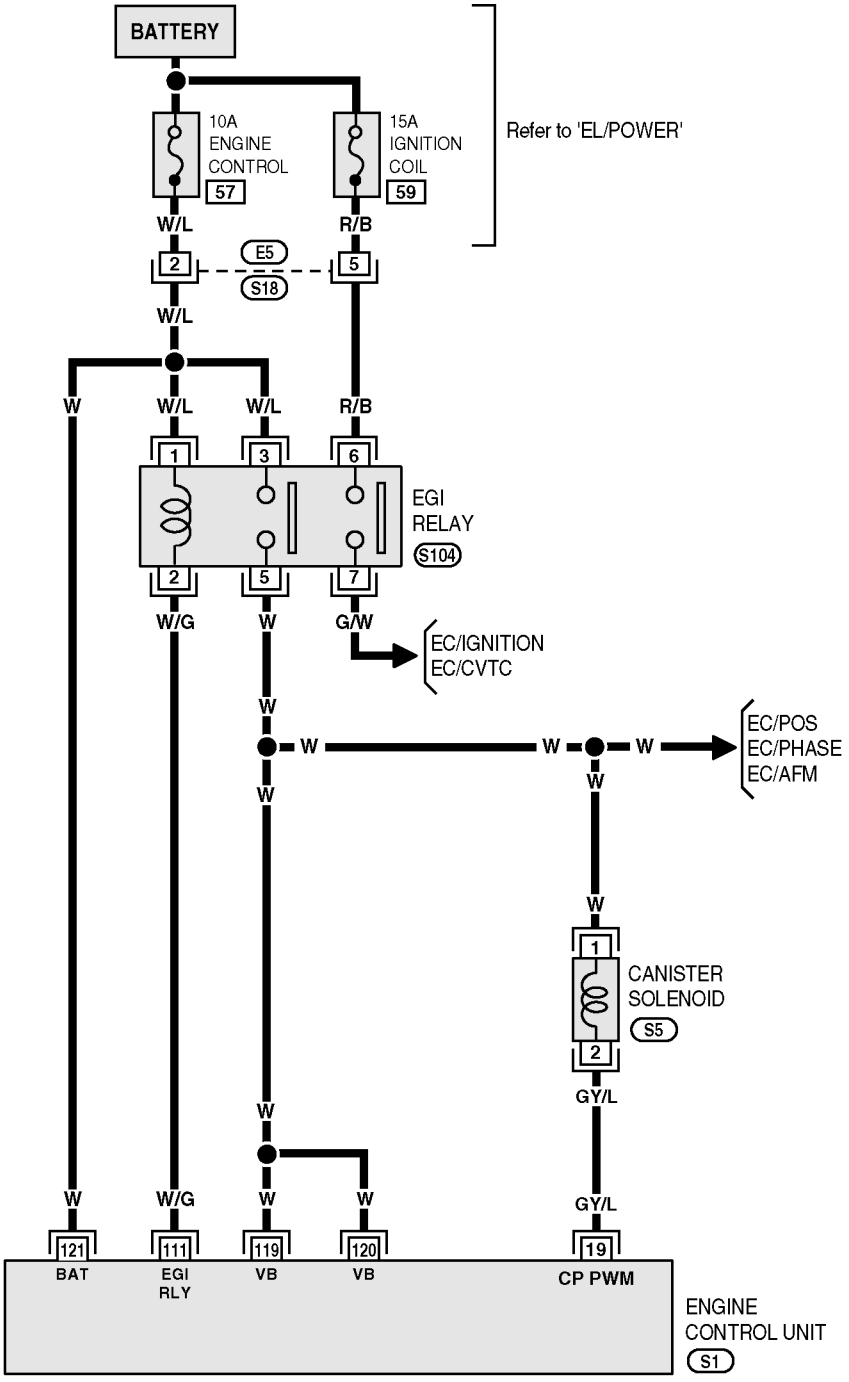
Component Description

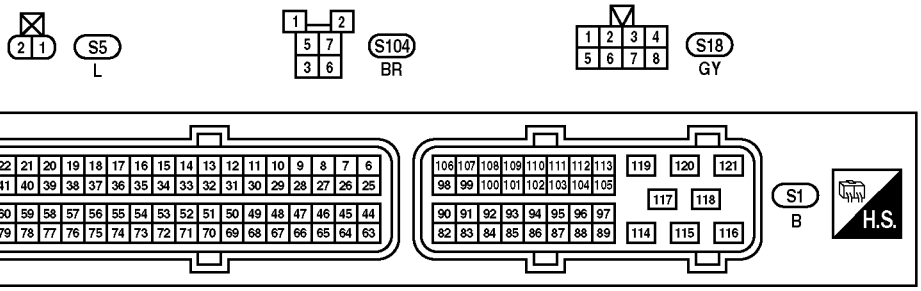
The EVAP canister purge volume control solenoid valve uses a ON/OFF duty to control the flow rate of fuel vapor from the EVAP canister. The EVAP canister purge volume control solenoid valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of fuel vapor that will flow through the valve.

CONSULT-II REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

Monitor Item	Condition		Specification
PURG VOL C/V	● Engine: After warming up ● Shift lever: N (A/T models) Neutral (M/T models) ● Air conditioner switch: OFF ● No-load	Idle	0%
		2,000 rpm	15 - 30%


BATTERY
10A ENGINE CONTROL 57
15A IGNITION COIL 59
Refer to 'EL/POWER'
W/L
R/B
E5
S18
EGI RELAY S104
W/G
G/W
EC/IGNITION
EC/CVTC
EC/POS
EC/PHASE
EC/AFM
CANISTER SOLENOID S5
GY/L
BAT
EGI RLY
VB
VB
CP PWM
ENGINE CONTROL UNIT S1


S5 L
S104 BR
S18 GY
S1 B
H.S.

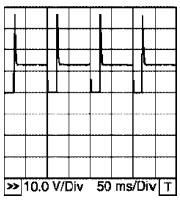
SEWK019_D1

EVAP Canister Purge Volume Control Solenoid Valve (Cont'd)

Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-II.

CAUTION:

- **Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

Terminal No.	Wire Color	Item	Condition	Data (DC Voltage)
19	GY/L	EVAP canister purge volume control solenoid valve	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14 V)
			[Engine is running] ● Engine speed is about 2,000 rpm	Approximately 7.0V ★ 

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

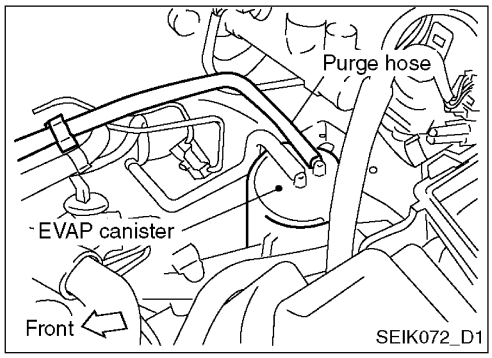
EVAP Canister Purge Volume Control Solenoid Valve (Cont'd)

Diagnostic Procedure

1. CHECK OVERALL FUNCTION

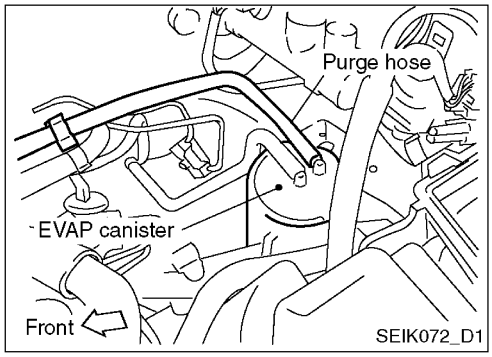
With CONSULT-II

1. Turn ignition switch OFF.
2. Disconnect the EVAP purge hose connected to the EVAP canister.
3. Turn ignition switch ON.
4. Select "PURG VOL C/V" in "ACTIVE TEST" mode with CONSULT-II.
5. Start engine and let it idle.



6. Change the valve opening percentage with touching "Qu" or "Qd" on CONSULT-II screen, and check for vacuum existence at the EVAP purge hose under the following conditions.

Conditions (PURG VOL CONT/V valve)	Vacuum
0%	Should not exist.
100%	Should exist.



Without CONSULT-II

1. Turn ignition switch OFF.
2. Disconnect the EVAP purge hose connected to the EVAP canister.
3. Start engine and let it idle for at least 80 seconds.
4. Check for vacuum existence at the EVAP purge hose under the following conditions.

Conditions (PURG VOL CONT/V valve)	Vacuum
At idle	Should not exist.
Engine speed is about 2,000 rpm	Should exist.

OK or NG

OK >> GO TO 2.

NG >> GO TO 3.

2. CHECK EVAP CANISTER

Refer to EC-316, "Component Inspection".

OK or NG

OK >> INSPECTION END

NG >> Replace EVAP canister.

EVAP Canister Purge Volume Control Solenoid Valve (Cont'd)

3. CHECK EVAP PURGE LINE

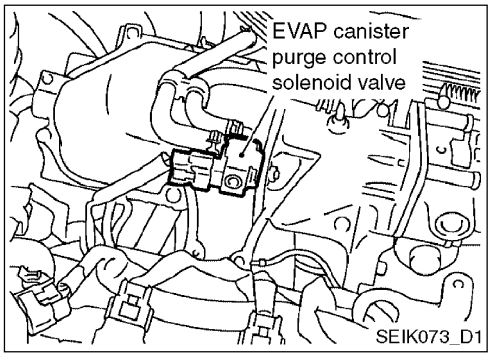
Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks or improper connection.

Refer to EC-313, "EVAPORATIVE EMISSION SYSTEM".

OK or NG

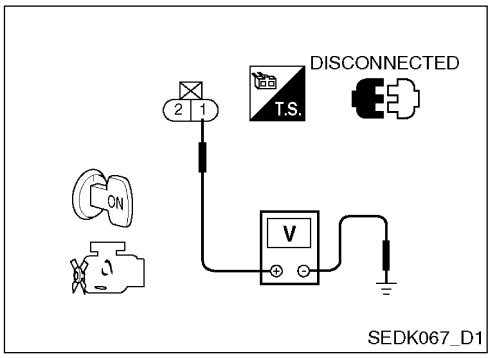
OK >> GO TO 4.

NG >> Repair or reconnect the hose.



4. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
3. Turn ignition switch ON.



4. Check voltage between EVAP canister purge volume control solenoid valve terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 6.

NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between EVAP canister purge volume control solenoid valve and ECM
- Harness for open or short between EVAP canister purge volume control solenoid valve and ECM relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

EVAP Canister Purge Volume Control Solenoid Valve (Cont'd)

6. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 19 and EVAP canister purge volume control solenoid valve terminal 2. Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK (With CONSULT-II)>>GO TO 7.

OK (Without CONSULT-II)>>GO TO 8.

NG >> Repair open circuit or short to ground and short to power in harness or connectors.

7. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT-II

1. Reconnect all harness connectors disconnected.
2. Start engine.
3. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT-II. Check that engine speed varies according to the valve opening.

OK or NG

OK >> GO TO 9.

NG >> GO TO 8.

8. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-220, "Component Inspection".

OK or NG

OK >> GO TO 9.

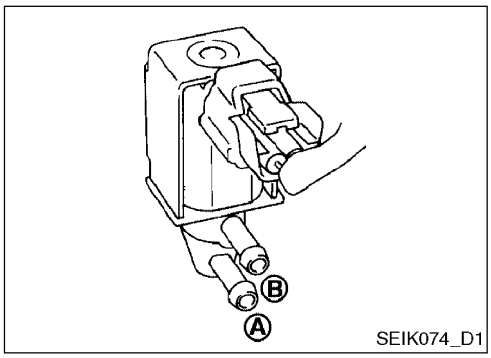
NG >> Replace EVAP canister purge volume control solenoid valve.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-74, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".

>> **INSPECTION END**

EVAP Canister Purge Volume Control Solenoid Valve (Cont'd)



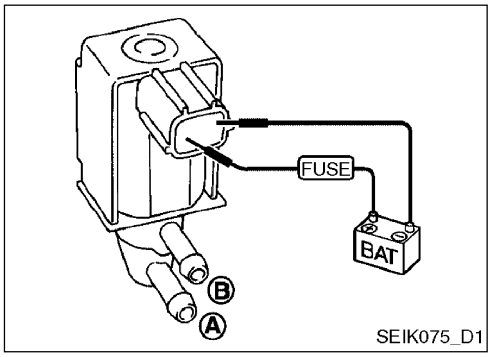
Component Inspection

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

Conditions (PURG VOL CONT/V valve)	Vacuum
At idle	Should not exist.
Engine speed is about 2,000 rpm	Should exist.



Without CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

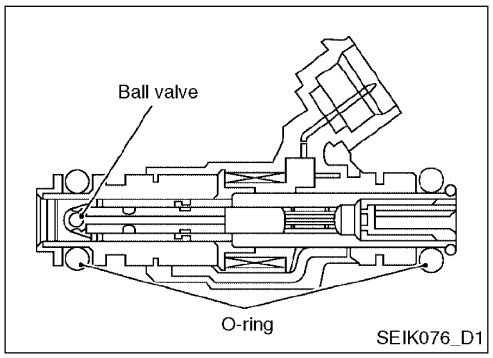
Conditions (PURG VOL CONT/V valve)	Vacuum
At idle	Should not exist.
Engine speed is about 2,000 rpm	Should exist.

Removal and Installation

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to "OUTER COMPONENT PARTS" (QG16: EM-12).

Injector Circuit



Component Description

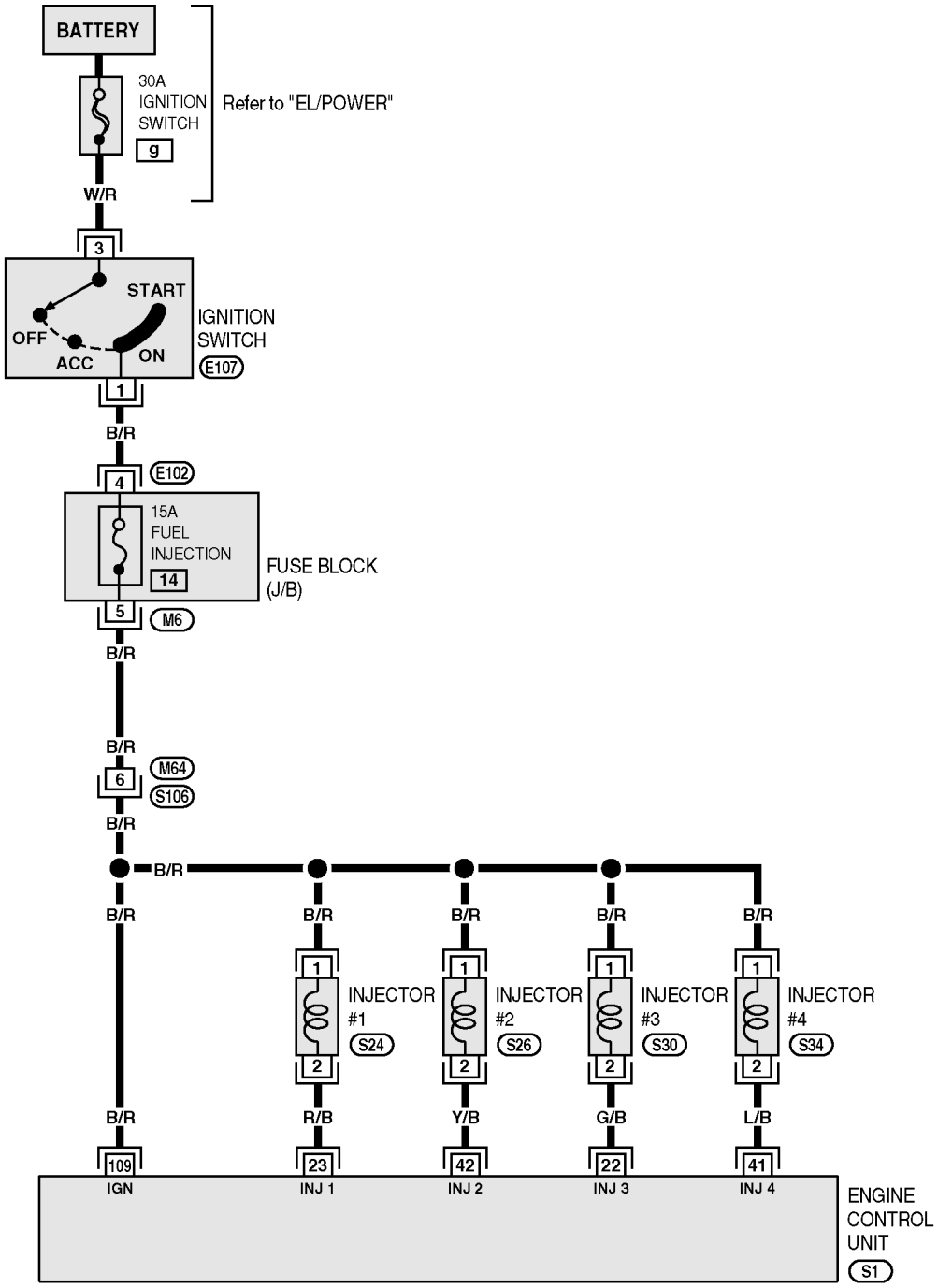
The fuel injector is a small, precise solenoid valve. When the ECM supplies a ground to the injector circuit, the coil in the injector is energized. The energized coil pulls the needle valve back and allows fuel to flow through the injector into the intake manifold. The amount of fuel injected depends upon the injection pulse duration. Pulse duration is the length of time the injector remains open. The ECM controls the injection pulse duration based on engine fuel needs.

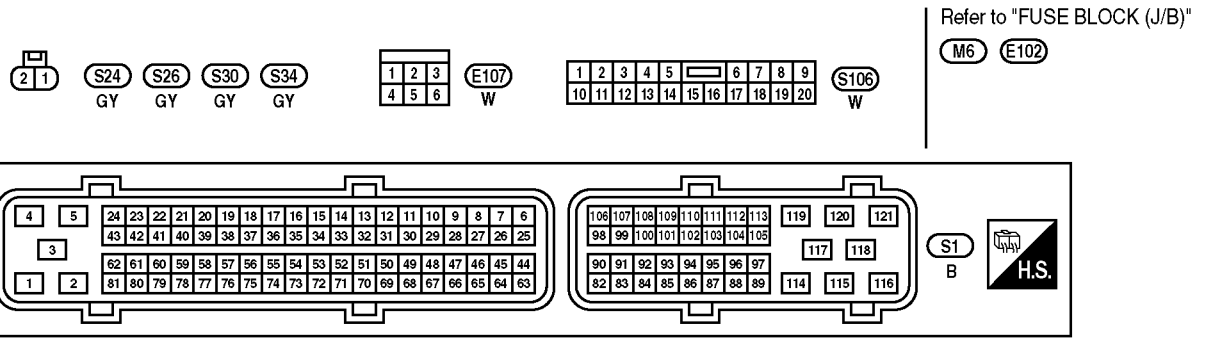
CONSULT-II REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

Monitor Item	Condition		Specification
B/FUEL SCHDL	● Engine: After warming up ● Shift lever: N (A/T models) Neutral (M/T models) ● Air conditioner switch: OFF ● No-load	Idle	1.5 - 3.0 msec
		2,000 rpm	1.2 - 3.0 msec
INJ PULSE-B1	● Engine: After warming up ● Shift lever: N (A/T models) Neutral (M/T models) ● Air conditioner switch: OFF ● No-load	Idle	2.0 - 3.5 msec
		2,000 rpm	1.5 - 3.5 msec

Wiring Diagram EC/Injector





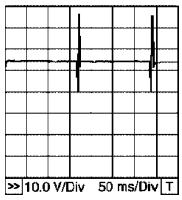
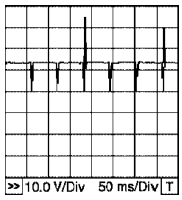
SEWK016_D1

Injector Circuit (Cont'd)

Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-II.

CAUTION:

- **Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

Terminal No.	Wire Color	Item	Condition	Data (DC Voltage)
22 23 41 42	G/B R/B L/B Y/B	Injector No. 3 Injector No. 1 Injector No. 4 Injector No. 2	**[Engine is running]** ● Warm-up condition ● Idle speed	BATTERY VOLTAGE (11 - 14 V) ★ 
			[Engine is running] ● Warm-up condition ● Engine speed is 2,000 rpm	BATTERY VOLTAGE (11 - 14 V) ★ 

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

1. INSPECTION START

Turn ignition switch to START.
Is any cylinder ignited?
Yes or No

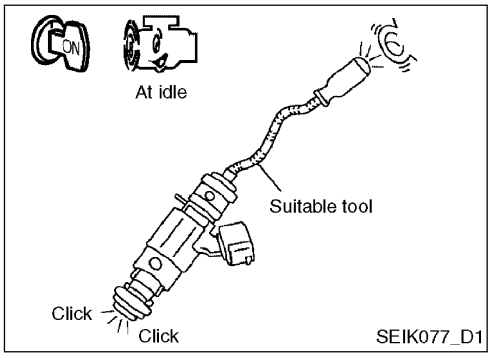
Yes >> GO TO 2.
No >> GO TO 3.

Injector Circuit (Cont'd)

2. CHECK OVERALL FUNCTION

With CONSULT-II

1. Start engine.
2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT-II.
3. Make sure that each circuit produces a momentary engine speed drop.



Without CONSULT-II

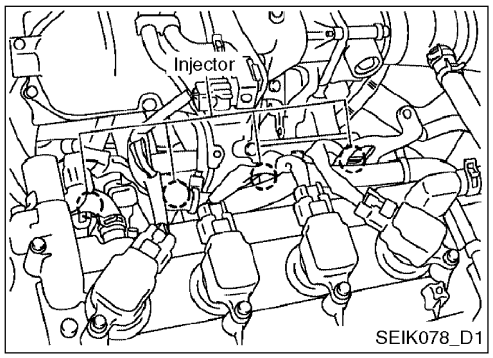
1. Start engine.
2. Listen to each injector operating sound.
   Clicking noise should be heard.

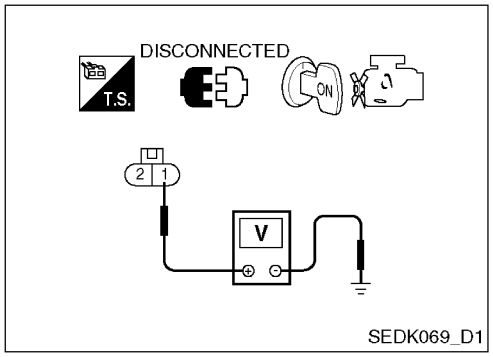
OK or NG

OK >> **INSPECTION END**

NG >> GO TO 3.

Injector Circuit (Cont'd)





3. CHECK INJECTOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect injector harness connector.
3. Turn ignition switch ON.
4. Check voltage between injector terminal 1 and ground with CONSULT-II or tester.

   Voltage: Battery voltage

OK or NG

OK >> GO TO 5.

NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M64, S106
- Fuse block (J/B) connector M6
- 15A fuse
- Harness for open or short between injector and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK INJECTOR OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between injector terminal 2 and ECM terminals 22, 23, 41, 42.

   Refer to Wiring Diagram.

   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK INJECTOR

Refer to EC-226, "Component Inspection".

OK or NG

OK >> GO TO 7.

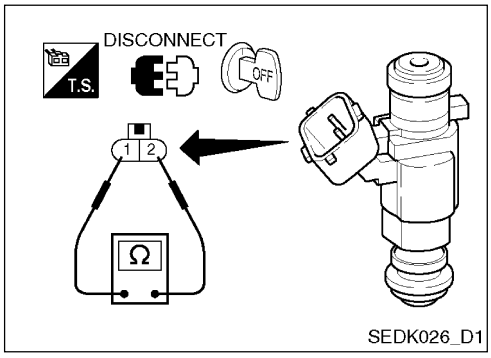
NG >> Replace injector.

Injector Circuit (Cont'd)

7. CHECK INTERMITTENT INCIDENT

Refer to EC-74, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".

>> **INSPECTION END**



Component Inspection

INJECTOR

1. Disconnect injector harness connector.
2. Check resistance between injector terminals as shown in the figure.

Resistance:
13.5 - 17.5 Ω [at 20°C (68°F)]

Removal and Installation

INJECTOR

Refer to EC-28, "Injector".

DTC P0171 Fuel Injection System Too Lean

On Board Diagnosis Logic

The mixture ratio feedback control system monitors the mixture ratio signal transmitted from heated oxygen sensor 1. This feedback signal is then sent to the ECM. The ECM controls the basic mixture ratio as close to the theoretical mixture ratio as possible. However, the basic mixture ratio is not necessarily controlled as originally designed. When the compensated air-fuel mixture ratio is too high due to lean condition, the ECM considers it as the malfunction of the fuel injection system and turns on the MIL.

Sensor	Input Signal to ECM	ECM Function	Actuator
Heated oxygen sensor 1	Density of oxygen in exhaust gas (mixture feedback signal)	Fuel injection control	Fuel injection

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P0171 0171	Fuel injection control system (too lean)	Fuel injection control system is not working properly. The compensated air-fuel mixture ratio is too high (the actual air-fuel mixture ratio is too lean).	● Leakage of intake air ● Heated oxygen sensor 1 ● Injector ● Leakage of exhaust gas ● Abnormal fuel pressure ● Low fuel level ● Mass air flow sensor ● PCV hose connection

DTC Confirmation Procedure

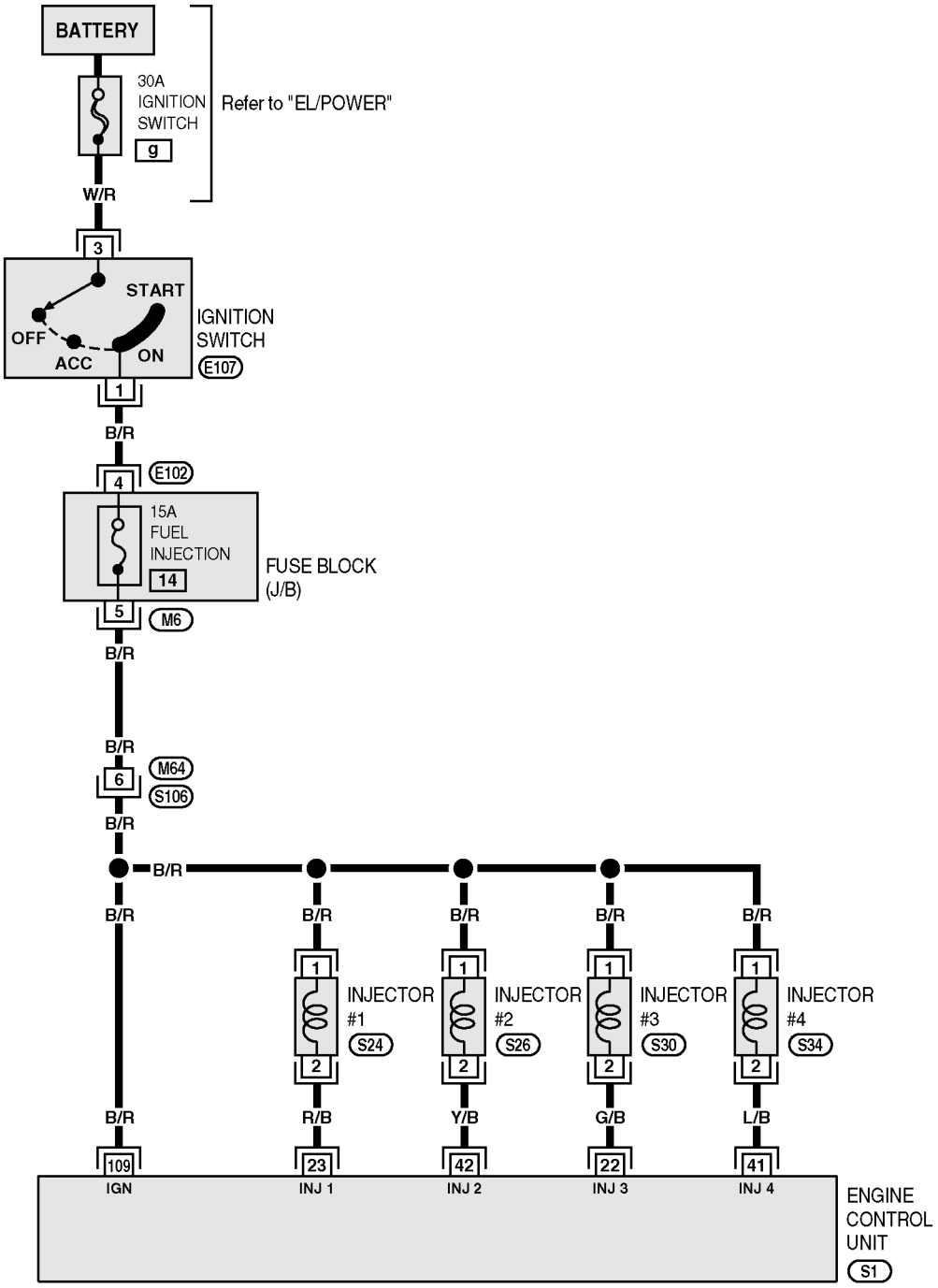
NOTE:

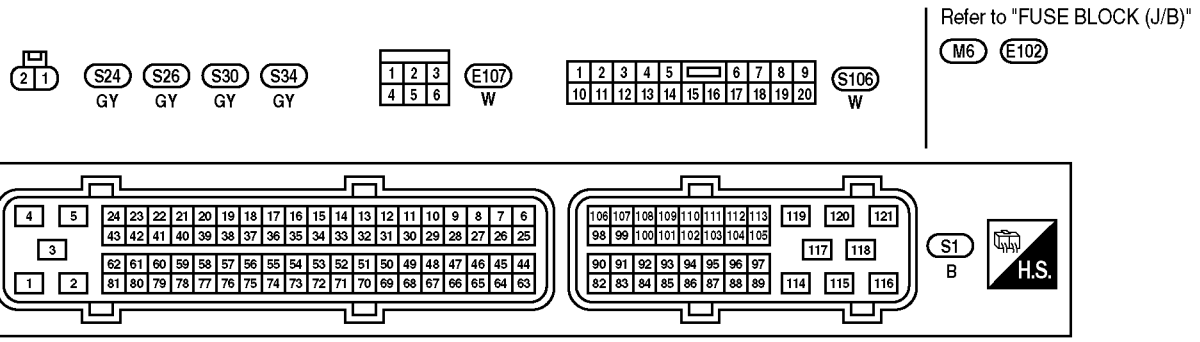
- **If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.**

With CONSULT-II

1. Start engine and warm it up until engine coolant temperature reaches at normal operating level.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON and select “Self-Learning Control” in “Work Support” mode with CONSULT-II.
4. Eliminate the self learning control coefficient by touching “ERASE”.
5. Select “DATA MONITOR” mode with CONSULT-II.
6. Start engine again and let it idle for 10 minutes. If the system is defective, the DTC P0171 should be detected at this step. Refer to EC-229, “Diagnostic Procedure”.
7. If the engine cannot be started easily at step 6, this is also a malfunction of fuel injection system.
8. Crank engine with the accelerator pedal depressed. If the engine can be started, go to EC-229, “Diagnostic Procedure”. If the engine cannot be started, visually check the intake and exhaust system for leakage.

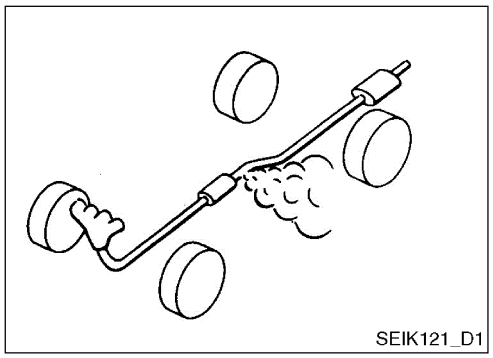
Wiring Diagram EC/Injector





SEWK016_D1

DTC P0171 Fuel Injection System Function Too Lean (Cont'd)


SEIK121_D1

Diagnostic Procedure

1. CHECK EXHAUST SYSTEM FOR LEAKAGE

1. Start engine and let it idle.
2. Check whether the hiising sound of exhaust gas exists before the three way catalyst.

OK or NG

OK >> GO TO 2.

NG >> Fix the problems.

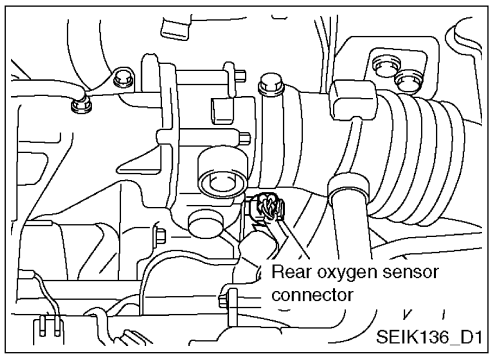
2. CHECK PCV HOSES AND INTAKE SYSTEM FOR LEAKAGE

1. Check whether the hiising sound of intake air exists after the mass air flow sensor.
2. Check whether the hiising sound of exhaust gas exists before the three way catalyst.

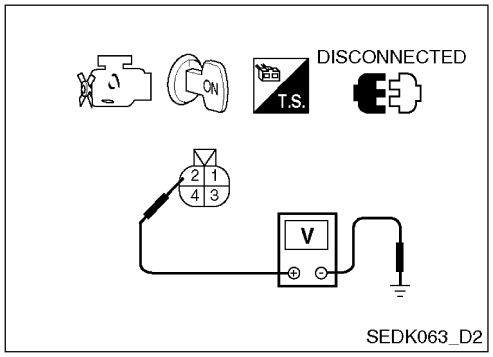
OK or NG

OK >> GO TO 3.

NG >> Fix the problems.



SEIK136_D1



SEDK063_D2

3. CHECK HEATED OXYGEN SENSOR 1 CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor 1 (oxygen sensor (FR)) harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between heated oxygen sensor 1 terminal 2 and ECM terminals 35.

   Refer to Wiring Diagram.

   Continuity should exist.
5. Check harness continuity between ECM terminals 35 or heated oxygen sensor 1 terminal 2 and ground.

   Refer to EC-249, "Wiring Diagram".

   Continuity should exist.
6. Check harness for short to power.

OK or NG

OK >> GO TO 4.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK FUEL PRESSURE

1. Release fuel pressure. Refer to EC-26, "FUEL PRESSURE RELEASE".
2. Install fuel pressure gauge and check fuel pressure. Refer to EC-26, "Fuel Pressure Check".

   At idling:

   Approximately 350 kPa (3.5 bar, 3.57 kg/cm^2, 51 psi)

OK or NG

OK >> GO TO 5.

NG >> Fix the problems.

DTC P0171 Fuel Injection System Function Too Lean (Cont'd)

5. CHECK MASS AIR FLOW SENSOR

1. Install the removed components.
2. Check the mass air flow sensor in "DATA MONITOR" mode with CONSULT-II.

   At idling: 10 - 40 gm/sec

   At 2,500 rpm: 40 - 10 gm/sec

OK or NG

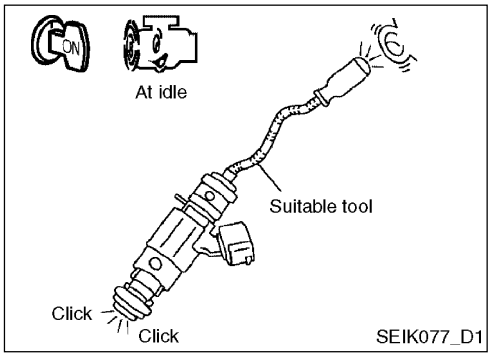
OK >> GO TO 6.

NG >> Check mass air flow sensor harness connection and engine ground connection for looseness. Check connector for corrosion. Refer to EC-108, "DTC P0102, P0103 MASS AIR FLOW SENSOR".

6. CHECK MASS AIR FLOW SENSOR

With CONSULT-II

1. Start engine.
2. Perform power balance operation in "ACTIVE TEST" mode in CONSULT-II.
3. Check sudden drop of engine speed in each injector.



Without CONSULT-II

1. Start engine.
2. Listen to each injector operating sound.

OK or NG

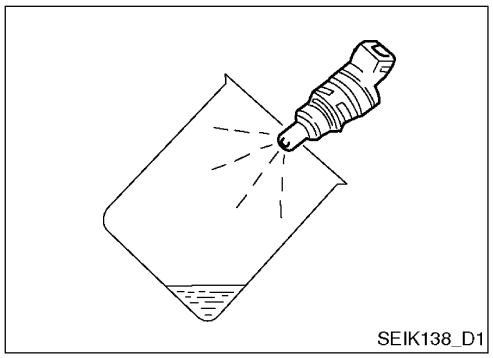
OK >> GO TO 7.

NG >> Perform trouble diagnosis.
Refer to EC-223, "Diagnostic Procedure".

7. CHECK INJECTORS

1. Check if there are any possibilities of fire and the engine is cooled down.
2. Turn ignition switch OFF.
3. Disconnect injector harness connectors.
4. Remove injector gallery assembly. Refer to "OUTER COMPONENT PARTS" (QG16: EM-12). Do not remove fuel hoses and injectors from injector gallery. Do not disconnect injector harness connector.

DTC P0171 Fuel Injection System Function Too Lean (Cont'd)



5. Crank engine for about 3 seconds. Check fuel injection from injectors. The fuel should be injected.

OK or NG

OK >> GO TO 8.

NG >> Replace the injectors that cannot inject fuel with new ones. The O-rings should be replaced whenever the injector is removed.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-74, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".

>> **INSPECTION END**

DTC P0172 Fuel Injection System Function Too Rich

On Board Diagnosis Logic

The mixture ratio feedback control system monitors the mixture ratio signal transmitted from heated oxygen sensor 1. This feedback signal is then sent to the ECM. The ECM controls the basic mixture ratio as close to the theoretical mixture ratio as possible. However, the basic mixture ratio is not necessarily controlled as originally designed. When the compensated air-fuel mixture ratio is too high due to lean condition, the ECM considers it as the malfunction of the fuel injection system and turns on the MIL.

Sensor	Input Signal to ECM	ECM Function	Actuator
Heated oxygen sensor 1	Density of oxygen in exhaust gas (mixture feedback signal)	Fuel injection control	Fuel injection

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P0172 0172	Fuel injection control system (too lean)	Fuel injection control system is not working properly. The compensated air-fuel mixture ratio is too high (the actual air-fuel mixture ratio is too lean).	● Leakage of intake air ● Heated oxygen sensor 1 ● Injector ● Leakage of exhaust gas ● Abnormal fuel pressure ● Low fuel level ● Mass air flow sensor ● PCV hose connection

DTC Confirmation Procedure

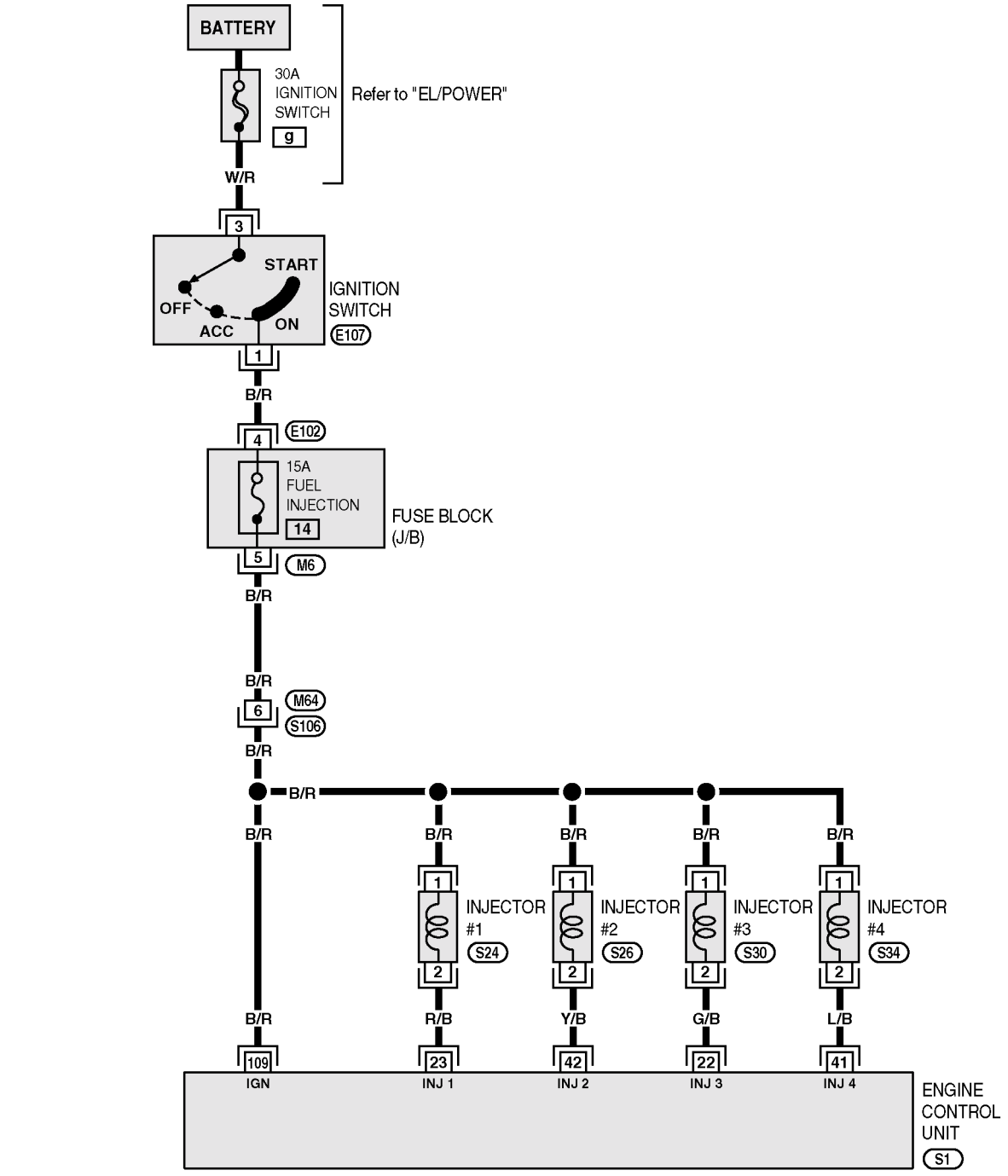
NOTE:

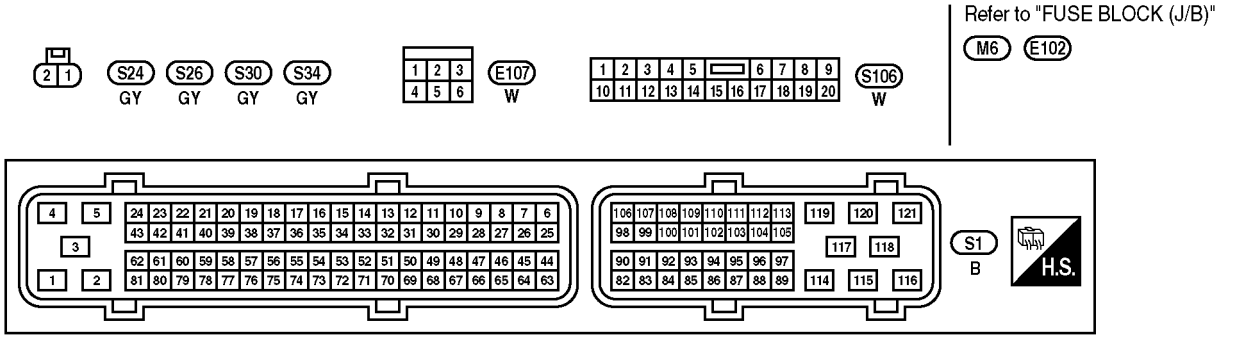
- **If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.**

With CONSULT-II

1. Start engine and warm it up until engine coolant temperature reaches at normal operating level.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON and select “Self-Learing Control” in “Work Support” mode with CONSULT-II.
4. Eliminate the self learning control coefficient by touching “ERASE”.
5. Select “DATA MONITOR” mode with CONSULT-II.
6. Start engine again and let it idle for 10 minutes. If the system is defective, the DTC P0171 should be detected at this step. Refer to EC-234, “Diagnostic Procedure”.
7. If the engine cannot be started easily at step 6, this is also a malfunction of fuel injection system.
8. Crank engine with the accelerator pedal depressed. If the engine can be started, go to EC-234, “Diagnostic Procedure”. If the engine cannot be started, remove ignition plugs and check if there are any foreign materials and impurities.

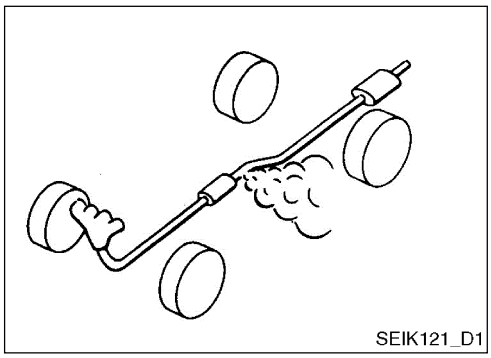
Wiring Diagram EC/Injector





SEWK016_D1

DTC P0172 Fuel Injection System Function Too Rich (Cont'd)


SEIK121_D1

Diagnostic Procedure

1. CHECK EXHAUST SYSTEM FOR LEAKAGE

1. Start engine and let it idle.
2. Check whether the hiising sound of exhaust gas exists before the three way catalyst.

OK or NG

OK >> GO TO 2.

NG >> Fix the problems.

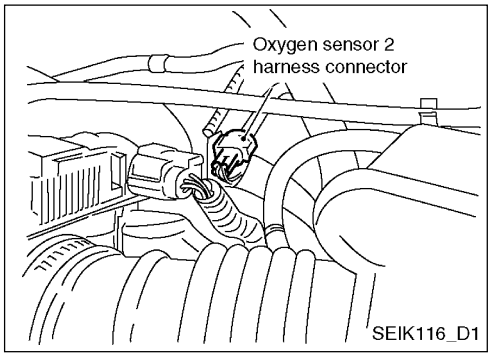
2. CHECK PCV HOSES AND INTAKE SYSTEM FOR LEAKAGE

1. Check whether the hiising sound of intake air exists after the mass air flow sensor.
2. Check whether the hiising sound of exhaust gas exists before the three way catalyst.

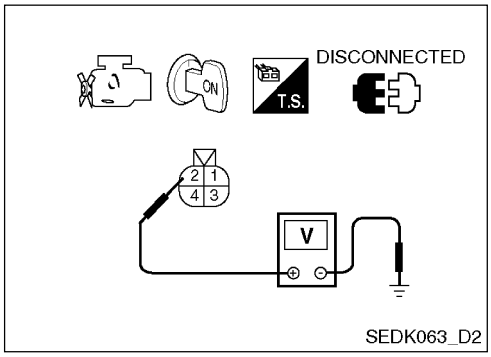
OK or NG

OK >> GO TO 3.

NG >> Fix the problems.



SEIK116_D1



SEDK063_D2

3. CHECK HEATED OXYGEN SENSOR 1 CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor 1 (oxygen sensor (FR)) harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between heated oxygen sensor 1 terminal 2 and ECM terminals 35.

   Refer to Wiring Diagram.

   Continuity should exist.
5. Check harness continuity between ECM terminals 35 or heated oxygen sensor 1 terminal 2 and ground.

   Refer to EC-249, "Wiring Diagram".

   Continuity should exist.
6. Check harness for short to power.

OK or NG

OK >> GO TO 4.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK FUEL PRESSURE

1. Release fuel pressure. Refer to EC-26, "FUEL PRESSURE RELEASE".
2. Install fuel pressure gauge and check fuel pressure. Refer to EC-26, "Fuel Pressure Check".

   At idling:

   Approximately 350 kPa (3.5 bar, 3.57 kg/cm^2, 51 psi)

OK or NG

OK >> GO TO 5.

NG >> Fix the problems.

DTC P0172 Fuel Injection System Function Too Rich (Cont'd)

5. CHECK MASS AIR FLOW SENSOR

1. Install the removed components.
2. Check the mass air flow sensor in "DATA MONITOR" mode with CONSULT-II.

   At idling: 10 - 40 gm/sec

   At 2,500 rpm: 40 - 10 gm/sec

OK or NG

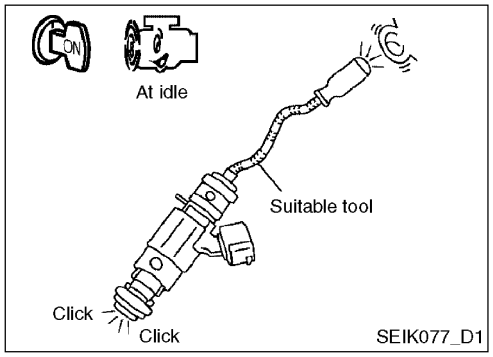
OK >> GO TO 6.

NG >> Check mass air flow sensor harness connection and engine ground connection for looseness. Check connector for corrosion. Refer to EC-108, "DTC P0102, P0103 MASS AIR FLOW SENSOR".

6. CHECK MASS AIR FLOW SENSOR

With CONSULT-II

1. Start engine.
2. Perform power balance operation in "ACTIVE TEST" mode in CONSULT-II.
3. Check sudden drop of engine speed in each injector.



Without CONSULT-II

1. Start engine.
2. Listen to each injector operating sound.

OK or NG

OK >> GO TO 7.

NG >> Perform trouble diagnosis.
Refer to EC-223, "Diagnostic Procedure".

DTC P0172 Fuel Injection System Function Too Rich (Cont'd)

7. CHECK INJECTORS

1. Remove injector assembly. Refer to "OUTER COMPONENT PARTS" (QG16: EM-12). Do not remove fuel hoses and injectors from injector gallery
2. Check if there are any possibilities of fire and the engine is cooled down.
3. Disconnect injector harness connector.
4. Disconnect all injector harness connectors.
5. Place a suitable container under each injector to collect fuel spilage.
6. Crank engine for about 3 seconds. There should not be fuel drops from injectors.

OK or NG

OK >> GO TO 8.

NG >> Replace the injectors that cannot inject fuel properly with new ones. The O-rings should be replaced whenever the injector is removed.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-74, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".

>> **INSPECTION END**

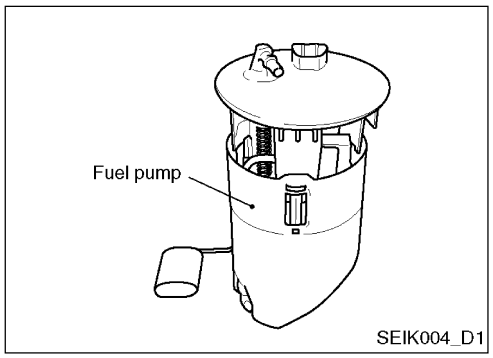
Fuel Pump Circuit

Description

Sensor	Input Signal to ECM	ECM Function	Actuator
Crankshaft position sensor (POS)	Engine speed*	Fuel pump control	Fuel pump relay
Camshaft position sensor (PHASE)			
Battery	Battery voltage*		

*: The ECM determines the start signal status by the signals of engine speed and battery voltage.
The ECM controls ON/OFF duty of heated oxygen sensor 1 heater according to the engine speed and coolant temperature.
The ECM activates the fuel pump for several seconds after the ignition switch is turned on to improve engine startability. If the ECM receives a engine speed signal from the crankshaft position sensor (POS) and camshaft position sensor (PHASE), it knows that the engine is rotating, and causes the pump to operate. If the engine speed signal is not received when the ignition switch is ON, the engine stalls. The ECM stops pump operation and prevents battery discharging, thereby improving safety. The ECM does not directly drive the fuel pump. It controls the ON/OFF fuel pump relay, which in turn controls the fuel pump.

Condition	Fuel Pump Operation
Ignition switch is turned to ON	Operates for 1 second
Engine running and cranking	Operates
When engine is stopped	Stops in 1.5 seconds
Except as shown above	Stops



Component Description

- A turbine type design fuel pump is used in the fuel tank.
- Fuel pressure regulator integrated type

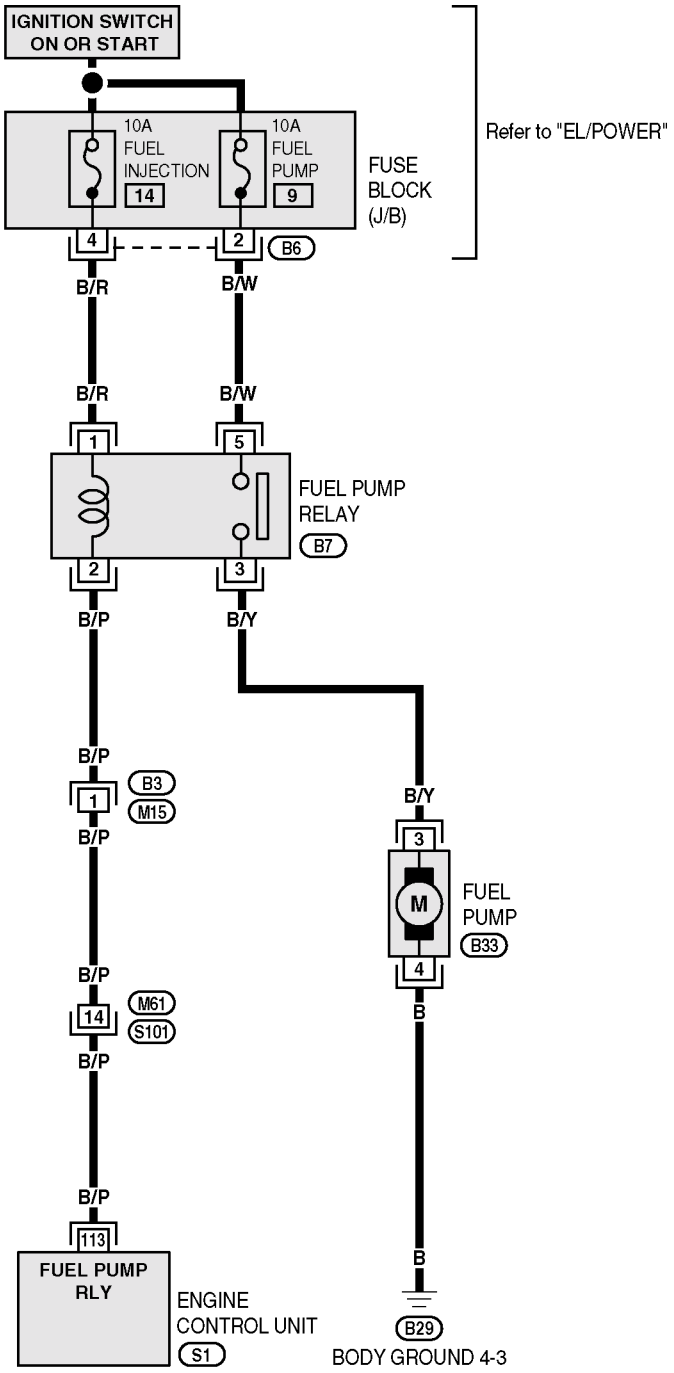
CONSULT-II REFERENCE VALUE IN DATA MONITOR MODE

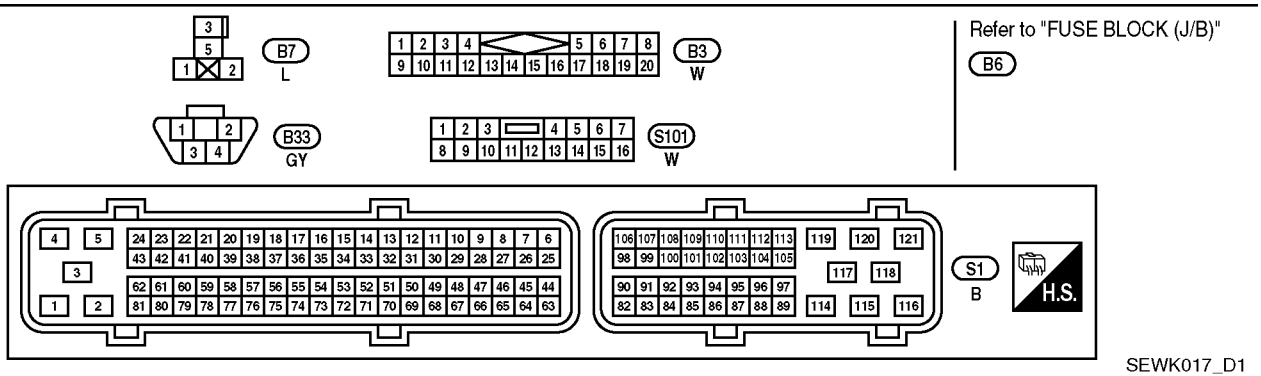
Specification data are reference values.

Monitor Item	Condition	Specification
FUEL PUMP RLY	● For 1 seconds after turning ignition switch ON ● Engine running or cranking	ON
	● Except above conditions	OFF

Wiring Diagram

EC/Fuel Pump





SEWK017_D1

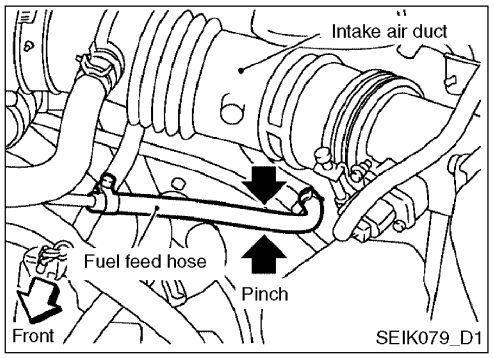
Fuel Pump Circuit (Cont'd)

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

- **Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

Terminal No.	Wire Color	Item	Condition	Data (DC Voltage)
113	B/P	Fuel pump relay	**[Ignition switch ON]** ● For 1 seconds after turning ignition switch ON **[Engine is running]**	Approximately 0 V
			[Ignition switch ON] ● More than 1 seconds after turning ignition switch	BATTERY VOLTAGE (11 - 14 V)



Diagnostic Procedure

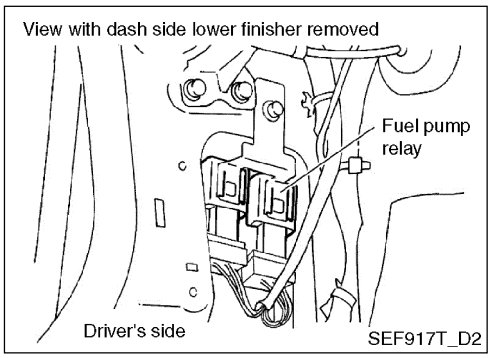
1. CHECK OVERALL FUNCTION

1. Turn ignition switch ON.
2. Pinch fuel feed hose with two fingers.
   Fuel pressure pulsation should be felt on the fuel hose for 1 second after ignition switch is turned ON.

OK or NG

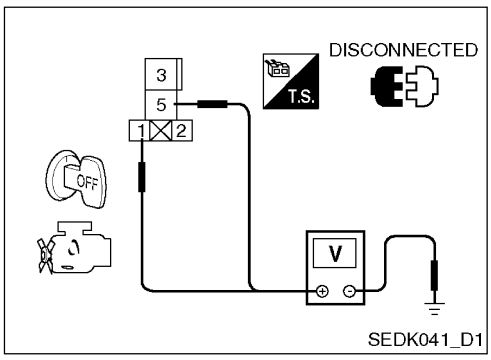
OK >> **INSPECTION END**
NG >> GO TO 2.

Fuel Pump Circuit (Cont'd)



2. CHECK FUEL PUMP RELAY POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect fuel pump relay harness connector.
3. Turn ignition switch ON.



4. Check voltage between fuel pump relay terminals 1, 5 and ground with CONSULT-II or tester.

   Voltage: Battery voltage

OK or NG

OK >> GO TO 4.

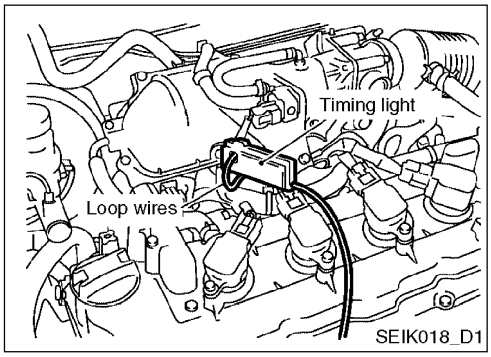
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector B6
- 10A fuse
- Harness for open or short between fuel pump relay and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.



4. CHECK FUEL PUMP POWER SUPPLY AND GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect fuel level sensor unit and fuel pump harness connector.
3. Check harness continuity between fuel pump relay terminal 3 and fuel level sensor unit and fuel pump terminal 5, fuel level sensor unit and fuel pump terminal 4 and body ground.

   Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.

NG >> GO TO 5.

Fuel Pump Circuit (Cont'd)

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between fuel level sensor unit and fuel pump and fuel pump relay
- Harness for open or short between fuel level sensor unit and fuel pump and body ground

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B3, M15
- Harness connectors M61, S101
- Harness for open or short between ECM and fuel pump relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK FUEL PUMP RELAY

Refer to EC-242, "Component Inspection".

OK or NG

OK >> GO TO 8.

NG >> Replace fuel pump relay.

8. CHECK FUEL PUMP

Refer to EC-242, "Component Inspection".

OK or NG

OK >> GO TO 9.

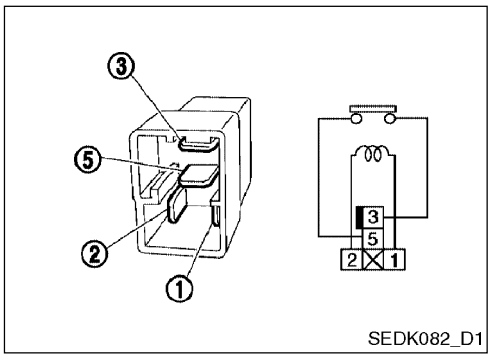
NG >> Replace fuel pump.

9. CHECK INTERMITTENT INCIDENT

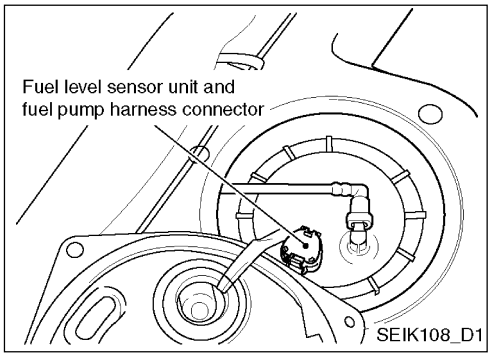
Refer to EC-74, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".

>> **INSPECTION END**

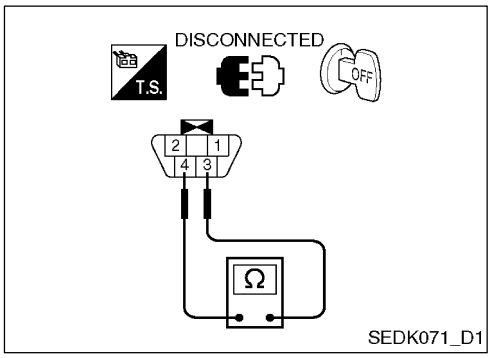
Fuel Pump Circuit (Cont'd)



SEDK082_D1



SEIK108_D1



SEDK071_D1

Component Inspection

FUEL PUMP RELAY

Check continuity between fuel pump relay terminals 3 and 5 under the following conditions.

Conditions	Continuity
12 V direct supply between terminal 1 and 2	Yes
No current supply	No

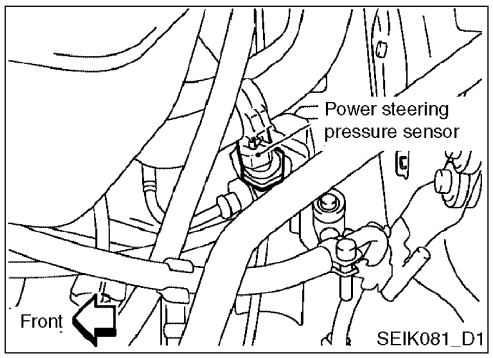
FUEL PUMP

1. Disconnect fuel level sensor unit and fuel pump harness connector.

2. Check resistance between fuel level sensor unit and fuel pump terminals 3 and 4.

   Resistance:
   Approximately 1.0 Ω [at 25°C (77°F)]

DTC P0550 Power Steering Pressure Sensor Circuit



Component Description

Power steering pressure (PSP) sensor is installed to the power steering high-pressure tube and detects a power steering load. This sensor is a potentiometer which transforms the power steering load into output voltage, and emits the voltage signal to the ECM. The ECM controls the electric throttle control actuator and adjusts the throttle valve opening angle to increase the engine speed and adjusts the idle speed for the increased load.

CONSULT-II REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

Monitor Item	Condition		Specification
PW/ST SIGNAL	Engine: After warming up, idle the engine	Steering wheel is in neutral position. (Forward direction)	OFF
		Steering wheel is turned.	ON

On Board Diagnosis Logic

The MIL will not light up for this diagnosis.

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P0550 0550	Power steering pressure sensor circuit	An excessively low or high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Power steering pressure sensor

DTC Confirmation Procedure

NOTE:

- **If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.**

With CONSULT-II

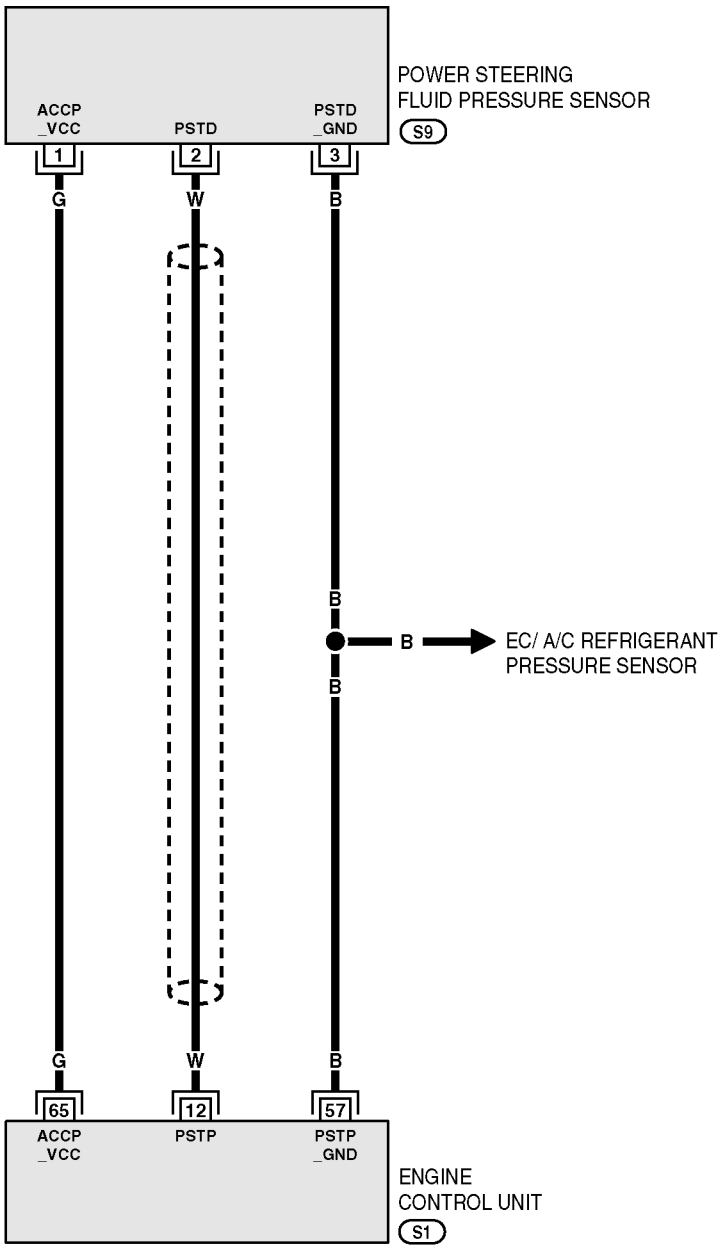
1. Turn ignition switch ON.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for at least 5 seconds.
4. If DTC is detected, go to EC-245, “Diagnostic Procedure”.

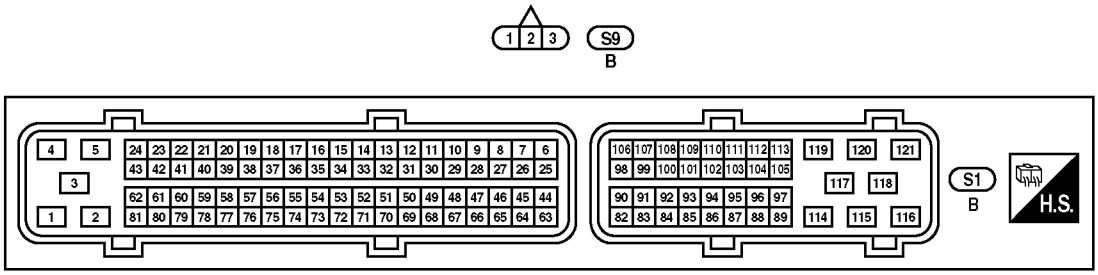
Without CONSULT-II

1. Start engine and let it idle for at least 5 seconds.
2. Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
3. Perform Diagnostic Test Mode II (Self-diagnostic results).
4. If DTC is detected, go to EC-245, “Diagnostic Procedure”.

Wiring Diagram

EC/P•S-Signal





SEWK012_D1

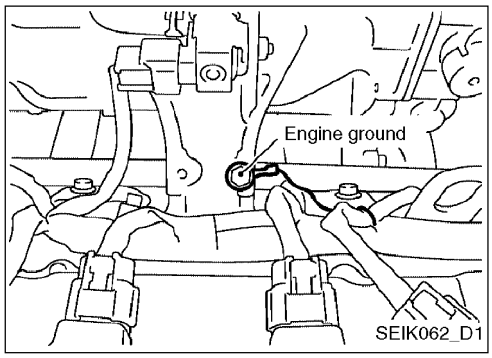
DTC P0550 Power Steering Pressure Sensor Circuit (Cont'd)

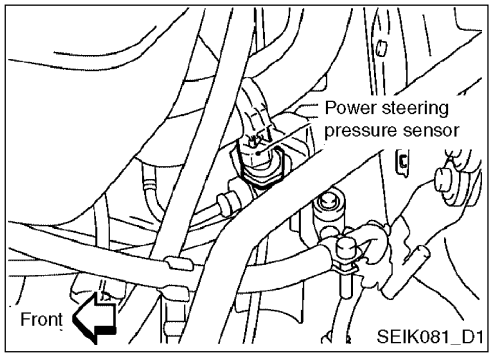
Specification data are reference values and are measured between each terminal and ground.

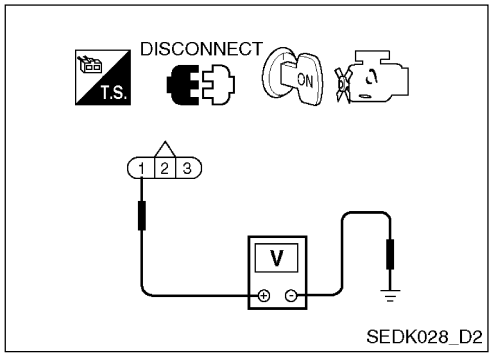
CAUTION:

- **Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

Terminal No.	Wire Color	Item	Condition	Data (DC Voltage)
12	W	Power steering pressure sensor	**[Engine is running]** ● Steering wheel is being turned.	0.5 - 4.0 V
			[Engine is running] ● Steering wheel is not being turned.	0.4 - 0.8 V
57	B	Sensors ground (Power steering pressure sensor/ Refrigerant pressure sensor)	**[Engine is running]** ● Idle speed	Approximately 0 V
65	G	Sensor power supply (Power steering pressure sensor)	**[Ignition switch ON]**	Approximately 5 V







Diagnostic Procedure

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch OFF.
2. Loosen and retighten engine ground screws.

>> GO TO 2.

2. CHECK POWER STEERING PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Disconnect power steering pressure sensor harness connector.
2. Turn ignition switch ON.
3. Check voltage between power steering pressure sensor terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V

OK or NG

OK >> GO TO 3.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

DTC P0550 Power Steering Pressure Sensor Circuit (Cont'd)

3. CHECK PSP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 57 and power steering pressure sensor terminal 3.
   Refer to Wiring Diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK PSP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 12 and power steering pressure sensor terminal 2.
   Continuity should exist.
2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK POWER STEERING PRESSURE SENSOR

Refer to EC-246, "Component Inspection".

OK or NG

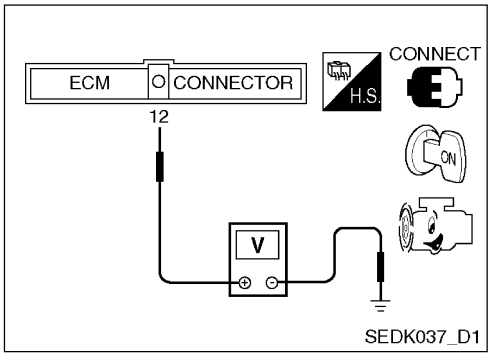
OK >> GO TO 6.

NG >> Replace power steering pressure sensor.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-74, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".

>> **INSPECTION END**



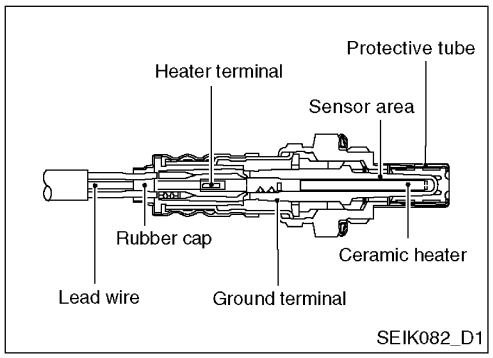
Component Inspection

POWER STEERING PRESSURE SENSOR

1. Reconnect all harness connectors disconnected.
2. Start engine and let it idle.
3. Check voltage between ECM terminal 12 and ground under the following conditions.

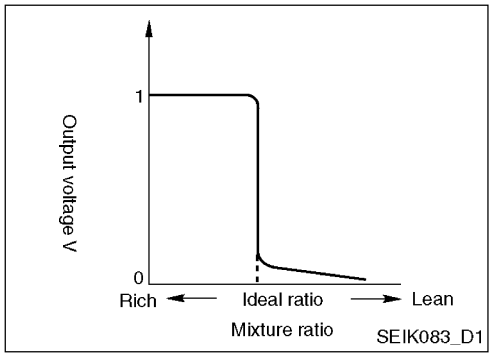
Condition	Voltage
Steering wheel is being turned fully.	0.5 - 4.0 V
Steering wheel is not being turned.	0.4 - 0.8 V

DTC P0132 Heated Oxygen Sensor - FR Circuit High Voltage



Component Description

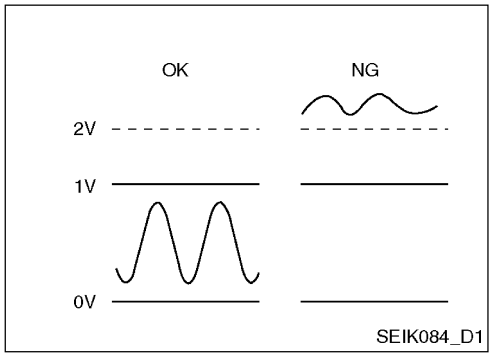
The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1 V in richer conditions to 0 V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1 V to 0 V.



CONSULT-II REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

Monitor Item	Condition		Specification
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ↔ Approx. 0.6 - 1.0 V
HO2S1 MNTR (B1)			LEAN ↔ RICH Changes more than 5 times during 10 seconds.



On Board Diagnosis Logic

To judge the malfunction, the diagnosis checks that the heated oxygen sensor 1 output is not inordinately high.

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P0132 0132	Heated oxygen sensor 1 circuit high voltage	An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 1

DTC P0132 Heated Oxygen Sensor - FR Circuit High Voltage (Cont'd)

DTC Confirmation Procedure

NOTE:

- **If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.**

With CONSULT-II

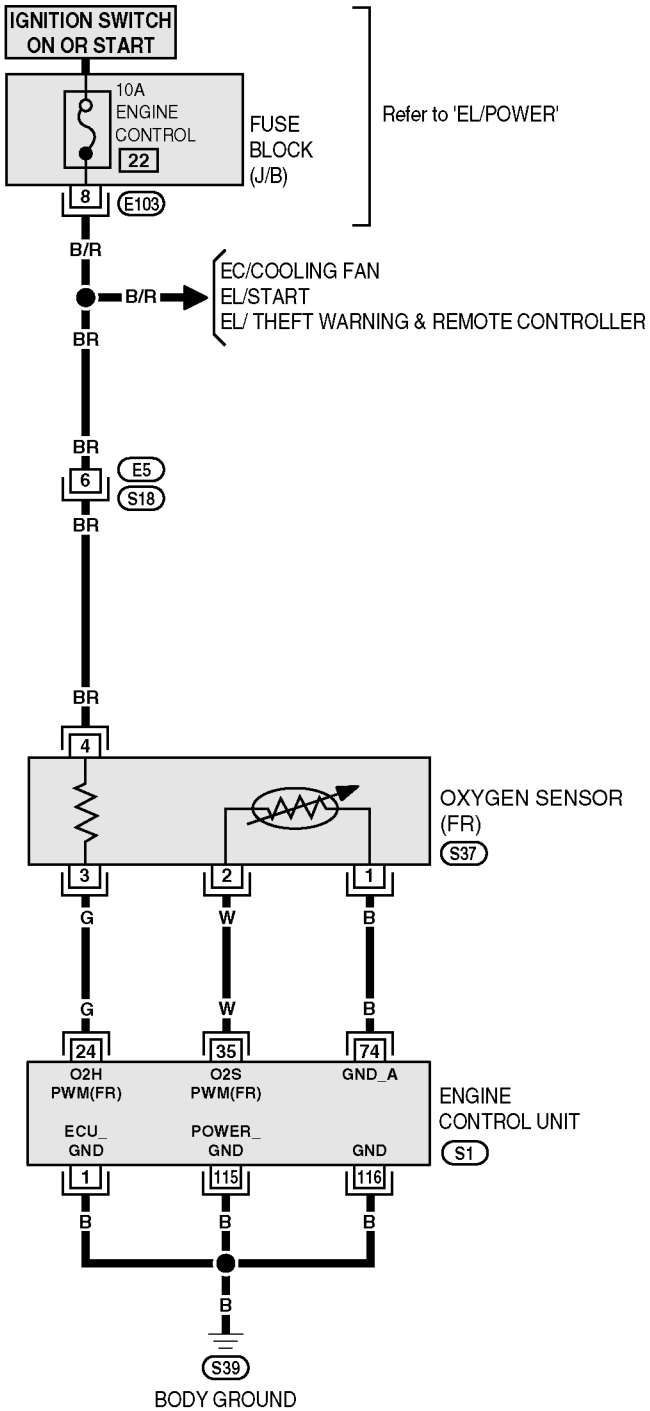
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Select "DATA MONITOR" mode with CONSULT-II.
5. Restart engine and let it idle for 2 minutes.
6. If DTC is detected, go to EC-250, "Diagnostic Procedure".

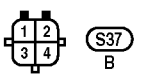
Without CONSULT-II

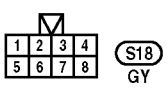
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Restart engine and let it idle for 2 minutes.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Perform Diagnostic Test Mode II (Self-diagnostic results) with ECM.
6. If DTC is detected, go to EC-250, "Diagnostic Procedure".

Wiring Diagram

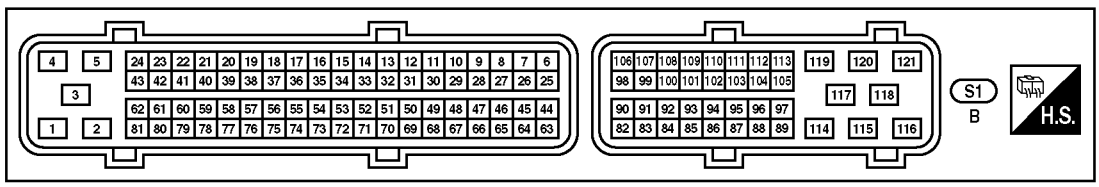
EC/Oxygen Sensor - FR







Refer to "FUSE BLOCK (J/B)"
E103



SEWK006_D1

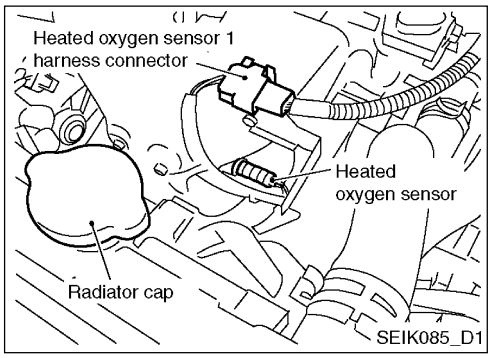
DTC P0132 Heated Oxygen Sensor - FR Circuit High Voltage (Cont'd)

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

- **Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

Terminal No.	Wire Color	Item	Condition	Data (DC Voltage)
35	W	Heated oxygen sensor 1	**[Engine is running]** ● Warm-up condition ● Engine speed is 2,000 rpm	0 - Approximately 1.0 V (Periodically change)
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0 V



Diagnostic Procedure

1. RETIGHTEN HEATED OXYGEN SENSOR 1

1. Turn ignition switch OFF.
2. Loosen and retighten heated oxygen sensor 1.

   Tightening torque:

   40 - 60 N·m (4.1 - 6.2 kg-m, 30 - 44 ft-lb)

>> GO TO 2.

2. CHECK HEATED OXYGEN SENSOR 1 (FR) GROUND CIRCUIT FOR OPEN AND SHORT

1. Disconnect heated oxygen sensor 1 harness connector.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 74 and heated oxygen sensor 1 (FR) terminal 4.

   Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

DTC P0132 Heated Oxygen Sensor - FR Circuit High Voltage (Cont'd)

3. CHECK HEATED OXYGEN SENSOR 1 (FR) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 35 and heated oxygen sensor 1 (FR) terminal 2.
   Refer to Wiring Diagram.
   Continuity should exist.
2. Check harness continuity between ECM terminal 35 or heated oxygen sensor 1 (FR) terminal 2 and ground.
   Refer to Wiring Diagram.
   Continuity should not exist.
3. Also check harness for short to power.

OK or NG

OK >> GO TO 4.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HEATED OXYGEN SENSOR 1 (FR) CONNECTOR FOR WATER

Check heated oxygen sensor 1 connectors for water.

Water should not exist.

OK or NG

OK >> GO TO 5.

NG >> Repair or replace harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-251, "Component Inspection".

OK or NG

OK >> GO TO 6.

NG >> Replace heated oxygen sensor 1.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-74, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".

>> **INSPECTION END**

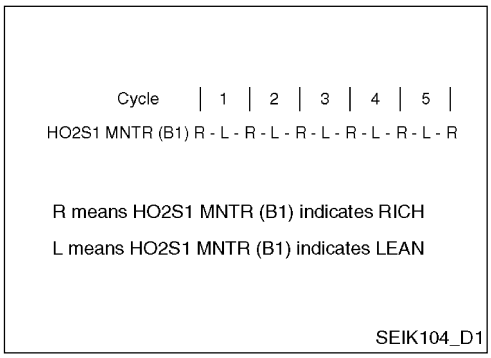
Component Inspection

HEATED OXYGEN SENSOR 1

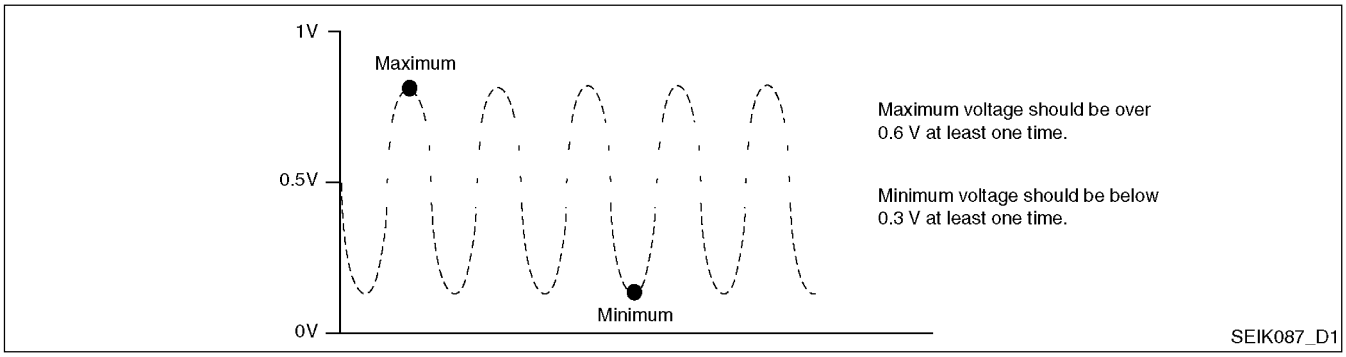
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select "MANU TRIG" and adjust "TRIGGER POINT" to 100% in "DATA MONITOR" mode with CONSULT-II.
3. Select "HO2S1 (B1)" and "HO2S1 MNTR (B1)".
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch "RECORD" on CONSULT-II screen.

DTC P0132 Heated Oxygen Sensor - FR Circuit High Voltage (Cont'd)

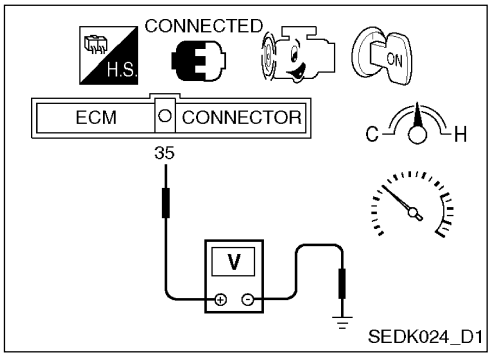


6. Check the following.
   - "HO2S1 MNTR (B1)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" more than 5 times in 10 seconds. 5 times (cycles) are counted as shown at right.
   - "HO2S1 (FR) (B1)" voltage goes above 0.6 V at least once.
   - "HO2S1 (FR) (B1)" voltage goes below 0.3 V at least once.
   - "HO2S1 (FR) (B1)" voltage never exceeds 1.0 V.



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using oxygen sensor thread cleaner and approved anti-seize lubricant.**



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 (HO2S1 (FR) signal) and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3 V and 0.6 to 1.0 V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6 V at least one time.
   - The minimum voltage is below 0.3 V at least one time.
   - The voltage never exceeds 1.0 V.

     1 time: 0 - 0.3 V → 0.6 - 1.0 V → 0 - 0.3 V

     2 times: 0 - 0.3 V → 0.6 - 1.0 V → 0 - 0.3 V → 0.6 - 1.0 V

CAUTION:

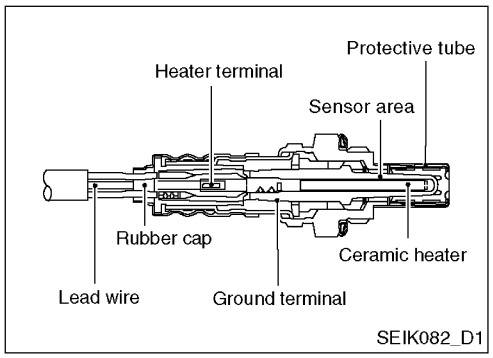
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using oxygen sensor thread cleaner and approved anti-seize lubricant.**

Removal and Installation

HEATED OXYGEN SENSOR 1

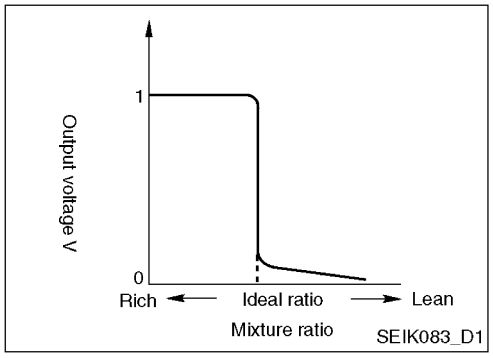
Refer to "OUTER COMPONENT PARTS" (QG16: EM-13).

DTC P0134 Heated Oxygen Sensor - FR Circuit No Activity Detected



Component Description

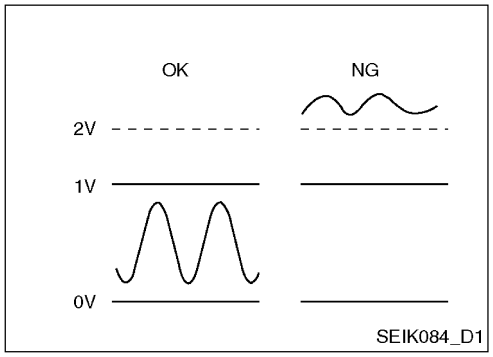
The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1 V in richer conditions to 0 V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1 V to 0 V.



CONSULT-II REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

Monitor Item	Condition		Specification
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ↔ Approx. 0.6 - 1.0 V
HO2S1 MNTR (B1)			LEAN ↔ RICH Changes more than 5 times during 10 seconds.



On Board Diagnosis Logic

Under the condition in which the heated oxygen sensor 1 signal is not input, the ECM circuits will read a continuous approximately 0.3 V. Therefore, for this diagnosis, the time that output voltage is within 200 to 400 mV range is monitored, and the diagnosis checks that this time is not inordinately long.

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P0134 0134	Heated oxygen sensor 1 circuit no activity detected	The voltage from the sensor is constantly approx. 0.3V.	Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 1

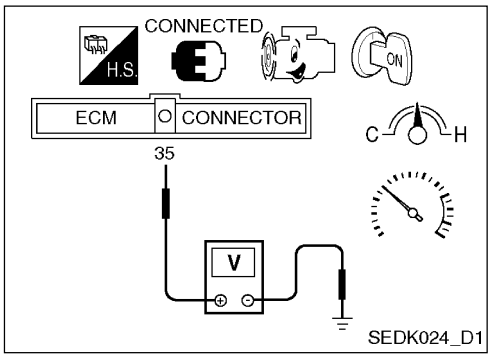
DTC P0134 Heated Oxygen Sensor - FR Circuit No Activity Detected (Cont'd)

Overall Function Check

Use this procedure to check the overall function of the heated oxygen sensor 1 circuit. During this check, a DTC might not be confirmed.

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select "MANU TRIG" in "DATA MONITOR" mode with CONSULT-II, and select "HO2S1 (B1)".
3. Hold engine speed at 2,000 rpm under no load.
4. Make sure that the indications do not remain in the range between 0.2 to 0.4 V.
5. If NG, go to EC-256, "Diagnostic Procedure".

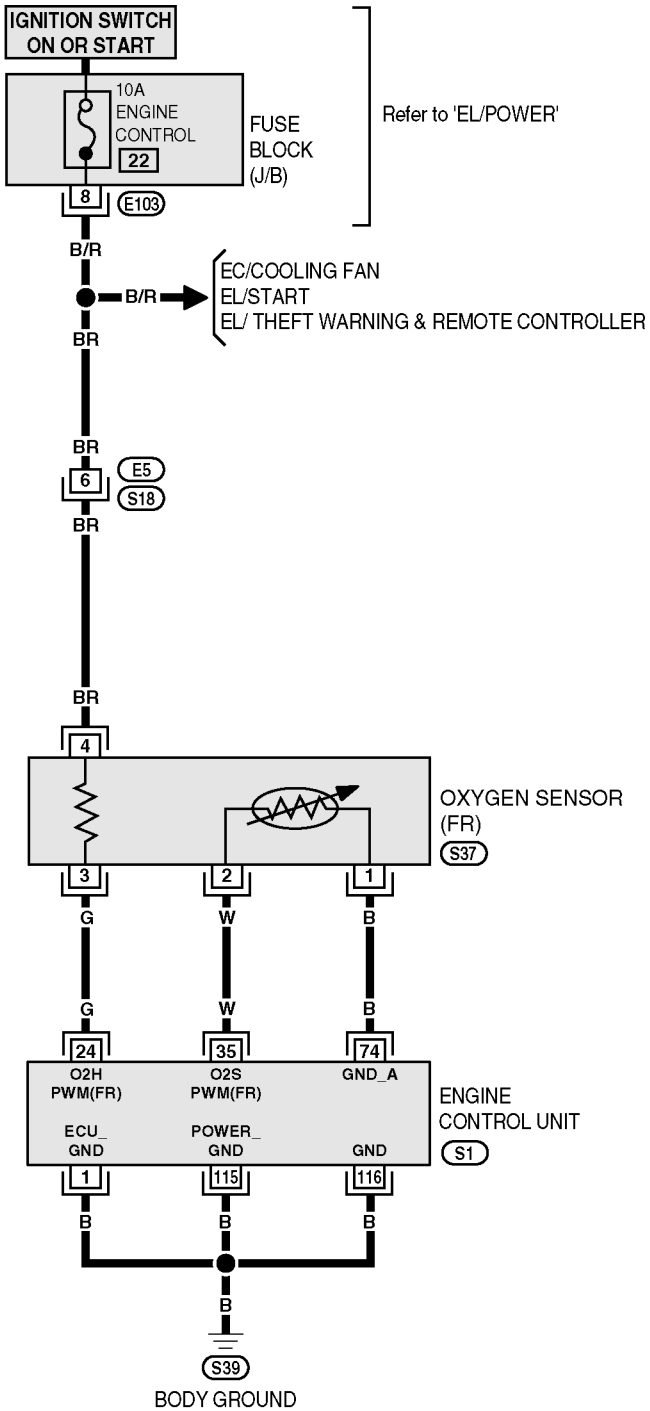


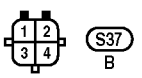
Without CONSULT-II

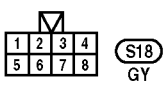
1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 (HO2S1 (FR) signal) and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage does not remain in the range of 0.2 to 0.4 V.
4. If NG, go to EC-256, "Diagnostic Procedure".

Wiring Diagram

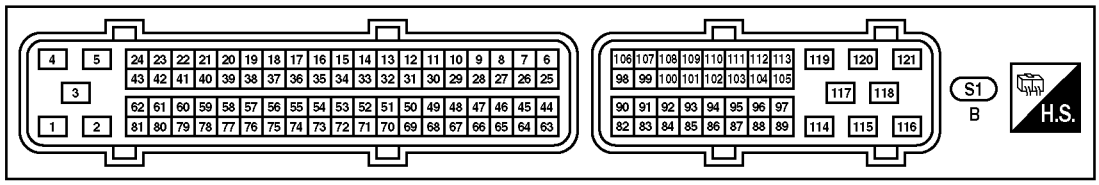
EC/Oxygen Sensor - FR







Refer to "FUSE BLOCK (J/B)"
E103



SEWK006_D1

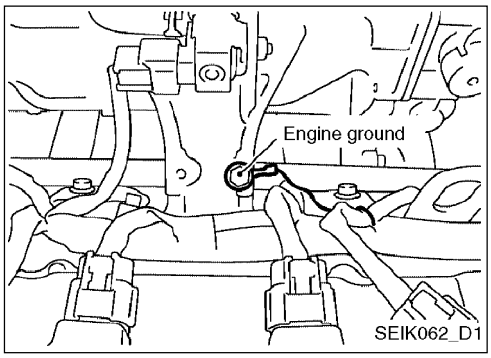
DTC P0134 Heated Oxygen Sensor - FR Circuit No Activity Detected (Cont'd)

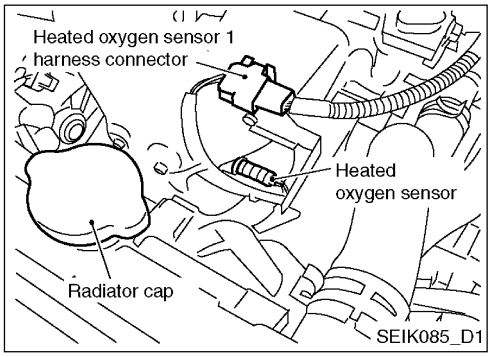
Specification data are reference values and are measured between each terminal and ground.

CAUTION:

- **Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

Terminal No.	Wire Color	Item	Condition	Data (DC Voltage)
35	W	Heated oxygen sensor 1	**[Engine is running]** ● Warm-up condition ● Engine speed is 2,000 rpm.	0 - Approximately 1.0 V (Periodically change)
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0 V





Diagnostic Procedure

1. INSPECTION START

1. Turn ignition switch OFF.
2. Loosen and retighten engine ground screws.

>> GO TO 2.

2. CHECK HEATED OXYGEN SENSOR 1 (FR) GROUND CIRCUIT FOR OPEN AND SHORT

1. Disconnect heated oxygen sensor 1 harness connector.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 74 and heated oxygen sensor 1 (FR) terminal 1. Refer to Wiring Diagram.

   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

DTC P0134 Heated Oxygen Sensor - FR Circuit No Activity Detected (Cont'd)

3. CHECK HEATED OXYGEN SENSOR 1 (FR) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 35 and heated oxygen sensor 1 (FR) terminal 2.
   Refer to Wiring Diagram.
   Continuity should exist.
2. Check harness continuity between ECM terminal 74 or heated oxygen sensor 1 terminal 1 and ground.
   Refer to Wiring Diagram.
   Continuity should not exist.
3. Also check harness for short to power.

OK or NG

OK >> GO TO 4.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-257, "Component Inspection".

OK or NG

OK >> GO TO 5.

NG >> Replace heated oxygen sensor 1.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-74, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".

>> **INSPECTION END**

Component Inspection

HEATED OXYGEN SENSOR 1

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select "MANU TRIG" and adjust "TRIGGER POINT" to 100% in "DATA MONITOR" mode with CONSULT-II.
3. Select "HO2S1 (B1)" and "HO2S1 MNTR (B1)".
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch "RECORD" on CONSULT-II screen.
6. Check the following.
   - "HO2S1 MNTR (B1)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" more than 5 times in 10 seconds. 5 times (cycles) are counted as shown at right.
   - "HO2S1 (FR) (B1)" voltage goes above 0.6V at least once.
   - "HO2S1 (FR) (B1)" voltage goes below 0.3V at least once.
   - "HO2S1 (FR) (B1)" voltage never exceeds 1.0V.

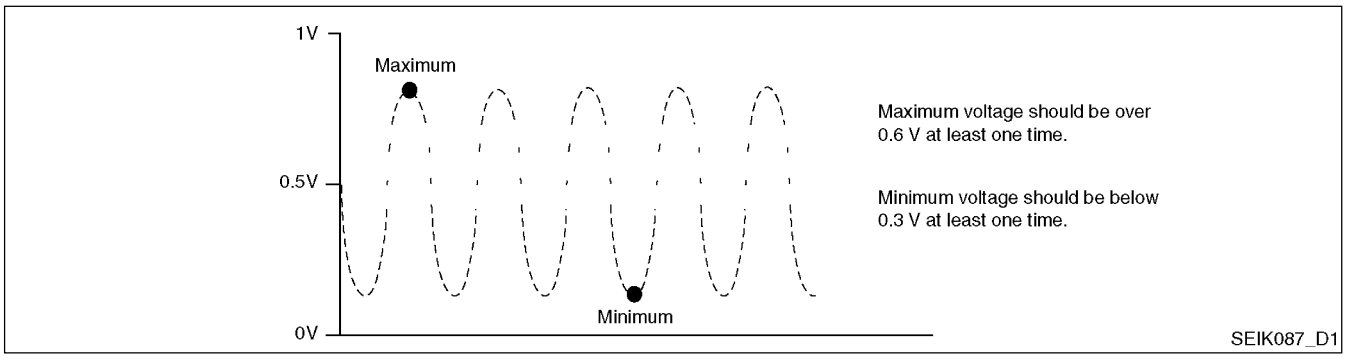
Cycle	1	2	3	4	5
HO2S1 MNTR (B1)	R - L - R - L - R - L - R - L - R - L - R				

R means HO2S1 MNTR (B1) indicates RICH

L means HO2S1 MNTR (B1) indicates LEAN

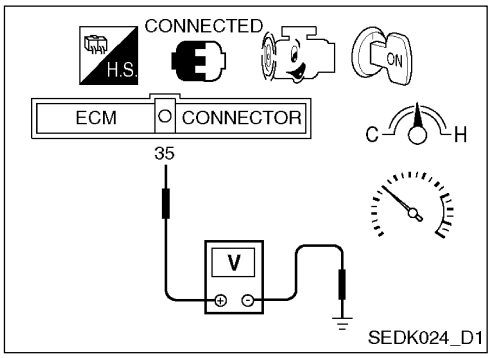
SEIK104_D1

DTC P0134 Heated Oxygen Sensor - FR Circuit No Activity Detected (Cont'd)



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using oxygen sensor thread cleaner and approved anti-seize lubricant.**



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 (HO2S1 (FR) signal) and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3 V and 0.6 to 1.0 V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6 V at least one time.
   - The minimum voltage is below 0.3 V at least one time.
   - The voltage never exceeds 1.0 V.

     1 time: 0 - 0.3 V → 0.6 - 1.0 V → 0 - 0.3 V

     2 times: 0 - 0.3 V → 0.6 - 1.0 V → 0 - 0.3 V → 0.6 - 1.0 V

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using oxygen sensor thread cleaner and approved anti-seize lubricant.**

Removal and Installation

HEATED OXYGEN SENSOR 1

Refer to "OUTER COMPONENT PARTS" (QG16: EM-13).

Heated Oxygen Sensor 1 Heater (FR)

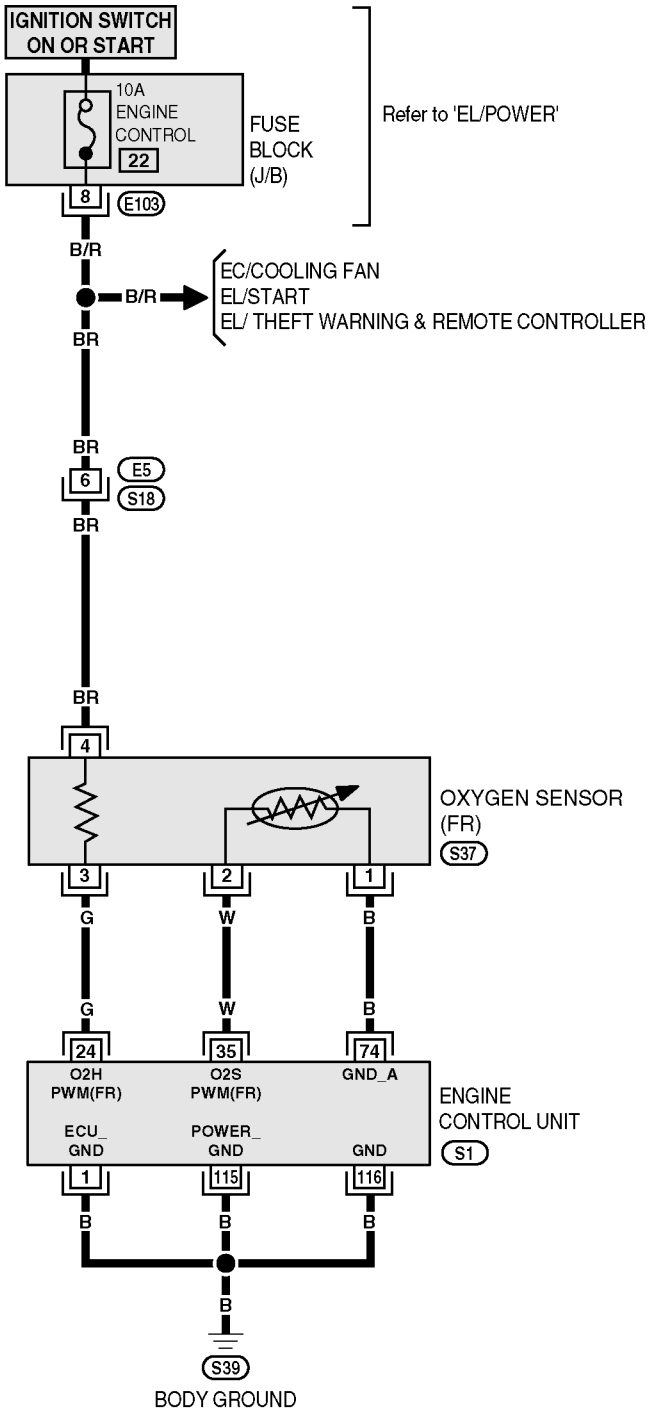
Description

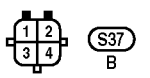
Sensor	Input Signal to ECM	ECM Function	Actuator
Camshaft position sensor (PHASE)	Engine speed	Heated oxygen sensor 1 heater control	Heated oxygen sensor 1 heater
Crankshaft position sensor (POS)			
Engine coolant temperature sensor	Engine coolant temperature		

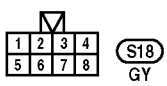
The ECM performs ON/OFF duty control of the heated oxygen sensor 1 heater corresponding to the engine speed and engine coolant temperature. The duty percent varies with engine coolant temperature when engine is started.

Operation

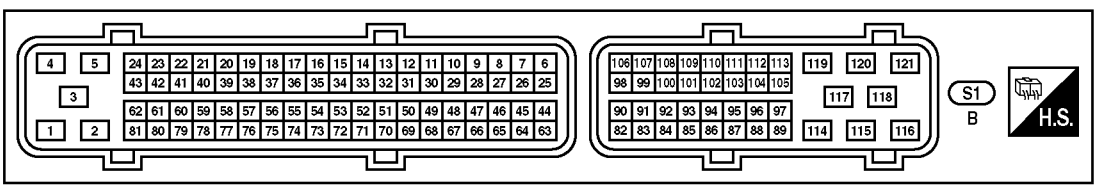
Engine speed rpm	Heated oxygen sensor 1 heater
Above 3,600	OFF
Below 3,600 after warming up	ON







Refer to "FUSE BLOCK (J/B)"
E103



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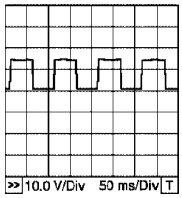
Heated Oxygen Sensor 1 Heater (FR) (Cont'd)

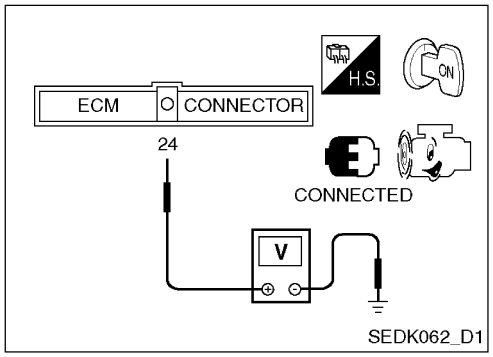
Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-II.

CAUTION:

- **Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

Terminal No.	Wire Color	Item	Condition	Data (DC Voltage)
24	G	Heated oxygen sensor 1 heater	**[Engine is running]** ● Warm-up condition. ● Engine speed is below 3,600 rpm.	Approximately 7.0 V ★ 
			[Ignition switch ON] ● Engine stopped. **[Engine is running]** ● Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14 V)

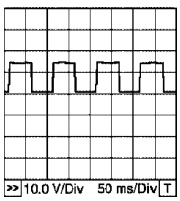
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)



Diagnostic Procedure

1. CHECK OVERALL FUNCTION CHECK

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Set the tester probe between ECM terminal 24 (HO2S1 (FR) heater signal) and ground.
5. Start engine and let it idle.
6. Check the voltage under the following conditions.
   Verify that the oscilloscope screen shows the signal wave as shown below.

Conditions	Voltage
At idle	Approximately 7.0 V ★ 
Engine speed is above 3,600 rpm	BATTERY VOLTAGE (11 - 14 V)

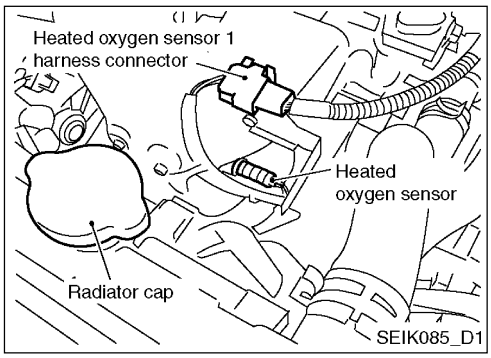
★ : Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

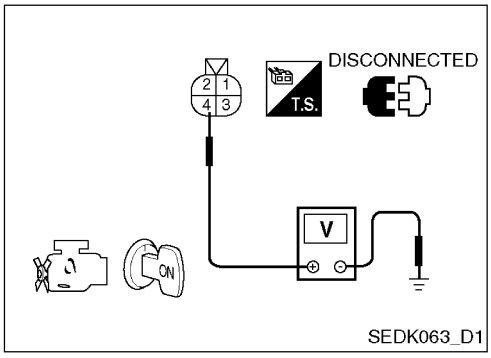
OK or NG

OK >> **INSPECTION END.**

NG >> GO TO 2.

Heated Oxygen Sensor 1 Heater (FR) (Cont'd)





2. CHECK HEATED OXYGEN SENSOR 1 (FR) POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor 1 harness connector.
3. Turn ignition switch ON.
4. Check voltage between heated oxygen sensor 1 (FR) terminal 4 and ground with CONSULT-II or tester.

   Voltage: Battery voltage

OK or NG

OK >> GO TO 4.

NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E5, S18 harness connector
- Fuse block (J/B) connector E104
- 10A fuse
- Harness for open or short between heated oxygen sensor 1 and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HEATED OXYGEN SENSOR 1 (FR) OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 24 and heated oxygen sensor 1 (FR) terminal 3.

   Refer to Wiring Diagram.

   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

Heated Oxygen Sensor 1 Heater (FR) (Cont'd)

5. CHECK HEATED OXYGEN SENSOR 1 (FR) HEATER

Refer to EC-263, "Component Inspection".

OK or NG

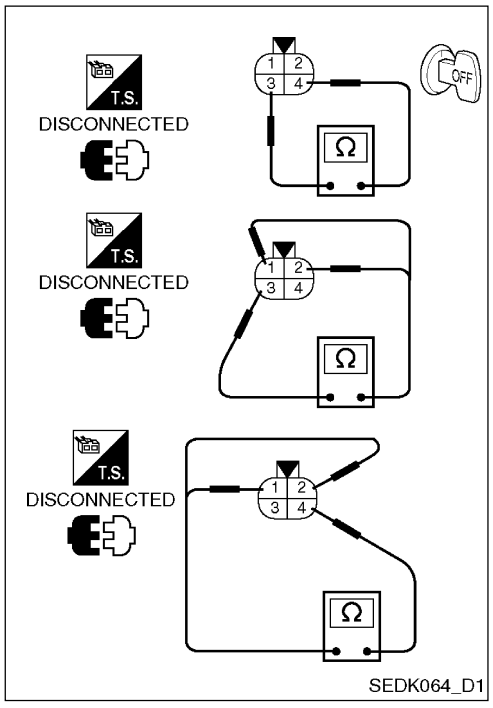
OK >> GO TO 6.

NG >> Replace heated oxygen sensor 1.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-74, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".

>> **INSPECTION END**



Component Inspection

HEATED OXYGEN SENSOR 1 HEATER

1. Check resistance between heated oxygen sensor 1 terminals as follows.

Terminal No.	Resistance
3 and 4	3.3 - 4.0Ω at 25°C (77°F)
3 and 1, 2	α Ω
4 and 1, 2	(Continuity should not exist)

2. If NG, replace heated oxygen sensor 1.

CAUTION:

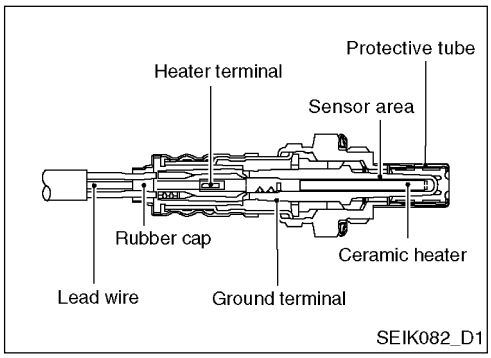
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using oxygen sensor thread cleaner and approved anti-seize lubricant.**

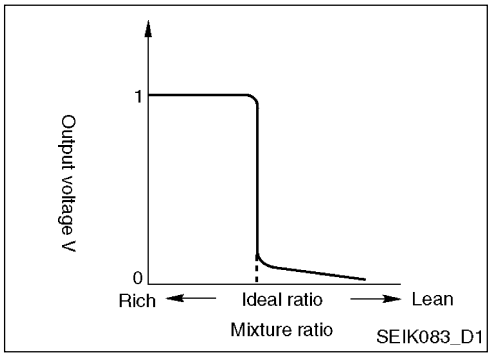
Removal and Installation

HEATED OXYGEN SENSOR 1

Refer to "OUTER COMPONENT PARTS" (QG16: EM-13).

Heated Oxygen Sensor 1 (FR)





Component Description

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1 V in richer conditions to 0 V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1 V to 0 V.

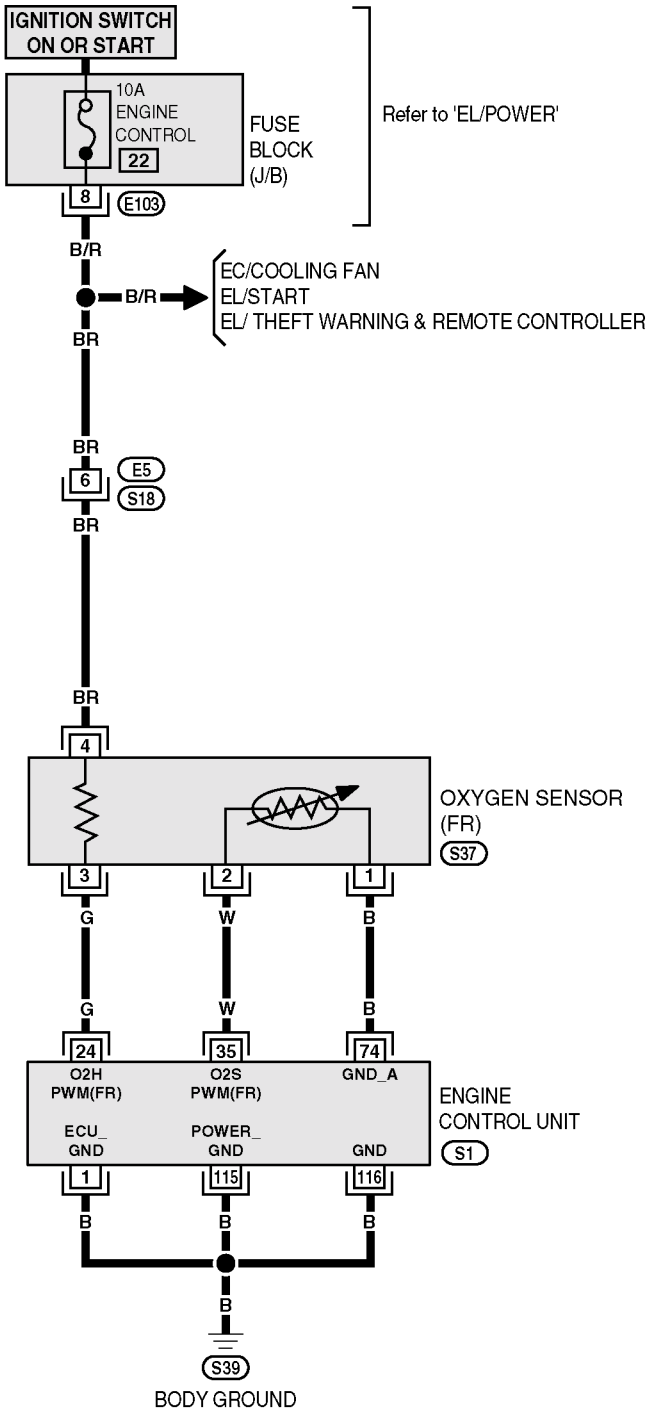
CONSULT-II REFERENCE VALUE IN DATA MONITOR MODE

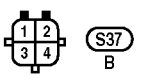
Specification data are reference values.

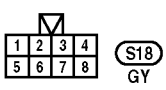
Monitor Item	Condition		Specification
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ↔ Approx. 0.6 - 1.0 V
HO2S1 MNTR (B1)			LEAN ↔ RICH Changes more than 5 times during 10 seconds.

Wiring Diagram

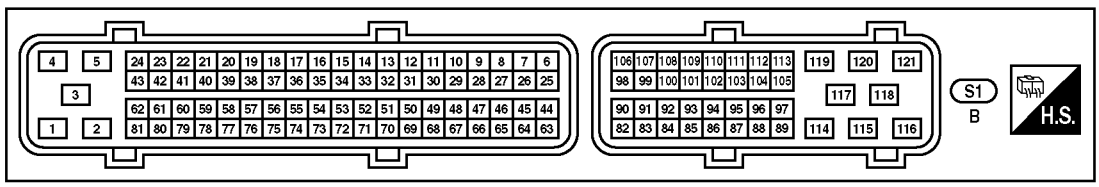
EC/Oxygen Sensor - FR







Refer to "FUSE BLOCK (J/B)"
E103



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Heated Oxygen Sensor 1 (FR) (Cont'd)

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

- **Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

Terminal No.	Wire Color	Item	Condition	Data (DC Voltage)
35	W	Heated oxygen sensor 1	**[Engine is running]** ● Warm-up condition ● Engine speed is 2,000 rpm.	0 - Approximately 1.0 V (Periodically change)
74	B	Sensors ground (Heated oxygen sensor)	**[Engine is running]** ● Idle speed	Approximately 0 V

Diagnostic Procedure

1. INSPECTION START

Do you have CONSULT-II?

Yes or No

Yes >> GO TO 2.

No >> GO TO 3.

2. CHECK OVERALL FUNCTION

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select "HO2S1 MNTR (B1)" in "DATA MONITOR" mode with CONSULT-II.
3. Keep the engine speed at 2,000 rpm under no load, and make sure that the monitors fluctuate between LEAN and RICH more than five times in 10 seconds.

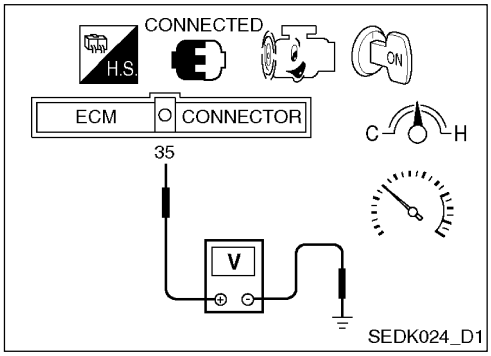
   1 time: RICH → LEAN → RICH

   2 times: RICH → LEAN → RICH → LEAN → RICH

OK or NG

OK >> **INSPECTION END**

NG >> GO TO 4.



3. CHECK OVERALL FUNCTION

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 (HO2S1 signal) and engine ground.
3. Keep the engine speed at 2,000 rpm under no load, and make sure that the voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than five times in 10 seconds.

   1 time: 0 - 0.3 V → 0.6 - 1.0 V → 0 - 0.3 V

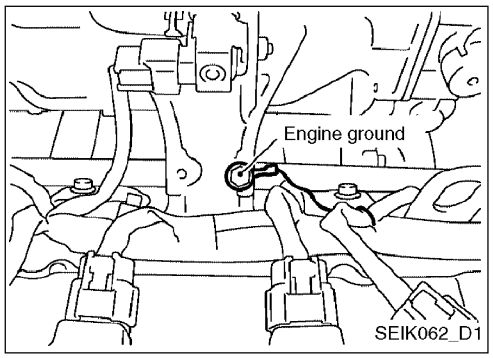
   2 times: 0 - 0.3 V → 0.6 - 1.0 V → 0 - 0.3 V → 0.6 - 1.0 V → 0 - 0.3 V

OK or NG

OK >> **INSPECTION END**

NG >> GO TO 4.

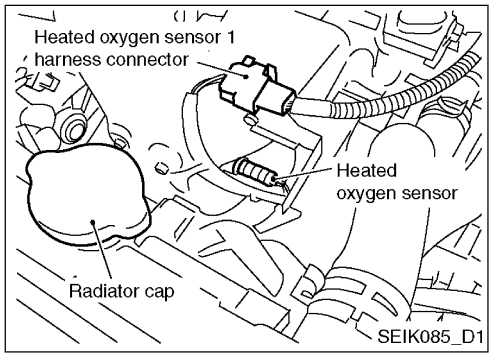
Heated Oxygen Sensor 1 (FR) (Cont'd)



4. RETIGHTEN GROUND SCREWS

1. Turn ignition switch OFF.
2. Loosen and retighten engine ground screws.

>> GO TO 5.



5. RETIGHTEN HEATED OXYGEN SENSOR 1

Loosen and retighten heated oxygen sensor 1.

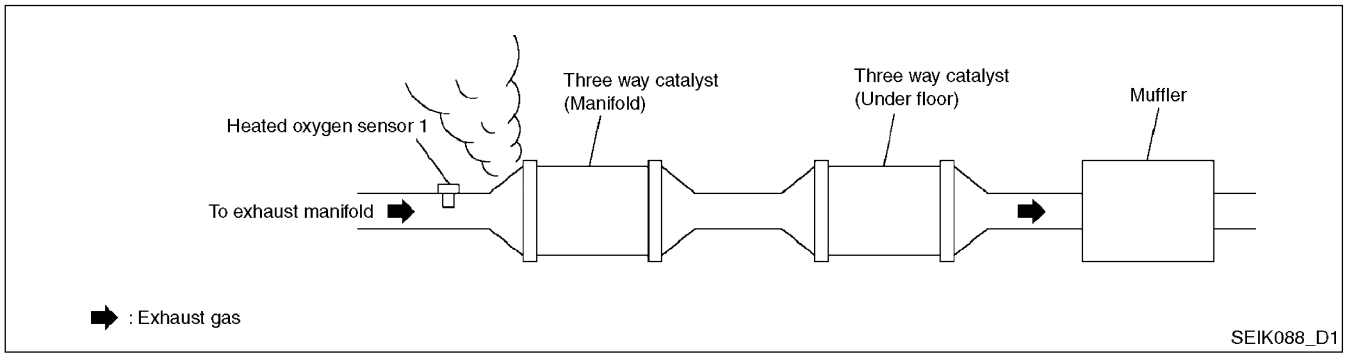
Tightening torque:

40 - 60 N·m (4.1 - 6.2 kg-m, 30 - 44 ft-lb)

>> GO TO 6.

6. CHECK FOR EXHAUST GAS LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust gas leak before three way catalyst (Manifold).



OK or NG

OK >> GO TO 7.

NG >> Repair or replace.

7. CHECK FOR INTAKE AIR LEAK

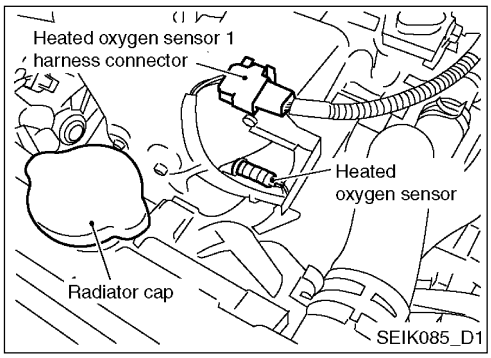
Listen for an intake air leak after the mass air flow sensor.

OK or NG

OK >> GO TO 8.

NG >> Repair or replace.

Heated Oxygen Sensor 1 (FR) (Cont'd)



8. CHECK HEATED OXYGEN SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor 1 harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 74 and heated oxygen sensor 1 (FR) terminal 1. Refer to Wiring Diagram.

   Continuity should exist.
5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK HEATED OXYGEN SENSOR 1 (FR) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 35 and heated oxygen sensor 1 (FR) terminal 2.

   Refer to Wiring Diagram.

   Continuity should exist.
2. Check harness continuity between ECM terminal 35 or heated oxygen sensor 1 (FR) terminal 2 and ground.

   Refer to Wiring Diagram.

   Continuity should not exist.
3. Also check harness for short to power.

OK or NG

OK >> GO TO 10.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

10. CHECK HEATED OXYGEN SENSOR 1 HEATER

Refer to EC-269, "Component Inspection".

OK or NG

OK >> GO TO 11.

NG >> Replace malfunctioning heated oxygen sensor 1.

11. CHECK MASS AIR FLOW SENSOR

Refer to EC-108, "Component Inspection".

OK or NG

OK >> GO TO 12.

NG >> Replace mass air flow sensor.

Heated Oxygen Sensor 1 (FR) (Cont'd)

12. CHECK PCV VALVE

Refer to EC-316, "Component Inspection".

OK or NG

OK >> GO TO 13.

NG >> Replace PCV valve.

13. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-269, "Component Inspection".

OK or NG

OK >> GO TO 14.

NG >> Replace malfunctioning heated oxygen sensor 1.

14. CHECK INTERMITTENT INCIDENT

Refer to EC-74, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".

>> **INSPECTION END**

Component Inspection

HEATED OXYGEN SENSOR 1

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select "MANU TRIG" and adjust "TRIGGER POINT" to 100% in "DATA MONITOR" mode with CONSULT-II.
3. Select "HO2S1 (B1)" and "HO2S1 MNTR (B1)".
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch "RECORD" on CONSULT-II screen.
6. Check the following.
   - "HO2S1 MNTR (B1)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" more than 5 times in 10 seconds. 5 times (cycles) are counted as shown at right.
   - "HO2S1 (FR) (B1)" voltage goes above 0.6 V at least once.
   - "HO2S1 (FR) (B1)" voltage goes below 0.3 V at least once.
   - "HO2S1 (FR) (B1)" voltage never exceeds 1.0 V.

Cycle	1	2	3	4	5
HO2S1 MNTR (B1)	R - L - R - L - R - L - R - L - R - L - R				

R means HO2S1 MNTR (B1) indicates RICH

L means HO2S1 MNTR (B1) indicates LEAN

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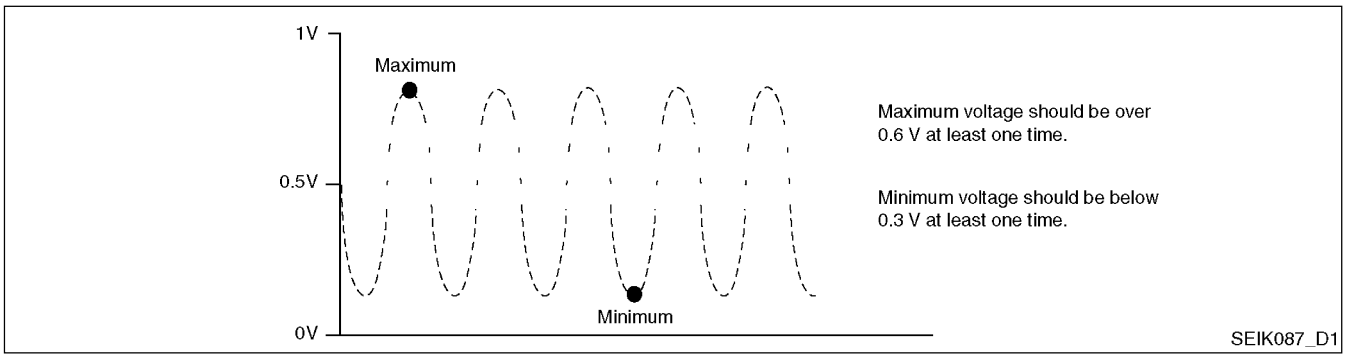
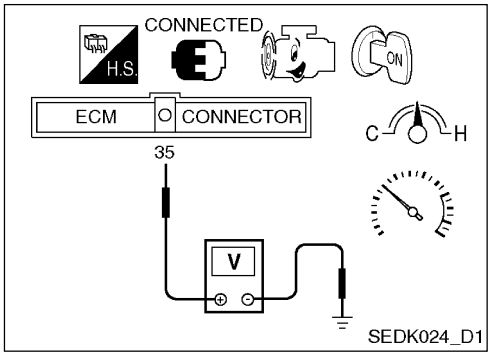
Heated Oxygen Sensor 1 (FR) (Cont'd)



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using oxygen sensor thread cleaner and approved anti-seize lubricant.**



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 (HO2S1 (FR) signal) and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3 V and 0.6 to 1.0 V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6 V at least one time.
   - The minimum voltage is below 0.3 V at least one time.
   - The voltage never exceeds 1.0 V.
     1 time: 0 - 0.3 V → 0.6 - 1.0 V → 0 - 0.3 V
     2 times: 0 - 0.3 V → 0.6 - 1.0 V → 0 - 0.3 V → 0.6 - 1.0 V

CAUTION:

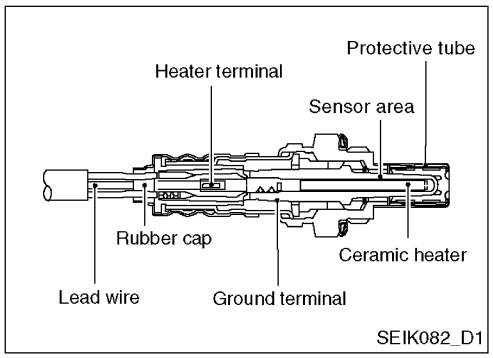
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using oxygen sensor thread cleaner and approved anti-seize lubricant.**

Removal and Installation

HEATED OXYGEN SENSOR 1

Refer to "OUTER COMPONENT PARTS" (QG16: EM-13).

DTC P0138 Heated Oxygen Sensor - RR Circuit High Voltage



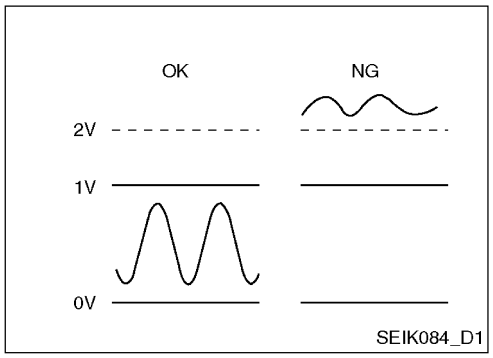
Component Description

The heated oxygen sensor 2 is placed after the three way catalyst. It detects the amount of oxygen in the exhaust gas. While the changing characteristics of the heated oxygen sensor 1 is changed, the mixture ratio is chemically controlled by the signals from the heated oxygen sensor 2. The heated oxygen sensor 2 is made of ceramic zirconia. The zirconia generates voltage from approximately 1 V in richer conditions to 0 V in leaner conditions. The heated oxygen sensor 2 is not used for engine control system when the operating conditions are normal.

CONSULT-II REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

Monitor Item	Condition		Specification
HO2S2 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ↔ Approx. 0.6 - 1.0 V



On Board Diagnosis Logic

The changing time between lean and rich conditions of the heated oxygen sensor 2 is much longer than that of heated oxygen sensor 1. This is caused by the oxygen reserving capacity before the three way catalyst. To judge the malfunction of heated oxygen sensor 2, ECM checks whether the voltage is excessivel high in various operating conditions such as shutting off the fuel.

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P0138 0138	Heated oxygen sensor 2 circuit high voltage	Current in heated oxygen sensor 2 heater circuit is not within normal operating range (An excessively high voltage from the heated oxygen sensor is sent to ECM.)	● Harness or connectors (The heated oxygen sensor heater circuit is open or shorted.) ● Heated oxygen sensor heater

DTC Confirmation Procedure

CAUTION:

- **Always operate in safe driving speed.**

NOTE:

- **If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.**

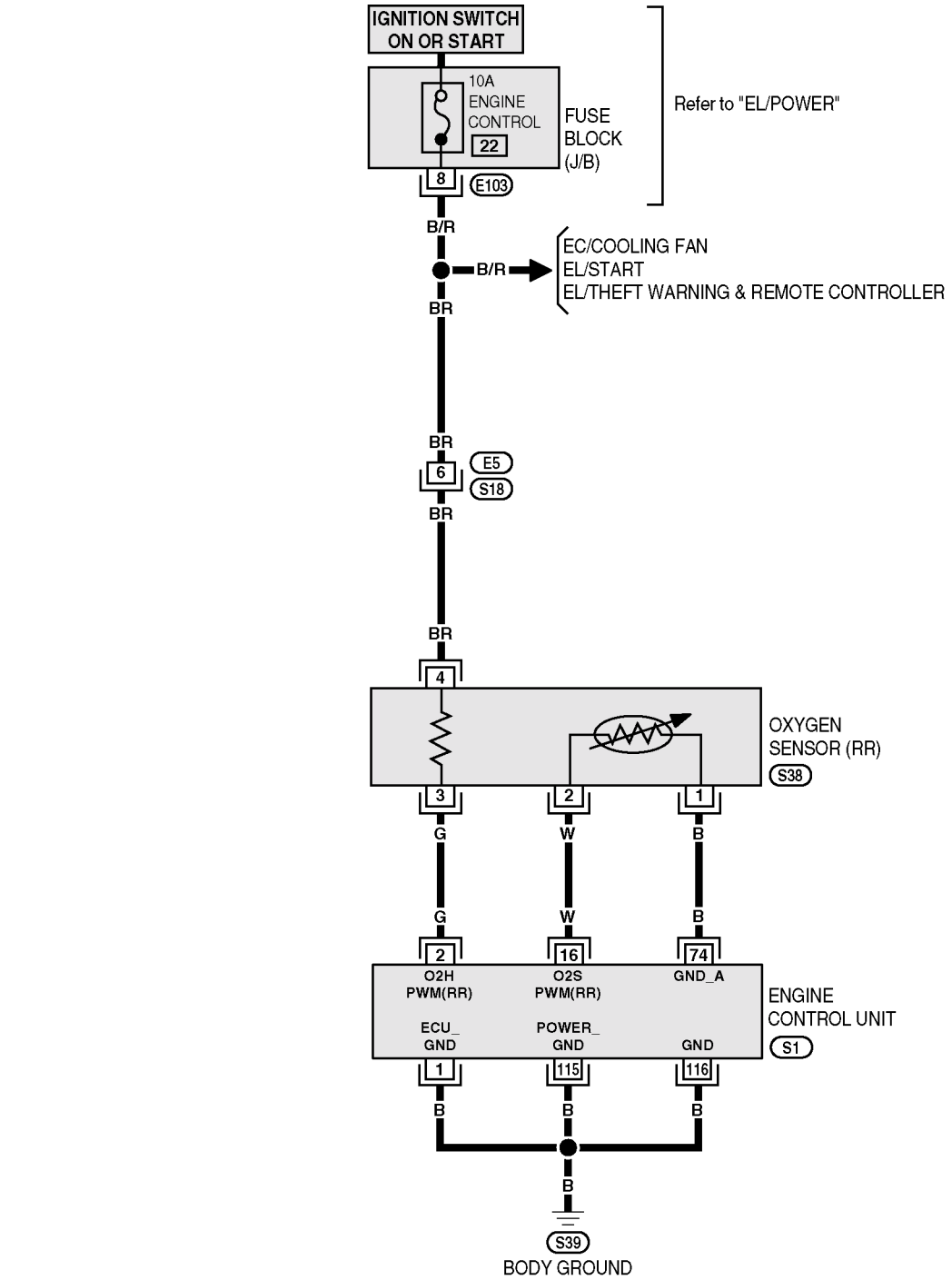
DTC P0138 Heated Oxygen Sensor - RR Circuit High Voltage (Cont'd)

With CONSULT-II

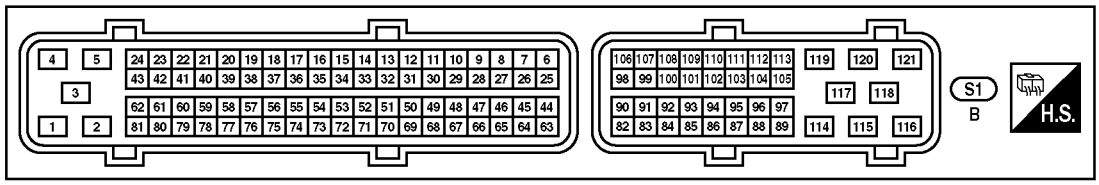
1. Turn ignition switch ON.
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Start engine and drive vehicle for 2 minutes at least 70 km/h of driving speed.
4. Stop the vehicle and let the engine idle for 1 minute.
5. If DTC is detected, go to EC-274, "Diagnostic Procedure".

Wiring Diagram

EC/Oxygen Sensor - RR



Refer to "FUSE BLOCK (J/B)"
E103



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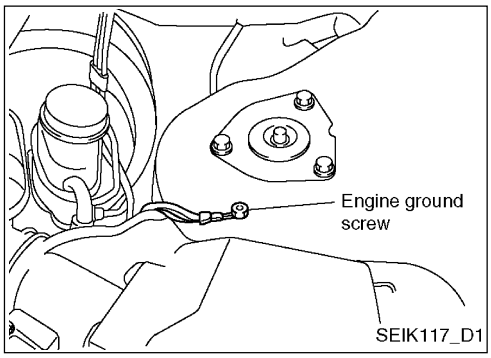
DTC P0138 Heated Oxygen Sensor - RR Circuit High Voltage (Cont'd)

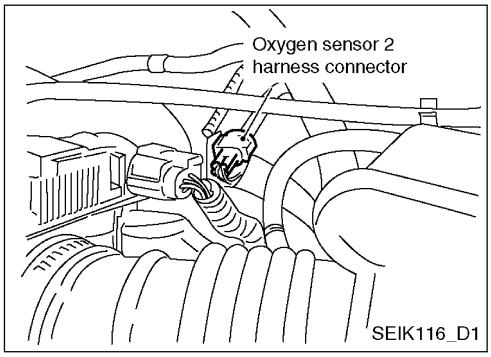
Specification data are reference values and are measured between each terminal and ground.

CAUTION:

- **Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

Terminal No.	Wire Color	Item	Condition	Data (DC Voltage)
2	W	Heated oxygen sensor 2	**[Engine is running]** ● Warm-up condition ● Engine speed is 2,000 rpm.	0 - Approximately 1.0 V (Periodically change)





Diagnostic Procedure

1. RETIGHTEN GROUND SCREW

1. Turn ignition switch OFF.
2. Loosen and retighten engine ground screw.

>> GO TO 2.

2. CHECK HEATED OXYGEN SENSOR 2 (RR) GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Check harness continuity between engine ground and heated oxygen sensor 2 (FR) terminal 4.

   Refer to Wiring Diagram.

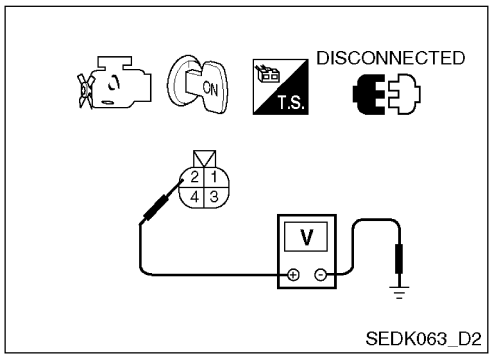
   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

DTC P0138 Heated Oxygen Sensor - RR Circuit High Voltage (Cont'd)



3. CHECK HEATED OXYGEN SENSOR 2 (RR) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 16 and heated oxygen sensor 2 (RR) terminal 2.
   Refer to Wiring Diagram.
   Continuity should exist.
3. Check harness continuity between ECM terminal 16 or heated oxygen sensor 2 (RR) terminal 2 and ground.
   Refer to Wiring Diagram.
   Continuity should not exist.
4. Also check harness for short to power.

OK or NG

OK >> GO TO 4.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HEATED OXYGEN SENSOR 2 (RR) CONNECTOR FOR WATER

Check heated oxygen sensor 2 connectors for water.

Water should not exist.

OK or NG

OK >> GO TO 5.

NG >> Repair or replace harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-269 "Component Inspection".

OK or NG

OK >> GO TO 6.

NG >> Replace heated oxygen sensor 2.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-74, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".

>> **INSPECTION END**

Component Inspection

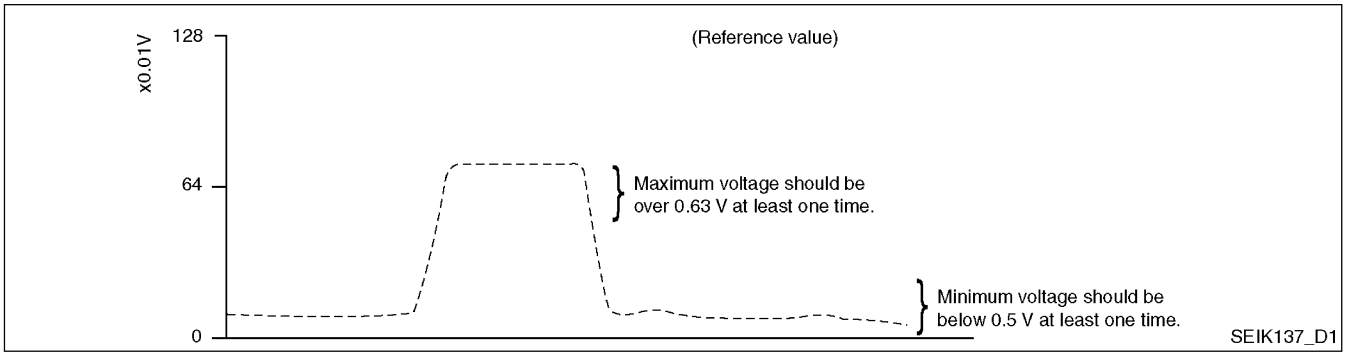
HEATED OXYGEN SENSOR 2

With CONSULT-II

1. Start engine and drive vehicle for 2 minutes at least 70 km/h of driving speed.
2. Stop the vehicle and let the engine run.
3. Select "B/FUEL SCHDL" in "ACTIVE TEST" mode with CONSULT-II.

DTC P0138 Heated Oxygen Sensor - RR Circuit High Voltage (Cont'd)

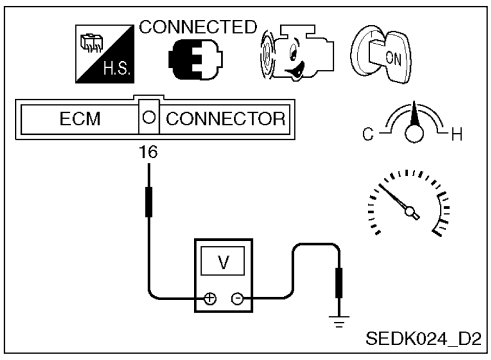
4. Check heated oxygen sensor 2 (RR) in idle with 25% of fuel injection.



The voltage of oxygen sensor (RR) (B1) should be over 0.63 V at least once if the fuel injection is +25%.
The voltage of oxygen sensor (RR) (B1) should be below 0.5 V at least once if the fuel injection is -25%.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using oxygen sensor thread cleaner and approved anti-seize lubricant.**



Without CONSULT-II

1. Start engine and drive vehicle for 2 minutes at least 70 km/h of driving speed.
2. Stop the vehicle and let the engine run.
3. Set voltmeter probes between ECM terminal 16 (HO2S2 (RR) signal) and engine ground.
4. Check the following at least 10 times with engine speed held at 4,000 rpm constant under no load. (depress and release the accelerator pedal as quick as possible)
   a) The maximum voltage is over 0.63 V at least one time during this procedure.
   b) If the maximum voltage is over 0.63 V, no need to perform step 5.
5. Let the engine in idle for about 10 minutes and check the voltage. Or, check the voltage with the accelerator pedal released, vehicle speed 80 km/h, 3rd gear (manual transmission equipped vehicle), "D" position and overdrive OFF (automatic transmission equipped vehicle). Minimum voltage should be below 0.5 V at least one time during this procedure.
6. If NG, replace heated oxygen sensor 2 with new one.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using oxygen sensor thread cleaner and approved anti-seize lubricant.**

DTC P0031, P0032 Heated Oxygen Sensor Heater Control Circuit - FR

System Description

DESCRIPTION

Sensor	Input Signal to ECM	ECM Function	Actuator
Camshaft position sensor (PHASE)	Engine speed	Heated oxygen sensor 1 heater control	Heated oxygen sensor 1 heater
Crankshaft position sensor (POS)			
Engine coolant temperature sensor	Engine coolant temperature		

The ECM performs ON/OFF duty control of the heated oxygen sensor 1 heater corresponding to the engine speed and engine coolant temperature. The duty percent varies with engine coolant temperature when engine is started.

Operation

Engine speed rpm	Heated oxygen sensor 1 heater
Above 3,600	OFF
Below 3,600	ON

On Board Diagnosis Logic

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P0031 0031	Heated oxygen sensor 1 circuit low voltage	Current in heated oxygen sensor 1 heater circuit is not within normal operating range (An excessively low voltage from theheated oxygen sensor 1 is sent to ECM.)	● Harness or connectors (The heated oxygen sensor 1 heater circuit is open or shorted.) ● Heated oxygen sensor 1 heater
P0032 0032	Heated oxygen sensor 1 circuit high voltage	Current in heated oxygen sensor 1 heater circuit is not within normal operating range (An excessively high voltage from theheated oxygen sensor 1 is sent to ECM.)	● Harness or connectors (The heated oxygen sensor 1 heater circuit is shorted.) ● Heated oxygen sensor 1 heater

DTC Confirmation Procedure

NOTE:

- **If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.**

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is between 10.5 V and 16 V.

With CONSULT-II

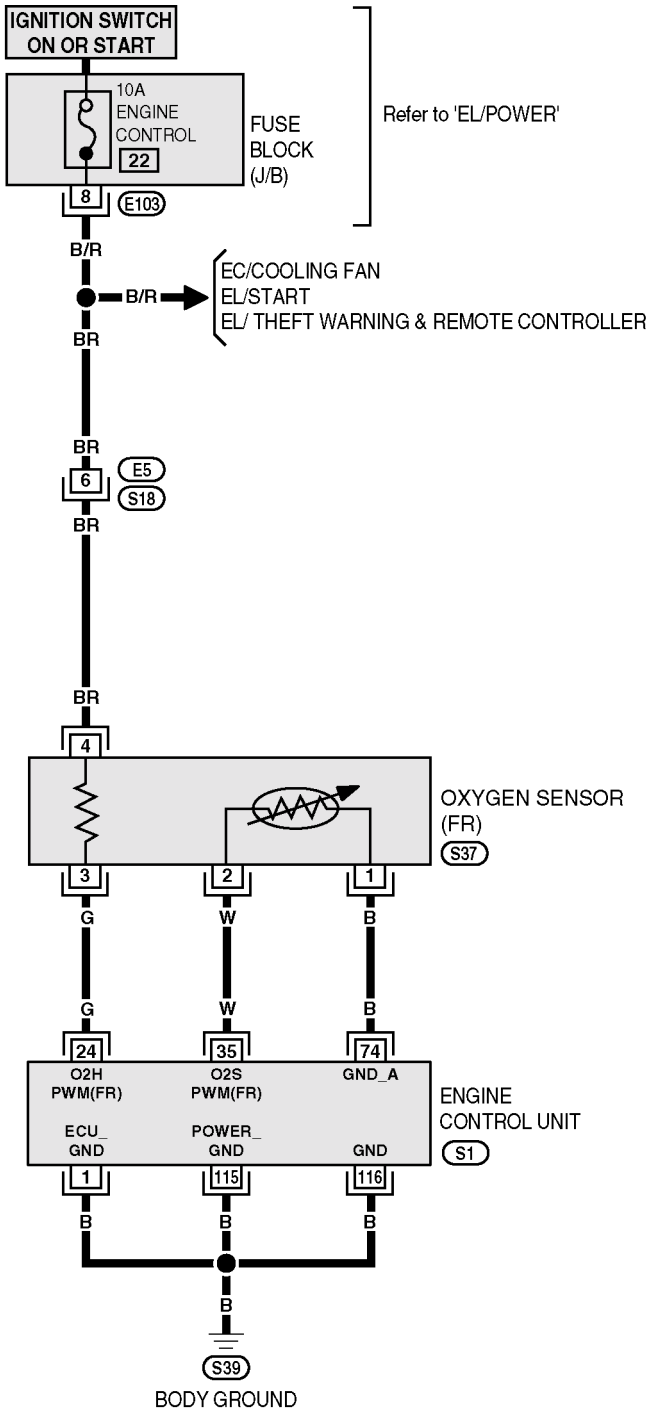
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait 10 seconds.

DTC P0031, P0032 Heated Oxygen Sensor Heater Control Circuit - FR (Cont'd)

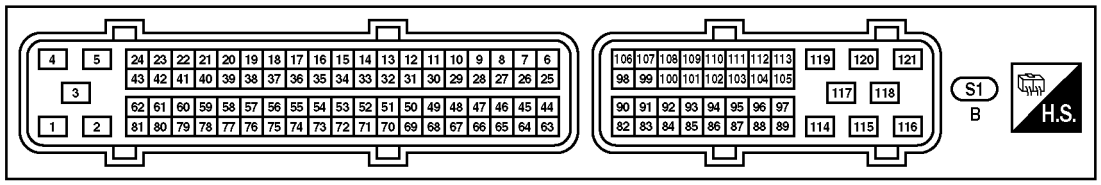
3. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT-II.
4. Start engine and let it in idle for about 6 seconds.
5. If DTC is detected, go to EC-280, "Diagnostic Procedure".

Wiring Diagram

EC/Oxygen Sensor - FR



Refer to "FUSE BLOCK (J/B)"
E103



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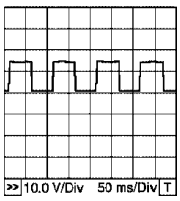
DTC P0031, P0032 Heated Oxygen Sensor Heater Control Circuit - FR (Cont'd)

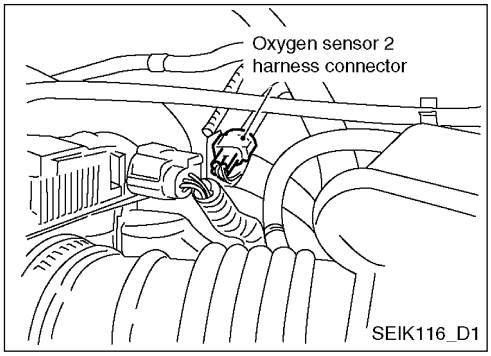
Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-II.

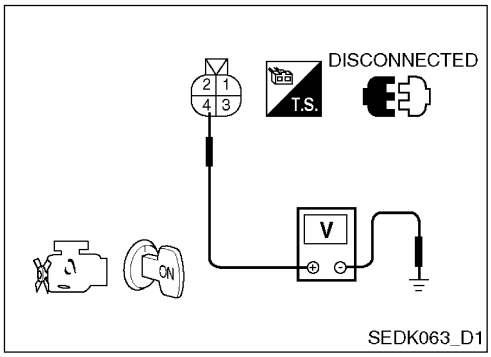
CAUTION:

- **Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

Terminal No.	Wire Color	Item	Condition	Data (DC Voltage)
24	G	Heated oxygen sensor 1 heater	**[Engine is running]** ● Warm-up condition. ● Engine speed is below 3,600 rpm.	Approximately 7.0 V 
			[Engine is running] ● Warm-up condition. ● Engine speed is above 2,000 rpm.	BATTERY VOLTAGE (11 - 14 V) ★

★ : Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)





Diagnostic Procedure

1. CHECK HEATED OXYGEN SENSOR 1 (FR) POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor 1 harness connector.
3. Turn ignition switch ON.
4. Check voltage between heated oxygen sensor 1 (FR) terminal 4 and ground with CONSULT-II or tester.

   Voltage: Battery voltage

OK or NG

OK >> GO TO 3.

NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors S38
- Fuse block (J/B) connector E103
- 10A fuse
- Harness for open or short between heated oxygen sensor 1 and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

DTC P0031, P0032 Heated Oxygen Sensor Heater Control Circuit - FR (Cont'd)

3. CHECK HEATED OXYGEN SENSOR 1 (FR) OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 35 and heated oxygen sensor 1 terminal 2.
   Refer to Wiring Diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HEATED OXYGEN SENSOR 1 HEATER

Refer to EC-281, "Component Inspection".

OK or NG

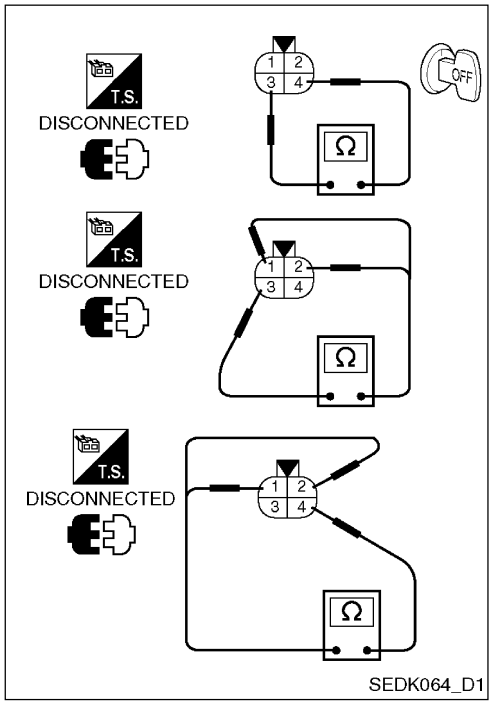
OK >> GO TO 5.

NG >> Replace heated oxygen sensor 1.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-74, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".

>> **INSPECTION END**



Component Inspection

HEATED OXYGEN SENSOR 1 HEATER

1. Check resistance between HO2S1 terminals as follows.

Terminal No.	Resistance
3 and 4	2.3 - 4.3 Ω at normal temperature
3 and 1, 2	α Ω (Continuity should not exist)
4 and 1, 2	

2. If NG, replace heated oxygen sensor 1.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using oxygen sensor thread cleaner and approved anti-seize lubricant.**

Removal and Installation

HEATED OXYGEN SENSOR 1

Refer to "OUTER COMPONENT PARTS" (QG16: EM-13).

DTC P0037, P0038 Heated Oxygen Sensor Heater Control Circuit - RR

System Description

DESCRIPTION

Sensor	Input Signal to ECM	ECM Function	Actuator
Camshaft position sensor (PHASE)	Engine speed	Heated oxygen sensor 2 heater control	Heated oxygen sensor 2 heater
Crankshaft position sensor (POS)			
Engine coolant temperature sensor	Engine coolant temperature		

The ECM performs ON/OFF duty control of the heated oxygen sensor 2 heater corresponding to the engine speed and engine coolant temperature. The duty percent varies with engine coolant temperature when engine is started.

Operation

Engine speed rpm	Heated oxygen sensor 2 heater
Above 3,600	OFF
Below 3,600	ON

On Board Diagnosis Logic

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P00371 0037	Heated oxygen sensor 2 circuit low voltage	Current in heated oxygen sensor 2 heater circuit is not within normal operating range (An excessively low voltage from the heated oxygen sensor 1 is sent to ECM.)	● Harness or connectors (The heated oxygen sensor 1 heater circuit is open or shorted.) ● Heated oxygen sensor 1 heater
P0038 0038	Heated oxygen sensor 2 circuit high voltage	Current in heated oxygen sensor 2 heater circuit is not within normal operating range (An excessively high voltage from the heated oxygen sensor 1 is sent to ECM.)	● Harness or connectors (The heated oxygen sensor 1 heater circuit is shorted.) ● Heated oxygen sensor 1 heater

DTC Confirmation Procedure

NOTE:

- **If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.**

TESTING CONDITION:

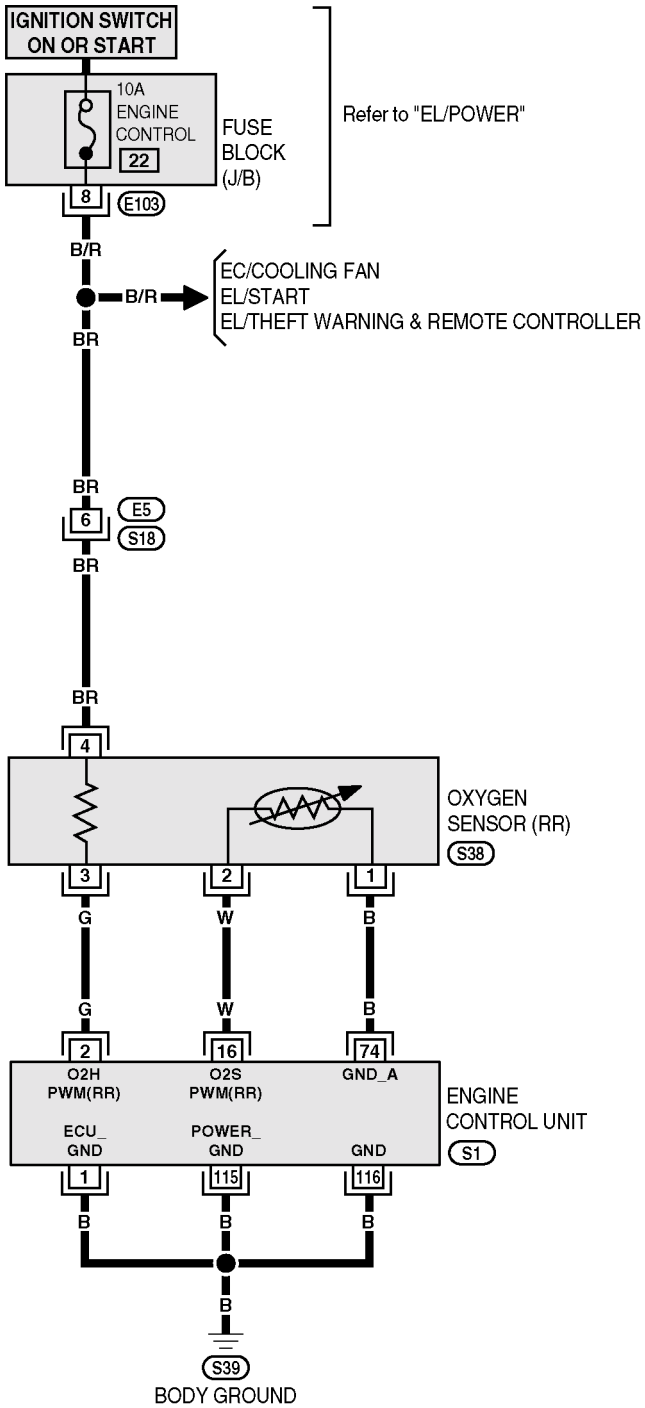
Before performing the following procedure, confirm that battery voltage is between 10.5 V and 16 V.

With CONSULT-II

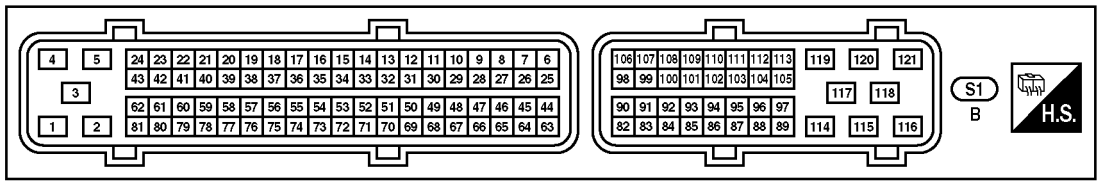
1. Turn ignition switch ON and select “DATA MONITOR” mode with CONSULT-II.
2. Start engine.
3. Drive vehicle for 2 minutes at least 70 km/h of driving speed.
4. Stop the vehicle and let the engine idle for over 6 seconds.
5. If DTC is detected, go to EC-284, “Diagnostic Procedure”.

Wiring Diagram

EC/Oxygen Sensor - RR



Refer to "FUSE BLOCK (J/B)"
E103



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DTC P0037, P0038 Heated Oxygen Sensor Heater Control Circuit - RR (Cont'd)

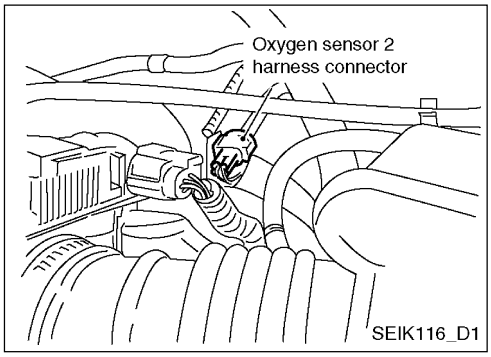
Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-II.

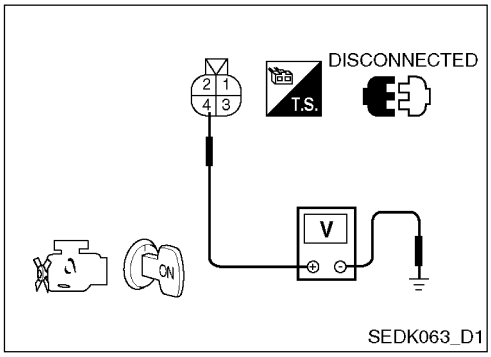
CAUTION:

- **Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

Terminal No.	Wire Color	Item	Condition	Data (DC Voltage)
3	G	Heated oxygen sensor 2 heater	**[Engine is running]** ● Engine speed is below 3,600 rpm. ● After driving for 2 minutes with over 70 km/h of driving speed	0 - 1.0 V
			[Ignition switch "ON"] ● Engine stopped. **[Engine is running]** ● Warm-up condition. ● Engine speed is above 2,000 rpm.	BATTERY VOLTAGE (11 - 14 V) ★

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)





Diagnostic Procedure

1. CHECK HEATED OXYGEN SENSOR 2 (RR) POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Turn ignition switch ON.
4. Check voltage between heated oxygen sensor 2 (RR) terminal 4 and ground with CONSULT-II or tester.

   Voltage: Battery voltage

OK or NG

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

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors S38
- Fuse block (J/B) connector E103
- 10A fuse
- Harness for open or short between heated oxygen sensor 2 and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

DTC P0037, P0038 Heated Oxygen Sensor Heater Control Circuit - RR (Cont'd)

3. CHECK HEATED OXYGEN SENSOR 2 (RR) OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 16 and heated oxygen sensor 2 terminal 2.
   Refer to Wiring Diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HEATED OXYGEN SENSOR 2 HEATER

Refer to EC-285, "Component Inspection".

OK or NG

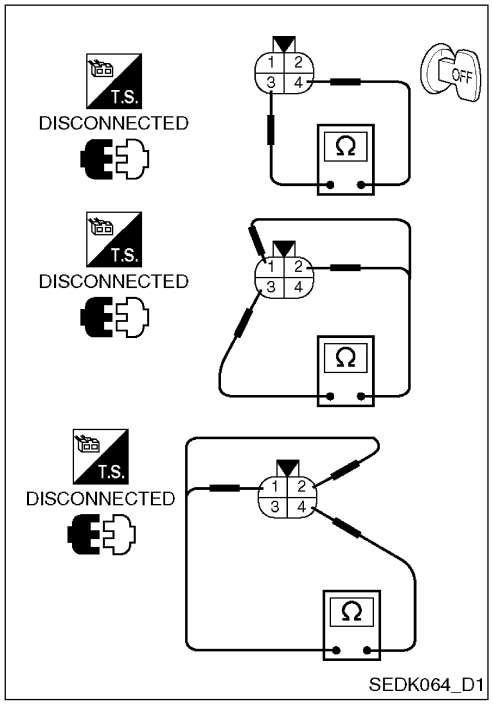
OK >> GO TO 5.

NG >> Replace heated oxygen sensor 2.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-74, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".

>> **INSPECTION END**



Component Inspection

HEATED OXYGEN SENSOR 2 HEATER

1. Check resistance between heated oxygen sensor 2 terminals as follows.

Terminal No.	Resistance
3 and 4	2.3 - 4.3 Ω at normal temperature
3 and 1, 2	α Ω (Continuity should not exist)
4 and 1, 2	

2. If NG, replace heated oxygen sensor 1.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using oxygen sensor thread cleaner and approved anti-seize lubricant.**

Electrical Load Signal

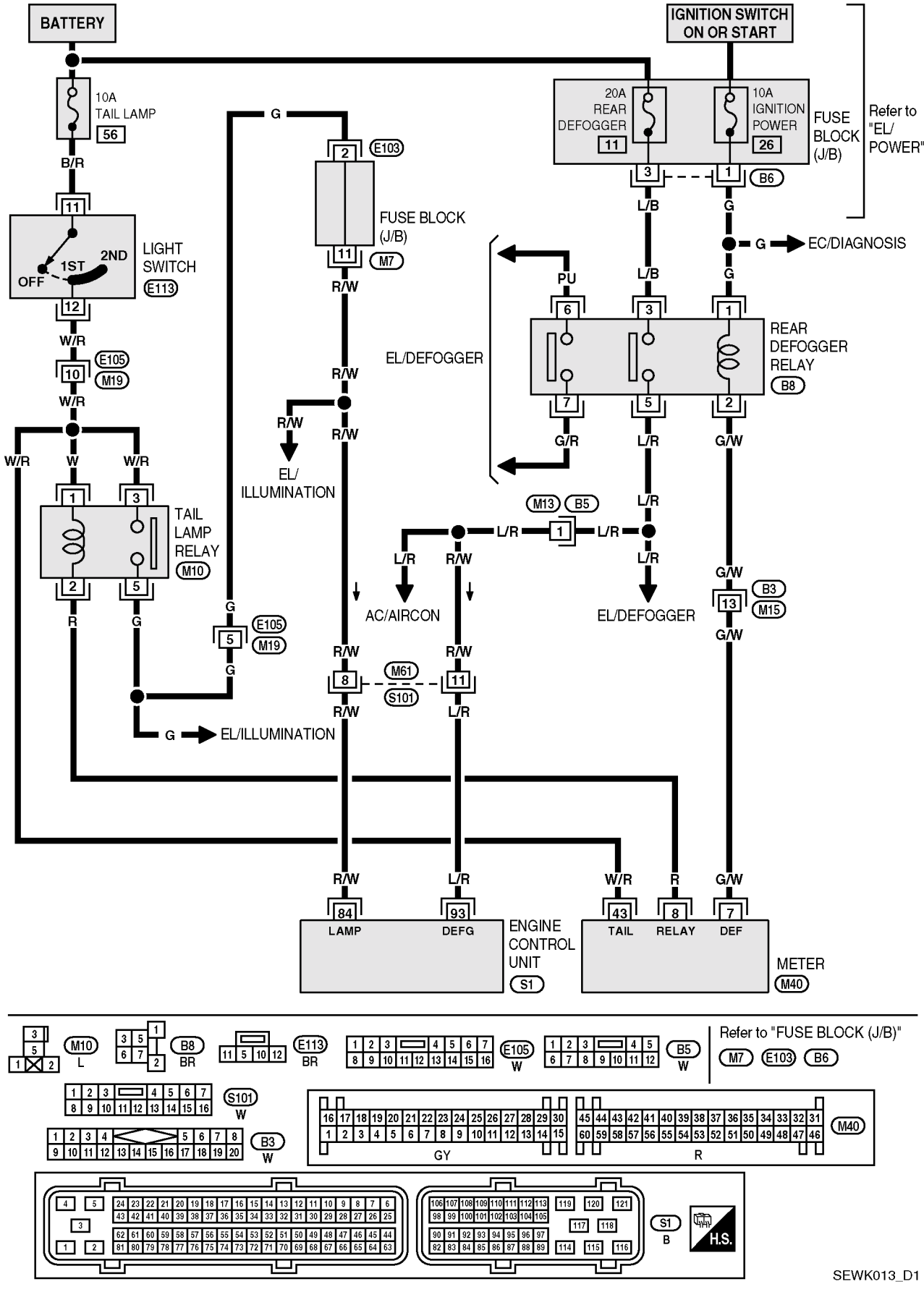
CONSULT-II REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

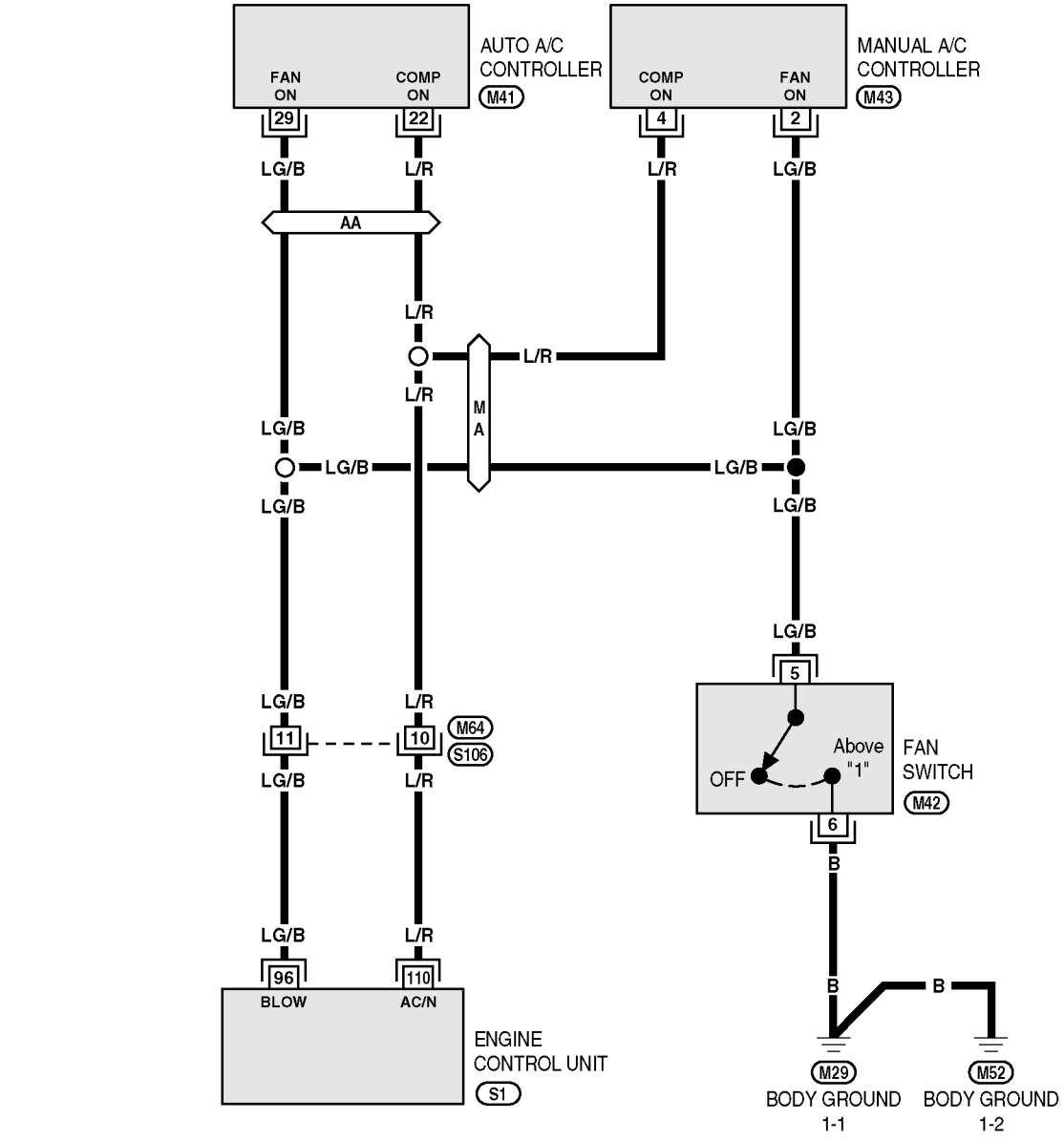
Monitor Item	Condition		Specification
LOAD SIGNAL	● Ignition switch: ON	Rear window defogger switch is ON	ON
		Rear window defogger switch is OFF	OFF
HEATER FAN SW	● Engine: After warming up, idle the engine	Heater fan is operating.	ON
		Heater fan is not operating.	OFF

Wiring Diagram

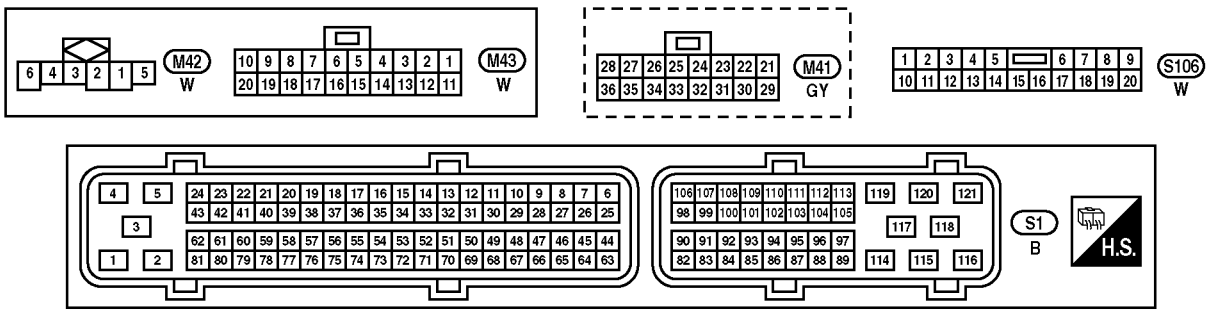
EC/Electrical Load



Wiring Diagram — EC/Blower Fan Signal



AA : WITH AUTO A/C
MA : WITH MANUAL A/C



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Electrical Load Signal (Cont'd)

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

- **Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

Terminal No.	Wire Color	Item	Condition	Data (DC Voltage)
84	R/W	Electrical load signal (Headlamp signal)	**[Ignition switch ON]** ● Lighting switch is 2ND position	BATTERY VOLTAGE (11 - 14 V)
			[Ignition switch "ON"] ● Lighting switch is OFF	Approximately 0 V
93	L/R	Electrical load signal (Rear window defogger signal)	**[Ignition switch ON]** ● Rear window defogger switch is ON	BATTERY VOLTAGE (11 - 14 V)
			[Ignition switch ON] ● Rear window defogger switch is OFF	Approximately 0 V
96	LG/B	Heater fan switch signal	**[Ignition switch ON]** ● Heater fan control switch is ON	Approximately 0 V
			[Ignition switch ON] ● Heater fan control switch is OFF	BATTERY VOLTAGE (11 - 14 V)

Diagnostic Procedure

1. INSPECTION START

Do you have CONSULT-II?

Yes or No

Yes >> GO TO 2.

No >> GO TO 5.

2. CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-I

With CONSULT-II

1. Turn ignition switch ON.
2. Check "LOAD SIGNAL" in "DATA MONITOR" mode with CONSULT-II under the following conditions.

Condition	LOAD SIGNAL
Lighting switch ON at 2nd position	ON
Lighting switch OFF	OFF

OK or NG

OK >> GO TO 3.

NG >> GO TO 8.

Electrical Load Signal (Cont'd)

3. CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-II

With CONSULT-II

1. Turn ignition switch ON.
2. Check "LOAD SIGNAL" in "DATA MONITOR" mode with CONSULT-II under the following conditions.

Condition	LOAD SIGNAL
Rear window defogger switch ON	ON
Rear window defogger switch OFF	OFF

OK or NG

OK >> GO TO 4.

NG >> GO TO 12.

4. CHECK HEATER FAN SIGNAL CIRCUIT OVERALL FUNCTION

With CONSULT-II

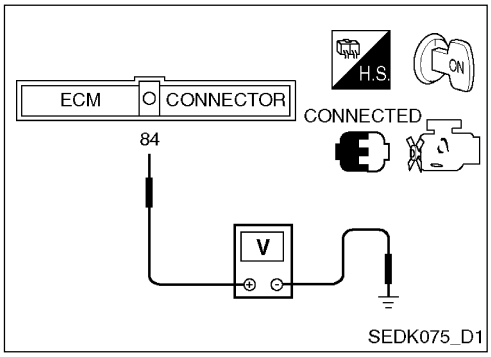
1. Turn ignition switch ON.
2. Check "LOAD SIGNAL" in "DATA MONITOR" mode with CONSULT-II under the following conditions.

Condition	LOAD SIGNAL
Heater fan control switch ON	ON
Heater fan control switch OFF	OFF

OK or NG

OK >> **INSPECTION END**

NG >> GO TO 16.



5. CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-I

Without CONSULT-II

1. Turn ignition switch ON.
2. Check voltage between ECM terminal 84 and ground under the following conditions.

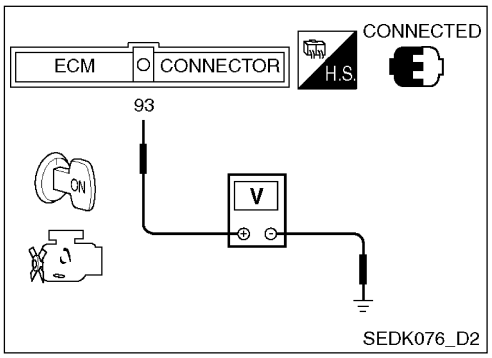
Condition	LOAD SIGNAL
Lighting switch ON at 2nd position	BATTERY VOLTAGE
Lighting switch OFF	0 V

OK or NG

OK >> GO TO 6.

NG >> GO TO 8.

Electrical Load Signal (Cont'd)



6. CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-II

Without CONSULT-II

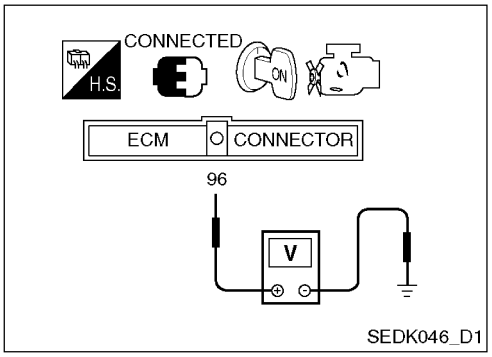
1. Turn ignition switch ON.
2. Check voltage between ECM terminal 93 and ground under the following conditions.

Condition	LOAD SIGNAL
Rear window defogger switch ON	BATTERY VOLTAGE
Rear window defogger switch OFF	0 V

OK or NG

OK >> GO TO 7.

NG >> GO TO 12.



7. CHECK HEATER FAN CONTROL CIRCUIT OVERALL FUNCTION

Without CONSULT-II

1. Turn ignition switch ON.
2. Check voltage between ECM terminal 96 and ground under the following conditions.

Condition	LOAD SIGNAL
Heater fan control switch ON	BATTERY VOLTAGE
Heater fan control switch OFF	0 V

OK or NG

OK >> GO TO 6.

NG >> GO TO 8.

8. CHECK HEADLAMP FUNCTION

1. Start engine.
2. Turn the lighting switch ON at 2nd position.
3. Check that headlamps are illuminated.

OK or NG

OK >> GO TO 9.

NG >> Refer to "HEADLAMP" (EL-37).

9. CHECK HEADLAMP INPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Stop engine.
2. Disconnect ECM harness connector.
3. Disconnect lighting switch harness connectors.
4. Check harness continuity between ECM terminal 84 and lighting switch terminal 12.
   Refer to Wiring Diagram.
   Continuity should exist
5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 11.

NG >> GO TO 10.

Electrical Load Signal (Cont'd)

10. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M61, S101.
- Harness for open and short between ECM and lighting switch.

>> Repair open circuit or short to ground or short to power in harness or connectors.

11. CHECK INTERMITTENT INCIDENT

Perform EC-75, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".

>> **INSPECTION END**

12. CHECK REAR WINDOW DEFOGGER FUNCTION

1. Start engine.
2. Turn ON the rear window defogger switch.
3. Check the rear windshield. Is the rear windshield heated up?

Yes or No

Yes >> GO TO 13.

No >> Refer to "COMBINATION METER - TROUBLE DIAGNOSIS" (EL-69).

13. CHECK REAR WINDOW DEFOGGER INPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Stop engine.
2. Disconnect ECM harness connector.
3. Disconnect rear window defogger relay.
4. Check harness continuity between ECM terminal 93 and rear window defogger relay terminal 5.

   Refer to Wiring Diagram.

   Continuity should exist.
5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 15.

NG >> GO TO 14.

14. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B3, M15.
- Harness connectors M01, S101.
- Harness for open and short between ECM and harness rear window defogger relay.

>> Repair open circuit or short to ground or short to power in harness or connectors.

Electrical Load Signal (Cont'd)

15. CHECK INTERMITTENT INCIDENT

Perform EC-74, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".

>> **INSPECTION END**

16. CHECK HEATER FAN CONTROL FUNCTION

1. Start engine.
2. Turn ON the fan control switch.
3. Check the blower fan motor. Does the blower fan motor activate?

Yes or No

Yes >> GO TO 17.

No >> Refer to "Blower Fan Motor System" (AC-66).

17. CHECK HEATER FAN SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Stop engine.
2. Disconnect ECM harness connector.
3. Disconnect heater control panel harness connector.
4. Check harness continuity between following.

- ECM terminal 96 and heater control panel terminal 29 (without auto A/C).
- ECM terminal 96 and heater control panel terminal 2 (with auto A/C).

Refer to wiring diagram.

Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 19.

NG >> GO TO 18.

18. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M64, S106.
- Harness for open and short between ECM and heater control panel.

>> Repair open circuit or short to ground or short to power in harness or connectors.

19. CHECK INTERMITTENT INCIDENT

Perform EC-74, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".

>> **INSPECTION END**

DTC P1805 Brake Switch

Description

Brake switch signal is applied to the ECM through the stop lamp switch when the brake pedal is depressed. This signal is used mainly to decrease the engine speed when the vehicle is driving.

CONSULT-II REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

Monitor Item	Condition		Specification
BRAKE SW	Ignition switch: ON	Brake pedal: Fully released	OFF
		Brake pedal: Slightly depressed	ON

On Board Diagnosis Logic

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P1805 1805	Brake switch	A brake switch signal is not sent to ECM for an extremely long time while the vehicle is driving.	● Harness or connectors (Stop lamp switch circuit is open or shorted.) ● Stop lamp switch

Fail-Safe Mode

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Engine operating condition in fail-safe mode	
ECM controls the electric throttle control actuator by regulating the throttle opening to a small range. Therefore, acceleration will be poor.	
Vehicle condition	Driving condition
When engine is idling	Normal
When accelerating	Poor acceleration

DTC Confirmation Procedure

With CONSULT-II

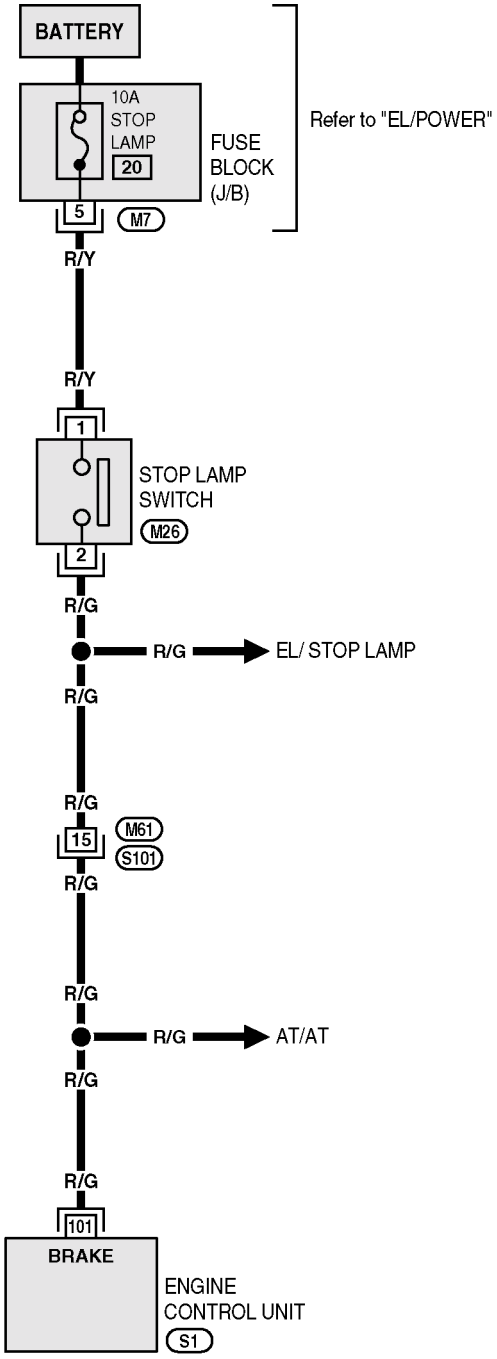
1. Turn ignition switch ON.
2. Fully depress the brake pedal for at least 5 seconds.
3. Erase the DTC with CONSULT-II.
4. Select “DATA MONITOR” mode with CONSULT-II.
5. If DTC is detected, go to EC-296, “Diagnostic Procedure”.

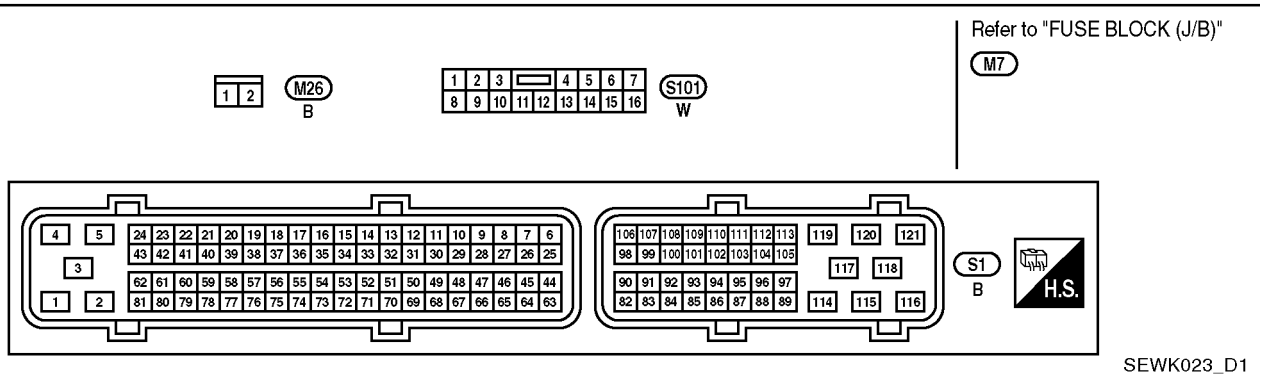
Without CONSULT-II

1. Turn ignition switch ON.
2. Fully depress the brake pedal at least 5 seconds.
3. Erase the Diagnostic Test Mode II (Self-diagnostic results) memory.
4. Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
5. Perform Diagnostic Test Mode II (Self-diagnostic results) with ECM.
6. If DTC is detected, go to EC-296, “Diagnostic Procedure”.

Wiring Diagram

EC/Stop Lamp





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DTC P1805 Brake Switch (Cont'd)

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

- **Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

Terminal No.	Wire Color	Item	Condition	Data (DC Voltage)
101	R/G	Stop lamp switch	**[Ignition switch OFF]** ● Brake pedal fully released	Approximately 0 V
			[Ignition switch OFF] ● Brake pedal depressed	BATTERY VOLTAGE (11 - 14 V)

Diagnostic Procedure

1. CHECK STOP LAMP SWITCH CIRCUIT

1. Turn ignition switch OFF.
2. Check the stop lamp when depressing and releasing the brake pedal.

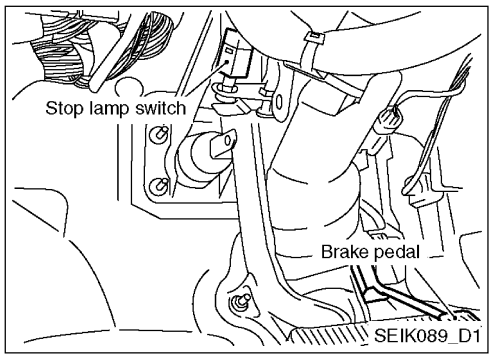
Brake pedal	Stop lamp
Fully released	Not illuminated
Depressed	Illuminated

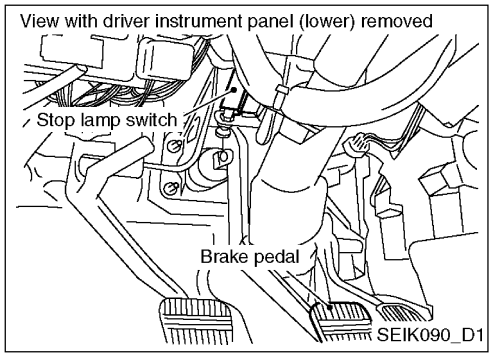
OK or NG

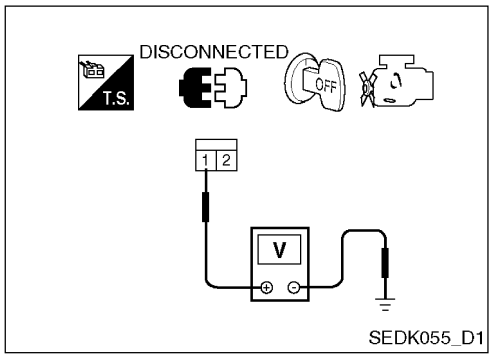
OK >> GO TO 4.

NG >> GO TO 2.

DTC P1805 Brake Switch (Cont'd)







2. CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

1. Disconnect stop lamp switch harness connector.
2. Check voltage between stop lamp switch terminal 1 and ground with CONSULT-II or tester.

   Voltage: Battery voltage

OK or NG

OK >> GO TO 4.

NG >> GO TO 3.

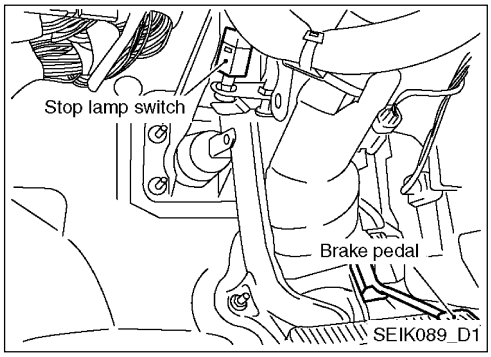
DTC P1805 Brake Switch (Cont'd)

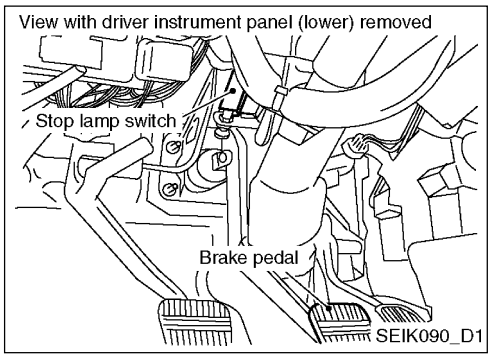
3. DETECT MALFUNCTIONING PART

Check the following.

- 10A fuse
- Fuse block (J/B) connector M7
- Harness for open and short between stop lamp switch and battery.

>> Repair open circuit or short to ground or short to power in harness or connectors.





4. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Disconnect stop lamp switch harness connector.
3. Check harness continuity between ECM terminal 101 and stop lamp switch terminal 2.

   Refer to Wiring Diagram.

   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK STOP LAMP SWITCH

Refer to EC-299, "Component Inspection".

OK or NG

OK >> GO TO 6.

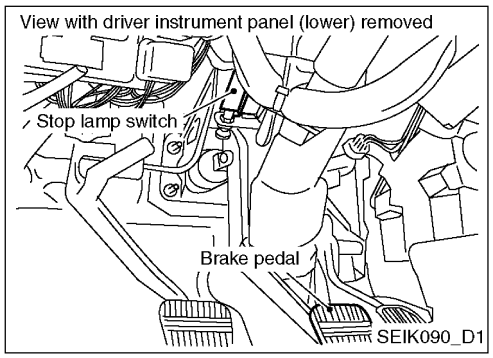
NG >> Replace stop lamp switch.

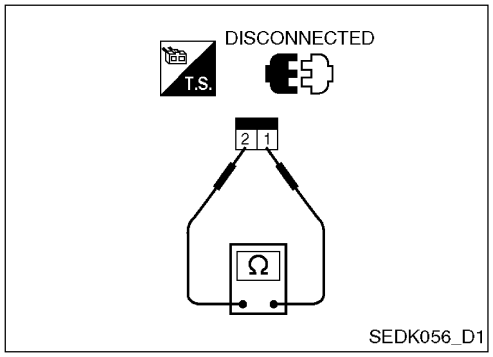
6. CHECK INTERMITTENT INCIDENT

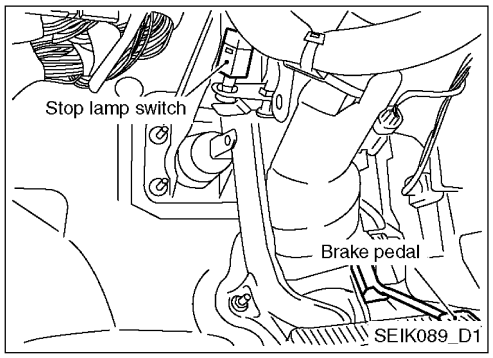
Refer to EC-74, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".

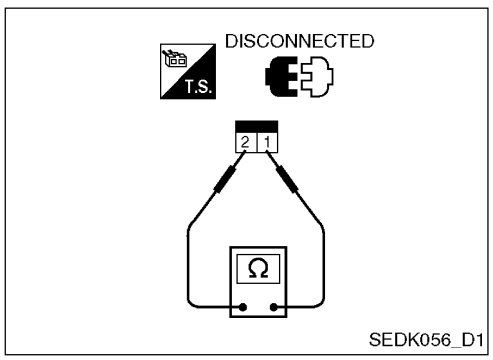
>> **INSPECTION END**

DTC P1805 Brake Switch (Cont'd)









Component Inspection

STOP LAMP SWITCH

M/T Models

1. Disconnect stop lamp switch harness connector.

2. Check continuity between stop lamp switch terminals 1 and 2 under the following conditions.

Conditions	Continuity
Brake pedal fully released	Should not exist
Brake pedal depressed	Should exist

If NG, adjust brake pedal installation, refer to "BRAKE PEDAL" (BR-5), and perform step 2 again.

A/T Models

1. Disconnect stop lamp switch harness connector.

2. Check continuity between stop lamp switch terminals 1 and 2 under the following conditions.

Conditions	Continuity
Brake pedal fully released	Should not exist
Brake pedal depressed	Should exist

If NG, adjust brake pedal installation, refer to "BRAKE PEDAL" (BR-5), and perform step 2 again.

Park/Neutral Position (PNP) Switch

Component Description

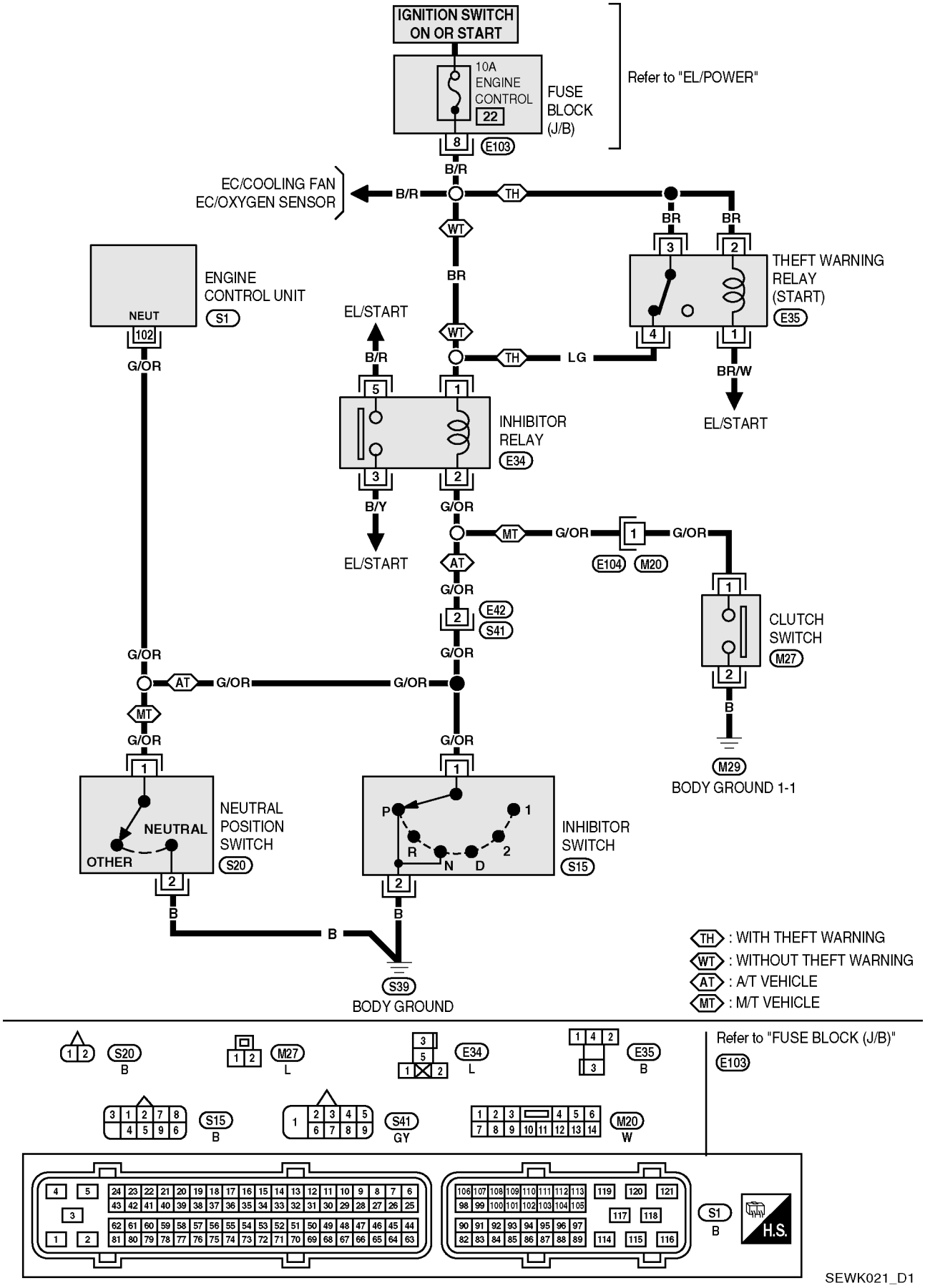
When the gear position is P (A/T models only) or N, park/neutral position (PNP) switch is ON.
ECM detects the position because the continuity of the line (the ON signal) exists.

CONSULT-II REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

Monitor Item	Condition		Specification
P/N POSI SW	● Ignition switch: ON	Shift lever: P or N (A/T models) Neutral (M/T models)	ON OFF
		Shift lever: Except above	

Wiring Diagram — EC/Park/Neutral Position Signal



Park/Neutral Position (PNP) Switch (Cont'd)

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

- **Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

Terminal No.	Wire Color	Item	Condition	Data (DC Voltage)
102	G/OR	Neutral position (PNP) Switch	**[Ignition switch ON]** ● Shift lever position is P or N (A/T models) Neutral (M/T models).	**A/T models:** BATTERY VOLTAGE (11 - 14 V) **M/T models:** BATTERY VOLTAGE (11 - 14 V)
			[Ignition switch "ON"] ● Except the above gear position	Approximately 0 V

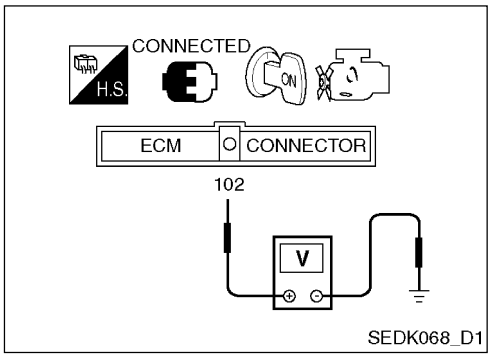
Diagnostic Procedure

1. CHECK OVERALL FUNCTION

With CONSULT-II

1. Turn ignition switch ON.
2. Select "P/N POSI SW" in "DATA MONITOR" mode with CONSULT-II.
3. Check the "P/N POSI SW" signal under the following conditions.

Selector lever position	P/N POSI SW signal
P and N position (A/T models) Neutral position (M/T models)	ON
Except the above position	OFF



Without CONSULT-II

1. Turn ignition switch ON.
2. Check voltage between ECM terminal 102 and ground under the following conditions.

Selector lever position	P/N POSI SW signal
P and N position (A/T models) Neutral position (M/T models)	Approximately 0 V
Except the above position	A/T models: Battery voltage M/T models: Battery voltage

OK or NG

OK >> **INSPECTION END**

NG >> GO TO 2.

Park/Neutral Position (PNP) Switch (Cont'd)

2. CHECK PARK/NEUTRAL POSITION (PNP) SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect neutral position switch harness connector.
3. Check harness continuity between Park/Neutral position switch terminal 2 and body ground. Refer to Wiring Diagram.

   Continuity should exist.
4. Also check harness for short to power.

OK or NG

OK >> GO TO 4.

NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M20, E104
- Harness for open or short between Park/Neutral position (PNP) switch and ground

>> Repair open circuit or short to power in harness or connectors.

4. CHECK PARK/NEUTRAL POSITION (PNP) SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 102 and Park/Neutral position (PNP) switch terminal 1.

   Refer to Wiring Diagram.

   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK PARK/NEUTRAL POSITION (PNP) SWITCH

Refer to "INHIBITOR SWITCH" (AT-79) or "POSITION SWITCH" (MT-6).

OK or NG

OK >> GO TO 6.

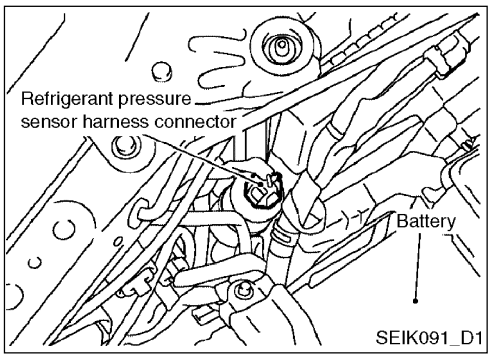
NG >> Replace PNP switch.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-74, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".

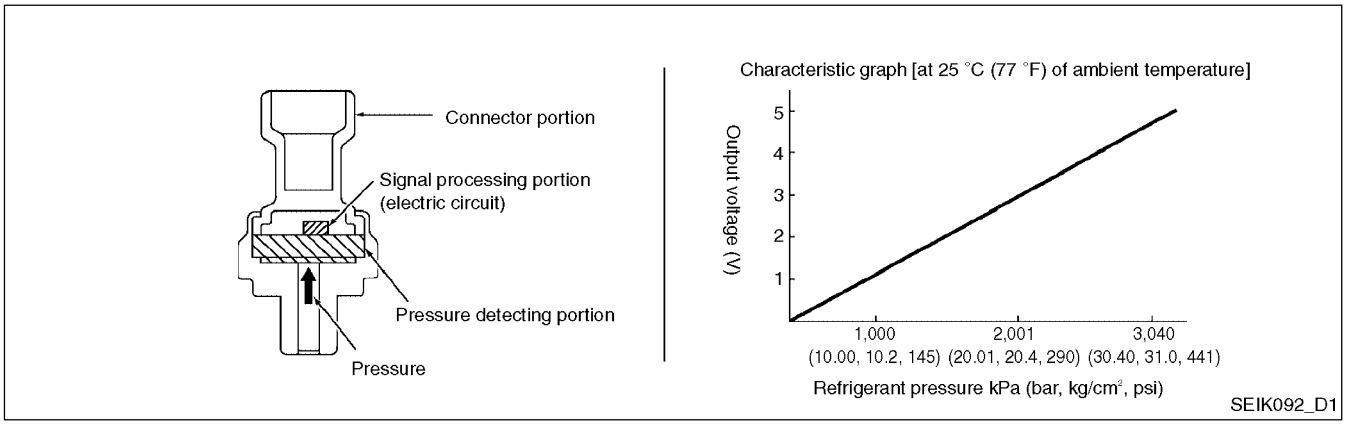
>> **INSPECTION END**

Refrigerant Pressure Sensor



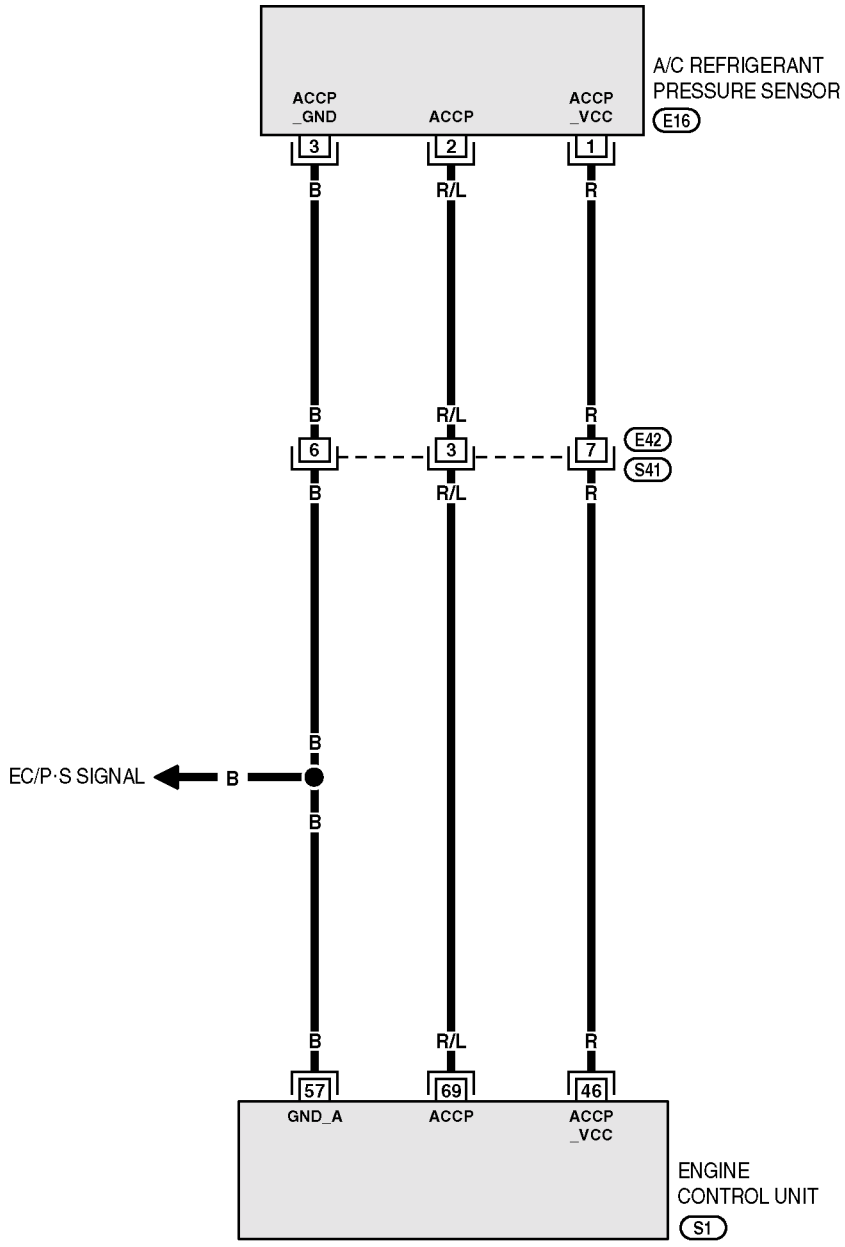
Component Description

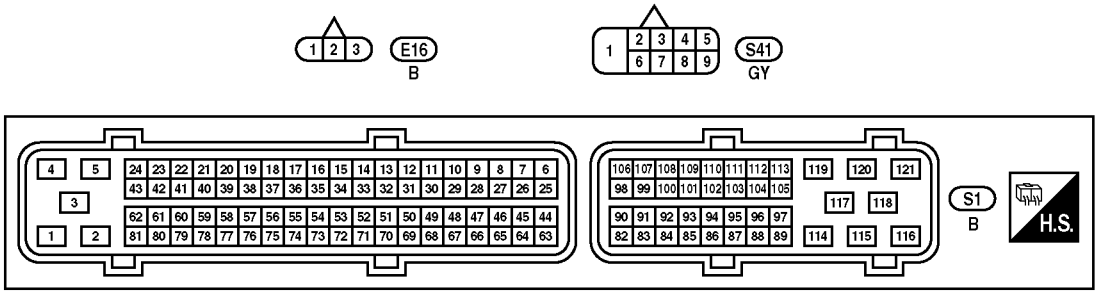
The refrigerant pressure sensor is installed at the receiver tank of the air conditioner system. The sensor uses an electrostatic volume pressure transducer to convert refrigerant pressure to voltage. The voltage signal is sent to ECM, and ECM controls cooling fan system.



Wiring Diagram

EC/Refrigerant Pressure Sensor





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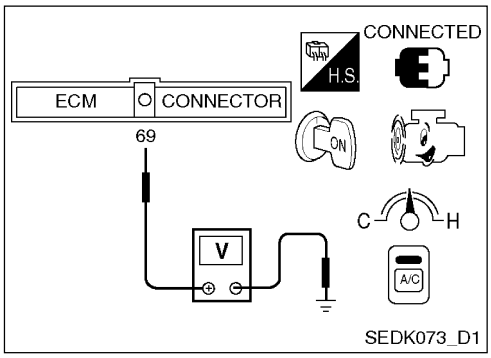
Refrigerant Pressure Sensor (Cont'd)

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

- **Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

Terminal No.	Wire Color	Item	Condition	Data (DC Voltage)
46	R	Sensor power supply (Refrigerant pressure sensor)	**[Ignition switch ON]**	Approximately 5 V
57	B	Sensors ground (Power steering pressure sensor/Refrigerant pressure sensor)	**[Engine is running]** ● Warm-up condition ● Idle speed	Approximately 0 V
69	R/L	Refrigerant pressure sensor	**[Engine is running]** ● Warm-up condition ● Both A/C switch and blower switch are ON. (Compressor operates.)	1.0 - 4.0 V



Diagnostic Procedure

1. CHECK REFRIGERANT PRESSURE SENSOR OVERALL FUNCTION

1. Start engine and warm it up to normal operating temperature.
2. Turn A/C switch and blower switch ON.
3. Check voltage between ECM terminal 69 and ground with CONSULT-II or tester.

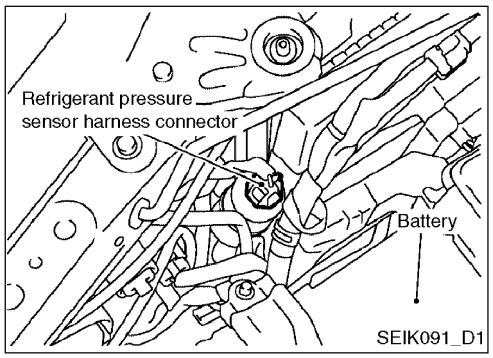
   Voltage: 1.0 - 4.0 V

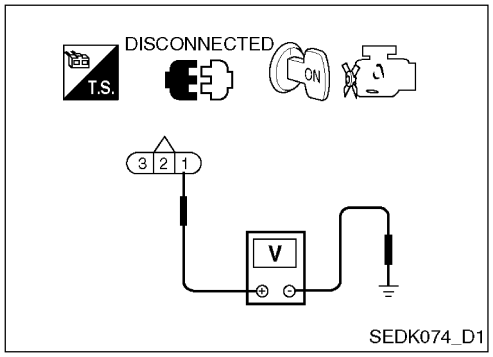
OK or NG

OK >> **INSPECTION END**

NG >> GO TO 2.

Refrigerant Pressure Sensor (Cont'd)





2. CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn A/C switch and blower switch OFF.
2. Stop engine.
3. Disconnect refrigerant pressure sensor harness connector.
4. Turn ignition switch ON.
5. Check voltage between refrigerant pressure sensor terminal 1 and ground with CONSULT-II or tester.

   Voltage: Approximately 5 V

OK or NG

OK >> GO TO 4.

NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E42, S41
- Harness for open or short between refrigerant pressure sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors

4. CHECK REFRIGERANT PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 57 and refrigerant pressure sensor terminal 1.

   Refer to Wiring Diagram.

   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.

NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E42, S41
- Harness for open or short between refrigerant pressure sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors

Refrigerant Pressure Sensor (Cont'd)

6. CHECK REFRIGERANT PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 69 and refrigerant pressure sensor terminal 2.

   Refer to Wiring Diagram.

   Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.

NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E42, S41
- Harness for open or short between refrigerant pressure sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors

8. CHECK INTERMITTENT INCIDENT

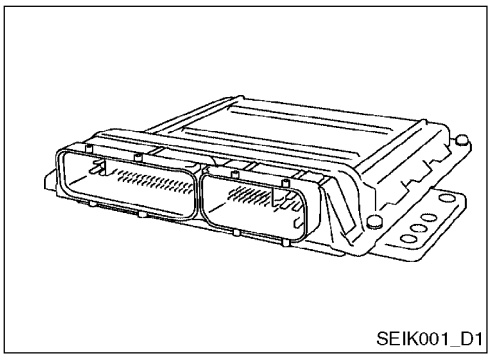
Refer to EC-74, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".

OK or NG

OK >> Replace refrigerant pressure sensor.

NG >> Repair or replace.

DTC P0605 Engine Control Module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Component Description

The ECM consists of a microcomputer and connectors for signal input and output and for power supply. The ECM controls the engine.

On Board Diagnosis Logic

This self-diagnosis has one or tow trip detection logic.

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition		Possible Cause
P0605 0605	Engine control module (ECM)	A	ECM calculation function is malfunctioning.	ECM
		B	ECM EEP-ROM system is malfunctioning.	
		C	ECM self shut-off function is malfunctioning.	

Fail-Safe Mode

ECM enters fail-safe mode when malfunction A is detected.

Detected Items	Engine Operating Condition In Fail-Safe Mode
Malfunction A	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 6.05 degrees) by the return spring.

DTC Confirmation Procedure

Perform PROCEDURE FOR MALFUNCTION A first. If the DTC cannot be confirmed, perform PROCEDURE FOR MALFUNCTION B. If there is no problem on PROCEDURE FOR MALFUNCTION B, perform PROCEDURE FOR MALFUNCTION C.

NOTE:

- **If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.**

PROCEDURE FOR MALFUNCTION A

With CONSULT-II

1. Turn ignition switch ON.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. If DTC is detected, go to EC-311, “Diagnostic Procedure”.

DTC P0605 Engine Control Module (Cont'd)

Without CONSULT-II

1. Turn ignition switch ON.
2. Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
3. Perform Diagnostic Test Mode II (Self-diagnostic results) with ECM.
4. If DTC is detected, go to EC-311, "Diagnostic Procedure".

PROCEDURE FOR MALFUNCTION B

With CONSULT-II

1. Turn ignition switch ON and wait at least 1 second.
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Turn ignition switch OFF, wait at least 10 seconds, and then turn ON.
4. If DTC is detected, go to EC-311, "Diagnostic Procedure".

Without CONSULT-II

1. Turn ignition switch ON and wait at least 1 second.
2. Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
3. Perform Diagnostic Test Mode II (Self-diagnostic results) with ECM.
4. If DTC is detected, go to EC-311, "Diagnostic Procedure".

PROCEDURE FOR MALFUNCTION C

With CONSULT-II

1. Turn ignition switch ON and wait at least 1 second.
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Turn ignition switch OFF, wait at least 10 seconds, and then turn ON.
4. Repeat step 3 for 32 times.
5. If DTC is detected, go to EC-311, "Diagnostic Procedure".

Without CONSULT-II

1. Turn ignition switch ON and wait at least 1 second.
2. Turn ignition switch OFF wait at least 10 seconds and then turn ON.
3. Repeat step 2 for 32 times.
4. Perform Diagnostic Test Mode II (Self-diagnostic results) with ECM.
5. If DTC is detected, go to EC-311, "Diagnostic Procedure".

DTC P0605 Engine Control Module (Cont'd)

Diagnostic Procedure

1. INSPECTION START

With CONSULT-II

1. Turn ignition switch ON.
2. Select "SELF DIAG RESULTS" mode with CONSULT-II.
3. Touch "ERASE".
4. Perform EC-309, "DTC Confirmation Procedure".
5. Is the DTC P0605 displayed again?

Without CONSULT-II

1. Turn ignition switch ON.
2. Erase the Diagnostic Test Mode II (Self-diagnostic results) memory.
3. Perform EC-309, "DTC Confirmation Procedure".
4. Is the DTC P0605 displayed again?

Yes or No

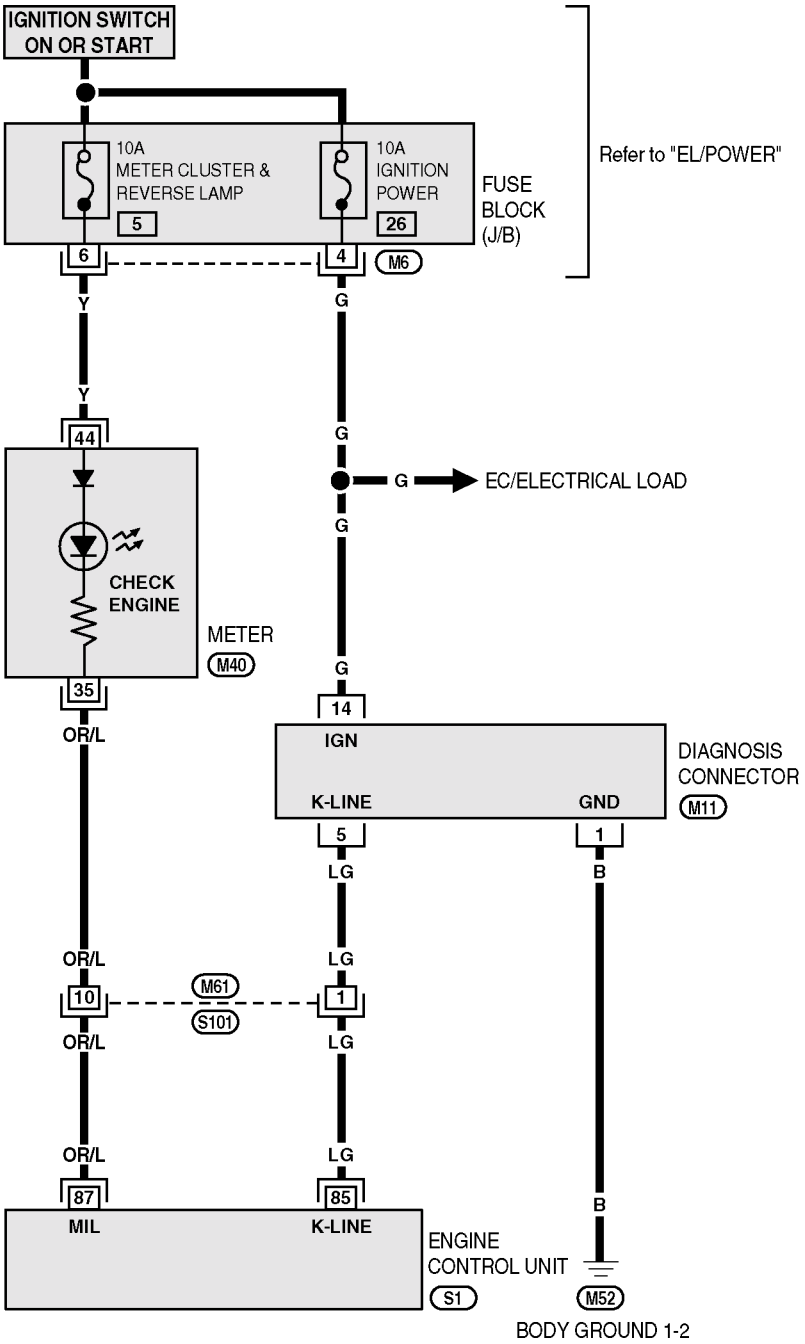
Yes >> GO TO 2.

No >> **INSPECTION END**

2. REPLACE ECM

1. Replace ECM.
2. Perform EC-23, "Accelerator Pedal Released Position Learning".
3. Perform EC-23, "Throttle Valve Closed Position Learning".
4. Perform EC-24, "Idle Air Volume Learning".

>> **INSPECTION END**


IGNITION SWITCH ON OR START
10A METER CLUSTER & REVERSE LAMP
5
10A IGNITION POWER
26
FUSE BLOCK (J/B)
Refer to "EL/POWER"
6
4
M6
Y
G
44
CHECK ENGINE
METER
M40
G
EC/ELECTRICAL LOAD
35
OR/L
14
IGN
K-LINE
GND
DIAGNOSIS CONNECTOR
M11
5
1
LG
B
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MIL
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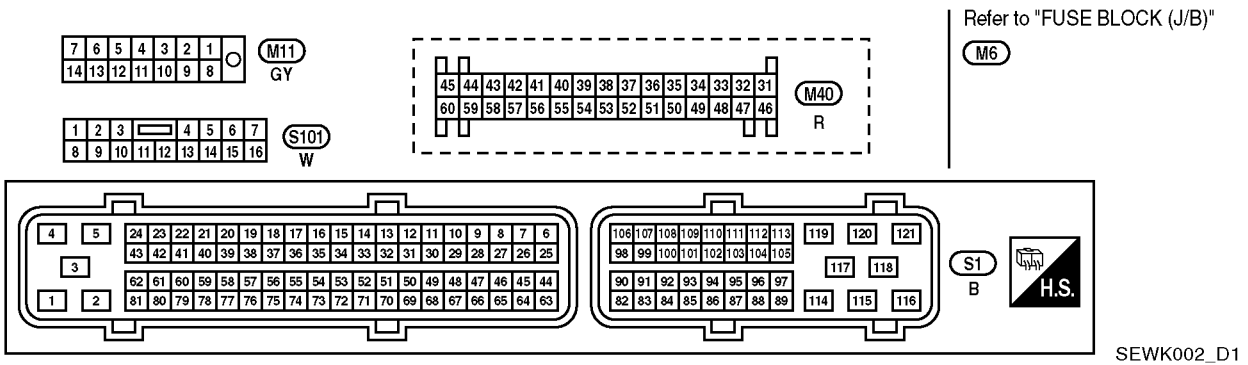
S1
M52
BODY GROUND 1-2

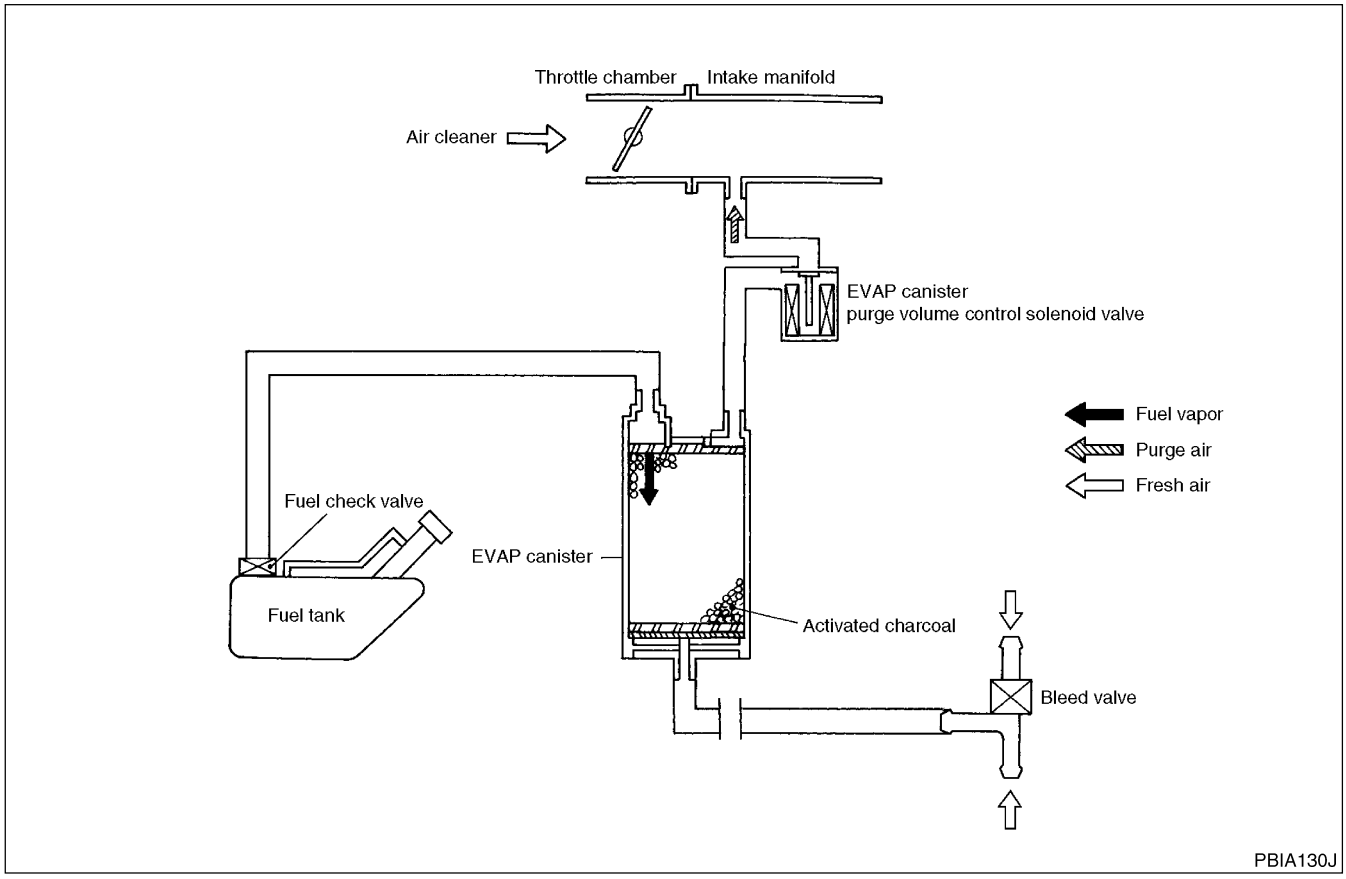

M11
GY
S101
W
M40
R
Refer to "FUSE BLOCK (J/B)"
M6
S1
B
H.S.

SEWK002_D1

Evaporative Emission System

Description

SYSTEM DESCRIPTION



The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the EVAP canister.

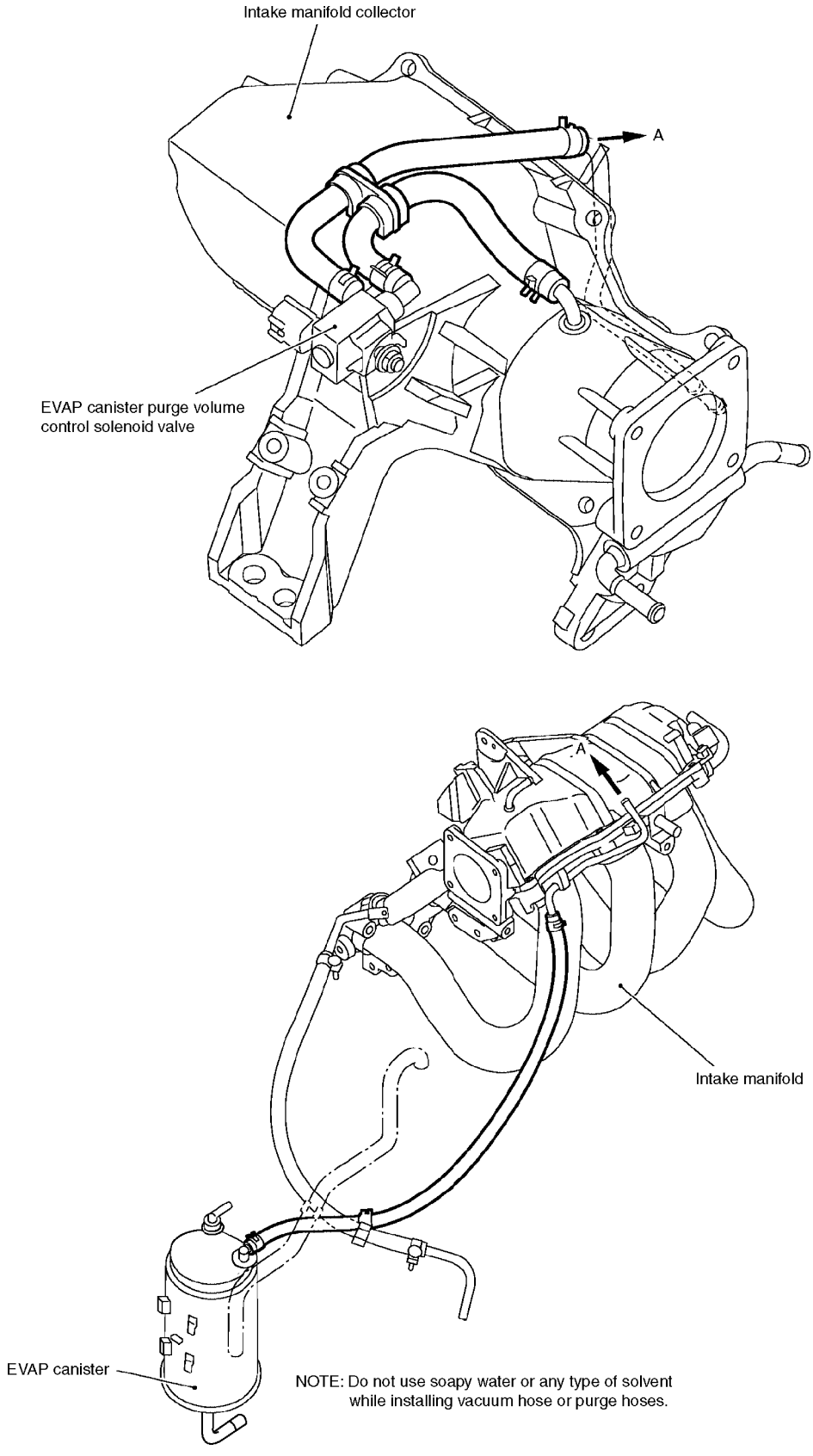
The fuel vapor in the sealed fuel tank is led into the EVAP canister which contains activated carbon and the vapor is stored there when the engine is not operating or when refueling to the fuel tank.

The vapor in the EVAP canister is purged by the air through the purge line to the intake manifold when the engine is operating. EVAP canister purge volume control solenoid valve is controlled by ECM. When the engine operates, the flow rate of vapor controlled by EVAP canister purge volume control solenoid valve is proportionally regulated as the air flow increases.

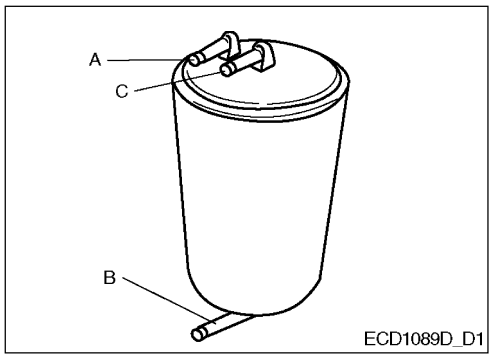
EVAP canister purge volume control solenoid valve also shuts off the vapor purge line during decelerating and idling.

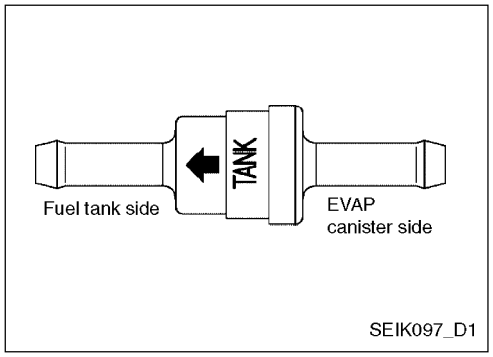
Evaporative Emission System (Cont'd)

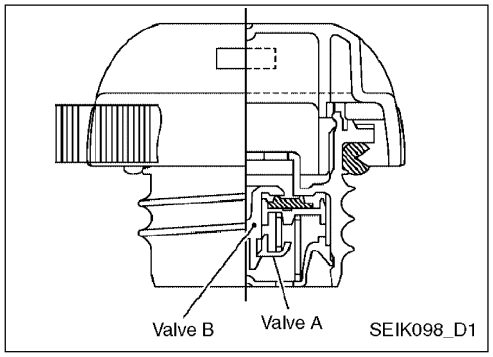
Vacuum Lines in Evaporative Emission System

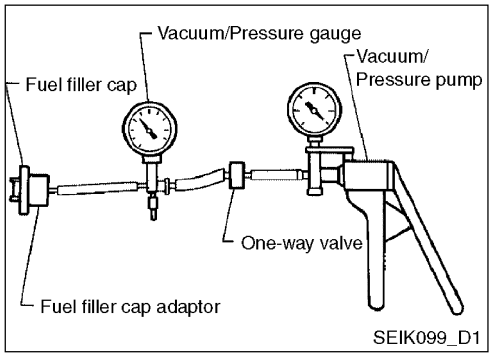


Evaporative Emission System (Cont'd)









Component Inspection

EVAP CANISTER

1. Visually check EVAP canister for crack and damage.
2. Block port B with a finger. The port A doesn't have a vacuum air pressure even when applying the vacuum air pressure through port A with a hand pump.
3. Block port B with a finger. The hissing sound should be exist when opening port B with vacuum air pressure applied to port C.

FUEL CHECK VALVE

1. Blow air through connector on fuel tank side. A considerable resistance should be felt and a portion of air flow should be directed toward the EVAP canister side.
2. Blow air through connector on EVAP canister side. Air flow should be smoothly directed toward fuel tank side.
3. If fuel check valve is suspected of not properly functioning in steps 1 and 2 above, replace it.

FUEL TANK VACUUM RELIEF VALVE (BUILT INTO FUEL FILLER CAP)

1. Wipe clean valve housing.
2. Check valve opening pressure and vacuum.

   Pressure:

   15.3 - 20.0 kPa (0.153 - 0.200 bar, 0.156 - 0.204 kg/cm², 2.22 - 2.90 psi)

   Vacuum:

   -6.0 to -3.3 kPa (-0.060 to -0.033 bar, -0.061 to -0.034 kg/cm², -0.87 to -0.48 psi)
3. If out of specification, replace fuel filler cap as an assembly.

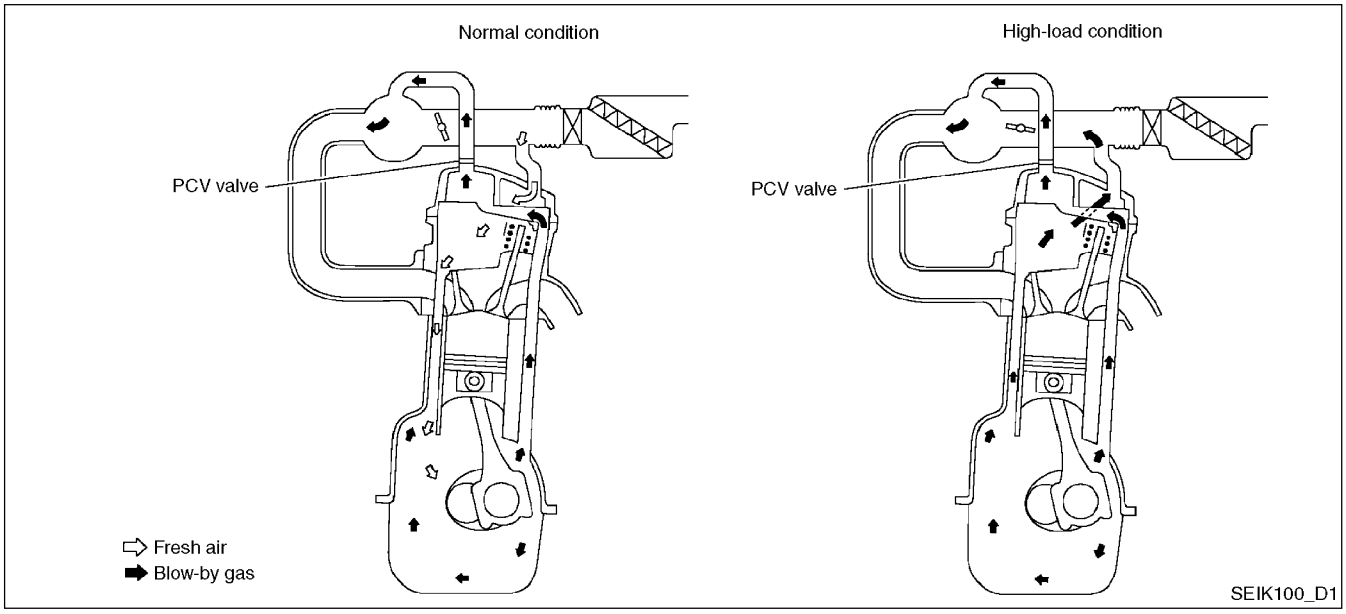
EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

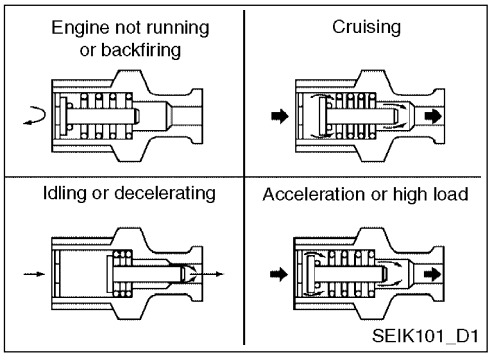
Refer to EC-316, "Component Inspection".

Positive Crankcase Ventilation

Description

SYSTEM DESCRIPTION

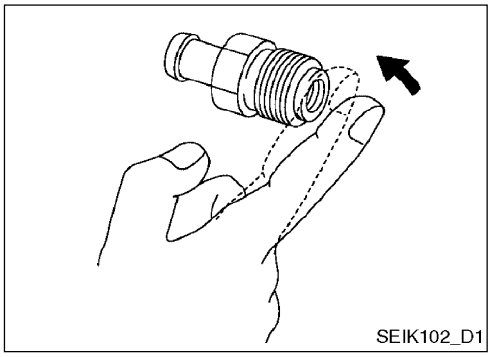




This system returns blow-by gas to the intake manifold.

The positive crankcase ventilation (PCV) valve is provided to conduct crankcase blow-by gas to the intake manifold. During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the PCV valve. Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air. The ventilating air is then drawn from the air inlet tubes into the crankcase. In this process the air passes through the hose connecting air inlet tubes to rocker cover. Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve. The flow goes through the hose connection in the reverse direction.

On vehicles with an excessively high blow-by, the valve does not meet the requirement. This is because some of the flow will go through the hose connection to the air inlet tubes under all conditions.

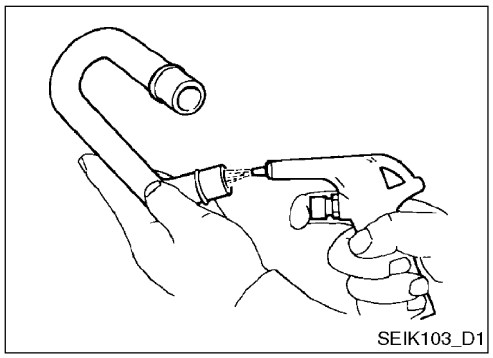


Component Inspection

PCV (POSITIVE CRANKCASE VENTILATION) VALVE

With engine running at idle, remove PCV valve from rocker cover. A properly working valve makes a hissing noise as air passes through it. A strong vacuum should be felt immediately when a finger is placed over the valve inlet.

Positive Crankcase Ventilation (Cont'd)


SEIK103_D1

PCV VALVE VENTILATION HOSE

1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.

Service Data and Specifications (SDS)

Fuel Pressure

Fuel pressure at idle	Approximately 350 kPa (3.5 bar, 3.57 kg/cm^2, 51 psi)

Idle Speed and Ignition Timing

			QG16DE
Target idle speed	A/T	No-load*1 (in P or N position)	700 ± 50 rpm
	M/T	No-load*1 (in Neutral position)	630 ± 50 rpm
Air conditioner: ON	A/T	In P or N position	850 rpm or more
	M/T	In Neutral position	800 rpm or more
Ignition timing	A/T	In P or N position	6 ± 2° BTDC
	M/T	In Neutral position	6 ± 2° BTDC

*1: Under the following conditions:
- Air conditioner switch: OFF
- Electric load: OFF (Lights, heater fan & rear window defogger)
- Steering wheel: Kept in straight-ahead position

Mass Air Flow Sensor

Supply Voltage	Battery Voltage (11 - 14 V)
Output voltage at idle	Approximately 0.8 V*

* : Engine is warmed up to normal operating temperature and running under no-load.

Intake Air Temperature Sensor

Temperature °C (°F)	Resistance kΩ
25 (77)	1.94 - 2.06
80 (176)	0.295 - 0.349

Engine Coolant Temperature Sensor

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260

Engine Coolant Temperature Sensor

Resistance [at 25°C (77°F)]	3.3 - 4.0 Ω

Crankshaft Position Sensor (POS)

Refer to EC-96, “Component Inspection”.

Camshaft Position Sensor (PHASE)

Refer to EC-89, “Component Inspection”.

Throttle Control Motor

Resistance [at 25° (77°F)]	Approximately 1 - 15 Ω

Service Data and Specifications (SDS) (Cont'd)

Injector

Resistance [at 20°C (68°F)]	13.5 - 17.5 Ω

Fuel Pump

Resistance [at 25°C (77°F)]	Approximately 1.0 Ω

ELECTRICAL SYSTEM

SECTION EL

GI
EM
LC
EC
FE
RS
AC
AV
EL
WH
CL
MT
AT
FA
RA
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SRS Airbag • Pretensioner Seatbelt

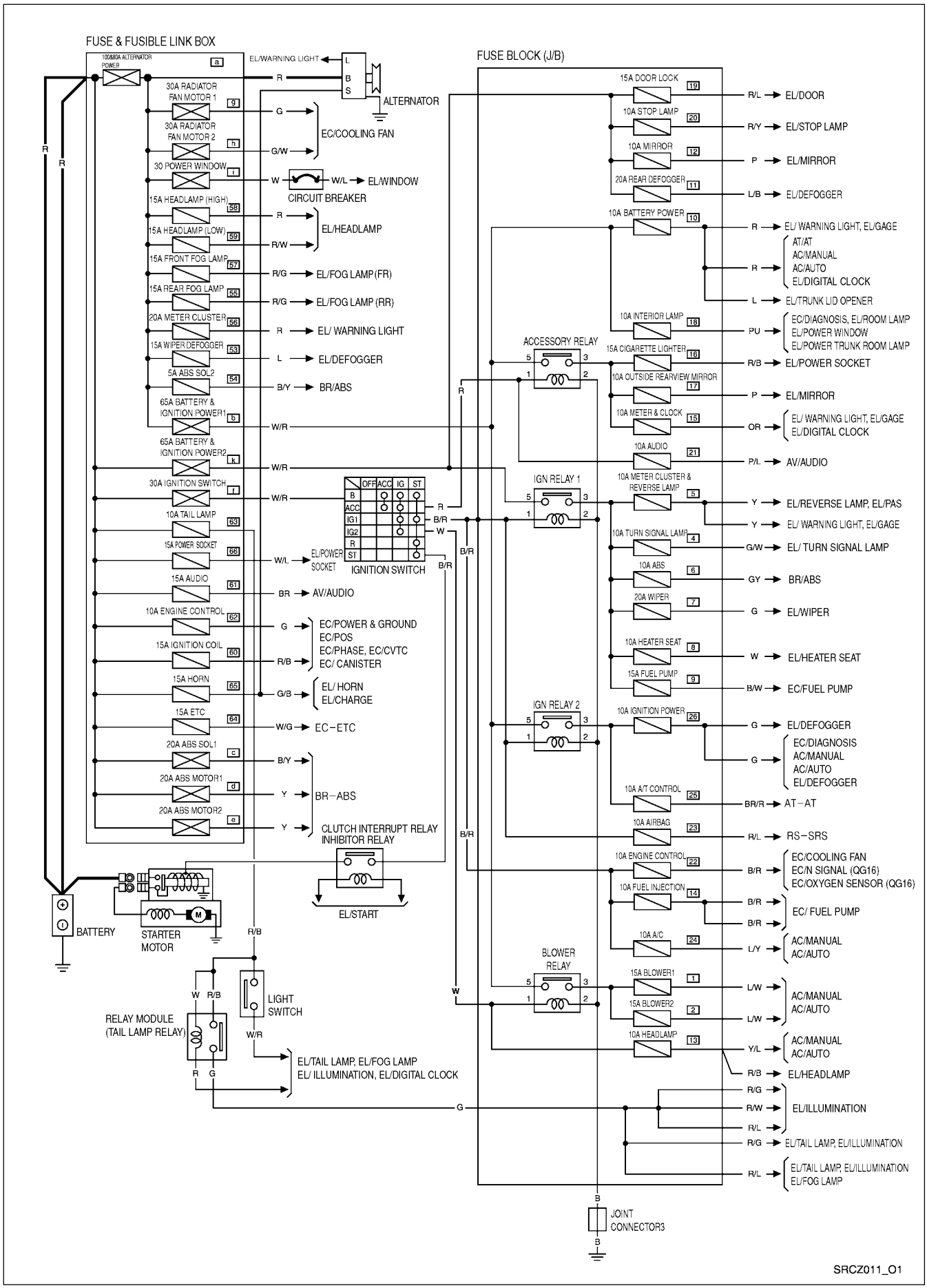
WARNING:

- **To install/remove the SRS airbag, pretensioner seatbelt system related components and harness, turn the ignition switch "OFF", disconnect the battery terminals and wait over 3 minutes. (This is to discharge all the remaining electricity in the airbag sensor unit's auxiliary power circuit.)**
- **Do not use air impact or electrical tools when installing/removing the components.**
- **Do not use any hand-held tools for harness used in SRS airbag and pretensioner seatbelt systems. Be careful with the harness not to tangle with or interfere with other components.**
- **Do not use any electrical test equipments such as circuit tester when inspecting the SRS airbag and pretensioner seatbelt circuit while installed unless the Service Manual instructs to do so. (The weak current in the tester can cause the SRS airbag to operate.)**
- **Do not insert any foreign materials such as a screwdriver in the airbag module and pretensioner seatbelt connector in order to prevent unintended operation due to static electricity.**
- **The harnesses used in SRS airbag and pretensioner are covered with yellow insulation for easy identification.**
- **Refer to "RS Restraint System" in this Service Manual for safe airbag system service information.**

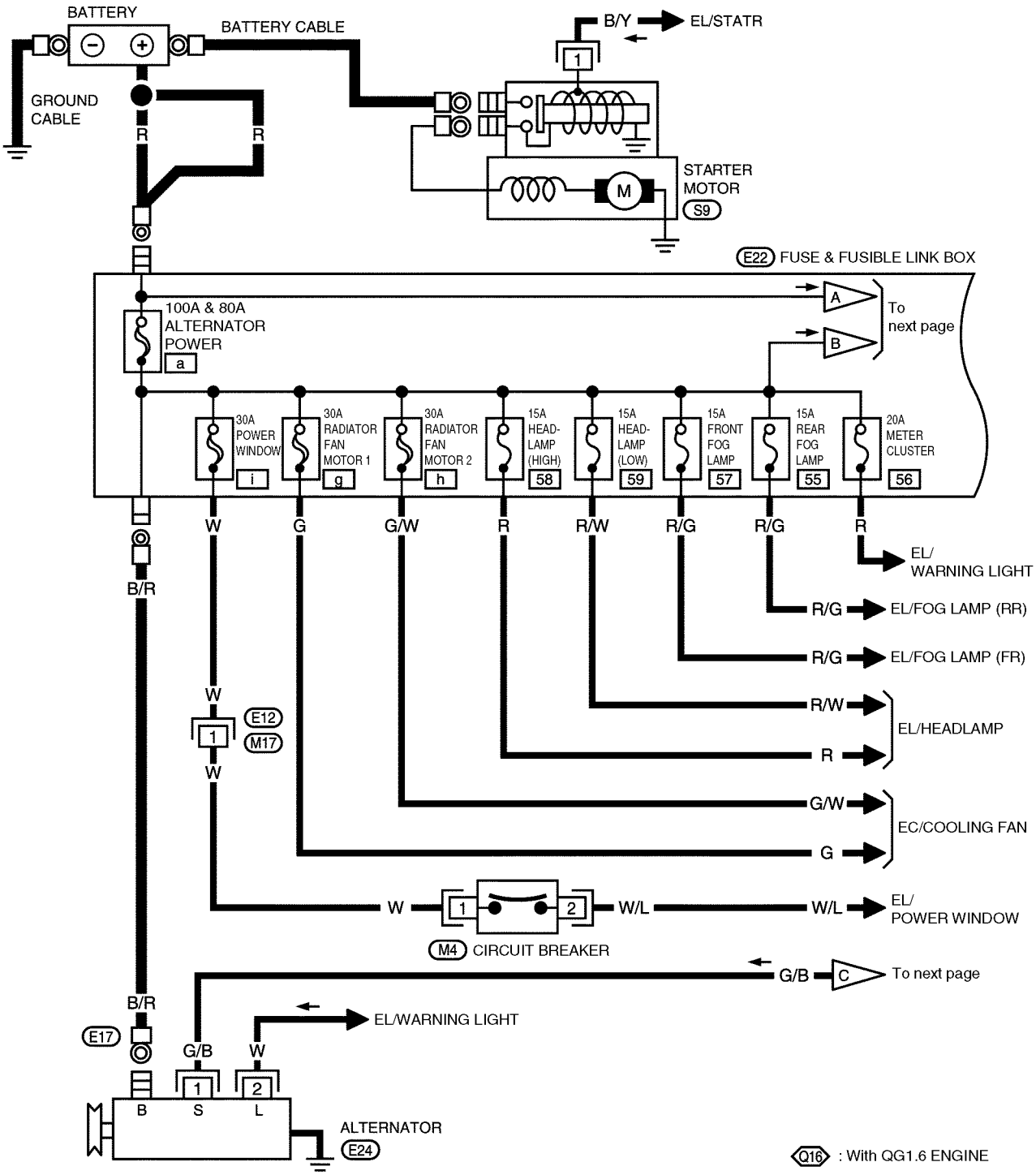
General Precautions in Service

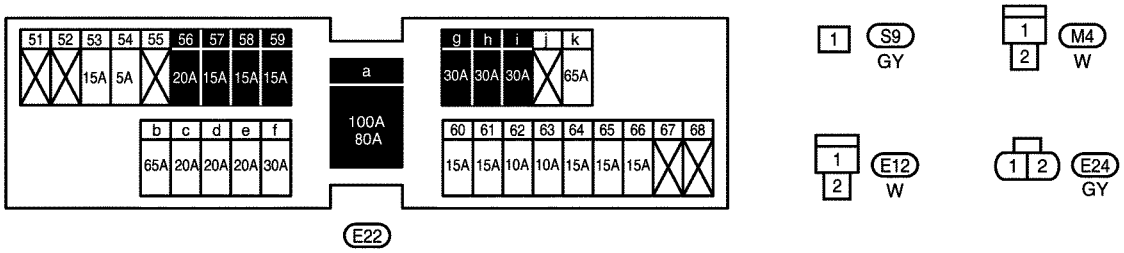
- Do not touch the bulb glass with bare hand or stain oil. Do not touch the bulb when lighted or right after turning off. It is extremely hot.
- When you leave the removed bulb for a long time, the bulb performance decreases due to lens and reflector dusting (dirty and dark). Perform the bulb replacement after preparing a new bulb.
- Aiming adjust screw should be turned towards tightening direction. (If have to be adjusted reverse direction, loosen enough and then tighten to adjust.)
- Do not use organic detergent (thinner or gasoline) when removing the dirt or sealant at the lamp.
- When replacing the bulb, grab the bulb socket and pull it out backwards right away. (When you pull it out sideways by grabbing the harness, the bulb may fall inside the lamp and it is hard to take it out.)

Circuit Diagram



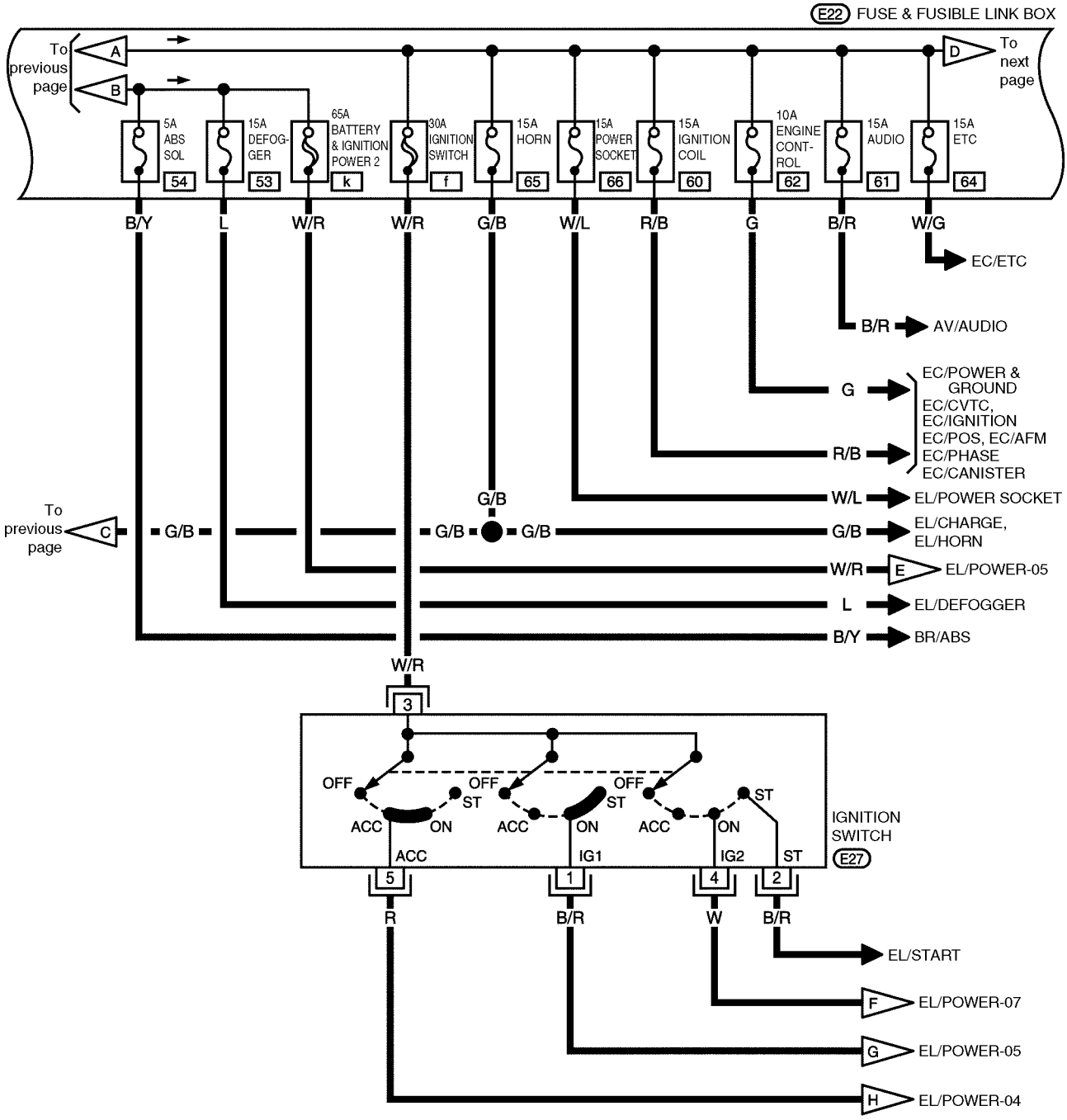
Wiring Diagram

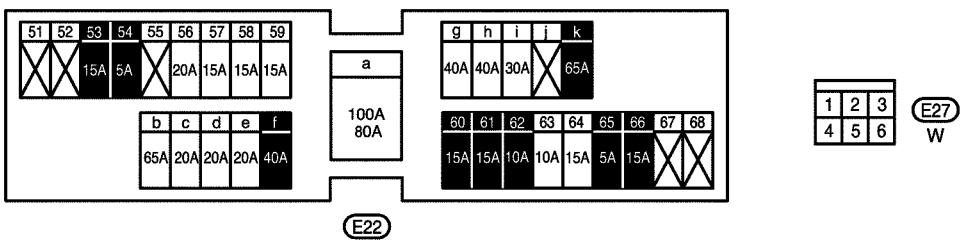




SRWZ047_01

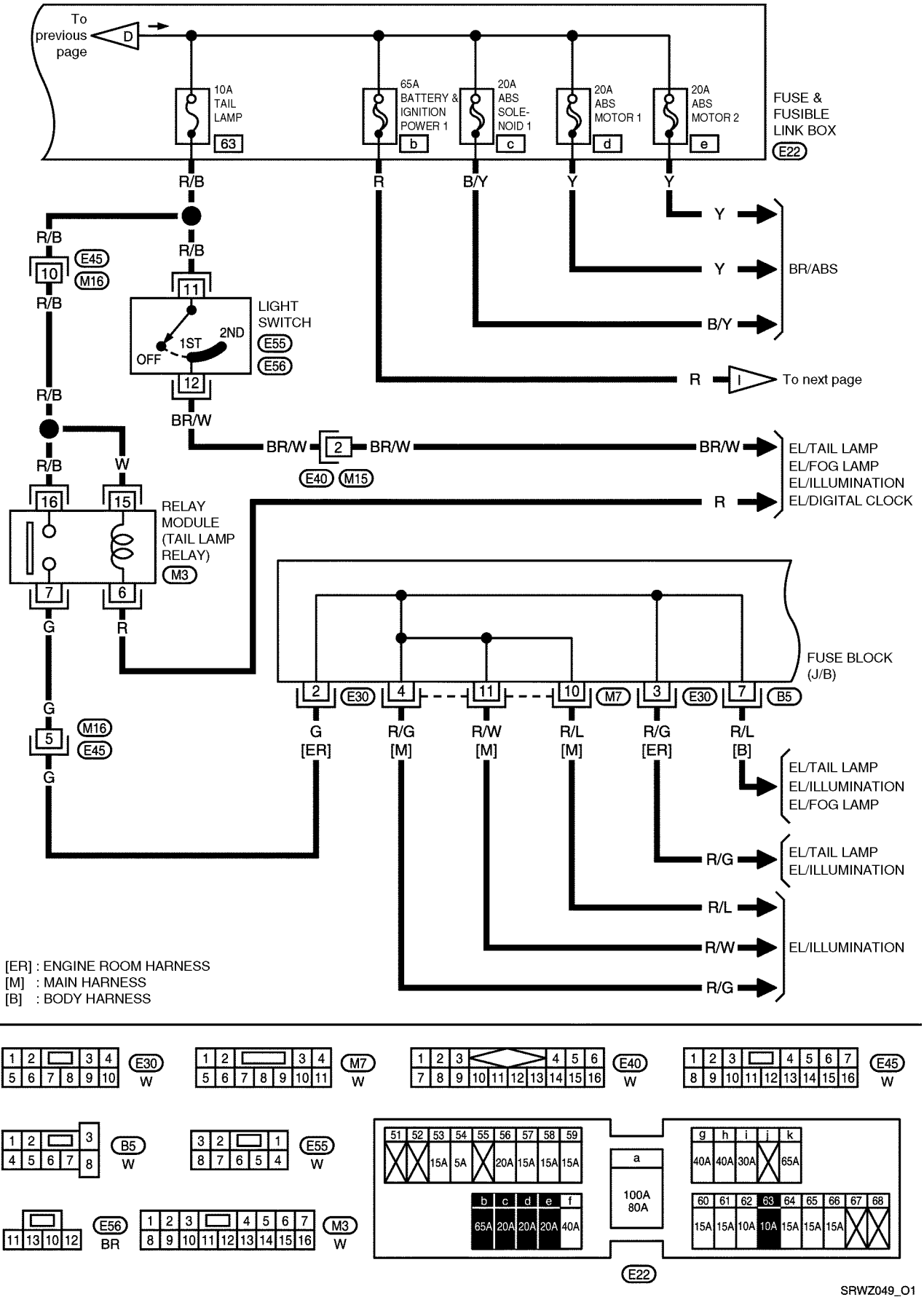
Wiring Diagram



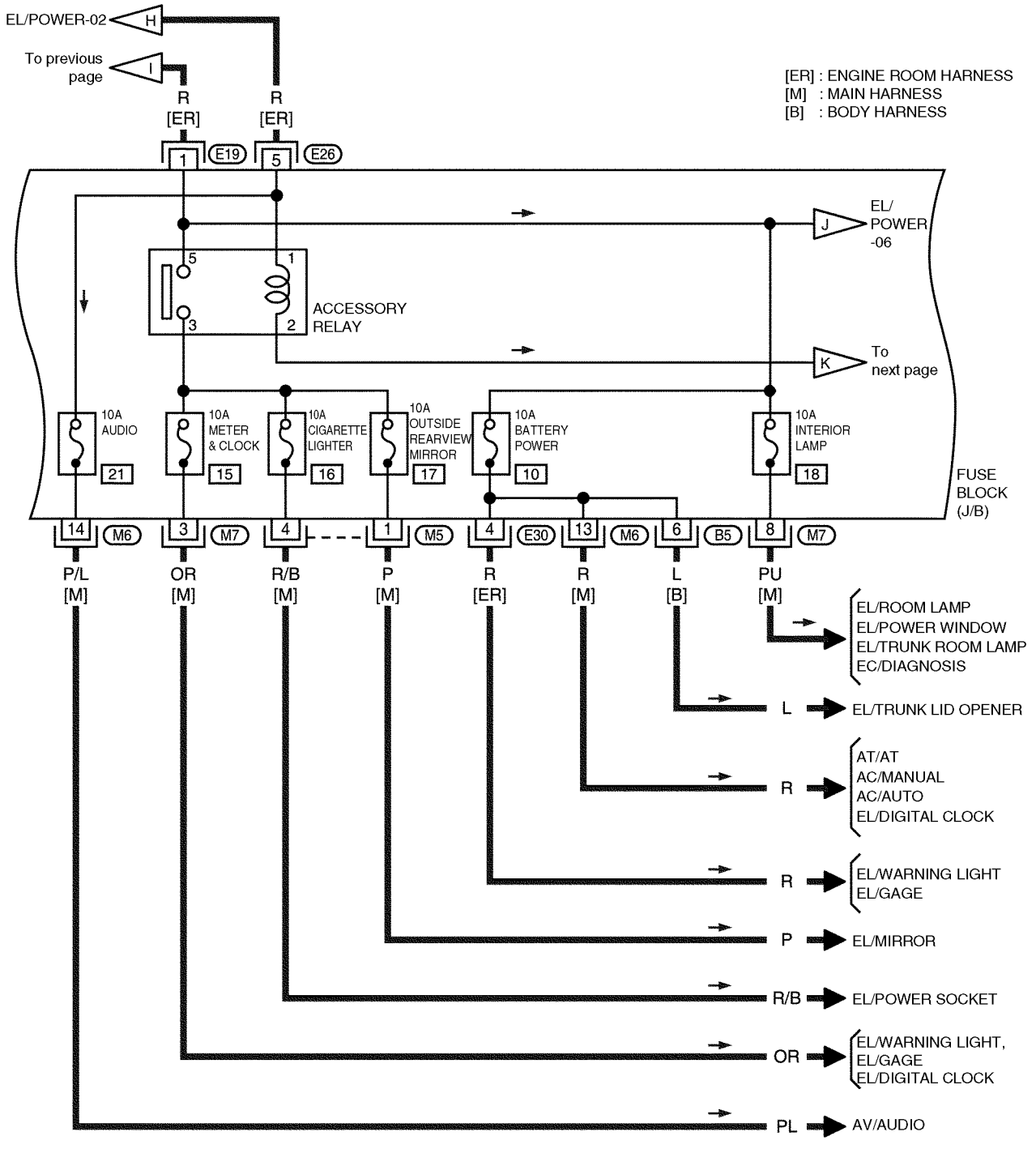


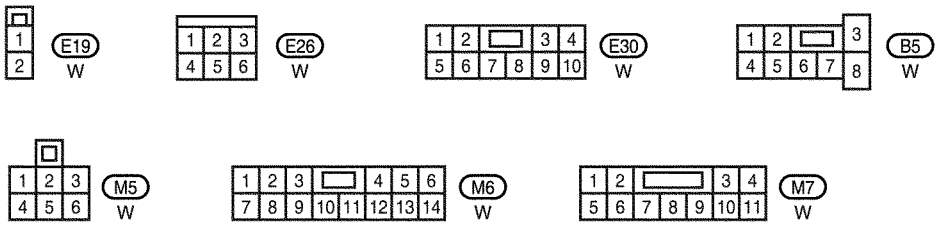
SRWZ048_O1

Wiring Diagram



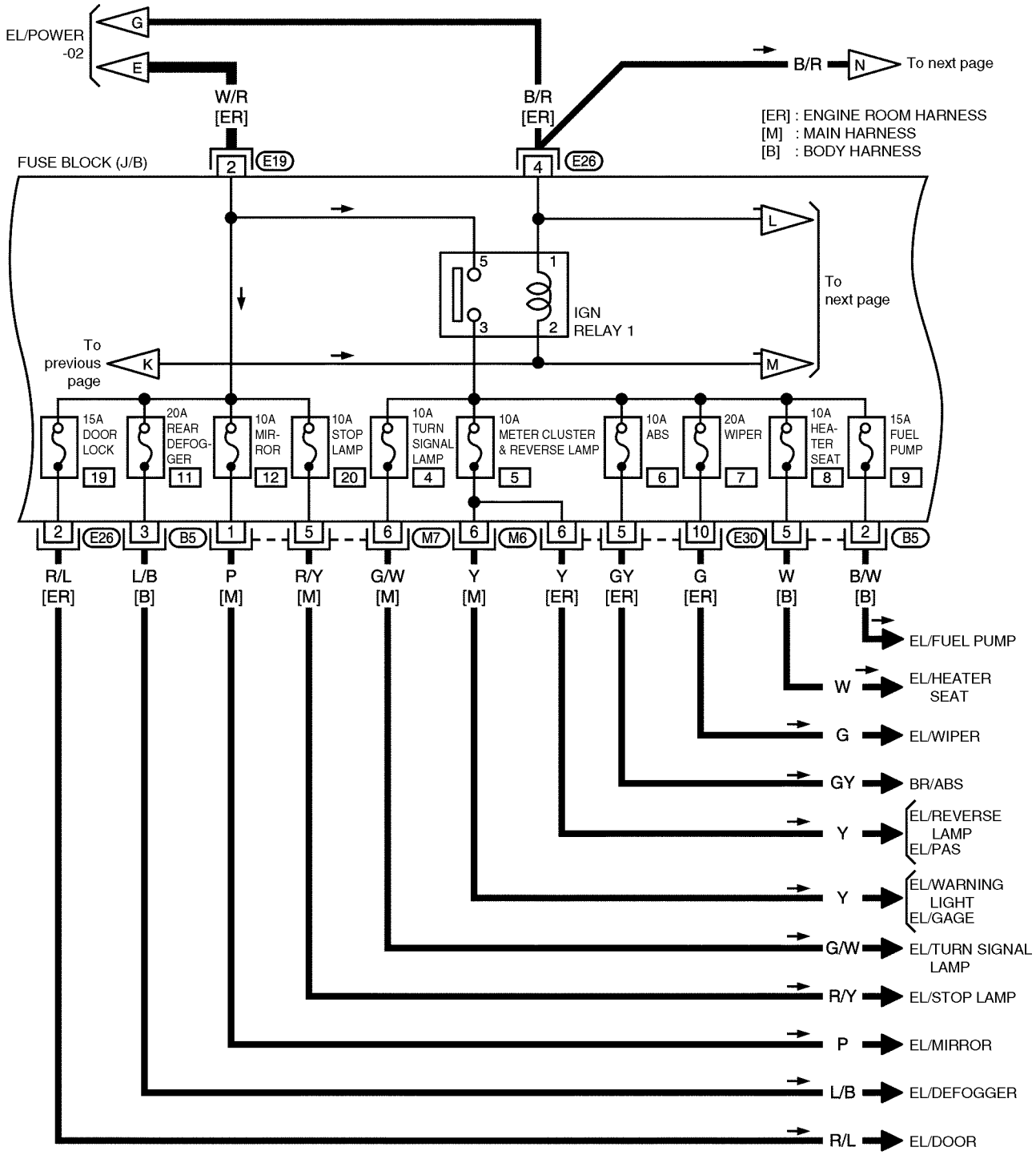
Wiring Diagram

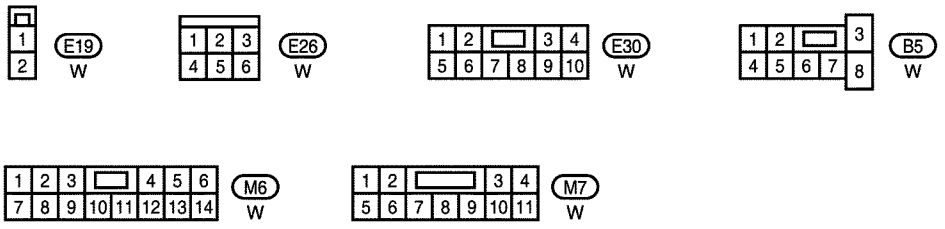




SRWZ050_O1

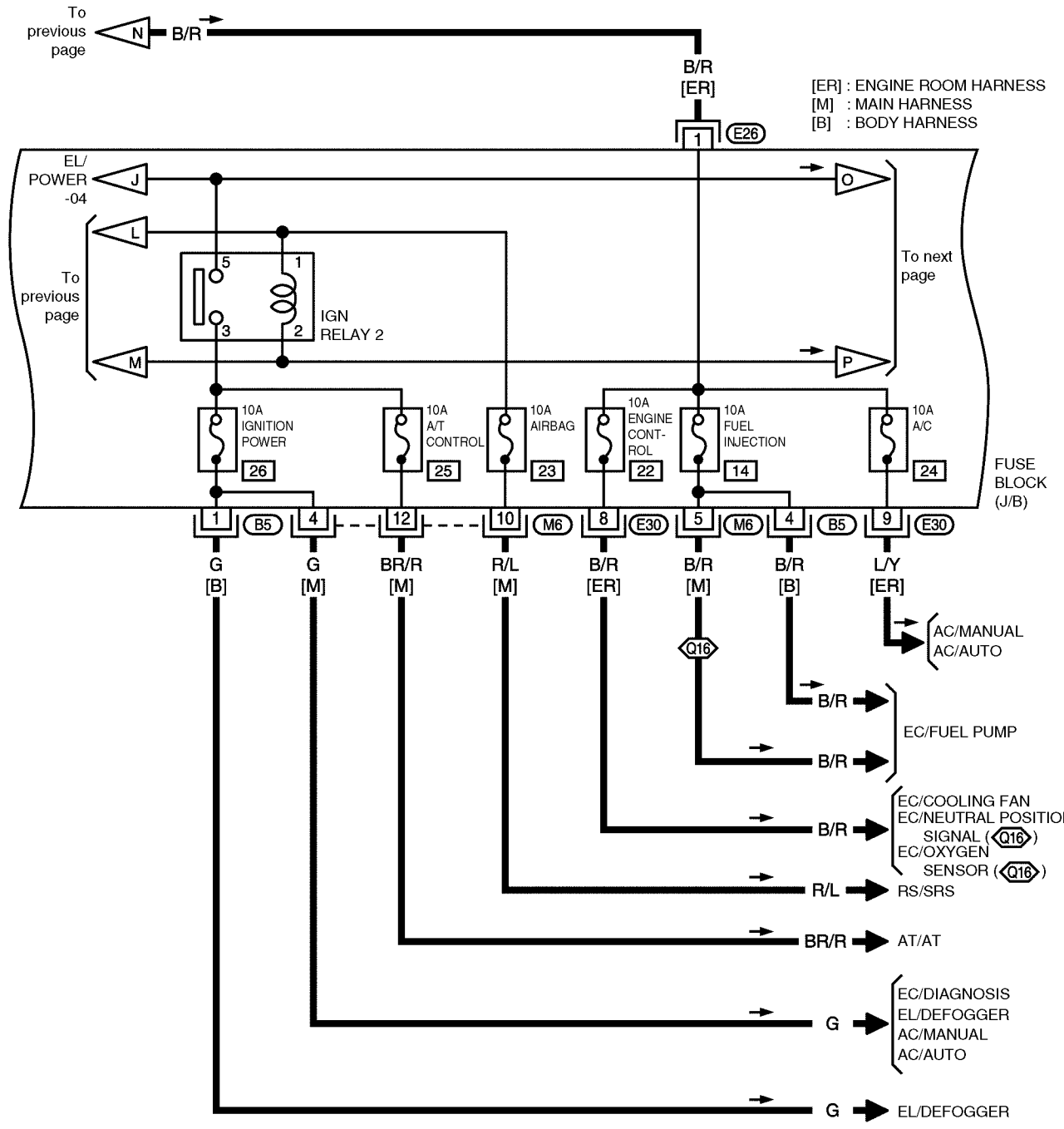
Wiring Diagram



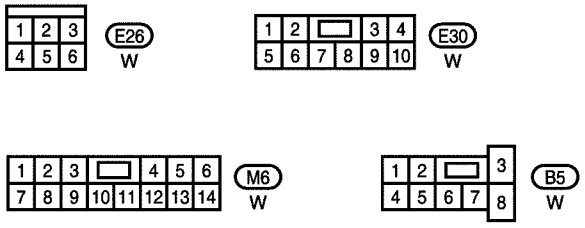


SRWZ051_O1

Wiring Diagram

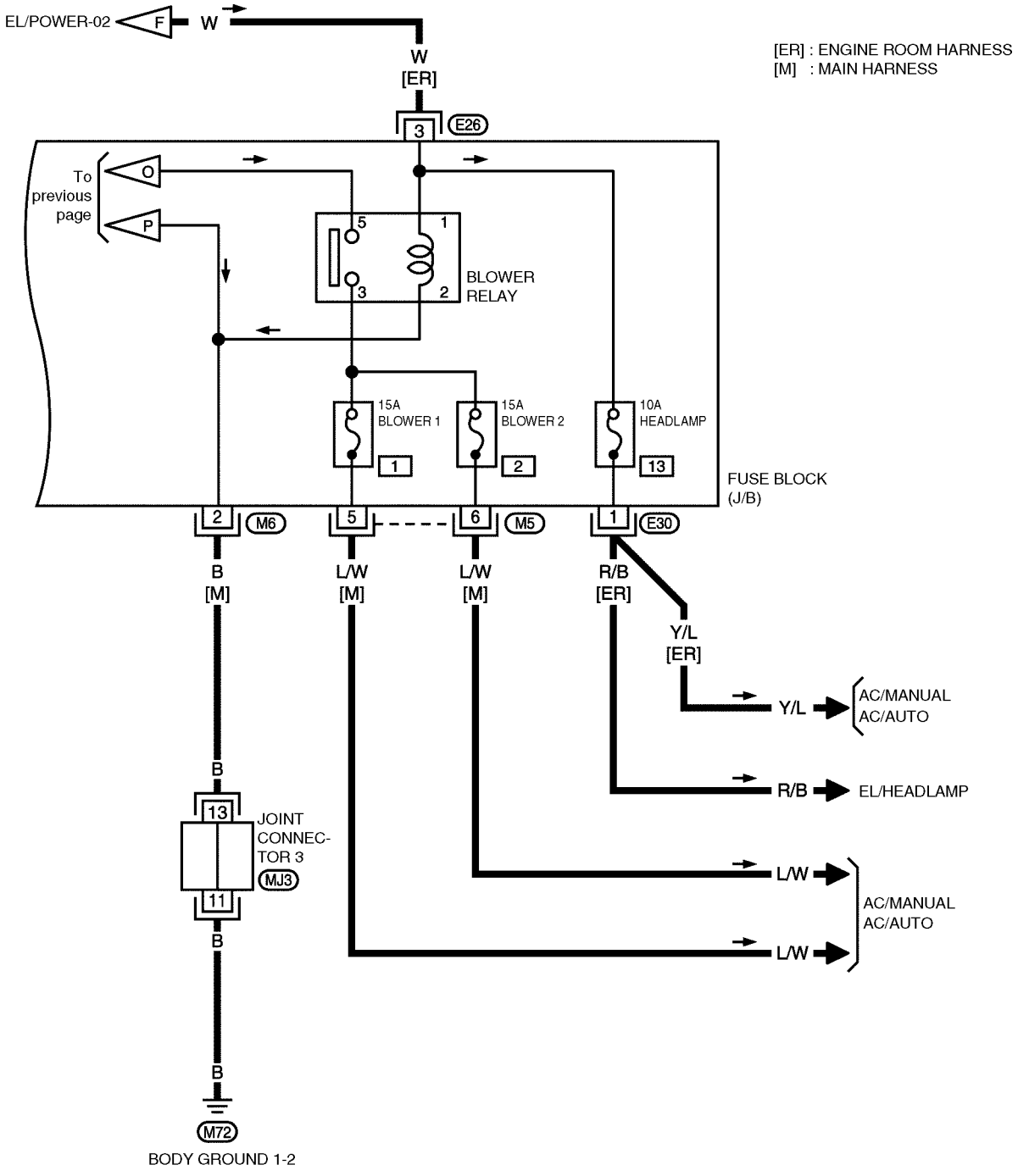


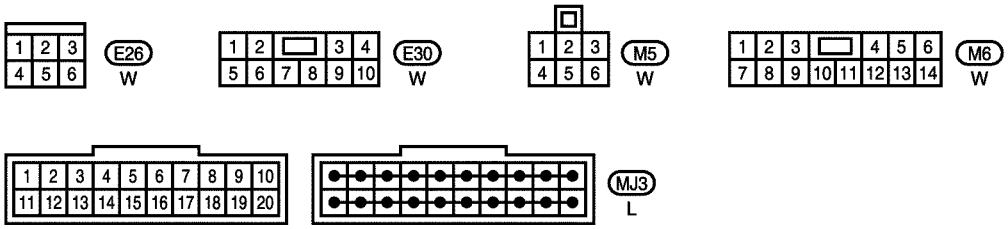
Q16 : With QG1.6 ENGINE



SRWZ052_O1

Wiring Diagram

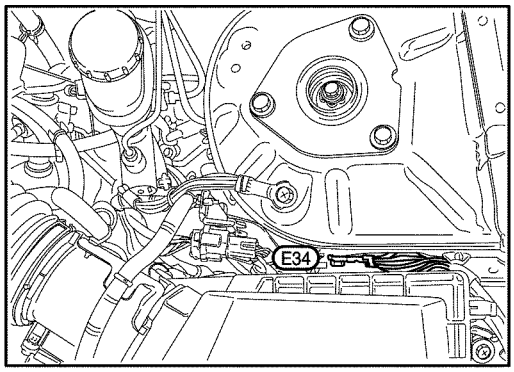


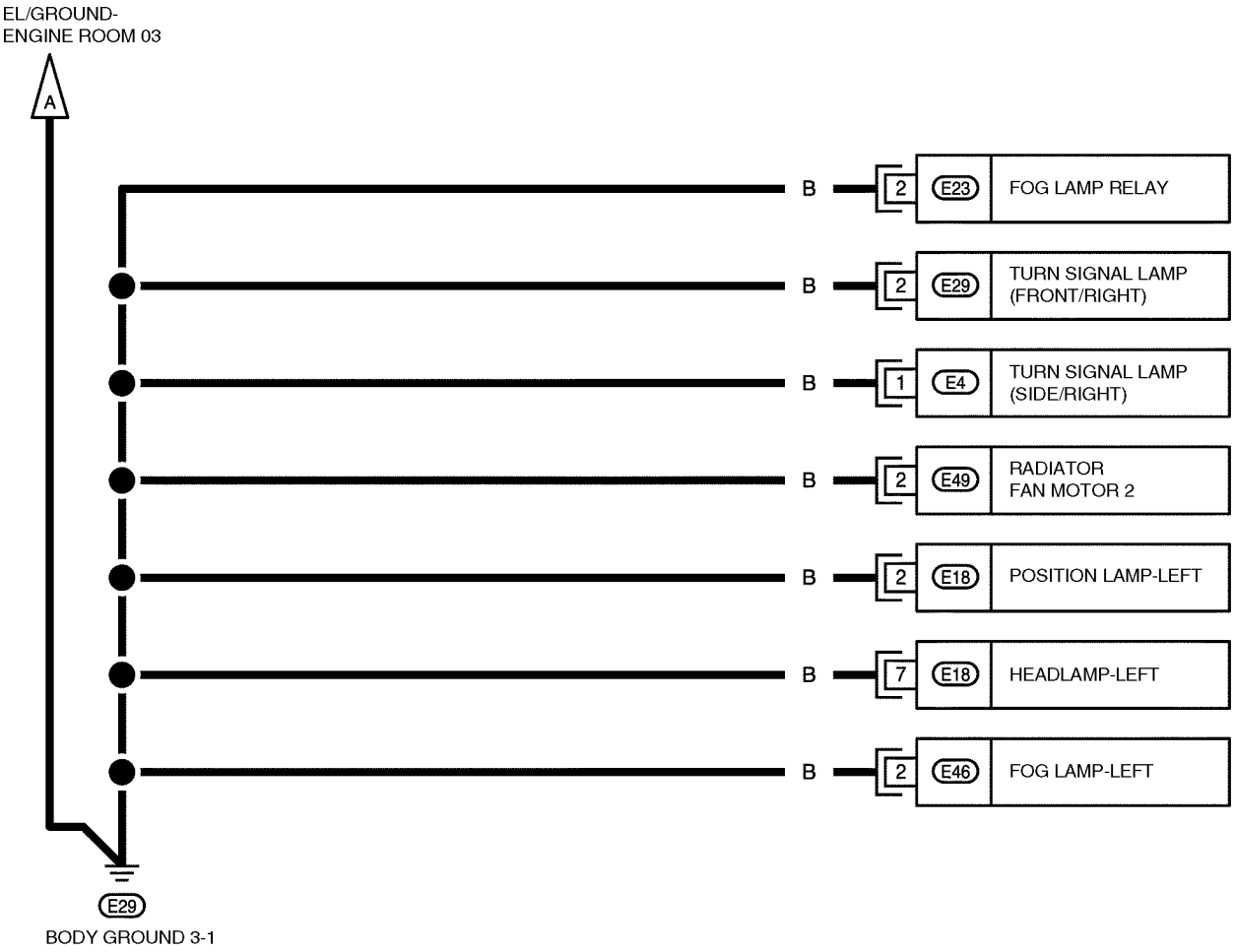


SRWZ053_O1

Wiring Diagram — EL/Ground-Engine Room 01

ENGINE ROOM HARNESS

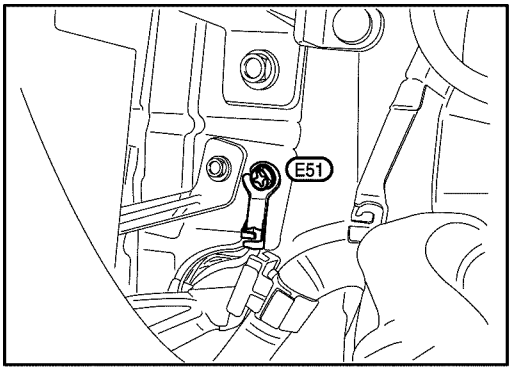


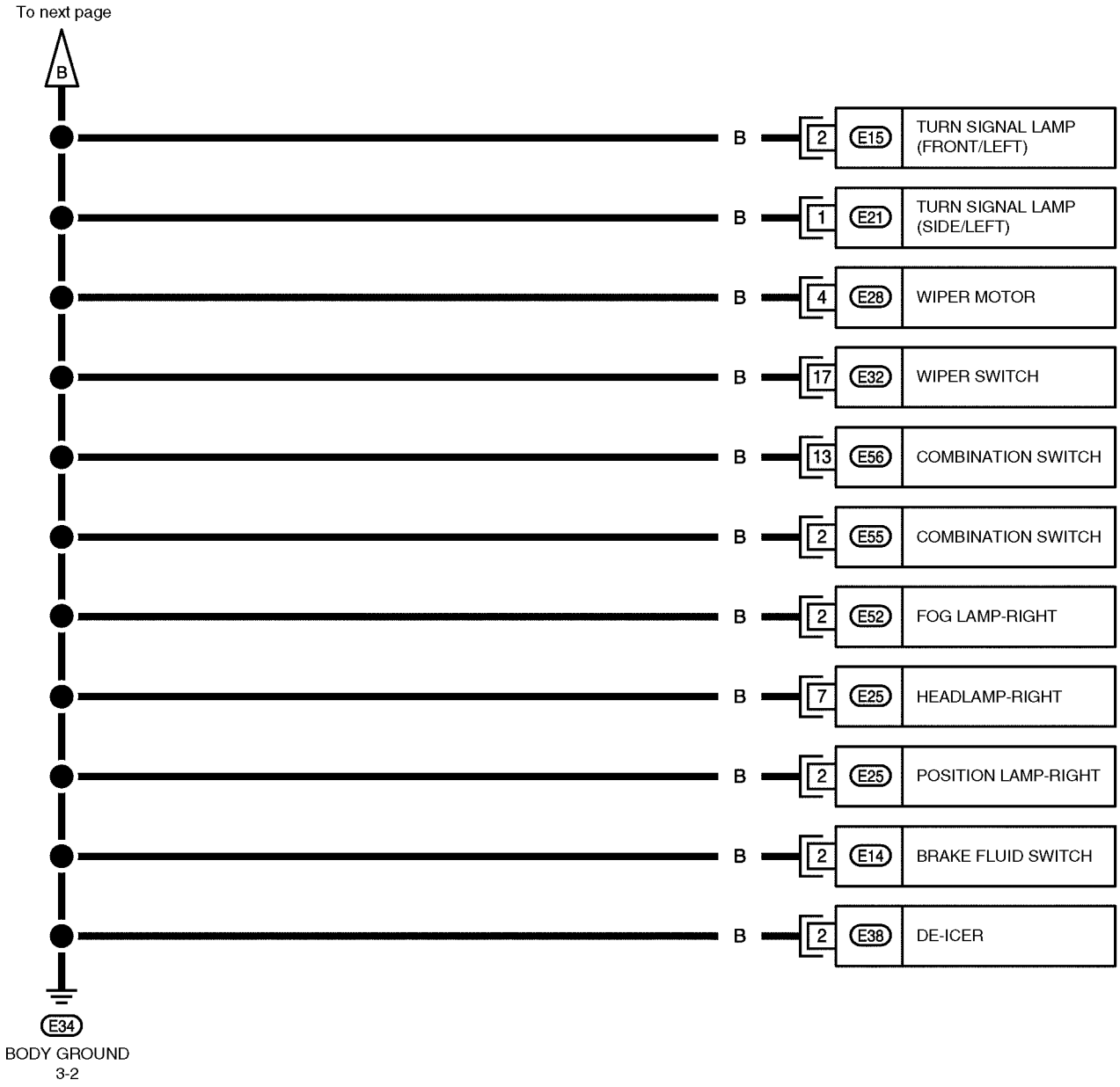


SRWZ055_O1

Wiring Diagram — EL/Ground-Engine Room 02

ENGINE ROOM HARNESS-CONTINUED

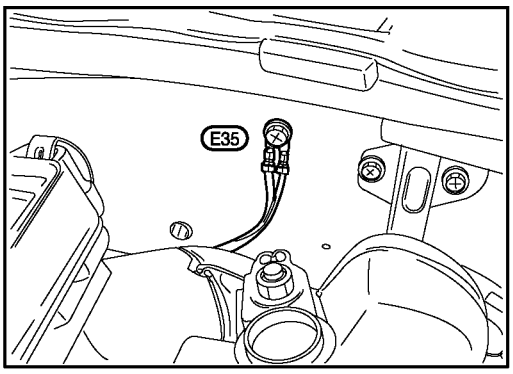


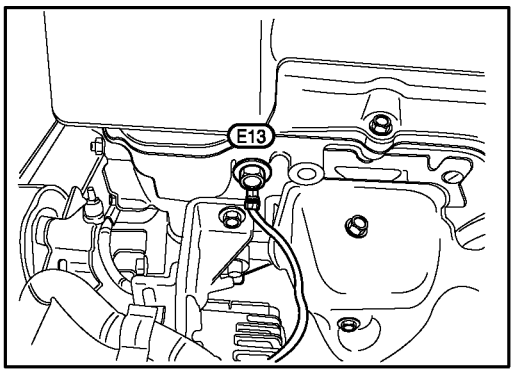


SRWZ056_O1

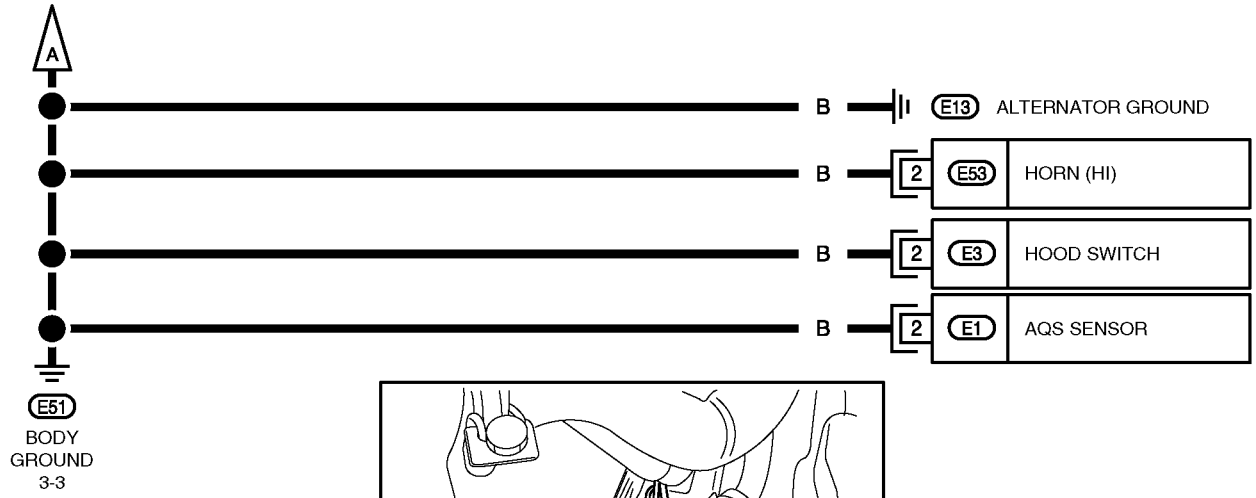
Wiring Diagram — EL/Ground-Engine Room 03

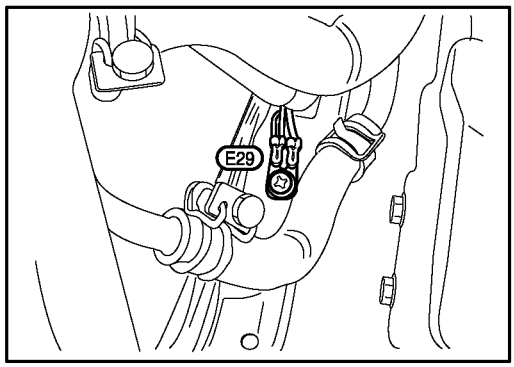
ENGINE ROOM HARNESS-CONTINUED



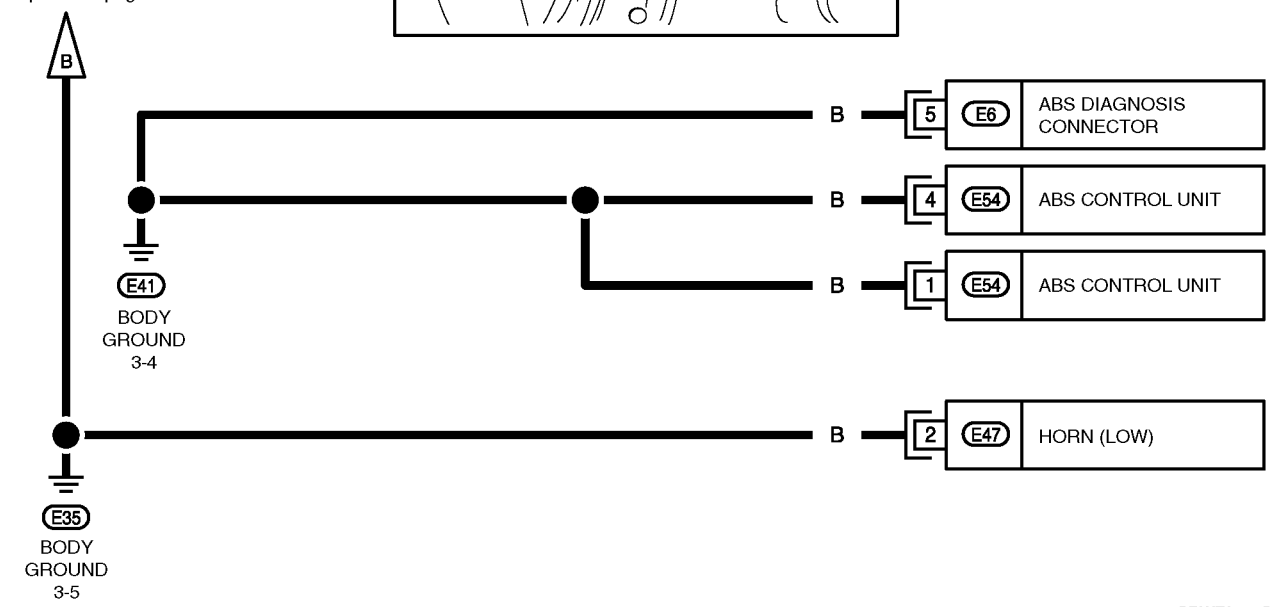


EL/GROUND-
ENGINE ROOM 01





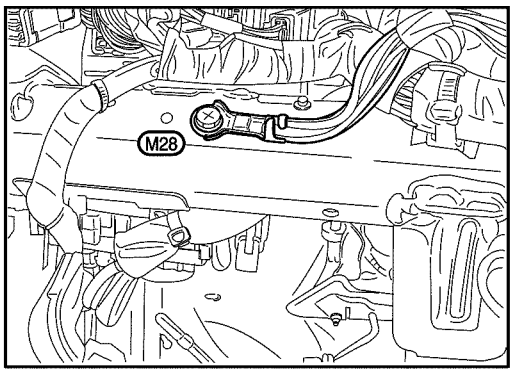
To previous page

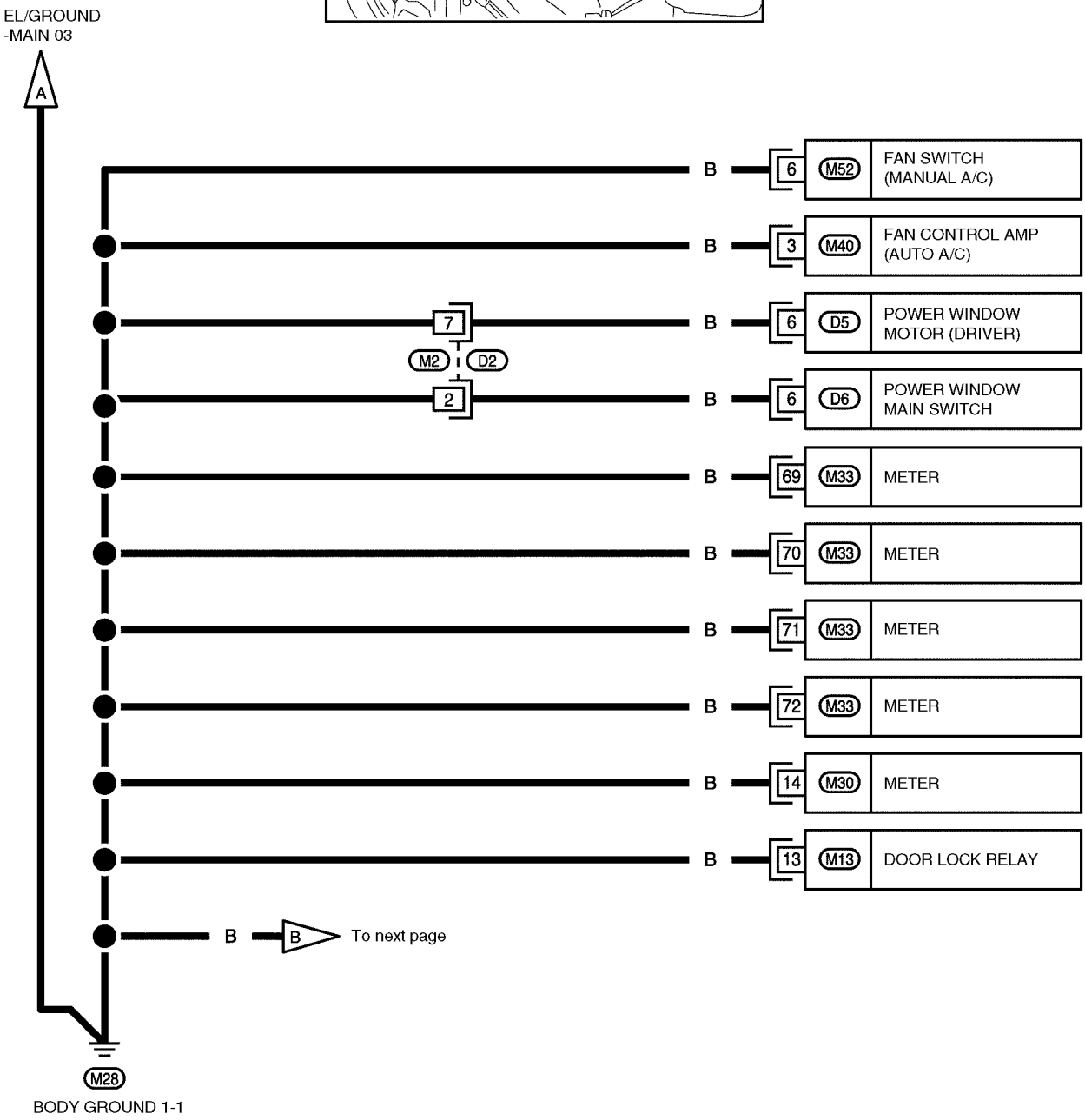


SRWZ057_O1

Wiring Diagram — EL/Ground-Main 01

MAIN HARNESS

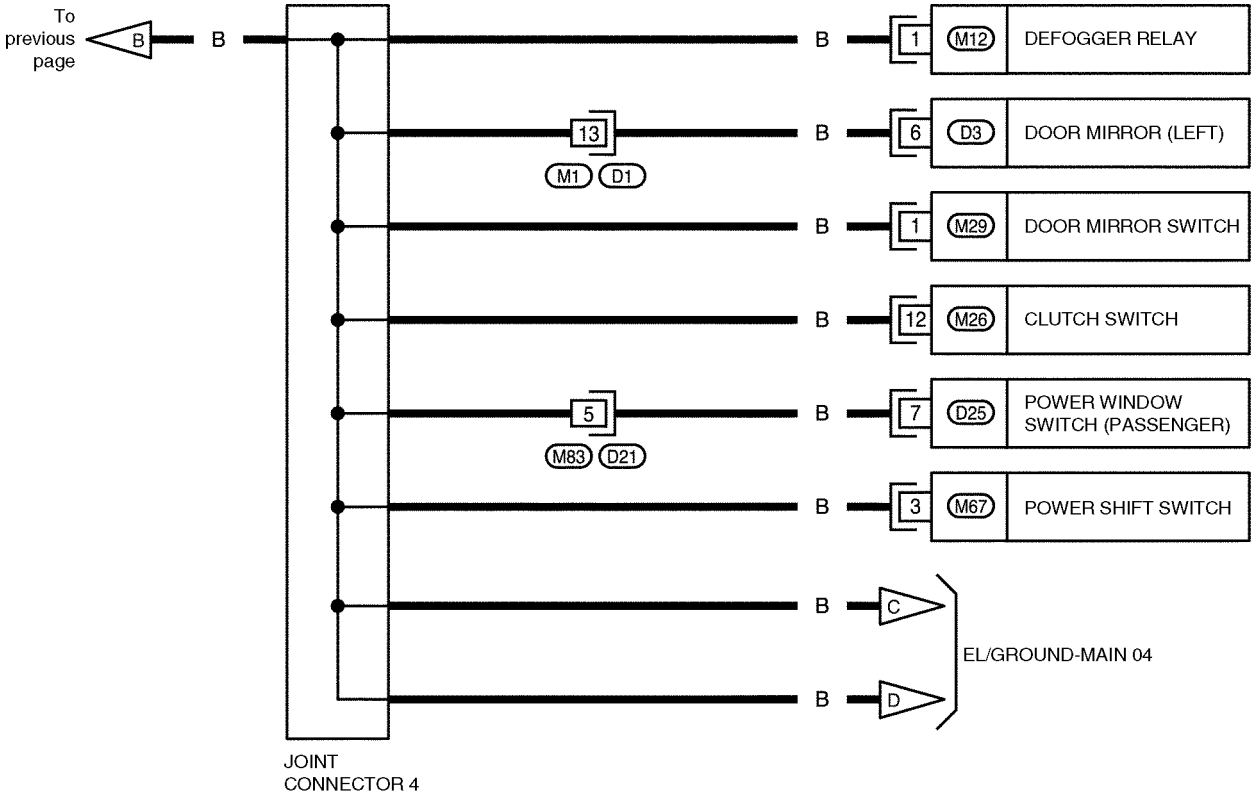




SRWZ058_O1

Wiring Diagram — EL/Ground-Main 02

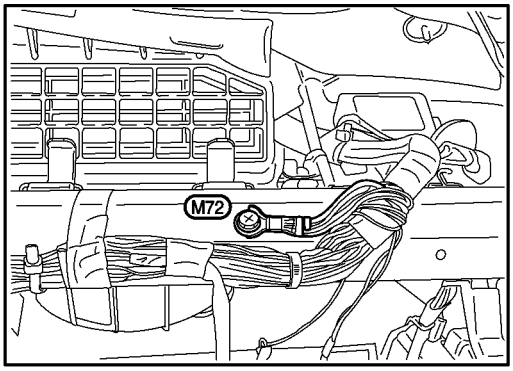
MAIN HARNESS-CONTINUED

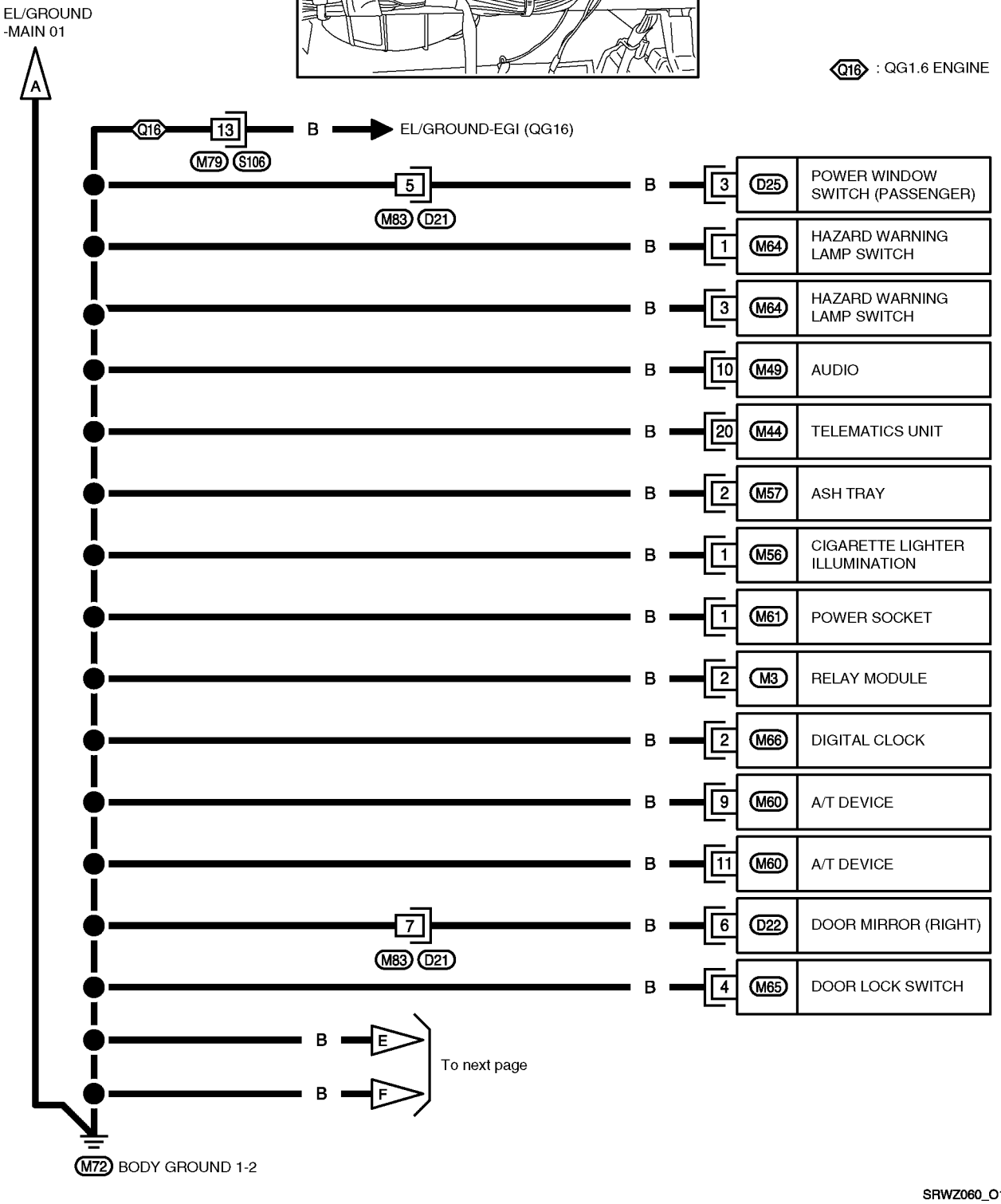


SRWZ059_O1

Wiring Diagram — EL/Ground-Main 03

MAIN HARNESS-CONTINUED

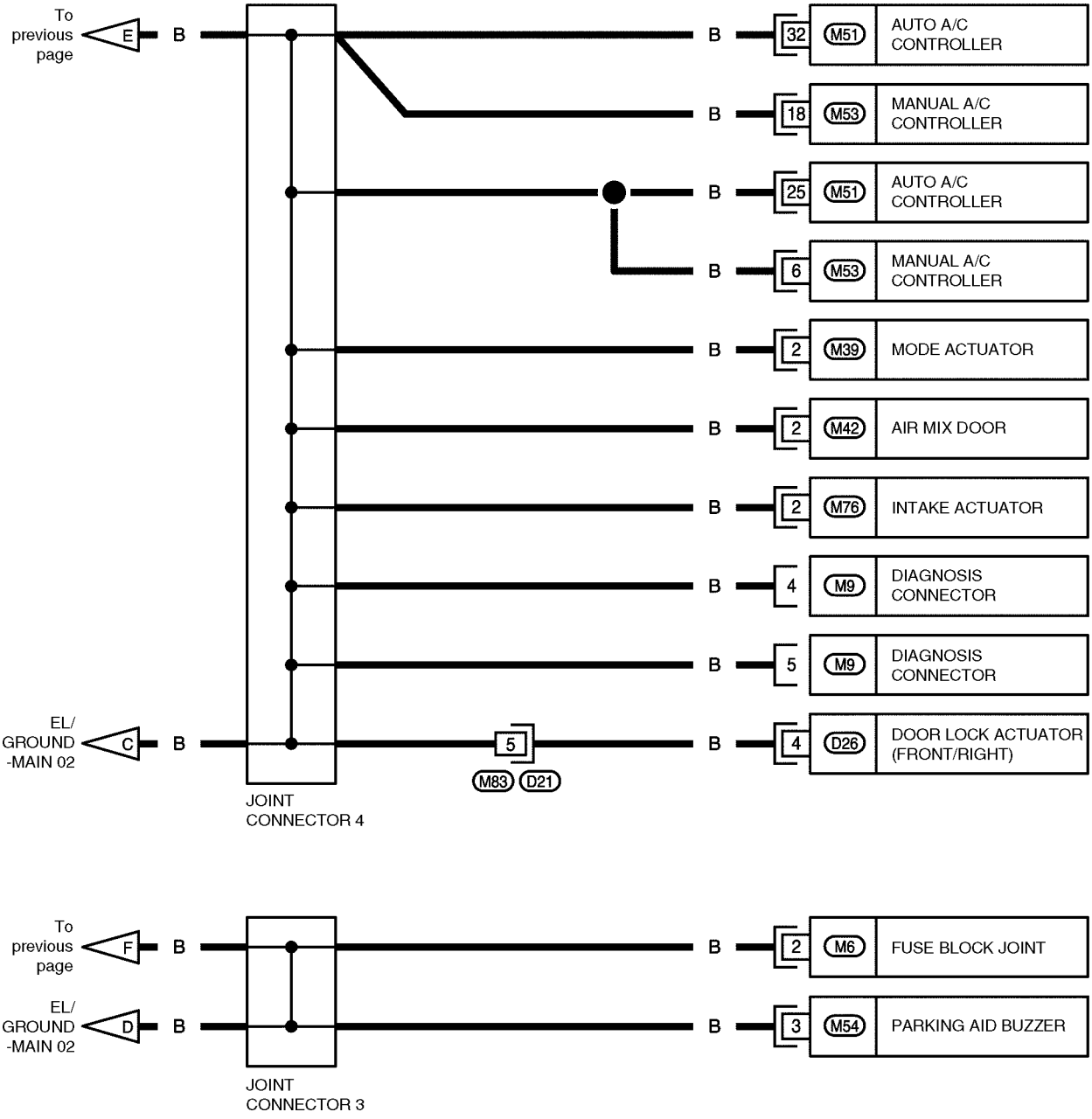




SRWZ060_O1

Wiring Diagram — EL/Ground-Main 04

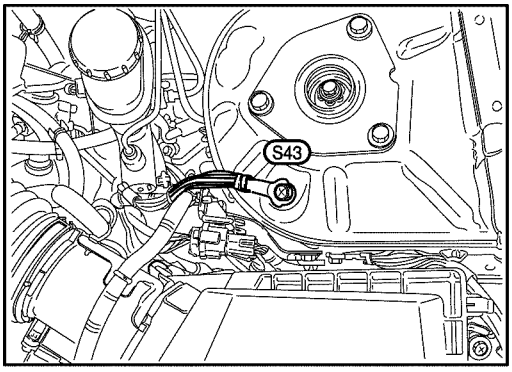
MAIN HARNESS-CONTINUED



SRWZ061_O1

Wiring Diagram — EL/Ground-EGI (QG16)

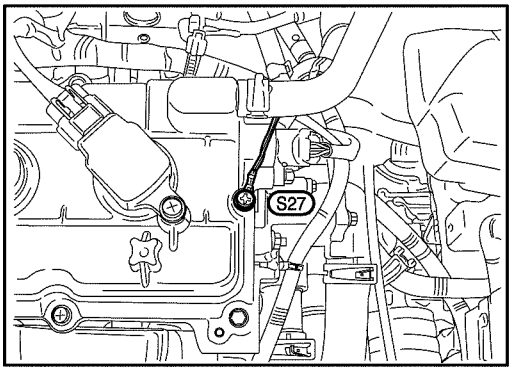
EGI HARNESS (QG16)



B → EL/GROUND-MAIN 03

B	1	S1	ENGINE CONTROL UNIT
B	115	S1	ENGINE CONTROL UNIT
B	116	S1	ENGINE CONTROL UNIT
B	25	S105	A/T CONTROL UNIT
B	48	S105	A/T CONTROL UNIT
B	1	S40	ETC SHIELD GROUND
B	1	S40	ETC SHIELD GROUND
B	1	S40	ETC SHIELD GROUND
B	2	S15	INHIBITOR SWITCH
B	2	S20	NEUTRAL POSITION SWITCH (M/T)

S34
BODY GROUND



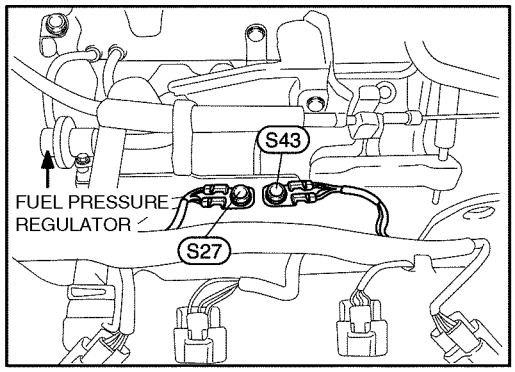
B	2	S25	IGNITION COIL #1
B	2	S26	IGNITION COIL #2
B	2	S31	IGNITION COIL #3
B	2	S35	IGNITION COIL #4

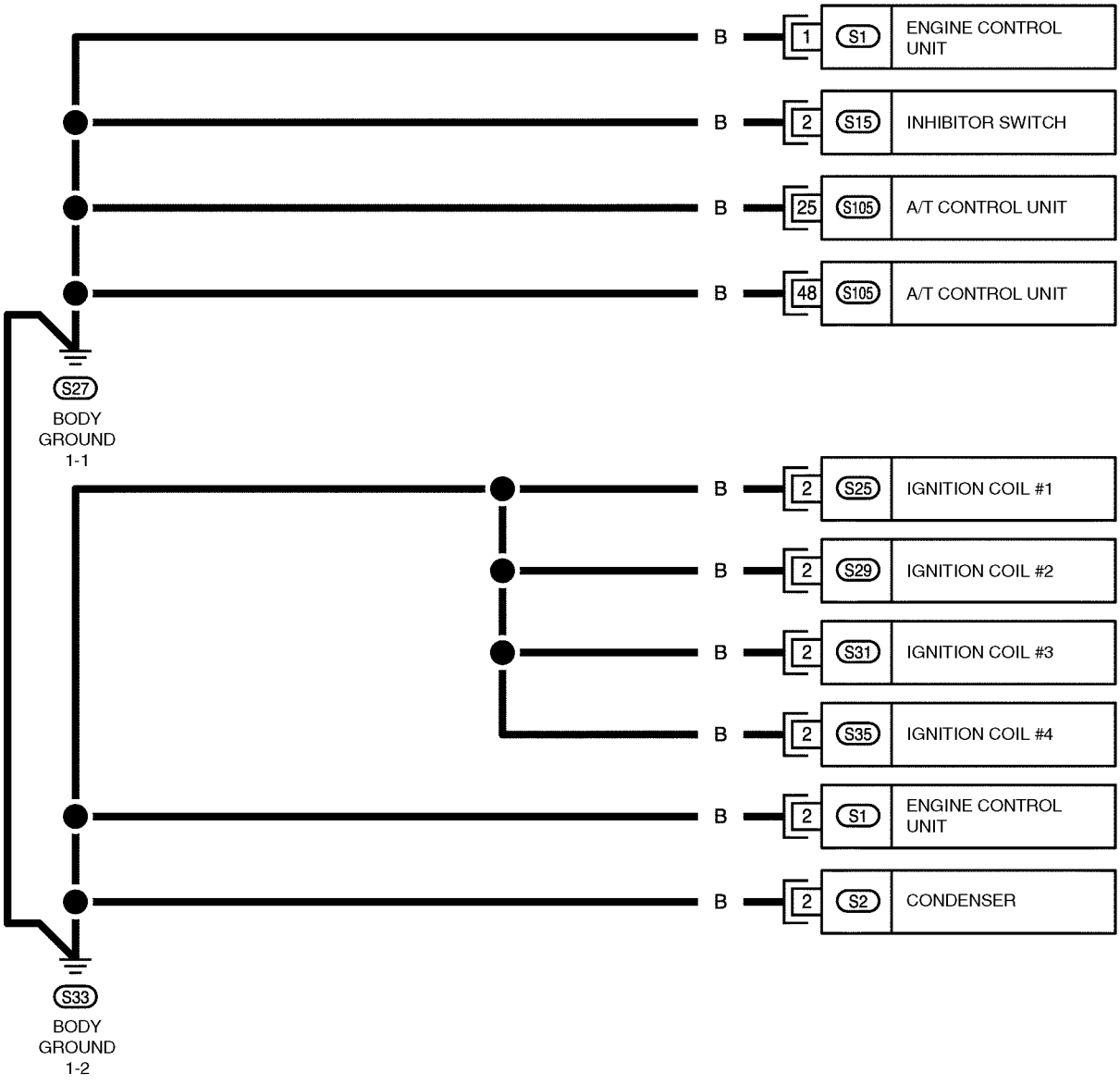
S27
BODY GROUND
1-1

SRWZ062_O1

Wiring Diagram — EL/Ground-EGI (QG15)

EGI HARNESS (QG15)

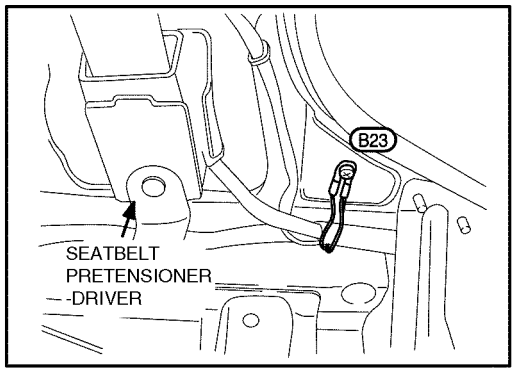


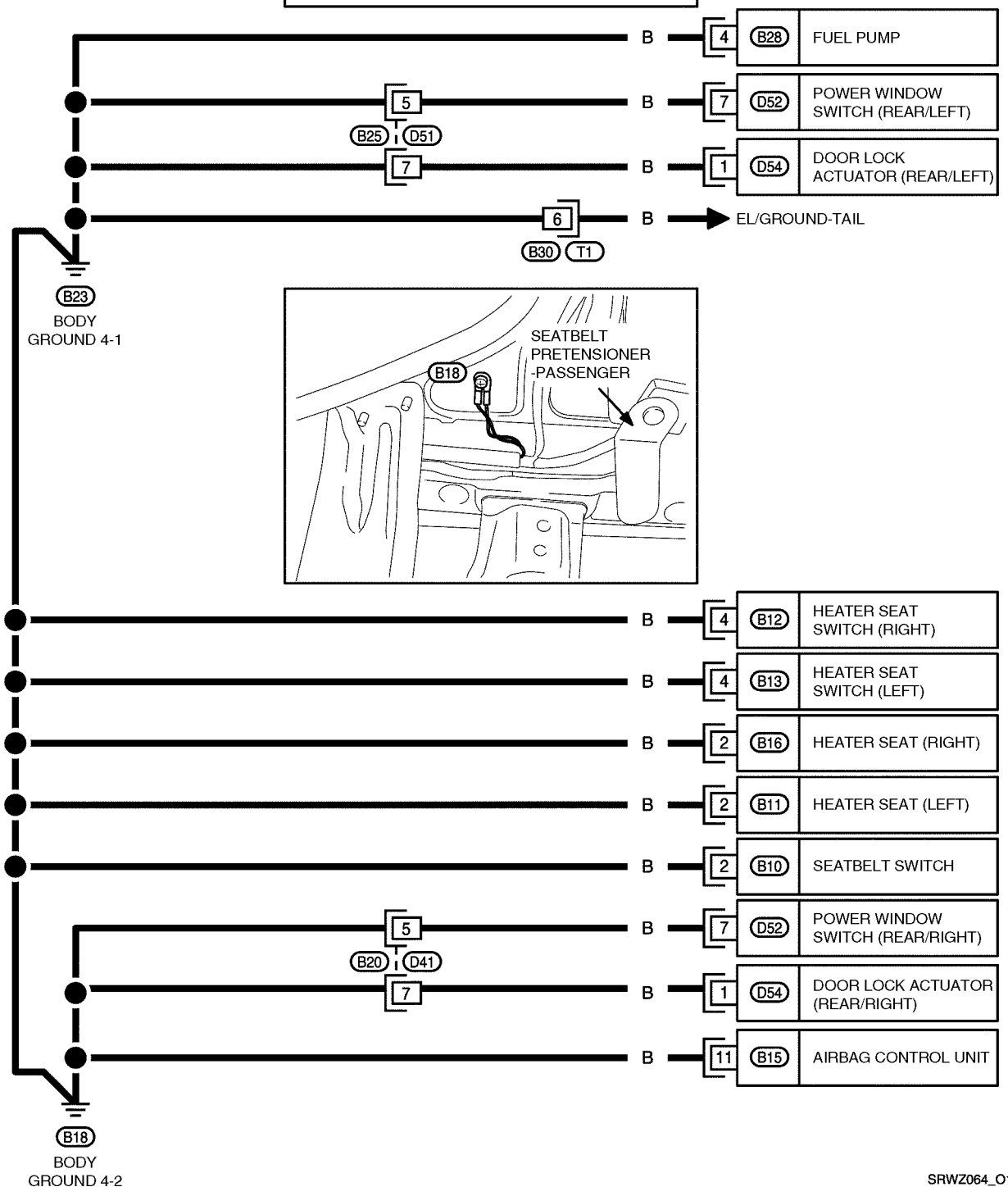


SRWZ063_O1

Wiring Diagram — EL/Ground-Body

BODY HARNESS

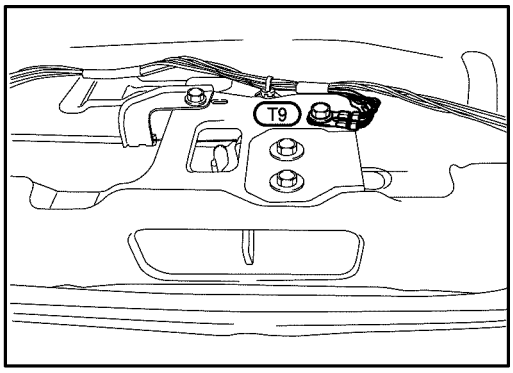


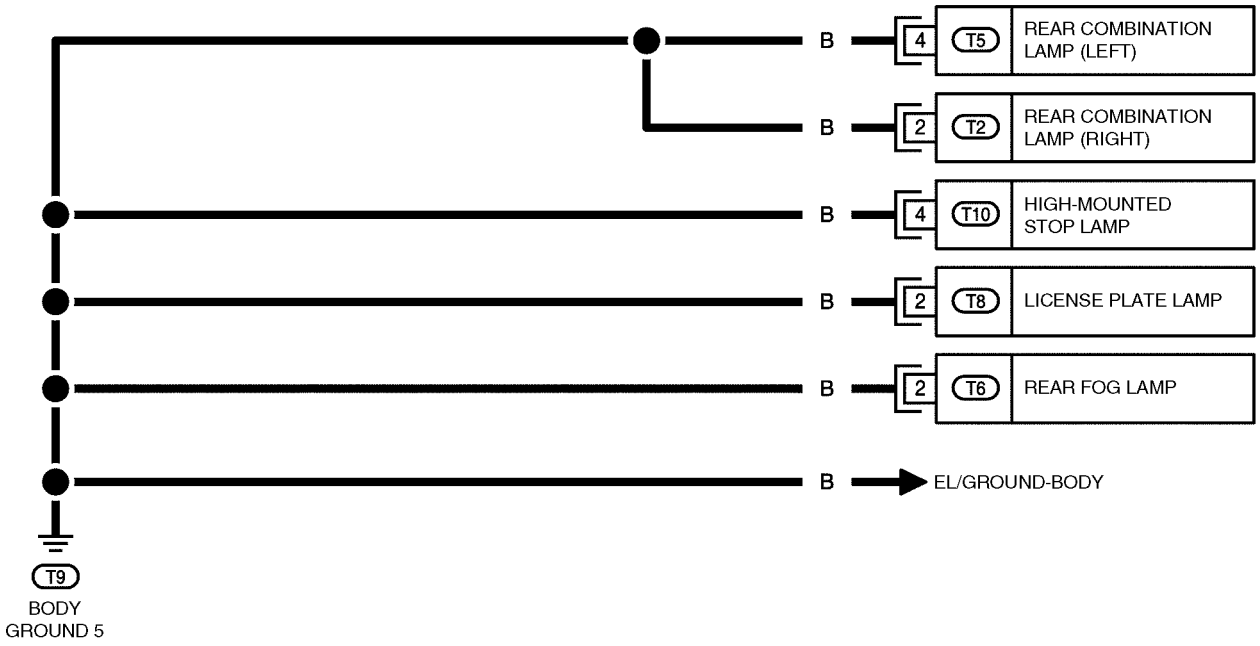


SRWZ064_O1

Wiring Diagram — EL/Ground-Tail

TAIL HARNESS



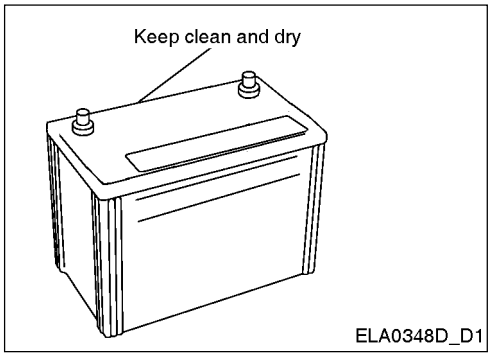


SRWZ065_O1

Precautions in Handling

CAUTION:

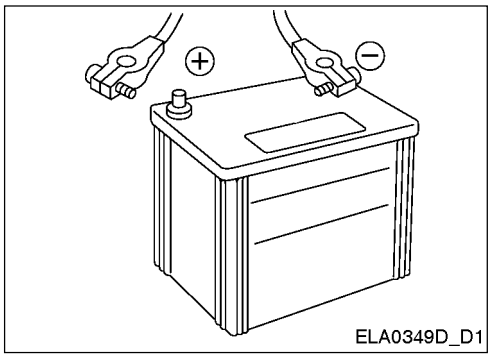
- **When you have to jump start the engine using battery and the jumper cable, use only 12 V battery.**
- **After battery cable connection, check if it is securely tightened on the terminal.**
- **During regular inspection, check the electrolyte level.**



OVER DISCHARGING PREVENTION

In order to prevent from battery over-discharging, be sure to follow as below.

- Always keep the battery surface (specially the upper surface) clean and dry.
- Keep the terminal connections clean and securely tightened.
- During regular inspection, check the electrolyte level.



- Disconnect the negative (-) terminal of the battery when not using the vehicle for a long period of time.
- Check the battery charge status.

  Check the electrolyte level periodically and check the battery charge status to prevent from over-discharge.

Inspection

ELECTROLYTE LEVEL

Visually inspect if the battery cell's electrolyte level is within the specified level (between MAX and MIN marks).

If the level is low, remove the cap and add the electrolyte to the MAX mark.

CAUTION:

- **The battery fluid has a strong corrosion characteristic so be careful not to stain in your skin, clothes or vehicle. When stained, wash it out with water. Also, do not touch or rub your eyes after touching the battery. If the battery fluid has stained in your eyes, skin or clothes, wash it out in running water for about 15 minutes and consult with a doctor if stained in your eyes.**
- **If the battery is contaminated, wash it with water or warm water.**
- **Use battery fluid or distilled water when adding. If you use tab water, it can cause reduction or discharging.**

Charging Procedure

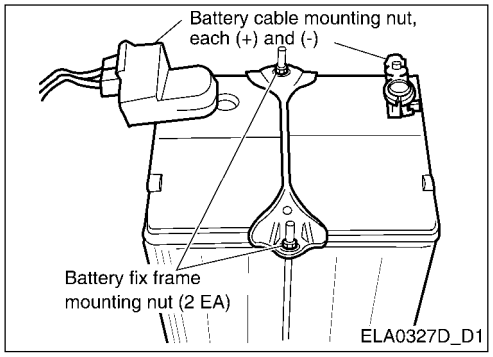
Perform the charging following the charger's instruction manual.

CAUTION:

- **There are 2 kinds of charging procedures: "Normal charge" and "Quick charge".**
  Normal charge: Charging used for battery capacity recovery.
  Quick charge: Charging used for emergency recovery just enough to start the engine.
- **Do not perform "Quick charge" for batteries not fully charged.**
  Normally perform the "Normal charge".
- **The standard charging rate is 1/10 of 5-hour rate capacity for "Normal charge" and 1/2 of 5-hour rate capacity for "Quick charge".**
- **Keep away from flammables when charging the battery.**
- **When connecting the battery to the charger, connect the lead wire first and then turn on the charger. If you turn on the charger first, it may cause sparks.**
- **The battery electrolyte temperature while charging must be maintained at under 45°C for "Normal charge" and under 55°C for "Quick charge".**
- **The quick charge dissipates a lot of heat since it is being charged at a high rate. Do not perform this charging for more than 30 minutes.**

REFERENCE:

- **While charging the battery, the charger's current decreases gradually. This indicates that the battery's voltage is increasing at a normal rate as it is being charged.**



Removal • Installation

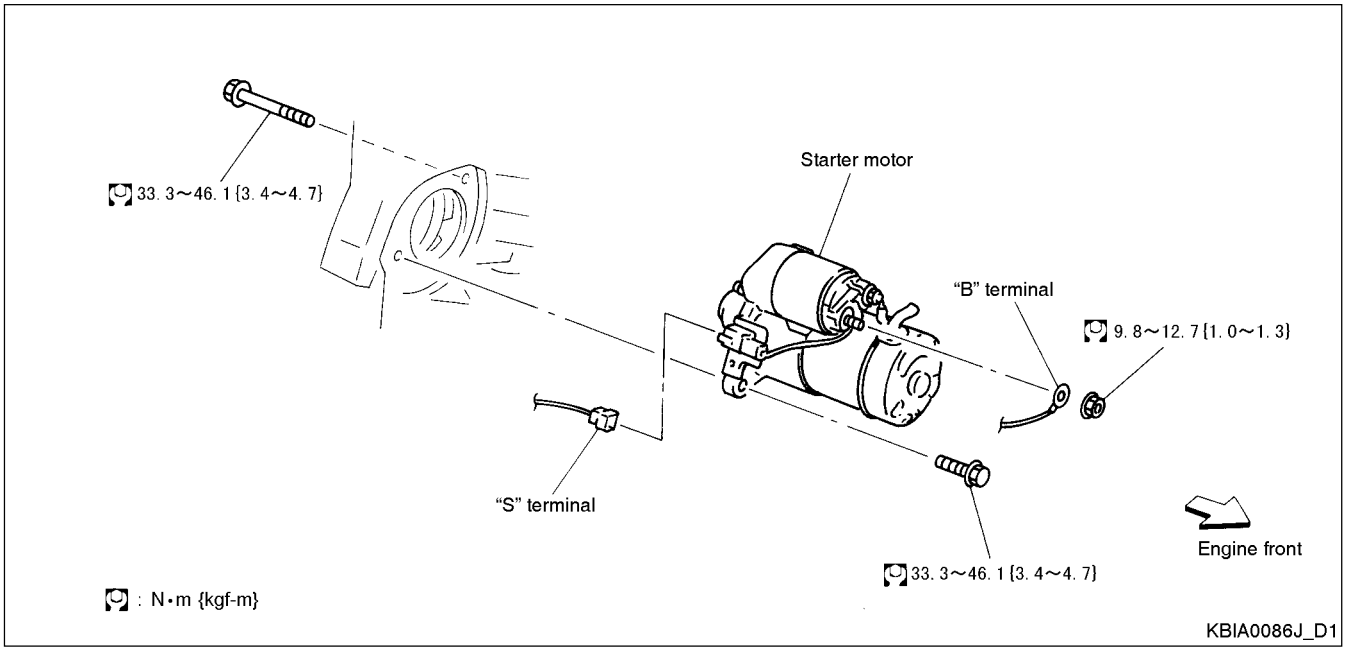
Consider the following cautions during operation.

CAUTION:

- **Remove the negative (-) terminal first and install the positive (+) terminal first.**
- **Tighten the bolts with the specified torque shown below.**

Battery fix frame
Mounting nut
Tightening torque:
3.5 - 5.3 N•m (0.35 - 0.55 kgf-m)
Battery cable
Tightening nut
Tightening torque:
3.0 - 5.1 N•m (0.30 - 0.51 kgf-m)

Removal • Installation of Starter Motor



REMOVAL

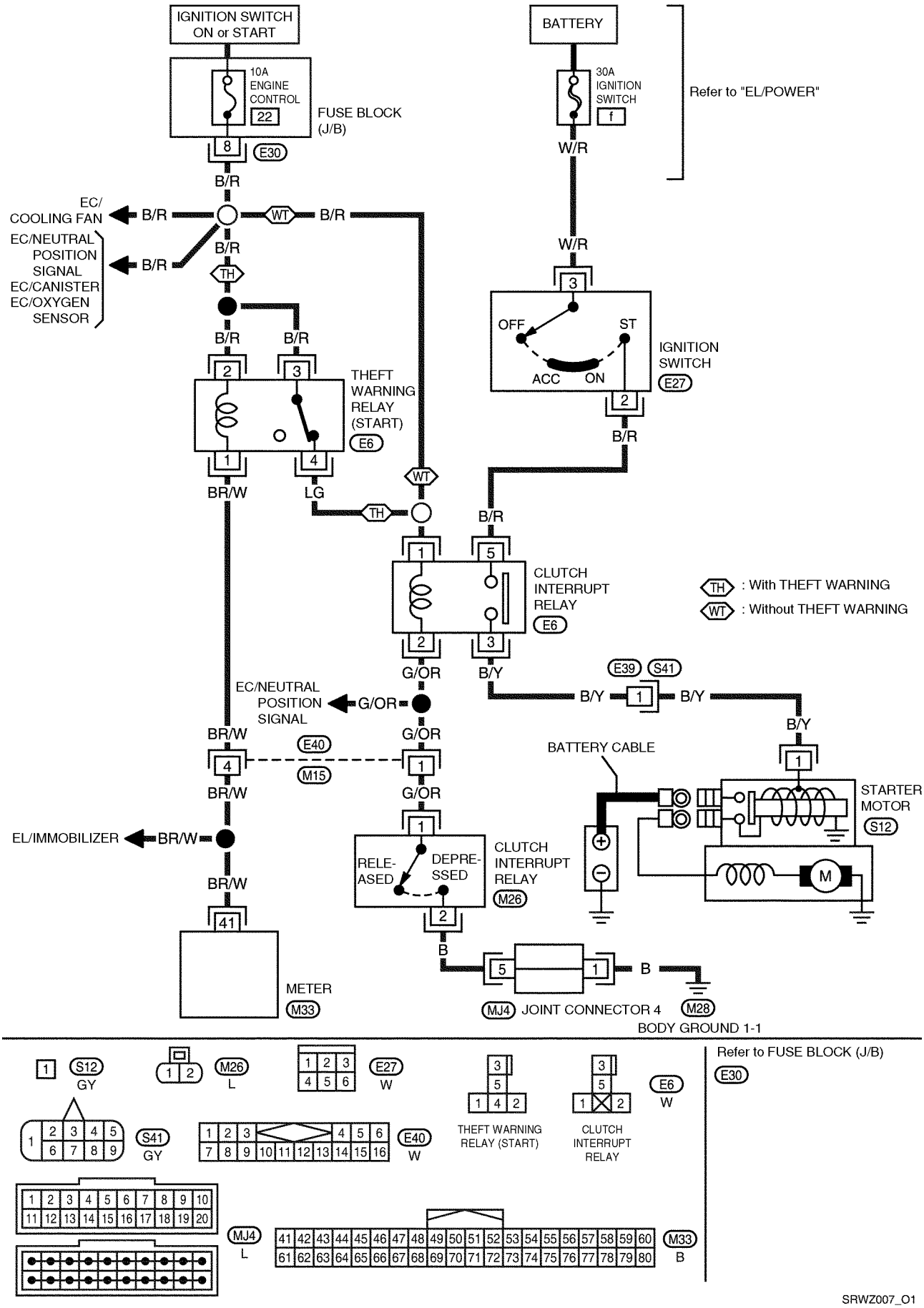
1. Remove the negative (-) cable of the battery.
2. Remove the air duct.
3. Remove the starter motor upper mounting bolt.
4. Disconnect the starter motor "S" and "B" terminals from the bottom of the vehicle.
5. Remove the starter motor lower mounting bolt and remove the starter motor from under the vehicle.

INSTALLATION

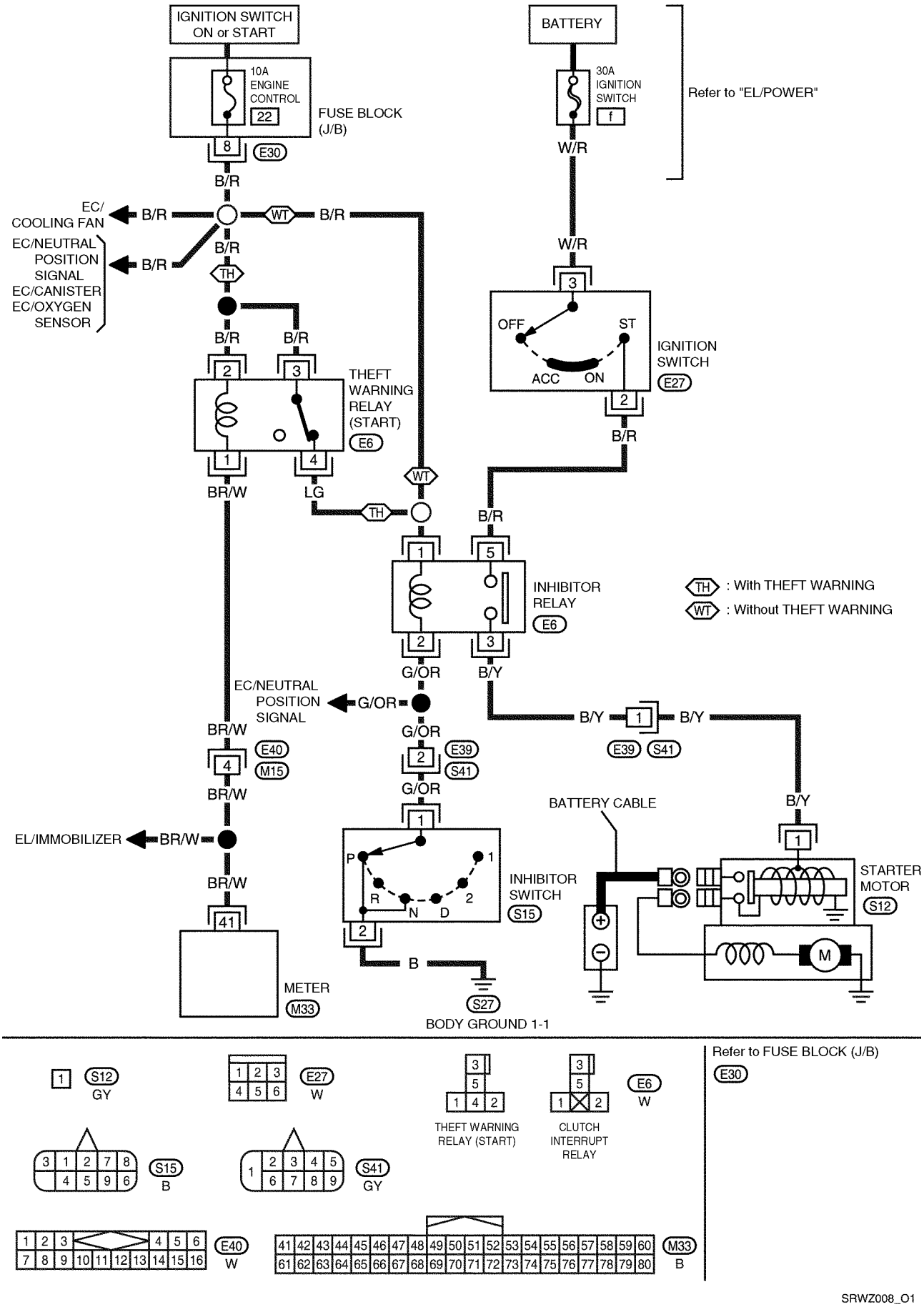
- Installation is in the reverse order of removal.

Wiring Diagram

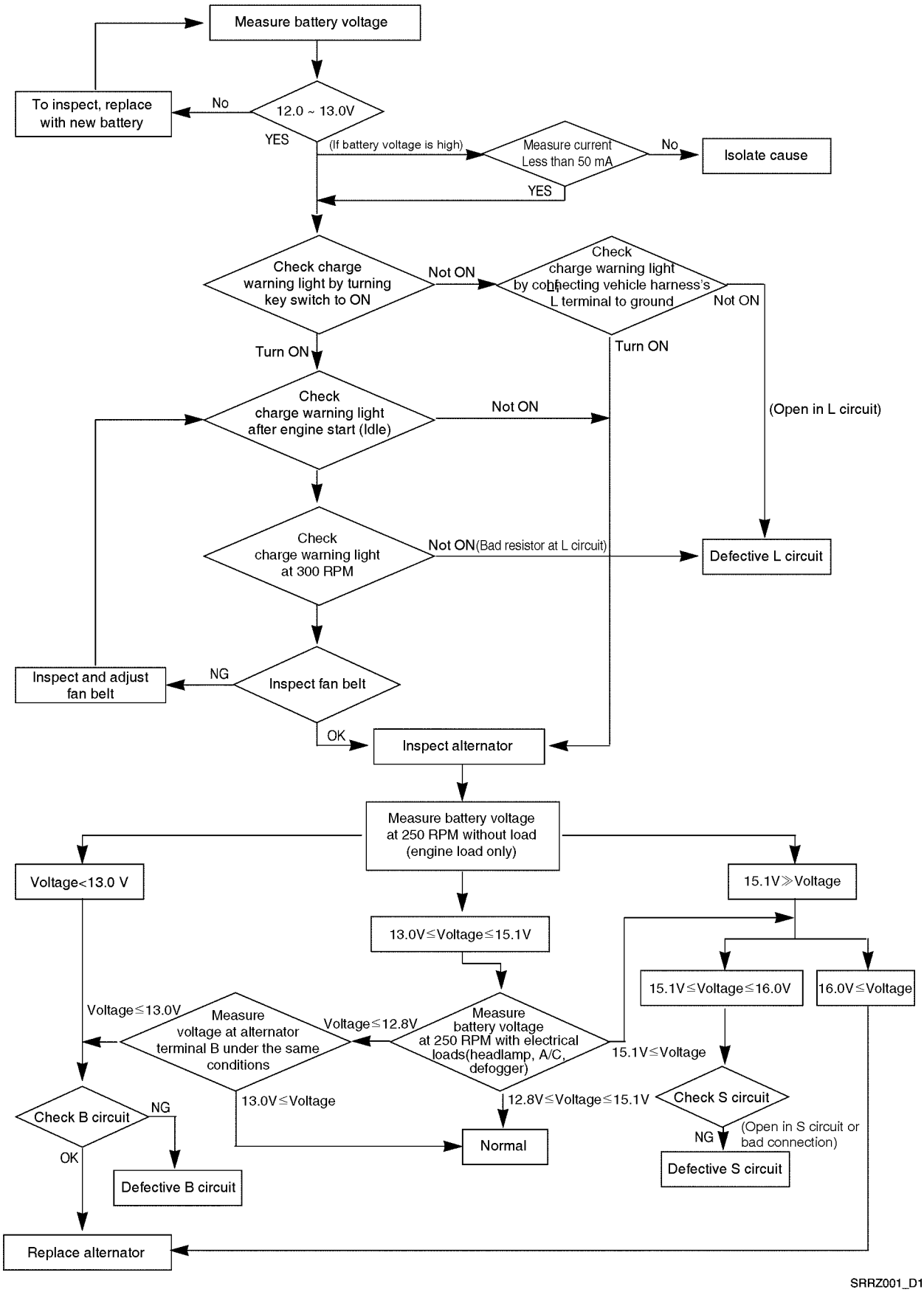
EL/Start (M/T)- 01



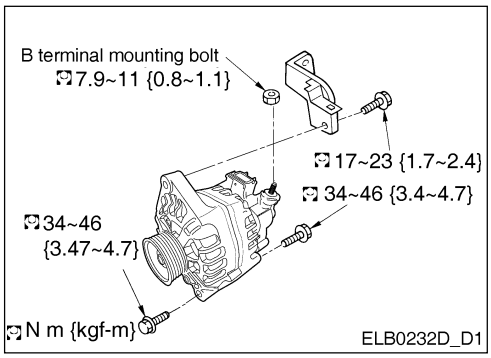
Wiring Diagram



Trouble Diagnosis

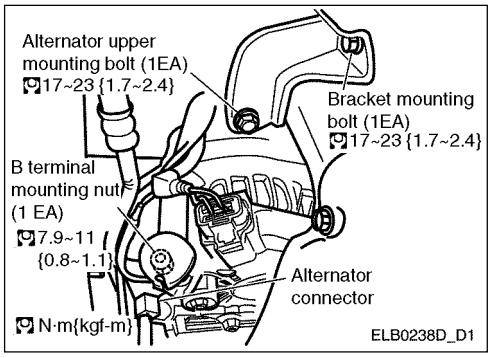


Removal • Installation of Alternator



REMOVAL

1. Remove the negative (-) terminal of the battery.
2. Remove the alternator belt.



3. Remove the alternator connector and B terminal mounting nut.
4. Remove the alternator bracket.
5. Remove the alternator mounting bolt and remove the alternator upwards.

INSTALLATION

Install in the reverse order of removal cautioning as below.

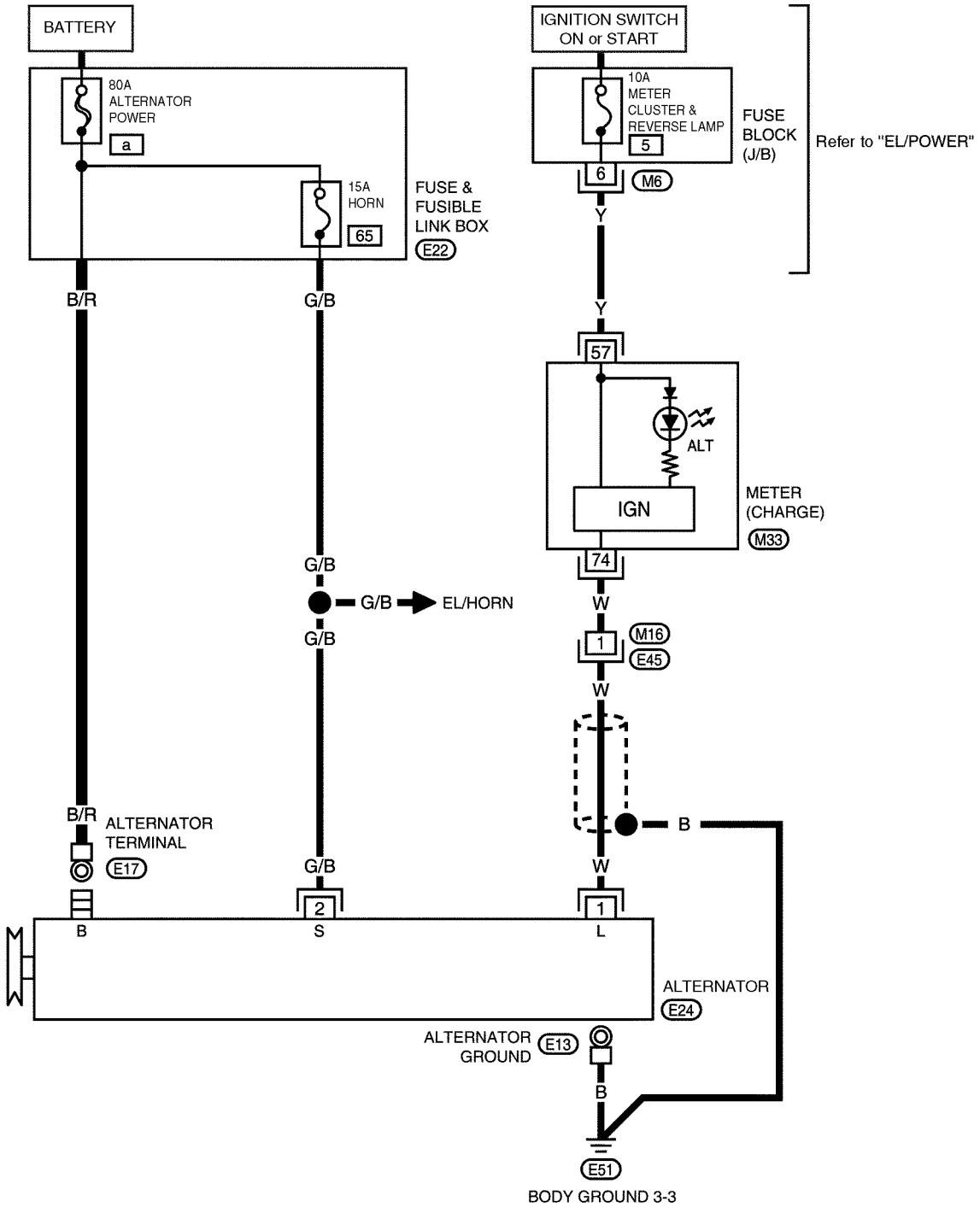
- Adjust the belt tension after installation.

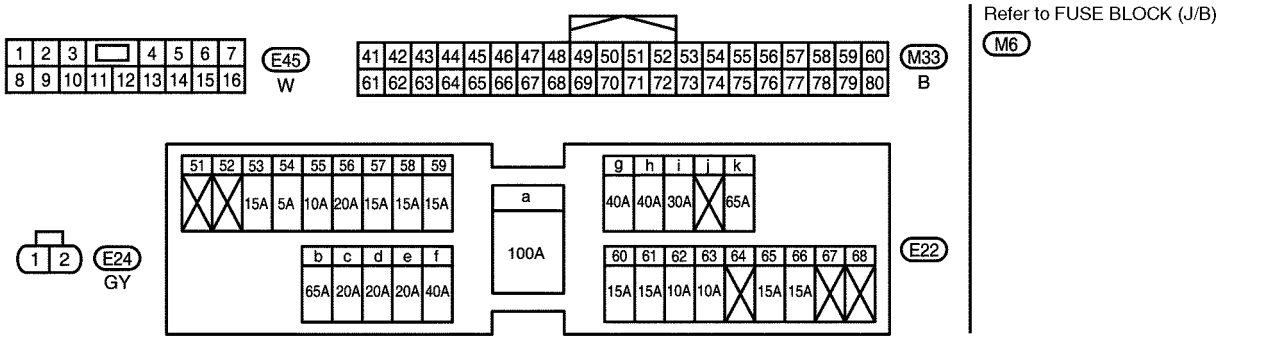
CAUTION:

- **Tighten the B terminal mounting nut extra carefully.**

Wiring Diagram

EL/Charge





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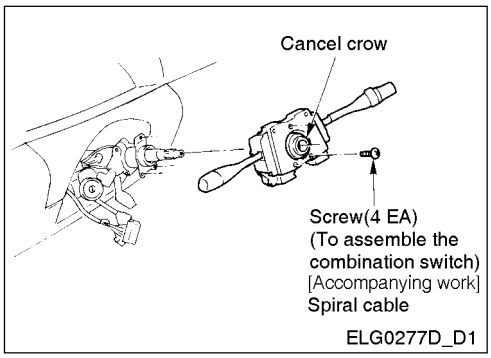
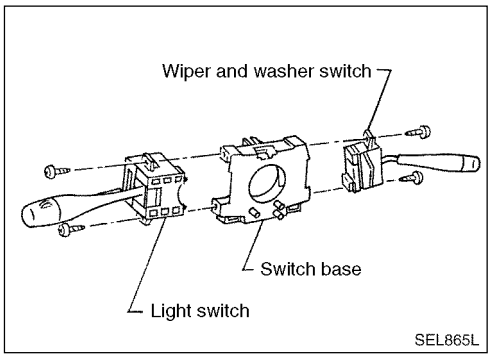


Removal • Installation of Combination Switch

CAUTION:

- **Refer to “Spiral Cable” in “Restraint System” in RS section (RS-13).**

- Each switch can be replaced respectively without removing the combination switch base.
- Remove the screws when removing the combination switch base.
- Install the cancel crow mark (R) downwards when installing the combination switch base.



Removal • Installation

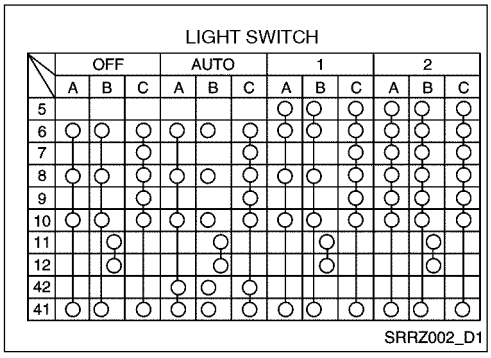
REMOVAL

When removing or installing the airbag module and the spiral cable, refer to the RS section (RS-13).

- Each switch can be replaced respectively without removing the combination switch base.
- Remove the switch base fixing screws to remove the combination switch base.

INSTALLATION

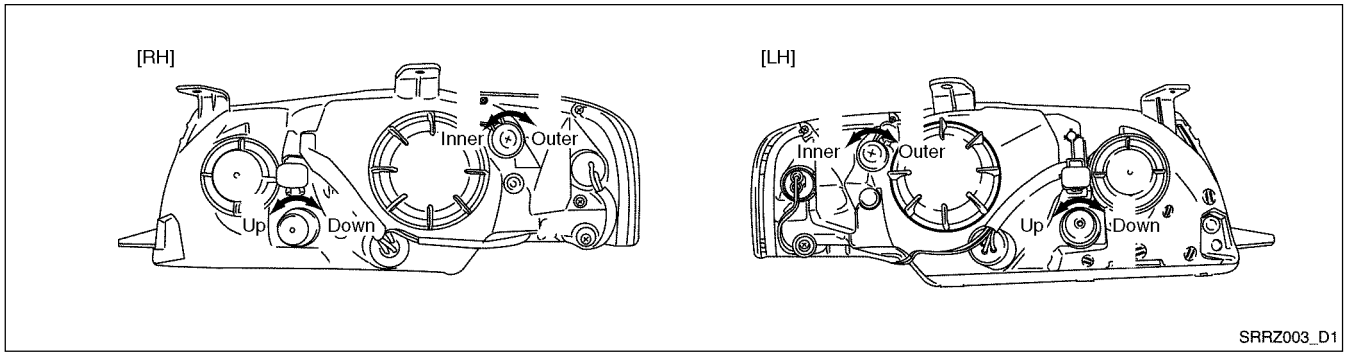
Installation is in the reverse order of removal.



Switch Circuit Inspection

Using a circuit tester, inspect the continuity between the terminals during light/turn signal switch operation.

Aiming Adjustment



- Adjust by rotating the aiming adjust screw.
- Refer to the illustration for adjust screw location.

CAUTION:

- **Turn the aiming adjust screw towards tightening direction. (If have to be adjusted reverse direction, loosen enough and then tighten to adjust.)**

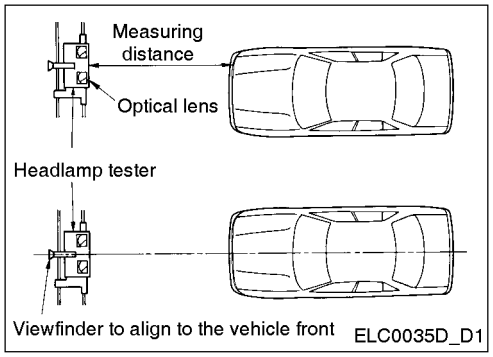
PREPARATION BEFORE ADJUSTMENT

1. Let the vehicle empty (Remove all objects from the vehicle's interior and trunk).
2. Clean the headlamp.

CAUTION:

- **Do not use any organic detergent (thinner or gasoline).**

3. Start the engine.
4. Let one person sit on the driver's seat.

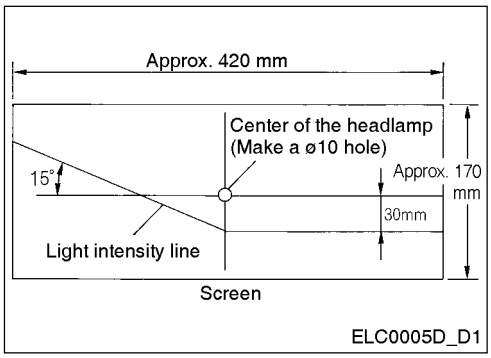


Adjustment Using an Optical Aimer

1. Park the vehicle in front of the tester and maintain the specified distance (1 or 3 m) between the headlamp and the tester lens.
2. Check if the vehicle is facing the tester directly by using viewfinder. If not facing directly, adjust the position by using a correction handle.
3. Turn on the headlamp (high beam) and move the tester so that the light illuminates the tester front.
4. Set the up and down, and, left and right angle adjust handle to the standard values and then rotate the aiming adjust screw so that the light beam points the center of indicator needle.

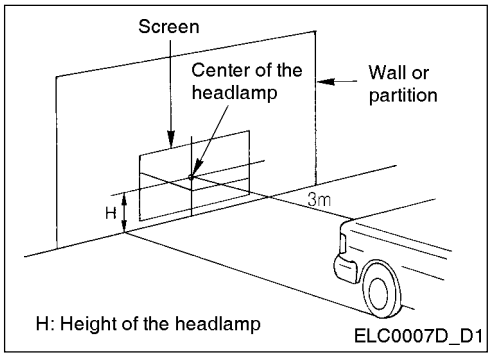
CAUTION:

- **Refer to tester's instruction manual for details.**

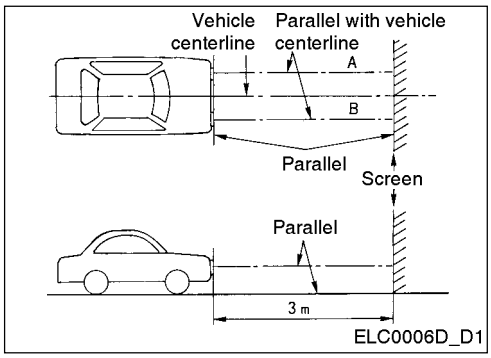


Adjustment Using an Aiming Screen (Adjustment by Using Beam Pattern)

1. Prepare an aiming screen (adjustment by using beam pattern) as shown in the illustration using a white paper board.



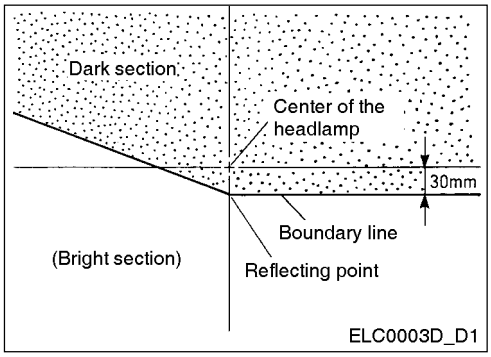
2. Park the vehicle in front of the wall or partition (perpendicular with the road) on the level ground.
3. Mark the center point of the headlamp on the wall or partition.
4. Place the aiming screen at the wall or partition so that the marked center point matches with the hole on the aiming screen and then fix it to be parallel with the road surface.



5. Maintain the 3 m of distance between the aiming screen and the headlamp in parallel as A = B.
6. Block the headlamp light that is not being adjusted with a partition.

CAUTION:

- **Do not cover the lens surface with a mask since it is the resin-type lens.**

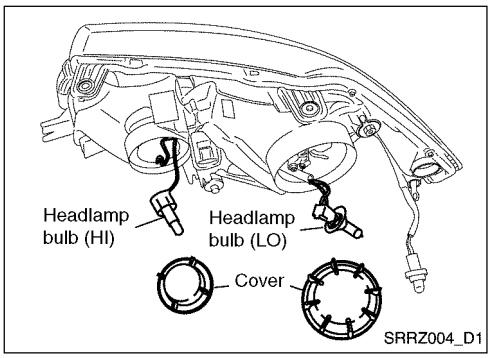


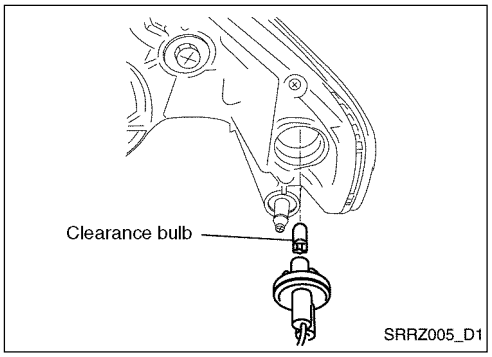
7. Inspect the headlamp (low beam).
8. Adjust the headlamp aiming as shown in the illustration to meet the brightness boundary line in the aiming screen.

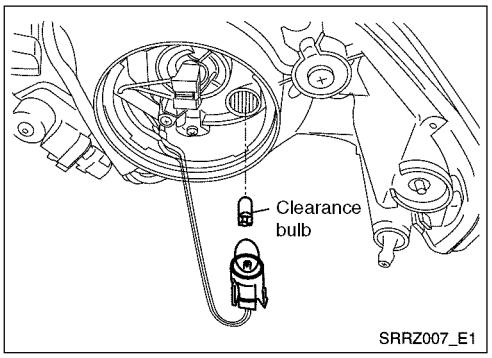
BRIGHTNESS INSPECTION

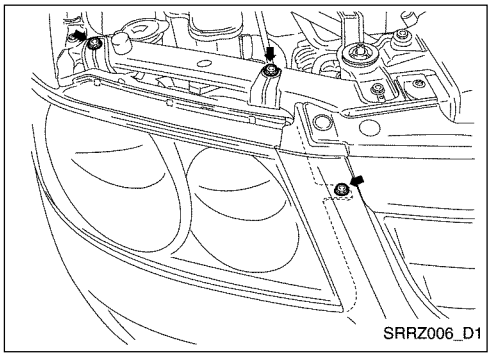
Standard Value:

More than 15,000 candelas (cd)









Bulb Replacement

1. Remove the headlamp connector.
2. Remove the headlamp cover.
3. Remove the retaining spring and remove the bulb.

4-lamp type
Headlamp (High): 12 V, 55 W (H1)
Headlamp (Low): 12 V, 55 W (H7)
Clearance lamp: 12 V, 5 W

CAUTION:

- **Do not touch the bulb glass with bare hand or stain oil. Do not touch the bulb when lighted or right after turning off. It is extremely hot.**
- **When you leave the removed bulb for a long time, the bulb performance decreases due to lens and reflector dusting (dirty and dark). Perform the bulb replacement after preparing a new bulb.**
- **After installing the bulb, securely fasten the headlamp cover to assure water resistance.**

Removal • Installation

REMOVAL

1. Remove the headlamp, clearance lamp and front turn signal lamp connectors.
2. Remove the front turn signal lamp. Refer to “Removal • Installation of Front Turn Signal Lamp” in “Turn Signal Lamp and Hazard Lamp” (EL-44).
3. Remove the bolts (3 EA) and remove the headlamp from the vehicle while disconnecting the lamp from the headlamp lower clip.

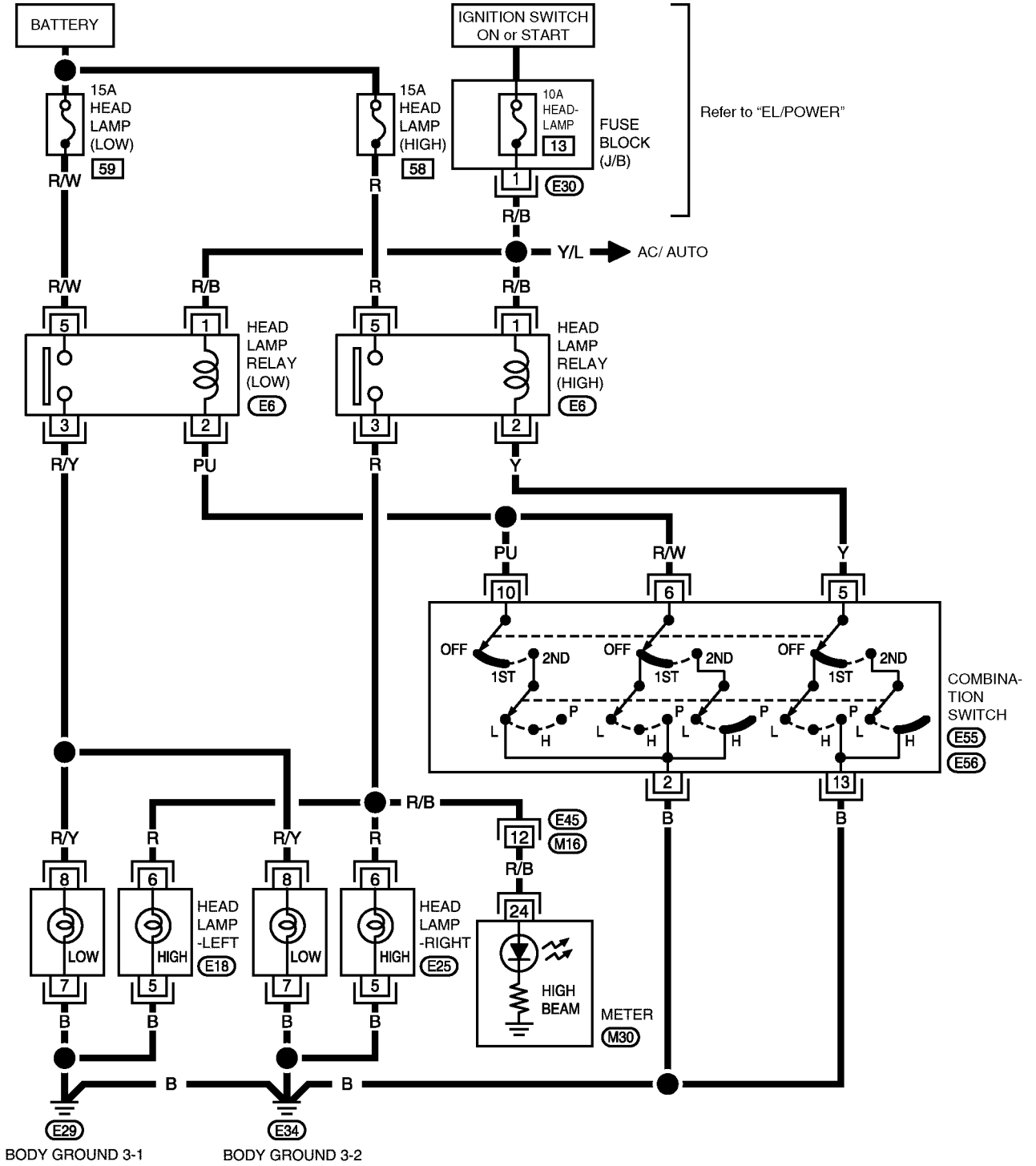
INSTALLATION

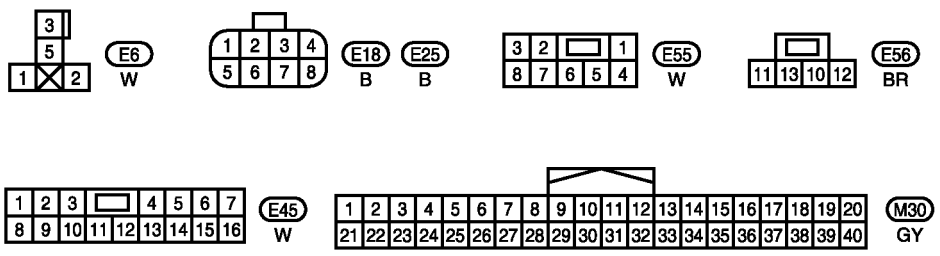
Install in the reverse order of removal cautioning as below.

Headlamp mounting screw
Tightening torque:
4.4 - 6.5 N•m (0.45 - 0.66 kgf-m)

Wiring Diagram

EL/Headlamp



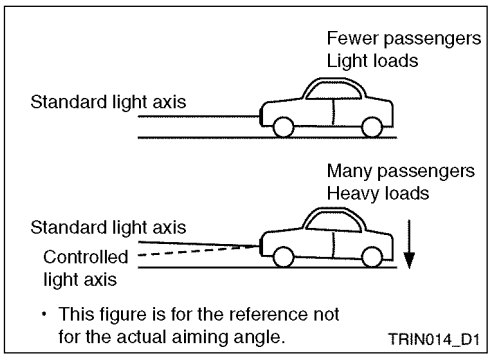


Refer to "FUSE BLOCK (J/B)"
E30

SRWZ001_O1

Trouble Diagnosis

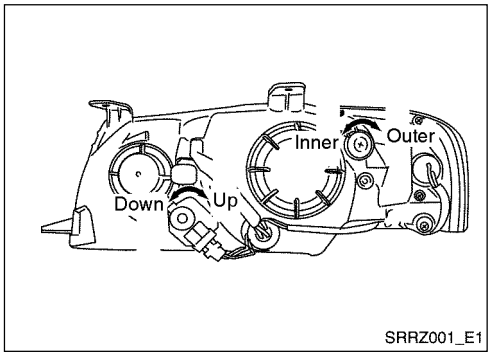
Symptoms	Probable cause	Corrective action
Headlamp high beam does not illuminate (both sides).	1. Bulb 2. Headlamp (high) relay 3. 15 A fuse 4. Lighting switch	1. Check bulb. 2. Check headlamp (high) relay. 3. Check 15 A fuse (No. 58, located in fusible link). 4. Check lighting switch.
Headlamp low beam does not illuminate (both sides).	1. Bulb 2. Headlamp (low) relay 3. 15 A fuse 4. Lighting switch	1. Check bulb. 2. Check headlamp (low) relay. 3. Check 15 A fuse (No. 59, located in fusible link). 4. Check lighting switch.
LH high beam does not operate, but LH low beam operates.	1. Bulb 2. Open in LH high beam circuit	1. Check bulb. 2. Check R wire between joint connector and LH headlamp for an open circuit.
LH low beam does not operate, but LH high beam operates.	1. Bulb 2. Open in LH low beam circuit	1. Check bulb. 2. Check R/Y wire between joint connector and LH headlamp for an open circuit.
RH high beam does not operate, but RH low beam operates.	1. Bulb 2. Open in RH high beam circuit	1. Check bulb. 2. Check R wire between joint connector and LH headlamp for an open circuit.
RH low beam does not operate, but RH high beam operates.	1. Bulb 2. Open in RH low beam circuit	1. Check bulb. 2. Check R/Y wire between joint connector and LH headlamp for an open circuit.
High beam indicator lamp does not operate.	1. Bulb 2. High beam circuit ground 3. Open in high beam circuit	1. Check bulb in combination meter. 2. Check combination meter ground. 3. Check wire between joint connector and combination meter for an open circuit.



Basic Operation

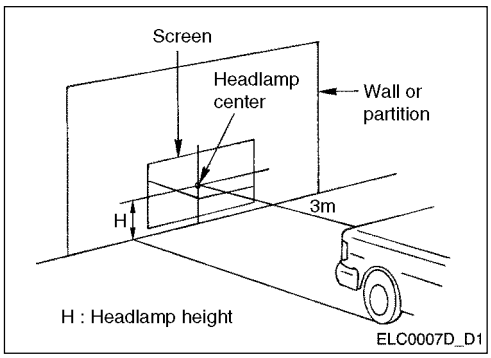
DESCRIPTION

- The headlamp levelling device is a device that adjusts the light axis by moving the headlamp's reflector up or down with the actuator built into the headlamp when the driver operates the levelling control switch according to the number of passengers and loads.
- When picking up passengers or loading luggage, the rear part of the vehicle is lowered and light axis is elevated. At this time, Operate the levelling control switch from 0 to 3rd position (4 stages) so that the light axis is lowered by the actuator.



AIMING ADJUSTMENT

- Adjust by turning the aiming adjustment screw.
- Refer to the figure for the location of the adjustment screw.
- Set the vehicle in unladen condition. (Unload all goods from passenger compartment and trunk compartment.)
- Remove any dirt from the fog lamps.
- Start engine.
- Have one person in driver's seat.

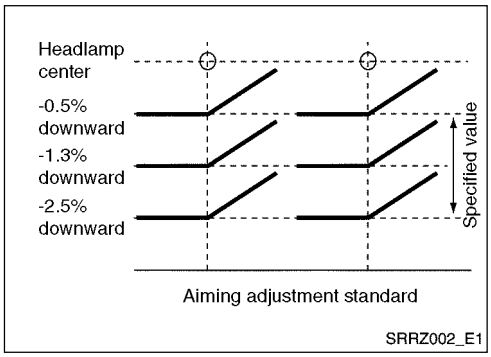


ADJUSTMENT USING AN OPTICAL AIMER

- For adjustment instructions, refer to EL-33.

ADJUSTMENT USING AN AIMING SCREEN (ADJUSTEMENT BY USING BEAM PATTERN)

- For adjustment instructions, refer to EL-34.



AIMING ADJUSTMENT STANDARD

- Set the distance between the aiming adjustment panel and the headlamp at intervals of 10 m and adjust the position so that the vehicle and the panel face each other.

  Position the headlamp levelling control switch to the 0th position and adjust the adjustment screw so that the height of the headlamp is 1.3 % (1.3 cm) lower than the of the center of the headlmap (H).

REFERENCE:

- **If the height "H" of the headlamp center is 100 cm, lower the headlamp height by 1.3 cm which is the 1.3% of the 100 cm so that the headlamp height is 98.7 cm.**

- Specified value of the aiming adjustment

  The headlamp height should be adjusted within -0.5% ~ -2.5% to the headlamp center height "H".

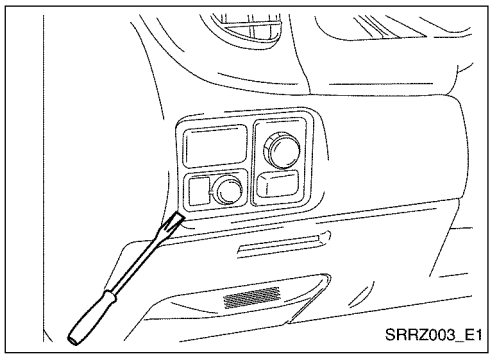
Switch Operation According to Passengers/Loads

REFERENCE DATA

Passengers/Loads	Headlamp levelling switch	Specified value of the aiming adjustment	Measured value		Remarks
			LH	RH	
1 person on the driver's seat	0 position	-0.5% ~ -2.5%	-1.3%	-1.3%	OK
2 persons on the driver's and the passenger's seats	0 position		-1.3%	-1.3%	OK
5 persons	1st position		-1.1%	-1.1%	OK
5 persons + loads in the trunk (120 kg)	2nd position		-0.9%	-0.9%	OK
1 person + loads in the trunk (385 kg)	3rd position		-0.9%	-0.9%	OK

CAUTION:

- **Reference value for 1 person = The weight is 75 kg and the initial aiming adjustment is set to -1.3%.**



Headlamp Levelling Control Switch

REMOVAL AND INSTALLATION

REMOVAL

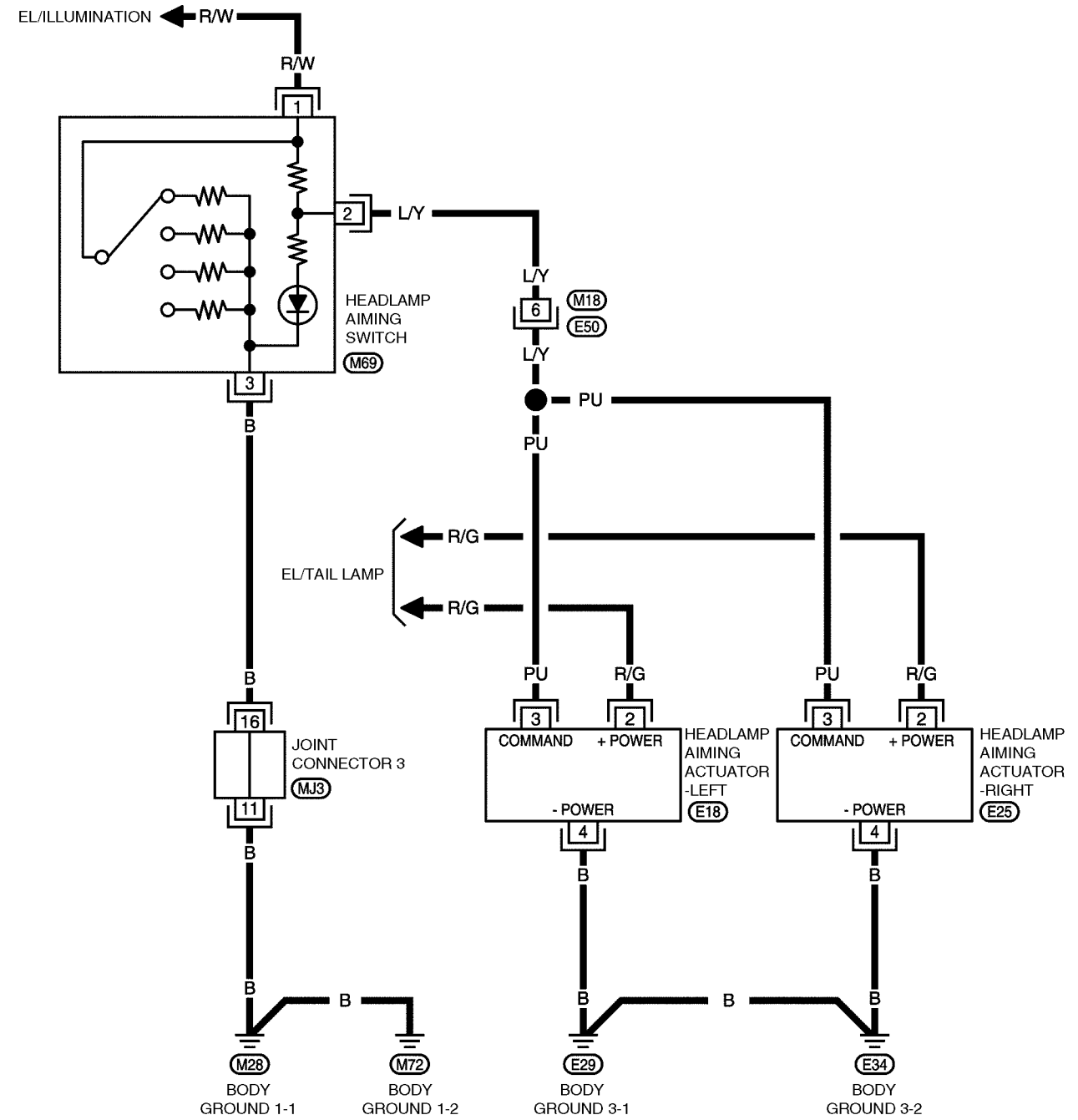
- Remove the headlamp levelling control switch by inserting a minus (-) screwdriver between the left side of the switch and the panel.
- Disconnect the connected connector.

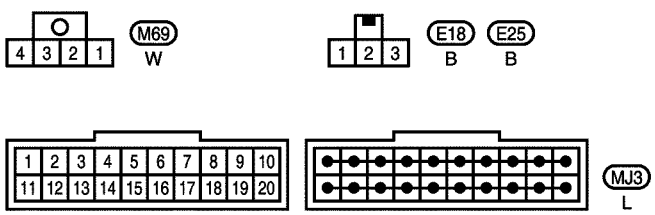
CAUTION:

When removing the switch

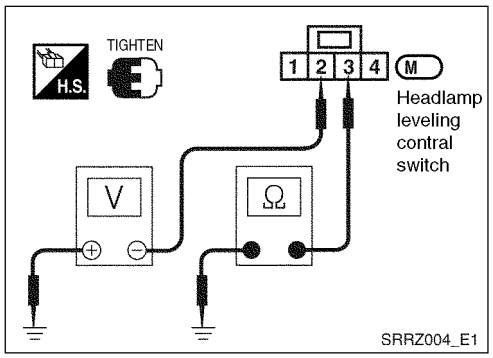
INSTALLATION

- Install in the reverse order of removal.


EL/ILLUMINATION
R/W
R/W
1
2
L/Y
HEADLAMP AIMING SWITCH
M69
3
B
L/Y
6
M18
E50
L/Y
PU
PU
R/G
EL/TAIL LAMP
R/G
B
16
JOINT CONNECTOR 3
MJ3
11
B
PU
R/G
3
2
COMMAND
+ POWER
- POWER
4
HEADLAMP AIMING ACTUATOR -LEFT
E18
PU
R/G
3
2
COMMAND
+ POWER
- POWER
4
HEADLAMP AIMING ACTUATOR -RIGHT
E25
B
B
B
B
B
B
M28
BODY GROUND 1-1
M72
BODY GROUND 1-2
E29
BODY GROUND 3-1
E34
BODY GROUND 3-2


M69
W
E18
E25
B
B
E50
GY
MJ3
L

SRWZ074_O1

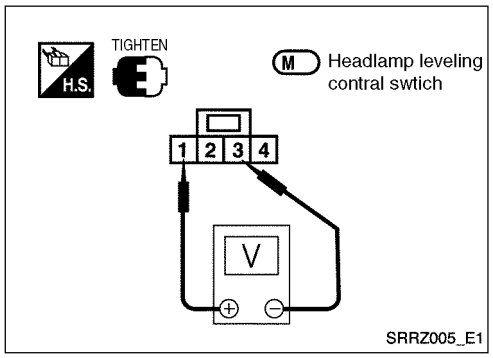


Headlamp Levelling Control Switch

CHECK POWER AND SWITCH GROUND

- Check the headlamp levelling control switch for the power terminal voltage and continuity between terminals.

Terminal No.	Signal	Condition	Measured value
2	Power	Ignition switch ON	Battery voltage
3	Ground	Ignition switch OFF	Continuity should exist

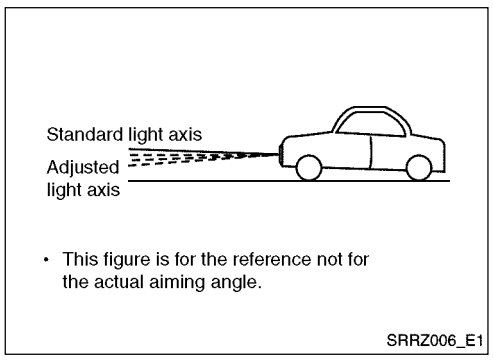


CHECK HEADLAMP LEVELLING CONTROL SWITCH SIGNAL

- Check the signal terminal voltage of the headlamp levelling control switch.

Terminal	Switch position	Measured voltage (V)	Tolerance range
1 - 3	0	9.75	± 5%
	1	7.96	
	2	7.09	
	3	4.89	

- If the measured value is out of the standard, replace the switch.



CHECK HEADLAMP LEVELLING ACTUATOR FOR OPERATION

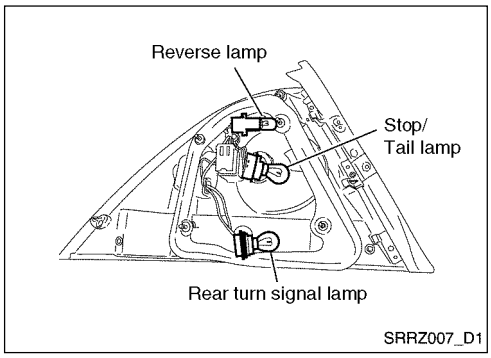
- Check if the light axis is adjusted by operating the headlamp levelling control switch from 0th to 3rd position while the headlamp is turned on.

OK or NG

OK → Connect all the connectors and diagnose again.

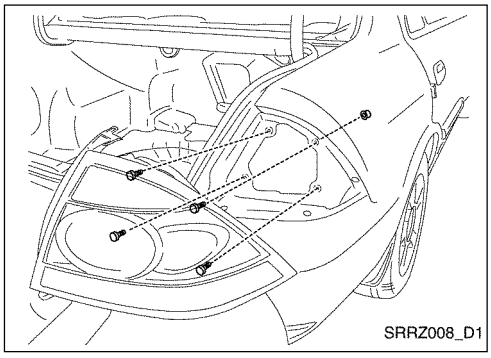
NG → Replace the headlamp assembly.

Rear Combination Lamp



Bulb Replacement

Stop/Tail lamp: 12 V, 21/5 W
Rear turn signal lamp: 12 V, 21 W
Reverse lamp: 12 V, 16 W



Removal • Installation

REMOVAL

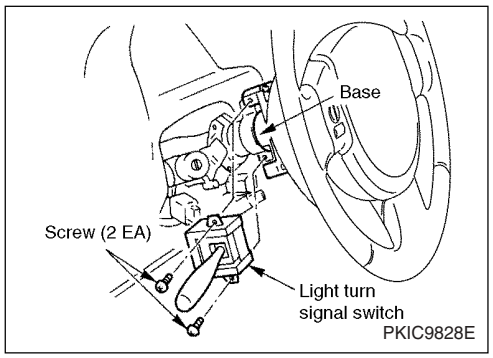
1. Remove the rear wheelhouse finisher. Refer to “Trunk Trim and Trunk Lid Trim” (BT-39).
2. Remove the nuts (4 EA) and remove the assembly from the vehicle by pressing the lamp from the trunk room.

INSTALLATION

Note the following, and install in the reverse order of removal.

Rear combination lamp mounting nut
Tightening torque:
2.5 - 3.8 N•m (0.26 - 0.39 kgf-m)

Light/Turn Signal Switch



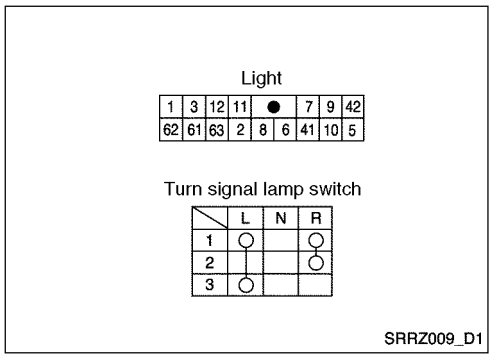
Removal • Installation

REMOVAL

1. Remove the steering column cover. Refer to “Steering Column” in ST section (ST-8).
2. Remove the light/turn signal switch connector.
3. Remove the screws (2 EA) and remove the light/turn signal switch from the base.

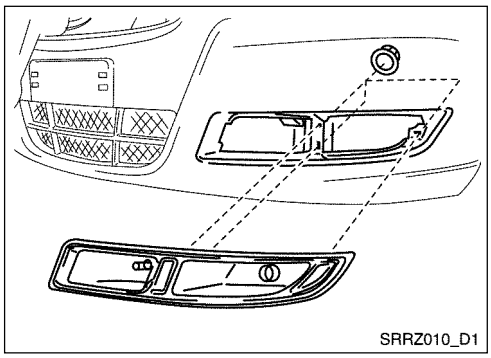
INSTALLATION

Installation is in the reverse order of removal.



Switch Circuit Inspection

Using a circuit tester, inspect the continuity between the terminals during light/turn signal switch operation.



Removal • Installation of Front Turn Signal Lamp

REMOVAL

Press the upper mounting section of the lamp using a minus (-) screwdriver, pull towards the front of the vehicle and remove.

Wrap the screwdriver with a tape or cloth to prevent from scratching the vehicle.

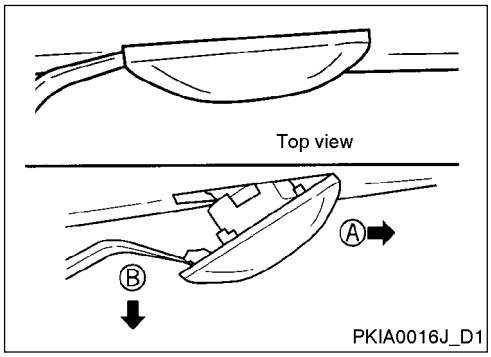
INSTALLATION

Insert the lamp mounts (2 EA) into the lamp mounting holes and install the lamp assembly by pressing it in.

Front turn signal lamp mounting nut

Tightening torque:

2.5 - 3.8 N•m (0.26 - 0.39 kgf-m)



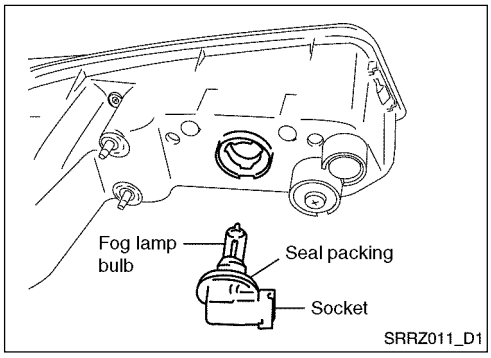
Removal • Installation of Side Turn Signal Lamp

REMOVAL

1. Press the side turn signal lamp towards the arrow A direction in the illustration. Pull towards the B direction and remove it from the vehicle.
2. Remove the side turn signal lamp connector.

INSTALLATION

Installation is in the reverse order of removal.



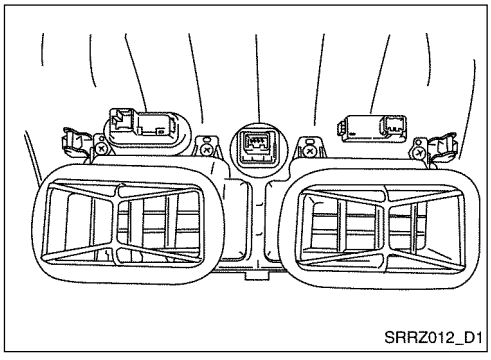
Bulb Replacement (Front Turn Signal Lamp)

Remove the bulb socket by turning it to the arrow direction in the figure.

Front turn signal lamp: 12 V, 21 W

Removal • Installation of Rear Turn Signal Lamp

Refer to “Removal • Installation” in “Rear Combination Lamp” (EL-42).



Removal • Installation of Hazard Switch

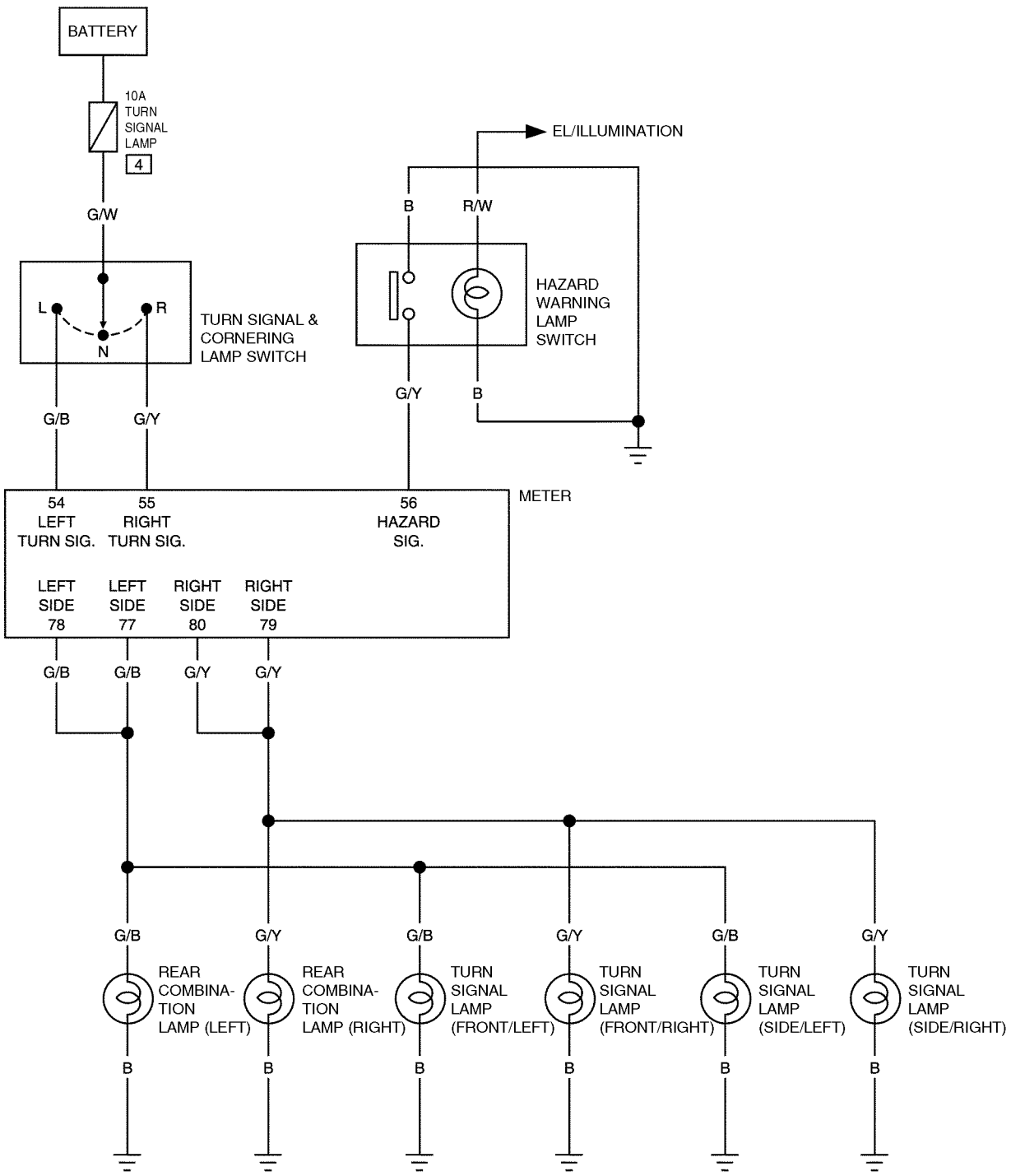
REMOVAL

1. Remove the cluster lid C. Refer to “Instrument Assembly” (BT-40).
2. Using a minus (-) screwdriver, press the hazard switch mount and remove from the cluster lid C.

INSTALLATION

Installation is in the reverse order of removal.

Circuit Diagram



Bulb Replacement - Clearance Lamp

Refer to “Bulb Replacement” in “Headlamp” (EL-35).

Bulb Replacement - Tail Lamp

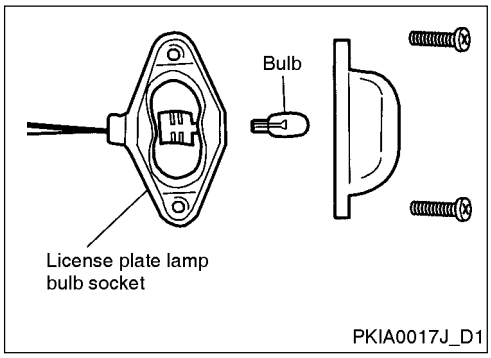
Refer to “Bulb Replacement” in “Rear Combination Lamp” (EL-42).

Removal • Installation of Clearance Lamp

Refer to “Removal • Installation” in “Headlamp” (EL-35).

Removal • Installation of Tail Lamp

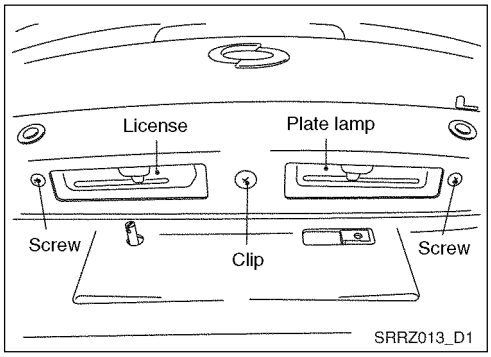
Refer to “Removal • installation” in “Rear Combination Lamp” (EL-42).



Bulb Replacement - License Plate Lamp

1. Using a screwdriver, unscrew the 2 screws at both ends of the lamp to remove and then remove the lens.
2. Replace the bulb.

   License plate lamp: 12 V, 5 W



Removal • Installation of License Plate Lamp

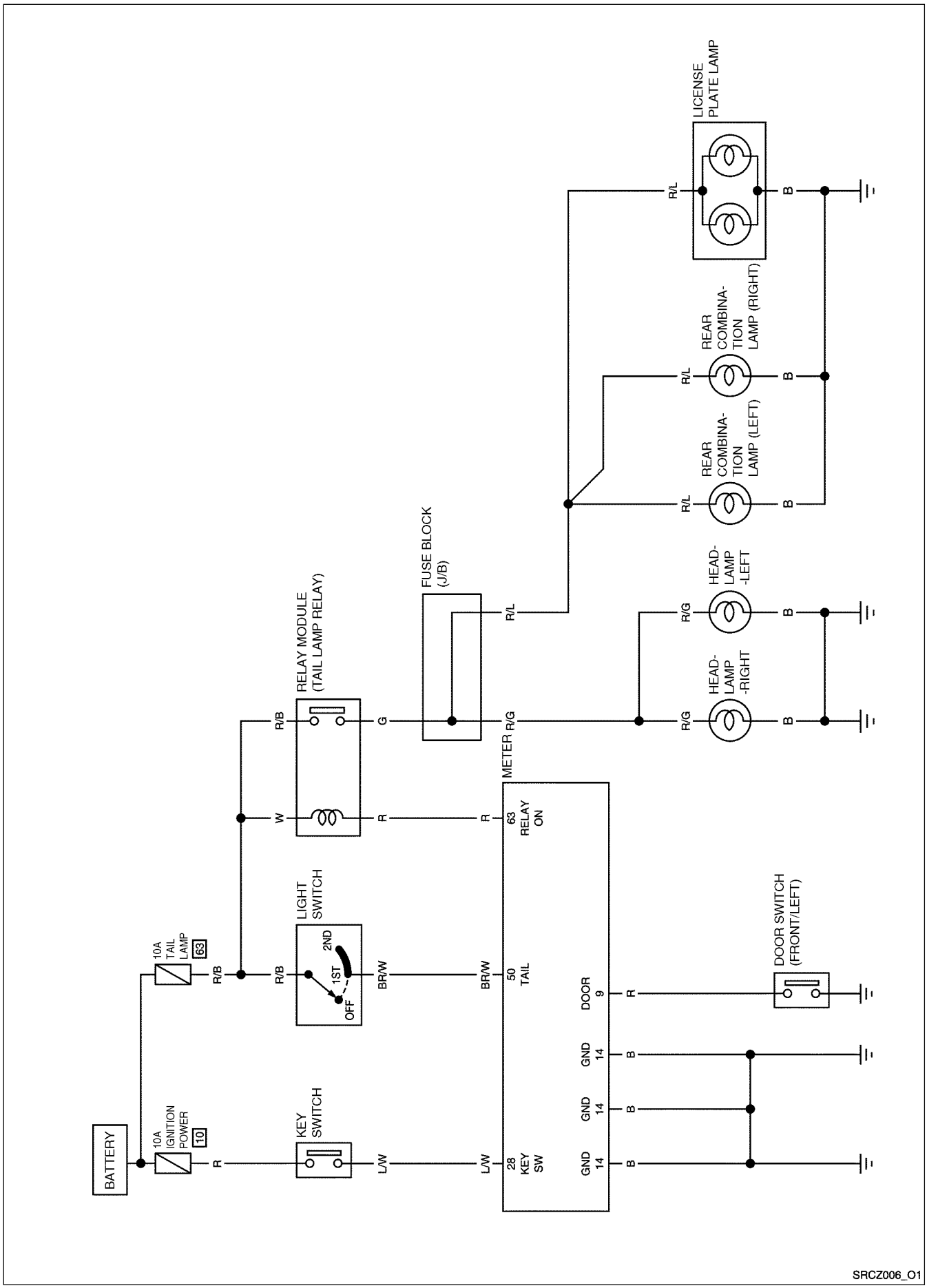
REMOVAL

1. Remove the screws on both sides and the clip on the center to remove the license plate lamp.
2. Remove the license plate lamp connector.

INSTALLATION

Installation is in the reverse order of removal.

Circuit Diagram

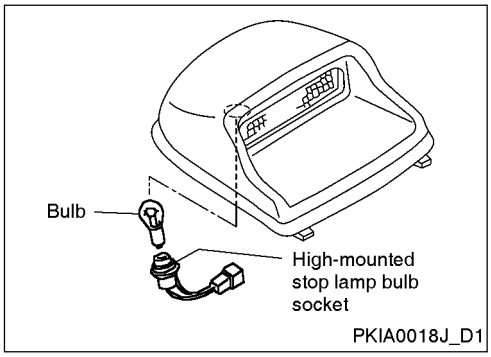


Bulb Replacement

Refer to “Bulb Replacement” in “Rear Combination Lamp” (EL-42).

Removal • Installation

Refer to “Removal • Installation” in “Rear Combination Lamp” (EL-42).

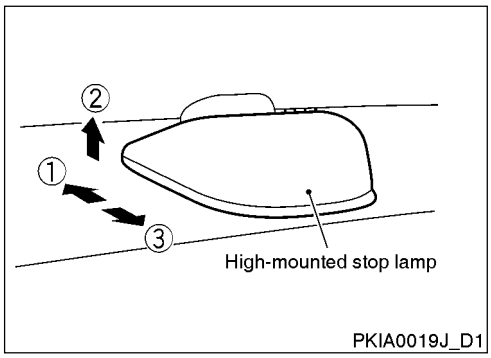


High-Mounted Stop Lamp

BULB REPLACEMENT

1. Remove the high-mounted stop lamp.
2. Remove the bulb socket by rotating it as shown in the illustration.

High-mounted stop lamp: 12 V, 21 W



Removal • Installation of High-Mounted Stop Lamp (Bulb Type)

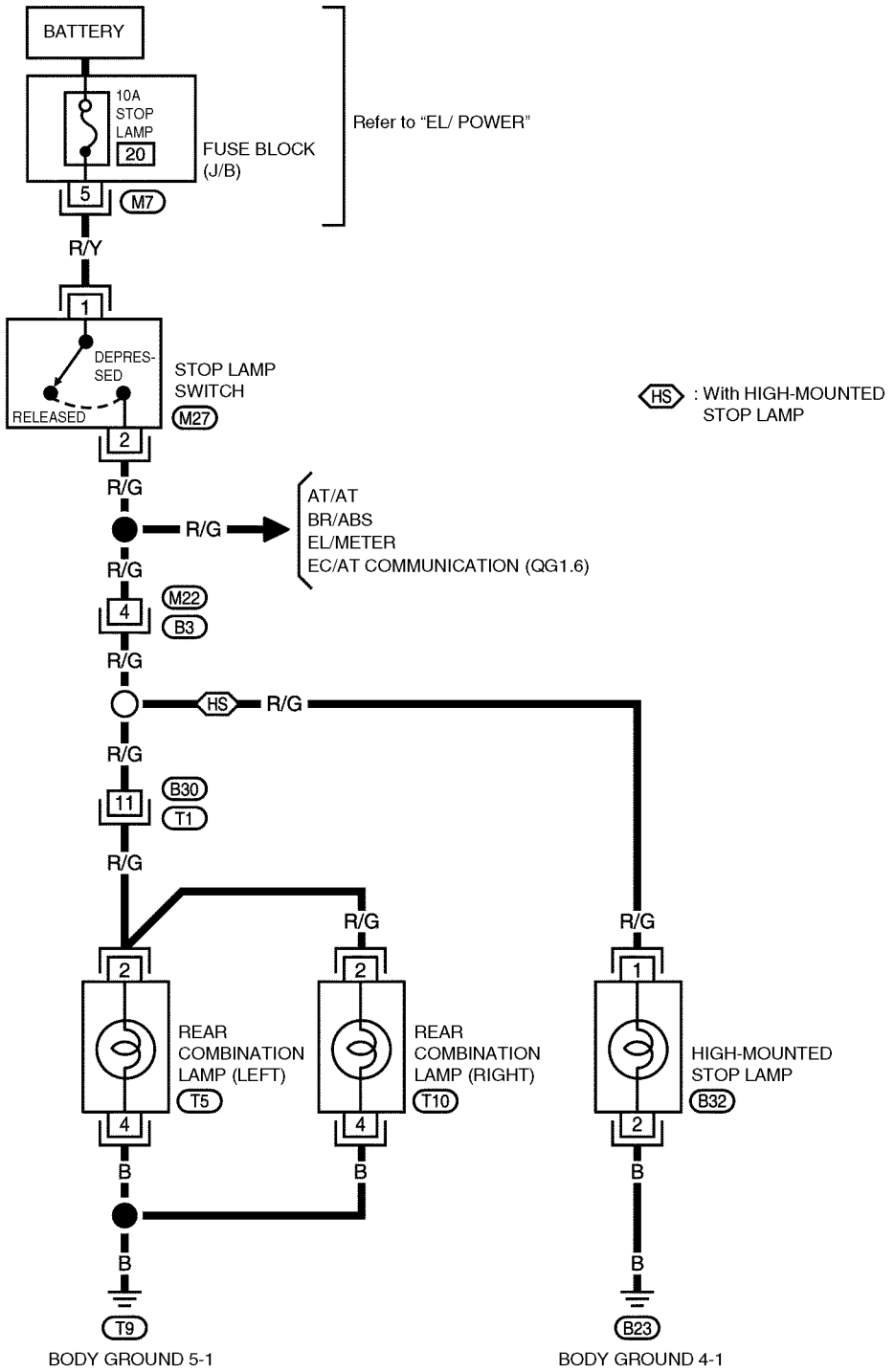
REMOVAL

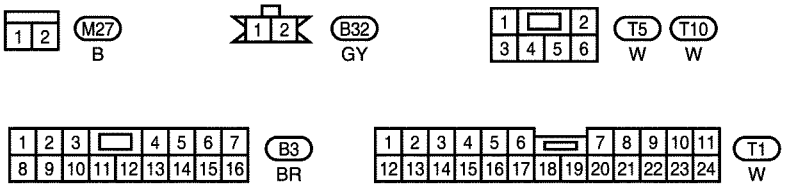
1. Push towards the rear of the vehicle.
2. Pull it upwards.
3. Pull towards the front of the vehicle and remove.
4. Remove the connector.

INSTALLATION

- Installation is in the reverse order of removal.

Wiring Diagram





Refer to "FUSE BLOCK (J/B)"
M7

SRWZ022_O1

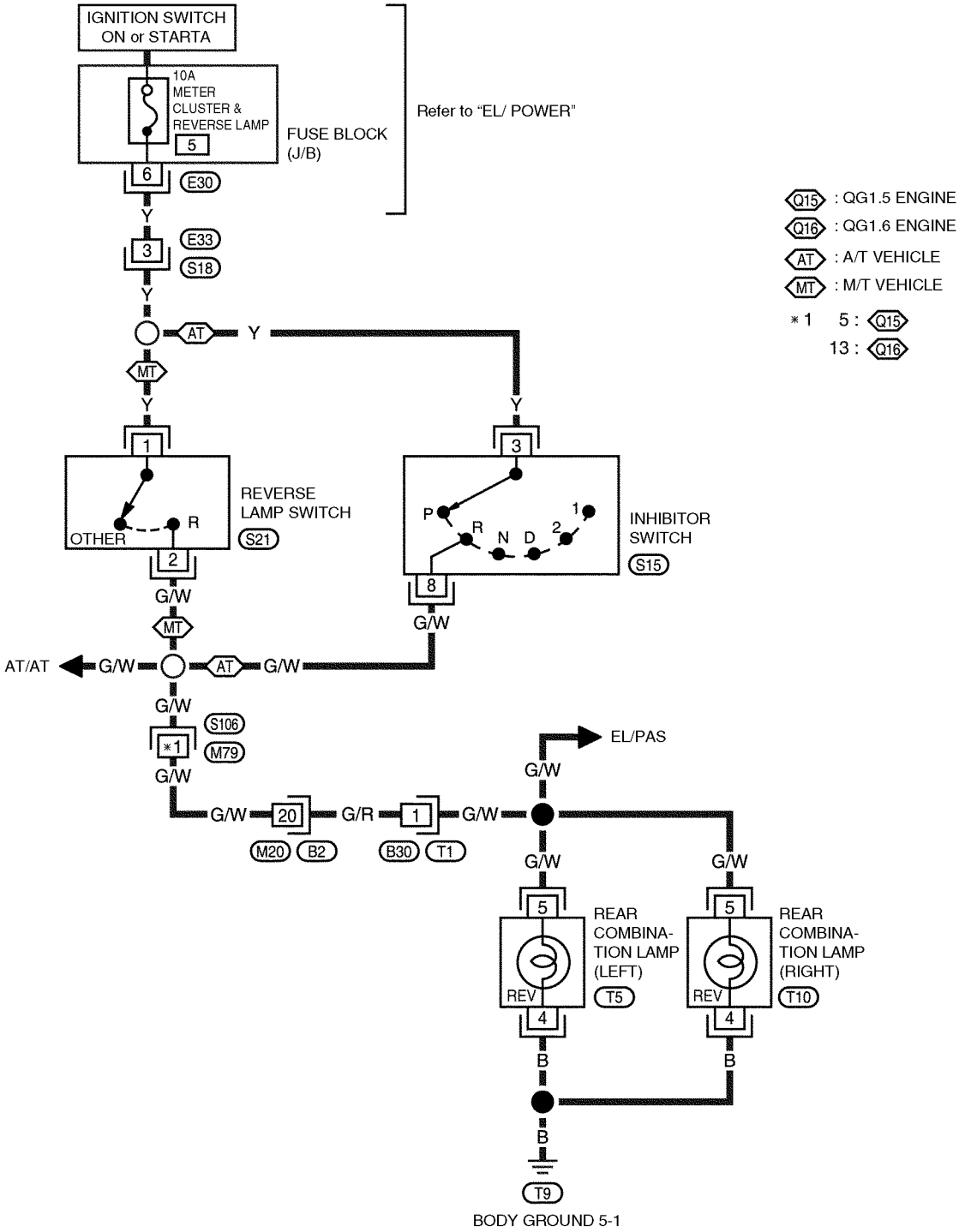
Bulb Replacement

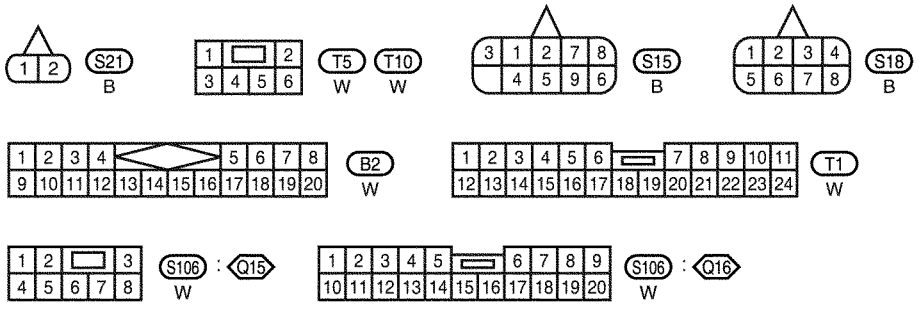
Refer to “Bulb Replacement” in “Rear Combination Lamp” (EL-42).

Removal • Installation

Refer to “Removal • Installation” in “Rear Combination Lamp” (EL-42).

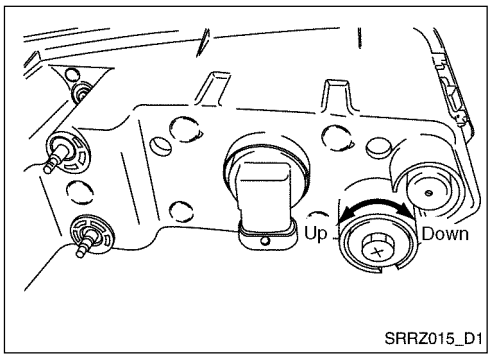
Wiring Diagram — EL/Reverse Lamp





Refer to "FUSE BLOCK (J/B)"
E30

SRWZ021_O1



Aiming Adjustment

- Adjust the aiming by rotating the aiming adjust screw.
- Refer to the illustration for adjust screw location.

CAUTION:

- **Adjust the aiming adjust screw to the tightening direction. (If have to be adjusted reverse direction, loosen enough and then tighten to adjust.)**

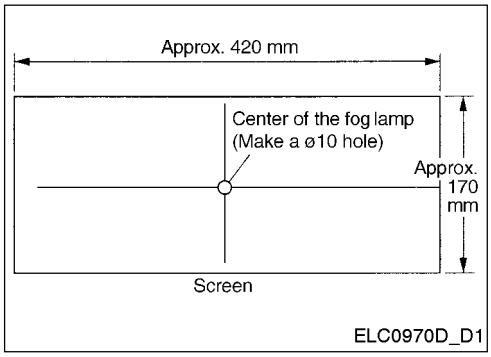
Inspection Before Adjustment

1. Adjust the tire pressure to specified values.
2. Let the vehicle empty. (Remove all objects from the vehicle's interior and trunk.)
3. Remove the dirt from the fog lamp.

CAUTION:

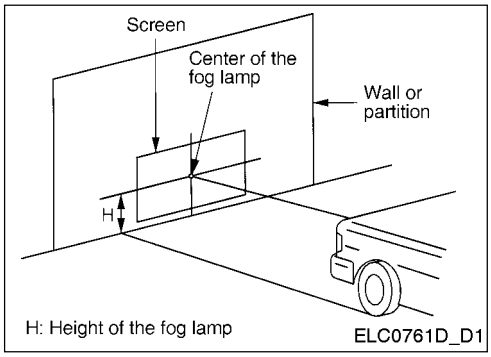
- **Do not use any organic detergent (thinner or gasoline).**

4. Start the engine.
5. Let one person sit on the driver's seat.

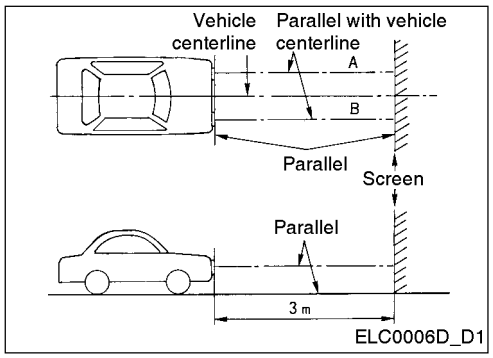


Adjustment Using an Aiming Screen (Adjustment by Using Beam Pattern)

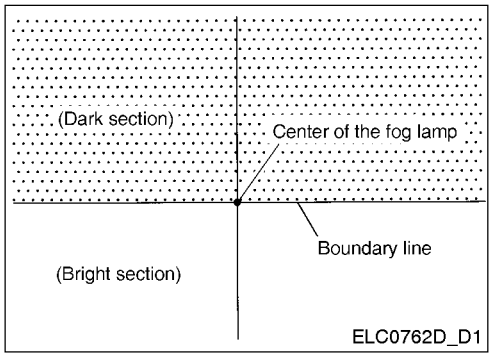
1. Prepare an aiming screen (adjustment by using beam pattern) as shown in the illustration using a white paper board.



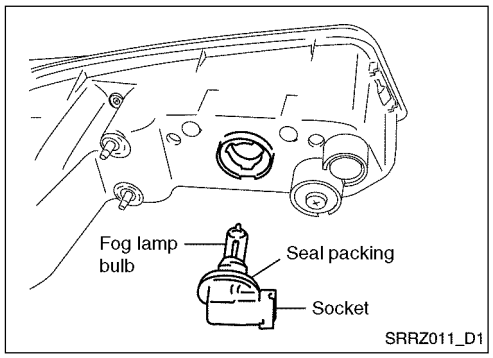
2. Park the vehicle in front of the wall or partition (perpendicular with the road) on the level ground.
3. Mark the center point of the fog lamp on the wall or partition.
4. Place the aiming screen at the wall or partition so that the marked center point matches with the hole on the aiming screen and then fix it to be parallel with the road surface.



5. Maintain the 3 m of distance between the aiming screen and the headlamp in parallel as A = B.
6. Block the headlamp light that is not being adjusted with a partition.
7. Inspect the fog lamp.



8. Adjust the fog lamp aiming as shown in the illustration to meet the brightness boundary line in the aiming screen.



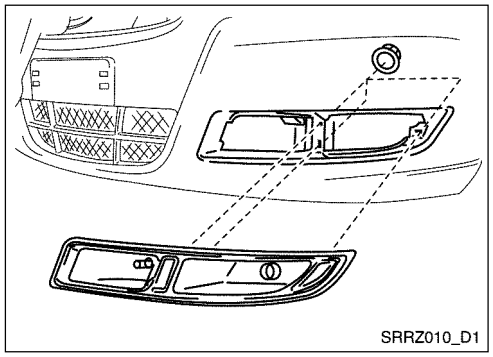
Bulb Replacement

1. Disconnect the harness connector and remove the bulb socket by rotating it counterclockwise.
2. Replace the whole assembly since the bulb is integrated into the socket.

Fog Lamp: 12 V, 35 W (H8)

CAUTION:

- **Do not touch the bulb glass with bare hand or stain oil. Do not touch the bulb when lighted or right after turning off. It is extremely hot.**
- **When you leave the removed bulb for a long time, the bulb performance decreases due to lens and reflector dusting (dirty and dark). Perform the bulb replacement after preparing a new bulb.**
- **When installing the bulb, securely fasten the resin cap to assure water resistance.**



Removal • Installation

REMOVAL

For details, refer to the “Removal • Installation of Turn Signal Lamp (front foglamp integrated type)” (EL-44).

INSTALLATION

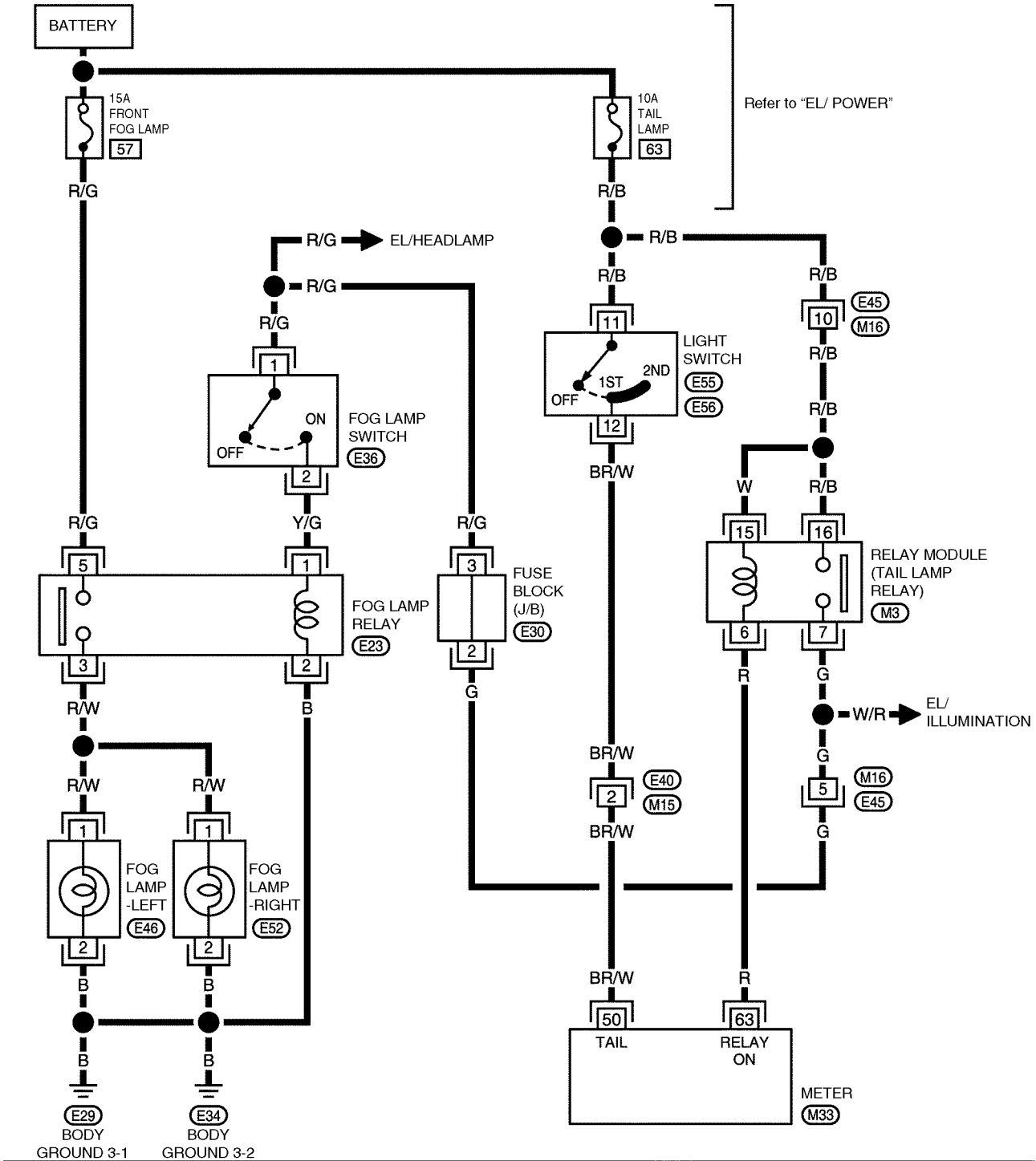
Install in the reverse order of removal cautioning as below.

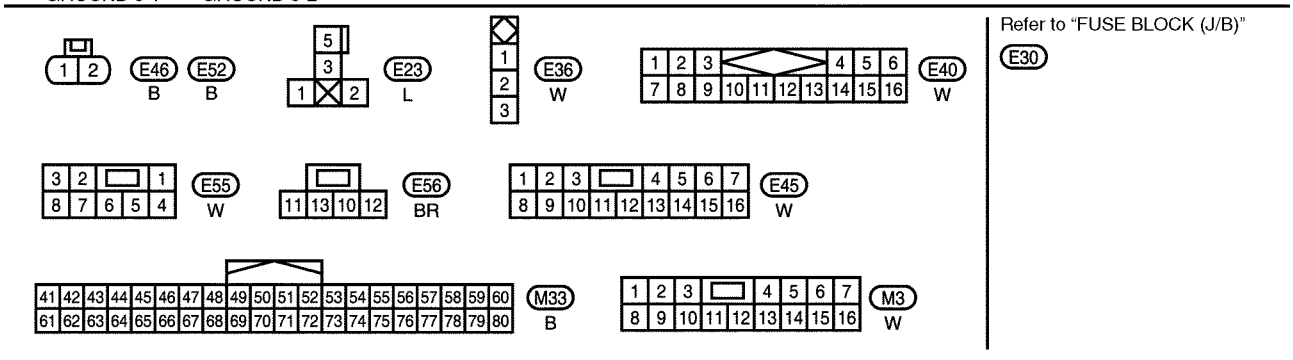
Fog Lamp Mounting Screw

Tightening torque:

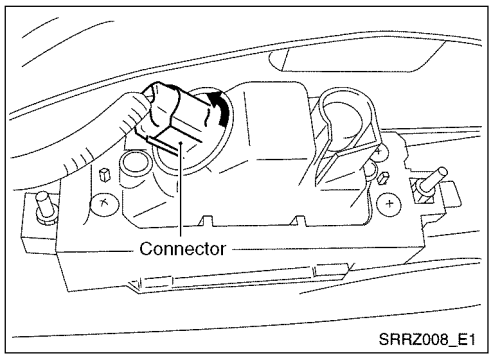
2.5 - 3.8 N•m (0.26 - 0.39 kgf-m)

Wiring Diagram — EL/Fog Lamp (FR)



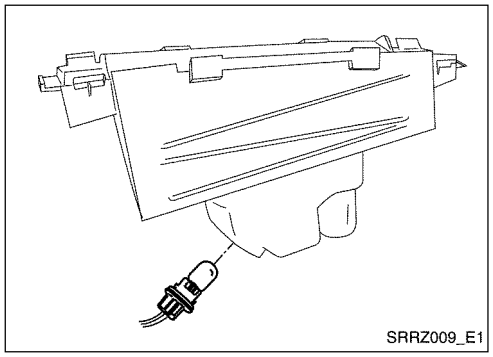


SRWZ020_O1



Bulb Replacement

1. Disconnect the harness connector and remove the bulb socket by rotating it counterclockwise.

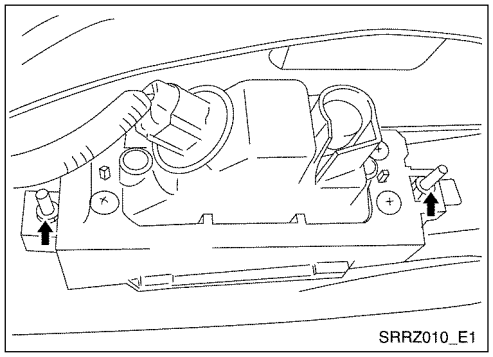


2. Replace the bulb by removing it from the socket.

   Rear Fog Lamp Bulb: 12 V, 21 W

CAUTION:

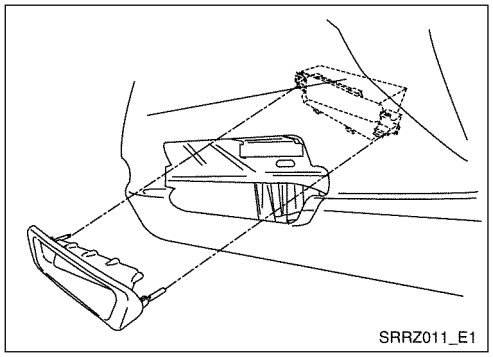
- **Be careful not to touch the surface of the bulb and do not let the oil get on it.**
  Also, do not touch the bulb while it is on or right after it is turned off since the bulb is hot.
- **Leaving the bulb removed from the headlamp housing for a long period of time can deteriorate the performance of the lens and reflector (dirt, clouding). Always prepare a new bulb and have it on hand when replacing the bulb.**
- **When installing bulb, be sure to install the bulb socket securely to insure watertightness.**



Removal • Installation

REMOVAL

1. Remove the rear fog lamp mounting nuts (2 EA).
2. Disconnect harness connector.

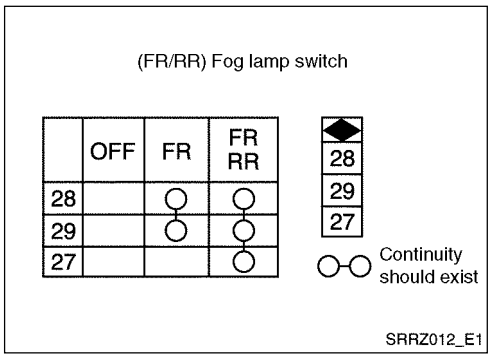


3. Remove the rear fog lamp cover and remove the rear fog lamp.

INSTALLATION

Note the following, and install in the reverse order of removal.

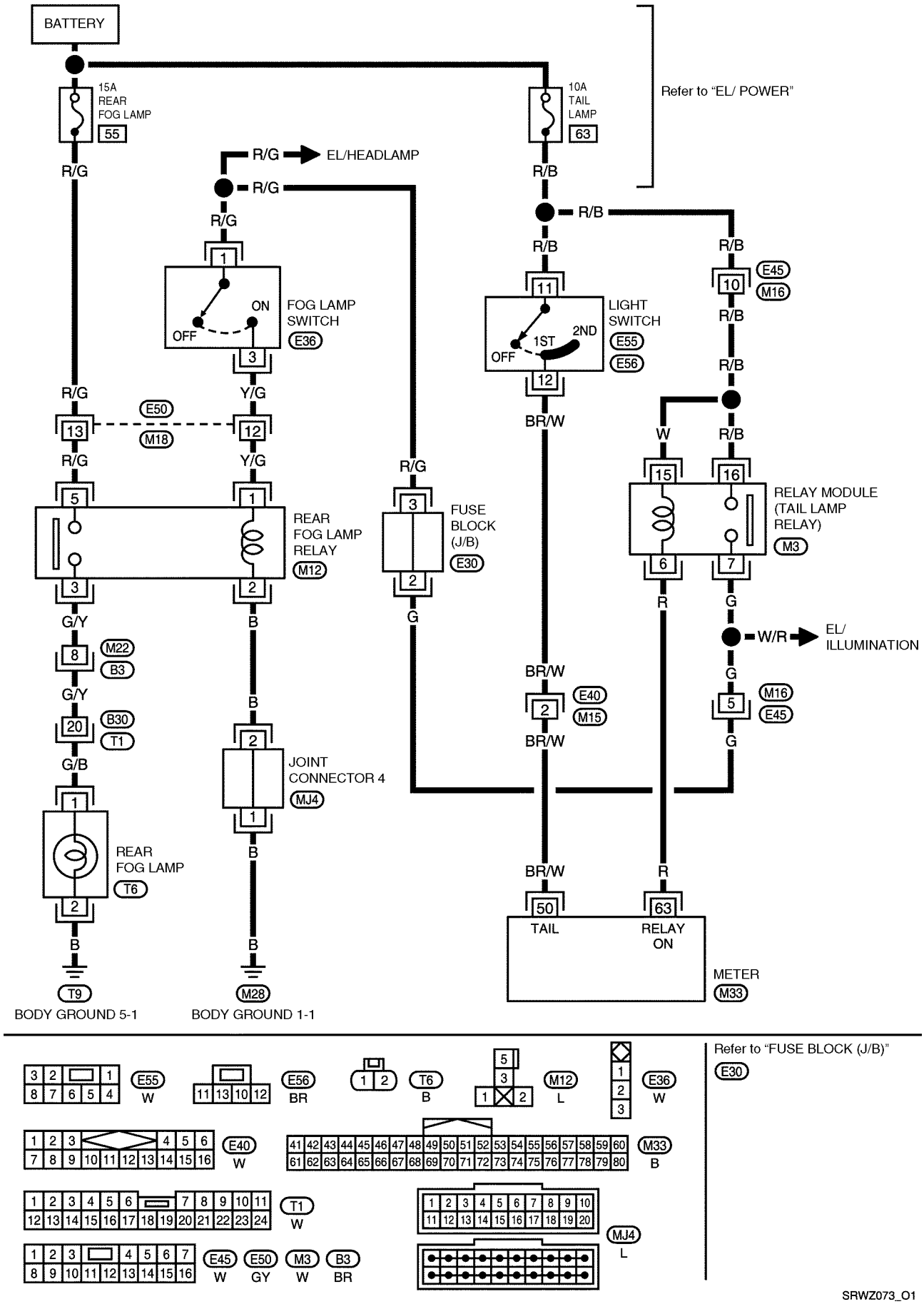
Rear fog lamp mounting nut
Tightening Torque: 2.5 - 3.8 N•m (0.26 - 0.39 kgf-m)

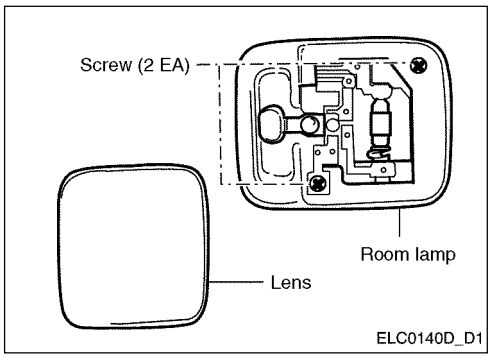


Switch Circuit Inspection

Check continuity between terminals of the rear fog lamp switch for operation using a circuit tester.

Wiring Diagram — EL/Fog Lamp (RR)

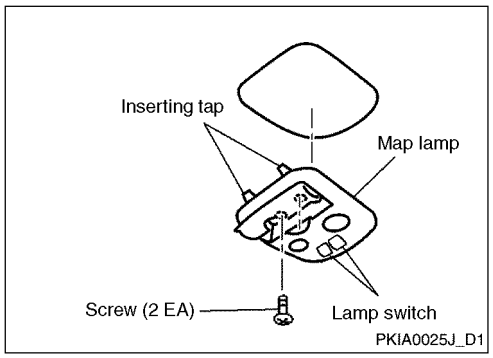




Bulb Replacement (Room Lamp)

Room lamp: 12 V, 10 W

1. Remove the room lamp lens using a flat-bladed (-) screwdriver.
2. Remove the bulb.

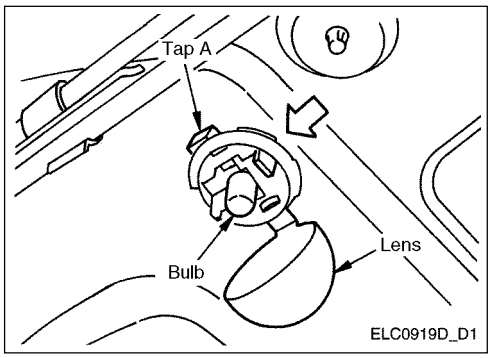


Bulb Replacement (Map Lamp)

Map lamp: Bulb 12 V/3.4 W (2 EA)

BULB REPLACEMENT

1. Remove the lens using a flat-bladed (-) screwdriver.
2. Remove the bulb.

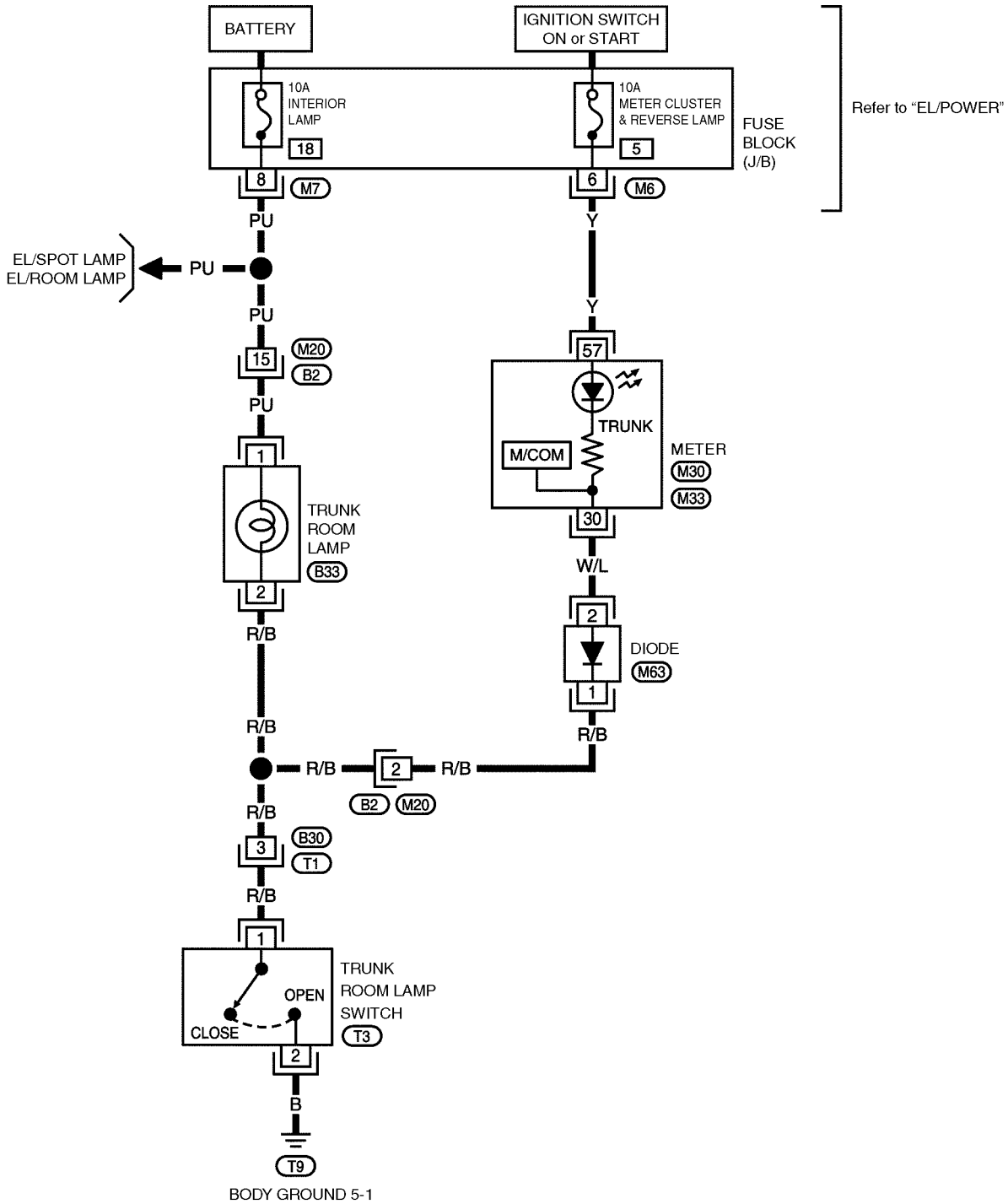


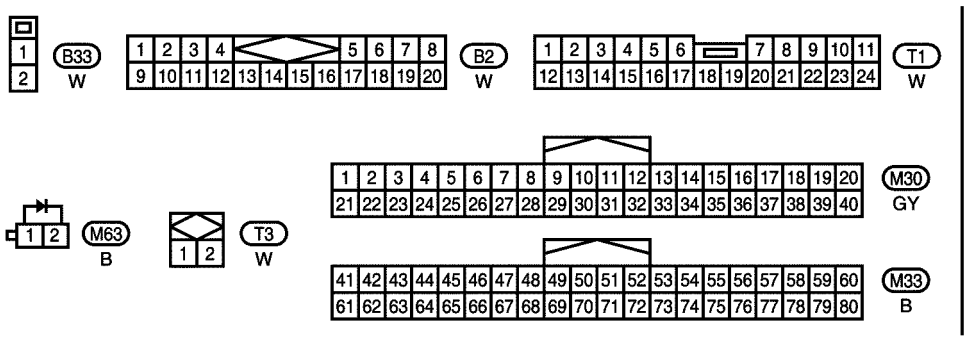
Bulb Replacement

1. Press the tap A to open the lans.
2. Remove the bulb by pulling downwards.

Trunk room lamp: 12 V, 3.4 W

Wiring Diagram — EL/Trunk Room Lamp





Refer to "FUSE BLOCK (J/B)"
M6 M7

SRWZ025_O1

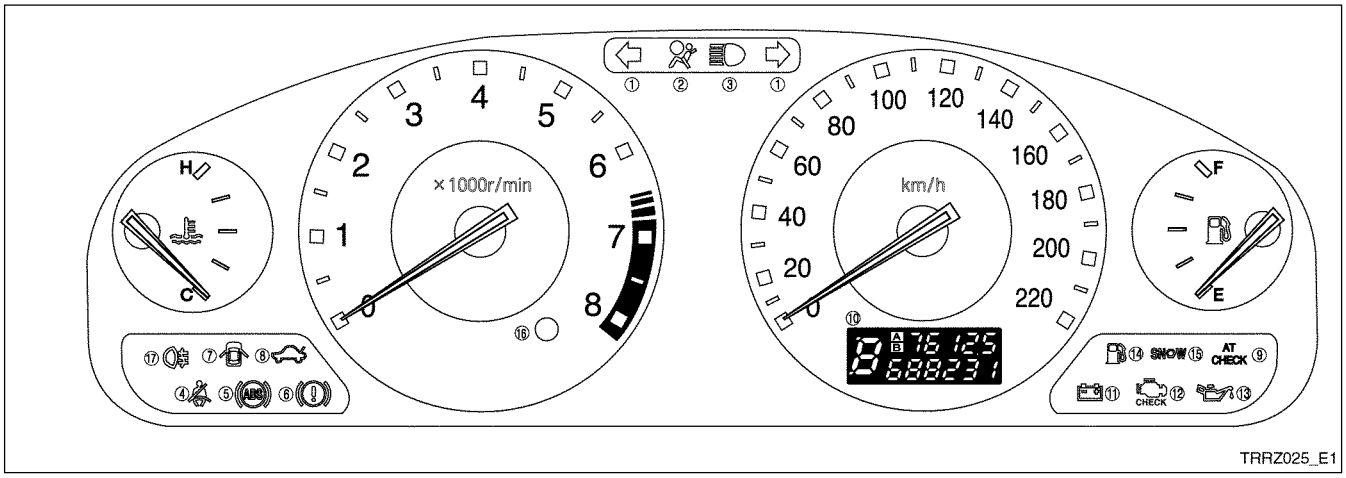
System Overview

GENERAL

- The 4-needle-analog-type combination meter is adopted.
- LED is used for warning lights and illuminations.
- The AT-ranges, odometer, and trip odometer are integrated in an LCD and the trip odometer has 2-mode.
- Various timing control function is adopted on the vehicle.

Design

4-NEEDLE-ANALOG-TYPE COMBINATION METER



1-4 WARNING LAMP AND INDICATOR LAMP

	Name
1	Turn signal indicator lamp
2	SRS airbag warning lamp
3	High-beam indicator lamp
4	Seat belt warning lamp
5	ABS warning lamp
6	Brake warning lamp
7	Door open warning lamp
8	Trunk lid ajar warning lamp
9	A/T warning lamp
10	Position indicator
11	Charge warning lamp
12	Malfunction indicator lamp (MIL)
13	Oil pressure warning lamp
14	Low-fuel warning lamp
15	SNOW indicator lamp
16	Security indicator
17	Rear fog lamp (Europe)

Telltable	Icon	Color
Turn L/R		Green
Fuel		Amber
Beam		Blue
Charge		Red
ABS		Amber
CHK eng.		Amber
Airbag		Red
Door		Red
Oil		Red
Snow		Amber
Brake		Red
Seatbelt		Red
Trunk		Red
Security Indicate		Red
A/T CHECK		Amber
Rear fog		Amber

Function

TIMER CONTROL FUNCTION OF COMBINATION METER

- Rear defogger control

  The rear defogger operates for 15 minutes when turning on the rear defogger switch with the ignition switch ON.

- Tail lamp control

  Tail lamp comes on and off according to the tail lamp switch signal.

  Tail lamp relay is off when turning off the key-in switch and driver's door switch with the light switch ON.

- Turn signal lamp/Hazard warning lamp control

  Turn signal lamp is controlled by the turn signal lamp switch signal.

  Hazard warning lamp blinks when receiving the collision signal or hazard warning lamp signal.

  Hazard warning lamp blinks twice when locking the doors with remote controller or relocking (automatically) the doors.

  Hazard warning lamp blinks once when unlocking the doors with remote controller.

  Hazard warning lamp blinks for 30 seconds with 1 Hz of frequency when operating panic function with remote controller.

  Hazard warning lamp blinks for 30 seconds with 1 Hz of frequency when operating anti-theft function.

  Hazard warning lamp blinks once when entering into the remote controller ID registration mode.

- Buzzer control

  Key-in alarm:

  Key-in alarm sounds with 2 kHz of frequency when the key-in switch is ON and driver's door switch is in open position with the ignition switch OFF.

  Seat belt alarm:

  Seat belt alarm sounds for a specific period when driving over a specified speed (set in combination meter control unit) while the seat beat switch is ON (not fastened).

  It stops when the vehicle speed is lower than 5 km/h than the specified speed.

  ** Trouble diagnosis – Refer to "CONFIGURATION" (EL-76).

  Vehicle speed sensitive door lock alarm:

  Warning buzzer sounds for approx. 0.5 seconds while driving when the auto door lock function is activated.

  ** Trouble diagnosis – Refer to "CONFIGURATION" (EL-76).

  Turn signal lamp/hazard warning lamp buzzer:

  Buzzer sounds when the ignition switch is defective or the turn signal lamp switch or hazard warning lamp switch is turned on while the ignition switch is in OFF position.

  Over-speed alarm:

  Warning buzzer sounds when the vehicle speed exceeds 120 km/h and stops when the vehicle speed goes below 115 km/h.

  ** Trouble diagnosis – Refer to "CONFIGURATION" (EL-76).

- Room lamp timer control

  Room lamps and key hole lamp come on when turning on the driver's door switch.

  Room lamps and key hole lamp are dimmed down by timer when turning the driver's door switch to OFF from ON.

  Room lamps and key hole lamp are turned on and off according to door switch operation.

- Room lamp battery saver relay control

  To prevent the battery from discharging, the combination meter turns off the battery saver relay after 30 minutes from when turning on the room lamps while the ignition switch and key-in switch are OFF.

- Shift lock solenoid control

  The A/T selector lever cannot be moved to any other positions from “P” when the detent switch (P-range detection) is ON and the brake switch is not in ON position.

  The A/T selector lever cannot be moved to “R” from “N” when the vehicle speed exceeds 14 km/h.

  The A/T selector lever can be moved to “P” from “N” for 3 minutes after turning the ignition switch to OFF from ON.

- Power window/folding mirror residual voltage control ** Refer to Power Window Wiring Diagram (EL-98).

  The power window relay is activated for approx. 30 seconds after turning the ignition switch to OFF from ON.

OTHER FUNCTIONS OF COMBINATION METER

- A/C signal transferring function

  It receives the A/C switch signal and blower switch signal from A/C controller and transfers them to engine control unit.

- Engine coolant temperature output function

  It sends the voltage signal to A/C control unit according to the engine coolant temperature information through CAN network.

  below 55°C: 12 V

  over 55°C: 0 V

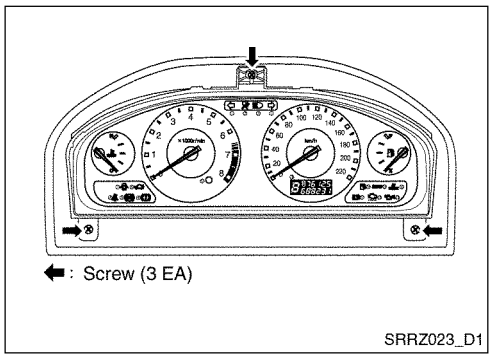
- Vehicle speed (2-pulse) output function

  It coverts the vehicle speed signals from ABS control unit or transmission vehicle speed sensor to 2-pulse signals and then sends them to TCM.

- Remote control system control ** Refer to EL-POWER DOOR LOCK/REMOTE KEYLESS ENTRY SYSTEM (EL-154).

- Immobilizer control ** Refer to ANTI-THEFT SYSTEM (IMMOBILIZER) (EL-165).

- Door lock control ** Refer to EL-POWER DOOR LOCK/REMOTE KEYLESS ENTRY SYSTEM (EL-154).



Removal • Installation of Combination Meter

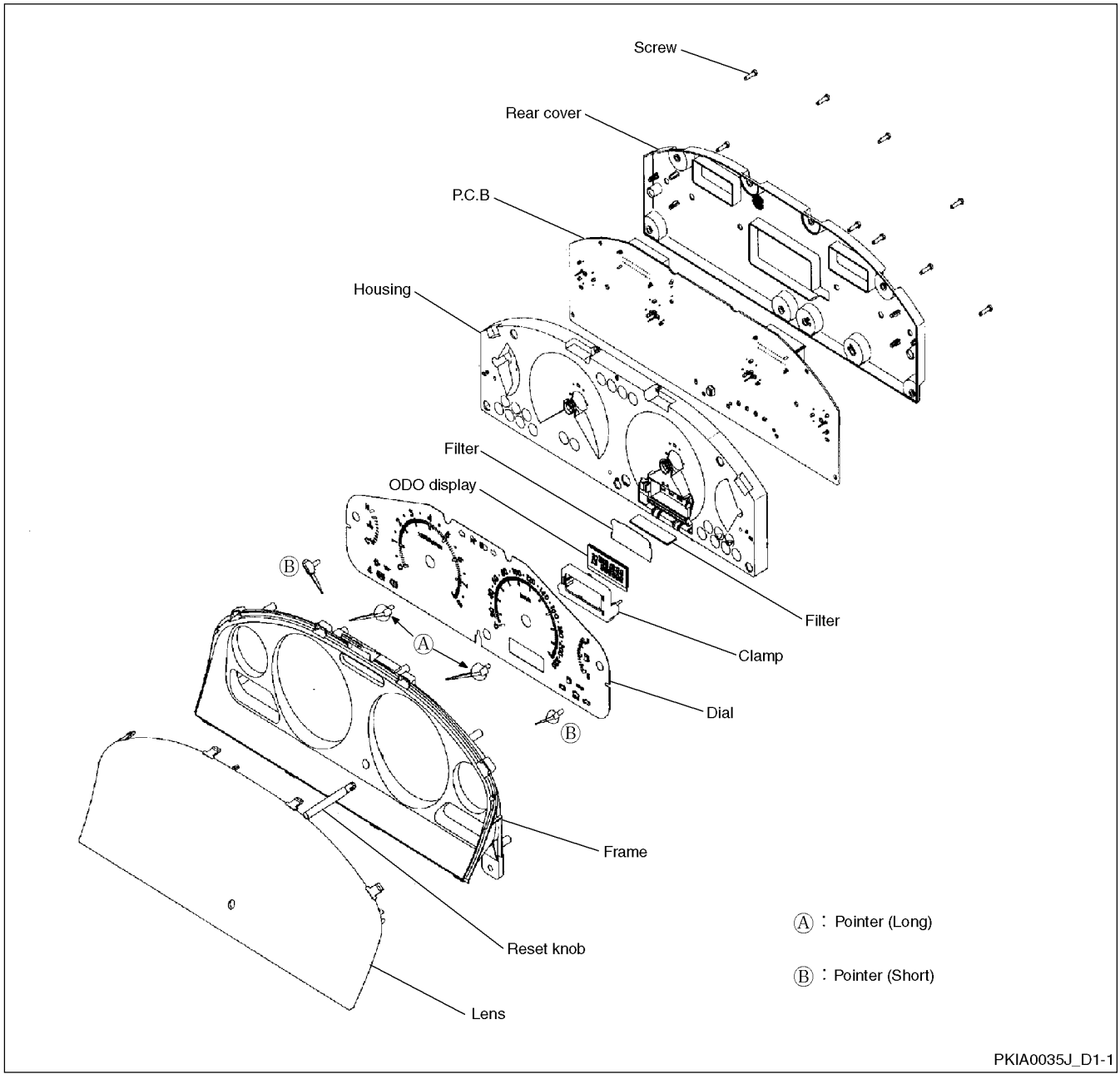
RELATED WORKS

- Column cover: Refer to “Steering Column” in ST section (ST-8).
- Cluster lid A: Refer to “Instrument Assembly” in BT section (BT-40).

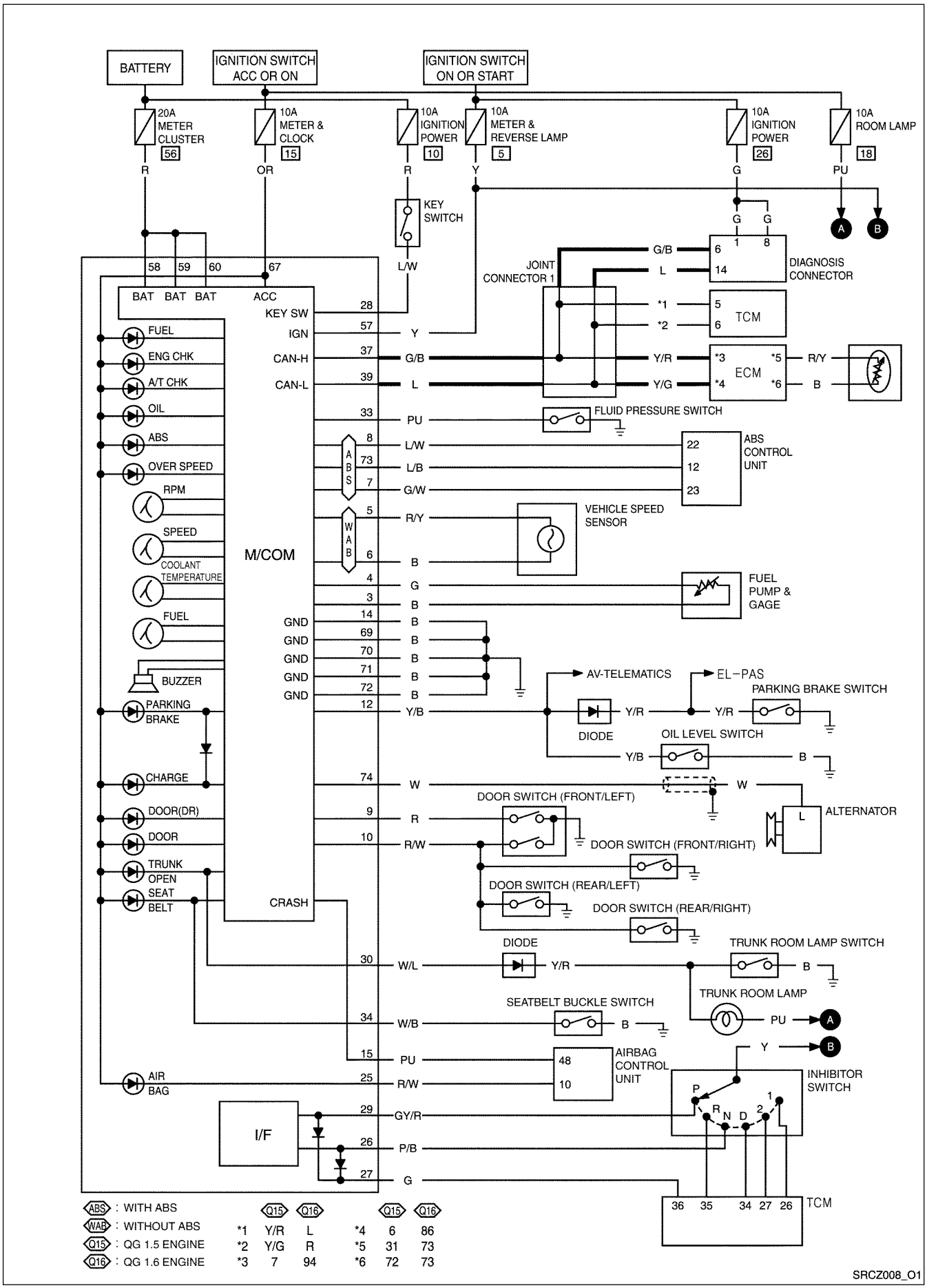
CAUTION:

- **When replacing combination meter, perform CONFIGURATION with CONSULT-II. Refer to EL-76.**

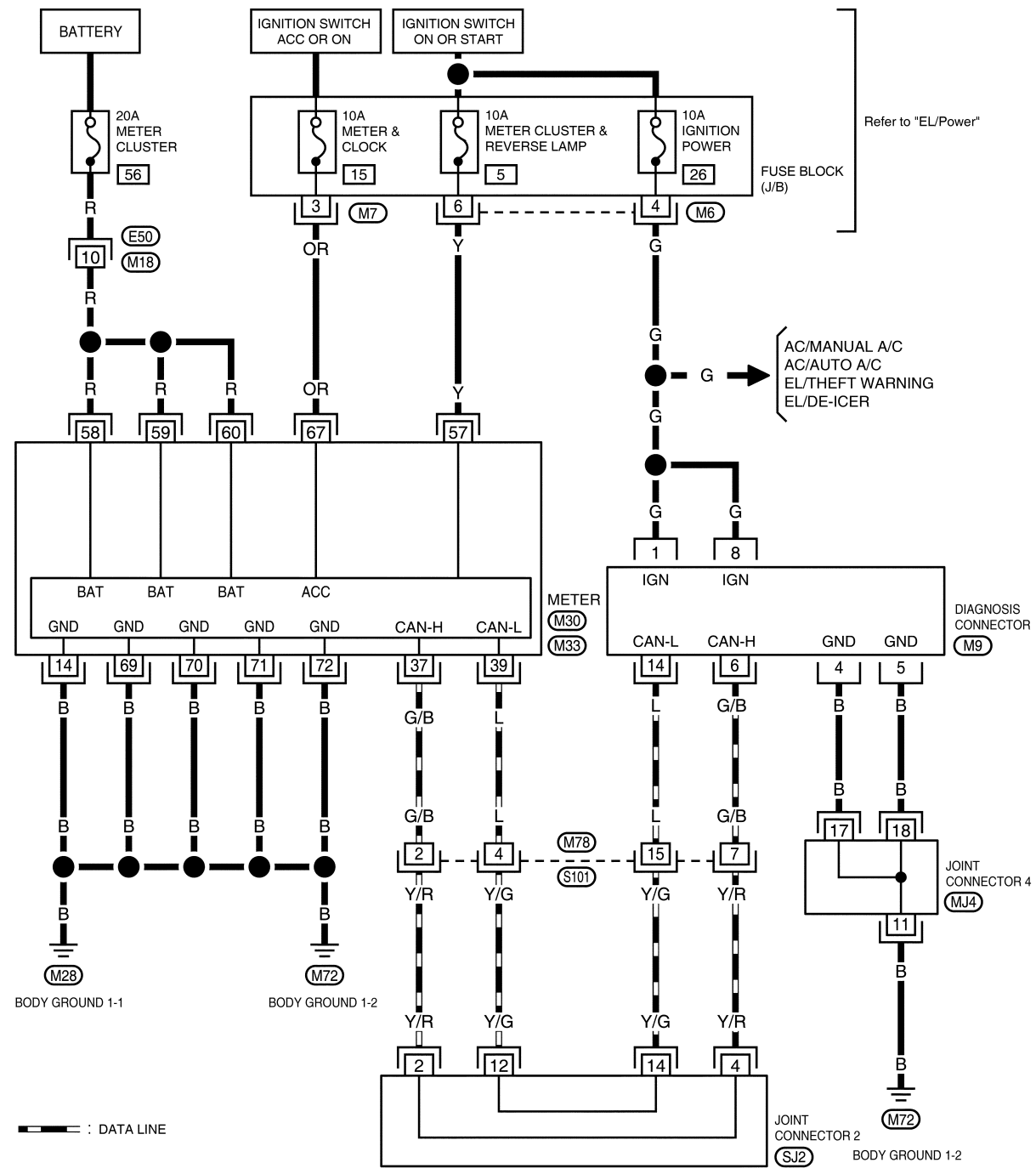
COMPONENTS DIAGRAM



Circuit Diagram



Wiring Diagram



SRWZ071_O1

Specifications

SPEEDOMETER AND TACHOMETER

Engine Model		QG16DE
Speedometer	Type	Stepper motor
	Max. reading	220 km/h
	Vehicle speed signal (Input)	42-pulse at ABS unit (vehicle with ABS) 8-pulse at vehicle speed sensor (vehicle without ABS)
	Vehicle speed signal (Output)	2-pulse (Single wave signal), 8-pulse (vehicle without ABS)
Tachometer	Type	Stepper motor
	Max. reading	8,000 RPM
	Red zone	6,600 - 8,000 RPM
	Revolution signal (Single wave signal)	2-pulse/revolution

FUEL LEVEL GAGE • COOLANT TEMPERATURE GAGE

Item	Specifications					
Fuel level gage	Type	Stepper motor				
	Needle position	E	1/4	1/2	3/4	F
	Fuel in the tank (L)/ Resistance (Ω)	Approx. 5.5/80 +3 0	Approx. 15/55.5 +1 -2	Approx. 26/33 +0 5	Approx. 37/18 +0 2	Approx. 52/6 +0 5
	Fuel level when low fuel level warning light is ON (L)	Approx. 9				
Coolant temperature gage	Type	Stepper motor				
	Needle position	C	Center		-	H
	Engine coolant temperature (°C)	Approx. 50	Approx. 70 - 105		Approx. 119	Approx. 130
	Resistance (Ω)	Approx. 405	Approx. 142.5 - 65.3		45.2	32.5

CONSULT-II Function (CLUSTER)

FUNCTION

Diagnostic test item	Check item, diagnostic test mode	Content
Inspection by part	SELF-DIAG RESULTS	Combination meter performs self-disgnosis of CAN communication
	DATA MONITOR	Displays the input data Combination meter in real time.
	CAN DIAG SUPPORT MNTR	The result of transmit/receive diagnosis of CAN communication can be read.
	ACTIVE TEST	Gives a drive signal to a load to check the operation.
	CONFIGURATION	Function to READ/WRITE/NATS SETTING vehicle configuration of Combination meter.
	ECU PART NUMBER	Combination meter part number can be read.

CONSULT-II PROCEDURE

1. Turn ignition switch OFF.
2. Connect CONSULT-II to data link connector, which is located under the driver's dash panel.
3. Turn ignition switch ON.
4. Touch "START(X-BADGE VHCL)".
5. Touch "CLUSTER".
6. Perform each diagnostic test mode according to each service procedure.

SELF-DIAG RESULTS

Display item	Item list	Reference
C/U - EEPROM	Control unit - EEPROM	EL-78
BATTERY VOLTAGE	Battery voltage	EL-79
FUEL SENDER CIRC	Fuel gauge sensor circuit	EL-80
VHCL SPD OUT CIRC1	Vehicle speed output circuit 1- 2-pulse	EL-81
VHCL SPD OUT CIRC2	Vehicle speed output circuit 2 - 8-pulse	EL-82
RIGHT INDCT CIRC	Turn signal lamp circuit - RH	EL-85
LEFT INDCT CIRC	Turn signal lamp circuit - LH	EL-86
NEUTRAL SW CIRC	Park/Neutral Position (PNP) Switch	EL-89
REAR DEFOGGER RLY	Rear defogger relay circuit	EL-91
TAIL LAMP RLY CIRC	Tail lamp relay circuit	EL-94
POWER WINDOW RLY	Power window relay circuit	EL-97
BAT SAVER RLY CIRC	Battery saver relay circuit	EL-103
WATR TEMP OUT CIRC	Engine coolant temperature output circuit	EL-105
LOCK RLY CIRC	Door lock relay circuit	EL-106
UNLK RLY CIRC-DR	Driver’s door unlock relay circuit	EL-107
UNLK RLY CIR-OTHR	Other door unlock relay circuit	EL-107
AIR BAG-METER COMM	Air bag collision circuit	EL-112
AUDIBLE WARN CIRC	Alarm relay circuit	EL-117
THEFT-WARNING RLY	Anti-theft relay circuit	EL-118
CHAIN OF METER-ANT	Engine immobilizer	EL-122

DATA MONITOR

Memo of Parameter

Display item	Index name	Reference value and notes
FUEL LEV OUT	FUEL LEVEL OUTPUT	_
FUEL LEVEL	FUEL LEVEL	_
BATERY VOLTGE	BATTERY VOLTAGE	Battery voltage
RH IND CRRNT	RIGHT INDICATOR CURRENT	Change to 0-4,500mA when RH turn signal lamp operates
LH IND CRRNT	LEFT INDICATOR CURRENT	Change to 0-4,500mA when LH turn signal lamp operates
VHCL SPEED 1	VEHICLE SPEED 1	Output according to driving speed
VHCL SPEED 2	VEHICLE SPEED 2	Output according to driving speed
REGISTERD KEY	NUMBER OF KEYS PROGRAMMED	Number of keys registered to immobilizer

Input/Output Status

Display item	Index name	Reference value and notes
RESET KNOB SW	RESET KNOB SWITCH	Pressing reset knob - on Other - OFF
LH INDCT INFO	LEFT HAND INDICATOR INFORMATION	When turning on LH turn signal lamp - ON and OFF Other - OFF
RH INDCT INFO	RIGHT HAND INDICATOR INFORMATION	When turning on RH turn signal lamp - ON and OFF Other - OFF
P RANGE SW	P RANGE SWITCH	Selector lever in P range - ON Selector lever in ranges other than P - OFF
REVERSE SW	REVERSE SWITCH	In R range - ON Others - OFF
C/DOOR LK BTN	CENTRAL DOOR LOCKING BUTTON	Door lock/unlock button ON - ON Others - OFF
REAR DEF SW	HEATED REAR SRCEEN SWITCH	When pressing the rear defogger swich - ON Other - OFF
DETENT SW	DETENT SWITCH	Selector lever in P range - ON Selector lever in ranges other than P - OFF
AIR COND SW	AIR CONDITIONING SWITCH	Air conditioner switch ON - ON Air conditioner switch OFF - OFF
BLOWER SW	BLOWER FAN SWITCH	Blower switch ON - ON Blower switch OFF - OFF
S/B WARN	SEATBELT WARNING	Seat belt is fastened after IGN ON - OFF Seat belt is not fastened after IGN ON - OFF
SEAT BELT W/L	SEAT BELT WARNING LAMP	Seat belt is fastened after IGN ON - OFF Seat belt is not fastened after IGN ON - OFF
OIL PRESS SW	OIL PRESSURE SWITCH	Oil pressure reaches specified level after starting engine - OFF No oil pressure before starting engine - ON
STOP LAMP SW	STOP LAMP SWITCH	Depressing brake pedal - ON Releasing brake pedal - OFF

Display item	Index name	Reference value and notes
DOOR SW-DR	DRIVER DOOR SWITCH	Driver's door is closed - ON Driver's door is opened - OFF
DOOR SW-ALL	ALL DOOR SWITCH	All doors are closed - OFF Any door is open - ON
DOOR STAT -DR	DRIVER'S DOOR	Driver's door locked - LOCK Driver's door unlocked - UNLOCK
DOOR STAT-AS	PASSENGER'S DOOR	All doors (except driver's door) are locked - LOCK Any door (except driver's door) is unlocked - UNLOCK
HAZARD W/L BT	HAZARD WARNING LIGHTS BUTTON	When pressing the hazard warning lamp switch - ON Others - OFF
TRUNK R/L SW	TRUNK ROOM LAMP SWITCH	Trunk open - ON Trunk closed - OFF
HOOD SW	HOOD SWITCH	Hood open - ON Hood closed - OFF
+12V AFTR IGN	+ 12 V AFTER IGNITION	IGN SW ON - ON IGN SW OFF - OFF
TAIL LAMP SW	TAIL LAMP SWITCH	Tail lamp swich ON - ON Tail lamp swich OFF - OFF
KEY INSERTED	KEY INSERTED	It indicates the conditions of key-in switch.
N RANGE SW	N RANGE SWITCH	Selector lever in N range - ON Selector lever in ranges other than N - OFF
SHOCK SENSOR	IMPACT SIGNAL	When impact is detected at collision - ON Under normal condition - OFF
DOOR W/L	DOOR WARNING LAMP	Any door in open - ON All door are closed - OFF
ANTITHEFT IND	ANTI-THEFT INDICATOR	It comes on and off according to the anti-theft indicator operating conditions.
CLANT TMP W/L	COOLANT TEMPERATURE WARNING LIGHT	Engine coolant temperature warning lamp ON - ON Engine coolant temperature warning lamp OFF - OFF
MIL	ENGINE CHECK LAMP	MIL (malfunction indicator lamp) ON - ON MIL OFF - OFF
SNOW MODE IND	SNOW MODE INDICATOR	ON when SNOW switch is ON OFF when SNOW switch is OFF
LEFT IND	LEFT INDICATOR	When turning on LH turn signal lamp - ON and OFF Other - OFF
RH IND	RIGHT-HAND INDICATOR	When turning on RH turn signal lamp - ON and OFF Other - OFF
FUEL W/L	FUEL WARNING LAMP	Fuel in tank is approx. 9 liter after IGN ON - ON Others - OFF
AT CHECK LAMP	AT CHECK LAMP	A/T CHECK warning lamp ON - ON A/T CHECK warning lamp OFF - OFF
OIL PRESS W/L	OIL PRESSURE WARNING LIGHT	Oil pressure warning lamp ON - ON Oil pressure warning lamp OFF - OFF
BATTERY CHARG	BATTERY CHARGE	Battery charge lamp ON - ON Battery charge lamp OFF - OFF
REAR DEF RLY	HEATED REAR SCREEN CONTROL	While rear defogger is controlled - ON While rear defogger is NOT controlled - OFF

Display item	Index name	Reference value and notes
PWR RESI CTRL	POWER RESIDUAL CONTROL	When turning the power window relay & folding mirror relay ON - ON When turning the power window relay & folding mirror relay OFF - OFF
BAT S RLY CMD	BATTERY SAVER RELAY COMMAND	After 30 minutes from when turning the room lamp ON with ignition OFF and key - in switch OFF - OFF Other - ON
TAIL RLY CMD	TAIL LAMP RELAY COMMAND	Tail lamp relay ON - ON Tail lamp relay OFF - OFF
SELECT UNLCK1	DRIVER'S DOOR UNLOCK RELAY	Double step type door unlock eqipped vehicle
SELECT UNLCK2	OTHER DOORS UNLOCK RELAY	Double step type door unlock eqipped vehicle
DOOR L-RLY	LOCKING RELAY COMMAND	Door lock relay ON - ON Others - OFF
TRNK OPN MNTR	TRUNK OPEN ACTUATOR	Trunk open actuator is in operation - ON Trunk open actuator is not in operation - OFF
THEFT RELAY	ANTI-THEFT RELAY COMMAND	When operationg anti-theft relay during alarm operation - ON Other - OFF
HORN RELAY	HORN RELAY COMMAND	When operating horn or alarm buzzer - ON Other - OFF
DOOR-LK LAMP	DOOR LOCKING LAMP	When tail lamp is ON - ON Others - OFF
LH INDCT CTRL	LEFT HAND INDICATOR CONTROL	When turning on LH turn signal lamp - ON and OFF Other - OFF
RH INDCT CTRL	RIGHT HAND INDICATOR CONTROL	When turning on RH turn signal lamp - ON and OFF Other - OFF

Immobilizer Status (Only for Immobilizer System)

Display item	Index name	Reference value and notes
BLANK B/COMP	BLANK BODY COMPUTER	Immobilizer system is registered - YES Others - NO
K/CODE VALID	KEY CODE VALIDATED	Key code is validated: OK - YES Others - NO
KEY ID REGIST	KEY CODE REGISTERED	Key code is registered on combination meter
KEY ID RECEIV	RESPONSE RECEIVED	Key code response received by combination meter
KEY ID VALID	RESPONSE RECOGNIZED	Key code response is recognized between key and combination meter
BLANK KEY	BLANK KEY	Unregistered key is used
K/CODE REGIST	KEY CODE REGISTERED	Verification between key and combination meter: OK - YES Others - NO
LOCK MODE	INJECTION PROTECTED	ECM is protected - YES Others - NO
DISCORD ECM	BLANK INJECTION	ECM is registered - NO Others - YES

Vhicle Access Status (Only For Remote Keyless Entry System)

Display item	Index name	Reference value and notes
DOOR STAT-ALL	DOORS	All doors are locked - LOOK All doors are unlocked - UNLOCK
L OPN CMD S	LAST OPENING ELEMENT COMMAND SOURCE	Final door open source is the remote controller - R Final door open source is the door lock button - D
RF FRAME RCVD	R.F. FRAME RECEIVED (Note)	When receiving the signals from registered remote controller - YES When receiving the signals from unregistered remote controller - NO
RF KEY VALID	RF KEY VALID (Note)	If the remote controller is registered - YES If the remote controller is not registered - NO
KEYLESS LOCK	REMOTE LOCK BUTTON 1 (Note)	When briefly pressing the lock/unlock button on the registered remote controller - ON When pressing the lock/unlock button on the unregistered remote controller - OFF
KEYLESS UNLCK	REMOTE UNLOCK BUTTON 1 (Note)	
KEYLESS PANIC	REMOTE LOCK BUTTON 2 (Note)	When pressing and holding the lock/unlock button on the registered remote controller - ON When pressing and holding the lock/unlock button on the unregistered remote controller - OFF
KEYLES UNLCK2	REMOTE UNLOCK BUTTON 2 (Note)	

(Note) Perform the test only under the remote controller operating conditions.

ACTIVE TEST

Display item	Test item
INPANE WARNING LIGHT	INSTRUMENT PANEL WARNING LIGHTS
LCD INSTRUMENT SEGMENTS	LCD INSTRUMENTATION SEGMENTS
WATER TEMPERATURE GAUGE	WATER TEMPERATURE GAUGE
FUEL GAUGE	FUEL GAUGE
SPEEDOMETER	SPEEDOMETER
REV COUNTER	REV COUNTER
BUZZER	BUZZER
REAR SCREEN DEMISTER	REAR SCREEN DEMISTER
FOLDING MIRROR	FOLDING MIRROR RELAY
TAIL LAMP	TAIL LAMP
POWER WINDOWS	ELECTRIC WINDOWS RELAY
BATTERY SAVER RELAY	BATTERY SAVER RELAY
DOOR LOCK	DOOR LOCK RELAY
DRIVER DOOR UNLOCK	DRIVER DOOR UNLOCK RELAY
OTHER DOOR UNLOCK	OTHER DOORS UNLOCK RELAY
DOOR LOCKING LAMP	DOOR LOCKING LAMP
THEFT-WARNING RELAY	ANTI-THEFT RELAY
HORN	HORN RELAY
SELECTLEV LOCK ELECMAG	SELECTOR LEVER LOCKING ELECTROMAGNET
LEFT INDICATOR	LEFT INDICATOR
RIGHT-HAND INDICATOR	RIGHT-HAND INDICATOR
INTERIOR LIGHTING	INTERIOR LIGHTING
TRUNK OPEN	TRUNK OPEN

CAN DIAG SUPPORT MNTR

Refer to LAN section.

CONFIGURATION

Description

CONFIGURATION has three functions as follows:

- READ CONFIGURATION is the function to confirm vehicle configuration of current combination meter.
- WRITE CONFIGURATION is the function to write vehicle configuration on combination meter.
- NATS SETTING is the function to set immobilizer configuration on combination meter.

CAUTION:

- When replacing combination meter, you must perform WRITE CONFIGURATION with CONSULT-II.
- Complete the procedure of WRITE CONFIGURATION in order.
- If you set incorrect WRITE CONFIGURATION, incidents will occur.
- Configuration is different for each vehicle model. Confirm configuration of each vehicle model.

Read Configuration Procedure

1. Turn ignition switch OFF.
2. Connect CONSULT-II to data link connector, which is located under the driver's dash panel.
3. Turn ignition switch ON.
4. Touch "START(X-BADGE VHCL)".
5. Touch "CLUSTER".
6. Touch "CONFIGURATION".
7. Touch "READ CONFIGURATION".
8. Touch "PRINT" on "READ CONFIGURATION" screen.

Write Configuration Procedure

1. Turn ignition switch OFF.
2. Connect CONSULT-II to data link connector, which is located under the driver's dash panel.
3. Turn ignition switch ON.
4. Touch "START(X-BADGE VHCL)".
5. Touch "CLUSTER".
6. Touch "CONFIGURATION".
7. Touch "WRITE CONFIGURATION".
8. Using the followig flow chart, identify the correct model and cofiguration list. Confirm and/or change setting value for each item according to the configuration list.
9. Touch "CHNG SETTING" on "WRITE CONFIGURATION" screen.

CAUTION:

Make sure to touch "CHNG SETTING" even if the indicated configuration of brand-new combination meter is same as the desirable configuration.

If not, configuration which is set automatically by selecting vehicle model can not be memorized.

10. Touch "OK" on "WRITE CONFIGURATION" screen.
11. Wait until the next screen during setting.
12. Confirm "WRITE CONFIGURATION" is correctly executed by comparing sheet with applicable configuration list shown in step 9.

Display item	Index name	Possible setting value
VHCL SPD SOU	VEHICLE SPEED INPUT SOURCE (Note 1)	ABS, TRANSMISSION
OVERSPEED ALM	OVERSPEED ALARM	WITHOUT, WITH
S/BELT BUZZER	SEAT BELT REMINDER BUZZER	WITHOUT, WITH
AUT D-LK SET	AUTOMATIC LOCKING WHEN DRIVING (Note 2)	WITHOUT, WITH
SELECT UNLOCK	DOUBLE STEP DOOR UNLOCK	WITHOUT, WITH
KEYLESS ENTRY	MULTI REMOTE ENTRY	WITHOUT, WITH
S/B WARN SPD	SEATBELT WARNING SPEED	10, 15, 14, 20
S/B WARN TIME	SEATBELT WARNING BUZZER OPERATING TIME	0, 30, 60, 90, 120
AUT D-LK HOLD	AUTO DOOR LOCK SPEED	0, 40
TRANSMISSION	TRANSMISSION (Note 3)	MANUAL, AUTOMATIC

(Note 1) It should be set to ABS for the veicle equiped with ABS
(Note 2) It can be set manually. (The setting value is changed when pressing the central door lock switch for more than 5 seconds with the ignition switch ON.)
(Note 3) If Manual is set to the vehicle equipped with automatic transaxle, the selector leverinformation is not displayed.

NATS Setting

CAUTION:

- Setting of the immobilizer system (NATS) configuration can be changed only once after replacing combination meter.

Display item	Index name	Possible setting value
WITH NATS	WITH ENGINE IMMOBILIZER (Note)	NO, YES
WITHOUT NATS	WITHOUT ENGINE IMMOBILIZER (Note)	NO, YES

(Note) It is set to the veicle equiped with immobilizer.

Control unit - EEPROM

POSSIBLE CAUSE

Control unit - EEPROM **DEF : Internal circuit fault**

DTC Detecting Condition	**DEF : If the EEPROM set in control unit is failed.**

DIAGNOSIS PROCEDURE

Refer to Wiring Diagram (EL-83).

Check the power supply and ground circuits of control unit. Check the voltage between the control unit M33 terminal No. 58 and terminal No. 14, 69, 70: Power supply voltage Check the voltage between the control unit M33 terminal No. 59 and terminal No. 71: Power supply voltage Check the voltage between the control unit M33 terminal No. 60 and terminal No. 72: Power supply voltage Repair the circuit if necessary.
Erase the fault. If the fault cannot be erased, replace the combination meter.

Check after repair	Perform the fault detection procedure and check the malfunction does not occur again. Check the possible causes related to this failure to make sure there is no fault. Erase the fault memory.

Battery voltage

POSSIBLE CAUSE

Battery voltage **3.DEF : Abnormal voltage**

DTC Detecting Condition	**3.DEF : If the battery voltage is over 16 V**

DIAGNOSIS PROCEDURE

Refer to Wiring Diagram (EL-83).

Measure the battery voltage. Start the engine and measure the battery voltage and charging voltage. Specified value - approx. 13 V If necessary, replace the defective component with new one.
Check the power supply and ground circuits of control unit. Check the voltage between the control unit M33 terminal No. 58 and terminal No. 14, 69, 70: Power supply voltage Check the voltage between the control unit M33 terminal No. 59 and terminal No. 71: Power supply voltage Check the voltage between the control unit M33 terminal No. 60 and terminal No. 72: Power supply voltage Repair the circuit if necessary.

Check after repair	Perform the fault detection procedure and check the malfunction does not occur again. Check the possible causes related to this failure to make sure there is no fault. Erase the fault memory.

Fuel gauge sensor circuit

POSSIBLE CAUSE

Fuel gauge sensor circuit **CO: OpenCC.0: Short to ground**

DTC Detecting Condition	**This fault can be detected only when the ignition switch is in ON position.** **CO: If the resistance of fuel gauge sensor is over 100W** **CC.0: If the resistance of fuel gauge sensor is below 2W**

DIAGNOSIS PROCEDURE

Refer to Wiring Diagram (EL-84).

Inspect the fuel gauge sensor. Remove the fuel gauge sensor and measure the resistance of it. Fuel F position (approx. 52ℓ) - approx. 6Ω Fuel 3/4 position (approx. 37ℓ) - approx. 18Ω Fuel 1/2 position (approx. 33ℓ) - approx. 33Ω Fuel 1/4 position (approx. 15ℓ) - approx. 55Ω Fuel E position (approx. 5.5ℓ) - approx. 80Ω If necessary, replace the defective component with new one.
Check continuity between meter control unit and fuel gauge sensor. Disconnect M30 connector and B28 connector. M30 connector terminal No. 4 and B28 connector terminal No. 1 - approx. 0W M30 connector terminal No. 3 and B28 connector terminal No. 2 - approx. 0W M30 connector terminal No. 3, 4 and body - Continuity should not exist Repair the circuit if necessary.
Check the fuel gauge circuit for short to power supply. Disconnect the fuel gauge unit connector and the combination meter connector. Check the voltage between meter control unit M30 connector terminal No. 3, 4 and ground. Specified value: The voltage should not be detected. The control circuit is short to power supply circuit if the battery voltage is detected. Repair the circuit if necessary.

Check after repair	Perform the fault detection procedure and check the malfunction does not occur again. Check the possible causes related to this failure to make sure there is no fault. Erase the fault memory.

Vehicle speed output circuit 1 (2-pulse)

POSSIBLE CAUSE

Vehicle speed output circuit 1 (2-pulse) **CC.1 : Short to power**

DTC Detecting Condition	When driving the vehicle **CC.1: If the vehicle speed output circuit consumes more voltage than estimated**

DIAGNOSIS PROCEDURE

Refer to Wiring Diagram (EL-84).

Check the continuity between control unit and vehicle speed sensor. Disconnect the control unit and vehicle speed sensor connectors. Check the continuity between control unit M30 connector terminal No. 5 and vehicle speed sensor terminal No. 1. Continuity should exist. Check the continuity between control unit M30 connector terminal No. 6 and vehicle speed sensor terminal No. 2. Continuity should exist. Repair the circuit if necessary.
Inspect the vehicle speed sensor. Check the output voltage while rotating the sprocket of vehicle speed sensor by hand. Specified value - 0 ~ 5 V If necessary, replace the vehicle speed sensor.

Check after repair	Perform the fault detection procedure and check the malfunction does not occur again. Check the possible causes related to this failure to make sure there is no fault. Erase the fault memory.

Vehicle speed output circuit 2 (8-pulse)

POSSIBLE CAUSE

Vehicle speed output circuit 2 (8-pulse)

DTC Detecting Condition	**CC.1: If the vehicle speed output circuit consumes more voltage than estimated**

DIAGNOSIS PROCEDURE

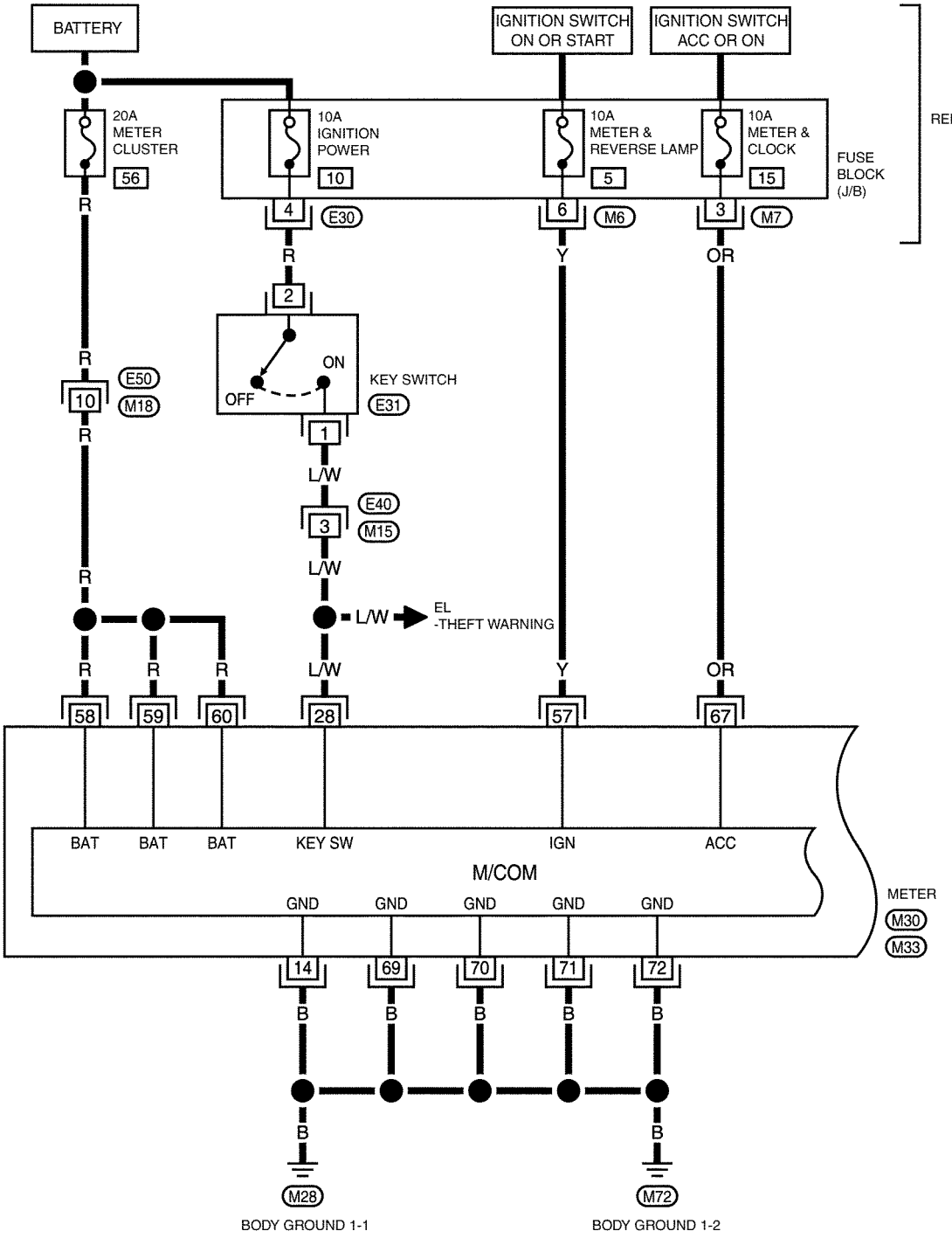
Refer to Wiring Diagram (EL-84).

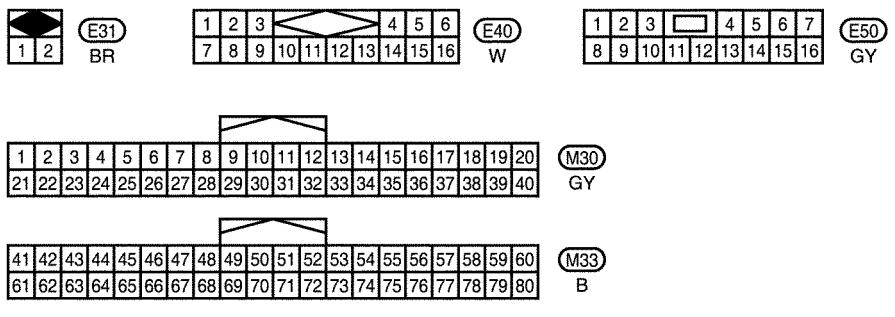
Check the continuity between control unit and vehicle speed sensor. Disconnect the control unit and vehicle speed sensor connectors. Check the continuity between control unit M30 connector terminal No. 7 and ABS C/U terminal No. 23. Continuity should exist. Repair the circuit if necessary.
Perform the diagnosis for ABS C/U. Refer to “TROUBLE DIAGNOSIS” (BR-43).

Check after repair	Perform the fault detection procedure and check the malfunction does not occur again. Check the possible causes related to this failure to make sure there is no fault. Erase the fault memory.

Wiring Diagram

EL/Gauge- 01





REFER TO FUSE BLOCK (J/B)

M6 M7 E30

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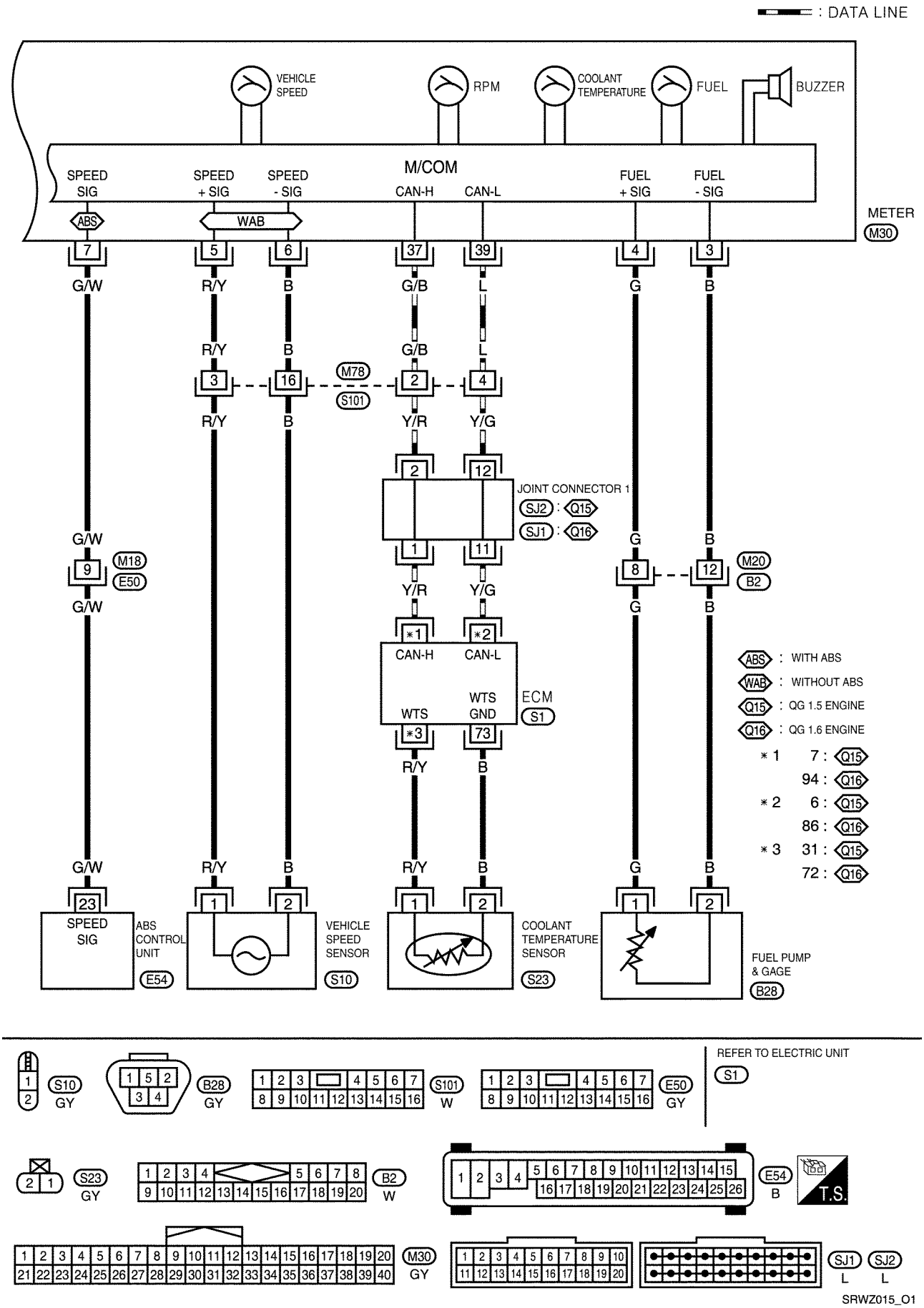
Wiring Diagram

EL/Gauge- 02



Turn signal lamp circuit - RH

POSSIBLE CAUSE

Turn signal lamp circuit - RH **CO: OpenCC.0: Short to ground CC.1: Short to power**

DTC Detecting Condition	When operating the RH turn signal lamp, **CO: If the RH turn signal lamp consumes less voltage than estimated (only for 21 W turn signal lamp),** **CC.0: If the RH turn signal lamp control circuit is short to ground,** CC.1: If the RH turn signal lamp control circuit is short to power

DIAGNOSIS PROCEDURE

Refer to Wiring Diagram (EL-87).

Check RH turn signal lamp bulbs and each turn signal lamp connector for tightening. Replace the burnt bulb and tighten the connector correctly.
Check the control voltage of RH turn signal lamp control circuit. Voltage of control unit M33 connector terminal No. 79 and 80 When controlling RH turn signal lamp - approx. 0 V and 12 V alternatively Others - approx. 0 V Repair the circuit if necessary.
Check the continuity of RH turn signal lamp control circuit. Disconnect the meter control unit, rear combination lamp, front turn signal lamp and side turn signal lamp connectors. Check the continuity between the control unit M33 connector terminal No. 79 or 80 and each turn signal lamp connector. Specified value: Continuity should exist. Repair the circuit if necessary.
Check the RH turn signal lamp control circuit for short to ground and short to power. Disconnect the meter control unit, rear combination lamp, front turn signal lamp and side turn signal lamp connectors. Check the continuity between the control unit M33 connector terminal No. 79 or 80 and ground. Specified value: Continuity should not exist. The control line is short to ground if there is continuity. Check the voltage between the control unit M33 connector terminal No. 79 or 80 and ground. Specified value: The voltage should not be detected. It is short to power if the battery voltage is detected. Repair the circuit if necessary.

Check after repair	Perform the fault detection procedure and check the malfunction does not occur again. Check the possible causes related to this failure to make sure there is no fault. Erase the fault memory.

Turn signal lamp circuit - LH

POSSIBLE CAUSE

Turn signal lamp circuit - LH **CO: OpenCC.0: Short to ground CC.1: Short to power**

DTC Detecting Condition	When operating the LH turn signal lamp, **CO: If the LH turn signal lamp consumes less voltage than estimated (only for 21 W turn signal lamp),** **CC.0: If the LH turn signal lamp control circuit is short to ground,** **CC.1: If the LH turn signal lamp control circuit is short to power**

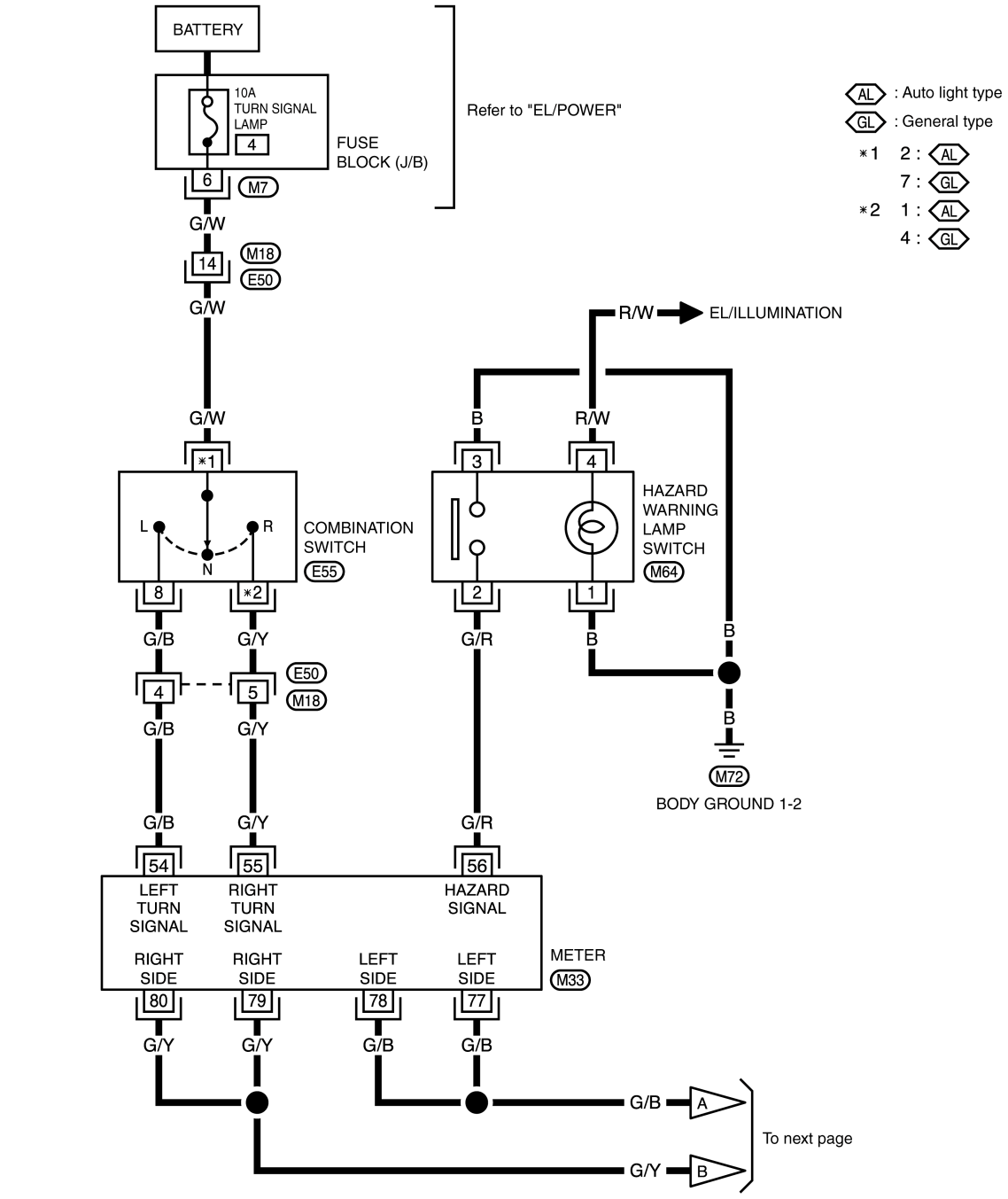
DIAGNOSIS PROCEDURE

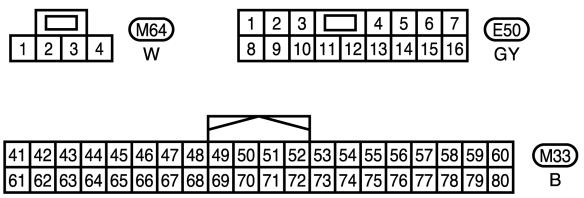
Refer to Wiring Diagram (EL-87).

Check LH turn signal lamp bulbs and each turn signal lamp connector for tightening. Replace the burnt bulb and tighten the connector correctly.
Check the control voltage of LH turn signal lamp control circuit. Voltage of control unit M33 connector terminal No. 77 and 78 When controlling LH turn signal lamp - approx. 0 V and 12 V alternatively Others - approx. 0 V Repair the circuit if necessary.
Check the continuity of LH turn signal lamp control circuit. Disconnect the meter control unit, rear combination lamp, front turn signal lamp and side turn signal lamp connectors. Check the continuity between the control unit M33 connector terminal No. 77 or 78 and each turn signal lamp connector. Specified value: Continuity should exist. Repair the circuit if necessary.
Check the LH turn signal lamp control circuit for short to ground and short to power. Disconnect the meter control unit, rear combination lamp, front turn signal lamp and side turn signal lamp connectors. Check the continuity between the control unit M33 connector terminal No. 77 or 78 and ground. Specified value: Continuity should not exist. The control line is short to ground if there is continuity. Check the voltage between the control unit M33 connector terminal No. 77 or 78 and ground. Specified value: The voltage should not be detected. It is short to power if the battery voltage is detected. Repair the circuit if necessary.

Check after repair	Perform the fault detection procedure and check the malfunction does not occur again. Check the possible causes related to this failure to make sure there is no fault. Erase the fault memory.

Wiring Diagram — EL/Turn Signal Lamp- 01

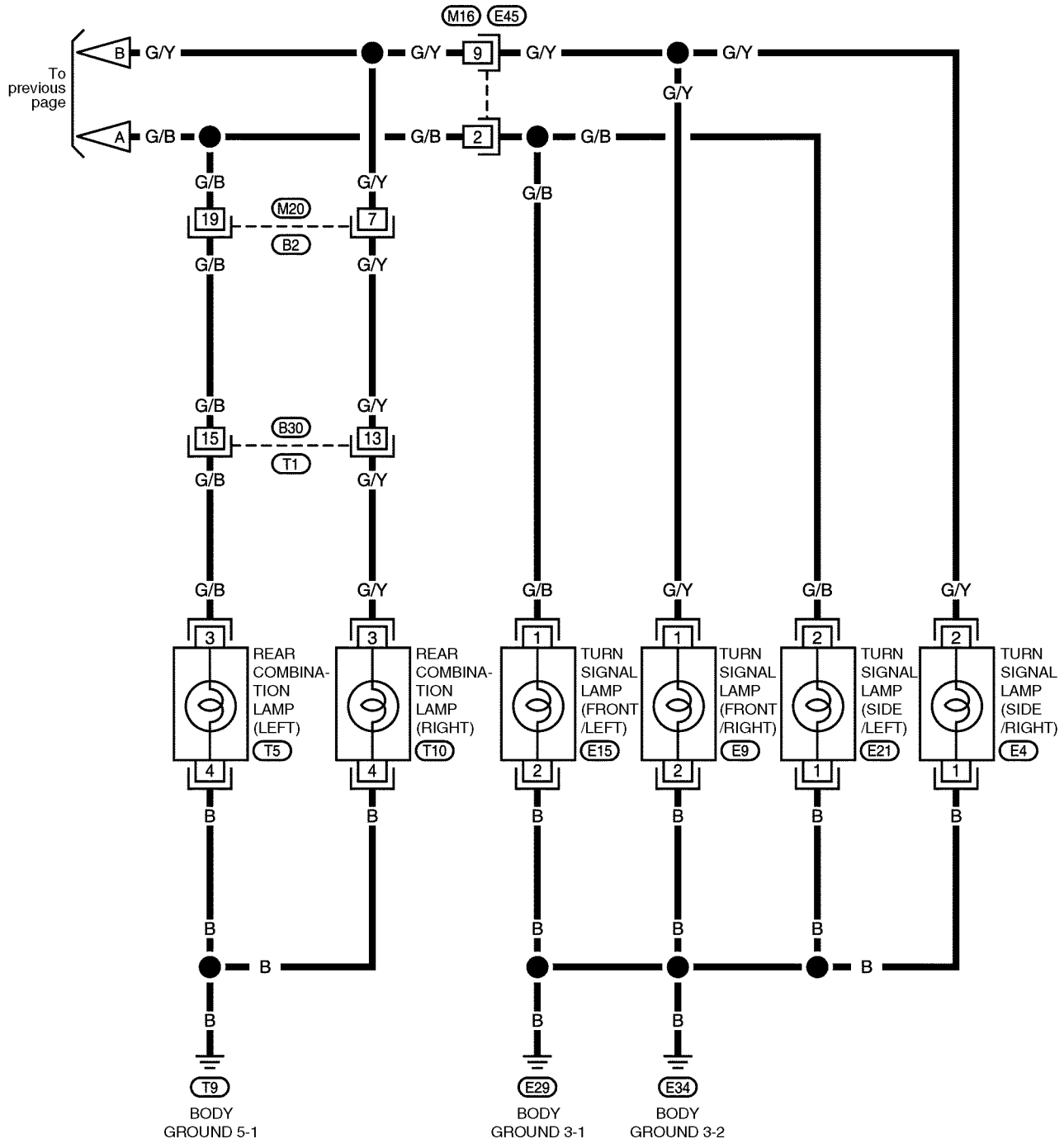


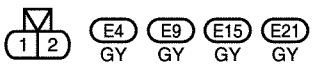


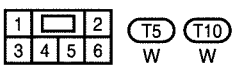
Refer to "FUSE BLOCK (J/B)"
M7

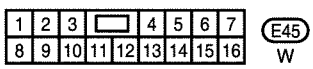
SRWZ018_D1

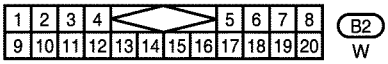
Wiring Diagram — EL/Turn Signal Lamp- 02

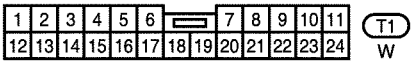












SRWZ019_O1

PNP switch circuit

POSSIBLE CAUSE

PNP switch circuit **CC.0: Short to ground**

DTC Detecting Condition	**CC.0: If there is a current consumption higher than normal.**

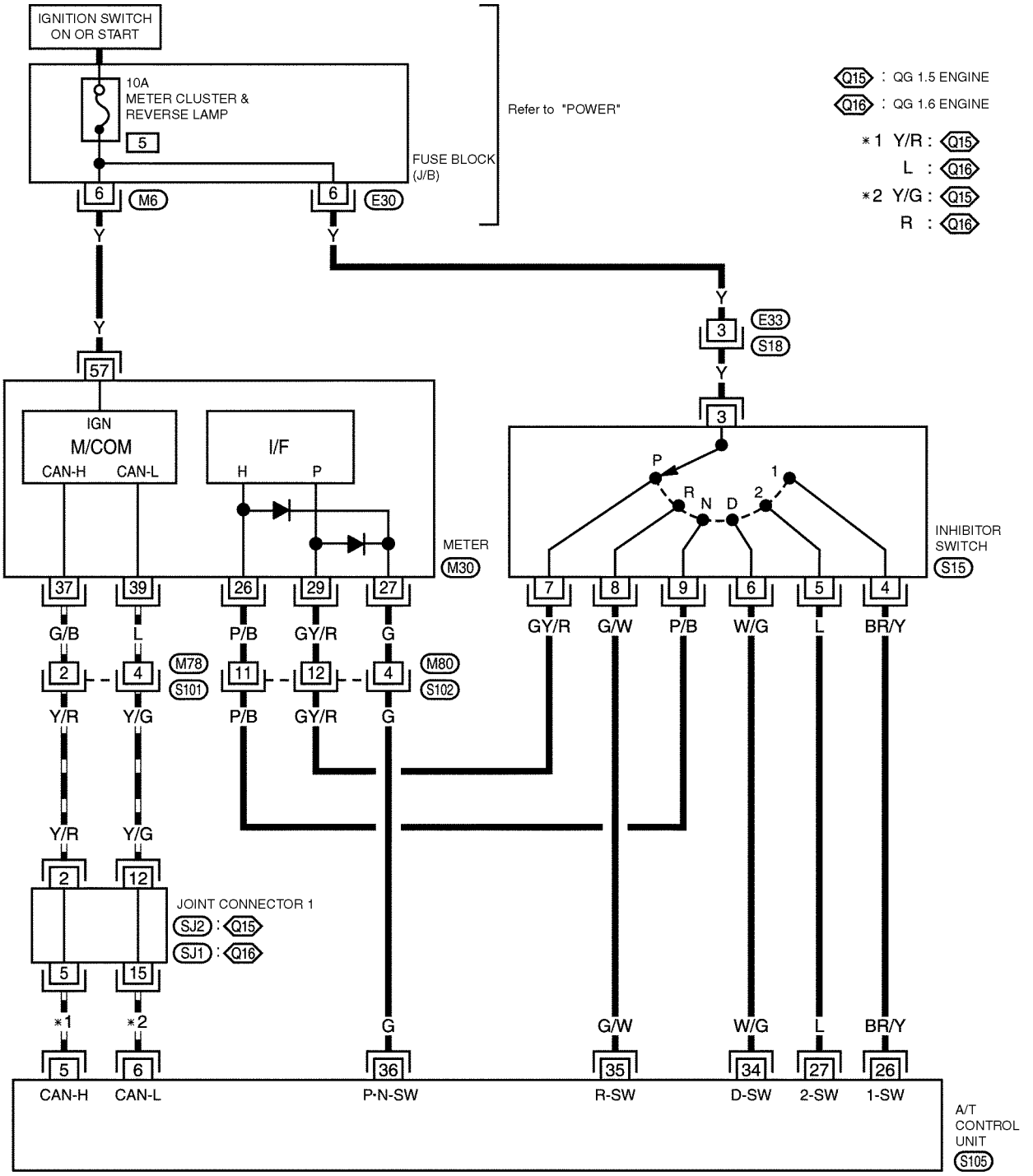
DIAGNOSIS PROCEDURE

Refer to Wiring Diagram (EL-90).

Check the inhibitor switch position. Check the control voltage of PNP switch circuit. Check the voltage between combination meter M30 connector terminal No. 29 and ground. Selector lever set in the “P” position - Battery voltage Other positions - approx. 0V Check the voltage between combination meter M30 connector terminal No. 26 and ground. Selector lever set in the “N” position - Battery voltage Other positions - approx. 0V Disconnect the inhibitor switch connector. Check the continuity between the inhibitor switch terminals 3 and 7. Selector lever set in the “P” position - Continuity should exist Check the continuity between the inhibitor switch terminals 3 and 9. Selector lever set in the “N” position - Continuity should exist Repair the circuit or replace the inhibitor switch and combination meter if necessary.

Check after repair	Perform the fault detection procedure and check the malfunction does not occur again. Check the possible causes related to this failure to make sure there is no fault. Erase the fault memory.

Wiring Diagram — EL/LCD Meter- 01



SRWZ054_O1

Rear defogger relay circuit

POSSIBLE CAUSE

Rear defogger relay circuit **CC.1: Short to power**

DTC Detecting Condition	When operating the rear defogger relay **CC.1: If the rear defogger relay control consumes more voltage than estimated**

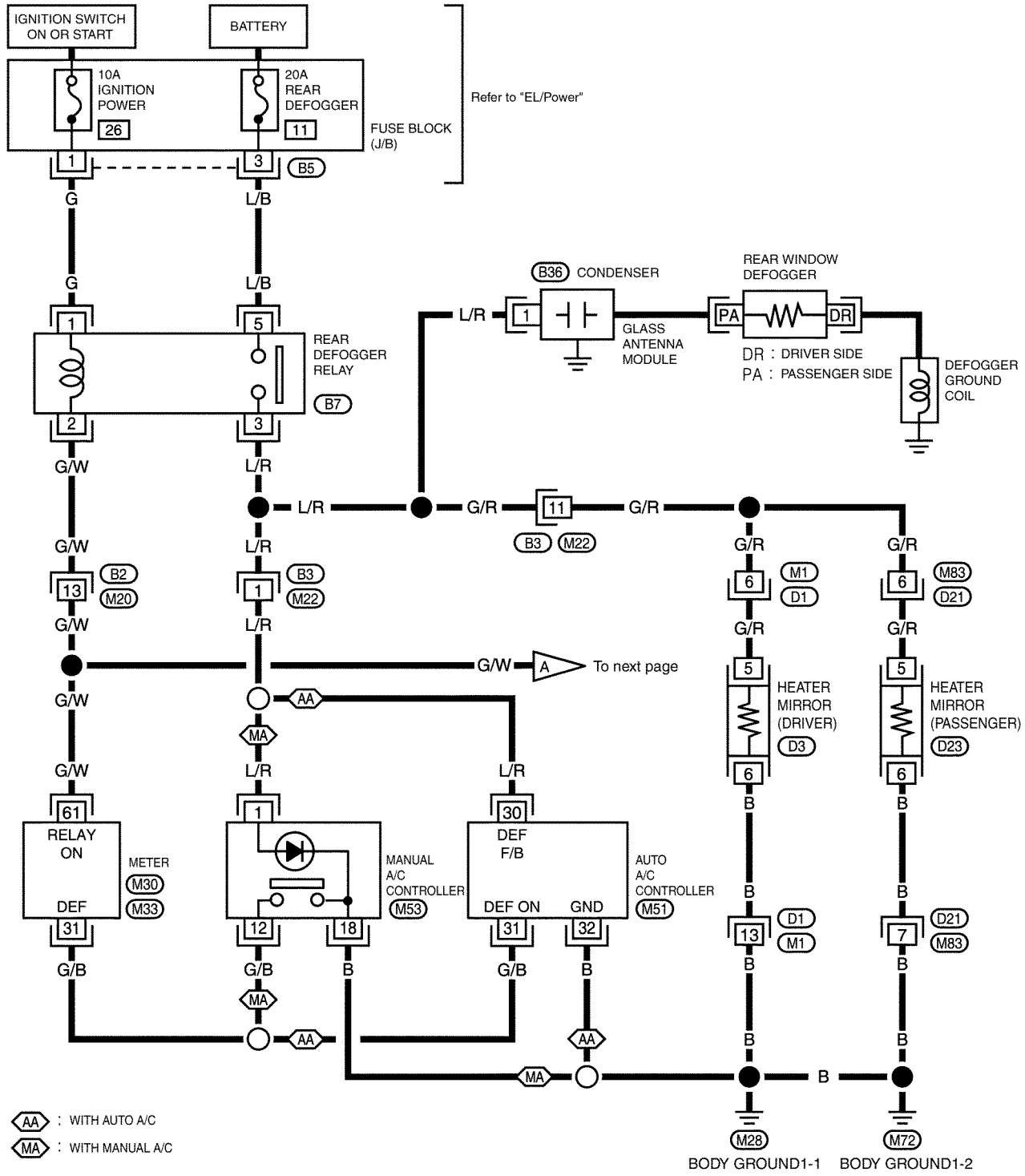
DIAGNOSIS PROCEDURE

Refer to Wiring Diagram (EL-92).

Check the control voltage of rear defogger relay. Voltage of control unit M33 connector terminal No. 61 When operating the rear defogger relay - approx. 1 V Others - approx. 12 V Repair the circuit if necessary.
Check the rear defogger relay control circuit for short to power. Disconnect the rear defogger relay, rear de-icer relay and combination meter. Check the voltage between the control unit M33 connector terminal No. 61 and ground. Specified value: The voltage should not be detected. The control circuit is short to power supply circuit if the battery voltage is detected. Repair the circuit if necessary.

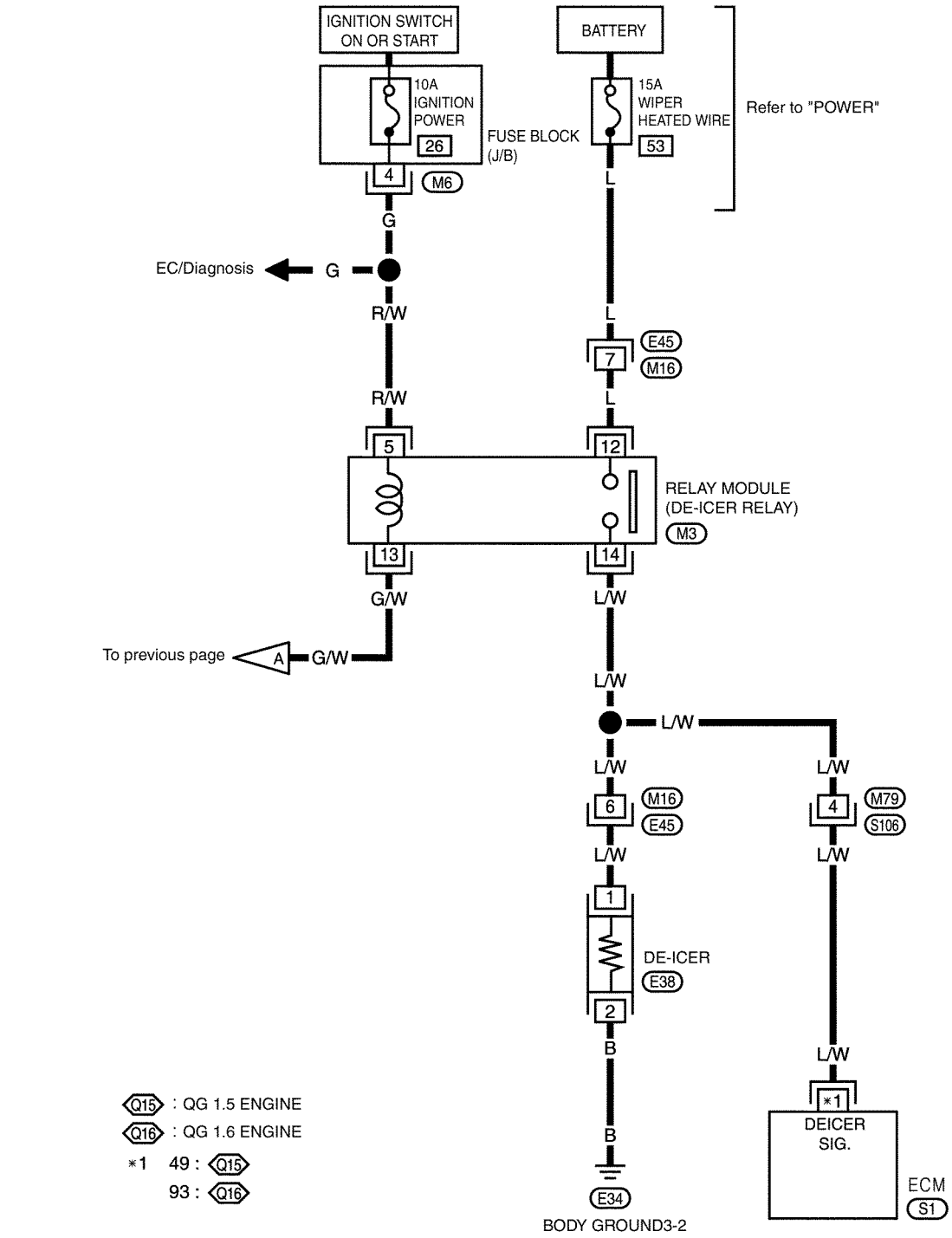
Check after repair	Perform the fault detection procedure and check the malfunction does not occur again. Check the possible causes related to this failure to make sure there is no fault. Erase the fault memory.

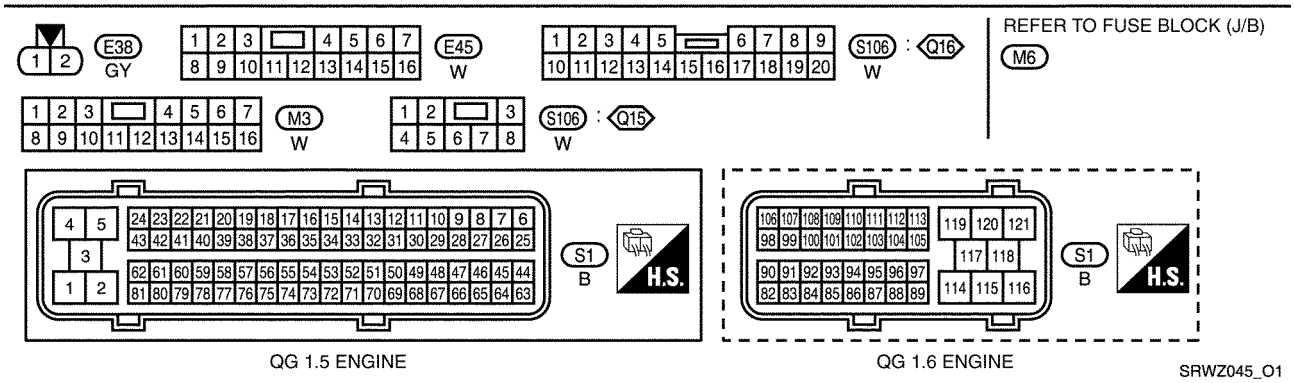
Wiring Diagram — EL/Defogger- 01



Wiring Diagram

EL/Defogger- 02





Tail lamp relay circuit

POSSIBLE CAUSE

<u>Tail lamp relay circuit</u> **CC.1: Short to power**

DTC Detecting Condition	When operating the tail lamp **CC.1: If the tail lamp relay control consumes more voltage than estimated**

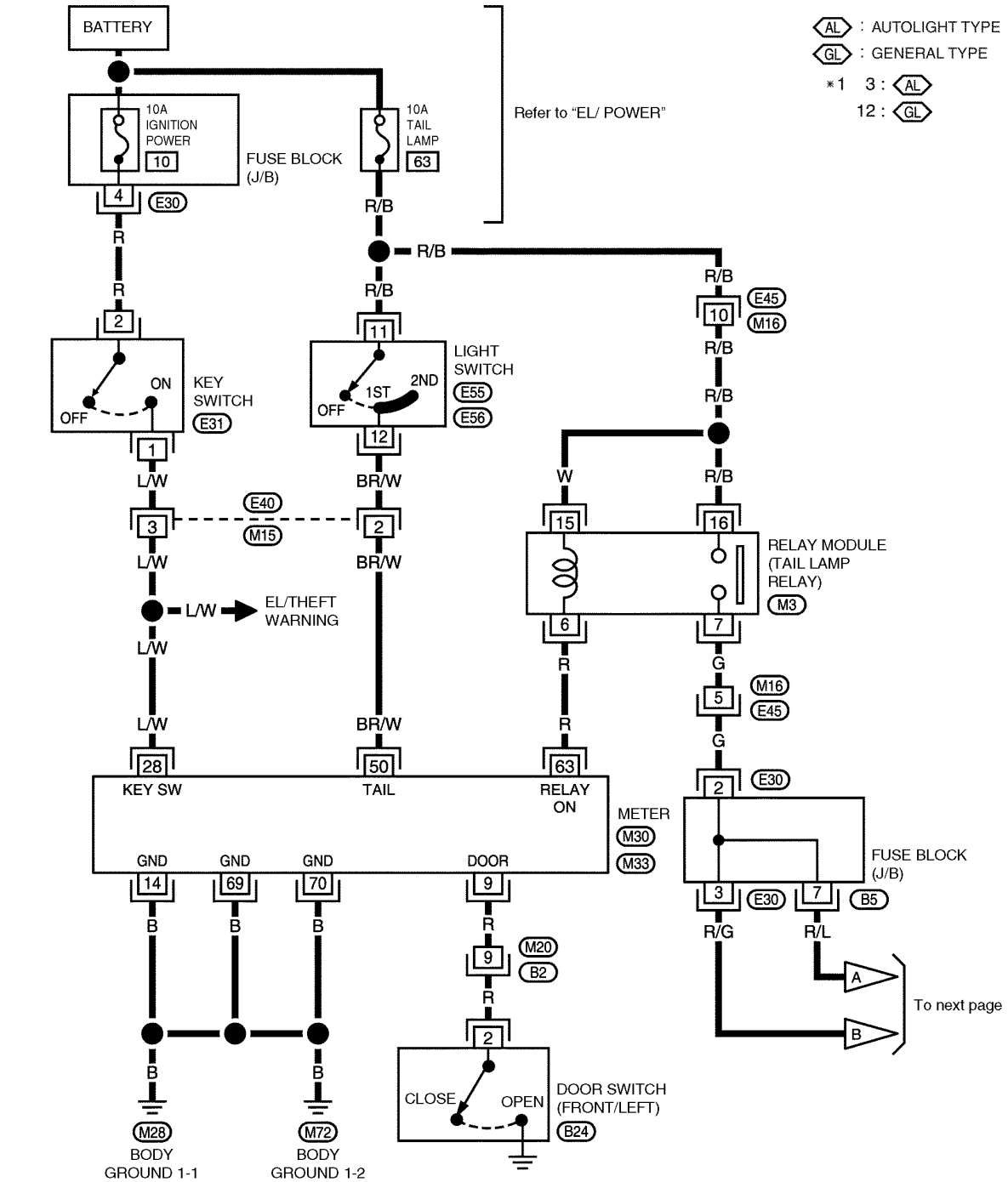
DIAGNOSIS PROCEDURE

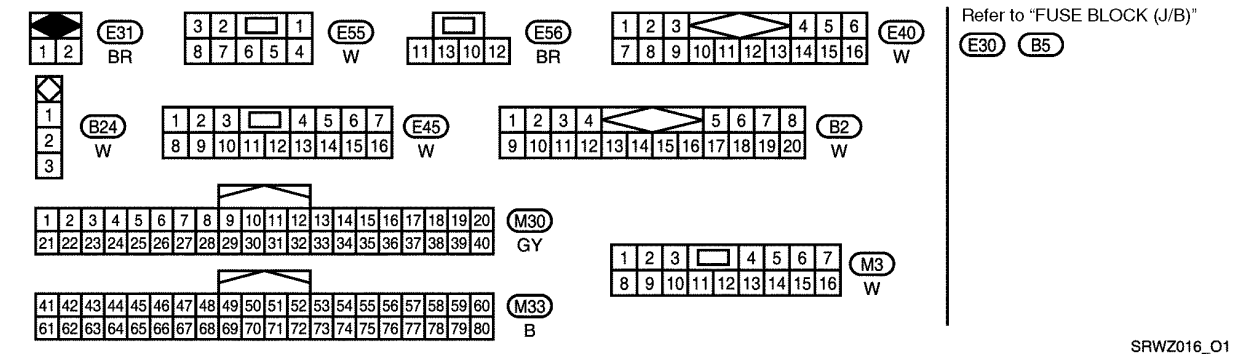
Refer to Wiring Diagram (EL-95).

Check the control voltage of tail lamp relay. Voltage of control unit M33 connector terminal No. 63 When depressing the tail lamp switch - approx. 1 V Others - approx. 12 V Repair the circuit if necessary.
Check the tail lamp relay control circuit for short to power. Disconnect the tail lamp relay and combination meter connectors. Check the voltage between the control unit M33 connector terminal No. 63 and ground. Specified value: The voltage should not be detected. The control circuit is short to power supply circuit if the battery voltage is detected. Repair the circuit if necessary.

Check after repair	Perform the fault detection procedure and check the malfunction does not occur again. Check the possible causes related to this failure to make sure there is no fault. Erase the fault memory.

Wiring Diagram — EL/Tail Lamp- 01

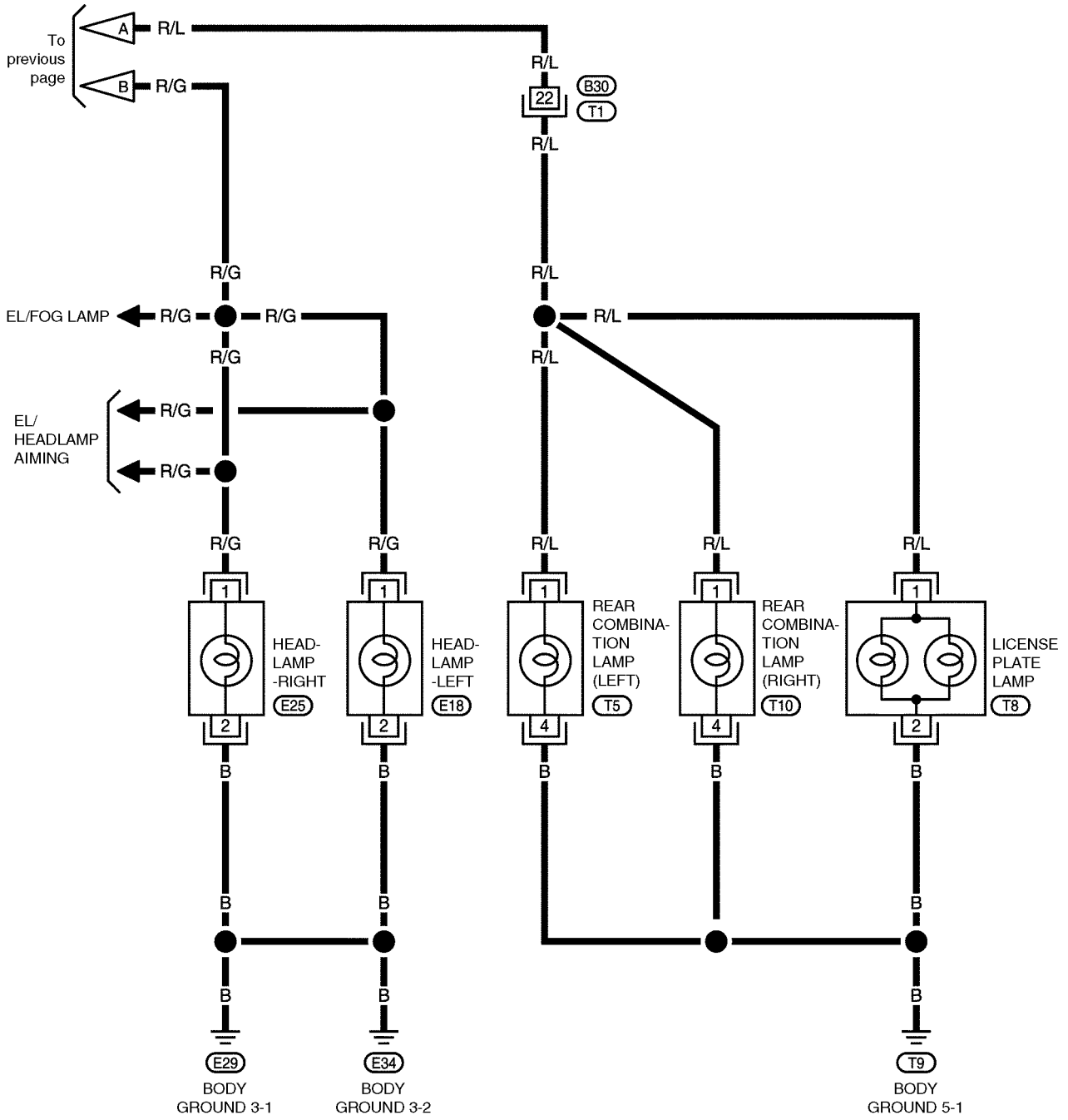


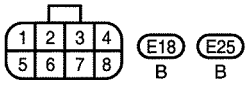


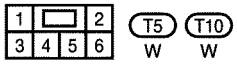
SRWZ016_O1

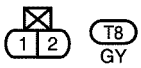
Wiring Diagram

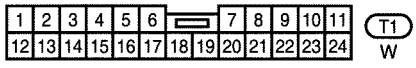
EL/Tail Lamp- 02











SRWZ017_O1

Power window relay circuit

POSSIBLE CAUSE

Power window relay circuit **CC.1: Short to power**

DTC Detecting Condition	When operating the power window relay **CC.1: If the power window relay control consumes more voltage than estimated**

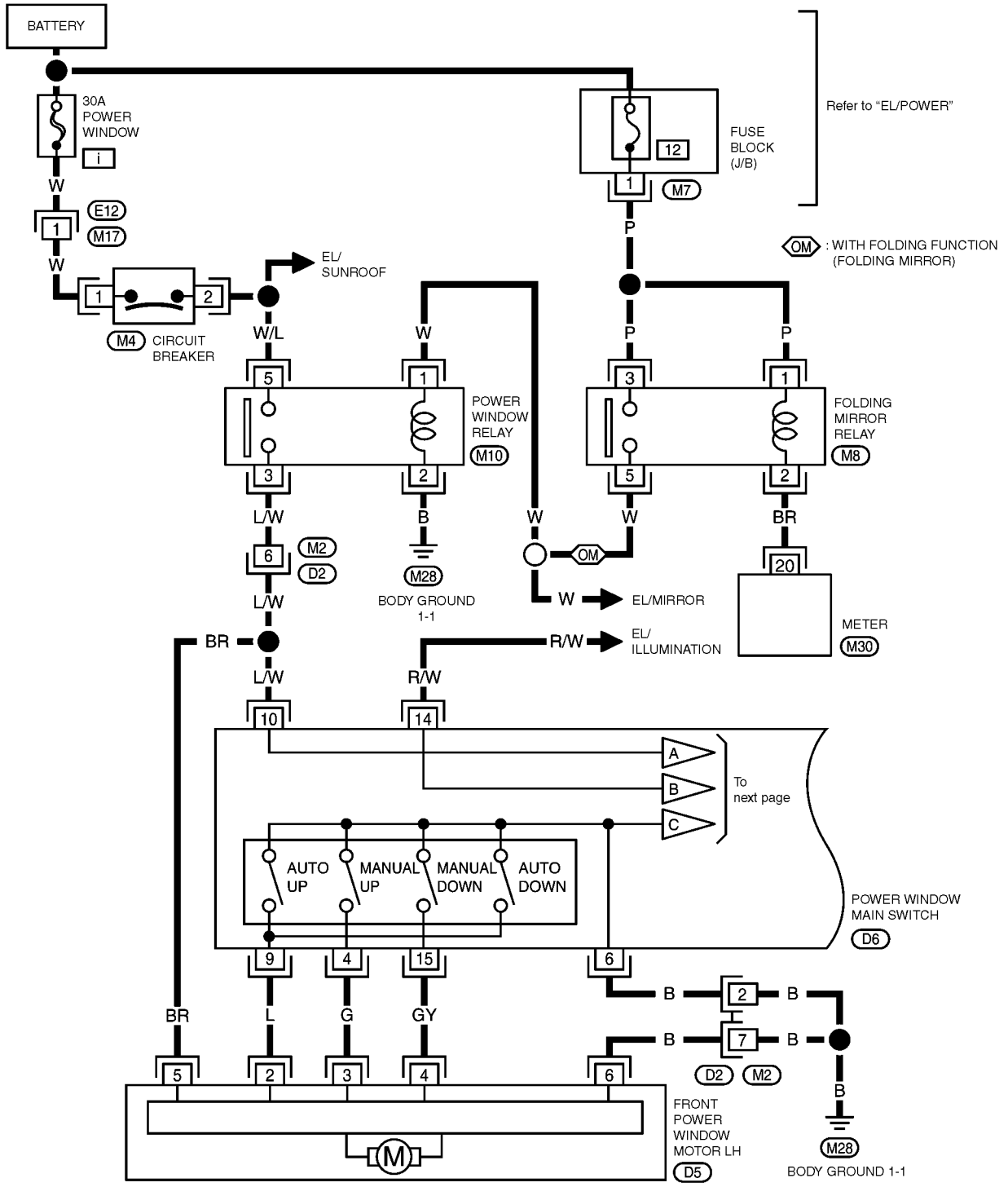
DIAGNOSIS PROCEDURE

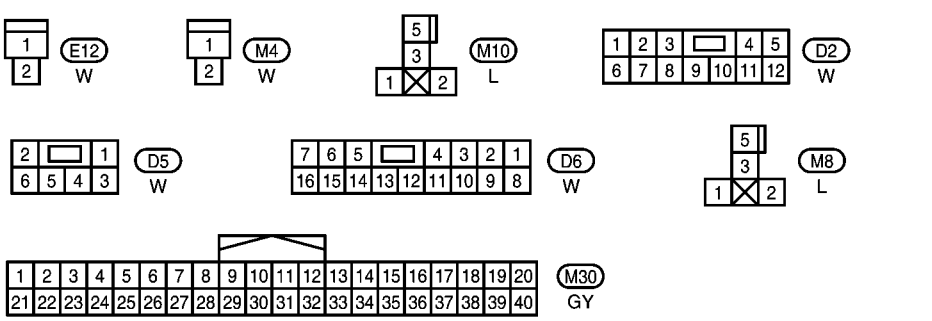
Refer to Wiring Diagram (EL-98).

Check the control voltage of power window relay. Check the voltage between the control unit M30 connector terminal No. 20 and ground. For 30 seconds after turning the ignition from ON to OFF - approx. 1 V After 30 seconds from when turning the ignition from ON to OFF - Battery voltage Repair the circuit if necessary.
Check the power window relay control circuit for short to power. Disconnect the power window relay, folding mirror relay and combination meter connectors. Check the voltage between the control unit M30 connector terminal No. 20 and ground. Specified value: The voltage should not be detected. The control circuit is short to power supply circuit if the battery voltage is detected. Repair the circuit if necessary.

Check after repair	Perform the fault detection procedure and check the malfunction does not occur again. Check the possible causes related to this failure to make sure there is no fault. Erase the fault memory.

Wiring Diagram — EL/Power Window (4DR)- 01

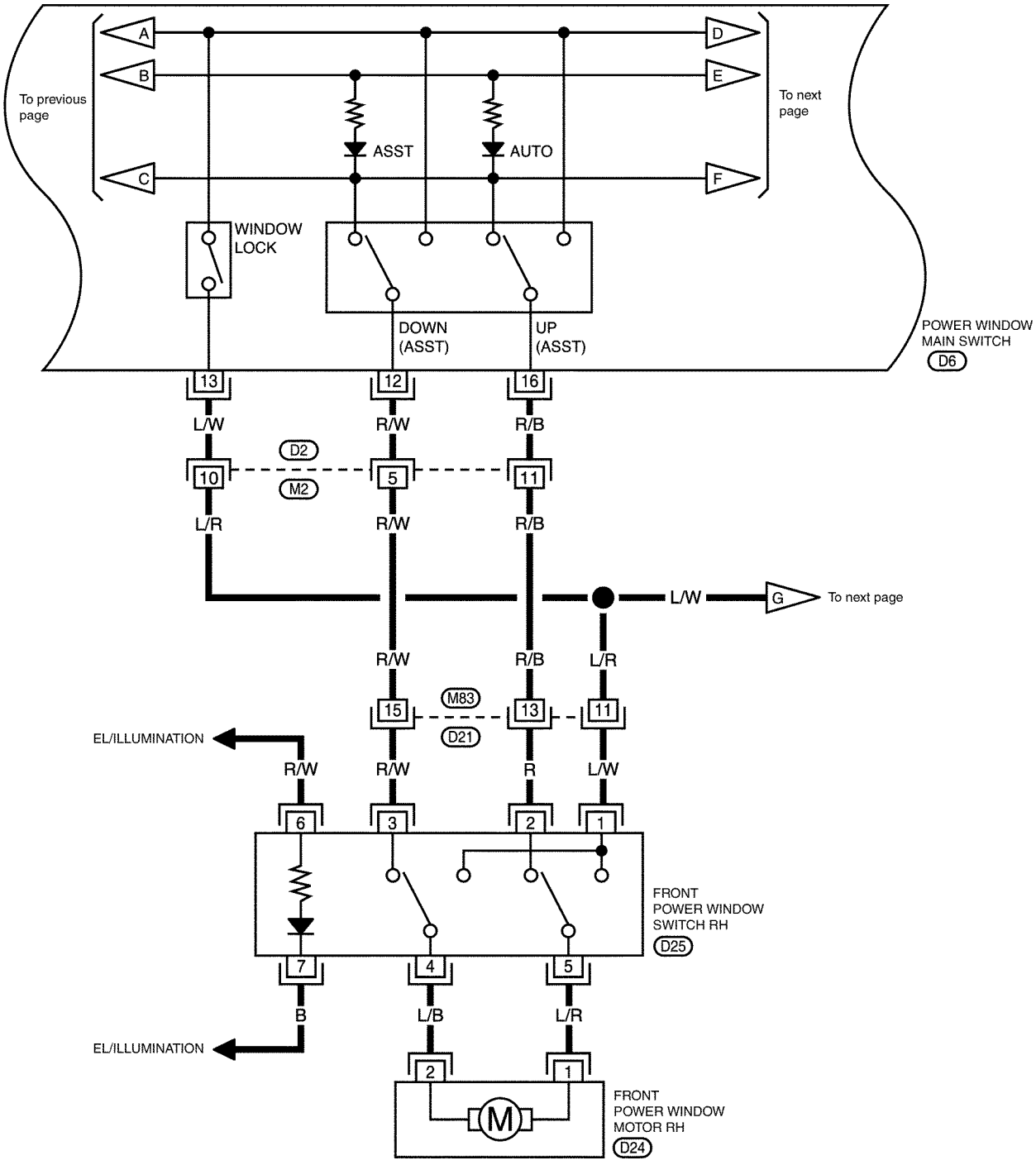


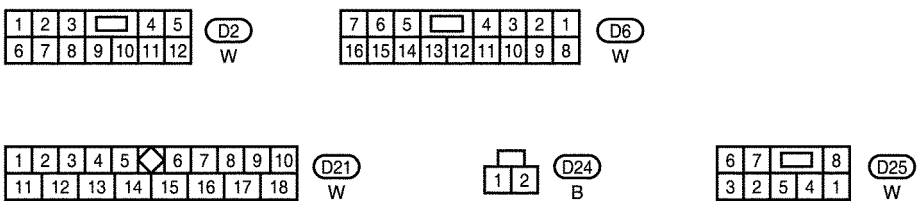


Refer to "FUSE BLOCK (J/B)"
M7

SRWZ033_O1

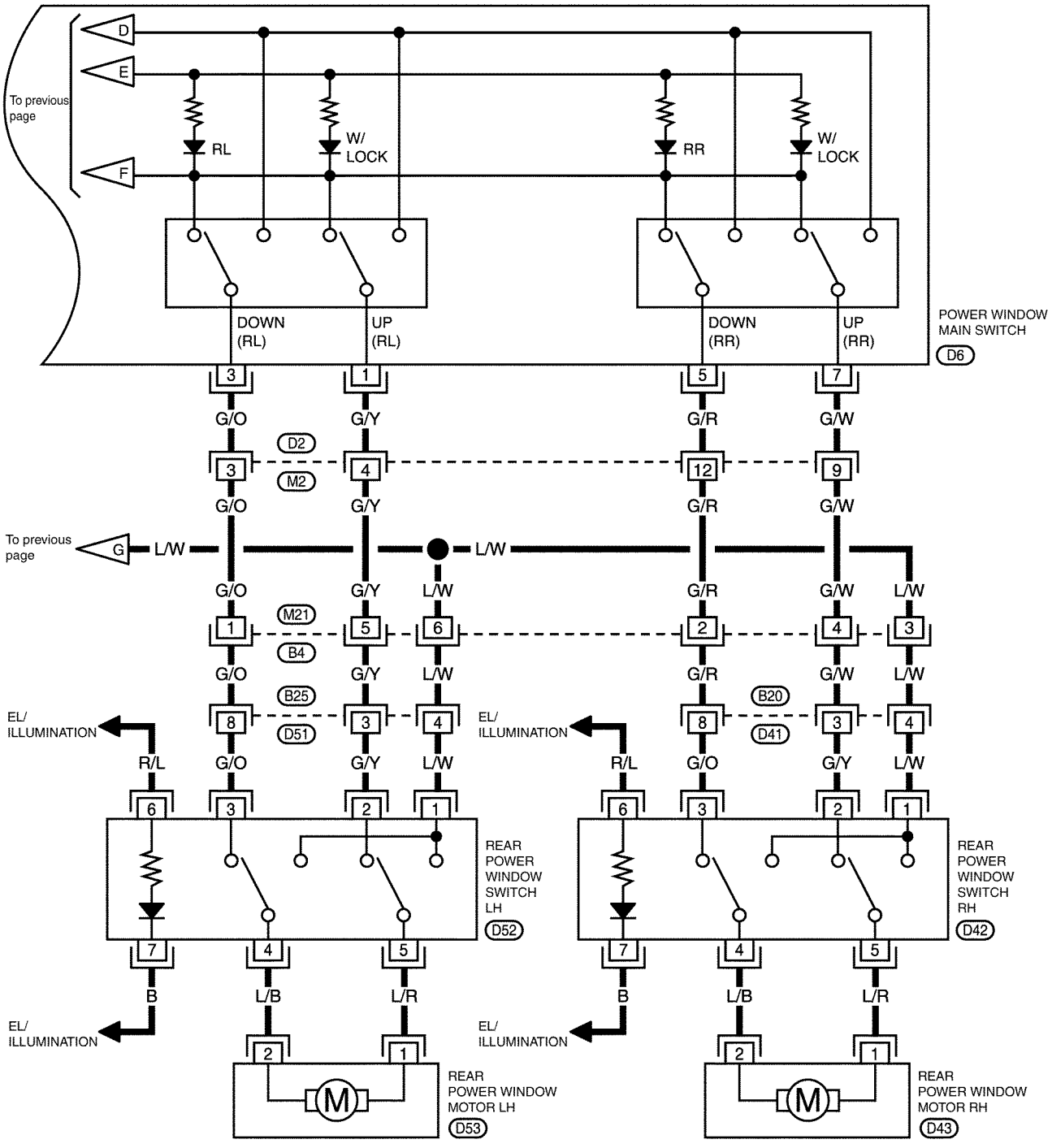
Wiring Diagram — EL/Power Window (4DR)- 02

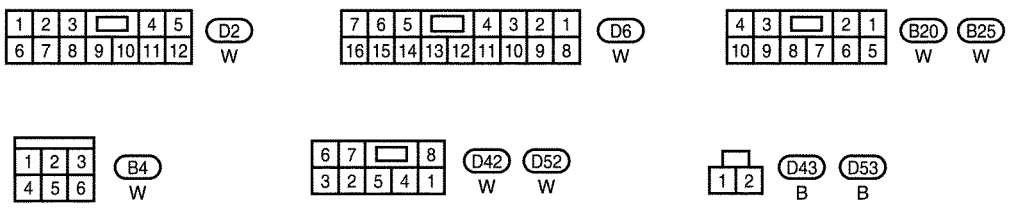




SRWZ034_O1

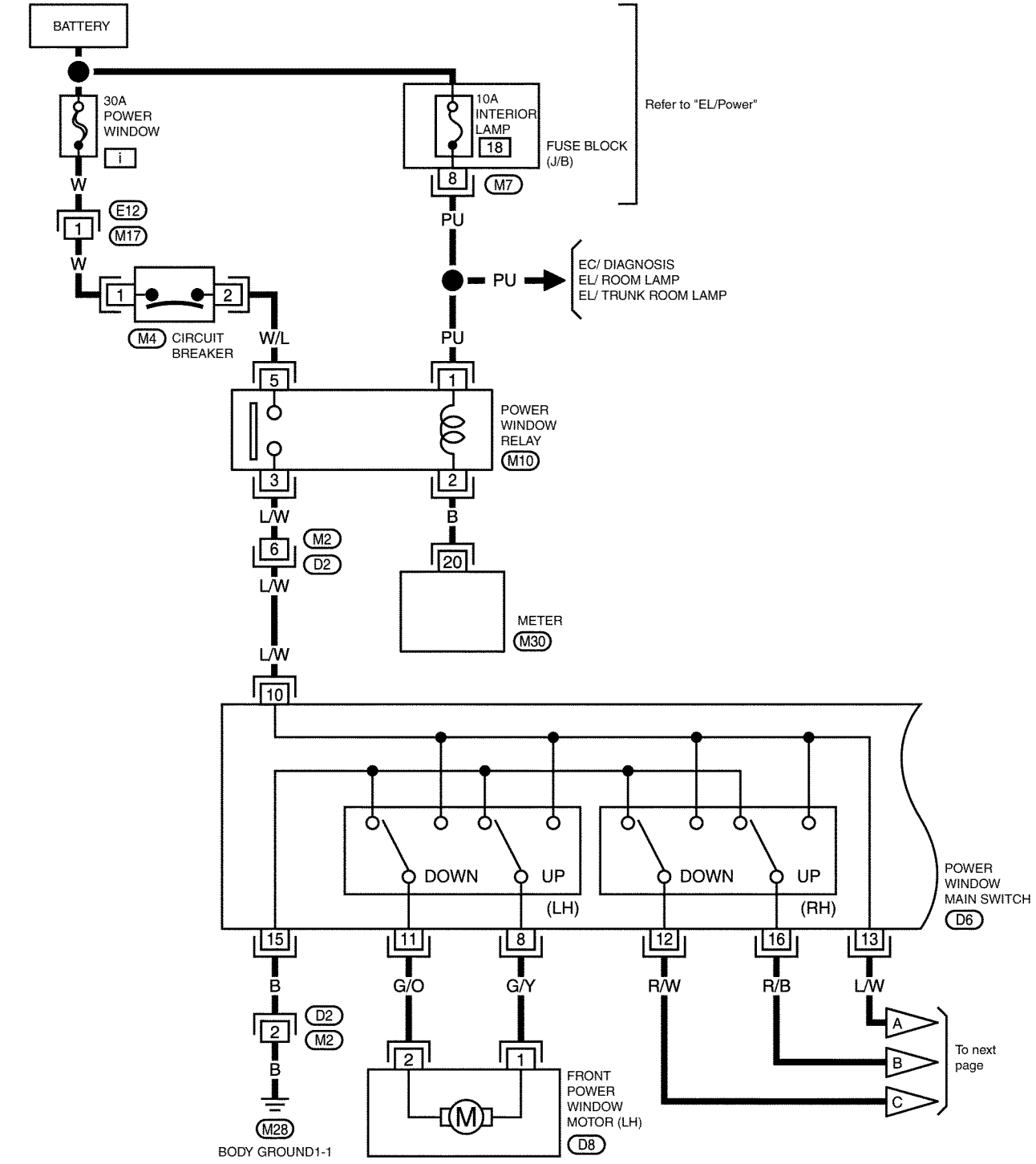
Wiring Diagram — EL/Power Window (4DR)- 03

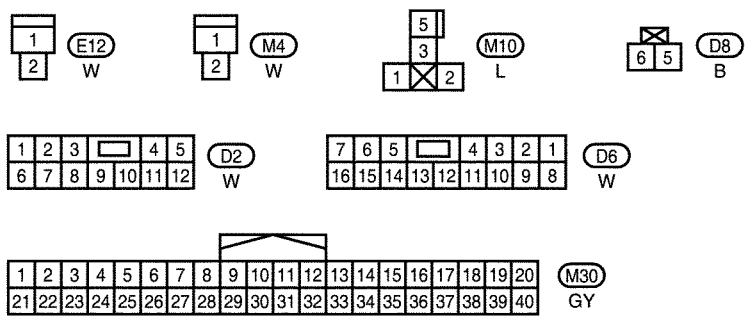




SRWZ035_O1

Wiring Diagram — EL/Power Window (2DR) - 01



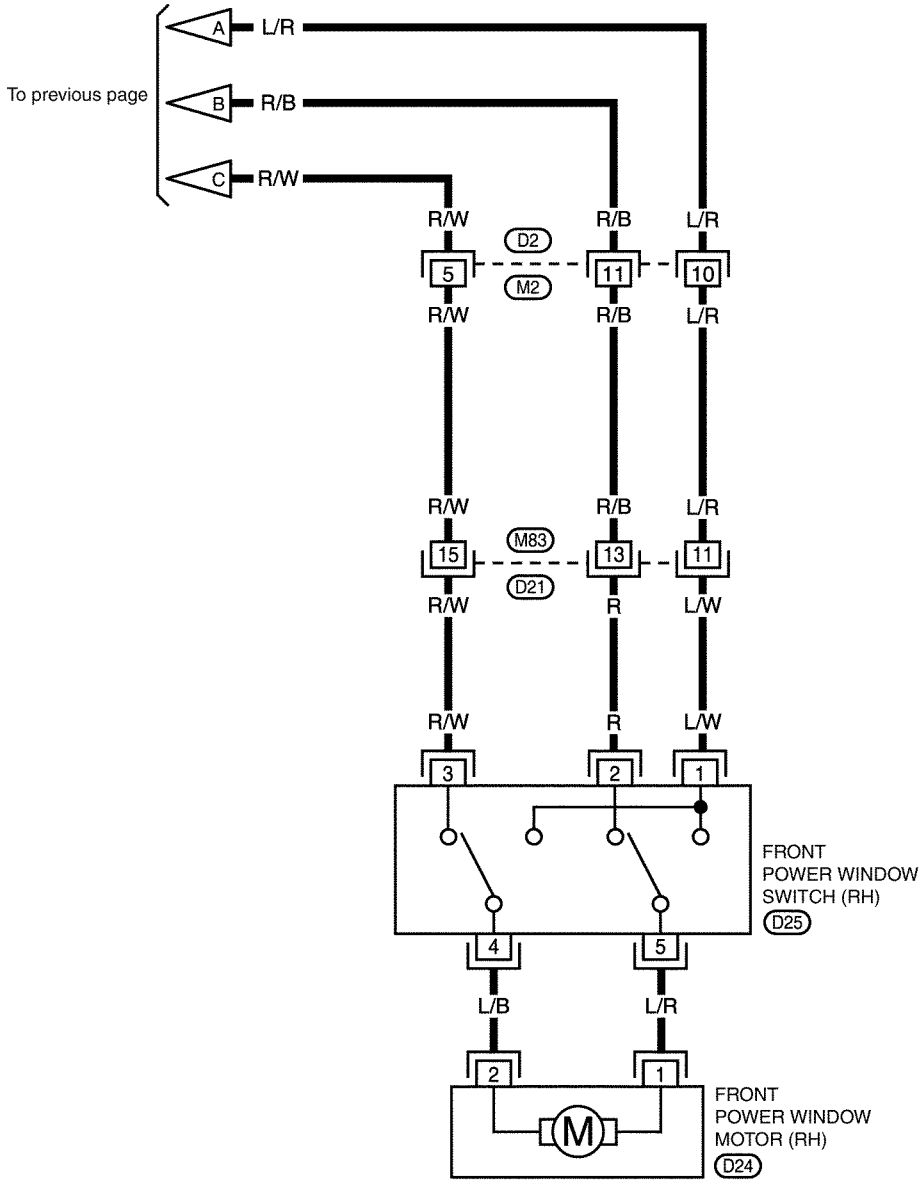


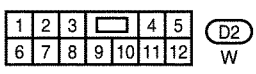
REFER TO FUSE BLOCK (J/B)

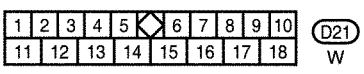
M7

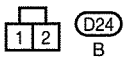
SRWZ075_O1

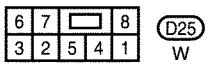
Wiring Diagram — EL/Power Window (2DR)- 02











SRWZ076_O1

Battery saver relay circuit

POSSIBLE CAUSE

Battery saver relay circuit **CC.1 : Short to power**

DTC Detecting Condition	When operating the battery saver relay **CC.1: If the battery saver relay control consumes more voltage than estimated**

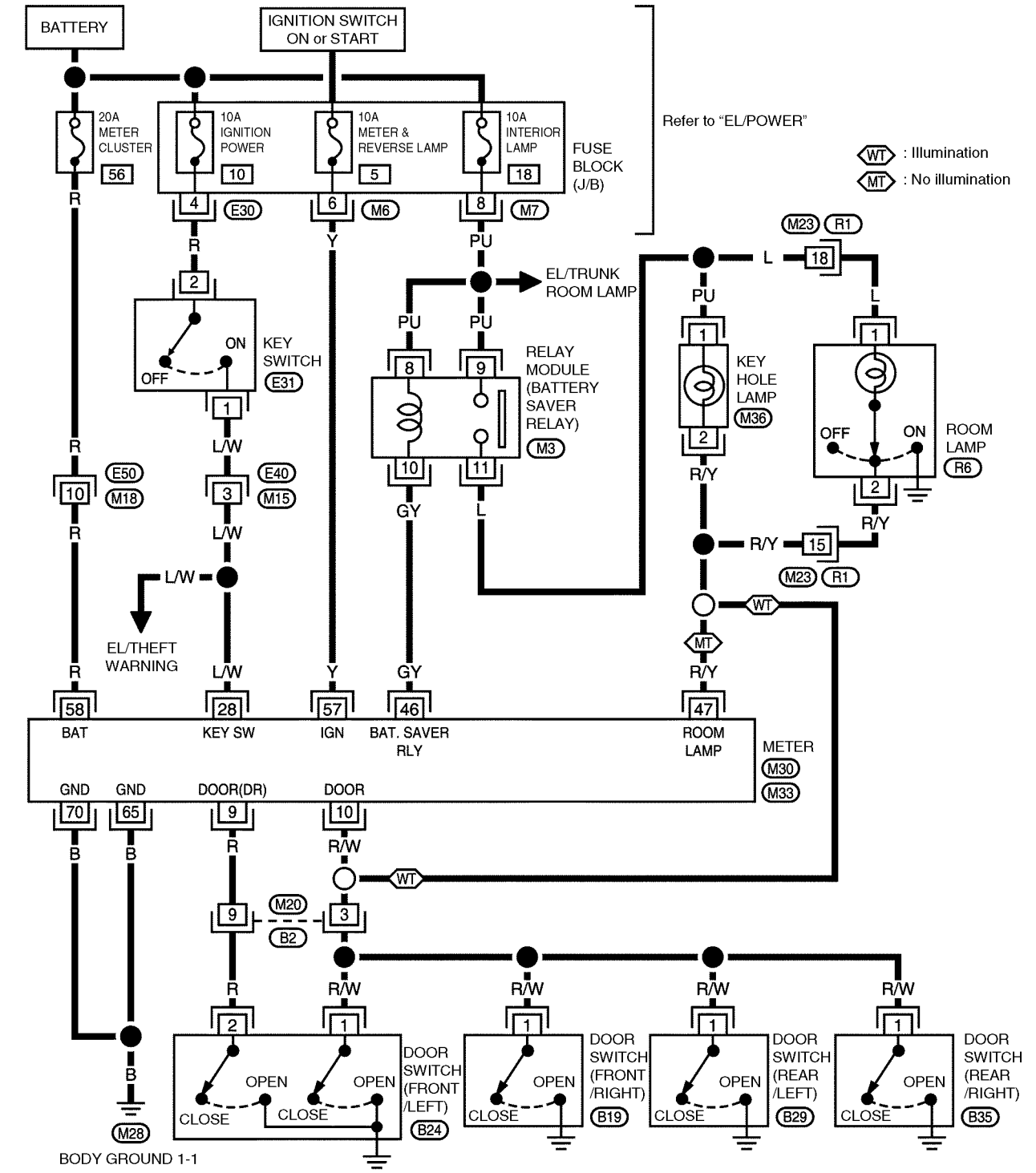
DIAGNOSIS PROCEDURE

Refer to Wiring Diagram (EL-104).

Check the control voltage of the battery saver relay. Check the voltage between the control unit M33 connector terminal No. 46 and ground. Ignition ON - approx. 1 V After 30 minutes from when turning the room lamp ON with ignition OFF and key-in switch OFF - approx. 12 V Repair the circuit if necessary.
Check the battery saver relay control circuit for short to power. Disconnect the battery saver relay and combination meter connectors. Check the voltage between the control unit M33 connector terminal No. 46 and ground. Specified value: The voltage should not be detected. The control circuit is short to power supply circuit if the battery voltage is detected. Repair the circuit if necessary.

Check after repair	Perform the fault detection procedure and check the malfunction does not occur again. Check the possible causes related to this failure to make sure there is no fault. Erase the fault memory.

Wiring Diagram — EL/Room Lamp



SRWZ023_O1

Engine coolant temperature output circuit

POSSIBLE CAUSE

Engine coolant temperature output circuit **CC.1: Short to power**

DTC Detecting Condition	**CC.1: If the engine coolant temperature output circuit consumes more voltage than estimated**

DIAGNOSIS PROCEDURE

Refer to Wiring Diagram (AC-15).

Check the signal of the engine coolant temperature output circuit. Check the voltage between the control unit M30 connector terminal No. 16 and ground. Specified value: Coolant temperature is below approx. 55°C - approx. 12 V Specified value: Coolant temperature is over approx. 55°C - approx. 0 V Repair the circuit if necessary.
Check the engine coolant temperature output circuit for short to power. Remove the meter control unit and automatic A/C controller connectors. Check the voltage between the control unit M30 connector terminal No. 16 and ground. Specified value: The voltage should not be detected. The control circuit is short to power supply circuit if the battery voltage is detected. Repair the circuit if necessary.

Check after repair	Perform the fault detection procedure and check the malfunction does not occur again. Check the possible causes related to this failure to make sure there is no fault. Erase the fault memory.

Door lock relay circuit

POSSIBLE CAUSE

Door lock relay circuit **CC.1: Short to power**

DTC Detecting Condition	When operating the door lock relay **CC.1: If the door lock relay control consumes more voltage than estimated**

DIAGNOSIS PROCEDURE

Refer to Wiring Diagram (EL-108).

Check the control voltage of door lock relay. Check the voltage between the control unit M33 connector terminal No. 65 and ground. Door locked - approx. 1 V Others - approx. 12 V Repair the circuit if necessary.
Check the door lock relay control circuit for short to power. Disconnect the door lock relay and combination meter connectors. Check the voltage between the control unit M33 connector terminal No. 65 and ground. Specified value: The voltage should not be detected. The control circuit is short to power supply circuit if the battery voltage is detected. Repair the circuit if necessary.

Check after repair	Perform the fault detection procedure and check the malfunction does not occur again. Check the possible causes related to this failure to make sure there is no fault. Erase the fault memory.

Driver's door unlock relay circuit, Other door unlock relay circuit

POSSIBLE CAUSE

Driver's door unlock relay circuit **Other door unlock relay circuit** **CC.1: Short to power**

DTC Detecting Condition	When operating the door unlock relay **CC.1: If the door unlock relay control consumes more voltage than estimated**

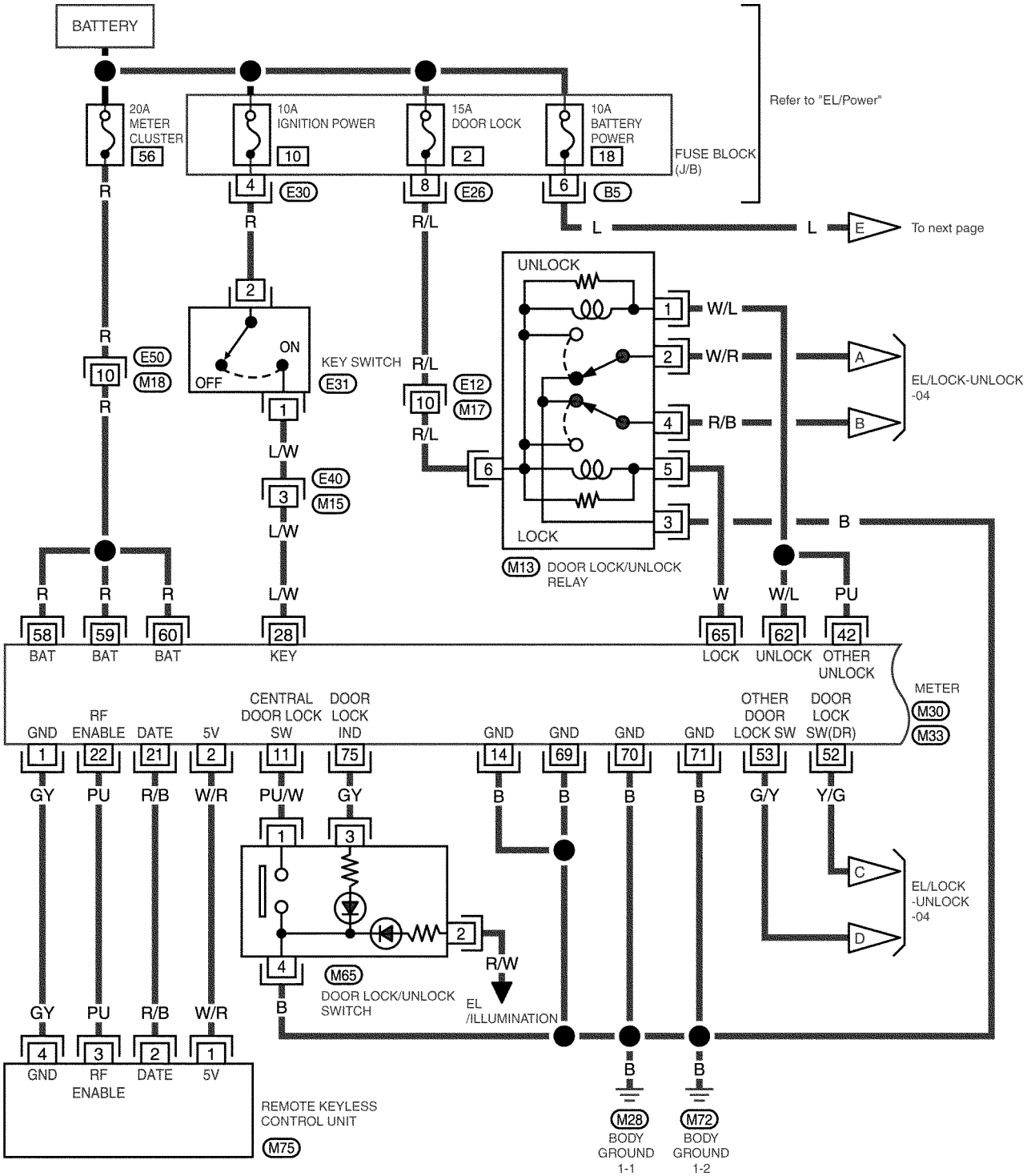
DIAGNOSIS PROCEDURE

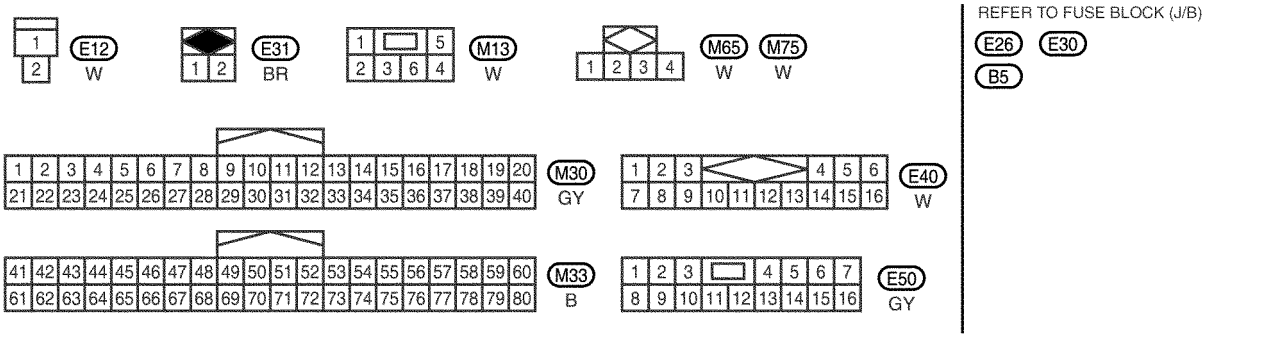
Refer to Wiring Diagram (EL-108).

Check the control voltage of door unlock relay. Check the voltage between the control unit M33 connector terminal No. 62 or 42 and ground. Door locked - approx. 1 V Others - approx. 12 V Repair the circuit if necessary.
Check the door unlock relay control circuit for short to power. Disconnect the door lock relay and combination meter connectors. Check the voltage between the control unit M33 connector terminal No. 62 or 42 and ground. Specified value: The voltage should not be detected. The control circuit is short to power supply circuit if the battery voltage is detected. Repair the circuit if necessary.

Check after repair	Perform the fault detection procedure and check the malfunction does not occur again. Check the possible causes related to this failure to make sure there is no fault. Erase the fault memory.

Wiring Diagram — EL/Lock-Unlock- 01

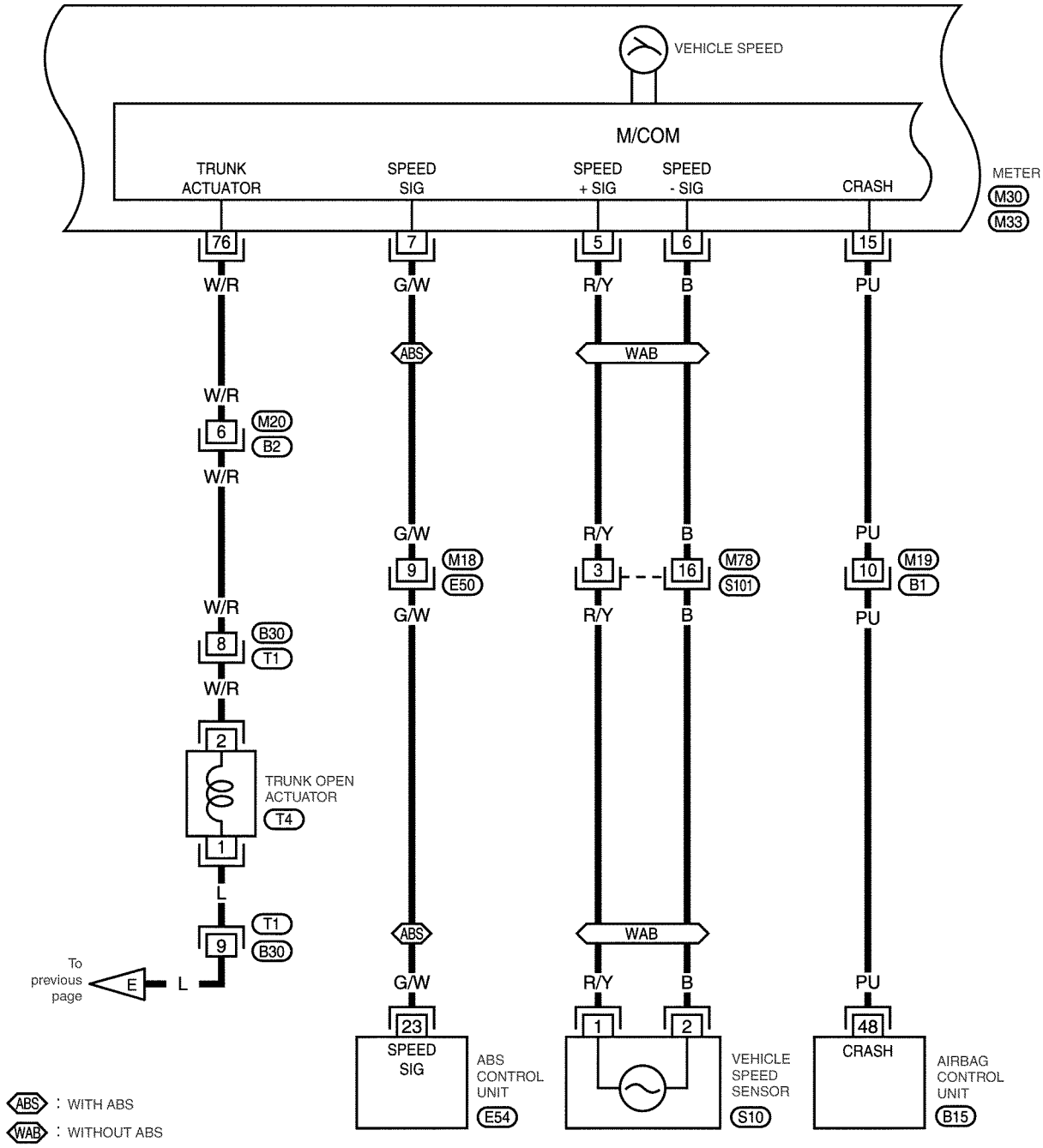


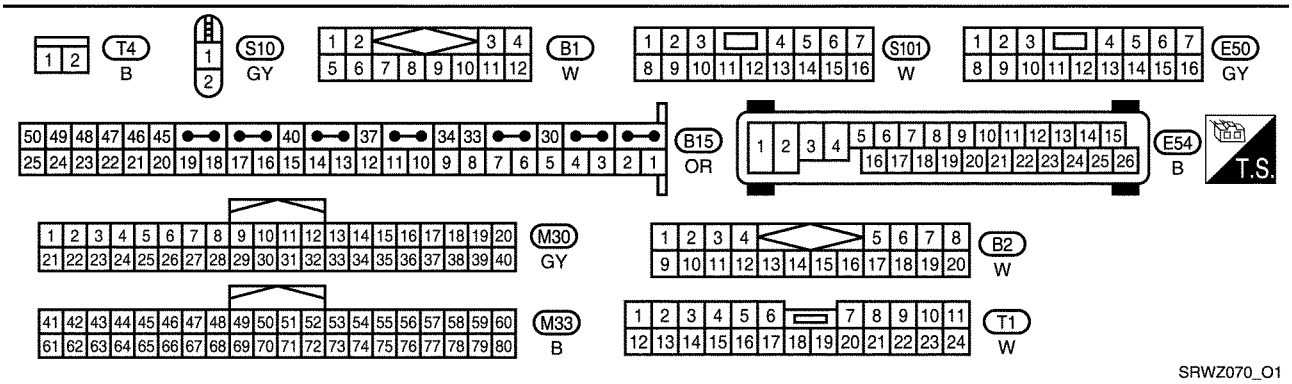


REFER TO FUSE BLOCK (J/B)
E26 E30 B5

SRWZ031_O1

Wiring Diagram — EL/Lock-Unlock- 02

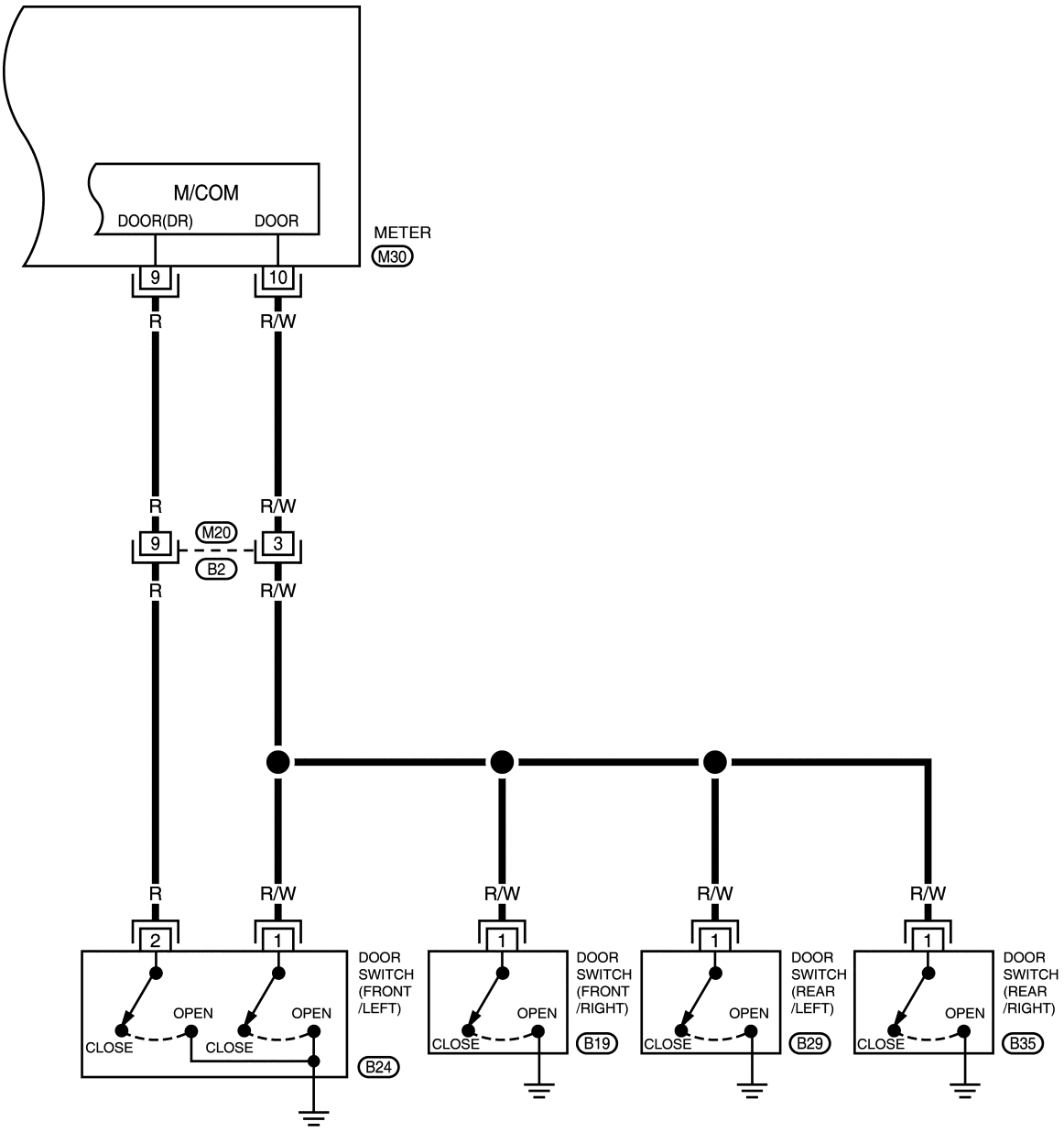


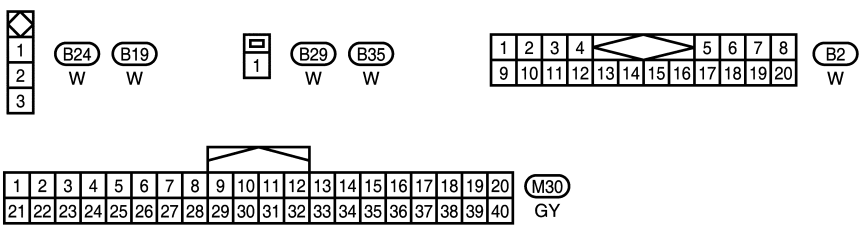


SRWZ070_O1

Wiring Diagram

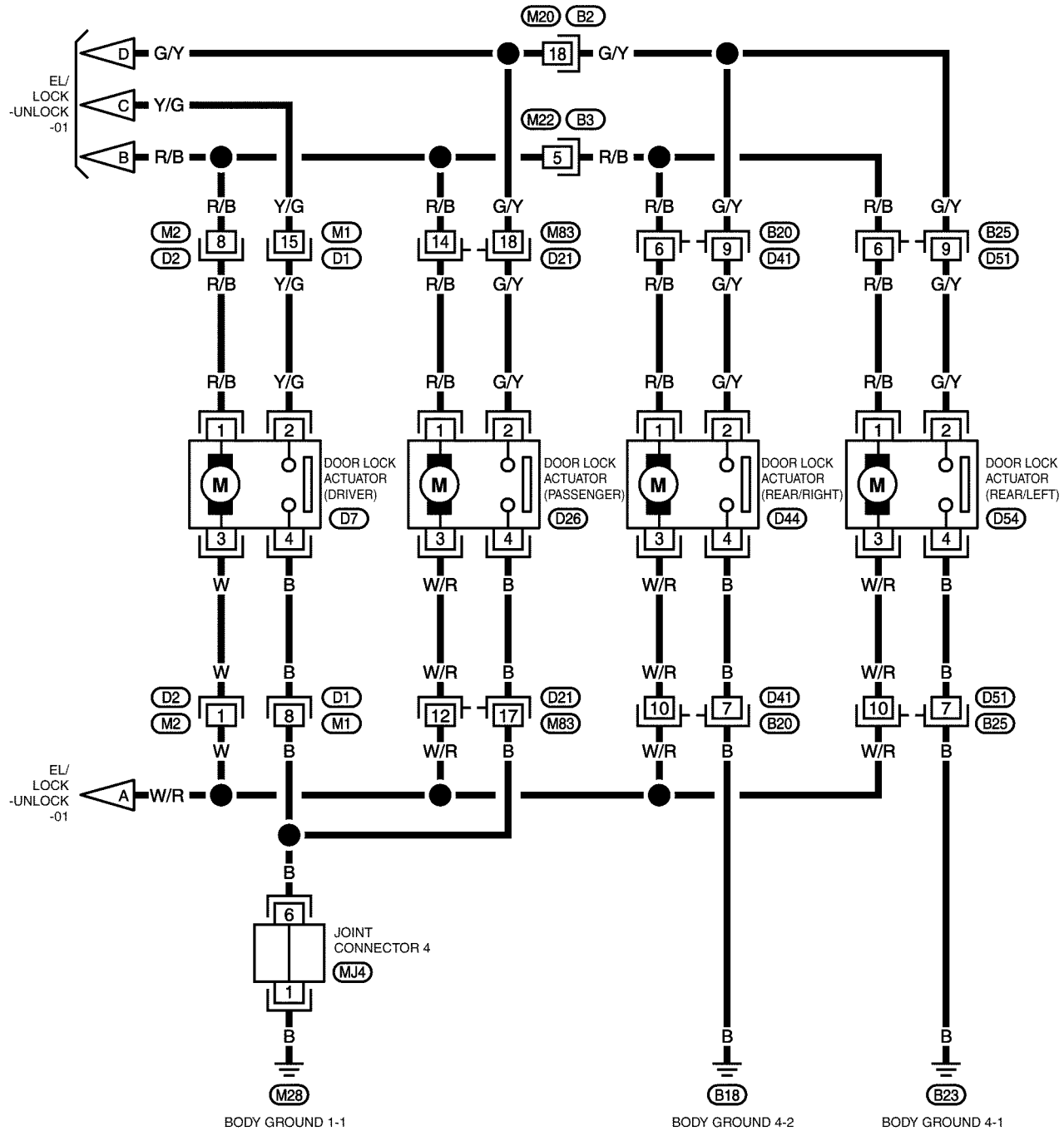
EL/Lock-Unlock- 03

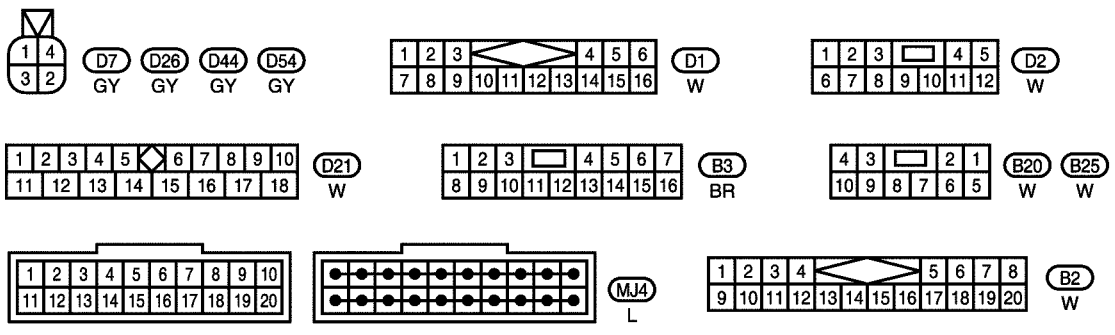




SRWZ072_O1

Wiring Diagram — EL/Lock-Unlock- 04





SRWZ032_O1

Air bag collision circuit

POSSIBLE CAUSE

Air bag collision circuit **1.DEF: No signal**

DTC Detecting Condition	**1.DEF: If there is no air bag collision signal input within 3 seconds after turning the ignition ON** **If there is no diagnosis pulse within 1.5 seconds after generating the diagnosis pulse**

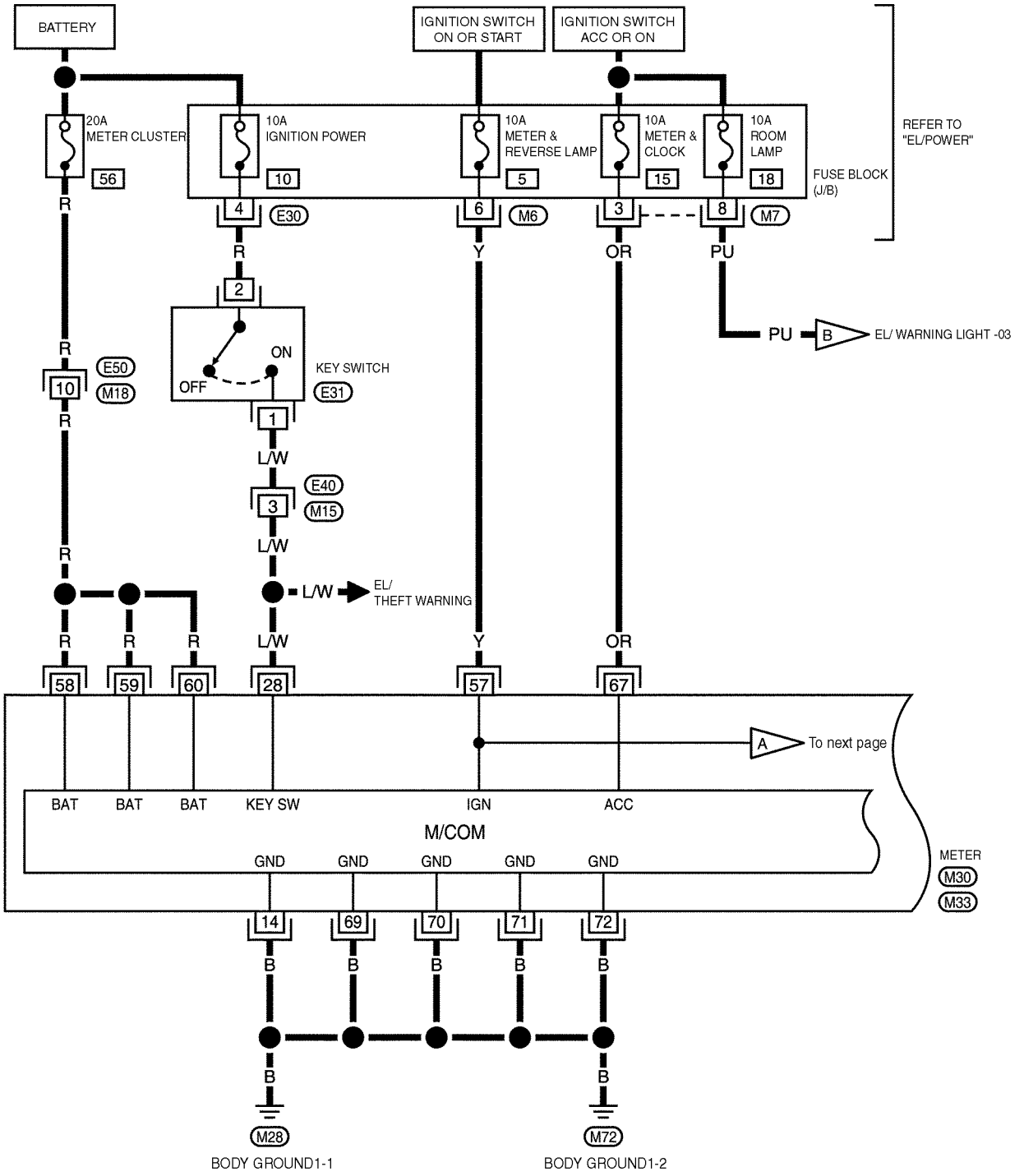
DIAGNOSIS PROCEDURE

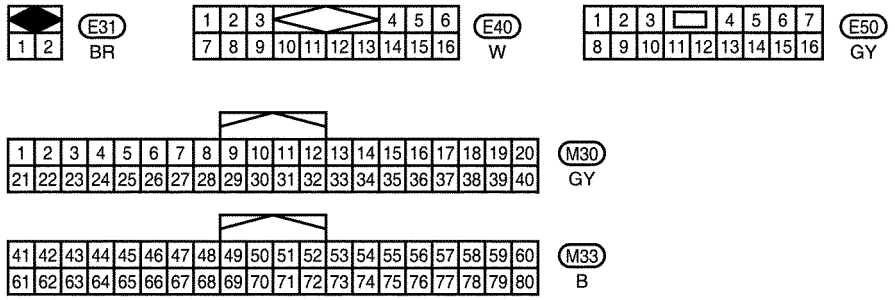
Refer to Wiring Diagram (EL-115).

Check the continuity of the air bag collision circuit. Disconnect the meter control unit and air bag control unit connectors. The meter control unit M30 connector terminal No. 15 and the air bag control unit B 15 connector terminal No. 48 Specified value: approx. 0W Repair the circuit if necessary.
Check the continuity between the air bag collision circuit and body. Disconnect the meter control unit and air bag control unit connectors. Check the continuity between the meter control unit M30 connector terminal No. 15 and body. Specified value: Continuity should no exist. Repair the circuit if necessary.
Check the air bag collision circuit for short to power. Disconnect the meter control unit and air bag control unit connectors. Check the voltage between the meter control unit M30 connector terminal No. 15 and body. Specified value: The voltage should not be detected. The control circuit is short to power supply circuit if the battery voltage is detected. Repair the circuit if necessary.
Replace the air bag unit and combination meter control unit if the fault stays.

Check after repair	Perform the fault detection procedure and check the malfunction does not occur again. Check the possible causes related to this failure to make sure there is no fault. Erase the fault memory.

Wiring Diagram — EL/Warning Light- 01

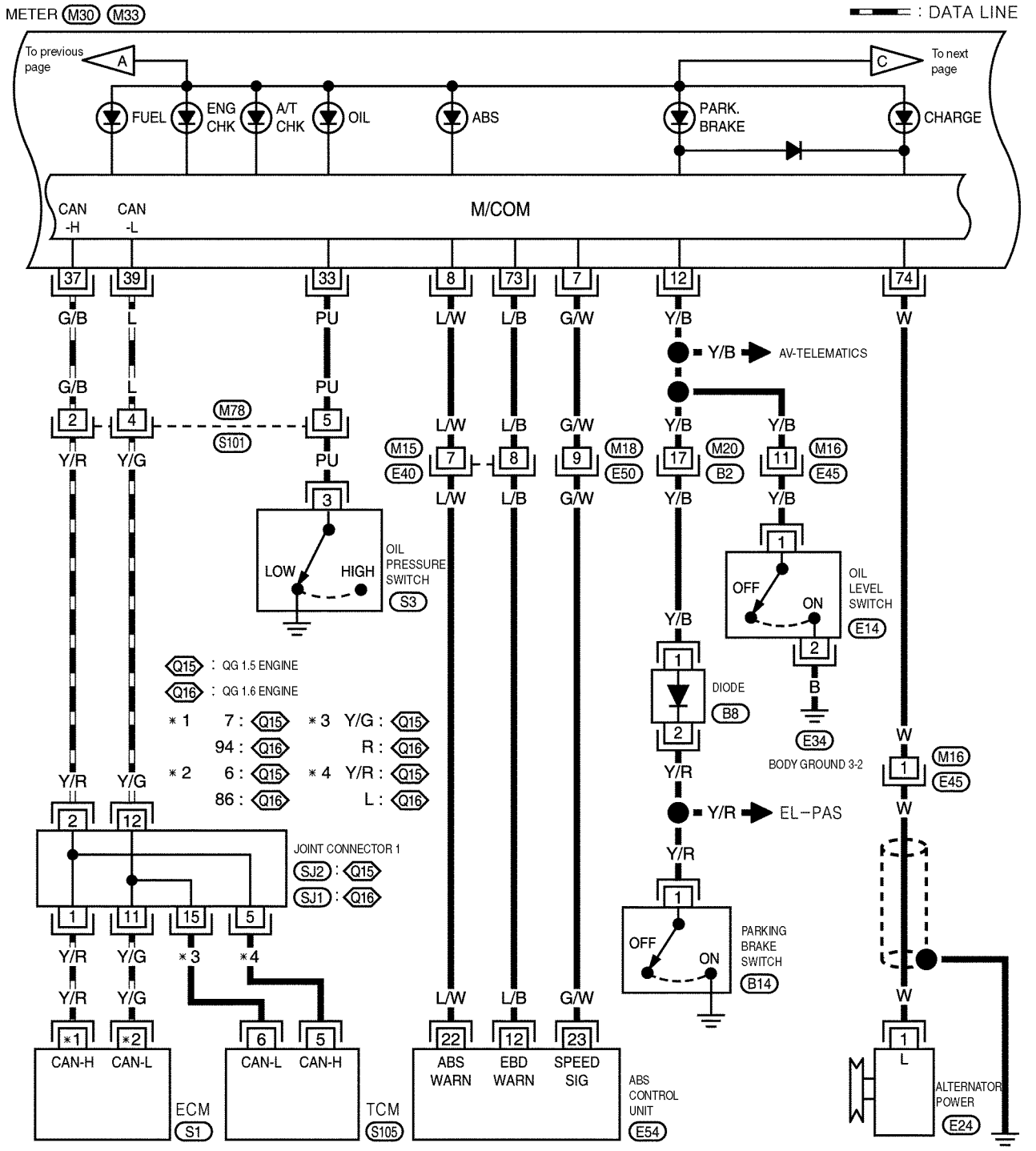


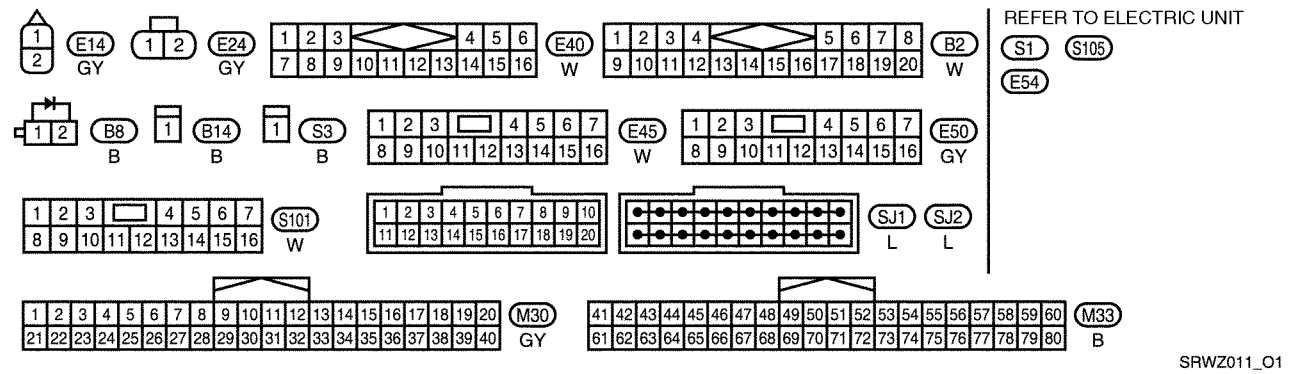


REFER TO FUSE BLOCK (J/B)
M6 M7
E30

SRWZ010_O1

Wiring Diagram — EL/Warning Light- 02

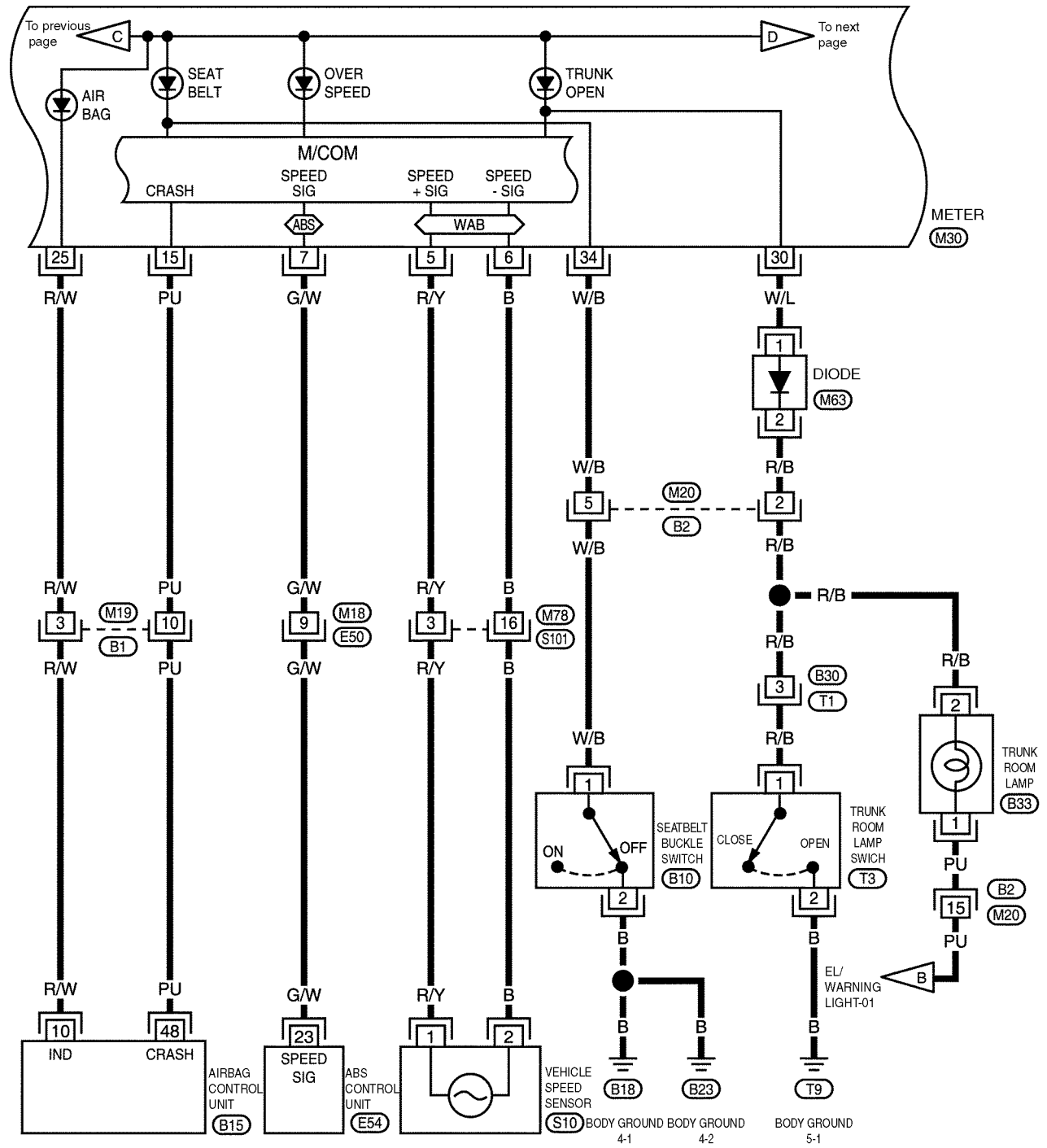




SRWZ011_O1

Wiring Diagram

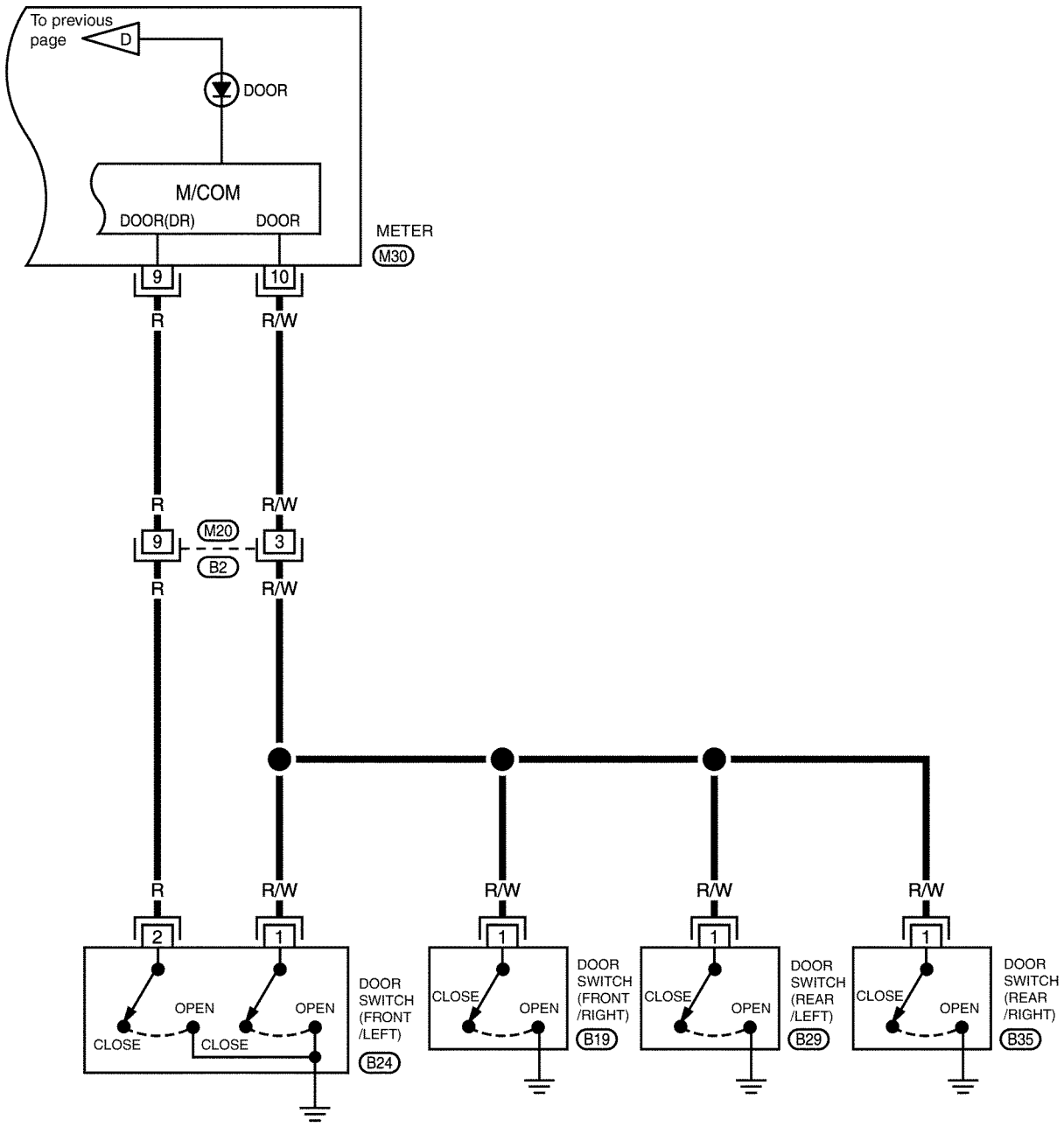
EL/Warning Light- 03

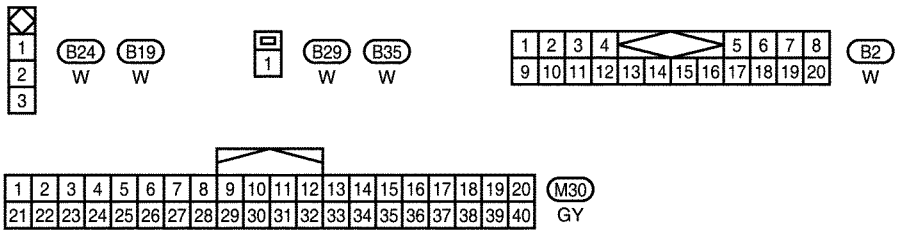


SRWZ012_O1

Wiring Diagram

EL/Warning Light- 04





SRWZ013_O1

Alarm relay circuit

POSSIBLE CAUSE

Alarm relay circuit **CC.1: Short to power**

DTC Detecting Condition	When operating the alarm relay **CC.1: If the alarm relay control consumes more voltage than estimated**

DIAGNOSIS PROCEDURE

Refer to Wiring Diagram (EL-119).

Check the control voltage of alarm relay. Check the voltage between the control unit M33 connector terminal No. 45 and ground. Alarm relay controlled - approx. 1 V Others - approx. 12 V Repair the circuit if necessary.
Check the alarm relay control circuit for short to power. Disconnect the horn relay and combination meter connectors. Check the voltage between the control unit M33 connector terminal No. 45 and ground. Specified value: The voltage should not be detected. The control circuit is short to power supply circuit if the battery voltage is detected. Repair the circuit if necessary.

Check after repair	Perform the fault detection procedure and check the malfunction does not occur again. Check the possible causes related to this failure to make sure there is no fault. Erase the fault memory.

Anti-theft relay circuit

POSSIBLE CAUSE

Anti-theft relay circuit **CC.1: Short to power**

DTC Detecting Condition	When operating the anti-theft relay **CC.1: If the anti-theft relay control consumes more voltage than estimated**

DIAGNOSIS PROCEDURE

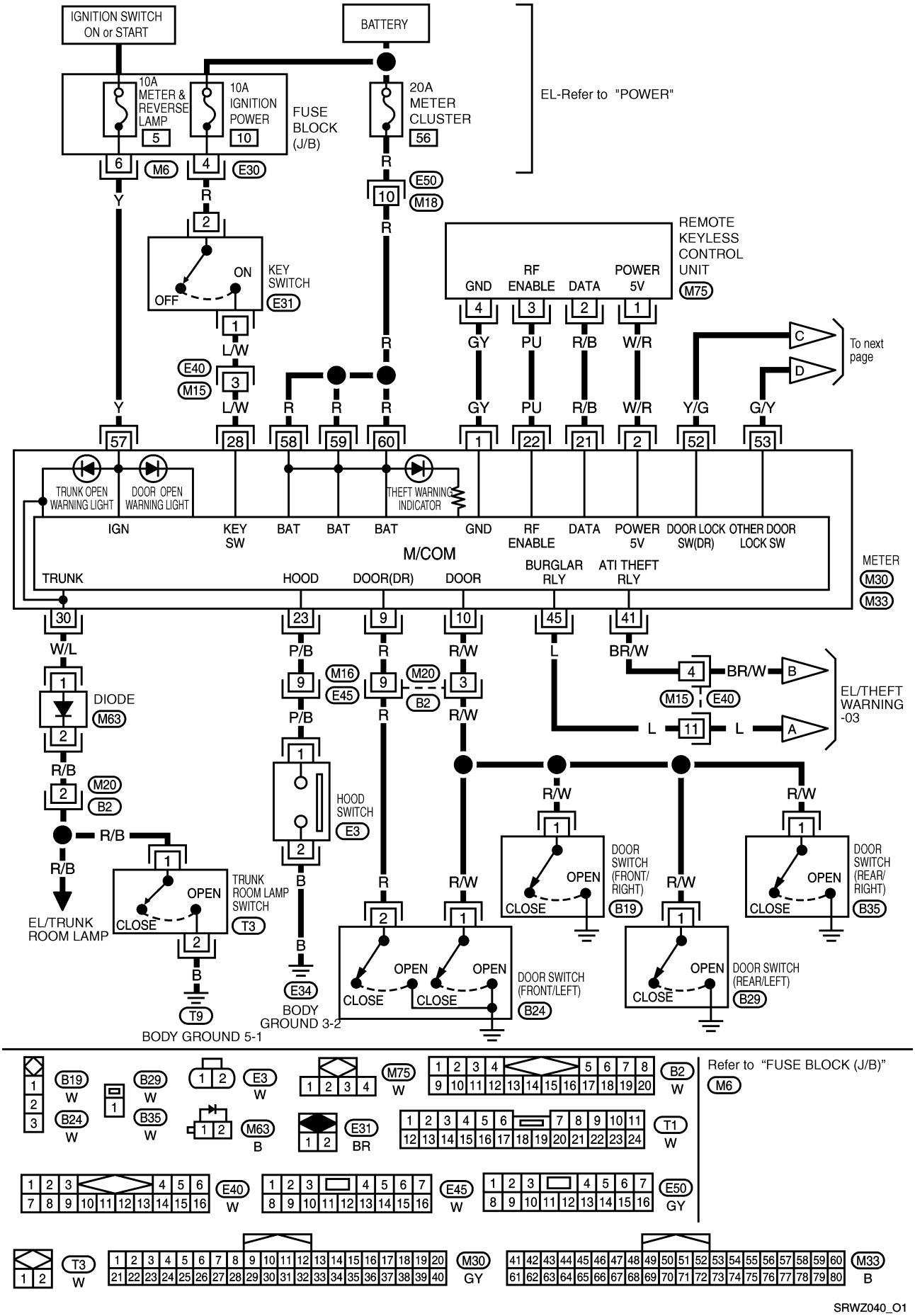
Refer to Wiring Diagram (EL-119).

Check the control voltage of anti-theft relay. Check the voltage between the control unit M33 connector terminal No. 41 and ground. Anti-theft relay controlled - approx. 1 V Others - approx. 12 V Repair the circuit if necessary.
Check the anti-theft relay control circuit for short to power. Disconnect the anti-theft relay and combination meter connectors. Check the voltage between the control unit M33 connector terminal No. 41 and ground. Specified value: The voltage should not be detected. The control circuit is short to power supply circuit if the battery voltage is detected. Repair the circuit if necessary.

Check after repair	Perform the fault detection procedure and check the malfunction does not occur again. Check the possible causes related to this failure to make sure there is no fault. Erase the fault memory.

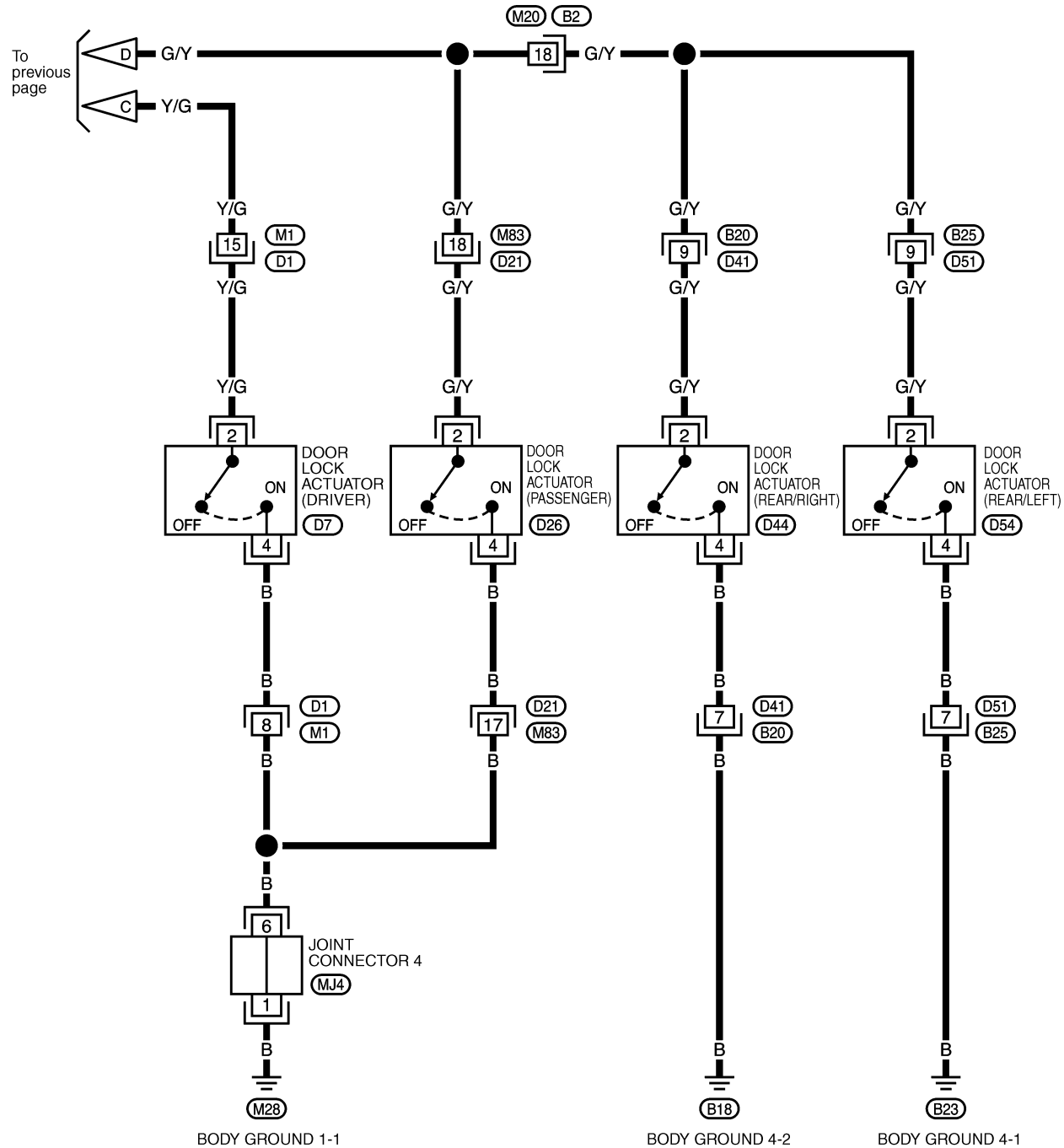
Wiring Diagram

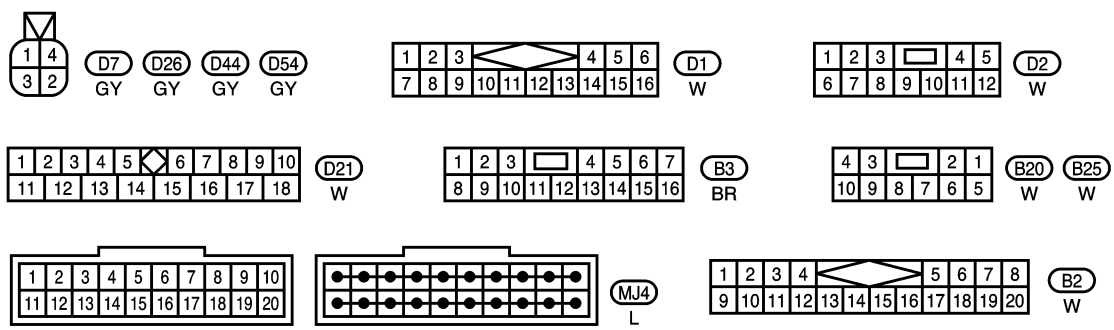
EL/Anti-Theft- 01



SRWZ040_O1

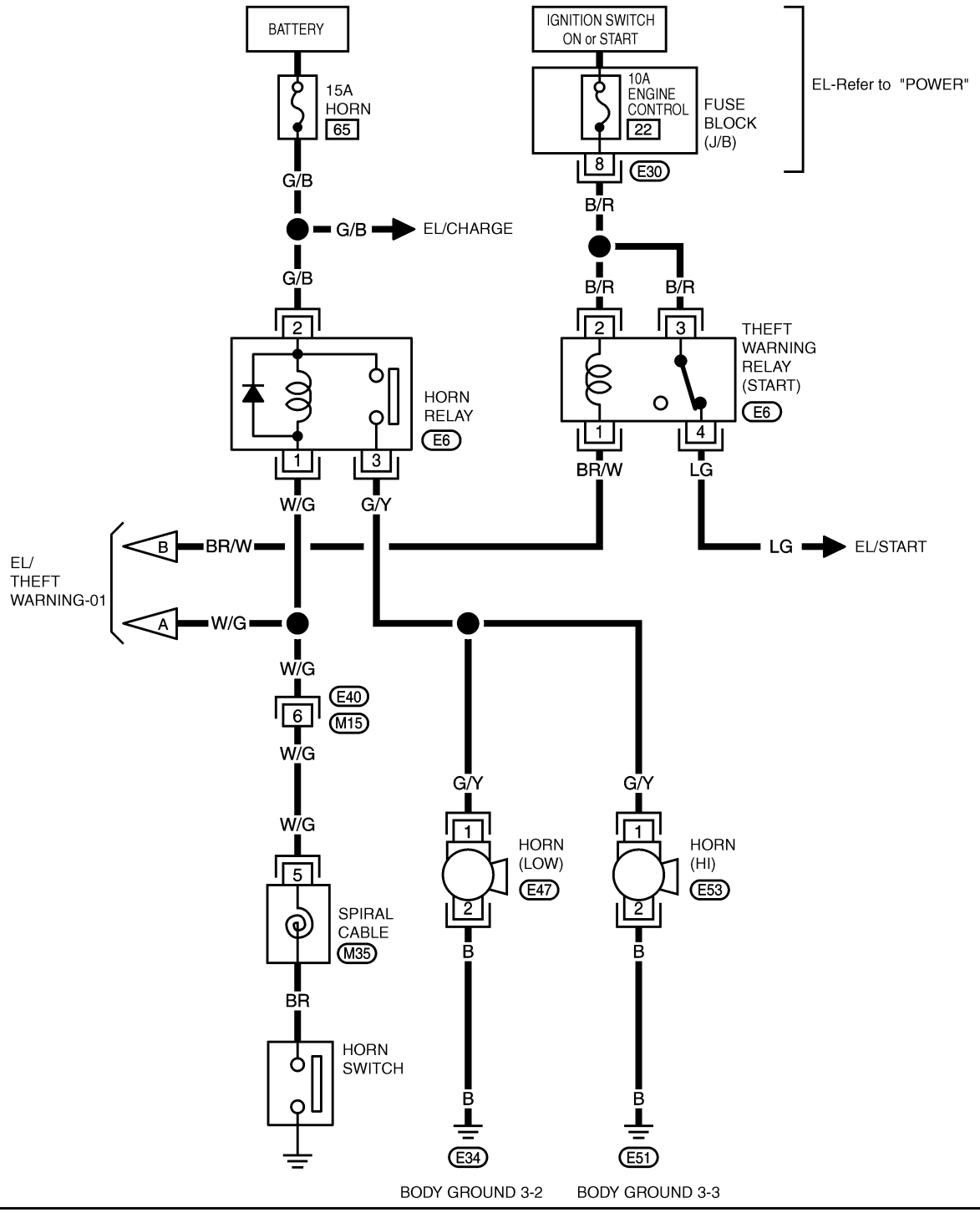
Wiring Diagram



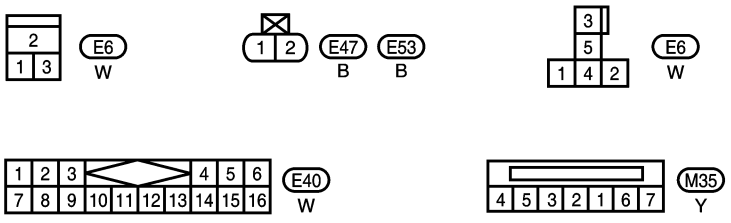


SRWZ069_O1

Wiring Diagram



Refer to "FUSE BLOCK (J/B)"
E30



SRWZ041_O1

Engine immobilizer circuit

POSSIBLE CAUSE

Engine immobilizer circuit

DTC Detecting Condition	**If no signal come from immobilizer antenna.**

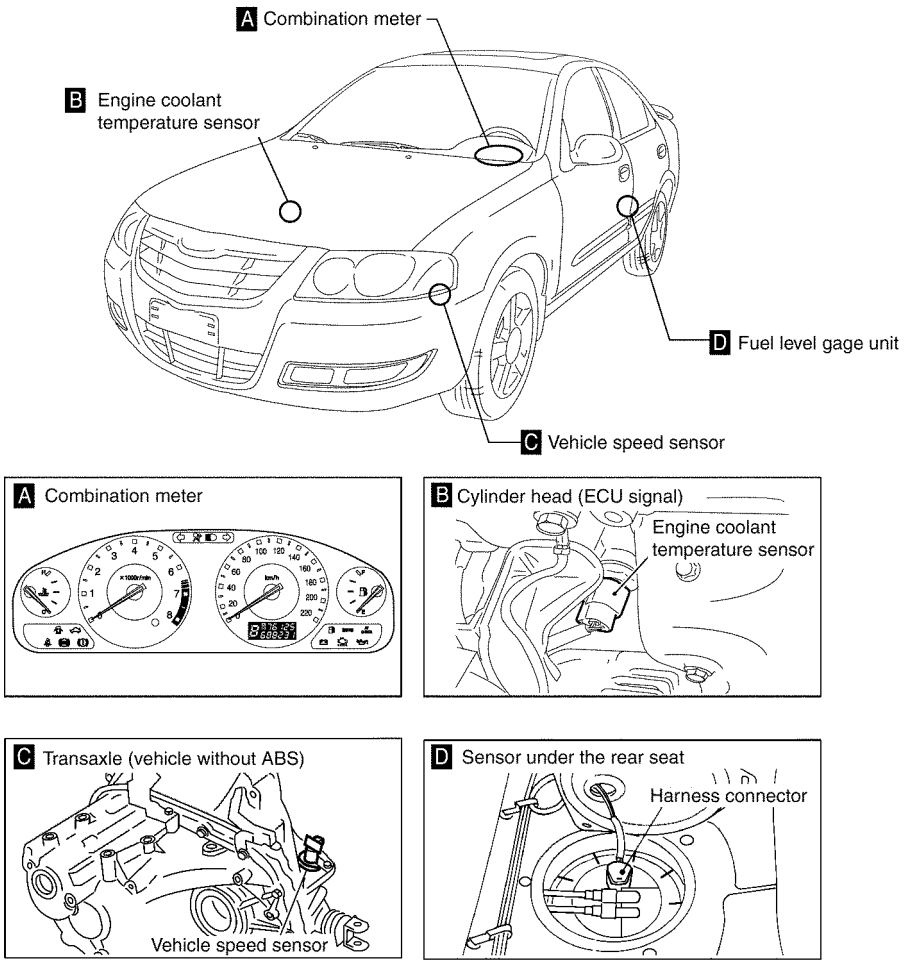
DIAGNOSIS PROCEDURE

Refer to Wiring Diagram (EL-169).

Refer to EL - Immobilizer Antenna Inspection (EL-171).

Check after repair	Perform the fault detection procedure and check the malfunction does not occur again. Check the possible causes related to this failure to make sure there is no fault. Erase the fault memory.

Components Location



CAN Communication System Description

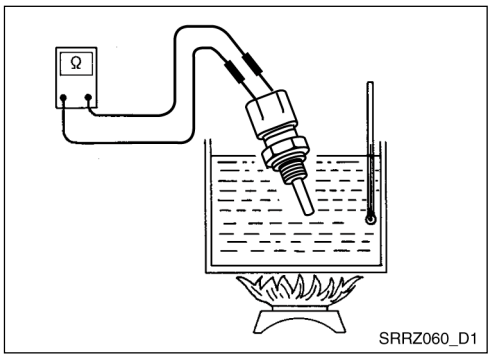
CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information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

Refer to LAN section.

Meter CAN Communication System

The meter receives data from the ECCS control unit through the communication line using the CAN communication to get the required engine coolant temperature signal and the engine speed signal so that the data are displayed in the gauge.

Refer to LAN section.



Component Inspection

ENGINE COOLANT TEMPERATURE SENSOR SIGNAL

- Send the engine coolant temperature value detected by the engine ECM to the meter using the CAN communication line.
- Remove the engine coolant temperature sensor and check as indicated in the figure.

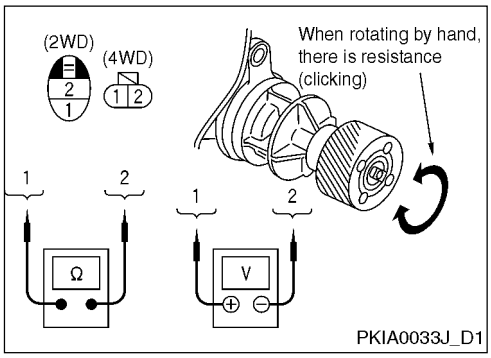
Resistance

When the temperature is 20°C: Approx. 2.5 kΩ

When the temperature is 80°C: Approx. 0.3 kΩ

CHECK CAN COMMUNICATION LINE

Meter Terminal No.	ECM Terminal No.	Measured condition	Measured value
37	QG 15: 7 / QG 16: 94	Check continuity between terminals	Approx. 0 Ω
39	QG 15: 6 / QG 16: 86		



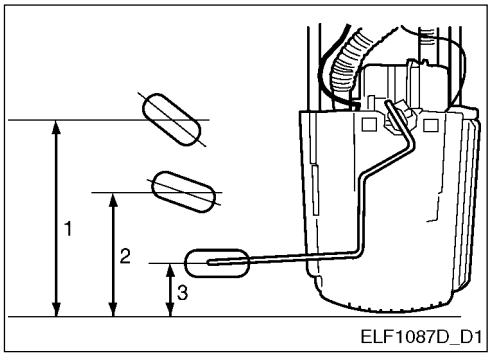
VEHICLE SPEED SENSOR

- Detect the vehicle speed with the signal of the vehicle speed sensor if the vehicle is not equipped with ABS.
- Remove the vehicle speed sensor from the vehicle.
- Measure the vehicle speed sensor voltage and resistance.

Terminal No.	Condition	Voltage (V)	Resistance (Ω)
1 - 2	Rotate the sensor with hand	Approx. 0 - 5	-
	-	-	Approx. 180 - 250

- The ABS control unit detects the wheel speed sensor signal and sends it to the meter if the vehicle is equipped with ABS.

Meter Terminal No.	ABS control unit terminal No.	Measured condition	Measured value
7	23	Check continuity between terminals	Approx. 0 Ω



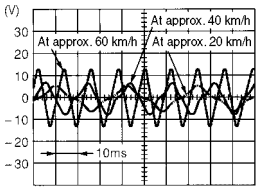
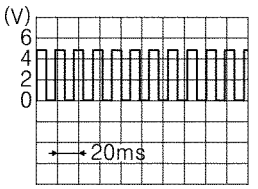
FUEL LEVEL GAGE UNIT (SENSOR SIDE)

- Remove the fuel level gage unit from the vehicle.
- Make flat the gage flange.
- Measure the gage resistance by locating fuel level gage to full, 1/2 and empty.

Terminal No.		Float position		Resistance
3	5	Full (1)	Approx. 160.3	Approx. 6
		1/2 (2)	Approx. 97.5	Approx. 33
		Empty (3)	Approx. 32	Approx. 80

Meter Control Unit Input/Output Signal Standards

Refer to Wiring Diagram (EL-83).

Terminal No.	Signal	Measurement		Standard value
		Key switch	Operation or status	
58, 59, 60	Battery power	OFF	-	Approx. 12 V
28	Ignition power	ON	-	Approx. 12 V
57	Ignition switch ON or OFF	ON, START	-	Approx. 12 V
67	Ignition switch ACC or ON	ACC or ON	-	Approx. 12 V
14, 69, 70, 71, 72	Ground	ON	-	Approx. 0 V
4	Fuel level gage signal	ON	-	Refer to “Fuel Level Gage Unit” in “Components Inspection” (EL-124)
37	CAN - H	-	-	-
39	CAN - L	-	-	-
5	Vehicle speed signal (vehicle without ABS)	ON	When speedometer is operating (At approx. 20 km/h) At 40 km/h (At approx. 40 km/h) At 60 km/h (At approx. 20 km/h) At 20 km/h	 SRDX0350D_D1
7	Vehicle speed signal (USO)	ON	When speedometer is operating (Vehicle speed in approx. 20 km/h)	 SRDX714_D1

Fuel Level Gage System

The following symptoms are not malfunction.

Fuel Level Gage

- Sometimes the needle moves when fuel inside the tank moves while vehicle driving or according to driving conditions.
- While filling the fuel into the tank when the key switch is ON, the needle rises slower than actual level.

Low Fuel Level Warning Light

- Sometimes the warning light turning on timing varies when the fuel inside the tank moves during driving or due to vehicle positions.

Inspection Procedure

1. Connector Inspection

1. Turn the key switch OFF.
2. Inspect the meter and fuel level gage unit terminals (meter, unit and harness sides) for looseness or bend.

Inspection results are OK?

OK → Go to No. 2.

NG → Repair the terminal or connector.

2. Continuity Inspection

1. Remove the meter and fuel level gage unit connectors.
2. Check the continuity between the meter terminal No. 3 and fuel level gage unit terminal No. 2.
3. Check the continuity between the meter terminal No. 4 and fuel level gage unit terminal No. 1.

Is there continuity?

OK → Go to No. 3.

NG → Repair the terminal or connector.

3. Fuel Level Gage Unit Inspection

Inspect the components. Refer to “FUEL LEVEL GAGE UNIT” (EL-124).

Inspection results are OK?

OK → Go to No. 4.

NG → Replace the fuel level gage unit.

4. Installation Status Check

Inspect for any interference or entanglement in the fuel level gage unit’s installation, float arm and the components inside the tank.

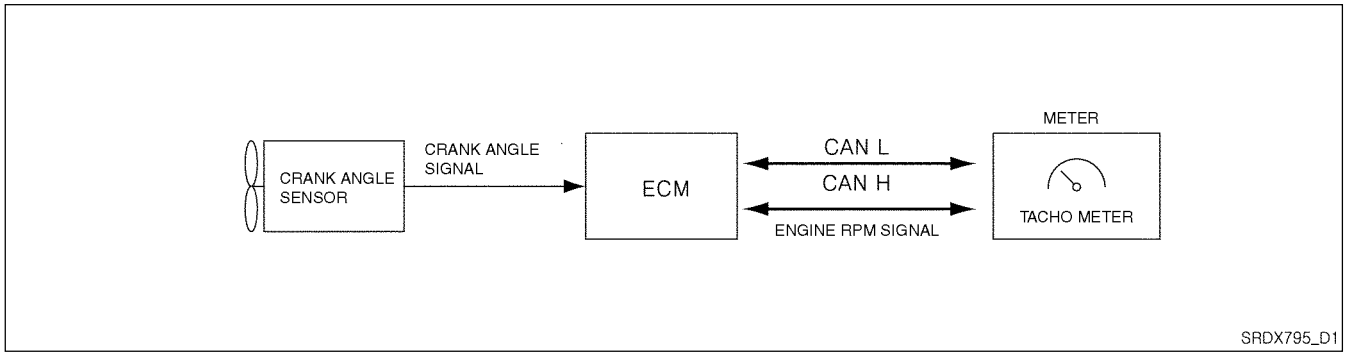
Inspection results are OK?

OK → Replace the meter control unit.

NG → Install the fuel level gage unit correctly.

Tachometer System

1. Tachometer Circuit Inspection



2. Connector Inspection

1. Turn the key switch OFF.
2. Inspect the meter and ECCS control unit terminals (meter, control unit, and harness sides) for looseness or bend.

Inspection results are OK?

OK → Go to No. 3.

NG → Repair the terminal or connector.

3. Continuity Inspection

1. Turn the key switch OFF.
2. Disconnect the meter connector.
3. Check the CAN communication line. (Refer to LAN section.)

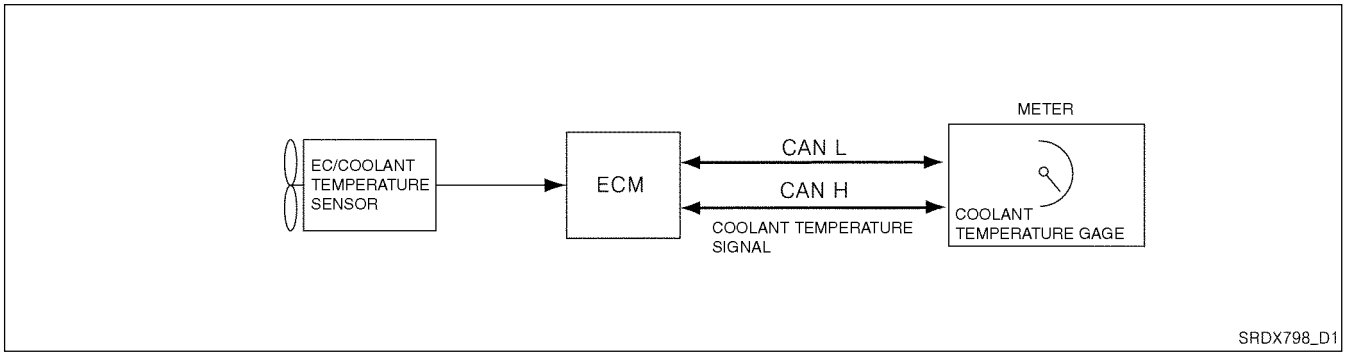
Inspection results are OK?

OK → Replace the meter control unit.

NG → Repair the harness or connector.

Coolant Temperature Gage System

1. Coolant Temperature Gage Circuit Inspection



2. Connector Inspection

1. Turn the key switch OFF.
2. Inspect the meter and ECCS control unit terminals (meter, control unit, and harness sides) for looseness or bend.

Inspection results are OK?

OK → Go to No. 3.

NG → Repair the terminal or connector.

3. Continuity Inspection

1. Disconnect the meter and thermal transmitter connectors.
2. Check the CAN communication line. (Refer to LAN section.)

Is there continuity?

OK → Replace the meter control unit.

NG → Repair the harness or connector.

Vehicle Speed System

INSPECTION PROCEDURE (VEHICLE WITHOUT ABS)

1. Connector Inspection

1. Turn the key switch OFF.
2. Inspect the meter and vehicle speed sensor terminals (meter, vehicle speed sensor and harness sides) for looseness or bend.

Inspection results are OK?

OK → Go to No. 2.

NG → Repair the terminal or connector.

2. Wave Inspection

1. Remove the meter connector.
2. Start the engine.
3. Check the wave between the meter terminal No. 5 and body ground.

   Refer to “Meter Control Unit Input/Output Signal Standards” (EL-125) for between the terminal No. 5 and body ground.

Inspection results are OK?

OK → Replace the meter control unit.

NG → Go to No. 3.

3. Continuity Inspection

1. Turn the key switch OFF.
2. Remove the meter and vehicle speed sensor connectors.
3. Check the continuity between the meter terminal No. 49 and vehicle speed sensor terminal No. 1 and between the meter terminal No. 50 and vehicle speed sensor terminal No. 2.

Is there continuity?

OK → Go to No. 4.

NG → Repair the harness or connector.

4. Vehicle Speed Sensor Inspection

Inspect the component. Refer to “VEHICLE SPEED SENSOR” (EL-124).

Inspection results are OK?

OK → Replace the meter control unit.

NG → Replace the vehicle speed sensor.

Inspection Procedure (Vehicle with ABS)

1. Connector Inspection

1. Turn the key switch OFF.
2. Inspect the meter and vehicle speed sensor terminals (meter, vehicle speed sensor and harness sides) for looseness or bend.

Inspection results are OK?

OK → Go to No. 2.

NG → Repair the terminal or connector.

2. Wave Inspection

1. Remove the meter connector.
2. Start the engine.
3. Check the wave between the meter terminal No. 7 and body ground.

   Check the wave between the meter terminal No. 7 and body ground. (Refer to the “Meter Control Unit Input/Output Signal Reference Values” in EL-125.)

Inspection results are OK?

OK → Replace the meter control unit.

NG → Go to No. 3.

3. Continuity Inspection

1. Turn the key switch OFF.
2. Remove the meter and ABS control unit connectors.
3. Check the continuity between the meter terminal No. 7 and ABS control unit terminal No. 23.

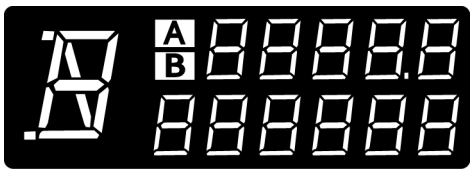
Is there continuity?

OK → Go to No. 4.

NG → Repair harness or connectors.

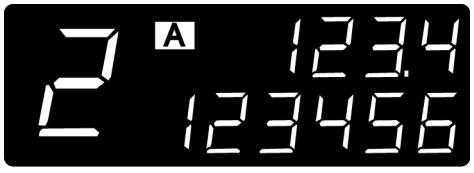
Odometer • Trip Odometer Display

The odometer and trip odometer mode converts as follows.



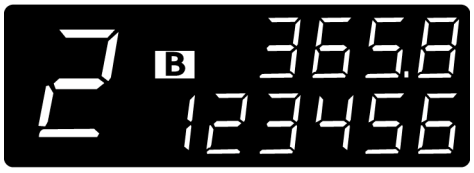
- The TRIP odometer consists of 25 stages. The displaying unit of odometer is kilometer and trip odometer is 0.1 kilometer.
- The A/T indicator displays P-R-N-D-2-1 according to the shift lever position.

1. Change between Odometer and Trip Odometer



- The A TRIP odometer displays 123.4 km and odometer displays 123,456 km.

Press the ODO/TRIP knob.



- The B TRIP odometer displays 365.8 km and odometer displays 123,456 km.

Press the ODO/TRIP knob.

- When the TRIP knob is pressed for over 0.8 seconds during TRIP A display, the traveled distance memorized in TRIP A is reset to 0.0 km.

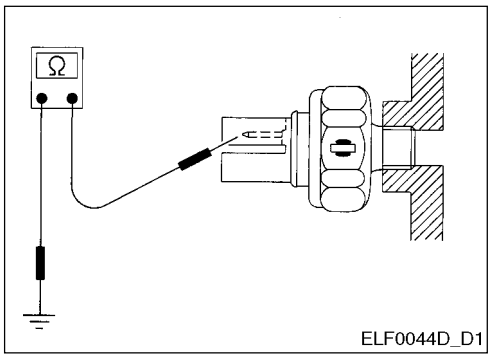
Press the ODO/TRIP knob for less than 0.8 seconds.

- When the ODO/TRIP knob is pressed for over 0.8 seconds during TRIP B display, the traveled distance memorized in TRIP B is reset to 0.0 km.

- When the battery terminal is disconnected, the odometer continues the calculation, but the trip odometers will be reset to 0.0 km.

Trip odometer (Display range)
0.0 km → 9999.9 km → 0.0 km
Odometer (Display range)
0.0 km → 999,999 km

- The odometer does not count over 999,999 km.

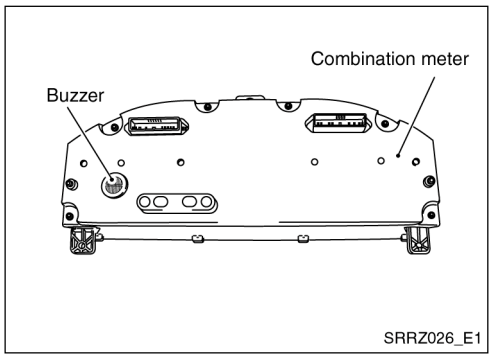


Component Inspection

OIL PRESSURE SWITCH

Check the continuity between the oil pressure switch and body ground.

	Oil Pressure (kgf/cm^2)	Continuity
While engine stopped	Under 0.02 - 0.029 (0.2 - 0.3)	Yes
While engine running	More than 0.02 - 0.029 (0.2 - 0.3)	No



System Description

1. Ignition Key Warning

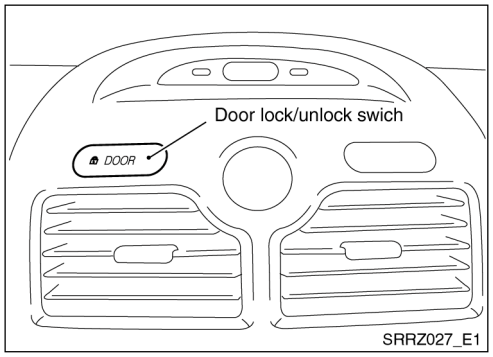
- The buzzer sounds when opening the door while the key is inserted in the ignition key cylinder (key detect switch ON) and the ignition switch is not in the “ON” position.
- When the key is removed (key detect switch OFF) during alarming, the buzzer stops.
- When the ignition switch moves to the “ON” position or driver’s door is closed (door switch OFF) during alarming, the buzzer stops.

2. Turn Signal/Harzard Warning Lamp Operation Buzzer

- The buzzer sounds through the meter buzzer which sounded through the flasher unit when the turn signal/hazard warning lamp operate.

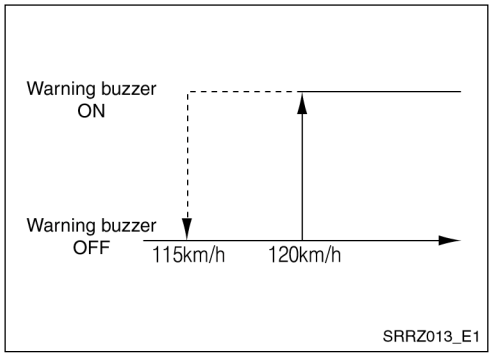
3. Seat Belt Warning Chime

- The warning chime sounds when the driver does not wear the seat belt and the vehicle speed exceeds 10 km/h.
- The warning chime does not sound when the vehicle speed is less than 10 km/h.
- The chime sounds at 0.5 seconds interval.



4. Vehicle Speed Sensitive Door Lock Emabling/Disabling Alarm

- The alarm sounds once when emabling/disabling alarm the vehicle speed sensitive door lock function while the vehicle speed is over 40 km/h.
- The door lock function is emabling/disabling alarm when pressing the door lock switch for more than 3 seconds within 20 seconds while the ignition switch is in the “ON” position.

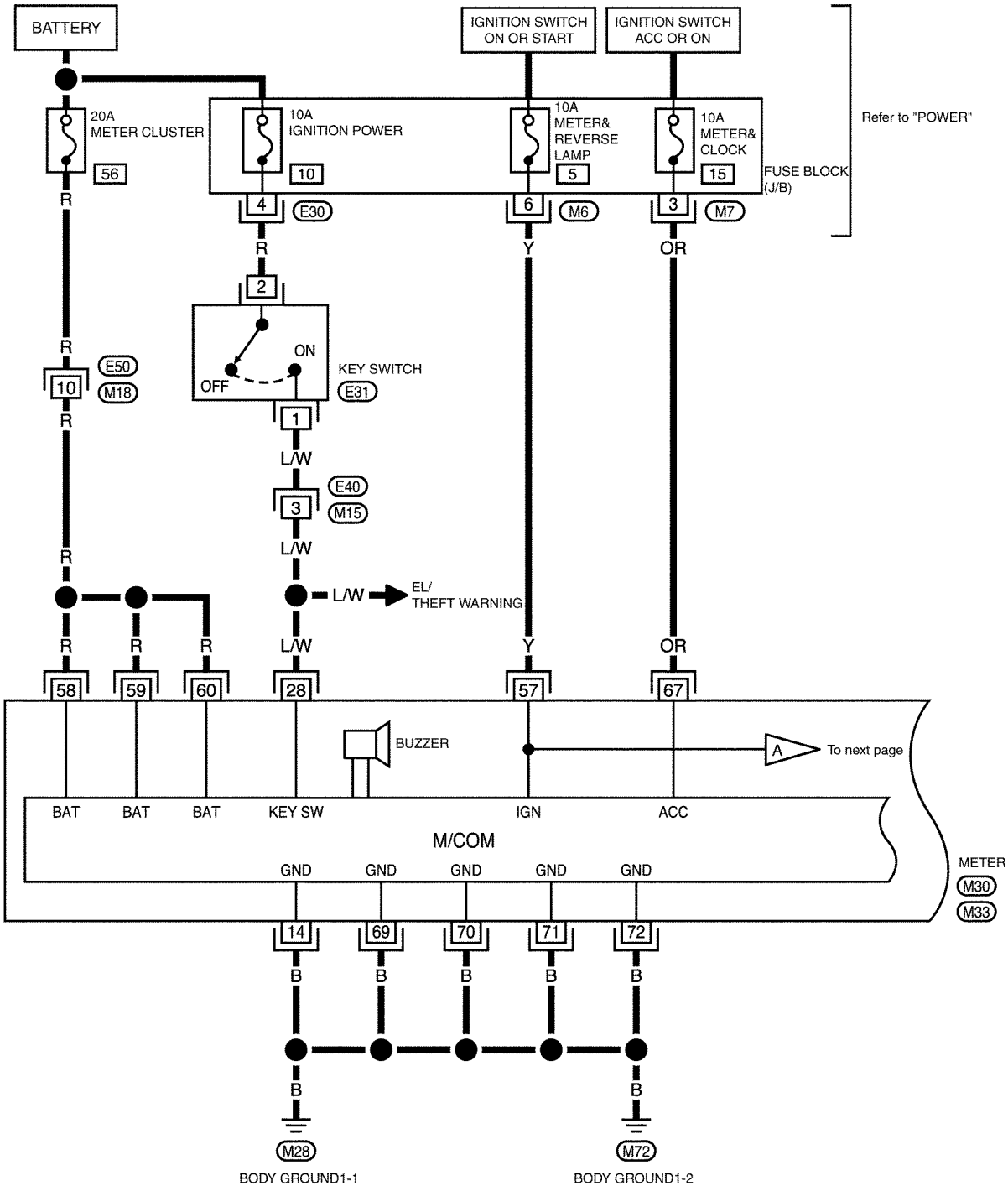


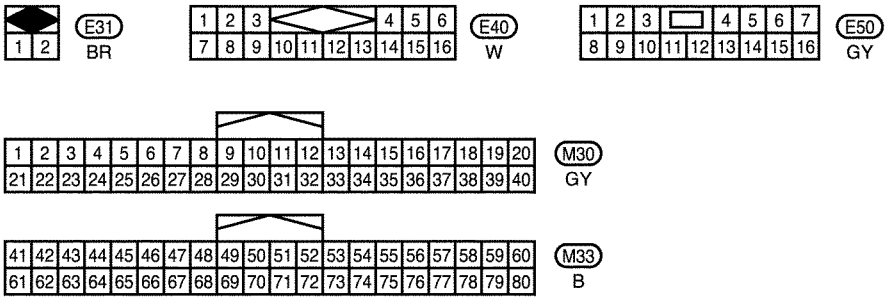
5. Over Speed Alarm (For Middle East)

- The alarm sounds through the buzzer in meter when the vehicle speed exceeds 120 km/h.
- The alarm stops when the vehicle speeds is less than 115 km/h.

Wiring Diagram

EL/Alarm (Buzzer)- 01





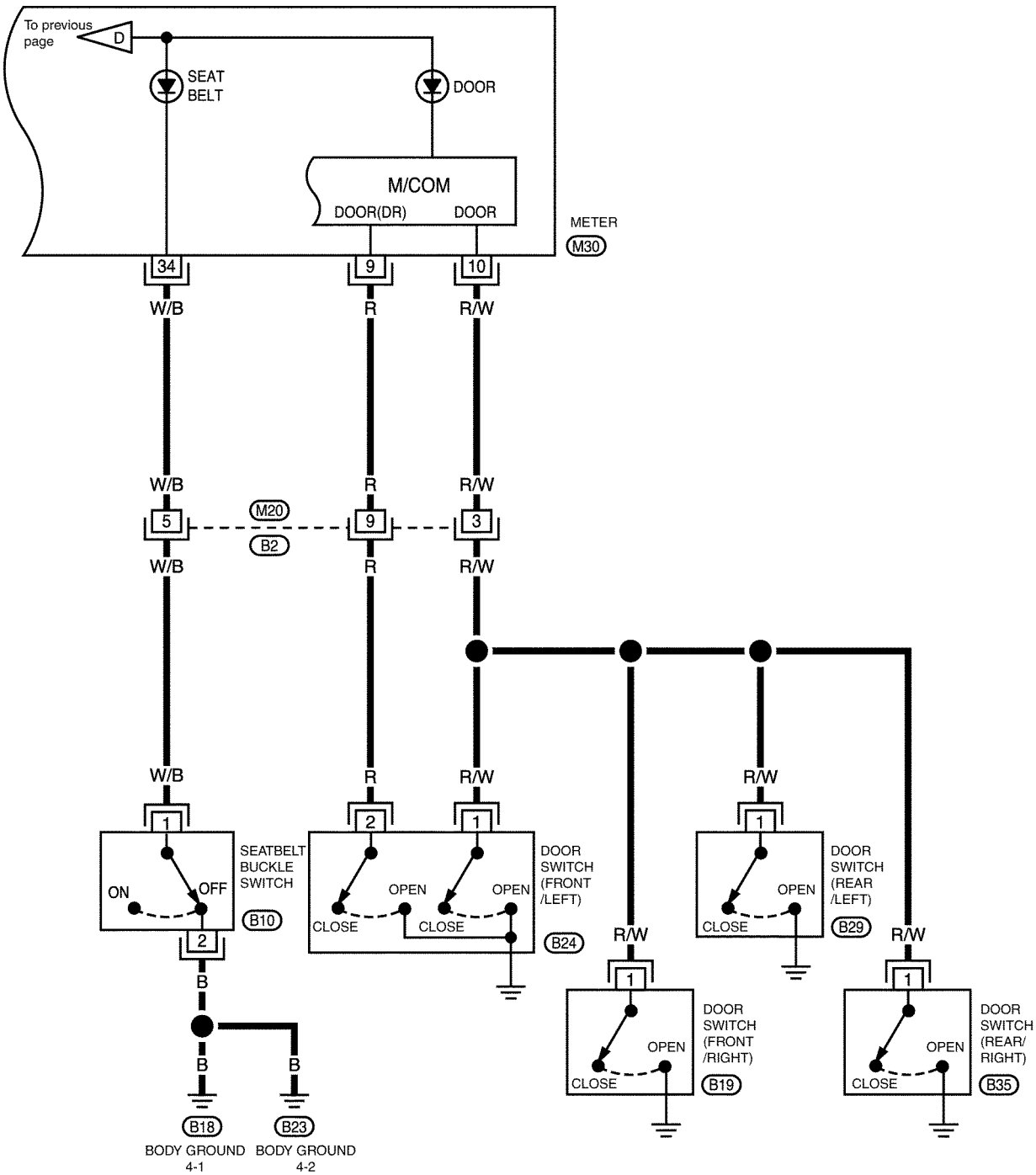
REFER TO FUSE BLOCK (J/B)

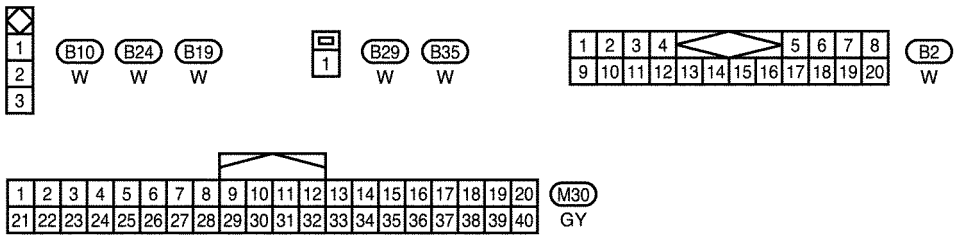
M6 M7

E30

SRWZ067_O1

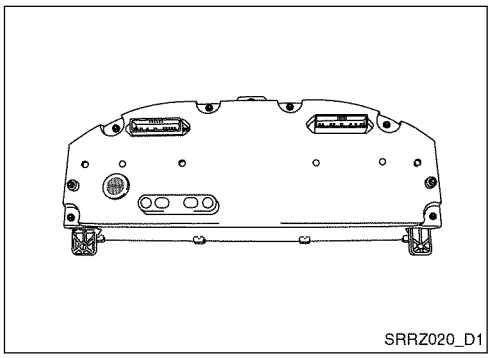
Wiring Diagram





SRWZ068_O1

Key Coupled Illumination System


SRRZ020_D1

Room Lamp Timer Control

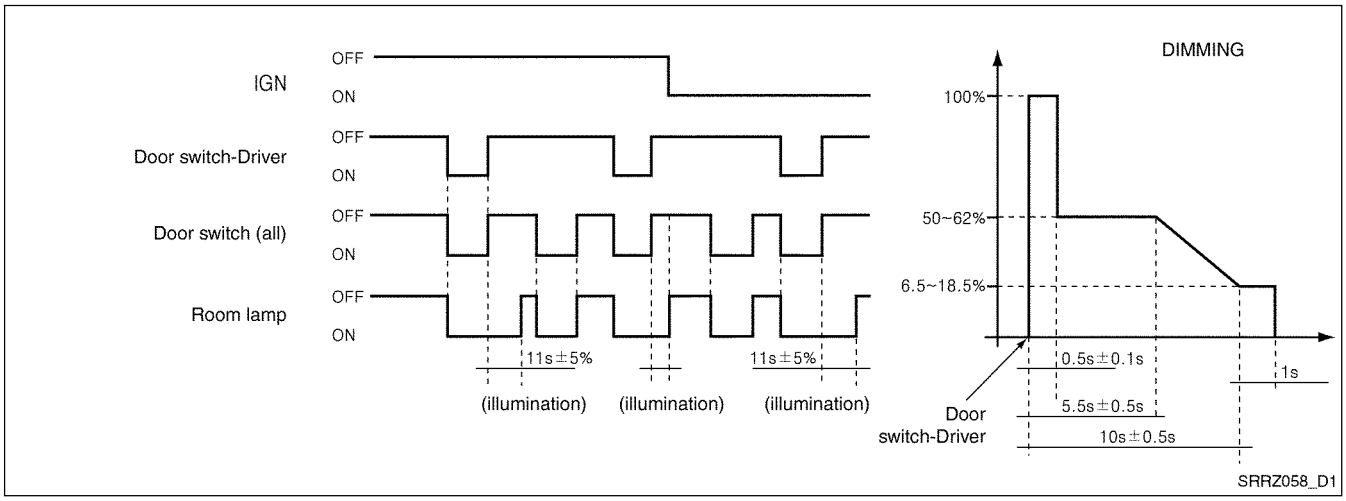
- When the room lamp switch is at neutral position, the room lamp and ignition key hole lamp turning on and off is controlled by the timer according to driver's door switch signal and all door switch signals.
- The timer is controlled by the meter control unit in the combination meter.

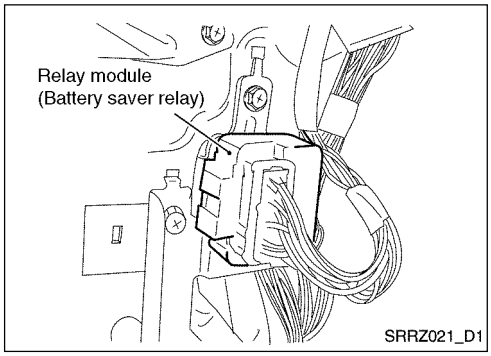
Basic Operations

- The room lamp and ignition key hole lamp turns on when the driver's door switch is ON (door open).
- When the driver's door switch goes from ON (door open) to OFF (door closed), the lamps gradually dims by the meter timer.
- The lamps turns on when all door switches turn on and turns off when all door switches turn off.

Room Lamp Timer

- The timer operates only when the driver's door switch turns from ON to OFF.
- The timer operates for max. 10 seconds.
- When a new timer operation signal is inputted during the timer operation, the newly inputted timer operation signal takes priority.
- When all door switch signal is inputted during the timer operation, the timer function cancels.





Room Lamp Battery Saver Control

- The battery saver relay control cuts off the battery supply of the battery saver relay in the relay module by the combination meter if the room lamp is on for more than 30 minutes while the ignition key is "OFF" and the ignition switch is in the "OFF" position.

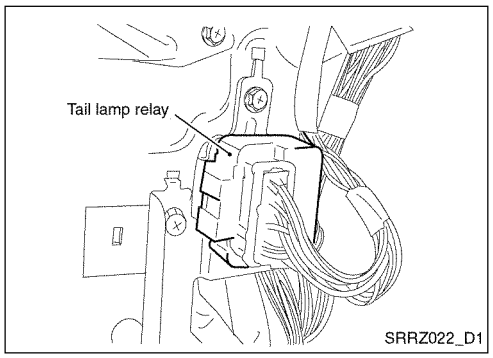
Basic Operations

- The battery saver mode is activated when the IGN, ACC, key switch, hazard warning switch and light switch are OFF and the room lamp and the map lamp are turned off after 30 minutes.

CAUTION:

- **The lamps are turned off when the room lamp switch is ON.**

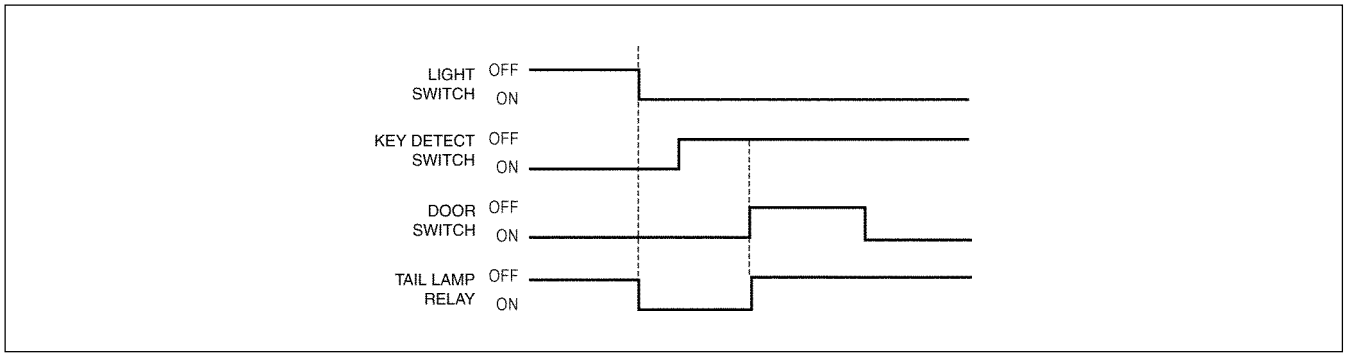
Tail Lamp Auto Cut Control



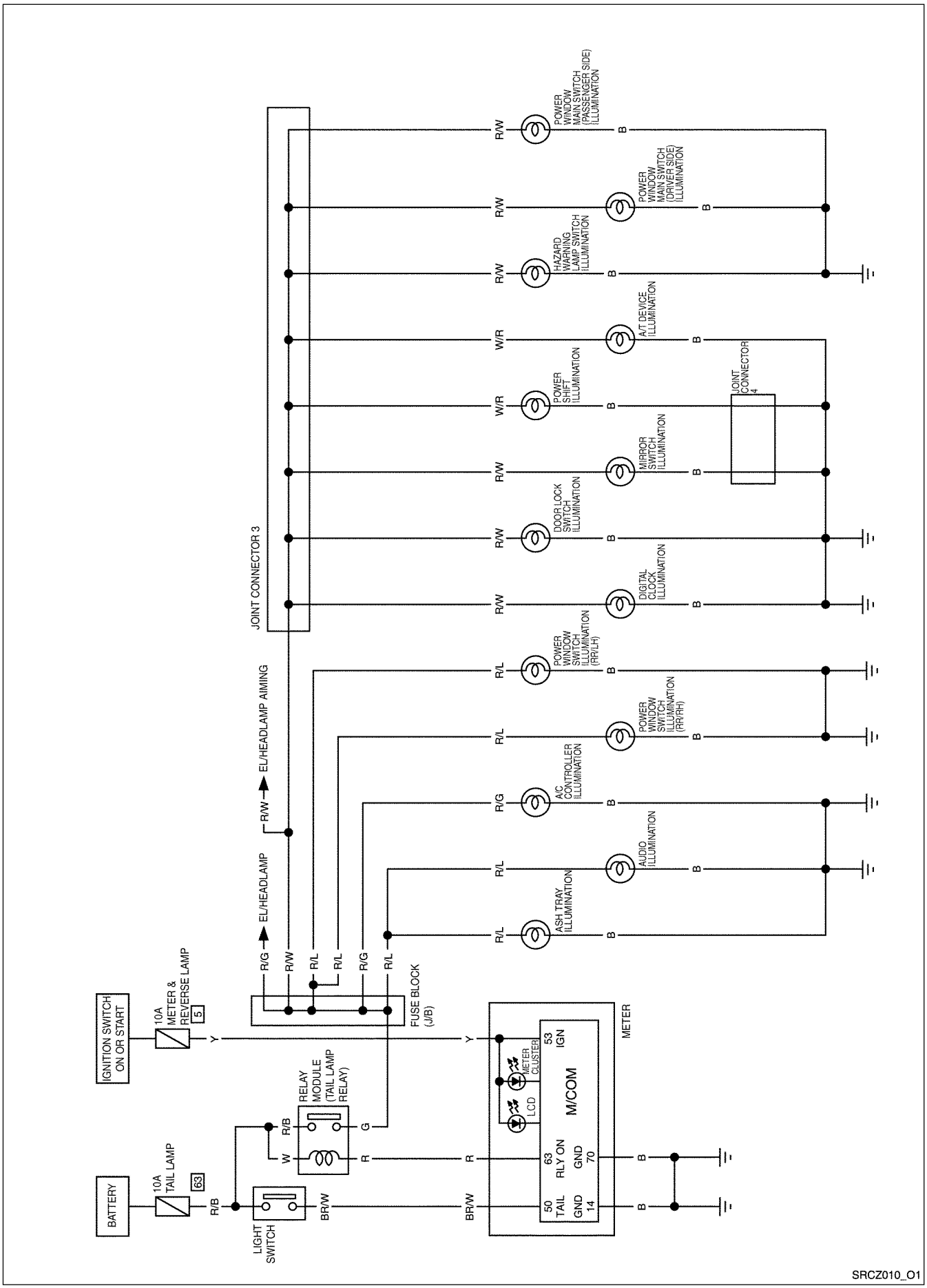
DESCRIPTION

- The meter integrated BCM cuts the power supply to tail lamp relay in relay module (Tail lamp OFF) when opening the driver's door after removing the ignition key even though the light switch is in "ON" position.
- The tail lamp is turned on again when inserting the key or turning the lamp switch OFF and then ON.

BASIC OPERATION

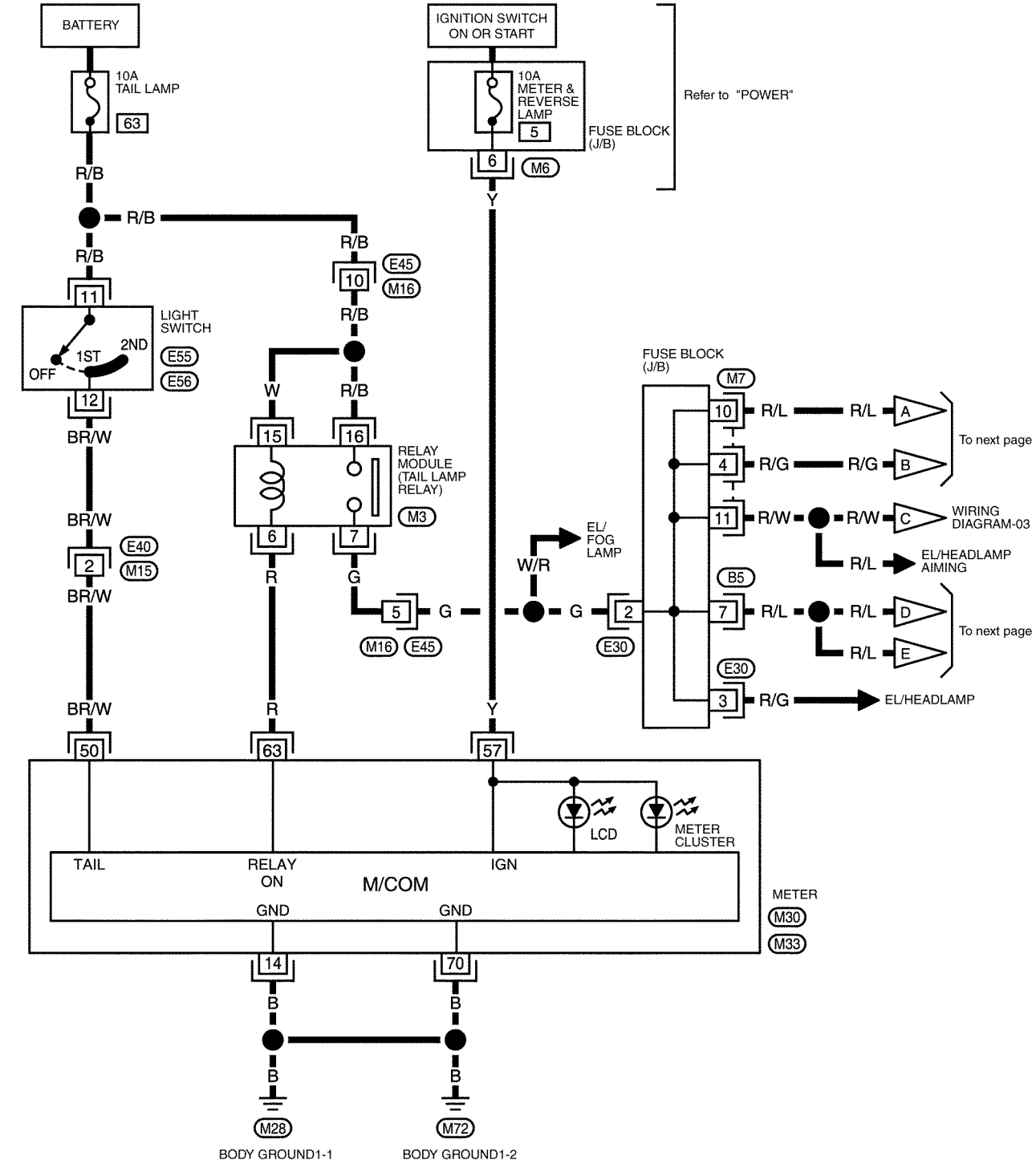


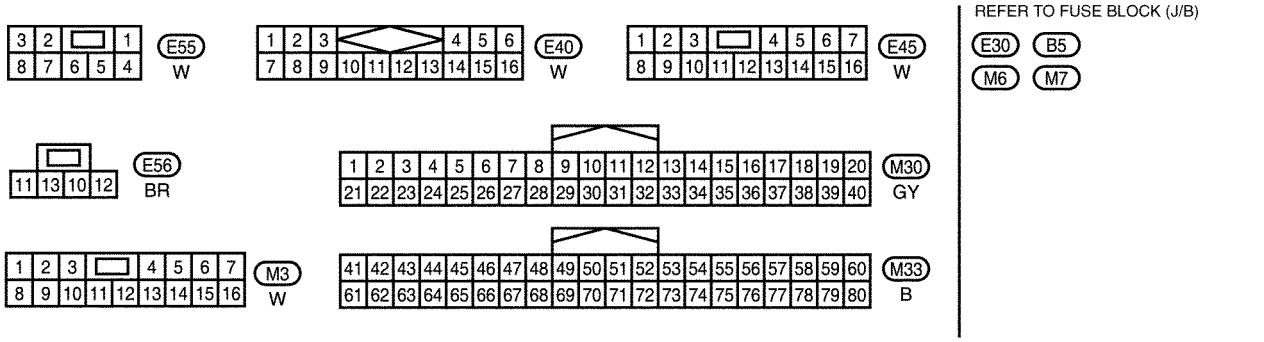
Circuit Diagram



Wiring Diagram

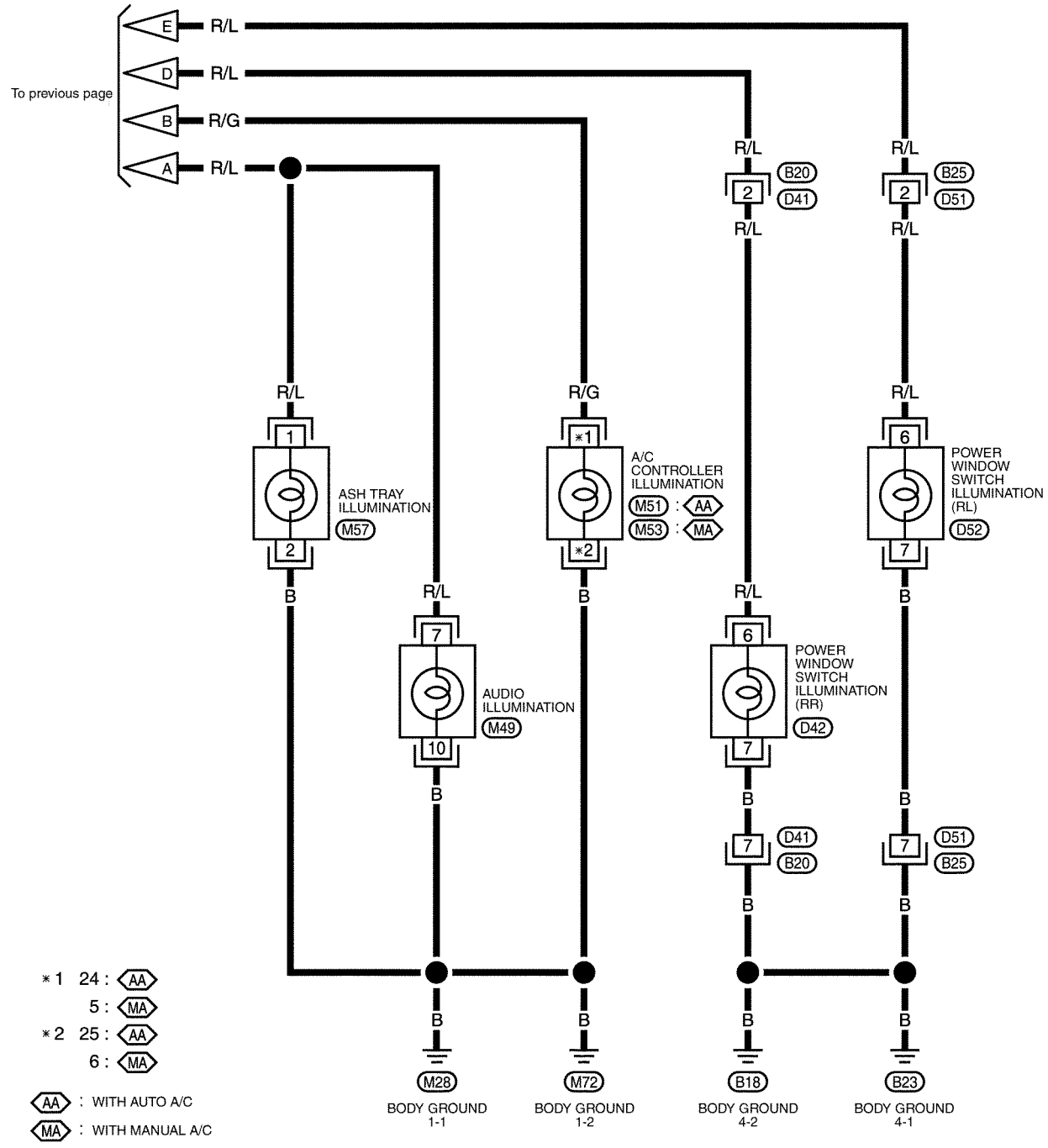
EL/Illumination- 01

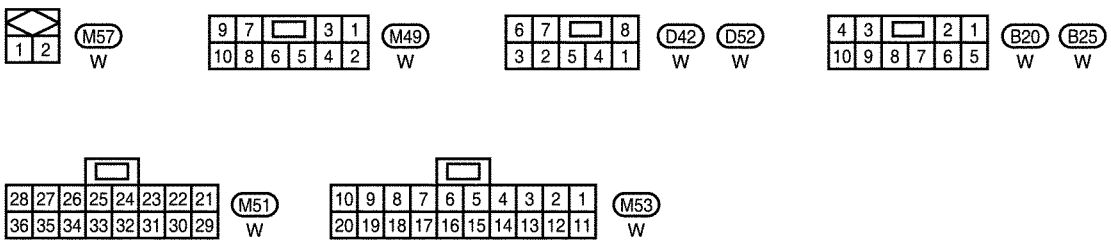




SRWZ027_O1

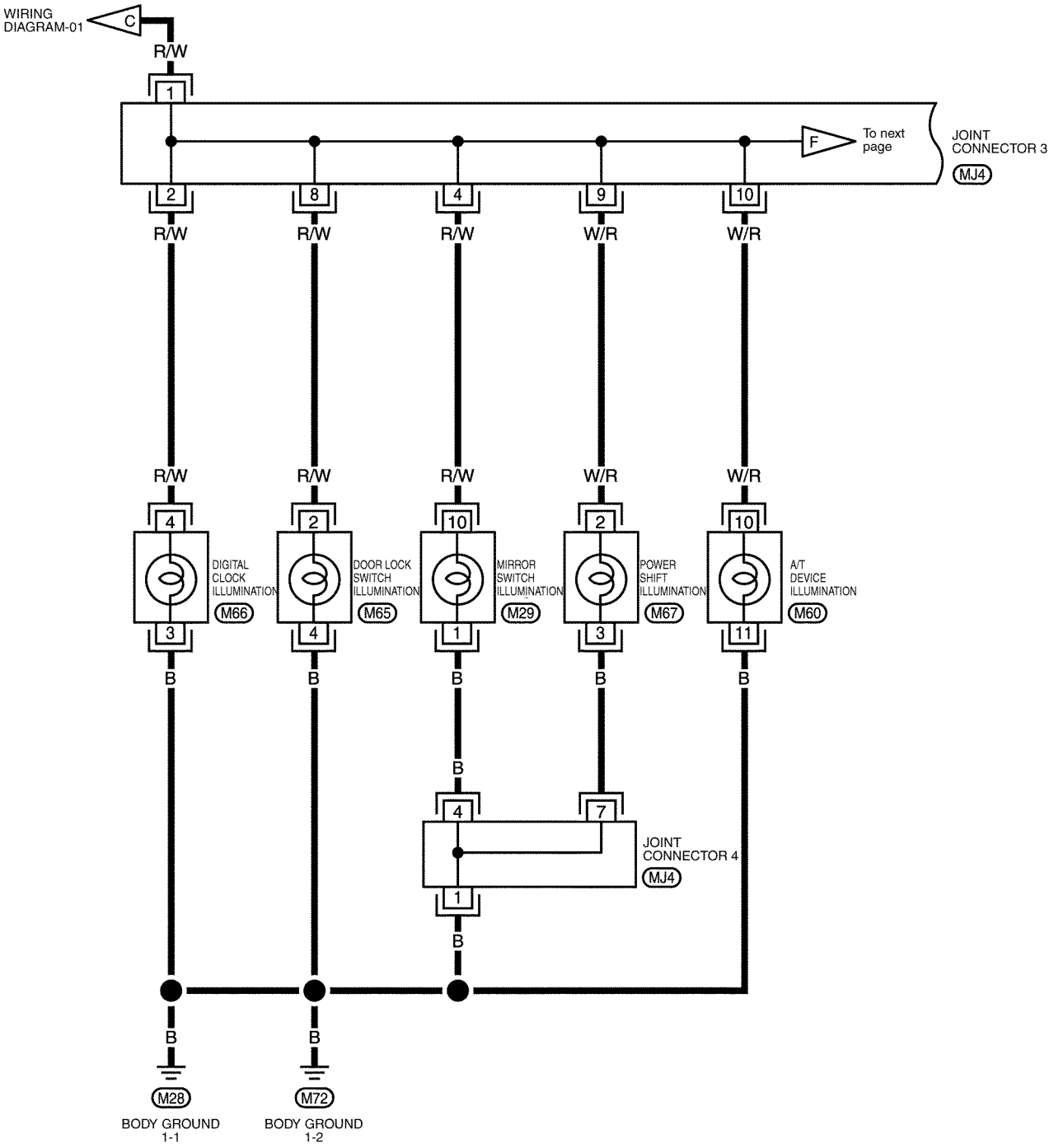
Wiring Diagram

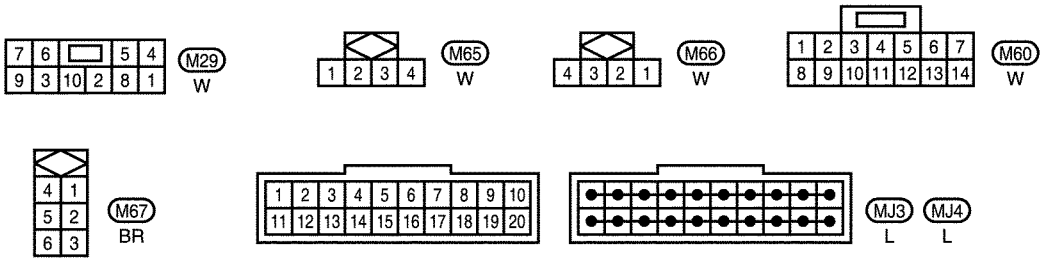




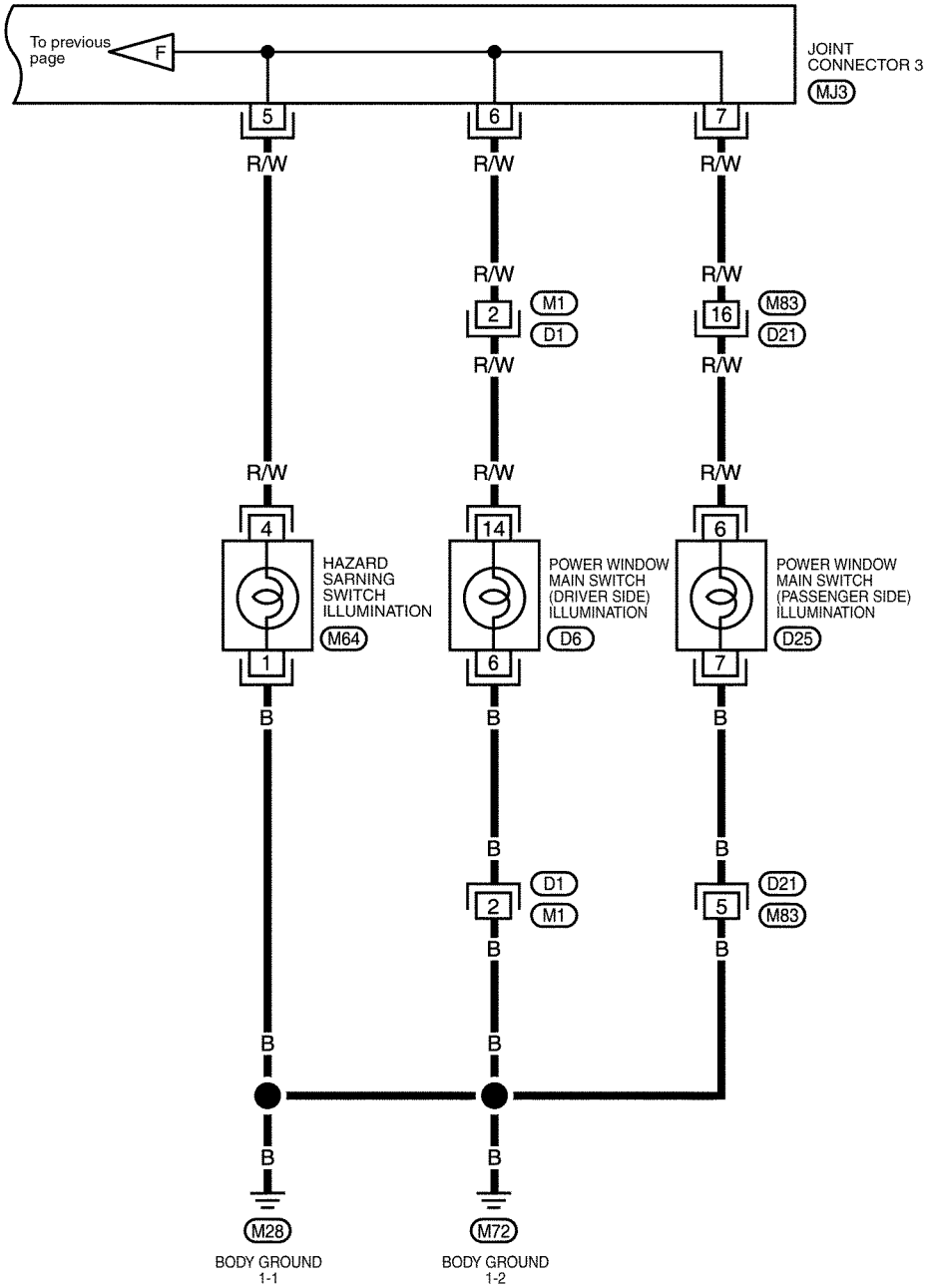
SRWZ028_O1

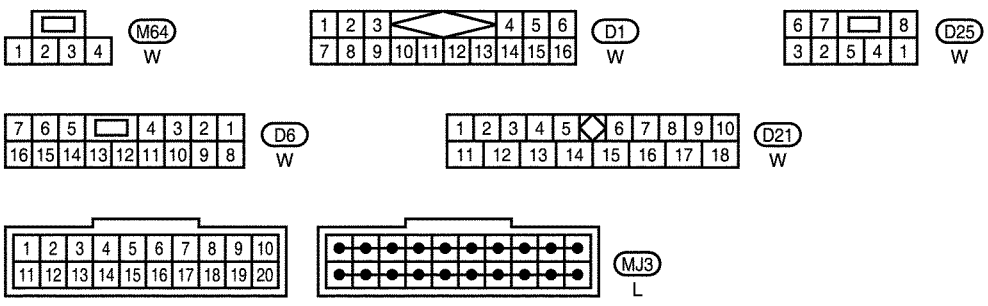
Wiring Diagram





SRWZ029_O1


To previous page
F
JOINT CONNECTOR 3
MJ3
5
6
7
R/W
M1
D1
M83
D21
16
2
4
14
6
1
7
HAZARD SARNING SWITCH ILLUMINATION
M64
POWER WINDOW MAIN SWITCH (DRIVER SIDE) ILLUMINATION
D6
POWER WINDOW MAIN SWITCH (PASSENGER SIDE) ILLUMINATION
D25
B
5
M28
M72
BODY GROUND 1-1
BODY GROUND 1-2


M64
W
D1
W
D25
W
D6
W
D21
W
MJ3
L

SRWZ030_O1

Meter Control Unit Input/Output Signal Standards

Refer to Wiring Diagram (EL-104).

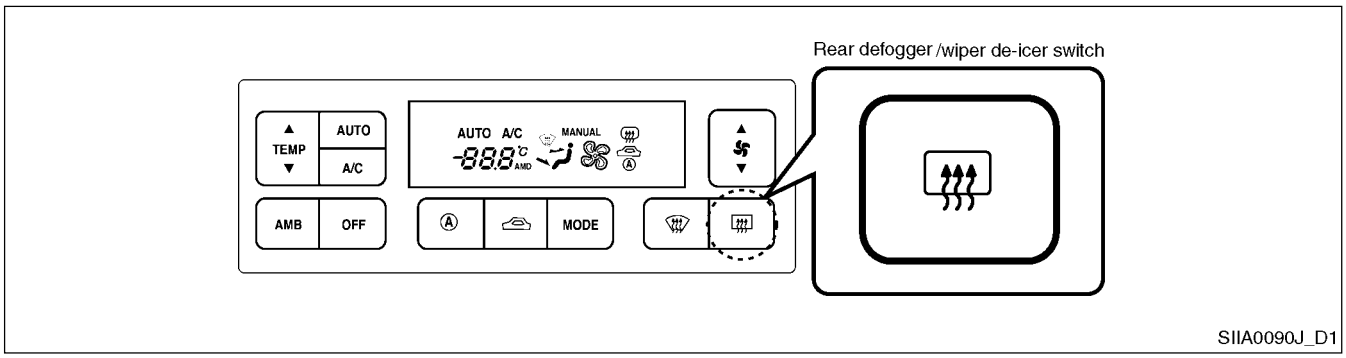
Terminal No.	Signal	Measurement					Standard value (V)
		Key switch	Operation or Status				
10	Door switch signal	OFF	Open any one door Close all doors				Approx. 0
9	Driver's door switch signal	OFF	Driver's door switch		ON (Open)		Approx. 12
					OFF (Close)		
65, 70	Ground	ON	-				Approx. 5
47	Room lamp signal	OFF	Room lamp switch: Neutral	Insert the key	Each door switch	ON (Open)	Approx. 0
						OFF (Close)	Approx. 12
		-	Room lamp switch: Neutral	Close all doors	Remove the inserted key		Approx. 0
					Turn the key switch to "ON"		Approx. 12
58	Battery power	OFF	-				Approx. 12
57	Ignition power	ON	-				Approx. 12

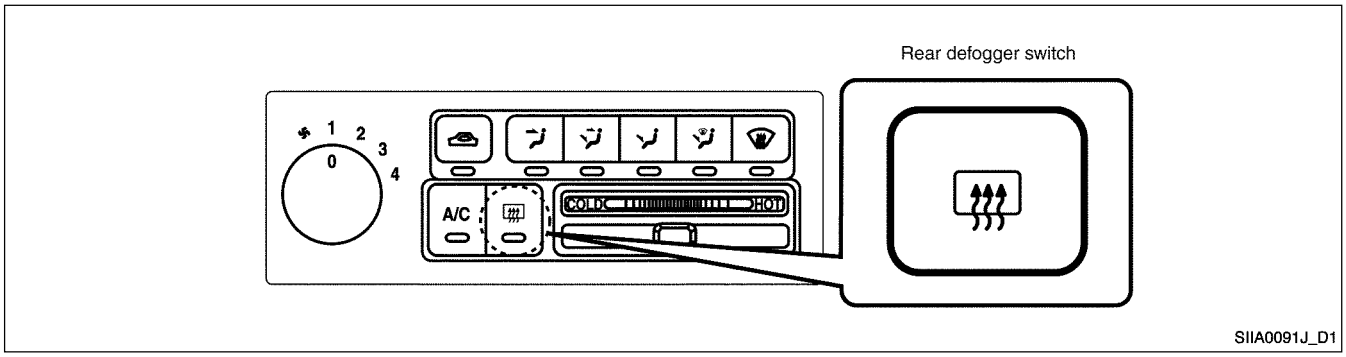
System - General

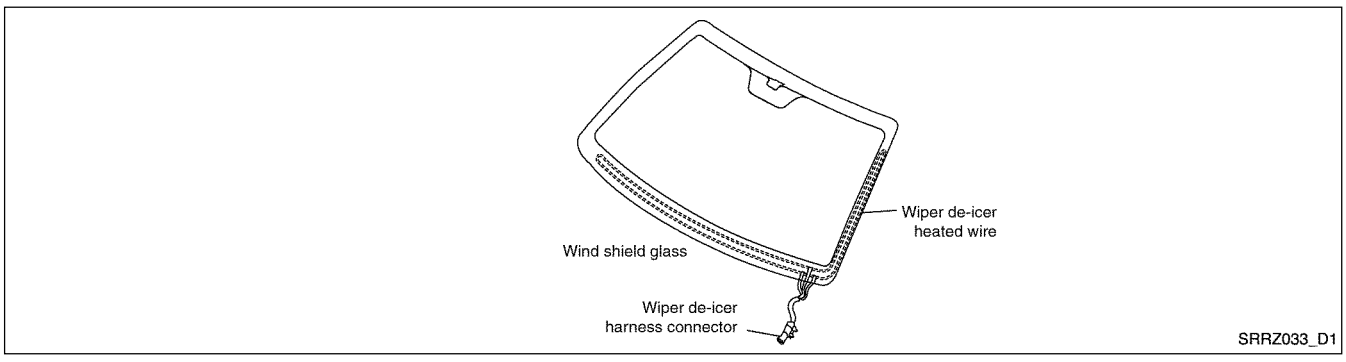
TIMER FUNCTION

- The rear window defogger and the wiper de-icer (optional) operate simultaneously when operating the switch.
- While the key switch is ON, the rear defogger/wiper de-icer are turned on when turning the defogger/de-icer switch to ON position. The timer operates for about 15 minutes.
- While the timer function is operating, the timer function and the rear defogger output stops when the rear defogger switch is turned off.
- The timer control is performed by the meter control unit in the combination meter.
- The wiper de-icer heated wire is routed to the botton and left-end of windshield glass.
- The wiper de-icer prevents the wiper blade and glass from freezing.

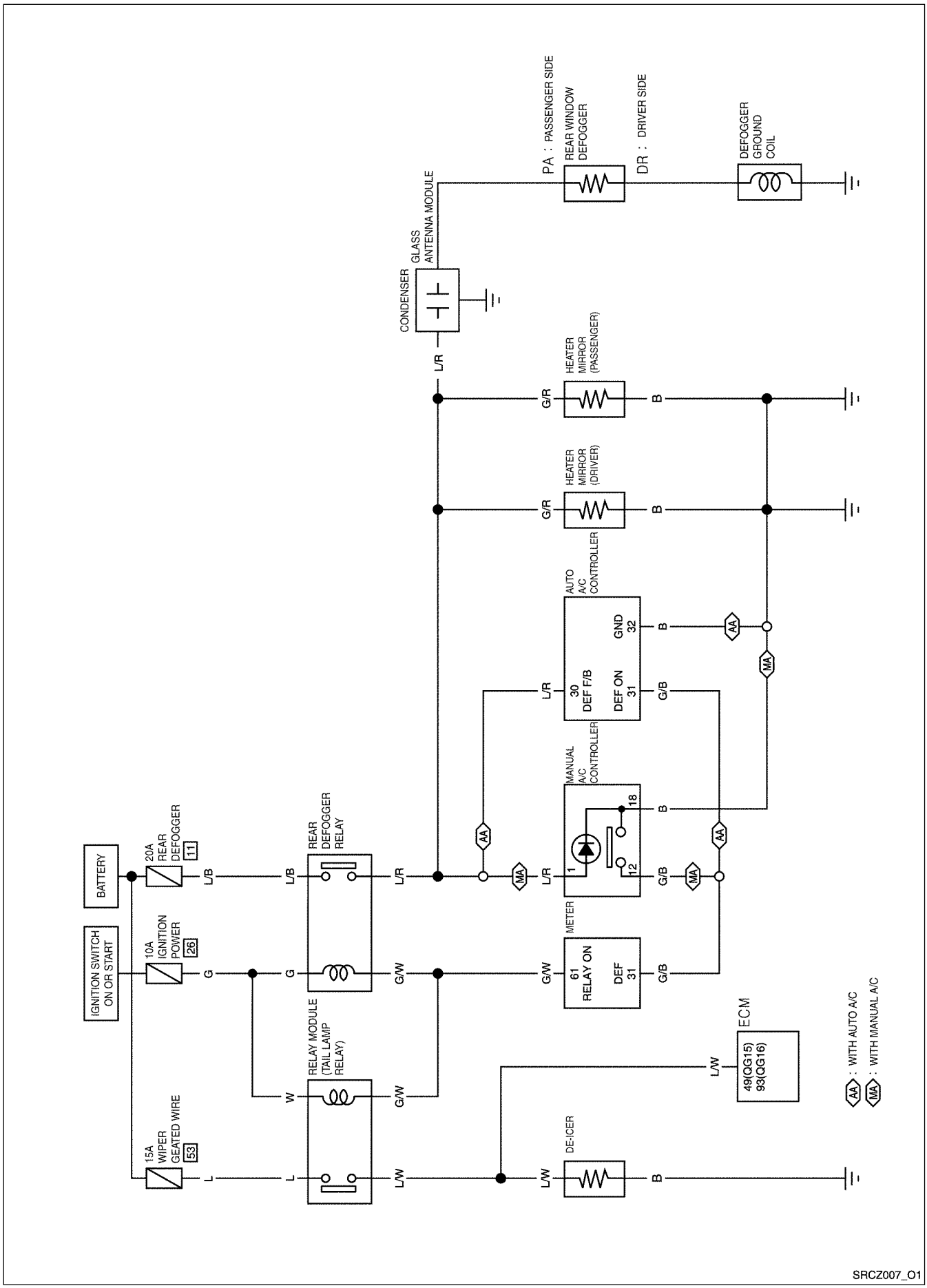
COMPONENTS LOCATION







Circuit Diagram



Meter Control Unit Input/Output Signal Standards

Terminal No.	Signal	Operation conditions			Standard value (V)
		Key switch	Operation		
31	Rear defogger switch/de-icer signal	OFF	Rear defogger switch (Switch is pressed in)	ON	Approx. 0
				OFF	Approx. 12
61	Rear defogger/de-icer relay control signal	ON	Rear defogger switch	ON	Approx. 0 During rear defogger output: For approx. 15 min.
				OFF	Approx. 12

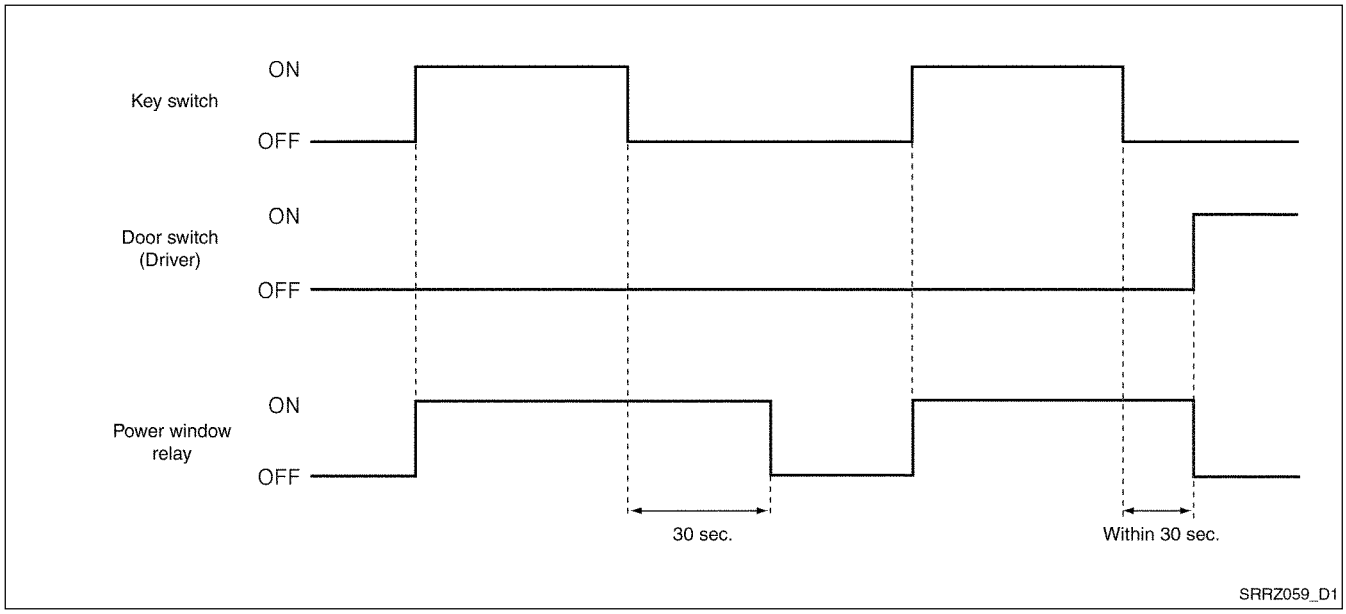
System - General

TIMER FUNCTION

- The timer function allows the driver's power window operation for about 30 seconds after the key switch has been turned off. But when the driver's door changes from open (door switch ON) to closed (door switch OFF) or key switch changes from OFF to ON, the timer is reset.

OPERATING CONDITIONS

- When driver's door glass is not in fully closed position (limit switch ON).
- Operation when the key switch is ON.
- Operation when key switch is other than ON (during timer operation).



WHEN OPERATING POWER WINDOW

All the window switches except the driver's window switch become inoperative if operating the power window lock switch.

Anti-Pinch Function

The anti-pinch function enables a window to automatically reverse when something is caught in the window as it is closing. When the control unit detects an obstacle, the window will be lowered 150 mm down immediately.

CAUTION:

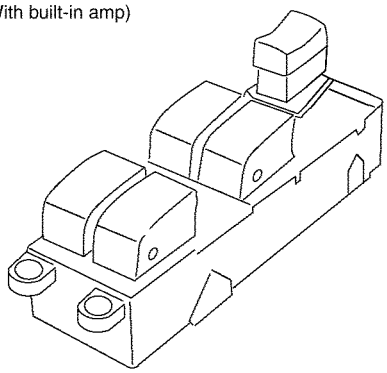
- **The anti-pinch function may be activativated if an impact or load is given to window glass by environment or weather condition.**
- **Reset the system after performing the followings:**
  Removal and installation of the motor from the regulator assembly.

OPERATING CONDITIONS

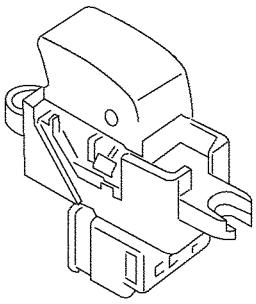
- When driver's door glass is not in fully closed position.
- Window up operation (automatic) when the ignition switch is ON.
- Window up operation when ignition switch is other than ON (during timer operation).

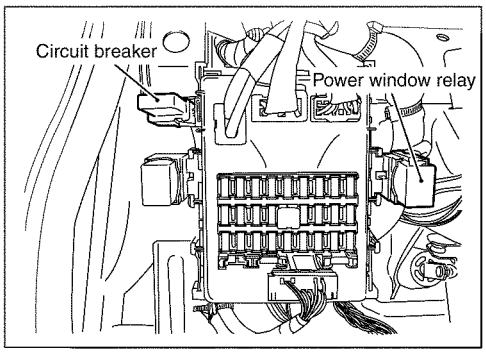
Components Location

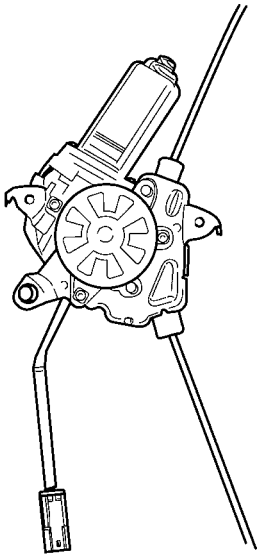
Power window main switch
(With built-in amp)



Passenger, rear left/right
power window switch







Driver's power window motor

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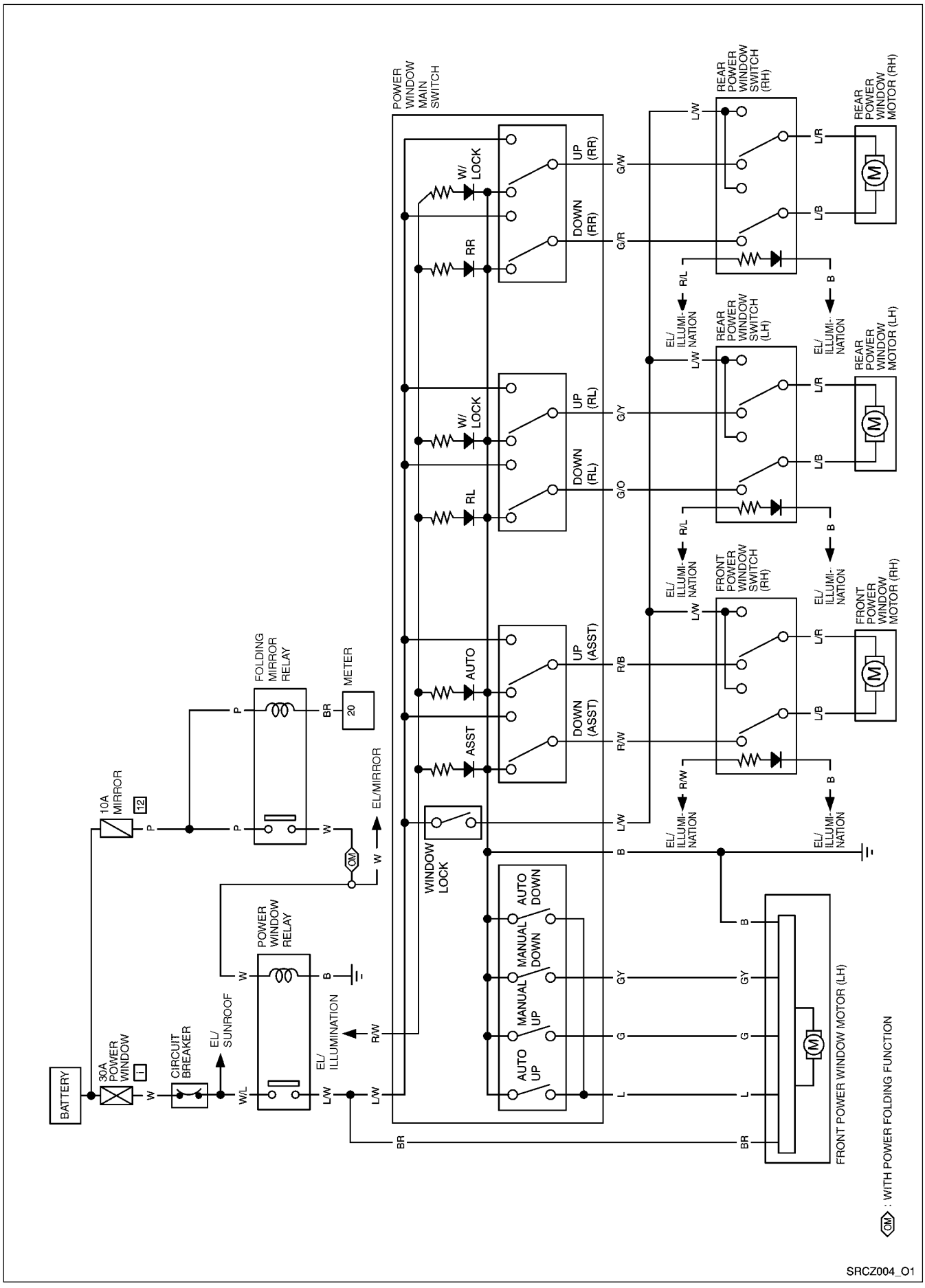
Circuit Diagram



Power Window Main Switch Input/Output Signal Standards

Refer to Wiring Diagram (EL-98).

Terminal No.	Signal	Measurement			Standard value (V)
		Key switch		Operation or conditions	
11	Battery power	-		-	Approx. 12
16	Passenger power window UP signal	ON	Power window lock switch OFF operation (Switch ON)	Main switch right rear seat switch DOWN operation (Motor operating)	Approx. 12
				Main switch passenger switch DOWN operation (Motor operating)	Approx. 0
			Power window lock switch ON operation (Switch OFF)	Main switch passenger switch UP operation (Motor not operating)	Approx. 12
				Main switch passenger switch DOWN operation (Motor not operating)	Approx. 12
			Other than the conditions above		Approx. 0
12	Passenger power window DOWN signal	ON	Power window lock switch OFF operation (Switch ON)	Main switch right rear seat switch DOWN operation (Motor operating)	Approx. 12
				Main switch passenger switch UP operation (Motor operating)	Approx. 0
			Power window lock switch ON operation (Switch OFF)	Main switch passenger switch DOWN operation (Motor not operating)	Approx. 12
				Main switch passenger switch DOWN operation (Motor not operating)	Approx. 12
			Other than the conditions above		Approx. 0
4	Driver power window motor UP signal	ON or other than ON (During timer operation)		During UP operation: Other than the above During DOWN operation: Other than the above	Approx. 12 Approx. 0
15	Driver power window motor DOWN signal	ON or other than ON (During timer operation)		During UP operation: Other than the above During DOWN operation: Other than the above	Approx. 12 Approx. 0
7	Right rear seat window UP signal	ON	Power window lock switch OFF operation (Switch ON)	Main switch right rear seat switch DOWN operation (Motor operating)	Approx. 12
				Main switch right rear seat switch DOWN operation (Motor operating)	Approx. 0
			Power window lock switch ON operation (Switch OFF)	Main switch left rear seat switch UP operation (Motor not operating)	Approx. 12
				Main switch left rear seat switch DOWN operation (Motor not operating)	Approx. 12
			Other than the conditions above		Approx. 0

Terminal No.	Signal	Measurement			Standard value (V)
		Key switch		Operation or conditions	
5	Right rear seat window DOWN signal	ON	Power window lock switch OFF operation (Switch ON)	Main switch right rear seat switch DOWN operation (Motor operating)	Approx. 12
				Main switch right rear seat switch UP operation (Motor operating)	Approx. 0
			Power window lock switch ON operation (Switch OFF)	Main switch left rear seat switch DOWN operation (Motor not operating)	Approx. 12
				Main switch left rear seat switch UP operation (Motor not operating)	Approx. 12
			Other than the conditions above		Approx. 0
20	Power window relay operation signal	ON	Refer to the “Operation Conditions” in the “System Description” (EL-147).		-
10	Power for passenger and rear seats power window switch	ON	-		Approx. 12
1	Rear left seat power window UP signal	ON	Power window lock switch OFF operation (Switch ON)	Main switch right rear seat switch DOWN operation (Motor operating)	Approx. 12
				Main switch left rear seat switch DOWN operation (Motor operating)	Approx. 0
			Power window lock switch ON operation (Switch OFF)	Main switch left rear seat switch UP operation (Motor not operating)	Approx. 12
				Main switch left rear seat switch DOWN operation (Motor not operating)	Approx. 12
			Other than the conditions above		Approx. 0
3	Rear left seat power window DOWN signal	ON	Power window lock switch OFF operation (Switch ON)	Main switch right rear seat switch DOWN operation (Motor operating)	Approx. 12
				Main switch left rear seat switch UP operation (Motor not operating)	Approx. 0
			Power window lock switch ON operation (Switch OFF)	Main switch right rear seat switch DOWN operation (Motor operating)	Approx. 12
				Main switch left rear seat switch UP operation (Motor not operating)	Approx. 12
			Other than the conditions above		Approx. 0
6	Ground		-		Approx. 0

Each Power Window Switch Input/Output Signal Standards

Refer to Wiring Diagram (EL-98).

Terminal No.	Signal	Measurement			Standard value (V)
		Key switch		Operation or conditions	
1	Power of the power window switch	ON		-	Approx. 12
4	Power window motor DOWN signal	ON		DOWN operation	Approx. 12
				UP operation	Approx. 0
				Other than above	Approx. 0
2	Power window UP signal	ON	Power window lock switch OFF operation (Switch ON)	Power window switch UP operation (Motor operating)	Approx. 0
				Power window switch DOWN operation (Motor operating)	Approx. 0
			Power window lock switch ON operation (Switch OFF)	Power window switch UP operation (Motor not operating)	Approx. 12
				Power window switch DOWN operation (Motor not operating)	Approx. 12
			Other than the conditions above		Approx. 0
5	Power window motor DOWN signal	ON		DOWN operation	Approx. 12
				UP operation	Approx. 0
				Other than above	Approx. 0
3	Power window DOWN signal	ON	Power window lock switch OFF operation (Switch ON)	Power window switch UP operation (Motor operating)	Approx. 0
				Power window switch DOWN operation (Motor operating)	Approx. 0
			Power window lock switch ON operation (Switch OFF)	Power window switch UP operation (Motor not operating)	Approx. 12
				Power window switch DOWN operation (Motor not operating)	Approx. 12
			Other than the conditions above		Approx. 0

Trouble Diagnosis by Symptoms

Inspect if the other systems that use the signals as follows is operating properly.

Symptom	Defective system	Possible cause
The timer function does not stop by the driver's door switch ON/OFF operation	Driver's door switch route	● Defective harness or connection ● Defective harness between the driver's door switch and power window switch
	Power window main switch inside	● Defect power window main switch
The driver's door glass does not reverse the operation at the full close position	Door glass main operation	● Foreign material stuck at the glass or glass run rubber ● Wear or deformation of glass run rubber ● Overly depressed or protruded vehicle's chassis
	Power window main switch inside	● Defect power window main switch
The driver's door glass reverses the operation during UP operation	Door glass main operation	● Foreign material stuck at the glass or glass run rubber ● Wear or deformation of glass run rubber ● Overly depressed or protruded vehicle's chassis
	Power window main switch inside	● Defect power window main switch
The driver's door glass reverses the operation at situations other than the above	Door glass main operation	● Foreign material stuck at the glass or glass run rubber ● Wear or deformation of glass run rubber ● Overly depressed or protruded vehicle's chassis
	Power window main switch inside	● Defect power window main switch

System Description (Power Door Lock System)

1. Door Lock/Unlock Function

1. All door locks and unlocks are operated by the driver's door key cylinder operation.
   - It outputs the all door lock signal if the driver's door lock switch is turned from "ON" to "OFF".
   - It outputs the all door unlock signal if the driver's door lock switch is turned from "OFF" to "ON".
2. The door lock and unlock are operated by the door lock/unlock switch operation.
   - The door lock/unlock switch is the automatic return type switch. It outputs the lock or unlock signal according to current condition everytime it is pushed.

     However, the meter does not output the door lock/unlock signal when operating the door lock/unlock switch while the system is armed by the remote controller.
3. All door locks and unlocks are operated by moving the driver's door lock knob.
4. All door locks and unlocks are operated by operating the remote controller.

   For details, refer to "Remote Keyless Entry System" (EL-156).

2. Key Reminder Function

- This function prevents the doors from locking when the ignition key is in key cylinder.

3. Vehicle Speed Sensing Auto Door Lock Function

- When the vehicle speed exceeds 40 km/h, all doors are automatically locked.
- The vehicle speed at which the door lock operates can be selected 8 km/h or 40 km/h by the diagnostic device.

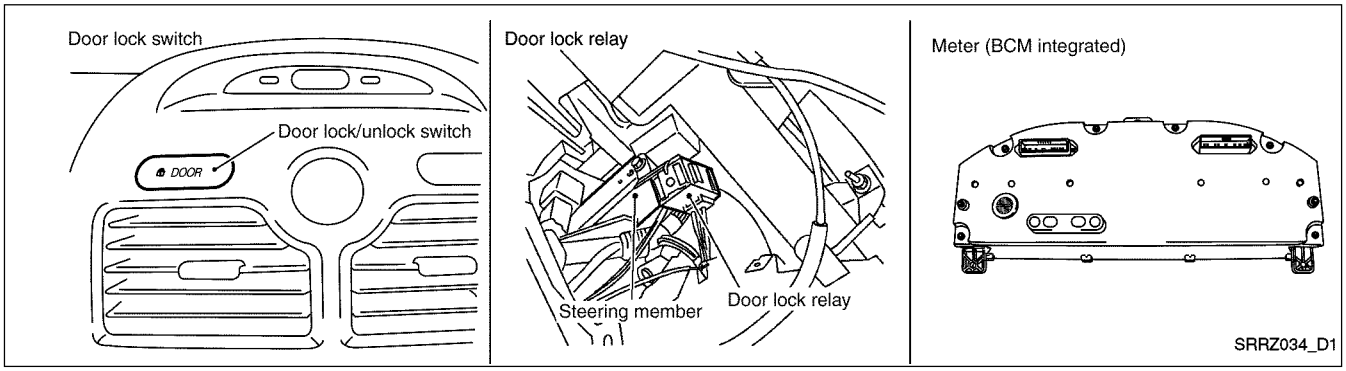
4. Door Unlock Function Under Collision

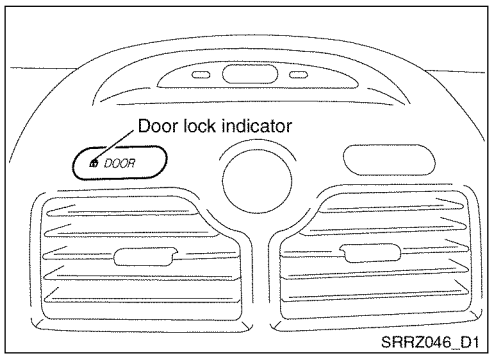
- To improve the safety, the meter receives the collision signal from airbag unit and unlocks all doors.
- The "Vehicle Speed Sensing Auto Door Lock Function" does not operate after this function is operated by collision.

REFERENCE:

The function may not operate due to the electric damage on parts.

Component Parts





Door Lock Indicator

BASIC OPERATION (ON)

- There is a red (🔒) lock mark on the door lock/unlock switch and it turns on when the door lock/unlock function is operated.

OPERATING CONDITIONS

- The red door lock indicator comes on to notify tha the doors are in the lock condition when the ignition key is in the “ON” position and all the doors are locked.

Trouble Diagnosis

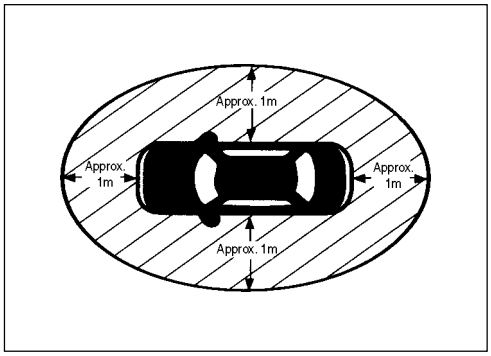
Refer to COMBINATION METER - TROUBLE DIAGNOSIS (EL-69).

System Description (Remote Keyless Entry System)

- The keyless entry unit receives the signal from the transmitter (meter integrated type) by remote controller operation. Then, it sends this signal to BCM (Body Control Module) to compare to the ID registered in BCM. Only if the ID is identical with it, doors can be locked and unlocked.
- The trunk lid can be unlocked by remote controller.
- When the doors are locked or unlocked by remote controller, supply power to hazard warning lamp flashes as follows: LOCK operation (flash once) UNLOCK operation (flash twice).
- Panic Alarm Function: Press and hold the door lock switch in remote controller to operate panic alarm.
- New remote controller can be registered when missing. Up to 4 remote controller can be registered (can register more remote controllers, but only latest 6 are available).

Operation

Function	Description
Lock	● When pressing lock switch in remote controller, all doors are locked and hazard lamps flash twice.
Unlock	● When pressing unlock switch in remote controller, all doors are unlocked and hazard lamps flash once. ● If no operations are performed within 30 seconds after unlocking with the remote controller, such as opening the door(s) or trunk, inserting the key into the ignition key cylinder or operating the remote controller, all doors are locked automatically and the active check function does not operate (auto lock function).
Trunk lid open	● When trunk open request switch is pushed for approx. 0.5 seconds, trunk lid is opened.
Panic Alarm	● When pressing lock switch in remote controller for more than 1.5 seconds, anti-theft alarm (horn) relay and hazard relay are turned on for approx. 30 seconds to operate hazard flasher and warning alarm.



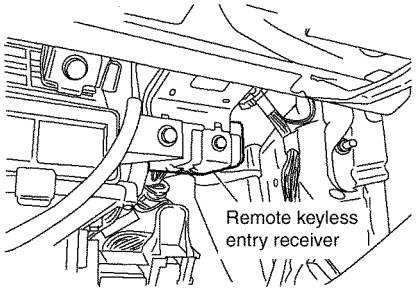
Operating Range

- To securely operate the remote controller, operate it within 1 m from outside door handle in front doors or center of trunk rear end.
- Operating range of remote controller is 5 m from center point of vehicle. However, it may varies according to the surroundings.

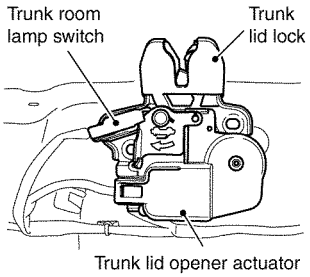
CAUTION:

If there are two vehicles equipped with the keyless entry system at same place, the remote controller may not work properly.

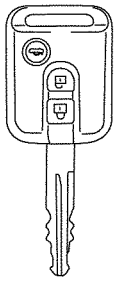
Inside glove box



Remote controller key



Remote controller key



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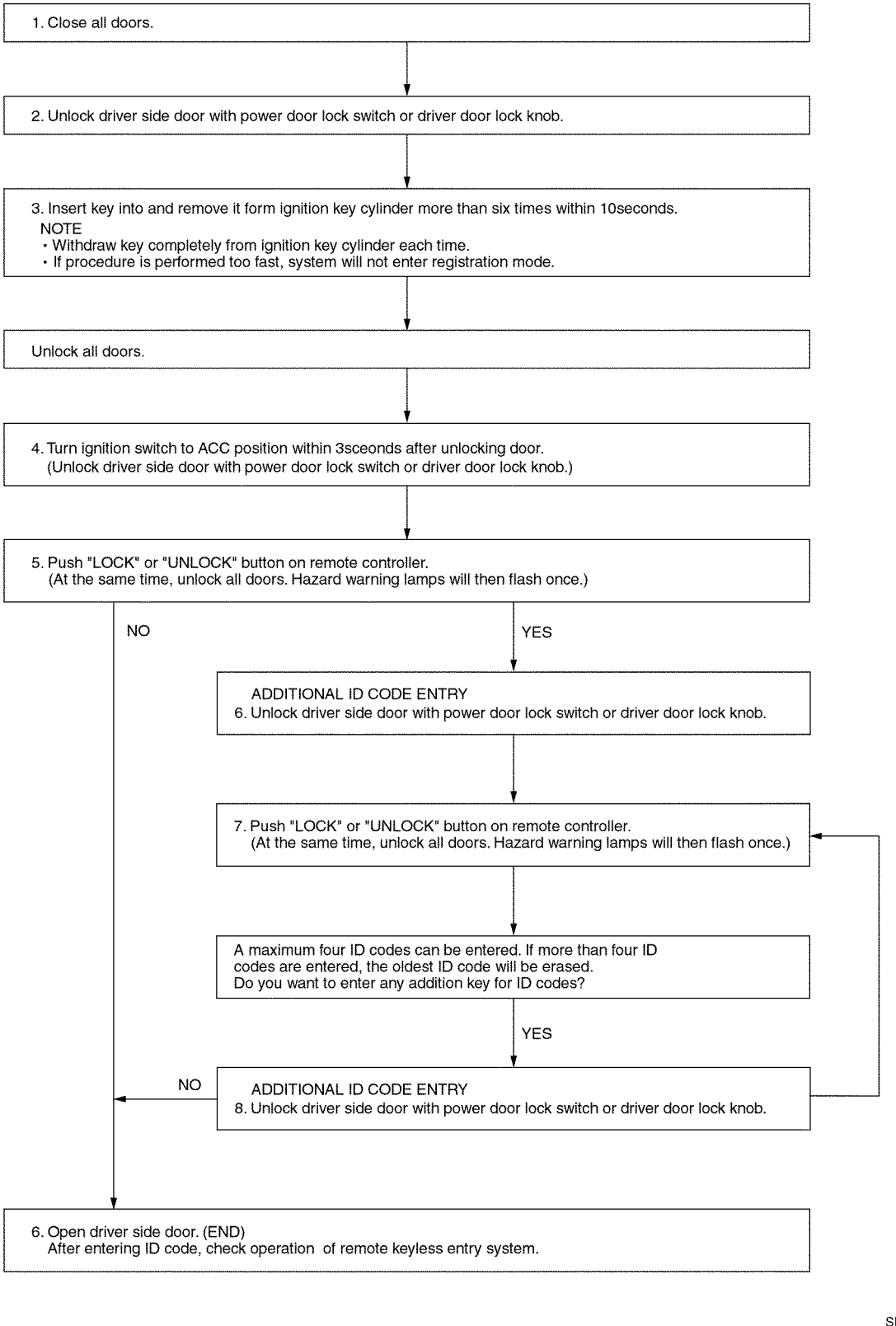
Remote Controller ID Set Up with Ignition Key Operation

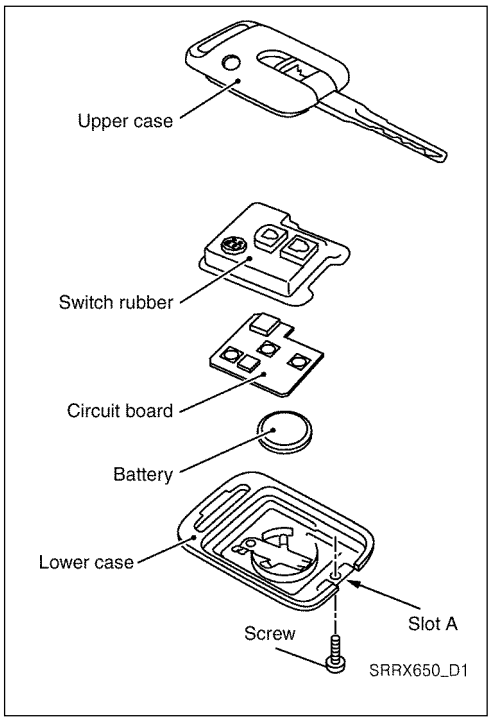


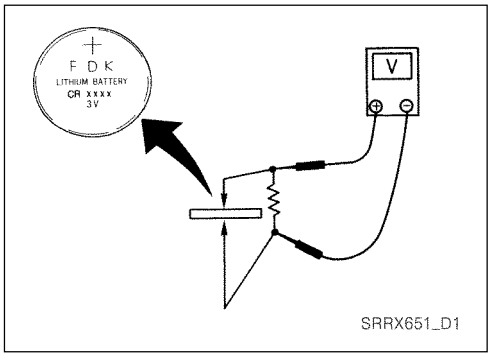
SRRX649_D1

CAUTION:

- **If a remote controller is lost, the ID code of the lost remote controller must be erased to prevent unauthorized use. However, when the ID code of a lost remote controller is not known, all controller ID codes should be erased. To erase all ID codes in memory, register one ID code (remote controller) four times. After all ID codes are erased, the ID codes of all remaining and/or new remote controllers must be re-registered.**
- **When registering an additional remote controller, the existing ID codes in memory may or may not be erased. If four ID codes are stored in memory, when an additional code is registered, only the oldest code is erased. If less than four ID codes are stored in memory, when an additional ID code is registered, the new ID code is added and no ID codes are erased. If you need to activate more than two additional new remote controllers, repeat the procedure "Additional ID code entry" for each new remote controllers.**

  Entry of maximum four ID codes is allowed. When more than four ID codes are entered, the oldest ID code will be erased.
- **Even if same ID code that is already in the memory is input, the same ID code can be entered. The code is counted as an additional code.**





Remote Controller Inspection

DISASSEMBLY AND ASSEMBLY OF KEY INTEGRATED REMOTE CONTROLLER

1. Remove case mounting screw.
2. Insert a flat-bladed screwdriver into slot A and pry off the case.

CAUTION:

Be careful not to touch the printed circuits directly.

3. Replace the battery.
   - Remove the battery from the lower case and replace it.

CAUTION:

When replacing battery, be sure to keep dirt, grease, and other foreign materials off the electrode contact area.

4. Assemble the separated case halves and tighten the screws.

   After replacing components, check to make sure all remote controller functions work normally.

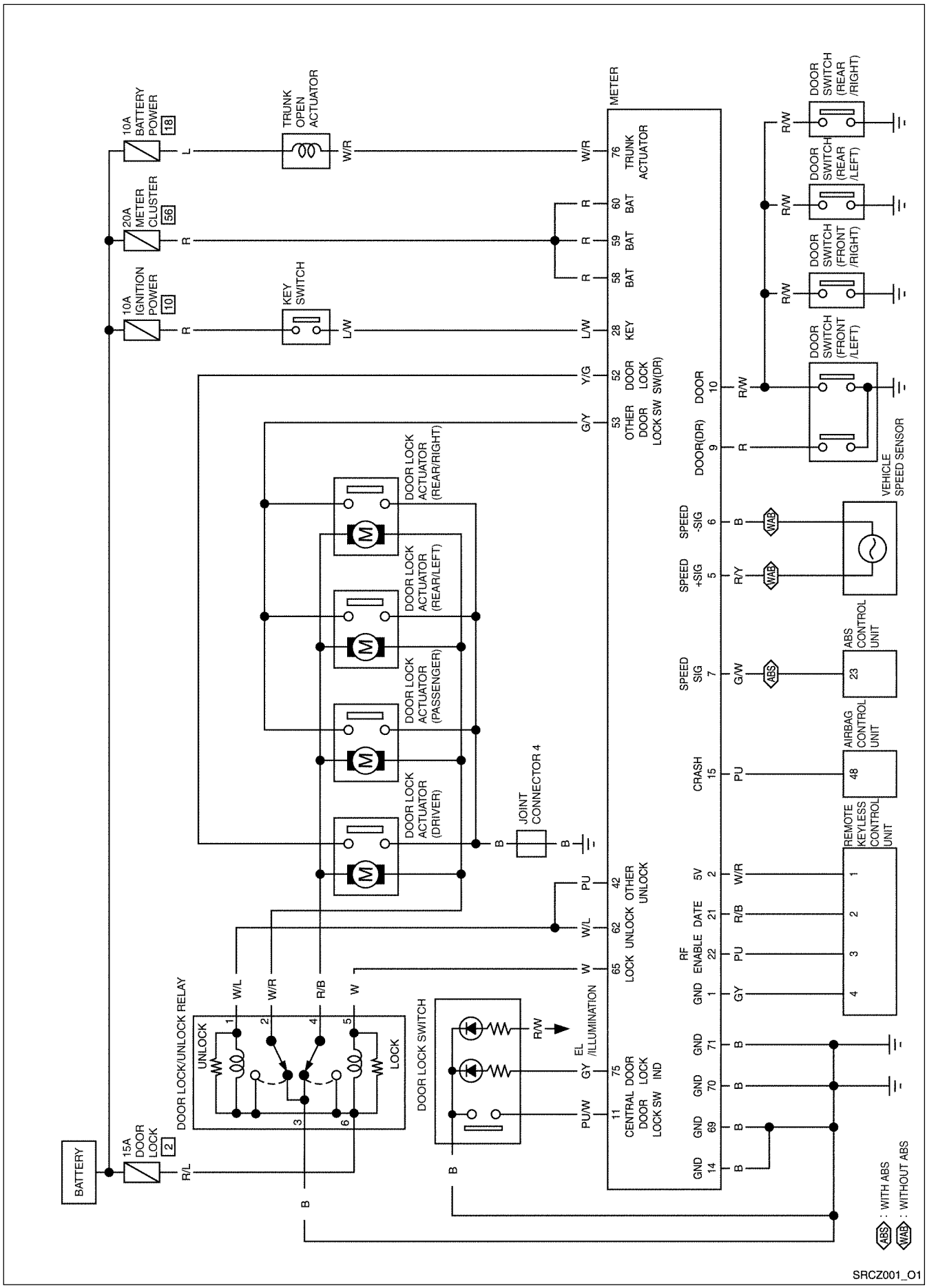
REMOTE CONTROLLER BATTERY INSPECTION

Check voltage by connecting a resistance (approximately 300Ω) so that the current value becomes about 10 mA.

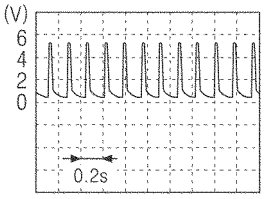
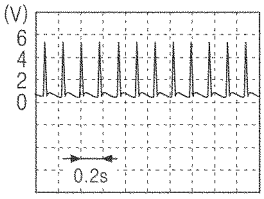
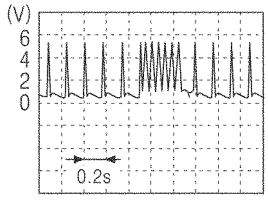
Judgement standard (Approx.):

Approx. 2.5 V - Approx. 3.0 V

Circuit Diagram



Combination Meter (Meter Control Unit) Input/Output Signal Standards

Terminal No.	Signal	Operation or condition	Standard value (V)
58, 59, 60	Battery power supply	-	Power voltage
28	IGN power supply	Ignition switch ON	Power voltage
52	Driver's door lock switch signal	Unlocked (ON)	Approx. 0 V
		Locked (OFF)	Approx. 5 V
53	Passenger's (rear) door lock switch signal	Unlocked (ON)	Approx. 0 V
		Locked (OFF)	Approx. 5 V
2	Keyless tuner power supply	-	Approx. 5 V
1	Keyless tuner ground	-	Approx. 0 V
22	Keyless tuner power supply	-	 SRDX233_D1
21	Keyless tuner signal	Waiting	 SRDX234_D1
		When signal is received	 SRDX235_D1
65	Door lock actuator lock signal	During lock operation	Varies approx. 12 V→0 V→12 V
62	Door lock actuator unlock signal	During unlock operation	Varies approx. 12 V→0 V→12 V
14, 69, 70, 71	Ground	-	Approx. 0 V

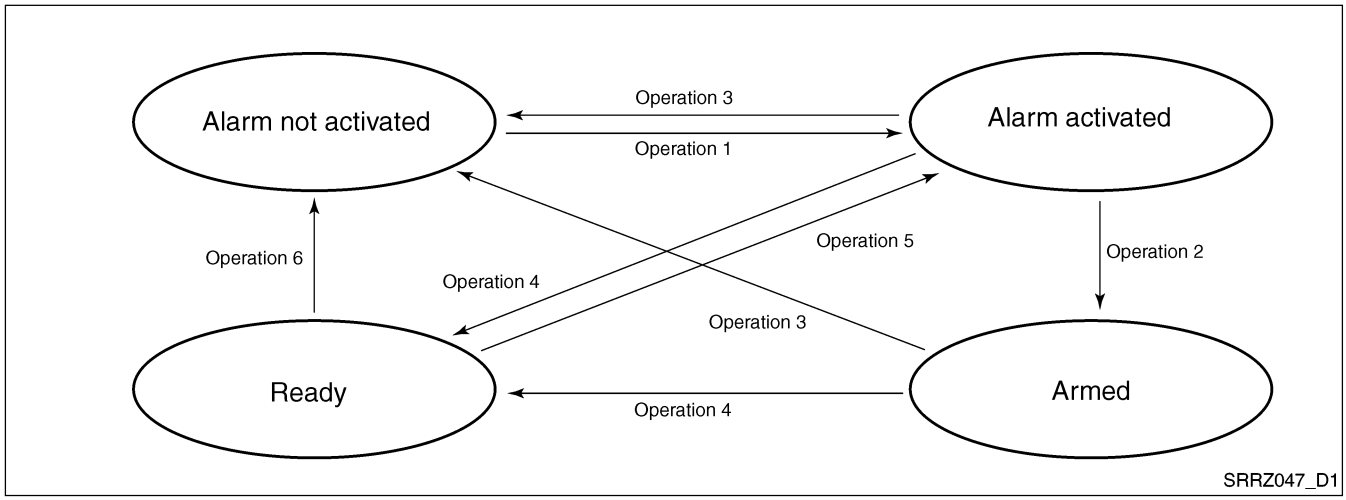
Trouble Diagnosis

Refer to COMBINATION METER - TROUBLE DIAGNOSIS (EL-69).

Description

The anti-theft system is set by operating the remote controller's lock button. There are four modes which are alarm activated mode, armed mode, alarm cancellation mode and ready mode, and the anti-theft indicator indicates the current condition according to the current mode by flashing indicator.

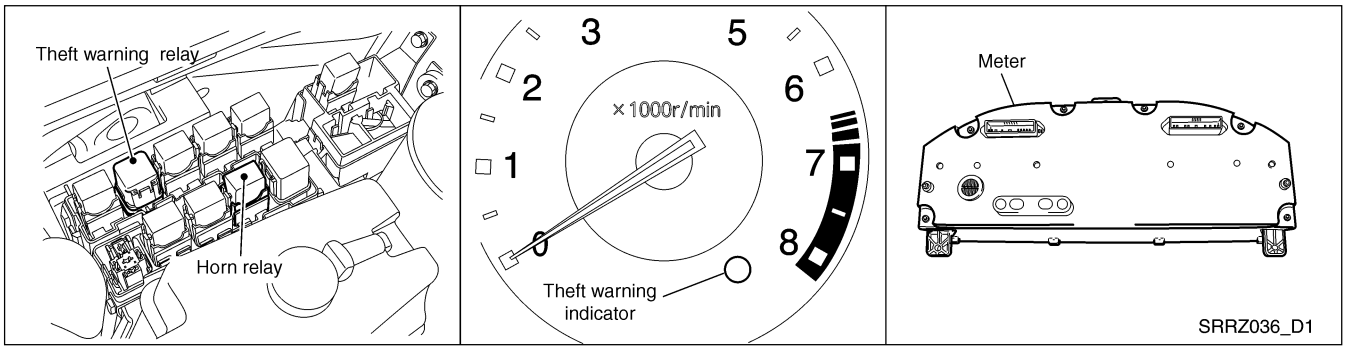
BASIC OPERATION



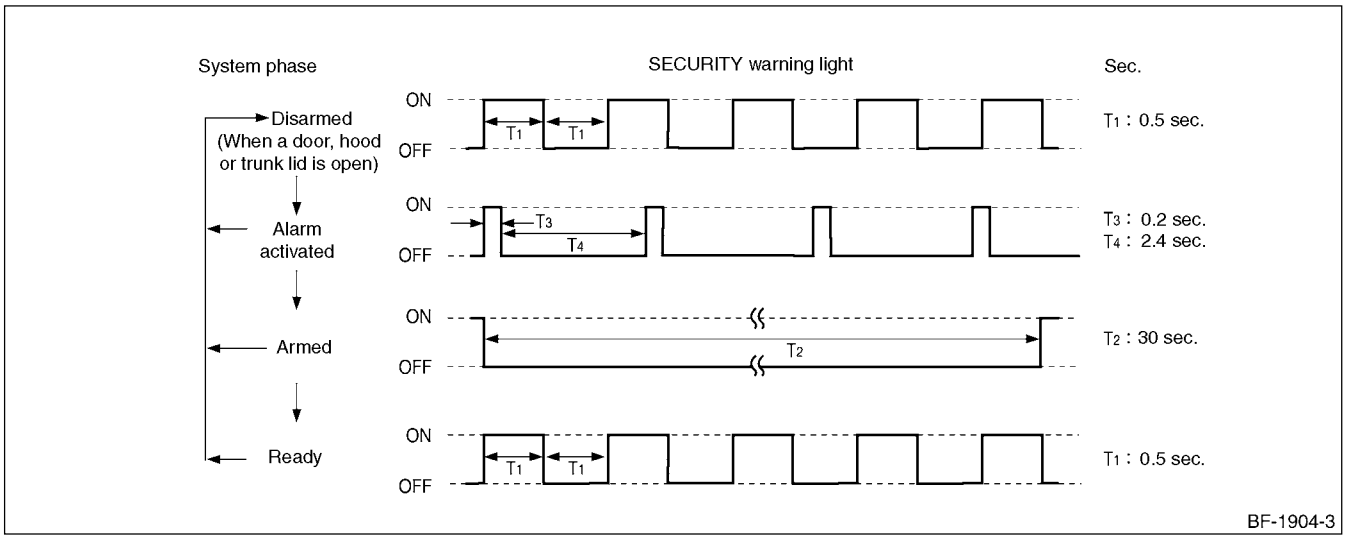
OPERATING CONDITIONS

Operation	Previous condition	Current condition	Condition and function
Operation 1	Alarm not activated	Alarm activated	● The alarm is activated when operating the door lock by the remote controller or operating the auto lock function under the following conditions: ignition switch OFF, key switch OFF, all door switch OFF, hood switch OFF, trunk lid open switch OFF and driver's door lock switch OFF.
Operation 2	Alarm activated	Armed	● The system is armed when receiving hood switch ON signal, trunk open switch ON signal or door lock switch ON signal while reconnecting the battery after the battery is discharged. ● The theft warning alarm (horn) relay and theft warning alarm (hazard) relay are turned ON for 30 seconds to indicate the theft warning state. This state remains until the cancel condition is inputted for theft warning alarm (start) cancellation relay operation.
Operation 3	Alarm activated/ Armed	Alarm not activated	● When door is unlocked using the remote controller or ● When the key switch is in the "ON" position and the ignition switch is in the "ON" position, the alarm is deactivated.
Operation 4	Alarm activated/ Armed	Ready	● When door is unlocked using the remote controller or ● When opening the trunk lid using the remote controller, it goes to the ready mode.
Operation 5	Ready	Alarm activated	● When the trunk lid open switch is turned OFF, the alarm is activated again.
Operation 6	Ready	Alarm not activated	● The alarm is deactivated when receiving door switch ON signal, hood switch ON signal, one of door lock switch ON signal, key switch ON signal or the ignition switch ON signal.

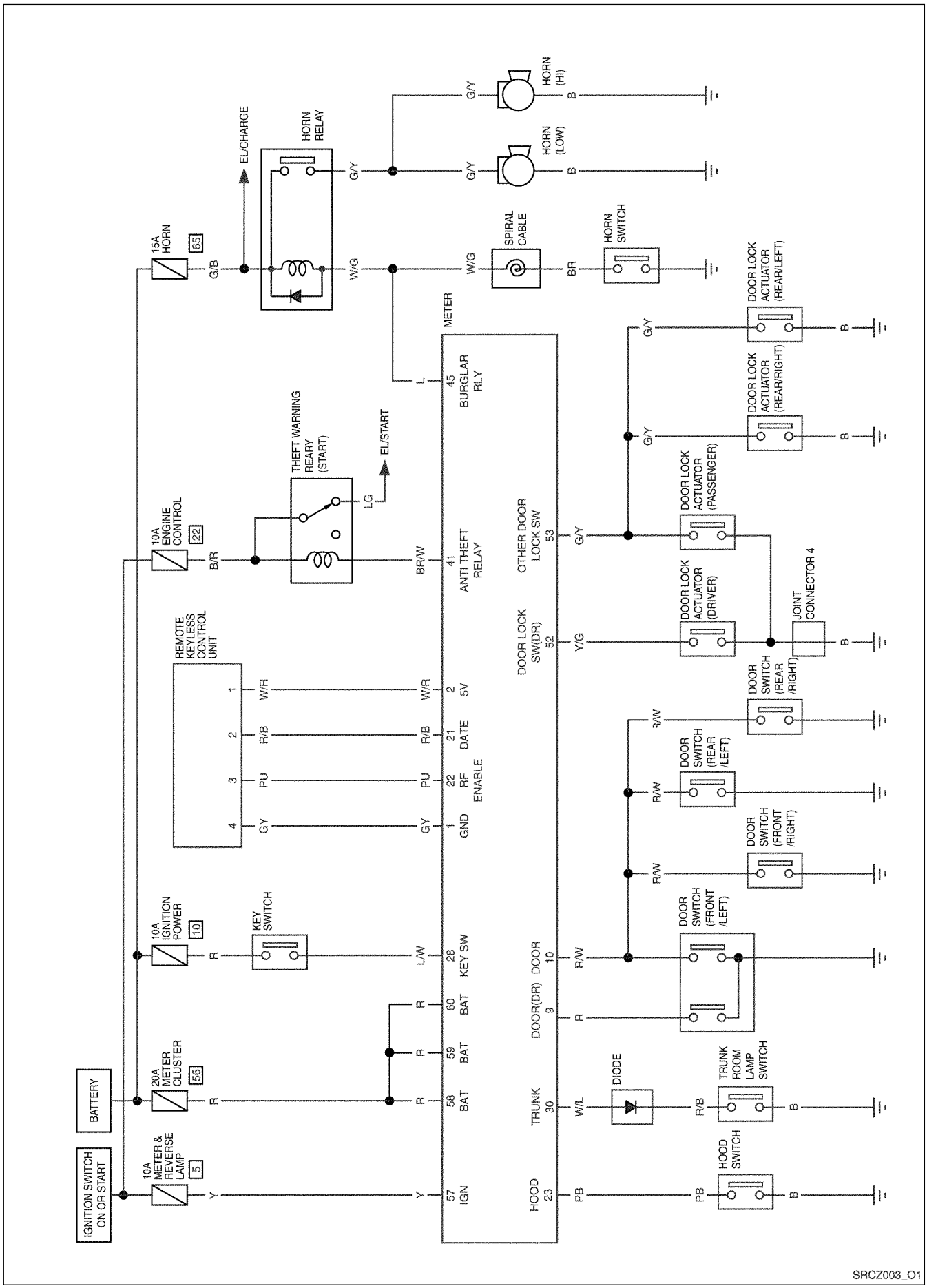
Component Parts Location



ANTI-THEFT INDICATOR OPERATION



Circuit Diagram



Meter Input/Output Signal Standards

Terminal No.	Signal	Operation or condition	Standard value (V)
58, 59, 60	Battery power supply	-	Approx. 12 V
57	IGN power supply	Ignition switch	Approx. 12 V
9	Driver's door lock switch input signal	Driver's door is closed (OFF)	Approx. 12 V
		Driver's door is opened (ON)	Approx. 0 V
10	All door's switch input signal	All doors are closed (OFF)	Approx. 12 V
		One of doors is opened	Approx. 0 V

Trouble Diagnosis

Refer to COMBINATION METER - TROUBLE DIAGNOSIS (EL-69).

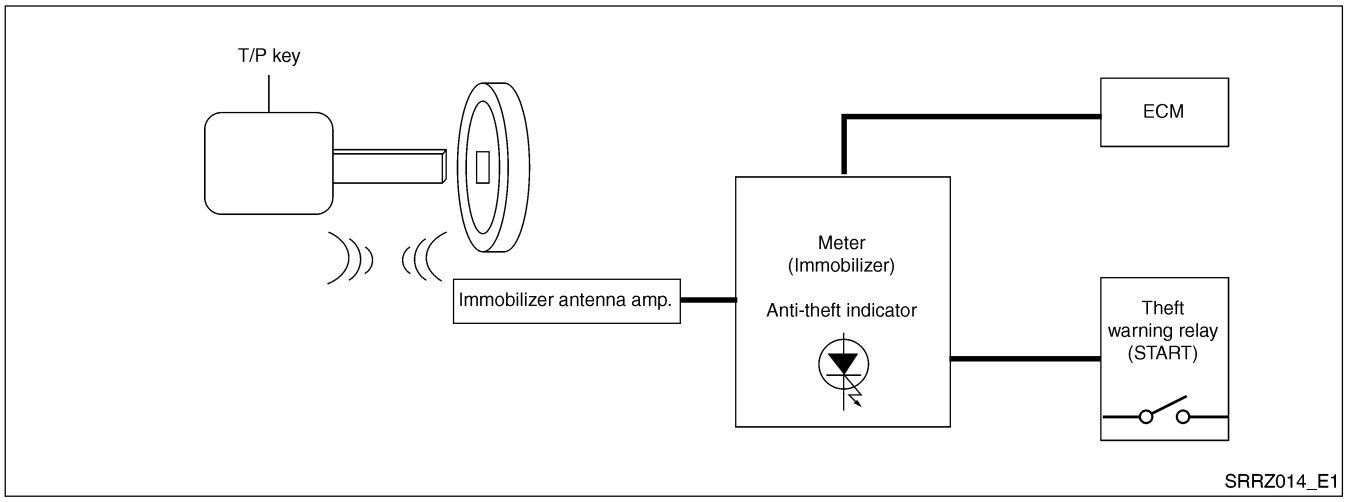
Description

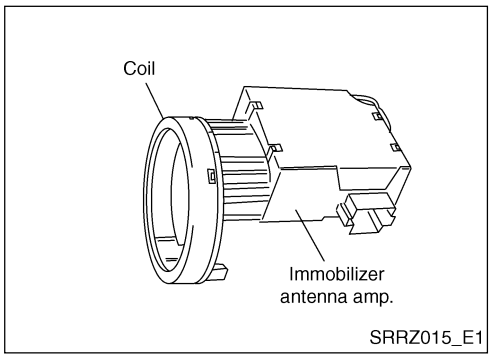
Anti-Theft System has the following immobilizer functions:

- Engine immobilizer shows high anti-theft performance to prevent engine start by other than the owner (registered key: ignition key, mechanical key).
- Only a key with key ID registered in ECM and meter can start engine. If the code data received from TP key does not match, the immobilizer antenna communicates with the meter. Then it cuts off the power to the engine start circuit and ECM controls the fuel supply so that the engine cannot be started.
- Anti-theft indicator warns outsiders that the vehicle is equipped with the anti-theft system.
- During trouble diagnosis or when the ECM or the meter have been replaced or if the additional TP key was registered, registration(*1) is required.

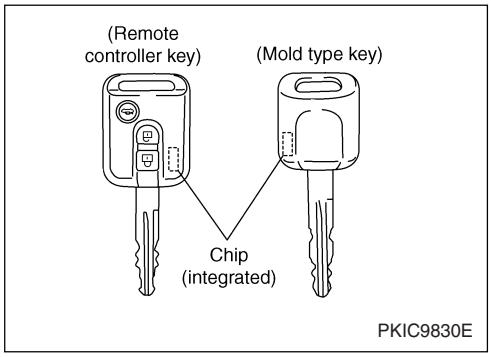
  (*1) : All keys kept by the owner of the vehicle should be registered.
- If the owner requires, mechanical key ID can be registered for up to 4 keys.

System Description





SRRZ015_E1



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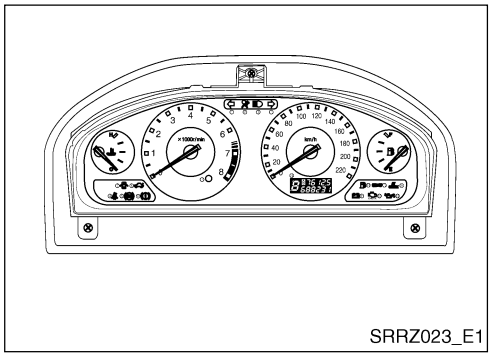
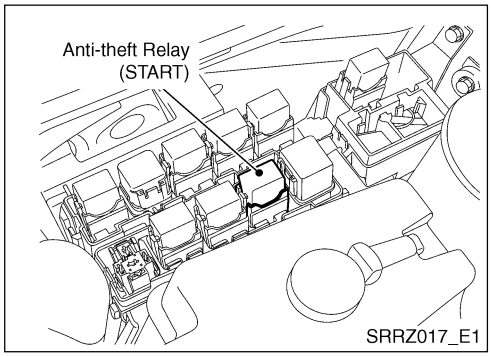

SRRZ023_E1



SRRZ017_E1

System Composition

IMMOBILIZER ANTENNA AMP.

- When the ignition switch is “ON”, the coil becomes magnetic as the power supplies to the coil and the magnetic field forms around the coil.
- The immobilizer antenna receives the ID code from the meter through the communication line and sends the meter the data according to the matching condition of the ID code received from the TP key.

TP KEY

- There is a chip integrated in the TP key. The TP key transfers the ID code to the immobilizer antenna amp. with the power of the magnetic field formed by the oil on the antenna.

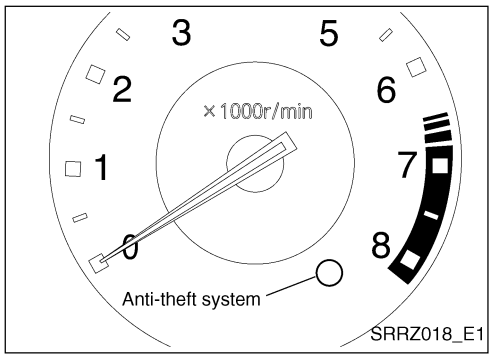
UNIFIED METER

- The unified meter receives the ID code data from the immobilizer antenna amp. and turns on the anti-theft indicator. If the ID code matches, the engine can be started through the communication with ECM and CAN. If the ID code does not match, ECM controls the fuel supply and cuts off the power supply to the anti-theft relay (START) so that the engine cannot be started.

ANTI-THEFT RELAY (START) CONTROL

- The anti-theft relay (START) control is controlled by the meter. If the ID code does not match and the communication between ECM and CAN fails, it cuts off the power supply to the anti-theft relay (START) when the ignition switch is “ON”.

Security Indicator



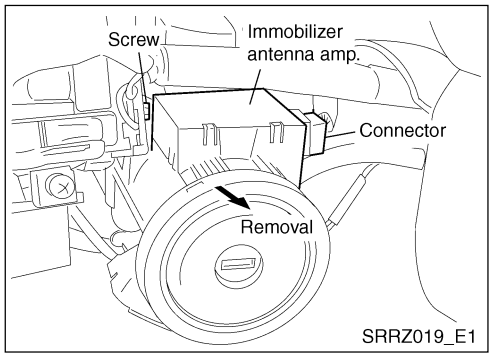
Indicator ON Condition

The immobilizer indicator operates when the ignition key is “ON”.

1. If the indicator comes on and goes off in 2~3 seconds
   The engine can be started when the system is in a normal condition.
2. If the indicator does not go off but comes on
   - The indicator comes on when there is an error with the ECM. If there is no code registered in the ECM or there is a communication malfunction between the ECM and the meter, the indicator comes on and does not go off.
3. If the indicator does not go off but flashes
   - The indicator flashes when there in an error with the TP key. If the TP key is not registered or TP key is out of the specified distance, the indicator keeps flashing.

REFERENCE:

For other “ON” conditions of the indicator, refer to the “Anti-theft indicator operation” in “Anti-theft system” (EL-161).



Removal and Installation Immobilizer Antenna Amp.

REMOVAL

CAUTION:

- **Before servicing SRS, turn ignition switch OFF, disconnect both battery cables and wait at least 3 minutes.**

1. Remove the steering column cover. Refer to ST-8.
2. Disconnect the immobiliser antenna amp. connector, remove the screw and immobiliser antenna amp.

INSTALLATION

Install in the reverse order of removal.

ID Code Entry Procedure When Replacing Parts

TP KEY REPLACEMENT/ADDITION MODE

Refer to CONSULT-II OPERATION MANUAL NATS.

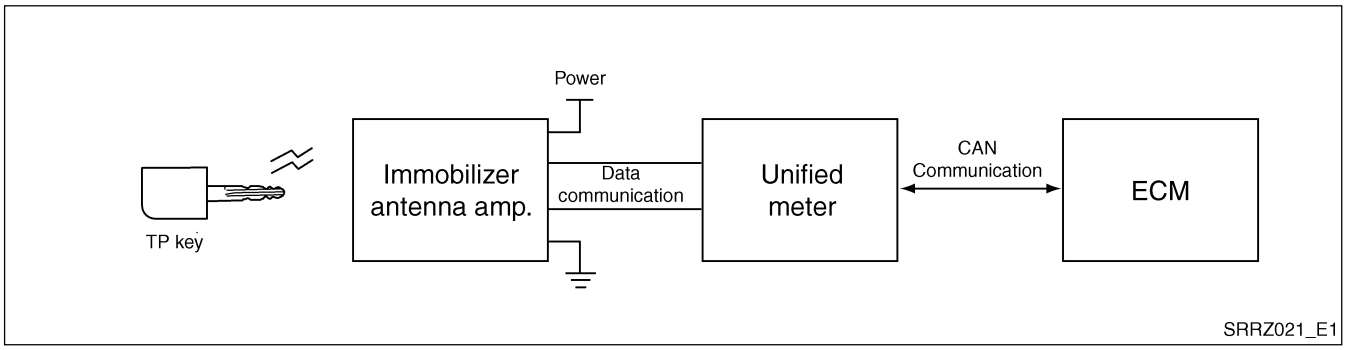
METER REPLACEMENT MODE

Refer to CONSULT-II OPERATION MANUAL NATS.

ECM REPLACEMENT MODE

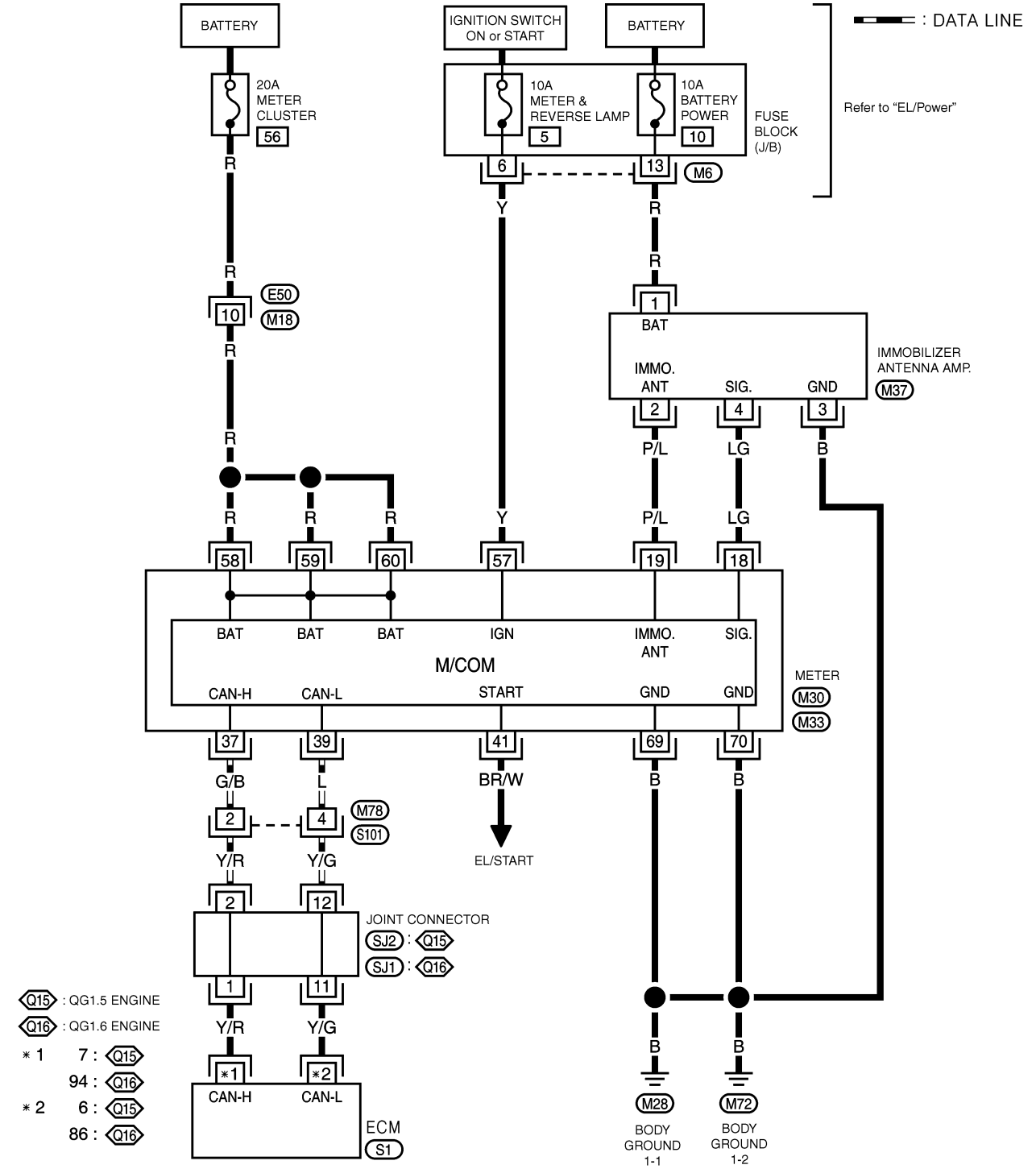
Refer to CONSULT-II OPERATION MANUAL NATS.

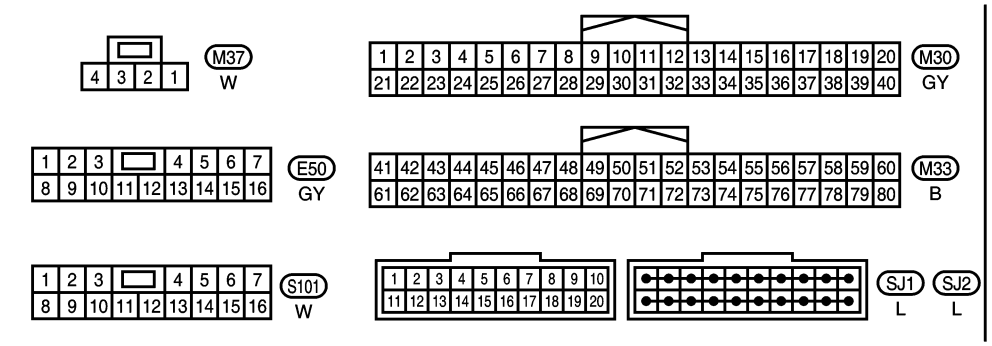
Normal Engine Starting Procedure



1. When the ignition switch is “ON”, ECM sends the security code to the meter and requests for the reply from the meter.
2. The meter calculate the security code and send the result to the ECM.
3. The ECM compares the result with its calculation result. If the result is OK, the ECM replies with OK and the engine can be started.

Wiring Diagram — EL/Immobilizer





Refer to "FUSE BLOCK (J/B)"
M6

Refer to "ELECTRICAL UNIT"
S1

SRWZ044_O1

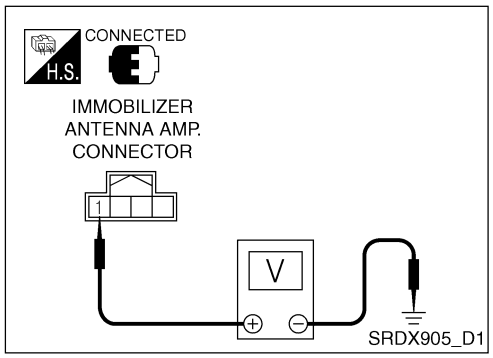
Terminals and Reference Values for Meter

Terminal No.	Wire color	Signal name	Measuring condition		Reference value
			Ignition switch	Operation or condition	
57	Y	IGN power supply	ON	-	Battery voltage
58, 59, 60	R	Battery power supply	OFF	-	Battery voltage
41	BR/W	Anti-theft relay signal	ON	-	Battery voltage
37	G/B	CAN-H	-	-	-
39	L	CAN-L	-	-	-
18	LG	Immobilizer antenna amp. signal	-	Ignition switch: OFF → ON	Pointer of analog tester moves when the ignition switch is "ON".
19	P/L	Immobilizer antenna amp. signal	-	Ignition switch: OFF → ON	Pointer of analog tester moves when the ignition switch is "ON".
67, 70	B	Ground	-	-	0 (V)

Trouble Diagnosis

Refer to COMBINATION METER - TROUBLE DIAGNOSIS (EL-69).

Immobilizer Antenna Inspection



1.Check Power Supply Circuit Of Immobilizer

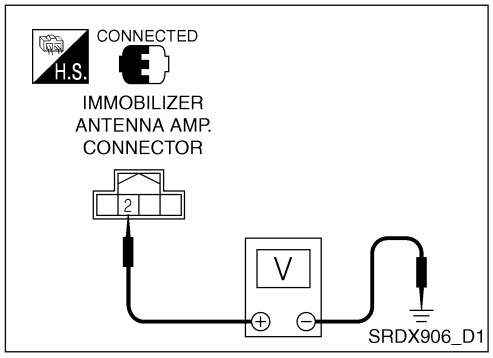
Check voltage between immobilizer antenna amp. harness connector terminal 1 and ground with tester.

1 - Ground : Power voltage

OK or NG

OK → GO TO 2.

NG → Check harness for open or short between immobilizer antenna amp. and fuse.



2. Check Immobiliser Antenna Amp. Signal Line- 1

Check voltage between immobilizer antenna amp. harness connector terminal 2 and ground with analogue tester.

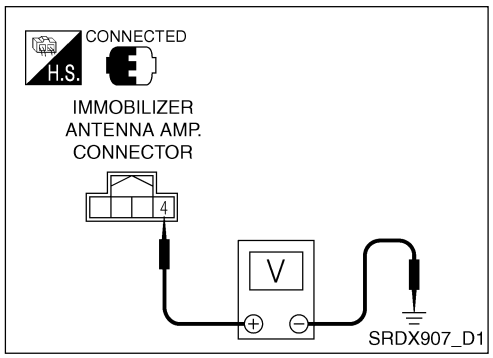
Before inserting mechanical key in ignition switch: Approx. 0 V

After inserting mechanical key in ignition switch: Pointer of tester should move.

OK or NG

OK → GO TO 3.

NG → Check harness for open or short between immobilizer antenna amp. and meter.



3. Check Immobiliser Antenna Amp. Signal Line- 2

Check voltage between immobilizer antenna amp. harness connector terminal 4 and ground with analogue tester.

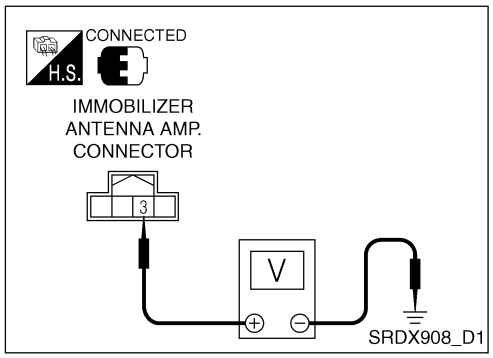
Before inserting mechanical key in ignition switch: Approx. 0 V

After inserting mechanical key in ignition switch: Pointer of tester should move.

OK or NG

OK → GO TO 4.

NG → Check harness for open or short between immobilizer antenna amp. and meter.



4. Check Immobiliser Antenna Amp. Ground Line Circuit

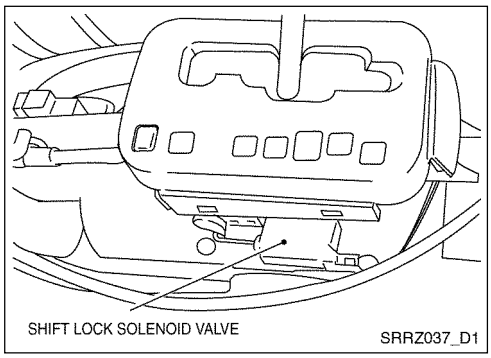
1. Turn ignition switch OFF.
2. Check continuity between immobiliser antenna amp. connector terminal 3 and ground.

3 - Ground : Continuity should exist.

OK or NG

OK → Immobiliser antenna amp. is malfunctioning.

NG → Check harness for open or short between immobilizer antenna amp. and ground.



Description

When combination meter (BCM integrated) detects the P range signal and the brake switch signal, it operates the solenoid valve to control the shift lever from P to R range or from N to R range.

Basic Operation

1. P Range Lock Control

When the brake switch signal is detected by depressing the brake pedal, the shift lock solenoid valve operates so that the shift from P range is possible while the ignition switch is “ON”.

2. N Range Lock Control

If the vehicle speed exceeds 14 km/h, the shift lock solenoid valve operates so that the shift from N to R range is not possible.

If the vehicle speed becomes below 8 km/h, the shift lock solenoid valve is disengaged so that the shift is possible.

3. 3-minute Timer Control

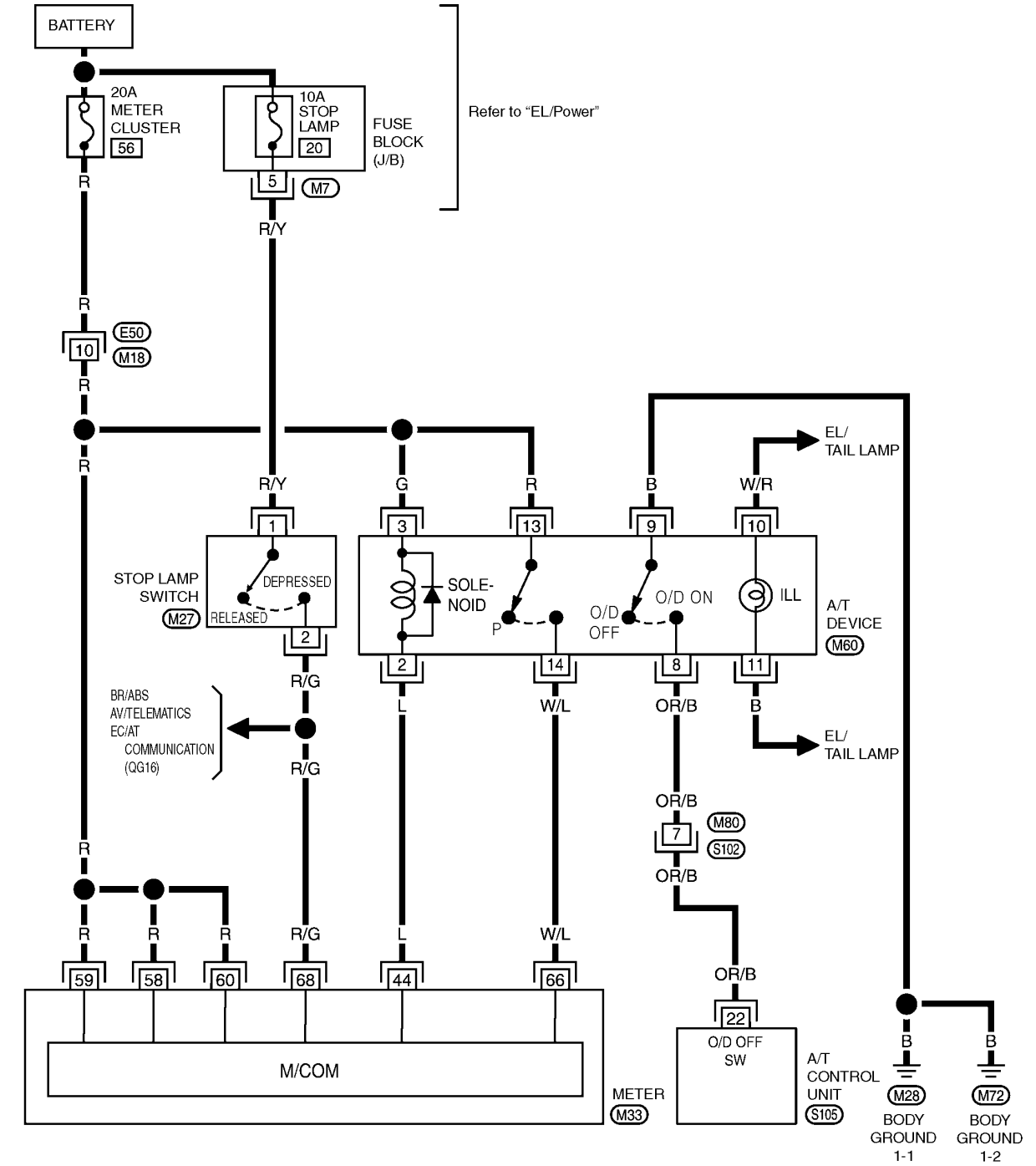
The shift from N to P range is possible within 3 minutes after turning the ignition switch from “ON” to “OFF”.

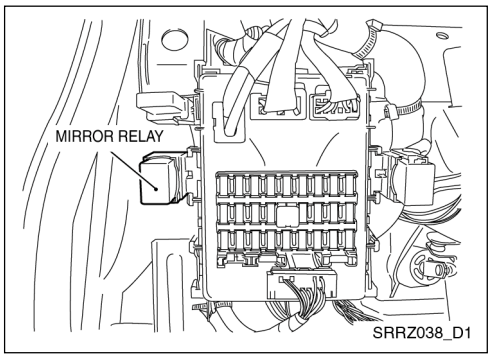
Operation Check

Refer to the “INSPECTION TIPS” (AT-115).

Wiring Diagram

AT/Device

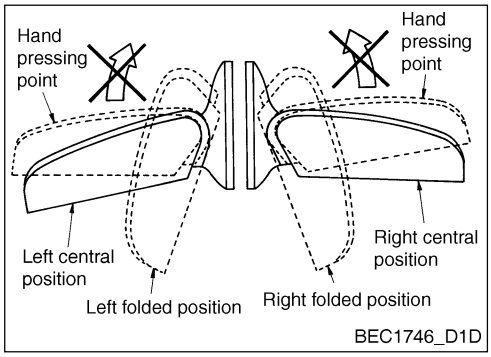




Timer Function

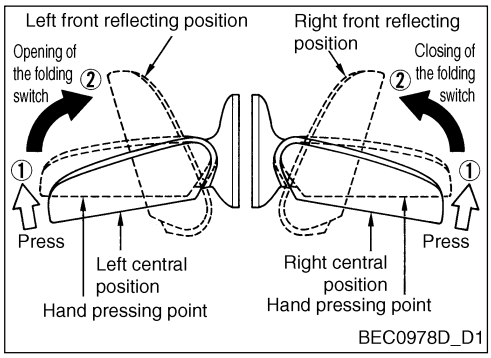
The operation of mirrors can be continued for 30 seconds even after turning the ignition key switch to “OFF” position with the power mirror timer function.

The power supplies to the mirror switch by operating the mirror relay when the ignition key switch is “OFF”.



Precautions in Handling Electrical Folding Mirror

- Do not attempt to fold the power folding mirror manually. If have to, always fold it until it clicks to the folded position. (When the mirror is unfolded to its original position by hand, there may be vibration during driving, chattering or no folding operation.)

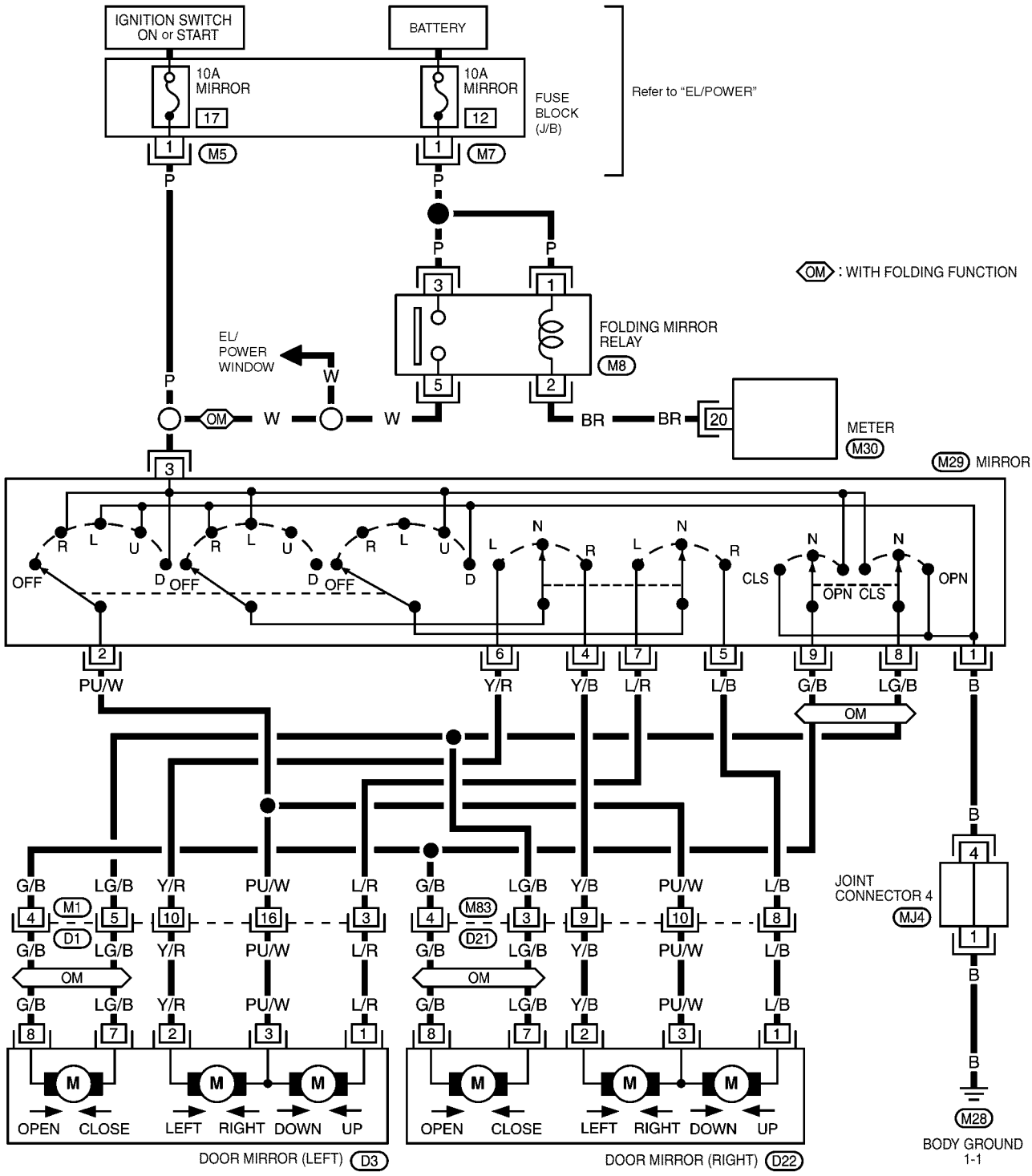


CAUTION:

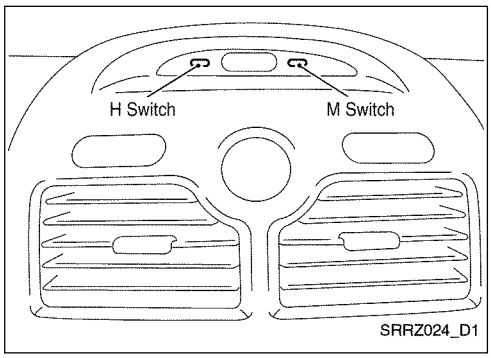
- **Do not fold the mirror assembly towards the front too much, it may brake.**
- **When folding the mirror with mirror folding switch, a “click” may be heard. This is not a malfunction.**
- **The left and right rearview mirrors are installed in little different positions from the center of the vehicle. The right mirror folds a little slower than the left mirror.**
- **When the mirror is folded towards vehicle front by hand and press the folding switch towards opening direction, the mirror body moves towards vehicle front but it is not a malfunction. Fold the mirrors all the way (towards rear of the vehicle) with the switch.**
- **The power folding mirror sometimes may not operate it the switch is operated over 5 times consecutively (to prevent from overheating). Let the system cool for about 5 minutes and it will come back normal.**

Wiring Diagram

EL/Mirror

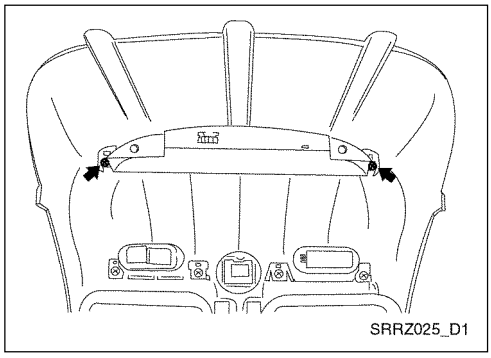


SRWZ036_O1



Clock Adjustment

- To adjust the hour, press the “H” adjusting button. To adjust the minutes, press the “M” button.



Removal • Installation of Clock

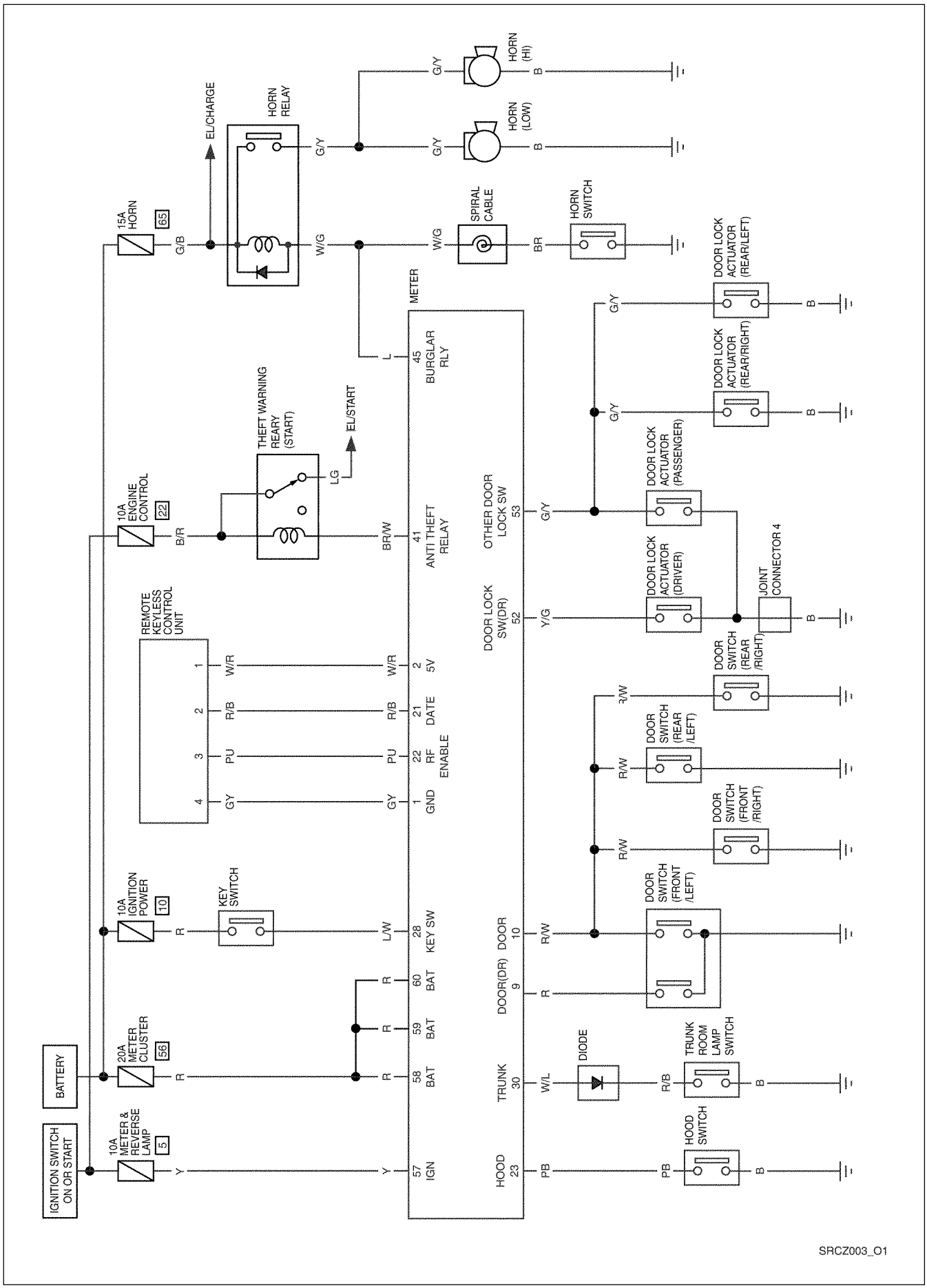
REMOVAL

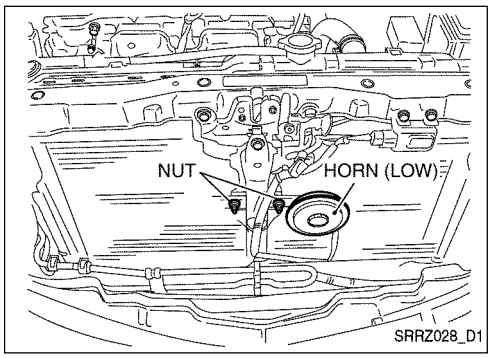
1. Remove the clluster lid C (refer to BT-40).
2. Remove screws (2) and remove the clock.

INSTALLATION

Install in the reverse order of removal.

Circuit Diagram





Removal and Installation

REMOVAL

1. Remove the radiator grille.
2. Remove the horn mounting nuts.

CAUTION:

Use FT bolts for horn installation.

INSTALLATION

Installation is in the reverse order of removal.

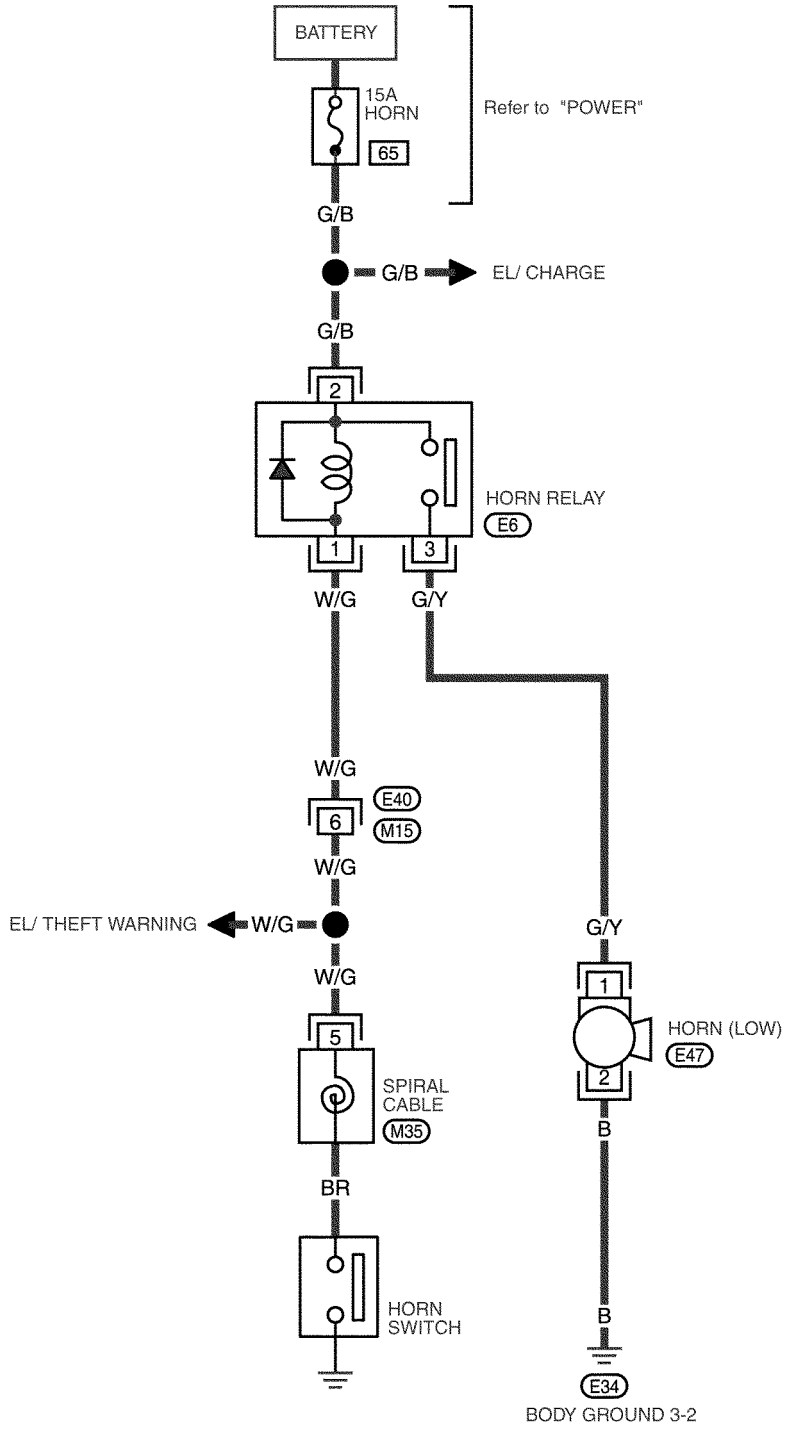
Horn mounting nut

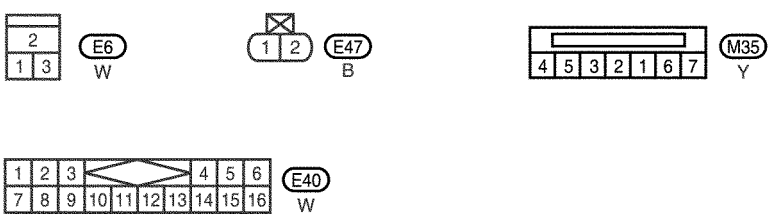
Tightening torque:

15.7 - 18.6 N•m (1.6 - 1.9 kgf•m)

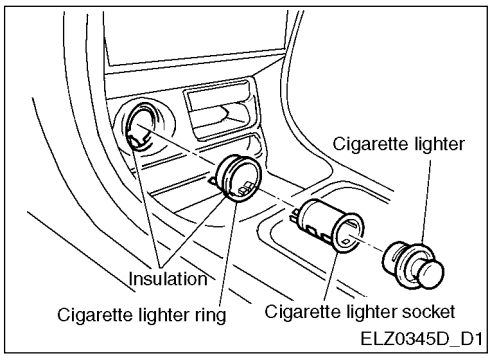
Wiring Diagram

EL/Horn





SRWZ039_O1



Removal • Installation of Cigarette Lighter

REMOVAL

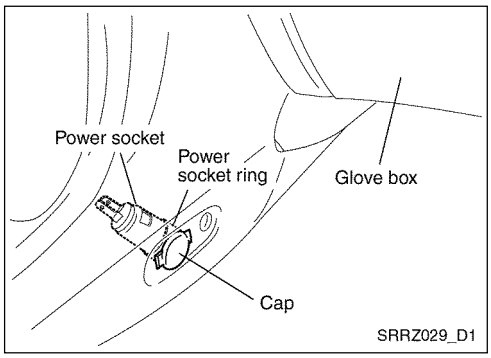
1. Remove the A/T finisher or M/T finisher. Refer to “Instrument Assembly” (BT-40).
2. Release the screws (2 EA) that holds the cluster lid C lower. Remove the cluster lid C lower.
3. Pull out the cigarette lighter.
4. Push the cigarette lighter socket from the back of the cluster lid C lower and remove.
5. Remove the cigarette lighter ring.

INSTALLATION

Install in the reverse order of removal cautioning as below.

CAUTION:

- **To install, align the cigarette lighter ring with open ends of the cluster lid C lower.**



Removal • Installation of Power Socket

REMOVAL

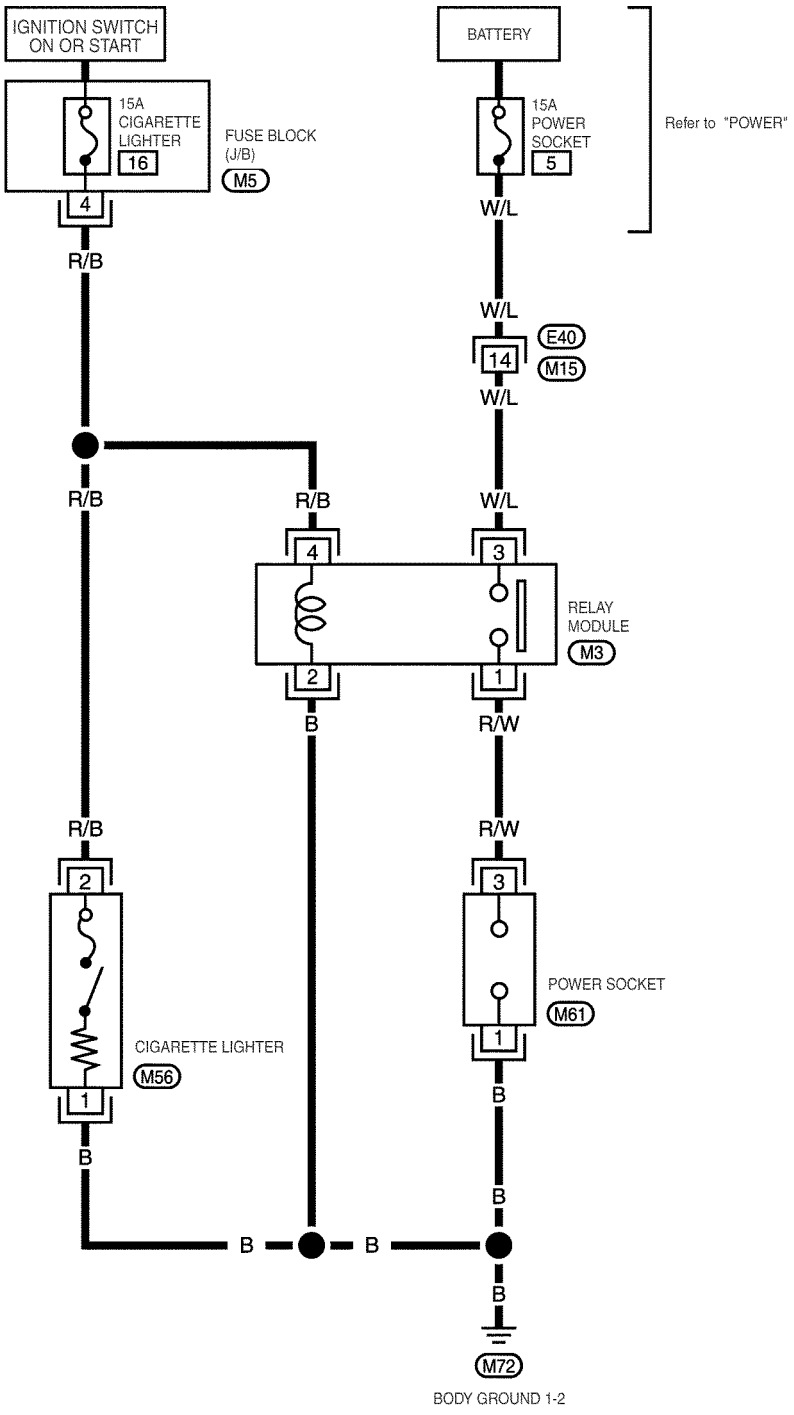
Open the power socket cap and remove the power socket by pressing the power socket ring’s groove using a flat-bladed screwdriver.

INSTALLATION

Install in the reverse order of removal cautioning as below.

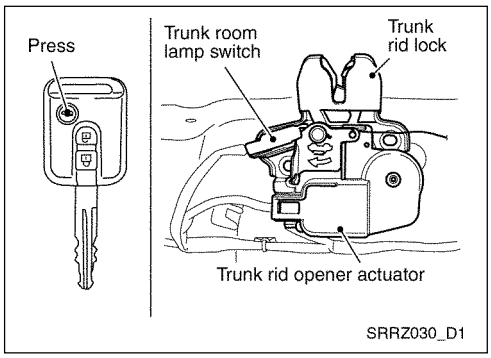
Wiring Diagram

EL/Power Socket



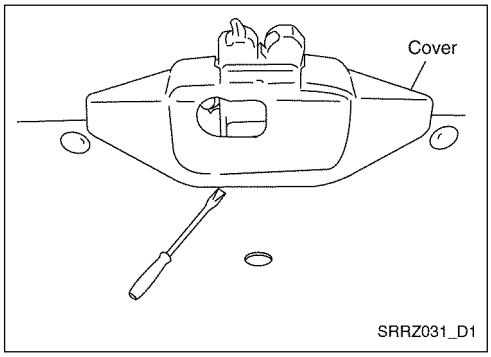
REFER TO FUSE BLOCK (J/B)
M5

SRWZ005_O1



Operation

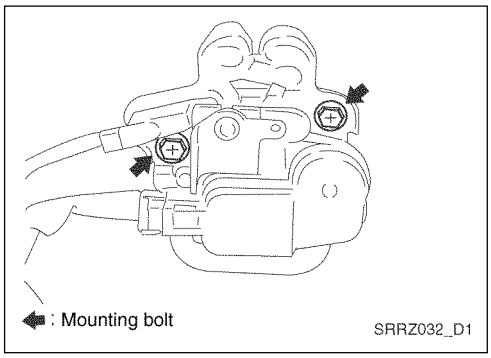
- When pressing the trunk open button in the remote controller, the remote keyless entry receiver detects the signal and sends it to BCM (meter integrated). Then, the trunk lid opener actuator is operated by the BCM signal.
- There is an phosphorescent emergency release lever to release the trunk lid lock inside the trunk.



Removal • Installation

REMOVAL

1. Remove the cover of the trunk lid opener using a flat bladed screwdriver.
2. Remove both bolts and then remove the trunk lid opener actuator.
3. Disconnect the connected harness connector.



INSTALLATION

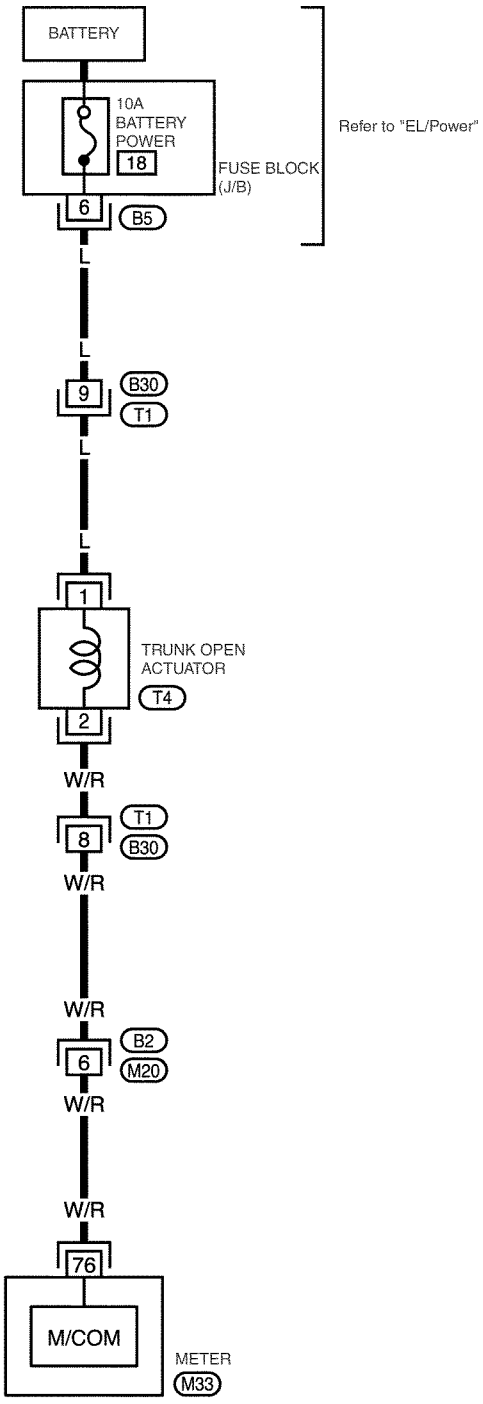
Install in the reverse order of removal.

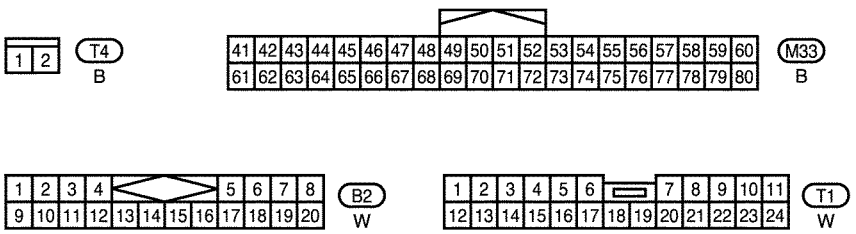
Trunk lid opener mounting bolt

Tightening torque:

5.8 N•m (0.59 kg•m)

Wiring Diagram



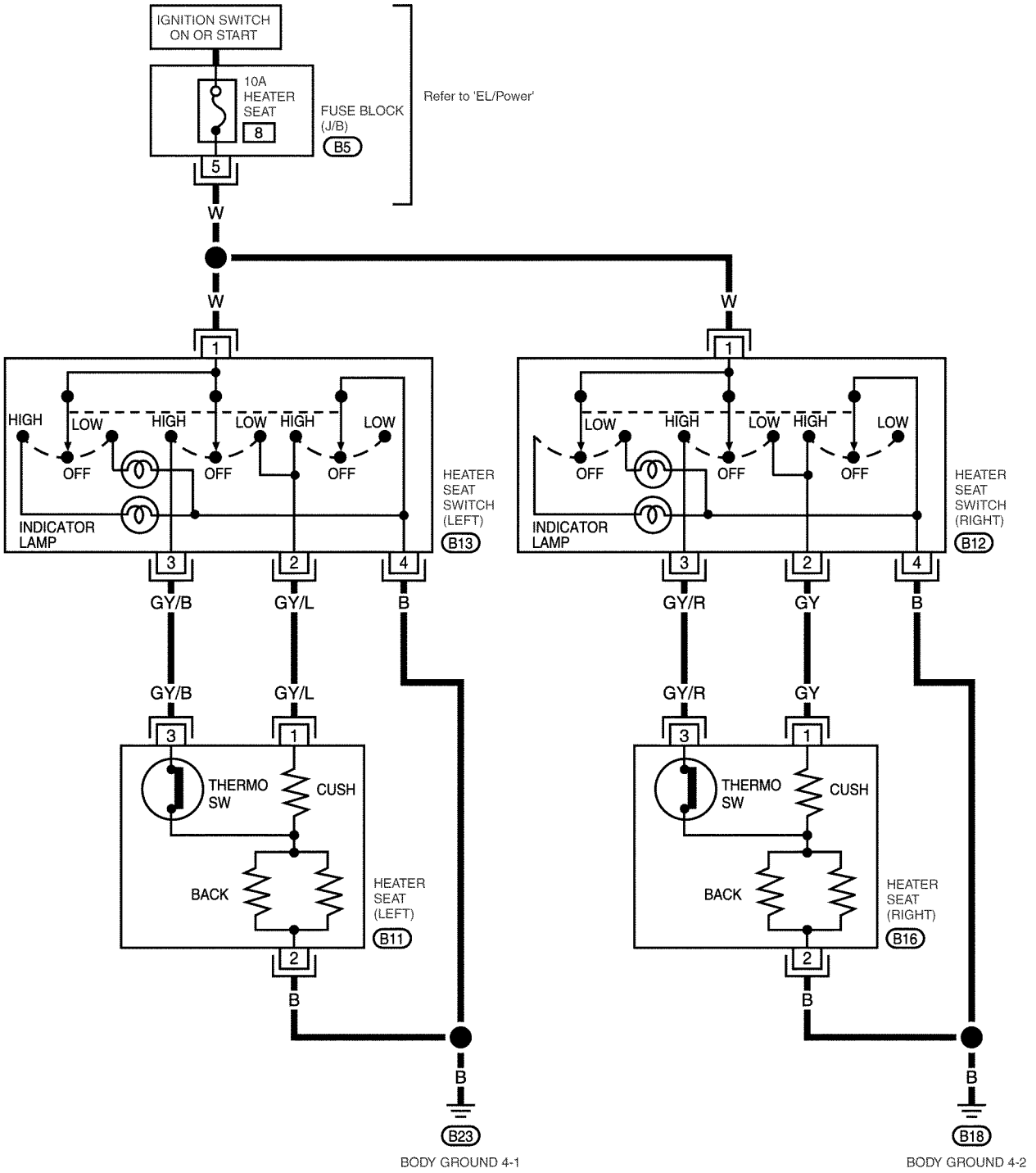


REFER TO FUSE BLOCK (J/B)

B5

SRWZ066_O1

Wiring Diagram — EL/Heater Seat



REFER TO FUSE BLOCK (J/B) B5

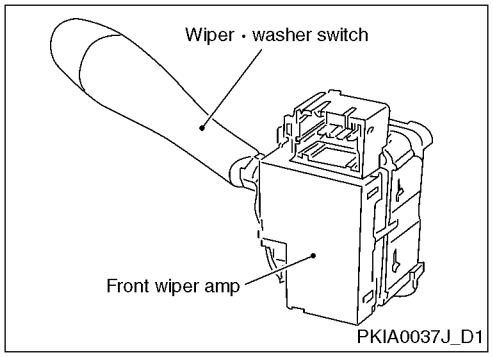
SRWZ004_O1

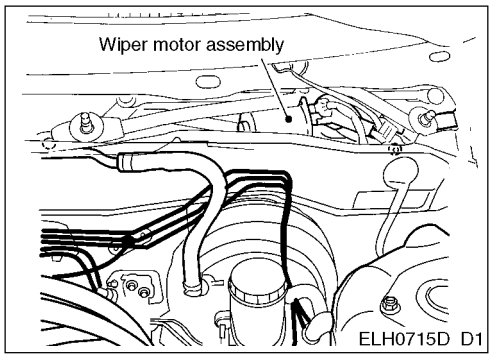
System - General

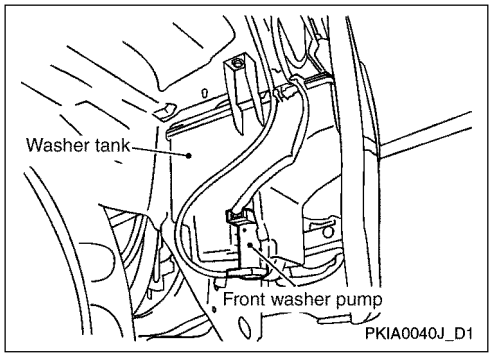
FRONT WIPER INTERMITTENT OPERATION

The intermittent operation can set the wiper motor to operate the wiper arm within the intervals 2 to 13 seconds. It is controlled by the wiper amp in the wiper switch and when the wiper switch is at INT, ground is supplied to the wiper amp. The operation interval is controlled by the signal transmitted to the wiper amp from the wiper volume switch in the wiper switch.

Components Location

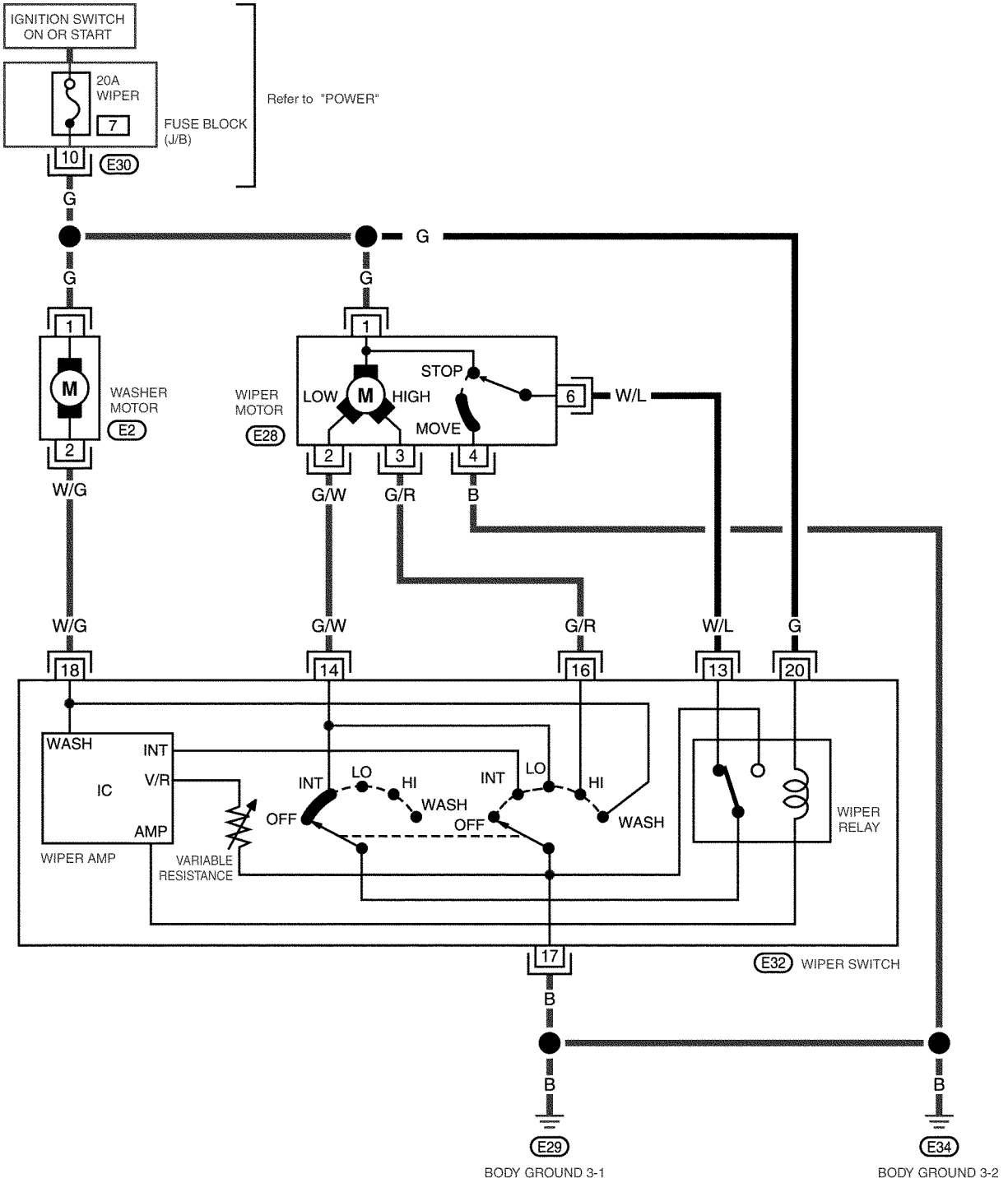




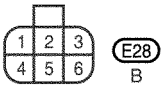


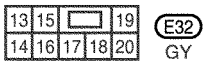
Wiring Diagram

EL/Wiper



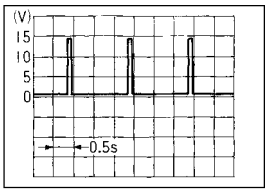
REFER TO FUSE BLOCK (J/B)
E30





SRWZ037_O1

Front Wiper Amp Input/Output Signal Standards

Terminal No.	Signal	Measurement			Standard value (V)
		Key switch	Operation		
13	Wiper motor position detect signal	ON	Wiper switch: LO position		 ELH0542D_D1
16	Wiper motor HI signal	ON	Wiper switch	OFF	Approx. 12
				HI	Approx. 0
14	Wiper motor LO signal	ON	Wiper switch	OFF	Approx. 12
				LO	Approx. 0
17	Ground	ON	-		Approx. 0
18	Washer operation detect signal	ON	Washer motor OFF		Approx. 0
			Washer motor ON		Approx. 12
20	Ignition power	ON	-		Approx. 12

ENGINE MECHANICAL

SECTION EM

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Precautions

Coolant Drain

- Drain the coolant when it completely cooled down.

Fuel Line Removal

- Work in location without any fire.
- Release the fuel pressure prior to work.
- After removal, place a cap at the fuel lines to prevent fuel leakage.

Removal and Disassembly

- Work safely with correct special tools where it is instructed.
- Be extra careful not to damage the mating surfaces.
- Block with tapes if necessary to prevent foreign particles entering into the engine.
- Arrange properly in order all the removed components to facilitate inspection and assembly.
- In principle, loosen the bolts and nuts from the outer edge diagonally. Follow the instructions when special instructions are given.

Inspection, Adjustment and Replacement

- Adjust or replace after through component inspection according to inspection methods. The same applies for new components. Replace if necessary.

Assembly and Installation

- Always use torque wrench for bolt and nut tightening.
- In principle, tighten the bolts and nuts 2 to 3 times little by little from the center diagonally. Follow the instructions when special instructions are given.
- Replace the gasket, packing, oil seal, and O-ring with new.
- Clean and air-blow all components. Be careful not to clog the oil and coolant passages.
- Be careful not to damage the mating surfaces and clean all dusts and foreign particles. Properly apply engine oil on the mating surfaces and then assemble.
- When coolant is drained, bleed the air from the coolant passages.
- After the assembly has completed, run the engine and check for any coolant, oils and exhaust gas leakage.

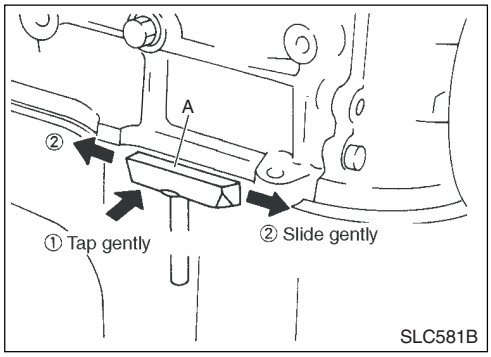
Parts Requiring Angular Tightening

- Use angle wrench (SST: KV10112100) for the following components.
  - Cylinder head bolt
  - Connecting rod cap nut
- The designated tightening torque for the components is not the final tightening value. It is the torque needed before the angular tightening.
- Check for any foreign particles at the nut or bolt and mating surfaces. Apply engine oil before tightening.

Precautions in Liquid Gasket Application Procedure

Parts Requiring Angular Tightening

- Use angle wrench (SST: KV10112100) for the final tightening of the following engine parts:
  a) Cylinder head bolt
  b) Main bearing cap bolt
  c) Connecting rod cap nut
- Do not use a torque value for final tightening. The torque value for these parts are for a preliminary step.
- Ensure thread and seat surfaces are clean and coated with engine oil.



Removal of Liquid Gasket

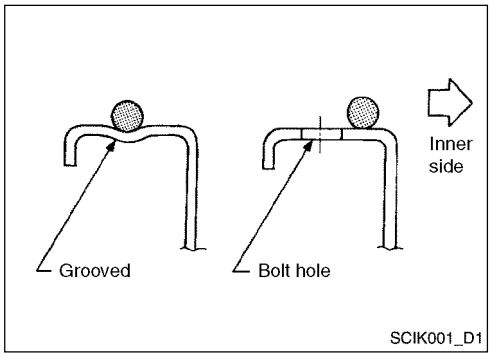
- Remove the bolts and nuts. Then cut and remove the liquid gasket using a seal cutter (A: KV10111100).

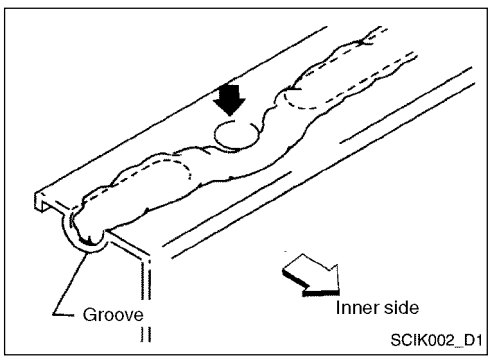
CAUTION:

- **Be careful not to damage the mating surfaces.**
- For locations hard to use the seal cutter, apply plastic hammer gently and remove.

CAUTION:

- **When it is necessary to use the minus (-) screwdriver, be careful not to damage the mating surfaces.**





Liquid Gasket Application

1. Using scraper, remove old liquid gasket adhering to the liquid gasket application surface and the mating surface. Remove liquid gasket completely from the groove of the liquid gasket application surface, mounting bolts and bolt holes.

CAUTION:

- **Be careful not to damage the mating surfaces.**

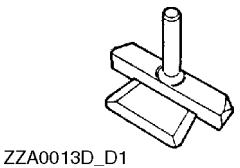
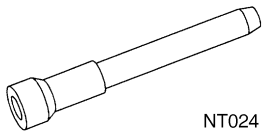
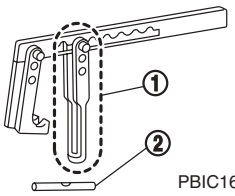
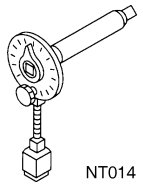
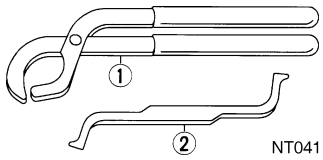
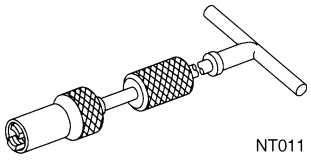
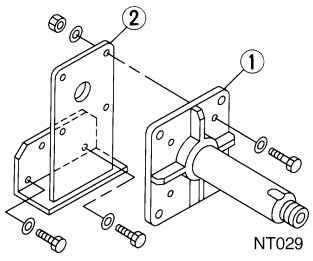
2. Apply liquid gaskert without breaks to the specified location.
   - Use Genuine Liquid Gasket or equivalent.
   - For oil pan, be sure liquid gasket diameter is 3.5 to 4.5 mm (0.138 to 0.177 in).
   - For areas except oil pan, be sure liquid gasket diameter is 2.0 to 3.0 mm (0.079 to 0.118 in).
3. As for the bolt holes, normally apply liquid gasket inside the holes (unless otherwise specified).
   - Within 5 minutes of liquid gasket application, install the mating component.
   - Wait at least 30 minutes before refilling engine oil and engine coolant.

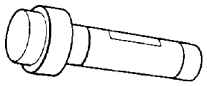
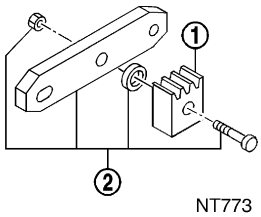
CAUTION:

- **If instructed in this Manual, follow the instructions.**

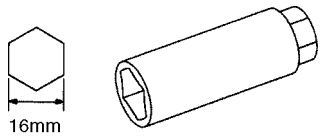
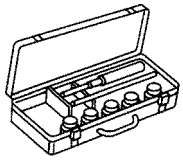
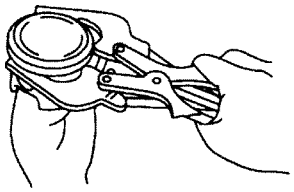
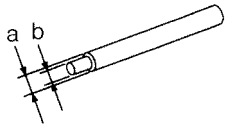
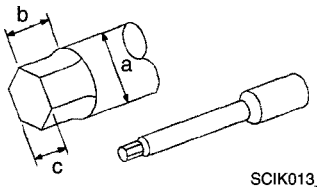
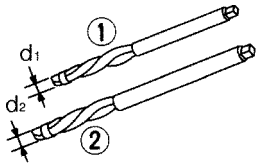
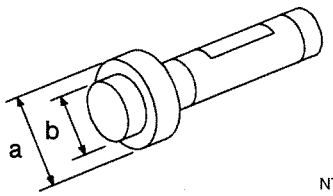
Preparations

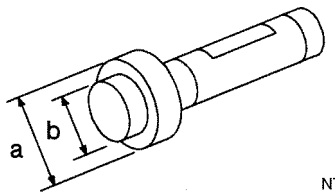
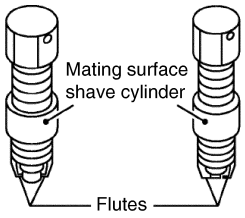
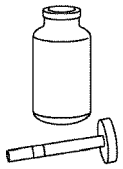
Special Service Tools

Item	Description	
Seal cutter KV10111100	 ZZA0013D_D1	Removing applied liquid gasket
Valve oil seal drift KV10115600	 NT024	Installing valve oil seal
KV101092S0 Valve spring compressor 1. KV10115900 Compressor 2. KV10109230 Adapter	 PBIC1650E	Compressing valve spring
Angle wrench KV10112100	 NT014	Tightening bolts for bearing cap, cylinder head, etc. in angle
KV101151S0 Lifter stopper set 1. KV10115110 Camshaft pliers 2. KV10115120 Lifter stopper	 NT041	Changing shims
Valve oil seal puller KV10107902	 NT011	Removing valve oil seal
Engine attachment assembly 1. KV10106500 Engine attachment 2. KV10113300 Sub-attachment	 NT029	Overhauling engine

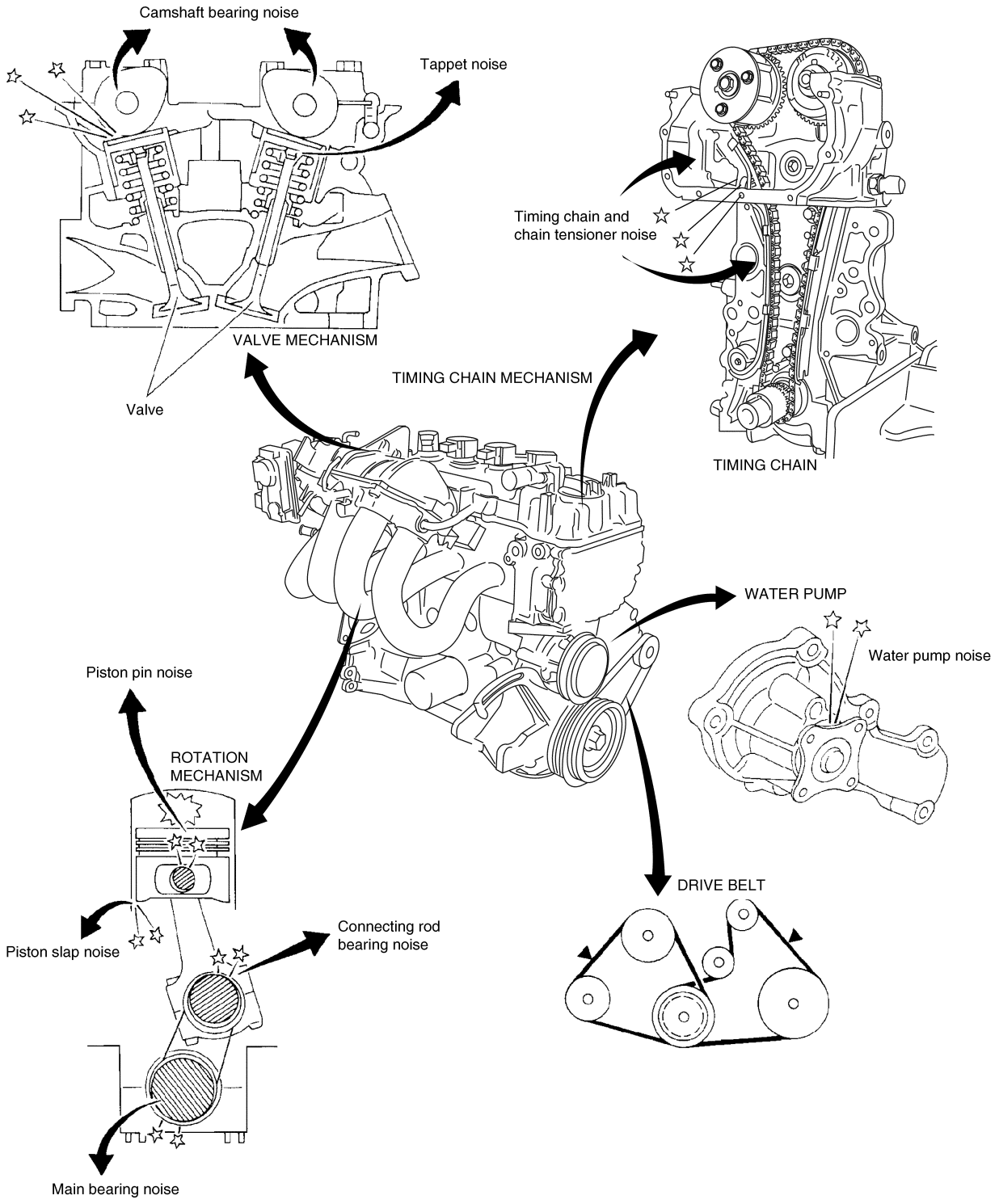
Item	Description	
Front oil seal drift ST33230000	 ZZA0012D	Assembling front cover oil seal
KV101056S0 Ring gear stopper 1. KV10105620 Adapter 2. KV10105610 Plate assembly	 NT773	Preventing crankshaft and drive plate from rotating

Commercial Service Tools

Item		
Spark plug wrench	 NT047	Removing and installing spark plug
Valve seat cutter set	 NT048	Finishing valve seat dimensions
Piston ring expander	 NT030	Removing and installing piston ring
Valve guide drift	 NT015	Removing and installing valve guide Intake & Exhaust a: dia. 95 mm b: dia. 55 mm
Cylinder head bolt wrench	 SCIK013_D1	Loosening and tightening cylinder head bolt a: dia. 13 mm b: 12 mm c: 10 mm
Valve guide reamer	 NT016	Reaming valve guide 1 or hole for oversize valve guide 2 Intake & Exhaust a: dia. 5.5 mm b: dia. 9.685 mm
Front oil seal drift	 NT049	Installing front oil seal a: dia. 52 mm b: dia. 40 mm

Item	Description	
Rear oil seal drift	 NT049	Installing rear oil seal a: dia. 103 mm b: dia. 84 mm
Oxygen sensor thread cleaner	 SCIK014_D1	Reconditioning the exhaust system threads before installing a new heated oxygen sensor. Use with anti-seize lubricant. a: 18 mm dia. with a pitch of 1.5 mm (for zirconia heated oxygen sensor) b: 12 mm dia. with a pitch of 1.25 mm (for titania oxygen sensor)
Anti-seize lubricant (Pematex 133AR or Equivalent meeting MIL specification MIL-A-907)	 SCIK015_D1	Lubricating heated oxygen sensor thread clearing tool when reconditioning exhaust system threads

NVH Troubleshooting - Engine Noise



NVH Troubleshooting - Engine Noise (Cont'd)

NVH Troubleshooting - Engine Noise

Use the chart below to help you find the cause of the symptom.

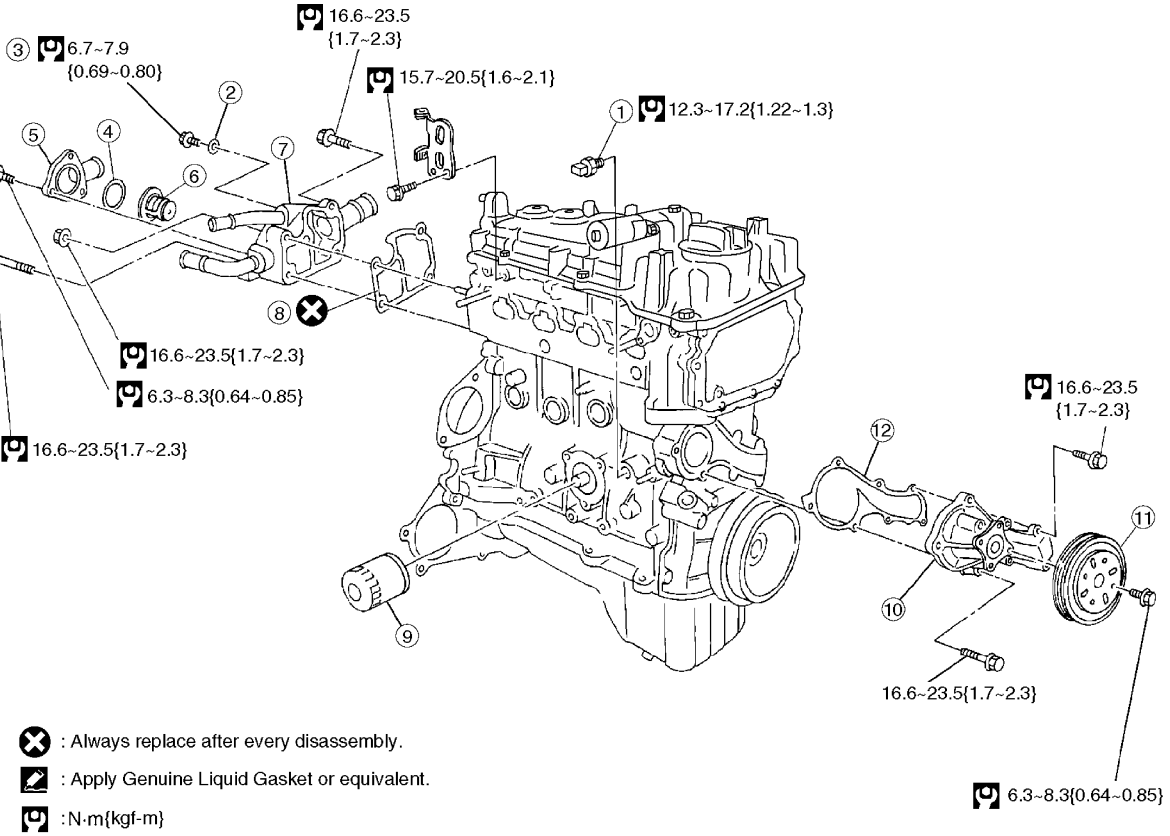
1. Locate the area where noise occurs.
2. Confirm the type of noise.
3. Specify the operating condition of engine.
4. Check specified noise source.
   If necessary, repair or replace these parts.

Location of noise	Type of noise	Operating condition of engine						Source of noise	Check item	Reference page
		Before warmup	After warmup	When starting	When idling	When racing	While driving			
Top of Engine, Rocker Cover, Cylinder Head	Ticking or click	C	A	-	A	B	-	Tappet noise	Valve clearance	EM-52
	Rattle	C	A	-	A	B	C	Camshaft bearing noise	Camshaft journal clearance, Camshaft runout	EM-44
Crankshaft Pulley, Cylinder block (Side of Engine), Oil pan	Slap or knock	-	A	-	B	B	-	Piston pin noise	Piston and piston pin clearance, Connecting rod bushing clearance	EM-65, 70
	Slap or rap	A	-	-	B	B	A	Piston slap noise	Piston-to-bore clearance, Piston ring side clearance, Piston ring end gap, Connecting rod bend and torsion	EM-65, 66
	Knock	A	B	C	B	B	B	Connecting rod-bearing noise	Connecting rod bearing clearance (Big end), Connecting rod bushing clearance (Small end)	EM-69
	Knock	A	B	-	A	B	C	Main bearing noise	Main bearing oil clearance, Crankshaft runout	EM-68
Front of Engine, Timing Chain Cover	Tapping or ticking	A	A	-	B	B	B	Timing chain and chain tensioner noise	Timing chain cracks and wear, Timing chain tensioner operation	EM-29
Front of Engine	Squeak or fizzing	A	B	-	B	-	C	Drive belts (sticking or slipping)	Drive belts deflection	EM-15
	Creaking	A	B	A	B	A	B	Drive belts (slipping)	Idler pulley bearing operation	
	Squall or creak	A	B	-	B	A	B	Water pump noise	Water pump operation	LC

A: Closely related B: Related C: Sometimes related —: Not related

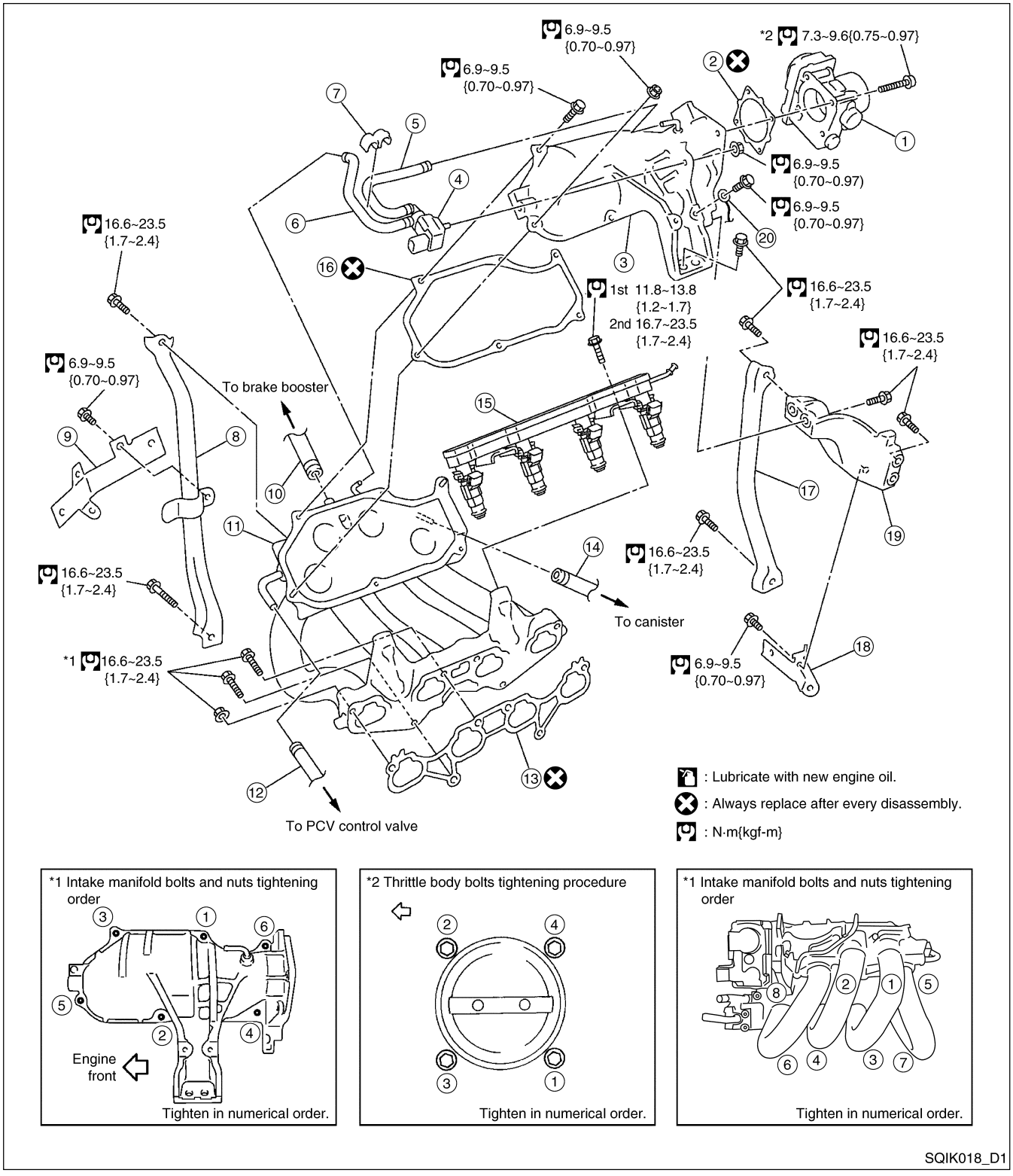
Removal • Installation

Removal • Installation



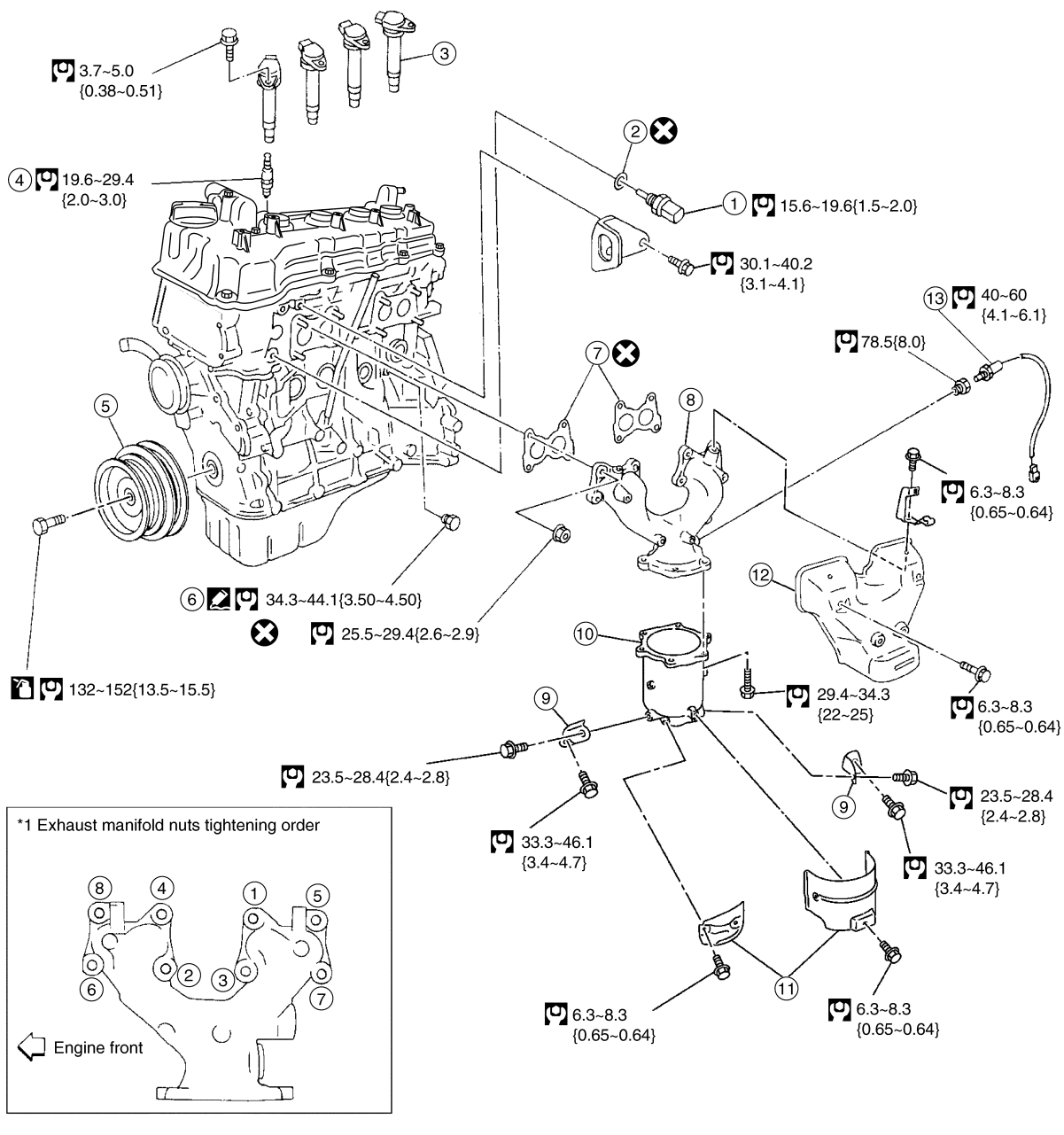
① Oil pressure switch
② Washer
③ Air relief plug
④ Gum ring
⑤ Water inlet
⑥ Thermostat
⑦ Thermostat housing
⑧ Gasket
⑨ Oil filter
⑩ Water pump
⑪ Water pump pulley
⑫ Gasket

Removal • Installation (Cont'd)



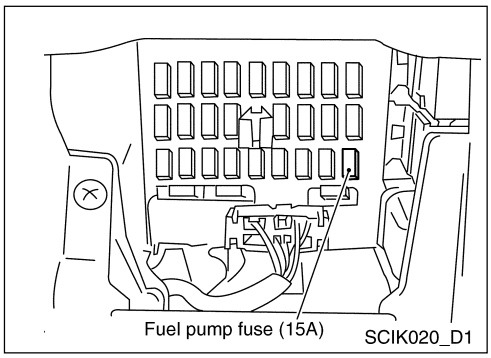
① Throttle body
② Gasket
③ Intake manifold collector
④ EVAP canister purge volume control solenoid valve
⑤ Vacuum hose
⑥ Vacuum hose
⑦ Hose clamp
⑧ Intake manifold support (front)
⑨ Harness bracket
⑩ Vacuum hose
⑪ Intake manifold
⑫ PCV hose
⑬ Gasket
⑭ Vacuum hose
⑮ Fuel tube and fuel injector assembly
⑯ Gasket
⑰ Intake manifold support (engine rear)
⑱ Harness bracket
⑲ Intake manifold support (rear)
⑳ Ground cable

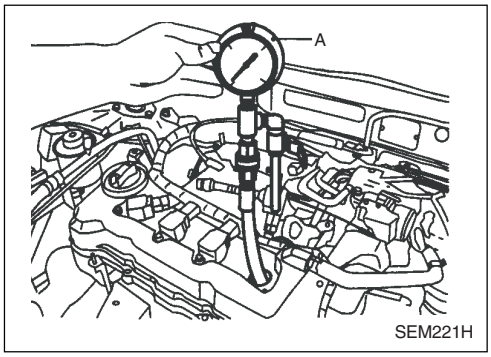
Removal • Installation (Cont'd)



① Engine coolant temperature sensor
② Washer
③ Ignition coil
④ Spark plug
⑤ Crankshaft pulley
⑥ Water drain plug
⑦ Gasket
⑧ Exhaust manifold
⑨ Support
⑩ Three way catalyst
⑪ Three way catalyst cover
⑫ Exhaust manifold cover
⑬ Heated oxygen sensor

Measurement of Compression Pressure





Measurement of Compression Pressure

1. Warm up engine and turn ignition switch OFF.
2. Disconnect fuel pump fuse to avoid injection during measurement.
3. Install engine rpm tester.
4. Disconnect ignition coil with power transistor harness connectors, then remove ignition coils.
5. Remove all spark plugs.
   - Clean area around plug with compressed air before removing the spark plug.
6. Attach a compression tester (A: Commercial tool) to No.1 cylinder.
7. Turn ignition switch to “START” position.
8. Crank engine and record highest gauge indications. Repeat the measurement on each cylinder as shown above.

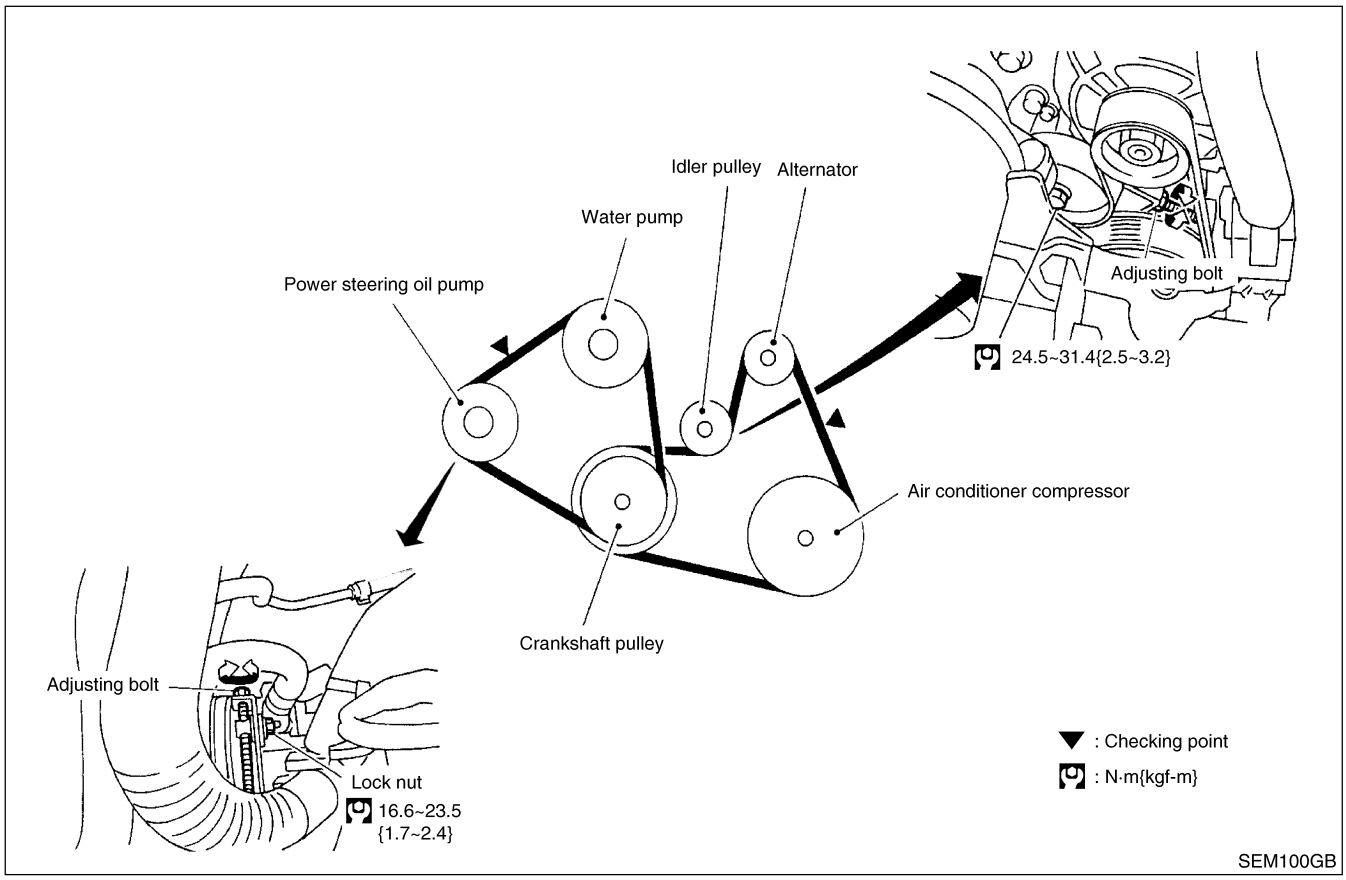
Unit: kPa (bar, kg/cm^2, psi)/rpm

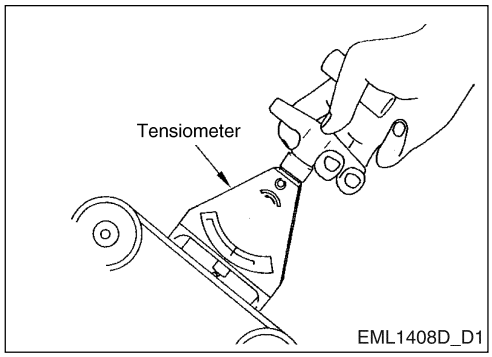
Standard	Minimum	Difference limit between cylinders
1,324 (13.24, 13.5, 192)/350	1,128 (11.28, 11.5, 164)/350	98 (0.98, 1.0, 14)/350

- Always use a fully-charged battery to obtain the specified engine speed.
- If pressure is below the minimum value, check the valve clearance and components around combustion chamber (valves, valve seats, piston, piston rings, cylinder bore, cylinder head, and cylinder head gasket) and retest compression.
- If compression in one or more cylinders is low, pour a small amount of engine oil into cylinders through spark plug holes and retest compression.
  a) If adding oil helps compression, piston rings may be worn or damaged. If so, replace piston rings after checking piston.
  b) If pressure stays low, a valve may be sticking or seating improperly. Inspect and repair valve and valve seat. If valve or valve seat is damaged excessively, replace them.
- If compression stays low in two cylinders that are next to each other, the cylinder head gasket may be leaking or both cylinders may have valve component damage. Inspect and repair as necessary.

9. Install removed parts in the reverse order of removal.

Checking





1. Inspect for cracks, fraying, wear or oil adhesion. If necessary, replace with a new one.
   - Before inspecting the engine, make sure the engine has cooled down; wait approximately 30 minutes after the engine has been stopped.
   - When replacing belt, make sure the new belt has the same number of ribs as the old one.
2. Inspect drive belt deflections by pushing on the belt midway between pulleys. Adjust if belt deflections exceed the limit.

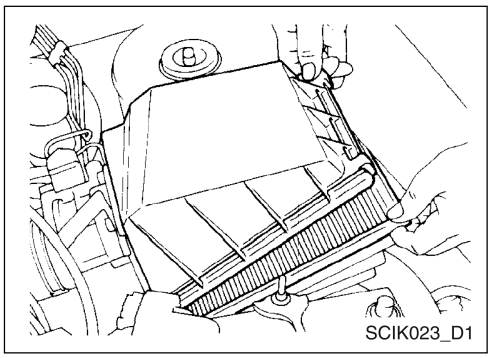
CAUTION:

- **When measuring belt tension immediately after belt is installed, first set the tension to the standard. Then, rotate crankshaft for more than two turns in order to eliminate variance in belt deflection between the pulleys. Re-measure and adjust the tension to the standard.**

Unit: mm (in)

		Applied engine	Used belt deflection		Deflection of new belt
			Limit	Deflection after adjustment	
With air conditioner compressor	With air conditioner compressor	QG16DE	8.1 (0.319)	5.3 - 5.7 (0.209 - 0.224)	4.5 - 5.0 (0.177 - 0.197)
Power steering oil pump			8.5 (0.335)	5.2 - 5.8 (0.205 - 0.228)	4.6 - 5.2 (0.181 - 0.205)
Applied pushing force		98.1 N (10 kg, 22 lb)			

Cleaning and Changing

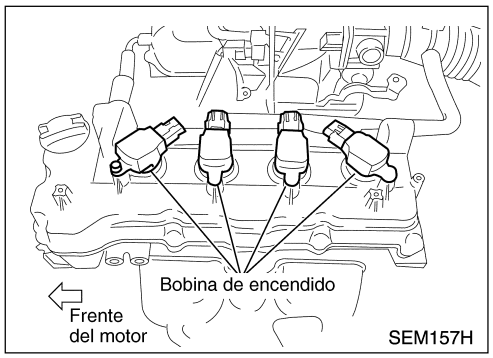


Cleaning and Changing

VISCOUS PAPER TYPE

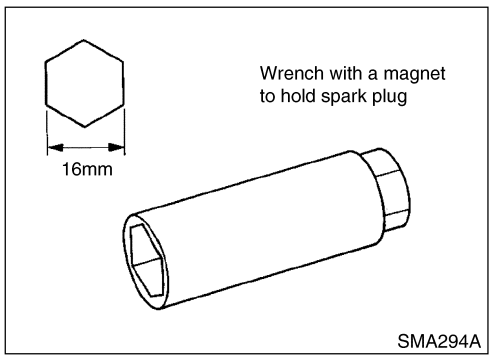
The viscous paper type filter does not need cleaning between renewals. Refer to MA section.

Cleaning and Changing



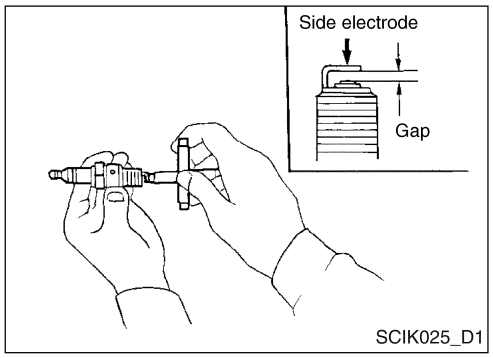
Cleaning and Changing

1. Disconnect ignition coil harness connectors.
2. Remove ignition coils.



3. Remove spark plugs with spark plug wrench.
4. Clean plugs in sand blast cleaner.
5. Check insulator for cracks or chips, gasket for damage or deterioration and electrode for wear and burning. If they are excessively worn away, replace with new spark plugs.

   Wrench with a magnet to hold spark plug



6. Check spark plug gap.

Spark plug:

		NGK
Type	Standard	LFR5A-11
	Hot	LFR5A-11
	Cold	LFR6A-11
Plug gap mm (in)		1.0 - 1.1 (0.039 - 0.043)

- Use standard type spark plug for normal condition.

  The hot type spark plug is suitable when fouling may occur with the standard type spark plug such as:

  a) frequent engine starts

  b) low ambient temperatures
- The cold type spark plug is suitable when spark knock may occur with the standard type spark plug such as:

  a) extended highway driving

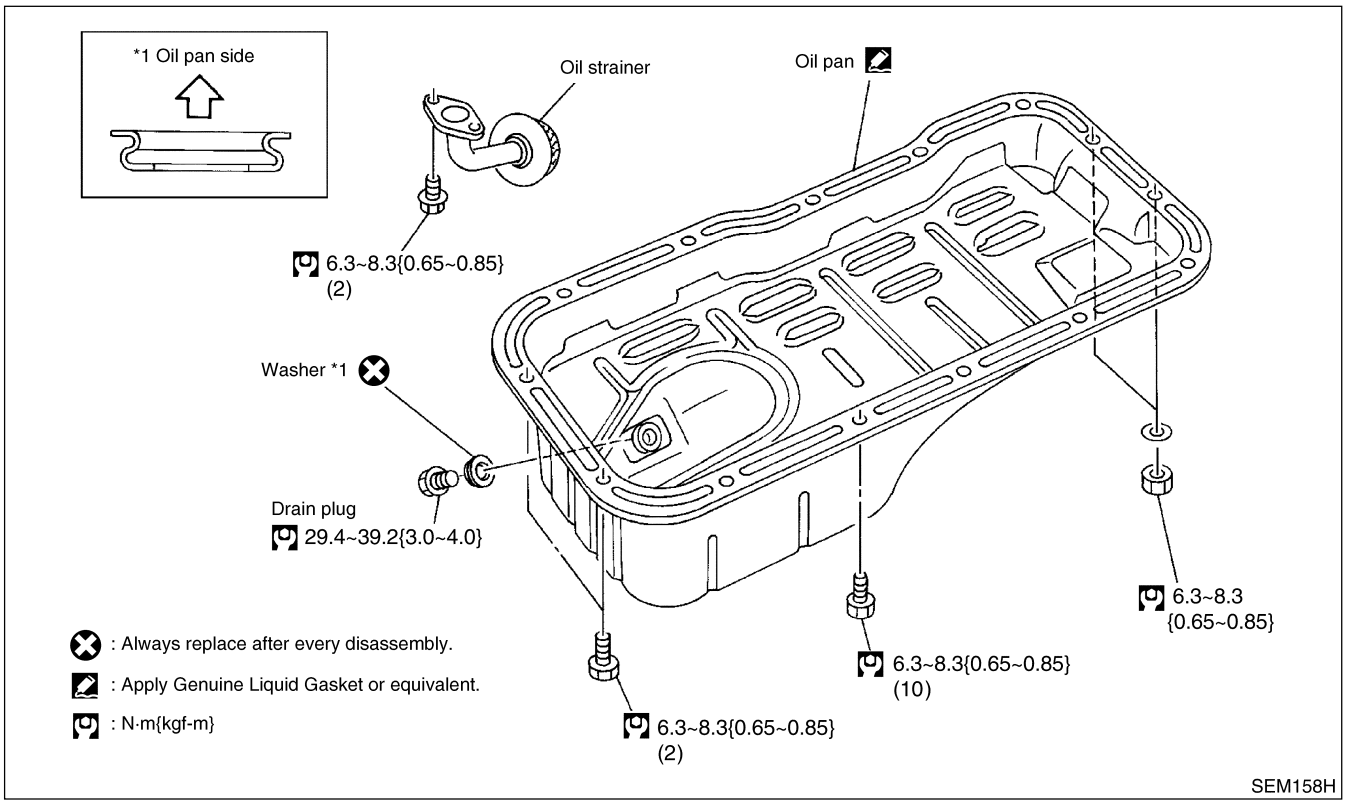
  b) frequent high engine revolution

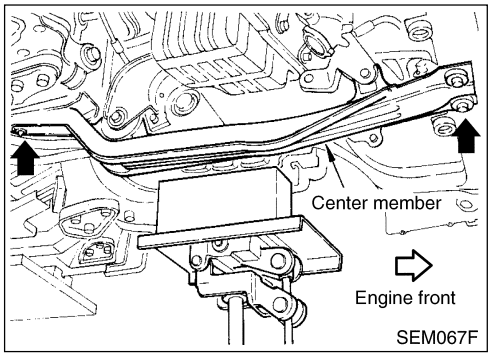
7. Install spark plugs.

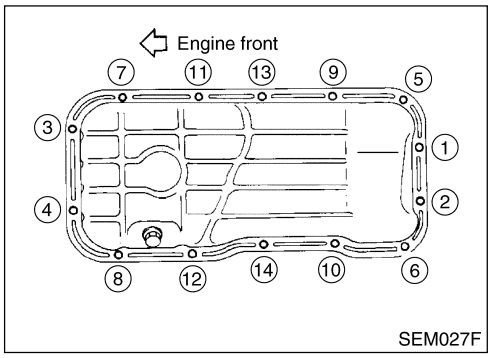
   Spark plug:

   19.6 - 29.4 N·m (2.0 - 2.9 kg-m, 15 - 21 ft-lb)
8. Install ignition coils.
9. Connect ignition coil harness connectors.

Components



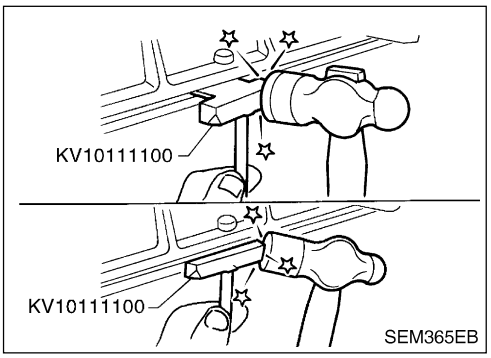




Removal

1. Remove front RH side cover.
2. Drain engine oil.
3. Remove front exhaust tube.
4. Set a suitable transmission jack under transaxle and lift engine with engine slinger.
5. Remove center member.
6. Remove engine gussets.
7. Remove rear lower plate (A/T models).
8. Remove oil pan.
   a) Loosen oil pan bolts and nuts in the numerical order shown in the figure.

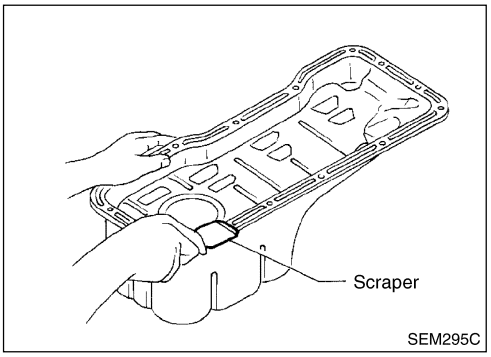
Removal (Cont'd)



b) Insert seal cutter (SST: KV10111100) between cylinder block and oil pan.
- Be careful not to damage aluminum mating face.
- Do not insert screwdriver, or oil pan flange will be damaged.

c) Slide seal cutter by tapping on the side of the tool with a hammer.

9. Remove oil strainer.

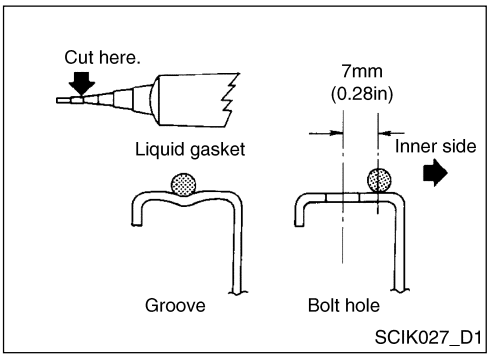


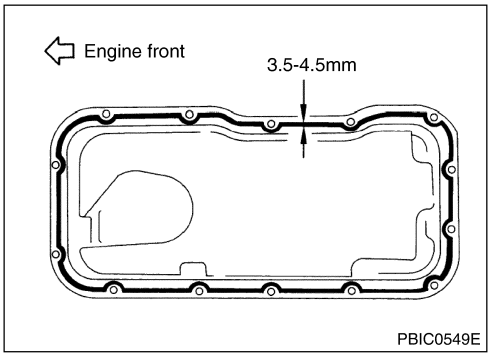
Installation

1. Install oil strainer.

NOTE:
- **Gasket and O-ring are not used for sealed area with oil pump.**

2. Use a scraper to remove old liquid gasket from mating surface of oil pan.
   - Also remove old liquid gasket from mating surface of cylinder block.
3. Temporarily tighten drain plug.
   - Refer to EM-18, "Components".
4. Apply a continuous bead of liquid gasket to mating surface of oil pan.
   - Use Genuine Liquid Gasket or equivalent.
   - Apply to groove on mating surface.
   - Allow 7 mm (0.28 in) clearance around bolt holes.

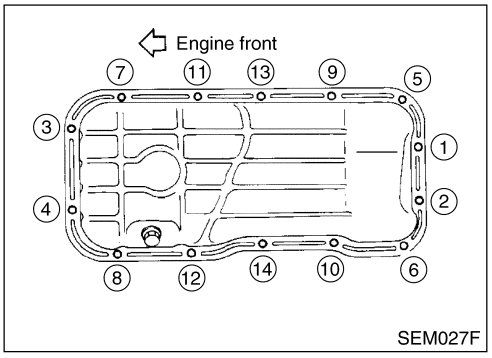




   - Be sure liquid gasket diameter is 3.5 to 4.5 mm (0.138 to 0.177 in).
   - Attaching should be done within 5 minutes after coating.

5. Install oil pan and drain plug. Refer to EM-18, "Components".
   - Tighten oil pan nuts and bolts in the reverse order shown in the figure.

     Bolt: M6 x 12 mm (0.47 in): 1 to 10 in the figure
     M6 x 14 mm (0.55 in): 11 to 12 in the figure
     Nut: 13 and 14 in the figure



   - Install drain plug.

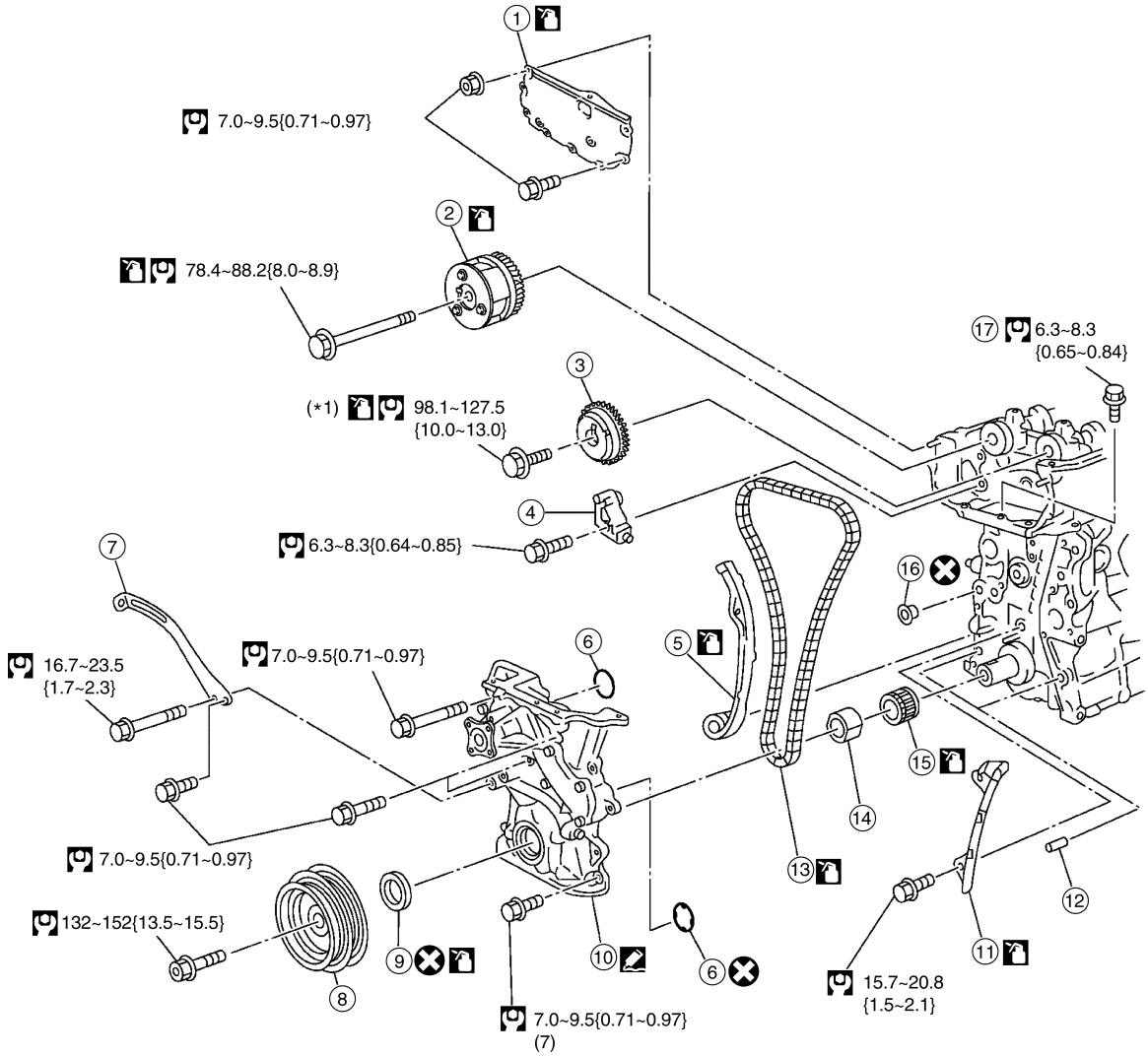
Installation (Cont'd)

6. Install center member.
   - Refer to EM-56, "Engine Assembly".
7. Install removed parts in the reverse order of removal.

Inspection After Installation

- Wait at least 30 minutes before refilling engine oil.
- Check engine oil level.
- Warm up engine and check the oil amount and no leakage of oil.

Components

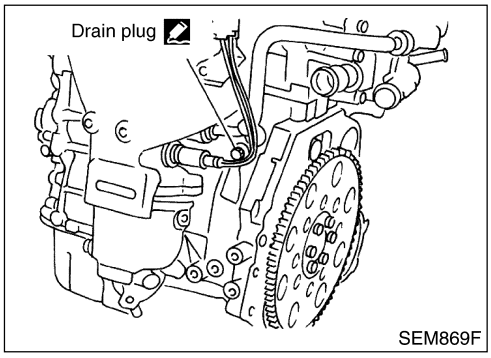


① Cylinder head front cover
② Camshaft sprocket (Intake)
③ Camshaft sprocket (Exhaust)
④ Chain tensioner
⑤ Slack guide
⑥ O-ring
⑦ Power steering oil pump adjusting bar
⑧ Crankshaft pulley
⑨ Oil seal
⑩ Front cover
⑪ Tension guide
⑫ Cylinder block dowel
⑬ Timing chain
⑭ Oil pump drive spacer
⑮ Crankshaft sprocket
⑯ O-ring
⑰ Cylinder head auxiliary bolt

Components (Cont'd)

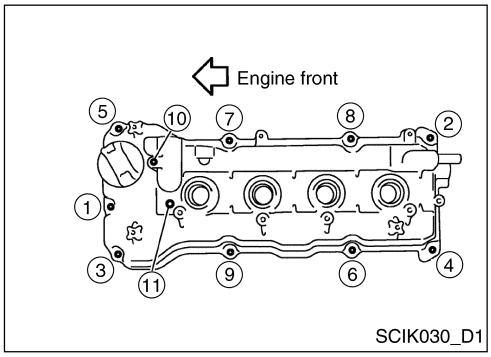
CAUTION:

- **After removing timing chain, do not turn crankshaft and camshaft separately, or valves will strike piston heads.**
- **When installing chain tensioner, oil seals, or other sliding parts, lubricate contacting surfaces with new engine oil.**
- **Apply new engine oil to bolt threads and seat surfaces when installing camshaft sprocket and crankshaft pulley.**
- **Be careful not to damage sensor edges.**



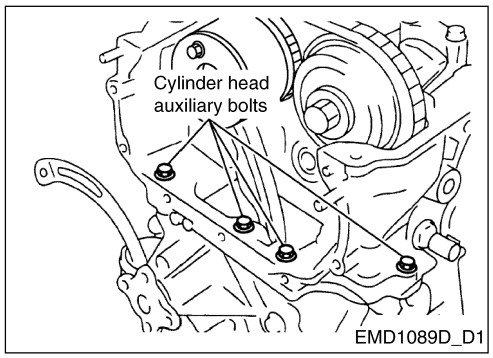
Removal

1. Disconnect battery ground cable.
2. Drain engine coolant from radiator and cylinder block.
   - Be careful not to spill engine coolant on drive belts.
3. Remove reservoir tank.
4. Drain engine oil from oil pan.
5. Remove drive belts. Refer to EM-15, "DRIVE BELTS".
6. Remove front right road wheel.
7. Remove front right splash undercover.
8. Remove power steering oil pump from adjusting bar.
9. Remove alternator.
10. Remove front exhaust tube. Refer to QG16: FE-12, "EXHAUST SYSTEM".
11. Remove ignition coils.
12. Remove spark plugs.

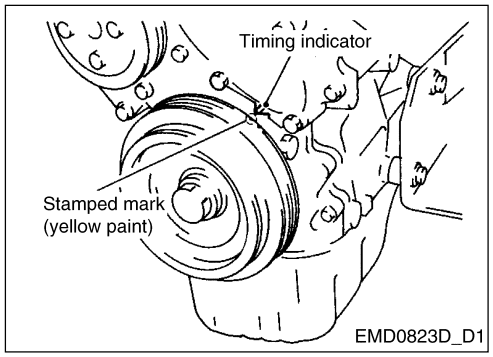


13. Remove rocker cover bolts in the numerical order as shown in the figure.

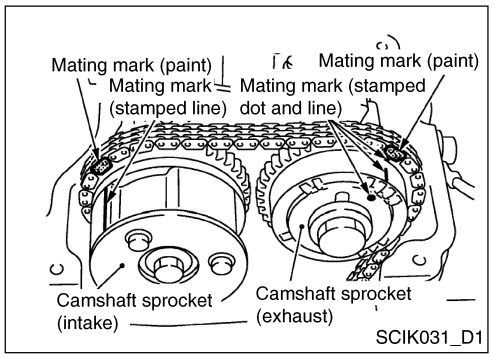
Removal (Cont'd)



14. Remove the cylinder head auxiliary bolts.

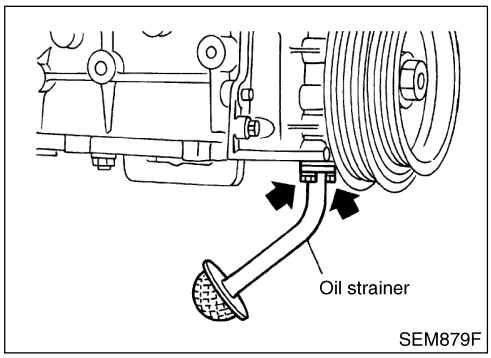


15. Set No. 1 piston at TDC on its compression stroke.
    a) Rotate crankshaft pulley clockwise and align stamped mark (yellow paint) with timing indicator.

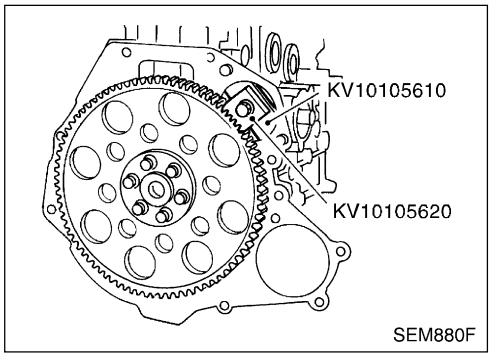


    b) Confirm mating marks stamped on intake and exhaust sprockets are located as shown.
       - If not, rotate crankshaft pulley further one turn and align them.
    c) Referring to mating marks on intake and exhaust camshaft sprockets, put paint mating marks on timing chain links.

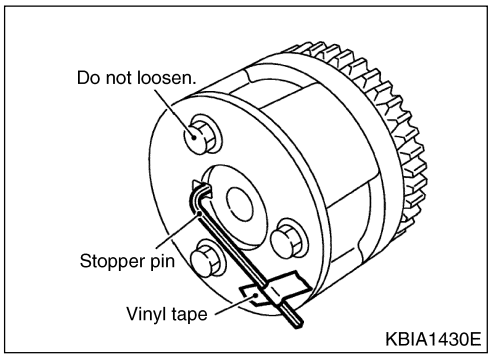
Removal (Cont'd)



16. Remove oil pan. Refer to EM-18, "Removal".
17. Remove oil strainer.
18. For safe operation, and to reduce load to mount insulator, install removed center member again.



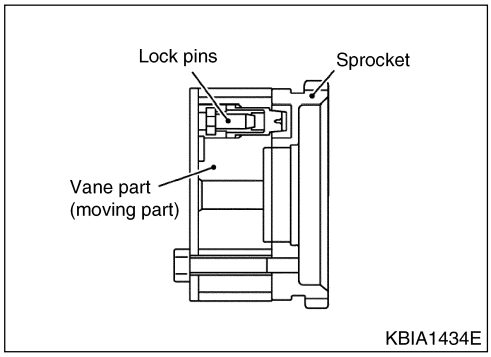
19. Remove starter motor, and set ring gear stopper (SST: KV101056S0) using mounting bolt holes.



20. Loosen crankshaft pulley bolt.
21. Remove crankshaft pulley using crankshaft pulley puller (commercial service tool).

CAUTION:

- **Hook tab onto back of crankshaft pulley only.**
- **Do not remove crankshaft pulley bolt. Fully loosen, and then use it as support point.**



22. Set intake camshaft sprocket to most advanced position. (With intake valve timing control)

CAUTION:

- **Removal/installation of intake camshaft sprocket is required to maintain most advanced position because of the following reasons. Therefore, follow procedure exactly.**

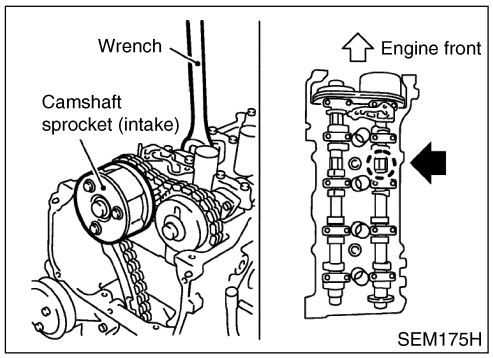
CAUTION:

- **This adopts the structure where sprocket and vane (where camshaft is joined) rotate, and they get dislocated within the specified angle range.**
- **With engine stopped, vane is in most retarded angle position. It does not rotate because it is locked in sprocket by internal lock pin.**
- **If camshaft sprocket bolt is rotated under above condition, lateral load (shearing force) is applied to lock pin. It will damage to lock pin and cause operation malfunction.**
- **Set intake camshaft sprocket to most advanced position as follows.**
- **Do not remove chain tensioner before performing this step.**

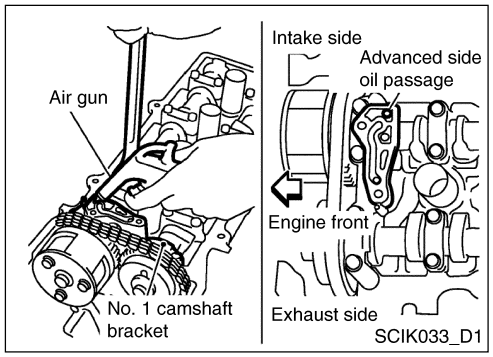
NOTE:

- **"Rotating direction" means direction viewed from engine front side.**

Removal (Cont'd)



a) Using a wrench, hold hexagonal part so that intake camshaft does not move.



b) Using an air gun, apply air pressure to intake valve timing control (CVTC) solenoid valve advanced side oil passage on top surface of No. 1 camshaft bracket.

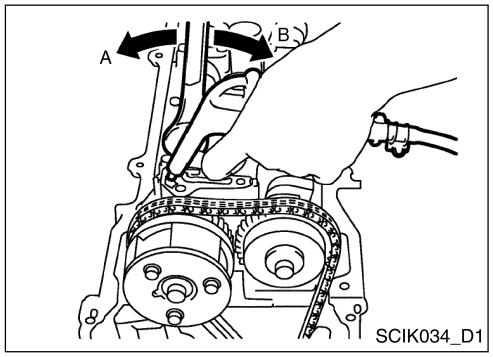
Air pressure:

300 kPa (3.00 bar, 3.06 kg/cm², 43.5 psi) or more

- Keep applying air pressure until step d is complete.
- Air pressure is used to release lock pin.

CAUTION:

- **Be careful not to damage oil passage from interference with air gun tip.**
- **Thoroughly wipe off oil before applying air pressure. When applying air pressure, cover area around air gun using a rag. Wear protective glasses if necessary.**



c) Slowly turn intake camshaft in direction A (counterclockwise: intake manifold side).

- Perform while applying air pressure.

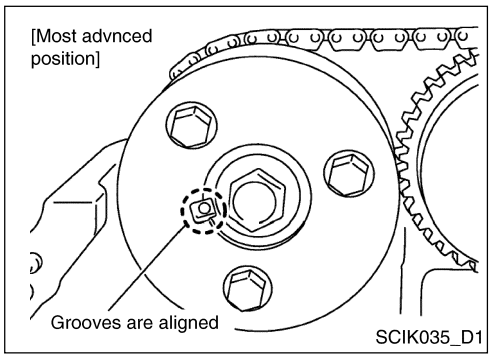
CAUTION:

- **Be careful not to dislocate camshaft retaining wrench.**

d) During above step, operating click (a sound indicating internal lock pin is disengaged) is heard from inside of intake camshaft sprocket. After hearing it, slowly turn intake camshaft in direction B (clockwise: exhaust manifold side), and set to most advanced position.

- Perform while applying air pressure.
- When vane part side (where camshaft is joined) rotates solely against sprocket, lock pin is disengaged even if operating click is not heard.
- If lock pin is not disengaged, apply vibration by jiggling the camshaft with a wrench.
- If lock pin is still fit-in even after the work above is performed, tap front end of camshaft on intake side using plastic hammer.

Removal (Cont'd)

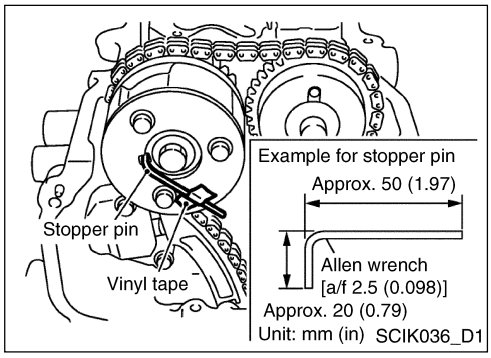


e) The following status indicates that most advanced position is achieved:

Vane (where camshaft is joined) starts rotating on its own, then sprocket also starts rotating when camshaft is turned.

When above status is achieved, this step is complete.

- Most advanced position is confirmed when stopper pin groove and lock pin breathing groove are aligned as illustrated.

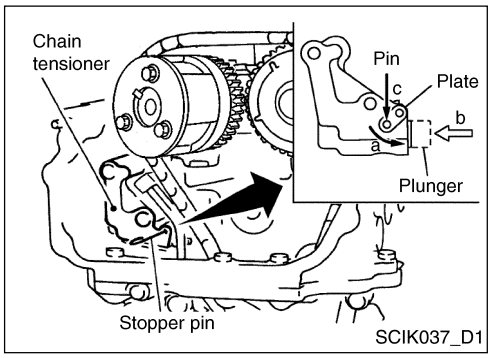


f) Stop air, insert stopper pin [approximately 3 mm (0.12 in) dia, length of inserted part is approximately 15 mm (0.59 in)] into pin hole on camshaft sprocket to fix most advanced position.

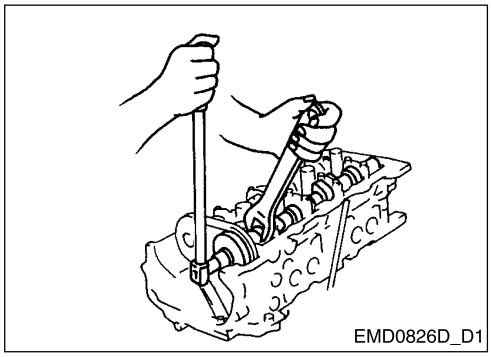
- In the figure, an Allen wrench [a/f 2.5 mm (0.098 in), short part: approximately 20 mm (0.79 in), long part: approximately 50 mm (1.97 in)] is used for stopper pin as an example.

CAUTION:

- **Load (spring reaction force) is not applied to stopper pin. Stopper pin is easily detached. Therefore, secure it with vinyl tape to prevent detachment.**



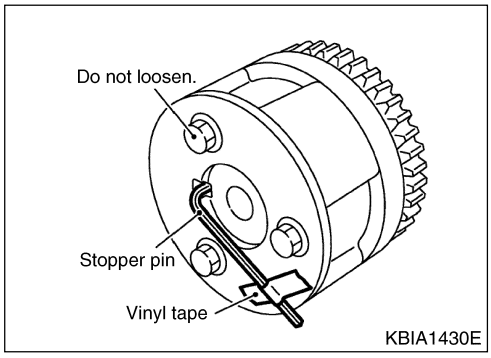
23. Remove chain tensioner as follows.
    a) Press plate down, and release stopper tab.
    b) Insert plunger into chain tensioner body until it stops.
    c) Secure plate by passing stopper pin (such as a hard wire) through plate hole and body hole. (Plunger is also secured.)
    d) Loosen chain tensioner bolts and remove chain tensioner.



24. While holding hexagonal part of camshaft with a wrench, loosen mounting bolts and remove intake and exhaust camshaft sprockets.

CAUTION:

- **Be careful that tool does not interfere with other components around cylinder head.**
- **Avoid securing camshaft at other than hexagonal part.**



- When handling intake camshaft sprocket, taking care of the following.

CAUTION:

- **Secure stopper pin with vinyl tape to prevent detachment.**
- **Handle it carefully, and avoid any chance of impact caused by dropping.**
- **Do not disassemble. (Do not loosen 3 bolts on front surface.)**

Removal (Cont'd)

- If stopper pin is detached and lock pin is engaged at most retarded position during removal, recover as follows.
  a) Reinstall intake camshaft sprocket to intake camshaft, and tighten camshaft sprocket mounting bolt so that air does not leak.

CAUTION:

- **Tightening torque for mounting bolts must be minimum, preventing damage to internal lock pin.**

  b) Apply air pressure to disengage lock pin, and turn vane to most advanced position. (This step can be performed with timing chain removed.)
  c) Reinstall stopper pin.
  d) Remove camshaft sprocket from camshaft.

25. Remove RH engine mount. Refer to EM-56, "ENGINE ASSEMBLY".
  a) Remove any parts that cause difficulties for operation around mount, or perform transfer.
  b) Support cylinder block bottom surface with a transmission jack.

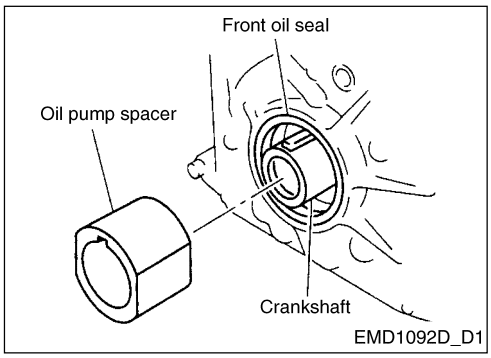
CAUTION:

- **When applying jack, use a wooden block to avoid damage to oil pan mounting surface.**
- **While performing following operations, support engine front-side with jack.**

  c) Remove RH engine mounting insulator.
  d) Remove RH engine mounting bracket.

26. Remove water pump pulley and idler pulley bracket assembly.

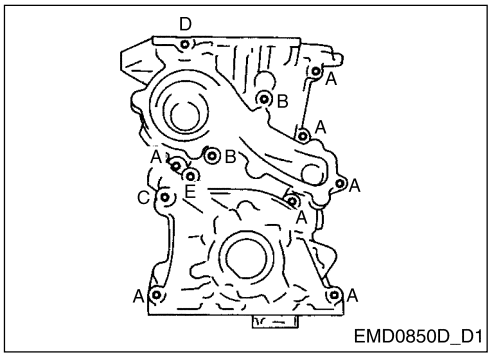
Removal (Cont'd)



27. Remove front cover with the following procedure:
    a) To increase freedom of front cover posture during removal/installation, pull oil pump drive spacer out through front oil seal.
        - Pull it straight out using long-nose pliers or two flat-bladed screwdrivers.

CAUTION:

- **Be careful not to damage side of oil pump drive spacer and front oil seal lip.**



    b) Remove power steering oil pump adjusting bar.
    c) Remove front cover carefully.
        - Remove mounting bolts A - E shown in figure.

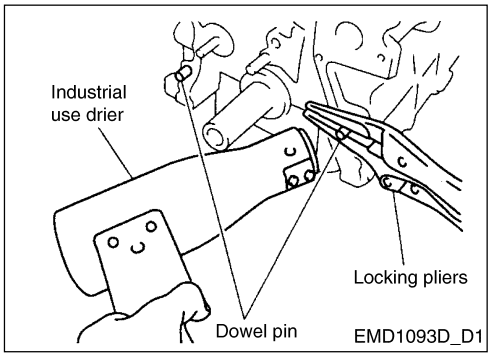
NOTE:

Bolts C and E have been removed in step b.

CAUTION:

- **When removing, be careful not to damage or bend front end of cylinder head gasket. Also after peeling off contact face between front cover and gasket, their surfaces shall be smooth.**
- **If cylinder head gasket is damaged, replace it with new one.**

    d) Remove O-rings from front cover and cylinder block.



28. Pull two dowel pins for front cover out of cylinder block.
    - Heat them with industrial dryer sufficiently, then pull them out using locking pliers.

NOTE:

- **This operation is performed as preparation operation for front cover installation.**
- **This operation can be performed after removal of timing chain.**

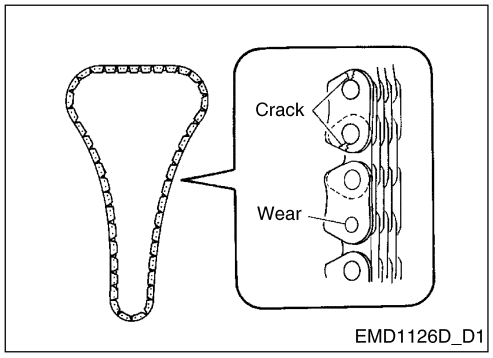
29. Remove front oil seal from front cover.
    - Insert a flat-bladed screwdriver in notch on oil seal mounting point, and lift front oil seal to remove.

NOTE:

- **Remove timing chain and its related parts with the following steps.**

Removal (Cont'd)

30. Remove timing chain, timing chain slack guide and tension guide.
31. Remove crankshaft sproket.



Inspection after Removal

TIMING CHAIN

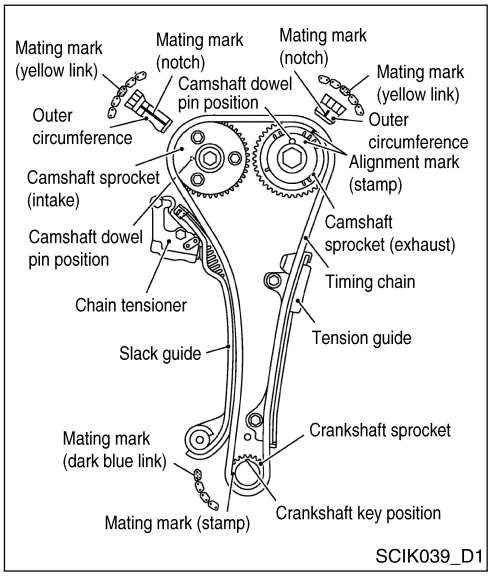
Check timing chain for cracks or serious wear. If a malfunction is detected, replace it.

Installation

Installation

CAUTION:

- **Use a scraper to completely remove all liquid gasket adhering to mounting surface. De-grease and clean with white gasoline.**
- **After installation, wipe off any protruding liquid gasket.**



1. Install timing chain and its related parts with the following procedure:
   - For aligning positions for each sprocket and timing chain, and installed condition of their related parts, refer to figure.
   - Install each sprocket with its mating mark facing engine front side.

a) Install timing chain and crankshaft sprocket.
   - Make sure that crankshaft key is positioned straight up (No. 1 cylinder is at TDC).
   - Hook timing chain on front end of camshaft so that it will not fall off.

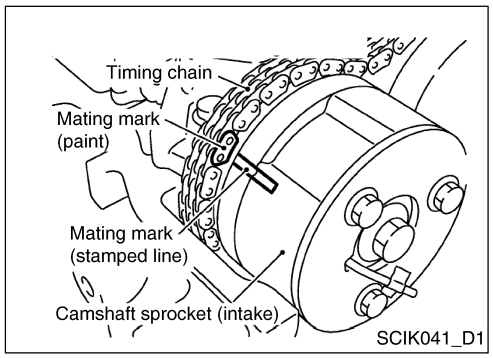
b) Install timing chain slack guide and tension guide.

c) Install intake camshaft sprocket as follows.
   - Before installation, make sure that stopper pin is inserted in intake camshaft sprocket.
   - Service parts are provided with pin inserted.

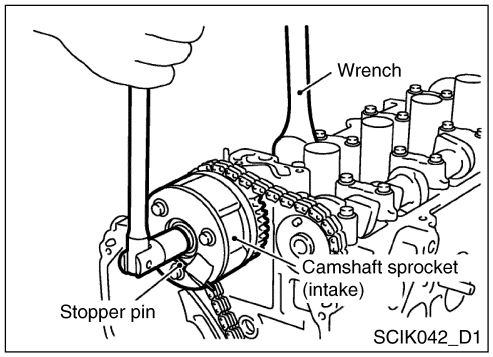
CAUTION:

- **Stopper pin is easily detached. Secure it with vinyl tape to prevent detachment.**

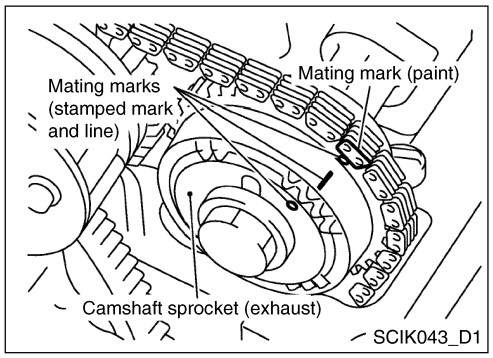
Installation (Cont'd)



1) Install timing chain to camshaft by aligning its mating mark (marked when timing chain is removed) with mark on camshaft sprocket.
   - Align dowel pin on camshaft front surface and pin hole on sprocket backside, then install.



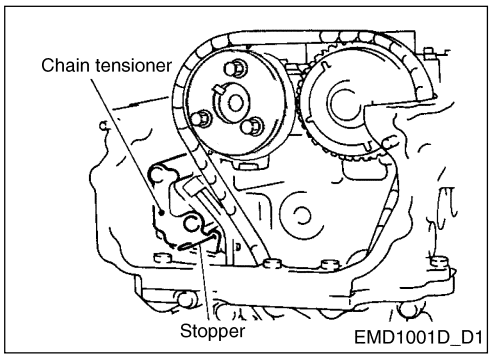
2) While holding hexagonal part of camshaft with a wrench, tighten intake camshaft sprocket mounting bolt.
   - Make sure that stopper pin is not detached.



d) Install exhaust camshaft sprocket as follows.

1) Install timing chain to camshaft by aligning its mating mark (marked when timing chain is removed) with mark on camshaft sprocket.
   - Align dowel pin on camshaft front surface with pin groove on camshaft sprocket, then install.
2) While holding hexagonal part of camshaft with a wrench, tighten exhaust camshaft sprocket bolt.
   - Tightening torque is different from intake side tightening torque.
3) Make sure that mating marks on intake/exhaust camshaft sprockets and mating marks on timing chain are aligned.

Installation (Cont'd)

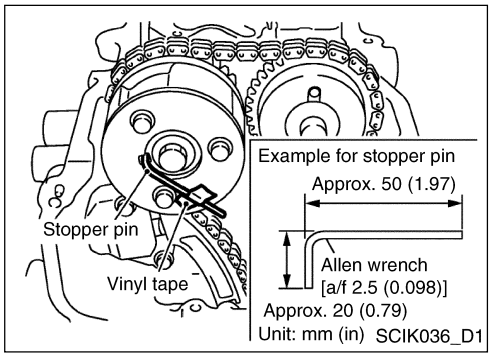


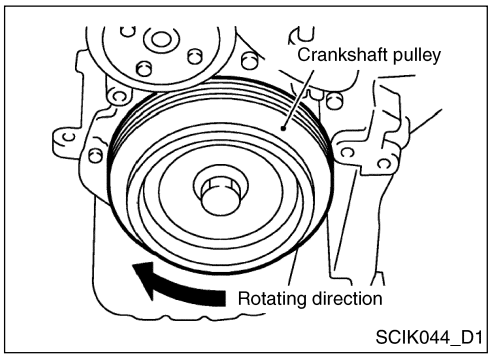
e) Install chain tensioner.
- Hold plate and plunger with a stopper pin, then install chain tensioner.
- After installation, remove stopper pin and release plunger.
- Make sure again that mating marks on intake/exhaust camshaft sprockets and mating marks on timing chain are aligned.

f) Make sure again that mating marks are properly aligned.

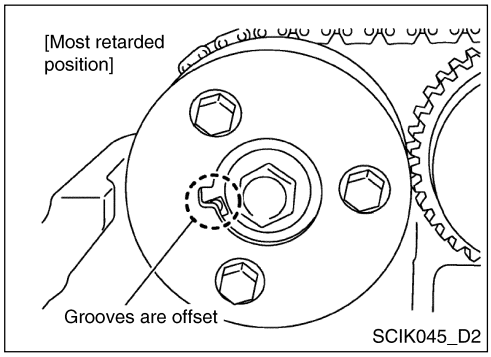
g) Temporarily install oil pump drive spacer, crankshaft pulley, and crankshaft pulley mounting bolt so that crankshaft can be rotated.

h) Remove stopper pin from intake camshaft sprocket.





i) Slowly turn crankshaft pulley clockwise, and set intake camshaft sprocket to most retarded position.

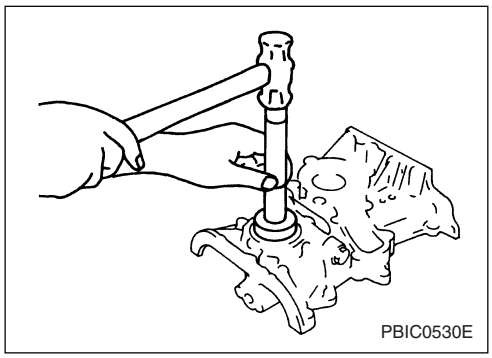


- Sprocket begins turning after crankshaft does. Once sprocket starts turning, keep turning crankshaft until the vane (cam-shaft) also begins turning. Most retarded position should now be achieved.
- Most retarded position is confirmed when stopper pin groove is clockwise and offset from lock pin breathing groove.
- In addition, make sure that lock pin is fit-in. When slightly rotating crankshaft counterclockwise, check that both vane and sprocket rotate.

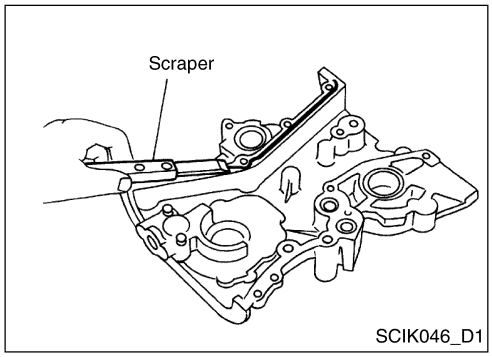
j) Rotate crankshaft clockwise several times, and check that there is no unusual condition.

k) Remove parts temporarily installed in step g.

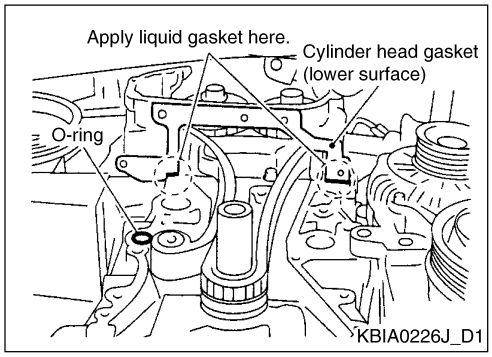
Installation (Cont'd)



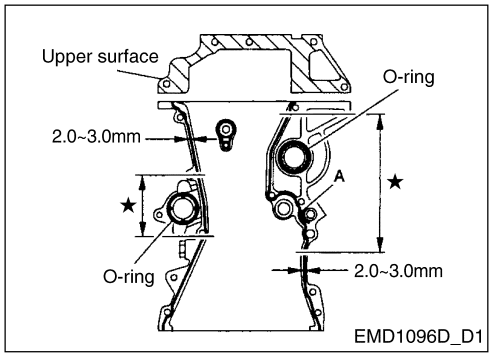
2. Install front oil seal to front cover.
   - Install it so that identification letters on oil seal will face toward front side of the engine.
   - Using an oil seal drift (SST: ST33230000), press oil seal in until it is flush with end surface of mounting position.
   - Make sure that oil seal outer circumference is free from damage and burr.



3. Install front cover with the following procedure:
   a) Before installing front cover, remove all traces of old liquid gasket from mating surface using a scraper.
      - Also remove traces of liquid gasket from mating surface of cylinder block.



   b) Install O-ring to cylinder block.
   c) Using a flat-bladed screwdriver, apply a continuous bead of liquid gasket to contact surface between cylinder head gasket lower surface and cylinder block (2 locations shown in figure).
      Use Genuine Liquid Gasket or equivalent.



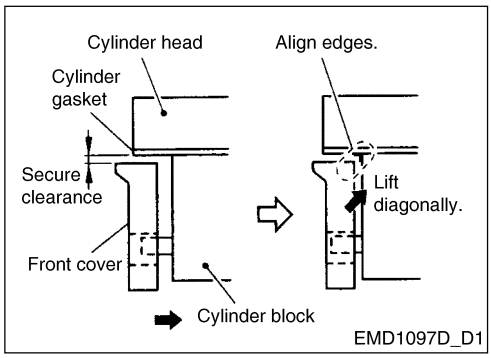
   d) Apply a continuous bead of liquid gasket to back surface of front cover (location shown in figure).

CAUTION:

- **Do not apply liquid gasket to groove A shown in figure.**
- **Especially for locations indicated by "★" mark in figure, strictly observe application range of liquid gasket.**

   e) Apply liquid gasket to top surface of front cover lightly and evenly.
   f) Install O-ring to back surface of front cover.

Installation (Cont'd)

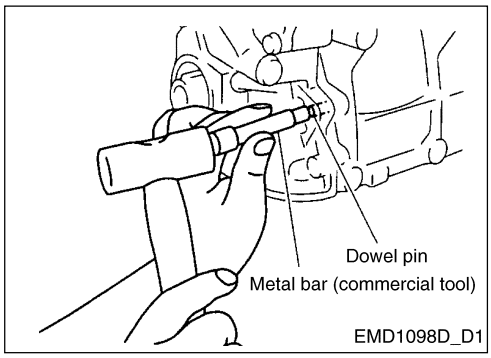


g) With socket of oil pump inner rotor placed on crankshaft top surface (clearance between front cover top surface and cylinder head gasket lower surface is secured), move front cover close to cylinder block. (Left side in figure)

h) Lift front cover at an angle and install it to mounting position so that front cover will come in contact with both cylinder head gasket lower surface and cylinder block front surface at the same time. (Right side in figure)

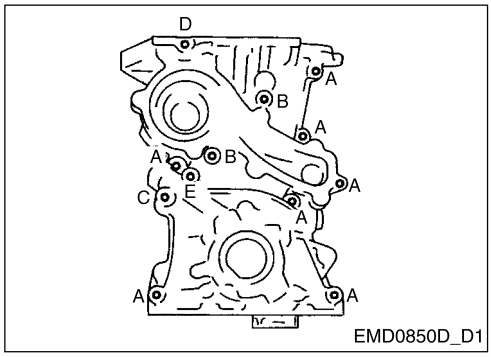
CAUTION:

- **During work, be sure not to damage cylinder head gasket.**
- **When installing, avoid discontinuous bead of liquid gasket caused by allowing it to adhere to an unnecessary area.**



i) Install front cover with mounting bolts temporarily so that front cover will not move.

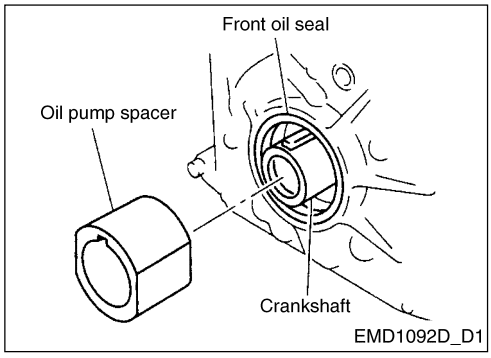
j) Press fit two dowel pins into cylinder block through front cover.



k) Tighten front cover mounting bolts temporarily.
- A [M6 x 20 mm (0.79 in)], B [M6 x 40 mm (1.57 in)], C [M8 x 70 mm (2.76 in)], D [M6 x 73 mm (2.87 in)]
- Bolt C also secures power steering oil pump adjusting bar.
- Bolt E [M6 x 12 mm (0.47 in)] is for installing power steering oil pump adjusting bar.

l) Tighten cylinder head auxiliary bolts (M6, 4) temporarily.

m) Tighten front cover mounting bolts and cylinder head auxiliary bolts to the specified torque.



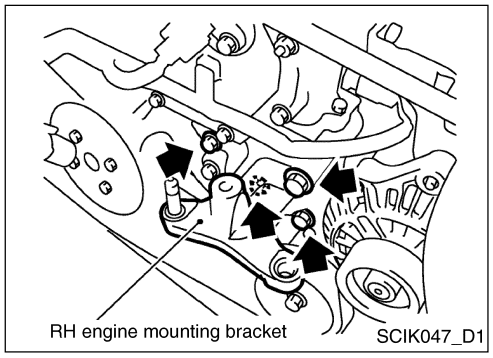
4. Install oil pump drive spacer.
   - When installing, align with flat of oil pump inner rotor.
   - If they are not aligned, rotate inner rotor with a flat-bladed screwdriver to align them.

CAUTION:

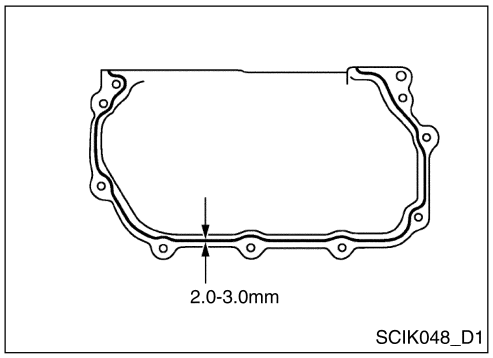
- **Be careful not to damage oil seal lips.**

Installation (Cont'd)

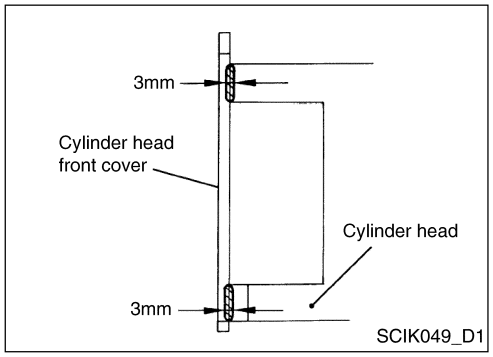
5. Install water pump pulley and idler pulley bracket assembly.



6. Install RH engine mounting bracket.
7. Install RH engine mounting insulator.
8. Install oil strainer.
9. Install oil pan. Refer to EM-18, "Installation".
10. Install crankshaft pulley.
    - When installing crankshaft pulley, make sure that front oil seal lip is not inverted and garter spring is in position.
    - With same procedure as "removal", secure crankshaft, and tighten mounting bolt.
11. Install starter motor.

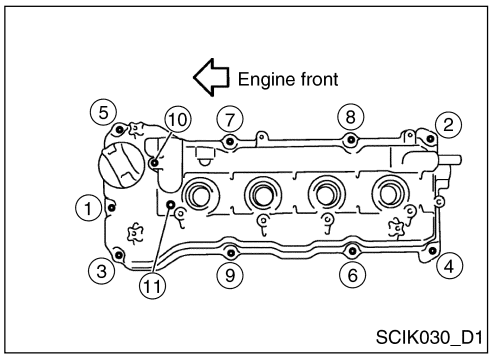


12. Install cylinder head front cover.
    - Apply liquid gasket to cylinder head front cover.
    - Use Genuine Liquid Gasket or equivalent.



13. Apply a continuous bead of liquid gasket to mating surface of cylinder head.
    - Use Genuine Liquid Gasket or equivalent.

Installation (Cont'd)



14. Install rocker cover with rocker cover gasket and tighten bolts in reverse order as shown in the figure.

15. Reinstall parts in the reverse order of removal.

Inspection after Installation

- In order to allow liquid gasket to be cured, perform inspection at least 30 minutes after the last step in which parts sealed with liquid gasket are installed.
- With engine warmed up, check each part for engine oil leakage.

Replacement

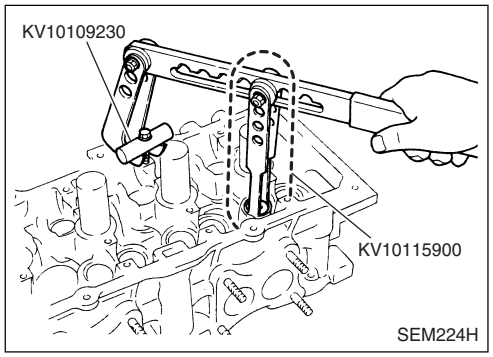
Replacement

VALVE OIL SEAL

1. Remove camshaft. Refer to EM-41, “Removal”.
2. Remove adjusting shim and valve lifters.
3. To prevent valve from falling inside cylinder, turn crankshaft until cylinder with oil seal to be removed is at TDC.

CAUTION:

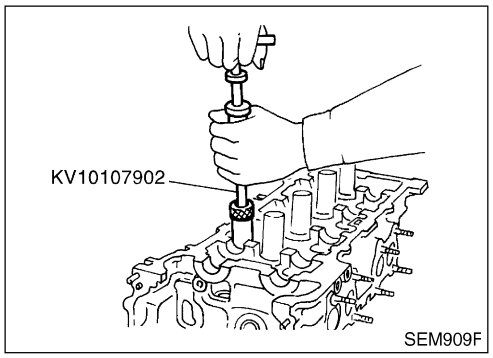
- **When rotating crankshaft, be careful that timing chain is not caught by front cover.**



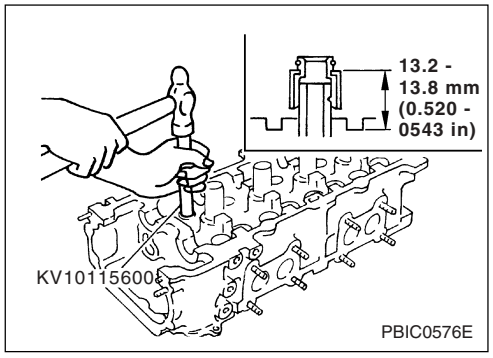
4. Using valve spring compressor (SST: KV101092S0), remove valve collet. Then remove valve spring and valve spring retainer.

CAUTION:

- **When working, take care not to damage valve lifter holes.**



5. Remove valve oil seal using valve oil seal puller (SST: KV10107902).
6. Apply new engine oil on new valve oil seal joint and seal lip.



7. Using valve oil seal drift (SST: KV10115600), press fit valve oil seal to height shown in the figure.
8. Install in the reverse order of removal.

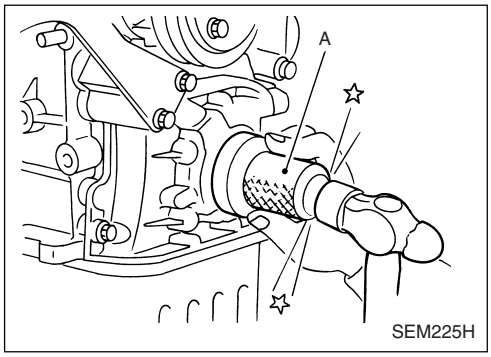
Replacement (Cont'd)

FRONT OIL SEAL

1. Remove the following parts:
   - RH undercover (with splash cover).
   - Drive belt; Refer to EM-15, "DRIVE BELTS".
   - Crankshaft pulley; Refer to EM-21, "Components".
2. Using flat-head screwdriver, remove front oil seal.

CAUTION:

- **Be careful not to damage front timing chain cover and crankshaft.**

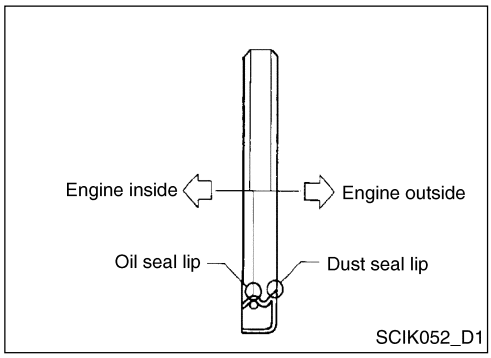


3. Apply new engine oil on new front oil seal.
4. Using front oil seal drift (A: ST33230000), press fit until the height of front oil seal is level with the mounting surface.

   Suitable drift:

   outer diameter 50 mm (1.97 in),

   inner diameter 44 mm (1.73 in).



CAUTION:

- **Be careful not to damage front cover and crankshaft.**
- **Press oil seal straight so that it is not curling up or inclined.**

5. Install in the reverse order of removal.

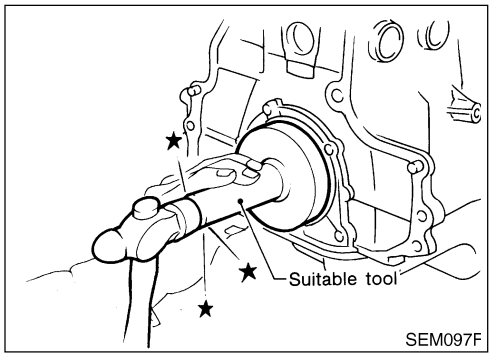
Replacement (Cont'd)

REAR OIL SEAL

1. Remove transaxle assembly. Refer to "Transaxle Assembly" (MT: MT-8, AT: AT-128).
2. Remove flywheel (M/T) or drive plate (A/T). Refer to EM-60, "CYLINDER BLOCK".
3. Using flat-head screwdriver, remove rear oil seal.

CAUTION:

- **Be careful not to damage mounting surface.**

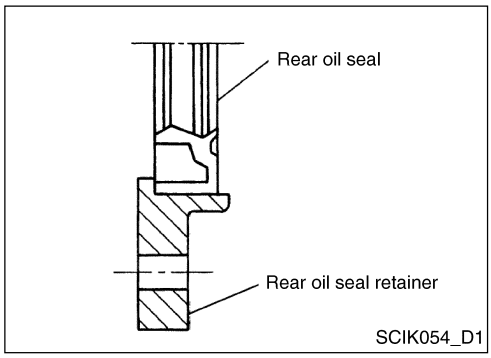


4. Using rear oil seal drift (commercial tool), press new rear oil seal to rear oil seal retainer.

   Suitable drift:
   outer diameter 102 mm (4.02 in),
   inner diameter 90 mm (3.54 in).

CAUTION:

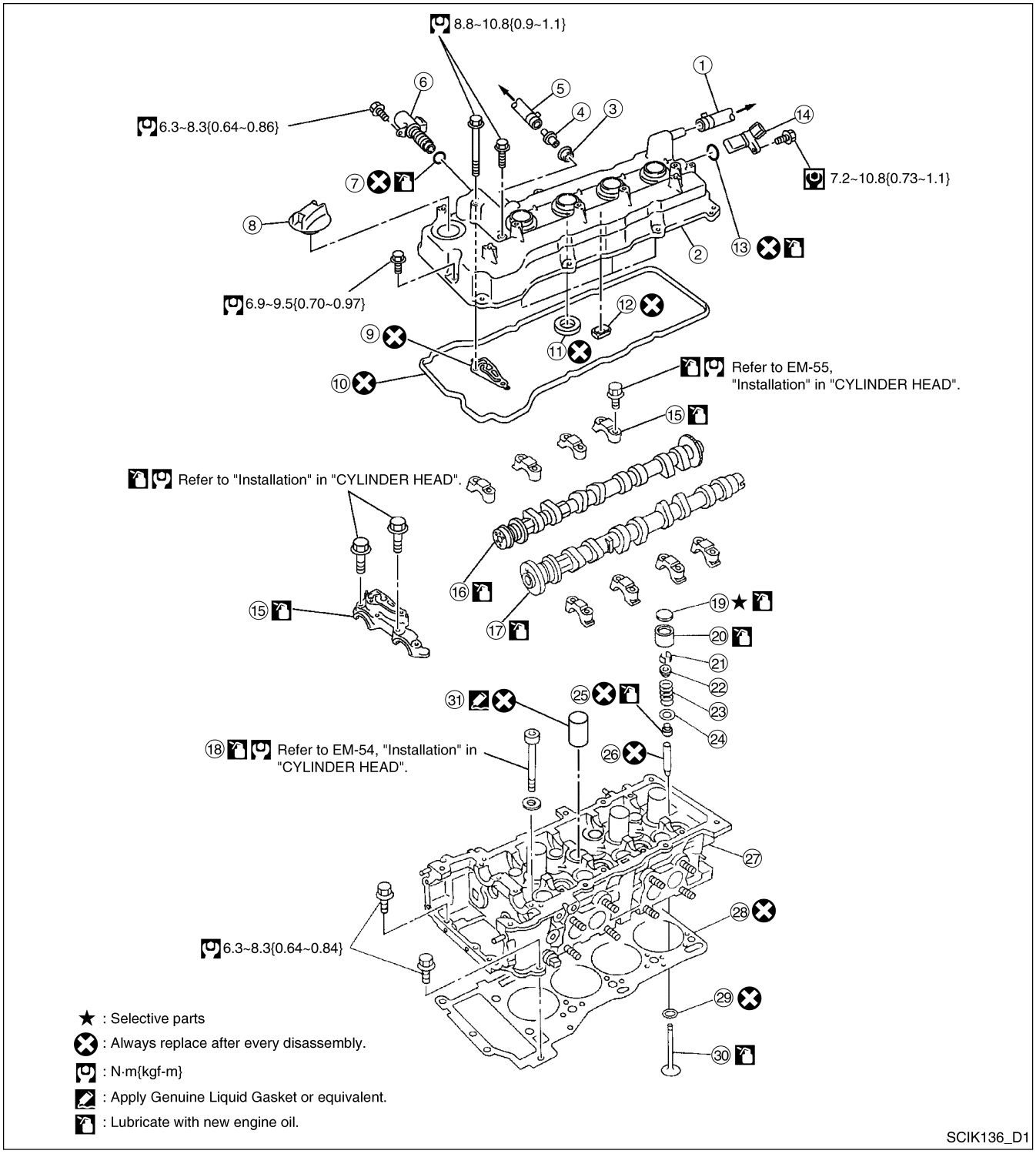
- **Do not touch grease applied on oil seal lip.**
- **Be careful not to damage rear oil seal retainer and crankshaft.**
- **Press in straight to avoid causing any burrs or tilting of oil seal.**
- **Press rear oil seal into rear oil seal retainer so that is does not project from the end.**



5. Install in the reverse order of removal.

Components

Components

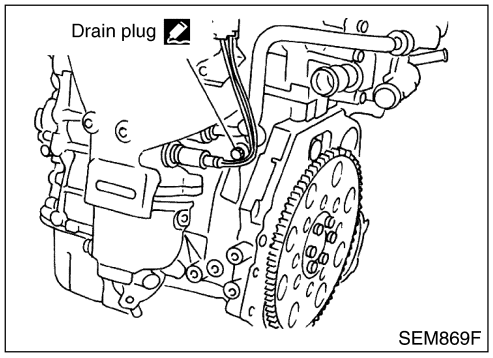


① PCV hose
② Rocker cover
③ Grommet
④ PCV control valve
⑤ PCV hose
⑥ Intake valve timing control solenoid valve
⑦ O-ring
⑧ Oil filler cap
⑨ Gasket
⑩ Rocker cover gasket
⑪ Rocker cover oil seal
⑫ Rocker cover oil seal
⑬ O-ring
⑭ Camshaft position sensor
⑮ Camshaft bracket
⑯ Intake camshaft
⑰ Exhaust camshaft
⑱ Cylinder head bolt
⑲ Adjusting shim
⑳ Valve lifter
㉑ Valve collet
㉒ Valve spring retainer
㉓ Valve spring
㉔ Valve spring seat
㉕ Valve oil seal
㉖ Valve guide
㉗ Cylinder head
㉘ Cylinder head gasket
㉙ Valve seat
㉚ Valve
㉛ Spark plug tube

Components (Cont'd)

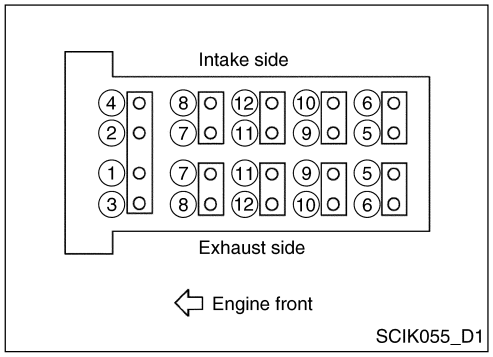
CAUTION:

- **When installing camshaft and oil seal, lubricate contacting surfaces with new engine oil.**
- **When tightening cylinder head bolts, camshaft sprocket bolts and camshaft bracket bolts, lubricate bolt threads and seat surfaces with new engine oil.**
- **Attach tags to adjusting shims and valve lifters so as not to mix them up.**



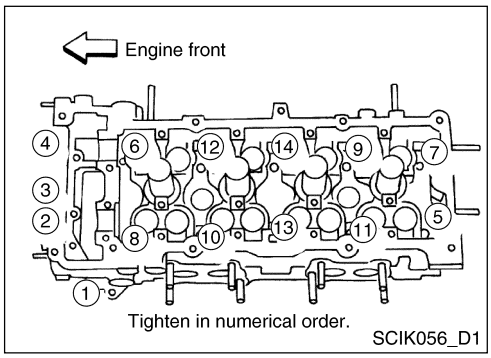
Removal

1. Release fuel pressure. Refer to QG16: EC-27, "Fuel Pressure Release".
2. Disconnect battery ground cable.
3. Drain engine coolant from radiator and cylinder block.
   - Be careful not to spill engine coolant on drive belts.
4. Remove drive belts. Refer to EM-15, "DRIVE BELTS".
5. Remove air duct to intake manifold collector.
6. Remove front undercovers.
7. Remove front exhaust tube.
   Refer to QG16: FE-12, "EXHAUST SYSTEM".
8. Disconnect vacuum hoses, fuel hoses, water hoses, wires, harness, connectors and so on.
9. Remove intake manifold and intake manifold collector assembly. Refer to EM-12, "Removal and Installation".
10. Remove exhaust manifold.
    Refer to EM-13, "Removal and Installation".
11. Remove ignition coils.
12. Remove rocker cover.
13. Remove thermostat housing. Refer to "Removal
14. Remove camshaft sprockets. Refer to EM-21, "Removal".
    - Apply paint to timing chain and camshaft sprockets for alignment during installation.



15. Remove camshaft brackets.
    - Loosen mounting bolts in several steps in the reverse order shown in the figure.
16. Remove camshafts.
    - Be careful not to damage signal plate on rear end of intake camshaft.

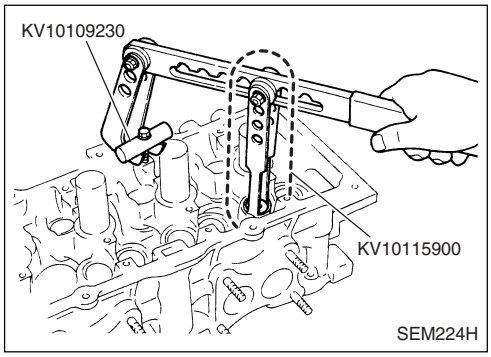
Components (Cont'd)

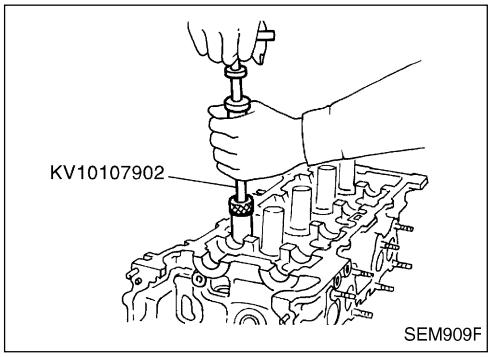


17. Loosen bolts in the numerical order shown in the figure and then remove cylinder head.
    - Cylinder head bolts should be loosened in two or three steps.
18. Remove cylinder head gasket.

Disassembly

1. Remove spark plugs with a spark plug wrench.
2. Remove adjusting shim and valve lifter.
    - Attach tags to adjusting shims and valve lifters so as not to mix them up.





3. Remove valve collet.
    - Compress the valve spring with valve spring compressor (SST: KV101092S0). Remove valve collet with a magnetic driver.

CAUTION:

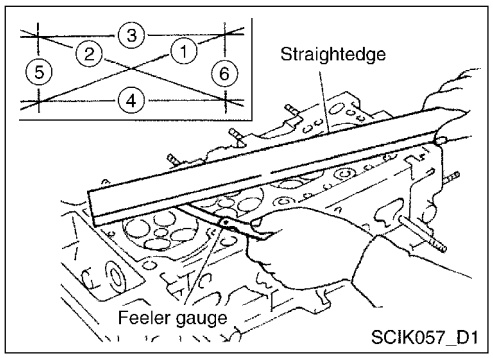
- **When working, take care not to damage valve lifter holes.**

4. Remove valve spring retainer and valve spring.
5. Push the valve stem toward the combustion chamber side and remove the valve.
    - Before removal, check valve guide clearance. Refer to EM-45, "Valve Guide Clearance".
    - Mark position on valve for assembly.
6. Remove valve oil seal.
    - Use valve oil seal puller (SST: KV10107902).
7. Remove valve spring seat.
8. When valve seat replacement is necessary, refer to EM-47, "VALVE SEAT REPLACEMENT".
9. When valve guide replacement is necessary, refer to EM-46, "VALVE GUIDE REPLACEMENT".
10. Remove spark plug tube, as necessary.
    - Using a pair of pliers, pull spark plug tube out of cylinder head.

CAUTION:

- Take care not to damage cylinder head.
- Once removed, a spark plug tube will be deformed and cannot be reused. Do not remove it unless absolutely necessary.

Inspection



Inspection

CYLINDER HEAD DISTORTION

- Clean surface of cylinder head.
- Use a reliable straightedge and feeler gauge to check the flat-ness of cylinder head mating surface.
- Check along six positions shown in figure.

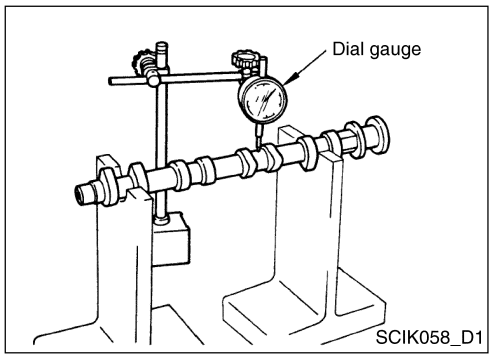
  Head surface

  Limit: 0.1 mm
- If it exceeds the limit, replace the cylinder head.

CAMSHAFT VISUAL CHECK

Check camshaft for scratches, seizure and wear.

- If anything above it found, replace camshaft.



CAMSHAFT RUNOUT

1. Measure camshaft runout at the center journal.
   - Put V-blocks on a work bench and support camshaft at No. 2 and No. 5 journals.

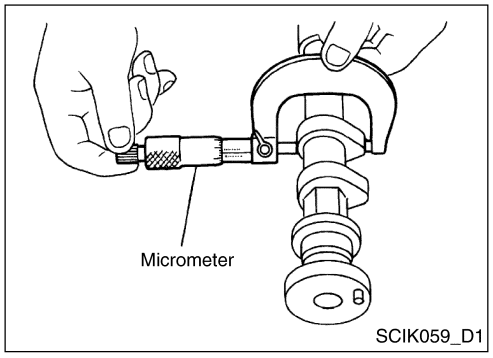
CAUTION:

- **Do not support journal No. 1 (on the side of the camshaft sprocket) because it has a different diameter from the other four locations.**
- **Set dial gauge vertically at No. 3 journal.**
- **Turn camshaft by hand in one direction and measure camshaft runout on dial gauge (Total indicator reading).**

  Runout (Total indicator reading):

  Standard: Less than 0.04 mm (0.0016 in)

2. If out of the standard, replace camshaft.



CAMSHAFT CAM HEIGHT

1. Measure the camshaft cam height.

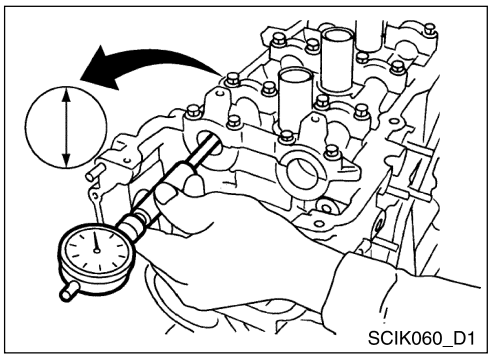
   Standard:

   Intake: 40.217 - 40.407 mm (1.5833 - 1.5908 in)

   Exhaust: 38.965 - 39.155 mm (1.5341 - 1.5415 in)

2. If out of the standard, replace camshaft.

Inspection (Cont'd)



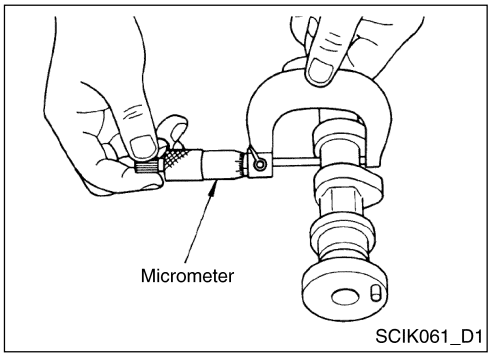
CAMSHAFT JOURNAL CLEARANCE

1. Install camshaft bracket and tighten bolts to the specified torque. Refer to EM-55, "Installation".
2. Measure inner diameter of camshaft bracket.

   Standard:

   No. 1 journal 28.000 - 28.021 mm (1.1024 - 1.1032 in)

   No. 2 to No. 5 journals 23.985 - 24.006 mm (0.9443 - 0.9451 in)



3. Measure outer diameter of camshaft journal.

   Standard:

   No. 1 journal 27.935 - 27.955 mm (1.0998 - 1.1006 in)

   No. 2 to No. 5 journals 23.935 - 23.955 mm (0.9423 - 0.9431 in)

4. Calculate camshaft journal clearance.

   (Clearance) = (inner diameter of camshaft bracket) - (outer diameter of camshaft journal)

   Standard:

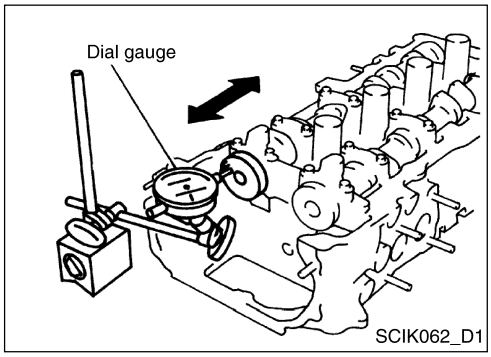
   No. 1 journal 0.045 - 0.086 mm (0.0018 - 0.0034 in)

   No. 2 to No. 5 journals 0.030 - 0.071 mm (0.0012 - 0.0028 in)

5. If clearance is out of the standard, replace camshaft and/or cylinder head.

NOTE:

- **Camshaft bracket is machined along with cylinder head. Replace the cylinder head assembly when the clearance is out of the specified value.**



CAMSHAFT END PLAY

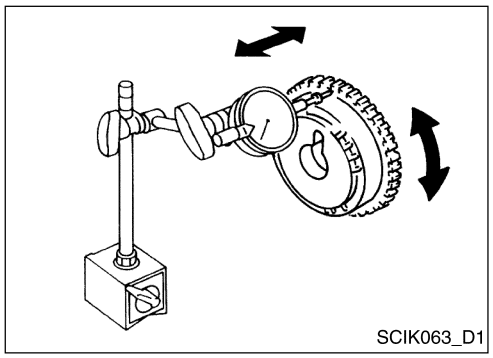
1. Install camshaft in cylinder head. Refer to EM-55.
2. Measure the camshaft end play.

   Standard:

   Intake: 0.070 - 0.143 mm (0.0028 - 0.0056 in)
   Exhaust: 0.115 - 0.188 mm (0.0045 - 0.0074 in)

3. If out of the standards, replace camshaft and remeasure the end play.
   - If limit is still exceeded after replacing camshaft, replace cylinder head.

Inspection (Cont'd)


SCIK063_D1

CAMSHAFT SPROCKET RUNOUT

1. Install sprocket on camshaft.
2. Put V-blocks on a work bench and support camshaft at No. 2 and No. 5 journals.

CAUTION:

- **Do not support journal No. 1 (on the side of the camshaft sprocket) because it has a different diameter from the other four locations.**

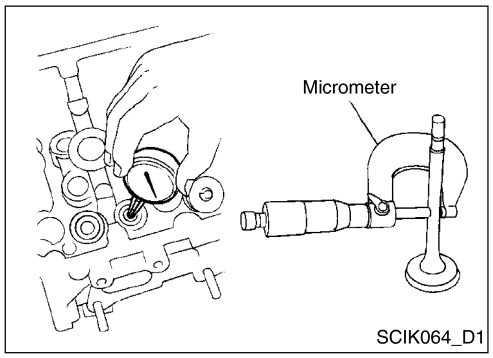
3. Measure camshaft sprocket runout.

   Runout (Total indicator reading):

   Limit: Intake: 0.20 mm (0.0079 in)

   Exhaust: 0.15 mm (0.0059 in)

4. If it exceeds the limit, replace camshaft sprocket.



SCIK064_D1

VALVE GUIDE CLEARANCE

1. Measure valve stem diameter and valve guide inner diameter.
2. Calculate valve to valve guide clearance.

   (Valve to valve guide clearance) = (valve guide inner diameter) - (valve stem diameter)

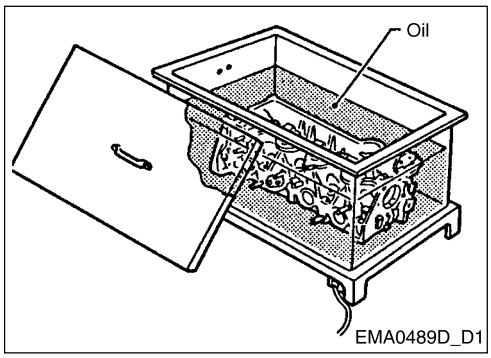
   - Make sure that clearance is within specification.

Unit: mm (in)

	Standard
Intake	0.020 - 0.050 (0.0008 - 0.0020)
Exhaust	0.030 - 0.060 (0.0012 - 0.0024)

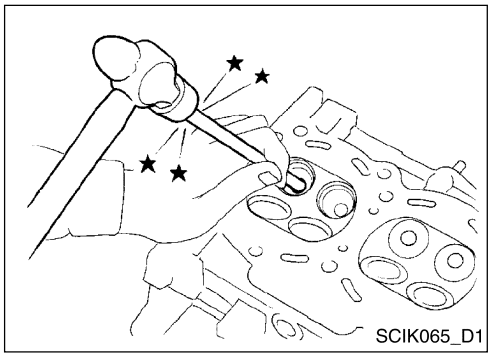
- If out of the standard, replace valve and remeasure the clearance.
- If the standard is still exceeded after replacing valve, replace valve guide.

Inspection (Cont'd)



VALVE GUIDE REPLACEMENT

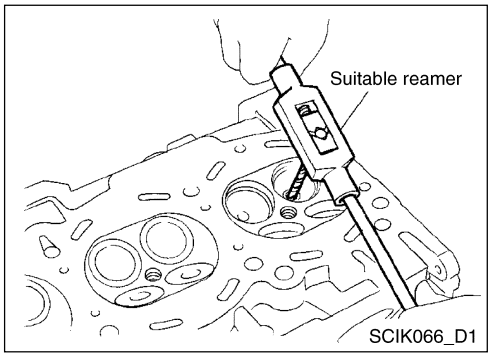
1. To remove valve guide, heat cylinder head to 110 to 130°C (230 to 266°F).



2. Drive out valve guide with a press [under a 20 kN (2 ton, 2.2 US ton, 2.0 Imp ton) pressure] or hammer and suitable tool.

CAUTION:

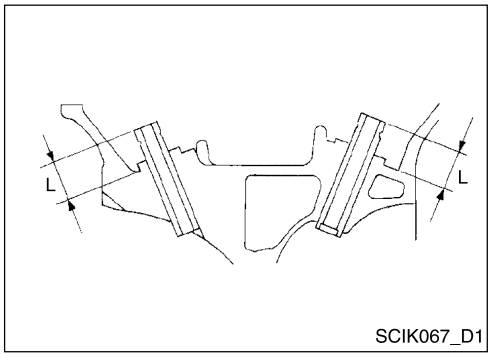
- **Cylinder head contains heat. When working, wear protective equipment to avoid getting burned.**



3. Ream cylinder head valve guide hole.

   Valve guide hole diameter (for service parts):

   Intake and Exhaust: 9.685 - 9.696 mm (0.3813 - 0.3817 in)

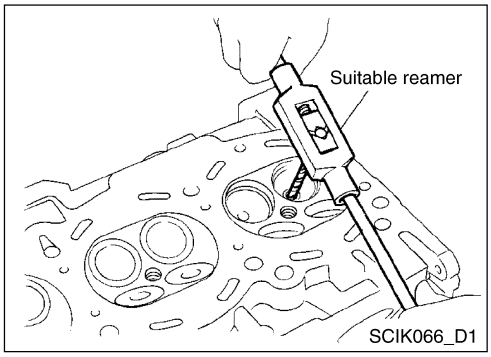


4. Heat cylinder head to 110 to 130°C (230 to 266°F) and press service valve guide into cylinder head.

   Projection "L": 11.5 - 11.7 mm (0.453 - 0.461 in)

CAUTION:

- **Cylinder head contains heat. When working, wear protective equipment to avoid getting burned.**

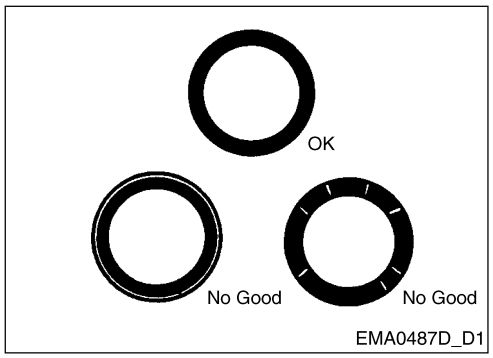


5. Ream valve guide.

   Finished size:

   Intake and Exhaust: 5.500 - 5.515 mm (0.2165 - 0.2171 in)

Inspection (Cont'd)



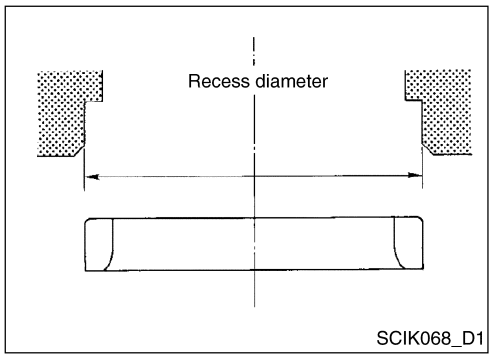
VALVE SEAT CONTACT

- After confirming that the dimensions of valve guides and valves are within specifications, perform this procedure.
- Apply prussian blue (or white lead) onto contacting surface of valve seat to check the condition of the valve contact on the surface.
- Check if the contact area band is continuous all around the circumference.
- If not, grind to adjust valve fitting and check again. If the contacting surface still has N.G conditions even after the re-check, replace valve seat.

VALVE SEAT REPLACEMENT

When valve seat is removed, replace with oversized [0.5 mm (0.020 in)] valve seat.

1. Bore out old seat until it collapses. Boring should not continue beyond the bottom face of the seat recess in cylinder head. Set the machine depth stop to ensure this.



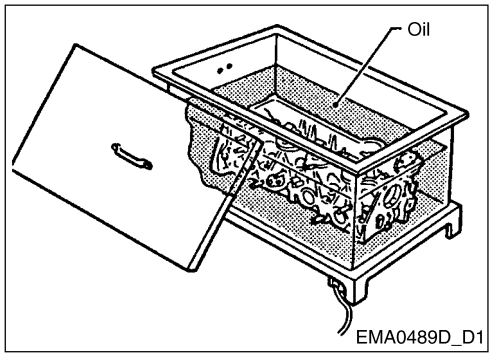
2. Ream cylinder head recess diameter for service valve seat.

Oversize [0.5 mm (0.020 in)]:

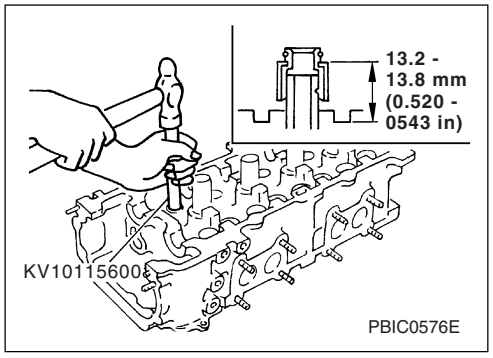
Unit: mm

	Standard
Intake	0.020 - 0.050 (0.0008 - 0.0020)
Exhaust	0.030 - 0.060 (0.0012 - 0.0024)

- Be sure to ream in circles concentric to the valve guide center.
- This will enable valve seat to fit correctly.



3. Heat cylinder head to 110 to 130°C (230 to 266°F) by soaking in heated oil.

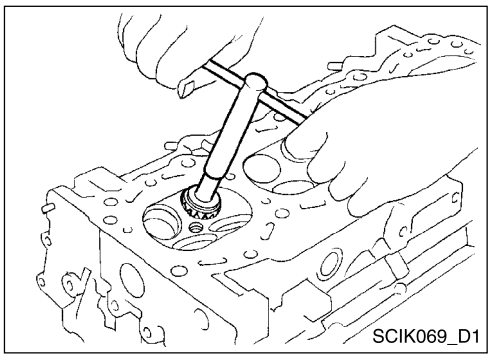


4. Provide valve seats cooled well with dry ice. Force fit valve seat into cylinder head with valve seat drift (SST: KV10115600).

CAUTION:

- **Avoid directly to touching cold valve seats.**
- **Cylinder head contains heat. When working, wear protective equipment to avoid getting burned.**

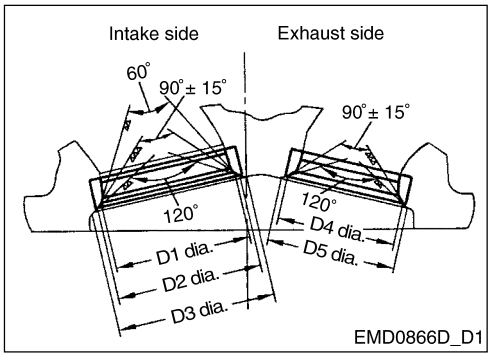
Inspection (Cont'd)


SCIK069_D1

5. Using valve seat cutter set (commercial service tool) or valve seat grinder, finish the seat to the specified dimensions.

CAUTION:

- **When using valve seat cutter, firmly grip the cutter handle with both hands. Then, press on the contacting surface all around the circumference to cut in a single drive. Improper pressure on with the cutter or cutting many different times may result in stage valve seat.**



EMD0866D_D1

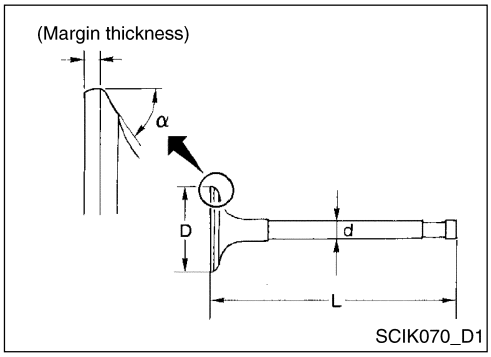
Grind to obtain the dimensions indicated in figure.

Unit: mm (in)

	QG16DE
D1 dia.*1	27.8 - 28.0 (1.094 - 1.102)
D2 dia.*2	29.5 - 29.7 (1.161 - 1.169)
D3 dia.	31.9 - 32.1 (1.256 - 1.264)
D4 dia.*1	24.5 - 24.7 (0.965 - 0.972)
D5 dia.*2	26.2 - 26.4 (1.031 - 1.039)

*1: Diameter made by intersection point of conic angles 60° and 90°
*2: Diameter made by intersection point of conic angles 90° and 120°

6. Using compound, grind to adjust valve fitting.
7. Check again for normal contact.



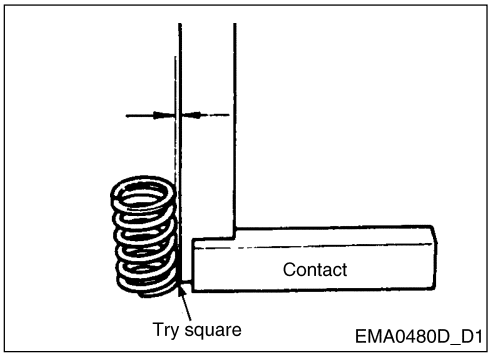
SCIK070_D1

VALVE DIMENSIONS

Check dimensions of each valve. Refer to SDS, EM-80 for dimensions.

When valve head has been worn down to 0.5 mm (0.020 in) in margin thickness, replace valve.

Grinding allowance for valve stem tip is 0.2 mm (0.008 in) or less.



EMA0480D_D1

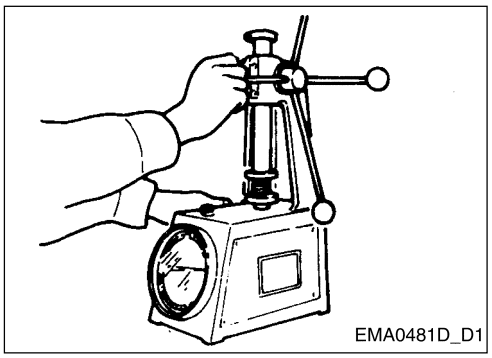
VALVE SPRING

Squareness

- Set try squre along the side of valve spring and rotate the spring.
- Measure the maximum clearance between the top face of spring and try square.

  Limit: 2.0 mm (0.079 in)
- If it exceeds the limit, replace spring.

Inspection (Cont'd)


EMA0481D_D1

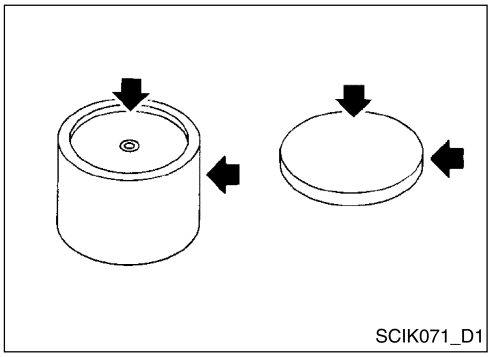
PRESSURE

Check with a valve spring tester.

STANDARD

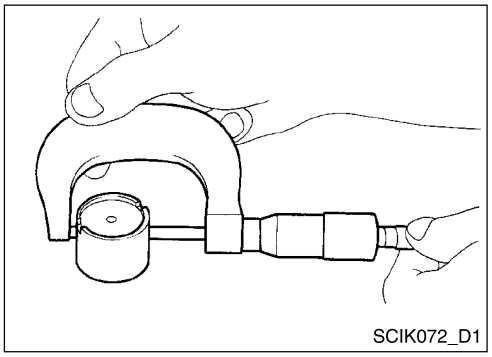
Free length mm (in)	40.19 (1.5823)	45.75 (1.8012)
Length when installed mm (in)	33.82 (1.3315)	32.82 (1.2921)
Load when installed N (kg, lb)	149 - 165 (15.2 - 16.8, 33.5 - 37.0)	147 - 167 (15.0 - 17.0, 33.0 - 37.5)
Valve-opening length mm (in)	23.61 (0.9295)	24.48 (0.9638)
Valve-opening load N (kg, lb)	353 - 389.7 (36.0 - 39.8, 79.4 - 87.7)	271 - 305 (27.6 - 31.1, 60.9 - 68.6)
Identification color	None	Red or white (parallel provision)

- Inspect the service specifications according to the identification color.
- If either load when installed or valve-opening load is out of the standard, replace valve spring.


SCIK071_D1

VALVE LIFTER AND ADJUSTING SHIM

1. Check contact and sliding surfaces for wear or scratches.
   - If anything above is found, replace valve lifter or adjusting shim.


SCIK072_D1

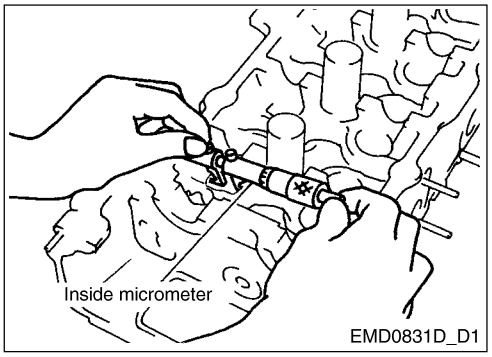
2. Check diameter of valve lifter and valve lifter guide bore.

   Valve lifter outer diameter:

   29.965 - 29.980 mm (1.1797 - 1.1803 in)

   Valve lifter hole diameter:

   30.000 - 30.021 mm (1.1811 - 1.1819 in)



EMD0831D_D1

3. Calculate clearance between valve lifter and valve lifter guide.

   (Clearance) = (Lifter guide inside diameter) - (Valve lifter outside diameter)

   Standard: 0.020 - 0.056 mm (0.0008 - 0.0022 in)

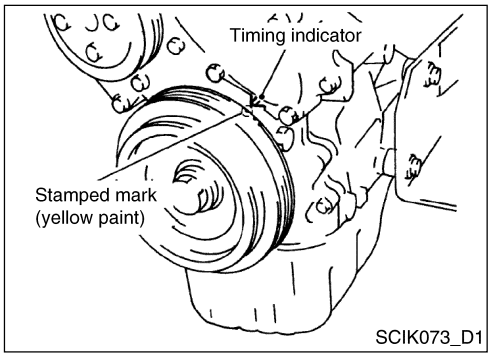
If it exceeds the standard, replace valve lifter or cylinder head which exceeds the standard diameter tolerance.

Valve Clearance

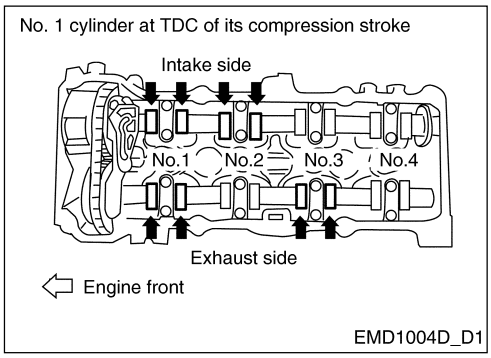
Valve Clearance

CHECKING

Check valve clearance while engine is warm and not running.

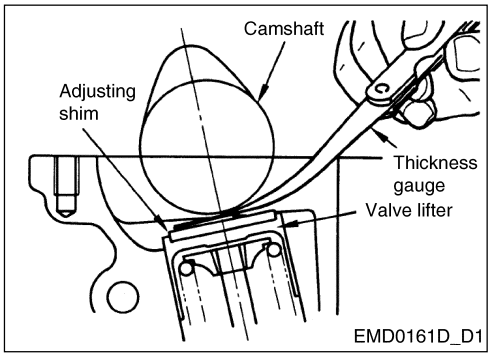


1. Remove rocker cover.
2. Set No. 1 cylinder at TDC on its compression stroke.
   - Align timing indicator with stamped mark on crankshaft pulley.
   - Make sure that valve lifters on No. 1 cylinder are loose and valve lifters on No. 4 are tight.
   - If not, turn crankshaft one revolution (360 degrees) and align as described above.



3. Referring to the figure, measure valve clearance of values with “O” in table below.

		No. 1	No. 2	No. 3	No. 4
No. 1 cylinder at TDC of its compression stroke	Intake	O	O		
	Exhaust	O		O	

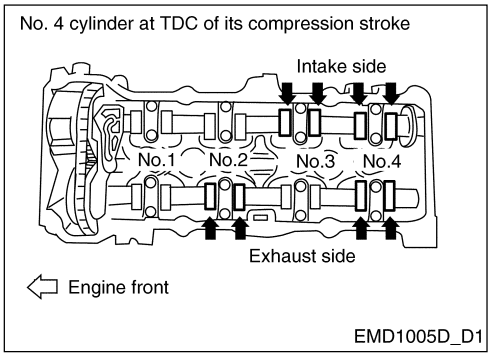


- Using a feeler gauge, measure clearance between valve lifter and cam of camshaft.
- Record any valve clearance measurements which are out of the specification. They will be used later to determine the required replacement adjusting shim.

Valve clearance for checking (Hot):

Intake: 0.304 - 0.416 mm (0.012 - 0.016 in)

Exhaust: 0.348 - 0.472 mm (0.014 - 0.019 in)

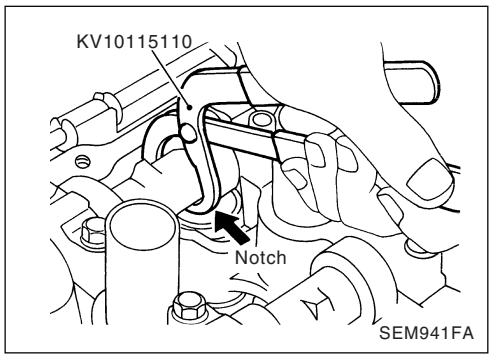


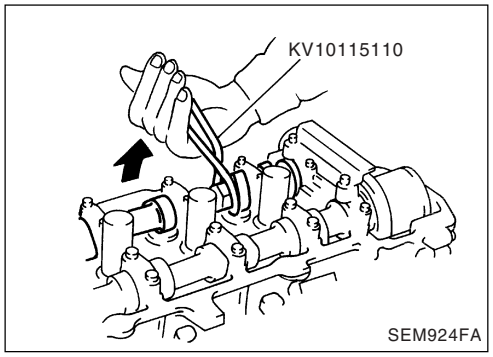
4. Turn crankshaft one revolution (360 degrees) and stamped mark on crankshaft pulley with timing indicator.
5. Referring to the figure, measure valve clearances with “O” in table below.

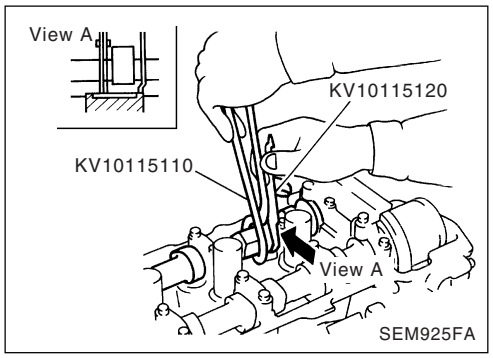
		No. 1	No. 2	No. 3	No. 4
No. 1 cylinder at TDC of its compression stroke	Intake			O	O
	Exhaust		O		O

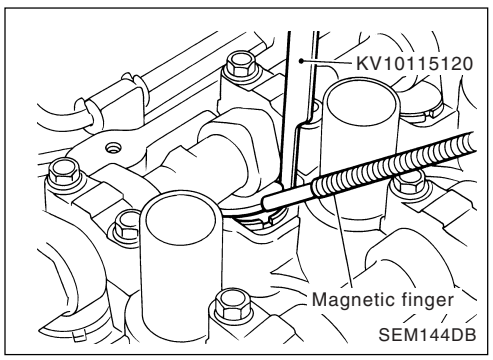
6. If all valve clearances are within specification, install rocker cover.

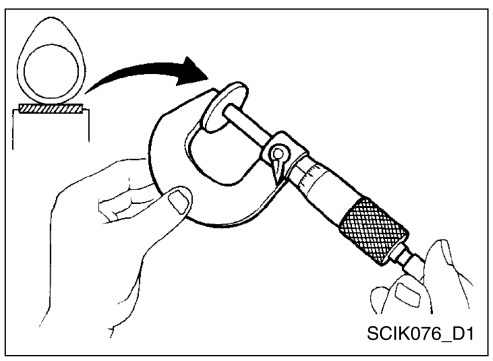
Valve Clearance (Cont'd)











ADJUSTING

Adjust valve clearance while engine is cold.

1. Turn crankshaft. Position cam lobe upward on camshaft for valve that must be adjusted.
2. Place camshaft pliers (SST: KV10115110) around camshaft as shown in figure. Before the placing camshaft pliers, rotate notch toward center of cylinder head. (See figure.) This will simplify shim removal later.

CAUTION:

- **Be careful not to damage cam surface with the camshaft pliers.**

3. Rotate camshaft pliers (SST: KV10115110) so that valve lifter is pushed down.
4. Place lifter stopper (SST: KV10115120) between camshaft and valve lifter to retain valve lifter.

CAUTION:

- **The lifter stopper must be placed as close to camshaft bracket as possible.**
- **Be careful not to damage cam surface with lifter stopper.**

5. Remove camshaft pliers (SST: KV10115110).
6. Remove adjusting shim using a small screwdriver and a magnetic finger.
7. Determine replacement adjusting shim size using the following formula.
   - Use a micrometer to determine thickness of removed shim.
   - Calculate thickness of new adjusting shim so valve clearance comes within the specified values.

   R = Thickness of removed shim

   N = Thickness of new shim

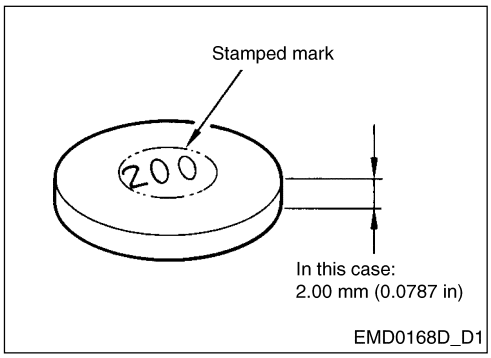
   M = Measured valve clearance

   Intake: N = R + [M - 0.37 mm (0.0146 in)]

   Exhaust: N = R + [M - 0.40 mm (0.0157 in)]

   Shims are available in 73 sizes from 2.00 mm (0.0787 in) to 2.98 mm (0.1173 in).

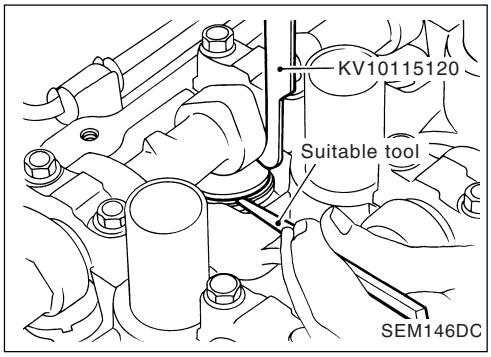
Valve Clearance (Cont'd)



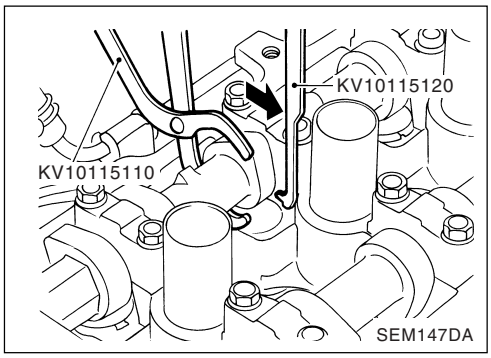
- Select the closest size shim to the calculated thickness. Refer to chart in SDS, EM-78.

  Stamped mark

  In this case: 2.00 mm (0.0787 in)



8. Install new shim using a suitable tool.
   - Install with the surface on which the thickness is stamped facing down.



9. Place camshaft pliers as explained in steps 2 and 3.
10. Remove lifter stopper (SST: KV10115110).
11. Remove camshaft pliers (SST: KV10115120).
12. Recheck valve clearance.

VALVE CLEARANCE:

Unit: mm (in)

	Hot	Cold* (reference data)
Intake	0.304 - 0.416 (0.012 - 0.016)	0.25 - 0.33 (0.010 - 0.013)
Exhaust	0.348 - 0.472 (0.014 - 0.019)	0.32 - 0.40 (0.013 - 0.016)

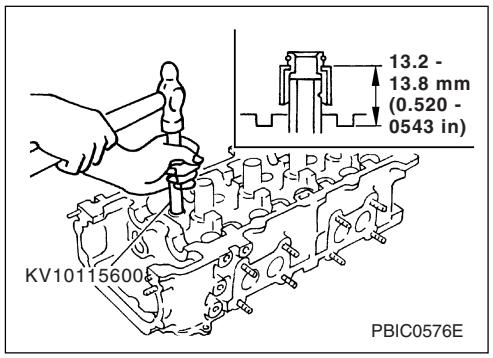
*: At a temperature of approximately 20°C (68°F)

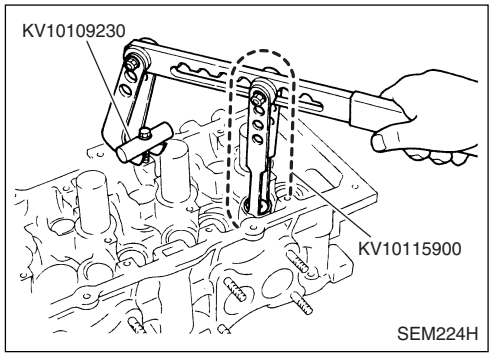
Whenever valve clearances are adjusted to cold specifications, check that the clearances satisfy hot specifications and adjust again if necessary.

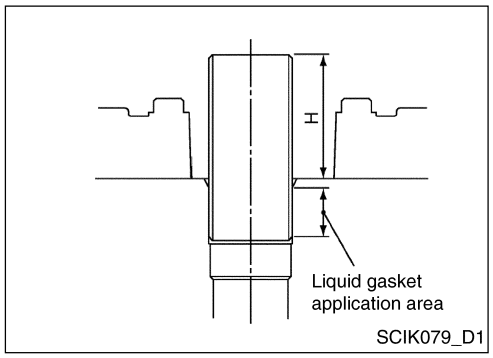
Assembly

1. Install valve guide.
   Refer to EM-46, "VALVE GUIDE REPLACEMENT".
2. Install valve seat.
   Refer to EM-47, "VALVE SEAT REPLACEMENT".

Assembly (Cont'd)







3. Install valve oil seal.
   - Install with valve oil seal drift (SST: KV10115600) to match dimension in illustration.
4. Install valve spring seat.
5. Install valve.
   - Valves of larger diameter are for intake side.
6. Install valve spring.
   - If the valve has a identification color, install with the colored surface facing down.
7. Install valve spring retainer.
8. Install valve collet.
   - Use valve spring compressor (SST: KV101092S0) to compress valve spring, then install collet with a magnetic finger.

CAUTION:

- **When working, take care not to damage valve lifter holes.**
- **After installing valve component parts, tap valve stem tip with a plastic hammer to assure a proper fit.**

9. Install valve lifter and adjusting shim.
   - Install it in its original positions.
10. Install spark plug tube.
    - Press-fit into cylinder head in the following order.

    a) Remove the old liquid gasket which has become attached to the cylinder head mounting hole.

    b) Apply the liquid gasket to the area around the spark plug tube press-fit. Use Genuine Liquid Gasket or equivalent.

    c) Using a drift, press-fit spark plug tube so that its height "H" is as specified in the figure.

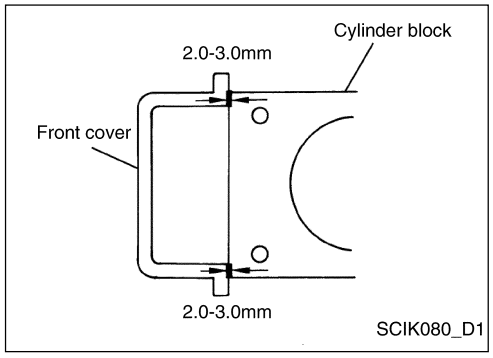
    Standard press-fit height "H":

    41.0 - 42.0 mm (1.614 - 1.654 in)

CAUTION:

- **Press-fit, making sure not to deform the spark plug tube.**
- **After press-fitting, wipe off liquid gasket protruding onto cylinder head upper face.**

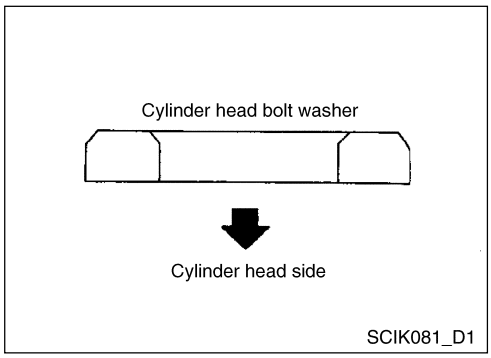
11. Install spark plug.
    - Use a spark plug wrench.



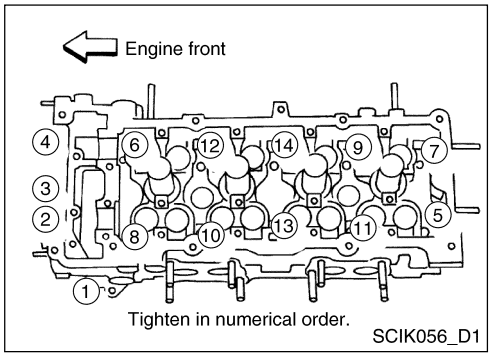
Installation

1. Apply liquid gasket to positions shown in the figure.
   Use Genuine Liquid Gasket or equivalent.
2. Install cylinder head gasket.
   - When installing cylinder head, use new cylinder head gasket.

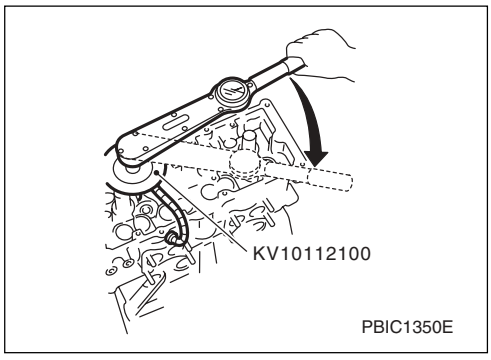
Installation (Cont'd)



3. Install cylinder head and tighten bolts in reverse order as shown in the figure.
   - Be sure to install washers between cylinder head bolts and cylinder head.
   - Do not rotate crankshaft and camshaft separately, or valves will strike piston heads.
   - Apply new engine oil to cylinder head bolt threads and seat surfaces.



   - Tightening procedure
     a) Tighten bolts (5 - 14) to 29.4 N·m (3 kg-m, 22 ft-lb).
     b) Tighten bolts (5 - 14) to 58.8 N·m (6 kg-m, 43 ft-lb).
     c) Loosen bolts (5 - 14) completely.
     d) Tighten bolts (5 - 14) to 29.4 N·m (3 kg-m, 22 ft-lb).

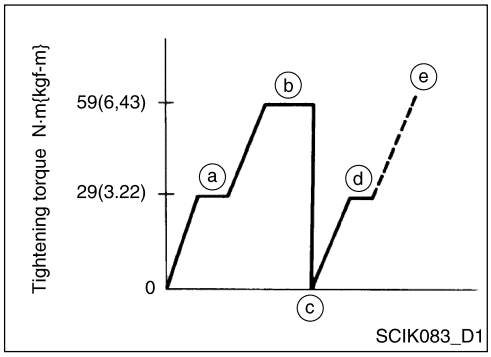


     e) Turn bolts (5 - 14) 50 to 55 degrees (target: 50 degrees) clockwise. (Angle tightening)

CAUTION:

- **Check and confirm the tightening angle by using angle wrench (SST: KV10112100). Avoid judgment by visual inspection without the tool.**

     f) Tighten bolts (1 - 5) to 6.3 to 8.3 N·m (0.64 to 0.85 kg-m, 55.8 to 73.5 in-lb).

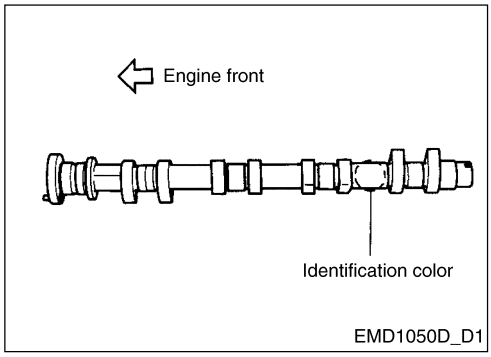


	Tightening torque N·m (kg-m, ft-lb)				
	a	b	c	d	e, f
Bolts (1 - 10)	29.4 (3, 22)	58.8 (6, 43)	0 (0, 0)	29.4 (3, 22)	50 - 55 degrees
Bolts (11 - 14)	-	-	-	-	6.3 - 8.3 (0.64 - 0.85, 55.8 - 73.5 in-lb)

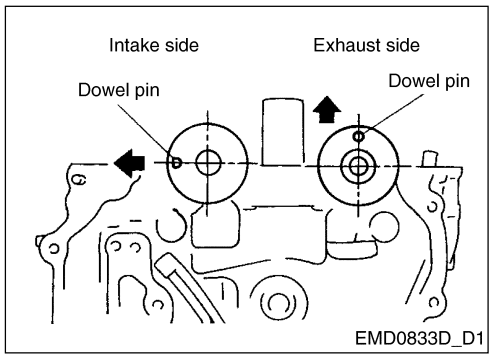
4. Install camshaft.
   - Identify intake and exhaust camshafts by identification paint colors (paint between cylinders No. 3 and No. 4).

     Intake camshaft: Yellow

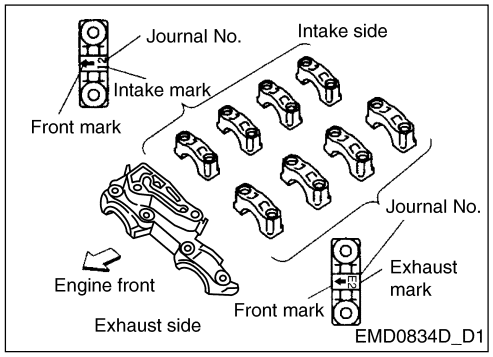
     Exhaust camshaft: Yellowish green



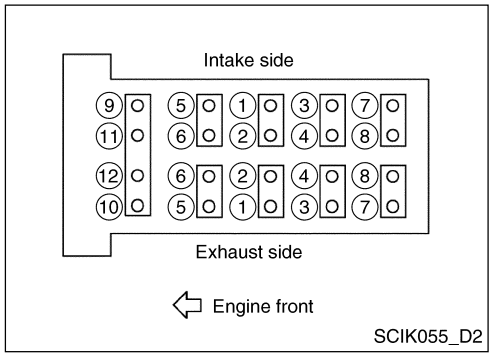
Installation (Cont'd)



- Make sure camshafts are aligned as shown in the figure.



5. Install camshaft brackets.
   - Completely remove any foreign material on back surfaces of camshaft brackets and top surface of cylinder head.
   - Referring to marks on top surfaces of camshaft brackets, install them to their original positions and in their original directions.



   - Apply new engine oil to bolt threads and seat surface.
   - Tighten camshaft bracket bolts in the following steps.
     a) Tighten bolts 9 - 12, then 1 - 8: 2.0 N·m (0.20 kg-m, 17.7 in-lb)
     b) Tighten bolts 1 - 12: 5.9 N·m (0.60 kg-m, 52.2 in-lb)
     c) Tighten bolts 1 - 12: 9.0 - 11.8 N·m (0.92 - 1.20 kg-m, 80 - 104 in-lb)
   - If any part of valve assembly or camshaft is replaced, check valve clearance according to reference data.

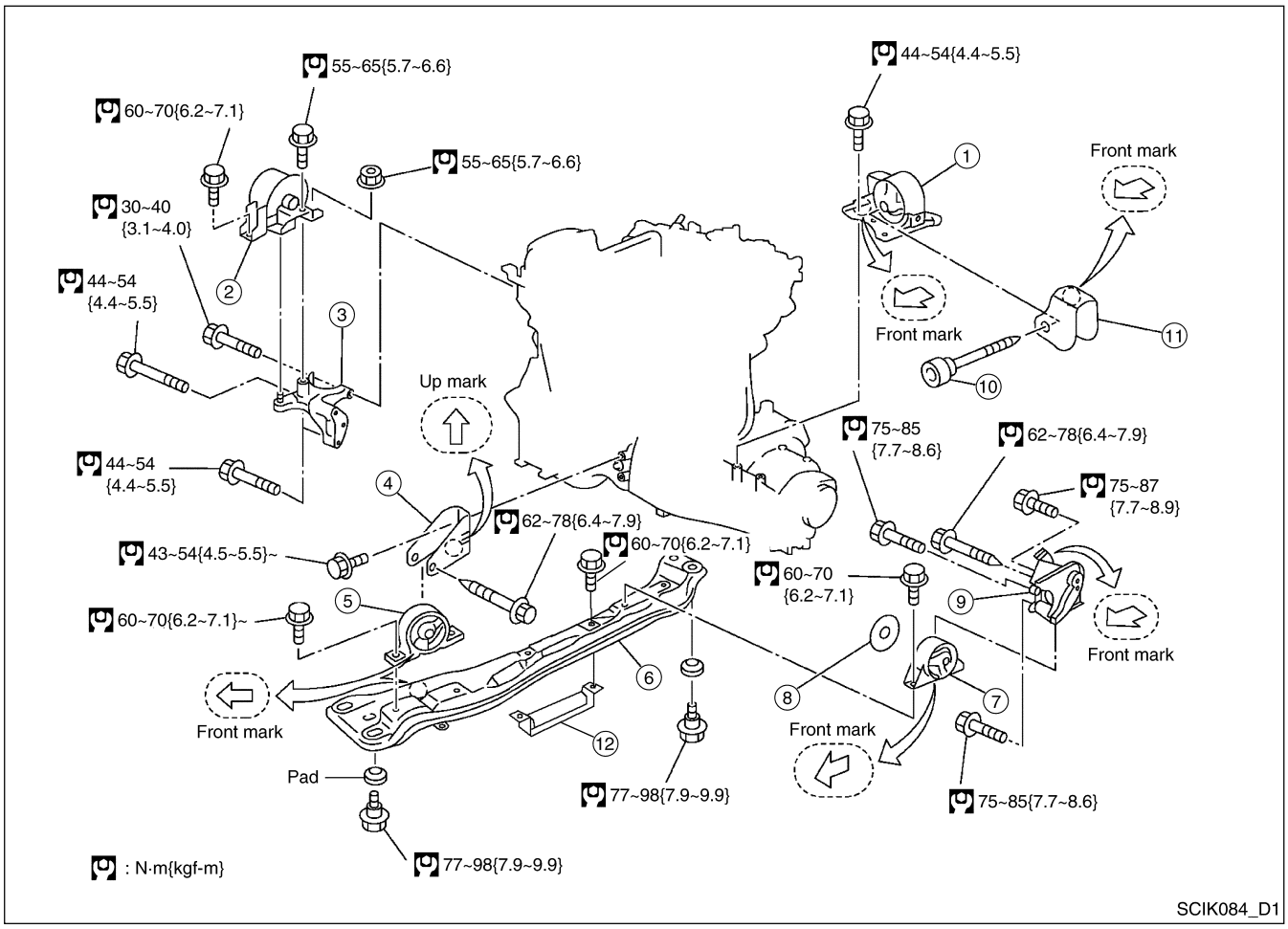
     After completing assembly check valve clearance. Refer to EM-50, "Checking" and "Adjusting" in "VALVE CLEARANCE".

     Reference data valve clearance (Cold):

     Intake: 0.25 - 0.33 mm (0.010 - 0.013 in)

     Exhaust: 0.32 - 0.40 mm (0.013 - 0.016 in)

Removal • Installation



① Engine mounting insulator (LH)
② Engine mounting insulator (RH)
③ Engine mounting bracket (RH)
④ Engine mounting bracket (Front)
⑤ Engine mounting insulator (Front)
⑥ Center member
⑦ Engine mounting insulator (Rear)
⑧ Rubber
⑨ Engine mounting bracket (Rear)
⑩ Through-bolt
⑪ Engine mounting bracket (LH)
⑫ Dynamic damper

WARNING:

- **Position vehicle on a flat and solid surface.**
- **Place chocks at front and back of rear wheels.**
- **Do not remove engine until exhaust system has completely cooled off, otherwise, you may burn yourself and/or fire may break out in fuel line.**
- **Before disconnecting fuel hose, release pressure. Refer to QG16: EC-26, "Fuel Pressure Check".**
- **Be sure to lift engine and transaxle in a safe manner.**
- **For engines not equipped with engine slingers, attach proper slingers and bolts described in PARTS CATALOG.**

CAUTION:

- **When lifting engine, be sure to clear surrounding parts.**
- **Use special care near accelerator wire casing, brake lines and brake master cylinder.**
- **When lifting the engine, always use engine slingers in a safe manner.**

Removal • Installation (Cont'd)

- **When removing drive shaft, be careful not to damage grease seal of transaxle.**
- **Before separating engine and transaxle, remove crankshaft position sensor (POS) from the cylinder block assembly.**
- **Always be extra careful not to damage edge of crankshaft position sensor (POS), or signal plate teeth. Engine cannot be removed separately from transaxle. Remove engine with transaxle as an assembly.**

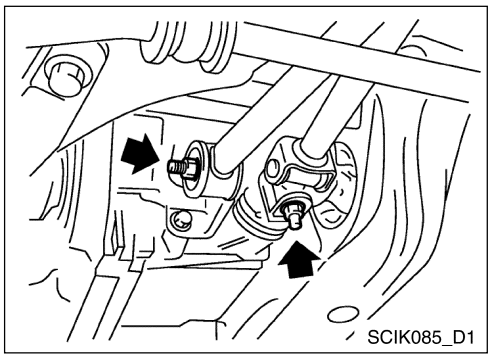
Removal

1. Release fuel pressure. Refer to QG16: EC-26, "Fuel Pressure Check".
2. Drain coolant from radiator and cylinder block.
3. Remove reservoir tank and bracket.
4. Disconnect both battery cables.
5. Remove battery and battery tray.
6. Disconnect fuel hose.
7. Remove air cleaner and air duct.
8. Remove drive belts. Refer to EM-15, "DRIVE BELTS".
9. Remove alternator.
10. Remove air conditioner compressor with piping connected from bracket. Temporarily secure it on body with a rope to avoid putting stress on A/C pipes.
11. Remove power steering oil pump from engine and position aside. Power steering oil pump does not need to be disconnected from power steering tubes.
12. Remove the following parts:
    - RH and LH front wheels
    - Front undercovers
    - RH and LH brake caliper assemblies.

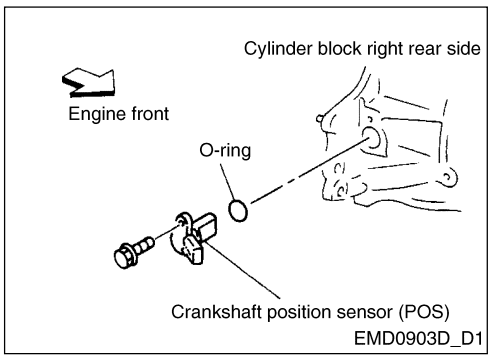
      Brake hose does not need to be disconnected from brake caliper assembly. Never depress brake pedal.
    - RH and LH drive shaft.

      When removing drive shaft, be careful not to damage transaxle side oil seal.
    - Idler pulley and bracket assembly
    - Front exhaust tube: Refer to QG16: FE-13, "Removal and Installation".
    - Stabilizer bar
    - Cooling fan and radiator: Refer to "Radiator"
13. Disconnect wires, harness, pipes, hoses and so on.

Removal • Installation (Cont'd)



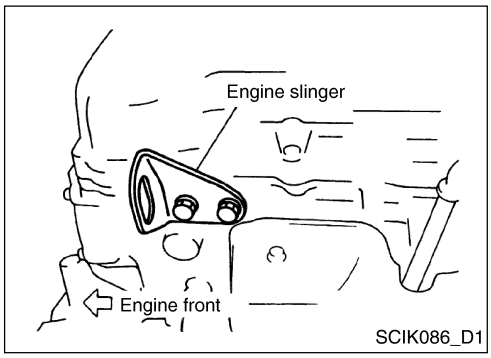
14. Disconnect control rod and support rod from transaxle. (M/T models.)
15. Disconnect control cable from transaxle. (A/T models.)



16. Remove crankshaft position sensor (POS).

CAUTION:

- **Avoid impacts such as a dropping.**
- **Do not disassemble.**
- **Keep it away from metal particles.**
- **Do not place sensor close to magnetic materials.**



17. Install engine slinger to front left of cylinder head.

    Tightening torque:

    30.4 - 40.2 N·m (3.1 - 4.1 kg-m, 23 - 29 ft-lb)

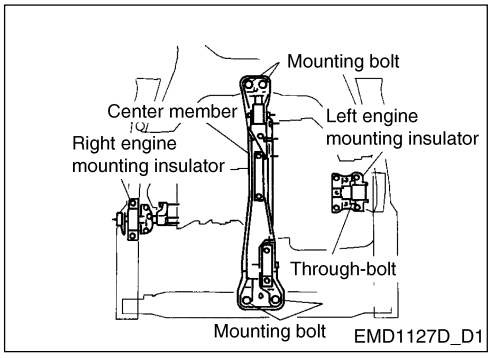
NOTE:

- **For rear side, use those provided on engine.**

18. Install lifting chain hooks into engine slinger and suspend engine with hoist.
19. Lift with hoist and secure the engine in position.
    - Use a manual lift table caddy (commercial service tool) or equivalently rigid tool such as a jack or trestle. Securely support bottom of engine and transaxle, and simultaneously adjust hoist tension.

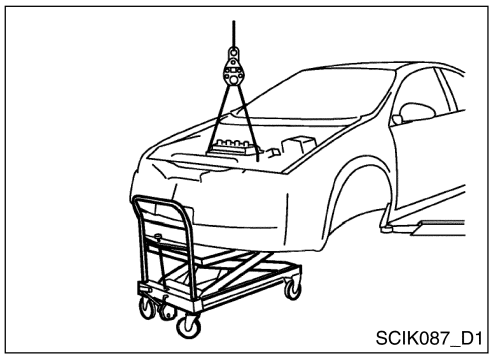
CAUTION:

- **Put a piece of wood or something similar as the supporting surface, secure a completely stable condition.**



20. Remove RH engine mounting insulator.
21. Pull LH engine mounting through-bolt out.
22. Remove mounting bolts at front and rear of center member.

Removal • Installation (Cont'd)



23. Lower manual lift table caddy, and remove engine transaxle assembly from vehicle.

CAUTION:

- **When carrying out this work, be sure to check all parts for interference with vehicle body.**
- **Be sure to check that all the applicable connections have been properly disconnected.**
- **Be careful to prevent vehicle from dropping off the lift. Be aware that changes in center of gravity may cause balance incidents.**

24. Separate engine and transaxle as follows:

CAUTION:

- **During separate, always support bottom with a wooden block. Suspend engine slinger with a hoist. Be sure to check safety of work at any time.**

a) Remove center member.

b) Remove engine mounting insulators and bracket.

c) Remove stater motor.

d) Separate engine and transaxle.

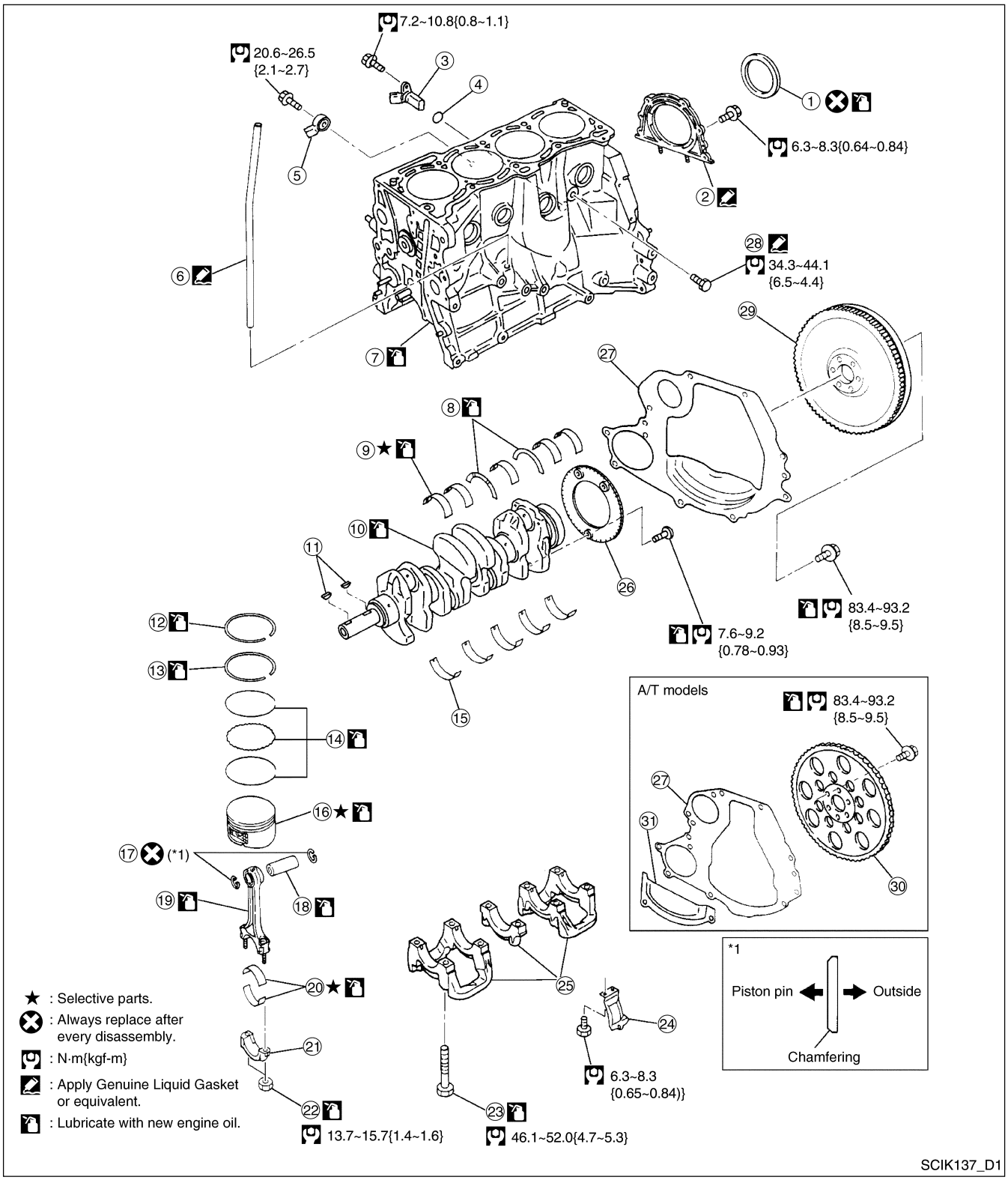
Inspection

- Install in the reverse order of removal.

Inspection After Installation

- Before starting engine, check the levels of coolant, lubrications and working oils. If less than required quantity, fill to the specified level.
- Use procedure below to check for fuel leakage.
  a) Turn ignition switch ON (with engine stopped). With fuel pressure applied to fuel piping, check for fuel leakage at connection points.
  b) Start engine. With engine speed increased, check again for fuel leakage at connection points.
- Run engine to check for unusual noise and vibration.
- Warm up engine thoroughly to make sure there is no leakage of engine coolant, lubricants, working oil, fuel and exhaust gas.
- Bleed air from passages in pipes and tubes of applicable lines, such as in cooling system.
- After cooling down engine, again check amounts of engine coolant, lubricants, oil, and fluid. Refill to the specified level, if necessary.

Components

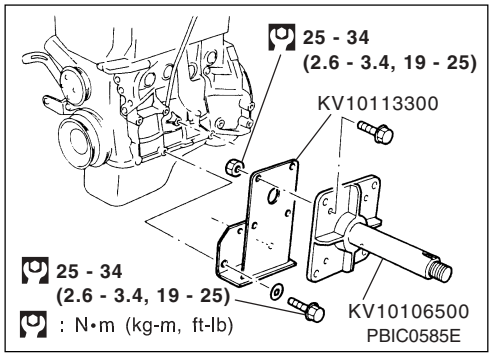


① Rear oil seal
② Rear oil seal retainer
③ Crankshaft position sensor (POS)
④ O-ring
⑤ Knock sensor
⑥ Oil level gauge guide
⑦ Cylinder block
⑧ Thrust bearing
⑨ Main bearing (Upper)
⑩ Crankshaft
⑪ Key
⑫ Top ring
⑬ 2nd ring
⑭ Oil ring
⑮ Main bearing (Lower)
⑯ Piston
⑰ Snap ring
⑱ Piston pin
⑲ Connecting rod
⑳ Connecting rod bearing
㉑ Connecting rod cap
㉒ Connecting rod nut
㉓ Main bearing cap bolt
㉔ Baffle plate
㉕ Main bearing cap
㉖ Signal plate
㉗ Rear plate
㉘ Coolant drain plug
㉙ Flywheel (M/T models)
㉚ Drive plate (A/T models)
㉛ Rear plate cover

Removal • Installation

CAUTION:

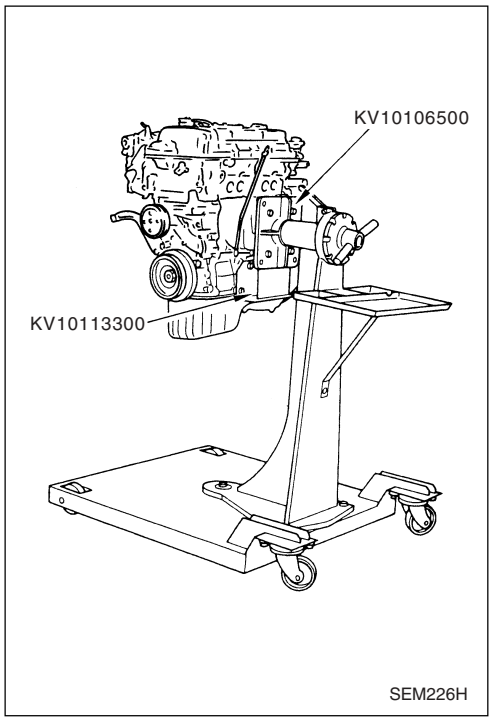
- **When installing sliding parts such as bearings and pistons, apply engine oil on the sliding surfaces.**
- **Place removed parts, such as bearings and bearing caps, in their proper order and direction.**
- **When installing connecting rod nuts and main bearing cap bolts, apply new engine oil to threads and seating surfaces.**
- **Do not allow any magnetic materials to contact the signal plate teeth of flywheel or drive plate, and rear plate.**
- **Be careful not to damage sensor edges and single plate teeth.**



Disassembly

PISTON AND CRANKSHAFT

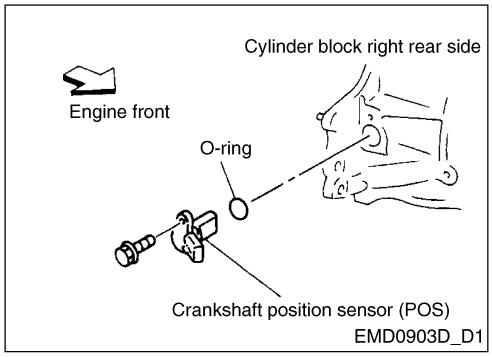
1. Remove engine assembly from vehicle, and separate transaxle from engine. Refer to EM-57, “ENGINE ASSEMBLY”.
2. Remove front engine mounting bracket. Refer to EM-56, “ENGINE ASSEMBLY”.



3. Remove exhaust manifold. Refer to EM-13, “OUTER COMPONENT PARTS”.
4. Place engine on a work stand.
5. Drain engine oil.
6. Remove the following components and associated parts.
   - Intake manifold and intake manifold collector assembly. Refer to EM-12, “OUTER COMPONENT PARTS”.
   - Oil pan and oil strainer. Refer to EM-18, “OIL PAN”.
   - Timing chain. Refer to EM-21, “TIMING CHAIN”.
   - Camshaft. Refer to EM-40, “CYLINDER HEAD”.
   - Cylinder head. Refer to EM-40, “CYLINDER HEAD”.
7. Remove knock sensor.

CAUTION:

- **Avoid impacts such as a dropping.**

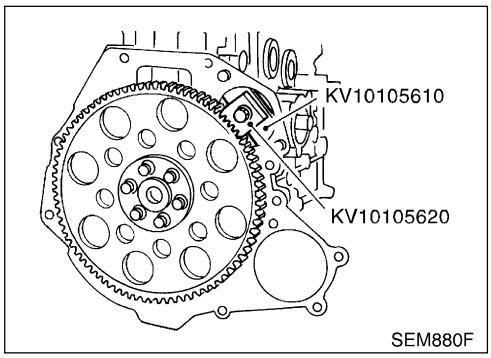


8. Remove POS sensor.

CAUTION:

- **Avoid impacts such as a dropping.**
- **Do not disassemble.**
- **Keep it away from metal particles.**
- **Do not place sensor close to magnetic materials.**

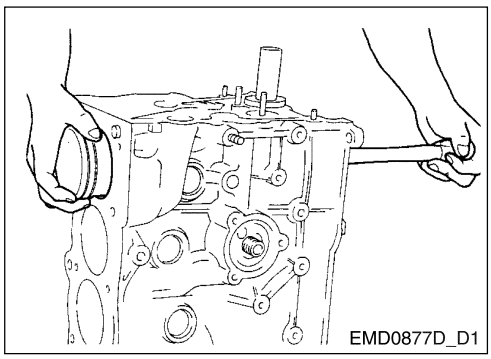
Disassembly (Cont'd)



9. Remove flywheel (M/T models) or drive plate (A/T models). Fix crankshaft with ring gear stopper (SST: KV101056S0), and remove mounting bolts.
10. Remove rear plate.
11. Remove rear oil seal retainer.
    - Insert a flat-bladed screwdriver between main bearing cap and rear oil seal retainer to remove retainer.
12. Remove rear oil seal from rear oil seal retainer.
    - Punch out with a flat-bladed screwdriver.

CAUTION:

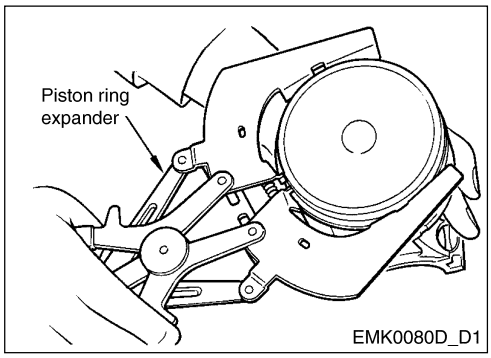
- **Be careful not to damage rear oil seal retainer.**



13. Remove piston and connecting rod assembly.
    - Before removing piston and connecting rod assembly, check connecting rod side clearance. Refer to EM-86, "CRANKSHAFT".
    a) Position the crankshaft pin corresponding to connecting rod to be removed onto the bottom dead center.
    b) Remove connecting rod cap.
    c) Using a hammer handle or similar tool, push piston and connecting rod assembly out to the cylinder head side.
14. Remove connecting rod bearings.

CAUTION:

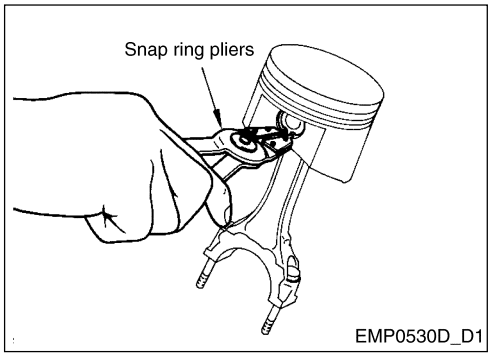
- **When removing them, note the installation position. Keep them in the correct order.**



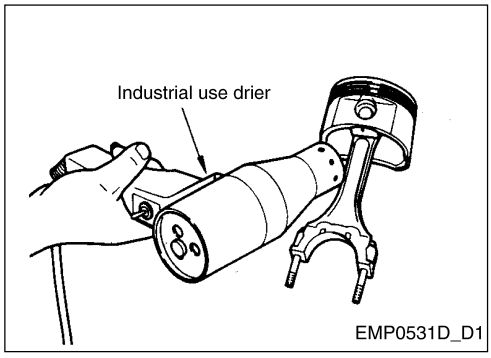
15. Remove piston rings from piston.
    - Before removing piston rings, check the piston ring side clearance. Refer to EM-84, "PISTON RING".
    - Use a piston ring expander (commercial service tool).

CAUTION:

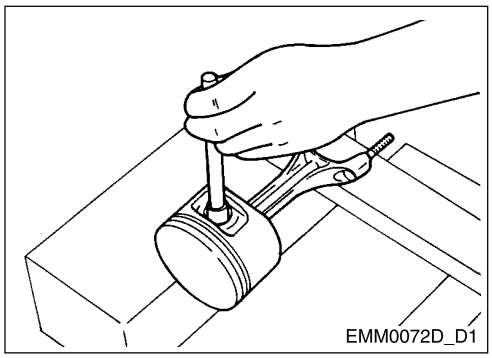
- **When removing piston rings, be careful not to damage piston.**
- **Be careful not to damage piston rings by expanding them excessively.**



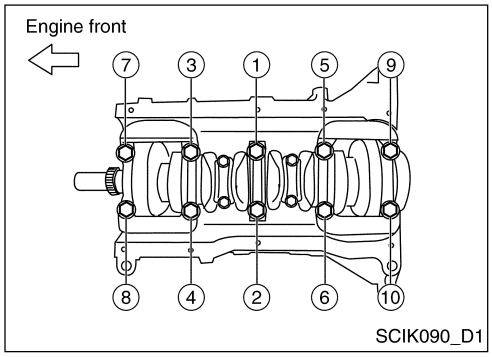
16. Remove piston from the connecting rod as follows:
    a) Using a snap ring pliers, remove snap ring.
    b) Heat piston to 60 to 70°C (140 to 158°F) with drier or equivalent.



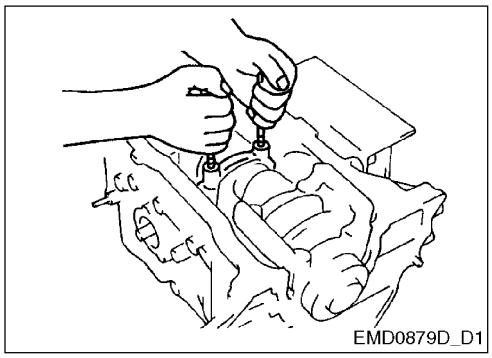
Disassembly (Cont'd)



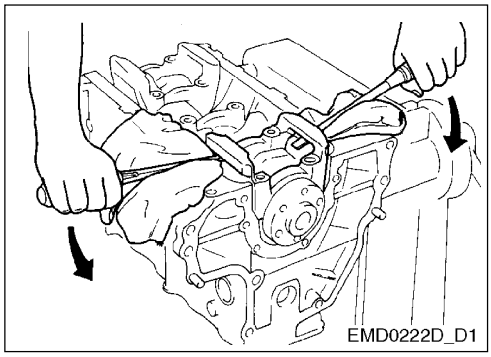
c) Push out piston pin with stick of outer diameter approximately 17 mm (0.67 in).



17. Remove main bearing cap bolts.
- Loosen main bearing cap bolts in several steps in the reverse order shown in the figure, and remove them.
- Measure crankshaft side clearance before loosening main bearing cap bolts. Refer to EM-86, "CRANKSHAFT".

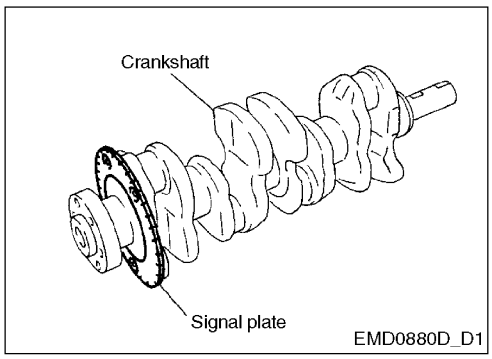


18. Remove main bearing caps.
- Using main bearing cap bolts as shown, remove center main bearing cap while shaking it back-and-forth.



- To remove front and rear main bearing caps, lever them off using screwdriver or similar tool. Or, using a plastic hammer, tap them back-and-forth.

CAUTION:
- **Using shop cloth or wooden block, protect oil pan mounting surface on cylinder block, so that mounting surface is not damaged.**



19. Remove crankshaft.

CAUTION:
- **When placing crankshaft on ground, be careful not to damage signal plate.**
- **Never remove signal plate unless it is necessary.**

NOTE:
- **If it is removed, positioning dowel pin (dowel pins for crankshaft and signal plate are specified as a single set) must be reinstalled.**

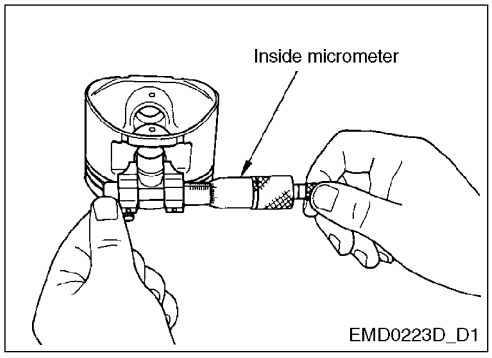
Disassembly (Cont'd)

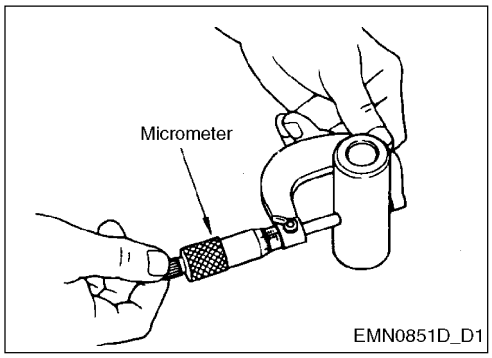
20. Remove main bearing and thrust bearing from cylinder block and main bearing cap.

CAUTION:

- **Check mounting positions, and store them without mixing them up.**

21. Remove baffle plate.





Inspection

PISTON AND PISTON PIN CLEARANCE

1. Measure inner diameter of piston pin hole.

   Standard:

   18.987 - 18.999 mm (0.7475 - 0.7480 in)

CAUTION:

- **Use only the pin provided with piston.**

2. Measure outer diameter of piston pin.

   Standard:

   18.989 - 19.001 mm (0.7476 - 0.7481 in)

3. Calculate piston pin clearance.

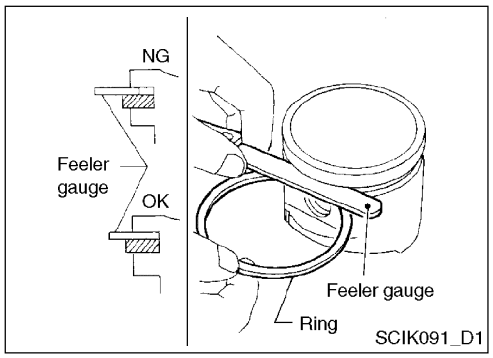
   (Piston pin clearance) = (Piston pin hole inner diameter) – (Piston pin outer diameter)

   Standard:

   -0.004 to 0 mm (-0.0002 to 0 in)

   If it exceeds the standard, replace piston assembly with pin.

Inspection (Cont'd)

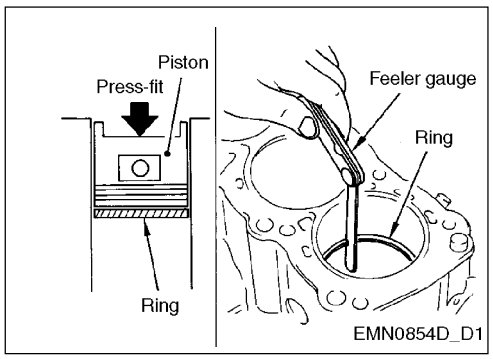


PISTON RING SIDE CLEARANCE

Side clearance: Refer to SDS, EM-83.

Limit of side clearance: Refer to SDS, EM-83.

If out of specification, replace piston and/or piston ring assembly.



PISTON RING END GAP

- Insert the piston ring in the cylinder after applying the engine oil on the piston and the piston ring.

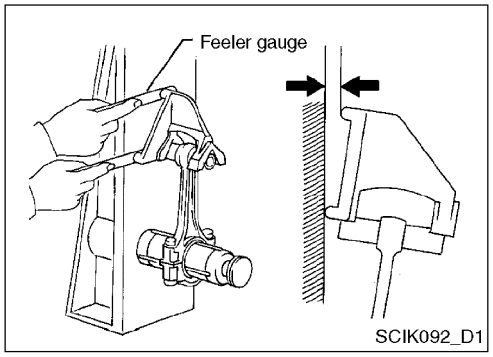
End gap: Refer to SDS, EM-83.

Limit of end gap: Refer to SDS, EM-83.

If out of specification, replace piston ring. If gap exceeds maximum limit with a new ring, rebore cylinder and use oversized piston and piston rings.

Refer to SDS, EM-87.

- When replacing the piston, check the cylinder bore surface for scratches or seizure. If scratches or seizure is found, hone or replace the cylinder block.



CONNECTING ROD BEND AND TORSION

Bend:

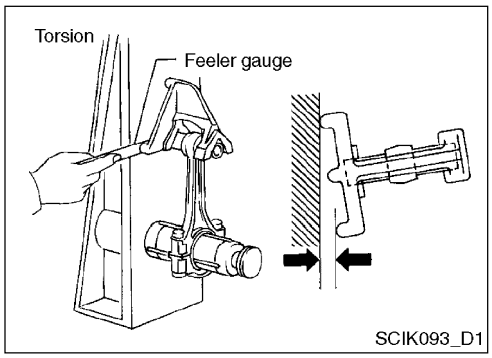
Limit 0.15 mm (0.0059 in) per 100 mm (3.94 in) length

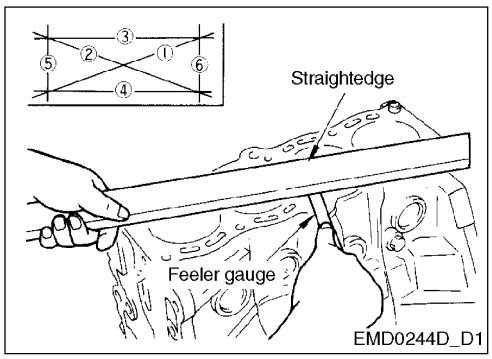
Torsion:

Limit 0.3 mm (0.012 in) per 100 mm (3.94 in) length

If it exceeds the limit, replace connecting rod assembly.

Inspection (Cont'd)





CYLINDER BLOCK DISTORTION

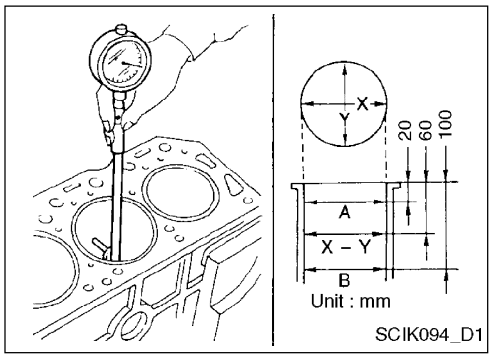
Clean upper surface of cylinder block.

Use a reliable straightedge and feeler gauge to check the flatness of cylinder block surface. Check along six positions shown in figure.

Block surface flatness:

Limit: 0.10 mm (0.004 in)

If out of the distortion limit, replace cylinder block.



PISTON-TO-BORE CLEARANCE

1. Using a bore gauge, measure cylinder bore for wear, out-ofround and taper.

   Standard inner diameter:

   Refer to SDS, EM-83.

   Out-of-round (Difference between X and Y) standard:

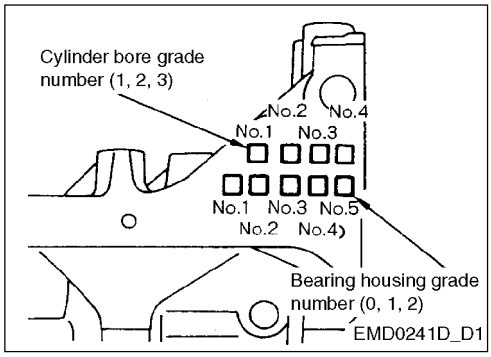
   Less than 0.015 mm (0.0006 in)

   Taper (Difference between A and B) standard:

   Less than 0.01 mm (0.0004 in)

   If it exceeds the limit, rebore all cylinders. Replace cylinder block if necessary.

2. Check for score and seizure. If seizure is found, hone it.
   - If cylinder block or piston is replaced, match piston grade with grade number on cylinder block lower surface.



3. Measure piston skirt diameter.

   Piston diameter "A": Refer to SDS, EM-84.

   Measuring point "a" (Distance from the top):

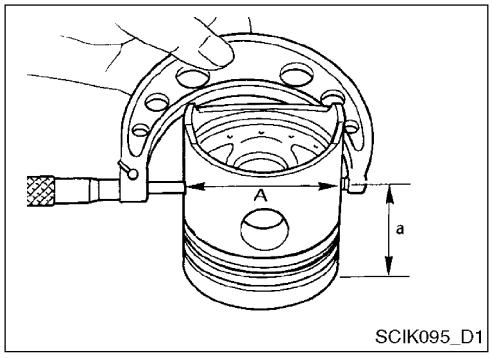
   Refer to SDS, EM-84.

4. Check that piston-to-bore clearance is within the specification.

   Piston-to-bore clearance

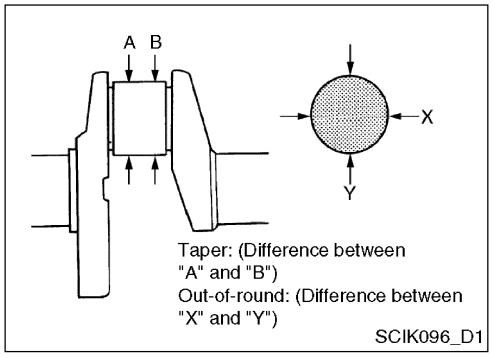
   = cylinder bore measurement "B" - Piston diameter "A"

   Refer to SDS, EM-87.



Inspection (Cont'd)

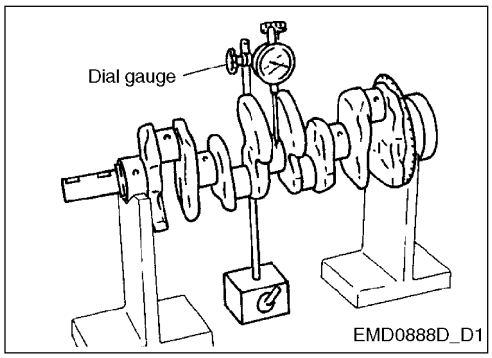
5. Determine piston oversize according to amount of cylinder wear.
   Oversize pistons are available for service. Refer to SDS, EM-87.
6. Cylinder bore size is determined by adding piston-to-bore clearance to piston diameter "A".
   Rebored size calculation:
   D = A + B - C
   where,
   D: Bored diameter
   A: Piston diameter as measured
   B: Piston-to-bore clearance
   C: Honing allowance 0.02 mm (0.0008 in)
7. Install main bearing caps and tighten bolts to the specified torque. Refer to EM-71, "CRANKSHAFT". This will prevent distortion of cylinder bores.
8. Cut cylinder bores.
   - When any cylinder needs boring, all other cylinders must also be bored.
   - Do not cut too much out of cylinder bore at a time. Cut only 0.05 mm (0.0020 in) or so at a time.
9. Hone cylinders to obtain the specified piston-to-bore clearance.
10. Measure finished cylinder bore for out-of-round and taper.
    - Measurement should be done after cylinder bore cools down.



CRANKSHAFT

1. Check crankshaft main and pin journals for score, wear or cracks.
2. With a micrometer, measure journals for taper and out-ofround.
   Limit:
   Out-of-round (Difference between X and Y):
   Less than 0.005 mm (0.0002 in)
   Taper (Difference between A and B):
   Less than 0.005 mm (0.0002 in)
   - If the measurd value exceeds the limit, repair or replace crankshaft.

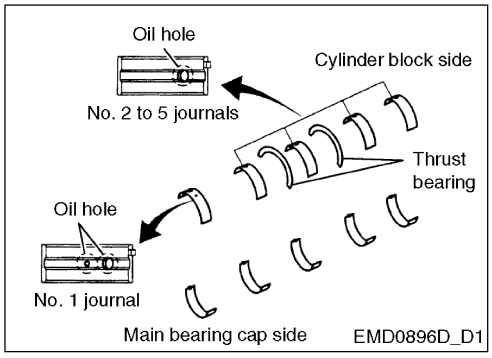
Inspection (Cont'd)



3. Measure crankshaft runout.
   - Place a V-block on a precise flat table to support the journals on the both end of crankshaft.
   - Place a dial gauge straight up on the No. 3 journal.
   - While rotating crankshaft, read the movement of the pointer on the dial gauge.

     (Total indicator reading)

     Limit: Less than 0.10 mm (0.0020 in)
   - If it exceeds the limit, replace crankshaft.



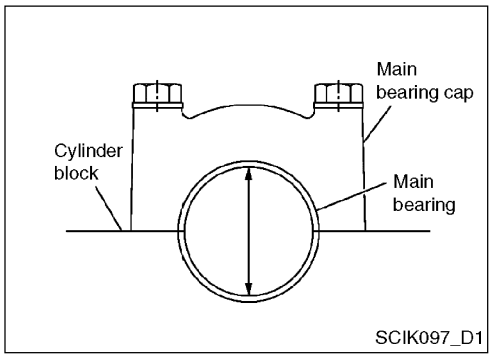
BEARING CLEARANCE

- Use Method A or Method B. Method A is preferred because it is more accurate.

METHOD A (USING BORE GAUGE AND MICROMETER)

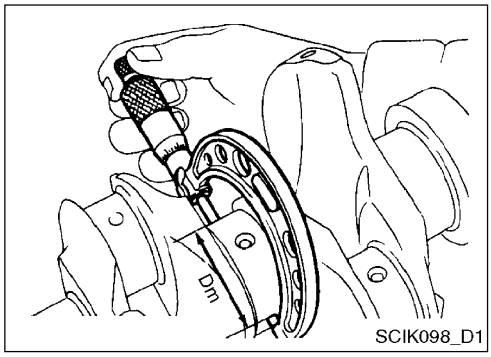
MAIN BEARING

1. Set main bearings in their proper positions on cylinder block and main bearing cap



2. Install main bearing cap to cylinder block.

   Tighten all bolts in correct order in two or three stages. Refer to EM-71 "CRANKSHAFT".
3. Measure inner diameter "A" of each main bearing.



4. Measure outer diameter "Dm" of each main journal in crankshaft.
5. Calculate main bearing clearance.

   Main bearing clearance = A - Dm

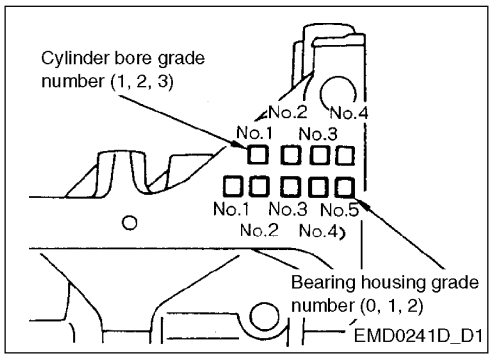
   Standard: 0.018 - 0.042 mm (0.0007 - 0.0017 in)

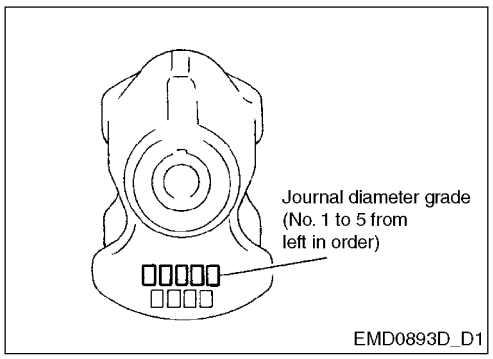
   Limit: 0.1 mm (0.004 in)

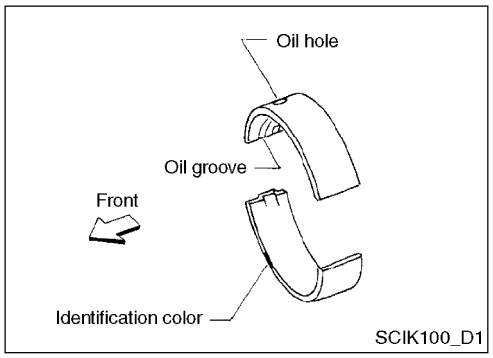
If it exceeds the limit, replace main bearing.

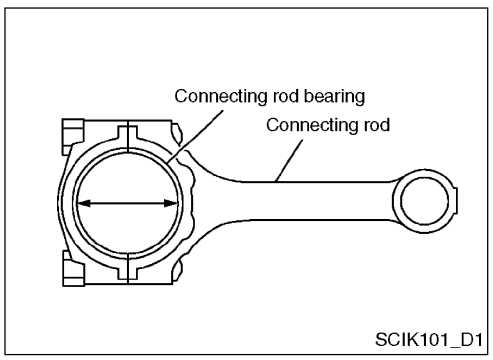
If clearance cannot be adjusted within standard of any bearing, grind crankshaft journal and use undersized bearing.

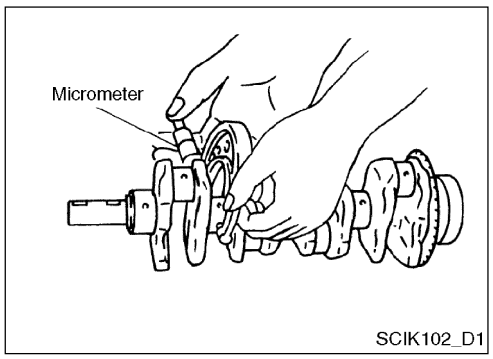
Inspection (Cont'd)











6. If the crankshaft is replaced, select thickness of main bearings as follows:
   a) Grade number of each cylinder block main journal is punched on the respective cylinder block. These numbers are punched in either Arabic or Roman numerals.
   b) Grade number of each crankshaft main journal is punched on the respective crankshaft. These numbers are punched in either Arabic or Roman numerals.
   c) Select main bearing with suitable thickness according to the following table.

MAIN BEARING GRADE COLOR:

Crankshaft main journal grade number	Cylinder block main journal grade number		
	0	1	2
0	Black	Brown	Green
1	Brown	Green	Yellow
2	Green	Yellow	Blue

Journal diameter grade (No. 1 to 5 from left in order)

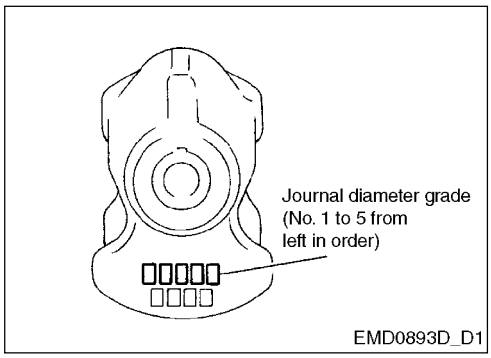
For example:
Cylinder block main journal grade number : 1
Crankshaft main journal grade number : 2
Main bearing grade number : Yellow

CONNECTING ROD BEARING

1. Install connecting rod bearing to connecting rod and cap.
2. Install connecting rod cap to connecting rod.
   Tighten bolts to the specified torque. Refer to EM-71, "CRANKSHAFT".
3. Measure connecting rod bearing inner diameter using an inside micrometer.
4. Measure outer diameter of crankshaft pin.
5. Calculate connecting rod bearing oil clearance.
   (Connecting rod bearing oil clearance) = (Connecting rod bearing inner diameter) - (Crankshaft pin outer diameter)
   Standard: 0.014 - 0.039 mm (0.0006 - 0.0015 in)
   Limit: 0.1 mm (0.004 in)

If it exceeds the limit, replace connecting rod bearing.

Inspection (Cont'd)



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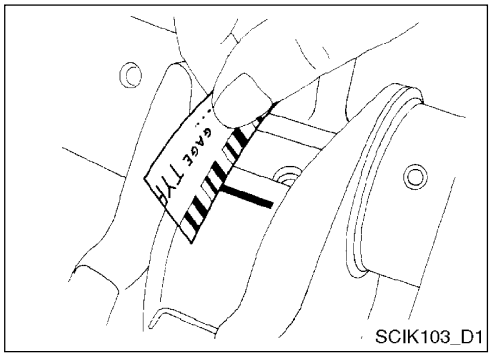
- If a new bearing, crankshaft or connecting rod is replaced, select connecting rod bearing according to the following table.

CONNECTING ROD BEARING GRADE NUMBER:

These numbers are punched in either Arabic or Roman numerals.

Crankshaft pin journal grade number	Connecting rod bearing grade color
0	-
1	Brown
2	Green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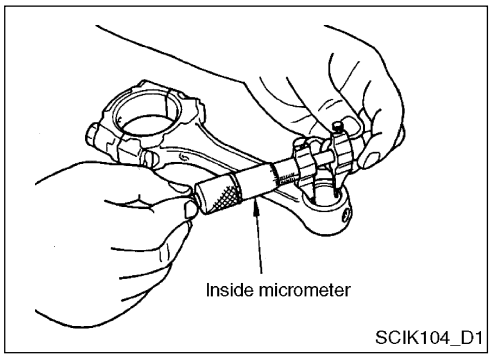
METHOD B (USING PLASTIGAGE)

CAUTION:

- **Do not turn crankshaft or connecting rod while Plastigage is being inserted.**
- **If incorrect bearing clearance exists, use a thicker or undersized main bearing to ensure specified clearanc**



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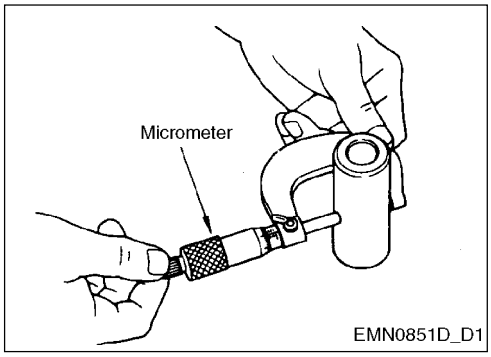
CONNECTING ROD BUSHING CLEARANCE (SMALL END)

1. Measure connecting rod bushing inner diameter using an inside micrometer.



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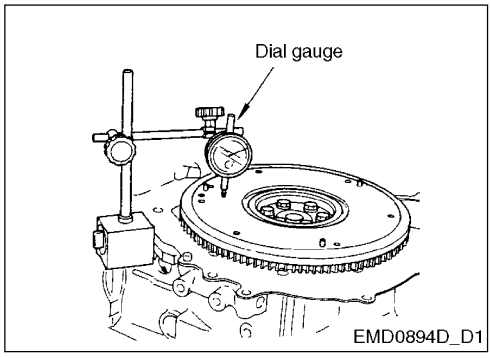
2. Measure outer diameter of piston pin.
3. Calculate connecting rod bushing clearance.

   (Connecting rod bushing clearance) = (Connecting rod bushing inner diameter) - (Piston pin outer diameter)

   Standard:

   0.005 - 0.017 mm (0.0002 - 0.0007 in)

   If out of the standard, replace connecting rod assembly



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FLYWHEEL/DRIVE PLATE RUNOUT

Limit (Total indicator reading):

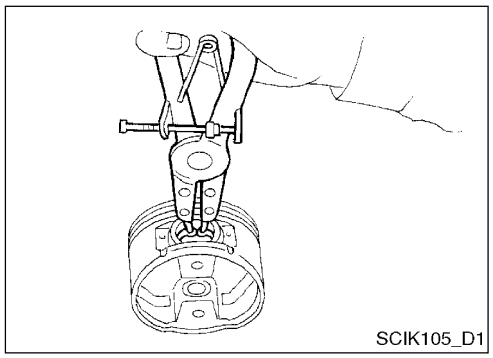
Flywheel (M/T models): 0.15 mm (0.0059 in)

Drive plate (A/T models)*: 0.2 mm (0.008 in)

- Measuring points: Approximately 115 mm (4.53 in) from crankshaft center

CAUTION:

- **Do not allow any magnetic materials to contact the ring gear teeth and rear plate.**
- **Do not resurface flywheel. Replace as necessary.**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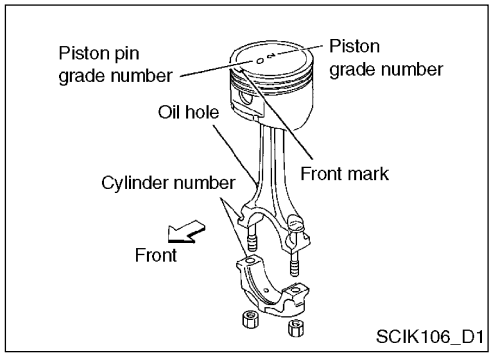
Assembly

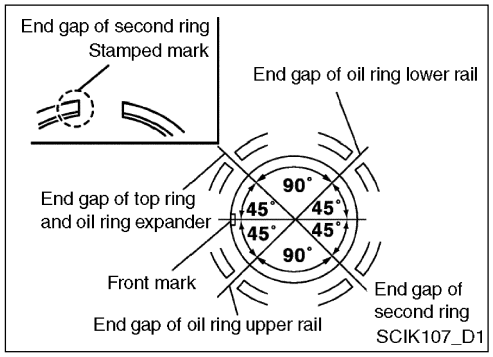
PISTON

1. Install new snap ring on rear side of piston pin hole.



SCIK106_D1

2. Heat piston to 60 to 70°C (140 to 158°F) and assemble piston, piston pin, connecting rod and new snap ring.
   - Align the direction of piston and connecting rod.
   - Numbers stamped on connecting rod and cap correspond to each cylinder.
   - After assembly, make sure connecting rod swings smoothly.

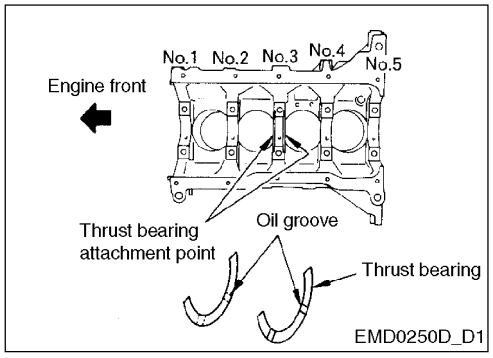


SCIK107_D1

3. Install piston rings with piston ring expander (commercial service tool).

CAUTION:

- **Be careful not to damage piston.**
- **When piston rings are not replaced, make sure that piston rings are mounted in their original position.**
- **Install new piston rings either side up if there is no punch mark.**
- **Position end gaps of each piston ring to piston front mark as shown in the figure, then install rings.**
- **Install second ring with stamp mark side facing upward.**

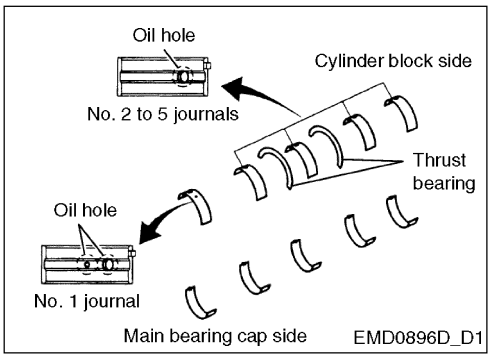


EMD0250D_D1

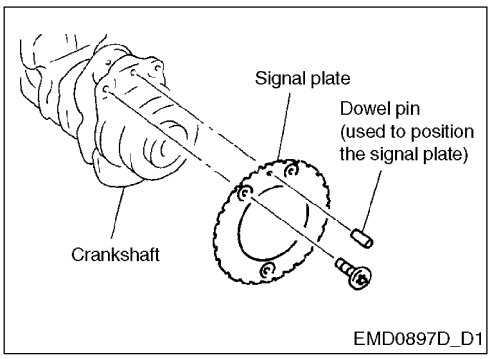
CRANKSHAFT

1. Install main bearings and thrust bearings.
   a) Remove dust, dirt, and oil on the bearing mating surfaces of cylinder block.
   b) Install thrust bearings to the both sides of the No. 3 journal housing on cylinder block.
      - Install thrust bearings with the oil groove facing the crankshaft arm (outside).

Assembly (Cont'd)



c) Install main bearings paying attention to the direction.
- Main bearing with an oil hole and groove goes on cylinder block. The one without them goes on main bearing caps.
- Main bearings (cylinder block side) for journal No. 1 and for No. 2 to No. 5 are different.
- Before installing bearings, apply engine oil to the bearing surface (inside). Do not apply oil to the back surface, but thoroughly clean it.
- When installing, align the bearing stopper to the notch.
- Ensure the oil holes on cylinder block and those on the corresponding bearing are aligned.

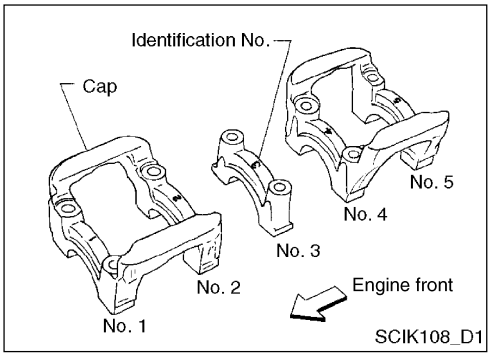


2. Install signal plate to crankshaft.
   a) Position crankshaft and signal plate using positioning dowel pin, and tighten mounting bolts.
   b) Remove dowel pin.

CAUTION:
- **Be sure to remove dowel pin.**

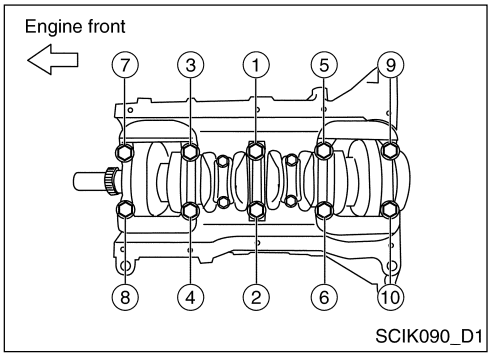
NOTE:
- **Dowel pin of crankshaft and signal plate are provided as a set for each.**
- **If dowel pin is not available (when crankshaft and signal plate are reused), use M6 bolt [length under head: 10 mm (0.39 in) or longer] as its substitute.**

3. Install crankshaft to cylinder block.
   - While turning crankshaft by hand, check that it turns smoothly.



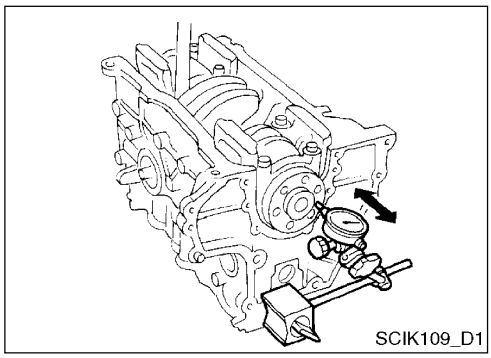
4. Install main bearing cap.
   - Main bearing cap is identified by identification paint No. made on it before it is removed.
   - Install it with arrow facing to front.

CAUTION:
- **Main bearing cap cannot be replaced as a single part, because it is machined together with cylinder block.**



5. Tighten main bearing bolts in several steps in numerical order shown in the figure.
   - Apply new engine oil onto thread and seat of mounting bolt.
   - After tightening bolts to the specified torque, make sure that crankshaft rotates smoothly.

Assembly (Cont'd)



6. Measure crankshaft end play.

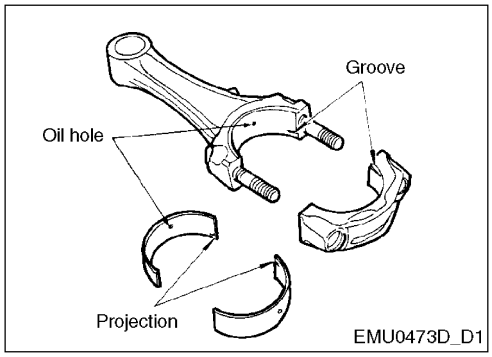
Crankshaft end play:

Standard: 0.060 - 0.220 mm (0.0024 - 0.0087 in)

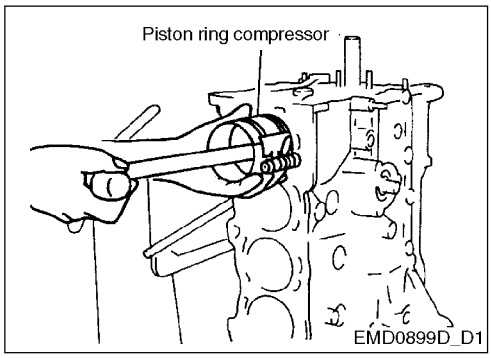
Limit: 0.3 mm (0.012 in)

If it exceeds the limit, replace thrust bearing with new ones, and measure again.

If it still exceeds the limit, replace the crankshaft also.



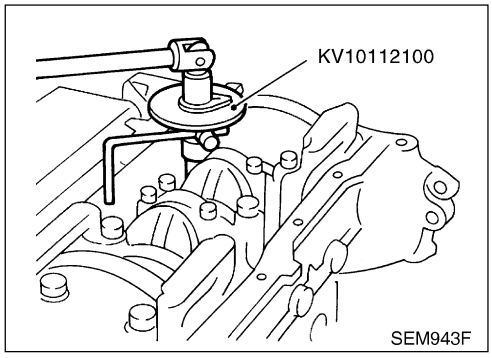
7. Install connecting rod bearings to the connecting rod and connecting rod cap.
   - When installing connecting rod bearings, apply new engine oil to the bearing surface (inside). Do not apply oil to the back surface, but thoroughly clean it.
   - When installing, align the connecting rod bearing stopper protrusion with the groove of connecting rod and connecting rod cap to install.
   - Check the oil holes on connecting rod and those on the corresponding bearing are aligned.



8. Install the piston and connecting rod assembly to crankshaft.
   - Position the crankshaft pin corresponding to connecting rod to be installed onto the bottom dead center.
   - Apply engine oil sufficiently to the cylinder bore, piston and crankshaft pin.
   - Match the cylinder position with the cylinder No. on connecting rod to install.
   - Using a piston ring compressor, install piston with the front mark on the piston crown facing the front of the engine.

CAUTION:

- **Be careful not to damage the crankshaft pin, resulting from an interference of the connecting rod big end.**



9. Install connecting rod caps.

Apply new engine oil to bolt threads and nut seating surfaces.

Tighten connecting rod cap nuts in the following procedure:

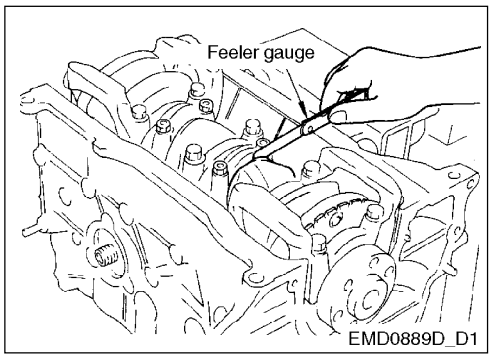
Tighten to 13.7 to 15.7 N·m (1.4 to 1.6 kg-m, 10.1 to 11.5 ft-lb).

Turn nuts to 35 to 40 degrees (Target: 35 degrees) clockwise with angle wrench (SST: KV10112100).

CAUTION:

- **Use only the angle wrench (SST: KV10112100) when tightening the nuts in angle. Never determine the tightening value with only eyes.**

Assembly (Cont'd)



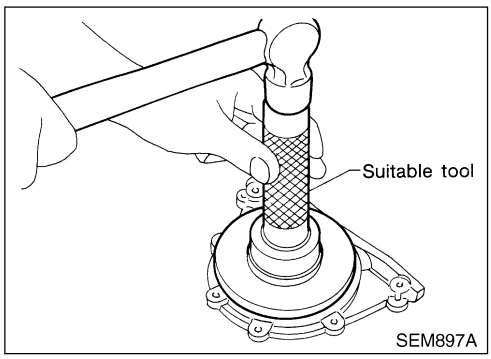
10. Measure connecting rod side clearance.

Connecting rod side clearance:

Standard: 0.200 - 0.470 mm (0.0079 - 0.0185 in)

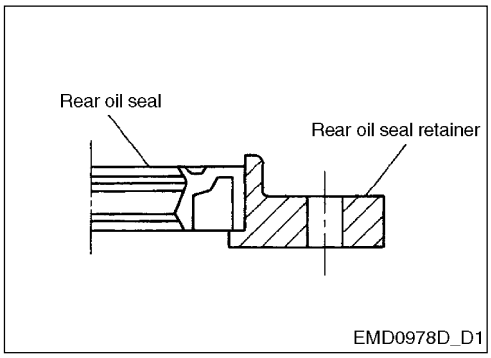
Limit: 0.5 mm (0.020 in)

If beyond the limit, replace connecting rod and/or crankshaft.

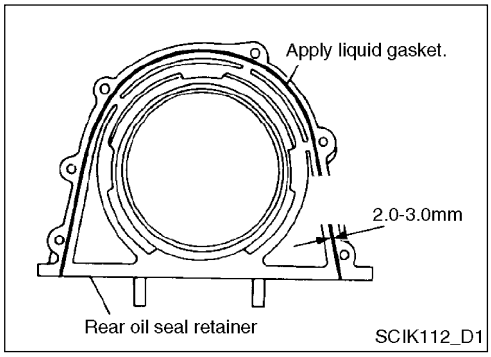


11. Install rear oil seal.

- Use an oil seal drift (Commercial tool) to press it in. At this time, be careful not to cause any scratches or burrs on circumference of oil seal.



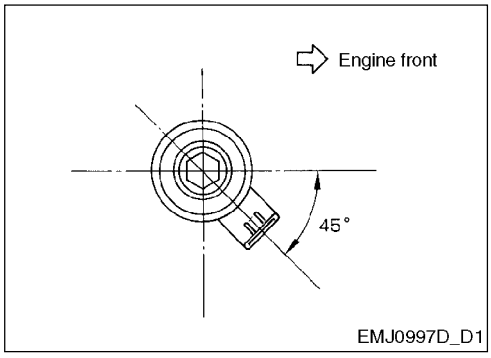
- Press oil seal into rear oil seal retainer until it does not project from end.



12. Install rear oil seal retainer.

- Apply continuous bead of liquid gasket to parts shown in figure.

  Use Genuine Liquid Gasket or equivalent.
- Install rear oil seal retainer by aligning it with dowel pins on cylinder block.



KNOCK SENSOR

- Install knock sensor with connector facing lower right by 45 degrees as shown in the figure.

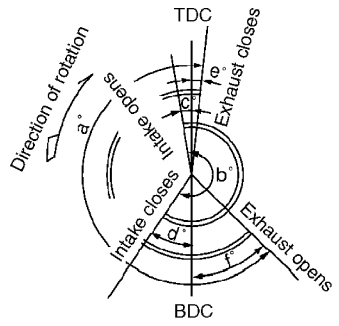
CAUTION:

- **If any impact by dropping is applied to knock sensor, replace it with new one.**
- **Make sure that there is no foreign material on the cylinder block mating surface and the back surface of knock sensor.**
- **Do not tighten the mounting bolts while holding the connector.**
- **Make sure that knock sensor does not interfere with other parts.**

General Specifications

General Specifications

Engine		QG16DE
Classification		Gasoline
Cylinder arrangement		4, in-line
Displacement cm^3 (cu in)		1,596 (97.39)
Bore x stroke mm (in)		76.0 x 88.0 (2.992 x 3.465)
Valve arrangement		DOHC
Firing order		1-3-4-2
Number of piston rings	Compression	2
	Oil	1
Number of main bearings		5
Compression ratio		9.5



SCIK113_D1

		a	b	c	d	e	f
Valve timing	QG16DE	204°	228°	-8° to 32°	56° to 16°	-2°	26°

COMPRESSION PRESSURE

Unit: kPa (bar, kg/cm^2, psi)/350 rpm

Standard	1,324 (13.24, 13.5, 192)
Minimum	1,128 (11.28, 11.5, 164)
Difference limit between cylinders	98 (0.98, 1.0, 14)

Belt Deflection, Spark Plug, Cylinder Head

BELT DEFLECTION

Unit: mm (in)

		Applied engine	Used belt deflection		Deflection of new belt
			Limit	Deflection after adjustment	
Alternator	With air conditioner compressor	QG16DE	8.1 (0.319)	5.3 - 5.7 (0.209 - 0.224)	4.5 - 5.0 (0.177 - 0.197)
Power steering oil pump			8.5 (0.335)	5.2 - 5.8 (0.205 - 0.228)	4.6 - 5.2 (0.181 - 0.205)
Applied pushing force		98.1 N (10 kg, 22 lb)			

SPARK PLUG

		NGK
Type	Standard	LFR5A-11
	Hot	LFR4A-11
	Cold	LFR6A-11
Plug gap mm (in)		1.0 - 1.1 (0.039 - 0.043)

CYLINDER HEAD

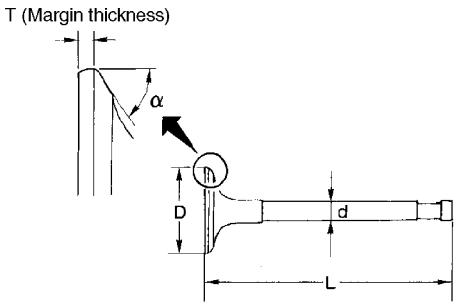
Unit: mm (in)

	Standard	Limit
Head surface flatness	Less than 0.03 (0.0012)	0.1 (0.004)
Height	117.8 - 118.0 (4.638 - 4.646)	-

Valve

VALVE

Unit: mm (in)



		QG16DE
Valve head diameter “D”	Intake	29.9 - 30.2 (1.177 - 1.189)
	Exhaust	24.9 - 25.2 (0.980 - 0.992)
Valve length “L”	Intake	92.25 (3.6319)
	Exhaust	92.62 (3.6464)
Valve stem diameter “d”	Intake	5.465 - 5.480 (0.2152 - 0.2157)
	Exhaust	5.455 - 5.470 (0.2148 - 0.2154)
Valve face angle “á”		45°1' - 45°45'
Valve margin “T”		1 (0.04)
Valve margin “T” limit		More than 0.5 (0.020 in)
Valve stem end surface grinding limit		0.2 (0.008)

VALVE SPRING

Identification color		None	Red or White
Free height mm (in)		40.19 (1.5823)	45.75 (1.8012)
Pressure N (kg, lb) at height mm (in)	Installed	149 - 165 (15.2 - 16.8, 33.5 - 37.0) at 32.82 (1.2921)	147 - 167 (15.0 - 17.0, 33.0 - 37.5) at 32.82 (1.2921)
	Valve-opening	353 - 387 (36.0 - 39.5, 79.4 - 87.1) at 24.61 (0.9689)	271 - 305 (27.6 - 31.0, 60.9 - 68.6) at 24.48 (0.9638)
Out-of-square mm (in)		2.0 (0.0709)	2.0 (0.0709)

VALVE LIFTER

Unit: mm (in)

Valve lifter outer diameter	29.965 - 29.980 (1.1797 - 1.1803)
Valve lifter hole diameter	30.000 - 30.021 (1.1811 - 1.1819)
Clearance between valve lifter and valve lifter hole	0.020 - 0.056 (0.0008 - 0.0020)

Valve (Cont'd)

VALVE CLEARANCE

Unit: mm (in)

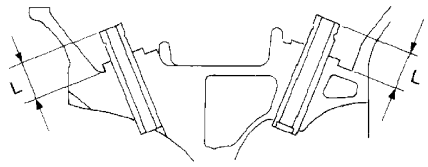
	Hot	Cold* (reference data)
Intake	0.304 - 0.416 (0.012 - 0.016)	0.25 - 0.33 (0.010 - 0.013)
Exhaust	0.348 - 0.472 (0.014 - 0.019)	0.32 - 0.40 (0.013 - 0.016)

*: At a temperature of approximately 20°C (68°F)

Whenever valve clearances are adjusted to cold specifications, check that the clearances satisfy hot specifications and adjust again if necessary.

VALVE GUIDE

Unit: mm (in)



SCIK115_D1

		Intake		Exhaust	
		Standard	Service	Standard	Service
Valve guide	Outer diameter	9.523 - 9.534 (0.3749 - 0.3754)	9.723 - 9.734 (0.3828 - 0.3832)	9.523 - 9.534 (0.3749 - 0.3754)	9.723 - 9.734 (0.3828 - 0.3832)
	Inner diameter [Finished size]	5.500 - 5.515 (0.2165 - 0.2171)		5.500 - 5.515 (0.2165 - 0.2171)	
Cylinder head valve guide hole diameter		9.475 - 9.496 (0.3730 - 0.3739)	9.685 - 9.696 (0.3813 - 0.3817)	9.475 - 9.496 (0.3730 - 0.3739)	9.685 - 9.696 (0.3813 - 0.3817)
Interference fit of valve guide		0.027 - 0.059 (0.0011 - 0.0023)	0.027 - 0.049 (0.0011 - 0.0019)	0.027 - 0.059 (0.0011 - 0.0023)	0.027 - 0.049 (0.0011 - 0.0019)
Stem to guide clearance		0.020 - 0.050 (0.0008 - 0.0020)		0.030 - 0.060 (0.0012 - 0.0024)	
Projection length "L"		11.5 - 11.7 (0.453 - 0.461)			

AVAILABLE SHIMS

Thickness mm (in)	Identification mark
2.00 (0.0787)	200
2.02 (0.0795)	202
2.04 (0.0803)	204
2.06 (0.0811)	206
2.08 (0.0819)	208
2.10 (0.0827)	210
2.12 (0.0835)	212
2.14 (0.0843)	214
2.16 (0.0850)	216
2.18 (0.0858)	218
2.20 (0.0866)	220

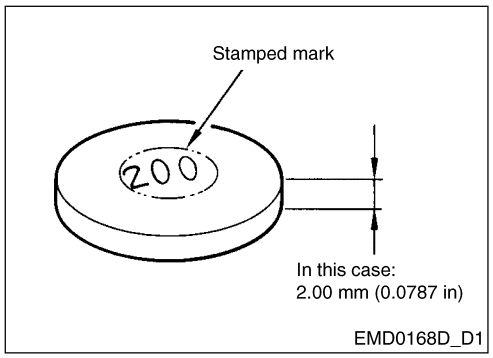
Valve (Cont'd)

Thickness mm (in)	Identification mark
2.21 (0.0870)	221
2.22 (0.0874)	222
2.23 (0.0878)	223
2.24 (0.0882)	224
2.25 (0.0886)	225
2.26 (0.0890)	226
2.27 (0.0894)	227
2.28 (0.0898)	228
2.29 (0.0902)	229
2.30 (0.0906)	230
2.31 (0.0909)	231
2.32 (0.0913)	232
2.33 (0.0917)	233
2.34 (0.0921)	234
2.35 (0.0925)	235
2.36 (0.0929)	236
2.37 (0.0933)	237
2.38 (0.0937)	238
2.39 (0.0941)	239
2.40 (0.0945)	240
2.41 (0.0949)	241
2.42 (0.0953)	242
2.43 (0.0957)	243
2.44 (0.0961)	244
2.45 (0.0965)	245
2.46 (0.0969)	246
2.47 (0.0972)	247
2.48 (0.0976)	248
2.49 (0.0980)	249
2.50 (0.0984)	250
2.51 (0.0988)	251
2.52 (0.0992)	252
2.53 (0.0996)	253
2.54 (0.1000)	254
2.55 (0.1004)	255
2.56 (0.1008)	256
2.57 (0.1012)	257
2.58 (0.1016)	258
2.59 (0.1020)	259
2.60 (0.1024)	260

Valve (Cont'd)

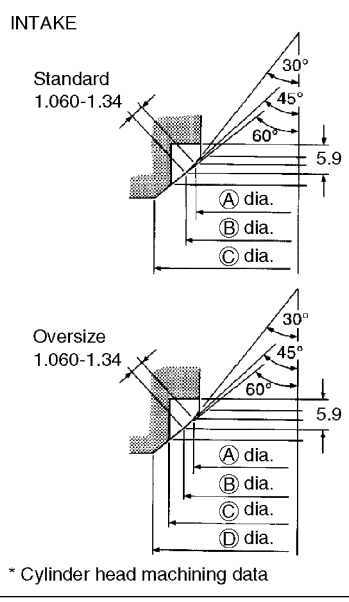
Thickness mm (in)	Identification mark
2.61 (0.1028)	261
2.62 (0.1031)	262
2.63 (0.1035)	263
2.64 (0.1039)	264
2.65 (0.1043)	265
2.66 (0.1047)	266
2.68 (0.1055)	268
2.70 (0.1063)	270
2.72 (0.1071)	272
2.74 (0.1079)	274
2.76 (0.1087)	276
2.78 (0.1094)	278
2.80 (0.1102)	280
2.82 (0.1110)	282
2.84 (0.1118)	284
2.86 (0.1126)	286
2.88 (0.1134)	288
2.90 (0.1142)	290
2.92 (0.1150)	292
2.94 (0.1157)	294
2.96 (0.1165)	296
2.98 (0.1173)	298

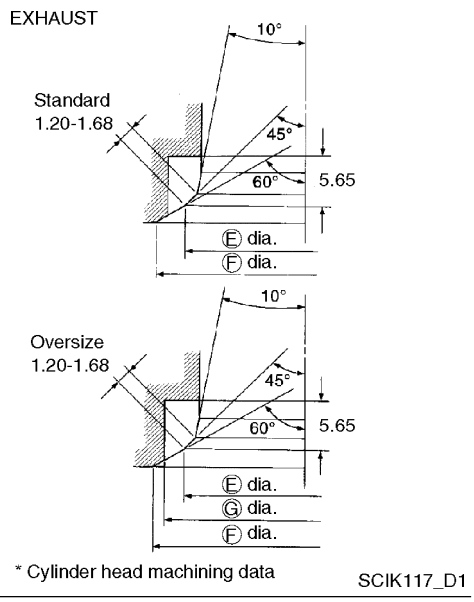
Valve (Cont'd)



VALVE SEAT

Unit: mm (in)





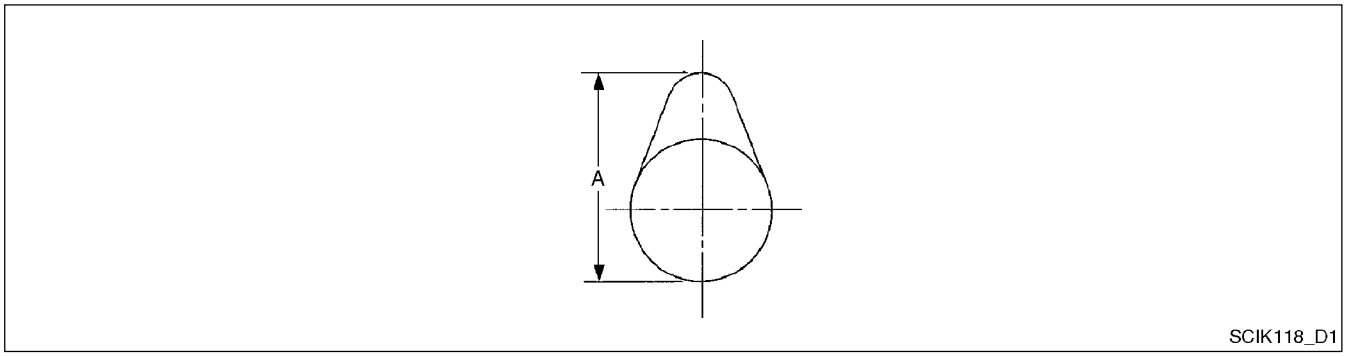
Diameter	QG16DE
A	27.8 - 28.0 (1.094 - 1.102)
B	29.5 - 29.7 (1.161 - 1.169)
C	31.9 - 32.1 (1.256 - 1.264)
D	31.500 - 31.516 (1.2402 - 1.2408)
E	24.5 - 24.7 (0.9646 - 0.9724)
F	26.2 - 26.4 (1.031 - 1.039)
G	26.500 - 26.516 (1.043 - 1.0439)

Camshaft and Camshaft Bearing

CAMSHAFT AND CAMSHAFT BEARING

Unit: mm (in)

Engine model		QG16DE
Cam height “A”	Intake	40.217 - 40.407 (1.5833 - 1.5908)
	Exhaust	40.056 - 38.965 - 39.155 (1.5341 - 1.5415)



* Total indicator reading

Unit: mm (in)

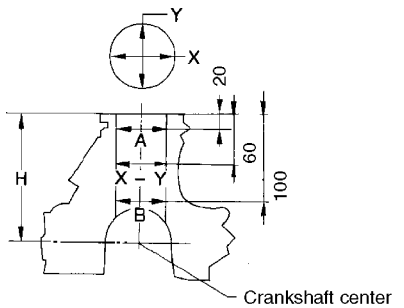
		Standard
Camshaft journal clearance	No. 1	0.045 - 0.086 (0.0018 - 0.0034)
	No. 2 to No. 5	0.030 - 0.071 (0.0012 - 0.0028)
Camshaft bracket inner diameter	No. 1	28.000 - 28.021 (1.1024 - 1.1032)
	No. 2 to No. 5	23.985 - 24.006 (0.9443 - 0.9451)
Camshaft journal diameter	No. 1	27.935 - 27.955 (1.0998 - 1.1006)
	No. 2 to No. 5	23.935 - 23.955 (0.9423 - 0.9431)
Camshaft runout [TIR*]		Less than 0.04 (0.0016)
Camshaft end play	Intake (with intake valve timing control)	0.070 - 0.143 (0.0028 - 0.0056)
	Exhaust	0.115 - 0.188 (0.0045 - 0.0074)

* Total indicator reading

Cylinder Block

CYLINDER BLOCK

Unit: mm (in)



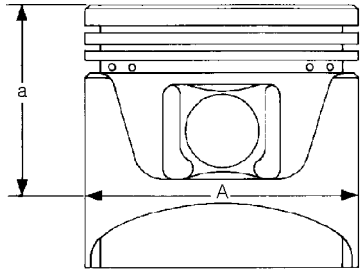
SCIK119_D1

			QG16DE	Limit
			Standard	
Surface flatness			Less than 0.03 (0.0012)	0.1 (0.004)
Height “H” (nominal)			213.95 - 214.05 (8.4232 - 8.4271)	-
Cylinder bore inner diameter	Standard	Grade No. 1	76.000 - 76.010 (2.9921 - 2.9925)	
		Grade No. 2	76.010 - 76.020 (2.9925 - 2.9929)	-
		Grade No. 3	76.020 - 76.030 (2.9929 - 2.9933)	
Out-of-round (Difference between X and Y)			Less than 0.015 (0.0006)	-
Taper (Difference between A and B)			Less than 0.01 (0.0004)	
Difference in inner diameter between cylinders			0.05 (0.0020)	0.2 (0.008)

Piston, Piston Ring and Piston Pin

PISTON

Unit: mm (in)



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			QG16DE
Piston skirt diameter “A”	Standard	Grade No. 1	75.975 - 75.985 (2.9911 - 2.9915)
		Grade No. 2	75.985 - 75.995 (2.9915 - 2.9919)
		Grade No. 3	75.995 - 76.005 (2.9919 - 2.9923)
0.25 (0.0098) oversize (service)			-
0.5 (0.002) oversize (service)			76.475 - 76.505 (3.0108 - 3.0120)
1.0 (0.039) oversize (service)			76.975 - 77.005 (3.0305 - 3.0317)
“a” dimension			44.5 (1.7520)
Piston pin hole inner diameter			18.987 - 18.999 (0.7475 - 0.7480)
Piston to bore clearance			0.015 - 0.035 (0.0006 - 0.0014)

PISTON RING

Unit: mm (in)

		QG16DE	
		Standard	Limit
Side clearance	Top	0.050 - 0.085 (0.0020 - 0.0033)	0.110 (0.0043)
	2nd	0.030 - 0.070 (0.0012 - 0.0028)	0.100 (0.0039)
	Oil	0.050 - 0.120 (0.0020 - 0.0047)	-
End gap	Top	0.20 - 0.44 (0.0079 - 0.0173)	0.58 (0.0228)
	2nd	0.37 - 0.61 (0.0146 - 0.0240)	0.72 (0.0283)
	Oil	0.20 - 0.69 (0.0079 - 0.0272)	0.95 (0.0374)

Piston, Piston Ring and Piston Pin (Cont'd)

PISTON PIN

Unit: mm (in)

		QG16DE
Piston pin outer diameter		18.989 - 19.001 (0.7476 - 0.7481)
Piston pin to piston clearance		-0.004 to 0 (-0.0002 to 0)
Piston pin to connecting rod bushing clearance	Standard	0.005 - 0.017 (0.0002 - 0.0007)

CONNECTING ROD

Unit: mm (in)

Center distance		140.45 - 140.55 (5.5295 - 5.5335)
Bend limit [per 100 (3.94)]		0.15 (0.0059)
Torsion limit [per 100 (3.94)]		0.3 (0.012)
Connecting rod bushing inner diameter* (small end)		19.000 - 19.012 (0.7480 - 0.7485)
Connecting rod big end inner diameter		43.000 - 43.013 (1.6929 - 1.6934)
Side clearance	Standard	0.200 - 0.470 (0.0079 - 0.0185)
	Limit	0.5 (0.020)

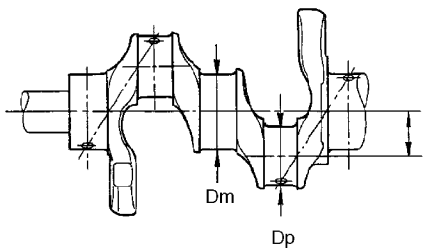
* Total indicator reading

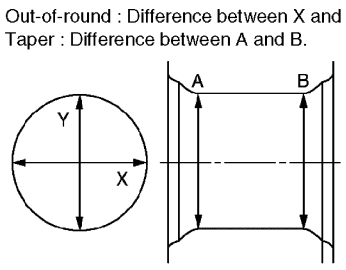
Crankshaft, Main Bearing

CRANKSHAFT

Unit: mm (in)

		QG16DE
Main journal dia. “Dm”	Grade No. 0	49.956 - 49.964 (1.9668 - 1.9671)
	Grade No. 1	49.948 - 49.956 (1.9665 - 1.9668)
	Grade No. 2	49.940 - 49.948 (1.9661 - 1.9665)
Pin journal dia. “Dp”	Grade No. 0	39.968 - 39.974 (1.5735 - 1.5738)
	Grade No. 1	39.962 - 39.968 (1.5733 - 1.5735)
	Grade No. 2	39.956 - 39.962 (1.5731 - 1.5733)
Center distance “r”		43.95 - 44.05 (1.7303 - 1.7342)
Out-of-round	Standard	Less than 0.003 (0.0001)
(Difference between X and Y)	Limit	Less than 0.005 (0.0002)
Taper (Difference between A and B)	Standard	Less than 0.004 (0.0002)
	Limit	Less than 0.005 (0.0002)
Runout [TIR*]	Standard	Less than 0.04 (0.0016)
	Limit	Less than 0.05 (0.0020)
Free end play	Standard	0.060 - 0.220 (0.0024 - 0.0087)
	Limit	0.3 (0.012)





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*: Total indicator reading

Main Bearing

STANDARD

Unit: mm (in)

Grade No.	Thickness “T” mm (in)	Identification color
0	1.827 - 1.831 (0.0719 - 0.0721)	Black
1	1.831 - 1.835 (0.0721 - 0.0722)	Brown
2	1.835 - 1.839 (0.0722 - 0.0724)	Green
3	1.839 - 1.843 (0.0724 - 0.0726)	Yellow
4	1.843 - 1.847 (0.0726 - 0.0727)	Blue

UNDERSIZE

Unit: mm (in)

Grade No.	Thickness	Identification color
0.25 (0.0098)	1.960 - 1.964 (0.0772 - 0.0773)	-
0.50 (0.0197)	2.085 - 2.089 (0.0821 - 0.0822)	-

Connecting Rod Bearing, Miscellaneous Components

Connecting Rod Bearing

STANDARD SIZE

Unit: mm (in)

Grade No.	Thickness	Identification color
0	1.503 - 1.506 (0.0592 - 0.0593)	-
1	1.506 - 1.509 (0.0593 - 0.0594)	Brown
2	1.509 - 1.512 (0.0594 - 0.0595)	Green

UNDERSIZE

Unit: mm (in)

Grade No.	Thickness	Identification color
0.08 (0.0031)	1.542 - 1.546 (0.0607 - 0.0609)	-
0.12 (0.0047)	1.562 - 1.566 (0.0615 - 0.0617)	-
0.25 (0.0098)	1.627 - 1.631 (0.0641 - 0.0642)	-

BEARING CLEARANCE

Unit: mm (in)

Main bearing clearance	Standard	0.018 - 0.042 (0.0007 - 0.0017)
	Limit	0.1 (0.004)
Connecting rod bearing clearance	Standard	0.014 - 0.039 (0.0006 - 0.0015)
	Limit	0.1 (0.004)

MISCELLANEOUS COMPONENTS

Unit: mm (in)

		Limit
Flywheel runout [TIR*]		Less than 0.15 (0.0059)
Drive plate runout [TIR*]		Less than 0.2 (0.008)
Camshaft sprocket runout [TIR*]	Intake (with intake valve timing control)	0.20 (0.0079)
	Exhaust	0.15 (0.0059)

*: Total indicator reading

FRONT AXLE AND FRONT SUSPENSION

SECTION **FA**

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Precautions and Preparation

Caution (Front Axle)

Observe following cautions while disassembling the drive shaft.

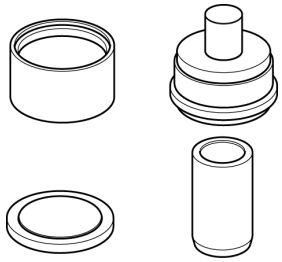
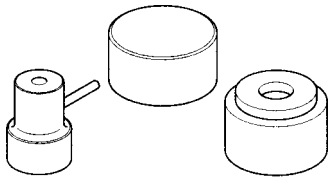
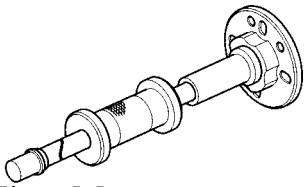
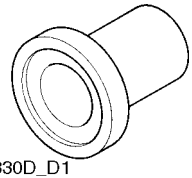
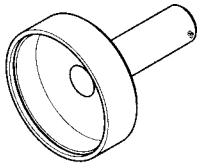
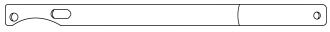
- Do not disassemble the connecting sections towards wheel.
- Operate in a clean location.
- Clean the components before disassembling.
- Keep the operation location clean to prevent dirtying the components or inlet of foreign particles.
- Install the disassembled components in correct order. Cover the components when stopping the operation.
- Use a paper towel for cleaning. The cloth towel can cause problems due to waste threads. Do not use it.
- Clean the disassembled components (except for the rubber components) with white kerosene and wipe the oil using the compressed air or paper towel.

Caution (Front Suspension)

- Bushes should be installed completely while vehicle empty and on the ground. Wipe out all oil that can deteriorate the durability of bushes.
- An empty vehicle means it has all the necessary fluids that allow being ready for driving such as full tank of fuel, coolant and all lubricants. However, jack and other service tools are excluded.
- Always inspect the wheel alignment after suspension system service.
- The lock nut cannot be reused. Replace it with new when installing. Oil is applied on it when new, but install as it is.

Preparation

Special Service Tools

Item	Description	
Wheel hub support KV40104710 KV40106200 KV40105310 Bearing remover & hub installer KV38100200 ST35300000		Assembling wheel hub Disassembling/assembling wheel hub bearing
ABS sensor rotor drift set KV38100500 KV40101840 Rear ABS sensor rotor drift KV10105501	 ZZA0939D_D1	Assembling front and rear ABS sensor rotor
Wheel hub puller KV40104100 ST36230000	 ZZA09425D_D1	Disassembling wheel hub
Wheel hub bearing drift ST35271000	 ZZA09330D_D1	Assembling wheel hub bearing
Splash guard drift KV40106200 ST30022000 KV40105220	 ZZA09420D_D1	Assembling splash guard
Wheel hub lock wrench KV40104000		Disassembling/assembling wheel hub lock nut

Front Wheel Hub and Knuckle

On-Vehicle Service

Inspect for any excessive free play, damage and wear in the front axle.

- Check the free play by moving the front wheel (left and right).
- Inspect if any foreign particles such as nail is stuck in the component.
- Tighten all nuts and bolts in the axle to the specified torque.

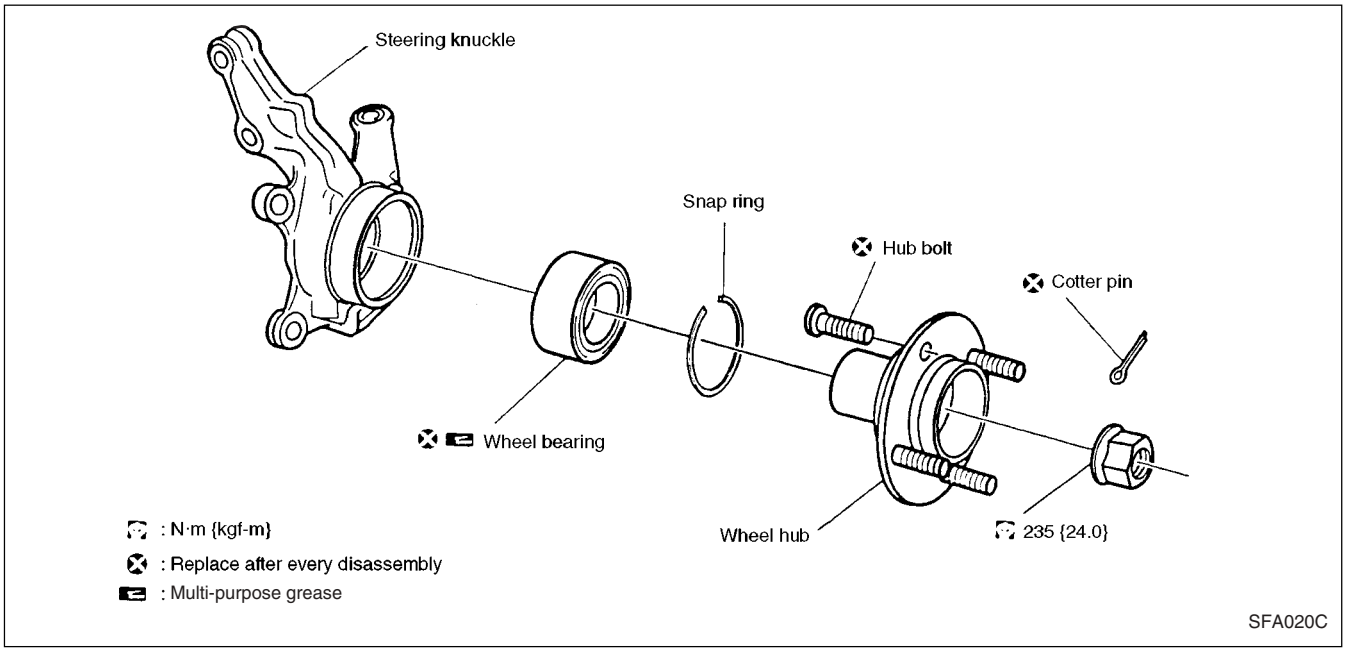
FRONT WHEEL BEARING

Inspect the following while vehicle lifted up.

- Inspect for any rattles in the front wheel bearing by moving the wheel hub in the axial direction.

  Axial direction endplay: 0.05 mm

Removal • Installation



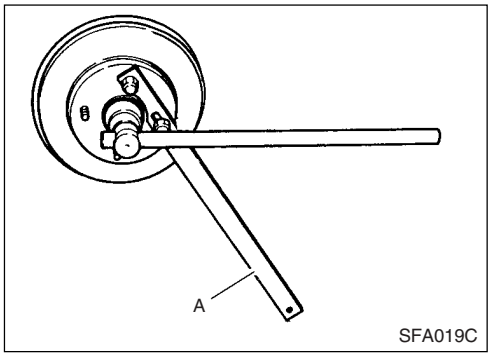
REMOVAL

1. Remove the tires and remove the lock plate on the brake line.
2. Remove the brake caliper from the steering knuckle and hang to a safe place.

CAUTION:

- **Do not depress the brake pedal while brake caliper is removed.**

3. Remove the ABS wheel speed sensor and wires from the steering knuckle.



CAUTION:

- **Do not pull the ABS wheel speed sensor harness.**

4. Remove the cotter pin and remove the lock nut from the drive shaft using a special tool (A: KV40104000).
5. Remove the disc rotor from the wheel hub.
6. Remove the cotter pin and remove the tie rod from the steering knuckle using a pitman arm puller (commercial tool).

CAUTION:

- **When using the pitman arm puller (commercial tool), always insert the nut.**

7. Remove the steering knuckle.

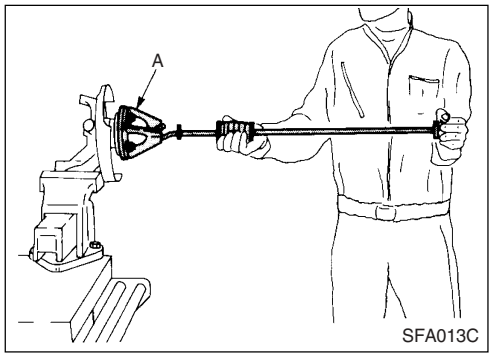
8. Remove the drive shaft from the steering knuckle.
9. Remove the cotter pin and remove the transverse link from the steering knuckle using the pitman arm puller (commercial tool).

CAUTION:

- **When using the pitman arm puller (commercial tool), always insert the nut.**

INSTALLATION

Install in the reverse order of removal by referring the components diagram for tightening torque.



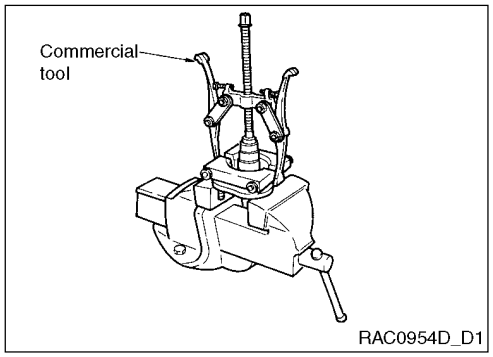
Disassembly • Assembly

DISASSEMBLY

1. Install the strut and mounting section of the steering knuckle to the vise and remove the wheel hub from the steering knuckle using the wheel hub puller (A: KV40104100, ST36230000).

CAUTION:

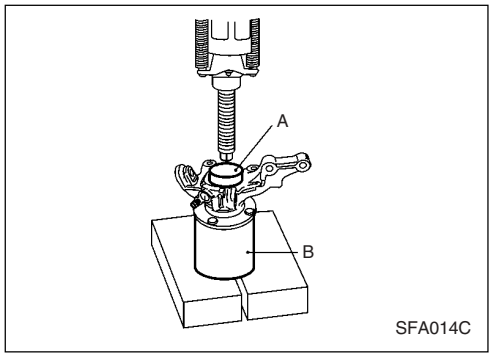
- **During installing on the vise, be careful not to damage the steering knuckle mounting surface by using the aluminum panel.**



2. Remove the outer wheel bearing inner race from the wheel hub using a press.
3. Remove the snap ring using a minus (-) screwdriver.

CAUTION:

- **Be careful not to damage the steering knuckle.**



4. Remove the wheel bearing by applying pressure using drift (A: KV38100200, ST35300000), (B: KV40104710, KV40106200, KV40105310).

Inspection after Disassembly

WHEEL HUB

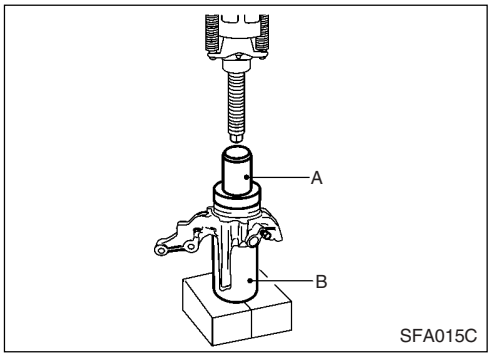
- Inspect the wheel bearing for any damages caused by heat and rust or cracks (check using dye penetrant testing) and replace if defective.

STEERING KNUCKLE

- Inspect the steering knuckle for any deformation, cracks or damages and replace if defective.

SNAP RING

- Inspect the snap ring for any wear and damages and replace if defective.



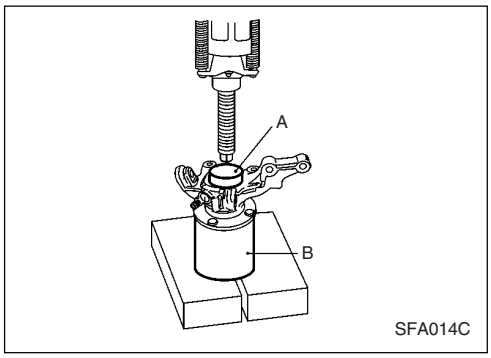
ASSEMBLY

1. Install the splash guard to the steering knuckle using drift (A: KV40106200, ST30022000, KV40105220), (B: KV40104710, KV40106200, KV40105310).

CAUTION:

- **The wheel bearing is not reusable. Do not reuse.**

2. Install the snap ring to the steering knuckle.



3. Press in the wheel hub using a drift (A: ST35271000), (B: KV40104710, KV40106200, KV40105310).
4. By applying 49030 N (5000 kg) of force as shown in the illustration, smoothly rotate 10 times in reverse direction.
5. Place a spring balance at the illustrated location and measure the turning torque while rotating 10 ± 2 RPM.

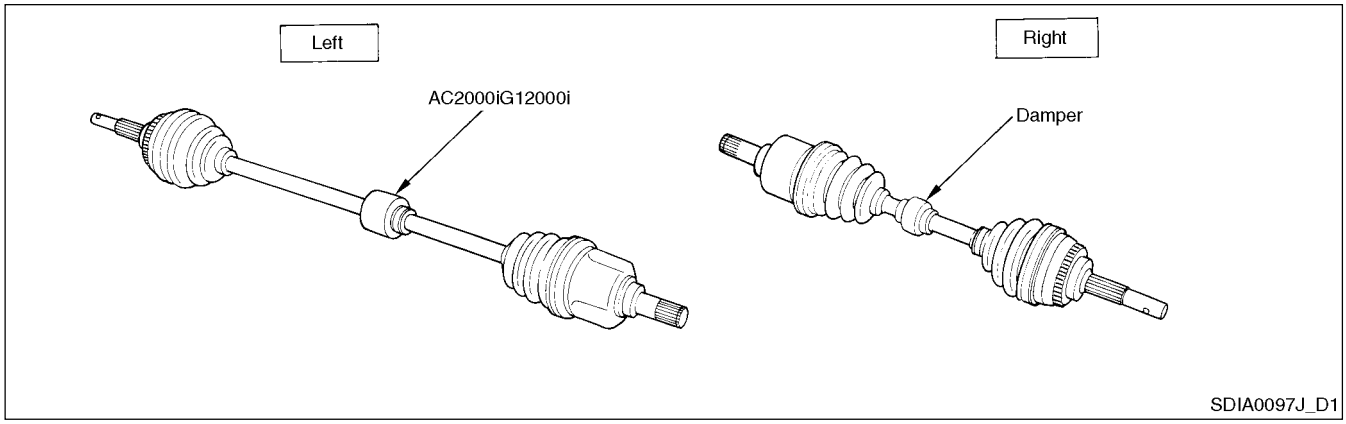
   Turning torque: Less than 1.21 KN•m (123 kgf-m)

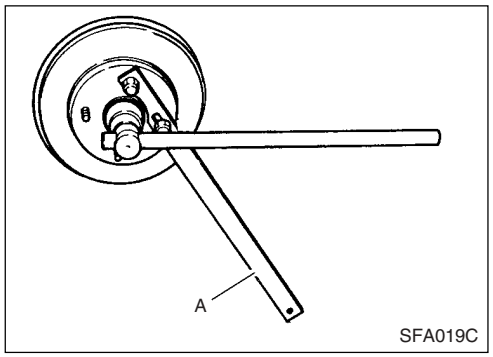
   Measured value by spring balance:

   Less than 8.13 N (0.83 kg)

Front Drive Shaft

Removal • Installation





REMOVAL

1. Remove the cotter pin and remove the lock nut and washer using a special tool (A: KV40104000).
2. Remove the ABS wheel speed sensor from the steering knuckle.
3. Remove the tie rod from the steering knuckle using a pitman arm puller (commercial tool).
4. Remove the lock plate and disconnect the brake hose.
5. Remove the steering knuckle and mounting bolts.

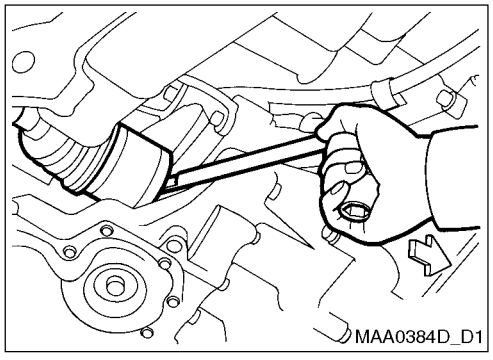
CAUTION:

- **Do not apply more than 22° on the drive shaft connection. Securely hold the steering knuckle to prevent the slide joint from over stretching.**

6. Remove the drive shaft from the steering knuckle using a puller (commercial tool).

CAUTION:

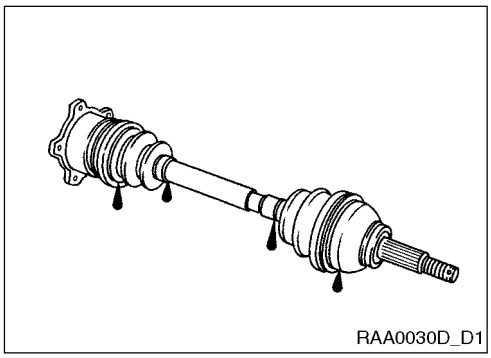
- **Do not apply excessive angle (more than 22°) on the drive shaft connection while removing the drive shaft. And do not stretch the slide joint excessively.**
- **Do not carry the drive shaft by holding the middle section connected to the axle.**
- **Do not hang the drive shaft inserted in the transaxle without supporting the middle of the shaft or wheel joint.**



7. Remove the drive shaft from the transaxle using a wheel wrench as shown in the illustration.

CAUTION:

- **Perform the above operation for the left side drive shaft after removing the center main bar on the engine.**
- **When removing the drive shaft from the vehicle, be careful not to interfere with the brake hose and ABS wheel speed sensor harness.**
- **Check if the circular clip is attached to the end section of the drive shaft when removed.**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Engine model	Circular clip attached drive shaft	
	Right	Left
QG15DE	O	O

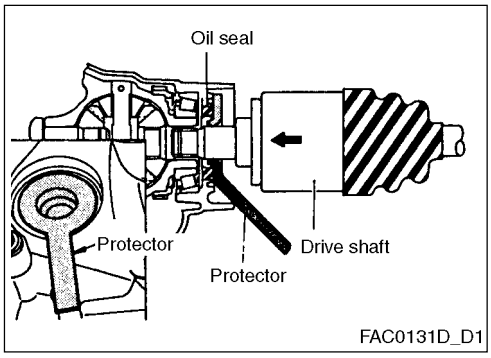
Inspection after Removal

- Inspect for smooth movement and noise presence by moving the connecting sections left & right, up & down and axial direction.
- Inspect the boot for any cracks, damages or grease leakage.

1. To prevent from damaging the differential side oil seal, install the protector (commercial tool) to the oil seal. Insert the drive shaft and push in the slide joint in the drive shaft, then securely install it by hammering.

CAUTION:

- **Check if the circular clip is securely engaged.**



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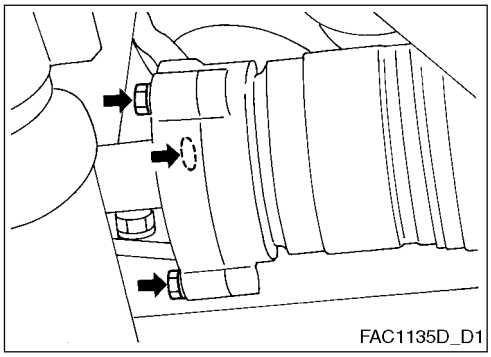
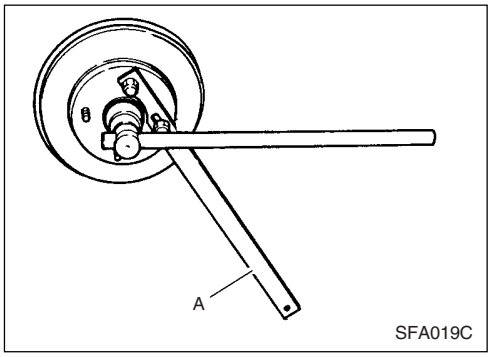
2. Insert the drive shaft to the steering knuckle and install the washer, then insert the lock nuts.
3. Install the steering knuckle.
4. Hold the brake hose with a lock plate.
5. Install the tie rod to the steering knuckle.
6. Install the ABS wheel speed sensor.


FAC1135D_D1

7. Tighten the hub lock nut to the specified torque. Tool A: KV40104000
8. Install the cotter pin.

CAUTION:

- **The cotter pin is not reusable. Do not reuse.**



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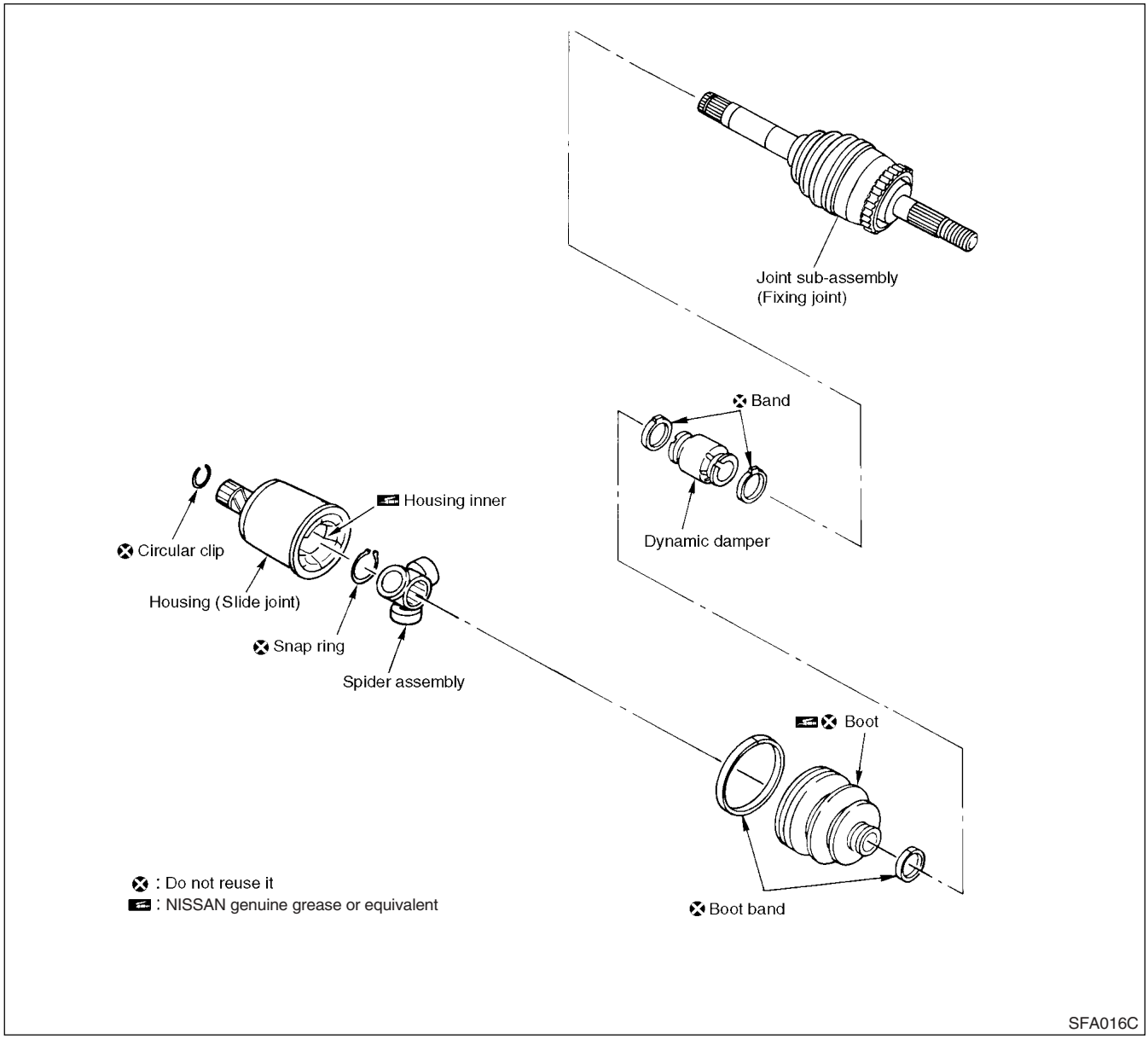
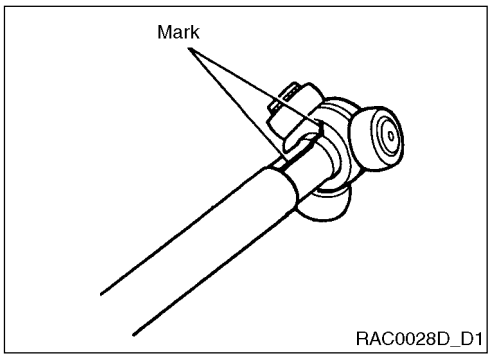
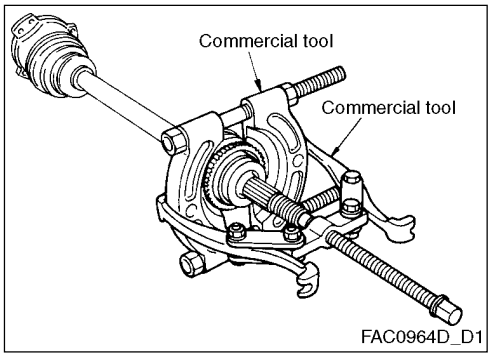
Disassembly • Assembly







TRANSAXLE SIDE (AC2000i, GI2000i)

1. Remove the boot band.
2. Secure the shaft to the vise.

CAUTION:

- **Use the copper plate or aluminum plate to securing on the vise.**

3. Put a mark on the shaft and spider assembly.

CAUTION:

- **Use paint for marking not to damage the surface.**

4. Remove the snap ring and remove the spider assembly from the shaft.
5. Remove the boot from the shaft.
6. Remove the dynamic damper from the shaft.

WHEEL SIDE

- Remove the sensor rotor from the drive shaft using a bearing presser (commercial tool) and puller (commercial tool) as shown in the illustration.

CAUTION:

- **Do not disassemble any other components except for the sensor rotor.**

Inspection after Disassembly

SHAFT

- Replace the shaft if it has vibration, cracks or damages.

BOOT AND BOOT BAND

- Replace the boot if cracked.

CAUTION:

- **Replace the drive shaft assembly for the wheel side.**
- Always replace with new boot band when removed.

CAUTION:

- **Replace the drive shaft assembly for the wheel side.**

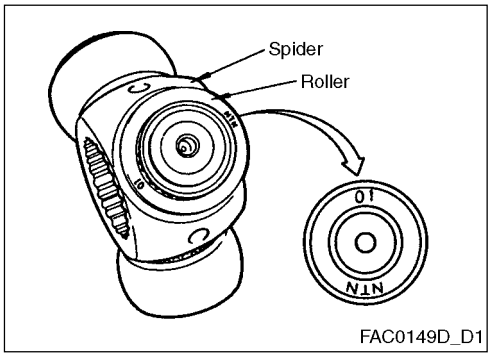
JOINT SUB-ASSEMBLY (FIXING JOINT)

CAUTION:

- **This is not a disassembling component. Do not disassemble.**

JOINT ASSEMBLY (TRANSAXLE SIDE)

T-type and S-type slide joint



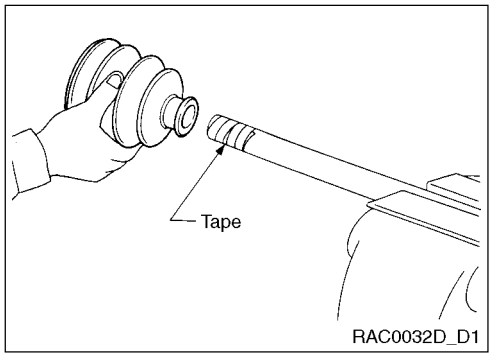
- Replace the housing and spider assembly if the roller contacting surface in the housing or roller surface of the spider have worn or damages.
- If the spider roller has rattle noises in circular motion or has stiff rotation, replace the spider assembly.
- When the joint assembly components are defective, replace the joint assembly.
- Replace the spider assembly as a set when replacing the housing.
- When replacing the spider assembly, select an identical component from below table by referring the seal on the roller as shown in the illustration.

Seal No.	Type
00	T70C
01	
02	
03	

JOINT ASSEMBLY (WHEEL SIDE)

CAUTION:

- **This is not a disassembling component. Do not disassemble.**



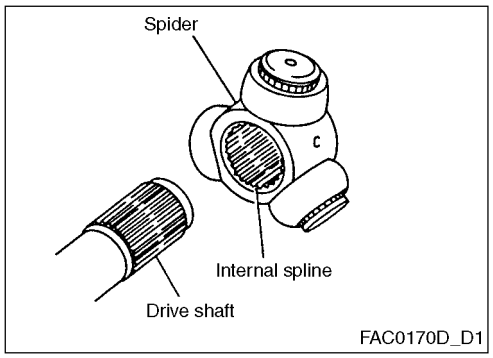
TRANSAXLE SIDE

1. Cover the splined section of the drive shaft with tape to prevent the boot from damaging. Then install the boot band and boot to the shaft.

CAUTION:

- **The boot band and boot cannot be reused. Do not reuse.**

2. Remove the tape on the splined section of the shaft.



3. Install the spider assembly to the drive shaft by aligning marks so that the internal spline of the spider assembly on the external spline of the drive shaft.
4. Secure the spider assembly on the snap ring.

CAUTION:

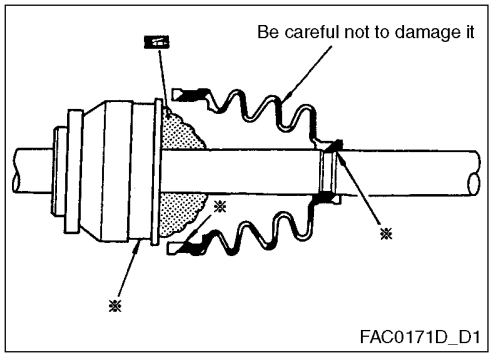
- **The snap ring cannot be reused. Do not reuse.**

5. Apply NISSAN genuine grease or equivalent on the spider assembly and other main moving parts.
6. Install the slide joint housing to the spider assembly and fill the remaining grease to the below specifications.

Grease capacity

GI2000i type: 115 ± 5 g

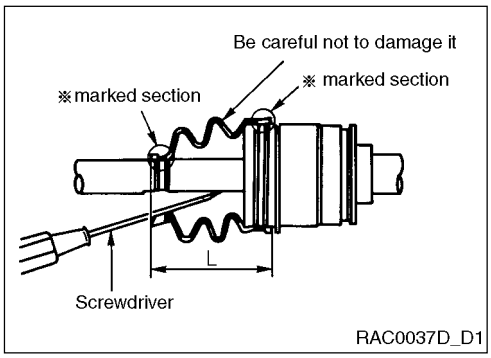
T79C type: 160 ± 5 g



7. Securely install the boot on the grooved section (at the ※ marked section).

CAUTION:

- **Remove all grease on the boot installation surface (at the ※ marked section). Or the boot may come off.**



8. Check if the boot length (L) is the value below and prevent from boot deformation by releasing the air inside the boot by inserting a minus (-) screwdriver.

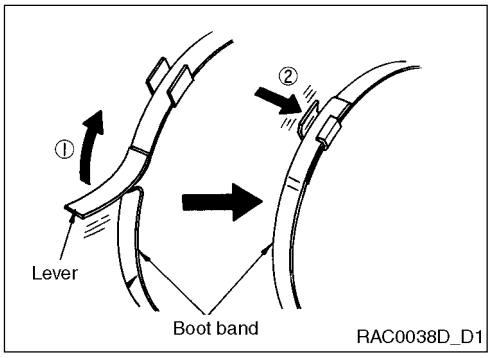
Boot mounting length

GI2000i type: 96.5 ± 1 m

T79C type: 160 ± 1 m

CAUTION:

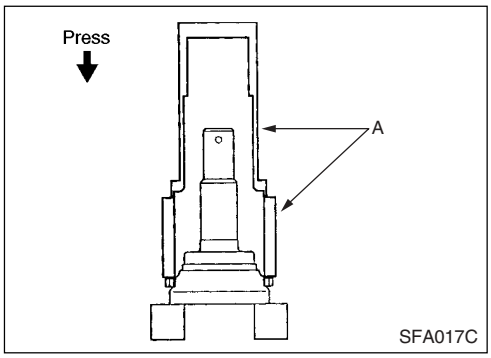
- **If the boot mounting length is out of the standard value, it may be damaged.**
- **Be careful to not touch the boot with the screwdriver sharp end.**



9. Secure the boot's external side and internal side with new boot band as shown in the illustration.

CAUTION:

- **The boot must not come off while housing is rotating. If comes off, the boot band should be re-assembled.**

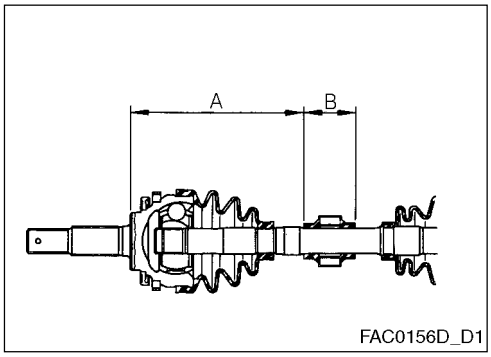


WHEEL SIDE

1. Push the sensor rotor into the joint sub-assembly using a drift (A: KV38100500, KV40101840).

CAUTION:

- **The sensor rotor cannot be reused. Do not reuse.**
- **The joint assembly is not a disassembling component. Do not disassemble.**



DYNAMIC DAMPER

- If disassemble the dynamic damper, secure it with bands away from the fixing joint to be the below value.

CAUTION:

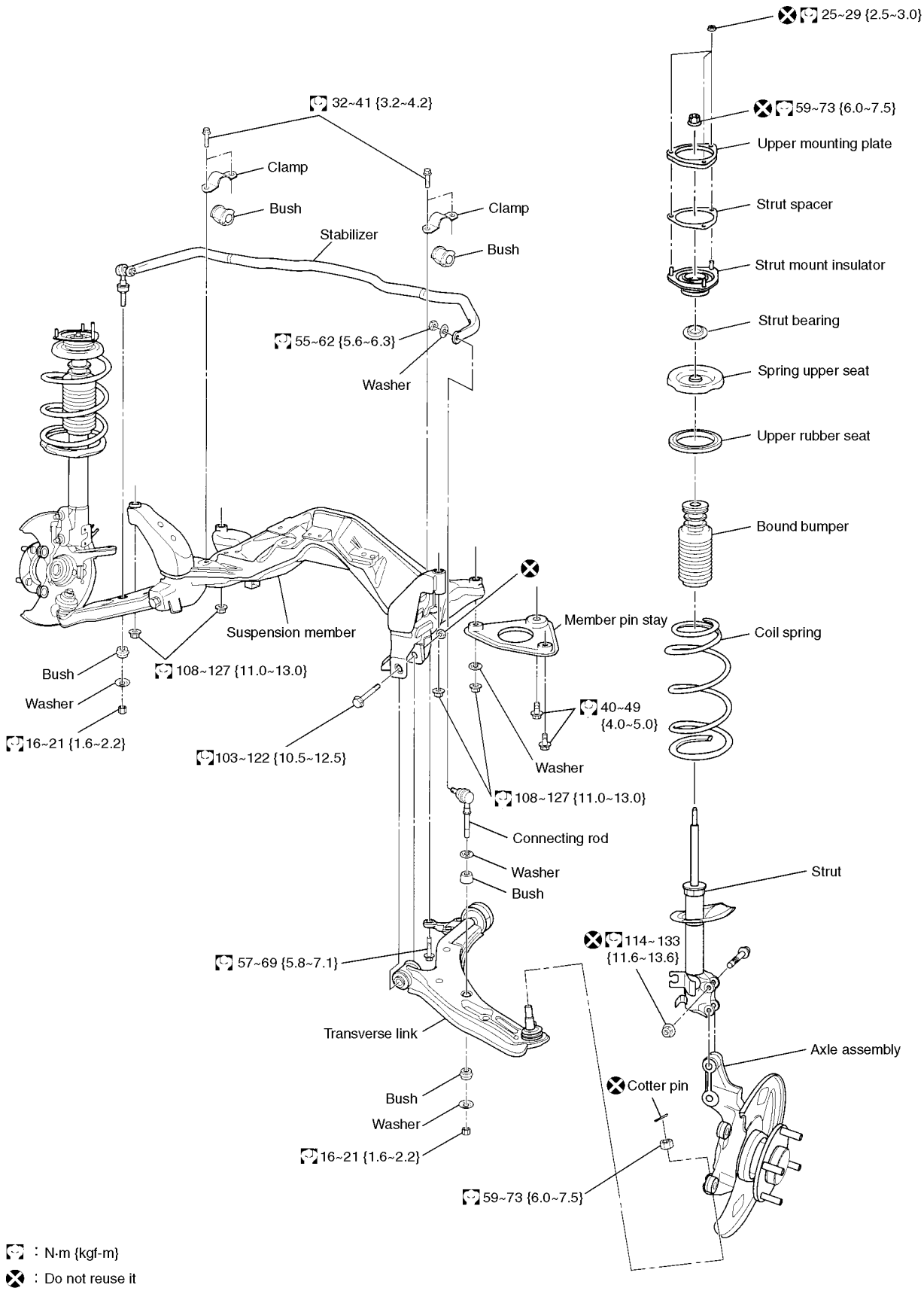
- **The dynamic damper band cannot be reused. Do not re-use.**

INSTALLATION VALUE

Engine model	Drive shaft type	Drive type	Specifications	Value A (mm)	Value B (mm)
QG15DE	AC2000i, GI2000i	Front wheel drive	Right side	437 ± 5	70
			Left side (A/T)	180 ± 5	

Front Suspension Assembly

Components Diagram



On-Vehicle Inspection and Service

INSPECT FOR ANY LOOSENESS, ABNORMAL NOISES AND DAMAGES AT THE MOUNTING AND CONNECTING SECTIONS

Inspect the following items while vehicle lifted-up.

- Inspect each component for any looseness, abnormal noises and damages at the mounting and connecting sections.
- Inspect the lower ball joint endplay.

1. Install the dial gage to the vehicle and install the dial gage end to the brake caliper.
2. Do not press the brake pedal while the front wheels are straight ahead.
3. Measure the axial direction end play between the transverse link and steering knuckle using a iron rod.

Axial direction endplay: 0 mm

CAUTION:

- **Be careful not to damage the ball joint boot.**

4. If the axial direction endplay exceeds the standard value, remove the transverse link and inspect the lower ball joint.

Wheel Alignment

GENERAL

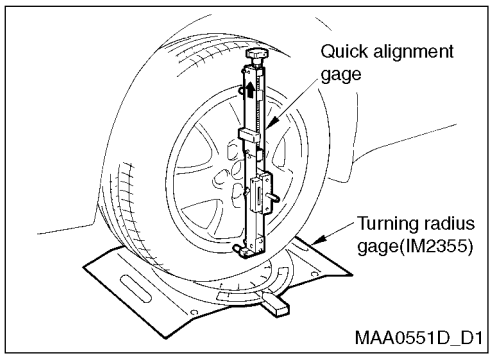
- Perform the wheel alignment while vehicle is empty. An empty vehicle means it has all the necessary fluids that allow being ready for driving such as full tank of fuel, coolant and all lubricants but except for jack and service tools.

Inspection before Service

1. Inspect the tire inflation pressure and wear.
2. Inspect the rod wheel for any vibration.
3. Inspect the axial direction endplay of the wheel bearing.
4. Inspect the axial direction endplay of the suspension lower ball joint.
5. Inspect the strut operation.
6. Inspect the axle and suspension mountings for any looseness and deformation.
7. Inspect the links and arms for any damages, cracks or deformation.
8. Inspect if the vehicle exterior is normal.

Camber, Caster, King Pin Angle Inspection

- The camber, caster and king pin angle cannot be adjusted.
- The front alignment inspection can be done with quick alignment gage quickly and accurately.
- Refer to the user's manual for detailed instructions of quick alignment gage.
- Keep the vehicle leveled by placing the front wheels on the turning radius gage and the rear wheels on the support with the same height with the turning radius gage before installation.



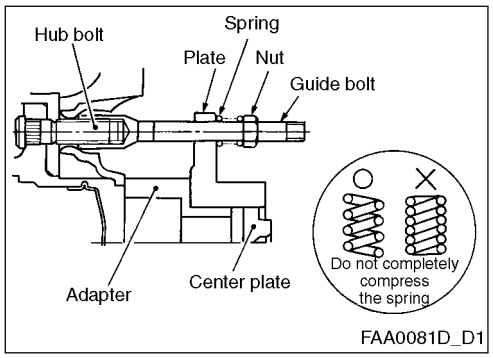
WHEN USING QUICK ALIGNMENT GAGE

- The quick alignment gage cannot measure the king pin angle.
- Install the quick alignment gage assembly so that the arrow sticker faces upwards and perpendicular with the floor as in the illustration before measurement.

Camber: -0°15′ ± 45′
Caster: -1°30′ ± 45′

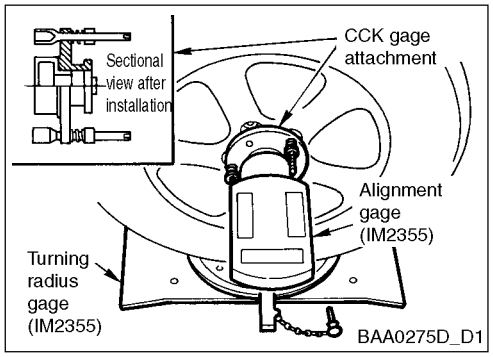
CAUTION:

- **For caster values, multiply 2.865 to the value measured by quick alignment gage.**



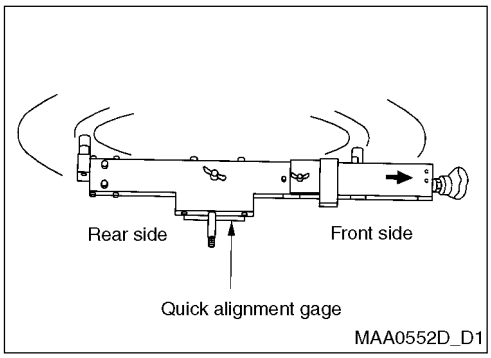
When Using CCK Gage

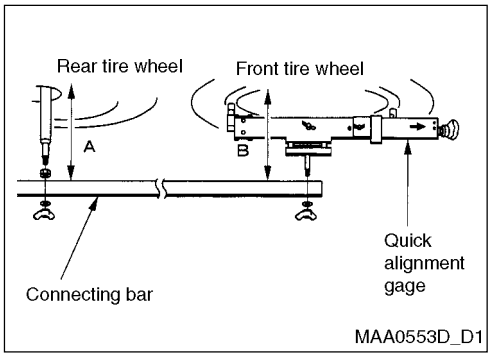
1. Remove the full wheel cover or center cap and wheel nut (2 EA) and install the guide bolt to the hub bolt as shown in the illustration.
2. Push the adaptor until it becomes in contact with the plate.
3. Push the center plate into the plate.
4. Push the plate onto the guide bolt and tighten the guide bolt nut evenly after inserting the spring. The spring must not be fully compressed.
5. Perform the measurement after aligning the bent section of the center plate with bent section of the alignment gage.



Camber: -0°15′ ± 45′
Caster: -1°30′ ± 45′
King pin angle: -14°30′ ± 45′

- If the camber, caster and king pin angle is out of the standard value, inspect the front suspension components for any wear or damages and replace if defective.





Tow-In Inspection

1. Place the quick alignment gage assembly on a flat board and adjust the tow angle measurement meter to 0° using device block.
2. Install the quick alignment gage onto the wheel to be measured so that the arrow sticker faces towards vehicle front.
3. Remove one wheel nut from rear wheel which is nearest to the center line and install the hub bolt adaptor.
4. Install the connecting bar to the vehicle.

CAUTION:

- **Adjust the distance A and B by considering tread so that the connecting bar and the vehicle become parallel.**

5. Remove the quick alignment gage assembly from the vehicle and place on the flat board. Then convert the measured value to regular value using the conversion formula.

   Sin [Measured value (decimal method)] tire outer diameter (mm) = Tow-in (mm)

NOTE:

- **The measured value means the sum of the measured value of left and right wheels.**

  Example

  When measured value is 0° 30′ (0.5°) and tire outer diameter is 600 mm

  Sin 0.5 X 600 = 5.2 mm

  Tow-in: In 3 mm - In 1 mm

6. If the tow-in value is out of the standard value, adjust the tow-in value to the standard value by releasing the tie rod lock nut and adjusting the length.

CAUTION:

- **When adjusting the tie rod, adjust the left and right tie rods equally.**
- **Always secure the tie rod with a wrench when tightening the lock nut.**

Side Slip Inspection

- Inspect if the side slip value is within the specified value using the side slip tester.
- The side slip value may be different even for the same alignment due to the wear of the tire pattern.

  Side slip (Reference value): In 5 mm - Out 5 mm

CAUTION:

- **Always inspect the wheel alignment before inspecting the side slip.**
- **Check if the tow-in value is within the standard value even when the side slip value is within the standard value.**

Steering Angle Inspection

1. Locate the front wheels straight ahead position and place the front wheels on the turning radius gage by moving the vehicle.
2. Measure the steering angle by rotating the steering wheel all the way to the left and then to right.

Coil Spring and Shock Absorber

Removal • Installation

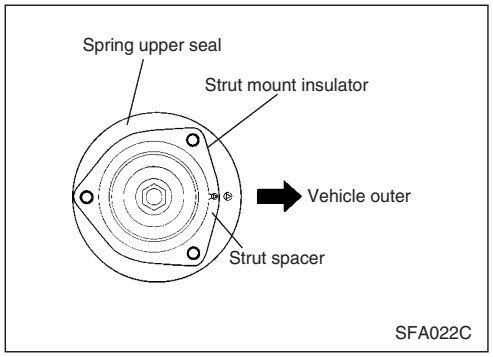
REMOVAL

1. Remove the tires. Remove the brake calipers and store to a safe place.

CAUTION:

- **Do not depress the brake pedal while brake calipers are removed.**

2. Remove the ABS wheel speed sensor wires from the strut.
3. Remove the brake hose lock plate.
4. Remove the bolts and nuts from strut and steering knuckle.
5. Remove the strut upper mounting nut and remove the upper mounting plate and strut from the vehicle.



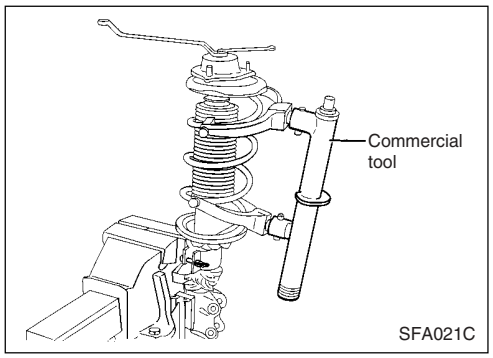
INSTALLATION

- Refer to "Components Diagram" (FA-13) in "Front Suspension Assembly" for tightening torque and install in the reverse order of removal.
- Install the strut to the vehicle after checking that the arrow in the strut mount insulator and spring upper seat and the divided ends of the strut spacer faces the direction shown in the illustration.
- Install the upper mounting plate so that its divided ends face the vehicle outer.

Disassembly • Assembly

DISASSEMBLY

1. Install the strut attachment (commercial tool) to the strut and secure on the vise.



CAUTION:

- **Cover the lock strut with oil cloth during strut attachment (commercial tool) installation to prevent from damaging.**

2. Loosen the piston rod lock nut gradually.

CAUTION:

- **Do not release the piston rod lock nut completely. If so, the coil spring will bounce out and cause injury.**

3. Compress the coil spring using a spring compressor (commercial tool).

CAUTION:

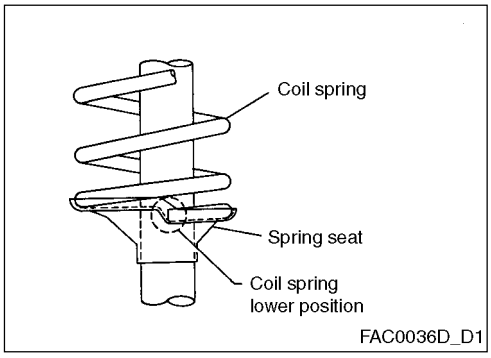
- **Check if the spring compressor (commercial tool) is securely installed on the coil spring and then perform the coil spring compression.**

4. After finishing the step 3, check if the coil spring is fully released between the upper seat and lower seat and remove the piston rod lock nut.
5. Remove the small components of the strut.
   - Remove the strut spacer, strut mount insulator, strut bearing, spring upper seat and upper rubber seat and then remove the coil spring from the strut.
6. Remove the bound bumper from the spring upper seat.
7. Slowly release the spring compressor (commercial tool) and remove the coil spring.

Inspection after Disassembly

STRUT INSPECTION

- Inspect the strut for any deformation, cracks or damages and replace if defective.
- Inspect the piston rod for any damages, uneven wear and refraction and replace if defective.
- Inspect the welded sections and sealing sections for any oil leakages and replace if defective.



Insulator and Rubber Inspection

Inspect the strut mount insulator for any cracks and the rubber components for wear and replace if defective.

Coil Spring Inspection

Inspect for any cracks, wear and damages and replace if defective.

ASSEMBLY

1. Compress the coil spring using the spring compressor (commercial tool) and install it to the strut.

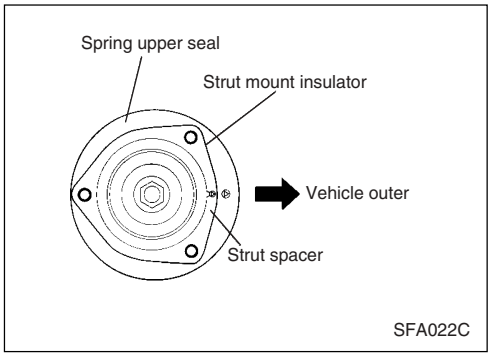
CAUTION:

- **Face the coil spring tube side downwards and adjust the lower section on the strut spring seat as shown in the illustration.**
- **Check if the spring compressor (commercial tool) is securely installed on the coil spring and then compress the coil spring.**

2. Install the bound bumper to the spring upper seat.

CAUTION:

- **Securely install the bound bumper to the spring upper seat.**
- **Use soap water for installation. Do not use any oils.**

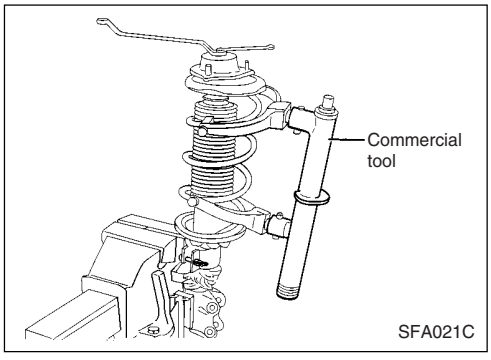


3. Install the small components of the strut.
   - Install the upper rubber seat, spring upper seat, strut bearing, strut mount insulator and strut spacer and hang the piston rod lock nut.

CAUTION:

- **The piston rod lock nuts cannot be reused. Do not reuse.**

4. Check if the arrow in the strut mount insulator and spring upper seat and the divided ends of the strut spacer are installed at the location shown in the illustration.
5. Check if the coil spring is securely installed to the upper rubber seat and release the spring compressor (commercial tool) slowly.



CAUTION:

- **Install the upper rubber seat so that it does not come off from the spring upper seat and coil spring.**

6. Tighten the piston rod lock nut to the specified torque.
7. Remove the strut attachment (commercial tool) from the strut.

Transverse Link

Removal • Installation

REMOVAL

1. Remove the steering knuckle from the transverse link. Refer to “Removal” (FA-4) in “Front Wheel Hub and Knuckle”.
2. Remove the mounting nuts, washer and bushings from below the stabilizer connecting rod.
3. Loosen the transverse link mounting bolt slightly.
4. Remove the compression rod bracket mounting bolt.
5. Remove the transverse link mounting bolt and nut and remove the transverse link from the suspension member.

Inspection after Removal

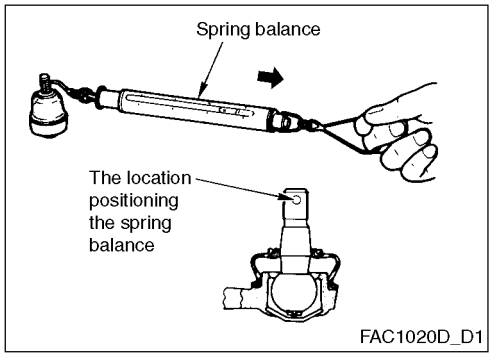
EXTERIOR INSPECTION

Inspect the transverse link and bushing for any deformation, cracks and damages and replace the transverse link assembly if defective.

BALL JOINT INSPECTION

CAUTION:

- **Move the ball joint over 10 times with hand to make it flexible before measurement.**

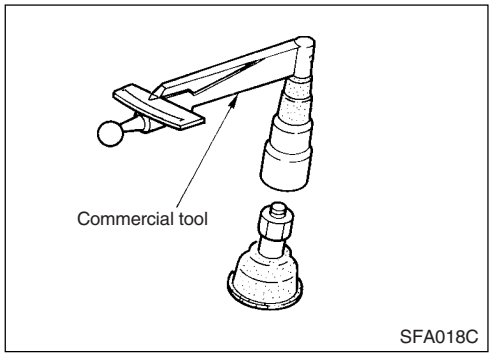


Swing Force Inspection

- Hang the spring balance to the cotter pin hole on the ball stud and inspect if the value measured when the ball stud starts to move falls within the standard value.

  Measured value by spring balance: 0.85 - 8.63 kg

- If the value is out from the standard value range, replace the transverse link.



Turning Torque Inspection

- Install the mounting nut to the ball stud and measure if the turning torque is within the standard value by using the free-load gage (commercial tool).

  Turning torque: 0.49 - 4.9 N•m (0.05 - 0.50 kgf-m)

- If the value is out of the standard value, replace the transverse link.

AXIAL DIRECTION ENDPLAY INSPECTION

- Put the end of the ball joint to the axial direction and inspect for any abnormal noises.

  Axial direction endplay: 0 mm

- If the value is out of the standard value, replace the transverse link.

Installation

- Refer to “Components Diagram” (FA-13) in “Front Suspension Assembly” for tightening torque and install in the reverse order of removal.
- When installing the transverse link to the suspension member, check if the stopper rubber is inserted at the rear of the bushing collar in the vehicle front bushing.
- Perform in empty vehicle condition on the ground when tightening the transverse link mounting bolt to the specified torque.
- Inspect the wheel alignment after installation. Refer to “Wheel Alignment” (FA-14) in “Front Suspension Assembly”.

Stabilizer

Removal • Installation

REMOVAL

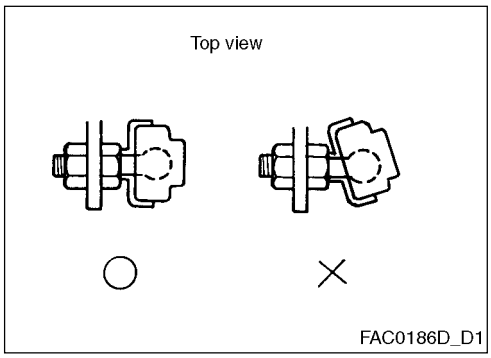
1. Remove the stabilizer connecting rod upper mounting bolt.
2. Remove the stabilizer clamp mounting bolts.
3. Remove the steering gear from the vehicle. Refer to “Removal” (ST-11) in “Steering System”.
4. Remove the stabilizer from the vehicle.

Inspection after Removal

Inspect the stabilizer, connecting rod, bushing and clamp for any deformation, cracks or damages and replace if defective.

INSTALLATION

- Refer to “Components Diagram” (FA-13) in “Front Suspension Assembly” for tightening torque and install in the reverse order of removal.



- The stabilizer uses a pillow ball type connecting rod. Thus, when determining the ball joint location, install it so that the case of the pillow ball head section becomes parallel with the stabilizer.

Front Suspension Member

Removal • Installation

REMOVAL

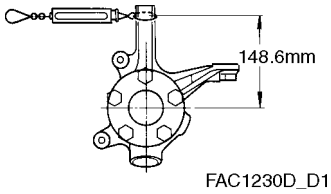
1. Remove the steering knuckle from the vehicle. Refer to “Removal” (FA-4) in “Front Wheel Hub and Knuckle”.
2. Remove the front exhaust pipe from the vehicle.
3. Remove the steering compression tube bracket from the suspension member.
4. Remove the high and low pressure tubes from the steering gear.
5. Remove the pinch bolt under the lower joint of the steering gear and put the alignment mark on the lower joint and steering gear.
6. Install the transmission jack to the engine.
7. Remove the center member from the vehicle.
8. Remove the transverse link from the suspension member. Refer to “Removal” (FA-19) in “Transverse Link”.
9. Remove the body side mounting bolts from the member pin stay.
10. Install the transmission jack at the suspension member and remove the suspension member mounting nuts.
11. Lower the transmission jack slowly and remove the suspension member from the vehicle.

INSTALLATION

- Refer to “Components Diagram” (FA-13) in “Front Suspension Assembly” for tightening torque and install in the reverse order of removal.
- After completing the service, perform the final tightening to all sections, inspect the wheel alignment and bleed air from the steering gear fluid pipes. Refer to “Power Steering Fluid Air Bleeding” (ST-4) in “Steering System”.

Service Data

Wheel Bearing

Drive type		Front wheel drive
Turning torque	KN•m (kgf-m)	Less than 1.21 (Less than 123)
Measured value by spring balance	N (kg)	Less than 8.13 (Less than 0.83)
Spring balance position		 FAC1230D_D1
Axial direction endplay (mm)		0.05

Drive Shaft

AC2000i, GI2000i

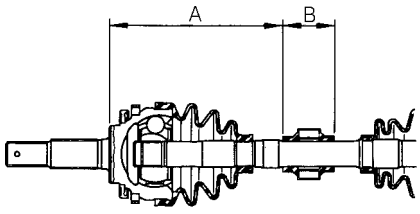
Joint type		T79C
Grease capacity		115 ± 5 g
Boot length		96.5 ± 1 mm
Spider assembly in final drive side	Seal No.	Type
	00	T70C
	01	
	02	
	03	

Z90T79C

Joint type	Final drive side	T70C
Grease capacity		160 ± 5 g
Boot length		102.5 ± 1 mm

Dynamic Damper

Type	Drive type	Specification	Value A (mm)	Value B (mm)
AC2000i, GI2000i	Front wheel drive	Right	437 ± 5	70
		Left (A/T)	180 ± 5	
Z90T79C		Right	425 ± 5	64
		Left	180 ± 5	70



FAC0156D_D1

Tightening Torque

Wheel hub lock nut	235 N•m (24.0 kgf-m)

Service Data

Wheel Alignment (When Curb Weight)

Drive type		Front wheel drive
Engine model		QG16DE
Camber		-0° 20′ ± 45′
Caster		1° 25′ ± 45′
King pin angle		14° 40′ ± 45′
Tow-in	(mm)	In 1 - In 3
Side slip (Reference only)	(mm)	In 5 - Out 5

Ball Joint

Turning torque	(N•m (kgf-m))	0.50 - 0.49 (0.05 - 0.05)
Measured value by spring balance (At the cotter pin hole)	(N (kg))	8.40 - 81.9 (0.85 - 8.36)
Main movement torque	(N•m (kgf-m))	0.50 - 4.90 (0.05 - 0.50)
Axial direction endplay	(mm)	0

Tightening Torque

Unit: N•m (kgf-m)

Transverse link - Suspension member	103 - 122 (10.5 - 12.5)
Steering knuckle - Transverse link	59 - 73 (6.0 - 7.5)
Stabilizer connecting rod - Transverse link	16 - 21 (1.6 - 2.2)
Strut - Body	25 - 29 (2.5 - 3.0)
Piston rod lock nut	59 - 73 (6.0 - 7.5)
Strut - Steering knuckle	114 - 133 (11.6 - 13.6)
Suspension member - Compression rod bracket	57 - 69 (5.8 - 7.1)
Suspension member - Stabilizer clamp	32 - 41 (3.2 - 4.2)

ACCELERATOR CONTROL, FUEL AND EXHAUST SYSTEMS

SECTION **FE**

GI
EM
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Precaution

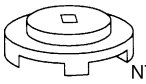
SRS Airbag • Pretensioner Seatbelt

WARNING:

- **To install/remove the SRS airbag, pretensioner seatbelt system related components and harness, turn the ignition switch "OFF", disconnect the battery terminals and wait over 3 minutes. (This is to discharge all the remaining electricity in the airbag sensor unit's auxiliary power circuit.)**
- **Do not use air impact or electrical tools when installing/removing the components.**
- **Do not use any hand-held tools for harness used in SRS airbag and pretensioner seatbelt systems. Be careful with the harness not to tangle with or interfere with other components.**
- **Do not use any electrical test equipments such as circuit tester when inspecting the SRS airbag and pretensioner seatbelt circuit while installed unless the Service Manual instructs to do so. (The weak current in the tester can cause the SRS airbag to operate.)**
- **Do not insert any foreign materials such as a screwdriver in the airbag module and pretensioner seatbelt connector in order to prevent unintended operation due to static electricity.**
- **The harnesses used in SRS airbag and pretensioner are covered with yellow insulation for easy identification.**
- **Refer to "RS Restraint System" in this Service Manual for safe airbag system service information.**

Preparation

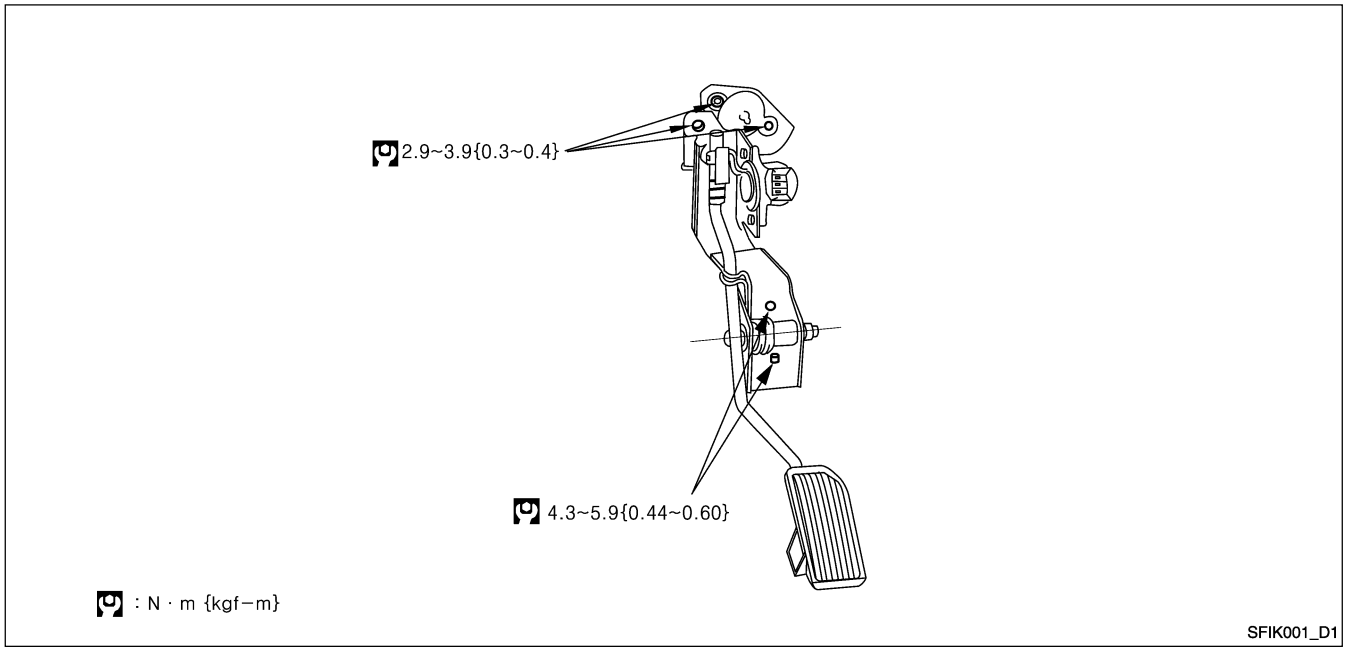
Special Service Tool

Item	Description
KV999G0010 Fuel tank lock ring socket	 NT057 Removing/installing fuel tank

Removal • Installation

WARNING:

- **Make sure that throttle valve opens when depressing accelerator pedal. Also, make sure that throttle valve returns to the idle position when releasing accelerator pedal while the ignition switch is ON.**
- **Make sure that the accelerator control system is interfered with various parts.**



Removal

1. Disconnect accelerator pedal position sensor harness connector.
2. Remove the mounting nuts and remove the accelerator pedal assembly.

WARNING:

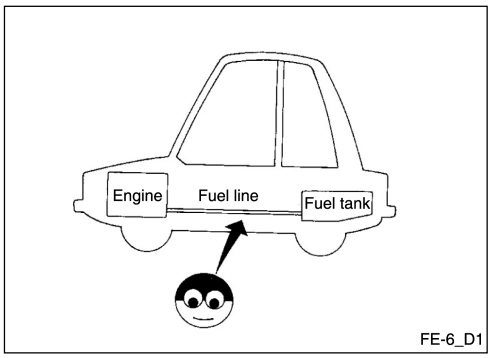
- **Do not disassemble accelerator pedal assembly. Do not remove accelerator pedal position sensor from accelerator pedal assembly.**
- **Avoid impact from dropping etc. during handling.**
- **Be careful to keep accelerator pedal assembly away from water.**

Installation

Install in the reverse order of removal.

Inspection after Installation

- Make sure that accelerator pedal moves smoothly within the whole operation range.
- Make sure that accelerator pedal securely returns to the original position.
- If harness connector of accelerator pedal position sensor is disconnected, perform “Accelerator Pedal Released Position Learning” (QG16: EC-23).
- For electric inspection of the accelerator pedal assembly, refer to “DTC P2138 APP Sensor” (QG16: EC-201).



Fuel Line Inspection

Make sure that fuel line, fuel filler cap and fuel tank are attached correctly. If there is tremble or dir, repair or replace them.

Removal • Installation

WARNING:

When replacing the fuel line part, observe the followings:

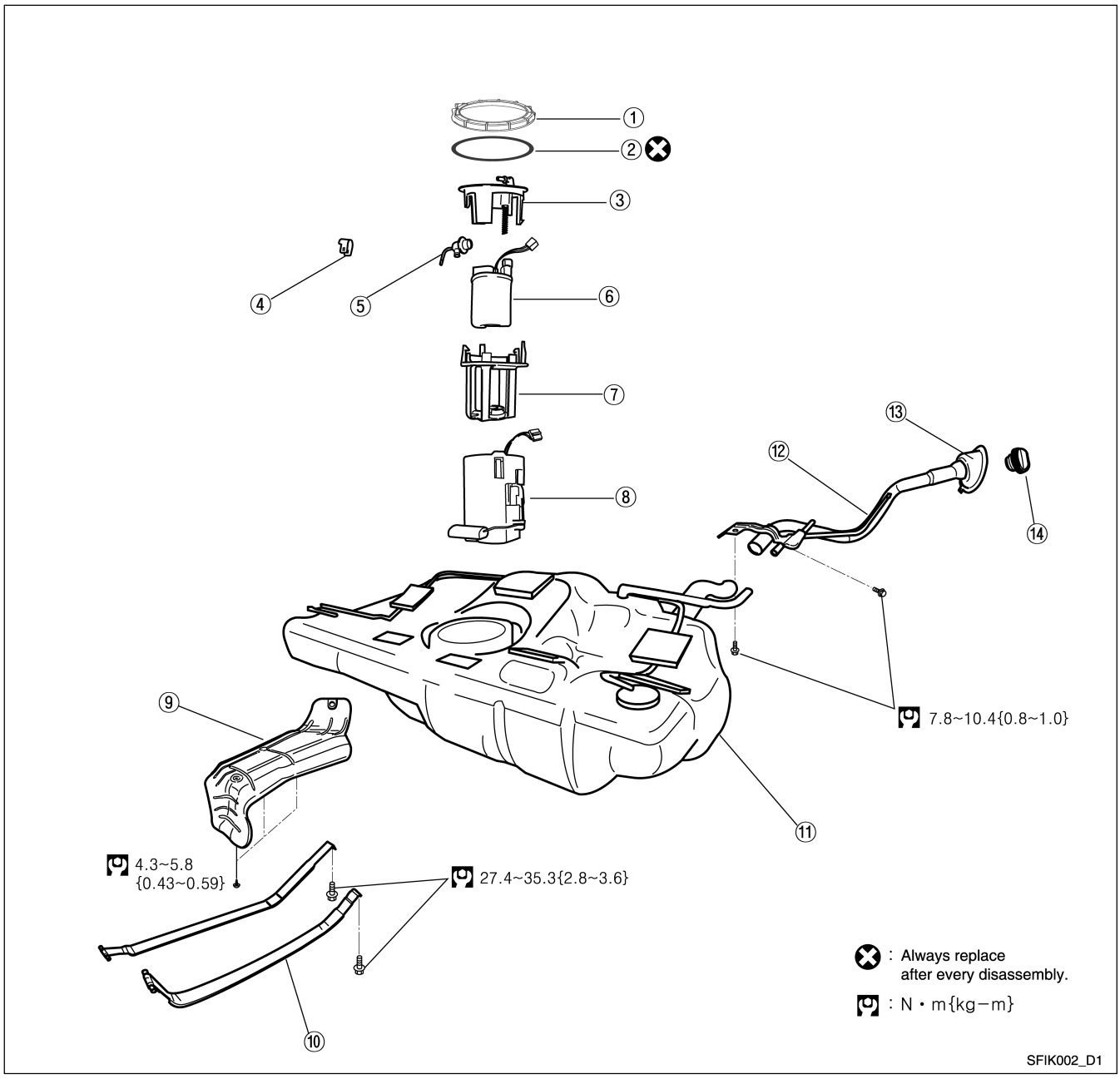
- **Put a "CAUTION: INFLAMMABLE" sign in the workshop.**
- **Be sure to work in a well ventilated area and to furnish workshop with a CO2 fire extinguisher.**
- **Do not smoke while working on the fuel system. Also, work in location without any fire.**

WARNING:

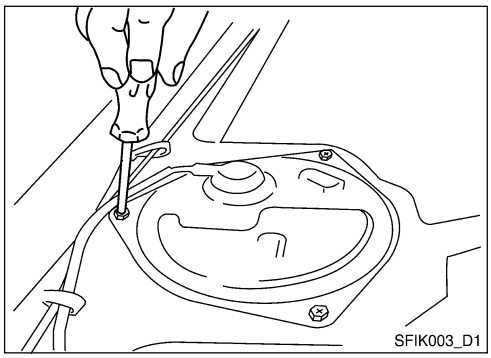
- **Use the following procedure before removing the fuel line parts.**
  - **a) Drain engine oil to the anti-explosible container and close it tight.**
  - **b) Release fuel pressure from the fuel line. Refer to "FUEL PRESSURE RELEASE" (QG16: EC-26).**
  - **c) Disconnect the battery negative cable.**
- **Always replace O-ring with a new one.**
- **Do not install the fuel tube twisted.**
- **Do not tighten the hose clamp excessively. The fuel hose can be damaged.**
- **Make sure that there are no fuel leaks at the fuel system connections while the engine is running after installing the fuel tube.**
  - **a) Turn the ignition switch ON (engine not running) and generate the fuel pressure in the fuel line.**

    Also, make sure that are no fuel leaks at the connections.
  - **b) Start engine, rev it up and make sure there are no fuel leaks at the fuel system connections.**
- **Use only NISSAN Geunuine part when replacing the fuel filler cap.**

Fuel Tank

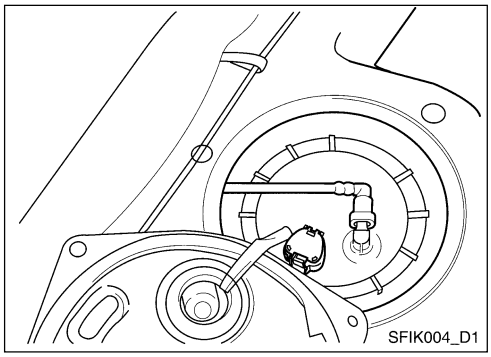


① Fuel pump cover
② O-ring
③ Fuel pump upper bracket
④ Fuel pressure regulator fixing bracket
⑤ Fuel pressure regulator
⑥ Fuel pump
⑦ Fuel pump mounting bracket
⑧ Fuel level sensor unit
⑨ Fuel tank protector
⑩ Fuel tank mounting band
⑪ Fuel tank
⑫ Filler tube
⑬ Grommet
⑭ Filler cap

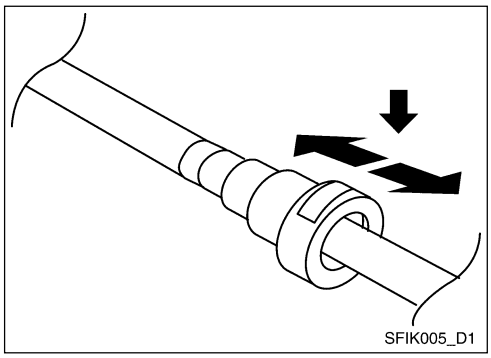

SFIK003_D1

Removal

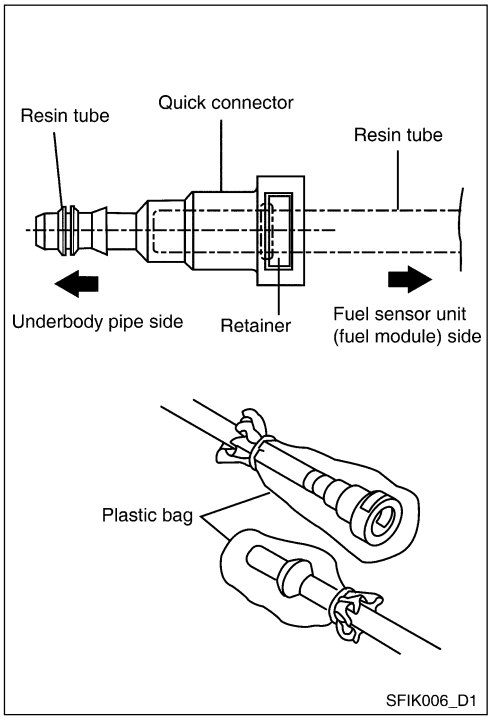
1. Release fuel pressure in the fuel line. Refer to “FUEL PRESSURE RELEASE” (EC-26).
2. Disconnect negative battery cable.
3. Open the fuel filler lid and cap.
4. Remove the rear seat cushion. Refer to “Removal • Installation” (BT-52).
5. Remove the inspection hole cover under the rear seat.


SFIK004_D1

6. Disconnect electric connector.
7. Disconnect quick connector as follows.
   a) Align the mating marks of the connector and the tube.


SFIK005_D1

   b) Hold the sides of connector, push in tabs and pull out fuel feed tube.



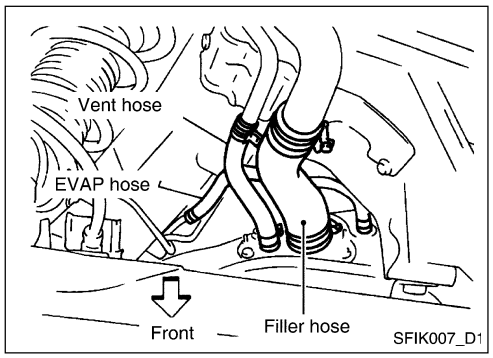
SFIK006_D1

WARNING:

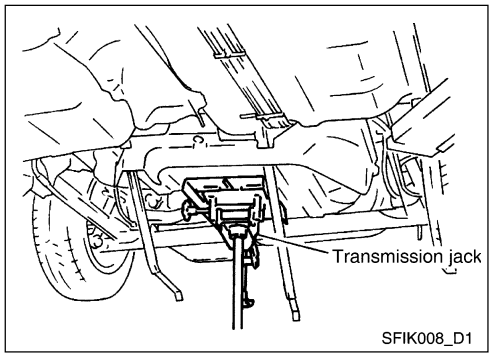
- **Quick connector can be disconnected when the tabs are completely depressed. Do not twist it more than necessary.**
- **Do not use any tools to disconnected quick connector.**
- **Keep resin tube away from heat. Be especially careful when welding near the resin tube.**
- **Prevent acid liquid such as battery electrolyte, etc. from getting on resin tube.**
- **Do not bend or twist resin tube during installation and disconnection.**
- **Do not remove the remaining retainer on hard tube (or the equivalent) except when resin tube or retainer is replaced.**
- **When resin tube or hard tube (or the equivalent) is replaced, also replace retainer with new one.**

- To keep the connecting portion clean and to avoid damage and foreign materials, cover them completely with plastic bags or something similar.

Removal (Cont'd)



8. Remove the exhaut center tube.
9. Disconnect fuel filler hose, vent hose and EVAP purge hose from the left side of the fuel tank rear side.

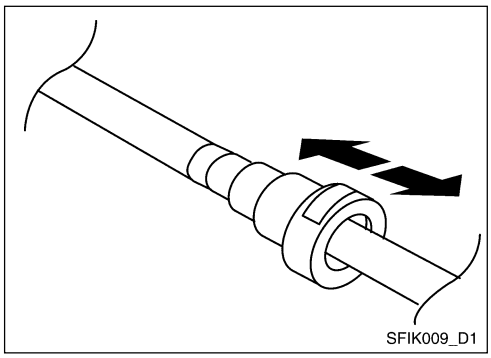


10. Install the transmission jack under the fuel tank.
11. Remove the fuel tank mounting band bolts while supporting the fuel tank by the jack.
12. Remove the fuel tank mounting band.
13. Remove the fuel tank by lowering the transmission jack while the paying attention to the interference with other parts.

Installation

Note the following, and install in the reverse order of removal.

Installation (Cont'd)

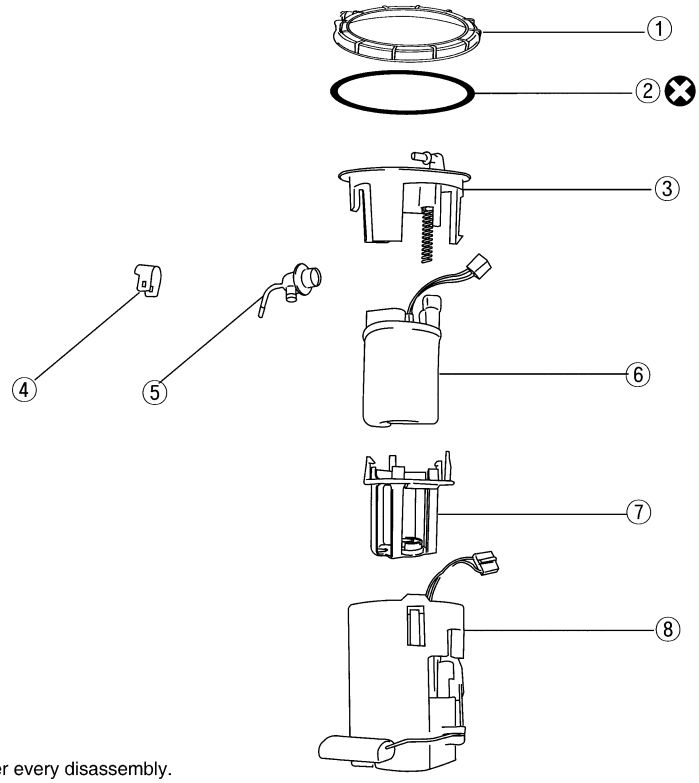


- Connect the quick connector as follows:
  a) Check the connection for damage or any foreign materials.
  b) Align the connector with the tube, then insert the connector straight into the tube until a click sound is heard.
  c) After connecting, make sure that the connection is secure by following method.
  d) Pull the tube and the connector to make sure they are securely connected.

Inspection after Installation

- Use the following procedure to check for fuel leaks.
  a) Turn ignition switch "ON" (with engine stopped), then check connections for leaks by applying fuel pressure to fuel piping.
  b) Start engine and rev it up and make sure there are no fuel leaks at the fuel system connections.

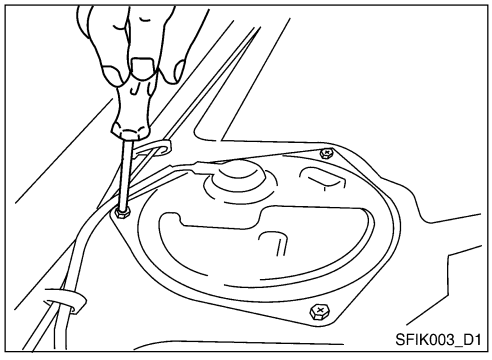
Fuel Level Sensor Unit, Fuel Filter and Fuel Pump Assembly



: Always replace after every disassembly.

SFIK010_D1

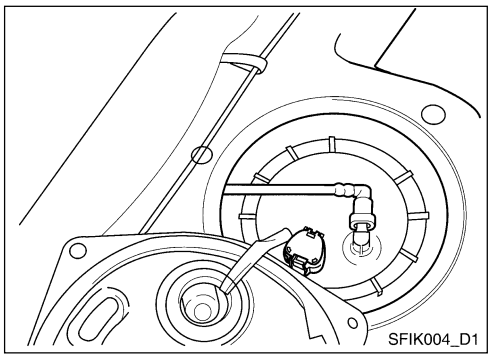
① Fuel pump cover
② O-ring
③ Fuel pump upper bracket
④ Fuel pressure regulator fixing bracket
⑤ Fuel pressure regulator
⑥ Fuel pump
⑦ Fuel pump mounting bracket
⑧ Fuel level sensor unit



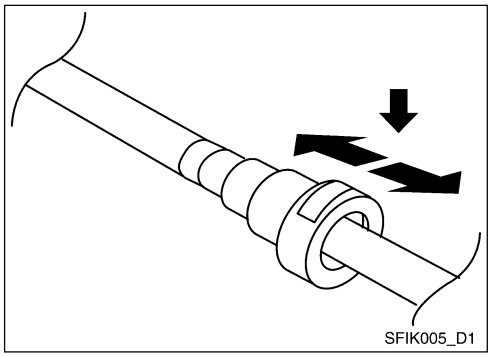
Removal

1. Release fuel pressure in the fuel line. Refer to “FUEL PRESSURE RELEASE” (EC-26).
2. Disconnect negative battery cable.
3. Open the fuel filler lid and cap.
4. Remove the rear seat cushion. Refer to “Removal • Installation” (BT-52).
5. Remove the inspection hole cover under the rear seat.

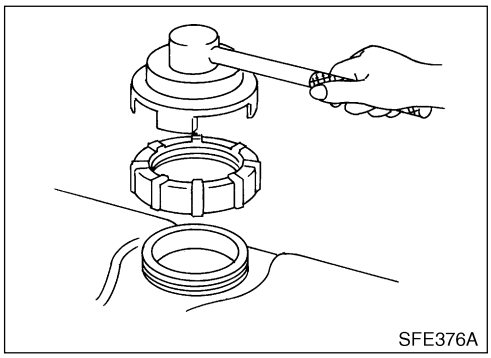
Removal (Cont'd)



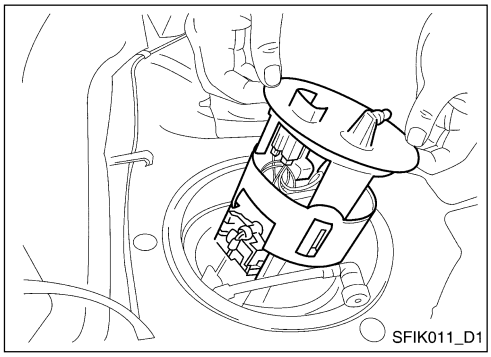
6. Disconnect electric connector.



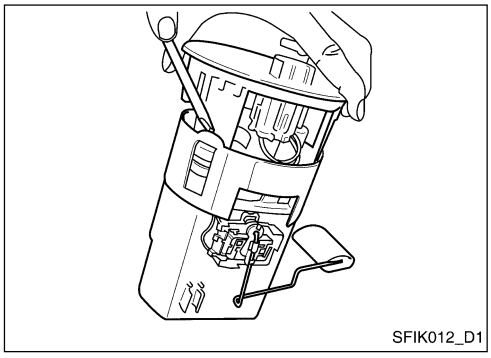
7. Disconnect quick connector as follows.
   a) Align the mating marks of the connector and the tube.
   b) Hold the sides of connector, push in tabs and pull out fuel feed tube.



8. Remove it using the fuel tank lock ring socket (SST: KV999G0010).
   - Be careful not to damage the arm of the fuel level sensor unit.

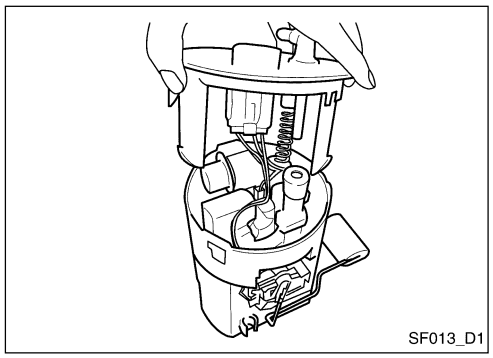


9. Remove the fuel level sensor unit, fuel filter and fuel pump assembly from the fuel tank.
   - Be careful not to damage the arm of the fuel level sensor unit.

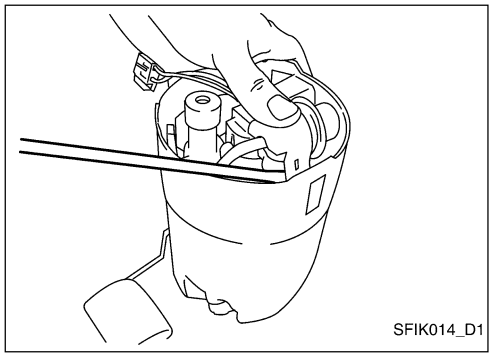


10. Remove the fuel pump upper bracket as shown in the figure.

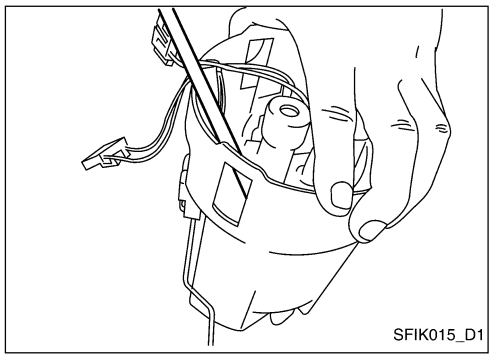
Fuel Level Sensor Unit, Fuel Filter and Fuel Pump Assembly


SF013_D1

11. Disconnect the fuel pump and fuel level sensor harness connectors.


SFIK014_D1

12. Remove the mounting bracket of the fuel pressure regulator.


SFIK015_D1

13. Remove the fuel pump.

Installation

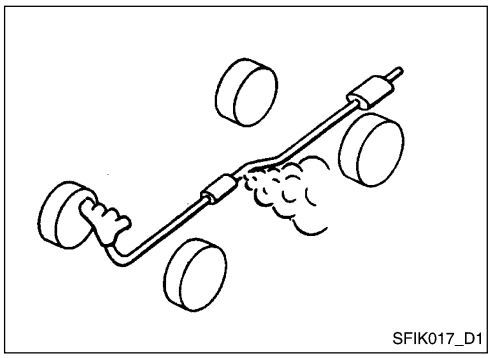
Install in the reverse order of removal with following cares.

- Align the bracket connection parts, then insert the connector straight until a click sound is heard. Make sure that the connector is installed securely.
- Connect the harness connector of the fuel pump securely.
- When installing O-ring, note the followings.

WARNING:

- **Always replace O-ring with a new one.**
- **Do not handle O-ring with bare hands.**
- **Make sure there are not damage and dirt on the O-ring and O-ring installation part.**
- **Before installing O-ring, apply engine oil to O-ring.**
- **Be careful not to apply excessive force when pulling or extending O-ring.**

Exhaust System Inspection



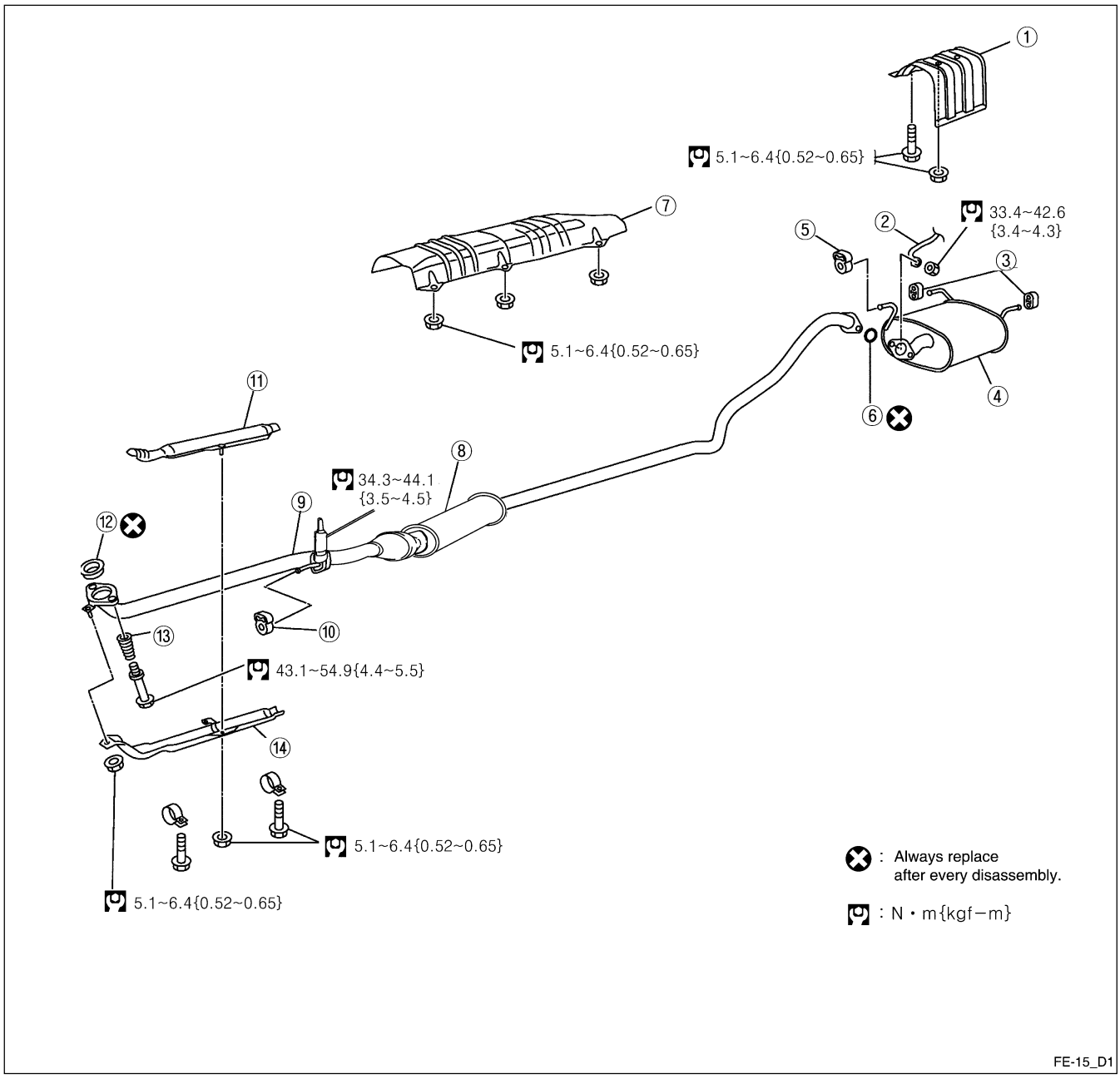
Inspection

Check the exhaust pipe, muffler and mounting for improper installation, gas leak, crack, damage, rattle or contamination.

Removal • Installation

WARNING:

- **Replace gasket to a new one when reassembling the exhaust system.**
- **Check exhaust system for improper attachment such as exhaust gas leaks and noise while the engine is running..**
- **Make sure that the mounting bracket and the mounting insulator are installed properly and there is no excessive stress. It can result in noise and vibration.**
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using oxygen sensor thread cleaner and approved anti-seize lubricant.**
- **Do not tighten the heated oxygen sensor excessively. It can damage the heated oxygen sensor resulting in warning light blinking.**
- **Be sure to use genuine exhaust system parts or equivalents which are specially designed for heat resistance, corrosion resistance, and shape.**
- **Do not work on the exhaust system right after engine stops since it is still hot.**
- **Be careful not to hurt by the heat resistant material.**



① Heat insulator
② Ground wire
③ Mounting rubber
④ Main muffler
⑤ Mounting rubber
⑥ Gasket
⑦ Heat insulator
⑧ Free muffler
⑨ Exhaust front tube
⑩ Mounting rubber
⑪ Heat insulator
⑫ Seal bearing
⑬ Spring
⑭ Heat insulator

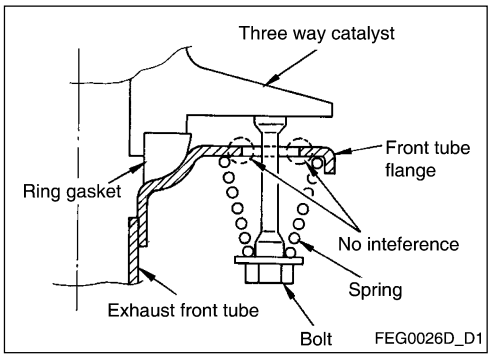
Removal

- Remove the joints and mountings on exhaust system.

Installation

Install in the reverse order of removal with following cares.

- Remove old gasket on mating surface of connections.
- When installing the exhaust pipe assembly, temporarily tighten the mounting nut (vehicle side) and the bolt on the exhaust manifold. Make sure that there is not tensile force on each part and then tighten nuts and bolts to the specified torque.
- Do not apply excessive tensile force on the mounting rubber or do not twist it when installing it.
- Install the seal bearing unit according to the following procedures.



Exhaust Front Tube to Three Way Catalyst (Exhaust Manifold)

1. Insert the seal bearing to the three way catalyst to the direction as shown in the figure.

WARNING:

- **Be careful not to damage the seal bearing surface when installing.**

2. Tighten the bolt while the spring side with bigger diameter faces the flange.

- Tighten the mounting bolt and make sure no part interferes with the bolt.

Inspection after Installation

Check if there is exhaust gas leak and noise from the exhaust tube joint while engine is running.

Service Data

Accelerator Control System

Unit: N•m (kgf-m)

Accelerator pedal bracket	4.3 ~ 5.9 (0.44 ~ 0.6)
Dynamic Damper	4.4 ~ 5.9 (0.45 ~ 0.6)

Fuel Tank

Fuel tank capacity (L)	55

Tightening Torque

Unit: N•m (kgf-m)

Fuel pump module	6 ~ 7 (58.8 ~ 68.6)
Fuel tank mounting band	3.8 ~ 5.0 (37 ~ 49)
Filler tube	1.3 ~ 3.7 (0.13 ~ 0.38)
Fuel tank protector	2 ~ 2.9 (0.2 ~ 0.3)

Exhaust System

Unit: N•m (kgf-m)

Exhaust system	
Catalytic converter in manifole~ Exhaust sub muffler ~ Assembly	43.1 ~ 54.9 (4.4 ~ 5.6)
Exhaust sub muffler assembly ~ Main muffler	33.3 ~ 43.1 (3.4 ~ 4.4)
Exhaust muffler assembly ~ Heated oxygen sensor	34.3 ~ 44.1 (3.5 ~ 4.5)

SECTION **GI**

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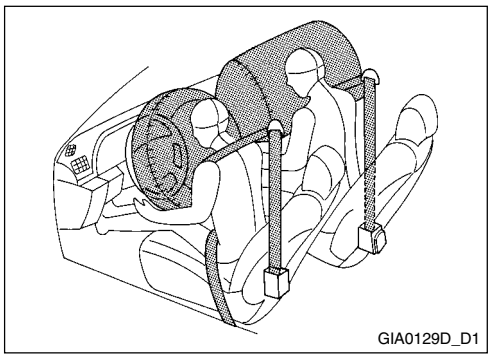
SRS Airbag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SRS Airbag • Pretensioner Seatbelt

The driver and passenger's SRS (Supplemental Restraint System) airbag that is employed with the pretensioner seatbelt helps diminish the facial impact of both driver and passenger during frontal crash.

The driver and passenger's SRS side airbag, with the aid of seatbelt, stiff body structure and energy-absorbing doors, also helps diminish the facial and chest impact.

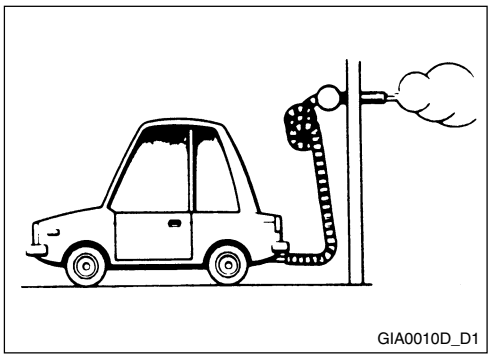
The SRS airbag and pretensioner seatbelt system consists of driver airbag module (in center of steering wheel), passenger airbag module (in passenger's instrument panel), front side airbag modules (outer location of front seats), pretensioner seatbelt, airbag sensor unit, spiral cable, side sensor, and warning light.

Refer to "RS Restraint System" in this service manual for safe airbag system service.

WARNING:

- **To install/remove the SRS airbag, pretensioner seatbelt system related components and harness, turn the ignition switch "OFF", disconnect the battery terminals and wait over 3 minutes. (This is to discharge all the remaining electricity in the airbag sensor unit's auxiliary power circuit.)**
- **Do not use air impact or electrical tools when installing/ removing the components.**
- **Do not use any hand-held tools for harness used in SRS airbag and pretensioner seatbelt systems. Be careful with the harness not to tangle with or interfere with other components.**
- **Do not use any electrical test equipments such as circuit tester when inspecting the SRS airbag and pretensioner seatbelt circuit while installed unless the Service Manual instructs to do so. (The weak current in the tester can cause the SRS airbag to operate.)**
- **Do not insert any foreign materials such as a screwdriver in the airbag module and pretensioner seatbelt connector in order to prevent unintended operation due to static electricity.**
- **The harnesses used in SRS airbag and pretensioner are covered with yellow insulation for easy identification.**
- **Refer to "RS Restraint System" in this Service Manual for safe airbag system service information.**

General Precautions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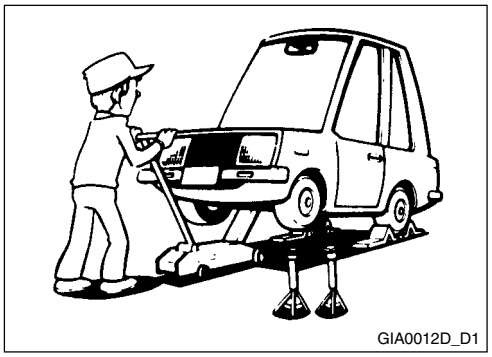
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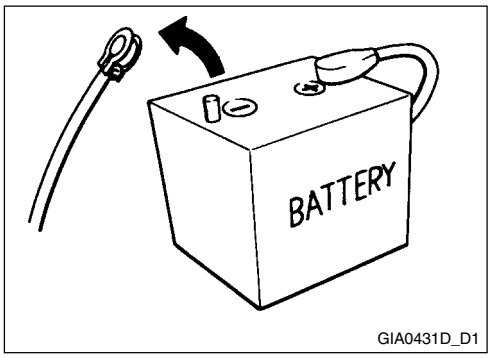

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SAFE SERVICE

- Do not work while engine is running when there are no proper air ventilation against exhaust gases.
- Keep the work site well ventilated and remove inflammable materials. Be extra careful when working with inflammables or poisonous materials such as gasoline or refrigerant.
- Dispose of used engine oils and other used cleansing liquids according to the local laws.
- Be careful not to get burnt or hurt when working on hot or moving parts.
- Place wheel blocks or tires to prevent the vehicle from moving before lifting the vehicle with the garage jack.
- After lifting the vehicle, place supporting objects under the vehicle to hold it firm.
- Hold or support the heavy components firmly such as the engine or suspension parts when removing them.
- When there is no need of the battery power, always place the ignition switch at “OFF” position and disconnect the battery ground (-) terminal in order to prevent an unwanted short circuit.

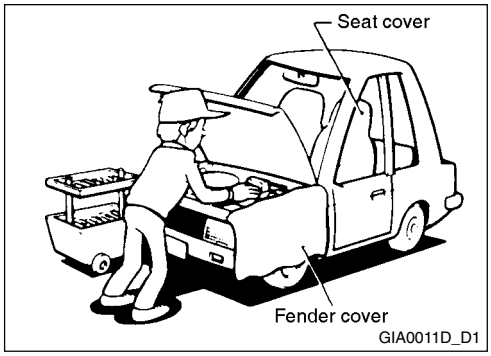
CAUTION:

- **When battery terminal is disconnected, all the memories in the radio and control units will be erased.**
- Do not touch hot components such as radiator, exhaust manifold and muffler to prevent from burning your skin. When engine is hot, do not remove any radiator components such as the radiator cap until it cools down completely.
- Use designated tools or special tools for safe and effective service.
- When fuel dispenser nozzle stops automatically while fueling in the gas station, do not attempt to overfill the fuel tank. If so, it may lead to fire due to fuel overflow.

General Precautions (Cont'd)

CORRECT SERVICE

- Operate effectively by fully understanding and diagnosing the trouble symptom.
- Be sure of the fully assembled components before performing any disassemble and removal. If need, mark on the part not to affect normal operating functions.
- When removing oil seals, gaskets, packing, O-rings, locking washers, cotter pins, self-locking nuts, replace them with new parts when instructed (when re-use is not allowed).
- Both inner and outer taper roller bearing and needle bearing should be replaced.
- Place the removed parts in order in which they were removed.
- Clean the removed parts with cleaning solutions or solvents and then perform inspection or assembly.
- The NISSAN genuine parts must be used when replacing the components.
- Use designated paper gasket and sealant.
- Release all the remaining pressure inside the pipes and hoses before removing them.
- When working on the fuel, oil, coolant, exhaust and vacuum systems, check if any of their system is wet.



VEHICLE PROTECTION

- Use fender covers, seat covers, steering wheel covers and paper mats to prevent the vehicle from getting dirty.

Precautions in Wireless System Installation

The installation of business or personal wireless or cellular phones may cause trouble to electronic control systems according to their installed locations. Be sure to check the following criteria before performing any installations.

- Place the antenna as far as possible from the ECCS control unit.
- Place the antenna feeder line no less then 20 cm from the control unit harness.
- Adjust the antenna and feeder lines so that there is no jamming.
- Be sure to check the vehicle's radio ground wire.

How to Use This Manual

General

This section explains about “removal, disassembly, assembly, installation, inspection, adjustment and trouble diagnosis”.

Definition of Terms

WARNING: When instructions are not properly followed, death or serious injuries may occur.

CAUTION: When instructions are not properly followed, vehicle damage or personal injuries may occur.

REFERENCE: Useful explanations for easy service.

Standard Value: The permitted range in inspection and adjustment.

Limit Value: The maximum and minimum values never to be exceeded during inspection and adjustment.

Definition of Units

This manual uses N•m (kgf-m) for tightening torque.

“Example”

Tightening Torque:

58.8 - 78.4 N•m (6.0 - 8.0 kgf-m)

Alternative Units

Item	SI unit	Conventional unit	To convert to SI unit
Acceleration	m/s^2	G	9.80665
Torque, Moment	N•m	kgf-m	9.80665
Power	N	kgf	9.80665
Pressure	MPa	kgf/cm^2	0.0980665
	kPa	mmHg	0.133322
Work efficiency,	k W	PS	0.735499
Power efficiency	W	kcal/h	1.16279
Volume	cm^3	cc	1
Spring coefficient	N/mm	kgf/mm	9.80665
Fuel consumption ratio	※g/kW•h	g/PS•h	1.3596

※ The conventional unit can be used as SI unit.

Manual Description Order

Precautions: Describes caution details at the beginning of each section.

Preparation: Describes details at the beginning of each section and trouble diagnosis regarding special tools and gauges that need to be prepared before work. However, general service tools are excluded.

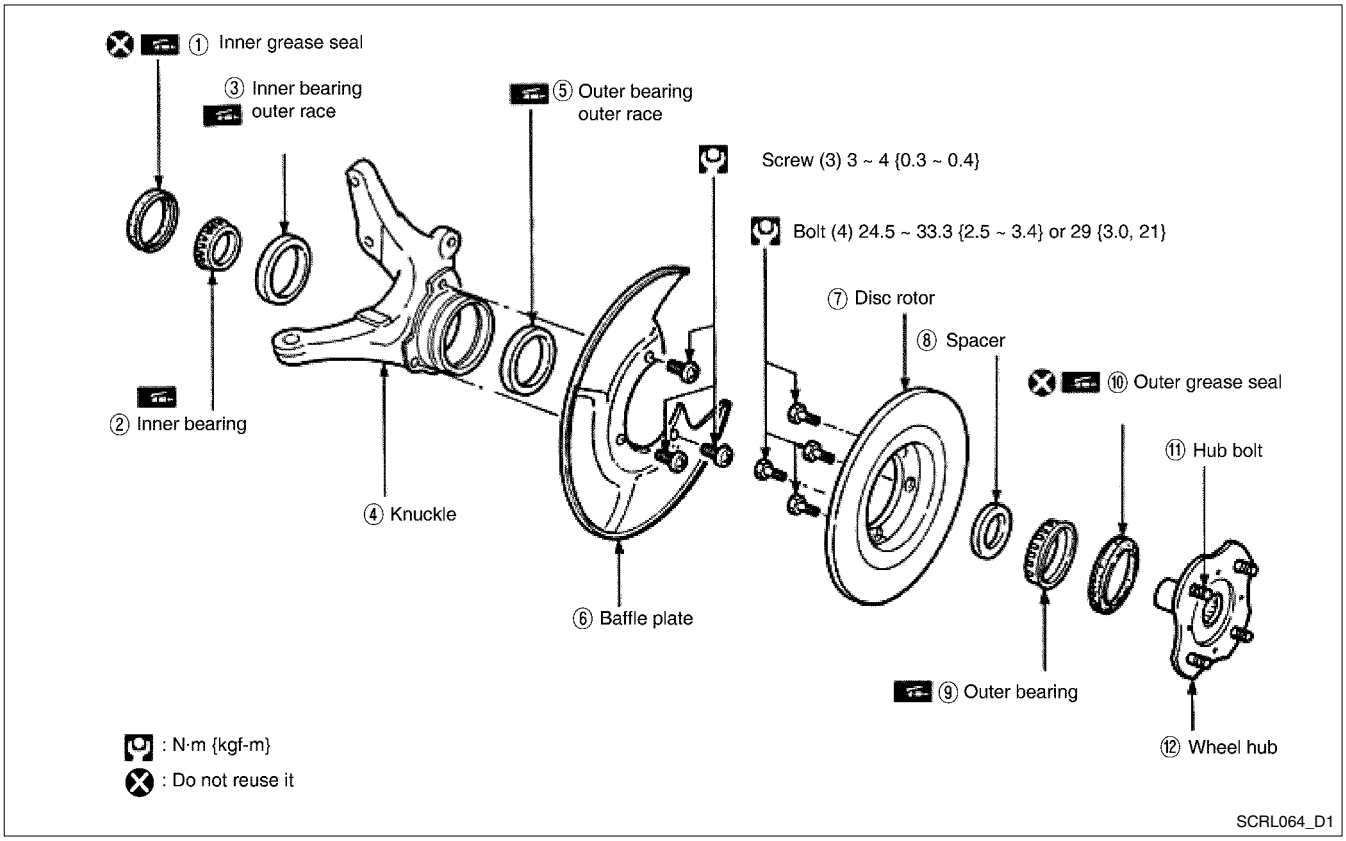
Description: All the service instructions, notes, special tools and other service information needed for each appropriate service is described in.

CAUTION:

- **Visual inspection and cleaning of removed parts are not described in this manual since they are fundamental operations. Be sure to perform these operations.**

Components Diagram

The components diagram (see illustration) contains informational notes such as installation/removal, tightening torque on disassembly/assembly, lubrication points and parts should not be reused.



Symbols

Symbol	Description	Symbol	Description
	The part should be tightened with specified torque and its tightening torque. When the specified torque is△-△ N•m (○-○ kgf-m), the standard torque will be the mean value.		Always replace after every disassembly.
	Apply grease. Unless otherwise indicated, use recommended multi-purpose grease.	Petrolatum	Apply petroleum jelly.
	Lubrication point. The location where lubricant should be applied.	★	Select with proper thickness.
	Sealing point.	☆	Adjustment needed.
	Checking point.		

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Trouble Diagnosis

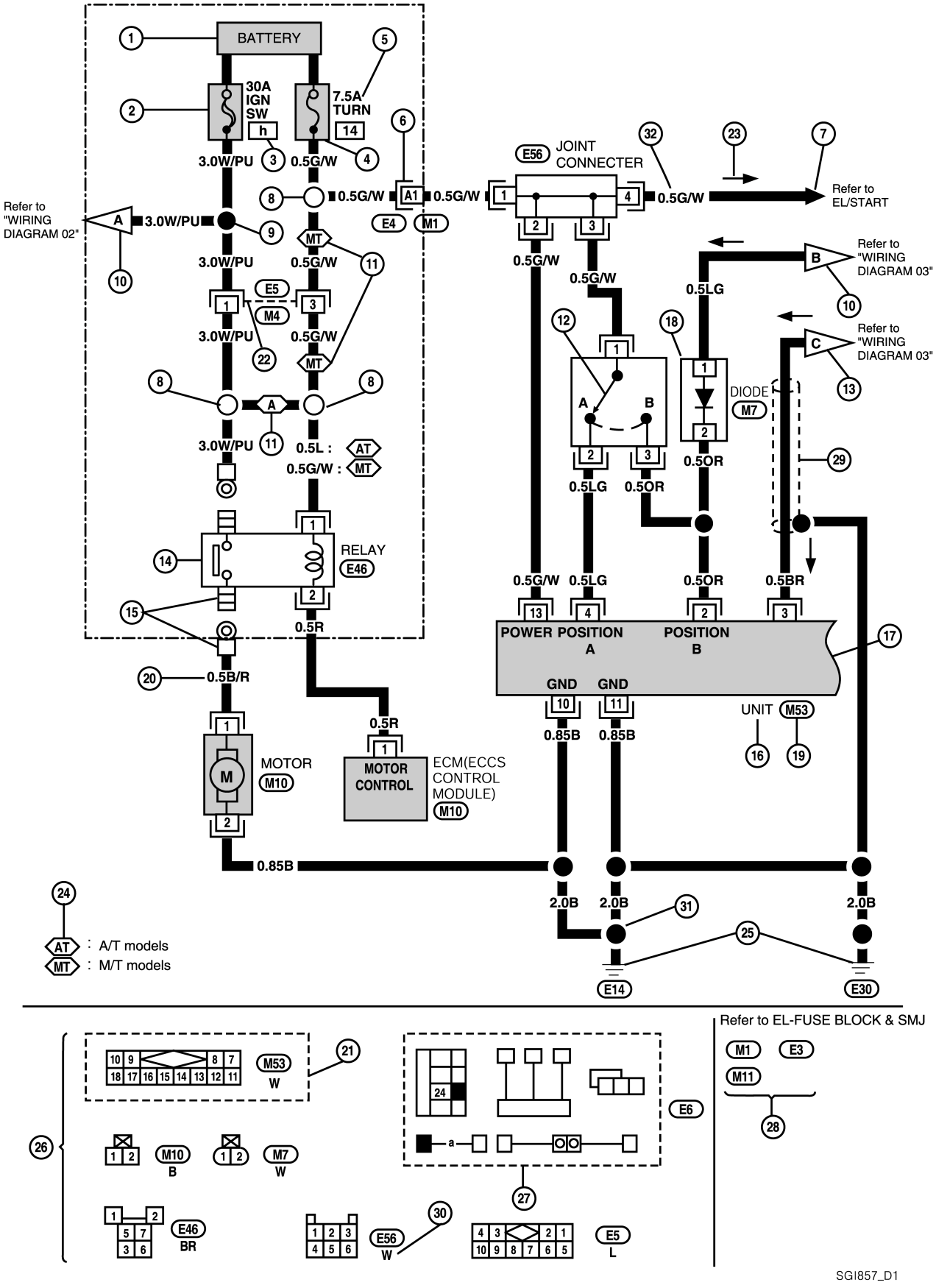
CAUTION:

The trouble diagnosis tells the sequence where trouble cause is effectively found. When executing the trouble diagnosis, refer to the following.

- **Read "General Inspection" and "Troubleshooting Table by Symptoms" before executing the trouble diagnosis.**
- **After repair, check whether functional defectives are removed.**
- **Refer to each section's "Component Location" for location of parts and harness connectors.**
- **Use circuit diagram for simple inspection. For detailed inspection including sub-harnesses, use wiring diagram to check the harness layout by identifying the connectors.**
- **Always place the ignition switch "OFF" when inspecting the circuit.**
- **Measure the battery voltage before checking the connector voltage.**
- **After finishing the diagnosis or inspection, check whether all the harness connectors are in original position.**

How to Read Wiring Diagrams

1. Sample/Wiring Diagram - EXAMPLE -



How to Read Wiring Diagrams (Cont'd)

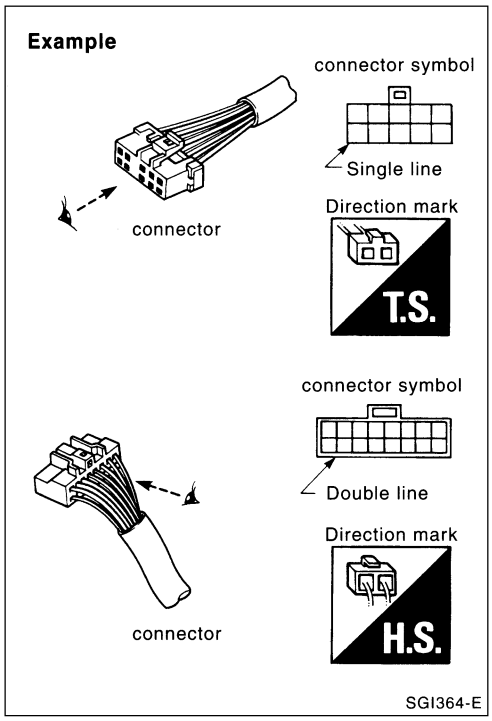
2. Description

Number	Item	Description
1	Power condition	● This shows the condition when the system receives battery positive voltage (can be operated).
2	Fusible link	● The double line shows that this is a fusible link. ● The open circle shows current flow in, and the shaded circle shows current flow out.
3	Fusible link/fuse location	● This shows the location of the fusible link or fuse in the fusible link or fuse box. For arrangement, refer to "FUSE BLOCK-JUNCTION BLOCK (J/B)" (WH-183).
4	Fuse	● The single line shows that this is a fuse. ● The open circle shows current flow in, and the shaded circle shows current flow out.
5	Current rating	● This shows the current rating of the fusible link of fuse.
6	Connectors	● This shows that connector E3 is female and connector M1 is male. ● The 0.5G/R wire is located in the A1 terminal of both connectors. ● Terminal number with an alphabet (A1, B5, etc.) indicates that the connector is SMJ connector. Refer to GI-13.
7	System branch	● This show that the system branches to another system identified by cell code. (section and system)
8	Optional Splice	● The open circle shows that the splice is optional depending on vehicle application.
9	Splice	● The shaded circle shows that the splice is always on the vehicle.
10	Page crossing	● This arrow shows that the circuit continues to an adjacent page. ● The A will match with the A on the preceding or next page.
11	Option abbreviation	● This shows that the circuit is optional depending on vehicle application.
12	Switch	● This shows that continuity exists between terminals 1 and 2 when the switch is in the A position. Continuity exists between terminals 1 and 3 when the switch is in the B position.
13	Page crossing	● This arrow shows that the circuit continues to an adjacent page.
14	Relay	● This shows an internal representation of the relay. For details, refer to "ELECTRICAL UNIT LOCATION" (WH-166).
15	Connectors	● This shows that the connector is connected to the body or a terminal with bolt or nut.
16	Component name	● This shows the name of a component.
17	Component box in wave line	● This shows that another part of the component is also shown on another page (indicated by wave line) within the system.
18	Assembly parts	● Connector terminal in component shows that it is a harness incorporated assembly.
19	Connector number	● This shows the connector number. ● The letter shows which harness the connector is located in. Example: M: main harness. For detail and to locate the connector, refer to "HARNESS LAYOUT" (WH-171). A coordinate grid is included for complex harnesses to aid in locating connectors.

How to Read Wiring Diagrams (Cont'd)

Number	Item	Description
20	Wire color	● This shows a code for the color of the wire. B = Black BR = Brown W = White OR = Orange R = Red P = Pink G = Green PU = Purple L = Blue GY = Gray Y = Yellow SB = Sky Blue LG = Light Green CH = Dark Brown DG = Dark Green When the wire color is striped, the base color is given first, followed by the stripe color as shown below: Example: L/W = Blue with White Stripe
21	Common component	● Connectors enclosed in broken line show that these connectors belong to the same component
22	Common connector	● The dotted lines between terminals show that these terminals are part of the same connector.
23	Current flow arrow	● Arrow indicates electric current flow, especially where the direction of standard flow (vertically downward or horizontally from left to right) is difficult to follow. ● A double arrow "⇔" shows that current can flow in either direction depending on circuit operation.
24	Option description	● This shows a description of the option abbreviation used on the page.
25	Ground (GND)	● This shows the ground connection.
26	Connector component	● This area shows the connector faces of the components in the wiring diagram on the page.
27	Fusible link and fuse box	● This shows the arrangement of fusible link(s), used for connector views of "FUSE BLOCK-JUNCTION BLOCK (J/B)" (WH-183). The open square shows current flow in, and the shaded square shows current flow out. This is the same meaning as open circle and shaded circle of No. 2 and No. 4.
28	Reference area	● This shows that more information on the Super Multiple Junction (SMJ) and Joint Connectors (J/C) exists on the foldout page.
29	Shielded line	● The line enclosed by broken line circle shows shield wire.
30	Connector color	● This shows a code for the color of the connector. For code meaning, refer to wire color codes, Number 20 of the chart.
31	Ground (GND)	● The line spliced and grounded under wire color shows that ground line is spliced at the grounded connector.

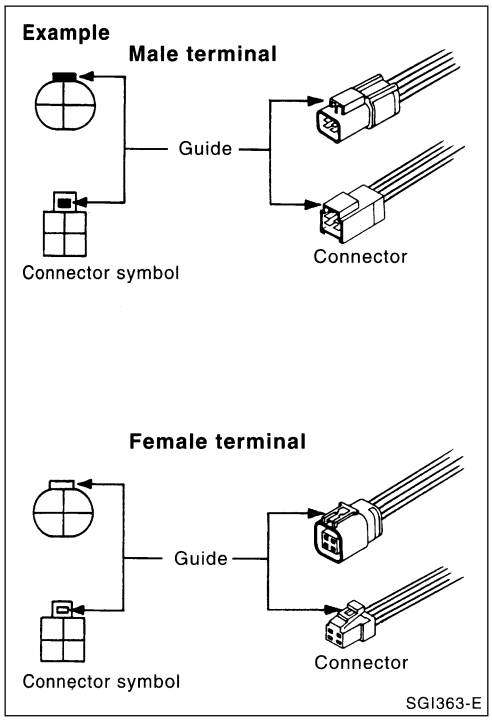
How to Read Wiring Diagrams (Cont'd)



2-1. CONNECTOR SYMBOLS

Most of connector symbols in wiring diagrams are shown from the terminal side.

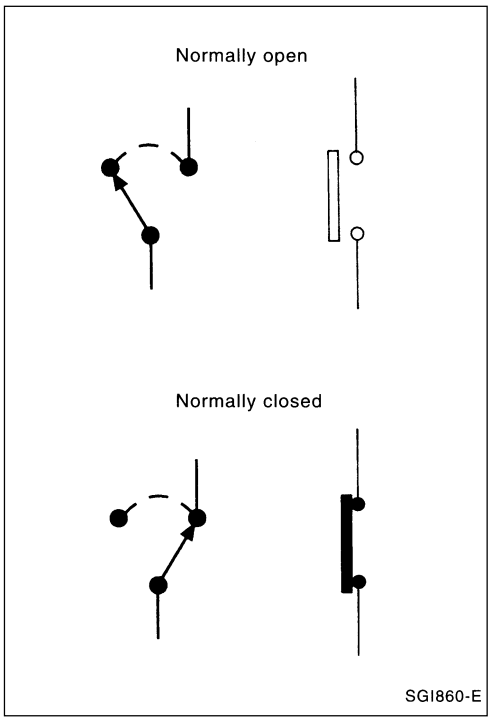
- Connector symbols shown from the terminal side are enclosed by a single line and followed by the direction mark (T.S.).
- Connector symbols shown from the harness side are enclosed by a double line and followed by the direction mark (H.S.).



- Male and female terminals

  Connector guides for male terminals are shown in black and female terminals in white in wiring diagrams.

How to Read Wiring Diagrams (Cont'd)



2-2. SWITCH POSITIONS

Switches are shown in wiring diagrams as if the vehicle is in the "normal" condition

A vehicle is in the "normal" condition when:

- ignition switch is "OFF",
- doors, hood and trunk lid/back door are closed,
- pedals are not depressed, and
- parking brake is released.

2-3. MULTIPLE SWITCH

The continuity of multiple switch is described in two ways as shown below.

- The switch chart is used in schematic diagrams.
- The switch diagram is used in wiring diagrams.

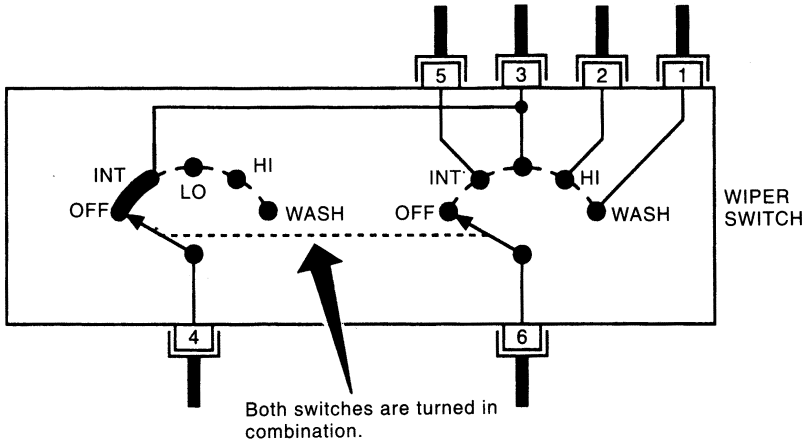
Example

(SWITCH CHART)

WIPER SWITCH

	OFF	INT	LO	HI	WAS
1					○
2				○	
3	○	○	○		
4	○	○			
5		○			
6		○	○	○	○

(SWITCH DIAGRAM)



Continuity circuit of wiper switch

SWITCH POSITION	CONTINUITY CIRCUIT
OFF	3-4
INT	3-4, 5-6
LO	3-6
HI	2-6
WASH	1-6

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How to Read Wiring Diagrams (Cont'd)

2-4. FOLDOUT PAGE

The foldout page should be opened when reading wiring diagram.

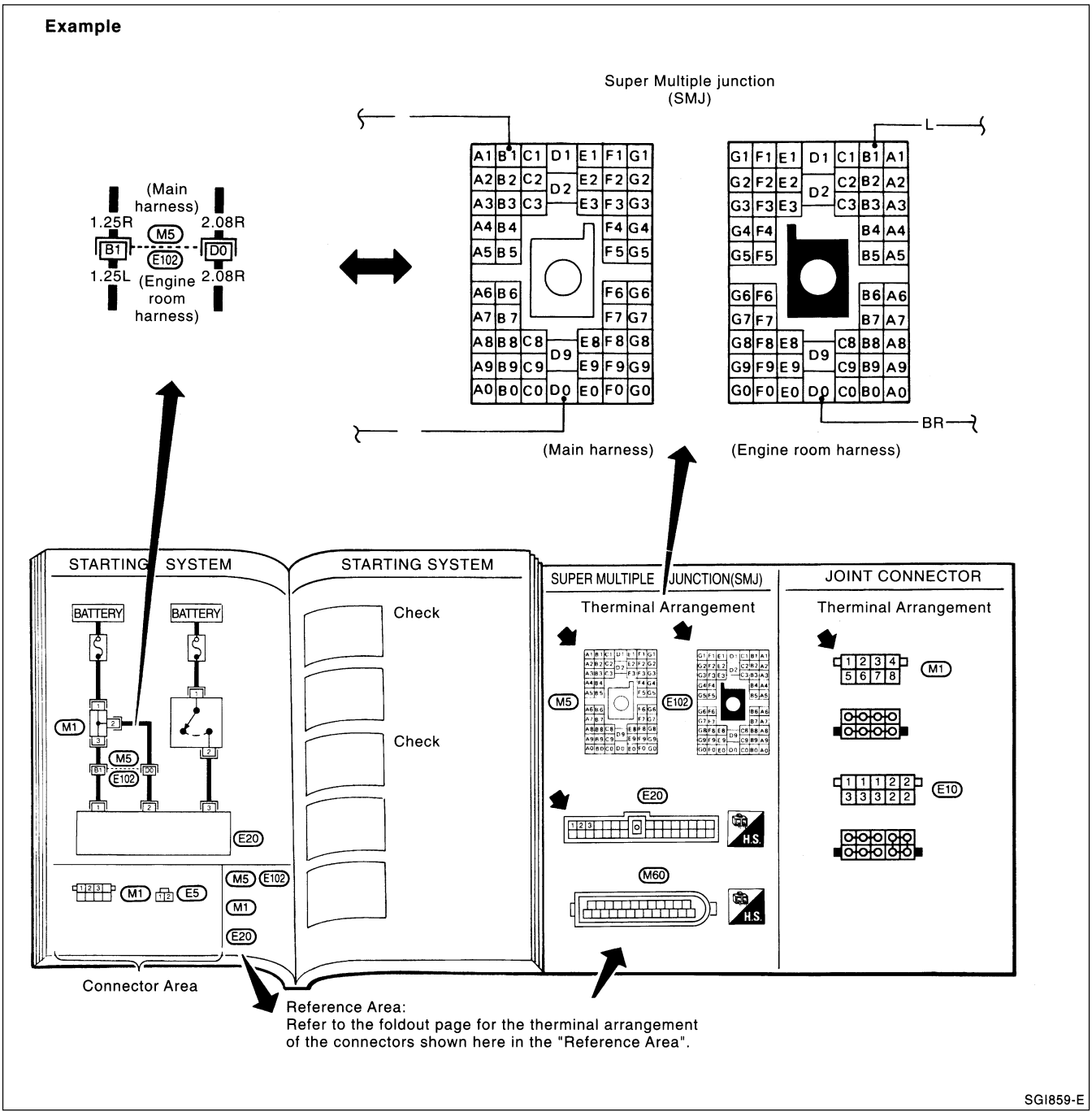
2-5. SUPER MULTIPLE JUNCTION (SMJ)

In wiring diagram, connectors consisting of terminals having terminal numbers with an alphabet (B1, D0, etc.) are SMJ connectors.

If connector numbers are shown in Reference Area, these connector symbols are not shown in Conector Area. For terminal arrangement of these connectors, refer to the foldout page at the end of this manual.

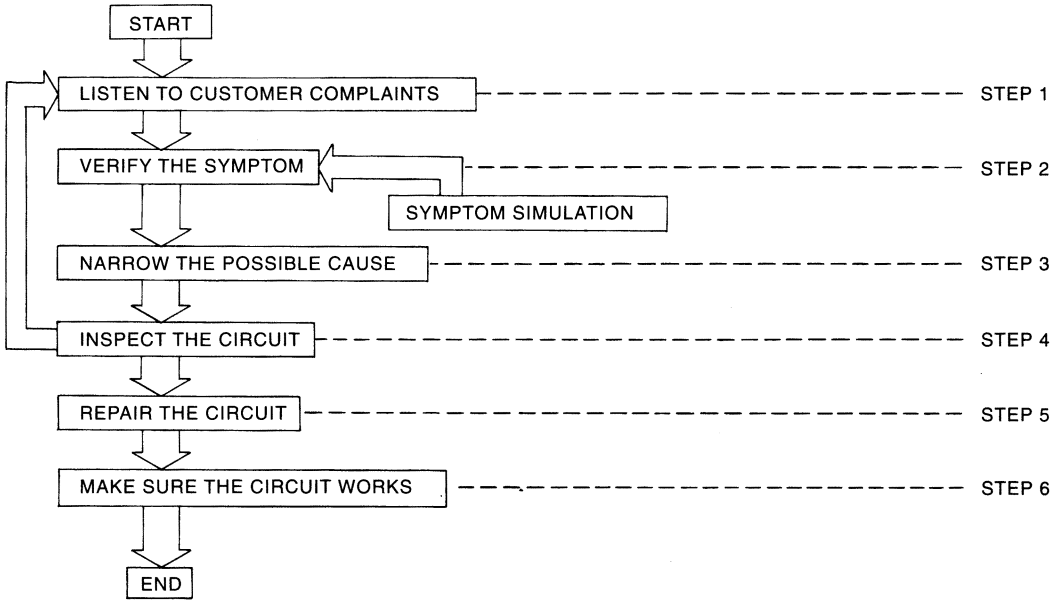
2-6. JOINT CONNECTOR

Joint connector symbols are shown in Connector Area in the wiring diagram concerned. Foldout page also carries inside wiring layout together with such joint connector symbols.



How to Perform Efficient Diagnosis for an Electrical Incident

1. Work Flow



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STEP	DESCRIPTION
STEP 1	Get detailed information about the conditions and the environment when the incident occurred. The following are key pieces of information required to make a good analysis: **WHAT** Vehicle Model, Engine, Trans Axle and the System, etc. (i.e. Radio) **WHEN** Date, Time of Day, Weather conditions, Frequency. **WHERE** Road Conditions, Altitude and Traffic Situation. **HOW** System Symptoms, Operating Conditions, (Other Components Interaction) Service History and if any After Market Accessories have been installed.
STEP 2	Operate the system, road test if necessary. Verify the parameter of the incident. If the problem can not be duplicated, refer to “Incident Simulation Tests” next page.
STEP 3	Get the proper diagnosis materials together including: ● POWER SUPPLY ROUTING ● System Operation Descriptions ● Applicable Service Manual Sections ● Available Service Bulletin Identify where to begin diagnosis based upon your knowledge of the system operation and the customer comments.
STEP 4	Inspect the system for mechanical binding, loose connectors or wiring damage. Determine which circuits and components are involved and diagnose using the Power Supply Routing and Harness Layouts.
STEP 5	Repair or replace the incident circuit or component.
STEP 6	Operate the system in all modes. Verify the system works properly under all conditions. Make sure you have not inadvertently created a new incident during your diagnosis or repair steps.

2. Incident Simulation Tests

2-1. INTRODUCTION

Sometimes the symptom is not present when the vehicle is brought in for service If possible, recreate the conditions present at the time of the incident. Doing so may help avoid a No Trouble Found Diagnosis. The following section illustrates ways to simulate the conditions/environment under which the owner experiences an electrical incident.

The section is broken into the six following topics:

- Vehicle Vibration
- Heat sensitive
- Freezing
- Water Intrusion
- Electrical load
- Cold or hot start up

Get a thorough description of the incident from the customer. It is important for simulating the conditions of the problem.

2-2. VEHICLE VIBRATION

The problem may occur or become worse while driving on a rough road or when engine is vibrating (idle with A/C on). In such a case, you will want to check for a vibration related condition. Refer to the illustration below.

2-3. CONNECTORS & HARNESS

Determine which connectors and wiring harness would affect the electrical system you are inspecting. Gently shake each connector and harness while monitoring the system for the incident you are trying to duplicate. This test may indicate a loose or poor electrical connection.

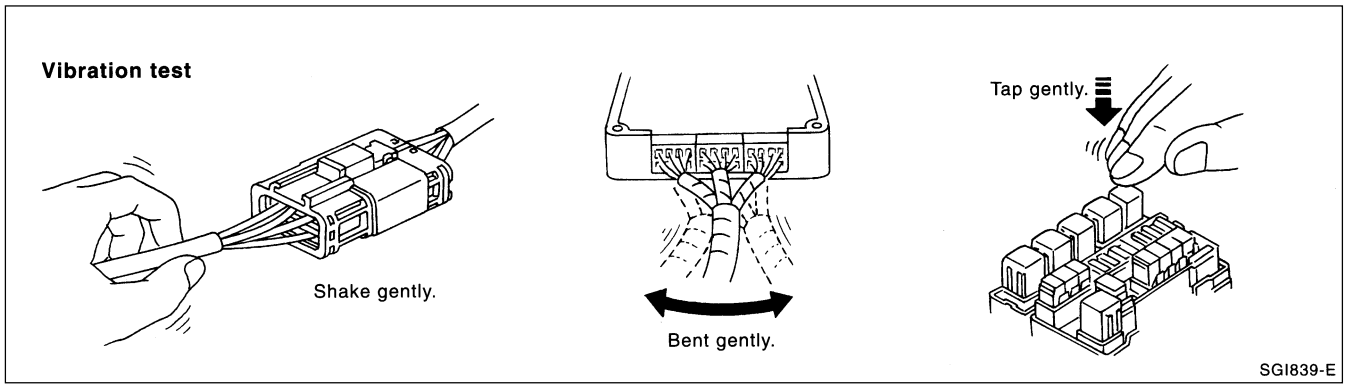
2-4. HINT

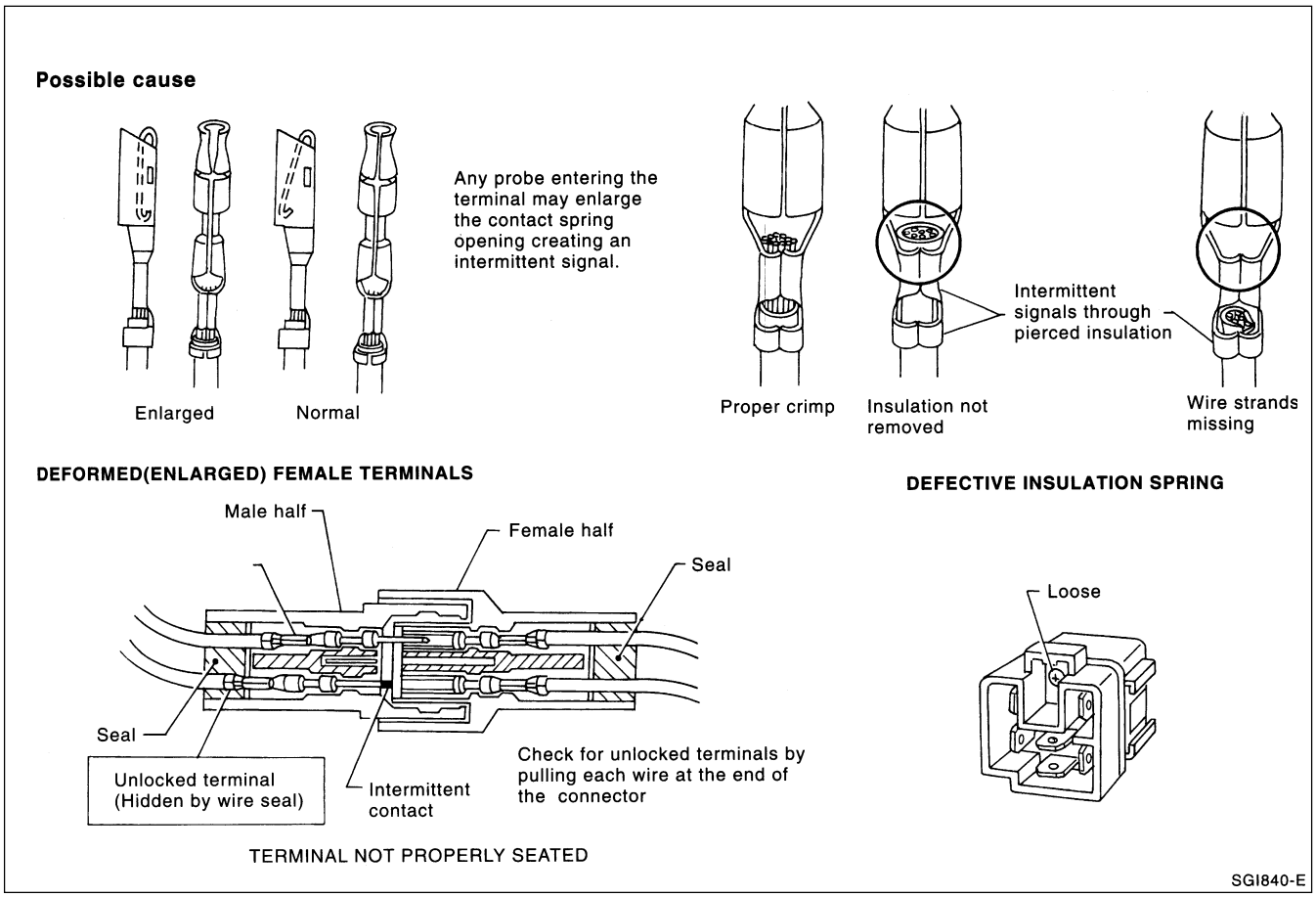
Connectors can be exposed to moisture. It possible to get a thin film of corrosion on the connetctor terminals. A visual inspection may not reveal this without disconnecting the connector. If the problem occurs intermittently, perhaps the problem is caused by corrosion. It is a good idea to disconnect, inspect and clean the terminals on related connectors in the system.

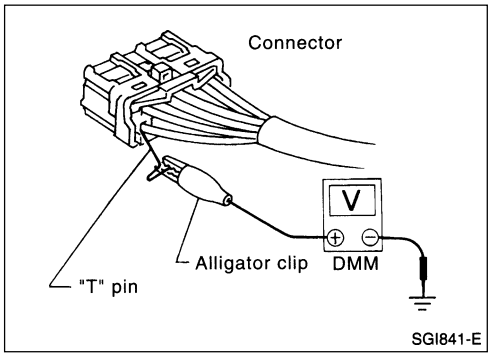
2-5. SENSORS & RELAYS

Gently apply a slight vibration to sensors and relays in the system you are inspecting.

This test may indicate a loose or poorly mounted sensor or relay.







2-6. TESTER PROBE

When probing a connector it is possible to enlarge the contact spring opening If this occurs it may create an intermittent signal in the circuit. When probing a connector, use care not to enlarge the opening. The probe of the Digital Multimeter (DMM) may not fit into the connector cavity. In such cases make an extension of a “T” pin and probe it from the harness side of the connector. Most DMMs have accessory alligator clips. Slide these over the probe to allow clipping the “T” pin for a better contact. If you have any difficulty probing a terminal, inspect the terminal. Ensure you have not accidentally opened the contact spring or pulled a wire loose.

2-7. ENGINE COMPARTMENT

There are several reasons a vehicle or engine vibration could cause an electrical complaint. Some of the things to check for are:

- Connectors not got near diagnosis probe.
- Connectors not fully seated.
- Wiring harness not long enough and is being stressed due to engine vibrations or rocking.
- Wires laying across brackets or moving components.
- Loose, dirty or corroded ground wires.
- Wires routed too close to hot components.

To inspect components under the hood, start by verifying the integrity of ground connections. Refer to GROUND INSPECTION (GI-21). First check that the system is properly grounded.

Then check for loose connection by gently shaking the wiring or components as previously explained. Using the wiring diagrams inspect the wiring for continuity.

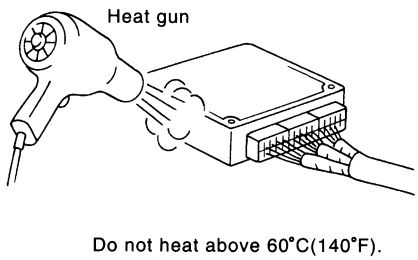
2-8. BEHIND THE INSTRUMENT PANEL

An improperly routed or improperly clamped harness can become pinched during accessory installation. Vehicle vibration can aggravate a harness which is routed along a bracket or near a screw.

2-9. UNDER SEATING AREAS

An unclamped or loose harness can cause wiring to be pinched by seat components (such as slide guides) during vehicle vibration. If the wiring runs under seating areas, inspect wire routing for possible damage or pinching.

Heating test

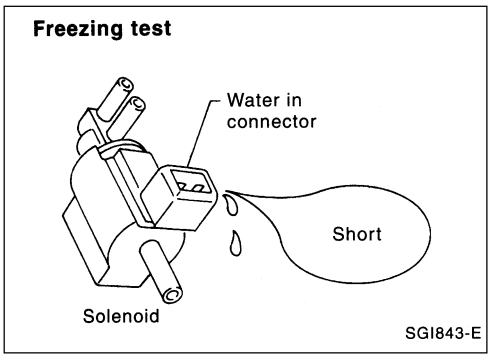


2-10. HEAT SENSITIVE

The owner's problem may occur during hot weather or after car has sat for a short time. In such cases you will want to check for a heat sensitive condition.

To determine if an electrical component is heat sensitive, heat the component with a heat gun or equivalent.

Do not heat components above 60°C (140°F). If incident occurs while heating the unit, either replace or properly insulate the component.

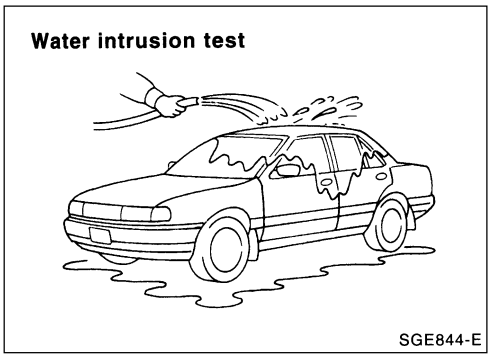


2-11. FREEZING

The customer may indicate the incident goes away after the car warms up (winter time). The cause could be related to water freezing somewhere in the wiring/electrical system.

There are two methods to check for this. The first is to arrange for the owner to leave his car overnight. Make sure it will get cold enough to demonstrate his complaint. Leave the car parked outside overnight. In the morning, do a quick and thorough diagnosis of those electrical components which could be affected.

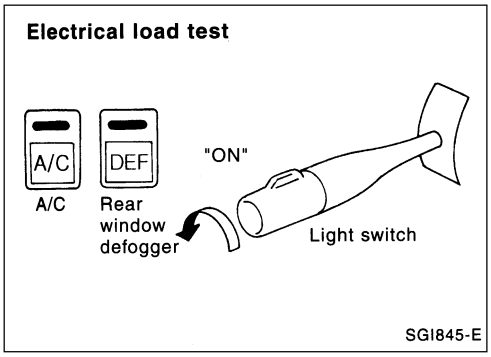
The second method is to put the suspect component into a freezer long enough for any water to freeze. Reinstall the part into the car and check for the reoccurrence of the incident. If it occurs, repair or replace the component.



2-12. WATER INTRUSION

The incident may occur only during high humidity or in rainy/snowy weather. In such cases the incident could be caused by water intrusion on an electrical part. This can be simulated by soaking the car or running it through a car wash.

Do not spray water directly on any electrical components.



2-13. ELECTRICAL LOAD

The incident may be electrical load sensitive. Perform diagnosis with all accessories (including A/C, rear window defogger, radio, fog lamps) turned on.

2-14. COLD OR HOT START UP

On some occasions an electrical incident may occur only when the car is started cold. Or it may occur when the car is restarted hot shortly after being turned off. In these cases you may have to keep the car overnight to make a proper diagnosis.

3. Circuit Inspection

3-1. INTRODUCTION

In general, testing electrical circuits is an easy task if it approached in a logical and organized method. Before beginning it is important to have all available information on the system to be tested.

Also, get a thorough understanding of system operation. Then you will be able to use the appropriate equipment and follow the correct test procedure.

You may have to simulate vehicle vibrations while testing electrical components. Gently shake the wiring harness or electrical component to do this.

OPEN A circuit is open when there is no continuity through a section of the circuit.

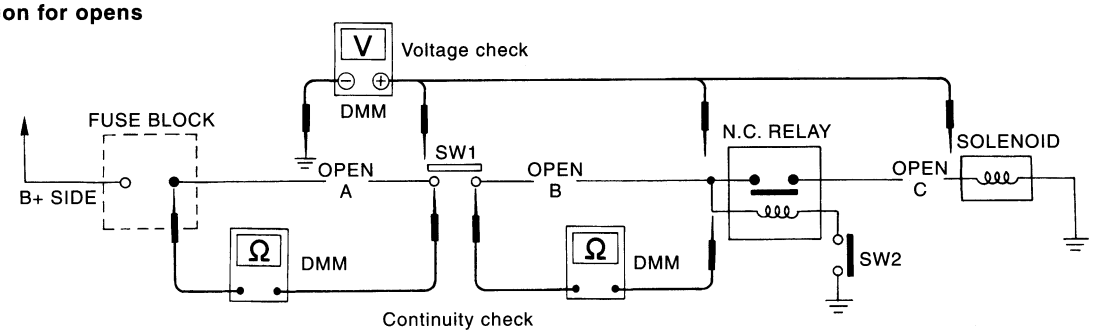
SHORT There are two types of shorts.

- SHORT CIRCUIT When a circuit contacts another circuit and causes the normal resistance to change.
- SHORTTOGROUND When a circuit contacts a ground source and grounds the circuit.

3-2. TESTING FOR "OPENS" IN THE CIRCUIT

Before you begin to diagnose and test the system, you should rough sketch a schematic of the system. This will help you to logically walk through the diagnosis process. Drawing the sketch will also reinforce your working knowledge of the system.

Inspection for opens



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3-3. CONTINUITY CHECK METHOD

The continuity check is used to find an open in the circuit, The Digital Multimeter (DMM) set on the resistance function will indicate an open circuit as over limit. (OL, no beep tone or no ohms symbol)

Make sure to always start with the DMM at the highest resistance level.

To help in understanding the diagnosis of open circuits please refer to the schematic above.

1. Disconnect the battery negative cable.
2. Start at one end of the circuit and work your way to the other end. (At the fuse block in this example)
3. Connect one probe of the DMM to the fuse block terminal on the load side.
4. Connect the other probe to the fuse block (power) side of SWI. Little or no resistance will indicate that portion of the circuit has good continuity. If there were an open in the circuit, the DMM would indicate an over limit or infinite resistance condition. (point A)
5. Connect the probes between SWI and the relay. Little or no resistance will indicate that portion of the circuit has good continuity. If there were an open in the circuit, the DMM would indicate an over limit or infinite resistance condition. (point B)
6. Connect the probes between the relay and the solenoid. Little or no resistance will indicate that portion of the circuit has good continuity If there were an open in the circuit, the DMM would indicate an over limit or infinite resistance condition. (point C)

   Any circuit can be diagnosed using the approach in the above example.

3-4. VOLTAGE CHECK METHOD

To help in understanding the diagnosis of open circuits please refer to the previous schematic.

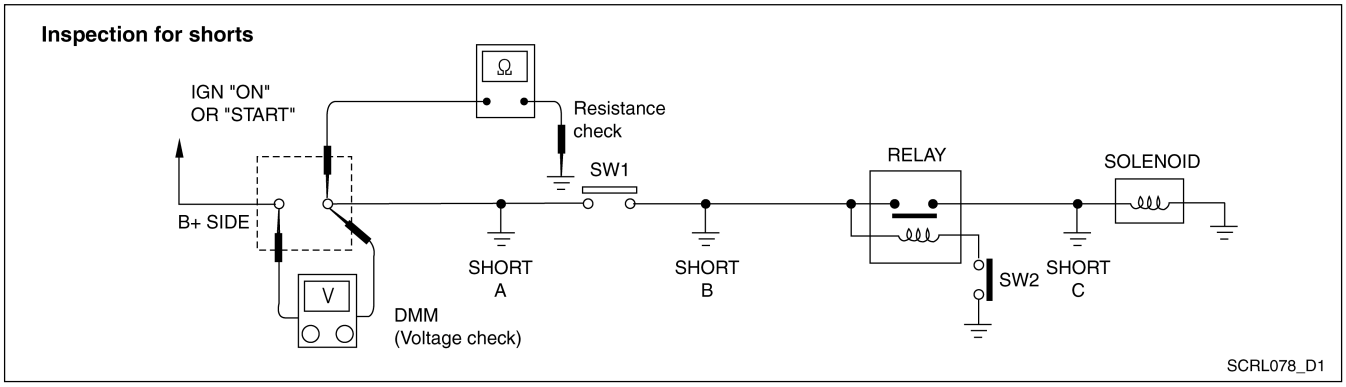
In any powered circuit, an open can be found by methodically checking the system for the presence of voltage. This is done by switching the DMM to the voltage function.

1. Connect one probe of the DMM to a known good ground.
2. Begin probing at one end of the circuit and work your way to the other end.
3. With SW1 open, probe at SW1 to check for voltage.
   - voltage; open is further down the circuit than SW1.
   - no voltage; open is between fuse block and SW1. (point A)
4. Close SW1 and probe at relay.
   - voltage; open is further down the circuit than the relay.
   - no voltage; open is between SW1 and relay. (point B)
5. Close the relay and probe at the solenoid.
   - voltage; open is further down the circuit than the solenoid.
   - no voltage; open is between relay and solenoid. (point C)

Any powered circuit can be diagnosed using the approach in the above example.

3-5. TESTING FOR "SHORT" IN THE CIRCUIT

To simplify the discussion of shorts in the system please refer to the schematic below.



3-6 RESISTANCE CHECK METHOD

1. Disconnect the battery negative cable and remove the blown fuse.
2. Disconnect all loads (SW1 open, relay disconnected and solenoid disconnected) powered through the fuse.
3. Connect one probe of the ohmmeter to the load side of the fuse terminal. Connect the other probe to a known good ground.
4. With SW1 open, check for continuity.
   - continuity; short is between fuse terminal and SW1 (point A)
   - no continuity; short is further down the circuit than SW1.
5. Close SW1 and disconnect the relay. Put probes at the load side of fuse terminal and a known good ground. Then, check for continuity.
   - continuity; short is between SW1 and the relay. (point B)
   - no continuity; short is further down the circuit than the relay.
6. Close SW1 and jump the relay contacts with jumper wire. Put probes at the load side of fuse terminal and a known good ground. Then, check for continuity.
   - continuity; short is between relay and solenoid. (point C)
   - no continuity; check solenoid, retrace steps.

3-7. VOLTAGE CHECK METHOD

1. Remove the blown fuse and disconnect all loads (i.e. SW1 open, relay disconnected and solenoid disconnected) powered through the fuse.
2. Turn the ignition key to the ON or START position. Verity battery voltage at the B + side of the fuse terminal (one led on the B + terminal side of the fuse block and on lead on a known good ground).
3. With SW1 open and the DMM leads across both fuse terminals, check for voltage.
   - voltage; short is between fuse block and SW1. (point A)
   - no voltage; short is further down the circuit than SW1.
4. With SW1 closed, relay and solenoid disconnected and the DMM leads across both fuse terminals, check for voltage.
   - voltage; short is between SW1 and the relay. (point B)
   - no voltage; short is further down the circuit than the relay.
5. With SW1 closed, relay contacts jumped with fused jumper wire check for voltage.
   - voltage; short is down the circuit of the relay or between the relay and the disconnected solenoid. (point C)
   - no voltage; retrace steps and check power to fuse block

3-8. GROUND INSPECTION

Ground connections are very important to the proper operation of electrical and electronic circuits.

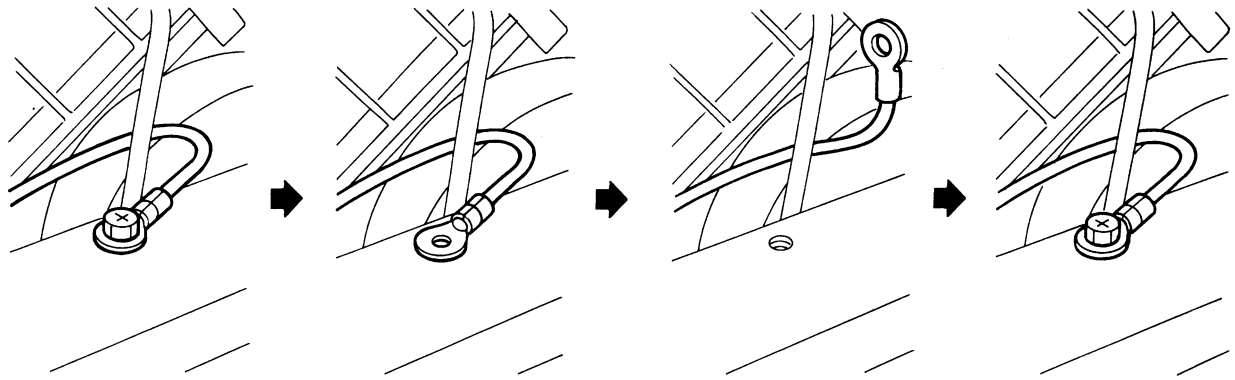
Ground connections are often exposed to moisture, dirt and other corrosive elements. The corrosion (rust) can become an unwanted resistance. This unwanted resistance can change the way a circuit works.

Electronically controlled circuits are very sensitive to proper grounding. A loose or corroded ground can drastically affect an electronically controlled circuit. A poor or corroded ground can easily affect the circuit. Even when the ground connection looks clean, there can be a thin film of rust on the surface.

When inspecting a ground connection follow these rules:

1. Remove the ground bolt screw or clip.
2. Inspect all mating surfaces for tarnish, dirt, rust, etc.
3. Clean as required to assure good contact.
4. Reinstall bolt or screw securely.
5. Inspect for “add-on” accessories which may be interfering with the ground circuit.
6. If several wires are crimped into one ground eyelet terminal, check for proper crimps, Make sure all of the wires are clean, securely fastened and providing a good ground path. If multiple wires are cased in one eyelet make sure no ground wires have excess wire insulation.

Ground Inspection



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3-9. VOLTAGE DROP TESTS

Voltage drop tests are often used to find components or circuits which have excessive resistance.

voltage drop in a circuit is caused by a resistance when the circuit is in operation.

Check the wire in the illustration. When measuring resistance with ohmmeter, contact by a single strand of wire will give reading of 0 ohms. This would indicate a good circuit. When the circuit operates, this single stand of wire is not able to carry the current. The single strand will have a high resistance to the current. This will be picked up as slight voltage drop.

Unwanted resistance can be caused by many situations as follows:

Undersized wiring (single strand example)

Corrosion on switch contacts

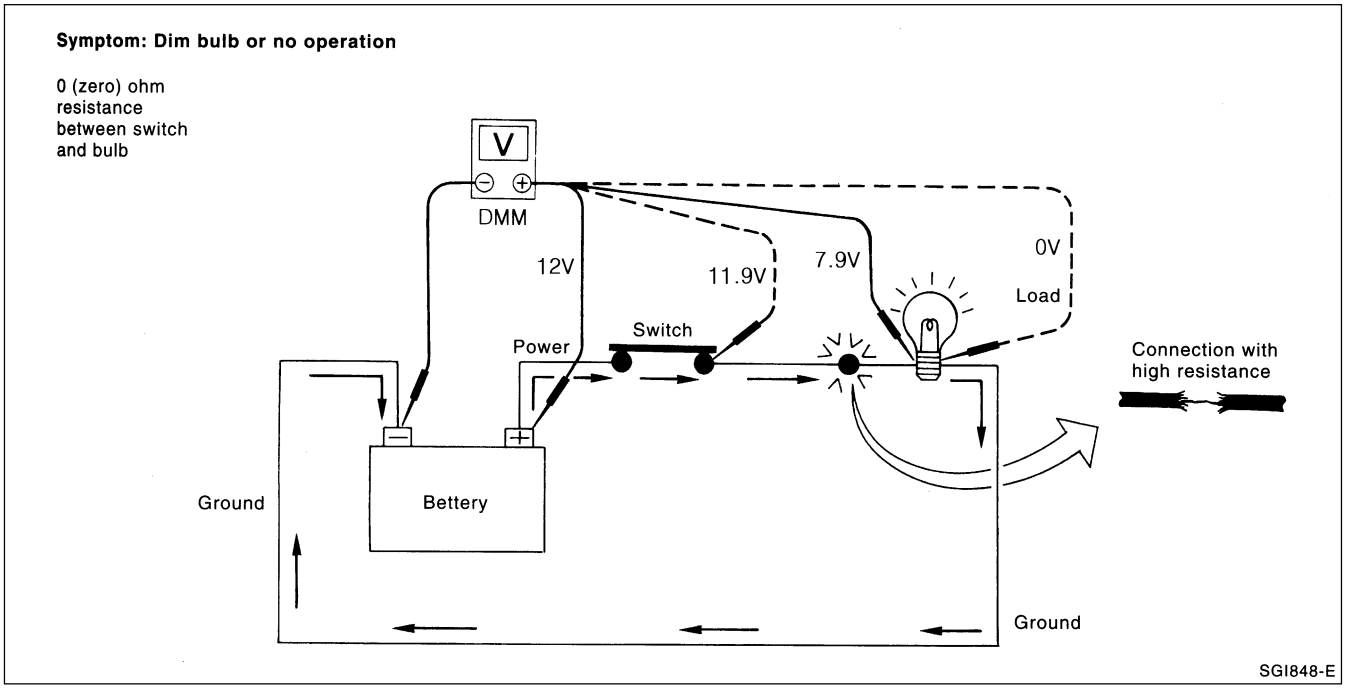
Loose wire connections or splices.

If repairs are needed always use wire that is of the same or larger gauge.

3-10. MEASURING VOLTAGE DROP - ACCUMULATED METHOD

1. Connect the voltmeter across the connector or part of the circuit you want to check. The positive lead of the voltmeter should be closer to power and the negative lead closer to ground.
2. Operate the circuit.
3. The voltmeter will indicate how manu volts are being used to “push” current through that part of the circuit.

Note in the illustration that there is an excessive 4.1 volt drop between the battery and the bulb.



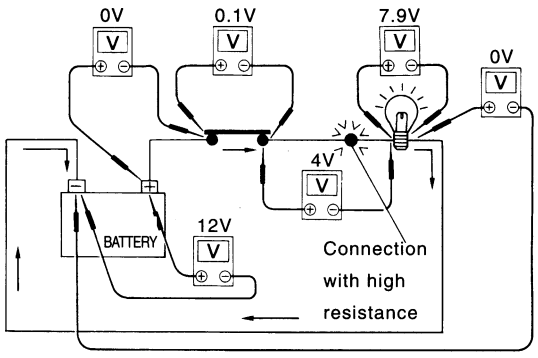
3-11. MEASURING VOLTAGE DROP - STEP BY STEP

The step by step method is most useful for isolating excessive drops in low voltage system. (such as those in “Computer Controlled System”)

Circuit in the “Computer Controlled System” operate on very low amperage.

The (Computer Controlled) system operations can be adversely affected by any variation in resistance in the system. Such resistance variation may be caused by poor connection, improper installation, improper wire gauge or corrosion.

The step by step voltage drop test can identify a component or wire with too much resistance.



1. Connect the voltmeter as shown, starting at the battery and working your way around the circut.
2. An unsually large voltage drop will indicate a component or wire that needs to be repuired. As you can see the illustration left, the poor connection causes a 4 volt drop.

The chart that follows illustrates some maximum allowable voltage drops. These values are given as a guideline, the exact value for each component vary.

COMPONENT	VOLTAGE DROP
Wire	negligible < .001 volts
Ground Connections	Approx. 0.1 volts
Switch Contacts	Approx. 0.3 volts

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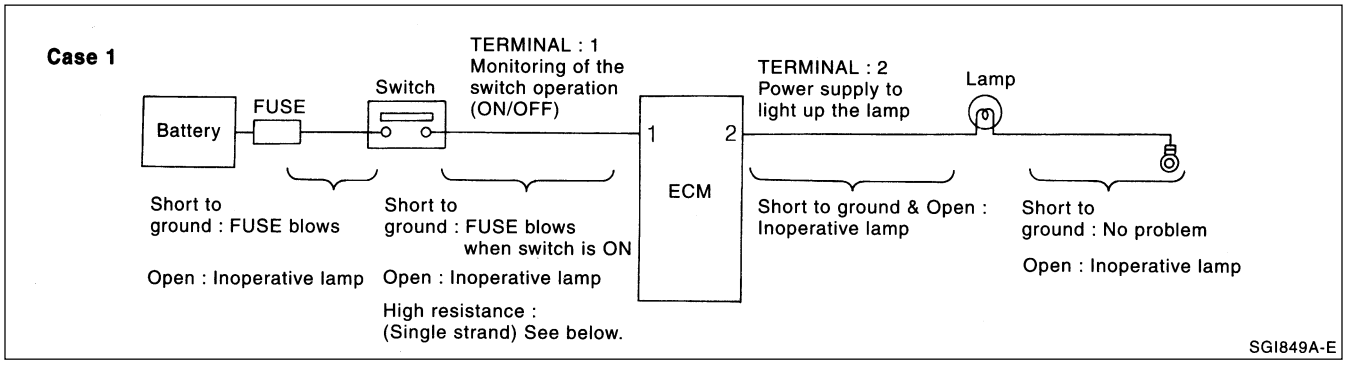
3-12. CONTROL UNIT CIRCUIT TEST

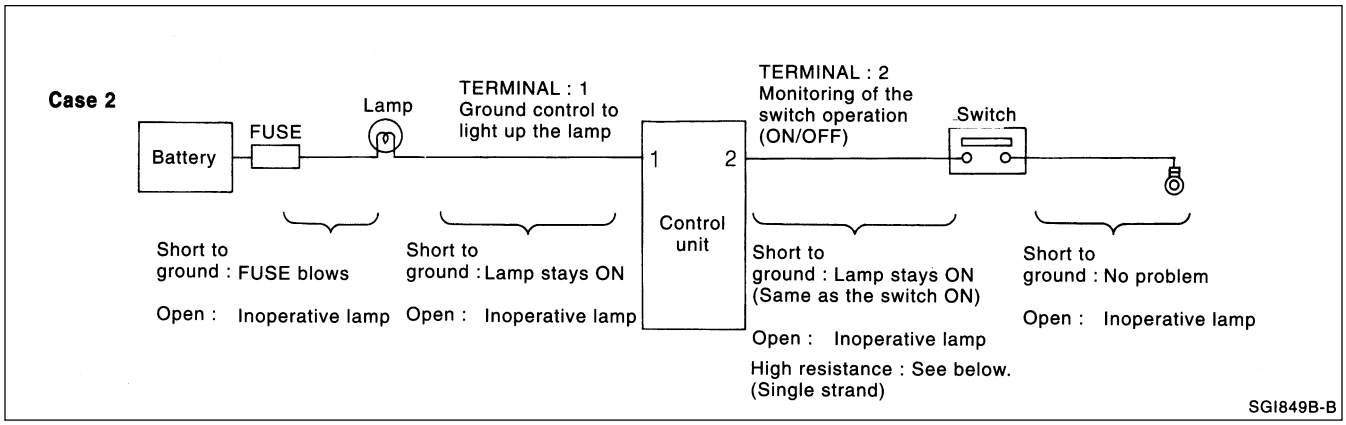
System Description: When the switch is ON, the control unit lights up the lamp.



Input-output voltage chart

Pin No.	Item	Condition	Voltage value [V]	In case of high resistance such as single strand [V] *
1	Switch	Switch	Battery	Lower than battery voltage
		ON	voltage	Approx. 8 (Example)
		OFF	Approx. 0	Approx. 0
2	Lamp	Switch	Battery	Approx. 0
		ON	voltage	(Inoperative lamp)
		OFF	Approx. 0	Approx. 0

The voltage value is based on the body ground.

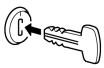
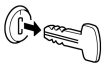
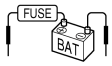
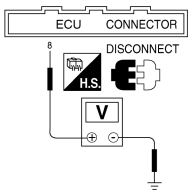
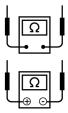


Input-output voltage chart

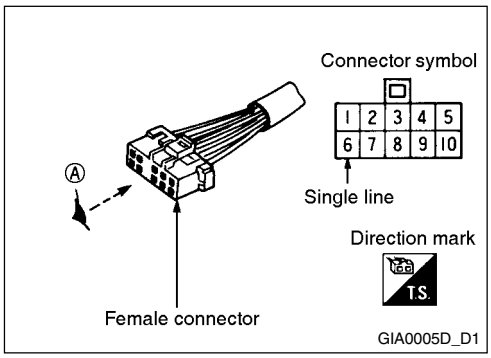
Pin No.	Item	Condition	Voltage value [V]	In case of high resistance such as single strand [V] *
1	Lamp	Switch	Battery	Battery voltage
		ON	voltage	(Inoperative lamp)
		OFF	Approx. 0	Battery voltage
2	Switch	Switch	Battery	Higher than 0
		ON	voltage	Approx. 4 (Example)
		OFF	Approx. 0	Approx. 5

The voltage value is based on the body round.

Key to Symbols Signifying Measurements or Procedures

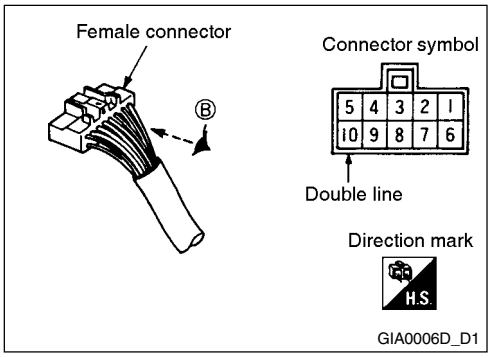
Symbol	Symbol explanation	Symbol	Symbol explanation
DISCONNECT	Check after disconnecting the connector to be measured.		A/C switch is "OFF"
CONNECT	Check after connecting the connector to be measured.		A/C switch is "ON"
	Insert key into ignition switch.		REC switch is "ON"
	Remove key from ignition switch.		REC switch is "OFF"
	Turn ignition switch to "OFF" position.		DEF switch is "ON"
	Turn ignition switch to "ON" position.		Vent switch is "ON"
	Turn ignition switch to "START" position.		Fan switch is "ON". (At any position except for "OFF" position)
	Turn ignition switch from "OFF" to "ACC" position.		Fan switch is "OFF".
	Turn ignition switch from "ACC" to "OFF" position.		Apply positive voltage from battery with fuse directly to components.
	Turn ignition switch from "OFF" to "ON" position.		Drive vehicle.
	Turn ignition switch from "ON" to "OFF" position.		Disconnect battery negative cable.
	Do not start engine, or check with engine stopped.		Depress brake pedal.
	Start engine, or check with engine running.		Release brake pedal.
	Apply parking brake.		Depress accelerator pedal.
	Release parking brake.		Release accelerator pedal.
	Check after engine is warmed up sufficiently.		Pin terminal check for SMJ type ECU and A/T control unit connectors. For details regarding the terminal arrangement, refer to the foldout page.
	Voltage should be measured with a voltmeter.		
	Circuit resistance should be measurd with an ohmmeter.		
	Current should be measured with an ammeter.		

Harness Connector Symbols

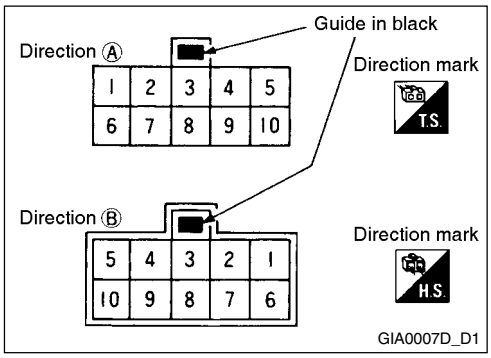


FEMALE CONNECTORS

- When the harness connector is viewed from the A-direction (at the terminal), the connector is indicated in single line. Also, a "T.S." (Terminal Side) is shown in white as a direction mark.

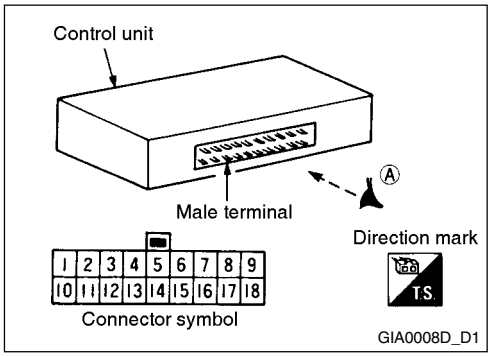


- When the harness connector is viewed from the B-direction (at the harness), the connector is indicated in double lines. Also, a "H.S." (Harness Side) is shown in white as a direction mark.
- The terminal arrangement in connector symbol is indicated as shown from A or B direction. So A-direction has reverse arrangement from B-direction.



MALE CONNECTORS

- It is the same as the female connector, but the male terminal connector guide is colored in black for identification.



ASSEMBLY SUCH AS CONTROL UNIT

- For assemblies such as control units, they have A-direction-view as illustrated.

Abbreviations

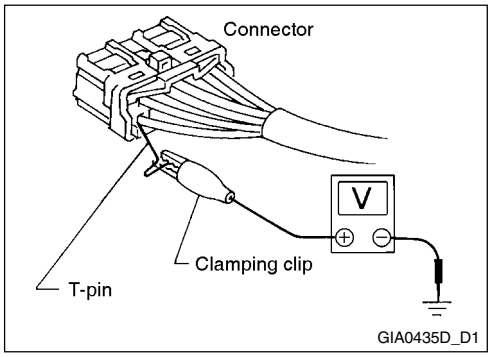
Abbreviation	Description	Abbreviation	Description
A/C	Air conditioner	ILL	Illumination
A/T	Automatic transaxle	INT	Intake
ABS	Anti-lock brake system	L/B	Lean-burn
ACC	Accessory	LH	Left
ADS	Active damper suspension	L.S.V	Load sensing valve
ALT	Alternator	L/U	Lock-up
ASCD	Auto speed control device	LED	Light emitting diode
ASSY	Assembly	LLC	Long life coolant
AV	Audio-visual	LSD	Limited slip differential
BC Valve	Boost control valve	M/T	Manual transaxle
BAT	Battery	NAVI	Navigation
BPT Valve	Back pressure transducer valve	O/D	Overdrive
	(back pressure control)	OHC	Overhead camshaft
C/B	Circuit breaker	OHV	Overhead valve
C/P	Crank pulley	OS	Oversize
C/U	Control unit	P/S	Power steering
CD	Compact disc	P/W	Power window
CVTC	Variable valve timing control	PBR	Potentio balance resistor
Cyl	Cylinder	PTC	Potentio temperature control
DOHC	Double overhead camshaft	PTO	Power take off
DSP	Digital signal processor	RH	Right
ELR	Emergency locking retractor	RR	Rear
ENG	Engine	S/V	Solenoid valve
EXH	Exhaust	SAS	Slow adjusting screw
F/L	Fusible link	SMJ	Super multi junction
FICD	Fast idle control device	SRS	Supplemental restraint system
FPCM	Fuel pump control module	TAS	Throttle adjusting screw
FR	Front	TCS	Traction control system
GPS	Global positioning system	TCU	Time control unit
H/B	Hatchback	Tr	Transistor
H/T	Hardtop	TV Valve	Thermal vacuum valve
HEC	Hybrid electronic control unit	US	Undersize
I/P	Idle pulley	VENT	Ventilation
IAA	Idle auxiliary air unit	VTC	Valve timing control
IAS	Idle adjust screw	VVT Valve	Ventury vacuum transducer valve
IGN	Ignition		

Connector Terminal Inspection

CONNECTOR INSPECTION

Incorrect circuit connector inspection may cause connector damage or bad connection.

The plug of the voltmeter or so may not be inserted into connector correctly. In that case follow the steps described below using the clips and T-pins.

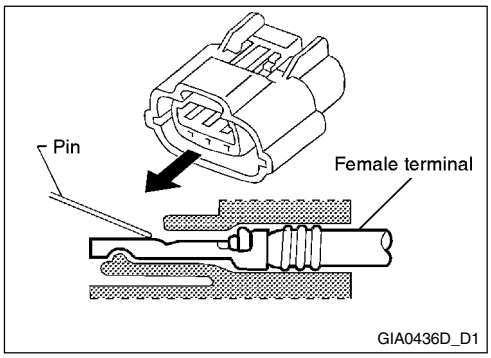


INSPECTION FROM HARNESS

For standard connectors, insert the T-pin from the harness side before inspection.

CAUTION:

- **Remove the rear cover before inspection for connectors with the rear cover as in the ECU.**



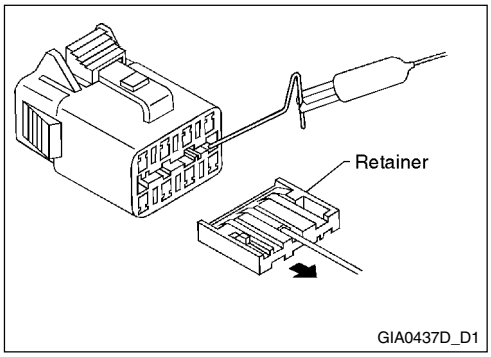
INSPECTION FROM TERMINALS

Female terminal

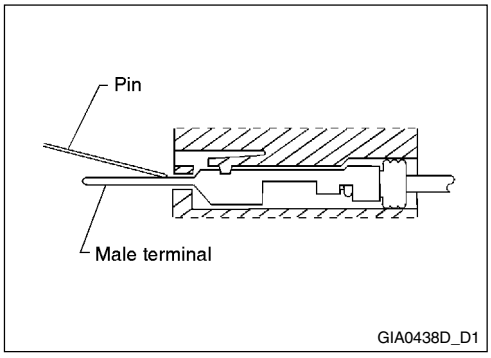
- Every female terminal has a small gap. Insert the T-pin into the gap and perform inspection.

CAUTION:

- **Do not insert any terminals except for the same type male terminal into the female terminal.**



- Inspect after removing the retainer for female terminals without a gap.



Male terminal

Inspect by positioning the T-pin at the surface of each male terminals.

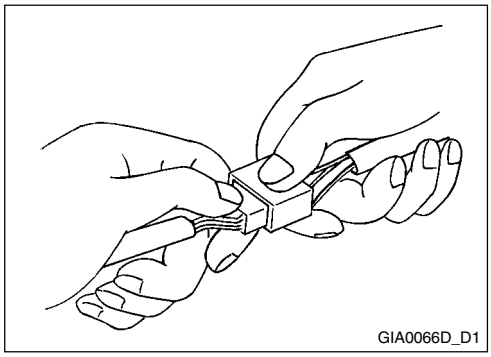
CAUTION:

- **Do not bend the terminal.**

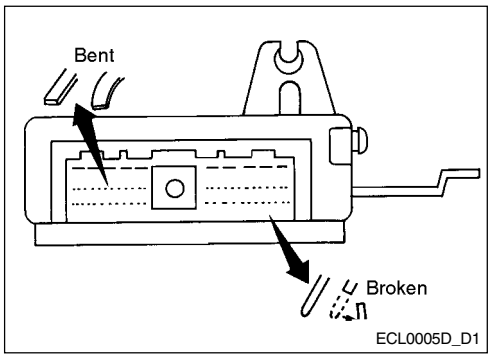
Electrical System Inspection

GENERAL

- When trouble occurs within the electrical system, inspect for short circuit in fuses and fusible links, and short/open circuit in connectors.
- If the fuse or the fusible link is shorted, inspect the cause and replace it with a fuse or fusible link with the specified capacity after replacing it.



- When fuses or fusible links are shorted, examine the cause and replace with correct capacity fuses and fusible links.
- Do not twist or pull too hard when disconnecting the connectors.
- Do not pull the harness.

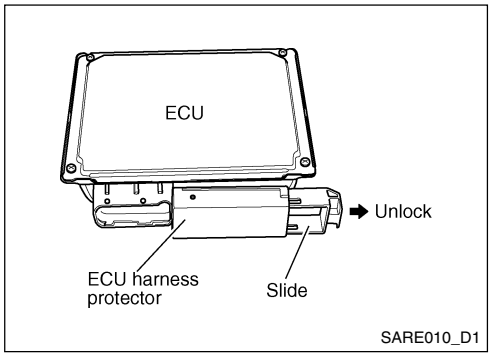


- For lock-type connectors, first disconnect the lock at the connector, hold the connectors and disconnect.
- Check if the connector terminals are not bent or broken. Then firmly connect them.
- For lock-type connectors, connect them by inserting until a firm lock has engaged.
- Avoid harness protrusion or tangling during assembly.

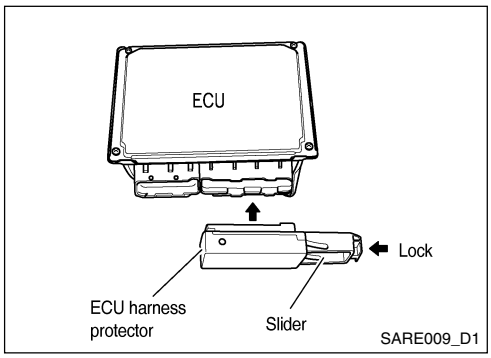
Control Unit and Electronic Components

PRECAUTIONS IN HANDLING

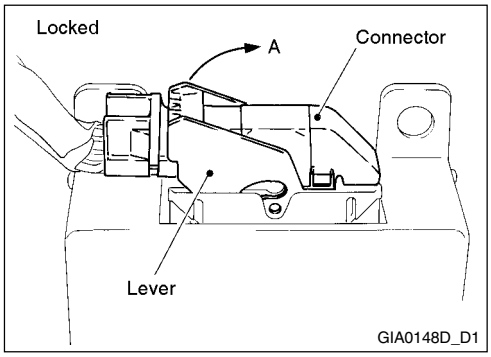
- Never inversely connect the battery terminals.
- Do not install any parts other then designated for the vehicle.
- Perform the unit input/output inspection and functional inspection of the components before replacing the control unit.
- Do not twist or pull too hard when disconnecting the connectors.
- When disconnecting ECU harness connector, push out the slider to unlock.



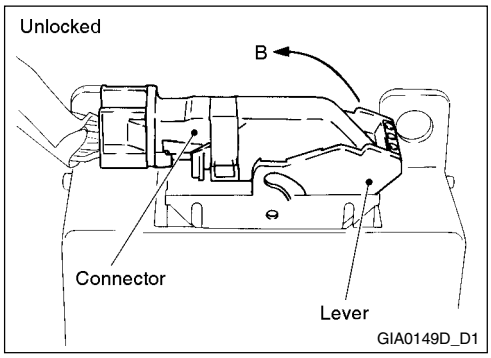
Electrical System Inspection (Cont'd)



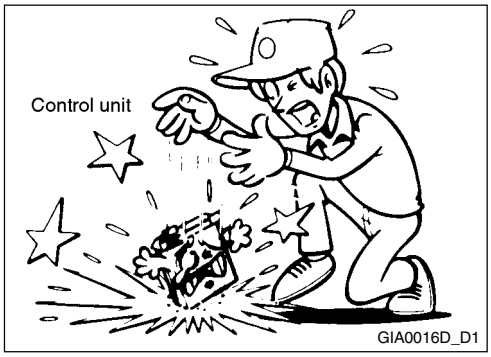
- Check if the connector terminals are not bent or broken. Then firmly connect them. When connecting ECU harness connector, push the slider to its end to lock securely. After connecting it, check for looseness by rocking the connector body.



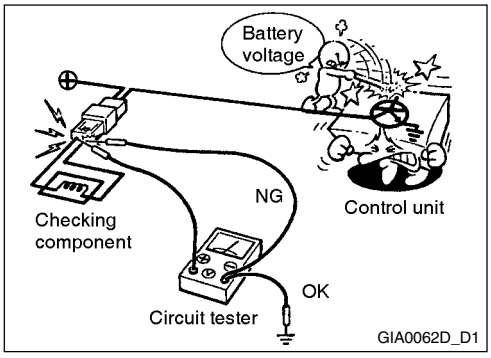
- For lever lock type removal, disconnect the connector by lifting the lever to A-direction as illustrated.



- For lever lock type installation, place the lever to B-direction until it clicks in.



- Do not exert any hard impact to the control unit such as dropping or hitting it.
- Avoid moisture due to sudden temperature change and rain from the control unit. When this happens, completely dry the control unit before installing into the vehicle.
- Be careful not to stain oil in the control unit connectors.
- Avoid volatile solvent cleaning for control unit.
- Do not remove the upper and lower cover of the control unit.



- During circuit testing, be careful not to place the proves too closely. If the tester probes come in contact each other, it may cause circuit overheating and may damage the power transistor inside the control unit due to battery voltage. Allow distance between the tester probes. Use the designated check adaptor when checking the input/output signals from the control unit.

Lifting Point and Towing

JACK/LIFT-UP POINTS

CAUTION:

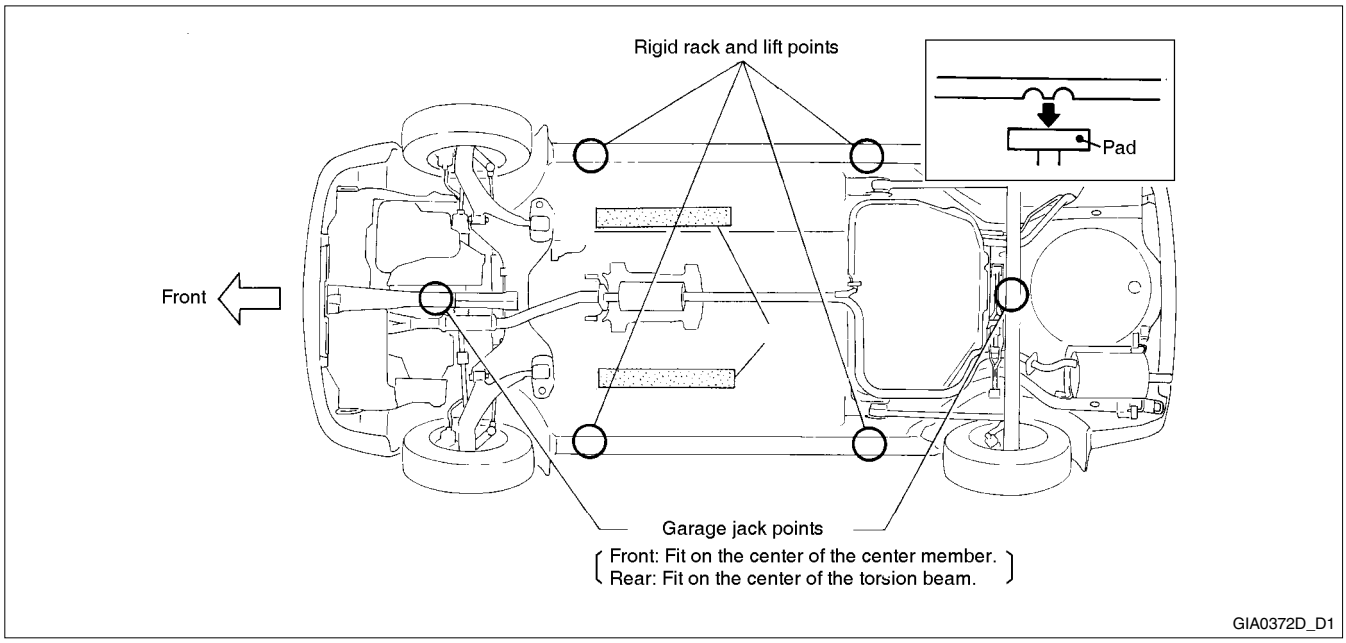
- **Check if the vehicle is empty before lifting.**
- **Support with transmission jack or others to the rear jack-up points of the vehicle during removal of frontal main components such as engine, transaxle and suspension because it may change the center of vehicle's gravity.**

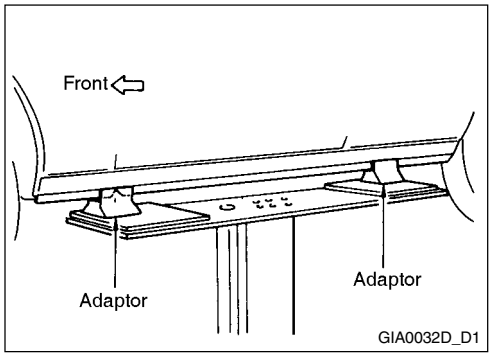
GARAGE JACK AND RIGID RACK SUPPORT POINTS

CAUTION:

- **Always work in flat surface when using the garage jack.**
- **When lifting the front (rear) with the jack, support the vehicle with the rigid rack by placing wood block behind the rear axle (in front of the front axle) and place wood blocks at both rear wheels (both front wheels).**
- **Use both jack and rigid rack when working.**
- **Set the rigid rack with an adaptor to adjust the rigid rack under the jack-up point of the vehicle.**

- Never place a rigid rack at the side members on the under floor and at the surface of the floor.





DOUBLE-POST LIFT SUPPORT POINTS

Put the double-post lift pad at the jack-up point.

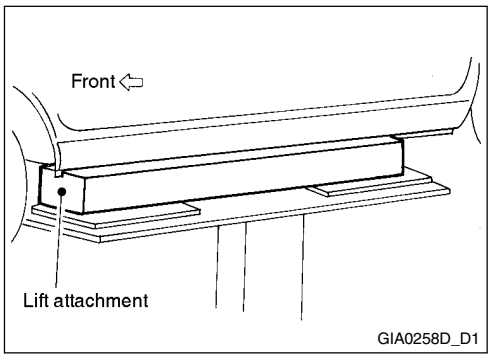
BOARD-ON LIFT SUPPORT POINTS

Put the adaptor at the jack-up point when using the board-on lift adaptor.

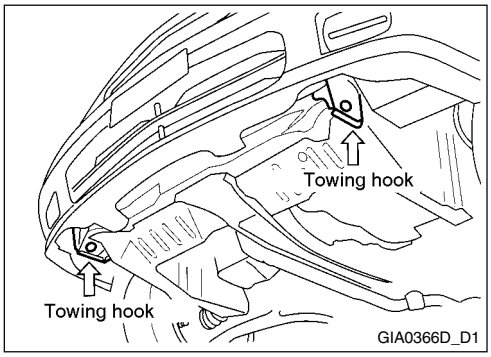
CAUTION:

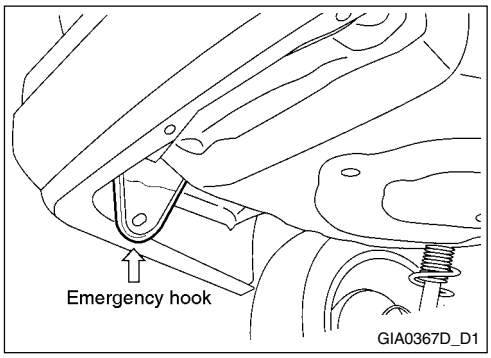
- **When the board-on lift cannot be installed at the front and rear jack-up points, use the lift attachment method as illustrated.**

Lifting Point and Towing (Cont'd)



- The jack-up points of the vehicle should be on the center of the lift attachments.





Towing

TOWING HOOK LOCATION

FRONT

Place the rope at the hook located at the front side member.

CAUTION:

- **The rope may damage the painted surface of the bumper. Wrap a cloth around the rope.**

REAR

CAUTION:

- **The hook located at the left rear of the side member must be used in emergency. Do not use it when towing.**

CAUTION:

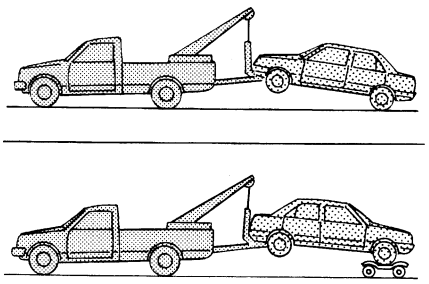
- **Obey all local laws regarding towing.**
- **Use appropriate towing tools to avoid any damages on the vehicle during towing.**

Lifting Point and Towing (Cont'd)

Tow Truck Towing

CAUTION:

- **All applicable local laws regarding the towing operation must be obeyed.**
- **It is necessary to use proper towing equipment to avoid possible damage to the vehicle during towing operation.**
- **When towing with the rear wheels on the ground, release the parking brake and move the gearshift lever to neutral position.**



SGI805-E

NISSAN recommends that vehicle be towed with the driving (front) wheels off the ground as illustrated.

TOWING AN AUTOMATIC TRANSAXLE MODEL WITH FOUR WHEELS ON GROUND

Observe the following restricted towing speeds and distances.

Speed:

Below 50 km/h (30 MPH)

Distance:

Less than 65 km (40 miles)

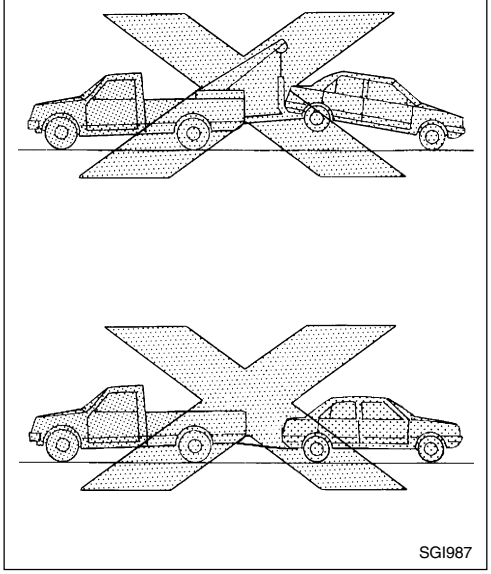
CAUTION:

Never tow an automatic transaxle model from the rear (i.e., backward) with four wheels on the ground as this may cause serious and expensive damage to the transaxle.

TOWING AN AUTOMATIC TRANSAXLE MODEL WITH REAR WHEELS RAISED (With front wheels on ground)

Never tow an automatic transaxle model with rear wheels raised (with front wheels on ground) as this may cause serious and expensive damage to the transaxle. If it is necessary to tow it with rear wheels raised, always use a towing dolly under the front wheels.

Automatic transaxle model



SGI987

Tightening Torque of Standard Bolt

Grade	Bolt size	Bolt diameter	Pitch	Standard tightening torque			
				Standard bolt		Flange bolt	
				N•m	kg-m	N•m	kg-m
4T	M6	6.0	1.0	5.1	0.52	6.1	0.62
	M8	8.0	1.25	13	1.3	15	1.5
			1.0	13	1.3	16	1.6
	M10	10.0	1.5	25	2.5	29	3.0
			1.25	25	2.6	30	3.1
	M12	12.0	1.75	42	4.3	51	5.2
			1.25	46	4.7	56	5.7
	M14	14.0	1.5	74	7.5	88	9.0
7T	M6	6.0	1.0	8.4	0.86	10	1.0
	M8	8.0	1.25	21	2.1	25	2.5
			1.0	22	2.2	26	2.7
	M10	10.0	1.5	41	4.2	48	4.9
			1.25	43	4.4	51	5.2
	M12	12.0	1.75	71	7.2	84	8.6
			1.25	77	7.9	92	9.4
	M14	14.0	1.5	127	13.0	147	15.0
9T	M6	6.0	1.0	12	1.2	15	1.5
	M8	8.0	1.25	29	3.0	35	3.6
			1.0	31	3.2	37	3.8
	M10	10.0	1.5	59	6.0	70	7.1
			1.25	62	6.3	74	7.5
	M12	12.0	1.75	98	10.0	118	12.0
			1.25	108	11.0	137	14.0
	M14	14.0	1.5	177	18.0	206	21.0

CAUTION:

- **Special parts are excluded.**
- **Above standards can be applied on the bolts which has following marks on the bolt head.**
  Grade Mark
  4T..... 4 or no mark
  7T..... 7
  9T..... 9

Description

- CONSULT-II is a hand-held type tester. When it is connected with a diagnostic connector equipped on the vehicle side, it will communicate with the control unit equipped in the vehicle and then enable various kinds of diagnostic tests.
- Refer to “CONSULT-II Software Operation Manual” for more information.

Function and System Application

Diagnostic test mode	Function	ENGINE (1.5L)	ENGINE (1.6L)	A/T	AIRBAG/PRT (R)	ABS	CLUSTER
Work support	This mode enables a technician to adjust some devices faster and more accurately by following the indications on CONSULT-II.	-	X	X	X	-	-
Self-diagnostic results	Self-diagnostic results can be read and erased quickly.	X	X	X	X	X	X
Data monitor	Input/Output data in the ECU can be read.	X	X	X	X	X	X
Active test	Diagnostic Test Mode in which CONSULT-II drives some actuators apart from the ECUs and also shifts some parameters in a specified range.	X	X	-	-	X	X
DTC work support	The operating condition to confirm Diagnosis Trouble Codes can be selected.	-	-	X	-	-	-
ECU (ECM/TCM) part number	ECU (ECM/TCM) part number can be read.	X	X	X	X	X	X
Function test	This mode can show results of self-diagnosis of ECU with either “OK” or “NG”. For engines, more practical tests regarding sensors/switches and/or actuators are available.	-	X	X	-	X	-
CAN diagnosis support monitor	The condition of CAN communication line can be indicated.	X	X	X	-	-	X
Configuration	Function to READ/WRITE/NATS SETTING vehicle configuration on combination meter	-	-	-	-	-	X

X: Applicable

Nickel Metal Hydride Battery Replacement

CONSULT-II contains a nickel metal hydride battery. When replacing the battery obey the following:

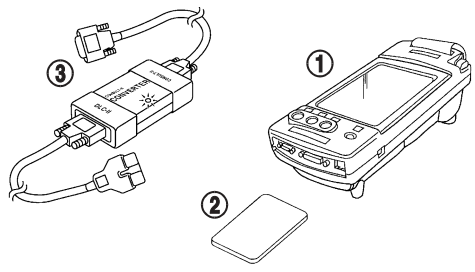
WARNING:

Replace the nickel metal hydride battery with Genuine CONSULT-II battery only. Use of another battery may present a risk of fire or explosion. The battery may present a fire or chemical burn hazard if mistreated. Do not recharge, disassemble or dispose of in fire.

Keep the battery out of reach of children and discard used battery conforming to the local regulations.

Checking Equipment

When ordering the following equipment, contact your NISSAN/INFINITI distributor.

Tool name	Description
NISSAN CONSULT-II 1. CONSULT-II unit (Tester internal soft: Resident version 3.3.0) and accessories 2. Program card AED06A and AEN06A (For NATS) 3. CONSULT-II CONVERTER	 SAIA0362E

CAUTION:

- **Previous CONSULT-II "I" and "Y" DLC-I and DLC-II cables should NOT be used anymore because their DDL connector pins can be damaged during cable swapping.**
- **If CONSULT-II is used with no connection of CONSULT-II CONVERTER, malfunctions might be detected in self-diagnosis depending on control unit which carry out CAN communication.**
- **If CONSULT-II CONVERTER is not connected with CONSULT-II, vehicle occur the "FAIL SAFE MODE" which is "LIGHT UP the HEAD LIGHT" and/or "COOLING FAN ROTATING" when CONSULT-II is started.**

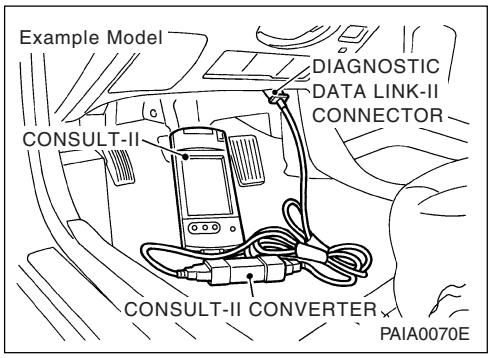
NOTE:

- The CONSULT-II must be used in conjunction with a program card.
  CONSULT-II does not require loading (Initialization) procedure.
- Be sure the CONSULT-II is turned off before installing or removing a program card.

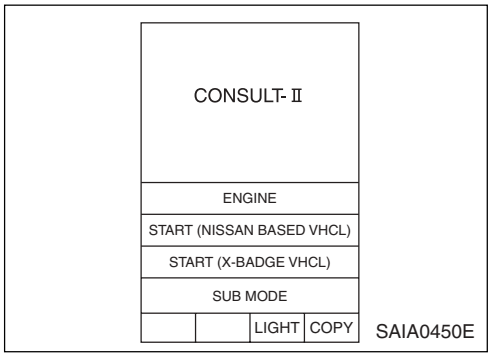
CONSULT-II Start Procedure

NOTE:

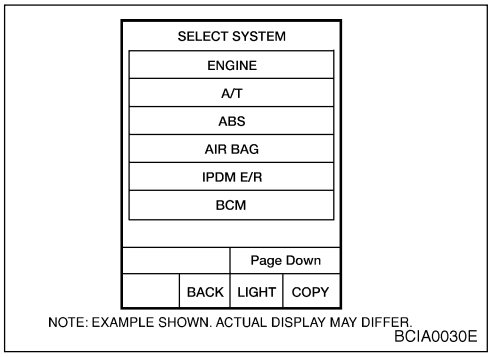
Turning ignition switch off when performing CAN diagnosis could cause CAN memory to be erased.



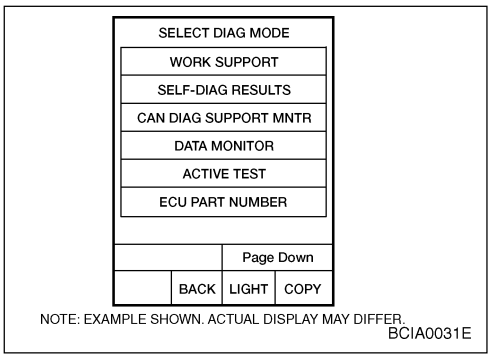
1. Connect CONSULT-II and CONSULT-II CONVERTER to the data link connector.



2. If necessary, turn on the ignition switch.
3. Touch "START (X-BADGE VHCL)" or System Shortcut key (eg: ENGINE) on the screen.



4. Touch necessary system on "SELECT SYSTEM" screen. If necessary system is not indicated, check power supply and ground of system control unit. If it is normal, refer to GI-37, "CONSULT-II Data Link Connector (DLC) Circuit".



5. Select the desired part to be diagnosed on the “SELECT DIAG MODE” screen.

CONSULT-II Data Link Connector (DLC) Circuit

INSPECTION PROCEDURE

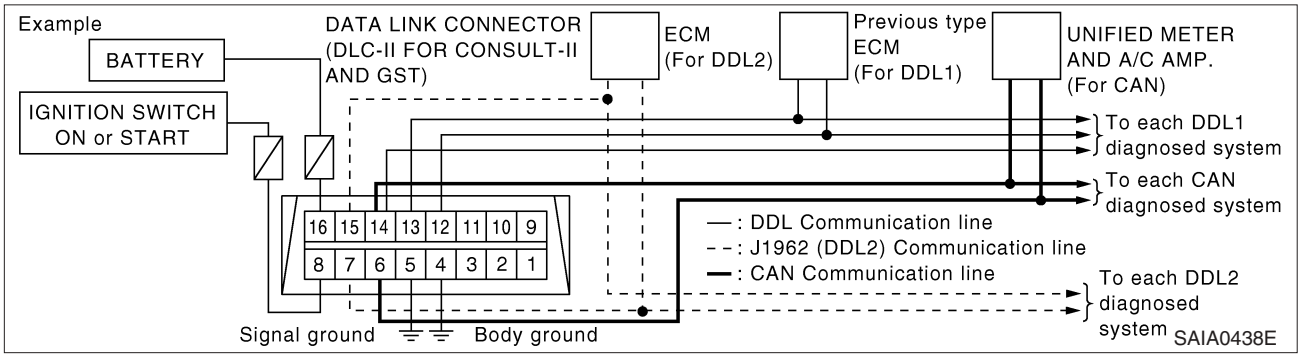
If the CONSULT-II cannot diagnose the system properly, check the following items.

Symptom	Check item
CONSULT-II cannot access any system.	● CONSULT-II DLC power supply circuit (Terminal 8) and ground circuit (Terminal 4) For detailed circuit, refer to “MIL AND DATA LINK CONNECTOR” (QG16: EC-312). ● CONSULT-II DLC cable and CONSULT-II CONVERTER
CONSULT-II cannot access individual system. (Other systems can be accessed.)	● CONSULT-II program card (Check the appropriate CONSULT-II program card for the system). Refer to “Checking Equipment” (GI-35). ● Power supply and ground circuit for the control unit of the system (For detailed circuit, refer to wiring diagram for each system.) ● Open or short circuit between the system and CONSULT-II DLC (For detailed circuit, refer to wiring diagram for each system.) ● Open or short circuit CAN communication line. Refer to LAN section.

NOTE:

The DDL1 and DDL2 circuits from DLC pins 12, 13, 14 and 15 may be connected to more than one system. A short in a DDL circuit connected to a control unit in one system may affect CONSULT-II access to other systems.

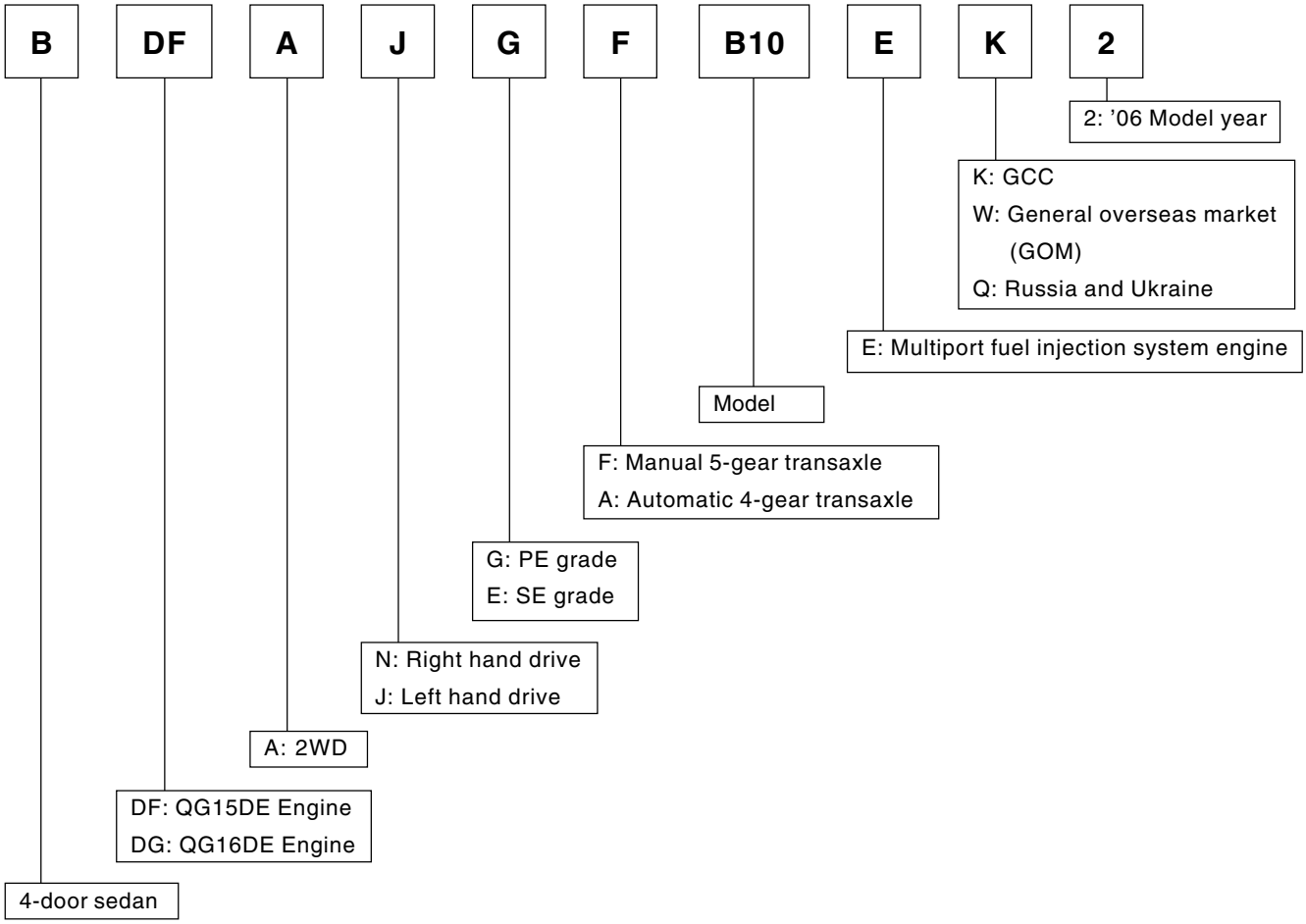
CIRCUIT DIAGRAM



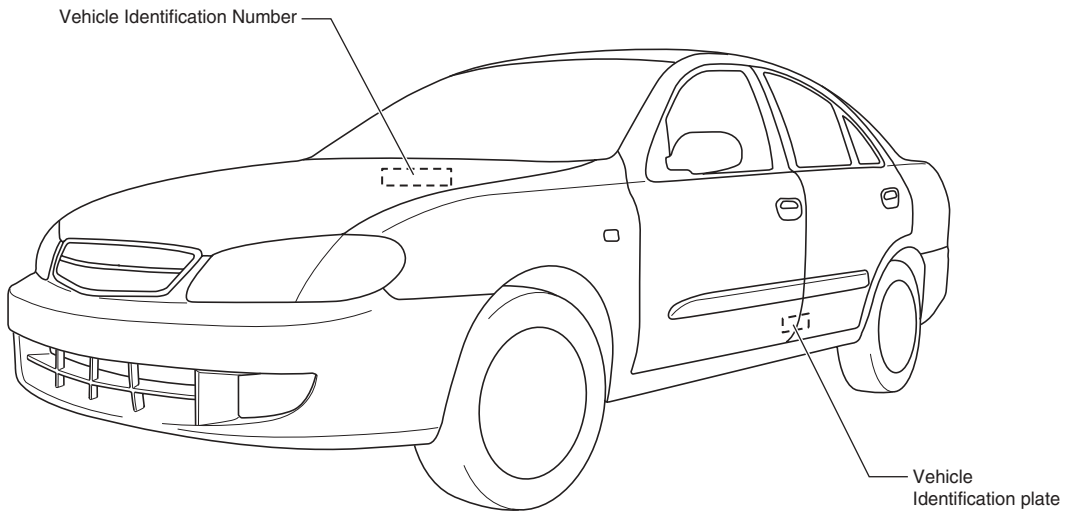
Vehicle Model

Body	Destination	Axle type	Engine	Handle	Grade	Transaxle	Model	Model year
4-door sedan	GCC	2WD	QG16DE	LH	PE	5MT	BDGAJGF-EK2	'06
						4AT	BDGAJGA-EK2	
					SE	5MT	BDGAJEF-EK2	
						4AT	BDGAJEA-EK2	
	Nigeria and Ghana	2WD	QG15DE	LH	PE	5MT	BDFAJGF-EW2	
					SE	5MT	BDFAJEF-EW2	
						4AT	BDFAJEA-EW2	
	Except GCC, Nigeria and Ghana	2WD	QG16DE	RH	PE	5MT	BDGANGF-EW2	
						4AT	BDGANGA-EW2	
					SE	5MT	BDGANEF-EW2	
						4AT	BDGANEA-EW2	
				LH	PE	5MT	BDGAJGF-EW2	
						4AT	BDGAJGA-EW2	
					SE	5MT	BDGAJEF-EW2	
						4AT	BDGAJEA-EW2	
	Russia and Ukraine	2WD	QG16DE	LH	PE	5MT	BDGAJGF-EQ2	
						4AT	BDGAJGA-EQ2	
					SE	5MT	BDGAJEF-EQ2	
						4AT	BDGAJEA-EQ2	

Description for Vehicle Model Name



Vehicle Identification Number



SGI207A

VEHICLE IDENTIFICATION NUMBER (FOR RUSSIA AND UKRAINE)

K	N	M	C	S	H	L	M	S	6	P	OOOOOO
①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫

① Country of origin: K → Korea
② Make: N → RENAULT SAMSUNG MOTORS CO., LTD.
③ Vehicle type: M → Passenger car
④ Line & models: C → B10 left hand drive models
⑤ Body type: S → Sedan
⑥ Engine capacity: H → 1600 cc, In-line 4 cylinders
⑦ Steering wheel position: L → Left hand drive
⑧ Transmission type: A → 4AT
M → 5MT
⑨ Check digit: S → Check digit for Europe
⑩ Model year: 6 → 2006
7 → 2007
⑪ Assembly plant: P → Pusan
⑫ Vehicle serial number: 000001 - 999999

VEHICLE IDENTIFICATION NUMBER (EXCEPT FOR RUSSIA AND UKRAINE)

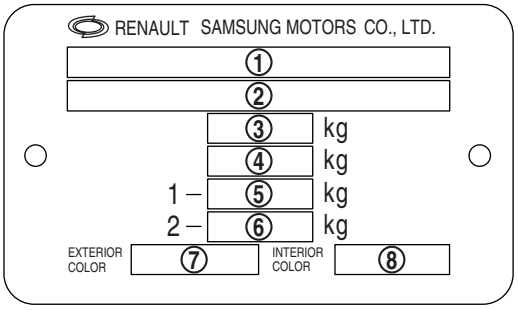
K	N	M	C	C	4	2	H	★	6	P	OOOOOO
①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫

① Country of origin: K → Korea
② Make: N → RENAULT SAMSUNG MOTORS CO., LTD.
③ Vehicle type: M → Passenger car
④ Line & models: C → B10 left hand drive models
D → B10 right hand drive models
⑤ The number of door: C → 4 doors for GCC
4 → 4 doors except for GCC
⑥ The number of passenger/
Engine capacity: 4 → 5 passengers for GCC
B → Small (From 800 to 1500 cc): QG15DE engine models except for GCC
C → Medium (From 1500 to 2000 cc): QG16DE engine models except for GCC
⑦ Restraint system: 2 → 3-point seatbelt with airbag
⑧ Engine type: G → 1500 cc, In-line 4 cylinders (Gasoline)
H → 1600 cc, In-line 4 cylinders (Gasoline)
⑨ Check digit: Depending on calculated value for GCC
P → Pilot production except for GCC
M → Mass production except for GCC
⑩ Model year: 6 → 2006
7 → 2007
⑪ Assembly plant: P → Pusan
⑫ Vehicle serial number: 000001 - 999999

Vehicle Identification Number (Cont'd)

Label-Certification

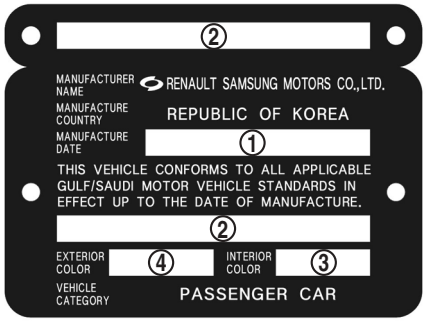
FOR RUSSIA AND UKRAINE



SGI208A

① Vehicle type approval number
② Vehicle identification number
③ Maximum permitted laden mass of the vehicle
④ Maximum permitted laden mass for the combination
⑤ Maximum permitted mass for front axle
⑥ Maximum permitted mass for rear axle
⑦ Exterior color code.
⑧ Interior color code.

FOR GCC

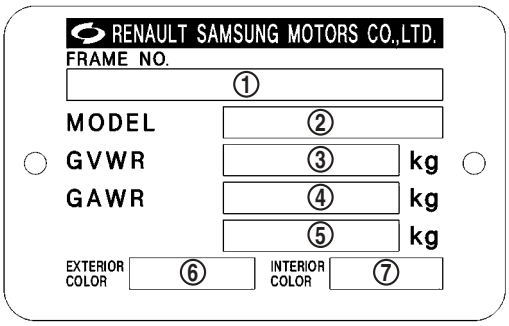


SGI209A

① Manufacture date (year, month)
② Vehicle identification number
③ Exterior color code.
④ Interior color code.

Vehicle Identification Number (Cont'd)

EXCEPT FOR GCC, RUSSIA AND UKRAINE

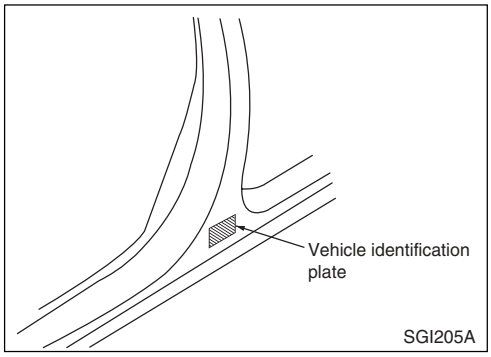


SGI210A

① Frame No.
② Model
③ GVWR (gross vehicle weight rating)
④ GAWR (gross axle weight rating, front)
⑤ GAWR (gross axle weight rating, rear)
⑥ Exterior color code.
⑦ Interior color code.

Location

The identification plate is ribetted at driver side B pillar



SECTION LAN

LAN SYSTEM

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CAN FUNDAMENTAL

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PRECAUTIONS

PFP:00001

Precautions When Using CONSULT-II

BKS002A5

Use CONSULT-II CONVERTER when connecting CONSULT-II to data link connector.

CAUTION:

CAN communication does not function normally if CONSULT-II is used without connecting CONSULT-II CONVERTER.

Precautions for Trouble Diagnosis

BKS002A6

CAUTION:

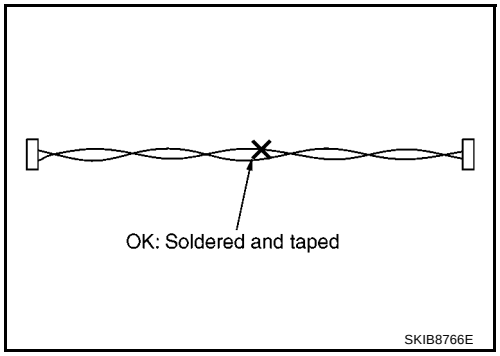
- **Never apply 7.0 V or more to the measurement terminal.**
- **Use a tester whose open terminal voltage is 7.0 V or less.**
- **Turn the ignition switch OFF and disconnect the battery cable from the negative terminal when checking the harness.**

Precautions for Harness Repair

BKS002A7

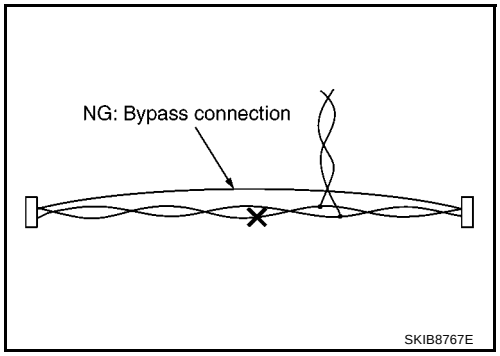
- Solder the repaired area and wrap tape around the soldered area.

  NOTE:
  A fray of twisted lines must be within 110 mm (4.33 in).



- Bypass connection is never allowed at the repaired area.

  NOTE:
  Bypass connection may cause CAN communication error as spliced wires that are separate from the main line, or twisted lines that lose noise immunity.



- Replace the applicable harness as an assembly if error is detected on the shield lines of CAN communication line.

SYSTEM DESCRIPTION

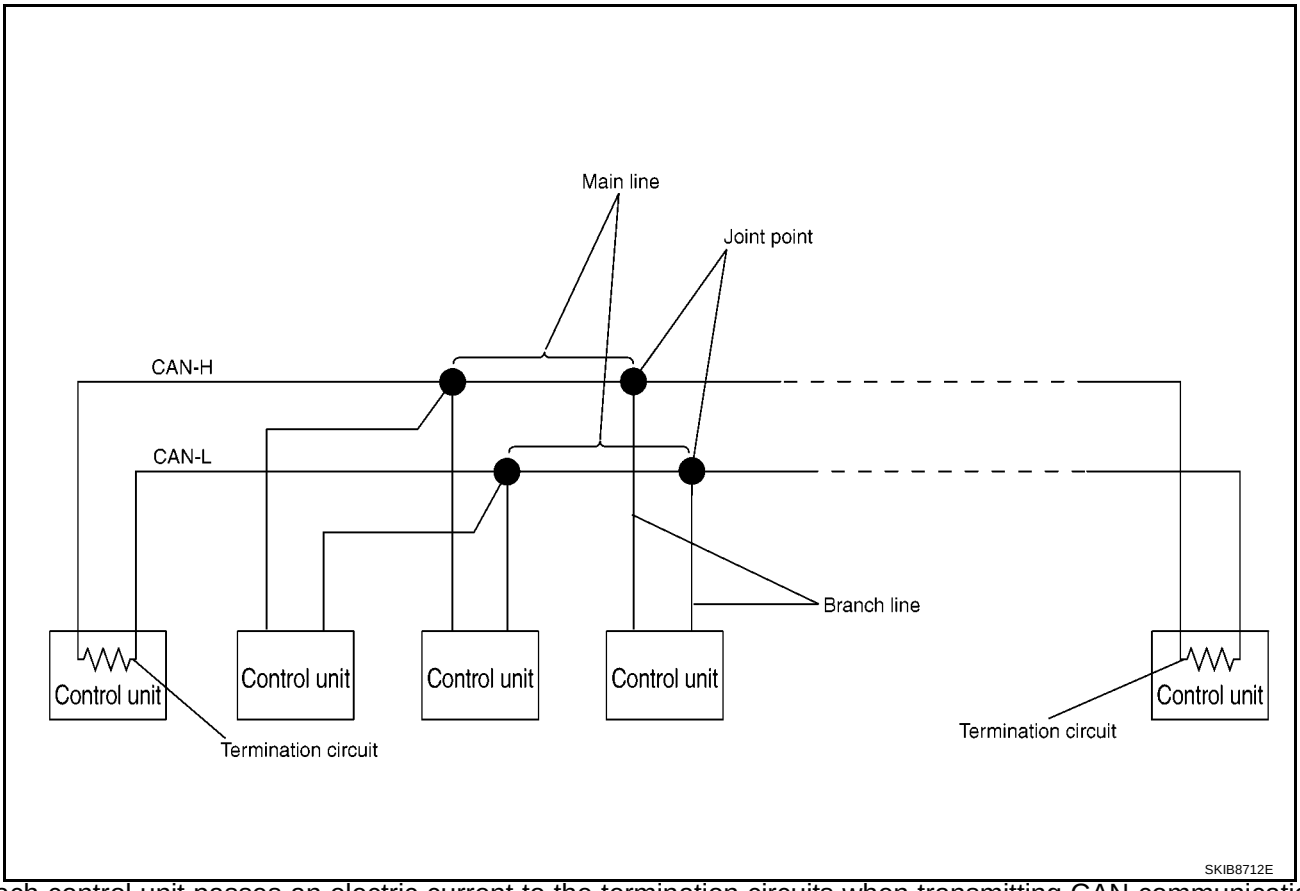
PFP:00000

CAN Communication System

BKS002A8

- CAN communication is a multiplex communication system. This enables it to transmit and receive many communication signals at high speed by connecting control units with two communication lines (CAN-H and CAN-L).
- Control units on the CAN network transmit signals with CAN communication control circuit in the control unit and receive only necessary signals from other control units for various controls.
- CAN communication lines adopt twisted-pair line style (two lines twisted) for noise immunity.

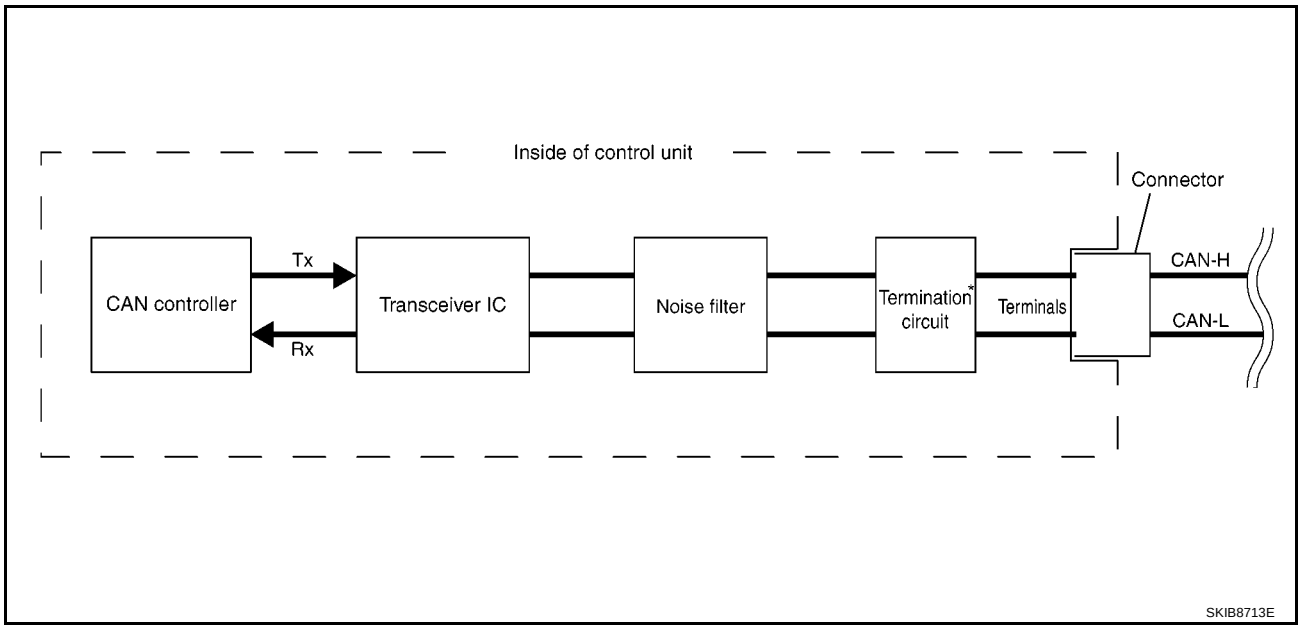
SYSTEM DIAGRAM



Each control unit passes an electric current to the termination circuits when transmitting CAN communication signal. The termination circuits produce an electrical potential difference between CAN-H and CAN-L. CAN communication system transmits and receives CAN communication signals by the potential difference.

Component	Description
Main line	CAN communication line between joint points
Branch line	CAN communication line between joint point and a unit
Joint point	A point connected a branch line with a main line
Termination circuit	Refer to LAN-4, "CAN COMMUNICATION CONTROL CIRCUIT" .

CAN COMMUNICATION CONTROL CIRCUIT



Component	System description
CAN controller	It controls CAN communication signal transmission and reception, error detection, etc.
Transceiver IC	It converts digital signal into CAN communication signal, and CAN communication signal into digital signal.
Noise filter	It eliminates noise of CAN communication signal.
Termination circuit* (Resistance of approx. 120 Ω)	It produces potential difference.

*: These are the only control units wired with both ends of CAN communication system.

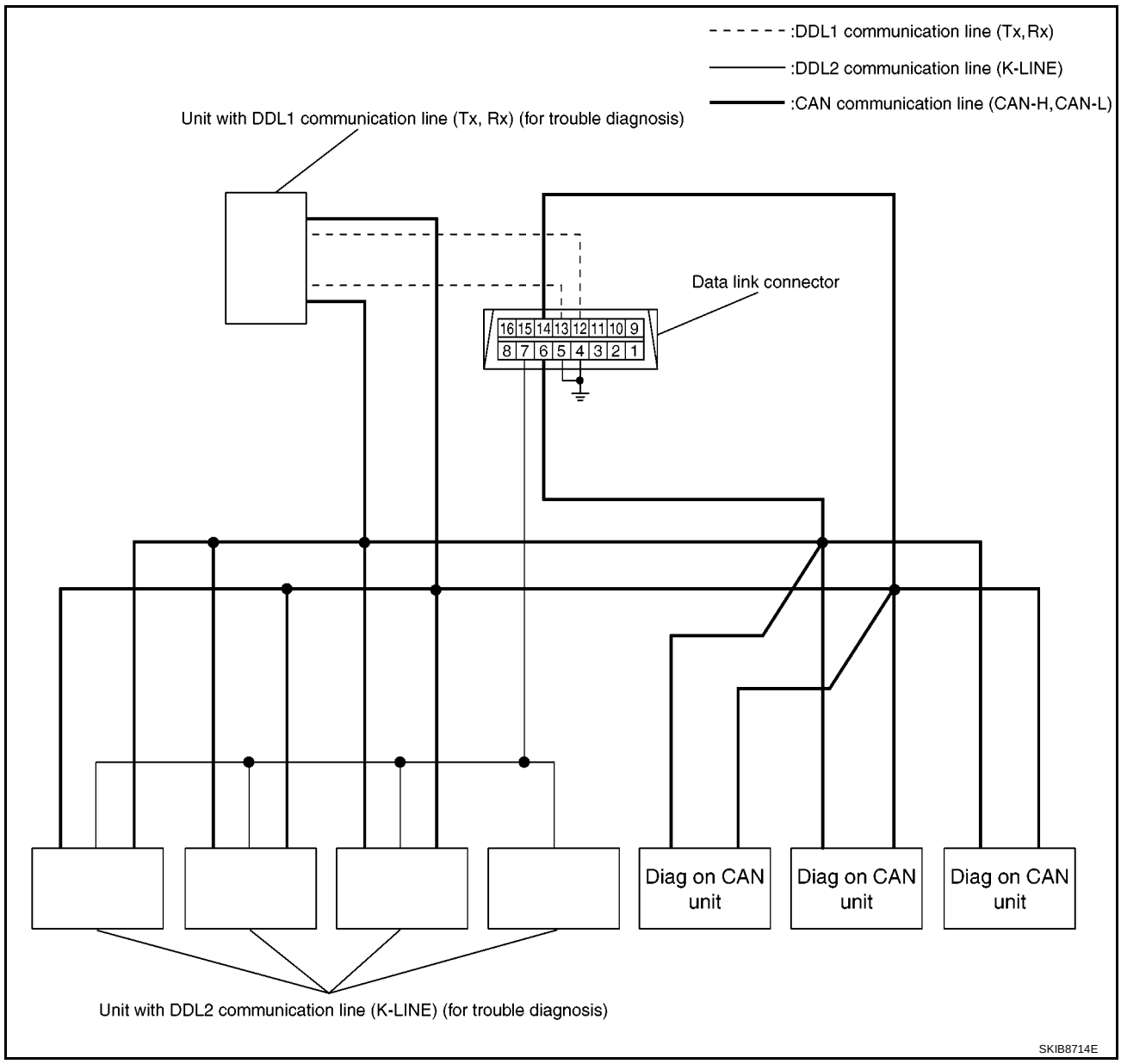
Diag on CAN

BKS002A9

DESCRIPTION

"Diag on CAN" is a diagnosis using CAN communication instead of previous DDL1 and DDL2 communication line, between control unit and diagnosis unit.

SYSTEM DIAGRAM



Name	Harness	Description
DDL1	Tx Rx	It is used for trouble diagnosis. (CAN-H and CAN-L are used for controlling)
DDL2	K-LINE	It is used for trouble diagnosis. (CAN-H and CAN-L are used for controlling)
Diag on CAN	CAN-H CAN-L	It is used for trouble diagnosis and control.

TROUBLE DIAGNOSIS

PFP:00004

Condition of Error Detection

BKS002AA

"U1000" or "U1001" is indicated on SELF-DIAG RESULTS on CONSULT-II if CAN communication signal is not transmitted or received between units for 2 seconds or more.

CAN COMMUNICATION SYSTEM ERROR

- CAN communication line open (CAN-H, CAN-L, or both)
- CAN communication line short (ground, between CAN communication lines, other harnesses)
- Error of CAN communication control circuit of the unit connected to CAN communication line

WHEN INDICATED "U1000" OR "U1001" IS INDICATED EVEN THOUGH CAN COMMUNICATION SYSTEM IS NORMAL

- CONSULT-II CONVERTER not connected: Error may be detected by the self-diagnosis when not using CONSULT-II CONVERTER (depending on the control unit that performs CAN communication).
- Removal/installation of parts: Error may be detected when removing and installing CAN communication unit and related parts while turning the ignition switch ON. (A DTC except for CAN communication may be detected.)
- Fuse blown out (removed): CAN communication of the unit may cease.
- Voltage drop: Error may be detected if voltage drops due to discharged battery when turning the ignition switch ON (depending on the control unit that performs CAN communication).
- Error may be detected if the power supply circuit of the control unit, which performs CAN communication, malfunctions (depending on the control unit that performs CAN communication).
- Error may be detected if reprogramming is not completed normally.

CAUTION:

CAN communication system is normal if "U1000" or "U1001" is indicated on SELF-DIAG RESULTS of CONSULT-II under the above conditions. Erase the memory of the self-diagnosis of each unit.

Symptom When Error Occurs in CAN Communication System

BKS002AB

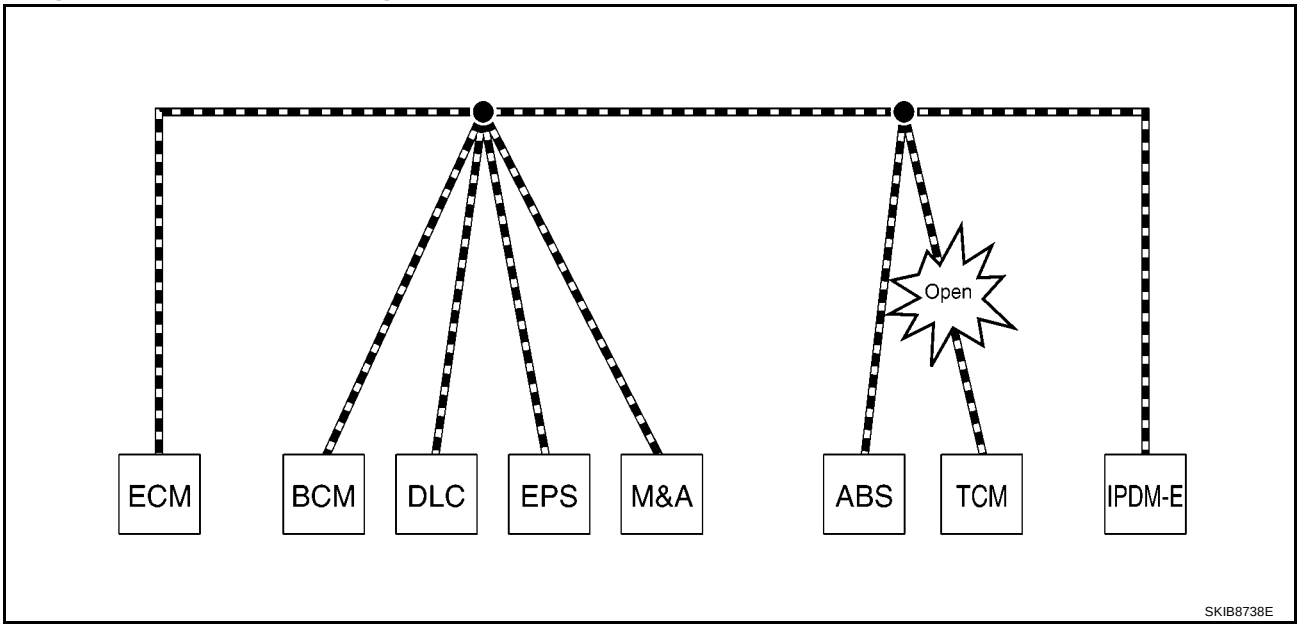
In CAN communication system, multiple units mutually transmit and receive signals. Each unit cannot transmit and receive signals if any error occurs on CAN communication line. Under this condition, multiple control units related to the root cause malfunction or start fail-safe mode.

ERROR EXAMPLE

NOTE:

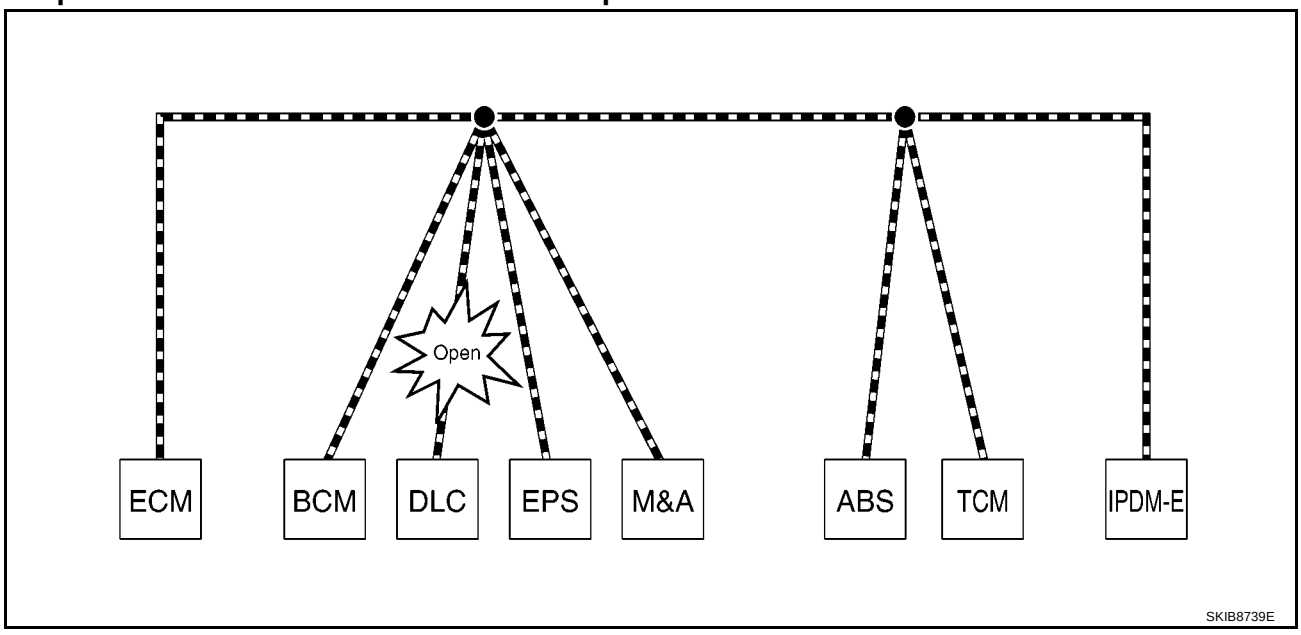
- Each vehicle differs in symptom of each unit under fail-safe mode and CAN communication line wiring.
- For abbreviations, refer to LAN-40, "Abbreviation List" .

Example: TCM branch line open circuit



Unit name	Symptom
ECM	Engine torque, etc. get out of control, and shift shock increases.
BCM	Reverse warning chime does not sound.
EPS control unit	Normal operation.
Combination meter	● Shift position indicator and OD OFF indicator turn OFF. ● Warning lamps turn ON.
ABS actuator and electric unit (control unit)	Normal operation.
TCM	No impact on operation.
IPDM E/R	Normal operation.

Example: Data link connector branch line open circuit



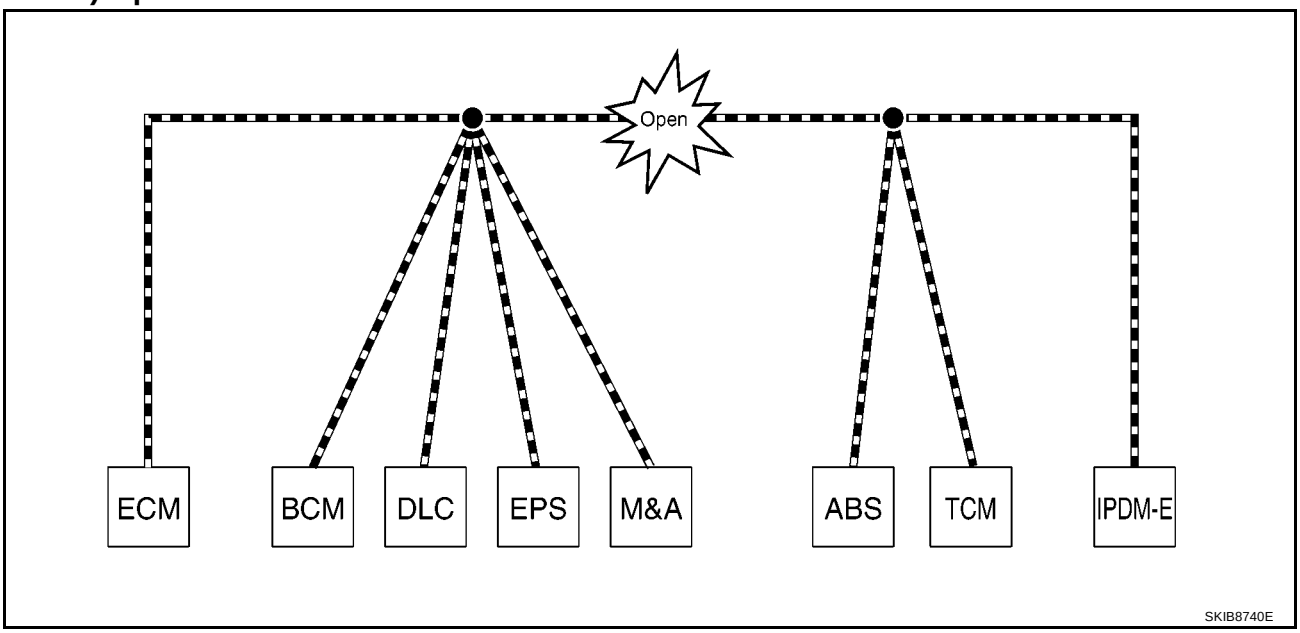
Unit name	Symptom
ECM	Normal operation.
BCM	
EPS control unit	
Combination meter	
ABS actuator and electric unit (control unit)	
TCM	
IPDM E/R	

CAUTION:

- **When data link connector branch line is open, there is no influence on transmission and reception of CAN communication signals. Therefore, no symptoms occur. However, be sure to repair malfunctioning circuit.**
- **When data link connector branch line is open, screen-display of the CONSULT-II "SELECT SYSTEM" screen may be the same as the case when CAN communication line has short-circuit. However, symptoms differ depending on the case. See below and understand the differences. Do not misunderstand malfunctioning circuit.**

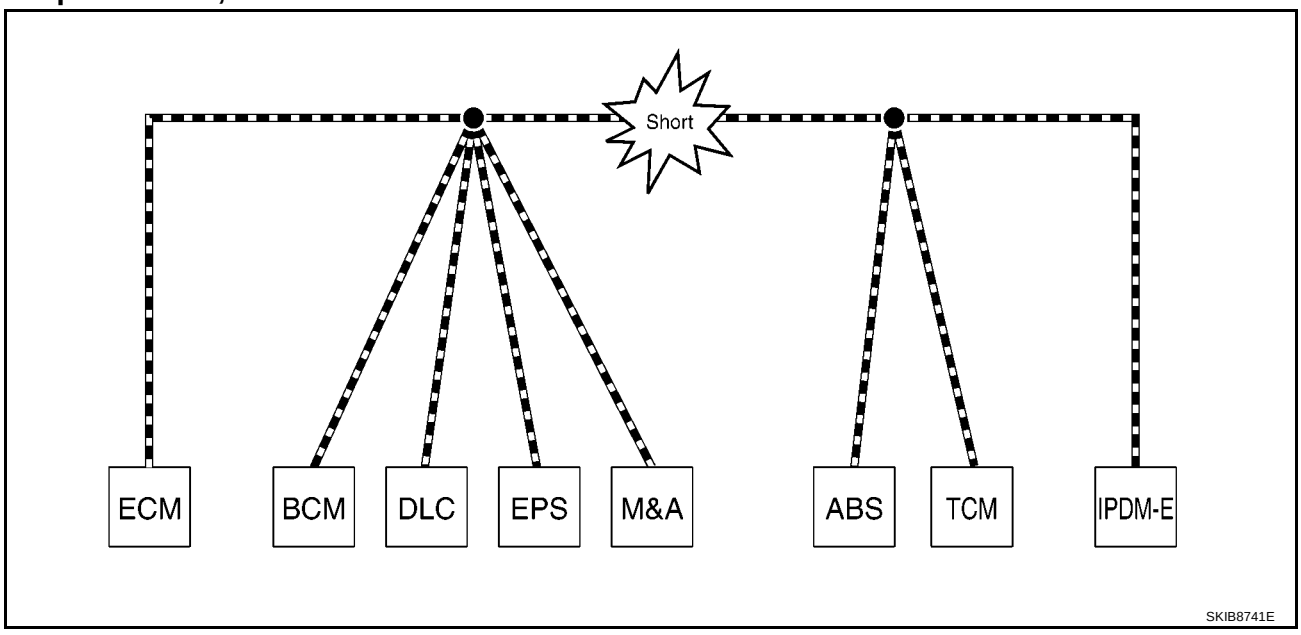
	SELECT SYSTEM (CONSULT-II)	Difference of symptom
Data link connector branch line open circuit	All Diag on CAN units are not indicated.	Normal operation.
CAN-H, CAN-L harness short-circuit		Most the units which are connected to the CAN communication system enter fail-safe mode or are deactivated.

Example: Main Line Between Data Link Connector and ABS Actuator and Electric Unit (Control Unit) Open Circuit



Unit name	Symptom
ECM	Engine torque, etc. get out of control, and shift shock increases.
BCM	● Reverse warning chime does not sound. ● The front wiper moves under the continuous operation mode even though the front wiper switch turns to intermittent.
EPS control unit	The steering effort increases.
Combination meter	● The shift position indicator and OD OFF indicator turn OFF. ● The speedometer continues indicating 0. ● The odo/trip meter stops.
ABS actuator and electric unit (control unit)	Normal operation.
TCM	No impact on operation.
IPDM E/R	When the ignition switch turns ON, ● The headlamps (Lo) turn ON. ● The cooling fan continues rotating.

Example: CAN-H, CAN-L Harness Short Circuit



Unit name	Symptom
ECM	● Engine torque, etc. get out of control, and shift shock increases. ● Engine speed drops.
BCM	● Reverse warning chime does not sound. ● The front wiper moves under the continuous operation mode even though the front wiper switch turns to intermittent. ● The room lamp does not turn ON. ● The engine does not start (if an error or malfunction occurs while turning the ignition switch is OFF.) ● The steering lock does not release (if an error or malfunction occurs while turning the ignition switch is OFF.)
EPS control unit	The steering effort increases.
Combination meter	● The tachometer and the speedometer do not move. ● Warning lamps turn ON. ● Indicator lamps do not turn ON.
ABS actuator and electric unit (control unit)	Normal operation.
TCM	No impact on operation.
IPDM E/R	When the ignition switch turns ON, ● The headlamps (Lo) turn ON. ● The cooling fan continues rotating.

Self-Diagnosis

BKS002AC

DTC	Self-diagnosis item (CONSULT-II indication)	DTC detection condition	Inspection/Action
U1000	CAN COMM CIRCUIT	When ECM is not transmitting or receiving CAN communication signal of OBD (emission-related diagnosis) for 2 seconds or more.	Refer to LAN-14, "TROUBLE DIAGNOSES WORK FLOW" .
		When a control unit (except for ECM) is not transmitting or receiving CAN communication signal for 2 seconds or more.	
U1001	CAN COMM CIRCUIT	When ECM is not transmitting or receiving CAN communication signal other than OBD (emission-related diagnosis) for 2 seconds or more.	
U1002	SYSTEM COMM	When a control unit is not transmitting or receiving CAN communication signal for 2 seconds or less.	Start the inspection. Refer to the applicable section of the indicated control unit.
U1010	CONTROL UNIT [CAN]	When detecting error during the initial diagnosis of CAN controller of each control unit.	Replace the control unit indicating “U1010”.

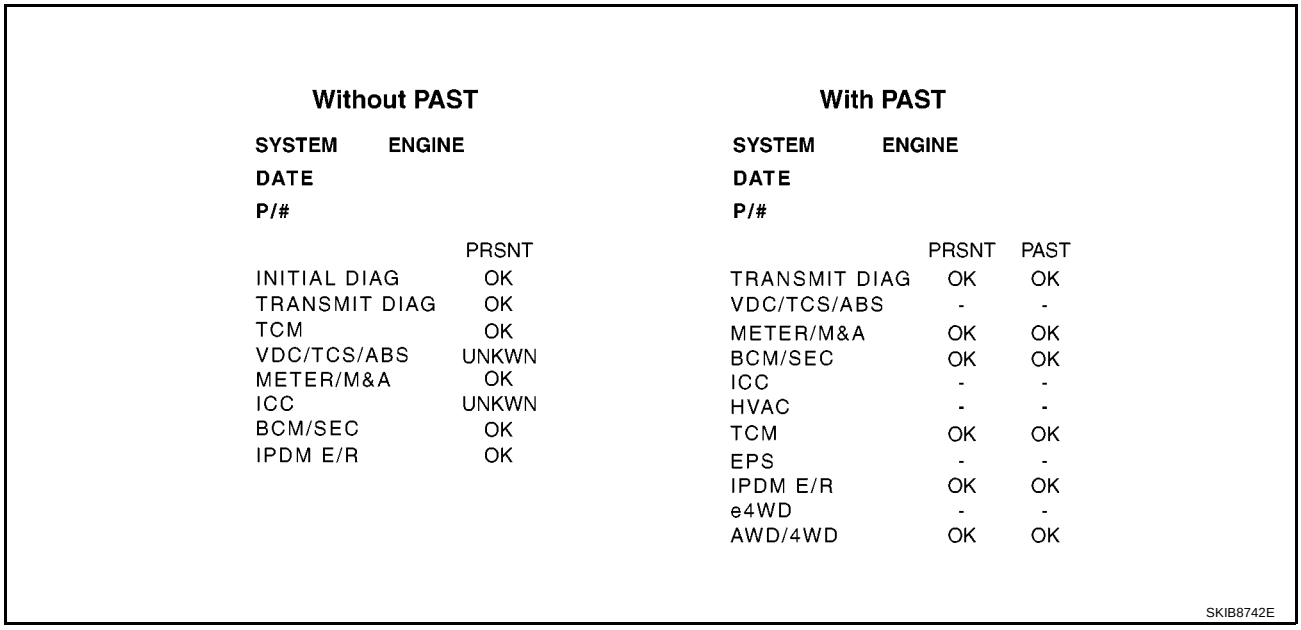
CAN Diagnostic Support Monitor

BKS002AD

CONSULT-II and CAN diagnostic support monitor (on-board diagnosis function) are used for detecting root cause.

MONITOR ITEM (CONSULT-II)

Example: CAN DIAG SUPPORT MNTR indication



Without PAST

Item	PRSNT	Description
Initial diagnosis	OK	Normal at present
	NG	Control unit error (Except for some control units)
Transmission diagnosis	OK	Normal at present
	UNKWN	Unable to transmit signals for 2 seconds or more.
		Diagnosis not performed
Control unit name (Reception diagnosis)	OK	Normal at present
	UNKWN	Unable to receive signals for 2 seconds or more.
		Diagnosis not performed
		No control unit for receiving signals. (No applicable optional parts)

With PAST

Item	PRSNT	PAST	Description
Transmission diagnosis	OK	OK	Normal at present and in the past
		1 – 39	Normal at present, but unable to transmit signals for 2 seconds or more in the past. (The number indicates the number of times the ignition switch is turned OFF to ON.)
	UNKWN	0	Unable to transmit signals for 2 seconds or more at present.
Control unit name (Reception diagnosis)	OK	OK	Normal at present and in the past
		1 – 39	Normal at present, but unable to receive signals for 2 seconds or more in the past. (The number indicates the number of times the ignition switch is turned OFF to ON.)
	UNKWN	0	Unable to receive signals for 2 seconds or more at present
	–	–	Diagnosis not performed.
			No control unit for receiving signals. (No applicable optional parts)

MONITOR ITEM (ON-BOARD DIAGNOSIS)

NOTE:

- For some models, CAN communication diagnosis result is received from the vehicle monitor or A/C controller indicator. (CONSULT-II is not available.)
- Refer to “CAN Diagnostic Support Monitor” of “TROUBLE DIAGNOSIS”, “LAN SYSTEM” in applicable Service Manual for the details.

Example: Vehicle Display

Item	Result indicated	Error counter	Description
CAN_COMM (Initial diagnosis)	OK	0	Normal at present
	NG	1 – 50	Control unit error (The number indicates the amount of times that diagnosis was performed.)
CAN_CIRC_1 (Transmission diagnosis)	OK	0	Normal at present
	UNKWN	1 – 50	Unable to transmit for 2 seconds or more at present. (The number indicates the amount of times that diagnosis was performed.)
CAN_CIRC_2 – 9 (Reception diagnosis of each unit)	OK	0	Normal at present
	UNKWN	1 – 50	Unable to transmit for 2 seconds or more at present. (The number indicates the amount of times that diagnosis was performed.)
			Diagnosis not performed.
			No control unit for receiving signals. (No applicable optional parts)

TROUBLE DIAGNOSES WORK FLOW

PFP:00004

Information Needed for Trouble Diagnosis

BKS002AE

CAN communication system performs trouble diagnosis with the following tools.

Tool	Usage
Interview sheet	For filling in vehicle information and interview with customer.
Data sheet	For attaching CONSULT-II data or on-board diagnosis data.
Diagnosis sheet	For detecting the root cause. (Diagnosis sheet includes system diagram for every CAN system type)
SELECT SYSTEM (CONSULT-II)	For checking the condition of control units and the status of CAN communication.
SELF-DIAG RESULTS (CONSULT-II)	
CAN DIAG SUPPORT MNTR (CONSULT-II)	
CAN communication signal chart	For judging CAN communication signal between control units is normal or abnormal, by converting the customer interview information to transmission and reception of CAN communication signals.
Abbreviation list	For checking abbreviations in CAN communication signal chart and diagnosis sheet.

How to Use CAN Communication Signal Chart

BKS002AF

CAN communication signal chart lists up signals needed for trouble diagnosis. It is useful for detecting the root cause by finding a signal related to the symptom, and by checking transmission and reception unit.

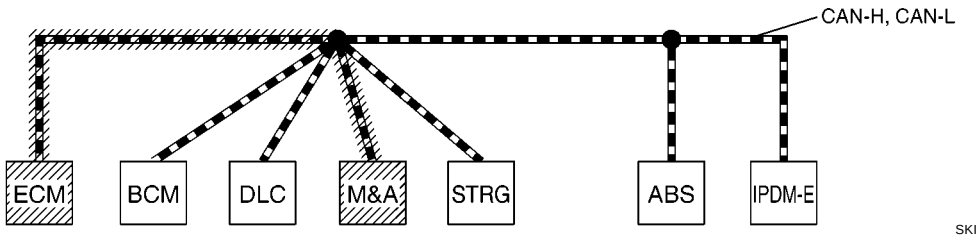
Example: Tachometer does not move even though the engine rotates.

T: Transmit R: Receive

Signal name/Connecting unit	ECM	BCM	M&A	STRG	ABS	IPDM-E
A/C compressor feedback signal	T		R			
A/C compressor request signal	T					R
Accelerator pedal position signal	T				R	
Cooling fan motor operation signal	T					R
Engine coolant temperature signal	T		R			
Engine speed signal	T		R		R	
Fuel consumption monitor signal	T		R			
Malfunction indicator lamp signal	T		R			
A/C switch signal	R	T				
Ignition switch signal		T				R
Sleep/wake up signal		T	R			R

No communication between ECM and M&A.

It indicates that an error occurs between ECM and M&A (Shaded area).



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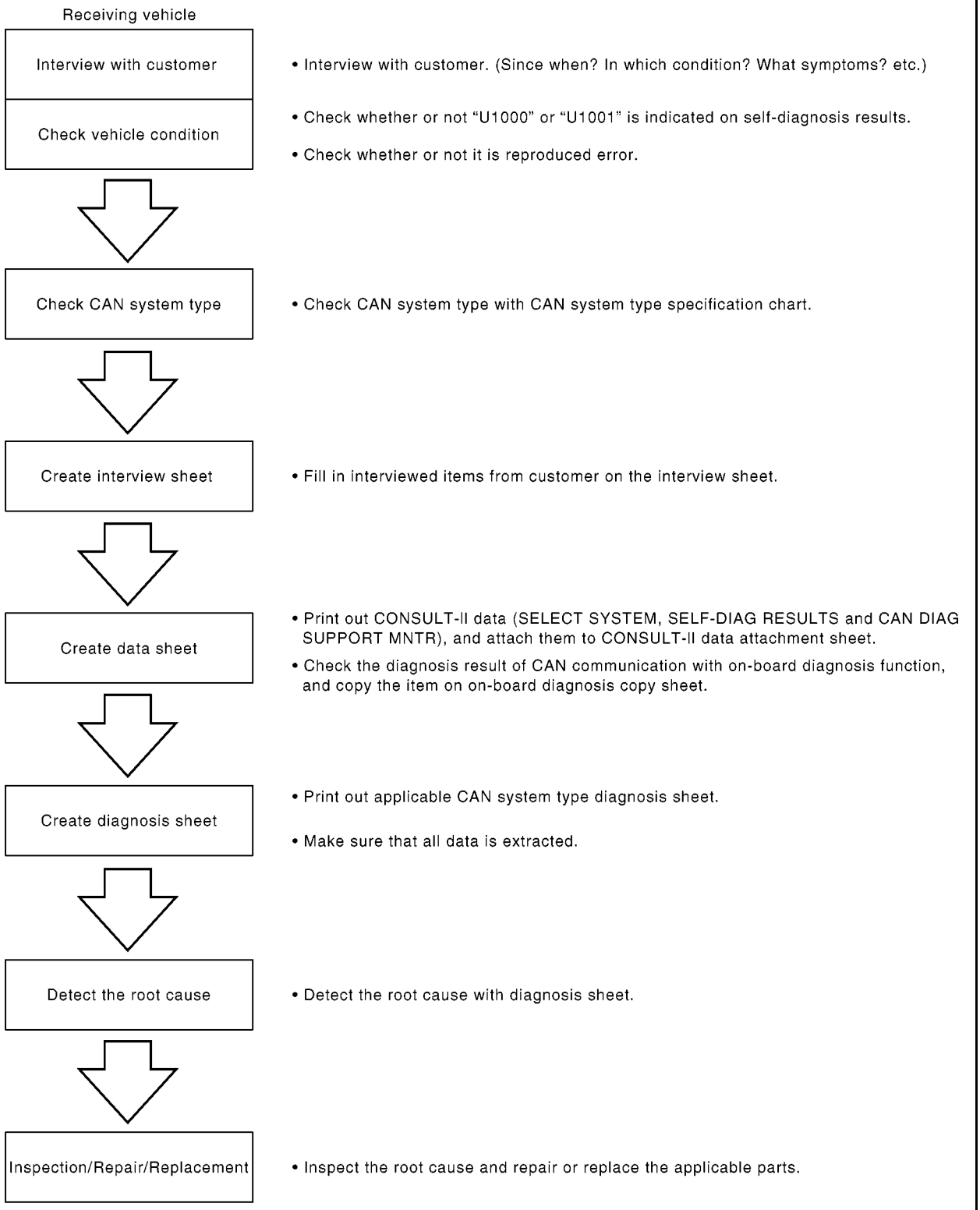
Trouble Diagnosis Flow Chart

BKS002AG



Trouble Diagnosis Procedure

BKS002AH

INTERVIEW WITH CUSTOMER

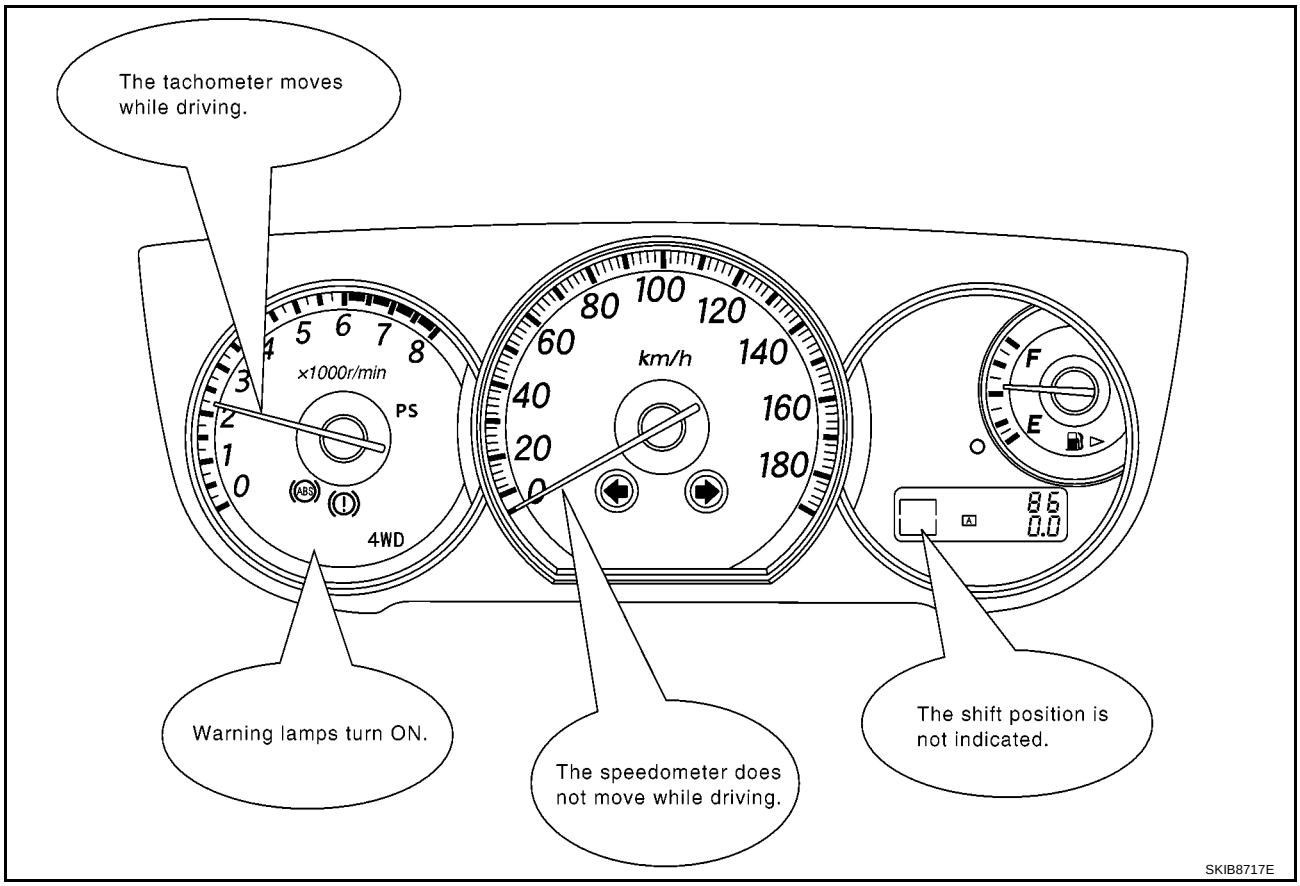
Interview with the customer is important to detect the root cause of CAN communication system. Grasp vehicle condition and symptom through the interview for proper trouble diagnosis.

Points in interview

- What: Parts name, System name
- When: Date, Frequency
- Where: Road condition, Place
- In what condition: Driving condition/environment
- Result: Symptom

NOTE:

- Check normal units as well as error symptoms.
  - Example: Circuit between ECM and the combination meter is judged normal if the customer indicated tachometer functions normally.
- Multiple control units malfunction or enter fail-safe mode under CAN communication system error.
- Indication of the combination meter is important to detect the root cause because it is the most obvious from the customer, and it performs CAN communication with many units.



INSPECTION OF VEHICLE CONDITION

- Check whether or not “U1000” or “U1001” is indicated on “SELF-DIAG RESULTS” by CONSULT-II.

  NOTE:
  Root cause cannot be detected with procedure in this section if “U1000” or “U1001” is not indicated.

- Check whether the symptom is reproduced or not.

  CAUTION:
  - **Never turn the ignition switch OFF, and never disconnect the battery cable while the error is reproduced. Reproducing the error may stop, or the root cause cannot be detected.**
  - **Check the trouble diagnosis procedure for detecting the root cause of CAN communication. The procedure for reproduced error differs from non-reproduced error's case. Refer to LAN-24, "DETECT THE ROOT CAUSE" .**

CHECK OF CAN SYSTEM TYPE (HOW TO USE CAN SYSTEM TYPE SPECIFICATION CHART)

Check CAN system type from the vehicle equipment. Decide the diagnosis sheet.

NOTE:

CAN system type specification chart is divided for some vehicles (CAN system type is many).

CAN System Type Specification Chart (One sheet type)

NOTE:

CAN system type is easily checked with the vehicle equipment identification information under the chart.

Example:

If the vehicle equips Wagon, AWD, VQ35DE, CVT, VDC, and Intelligent Key system. (◯ shows an example of CAN system type.)

CAN System Specification Chart

Check CAN system type from the following specification chart. Then decide diagnosis sheet.

Body type	Wagon					
Axle	2WD				AWD	
Engine	QR25DE		VQ35DE			
Transmission	A/T		CVT			
Brake control	ABS				VDC	
Intelligent Key system		×		×		×
CAN system type	1	2	3	4	5	6
Diagnosis sheet	(XX-XX)	(XX-XX)	(XX-XX)	(XX-XX)	(XX-XX)	(XX-XX)
CAN communication signal chart	XX-XX. "TYPE 1/TYPE 2"		XX-XX. "TYPE 3/TYPE 4"		XX-XX. "TYPE 5/TYPE 6"	

Check the vehicle equipment with the vehicle identification number plate.

Check the vehicle equipment.

Which number is selected through the above? The number is CAN system type of the vehicle.

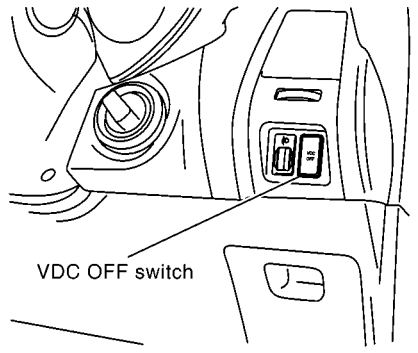
×: Applicable

VEHICLE EQUIPMENT IDENTIFICATION INFORMATION

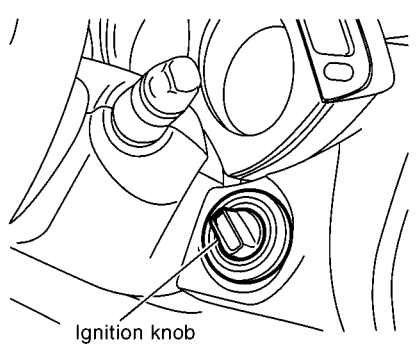
NOTE:

Check CAN system type from the vehicle shape and equipment.

With VDC



With Intelligent Key system



In the above example,

- Checking VDC OFF switch leads to judge whether or not VDC is equipped.
- Checking the ignition knob leads to judge whether or not Intelligent Key system is equipped.

For the above case, CAN system type is "6".

SKIB8718E

CAN System Type Specification Chart (Plural sheet type)

NOTE:

CAN system type is easily checked with the vehicle equipment identification information under the chart.

Example:

If the vehicle equips Sedan, 2WD, MR20DE, CVT, ABS, Active AFS, Intelligent Key system, Navigation system and Automatic drive positioner. (⬭ shows an example of CAN system type.)

CAN System Specification Chart

Refer to the specification chart as shown in the chart.

Body type	Sedan		
Axle	2WD		AWD
Engine	HR15DE	MR20DE	HR15DE
Transmission	A/T	CVT	A/T
Brake control	ABS		
Specification chart	XX.XX "SPECIFICATION CHART A"	YY.YY "SPECIFICATION CHART B"	XX.XX "SPECIFICATION CHART C"

Check the vehicle equipment with the vehicle identification number plate.

Check the vehicle equipment.

Select the vehicle equipment. Refer to the specification chart.

×: Applicable

SPECIFICATION CHART B

Check CAN system type from the following specification chart. Then decide diagnosis sheet.

Body type	Sedan											
Axle	2WD											
Engine	MR20DE											
Transmission	CVT											
Brake control	ABS											
Active AFS		×			×	×			×	×		×
Intelligent Key system			×		×		×	×	×	×	×	×
Navigation system				×		×	×		×		×	×
Automatic drive positioner								×		×	×	×
CAN system type	9	10	11	12	13	14	15	16	17	18	19	20
Diagnosis sheet	AA: XX	AA: XX	AA: XX	AA: XX	AA: XX	AA: XX	AA: XX	AA: XX	AA: XX	AA: XX	AA: XX	AA: XX
CAN communication signal chart	XX.XX "TYPE 9/TYPE 10/TYPE 11/TYPE 12/TYPE 13/TYPE 14/TYPE 15/TYPE 16/TYPE 17/TYPE 18/TYPE 19/TYPE 20"											

Check the vehicle equipment.

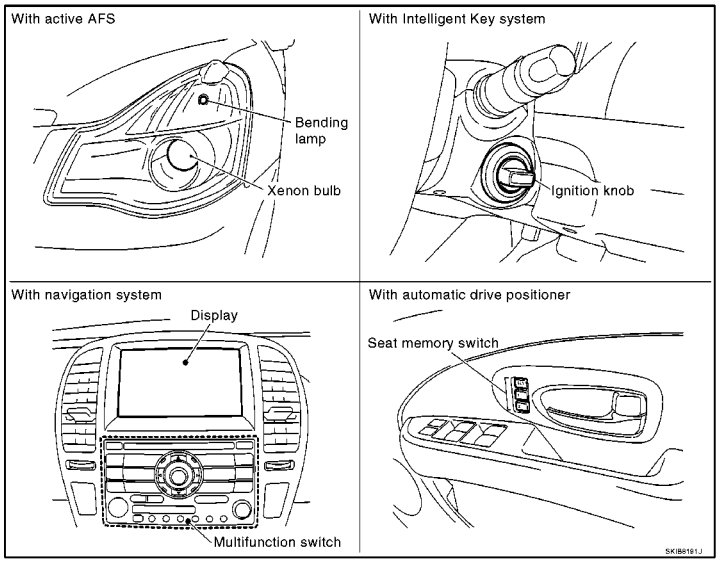
Which number is selected through the above?
The number is CAN system type of the vehicle.

×: Applicable

VEHICLE EQUIPMENT IDENTIFICATION INFORMATION

NOTE:

Check CAN system type from the vehicle shape and equipment.



In the above example,

- Checking Xenon bulb and bending lamp lead to judge whether or not Active AFS is equipped.
- Checking the ignition knob leads to judge whether or not Intelligent Key system is equipped.
- Checking display and multifunction switch lead to judge whether or not Navigation system is equipped.
- Checking seat memory switch leads to judge whether or not Automatic drive positioner is equipped.

For the above case, CAN system type is "20".

SKIB8719E

CREATE INTERVIEW SHEET

Fill in the symptoms from interview with the customer, vehicle condition, and CAN system type on the interview sheet.

Interview Sheet (Example)

CAN Communication System Diagnosis Interview Sheet

Receiving date: 3,Feb.2005

Type: DBA-KG11

VIN No.: KG11-005040

Model: BDRARGZ397EDA-E-J-

First registration: 10,Jan.2005

Mileage: 952 km

CAN system type: Type 19

Symptom (Results of interview with customer)

- Headlamps suddenly turn ON while driving the vehicle.
- The engine does not restart after stopping the vehicle and turning the ignition switch OFF.
- The cooling fan continues rotating while turning the ignition switch ON.

Condition at inspection

Error Symptom: (Reproduced) / Non-reproduced

The engine does not start.
While turning the ignition switch ON,
- The headlamps (Lo) turn ON, and the cooling fan continues rotating.
- The interior lamp does not turn ON.

On CONSULT-II screen,
- IPDM E/R is not indicated on SELECT SYSTEM.
- ENGINE: U1001
- BCM, ADAPTIVE LIGHT: U1000

SKIB8720E

CREATE DATA SHEET

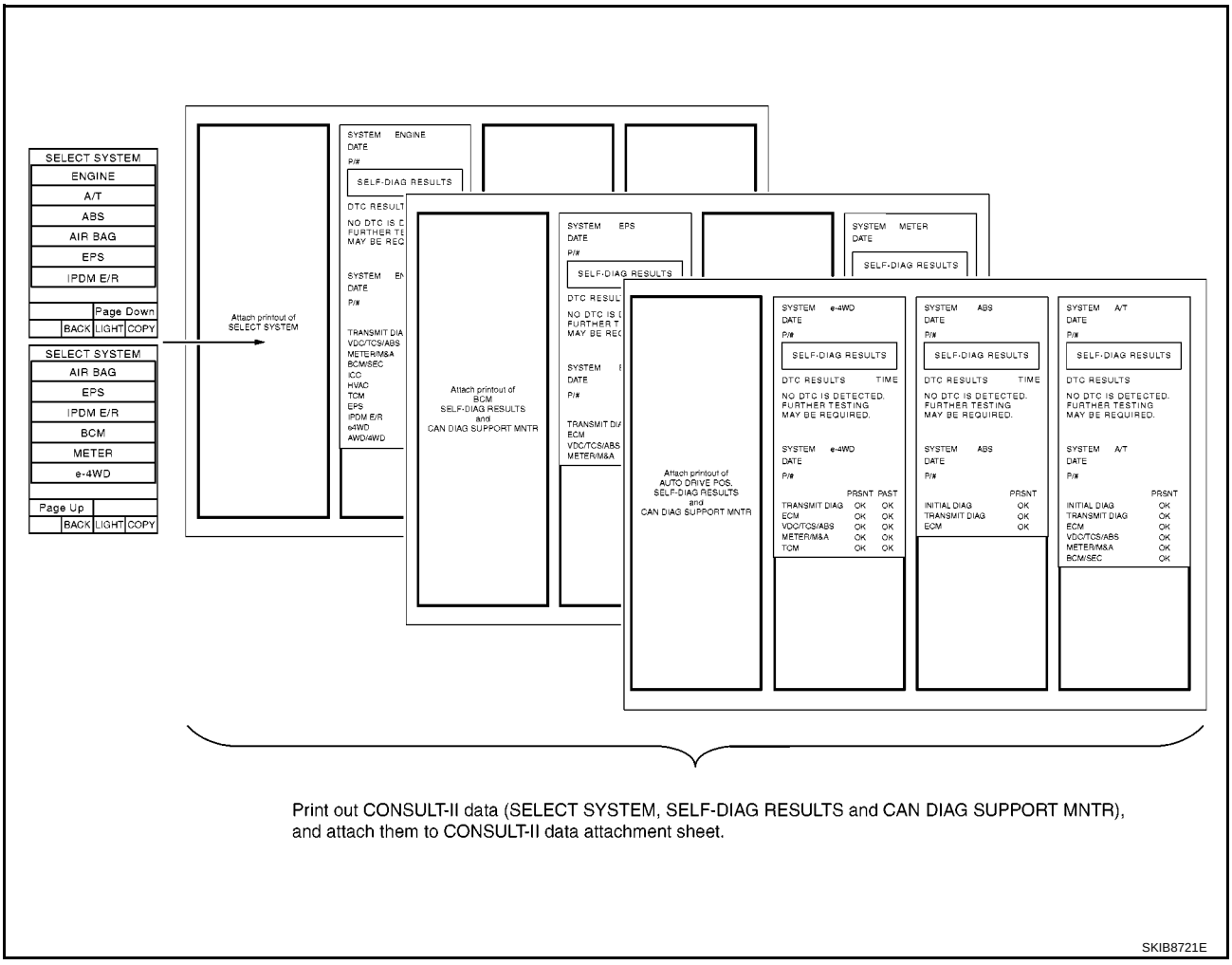
Create CONSULT-II Data Attachment Sheet

Print out the following CONSULT-II screens, and attach them to the CONSULT-II data attachment sheet.

- SELECT SYSTEM
- SELF-DIAG RESULTS
- CAN DIAG SUPPORT MNTR

NOTE:

Some items may not be needed according to CAN system type installed in the model.



Print out CONSULT-II data (SELECT SYSTEM, SELF-DIAG RESULTS and CAN DIAG SUPPORT MNTR), and attach them to CONSULT-II data attachment sheet.

Create On-board Diagnosis Copy Sheet

Display the trouble diagnosis result of CAN communication with the on-board diagnosis function on the vehicle monitor, etc. Copy them on the on-board diagnosis copy sheet.

NOTE:

- For some models, CAN communication diagnosis result is received from the vehicle monitor or A/C controller indicator. (CONSULT-II is not available.)
- Refer to “CAN Diagnostic Support Monitor” of “TROUBLE DIAGNOSIS”, “LAN SYSTEM” in applicable Service Manual for the details.

Example: Copy the diagnosis result of CAN communication from the vehicle monitor.

Vehicle monitor indication

CAN DIAG SUPPORT MONITOR

Delete

CAN_COMM	OK	0
CAN_CIRC_1	OK	0
CAN_CIRC_2	UNKWN	12
CAN_CIRC_3	UNKWN	12
CAN_CIRC_4	UNKWN	0
CAN_CIRC_5	OK	0
CAN_CIRC_6	UNKWN	0
CAN_CIRC_7	OK	0
CAN_CIRC_8	UNKWN	0
CAN_CIRC_9	UNKWN	50

Copy

Vehicle monitor (Display control unit) CAN DIAG SUPPORT MONITOR copy sheet

Indication item (Diagnosis item)	Vehicle monitor		Indication item (Diagnosis item)	Vehicle monitor	
	Result indicated	Error counter		Result indicated	Error counter
CAN_COMM (Initial diagnosis)	**OK**	**0**	CAN_CIRC_5 (Receive diagnosis of Unified meter and A/C amp.)	**OK**	**0**
CAN_CIRC_1 (Transmit diagnosis)	**OK**	**0**	CAN_CIRC_6	Not available	
CAN_CIRC_2 (Receive diagnosis of BCM)	**UNKWN**	**12**	CAN_CIRC_7 (Receive diagnosis of IPDM E/R)	**OK**	**0**
CAN_CIRC_3 (Receive diagnosis of ECM)	**UNKWN**	**12**	CAN_CIRC_8	Not available	
CAN_CIRC_4	Not available		CAN_CIRC_9	Not available	

Result indicated: Fill in the indication (OK, NG or UNKWN).
Error counter: Fill in the indicated number.

SKIB8722E

CREATE DIAGNOSIS SHEET

CAUTION:

Use the diagnosis sheet of decided CAN system type only.

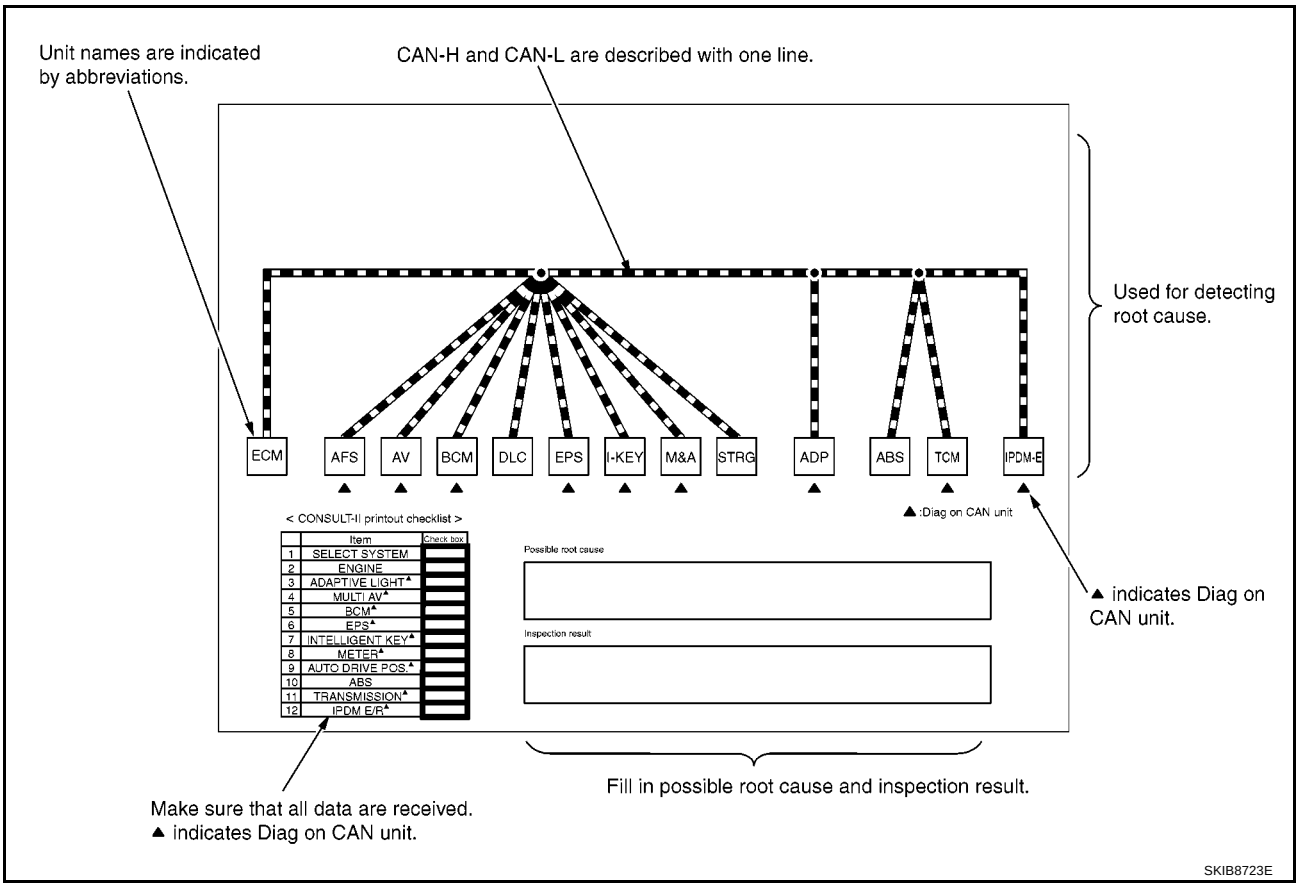
Print Out Diagnosis Sheet

Print out the diagnosis sheet of decided CAN system type.

Check of Received Data

Check the created data sheet for missing information or information not received.

- For abbreviations, refer to LAN-40, "Abbreviation List" .



DETECT THE ROOT CAUSE

Identify the root cause according to the diagnosis sheet created.

Outline of identifying the root cause

- Draw a line on the possible cause according to the created diagnosis sheet. Narrow the search.

  NOTE:
  - Color-code when drawing lines.
  - Do not draw a line onto a existing line.
- Drawing a line is not needed if the circuit is shorted. Each indication of the data sheet differs from that of the open circuit. Refer to LAN-31, "Reproduced Error — Short Circuit —" , LAN-38, "Non-reproduced Error — Short Circuit —" for the condition when the circuit is shorted.

Refer to the following for the details of the trouble diagnosis procedure.

- LAN-25, "Reproduced Error — Open Circuit —"
- LAN-31, "Reproduced Error — Short Circuit —"
- LAN-32, "Non-reproduced Error — Open Circuit —"
- LAN-38, "Non-reproduced Error — Short Circuit —"

CAUTION:

When the detected root cause is a branch line, or short-circuit, the control unit may have a malfunction, not the communication line. Be sure to check both communication line and the control unit.

Reproduced Error — Open Circuit —

Specify the error circuit through information of “SELECT SYSTEM” and “CAN DIAG SUPPORT MNTR”.

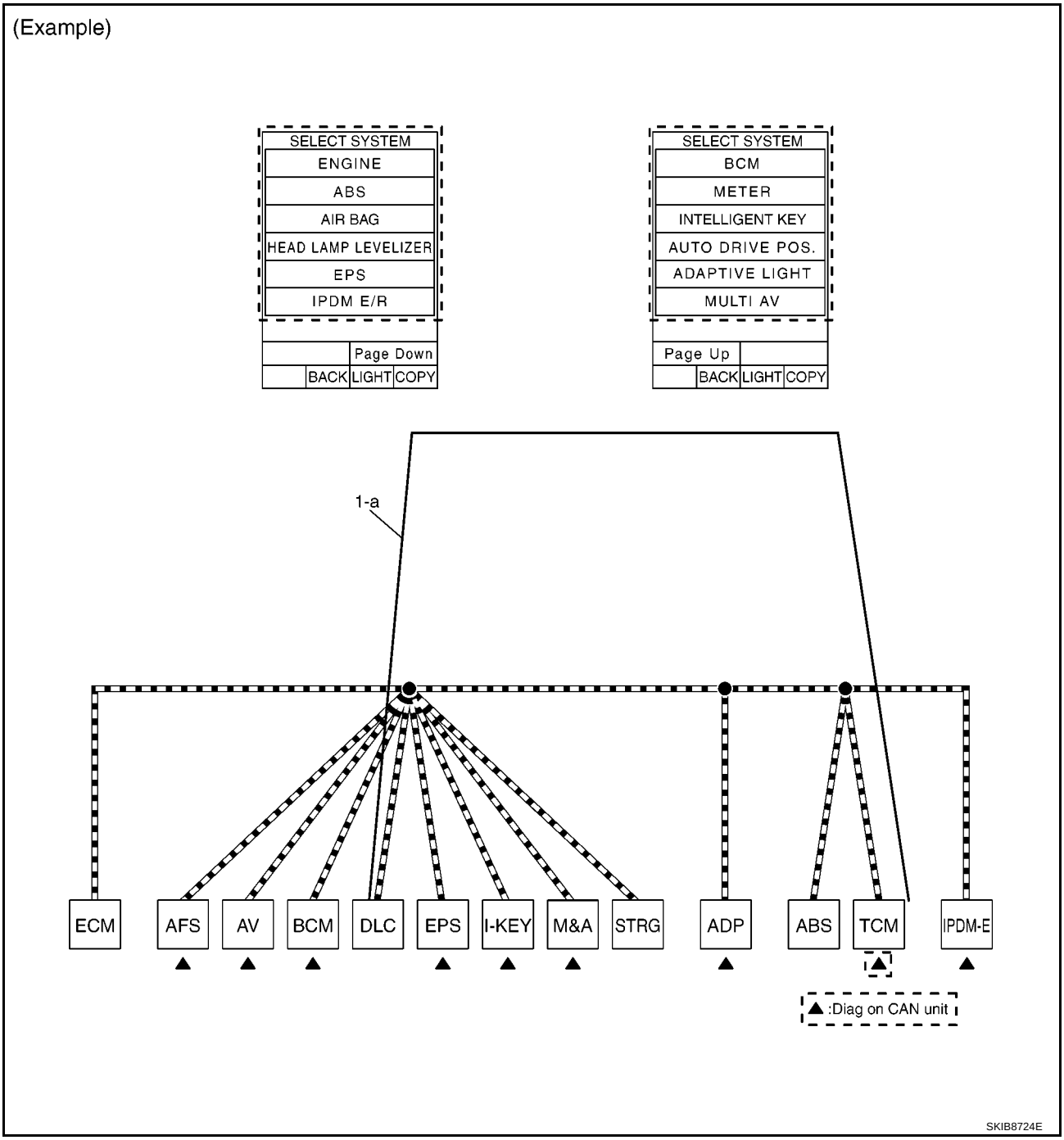
1. SELECT SYSTEM: Check the items indicated in “SELECT SYSTEM”. Draw a line on the error circuit.

CAUTION:
CAN communication line has no error if a unit except for Diag on CAN unit is not indicated. Power supply circuit, DDL1 communication line or DDL2 communication line may be malfunctioning.

a. “TCM” is not indicated on “SELECT SYSTEM” which is Diag on CAN unit. This means DLC does not receive the signal from TCM. Draw a line between DLC and TCM (line 1-a in the figure).

NOTE:
- The name of Diag on CAN unit is not indicated on “SELECT SYSTEM” when CAN line between Diag on CAN unit and the data link connector is open circuit.
- For description of Diag on CAN, refer to LAN-5, "Diag on CAN" .

(Example)



2. CAN DIAG SUPPORT MNTR: Check each item on “CAN DIAG SUPPORT MNTR”. Draw a line on the error circuit.

a. Reception item of “ENGINE”: On “TCM”, “UNKWN” is indicated. This means ECM cannot receive the signal from TCM. Draw a line between ECM and TCM (line 2-a in the figure).

NOTE:
If “UNKWN” is indicated on “TRANSMIT DIAG”, then the control unit cannot transmit CAN communication signal to each unit. Draw a line between the control unit and the joint point.

b. Reception item of “ADAPTIVE LIGHT”: On “TCM”, “UNKWN” is indicated. This means AFS cannot receive the signal from TCM. Draw a line between AFS and TCM (line 2-b in the figure).

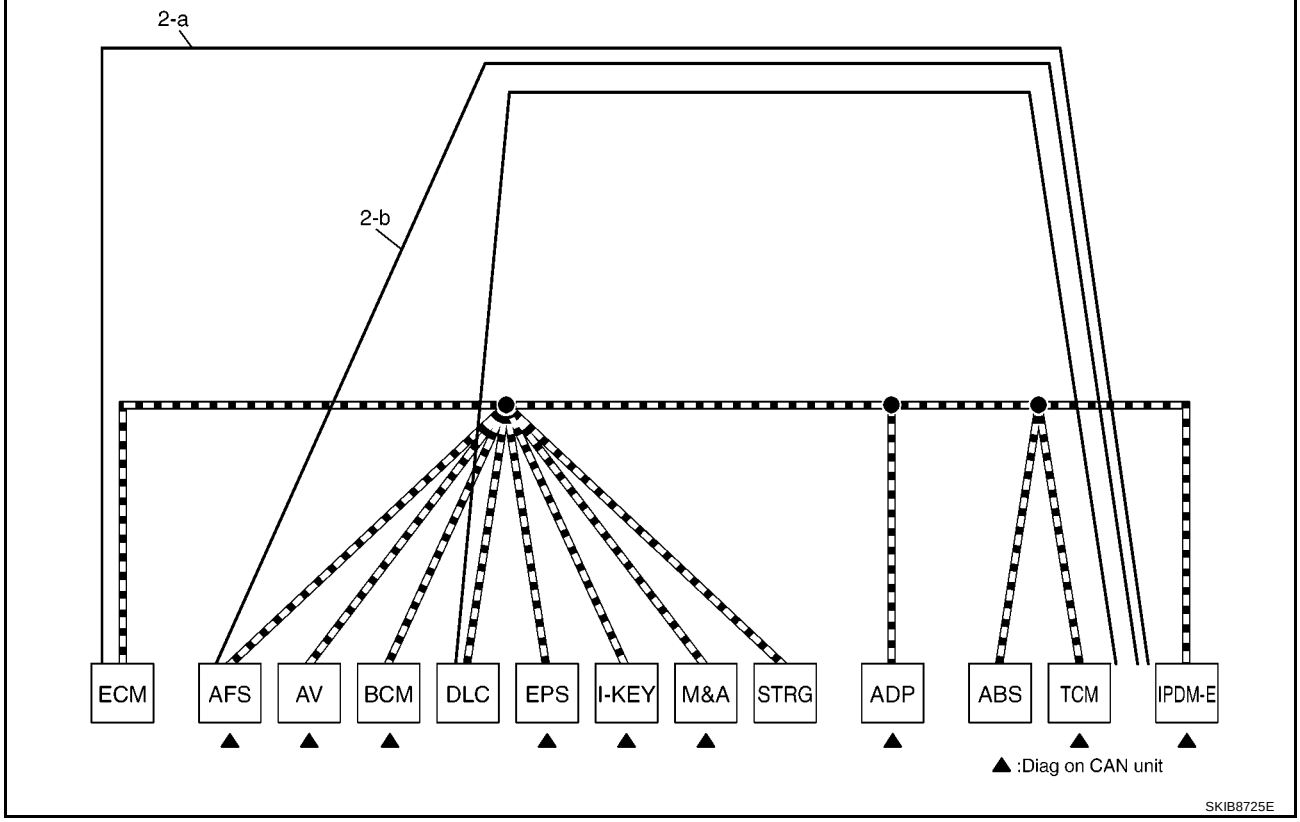
c. Reception item of “MULTI AV”: “UNKWN” is not indicated. This means that the AV can communicate normally with the units in the receiving items of AV. Do not draw any line.

(Example)

SYSTEM ENGINE DATE P/#	PRSNT	PAST
TRANSMIT DIAG	OK	OK
VDC/TCS/ABS	OK	OK
METER/M&A	-	-
BCM/SEC	OK	OK
ICC	-	-
HVAC	-	-
TCM	UNKWN	0
EPS	OK	OK
IPDM E/R	OK	OK
e4WD	-	-
AWD/4WD	-	-

SYSTEM ADAPTIVE LIGHT DATE P/#	PRSNT	PAST
TRANSMIT DIAG	-	-
ECM	OK	OK
METER/M&A	OK	OK
TCM	UNKWN	0
STRG	OK	OK
EPS	-	-
IPDM E/R	OK	OK

SYSTEM MULTI AV DATE P/#	PRSNT	PAST
TRANSMIT DIAG	-	-
ECM	OK	OK
METER/M&A	OK	OK
BCM/SEC	-	-
HVAC	-	-
IPDM E/R	-	-
TIRE-P	-	-



d. Reception item of “BCM”: On “TCM”, “UNKWN” is indicated. This means BCM cannot receive the signal from TCM. Draw a line between BCM and TCM (line 2-d in the figure).

e. Reception item of “EPS” and “INTELLIGENT KEY”: “UNKWN” is not indicated. This means that the EPS and I-KEY can communicate normally with the units in the receiving items of EPS and I-KEY. Do not draw any line.

NOTE:
On CAN DIAG SUPPORT MNTR (without PAST), “UNKWN” is indicated even though the item is not used in the trouble diagnosis. For the details of each item on CAN diagnostic support monitor, refer to LAN-43, "CAN Diagnostic Support Monitor" .

(Example)

SYSTEM BCM
DATE
P/#

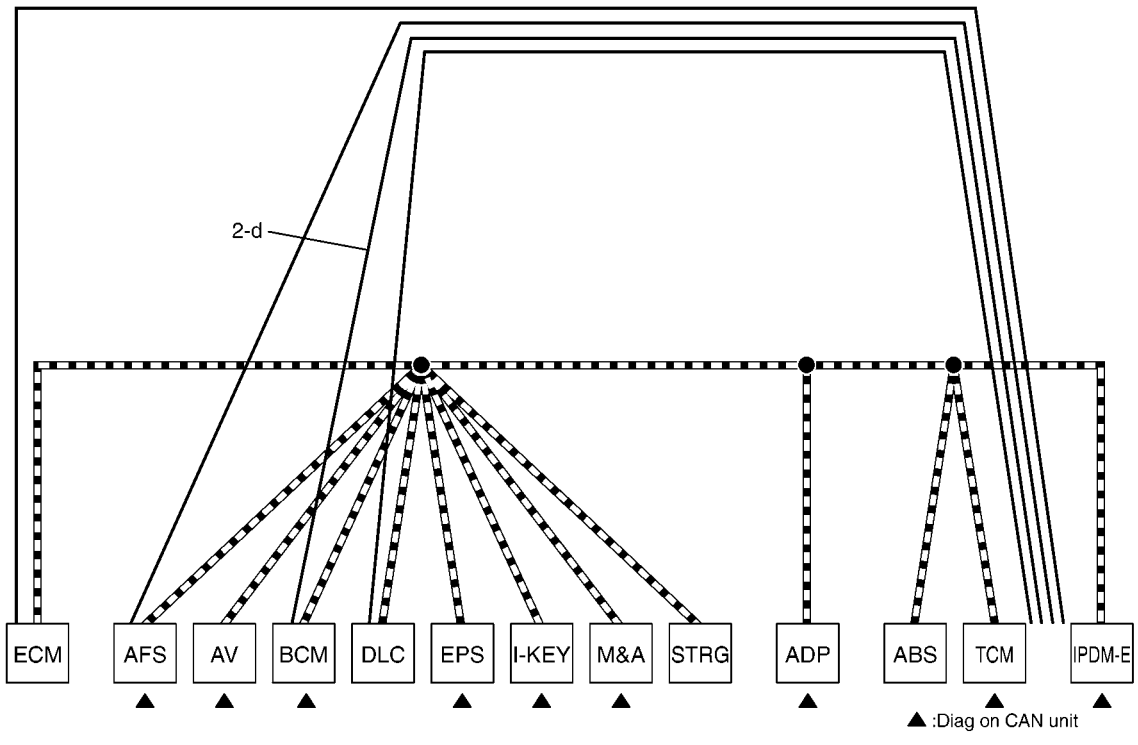
	PRSNT	PAST
TRANSMIT DIAG	OK	OK
ECM	OK	OK
METER/M&A	OK	OK
TCM	UNKWN	0
MULTI AV	-	-
IPDM E/R	OK	OK
I-KEY	OK	OK

SYSTEM EPS
DATE
P/#

	PRSNT
TRANSMIT DIAG	OK
ECM	OK
VDC/TCS/ABS	OK
METER/M&A	OK

SYSTEM INTELLIGENT KEY
DATE
P/#

	PRSNT	PAST
TRANSMIT DIAG	OK	OK
ECM	OK	OK
METER/M&A	OK	OK
BCM/SEC	OK	OK



f. Reception item of “METER”: On “TCM”, “UNKWN” is indicated. This means M&A cannot receive the signal from TCM. Draw a line between M&A and TCM (line 2-f in the figure).

g. Reception item of “AUTO DRIVE POS.”: On “TCM”, “UNKWN” is indicated. This means ADP cannot receive the signal from TCM. Draw a line between ADP and TCM (line 2-g in the figure).

h. Reception item of “ABS”: “UNKWN” is not indicated. This means that the ABS can communicate normally with the units in the receiving items of ABS. Do not draw any line.

(Example)

SYSTEM METER
DATE
P/#

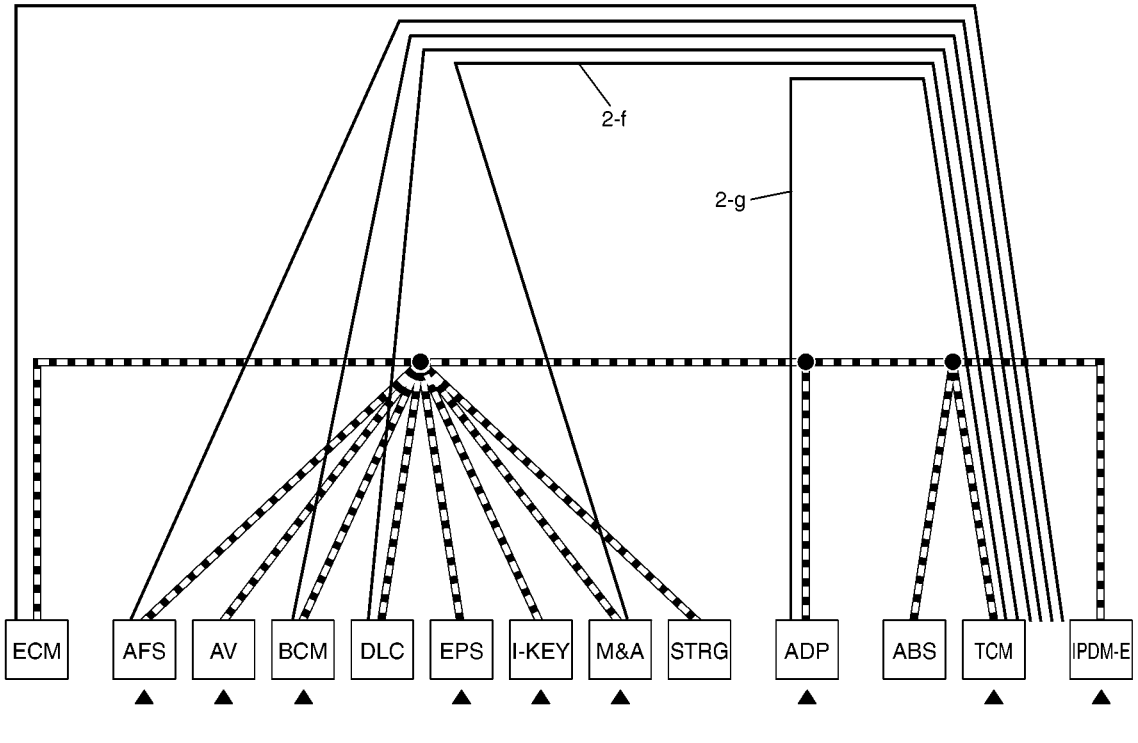
	PRSNT	PAST
TRANSMIT DIAG	OK	OK
ECM	OK	OK
TCM	UNKWN	0
BCM/SEC	OK	OK
VDC/TCS/ABS	OK	OK
IPDM E/R	-	-
DISPLAY	-	-
I-KEY	OK	OK
EPS	OK	OK
AWD/4WD	-	-
e4WD	-	-
ICC	-	-
LANE KEEP	-	-
TIRE-P	-	-

SYSTEM AUTO DRIVE POS.
DATE
P/#

	PRSNT	PAST
TRANSMIT DIAG	-	-
METER/M&A	OK	OK
BCM/SEC	OK	OK
TCM	UNKWN	0

SYSTEM ABS
DATE
P/#

	PRSNT
INITIAL DIAG	OK
TRANSMIT DIAG	OK
ECM	OK



i. Reception item of “IPDM E/R”: “UNKWN” is not indicated. This means that the IPDM-E can communicate normally with the units in the receiving items of IPDM-E. Do not draw any line.

3. Check the normal CAN communication line from “CAN DIAG SUPPORT MNTR” of the control units (ECM and IPDM-E), which connects to both ends of CAN communication system.

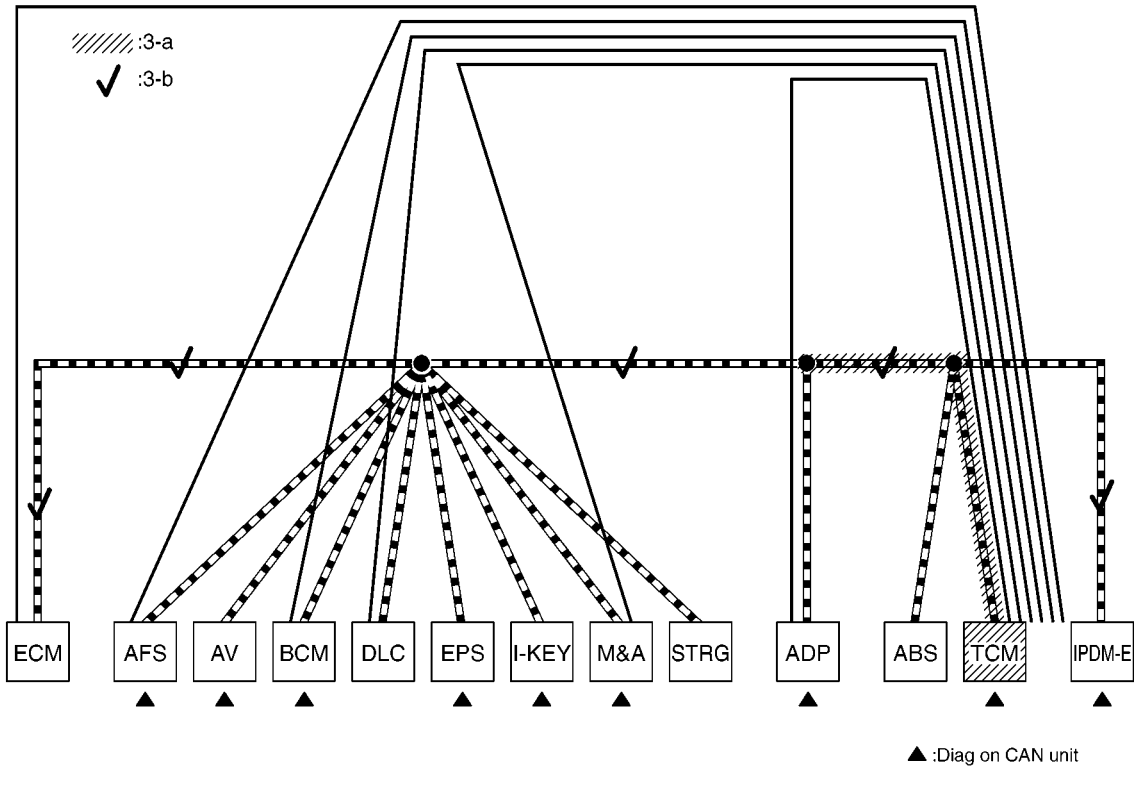
a. Through the previous procedure, the circuit between ADP joint point and TCM has the most amount of lines (shade 3-a in the figure).

b. Check the normal lines to detect the error circuit.
Reception item of “IPDM E/R”: On “ECM”, “OK” is indicated. IPDM-E communicates normally with ECM. Put a check mark on the normal circuit between ECM and IPDM-E (check mark 3-b in the figure).

(Example)

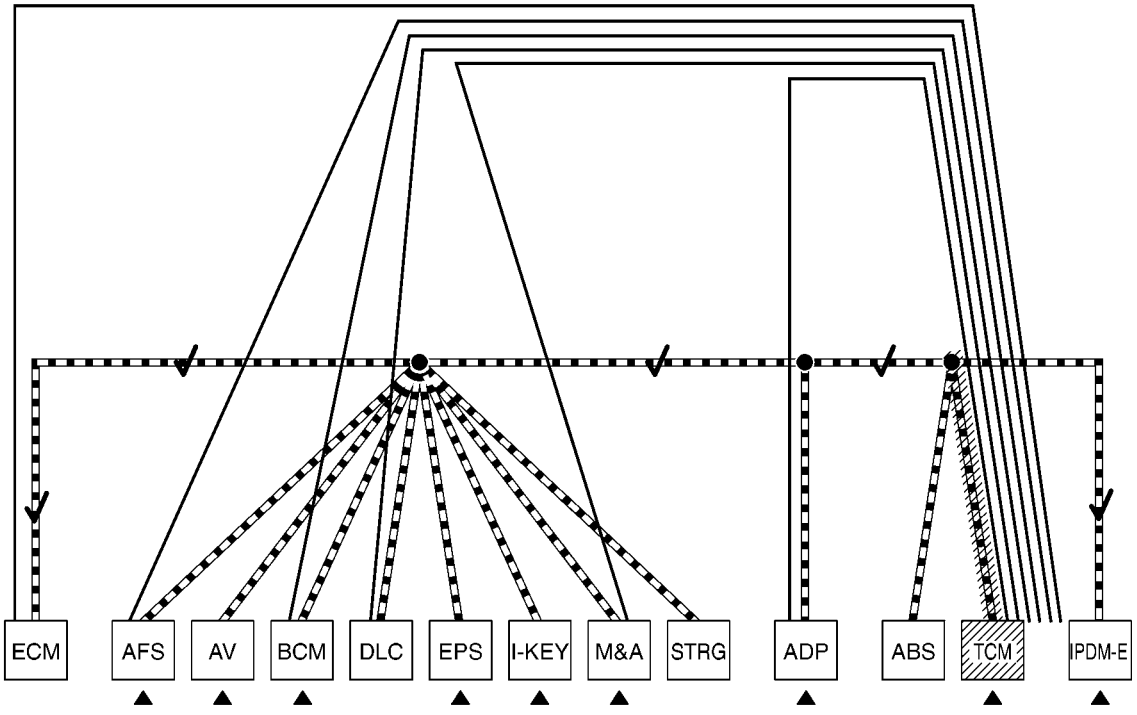
SYSTEM **IPDM E/R**
DATE

	PRSNT	PAST
TRANSMIT DIAG	OK	OK
ECM	OK	OK
BCM/SEC	OK	OK



4. Through the above procedure, the error is detected at TCM branch line (shaded in the figure).
   NOTE:
   For abbreviations, refer to LAN-40, "Abbreviation List" .
5. Perform the inspection for the detected error circuit. For the inspection procedure, refer to LAN-53, "Malfunction Area Chart" .

(Example)



< CONSULT-II printout checklist >

	Item	Check box
1	SELECT SYSTEM	✓
2	ENGINE	✓
3	ADAPTIVE LIGHT▲	✓
4	MULTI AV▲	✓
5	BCM▲	✓
6	EPS▲	✓
7	INTELLIGENT KEY▲	✓
8	METER▲	✓
9	AUTO DRIVE POS.▲	✓
10	ABS	✓
11	TRANSMISSION▲	N-IDC
12	IPDM E/R▲	✓

Possible root cause

- Error between TCM and joint point.
- Error in TCM.

Inspection result

SKIB8729E

Reproduced Error — Short Circuit —

When the received data and error symptom have the symptoms shown below, short circuit of CAN communication line is a root cause.

Received data

Item (CONSULT-II)	Indication
SELECT SYSTEM	All Diag on CAN units are not indicated.
CAN DIAG SUPPORT MNTR	“UNKWN” is indicated on the “TRANSMIT DIAG” and most reception item.

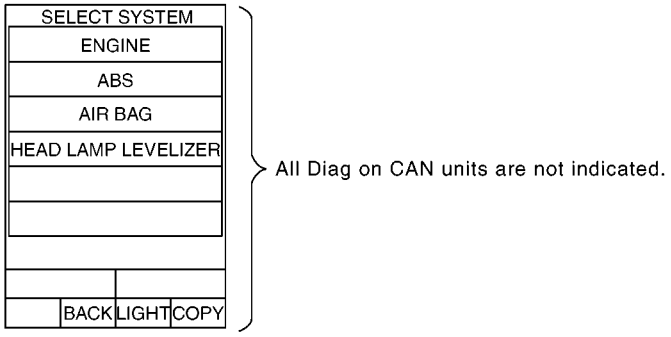
Error symptom

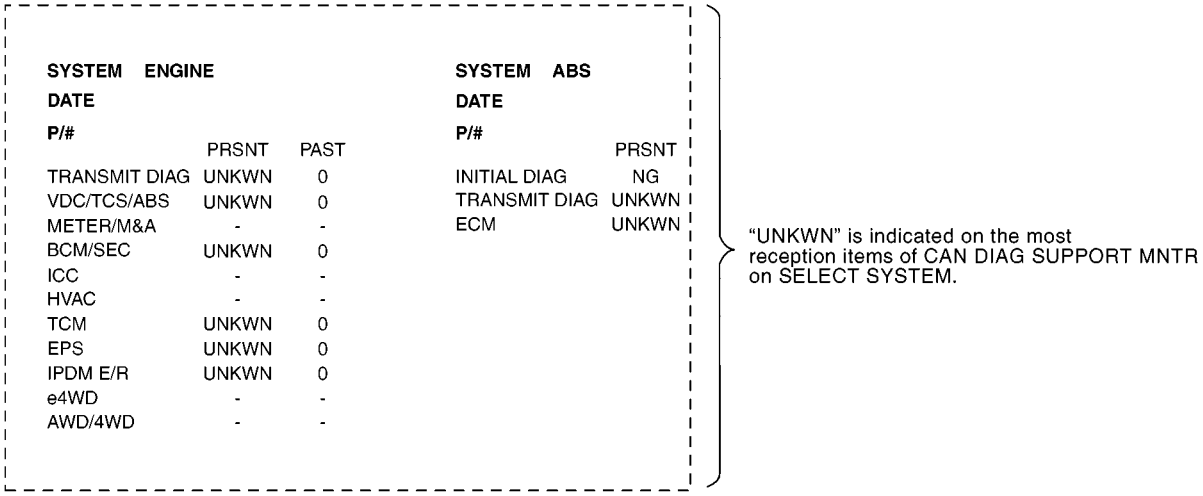
- Most the units which are connected to the CAN communication system enter fail-safe mode or are deactivated.

Inspection procedure

- Refer to LAN-53, "Malfunction Area Chart" .

(Example)





Non-reproduced Error — Open Circuit —

Check CAN communication signal chart according to SELF-DIAG RESULTS, CAN DIAG SUPPORT MNTR, and the interview with the customer. Detect the errors that occurred in the past.

1. SELF-DIAG RESULTS: Check the unit indicating “U1000” or “U1001” on SELF-DIAG RESULTS.

(Example)

SYSTEM ENGINE
DATE
P/#

SELF-DIAG RESULTS

DTC RESULTS	TIME
CAN COMM CIRCUIT [U1001]	1t

SYSTEM ADAPTIVE LIGHT
DATE
P/#

SELF-DIAG RESULTS

DTC RESULTS	TIME
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	

SYSTEM MULTI AV
DATE
P/#

SELF-DIAG RESULTS

DTC RESULTS	TIME
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	

SYSTEM BCM
DATE
P/#

SELF-DIAG RESULTS

DTC RESULTS	TIME
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	

SYSTEM EPS
DATE
P/#

SELF-DIAG RESULTS

DTC RESULTS	TIME
CAN COMM CIRCUIT [U1000]	PAST

SYSTEM INTELLIGENT KEY
DATE
P/#

SELF-DIAG RESULTS

DTC RESULTS	TIME
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	

SYSTEM METER
DATE

SELF-DIAG RESULTS

DTC RESULTS	TIME
CAN COMM CIRCUIT [U1000]	3

SYSTEM AUTO DRIVE POS.
DATE
P/#

SELF-DIAG RESULTS

DTC RESULTS	TIME
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	

SYSTEM ABS
DATE
P/#

SELF-DIAG RESULTS

DTC RESULTS	TIME
CAN COMM CIRCUIT [U1000]	3

SYSTEM TRANSMISSION
DATE
P/#

SELF-DIAG RESULTS

DTC RESULTS	TIME
CAN COMM CIRCUIT [U1000]	3

SYSTEM IPDM E/R
DATE

SELF-DIAG RESULTS

DTC RESULTS	TIME
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	

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2. CAN DIAG SUPPORT MNTR (with PAST): Check the CAN DIAG SUPPORT MNTR (with PAST) of units indicating “U1000” or “U1001” on SELF-DIAG RESULTS. Draw a line on the possible cause.

NOTE:
For the details of each indication on CAN DIAG SUPPORT MNTR, refer to LAN-43, "CAN Diagnostic Support Monitor" .

a. Reception item of “ENGINE”: On “VDC/TCS/ABS”, “3” is indicated in the “PAST”. This means ECM could not receive the signal from ABS in the past. Draw a line between ECM and ABS (line 2-a in the figure).

b. Reception item of “METER”: On “VDC/TCS/ABS”, “3” is indicated in the “PAST”. This means M&A could not receive the signal from ABS in the past. Draw a line between M&A and ABS (line 2-b in the figure).

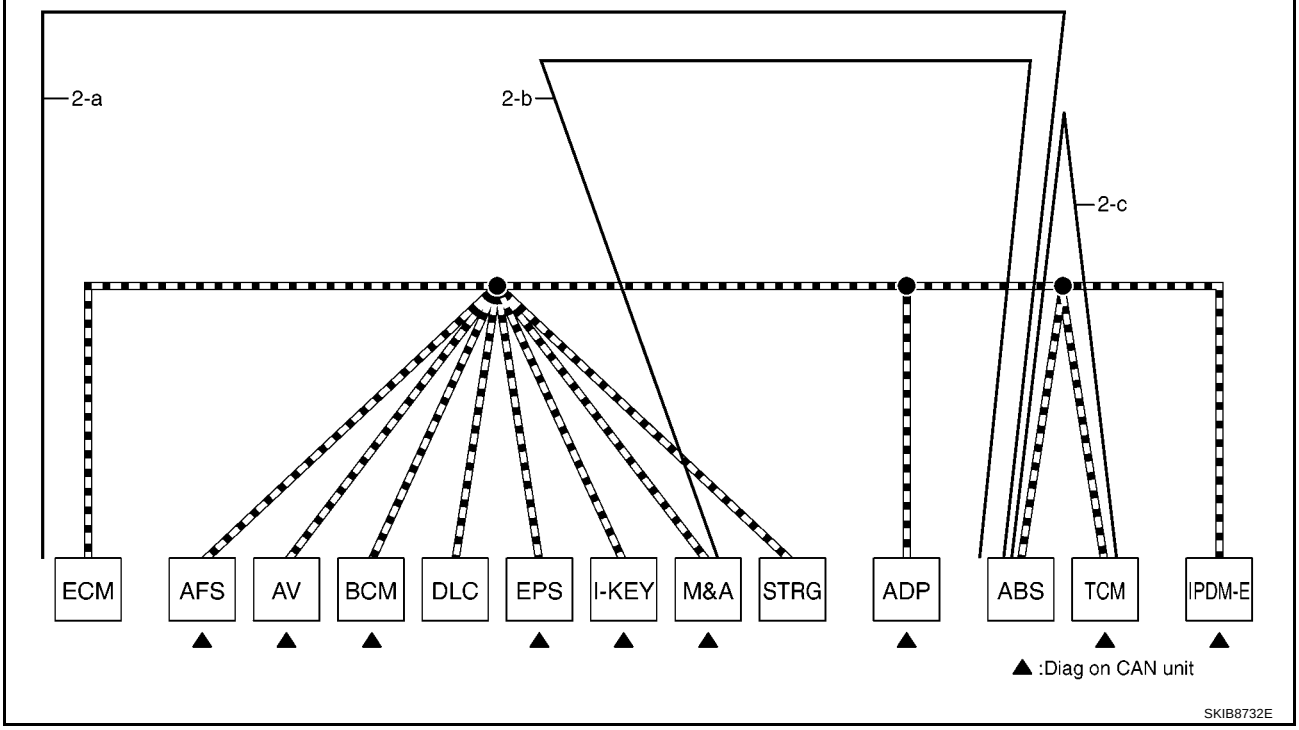
c. Reception item of “TRANSMISSION”: On “VDC/TCS/ABS”, “3” is indicated in the “PAST”. This means TCM could not receive the signal from ABS in the past. Draw a line between TCM and ABS (line 2-c in the figure).

(Example)

SYSTEM ENGINE DATE P/#	PRSNT	PAST
TRANSMIT DIAG	OK	OK
VDC/TCS/ABS	OK	3
METER/M&A	-	-
BCM/SEC	OK	OK
ICC	-	-
HVAC	-	-
TCM	OK	OK
EPS	OK	OK
IPDM E/R	OK	OK
e4WD	-	-
AWD/4WD	-	-

SYSTEM METER DATE	PRSNT	PAST
TRANSMIT DIAG	OK	OK
ECM	OK	OK
TCM	OK	OK
BCM/SEC	OK	OK
VDC/TCS/ABS	OK	3
IPDM E/R	-	-
DISPLAY	-	-
I-KEY	OK	OK
EPS	OK	OK
AWD/4WD	-	-
e4WD	-	-
ICC	-	-
LANE KEEP	-	-
TIRE-P	-	-

SYSTEM TRANSMISSION DATE P/#	PRSNT	PAST
TRANSMIT DIAG	OK	OK
ECM	OK	OK
VDC/TCS/ABS	OK	3
METER/M&A	OK	OK
BCM/SEC	OK	OK
ICC	-	-
e4WD	-	-
AWD/4WD	-	-



3. CAN DIAG SUPPORT MNTR (without PAST): Check the CAN DIAG SUPPORT MNTR (without PAST) of units indicating “U1000” or “U1001” on SELF-DIAG RESULTS. Draw a line on the possible cause.

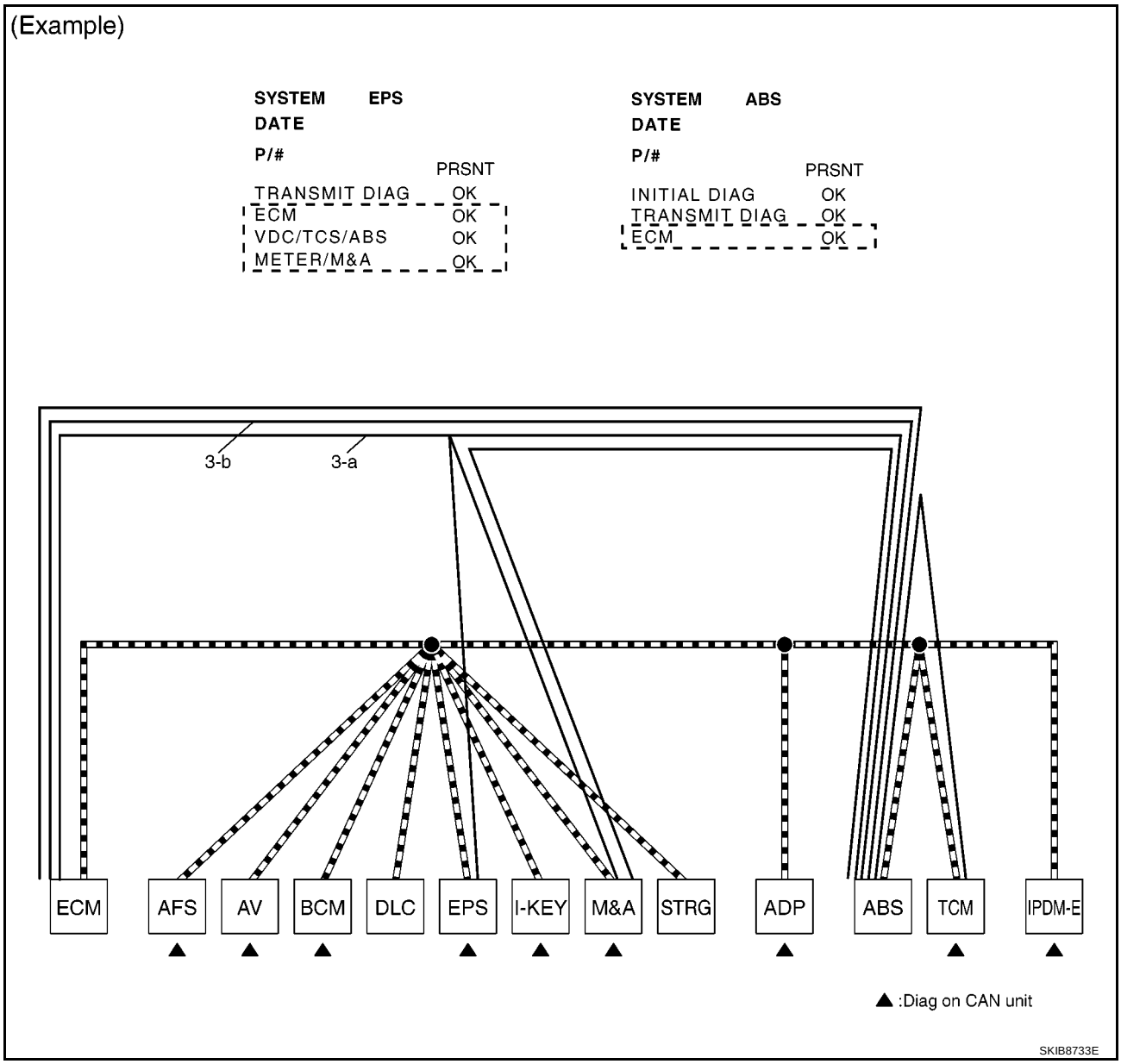
NOTE:

- While an error occurred in the past according to SELF-DIAG RESULTS, it is unclear which signal is not received. Assume that errors were detected from all reception items.
- Draw a single line among the unit and all reception items. (Work flow differs from CAN DIAG SUPPORT MNTR (with PAST).)

a. Reception item of “EPS”: Assume that the unit could not receive the signals from ECM, ABS, and M&A. Draw a line among EPS, ECM, ABS, and M&A (line 3-a in the figure).

b. Reception item of “ABS”: Assume that the unit could not receive the signal from ECM. Draw a line between ABS and ECM (line 3-b in the figure).

(Example)



4. Search for the possible cause using CAN communication signal chart from the interview with the customer.

NOTE:
For the details of CAN communication signal, refer to LAN-44, "CAN Communication Signal Chart" .

a. ABS warning lamp turned ON and speedometer did not move: This means that “ABS warning lamp signal” and “Vehicle speed signal” could not communicate between M&A and ABS (4-a in the figure).

b. The tachometer moved normally: This means that “Engine speed signal” could communicate normally between ECM and M&A (4-b in the figure).

(Example)

First registration: 28, Jan. 2005

CAN system type: Type 20

Symptom (Interview result from customer)

While driving,
• ABS warning lamp turned ON.
• Speedometer did not move.
• Tachometer moved normally.

CAN Communication Signal Chart

T: Transmit R: Receive

Signal name/Connecting unit	ECM	AFS*1	AV*2	BCM	EPS	I-KEY*3	M&A	STRG*1	ADP*4	ABS	TCM	IPDM-E
A/C compressor request signal	T											R
Accelerator pedal position signal	T										R	
Closed throttle position signal	T										R	
Cooling fan speed request signal	T											R
Engine and CVT integrated control signal	T										R	
	R										T	
Engine coolant temperature signal	T						R				R	
4-b Engine speed signal	T						R				R	
Engine status signal	T		R		R							
Fuel consumption monitor signal	T		R				R					
MI signal	T						R					
Wide open throttle position signal	T										R	
ABS warning lamp signal							R			T		
Brake warning lamp signal							R			T		
4-a Steering angle sensor signal		R						T				
Vehicle speed signal	R				R		R			T	R	
		R		R	R	R	T		R			
Input shaft revolution signal	R										T	
Output shaft revolution signal	R										T	
Shift position indicator signal	R	R	R	R*5			R		R*6		T	
Second position indicator signal							R				T	
Front wiper stop position signal				R								T
High beam status signal	R	R										T
Low beam status signal	R	R										T

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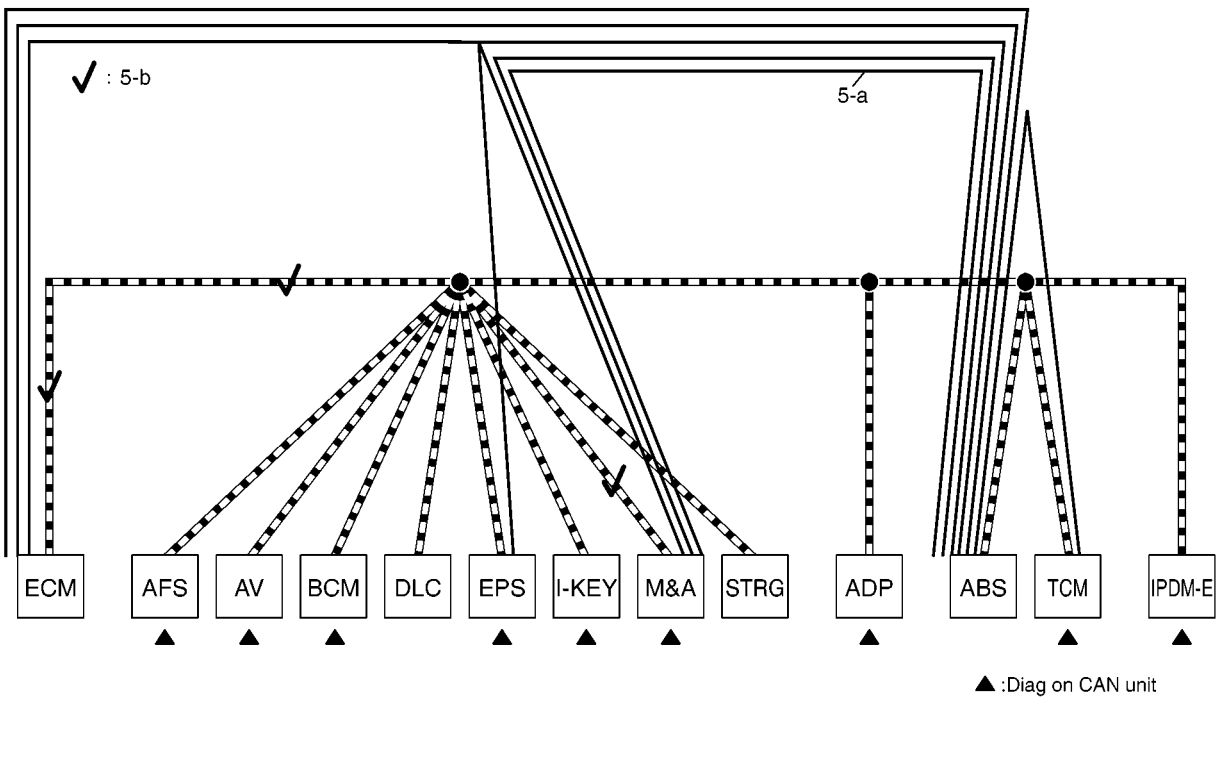
5. Fill in the possible cause assumed in step 4.

a. The ABS warning lamp turned ON and speedometer did not move: Assume that a possible cause is no communication between M&A and ABS. Draw a line between M&A and ABS. (Line 5-a in the figure).

b. The tachometer moved normally: Put check marks between ECM and M&A. The circuit between ECM and M&A is normal (check marks 5-b in the figure).

(Example)

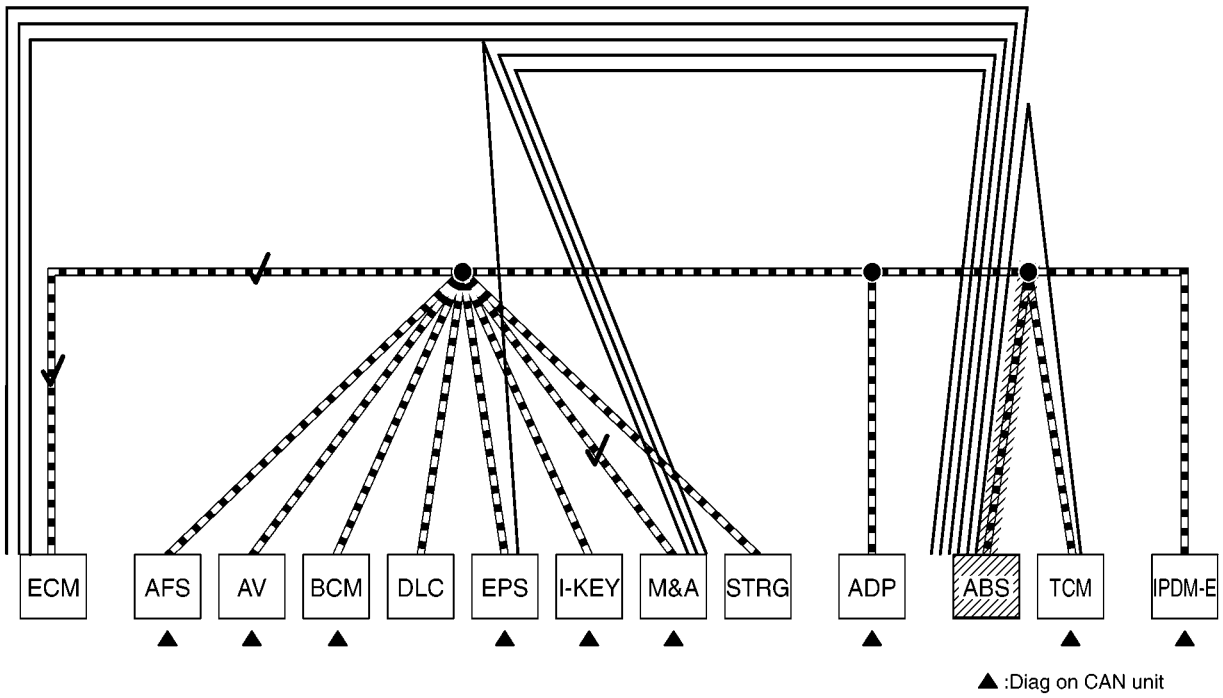


6. The circuit which has the most amount of lines are the possible cause. Error is detected from ABS actuator and electric unit (control unit) branch line (shaded in the figure).

NOTE:
For abbreviations, refer to LAN-40, "Abbreviation List" .

7. Perform the inspection of the possible cause. Refer to LAN-53, "Malfunction Area Chart" .

(Example)



< CONSULT-II printout checklist >

	Item	Check box
1	SELECT SYSTEM	✓
2	ENGINE	✓
3	ADAPTIVE LIGHT▲	✓
4	MULTI AV▲	✓
5	BCM▲	✓
6	EPS▲	✓
7	INTELLIGENT KEY▲	✓
8	METER▲	✓
9	AUTO DRIVE POS.▲	✓
10	ABS	✓
11	TRANSMISSION▲	✓
12	IPDM E/R▲	✓

Possible root cause

- Error between ABS actuator and electric unit (control unit) and joint point.
- Error in ABS actuator and electric unit (control unit).

Inspection result

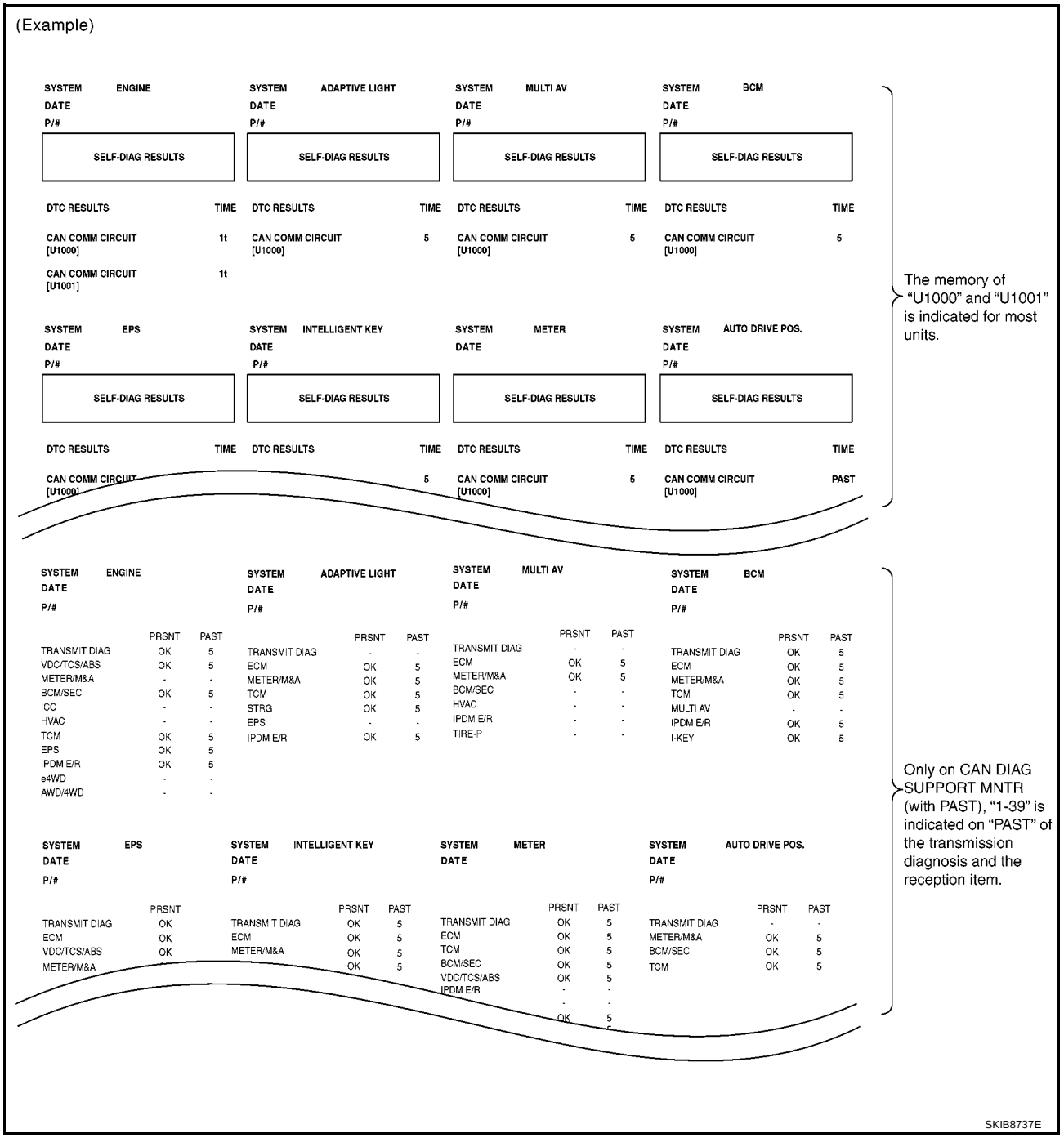
SKIB8736E

Non-reproduced Error — Short Circuit —

When the received data and error symptom have symptoms shown below, short circuit of CAN communication line is a possible cause.

Item (CONSULT-II)	Indication	Inspection procedure
SELF-DIAG RESULTS	The memory of “U1000” and “U1001” is indicated for most units.	Refer to LAN-53, "Malfunction Area Chart" .
CAN DIAG SUPPORT MNTR	Only on CAN DIAG SUPPORT MNTR (with PAST), “1 - 39” is indicated on “PAST” of the transmission diagnosis and the reception item.	

(Example)



INDEX FOR DTC

PFP:00004

DTC No. Index

BKS0029F

DTC	Self-diagnosis item (CONSULT-II indication)	DTC detection condition	Inspection
U1000	CAN COMM CIRCUIT	When ECM is not transmitting or receiving CAN communication signal of OBD (emission-related diagnosis) for 2 seconds or more.	Refer to LAN-40, "HOW TO USE THIS SECTION" .
		When a control unit (except for ECM) is not transmitting or receiving CAN communication signal for 2 seconds or more.	
U1001	CAN COMM CIRCUIT	When ECM is not transmitting or receiving CAN communication signal other than OBD (emission-related diagnosis) for 2 seconds or more.	

HOW TO USE THIS SECTION

PFP:00008

Caution

BKS0029G

- This section describes information specific to a vehicle, sheets for trouble diagnosis, and inspection procedures.
- For trouble diagnosis procedure, refer to LAN-16, "Trouble Diagnosis Procedure" .

Abbreviation List

BKS0029H

Abbreviations in CAN communication signal chart and the diagnosis sheet are as per the following list.

Abbreviation	Unit name	SELECT SYSTEM (CONSULT-II)	CAN DIAG SUPPORT MNTR (CONSULT-II)
DLC	Data link connector	–	–
ECM	ECM	ENGINE	ECM
M&A	Combination meter	METER	METER/M&A
TCM	TCM	A/T	TCM

PRECAUTIONS

PFP:00001

Precautions for SRS Airbag and Pretensioner Seatbelt

BKS002D0

WARNING:

- **To install/remove the SRS airbag, pretensioner seatbelt system related components and harness, turn the ignition switch “OFF”, disconnect the negative (–) terminal of the battery and wait over 3 minutes. (This is to discharge all the remaining electricity in the airbag sensor unitÅfs auxiliary power circuit.)**
- **Do not use air impact or electrical tools when installing/removing the components.**
- **Do not use any electric soldering gun or so for harness used in SRS airbag and pretensioner seatbelt systems. Be careful with the harness not to tangle with or interfere with other components.**
- **Do not use any electrical test equipments such as circuit tester when inspecting the SRS airbag and pretensioner seatbelt circuit while installed unless the Service Manual instructs to do so. (The weak current in the tester can cause the SRS airbag to operate.)**
- **Do not insert any foreign materials such as a screwdriver in the airbag module and pretensioner seatbelt connector in order to prevent unintended operation due to static electricity.**
- **The harnesses used in SRS airbag and pretensioner are covered with yellow corrugate tube or insulation tape and installed on yellow connector for easy identification.**
- **Refer to “RS Restraint System” in this Service Manual for safe airbag system service information.**

Precautions When Using CONSULT-II

BKS0029J

Use CONSULT-II CONVERTER when connecting CONSULT-II to data link connector.

CAUTION:

CAN communication does not function normally if CONSULT-II is used without connecting CONSULT-II CONVERTER.

Precautions for Trouble Diagnosis

BKS0029K

CAUTION:

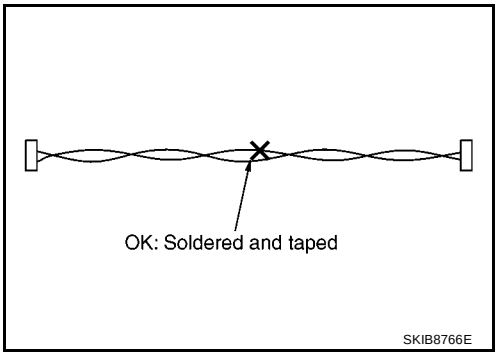
- **Never apply 7.0 V or more to the measurement terminal.**
- **Use a tester whose open terminal voltage is 7.0 V or less.**
- **Turn the ignition switch OFF and disconnect the battery cable from the negative terminal when checking the harness.**

Precautions for Harness Repair

BKS0029L

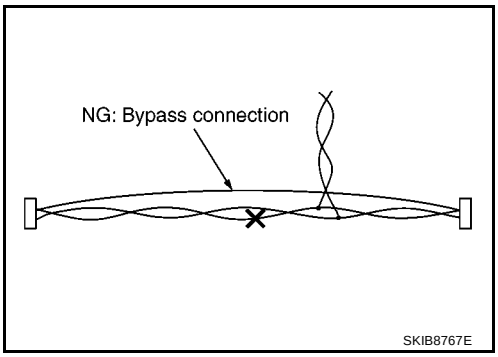
- Solder the repaired area and wrap tape around the soldered area.

  NOTE:
  A fray of twisted lines must be within 110 mm (4.33 in).



- Bypass connection is never allowed at the repaired area.

  NOTE:
  Bypass connection may cause CAN communication error as spliced wires that are separate from the main line, or twisted lines that lose noise immunity.



- Replace the applicable harness as an assembly if error is detected on the shield lines of CAN communication line.

TROUBLE DIAGNOSIS

PFP:00004

CAN Diagnostic Support Monitor

BKS002AI

Use “CAN DIAG SUPPORT MNTR” for detecting the root cause.

MONITOR ITEM LIST (CONSULT-II)

ECM (QG15DE)

NOTE:

Replace the unit when “NG” is indicated on the “INITIAL DIAG”.

SELECT SYSTEM	CAN DIAG SUPPORT MNTR	Description	Normal	Error
			PRSNT	
ECM	INITIAL DIAG	Status of CAN controller	OK	NG
	TRANSMIT DIAG	Signal transmission status		UNKWN
	TCM	Signal receiving status from the TCM		
	METER/M&A	Signal receiving status from the combination meter	OK	UNKWN

ECM (QG16DE)

NOTE:

Replace the unit when “NG” is indicated on the “INITIAL DIAG”.

SELECT SYSTEM	CAN DIAG SUPPORT MNTR	Description	Normal	Error
			PRSNT	
ECM	INITIAL DIAG	Status of CAN controller	OK	NG
	TRANSMIT DIAG	Signal transmission status		UNKWN
	TCM	Signal receiving status from the TCM		

TCM

NOTE:

Replace the unit when “NG” is indicated on the “INITIAL DIAG”.

SELECT SYSTEM	CAN DIAG SUPPORT MNTR	Description	Normal	Error
			PRSNT	
A/T	INITIAL DIAG	Status of CAN controller	OK	NG
	TRANSMIT DIAG	Signal transmission status		UNKWN
	ECM	Signal receiving status from the ECM		
	VDC/TCS/e4WD	Not used even though indicated		
	METER/M&A	Signal receiving status from the combination meter	OK	UNKWN
	ICC/e4WD	Not used even though indicated		

Combination meter

NOTE:

Replace the unit when “NG” is indicated on the “INITIAL DIAG”.

SELECT SYSTEM	CAN DIAG SUPPORT MNTR	Description	Normal	Error
			PRSNT	
METER/M&A	TRANSMIT DIAG	Signal transmission status	OK	UNKWN
	ECM	Signal receiving status from the ECM		
	TCM	Signal receiving status from the TCM		

CAN System Specification Chart

BKS002AJ

Check CAN system type from the following specification chart. Then decide diagnosis sheet.

NOTE:
Refer to LAN-18, "CHECK OF CAN SYSTEM TYPE (HOW TO USE CAN SYSTEM TYPE SPECIFICATION CHART)" for how to use CAN system specification chart.

Body type	Sedan			
Axle	2WD			
Engine	QG15DE		QG16DE	
Transmission	M/T	A/T	M/T	A/T
Brake control	ABS			
CAN system type	1	2	3	4
Diagnosis sheet	LAN-48	LAN-49	LAN-50	LAN-51
CAN communication signal chart	LAN-44, "TYPE 1/TYPE 2/TYPE 3/TYPE 4"			

CAN Communication Signal Chart

BKS002AK

Refer to LAN-14, "How to Use CAN Communication Signal Chart" for how to use CAN communication signal chart.

TYPE 1/TYPE 2/TYPE 3/TYPE 4

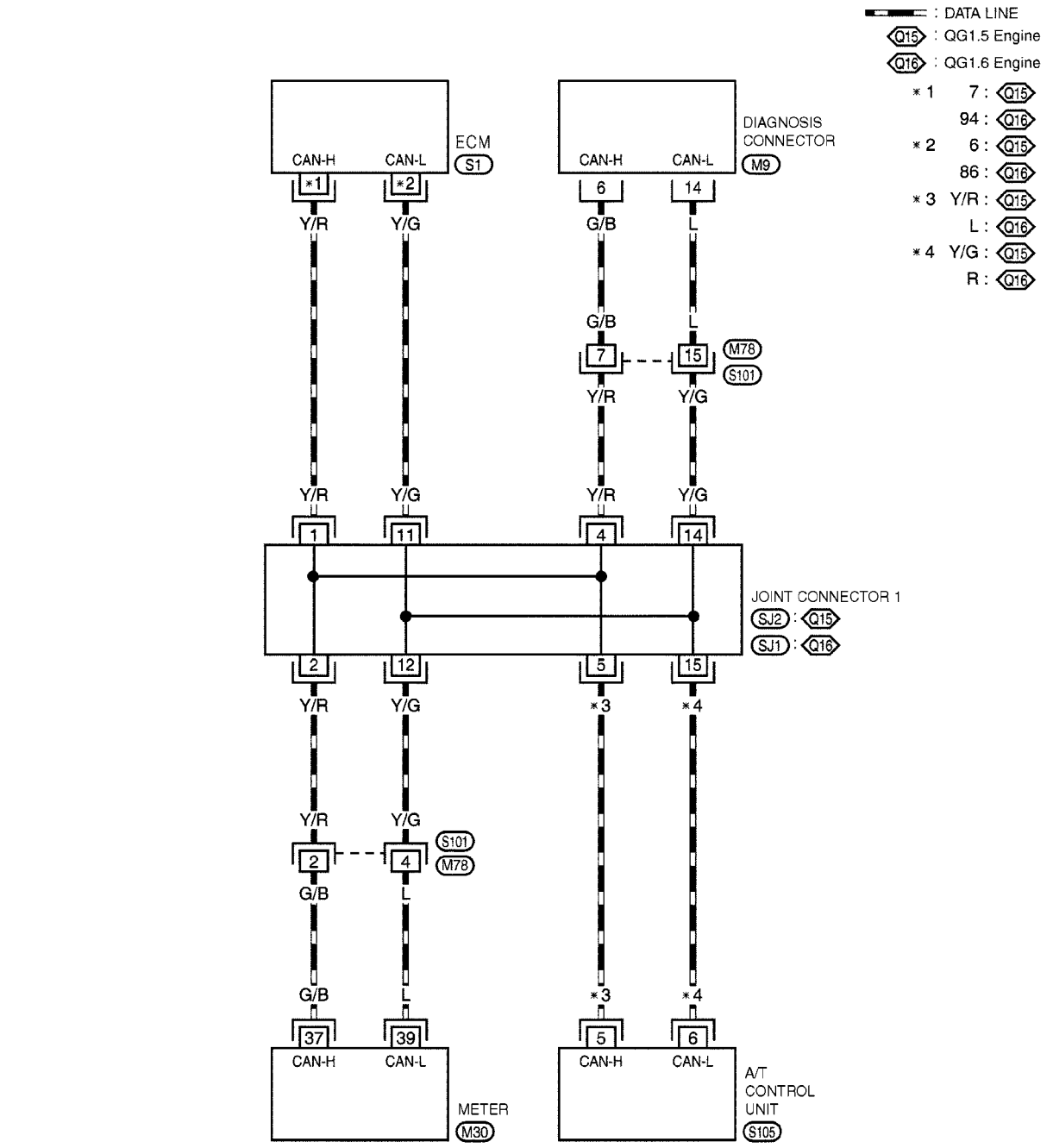
NOTE:
Refer to LAN-40, "Abbreviation List" for the abbreviations of the connecting units.

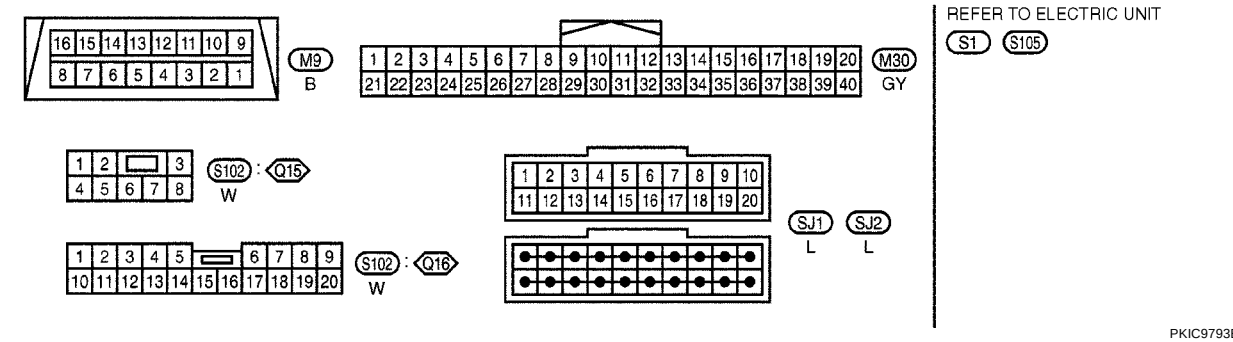
T: Transmit R: Receive

Signal name/Connecting unit	ECM	TCM	M&A
Engine and A/T integrated control signal	T	R	
	R	T	
Engine coolant temperature signal	T		R
Engine speed signal	T		R
Malfunctioning indicator lamp signal	T		R
A/T position indicator signal		T	R
A/T warning lamp signal		T	R
Snow mode signal		T	R
Air conditioner signal	R		T
Blower fan switch signal	R		T
Fuel gauge signal	R		T
Position lamp control signal	R		T
Rear window defogger switch signal	R		T
Reverse gear signal	R		T
Vehicle speed signal	R		T

Wiring Diagram — CAN —

BKS002AM





PKIC9793E

Interview Sheet

BKS002AN

CAN Communication System Diagnosis Interview Sheet

Receiving date:

Type: VIN No.:

Model:

First registration: Mileage:

CAN system type:

Symptom (Results of interview with customer)

Condition at inspection

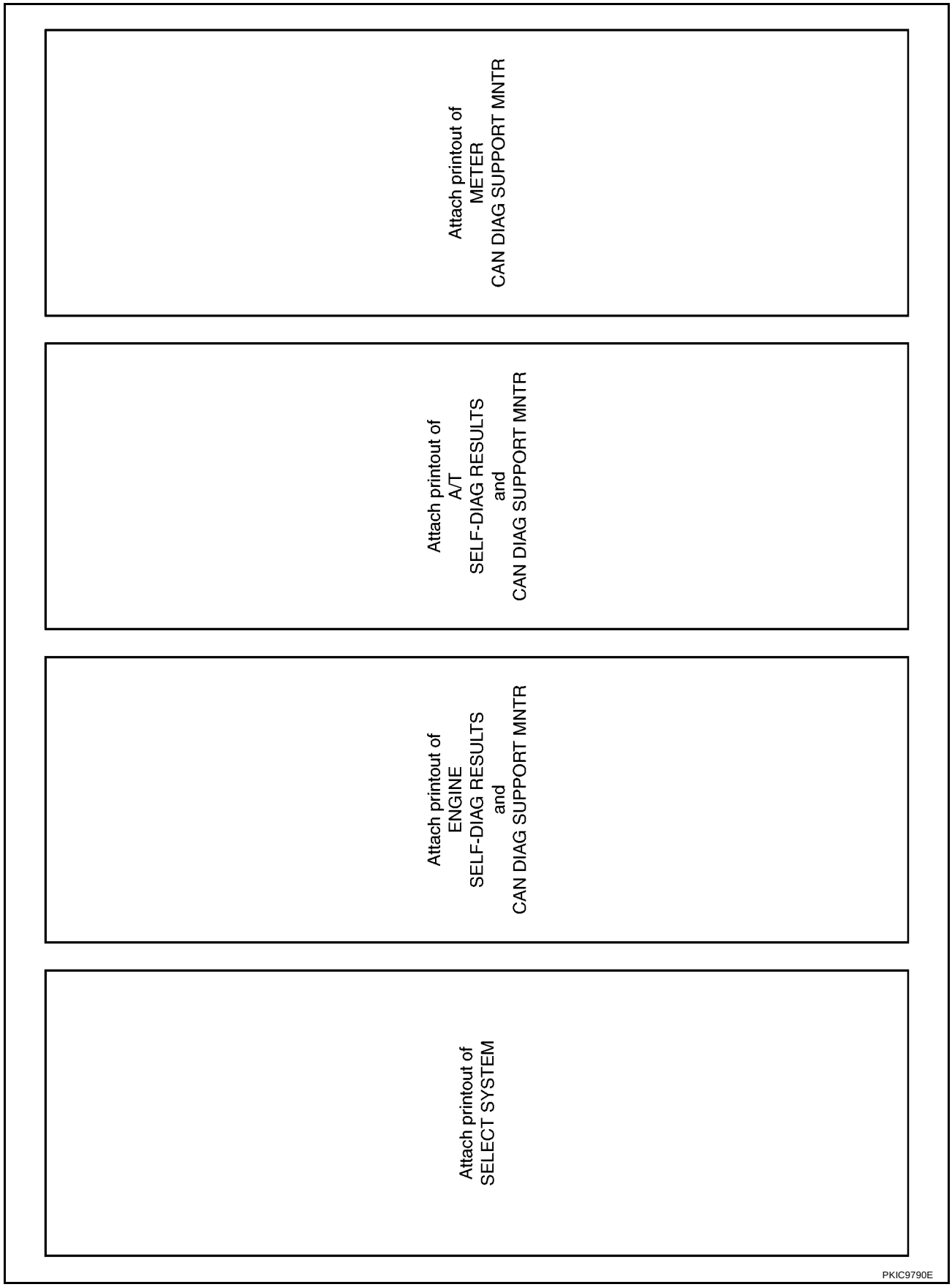
Error symptom : Reproduced / Non-reproduced

SKIB8701E

Data Sheet

BKS002AO

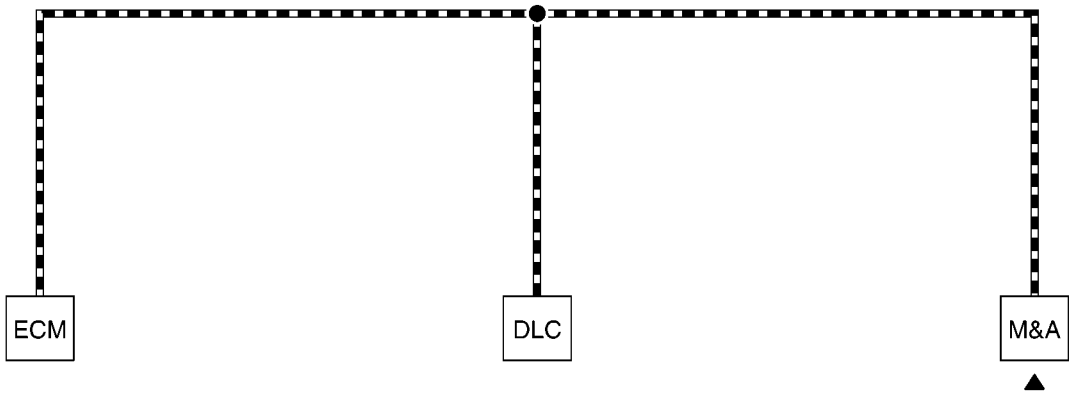
CONSULT-II DATA ATTACHMENT SHEET



CAN System (Type 1)

BKS002AP

DIAGNOSIS SHEET



< CONSULT-II printout checklist >

	Item	Check box
1	SELECT SYSTEM	
2	ENGINE	
3	METER▲	

Possible root cause

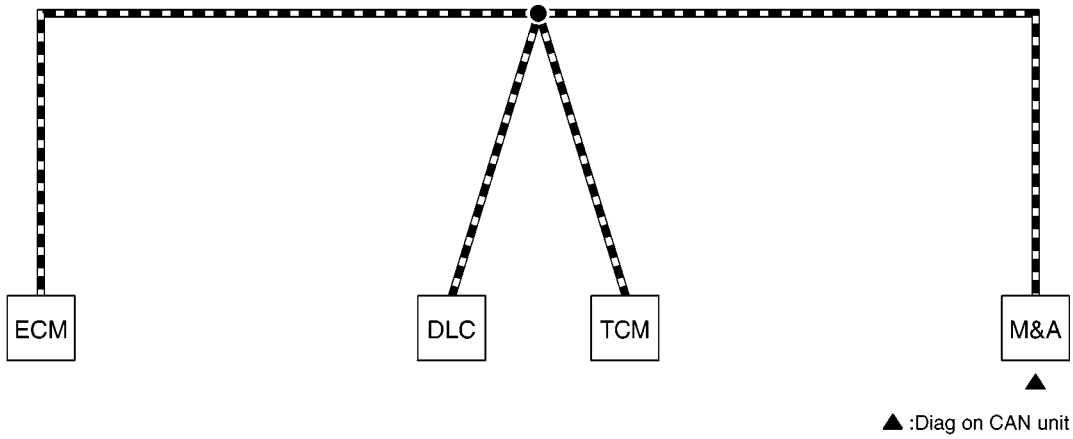
Inspection result

PKIC9791E

CAN System (Type 2)

BKS002AQ

DIAGNOSIS SHEET



< CONSULT-II printout checklist >

	Item	Check box
1	SELECT SYSTEM	
2	ENGINE	
3	A/T	
4	METER▲	

Possible root cause

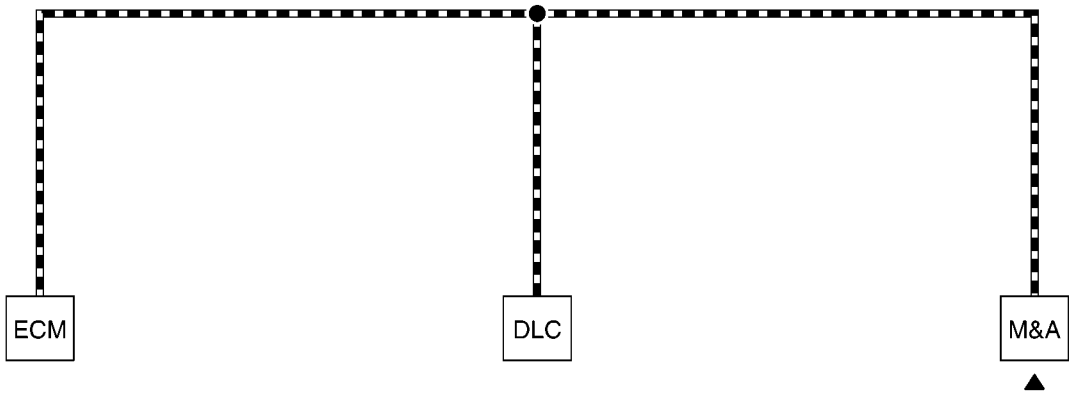
Inspection result

PKIC9792E

CAN System (Type 3)

BKS002AR

DIAGNOSIS SHEET



< CONSULT-II printout checklist >

	Item	Check box
1	SELECT SYSTEM	
2	ENGINE	
3	METER▲	

Possible root cause

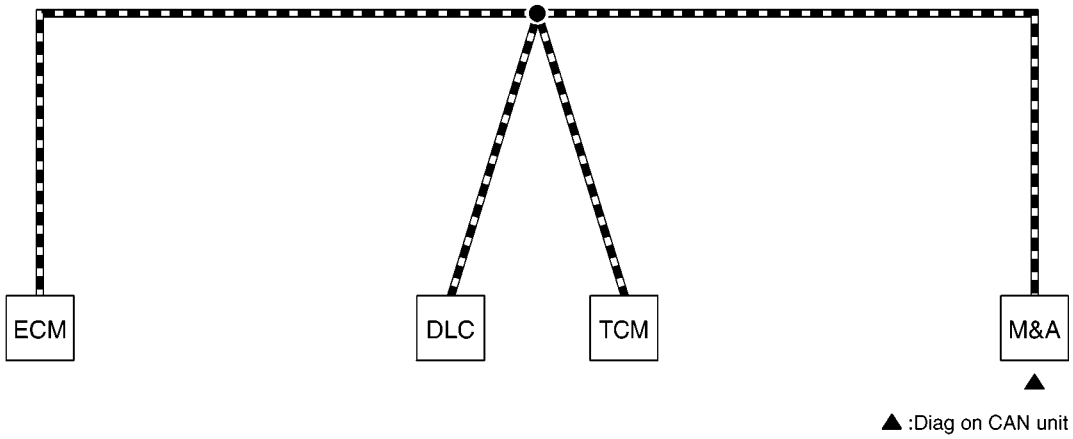
Inspection result

PKIC9791E

CAN System (Type 4)

BKS002AS

DIAGNOSIS SHEET



< CONSULT-II printout checklist >

	Item	Check box
1	SELECT SYSTEM	
2	ENGINE	
3	A/T	
4	METER▲	

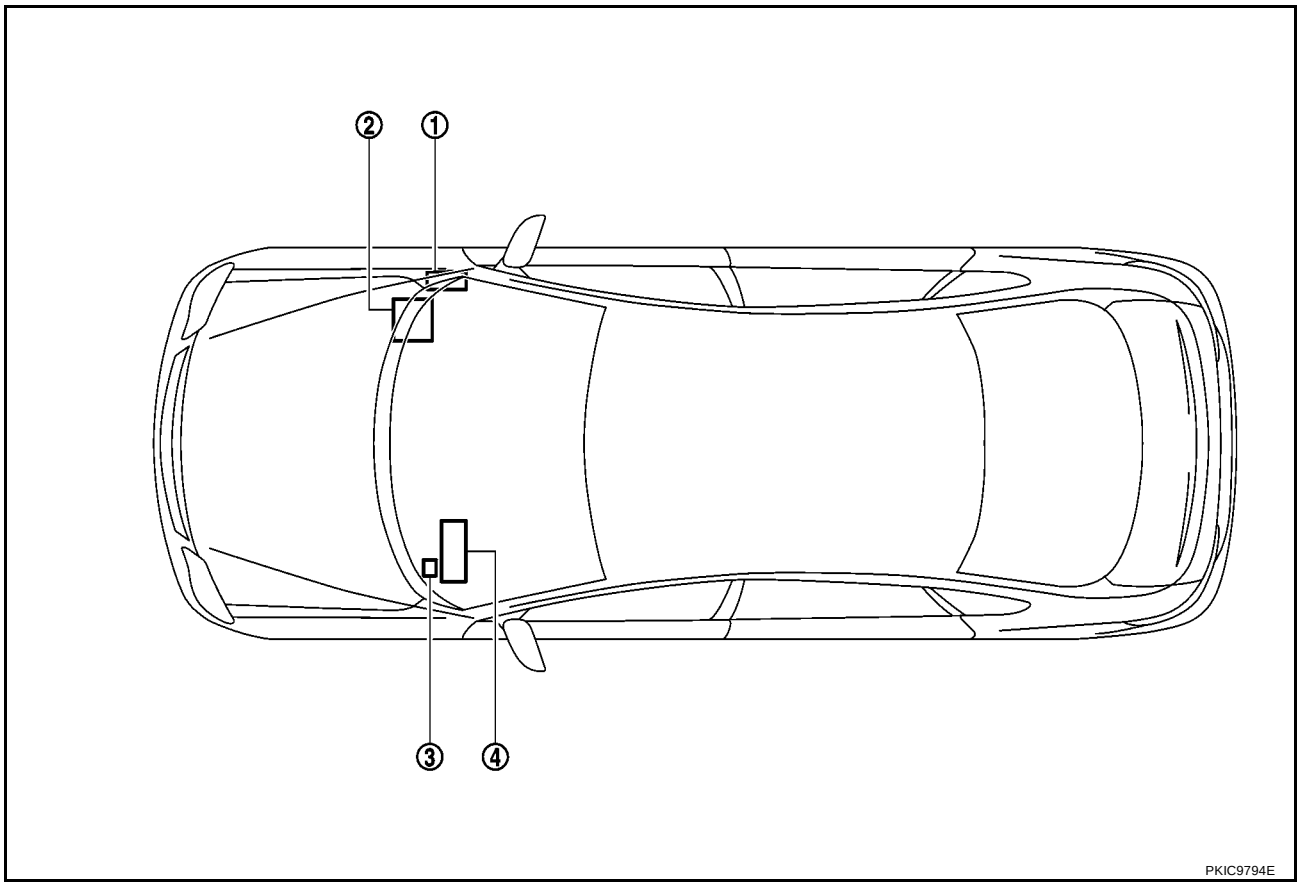
Possible root cause

Inspection result

PKIC9792E

Component Parts Location

BKS002AT



1. TCM S105
2. ECM S1
3. Data link connector M9
4. Combination meter M30

Harness Layout

BKS002AU

Refer to “HARNESS DIAGRAM” (WH-169).

Malfunction Area Chart

BKS002AV

BRANCH LINE

Trouble Area	Reference
ECM branch line circuit	LAN-53, "ECM Branch Line Circuit"
Data link connector branch line circuit	LAN-54, "Data Link Connector Branch Line Circuit"
TCM branch line circuit	LAN-54, "TCM Branch Line Circuit"
Combination meter branch line circuit	LAN-55, "Combination Meter Branch Line Circuit"

SHORT CIRCUIT

Trouble Area	Reference
CAN communication circuit	LAN-56, "CAN Communication Circuit"

ECM Branch Line Circuit

BKS002AW

INSPECTION PROCEDURE

1. CHECK CONNECTOR

1. Turn the ignition switch OFF.
2. Disconnect the battery cable from the negative terminal.
3. Check the terminals and connectors of ECM for damage, bend, and loose connection (unit side and connector side).

OK or NG

OK >> GO TO 2.
NG >> Repair the terminal and connector.

2. CHECK HARNESS FOR OPEN CIRCUIT

1. Disconnect the connector of ECM.
2. Check the resistance between the ECM harness connector terminals.

QG15DE

ECM harness connector			Resistance (Ω)
Connector No.	Terminal No.		
S1	7	6	Approx. 108 – 132

QG16DE

ECM harness connector			Resistance (Ω)
Connector No.	Terminal No.		
S1	94	86	Approx. 108 – 132

OK or NG

OK >> GO TO 3.
NG >> Repair the ECM branch line.

3. CHECK POWER SUPPLY AND GROUND CIRCUIT

Check the power supply and the ground circuit of ECM. Refer to “POWER AND GROUND SYSTEM” (QG15: EC-53), “POWER SUPPLY CIRCUIT FOR ECM” (QG16: EC-75).

OK or NG

OK >>
- Reproduced error: Replace ECM. Refer to “ECCS Control Unit” (QG15: EC-110), “Engine Control Component Parts Location” (QG16: EC-48).
- Non-reproduced error: Error was detected in ECM branch line.

NG >> Repair the power supply and the ground circuit.

Data Link Connector Branch Line Circuit

BKS002AX

INSPECTION PROCEDURE

1. CHECK CONNECTOR

1. Turn the ignition switch OFF.
2. Disconnect the battery cable from the negative terminal.
3. Check the following terminals and connectors for damage, bend, and loose connection (connector side and harness side).

- data link connector
- Harness connector M78
- Harness connector S101

OK or NG

OK >> GO TO 2.
NG >> Repair the terminal and connector.

2. CHECK HARNESS FOR OPEN CIRCUIT

Check the resistance between the data link connector terminals.

Data link connector			Resistance (Ω)
Connector No.	Terminal No.		
M9	6	14	Approx. 54 – 66

OK or NG

OK >>
- Reproduced error: Check the following items again.
  - Decision of CAN system type.
  - Not received CONSULT-II data (SELECT SYSTEM, SELF-DIAG RESULTS, CAN DIAG SUPPORT MNTR).
  - Procedure for detecting root cause.
- Non-reproduced error: Error was detected in the data link connector branch line circuit.

NG >> Repair the data link connector branch line.

TCM Branch Line Circuit

BKS002AZ

INSPECTION PROCEDURE

1. CHECK CONNECTOR

1. Turn the ignition switch OFF.
2. Disconnect the battery cable from the negative terminal.
3. Check the terminals and connectors of TCM for damage, bend, and loose connection (unit side and connector side).

OK or NG

OK >> GO TO 2.
NG >> Repair the terminal and connector.

2. CHECK HARNESS FOR OPEN CIRCUIT

1. Disconnect the connector of TCM.
2. Check the resistance between the TCM harness connector terminals.

TCM harness connector			Resistance (Ω)
Connector No.	Terminal No.		
S105	5	6	Approx. 54 – 66

OK or NG

OK >> GO TO 3.
NG >> Repair the TCM branch line.

3. CHECK POWER SUPPLY AND GROUND CIRCUIT

Check the power supply and the ground circuit of TCM. Refer to “Wiring Diagram” (AT-19).

OK or NG

OK >> ● Reproduced error: Replace TCM. Refer to “Components Location” (AT-17).
● Non-reproduced error: Error was detected in TCM branch line.

NG >> Repair the power supply and the ground circuit.

Combination Meter Branch Line Circuit

BKS002AY

INSPECTION PROCEDURE

1. CHECK CONNECTOR

1. Turn the ignition switch OFF.
2. Disconnect the battery cable from the negative terminal.
3. Check the following terminals and connectors for damage, bend, and loose connection (unit side and connector side).

– Combination meter connector
– Harness connector M78
– Harness connector S101

OK or NG

OK >> GO TO 2.
NG >> Repair the terminal and connector.

2. CHECK HARNESS FOR OPEN CIRCUIT

1. Disconnect the connector of combination meter
2. Check the resistance between the combination meter harness connector terminals.

Combination meter harness connector			Resistance (Ω)
Connector No.	Terminal No.		
M30	37	39	Approx. 108 – 132

OK or NG

OK >> GO TO 3.
NG >> Repair the combination meter branch line.

3. CHECK POWER SUPPLY AND GROUND CIRCUIT

Check the power supply and the ground circuit of combination meter. Refer to “Wiring Diagram” (EL-67).

OK or NG

OK >> ● Reproduced error: Replace combination meter. Refer to “Removal·Installation of Combination Meter” (EL-65).
● Non-reproduced error: Error was detected in combination meter branch line.

NG >> Repair the power supply and the ground circuit.

CAN Communication Circuit

BKS002B0

INSPECTION PROCEDURE

1. CONNECTOR INSPECTION

1. Turn the ignition switch OFF.
2. Disconnect the battery cable from the negative terminal.
3. Disconnect all the unit connectors on CAN communication system.
4. Check terminals and connectors for damage, bend, and loose connection.

OK or NG

OK >> GO TO 2.
NG >> Repair the terminal and connector.

2. CHECK HARNESS CONTINUITY (SHORT CIRCUIT)

Check the continuity between the data link connector terminals.

Data link connector			Continuity
Connector No.	Terminal No.		
M9	6	14	No

OK or NG

OK >> GO TO 3.
NG >> Check the harness and repair the root cause.

3. CHECK HARNESS CONTINUITY (SHORT CIRCUIT)

Check the continuity between the data link connector and the ground.

Data link connector		Ground	Continuity
Connector No.	Terminal No.		
M4	6		No
	14		No

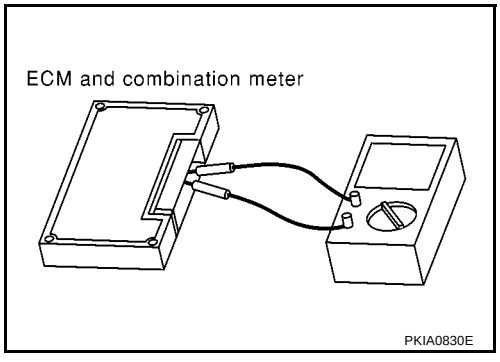
OK or NG

OK >> GO TO 4.
NG >> Check the harness and repair the root cause.

4. CHECK ECM AND COMBINATION METER TERMINATION CIRCUIT

1. Remove ECM and combination meter.
2. Check the resistance between ECM terminals.

ECM			Resistance (Ω)
Terminal No.			
QG15DE	7	6	Approx. 108 - 132
QG16DE	94	86	



3. Check the resistance between combination meter terminals.

Combination meter		Resistance (Ω)
Terminal No.		
37	39	Approx. 108 - 132

OK or NG

OK >> GO TO 5.
NG >> Replace ECM or combination meter.

5. CHECK SYMPTOM

Connect all the connectors. Check if the symptoms described in the “Symptom (Results of interview with customer)” are reproduced.

Inspection result

Reproduced>>GO TO 6.
Non-reproduced>>Start the diagnosis again. Follow the trouble diagnosis procedure when non-reproduced error is detected.

6. CHECK UNIT REPRODUCTION

Perform the reproduction test as per the following procedure for each unit.

1. Turn the ignition switch OFF.
2. Disconnect the battery cable from the negative terminal.
3. Disconnect one of the unit connectors of CAN communication system.

   NOTE:
   ECM and combination meter have a termination circuit. Check other units first.
4. Connect the battery cable to the negative terminal. Check if the symptoms described in the “Symptom (Results of interview with customer)” are reproduced.

   NOTE:
   Although unit-related error symptoms occur, do not confuse them with other symptoms.

Inspection result

Reproduced>>Connect the connector. Check other units as per the above procedure.
Non-reproduced>>Replace unit whose connector was disconnected.

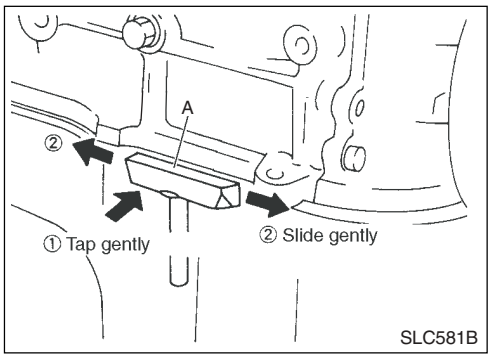
ENGINE LUBRICATION AND COOLING SYSTEMS

SECTION **LC**

CONTENTS

PRECAUTIONS AND PREPARATION
Precautions 2
Preparation 3
ENGINE LUBRICATION SYSTEM
Lubrication Circuit 4
SERVICE DATA
Engine Lubrication System 5

Precautions



Liquid Gasket Application

REMOVING THE APPLIED LIQUID GASKET

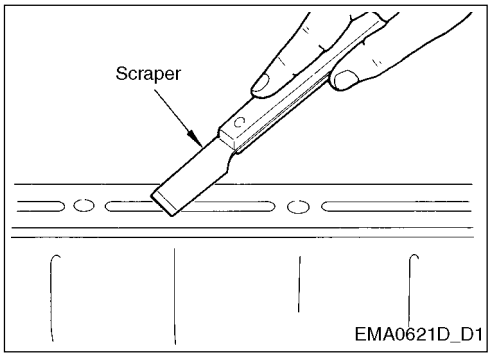
- After removing the bolts and nuts, remove the liquid gasket using a seal cutter (A: KV10111100).

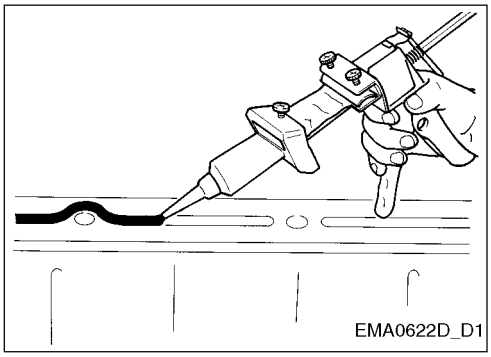
CAUTION:

- **Be careful not to damage the mating surfaces.**
- Use a plastic hammer to tap gently for locations hard to use the seal cutter during removal.

CAUTION:

- **When it is necessary to use the minus (-) screwdriver, be careful not to damage the mating surfaces.**





LIQUID GASKET APPLICATION PROCEDURE

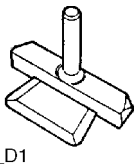
1. Remove the liquid gasket on the applied surfaces and mating surfaces with a scraper.
   - Completely remove all liquid gasket at grooves, bolts and bolt hole threads.
2. Clean these surfaces with white gasoline and completely remove all moisture, oil and other foreign particles.
3. Apply genuine liquid gasket with the tube pressure (commercial tool).
4. Apply the liquid gasket at designated locations with correct lengths.
   - Apply the liquid gasket at the surfaces grooves.
   - Apply the inner side of the bolt hole.
   - Assemble within 5 minutes from liquid gasket application.
   - Wipe out the stained liquid gasket.
   - Do not tighten the bolts temporarily after installation.
   - Wait at least 30 minutes before refilling engine oil and coolant.

CAUTION:

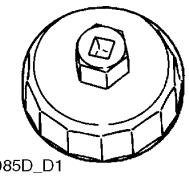
- **If instructed in this Manual, follow the instructions.**

Preparation

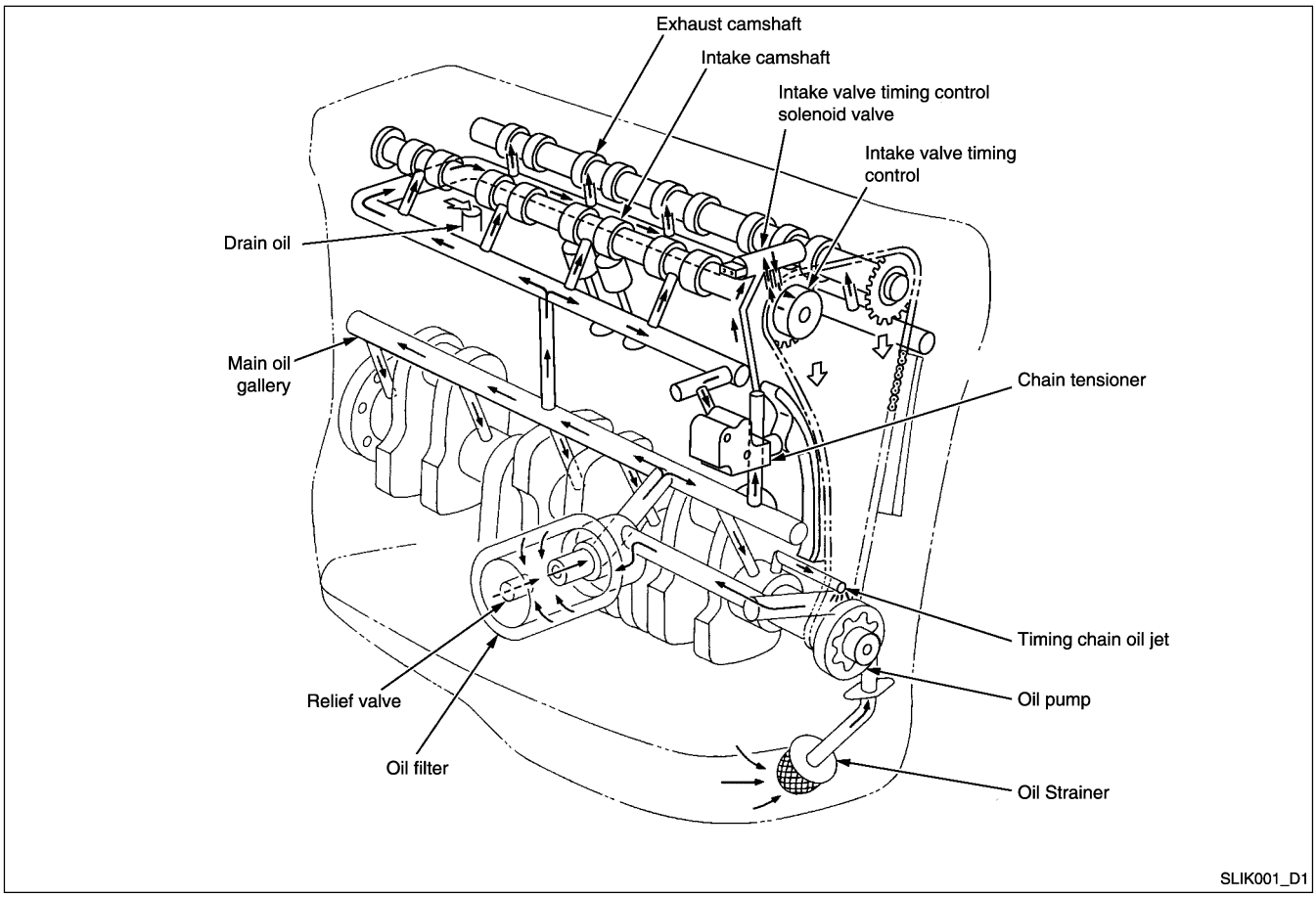
Special Service Tool

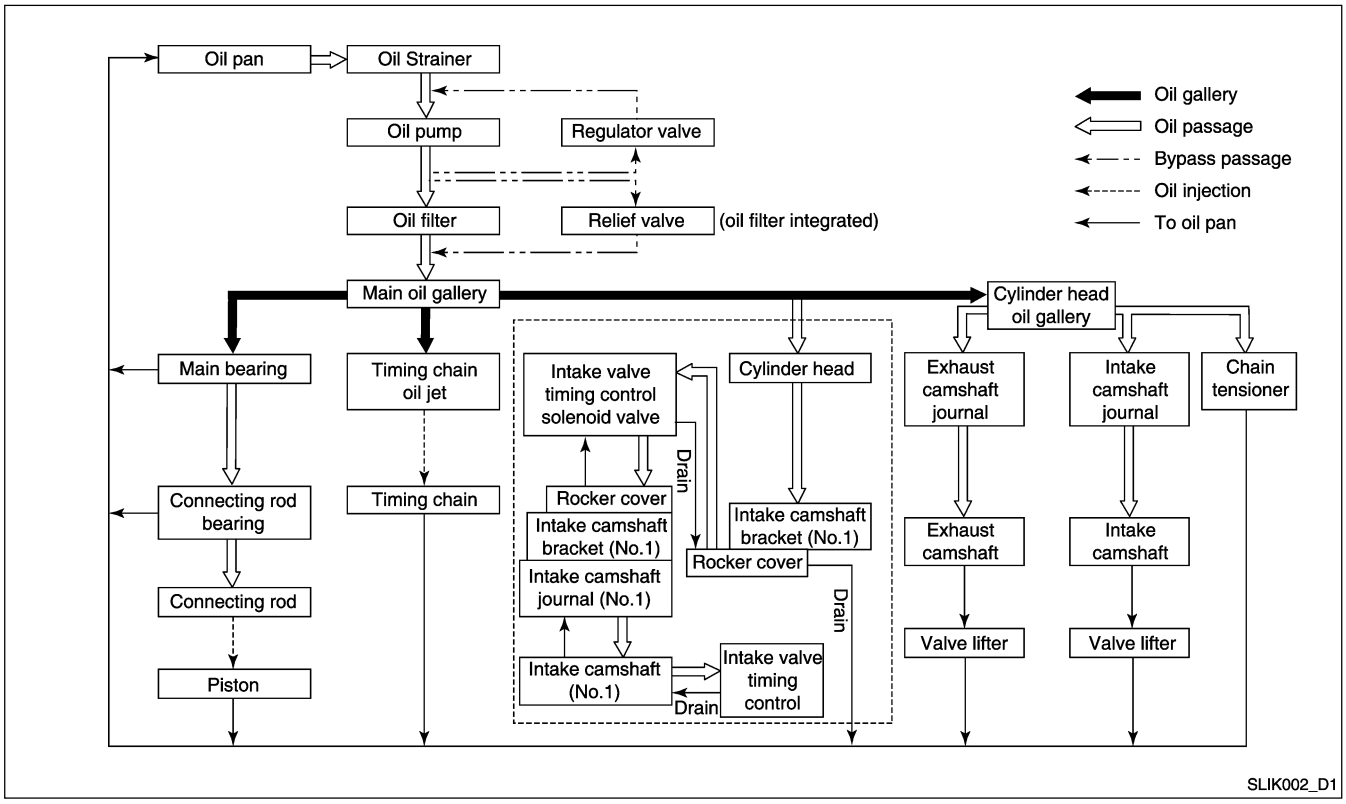
Item	Description	
Seal cutter KV10111100	 ZZA0013D_D1	Removing applied liquid gasket

Commercial Service Tool

Item	Description	
Oil filter wrench	 ZZA1085D_D1	Removing oil filter

Lubrication Circuit





Engine Lubrication System

Standard Value • Limit Value

Engine oil pressure MPa (kgf/cm²) *Oil temperature at 80°C.	When idling 2,000 rpm 6,000 rpm	Approx. more than 0.07 (0.7) Approx. more than 0.28 (2.9) Approx. more than 0.42 (4.3)
Engine oil change (with SH, SJ or SL grades)		Refer to MA section.
Engine oil capacity (L)	H level L level Without oil filter With oil filter Whole capacity (factory capacity)	2.7 2.0 Approx. 2.5 Approx. 2.7 3.1
Oil filter replacement		Refer to MA section.
Oil pump clearances (mm) Between the outer rotor and front cover Between the inner rotor and outer rotor tip Between the inner rotor and front cover Between the outer rotor and front cover Between the inner rotor and front cover inner Regulator valve		0.114 ~ 0.200 Less than 0.180 0.030 ~ 0.070 0.030 ~ 0.090 0.045 ~ 0.091 0.040 ~ 0.097

Tightening Torque

Unit: N•m (kgf-m)

Oil pressure switch	12.3 - 17.2 (1.25 - 1.75)
Oil pump cover	5.9 - 7.8 (0.60 - 0.80)
Oil strainer	6.3 - 8.3 (0.60 - 0.85)
Regulator	39.2 - 58.8 (4.0 - 6.0)

SECTION **MA**

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General Maintenance

General maintenance includes those items which should be checked during the normal day-to-day operation of the vehicle. They are essential if the vehicle is to continue operating properly. The owners can perform the checks and inspections themselves or they can have their NISSAN dealers do them for a nominal charge.

Maintenance item	Description
Engine	Fuel level and engine starting
	Coolant level and leakage
	Drive belt (alternator belt, power steering belt and air conditioner belt) wear and tension
	Engine oil level, contamination and leakage
	Exhaust gas color and toxic emission
Brake	Brake pedal operation and freeplay
	Brake oil level and leakage
	Parking brake operation
Transaxle	Gear selector lever operation
	Transaxle fluid level and leakage
Clutch	Clutch pedal operation and freeplay
	Clutch fluid level and leakage
Tire	Tire inflation pressure and wear (including spare tire)
	Tightening torque and conditions of wheel nuts
Steering wheel	Steering wheel operation and freeplay
	Power steering oil level and leakage
	Conditions of power steering hoses
Others	Operation of gauges, indicator lights, and warning indicator lights
	ON and OFF operations and damages
	Wiper operation and washer fluid level
	Horn operation
	Mirror reflection
	Battery capacity
	Seat belt condition
	Air conditioner and heater operation
	Body corrosion and fastener looseness
	Abnormalities in past driving

PERIODIC MAINTENANCE (FOR RUSSIA/UKRAINE)

The following tables show the normal maintenance schedule. Depending upon weather and atmospheric conditions, varying road surfaces, individual driving habits and vehicle usage, additional or more frequent maintenance may be required.

Periodic maintenance beyond the last period shown on the tables requires similar maintenance.

Engine and Emission Control Maintenance (QG16DE Engine) (Annual Mileage < 30,000 km/year)

Abbreviations: I = Inspect and correct or replace as necessary R = Replace [ ] = At the distance interval only

MAINTENANCE OPERATION		MAINTENANCE INTERVAL																
Perform on a kilometer basis, but on an annual basis	km x 1,000	1	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80
when driving less than 10,000 km (6,000 miles) per	(miles x 1,000)	(0.6)	(3)	(6)	(9)	(12)	(15)	(18)	(21)	(24)	(27)	(30)	(33)	(36)	(39)	(42)	(45)	(48)
year.	Months	-	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96
Engine compartment and under vehicle																		
Engine oil (Use recommended oil) ✱				R		R		R		R		R		R		R		R
Engine oil filter (Use NISSAN genuine part or equivalent) ✱				R		R		R		R		R		R		R		R
Drive belts		I		[I]		[I]		[I]		[I]		[I]		[I]		[I]		[I]
Cooling system				I		I		I		I		I		I		I		I
Engine anti-freeze coolant (Use genuine RENAULT SAMSUNG long life coolant or equivalent in its quality)	See NOTE (1)		I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Air cleaner filter ✱										R								R
Intake and exhaust valve clearance	See NOTE (2)																	
Fuel lines		I				[I]				[I]				[I]				[I]
EVAP vapor lines						[I]				[I]				[I]				[I]
Carbon canister																		[R]
Spark Plugs								[R]						[R]				
Fuel filter	See NOTE (3)																	
Oxygen sensor										[I]								[R]
Vacuum hoses & connections						[I]				[I]				[I]				[I]
Positive crankcase ventilation (PCV) system						[I]				[I]				[I]				[I]
Throttle valve and ISC valve										[I]								[I]
Overall test by CONSULT-II				[I]		[I]		[I]		[I]		[I]		[I]		[I]		[I]

NOTE:

* Maintenance items with "✱" should be performed more frequently according to "Maintenance Under Severe Driving Conditions".

(1) First replace at 100,000 km (60,000 miles)/60 months, then every 60,000 km (36,000 miles)/36 months. Perform "I" (Checking the mixture ratio and correcting the mixture ratio if necessary).

(2) Periodic maintenance is not required. However, if valve noise increases, check valve clearance.

(3) Fuel filter is maintenance-free.

Chassis and Body Maintenance (Annual Mileage < 30,000 km/year)

Abbreviations: I = Inspect and correct or replace as necessary, R = Replace, T= Tighten

MAINTENANCE OPERATION		MAINTENANCE INTERVAL																
Perform on a kilometer basis, but on an annual basis	km x 1,000	1	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80
when driving less than 10,000 km (6,000 miles) per	(miles x 1,000)	(0.6)	(3)	(6)	(9)	(12)	(15)	(18)	(21)	(24)	(27)	(30)	(33)	(36)	(39)	(42)	(45)	(48)
year.	Months	-	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96
Underhood and under vehicle																		
Headlamp aiming				I		I		I		I		I		I		I		I
Tire rotation & wheel alignment (if necessary, balance wheels)				I		I		I		I		I		I		I		I
Brake pads, rotors & other brake components ✱		I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Brake linings, drums & other brake components		I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Foot brake, parking brake & clutch (for free play, stroke & operation)		I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Brake booster vacuum hoses, connections, check valve		I				I				I				I				I
Brake & clutch, systems and fluid (for level and leaks)		I		I		I		I		I		I		I		I		I
Brake & clutch fluid						R				R				R				R
Power steering fluid and lines (for level and leaks)				I		I		I		I		I		I		I		I
Air conditioner filter (if equipped) ✱						R				R				R				R
Manual transaxle gear oil (check for leakage. Use recommended oil) ✱						I				I				I				I
Automatic transaxle fluid (for level and leaks) ✱				I		I		I		I		I		I		I		I
Steering gear & linkage, wheel hub nut tightness		I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Hub beering leakage and damage				I		I		I		I		I		I		I		I
Suspension parts						I				I				I				I
Drive shaft and boots ✱		I		I		I		I		I		I		I		I		I
Chassis & underbody bolts/nuts		T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
Exhaust system		I				I				I				I				I
Locks, hinges & hood latch		Frequently grease if necessary																
Body corrosion	See NOTE (1)																	

NOTE:

* Maintenance items with "✱" should be performed more frequently according to "Maintenance Under Severe Driving Conditions".

(1) Inspect once per year.

Maintenance Under Severe Driving Conditions (Annual Mileage < 30,000 km/year)

The maintenance intervals shown on the preceding pages are for normal operating conditions. If the vehicle is mainly operated under severe driving conditions as shown below, more frequent maintenance must be performed on the following items as shown in the table.

Severe driving conditions

A --- Driving in dusty conditions

B --- Repeatedly driving short distances

C --- Towing a trailer or caravan

D --- Extensive idling

E --- Driving in extremely adverse weather conditions or in areas where ambient temperatures are either extremely low or extremely high

F --- Driving in high humidity or mountainous areas

G --- Driving in areas using salt or other corrosive materials

H -- Driving on rough and / or muddy roads or in the desert

I --- Driving with frequent use of braking or in mountainous areas

Maintenance operation: Inspect = Inspect and correct or replace as necessary.

Driving condition									Maintenance item	Maintenance operation	Maintenance interval
A	B	C	D	.	.	.	.	.	Engine oil & engine oil filter	Replace	Every 5,000 km (3,000 miles) or 6 months
A	.	.	.	.	.	G	H	.	Air cleaner filter	Replace	Every 20,000 km (12,000 miles) or 24 months
A	.	.	.	.	.	.	.	.	Air conditioner filter	Replace	Every 10,000 km (6,000 miles) or 12 months
.	B	C	.	E	F	G	H	.	Manual transaxle gear oil	Replace	Every 80,000 km (48,000 miles) or 48 months
.	B	C	.	E	F	G	H	.	Automatic transaxle fluid	Replace	Every 100,000 km (60,000 miles) or 60 months
A		C	.	.	.	G	H	I	Brake pads, rotors & other brake components	Inspect	More frequently
A	B	C	.	E		G	H	.	Drive shafts and boots	Inspect	More frequently

Engine and Emission Control Maintenance (QG16DE Engine) (Annual Mileage > 30,000 km/year)

Abbreviations: I = Inspect and correct or replace as necessary R = Replace

MAINTENANCE OPERATION		MAINTENANCE INTERVAL								
Perform either at number of kilometers (miles) basis only.	km x 1,000 (miles x 1,000)	1 (0.6)	10 (6)	20 (12)	30 (18)	40 (24)	50 (30)	60 (36)	70 (42)	80 (48)
Engine compartment and under vehicle										
Engine oil (Use recommended oil) ✱			R	R	R	R	R	R	R	R
Engine oil filter (Use NISSAN genuine part or equivalent) ✱			R	R	R	R	R	R	R	R
Drive belts		I	I	I	I	I	I	I	I	I
Cooling system			I	I	I	I	I	I	I	I
Engine anti-freeze coolant (Use genuine RENAULT SAMSUNG long life coolant or equivalent in its quality)	See NOTE (1)		I	I	I	I	I	I	I	I
Air cleaner filter ✱								R		
Intake and exhaust valve clearance	See NOTE (2)									
Fuel lines		I		I		I		I		I
EVAP vapor lines				I		I		I		I
Carbon canister										R
Spark Plugs					R			R		
Fuel filter	See NOTE (3)									
Oxygen sensor						I				R
Vacuum hoses & connections				I		I		I		I
Positive crankcase ventilation (PCV) system				I		I		I		I
Throttle valve and ISC valve						I				I
Overall test by CONSULT-II			I	I	I	I	I	I	I	I

NOTE:

* Maintenance items with "✱" should be performed more frequently according to "Maintenance Under Severe Driving Conditions".

(1) First replace at 100,000 km (60,000 miles), then every 60,000 km (36,000 miles). Perform "I" (Checking the mixture ratio and correcting the mixture ratio if necessary).

(2) Periodic maintenance is not required. However, if valve noise increases, check valve clearance.

(3) Fuel filter is maintenance-free.

Chassis and Body Maintenance (Annual Mileage > 30,000 km/year)

Abbreviations: I = Inspect and correct or replace as necessary, R = Replace, T= Tighten

MAINTENANCE OPERATION		MAINTENANCE INTERVAL								
Perform either at number of kilometers (miles) basis only.	km x 1,000	1	10	20	30	40	50	60	70	80
	(miles x 1,000)	(0.6)	(6)	(12)	(18)	(24)	(30)	(36)	(42)	(48)
Underhood and under vehicle										
Headlamp aiming					I			I		
Tire rotation & wheel alignment (if necessary, balance wheels)				I		I		I		I
Brake pads, rotors & other brake components ✱		I	I	I	I	I	I	I	I	I
Brake linings, drums & other brake components		I	I	I	I	I	I	I	I	I
Foot brake, parking brake & clutch (for free play, stroke & operation)		I	I	I	I	I	I	I	I	I
Brake booster vacuum hoses, connections, check valve		I				I				I
Brake & clutch, systems and fluid (for level and leaks)		I		I		I		I		I
Brake & clutch fluid						R				R
Power steering fluid and lines (for level and leaks)					I			I		
Air conditioner filter (if equipped) ✱					R			R		
Manual transaxle gear oil (check for leakage. Use recommended oil) ✱						I				I
Automatic transaxle fluid (for level and leaks) ✱				I		I		I		I
Steering gear & linkage, wheel hub nut tightness		I	I	I	I	I	I	I	I	I
Hub beering leakage and damage				I		I		I		I
Suspension parts						I				I
Drive shaft and boots ✱		I		I		I		I		I
Chassis & underbody bolts/nuts		T	T	T	T	T	T	T	T	T
Exhaust system		I				I				I
Locks, hinges & hood latch		Frequently grease if necessary								
Body corrosion	See NOTE (1)									

NOTE:

* Maintenance items with "✱" should be performed more frequently according to "Maintenance Under Severe Driving Conditions".

(1) Inspect once per year.

Maintenance Under Severe Driving Conditions (Annual Mileage > 30,000 km/year)

The maintenance intervals shown on the preceding pages are for normal operating conditions. If the vehicle is mainly operated under severe driving conditions as shown below, more frequent maintenance must be performed on the following items as shown in the table.

Severe driving conditions

A --- Driving in dusty conditions

B --- Repeatedly driving short distances

C --- Towing a trailer or caravan

D --- Extensive idling

E --- Driving in extremely adverse weather conditions or in areas where ambient temperatures are either extremely low or extremely high

F --- Driving in high humidity or mountainous areas

G --- Driving in areas using salt or other corrosive materials

H -- Driving on rough and / or muddy roads or in the desert

I --- Driving with frequent use of braking or in mountainous areas

Maintenance operation: Inspect = Inspect and correct or replace as necessary.

Driving condition									Maintenance item	Maintenance operation	Maintenance interval
A	B	C	D	.	.	.	.	.	Engine oil & engine oil filter	Replace	Every 5,000 km (3,000 miles)
A	.	.	.	.	.	G	H	.	Air cleaner filter	Replace	Every 30,000 km (18,000 miles)
A	.	.	.	.	.	.	.	.	Air conditioner filter	Replace	Every 15,000 km (9,000 miles)
.	B	C	.	E	F	G	H	.	Manual transaxle gear oil	Replace	Every 80,000 km (48,000 miles)
.	B	C	.	E	F	G	H	.	Automatic transaxle fluid	Replace	Every 100,000 km (60,000 miles)
A		C	.	.	.	G	H	I	Brake pads, rotors & other brake components	Inspect	More frequently
A	B	C	.	E		G	H	.	Drive shafts and boots	Inspect	More frequently

PERIODIC MAINTENANCE (EXCEPT FOR RUSSIA/UKRAINE)

The following tables show the normal maintenance schedule. Depending upon weather and atmospheric conditions, varying road surfaces, individual driving habits and vehicle usage, additional or more frequent maintenance may be required.

Periodic maintenance beyond the last period shown on the tables requires similar maintenance.

Engine and Emission Control Maintenance (QG Engine)

Abbreviations: I = Inspect and correct or replace as necessary R = Replace [ ] = At the distance interval only

MAINTENANCE OPERATION		MAINTENANCE INTERVAL								
Perform either at number of kilometers (miles) or	km x 1,000	1	10	20	30	40	50	60	70	80
months, whichever comes first.	(miles x 1,000)	(0.6)	(6)	(12)	(18)	(24)	(30)	(36)	(42)	(48)
	Months	-	6	12	18	24	30	36	42	48
Engine compartment and under vehicle										
Engine oil (Use recommended oil) ✱			R	R	R	R	R	R	R	R
Engine oil filter (Use NISSAN genuine part or equivalent) ✱			R	R	R	R	R	R	R	R
Drive belts		I	[I]	[I]	[I]	[I]	[I]	[I]	[I]	[I]
Cooling system			I	I	I	I	I	I	I	I
Engine coolant (Use genuine RENAULT SAMSUNG long life coolant or equivalent in its quality)	See NOTE (1)		I	I	I	I	I	I	I	I
Air cleaner filter ✱				[R]		[R]		[R]		[R]
Intake and exhaust valve clearance	See NOTE (2)									
Fuel lines		I		[I]		[I]		[I]		[I]
EVAP vapor lines				[I]		[I]		[I]		[I]
Carbon canister										[R]
Spark plugs			[R]*1	[R]	[R]*1	[R]	[R]*1	[R]	[R]*1	[R]
Fuel filter	See NOTE (3)									
Oxygen sensor						[I]				[R]
Vacuum hoses & connections				[I]		[I]		[I]		[I]
Positive crankcase ventilation (PCV) system				[I]		[I]		[I]		[I]
Throttle valve and ISC valve						[I]				[I]
Overall test by CONSULT-II			[I]	[I]	[I]	[I]	[I]	[I]	[I]	[I]

NOTE:

* Maintenance items with "✱" should be performed more frequently according to "Maintenance Under Severe Driving Conditions".

(1) First replace at 100,000 km (60,000 miles)/60 months, then every 60,000 km (36,000 miles)/36 months. Perform "I" (Checking the mixture ratio and correcting the mixture ratio if necessary).

(2) Periodic maintenance is not required. However, if valve noise increases, check valve clearance.

(3) Fuel filter is maintenance-free.

*1: For Kazakhstan models only.

Chassis and Body Maintenance

Abbreviations: I = Inspect and correct or replace as necessary, R = Replace, T= Tighten

MAINTENANCE OPERATION		MAINTENANCE INTERVAL								
Perform either at number of kilometers (miles) or	km x 1,000	1	10	20	30	40	50	60	70	80
months, whichever comes first.	(miles x 1,000)	(0.6)	(6)	(12)	(18)	(24)	(30)	(36)	(42)	(48)
	Months	-	6	12	18	24	30	36	42	48
Underhood and under vehicle										
Tire rotation & wheel alignment (if necessary, balance wheels)				I		I		I		I
Brake pads, rotors & other brake components ✱		I	I	I	I	I	I	I	I	I
Brake linings, drums & other brake components		I	I	I	I	I	I	I	I	I
Foot brake, parking brake & clutch (for free play, stroke & operation)		I	I	I	I	I	I	I	I	I
Brake booster vacuum hoses, connections, check valve		I				I				I
Brake & clutch, systems and fluid (for level and leaks)		I		I		I		I		I
Brake & clutch fluid						R				R
Power steering fluid and lines (for level and leaks)			I	I	I	I	I	I	I	I
Air conditioner filter (if equipped) ✱				R		R		R		R
Manual transaxle gear oil (check for leakage. Use recommended oil) ✱						I				I
Automatic transaxle fluid (for level and leaks) ✱				I		I		I		I
Steering gear & linkage, wheel hub nut tightness		I	I	I	I	I	I	I	I	I
Hub beering leakage and damage				I		I		I		I
Suspension parts						I				I
Drive shaft and boots ✱		I		I		I		I		I
Chassis & underbody bolts/nuts		T	T	T	T	T	T	T	T	T
Exhaust system		I				I				I
Locks, hinges & hood latch		Frequently grease if necessary								

NOTE:

* Maintenance items with "✱" should be performed more frequently according to "Maintenance Under Severe Driving Conditions".

Maintenance Under Severe Driving Conditions

The maintenance intervals shown on the preceding pages are for normal operating conditions. If the vehicle is mainly operated under severe driving conditions as shown below, more frequent maintenance must be performed on the following items as shown in the table.

Severe driving conditions

A --- Driving in dusty conditions

B --- Repeatedly driving short distances

C --- Towing a trailer or caravan

D --- Extensive idling

E --- Driving in extremely adverse weather conditions or in areas where ambient temperatures are either extremely low or extremely high

F --- Driving in high humidity or mountainous areas

G --- Driving in areas using salt or other corrosive materials

H -- Driving on rough and / or muddy roads or in the desert

I --- Driving with frequent use of braking or in mountainous areas

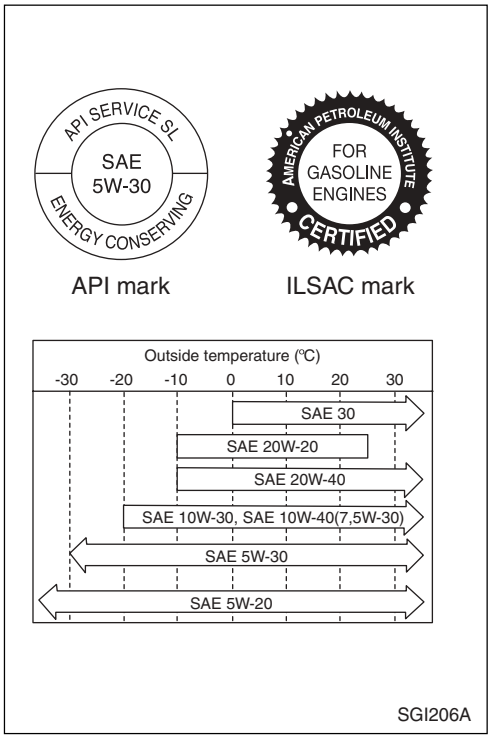
Maintenance operation: Inspect = Inspect and correct or replace as necessary.

Driving condition									Maintenance item	Maintenance operation	Maintenance interval
A	B	C	D	.	.	.	.	.	Engine oil & engine oil filter	Replace	Every 5,000 km (3,000 miles) or 3 months
A	.	.	.	.	.	G	H	.	Air cleaner filter	Replace	Every 5,000 km (3,000 miles) or 3 months
A	.	.	.	.	.	.	.	.	Air conditioner filter	Replace	Every 10,000 km (6,000 miles) or 6 months
.	B	C	.	E	F	G	H	.	Manual transaxle gear oil	Replace	Every 80,000 km (48,000 miles) or 48 months
.	B	C	.	E	F	G	H	.	Automatic transaxle fluid	Replace	Every 100,000 km (60,000 miles) or 60 months
A		C	.	.	.	G	H	I	Brake pads, rotors & other brake components	Inspect	More frequently
A	B	C	.	E		G	H	.	Drive shafts and boots	Inspect	More frequently
.	.	.	.	.	.	G	H	.	Brake system and fluid (for level and leaks)	Inspect	Every 10,000 km (6,000 miles) or 6 months

Fluids and Lubricants

	Recommended fluids and lubricants
Engine oil	Genuine NISSAN engine oil API, SH, SJ or SL*1 ILSAC grade, GF-3*1
Cooling system	Genuine RENAULT SAMSUNG long life coolant (Kukdong Jeyen: SEC-5) or equivalent in its quality*2
Manual transaxle gear oil	API GL-4 SAE Viscosity 75W-80
Automatic transaxle fluid	Genuine NISSAN ATF Matic Fluid D or equivalent*3
Power steering fluid	Genuine NISSAN PSF or equivalent*4
Brake and clutch fluid	For Russia/Ukraine: DOT 3 or DOT 4 Except for Russia/Ukraine: DOT 3
Multi-purpose grease	NLGI No. 2 (Lithium soap base)

*1: For further details, see “Specified Engine Oil”.
*2: Use Genuine RENAULT SAMSUNG long life coolant (Kukdong Jeyen: SEC-5) or equivalent in its quality, in order to avoid possible aluminum corrosion within the engine cooling system caused by the use of non-genuine engine coolant. **Note that any repairs for the incidents within the engine cooling system while using non-genuine engine coolant may not be covered by the warranty even if such incidents occurred during the warranty period.**
*3: Contact a NISSAN dealership for more information regarding suitable fluids, including recommended brand(s) of Dexron™ III/Mercon™ Automatic Transmission Fluid.
*4: DEXRON™ III type ATF can be used.



Specified Engine oil

- We recommend the engine oils that are API certified or ILSAC certified with the label as shown in the figure. Use genuine NISSAN engine oil.
- Use oil with the proper viscosity (SAE viscosity level) for the ambient temperature as specified. (Refer to the viscosity as shown in the left table.)
- For more information, contact a NISSAN dealer.

Mixture Ratio Of Anti-freeze and Distilled Water (Reference Use Only)

Area	LLC Concentration (%)	Safety Zone	Freezing Point
Hot	30	Over -13ºC	-16ºC
General	40	Over -21ºC	-24ºC
Cold	55	Over -40ºC	-43ºC

Engine Coolant Mixture Ratio

The engine cooling system is filled at the factory with a high-quality, year-round and extended life engine coolant. The high quality engine coolant contains the specific solutions effective for the anticorrosion and the anti-freeze function. Therefore, additional cooling system additives are not necessary.

CAUTION:

When adding or replacing coolant, be sure to use only a genuine RENAULT SAMSUNG long life coolant or equivalent in its quality with the proper mixture ratio. See the examples shown left.

The use of other types of engine coolant may damage your cooling system.

MANUAL TRANSAXLE

SECTION MT

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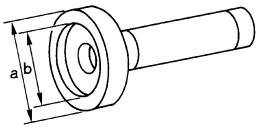
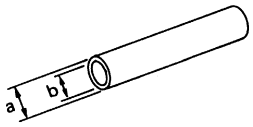
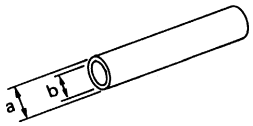
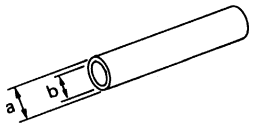
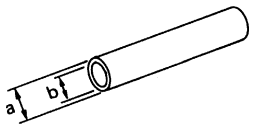
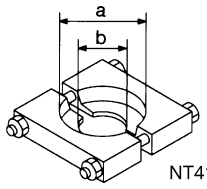
Precaution

Caution

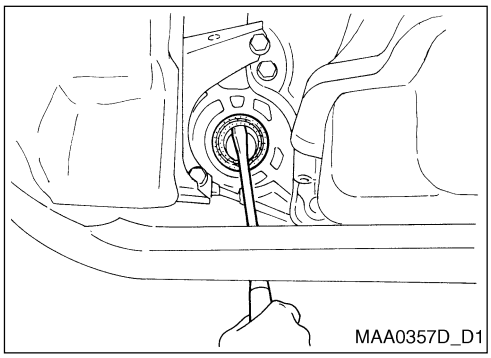
- Do not reuse the used transaxle oil.
- Perform the oil check or change while the vehicle is on the level ground.
- Be careful not to let any foreign particles such as waste or dust into the transaxle during removal/ installation.

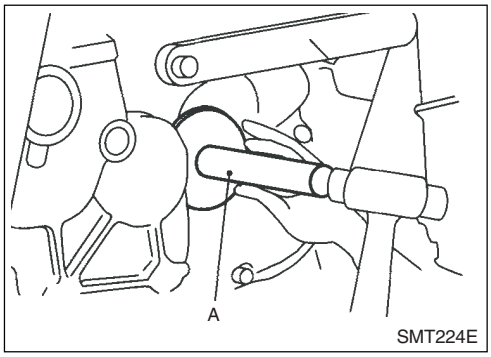
Preparation

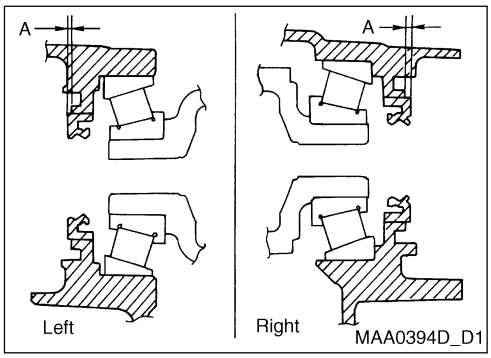
Special Service Tools

Item		Description
Differential oil seal drift set KV38100200	 ZZA1143D	Installing transaxle side oil seal **a: 65 mm (2.65 in) dia.** **b: 49 mm (1.93 in) dia.**
ST22350000 Drift	 ZZA0534D_D1	Installing striking rod oil seal Installing input shaft front bearing **a: 34 mm (1.34 in) dia.** **b: 28 mm (1.10 in) dia.**
ST22452000 Drift	 ZZA0534D_D1	Installing 1st & 2nd synchronizer **a: 45 mm (1.77 in) dia.** **b: 36 mm (1.42 in) dia.**
ST37750000 Drift	 ZZA0534D_D1	Installing 5th main gear Installing 3rd & 4th synchronizer Installing input shaft oil seal Installing 5th synchronizer **a: 40 mm (1.57 in) dia.** **b: 31 mm (1.22 in) dia.**
ST22360002 Drift	 ZZA0534D_D1	Installing mainshaft rear bearing inner race **a: 29 mm (1.14 in) dia.** **b: 23 mm (0.91 in) dia.**
ST30031000 Puller	 NT411	Removing 3rd, 5th input gear Removing 3rd & 4th and 5th & Rev synchronizer hub Removing mainshaft rear bearing Removing 2nd gear, 5th gear bush Removing 1st & 2nd synchronizer hub, 1st and 4th main gear Removing and installing differential side bearing **a: 90 mm (3.54 in) dia.** **b: 50 mm (1.97 in) dia.**

Side Oil Seal







Removal • Installation

REMOVAL

1. Remove the drive shaft from the transaxle assembly.
2. Remove the oil seal using a minus (-) screwdriver.

CAUTION:

- **Be careful not to damage the case surface when removing the oil seal.**

INSTALLATION

1. Using a drift (A: KV38100200), strike the oil seal from the case surface to be the clearance “A”.

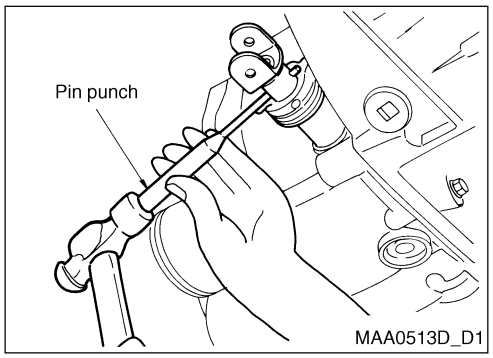
   Clearance A: Distance to the case surface 0 ± 0.5 mm

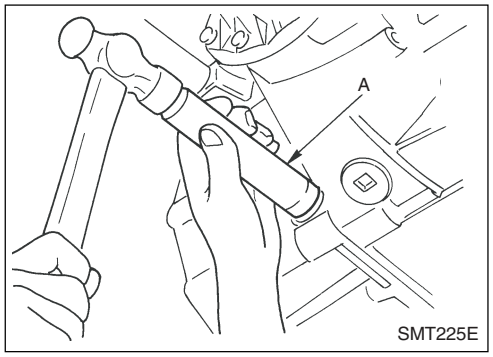
CAUTION:

- **Apply the multi-purpose grease to the oil seal lip when installing the oil seal.**
- **Do not reuse the oil seal. Replace it with new.**

2. Install in the reverse order of removal and check for the oil level.

Striking Rod Oil Seal





Removal • Installation

REMOVAL

1. Remove the control rod, support rod and bracket.
2. Pull out the retaining pin using the pin punch and remove the striking yoke.
3. Remove the oil seal using a minus (-) screwdriver.

CAUTION:

- **Be careful not to damage the case surface when removing the oil seal.**

INSTALLATION

1. Install the oil seal using the drift (A: ST22350000).

CAUTION:

- **Apply the multi-purpose grease to the oil seal lip when installing the oil seal.**
- **Do not exert too much force to prevent from oil seal deformation.**
- **Do not reuse the oil seal. Replace it with new.**

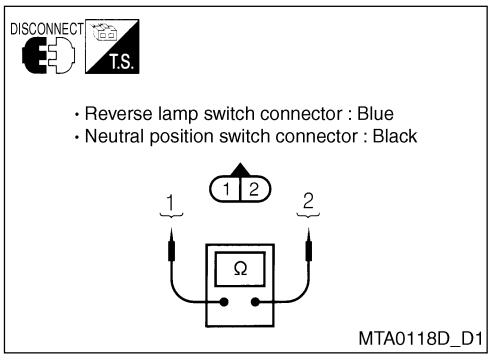
2. Insert the retaining pin to the striking yoke using a pin punch.

CAUTION:

- **Do not reuse the retaining pin. Replace it with new.**

3. Install the control yoke, support rod and bracket.

Position Switch



Inspection

REVERSE LAMP SWITCH

- Disconnect the reverse lamp switch connector and check the continuity by shifting the shift lever to each gear positions (1 - 5 and R). Replace if defective.

  1 - 2

  Reverse position: Continuity

  Other than reverse position: No continuity

NEUTRAL POSITION SWITCH

- Disconnect the neutral position switch connector and check the continuity by moving the shift lever to each shift button and neutral position switch. Replace if defective.

  1 - 2

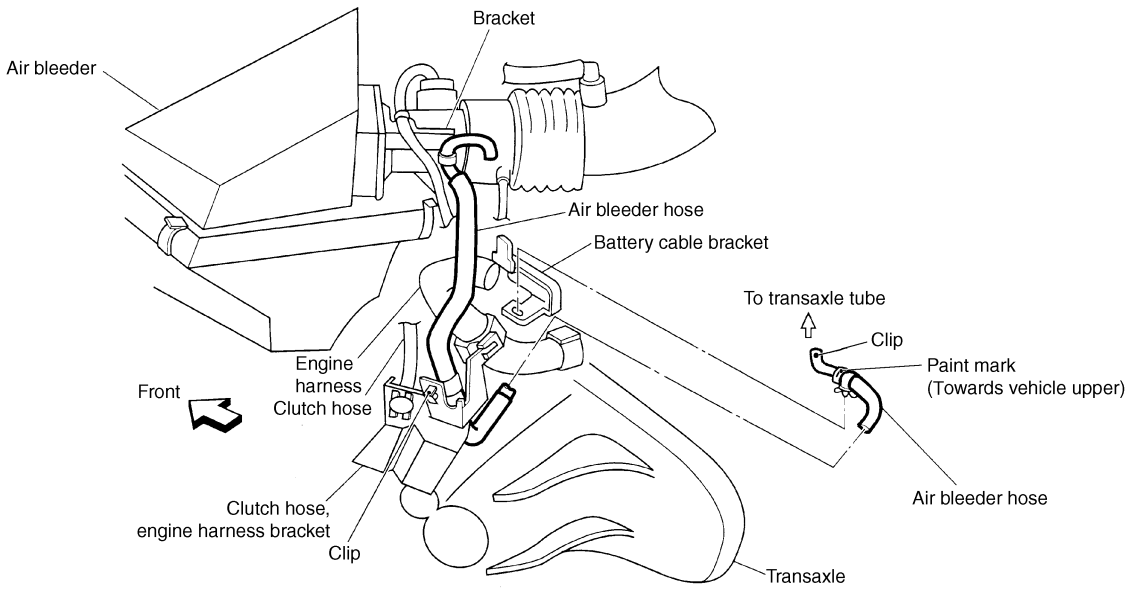
  Neutral position: Continuity

  Other than neutral position: No continuity

Air Bleeder Hose

Removal • Installation

Refer to the illustration to remove and install the air bleeder hose.



- Install the air bleeder hose in front of the engine harness.
- When inserting transaxle tube hose, securely insert so that it touches the rounded section of the tube.

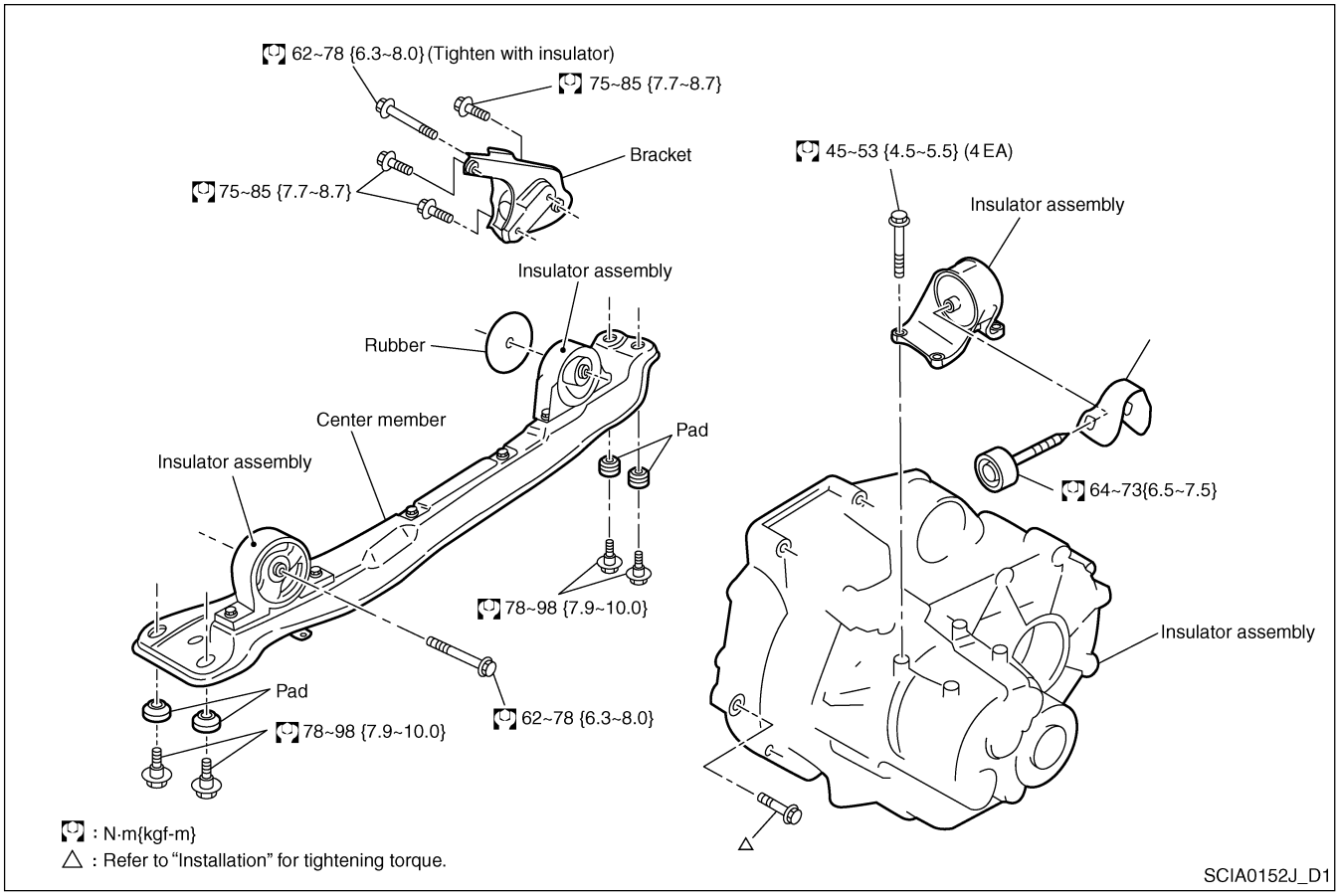
SCIA0151J_D1

CAUTION:

- **Be careful not to have any vibrations or clogging due to disconnections and bends during air bleeder hose installation.**

Transaxle Assembly

Removal • Installation



REMOVAL

1. Remove the air bleeder hose.
2. Remove the air cleaner and air duct.
3. Remove the clutch operating cylinder.

CAUTION:

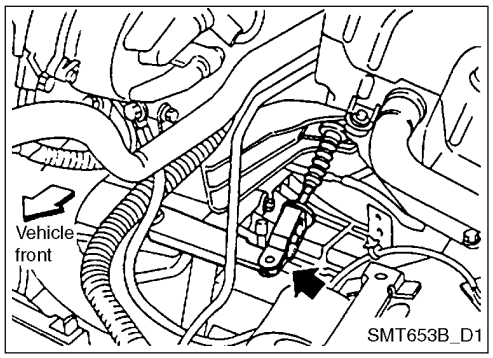
- **Do not depress the clutch pedal during removal.**

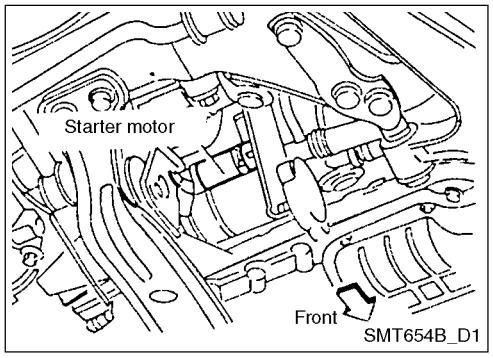
4. Remove the control linkage from the transaxle.
5. Remove the drive shaft.
6. Remove the connectors and harnesses such as neutral position switch, reverse lamp switch, speed sensor and ground.
7. Remove the starter motor.
8. Install the transmission jack to the transaxle.

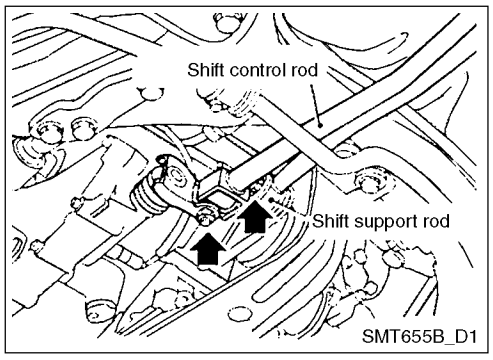
CAUTION:

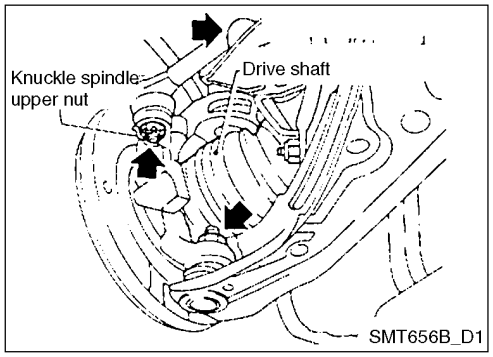
- **Be careful not to touch the switch during transmission jack installation.**

9. Remove the center member, engine insulator, engine mount bracket and gusset.
   - Refer to "Engine Assembly" (QG16: EM-56).
10. Install the transmission jack to the engine.
11. Remove the mounting bolts from the engine and transaxle.



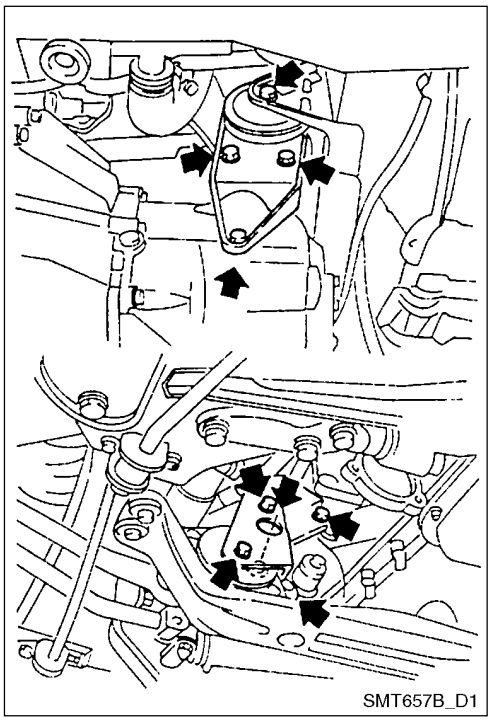






REMOVAL

1. Disconnect the battery negative (-) terminal.
2. Remove the air duct.
3. Remove the clutch pipe from the transaxle.
4. Remove the clutch operating cylinder from the transaxle.
5. Disconnect the reverse lamp switch, speedometer sensor, neutral position switch and ground connectors.
6. Remove the starter motor from the transaxle.
7. Remove the shift control rod and support rod from the transaxle.
8. Drain the gear oil from the transaxle.
9. Remove the front exhaust tube.
10. Remove the drive shaft from the transaxle.

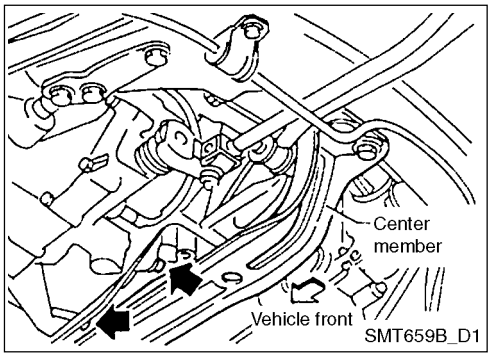


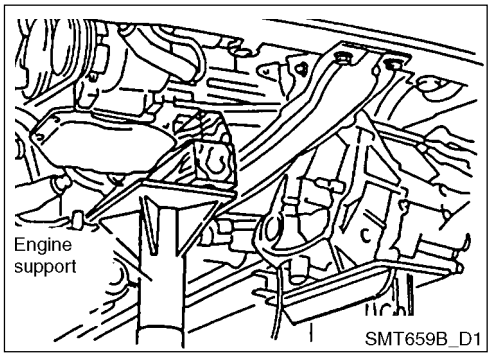
11. Support the jack under the engine oil pan.

CAUTION:

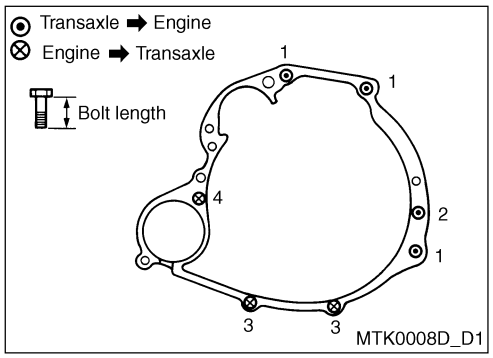
- **Do not position the jack under the oil pan drain plug.**

12. Support the transmission jack to the transaxle.
13. Remove the center member and engine mount.





14. Remove the transaxle mounting bolt.
15. Lower the transaxle slowly while the engine is supported by the jack.



Installation

Install in the reverse order of removal by cautioning as below.

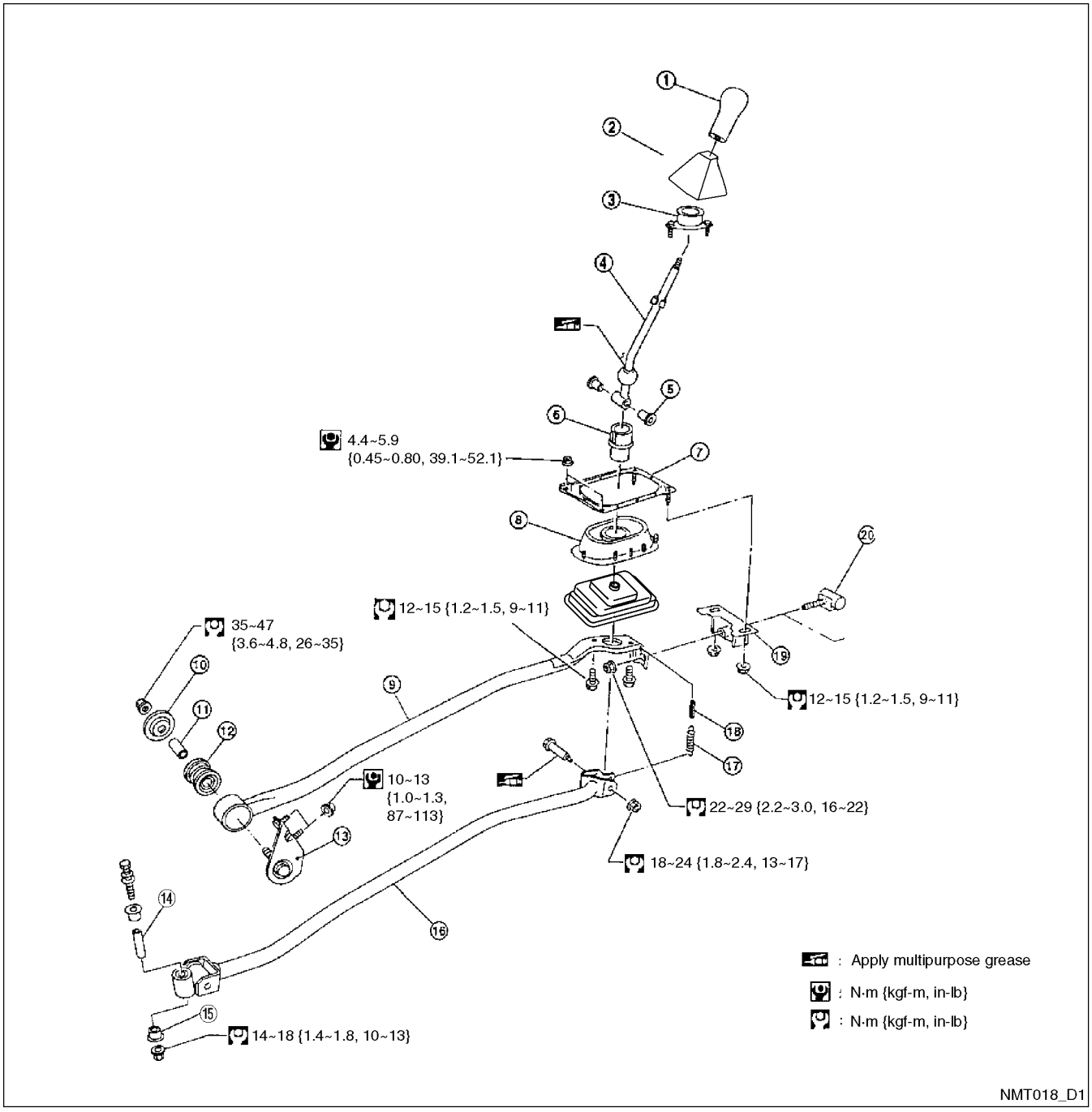
- While removing and installing the transaxle to the engine, follow the below standards for the mounting bolts.

CAUTION:

- **Be careful not let the transaxle input shaft touch the clutch cover during removal/installation.**

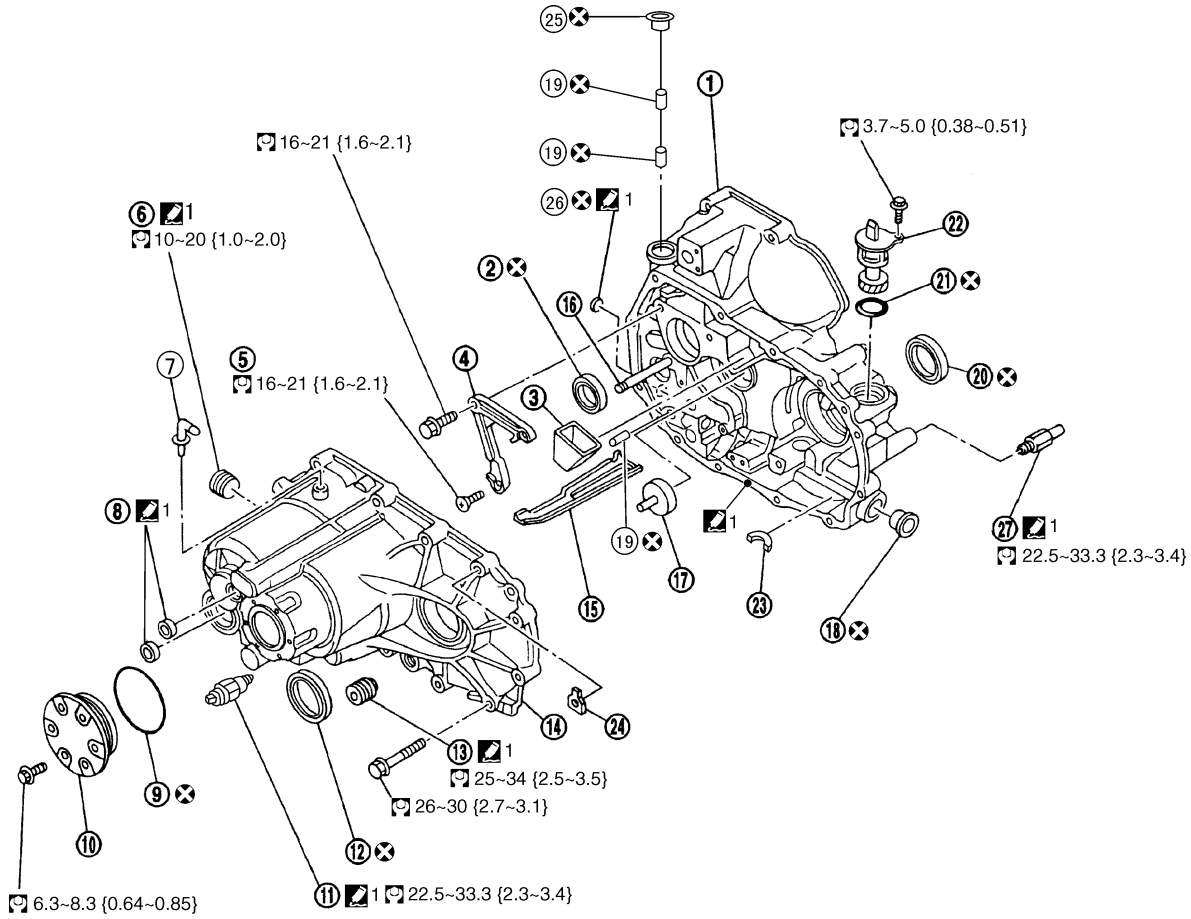
Bolt No.	1	2	3	4
Quantity	3	1	2	1
Bolt length (mm)	70	80	25	30
Tightening torque N•m (kgf-m)	30.4 - 40.2 (3.1 - 4.1)		15.7 - 20.6 (1.6 - 2.1)	30.4 - 40.2 (3.1 - 4.1)

Transaxle Gear Shift Control



① Control lever knob
② Boot
③ Control lever socket
④ Control lever
⑤ Bushing
⑥ Hand lever socket
⑦ Plate bolt
⑧ Transaxle hole cover
⑨ Support rod
⑩ Plate
⑪ Collar
⑫ Bushing
⑬ Support rod bracket
⑭ Collar
⑮ Bushing
⑯ Control rod
⑰ Return spring
⑱ Return spring rubber
⑲ Holder bracket
⑳ Mass damper

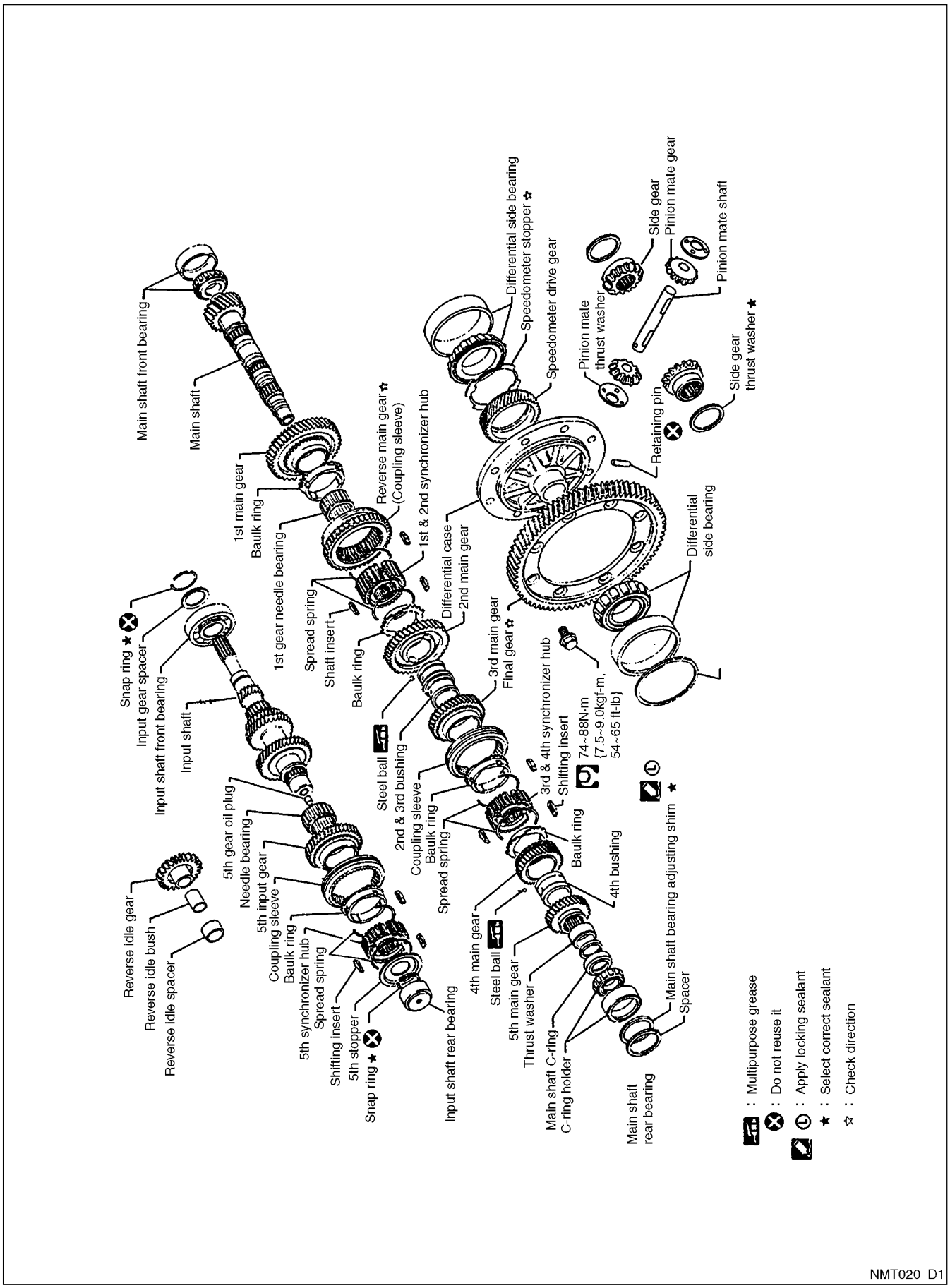
Case Components



SCIA0183J_D1

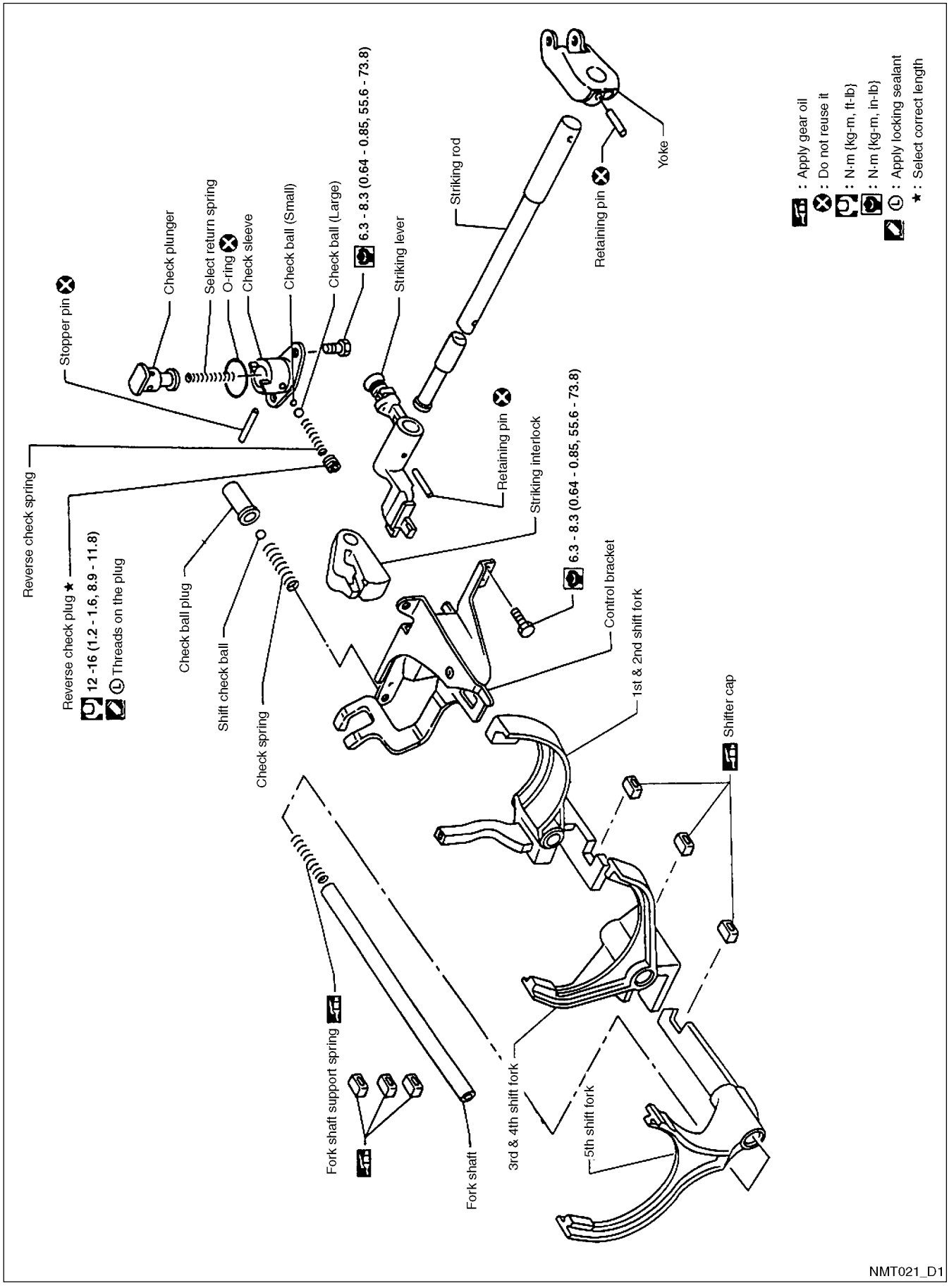
① Clutch housing
② Input shaft oil seal
③ Oil pocket
④ Bearing retainer
⑤ Torque support
⑥ Wheel plug
⑦ Air bleeder tube
⑧ Welch plug
⑨ O-ring
⑩ Case cover
⑪ Reverse switch
⑫ Differential oil seal
⑬ Drain plug
⑭ Transaxle case
⑮ Oil cover
⑯ Reverse idle shaft
⑰ Oil channel
⑱ Striking rod oil seal
⑲ Push
⑳ Differential oil seal
㉑ O-ring
㉒ Speedometer pinion assembly
㉓ Magnet
㉔ Ground terminal
㉕ Dust seal
㉖ Plug
㉗ Neutral position switch

Gear Component

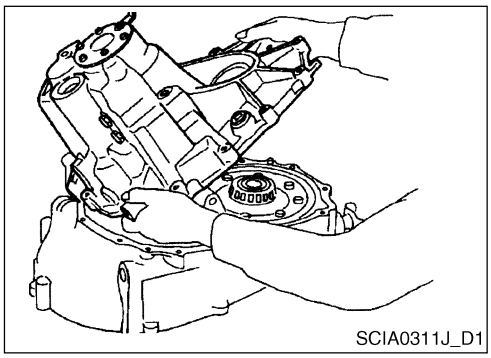


NMT020_D1

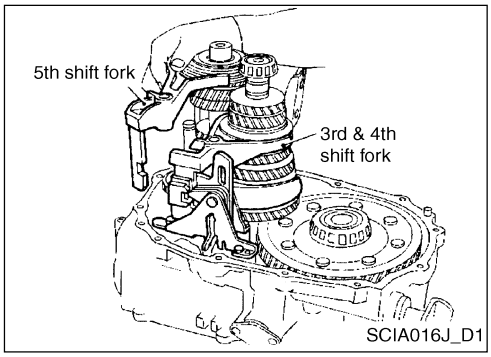
Shaft Control Components



Disassembly

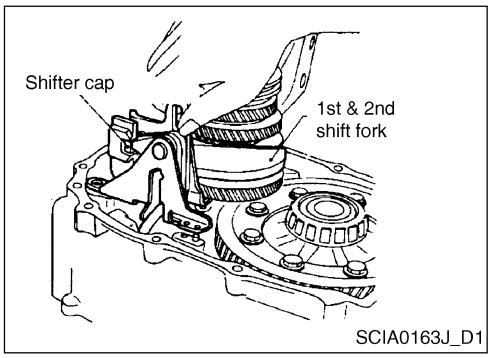

SCIA0311J_D1

1. Remove the transaxle case by tilting it slightly so that the 5th shift fork does not interfere with the transaxle case.



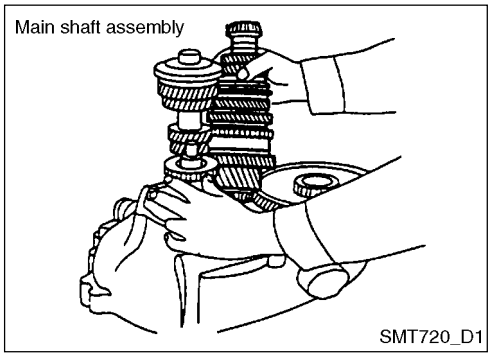
SCIA016J_D1

2. Take out the reverse idle spacer and fork shaft and remove the 5th shift fork and 3rd & 4th shift fork.
   - Be careful not to lose the shifter cap.



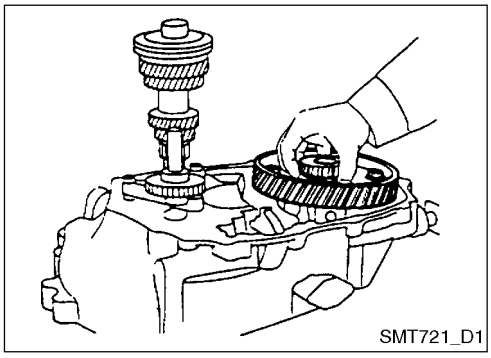
SCIA0163J_D1

3. Remove the 1st & 2nd shift fork and control bracket.
   - Be careful not to lose the shifter cap.

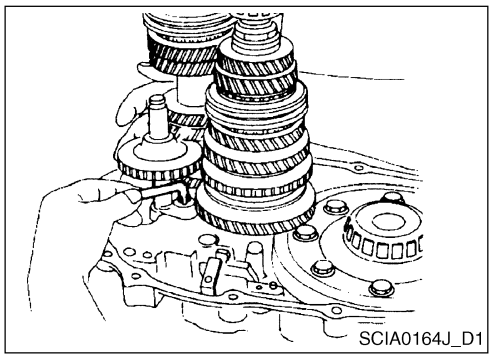


SMT720_D1

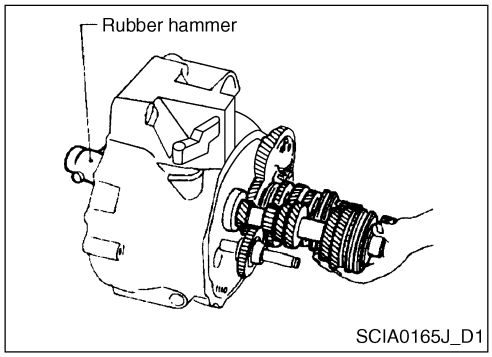
4. Remove the gear related components from the clutch housing.
   a. Remove the main shaft and final drive assembly.
      - Not to damage the oil channel in the clutch housing, remove the main shaft by lifting it upwards.


SMT721_D1

Disassembly (Continued)

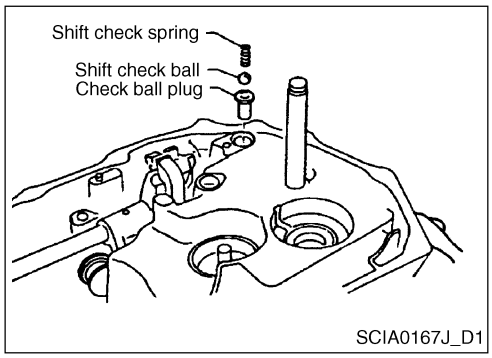

SCIA0164J_D1

b. Remove the bearing retainer mounting bolt.



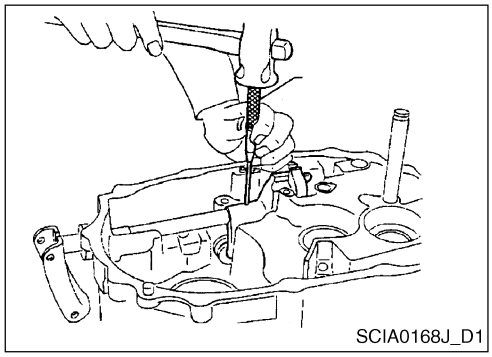
SCIA0165J_D1

c. Remove the input shaft and reverse idle gear by tapping them with rubber hammer.
- Do not remove the reverse idle shaft because its tightening can be loosened when reinstalled.
- Be careful not to damage the oil seal by the spline during input shaft removal.

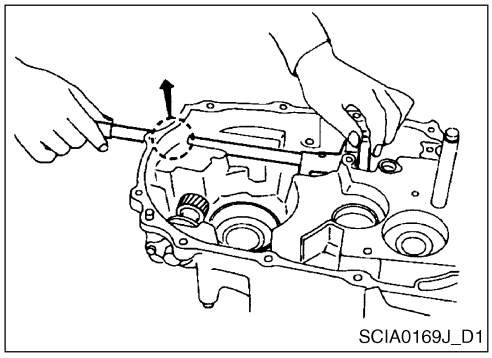


SCIA0167J_D1

5. Remove the oil pocket, shift check ball, check spring and check ball plug.

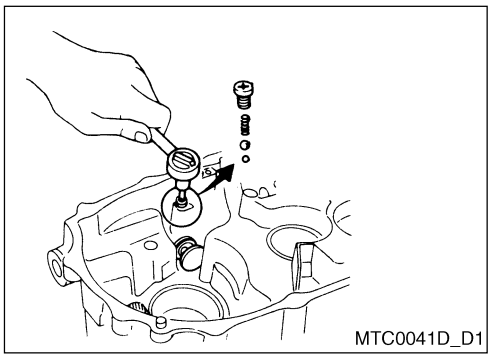

SCIA0168J_D1

6. Remove the retaining pin from the striking lever using the pin punch and remove the striking rod, bush, striking lever and striking interlock.
- Be careful not to let the retaining pin touch the clutch housing during retaining pin removal.

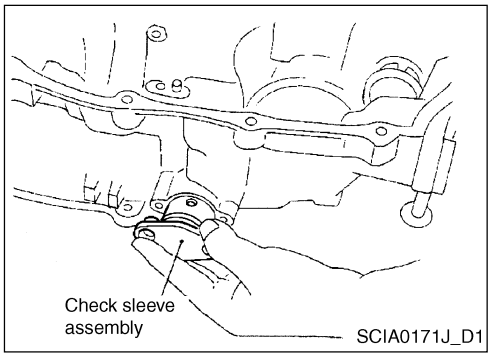

SCIA0169J_D1

- Be careful not to damage the oil seal lip during striking rod removal. Cover the striking rod's sharp edge with the tape if necessary.

Disassembly (Continued)

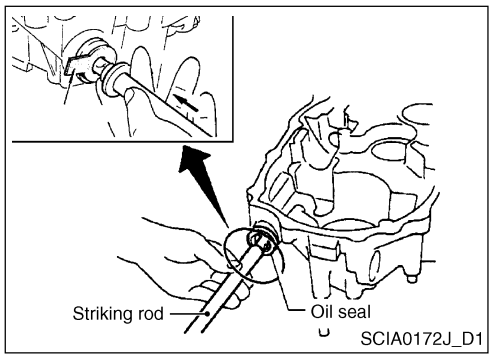


7. Remove the reverse check plug and disconnect the reverse check spring and the check ball.

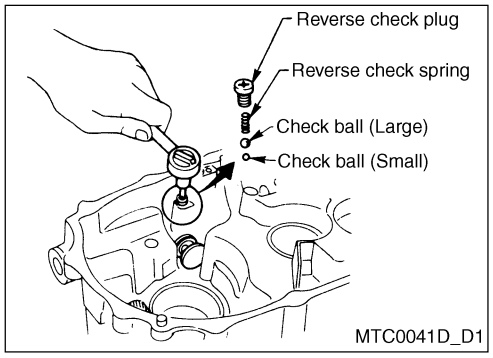


8 . Remove the check sleeve assembly.

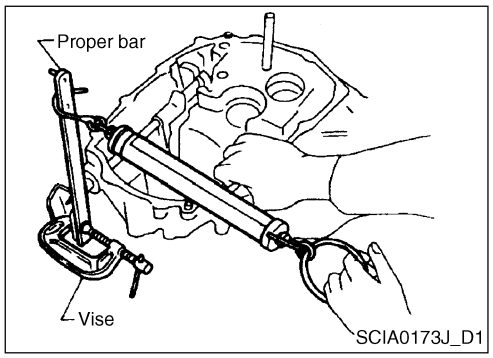
Assembly



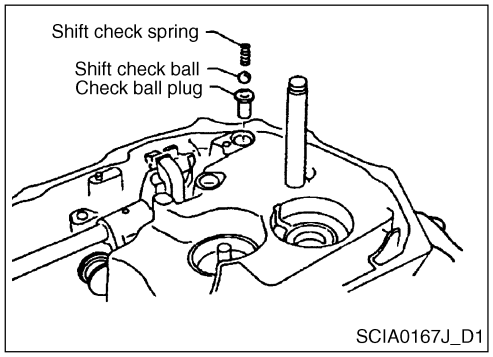
1. Install the striking rod, lever and interlock.
   - Cover the striking rod's sharp edge with the tape during striking rod installation not to damage the oil seal.

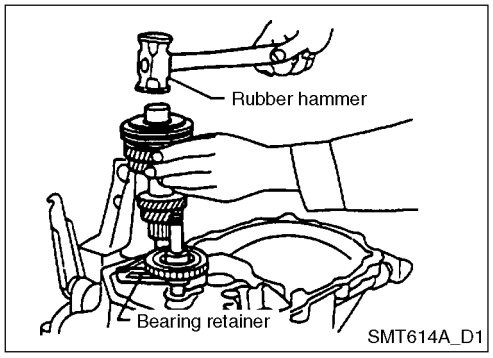


2. Install the reverse check sleeve assembly.
3. Install the reverse check ball, reverse check spring and reverse check plug.



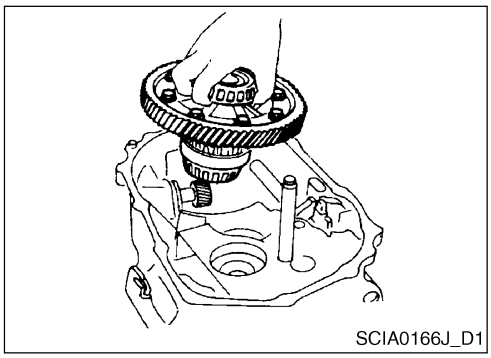
4. Measure the tension of the reverse check.
   Reverse check tension:
   4.9 - 7.4 N•m (50 - 75 kg-cm: 43 - 65 in-lb)
   - If out of the standard value, select and install a different check plug.
   - Reverse check plug: Refer to "Reverse Check Plug" (MT-39) in "Service Data".
5. Install the selected reverse check plug.
   - Apply the locking sealant at the plug surroundings before installation.
6. Install the shift check ball plug, shift check ball and check spring.
7. Install the oil pocket.



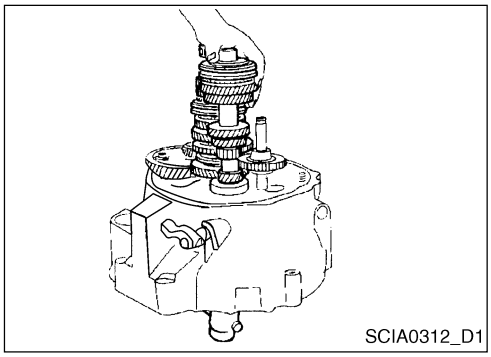


8. Install the gear related components to the clutch housing.
   a. Install the input shaft assembly and reverse idler gear.
      - Be careful not to damage the oil seal by the input shaft spline during installation of input shaft to the housing.
   b. Install the bearing retainer.
      Apply the liquid gasket (TB1215) on the threads of one torque bolt.

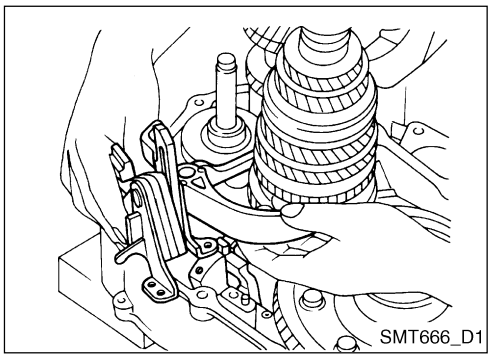
Assembly (Continued)


SCIA0166J_D1

b. Install the final drive assembly.


SCIA0312_D1

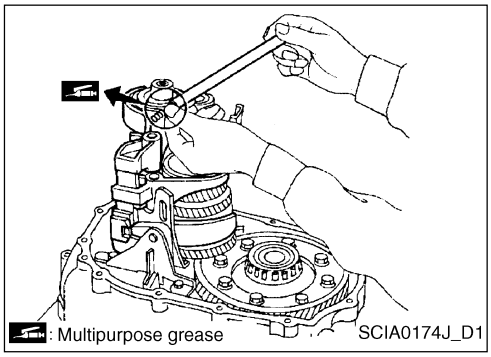
c. Install the main shaft assembly.
   - Be careful not to damage the oil channel when installing the main shaft to the clutch housing.


SMT666_D1

9. Apply grease to the shifter cap and install it to the control bracket.

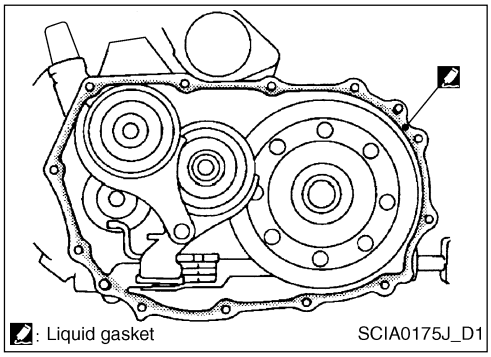
   Install the 1st & 2nd shift fork and control bracket.

10. Install the 3rd & 4th shift fork and 5th shift fork.



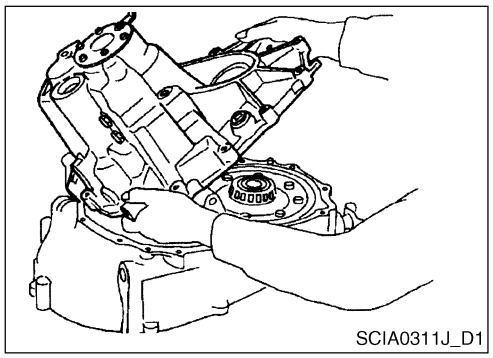
11. Install the fork shaft.
    - Apply a multipurpose grease to the support spring before fork shaft installation.

12. Install the reverse idle spacer.

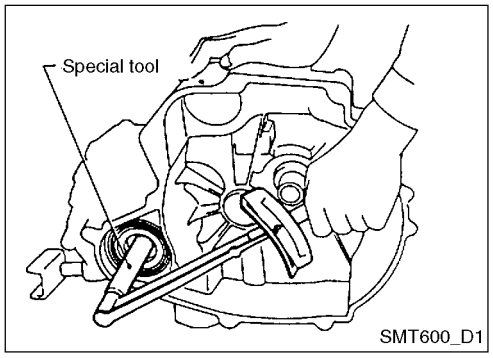


13. Apply the liquid gasket (TB1215) continuously to the clutch housing and transaxle mating surface.

Assembly (Continued)


SCIA0311J_D1

14. Install the transmission case to the clutch housing.
15. Tighten the mounting bolt to the specified torque.
    - Refer to “Installation” (MT-11) in “Transaxle Assembly” for tightening torque.



SMT600_D1

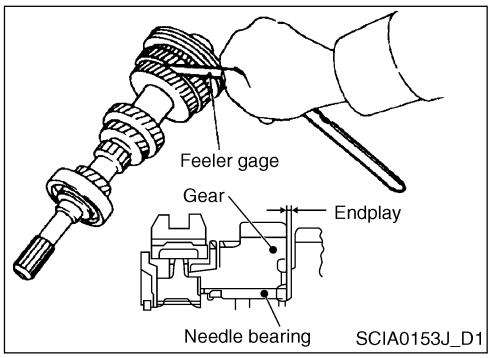
16. Measure the overall turning torque.

    Overall turning torque (new bearing):

    3.97 - 13.7 N•m (40 - 140 kgf-cm, 35 - 122 in-lb)

    - The turning torque is measured slightly lower than the above value if the bearing is reused.
    - Check if the turning torque is similar with the specified value.

Input Shaft and Gear



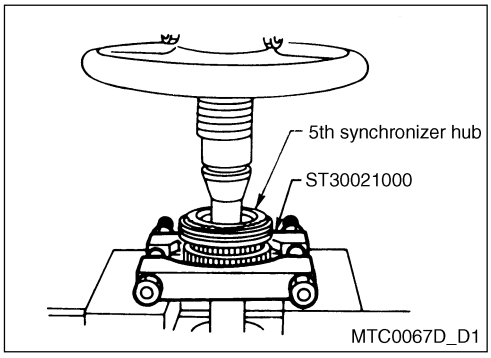
DISASSEMBLY

1. Measure the 5th gear endplay before disassembly.

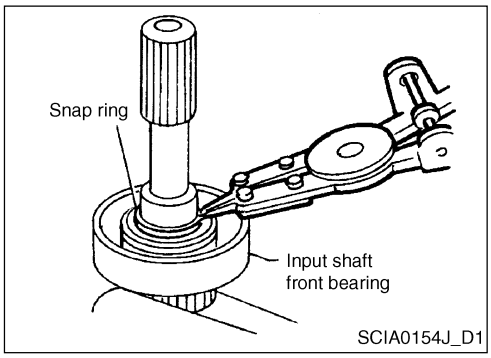
   Gear endplay

Gear	Endplay mm (in)
5th gear	0.18 - 0.31 (0.0071 - 0.0122)

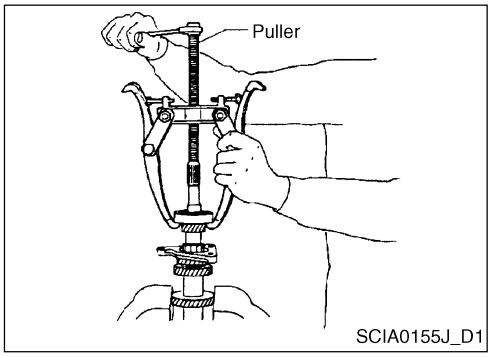
- When the values are out of the standard, disassemble and check the contacting surfaces of the gear, shaft and hub and measure the snap ring groove clearance during assembly.



2. Remove the snap ring and 5th stopper.
3. Remove the 5th synchronizer, 5th input gear and 5th needle bearing.

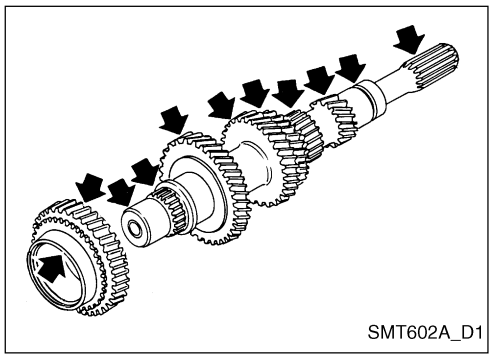


4. Remove the input shaft front bearing snap ring and remove the input gear spacer.



5. Remove the input shaft front bearing.
6. Remove the bearing retainer.

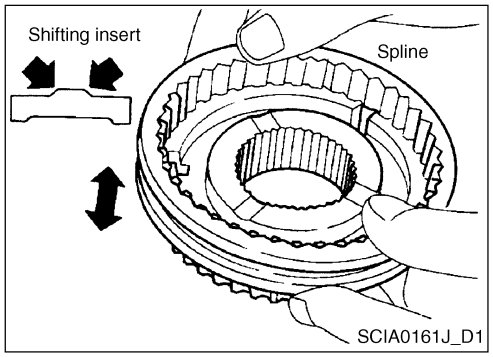
Input Shaft and Gear (Continued)


SMT602A_D1

INSPECTION AFTER DISASSEMBLY

GEAR AND SHAFT

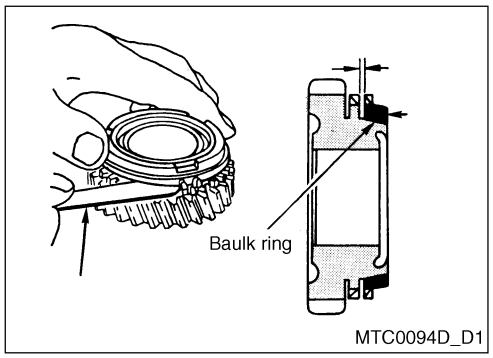
- Check for any crack, wear or distortion at the shaft.
- Check for any excessive wear, damage or chip at the gear.



SCIA0161J_D1

SYNCHRONIZER

- Inspect for any wear and crack at the coupling sleeve spline, hub and gear.
- Check for any wear or deformation at the baulk ring.
- Check for any wear or deformation at the shifting insert.



MTC0094D_D1

- Measure the clearance between the baulk ring and gear.

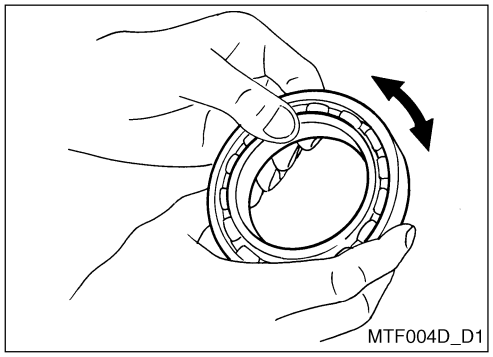
Clearance between the baulk ring and gear.

Standard:

1.0 - 1.35 mm (0.0394 - 0.0531 in)

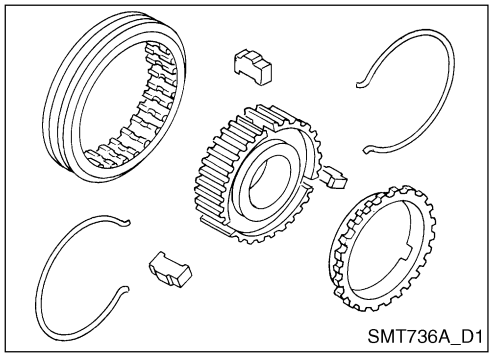
Wear limit:

0.7 mm (0.028 in)


MTF004D_D1

BEARING

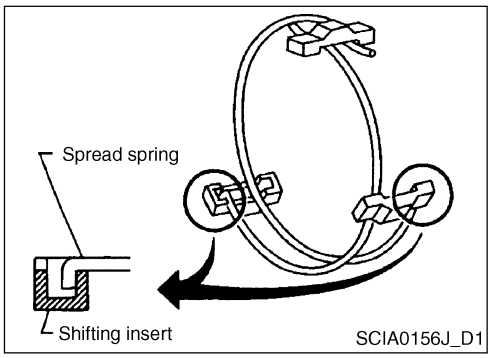
- Check if the bearing rotates smoothly without any ticking noises and check for any wear and deformation.


SMT736A_D1

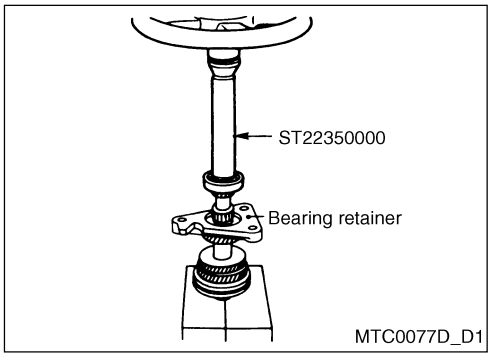
ASSEMBLY

1. Assemble the 5th synchronizer.

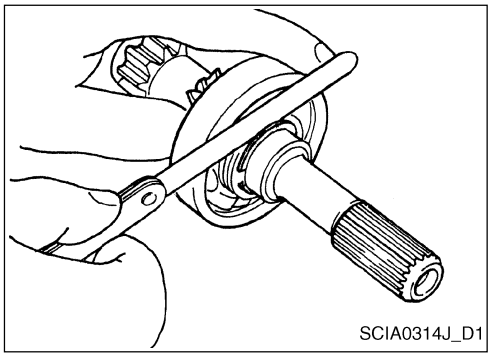
Input Shaft and Gear (Continued)



- Be careful so that the front and gear spread spring ends not to be caught by the same shifting insert.

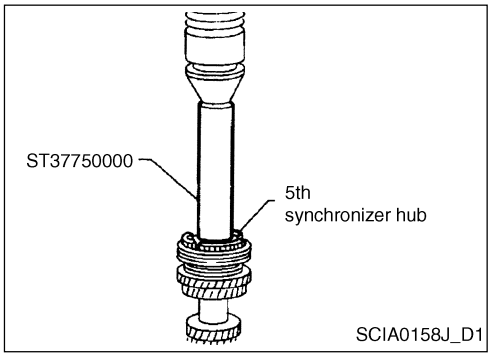


2. Install the bearing retainer.
3. Press in the input shaft front bearing.
4. Install the input gear spacer.



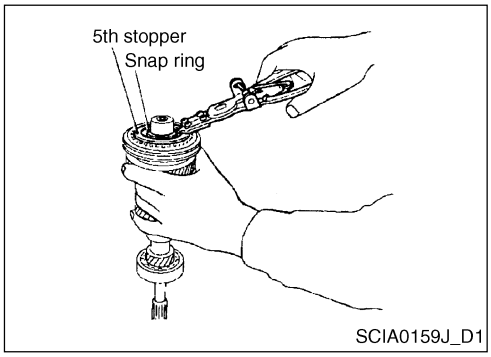
5. Select the input shaft front bearing snap ring to minimize the input shaft groove clearance. Install the snap ring.

   Groove clearance: 0 - 0.1 mm (0 - 0.004 in)



6. Install the 5th needle bearing, 5th input gear, 5th synchronizer and 5th stopper.
7. Measure the 5th input gear endplay.

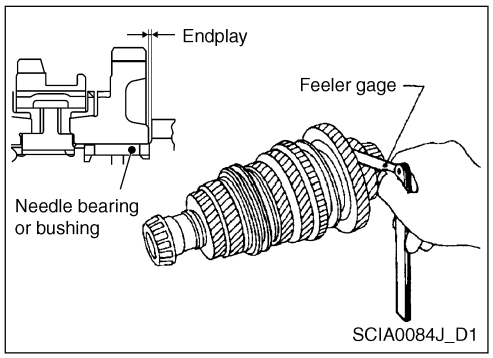
   Endplay standard: 0.18 - 0.31 mm



8. Select and install the 5th synchronizer hub snap ring to minimize the input shaft groove clearance.

   Groove clearance: 0 - 0.1 mm (0 - 0.004 in)

Main Shaft and Gear



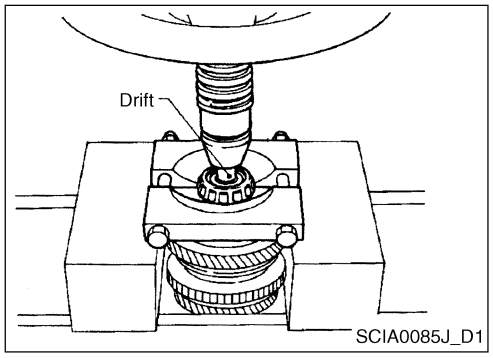
DISASSEMBLY

1. Measure the 1st, 2nd, 3rd and 4th main gear endplay.

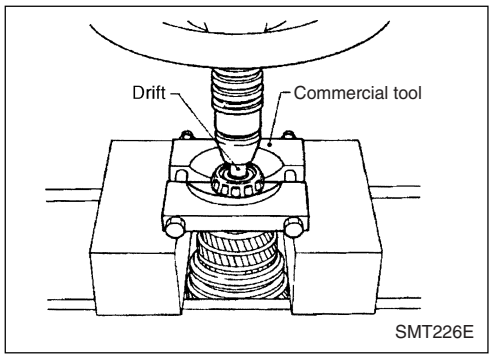
   Gear endplay:

   1st gear: 0.18 - 0.31 mm
   2nd gear: 0.2 - 0.3 mm
   3rd gear: 0.2 - 0.3 mm
   4th gear: 0.2 - 0.3 mm

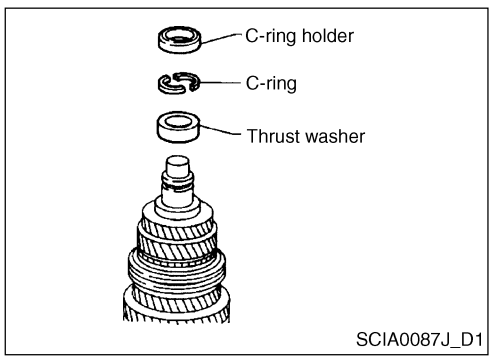
   - If out of the standard value, disassembly and inspect the contacting surfaces of the gear, shaft and hub. Adjust with the snap ring during assembly.



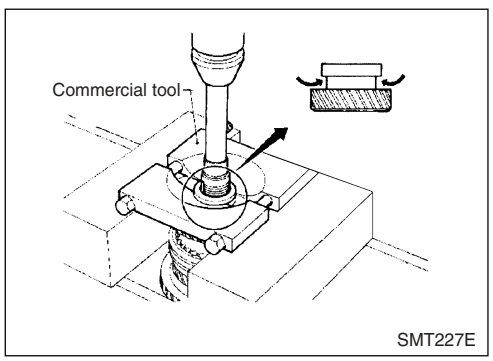
2. Remove the main shaft rear bearing using the press and commercial tool.



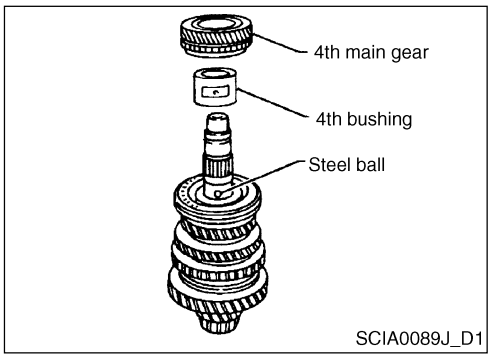
3. Remove the C-ring, C-ring holder and thrust washer.



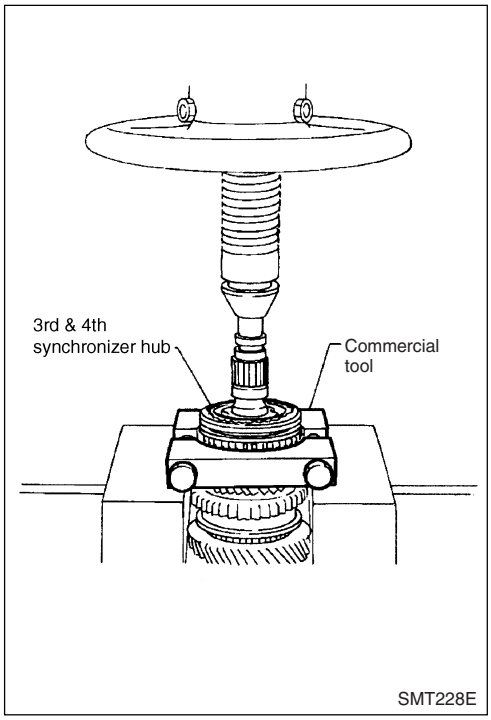
4. Remove the 5th main gear.



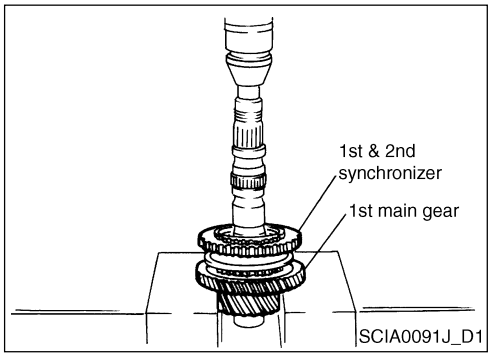
Main Shaft and Gear (Continued)



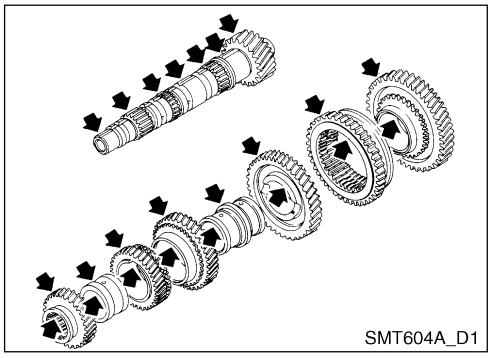
5. Remove the 4th main gear, 4th gear bushing and steel ball.
   - Be careful not to lose the steel ball.



6. Remove the 3rd & 4th synchronizer, 3rd main gear, 2nd & 3rd bushing, steel ball and 2nd main gear.
   - Be careful not to lose the steel ball.



7. Remove the 1st & 2nd synchronizer and 1st main gear. Remove the 1st gear needle bearing.

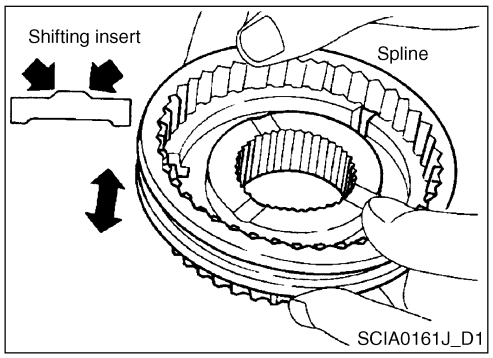


Inspection

GEAR AND SHAFT

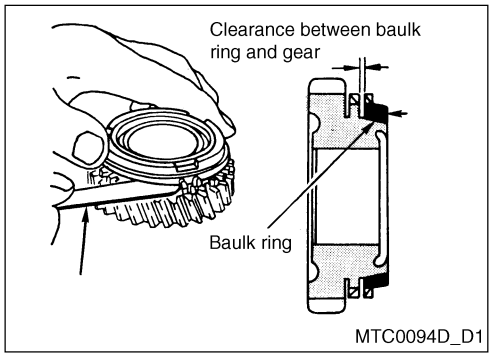
- Inspect for any crack, damage or distortion at the shaft.
- Inspect for any excessive wear or crack at the shaft gear.

Main Shaft and Gear (Continued)



SYNCHRONIZER

- Check for any wear and crack at the coupling sleeve spline, hub and gear.
- Inspect for any crack or deformation at the baulk ring.
- Inspect for any crack or deformation at the shifting insert.



- Measure the clearance between the baulk ring and gear.

  Clearance between the baulk ring and 1st~4th main gear

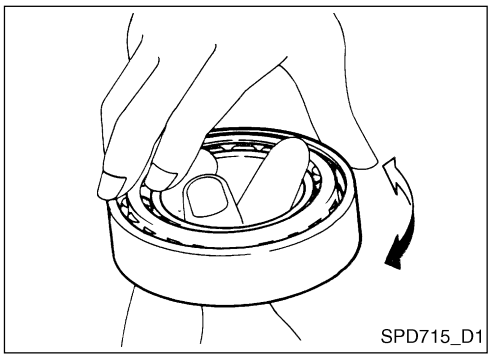
  Standard:

  1.0 - 1.35 mm (0.0394 - 0.0531 in)

  Wear limit:

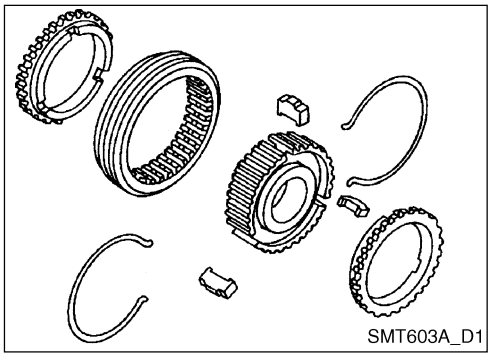
  0.7 mm (0.028 in)

Main Shaft and Gear (Continued)


SPD715_D1

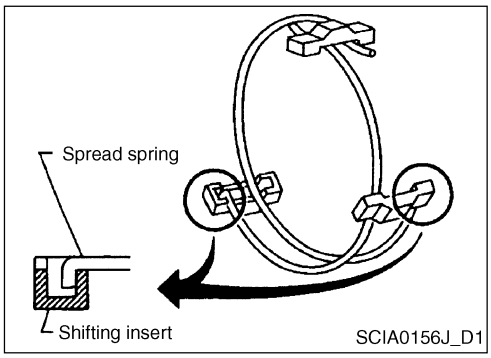
BEARING

- Check if the bearing rotates smoothly without any ticking noises and check for any wear and deformation.
- When replacing the taper roller bearing, replace the outer and inner race as a set.


SMT603A_D1

ASSEMBLY

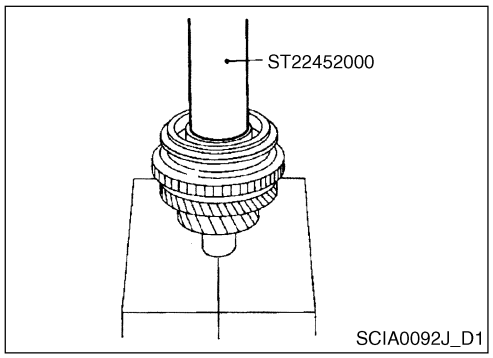
1. Assembly the 1st & 2nd, 3rd & 4th synchronizers.



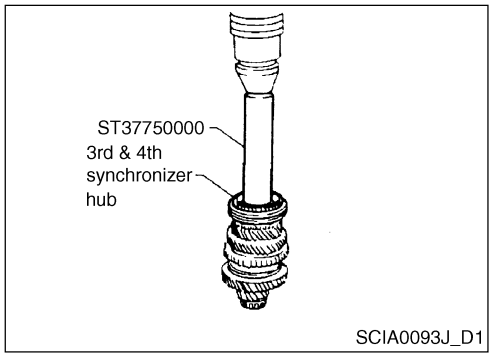
SCIA0156J_D1

- Be careful so that the front and gear spread spring ends not to be caught by the same shifting insert.

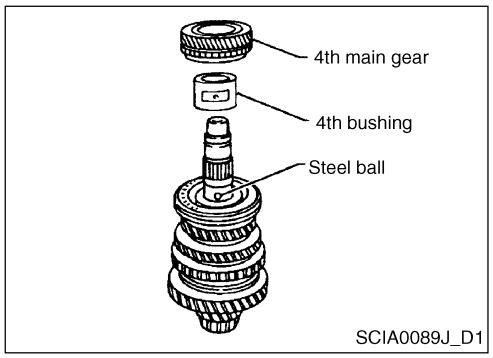
Main Shaft and Gear (Continued)



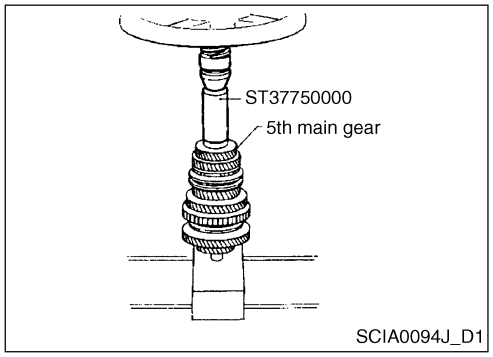
2. Install the 1st gear needle bearing and 1st main gear.
3. Press in the 1st & 2nd synchronizer.



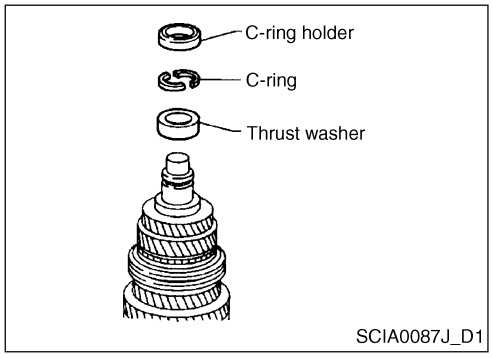
4. Install the steel ball, 2nd main gear, 2nd & 3rd bushing, 3rd main gear, 3rd & 4th synchronizer.
   - Apply a multipurpose grease to the steel ball before installing it to the 2nd & 3rd bushing groove.



5. Install the steel ball, 4th bushing and 4th main gear.
   - Apply a multipurpose grease to the steel ball before installing it to the 4th bushing groove.



6. Press in the 5th main gear.



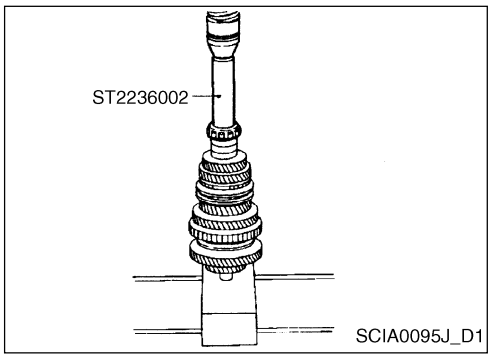
7. Install the thrust washer.
8. Select and install the C-ring so that the main shaft endplay becomes the standard value.

   Endplay standard:

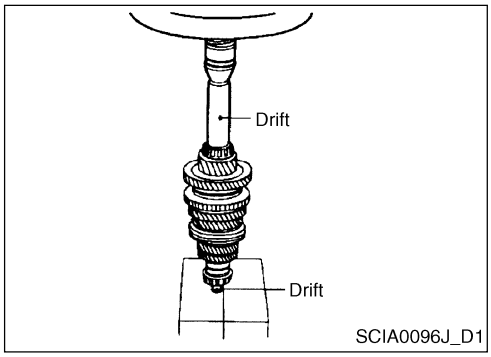
   0 - 0.1 mm (0 - 0.004 in)

9. Install the C-ring holder.

Main Shaft and Gear (Continued)



10. Press in the main shaft gear bearing.

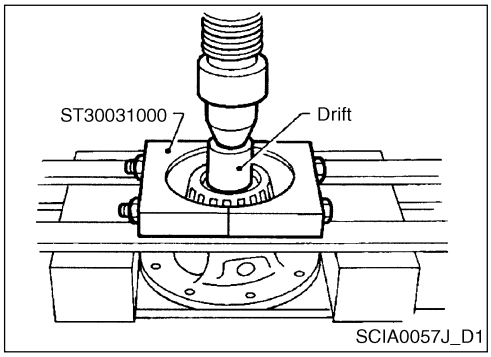


11. Press in the main shaft front bearing.
12. Measure the endplay for the 1st, 2nd, 3rd, 4th and main gear.

Endplay standard

1st gear: 0.18 - 0.31 mm

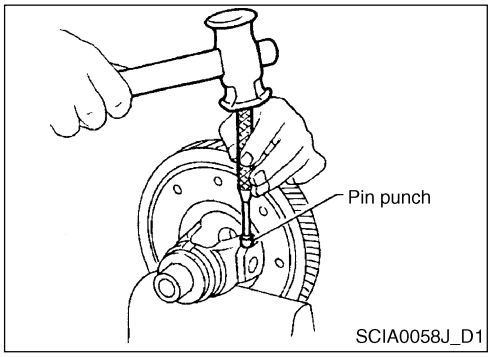
2nd~4th gear: 0.20 - 0.30 mm



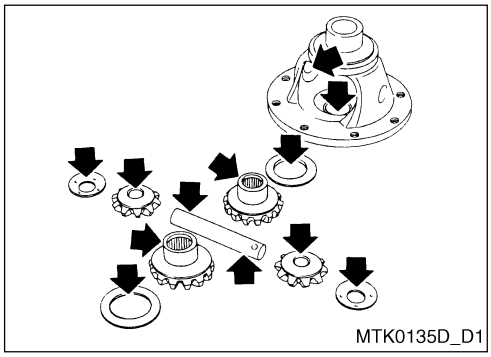
Final Drive

DISASSEMBLY

1. Remove the final gear.
2. Remove the differential side bearing.
   - Be careful not to mix the left and right bearings each other.



3. Remove the speedometer drive gear.
4. Remove the speedometer stopper.
5. Remove the lock pin using the pin punch and disassemble the pinion mate shaft.
6. Disconnect the pinion mate gear and side gear.

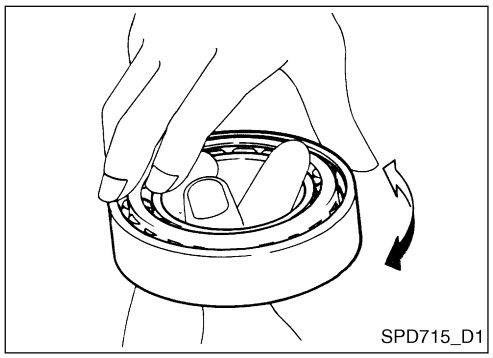


Inspection

GEAR, WASHER, SHAFT AND CASE

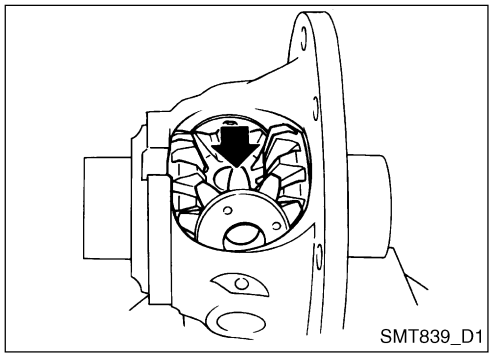
- Inspect the contacting surfaces of the side gear and pinion mate gear, and inspect for differential case and washer.

Final Drive (Continued)


SPD715_D1

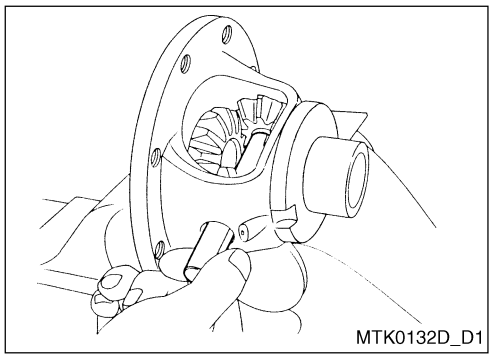
BEARING

- Check if the bearing rotates smoothly and check for any noise, crack, dents or wear at the bearing.
- When replacing the taper roller bearing, replace it as a set.

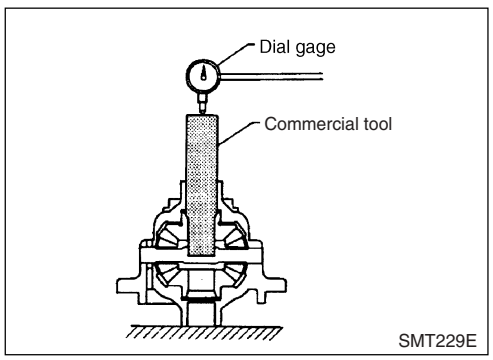

SMT839_D1

ASSEMBLY

1. Attach the side gear thrust washer to the side gear and install the pinion mate washer and pinion mate gear to their original positions.


MTK0132D_D1

2. Insert the pinion mate shaft.
   - Be careful not to damage the pinion mate thrust washer during insertion.

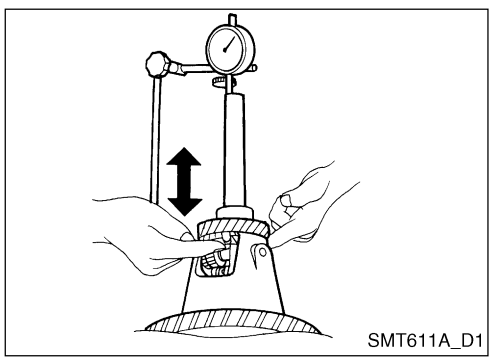


SMT229E

3. Measure the side gear endplay and select the proper side gear thrust washer.
   a. Install the commercial tool and dial gage to the side gear.
   b. By moving the side gear up and down, check the dial gage reading. Measure both side gears.

      Endplay standard:

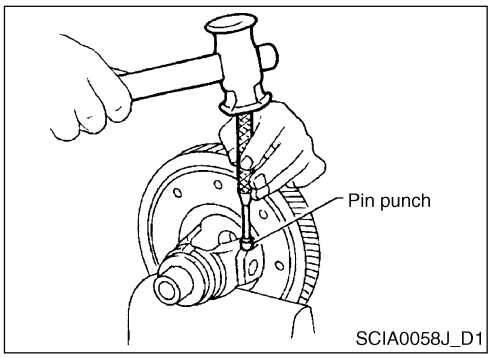
      0.1 - 0.2 mm


SMT611A_D1

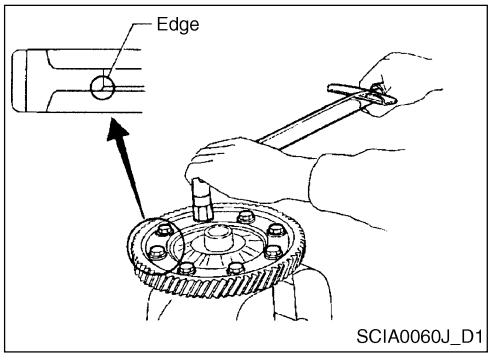
   c. If out of the standard value, adjust the clearance by changing the side gear thrust washer width.

      Side gear thrust washer: Refer to "SERVICE DATA" (MT-38).

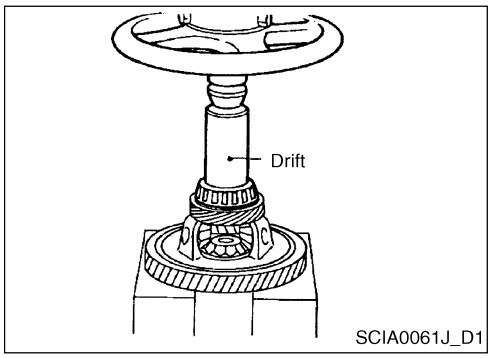
Final Drive (Continued)



4. Install the retaining pin.
   - Be careful not to let the retaining pin extrude over the case.



5. Install the final gear.
   - Apply the locking sealant to the mounting bolts before the final gear installation.
6. Install the speedometer drive gear and stopper.

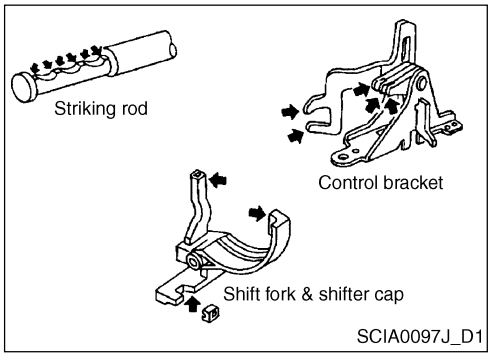


7. Press in the differential side bearing.

Shift Control Components

INSPECTION

- Check for any wear, scratch or damage at the contact surfaces and moving surfaces.

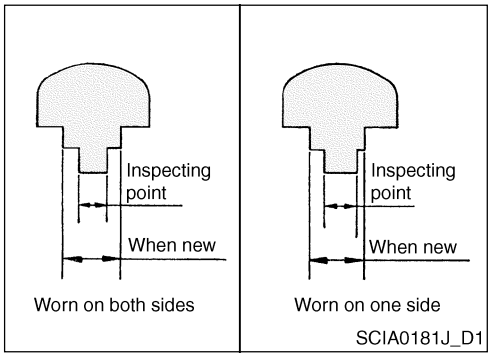


SHIFT FORK INSPECTION

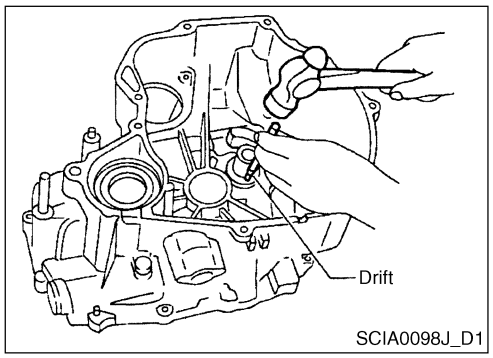
Check if the shift fork end width (the moving section against coupling sleeve) is in the limit value.

Shift fork width

- **1st~2nd, when new: 10.8 - 11.0 mm**
  Uneven wear limit: 10.3 [10.5]
- **3rd~4th, when new: 5.8 - 6.0 mm**
  Uneven wear limit: 5.3 [5.5]
- **5th, when new: 5.8 - 6.0 mm**
  Uneven wear limit: 5.3 [5.5]



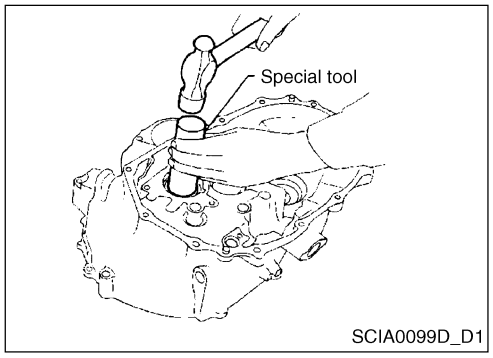
Case Components



REMOVAL • INSTALLATION

INPUT SHAFT OIL SEAL

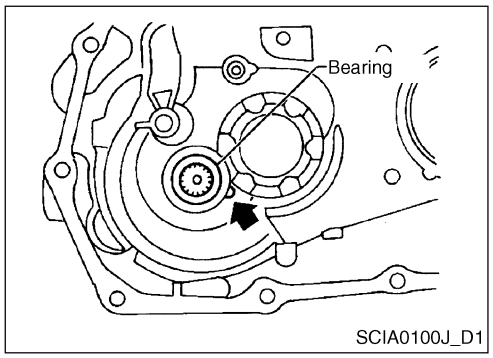
1. Remove the oil seal.



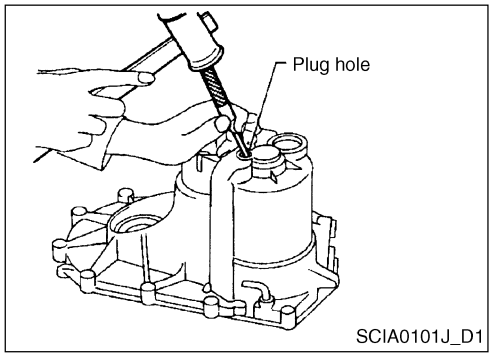
2. Install a new oil seal using the special tool.
   - Install after applying the multipurpose grease to the oil seal.
   - Always replace the oil seal. It cannot be used again.

INPUT SHAFT REAR BEARING

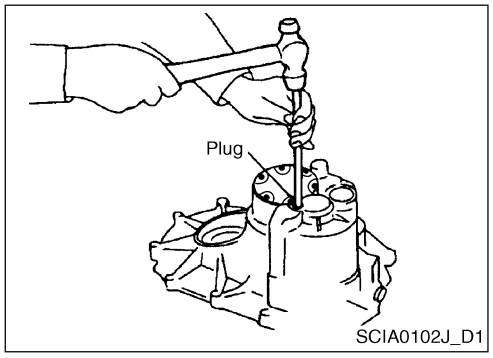
1. Remove the plug from the transmission case.



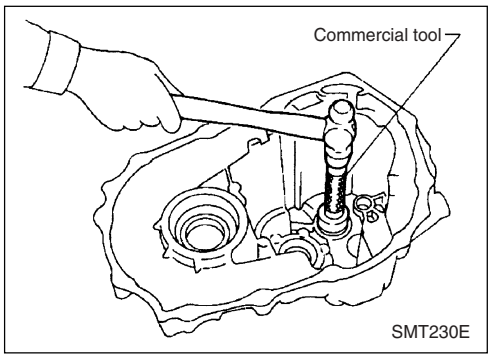
2. Remove the input shaft rear bearing from the plug hole by tapping with a pin punch.



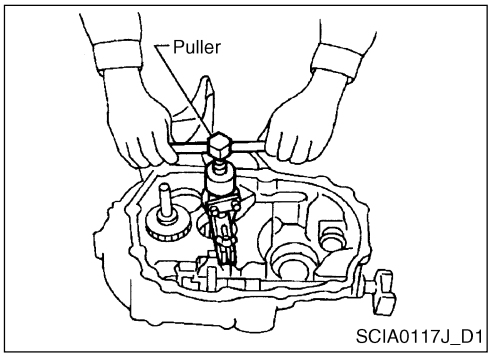
3. Apply the liquid gasket (TB1215) to the plug and install it to the transaxle case.



Case Components (Continued)

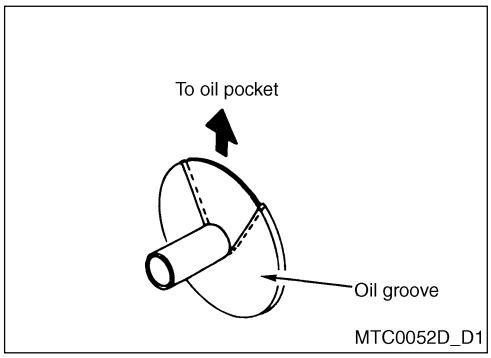


4. Install the input shaft rear bearing.

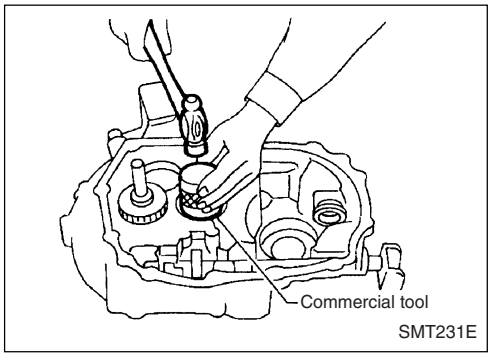


MAIN SHAFT FRONT BEARING OUTER RACE AND OIL CHANNEL

1. Remove the main shaft front bearing outer race using the puller.
2. Disconnect the oil channel.



3. Install the oil channel.
   - Pay attention to the oil channel installation direction.

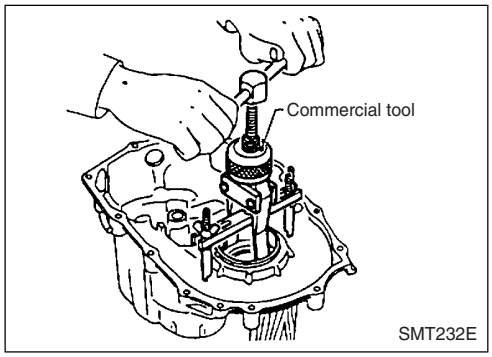


4. Install the main shaft front bearing outer race.
   - Refer to “MAIN SHAFT BEARING FREE LOAD” (MT-36) in “Differential Side Bearing Free Load” for main shaft bearing free load.

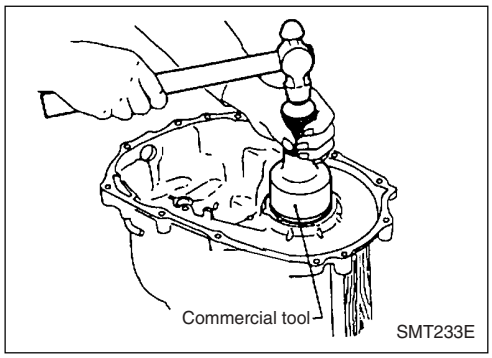
Differential Side Bearing Free Load

If any of the below is replaced, adjust the differential side bearing free load.

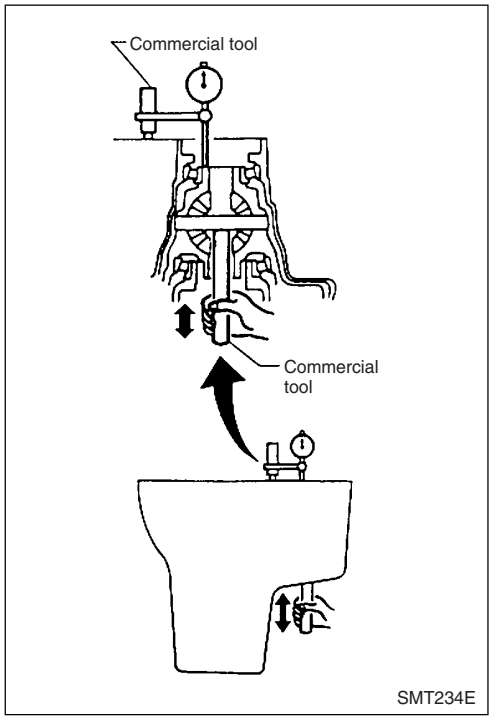
- Differential case
- Differential side bearing
- Clutch housing
- Transmission case



1. Remove the differential side bearing outer race (at the transmission case) and the shim.

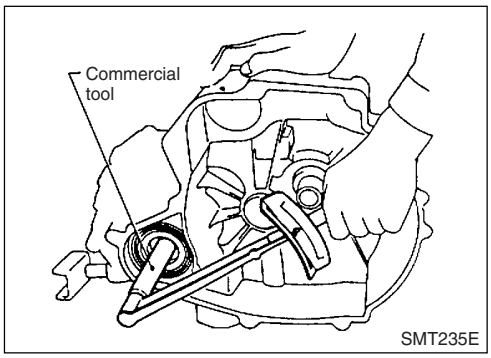


2. Reinstall the shim and differential side bearing outer race.
3. Install the final drive assembly to the clutch housing.
4. Install the transmission case to the clutch housing.
   - Tighten the transmission case mounting bolts to the specified torque.



5. Install the dial gage at the front end of the differential case.
6. Insert the tool to the differential side gear.
7. Read the dial gage changes by moving the tool up and down.
8. Select a proper shim referring the service data.
9. Install the selected shim and the differential side bearing outer race.
10. Measure the differential side bearing turning torque.
    a. Install the final drive assembly to the clutch housing.
    b. Install the transmission case to the clutch housing.
       - Tighten to the specified torque.

Differential Side Bearing Free Load (Continued)



c. Measure the turning torque of final drive assembly.

Turning torque (New bearing):

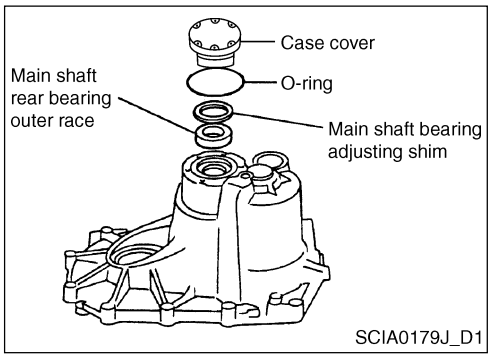
2.0 - 7.8 mm

- If the bearing is reused, then the turning torque value decreases.
- The value fluctuation for each measurement should be under 1.0 N•m (10 kg-cm: 17 - 69 in-lb).

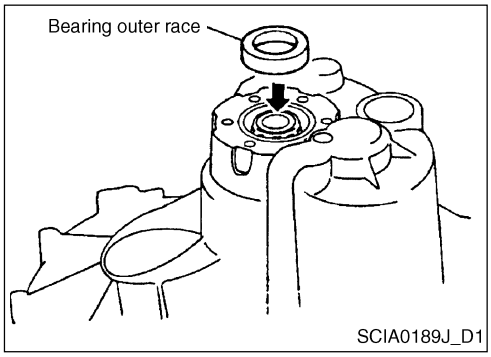
MAIN SHAFT BEARING FREE LOAD

If any of the below is replaced, adjust the main shaft bearing free load.

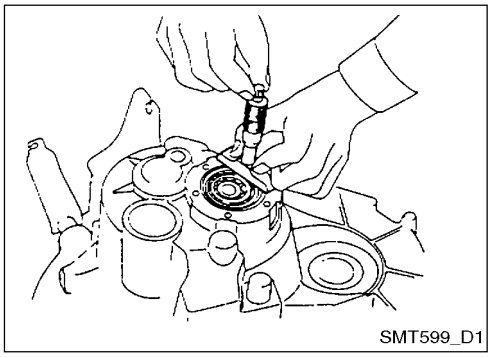
- Main shaft
- Main shaft bearing
- Clutch housing
- Transmission case



1. Remove the case cover, O-ring, spacer, main shaft bearing adjusting shim and main shaft rear bearing outer race from the transmission case.
2. Install the main shaft assembly to the clutch housing.
3. Install the transmission case to the clutch housing.
   - Tighten the transmission case mounting bolts to the specified torque.



4. Install the main shaft rear bearing outer race to the inner race.



5. Measure the clearance between the transmission case and bearing outer race.
   - Be sure to securely seat the bearing.
6. Select a proper shim referring the service data.

   Shim thickness = Measured value - 12.5 mm + Main bearing free load standard value 0.2 ~ 0.25 mm
7. Measure the overall turning torque.
   - **Overall turning torque (New bearing):**

     3.9 - 13.7 N•m (40 - 140 kgf-cm 35 - 122 in-lb)

     Refer to “Assembly” (MT-21).

General Specifications

Transaxle

Engine			QG15DE	QG16DE
Transaxle model			RS5F30A	
Number of gears			5	
Synchromesh type			key type	
Gear Ratio	1st		3.333	
	2nd		1.782	1.955
	3rd		1.207	1.286
	4th		0.902	0.926
	5th		0.756	
	Reverse		3.417	3.214
Number of teeth	Input gear	1st	15	
		2nd	23	22
		3rd	29	28
		4th	41	
		5th	45	
		Reverse	12	14
	Main gear	1st	50	
		2nd	41	43
		3rd	35	36
		4th	37	38
		5th	34	
		Reverse	41	45
	Reverse idler gear		30	37
Oil capacity			2.9 L (2.8 L ~ 3.0 L)	
Oil level			-58 ~ -66 mm from the speedometer hole	

Final Gear

Engine		QG15DE
Gear ratio		4.167
Number of teeth	Differential gear / Main shaft	75 / 18
	Side gear / Pinion mate	14 / 10

Service Data

Endplay

Item	Standard Value (mm)
1st gear	0.18 - 0.31
2nd gear	0.20 - 0.30
3rd gear	0.20 - 0.30
4th gear	0.20 - 0.30
5th gear	0.18 - 0.31
Input shaft front	0 - 0.1
Input shaft rear	0 - 0.1
Input shaft 5th synchronizer	0 - 0.1
Main shaft	0 - 0.1
Differential side gear	0.1 - 0.2

Snap Ring and C-Ring

Selecting Position	Thickness (mm)
Input shaft front	1.27 1.33 1.39 1.45
Input shaft rear	1.27 1.33 1.39 1.45
Input shaft 5th synchronizer	2.00 2.05 2.10 2.15 2.20 2.25 2.30
Main shaft	3.63 3.70 3.77 3.84 3.91 3.98 4.05 4.12 4.19 4.26 4.33 4.40 4.47 4.54

Thrust Washer

Selecting Position	Thickness (mm)	Part No.
Differential side gear	0.76 - 0.81	38424 01M10
	0.81 - 0.86	38424 01M11
	0.86 - 0.91	38424 01M12
	0.91 - 0.96	38424 01M13

Adjusting Shim

Selecting Position	Thickness (mm)
Main shaft bearing	0.10 0.15 0.20 0.25 0.30 0.35 0.40 0.45 0.50 0.55 0.60 0.65 0.70 0.75 0.80 0.85 0.90 0.95 1.00
Differential side bearing	0.44 0.48 0.56 0.60 0.64 0.68 0.72 0.76 0.80 0.84 0.88

Free Load

Item	Standard Value (mm)
Main shaft bearing	0.20 - 0.25
Differential side bearing	0.24 - 0.32

Reverse Check Tension

Item	Standard Value N•m (kgf • m)
Reverse checker	5.0 - 7.3 (0.50 - 0.75)

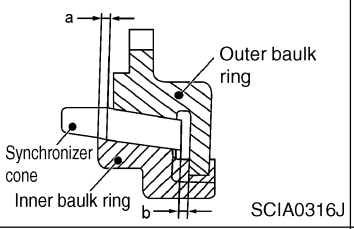
Reverse Check Plug

Item	Length (mm)	Part No.
Plug length of the reverse check plug	7.1	32188 M8002
	7.7	32188 M8003
	8.3	32188 M8001
	8.9	32188 M8004

Shift Fork

Item		Limit Value (mm)	New (mm)
End width of the shift fork	1st~2nd gear	10.3 [10.5]	10.8 - 11.0
	3rd~4th gear	5.3 [5.5]	5.8 - 6.0
	5th gear	5.3 [5.5]	5.8 - 6.0

Baulk Ring Clearance

Measuring Location	Standard Value (mm)	Limit Value (mm)
1st & 2nd inner baulk ring clearance a	0.7 - 0.9	Less than 0.2
Outer baulk ring clearance b	0.7 - 1.0	Less than 0.2
		
3rd, 4th, 5th	1.0 - 1.35	0.7

Tightening Torque

Unit: N•m (kgf - m)

Transaxle-Engine mounting torque	From transaxle towards engine	31 - 40 (3.1 - 4.1)
	From engine towards transaxle	16 - 20 (1.6 - 2.1)
		31 - 40 (3.1 - 4.1)

REAR AXLE AND REAR SUSPENSION

SECTION **RA**

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Precaution

Caution (Rear Axle)

Observe following cautions while disassembling the drive shaft.

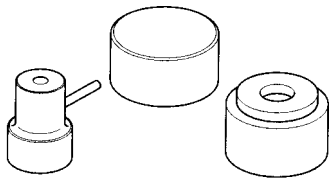
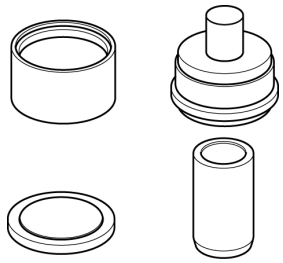
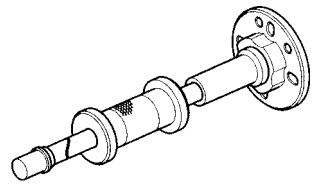
- Do not disassemble the connecting sections towards wheel.
- Operate in a clean location.
- Clean the components before disassembling.
- Keep the operation location clean to prevent dirtying the components or inlet of foreign particles.
- Install the disassembled components in correct order. Cover the components when stopping the operation.
- Use a paper towel for cleaning. The cloth towel can cause problems due to waste threads. Do not use it.
- Clean the disassembled components (except for the rubber components) with white kerosene and wipe the oil using the compressed air or paper towel.

Caution (Rear Suspension)

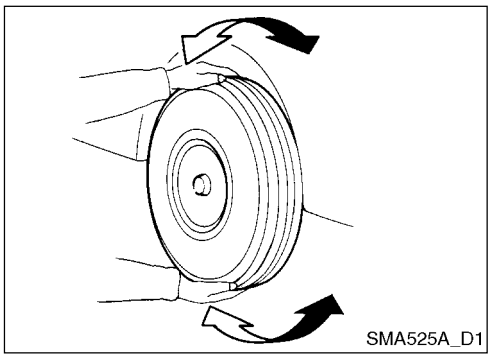
- Bushes should be installed completely while vehicle empty and on the ground. Wipe out all oil that can deteriorate the durability of bushes.
- An empty vehicle means it has all the necessary fluids that allow being ready for driving such as full tank of fuel, coolant and all lubricants. However, jack and other service tools are excluded.
- Always inspect the wheel alignment after suspension system service.
- The lock nut cannot be reused. Replace it with new when installing. Oil is applied on it when new, but install as it is.

Preparation

Special Service Tools

Item	Description	
ABS sensor rotor drift set KV38100500 KV40101840 Rear ABS sensor rotor drift KV10105501	 ZZA09425D_D1	Assembling front and rear ABS sensor rotor
Wheel hub support KV40104710 KV40106200 KV40105310		Assembling wheel hub Disassembling/assembling wheel hub bearing
Wheel hub puller KV40104100 ST36230000	 ZZA09425D_D1	Disassembling wheel hub

Wheel Hub



On-Vehicle Inspection

Inspect the rear axle for any excessive free play, damage, wear and others.

- Inspect the free play by moving the rear wheel (left and right).

Rear Wheel Bearing

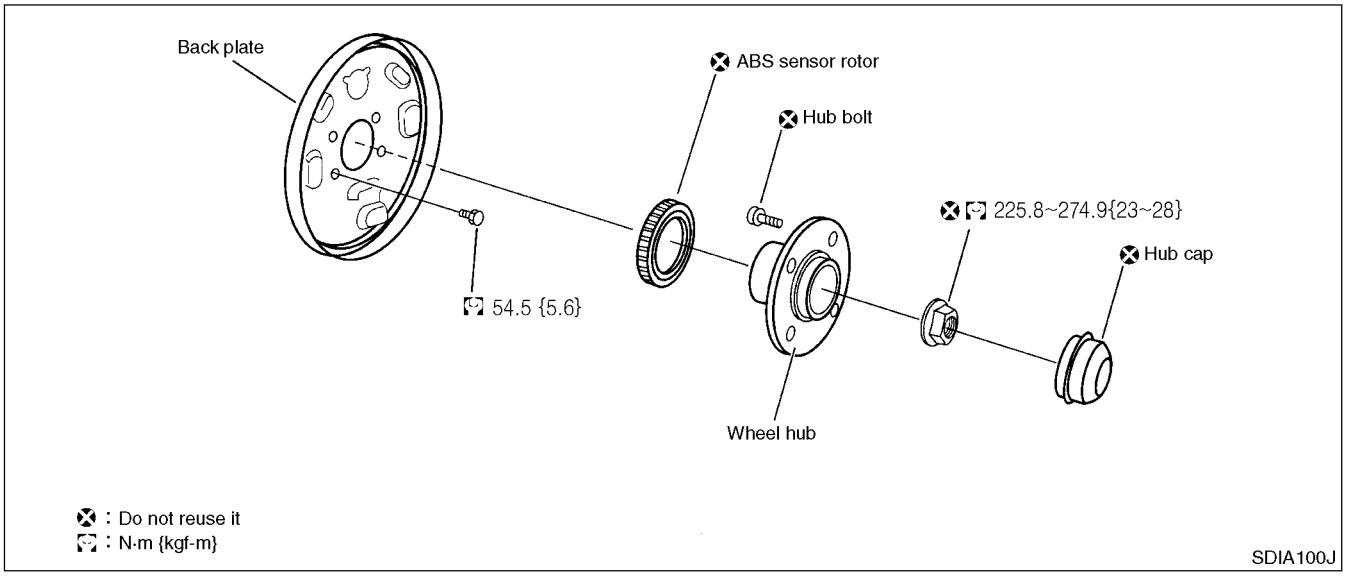
Inspect the following while vehicle lifted up.

- Inspect for any rattles in the front wheel bearing by moving the wheel hub in the axial direction.

  Axial direction endplay: 0.05 mm

- Inspect for any abnormal noises by rotating the wheels. If defective, replace the wheel bearing.
- If defective while inspection, replace the wheel hub.

Removal • Installation

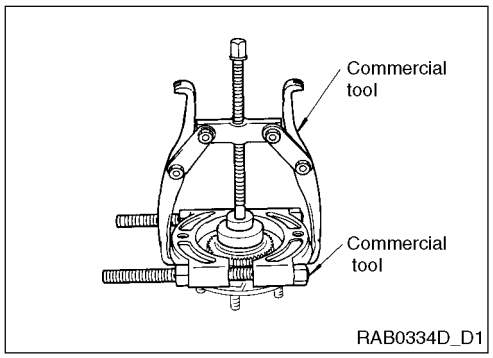


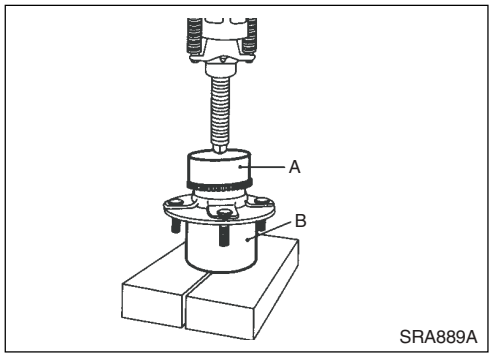
REMOVAL

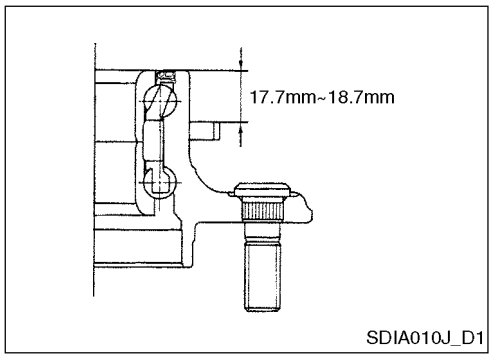
1. Remove the tires and remove the hub cap from the wheel hub using a hub cap pliers (commercial tool).
2. Lift up the lock nut caulking section with a minus (-) screwdriver.
3. Remove the lock nut and remove the wheel hub from the rear spindle.
4. Remove the ABS wheel speed sensor from the rear suspension trailing arm.
5. Remove the parking cable, brake drum, brake shoes and wheel cylinder from the back plate.

CAUTION:

- **Be careful not to stain the brake fluid on the painted surfaces during wheel cylinder removal.**
- **Do not depress the brake pedal while the brake shoes, wheel cylinder and brake drum are removed.**







6. Remove the back plate from the rear suspension beam complete assembly.
7. Remove the ABS sensor rotor from the wheel hub using the puller (commercial tool), drift (KV38100500, KV40101840) and bearing repressor (commercial tool).

INSPECTION AFTER REMOVAL

- Inspect the wheel hub for any deformation, cracks or damages and replace if defective.

INSTALLATION

1. Install the ABS sensor rotor to the wheel hub using a drift (A: KV10105501), (B: KV40104710, KV40106200, KV40105310).

CAUTION:

- **The ABS sensor rotor cannot be reused. Do not reuse.**
- Install the ABS sensor rotor to the illustrated location.

2. Install the back plate to the rear suspension beam complete assembly and tighten the mounting bolts to the specified torque.
3. Install the parking cable, brake shoes and wheel cylinder to the back plate.
4. Install the wheel hub to the rear spindle and tighten the lock nut to the specified torque.

CAUTION:

- **The lock nut cannot be reused. Do not reuse.**

5. Tighten the lock nut.
6. Rotate the wheel hub 10 times in reverse direction at the speed of 60 RPM.
7. Place a spring balance at the hub bolt location and measure the turning torque while rotating 10 ± 2 RPM.

   Turning torque:

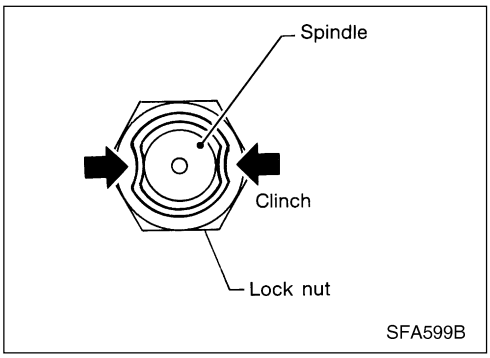
   0.150 - 0.980 N•m (0.015 - 0.100 kgf-m)

   Measured value by spring balance:

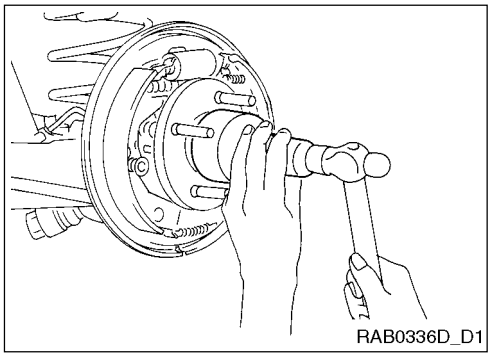
   3.0 - 19 N (0.3 - 2.0 kg)

   - If the value is out of the standard, replace the wheel hub as an assembly.

8. Install the ABS wheel speed sensor to the rear suspension trailing arm and beam complete assembly.



9. Clinch two places of lock nut.



10. Install the hub cap to the wheel hub.

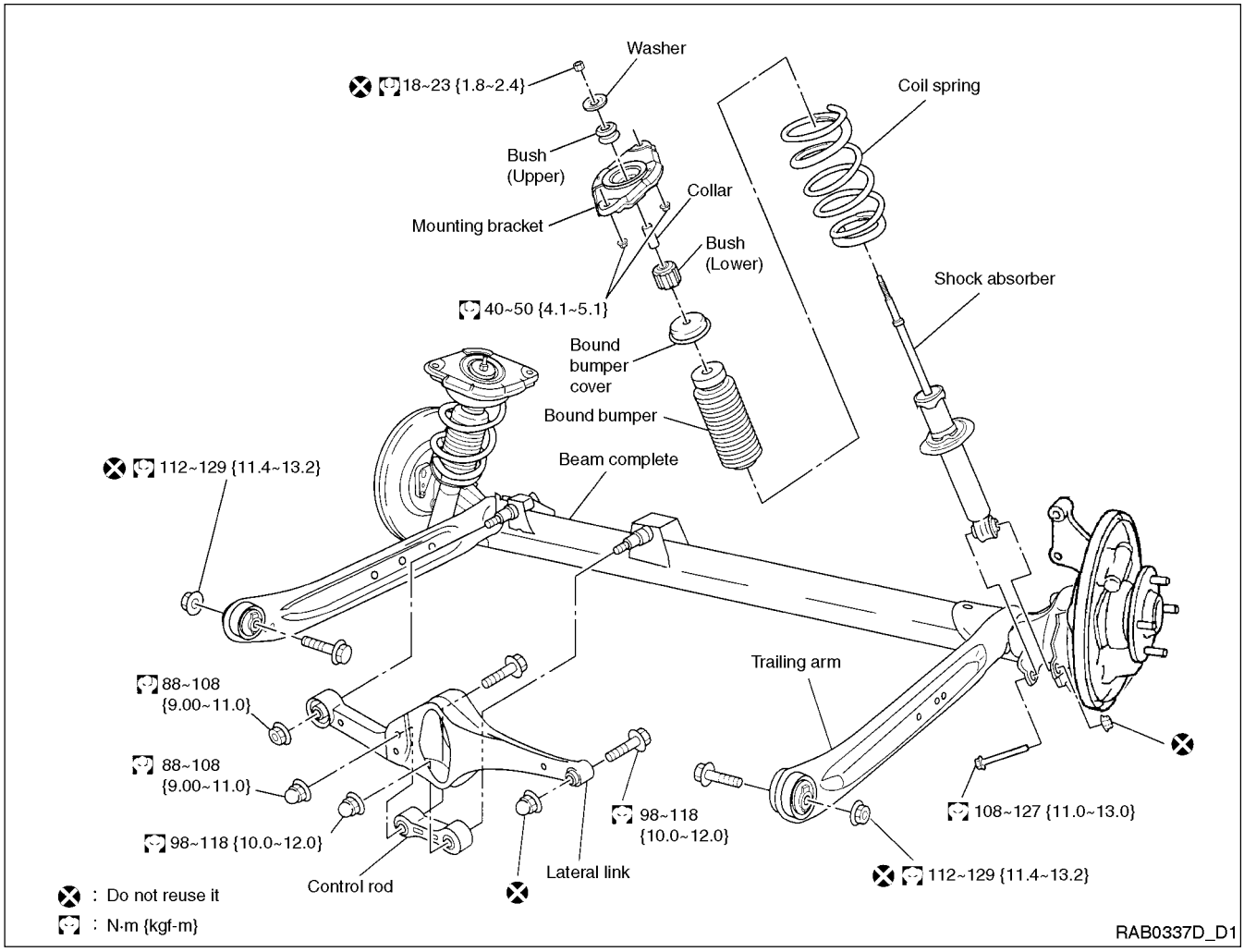
CAUTION:

- **The hub cap cannot be reused. Do not reuse.**

11. Install the brake drum.
12. Perform air bleeding to the brake system.
13. Install the tires.

Rear Suspension

Components Diagram



On-Vehicle Inspection and Service

Inspect for any excessive free play, wear and damages on rear axle and suspension components.

- Inspect for any excessive free play by moving the rear wheels (left and right).
- Tighten all nuts and bolts to the specified torque again.
- Inspect the shock absorber for any oil leakage and damages.

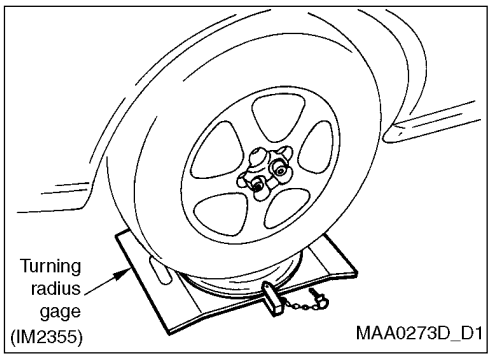
Wheel Alignment

GENERAL

- Perform the wheel alignment while vehicle is empty. An empty vehicle means it has all the necessary fluids that allow being ready for driving such as full tank of fuel, coolant and all lubricants but except for jack and service tools.

Inspection Before Service

1. Inspect the tire inflation pressure and wear.
2. Inspect the rod wheel for any vibration.
3. Inspect the axial direction endplay of the wheel bearing.
4. Inspect the shock absorber operation.
5. Inspect the axle and suspension mountings for any looseness and deformation.
6. Inspect the links and arms for any damages, cracks or deformation.
7. Inspect if the vehicle exterior is normal.

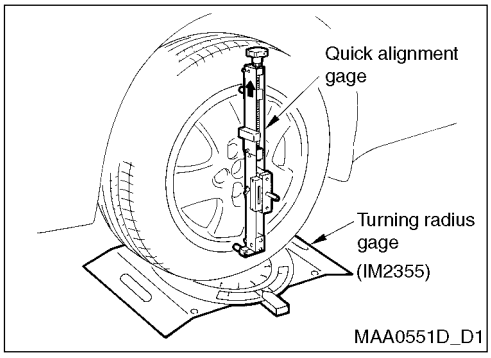


Camber Inspection

CAUTION:

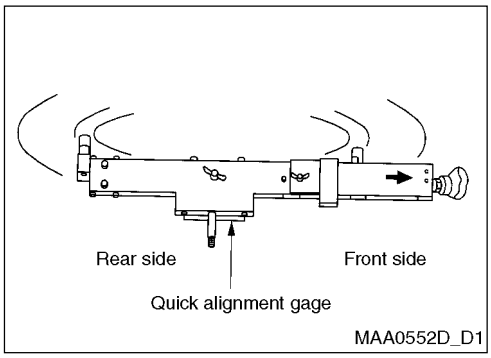
- **The rear alignment inspection can be done with quick alignment gage quickly and accurately.**
- **Refer to the user's manual for detailed instructions of quick alignment gage.**

1. Keep the vehicle leveled by placing the rear wheels on the turning radius gage and the front wheels on the support with the same height with the turning radius gage before installation.
2. Install the quick alignment gage assembly so that the arrow sticker faces upwards and perpendicular with the floor as in the illustration before measurement.



Tow-in Inspection

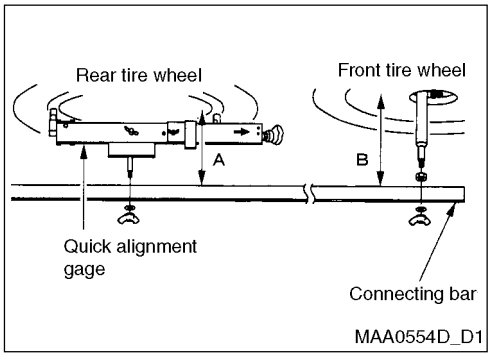
1. Place the quick alignment gage assembly on a flat board and adjust the tow angle measurement meter to 0° using device block.
2. Install the quick alignment gage onto the wheel to be measured so that the arrow sticker faces towards vehicle front.
3. Remove one wheel nut from front wheel which is nearest to the center line and install the hub bolt adaptor.



4. Install the connecting bar to the vehicle.

CAUTION:

- **Adjust the distance A and B by considering tread so that the connecting bar and the vehicle become parallel.**



5. Remove the quick alignment gage assembly from the vehicle and place on the flat board. Then convert the measured value to regular value using the conversion formula.

   Sin [Measured value (decimal method) tire outer diameter (mm)]= Tow-in (mm)

   Example:

   When measured value is 0° 30′ (0.5°) and tire outer diameter is 600 mm

   Sin 0.5 X 600 = 5.2 mm

   Tow-in: In 5 mm - Out 3 mm

Removal • Installation

REMOVAL

1. Remove the tires.
2. Remove the brake related components.
3. Remove the parking brake cable and brake hose from the trailing arm and beam complete assembly.

CAUTION:

- **Do not stain the brake fluid on the painted surface when the brake hose is removed.**
- **Do not depress the brake pedal while brake hose is removed.**

4. Remove the ABS wheel speed sensor from the beam complete and trailing arm.
5. Lift the vehicle up and install the transmission jack at the center of beam complete assembly.

CAUTION:

- **Do not perform removal operation when the shock absorber is under loads.**

6. Remove the mounting bolts under the shock absorber.
7. Remove the lateral link mounting bolts and nuts.
8. Remove the trailing arm mounting bolts and nuts and remove the rear suspension assembly from the vehicle by slowly lowering the transmission jack.

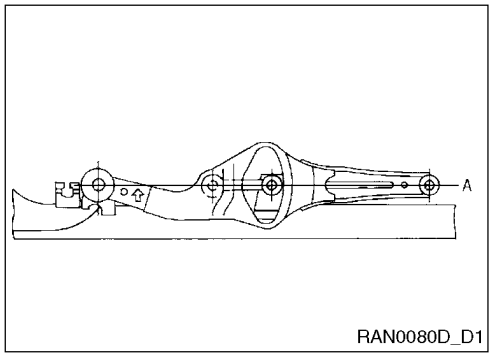
INSTALLATION

- Refer to “Components Diagram” (RA-7) in “Rear Suspension” for tightening torque and other information.

CAUTION:

- **The brake fluid cannot be reused. Do not reuse.**
- Perform the air bleeding to the brake system after installation.

1. Install the control rod to the lateral link.
   - Do not tighten the mounting bolts and nuts completely. Just leave it as inserted.
2. Install the lateral link and control rod to the beam complete assembly.
   - Do not tighten the mounting bolts and nuts completely. Just leave it as inserted.
3. Locate the transmission jack at the center of the beam complete assembly. Jack it up and then install the trailing arm and lateral link to the vehicle.
   - Do not tighten the mounting bolts and nuts completely. Just leave it as inserted.
4. Install the shock absorber to the vehicle and rear suspension assembly.
5. Remove the transmission jack from the beam complete assembly.
6. Tighten all the bolts and nuts while the beam complete assembly and the lateral link (A line) forms parallel as shown in the illustration when vehicle empty and on the ground.



Coil Spring and Shock Absorber

Removal • Installation

REMOVAL

CAUTION:

- **Do not loosen the piston rod lock nut when it is installed on the vehicle.**

1. Remove the tires.
2. After lifting up the vehicle, install the transmission jack at the center of the beam complete assembly.

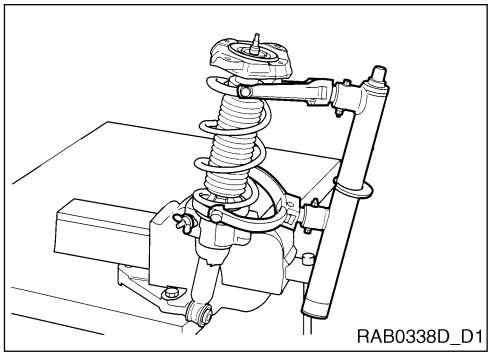
CAUTION:

- **Do not perform removal operation or lifting on the beam section when the shock absorber is under load.**

3. Remove the lower mounting bolts and nuts from the shock absorber.
4. Remove the upper mounting bolts and nuts from the shock absorber and remove the shock absorbers from the vehicle.

INSTALLATION

- Refer to “Components Diagram” (RA-7) in “Rear Suspension” for tightening torque and install in the reverse order of removal.



Disassembly • Assembly

DISASSEMBLY

1. Install the strut attachment (commercial tool) to the shock absorber and secure at the vise.

CAUTION:

- **Cover the lock strut with oil cloth during strut attachment (commercial tool) installation to prevent from damaging.**

2. Loosen the piston rod lock nut gradually.

CAUTION:

- **Do not release the piston rod lock nut completely. If so, the coil spring will bounce out and cause injury.**

3. Compress the coil spring using a spring compressor (commercial tool).

CAUTION:

- **Check if the spring compressor (commercial tool) is securely installed on the coil spring and then perform the coil spring compression.**

4. After finishing the step 3, check if the coil spring is fully released between the upper seat and lower seat and remove the piston rod lock nut.
5. Remove the small components of the shock absorber.
   - Remove the washer, bushing (upper), mounting bracket, collar, bushing (lower) bound bumper cover and bound bumper and then remove the coil spring from the shock absorber.
6. Slowly release the spring compressor (commercial tool) and remove the coil spring.

Inspection after Disassembly

SHOCK ABSORBER

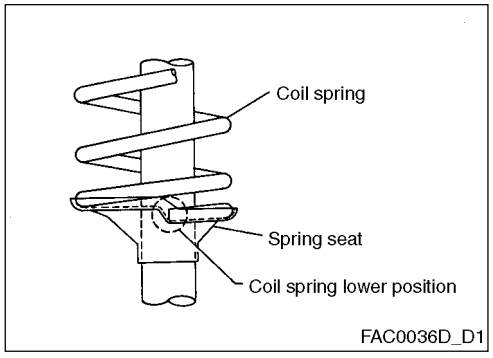
- Inspect the shock absorber for any deformation, cracks or damages and replace if defective.
- Inspect the piston rod for any damages, uneven wear and refraction and replace the shock absorber if defective.
- Inspect the welded sections and sealing sections for any oil leakages and replace if defective.

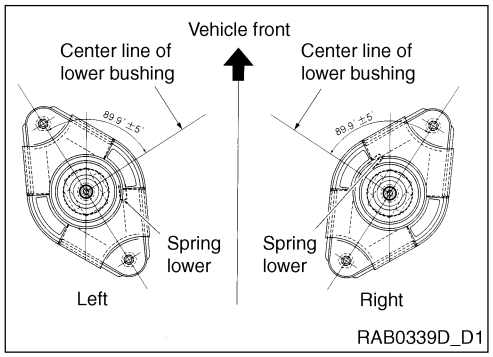
UPPER RUBBER SEAT AND BUSHING

- Inspect the bushing for any cracks and damages and replace if defective.

COIL SPRING

- Inspect for any cracks, wear and damages and replace if defective.





ASSEMBLY

1. Compress the coil spring using the spring compressor (commercial tool) and install it to the shock absorber.

CAUTION:

- **Face the coil spring tube side downwards and adjust the lower section to the spring seat as shown in the illustration.**
- **Check if the spring compressor (commercial tool) is securely installed on the coil spring and then compress the coil spring.**

2. Install the small components of the shock absorber.
   - Install the bound bumper, bound bumper cover, collar, bushing (lower), mounting bracket, bushing (upper) and washer and insert the piston rod lock nut.

CAUTION:

- **The piston rod lock nuts cannot be reused. Do not reuse.**
- **Check if the collar is securely installed.**

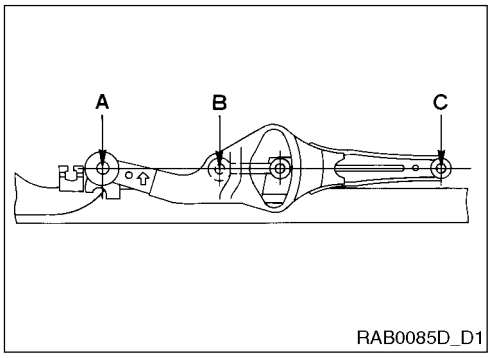
3. Install the mounting bracket as shown in the illustration.
4. Check if the coil spring is securely installed on the mounting bracket and release the spring compressor (commercial tool) slowly.
5. Tighten the piston rod lock nut to the specified torque.
6. Remove the strut attachment (commercial tool) from the strut.

Lateral Link and Control Rod

Removal • Installation

REMOVAL

1. Support the center of the beam complete assembly with a transmission jack. Loosen the mounting bolt from the lateral link and the beam complete, mounting bolt and nut from the lateral link and the vehicle, and the mounting nuts from the control rod and the beam complete. Then remove the lateral link and control rod from the vehicle.
2. Remove the mounting bolts and nuts from the lateral link and control rod and remove the control rod from the lateral link.



Inspection after Removal

LATERAL LINK

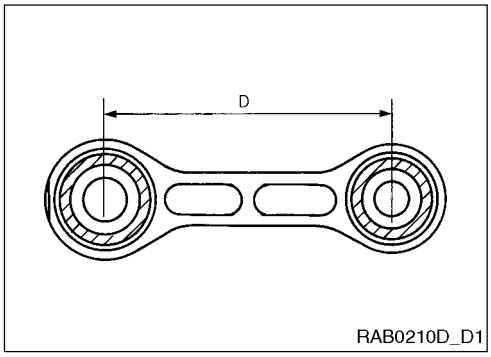
- Inspect the lateral link and bushing for any deformation, cracks and damages and replace if defective.
- Measure the distance AB, BC and AC as shown in the illustration. If much different from the standard value, replace the lateral link assembly.

  Standard value (Distance between the collar and hole center)

  Distance AB: 207.5 ± 0.5 mm

  Distance BC: 394.5 ± 0.5 mm

  Distance AC: 602.0 ± 1.0 mm

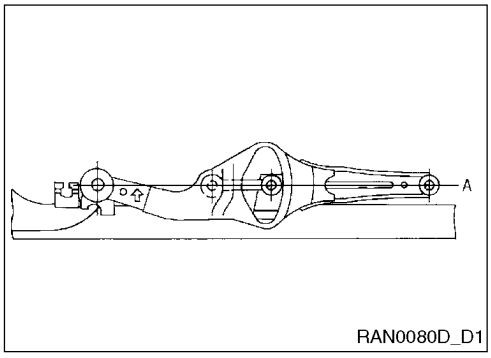


CONTROL ROD

- Inspect the control rod and bushing for any deformation, cracks and damages and replace if defective.
- Measure the distance D as shown in the illustration. If much different from the standard value, replace the control rod assembly.

  Standard value (Distance between the collar centers):

  107.0 ± 1.0 mm



Installation

- Refer to “Components Diagram” for tightening torque and install in the reverse order of removal.
- Tighten the mounting bolts (2 EA) and nuts (4 EA) to the specified torque while the beam complete and the lateral link (A line) is parallel during vehicle empty and on the ground.

Service Data

Wheel Alignment

Engine model	QG16DE
Camber	-1° 00' ± 45'
Tow-in (mm)	In 5 - Out 3

Tightening Torque

N•m (kgf-m)

Piston rod lock nut	18 - 23 (1.8 - 2.4)
Trailing arm - Body	112 - 129 (11.4 - 13.2)
Lateral link - Body	98 - 118 (10.0 - 12.0)
Shock absorber - Beam complete	108 - 127 (11.0 - 13.0)
Shock absorber - Body	40 - 50 (4.1 - 5.1)

SECTION **RS**

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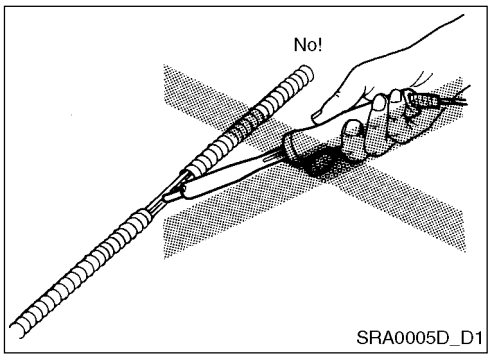
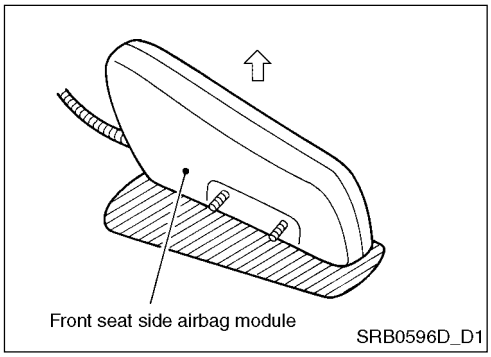
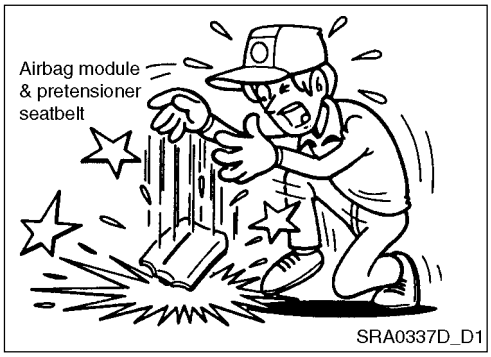
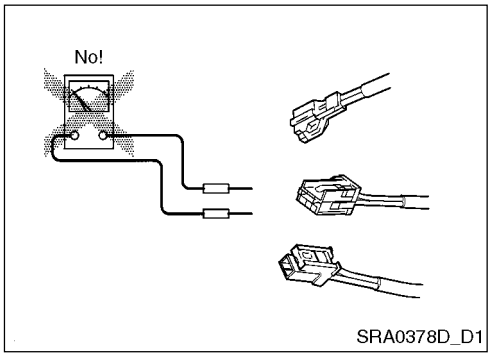








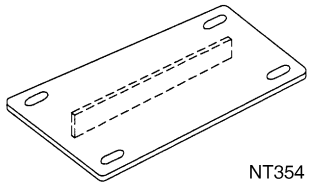
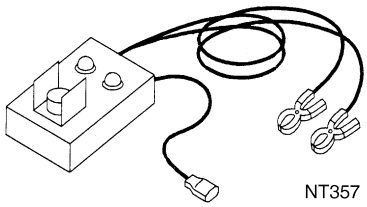
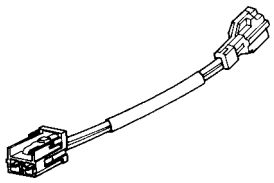
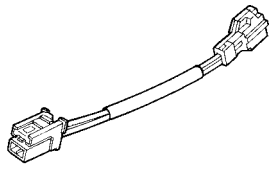
WARNING:

- **To install/remove the SRS airbag, pretensioner seatbelt system related components and harness, turn the ignition switch "OFF", disconnect the battery terminals and wait over 3 minutes. (This is to discharge all the remaining electricity in the airbag sensor unit's auxiliary power circuit.)**
- **Do not use air impact or electrical tools when installing/removing the components.**
- **Do not use any hand-held tools for harness used in SRS airbag and pretensioner seatbelt systems. Be careful with the harness not to tangle with or interfere with other components.**
- **Do not use any electrical test equipments such as circuit tester when inspecting the SRS airbag and pretensioner seatbelt circuit while installed unless the Service Manual instructs to do so. (The weak current in the tester can cause the SRS airbag to operate.)**
- **Do not insert any foreign materials such as a screwdriver in the airbag module and pretensioner seatbelt connector in order to prevent unintended operation due to static electricity.**
- **The harnesses used in SRS airbag and pretensioner are covered with yellow insulation for easy identification.**
- **Refer to "RS Restraint System" in this Service Manual for safe airbag system service information.**

- When storing the airbag module as a component, position the pad surface upwards for the driver's airbag, outer surface upwards for the passenger's airbag and stud bolts downwards by standing for the side airbags. (This is to be prepared for the unintended inflation.)
- Do not store the airbag module in the area where the temperature is over 90°C and pretensioner seatbelt in the area where over 80°C.
- Do not drop or shock the airbag module and pretensioner seatbelt. Replace if shocked.
- Be careful not to stain any oil, grease, solvents or water at airbag module and pretensioner seatbelt.
- Refer to "Airbag Module and Pretensioner Seatbelt Disposal" in "SRS Airbag" for safe disposal (RS-20, 23).
- After replacing or removing/installing the pretensioner seatbelt or after reconnecting the pertensioner seatbelt sensor connector, check for the normal operation of the system using the airbag warning light. Refer to "Trouble Diagnosis" (RS-31).
- Do not reuse the buckle and seatbelt assembly if the pretensioner seatbelt has operated.
- Replace the seatbelt assembly when the waving is cut, loose or damaged.
- When replacing the seatbelt assembly, use NISSAN genuine components.
- Do not use any electrical test equipments such as circuit tester when inspecting the airbag sensor unit, airbag module, pretensioner seatbelt, related harness or components while on-vehicle service. (The weak current in the tester can cause the SRS airbag to operate.)
- Do not insert any foreign materials such as a screwdriver in the airbag module and pretensioner seatbelt connector (to prevent unintended operation due to static electricity).
- Check the system by using airbag warning light or CONSULT-II. Do not use any electrical testers such as circuit tester.

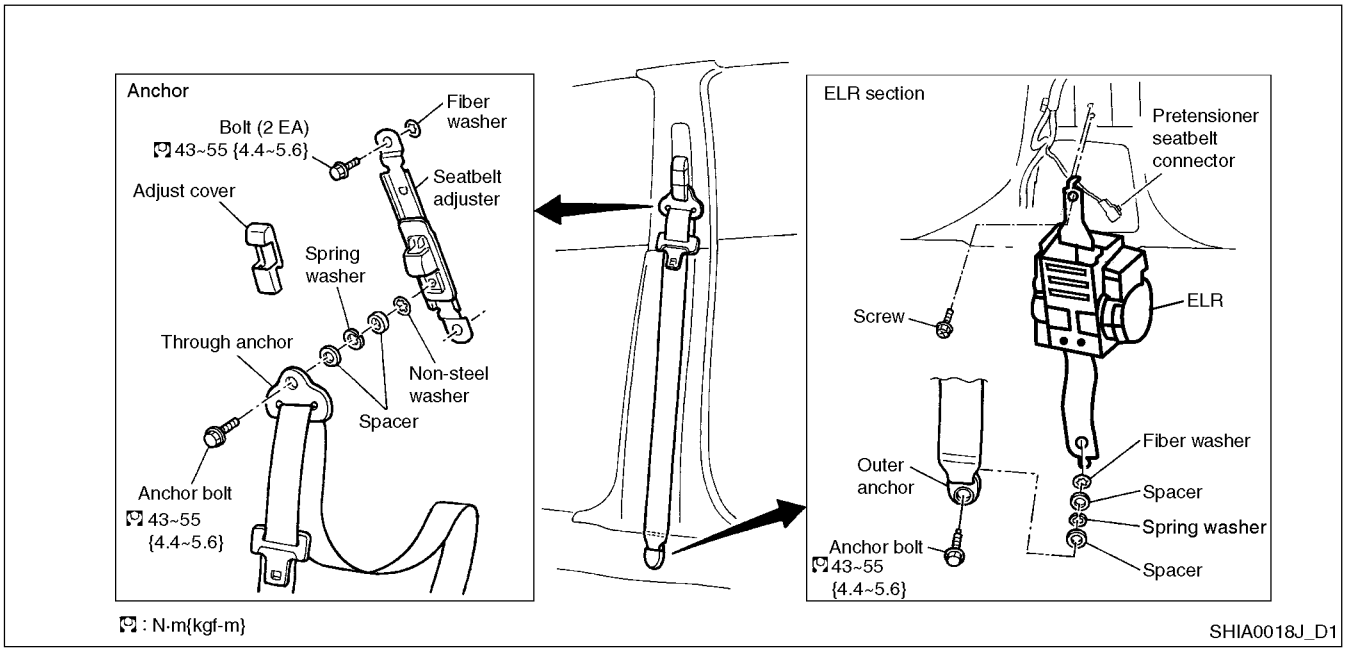
Preparation

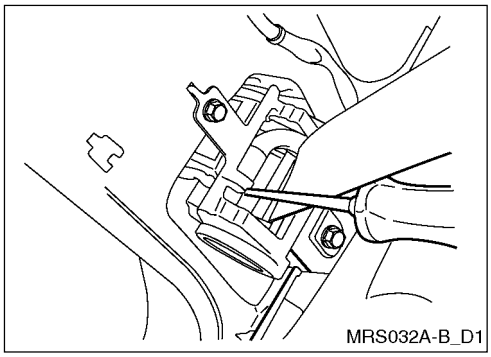
Special Service Tools

Item	Description	
KV99105300 Air bag module bracket	 NT354	Fixing the airbag module
KV99106400 Deployment tool	 NT357	Deploying the airbag module
KV99108300 Deployment tool adapter for passenger or built-in type side air bag module	 ZZA116D_D1	Connecting deployment tool with passenger airbag module
KV99109000 Deployment tool adapter for built-in type side air bag module	 ZZA1190D_D1	Connecting deployment tool with side airbag module

Removal • Installation of Front Seatbelt

ANCHOR AND ELR SECTIONS





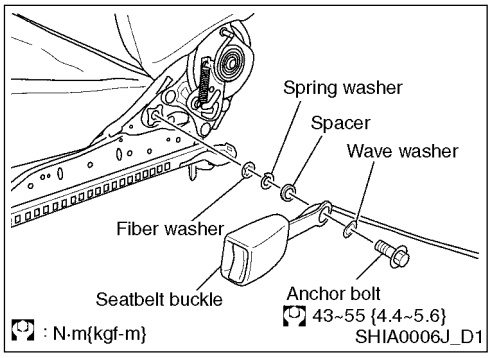
(Preceding work)

- Remove the upper and lower cover of the center pillar.

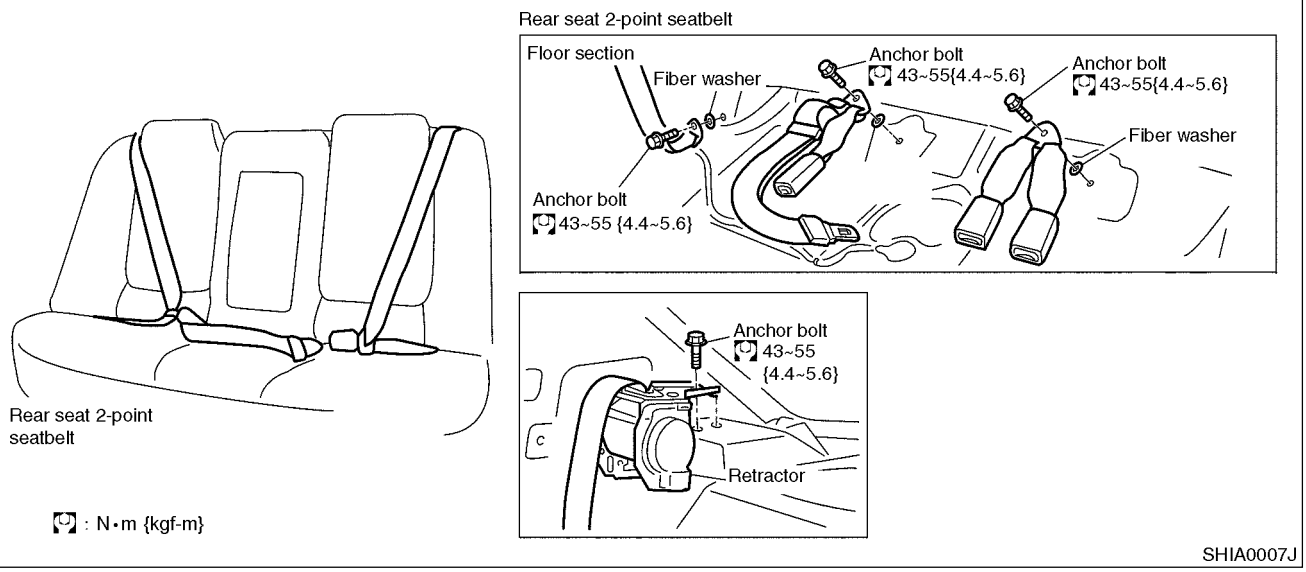
(Service Point) Pretensioner seatbelt connector

- Remove the pretensioner seatbelt connector by inserting a minus (-) screwdriver wrapped by insulation tape into the connection and lifting it up.
- Push in the connector to install the connector.

BUCKLE SECTION



Removal • Installation of Rear Seatbelt



(Preceding work)

- Removal of the rear seat.
- Removal/installation of the rear pillar finisher and self finisher.

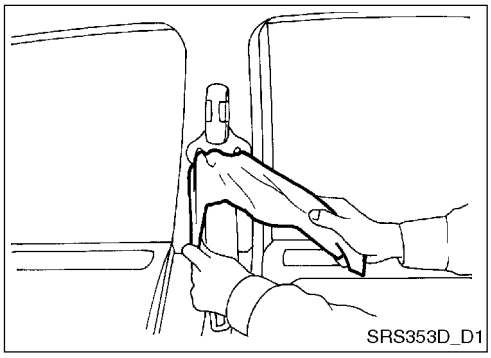
Inspection

INSPECTION AFTER COLLISION

Inspect all seatbelt assembly components including the retractor after a collision. Also inspect for any damages or deformation in the seatbelt mounting sections. If the components are damaged or does not operate normally after the collision, they must be replaced. If not properly replaced, there could be severe injuries under accident.

For the following cases, replace the seatbelt.

- When the seatbelt is damaged.
- When the seatbelt mounting section is damaged. (Check for damages or deformation before installation of a new seatbelt.)
- When the airbag is inflated.
- If not operate normally.



PRELIMINARY INSPECTION

1. Check the normal operation with the seatbelt reminder light.
   - When the key switch is turned to ON without wearing the seatbelt, seatbelt reminder light comes on and then goes out if fastened.
2. Inspect that the anchor bolt of the seatbelt retractor and buckle are securely tightened.
3. Inspect that the seatbelt shoulder anchor pivots smoothly or the seatbelt height adjuster moves and fits in properly.
4. Retractor operation
   a. Fully pull out the belt and inspect for any twists, cuts or any other damages.
   b. Release the belt while checking smooth rewinding into the retractor. If not, clean the upper section of the anchor with cloth because dust may have caused the trouble.
   c. Fasten the seatbelt. Check if the seatbelt clicks into the buckle.
   d. Unfasten the seatbelt. Check if the belt and tongue return to their original positions.
5. Perform the above steps for other seatbelt(s) if necessary.

On-Vehicle Inspection of the Retractor

ELR AND ALR

- ELR is a device that prevents the belt release under emergency cases such as hard braking by locking the retractor.

ELR STATIC INSPECTION

1. Pull out the belt quickly and check if the belt retractor locks.
2. When belt is fully rewound, ALR mode should be cancelled.

ELR DYNAMIC INSPECTION

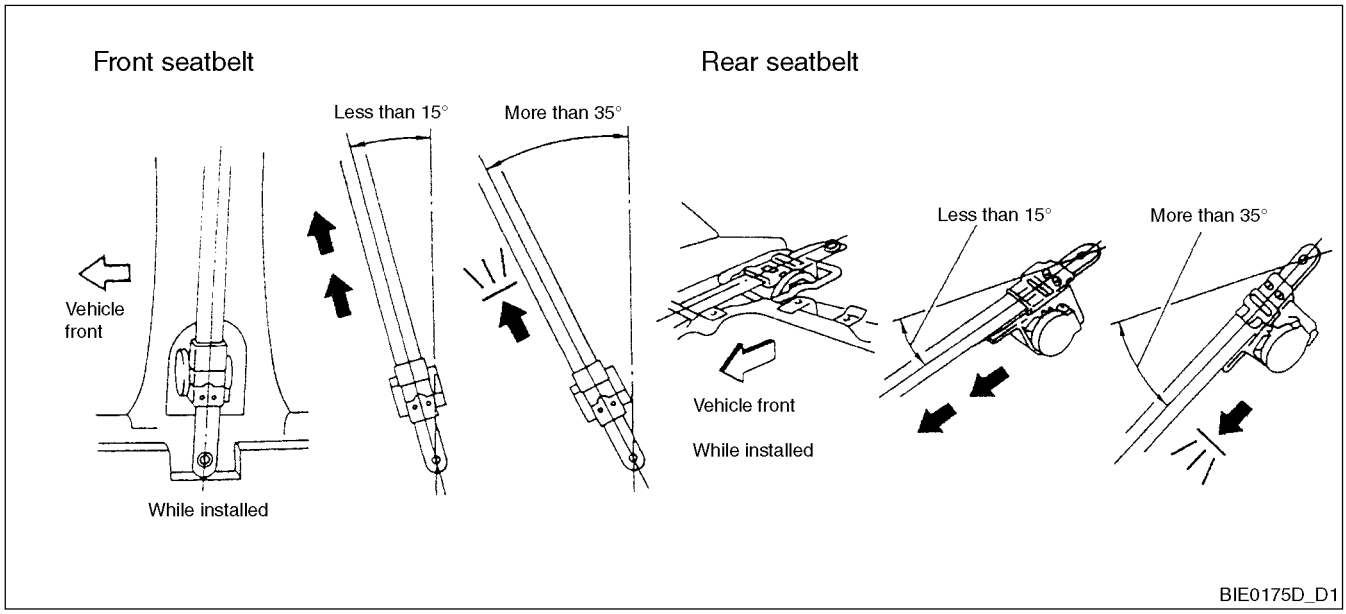
WARNING:

- **Perform the tests in a safe place where no obstacles and other vehicles.**
- **Perform the tests in a dry and paved road. Never do it on a wet, unpaved, driveways or highways. (Danger of traffic accident and body injury!)**
- **The driver and passenger must be prepared for the case that retractor doesn't lock.**

1. Fasten the driver's and passenger's seatbelts.
2. Drive at 16 km/h.
3. Let the passenger be warned of sudden stops and then fully depress the brake pedal while prepared for the case that retractors do not work.
4. The belt should not be released any more by locking the retractor when stopped. If unlocked, inspect the retractor.

Seatbelt Retractor Inspection

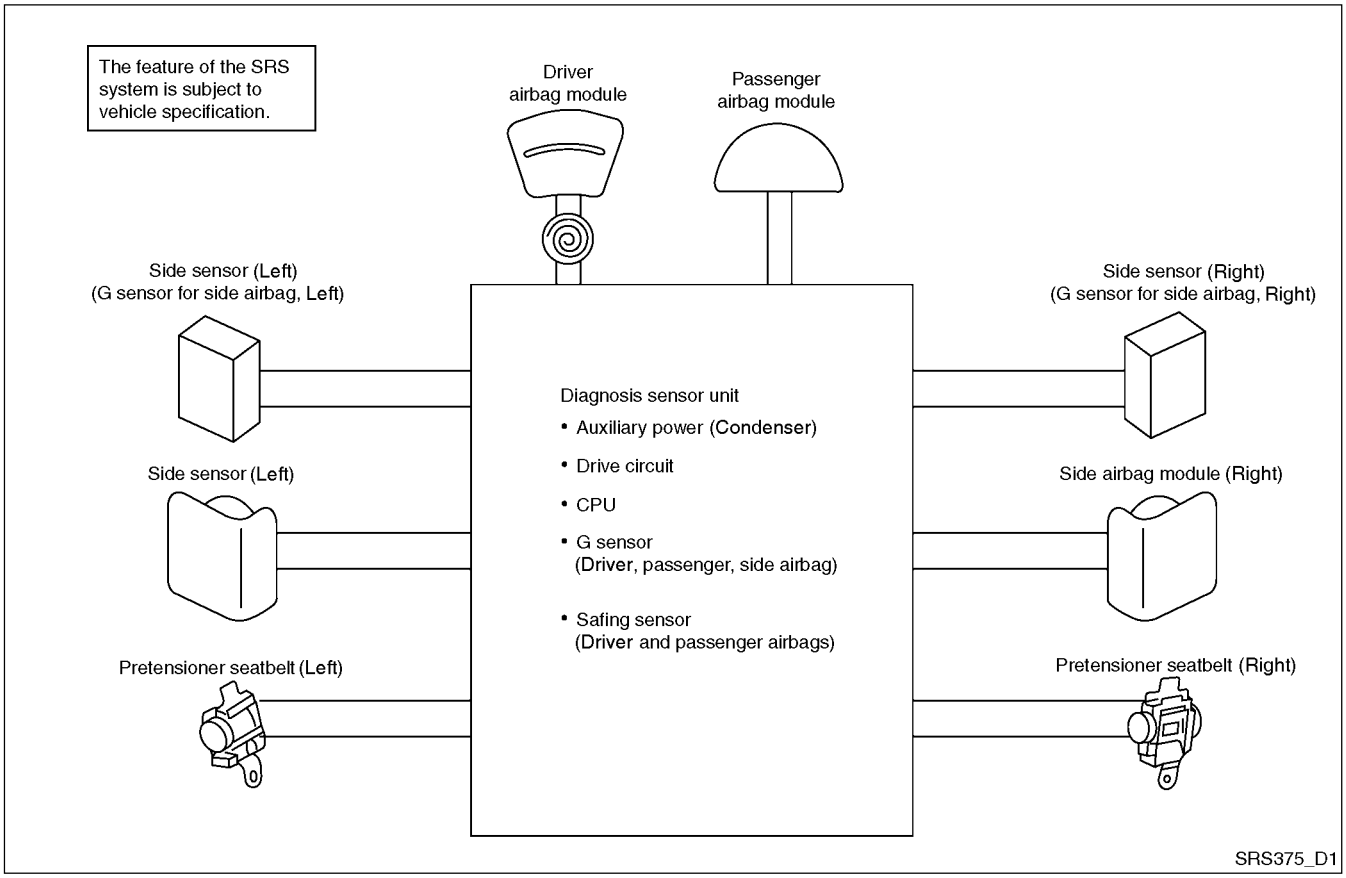
1. Remove the seatbelt retractor.
2. Pull out the seatbelt slowly by tilting the seatbelt retractor as shown in the illustration.
   When tilted less than 15°: Can pull out the belt
   When tilted more than 35°: Cannot pull out belt



If not work properly, replace the seatbelt assembly.

General

The airbag deploys when the diagnosis sensor unit determines as collision when the ignition switch is in ON or START.



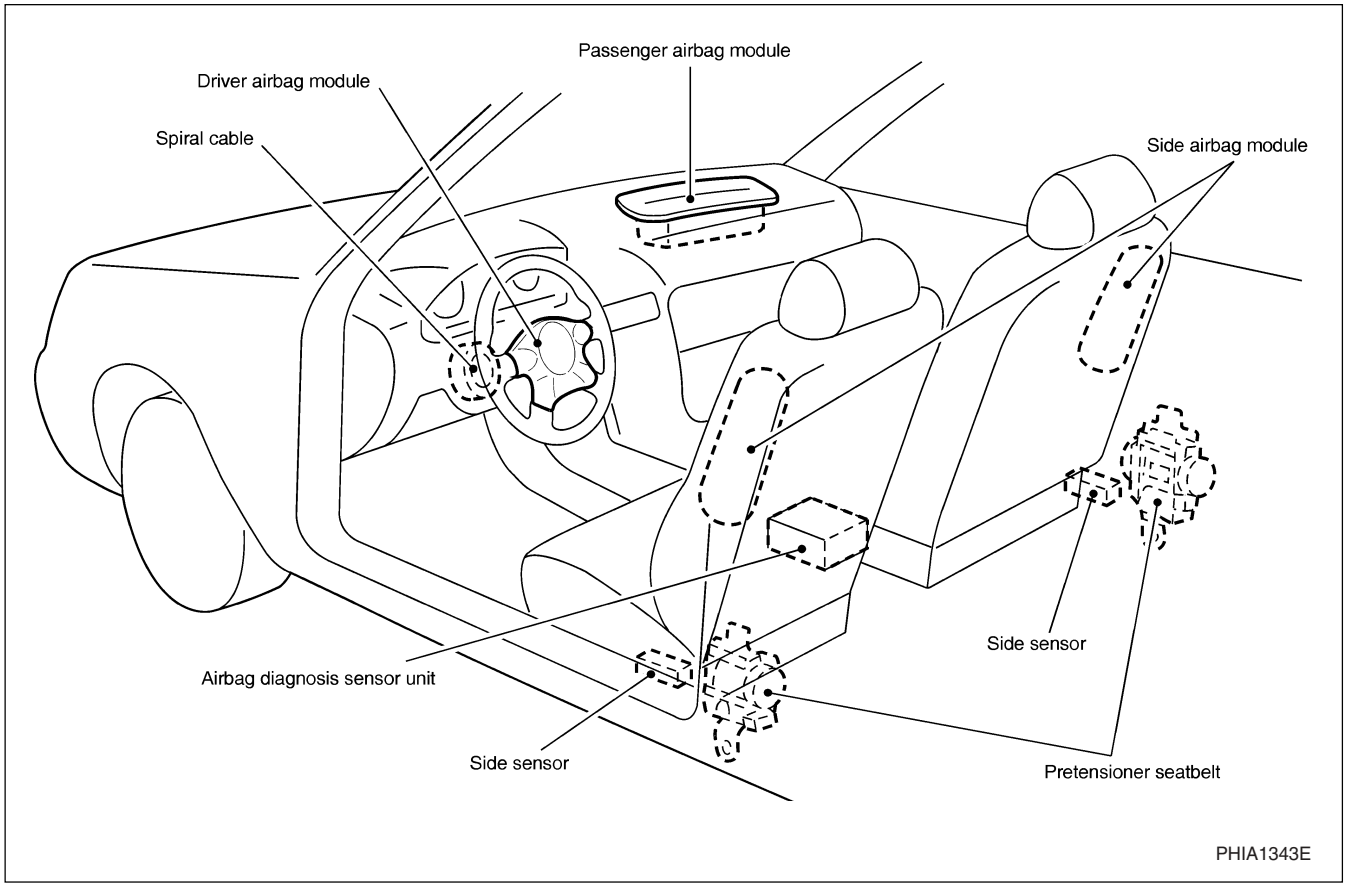
The collision mode for SRS activation varies slightly depending on SRS systems.

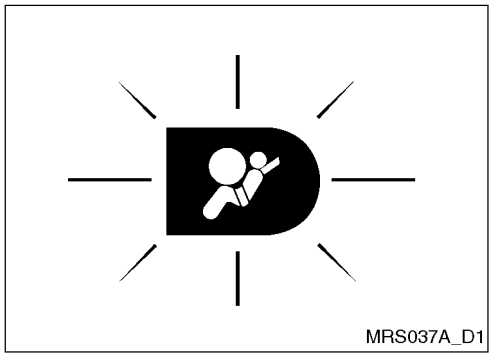
For example, the driver and passenger airbags deploy only under head-on collision and do not work for side impacts.

The SRS reaction for collision is as chart below.

SRS type	Front collision	Left side collision	Right side collision
Driver airbag module	O	-	-
Passenger airbag module	O	-	-
Side airbag module (Left)	-	O	-
Side airbag module (Right)	-	-	O
Pretensioner seatbelt	O		

SRS Components Locations





Inspection Items

1. Check the airbag warning light operation. The airbag warning light comes on when the ignition switch is turned to ON.
   The warning light goes out after 3 seconds if the airbag system is normal. However, if the airbag warning light works as below, inspect the airbag system immediately (Refer to RS-33 for details).
   - The warning light does not come on when the ignition switch is turned to ON.
   - The warning light does not go out after 3 seconds after coming on.
   - The warning light goes out after 3 seconds after coming on but comes on again.
   - The warning light comes on while driving.

2. Visually inspect the SRS components.
   (1) Diagnosis Sensor Unit
   - Check the diagnosis sensor unit and bracket for damage, cracks or deformations.
   - Check the connector for damage and terminal for deformation.

(2) Airbag Module and Steering Wheel

- Remove the airbag module from the instrument panel and inspect for any damages in harness cover and connector and any deformation or hardenings in the terminals.
- Install the driver airbag module in the steering wheel and inspect for firm seating and alignment with the steering wheel.
- Inspect for whether there are excessive gap with steering wheel.
- Install the passenger airbag module in the instrument panel and inspect for firm seating and alignment with the instrument penal.
- Install the side airbags in the seatbacks and inspect for firm seating and alignment with the seats.

(3) Spiral Cable

- Inspect for any damage, cracks or deformation at the spiral cable.
- Inspect for any damages in the connector and insulation tape.
- Inspect the steering wheel for noise, hardening and hard steering.

(4) Main Harness and Airbag Harness

- Inspect the connector for firm connection and damage and terminals for deformation.
- Inspect for any hardening, peel or open circuit in the harness.

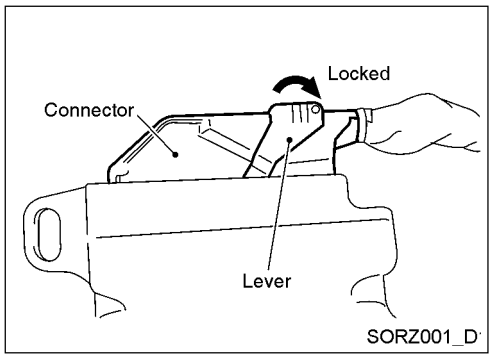
CAUTION:

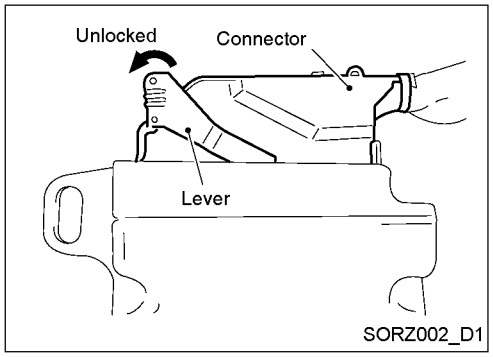
- **Be sure to replace the special bolt and ground bolt with new.**

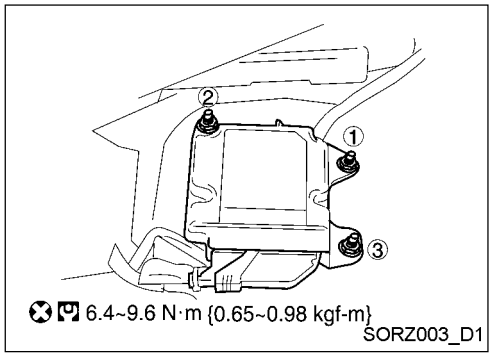
Removal • Installation - Diagnosis Sensor Unit and Side Sensor

CAUTION:

- **Before performing any SRS service, turn the ignition OFF, disconnect both battery terminals and then wait for more than 3 minutes.**
- **The special nut is coated with the bonding agent and the ground nut is also specially treated. Always replace them with new if removed.**
- **Inspect if the diagnosis sensor unit and the side sensor are correctly installed.**
- **Inspect the diagnosis sensor unit and the side sensor for any deformation, cracks, holes, or rust. If the damage can be identified visually, replace the damaged component with new.**
- **Inspect the diagnosis sensor unit and side sensor brackets for any deformation or rust.**
- **After replacing the diagnosis sensor unit and side sensor, perform "SELF-DIAG RESULTS" with CONSULT-II.**
- **Never disassemble the diagnosis sensor unit and the side sensor.**
- **When the diagnosis sensor unit is dropped or shocked, replace the unit.**







Removal of Diagnosis Sensor Unit

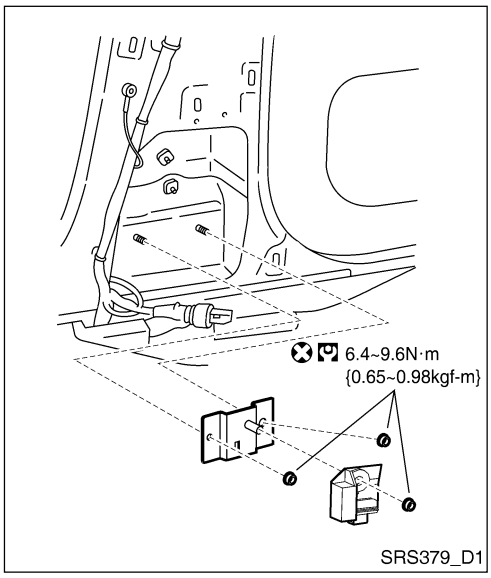
1. Disconnect the driver, passenger and side airbag module connectors.
2. Remove the console box. Refer to "INSTRUMENT ASSEMBLY" (BT-40).
3. Disconnect the diagnosis sensor unit connector. Flip the lock lever towards arrow direction.
4. Remove the diagnosis sensor unit after removing the special nut.

CAUTION:

- **Installation is in the reverse order of removal. However, tighten the diagnosis sensor unit as below.**

① → ② → ③ → ①

①	→	②	→	③	→	①
Temporary tightening		Complete tightening		Complete tightening		Complete tightening



Removal of Side Sensor

1. Remove the seatbelt retractor. Refer to “Front Seatbelt” (RS-4).
2. Disconnect the side sensor connector.
3. Remove the bolts and nuts from the side sensor unit and then remove the side sensor.

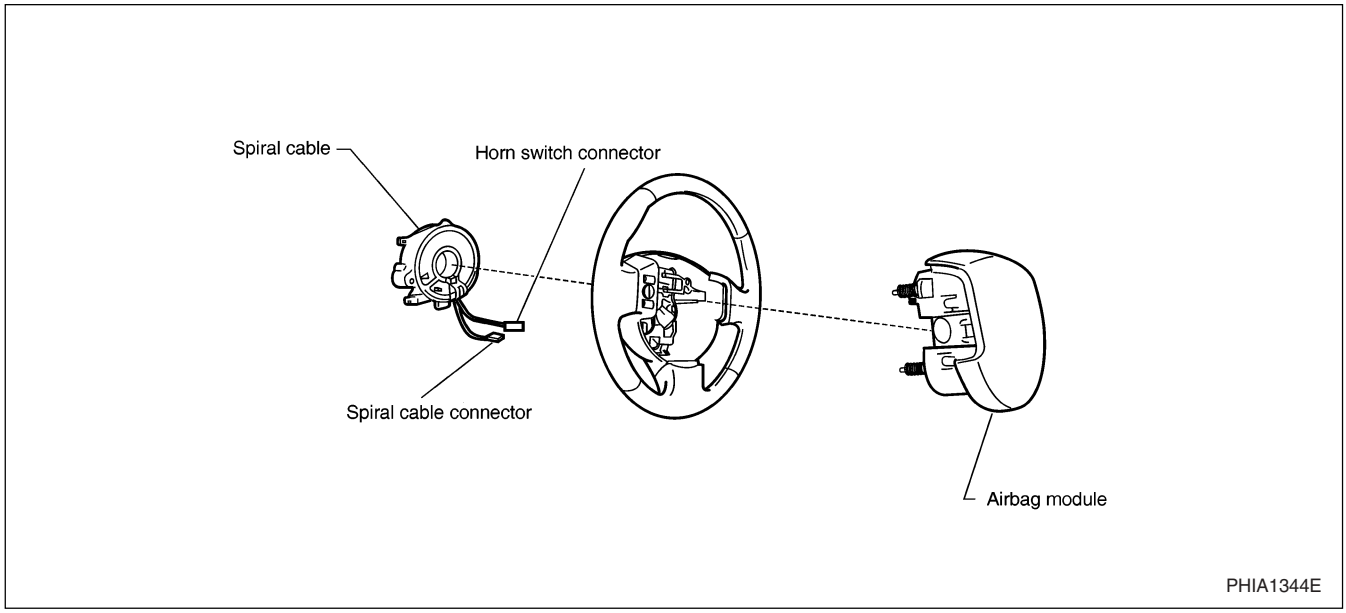
Installation of Side Sensor

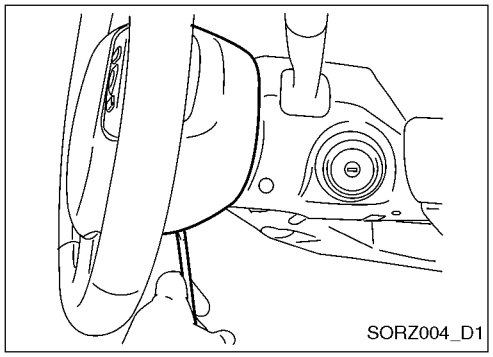
1. Position the side sensor bracket onto the vehicle.
2. Tighten the bracket mounting nuts.
3. Insert the side sensor protrusion into the bracket guide hole.
4. Tighten the side sensor mounting nuts.

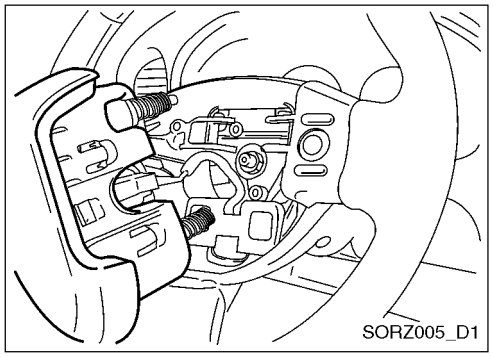
CAUTION:

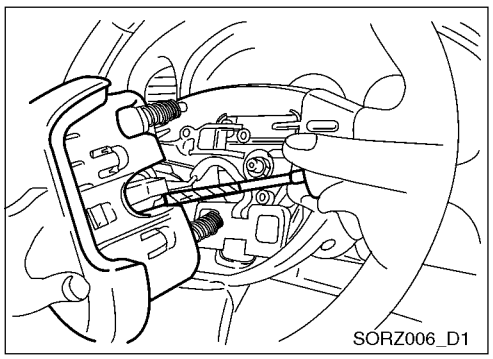
- **Specially designed nuts are used for bracket and side sensor to prevent from loosening. Always replace them with new if removed.**

Removal • Installation - Airbag Module and Spiral Cable









Removal - Airbag Module and Spiral Cable

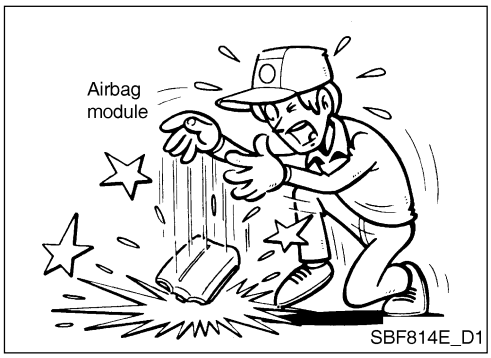
CAUTION:

- **Before performing any SRS service, turn the ignition OFF, disconnect both battery terminals and then wait for more than 3 minutes.**
- **Always work sideways from the airbag module.**

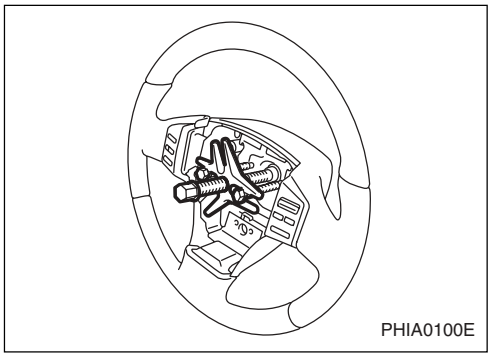
1. Remove the airbag module by inserting a flat-bladed (-) screwdriver inside the steering wheel lower hole and pushing the airbag module fixing spring up.
2. Remove the airbag module connector as shown in the illustration by wrapping the screwdriver with insulation tape.

CAUTION:

- **Always store the airbag module so that its pad faces upwards.**
- **Never disassembly the airbag module.**



- **Do not drop or shock the airbag module. Replace the module if deformed or cracked.**
- **Do not store the airbag module to where the temperature is over 90°C.**
- **Be careful not to stain the airbag module with oil, grease or water.**



3. While the steering wheel is in neutral, disconnect the horn connector and remove the nuts.
4. Remove the steering wheel using a steering wheel puller. Do not over-tighten the puller bolt in the steering wheel.

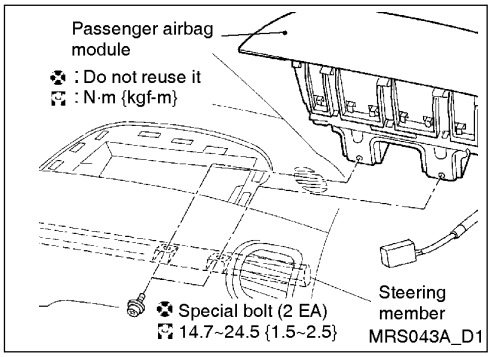
CAUTION:

- **Do not tap the steering wheel or hit against other objects.**

5. Remove the steering column cover.
6. Disconnect the connector and remove 4 screws to remove the spiral cable.

CAUTION:

- **Do not disassembly the spiral cable or stain it with any lubricants.**

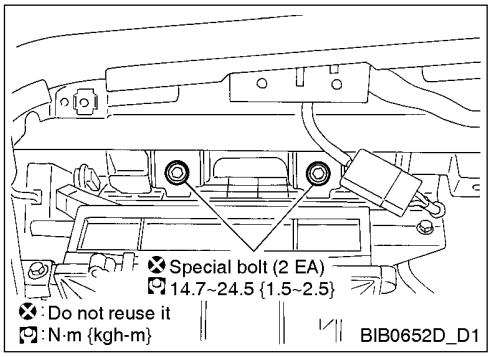


Removal - Passenger Airbag Module

CAUTION:

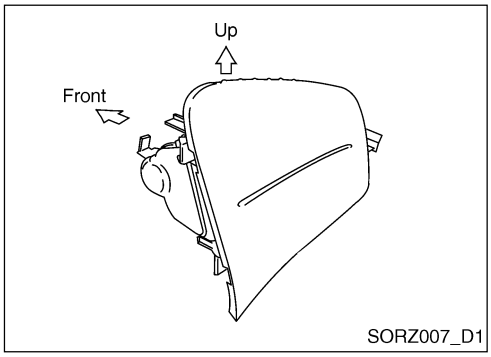
- **Before performing any SRS service, turn the ignition OFF, disconnect both battery terminals and then wait for more than 3 minutes.**

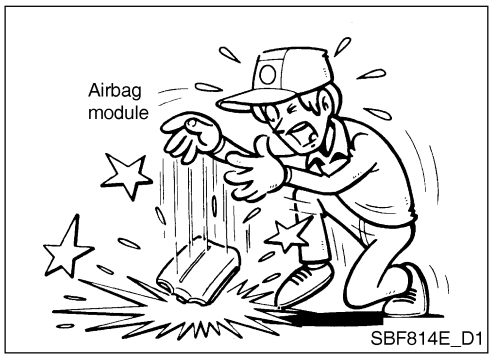
1. Open the glove box lid.
2. Disconnect the inflator connector from the airbag connector in the body side.
3. Remove the glove box assembly. Refer to “INSTRUMENT ASSEMBLY” (BT-40).
4. Remove the bolts and special bolts from passenger airbag module using a temper resistant torx (size 50) and take out the airbag module from the instrument panel.
   - Use both hands when removing the airbag module. It is heavy.



CAUTION:

- **Always keep the airbag module so that its pad surface faces upwards.**
- **Never disassemble the airbag module.**
- **The special bolt is coated with the bonding agent. Always replace it with new if removed.**
- **Be careful not to insert any foreign materials such as a screwdriver into the airbag module connector.**
- **Do not use a circuit tester to inspect the airbag module harness connector.**



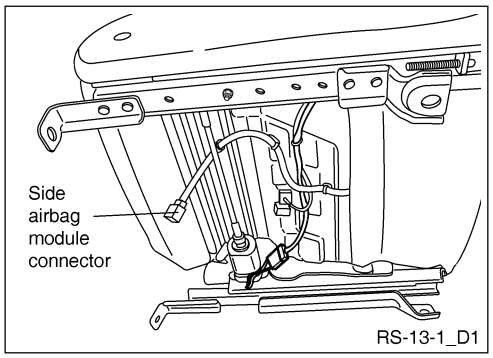


- **Do not drop or shock the airbag module. Replace the module if deformed or cracked.**
- **Do not store the airbag module to where the temperature is over 90°C.**
- **Be careful not to stain the airbag module with oil, grease or water.**

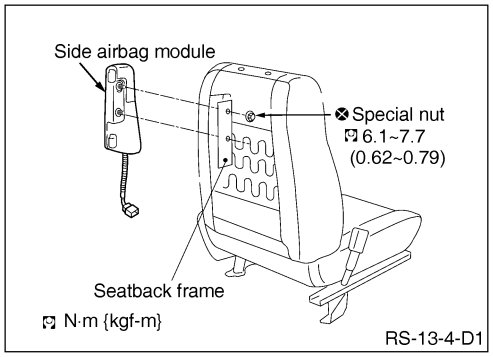
Removal - Side Airbag Module

CAUTION:

- **Before performing any SRS service, turn the ignition OFF, disconnect both battery terminals and then wait for more than 3 minutes.**
- **Always work behind the airbag module.**



1. Remove the seat mounting bolts. Refer to “FRONT SEAT” (BT-48).
2. Remove the side airbag module connector.
3. Remove the seatback assembly.

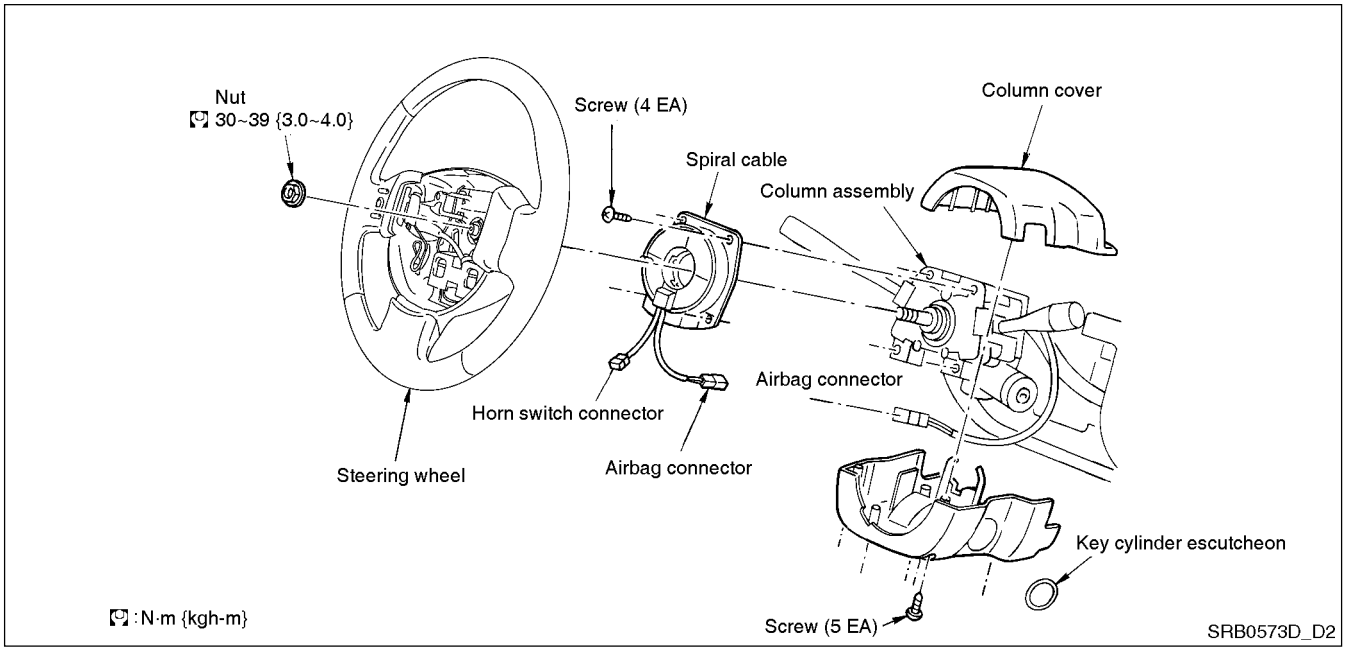


CAUTION:

- **The side airbag module is built in the seatback. Replace the seatback when replacing the airbag module after deployment.**
- **Keep the airbag module so that its pad surface faces upwards.**
- **Never disassemble the airbag module.**
- **Always replace the special nuts with new if removal.**
- **Be careful not to insert any foreign materials such as a screwdriver into the airbag module connector.**
- **Do not drop or shock the airbag module. Replace the module if deformed or cracked.**
- **Do not store the airbag module to where the temperature is over 90°C.**
- **Be careful not to stain the airbag module with oil, grease or water.**

Spiral Cable

Removal • Installation



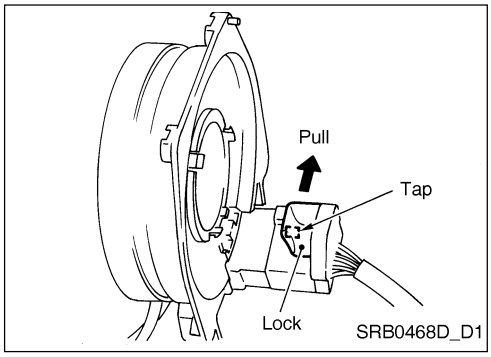
REMOVAL

1. Set the steering wheel to neutral position.
2. Remove the horn switch connector.
3. Pull out the steering wheel.

CAUTION:

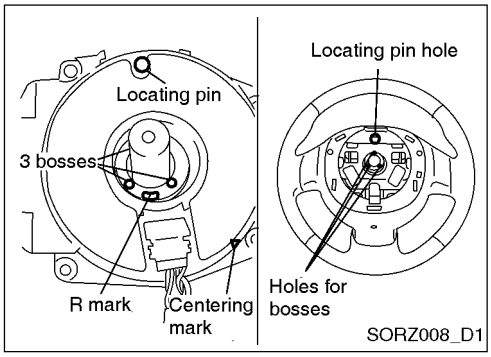
- **Do not tap the steering wheel or hit against other objects.**

4. Remove the steering column cover.
5. Remove the spiral cable by disconnecting the spiral cable connector and removing the 4 screws. Disconnect the spiral cable connector by pulling its lock and depressing the end.



CAUTION:

- **Do not disassemble the spiral cable.**
- **Do not apply oil to the spiral cable.**



INSTALLATION

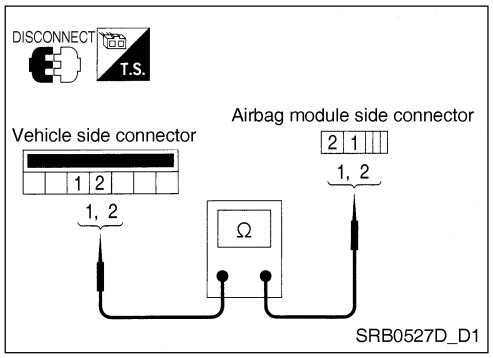
1. Set the front wheels straight-ahead position. Let the R mark on the spiral cable downwards and then install the steering wheel by aligning the 3 boss holes on the rear with 3 bosses on the spiral cable.
2. Check that the spiral cable is in neutral position.

CAUTION:

- **The spiral cable can be snapped while steering if it is not in correct positions.**

- **To set the neutral position, rotate the spiral cable clockwise until it stops. Then rotate counterclockwise (about 3.5 turns) until the adjust mark aligns with centering mark. (The spare parts are set to the neutral position with stopper. Install as it is by removing the stopper.)**
- **Do not rotate the spiral cable unnecessarily. And do not try to excessively rotate the spiral cable if it stopped (The cable can be snapped).**

3. Connect the spiral cable connector and position the spiral cable and then install the column cover.
4. Make sure that the locating pin on the left of the spiral cable aligns with the locating pin on the rear of the steering wheel assembly.
5. Connect the horn connector and airbag module connector.
6. After installation, check if system is working normally by using airbag warning light.
7. If the airbag warning light comes on, reset the system with self-diagnosis function and erase all stored defectives using CONSULT-II.
8. If airbag warning light still stays on after above step, diagnose the system (Refer to RS-30) and repair the defective location.



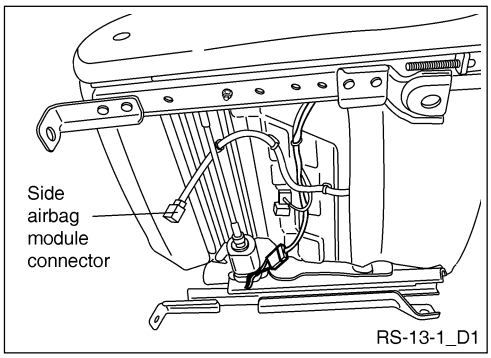
Spiral Cable Inspection

- Disconnect the connectors towards airbag module and airbag sensor from the spiral cable.
- Check continuity from each terminal.

Between spiral cable and airbag sensor unit

Terminal No. 1 - Terminal No. 1: Continuity

Terminal No. 2 - Terminal No. 2: Continuity

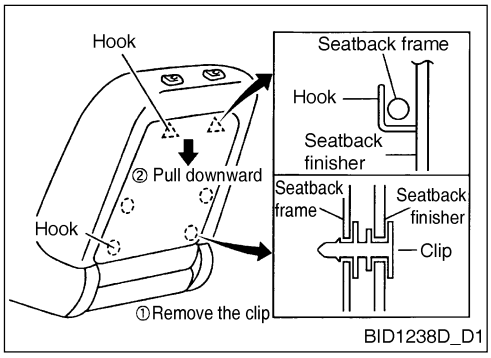


Removal - Seatback Assembly

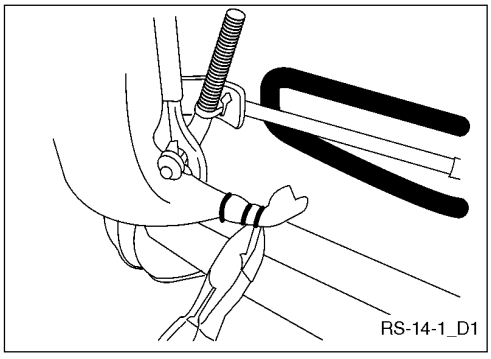
CAUTION:

- **For side airbag module service, turn the ignition OFF, disconnect both battery terminals and then wait for more than 3 minutes.**
- **Be careful not to damage the airbag harness.**

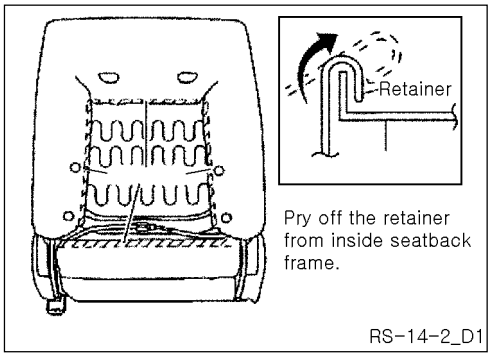
1. Disconnect the side airbag harness and seat warmer connector, and remove the fixing clip.



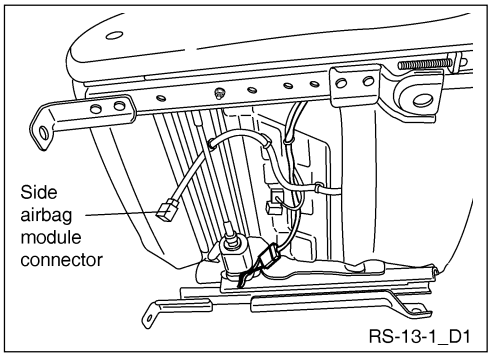
2. Remove the seatback board assembly.



3. Remove the seat fixing clip.

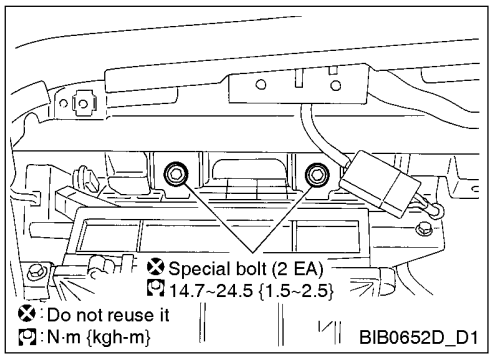


4. Pry off the retainer.



5. While the seatback pad is flipped over sideways, remove the bolts (both right and left) from the seatback frame and slide/reclining device.

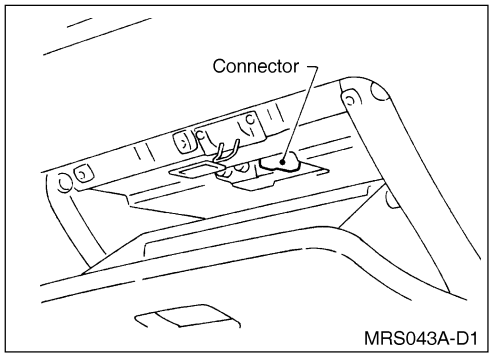
- **Installation is in the reverse order of removal.**



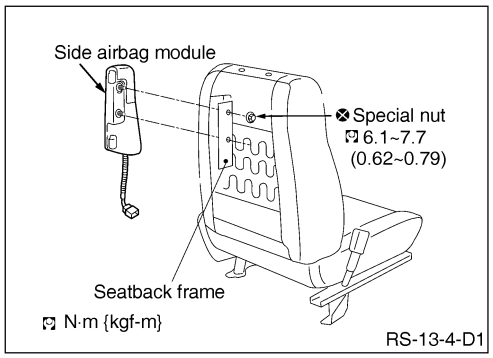
Installation - Passenger Airbag Module

- **Always work sideways or below from the airbag module.**

1. Install the passenger airbag module to the steering member.
   - **The harness should not be stuck between the rear of airbag module and steering member.**
2. Install the glove box assembly (Glove box lid is open).

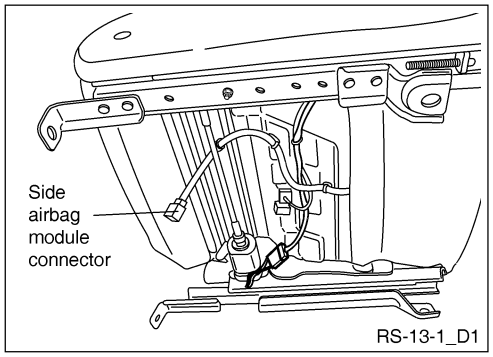


3. Connect the airbag module connector to the body harness connector.
4. Close the glove box lid.
5. Connect the battery cables.
6. Perform “SELF-DIAG RESULTS” using CONSULT-II to check that the airbag system is normal.



Installation - Side Airbag Module

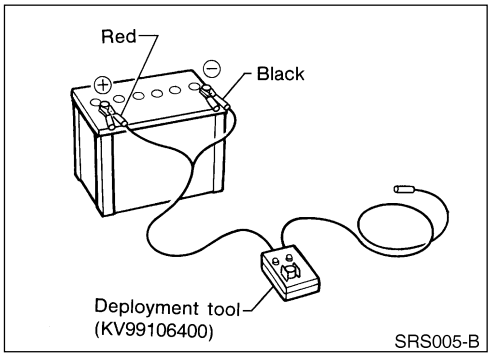
1. Install the seatback assembly to the seat.
   Refer to “FRONT SEAT” (BT-48).



2. Connect the side airbag module connector.
3. Connect the both battery terminals.
4. Perform “SELF-DIAG RESULTS” using CONSULT-II to check that the airbag system is normal.

Airbag Module Disposal

- **Be sure to deploy the airbag module before scrapping the airbag module or the vehicle equipped with airbag system. If the airbag has already deployed under accident, scrap it as instructed in "Airbag Module Disposal (RS-24)".**
- **Always use the deployment tool (SST: KV99106400) when deploying the airbag module.**
- **Be sure to away from airbag module deploying location at least 5 meters.**
- **When the airbag module is deployed, there are loud sound and smoke. They are not poisonous, but can stir nose and throat. Avoid inhaling the gas.**
- **The airbag module is very hot when deployed. Let the module cool down at least 30 minutes.**
- **Always wear gloves when handling the deployed airbag module.**
- **Do not wet the airbag module.**
- **Always wash hands after finishing deployment.**
- **Always deploy one airbag module at a time.**
- **When deploying the airbag module on the vehicle, park the vehicle in an open area where at least 5 meters clear from all directions.**
- **Use the voltage meter to check if vehicle's battery is fully charged.**
- **Never scrap the airbag module if not deployed.**



Deployment Tool

CONNECTING TO BATTERY

- Park the vehicle in an open area where at least 5 meters clear from all directions.
- Use a voltage meter to check if vehicle's battery is fully charged.

CAUTION:

Battery must be fully charged.

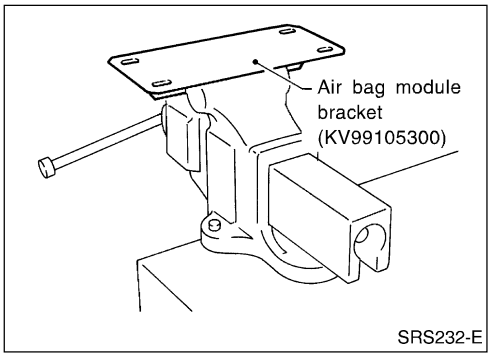
Remove the battery from the vehicle and place the battery at least 5 meters away from the vehicle.

- **Wait for at least 3 minutes after removing the battery before proceeding next job.**
- **Connect the deployment tool (SST: KV99106400) red clip to the positive (+) terminal and black clip to the negative (-) terminal of the battery.**

Check if terminals are correctly connected.

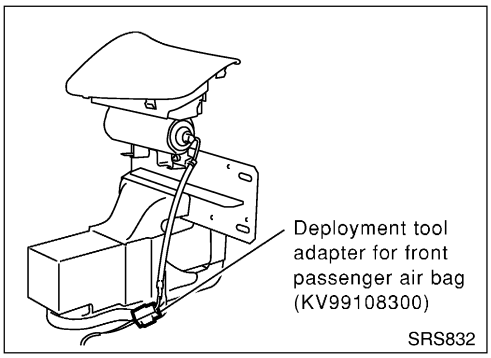
Airbag Module Deployment Procedure (Off-Vehicle Deployment)

When the airbag module is deployed on the vehicle, it may damage the vehicle. Always remove the airbag module from the vehicle if not scrapping the vehicle.

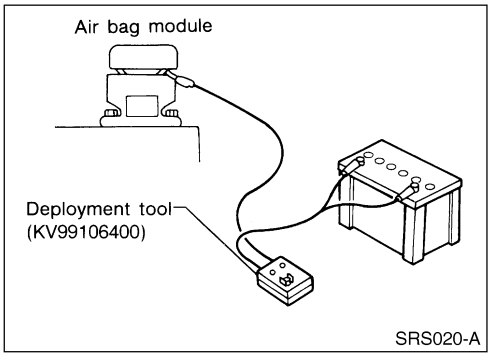


Front (Driver and Passenger) Airbag Module Deployment (Off-Vehicle Deployment)

1. Securely tighten the airbag module bracket (SST: KV99105300) to the vise.



2. Place the driver and passenger airbag module on the bracket and tighten them with 2 bolts.
3. Connect the deployment tool (SST: KV99106400) to the airbag module connector (SST: KV99108300).



4. Connect the deployment tool's red clip to the positive (+) terminal and black clip to the negative (-) terminal of the battery.

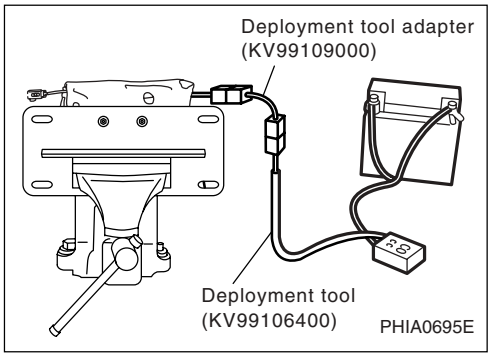
CAUTION:

Before deploying the airbag module, be sure to away from it at least 5 meters.

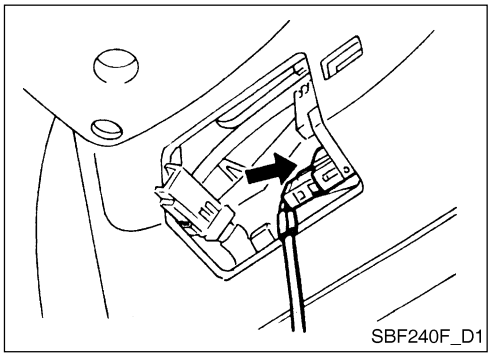
5. Press the button on the airbag deployment kit to deploy the airbag.

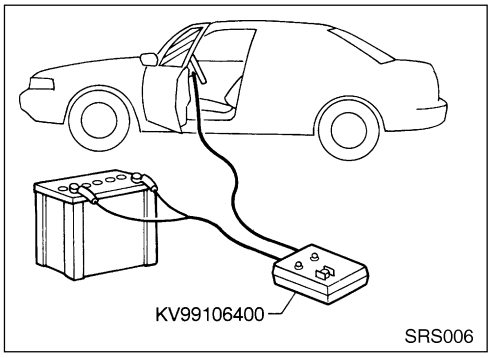
Side Airbag Module Deployment (Off-Vehicle Deployment)

1. Securely tighten the side airbag module to the vise.



2. Connect the deployment tool (SST: KV99106400) to the side airbag module connector (KV99109000).
3. Connect the deployment tool's red clip to the positive (+) terminal and black clip to the negative (-) terminal of the battery.
4. Press the button on the airbag deployment kit to deploy the airbag.





On-Vehicle Airbag Module Deployment

When scrapping the vehicle, deploy the airbag module on the vehicle.

CAUTION:

Be sure to check that vehicle is empty when deploying the airbag module.

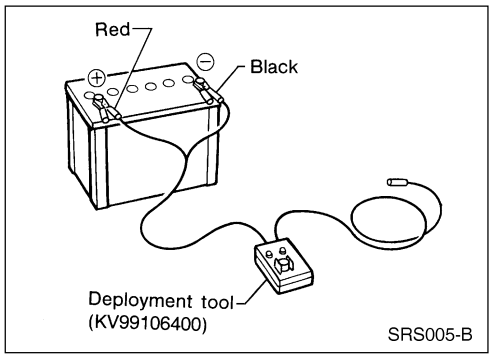
1. **Wait about 10 minutes after removing the battery terminals.**
2. **Disconnect the airbag module connector.**
3. **Connect the airbag deployment tool (SST: KV99106400) to the airbag module connector.**
4. **Connect the deployment tool's red clip to the positive (+) terminal and black clip to the negative (-) terminal of the battery.**
5. **Press the button on the airbag deployment kit to deploy the airbag.**

CAUTION:

Always deploy one airbag module at a time.

Airbag Module and Pretensioner Seatbelt Disposal

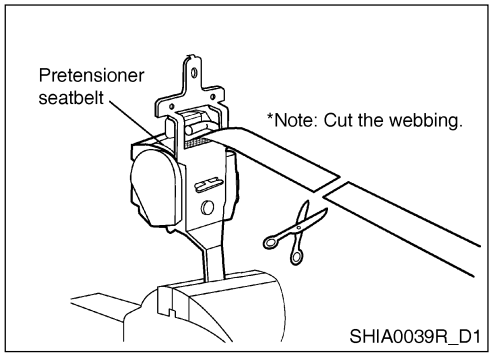
- **Be sure to deploy the airbag module and pretensioner seatbelt before scrapping the airbag module, pretensioner seatbelt and vehicle. The deployed airbag module and pretensioner seatbelt should scrapped as instructed in "Airbag Module Disposal (RS-20)".**
- **Be sure to away from airbag module and pretensioner seatbelt deploying location at least 5 meters.**
- **The airbag module deploys with big sound non-poisonous smoke. Warn the nearby people on your deployment. Be sure to deploy in good ventilation and do not work where fire and smoke alarm system is near.**
- **The airbag module is very hot when deployed. Let the driver and passenger airbag modules cool down at least 30 minutes, and pretensioner seatbelt and side airbag modules for 10 minutes.**
- **Always wear gloves when handling the deployed airbag module and pretensioner seatbelt.**
- **Do not spray water on the deployed airbag module and pretensioner seatbelt.**
- **Always wash hands after finishing deployment.**
- **When deploying the airbag module and pretensioner seatbelt on the vehicle, park the vehicle in an open area where at least 5 meters clear from all directions.**
- **Never scrap the airbag module and pretensioner seatbelt if not deployed.**



Deployment Tool

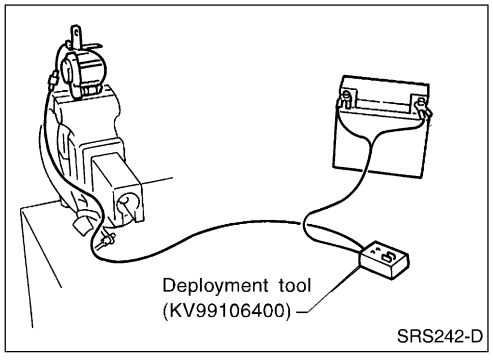
Prepare a fully charged battery.

- **Check if the battery is fully charged using a battery tester and multimeter.**
- **Connect the deployment tool (SST: KV99106400) red clip to the positive (+) terminal and black clip to the negative (-) terminal of the battery.**
- **Check if terminals are correctly connected.**



Pretensioner Seatbelt Deployment

1. Prepare a fully charged battery.
2. Tighten the pretensioner seatbelt to the vise.
3. Cut the webbing and remove the shoulder anchor and bracket.

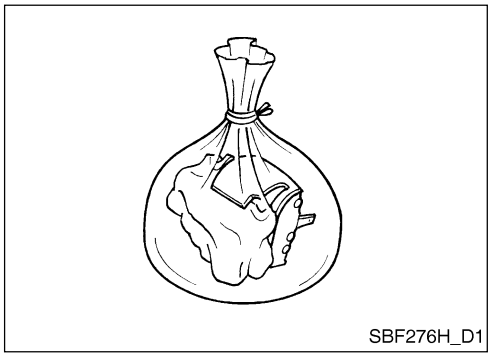


4. Connect the deployment tool as shown in the illustration using a deployment tool adaptor proper for the pretensioner seatbelt.
5. Press the button on the airbag deployment kit to deploy the pretensioner seatbelt.

CAUTION:

- **Be sure to away at least 5 meters from pretensioner seatbelt when deploying it.**
- **The deployed pretensioner seatbelt is hot. Wait at least 10 minutes and then put in a vinyl bag and dispose.**

- **Always wear gloves when handling the deployed pretensioner seatbelt and wash hands afterwards.**
- **Do not spray water on the deployed pretensioner seatbelt or disassemble it.**


SBF276H_D1

Airbag Module Disposal

The deployed airbag module is very hot. Wait at least 30 minutes and then put in a plastic bag and dispose.

CAUTION:

- **Do not spray water on the deployed airbag module.**
- **Always wear gloves when handling the deployed airbag module.**
- **When the airbag module is deployed, there will be smoke. It is not poisonous, but can stir nose and throat. Avoid inhaling the gas.**
- **Do not disassemble the airbag module.**
- **The airbag module cannot be reused.**
- **Always wash hands after service.**

General

PRELIMINARY INSPECTION

Check the following components for normal.

- Battery [Refer to “BATTERY” (EL-24)]
- Fuse [Refer to “POWER SUPPLY ROUTING” (EL-5)]
- Unit components and harness connection

DIAGNOSIS FUNCTION

The results of self-diagnosis can be read by airbag warning light or CONSULT-II.

	User Mode	Diagnosis Mode (CONSULT-II)
Airbag	○	○

The user mode let the driver to know the system troubles through airbag warning light. In diagnosis mode, CONSULT-II performs SELF-DIAG RESULTS.

DIAGNOSIS MODE FOR CONSULT-II

- WORK SUPPORT

  The initial lock/unlock state of diagnosis sensor unit will be displayed on CONSULT-II and can command to unlock.

  The ECU will be supplied as locked (no operation of airbag) so unlock it after service.
- SELF-DIAG RESULTS

  The results of self-diagnosis will be displayed on CONSULT-II in real-time.

  So can easily isolate the trouble causing component.
- DATA MONITOR

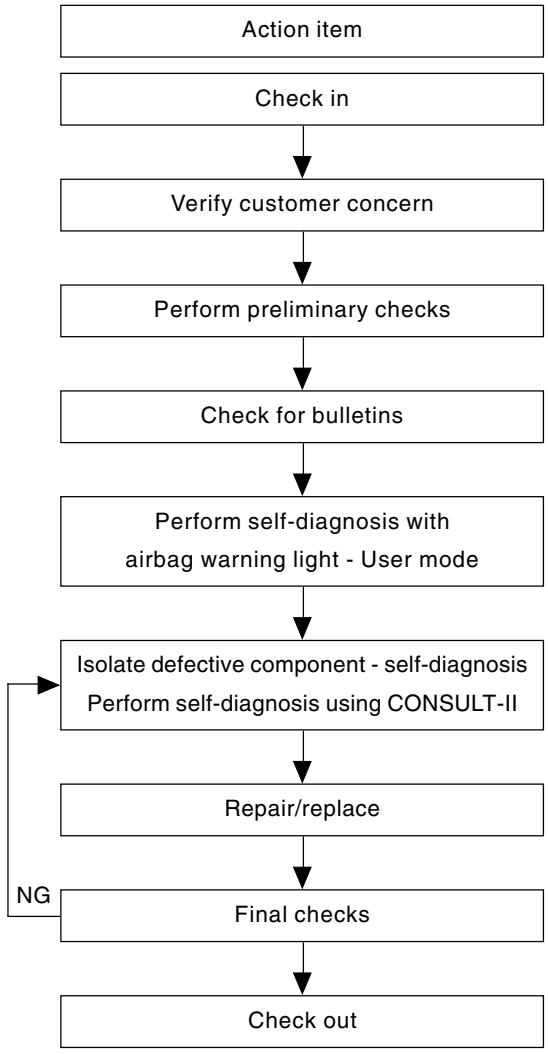
  Displays the input data airbag control unit in real-time.
- ECU PART NUMBER

  The installed ECU’s part number will be displayed.

CAUTION:

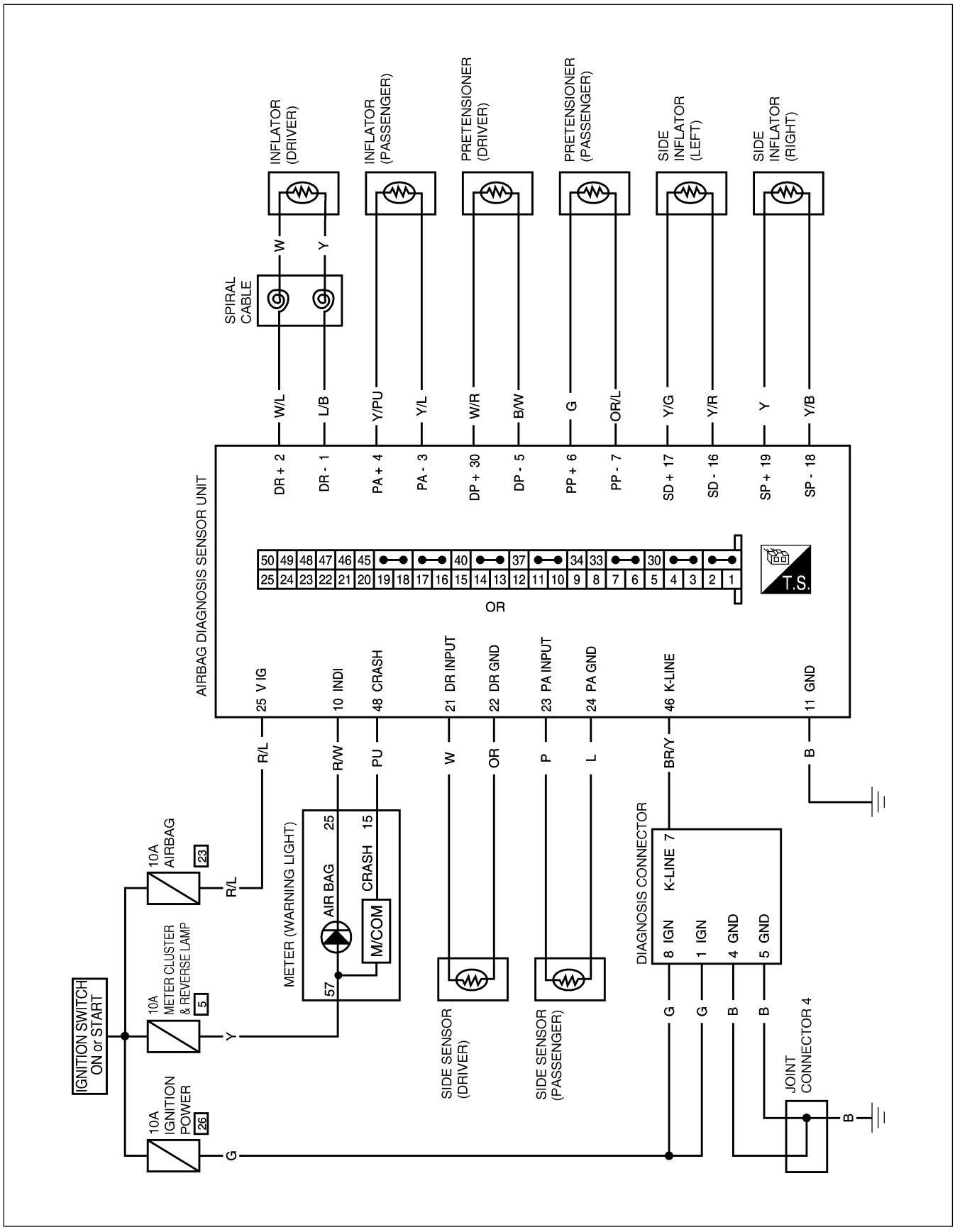
- **The circuit tester should not be used for the SRS harness connector unless it is instructed in this Manual. The SRS wiring harness is covered with yellow protector or insulator in order to be easily identified on the front of the connector and harness assembly.**
- **Do not attempt to repair, splice or modify the SRS wiring harness. If the harness is damaged, replace it with new.**
- **Keep ground section clean.**

WORK FLOW



SORZ010_D1

Circuit Diagram



GI
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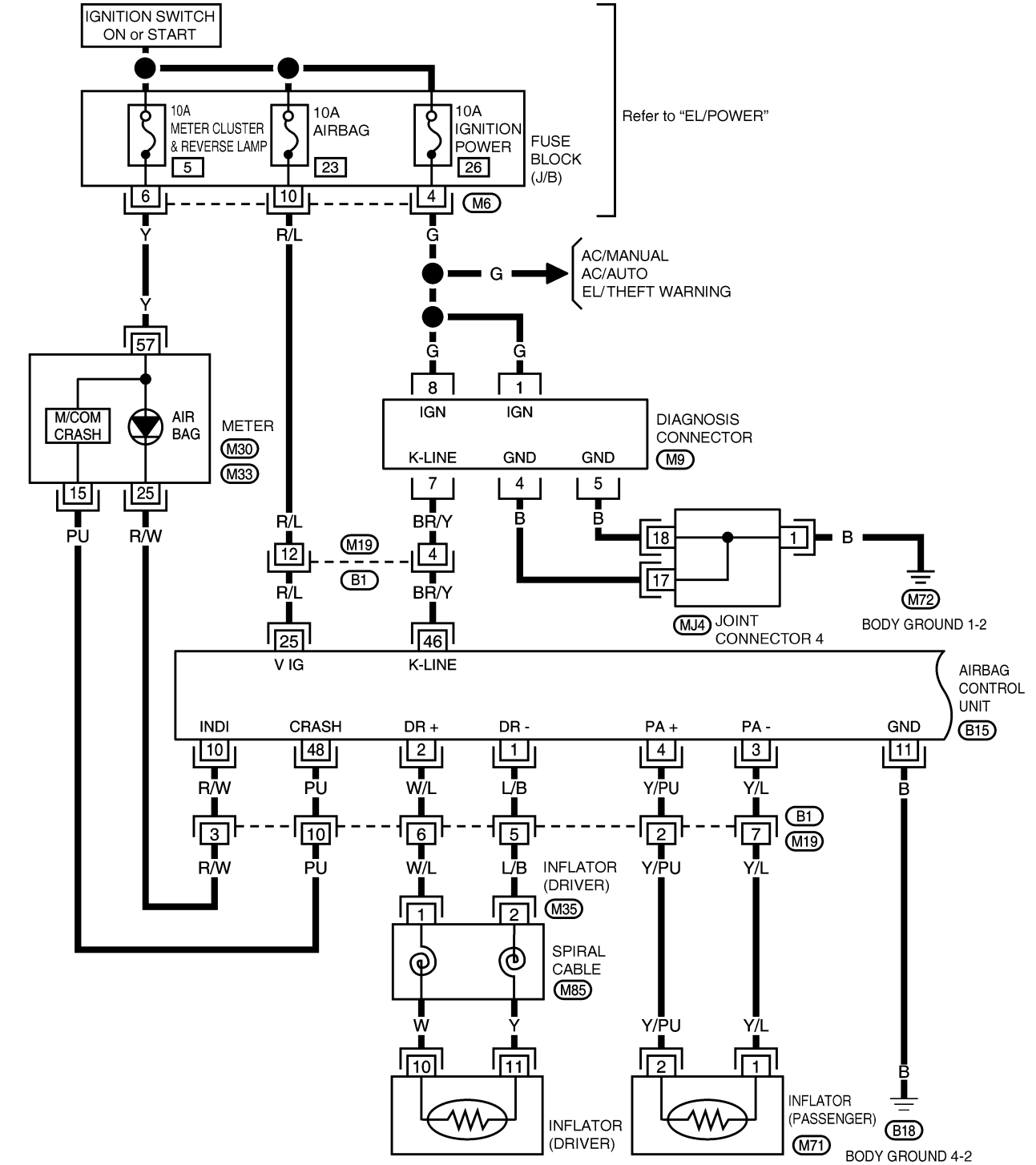
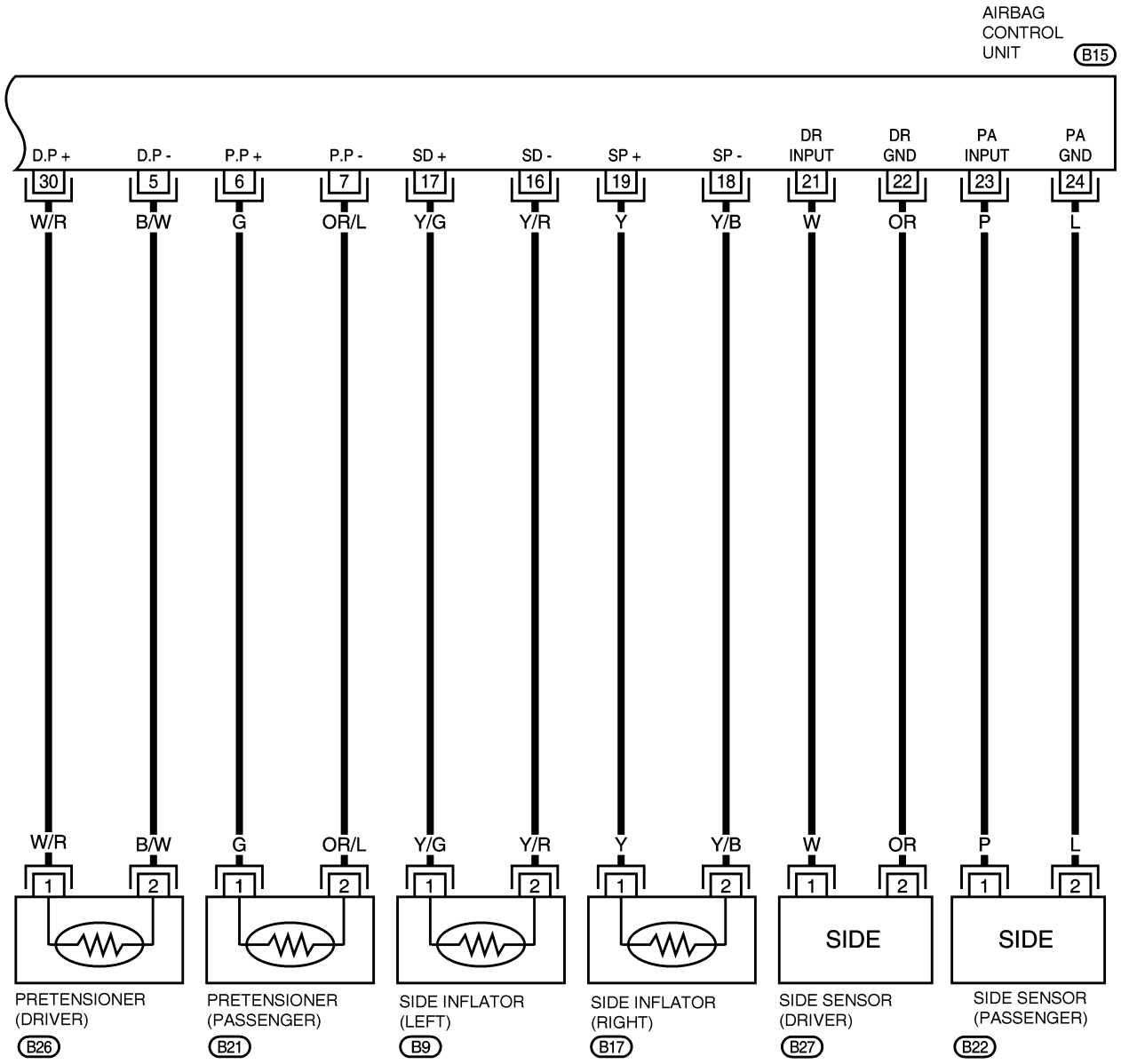
Wiring Diagram

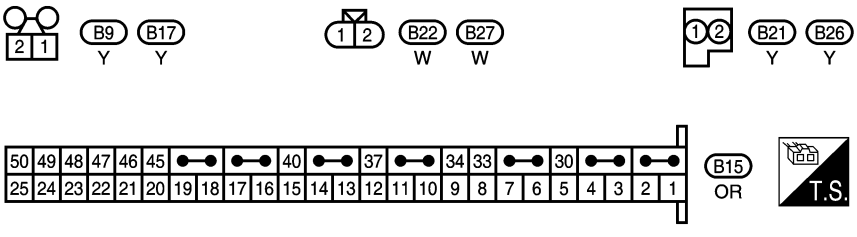
RS/SRS-D01



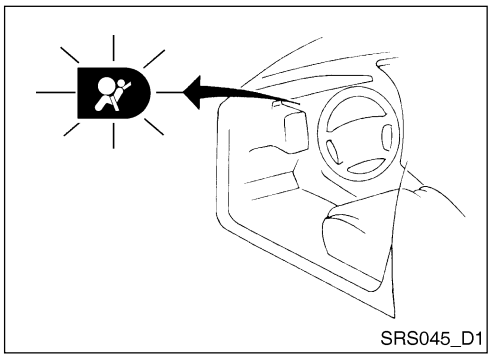
Wiring Diagram

RS/SRS-D02





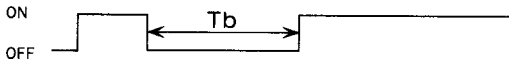
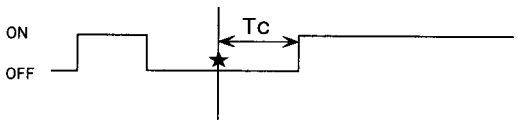
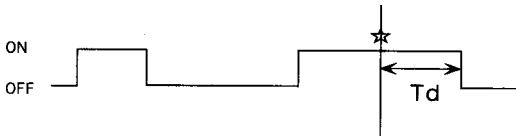
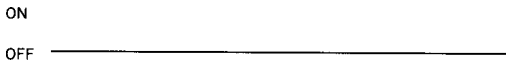
SOWZ002_O1



Self-Diagnosis

DIAGNOSIS USING AIRBAG WARNING LIGHT

1. The airbag warning light comes on when the ignition switch is turned from OFF to ON.
2. Compare airbag warning light operations with chart below.

SRS condition	Warning Lamp Operation	Time
When the system is normal		Ta = 3 sec
When turning the ignition switch to ON position while the system is defective		Tb = 0 sec
When a malfunction occurs while the system is normal		Tc = 2 sec
When the system is restored from a malfunction		Td = 15 sec
When the airbag unit is defective When the airbag unit connector is disconnected When the warning lamp circuit is open		

★ : Malfunctioning point

☆ : Repaired point

Diagnosis Using CONSULT-II

Isolate defective section of the SRS airbag pretensioner seatbelt by using CONSULT-II.

1. Turn the ignition switch OFF.
2. Connect the CONSULT-II to the data link connector.
3. Turn the ignition switch ON.
4. Press “START (X-BADGE VHCL)”.
5. Select “AIRBAG/PRT(R)”.
6. Select “SELF-DIAG RESULTS“.
7. Self-diagnosis result will be displayed.
8. Repair or replace the defective component according to self-diagnosis results.
9. Select “SELF-DIAG RESULTS” after repair and check the self-diagnosis results.

SELF-DIAG RESULTS

CAUTION:

Before removing the computer or before any operation on the airbag and pretensioner systems, it is vital that you lock the computer using the CONSULT-II.

Diagnostic item		Description	Repair order If replaced, recheck the SRS with CONSULT-II
NO DTC IS DETECTED.	-	-	-
IGN MODULE CONFIG (Diagnosis sensor unit)	-	-	1. Confirm the part number of diagnosis sensor unit 2. Replace diagnosis sensor unit
DR A/BAG CIRCUIT (Driver's front airbag circuit)	CC	Short circuit	1. Visually check the wiring harness connections 2. Replace the harness if it has visible damage 3. Replace driver airbag module (Deploy and then scrap it) 4. Replace diagnosis sensor unit
	CO	Open circuit	
	CC.1	Short circuit to power	
	CC.0	Short circuit to ground	
PAS FNT AIRBAG CIR (Passenger's front airbag circuit)	CC	Short circuit	1. Visually check the wiring harness connections 2. Replace the harness if it has visible damage 3. Replace passenger airbag module (Deploy and then scrap it) 4. Replace diagnosis sensor unit
	CO	Open circuit	
	CC.1	Short circuit to power	
	CC.0	Short circuit to ground	
DR SIDE A/BAG CIRC (Driver's side airbag circuit)	CC	Short circuit	1. Visually check the wiring harness connections 2. Replace the harness if it has visible damage 3. Replace side airbag module (left) (Deploy and then scrap it) 4. Replace diagnosis sensor unit
	CO	Open circuit	
	CC.1	Short circuit to power	
	CC.0	Short circuit to ground	
AS SIDE A/BAG CIRC (Passenger's side airbag circuit)	CC	Short circuit	1. Visually check the wiring harness connections 2. Replace the harness if it has visible damage 3. Replace side airbag module (right) (Deploy and then scrap it) 4. Replace diagnosis sensor unit
	CO	Open circuit	
	CC.1	Short circuit to power	
	CC.0	Short circuit to ground	
SIDE SENSOR CONFIG (Side sensor configuration)	-	-	1. Confirm the part number of side sensor unit 2. Replace side sensor unit
DR LATRAL SEN CIR (Driver's side sensor circuit)	CC.0	Short to ground	1. Visually check the wiring harness connections 2. Replace the harness if it has visible damage 3. Replace side sensor (left) 4. Replace diagnosis sensor unit
	1. DEF	No communication	
	2. DEF	Communication shutdown	
	3. DEF	Malfunctioning sensor	

Diagnostic item		Description	Repair order If replaced, recheck the SRS with CONSULT-II
PA LATRAL SEN CIR (Passenger's side sensor circuit)	CC.0	Short to ground	1. Visually check the wiring harness connections 2. Replace the harness if it has visible damage 3. Replace side sensor (right) 4. Replace diagnosis sensor unit
	1. DEF	No communication	
	2. DEF	Communication shutdown	
	3. DEF	Malfunctioning sensor	
CONTROL UNIT (Diagnosis sensor unit)	-	Internal circuit fault	1. Visually check the wiring harness connections 2. Replace diagnosis sensor unit
PRE-TEN CIRCUIT (Pretensioner circuit)	CC	Short circuit	1. Visually check the wiring harness connections 2. Replace pretensioner
	CO	Open circuit	
	CC.1	Short circuit to power	
	CC.0	Short circuit to ground	
WARN LITE CIR FALT (Airbag warning lamp circuit)	CC.1	Short circuit to power	1. Check airbag warning light circuit 2. Check wiring
	CC.0	Short circuit to ground	
COMP SUPPLY VOLTS (System power supply)	1. DEF	Voltage outside permitted tolerance values	1. Visually check the wiring harness connections 2. Check battery voltage
	2. DEF	Too many micro-cutoffs	

Be sure to follow the above procedure when repairing the malfunctioning components and check if the malfunction has disappeared after the repair using the airbag warning light and CONSULT-II. If malfunction still appears, go to the next step and stop the service if malfunction has disappeared.

WORK SUPPORT

LOCK COMPUTER

This command should be used whenever servicing the system. It shuts down all trigger lines.

UNLOCK COMPUTER

This command is for unlocking the computer (either a new computer or following locking).

DATA MONITOR

Memo of Parameter

Display item	Index name	Reference value and notes
LINE 1 IMP	Wiring 1 impedance	It outputs the impedance of the pretensioner circuit. Approx. 4 ~ 5 Ω
LINE 3 IMP	Wiring 3 impedance	It outputs the impedance of the driver's front airbag module circuit. Approx. 2.7 ~ 3.2 Ω
LINE 4 IMP	Wiring 4 impedance	It outputs the impedance of the passenger's front airbag module circuit. Approx. 2.5 ~ 3.2 Ω
LINE 9 IMP	Wiring 9 impedance	It outputs the impedance of the passenger's side airbag module circuit. Approx. 2.0 ~ 3.0 Ω
LINE 12 IMP	Wiring 12 impedance	It outputs the impedance of the driver's side airbag module circuit. Approx. 2.0 ~ 3.0 Ω
NUMBER/IMP	Impact No.	The number of the valid impacts that the airbag diagnosis sensor determines

List of Status

Display item	Index name	Reference value and notes
TRG/IGN MO-DUL	Ignition module trigger	YES if the ignition module is operated when the airbag detects the impact
W/L CTRL IMP	Malfunction warning lamp control after collision	ON if the warning lamp is ON after the airbag diagnosis sensor unit detects the collision
F-W/L CTRL	Airbag warning light control	ON if the airbag warning light is ON
COM LK/TOOL	ECU Lock-Tool	LOCK if the airbag diagnosis sensor unit is locked by the diagnostic tool

Front Collision

To repair the SRS after front collision, perform the following steps.

CAUTION:

Before removing the computer or before any operation on the airbag and pretensioner systems, it is vital that you lock the computer using the CONSULT-II.

WHEN SRS IS ACTIVATED IN A COLLISION (EXCEPT FOR SIDE AIRBAG)

1. Replace the diagnosis sensor unit.
2. Replace the pretensioner seat belt.
3. Remove the airbag module (except for side airbag).
4. Check the SRS components using the table shown below.

- Replace any SRS components showing visible signs of damage (dents, cracks, deformation) with new one.

5. Install new airbag modules (except for side airbag).
6. By performing the “Self-diagnosis” (RS-30), check the system function by using CONSULT-II or airbag warning light. Ensure entire SRS operates properly.

WHEN SRS IS NOT ACTIVATED IN A COLLISION

1. Check the SRS components using the table shown below.

- Replace any SRS components showing visible signs of damage (dents, cracks, deformation) with new.

2. By performing the “Self-diagnosis” (RS-30), check the system function by using CONSULT-II or airbag warning light. Ensure entire SRS operates properly.

SRS INSPECTION

Item	When SRS is activated	When SRS is not activated
Airbag module (Driver and passenger)	Replace - Install with new bolts.	1. Remove airbag module. Check harness cover and connectors for damage, terminals for deformities, and harness for binding. 2-1. Install driver airbag module into the steering wheel to check fit and alignment with the wheel. 2-2. Install passenger airbag module into the instrument panel to check fit with the instrument panel. 3. No damage found, reinstall with new bolts. 4. If damaged, replace. Airbag module must be deployed before scrap.
Diagnosis sensor unit	Replace - Install with new bolts.	1. Check case for dents, cracks or deformation. 2. Check connectors for damage and terminals for deformation. 3. If no damage is found, reinstall with new bolts. 4. If damaged, replace with new bolts.
Steering wheel	1. Visually check steering wheel for deformation. 2. Check harness and connectors on the steering wheel for damage, and terminals for deformation. 3. Install airbag module to check fit or alignment with steering wheel. 4. Check steering wheel for excessive free play. 5. If no damage is found, reinstall with new bolts. 6. If damaged, replace.	
Instrument panel	See RS-36.	
Spiral cable	1. Visually check spiral cable and combination switch for damage. 2. Check connectors and insulation tape for damage. 3. Check steering wheel for noise, binding or hard steering. 4. If no damage is found, reinstall with new bolts. 5. If damaged, replace.	
Harness and connectors	1. Check connectors for poor connection, damage, and terminals for deformation. 2. Check harness for binding, cuts, deformation or chafing. 3. If no damage is found, reinstall harness and connectors. 4. If damaged, replace the damaged section. Do not attempt to repair or modify the SRS harness.	

Side Collision

To repair the SRS after side collision, perform the following steps.

CAUTION:

Before removing the computer or before any operation on the airbag and pretensioner systems, it is vital that you lock the computer using the CONSULT-II.

WHEN SIDE AIRBAG IS ACTIVATED IN A COLLISION

1. Replace the following components.
   - Diagnosis sensor unit
   - Side sensor (for the activated side airbag)
2. Remove the deployed side airbag.
3. Check the SRS components using the table shown below.

● Replace any SRS components showing visible signs of damage (dents, cracks, deformation) with new.

4. Install new side airbag module with new bolts.
5. By performing the “Self-diagnosis” (RS-30), check the system function by using CONSULT-II or airbag warning light. Ensure entire SRS operates properly.

WHEN SIDE AIRBAG IS NOT ACTIVATED IN A COLLISION

1. Check the SRS components using the table shown below.

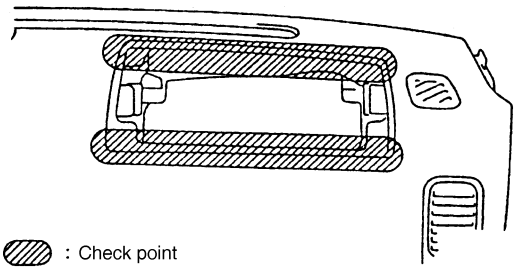
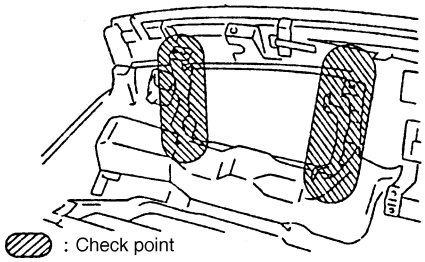
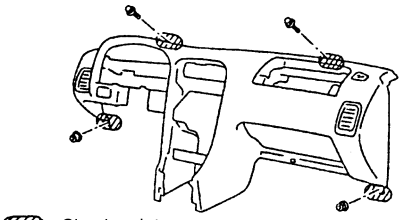
● Replace any SRS components showing visible signs of damage (dents, cracks, deformation) with new.

2. By performing the “Self-diagnosis” (RS-30), check the system function by using CONSULT-II or airbag warning light. Ensure entire SRS operates properly.

SRS INSPECTION AFTER SIDE COLLISION

Item	When SRS is activated	When SRS is not activated
Side airbag module (Left or right)	Replace the seatback assembly.	1. Visually check collided side airbag module for damage (dents, cracks, deformation). 2. Remove the collided side airbag module. 3. Check harness and connectors for damage, terminals for deformation. 4. Install side airbag module into the seatback to check fit and alignment with the seat. 5. No damage found, reinstall with new bolts. 6. If damaged, replace with new special bolts. Airbag module must be deployed before scrap.
Side sensor (Left or right)	Replace the collided side sensor with new bolts.	1. Remove the collided side sensor. Check harness and connectors for damage, terminals for deformation. 2. Visually check collided side sensor for damage (dents, cracks, deformation). 3. Install side sensor to check fit and alignment. 4. No damage found, reinstall with new bolts. 5. If damaged, replace with new special bolts.
Diagnosis sensor unit	Replace the diagnosis sensor unit with new bolts.	1. Check case and bracket for crack and deformation. 2. Check connectors for damage and terminals for deformation. 3. If no damage is found, reinstall with new special bolts and ground bolt. 4. If damaged, replace with special bolts and ground bolt.
Seat	1. Visually check the collided seat. 2. Remove the collided seat and check following components for damage and deformation. - Harness, connector, terminals - Frame, recliner, adjuster, slide 3. Install side airbag module into the seatback to check fit and alignment with the seat. 4. If no damage is found, reinstall the seat. 5. If damaged, replace with new bolts.	
Center pillar inner	1. Check collided sections for damage (cracks, deformation). 2. If damaged, repair the center pillar inner.	

Instrument Panel Inspection

Item	SRS airbag
Instrument panel	1. When passenger airbag is inflated, check the following points for bending, deformation or cracks. ● Opening portion of passenger airbag  : Check point SRS388_D1 ● Passenger airbag module brackets  : Check point SRS389_D1 ● The portions mounting the instrument panel  : Check point SRS390_D1 2. If no damage is found, reinstall the instrument panel. 3. If damaged, replace the instrument panel and bolts.

STEERING SYSTEM

SECTION **ST**

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Precaution

SRS Airbag • Pretensioner Seatbelt

WARNING:

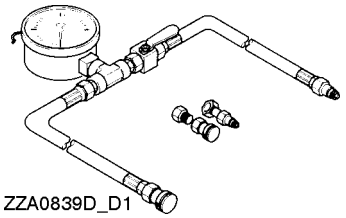
- **To install/remove the SRS airbag, pretensioner seatbelt system related components and harness, turn the ignition switch "OFF", disconnect the battery terminals and wait over 3 minutes. (This is to discharge all the remaining electricity in the airbag sensor unit's auxiliary power circuit.)**
- **Do not use air impact or electrical tools when installing/removing the components.**
- **Do not use any hand-held tools for harness used in SRS airbag and pretensioner seatbelt systems. Be careful with the harness not to tangle with or interfere with other components.**
- **Do not use any electrical test equipments such as circuit tester when inspecting the SRS airbag and pretensioner seatbelt circuit while installed unless the Service Manual instructs to do so. (The weak current in the tester can cause the SRS airbag to operate.)**
- **Do not insert any foreign materials such as a screwdriver in the airbag module and pretensioner seatbelt connector in order to prevent unintended operation due to static electricity.**
- **The harnesses used in SRS airbag and pretensioner are covered with yellow insulation for easy identification.**
- **Refer to "RS Restraint System" in this Service Manual for safe airbag system service information.**

Caution

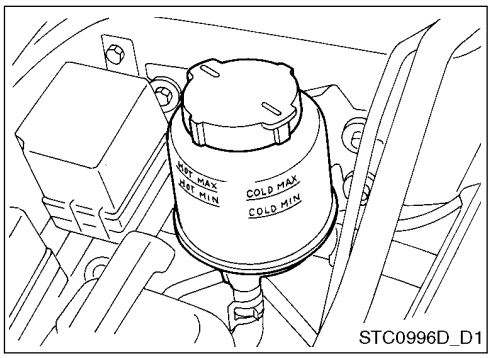
- The power steering gear should not be disassembled.
- Follow the cautions below before disassembly.
  - Perform in a garage or dust free location although a anti-dust equipment is not required.
  - Clean the unit exterior before disassembly.
  - Keep the disassembling location clean and be careful not to let foreign particles enter into the components.
  - Securely install the disassembled component in order. If stopped, cover with a clean cover.
  - Use a paper towel instead of conventional cloth towel. The cloth towel has waste threads that can damage the components if entered.
  - Clean the disassembled components (except for the rubber components) with white kerosene and wipe out all oil by air blowing or cleaning with a paper towel.
  - Apply Genuine NISSAN PSF or equivalent on the O-ring or seal before assembly.
  - Replace the gasket and O-ring with new. Be careful not to damage the O-ring, seal and gasket during installation.
- Disassemble the steering pump. Replace the casing, rear body, side plate, pulley, rotor, vane and flow control valve if damaged (including scratches).
- Mark the fluid leaking location with a white marker.
- Do not reuse the seals and copper washers.

Preparation

Special Service Tools

Item	Description
KV48103500 Pressure gauge KV48102500 Pressure gauge adapter	 ZZA0839D_D1 Measuring wheel pump relief pressure

Power Steering Fluid



Oil Level Inspection

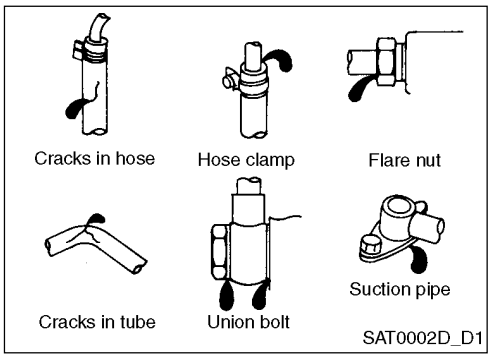
- Inspect while engine stopped.
- Check if the oil level is in between the MAX and MIN marks on the tank. Be careful not to add too much fluid (over the MAX level) to prevent leakage occurrence at the cap.
- Fluid level is different according to HOT and COLD conditions.

  HOT: Fluid temperature 50 - 80°C

  COLD: Fluid temperature 0 - 30°C

CAUTION:

- **Never reuse the drained power steering fluid.**
- **Always use a designated Genuine NISSAN PSF or equivalent.**



Leakage Inspection

Inspect the fluid pressure system mounts for any leakage, cracks, damages, loose connections or come off.

1. Run the engine at idle until the reservoir tank fluid temperature reaches 50 - 80°C.
2. Rotate the steering wheel left to right several times.
3. Rotate the steering wheel to the right end (or left end) and remain for 5 seconds. Then inspect for leakage.

CAUTION:

- **Do not remain the steering wheel rotated right or left end for more than 15 seconds (The pump may be damaged).**

4. When leakage is present at the joint, release the flare nut and tighten again. If over tightened, O-ring, washer and connector may be damaged.

Air Bleeding

1. Lift up the vehicle.
2. Fill the fluid into the tank. Rotate the steering wheel to the left and right ends several times and add fluid if the level goes down. Repeat the procedure until oil decrease or air bubble does not occur.
3. Start the engine. Repeat the above procedure during idle until fluid decrease or air bubble does not occur.

   If air bleeding is imperfect, the following occurs:

   - Air bubble forms in the reservoir tank.
   - A stone-hitting noise occurs from the oil pump.
   - Idle noise present from the oil pump.

   Sometimes oil noises are present in the gear valve and pump during steering or gentle steering. However, this noise does not affect the steering performance.

Steering Wheel

On-Vehicle Inspection and Service

FREE PLAY INSPECTION

1. Start the engine after turning the tire straight ahead. Measure the steering wheel travel by rotating the steering wheel lightly to the left and right until the tire starts to move.

   Steering wheel free play standard: 0 - 35 mm

2. If the measured value is out of the standard, inspect the installation condition of the steering gear assembly, front suspension, axle and steering column.
   - Inspect for any rattles when moving the steering wheel up, down, left and right in the axial direction.

     Steering wheel axial endplay: 0 mm
   - Inspect if the steering gear's mounting bolts and nuts are loose while the vehicle is lifted.

     Tightening torque

     Left mounting bolt: 9.90 - 12.0 kgf-m

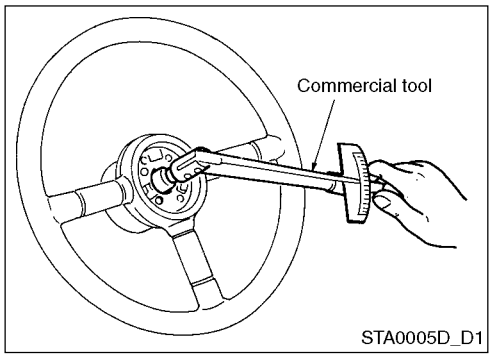
     Right mounting bolt: 50 - 70 N•m (5.1 - 7.1 kgf-m)

     Right mounting nut: 24.5 - 29.4 N•m (2.5 - 3.0 kgf-m)

NEUTRAL POSITION INSPECTION

- Perform the neutral position inspection after the wheel alignment inspection.
- Check if the steering gear is at neutral when steering wheel is removed.

1. Position the vehicle straight and inspect if the steering wheel is at neutral position.
2. If not, remove the steering wheel and install again correctly.
3. If the steering wheel cannot be adjusted in between the gear center and second gear tooth, then loosen the tie rod lock nut and adjust by rotating to the opposite direction until the left and right tie rod becomes the same.



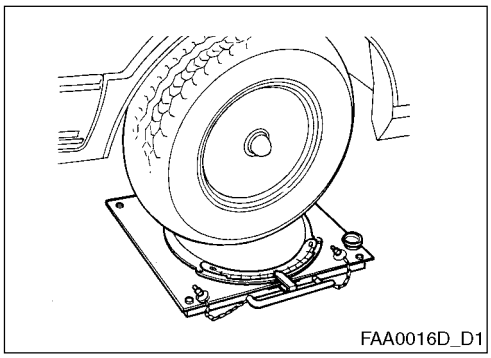
STEERING TORQUE INSPECTION

1. Park the vehicle on a dry and level ground and apply the parking brake.
2. Start the engine and inspect the steering wheel turning torque while the power steering fluid is hot using a free load gage (commercial tool).

   Torque: Less than 72 kgf-cm
3. If out of the standard value, inspect the rack sliding force and relief pressure of oil pump.

   Rack sliding force: Less than 15.5 - 24.5 kgf

   Oil pump relief pressure: $8.8^{+0.4}_{-0.2}$ MPa (90^{+4}_{-2} kg/cm²)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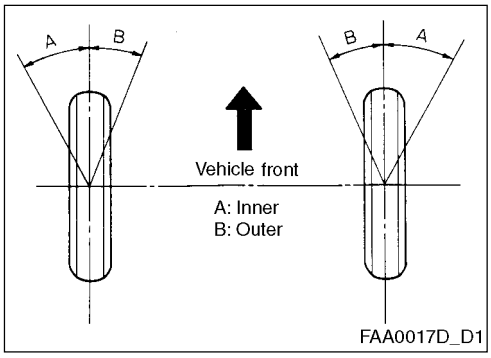

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STEERING ANGLE INSPECTION

- Perform the steering angle inspection after finishing the toe-in inspection. Keep the vehicle leveled by placing the front wheel on the turning radius gage and the rear wheels on the support with the same height with the turning radius gage. Inspect the maximum turning angle between the left and right inner wheels and the maximum turning angle between the left and right outer wheels.
- Temporarily start the engine and measure the steering angle by rotating the steering wheel to the left and right ends during idle.

Inner wheel	With 175 - size tire	37º	QG engine series
	With 185 - size tire		
Outer wheel	With 175 - size tire	31º	
	With 185 - size tire		

- If the measured value is out of the standard, then measure the rack stroke.

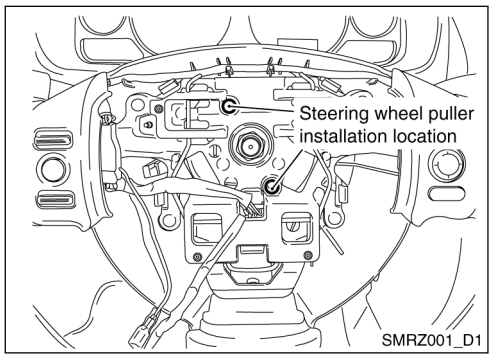
	Rack stroke	Engine model
With 175 - size tire	65.0 mm	QG15DE engine
With 185 - size tire	65.0 mm	QG15DE engine

- If the rack stroke is out of the standard value, disassemble the steering gear and inspect the rack stroke. Refer to “Removal • Installation” (ST-11).
- The steering angle cannot be adjusted. When the steering angle is out of the standard value, inspect the steering gear, column and front suspension for any wear and damages and replace if defective.

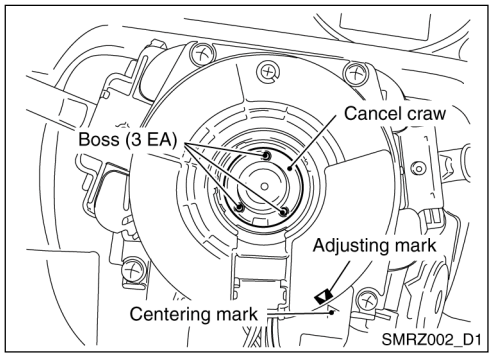
Removal • Installation

REMOVAL

1. Remove the airbag module. Refer to (RS-12).
2. Remove the horn connector.
3. Remove the steering wheel mounting nuts and put a alignment mark on the steering wheel assembly and column shaft head with a paint.



4. Remove the steering wheel using a steering wheel puller (commercial tool).



INSTALLATION

Install in the reverse order of removal by cautioning as below.

REFERENCE:

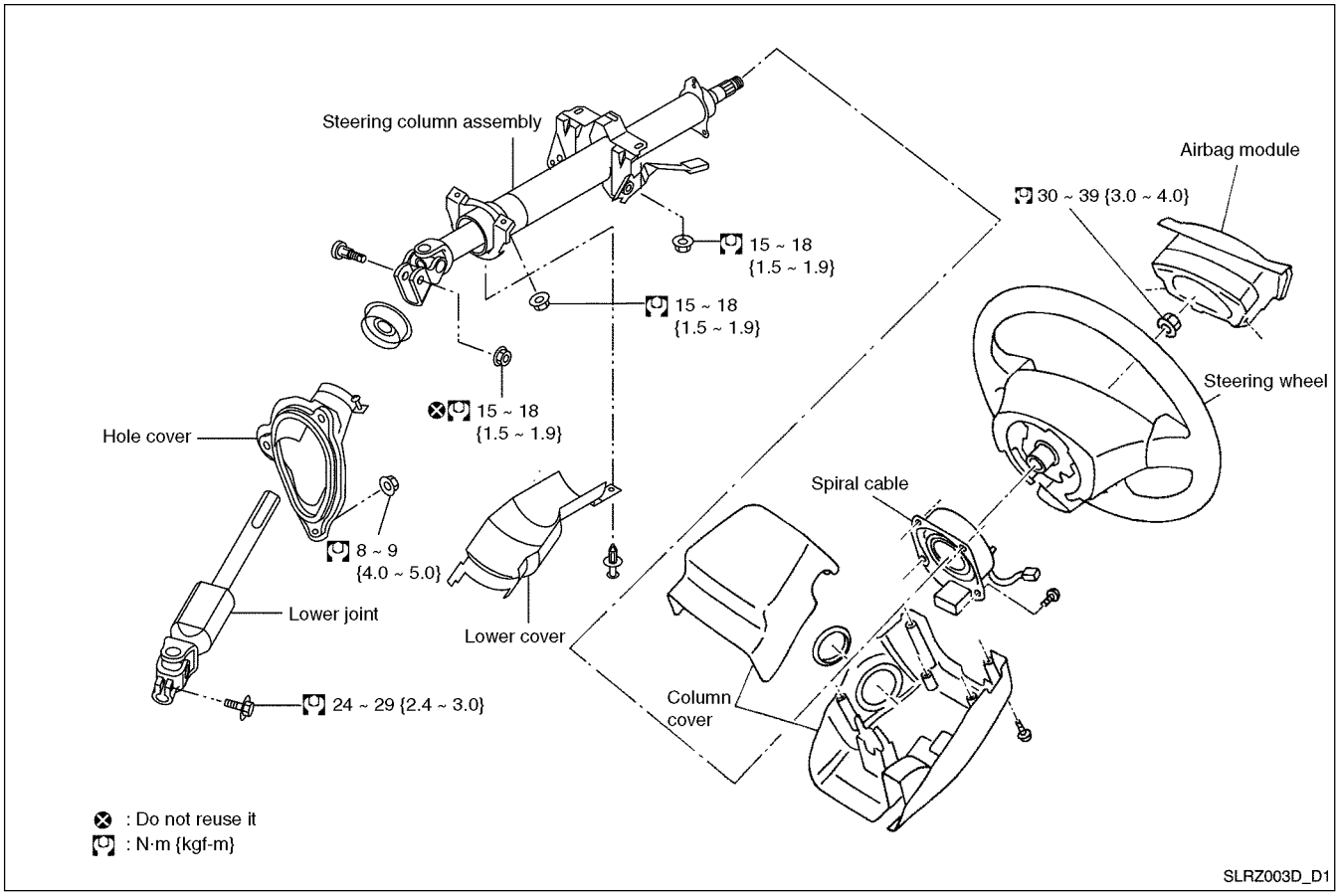
- **When reusing the spiral cable, you can skip the neutral position adjustment work if holding the spiral cable's mounting case and turning section with a tape.**
- **Neutral position (See illustration): Rotate the spiral cable to the right until getting tight and rotate in reverse direction (approx. 3 turns) to align the centering mark and adjust mark. (The spare parts are secured with a stopper while adjusted in neutral. So just install on the steering wheel after removing the stopper.)**

CAUTION:

- **While front wheels aligned straight, install the steering wheel by placing the cancel craw R mark downwards and aligning the 3 boss locations and the steering wheel assembly's rear 3 holes for steering wheel installation. Also, check if the spiral cable is at neutral position and install the steering wheel while the spiral cable locate pin in the left matches with the steering wheel assembly's behind locate hole.**
- **Do not turn the spiral cable unnecessarily. Also do not rotate excessively over its resistance (Cable may be damaged).**
- **After installation, check the normal operation of the system using airbag warning light.**
- **If the airbag warning light indicates defective, delete the stored memory using CONSULT-II.**
- **If airbag warning light is still on after the above procedure, diagnose the system and repair the defective part.**

Steering Column

Removal • Installation



CAUTION:

- **Be careful not to exert any impact to the steering column assembly perpendicularly during removal/installation.**

ROD JOINT AND HOLE COVER REMOVAL

1. Lift up the vehicle in the straight ahead position.
2. Put the alignment mark on the lower joint and steering gear with paint and remove the pin bolt under the lower joint.
3. Remove the lower cover on the upper lower joint, mounting bolts and nuts.
4. Remove the hole cover and lower joint from the vehicle.
5. Remove the clamp and lower seal cover from the hole cover.

LOWER JOINT AND HOLE COVER INSTALLATION

- Refer to the components diagram for tightening torque and install in the reverse order of removal.
- When installing the lower joint to the steering gear, check if the guide chip is in the pictured location and install it by adjusting the lower joint bottom's curved position (slit) with the guide chip protrusion.

STEERING COLUMN ASSEMBLY REMOVAL

1. Remove the steering wheel and column cover. Refer to "Removal • Installation" (ST-8).
2. Remove the instrument lower driver panel.
3. Remove the spiral cable. Refer to "Spiral Cable" (RS-13).

4. Remove the lower cover, mounting bolts and nuts from upper lower joint.
5. Remove the clamp and connector from the steering column assembly.
6. Remove the steering column assembly mounting nut and remove the steering column assembly from the vehicle.

CAUTION:

- **Do not deform the steering column assembly lower bracket during removal.**

STEERING COLUMN ASSEMBLY INSTALLATION

- Perform installation while the steering lock is released.

1. Insert the upper of the lower joint to the steering column assembly and install the steering column assembly to the vehicle using mounting nuts.
2. Install the lower cover, mounting bolts and nuts on the upper of the lower joint.

CAUTION:

- **The mounting nut cannot be reused. Do not reuse.**

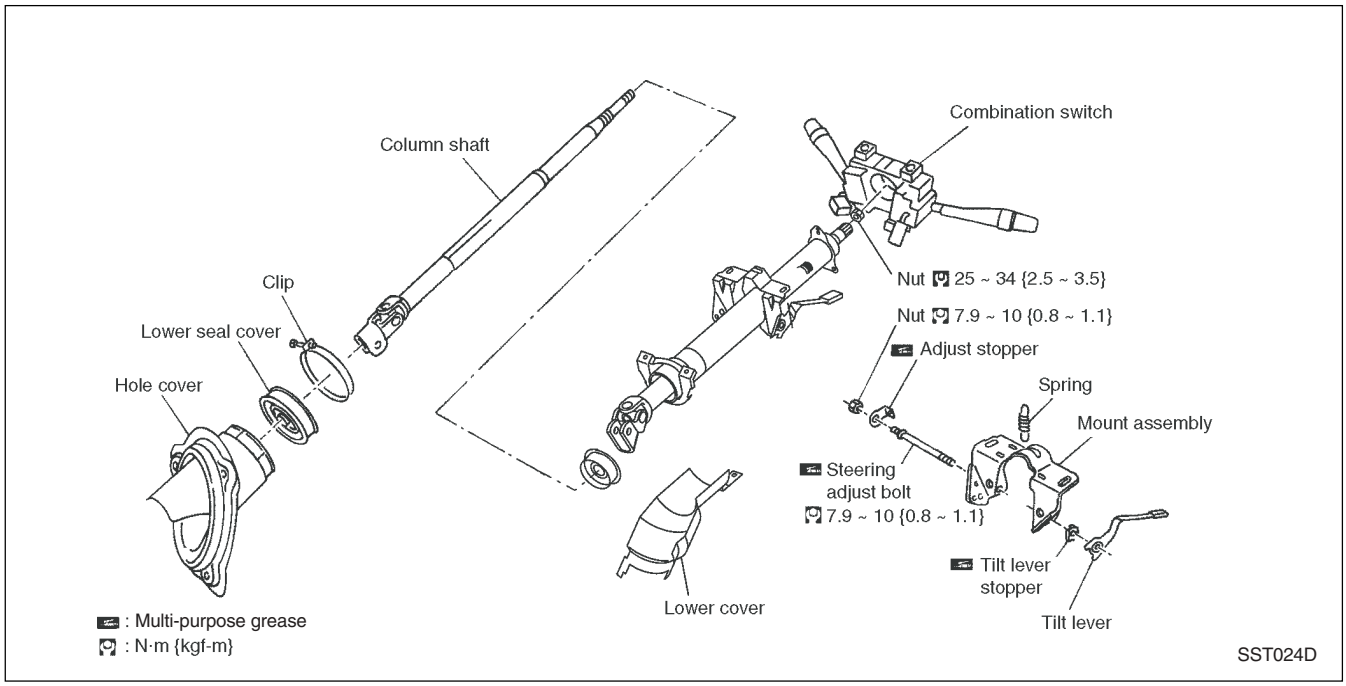
3. Install the clamp and connector.
4. Install the spiral cable. Refer to “Spiral Cable” (RS-13).
5. Install the instrument lower driver panel.
6. Install the steering wheel and column cover. Refer to “Removal • Installation” (ST-8).

CAUTION:

- **After installation, rotate the steering wheel and inspect if the steering wheel is rotating smoothly without any twisting, clogging, noises or too much steering efforts.**

Disassembly • Assembly

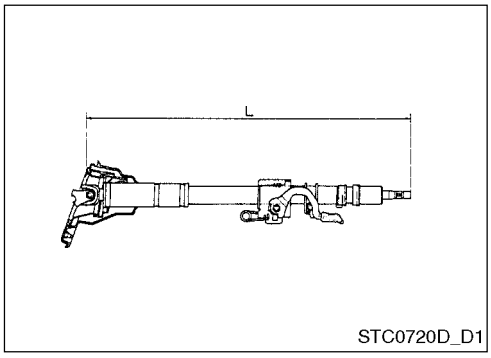
DISASSEMBLY



- Perform the disassembly and assembly after releasing the steering lock.

1. Remove the combination switch from the jacket tube.

2. Remove the mounting nut from the jacket tube and column shaft and remove the column shaft from the jacket tube.
3. Remove the spring from the mount assembly.
4. Remove the mounting nut and adjust stopper.
5. Remove the steering adjust bolt and remove the tilt lever stopper and tilt lever.



INSPECTION AFTER DISASSEMBLY

- If the steering wheel does not rotate properly, then replace the defective component as follows.

1. Inspect the column shaft bearing for any damages or defects. If defective, apply the grease or replace the column shaft if necessary.
2. Inspect the jacket tube for any deformation or damages and replace if defective.
   - If minor shock was exerted to the vehicle, inspect the length L as shown in the illustration. If out of the standard value, replace the steering column as an assembly.

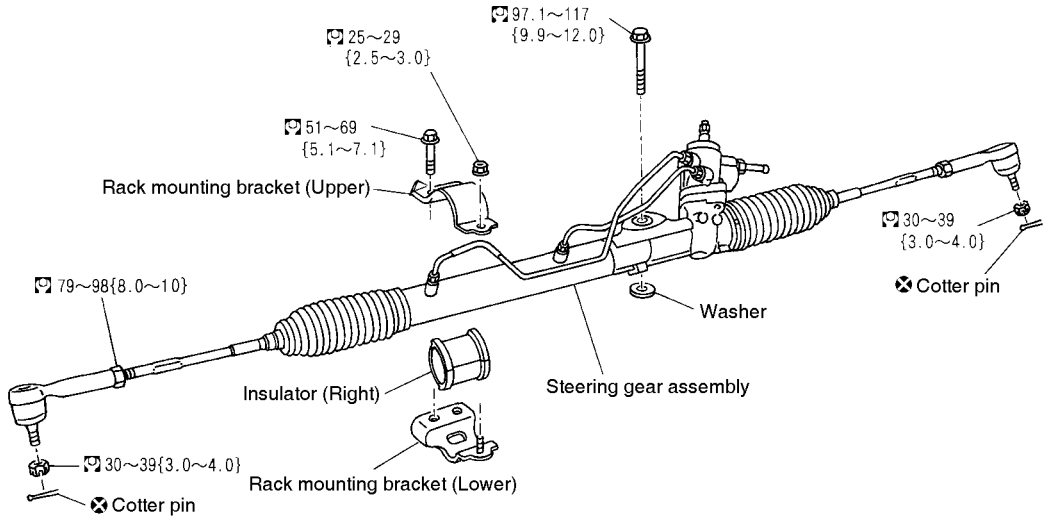
     Length L: 543 mm

ASSEMBLY

- Refer to the components diagram for tightening torque and assemble in the reverse order of disassembly.
- After assembling the steering column and inspect the tilting device.

Power Steering Gear

Removal • Installation



⊗ : Do not reuse it
: N•m {kgf−m}

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REMOVAL

1. Remove the cutter pin, release the mounting nuts and then remove the tie rod from the steering knuckle using a pitman arm puller (commercial tool).

CAUTION:

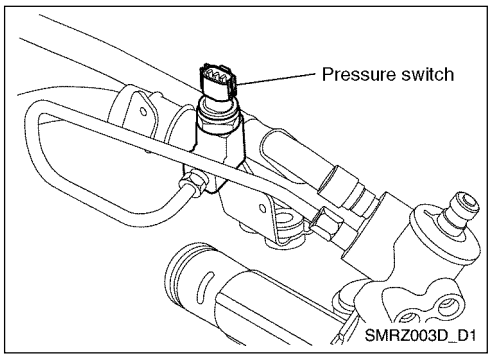
- **Be careful not to damage the dust boots on the tie rod ball joint.**
- **Lightly insert the nut when using the pitman arm puller (commercial tool).**

2. Put the alignment mark on the lower joint and steering gear with paint and remove the pinch bolt from lower joint gear side.
3. Remove the high pressure tube and low pressure hose from the steering gear.
4. Remove the upper mounting nut from the stabilizer connecting rod and mounting bolt from the stabilizer clamp and move the stabilizer towards the vehicle front.
5. Remove the steering gear assembly mounting bolts and nuts and remove the insulator (left), lower and upper mounting brackets from the steering gear assembly.
6. Remove the steering gear from the vehicle by changing the direction from the right side of the vehicle.

INSTALLATION

Install in the reverse order of removal by cautioning as below.

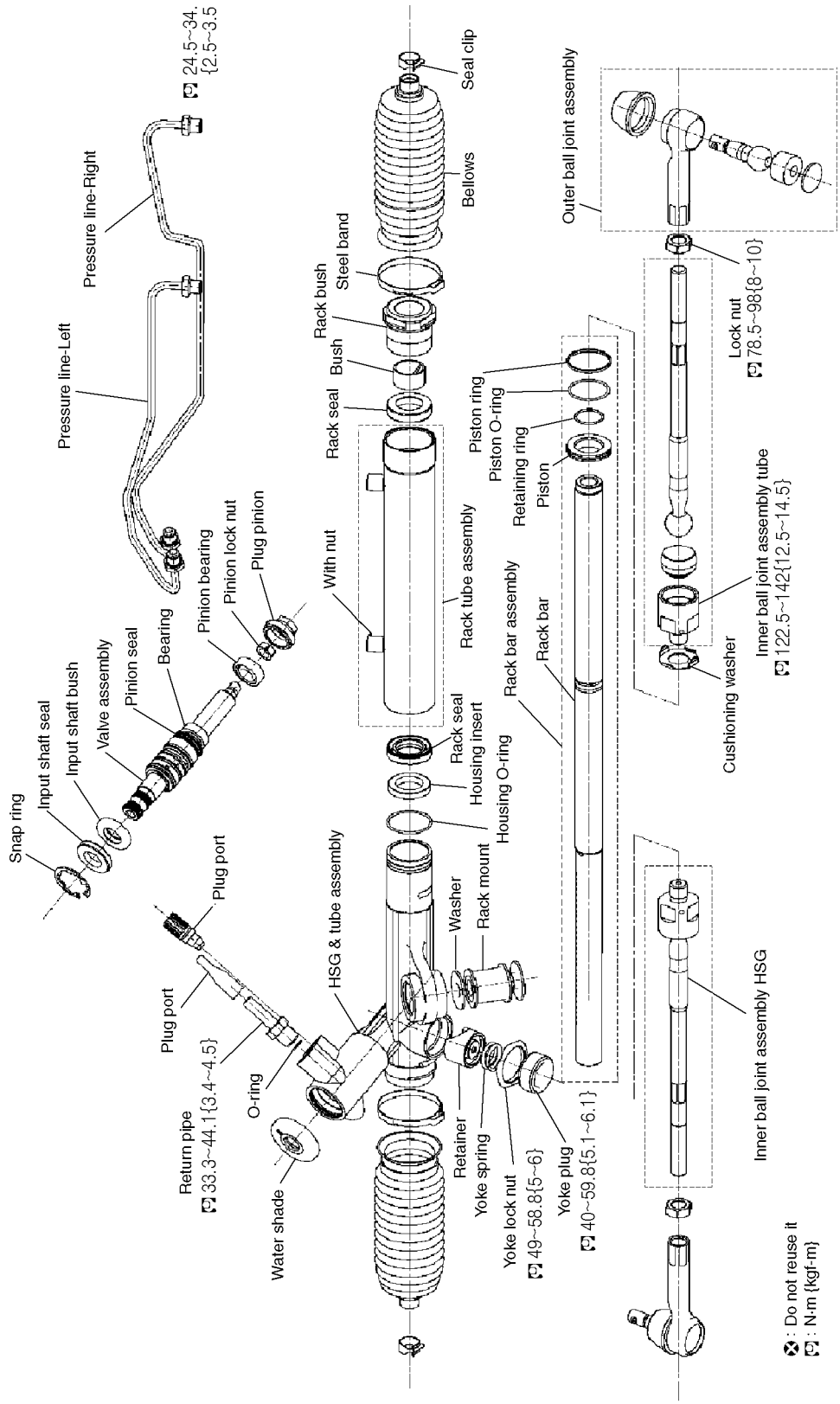
- Perform air bleeding after installation. Refer to “Air Bleeding” (ST-4).
- When installing the insulator (left), face the slit portion towards the front.
- When it is hard to install the lower joint to the steering gear, remove the lower cover, clip, mounting bolt and nuts from upper of the lower joint and install the lower joint by pushing it in.



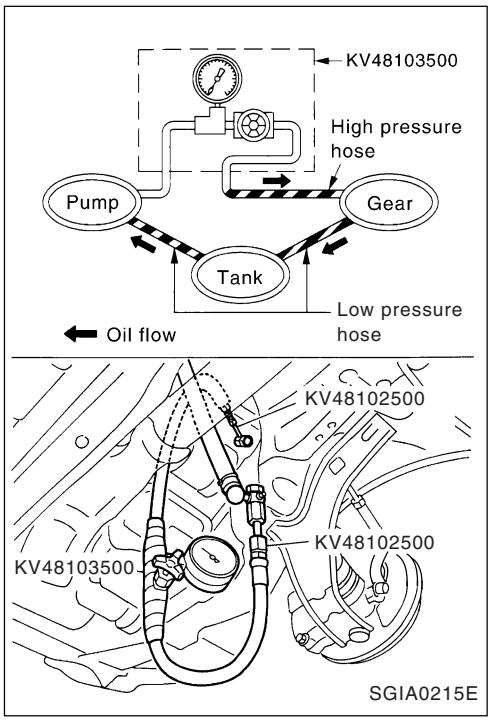
Air Switch

- During steering, it intakes auxiliary air to perform the RPM compensation according to initial steering amount.

Components Diagram



Power Steering Oil Pump



On-Vehicle Inspection and Service

OIL PUMP RELIEF OIL PRESSURE INSPECTION

Check the belt tension before inspection.

1. Lift up the vehicle and bleed air from the hydraulic line after installing the oil pressure meter (special tool) to oil pump outlet connector and high pressure hose.
2. Start the engine. Run the engine until the reservoir fluid temperature rises to 50 - 60°C.

CAUTION:

- **Open all oil pressure meter valves (special tool) during warming up. When the engine is started by closing all valves, the pressure in the oil pump increases up to the relief pressure and causing the oil temperature rise abnormally.**
- **Be careful to not touch the belt with the hose when starting the engine.**

3. Open all oil pressure meter valves during idle and measure the relief oil pressure.

   Relief oil pressure: 8.8 $^{+0.4}_{-0.2}$ MPa (90^{+4}_{-2} kgf/cm²)

4. Open the valve slowly after measurement.

CAUTION:

- **Never close the valve for more than 15 seconds.**

- When the relief oil pressure is out of the standard value, disassemble the oil pump. Refer to “Disassembly • Assembly” (ST-15).

5. Remove the oil pressure meter from the hydraulic circuit after inspection. Add fluid and perform air bleeding. Refer to “Air Bleeding” (ST-4).

Removal • Installation

REMOVAL

1. Loosen the adjustment screw and oil pump mounting bolts and remove the belt.
2. Remove the union bolt and hose from the oil pump.
3. Remove the oil pump bracket installation bolt.
4. Remove the oil pump from the vehicle.

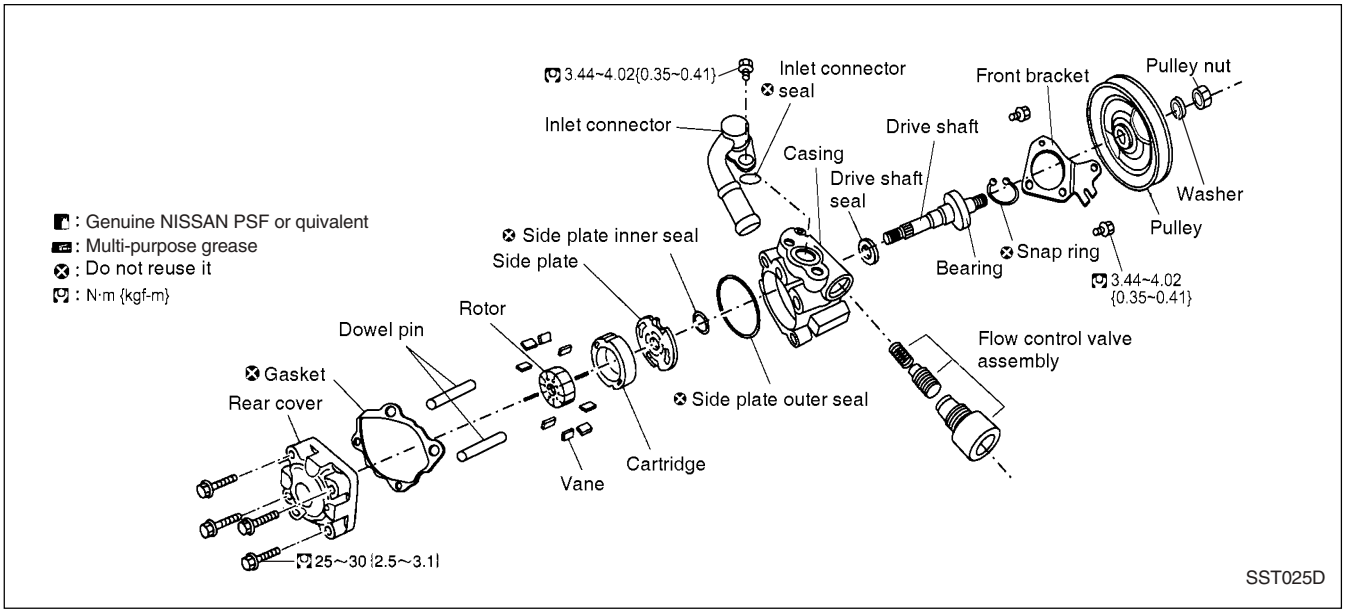
INSTALLATION

Install in the reverse order of removal by cautioning as below.

- Adjust the belt tension after installation.

- Always perform air bleeding after installation. Refer to “Air Bleeding” (ST-4).

Disassembly • Assembly



INSPECTION BEFORE DISASSEMBLY

Disassemble the power steering oil pump only in the following conditions.

- When there is oil leakage from the oil pump.
- When pulley is deformed or damaged.
- When performance goes down.

DISASSEMBLY

1. Secure the power steering pump to the vise.

CAUTION:

- **Use an aluminum plate to prevent from damaging the steering pump mounting surfaces.**

2. Remove the rear cover mounting bolts (4 EA) and remove the rear cover from the casing.
3. Remove the rear cover gasket.

CAUTION:

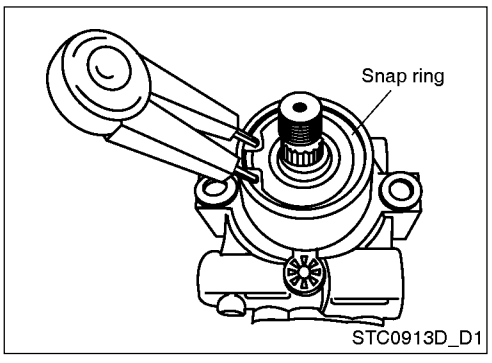
- **The rear cover gasket cannot be reused. Do not reuse.**

4. Remove the dowel pin, rotor, vane, cartridge, side plate, side plate outer seal, side plate inner seal, flow control valve and flow control valve spring assembly from the casing.

CAUTION:

- **Be careful not to drop and deform the flow control valve assembly.**

5. Remove the inlet connector mounting bolt (2 EA) and remove the inlet connector from the casing.



6. Remove the inlet connector seal from the inlet connector.

CAUTION:

- **The inlet connector seal cannot be reused. Do not reuse.**

7. Remove the pulley mounting nut and remove the pulley from the drive shaft.
8. Remove the front bracket mounting bolts (2 EA) and remove the front bracket from the casing.
9. Remove the snap ring using a snap ring pliers.

10 Remove the drive shaft and bearing from the case.

11. Remove the drive shaft seal from the case using a screwdriver.

CAUTION:

- **The drive shaft seal cannot be reused. Do not reuse. Be careful not to damage the drive shaft seal during installation.**

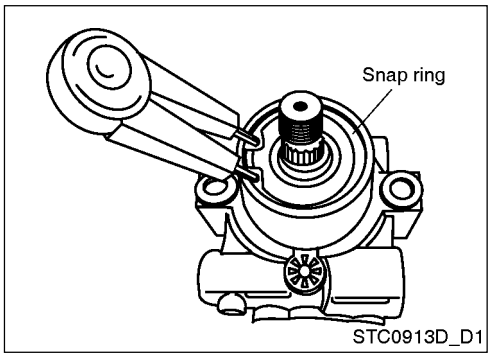
ASSEMBLY

1. Apply multi-purpose grease on the drive shaft surface and install the drive shaft seal to the casing using a drift (commercial tool).

CAUTION:

- **The drive shaft seal cannot be reused. Do not reuse. Be careful not to damage the drive shaft seal during installation.**

2. Apply multi-purpose grease on the bearing surface and install the drive shaft assembly by tapping with a rubber hammer.
3. Install the snap ring to the casing using a snap ring pliers.



CAUTION:

- **The snap ring cannot be reused. Do not reuse.**

4. Install the front bracket and tighten the mounting bolts (2 EA) to the specified torque.
5. Install the pulley to the drive shaft and tighten the mounting bolt to the specified torque.
6. Insert the inlet connector seal into the flow control valve, flow control valve spring assembly and inlet connector and install them to the casing.

CAUTION:

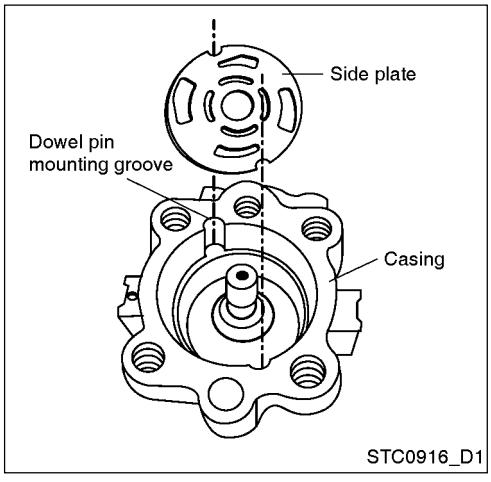
- **The inlet connector seal cannot be reused. Do not reuse.**

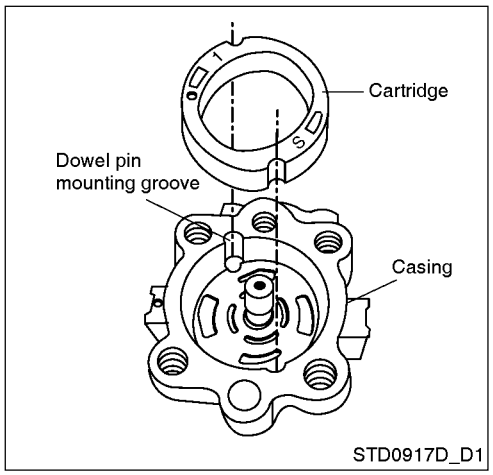
7. Install the side plate outer seal and side plate inner seal casing.

CAUTION:

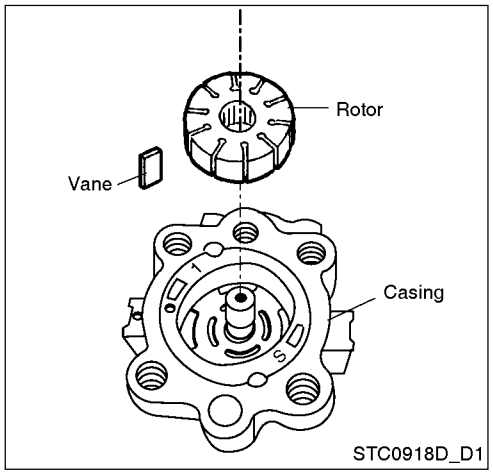
- **The side plate outer seal and side plate inner seal cannot be reused. Do not reuse.**

8. Install the side plate to the casing by aligning the side plate end to the dowel pin mounting groove inside the casing.





9. Install cartridge end to the casing by aligning the end with the dowel pin mounting groove so that the stamped portion faces upwards.



10. Install the rotor to the drive shaft.
11. Install the vane to the rotor.

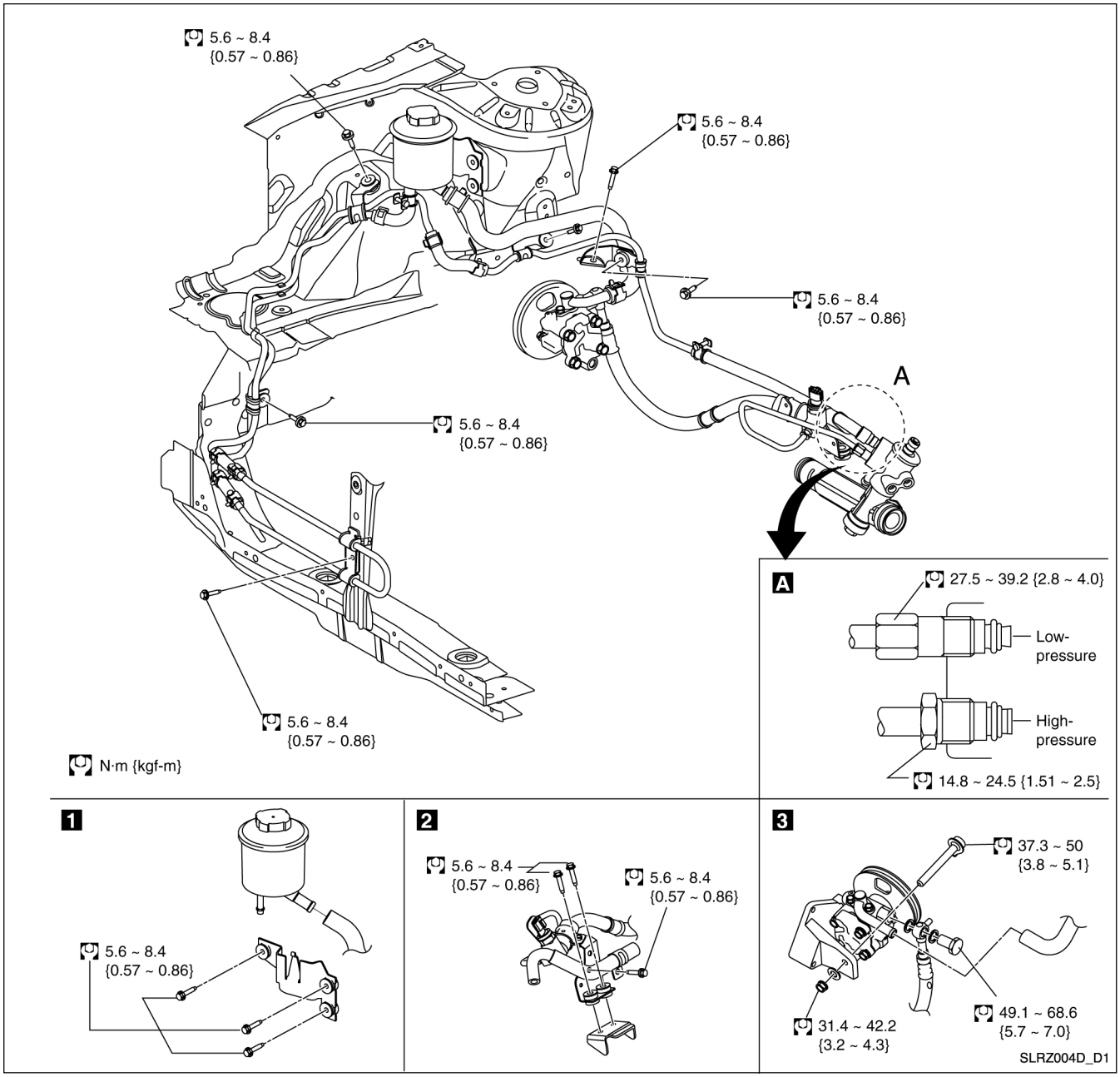
12. After installing the rear cover gasket, install the rear cover with dowel pin and tighten the mounting bolts (4 EA) to the specified torque diagonally.

CAUTION:

- **The rear cover gasket cannot be reused. Do not reuse.**

Hydraulic Line

Removal • Installation



Service Data

Steering Wheel

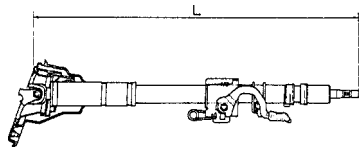
Steering wheel axial endplay	(mm)	0
Steering wheel freeplay	(mm)	0 - 35

Steering Angle

Engine model	Drive type	Tire size	Inner	Outer
QG16DE	Front wheel drive	175/70 R14	37° +1 -3	31.0°
		185/65 R14		

Steering Column

Steering column length “L”	543 mm



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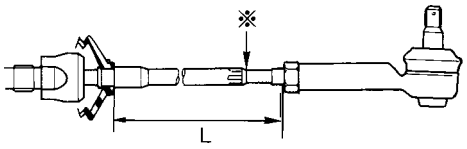
Steering Connection

Steering gear type		Rack and pinion
Tie rod ball joint outer socket	Turning torque N•m (kgf-m)	0.39 - 2.84 (0.04 - 0.29)
	Spring scale measured value (kg) (Measuring point: Stud bolt hole)	0.88 - 6.37
	Swing force N•m (kgf-m)	0.29 - 2.84 (0.03 - 0.29)
	Axle endplay (mm)	0
Tie rod ball joint inner socket	Turning torque N•m (kgf-m)	0.78 - 7.74 (0.08 - 0.79)
	Spring scale measured value (kg) (Measuring point: * marked)	0.60 - 5.70
	Axle endplay (mm)	0

Steering gear type	Rack and pinion
Tie rod length “L” (mm)	171 ± 1.5



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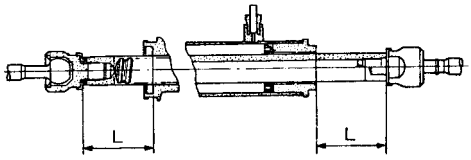
Steering Gear

Steering gear type	Rack and pinion
Rack neutral location “L”(mm)	65.0



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Steering gear type				Rack and pinion
Retainer adjustment	Screw lock nut tightening torque		N•m (kgf-m)	4.99 - 6.0 (0.51-0.61)
	Initial tightening torque		N•m (kgf-m)	19.6 (2.0)
	Second tightening torque after initial tightening		N•m (kgf-m)	5.4 ± 0.5 (0.5 - 0.6)
	Adjust screw loosening (Angle)		(°)	35
Rack sliding force	± 11.5 m from the neutral position (Power ON)	Area average value	(kg)	15.5 - 24.5
		Fluctuation	(kg)	Less than 10
	All area (Power OFF)	Maximum	(kg)	Less than 30.0
		Fluctuation	(kg)	Less than 15.0

Oil Pump

Oil pump relief pressure (MPa (kgf/cm^2))	With QG series engine	$8.8^{+0.4}_{-0.2}$ (90^{+4}_{-2})

Steering Fluid

Capacity	Approx. 1.1 L

Tightening Torque

Unit: N•m (kgf-m)

Steering wheel nut		3.0 - 4.0 (0.3-0.4)
Steering gear - Suspension member		Left mounting bolt: 9.90 - 12.0 (1.0-1.2) Right mounting bolt: 5.1 - 7.1 (0.52-0.72) Right mounting nut: 2.5 - 3.0 (0.25-0.30)
Steering gear - Steering column		2.4 - 3.0 (0.24-0.3)
Outer socket - Steering knuckle		3.0 - 4.0 (0.3-0.41)
Tie rod lock nut		8.0 - 10 (0.81-1.02)
Oil pump mounting bolt		3.2 - 4.3 (0.33-0.44)
Hydraulic tube (High pressure) - Oil pump		5.0 - 7.0 (0.51-0.71)
Hydraulic tube - Steering gear	High pressure	1.5 - 2.5 (0.15-0.25)
	Low pressure	3.4 - 4.5 (0.35-0.46)

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Precaution

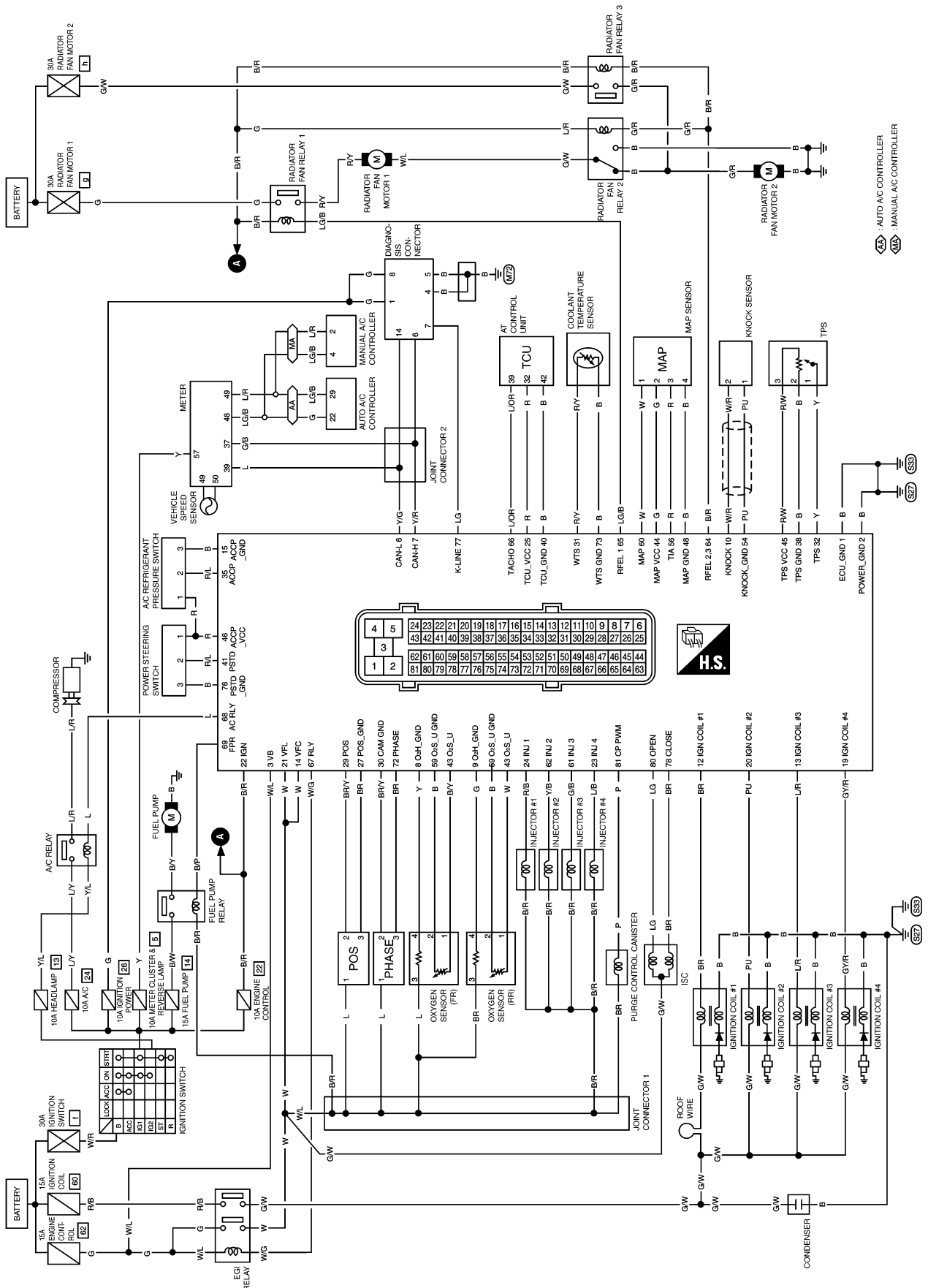
Precautions for Supplemental Restraint System (SRS) “AIR BAG” and “SEAT BELT PRE-TENSIONER”

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

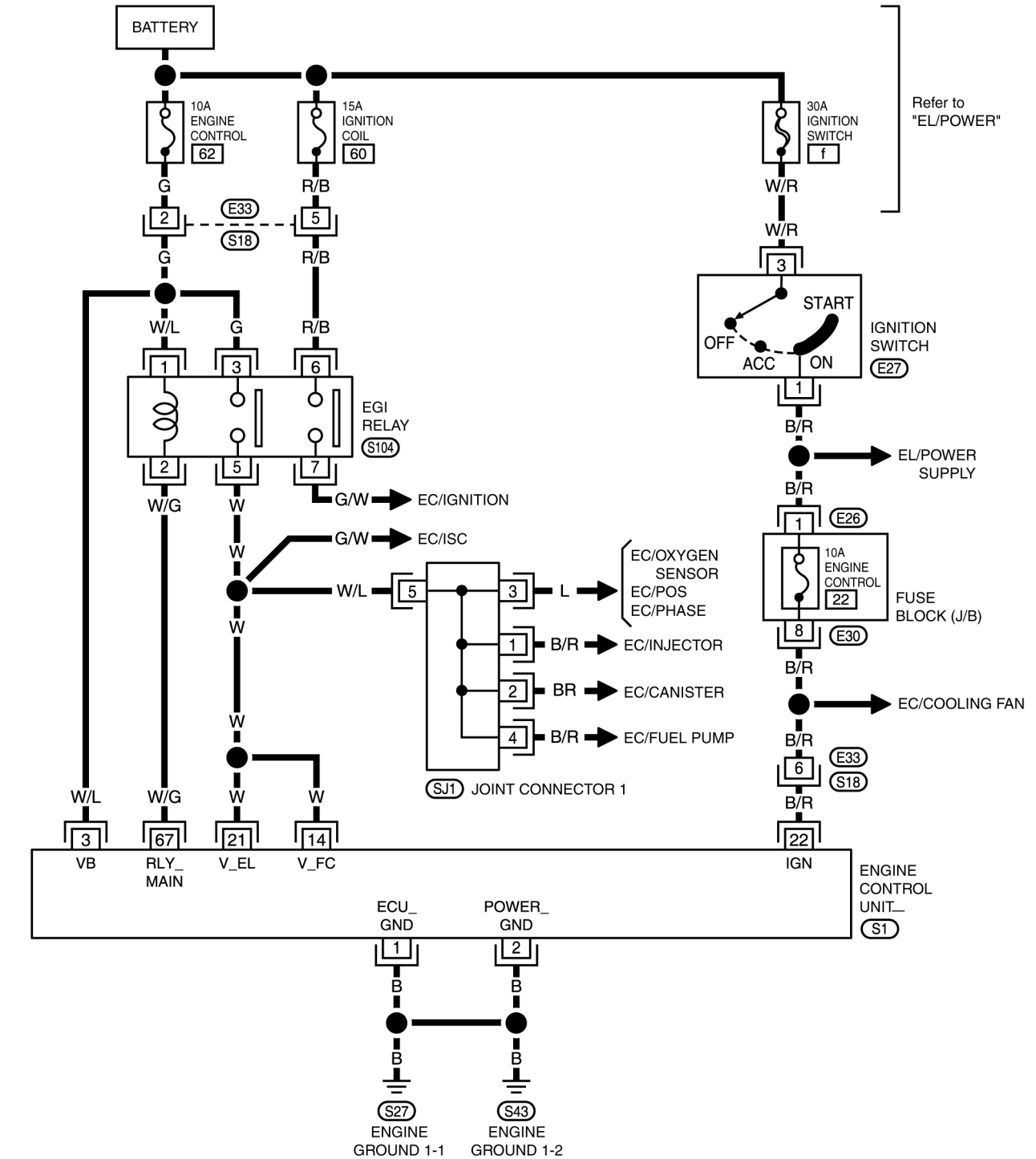
WARNING:

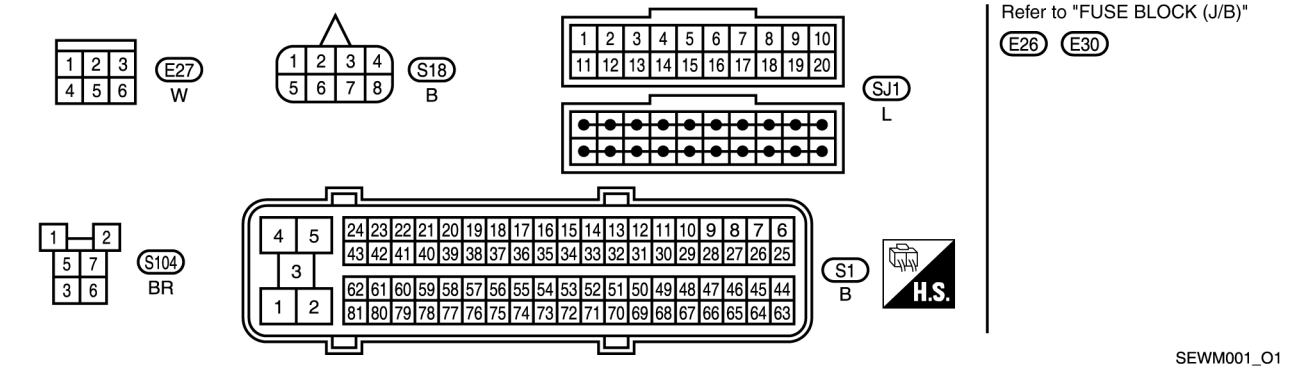
- **To install/remove the SRS airbag, pretensioner seatbelt system related components and harness, turn the ignition switch “OFF”, disconnect the battery terminals and wait over 3 minutes. (This is to discharge all the remaining electricity in the airbag sensor unit’s auxiliary power circuit.)**
- **Do not use air impact or electrical tools when installing/removing the components.**
- **Do not use any hand-held tools for harness used in SRS airbag and pretensioner seatbelt systems. Be careful with the harness not to tangle with or interfere with other components.**
- **Do not use any electrical test equipments such as circuit tester when inspecting the SRS airbag and pretensioner seatbelt circuit while installed unless the Service Manual instructs to do so. (The weak current in the tester can cause the SRS airbag to operate.)**
- **Do not insert any foreign materials such as a screwdriver in the airbag module and pretensioner seatbelt connector in order to prevent unintended operation due to static electricity.**
- **The harnesses used in SRS airbag and pretensioner are covered with yellow insulation for easy identification.**
- **Refer to “RS Restraint System” in this Service Manual for safe airbag system service information.**

Circuit Diagram



Wiring Diagram — EC/Power & Ground

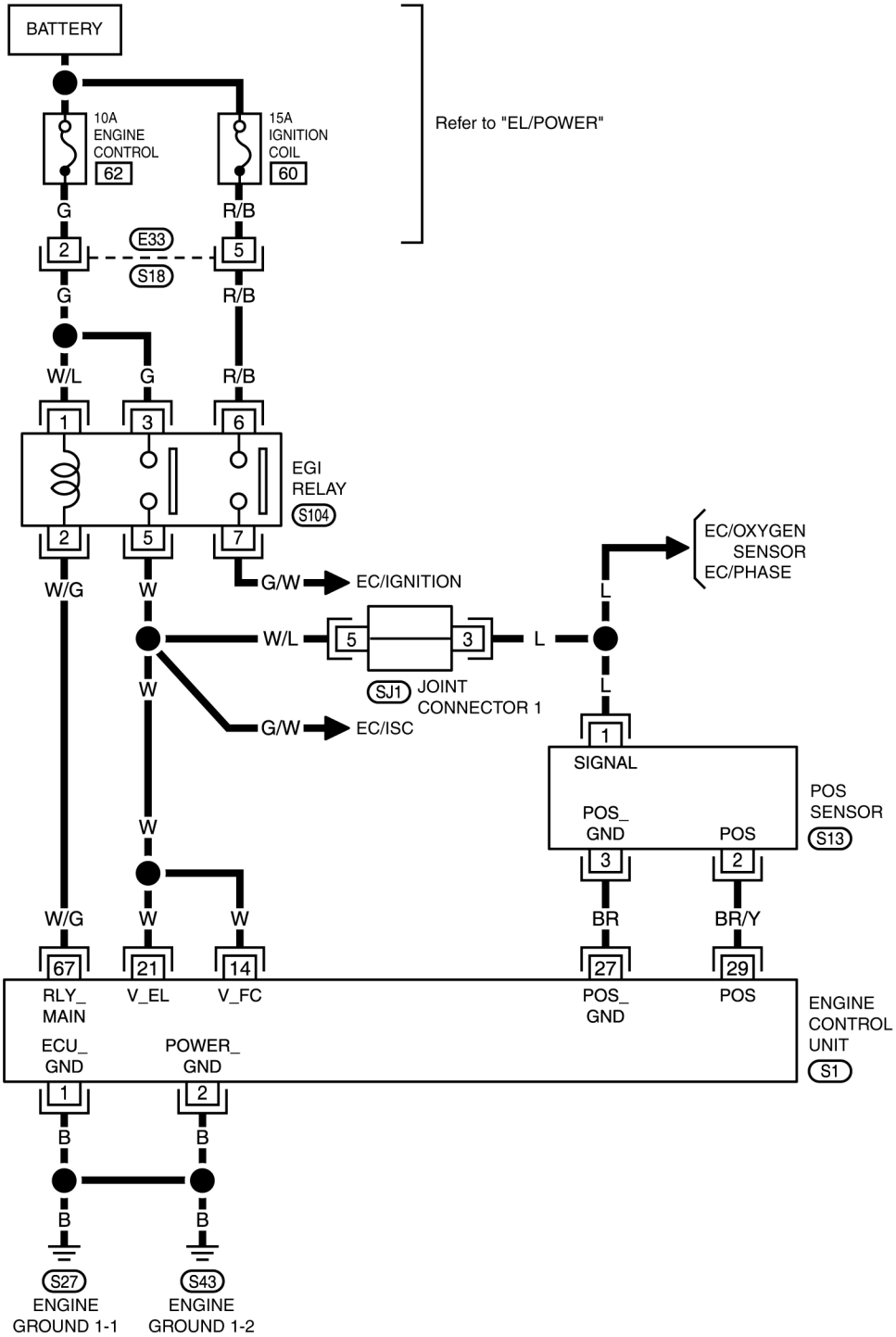


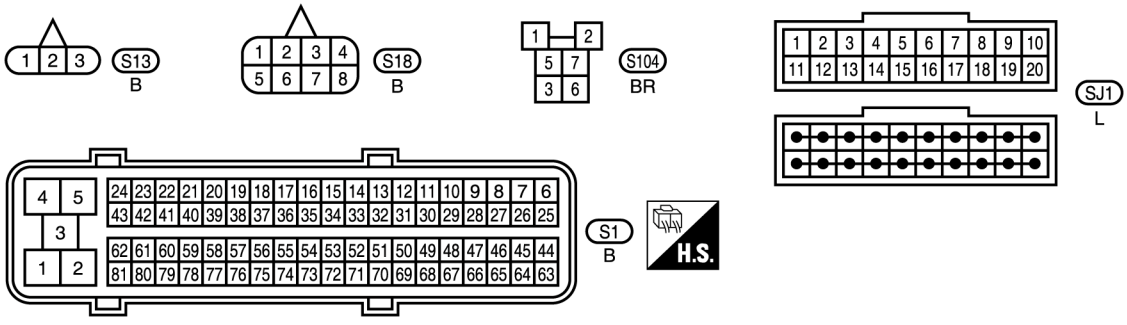


SEWM001_O1

Wiring Diagram

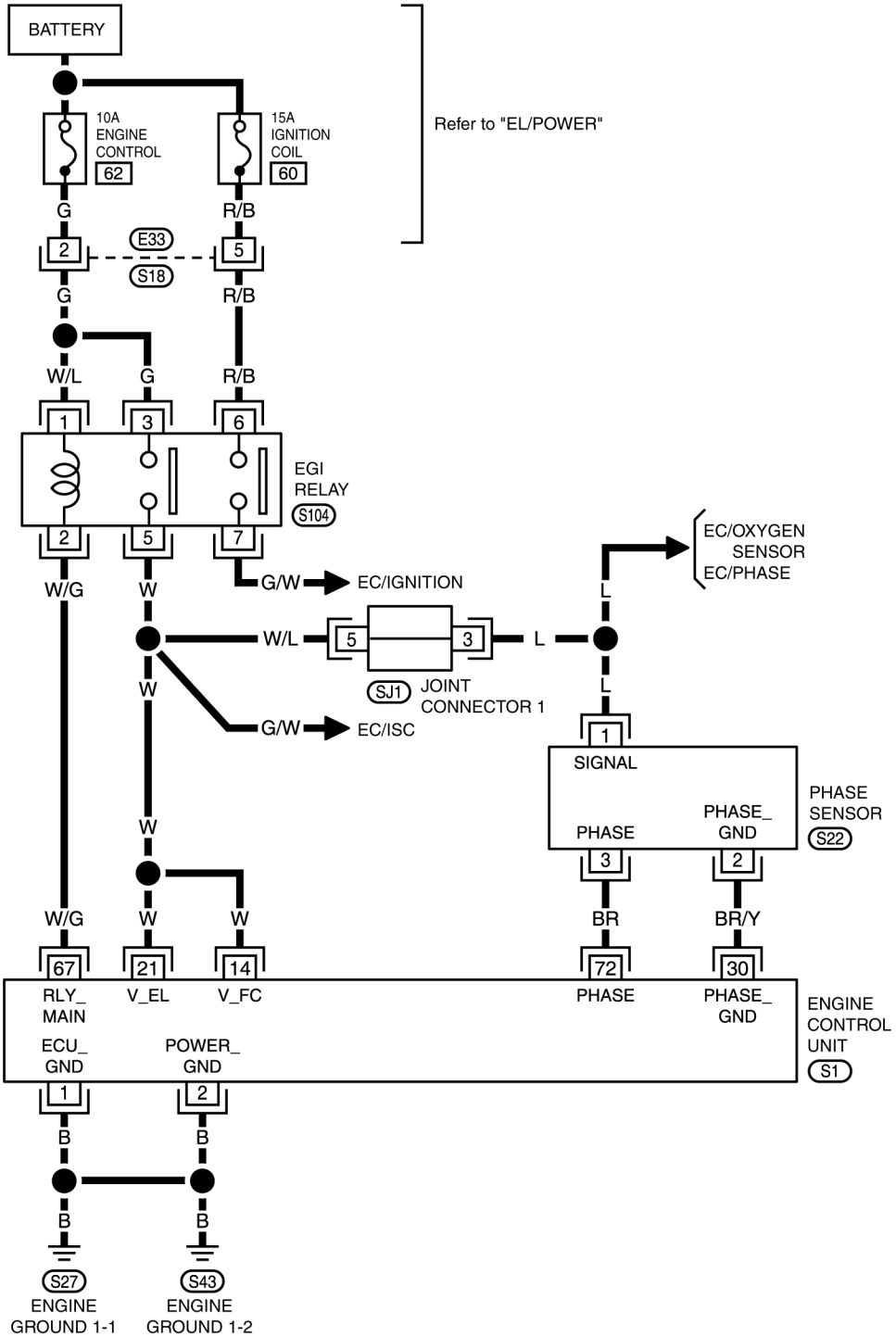
EC/POS

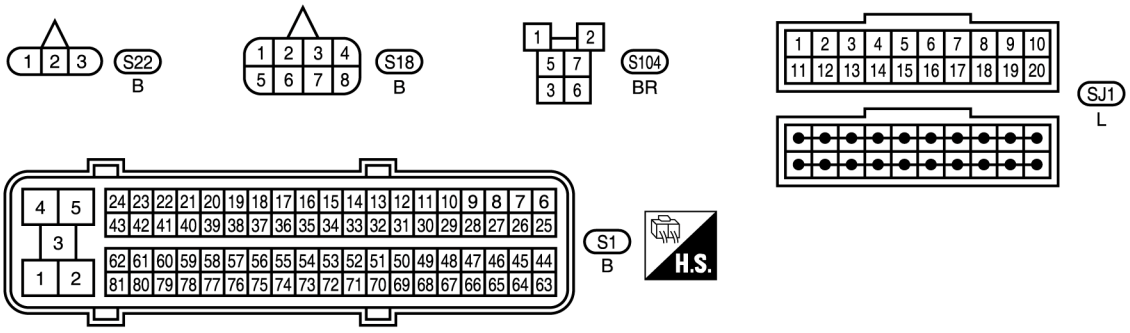




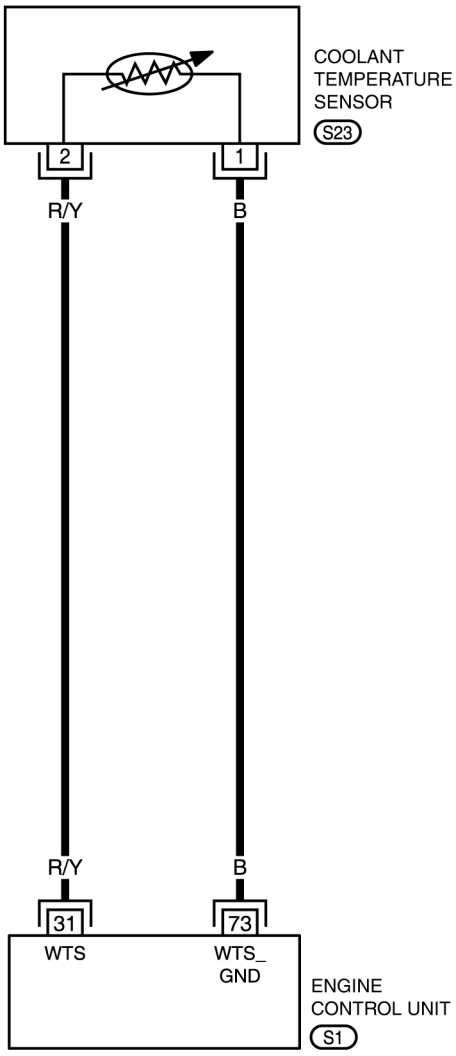
SEWM002_O1

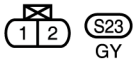
Wiring Diagram — EC/PHASE

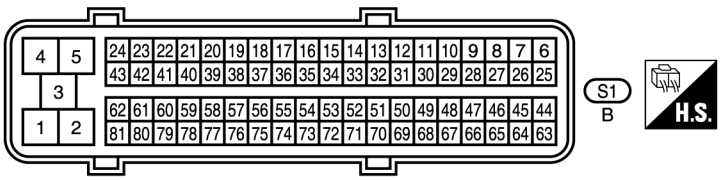




SEWM003_O1

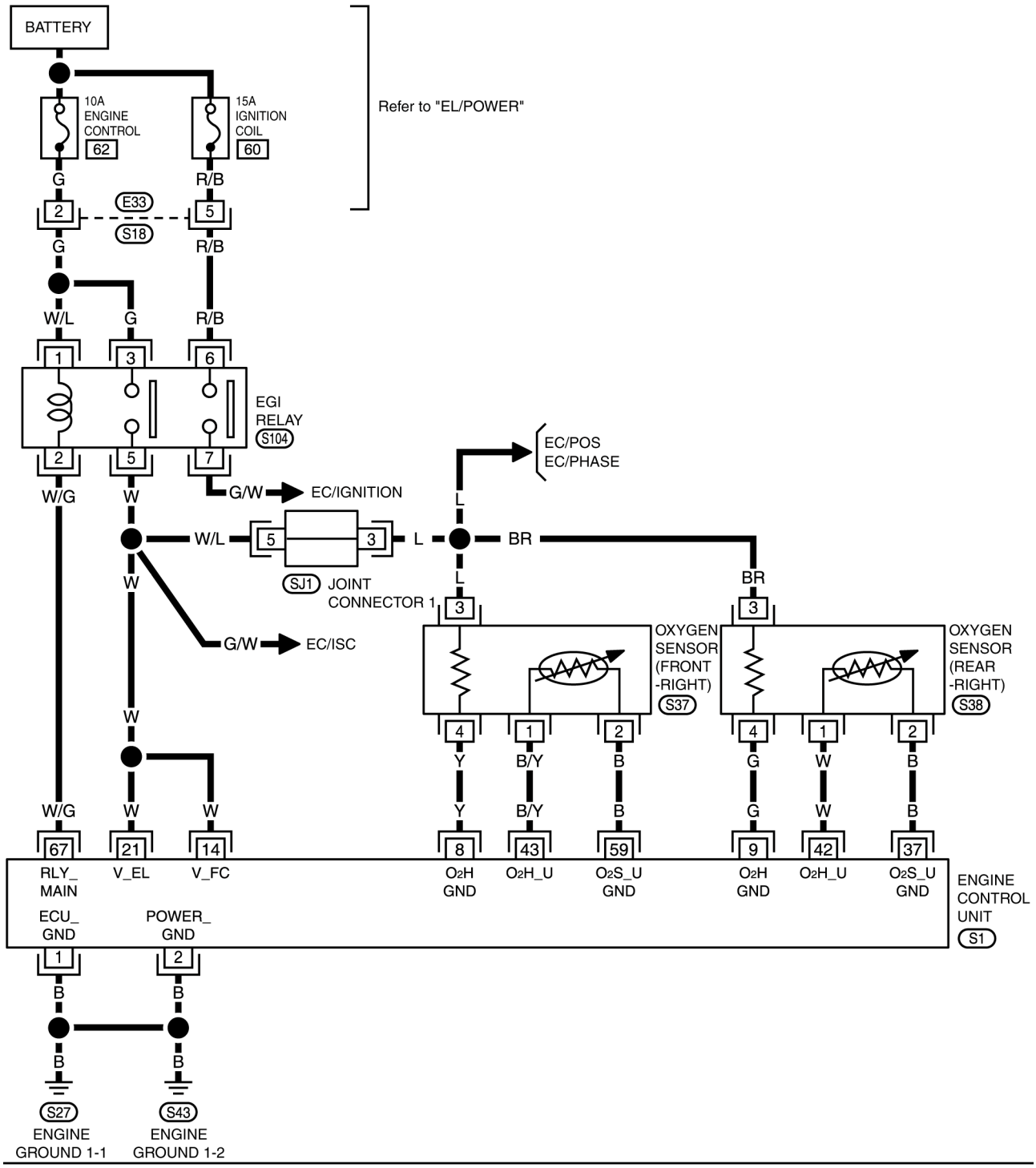

COOLANT
TEMPERATURE
SENSOR
S23
2
1
R/Y
B
R/Y
B
31
73
WTS
WTS_
GND
ENGINE
CONTROL UNIT
S1

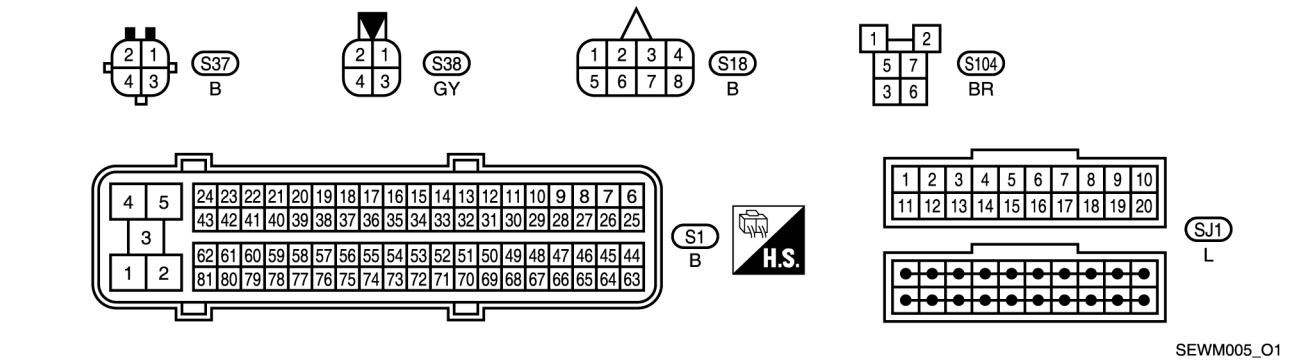

1 2
S23
GY


4 5
3
1 2
24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6
43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25
62 61 60 59 58 57 56 55 54 53 52 51 50 49 48 47 46 45 44
81 80 79 78 77 76 75 74 73 72 71 70 69 68 67 66 65 64 63
S1
B
H.S.

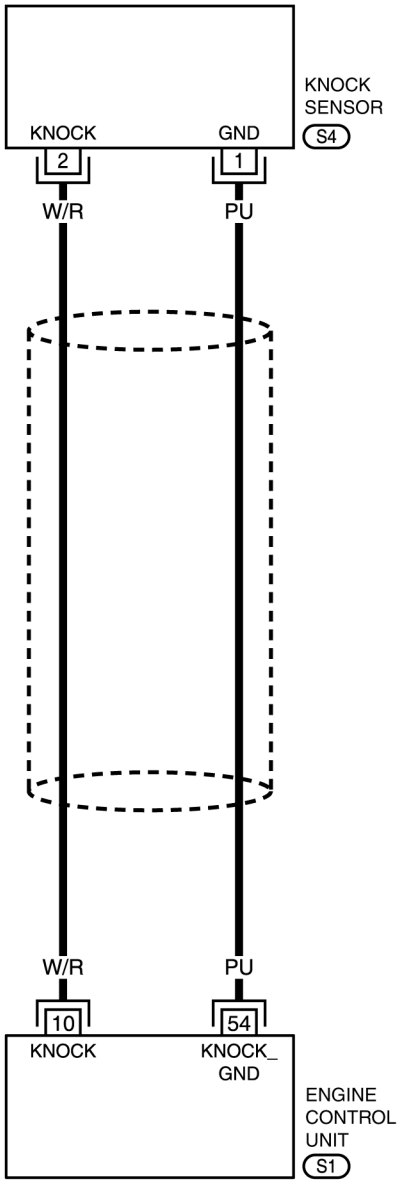
SEWM004_O1

Wiring Diagram — EC/Oxygen Sensor

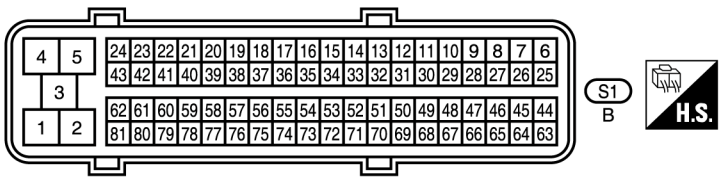




SEWM005_O1

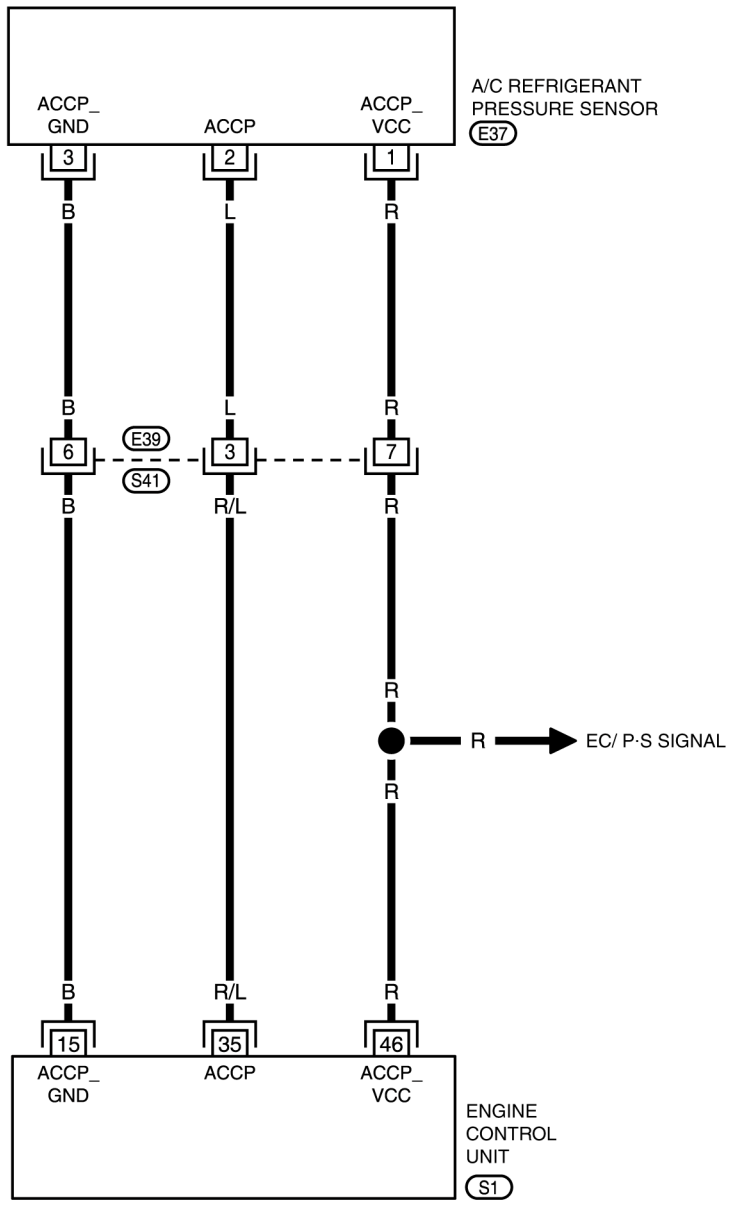

KNOCK SENSOR
S4
KNOCK
GND
2
1
W/R
PU
W/R
PU
10
54
KNOCK
KNOCK_ GND
ENGINE CONTROL UNIT
S1

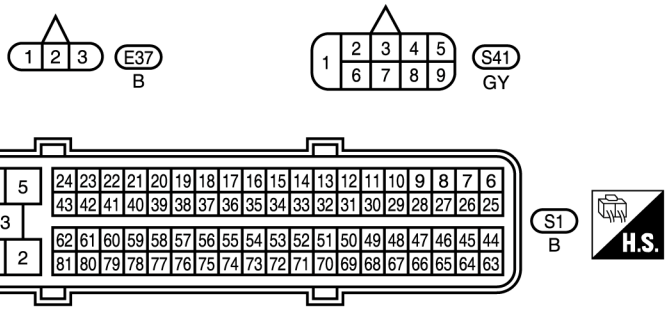
2 1
S4
B


4 5
3
1 2
24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6
43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25
62 61 60 59 58 57 56 55 54 53 52 51 50 49 48 47 46 45 44
81 80 79 78 77 76 75 74 73 72 71 70 69 68 67 66 65 64 63
S1
B
H.S.

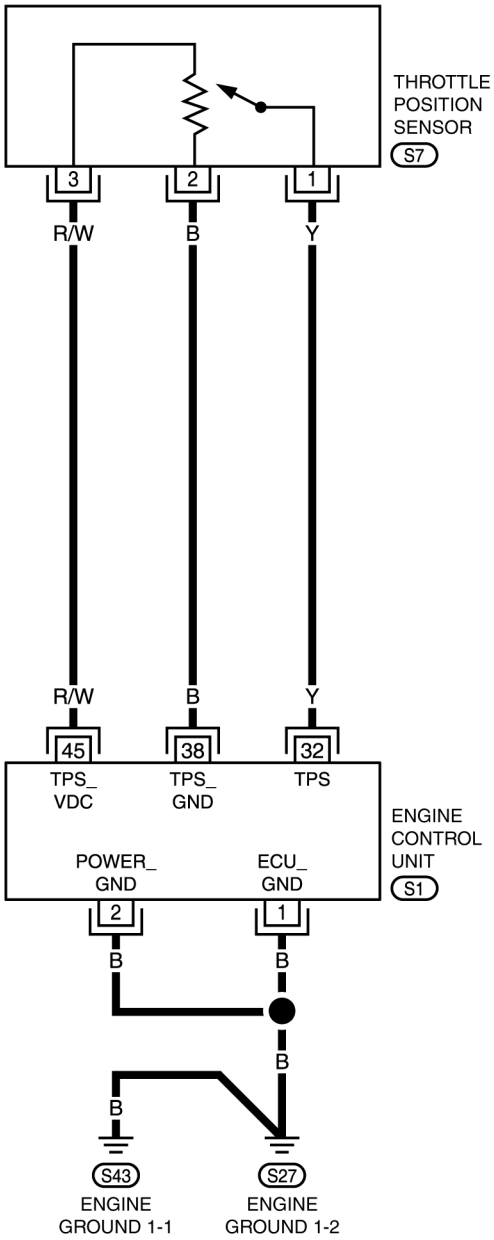
SEWM006_O1

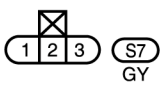
Wiring Diagram — EC/A/C Refrigerant Pressure Sensor

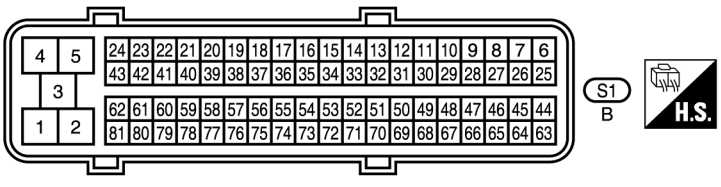




SEWM007_O1

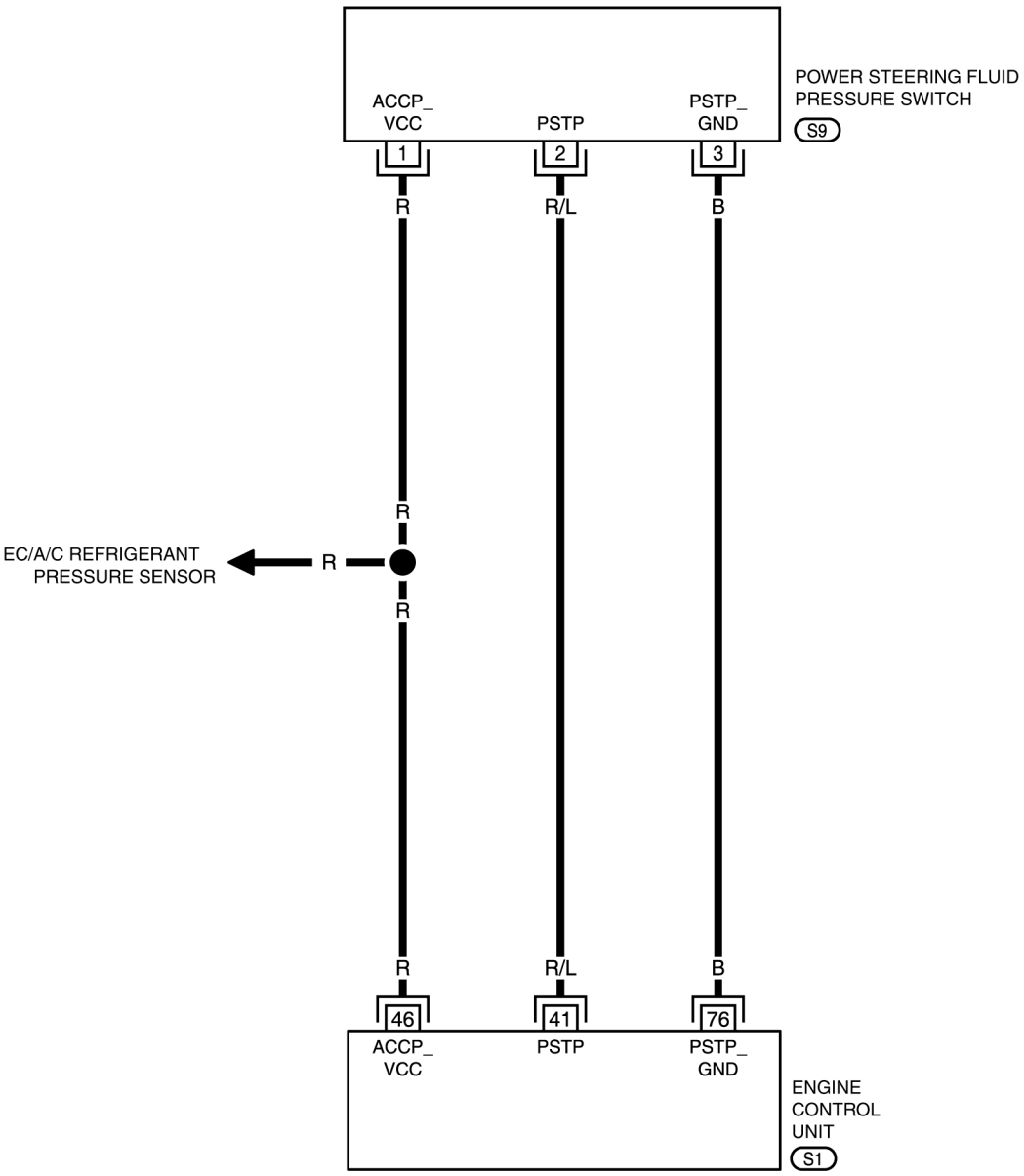

THROTTLE POSITION SENSOR
S7
3
2
1
R/W
B
Y
R/W
B
Y
45
38
32
TPS_ VDC
TPS_ GND
TPS
ENGINE CONTROL UNIT
S1
POWER_ GND
ECU_ GND
2
1
B
B
B
B
S43
S27
ENGINE GROUND 1-1
ENGINE GROUND 1-2

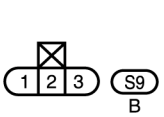

1 2 3
S7
GY

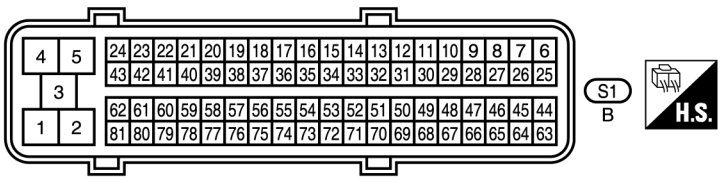

4 5
3
1 2
24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6
43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25
62 61 60 59 58 57 56 55 54 53 52 51 50 49 48 47 46 45 44
81 80 79 78 77 76 75 74 73 72 71 70 69 68 67 66 65 64 63
S1
B
H.S.

SEWM008_O1

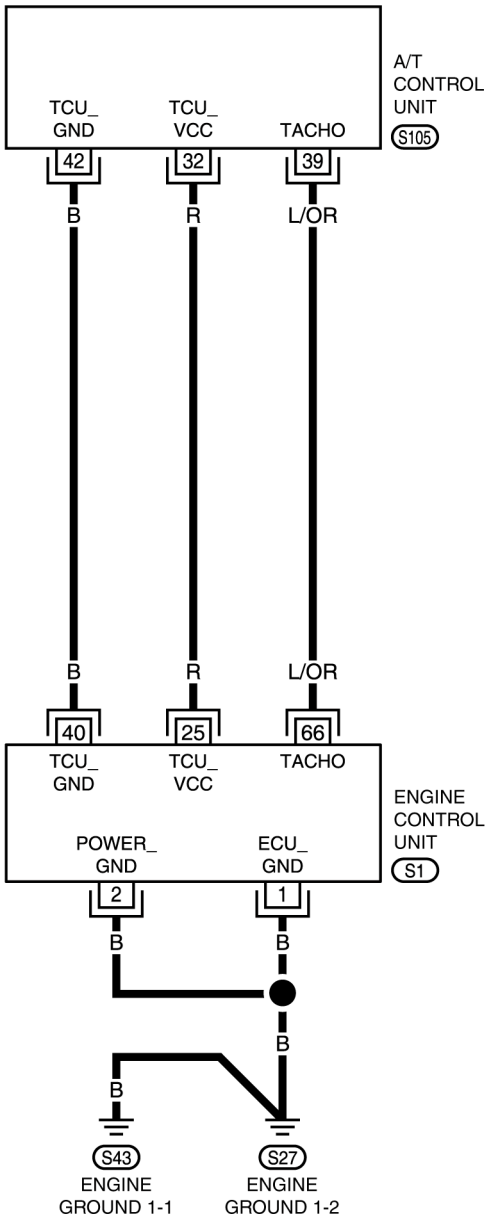
Wiring Diagram — EC/P·S Signal

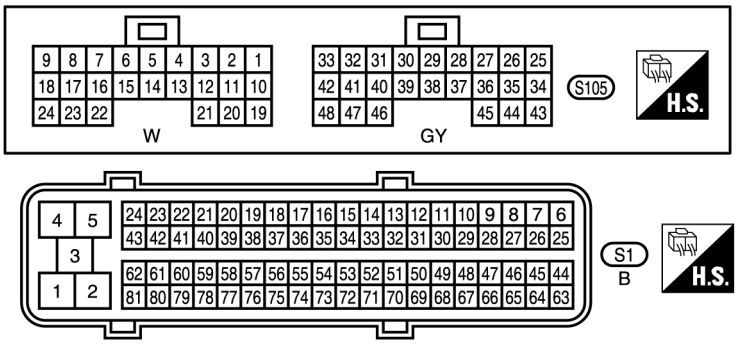






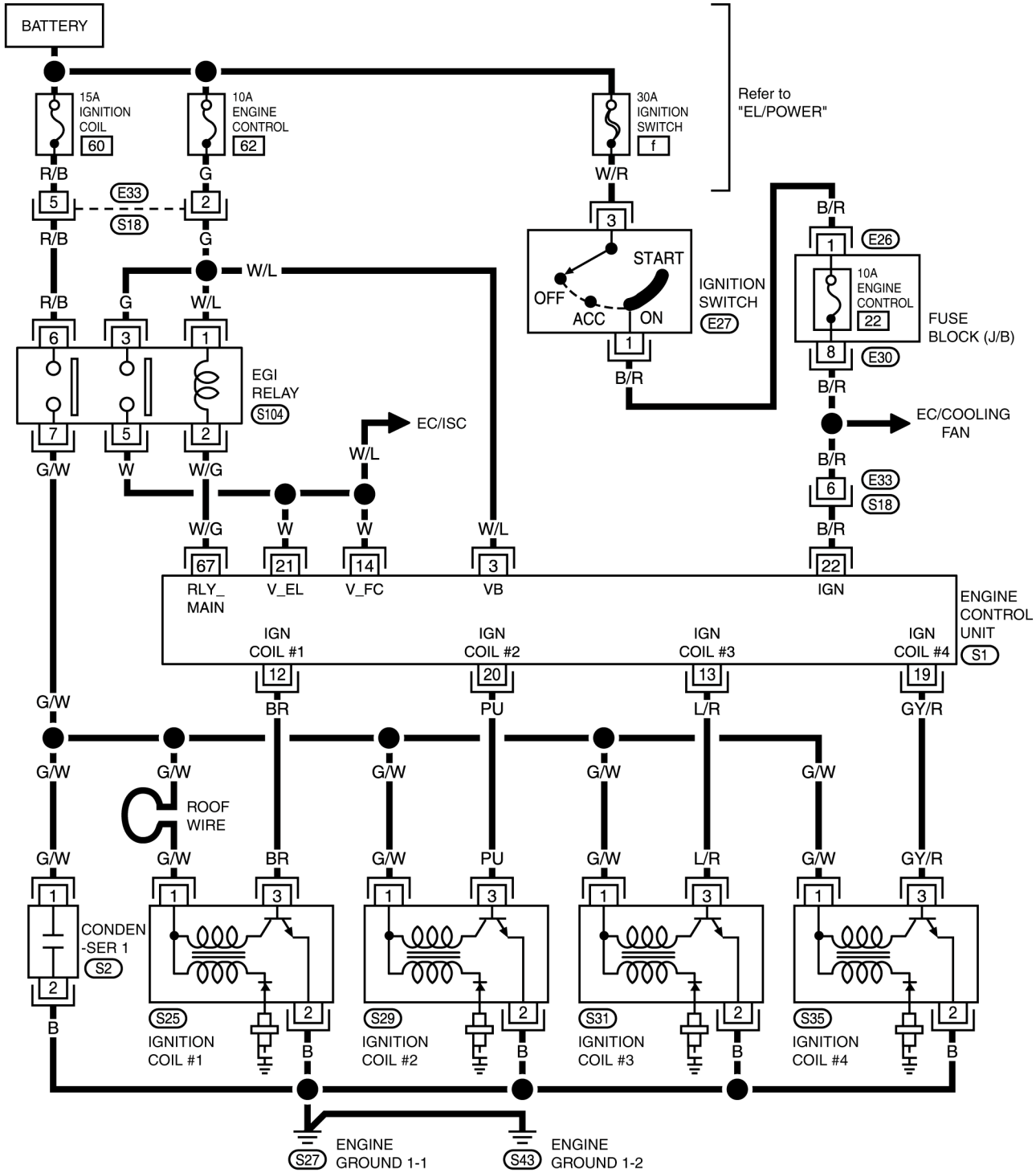
SEWM009_O1

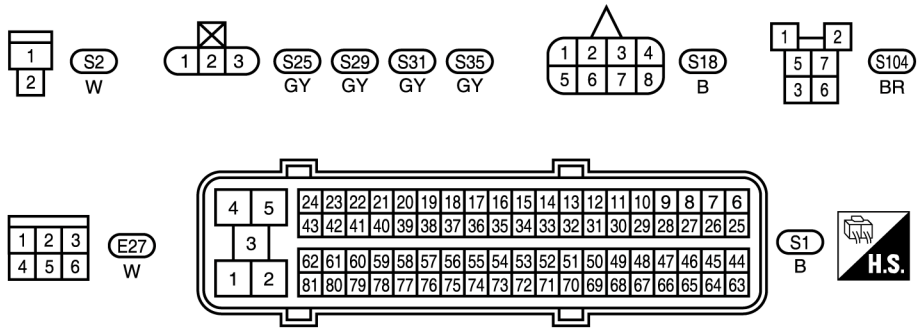

A/T
CONTROL
UNIT
S105
TCU_
GND
TCU_
VCC
TACHO
42
32
39
B
R
L/OR
B
R
L/OR
40
25
66
TCU_
GND
TCU_
VCC
TACHO
ENGINE
CONTROL
UNIT
S1
POWER_
GND
ECU_
GND
2
1
B
B
B
B
S43
S27
ENGINE
GROUND 1-1
ENGINE
GROUND 1-2


9 8 7 6 5 4 3 2 1
18 17 16 15 14 13 12 11 10
24 23 22 21 20 19
W
33 32 31 30 29 28 27 26 25
42 41 40 39 38 37 36 35 34
48 47 46 45 44 43
GY
S105
H.S.
4 5
3
1 2
24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6
43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25
62 61 60 59 58 57 56 55 54 53 52 51 50 49 48 47 46 45 44
81 80 79 78 77 76 75 74 73 72 71 70 69 68 67 66 65 64 63
S1
B
H.S.

SEWM010_O1

Wiring Diagram — EC/Ignition

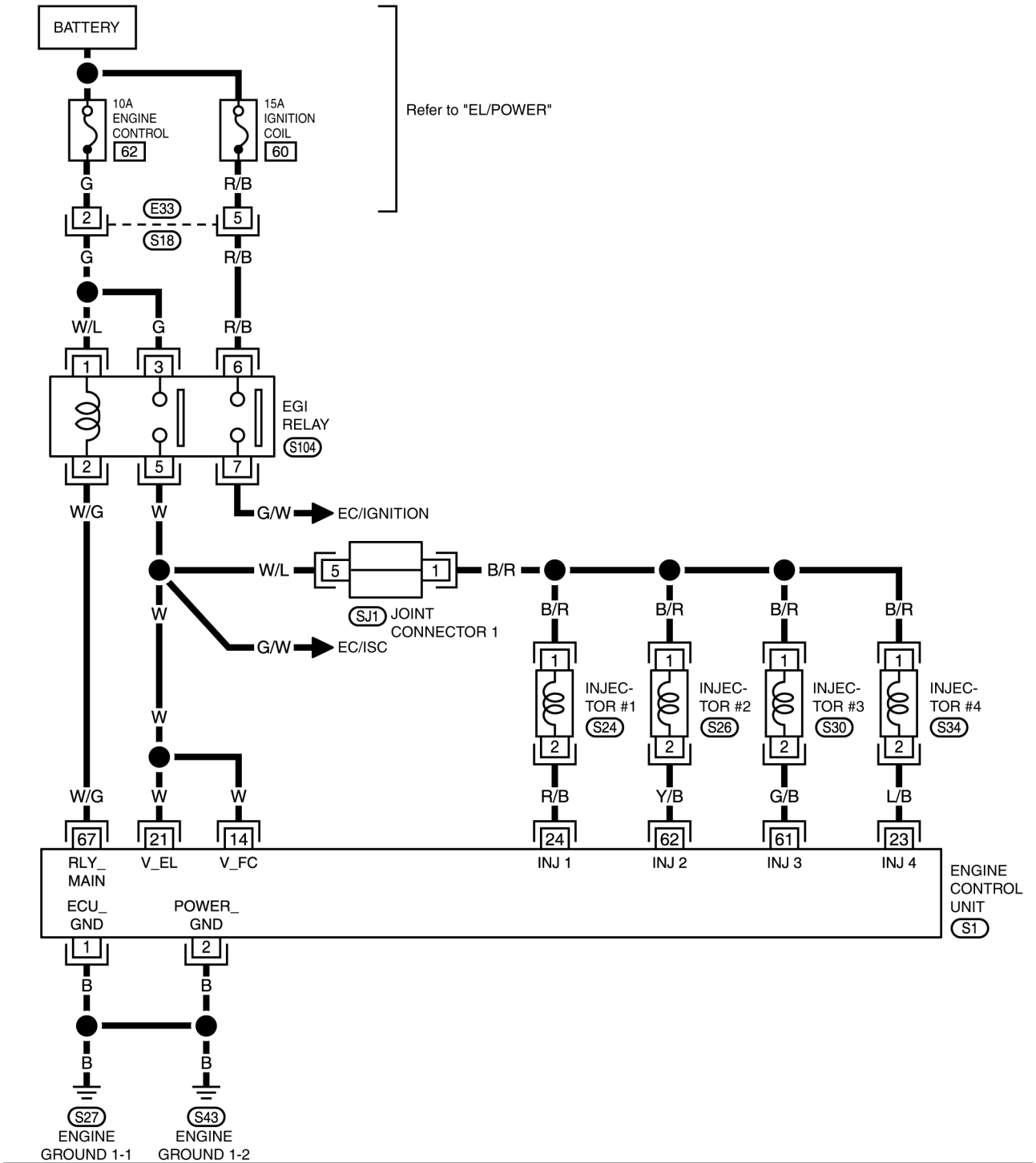


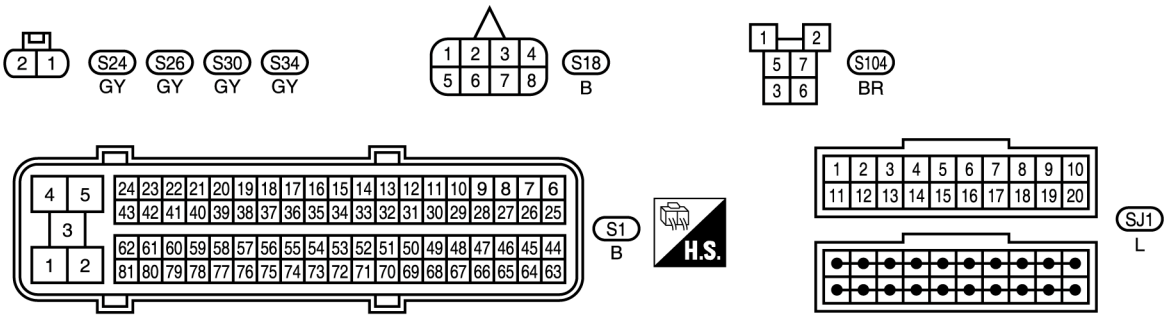


Refer to "FUSE BLOCK (J/B)"
E26 E30

SEWM011_O1

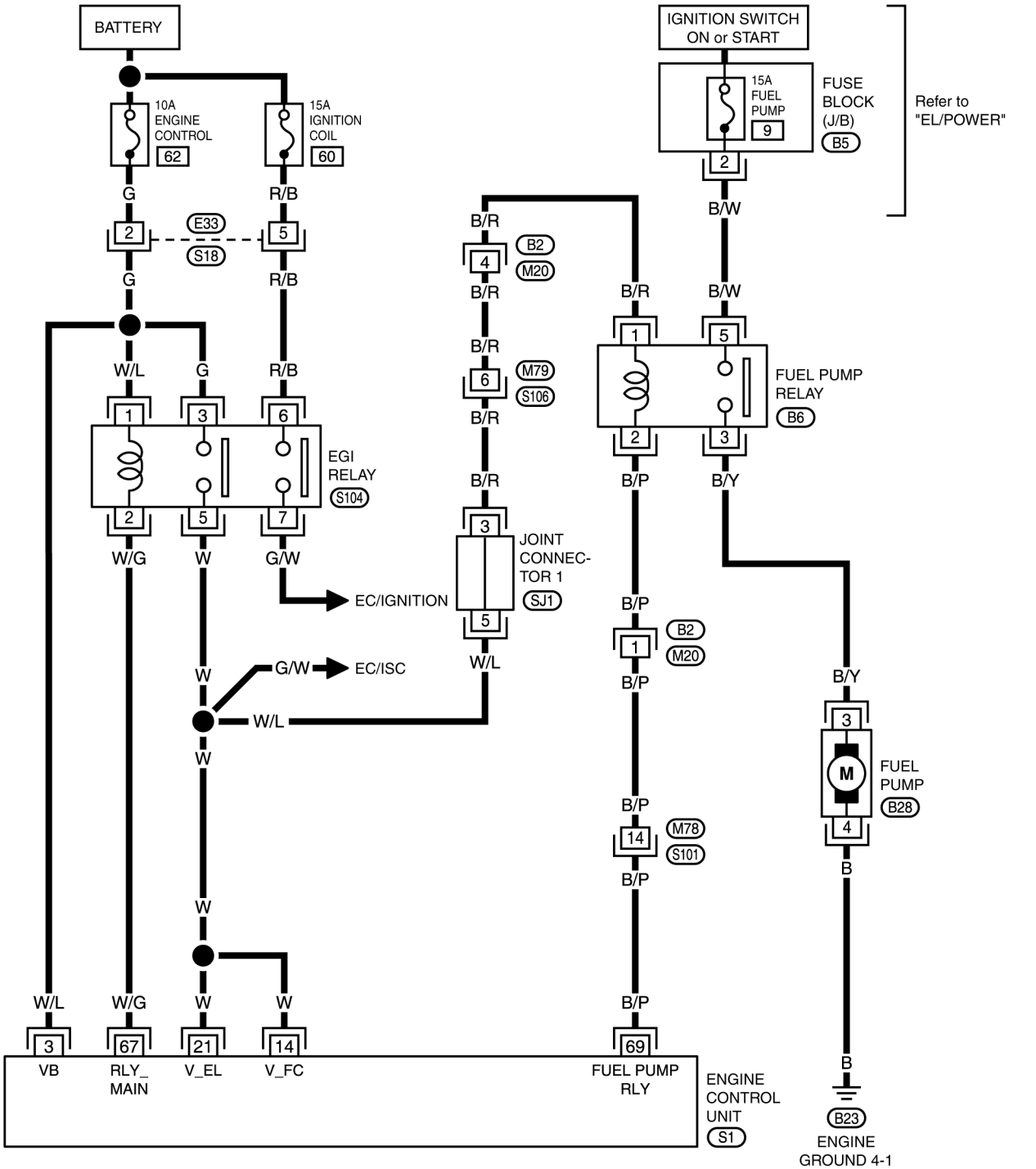
Wiring Diagram — EC/Injector





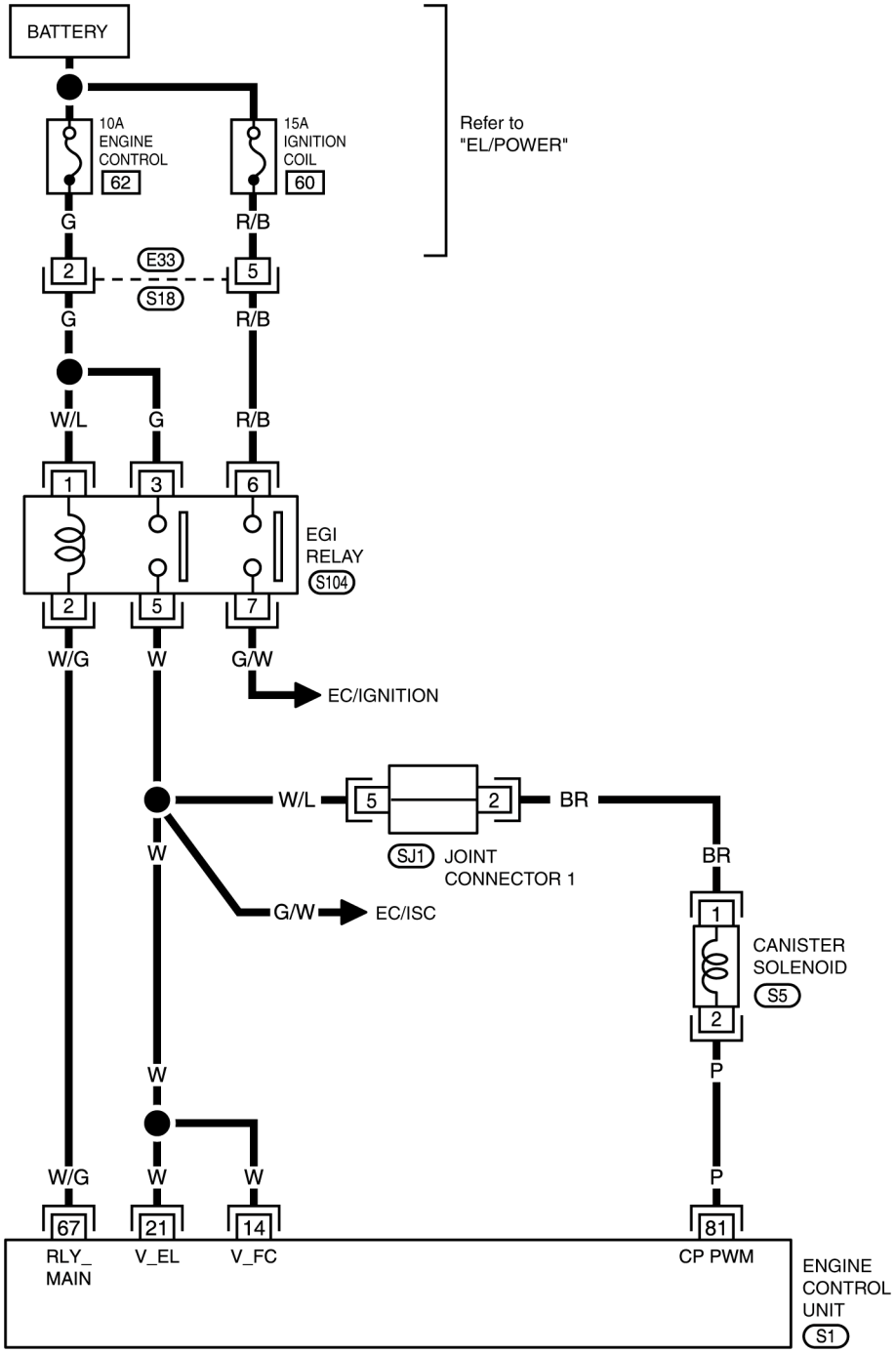
SEWM012_O1

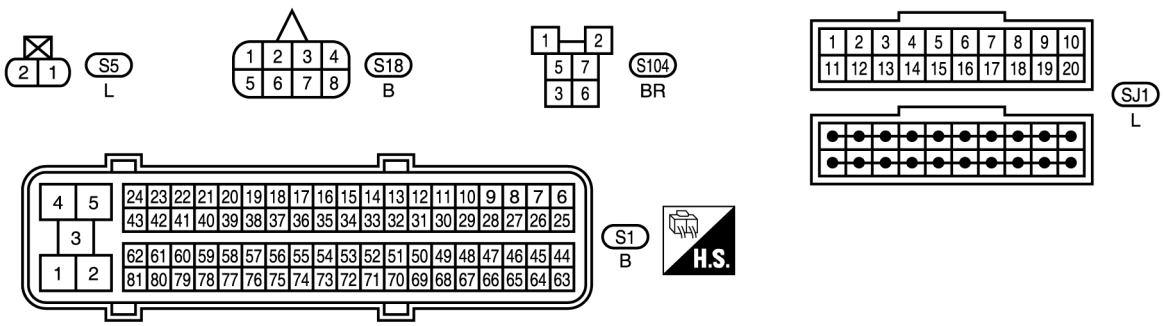
Wiring Diagram — EC/Fuel Pump



Wiring Diagram

EC/Canister

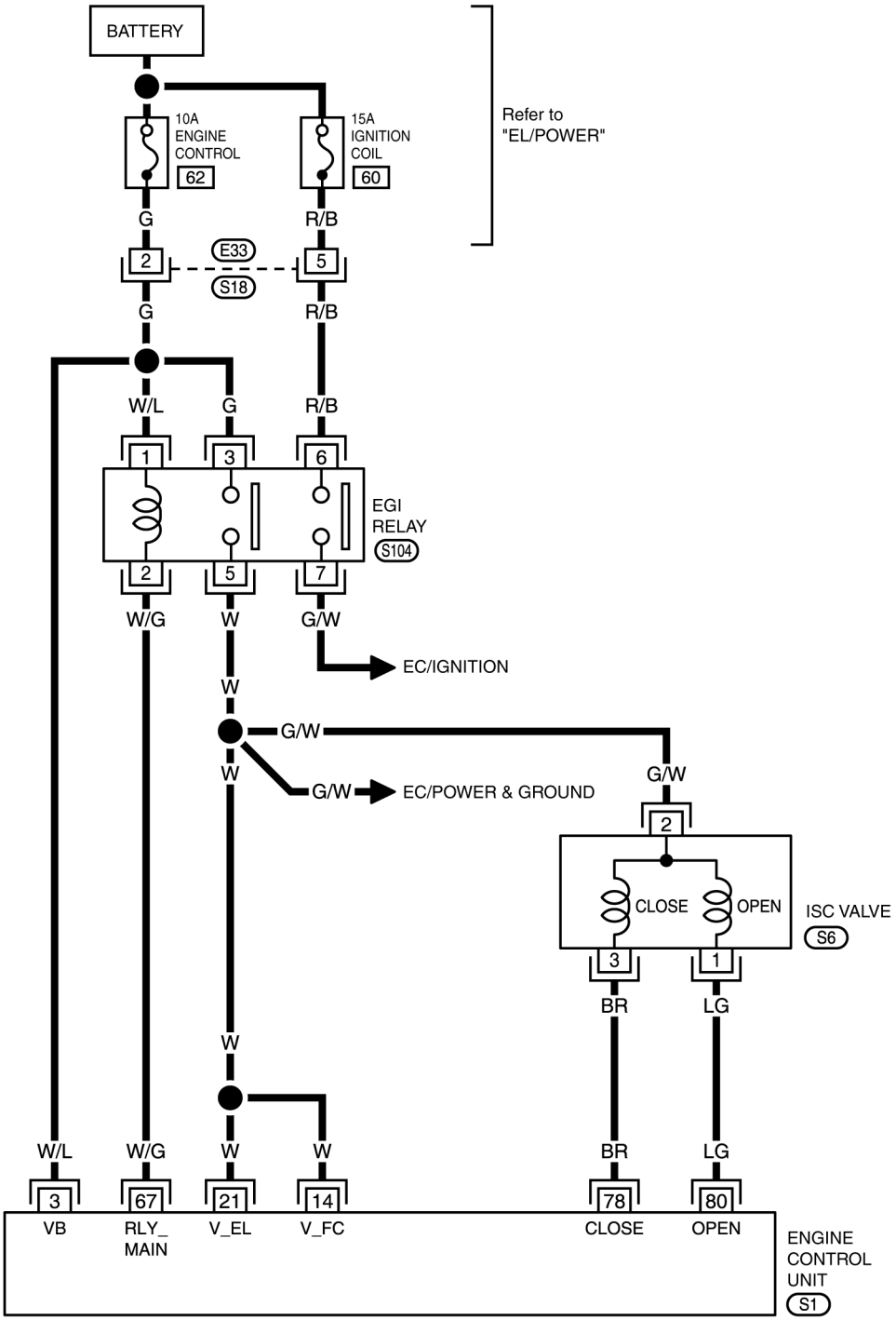


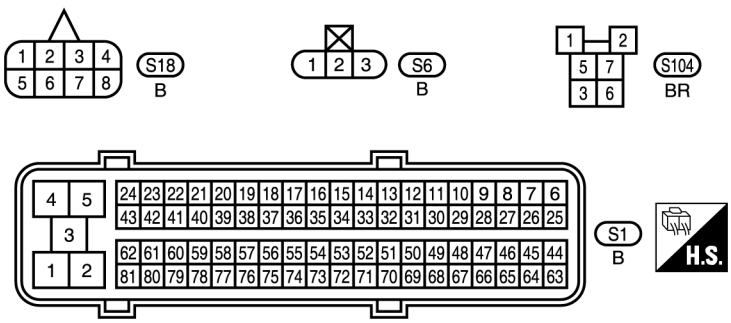


SEWM014_O1

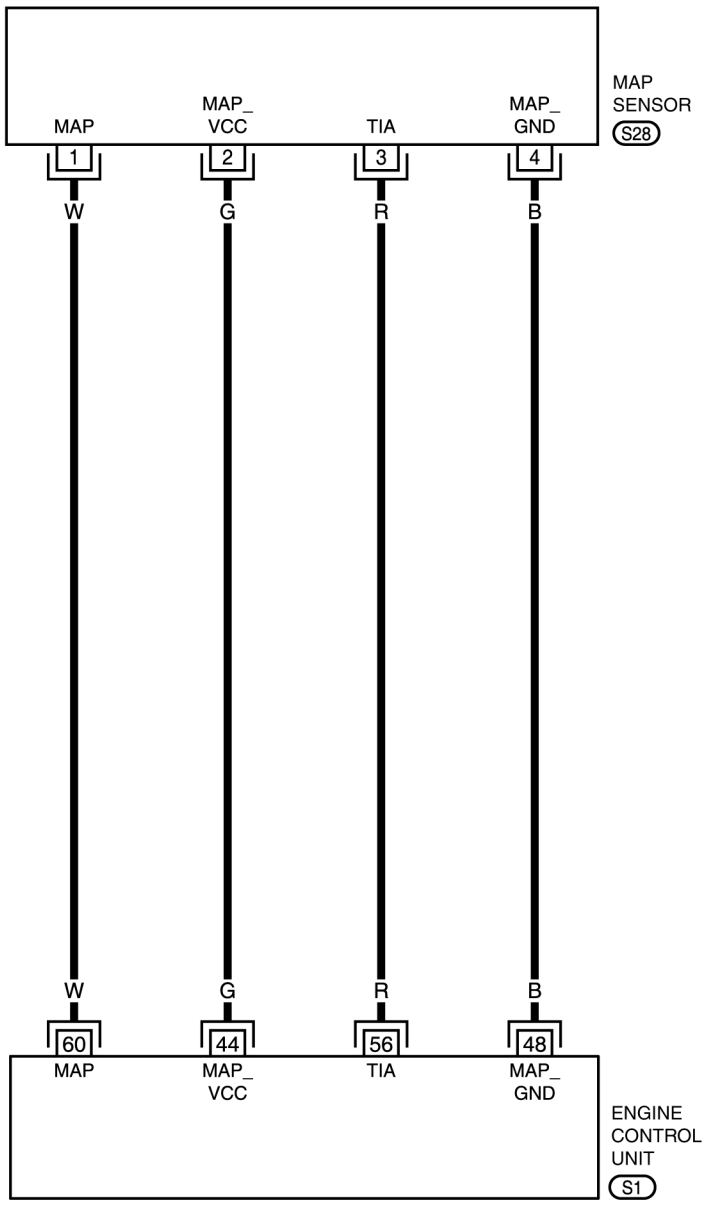
Wiring Diagram

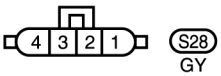
EC/ISC

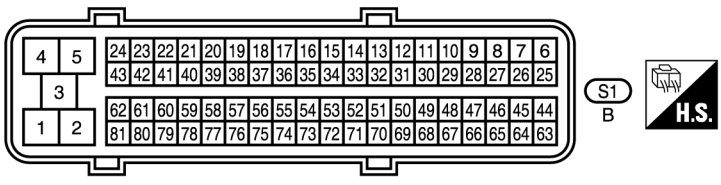




SEWM015_O1

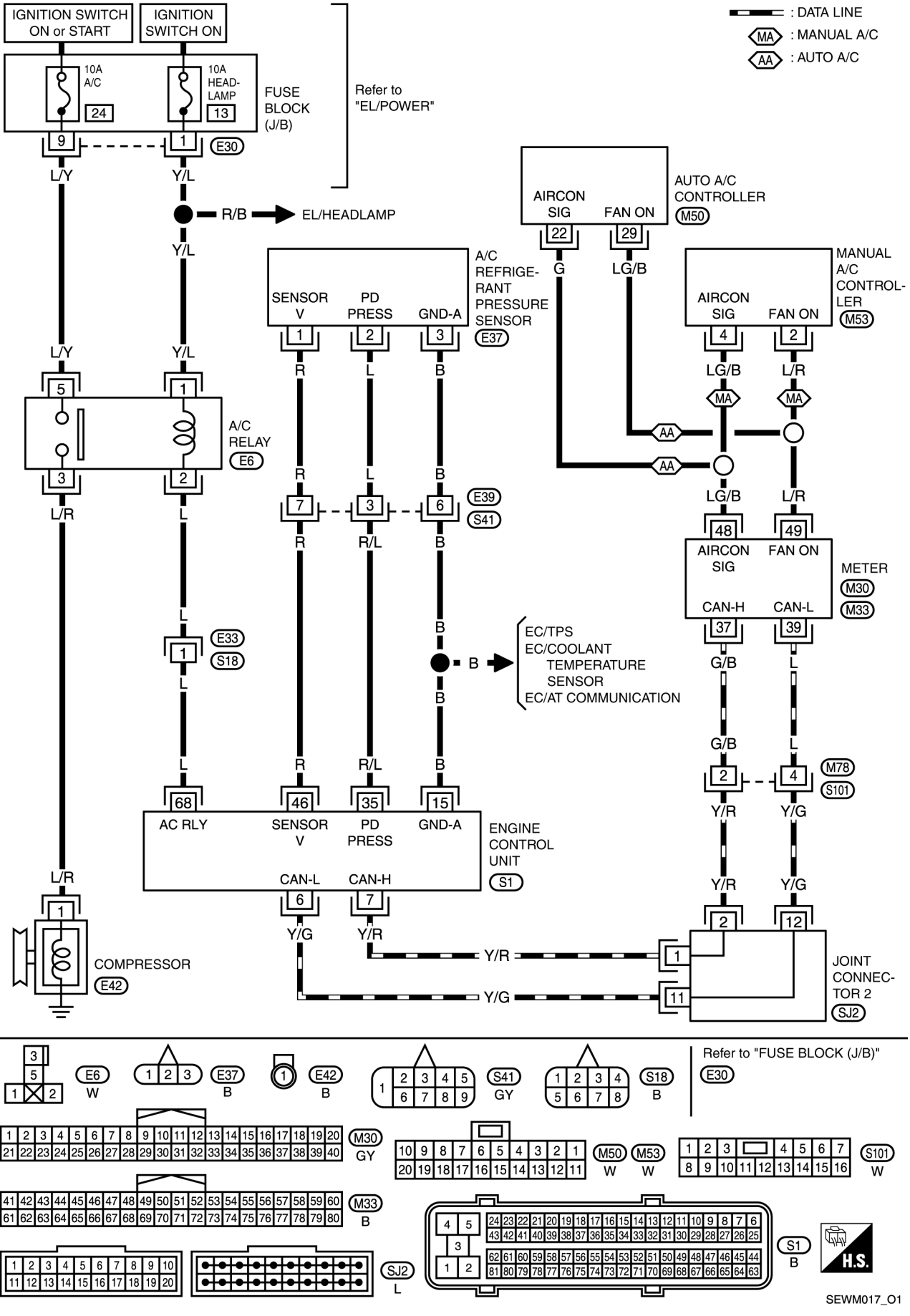

MAP
SENSOR
S28
MAP
MAP_
VCC
TIA
MAP_
GND
1
2
3
4
W
G
R
B
W
G
R
B
60
44
56
48
MAP
MAP_
VCC
TIA
MAP_
GND
ENGINE
CONTROL
UNIT
S1


4 3 2 1
S28
GY

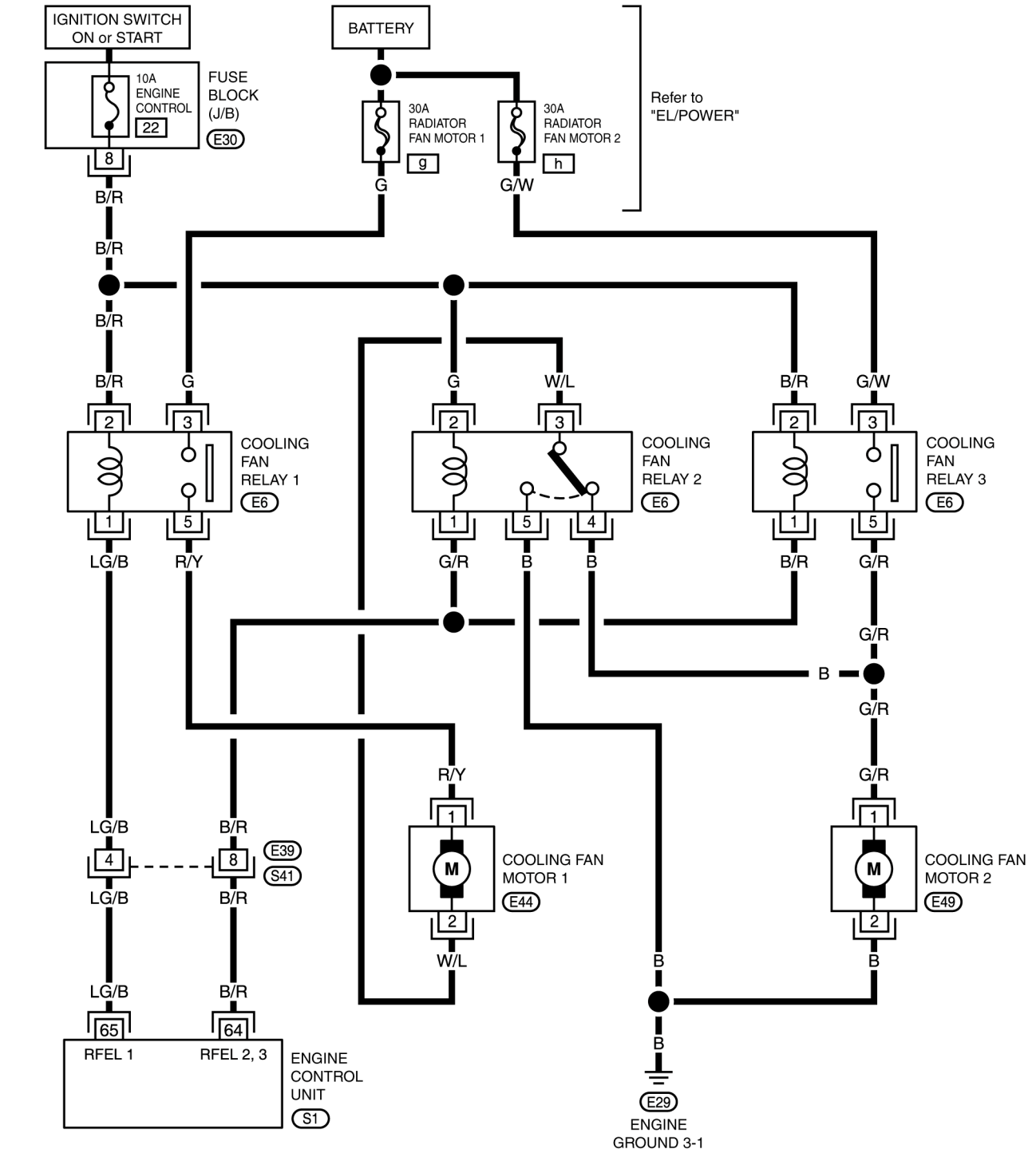

4 5
3
1 2
24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6
43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25
62 61 60 59 58 57 56 55 54 53 52 51 50 49 48 47 46 45 44
81 80 79 78 77 76 75 74 73 72 71 70 69 68 67 66 65 64 63
S1
B
H.S.

SEWM016_O1

Wiring Diagram — EC/AT Communication



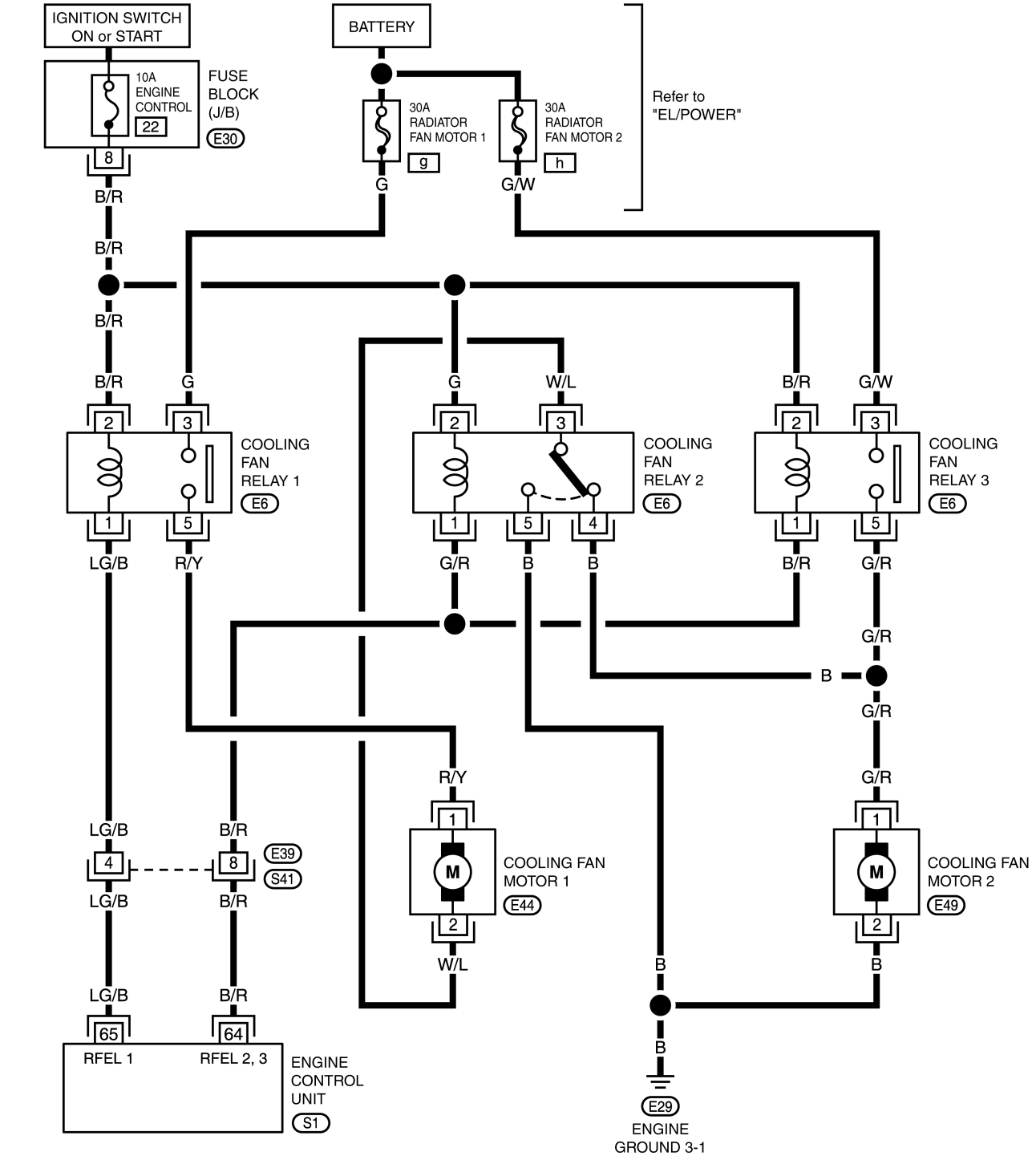
Wiring Diagram — EC/Cooling Fan

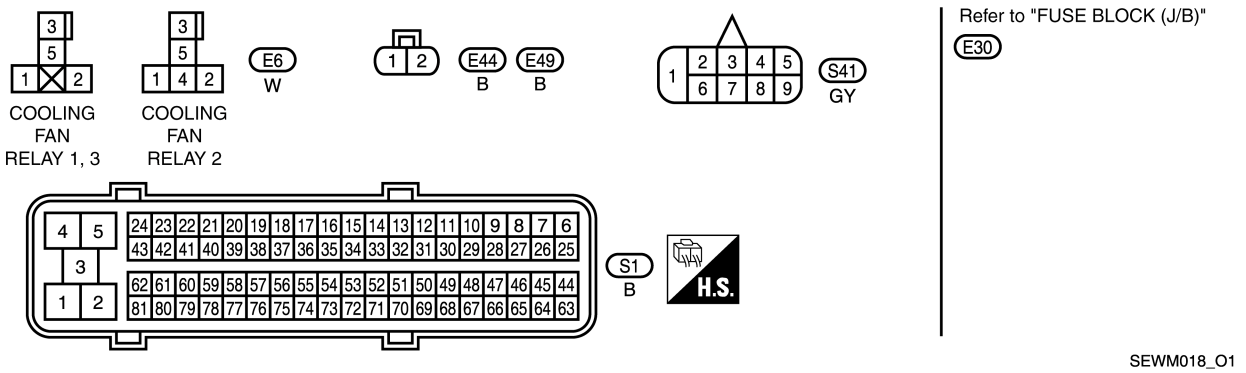


SEWM018_O1

Wiring Diagram

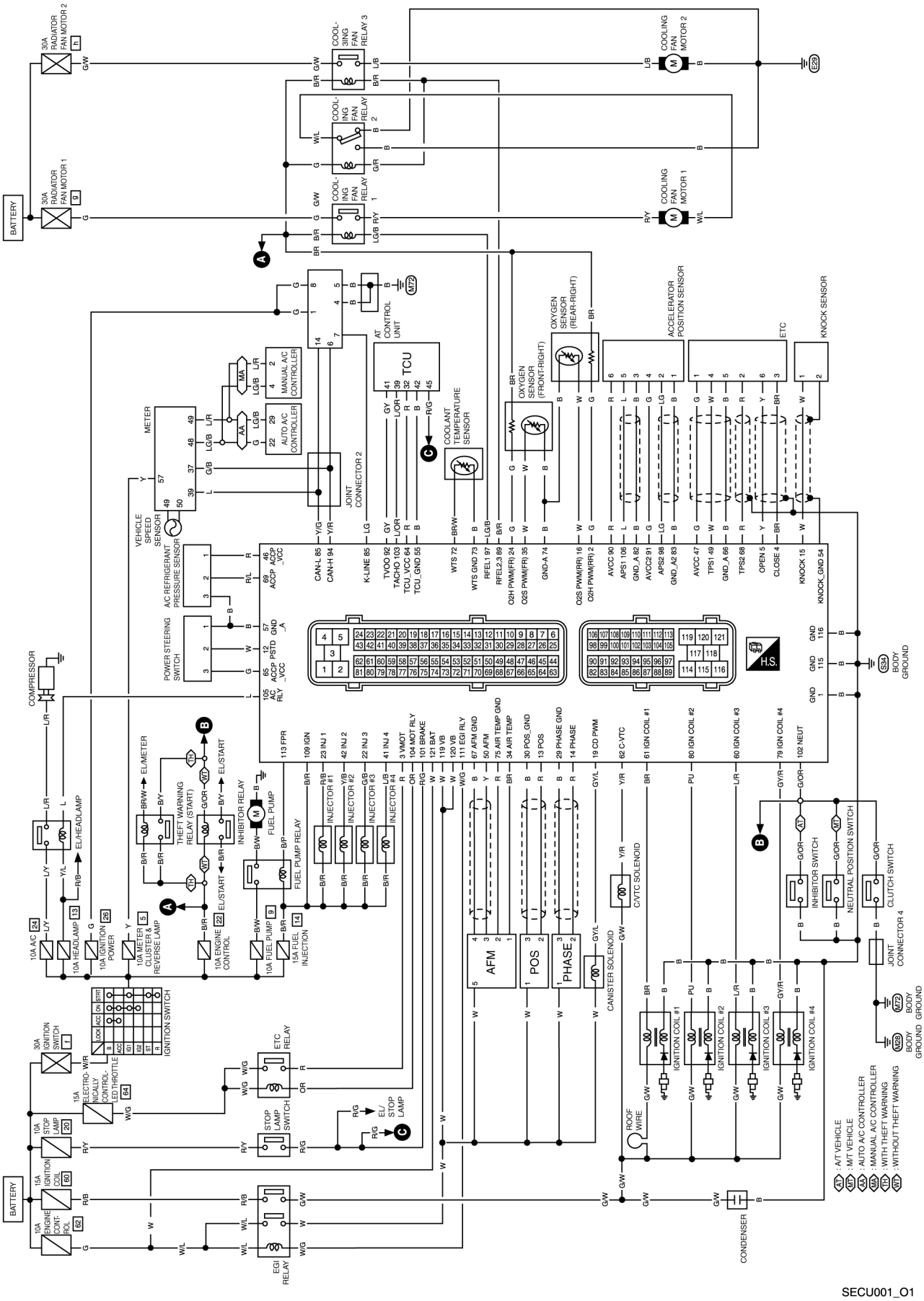
EC/Diagnosis





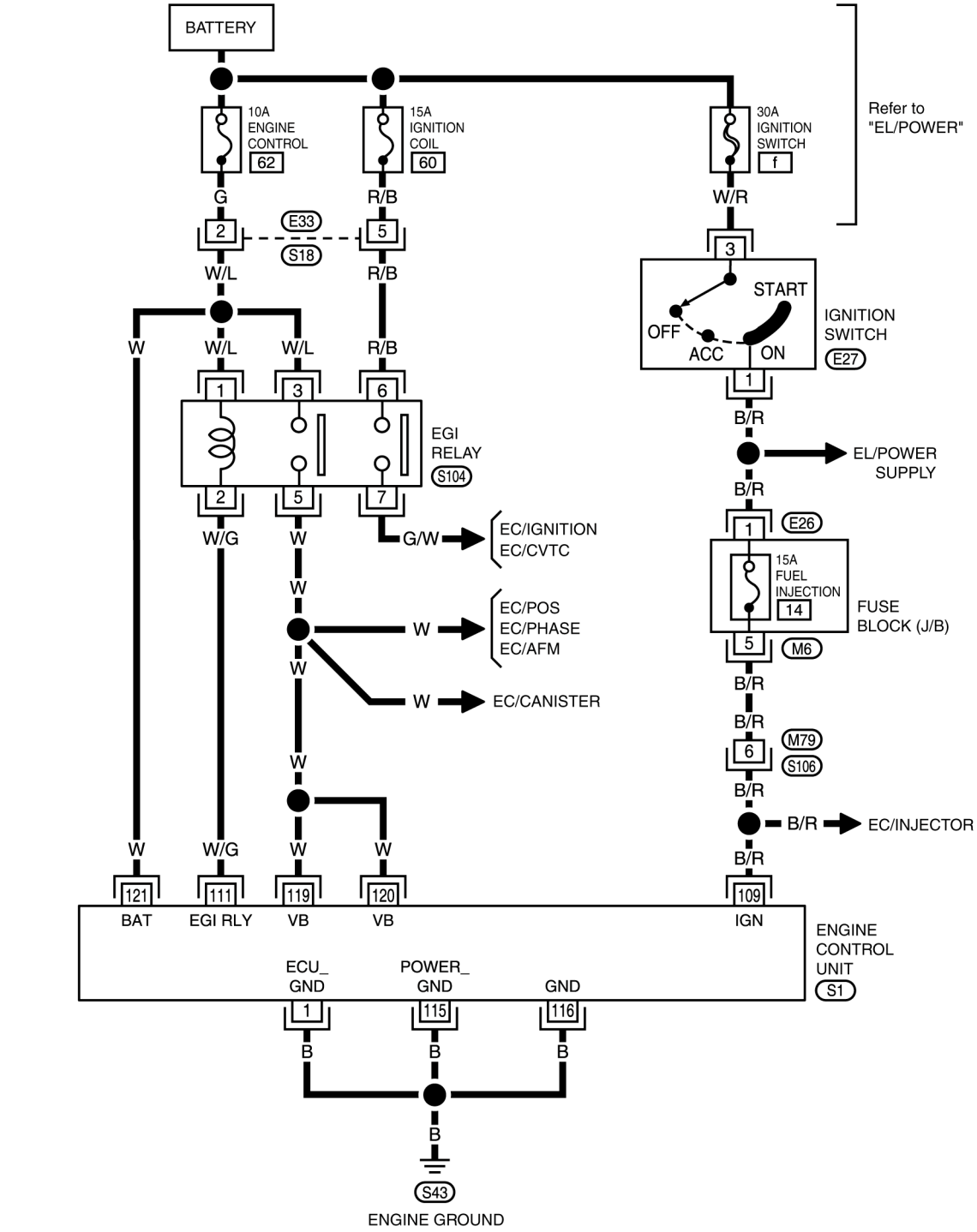
SEWM018_O1

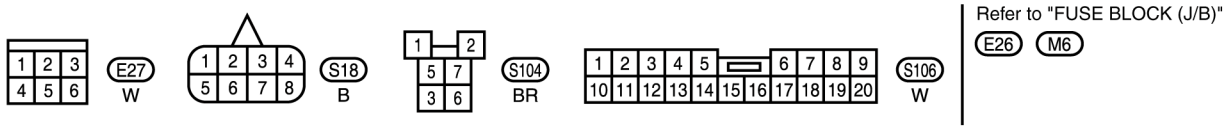
Circuit Diagram

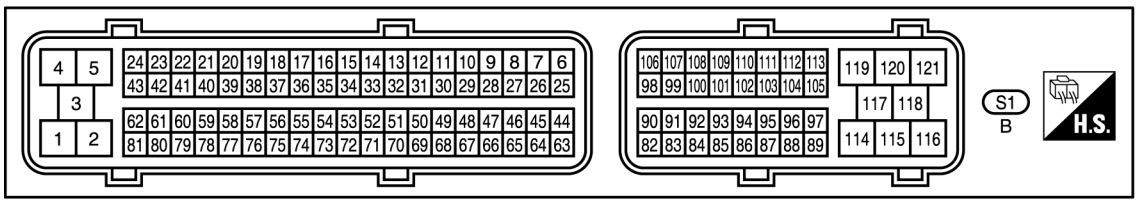


SECU001_O1

Wiring Diagram — EC/Power & Ground



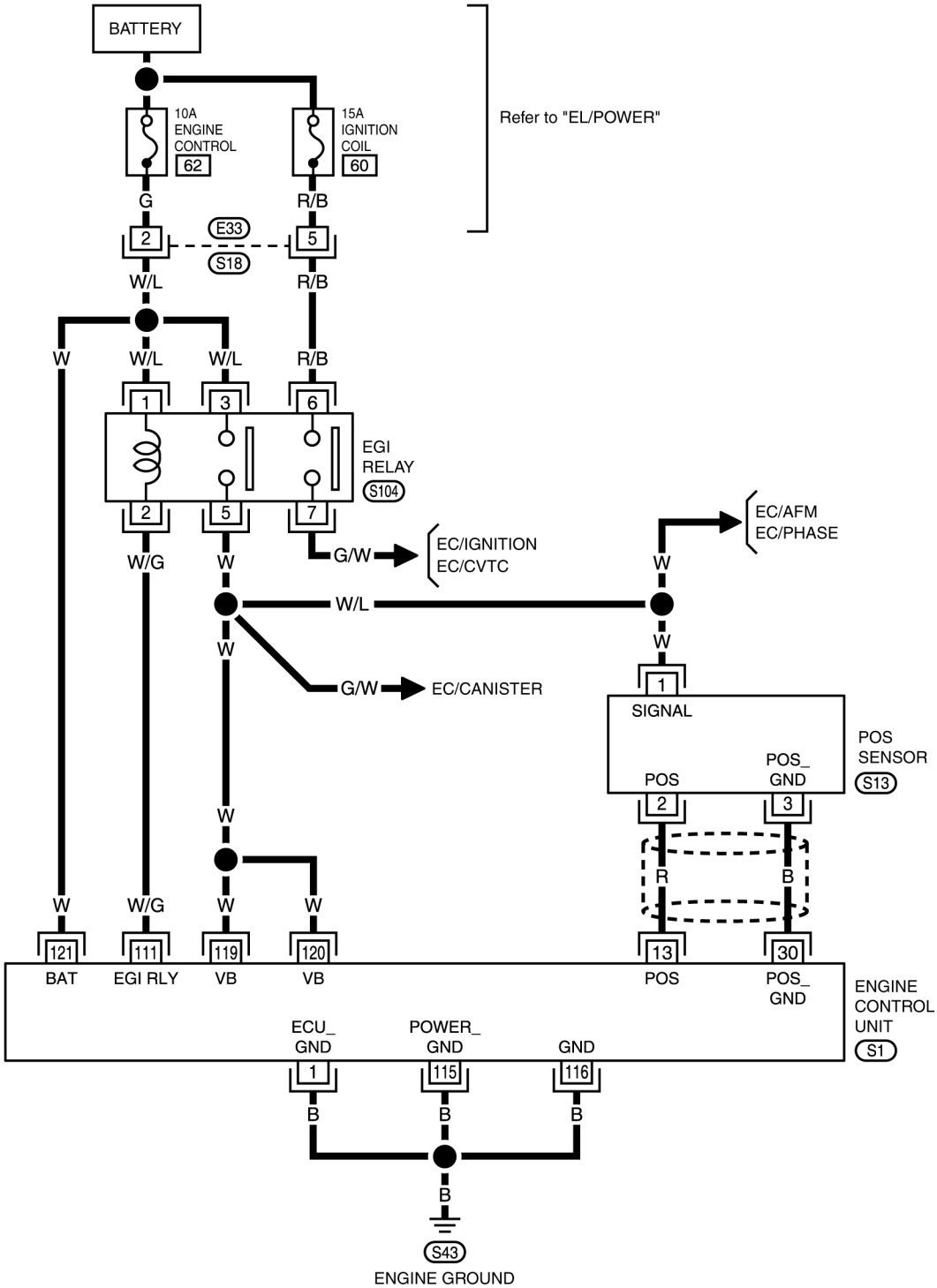


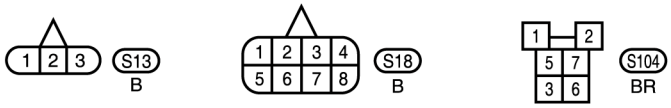


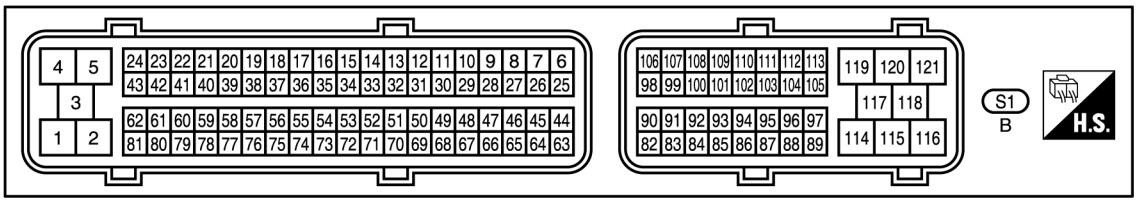
SEWU001_O1

Wiring Diagram

EC/POS

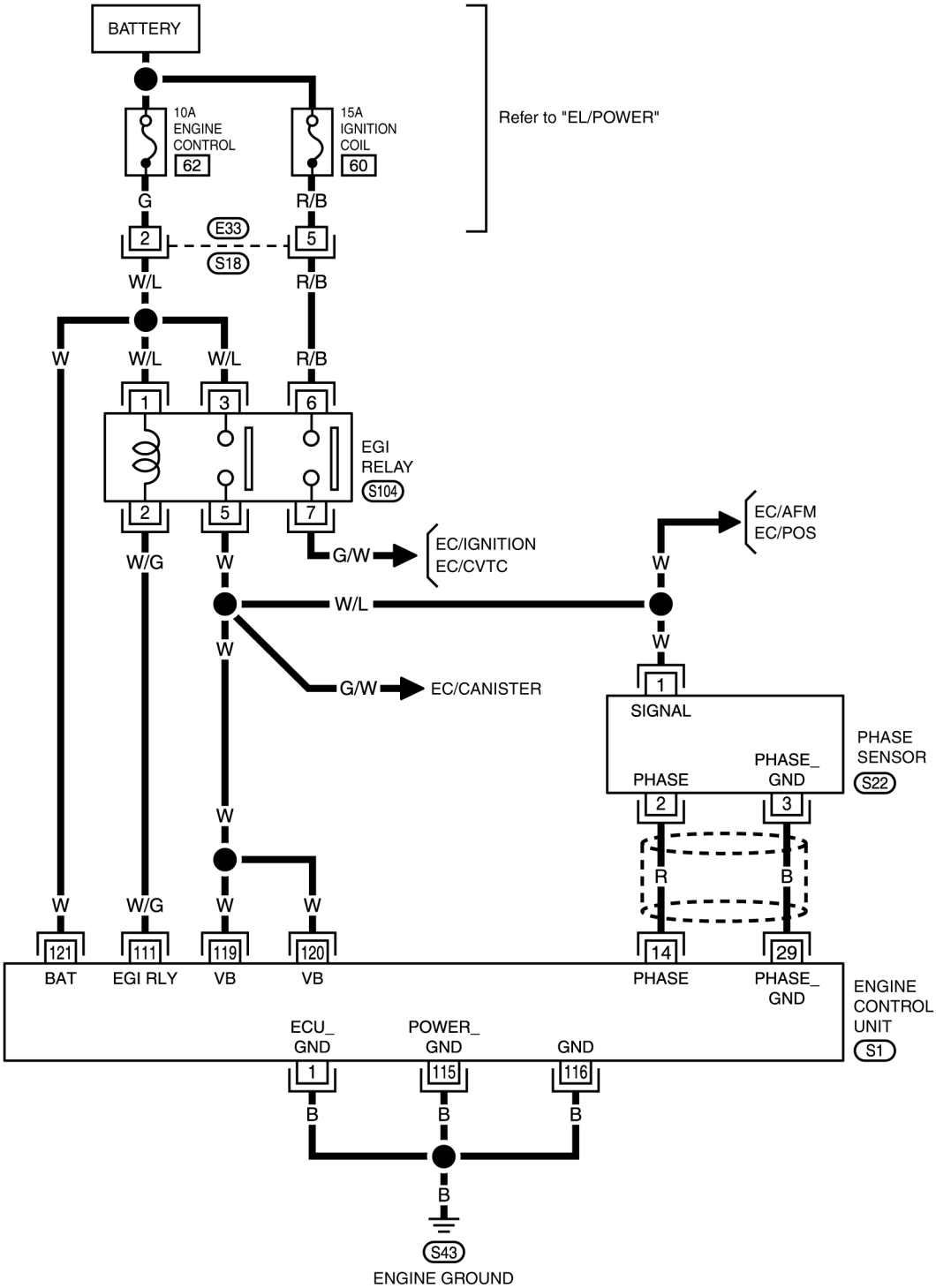


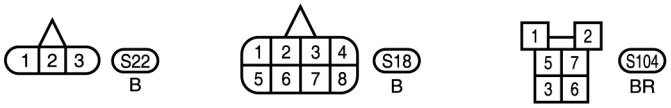


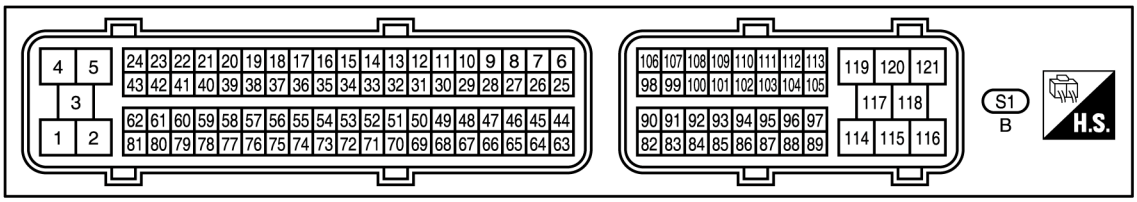


SEWU002_O1

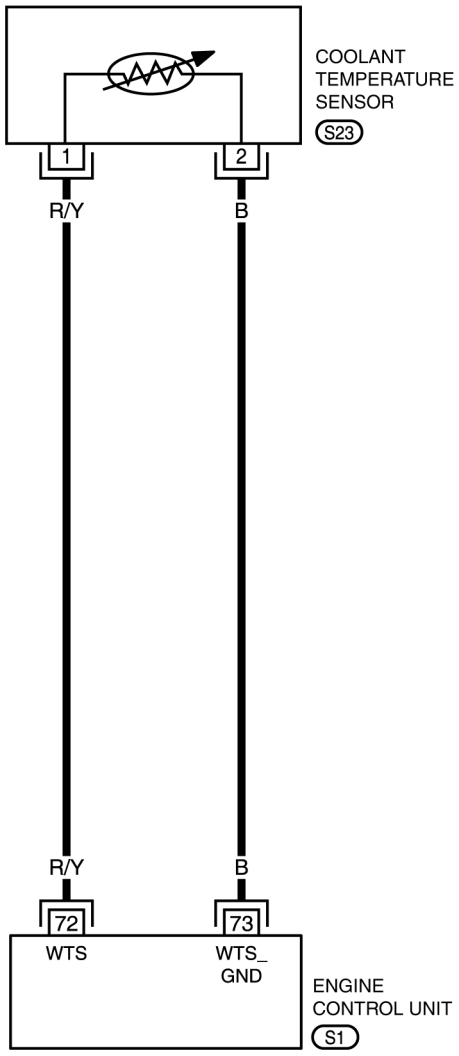
Wiring Diagram — EC/PHASE

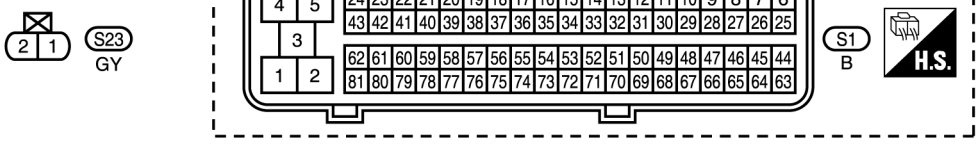






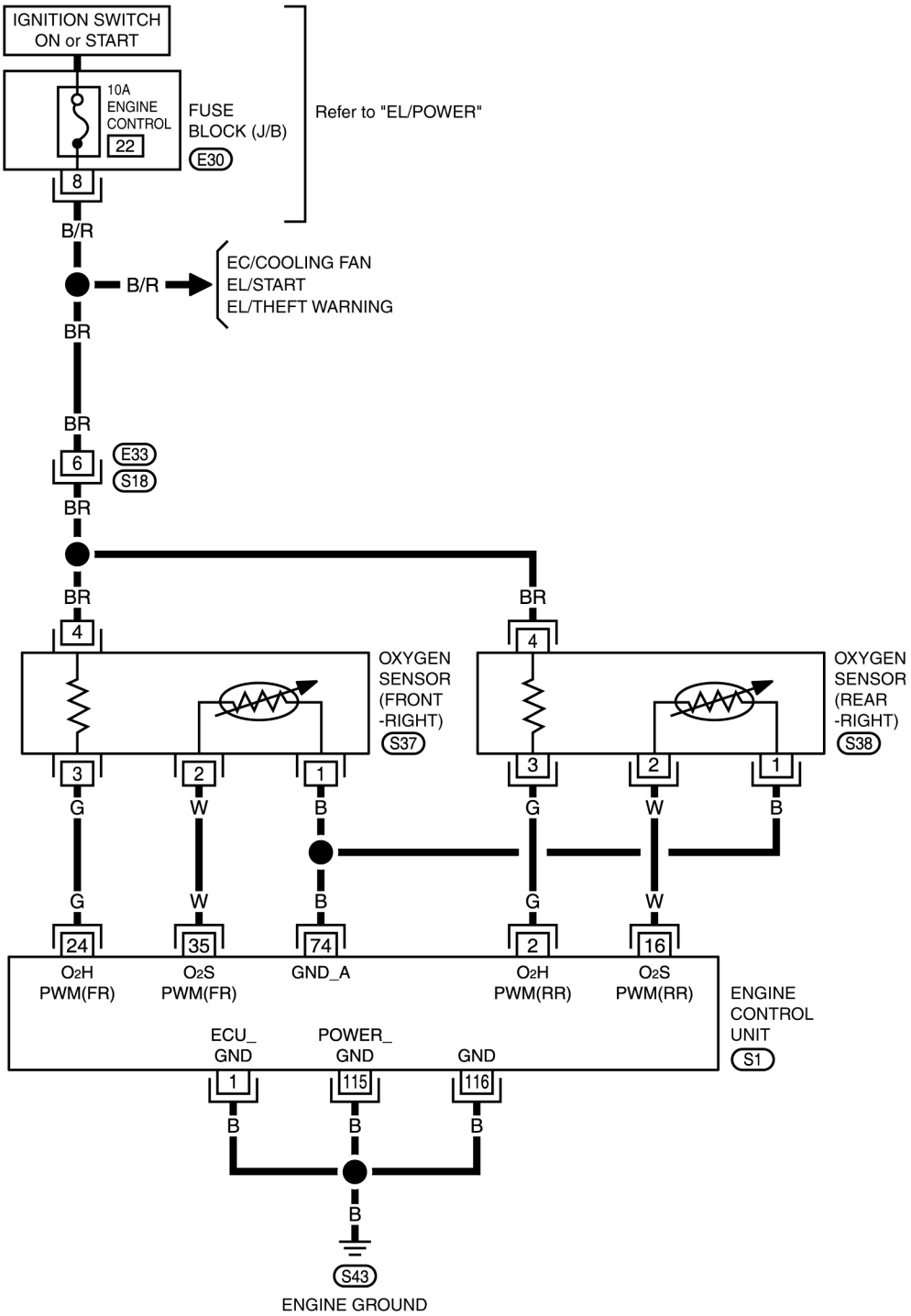
SEWU003_O1

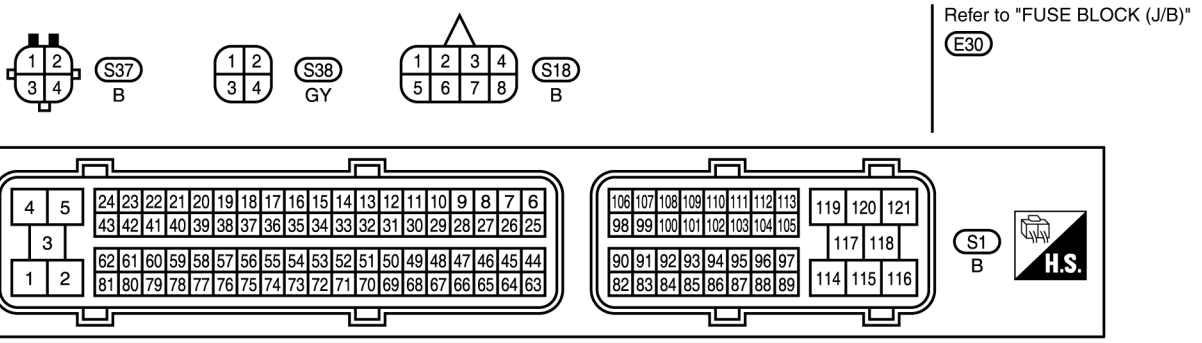

COOLANT
TEMPERATURE
SENSOR
S23
1
2
R/Y
B
R/Y
B
72
73
WTS
WTS_
GND
ENGINE
CONTROL UNIT
S1


2 1
S23
GY
4 5
3
1 2
24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6
43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25
62 61 60 59 58 57 56 55 54 53 52 51 50 49 48 47 46 45 44
81 80 79 78 77 76 75 74 73 72 71 70 69 68 67 66 65 64 63
S1
B
H.S.

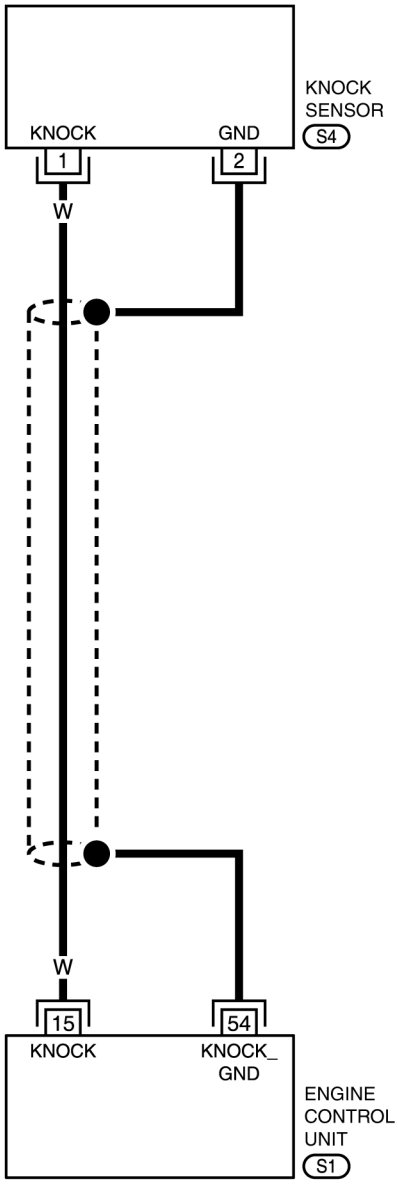
SEWU004_O1

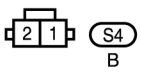
Wiring Diagram — EC/Oxygen Sensor

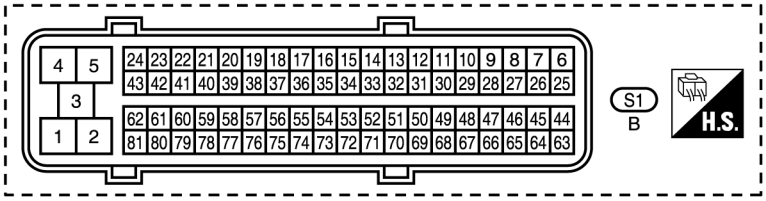




SEWU005_O1

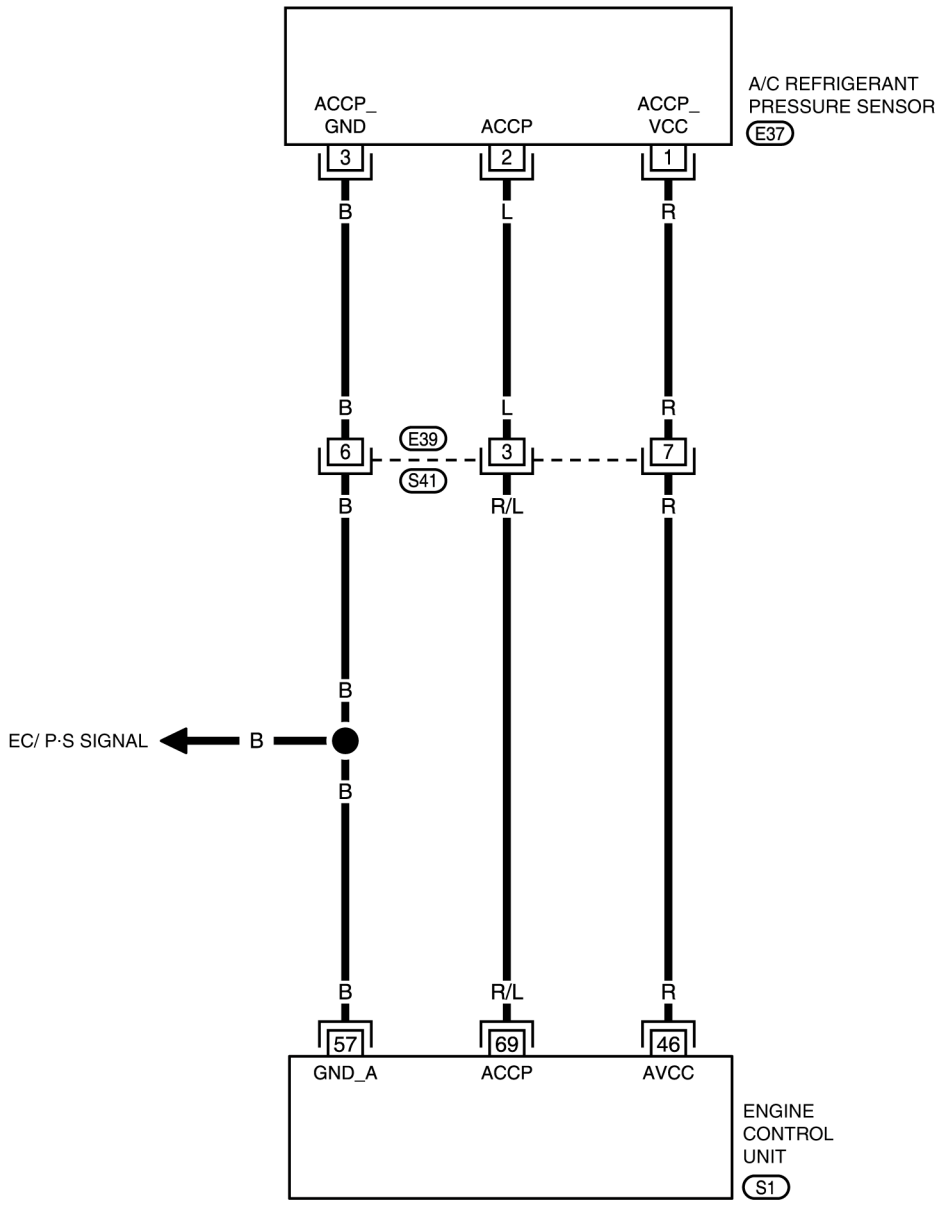

KNOCK SENSOR
S4
KNOCK
GND
1
2
W
W
15
54
KNOCK
KNOCK_ GND
ENGINE CONTROL UNIT
S1

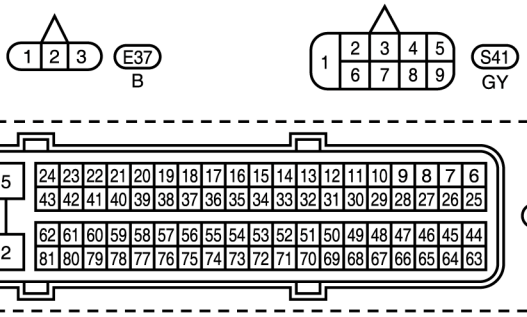

2 1
S4
B


4 5
3
1 2
24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6
43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25
62 61 60 59 58 57 56 55 54 53 52 51 50 49 48 47 46 45 44
81 80 79 78 77 76 75 74 73 72 71 70 69 68 67 66 65 64 63
S1
B
H.S.

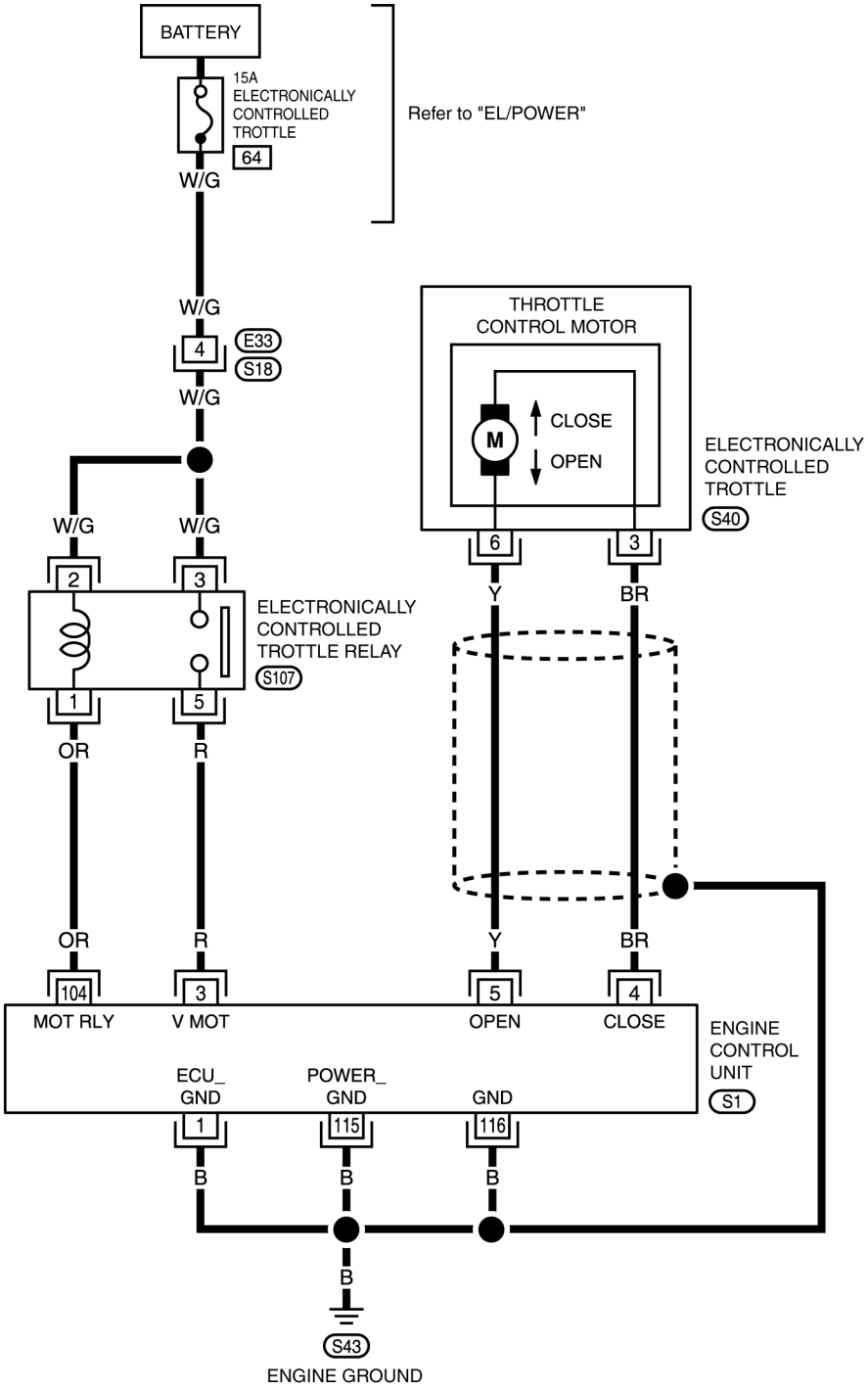
SEWU007_O1

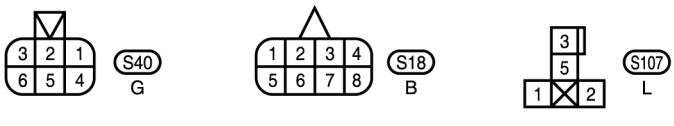
Wiring Diagram — EC/A/C Refrigerant Pressure Sensor

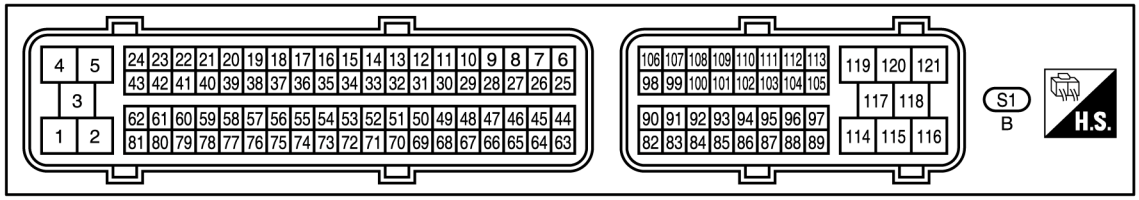




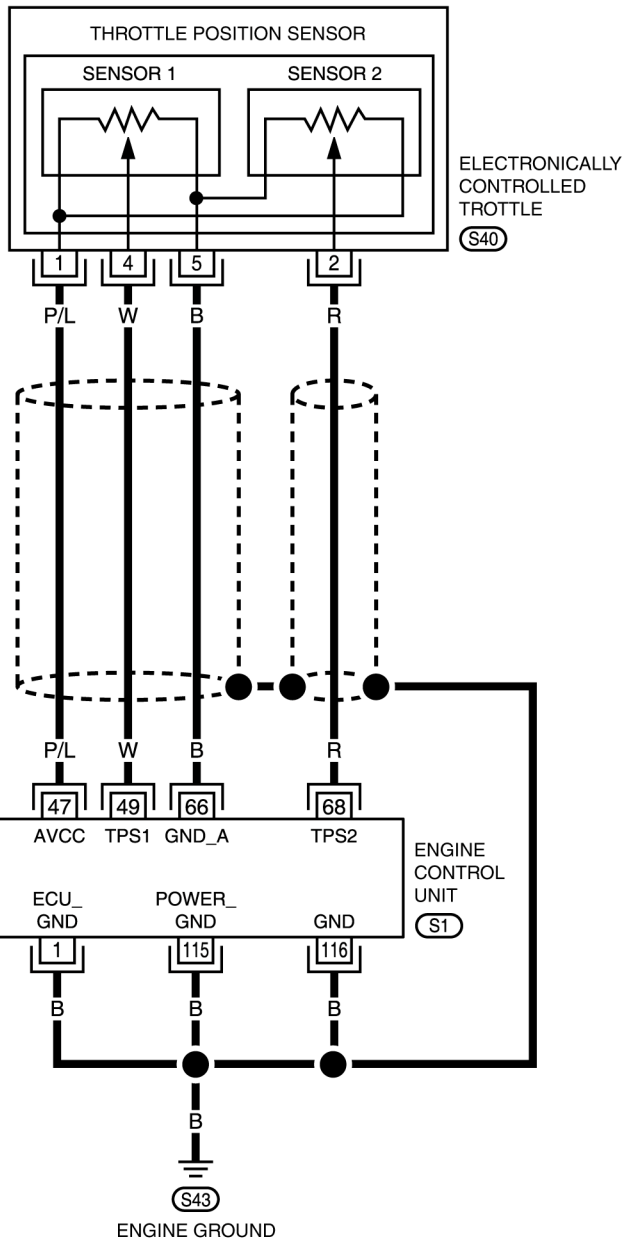
SEWU008_O1

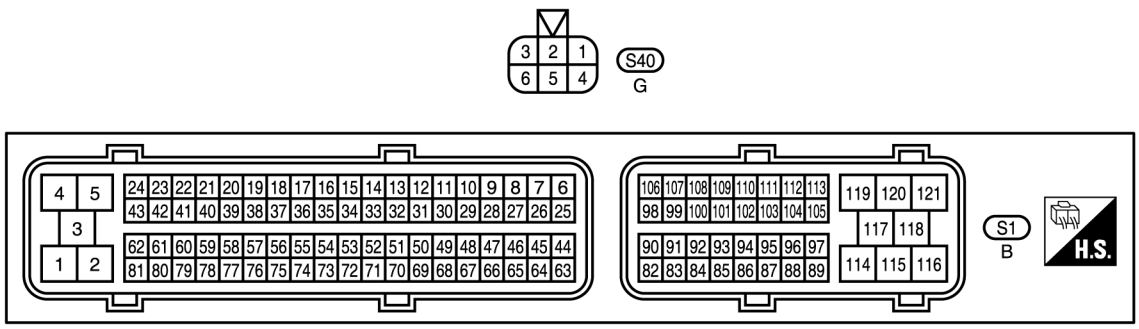

BATTERY
15A
ELECTRONICALLY
CONTROLLED
TROTTLE
64
W/G
Refer to "EL/POWER"
W/G
4
E33
S18
W/G
THROTTLE
CONTROL MOTOR
M
CLOSE
OPEN
ELECTRONICALLY
CONTROLLED
TROTTLE
S40
6
3
Y
BR
W/G
W/G
2
3
ELECTRONICALLY
CONTROLLED
TROTTLE RELAY
S107
1
5
OR
R
OR
R
Y
BR
104
3
5
4
MOT RLY
V MOT
OPEN
CLOSE
ENGINE
CONTROL
UNIT
S1
ECU_
GND
POWER_
GND
GND
1
115
116
B
B
B
B
S43
ENGINE GROUND


S40
G
S18
B
S107
L

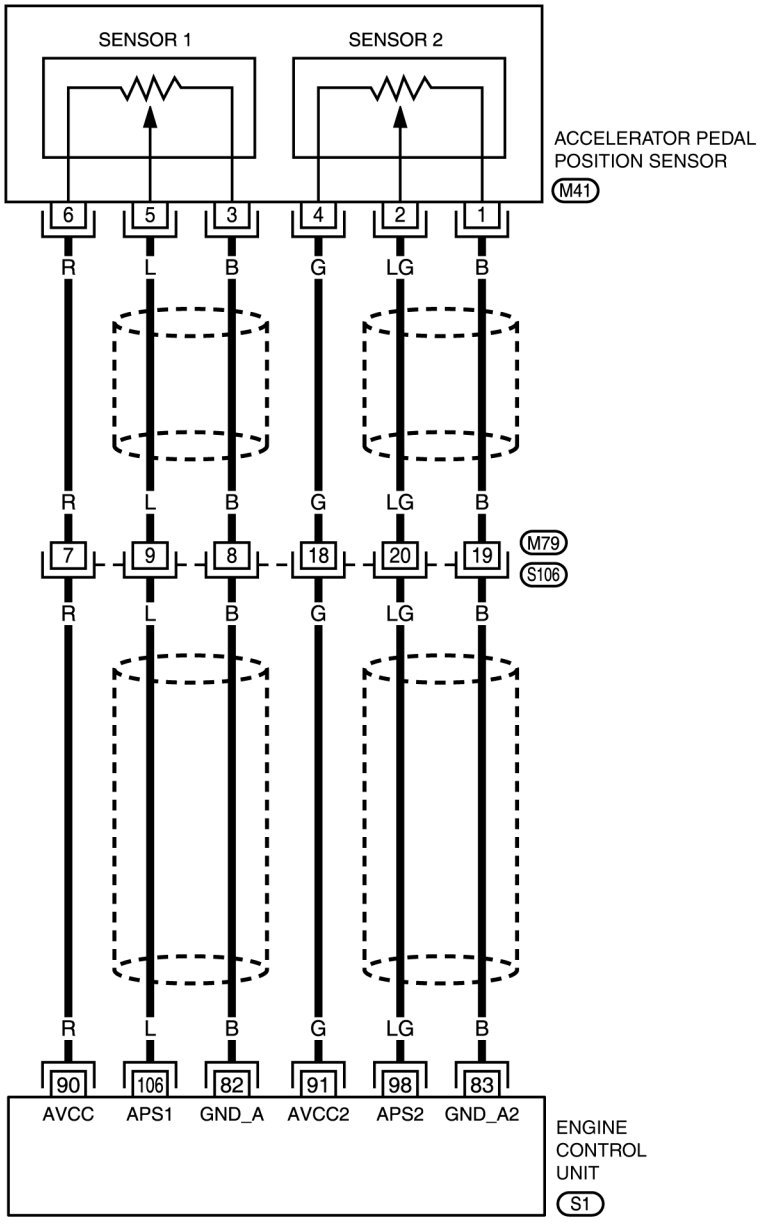

S1
B
H.S.

SEWU009_O1

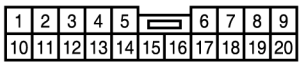

THROTTLE POSITION SENSOR
SENSOR 1
SENSOR 2
ELECTRONICALLY CONTROLLED TROTTLE
S40
1
4
5
2
P/L
W
B
R
P/L
W
B
R
47
49
66
68
AVCC
TPS1
GND_A
TPS2
ENGINE CONTROL UNIT
S1
ECU_ GND
POWER_ GND
GND
1
115
116
B
B
B
B
S43
ENGINE GROUND


3 2 1
6 5 4
S40
G
4 5
3
1 2
24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6
43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25
62 61 60 59 58 57 56 55 54 53 52 51 50 49 48 47 46 45 44
81 80 79 78 77 76 75 74 73 72 71 70 69 68 67 66 65 64 63
106 107 108 109 110 111 112 113
98 99 100 101 102 103 104 105
90 91 92 93 94 95 96 97
82 83 84 85 86 87 88 89
119 120 121
117 118
114 115 116
S1
B
H.S.

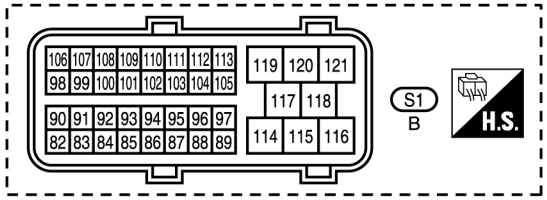
SEWU010_O1



M41
GY

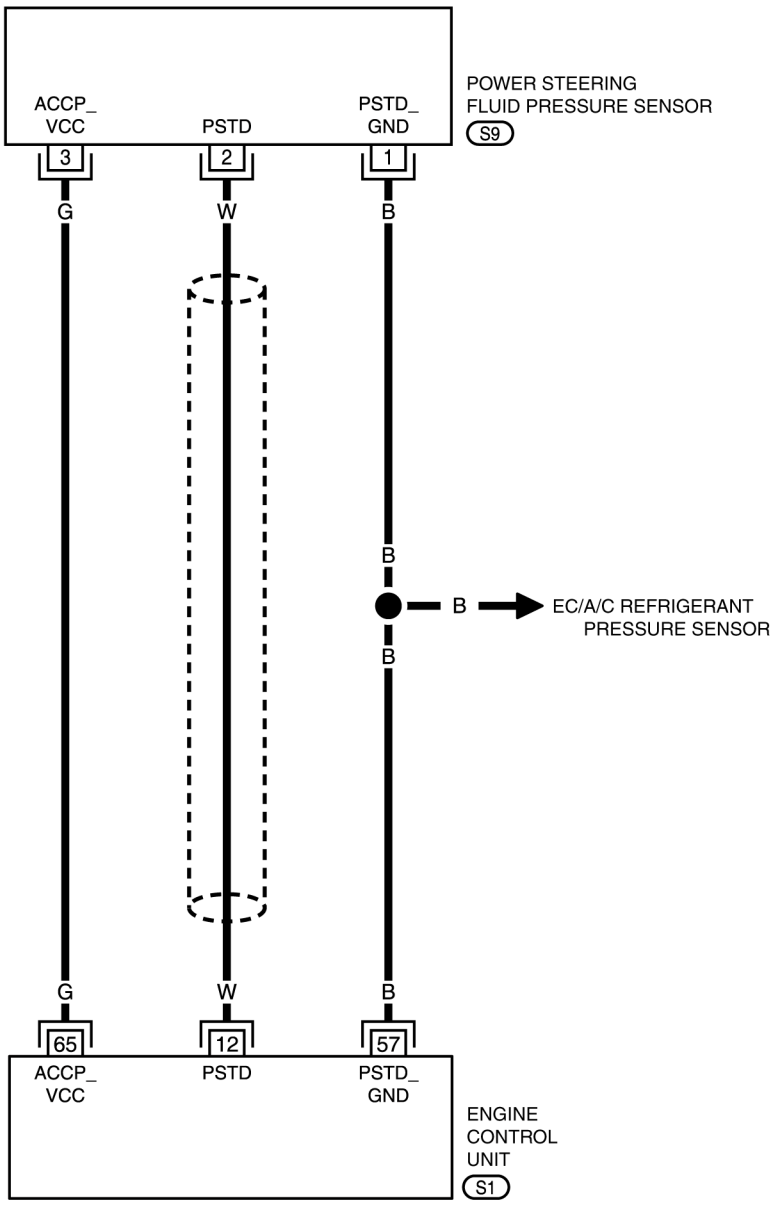


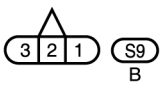
S106
W

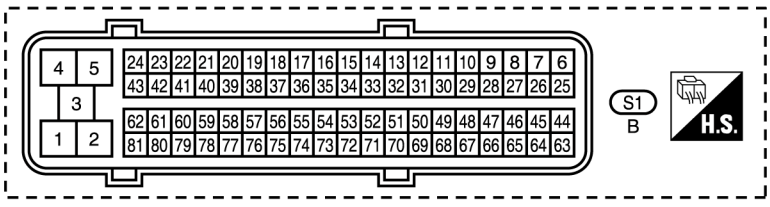


S1
B

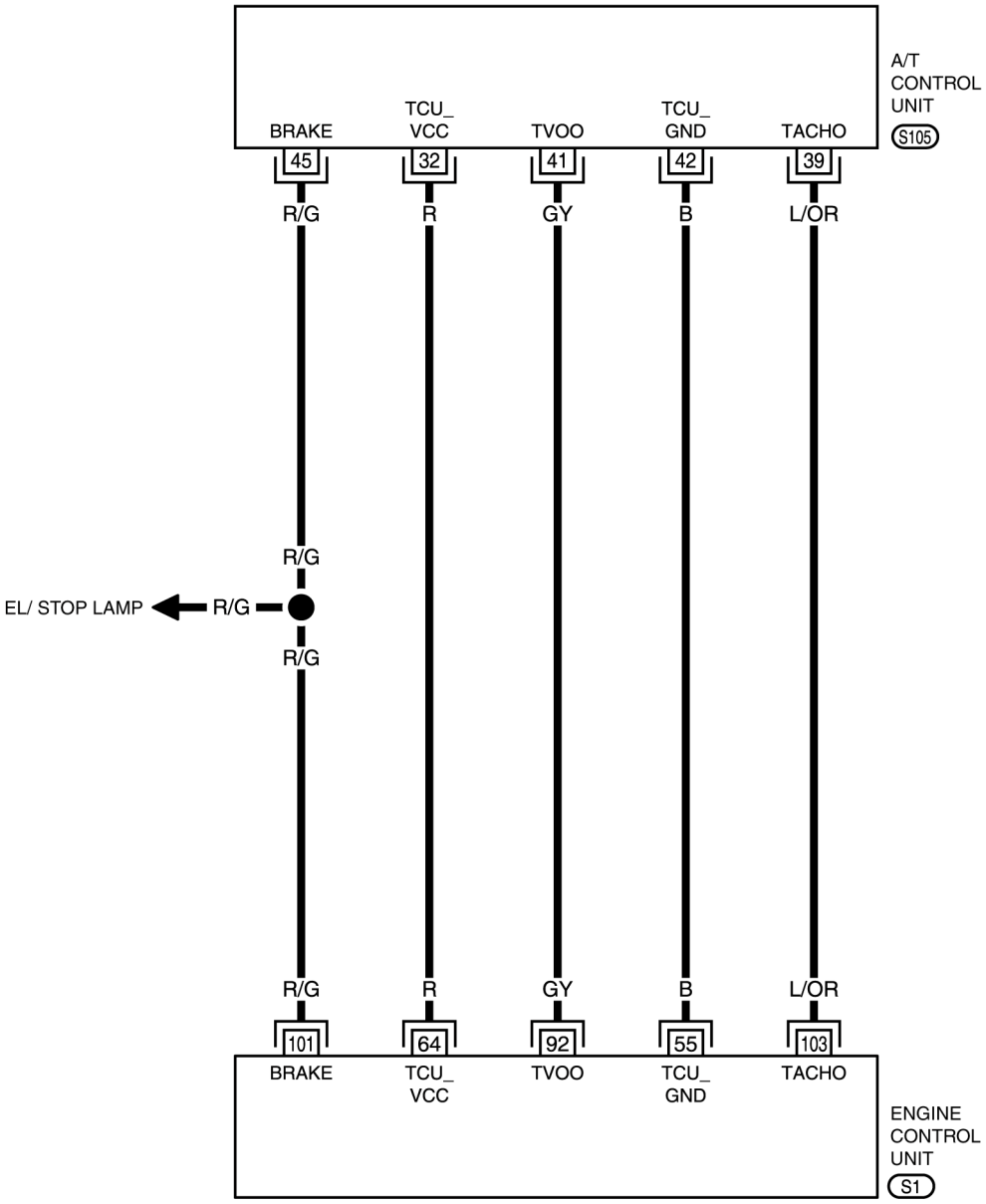
SEWU011_O1

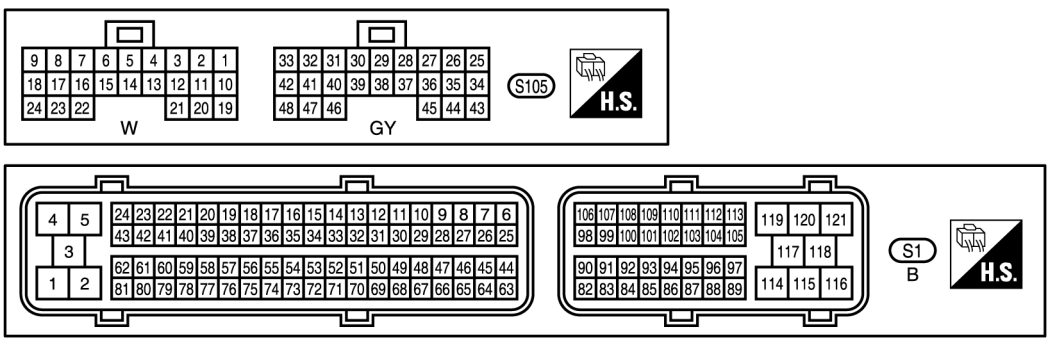

POWER STEERING
FLUID PRESSURE SENSOR
S9
ACCP_
VCC
PSTD
PSTD_
GND
3
2
1
G
W
B
B
B
EC/A/C REFRIGERANT
PRESSURE SENSOR
B
G
W
B
65
12
57
ACCP_
VCC
PSTD
PSTD_
GND
ENGINE
CONTROL
UNIT
S1


3 2 1
S9
B


4 5
3
1 2
24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6
43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25
62 61 60 59 58 57 56 55 54 53 52 51 50 49 48 47 46 45 44
81 80 79 78 77 76 75 74 73 72 71 70 69 68 67 66 65 64 63
S1
B
H.S.

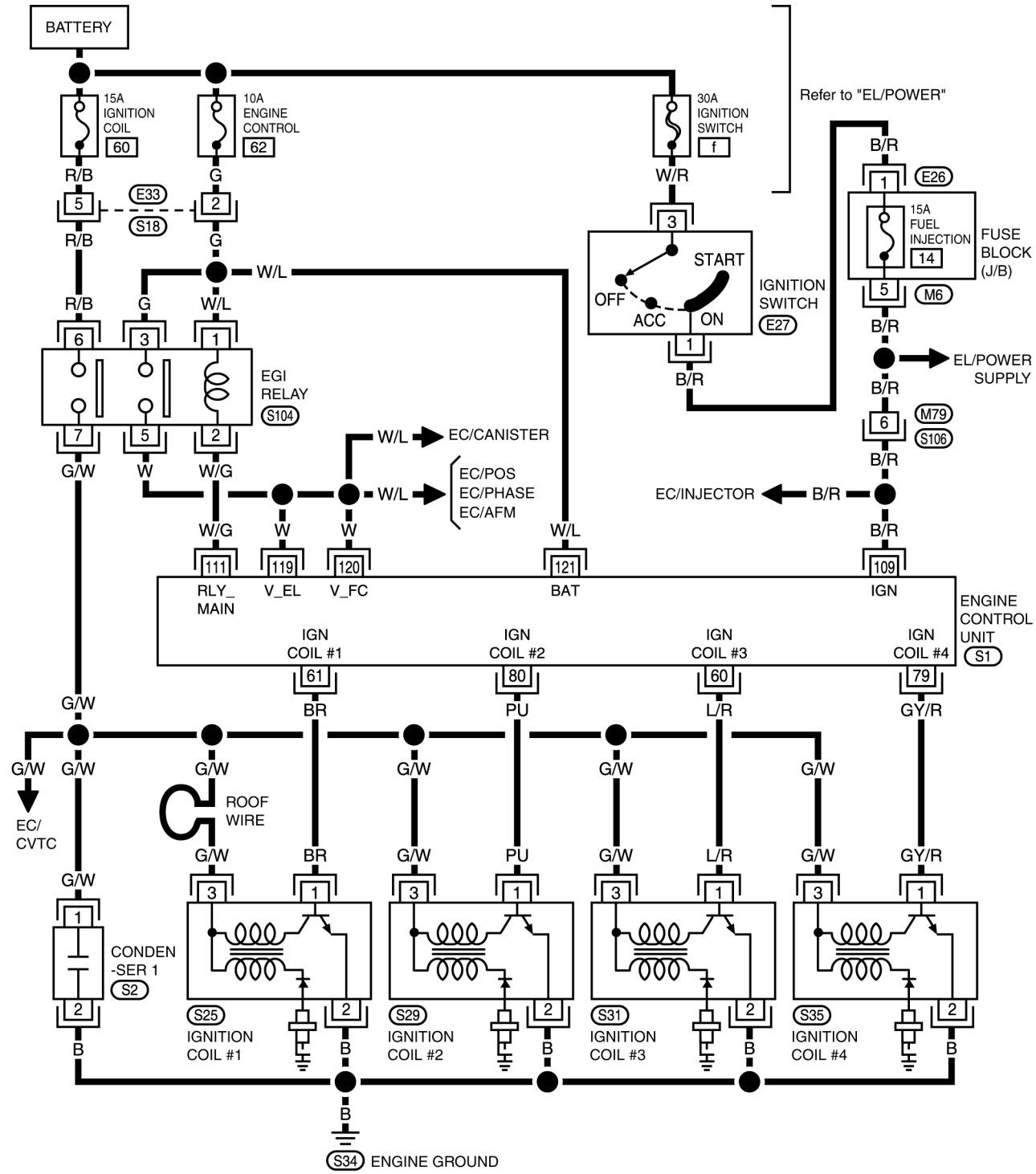
SEWU012_O1


A/T CONTROL UNIT
S105
BRAKE
TCU_ VCC
TVOO
TCU_ GND
TACHO
45
32
41
42
39
R/G
R
GY
B
L/OR
R/G
EL/ STOP LAMP
R/G
R/G
R/G
R
GY
B
L/OR
101
64
92
55
103
BRAKE
TCU_ VCC
TVOO
TCU_ GND
TACHO
ENGINE CONTROL UNIT
S1

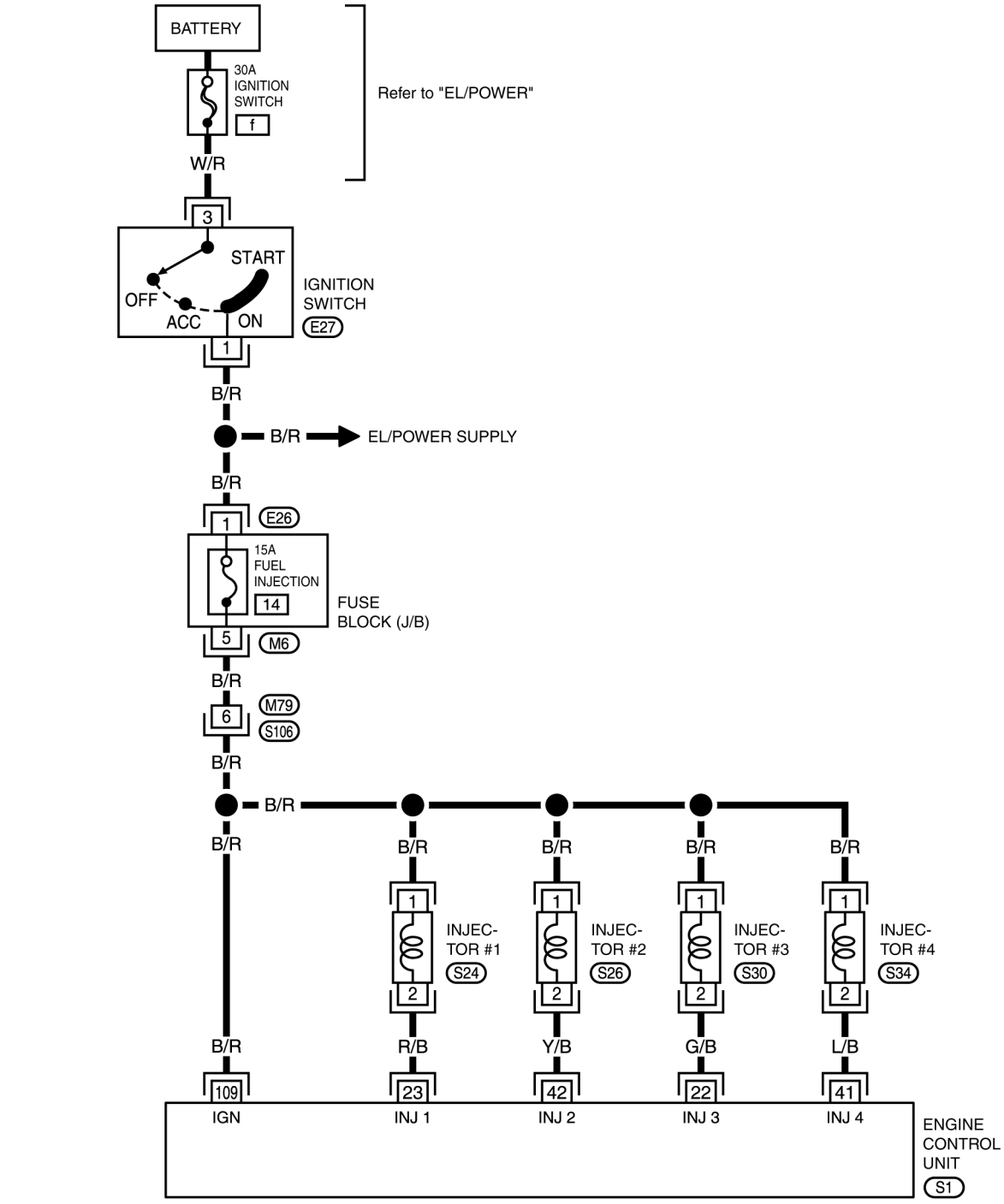

W
GY
S105
H.S.
S1
B
H.S.

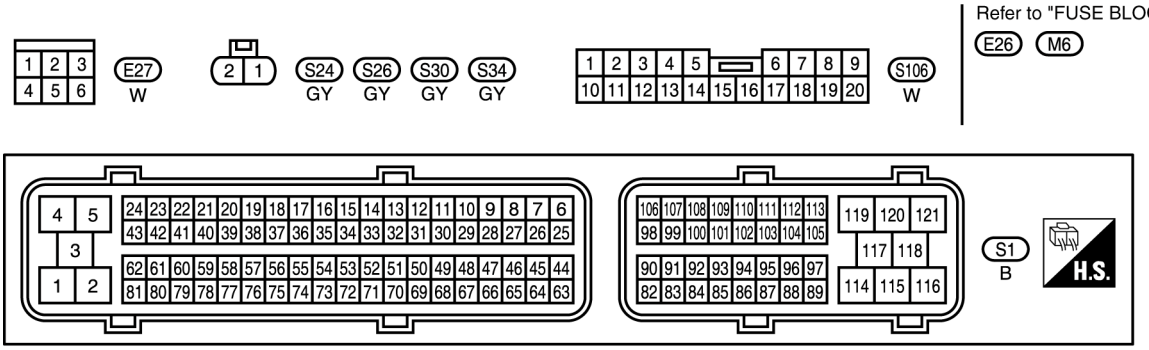
SEWU013_O1

Wiring Diagram — EC/Ignition



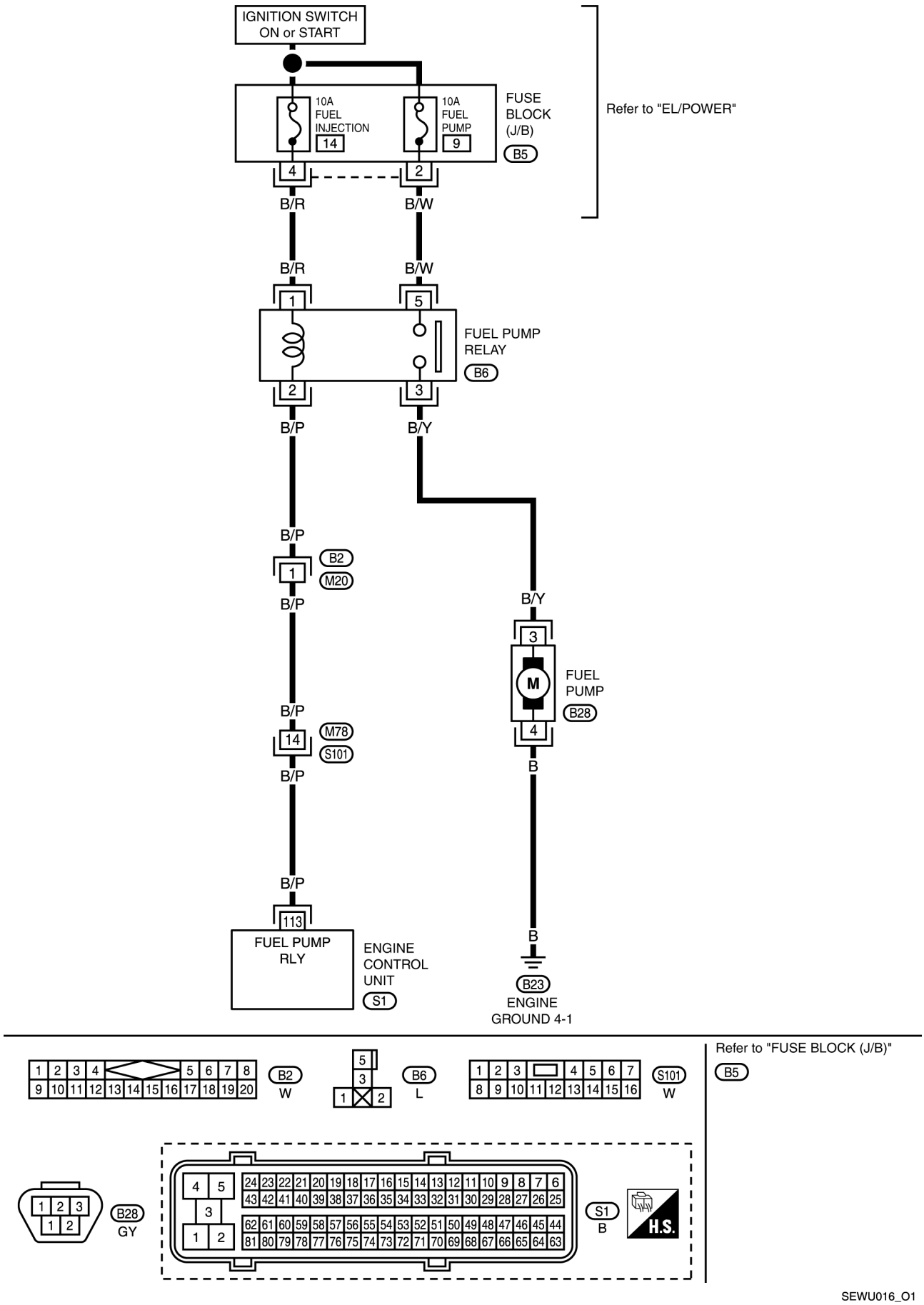
Wiring Diagram — EC/Injector





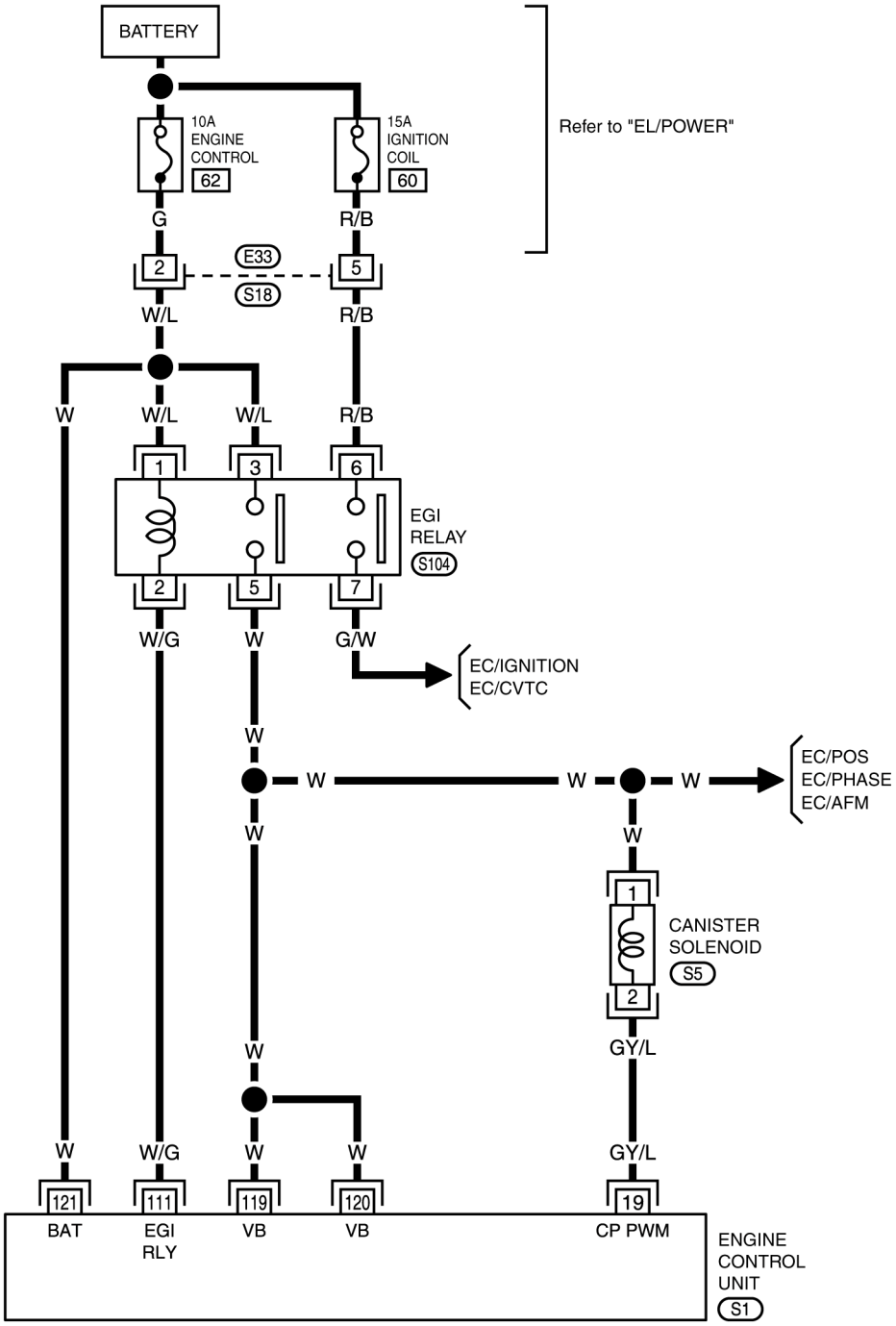
SEWU015_O1

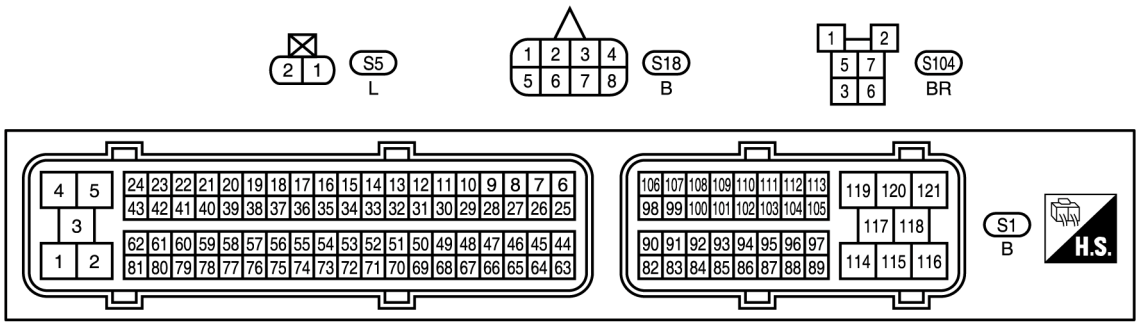
Wiring Diagram — EC/Fuel Pump



SEWU016_O1

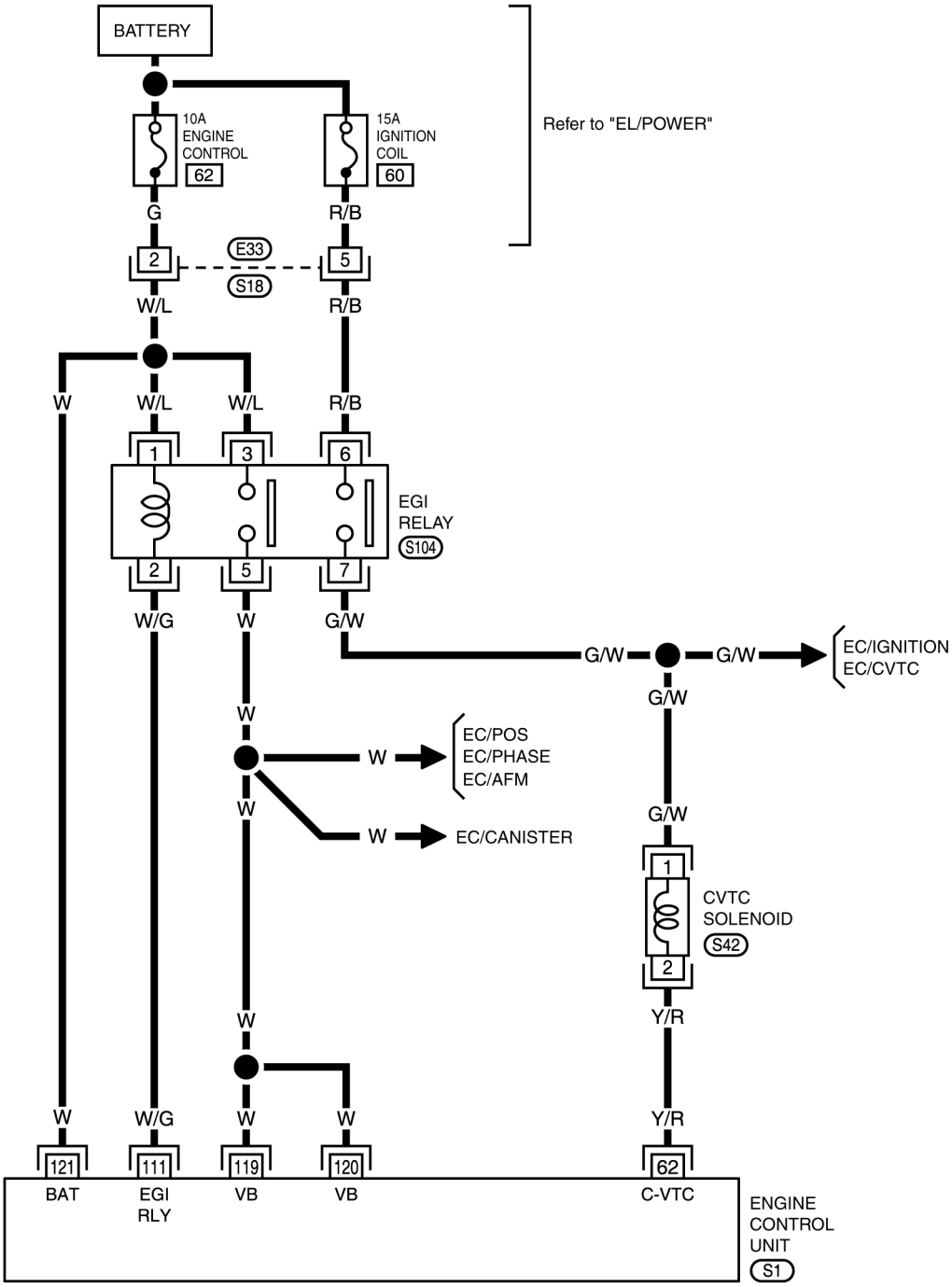
Wiring Diagram — EC/Canister

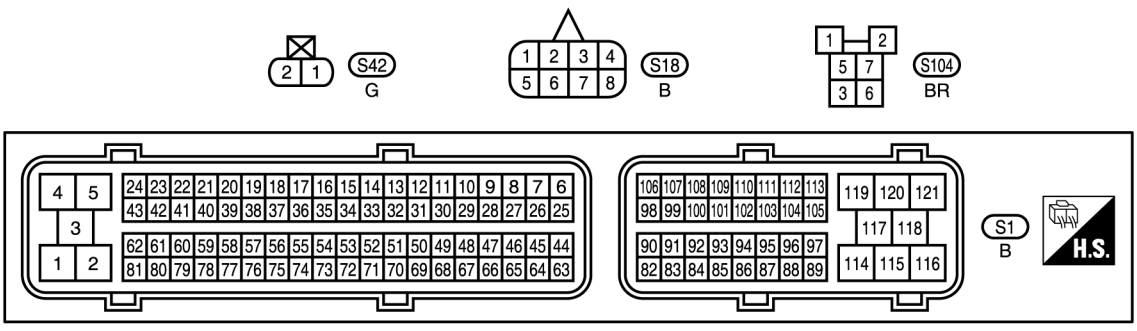




SEWU017_O1

Wiring Diagram — EC/CVTC

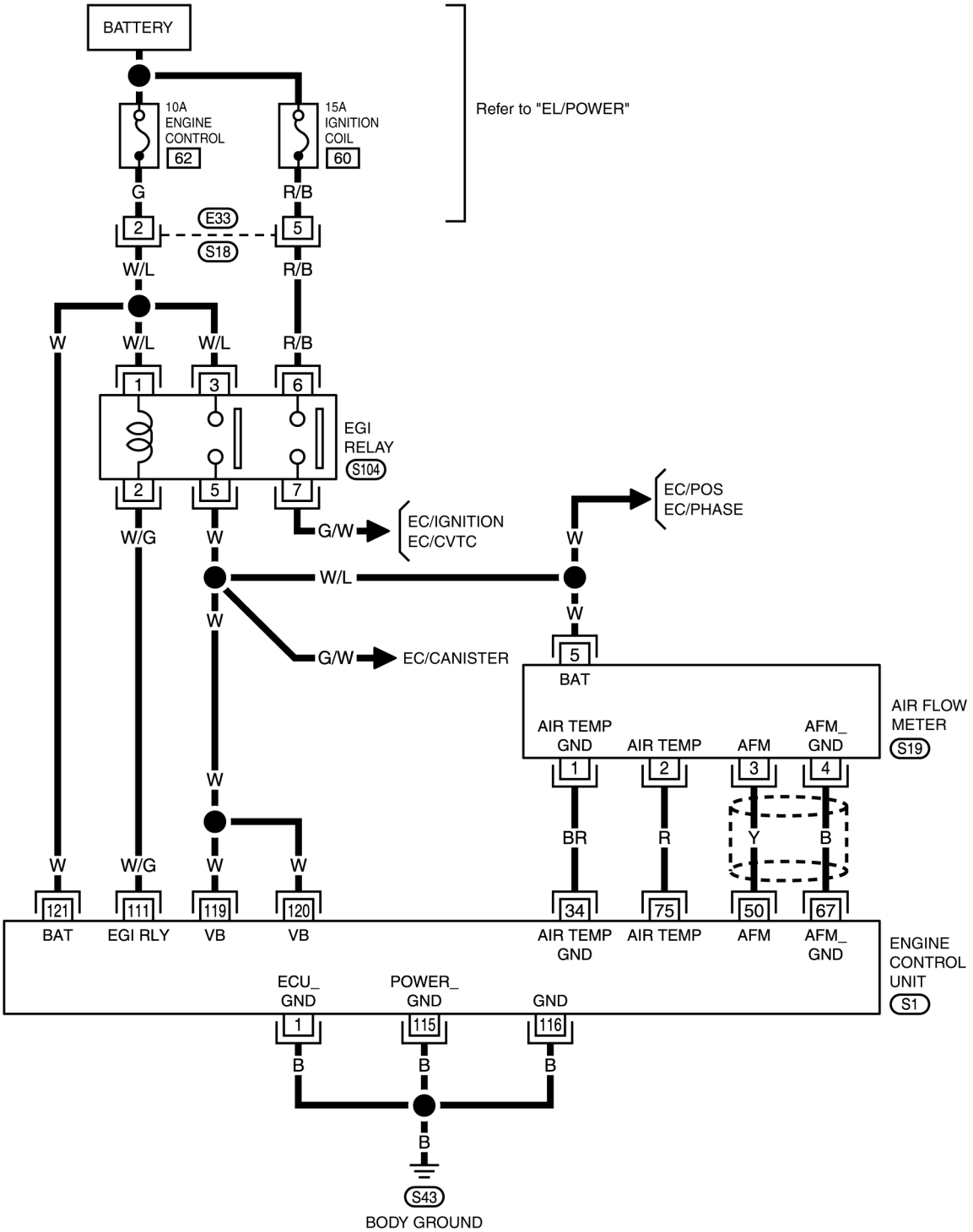


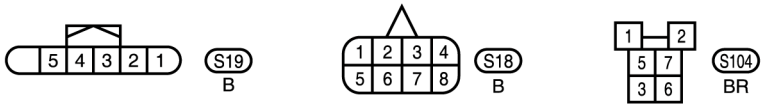


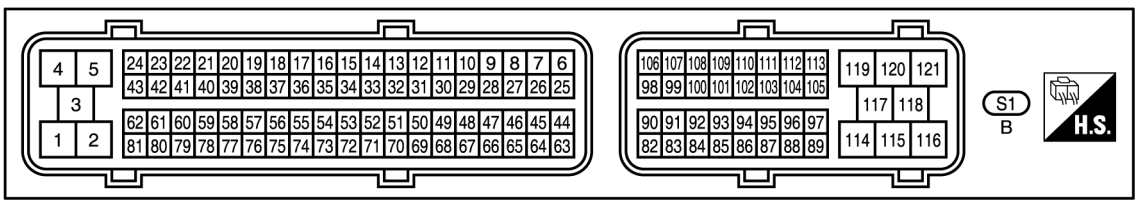
SEWU018_O1

Wiring Diagram

EC/AFM

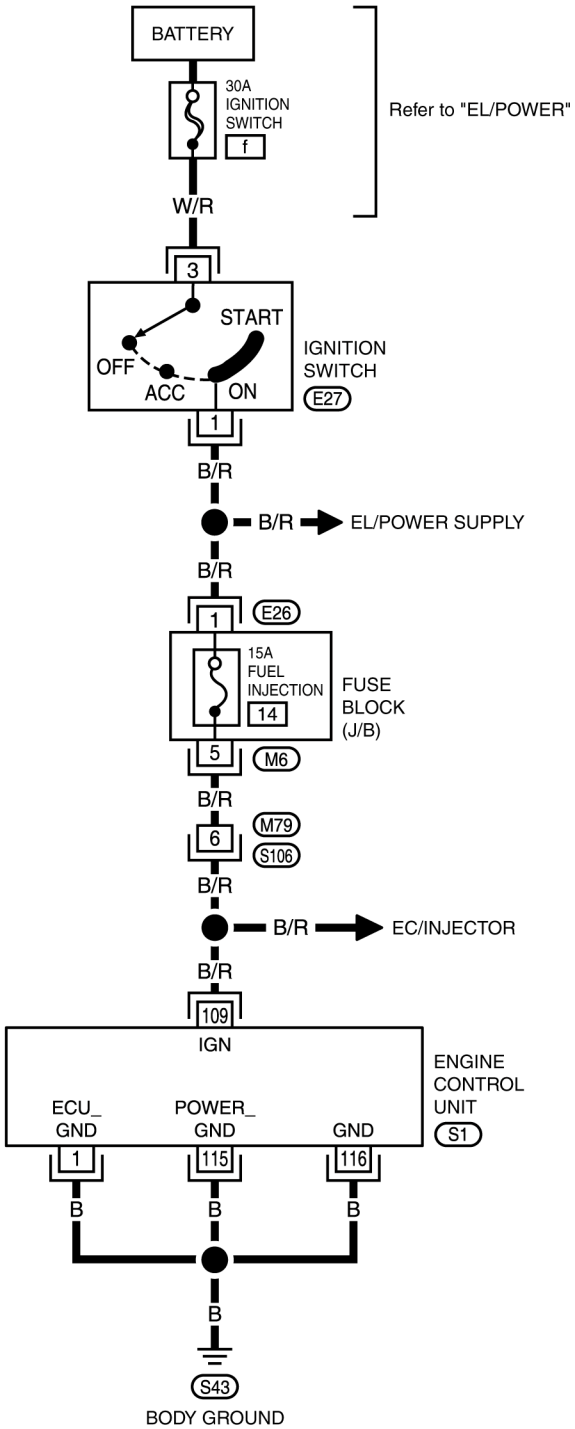


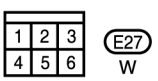


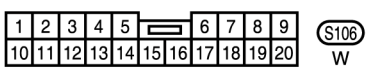


SEWU019_O1

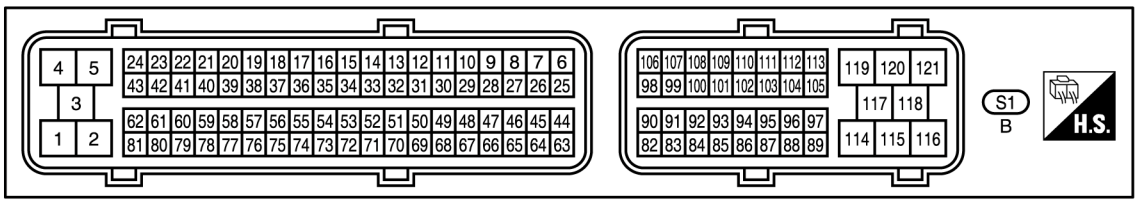
Wiring Diagram — EC/Ignition Signal



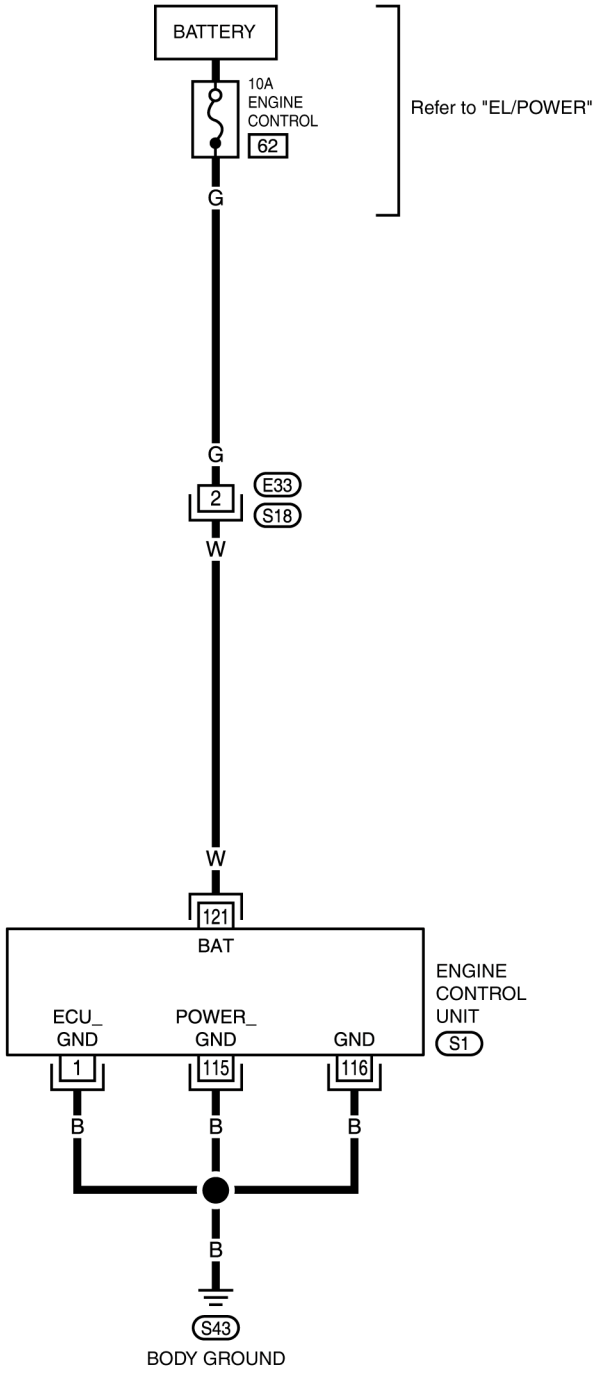


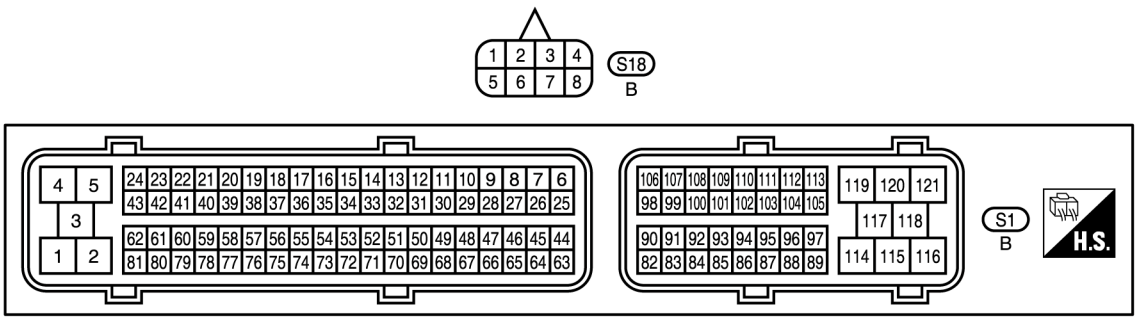


Refer to "FUSE BLOCK (J/B)"
E26 M6



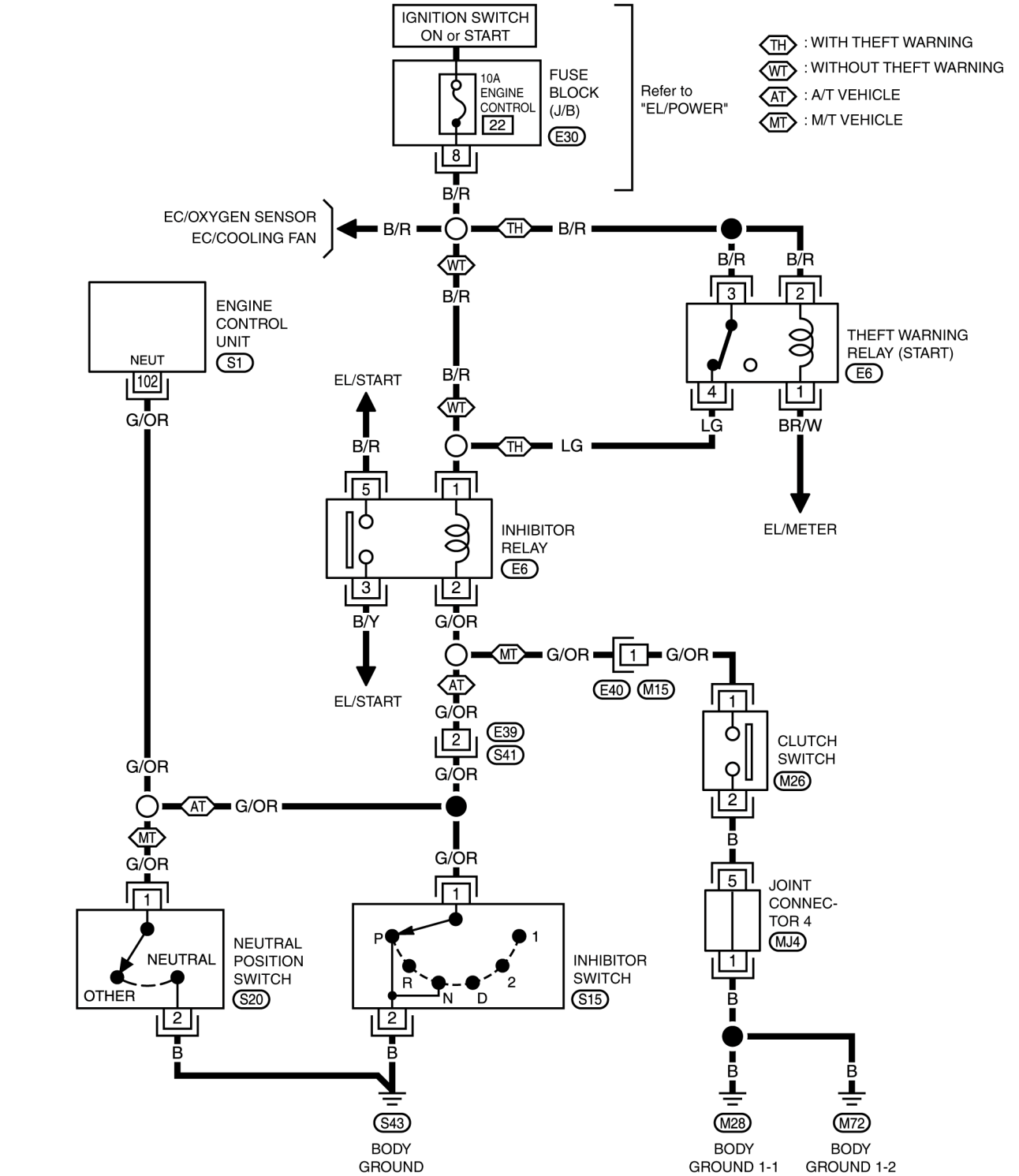
SEWU020_O1


BATTERY
10A
ENGINE
CONTROL
62
Refer to "EL/POWER"
G
G
2
E33
S18
W
W
121
BAT
ENGINE
CONTROL
UNIT
S1
ECU_
GND
1
POWER_
GND
115
GND
116
B
B
B
B
S43
BODY GROUND

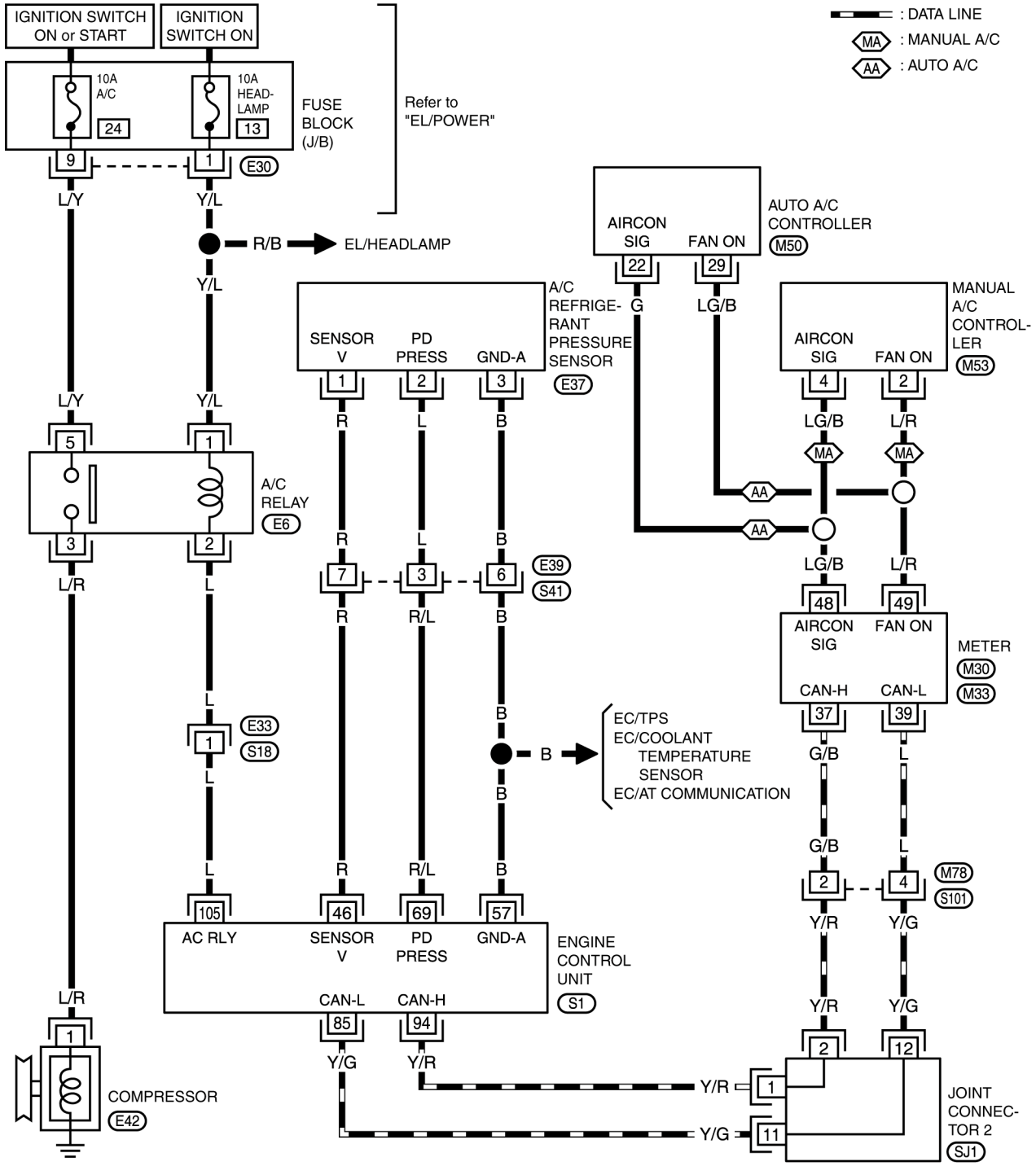

1 2 3 4
5 6 7 8
S18
B
4 5
3
1 2
24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6
43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25
62 61 60 59 58 57 56 55 54 53 52 51 50 49 48 47 46 45 44
81 80 79 78 77 76 75 74 73 72 71 70 69 68 67 66 65 64 63
106 107 108 109 110 111 112 113
98 99 100 101 102 103 104 105
90 91 92 93 94 95 96 97
82 83 84 85 86 87 88 89
119 120 121
117 118
114 115 116
S1
B
H.S.

SEWU021_O1

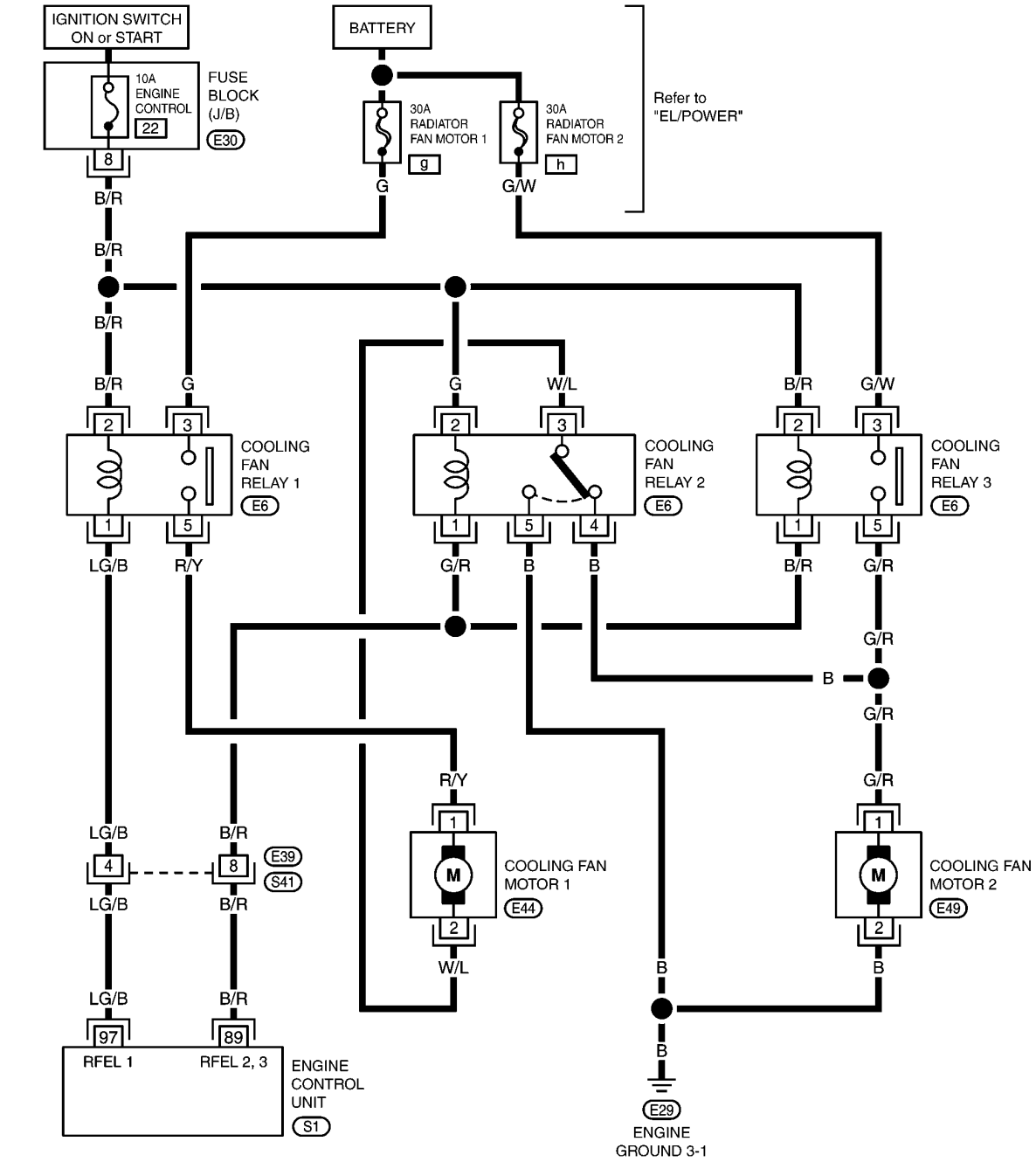
Wiring Diagram — EC/Neutral Position Signal

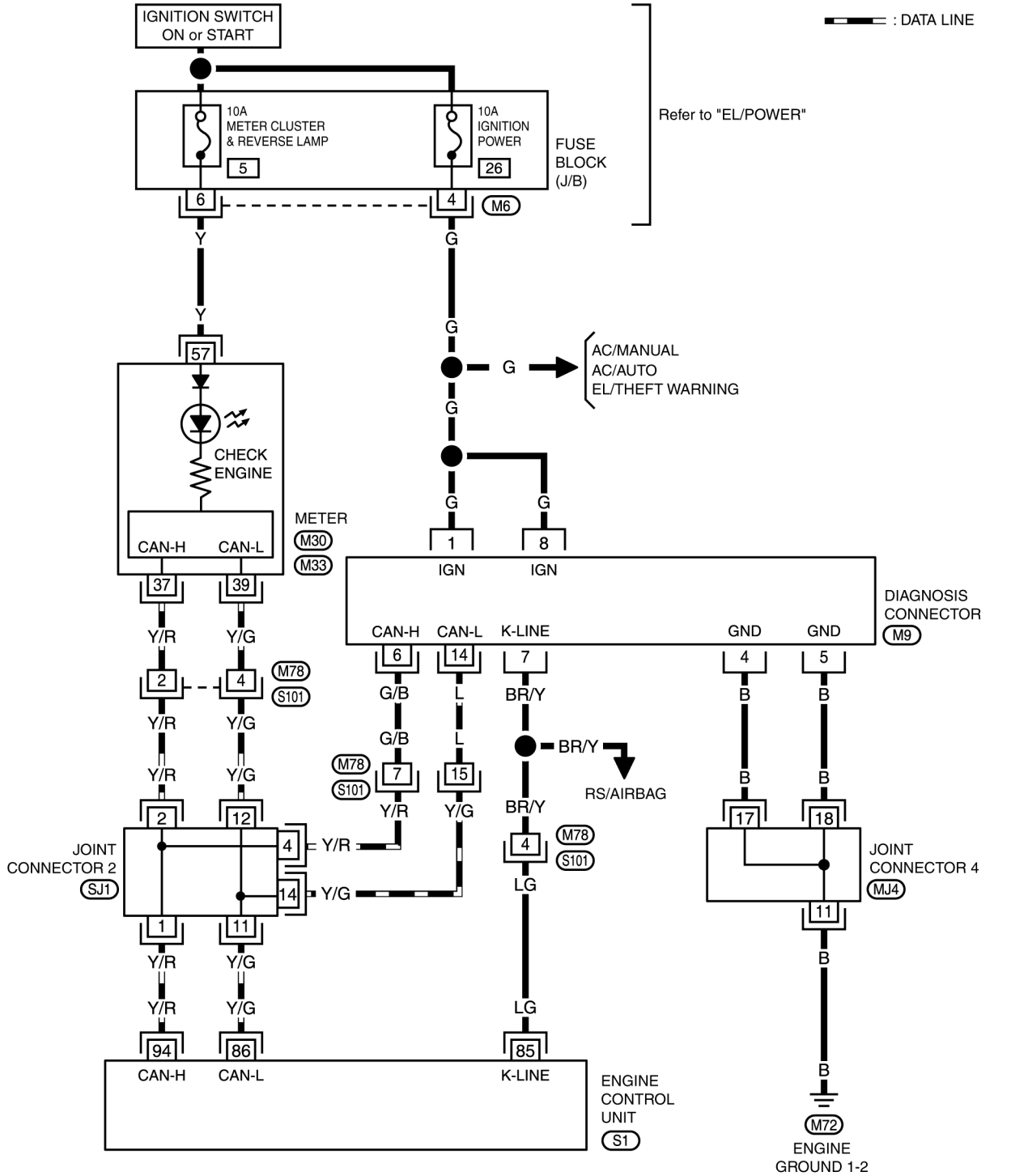


Wiring Diagram — EC/AT Signal

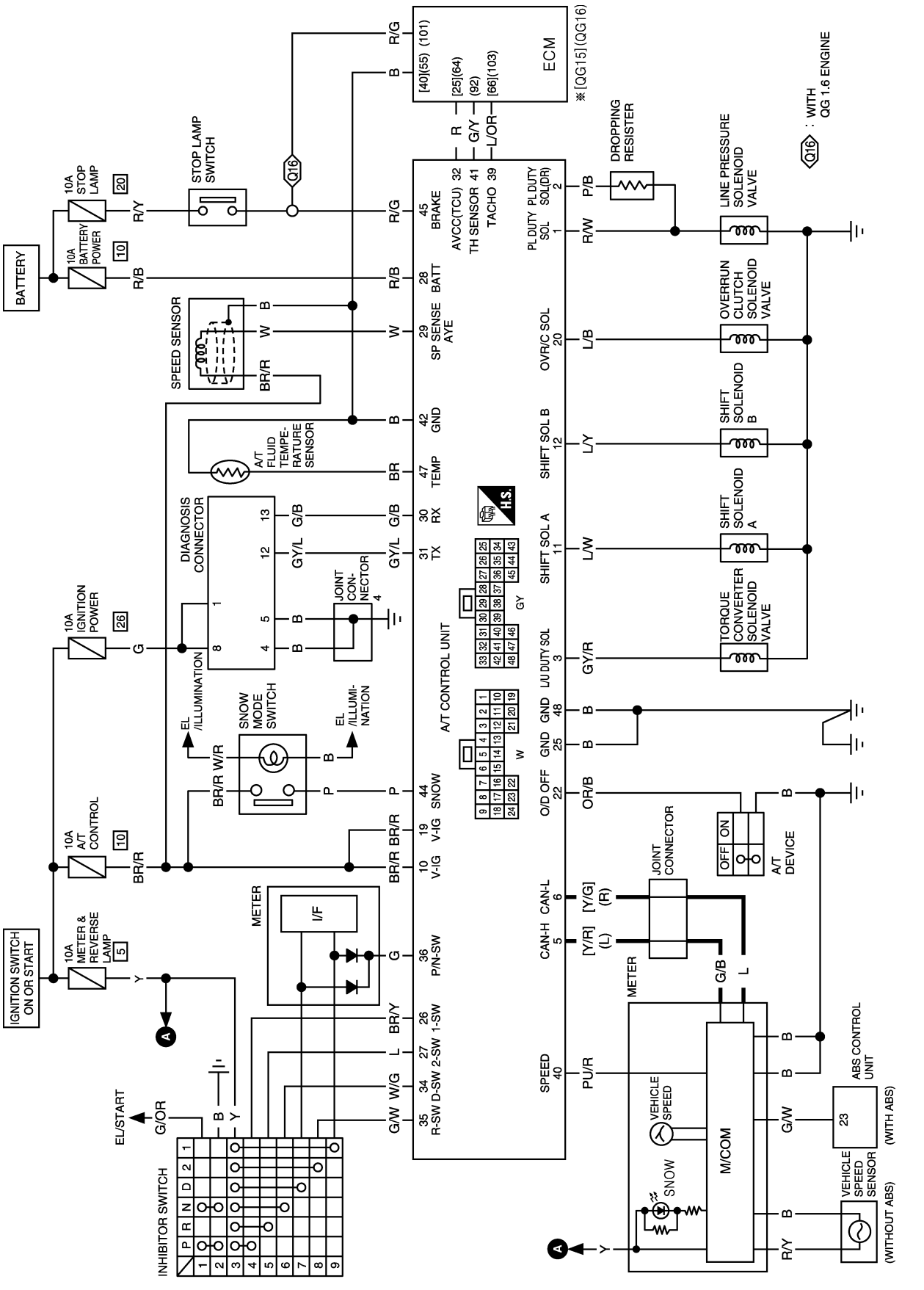


Wiring Diagram — EC/Cooling Fan



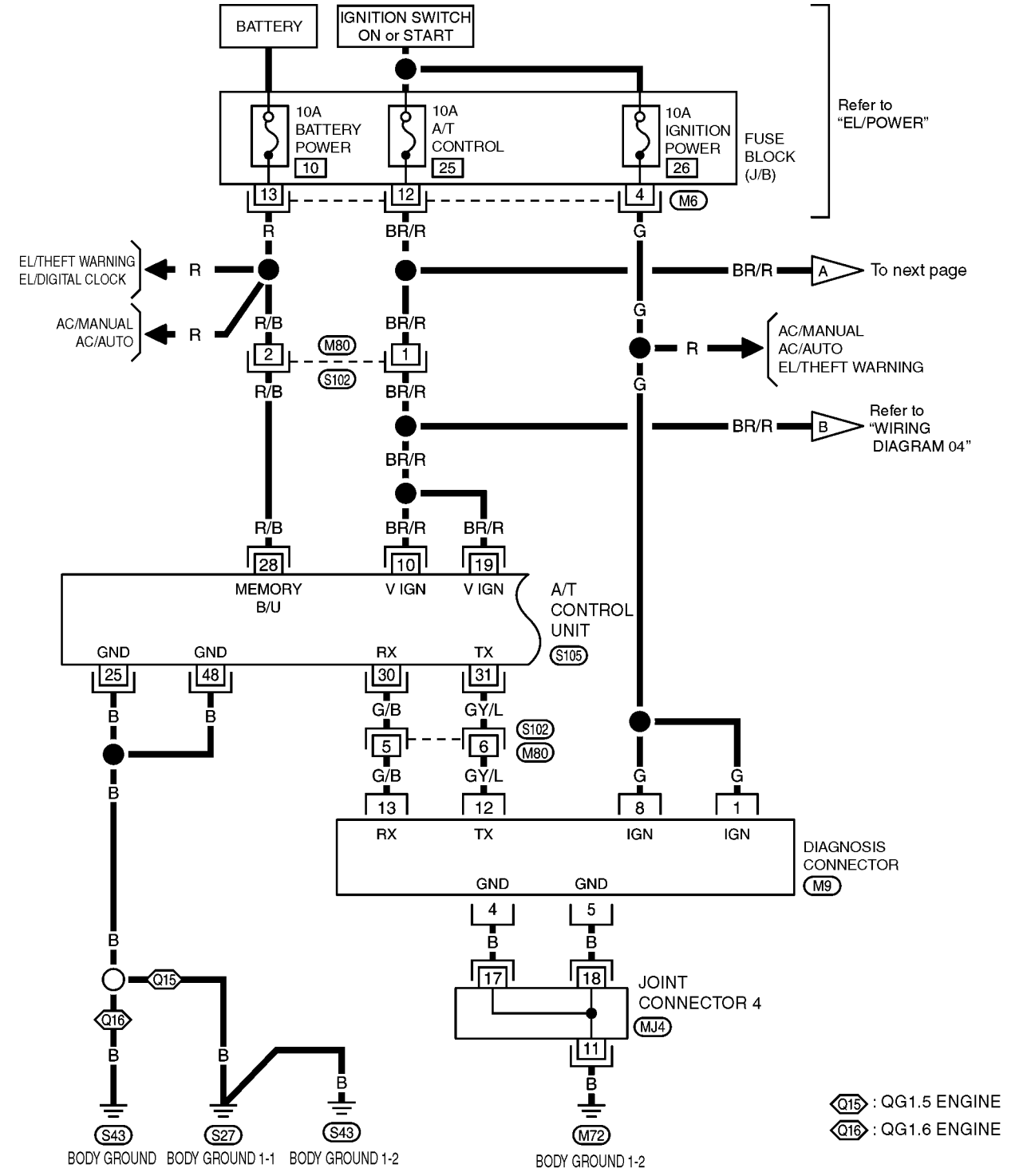

IGNITION SWITCH ON or START
: DATA LINE
10A METER CLUSTER & REVERSE LAMP
5
10A IGNITION POWER
26
FUSE BLOCK (J/B)
Refer to "EL/POWER"
6
4
M6
Y
G
57
CHECK ENGINE
CAN-H
CAN-L
METER
M30
M33
AC/MANUAL
AC/AUTO
EL/THEFT WARNING
1
8
IGN
IGN
DIAGNOSIS CONNECTOR
M9
CAN-H
CAN-L
K-LINE
GND
GND
37
39
6
14
7
4
5
Y/R
Y/G
G/B
L
BR/Y
B
M78
S101
2
4
7
15
RS/AIRBAG
JOINT CONNECTOR 2
SJ1
12
17
18
JOINT CONNECTOR 4
MJ4
1
11
94
86
85
CAN-H
CAN-L
K-LINE
LG
ENGINE CONTROL UNIT
S1
M72
ENGINE GROUND 1-2
M9
B
M30
GY
S101
W
M33
B
SJ1
L
MJ4
L
S1
B
H.S.
Refer to "FUSE BLOCK (J/B)"
M6
SEWU025_O1

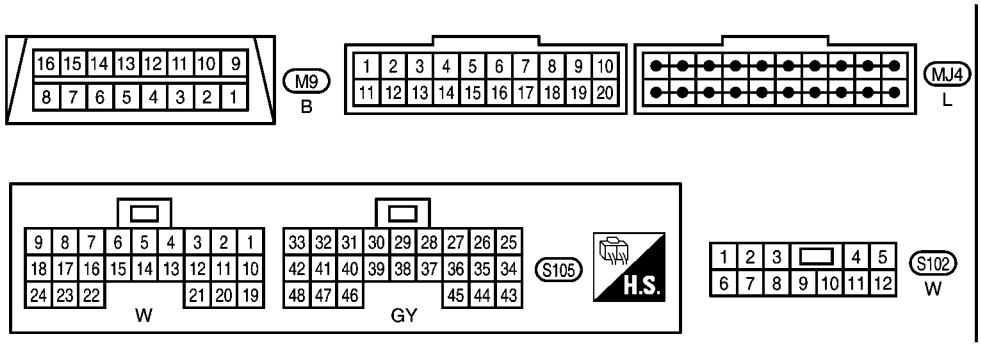
Circuit Diagram



SICZ001_O1

Wiring Diagram

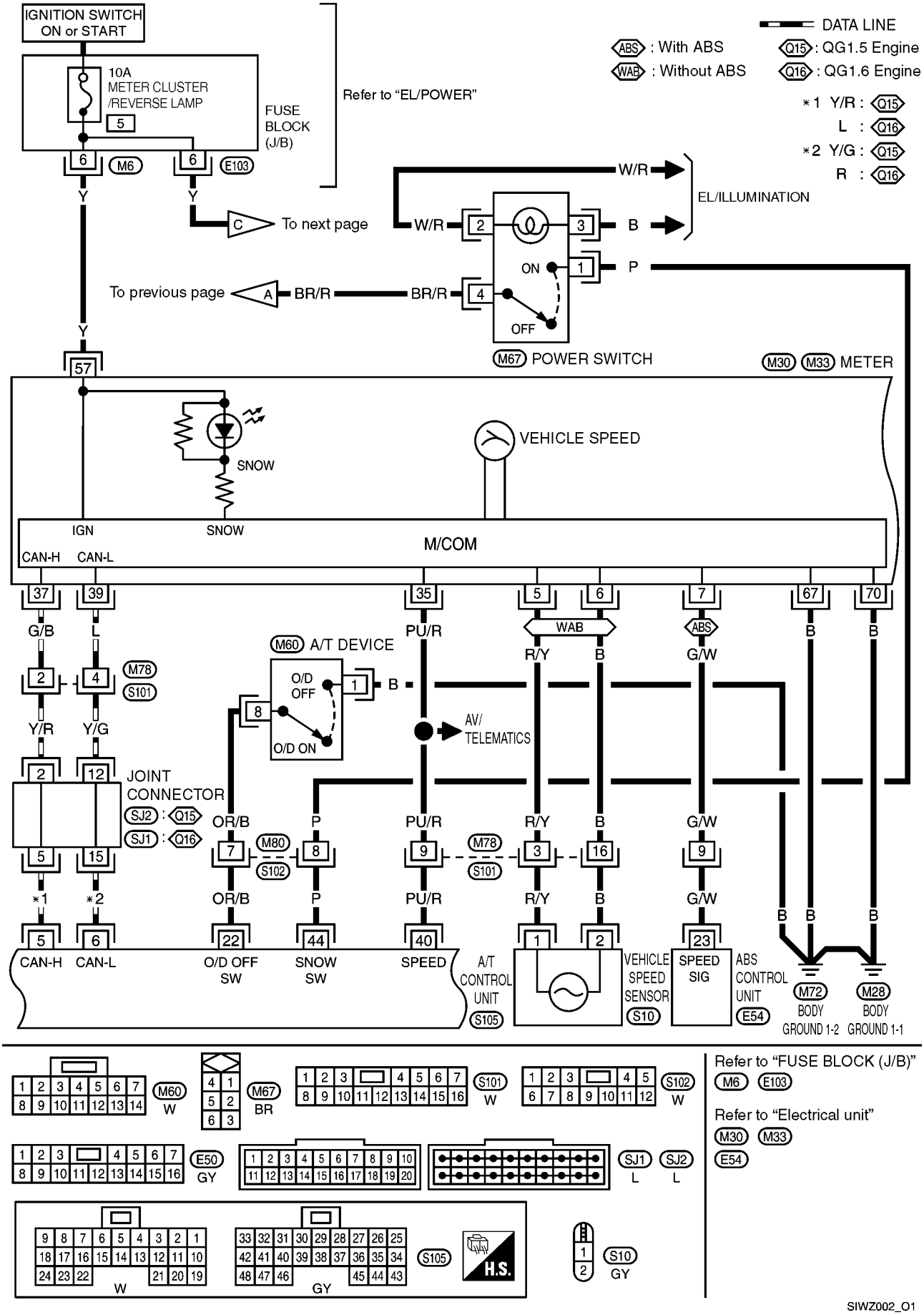


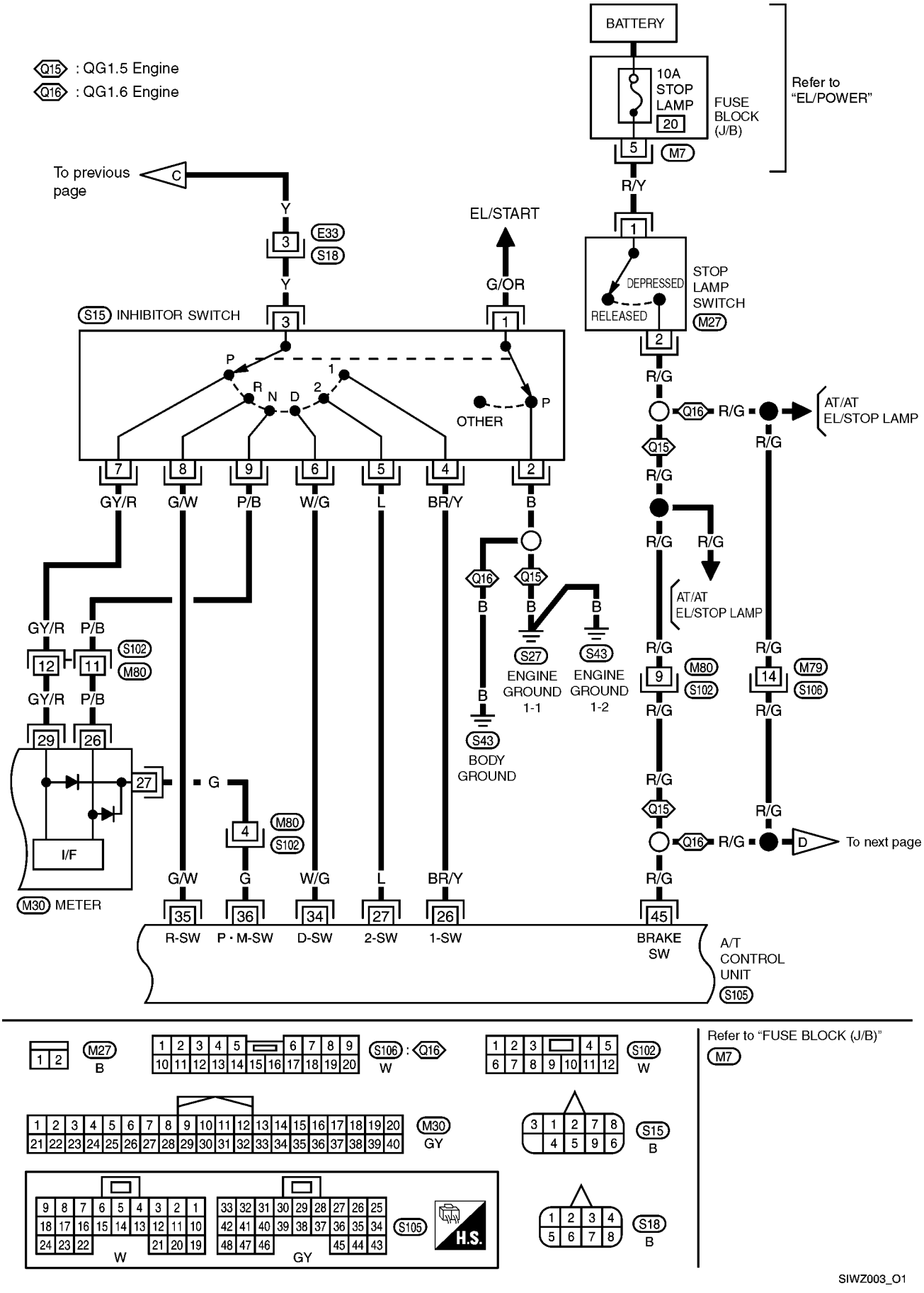


Refer to "FUSE BLOCK (J/B)"
M6

SIWZ001_O1

Wiring Diagram

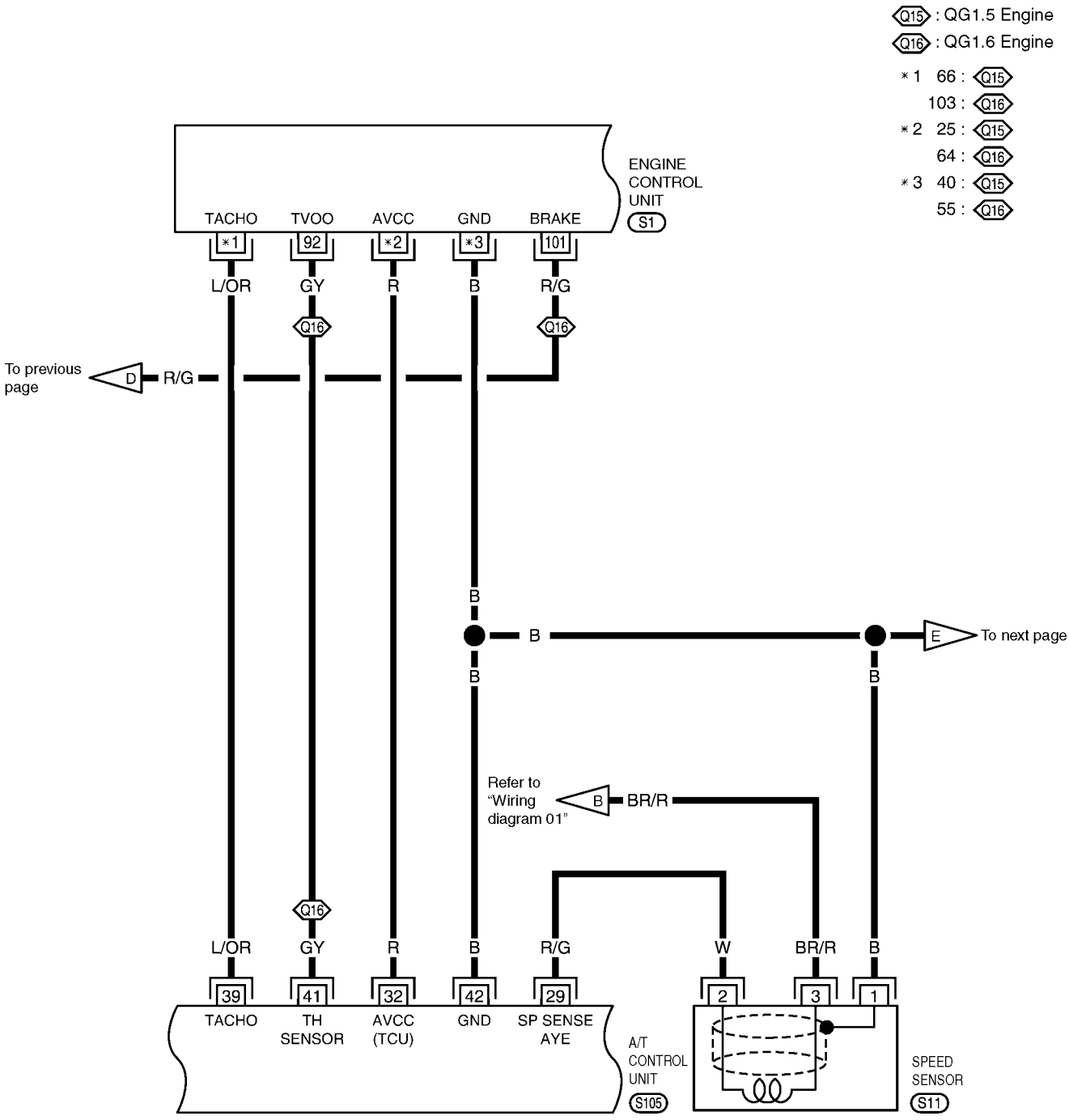


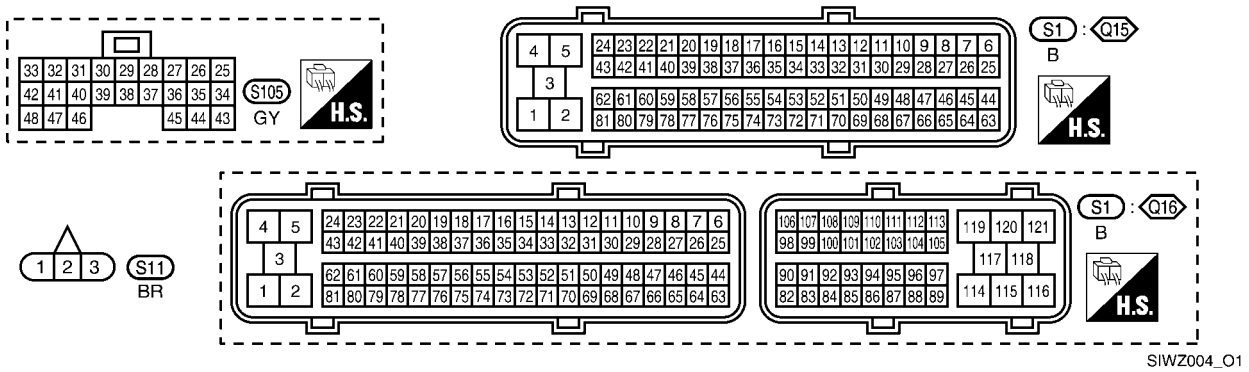


Refer to "FUSE BLOCK (J/B)"
M7

SIWZ003_O1

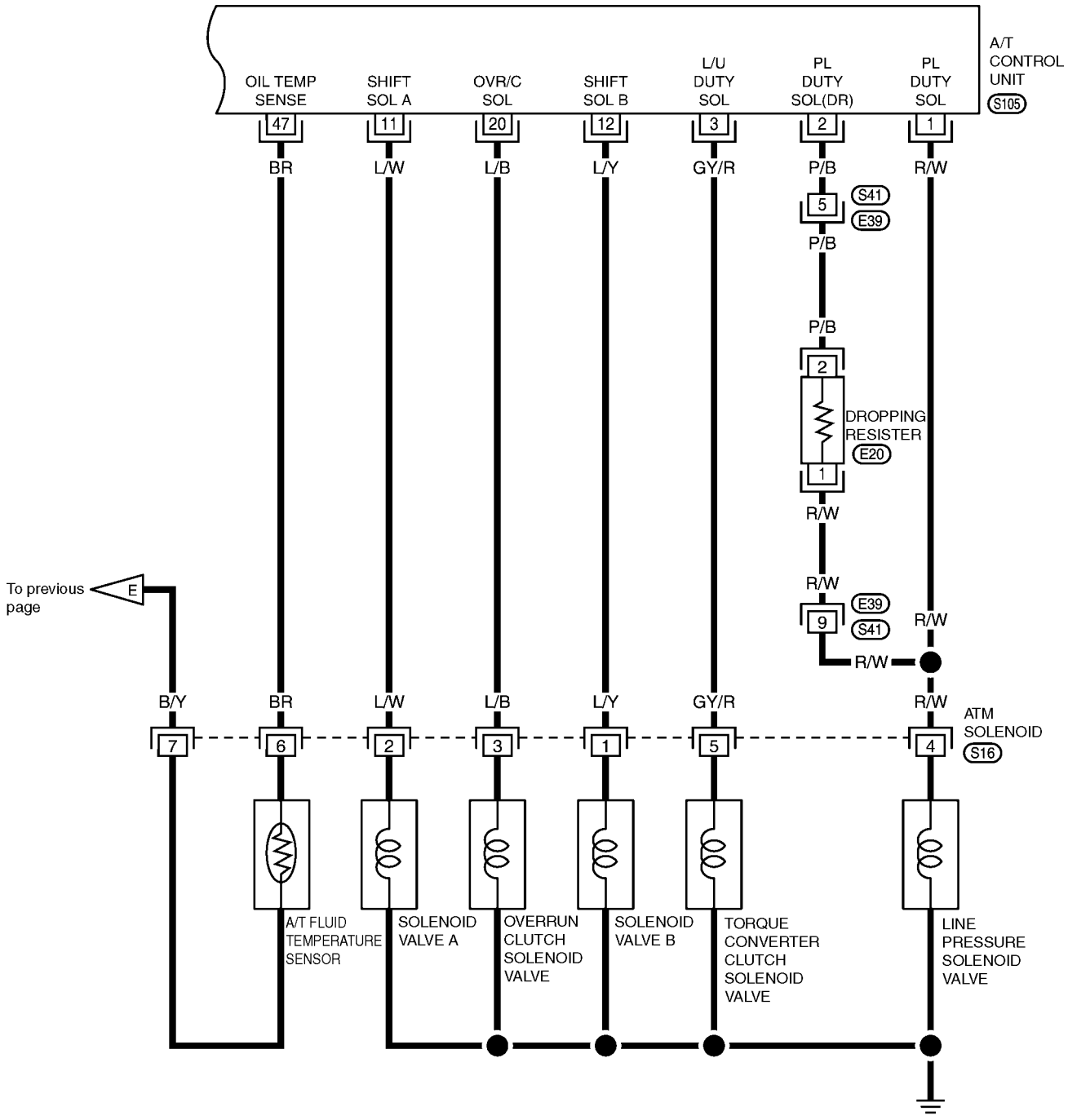
Wiring Diagram





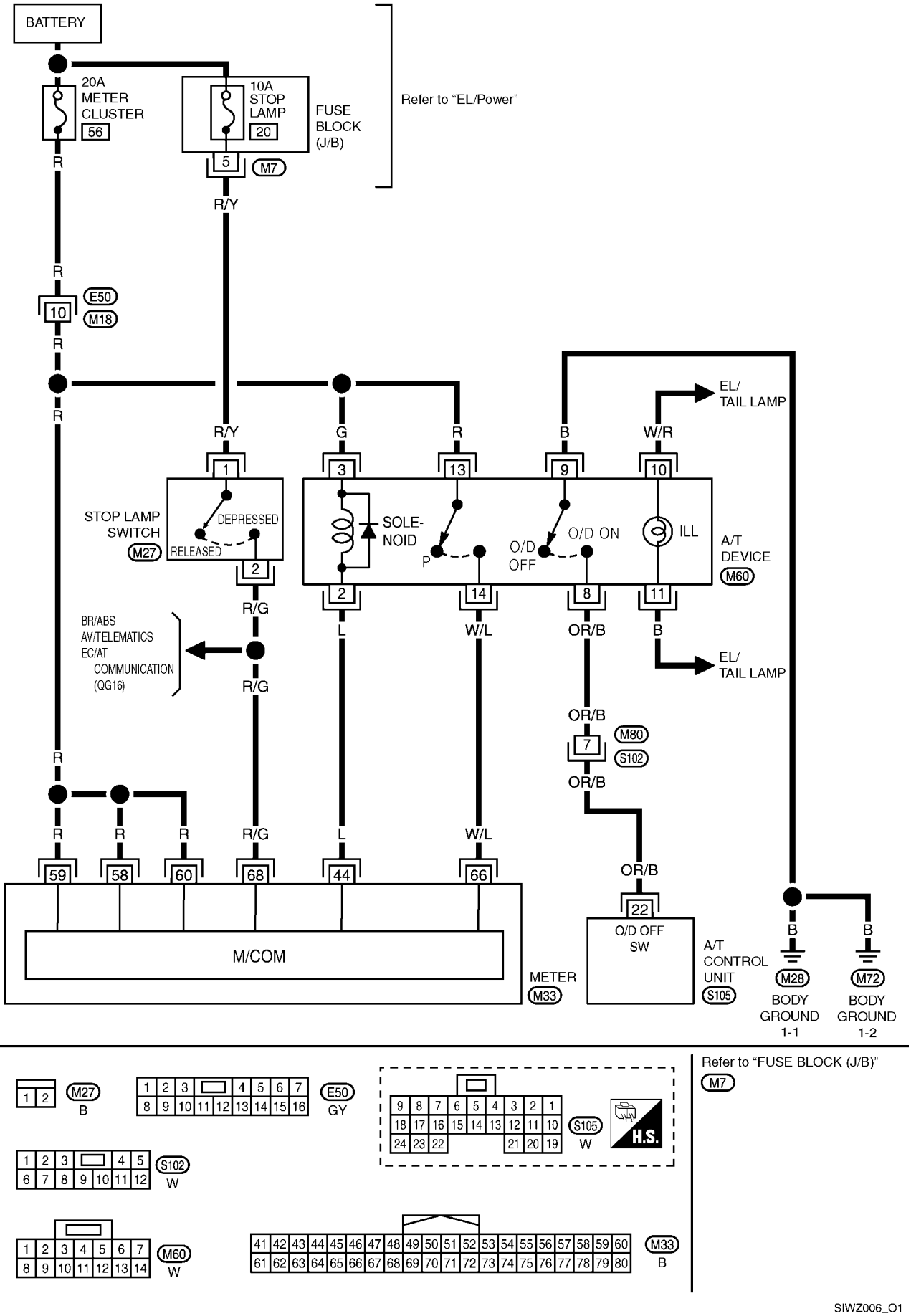
SIWZ004_O1

Wiring Diagram



SIWZ005_O1

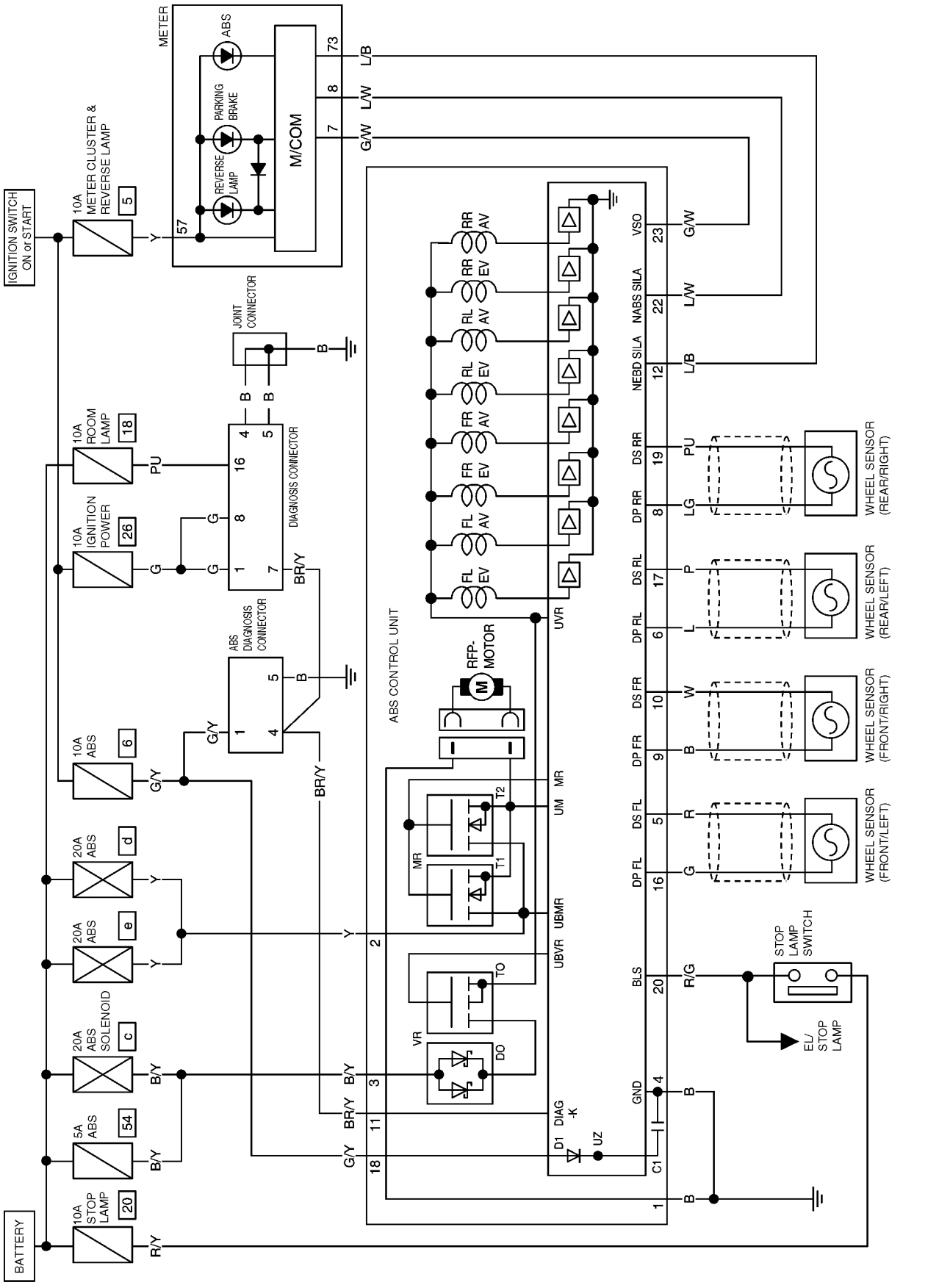
Wiring Diagram



Refer to "FUSE BLOCK (J/B)" M7

SIWZ006_O1

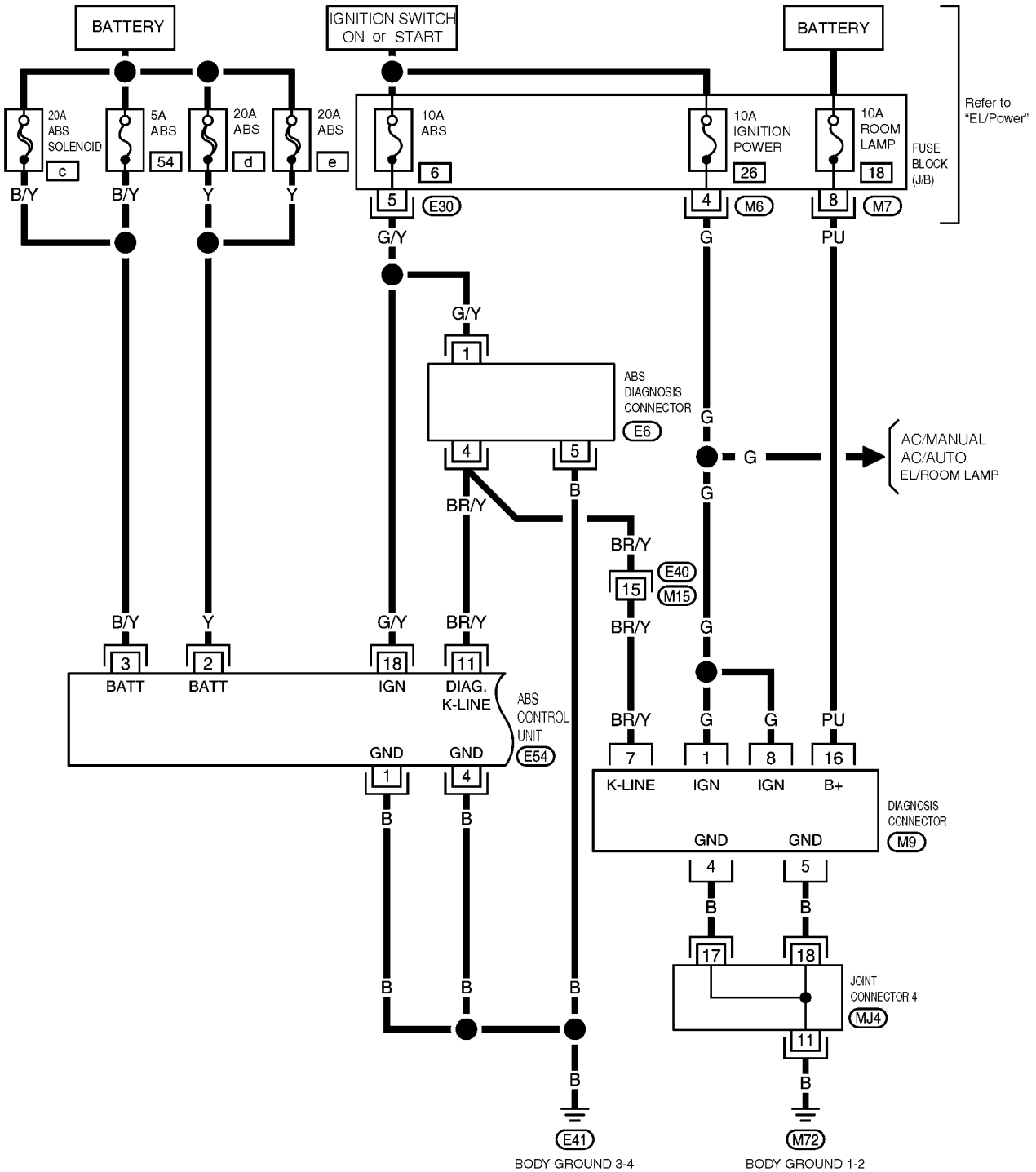
Circuit Diagram

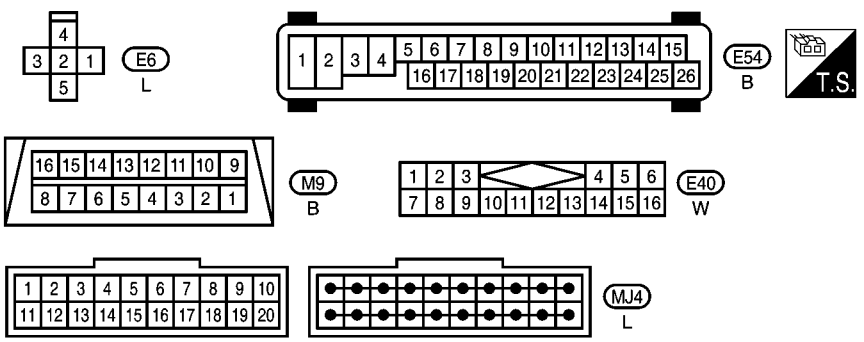


SLCZ001_O1

Wiring Diagram

BR/ABS-01

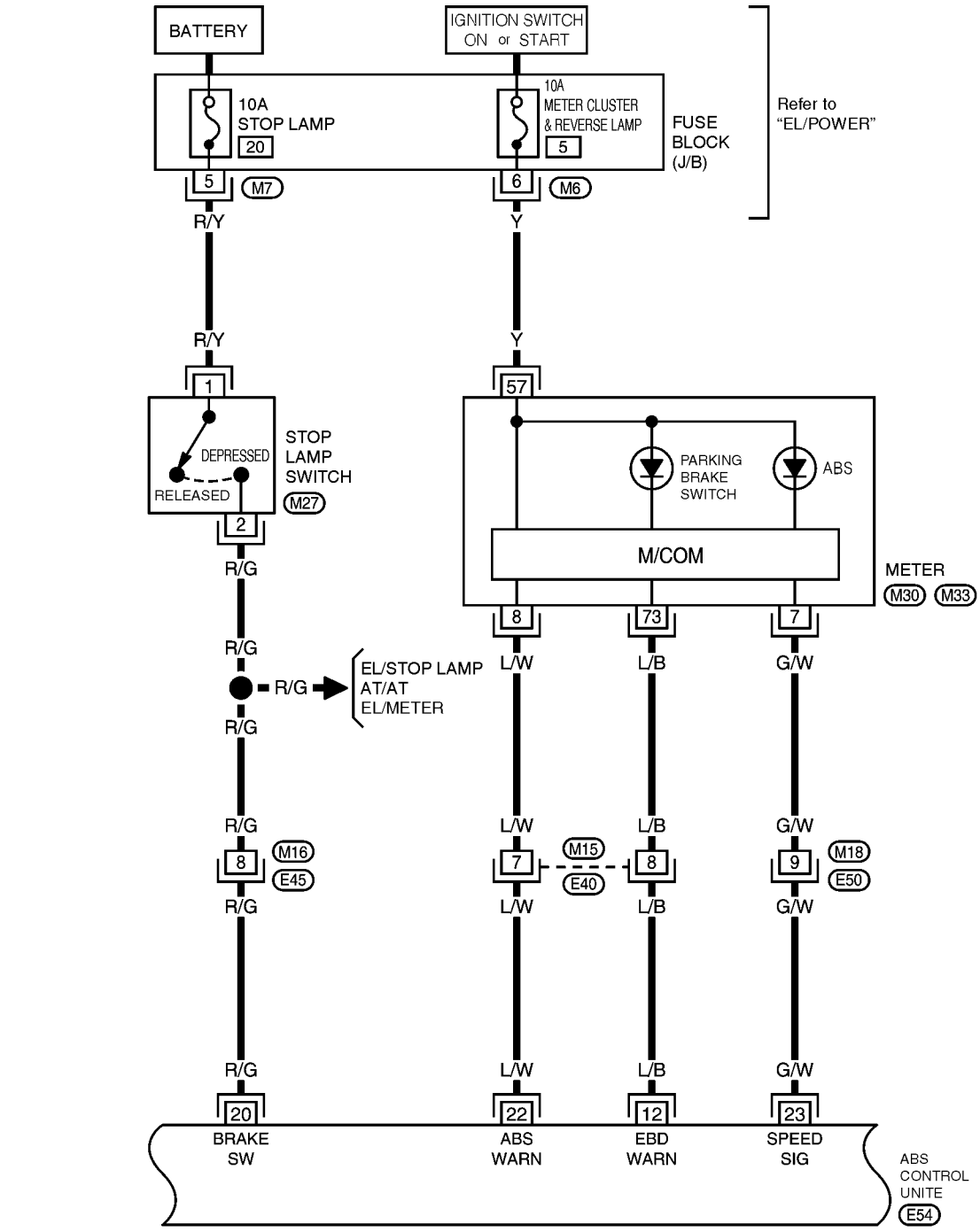


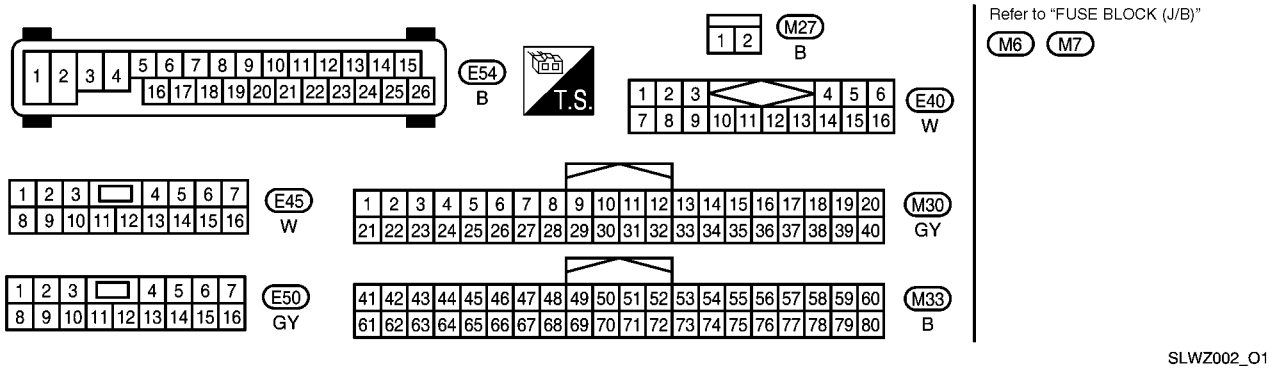


Refer to "FUSE BLOCK (J/B)"
M6 M7
E30

SLWZ001_O1

Wiring Diagram

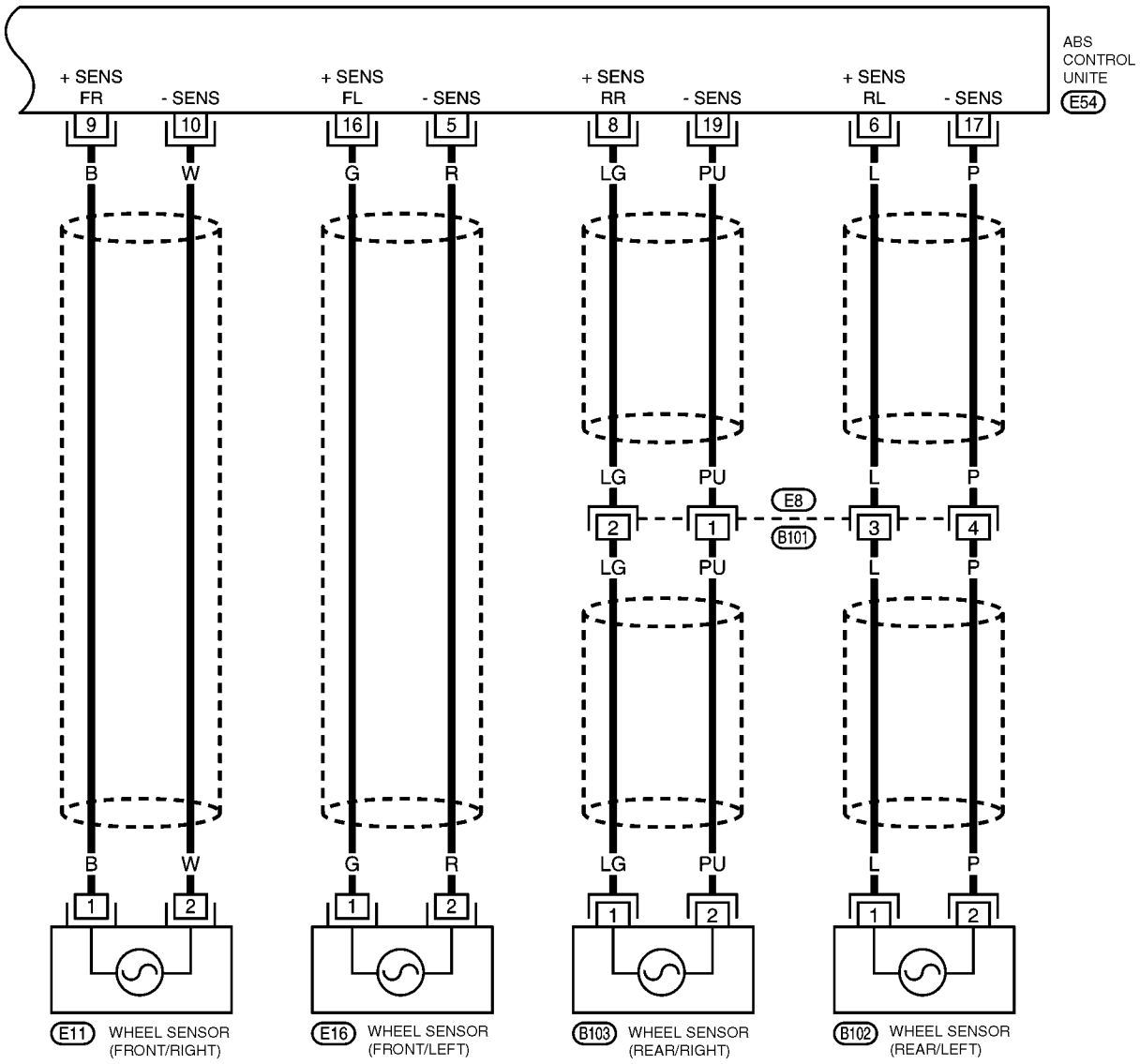


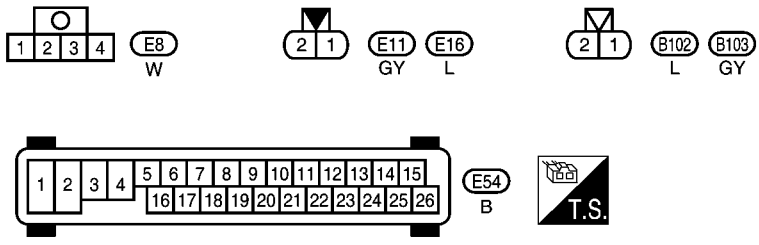


SLWZ002_O1

Wiring Diagram

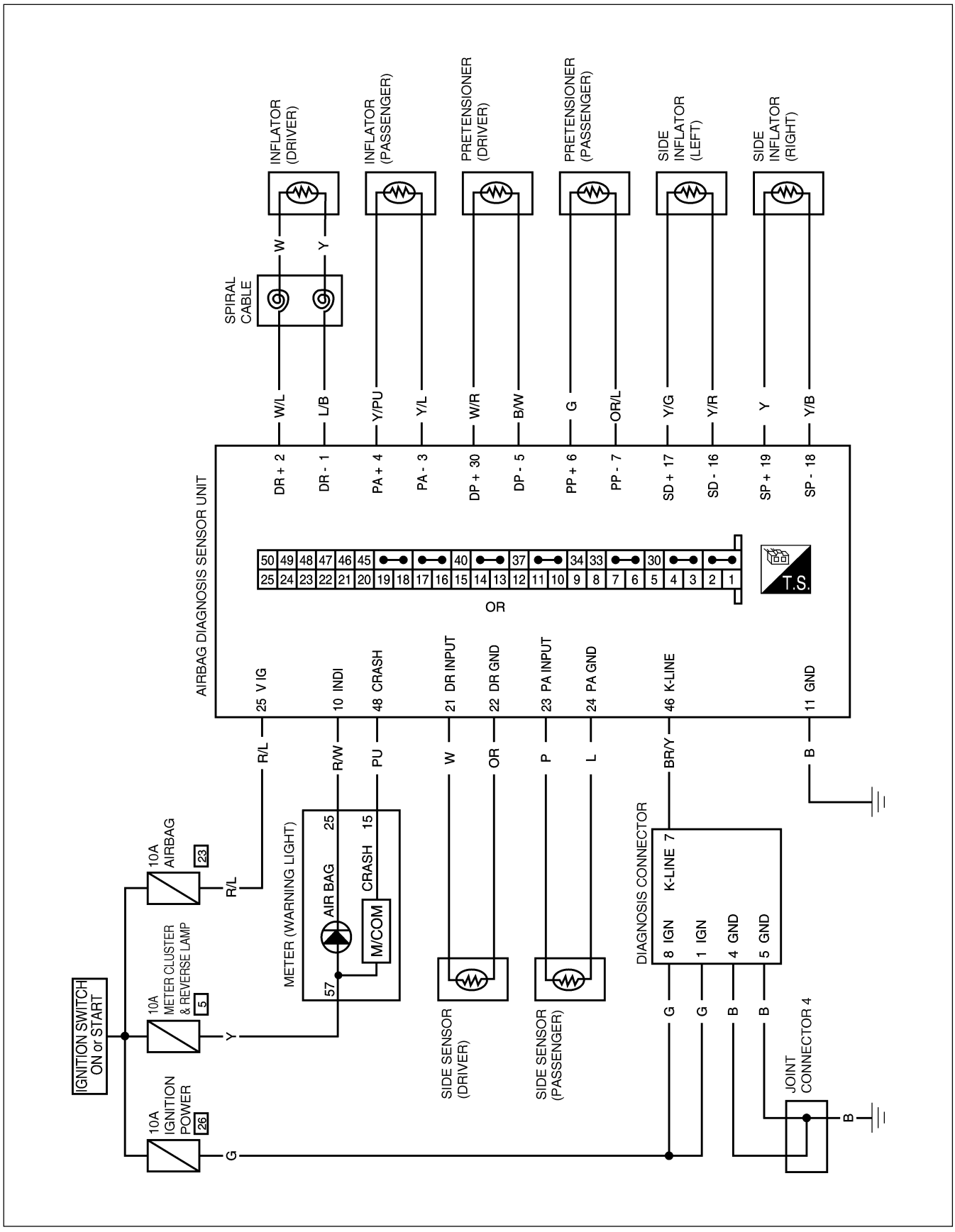
BR/ABS-03





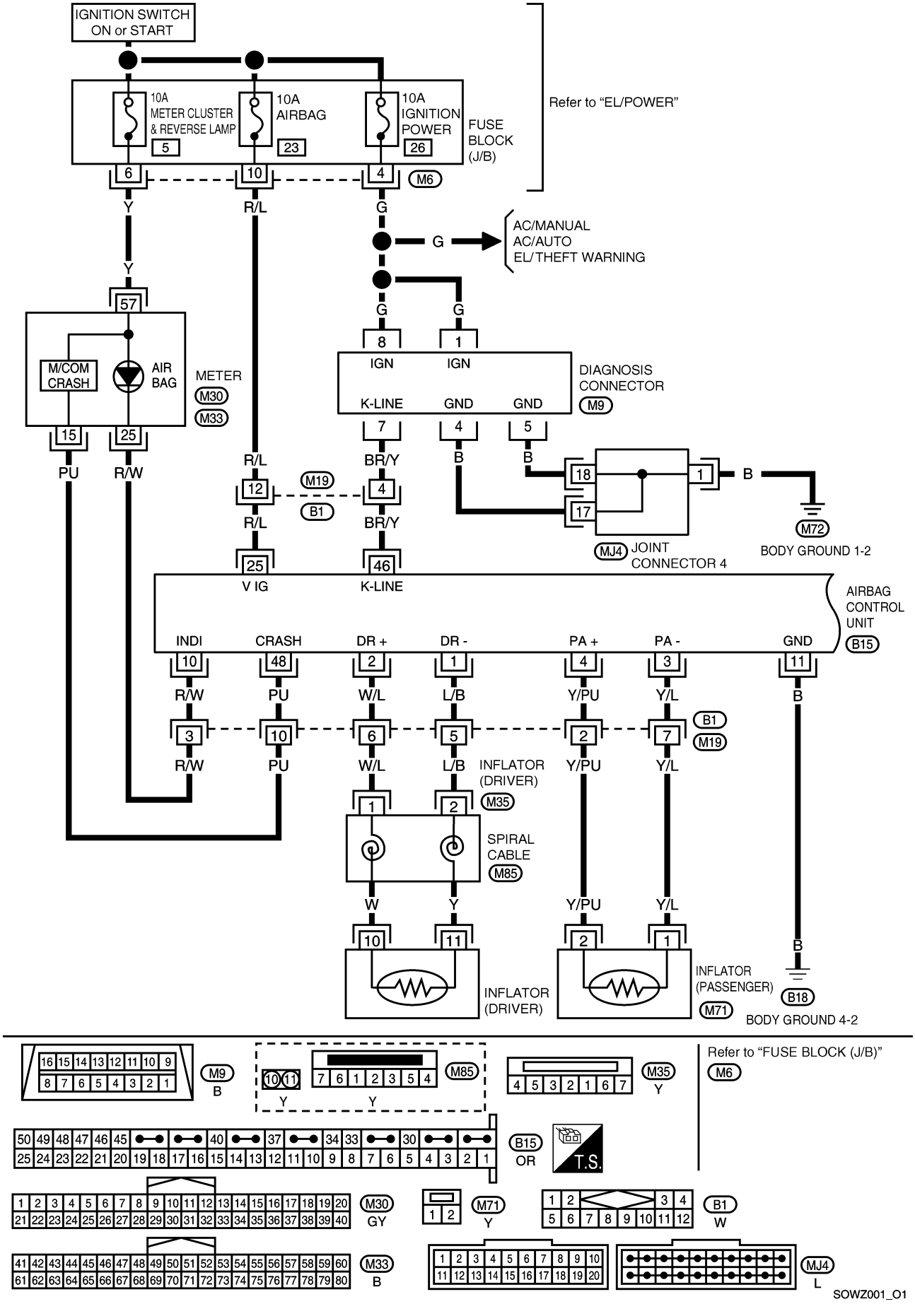
SLWZ003_O1

Circuit Diagram



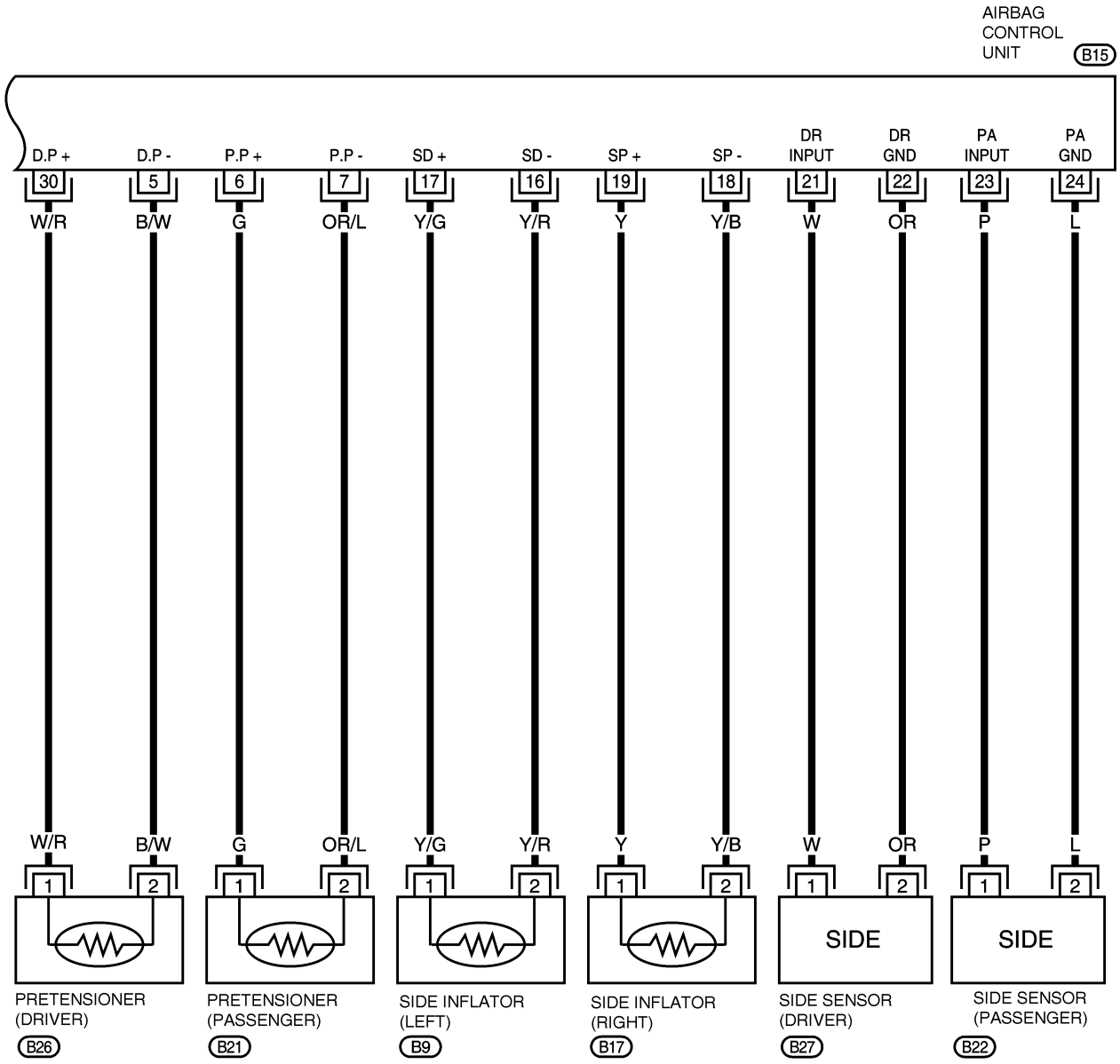
Wiring Diagram

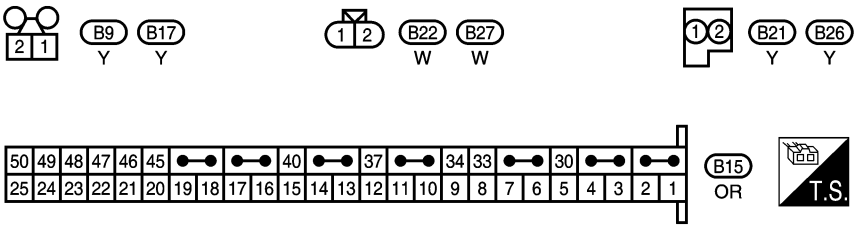
RS/SRS-01



Wiring Diagram

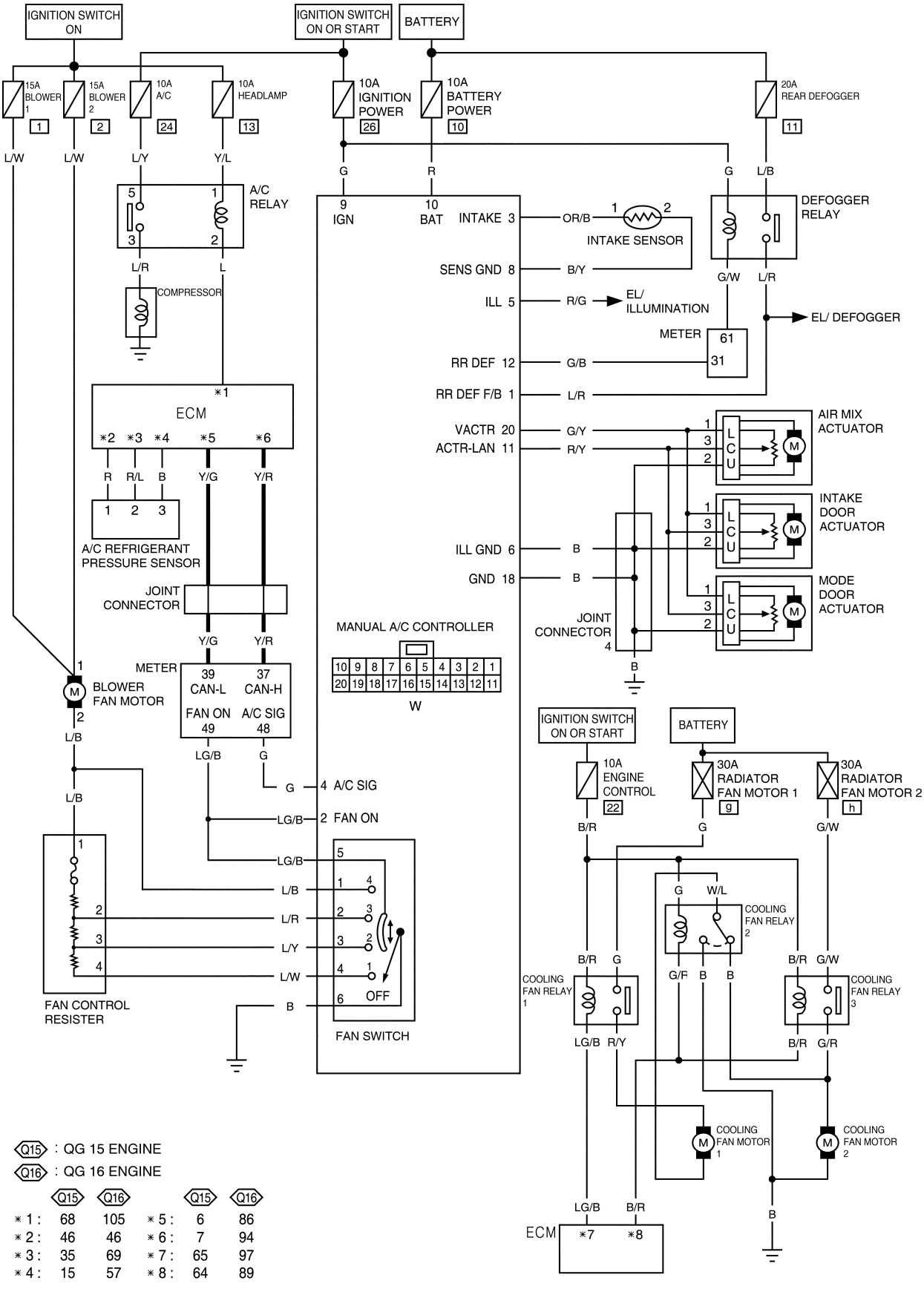
RS/SRS-02





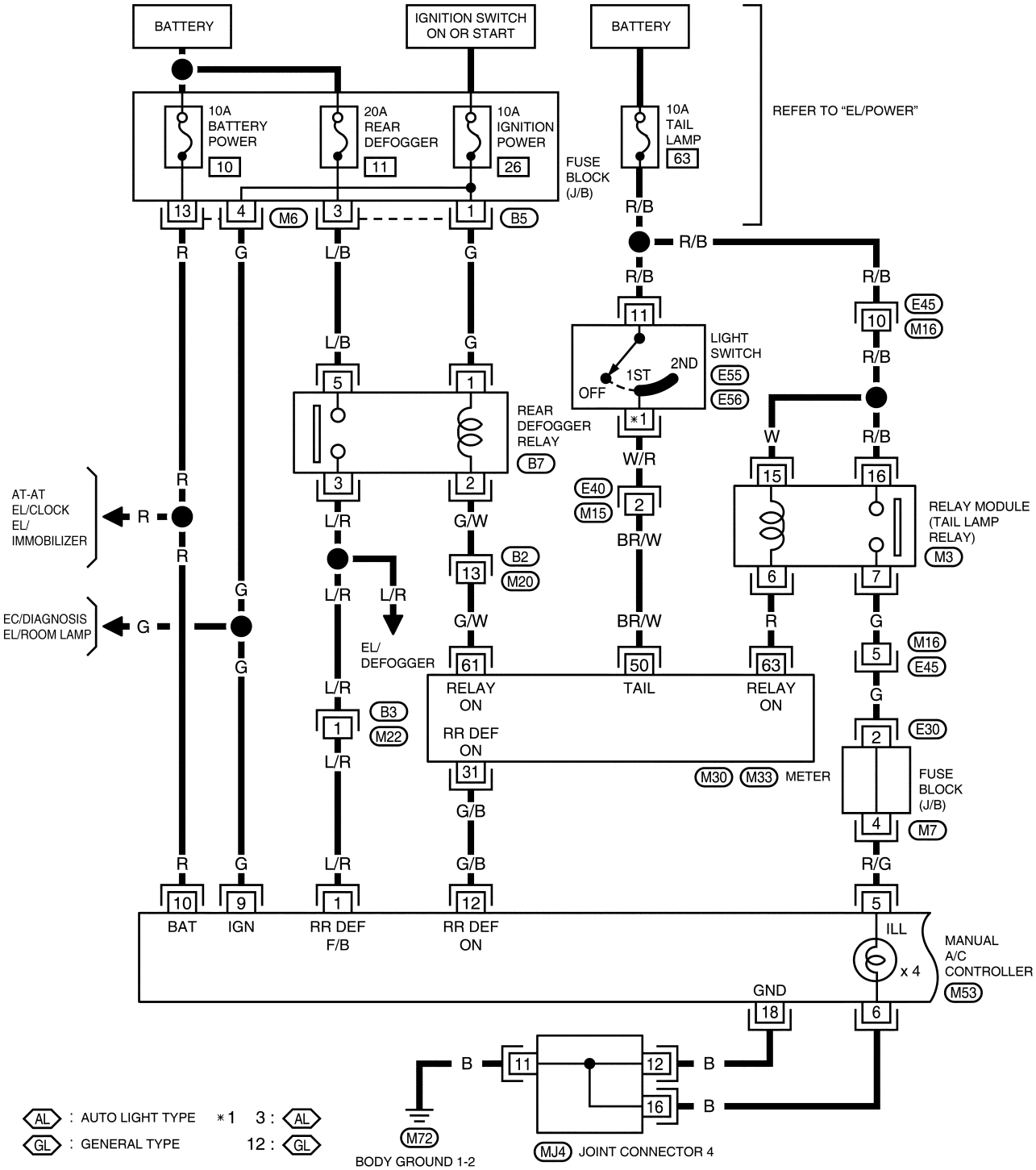
SOWZ002_O1

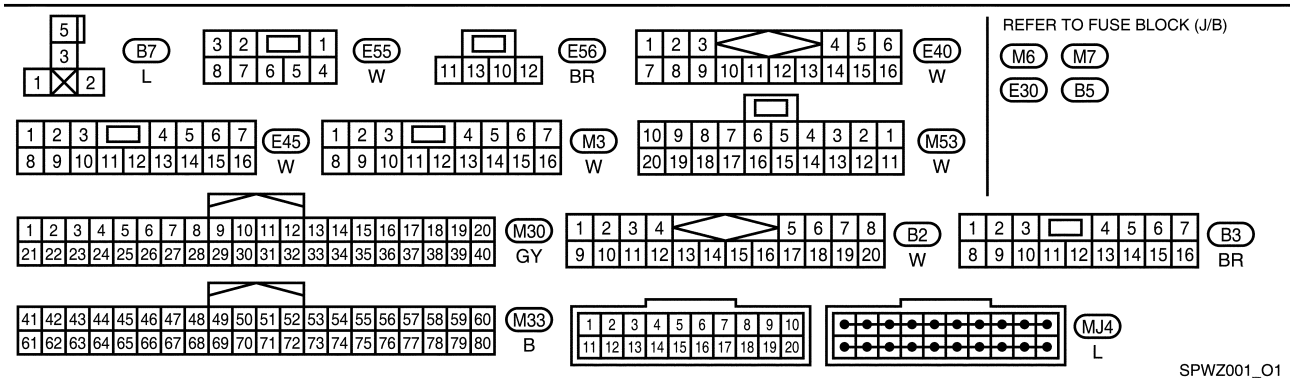
Circuit Diagram - Manual A/C



Wiring Diagram

AC/MANUAL A/C-01

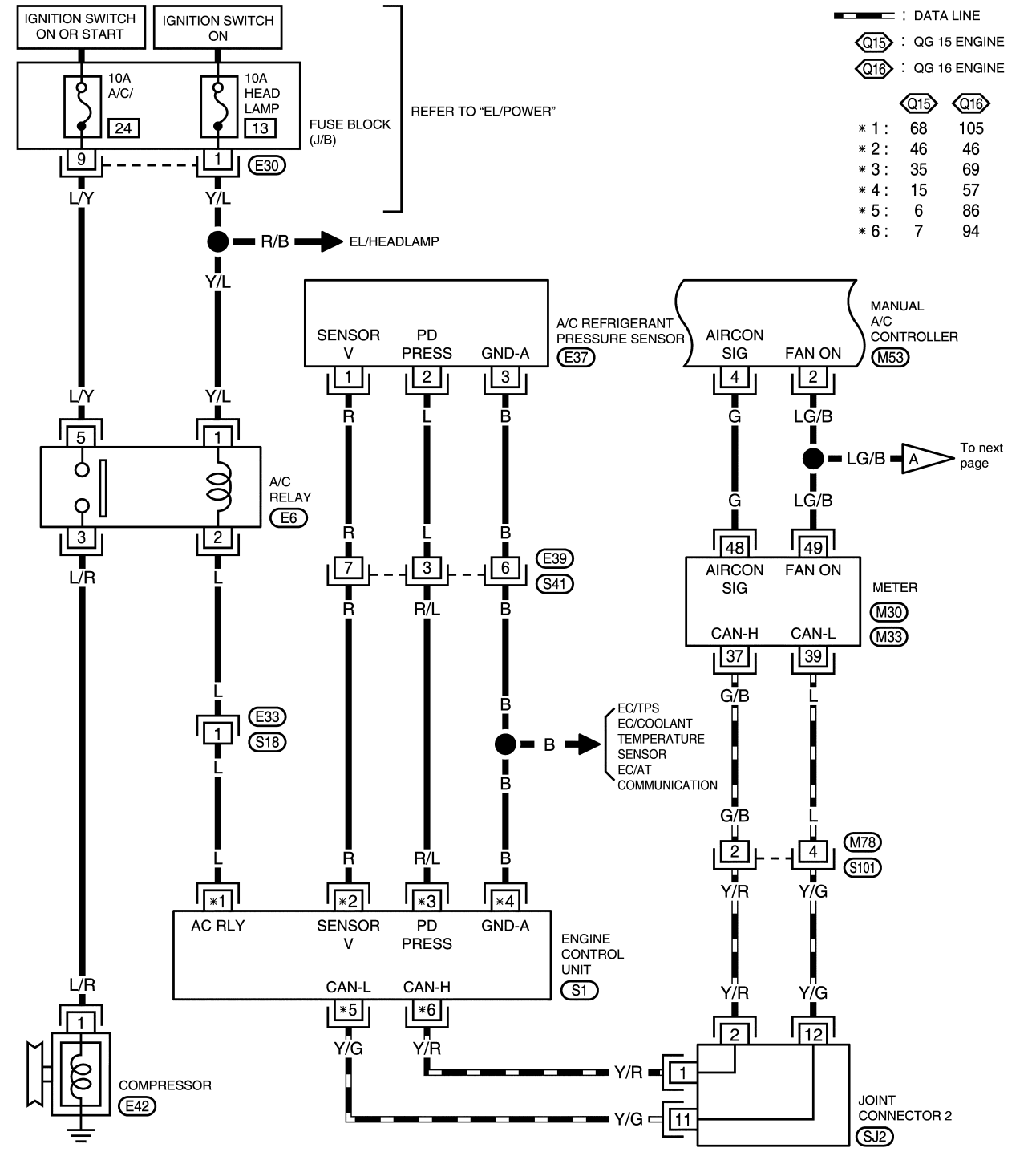


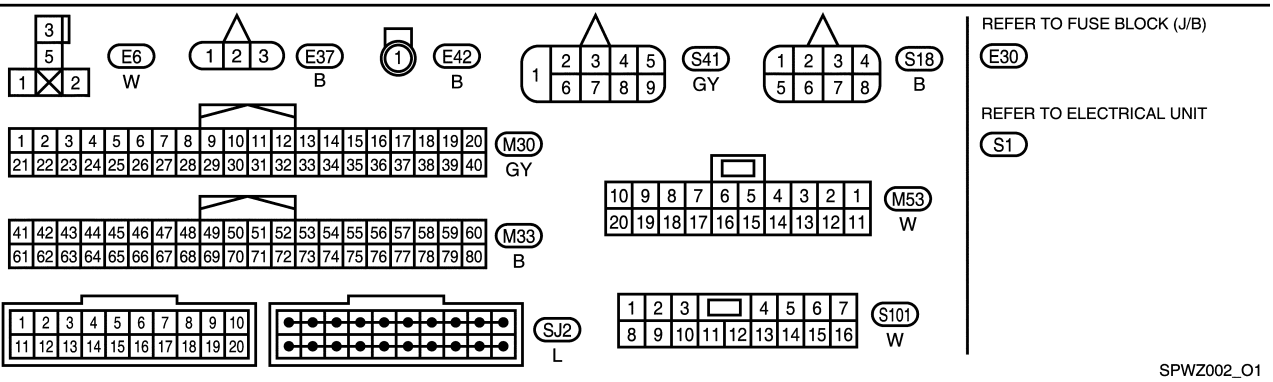


SPWZ001_O1

Wiring Diagram

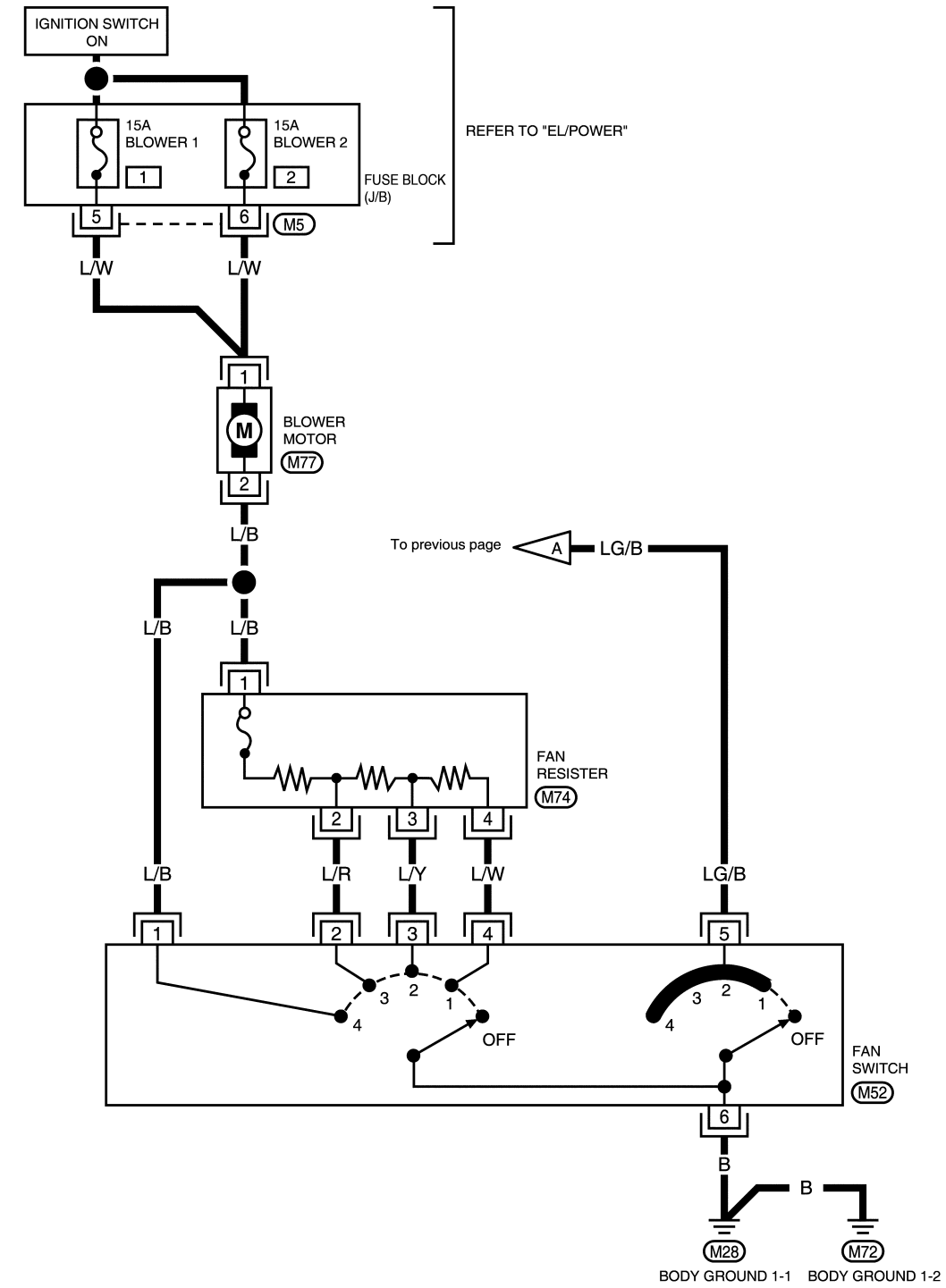
AC/MANUAL A/C-02



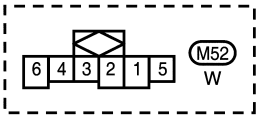


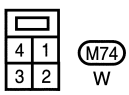
SPWZ002_O1

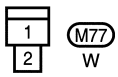
Wiring Diagram



REFER TO FUSE BLOCK (J/B)
M5

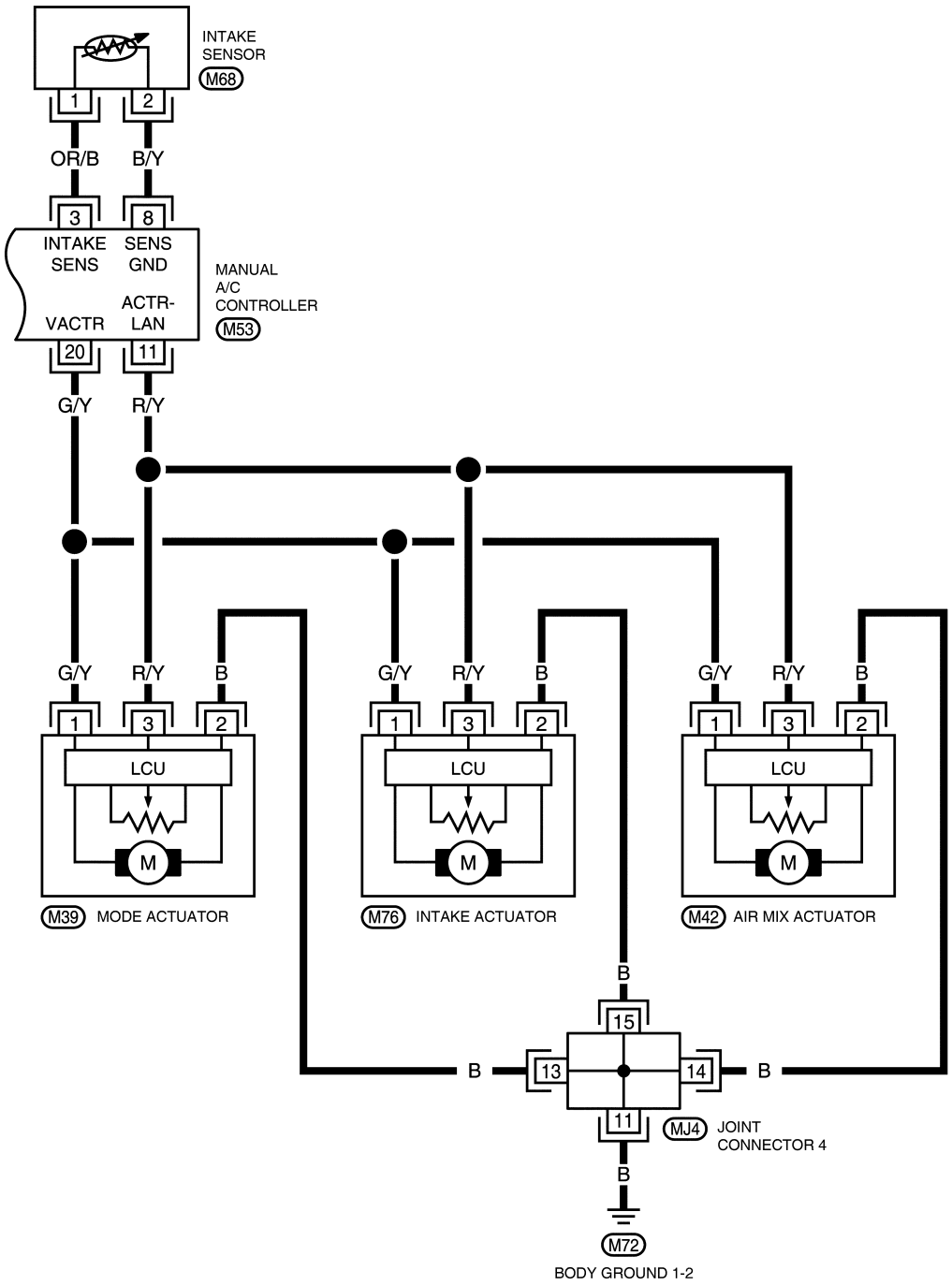


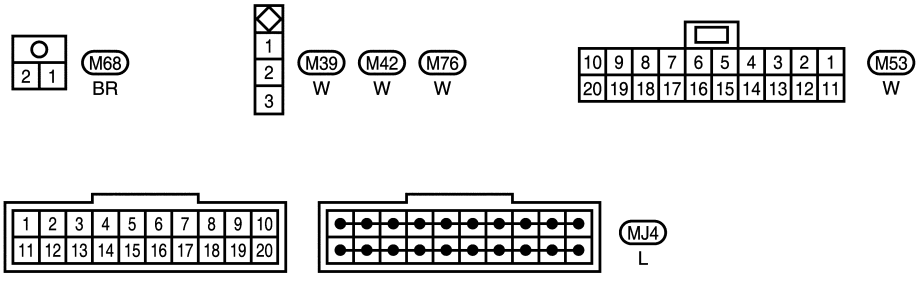




SPWZ003_O1

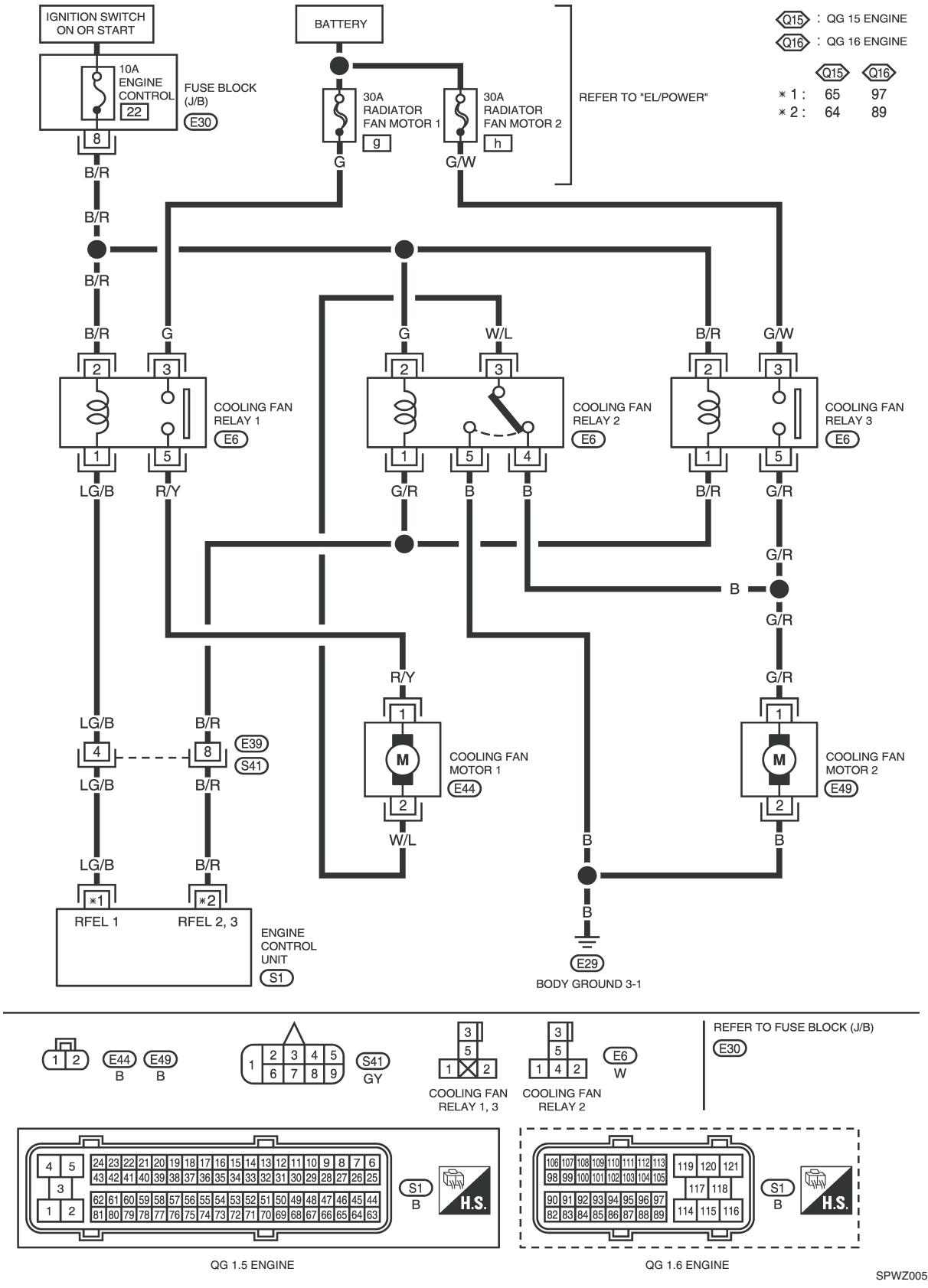
Wiring Diagram





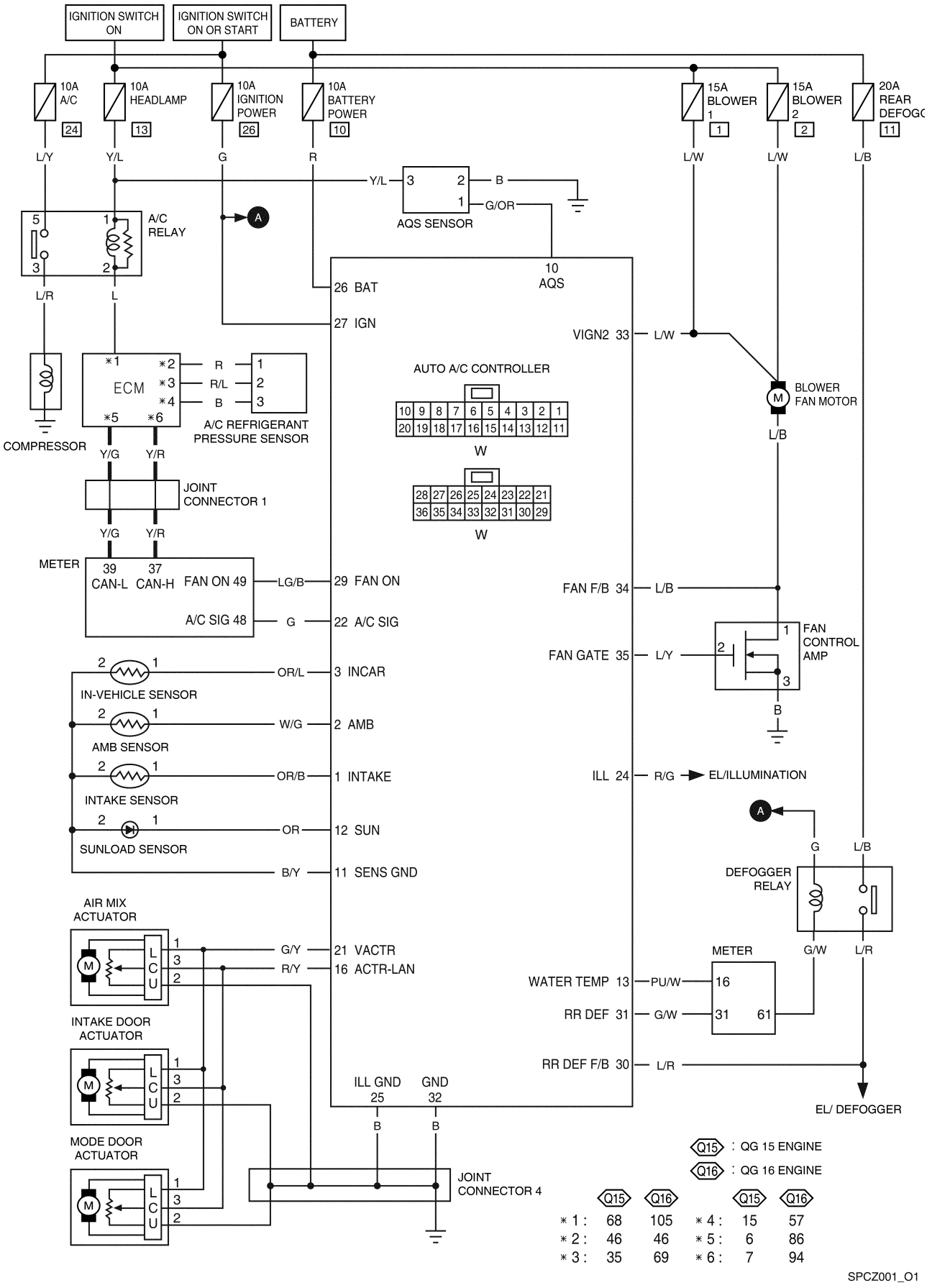
SPWZ004_O1

Wiring Diagram

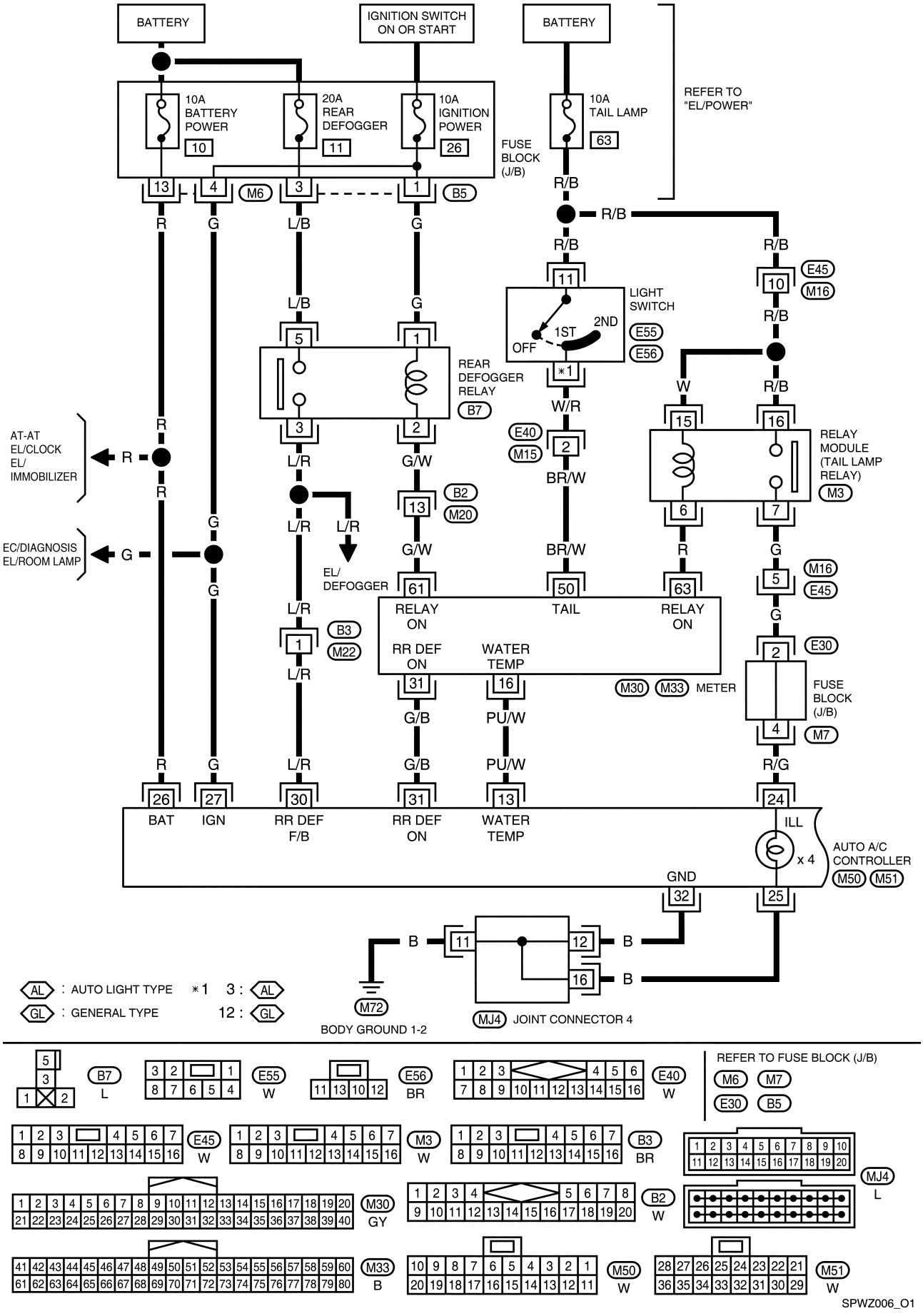


SPWZ005_O1

Circuit Diagram - Auto A/C

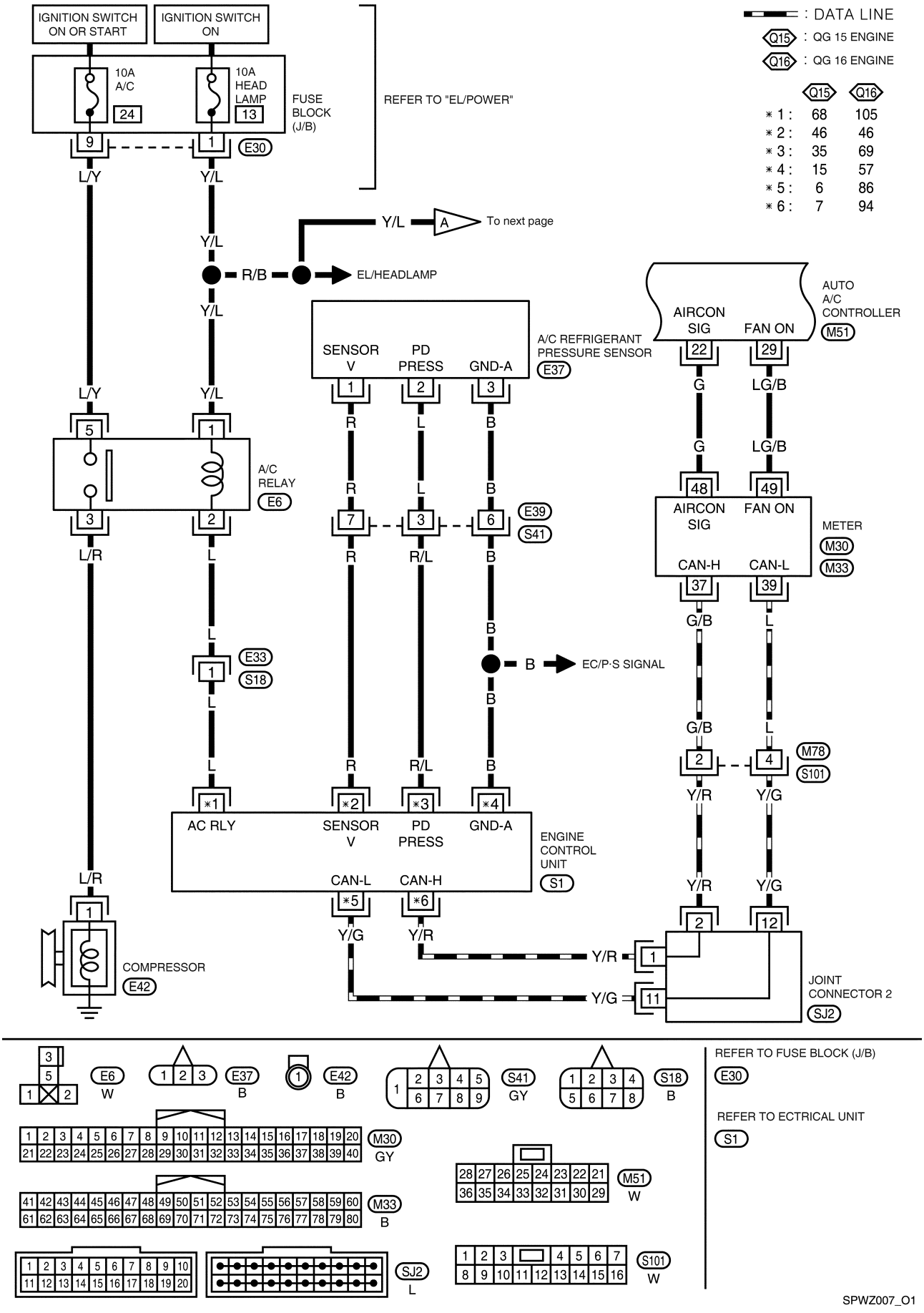


Wiring Diagram

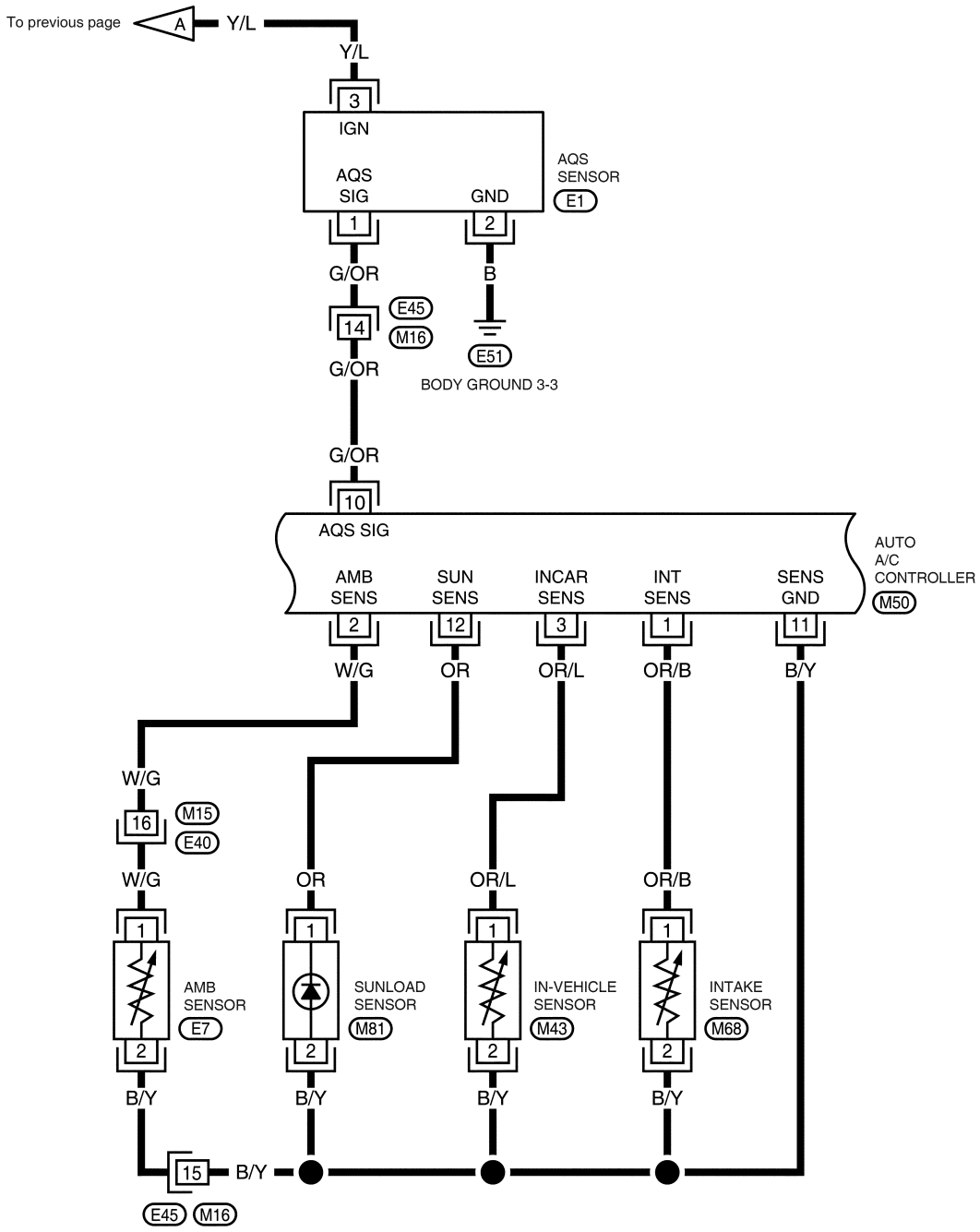


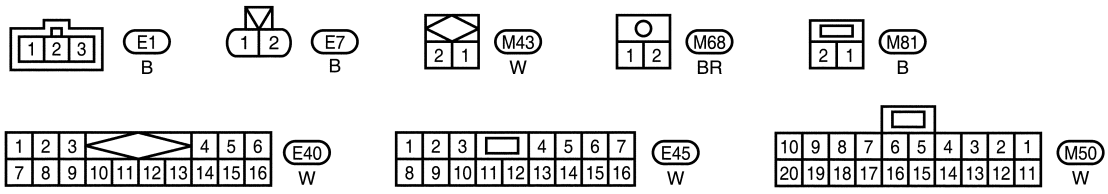
Wiring Diagram

AC/AUTO A/C- 02



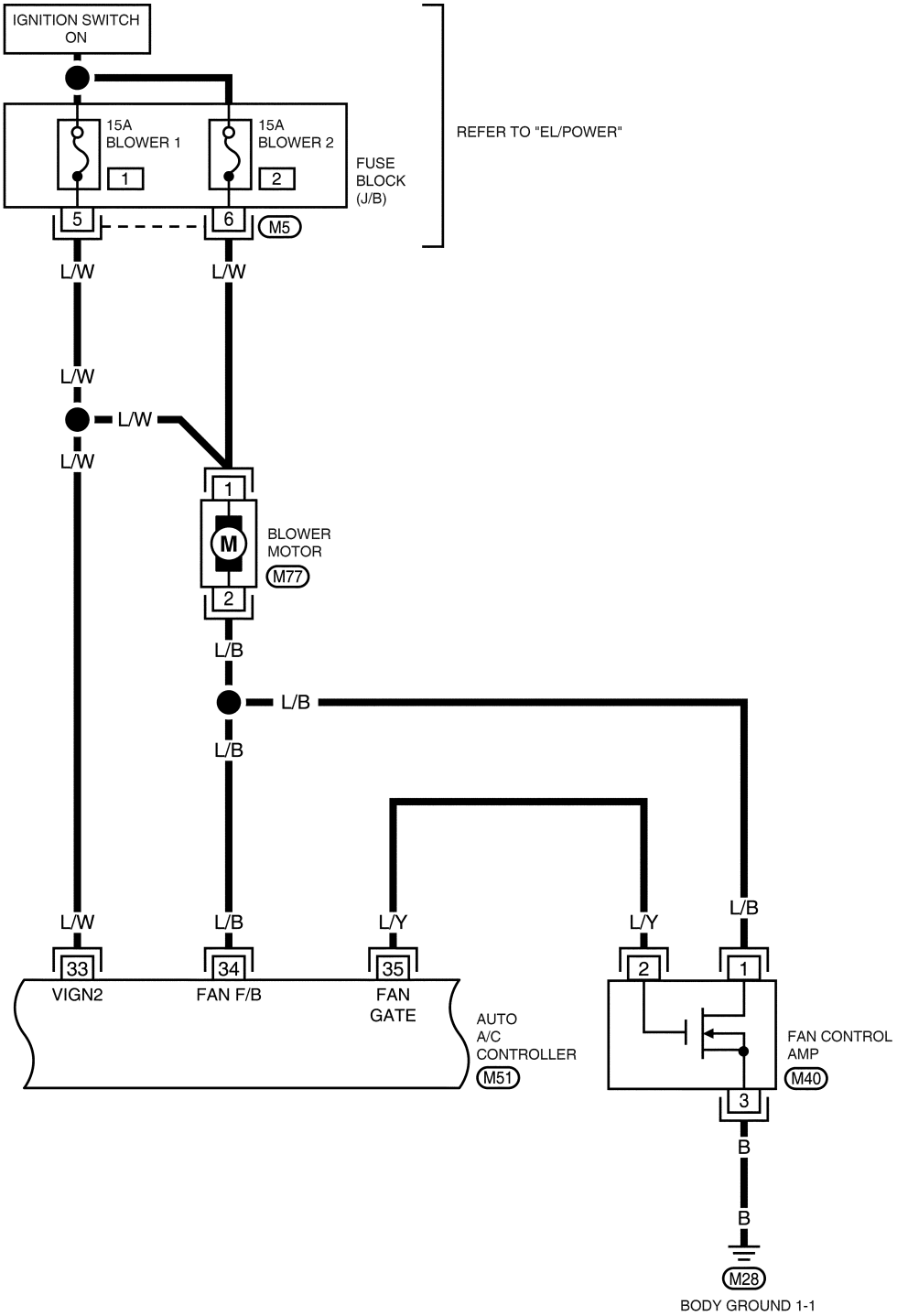
SPWZ007_O1

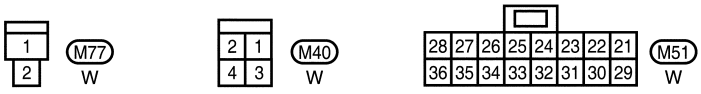

To previous page
A
Y/L
Y/L
3
IGN
AQS SIG
GND
AQS SENSOR
E1
1
2
G/OR
B
E45
14
M16
E51
G/OR
BODY GROUND 3-3
G/OR
10
AQS SIG
AMB SENS
SUN SENS
INCAR SENS
INT SENS
SENS GND
AUTO A/C CONTROLLER
M50
2
12
3
1
11
W/G
OR
OR/L
OR/B
B/Y
W/G
16
M15
E40
W/G
OR
OR/L
OR/B
1
AMB SENSOR
E7
SUNLOAD SENSOR
M81
IN-VEHICLE SENSOR
M43
INTAKE SENSOR
M68
2
B/Y
B/Y
B/Y
B/Y
15
B/Y
E45
M16


E1
B
E7
B
M43
W
M68
BR
M81
B
E40
W
E45
W
M50
W

SPWZ008_O1

Wiring Diagram

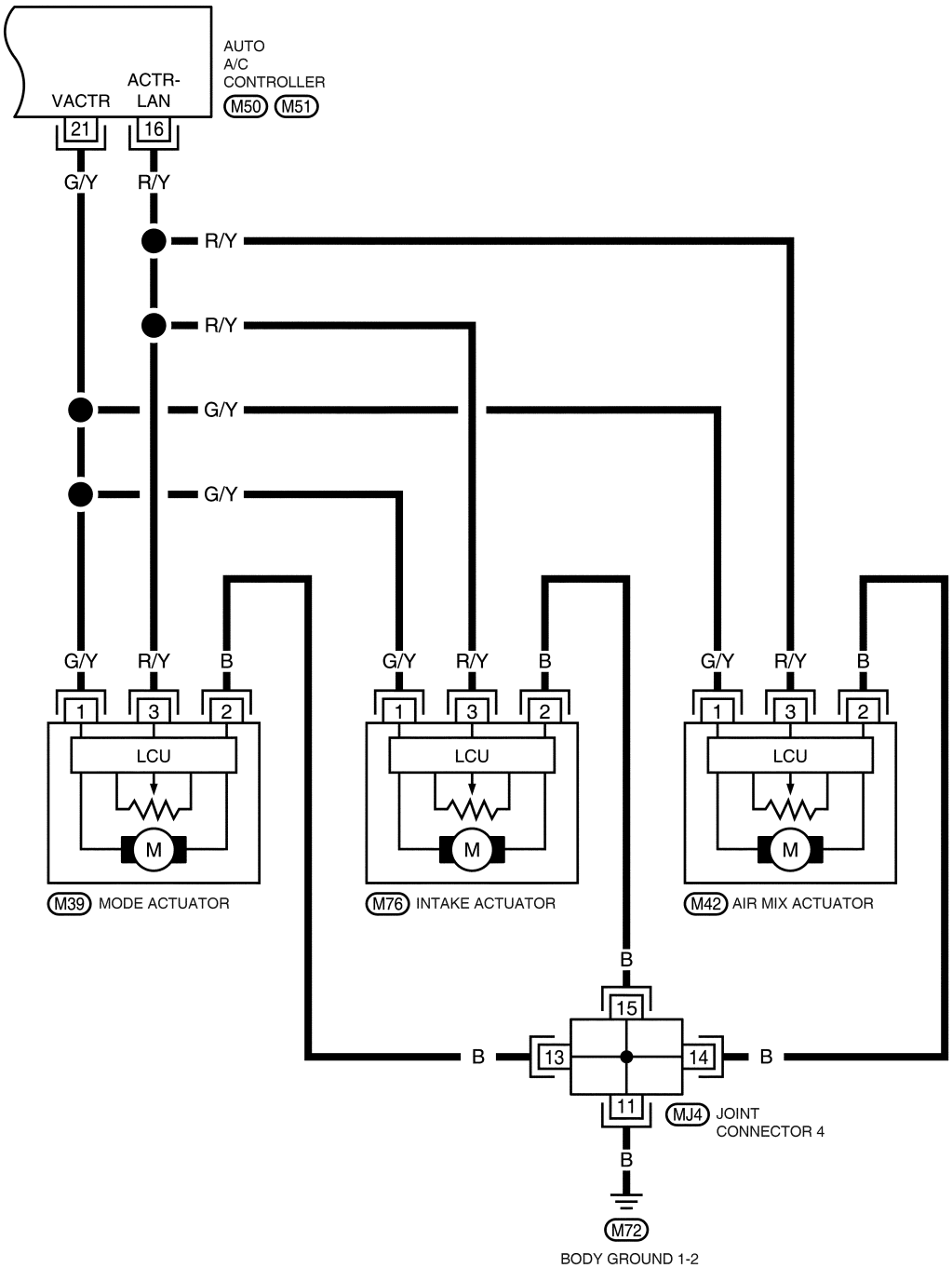


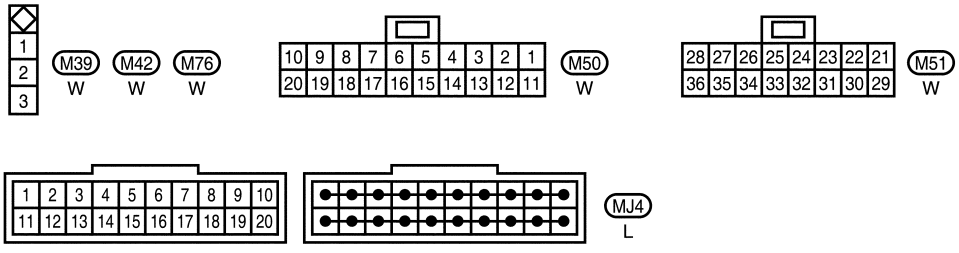


REFER TO FUSE BLOCK (J/B)

M5

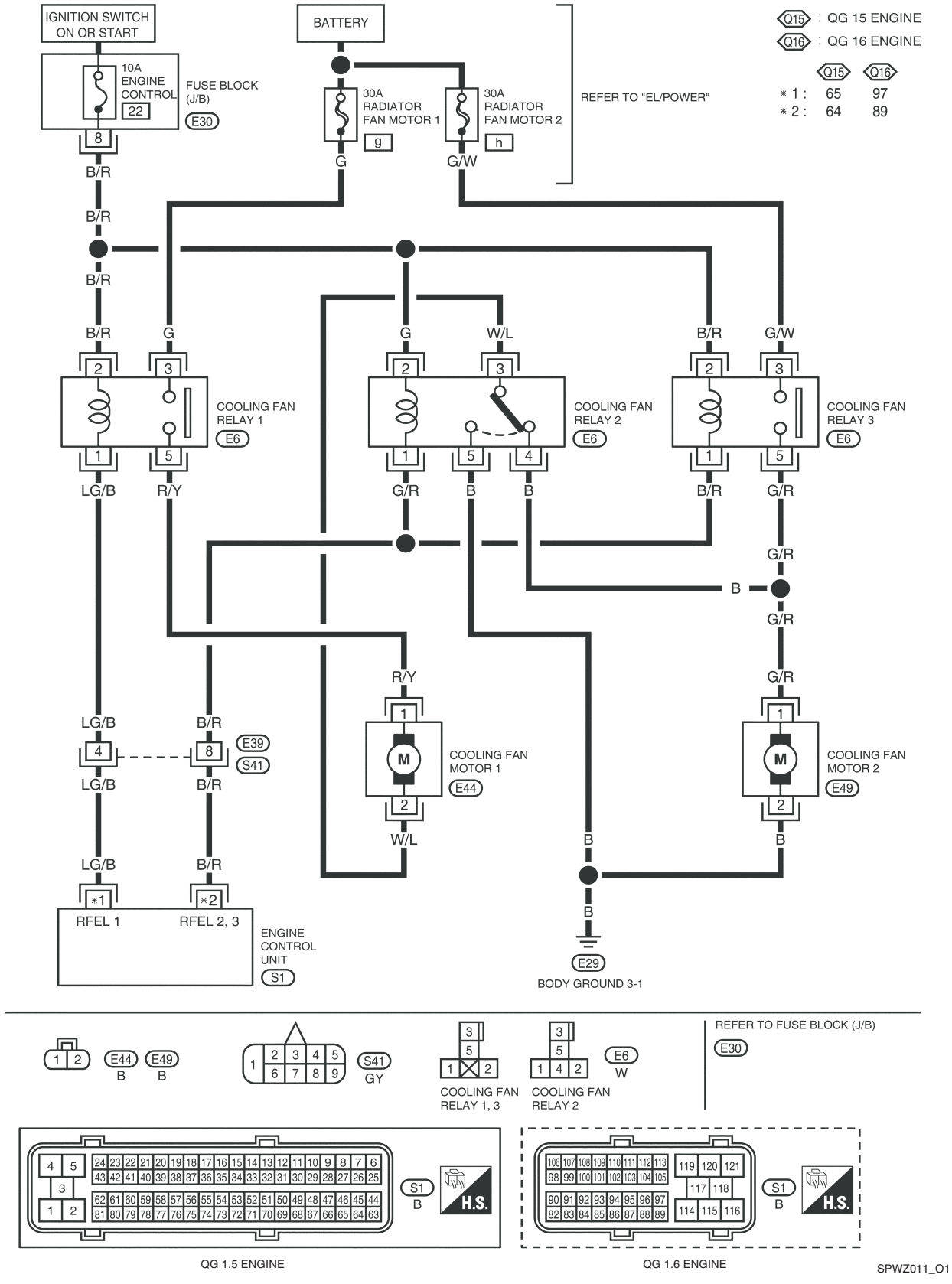
SPWZ009_O1


AUTO
A/C
CONTROLLER
M50
M51
VACTR
ACTR-
LAN
21
16
G/Y
R/Y
R/Y
R/Y
G/Y
G/Y
G/Y
R/Y
B
1
3
2
LCU
M
M39 MODE ACTUATOR
M76 INTAKE ACTUATOR
M42 AIR MIX ACTUATOR
B
15
13
14
11
MJ4 JOINT
CONNECTOR 4
M72
BODY GROUND 1-2

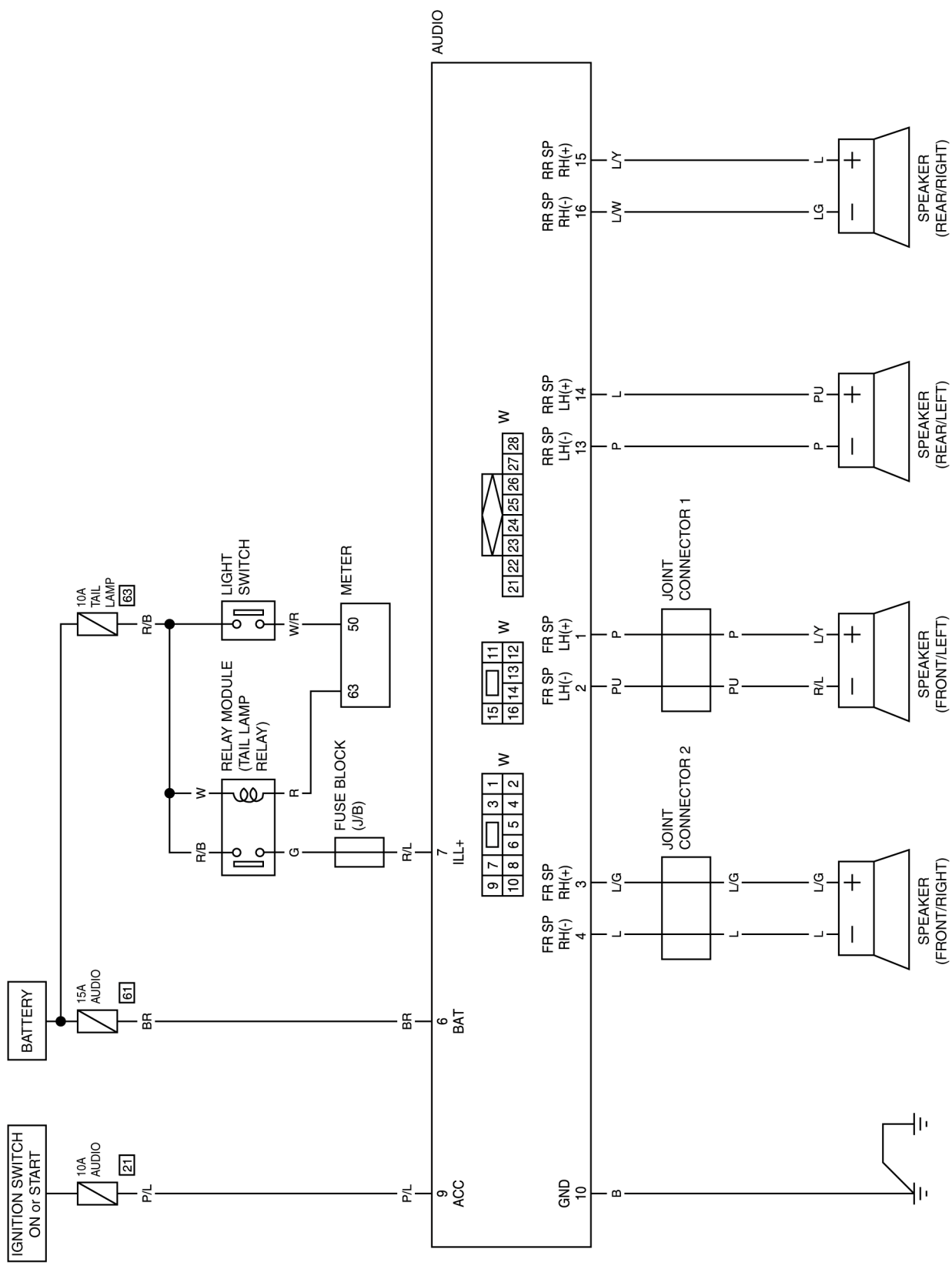

M39
M42
M76
W
M50
M51
MJ4
L

SPWZ010_O1

Wiring Diagram

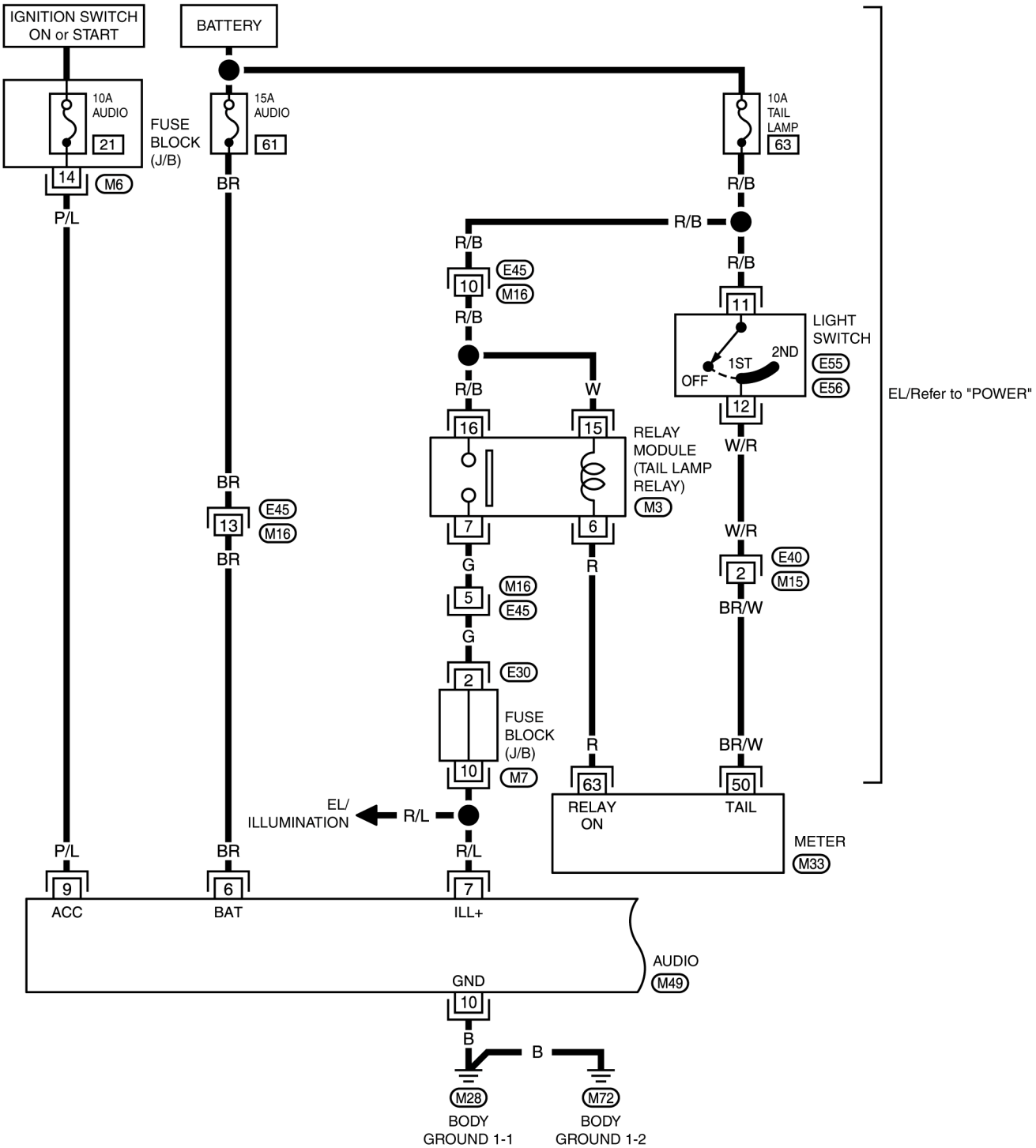


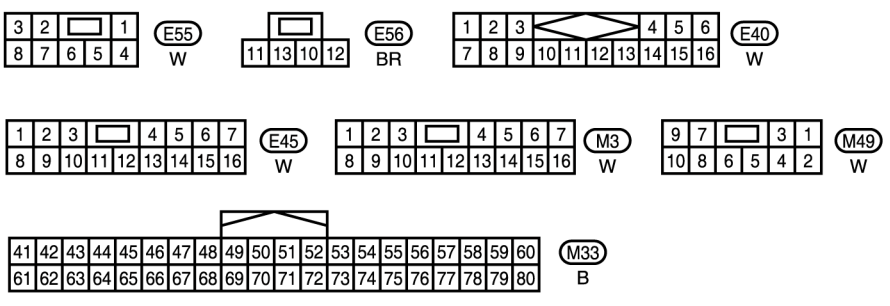
Circuit Diagram



SQCZ001_O1

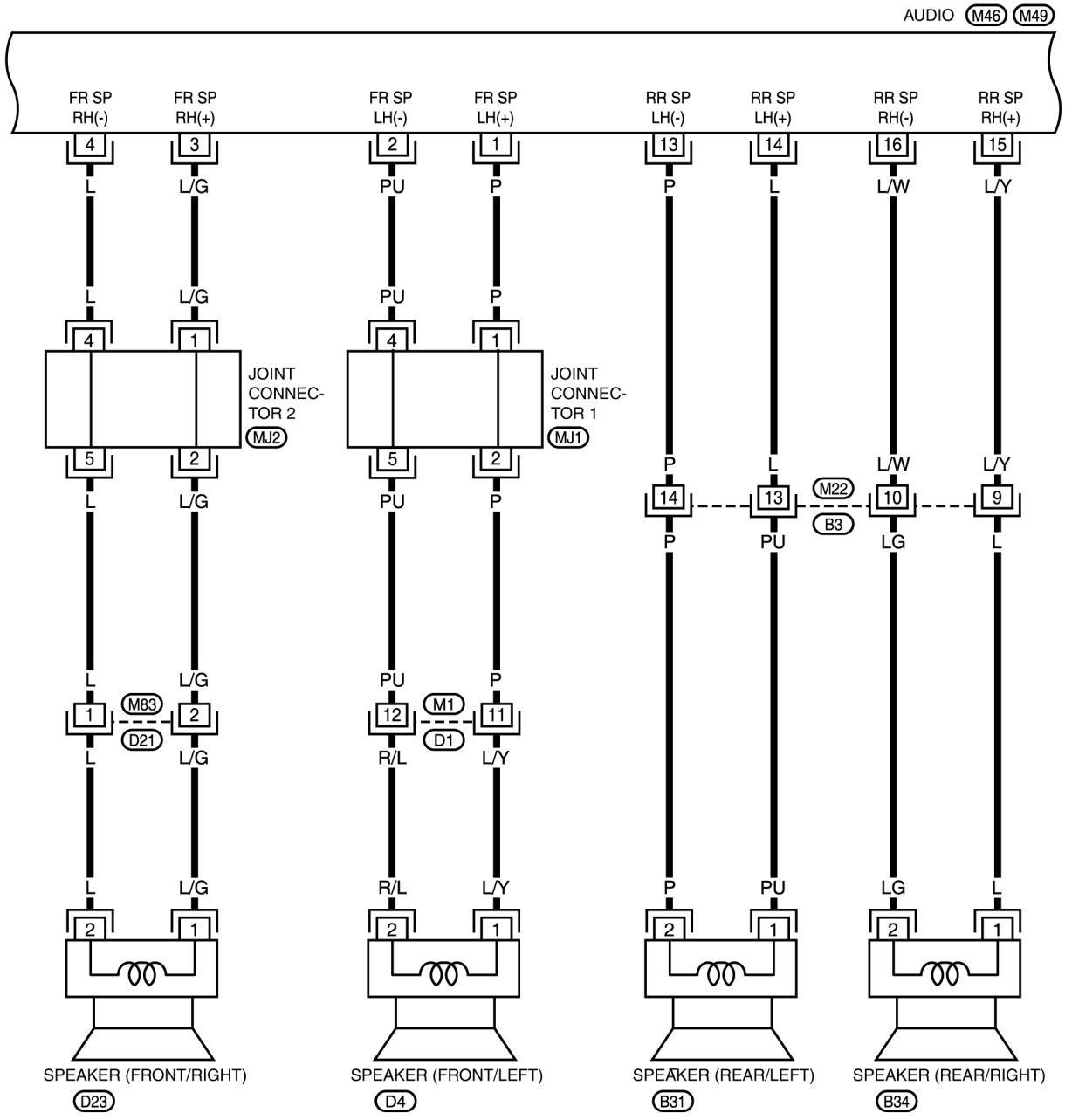
Wiring Diagram

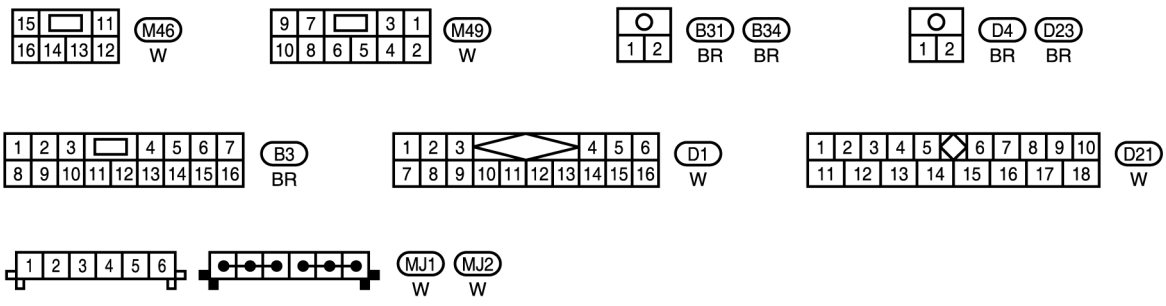




Refer to "FUSE BLOCK (J/B)"
M6 M7
E30

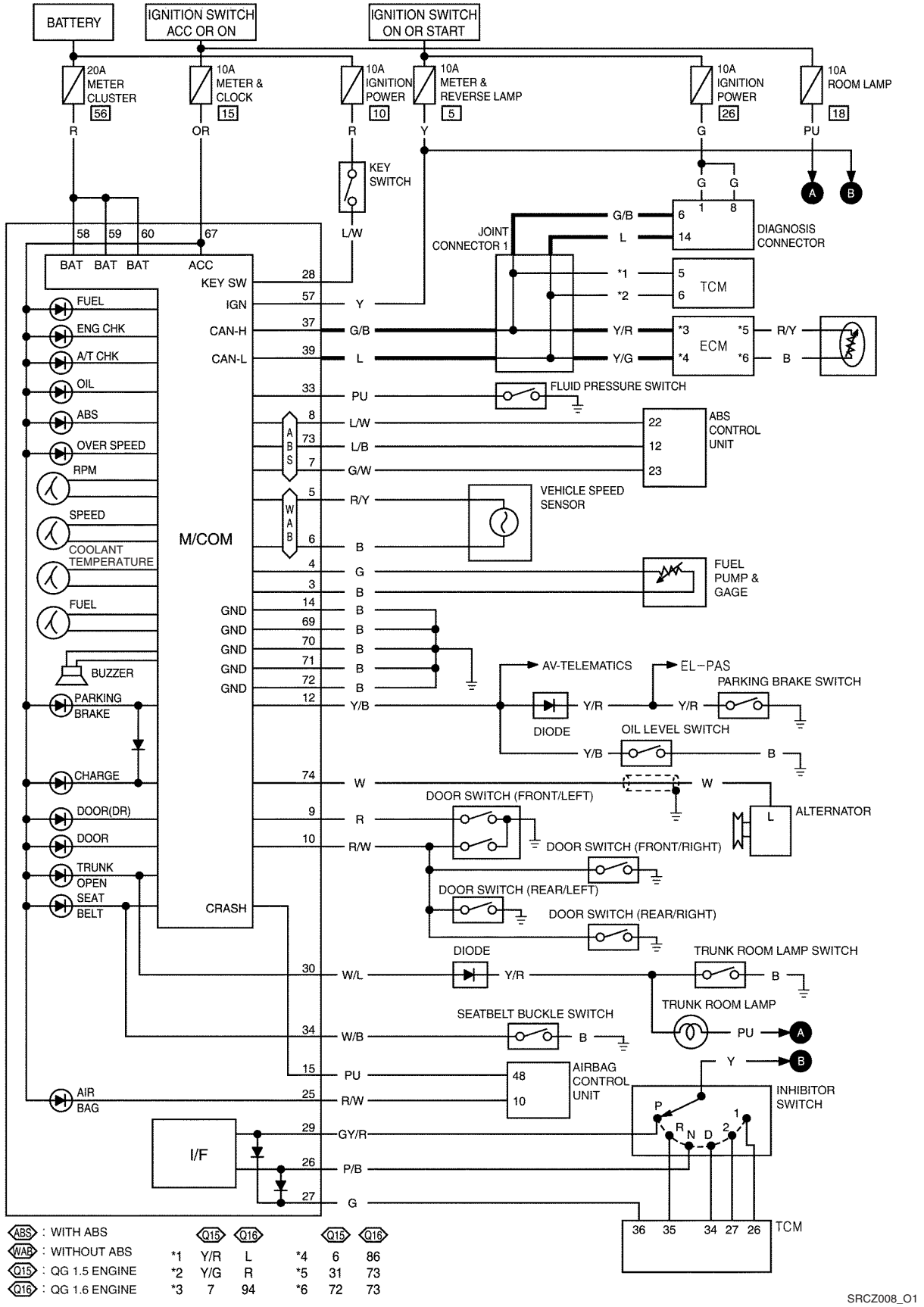
SQWZ001_O1


AUDIO M46 M49
FR SP RH(-)
FR SP RH(+)
FR SP LH(-)
FR SP LH(+)
RR SP LH(-)
RR SP LH(+)
RR SP RH(-)
RR SP RH(+)
JOINT CONNEC-TOR 2 MJ2
JOINT CONNEC-TOR 1 MJ1
M22
B3
M83
D21
M1
D1
SPEAKER (FRONT/RIGHT) D23
SPEAKER (FRONT/LEFT) D4
SPEAKER (REAR/LEFT) B31
SPEAKER (REAR/RIGHT) B34

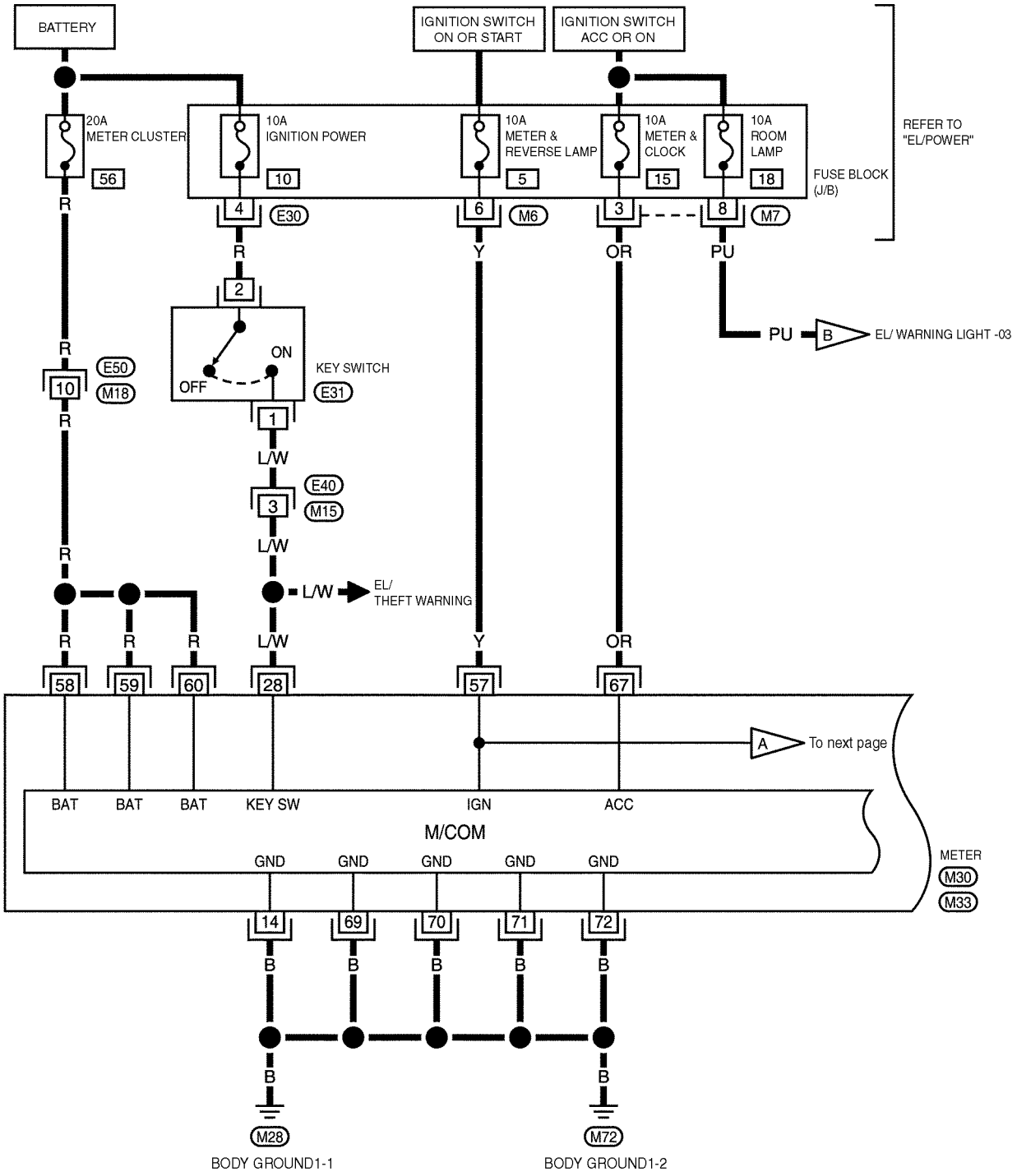

M46 W
M49 W
B31 BR
B34 BR
D4 BR
D23 BR
B3 BR
D1 W
D21 W
MJ1 W
MJ2 W

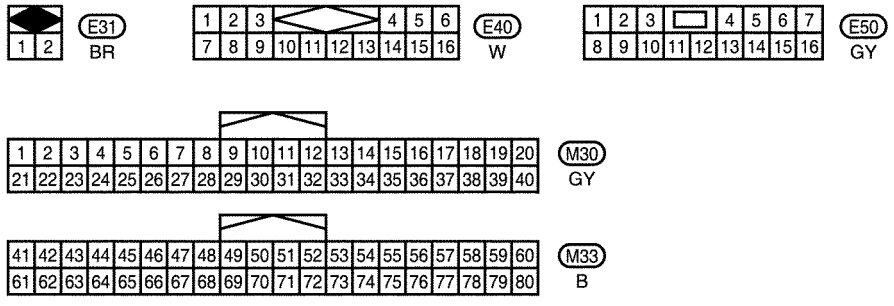
SQWZ002_O1

Circuit Diagram



Wiring Diagram — EL/Warning Light- 01

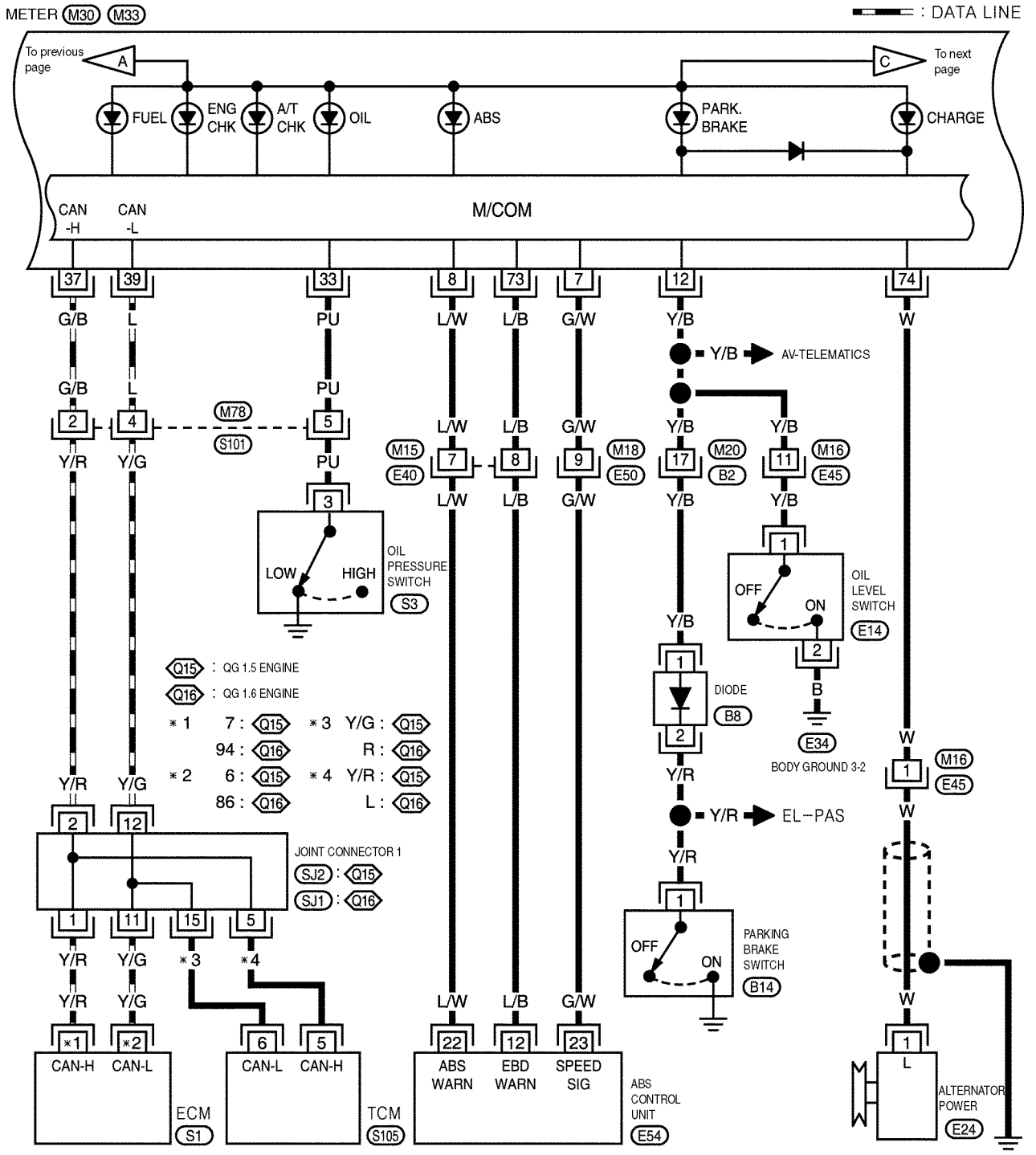




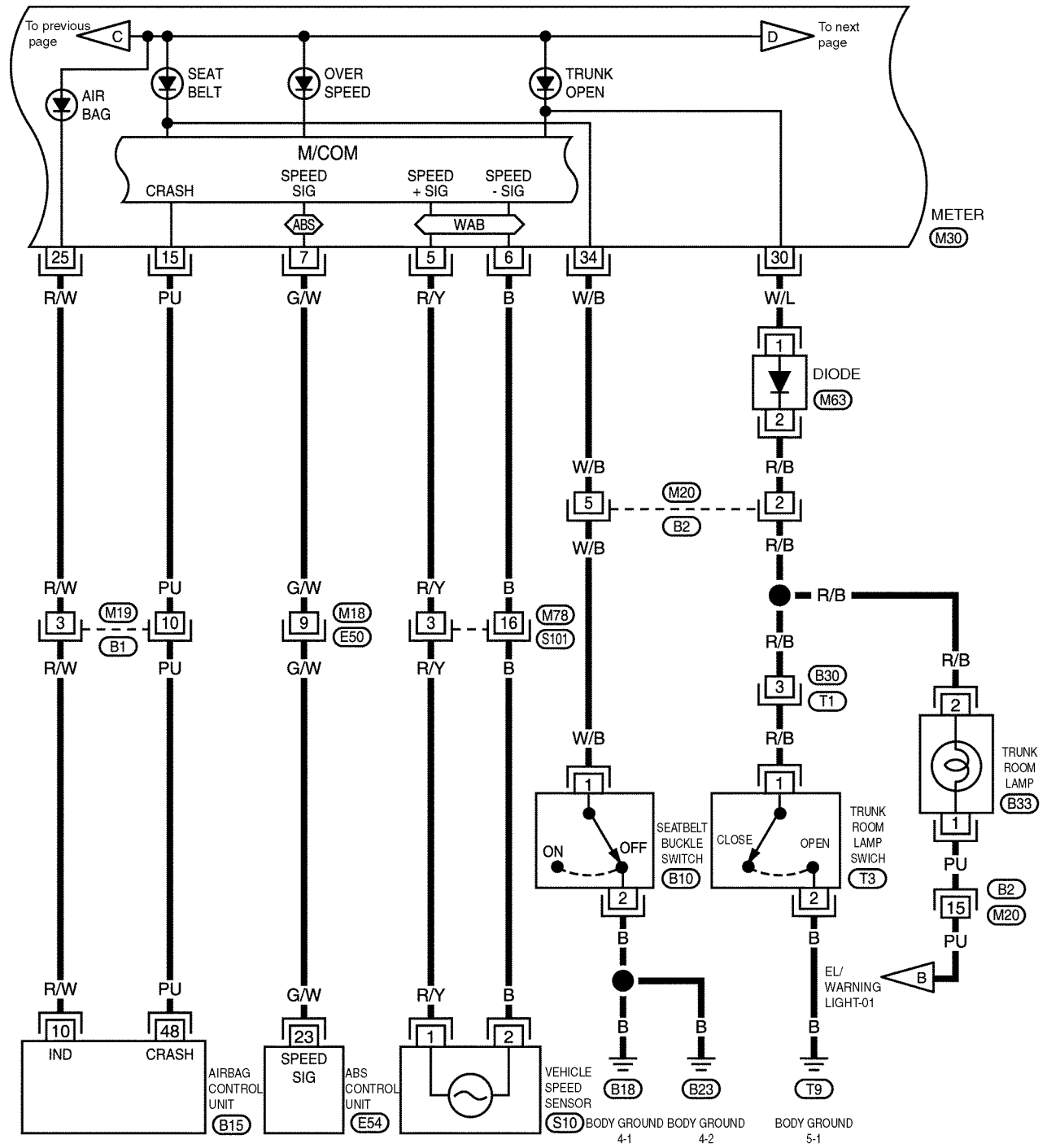
REFER TO FUSE BLOCK (J/B)
M6 M7
E30

SRWZ010_O1

Wiring Diagram — EL/Warning Light- 02



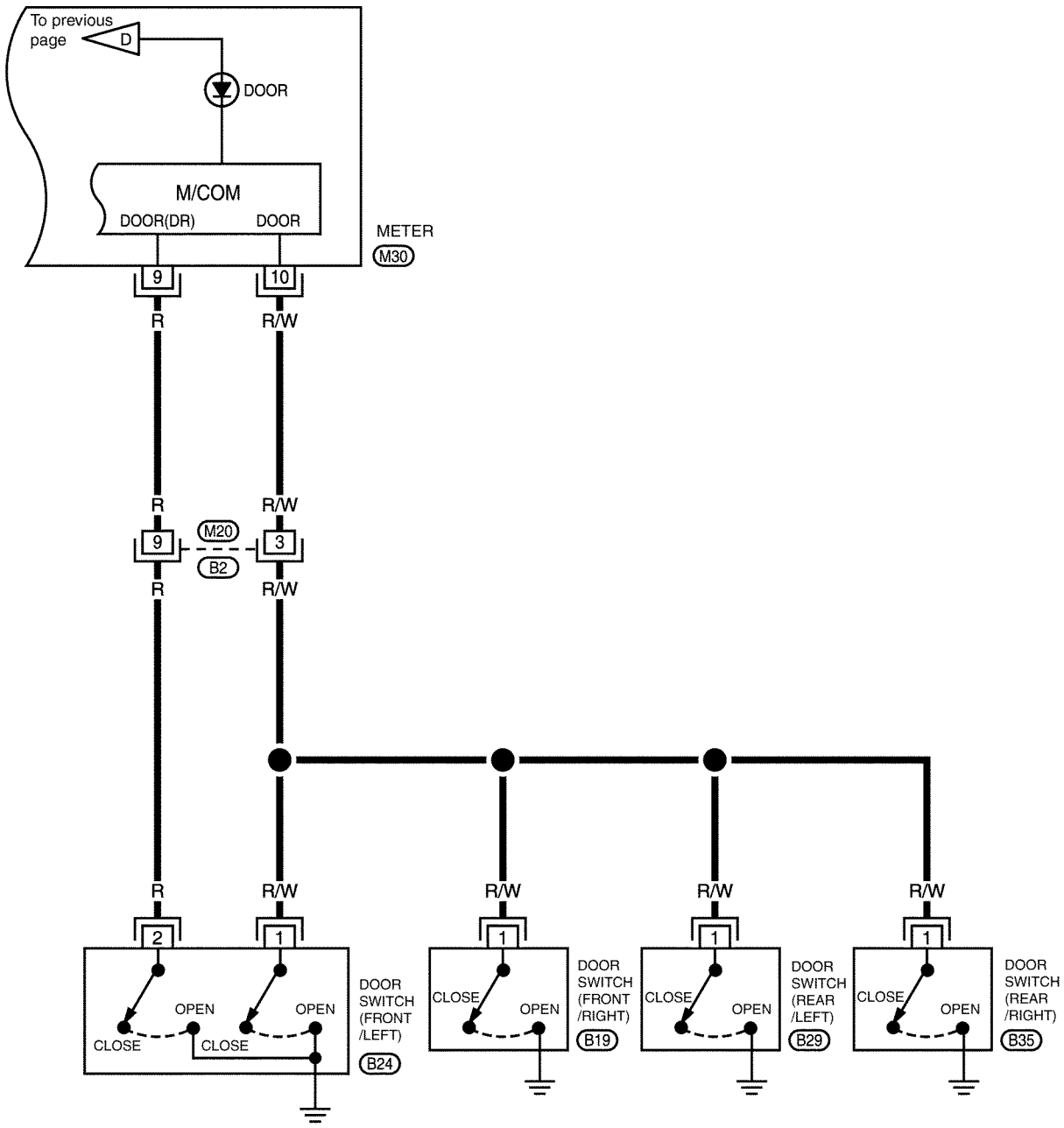
Wiring Diagram — EL/Warning Light- 03

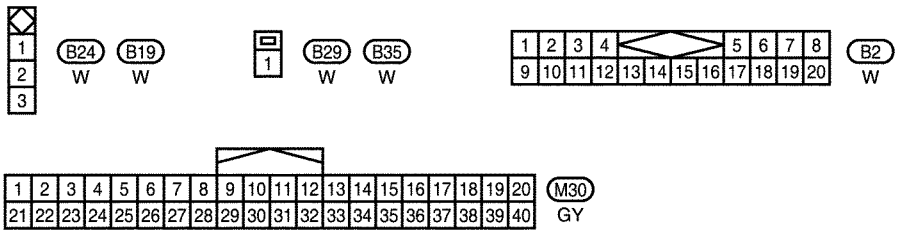


SRWZ012_O1

Wiring Diagram

EL/Warning Light- 04

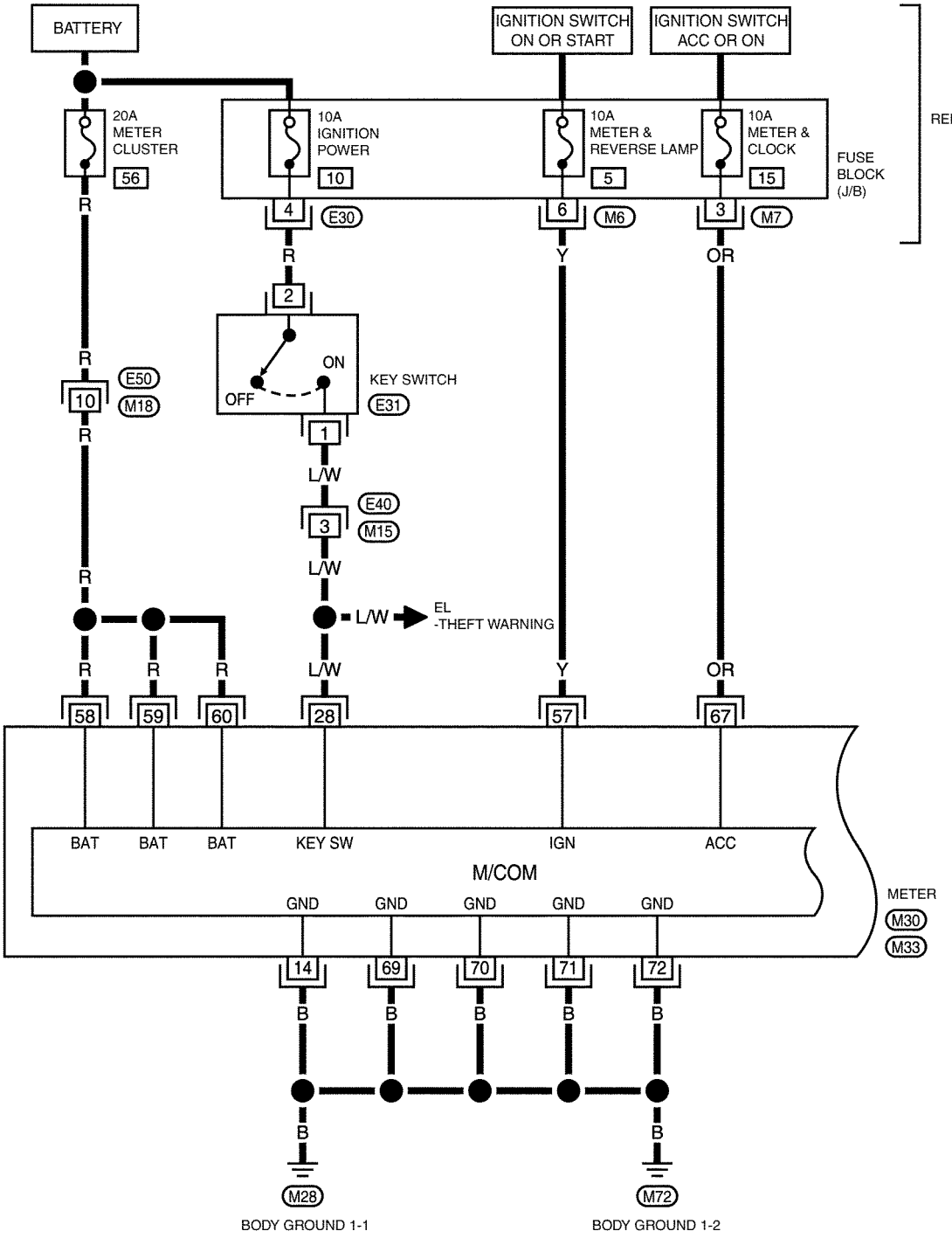


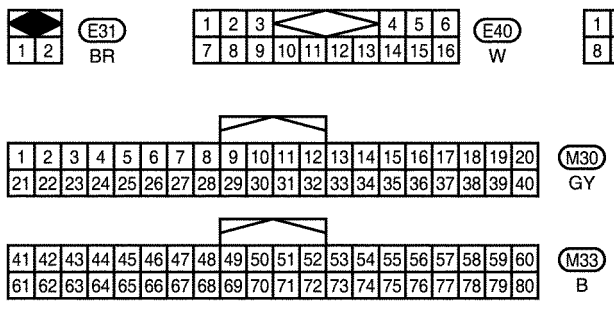


SRWZ013_O1

Wiring Diagram

EL/Gage- 01





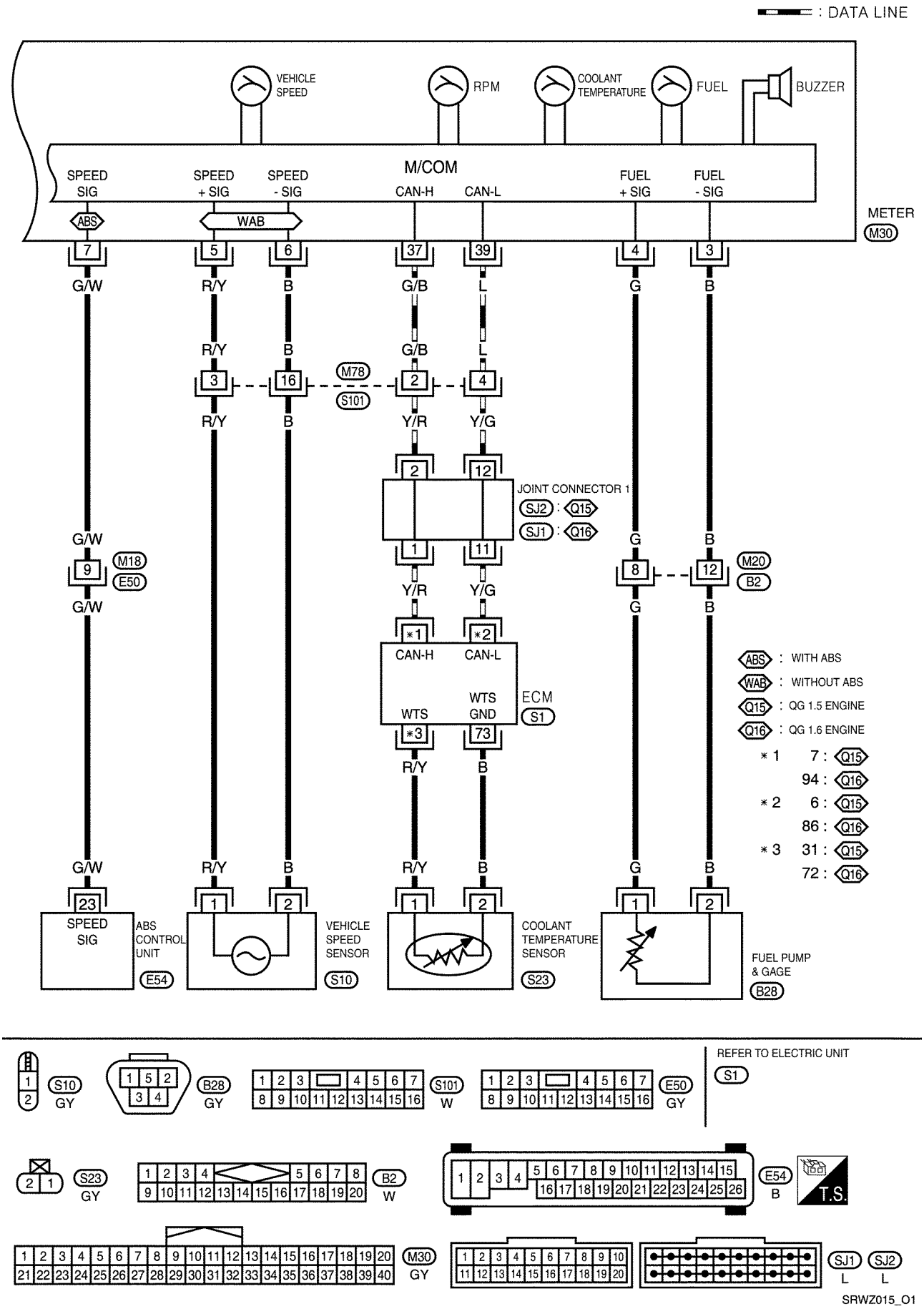
REFER TO FUSE BLOCK (J/B)

M6 M7 E30

SRWZ014_O1

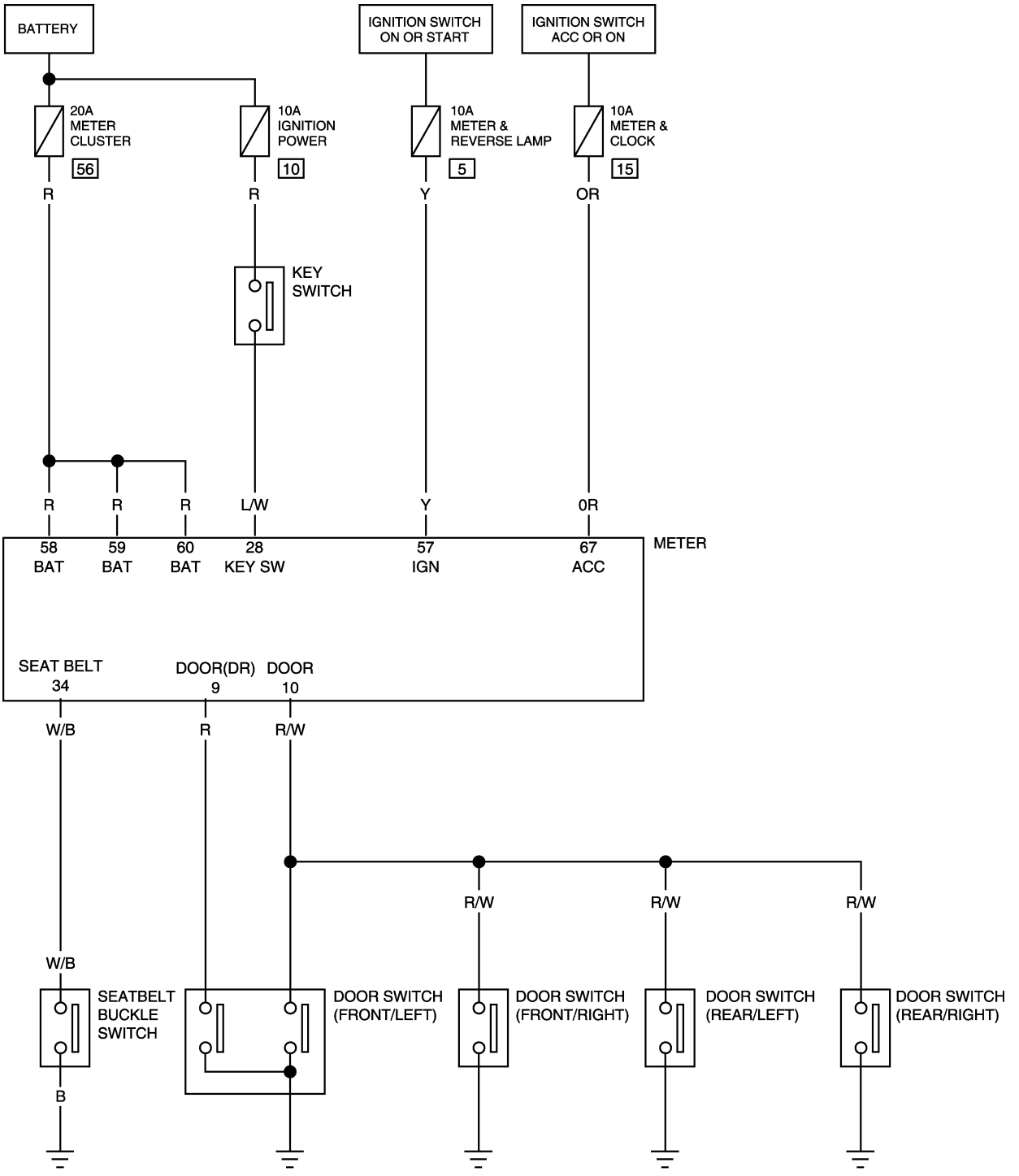
Wiring Diagram

EL/Gage- 02



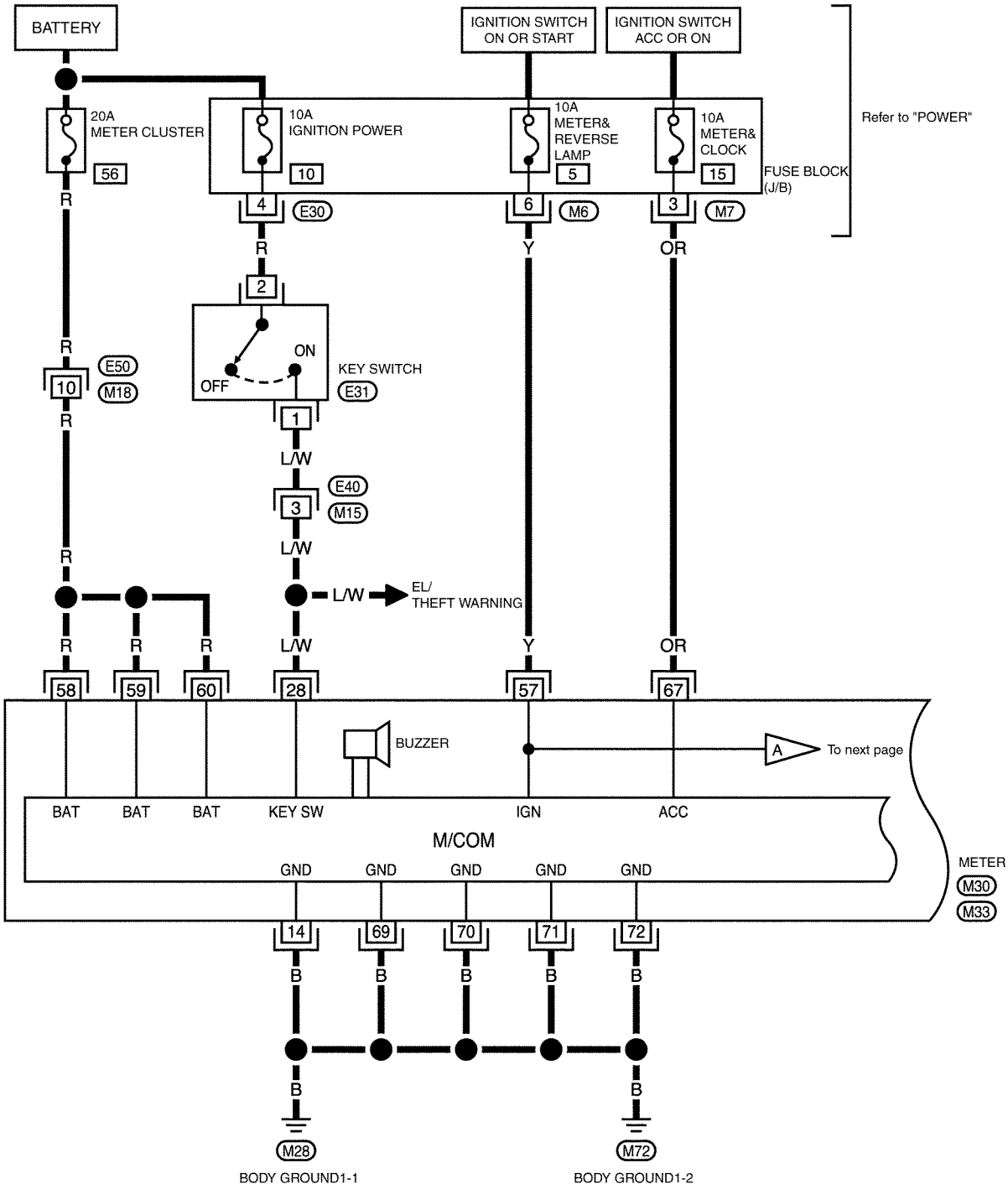
SRWZ015_O1

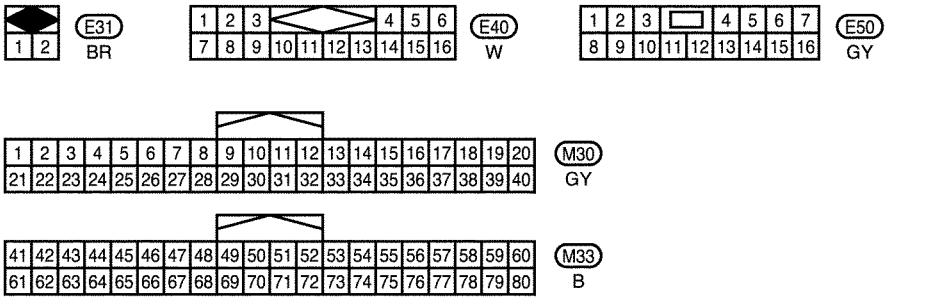
Circuit Diagram



SRCZ009_O1

Wiring Diagram — EL/Warning Light (Buzzer)- 01

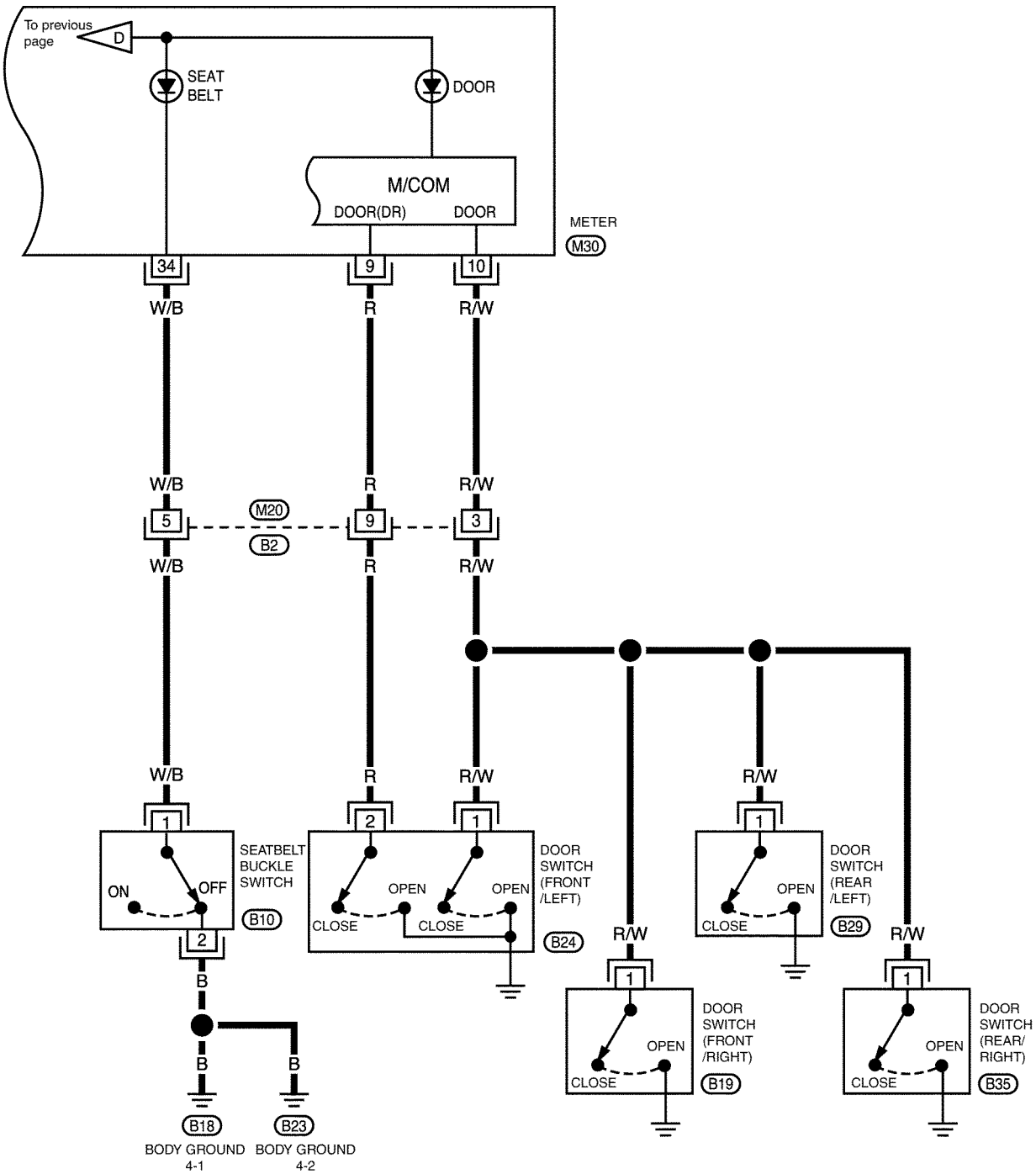


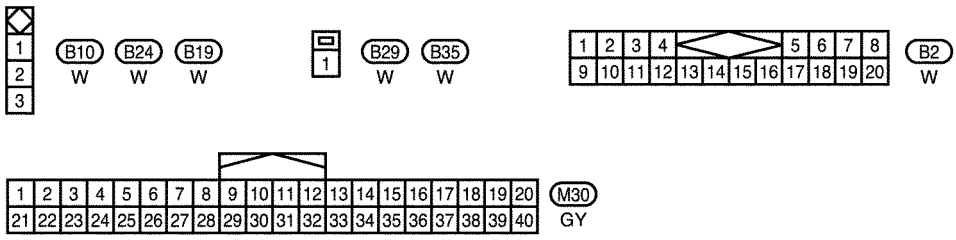


REFER TO FUSE BLOCK (J/B)
M6 M7
E30

SRWZ067_O1

Wiring Diagram — EL/Warning Light (Buzzer)- 02

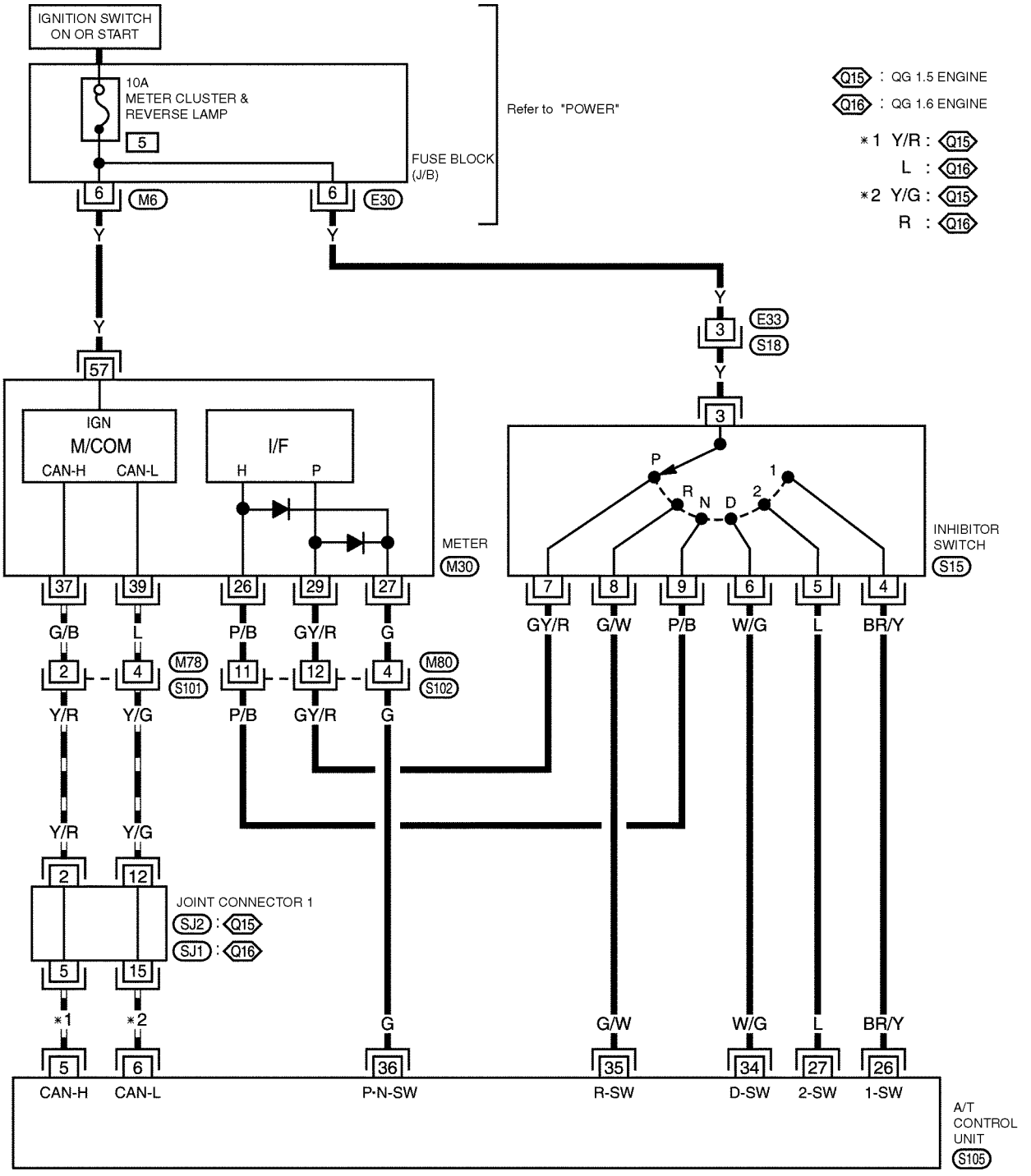




SRWZ068_O1

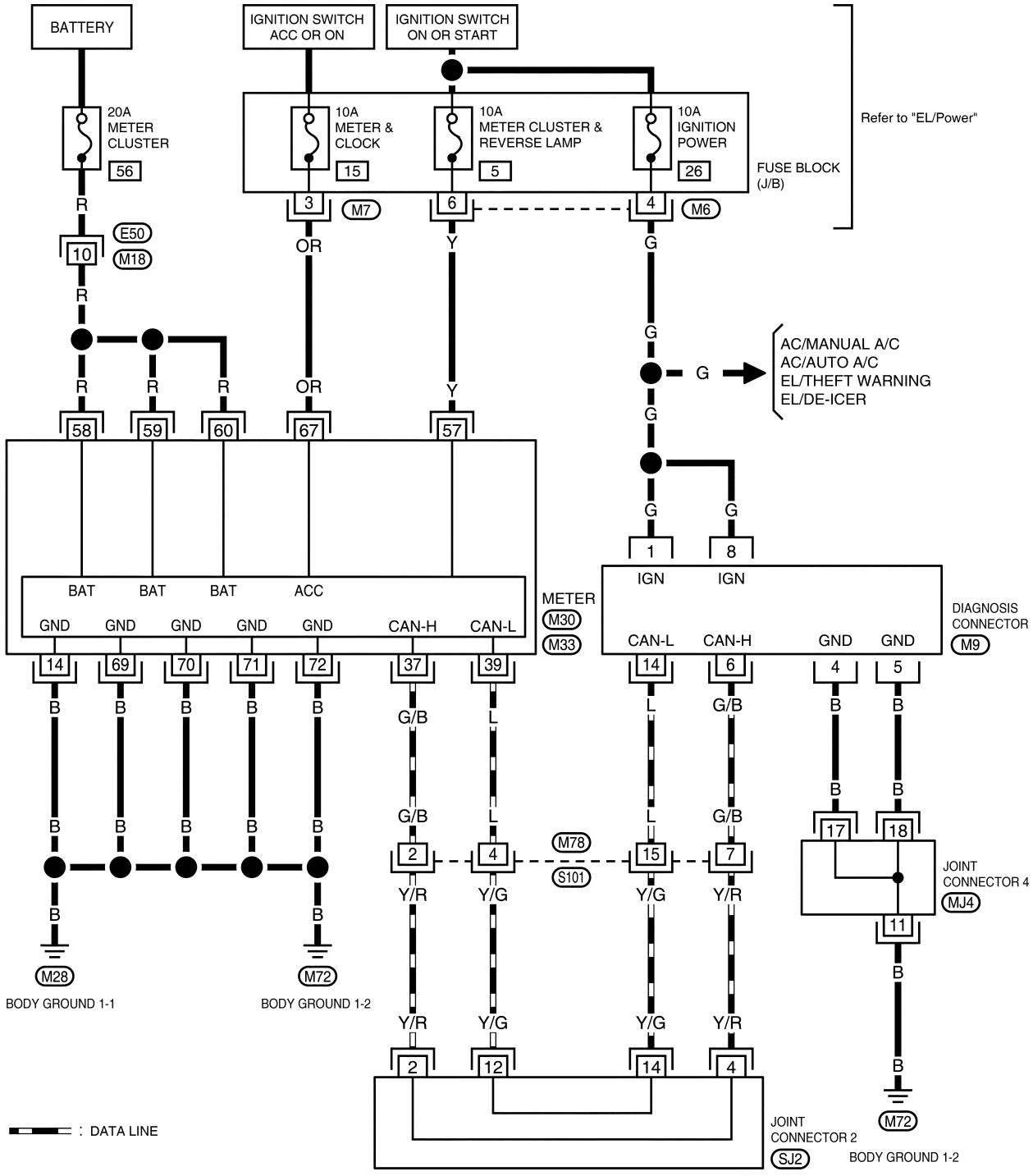
Wiring Diagram

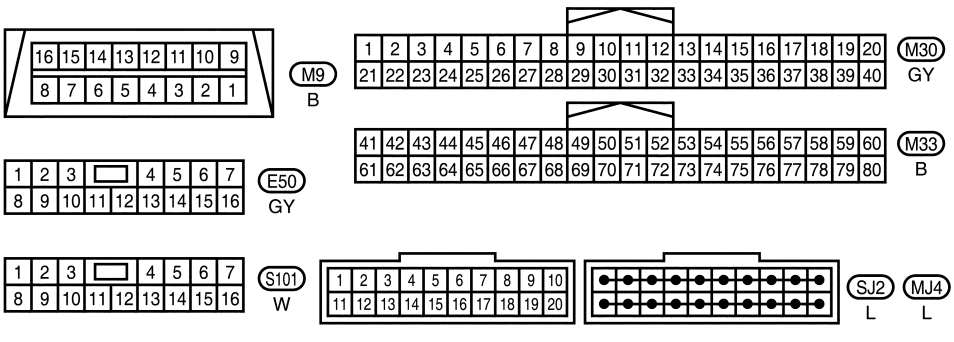
EL/Meter- 01



SRWZ054_O1

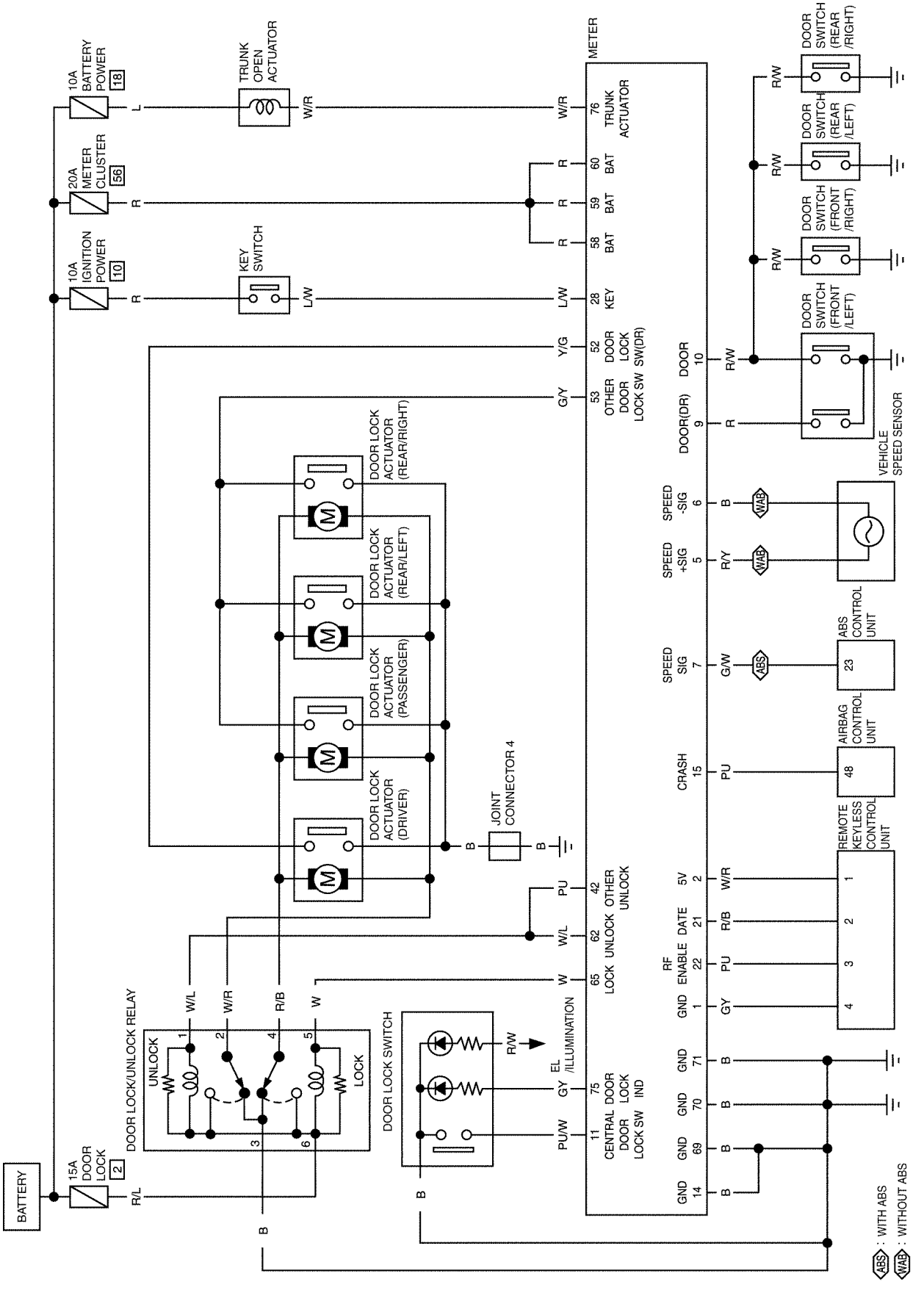
Wiring Diagram





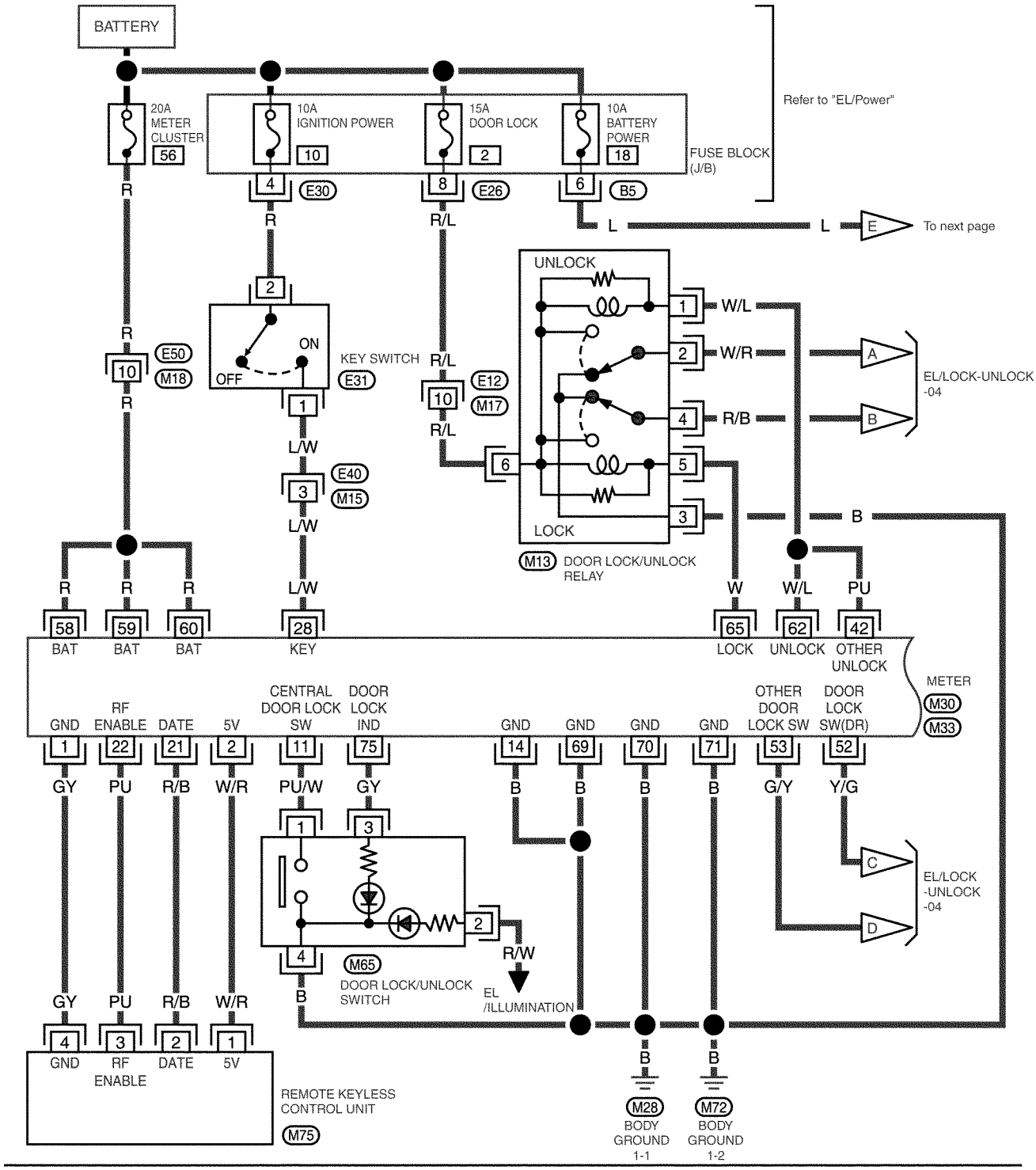
SRWZ071_O1

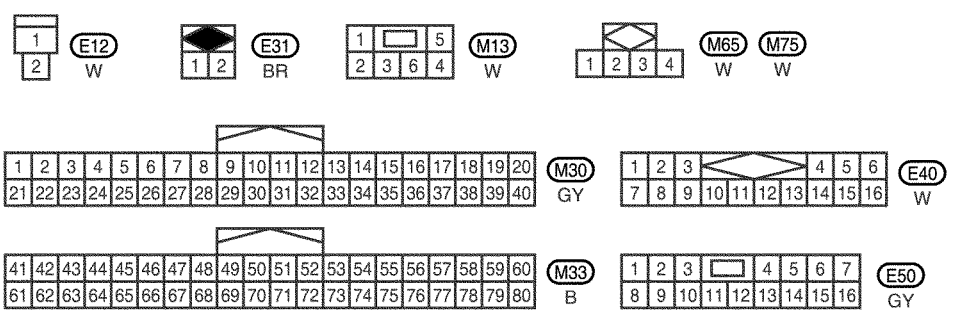
Circuit Diagram



SRCZ001_O1

Wiring Diagram — EL/Lock-Unlock (Single)- 01



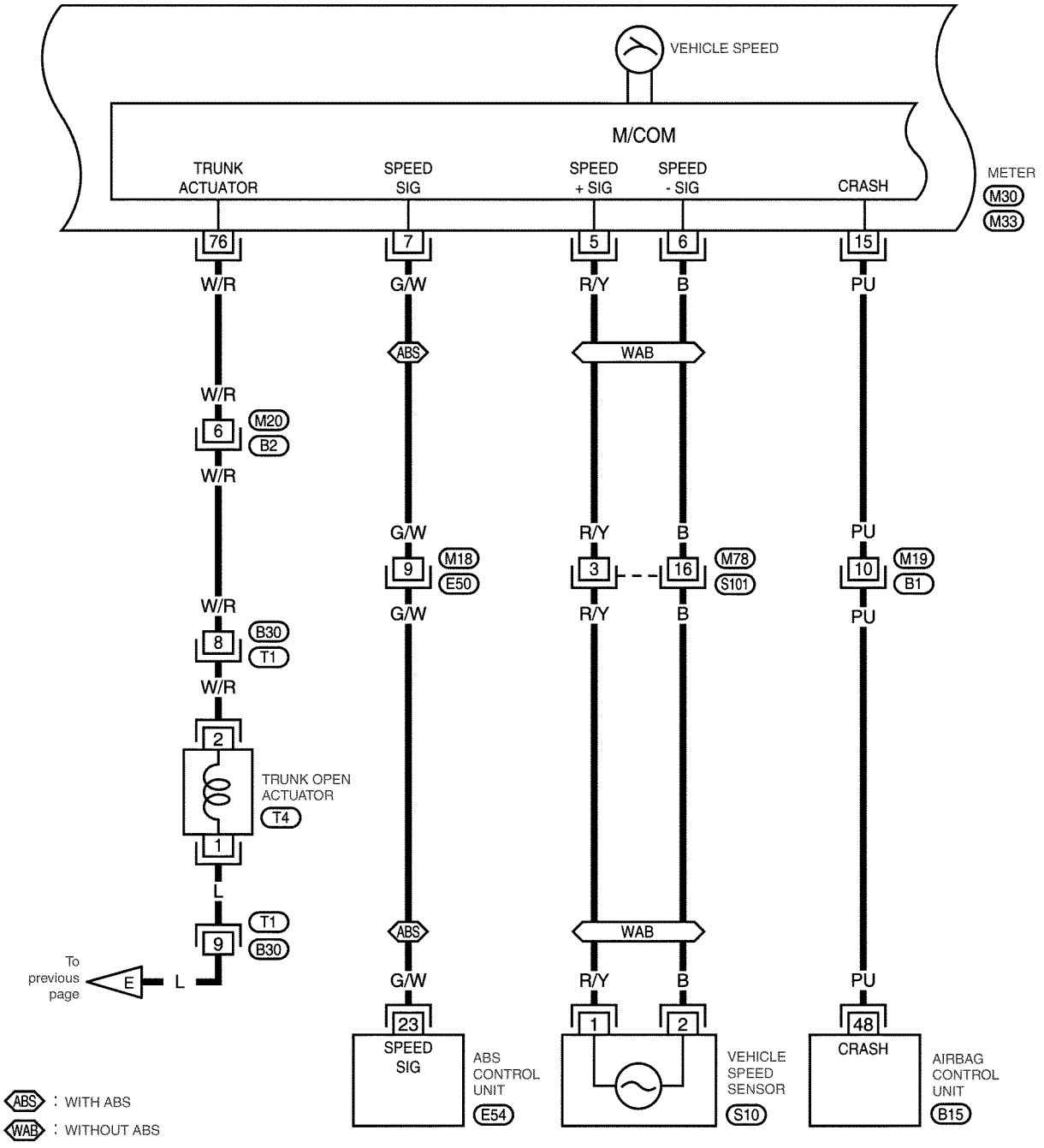


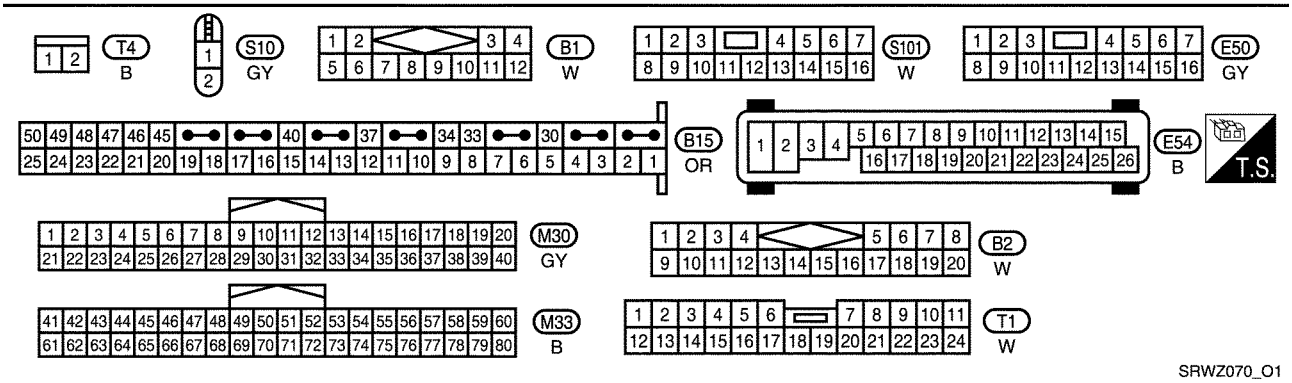
REFER TO FUSE BLOCK (J/B)
E26 E30 B5

SRWZ031_O1

Wiring Diagram

EL/Lock-Unlock (Single)- 02

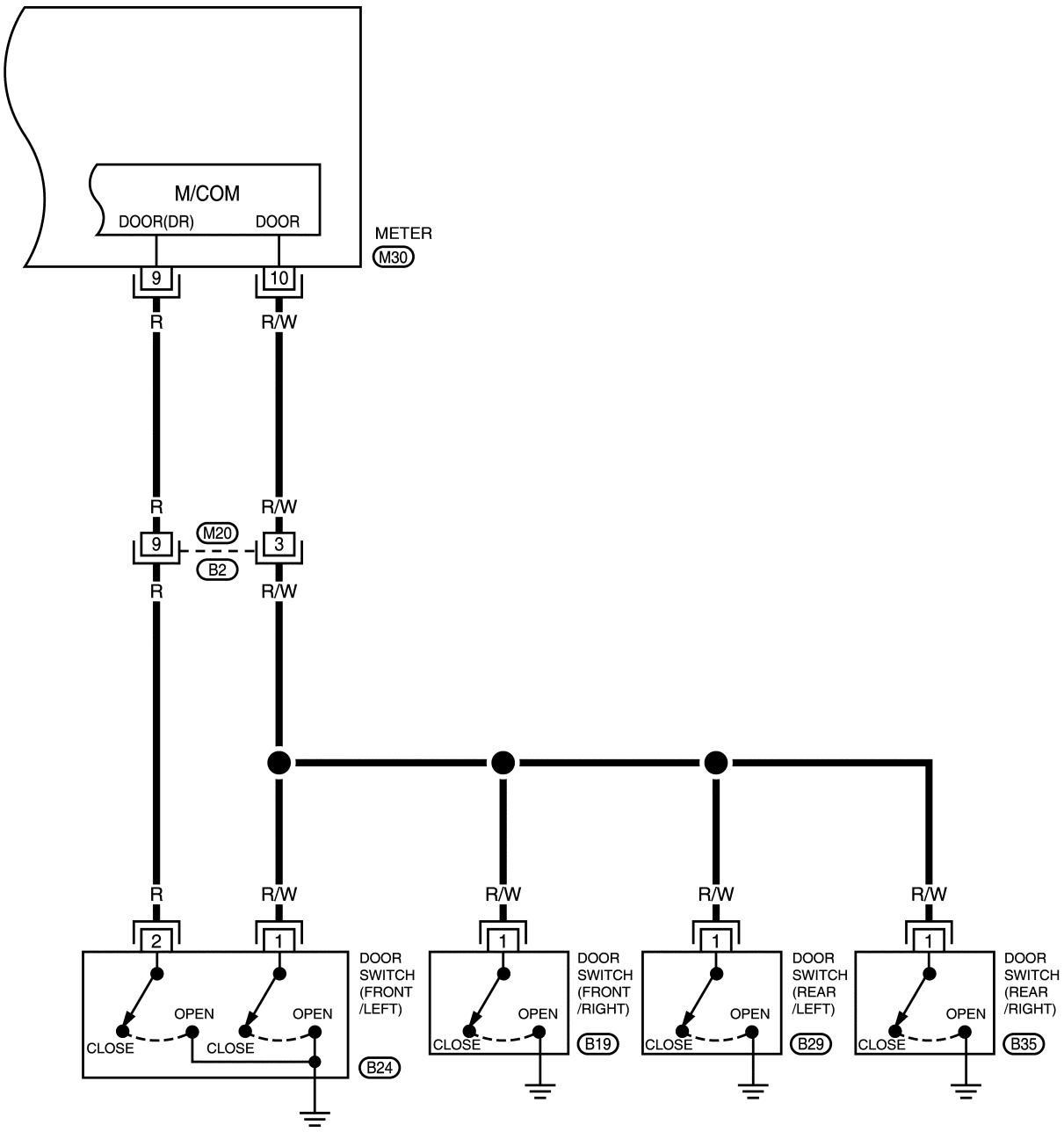


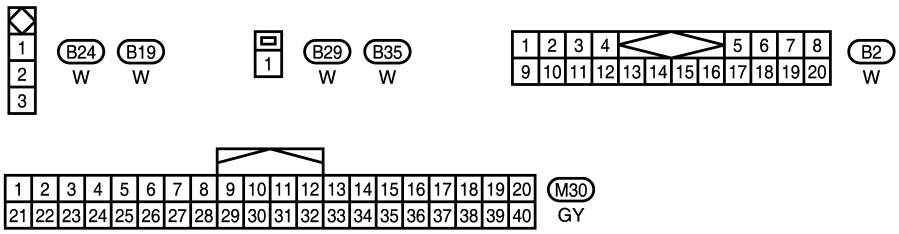


SRWZ070_O1

Wiring Diagram

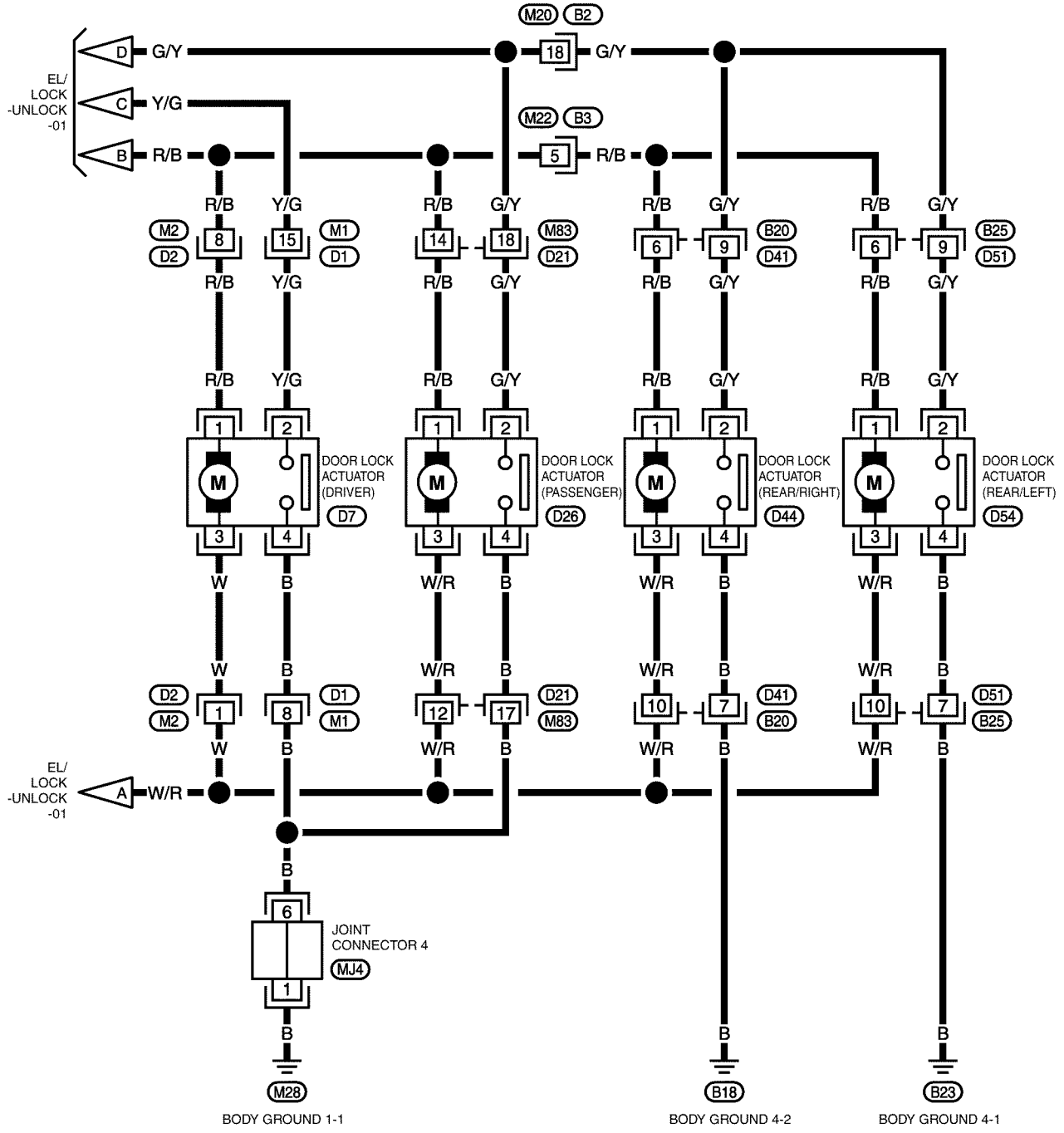
EL/Lock-Unlock (Single)- 03

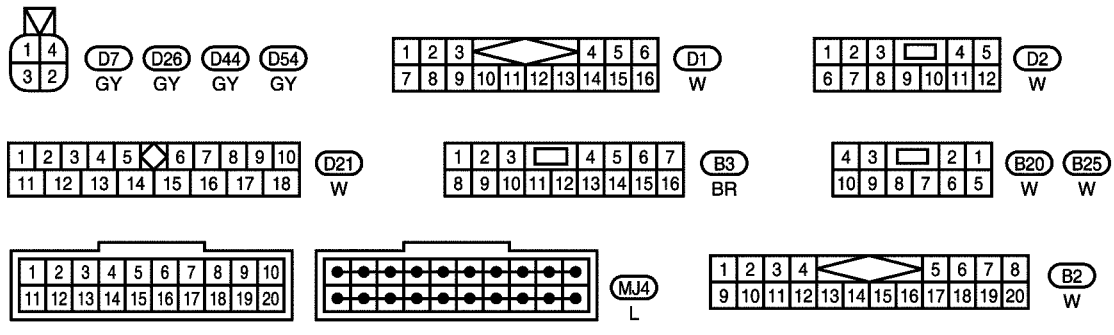




SRWZ072_O1

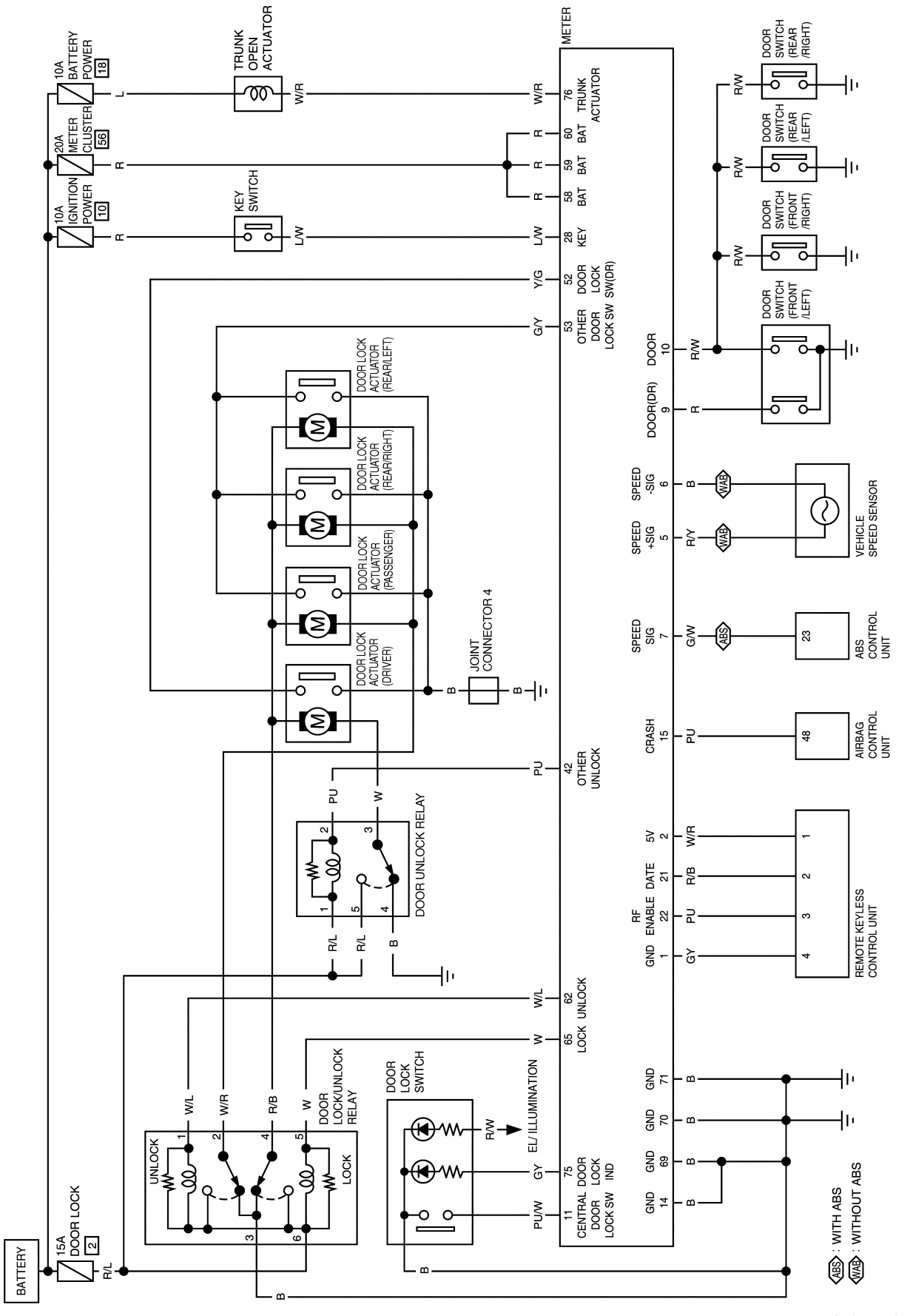
Wiring Diagram — EL/Lock-Unlock (Single)- 04





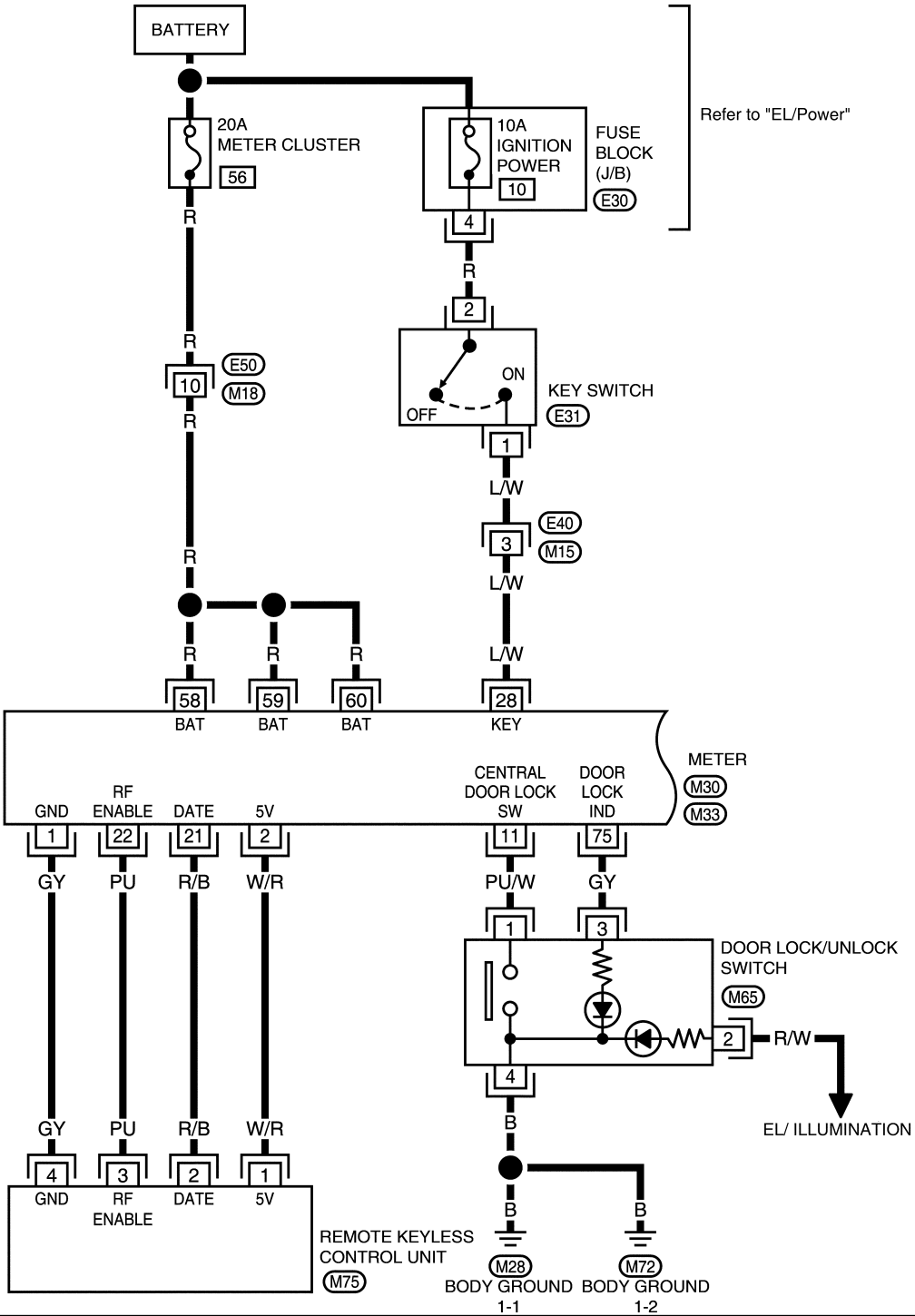
SRWZ032_O1

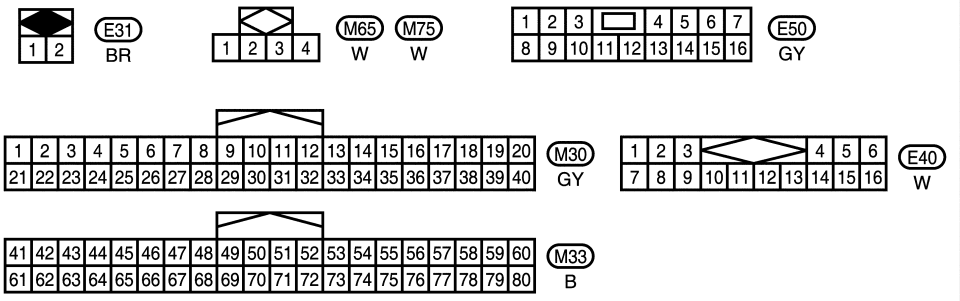
Circuit Diagram - Double



SRCZ012_O1

Wiring Diagram — EL/Lock-Unlock (Double)- 01

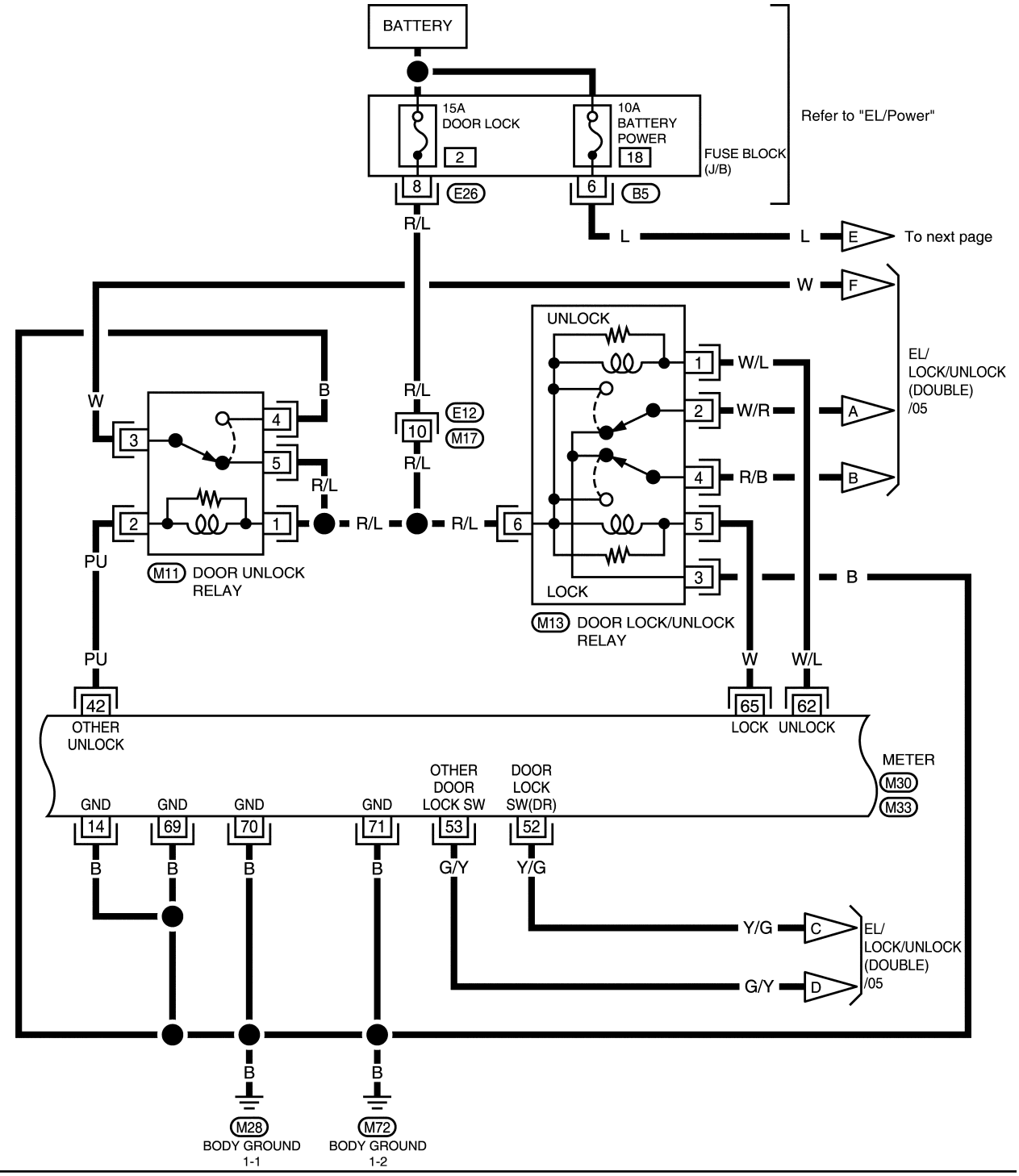


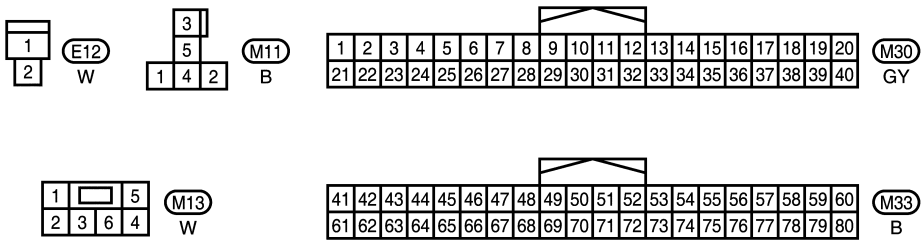


Refer to Fuse block (J/B)
E30

SRWZ077_O1

Wiring Diagram — EL/Lock-Unlock (Double)- 02

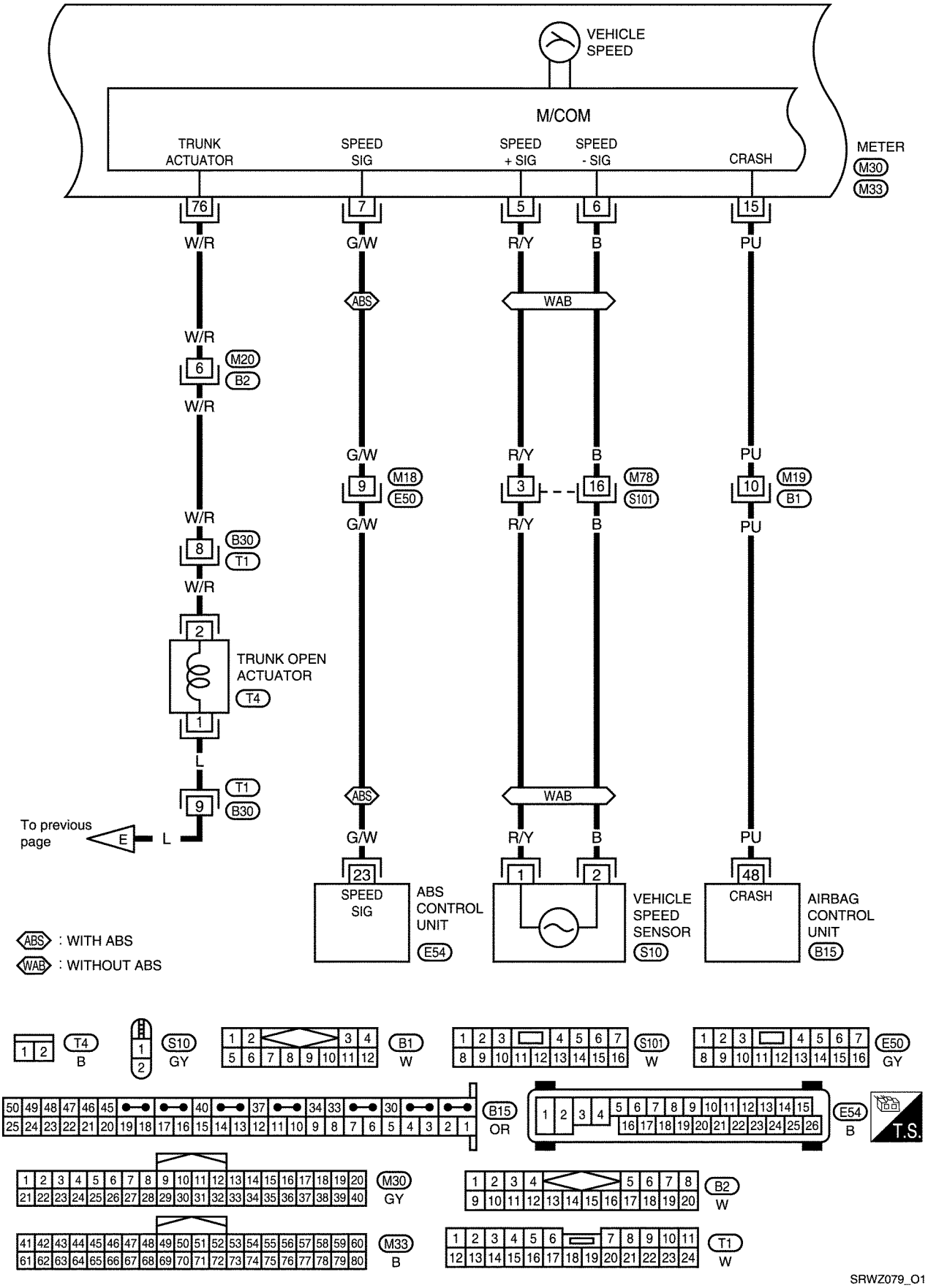




Refer to Fuse block (J/B)
E26 B5

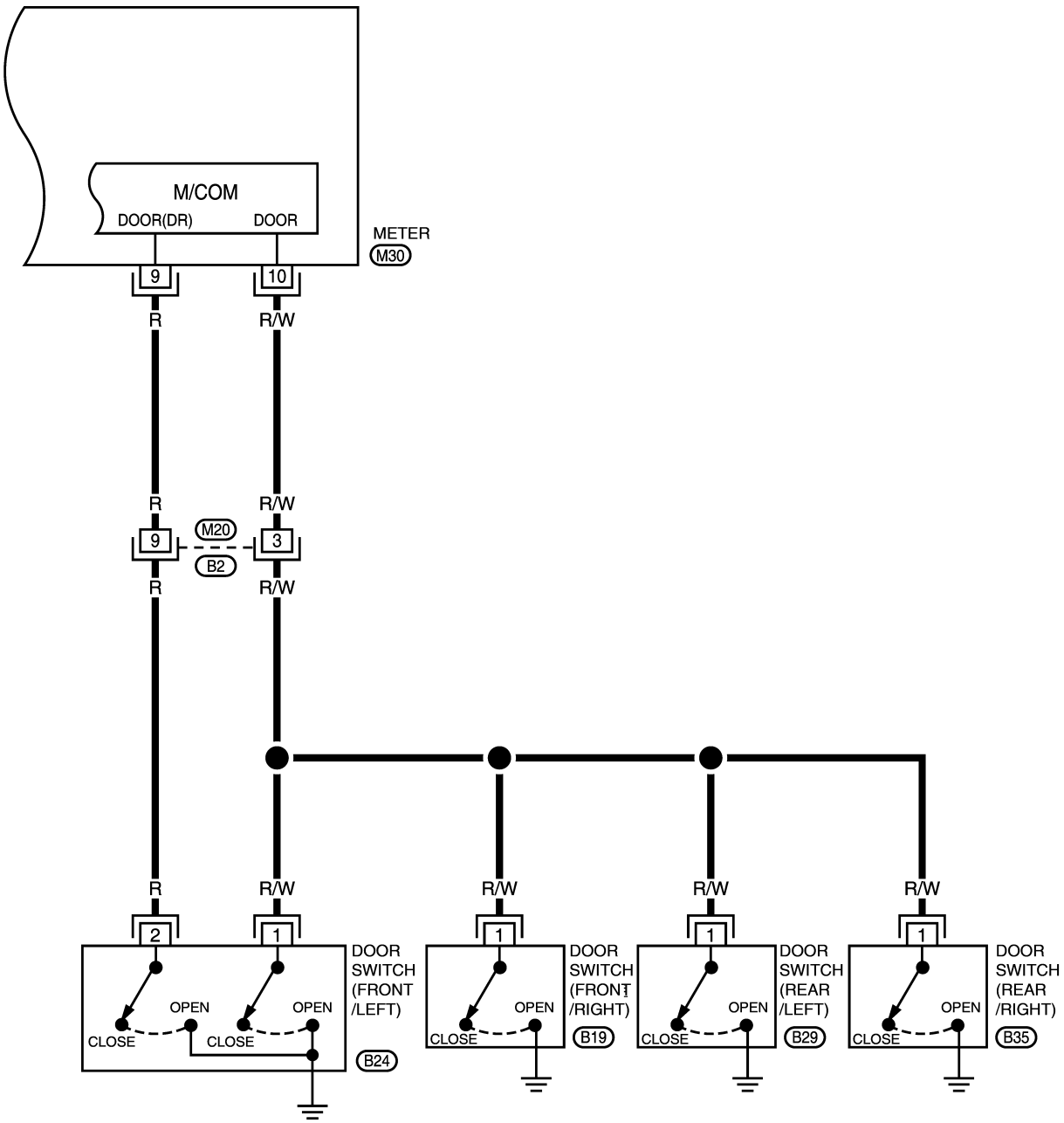
SRWZ078_O1

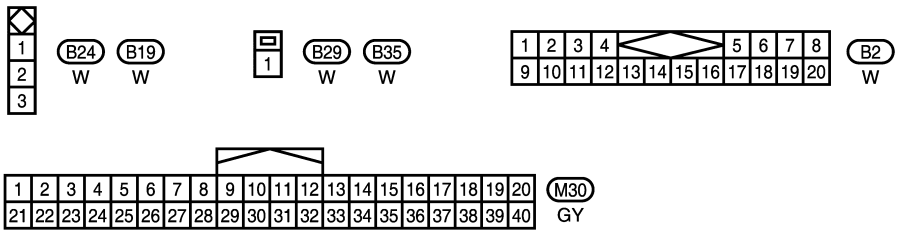
Wiring Diagram — EL/Lock-Unlock (Double)- 03



Wiring Diagram

EL/Lock-Unlock (Double)- 04

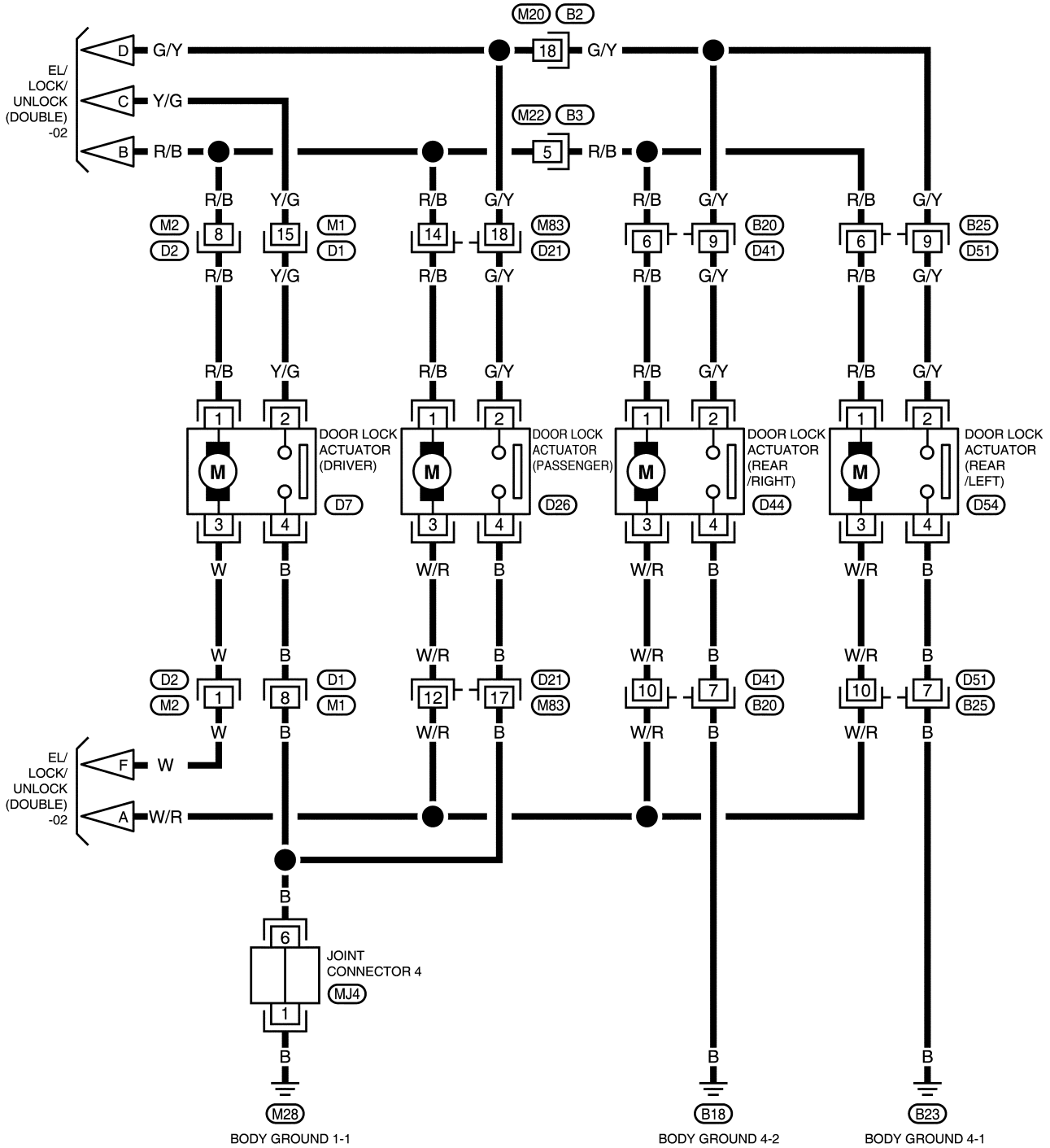


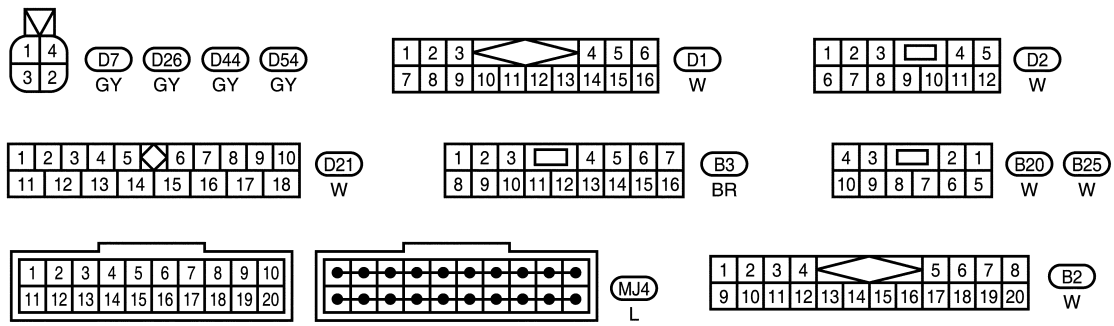


SRWZ080_O1

Wiring Diagram

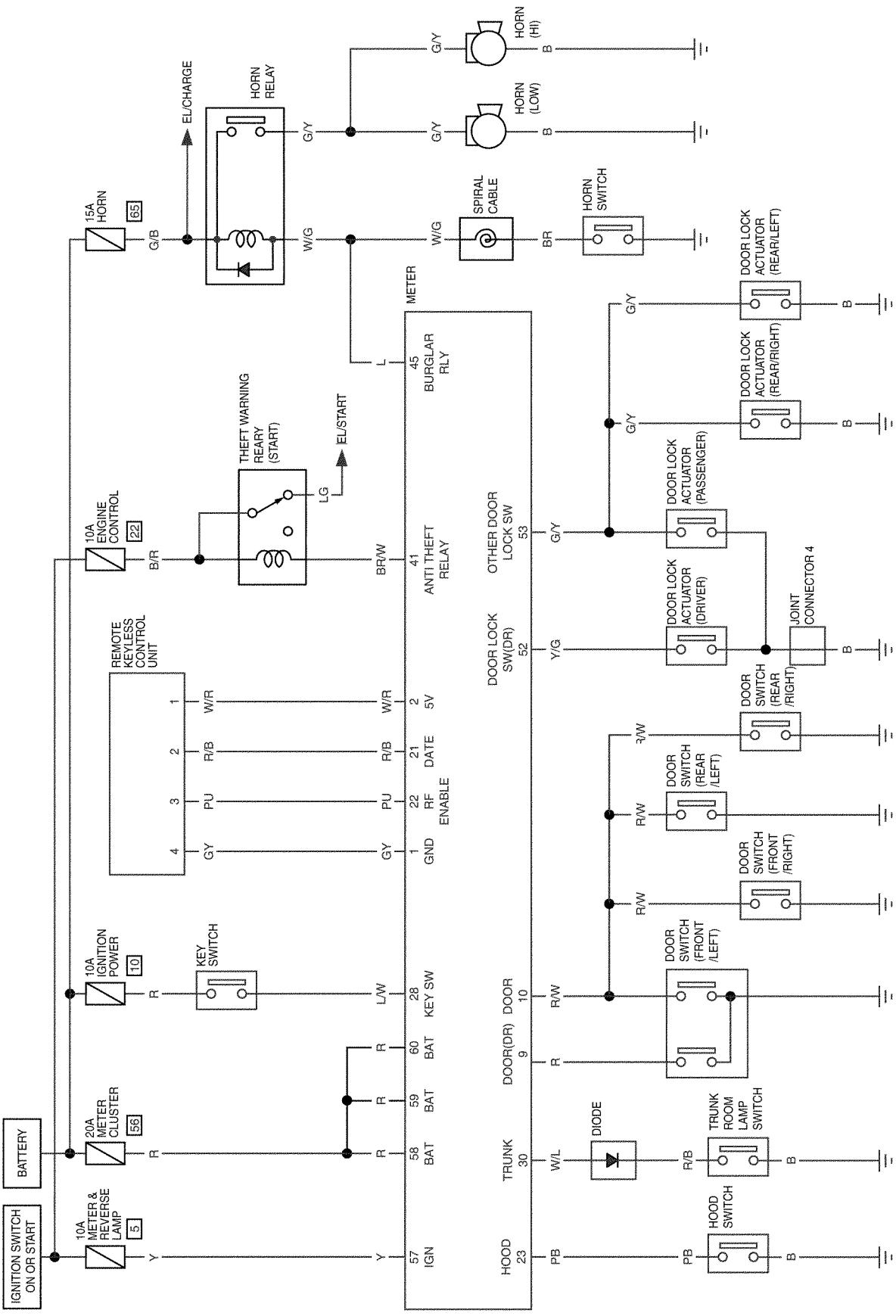
EL/Lock-Unlock (Double)- 05





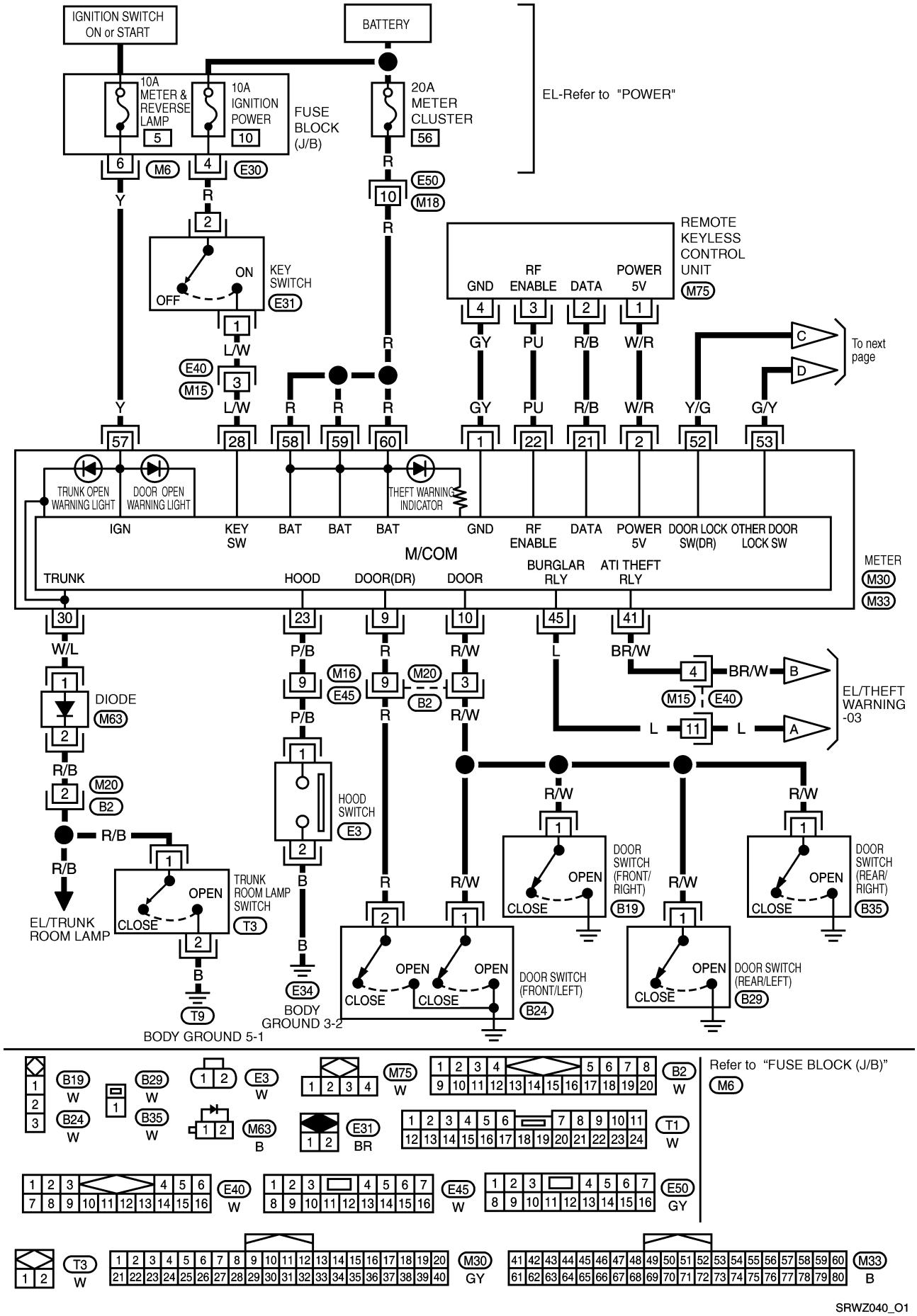
SRWZ081_O1

Circuit Diagram



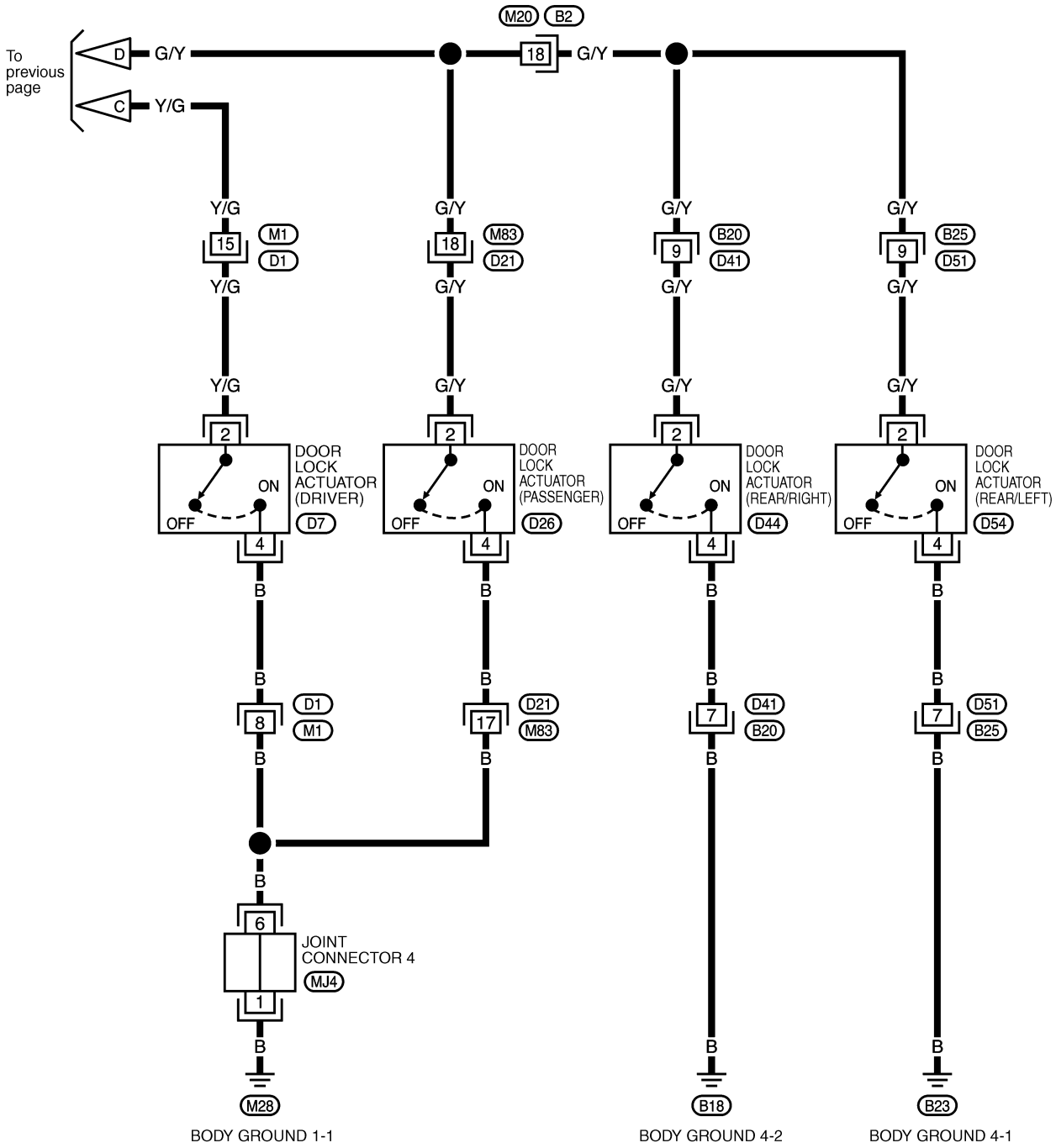
SRCZ003_O1

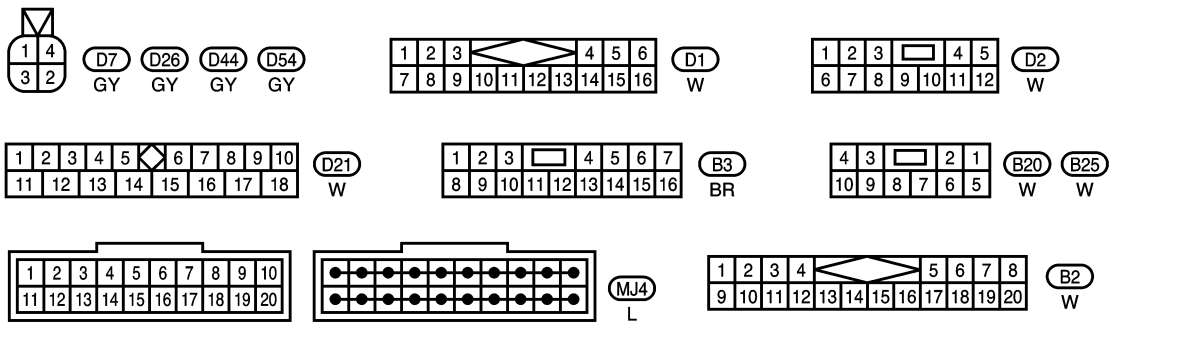
Wiring Diagram



SRWZ040_O1

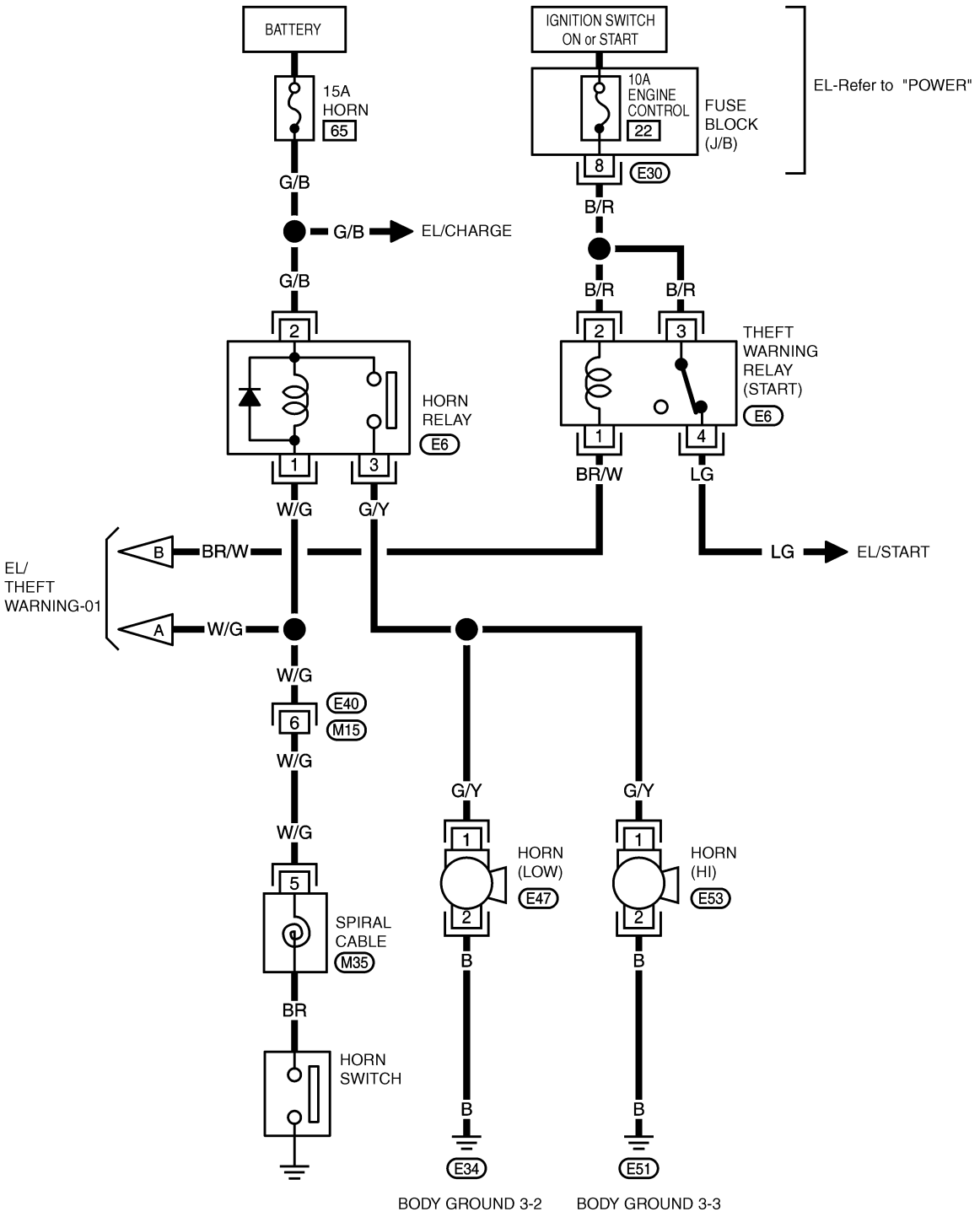
Wiring Diagram



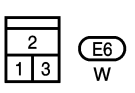


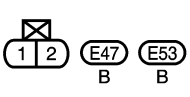
SRWZ069_O1

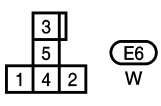
Wiring Diagram

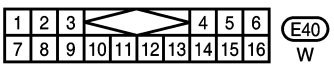


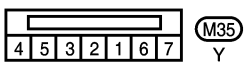
Refer to "FUSE BLOCK (J/B)"
E30





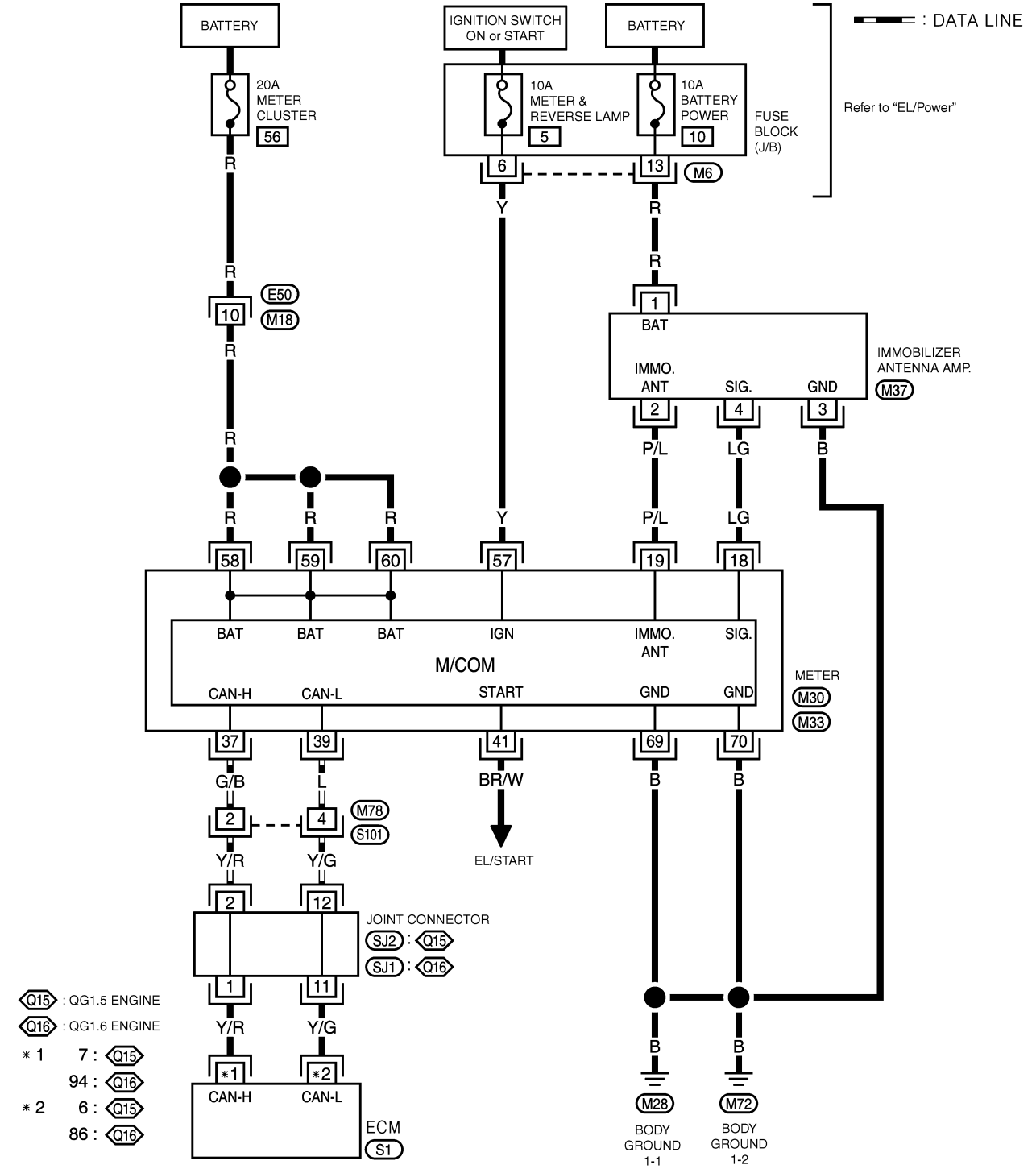


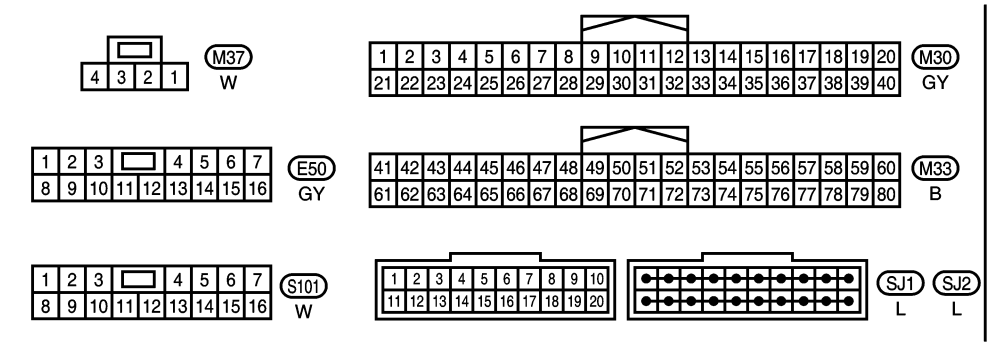




SRWZ041_O1

Wiring Diagram — EL/Immobilizer



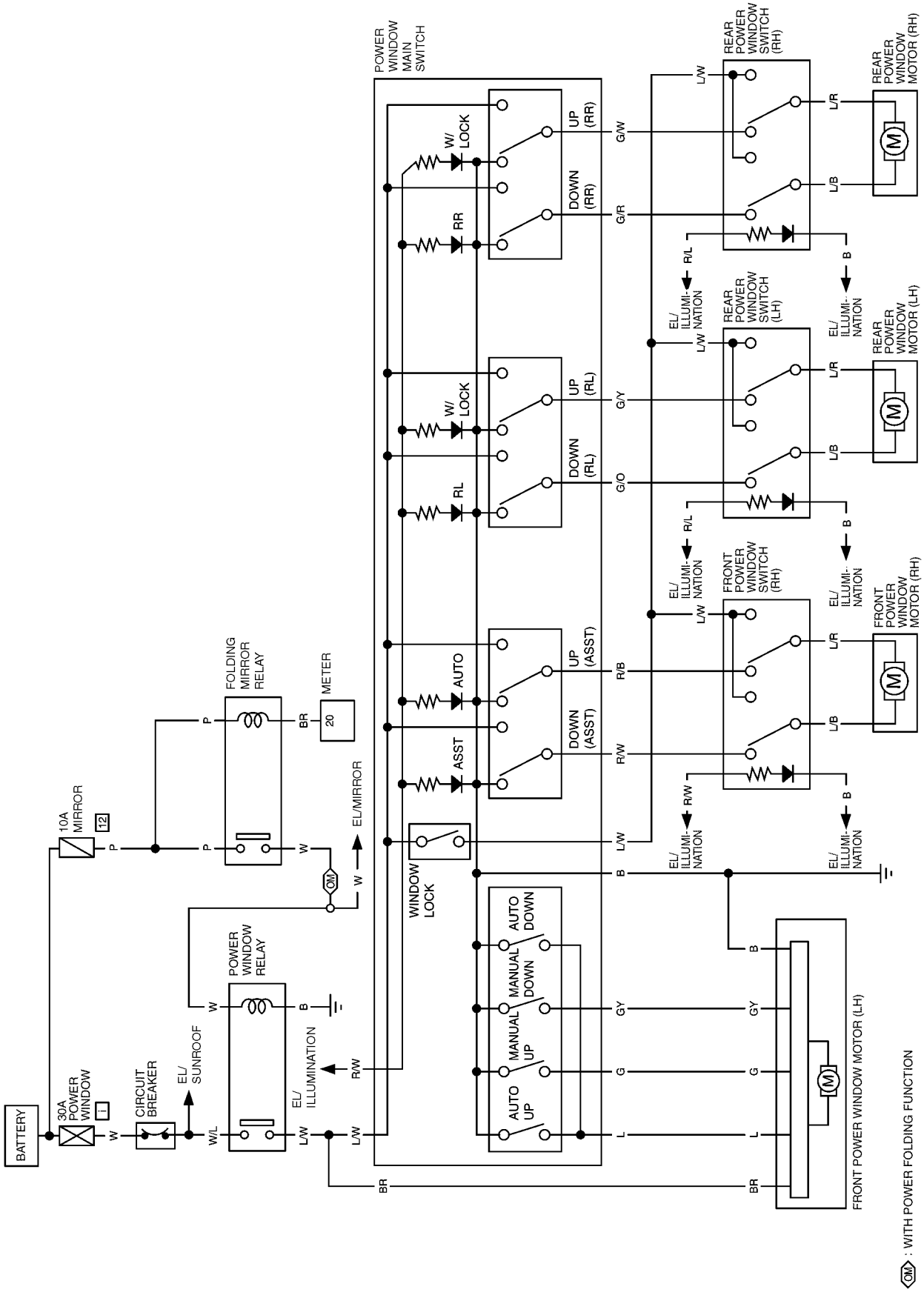


Refer to "FUSE BLOCK (J/B)" M6

Refer to "ELECTRICAL UNIT" S1

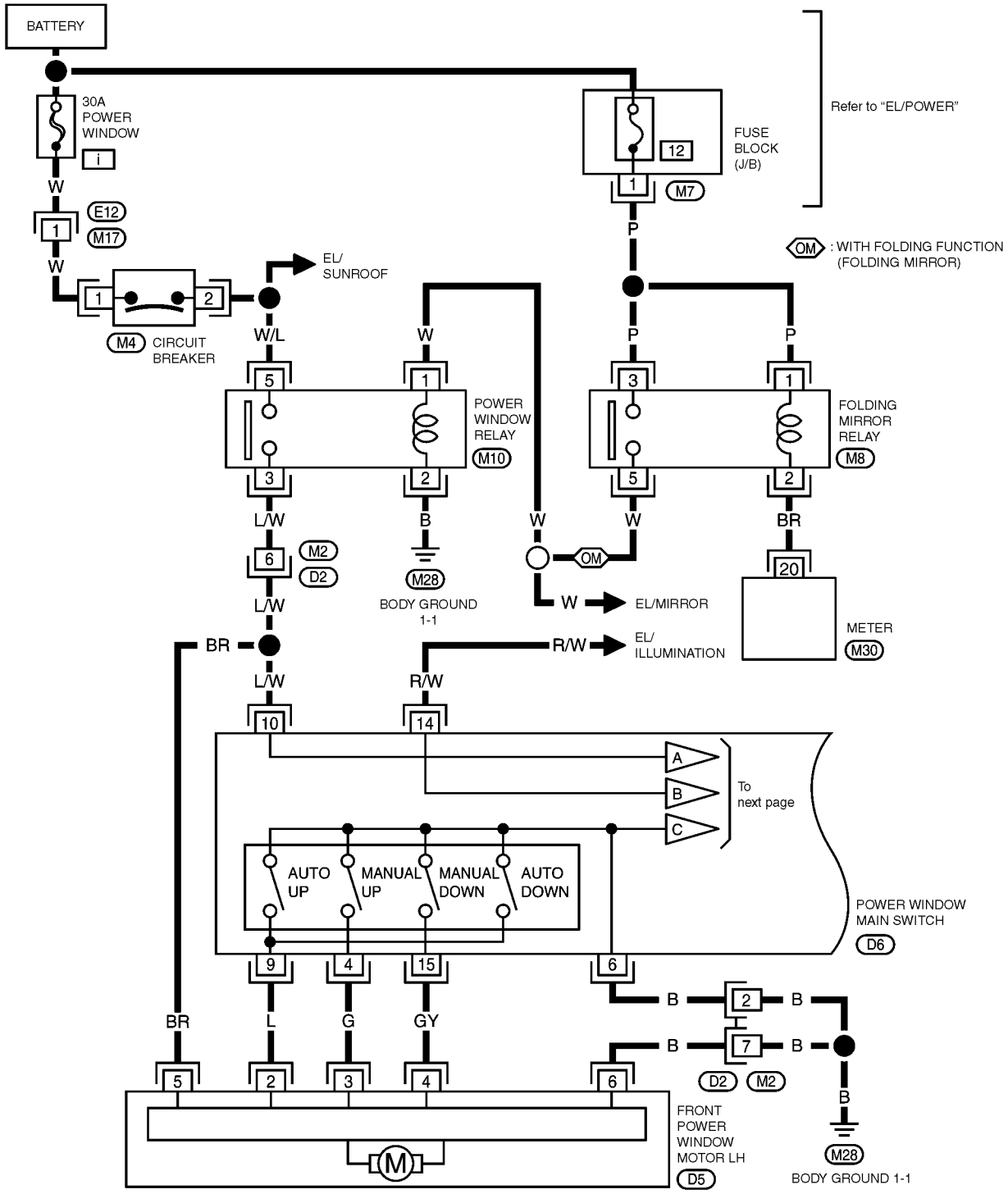
SRWZ044_O1

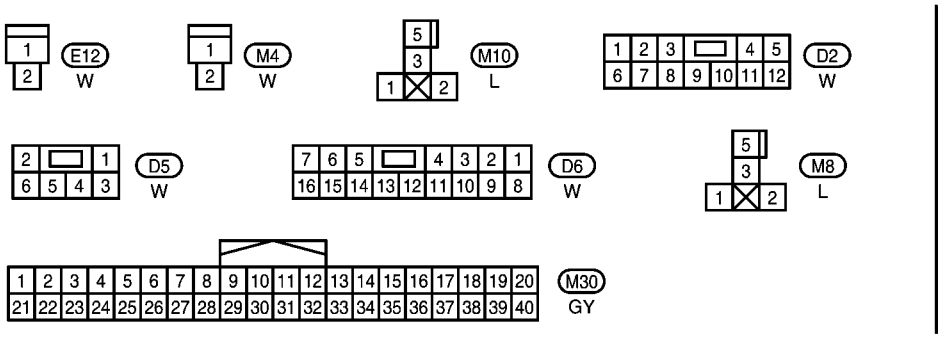
Circuit Diagram



SRCZ004_O1

Wiring Diagram — EL/Power Window (4DR)- 01

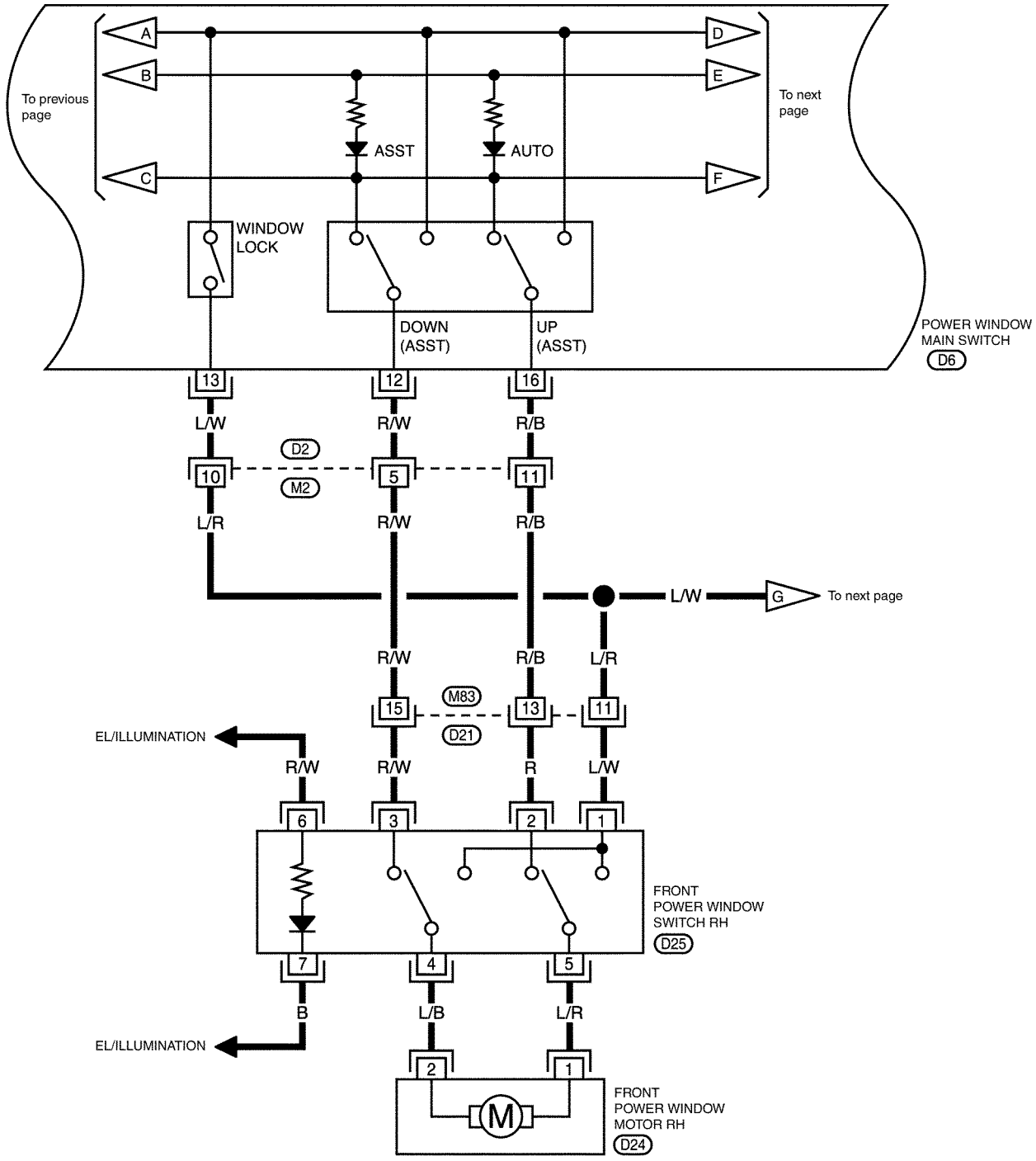


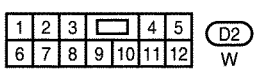


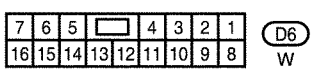
Refer to "FUSE BLOCK (J/B)"
M7

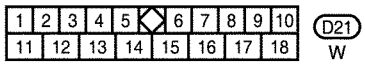
SRWZ033_O1

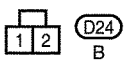
Wiring Diagram — EL/Power Window (4DR)- 02

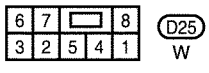






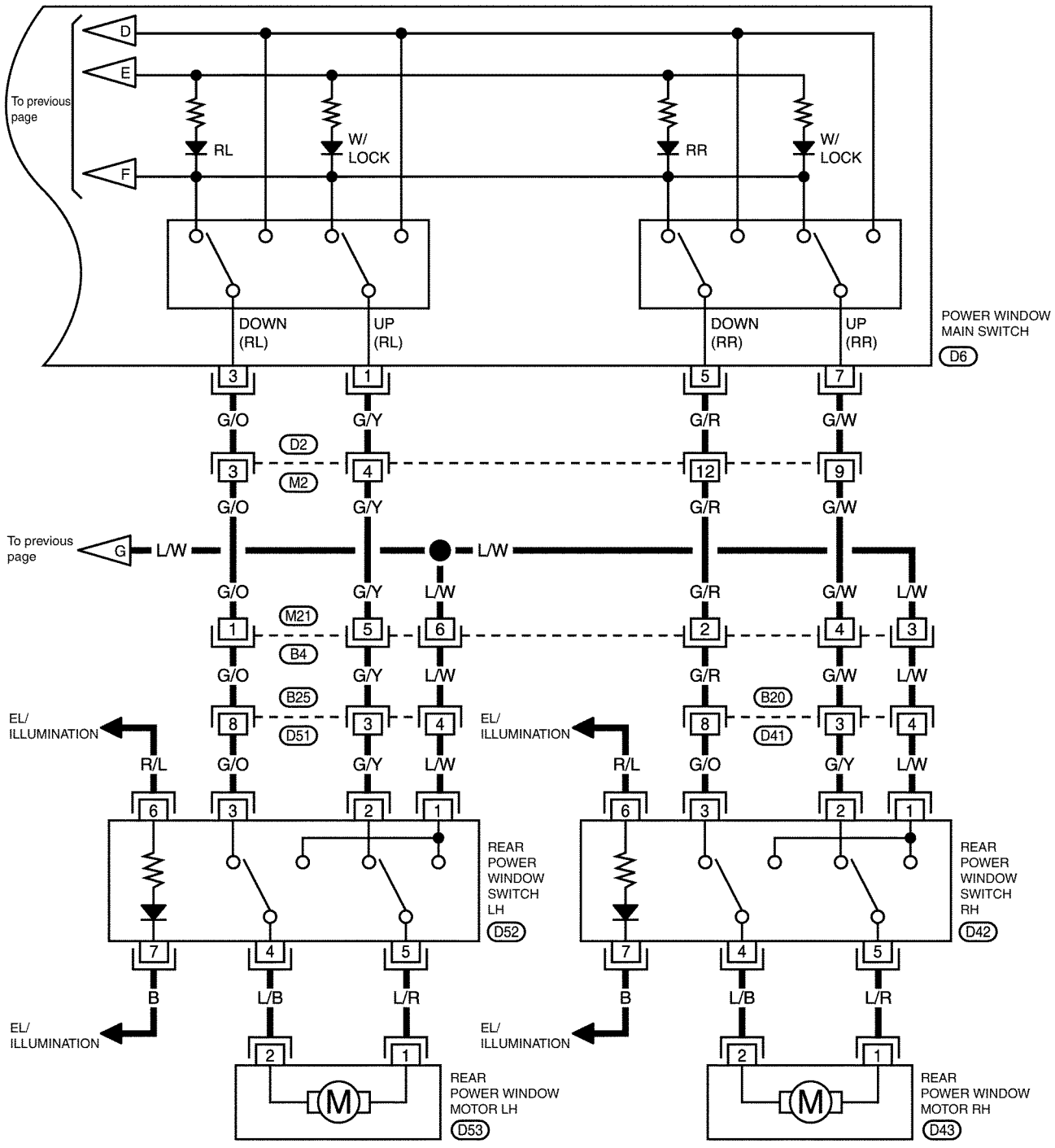


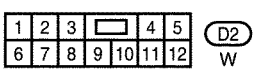


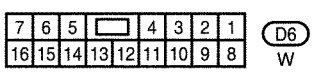


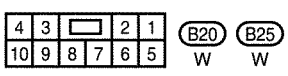
SRWZ034_O1

Wiring Diagram — EL/Power Window (4DR)- 03

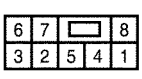


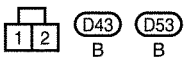

D2 W


D6 W


B20 W B25 W

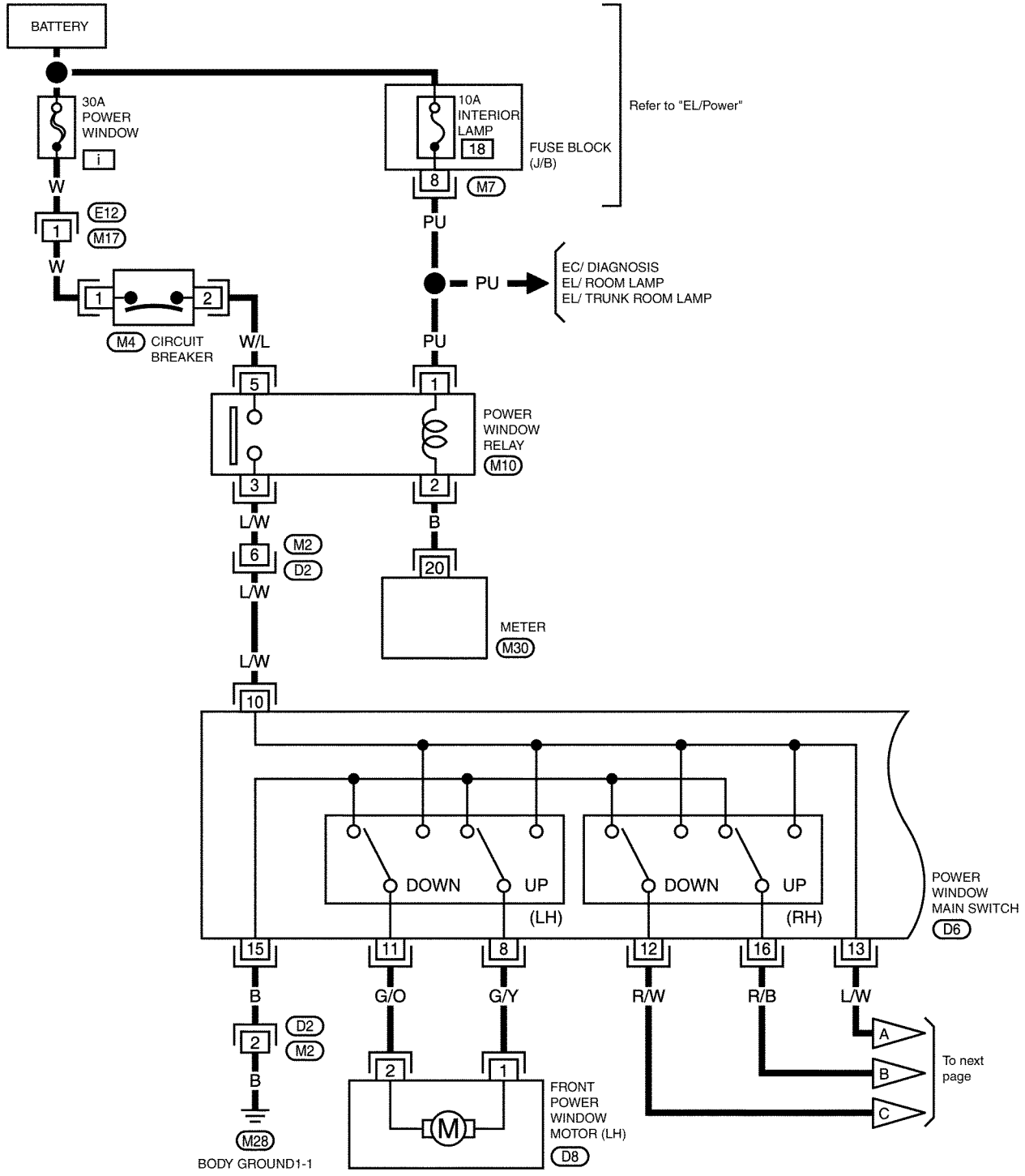
B4 W

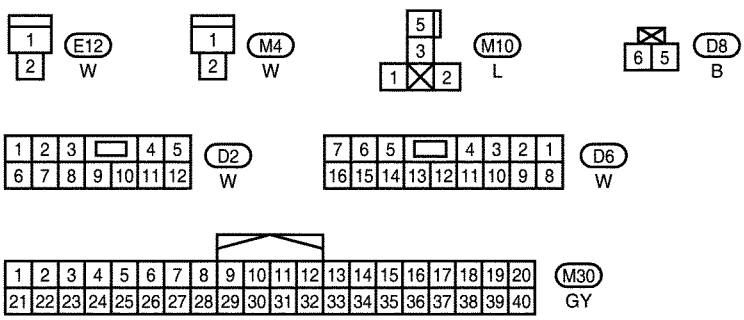

D42 W D52 W


D43 B D53 B

SRWZ035_O1

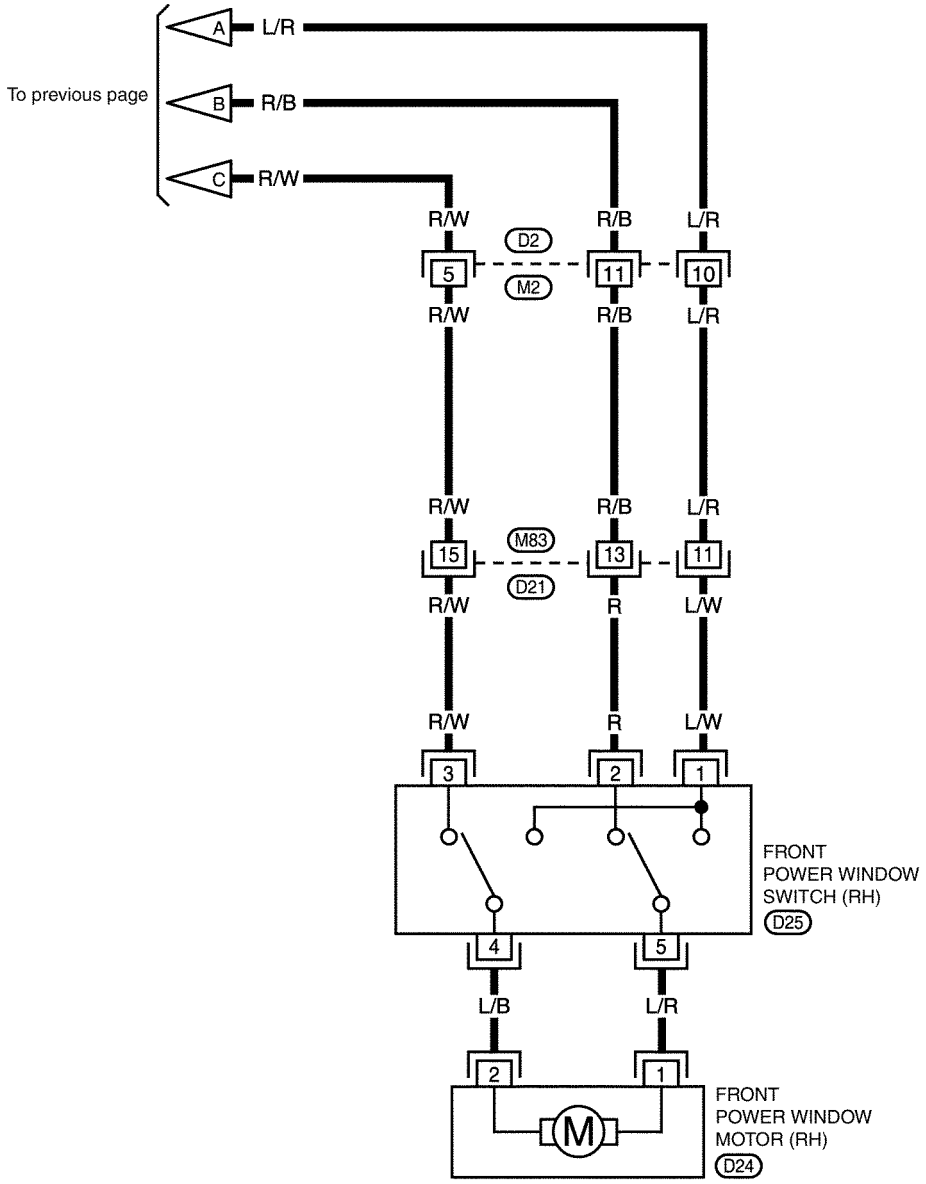
Wiring Diagram — EL/Power Window (2DR) - 01

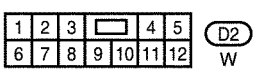


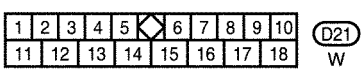


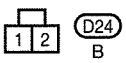
REFER TO FUSE BLOCK (J/B)
M7

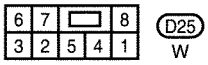
SRWZ075_O1


To previous page
A
L/R
B
R/B
C
R/W
D2
M2
M83
D21
FRONT
POWER WINDOW
SWITCH (RH)
D25
FRONT
POWER WINDOW
MOTOR (RH)
D24
M


D2
W

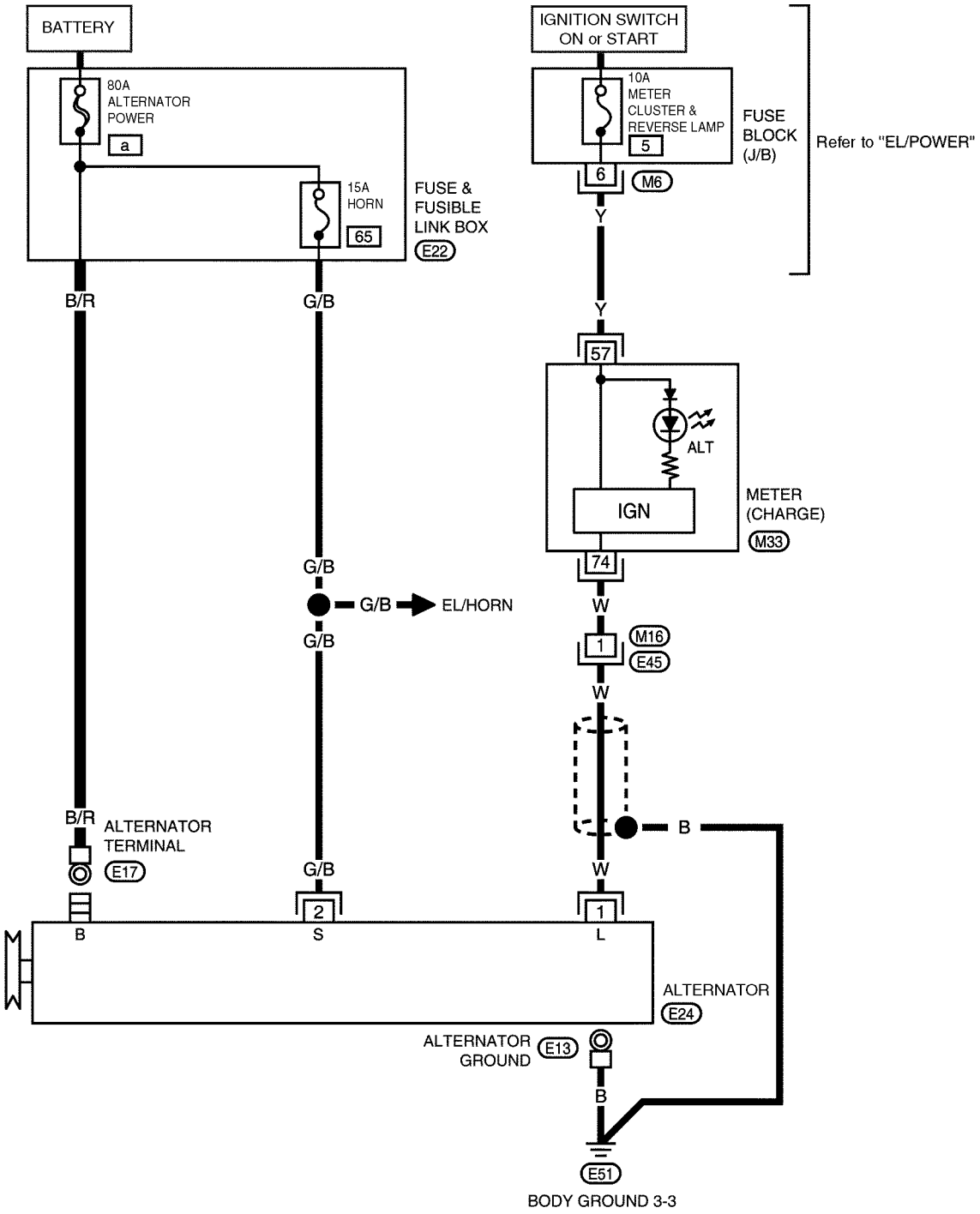

D21
W

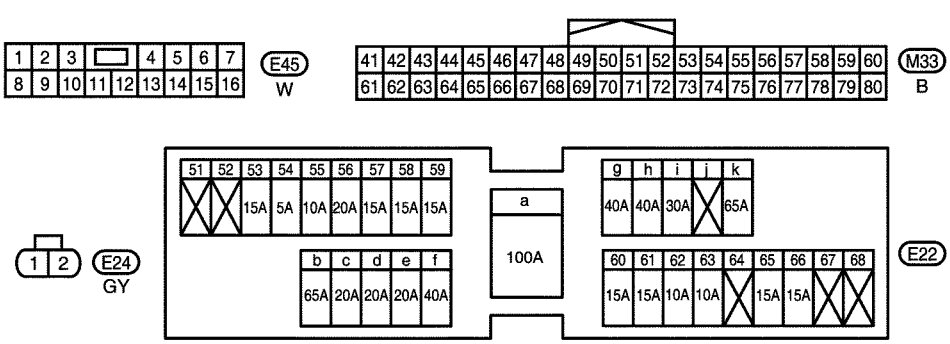

D24
B


D25
W

SRWZ076_O1

Wiring Diagram EL/Charge

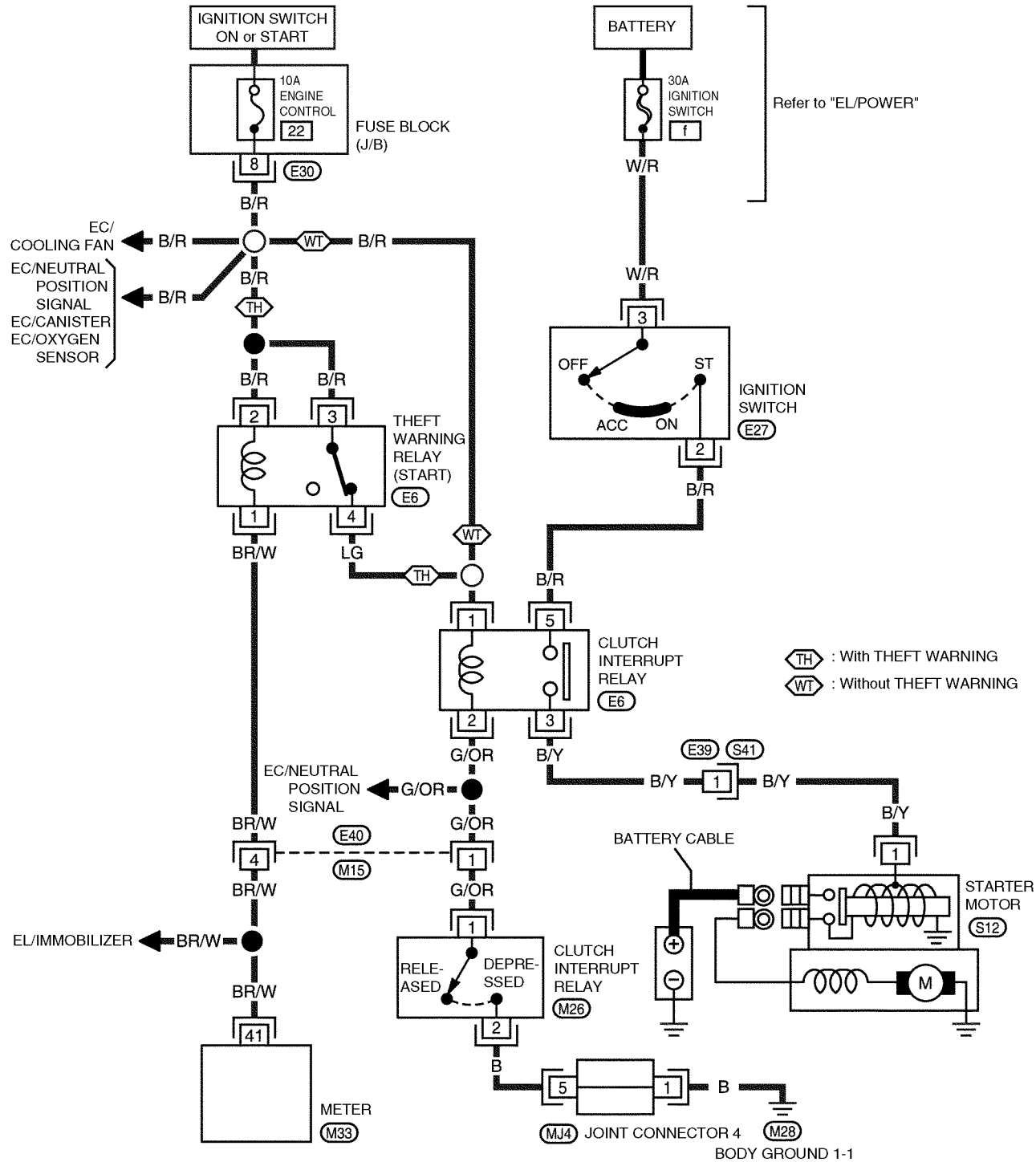




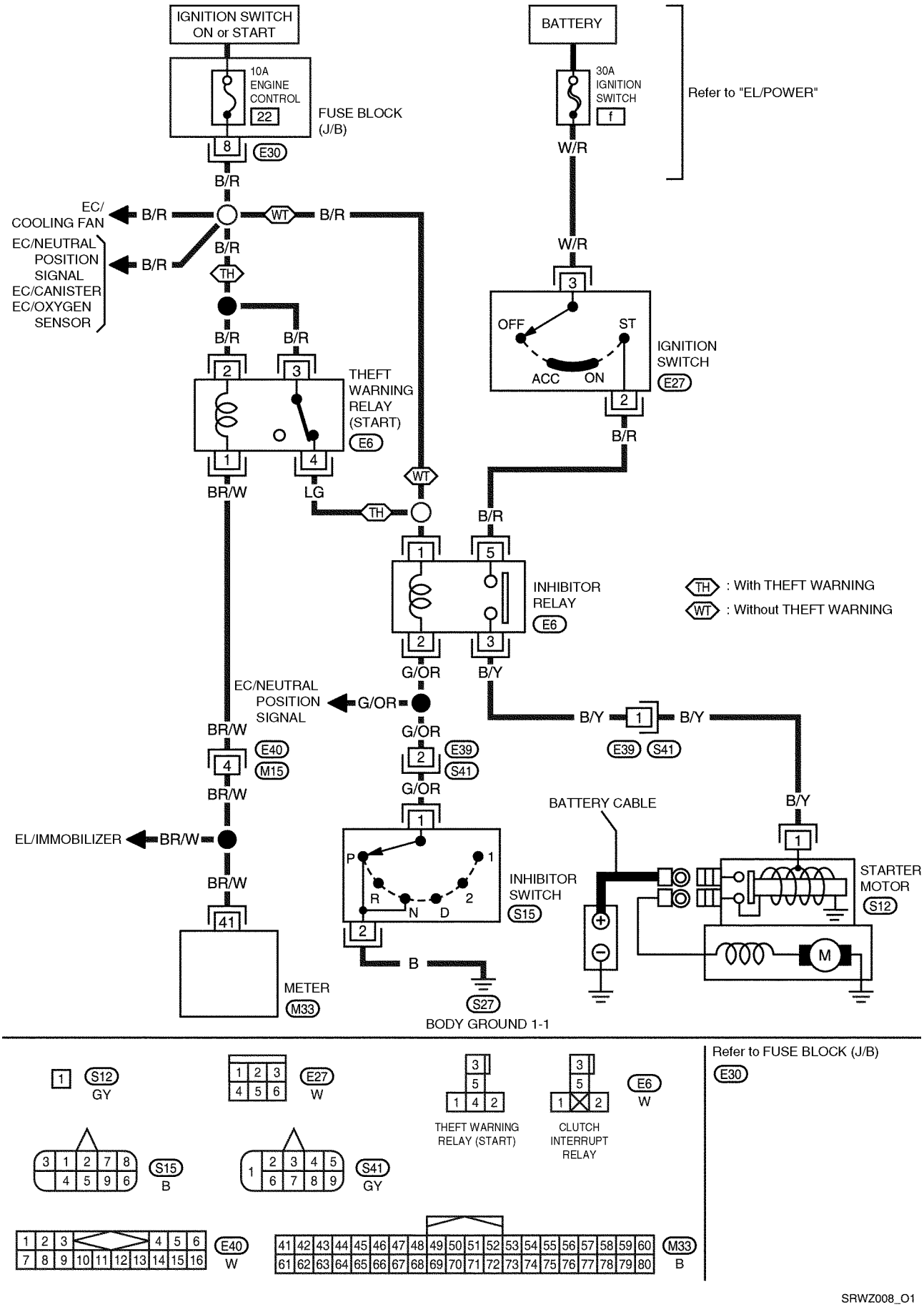
SRWZ009_O1

Wiring Diagram

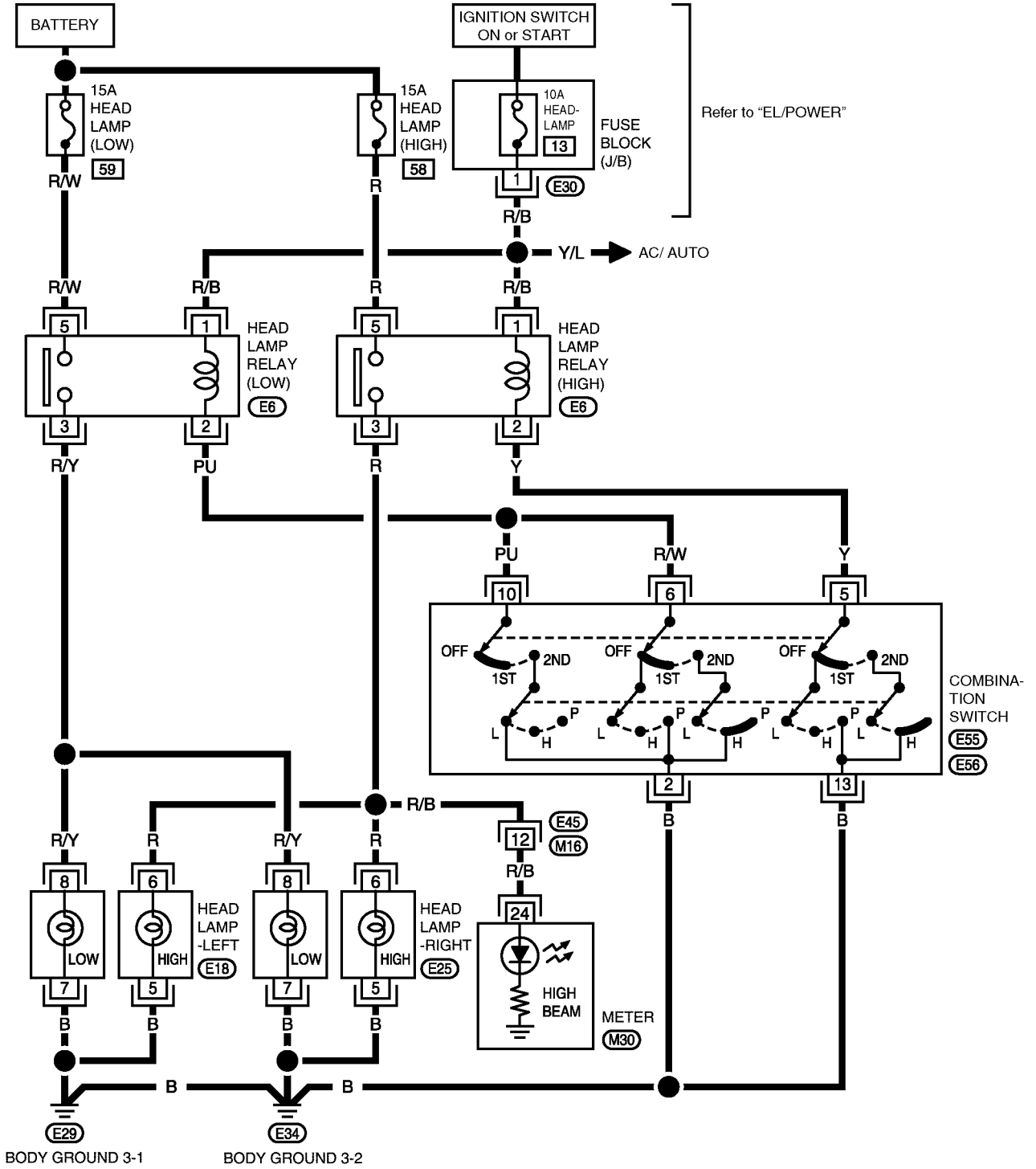
EL/Start (M/T)- 01

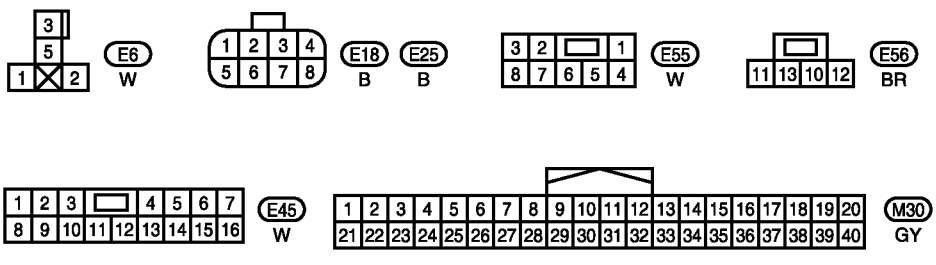


Wiring Diagram



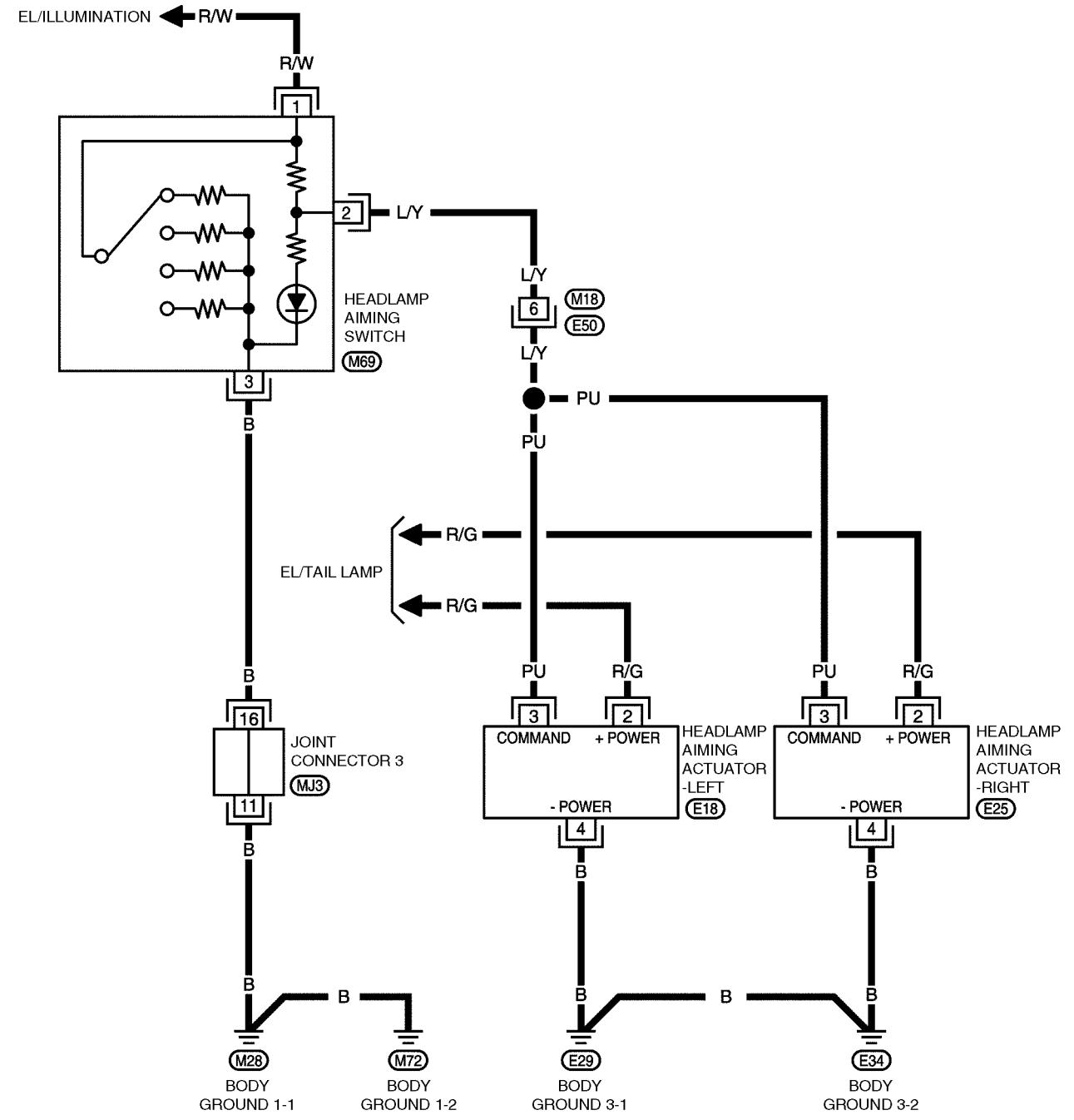
Wiring Diagram

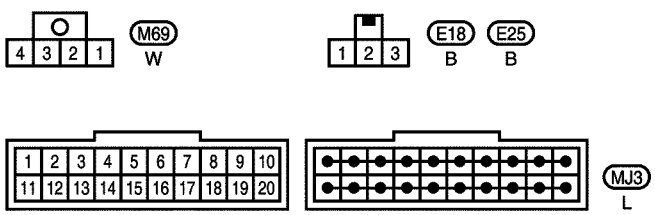




Refer to "FUSE BLOCK (J/B)"
E30

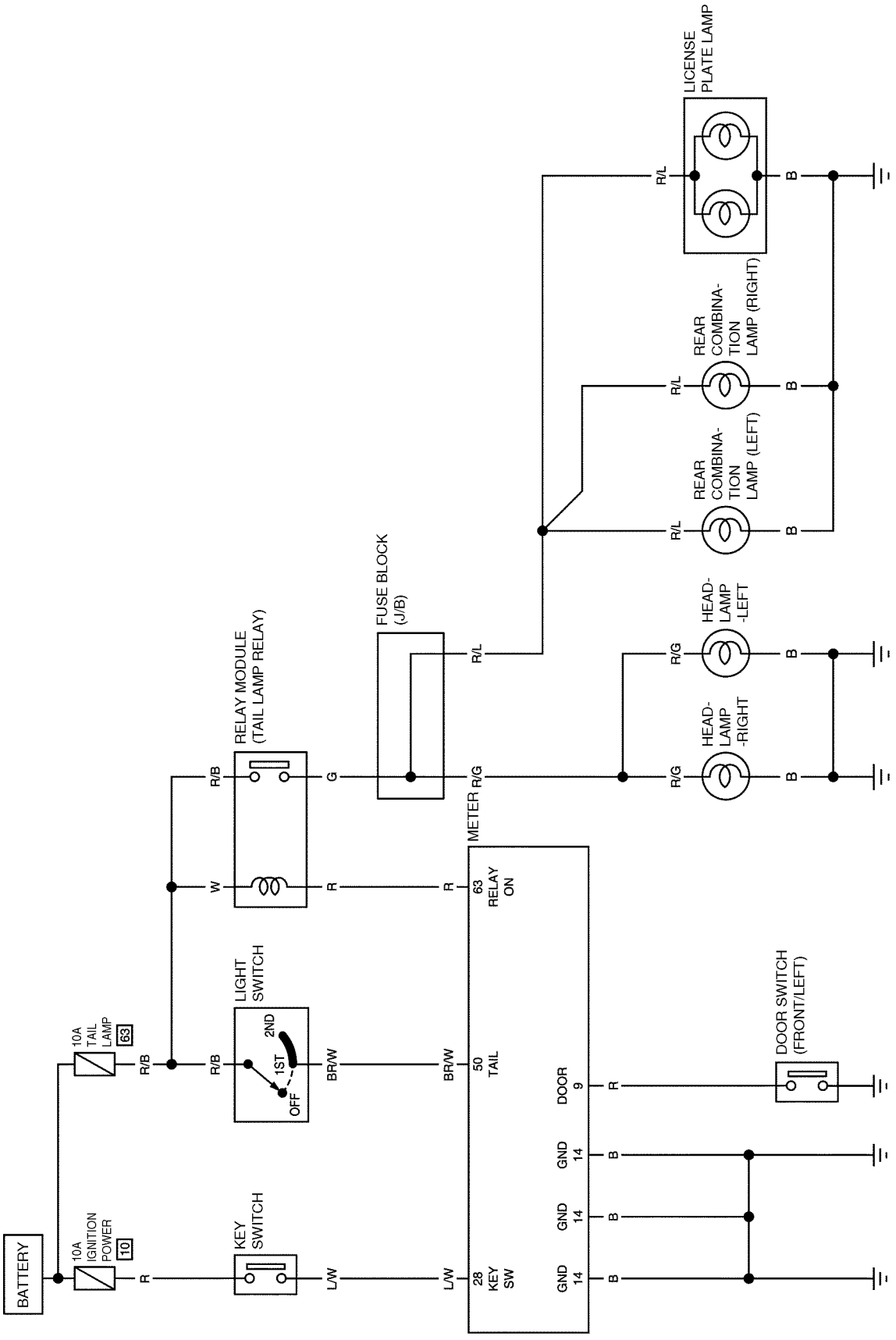
SRWZ001_O1


EL/ILLUMINATION
R/W
R/W
1
2
L/Y
HEADLAMP AIMING SWITCH
M69
3
B
L/Y
6
M18
E50
L/Y
PU
PU
R/G
EL/TAIL LAMP
R/G
B
16
JOINT CONNECTOR 3
MJ3
11
B
PU
R/G
3
2
COMMAND
+ POWER
- POWER
4
HEADLAMP AIMING ACTUATOR -LEFT
E18
PU
R/G
3
2
COMMAND
+ POWER
- POWER
4
HEADLAMP AIMING ACTUATOR -RIGHT
E25
B
B
B
B
B
B
M28
BODY GROUND 1-1
M72
BODY GROUND 1-2
E29
BODY GROUND 3-1
E34
BODY GROUND 3-2


M69
W
E18
E25
B
B
E50
GY
MJ3
L

SRWZ074_O1

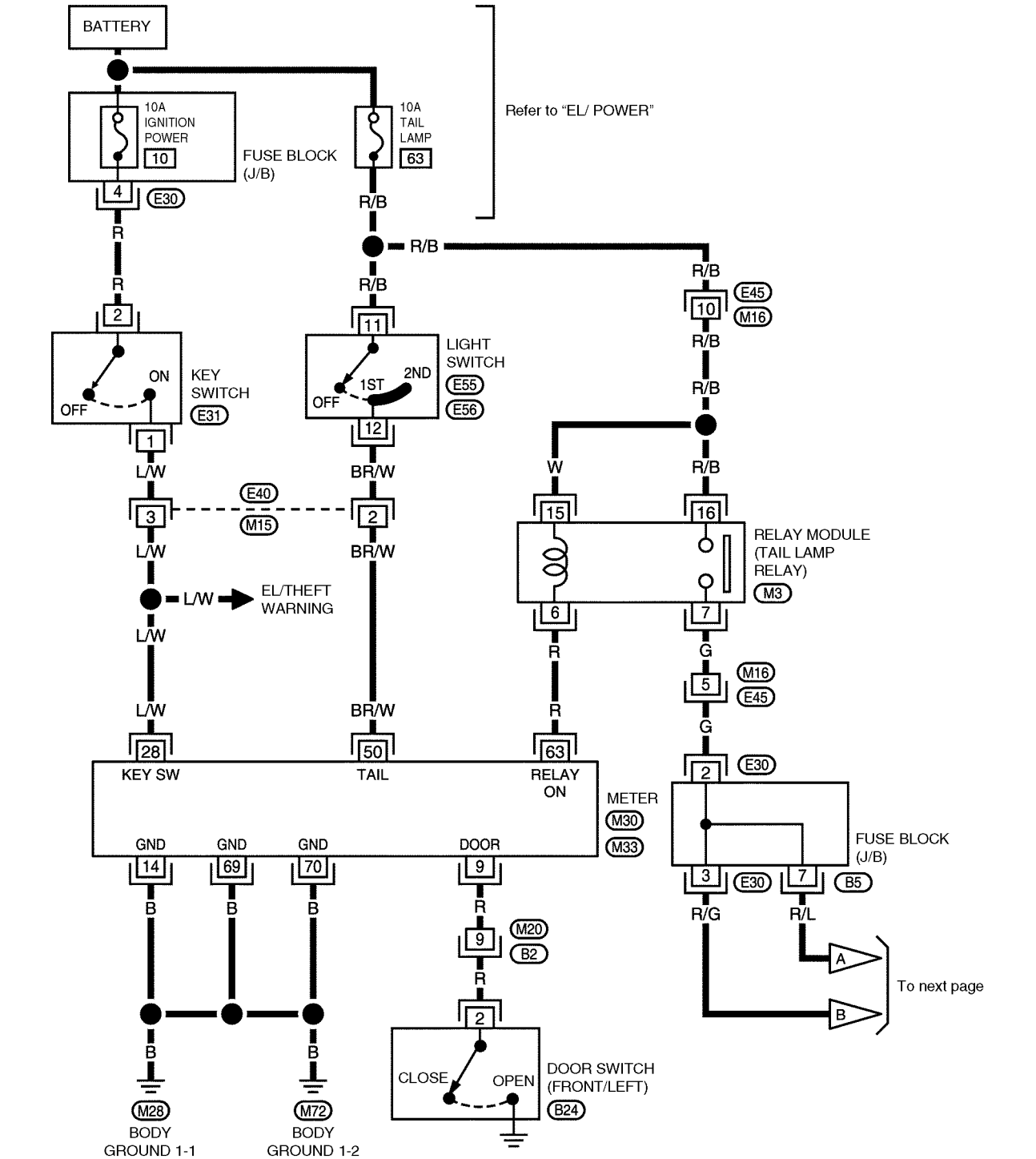
Circuit Diagram

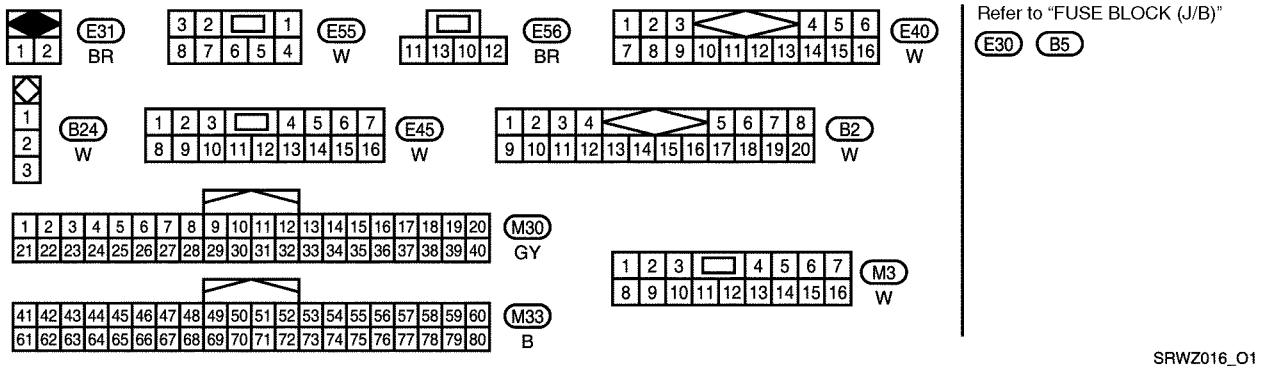


SRCZ006_O1

Wiring Diagram

EL/Tail Lamp- 01

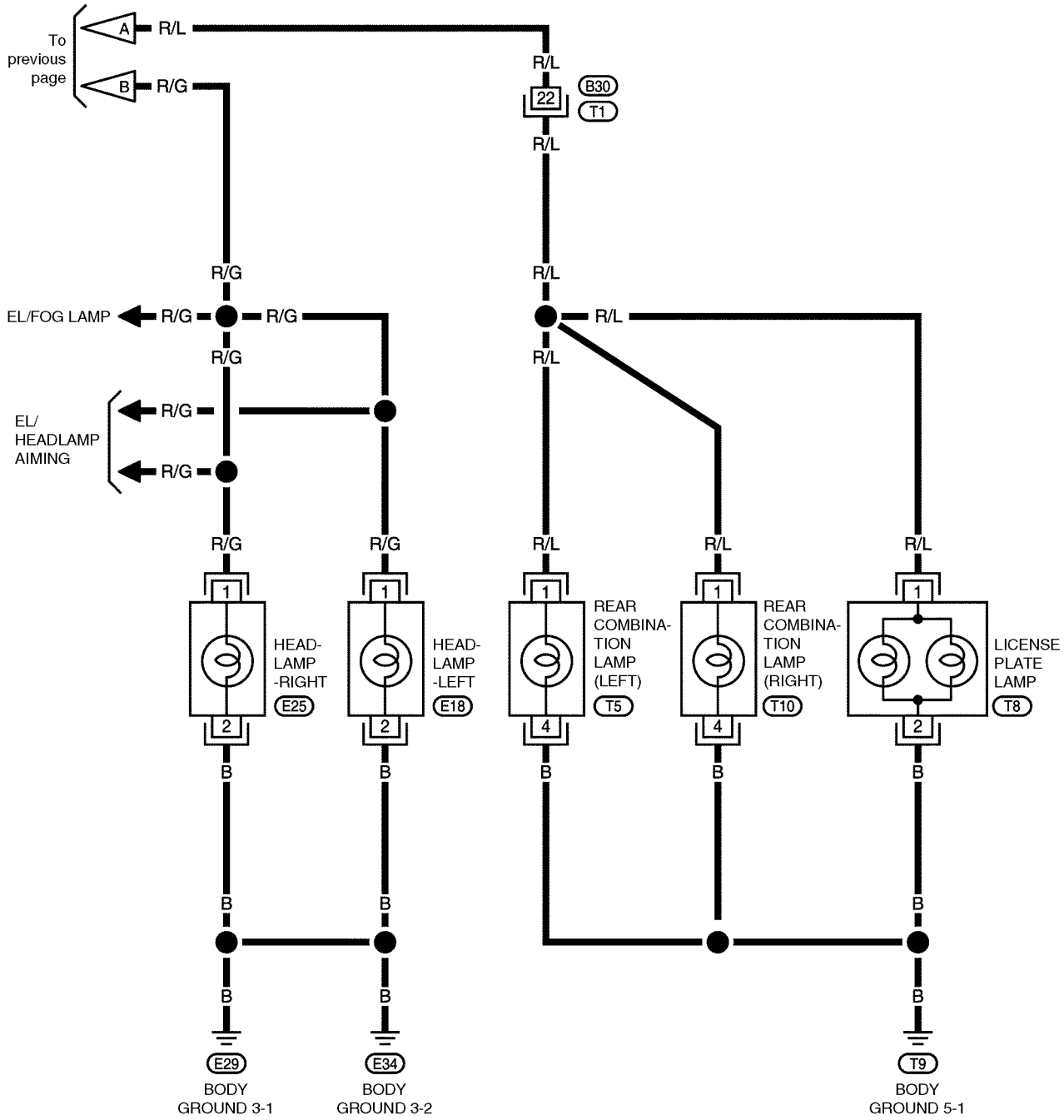


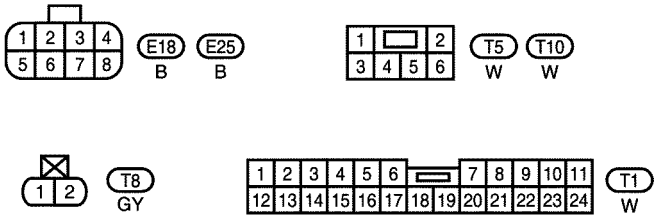


SRWZ016_01

Wiring Diagram

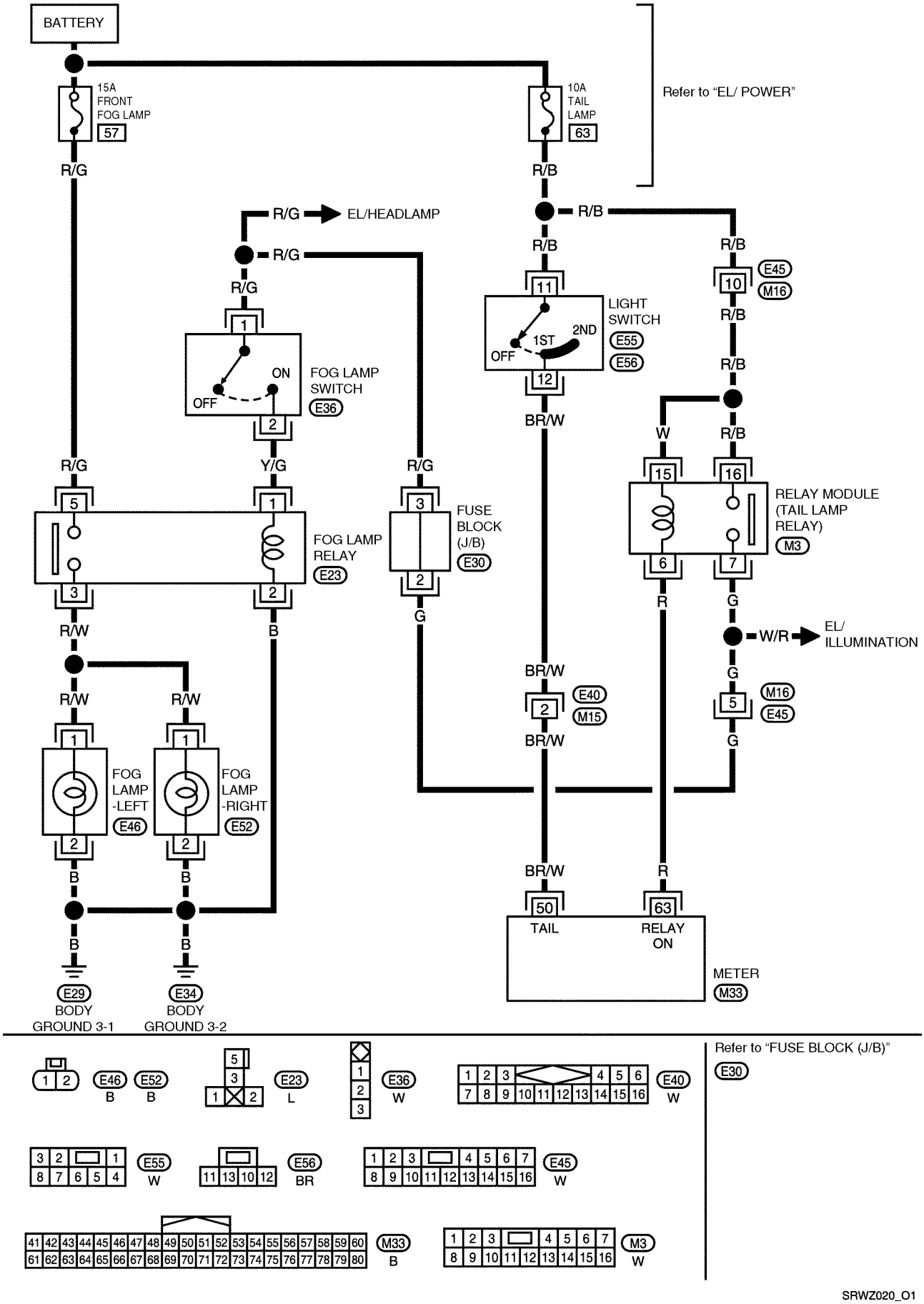
EL/Tail Lamp- 02





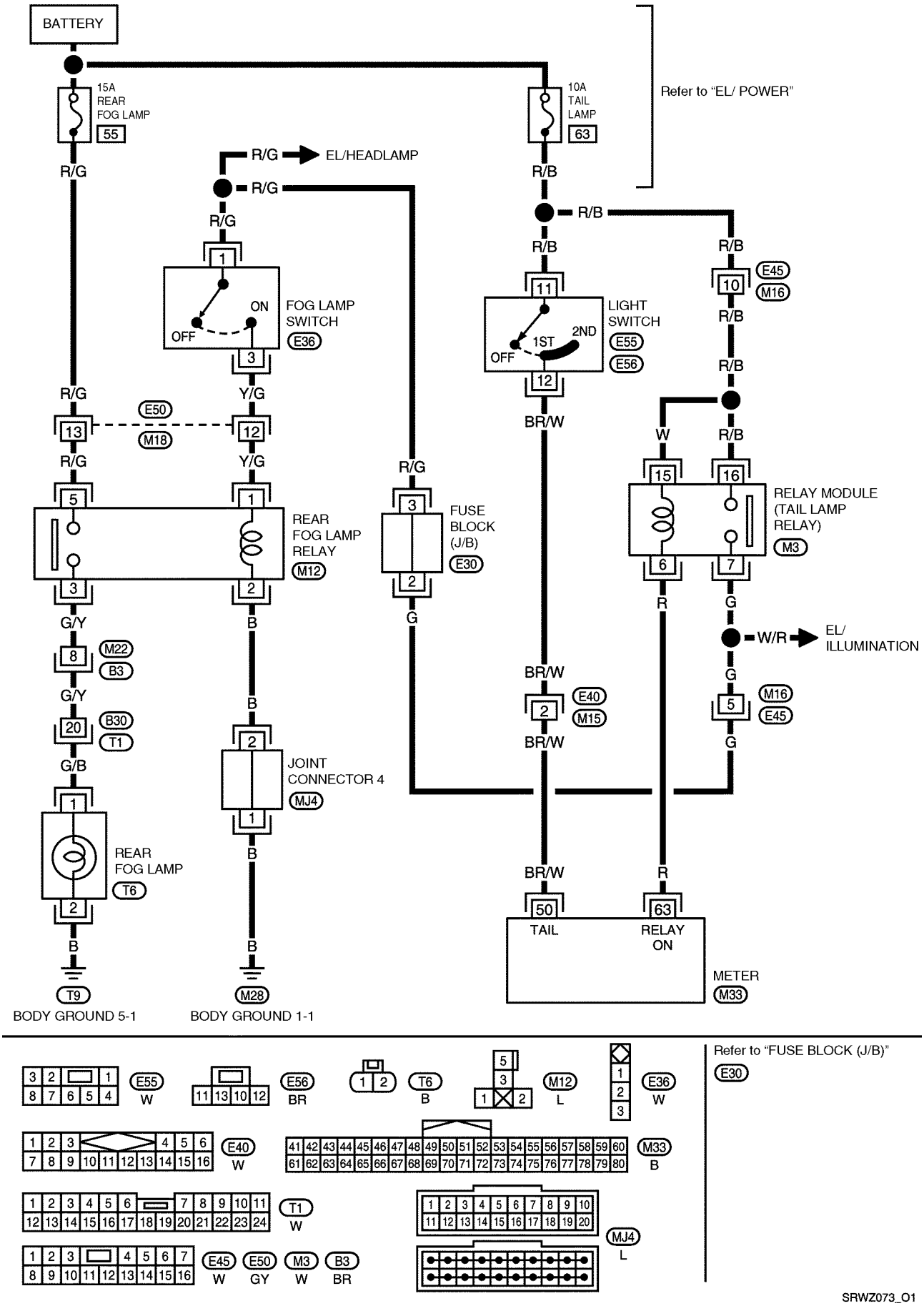
SRWZ017_O1

Wiring Diagram — EL/Fog Lamp (FR)

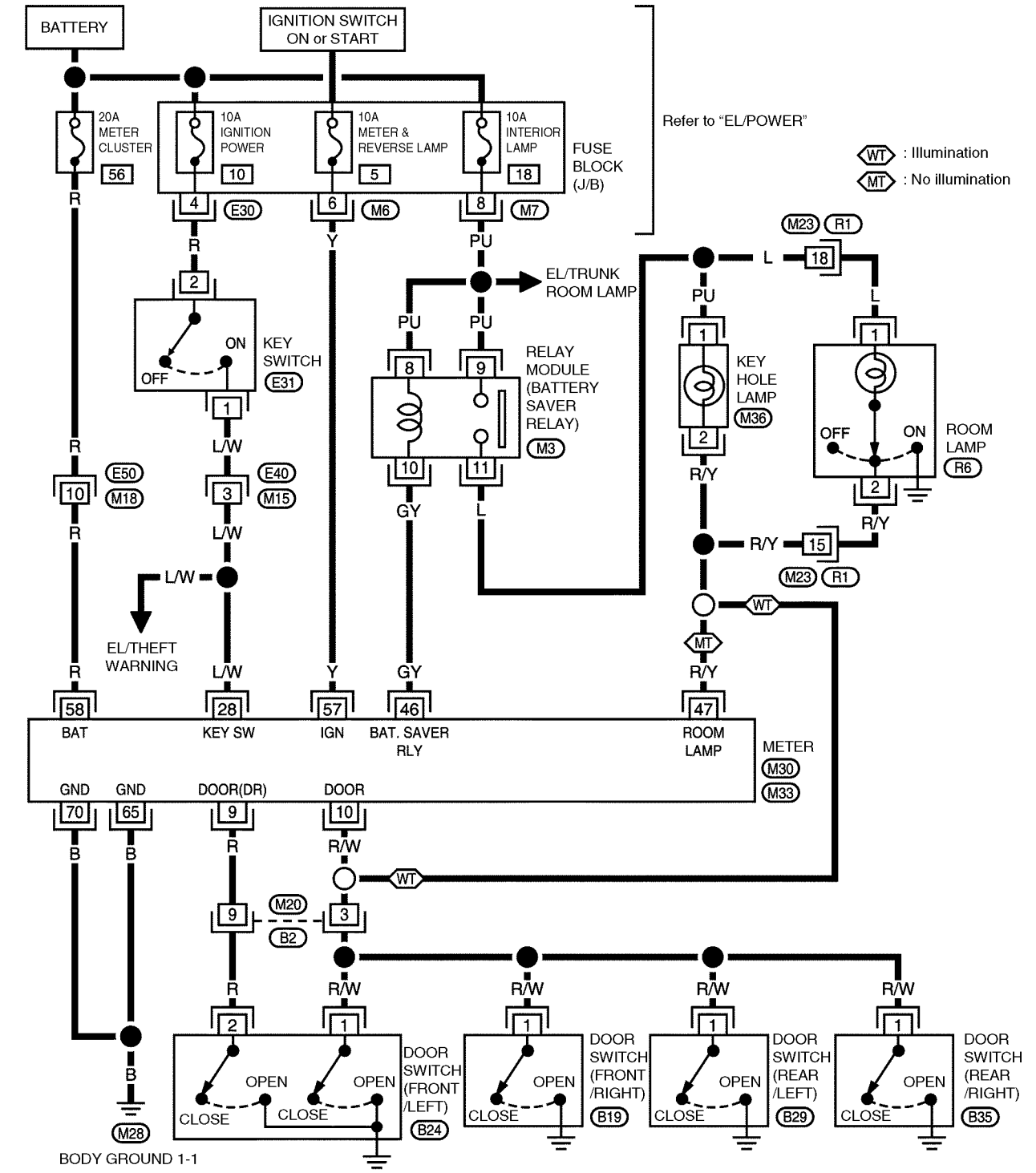


SRWZ020_O1

Wiring Diagram — EL/Fog Lamp (RR)

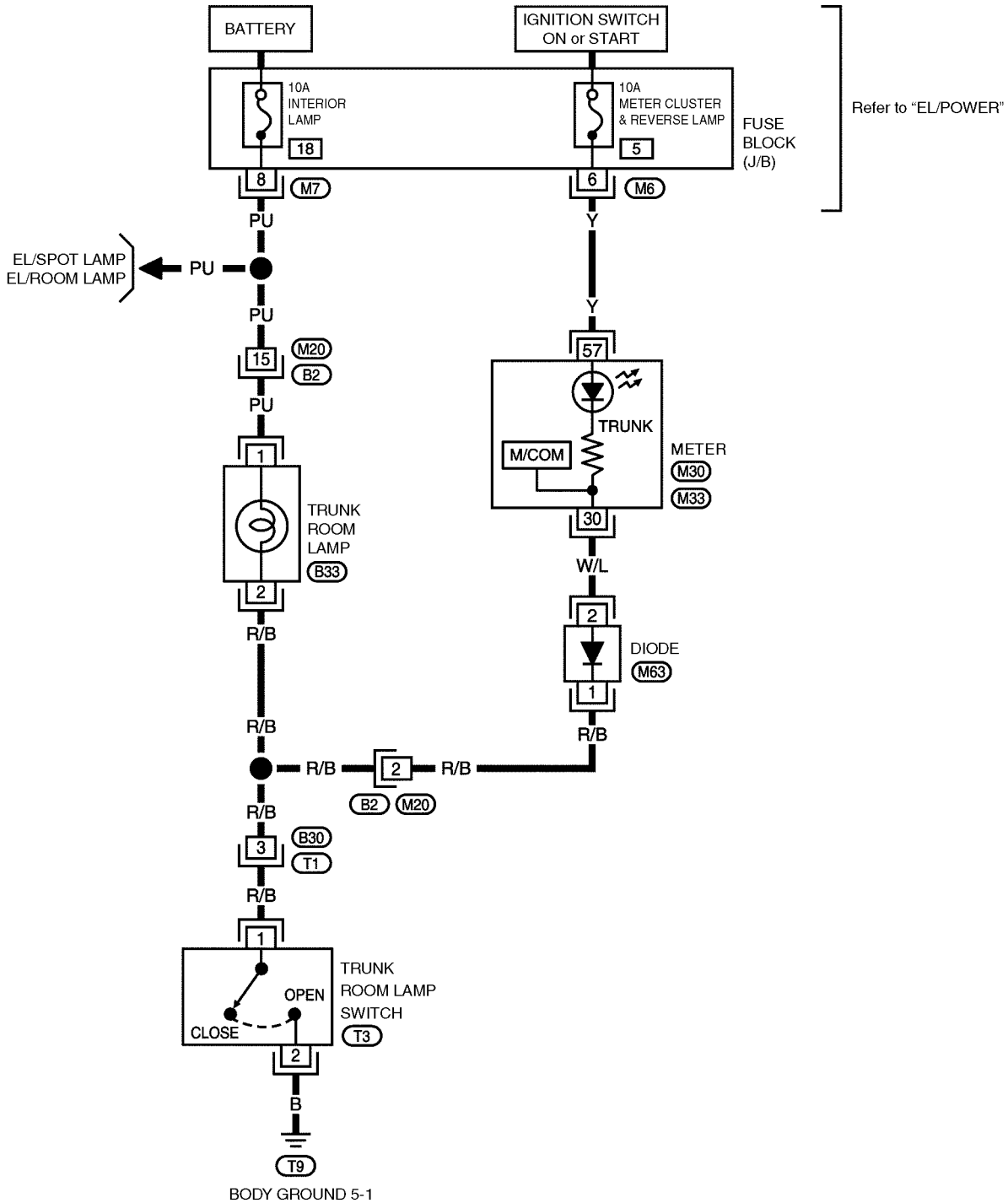


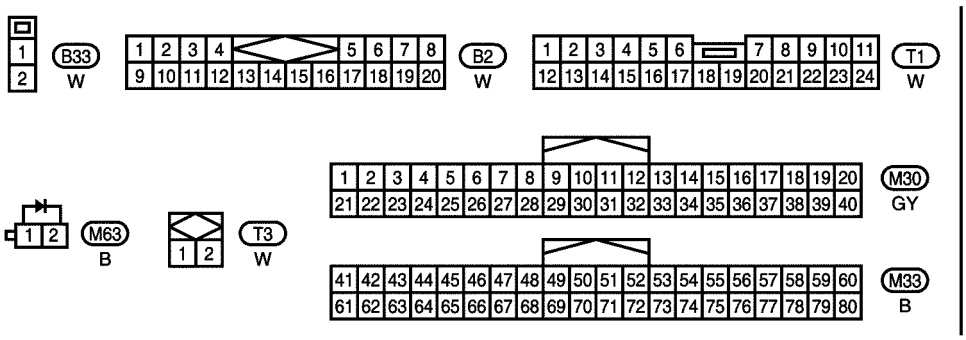
Wiring Diagram — EL/Room Lamp



SRWZ023_O1

Wiring Diagram — EL/Trunk Room Lamp

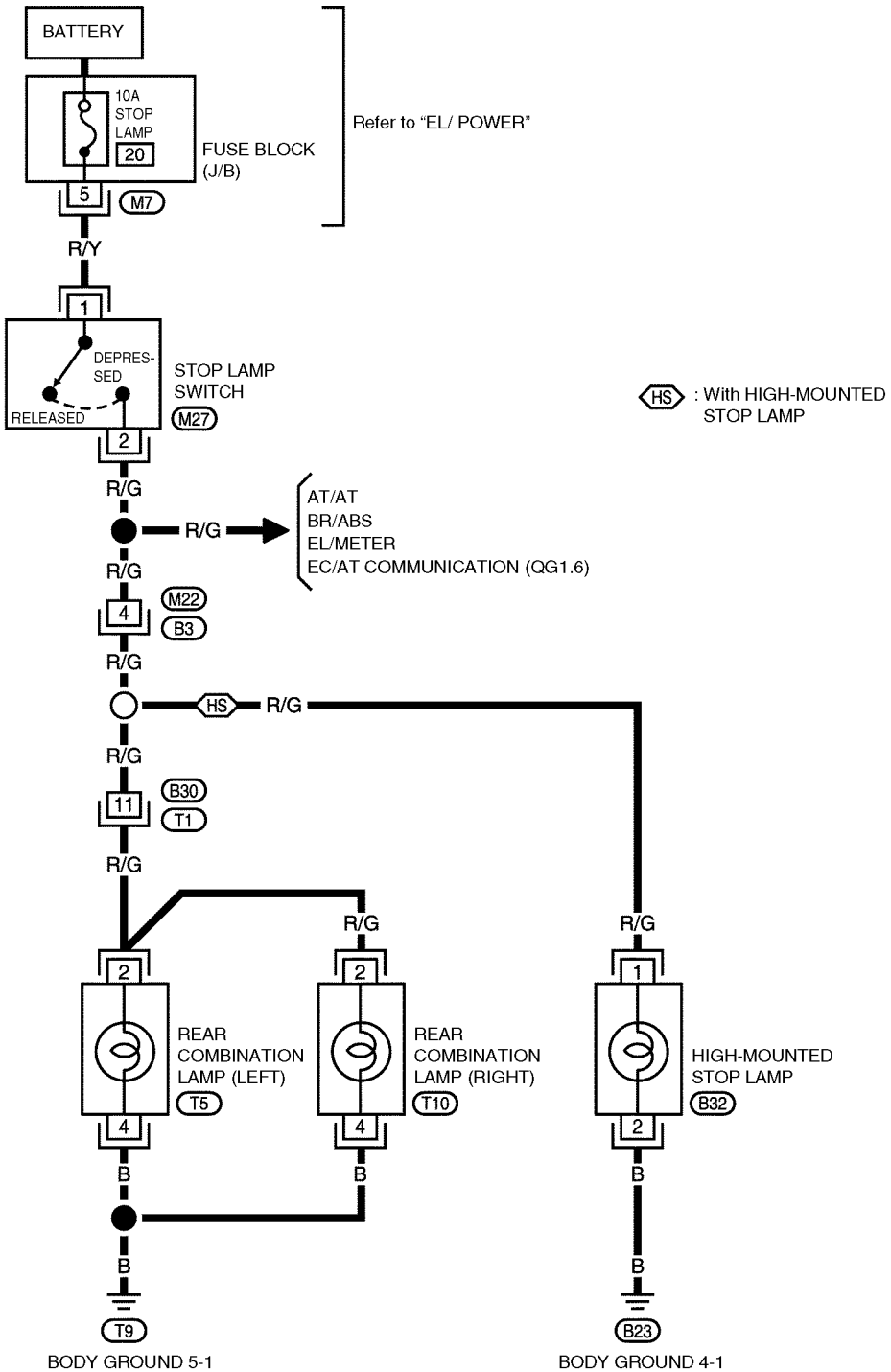


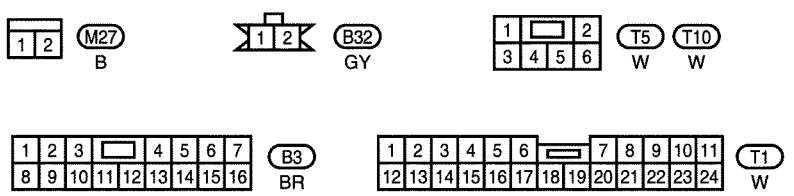


Refer to "FUSE BLOCK (J/B)"
M6 M7

SRWZ025_O1

Wiring Diagram — EL/Stop Lamp

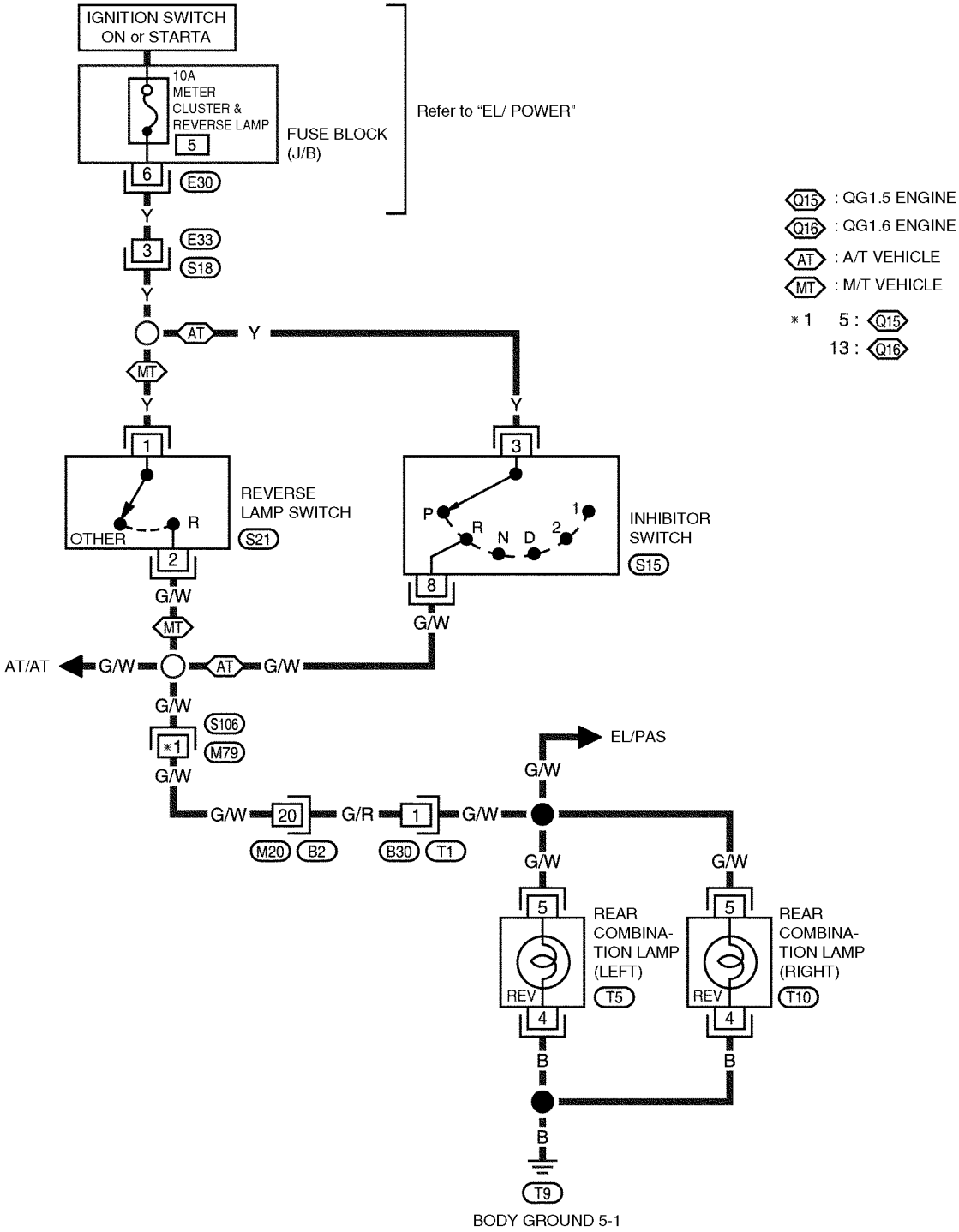


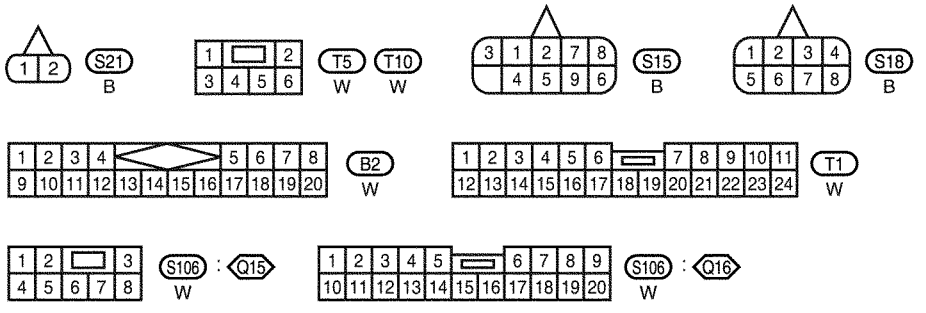


Refer to "FUSE BLOCK (J/B)"
M7

SRWZ022_O1

Wiring Diagram — EL/Reverse Lamp

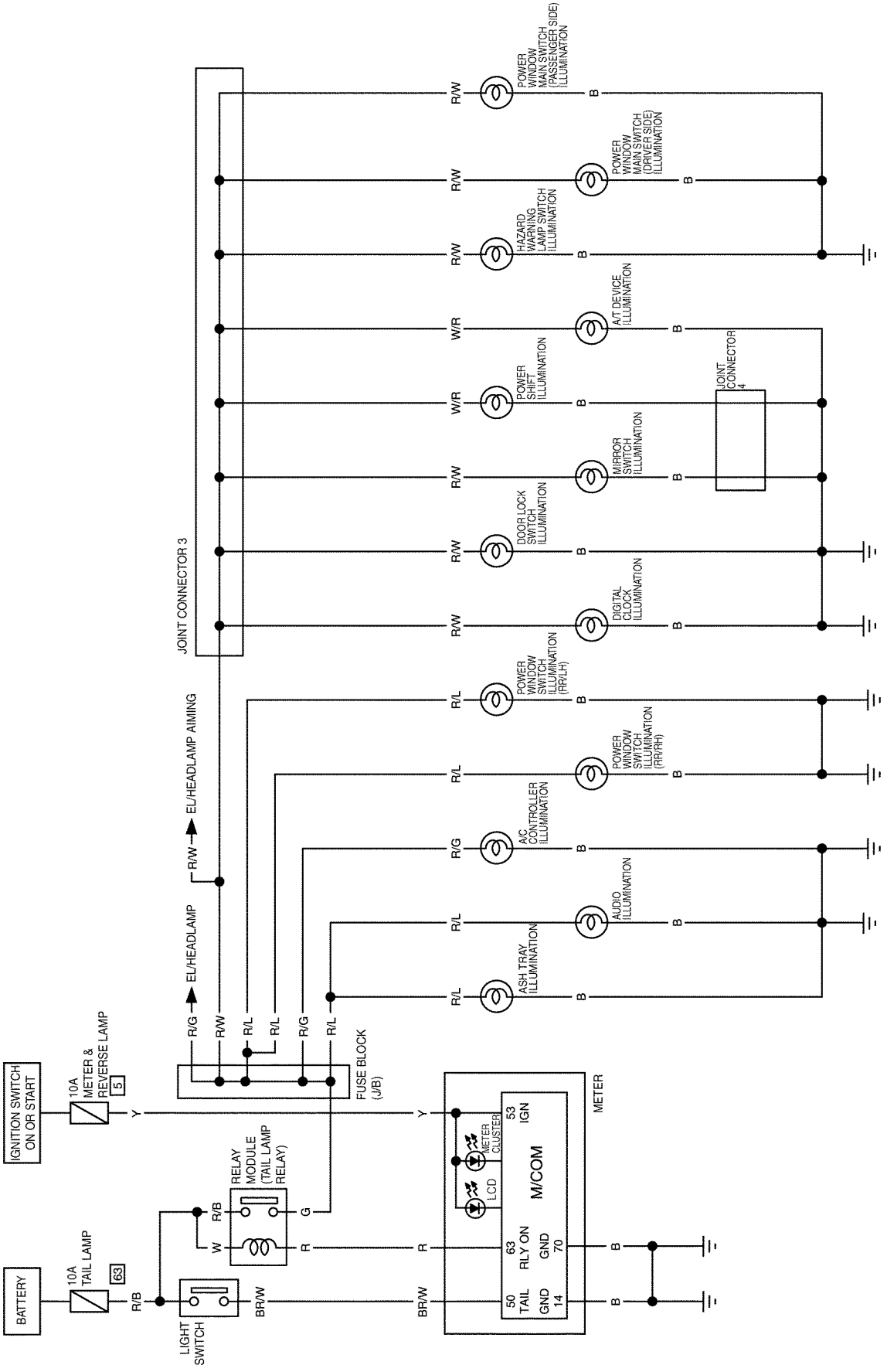




Refer to "FUSE BLOCK (J/B)"
E30

SRWZ021_01

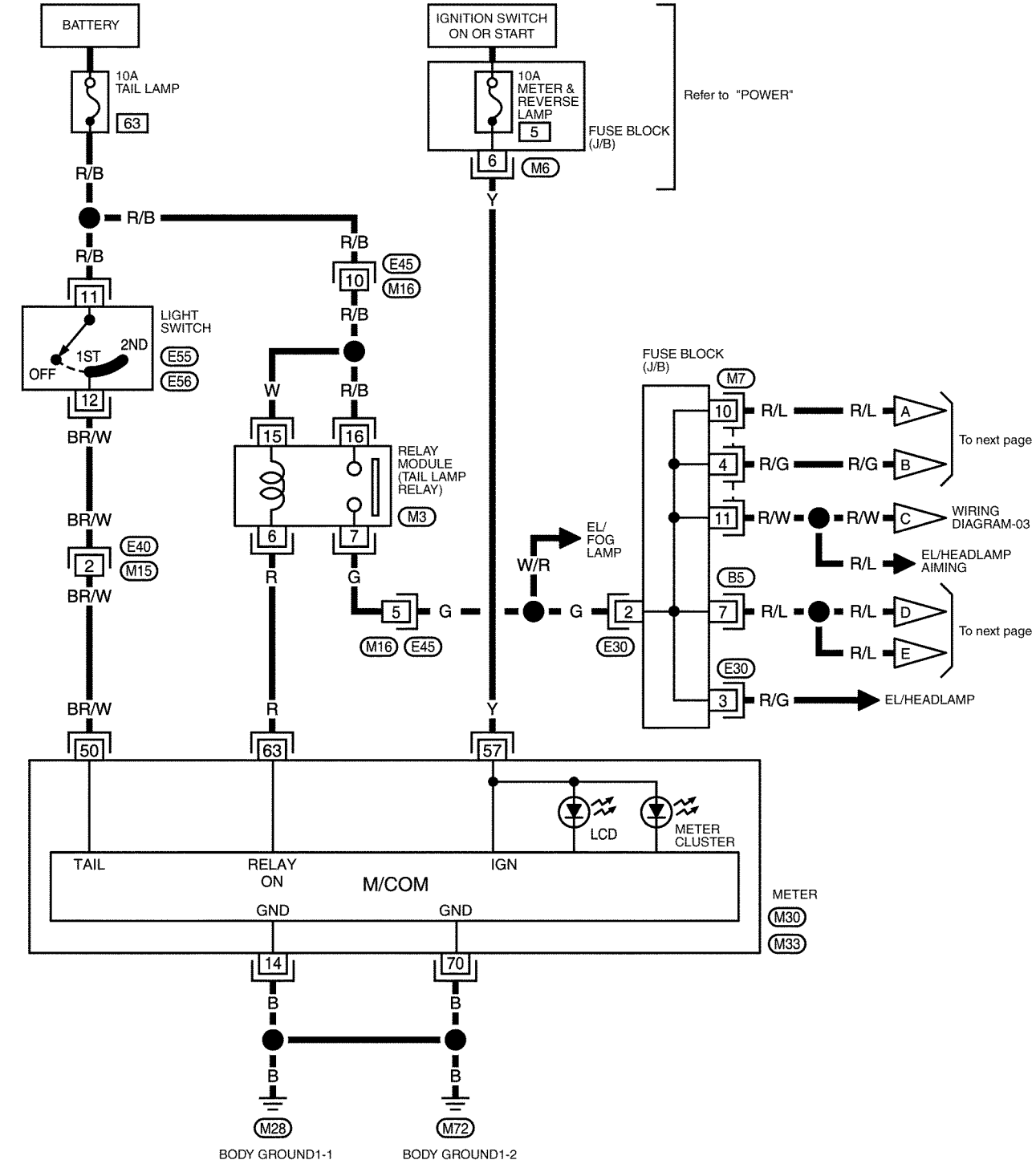
Circuit Diagram

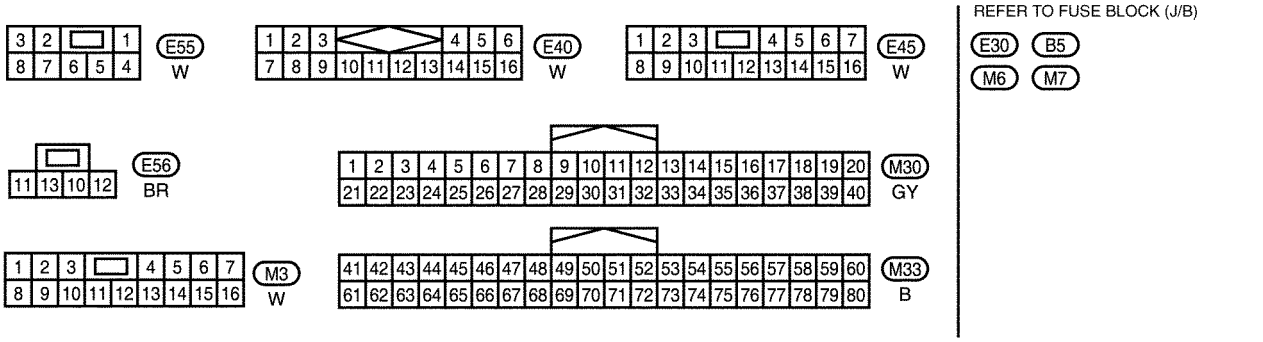


SRCZ010_O1

Wiring Diagram

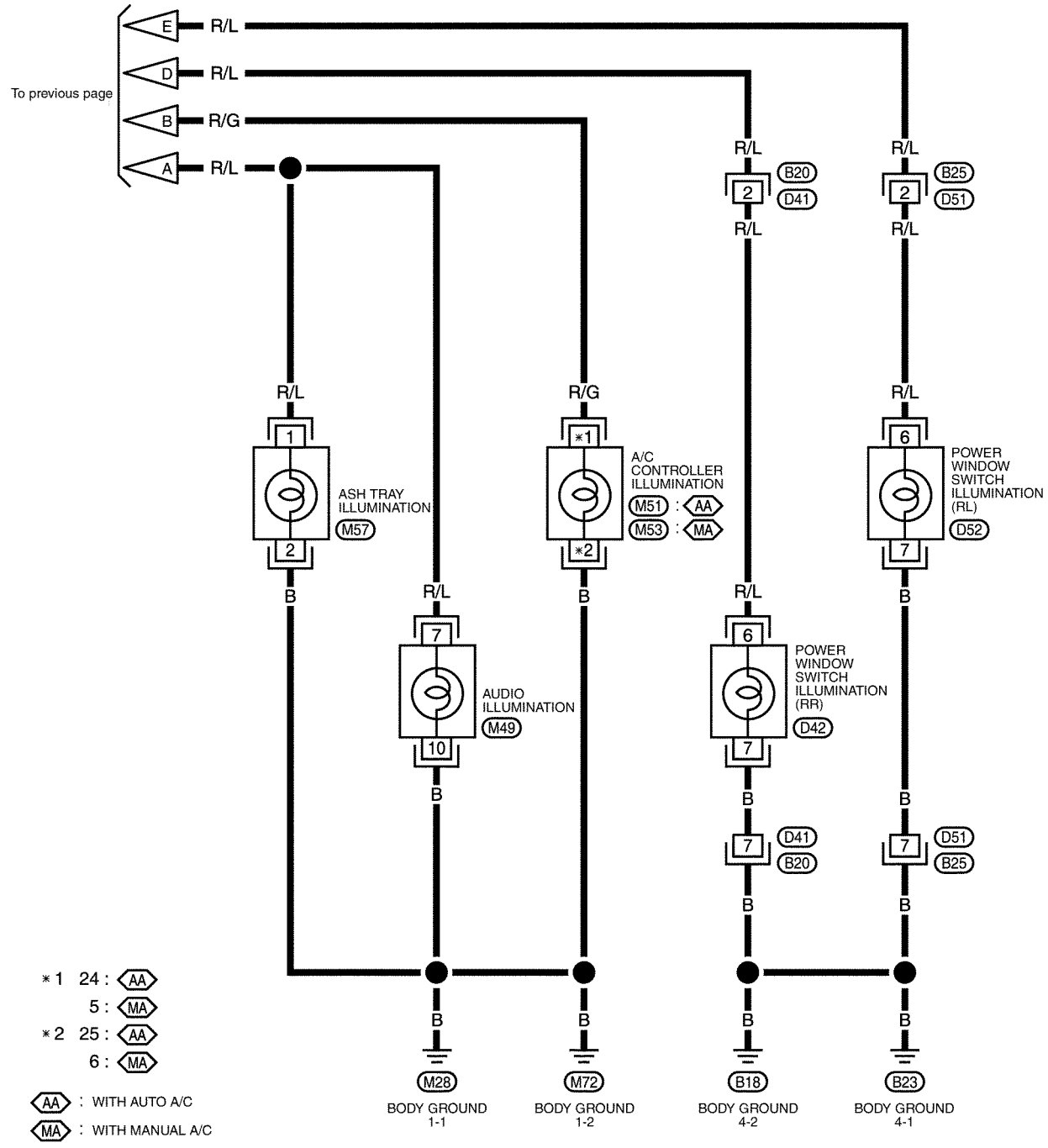
EL/Illumination- 01

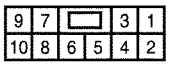


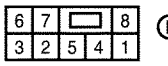


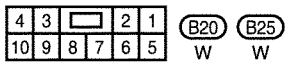
SRWZ027_O1

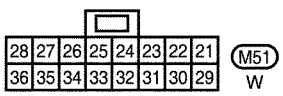
Wiring Diagram

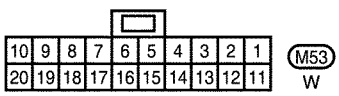






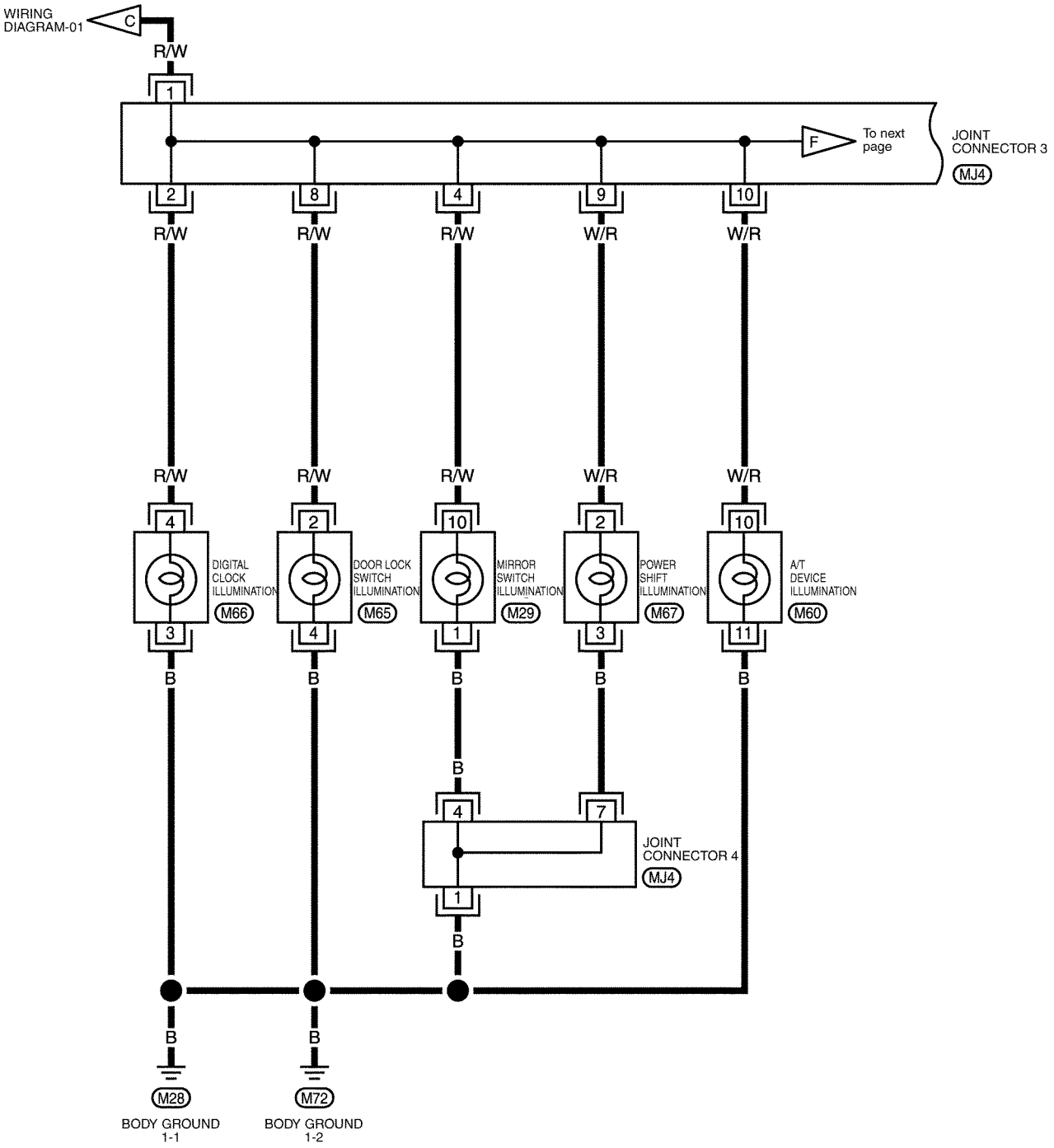


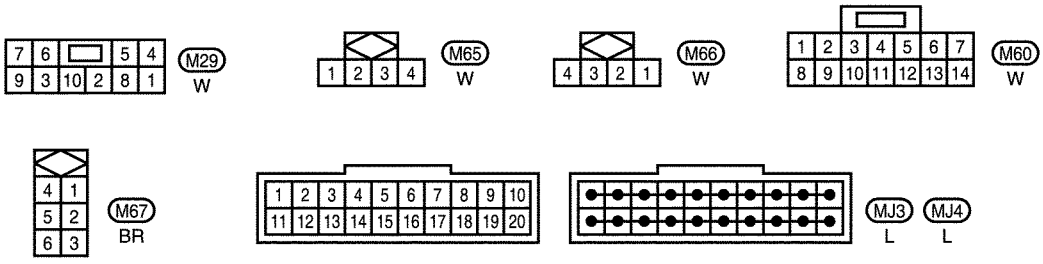




SRWZ028_O1

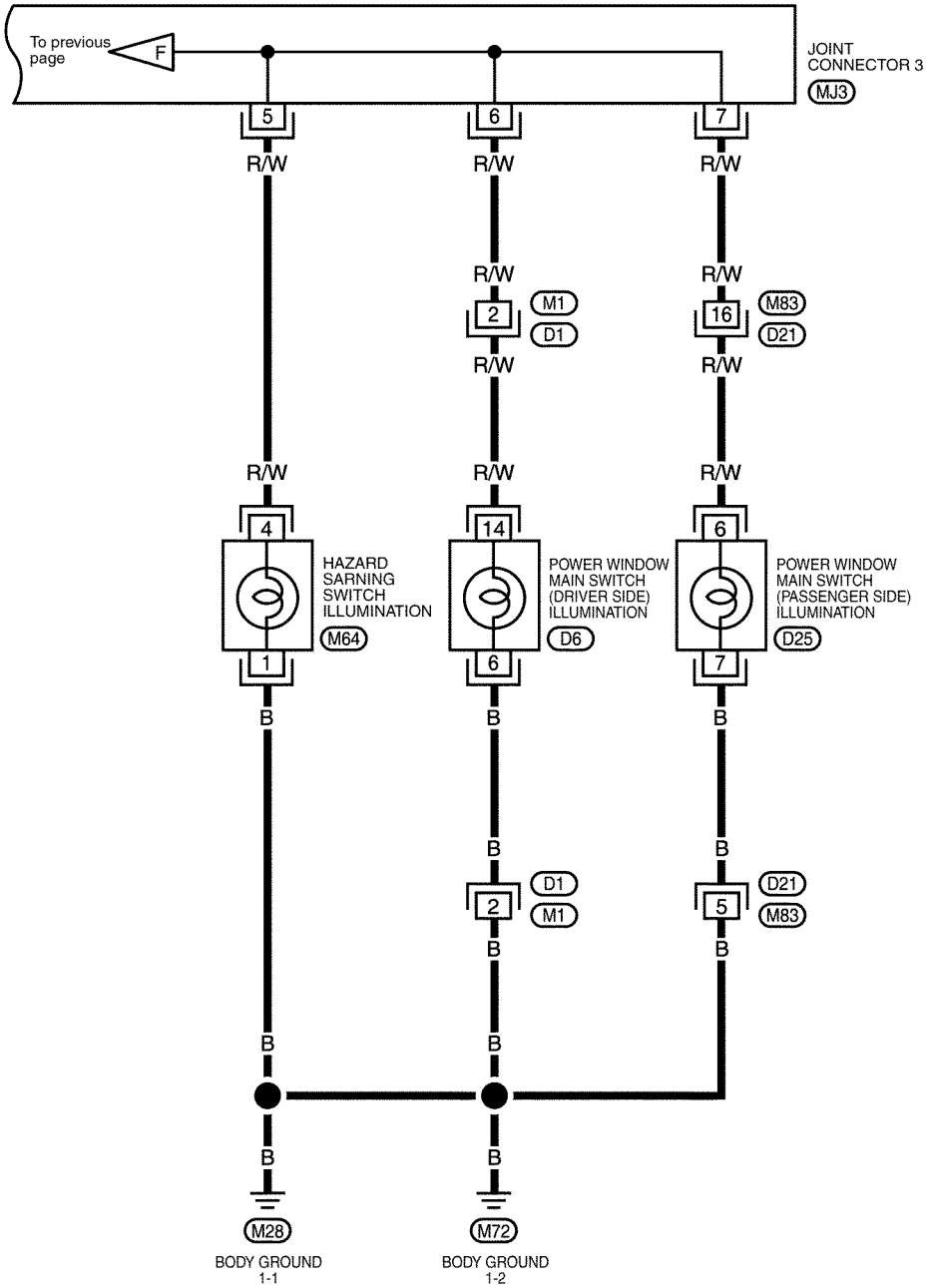
Wiring Diagram

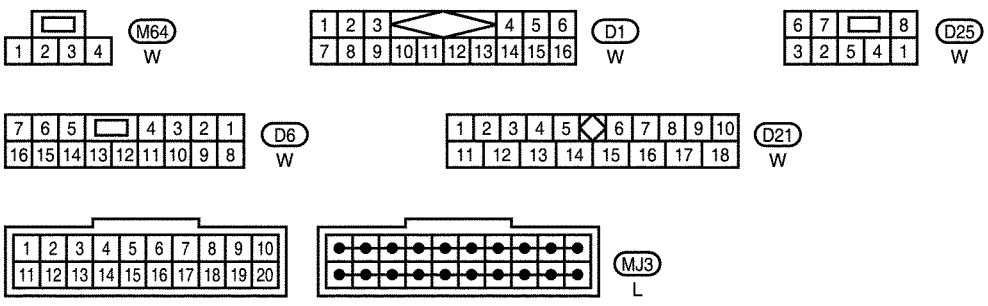




SRWZ029_O1

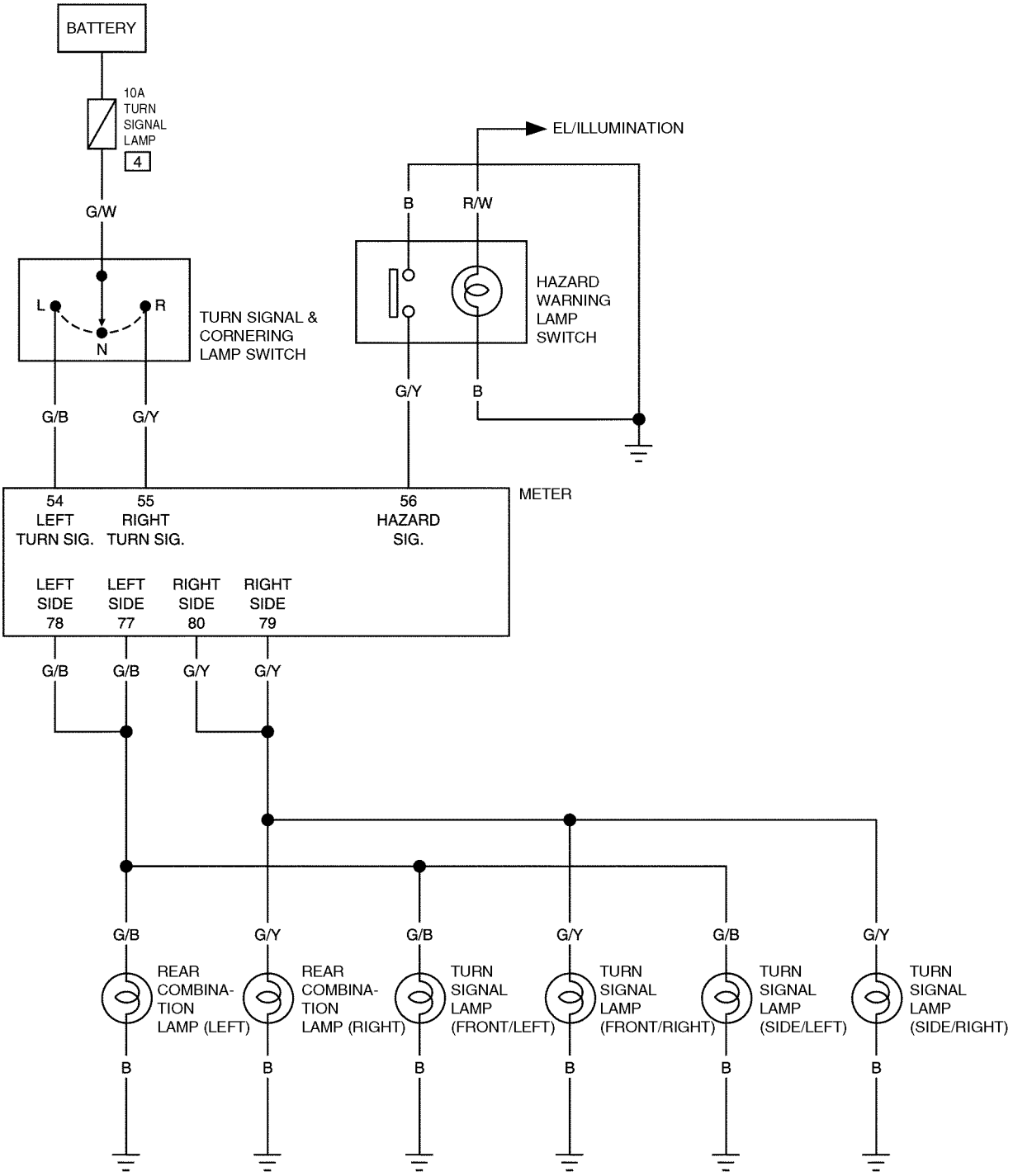
Wiring Diagram





SRWZ030_O1

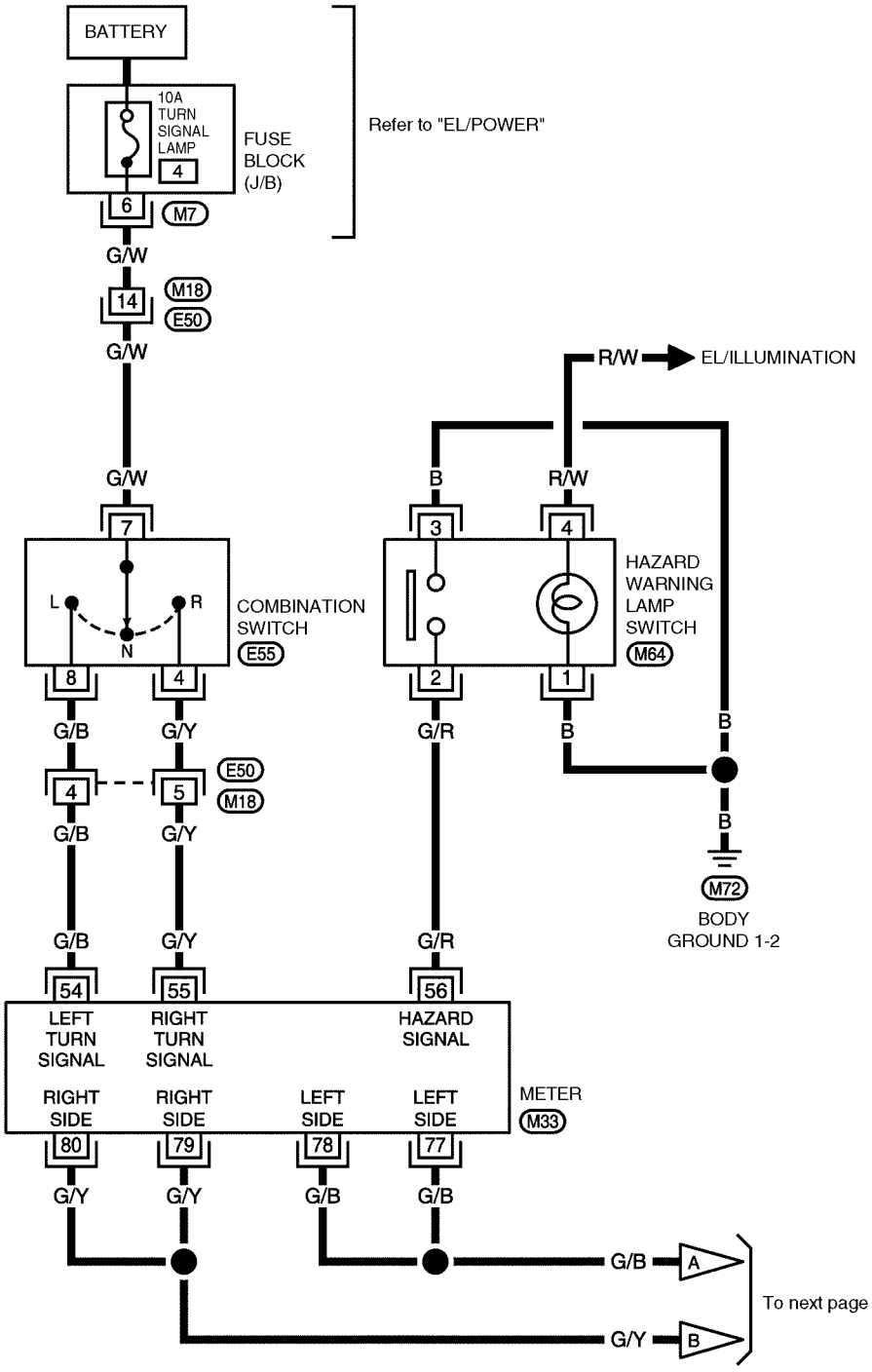
Circuit Diagram

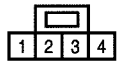


SRCZ005_O1

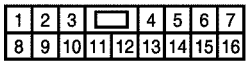
Wiring Diagram

EL/Turn Signal Lamp- 01

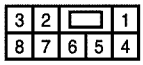




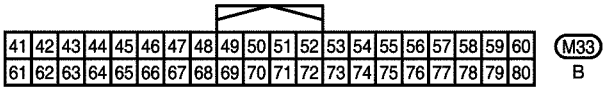
M64
W



E50
GY



E55
W



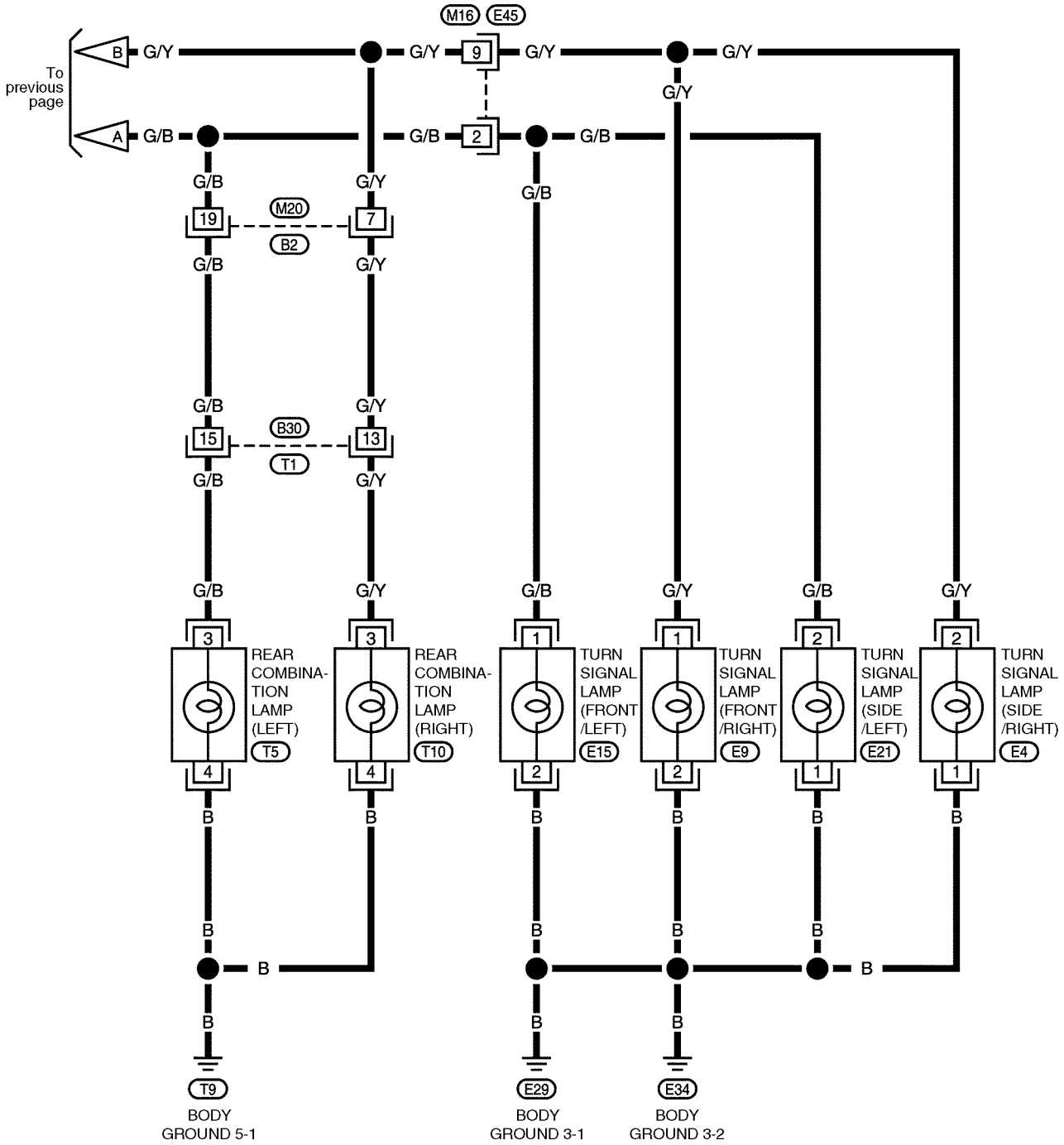
M33
B

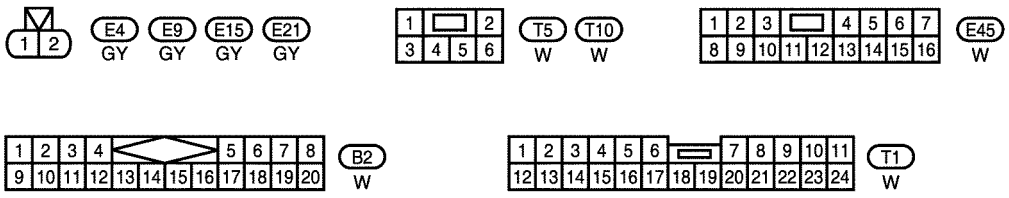
Refer to "FUSE BLOCK (J/B)"
M7

SRWZ018_O1

Wiring Diagram

EL/Turn Signal Lamp- 02

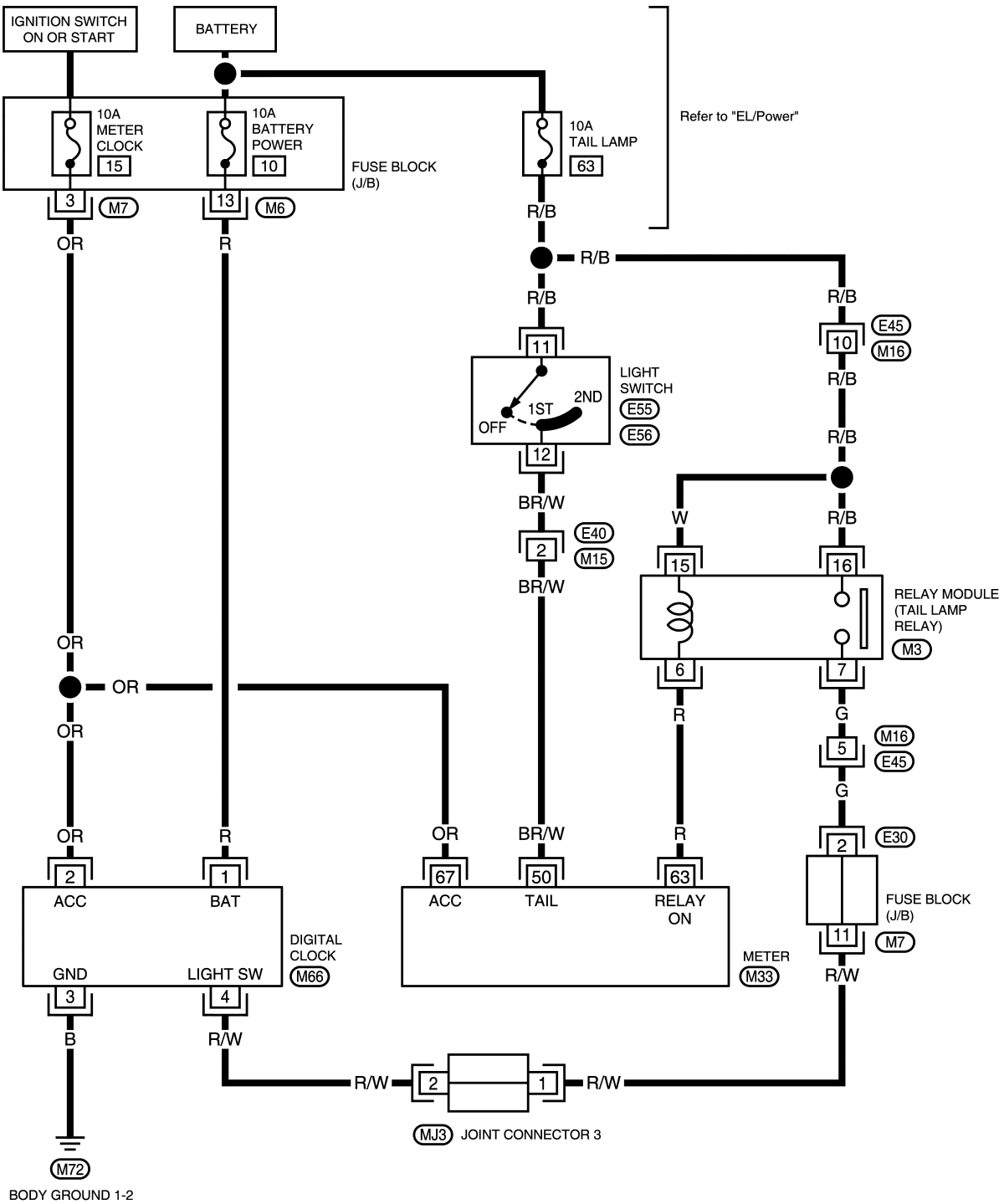


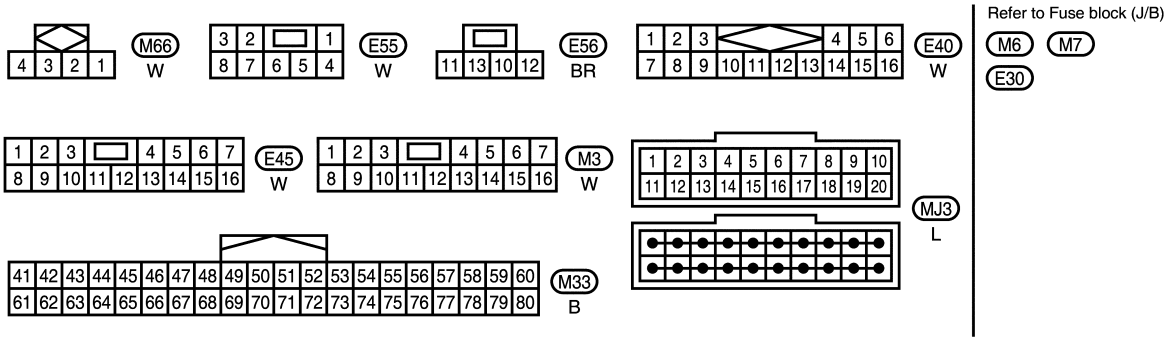


SRWZ019_O1

Wiring Diagram

EL/Digital Clock

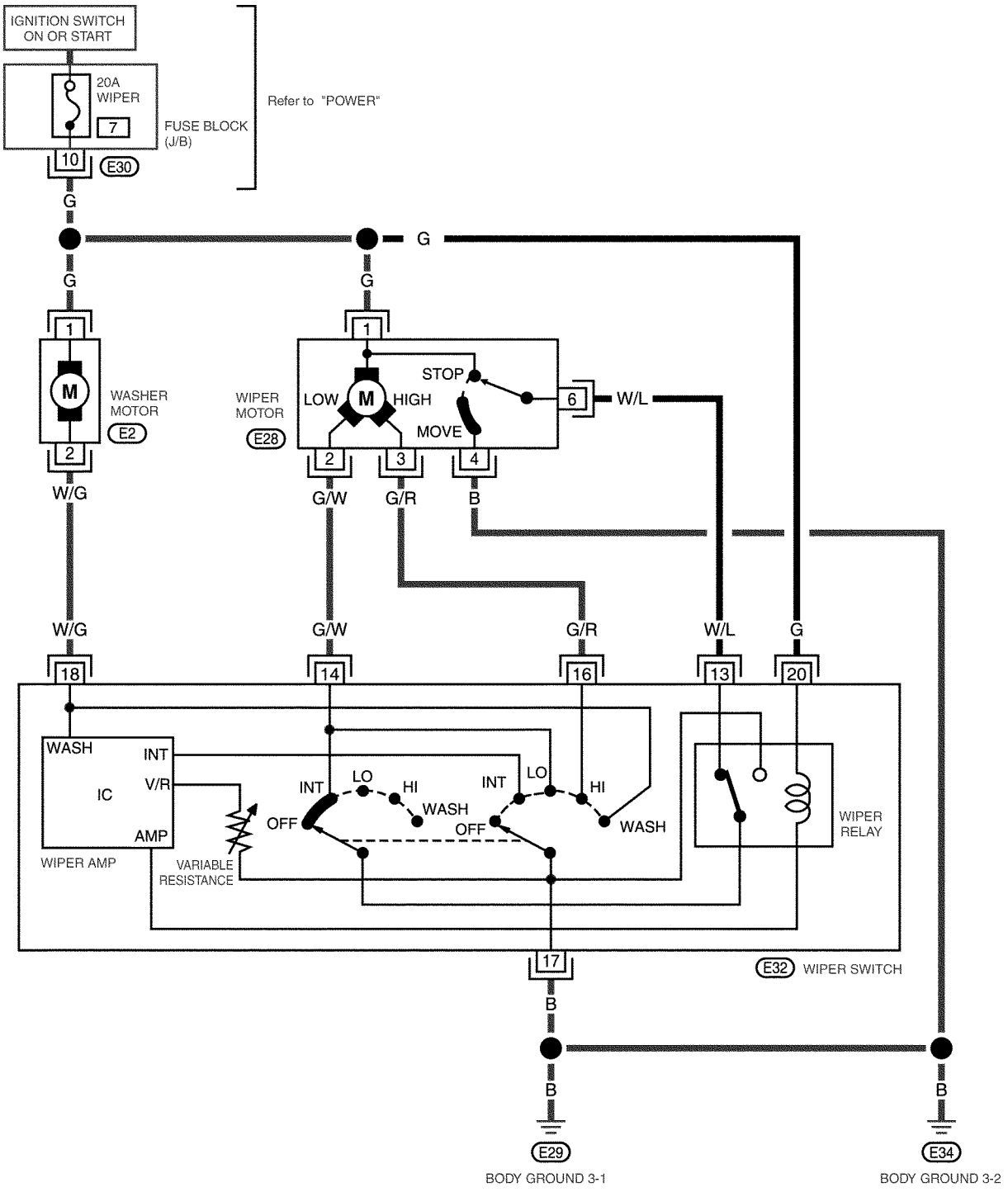




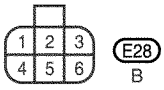
SRWZ003_O1

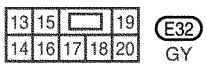
Wiring Diagram

EL/Wiper



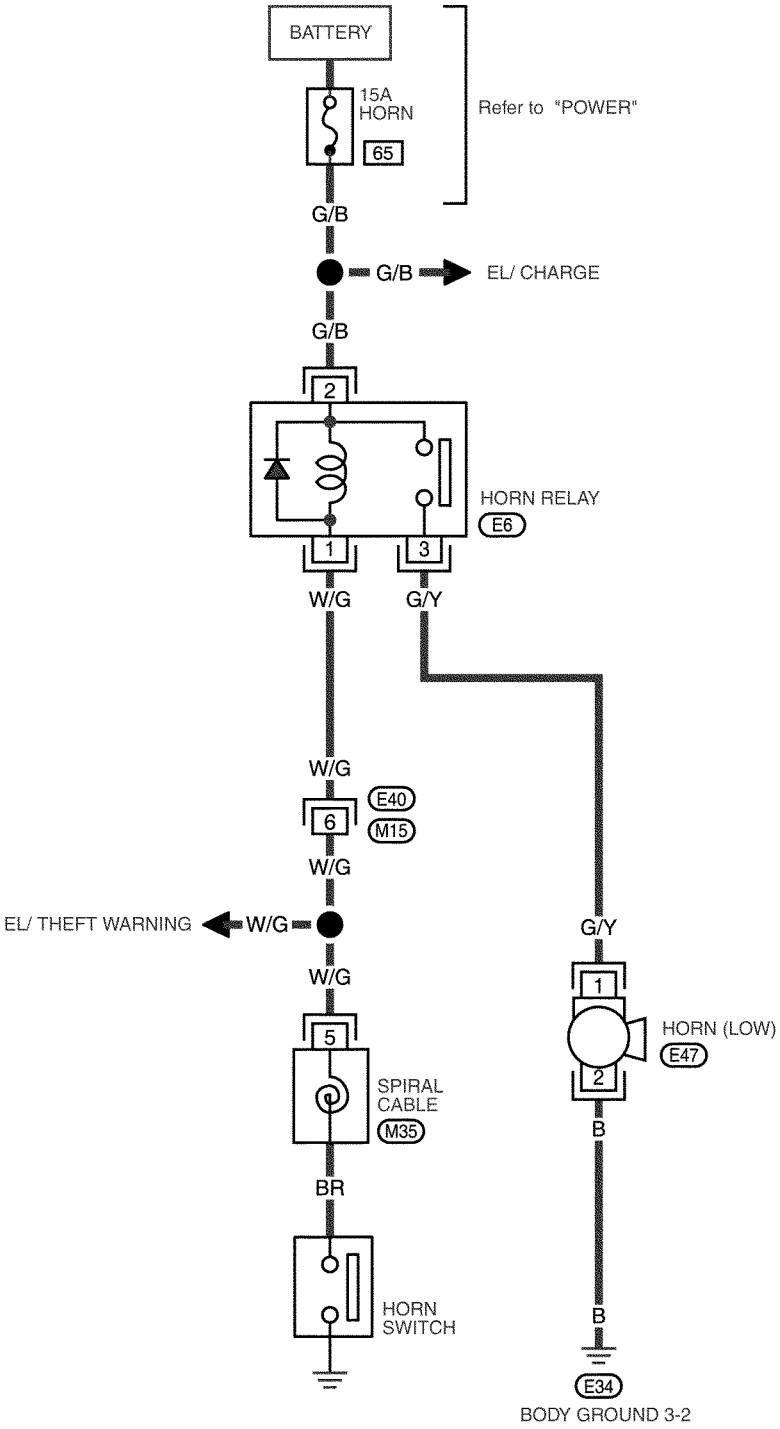
REFER TO FUSE BLOCK (J/B)
E30

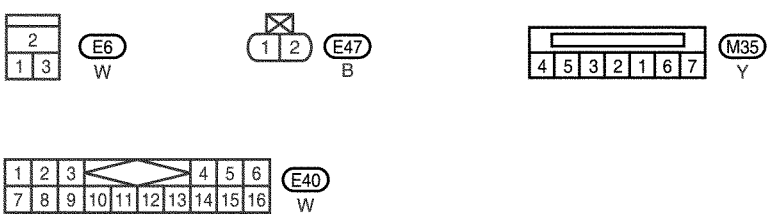




SRWZ037_O1

Wiring Diagram — EL/Horn

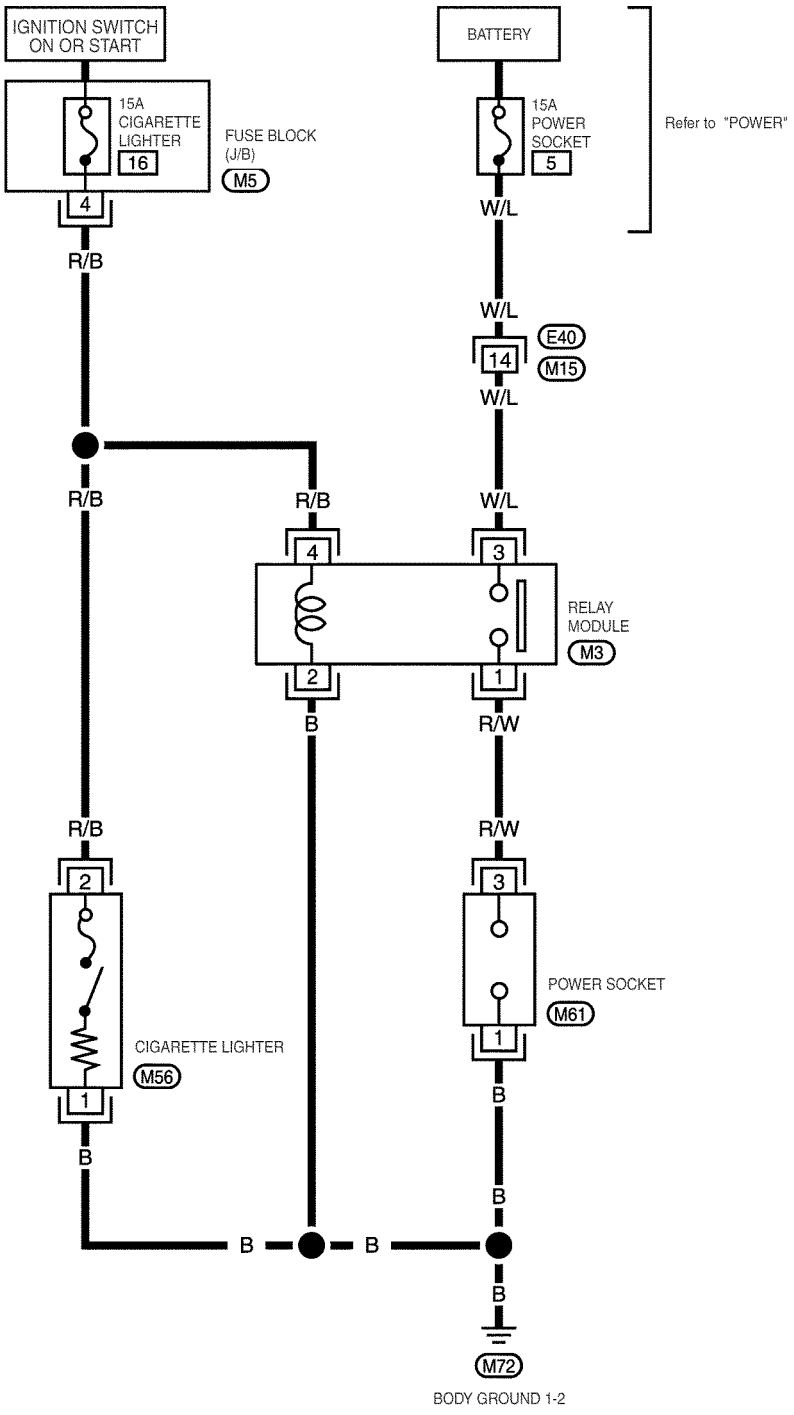


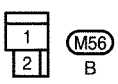


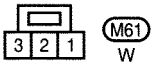
SRWZ039_O1

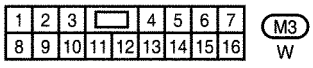
Wiring Diagram

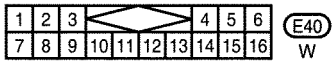
EL/Power Socket







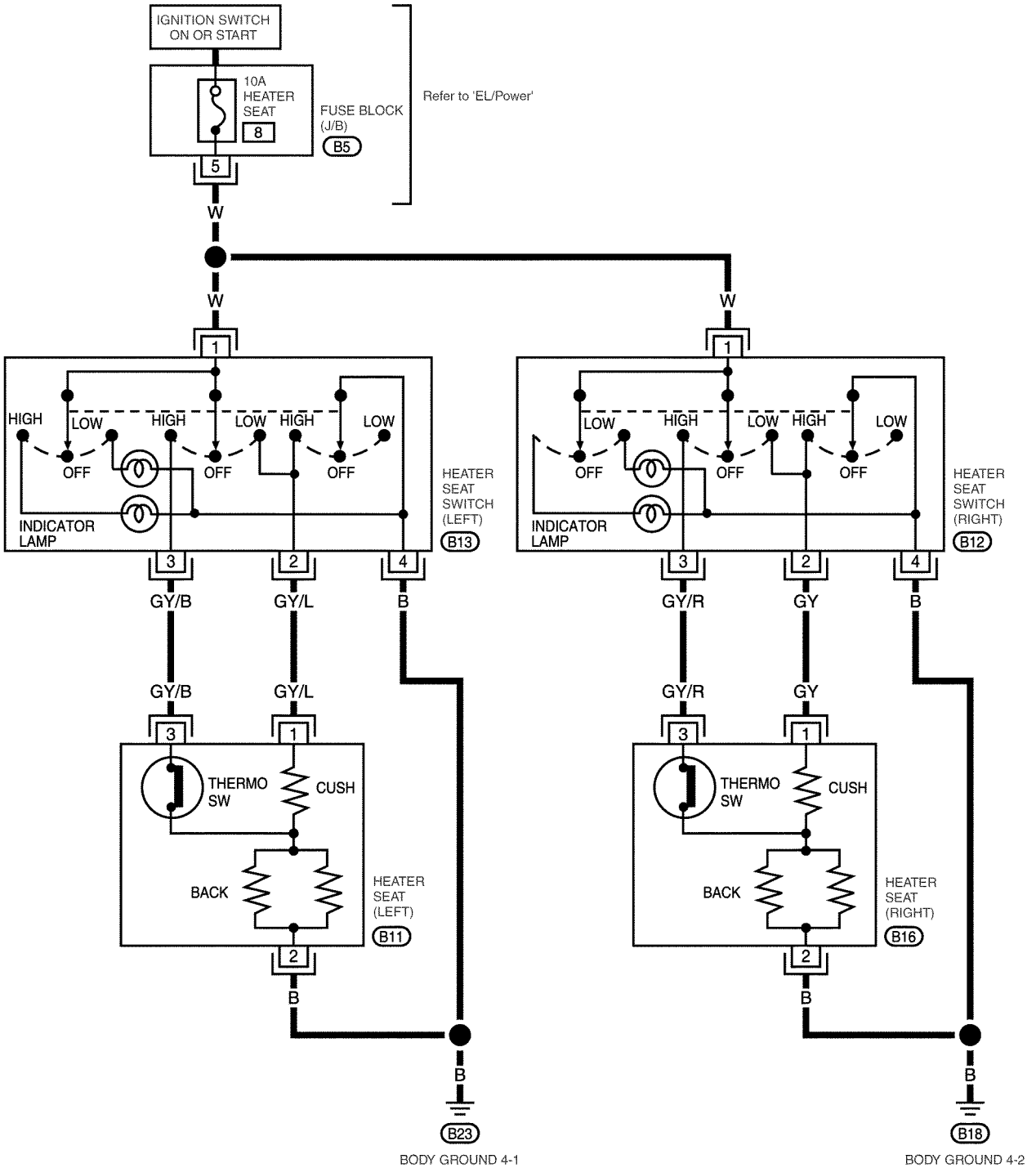




REFER TO FUSE BLOCK (J/B)
M5

SRWZ005_O1

Wiring Diagram — EL/Heater Seat

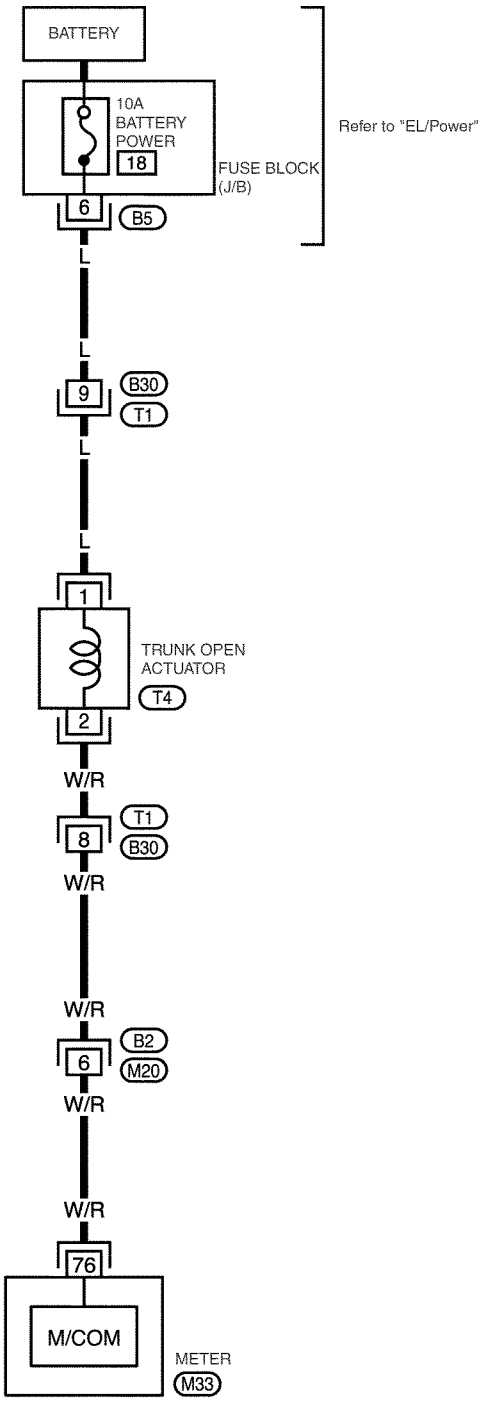


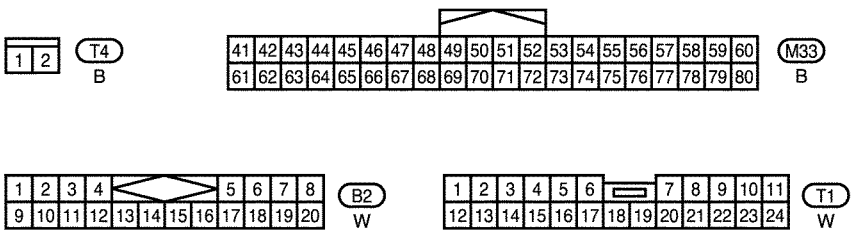
REFER TO FUSE BLOCK (J/B) B5

SRWZ004_O1

Wiring Diagram

EL/Trunk Opener



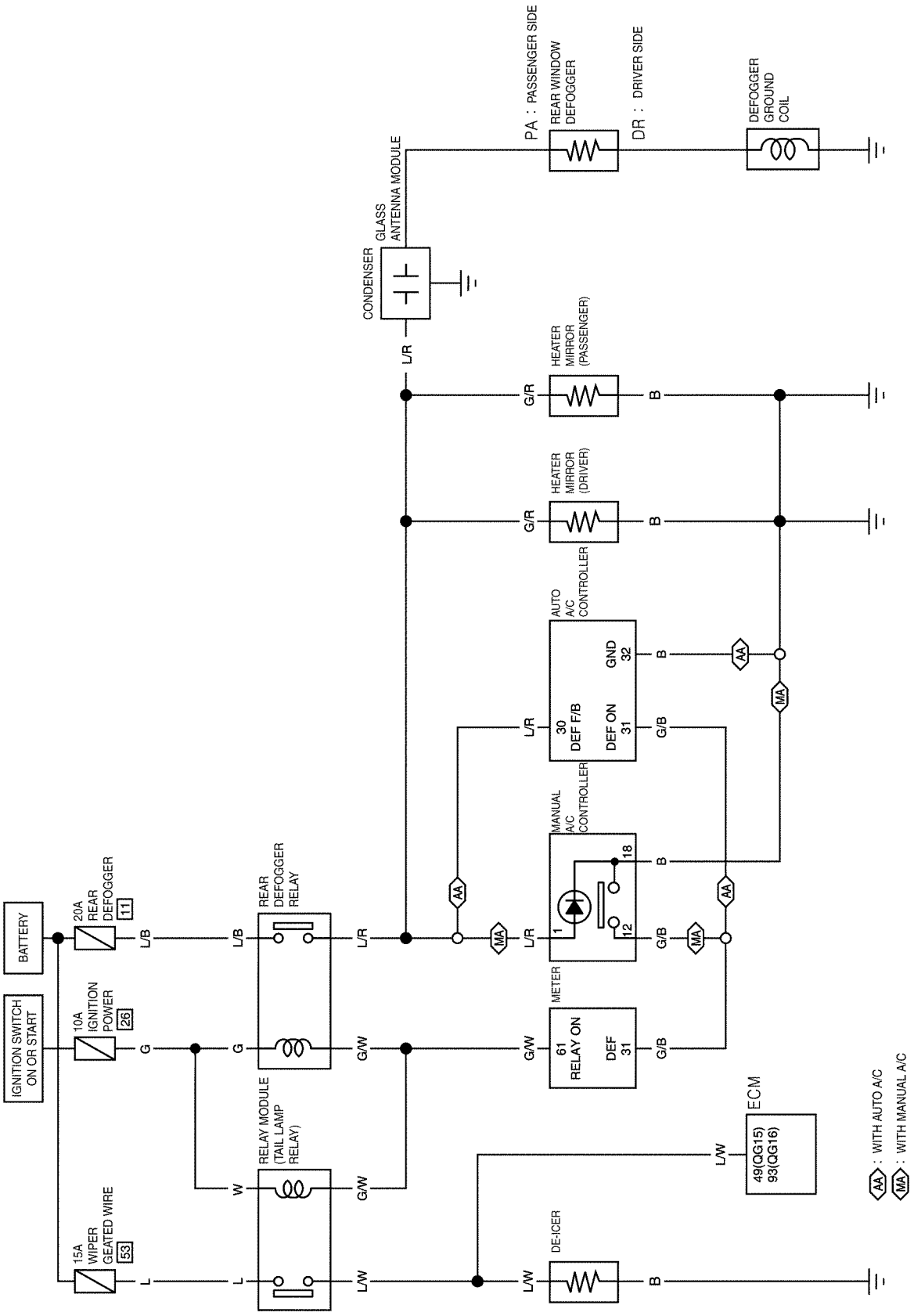


REFER TO FUSE BLOCK (J/B)

B5

SRWZ066_O1

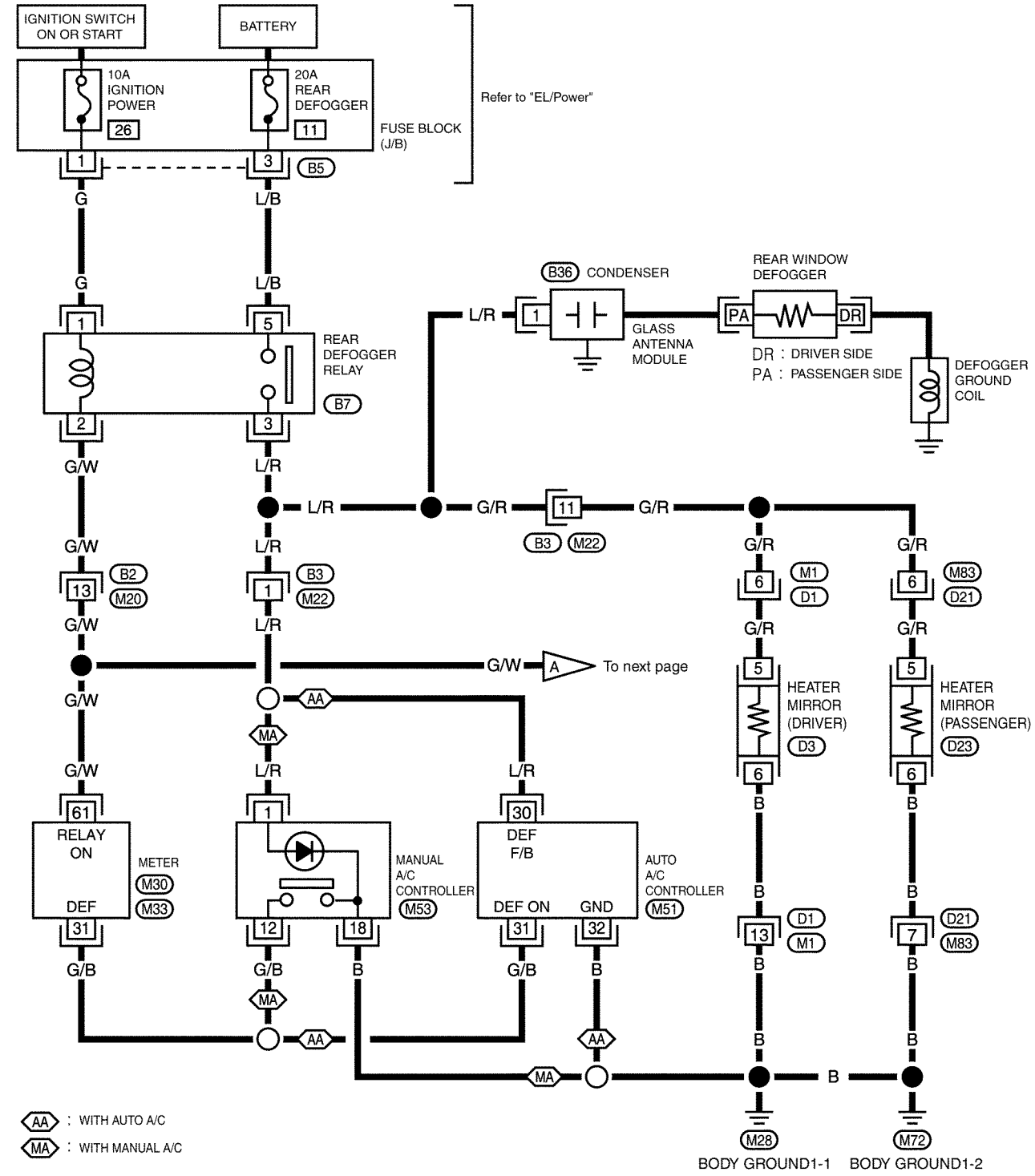
Circuit Diagram



SRCZ007_O1

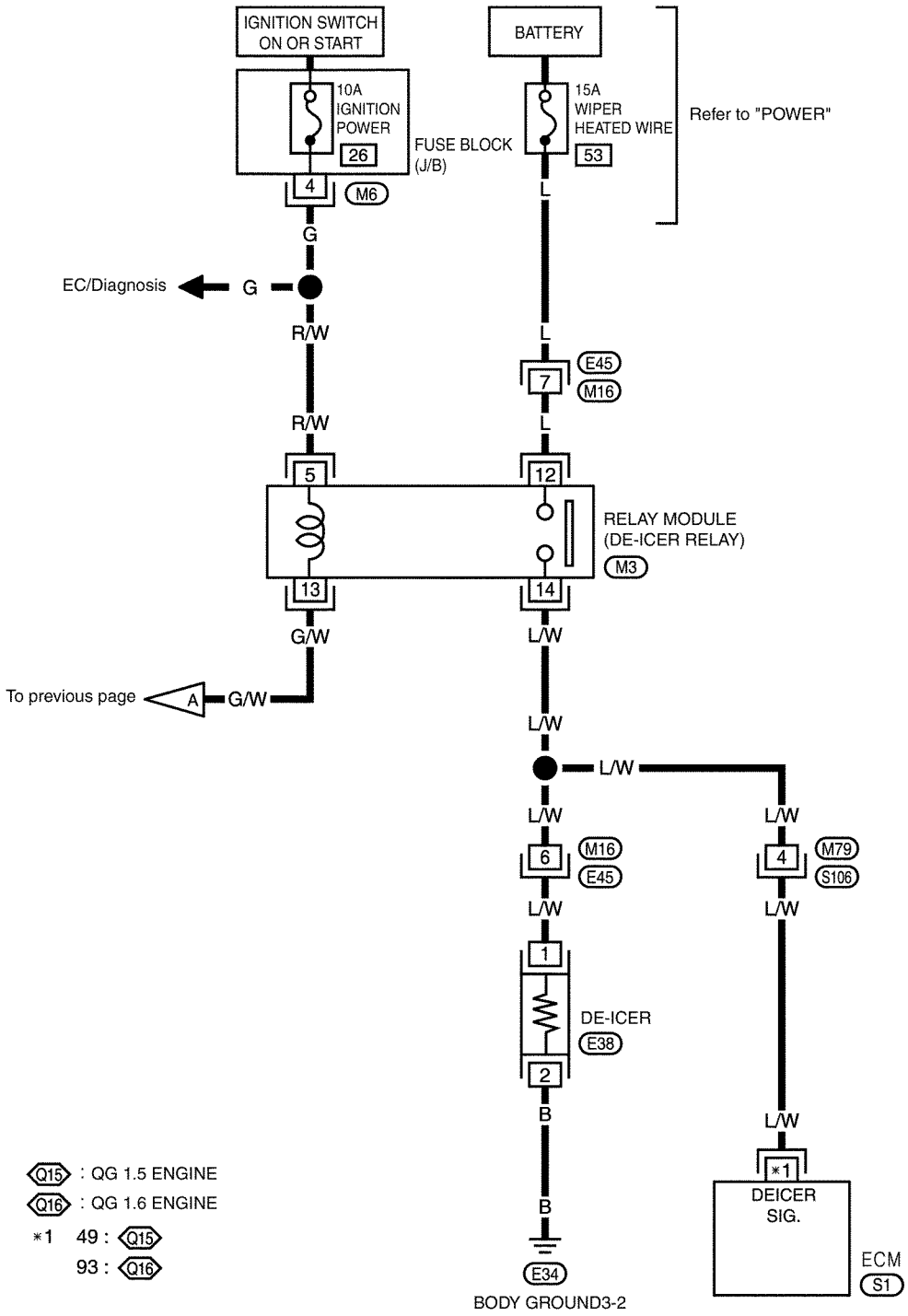
Wiring Diagram

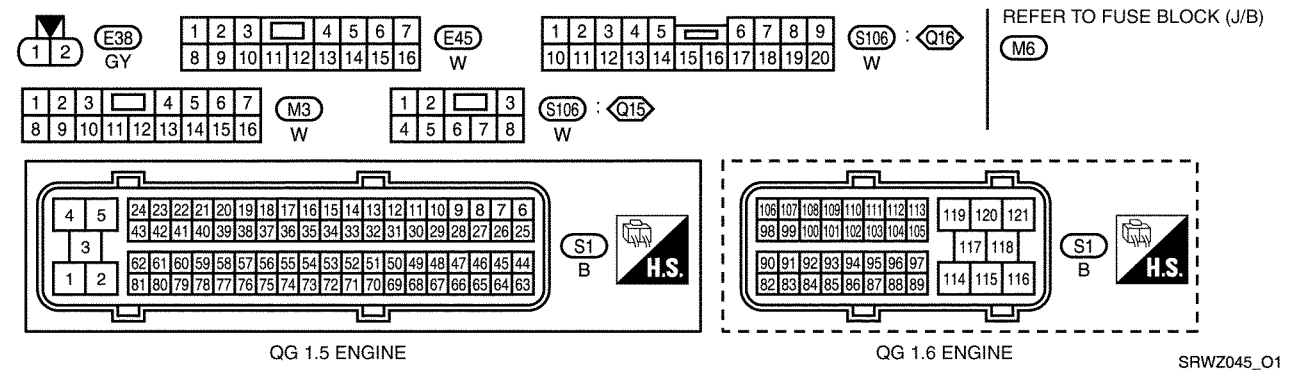
EL/Defogger- 01



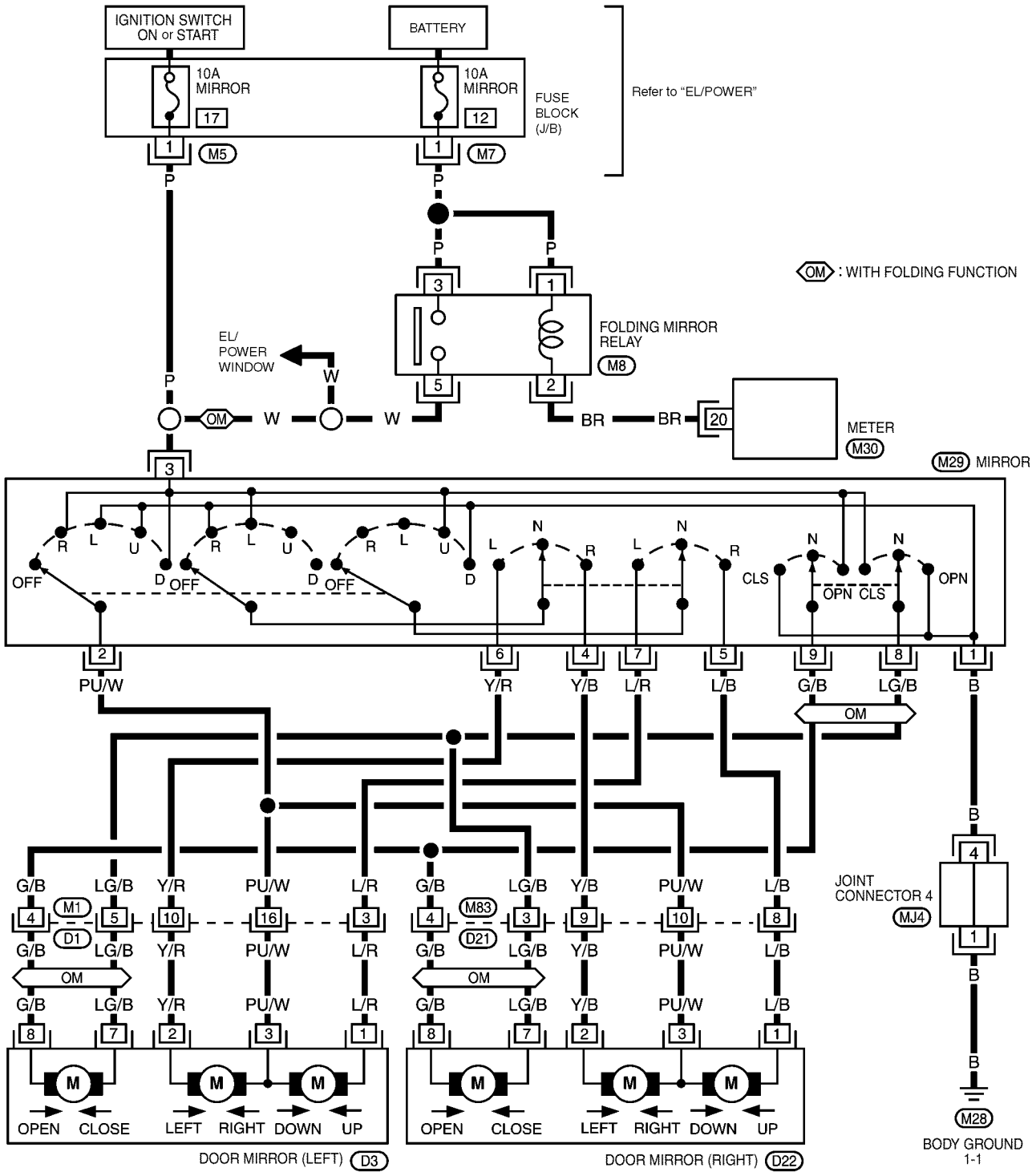
SRWZ006_O1

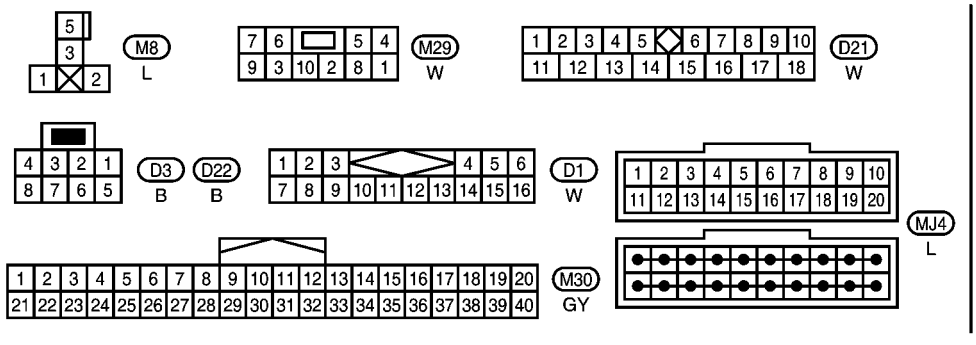
Wiring Diagram





Wiring Diagram — EL/Mirror

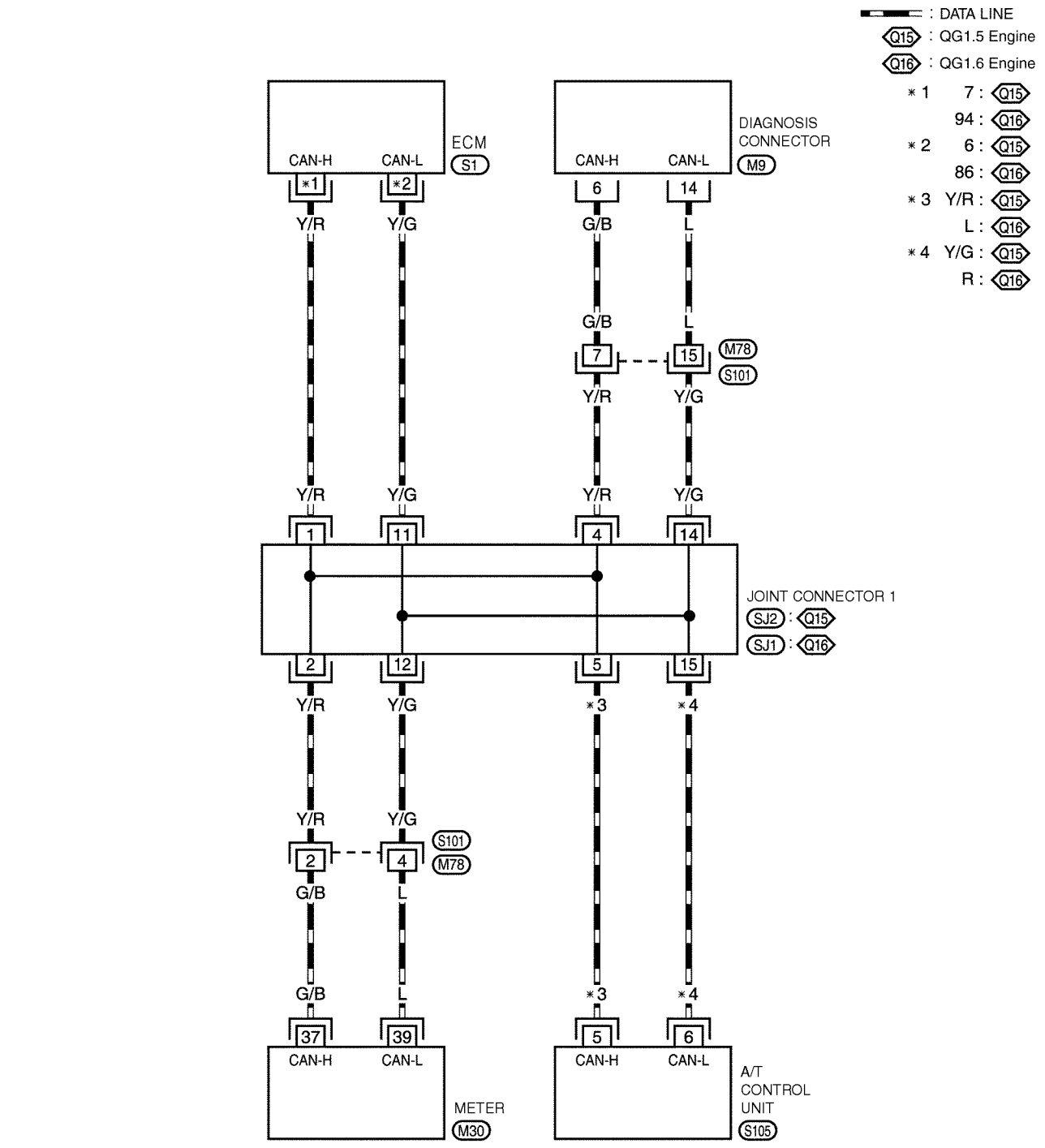


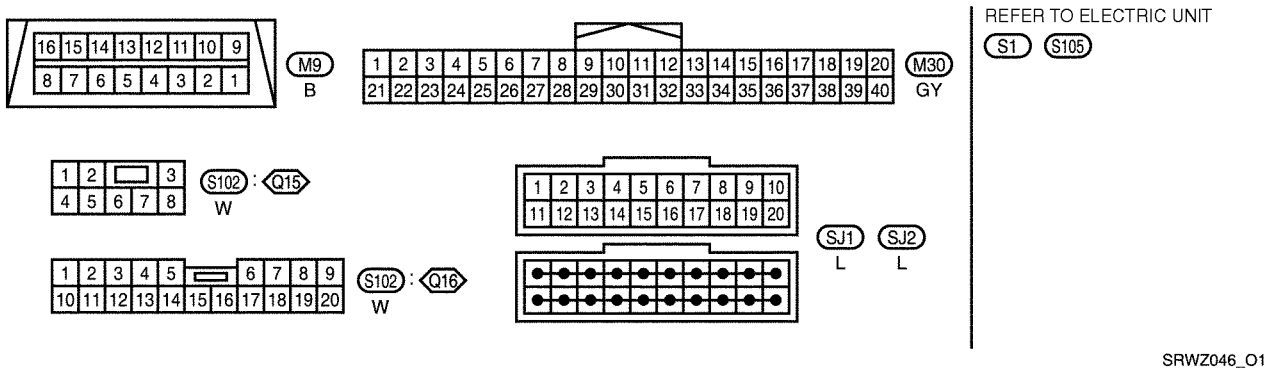


Refer to "FUSE BLOCK (J/B)"
M5 M7

SRWZ036_O1

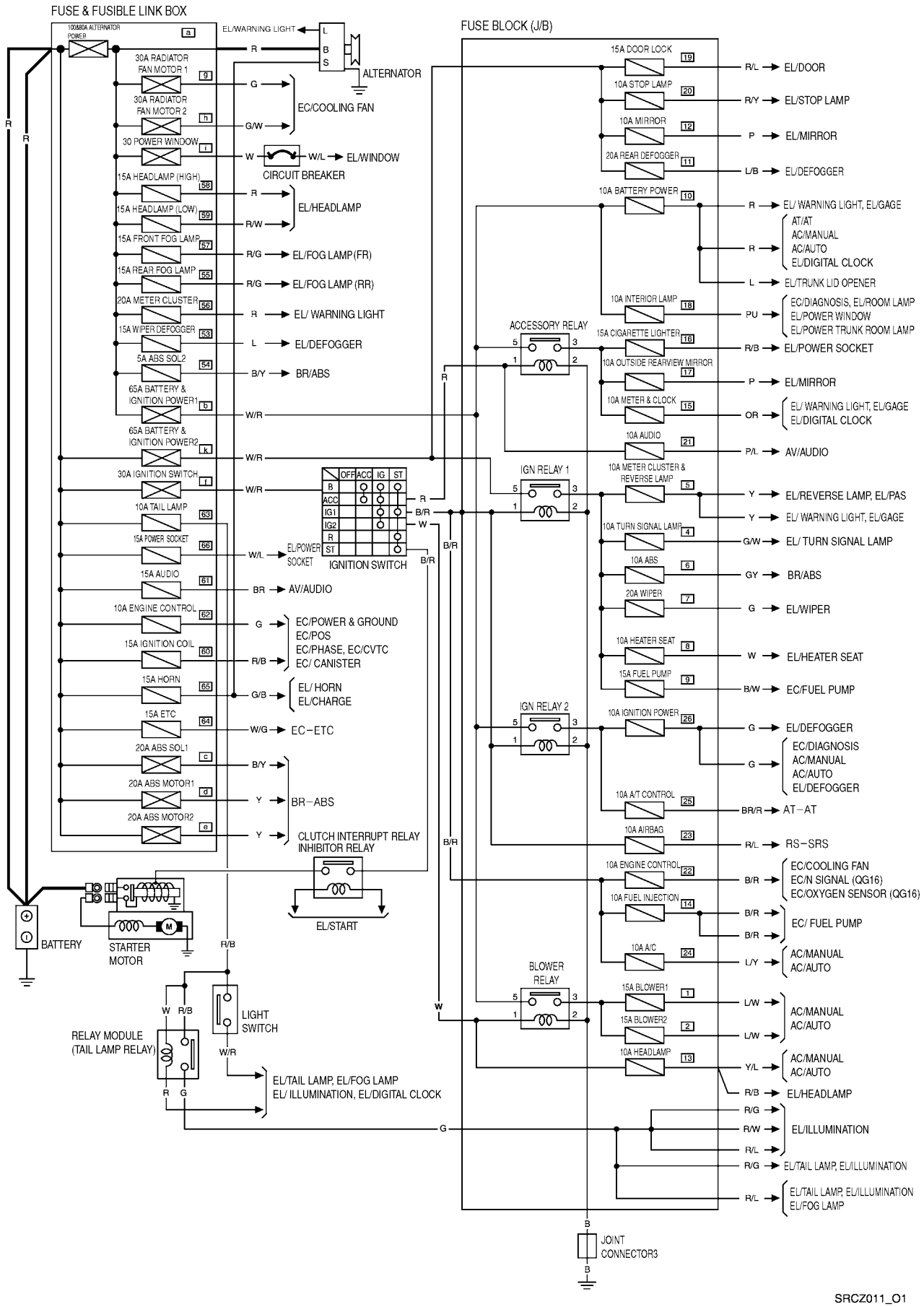
Wiring Diagram — EL-CAN Communication





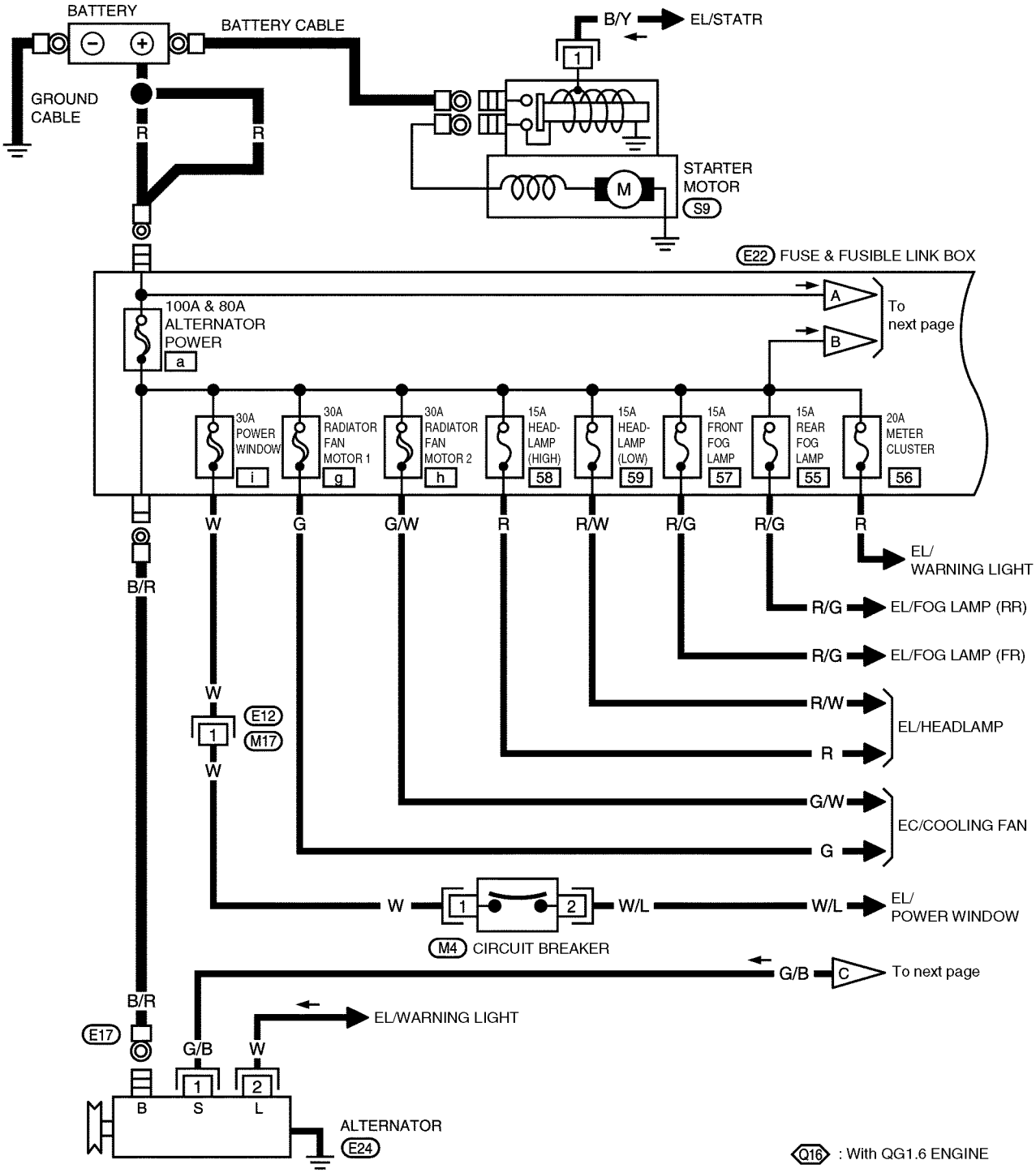
SRWZ046_O1

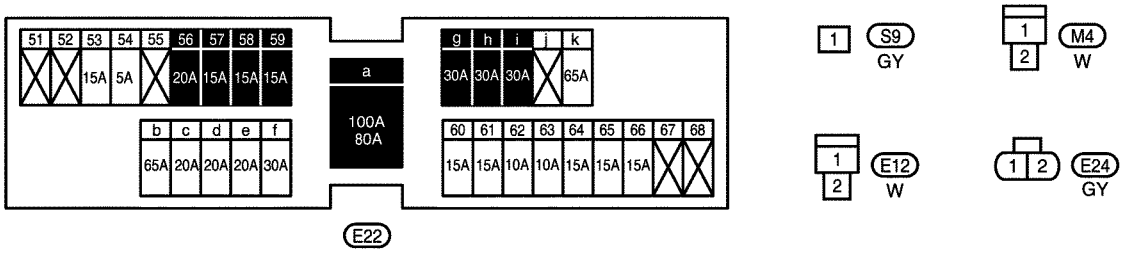
Circuit Diagram



Wiring Diagram

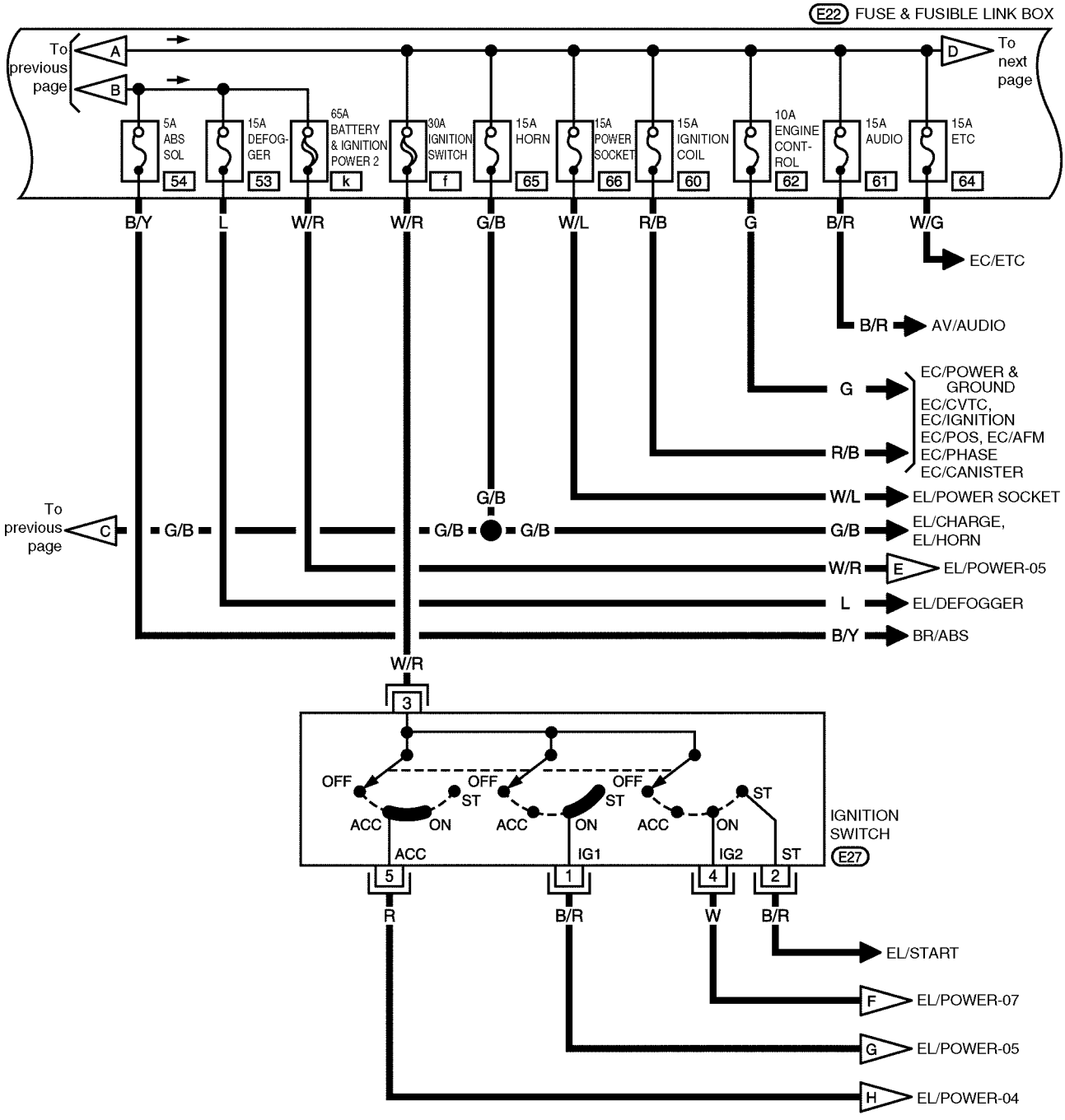
EL/Power- 01

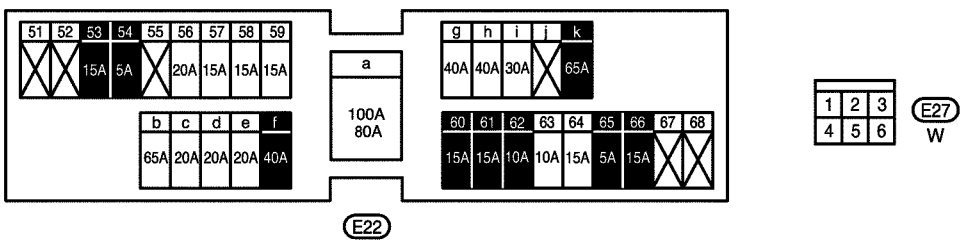




SRWZ047_01

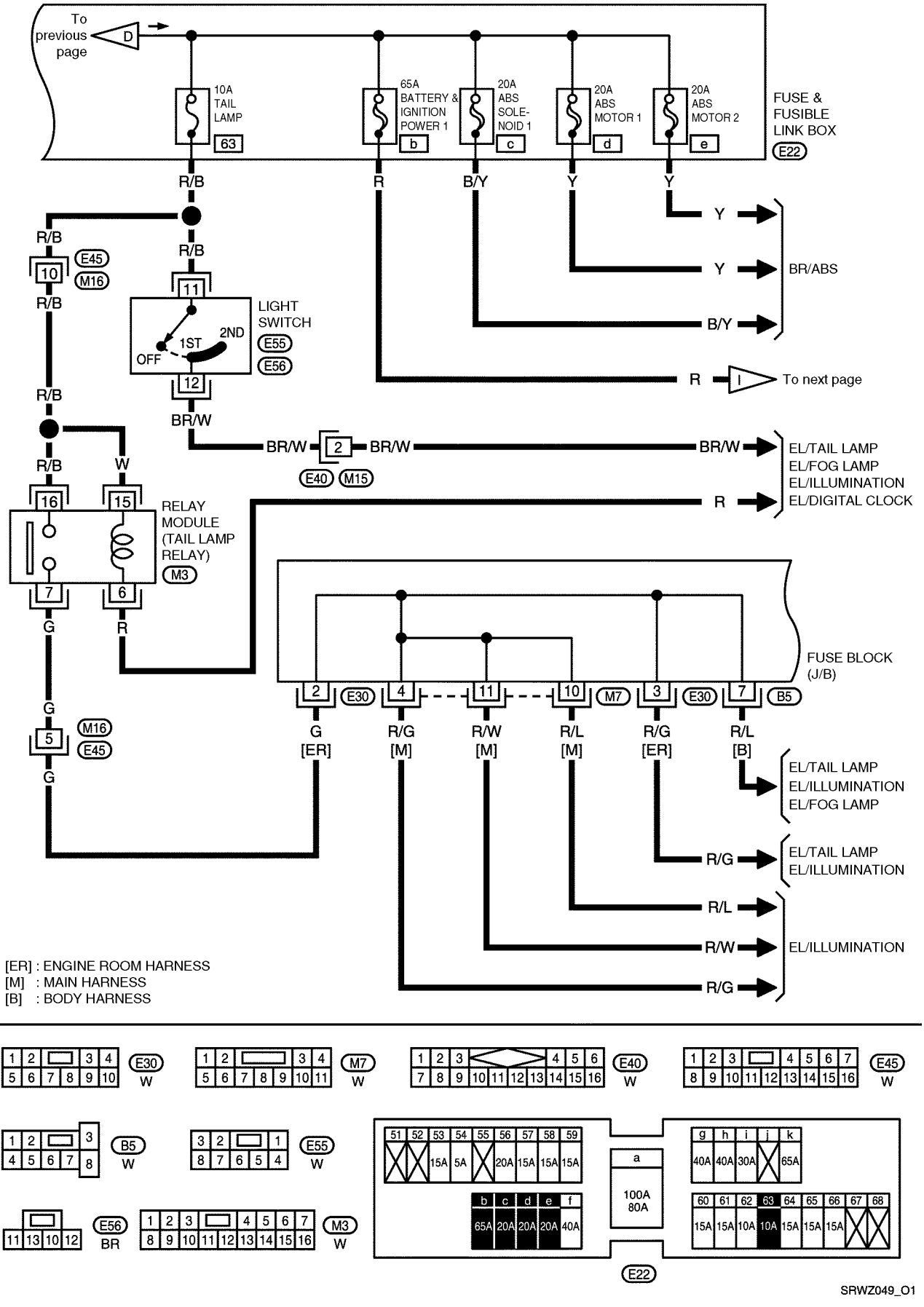
Wiring Diagram



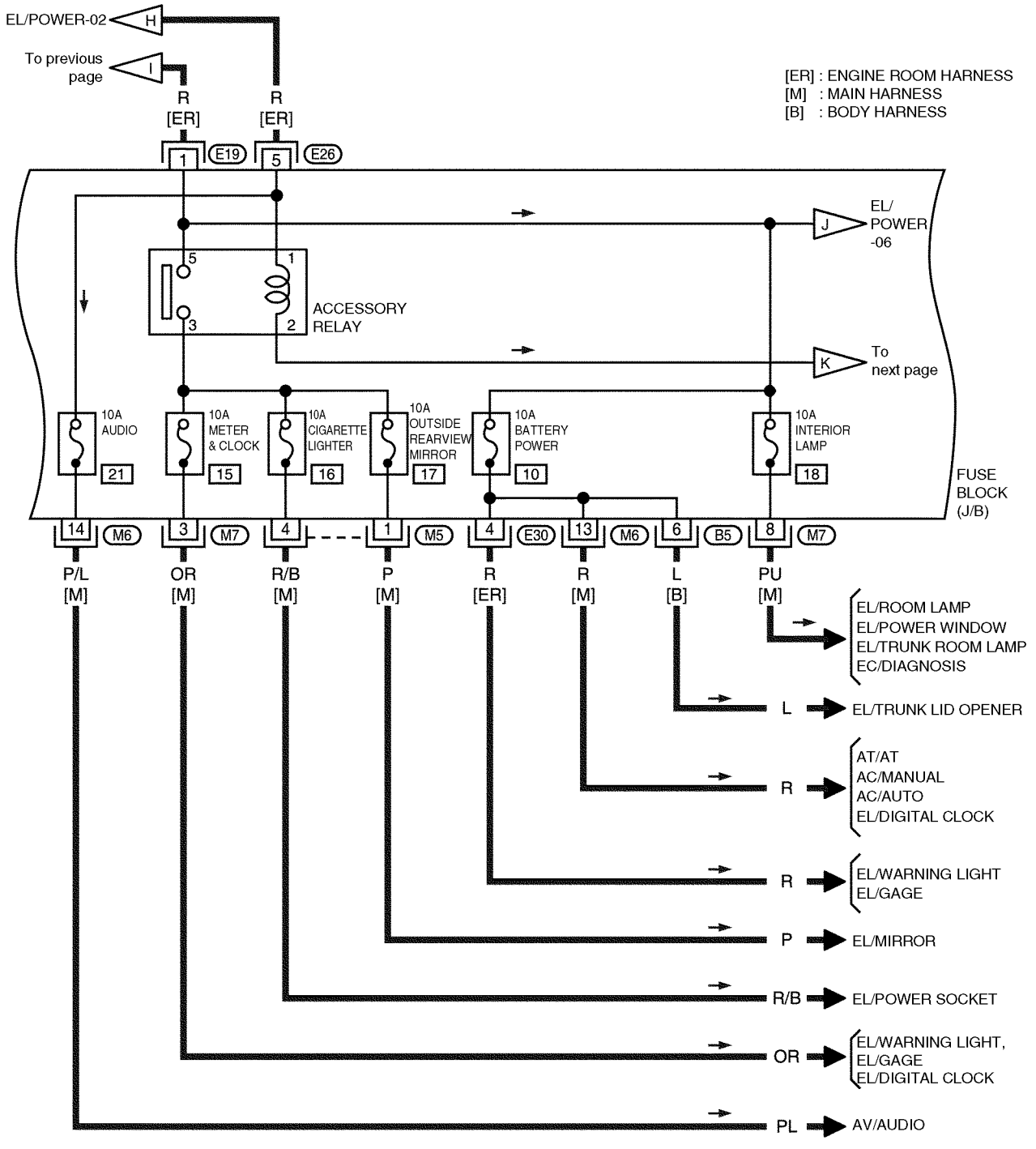


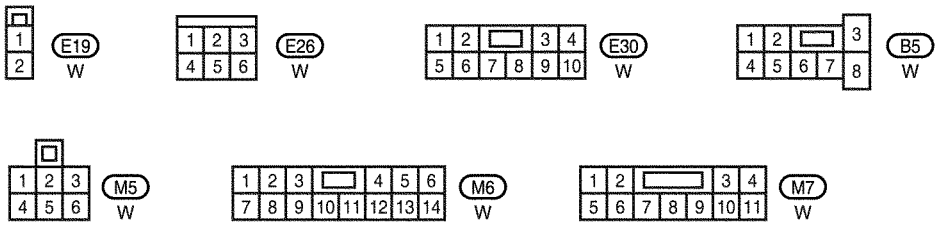
SRWZ048_01

Wiring Diagram



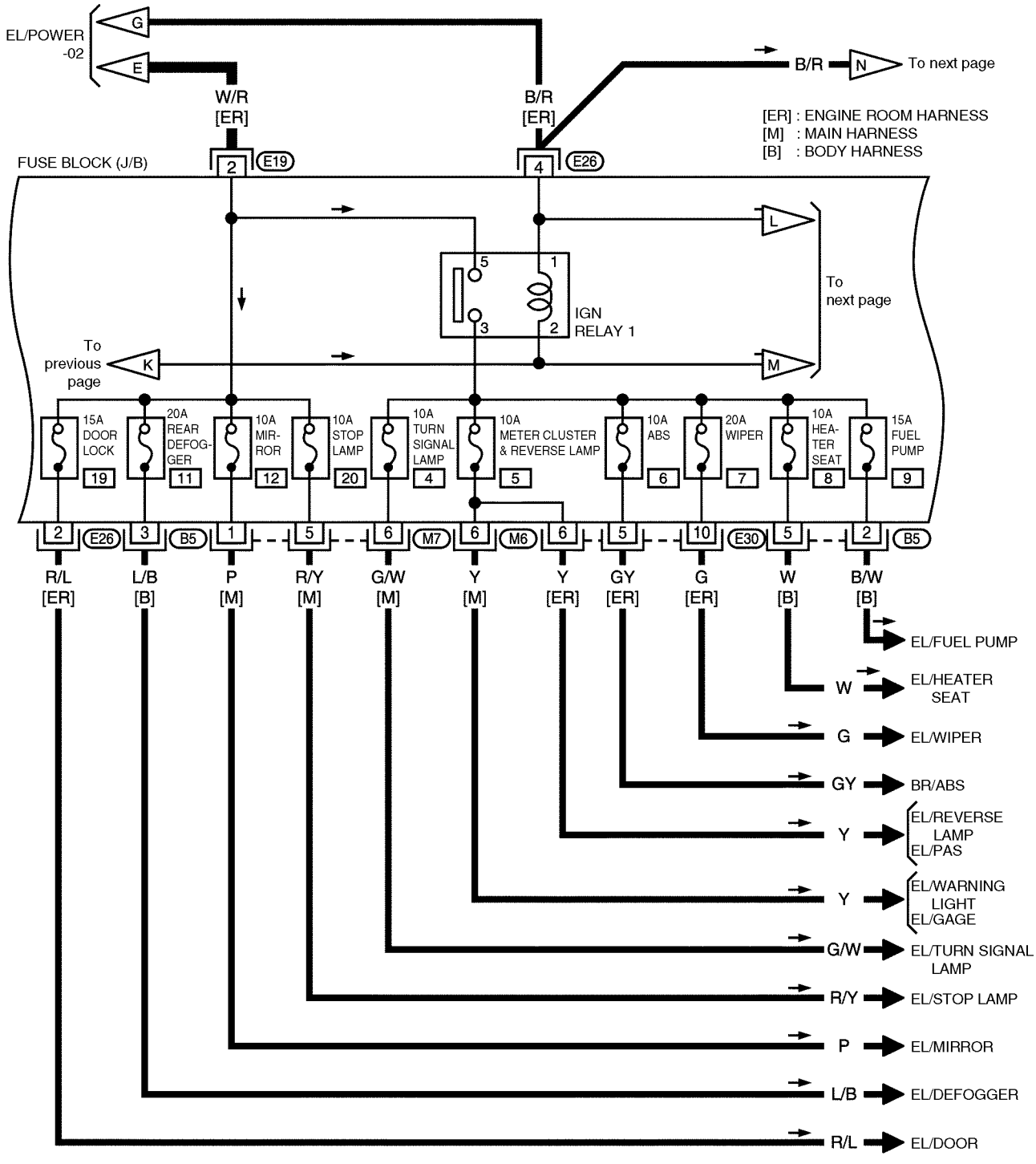
Wiring Diagram

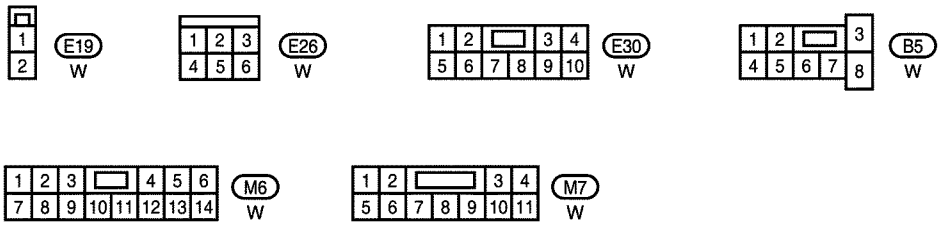




SRWZ050_O1

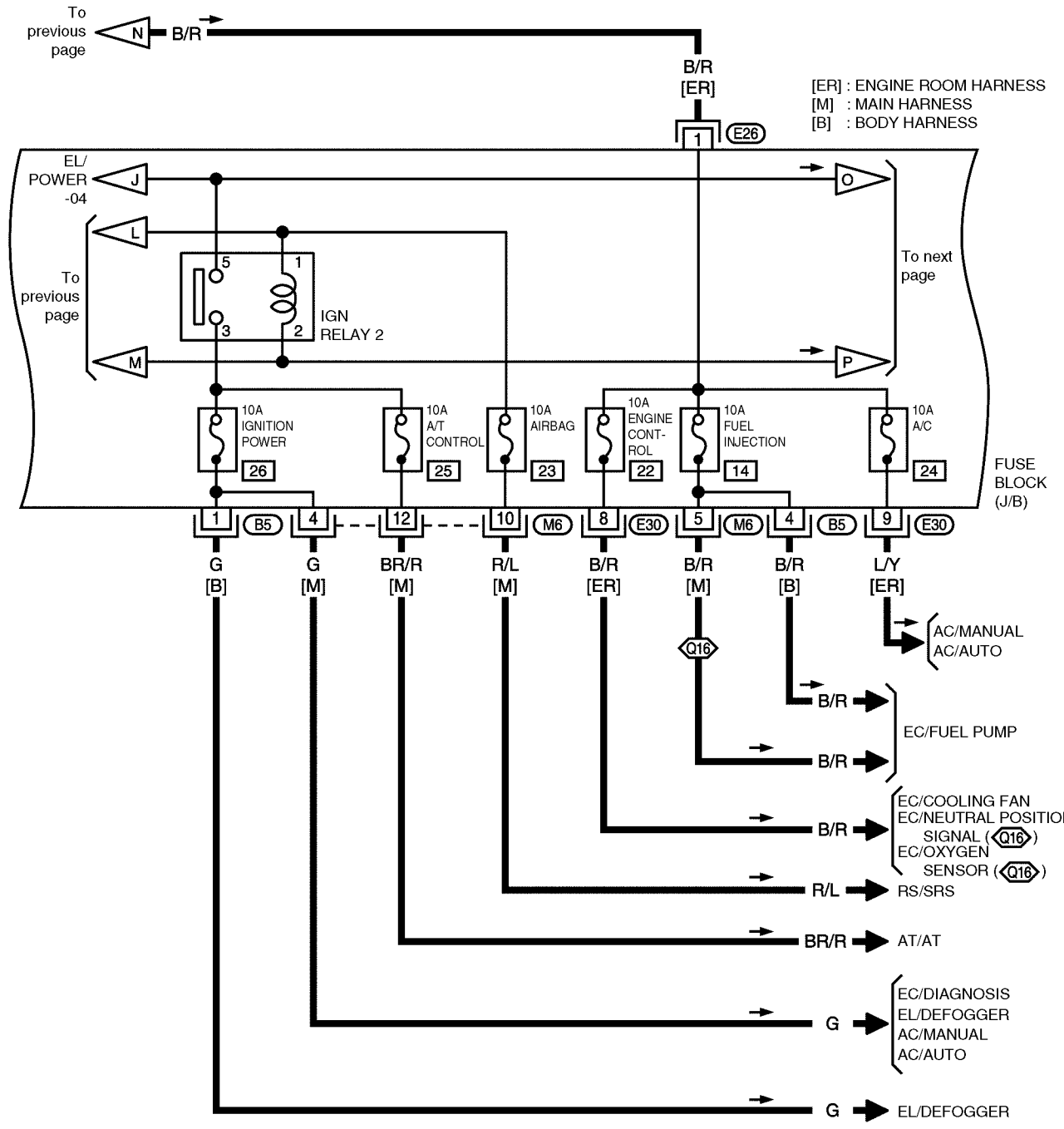
Wiring Diagram



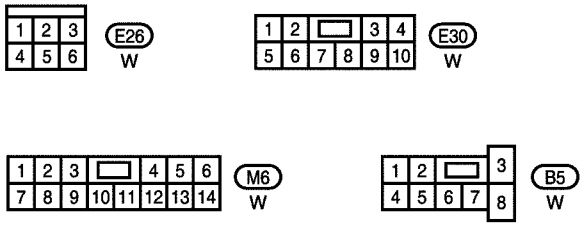


SRWZ051_O1

Wiring Diagram

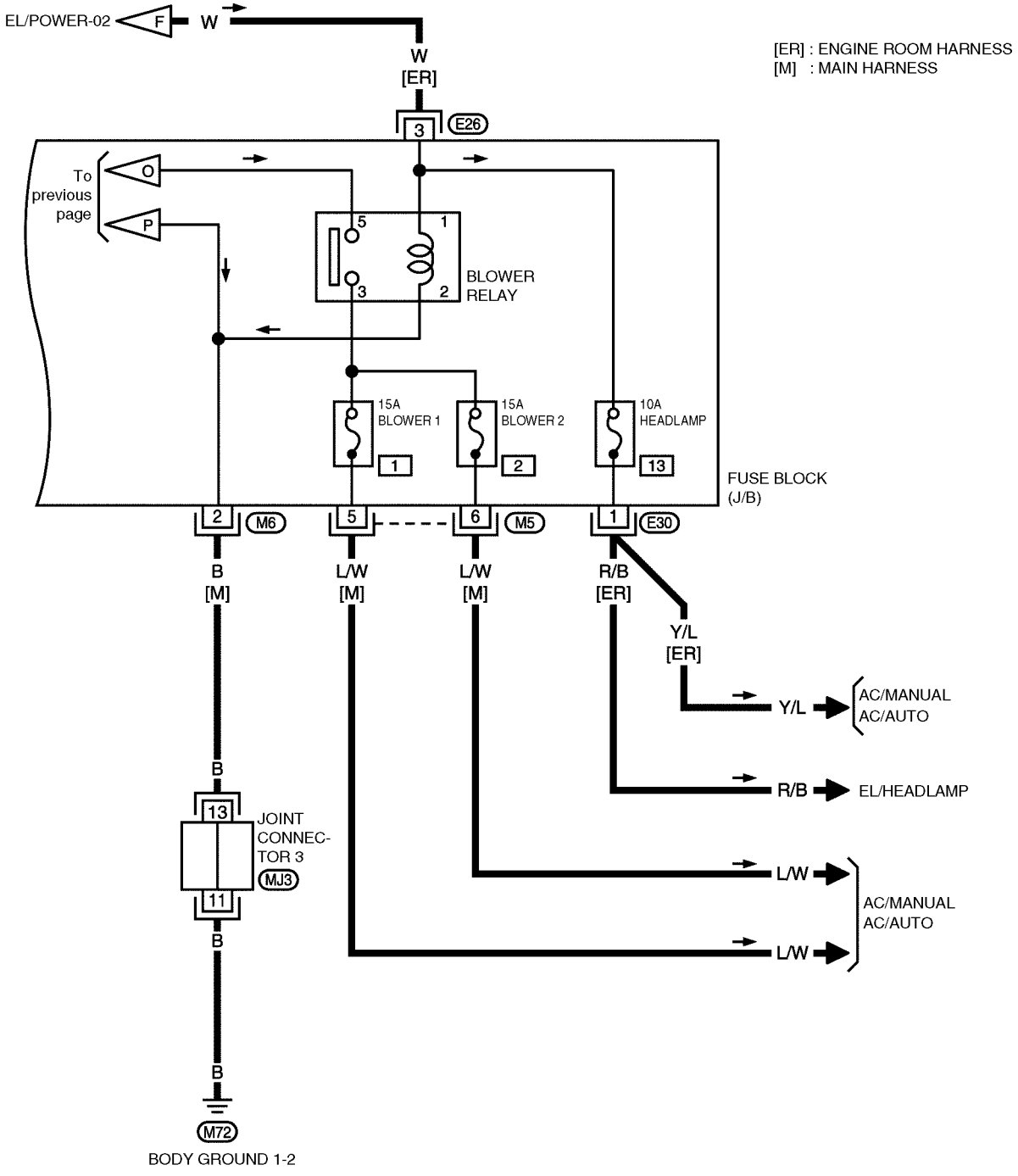


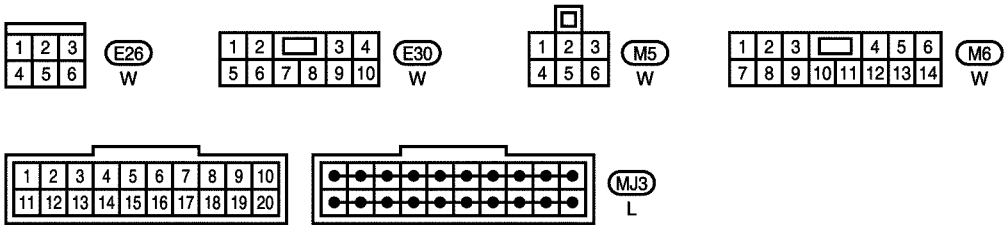
Q16 : With QG1.6 ENGINE



SRWZ052_O1

Wiring Diagram

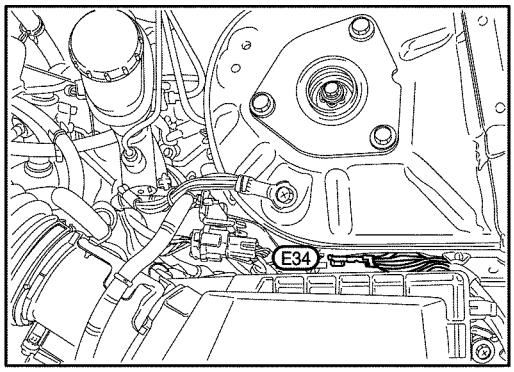


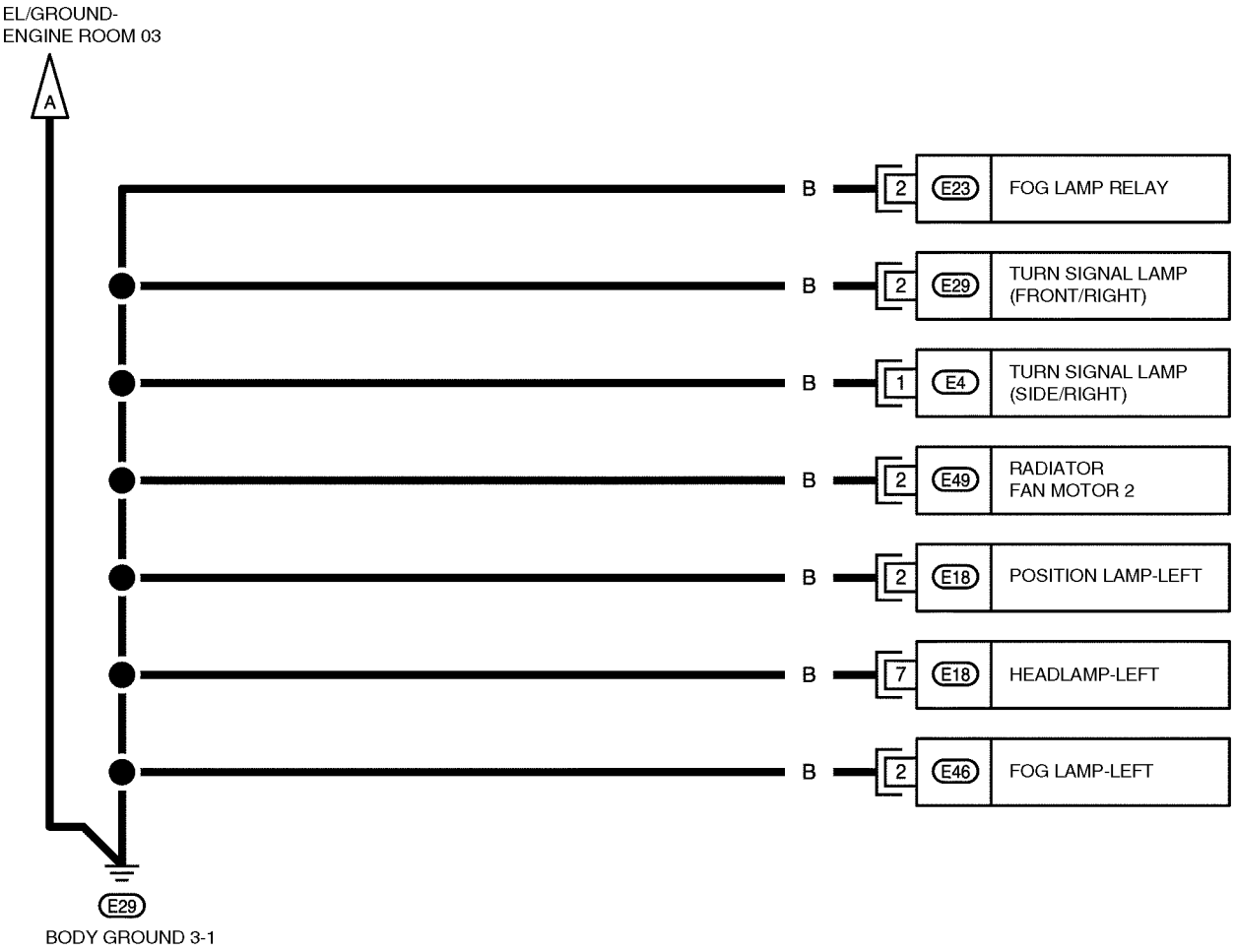


SRWZ053_O1

Wiring Diagram — EL/Ground-Engine Room 01

ENGINE ROOM HARNESS

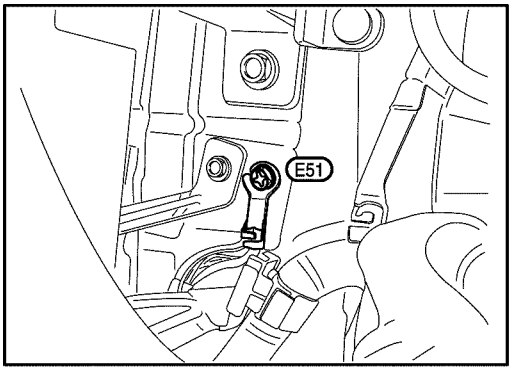




SRWZ055_O1

Wiring Diagram — EL/Ground-Engine Room 02

ENGINE ROOM HARNESS-CONTINUED



To next page

B

B	2	E15	TURN SIGNAL LAMP (FRONT/LEFT)
B	1	E21	TURN SIGNAL LAMP (SIDE/LEFT)
B	4	E28	WIPER MOTOR
B	17	E32	WIPER SWITCH
B	13	E56	COMBINATION SWITCH
B	2	E55	COMBINATION SWITCH
B	2	E52	FOG LAMP-RIGHT
B	7	E25	HEADLAMP-RIGHT
B	2	E25	POSITION LAMP-RIGHT
B	2	E14	BRAKE FLUID SWITCH
B	2	E38	DE-ICER

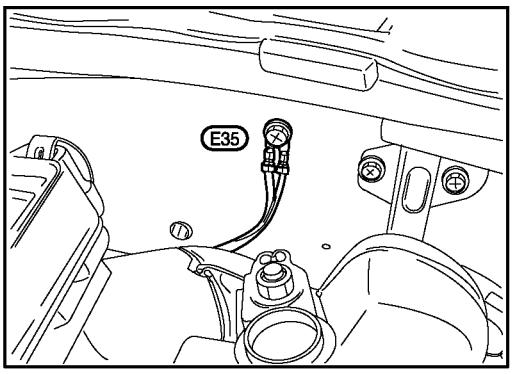
E34

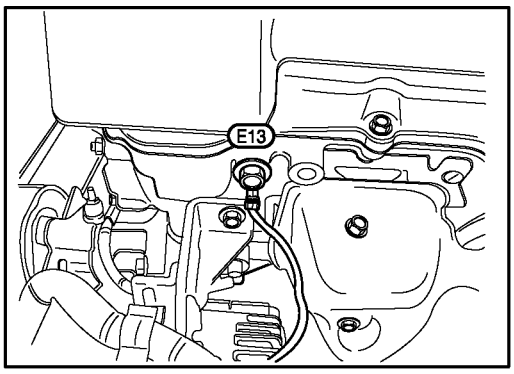
BODY GROUND
3-2

SRWZ056_O1

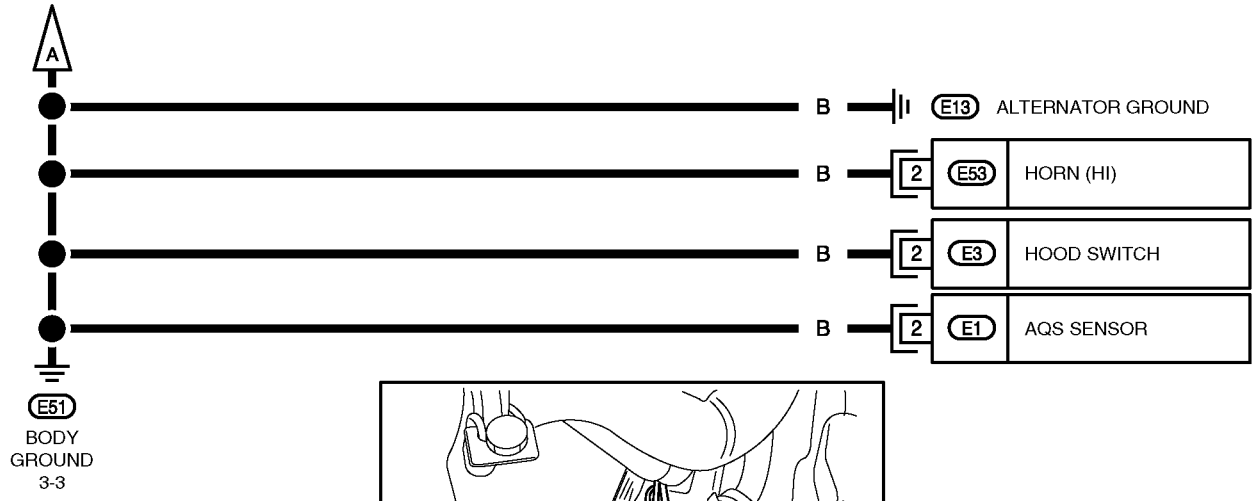
Wiring Diagram — EL/Ground-Engine Room 03

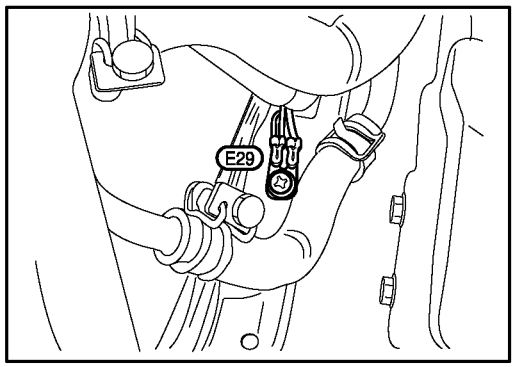
ENGINE ROOM HARNESS-CONTINUED





EL/GROUND-
ENGINE ROOM 01





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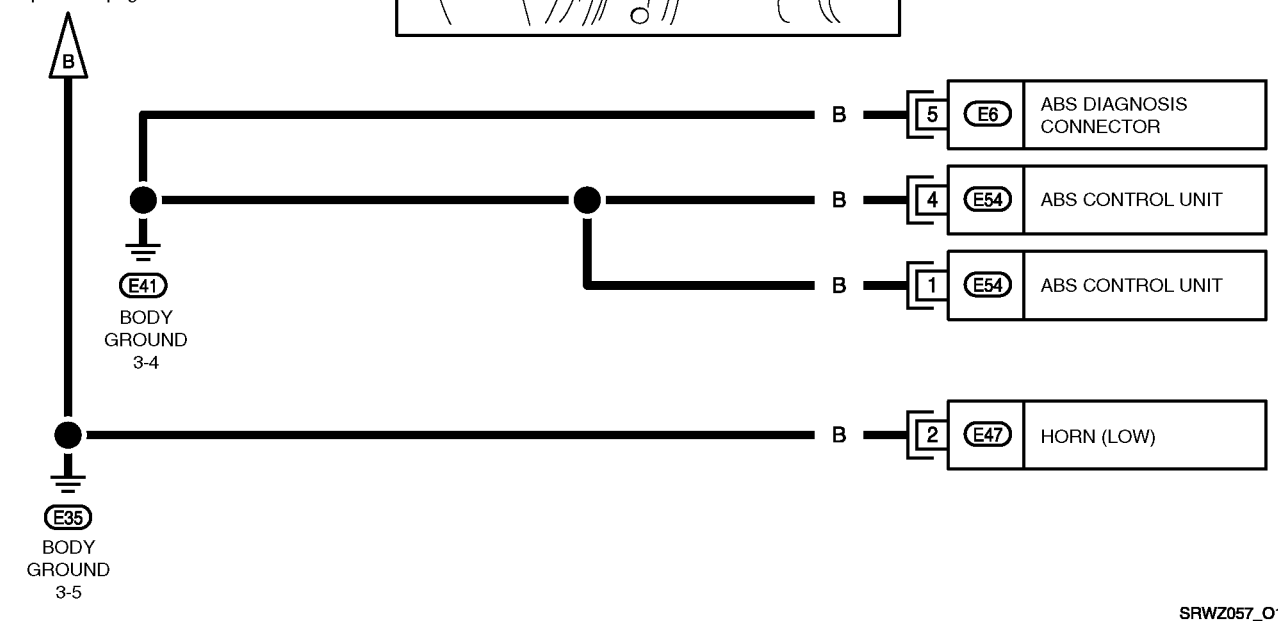
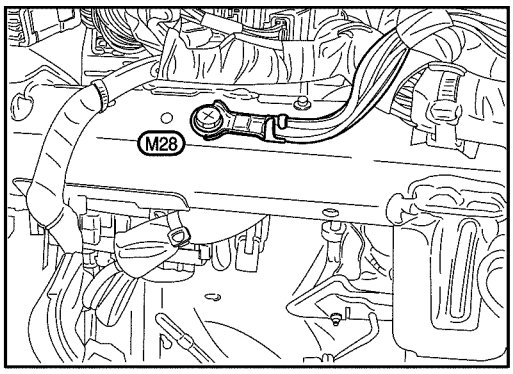
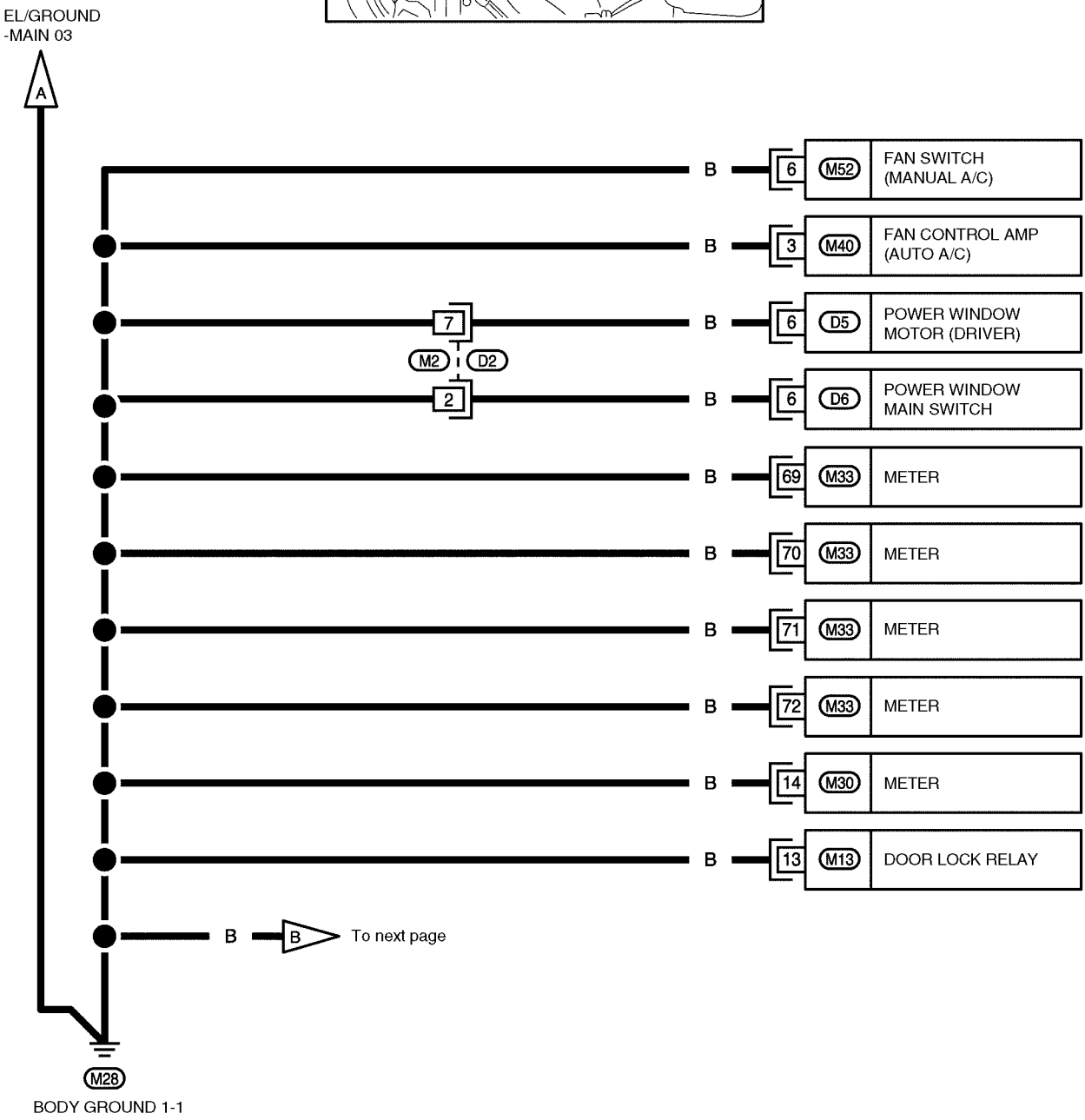


SRWZ057_O1

Wiring Diagram — EL/Ground-Main 01

MAIN HARNESS

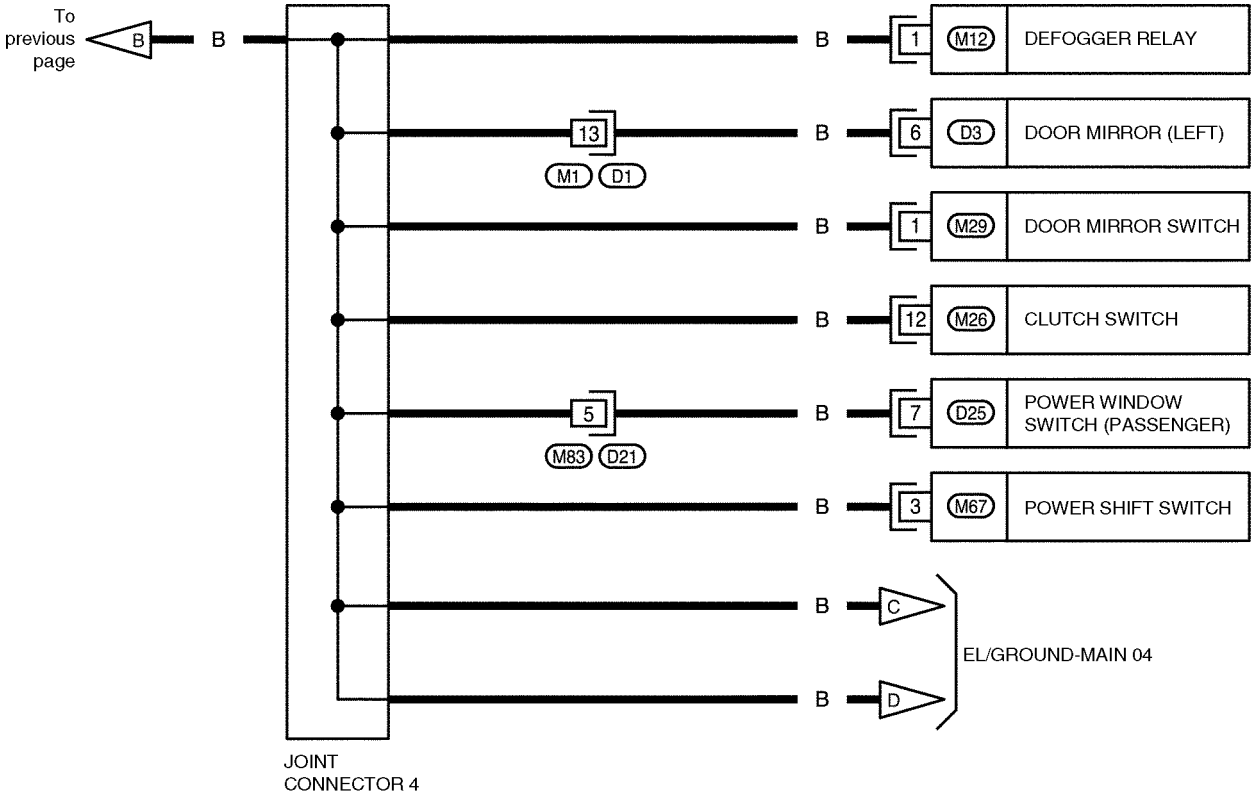




SRWZ058_O1

Wiring Diagram — EL/Ground-Main 02

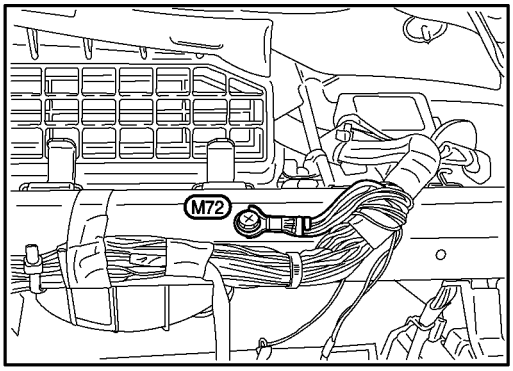
MAIN HARNESS-CONTINUED



SRWZ059_O1

Wiring Diagram — EL/Ground-Main 03

MAIN HARNESS-CONTINUED



EL/GROUND
-MAIN 01

A

Q16 : QG1.6 ENGINE

Q16 13 B → EL/GROUND-EGI (QG16)
M79 S106

5 (M83 D21)	B	3	D25	POWER WINDOW SWITCH (PASSENGER)
	B	1	M64	HAZARD WARNING LAMP SWITCH
	B	3	M64	HAZARD WARNING LAMP SWITCH
	B	10	M49	AUDIO
	B	20	M44	TELEMATICS UNIT
	B	2	M57	ASH TRAY
	B	1	M56	CIGARETTE LIGHTER ILLUMINATION
	B	1	M61	POWER SOCKET
	B	2	M3	RELAY MODULE
	B	2	M66	DIGITAL CLOCK
	B	9	M60	A/T DEVICE
	B	11	M60	A/T DEVICE
7 (M83 D21)	B	6	D22	DOOR MIRROR (RIGHT)
	B	4	M65	DOOR LOCK SWITCH

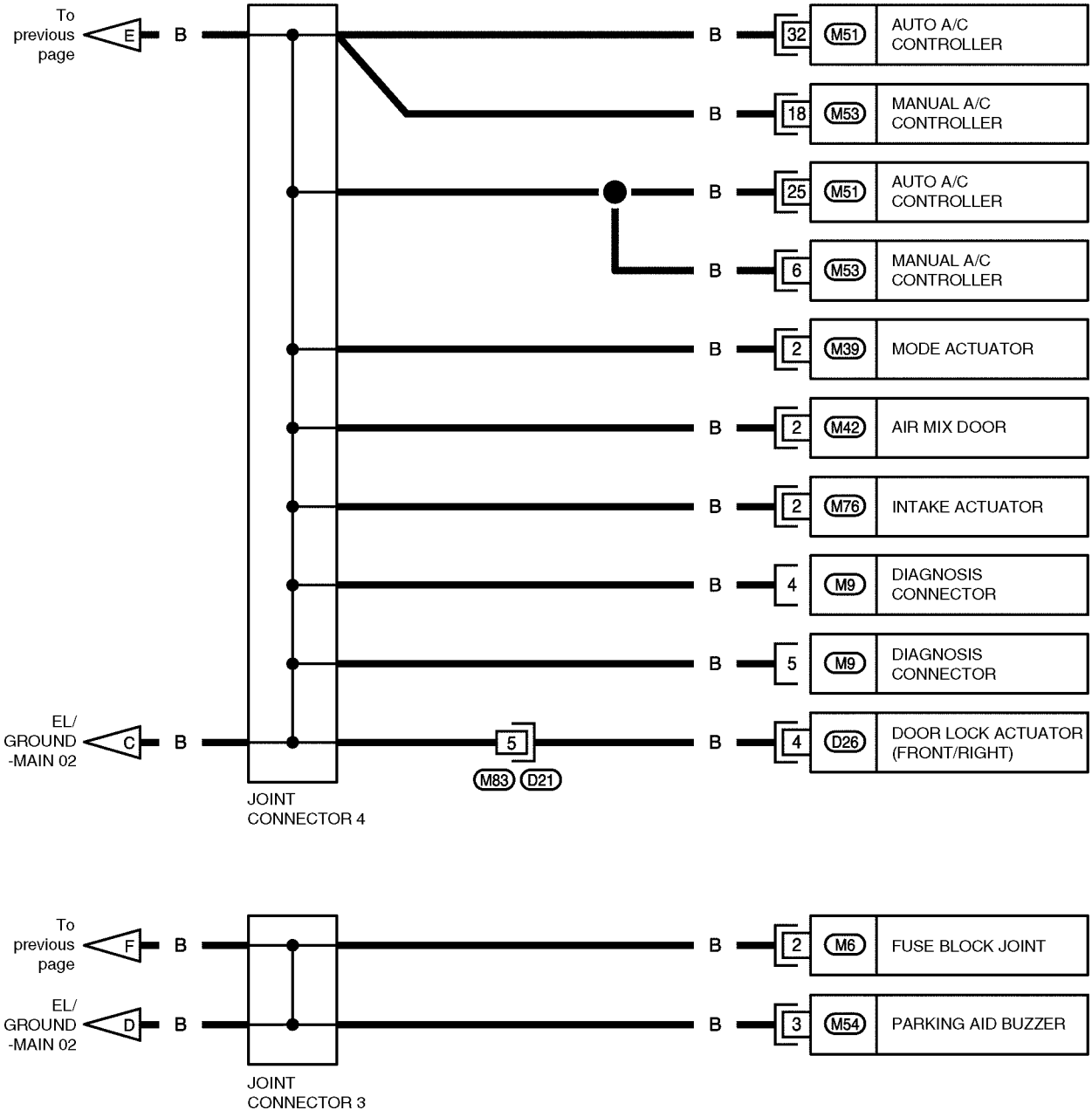
B → E
B → F
To next page

M72 BODY GROUND 1-2

SRWZ060_O1

Wiring Diagram — EL/Ground-Main 04

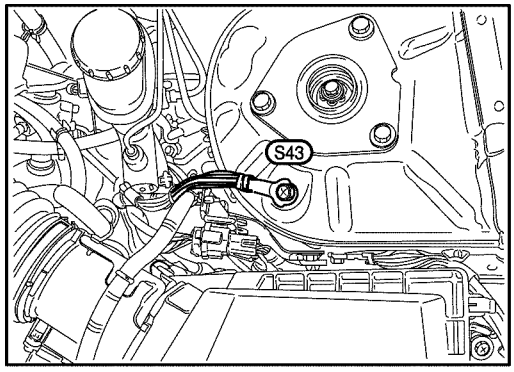
MAIN HARNESS-CONTINUED



SRWZ061_O1

Wiring Diagram — EL/Ground-EGI (QG16)

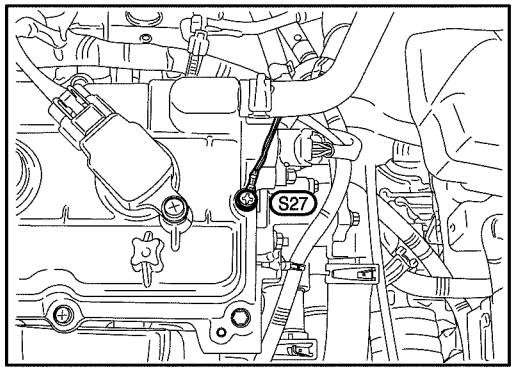
EGI HARNESS (QG16)



B → EL/GROUND-MAIN 03

B	1	S1	ENGINE CONTROL UNIT
B	115	S1	ENGINE CONTROL UNIT
B	116	S1	ENGINE CONTROL UNIT
B	25	S105	A/T CONTROL UNIT
B	48	S105	A/T CONTROL UNIT
B	1	S40	ETC SHIELD GROUND
B	1	S40	ETC SHIELD GROUND
B	1	S40	ETC SHIELD GROUND
B	2	S15	INHIBITOR SWITCH
B	2	S20	NEUTRAL POSITION SWITCH (M/T)

S34
BODY GROUND



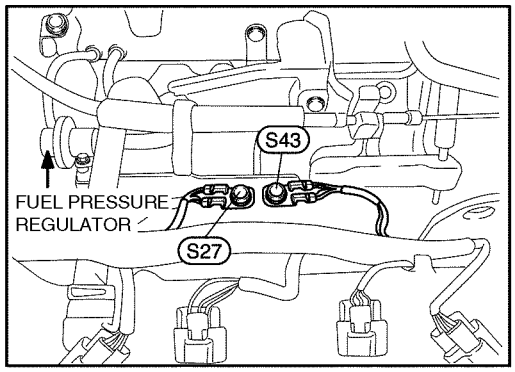
B	2	S25	IGNITION COIL #1
B	2	S26	IGNITION COIL #2
B	2	S31	IGNITION COIL #3
B	2	S35	IGNITION COIL #4

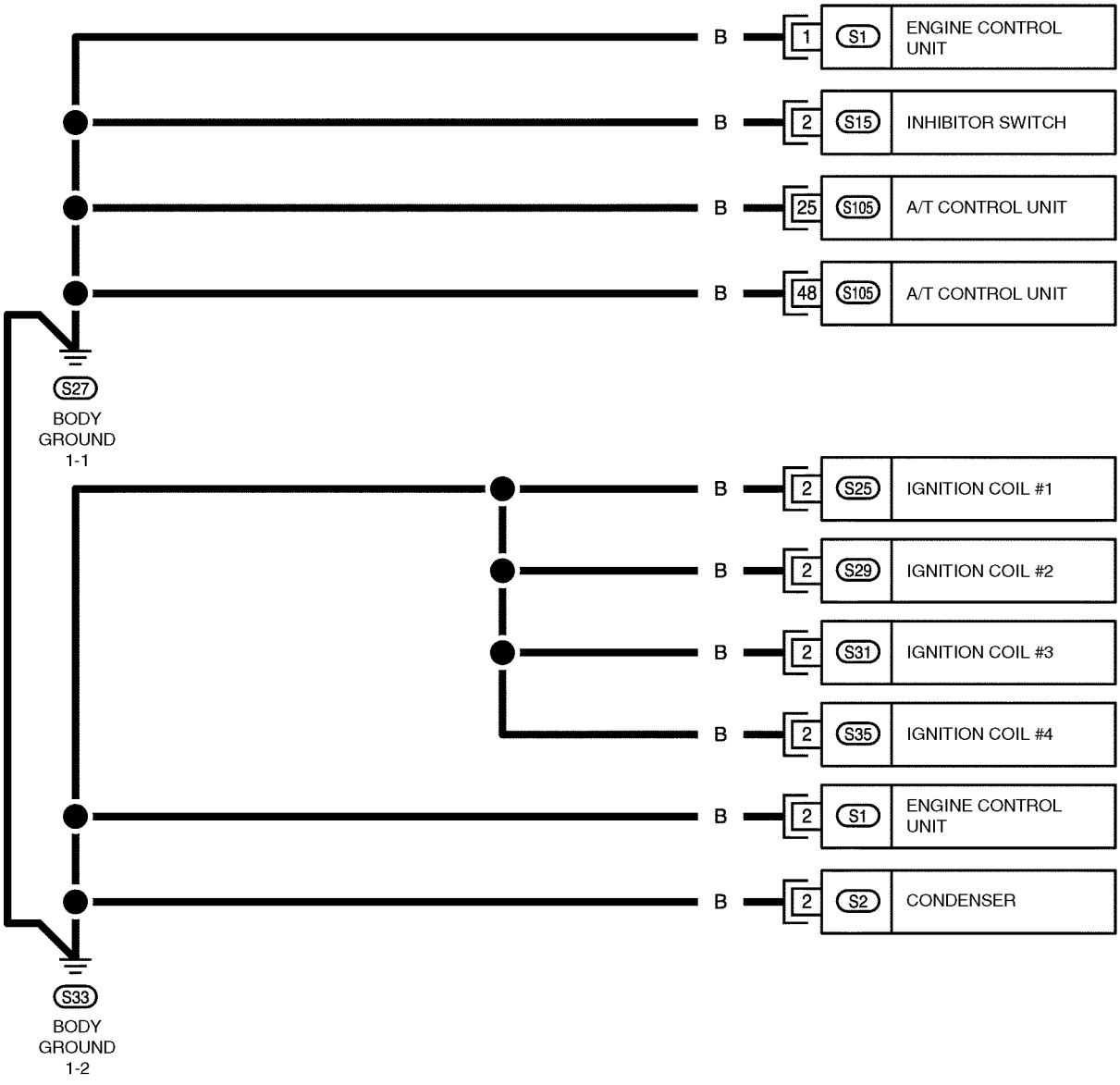
S27
BODY GROUND
1-1

SRWZ062_O1

Wiring Diagram — EL/Ground-EGI (QG15)

EGI HARNESS (QG15)

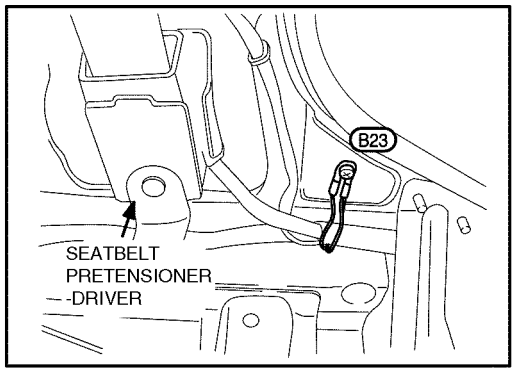


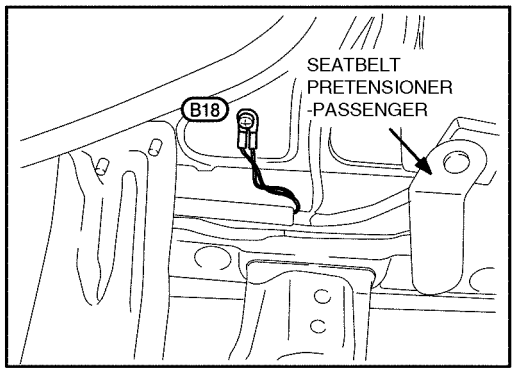


SRWZ063_O1

Wiring Diagram — EL/Ground-Body

BODY HARNESS

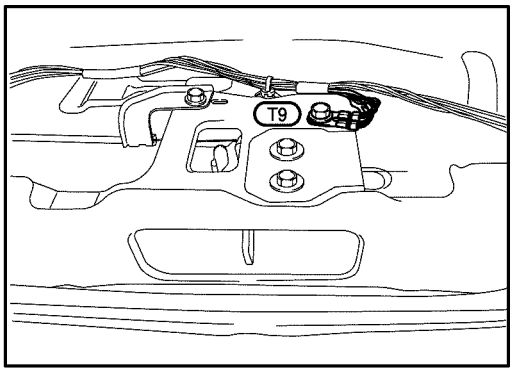


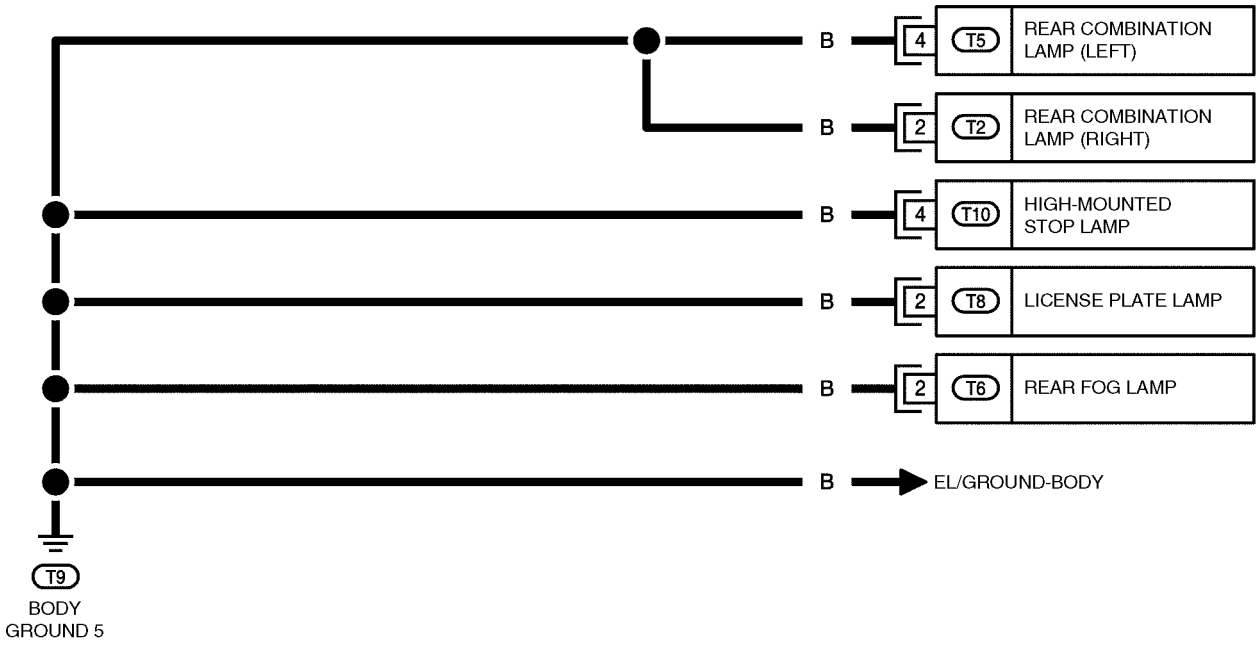


SRWZ064_O1

Wiring Diagram — EL/Ground-Tail

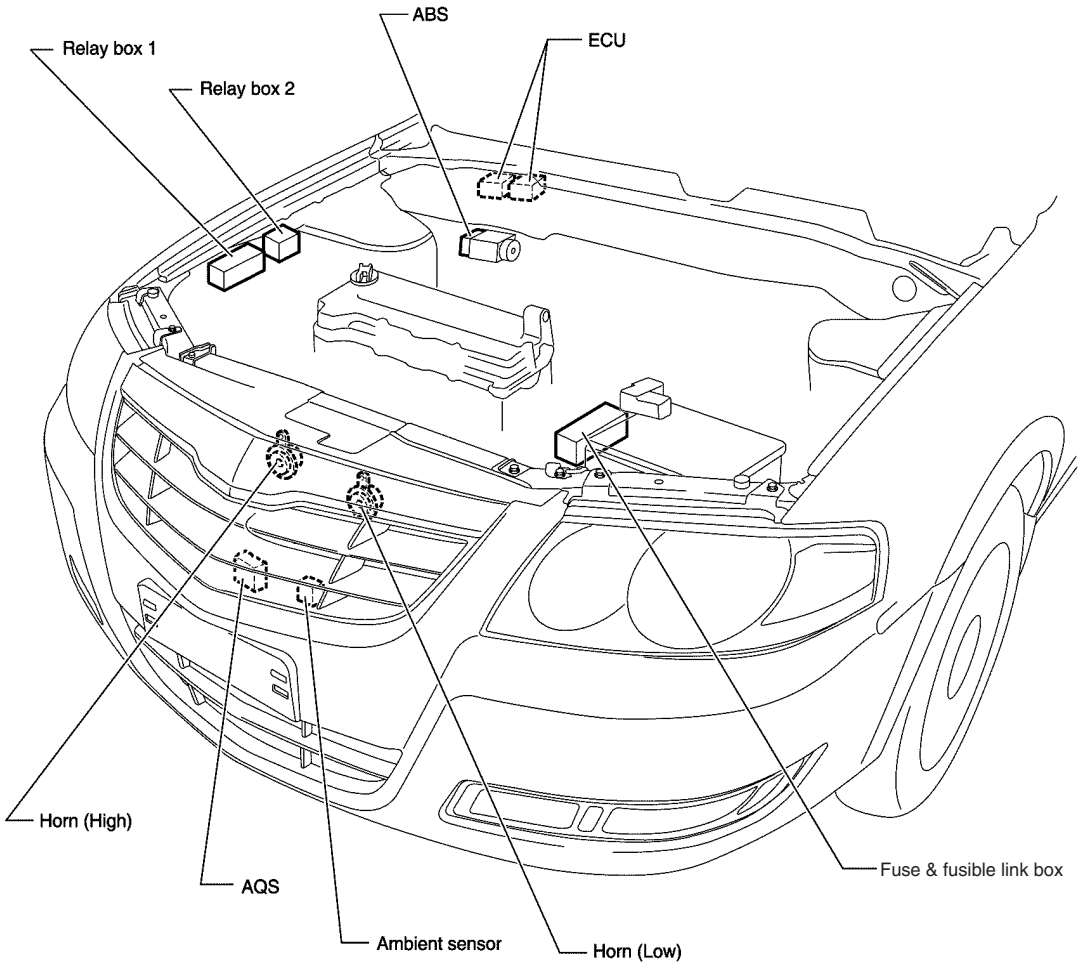
TAIL HARNESS

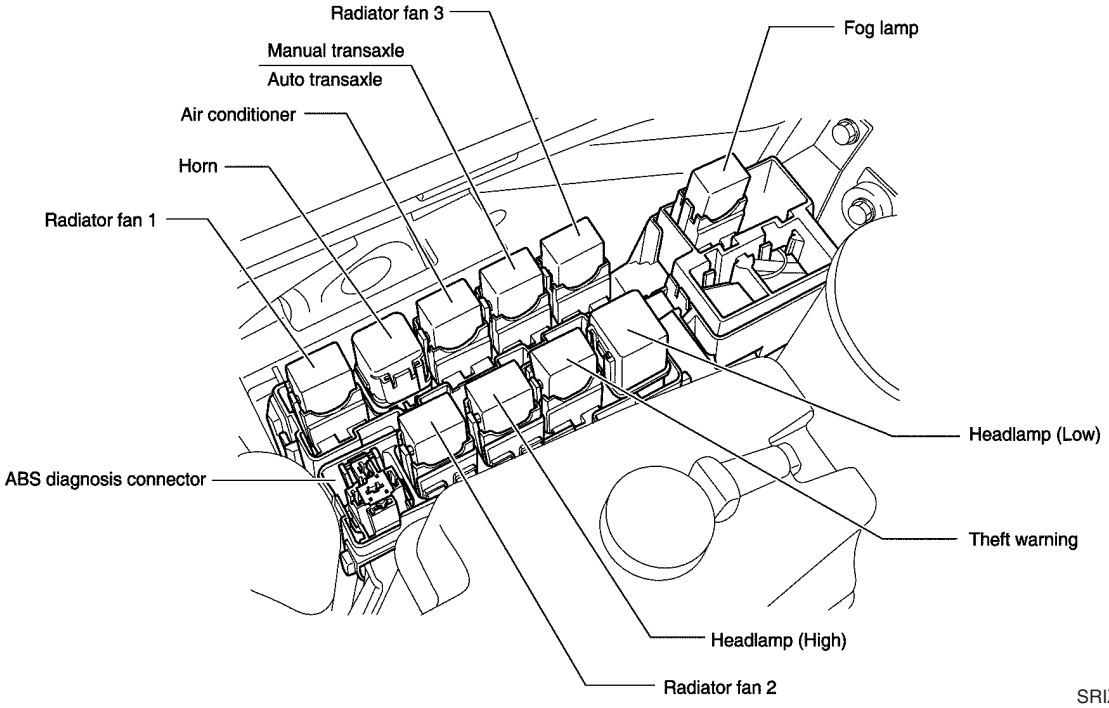




SRWZ065_O1

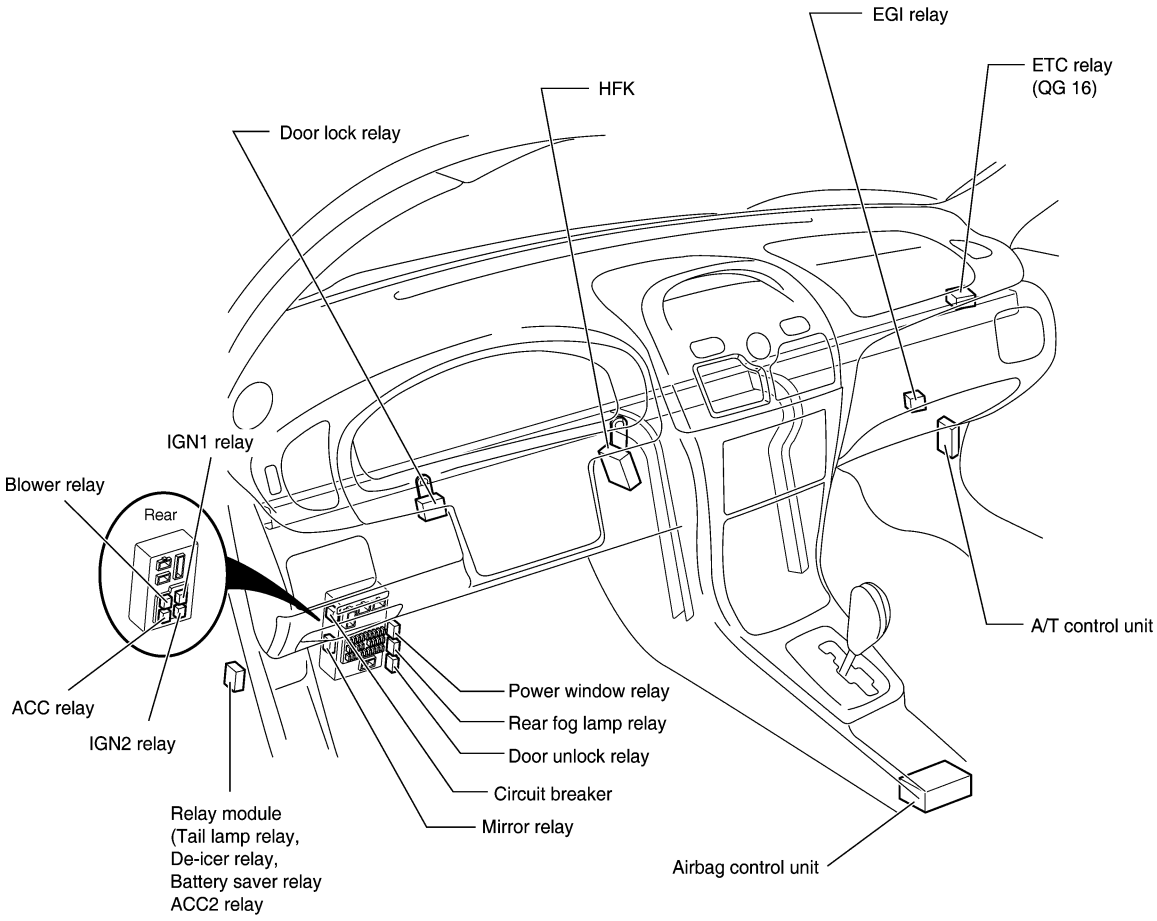
ENGINE ROOM





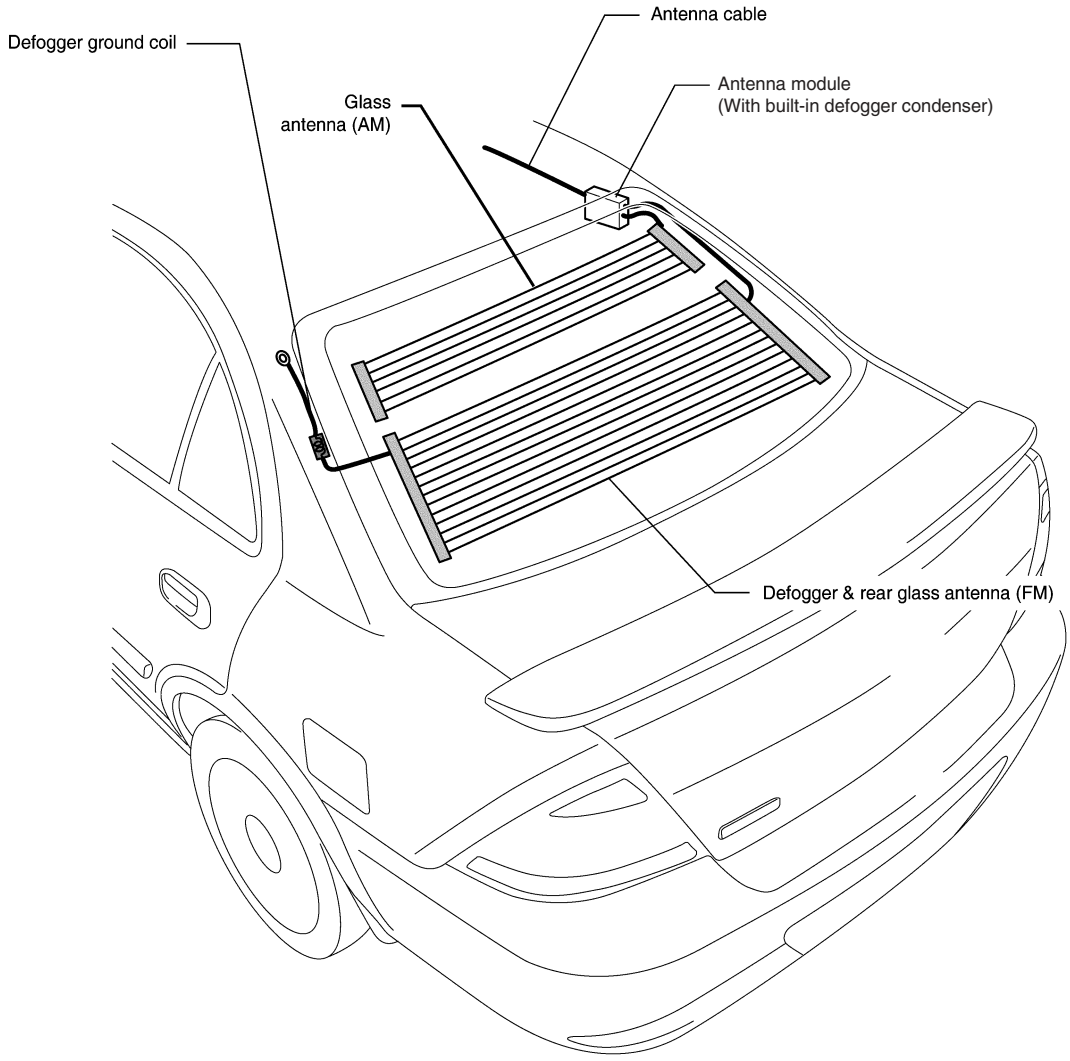
SRIZ001_D1

INTERIOR



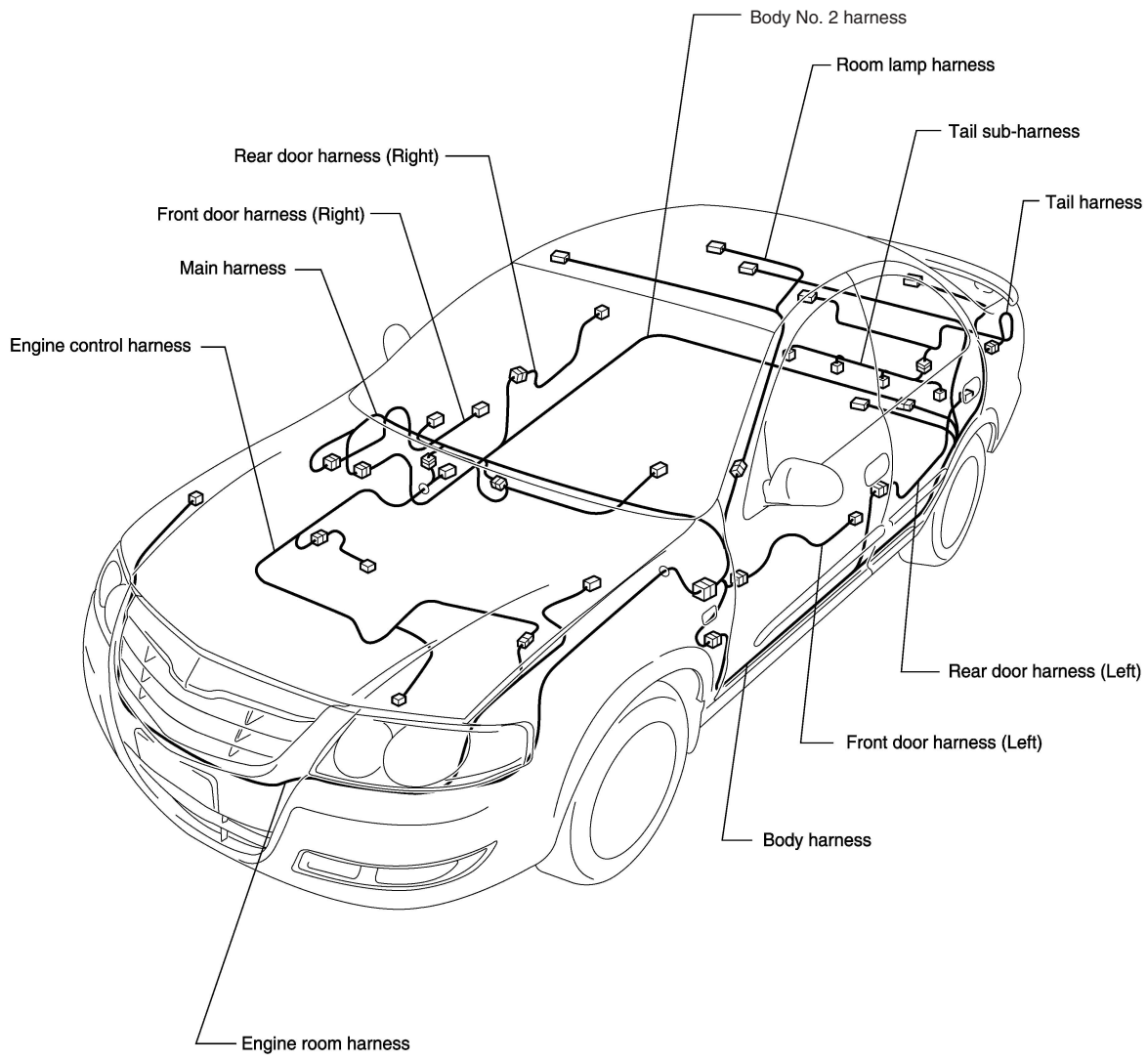
SRIZ002_D1

TRUNK ROOM



SRIZ003_D1

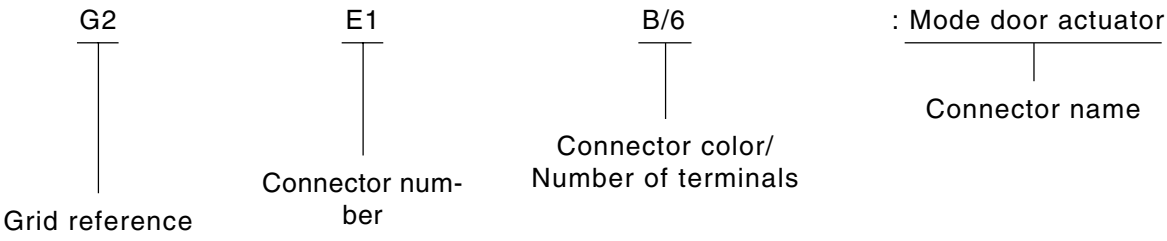
OVERALL



SRIZ004_D1

How to Read Harness Layout

Example:



The following harness layouts use a map style grid to help locate connectors on the drawings.

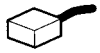
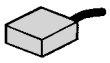
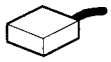
- Engine room harness (Engine Compartment)
- Main harness
- Engine control harness
- Body harness, Body No.2 harness, Tail harness
- Door harness

TO USE THE GRID REFERENCE

- Find the desired connector number on the connector list.
- Find the grid reference.
- On the drawing, find the crossing of the grid reference letter column and number row.
- Find the connecter number in the crossing zone.
- Follow the line to the connector.

CONNECTOR SYMBOL

Main symbols of connector (in harness layout) are indicated in the below.

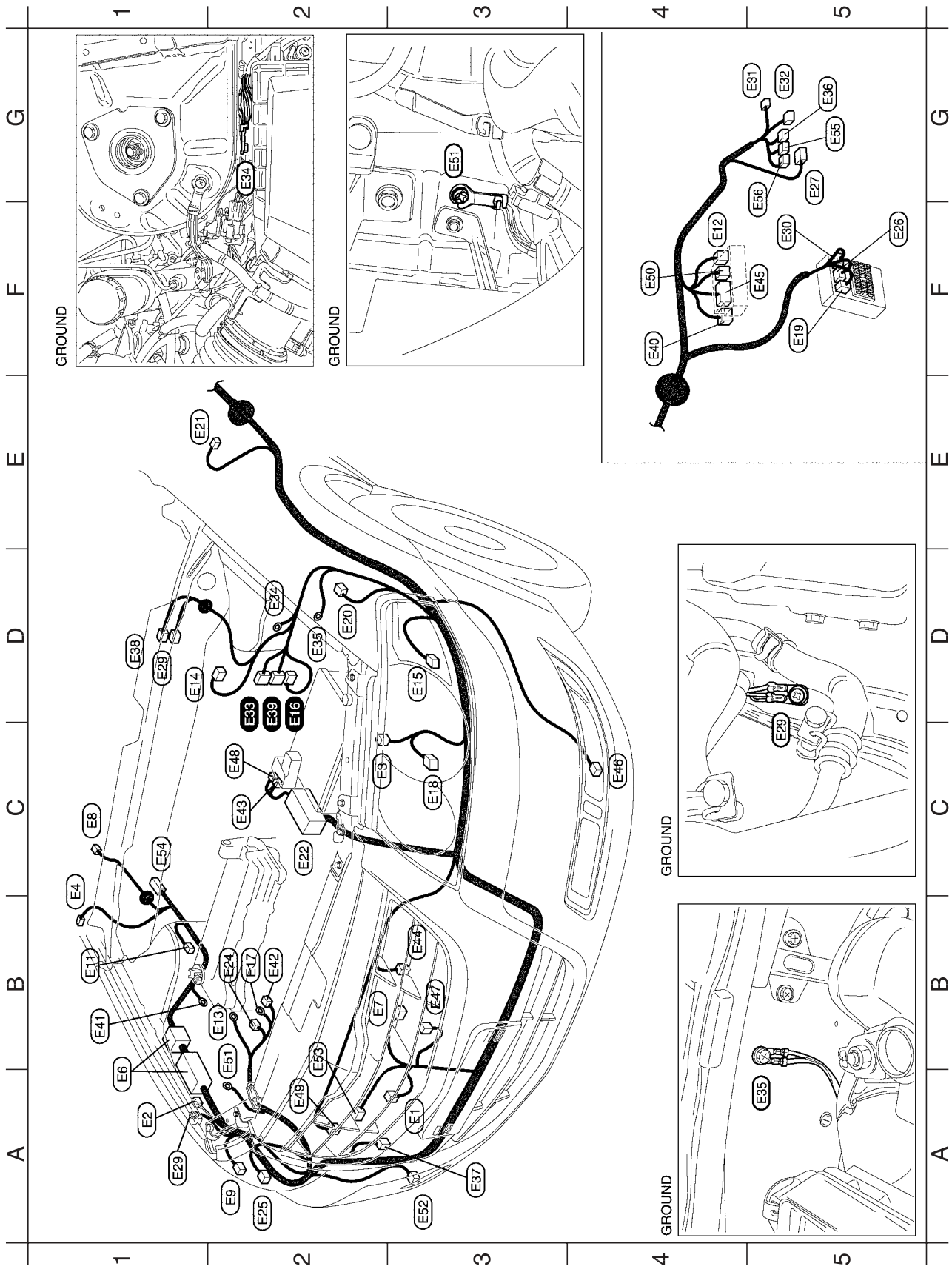
Connector type	Male	Female
● Number of terminals: Less than 4 ● Relay connector		
● Number of terminals: 5 - 8		
● Number of terminals: More than 9		
● Ground terminal or others		

WIRE

▬ : Indicates the thickness of the wire is over 5 mm

— : Indicates the thickness of the wire is below 5 mm

Engine Room Harness



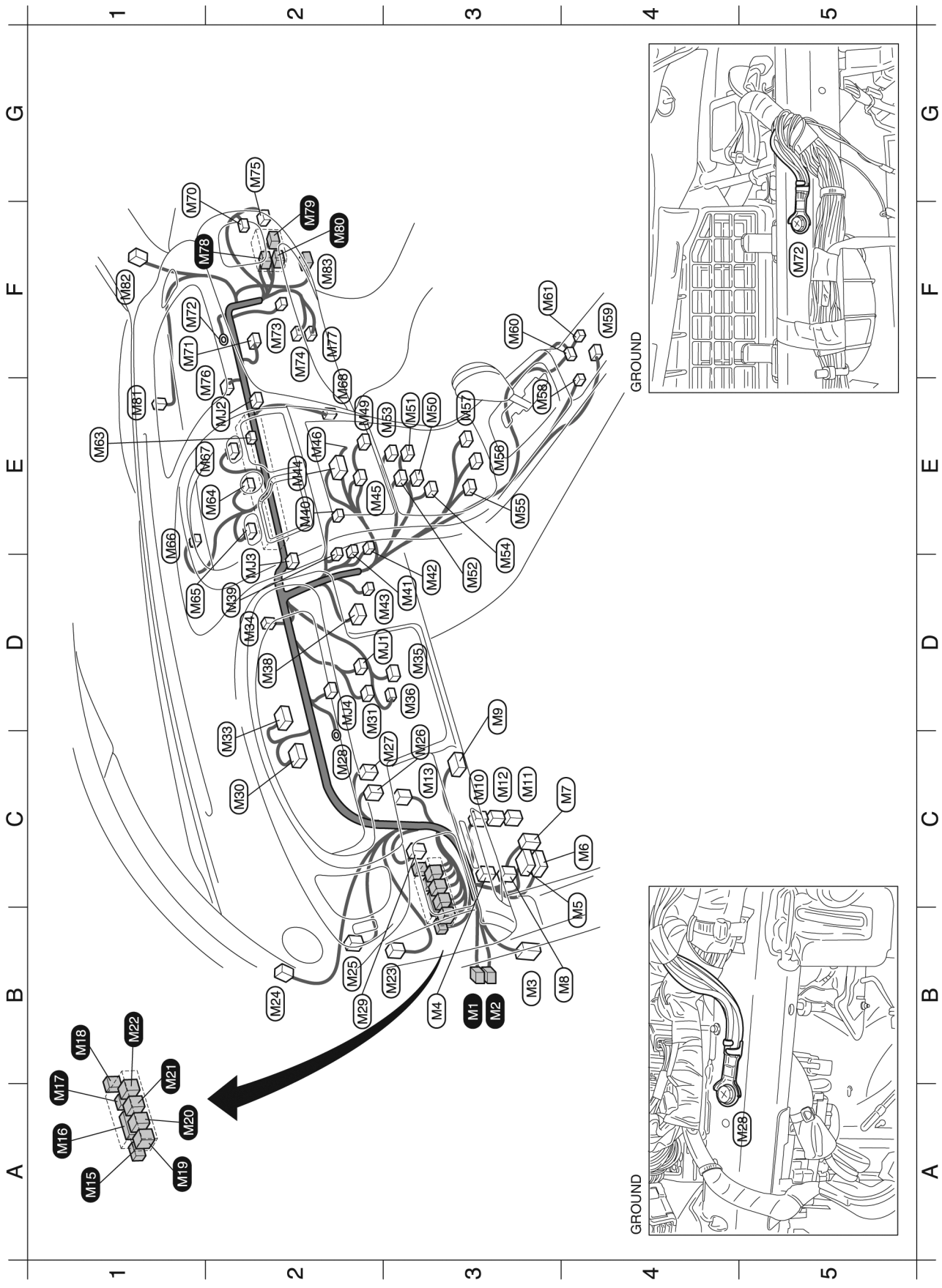
SRIZ006_D1

Engine Room Harness (Continued)

A3	E1	B/3	: AQS SENSOR
A1	E2	GY/2	: WASHER MOTOR
C2	E3	W/2	: HOOD SWITCH
C1	E4	GY/2	: TURN SIGNAL LAMP (SIDE/LEFT)
B2	E6	-	: RELAY BOX
B2	E7	B/2	: AMB SENSOR
C1	E8	W/4	: CONNECTED WITH B101
A2	E9	B/2	: TURN SIGNAL LAMP (FRONT/RIGHT)
B1	E11	GY/2	: WHEEL SENSOR (FRONT/RIGHT)
F2	E12	W/2	: CONNECTED WITH M17
B1	E13	TERMINAL	: ALTERNATOR GROUND
D1	E14	GY/2	: BRAKE FLUID SWITCH
D3	E15	GY/2	: TURN SIGNAL LAMP (FRONT/LEFT)
D2	E16	L/2	: WHEEL SENSOR (FRONT/LEFT)
B2	E17	TERMINAL	: ALTERNATOR 1
C3	E18	B/8	: HEADLAMP-LEFT
F5	E19	W/2	: FUSE BLOCK (J/B)
D2	E20	GY/2	: DROPPING RESISTER
C2	E22	-	: FUSE & FUSIBLE LINK BOX
B2	E24	W/2	: ALTERNATOR 2
A2	E25	B/8	: HEADLAMP-RIGHT
F5	E26	W/6	: FUSE BLOCK (J/B)
G5	E27	W/6	: IGNITION SWITCH
D1	E28	B/6	: WIPER MOTOR
A1	E29	TERMINAL	: BODY GROUND 3-1
F5	E30	W/10	: FUSE BLOCK (J/B)
G5	E31	BR/2	: KEY SWITCH
G5	E32	GY/8	: WIPER SWITCH
D2	E33	GY/8	: CONNECTED WITH S18 (QG 15)
		GY/8	: CONNECTED WITH S43 (QG 16)
D2	E34	TERMINAL	: BODY GROUND 3-2
D2	E35	TERMINAL	: BODY GROUND 3-5
G5	E36	W/3	: FRONT FOG LAMP SWITCH
A3	E37	B/3	: A/C REFRIGERANT PRESSURE SENSOR
D1	E38	GY/2	: DE-ICER
D2	E39	GY/8	: CONNECTED WITH S41
F4	E40	W/16	: CONNECTED WITH M15
B1	E41	TERMINAL	: BODY GROUND 3-4
B2	E42	B/1	: COMPRESSOR
C2	E43	B/1	: BATTERY 2
B2	E44	B/2	: RADIATOR FAN MOTOR 1
F4	E45	W/16	: CONNECTED WITH M16
C4	E46	B/2	: FRONT FOG LAMP-LEFT
B3	E47	B/2	: HORN (LOW)
C2	E48	B/1	: BATTERY 1
A2	E49	B/2	: RADIATOR FAN MOTOR 2
F4	E50	GY/16	: CONNECTED WITH M18
B2	E51	TERMINAL	: BODY GROUND 3-3
A3	E52	B/2	: FRONT FOG LAMP-RIGHT
B2	E53	B/2	: HORN (HIGH)
C1	E54	B/26	: ABS CONTROL UNIT
G5	E55	W/8	: COMBINATION SWITCH
G5	E56	BR/4	: COMBINATION SWITCH

SRIZ007_D1

Main Harness



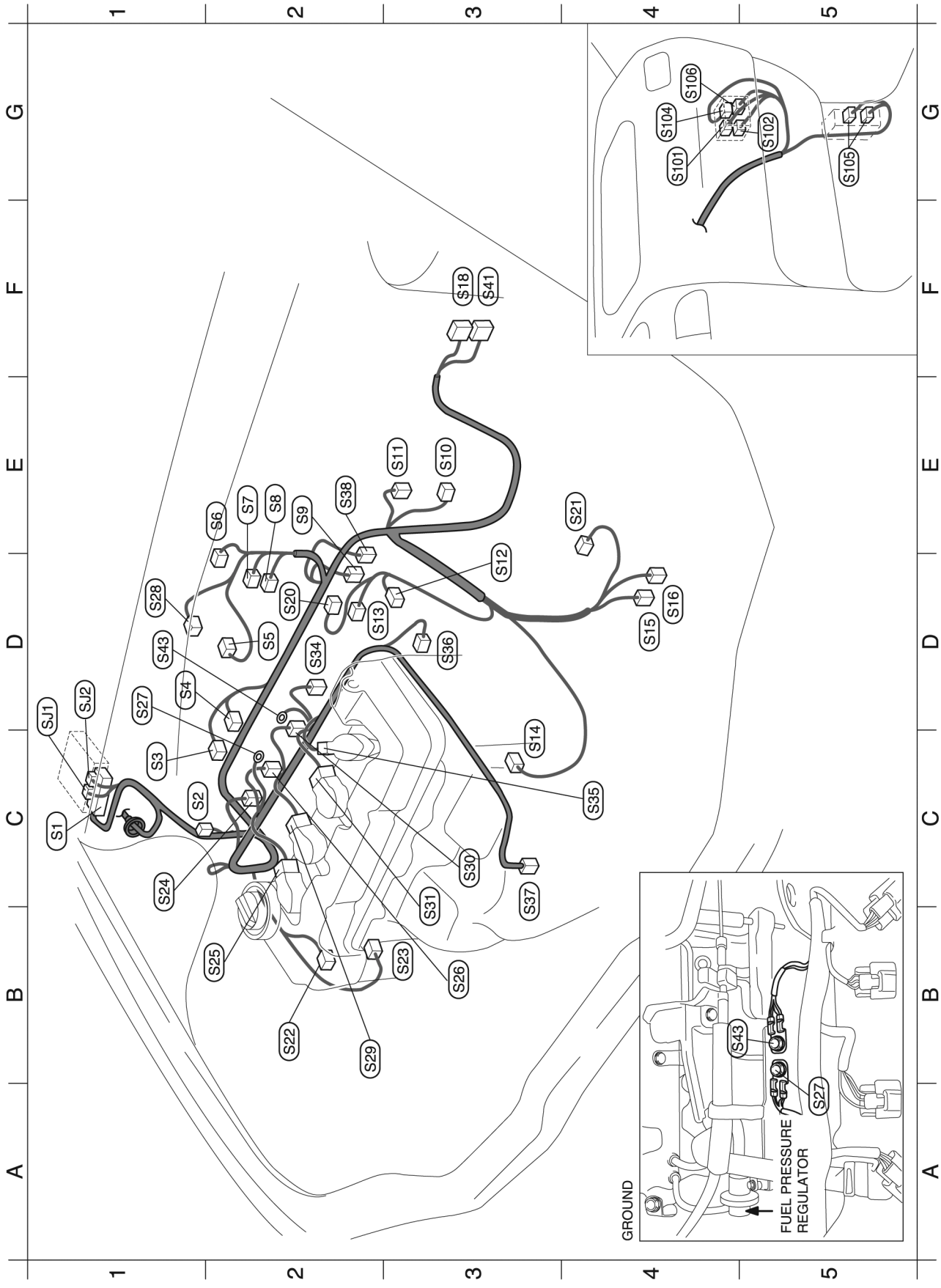
SRIZ008_D1

Main Harness (Continued)

B3	M1	W/16	: CONNECTED WITH S1	C2	M30	GY/40	: METER	E1	M63	B/2	: DIODE
B3	M2	W/12	: CONNECTED WITH S2	D2	M31	BR/2	: MICROPHONE	E2	M64	W/4	: HAZARD WARNING LAMP SWITCH
B3	M3	W/2	: RELAY MODULE	C2	M33	B/40	: METER	D1	M65	W/4	: DOOR LOCK SWITCH
B3	M4	W/2	: CIRCUIT BREAKER	D2	M34	B/1	: GPS ANTENNA	E1	M66	W/4	: DIGITAL CLOCK
B4	M5	W/6	: FUSE BLOCK (J/B)	D3	M35	Y/7	: INFLATOR (DRIVER)	E1	M67	B/6	: POWER SHIFT
C4	M6	W/14	: FUSE BLOCK (J/B)	D3	M36	W/2	: IGNITION KEY ILLUMINATION	E2	M68	BR/2	: INTAKE SENSOR
C4	M7	W/11	: FUSE BLOCK (J/B)	D2	M38	GY/16	: HANDS-FREE UNIT	F1	M70	B/2	: GLOVE BOX SWITCH
C4	M8	L/4	: FOLDING MIRROR RELAY	D2	M39	W/3	: MODE ACTUATOR	F1	M71	Y/2	: INFLATOR (PASSENGER)
C3	M9	B/16	: DIAGNOSIS CONNECTOR	E2	M40	GY/30	: FAN CONTROL AMP	F1	M72	TERMINAL	: BODY GROUND 1-2
C3	M10	L/4	: POWER WINDOW RELAY	D2	M41	GY/6	: ACCELERATOR PEDAL POSITION SENSOR	F2	M73	W/2	: GLOVE BOX LAMP
C3	M11	B/5	: DOOR UNLOCK RELAY	D2	M42	W/3	: AIR MIX ACTUATOR	F2	M74	W/4	: FAN RESISTER
C3	M12	L/4	: REAR FOG RELAY	D2	M43	W/2	: IN-VEHICLE SENSOR	G2	M75	W/4	: SMART CONTROL UNIT
C3	M13	W/6	: DOOR LOCK RELAY	E2	M44	GY/20	: TELEMATICS UNIT	E1	M76	W/3	: INTAKE ACTUATOR
A1	M15	W/16	: CONNECTED WITH E40	E2	M45	W/8	: AUDIO	F2	M77	W/2	: BLOWER MOTOR
A1	M16	W/16	: CONNECTED WITH E45	E2	M46	W/6	: AUDIO	F1	M78	W/16	: CONNECTED WITH S101
A1	M17	W/2	: CONNECTED WITH E12	E4	M49	W/10	: AUDIO	F2	M79	W/12	: CONNECTED WITH S106
B1	M18	GY/16	: CONNECTED WITH E50	E3	M50	GY/20	: AUTO A/C CONTROLLER	F2	M80	W/20	: CONNECTED WITH S102 (QG 16)
A1	M19	W/12	: CONNECTED WITH B1	E3	M51	GY/16	: AUTO A/C CONTROLLER			W/8	: CONNECTED WITH S102 (QG 15)
A1	M20	W/20	: CONNECTED WITH B2	D3	M52	W/6	: FAN SWITCH	E1	M81	B/2	: SUNLOAD SENSOR
A1	M21	W/6	: CONNECTED WITH B4	E3	M53	W/20	: MANUAL A/C CONTROLLER	F1	M82	W/2	: SPEAKER-LOUD (RIGHT)
B1	M22	BR/16	: CONNECTED WITH B3	D3	M54	W/3	: BUZZER (THEFT WARNING)	F2	M83	W/10	: CONNECTED WITH D21
B3	M23	W/18	: CONNECTED WITH R1	E3	M55	B/1	: CIGARETTE LIGHTER ILLUMINATION	D2	MJ1	W/6	: JOINT CONNECTOR 1
B2	M24	W/2	: SPEAKER-LOUD (LEFT)	E3	M56	B/2	: CIGARETTE LIGHTER	E2	MJ2	W/6	: JOINT CONNECTOR 2
B2	M25	W/6	: AUTO LIGHT SENSOR	E3	M57	W/2	: ASH TRAY ILLUMINATION	D2	MJ3	W/20	: JOINT CONNECTOR 3
C3	M26	L/2	: CLUTCH INTERRUPT SWITCH	E3	M58	W/2	: EAR JACK	D2	MJ4	W/20	: JOINT CONNECTOR 4
C3	M27	B/2	: STOP LAMP SWITCH	F4	M59	GY/20	: TELEMATICS CABLE ASSEMBLY				
C2	M28	TERMINAL	: BODY GROUND 1-1	F3	M60	W/14	: A/T DEVICE				
B2	M29	W/10	: MIRROR SWITCH	F3	M61	W/2	: POWER SOCKET				

SRIZ009_D1

Engine Control Harness (QG15)



SRIZ010_D1

Engine Control Harness (QG15) (Continued)

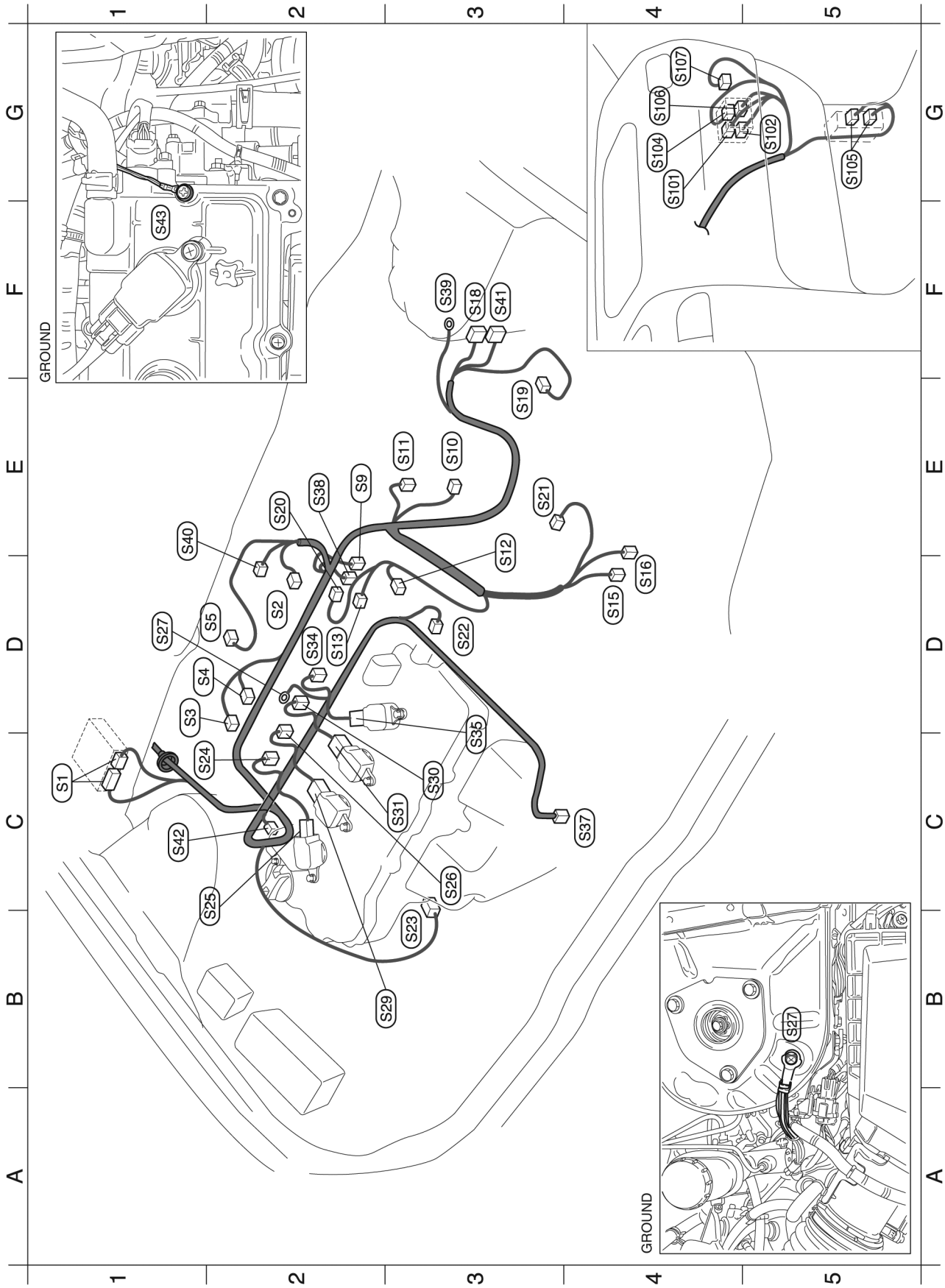
C1 (S1) B/81 : ENGINE CONTROL UNT
C2 (S2) W/2 : CONDENSER 1
C1 (S3) B/1 : OIL PRESSURE SWITCH
D1 (S4) B/2 : KNOCK SENSOR
D2 (S5) L/2 : CANISTER SOLENOID
E2 (S6) B/3 : ISC VALVE
E2 (S7) B/3 : THROTTLE POSITION SENSOR
E2 (S9) B/3 : POWERSTEERING SWITCH
E3 (S10) GY/2 : VEHICLE SPEED SENSOR
E3 (S11) BR/3 : REVOLUTION SENSOR
D3 (S12) GY/1 : STARTER MOTOR
D2 (S13) B/3 : POS SENSOR
D4 (S15) B/10 : INHIBITOR SWITCH (A/T VEHICLE)
D4 (S16) B/8 : ATM SOLENOID (A/T VEHICLE)
F3 (S18) GY/8 : CONNECTED WITH (E33)
D2 (S20) B/2 : NEUTRAL POSITION SWITCH (M/T VEHICLE)
E4 (S21) B/2 : REVERSE LAMP SWITCH (M/T VEHICLE)

B2 (S22) B/3 : PHASE SENSOR
B3 (S23) GY/2 : COOLANT TEMPERATURE SENSOR
C1 (S24) GY/2 : INJECTOR #1
B2 (S25) GY/3 : IGNITION COIL #1
B3 (S26) GY/2 : INJECTOR #2
D1 (S27) TERMINAL : ENGINE GROUND 1-1
D1 (S28) GY/4 : MAP SENSOR
B2 (S29) GY/3 : IGNITION COIL #2
C3 (S30) GY/2 : INJECTOR #3
B3 (S31) GY/3 : IGNITION COIL #3
D2 (S34) GY/2 : INJECTOR #4
C4 (S35) GY/3 : IGNITION COIL #4
B3 (S37) B/4 : OXYGEN SENSOR (FRONT-RIGHT)
E2 (S38) B/4 : OXYGEN SENSOR (REAR-RIGHT)
F3 (S41) GY/9 : CONNECTED WITH E39
D1 (S43) TERMINAL : ENGINE GROUND 1-2

G4 (S101) W/16 : CONNECTED WITH (M78)
G5 (S102) W/12 : CONNECTED WITH (M80)
G4 (S104) BR/6 : EGI RELAY
G5 (S105) GY/24 : A/T CONTROL UNIT
W/24 : A/T CONTROL UNIT
G4 (S106) W/20 : CONNECTED WITH (M79)
D1 (SJ1) L/20 : JOINT CONNECTOR 1
D1 (SJ2) W/20 : JOINT CONNECTOR 2

SRIZ011_D1

Engine Control Harness (QG16)



SRIZ020_D1

Engine Control Harness (QG16) (Continued)

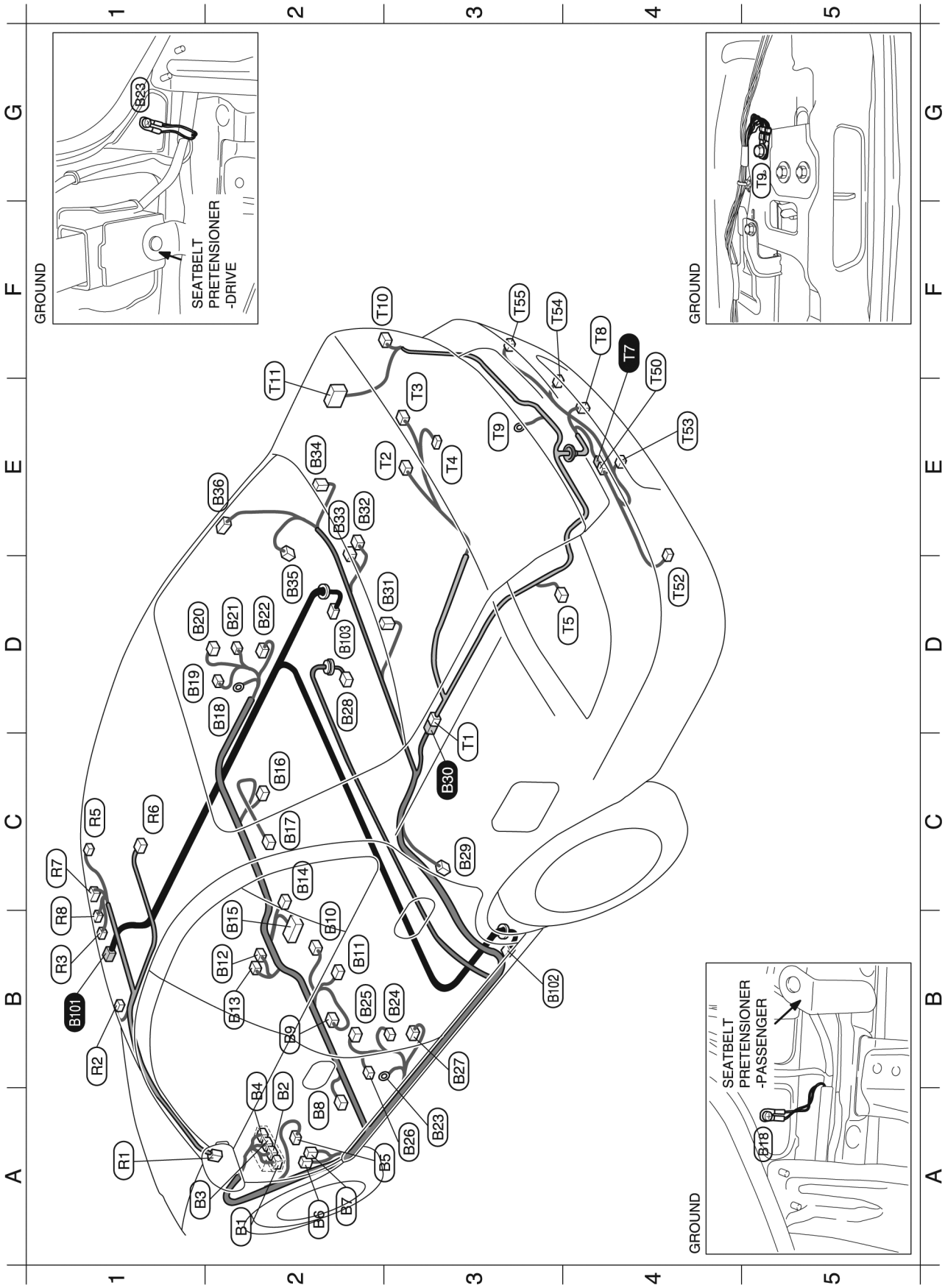
C1 (S1) B/81 : ENGINE CONTROL UNIT
B/32 : ENGINE CONTROL UNIT
C2 (S2) W/2 : CONDENSER 1
C1 (S3) B/1 : OIL PRESSURE SWITCH
D1 (S4) B/2 : KNOCK SENSOR
D1 (S5) L/2 : CANISTER SOLENOID
E2 (S9) B/3 : POWERSTEERING SWITCH
E3 (S10) GY/2 : VEHICLE SPEED SENSOR
E3 (S11) BR/3 : REVOLUTION SENSOR
D3 (S12) GY/1 : STARTER MOTOR
D2 (S13) B/3 : POS SENSOR
D4 (S15) B/10 : INHIBITOR SWITCH (A/T VEHICLE)
D4 (S16) B/8 : ATM SOLENOID (A/T VEHICLE)
F3 (S18) GY/8 : CONNECTED WITH (E33)
E3 (S19) B/6 : AIR FLOW METER
D2 (S20) B/2 : NEUTRAL POSITION SWITCH (M/T VEHICLE)
E4 (S21) B/2 : REVERSE LAMP SWITCH (M/T VEHICLE)

B2 (S22) B/3 : PHASE SENSOR
B2 (S23) GY/2 : COOLANT TEMPERATURE SENSOR
B1 (S24) GY/2 : INJECTOR #1
B1 (S25) GY/3 : IGNITION COIL #1
B3 (S26) GY/2 : INJECTOR #2
D1 (S27) TERMINAL : ENGINE GROUND 1-1
B2 (S29) GY/3 : IGNITION COIL #2
C3 (S30) GY/2 : INJECTOR #3
B3 (S31) GY/3 : IGNITION COIL #3
D2 (S34) GY/2 : INJECTOR #4
C4 (S35) GY/3 : IGNITION COIL #4
B3 (S37) B/4 : OXYGEN SENSOR (FRONT-RIGHT)
D2 (S38) B/4 : OXYGEN SENSOR (REAR-RIGHT)
E2 (S40) G/6 : ELECTRONICALLY CONTROLLED THROTTLE
C4 (S41) GY/9 : CONNECTED WITH (E39)
D3 (S42) G/2 : ENGINE GROUND 1-2

G4 (S101) W/16 : CONNECTED WITH (M78)
G5 (S102) W/12 : CONNECTED WITH (M80)
G4 (S104) BR/6 : EGI RELAY
G5 (S105) GY/24 : A/T CONTROL UNIT
W/24 : A/T CONTROL UNIT
G4 (S106) W/20 : CONNECTED WITH (M79)
G4 (S107) L/4 : ELECTRONICALLY CONTROLLED THROTTLE RELAY
C1 (SJ1) L/20 : JOINT CONNECTOR 1
C1 (SJ2) W/20 : JOINT CONNECTOR 2

SRIZ021_D1

Body, Body No. 2, Tail and Room Lamp Harness



SRIZ012_D1

Body, Body No. 2, Tail and Room Lamp Harness (Continued)

A2 (B1) W/12 : CONNECTED WITH (M19)
A2 (B2) W/20 : CONNECTED WITH (M20)
A1 (B3) BR/16 : CONNECTED WITH (M22)
A2 (B4) W/6 : CONNECTED WITH (M21)
A2 (B5) W/6 : FUSE BLOCK (J/B)
A2 (B6) L/2 : FUEL PUMP RELAY
A2 (B7) L/2 : REAR DEFOGGER RELAY
A2 (B8) B : DIODE
B2 (B9) B : SIDE INFLATOR LEFT
B2 (B10) W/3 : BUCKLE SWITCH (DRIVER)
B2 (B11) W/3 : HEATER SEAT-LEFT
B2 (B12) W/4 : HEATER SEAT SWITCH (RIGHT)
B2 (B13) L/4 : HEATER SEAT SWITCH (LEFT)
C2 (B14) B/1 : PARKING BRAKE SWITCH
B2 (B15) B : AIRBAG UNIT
C2 (B16) W/3 : HEATER SEAT SWITCH (RIGHT)
C2 (B17) B : SIDE INFLATOR (RIGHT)
D2 (B18) TERMINAL : BODY GROUND 4-2
D1 (B19) W/3 : DOOR SWITCH (PASSENGER)
D1 (B20) W/10 : CONNECTED WITH (D41)
D2 (B21) Y/2 : PRETENSIONER (PASSENGER)
D2 (B22) B : SIDE SENSOR RIGHT
A3 (B23) TERMINAL : BODY GROUND 4-1

B3 (B24) W/3 : DOOR SWITCH (DRIVER)
B2 (B25) W/10 : CONNECTED WITH (D51)
A3 (B26) BY/2 : PRETENSIONER (DRIVER)
B3 (B27) B/2 : SIDE SENSOR LEFT
D2 (B28) GY/5 : FUEL RESERVOIR
C3 (B29) W/1 : REAR DOOR SWITCH LEFT
C3 (B30) W/24 : CONNECTED WITH T1
D3 (B31) BR/2 : REAR SPEAKER LEFT
E2 (B32) GY/2 : HIGH-MOUNTED STOP LAMP
E2 (B33) W/2 : TRUNK ROOM LAMP
E2 (B34) BR/2 : SPEAKER (REAR/RIGHT)
D2 (B35) W/1 : DOOR SWITCH (REAR/RIGHT)
E2 (B36) B/1 : REAR DEFOGGER CONDENSER
B1 (B101) W/4 : CONNECTED WITH (E8)
B2 (B102) L/2 : WHEEL SENSOR (REAR/LEFT)
D2 (B103) GY/2 : WHEEL SENSOR (REAR/RIGHT)

C3 (T1) W/24 : CONNECTED WITH (B30)
E3 (T2) BR/2 : HIGH-MOUNTED STOP LAMP
E3 (T3) W/2 : TRUNK LAMP SWITCH
E3 (T4) B/2 : TRUNK OPEN ACTUATOR
D3 (T5) W/6 : COMBINATION LAMP (REAR/LEFT)
F4 (T7) B/10 : CONNECTED WITH (T50)
F4 (T8) GY/2 : LICENSE PLATE LAMP
E3 (T9) TERMINAL : BODY GROUND 5-1
F2 (T10) W/6 : COMBINATION LAMP (REAR/RIGHT)
E2 (T11) B : PARKING AID CONTROL UNIT

E4 (T50) B/10 : CONNECTED WITH (T7)
D4 (T52) B/4 : PARKING AID SENSOR (SIDE/LEFT)
E4 (T53) B/4 : PARKING AID SENSOR (REAR/LEFT)
F3 (T54) B/4 : PARKING AID SENSOR (REAR/RIGHT)
F3 (T55) B/4 : PARKING AID SENSOR (SIDE/RIGHT)

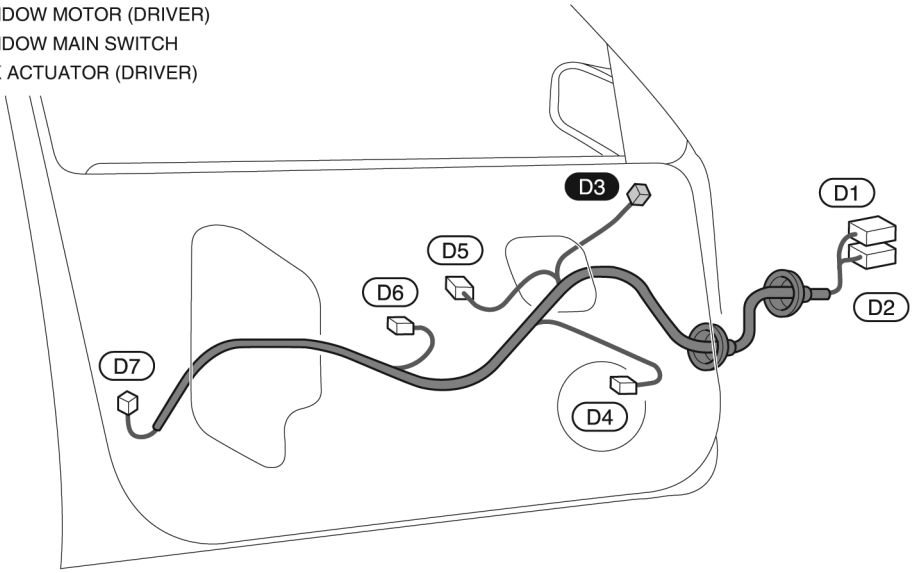
A1 (R1) W/10 : CONNECTED WITH (M23)
B1 (R2) W/2 : VANITY MIRROR LAMP (LEFT)
B1 (R3) W/2 : MAP LAMP
C1 (R5) W/2 : VANITY MIRROR LAMP (RIGHT)
C1 (R6) W/2 : ROOM LAMP
C1 (R7) W/3 : SUNROOP
B1 (R8) W/6 : SUNROOP SWITCH

SRIZ013_D1

Door Harness

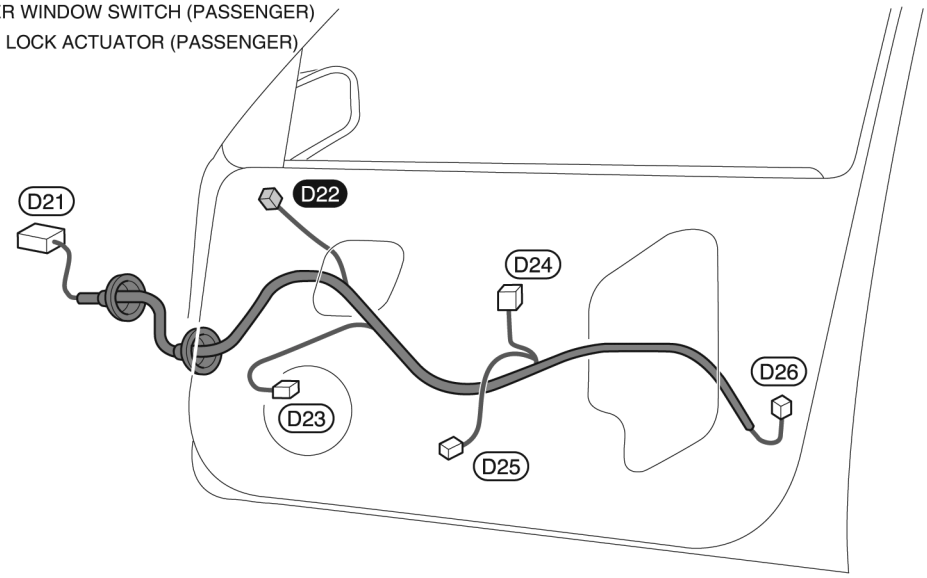
FRONT DOOR HARNESS (DRIVER)

D1 W/16 : CONNECTED WITH M19
D2 W/12 : CONNECTED WITH M12
D3 B/8 : DOOR MIRROR LEFT
D4 BR/2 : DOOR SPEAKER LEFT
D5 W/6 : POWER WINDOW MOTOR (DRIVER)
D6 W/16 : POWER WINDOW MAIN SWITCH
D7 GY/4 : DOOR LOCK ACTUATOR (DRIVER)



FRONT DOOR HARNESS (PASSENGER)

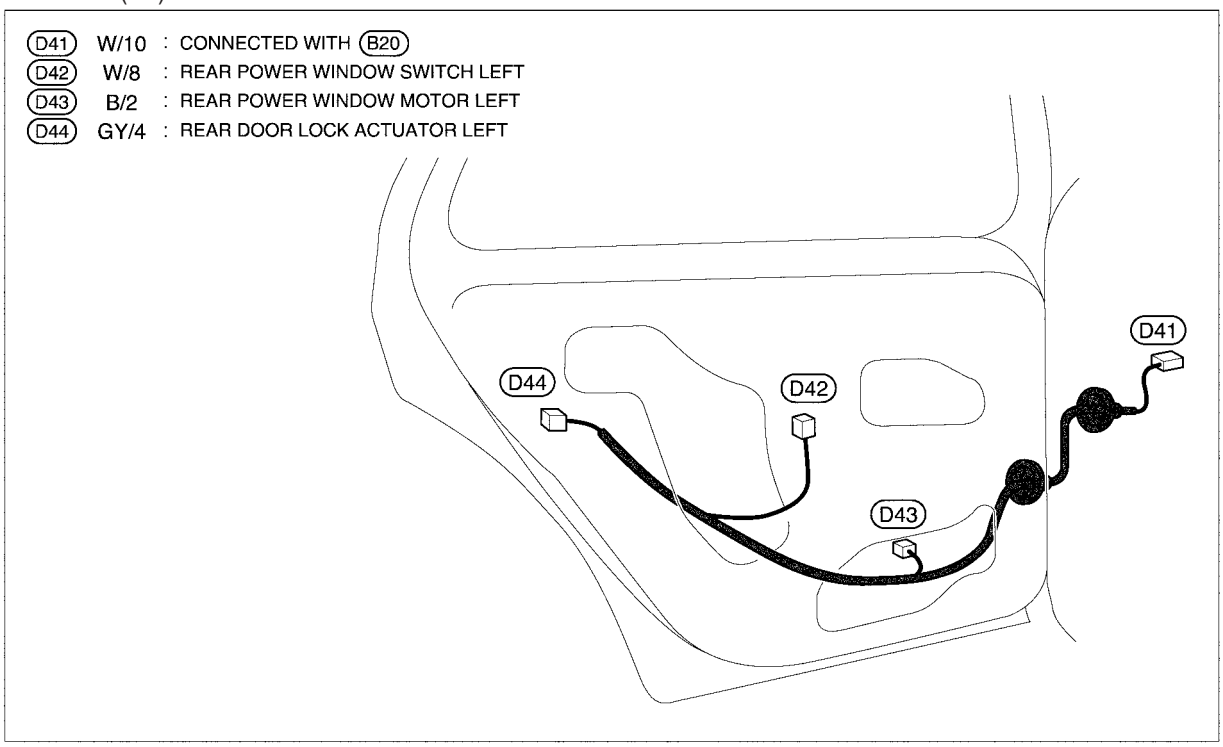
D21 W/18 : CONNECTED WITH M83
D22 B/8 : DOOR MIRROR RIGHT
D23 BR/2 : DOOR SPEAKER RIGHT
D24 B/2 : POWER WINDOW MOTOR (PASSENGER)
D25 W/8 : POWER WINDOW SWITCH (PASSENGER)
D26 GY/4 : DOOR LOCK ACTUATOR (PASSENGER)



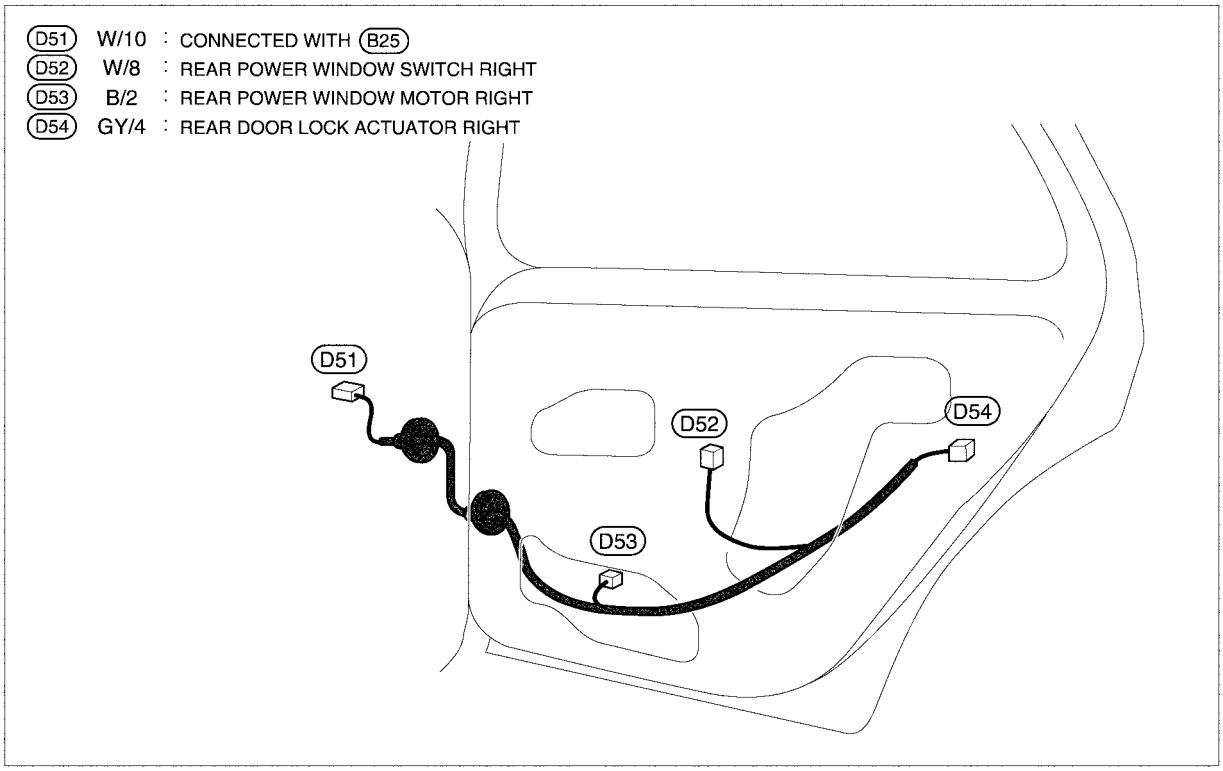
SRIZ014_D1

Door Harness

Rear door (LH)

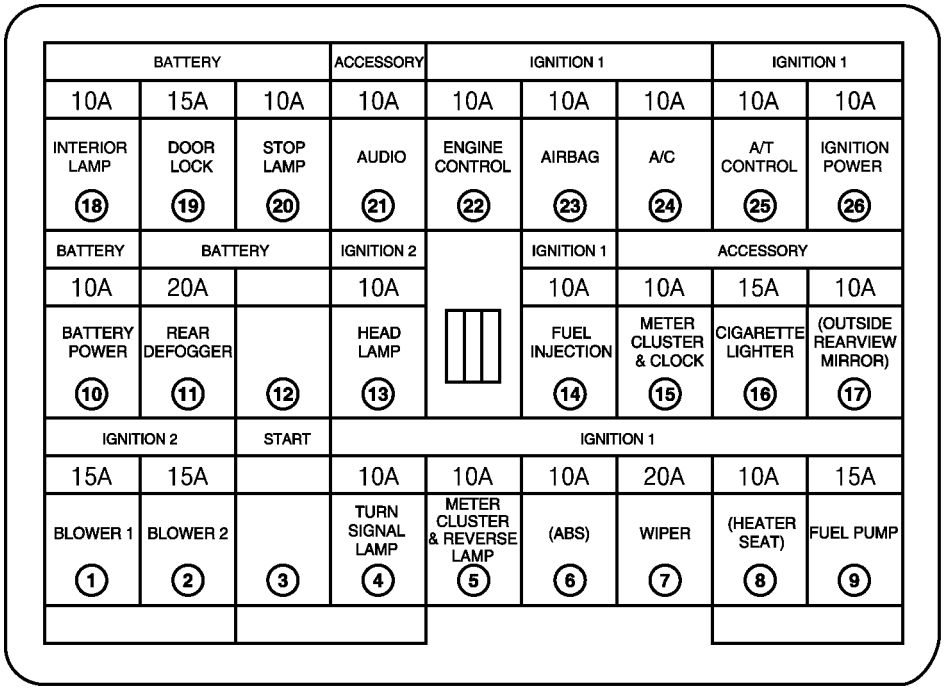


Rear door (RH)

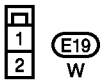


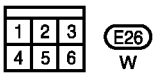
SRIZ015_D1

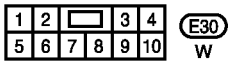
Fuse Block

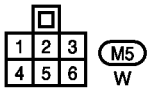


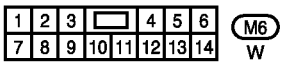
Connector

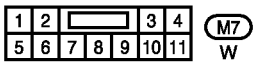


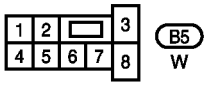






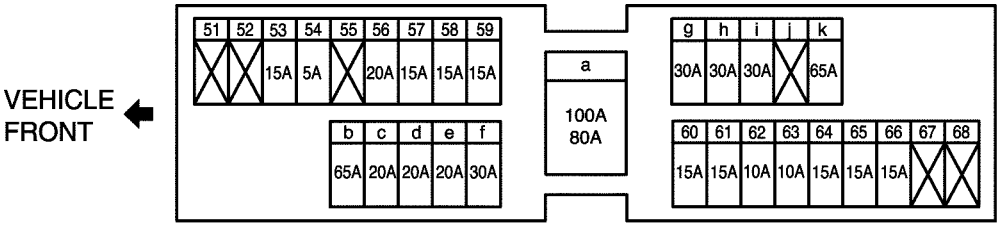






SRIZ016_D1

Fuse & Fusible Link Box



E22 FUSE & FUSIBLE LINK BOX

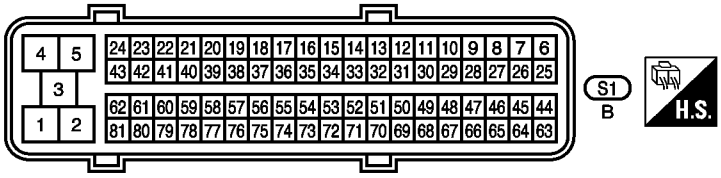
51 : -
52 : -
53 : WIPER HEATED - WIRE
54 : ABS SOLENOID 2
55 : -
56 : METER CLUSTER
57 : FOG LAMP
58 : HEADLAMP (HIGH)
59 : HEADLAMP (LOW)
60 : IGNITION COIL #1
61 : AUDIO
62 : ENGINE CONTROL
63 : TAIL LAMP
64 : ELECTRICALLY CONTROLLED THROTTLE
65 : HORN
66 : POWER SOCKET
67 : -
68 : -

a : ALTERNATOR POWER
b : BATTERY & IGNITION 1
c : ABS SOLENOID 1
d : ABS MOTOR 1
e : ABS MOTOR 2
f : IGNITION SWITCH
g : RADIATOR FAN MOTOR 1
h : RADIATOR FAN MOTOR 2
i : POWER WINDOW
j : -
k : BATTERY & IGNITION 2

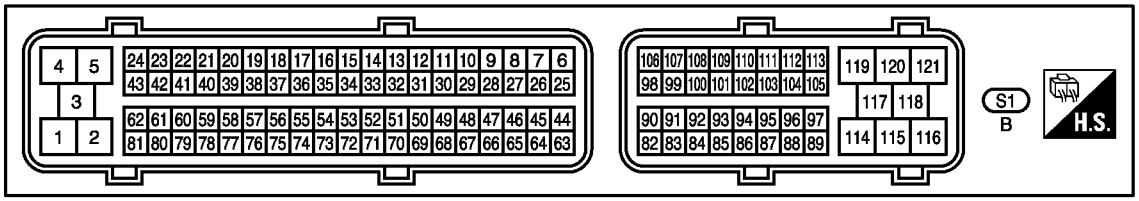
SRIZ017_D1

Terminal Arrangement

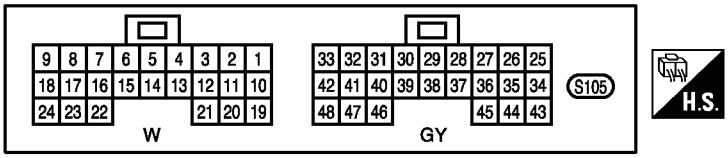
ENGINE CONTROL UNIT : QG 15



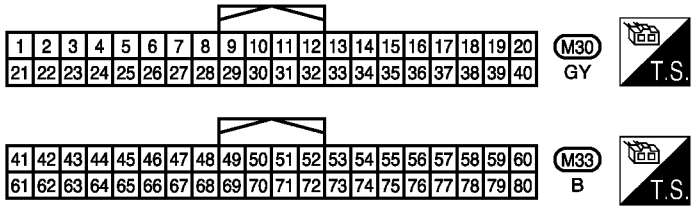
ENGINE CONTROL UNIT : QG 16



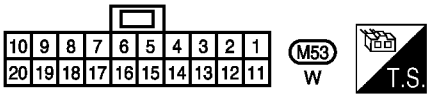
A/T CONTROL UNIT



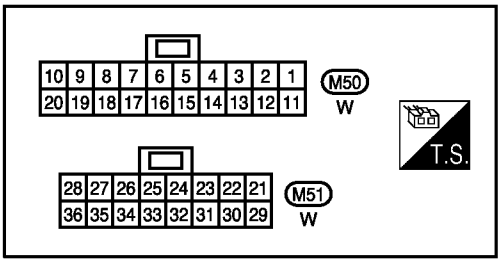
METER



AUTO A/C CONTROLLER



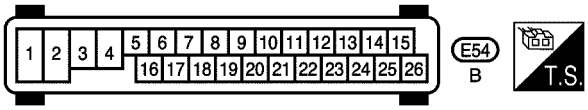
AUTO A/C CONTROLLER



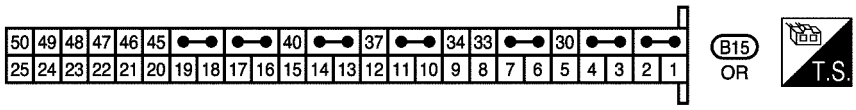
SRIZ018_D1

Terminal Arrangement

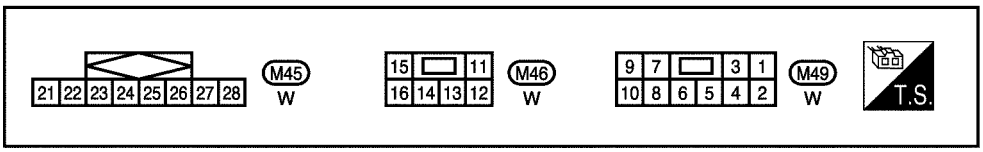
ABS CONTROL UNIT



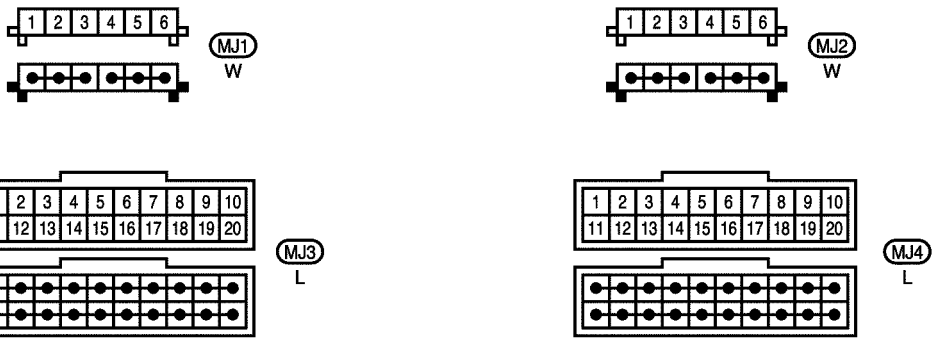
AIRBAG CONTROL UNIT



AUDIO



JOINT CONNECTOR



SRIZ019_D1