To open the menu
please click on the icon
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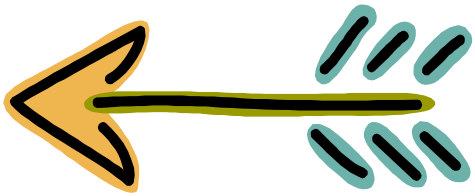
of this page.



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RANGER Body Measurement Chart Manual

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PRINTED IN THAILAND, DECEMBER 2005
F340–20–05L

FOREWORD

This manual has been prepared to provide information covering normal service repairs and maintenance for the Ranger.

As all information in this manual was the best available at the time of printing, vehicle specification and other information will be updated in Service Information.

Ford Motor Company

APPLICATION:
This manual is applicable to vehicles beginning with the Vehicle Identification Numbers (VIN), and related materials shown on the following page.

GENERAL INFORMATION

00
SECTION

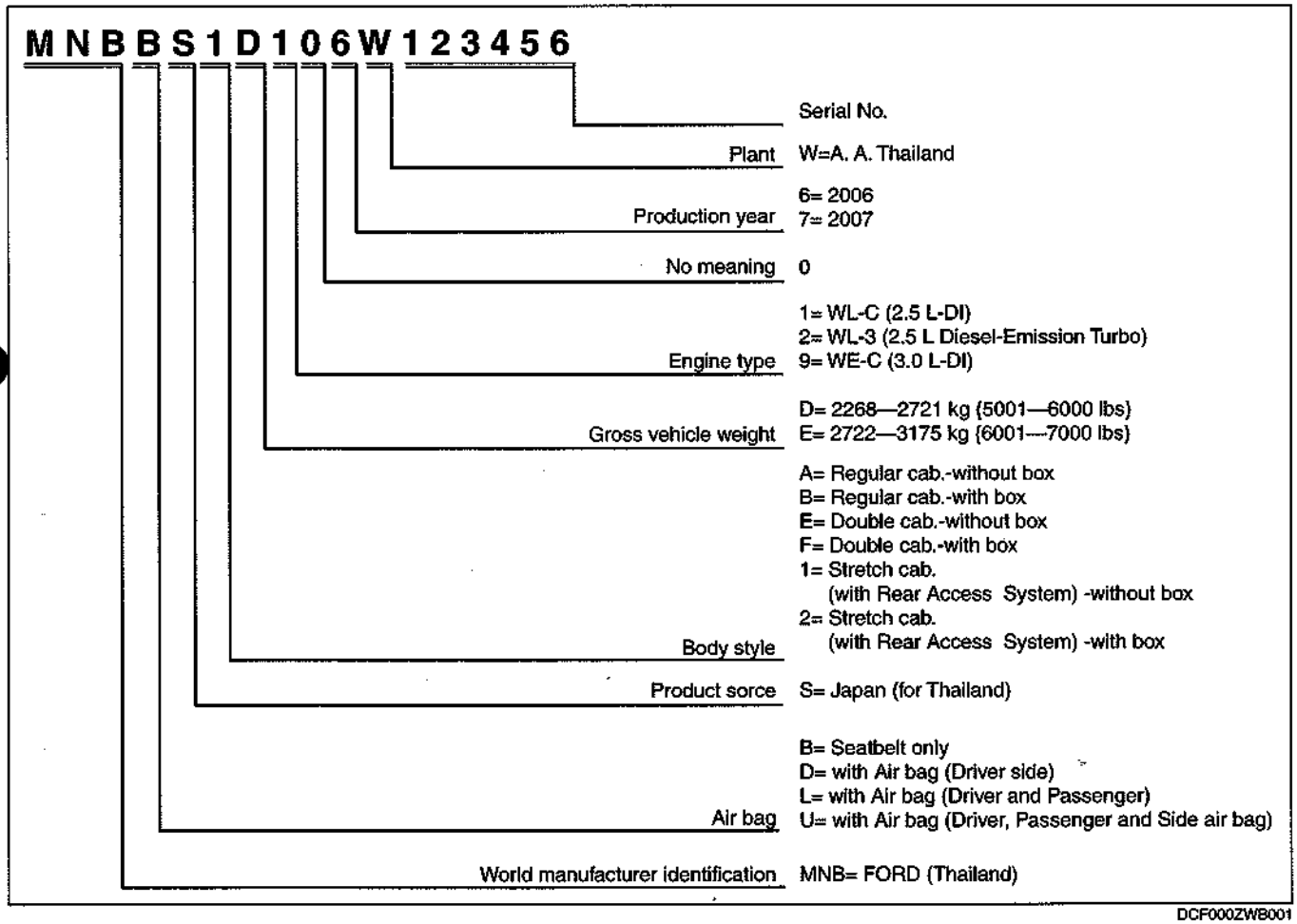
GENERAL INFORMATION . . . 00-00

00–00 GENERAL INFORMATION

VEHICLE IDENTIFICATION NUMBER (VIN) CODE 00–00–1
VEHICLE IDENTIFICATION NUMBERS (VIN) 00–00–1
HOW TO USE THIS MANUAL 00–00–2
ABBREVIATION 00–00–4

VEHICLE IDENTIFICATION NUMBER (VIN) CODE

DCF000000000B05



DCF000ZWB001

HOW TO USE THIS MANUAL

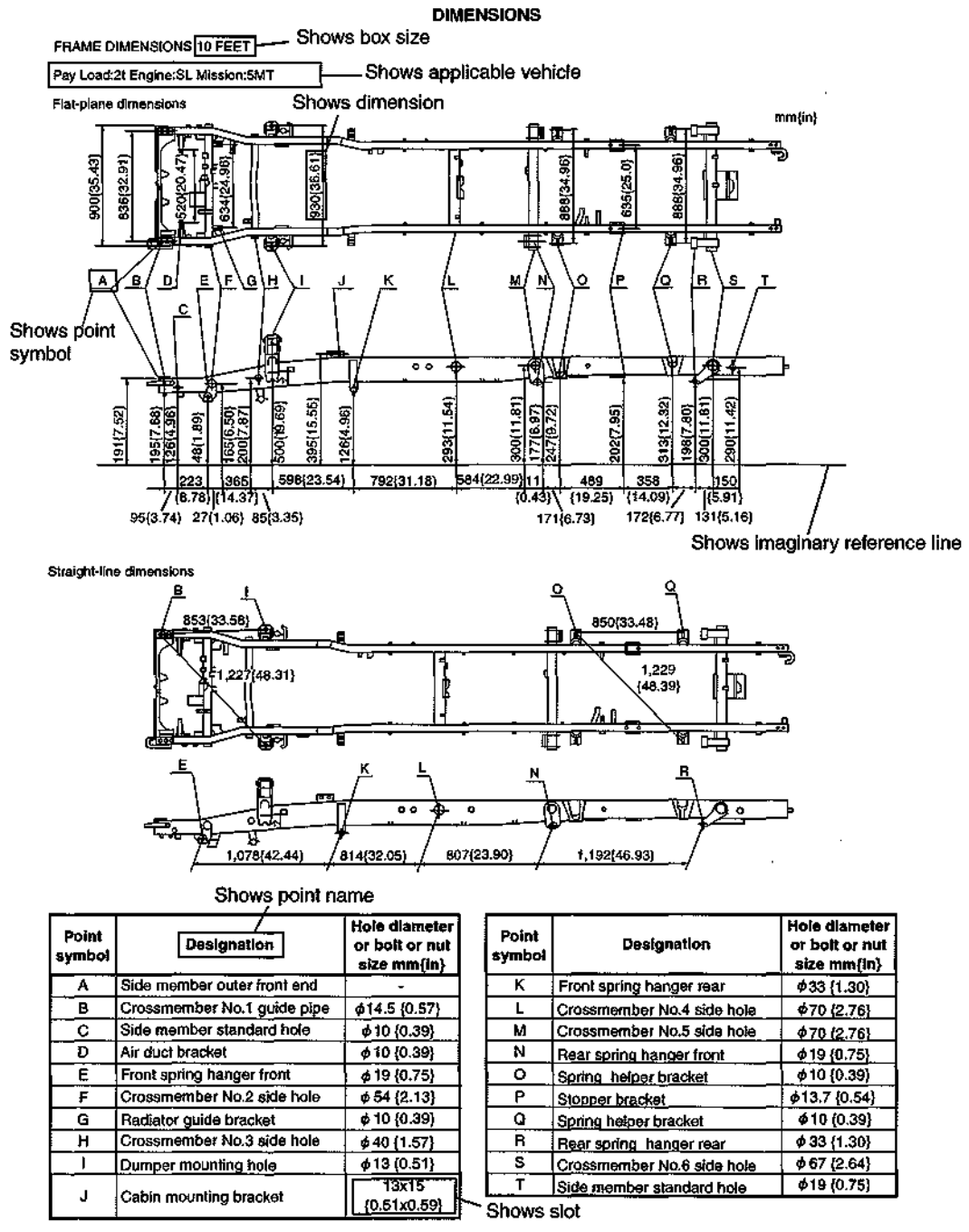
DCF000000000B03

This manual contains frame and cabin dimensions. An explanation of how to read the dimensional drawing is given below.

How To Read Frame Dimensions

- Frame dimensions are the dimensions measured by projecting certain reference points onto a plane surface.
- When there are no specific indications, the sta ndard points and dimensions are symmetrical in regard to the center of the vehicle.
- The hypothetical lines may differ according to the vehicle model.
- The outline drawing shows the figure that projected vehicle from the upper side.

Example



Point symbol	Designation	Hole diameter or bolt or nut size mm{in}
A	Side member outer front end	-
B	Crossmember No.1 guide pipe	ϕ14.5 {0.57}
C	Side member standard hole	ϕ10 {0.39}
D	Air duct bracket	ϕ10 {0.39}
E	Front spring hanger front	ϕ19 {0.75}
F	Crossmember No.2 side hole	ϕ54 {2.13}
G	Radiator guide bracket	ϕ10 {0.39}
H	Crossmember No.3 side hole	ϕ40 {1.57}
I	Dumper mounting hole	ϕ13 {0.51}
J	Cabin mounting bracket	13x15 {0.51x0.59}

Point symbol	Designation	Hole diameter or bolt or nut size mm{in}
K	Front spring hanger rear	ϕ33 {1.30}
L	Crossmember No.4 side hole	ϕ70 {2.76}
M	Crossmember No.5 side hole	ϕ70 {2.76}
N	Rear spring hanger front	ϕ19 {0.75}
O	Spring helper bracket	ϕ10 {0.39}
P	Stopper bracket	ϕ13.7 {0.54}
Q	Spring helper bracket	ϕ10 {0.39}
R	Rear spring hanger rear	ϕ33 {1.30}
S	Crossmember No.6 side hole	ϕ67 {2.64}
T	Side member standard hole	ϕ19 {0.75}

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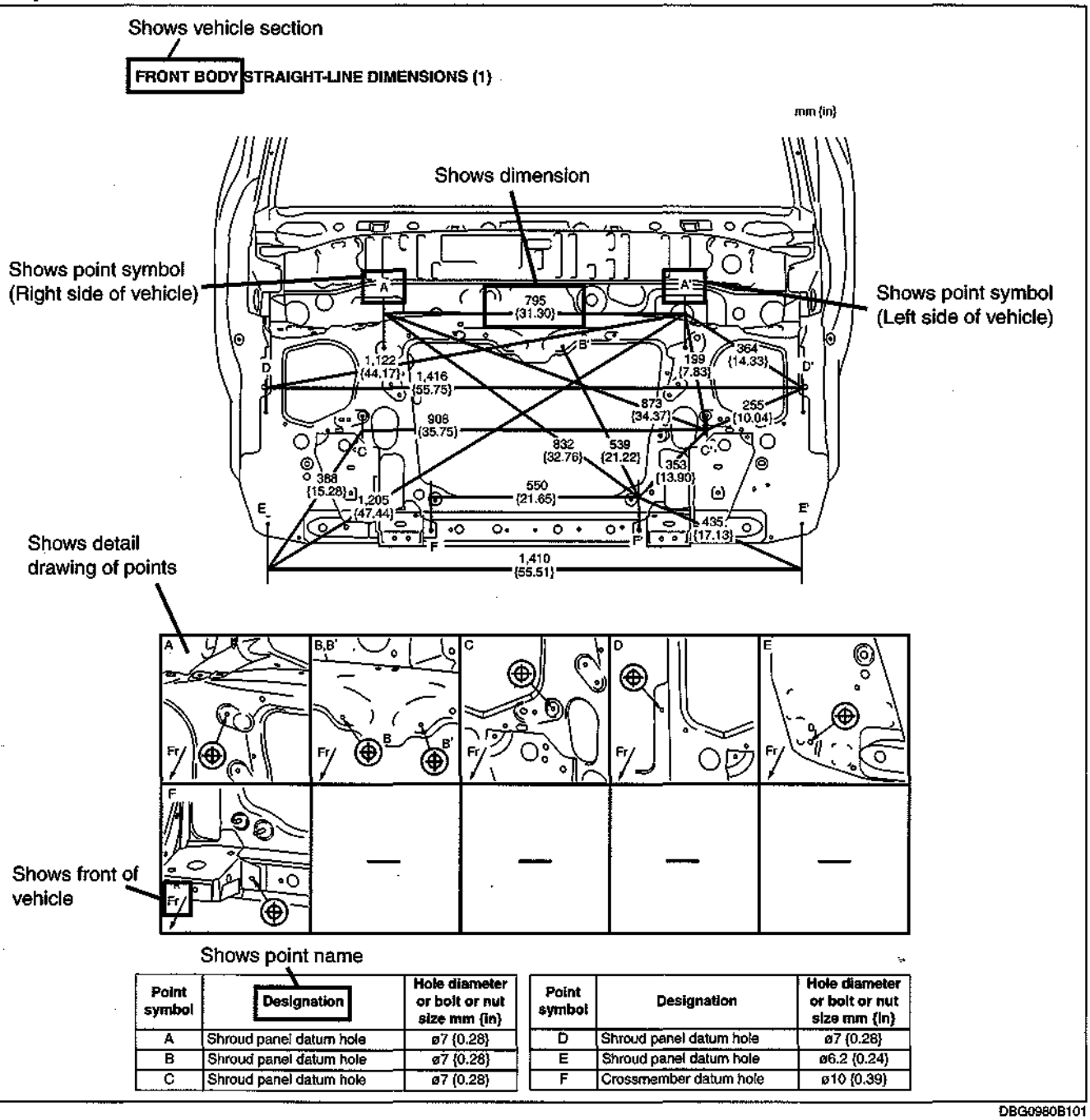
How To Rear Cabin Dimensions

- Cabin dimensions are the actual dimensions between two standard points.
- When there are no specific indications, the standard points and dimensions are symmetrical in regard to the center of the vehicle.

Example



Point symbol	Designation	Hole diameter or bolt or nut size mm {in}
A	Shroud panel datum hole	ø7 {0.28}
B	Shroud panel datum hole	ø7 {0.28}
C	Shroud panel datum hole	ø7 {0.28}

Point symbol	Designation	Hole diameter or bolt or nut size mm {in}
D	Shroud panel datum hole	ø7 {0.28}
E	Shroud panel datum hole	ø6.2 {0.24}
F	Crossmember datum hole	ø10 {0.39}

DBG0980B101

Symbols of Body Dimensions

- The following 8 symbols are used to indicate the standard points.

SYMBOL	MEANING
	Center of circular hole
	Center elliptical hole
	Notch
	Panel seam, bead, etc.

SYMBOL	MEANING
(arrow only)	Bolt tip
	Center of rectangular-shaped hole
	Edge of rectangular-shaped hole

MZZ2010B016

ABBREVIATION

DCF000000000B04

CM	Control module
Ctr	Center
DSC	Dynamic stability control
Fr	Front
HU	Hydraulic unit
LH	Left
M	Metallic
MC	Mica
RH	Right
Rr	Rear

BODY & ACCESSORIES

09
SECTION

BODY STRUCTURE
[DIMENSIONS] 09-80D

80D

09–80D BODY STRUCTURE [DIMENSIONS]

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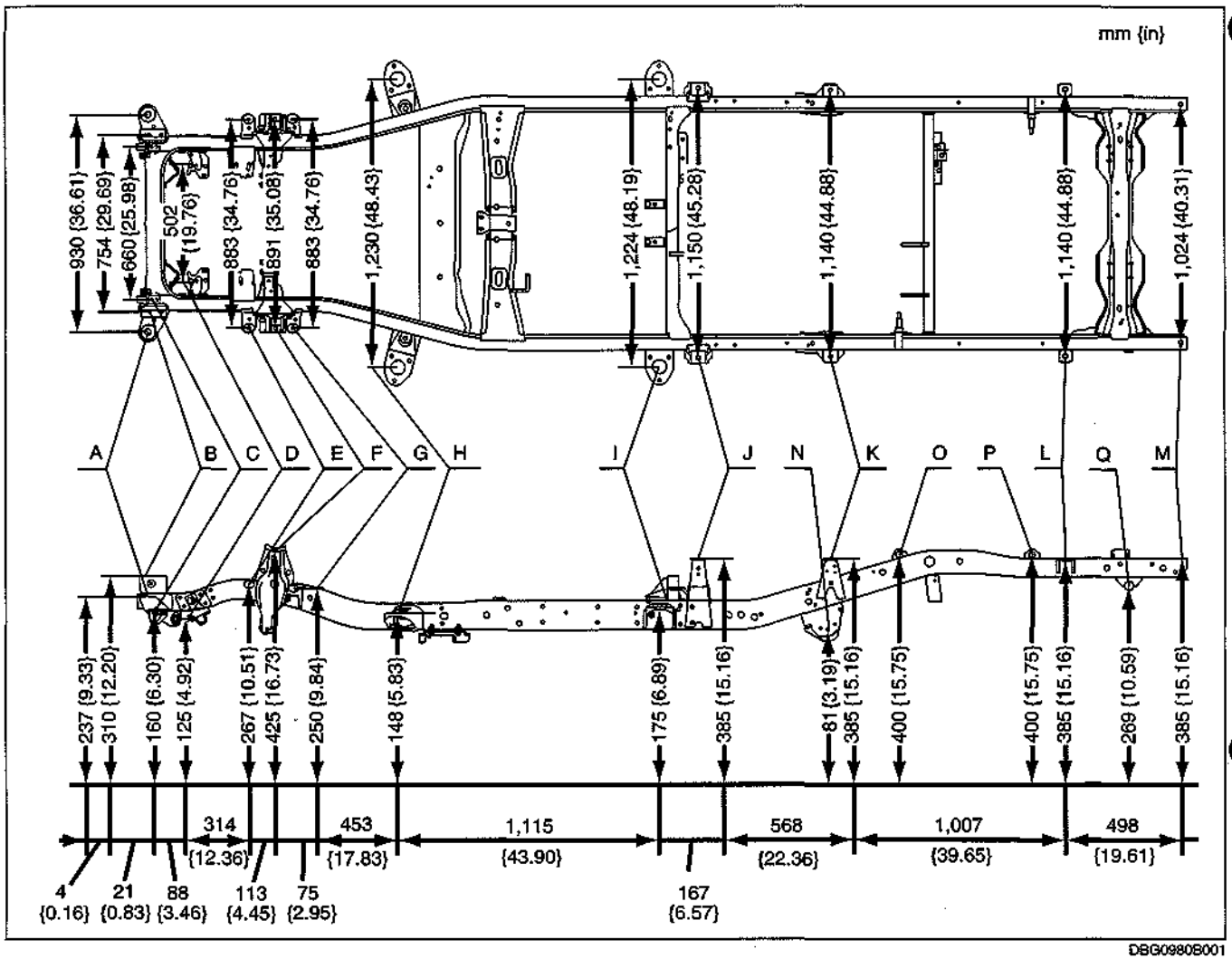
FRAME DIMENSIONS (UNDERBODY REGULAR CAB 2WD)

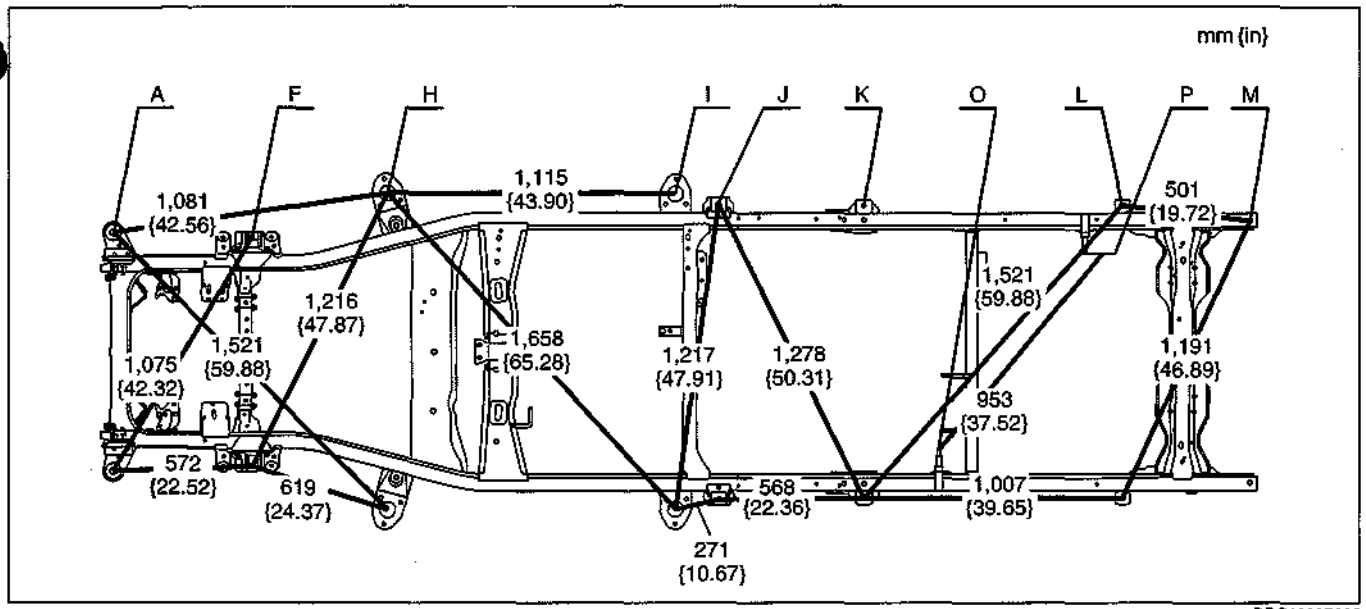
DCF098038010B01

Flat-plane dimensions



DBG0980B001

Straight-line dimensions



DBG0980B002

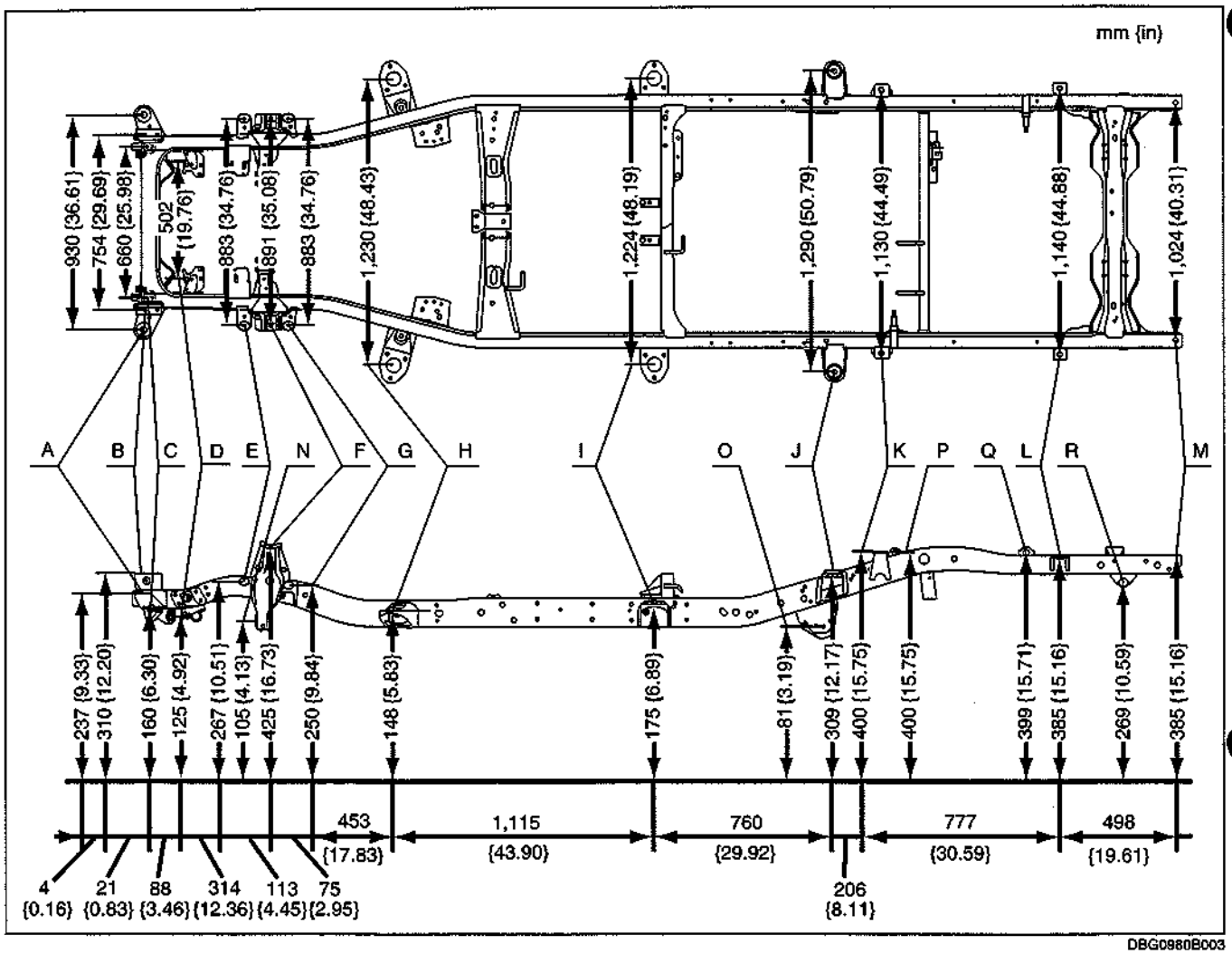
Point symbol	Designation	Hole diameter or bolt or nut size mm {in}
A	Cabin mounting bracket No.1	ø27 {1.06}
B	Bumper stay bracket	ø15 {0.59}
C	Tie down hook mounting hole	ø13.5 {0.53}
D	Front suspension bracket tension rod	ø25 {0.98}
E	Rebound stopper bracket	ø12.5 {0.49}
F	Front suspension bracket	ø16 {0.63}
G	Rebound stopper bracket	ø12.5 {0.49}
H	Cabin mounting bracket No.2	ø60 {2.36}
I	Cabin mounting bracket No.3	ø65 {2.56}
J	Box bracket No.1	ø20 {0.79}

Point symbol	Designation	Hole diameter or bolt or nut size mm {in}
K	Box bracket No.2	ø16 {0.63}
K'	Box bracket No.2	ø20 {0.79}
L	Box bracket No.3	ø16 x 23 {0.63 x 0.91}
L'	Box bracket No.3	ø20 {0.79}
M	Box mounting hole	ø20 {0.79}
N	Front spring hanger	ø14 {0.55}
O	Dumper bracket	M12 {0.47}
P	Dumper bracket	M12 {0.47}
Q	Rear spring hanger	ø32 {1.26}

FRAME DIMENSIONS (UNDERBODY DOUBLE CAB 2WD)

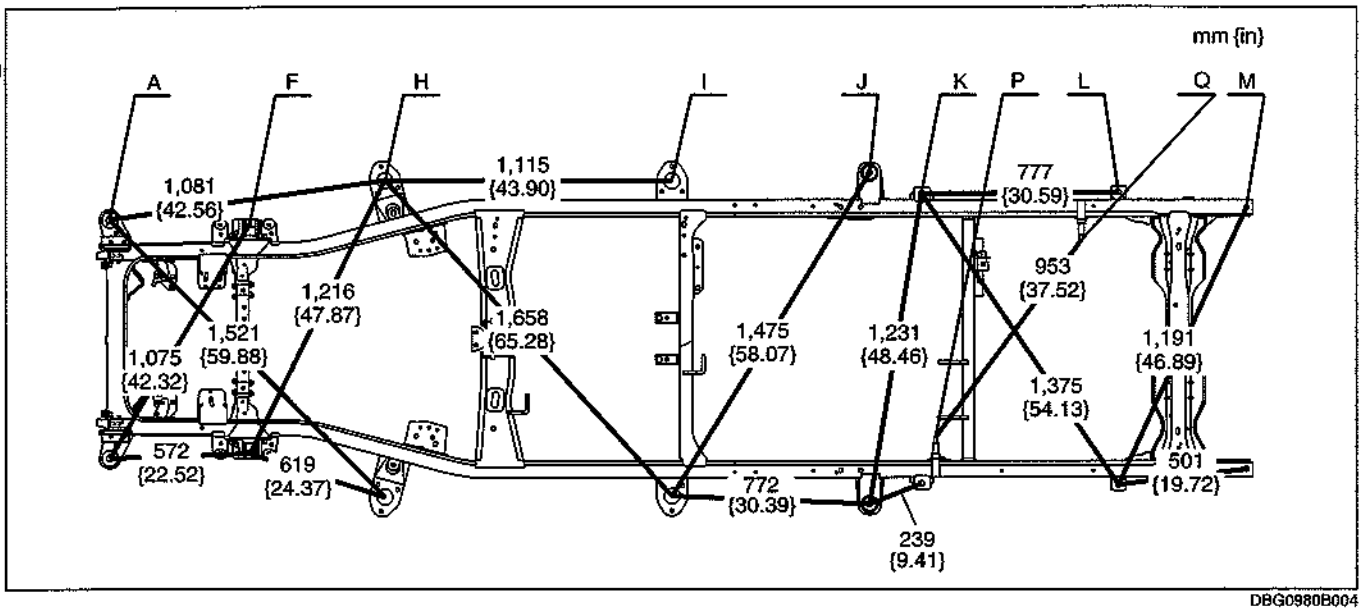
DCF098038010B02

Flat-plane dimensions



DBG0980B003

Straight-line dimensions



DBG0980B004

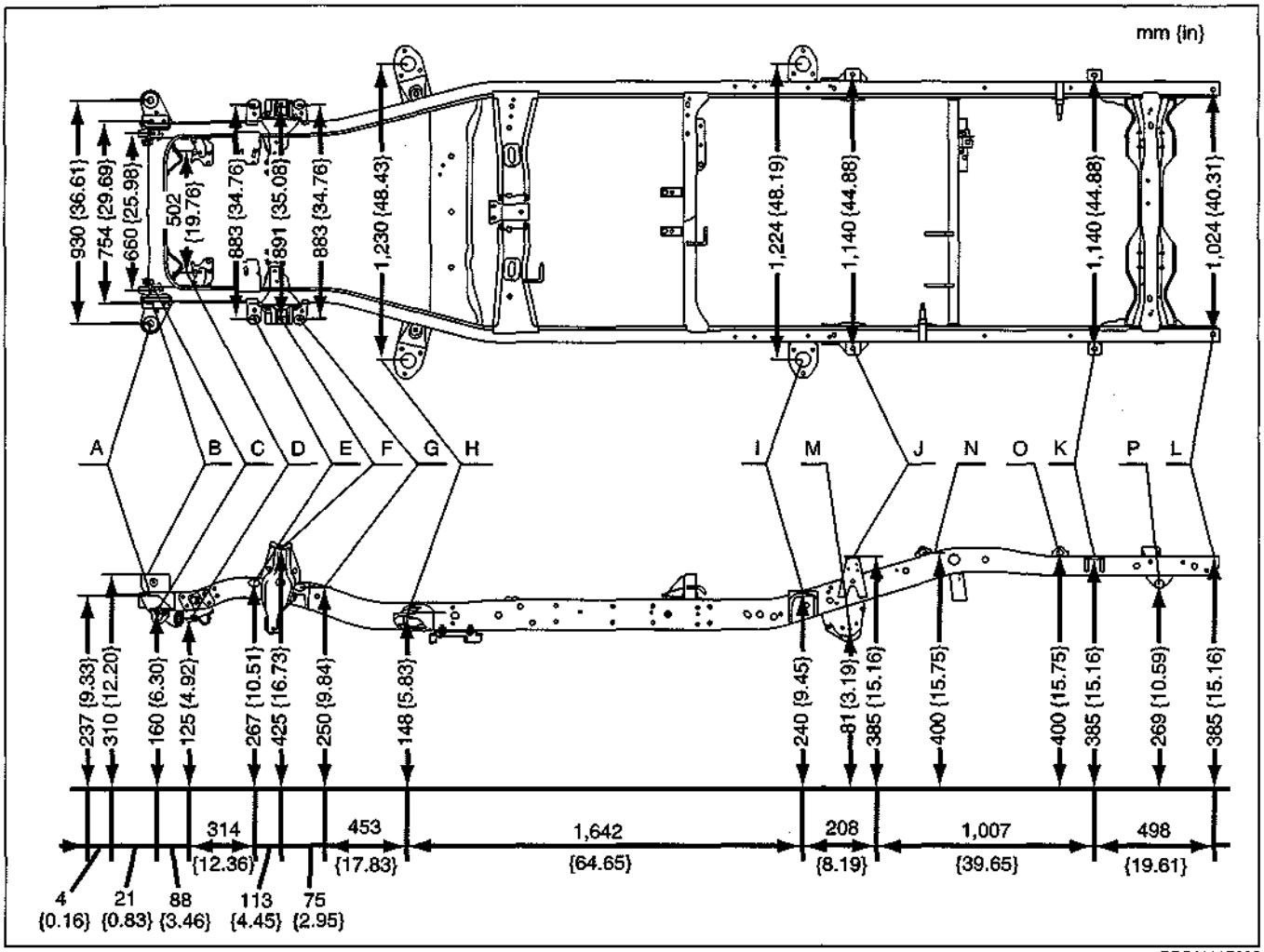
Point symbol	Designation	Hole diameter or bolt or nut size mm {in}
A	Cabin mounting bracket No.1	ø27 {1.06}
B	Bumper stay bracket	ø15 {0.59}
C	Tie down hook mounting hole	ø13.5 {0.53}
D	Front suspension bracket tension rod	ø25 {0.98}
E	Rebound stopper bracket	ø12.5 {0.49}
F	Front suspension bracket	ø16 {0.63}
G	Rebound stopper bracket	ø12.5 {0.49}
H	Cabin mounting bracket No.2	ø60 {2.36}
I	Cabin mounting bracket No.3	ø65 {2.56}
J	Cabin mounting bracket No.4	ø30 {1.18}

Point symbol	Designation	Hole diameter or bolt or nut size mm {in}
K	Box bracket No.1	ø16 {0.63}
K'	Box bracket No.1	ø20 {0.79}
L	Box bracket No.3	ø16 x 23 {0.63 x 0.91}
L'	Box bracket No.3	ø20 {0.79}
M	Box mounting hole	ø20 {0.79}
N	Front suspension bracket	ø48.5 {1.91}
O	Front spring hanger	ø14 {0.55}
P	Dumper bracket	M12 {0.47}
Q	Dumper bracket	M12 {0.47}
R	Rear spring hanger	ø32 {1.26}

FRAME DIMENSIONS (UNDERBODY STRETCH CAB {WITH REAR ACCESS SYSTEM} 2WD)

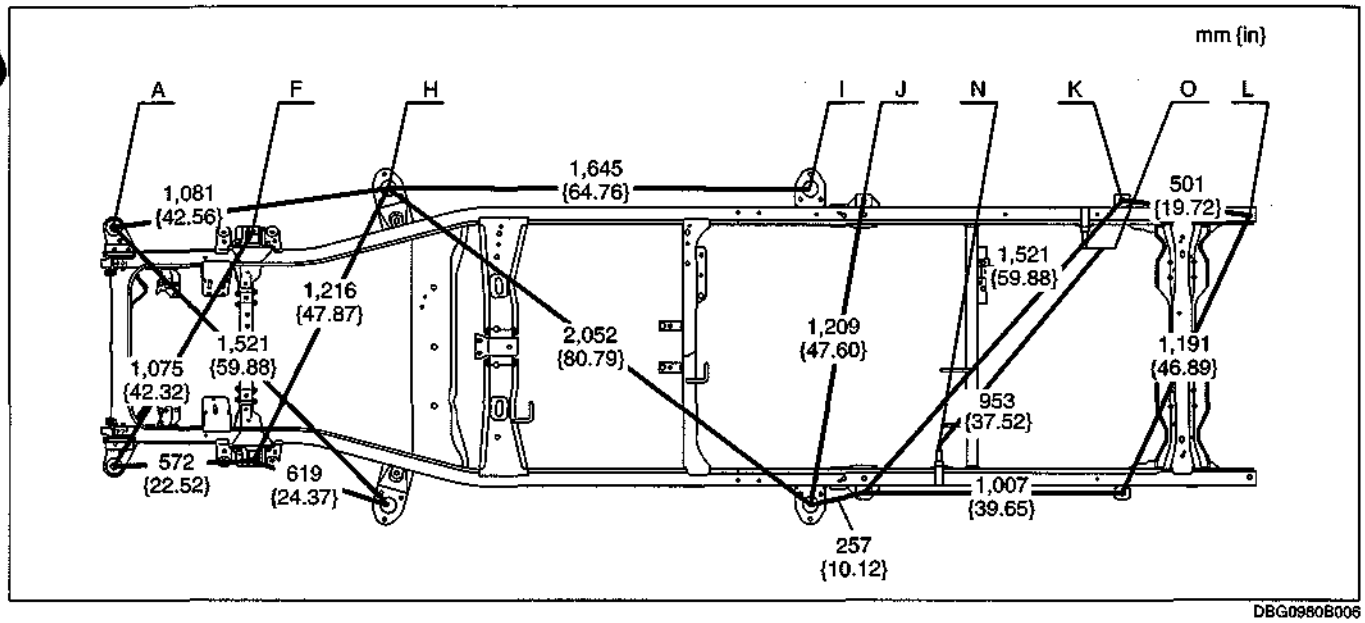
DCF098038010B03

Flat-plane dimensions



DBG0980B005

Straight-line dimensions



DBG0980B006

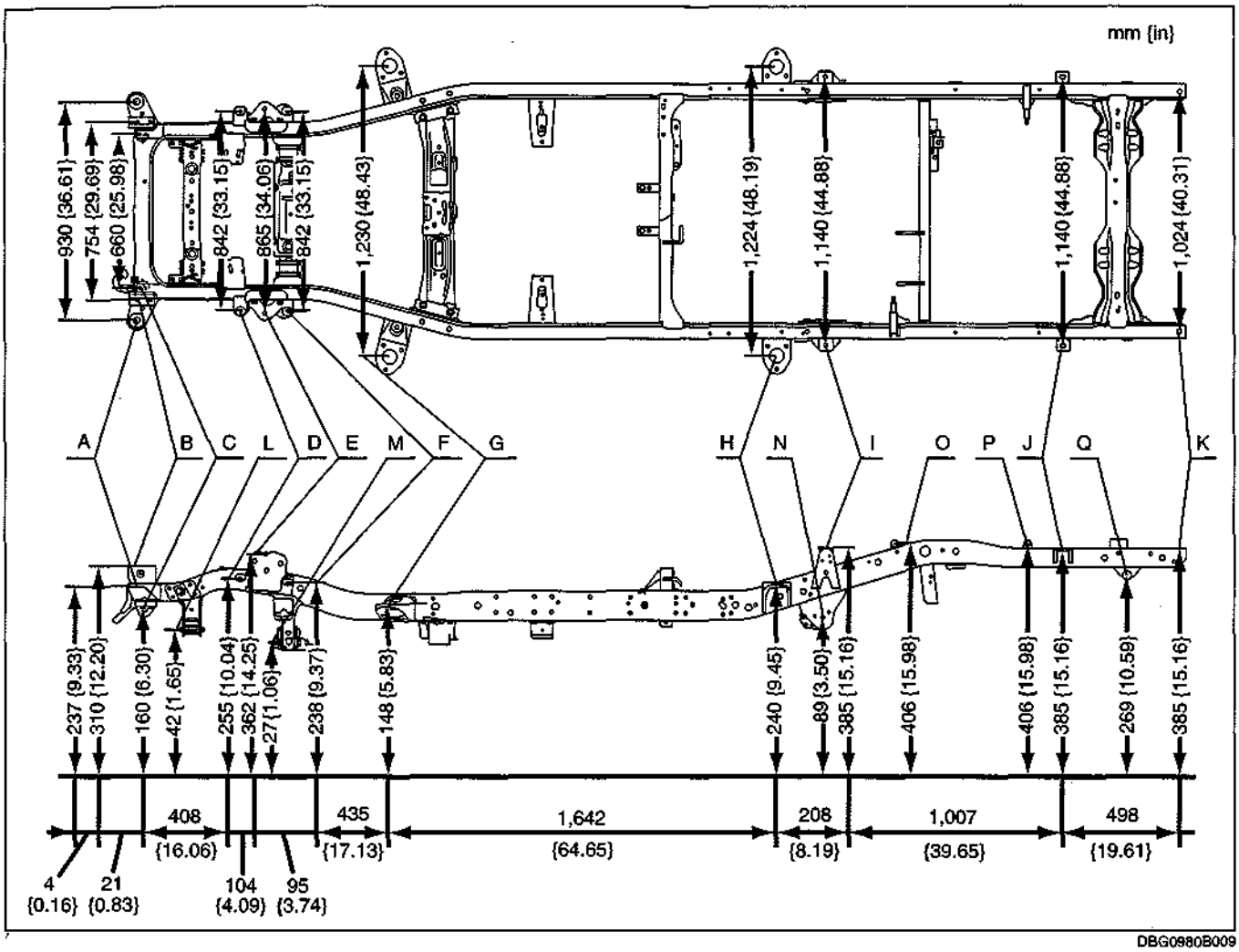
Point symbol	Designation	Hole diameter or bolt or nut size mm {in}
A	Cabin mounting bracket No.1	ø27 {1.06}
B	Bumper stay bracket	ø15 {0.59}
C	Tie down hook mounting hole	ø13.5 {0.53}
D	Front suspension bracket tension rod	ø25 {0.98}
E	Rebound stopper bracket	ø12.5 {0.49}
F	Front suspension bracket	ø16 {0.63}
G	Rebound stopper bracket	ø12.5 {0.49}
H	Cabin mounting bracket No.2	ø60 {2.36}
I	Cabin mounting bracket No.3	ø65 {2.56}

Point symbol	Designation	Hole diameter or bolt or nut size mm {in}
J	Box bracket No.1	ø16 {0.63}
J'	Box bracket No.1	ø20 {0.79}
K	Box bracket No.3	ø16 x 23 {0.63 x 0.91}
K'	Box bracket No.3	ø20 {0.79}
L	Box mounting hole	ø20 {0.79}
M	Front spring hanger	ø14 {0.55}
N	Dumper bracket	M12 {0.47}
O	Dumper bracket	M12 {0.47}
P	Rear spring hanger	ø32 {1.26}

FRAME DIMENSIONS (UNDERBODY STRETCH CAB {WITH REAR ACCESS SYSTEM} HI-RIDER)

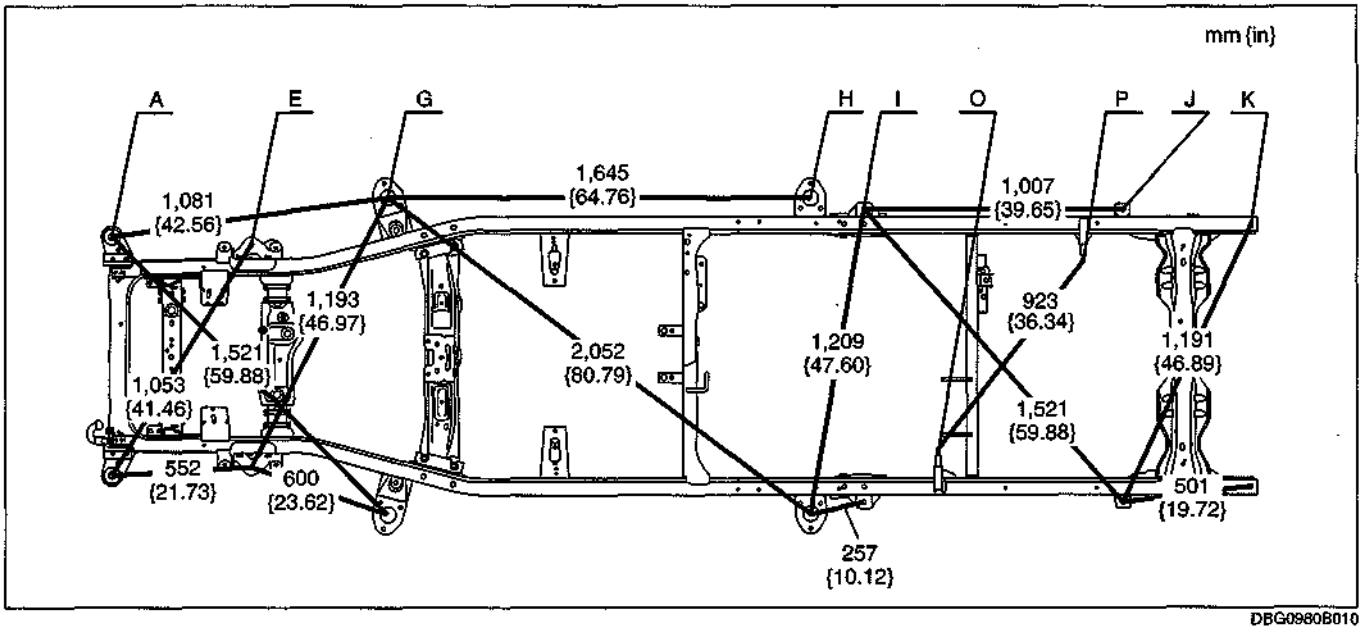
DCF098038010B06

Flat-plane dimensions



DBG0980B009

Straight-line dimensions



DBG0980B010

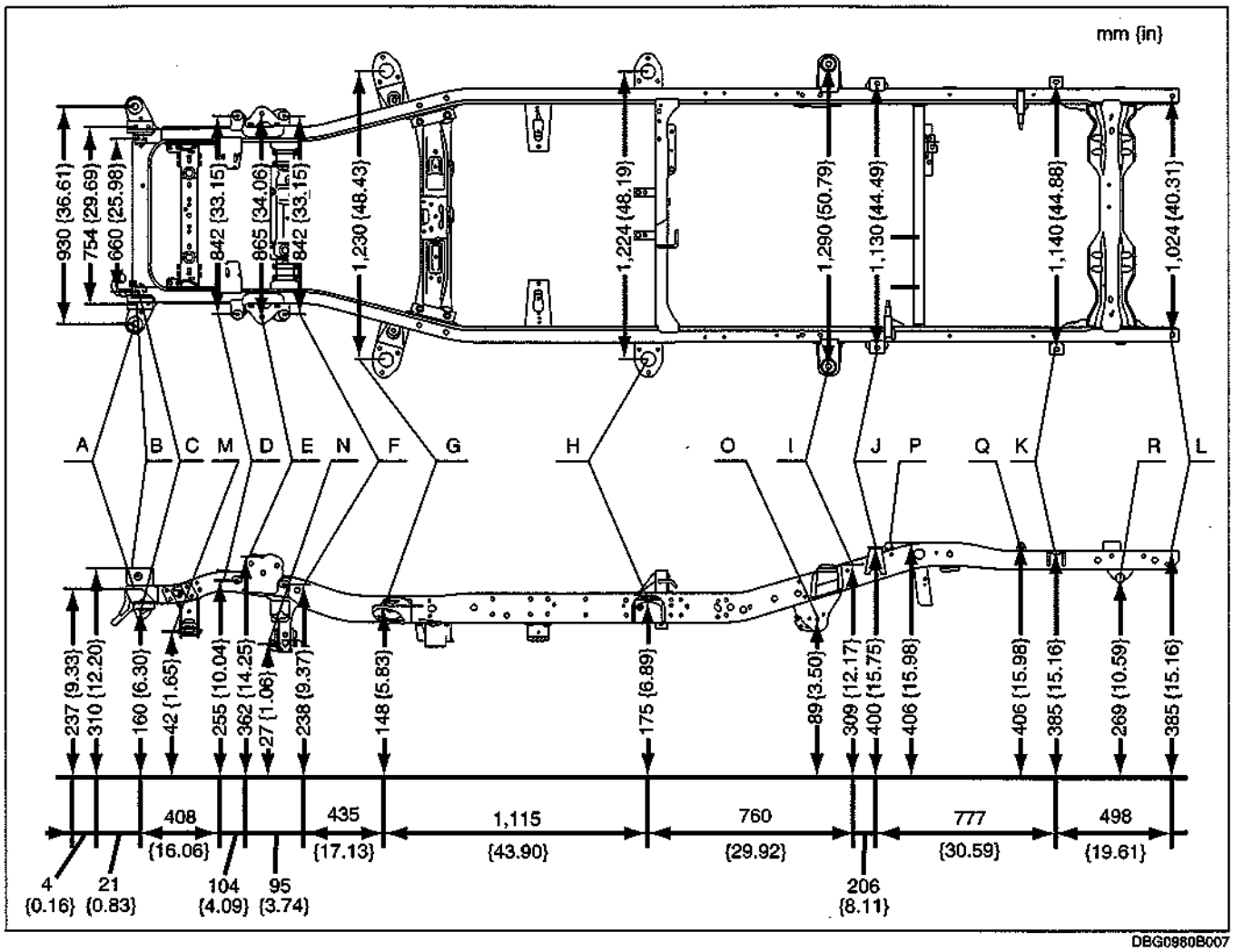
Point symbol	Designation	Hole diameter or bolt or nut size mm {in}
A	Cabin mounting bracket No.1	ø27 {1.06}
B	Bumper stay bracket	ø15 {0.59}
C	Tie down hook mounting hole	ø13.5 {0.53}
D	Rebound stopper bracket	ø12.5 {0.49}
E	Front suspension bracket	ø16 {0.63}
F	Rebound stopper bracket	ø12.5 {0.49}
G	Cabin mounting bracket No.2	ø60 {2.36}
H	Cabin mounting bracket No.3	ø65 {2.56}
I	Box bracket No.1	ø16 {0.63}
I'	Box bracket No.1	ø20 {0.79}

Point symbol	Designation	Hole diameter or bolt or nut size mm {in}
J	Box bracket No.3	ø16 x 23 {0.63 x 0.91}
J'	Box bracket No.3	ø20 {0.79}
K	Box mounting hole	ø20 {0.79}
L	Front suspension bracket	ø16.5 {0.65}
M	Front suspension bracket	ø40 {1.57}
N	Front spring hanger	ø14 {0.55}
O	Dumper bracket	M12 {0.47}
P	Dumper bracket	M12 {0.47}
Q	Rear spring hanger	ø32 {1.26}

FRAME DIMENSIONS (UNDERBODY DOUBLE CAB 4WD)

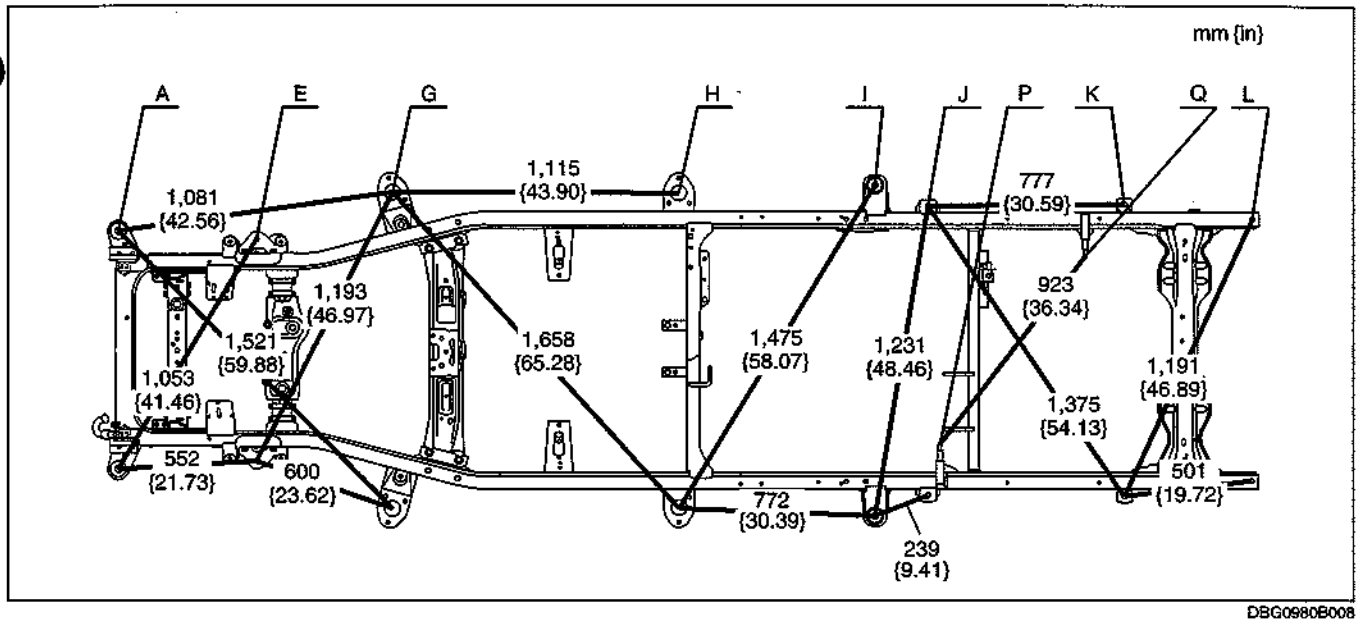
DCF098038010B04

Flat-plane dimensions



DBG0980B007

Straight-line dimensions



DBG0980B008

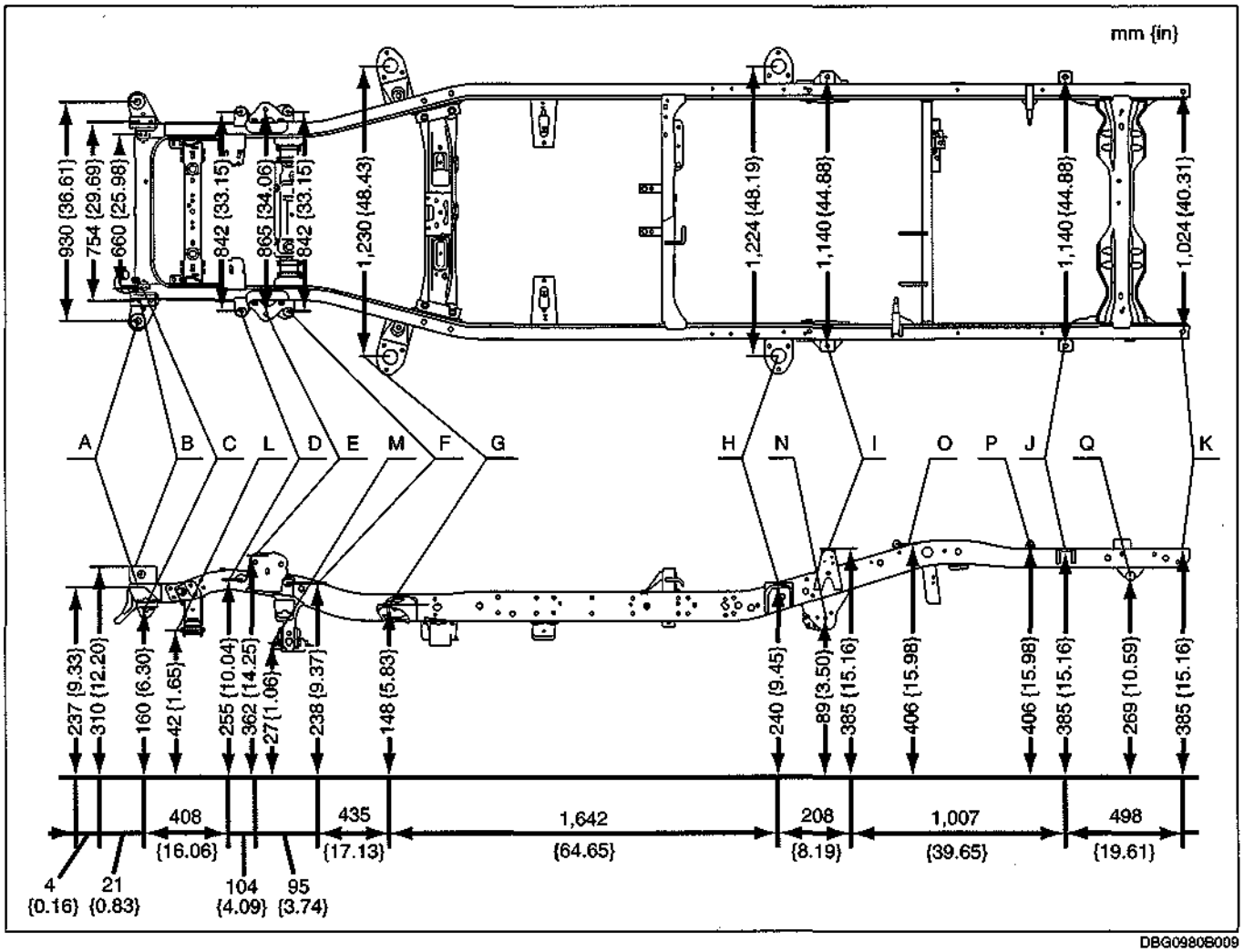
Point symbol	Designation	Hole diameter or bolt or nut size mm {in}
A	Cabin mounting bracket No.1	ø27 {1.06}
B	Bumper stay bracket	ø15 {0.59}
C	Tie down hook mounting hole	ø13.5 {0.53}
D	Rebound stopper bracket	ø12.5 {0.49}
E	Front suspension bracket	ø16 {0.63}
F	Rebound stopper bracket	ø12.5 {0.49}
G	Cabin mounting bracket No.2	ø60 {2.36}
H	Cabin mounting bracket No.3	ø65 {2.56}
I	Cabin mounting bracket No.4	ø30 {1.18}
J	Box bracket No.1	ø16 {0.63}
J'	Box bracket No.1	ø20 {0.79}

Point symbol	Designation	Hole diameter or bolt or nut size mm {in}
K	Box bracket No.3	ø16 x 23 {0.63 x 0.91}
K'	Box bracket No.3	ø20 {0.79}
L	Box mounting hole	ø20 {0.79}
M	Front suspension bracket	ø16.5 {0.65}
N	Front suspension bracket	ø40 {1.57}
O	Front spring hanger	ø14 {0.55}
P	Dumper bracket	M12 {0.47}
Q	Dumper bracket	M12 {0.47}
R	Rear spring hanger	ø32 {1.26}

FRAME DIMENSIONS (UNDERBODY STRETCH CAB {WITH REAR ACCESS SYSTEM} 4WD)

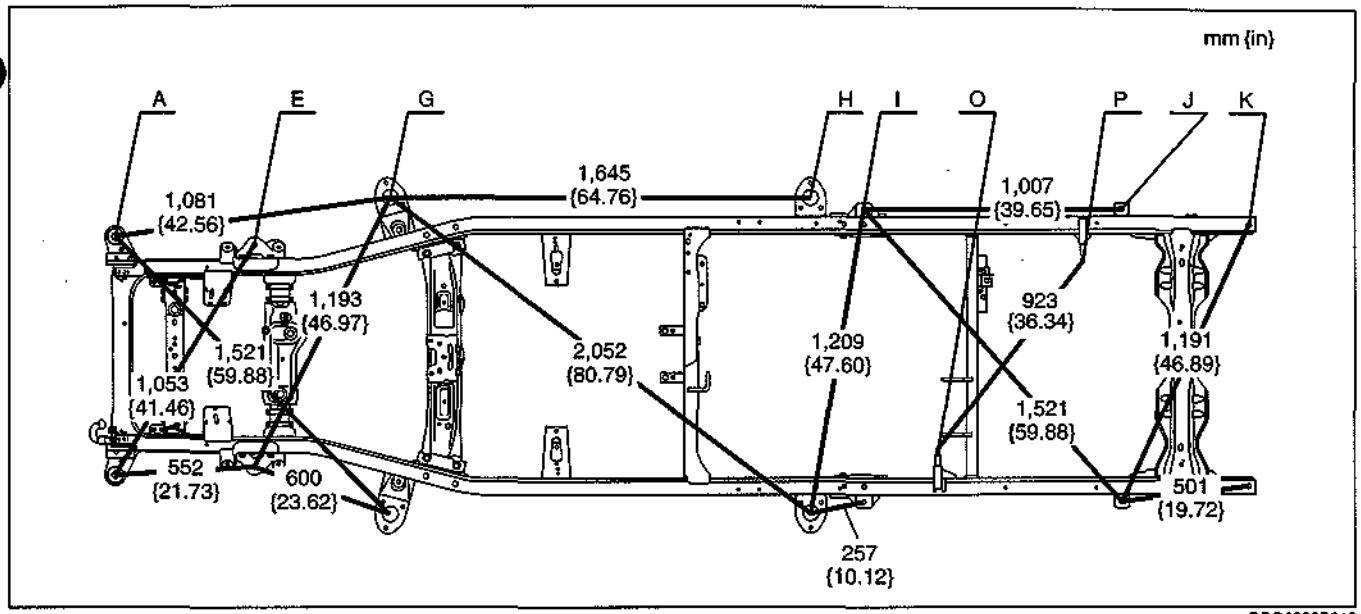
DCF098038010B05

Flat-plane dimensions



DBG0980B009

Straight-line dimensions



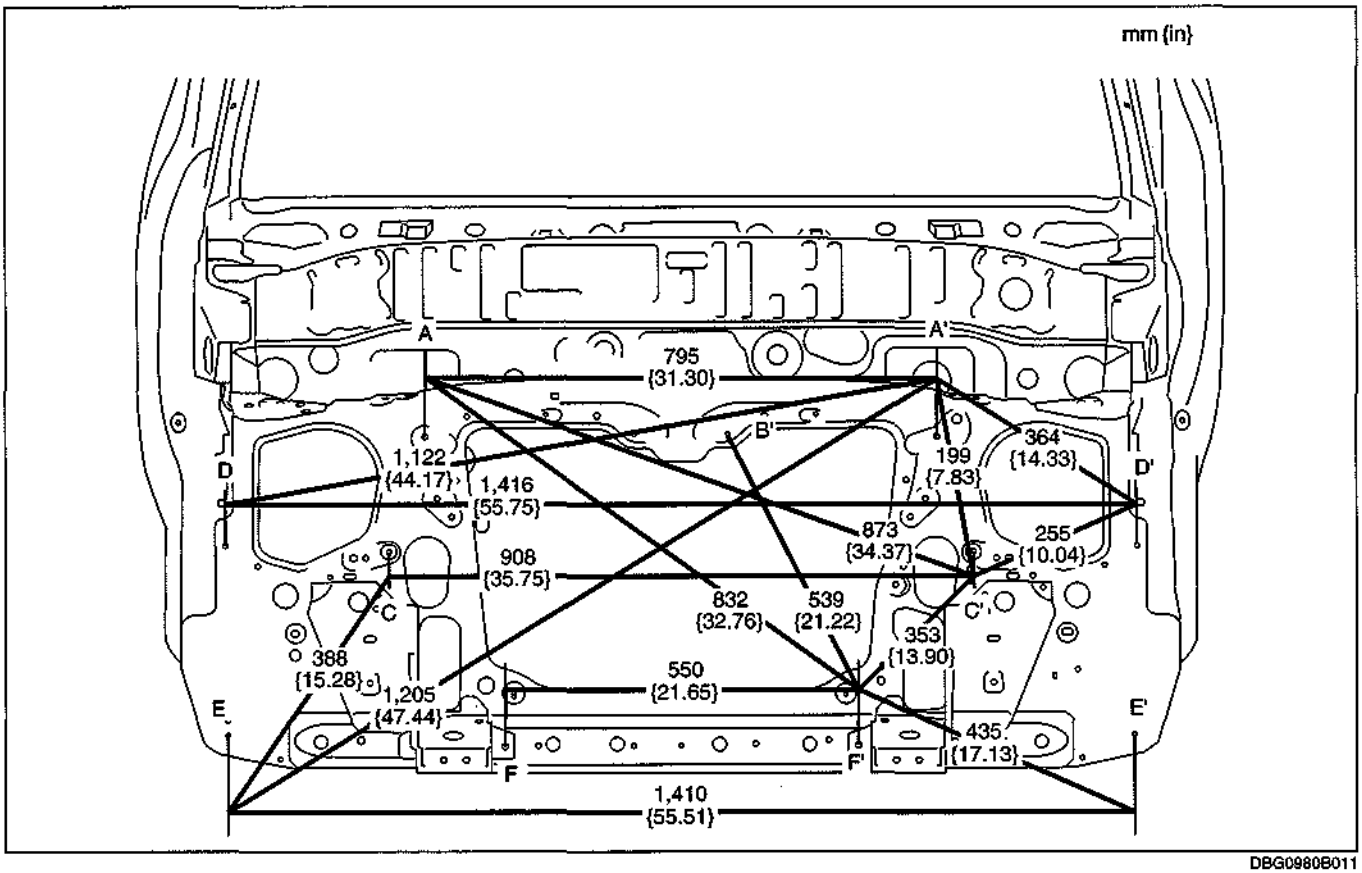
DBG0980B010

Point symbol	Designation	Hole diameter or bolt or nut size mm {in}
A	Cabin mounting bracket No.1	ø27 {1.06}
B	Bumper stay bracket	ø15 {0.59}
C	Tie down hook mounting hole	ø13.5 {0.53}
D	Rebound stopper bracket	ø12.5 {0.49}
E	Front suspension bracket	ø16 {0.63}
F	Rebound stopper bracket	ø12.5 {0.49}
G	Cabin mounting bracket No.2	ø60 {2.36}
H	Cabin mounting bracket No.3	ø65 {2.56}
I	Box bracket No.1	ø16 {0.63}
I'	Box bracket No.1	ø20 {0.79}

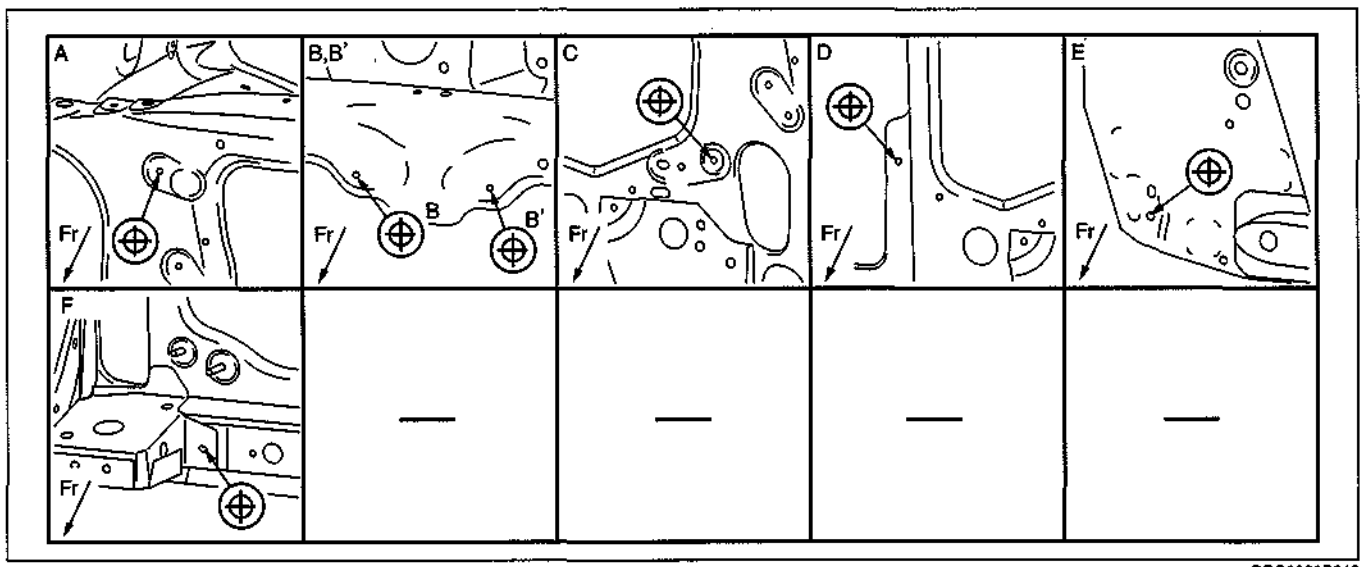
Point symbol	Designation	Hole diameter or bolt or nut size mm {in}
J	Box bracket No.3	ø16 x 23 {0.63 x 0.91}
J'	Box bracket No.3	ø20 {0.79}
K	Box mounting hole	ø20 {0.79}
L	Front suspension bracket	ø16.5 {0.65}
M	Front suspension bracket	ø40 {1.57}
N	Front spring hanger	ø14 {0.55}
O	Dumper bracket	M12 {0.47}
P	Dumper bracket	M12 {0.47}
Q	Rear spring hanger	ø32 {1.26}

FRONT BODY STRAIGHT-LINE DIMENSIONS (1)

DCF098053020B01



DBG0980B011



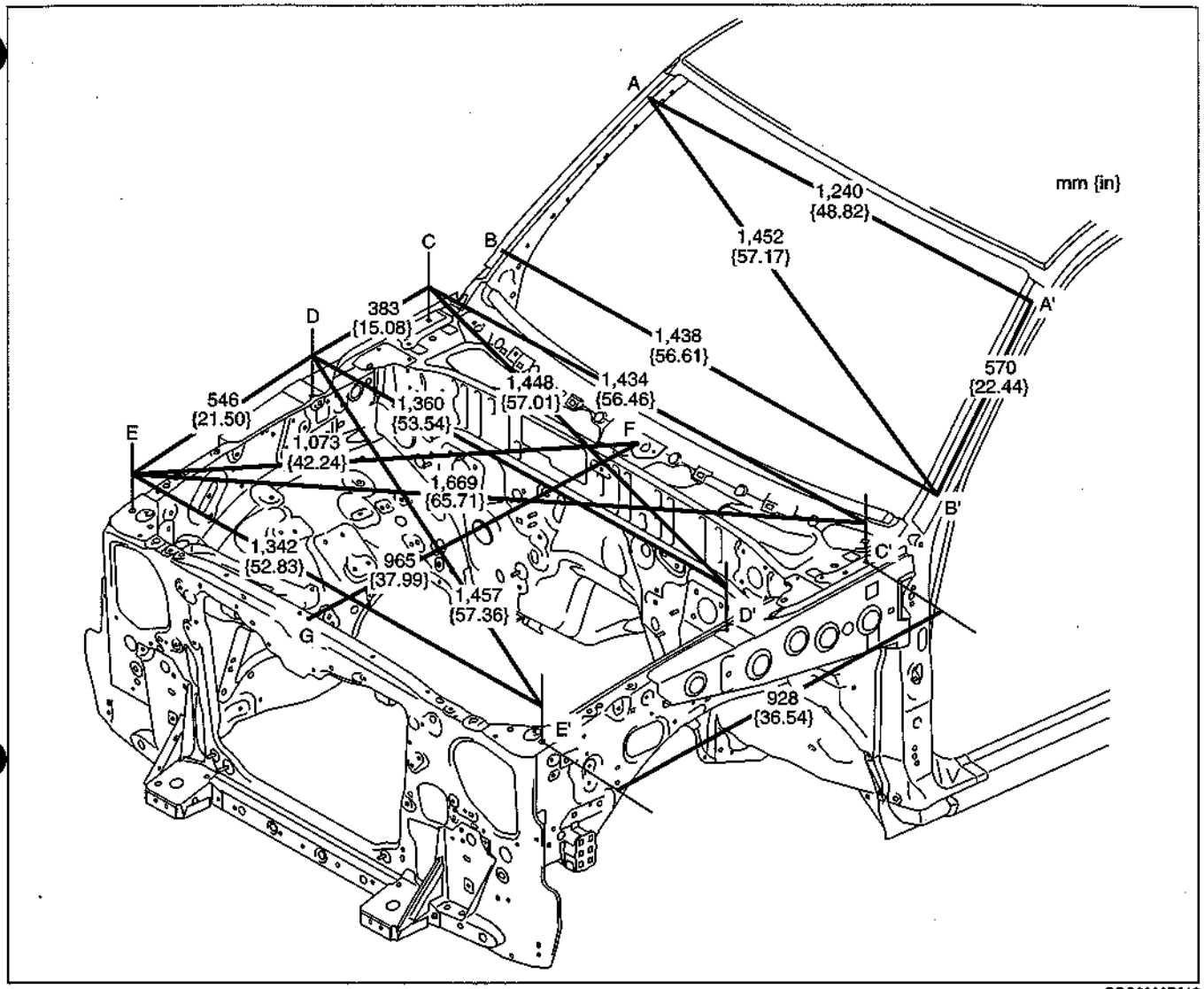
DBG0980B012

Point symbol	Designation	Hole diameter or bolt or nut size mm {in}
A	Shroud panel datum hole	ø7 {0.28}
B	Shroud panel datum hole	ø7 {0.28}
C	Shroud panel datum hole	ø7 {0.28}

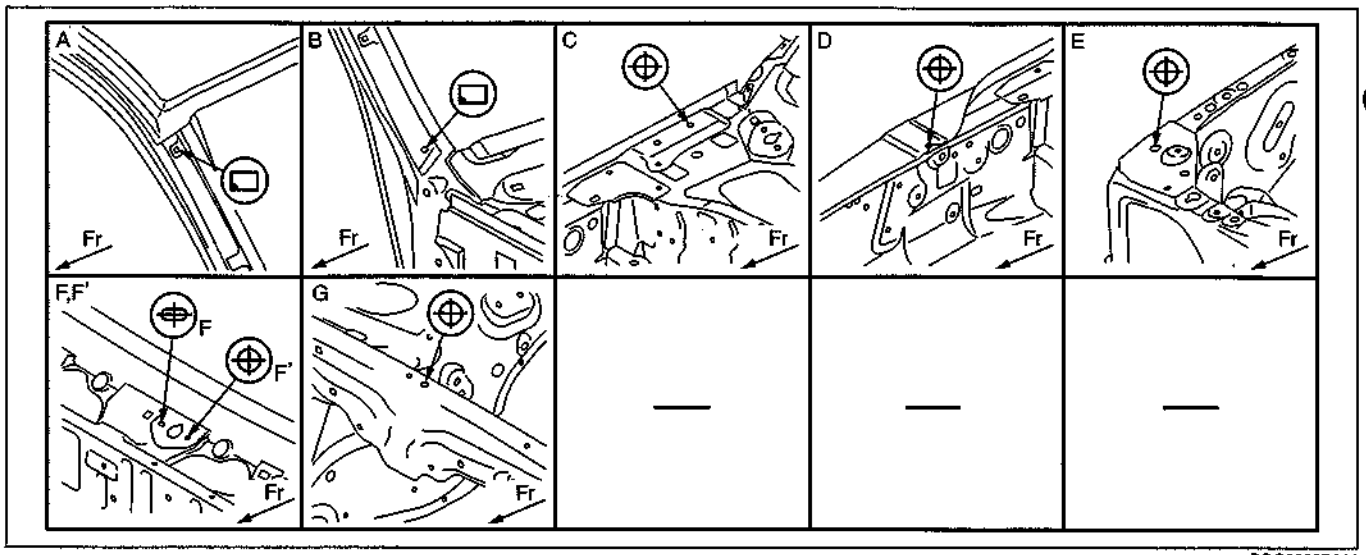
Point symbol	Designation	Hole diameter or bolt or nut size mm {in}
D	Shroud panel datum hole	ø7 {0.28}
E	Shroud panel datum hole	ø6.2 {0.24}
F	Crossmember datum hole	ø10 {0.39}

FRONT BODY STRAIGHT-LINE DIMENSIONS (2)

DCF098053020B02



DBG0980B013



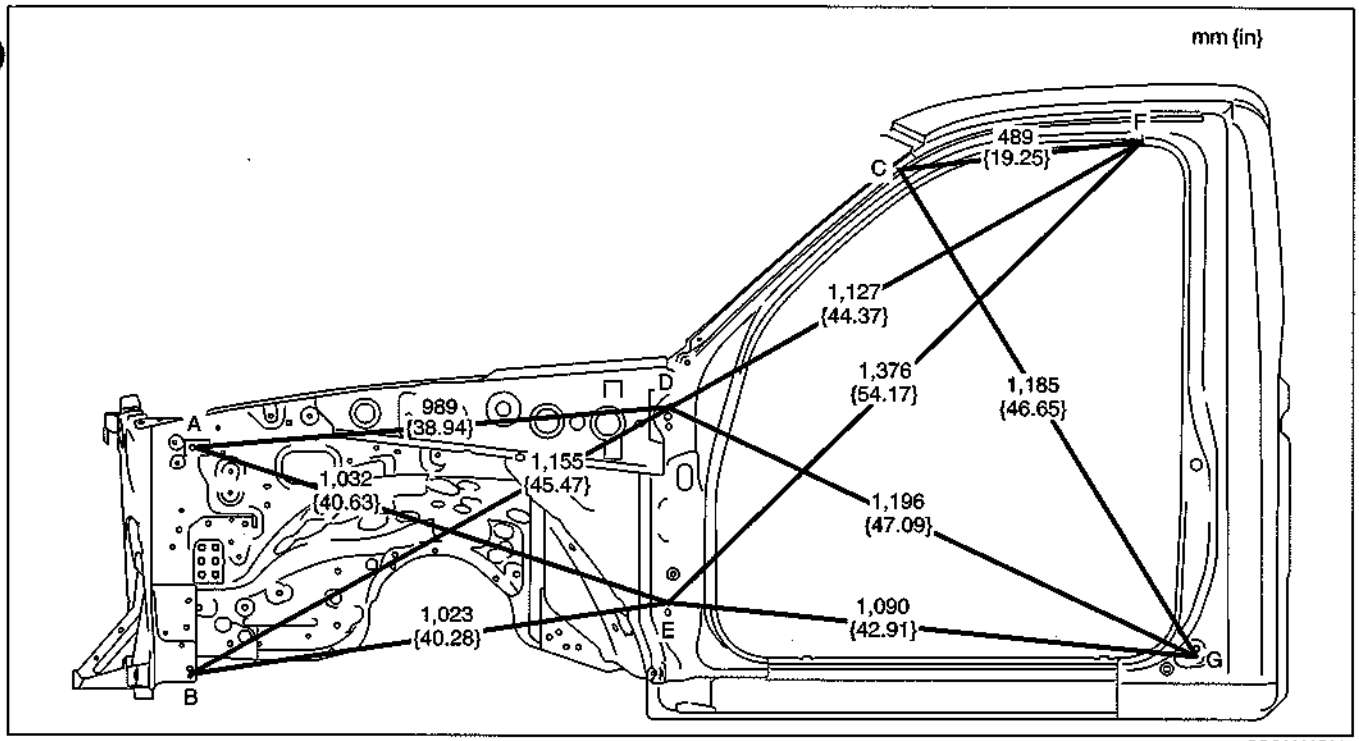
DBG0960E014

Point symbol	Designation	Hole diameter or bolt or nut size mm {in}
A	Windshield garnish installation square hole	6.8 x 6.8 {0.27 x 0.27}
B	Windshield garnish installation square hole	6.8 x 6.8 {0.27 x 0.27}
C	Bonnet hinge installation hole	ø12 {0.47}
D	Front fender installation hole	ø10 {0.39}

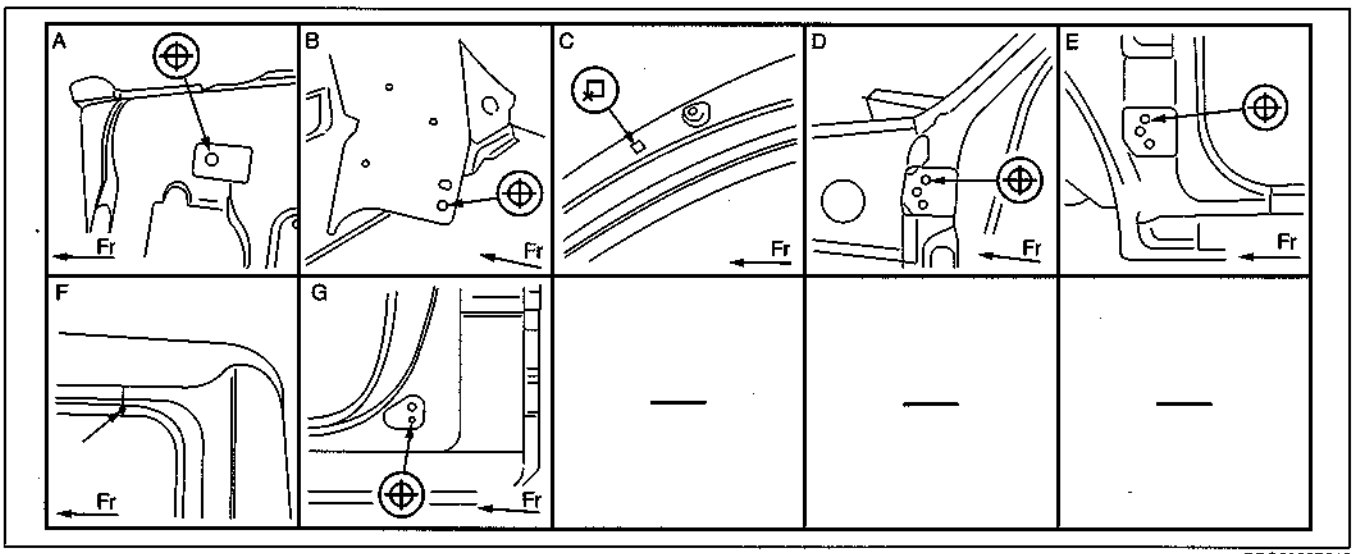
Point symbol	Designation	Hole diameter or bolt or nut size mm {in}
E	Shroud gusset datum hole	ø14 {0.55}
F	Cowl panel datum slot	ø6.2 x 8 {0.24 x 0.31}
F'	Cowl panel datum hole	ø6.2 {0.24}
G	Shroud panel datum hole	ø10 {0.39}

CABIN SIDE FRAME STRAIGHT-LINE DIMENSIONS (REGULAR CAB)

DCF098070010B01



DBG0980B015



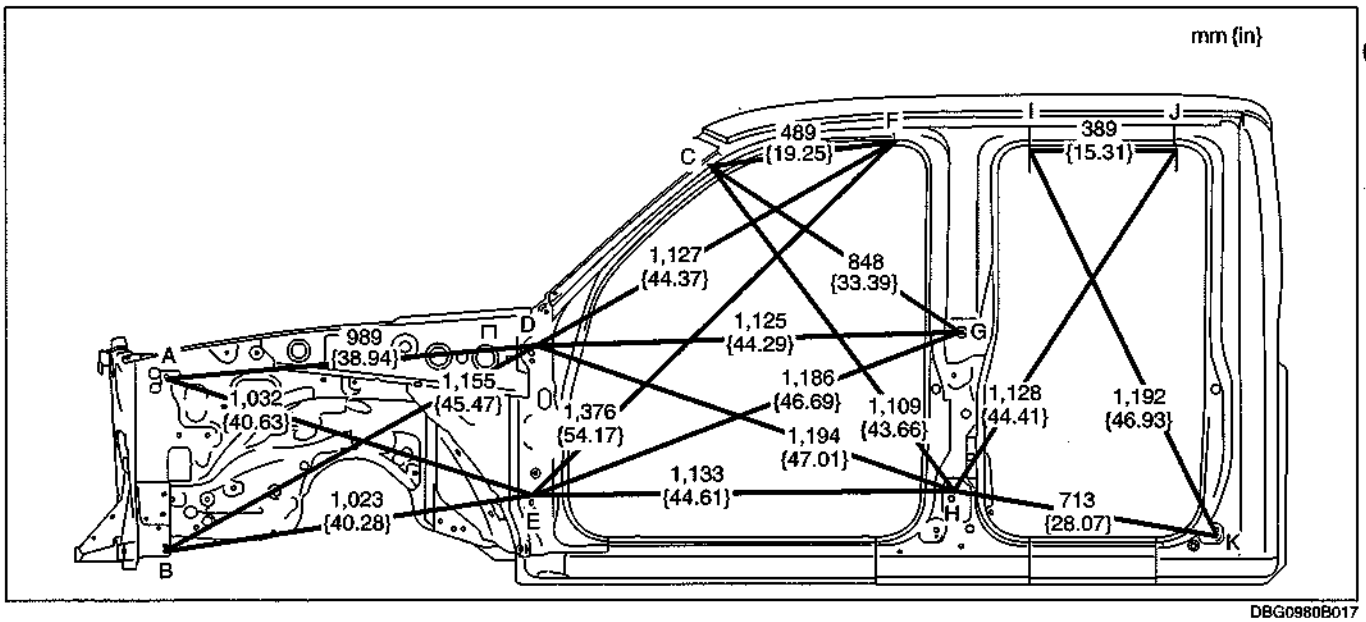
DBG0980B016

Point symbol	Designation	Hole diameter or bolt or nut size mm {in}
A	Wheel apron panel front datum hole	ø12 {0.47}
B	Shroud panel datum hole	ø7 {0.28}
C	Windshield garnish installation square hole	6.8 x 6.8 {0.27 x 0.27}

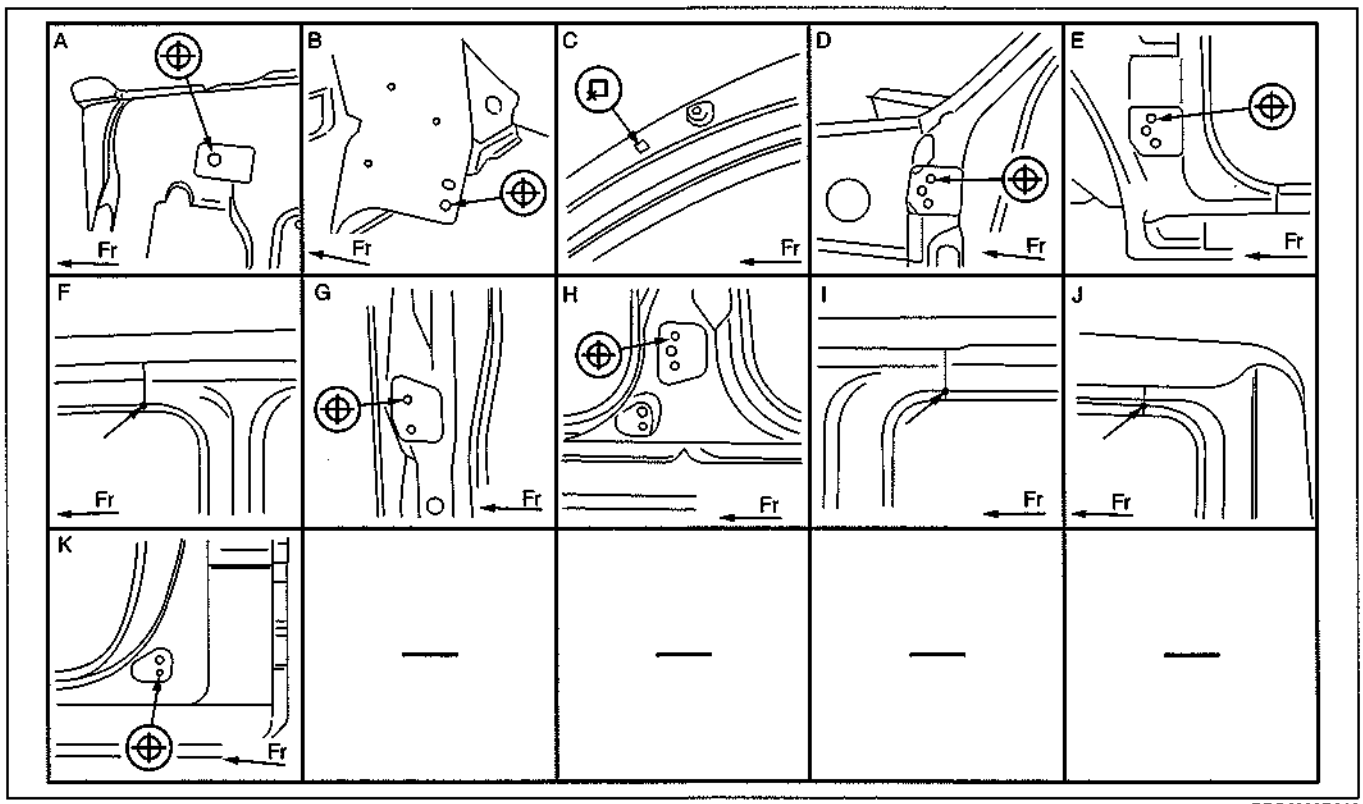
Point symbol	Designation	Hole diameter or bolt or nut size mm {in}
D	Door hinge installation hole	ø12 {0.47}
E	Door hinge installation hole	ø12 {0.47}
F	Side frame outer connection	-
G	Side frame outer datum hole	ø3.2 {0.13}

CABIN SIDE FRAME STRAIGHT-LINE DIMENSIONS (DOUBLE CAB)

DCF098070010B02



DBG0980B017



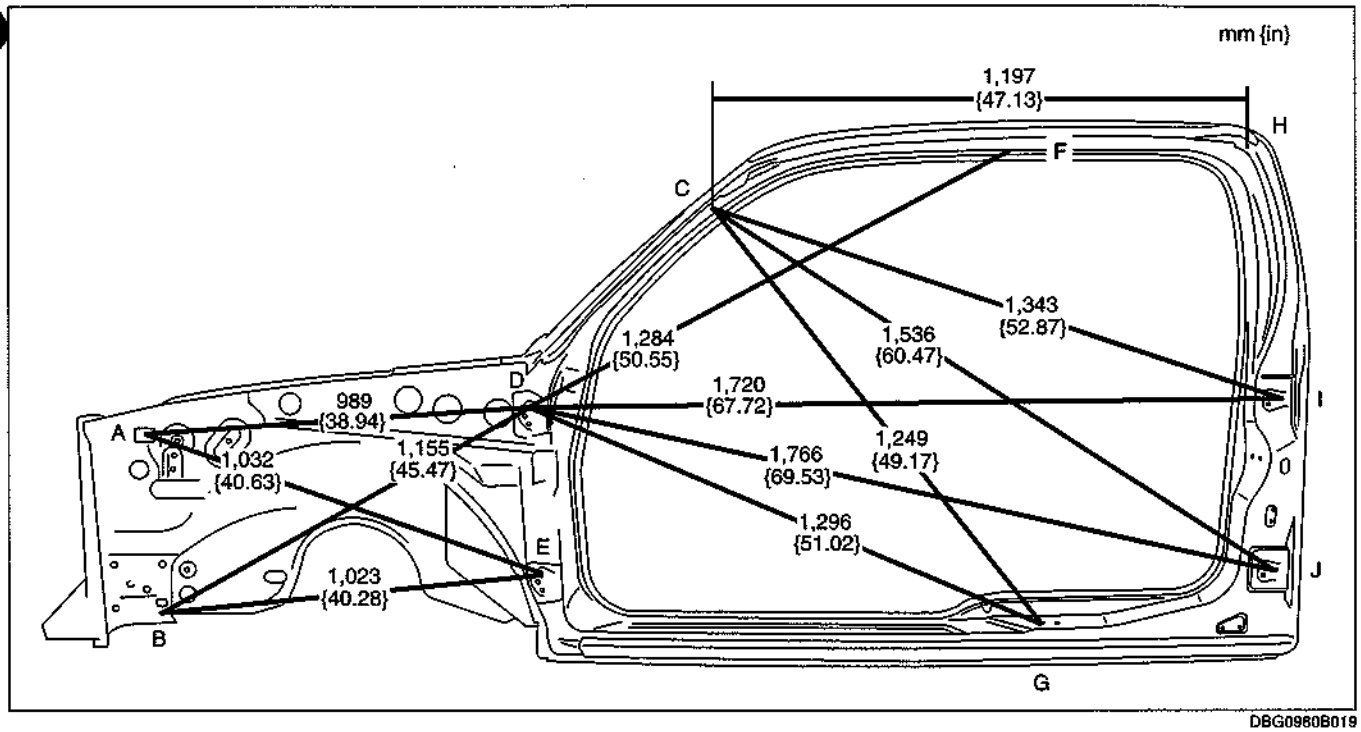
DBG0980B018

Point symbol	Designation	Hole diameter or bolt or nut size mm {in}
A	Wheel apron panel front datum hole	ø12 {0.47}
B	Shroud panel datum hole	ø7 {0.28}
C	Windshield garnish installation square hole	6.8 x 6.8 {0.27 x 0.27}
D	Door hinge installation hole	ø12 {0.47}
E	Door hinge installation hole	ø12 {0.47}

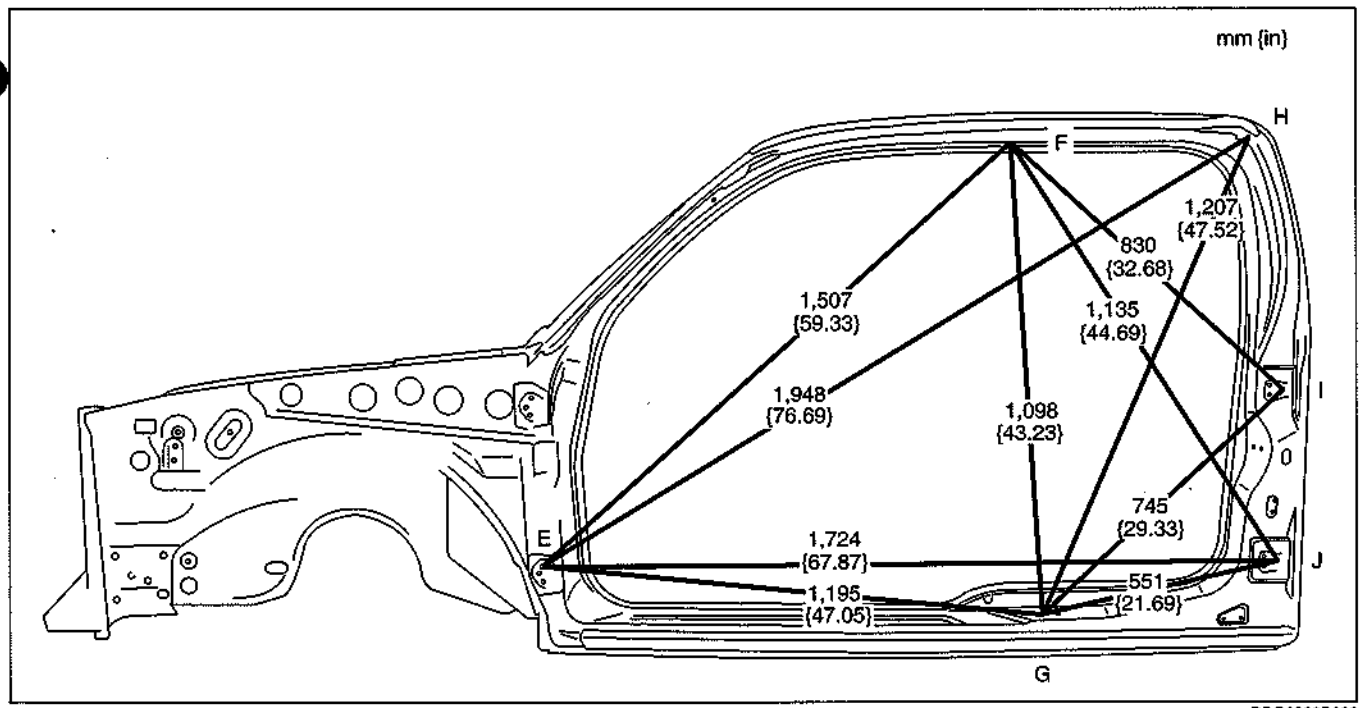
Point symbol	Designation	Hole diameter or bolt or nut size mm {in}
F	Side frame outer connection	-
G	Door hinge installation hole	ø12 {0.47}
H	Door hinge installation hole	ø12 {0.47}
I	Side frame outer connection	-
J	Side frame outer connection	-
K	Side frame outer datum hole	ø3.2 {0.13}

CABIN SIDE FRAME STRAIGHT-LINE DIMENSIONS (STRETHC CAB {WITH REAR ACCESS SYSTEM}, HI-RIDER)

DCF098070010B03



DBG0980B019



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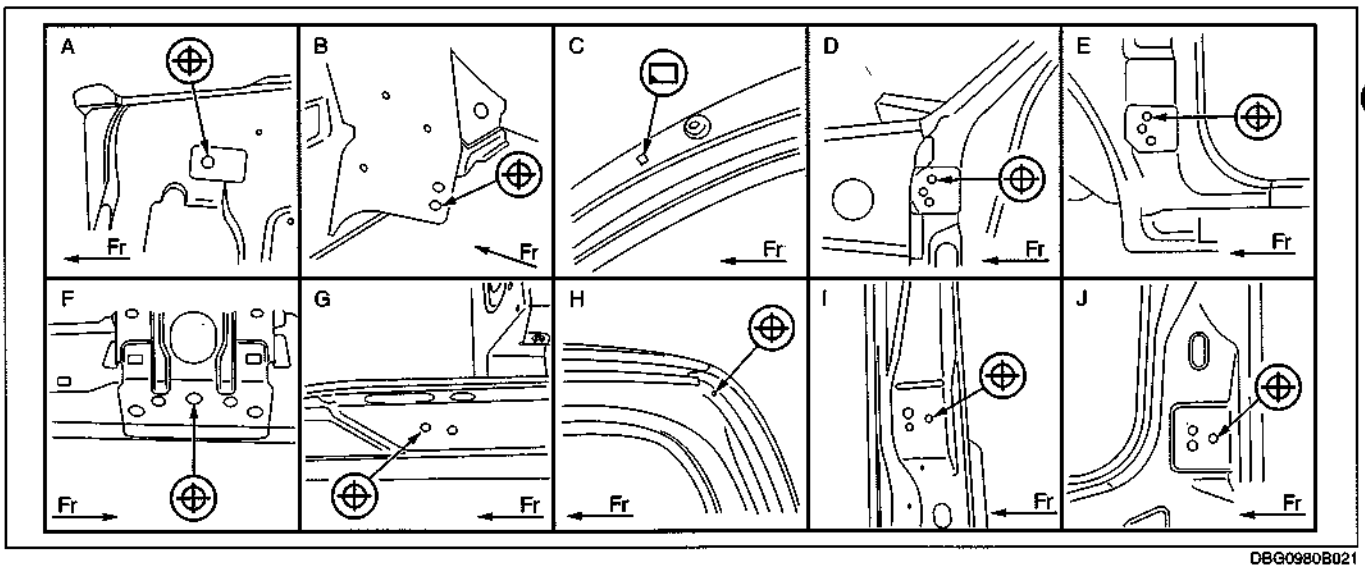


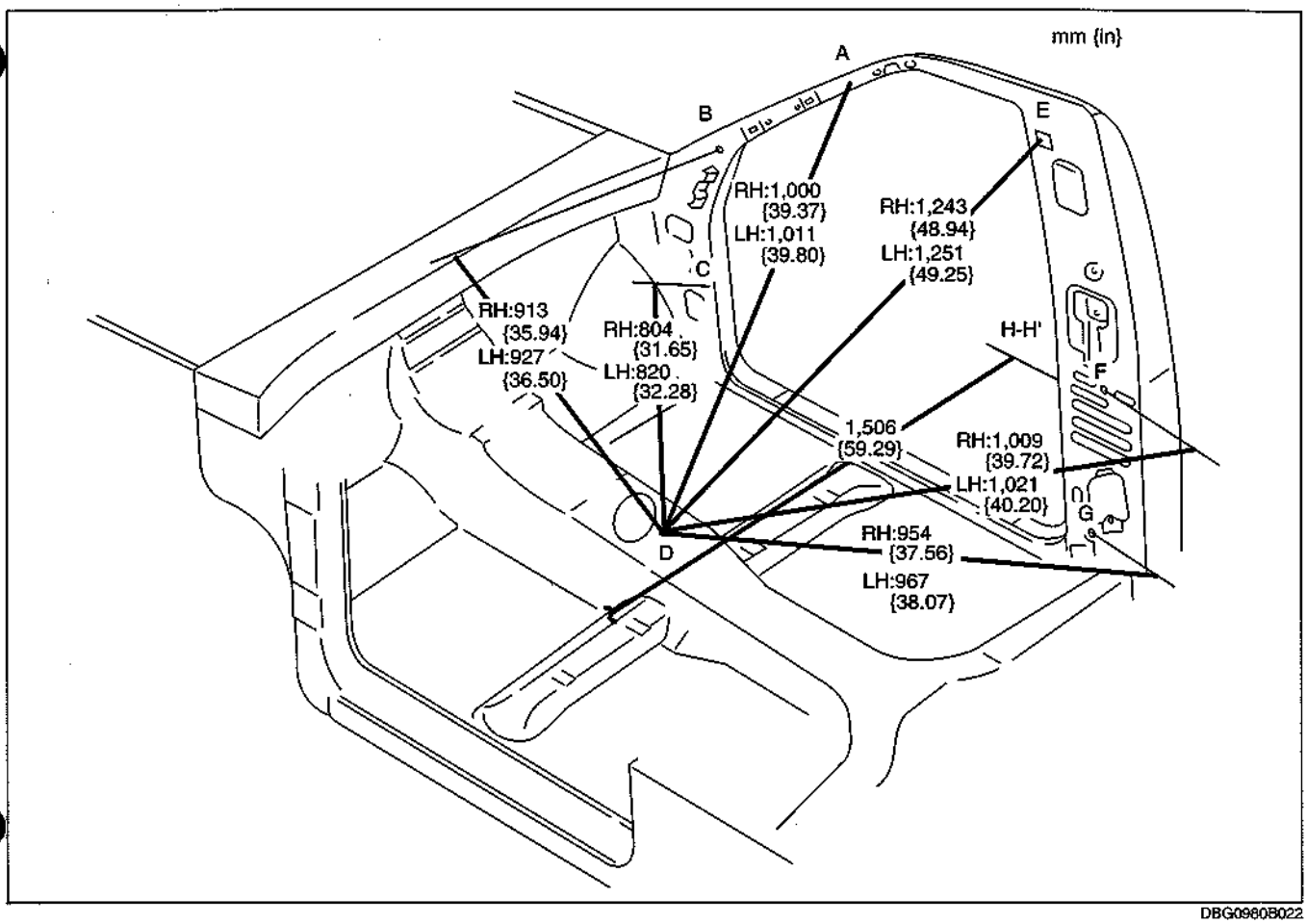
DBG0980B021

Point symbol	Designation	Hole diameter or bolt or nut size mm {in}
A	Wheel apron panel front datum hole	ø12 {0.47}
B	Shroud panel datum hole	ø7 {0.28}
C	Windshield garnish installation square hole	6.8 x 6.8 {0.27 x 0.27}
D	Door hinge installation hole	ø12 {0.47}
E	Door hinge installation hole	ø12 {0.47}

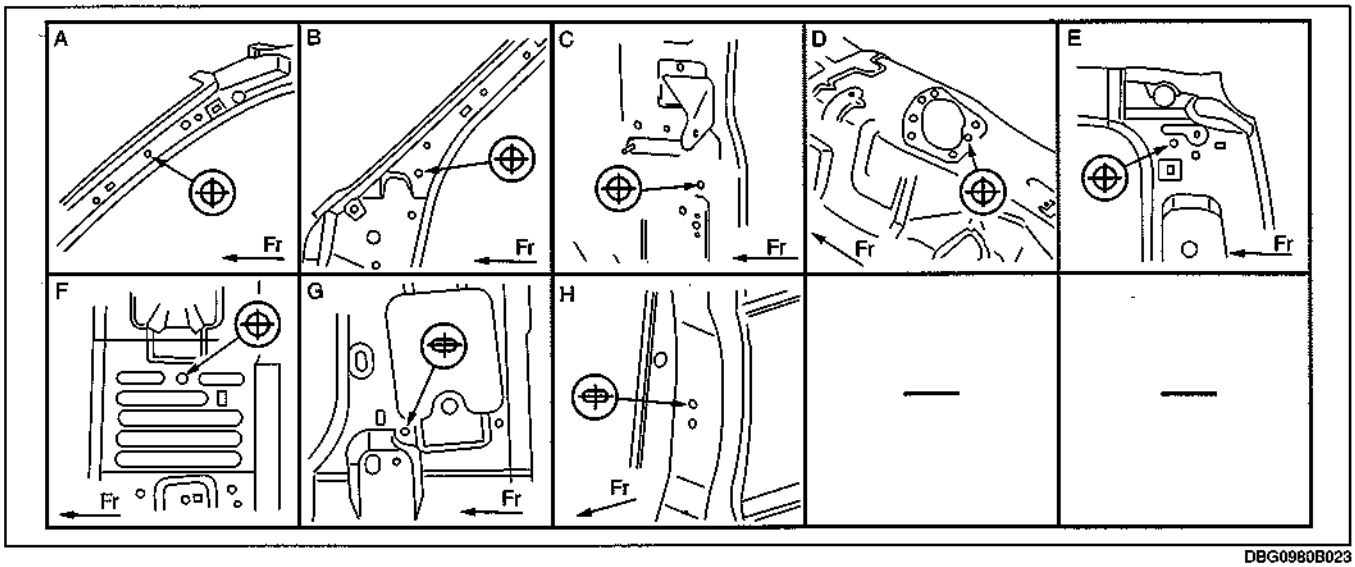
Point symbol	Designation	Hole diameter or bolt or nut size mm {in}
F	Striker installation hole	ø7 {0.28}
G	Striker installation hole	ø13 {0.51}
H	Side frame outer datum hole	ø5 {0.20}
I	Rear access panel hinge installation hole	ø12 {0.47}
J	Rear access panel hinge installation hole	ø12 {0.47}

ROOM STRAIGHT-LINE DIMENSIONS (REGULAR CAB)

DCF098070001B01



DBG0980B022



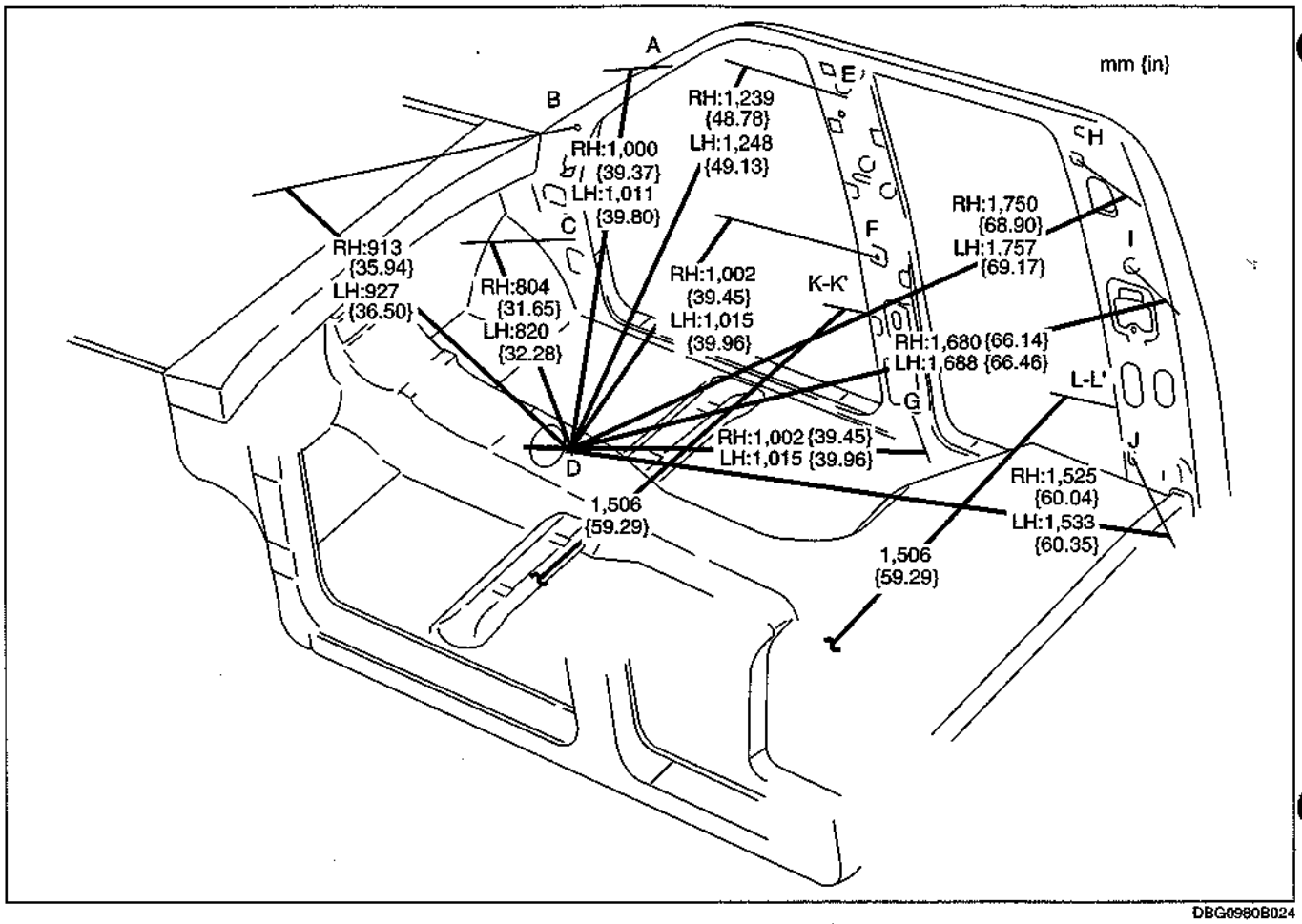
DBG0980B023

Point symbol	Designation	Hole diameter or bolt or nut size mm {in}
A	Harness installation hole	ø7 {0.28}
B	Front pillar inner datum hole	ø10 {0.39}
C	Cowl side panel datum hole	ø12 {0.47}
D	Tunnel reinforcement installation hole	ø7 {0.28}
E	Rear pillar inner datum hole	ø12 {0.47}

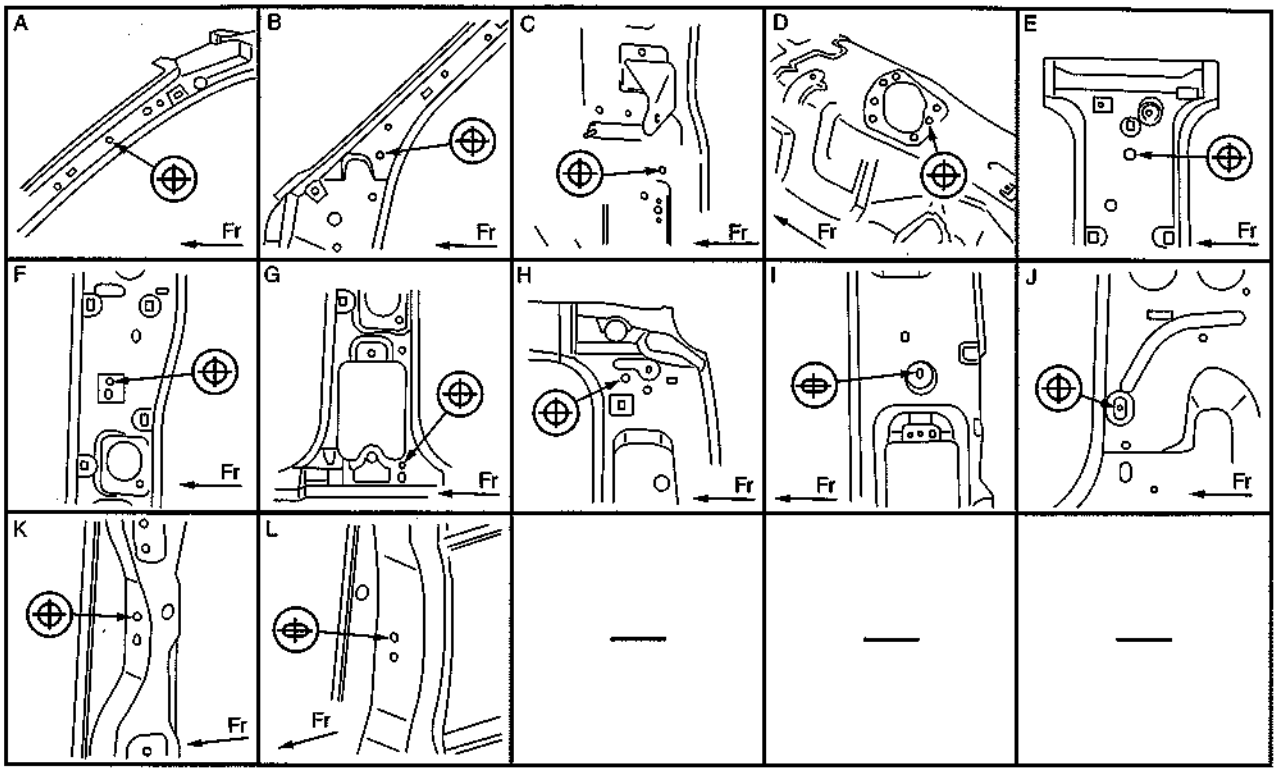
Point symbol	Designation	Hole diameter or bolt or nut size mm {in}
F	Rear pillar inner datum hole	ø12 {0.47}
G	Rear pillar inner datum slot	ø8 x 12 {0.31 x 0.47}
H	Striker installation slot	ø8.2 x 7.6 {0.32 x 0.30}

ROOM STRAIGHT-LINE DIMENSIONS (DOUBLE CAB)

DCF098070001B02



DBG0980B024



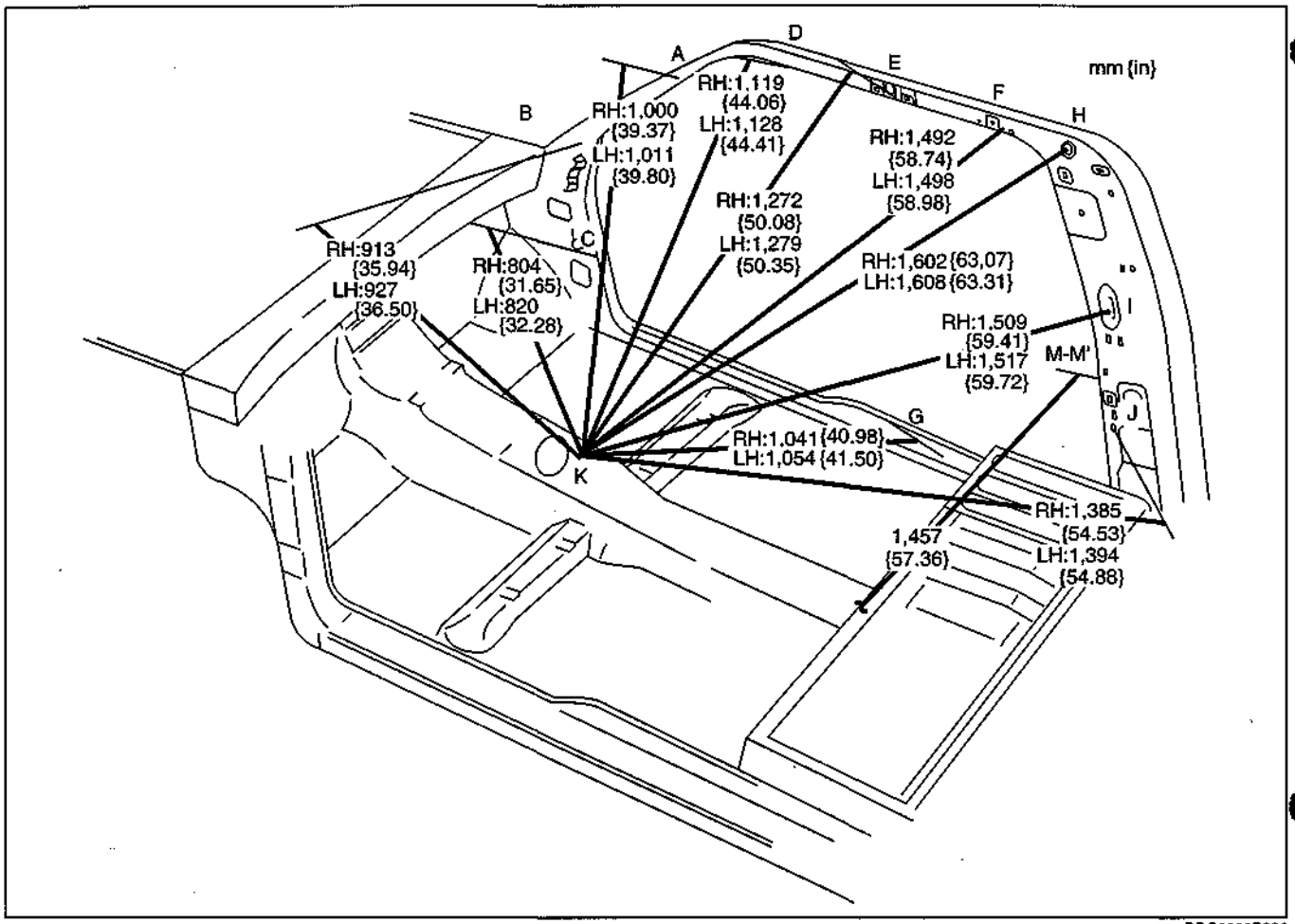
DBG0980B025

Point symbol	Designation	Hole diameter or bolt or nut size mm {in}
A	Harness installation hole	ø7 {0.28}
B	Front pillar inner datum hole	ø10 {0.39}
C	Cowl side panel datum hole	ø12 {0.47}
D	Tunnel reinforcement installation hole	ø7 {0.28}
E	Center pillar inner datum hole	ø7 {0.28}
F	Center pillar inner datum hole	ø7 {0.28}
G	Center pillar inner datum hole	ø7 {0.28}

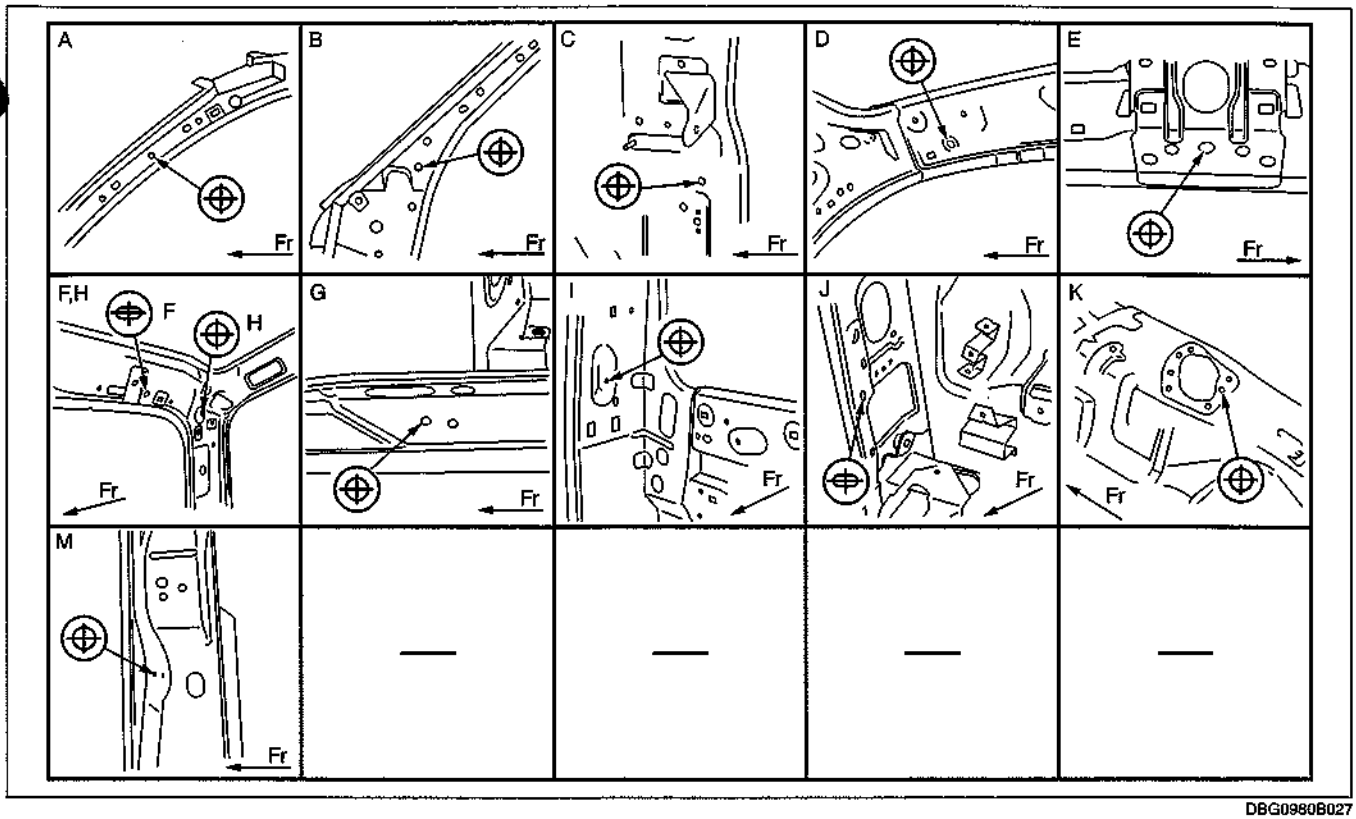
Point symbol	Designation	Hole diameter or bolt or nut size mm {in}
H	Rear pillar inner datum hole	ø12 {0.47}
I	Rear pillar inner datum slot	ø7 x 9 {0.28 x 0.35}
J	Rear pillar inner datum hole	ø6 {0.24}
K	Striker installation hole	ø10.2 {0.40}
L	Striker installation slot	ø8.2 x 7.6 {0.32 x 0.30}

ROOM STRAIGHT-LINE DIMENSIONS (STRETCH CAB {WITH REAR ACCESS SYSTEM}, HI-RIDER)

DCF098070001B03



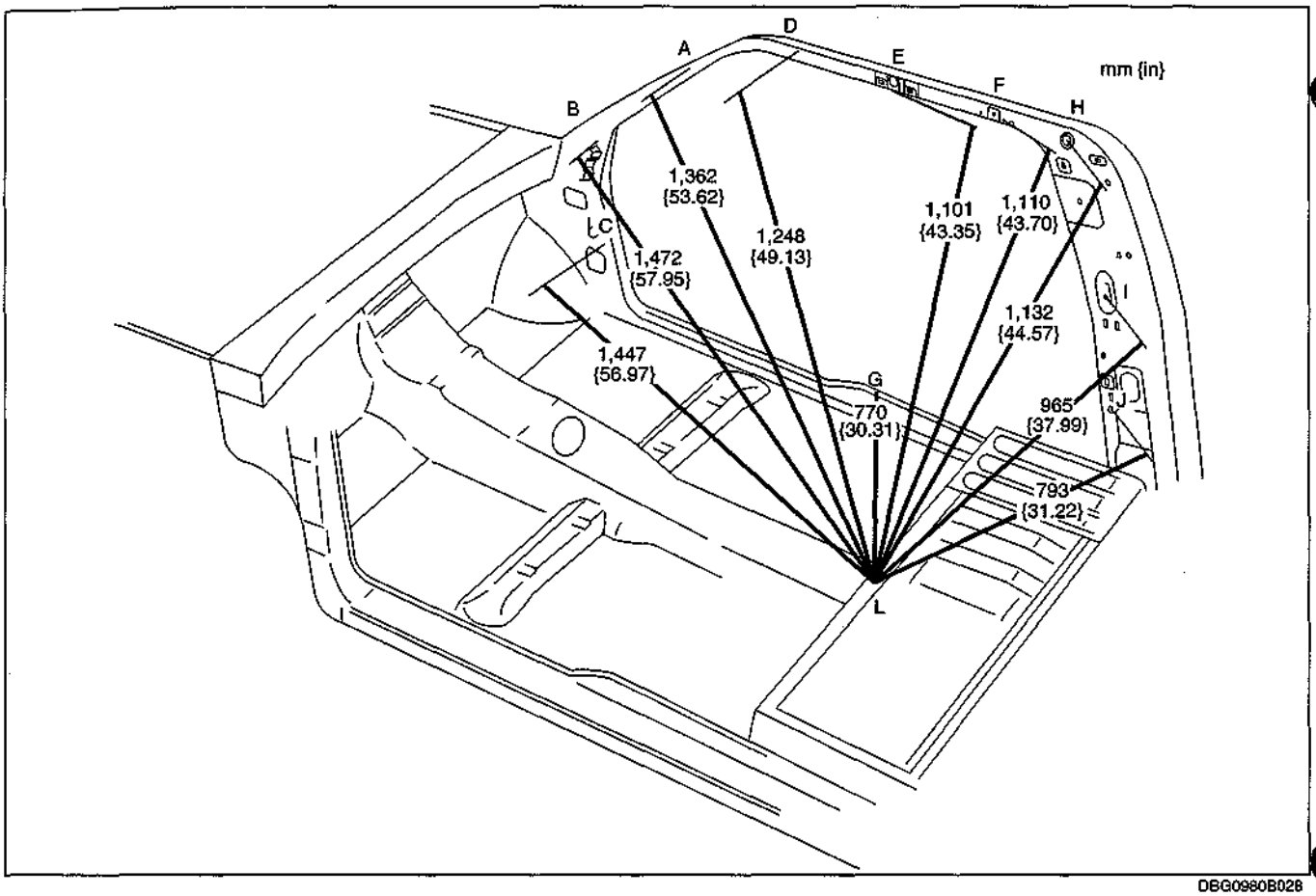
DBG0980B026



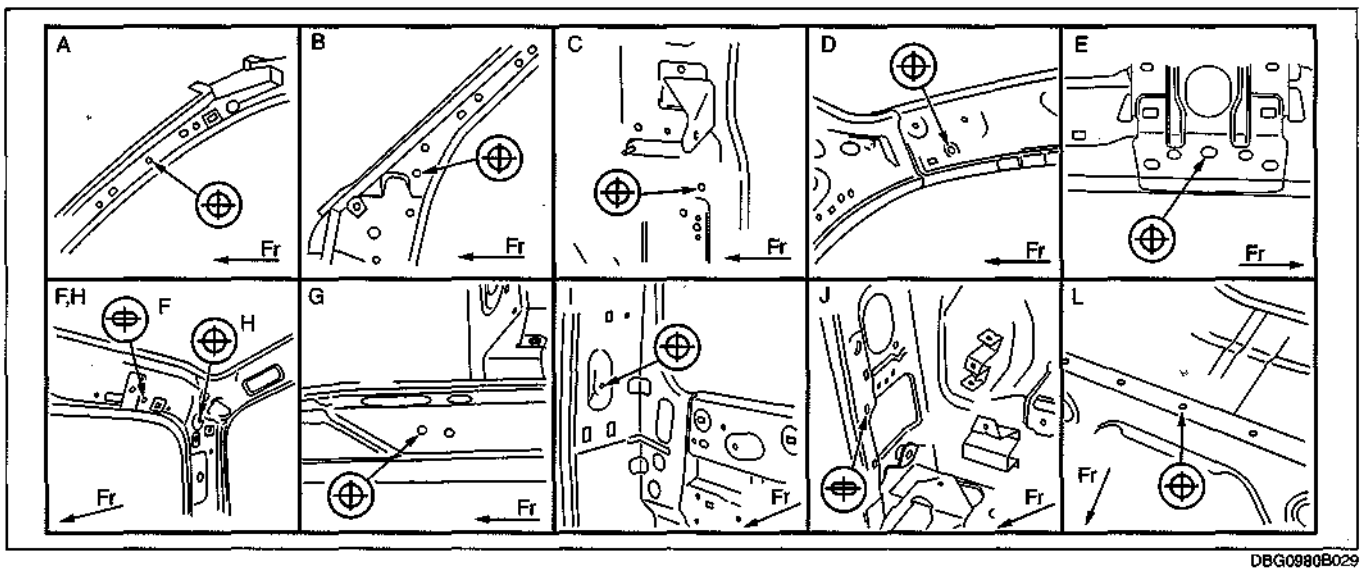
DBG0980B027

Point symbol	Designation	Hole diameter or bolt or nut size mm {in}
A	Harness installation hole	ø7 {0.28}
B	Front pillar inner datum hole	ø10 {0.39}
C	Cowl side panel datum hole	ø12 {0.47}
D	Trim installation hole	ø10 {0.39}
E	Striker installation hole	ø7 {0.28}
F	Trim installation slot	ø10 x 15 {0.39 x 0.59}
G	Striker installation hole	ø13 {0.51}

Point symbol	Designation	Hole diameter or bolt or nut size mm {in}
H	Rear pillar inner datum hole	ø12 {0.47}
I	Pillar trim datum hole	ø6 {0.24}
J	Pillar trim datum slot	ø10 x 20 {0.39 x 0.79}
K	Tunnel reinforcement datum hole	ø7 {0.28}
M	Side frame outer datum hole	ø10 {0.39}



DBG0980B028



DBG0980B029

Point symbol	Designation	Hole diameter or bolt or nut size mm {in}
A	Harness installation hole	ø7 {0.28}
B	Front pillar inner datum hole	ø10 {0.39}
C	Cowl side panel datum hole	ø12 {0.47}
D	Trim installation hole	ø10 {0.39}
E	Striker installation hole	ø7 {0.28}
F	Trim installation slot	ø10 x 15 {0.39 x 0.59}

Point symbol	Designation	Hole diameter or bolt or nut size mm {in}
G	Striker installation hole	ø13 {0.51}
H	Rear pillar inner datum hole	ø12 {0.47}
I	Pillar trim datum hole	ø6 {0.24}
J	Pillar trim datum slot	ø10 x 20 {0.39 x 0.79}
L	Crossmember No.3 datum hole	ø10 {0.39}

GENERAL INFORMATION . . . 00-00

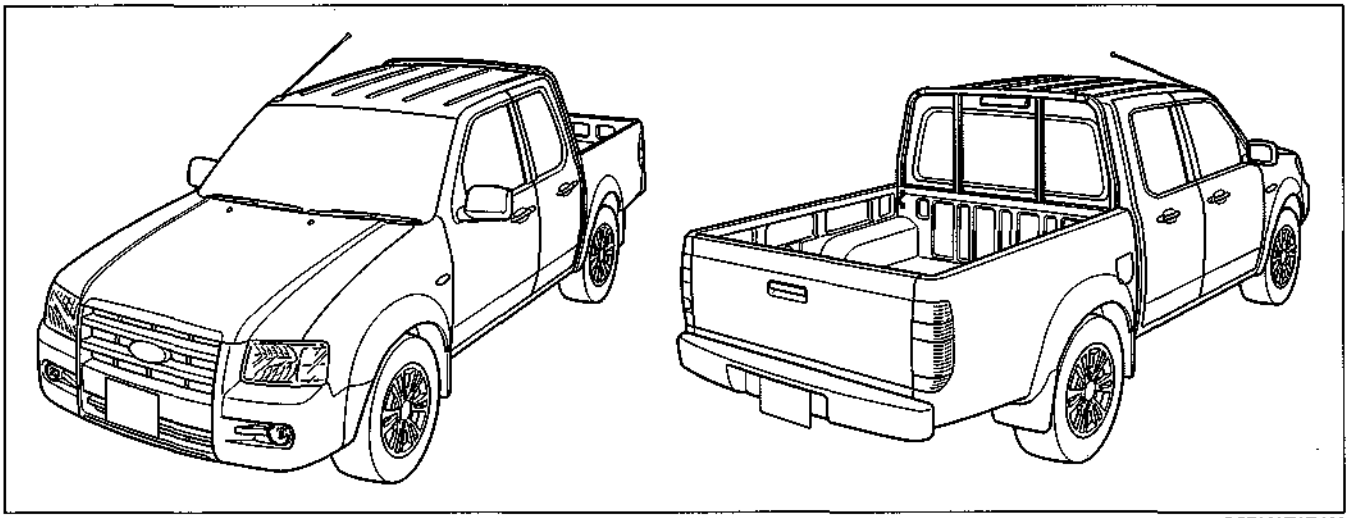
00-00 GENERAL INFORMATION

AIM OF DEVELOPMENT 00-00–1
VEHICLE IDENTIFICATION NUMBER (VIN) CODE 00-00–12
VEHICLE IDENTIFICATION NUMBERS (VIN) 00-00–12
UNITS 00-00–13
NEW STANDARDS 00-00–14

AIM OF DEVELOPMENT

dcf000000000t01

External View



DCF000ZWB002

Vehicle Outline

Engine

Mechanical

— A roller has been adopted to the rocker arm to reduce rolling resistance. Due to this, fuel economy has been improved. (WL-C, WE-C)
— Valve lift has been increased (high lift), improving intake and exhaust efficiencies. Due to this, engine torque and power have been improved. (WL-C, WE-C)
— A timing belt auto tensioner has been adopted to reduce timing belt deterioration. (WL-C, WE-C)
— A DOHC type valve system has been adopted for improved engine torque and power. (WL-C, WE-C)
— Due to the bifurcated oil pan bottom, vibration in the oil pan has been reduced for improved engine noise suppression. (WL-C, WE-C)
— A hard-plastic oil strainer has been adopted for weight reduction.
— A cover has been installed on the upper part of the engine for improved appearance and engine noise suppression. (WL-C, WE-C)
— A balance shaft has been adopted for reduced vibration and noise. (G

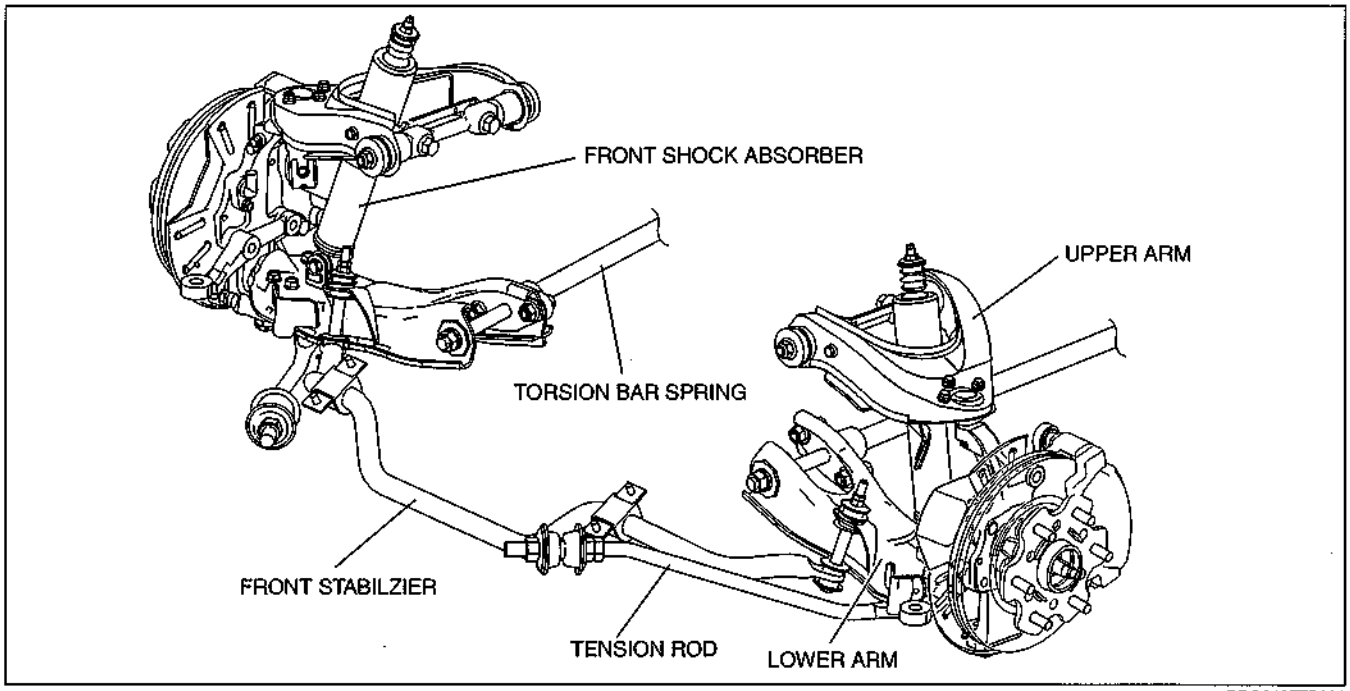
Intake/exhaust and fuel supply systems

— Superior high-output, noise suppression, and low fuel consumption have been realized due to the adoption of a direct injection type common rail. (WL-C, WE-C)
— Smooth driveability has been realized due to the adoption of a variable induction turbocharger which achieves a balance between the air charging pressure providing responsive rise from low speed and the air charging pressure at the high speed range. (WL-C, WE-C)
— A water-cooling type EGR cooler with excellent cooling capability has been adopted for improved intake air charging efficiency, recirculating more exhaust gas. Due to this, NOx has been reduced for improved exhaust emission performance.

Suspension and steering

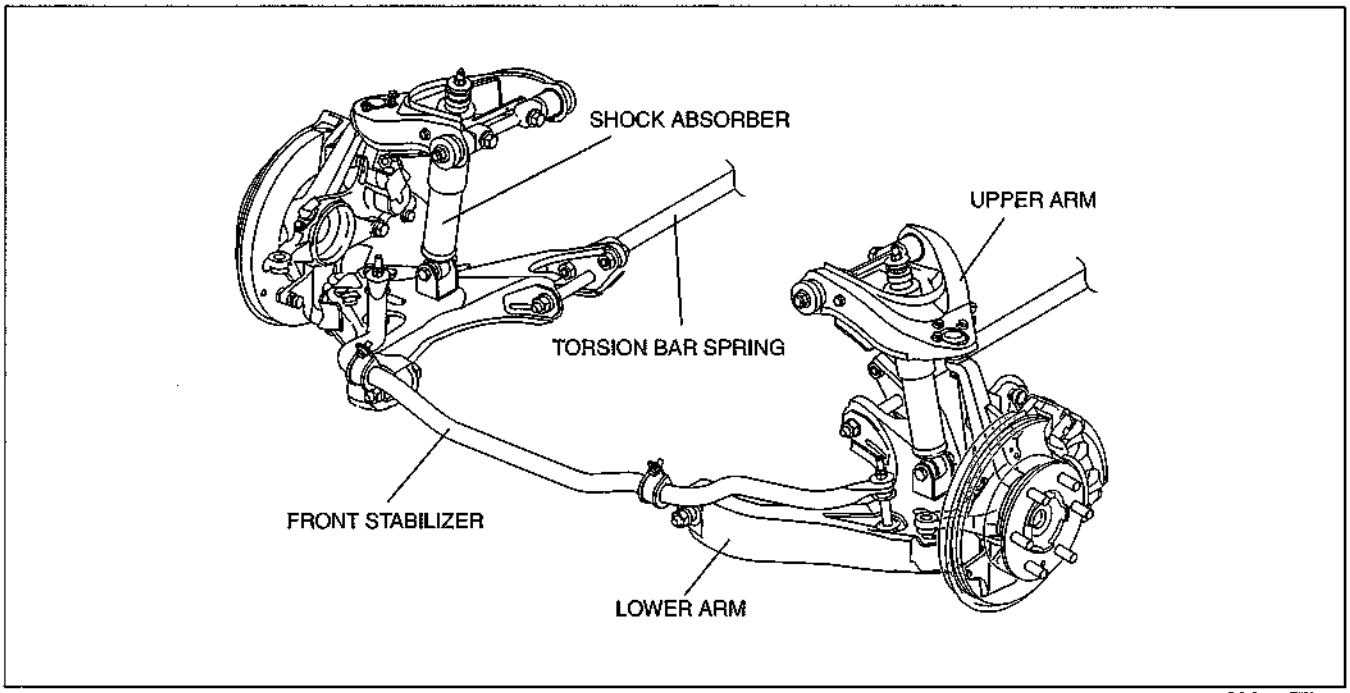
- Front suspension
  - — The double wishbone suspension, which has I-shape lower arms and tension rods, is used for the front suspension of 4x2 models.
  - — The double wishbone suspension, which has A-shape lower arms, is used for the front suspension of 4x2 (Hi-Rider) and 4x4 models. A-shape lower arms have high rigidly and durability.
  - — The torsion bar springs are used for both 4x2 and 4x4 models.

4x2



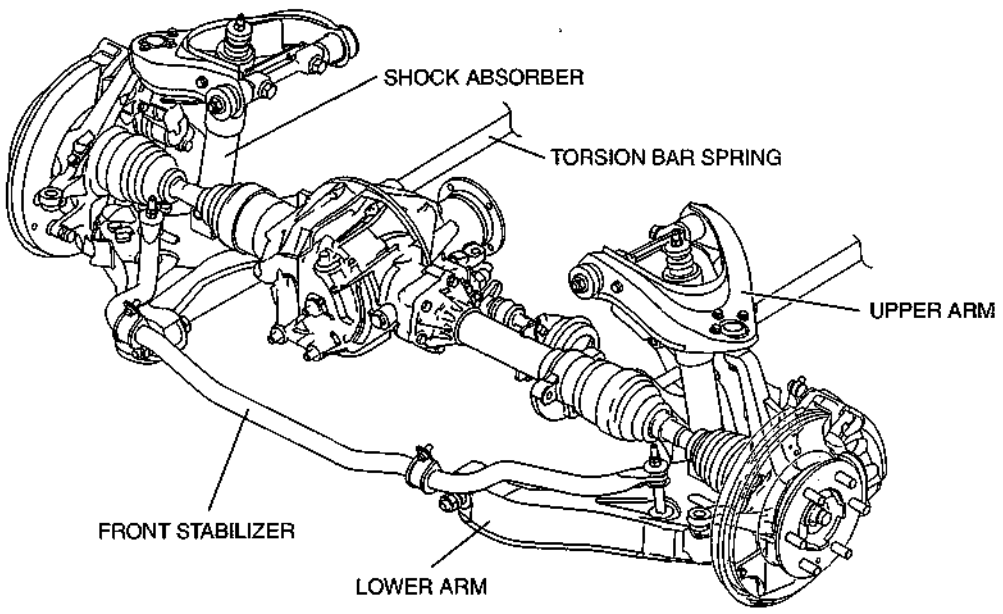
DBG213ZTB001

4x2 (Hi-Rider)



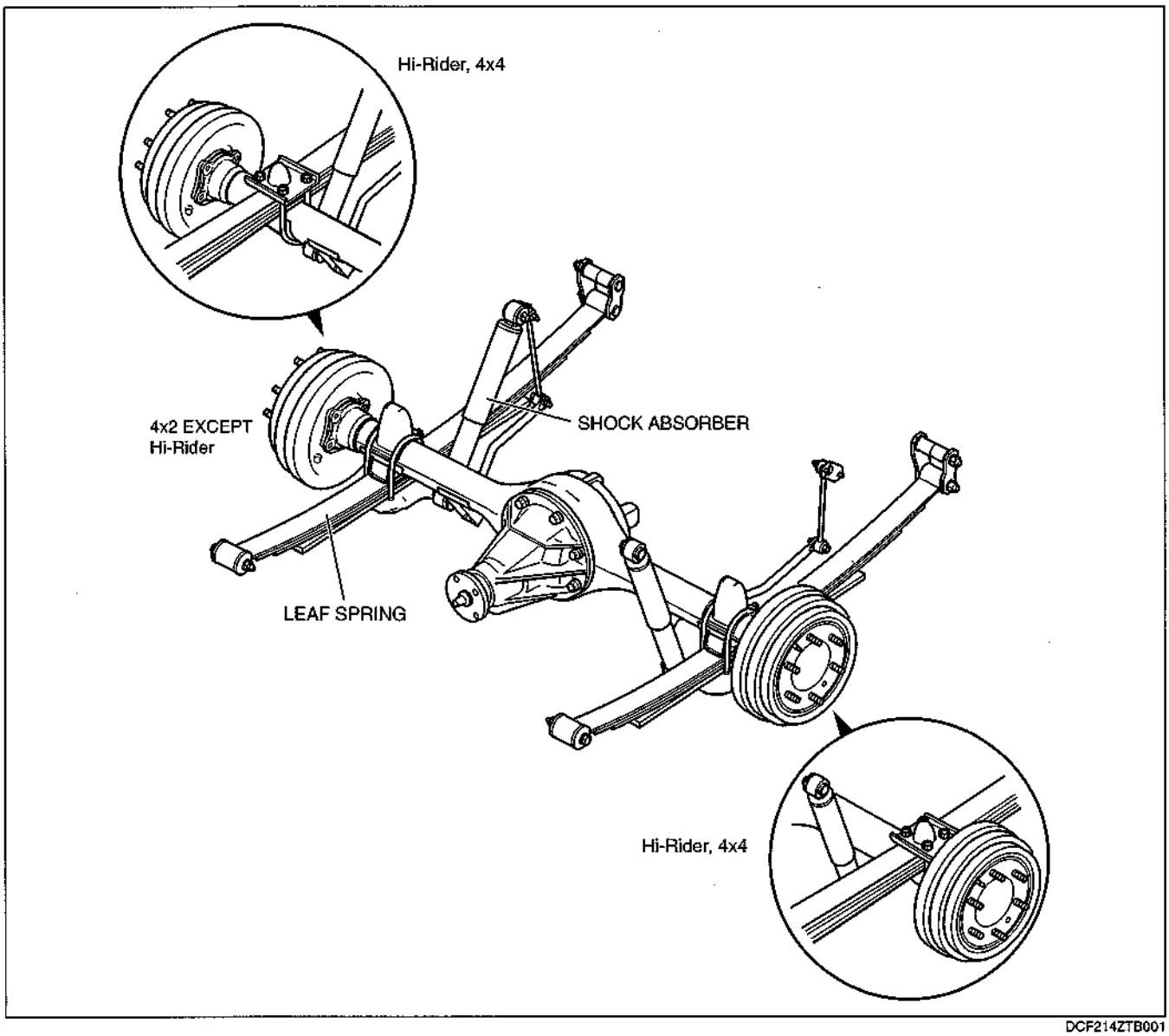
DBG213ZTB002

4x4



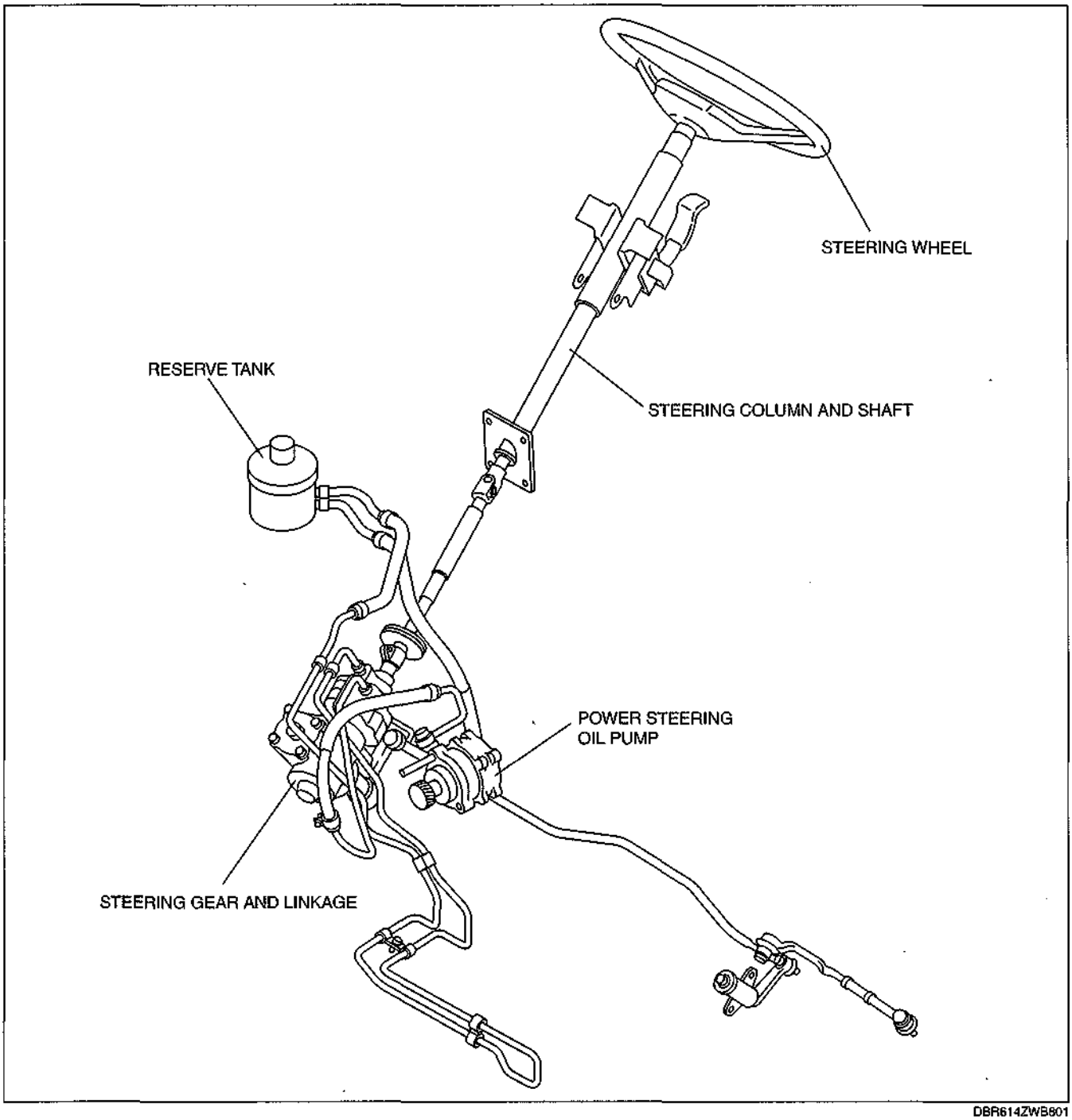
DBG213ZTB003

- Rear suspension
  - — The rigid axle suspension with leaf spring is used for the rear suspension.
  - — To prevent wind-up of the leaf springs during rapid acceleration or deceleration, the shock absorber on the right side is mounted at the rear of the axle and the left one is mounted at the front of the axle, (bias mount).In order to increase the rigidity in the lateral direction, wide shackle plates are used in the frame mounting.
  - — For 4x4 models, the rear springs are mounted on top of the axle housing to raise the center of gravity. Thus, the shock absorbers attach directly to brackets welded to the axle housing.



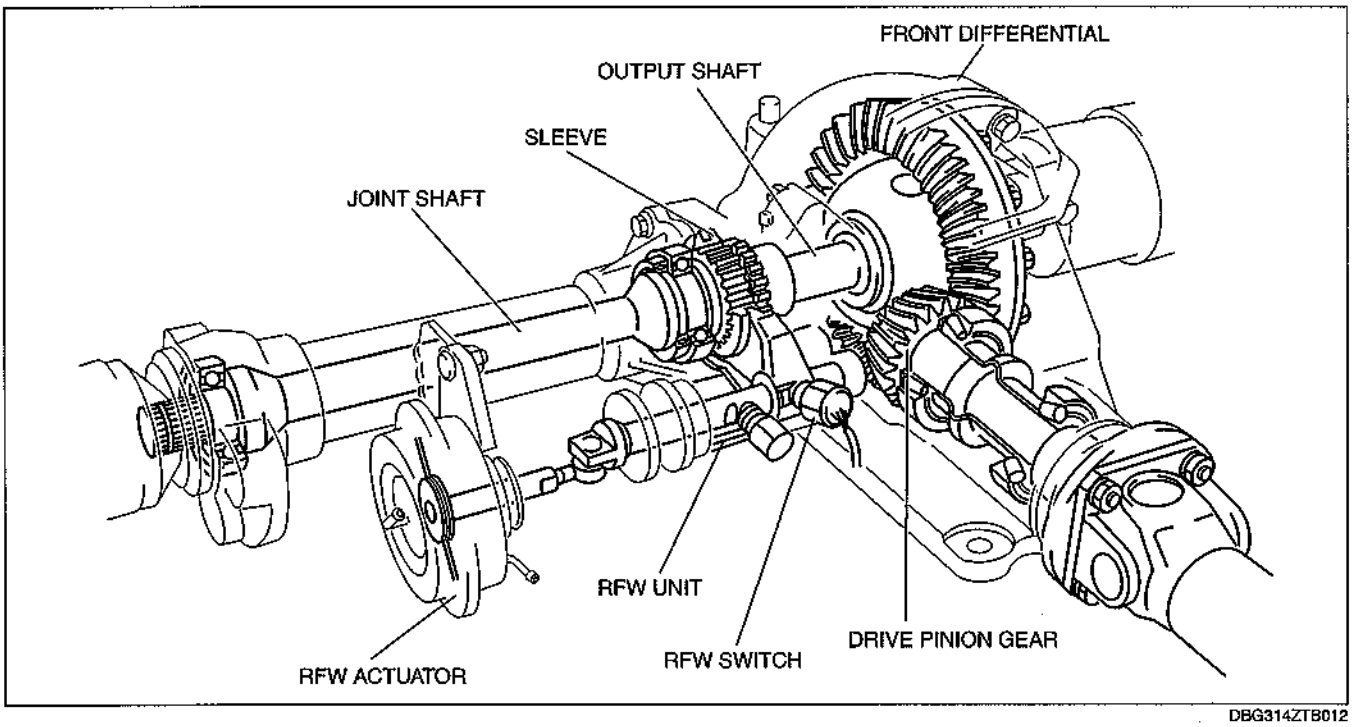
DCF214ZTB001

- Power steering
  - — With the adoption of an engine speed sensing power steering mechanism, handling stability has been improved.
  - — With the adoption, for all vehicles, of a steering column with a tilt mechanism, operability has been improved. (Some models)
  - — With the adoption of a steering shaft with an energy absorbing mechanism, safety has been improved.



DBR614ZWB601

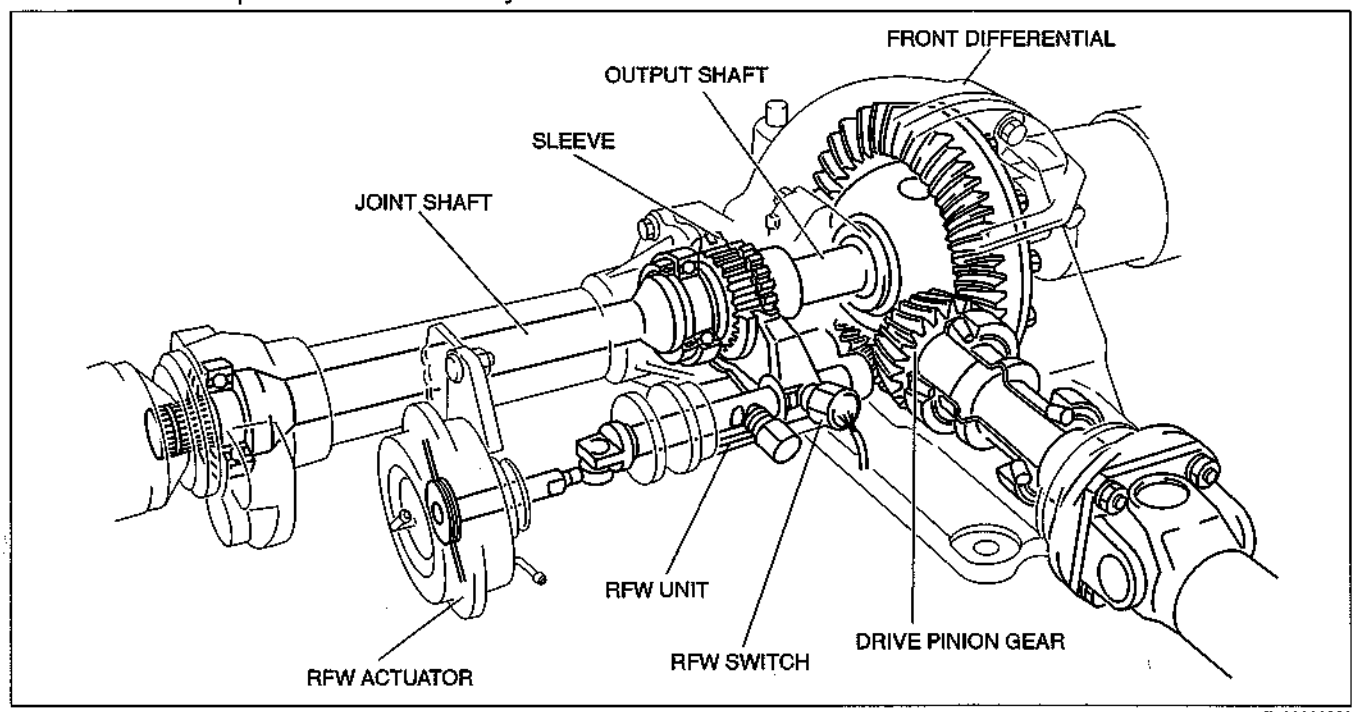
- Remote Freewheel (RFW)
  - — The PCM receives signals from the transfer case switch and other switches. It then activates one of two solenoids, causing a vacuum from the vacuum pump to be applied to the RFW actuator, and switching the remote freewheel (RFW) unit to lock or free.
  - — To prevent reduced performance of the actuator as a result of a decrease in engine vacuum or vacuum pump, such as during acceleration or at high altitude operation, the actuation system includes a one-way check valve.
  - — The switching mechanism of the RFW unit is a mechanical dog clutch on the left side of the front differential.
  - — The RFW operation is controlled by PCM.



DBG314ZT8012

4x4 control

- Remote Freewheel (RFW)
  - — A special 4x4 control module has been adopted for the 4x4 control system control, and it operates the transfer motor according to the signals from the speed sensor, 4x4 switch, and digital TR sensor to perform shifting between 2H, 4H and 4L.
  - — The 4x4 CM receives signals from the transfer case sensor and other switches. It then activates one of two solenoids, causing a vacuum from the vacuum pump to be applied to the RFW actuator, and switching the remote freewheel (RFW) unit to lock or free.
  - — To prevent reduced performance of the actuator as a result of a decrease in engine vacuum or vacuum pump, such as during acceleration or at high altitude operation, the actuation system includes a one-way check valve.
  - — The switching mechanism of the RFW unit is a mechanical dog clutch on the left side of the front differential.
  - — The RFW operation is controlled by 4x4 CM.



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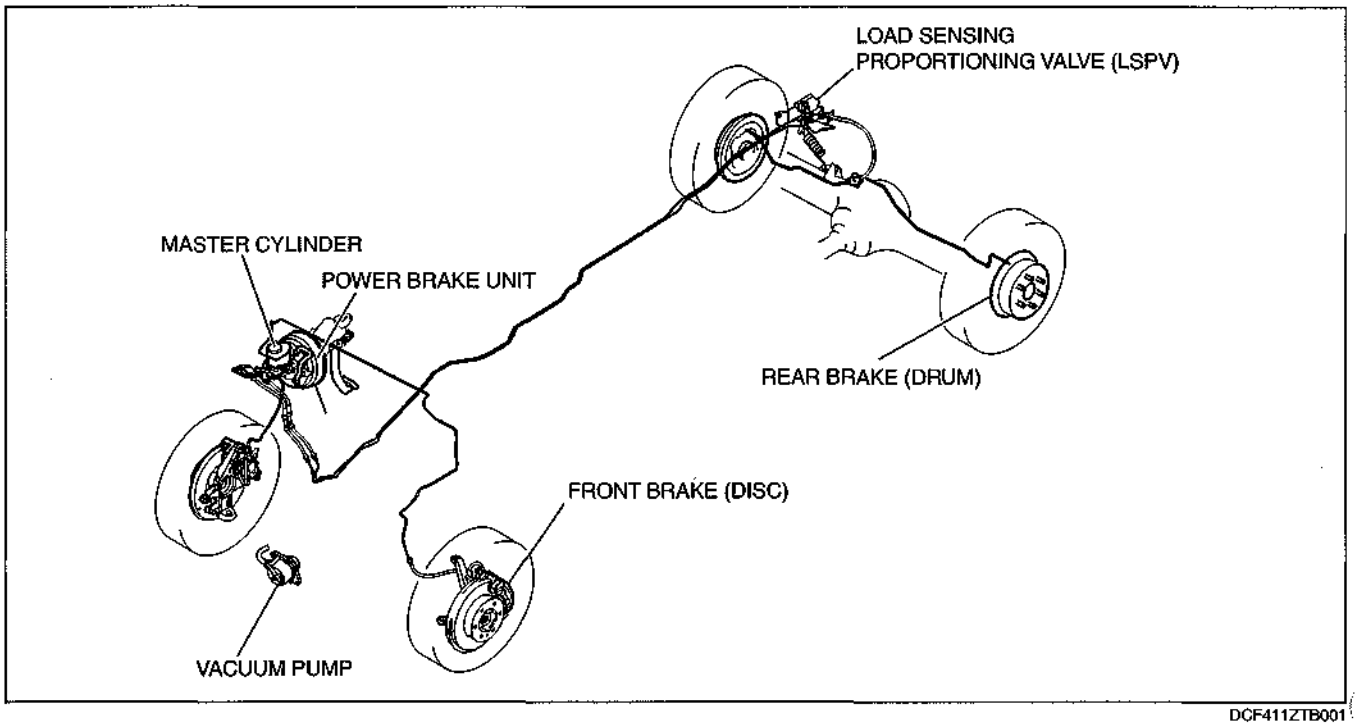
Brakes

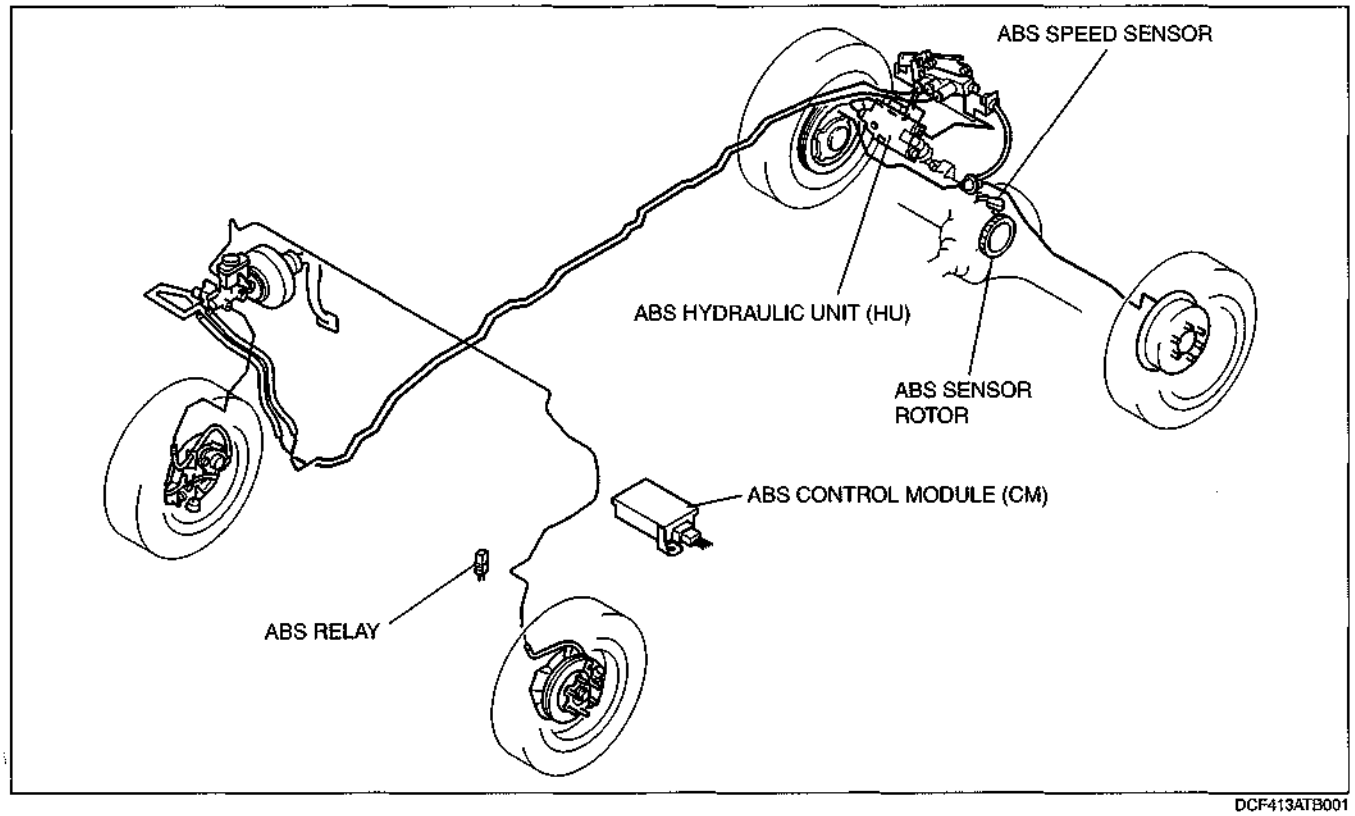
- A tandem-type master cylinder has been adopted, improving braking force.
- A large diameter, tandem diaphragm power brake unit has been adopted, improving braking force.
- A large diameter, ventilated disc-type front brake has been adopted, improving braking force.
- A two-piston type front disc brake caliper has been adopted, improving braking force. (Hi-Rider, 4x4)
- A wide width lining for the rear brake drum has been adopted, improving braking force.
- An Automatic adjustment mechanism rear brake (drum) has been adopted, improving serviceability.
- A vacuum pump has been adopted, improving braking force.



DCF411ZTB001

ABS [REAR ABS]

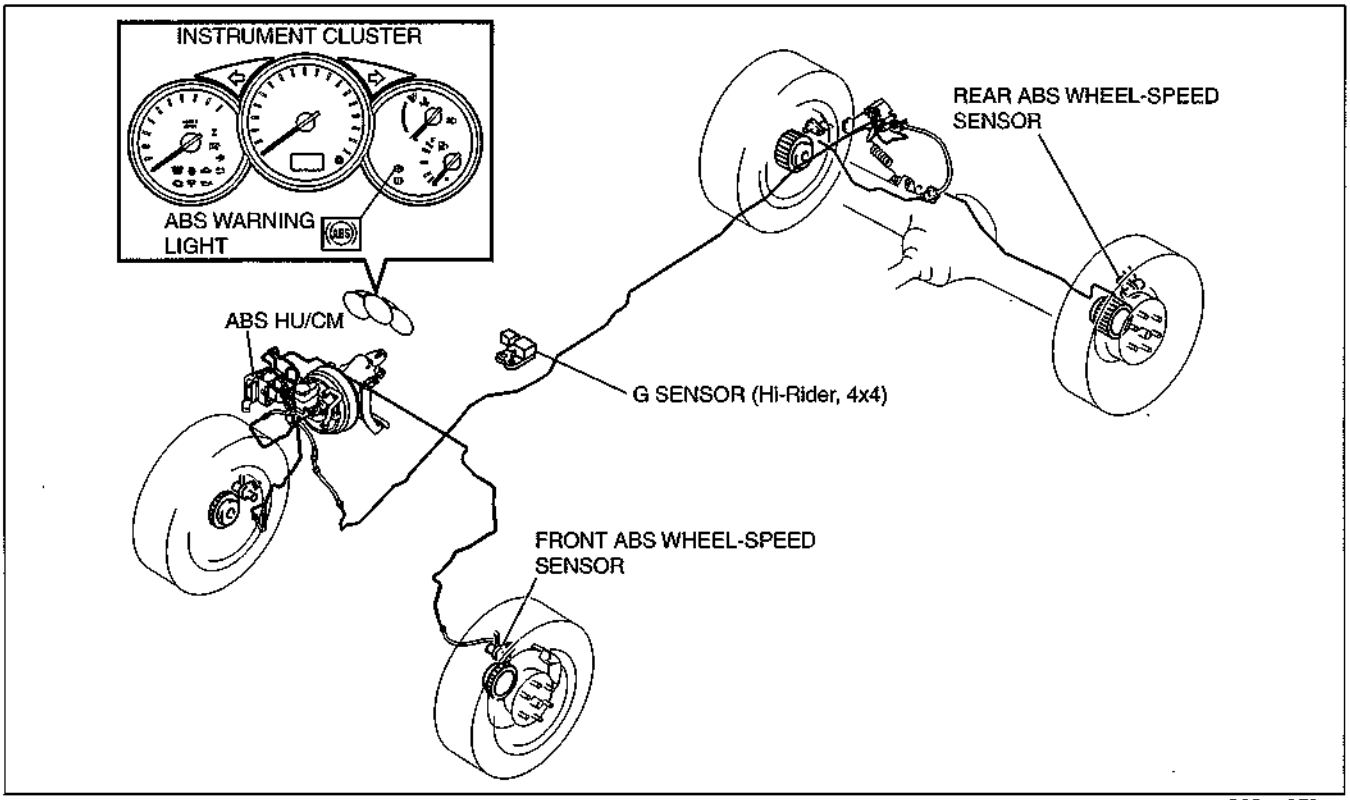
- The ABS is a one sensor, 1-channel control system, which provides dual control for the rear wheels.
- This system continuously monitors rear wheel speed via a sensor mounted on the differential. When the teeth on the sensor rotor, mounted on the ring gear, pass the sensor pickup, AC voltage is induced in the sensor circuit with a frequency proportional to the average rear wheel speed. If a rear wheel is judged likely to lockup during braking, the ABS modulates hydraulic pressure to the rear brakes, inhibiting lockup.



DCF413ATB001

ABS [4W-ABS]

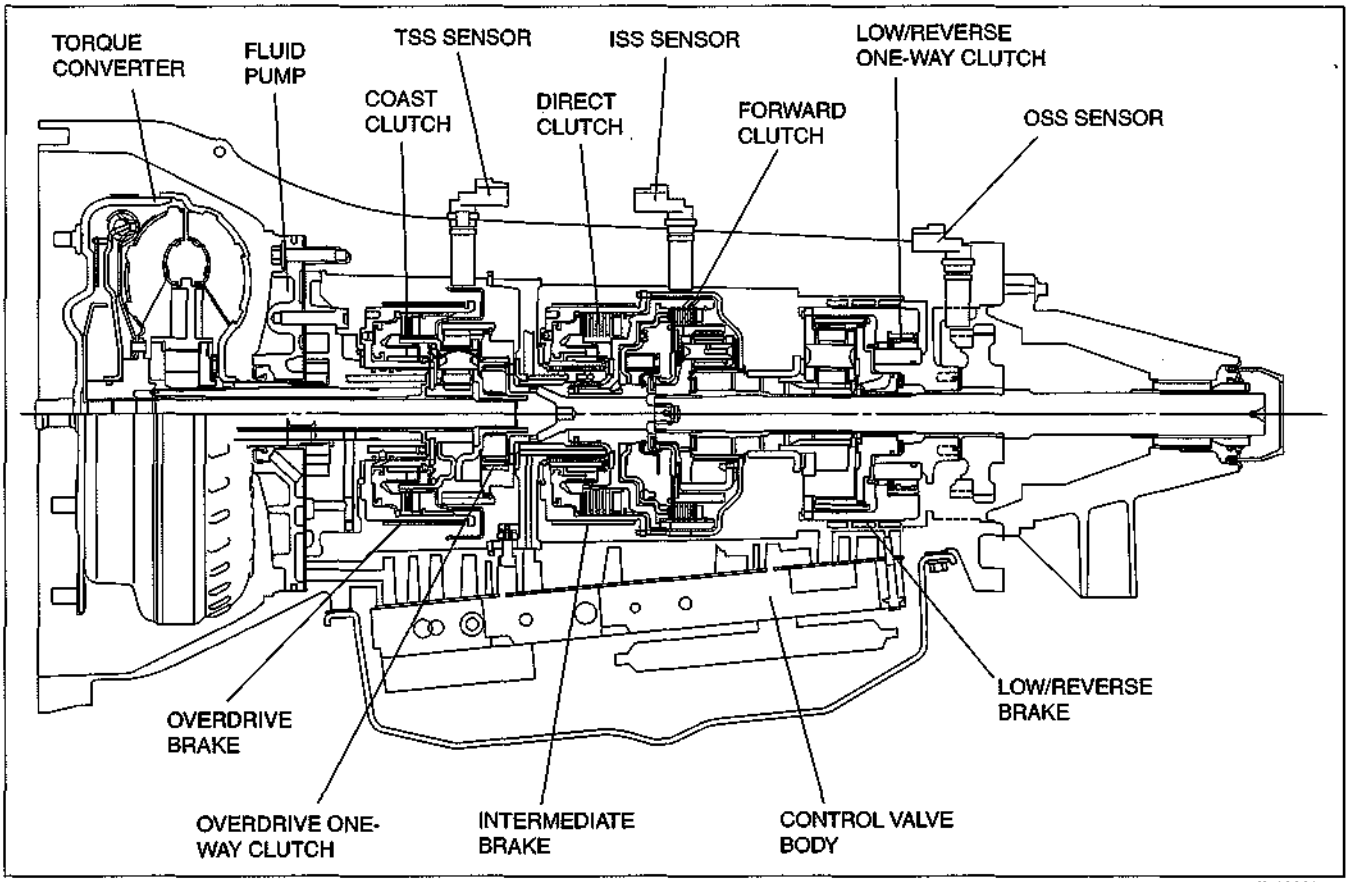
- The ABS HU/CM, integrating both the hydraulic unit (HU) and control module (CM), has been adopted, resulting in size and weight reduction.
- Select-low controlled-4-wheel anti-lock brake system with 4-sensor and 3-channel has been adopted, and has the following features.
  — The integrated ABS Hydraulic Unit/Control Module (HU/CM) system is compact, lightweight and highly reliable.



DCF413BTB001

Transmission

- Automatic transmission [5R55S]
  - — Five forward speeds automatic transmission has been adopted.
  - — A water-cooling type and an air-cooling type AT oil cooler has been adopted.
  - — An adaptive learn strategy system has been adopted.
  - — An engine-transaxle total control system has been adopted.



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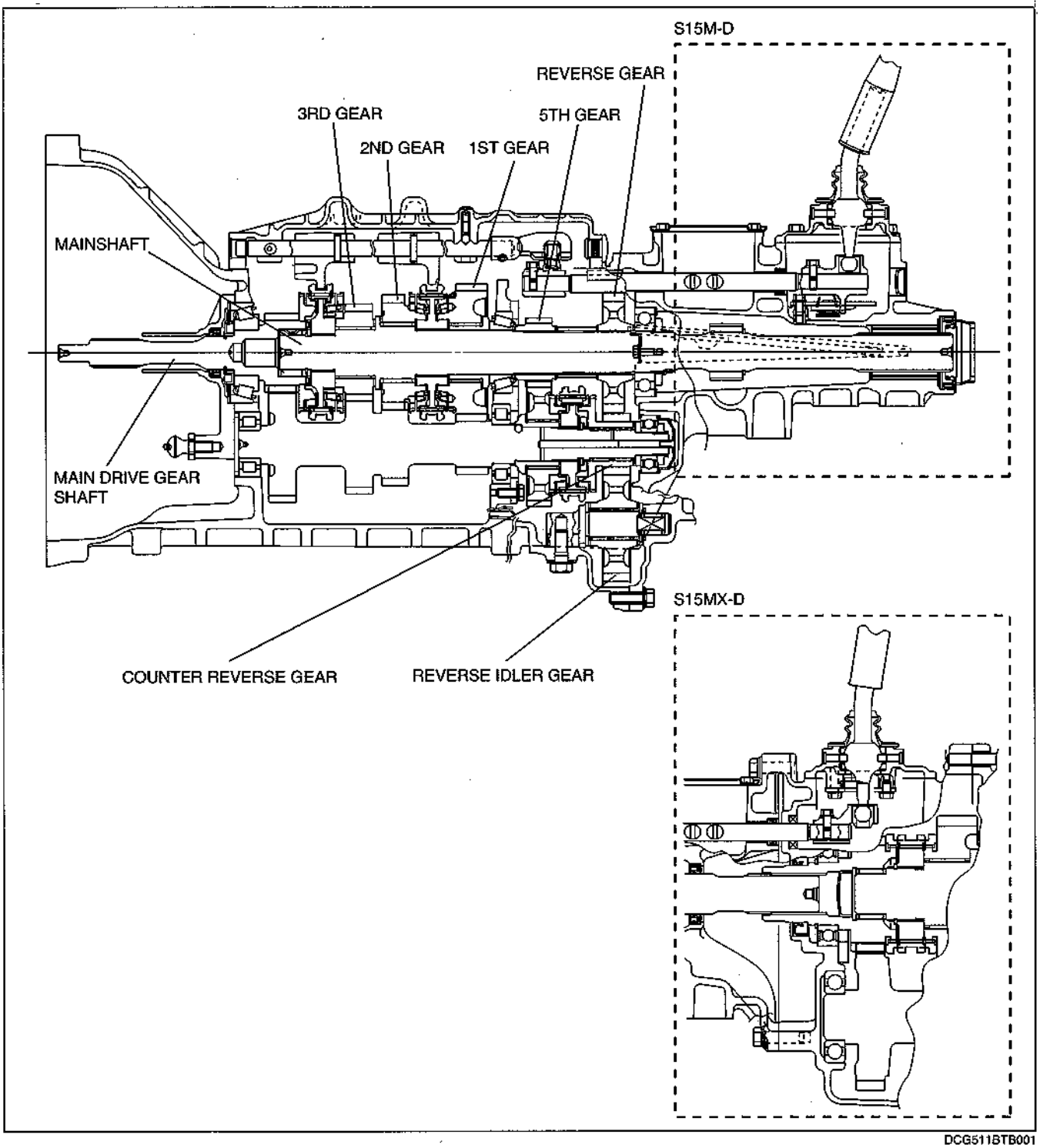
- Manual transmission [S15M-D, S15MX-D]
  - — A linked, triple-cone synchronizer mechanism has been adopted for 1st and 2nd gears.
  - — A linked, double cone synchronizer mechanism has been adopted for 3rd gear.
  - — A cam-type reverse lockout mechanism has been adopted.

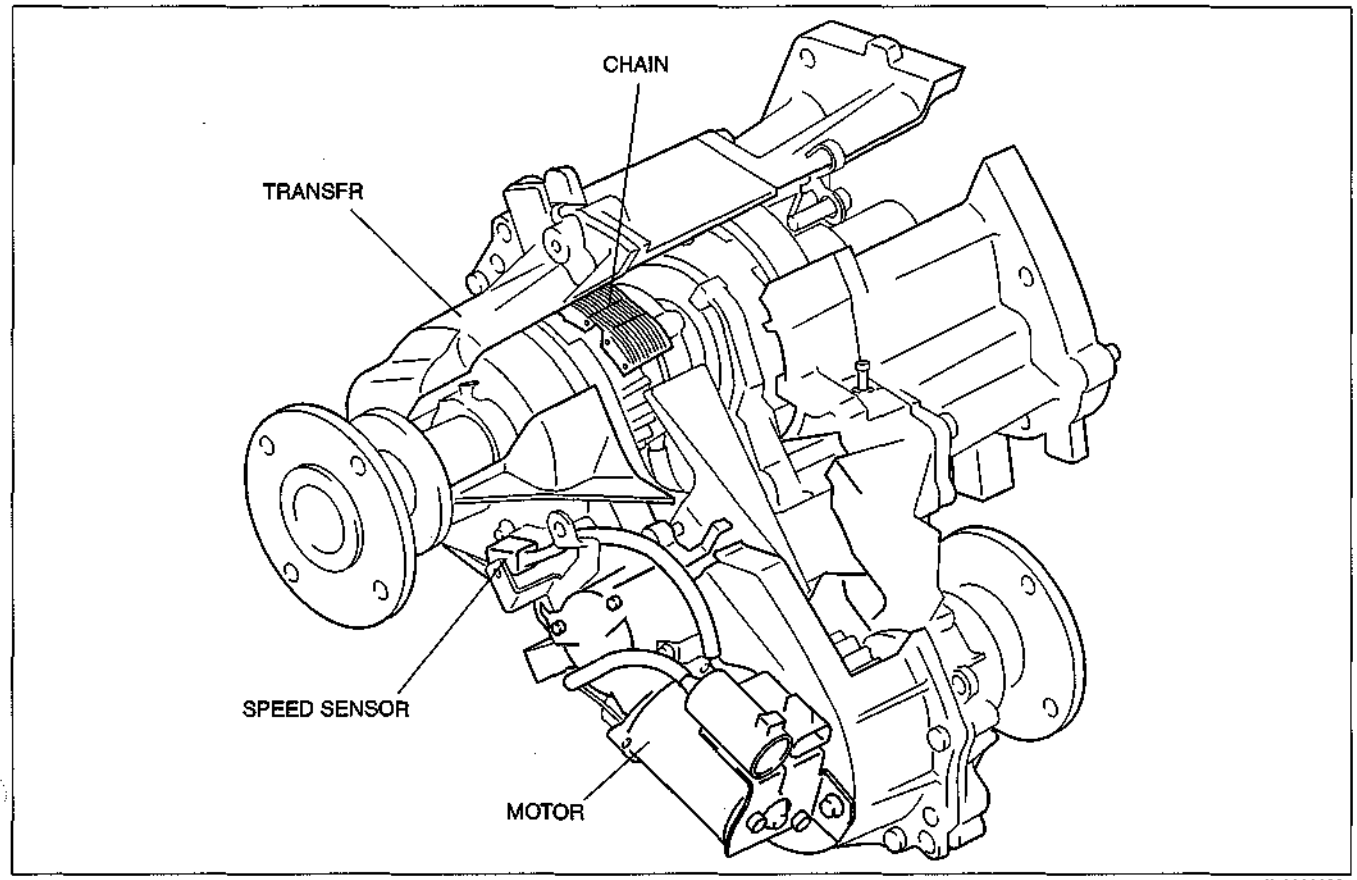


DCG511BTB001

Safety

- An immobilizer system has been adopted. This anti-theft device prevents the engine from being started unless the encrypted identification code, transmitted from a special electronic chip embedded in the key, corresponds with the identification code registered in the vehicle.
- Side air bags that effectively protect the chest area have been adopted for the seats.
- Pre-tensioner and load limiter mechanisms have been adopted for the seat belts.

- Transfer [5R55S]
  - — A chain-type transfer drive has been adopted for 4x4 driving to improve noise suppression. In addition, the drive sprocket, which drives the chain, rotates only during 4x4 driving to improve noise suppression during 4x2 driving.
  - — Shifting between 4x2 HIGH, 4x4 HIGH, and 4x4 LOW is performed by the motor for improved operability.



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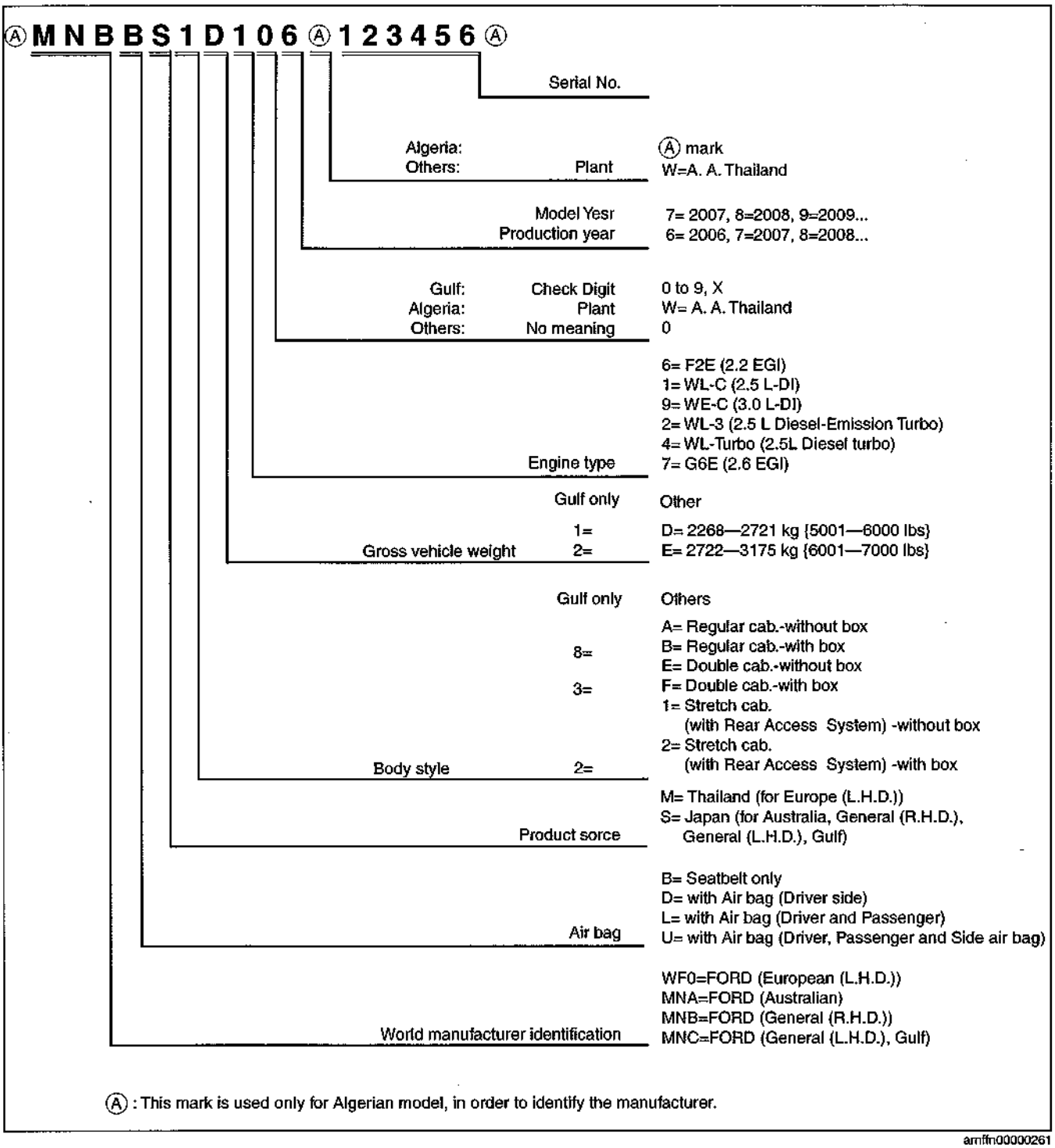
VEHICLE IDENTIFICATION NUMBER (VIN) CODE



Ⓐ : This mark is used only for Algerian model, in order to identify the manufacturer.

amffn00000261

Australian specs.

MNA BS******
MNA DS******
MNA LS******
MNA US******

amffw00001612

UNITS

dcf000000000104

Electrical current	A (ampere)
Electric power	W (watt)
Electric resistance	ohm
Electric voltage	V (volt)
Length	mm (millimeter)
	in (inch)
Negative pressure	kPa (kilo pascal)
	mmHg (millimeters of mercury)
	inHg (inches of mercury)
Positive pressure	kPa (kilo pascal)
	kgf/cm^2 (kilogram force per square centimeter)
	psi (pounds per square inch)
Torque	N·m (Newton meter)
	kgf·m (kilogram force meter)
	kgf·cm (kilogram force centimeter)
	ft·lbf (foot pound force)
	in·lbf (inch pound force)
Volume	L (liter)
	US qt (U.S. quart)
	Imp qt (Imperial quart)
	ml (milliliter)
	cc (cubic centimeter)
	cu in (cubic inch)
	fl oz (fluid ounce)
Weight	g (gram)
	oz (ounce)

Conversion to SI Units (Système International d'Unités)

- All numerical values in this manual are based on SI units. Numbers shown in conventional units are converted from these values.

Rounding Off

- Converted values are rounded off to the same number of places as the SI unit value. For example, if the SI unit value is 17.2 and the value after conversion is 37.84, the converted value will be rounded off to 37.8.

Upper and Lower Limits

- When the data indicates upper and lower limits, the converted values are rounded down if the SI unit value is an upper limit and rounded up if the SI unit value is a lower limit. Therefore, converted values for the same SI unit value may differ after conversion. For example, consider 2.7 kgf/cm^2 in the following specifications:

  210—260 kPa {2.1—2.7 kgf/cm^2, 30—38 psi}
  270—310 kPa {2.7—3.2 kgf/cm^2, 39—45 psi}

- The actual converted values for 2.7 kgf/cm^2 are 265 kPa and 38.4 psi. In the first specification, 2.7 is used as an upper limit, so the converted values are rounded down to 260 and 38. In the second specification, 2.7 is used as a lower limit, so the converted values are rounded up to 270 and 39.

NEW STANDARDS

dcf000000000l05

- Following is a comparison of the previous standard and the new standard.

New Standard		Previous Standard		Remark
Abbreviation	Name	Abbreviation	Name	
AP	Accelerator Pedal	—	Accelerator Pedal	
APP	Accelerator Pedal Position	—	Accelerator Pedal Position	
ACL	Air Cleaner	—	Air Cleaner	
A/C	Air Conditioning	—	Air Conditioning	
BARO	Barometric Pressure	—	Atmospheric Pressure	
B+	Battery Positive Voltage	V_B	Battery Voltage	
—	Brake Switch	—	Stoplight Switch	
—	Calibration Resistor	—	Corrected Resistance	#6
CMP sensor	Camshaft Position Sensor	—	Crank Angle Sensor	
LOAD	Calculated Load Voltage	—	—	
CAC	Charge Air Cooler	—	Intercooler	
CLS	Closed Loop System	—	Feedback System	
CTP	Closed Throttle Position	—	Fully Closed	
CPP	Clutch Pedal Position	—	Clutch Position	
CIS	Continuous Fuel Injection System	EGI	Electronic Gasoline Injection System	
CS sensor	Control Sleeve Sensor	CSP sensor	Control Sleeve Position Sensor	#6
CKP sensor	Crankshaft Position Sensor	—	Crank Angle Sensor 2	
DLC	Data Link Connector	—	Diagnosis Connector	
DTM	Diagnostic Test Mode	—	Test Mode	#1
DTC	Diagnostic Trouble Code(s)	—	Service Code(s)	
DI	Distributor Ignition	—	Spark Ignition	
DLI	Distributorless Ignition	—	Direct Ignition	
EI	Electronic Ignition	—	Electronic Spark Ignition	#2
ECT	Engine Coolant Temperature	—	Water Thermo	
EM	Engine Modification	—	Engine Modification	
—	Engine Speed Input Signal	—	Engine RPM Signal	
EVAP	Evaporative Emission	—	Evaporative Emission	
EGR	Exhaust Gas Recirculation	—	Exhaust Gas Recirculation	
FC	Fan Control	—	Fan Control	
FF	Flexible Fuel	—	Flexible Fuel	
4GR	Fourth Gear	—	Overdrive	
—	Fuel Pump Relay	—	Circuit Opening Relay	#3
FSO solenoid	Fuel Shut Off Solenoid	FCV	Fuel Cut Valve	#6
GEN	Generator	—	Alternator	
GND	Ground	—	Ground/Earth	
HO2S	Heated Oxygen Sensor	—	Oxygen Sensor	With heater
IAC	Idle Air Control	—	Idle Speed Control	
—	IDM Relay	—	Spill Valve Relay	#6
—	Incorrect Gear Ratio	—	—	
—	Injection Pump	FIP	Fuel Injection Pump	#6
—	Input/Turbine Speed Sensor	—	Pulse Generator	
IAT	Intake Air Temperature	—	Intake Air Thermo	
KS	Knock Sensor	—	Knock Sensor	
MIL	Malfunction Indicator Lamp	—	Malfunction Indicator Light	
MAP	Manifold Absolute Pressure	—	Intake Air Pressure	
MAF	Mass Air Flow	—	Mass Air Flow	
MAF sensor	Mass Air Flow Sensor	—	Airflow Sensor	
MFI	Multiport Fuel Injection	—	Multiport Fuel Injection	
OBD	On-Board Diagnostic	—	Diagnosis/Self Diagnosis	
OL	Open Loop	—	Open Loop	

New Standard		Previous Standard		Remark
Abbreviation	Name	Abbreviation	Name	
—	Output Speed Sensor	—	Vehicle Speed Sensor 1	
OC	Oxidation Catalytic Converter	—	Catalytic Converter	
O2S	Oxygen Sensor	—	Oxygen Sensor	
PNP	Park/Neutral Position	—	Park/Neutral Range	
PID	Parameter Identification	—	Parameter Identification	
—	PCM Control Relay	—	Main Relay	#6
PSP	Power Steering Pressure	—	Power Steering Pressure	
PCM	Powertrain Control Module	ECU	Engine Control Unit	#4
—	Pressure Control Solenoid	—	Line Pressure Solenoid Valve	
PAIR	Pulsed Secondary Air Injection	—	Secondary Air Injection System	Pulsed injection
—	Pump Speed Sensor	—	NE Sensor	#6
RAM	Random Access Memory	—	—	
AIR	Secondary Air Injection	—	Secondary Air Injection System	Injection with air pump
SAPV	Secondary Air Pulse Valve	—	Reed Valve	
SFI	Sequential Multipoint Fuel Injection	—	Sequential Fuel Injection	
—	Shift Solenoid A	—	1–2 Shift Solenoid Valve	
		—	Shift A Solenoid Valve	
—	Shift Solenoid B	—	2–3 Shift Solenoid Valve	
		—	Shift B Solenoid Valve	
—	Shift Solenoid C	—	3–4 Shift Solenoid Valve	
3GR	Third Gear	—	3rd Gear	
TWC	Three Way Catalytic Converter	—	Catalytic Converter	
TB	Throttle Body	—	Throttle Body	
TP	Throttle Position	—	—	
TP sensor	Throttle Position Sensor	—	Throttle Sensor	
TCV	Timer Control Valve	TCV	Timing Control Valve	#6
TCC	Torque Converter Clutch	—	Lockup Position	
TCM	Transmission (Transaxle) Control Module	—	EC-AT Control Unit	
—	Transmission (Transaxle) Fluid Temperature Sensor	—	ATF Thermosensor	
TR	Transmission (Transaxle) Range	—	Inhibitor Position	
TC	Turbocharger	—	Turbocharger	
VSS	Vehicle Speed Sensor	—	Vehicle Speed Sensor	
VR	Voltage Regulator	—	IC Regulator	
VAF sensor	Volume Air Flow Sensor	—	Air Flow Sensor	
WUTWC	Warm Up Three Way Catalytic Converter	—	Catalytic Converter	#5
WOT	Wide Open Throttle	—	Fully Open	

#1: Diagnostic trouble codes depend on the diagnostic test mode
#2: Controlled by the PCM
#3: In some models, there is a fuel pump relay that controls pump speed. That relay is now called the fuel pump relay (speed).
#4: Device that controls engine and powertrain
#5: Directly connected to exhaust manifold
#6: Part name of diesel engine

ENGINE

01
SECTION

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01

01-00 OUTLINE

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ENGINE SPECIFICATION [WL-C, WE-C] 01-00–5

ENGINE ABBREVIATIONS

dcf01000200t01

ABDC	After Bottom Dead Center
ABS	Antilock Brake System
ACC	Accessories
ATDC	After Top Dead Center
BBDC	Before Bottom Dead Center
BDC	Bottom Dead Center
BTDC	Before Top Dead Center
CAN	Controller Area Network
CCM	Comprehensive Component Monitor
CM	Control Module
DC	Drive Cycle
DLC-2	Data Link Connector-2
DOHC	Double Overhead Camshaft
DSC	Dynamic Stability Control
EX	Exhaust
FFD	Freeze Frame Data
HU	Hydraulic Unit
IN	Intake
KOEO	Key On Engine Off
KOER	Key On Engine Running
M	Motor
MRE	Magneto Resistance Element

MT	Manual Transmission
PATS	Passive Anti-theft System
OFF	Switch on
ON	switch off
PC	Pending Code
PCV	Positive Crankcase Ventilation
PID	Parameter Identification
P/S	Power Steering
SOHC	Single Overhead Camshaft
SST	Special Service Tool
TDC	Top Dead Center
VBC	Variable Boost Control

ENGINE FEATURES [WL-3, WL-C, WE-C]

dcf010002000102

Mechanical

Improved engine performance	• Coated pistons have been adopted (WL-C, WE-C) • Swirl type combustion chamber (WL-3) • DOHC with 4 valves per cylinder (WL-C, WE-C) • 3 valves per cylinder (WL-3)
Reduced engine noise and vibration	• An eight counter weight crankshaft has been adopted • A crankshaft pulley cover has been adopted (WL-C, WE-C) • An engine cover with insulator has been adopted (WL-C, WE-C) • Full-floating cylinder head cover mounting • Torsional damper pulley
Improved serviceability	• An auto tensioner that automatically adjusts the timing belt tension has been adopted (WL-C, WE-C)
Improved design	• An engine cover has been adopted (WL-C, WE-C)

Lubrication

Improved lubricity	• Gear type oil pump adopted • Oil jet valves adopted • Water-cooled type oil cooler adopted
Reduced weight	• Plastic oil strainer adopted
Reduced engine noise	• Oil pan baffle plate adopted (WL-C, WE-C)

Cooling System

Reduced weight	• Down flow type radiator with aluminum core and plastic tank adopted
Miniaturization	• Built-in type water pump adopted
Reduced noise	• Thermo-modulation type cooling fan adopted
Improved serviceability	• Longer-life new engine coolant (type FL22) adopted

Intake air System

Power efficiency, performance, and fuel economy	• A variable geometry turbocharger has been adopted (WL-C, WE-C)
Improved emission gas purification	• Small size turbocharge has been adopted (WL-3)

Fuel System

Improved emission gas purification	• Electronic control type fuel injection pump adopted
Exhaust gas purification	• Common rail injection system adopted (WL-C, WE-C)

Emission System

Improved exhaust gas purification	• EGR system adopted • EGR cooler adopted • Oxidation catalytic converter adopted
Improved reliability	• Rollover valve adopted

Charging System

Improved reliability	• Generator with built-in battery sensing type IC regulator adopted

Starting System

Improved startability	• Reduction type starter adopted

Control System

Improved emission gas purification	• Intake shutter valve control adopted (WL-C, WE-C) • Fuel injection control changed • EGR control adopted

ENGINE SPECIFICATION [WL-3]

dcf010002000003

Specification

Item				Specifications
				WL-3
MECHANICAL				
Type				Diesel, 4-cycle
Cylinder arrangement and number				In-line, 4 cylinder
Combustion chamber				Swirl type
Valve system				SOHC, timing gear and belt driven, 12-valve
Displacement			(ml {cc, cu in})	2,499 {2,499, 152.4}
Bore x stroke			(mm {in})	93.0 x 92.0 {3.66 x 3.62}
Compression ratio				21.6
Compression pressure			(kPa {kgf/cm^2, psi} [rpm])	2,942 {30.0, 427} [200]
Valve timing	IN	Open	BTDC (°)	8
		Close	ABDC (°)	23
	EX	Open	BBDC (°)	61
		Close	ATDC (°)	9
Valve clearance [Engine cold]	(mm {in})	IN		0.05—0.15 {0.0020—0.0059}
		EX		0.15—0.25 {0.0060—0.0098}
LUBRICATION SYSTEM				
Type				Force-fed type
Oil pressure (reference value) [after warm up]			(kPa {kgf/cm^2, psi} [rpm])	410—570 {4.19—5.81, 59.6—82.6} [2,500]
Oil pump	Type			Gear type
	Relief valve opening pressure (reference value)		(kPa {kgf/cm^2, psi})	580—700 {5.9—7.1, 84.1—101.5}
Oil cooler	Type			Water-cooled
Oil filter	Type			Full-flow, paper element
	Bypass pressure		(kPa {kgf/cm^2, psi})	80—120 {0.82—1.22, 11.6—17.4}
Oil capacity (approx. quantity)	Total (dry engine)		(L {US qt, Imp qt})	6.7 {7.1, 5.9}
	Oil replacement		(L {US qt, Imp qt})	5.5 {5.8, 4.8}
	Oil and oil filter replacement		(L {US qt, Imp qt})	6.2 {6.6, 5.5}
COOLING SYSTEM				
Type				Water-cooled, forced circulation
Coolant capacity (approx. quantity)			(L {US qt, Imp qt})	8.8 {9.3, 7.7}
Water pump	Type			Centrifugal, V-belt driven
Thermostat	Type			Wax, bottom-bypass
	Opening temperature		(°C {°F})	80—84 {176—183}
	Full-open temperature		(°C {°F})	95 {203}
	Full-open lift		(mm {in})	8.5 {0.33} or more
Radiator	Type			Corrugated fin
Cooling system cap	Cap valve opening pressure		(kPa {kgf/cm^2, psi})	93.2—122.6 {0.95—1.25, 13.5—17.8}
Cooling fan	Type			Thermo-modulation type
	Number of blades			10
	Outer diameter		(mm {in})	440 {17.3}

Item			Specifications
			WL-3
INTAKE AIR SYSTEM			
Turbocharger type			Small size turbocharger
Air cleaner element			Dry type (Non-woven fabric)
Glow plug type			Ceramic type
FUEL SYSTEM			
Fuel injection pump			Bosch VE distributor (Electronic control)
Fuel tank capacity (reference)		(L {US gal, Imp gal})	63 {17, 14}*1, 70 {18, 15}*2
EMISSION SYSTEM			
EGR valve type			Vacuum
Catalytic converter type			Oxidation catalytic converter
CHARGING SYSTEM			
Battery	Voltage	(V)	12
	Type and capacity (5-hour rate)	(A-h)	65D31R (56)
Generator	Output	(V-A)	12-70
	Regulated voltage	(V)	14.1—14.7
	Self diagnosis function		Equipped
STARTING SYSTEM			
Starter	Type		Coaxial reduction
	Output	(kW)	2.2
CONTROL SYSTEM			
IAT sensor No.2 (Inside MAF)			Thermistor
MAF sensor			Hot-wire
IAT sensor No.1			Thermistor
Boost sensor			Piezoelectric element
ECT sensor			Thermistor
CKP sensor			Magnetic pickup
APP sensor			Potentiometer
EGR valve position sensor			Potentiometer
BARO sensor (built into PCM)			Piezoelectric element
Fuel temperature sensor			Thermistor
CS sensor			Magnetic pickup
Timer position sensor			Magnetic pickup
Fuel pump speed sensor			Magnetic pickup
Neutral switch			ON/OFF
CPP switch			ON/OFF
Idle switch			ON/OFF

*1 : Double cab, freestyle cab
*2 : Regular cab

Recommended engine oil

Item	Specification
Grade	API CD/CE/CF–4 or ACEA B1/B3/B5
Viscosity (SAE)	5W-30, 10W-30

ENGINE SPECIFICATION [WL-C, WE-C]

dcl010002000004

Specification

Item			Specifications	
			WL-C	WE-C
MECHANICAL				
Type			Diesel, 4-cycle	
Cylinder arrangement and number			In-line, 4 cylinder	
Combustion chamber			Direct injection	
Valve system			DOHC, timing gear and belt driven, 16-valve	
Displacement		(ml {cc, cu in})	2,499 {2,499, 152.4}	2,953 {2,953, 180.2}
Bore x stroke		(mm {in})	93.0 x 92.0 {3.66 x 3.62}	96.0 x 102.0 {3.78 x 4.02}
Compression ratio			18	18
Compression pressure		(kPa {kgf/cm^2, psi} [rpm])	2,900 {29.6, 420.7} [250]	2,900 {29.6, 420.7} [250]
Valve timing	IN	Open BTDC ( )	10	10
		Close ABDC ( )	30	30
	EX	Open BBDC ( )	40	40
		Close ATDC ( )	8	8
Valve clearance [engine cold]	IN	(mm {in})	0.10—0.16 mm {0.0040—0.0062 in}	0.10—0.16 mm {0.0040—0.0062 in}
	EX	(mm {in})	0.17—0.23 mm {0.0067—0.0090 in}	0.17—0.23 mm {0.0067—0.0090 in}
LUBRICATION SYSTEM				
Type			Force-fed type	
Oil pressure (reference value) [after warm up]		(kPa {kgf/cm^2, psi} [rpm])	410—570 {4.19—5.81, 59.6—82.6} [2,500]	
Oil pump	Type		Gear type	
	Relief valve opening pressure (reference value)	(kPa {kgf/cm^2, psi})	580—700 {5.9—7.1, 84.1—101.5}	
Oil cooler	Type		Water-cooled	
Oil filter	Type		Full-flow, paper element	
	Bypass pressure	(kPa {kgf/cm^2, psi})	80—120 {0.82—1.22, 11.6—17.4}	
Oil capacity (approx. quantity)	Total (dry engine)	(L {US qt, Imp qt})	8.0 {8.5, 7.0}	
	Oil replacement	(L {US qt, Imp qt})	6.8 {7.2, 6.0}	
	Oil and oil filter replacement	(L {US qt, Imp qt})	7.0 {7.4, 6.2}	
COOLING SYSTEM				
Type			Water-cooled, forced circulation	
Coolant capacity (approx. quantity)		(L {US qt, Imp qt})	9.4	
Water pump	Type		Centrifugal, V-belt driven	
Thermostat	Type		Wax, bottom-bypass	
	Opening temperature	(C { F})	80—84 {176—183}	
	Full-open temperature	(C { F})	95 {203}	
	Full-open lift	(mm {in})	8.5 {0.33} or more	
Radiator	Type		Corrugated fin	
Cooling system cap	Cap valve opening pressure	(kPa {kgf/cm^2, psi})	93.2—122.6 {0.95—1.25, 13.5—17.8}	
Cooling fan	Type		Thermo-modulation type	
	Number of blades		9	
	Outer diameter	(mm {in})	450 {17.7}	
INTAKE AIR SYSTEM				
Turbocharger type			Variable geometry turbocharger	

Item			Specifications	
			WL-C	WE-C
Air cleaner element			Dry type	
Glow plug type			Stainless type	
FUEL SYSTEM				
Supply pump			Electronic control	
Fuel injector			Electromagnetic control	
Fuel tank capacity (reference)		(L {US gal, Imp gal})	70 {18, 15}	
EMISSION SYSTEM				
EGR valve type			Vacuum	
Catalytic converter type			Oxidation catalytic converter	
CHARGING SYSTEM				
Battery	Voltage	(V)	12	
	Type and capacity (5-hour rate)	(A·h)	65D31R (56)	95D31R (64)
Generator	Output	(V-A)	12-70	
	Regulated voltage	(V)	14.1—14.7	
	Self diagnosis function		Equipped	
STARTING SYSTEM				
Starter	Type		Coaxial reduction	
	Output	(kW)	2.2	
CONTROL SYSTEM				
IAT sensor No.2 (Inside MAF)			Thermistor	
MAF sensor			Hot-wire	
IAT sensor No.1			Thermistor	
Boost sensor			Piezoelectric element	
ECT sensor			Thermistor	
CMP sensor			Hall element type	
CKP sensor			Magnetic pickup	
APP sensor			Potentiometer	
EGR valve position sensor			Potentiometer	
BARO sensor (built into PCM)			Piezoelectric element	
Fuel temperature sensor			Thermistor	
Fuel pressure sensor			Piezoelectric element	
Neutral switch			ON/OFF	
CPP switch			ON/OFF	
Idle switch			ON/OFF	

Recommended engine oil

Item	Specification
Grade	API CD/CE/CF–4 or ACEA B1/B3/B5
Viscosity (SAE)	5W-30, 10W-30

01-02B ON-BOARD DIAGNOSTIC [WL-C, WE-C]

ON-BOARD DIAGNOSTIC OUTLINE [WL-C, WE-C] 01-02B–1
DIAGNOSTIC SYSTEM WIRING DIAGRAM [WL-C, WE-C] 01-02B–2
DTC TEST MODE [WL-C, WE-C] 01-02B–6
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PID/DATA MONITOR AND RECORD [WL-C, WE-C] 01-02B–15
SIMULATION TEST [WL-C, WE-C] 01-02B–16
KOEO/KOER SELF-TEST [WL-C, WE-C] 01-02B–16

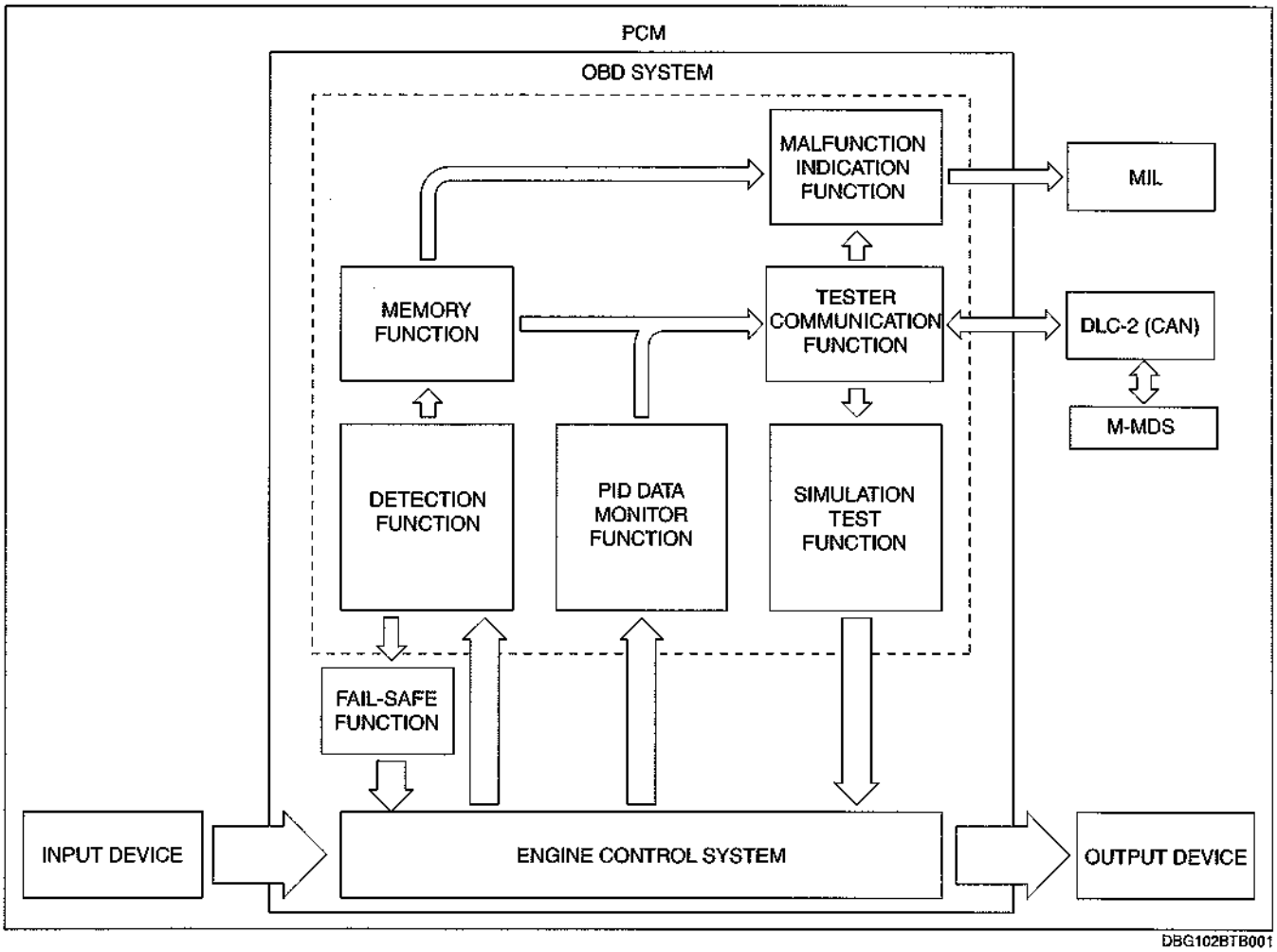
ON-BOARD DIAGNOSTIC OUTLINE [WL-C, WE-C]

dcf010200000t13

Features

Improved serviceability	• DTCs adopted • KOEO/KOER self-test function adopted • PID/DATA monitor function adopted • Simulation test function adopted

Block Diagram

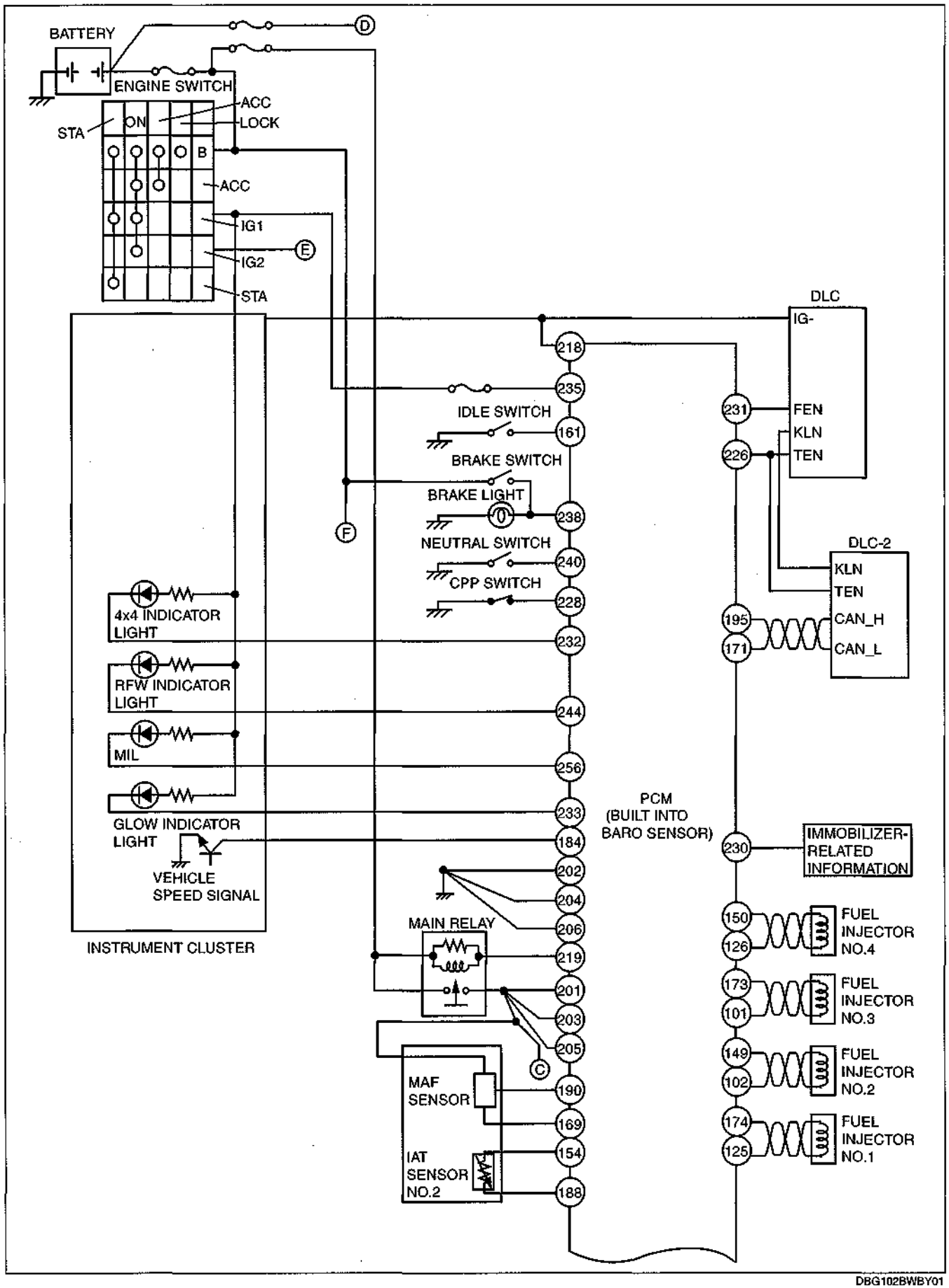


DBG102BTB001

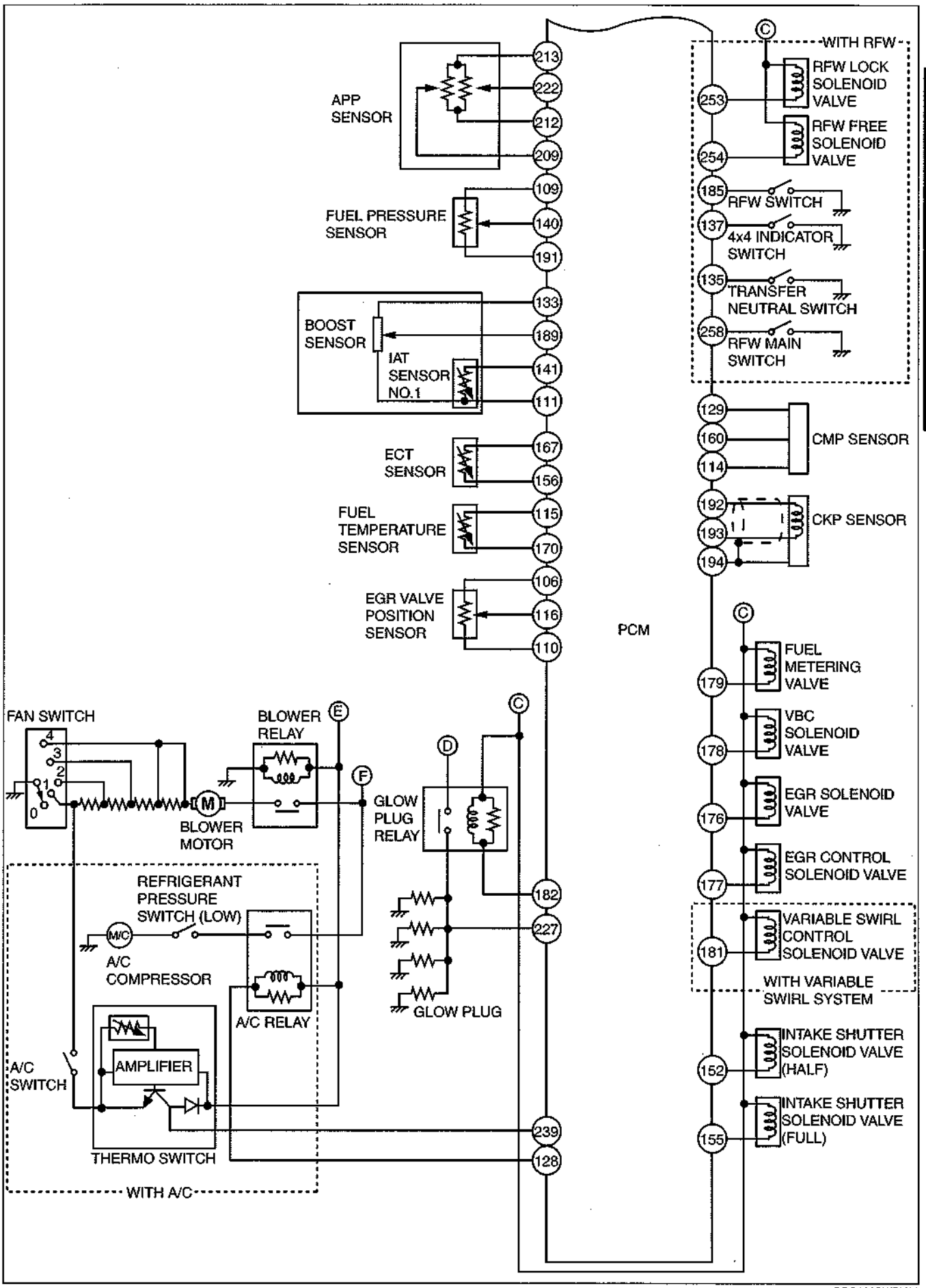
DIAGNOSTIC SYSTEM WIRING DIAGRAM [WL-C, WE-C]

dcf010200000114

With Immobilizer System

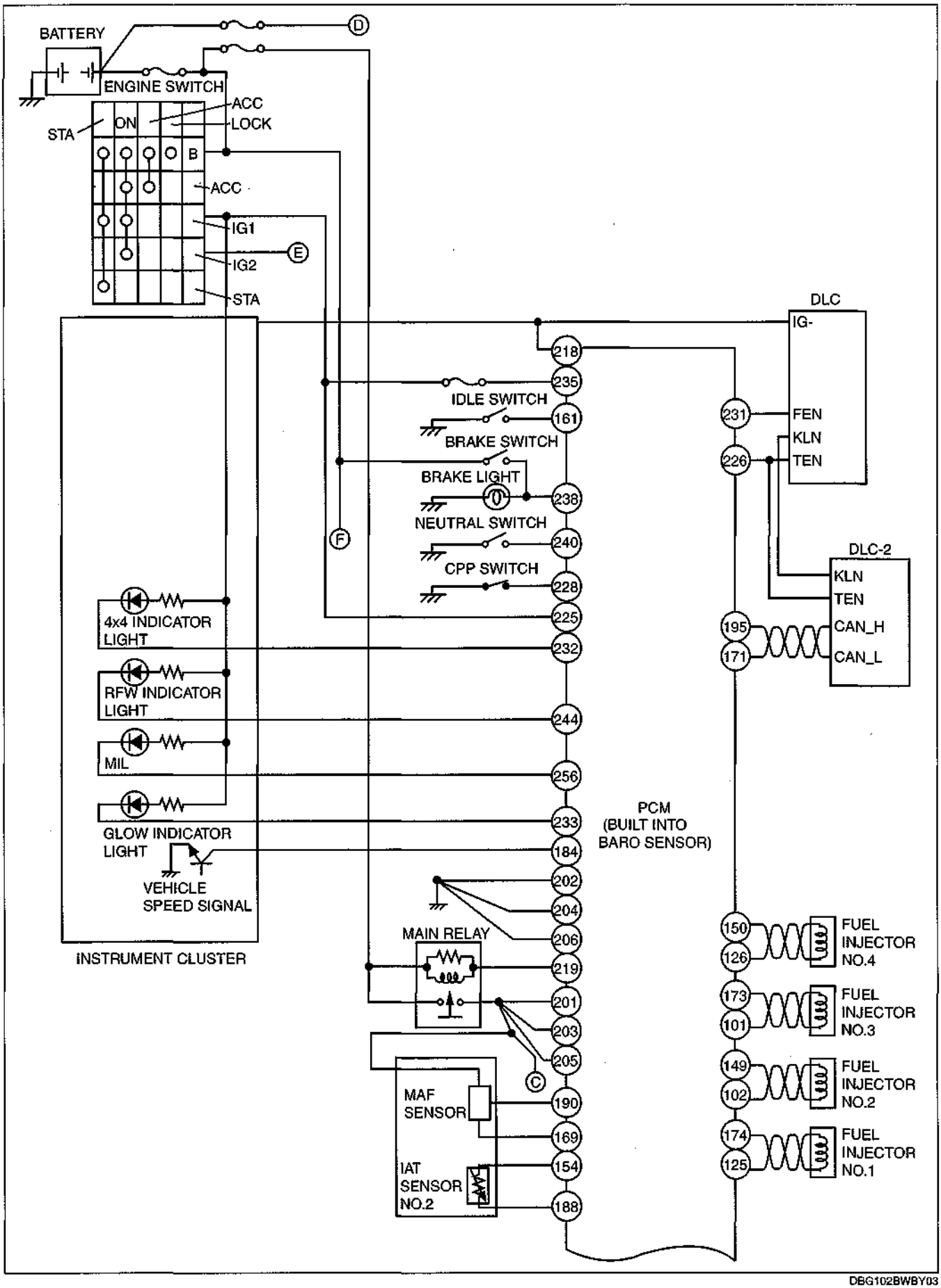


DBG102BWBY01

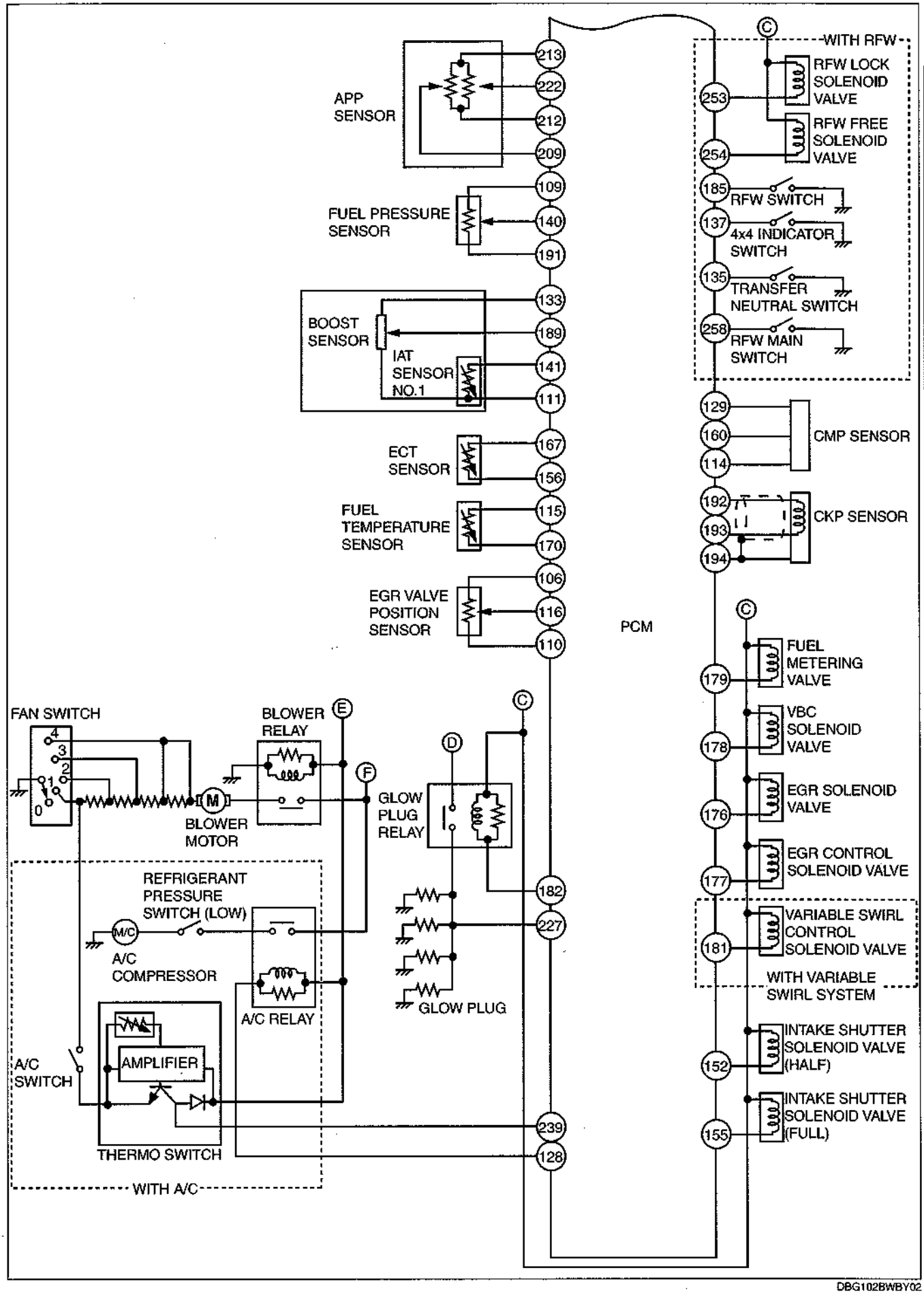


DBG102BWBY02

Without Immobilizer System



DBG102BWBY03



DBG102BWBY02

DTC TEST MODE [WL-C, WE-C]

dcf010200000t15

Sending Diagnostic Data

PID data monitor

- The PID data monitor items are shown below.

PID data monitor table

—: Not applicable

Full names	Unit	
Monitor status since DTCs cleared	—	
Calculated LOAD value	%	
Engine coolant temperature	°C	°F
Intake manifold absolute pressure	kPa	
Engine speed	rpm	
Vehicle speed	km/h	mph
Intake air temperature	°C	°F
Air flow rate from mass air flow sensor	g/s	
OBD requirement according to vehicle design	—	
Time Since Engine Start	s	
Distance travelled while MIL is activated	km	miles
Fuel rail pressure	kPa	
EGR valve control signal	%	
Number of warm-ups since DTCs cleared	—	
Distance travelled since DTCs cleared	km	miles
Barometric Pressure	kPa	
PCM power supply voltage	V	
Ambient air temperature	°C	°F
Accelerator pedal position (sensor No.1)	%	
Accelerator pedal position (sensor No.2)	%	

Sending Freeze Frame Data

- The Freeze Frame Data monitor items are shown below.

Freeze Frame Data monitor table

—: Not applicable

Full names	Unit	
DTC that caused required Freeze Frame Data storage	—	
Calculated LOAD value	%	
Engine coolant temperature	°C	°F
Intake manifold absolute pressure	kPa	
Engine speed	rpm	
Vehicle speed	km/h	mph
Intake air temperature	°C	°F
Air flow rate from mass air flow sensor	g/s	
Fuel rail pressure	kPa	
Barometric Pressure	kPa	
Accelerator pedal position (sensor No.1)	%	
Accelerator pedal position (sensor No.2)	%	

Sending Emission-related Malfunction Code

The DTCs are shown below.

: Applicable
—: Not applicable

DTC	Condition	MIL	DC	Self-test type*1	Memory function
P0016	CKP-CMP correlation	ON	1	C/R	
P0045	Variable boost control (VBC) solenoid valve control circuit open	ON	1	C/O/R	
P0046	Variable boost control (VBC) solenoid valve circuit range/ performance malfunction	ON	1	C/O/R	
P0047	Variable boost control (VBC) solenoid valve control circuit low input	ON	1	C/O/R	
P0048	Variable boost control (VBC) solenoid valve control circuit high input	ON	1	C/O/R	
P0088	Fuel pressure system too high	ON	1	C	
P0093	Fuel system leak detection	ON	1	C	
P0097	Intake air temperature (IAT) sensor No.2 circuit low input	ON	1	C/O/R	
P0098	Intake air temperature (IAT) sensor No.2 circuit high input	ON	1	C/O/R	
P0101	Mass airflow (MAF) sensor range/performance problem	ON	2	—	
P0102	Mass airflow (MAF) sensor circuit low input	ON	1	C/R	
P0103	Mass airflow (MAF) sensor circuit high input	ON	1	C/R	
P0106	Boost sensor range/performance malfunction	ON	1	C	
P0107	Boost sensor circuit low input	ON	1	C/O/R	
P0108	Boost sensor circuit high input	ON	1	C/O/R	
P0111	Intake air temperature (IAT) sensor No.1 range/performance	ON	2	C	
P0112	Intake air temperature (IAT) sensor No.1 circuit low input	ON	1	C/O/R	
P0113	Intake air temperature (IAT) sensor No.1 circuit high input	ON	1	C/O/R	
P0116	Engine coolant temperature (ECT) sensor range/performance problem	ON	2	—	
P0117	Engine coolant temperature (ECT) sensor circuit low input	ON	1	C/O/R	
P0118	Engine coolant temperature (ECT) sensor circuit high input	ON	1	C/O/R	
P0122	Accelerator pedal position (APP) sensor No.1 circuit low input	ON	1	C/O/R	
P0123	Accelerator pedal position (APP) sensor No.1 circuit high input	ON	1	C/O/R	
P0182	Fuel temperature sensor circuit low input	ON	1	C/O/R	
P0183	Fuel temperature sensor circuit high input	ON	1	C/O/R	
P0191	Fuel pressure sensor range/performance malfunction	ON	1	O	
P0192	Fuel pressure sensor circuit low input	ON	1	C/O/R	
P0193	Fuel pressure sensor circuit high input	ON	1	C/O/R	
P0201	Fuel injector No.1 circuit open/short	ON	1	C/R	
P0202	Fuel injector No.2 circuit open/short	ON	1	C/R	
P0203	Fuel injector No.3 circuit open/short	ON	1	C/R	
P0204	Fuel injector No.4 circuit open/short	ON	1	C/R	
P0222	Accelerator pedal position (APP) sensor No.2 circuit low input	ON	1	C/O/R	
P0223	Accelerator pedal position (APP) sensor No.2 circuit high input	ON	1	C/O/R	
P0227	Idle switch circuit low input	ON	1	C	
P0228	Idle switch circuit high input	ON	1	C	
P0300	Random misfire detected	ON	2	C/R	
P0301	Cylinder No.1 misfire detection	ON	2	C/R	
P0302	Cylinder No.2 misfire detection	ON	2	C/R	
P0303	Cylinder No.3 misfire detection	ON	2	C/R	
P0304	Cylinder No.4 misfire detection	ON	2	C/R	
P0335	Crankshaft position (CKP) sensor circuit malfunction	ON	1	C/R	
P0340	Camshaft position (CMP) sensor circuit malfunction	ON	1	C/R	
P0380	Glow plug relay circuit malfunction	ON	1	C/O	
P0401	EGR flow insufficient detected	ON	2	C	
P0402	EGR flow excessive detected	ON	2	C	

DTC	C ondition	MIL	DC	Self-test type*1	Memory function
P0403	EGR solenoid valve circuit malfunction	ON	1	C/O/R	
P0404	EGR valve stuck	ON	2	C/R	
P0405	EGR valve position sensor circuit low input	ON	1	C/O/R	
P0406	EGR valve position sensor circuit high input	ON	1	C/O/R	
P0489	EGR solenoid valve control circuit low input	ON	1/2	C/O	
P0490	EGR solenoid valve control circuit high input	ON	1/2	C/O	
P0500	VSS circuit malfunction	ON	2	C	
P0562	Battery voltage low input	ON	1	C/O/R	
P0563	Battery voltage high input	ON	1	C/O/R	
P0602	PCM programming error	ON	1	O	
P0606	PCM malfunction	ON	1	C/O/R	
P0607	PCM performance problem	ON	1/2	C/O/R	
P0610	PCM vehicle options error	ON	1	O	
P0627	Fuel metering valve control circuit open	ON	1	C/R	
P0628	Fuel metering valve control circuit low input	ON	1	C/R	
P0629	Fuel metering valve control circuit high input	ON	1	C/R	
P0642	Fuel pressure sensor and boost sensor 5 V circuit low input	ON	1	C/O/R	
P0643	Fuel pressure sensor and boost sensor 5 V circuit high input	ON	1	C/O/R	
P0652	CMP sensor and APP sensor 5 V circuit low input	ON	1	C/O/R	
P0653	CMP sensor and APP sensor 5 V circuit high input	ON	1	C/O/R	
P0660	Intake shutter solenoid valve (half) control circuit open	ON	1	C/O	
P0661	Intake shutter solenoid valve (half) control circuit low input	ON	1	C/O	
P0662	Intake shutter solenoid valve (half) control circuit high input	ON	1	C/O	
P0663	Intake shutter solenoid valve (full) control circuit open	ON	1	C/O	
P0664	Intake shutter solenoid valve (full) control circuit low input	ON	1	C/O	
P0665	Intake shutter solenoid valve (full) control circuit high input	ON	1	C/O	
P0685	Main relay control circuit open	—	—	—	
P0698	EGR valve position sensor 5 V circuit low input	ON	1	C/O/R	
P0699	EGR valve position sensor 5 V circuit high input	ON	1	C/O/R	
P1196	Key off voltage high input	—	—	—	
P1259	IMMOBILIZER to PCM signal error	—	—	C/O	—
P1260	Theft detected Vehicle immobilizer	—	—	C/O	—
P1391	Glow plug control circuit low input	ON	1	C/O	
P1392	Glow plug control circuit high input	ON	1	C/O	
P1528	Exhaust shutter solenoid valve circuit problem	—	1	C/O	—
P1602	Immobilizer/PCM communication error	—	—	C/O	—
P1603	ID Number Unregistered	—	—	C/O	—
P1604	Code word unregistered	—	—	C/O	—
P1621	Immobilizer code word does not match	—	—	C/O	—
P1622	Immobilizer ID does not match	—	—	C/O	—
P1623	Immobilizer code word/ID number write failure	—	—	C/O	—
P1624	Anti-theft system	—	—	C/O	—
P1675	Injection quantity adjustment value writing error	ON	1	O	
P1676	Injection quantity adjustment value checksum error	ON	1	O	
P2008	Variable swirl control (VSC) solenoid valve circuit open	ON	1	C/O	
P2009	Variable swirl control (VSC) solenoid valve circuit low input	ON	1	C/O	
P2010	Variable swirl control (VSC) solenoid valve circuit high input	ON	1	C/O	
P2135	Accelerator pedal position (APP) sensor No.1/No.2 voltage correlation problem	ON	1	C/O/R	
P2136	Accelerator pedal position (APP) sensor No.1/idle switch voltage correlation problem	ON	1	C/O/R	
P2143	EGR control solenoid valve control circuit open	ON	1/2	C/O	
P2144	EGR control solenoid valve control circuit low input	ON	1/2	C/O/R	
P2145	EGR control solenoid valve control circuit high input	ON	1/2	C/O/R	

DTC	Condition	MIL	DC	Self-test type*1	Memory function
P2146	Fuel injector No.1 and No.4 power supply circuit malfunction	ON	1	C/R	
P2147	Fuel injector No.1 and No.4 power supply circuit low input	ON	1	C/R	
P2148	Fuel injector No.1 and No.4 power supply circuit high input	ON	1	C/R	
P2149	Fuel injector No.2 and No.3 power supply circuit malfunction	ON	1	C/R	
P2150	Fuel injector No.2 and No.3 power supply circuit low input	ON	1	C/R	
P2151	Fuel injector No.2 and No.3 power supply circuit high input	ON	1	C/R	
P2227	BARO sensor circuit range/performance malfunction	ON	1	C	
P2228	BARO sensor circuit low input	ON	1	C/O/R	
P2229	BARO sensor circuit high input	ON	1	C/O/R	
P2263	Air charging system performance malfunction	—	1	C	
P2530	PCM (engine switch circuit) malfunction	ON	1	O	

*1 : C; CMDTC self test, O; KOEO self test, R; KOER self test

Sending Continuous Monitoring System Test Results
These appear when a problem is detected in a monitored system.

1-drive cycle type
If any problems are detected in the first drive cycle, confirmed DTCs will be stored in the PCM memory.

2-drive cycle type
The code for a failed system is stored in the PCM memory in the first drive cycle. If the problem is not found in the second drive cycle, the PCM determines that the system returned to normal or the problem was mistakenly detected, and deletes the pending code. If the problem is found in the second drive cycle too, the PCM determines that the system has failed, and stores the DTCs.
After pending codes are stored, if the PCM determines that the system is normal in any future drive cycle, the PCM deletes the pending codes.

DTC DETECTION LOGIC AND CONDITIONS[WL-C, WE-C]

id0102c4100300

P0016 CKP-CMP correlation
The PCM monitors the input pulses from the CKP and CMP sensors. If the pick-up timing input pulses do not match each other, the PCM determines that the camshaft position does not coincide with the crankshaft position.

P0045 Variable boost control (VBC) solenoid valve control circuit open
The PCM monitors the VBC solenoid valve control signal. If the VBC solenoid valve control voltage is **less than 5 V for 2 s** when the VBC solenoid valve is off, the PCM determines that there is a VBC solenoid valve control circuit malfunction (open circuit).

P0046 Variable boost control (VBC) solenoid valve circuit range/performance malfunction
The PCM monitors the driver IC temperature of the VBC solenoid valve. If the temperature of the VBC solenoid valve driver IC in the PCM exceeds **150 C{320 F}** while the VBC solenoid valve is operating, the PCM determines that there is a VBC solenoid value malfunction.

P0047 Variable boost control (VBC) solenoid valve control circuit low input
The PCM monitors the VBC solenoid valve control signal. If the PCM turns VBC solenoid valve off but the voltage at PCM terminal 178 still remains low, the PCM determines that the VBC solenoid valve circuit has a malfunction (circuit short to ground).

P0048 Variable boost control (VBC) solenoid valve control circuit high input
The PCM monitors the VBC solenoid valve control signal. If the PCM turns VBC solenoid valve on but the current at PCM terminal 178 still remains high, the PCM determines that the VBC solenoid valve circuit has a malfunction (circuit short to power supply).

P0088 Fuel pressure system too high
The PCM monitors the fuel pressure in the common rail from the fuel pressure sensor while the engine is running. If the fuel pressure is more than the preprogrammed criteria, the PCM determines that the fuel pressure is too high.

P0093 Fuel system leak detection
The PCM monitors the fuel pressure in the common rail from the fuel pressure sensor while the engine is running. If the fuel pressure is lower than the preprogrammed criteria, the PCM determines that there is leakage in the fuel system.

P0097 Intake air temperature (IAT) sensor No.2 circuit low input
The PCM monitors the input signal from intake air temperature sensor No.2. If the voltage from intake air temperature sensor No.2 is **less than 0.1 V for 2 s**, the PCM determines that there is a malfunction in the intake air temperature sensor No.2 circuit.

P0098 Intake air temperature (IAT) sensor No.2 circuit high input
The PCM monitors the input signal from intake air temperature sensor No.2. If the voltage from intake air temperature sensor No.2 is **more than 4.6 V for 1 s**, the PCM determines that there is a malfunction in the intake air temperature sensor No.2 circuit.

P0101 Mass airflow (MAF) sensor range/performance malfunction
The PCM monitors the ratio between calculated air mass flow and actual air mass flow under the programmed condition.
If the ratio is more than or less than the programmed criteria the PCM determine that there is a malfunction in the MAF sensor.

P0102 Mass airflow (MAF) sensor circuit low input
The PCM calculates the intake air flow amount based on the airflow sensor. If the calculated intake air flow amount is **below 0.44 g/s {0.058 lb/min} for 2.0 s** while the engine is running, the PCM determines that the airflow sensor signal input is low.

P0103 Mass airflow (MAF) sensor circuit high input
The PCM calculates the intake air flow amount based on the airflow sensor. If the calculated intake air flow amount is **above 170 g/s {22 lb/min} for 1.5 s** while driving other than under a fully open throttle condition, and the fuel injection quantity based on the engine speed is below the specification, the PCM determines that the airflow sensor signal input is high.

P0106 Boost sensor range/performance malfunction
The PCM monitors and compares the intake manifold internal pressure via the boost sensor with the atmospheric pressure via the barometric pressure sensor (built into PCM) while the engine is not running. If the difference of these pressure is **above 11 kPa {0.11 bar, 1.6 psi}**, the PCM determines that there is a boost sensor characteristic malfunction.

P0107 Boost sensor circuit low input
The PCM monitors the input signal from the boost sensor. If the voltage from the boost sensor is **less than 0.24 V for 2.0 s**, the PCM determines that there is a malfunction in the boost sensor circuit.

P0108 Boost sensor circuit high input
The PCM monitors the input signal from the boost sensor. If the voltage from the boost sensor is **more than 4.9 V for 1.0 s**, the PCM determines that there is a malfunction in the boost sensor circuit.

P0111 Intake air temperature (IAT) sensor No.1 range/performance malfunction
The PCM monitors the input signal from the IAT sensor No.1. If the difference between the maximum and minimum value of the IAT sensor No.1 is less than 1 °C {1.8 °F}, the PCM determines that there is a malfunction in the IAT sensor No.1.

P0112 Intake air temperature (IAT) sensor No.1 circuit low input
The PCM monitors the input signal from IAT sensor No.1. If the voltage from IAT sensor No.1 is **less than 0.14 V for 2.0 s**, the PCM determines that there is a malfunction in the IAT sensor No.1 circuit.

P0113 Intake air temperature (IAT) sensor No.1 circuit high input
The PCM monitors the input signal from IAT sensor No.1. If the voltage from IAT sensor No.1 is **more than 4.90 V for 1.0 s**, the PCM determines that there is a malfunction in the IAT sensor No.1 circuit.

P0116 Engine coolant temperature (ECT) sensor range/performance malfunction
Minimum engine coolant temperature rise is not achieved within the specified time limit from when the engine was started.

P0117 Engine coolant temperature (ECT) sensor circuit low input
The PCM monitors the input signal from the ECT sensor. If the voltage from the ECT sensor is **less than 0.20 V for 2.0 s**, the PCM determines that there is a malfunction in the ECT sensor circuit.

P0118 Engine coolant temperature (ECT) sensor circuit high input
The PCM monitors the input signal from the ECT sensor. If the voltage from the ECT sensor is **more than 4.91 V for 1.0 s**, the PCM determines that there is a malfunction in the ECT sensor circuit.

P0122 Accelerator pedal position (APP) sensor No.1 circuit low input
The PCM monitors the input signal from APP sensor No.1. If the voltage from APP sensor No.1 is **less than 0.29 V for 0.5 s** when the APP sensor No.1 power supply voltage is normal, the PCM determines that there is a malfunction in the APP sensor No.1 circuit.

P0123 Accelerator pedal position (APP) sensor No.1 circuit high input
The PCM monitors the input signal from APP sensor No.1. If the voltage from APP sensor No.1 is **more than 4.80 V for 0.5 s** when the APP sensor No.1 power supply voltage is normal, the PCM determines that there is a malfunction in the APP sensor No.1 circuit.

P0182 Fuel temperature sensor circuit low input
The PCM monitors the input signal from the fuel temperature sensor. If the voltage from the fuel temperature sensor is **less than 0.2 V**, the PCM determines that there is a malfunction in the fuel temperature sensor circuit.

P0183 Fuel temperature sensor circuit high input

The PCM monitors the input signal from the fuel temperature sensor. If the voltage from the fuel temperature sensor is **more than 4.9 V**, the PCM determines that there is a malfunction in the fuel temperature sensor circuit.

P0191 Fuel pressure sensor range/performance malfunction

The PCM monitors the fuel pressure in the common rail and input signal from the fuel pressure sensor while the engine is running. If all of the following conditions is met, the PCM determines that there is malfunction in the fuel pressure sensor range/performance malfunction.

— The PCM calculates the difference between the actual fuel pressure and the target fuel pressure. If the pressure difference is **more than 5 MPa {51 kgf/cm^2, 726 psi}.**

— The PCM monitors the input signal from the fuel pressure sensor. If the difference between the maximum and minimum voltage of the fuel pressure sensor is **less than 0.01 V.**

P0192 Fuel pressure sensor circuit low input

The PCM monitors the input voltage from the fuel pressure sensor while the engine is running. If the input voltage from the fuel pressure sensor is **less than 0.2 V**, the PCM determines that there is a malfunction in the fuel pressure sensor circuit.

P0193 Fuel pressure sensor circuit high input

The PCM monitors the input voltage from the fuel pressure sensor while the engine is running. If the input voltage from the fuel pressure sensor is **more than 4.8 V**, the PCM determines that there is a malfunction in the fuel pressure sensor circuit.

P0201 Fuel injector No.1 circuit open/short

The PCM monitors each cylinder fuel injector control signal current while the engine is running. If the PCM detects a control signal current of more or less than the preprogrammed criteria, the PCM determines that the fuel injector at No. 1cylinder has an open or short circuit.

P0202 Fuel injector No.2 circuit open/short

The PCM monitors each cylinder fuel injector control signal current while the engine is running. If the PCM detects a control signal current of more or less than the preprogrammed criteria, the PCM determine that the fuel injector at No.2 cylinder has an open or short circuit.

P0203 Fuel injector No.3 circuit open/short

The PCM monitors each cylinder fuel injector control signal current while the engine is running. If the PCM detects a control signal current of more or less than the preprogrammed criteria, the PCM determines that the fuel injector at No.3 cylinder has an open or short circuit.

P0204 Fuel injector No.4 circuit open/short

The PCM monitors each cylinder fuel injector control signal current while the engine is running. If the PCM detects a control signal current of more or less than the preprogrammed criteria, the PCM determines that the fuel injector at No.4 cylinder has an open or short circuit.

P0222 Accelerator pedal position (APP) sensor No.2 circuit low input

The PCM monitors the input signal from APP sensor No.2. If the voltage from APP sensor No.2 is **less than 0.29 V for 0.5 s** when the APP sensor No.2 power supply voltage is normal, the PCM determines that there is a malfunction in the APP sensor No.2 circuit.

P0223 Accelerator pedal position (APP) sensor No.2 circuit high input

The PCM monitors the input signal from APP sensor No.2. If the voltage from APP sensor No.2 is **more than 4.80 V for 0.5 s** when the APP sensor no.2 power supply voltage is normal, the PCM determines that there is a malfunction in the APP sensor No.2 circuit.

P0227 Idle switch circuit low input

The PCM monitors the input voltage from APP sensor No.1 when the idle switch is off. If the input voltage is **less than 0.86 V for 1.5 s**, the PCM determines that the idle switch circuit has a malfunction.

P0228 Idle switch circuit high input

The PCM monitors the input voltage from APP sensor No.1 when the idle switch is on. If the input voltage is **more than 1.35 V for 1.5 s**, the PCM determines that the idle switch circuit has a malfunction.

P0300 Random misfire detected

The PCM monitors the CKP sensor input signal interval time. The PCM calculates the deviation of the interval time for each cylinder. If the deviation of the interval time exceeds the preprogrammed criteria, the PCM detects a misfire in the corresponding cylinder. While the engine is running, the PCM counts the number of misfires and calculates the misfire ratio for each crankshaft revolution. If the ratio exceeds the preprogrammed criteria, the PCM determines that a misfire, which can affect emission performance, has occurred.

P0301, P0302, P0303, P0304 Cylinder No.1 No.2 No.3 No.4 misfire detection

The PCM monitors the CKP sensor input signal interval time. The PCM calculates the deviation of the interval time for each cylinder. If the deviation of the interval time exceeds the preprogrammed criteria, the PCM detects a misfire in the corresponding cylinder. While the engine is running, the PCM counts the number of misfires and calculates the misfire ratio for each crankshaft revolution. If the ratio exceeds the preprogrammed criteria, the PCM determines that a misfire, which can affect emission performance, has occurred.

P0335 Crankshaft position (CKP) sensor circuit malfunction
The PCM monitors the input signal from the CKP sensor while the engine is running. If the following conditions are detected, the PCM determines that the CKP circuit has a malfunction.
— The PCM receives no pulse from the CKP sensor
— The PCM receives an improper pulse number from the CKP sensor

P0340 Camshaft position (CMP) sensor circuit malfunction
The PCM monitors the input signal from the CMP sensor while the engine is running. If the following conditions are detected, the PCM determines that the CMP circuit has a malfunction.
— The PCM receives no pulse from the CMP sensor
— The PCM receives an improper pulse number from the CMP sensor

P0380 Glow plug relay circuit malfunction
The PCM monitors the glow plug relay control signal. If the following conditions are detected, the PCM determines that the glow plug relay circuit has a malfunction.
— The PCM turns the glow plug relay off but the voltage remains low
— The PCM turns the glow plug relay on but the voltage remains high
— The PCM internal driver IC temperature is **more than 150 C {320 F}** when the glow plug relay is on

P0401 EGR flow insufficient detected
The PCM monitors the difference between the target air amount and intake air amount while the EGR system is operating at EGR feedback control. If the difference between the target air amount and the intake air amount is less than the threshold, the PCM determines that there is a malfunction in the EGR system.

P0402 EGR flow excessive detected
The PCM monitors the difference between the target air amount and intake air amount while the EGR system is operating at EGR feedback control. If the difference between the target air amount and the intake air amount is more than the threshold, the PCM determines that there is a malfunction in the EGR system.

P0403 EGR solenoid valve circuit malfunction
The PCM monitors the EGR solenoid valve control signal. If the following conditions are detected, the PCM determines that the EGR solenoid valve circuit has a malfunction (open circuit).
— The PCM turns the EGR solenoid valve off but the voltage remains low
— The PCM internal driver IC temperature is **more than 150 C {320 F}** when the EGR solenoid valve is on

P0404 EGR control circuit range/performance
The PCM monitors the difference between target EGR valve lift and actual EGR valve lift under the programmed condition.
If the difference is more or less than the programmed criteria the PCM determines that there is a malfunction in the EGR control circuit.

P0405 EGR valve position sensor circuit low input
The PCM monitors the input voltage from the EGR valve position sensor while the engine is running. If the input voltage is **less than 0.1 V**, the PCM determines that the EGR valve position sensor circuit has a malfunction.

P0406 EGR valve position sensor circuit high input
The PCM monitors the input voltage from the EGR valve position sensor while the engine is running. If the input voltage is **more than 4.9 V**, the PCM determines that the EGR valve position sensor circuit has a malfunction.

P0489 EGR solenoid valve control circuit low input
The PCM monitors the EGR solenoid valve control signal. If the PCM turns the EGR solenoid valve off but the voltage remains low, the PCM determines that EGR solenoid valve circuit has a malfunction (circuit short to ground).

P0490 EGR solenoid valve control circuit high input
The PCM monitors the EGR solenoid valve control signal. If the PCM turns the EGR solenoid valve on but the voltage remains high, the PCM determines that EGR solenoid valve circuit has a malfunction (circuit short to power supply).

P0500 VSS circuit malfunction
The PCM monitors the input signal from the instrument cluster during set conditions. If the input signal is **less than 0 km/h {0 mph} for 25 s**, the PCM determines that there is a VSS circuit malfunction.

P0562 Battery voltage low input
The PCM monitors the battery voltage. If the battery voltage is **less than 8 V**, the PCM determines that there is a malfunction in the battery and the battery signal system.

P0563 Battery voltage high input
The PCM monitors the battery voltage. If the battery voltage is **more than 16 V**, the PCM determines that there is a malfunction in the battery charging system.

P0602 PCM programming error
No configuration data in the PCM

P0606 PCM malfunction
PCM internal malfunction.

P0607 PCM performance problem
PCM internal malfunction.

P0610 PCM vehicle options error
PCM data configuration error

P0627 Fuel metering valve control circuit open

The PCM monitors the fuel metering valve driver IC temperature in the PCM and the control voltage while the engine is running. If either of the following conditions is met, the PCM determines that there is a malfunction in the fuel metering valve range/performance.

— The PCM monitors the fuel metering valve driver IC temperature in the PCM. If the fuel metering valve driver IC temperature is **more than 150 C {320 F}** during the fuel metering valve operation, the PCM determines that the fuel metering valve has a malfunction

— The PCM monitors the fuel metering valve control voltage at the PCM terminals. If fuel metering valve control voltage is **less than 5 V** when fuel metering valve is not operating, the PCM determines that the fuel metering valve has a malfunction (open circuit)

P0628 Fuel metering valve control circuit low input

The PCM monitors the fuel metering valve circuit voltage while the engine is running. If the PCM detects that the circuit voltage is low when the fuel metering valve is off, the PCM determines that there is a malfunction in the fuel metering valve circuit (circuit short to ground).

P0629 Fuel metering valve control circuit high input

The PCM monitors the fuel metering valve circuit voltage while the engine is running. If the PCM detects that the circuit voltage is high when the fuel metering valve is on, the PCM determines that there is a malfunction in the fuel metering valve circuit (circuit short to power supply).

P0642 Fuel pressure sensor and boost sensor 5 V circuit low input

The PCM monitors the fuel pressure sensor and the boost sensor 5 V circuit. If the fuel pressure sensor and boost sensor power voltage is **lower than 4.9 V**, the PCM determines that there is a fuel pressure sensor and boost sensor 5 V circuit malfunction.

P0643 Fuel pressure sensor and boost sensor 5 V circuit high input

The PCM monitors the fuel pressure sensor and boost sensor 5 V circuit. If the fuel pressure sensor and boost sensor power voltage is **higher than 4.9 V**, the PCM determines that there is a fuel pressure sensor and boost sensor 5 V circuit malfunction.

P0652 CMP sensor and APP sensor 5 V circuit low input

The PCM monitors the CMP sensor and APP sensor 5 V circuit. If the CMP sensor and APP sensor power voltage is **lower than 4.9 V**, the PCM determines that there is a CMP sensor and APP sensor 5 V circuit malfunction.

P0653 CMP sensor and APP sensor 5 V circuit high input

The PCM monitors the CMP sensor and APP sensor 5 V circuit. If the CMP sensor and APP sensor power voltage is **higher than 5.1 V**, the PCM determines that there is a CMP sensor and APP sensor 5 V circuit malfunction.

P0660 Intake shutter solenoid valve (half) control circuit open

The PCM monitors the intake shutter solenoid valve (half) control signal. If the following conditions are detected, the PCM determines that the intake shutter solenoid valve (half) control circuit has a malfunction.

— The PCM turns the intake shutter solenoid valve (half) off, but the intake shutter solenoid valve (half) control voltage is **less than 5 V for 2 s** (open circuit)

— The PCM internal driver IC temperature is **more than 150 C {320 F}** when the intake shutter solenoid valve (half) is on

P0661 Intake shutter solenoid valve (half) control circuit low input

The PCM monitors the intake shutter solenoid valve (half) control signal at PCM terminal 152. If the PCM turns the intake shutter solenoid valve (half) off but the voltage at PCM terminal 152 remains low, the PCM determines that intake shutter solenoid valve (half) circuit has a malfunction (circuit short to ground).

P0662 Intake shutter solenoid valve (half) control circuit high input

The PCM monitors the intake shutter solenoid valve (half) control signal at PCM terminal 152. If the PCM turns the intake shutter solenoid valve (half) on but the voltage at PCM terminal 152 remains high, the PCM determines that the intake shutter solenoid valve (half) circuit has a malfunction (circuit short to power supply).

P0663 Intake shutter solenoid valve (full) control circuit open

The PCM monitors the intake shutter solenoid valve (full) control signal. If the following conditions are detected, the PCM determines that the intake shutter solenoid valve (full) control circuit has a malfunction.

— The PCM turns the intake shutter solenoid valve (full) off, but the intake shutter solenoid valve (full) control voltage is **less than 5 V for 2 s** (open circuit)

— The PCM internal driver IC temperature is **more than 150 C {320 F}** when the intake shutter solenoid valve (full) is on

P0664 Intake shutter solenoid valve (full) control circuit low input

The PCM monitors the intake shutter solenoid valve (full) control signal at PCM terminal 155. If the PCM turns the intake shutter solenoid valve (full) off, but the voltage at PCM terminal 155 remains low, the PCM determines that intake shutter solenoid valve (full) circuit has a malfunction (circuit short to ground).

P0665 Intake shutter solenoid valve (full) control circuit high input

The PCM monitors the intake shutter solenoid valve (full) control signal at PCM terminal 155. If the PCM turns the intake shutter solenoid valve (full) on, but the voltage at PCM terminal 155 remains high, the PCM determines that the intake shutter solenoid valve (full) circuit has a malfunction (circuit short to power supply).

P0685 Main relay control circuit open
The PCM monitors the power supply to the PCM. If the power supply is shut down several times when the engine switch is turned to the ON position, the PCM determines that there is a power circuit malfunction (open circuit).
P0698 EGR valve position sensor 5 V circuit low input
The PCM monitors the EGR position sensor 5 V circuit. If the EGR position sensor power voltage is **lower than 4.9 V**, the PCM determines that there is a EGR position sensor 5 V circuit malfunction.
P0699 EGR valve position sensor 5 V circuit high input
The PCM monitors the EGR position sensor 5 V circuit. If the EGR position sensor power voltage is **higher than 5.1 V**, the PCM determines that there is a EGR position sensor 5 V circuit malfunction.
P1196 Key off voltage high input
The PCM monitors whether the main relay opens **after 2 s** when the engine switch is turned to the off position. If the main relay does not open **after 2 s**, the PCM determines that there is malfunction in the main relay circuit.
P1259 IMMOBILIZER to PCM signal error
The PCM does not complete target ID transfer.
P1260 Theft detected Vehicle immobilizer
Immobilizer system malfunction
P1391 Glow plug control circuit low input
The PCM monitors the output signal to the glow plug relay when the glow plug relay is on. If the glow plug relay voltage is **less than 2 V for 1 s** when the glow plug relay is operating, The PCM determines that there is a malfunction in the glow plug relay circuit.
P1392 Glow plug control circuit high input
The PCM monitors the output signal to the glow plug relay when the glow plug relay is off. If the glow plug relay voltage is **more than 2 V for 1 s** when the glow plug relay is off, The PCM determines that there is a malfunction in the glow plug relay control circuit.
P1528 Exhaust shutter solenoid valve circuit problem
The PCM monitors the input voltages from the exhaust shutter solenoid valve. If the voltage remains low or high, the PCM determines that the exhaust shutter solenoid valve circuit has malfunction.
P1602 Immobilizer/PCM communication error
PCM internal malfunction
P1603 ID Number Unregistered
PCM internal malfunction
P1604 Code word unregistered
PCM internal malfunction
P1621 Immobilizer code word does not match
Cord word stored in immobilizer system and PCM does not to match.
ID number stored in immobilizer system and PCM does not to match.
P1622 Immobilizer ID does not match
Cord word stored in immobilizer system and PCM does not to match.
ID number stored in immobilizer system and PCM does not to match.
P1623 Immobilizer code word/ID number write failure
Cord word stored in immobilizer system and PCM does not to match.
ID number stored in immobilizer system and PCM does not to match.
P1624 Anti-theft system
Cord word stored in immobilizer system and PCM does not to match.
ID number stored in immobilizer system and PCM does not to match.
P1675 Injection quantity adjustment value writing error
The fuel injector compensation data configuration has not been completed.
P1676 Injection quantity adjustment value checksum error
The fuel injector compensation data check sum error.
P2008 Variable swirl control (VSC) solenoid valve control circuit open
The PCM monitors the VSC solenoid valve control signal. If the following conditions are detected, the PCM determines that the VSC solenoid valve control circuit has a malfunction.
— The PCM turns the VSC solenoid valve off, but the VSC solenoid valve control voltage is **less than 5 V for 2 s** (open circuit)
— The PCM internal driver IC temperature is **more than 150 C {320 F}** when the VSC solenoid valve is on
P2009 Variable swirl control (VSC) solenoid valve circuit low input
The PCM monitors the output signal to the VSC solenoid valve. If the voltage of the VSC solenoid valve is low even if the VSC solenoid valve is off, the PCM determines that there is a malfunction in the VSC solenoid valve control circuit.
P2010 Variable swirl control (VSC) solenoid valve circuit high input
The PCM monitors the output signal to the VSC solenoid valve. If the voltage of the VSC solenoid valve is high even if the VSC solenoid valve is on, the PCM determines that there is a malfunction in the VSC solenoid valve control system.

P2135 Accelerator pedal position (APP) sensor No.1/No.2 voltage correlation problem
The PCM monitors the input signals from accelerator pedal position sensor No.1 and accelerator pedal position sensor No.2. If the difference between accelerator pedal position sensor No.1 and accelerator pedal position sensor No.2 is **more than 0.9 V for 0.5 s**, the PCM determines that there is a malfunction in the accelerator pedal position sensor characteristic.

P2136 Accelerator pedal position (APP) sensor No.1/idle switch voltage correlation problem
The PCM compares the input voltage from APP sensor No.1 with the input voltage from the idle switch when the accelerator pedal is released (idle switch is on). If the difference is **more than 1.35 V for 0.5 s**, the PCM determines that there is an APP sensor No.1/idle switch angle correlation problem.

P2143 EGR control solenoid valve control circuit open
The PCM monitors the EGR control solenoid valve control signal. If the following conditions are detected, the PCM determines that the EGR control solenoid valve circuit has a malfunction.
— The PCM turns the EGR control solenoid valve off but the voltage remains low (open circuit).
— The PCM internal driver IC temperature is more than **150 C {320 F}** when the EGR control solenoid valve is on.

P2144 EGR control solenoid valve control circuit low input
The PCM monitors the EGR control solenoid valve control signal. If the PCM turns the EGR control solenoid valve off but the voltage remains low, the PCM determines that the EGR control solenoid valve circuit has a malfunction (circuit short to ground).

P2145 EGR control solenoid valve control circuit high input
The PCM monitors the EGR control solenoid valve control signal. If the PCM turns the EGR control solenoid valve on but the voltage still remains high, the PCM determines that the EGR control solenoid valve circuit has a malfunction (circuit short to power supply).

P2146 Fuel injector No.1 and No.4 power supply circuit malfunction
The PCM monitors the fuel injector No.1 and No.4 power supply voltage when the engine is running. If the following conditions are detected 5 times, the PCM determines that the fuel injector No.1 and No.4 power supply circuit has a malfunction.
— Fuel injector No.1 and No.4 power supply voltage is **less than 43 V**
— Fuel injector No.1 and No.4 power supply voltage is **53 V or above**

P2147 Fuel injector No.1 and No.4 power supply circuit low input
The PCM monitors the fuel injector No.1 and No.4 power supply current when the engine is running. If the power supply current is **25 A or above** 3 times while other fuel injector power supply current is **25 A or above**, the PCM determines that the fuel injector No.1 and No.4 power supply current is too high.

P2148 Fuel injector No.1 and No.4 power supply circuit high input
The PCM monitors the fuel injector No.1 and No.4 power supply current when the engine is running. If the power supply current is **50 A or above 3** times, the PCM determines that the fuel injector No.1 and No.4 power supply current is too high.

P2149 Fuel injector No.2 and No.3 power supply circuit malfunction
The PCM monitors the fuel injector No.2 and No.3 power supply voltage when the engine is running. If the following conditions are detected 5 times, the PCM determines that the fuel injector No.2 and No.3 power supply circuit has a malfunction.
— Fuel injector No.2 and No.3 power supply voltage is **less than 43 V**
— Fuel injector No.2 and No.3 power supply voltage is **53 V or above**

P2150 Fuel injector No.2 and No.3 power supply circuit low input
The PCM monitors the fuel injector No.2 and No.3 power supply current when the engine is running. If the power supply current is **25 A or above** 3 times while other fuel injector power supply current is **25 A or above**, the PCM determines that the fuel injector No.2 and No.3 power supply current is too high.

P2151 Fuel injector No.2 and No.3 power supply circuit high input
The PCM monitors the fuel injector No.2 and No.3 power supply current when the engine is running. If the power supply current is **50 A or above** 3 times, the PCM determines that the fuel injector No.2 and No.3 power supply current is too high.

P2227 BARO sensor circuit range/performance malfunction
The PCM monitors the input signal from the barometric pressure sensor. If the difference between the barometric pressure input from the barometric pressure sensor and the boost pressure is **more than 11 kPa {0.11 bar, 1.6 psi}**, the PCM determines that there is a malfunction in the barometric pressure sensor.

P2228 BARO sensor circuit low input
The PCM monitors the input signal for the barometric pressure. If the voltage from the barometric pressure sensor is **less than 2.2 V for 1 s**, the PCM determines that there is a malfunction in the barometric pressure sensor signal system.

P2229 BARO sensor circuit high input
The PCM monitors the input signal for the barometric pressure. If the voltage from the barometric pressure sensor is **more than 4.8 V for 1 s**, the PCM determines that there is a malfunction in the barometric pressure sensor signal system.

P2263 Air charging pressure performance malfunction
The PCM monitors the air charging pressure. If the air charging pressure is not within the specification for the PCM control target, the PCM determines that there is a malfunction in the air charging system.

P2530 PCM (engine switch circuit) malfunction
PCM internal malfunction.

PID/DATA MONITOR AND RECORD [WL-C, WE-C]

dcf010200000t17

The PID/DATA monitor items are shown below.

PID/DATA monitor item table

Monitor Item	Definition	Unit/Condition	PCM terminal
AAT	Ambient temperature	C	—
AC_REQ	A/C request signal	Off/On	239
ACCS	Air conditioning compressor cycling switch	Off/On	128
APP	Accelerator pedal position	%	209, 222
APP1	Accelerator pedal position sensor No.1	% V	222
APP2	Accelerator pedal position sensor No.2	% V	209
ARPMDES	Target engine speed	rpm	—
BARO	Barometric pressure	Pa V	—
BOO	Brake switch	Off/On	238
CPP	Clutch pedal position switch	Off/On	228
DTCCNT	DTC count (includes those needing no action)	No unit	—
ECT	Engine coolant temperature	C V	167
EGRV2	EGR solenoid valve (vent)	Off/On	177
FIP_FL	Supply pump flow control	A %	179
FIP_SCV	Fuel metering valve	A	179
FLT	Fuel temperature	C	115
FRP	Fuel pressure sensor	Pa	140
GP_LMP	Glow indicator light	Off/On	233
GPC	Glow plug relay	Off/On	182
IASV	Intake shutter solenoid valve (half)	Off/On	152
IASV2	Intake shutter solenoid valve (full)	Off/On	155
IAT	Intake air temperature (IAT sensor No.1)	C V	141
INGEAR	Load/no load condition	Off/On	240
IVS	Idle switch	Off Idle/Idle	161
LOAD	Engine load	%	—
MAF	Mass airflow amount	g/s V	190
MAP	Boost sensor	Pa V	189
MIL	Malfunction indicator lamp	Off/On	256
MIL_DIS	The distance travelled since the MIL was activated	km/h	—
RPM	Engine speed	rpm	193
SEGRP DSD	Desired EGR valve position	%	—
SELTESTDTC	Diagnostic trouble codes	No unit	—
VBCV	VBC solenoid valve	%	178
VPWR	Module supply voltage	V	201, 203, 205
VSS	Vehicle speed	km/h	184
WARM SW	Exhaust heating switch	Off/On	—

SIMULATION TEST [WL-C, WE-C]

dcf010200000118

The simulation items are shown below.

Simulation item table

: Applicable
—: Not applicable

Item	Applicable component	Unit/condition	Test condition		PCM terminal
			KOEO	KOER	
ACCS	Air conditioning compressor cycling switch	Off/On		—	128
EGRV2	EGR solenoid valve (vent)	Off/On		—	177
GP_LMP	Glow indicator light	Off/On		—	233
GPC	Glow plug relay	Off/On		—	182
IASV	Intake shutter solenoid valve (half)	Off/On		—	152
IASV2	Intake shutter solenoid valve (full)	Off/On		—	155
INJ_1	Fuel injector No.1	Off	—		125, 174
INJ_2	Fuel injector No.2	Off	—		102, 149
INJ_3	Fuel injector No.3	Off	—		101, 173
INJ_4	Fuel injector No.4	Off	—		126, 150
SEGRP	EGR valve position sensor	%		—	116
VBCV	VBC solenoid valve	%		—	178
WARM_SOL	Exhaust shutter solenoid valve	Off/On		—	—

KOEO/KOER SELF-TEST[WL-C, WE-C]

id0102c4100400

: Applicable
—: Not applicable

DTC	Condition	KOEO	KOER
P0016	CKP-CMP correlation	—	
P0045	Variable boost control (VBC) solenoid valve control circuit open		
P0046	Variable boost control (VBC) solenoid valve circuit range/performance malfunction		
P0047	Variable boost control (VBC) solenoid valve control circuit low input		
P0048	Variable boost control (VBC) solenoid valve control circuit high input		
P0088	Fuel pressure system too high	—	—
P0093	Fuel system leak detection	—	—
P0097	Intake air temperature (IAT) sensor No.2 circuit low input		
P0098	Intake air temperature (IAT) sensor No.2 circuit high input		
P0101	Mass airflow (MAF) sensor range/performance malfunction	—	—
P0102	Mass airflow (MAF) sensor circuit low input	—	
P0103	Mass airflow (MAF) sensor circuit high input	—	
P0106	Boost sensor range/performance malfunction	—	—
P0107	Boost sensor circuit low input		
P0108	Boost sensor circuit high input		
P0111	Intake air temperature (IAT) sensor No.1 range/performance malfunction	—	—
P0112	Intake air temperature (IAT) sensor No.1 circuit low input		
P0113	Intake air temperature (IAT) sensor No.1 circuit high input		
P0116	Engine coolant temperature (ECT) sensor range/performance malfunction	—	—
P0117	Engine coolant temperature (ECT) sensor circuit low input		
P0118	Engine coolant temperature (ECT) sensor circuit high input		
P0122	Accelerator pedal position (APP) sensor No.1 circuit low input		
P0123	Accelerator pedal position (APP) sensor No.1 circuit high input		
P0182	Fuel temperature sensor circuit low input		
P0183	Fuel temperature sensor circuit high input		
P0191	Fuel pressure sensor range/performance malfunction		—
P0192	Fuel pressure sensor circuit low input		
P0193	Fuel pressure sensor circuit high input		
P0201	Fuel injector No.1 circuit open/short	—	
P0202	Fuel injector No.2 circuit open/short	—	
P0203	Fuel injector No.3 circuit open/short	—	
P0204	Fuel injector No.4 circuit open/short	—	
P0222	Accelerator pedal position (APP) sensor No.2 circuit low input		
P0223	Accelerator pedal position (APP) sensor No.2 circuit high input		
P0227	Idle switch circuit low input	—	—
P0228	Idle switch circuit high input	—	—
P0300	Random misfire detected	—	
P0301	Cylinder No.1 misfire detection	—	
P0302	Cylinder No.2 misfire detection	—	
P0303	Cylinder No.3 misfire detection	—	
P0304	Cylinder No.4 misfire detection	—	
P0335	Crankshaft position (CKP) sensor circuit malfunction	—	
P0340	Camshaft position (CMP) sensor circuit malfunction	—	
P0380	Glow plug relay circuit malfunction		—
P0401	EGR flow insufficient detected	—	—

DTC	Co ndition	KOEO	KOER
P0402	EGR flow excessive detected	—	—
P0403	EGR solenoid valve circuit malfunction		
P0404	EGR control circuit range/performance	—	
P0405	EGR valve position sensor circuit low input		
P0406	EGR valve position sensor circuit high input		
P0489	EGR solenoid valve control circuit low input		—
P0490	EGR solenoid valve control circuit high input		—
P0500	VSS circuit malfunction	—	—
P0562	Battery voltage low input		
P0563	Battery voltage high input		
P0602	PCM programming error		
P0606	PCM malfunction		
P0607	PCM performance problem		
P0610	PCM vehicle options error		
P0627	Fuel metering valve control circuit open	—	
P0628	Fuel metering valve control circuit low input	—	
P0629	Fuel metering valve control circuit high input	—	
P0642	Fuel pressure sensor and boost sensor 5 V circuit low input		
P0643	Fuel pressure sensor and boost sensor 5 V circuit high input		
P0652	CMP sensor and APP sensor 5 V circuit low input		
P0653	CMP sensor and APP sensor 5 V circuit high input		
P0660	Intake shutter solenoid valve (half) control circuit open		—
P0661	Intake shutter solenoid valve (half) control circuit low input		—
P0662	Intake shutter solenoid valve (half) control circuit high input		—
P0663	Intake shutter solenoid valve (full) control circuit open		—
P0664	Intake shutter solenoid valve (full) control circuit low input		—
P0665	Intake shutter solenoid valve (full) control circuit high input		—
P0685	Main relay control circuit open	—	—
P0698	EGR valve position sensor 5 V circuit low input		
P0699	EGR valve position sensor 5 V circuit high input		
P1196	Key off voltage high input	—	—
P1259	IMMOBILIZER to PCM signal error		—
P1260	Theft detected Vehicle immobilizer		—
P1391	Glow plug control circuit low input		—
P1392	Glow plug control circuit high input		—
P1528	Exhaust shutter solenoid valve circuit problem		—
P1602	Immobilizer/PCM communication error		—
P1603	ID Number Unregistered		—
P1604	Code word unregistered		—
P1621	Immobilizer code word does not match		—
P1622	Immobilizer ID does not match		—
P1623	Immobilizer code word/ID number write failure		—
P1624	Anti-theft system		—
P1675	Injection quantity adjustment value writing error		—
P1676	Injection quantity adjustment value checksum error		—
P2008	Variable swirl control (VSC) solenoid valve control circuit open		—
P2009	Variable swirl control (VSC) solenoid valve circuit low input		—
P2010	Variable swirl control (VSC) solenoid valve circuit high input		—
P2135	Accelerator pedal position (APP) sensor No.1/No.2 voltage correlation problem		
P2136	Accelerator pedal position (APP) sensor No.1/idle switch voltage correlation problem		
P2143	EGR control solenoid valve control circuit open		—
P2144	EGR control solenoid valve control circuit low input		
P2145	EGR control solenoid valve control circuit high input		
P2146	Fuel injector No.1 and No.4 power supply circuit malfunction	—	

DTC	Condition	KOEO	KOER
P2147	Fuel injector No.1 and No.4 power supply circuit low input	—	
P2148	Fuel injector No.1 and No.4 power supply circuit high input	—	
P2149	Fuel injector No.2 and No.3 power supply circuit malfunction	—	
P2150	Fuel injector No.2 and No.3 power supply circuit low input	—	
P2151	Fuel injector No.2 and No.3 power supply circuit high input	—	
P2227	BARO sensor circuit range/performance malfunction	—	—
P2228	BARO sensor circuit low input		
P2229	BARO sensor circuit high input		
P2263	Air charging pressure performance malfunction	—	—
P2530	PCM (engine switch circuit) malfunction		—

01-10B MECHANICAL [WL-C, WE-C]

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ENGINE STRUCTURAL VIEW [WL-C, WE-C]

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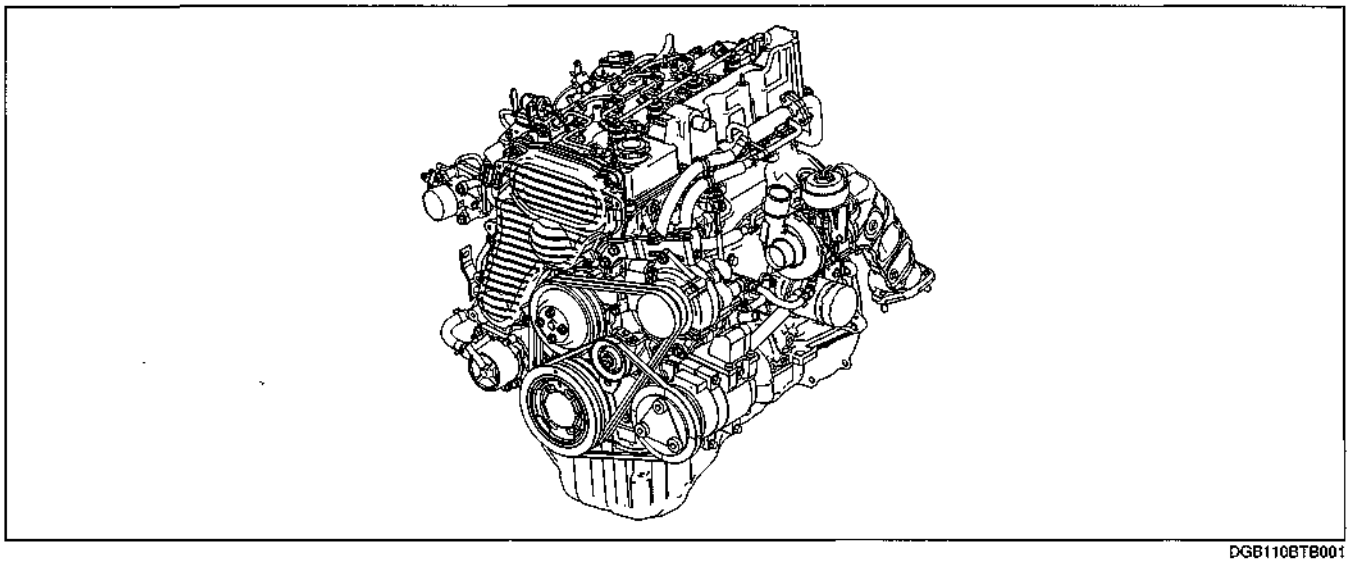


DGB110BTB001

CYLINDER HEAD COVER CONSTRUCTION [WL-C, WE-C]

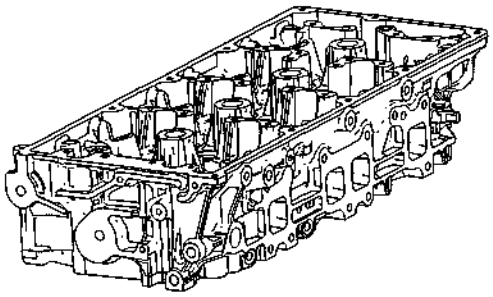
dcf011010220t02

- The cylinder head cover is made of aluminum alloy.
- The cylinder head cover is made of aluminum alloy with a baffle plate on its lower side for blow-by gas separation.

CYLINDER HEAD CONSTRUCTION [WL-C, WE-C]

dcf011010100i02

- A lightweight aluminum alloy cylinder head with good thermal conductivity has been adopted.
- A plastic region bolt has been adopted as a cylinder head bolt providing constant high axial force (tightening force).
- Due to the adoption of 4 valves, the opening area has been increased and the charging efficiency improved.
- The smooth curved intake port reduces intake resistance.



DBG110BTB801

CYLINDER HEAD GASKET CONSTRUCTION [WL-C, WE-C]

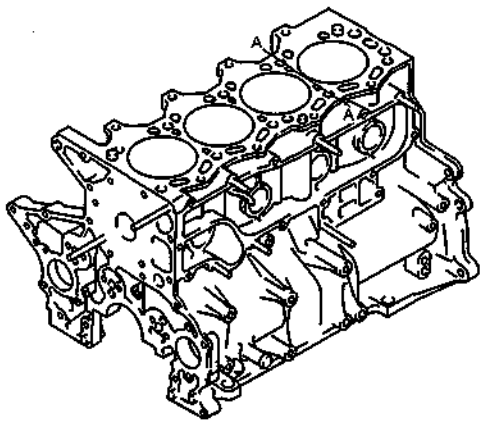
dcf011010271i02

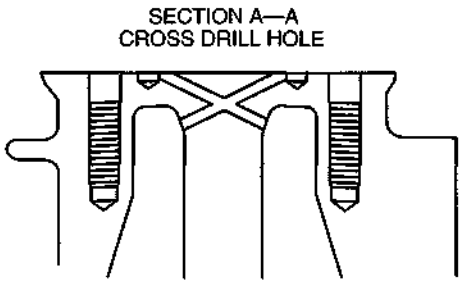
- A steel-laminated gasket has been adopted for the cylinder head gasket.

CYLINDER BLOCK CONSTRUCTION [WL-C, WE-C]

dcf011010300i02

- A special cast iron liner-less type cylinder block has been adopted to provide a thin-walled cylinder block. In addition, a curve-shaped, deep-skirt cylinder block has been adopted to heighten the cylinder block rigidity.
- The engine coolant passage has been equipped by cross-drilling in the bore, improving the cooling performance and reducing oil consumption.





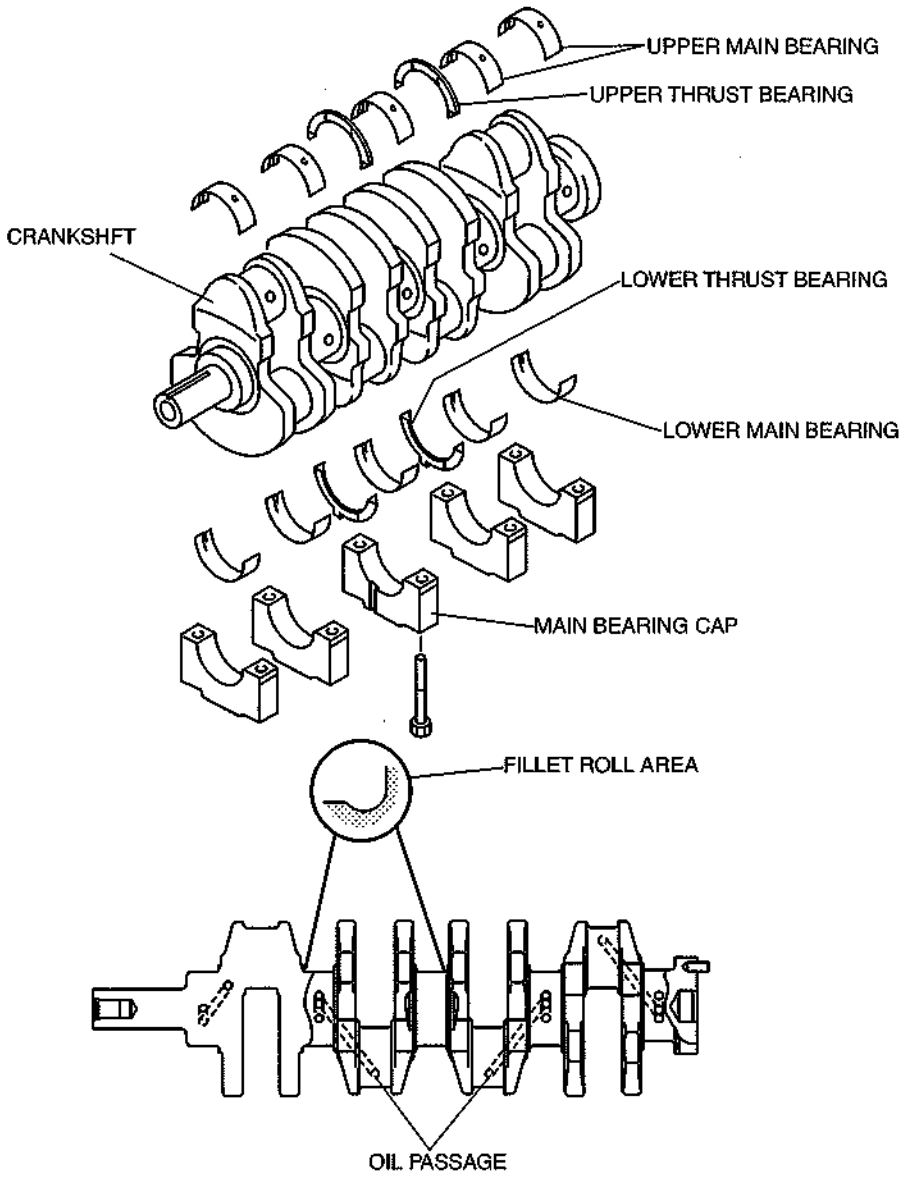
DGB110BTB002

CRANKSHAFT, MAIN BEARING CONSTRUCTION [WL-C, WE-C]

dcf011011301t02

Structure

- A five axle-hole, 8 counter weight steel crankshaft has been adopted.
- An oil line for supplying oil to each journal is provided in the crankshaft. Crank pins and fillets on both sides of the journal are rolled to bear heavy loads.
- Upper and lower main bearings are made of aluminum alloy and thrust bearings are used at the No.3 journal. The upper main bearing has oil grooves and oil holes.



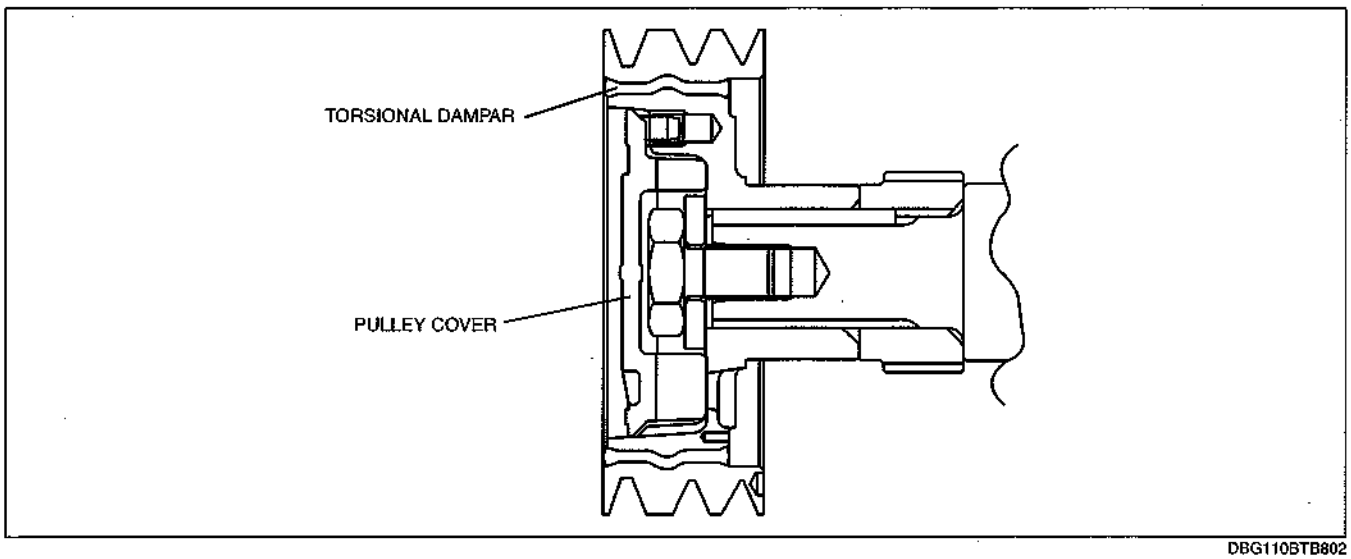
DBG110BTB004

CRANKSHAFT PULLEY CONSTRUCTION [WL-C, WE-C]

dcf011011371t02

Structure

- A torsional damper pulley is used for the crankshaft pulley to reduce torsional vibration noise.
- The pulley installation area has a pulley cover for reduction of engine noise.



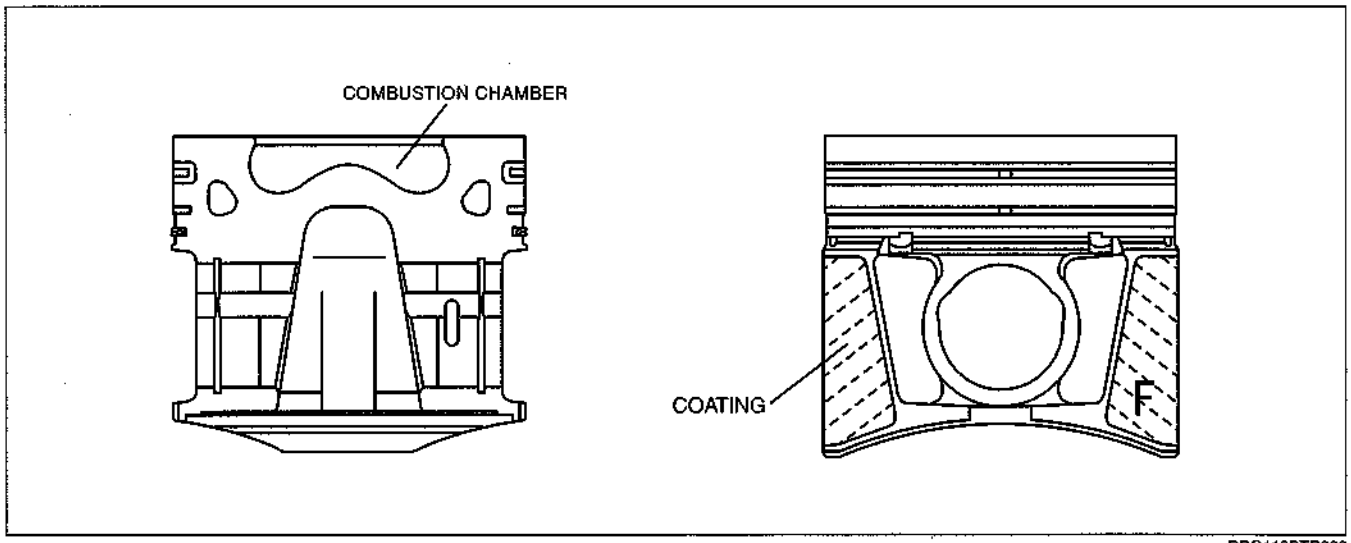
DBG110BTB802

PISTON CONSTRUCTION [WL-C, WE-C]

dcf011011010t02

Structure

- In accordance with the adoption of the common rail injection system, the piston head shape (combustion chamber) has been changed.
- A reduction in friction has been achieved by the coating of the skirt area together with a compression rating setting of 18.0.
- To realize high combustion efficiency, the diffusion area of the hotspot at combustion has been expanded by the change in the shape of the combustion chamber and the spray pattern of fuel injectors. Exhaust emission and combustion noise have been reduced through smooth and uniform combustion.



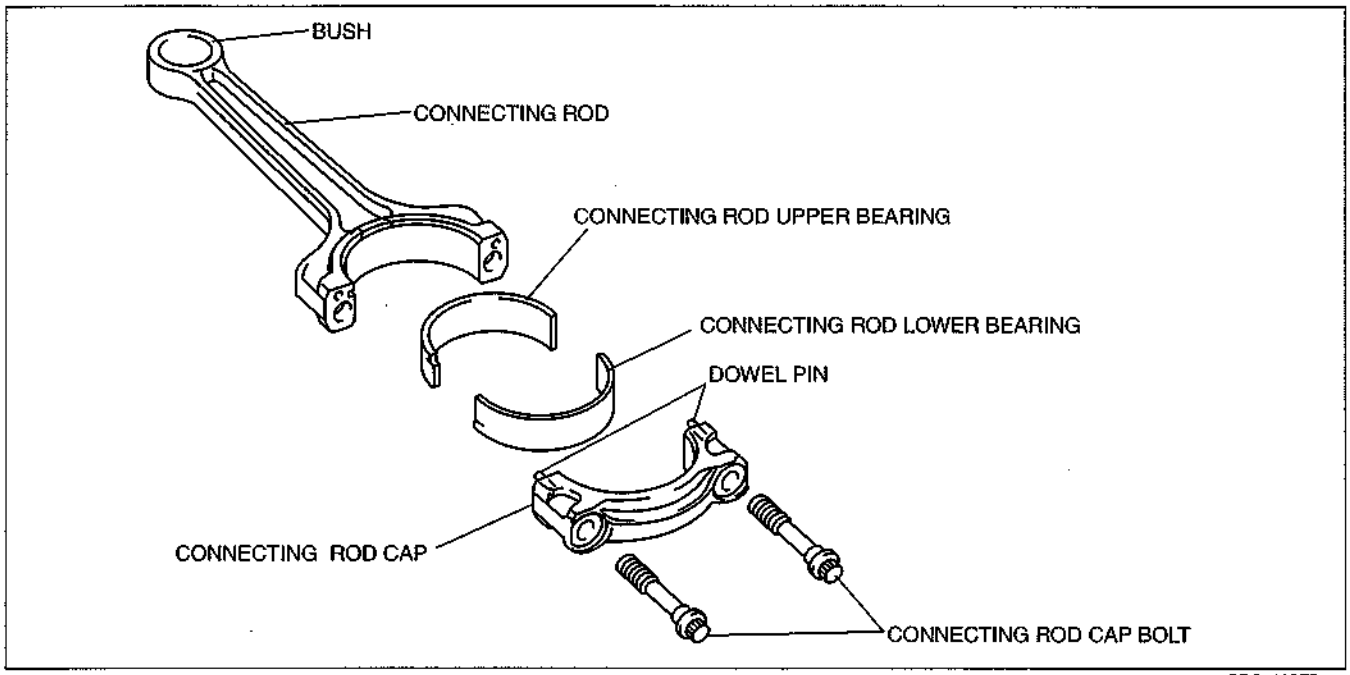
DBG110BTB803

CONNECTING ROD, CONNECTING ROD BEARING CONSTRUCTION [WL-C, WE-C]

dcf011011211t02

Structure

- Connecting rods are made of forget manganese steel.
- Dowel pins are used to position the rod cap to the connecting rod.
- Connecting rod caps are secured with plastic region bolts.
- The connecting rod bearing is mode of aluminum alloy.



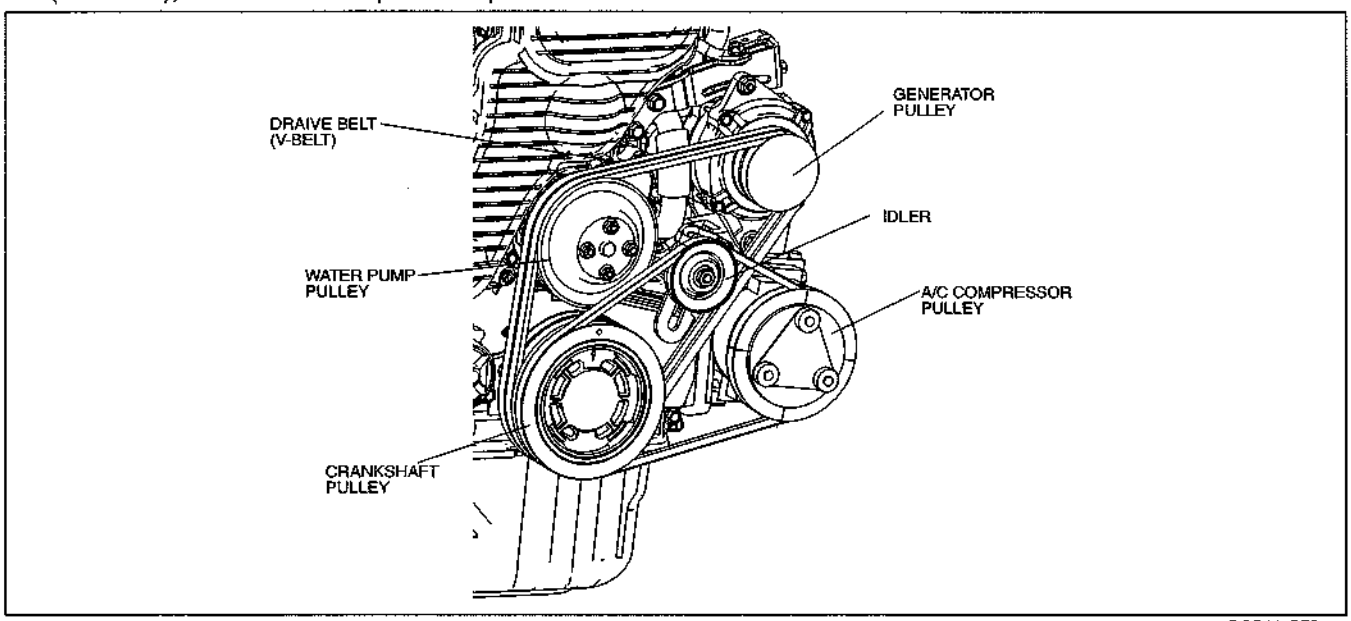
DBG110BTB804

DRIVE BELT CONSTRUCTION [WL-C, WE-C]

dcf011015800t01

Structure

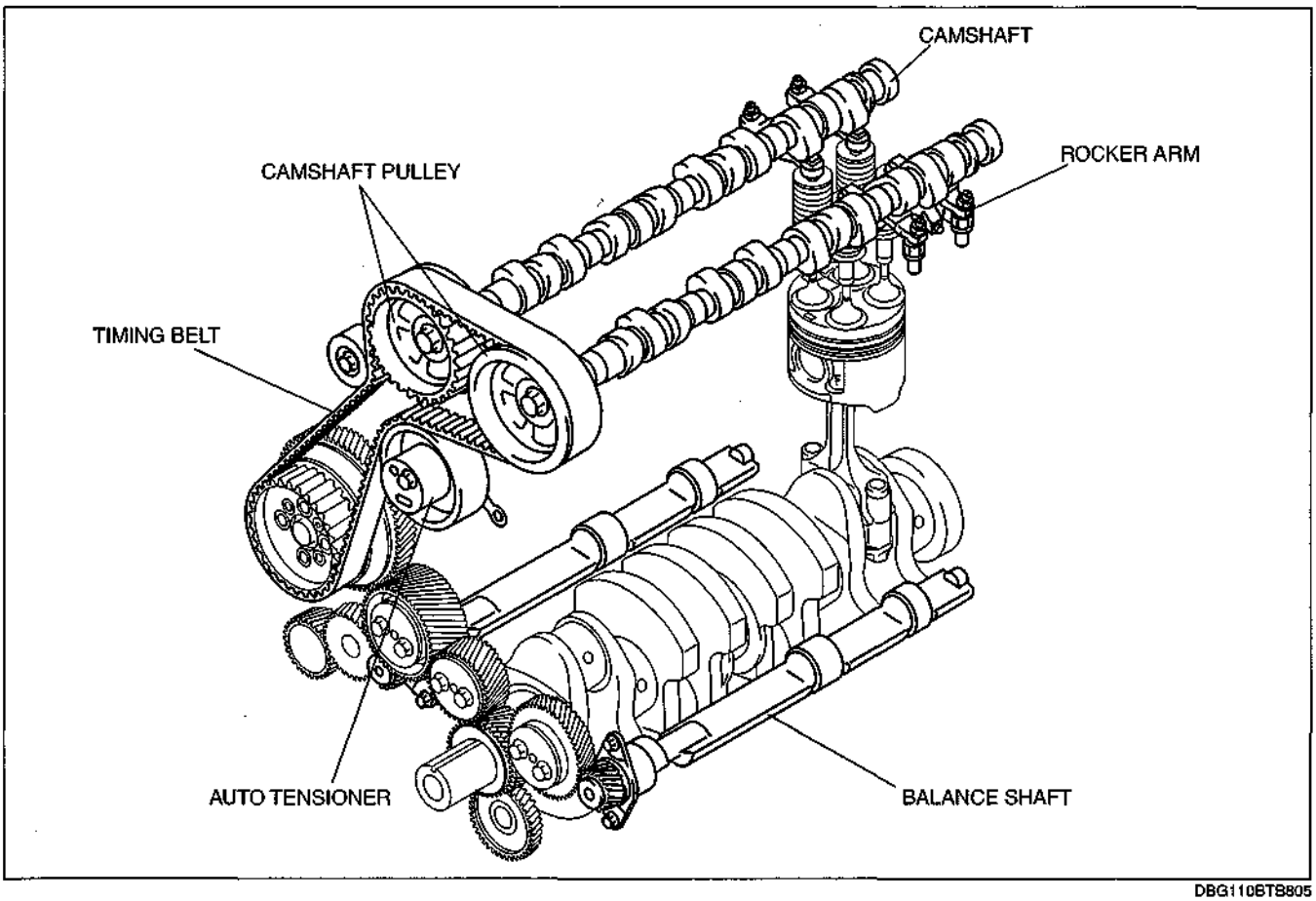
- A V-belt has been adopted which consists of three belts including generator and water pump operation belts (two belts), and an A/C compressor operation belt.



DGB110BTB003

VALVE MECHANISM STRUCTURAL VIEW [WL-C, WE-C]

dcf011012111i01



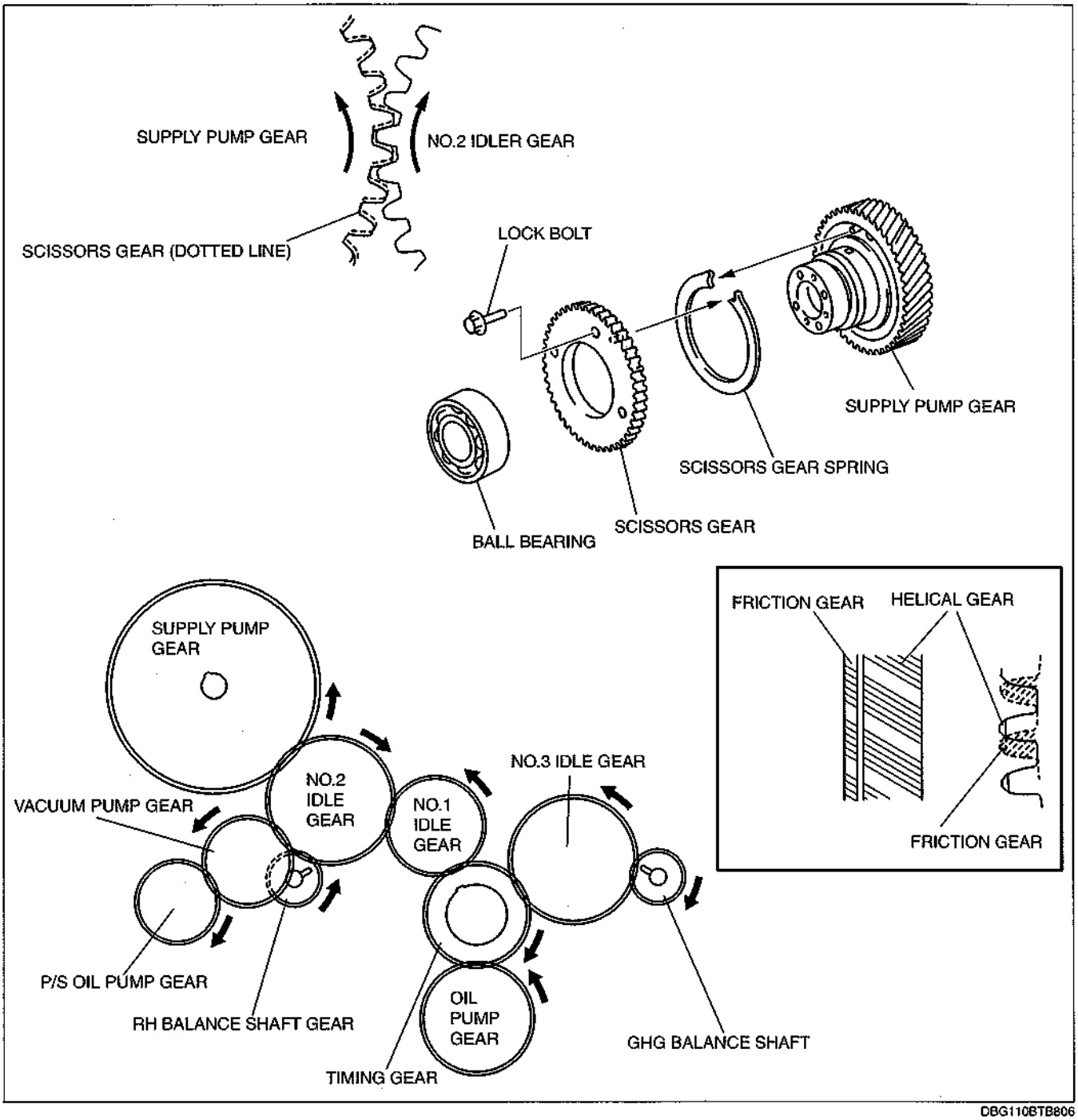
DBG110BTS805

TIMING GEAR CONSTRUCTION [WL-C, WE-C]

dcf011012111t02

Supply Pump Gear

- The gears are helical. Supply pump gear is combined with a scissors gear.
- The scissors gear, through the force of the scissors gear spring, prevents the teeth of the supply pump gear from moving back and forth (backlash) between the teeth of the No.2 idler gear, with which the supply pump gear is meshed, and thus reduces gear noise.
- When removing the supply pump gear, fix the scissors gear to the supply pump gear using a lock bolt (M6 x 1.0, length under the bolt head is approximately 10 mm {0.63 in} to prevent the scissors gear from rotating under the spring force.

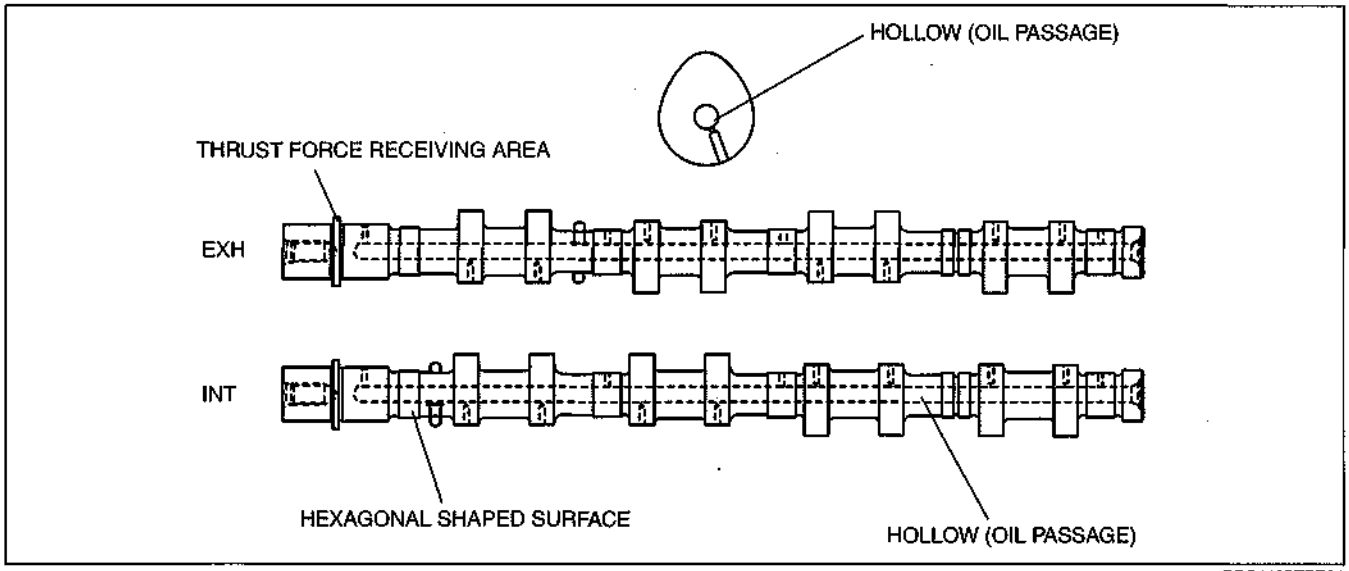


DBG110BTB806

CAMSHAFT CONSTRUCTION [WL-C, WE-C]

dcf011012111t03

- The camshaft is made of cast iron alloy.
- A hollow type camshaft with five bearings has been adopted. In addition, the hollow area is provided as the oil passage.
- The camshaft No. 1 journal has a hexagonal shaped surface around the rear of the shaft to prevent rotation during servicing.
- Thrust force is received at the front of the No. 1 journal.

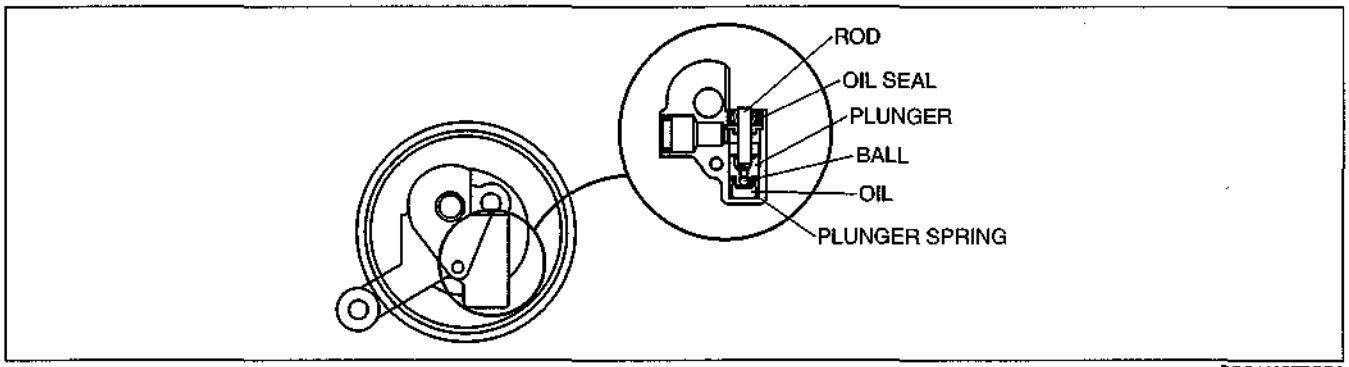


DBG110BTBR01

AUTO TENSIONER CONSTRUCTION [WL-C, WE-C]

dcf011012111t04

- A hydraulic timing belt auto tensioner has been adopted for timing belt adjustment so that the timing belt tension is maintained constantly.

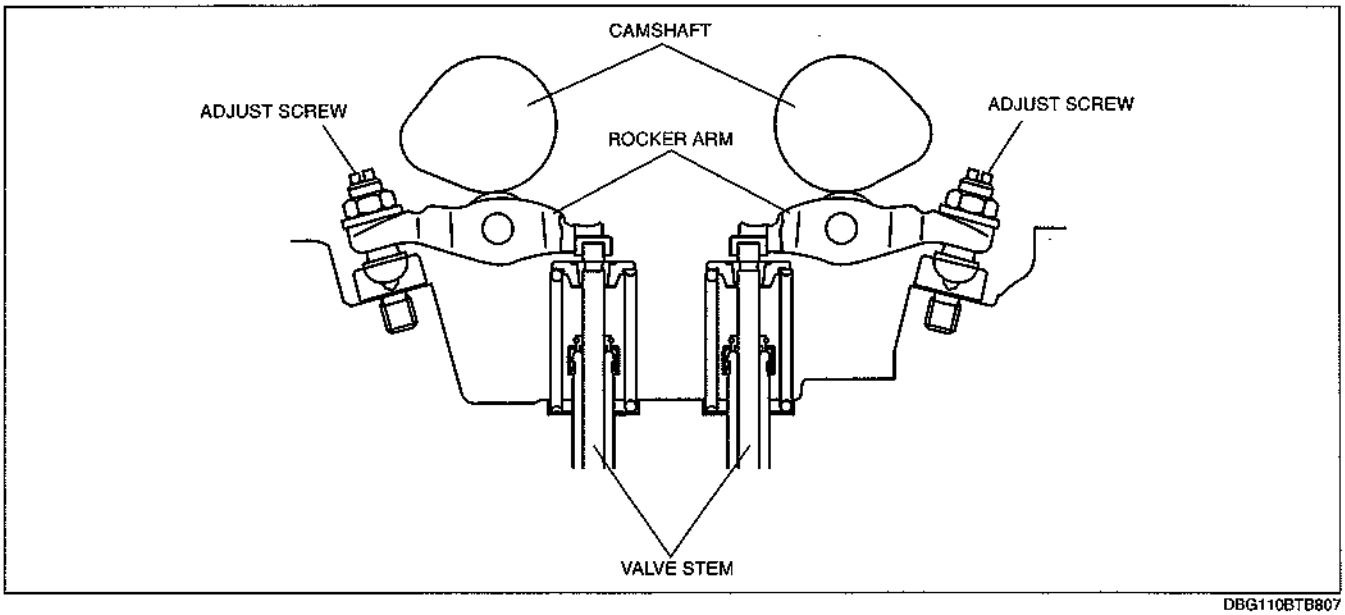


DBG110BTBRR2

VALVE, ROCKER ARM CONSTRUCTION [WL-C, WE-C]

dcf011012111t05

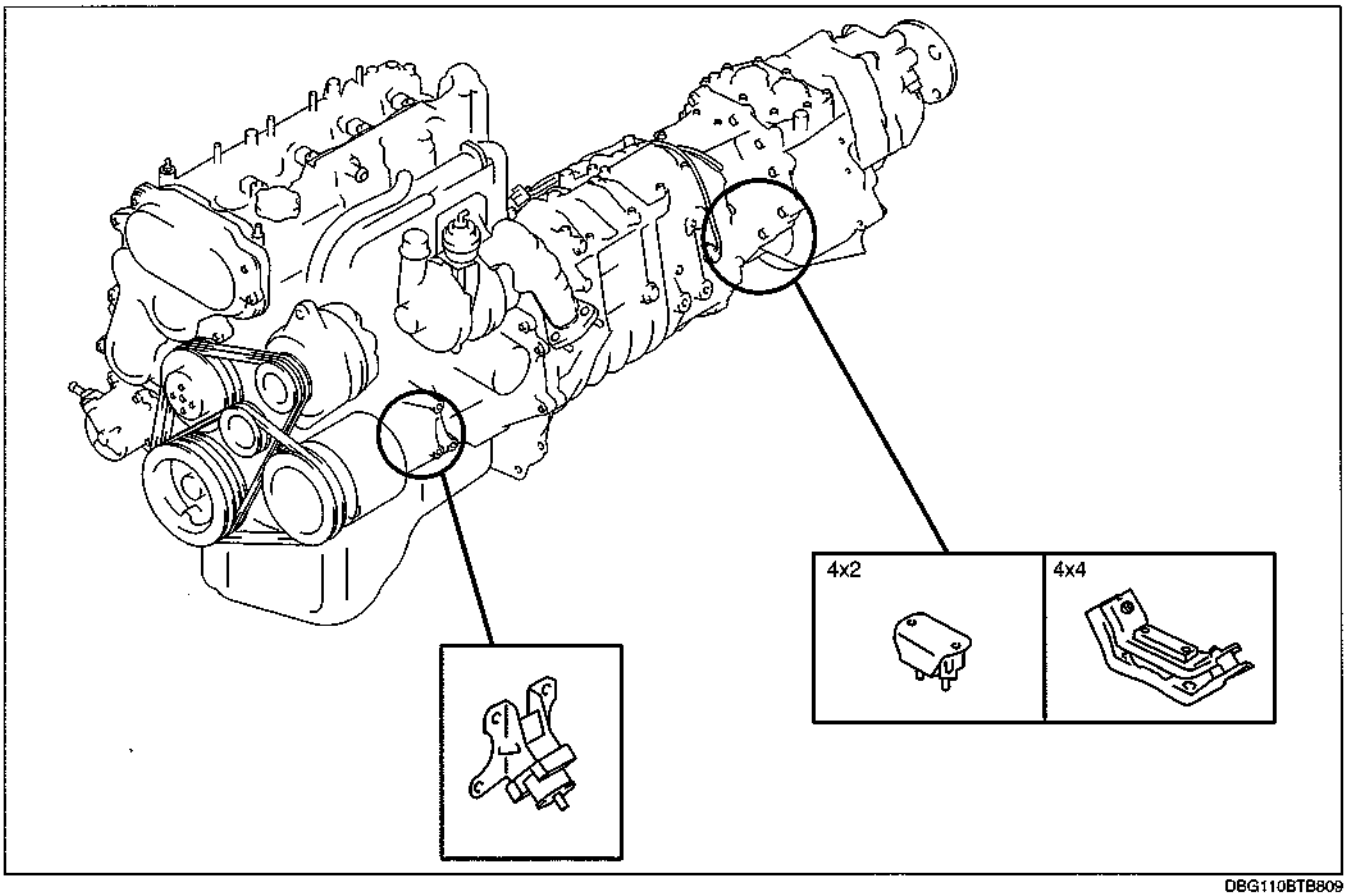
- The valves are operated by rocker arms.
- Valve clearance is adjusted by the adjust screw and nut of the rocker arm.



DBG110BTB807

ENGINE MOUNT STRUCTURAL VIEW [WL-C, WE-C]

dcf011039000t02



DBG110BTB809

01-11B LUBRICATION [WL-C, WE-C]

LUBRICATION SYSTEM OUTLINE [WL-C, WE-C]..... 01-11B–1
LUBRICATION SYSTEM STRUCTURAL VIEW [WL-C, WE-C]..... 01-11B–2
LUBRICATION SYSTEM FLOW DIAGRAM [WL-C, WE-C] 01-11B–3
OIL FILTER CONSTRUCTION [WL-C, WE-C] 01-11B–3
OIL COOLER, OIL FILTER BODY CONSTRUCTION [WL-C, WE-C]..... 01-11B–4
OIL PAN CONSTRUCTION [WL-C, WE-C]..... 01-11B–4
OIL STRAINER CONSTRUCTION [WL-C, WE-C]..... 01-11B–5
OIL PUMP CONSTRUCTION [WL-C, WE-C] 01-11B–5
OIL JET VALVE CONSTRUCTION/ OPERATION [WL-C, WE-C]..... 01-11B–6

LUBRICATION SYSTEM OUTLINE [WL-C, WE-C]

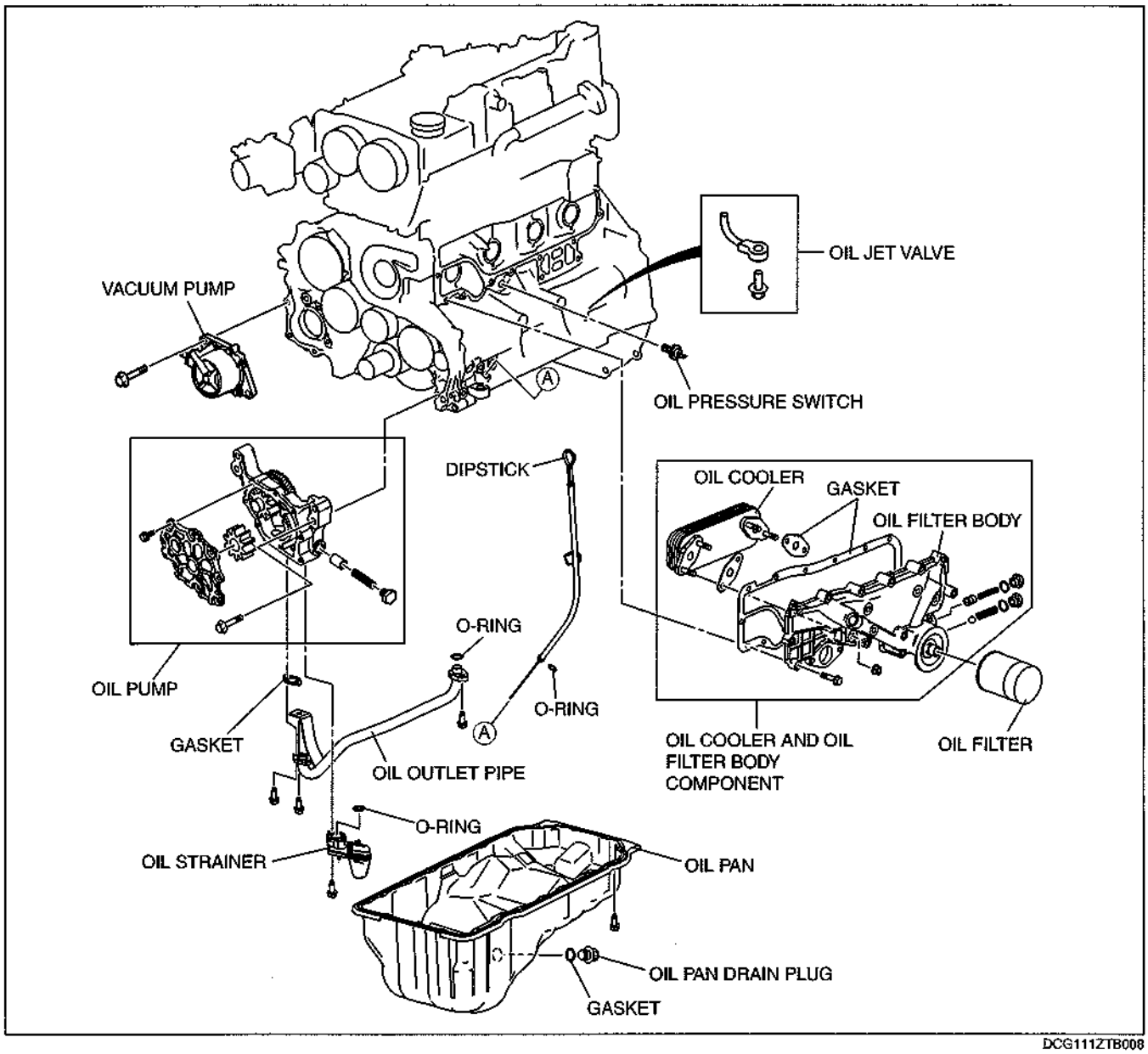
dcf011100000t04

Features

Improved lubricity	• Gear type oil pump adopted • Oil jet valves adopted • Water-cooled type oil cooler adopted
Reduced weight	• Plastic oil strainer adopted
Reduced engine noise	• Oil pan baffle plate adopted

LUBRICATION SYSTEM STRUCTURAL VIEW [WL-C, WE-C]

dcf011100000t05



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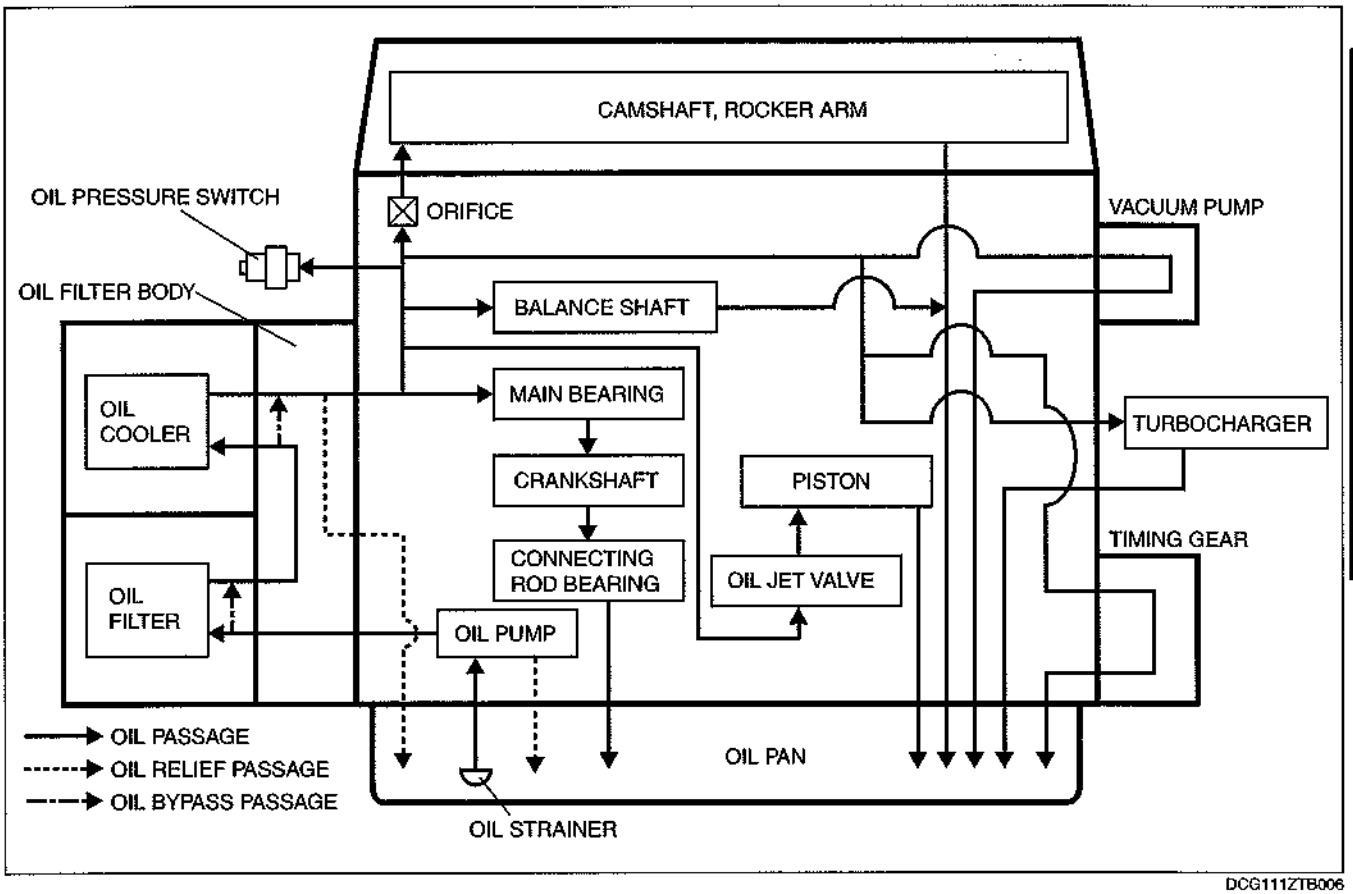
LUBRICATION SYSTEM FLOW DIAGRAM [WL-C, WE-C]

dcf011100000t06

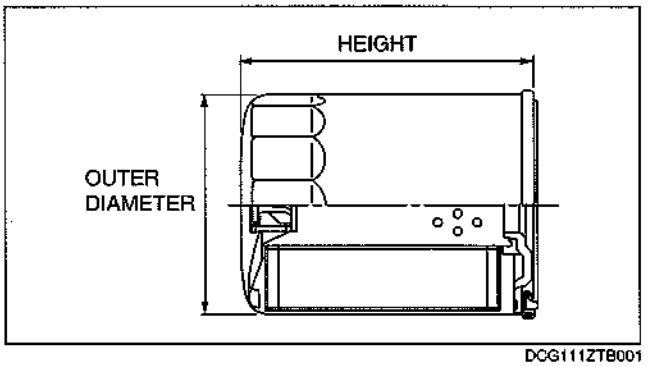


DCG111ZTB006

OIL FILTER CONSTRUCTION [WL-C, WE-C]

dcf011114300t02

- A full-flow paper element type oil filter has been adopted.
- The oil filter is installed on the oil filter body. (Left surface (vehicle left) of the cylinder block)



DCG111ZTB001

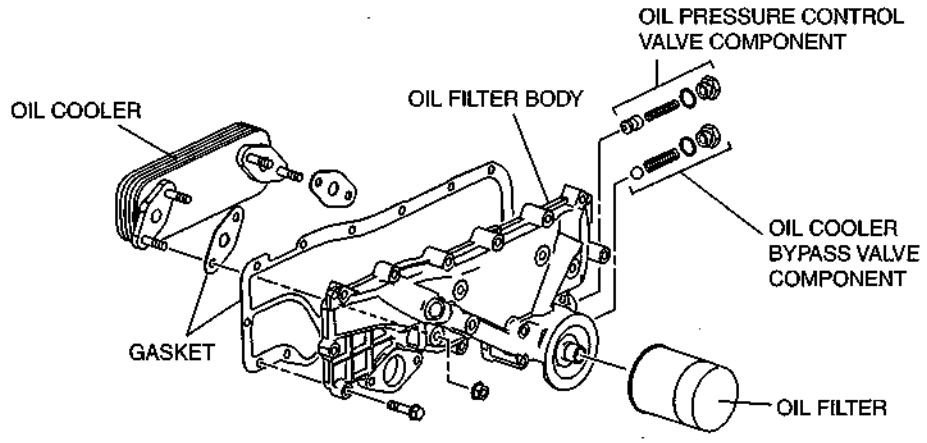
Oil filter specification

Item	Specification (mm {in})
Outer diameter	73.7 {2.90}
Height	100 {3.94}

OIL COOLER, OIL FILTER BODY CONSTRUCTION [WL-C, WE-C]

dcf011114700t02

- A water-cooled, 5-layered type oil cooler has been adopted to reduce engine oil degradation.
- The oil cooler, oil cooler bypass valve, and oil pressure control valve are built into the oil filter body.



DCG111ZTB007

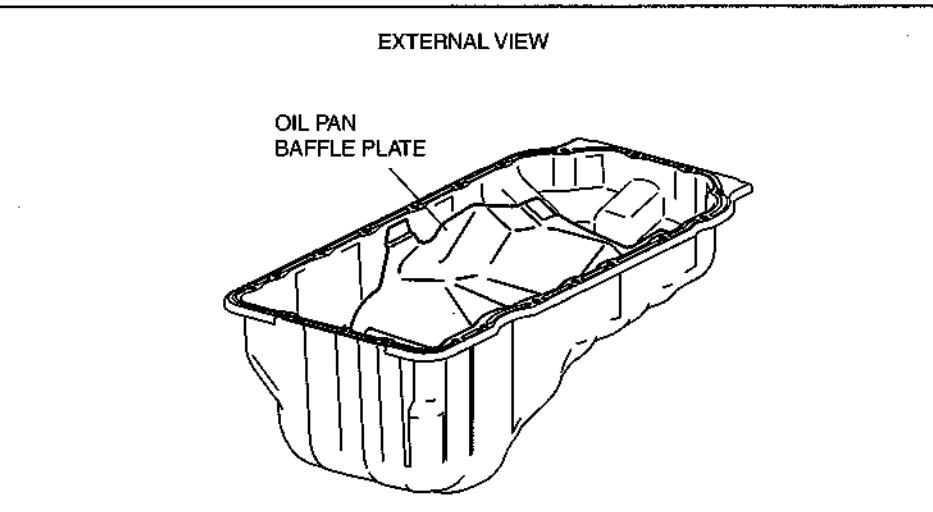
Oil filter body specification

Item	Specification (kPa {kgf/cm^2, psi}) [oil temperature: 120 °C {248 °F}]
Oil cooler bypass valve opening pressure	164—200
Oil pressure control valve opening pressure	400—480

OIL PAN CONSTRUCTION [WL-C, WE-C]

dcf011110040t02

- A steel oil pan has been adopted.
- A silicon sealant with excellent sealing qualities has been adopted. Also, sealing slots have been adopted on the oil pan attachment side to improve sealing performance.
- An oil baffle plate has been installed inside the oil pan to bifurcate the oil pan bottom. Due to this, the vibrations at the oil surface and in the oil pan have been reduced for improved engine noise suppression.

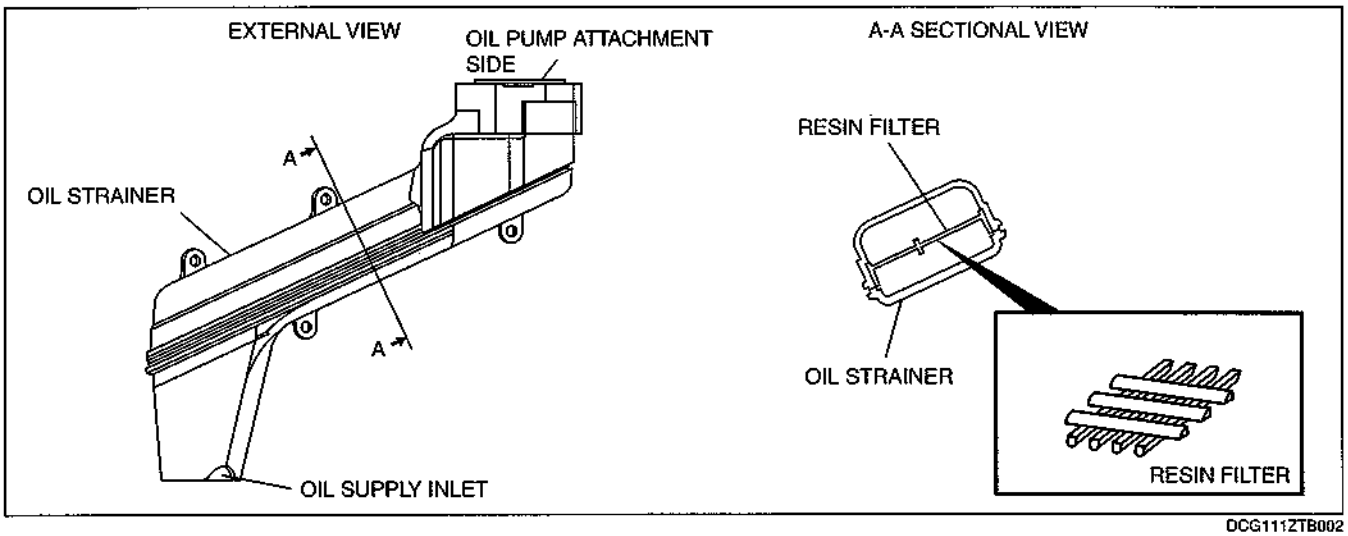


DCG111ZTB010

OIL STRAINER CONSTRUCTION [WL-C, WE-C]

dcf011114240l02

- A plastic oil strainer with a resin filter in the middle of the strainer has been adopted for weight reduction.

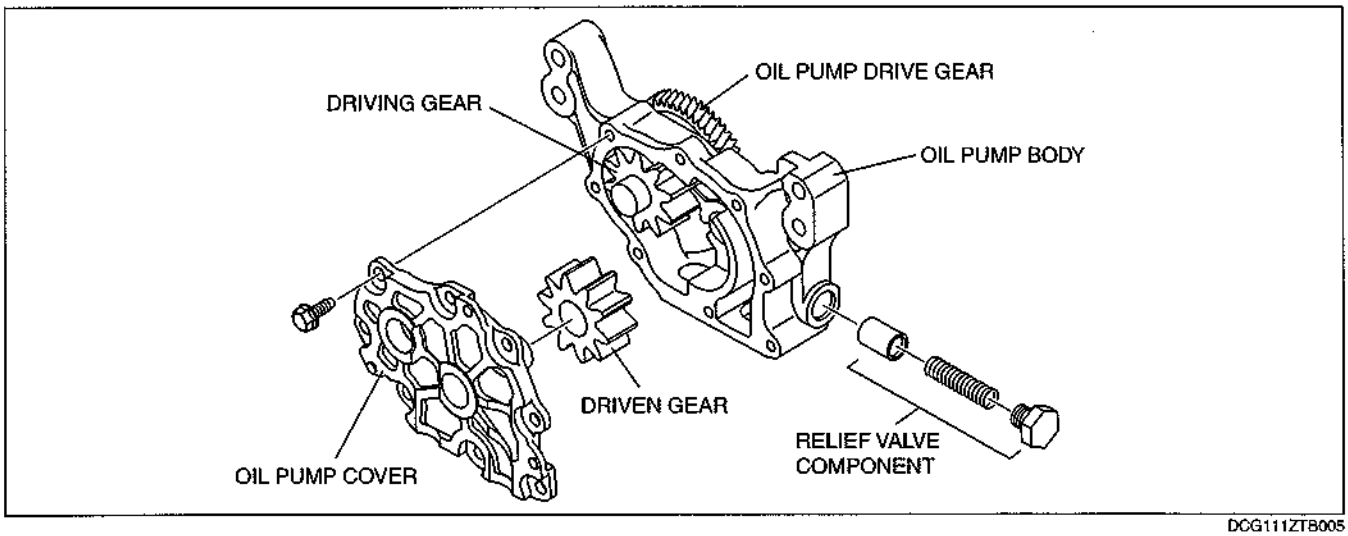


DCG111ZTB002

OIL PUMP CONSTRUCTION [WL-C, WE-C]

dcf011114100l02

- A gear type oil pump with superior heat resistance and noise reduction has been adopted, ensuring stable discharge performance.
- The oil pump consists of the oil pump body, oil pump drive gear, driving gear, driven gear, relief valve, and oil pump cover.
- The oil pump is driven by the crankshaft through the timing gear and oil pump drive gear.
- The relief valve is built into the oil pump body.



DCG111ZTB005

Oil pump specification

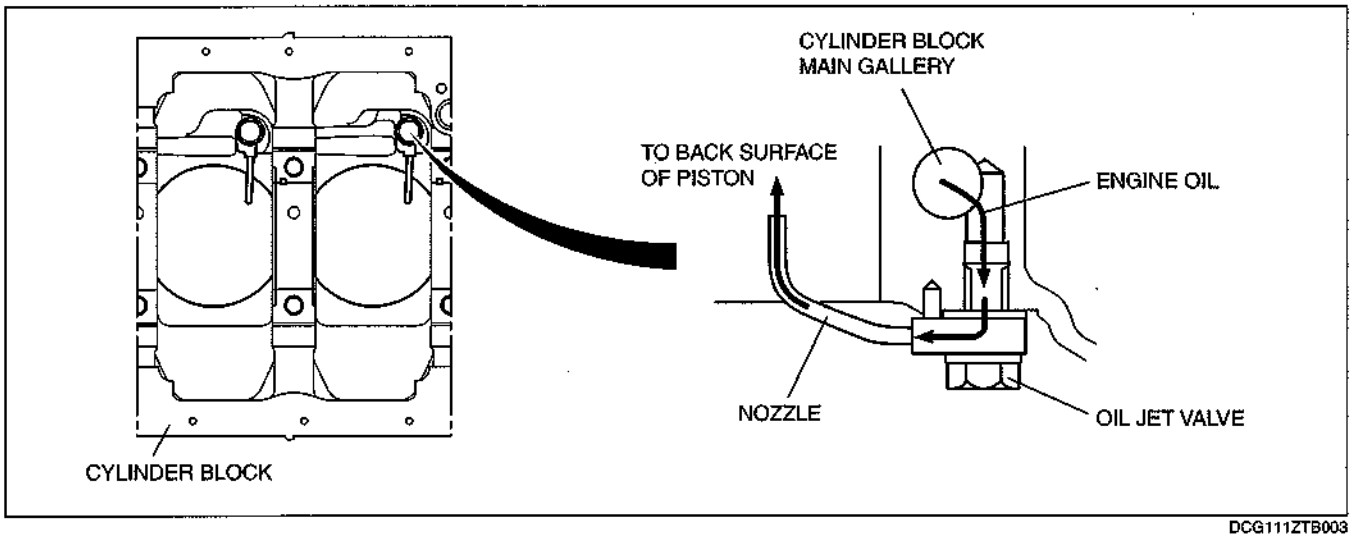
Item	Engine speed [rpm]	Specification (kPa {kgf/cm^2, psi})
Oil discharge pressure (reference value) [after warm up]	At idling	100—330 {1.02—3.36, 14.5—47.7}
	2,500	410—570 {4.19—5.81, 59.6—82.6}
Relief valve opening pressure (reference value)		580—700 {5.9—7.1, 84.1—101.5}

OIL JET VALVE CONSTRUCTION/OPERATION [WL-C, WE-C]

dcf01111073010z

Construction

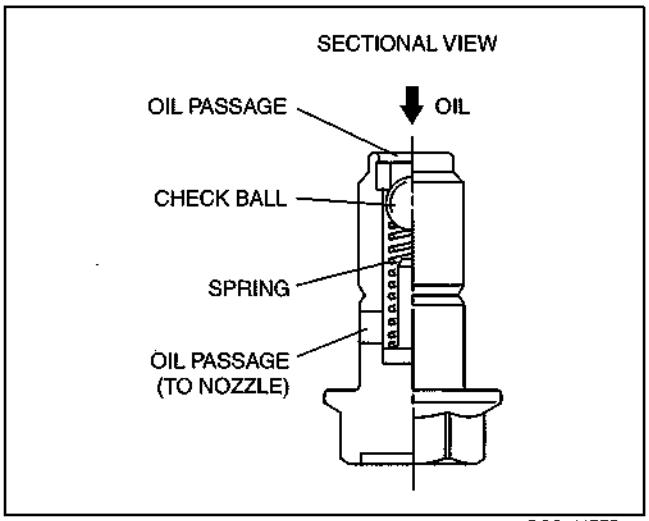
- The oil jet valves are installed in the cylinder block. The oil jet valve nozzles are installed pointed toward the back surface of each piston.
- The oil jet valves are designed to maintain optimum oil pressure in the engine by controlling the oil injection according to the oil pressure applied to the check ball in the oil jet valves.



DCG111ZTB003

Operation

- Oil pressure applied to the check-ball in the oil jet valve opens and closes the oil passage-way to the nozzle and controls oil injection starting and stopping.
- Oil pressure greater than the specified value applied to the check-ball in the oil jet valve opens the oil passage to the spring-pressed nozzle, starting injection. Conversely, oil pressure less than the specified value applied to the check-ball blocks the oil passage by spring force, stopping injection.



DCG111ZTB004

01-12B COOLING SYSTEM [WL-C, WE-C]

COOLING SYSTEM OUTLINE [WL-C, WE-C]..... 01-12B–1
COOLING SYSTEM STRUCTURAL VIEW [WL-C, WE-C]..... 01-12B–1
COOLING SYSTEM FLOW DIAGRAM [WL-C, WE-C] 01-12B–2
RADIATOR, COOLING SYSTEM CAP CONSTRUCTION [WL-C, WE-C]..... 01-12B–2
THERMOSTAT CONSTRUCTION/ OPERATION [WL-C, WE-C]..... 01-12B–3
WATER PUMP CONSTRUCTION/ OPERATION [WL-C, WE-C]..... 01-12B–3
COOLING FAN CONSTRUCTION [WL-C, WE-C]..... 01-12B–4

COOLING SYSTEM OUTLINE [WL-C, WE-C]

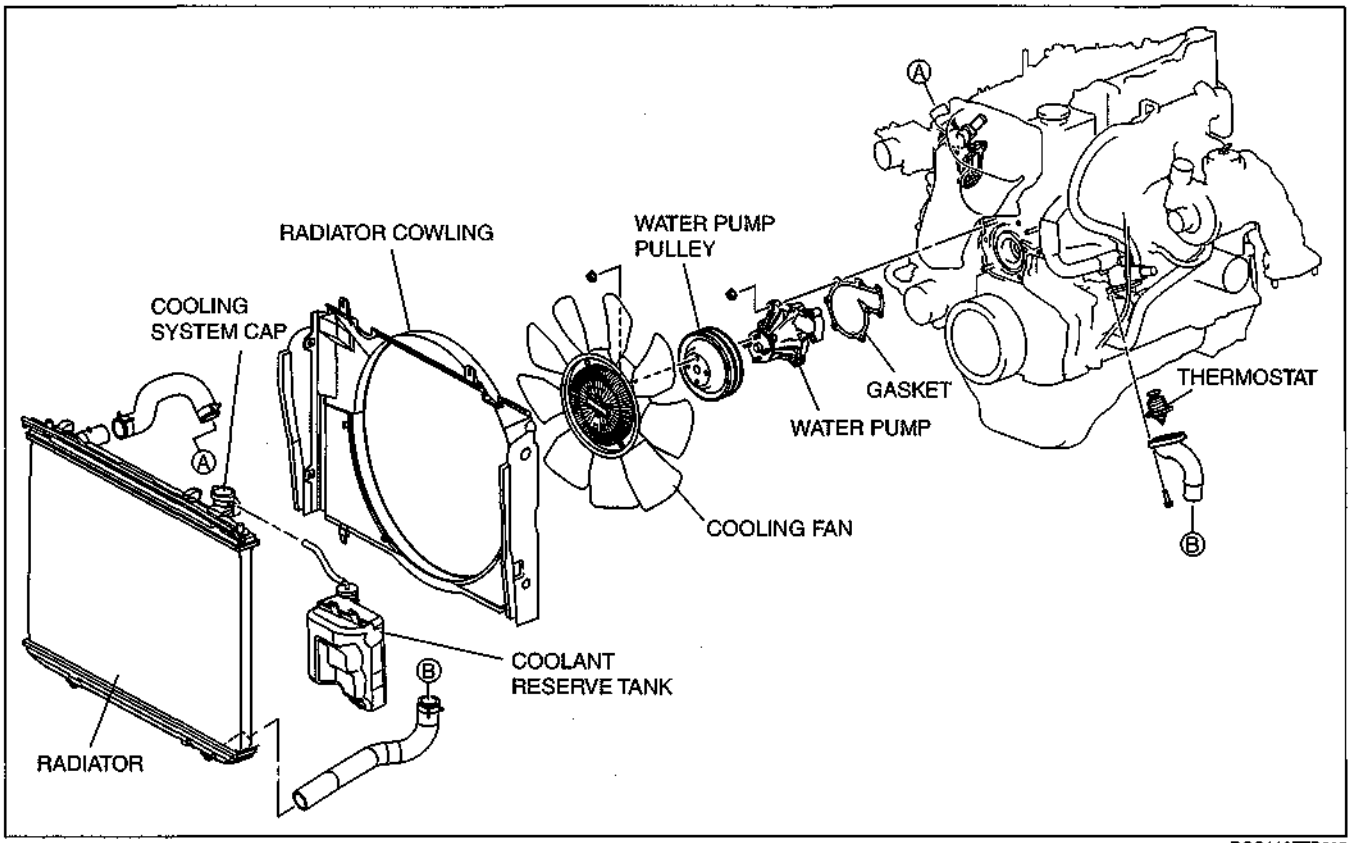
dcf011200000t04

Features

Reduced weight	• Down flow type radiator with aluminum core and plastic tank adopted
Miniaturization	• Built-in type water pump adopted
Reduced noise	• Thermo-modulation type cooling fan adopted
Improved serviceability	• Longer-life new engine coolant (type FL22) adopted

COOLING SYSTEM STRUCTURAL VIEW [WL-C, WE-C]

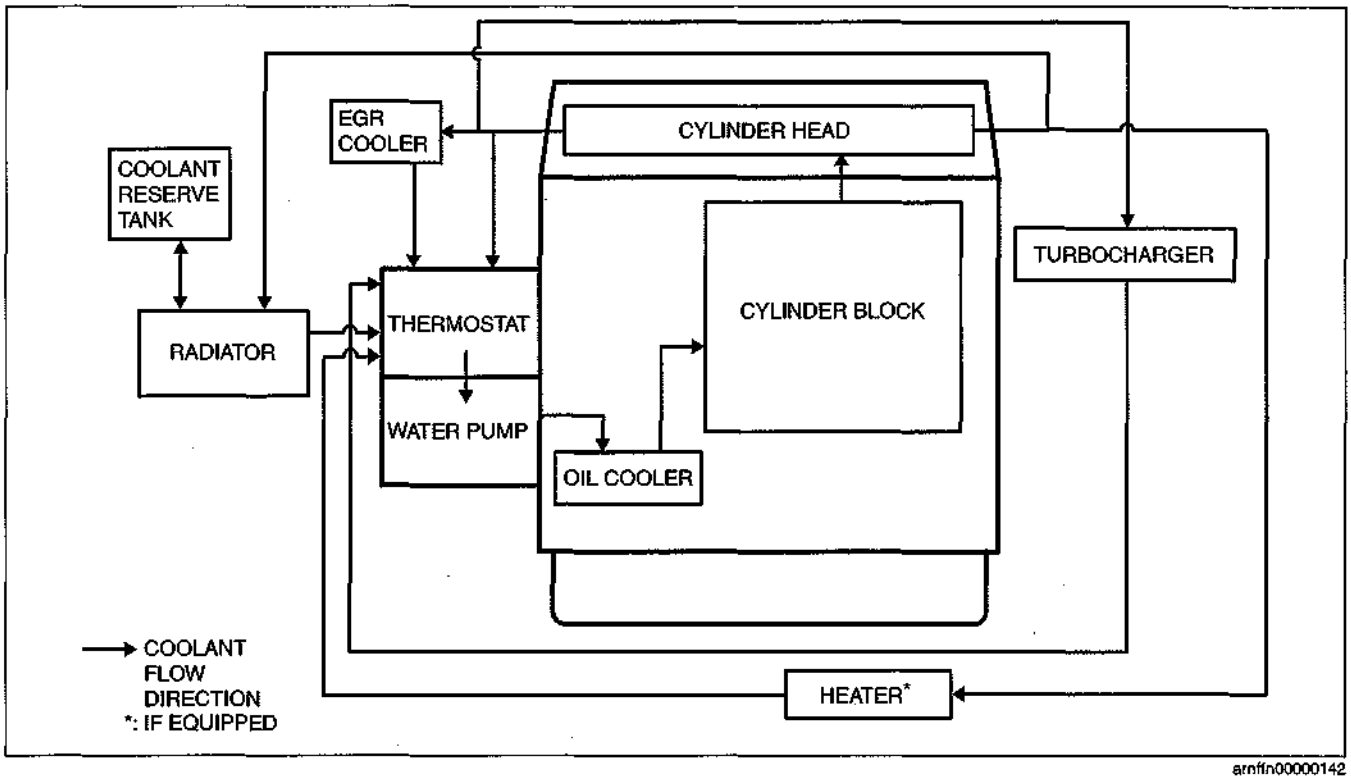
dcf011200000t05



DCG112ZTB005

COOLING SYSTEM FLOW DIAGRAM [WL-C, WE-C]

dcf011200000t06



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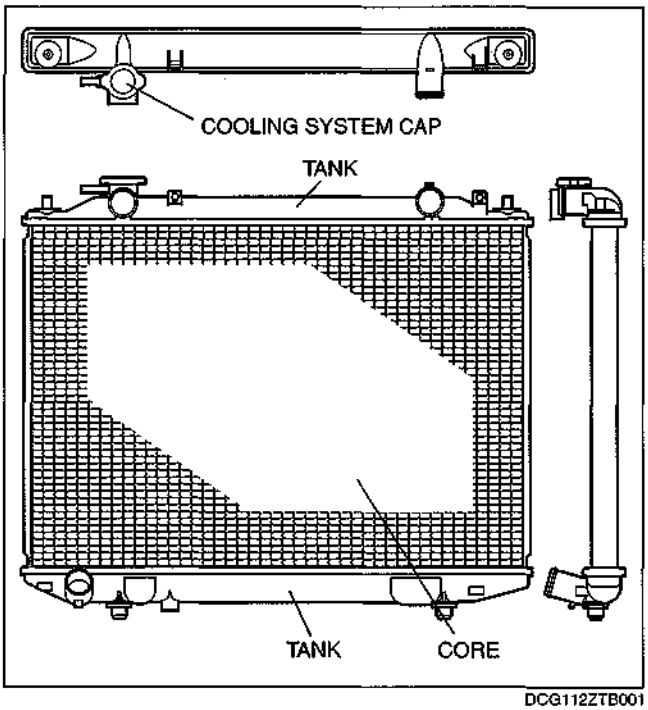
RADIATOR, COOLING SYSTEM CAP CONSTRUCTION [WL-C, WE-C]

dcf011215200t02

A corrugated fin type radiator has been adopted.
The radiator tanks are made of plastic and the core is made of aluminum for weight reduction.
The down-flow direction of water inside the radiator causes air to bleed from the cooling system easier.
Four mounting rubbers are utilized to decrease vibration.
A low-pressure type cap has been adopted for the cooling system. It is installed on the radiator.



DCG112ZTB001

THERMOSTAT CONSTRUCTION/OPERATION [WL-C, WE-C]

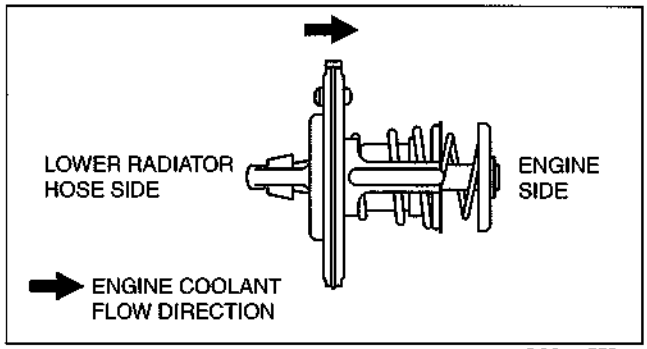
dcf011215171t02

Construction

- A wax-type thermostat with a jiggle-pin has been adopted.
- The thermostat body is made of stainless steel with excellent corrosion resistance.

Operation

- When the engine coolant temperature reaches 80—84 °C {176—183 °F}, the valve starts opening to allow engine coolant to flow from the radiator stabilizing the engine coolant temperature. When the engine coolant temperature decreases to approx. 77 °C {171 °F}, the valve closes to stop the engine coolant flow from the radiator.



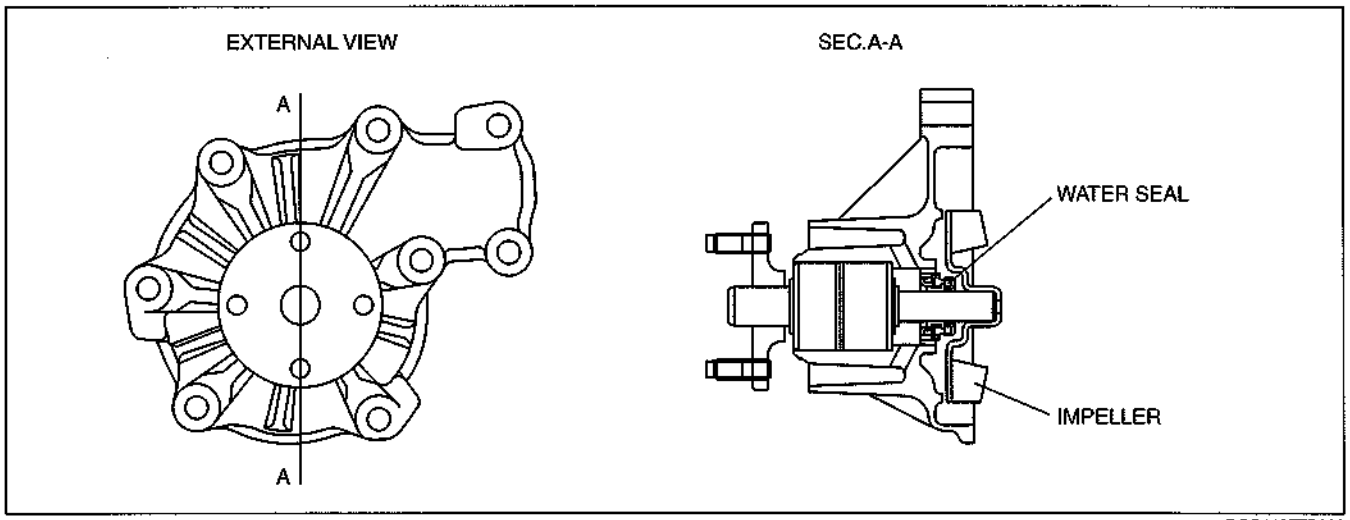
DCG112ZTB002

WATER PUMP CONSTRUCTION/OPERATION [WL-C, WE-C]

dcf011215010t02

Construction

- The aluminum alloy water pump with the impeller built into the cylinder block has been adopted for size reduction.
- A highly reliable integrated water seal has been adopted.
- The water pump is not serviceable and must be replaced as a single unit if it has a malfunction.



DCG112ZTB003

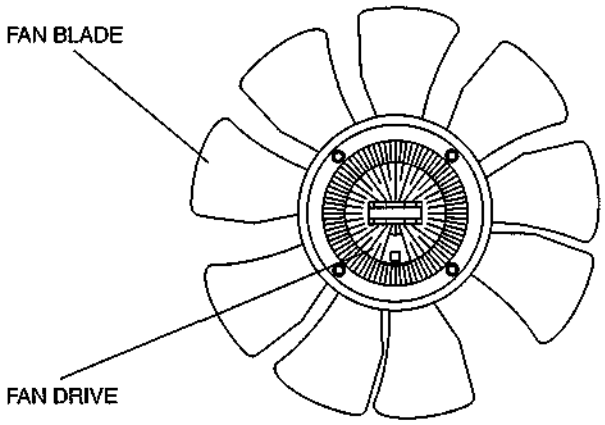
Operation

- The water pump is driven by the drive belt.

COOLING FAN CONSTRUCTION [WL-C, WE-C]

dcf011215140t02

- A thermo-modulation type cooling fan has been adopted which operates the cooling fan only when necessary. Due to this, the following effects have been obtained.
  - — Reduced noise
  - — Improved heating performance
  - — Rapid engine warming-up
- The cooling fan consists of the fan blades and fan drive.
- Noise (wind noise) which occurs during fan operation has been reduced due to the nonuniform positioning of the fan blades.
- The fan blades are made of plastic for weight reduction.
- The cooling fan is driven by the drive belt.



DCG112ZTB004

Cooling fan specification

Item	Specification
Type	Thermo-modulation type
Number of blades	9
Outer diameter (mm {in})	450 {17.7}

01-13B INTAKE-AIR SYSTEM [WL-C, WE-C]

INTAKE AIR SYSTEM OUTLINE [WL-C, WE-C] 01-13B–1
INTAKE AIR SYSTEM STRUCTURAL VIEW [WL-C, WE-C] 01-13B–2
INTAKE AIR SYSTEM HOSE ROUTING DIAGRAM [WL-C, WE-C] 01-13B–2
INTAKE AIR SYSTEM DIAGRAM [WL-C, WE-C] 01-13B–3
AIR CLEANER CONSTRUCTION [WL-C, WE-C] 01-13B–3
VARIABLE BOOST CONTROL (VBC) SOLENOID VALVE FUNCTION [WL-C, WE-C] 01-13B–3
VARIABLE BOOST CONTROL (VBC) SOLENOID VALVE CONSTRUCTION [WL-C, WE-C] 01-13B–3
AIR CHARGING SYSTEM OUTLINE [WL-C, WE-C] 01-13B–4
AIR CHARGING SYSTEM DIAGRAM [WL-C, WE-C] 01-13B–4
AIR CHARGING SYSTEM OPERATION [WL-C, WE-C] 01-13B–4
TURBOCHARGER FUNCTION [WL-C, WE-C] 01-13B–5
TURBOCHARGER CONSTRUCTION/ OPERATION [WL-C, WE-C] 01-13B–5
CHARGE AIR COOLER CONSTRUCTION [WL-C, WE-C] 01-13B–6
ACCELERATOR PEDAL COMPONENT CONSTRUCTION [WL-C, WE-C] 01-13B–6
GLOW SYSTEM OUTLINE [WL-C, WE-C] 01-13B–6
GLOW SYSTEM CONSTRUCTION [WL-C, WE-C] 01-13B–6
GLOW SYSTEM OPERATION [WL-C, WE-C] 01-13B–6
GLOW PLUG FUNCTION [WL-C, WE-C] 01-13B–6
GLOW PLUG CONSTRUCTION [WL-C, WE-C] 01-13B–7
GLOW PLUG RELAY OPERATION [WL-C, WE-C] 01-13B–7
VACUUM CHAMBER FUNCTION [WL-C, WE-C] 01-13B–7
VACUUM CHECK VALVE FUNCTION [WL-C, WE-C] 01-13B–7
VACUUM CHECK VALVE CONSTRUCTION [WL-C, WE-C] 01-13B–8

INTAKE AIR SYSTEM OUTLINE [WL-C, WE-C]

dcf011300000105

Features

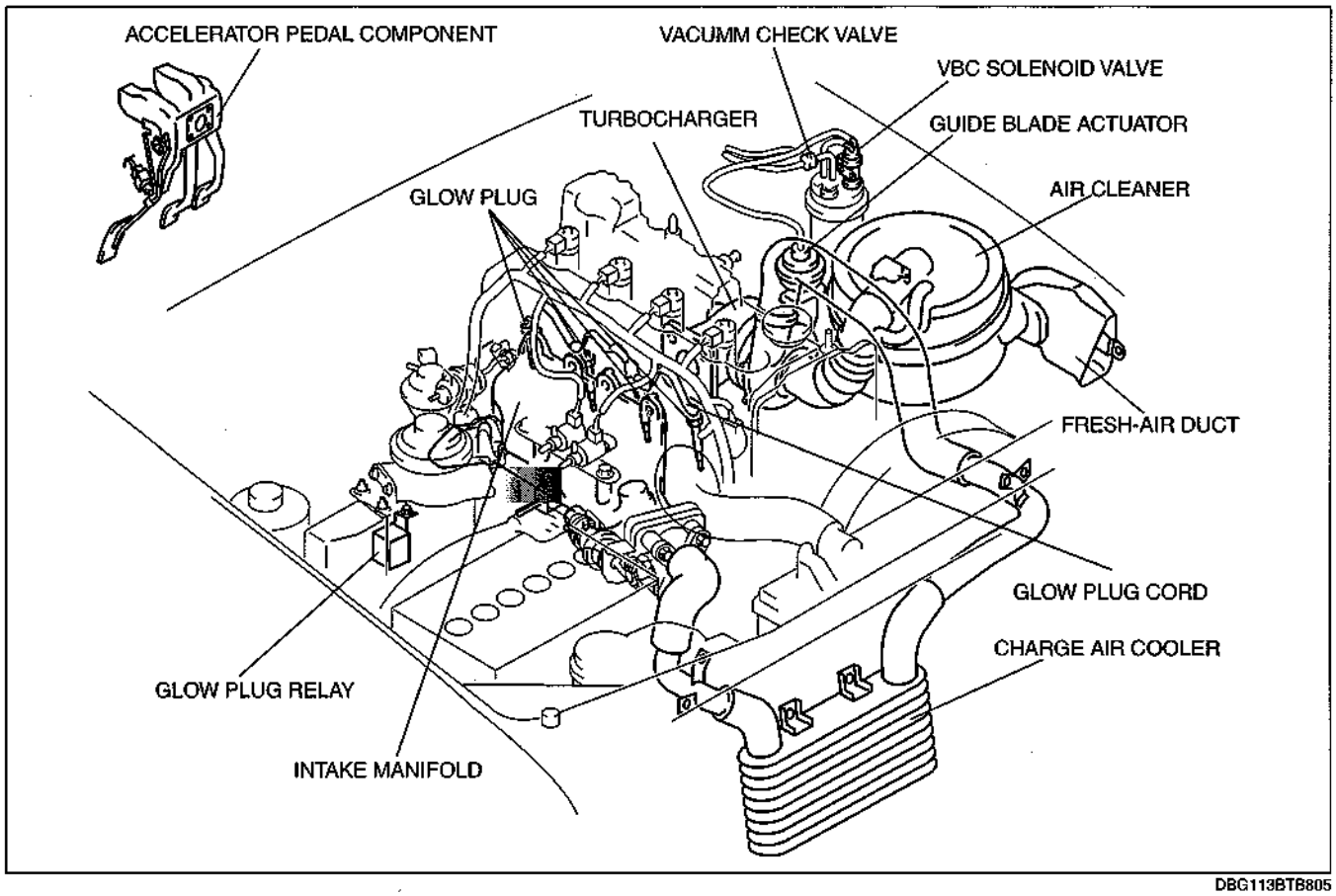
Power efficiency, performance, and fuel economy	• A variable geometry turbocharger has been adopted

Specification

Item	WL-C, WE-C
Turbocharger type	Variable geometry turbocharger
Air cleaner element	Dry type
Glow plug type	Stainless type

INTAKE AIR SYSTEM STRUCTURAL VIEW [WL-C, WE-C]

dcf011300000t06



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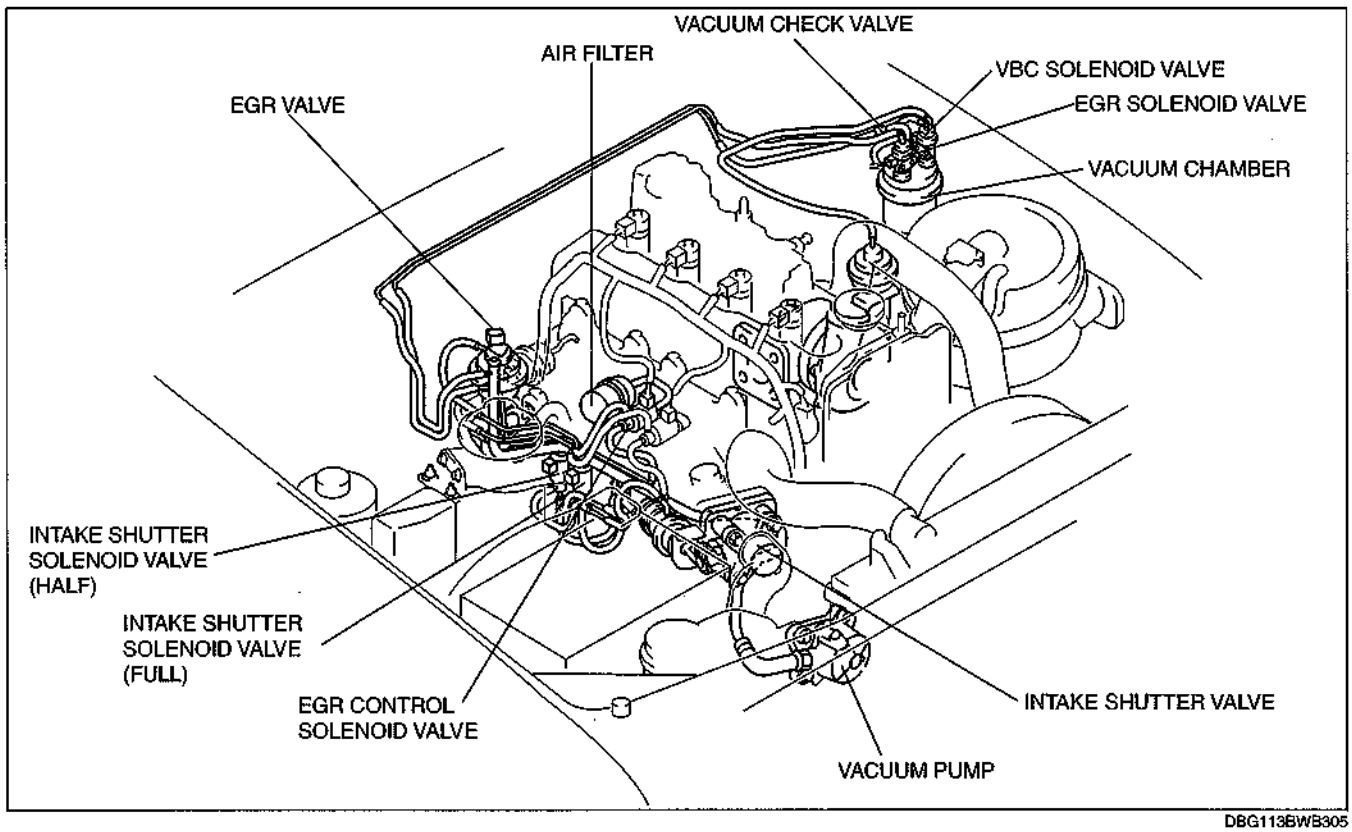
INTAKE AIR SYSTEM HOSE ROUTING DIAGRAM [WL-C, WE-C]

dcf011300000t07



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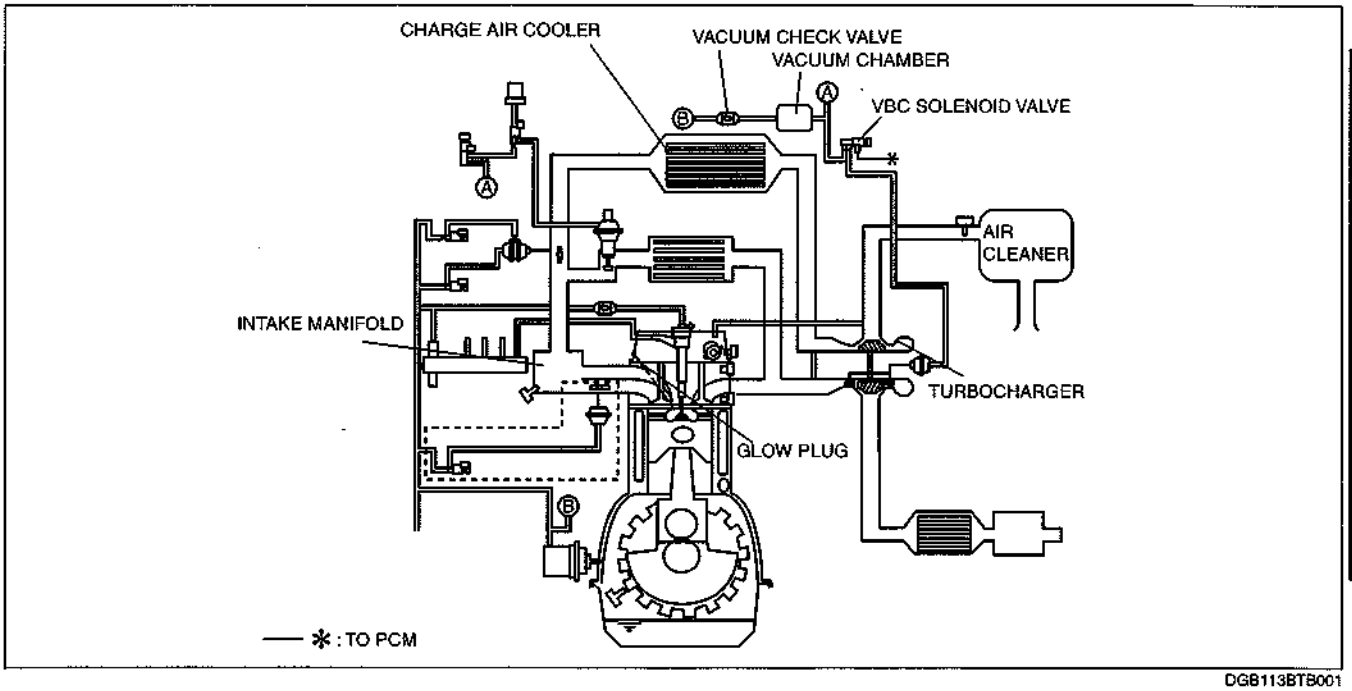
INTAKE AIR SYSTEM DIAGRAM [WL-C, WE-C]

dcf011300000108

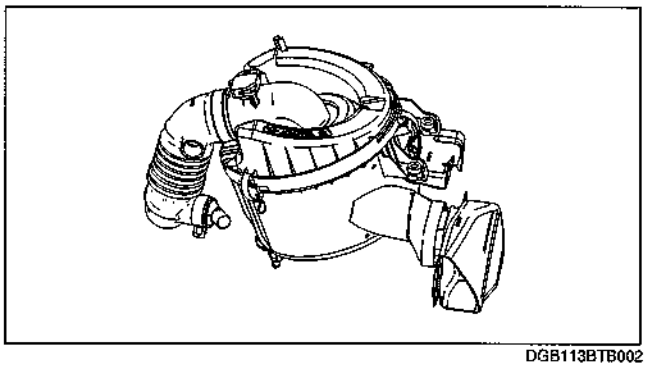


DGB113BTB001

AIR CLEANER CONSTRUCTION [WL-C, WE-C]

dcf011313300102

- Consists of the air cleaner case, air cleaner element, and fresh-air duct.
- A dry type air cleaner element has been adopted.



DGB113BTB002

VARIABLE BOOST CONTROL (VBC) SOLENOID VALVE FUNCTION [WL-C, WE-C]

dcf011318748101

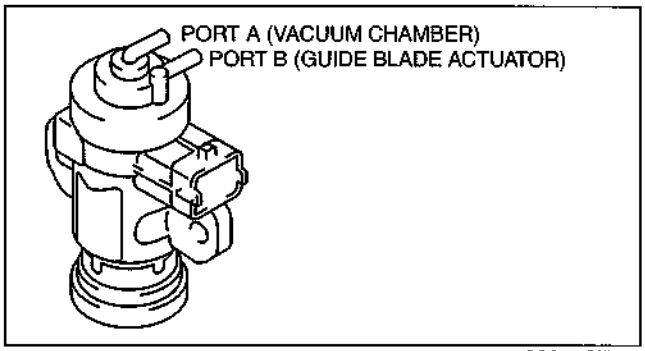
- Switches the vacuum passage between the vacuum chamber and the guide blade actuator.
- Vacuum is applied to the guide blade actuator using the VBC solenoid valve.
- As a result, the variable guide vanes of the turbocharger are adjusted based on the signals from the PCM.

VARIABLE BOOST CONTROL (VBC) SOLENOID VALVE CONSTRUCTION [WL-C, WE-C]

dcf011318748102

Construction

- Consists of the solenoid coil, spring, and plunger.



DBG113BTB311

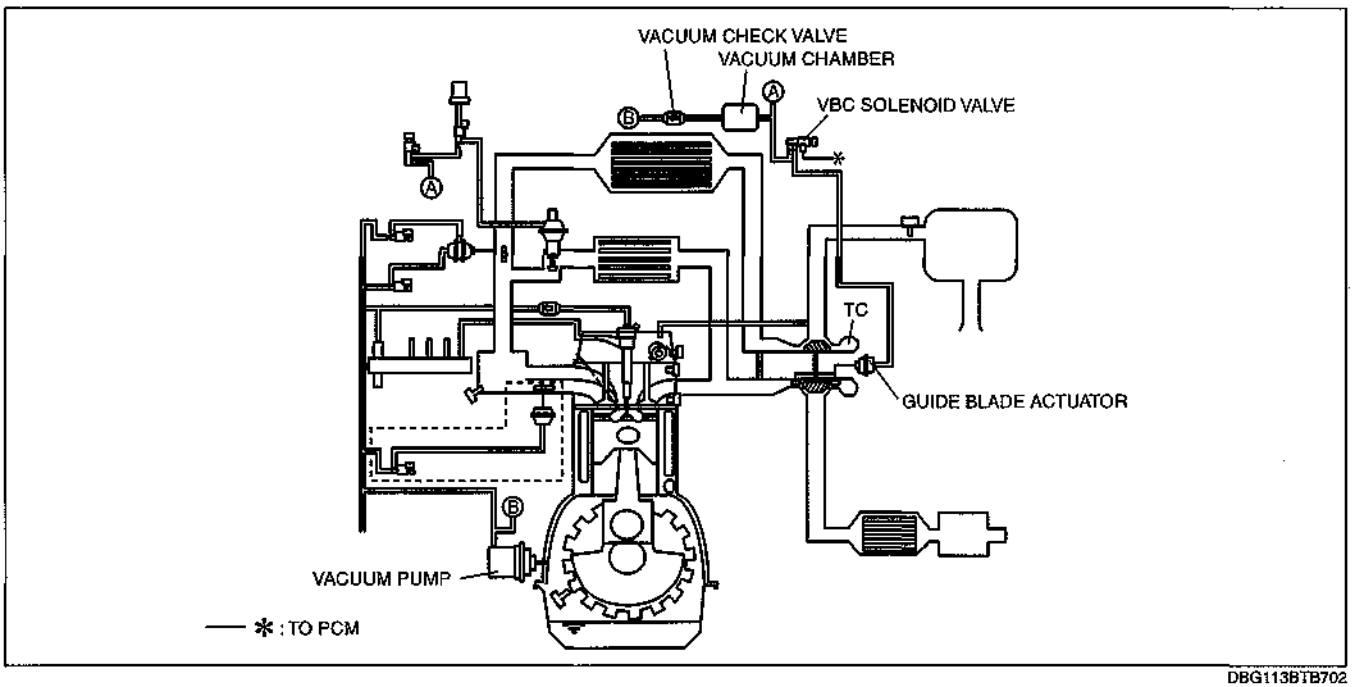
AIR CHARGING SYSTEM OUTLINE [WL-C, WE-C]

dcf011313700104

- A variable boost (variable geometry) type turbocharger has been adopted. By changing the opening angle of the guide blades and changing the exhaust pressure that acts on the turbine impellers, the optimum boost pressure according and fuel consumption have been improved in every driving range.

AIR CHARGING SYSTEM DIAGRAM [WL-C, WE-C]

dcf011313700105

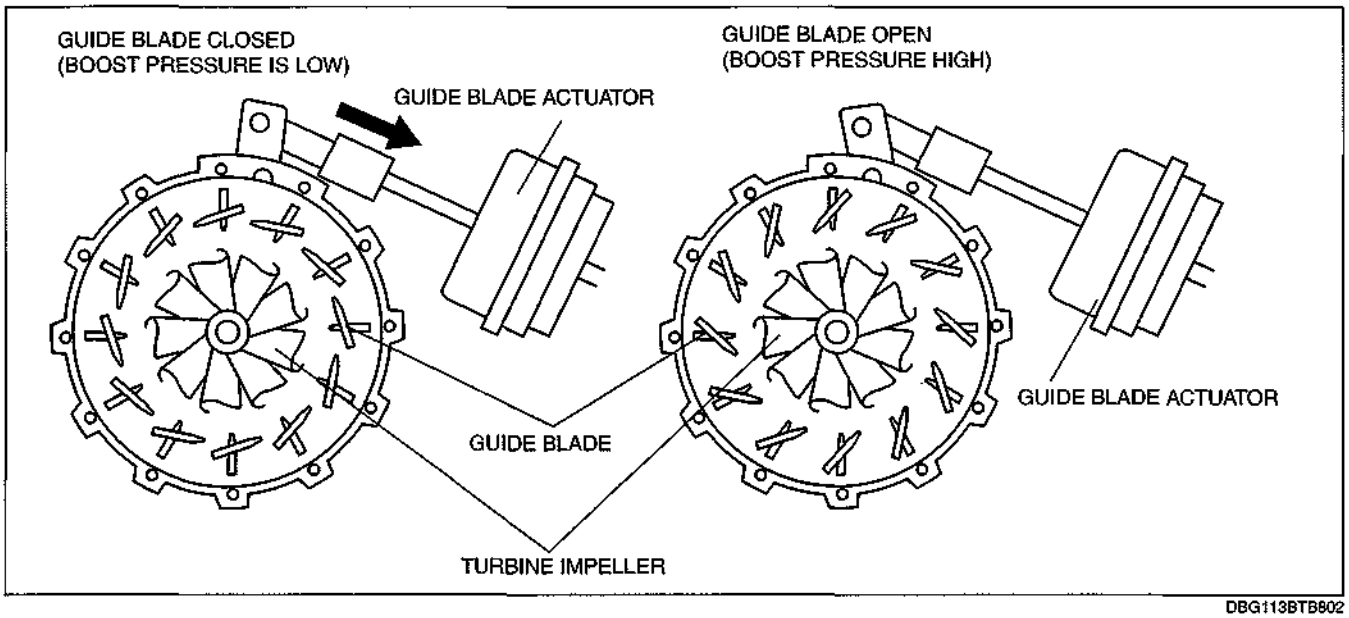


DBG113BTB702

AIR CHARGING SYSTEM OPERATION [WL-C, WE-C]

dcf011313700106

- When the VBC solenoid valve is operated according to the duty signal from the PCM, the vacuum passage is opened and vacuum is applied to the guide blade actuator of the turbocharger. Due to this, the rod of the guide blade actuator is pulled and the opening angle of the guide blades changes.
- When the duty signal is on for a long time, the vacuum that acts on the guide blade actuator is reduced and the guide blades move in the closing direction.
- When the duty signal is off for a long time, the vacuum that acts on the guide blade actuator is reduced and the guide blades move in the opening direction.
- When the guide blades are moved in the closing direction, the passages that lead the exhaust gas to the turbine impellers become narrow and the flow rate of the exhaust gas increases. Due to this, the exhaust gas pressure is increased and the boost pressure is also increased. On the other hand, when the guide blades are moved in the opening direction, the passages that lead the exhaust gas to the turbine impellers become wide. Due to this, the exhaust gas pressure is reduced and the boost pressure is also reduced.



DBG113BTB802

TURBOCHARGER FUNCTION [WL-C, WE-C]

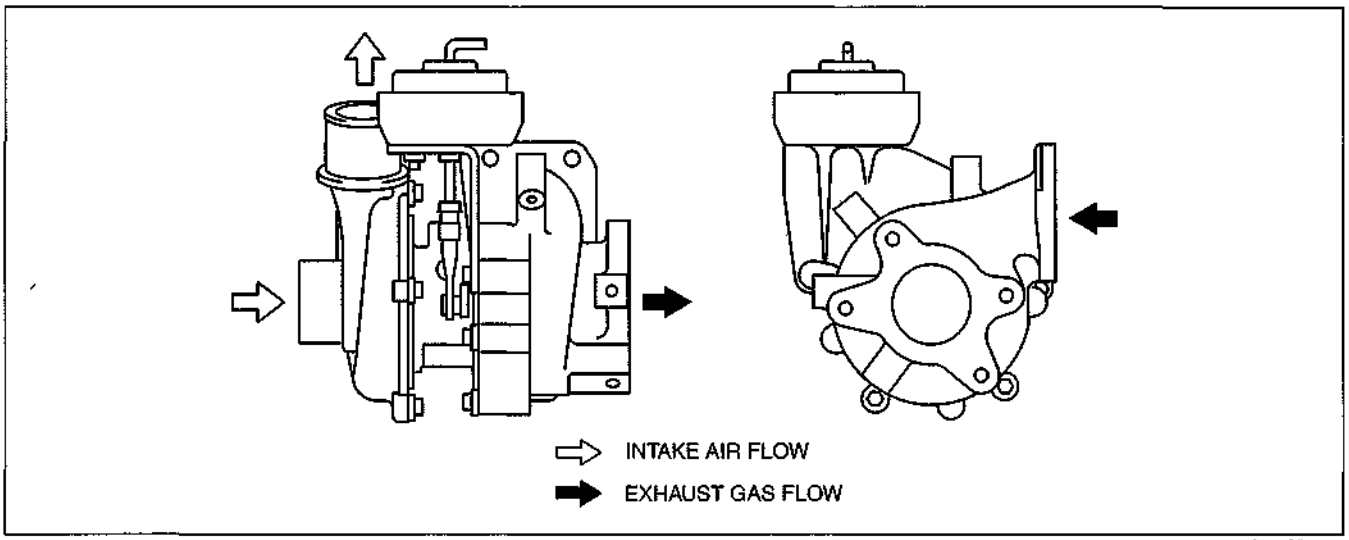
dcf011313700107

- The turbocharger uses the exhaust gas pressure to compress the intake air.

TURBOCHARGER CONSTRUCTION/OPERATION [WL-C, WE-C]

dcf011313700108

- A variable geometry turbocharger has been adopted.
- The turbocharger consists of mainly a turbine wheel, a compressor wheel, guide blades, and a guide blade actuator.
- When the exhaust gas flows to the turbine wheel, the turbine wheel and the compressor wheel that is on the same axis as the turbine wheel rotate to compress the intake air.
- The opening angle of the guide blades changes according to the movement of the guide blade actuator rod.

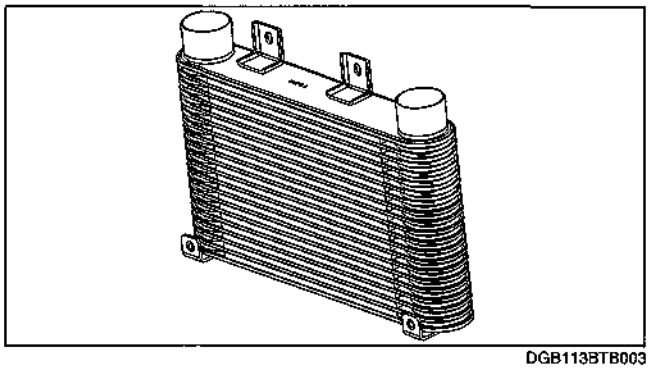


DBG113BTB396

CHARGE AIR COOLER CONSTRUCTION [WL-C, WE-C]

dcf011313560t02

- An aluminium-alloy intercooler has been adopted.
- Compressed and heated intake air is cooled by the intake air charger to increase air density, enhancing the charging efficiency.

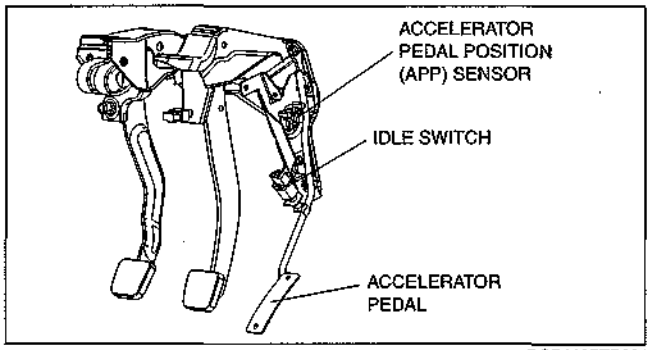


DGB113BTB003

ACCELERATOR PEDAL COMPONENT CONSTRUCTION [WL-C, WE-C]

dcf011341600t02

- Consists of the accelerator pedal and accelerator pedal position (APP) sensor.



DGB113BTB004

GLOW SYSTEM OUTLINE [WL-C, WE-C]

dcf011318601t07

- The glow system warms up the combustion chamber at engine start to improve ignitability.

GLOW SYSTEM CONSTRUCTION [WL-C, WE-C]

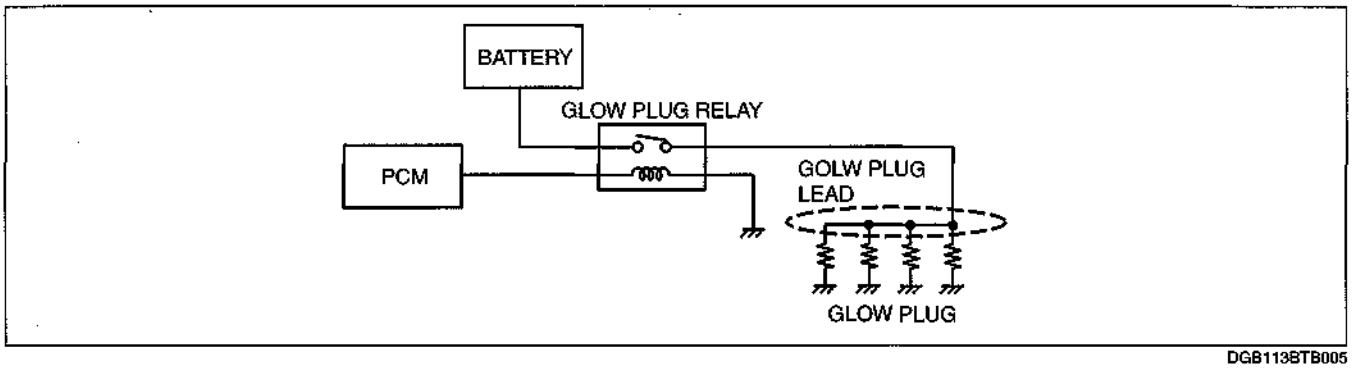
dcf011318601t08

- The glow system consists of the glow plug relay, glow plug lead, and glow plug.

GLOW SYSTEM OPERATION [WL-C, WE-C]

dcf011318601t09

- When the PCM energizes the glow plug relay, the glow plug activates, the circuit from the battery to the glow plug is established, and power is supplied to the glow plug via the glow plug lead. Due to this, the glow plug is heated and the combustion chamber is warmed up.



DGB113BTB005

GLOW PLUG FUNCTION [WL-C, WE-C]

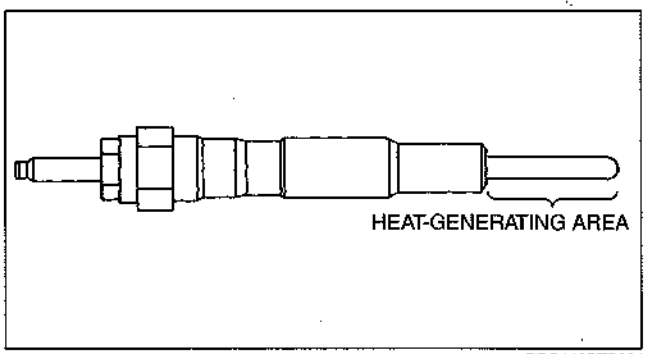
dcf011318601t10

- The glow plug warms up the air inside the combustion chamber by generating heat.

GLOW PLUG CONSTRUCTION [WL-C, WE-C]

dcf011318601t11

- Installed to the cylinder head.
- A stainless type glow plug has been adopted.

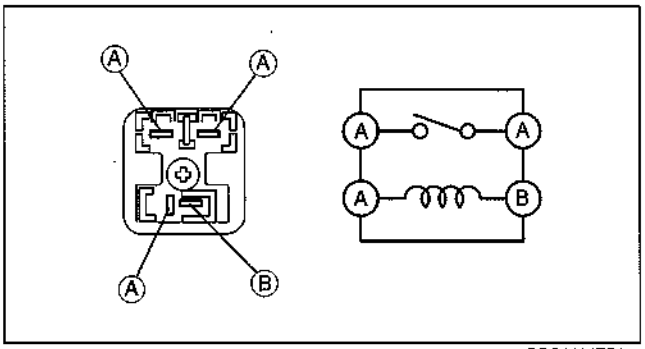


DBG113BTB804

GLOW PLUG RELAY OPERATION [WL-C, WE-C]

dcf011318601t12

- The glow plug relay activates according to the glow control signal from the PCM, and supplies/cuts the power to the glow plug.

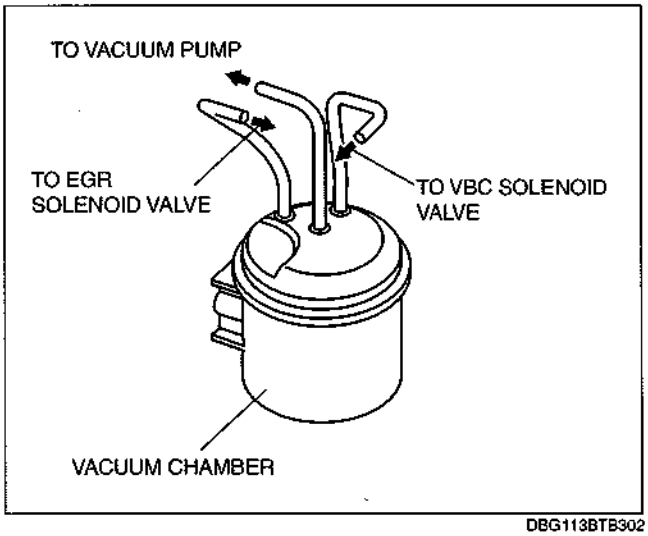


DBG113ATB105

VACUUM CHAMBER FUNCTION [WL-C, WE-C]

dcf011320330t01

- The vacuum chamber improves vacuum efficiency by reducing the pulsation generated when the air is drawn.



DBG113BTB302

VACUUM CHECK VALVE FUNCTION [WL-C, WE-C]

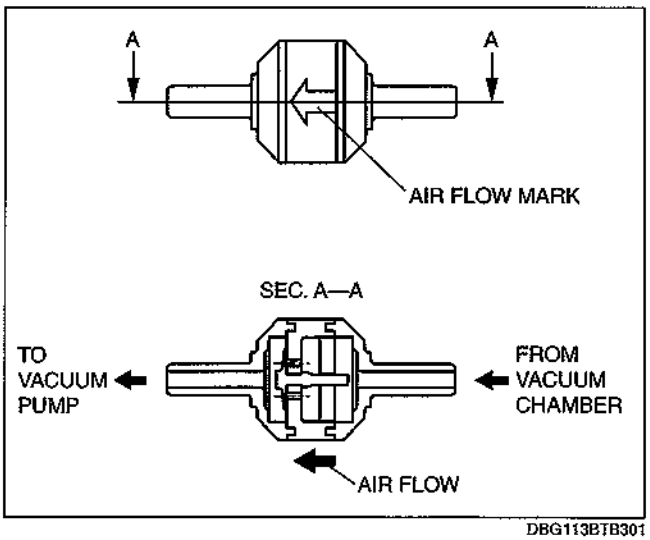
dcf011342910t01

- The one-way check valve prevents vacuum pressure inside the vacuum pump from flowing back to the vacuum chamber.

VACUUM CHECK VALVE CONSTRUCTION [WL-C, WE-C]

dcf01134291 0t02

- Mainly consists of the valve.



DBG113BTB301

01-14B FUEL SYSTEM [WL-C, WE-C]

FUEL SYSTEM OUTLINE [WL-C, WE-C] 01-14B–1
FUEL SYSTEM STRUCTURAL VIEW [WL-C, WE-C] 01-14B–2
FUEL SYSTEM DIAGRAM [WL-C, WE-C] 01-14B–3
COMMON RAIL INJECTION SYSTEM FUNCTION [WL-C, WE-C] 01-14B–4
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FUEL INJECTOR OPERATION [WL-C, WE-C] 01-14B–12
CHECK VALVE FUNCTION [WL-C, WE-C] 01-14B–13

FUEL SYSTEM OUTLINE [WL-C, WE-C]

dcf011400000t04

Features

Improved exhaust gas purification	Common rail injection system adopted

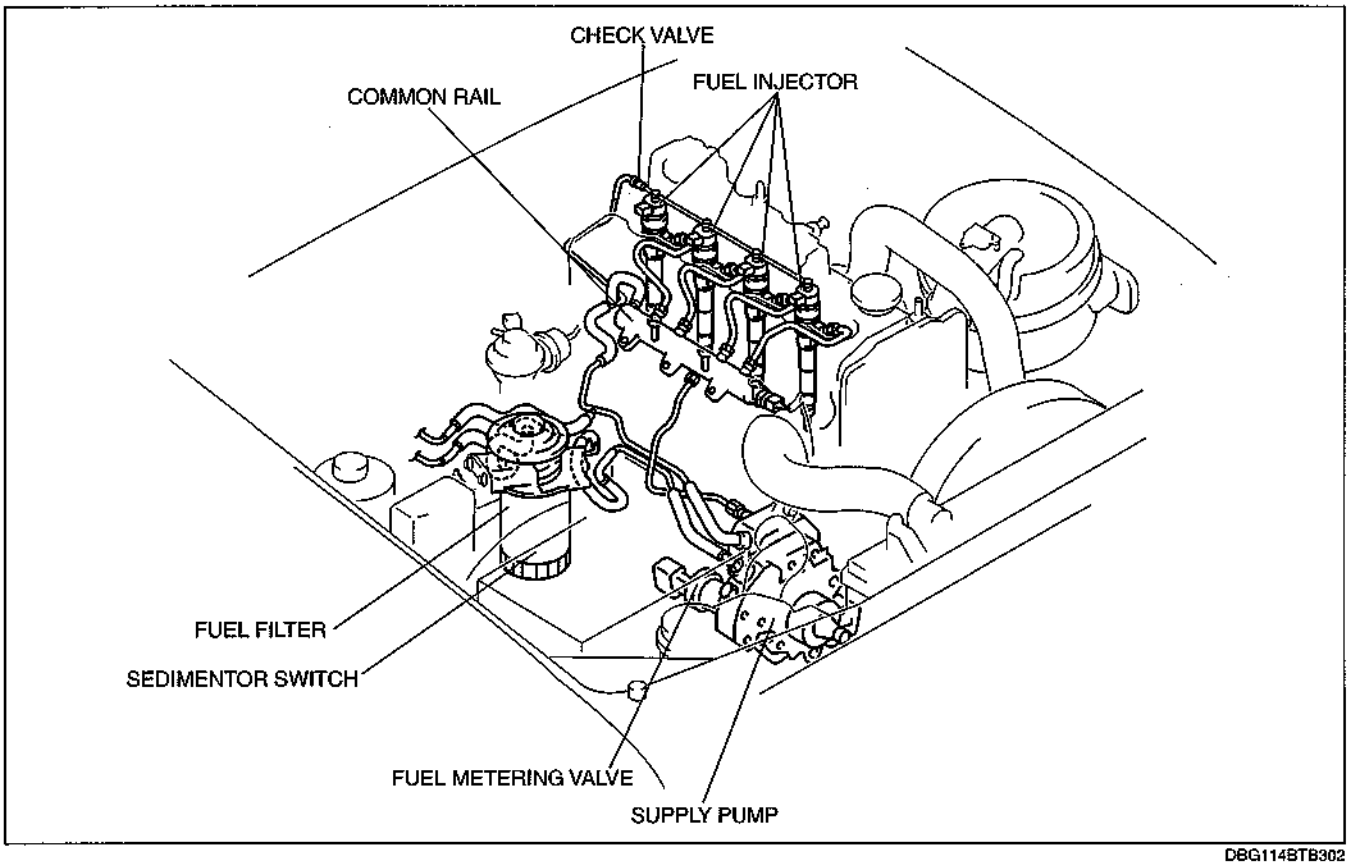
Specification

Item		WL-C, WE-C
Supply pump		Electronic control
Fuel injector		Electromagnetic control
Fuel tank capacity (reference)	(L {US gal, Imp gal})	70 {18, 15}

FUEL SYSTEM STRUCTURAL VIEW [WL-C, WE-C]

dcf011400000t05

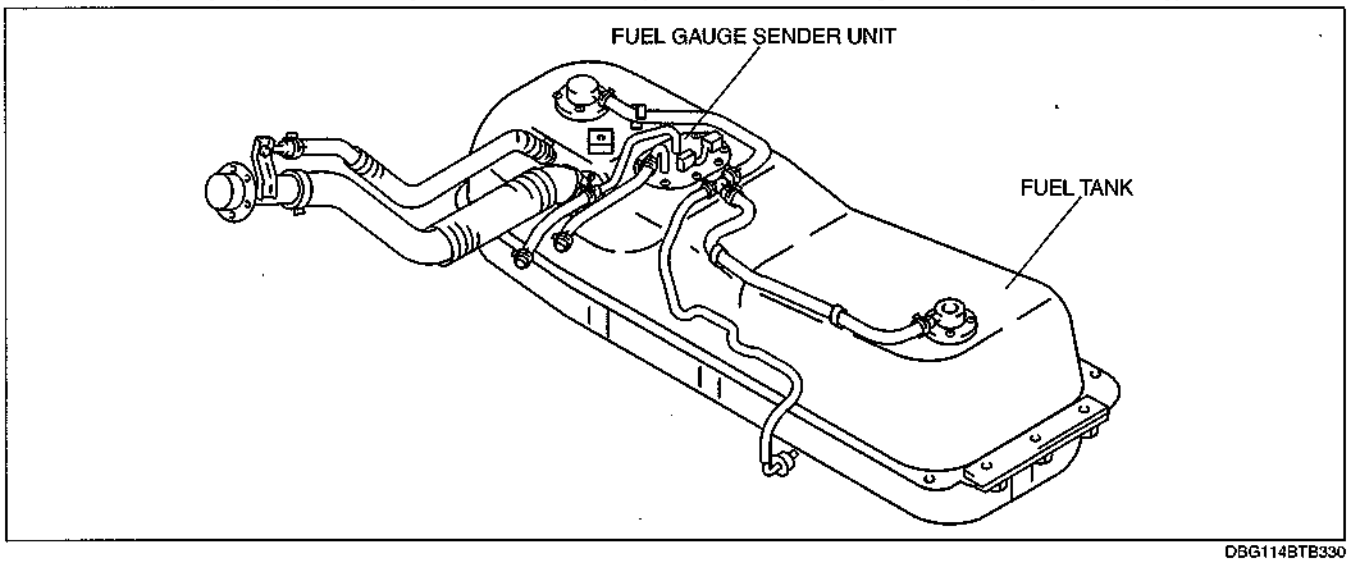
Engine Room Side



DBG114BTB302

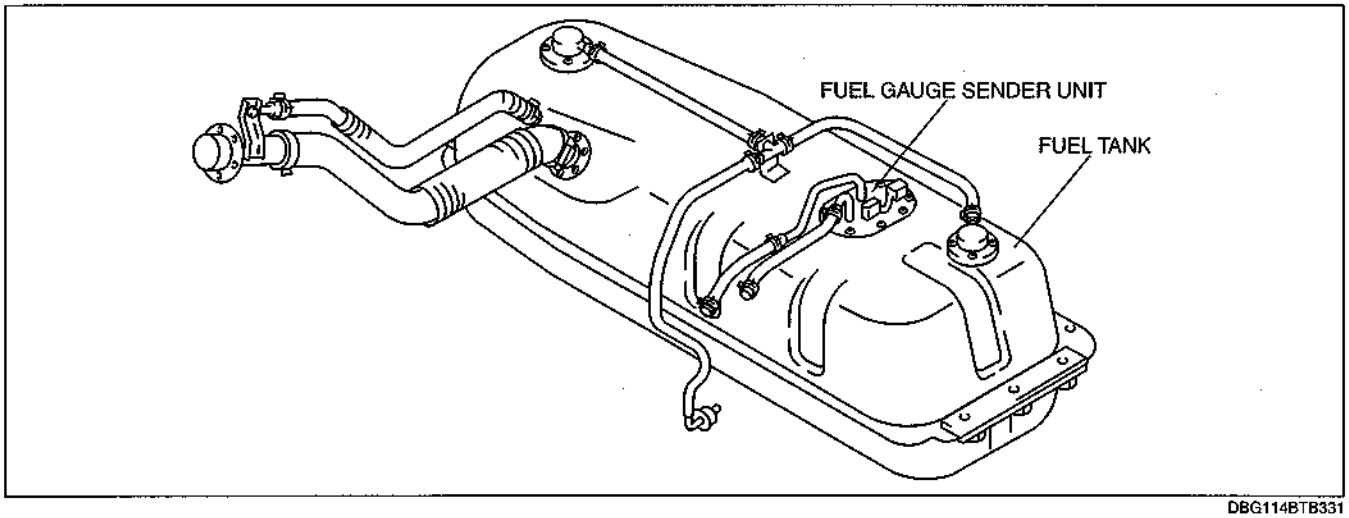
Fuel Tank Side

Double cab 4x2 (except Hi-Rider), Stretch cab 4x2 (with rear access system (except Hi-Rider))



DBG114BTB330

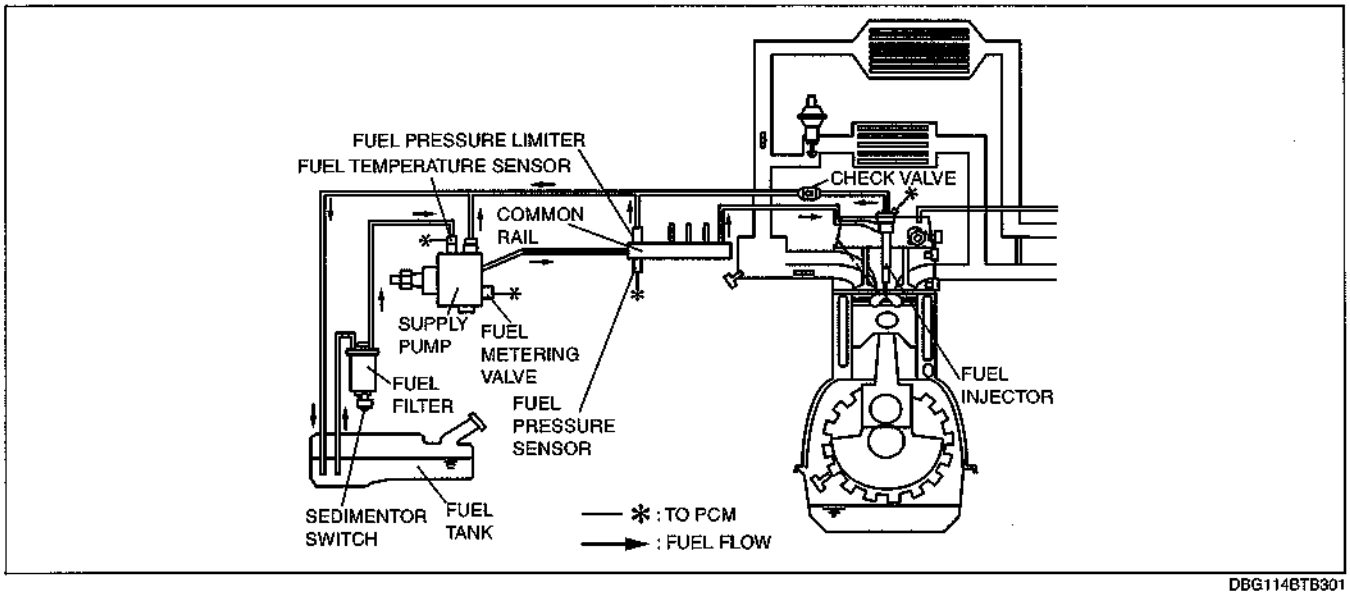
Regular cab 4x4, stretch cab 4x4 (with rear access system), Hi-Rider



DBG114BTB331

FUEL SYSTEM DIAGRAM [WL-C, WE-C]

dcf011400000106

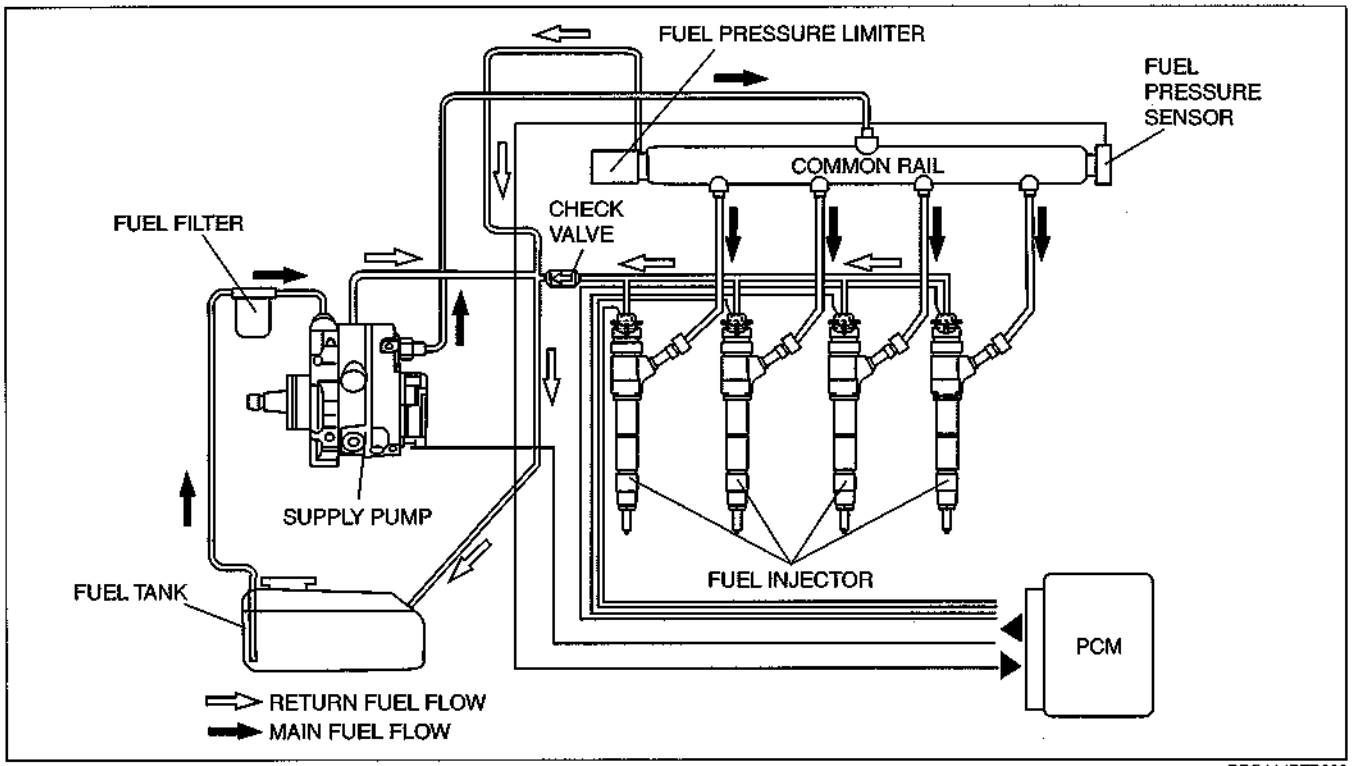


DBG114BTB301

COMMON RAIL INJECTION SYSTEM FUNCTION [WL-C, WE-C]

dcf011400000l07

This system stores fuel under high pressure supplied by the supply pump in the common rail, and injects it through the electromagnetic injectors.
The PCM controls both fuel injection amount and timing by sending a signal to the injector solenoid valve coil.
Since fuel is highly pressurized by the supply pump and stored in the common rail, injection pressure is constantly assured even at low speed since engine speed and load have no influence on the injection process.
The PCM can precisely control the fuel injection amount and timing due to use of an solenoid valve coil in the injector that opens and closes the fuel path.
Fuel is injected multiple times, including multiple auxiliary injections previous to the main injection. These multiple injections help to smooth the fuel combustion process, reducing noise and vibration levels as well as the amount of NOx in the exhaust.
With the use of 160 MPa {1.632 kgf/cm^2, 23,206 psi} ultra-high pressure injectors, engine output is improved and the amount of smoke and particulate matter in the exhaust is greatly reduced.



DBG114BTB908

FUEL TANK CONSTRUCTION [WL-C, WE-C]

dcf011442110t02

Capacity is 70 L {18 US gal, 15 Imp gal}.
Two rollover valves are built-in.

FUEL FILTER FUNCTION [WL-C, WE-C]

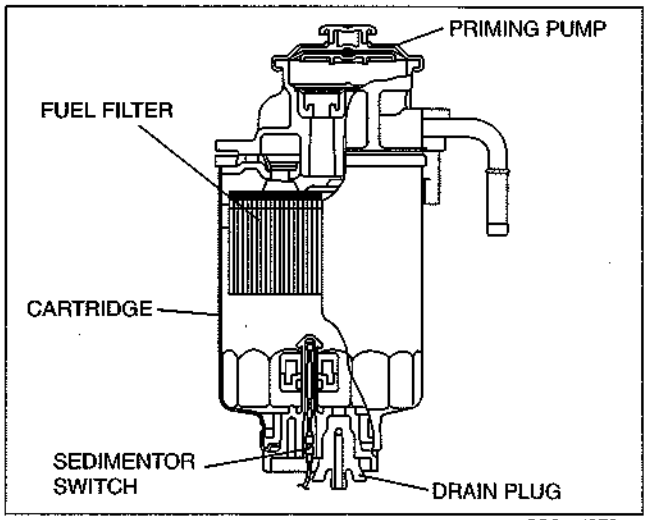
dcf011420490l03

The filter part removes foreign material or dirt in the fuel.
The priming pump is a pump to discharge (drain) the accumulated water efficiently.

FUEL FILTER CONSTRUCTION/OPERATION [WL-C, WE-C]

dcf011420490t04

- The fuel filter consists of the drain plug and the priming pump.
- To drain water, loosen the drain plug on the lower side and pump the priming pump on the upper side of the fuel filter.
- The sedimentor switch illuminates the sedimentor warning light to inform the user of the drain timing. The float rises according to the level of accumulated water. If the water level exceeds the specification, the circuit for the sedimentor switch is completed.



DBG114BTB307

SUPPLY PUMP FUNCTION [WL-C, WE-C]

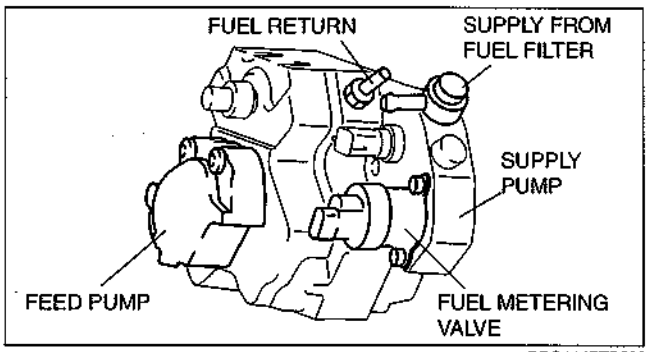
dcf011413350t01

- An electrically controlled supply pump with ultra-high discharge pressure and low-drive torque has been adopted.
- The supply pump intakes the proper fuel amount and pressure feeds the fuel to the common rail.

SUPPLY PUMP CONSTRUCTION/OPERATION [WL-C, WE-C]

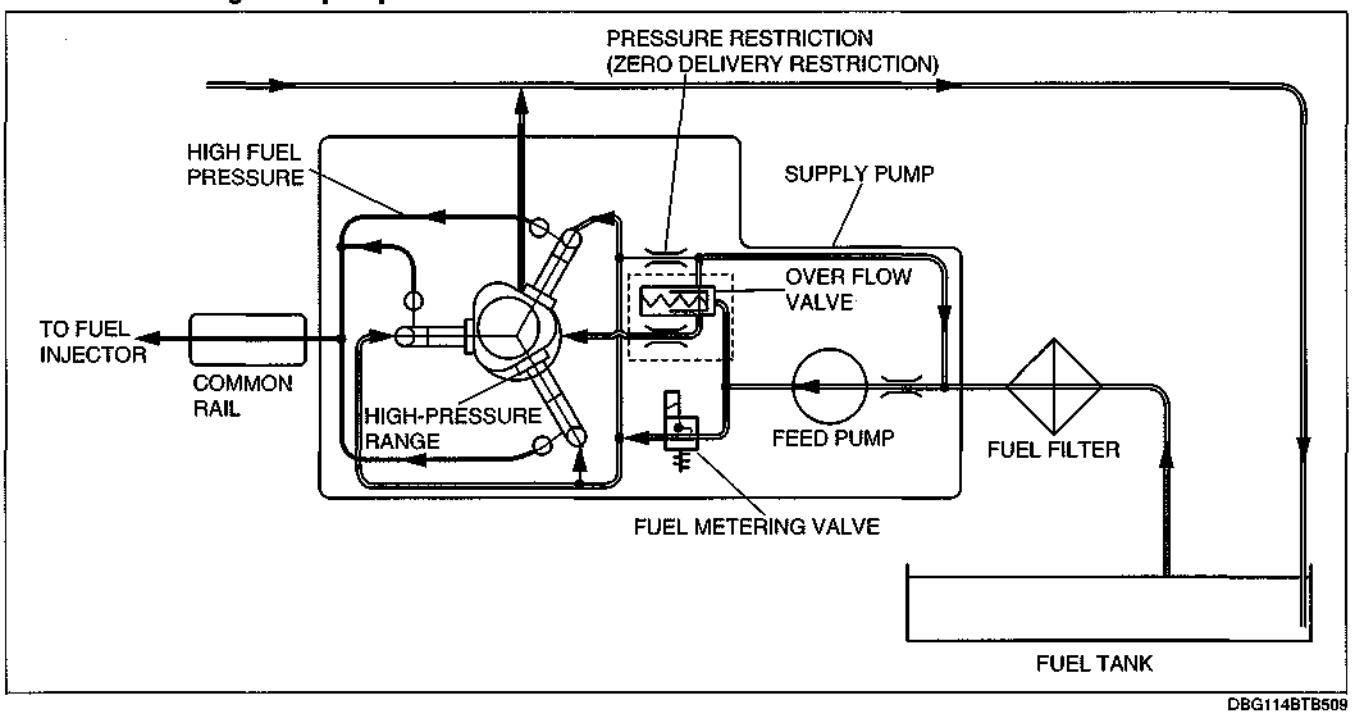
dcf011413350t02

- The supply pump is driven by the timing belt. The feed pump is driven by the supply pump drive shaft.
- The supply pump has three pumping elements with 120° offset (displacement pumps).
- The fuel metering valve is located in the supply duct between the feed pump and the supply pump, and meters the quantity of fuel which is to be delivered into the high-pressure chamber in accordance with the current operating status of the engine.
- Any surplus fuel is returned to the fuel tank via the fuel return.



DBG114BTB502

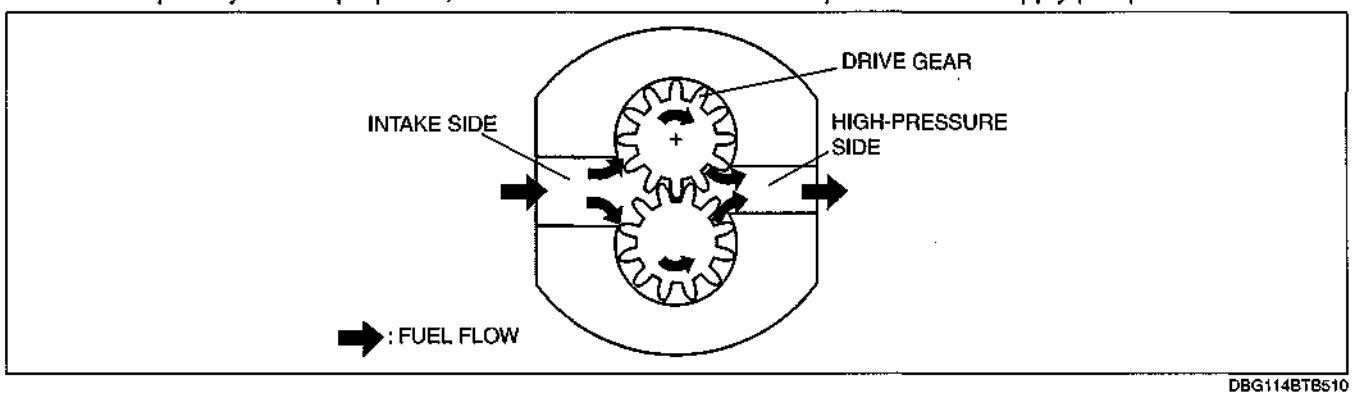
Flow of fuel through fuel pump



DBG114BTB509

Feed Pump Operation

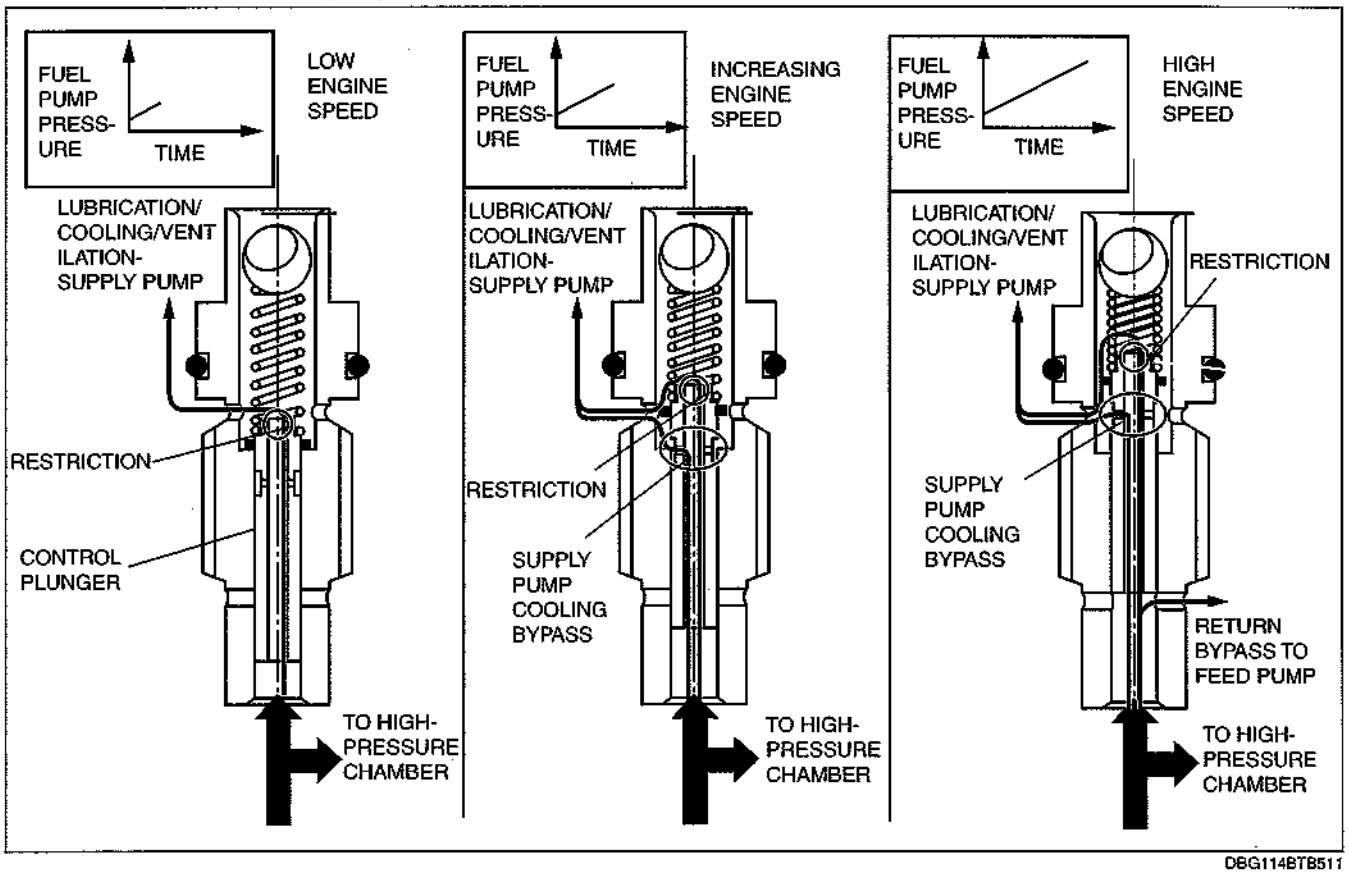
- The feed pump is designed as a gear pump and delivers the required fuel to the supply pump.
  Essential components are two counter-rotating, meshed gear wheels that transport the fuel in the tooth gaps from the intake side to the pressure side.
  The contact line of the gears forms a seal between the intake side and the pressure side and prevents the fuel from flowing back.
  The delivery quantity is approximately proportional to engine speed. For this reason, fuel-quantity control is required.
  For fuel-quantity control purposes, there is an overflow valve incorporated in the supply pump.



DBG114BTB510

Overflow Valve Operation

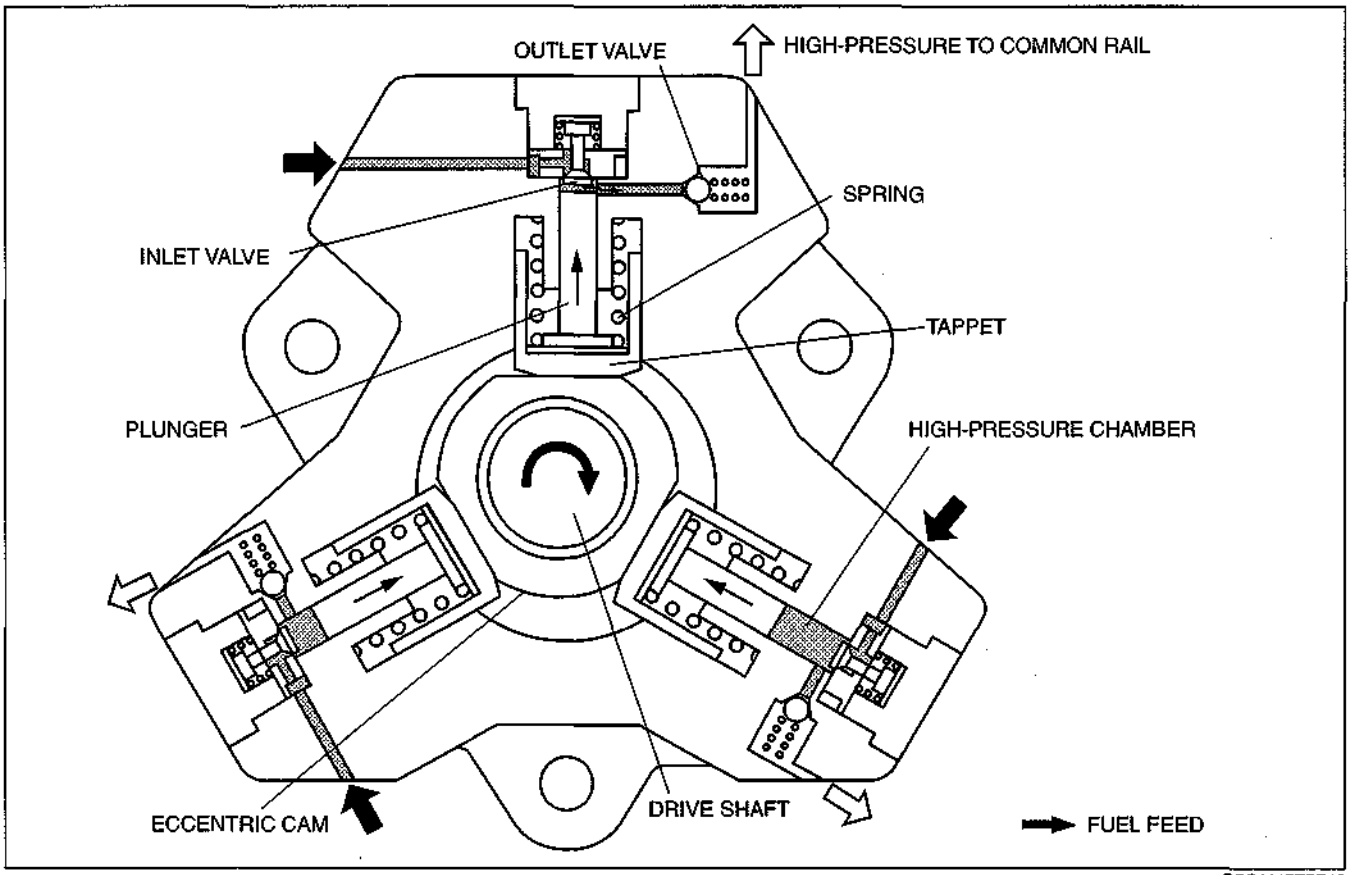
- High-pressure generation (up to 160 MPa {1,632 kgf/cm^2, 23,206 psi}) means high thermal load on the individual components of the supply pump. The mechanical components of the supply pump must also be lubricated sufficiently to ensure durability.
  The overflow valve is designed to ensure optimum lubrication or cooling for all operating conditions.
  At lower engine speeds (low feed pump pressure) the control plunger is moved only slightly out of its seat. The lubrication/cooling requirement is correspondingly low.
  A small amount of fuel is released to lubricate/cool the pump via the restriction at the end of the control plunger
  The supply pump features automatic venting. Any air in the supply pump is vented through the restriction.
  With increasing engine speed (increasing feed pump pressure), the control plunger is moved further against the compression spring.
  Increasing engine speeds require increased cooling of the supply pump. Above a certain pressure, the supply pump cooling bypass is opened and the flow rate through the supply pump is increased.
  At high engine speeds (high feed pump pressure), the control plunger is moved further against the compression spring. The supply pump cooling bypass is now fully open (maximum cooling).
  Excess fuel is transferred via the return bypass to the intake side of the feed pump.
  In this way, the internal pump pressure is limited to a maximum of 600 kPa {6.12 kgf/cm^2, 87.0 psi}.



DBG114BTB511

High Pressure Generation

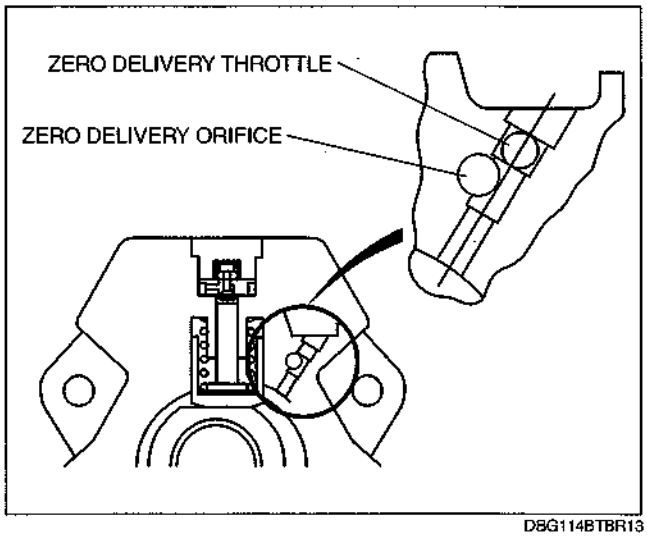
- The supply pump is driven via the drive shaft.
  An eccentric element is fixed to the drive shaft and moves the three plungers up and down according to the cam lobes of the eccentric element.
  Fuel pressure from the feed pump is applied to the inlet valve. If the feed pump pressure exceeds the internal pressure of the high-pressure chamber (pump plunger in TDC position), the inlet valve opens.
  Fuel is now pressed into the high-pressure chamber, which moves the pump plunger downwards (intake stroke).
  If BDC of the pump plunger is exceeded, the inlet valve closes due to the increasing pressure in the high-pressure chamber. The fuel in the high-pressure chamber can no longer escape.
  As soon as the pressure in the high-pressure chamber exceeds the pressure in the common rail, the outlet valve opens and the fuel is pressed into the common rail via the high-pressure connection (delivery stroke).
  The pump plunger delivers fuel until TDC is reached. After this, the pressure drops so that the outlet valve closes.
  As the pressure on the remaining fuel is reduced, the pump plunger moves downward.
  If the pressure in the high-pressure chamber falls below the transfer pressure, the inlet valve reopens and the process starts again.



DBG114BTBR12

Zero Delivery Restriction Operation

- The zero-delivery throttle is installed to the supply pump. The fuel metering unit sends a quantity of fuel to the plunger even during zero-delivery. To prevent this, the fuel is returned to the feed pump inlet via the orifice of the zero-delivery throttle, ensuring zero fuel delivery to the plunger. Except during zero-delivery, essentially no fuel is sent to the orifice due to the throttle effect, instead it is sent to the plunger.

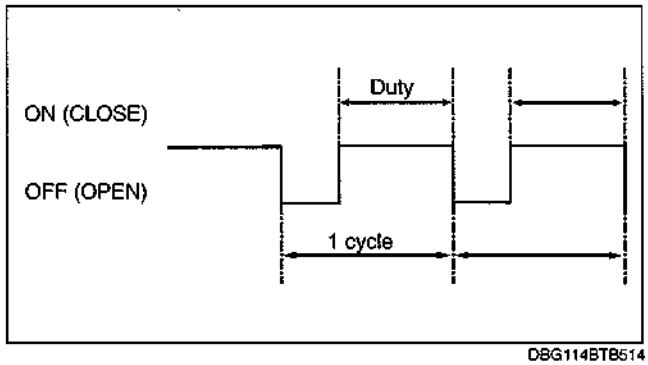


DBG114BTBR13

FUEL METERING VALVE FUNCTION [WL-C, WE-C]

dcf01141335003

- By controlling the supply pump intake amount, the fuel metering valve controls the pressure pump feed amount and the pressure inside the fuel injection pipe.
- The intake amount is determined by the total opening size of the valve as controlled by the duty value of the solenoid actuation current.
- The duty solenoid can adjust the open and close time ratio to control the intake amount by changing the OFF time during a single cycle. For a normally open type fuel metering valve, making the duty ratio larger increases the intake amount and, conversely, making the duty value smaller decreases the intake amount.



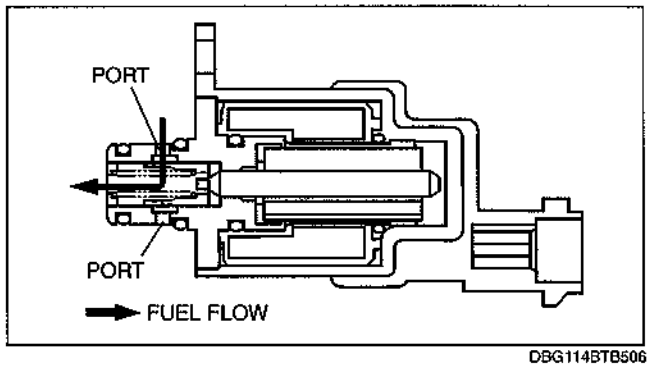
DBG114BTB514

FUEL METERING VALVE CONSTRUCTION/OPERATION [WL-C, WE-C]

dcf01141335004

De-energized (open)

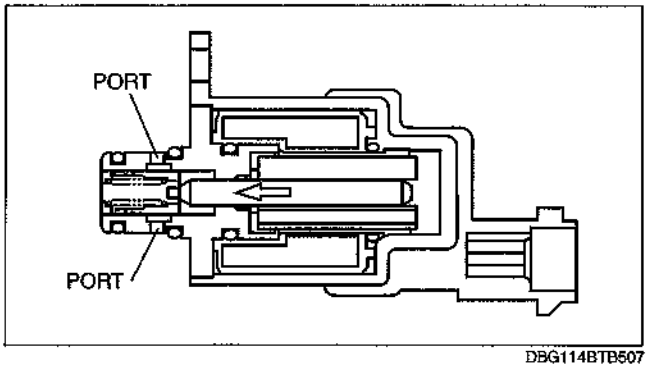
- The solenoid inner port is opened and fuel is sent into the high-pressure chamber.



DBG114BTB506

Energized (closed)

- The solenoid inner port is closed. Fuel siphoned by the feed pump is returned to the fuel tank through the overflow valve.



DBG114BTB507

COMMON RAIL FUNCTION [WL-C, WE-C]

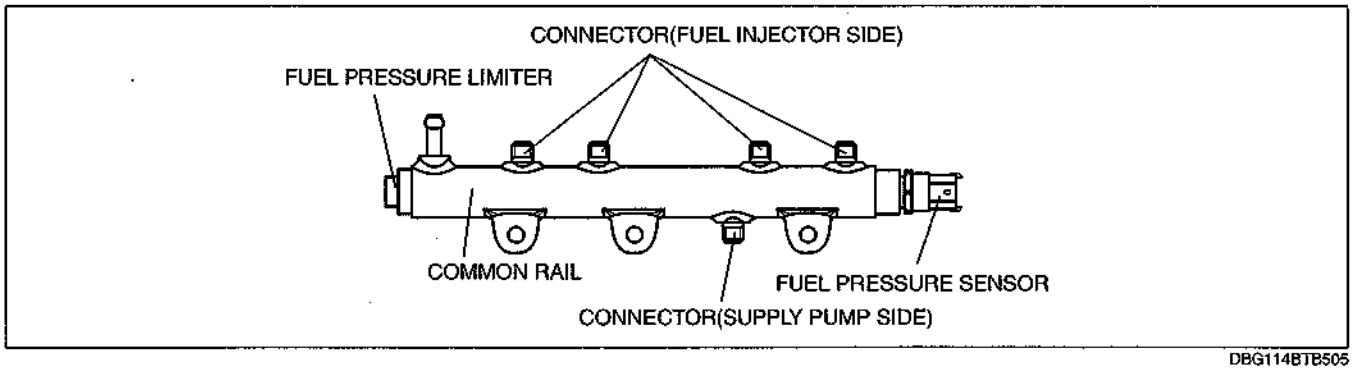
dcf011413151t01

- Due to constant high-pressure fuel (25—160 MPa {255—1.631 kgf/cm^2, 3,626—23,206 psi}) in the rail, electrically controlled injection is made possible.

COMMON RAIL CONSTRUCTION [WL-C, WE-C]

dcf011413151t02

- The PCM constantly maintains optimum pressure by monitoring the fuel pressure measurement signal from the fuel pressure sensor.
- As a consideration to safety, a fuel pressure limiter has been installed to mechanically drain fuel if the pressure goes above 195 MPa {1.988 kgf/cm^2, 28,282 psi}.



DBG114BTB505

FUEL INJECTOR FUNCTION [WL-C, WE-C]

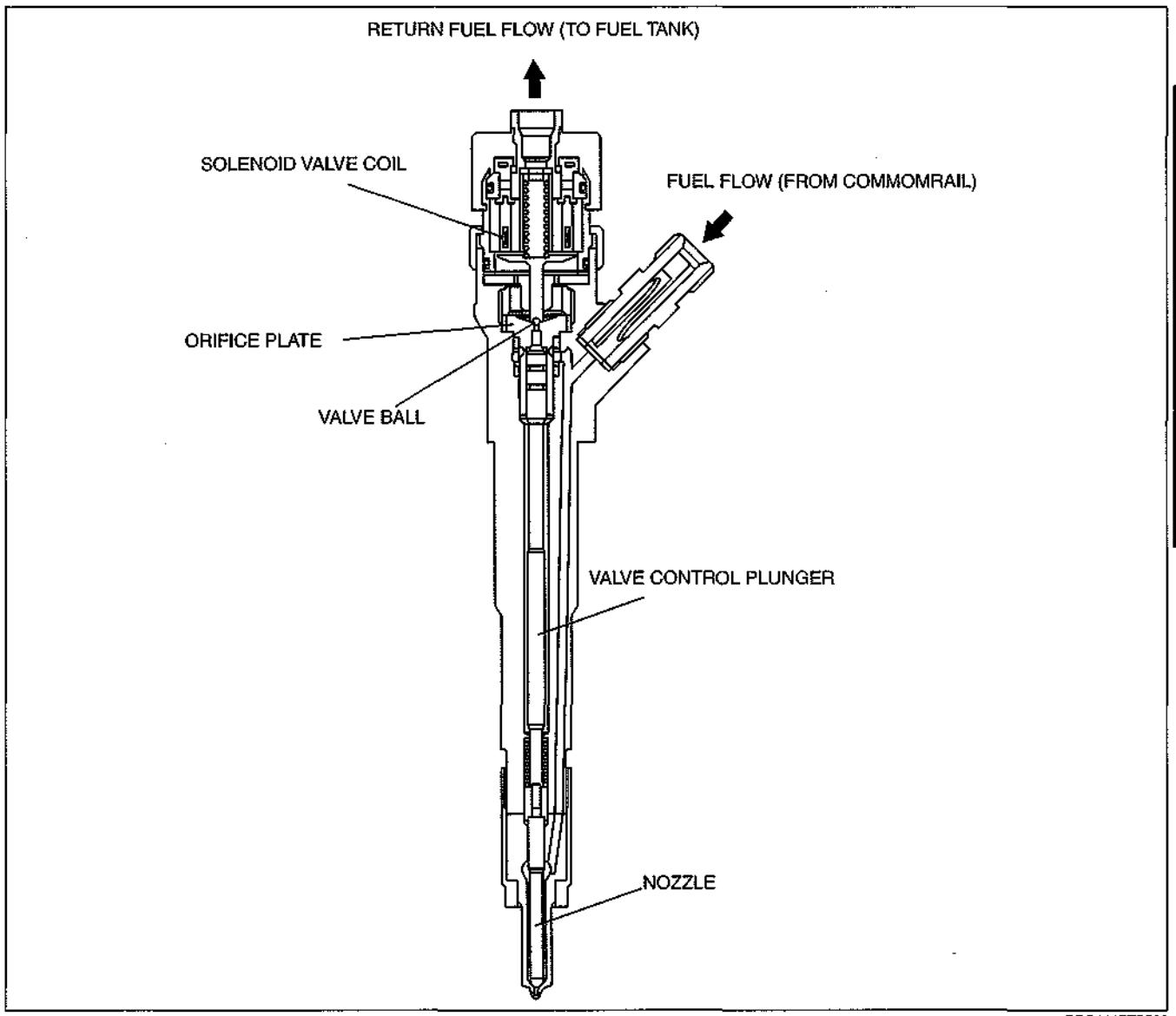
dcf011413250t01

- A small sized, energy saving, electromagnetically controlled injector has been adopted.
- A multiple fuel injection system has been adopted. The fuel injection amount and timing, as well as the division of the numerous injections are according to a PCM ON/OFF signal that controls the opening and closing of the electromagnetic valves.
- The construction and material of the electromagnetic valve has been modified to save energy and improve response.

FUEL INJECTOR CONSTRUCTION [WL-C, WE-C]

dcf011413250t02

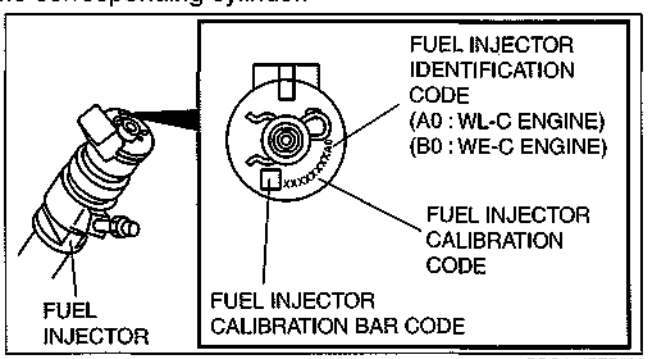
- The fuel injector is composed of: a valve control plunger that controls the nozzle, a control chamber with an inflow/outflow orifice, and an solenoid valve coil that controls the inflow/outflow of fuel to the control chamber via an on/off function.
- The valve control plunger is connected to the nozzle so that the up and down movement of the plunger results in the opening and closing of the nozzle.
- The control chamber contains a single orifice plate to provide an inflow and outflow path.



DBG114BTB500

Fuel Injector Calibration Code

- Because the fuel injector corrects the deviation of the fuel injection amount caused by the difference in mechanical characteristics, if the fuel injector or the PCM is replaced, the injector calibration code (rank number) programming in the PCM is required.
- This is done by inputting the eight digit fuel injector calibration code (or fuel injector calibration bar code) into the PCM by means of M-MDS and taking into account the corresponding cylinder.
- It is not necessary to configure the 9th and 10th digit (A0: WL-C engine, B0: WE-C engine) of the fuel injector calibration code as it is the fuel injector grade identification code.



DBG114BTB503

FUEL INJECTOR OPERATION [WL-C, WE-C]

dcf011413250t03

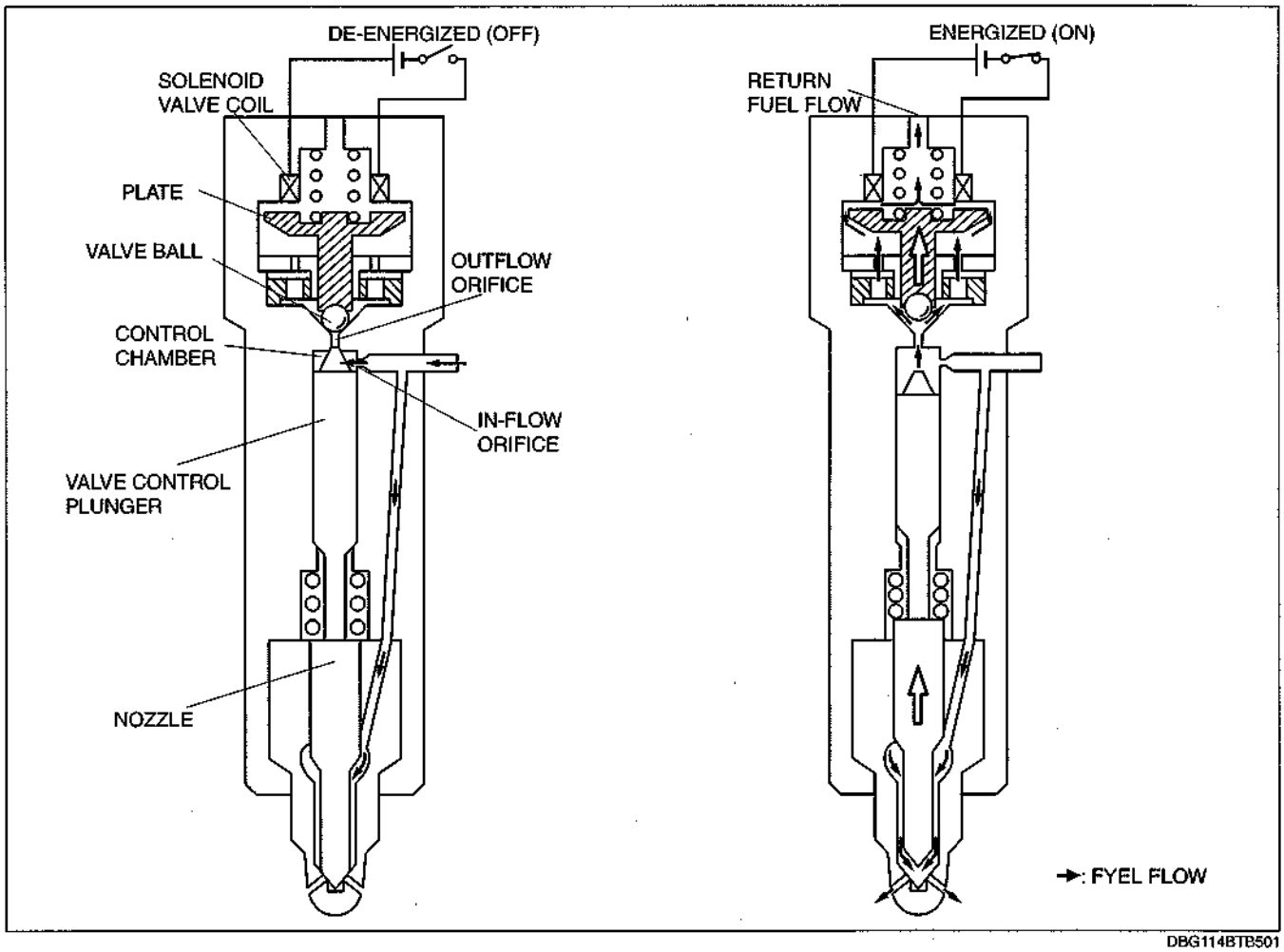
- The solenoid valve coil controls inflow/outflow of fuel to the control chamber by opening and closing according to an ON/OFF signal received from the PCM.

De-energized (off)

— When the solenoid valve coil is not energized, the plate is pushed down, closing the control chamber outflow orifice to valve ball, and causing the pressurized fuel from the fuel injection pipe to fill the control chamber. Due to this, the nozzle connected to the valve control plunger is closed and injection does not occur.

Energized (on)

— When solenoid valve coil energization begins the valve ball and plate are pulled upwards, opening the control chamber outflow orifice and fuel outflow occurs. As fuel outflow occurs, the control chamber pressure decreases, drawing the valve control plunger and the nozzle upward, and injection begins. As energization continues the nozzle is opened even more, providing maximum injection rate. When energization of the solenoid valve coil ends, the plate once again moves down and the nozzle is closed instantaneously. Since the coil can be repeatedly energized any number of times, multiple pilot injection is made possible.

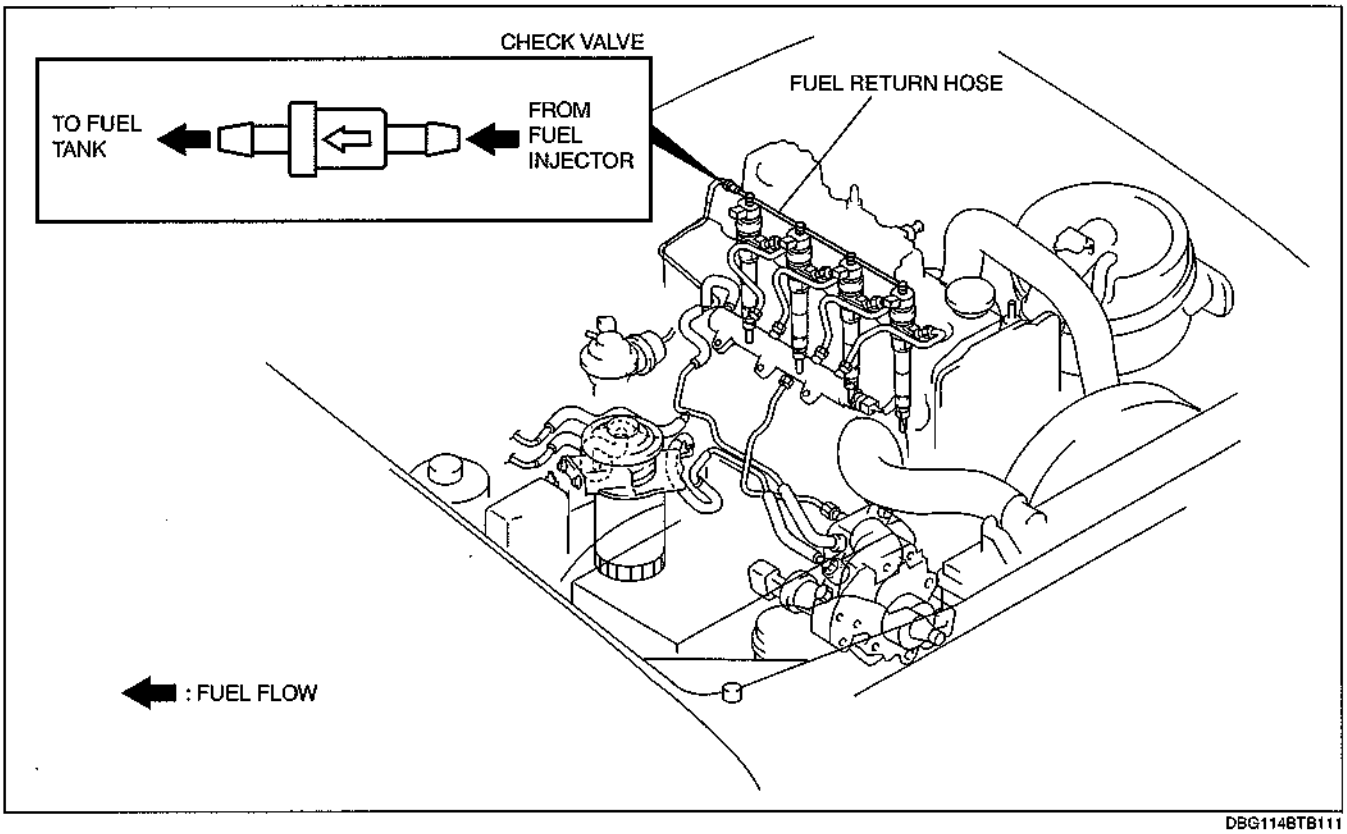


DBG114BTB501

CHECK VALVE FUNCTION [WL-C, WE-C]

dcf011413152t01

- The one-way check valve prevents fuel from flowing back to the fuel injector.



DBG114BTB111

01-15B EXHAUST SYSTEM [WL-C, WE-C]

EXHAUST SYSTEM OUTLINE [WL-C, WE-C]..... 01-15B–1
EXHAUST SYSTEM STRUCTURAL VIEW [WL-C, WE-C]..... 01-15B–1

EXHAUST SYSTEM OUTLINE [WL-C, WE-C]

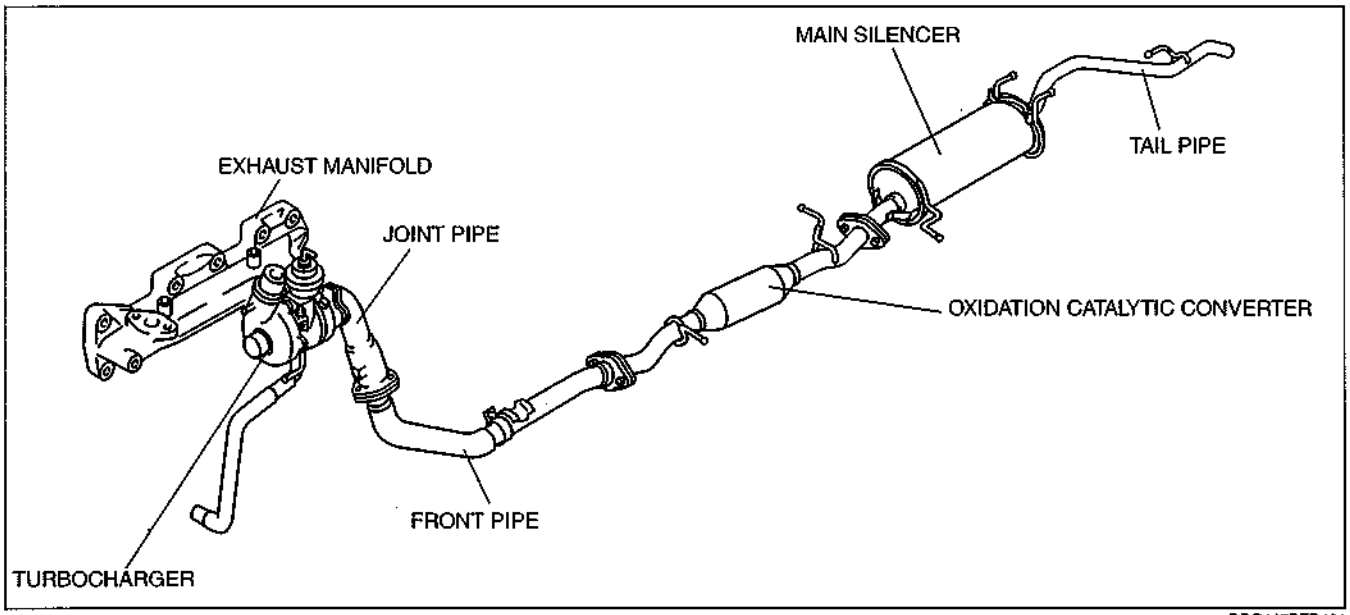
dcf011500000003

Features

- The exhaust system (including the exhaust manifold) has been laid out as straight as possible in order to achieve smooth flow of exhaust gas and maintain high power output.

EXHAUST SYSTEM STRUCTURAL VIEW [WL-C, WE-C]

dcf011500000004



DBG115BTB401

01-16B EMISSION SYSTEM [WL-C, WE-C]

EMISSION SYSTEM OUTLINE [WL-C, WE-C]..... 01-16B–1
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OXIDATION CATALYTIC CONVERTER CONSTRUCTION [WL-C, WE-C]..... 01-16B–7
OXIDATION CATALYTIC CONVERTER OPERATION [WL-C, WE-C]..... 01-16B–7
ROLLOVER VALVE FUNCTION [WL-C, WE-C]..... 01-16B–7
ROLLOVER VALVE CONSTRUCTION/OPERATION [WL-C, WE-C]..... 01-16B–7

EMISSION SYSTEM OUTLINE [WL-C, WE-C]

dcf011600000t04

Feature

Improved exhaust gas purification	• EGR system adopted • EGR cooler adopted • Oxidation catalytic converter adopted

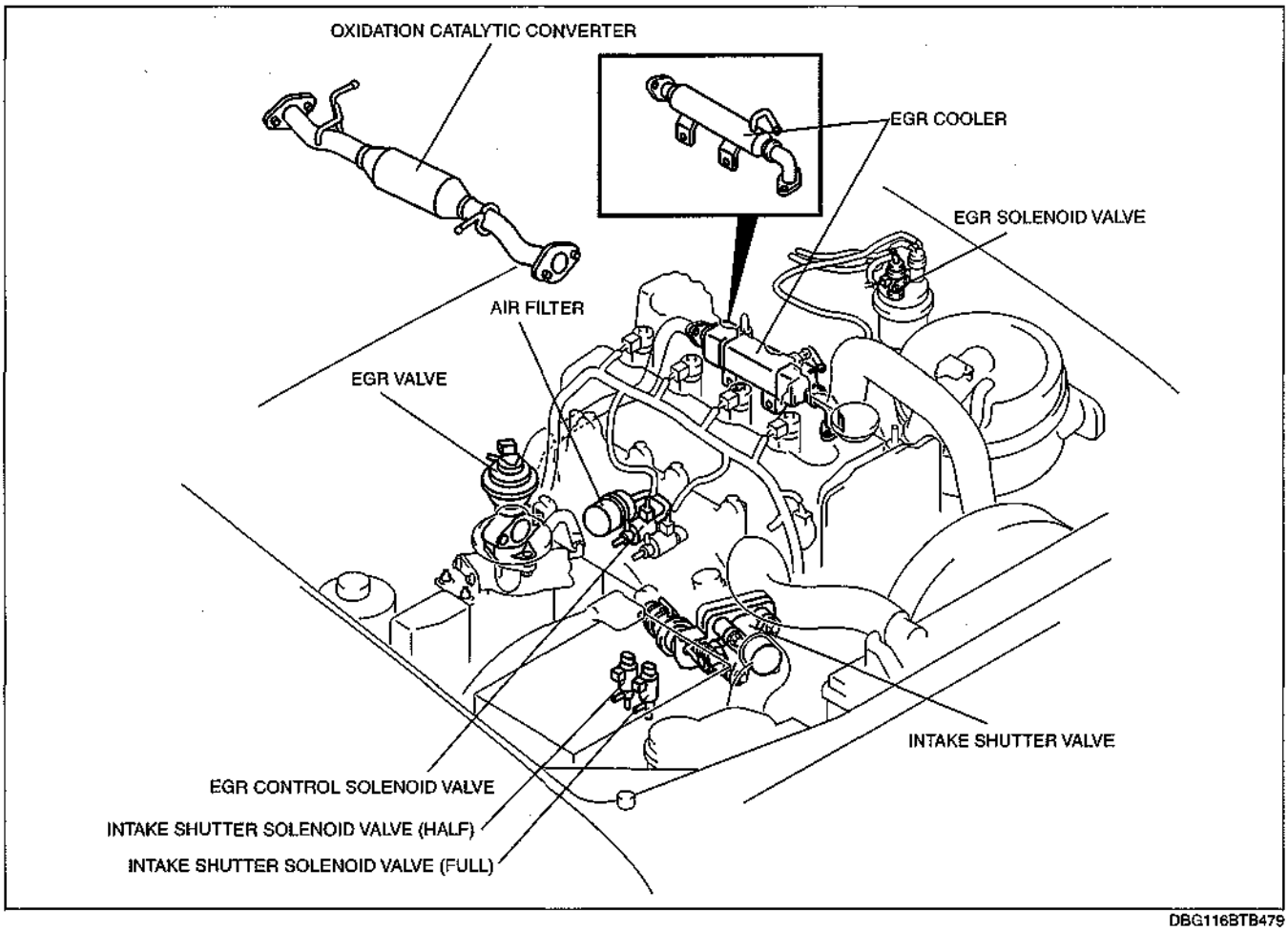
Specification

Item	WL-C, WE-C
EGR valve type	Vacuum
Catalytic converter type	Oxidation catalytic converter

EMISSION SYSTEM STRUCTURAL VIEW [WL-C, WE-C]

dcf011600000105

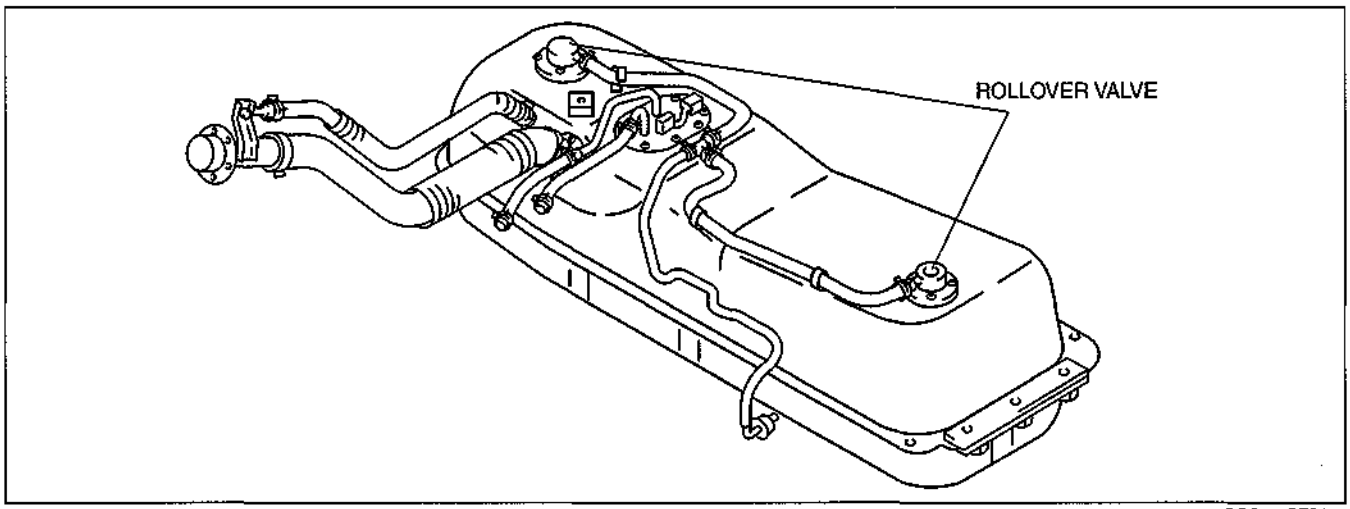
Engine Room Side



DBG116BTB479

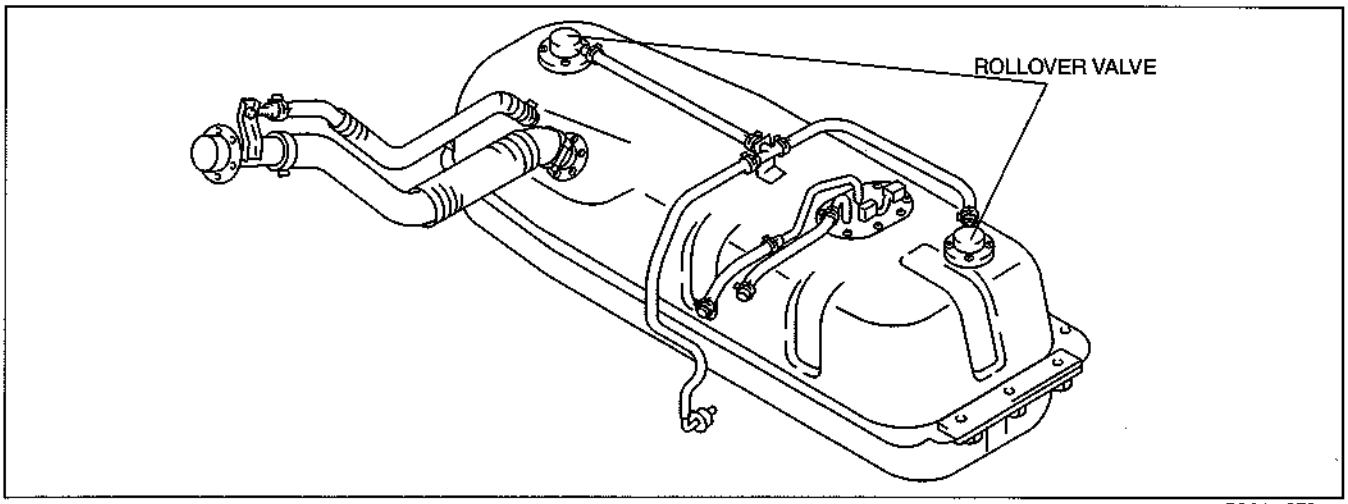
Fuel Tank Side

Double cab 4x2 (except Hi-Rider), Stretch cab 4x2 (with rear access system (except Hi-Rider))



DBG116BTB331

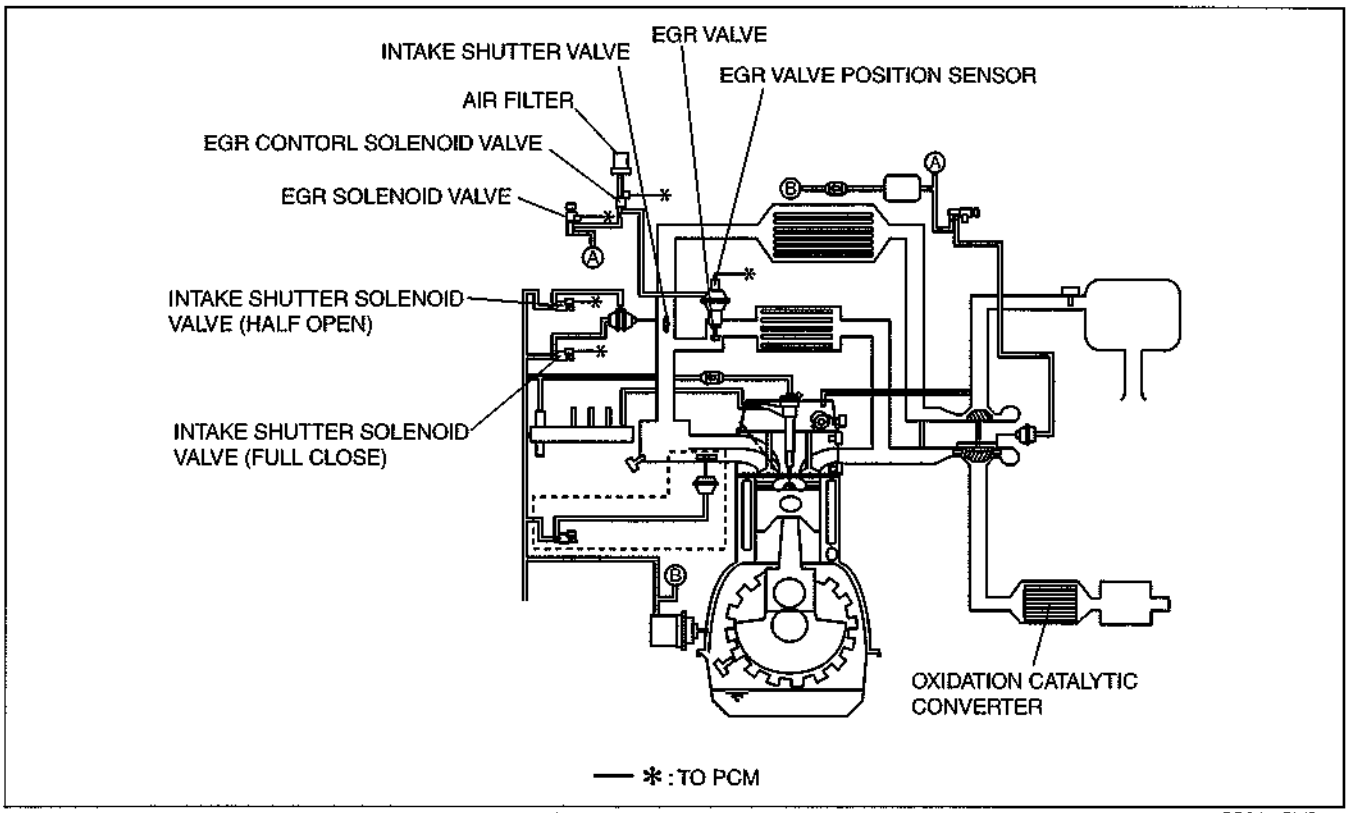
Regular cab 4x4, stretch cab 4x4 (with rear access system), Hi-Rider



DBG116BTB330

EMISSION SYSTEM DIAGRAM [WL-C, WE-C]

dcf011600000t06



DBG116BWB332

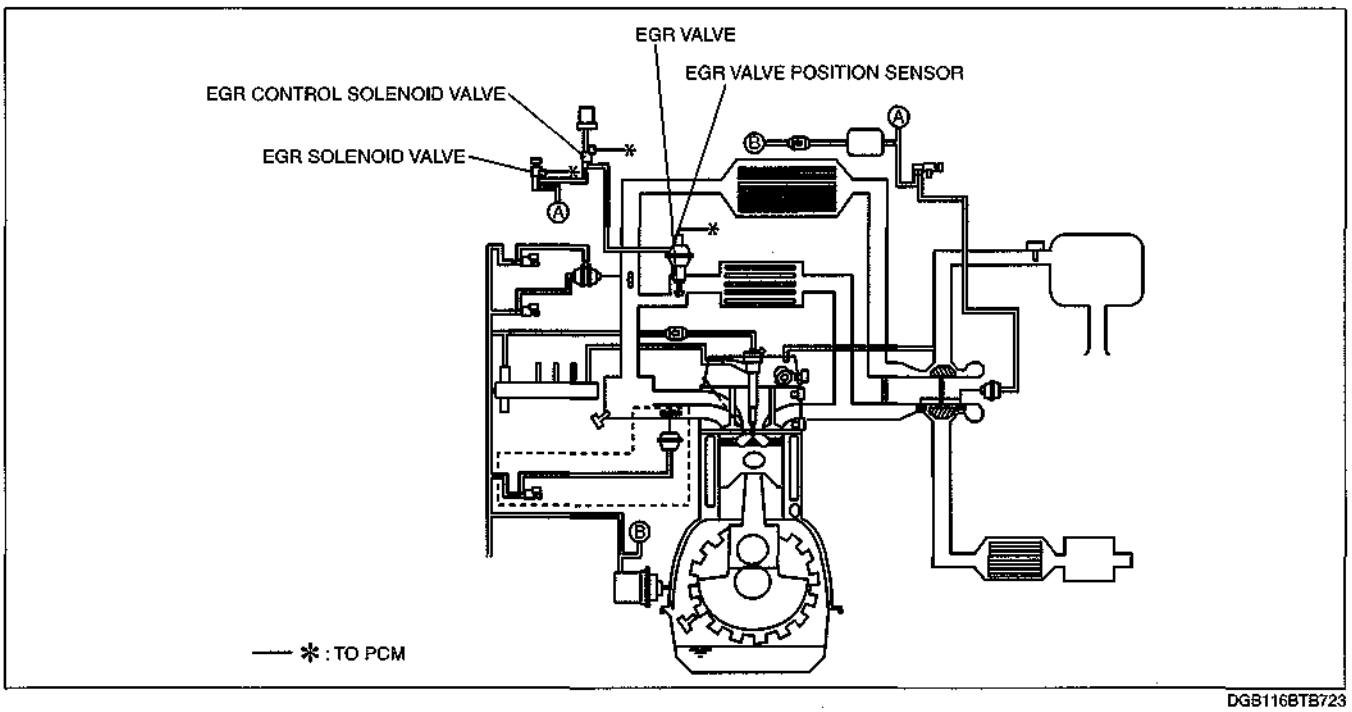
EGR SYSTEM OUTLINE [WL-C, WE-C]

dcf011600020t06

- The EGR cooler cools EGR gas and improves the intake-air charging efficiency, reducing black smoke.
- For control of EGR system, refer to CONTROL SYSTEM, EGR CONTROL. (See 01-40B-17 EGR CONTROL OUTLINE [WL-C, WE-C].) (See 01-40B-17 EGR CONTROL BLOCK DIAGRAM [WL-C, WE-C].) (See 01-40B-17 EGR CONTROL OPERATION [WL-C, WE-C].)

EGR SYSTEM DIAGRAM [WL-C, WE-C]

dcf011600020t07



DGB116BTB723

EGR SYSTEM OPERATION [WL-C, WE-C]

dcf011600020t08

- To open the EGR valve and increase the EGR amount, increase the EGR solenoid valve control duty valve to increase the vacuum applied to the EGR valve. To close the EGR valve to decrease the EGR amount, increase the EGR control solenoid valve control duty valve to decrease the vacuum applied to the EGR valve.
- When the PCM energizes the intake shutter solenoid valve during the exhaust gas introduction at low engine speed, the vacuum passage is opened and vacuum is applied to the intake shutter valve actuator. Due to this, the intake shutter valve is closed and vacuum is generated downstream of the intake manifold after the intake shutter valve, realizing easier introduction of the exhaust gas to the combustion chamber.

EGR SYSTEM FUNCTION [WL-C, WE-C]

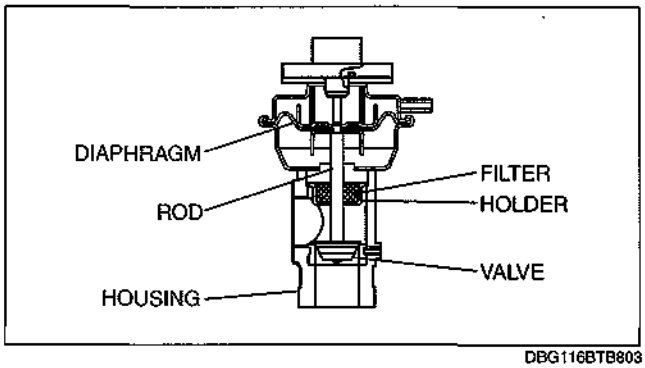
dcf011620300t03

- The EGR valve, installed to the intake manifold, recirculates the exhaust gas to the intake manifold.

EGR SYSTEM OPERATION [WL-C, WE-C]

dcf011620300t04

- Consists of a diaphragm and valves.
- The EGR solenoid valve operates based on the signal from the PCM and changes the valve opening angle to open the passage leading from the exhaust gas to the intake manifold by inducting the vacuum to the diaphragm on the upper part of the EGR valve.



DBG116BTB803

EGR SORENOID VALVE FUNCTION [WL-C, WE-C]

dcf011618741t05

- EGR solenoid valve open/close the passage which brings vacuum generated in the vacuum pump to the diaphragm, and control the EGR valve opening.

EGR SORENOID VALVE DESCRIPTION [WL-C, WE-C]

dcf011618741t06

Structure/Operation

- Vent side port of solenoid valve is connected to the EGR valve diaphragm through EGR control solenoid valve, and the vacuum side port of solenoid valve is connected to vacuum pump.
- Solenoid valve consists of a solenoid coil, spring, plunger and air filter.
- EGR solenoid valve increases the angle of the valve opening by increasing vacuum on EGR valve via the EGR control signal (duty signal).
- EGR solenoid valve decreases the angle of the valve opening by releasing vacuum on EGR valve via the EGR control signal (duty signal).

EGR CONTROL SOLENOID VALVE FUNCTION [WL-C, WE-C]

dcf011618741t07

- EGR valve changes the pressure on the diaphragm of the EGR valve from vacuum to atmospheric pressure.

EGR CONTROL SOLENOID VALVE DESCRIPTION [WL-C, WE-C]

dcf011618741t08

Structure/Operation

- EGR control solenoid valve consists of coil, spring, and plunger.
- When EGR valve is not energized, the passage between the diaphragm and atmospheric air side is open.
- When specified conditions are satisfied, the solenoid coils become energized and electromagnetic, and then pull the plunger. At this time, the passage between the diaphragm and atmospheric air side is closed and the passage between the diaphragm and vacuum pump side is opened.

EGR COOLER FUNCTION [WL-C, WE-C]

dcf011600020t09

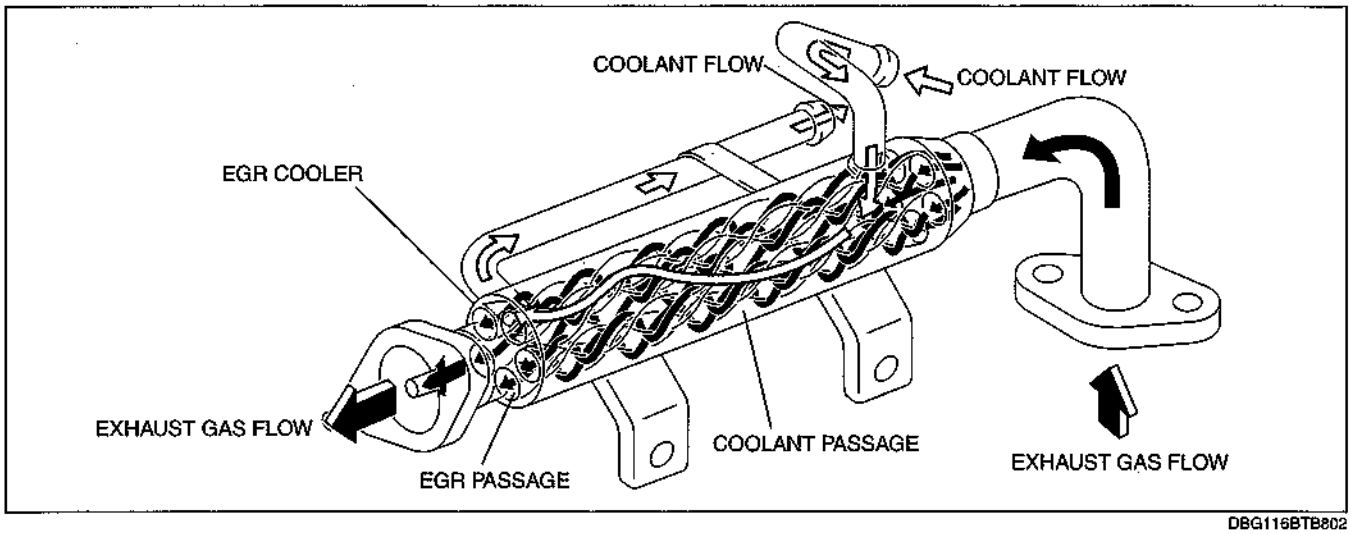
- EGR cooler cools recircurated exhaust gas from the intake manifold.

EGR COOLER DESCRIPTION [WL-C, WE-C]

dcf011600020t10

Structure/Operation

- EGR cooler has an EGR passage and coolant passage.



DBG116BTB802

INTAKE SHUTTER VALVE DESCRIPTION [WL-C, WE-C]

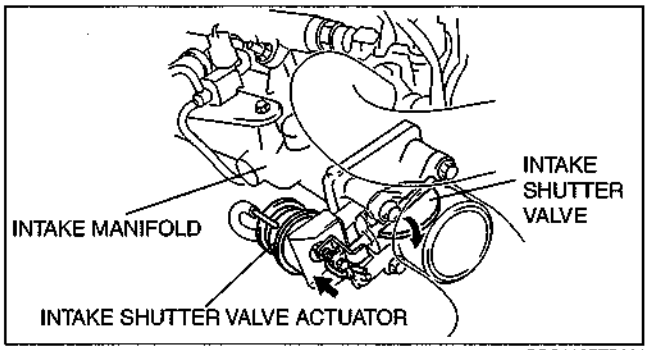
dcf011600000t07

Function

- When the exhaust gas recirculation system is operated, the intake shutter valve closes, vacuum is generated in the intake manifold, and EGR gas is efficiently transported to the combustion chamber. As a result, NOx is reduced.
- When the engine is idling, the intake shutter valve closes and reduces air intake noise.

Structure/Operation

- When the exhaust gas recirculation system is operated and vacuum is applied to the diaphragm of the intake shutter valve actuator, internal lever is pulled and the intake shutter valve closes.



DBG116BTB801

INTAKE SHUTTER SOLENOID VALVE DESCRIPTION [WL-C, WE-C]

dcf011600000t08

Function

- The intake shutter solenoid valve switches the opening/closing of the passage where the vacuum generated in the vacuum pump is led to the diaphragm of the intake shutter valve actuator.

Structure

- The intake shutter valve consists mainly of a solenoid coil, and a spring, a plunger.

Operation

- The vacuum passage between the intake shutter valve actuator and the vacuum pump is opened or closed depending upon whether the intake shutter solenoid valve is energized or de-energized.

OXIDATION CATALYTIC CONVERTER FUNCTION [WL-C, WE-C]

dcf011620500t04

- Purifies contaminants in the exhaust gas by utilizing a chemical reaction in a three way catalytic converter.
- The catalytic converter converts the noxious carbon monoxide and hydrocarbon in the exhaust gas to non-noxious carbon dioxide and water.

OXIDATION CATALYTIC CONVERTER CONSTRUCTION [WL-C, WE-C]

dcf011620500105

- Consists of a three-way catalytic converter and insulator.
- A catalytic converter utilizing a platinum–palladium–rhodium system has been adopted.

OXIDATION CATALYTIC CONVERTER OPERATION [WL-C, WE-C]

dcf011620500106

- Contaminants in the exhaust gas (HC and CO) are purified by oxidization while passing through the catalytic converter.
  - — Oxidization process
    - Noxious hydrocarbon (HC) and carbon monoxide (CO) are bonded to oxygen which is converted to non-noxious carbon dioxide and water.
      $O_2 + HC + CO \rightarrow CO_2 + H_2O$

ROLLOVER VALVE FUNCTION [WL-C, WE-C]

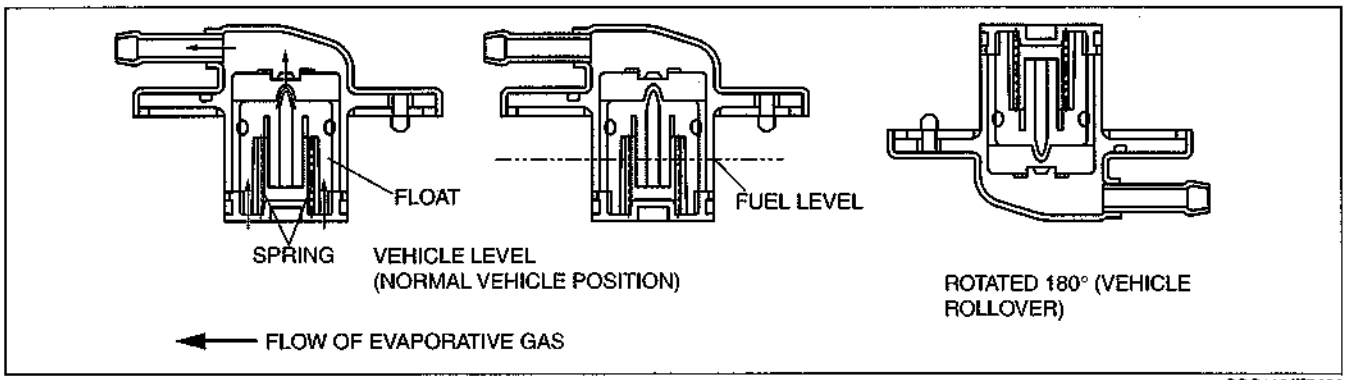
dcf011642720103

- The rollover valve prevents fuel flow into the airflow hose during sudden cornering or vehicle rollover.

ROLLOVER VALVE CONSTRUCTION/OPERATION [WL-C, WE-C]

dcf011642720104

- The rollover valve consists of a float, and spring.
- The rollover valve utilizes a combination of float weight, spring force, and buoyancy. When the float is sunk in the fuel, the float (valve) closes to block the sealing surface of the passage.



DBG116ATB030

01-17 CHARGING SYSTEM [WL-3, WL-C, WE-C]

CHARGING SYSTEM OUTLINE [WL-3, WL-C, WE-C] 01-17–1
CHARGING SYSTEM STRUCTURAL VIEW [WL-3, WL-C, WE-C] 01-17–1
GENERATOR CONSTRUCTION [WL-3, WL-C, WE-C] 01-17–2

CHARGING SYSTEM OUTLINE [WL-3, WL-C, WE-C]

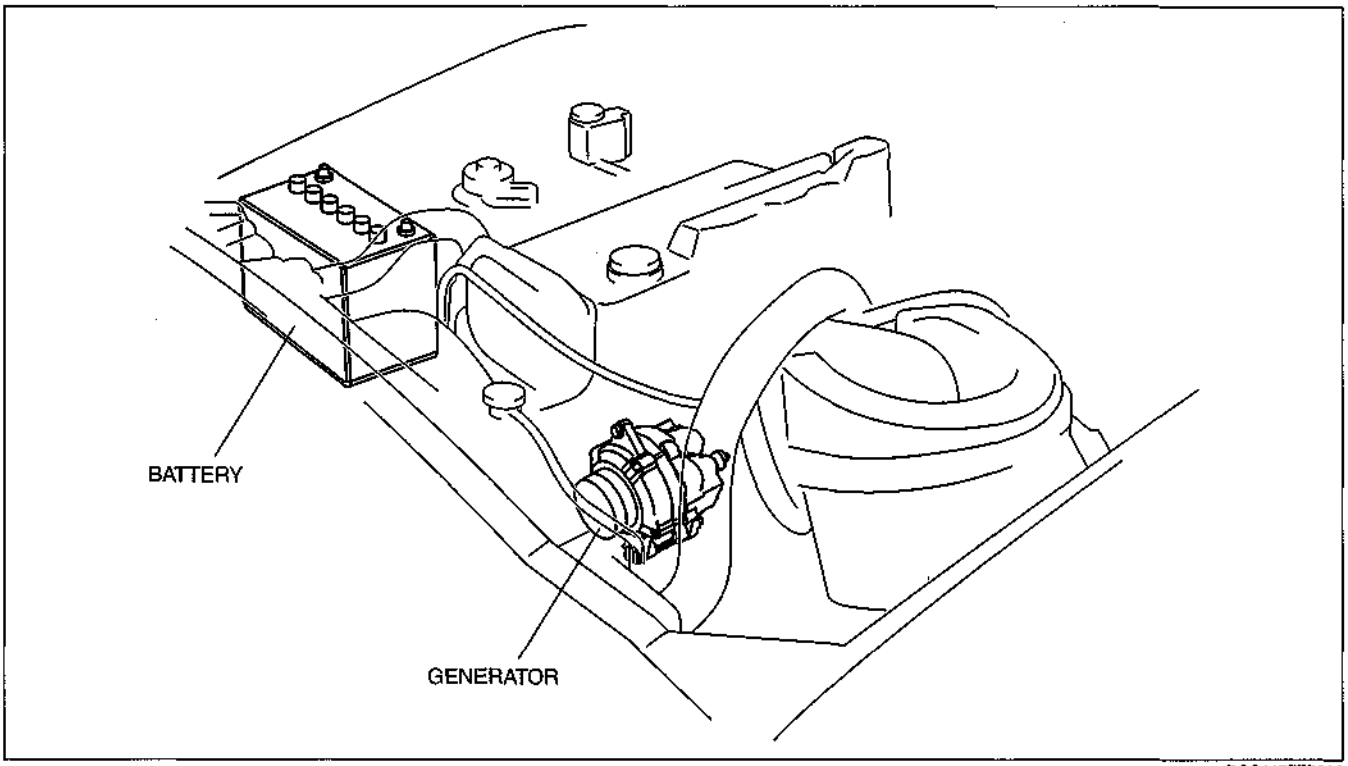
dcf011700000l01

Features

Improved reliability	• Generator with built-in battery sensing type IC regulator adopted

CHARGING SYSTEM STRUCTURAL VIEW [WL-3, WL-C, WE-C]

dcf011700000l02

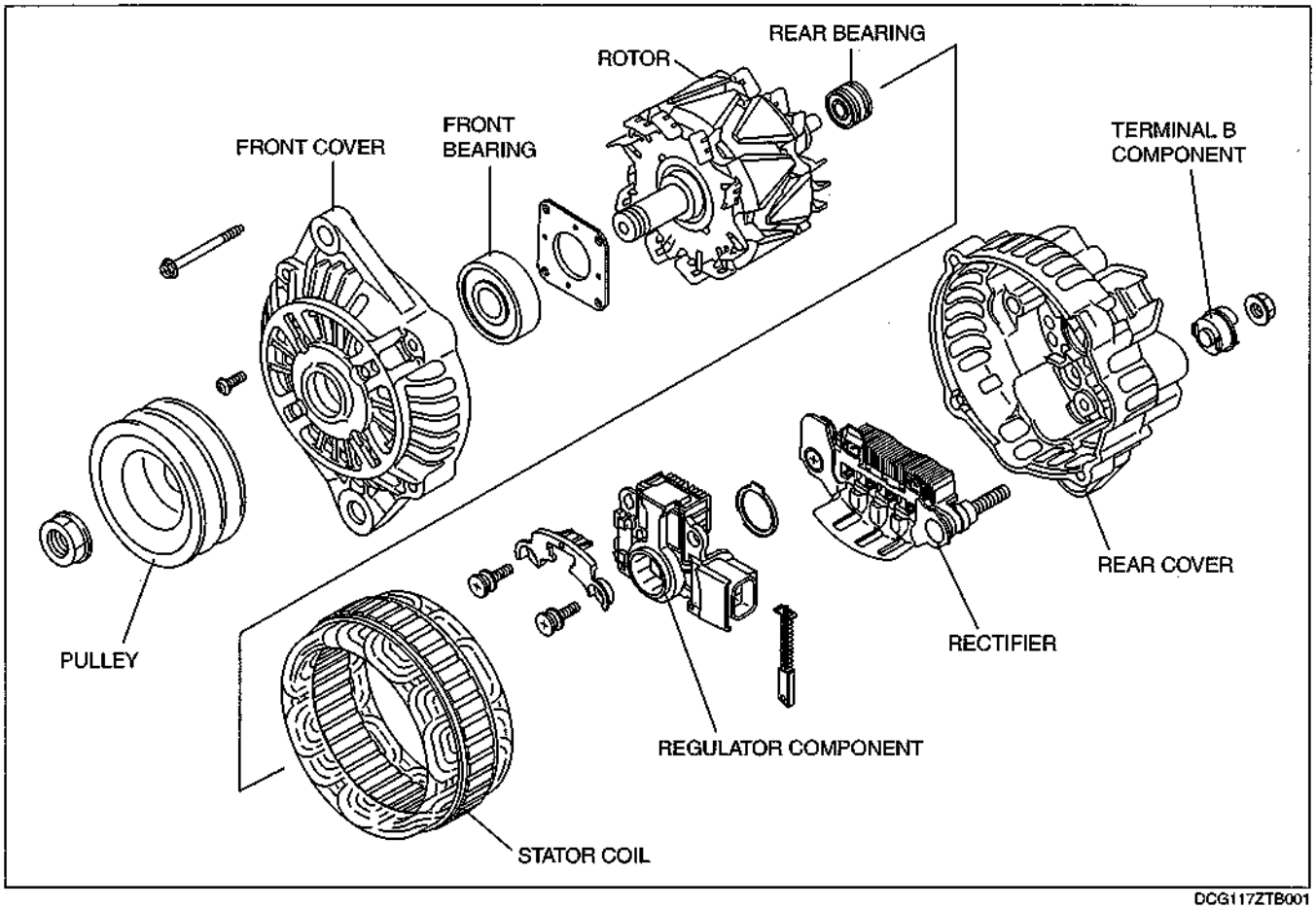


DCG117ZTB003

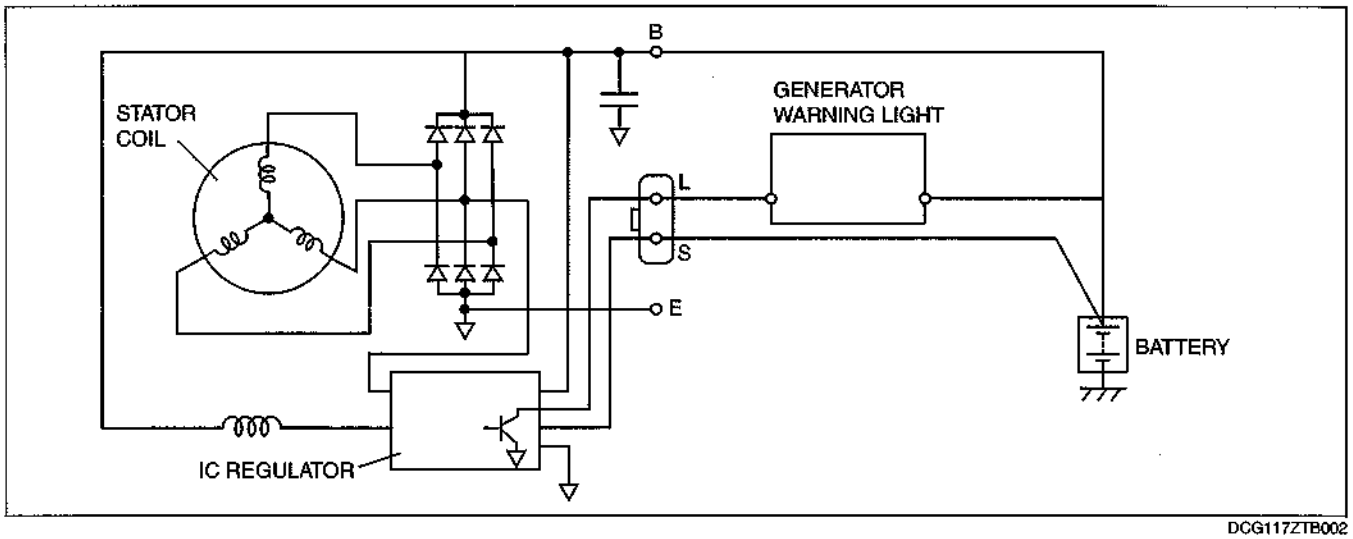
GENERATOR CONSTRUCTION [WL-3, WL-C, WE-C]

dcf011718300101

- A battery sensing type IC regulator is built into the generator which directly detects the voltage charged to the battery. Battery overcharge during light loads and charge voltage decreases during heavy loads have been prevented, improving battery reliability.



DCG117ZTB001



DCG117ZTB002

- An IC regulator with a malfunction diagnosis function is built into the generator. The generator warning light illuminates if any of the following malfunctions occurs.
  - — No power generation
  - — Overvoltage
  - — Open circuit
  - — Terminal B disconnected
  - — Terminal S disconnected

01-19 STARTING SYSTEM [WL-3, WL-C, WE-C]

STARTING SYSTEM OUTLINE [WL-3, WL-C, WE-C] 01-19–1
STARTING SYSTEM STRUCTURAL VIEW [WL-3, WL-C, WE-C] 01-19–1
STARTER CONSTRUCTION [WL-3, WL-C, WE-C] 01-19–1

STARTING SYSTEM OUTLINE [WL-3, WL-C, WE-C]

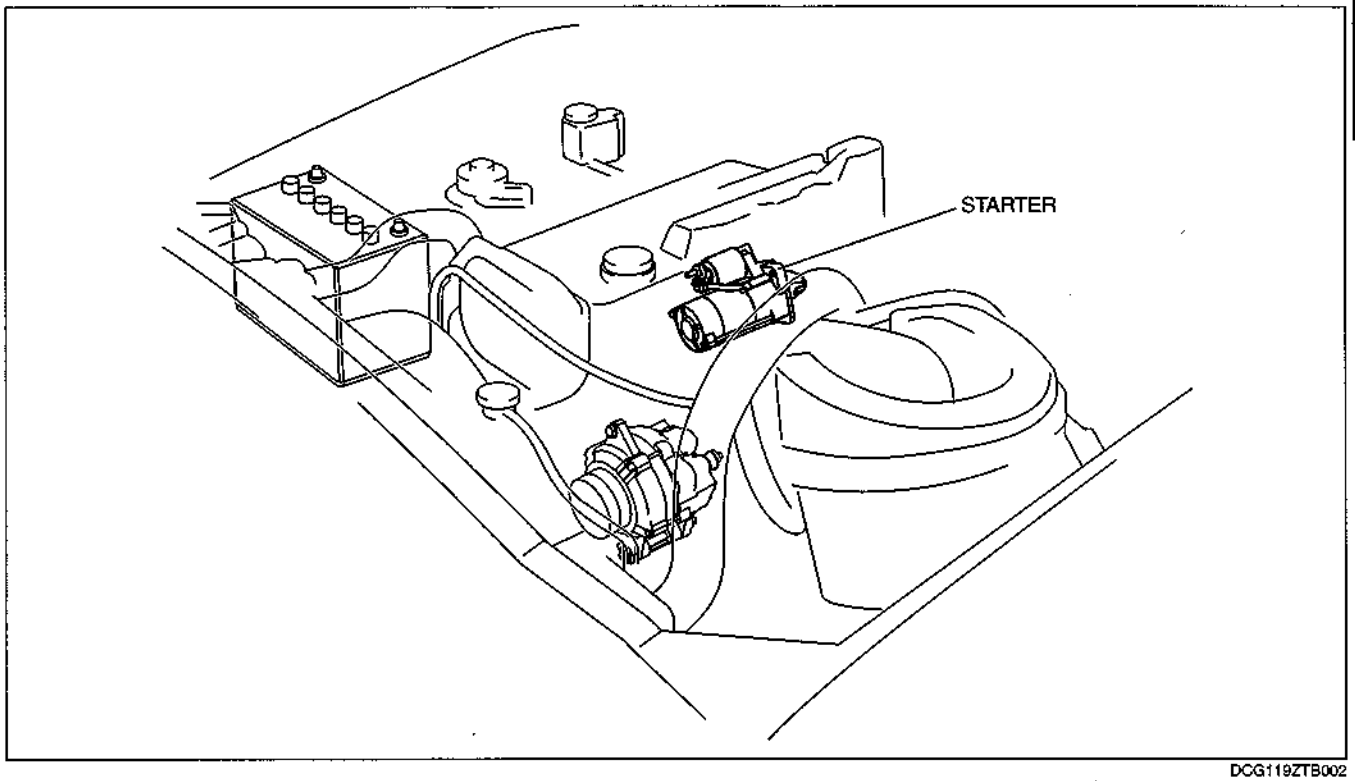
dcf011900000t01

Features

Improved startability	• Reduction type starter adopted

STARTING SYSTEM STRUCTURAL VIEW [WL-3, WL-C, WE-C]

dcf011900000t02

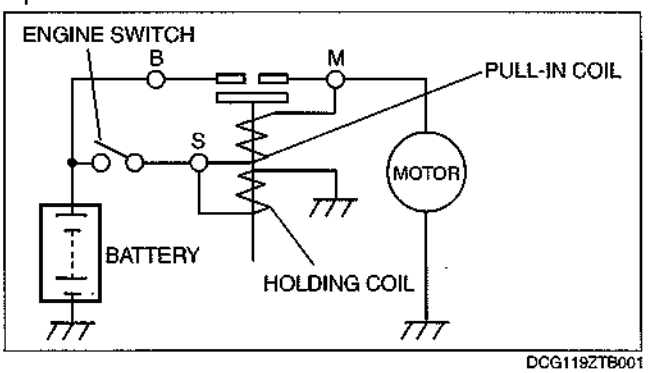


DCG119ZTB002

STARTER CONSTRUCTION [WL-3, WL-C, WE-C]

dcf011918400t01

- A high torque coaxial reduction type starter has been adopted.



DCG119ZTB001

01-40B CONTROL SYSTEM [WL-C, WE-C]

ENGINE CONTROL SYSTEM OUTLINE [WL-C, WE-C] 01-40B–2
ENGINE CONTROL SYSTEM STRUCTURAL VIEW [WL-C, WE-C] .. 01-40B–3
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FUEL INJECTION AMOUNT CONTROL BLOCK DIAGRAM [WL-C, WE-C] 01-40B–13
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INTAKE AIR TEMPERATURE (IAT) SENSOR NO.2 CONSTRUCTION/ OPERATION [WL-C, WE-C] 01-40B–21
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NEUTRAL SWITCH CONSTRUCTION/ OPERATION [WL-C, WE-C].....01-40B–28

ENGINE CONTROL SYSTEM OUTLINE [WL-C, WE-C]

dcf014000000l22

Features

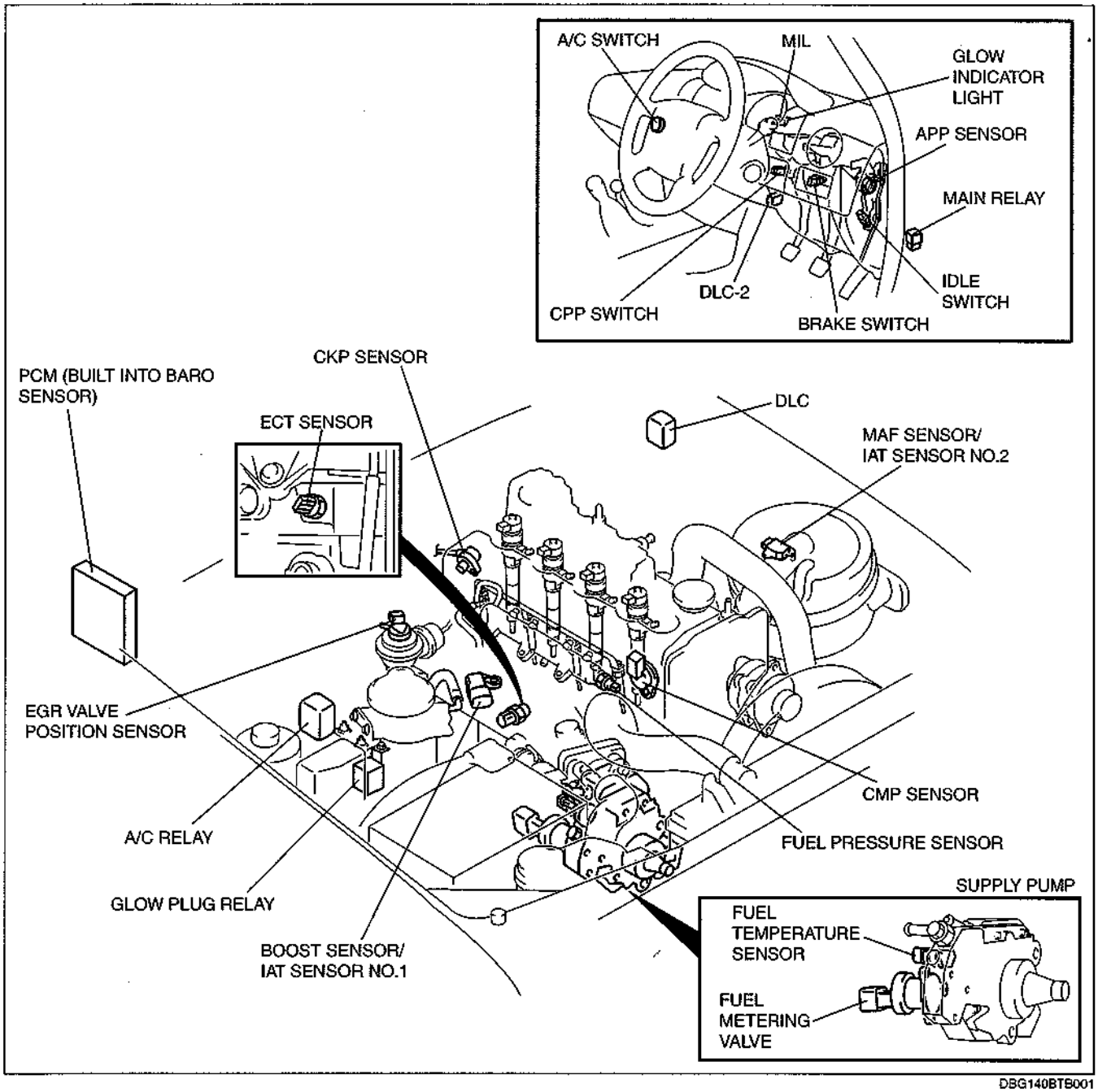
Improved emission gas purification	• Fuel injection control changed • EGR control (and intake shutter valve control) adopted

Specification

Item	Specification
IAT sensor No.2 (Inside MAF)	Thermistor
MAF sensor	Hot-wire
IAT sensor No.1	Thermistor
Boost sensor	Piezoelectric element
ECT sensor	Thermistor
CMP sensor	Hall element type
CKP sensor	Magnetic pickup
APP sensor	Potentiometer
EGR valve position sensor	Potentiometer
BARO sensor (built into PCM)	Piezoelectric element
Fuel temperature sensor	Thermistor
Fuel pressure sensor	Piezoelectric element
Neutral switch	ON/OFF
CPP switch	ON/OFF
Idle switch	ON/OFF

ENGINE CONTROL SYSTEM STRUCTURAL VIEW [WL-C, WE-C]

dcf014000000t23



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01

ENGINE CONTROL SYSTEM DIAGRAM [WL-C, WE-C]

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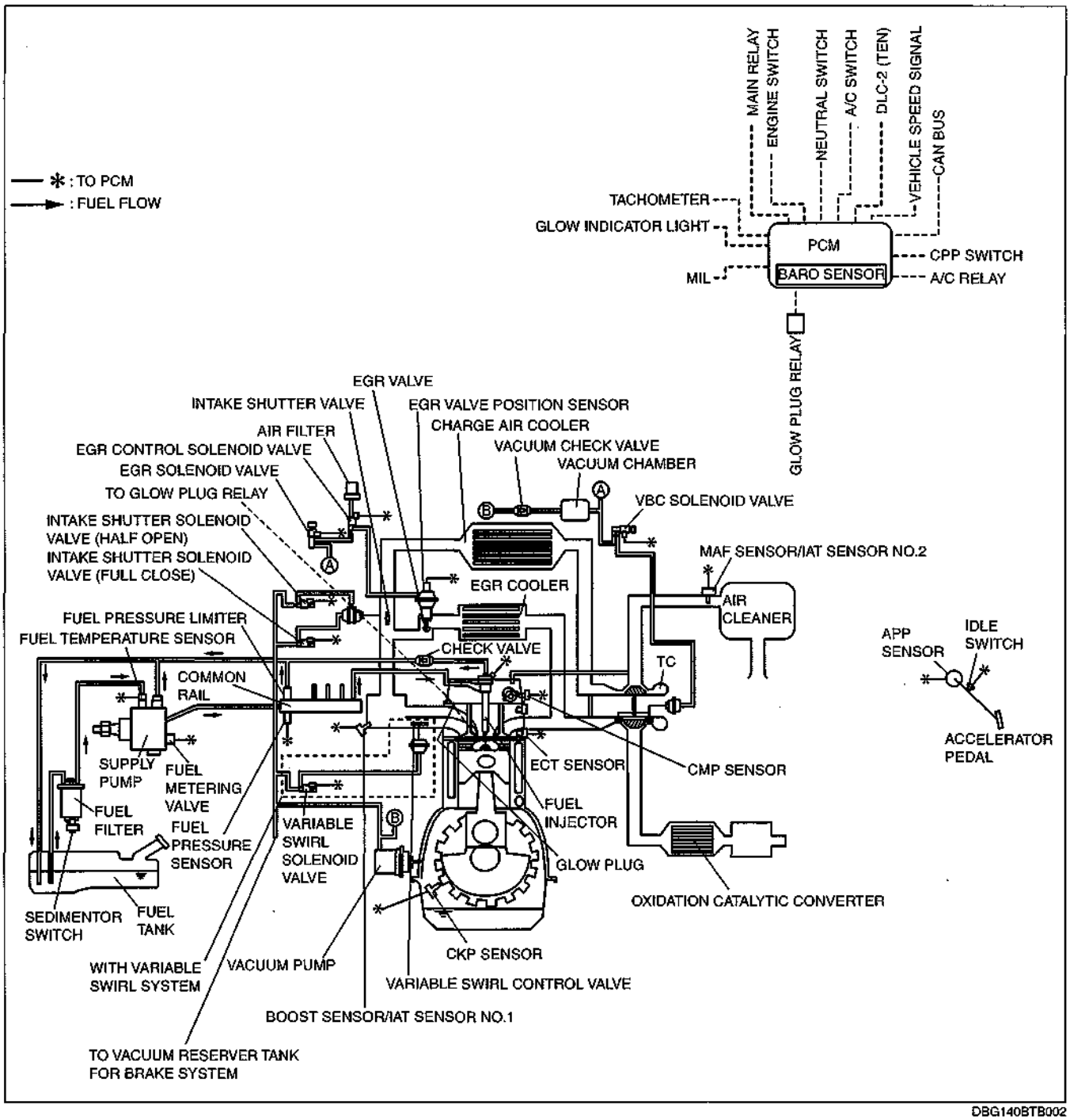

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ENGINE CONTROL SYSTEM WIRING DIAGRAM [WL-C, WE-C]

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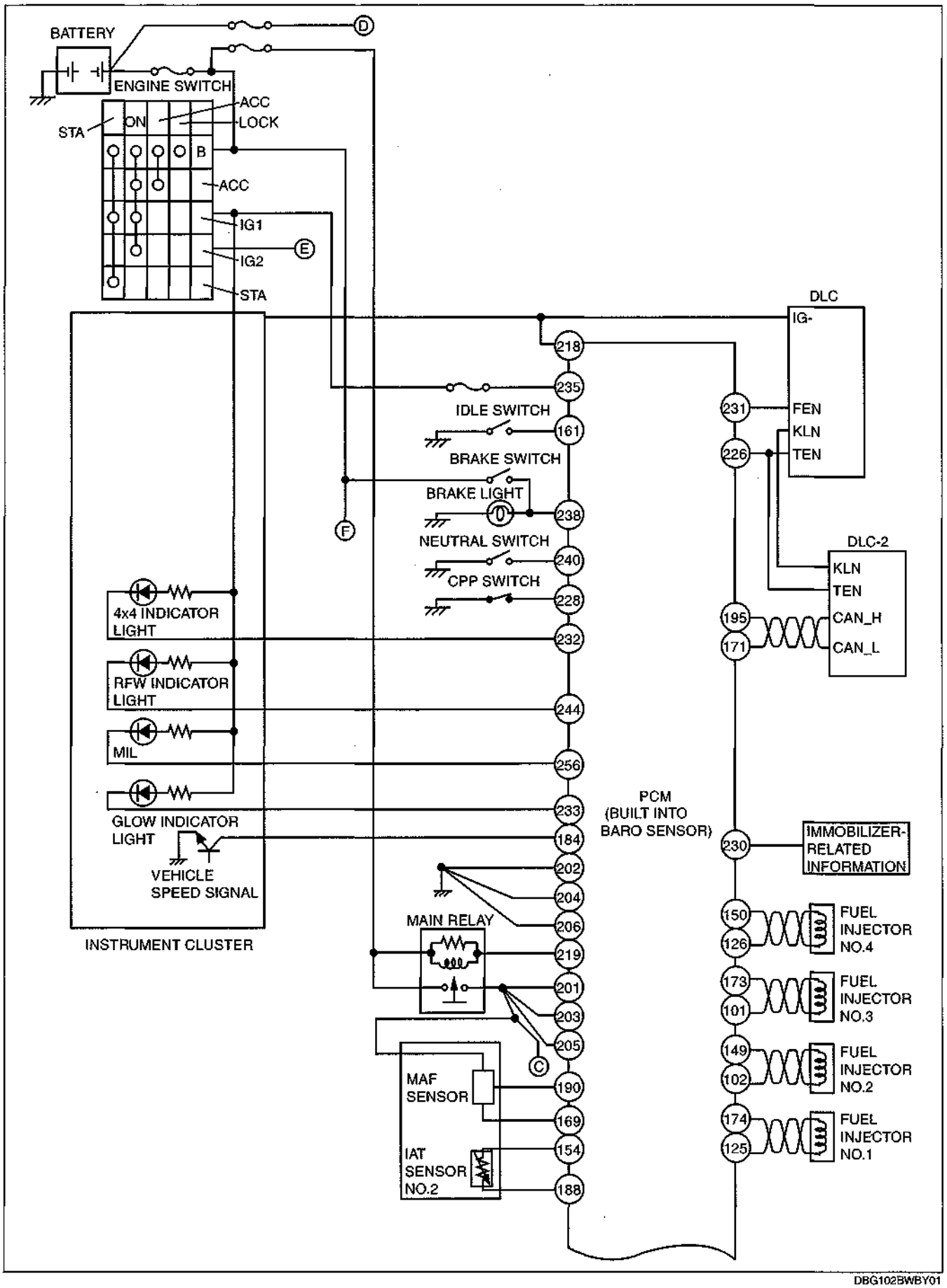
With Immobilizer System



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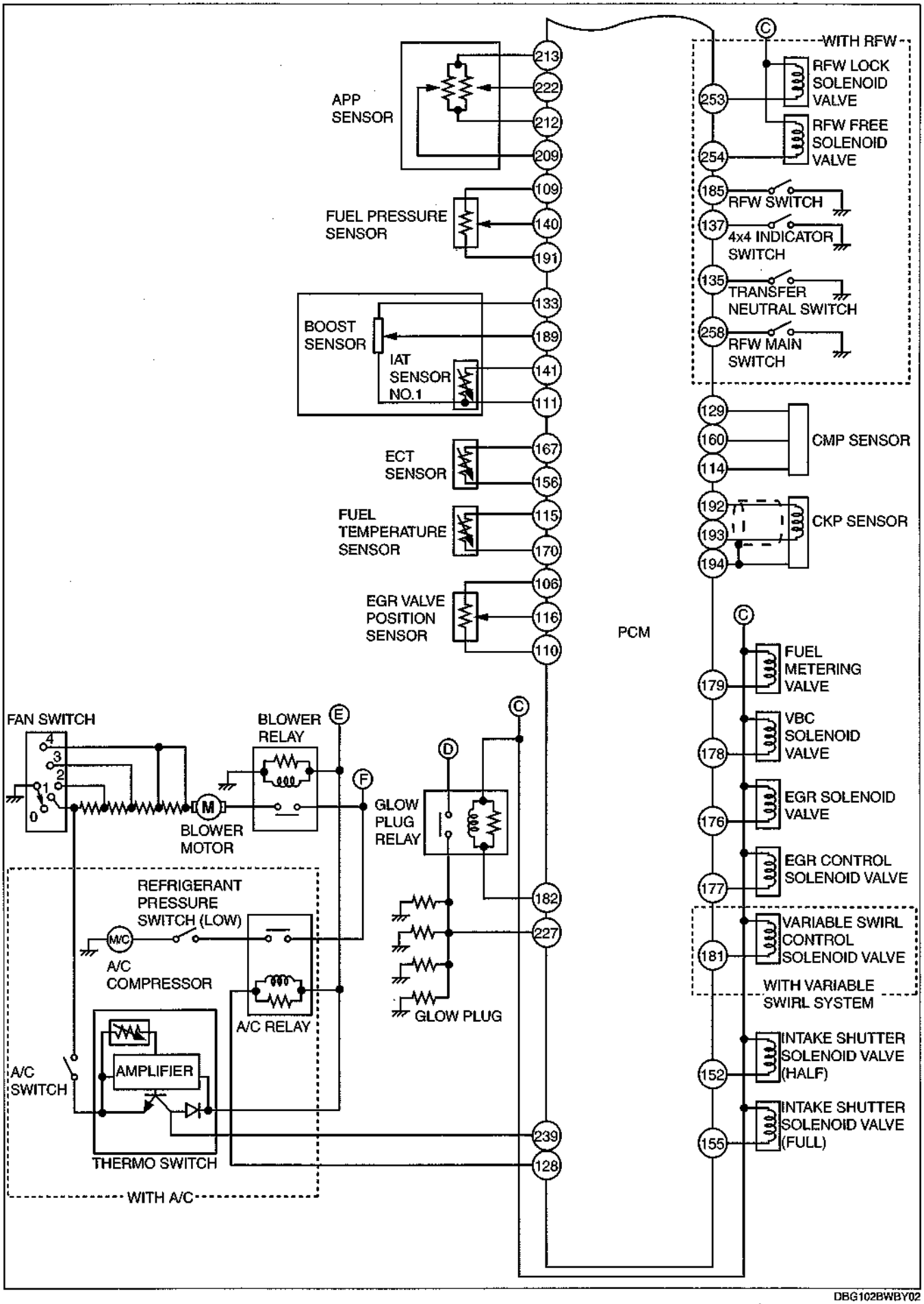

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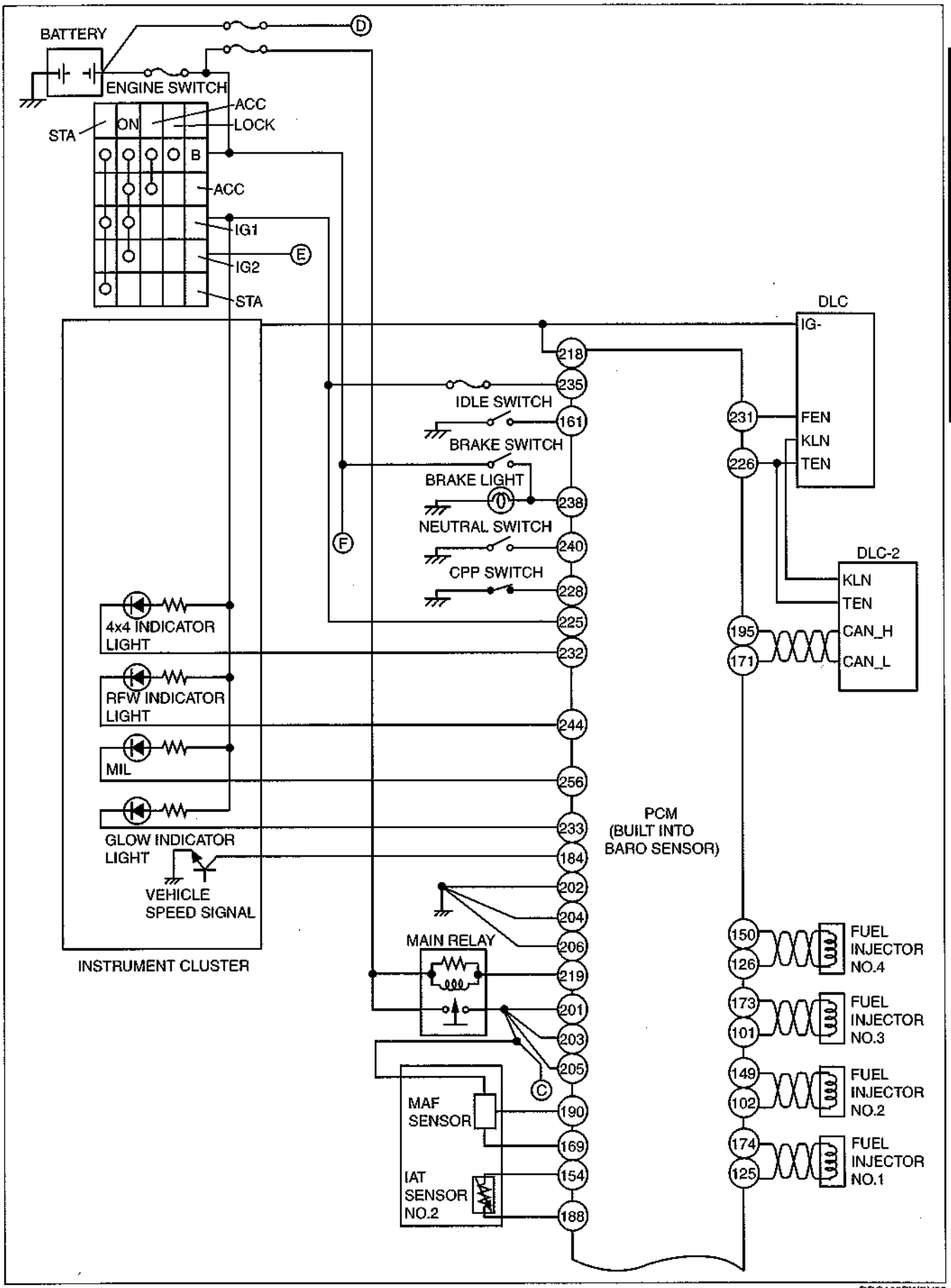
Without Immobilizer System



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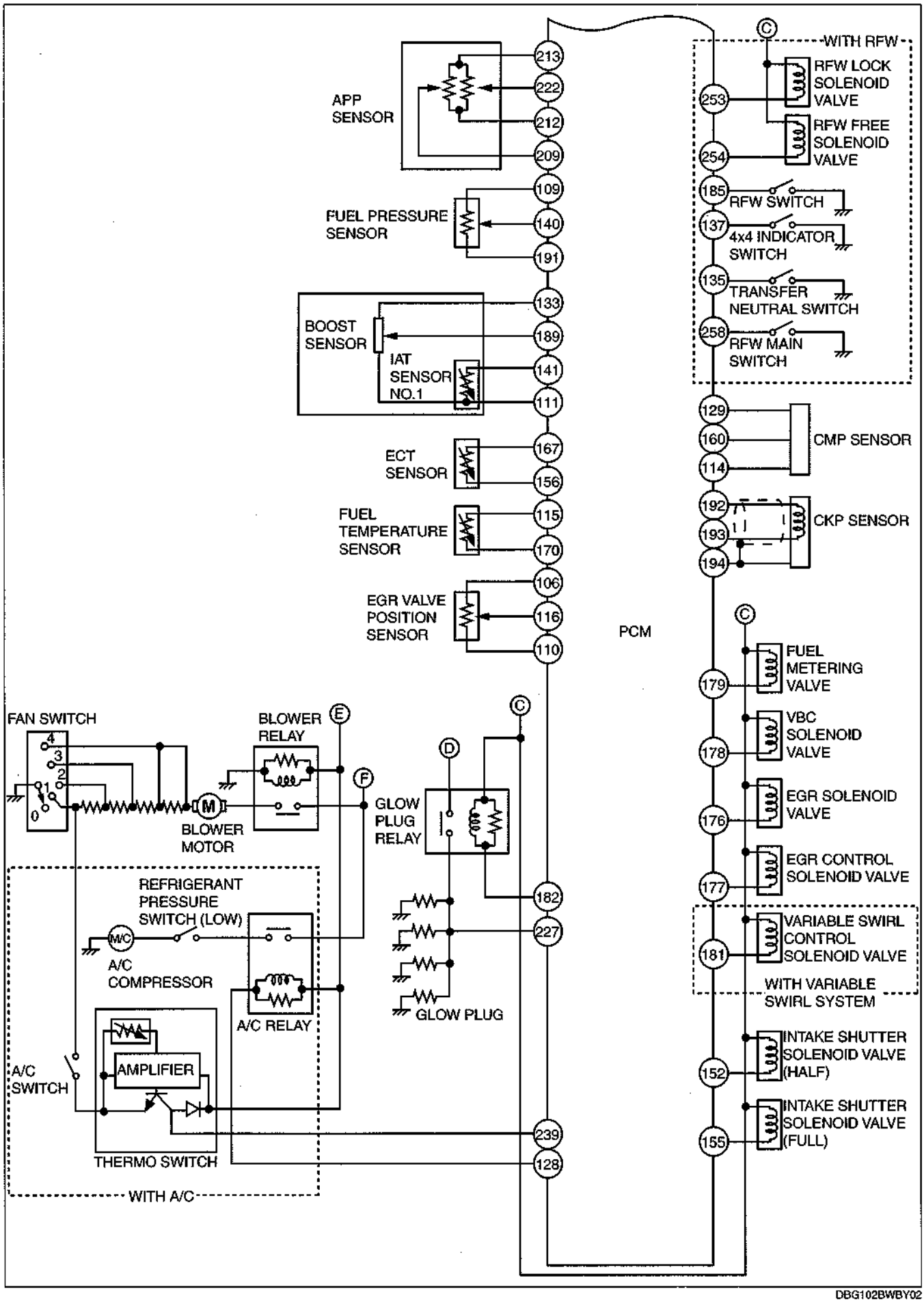

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ENGINE CONTROL SYSTEM BLOCK DIAGRAM [WL-C, WE-C]

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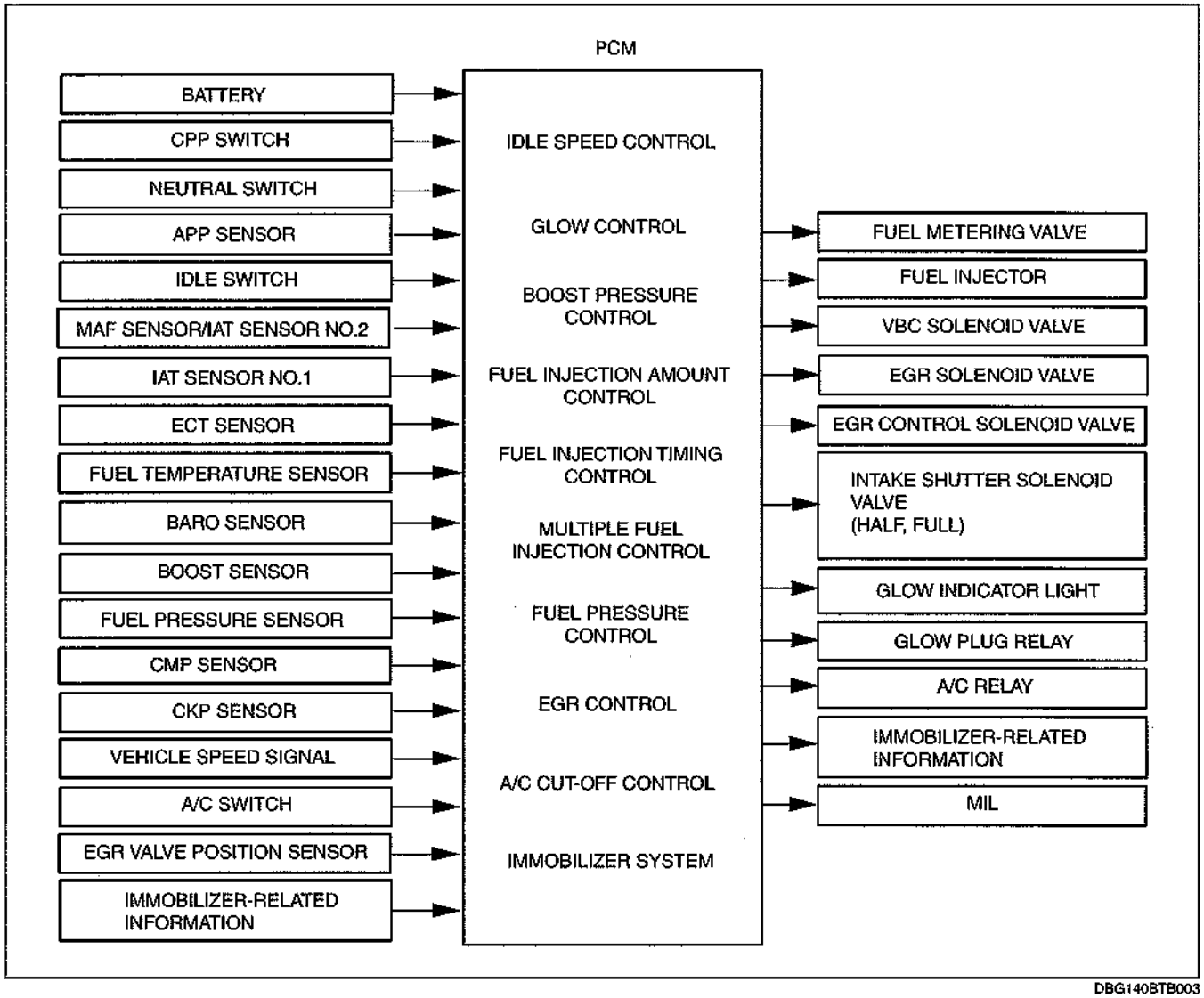

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ENGINE CONTROL SYSTEM RELATION CHART [WL-C, WE-C]

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×: Applicable

Item	Idle speed control	Glow control	Boost pressure control	Fuel injection amount control	Fuel injection timing control	Multiple fuel injection control	Fuel pressure control	EGR control	A/C cut-off control	Immobilizer system
Input device										
Battery			×							
CPP switch	×			×	×	×		×		
Neutral switch	×			×	×	×		×		
APP sensor	×		×	×	×	×	×	×	×	
Idle switch				×				×		
MAF sensor/IAT sensor No.2				×	×	×	×	×		
IAT sensor No.1				×	×					
ECT sensor	×	×	×	×	×	×	×	×	×	
Fuel temperature sensor				×	×		×			
BARO sensor			×	×	×	×	×	×		
Boost sensor			×							
Fuel pressure sensor				×			×	×		
CMP sensor	×			×	×	×				
CKP sensor	×	×	×	×	×	×	×	×	×	
Vehicle speed signal	×			×				×	×	
A/C switch	×									
EGR valve position sensor								×		
Immobilizer-related information										×
Output device										
Fuel metering valve							×			×
Fuel injector	×			×	×	×				×
VBC solenoid valve			×							
EGR solenoid valve								×		
EGR control solenoid valve								×		
Intake shutter solenoid valve (half, full)								×		
Glow indicator light		×								
Glow plug relay		×								
A/C relay									×	
Immobilizer-related information										×

IDLE SPEED CONTROL OUTLINE [WL-C, WE-C]

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- The PCM feedback controls the idle speed by calculating the fuel injection amount so that the idle speed is at the target idle speed corresponding to the driving conditions.

IDLE SPEED CONTROL BLOCK DIAGRAM [WL-C, WE-C]

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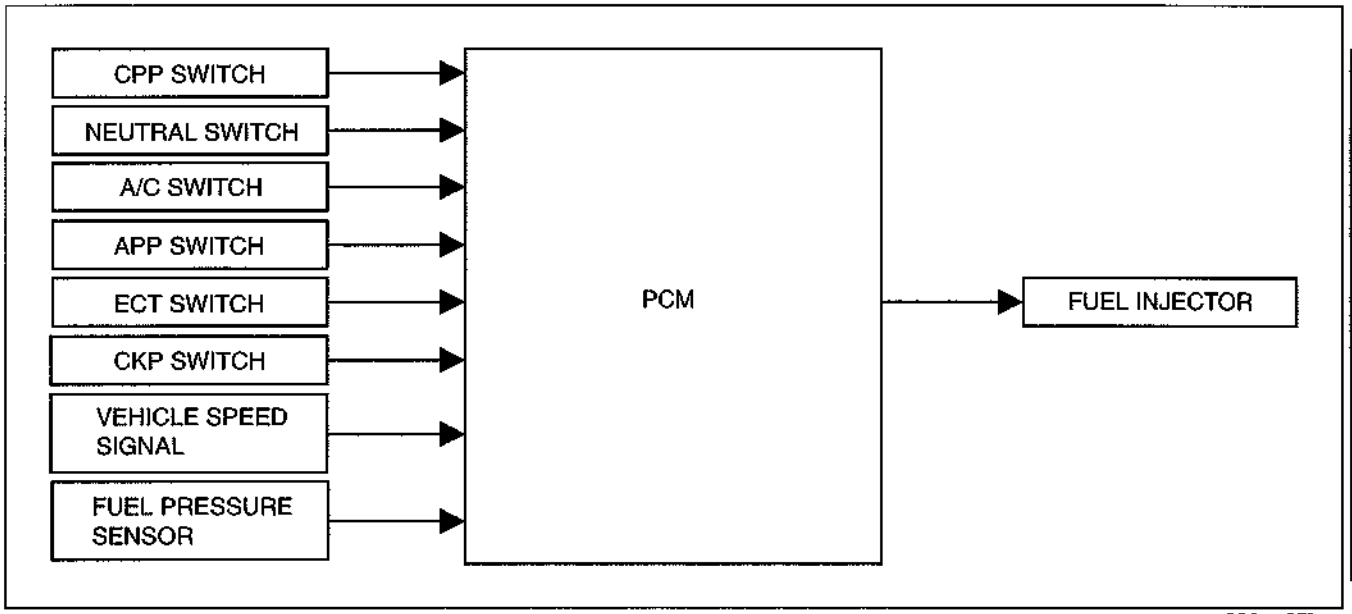

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IDLE SPEED CONTROL OPERATION [WL-C, WE-C]

dcf014000000l30

Feedback Control

- If there is a difference between the target idle speed and the actual idle speed, the PCM controls the fuel injection amount so that the actual idle speed corresponds to the target idle speed.

Target idle speed
No load: 720 rpm
A/C ON: 750 rpm

Engine Speed Control while Warming Up

- Controls engine speed based on the input signal from the engine coolant temperature sensor (below 0 °C {32 °F}) so that the engine speed while warming up corresponds to the target engine speed.

Engine speed while warming up control
720—1,000 rpm

Engine Speed Fluctuation Prevention Control for Each Cylinder

- The PCM detects the engine speed fluctuation while idling and corrects the fuel injection amount per each cylinder. Due to this, the variance in fuel injection amount caused by ununiformity of the cylinders (such as fuel injectors) and engine vibration while idling are reduced.

GLOW CONTROL OUTLINE [WL-C, WE-C]

dcf014000000l31

- Heating of the glow plug is controlled by the PCM through the glow plug relay to improve engine startability.
- Energization time to the glow plug is determined according to the engine coolant temperature and engine starting conditions.

GLOW CONTROL BLOCK DIAGRAM [WL-C, WE-C]

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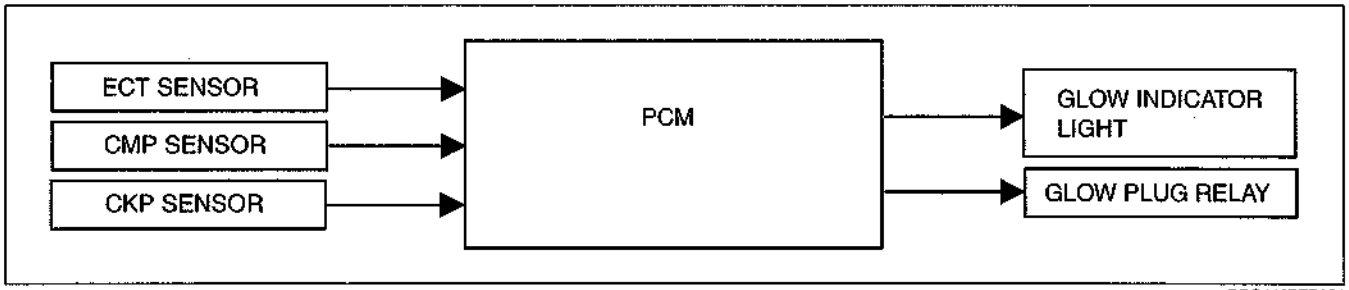

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GLOW CONTROL OPERATION [WL-C, WE-C]

dcf014000000t33

- The glow plug relay operates under the following conditions:
  — During preheating timer operation
  — During engine cranking
  — While outer glow is operating

Preheating Timer

- The PCM operates the glow plug relay for several seconds after the engine switch is turned to the ON position according to the engine coolant temperature. The higher the engine coolant temperature, the shorter the period of the timer operation.
- The glow indicator light illuminates during the preheating timer operation to inform the driver that the glow system is operating.

Glow Continuation Timer

- The PCM operates the glow plug relay for 120 s (max.). after the engine has been started with the engine coolant temperature lower than 32 °C {89.6 °F}. When the engine coolant temperature reaches 32 °C {89.6 °F} or more, the glow continuation timer is cancelled.

BOOST PRESSURE CONTROL OUTLINE [WL-C, WE-C]

dcf014000000t34

- The PCM duty-controls the VBC solenoid valve.
- By changing the opening angle of the guide blades (variable vanes) around the turbine impellers according to the engine driving conditions, turbocharger response, vehicle acceleration performance, and fuel consumption have been improved in every driving range.

BOOST PRESSURE CONTROL BLOCK DIAGRAM [WL-C, WE-C]

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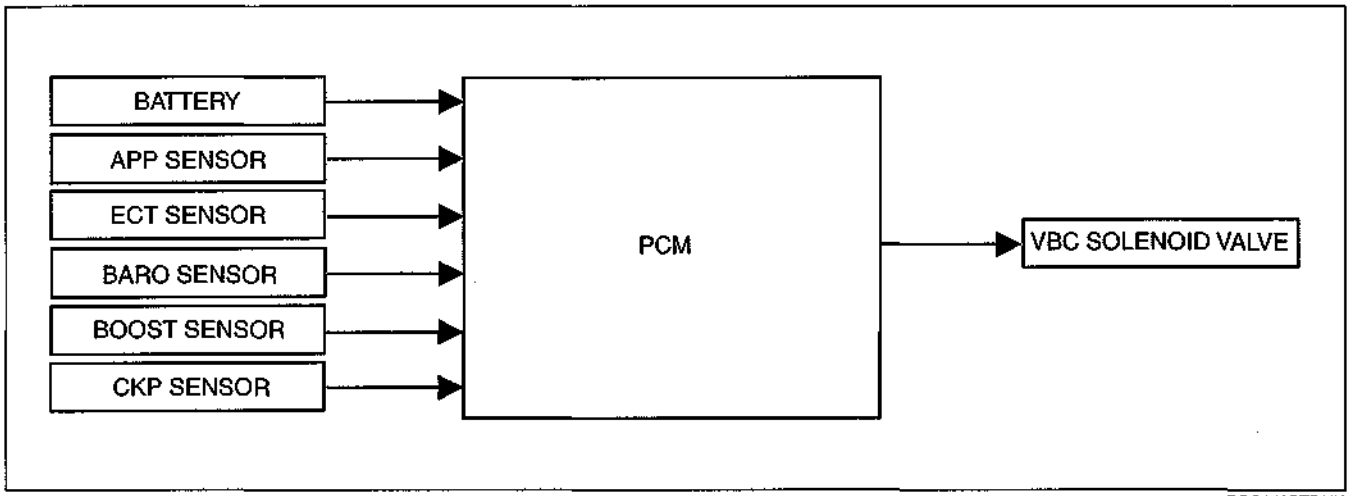

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BOOST PRESSURE CONTROL OPERATION [WL-C, WE-C]

dcf014000000t36

- The VBC solenoid valve is controlled by the variable boost control signal (duty signal) from the PCM. The longer the valve is ON, the higher the boost pressure becomes.
- The PCM performs feedback control by determining the period that the VBC solenoid valve is ON based on the engine speed and the fuel injection amount so that the optimum boost pressure can be obtained.
- Under driving conditions where more boost pressure is needed, the PCM sends the variable boost control signal to extend the ON period of the VBC solenoid valve, moving the guide blades in the turbocharger in the closing direction.
- Under driving conditions where less boost pressure is needed, the PCM sends the variable boost control signal to shorten the ON period of the VBC solenoid valve, moving the guide blades in the turbocharger in the opening direction.

FUEL INJECTION AMOUNT CONTROL OUTLINE [WL-C, WE-C]

dcf014000000t37

- The fuel injection amount is controlled by the opening of the nozzle in the fuel injector based on the signal from the PCM.
- The PCM corrects the variation in the fuel injection amount of each cylinder by inputting the fuel injector calibration code (or fuel injector calibration bar code) into the PCM.

FUEL INJECTION AMOUNT CONTROL BLOCK DIAGRAM [WL-C, WE-C]

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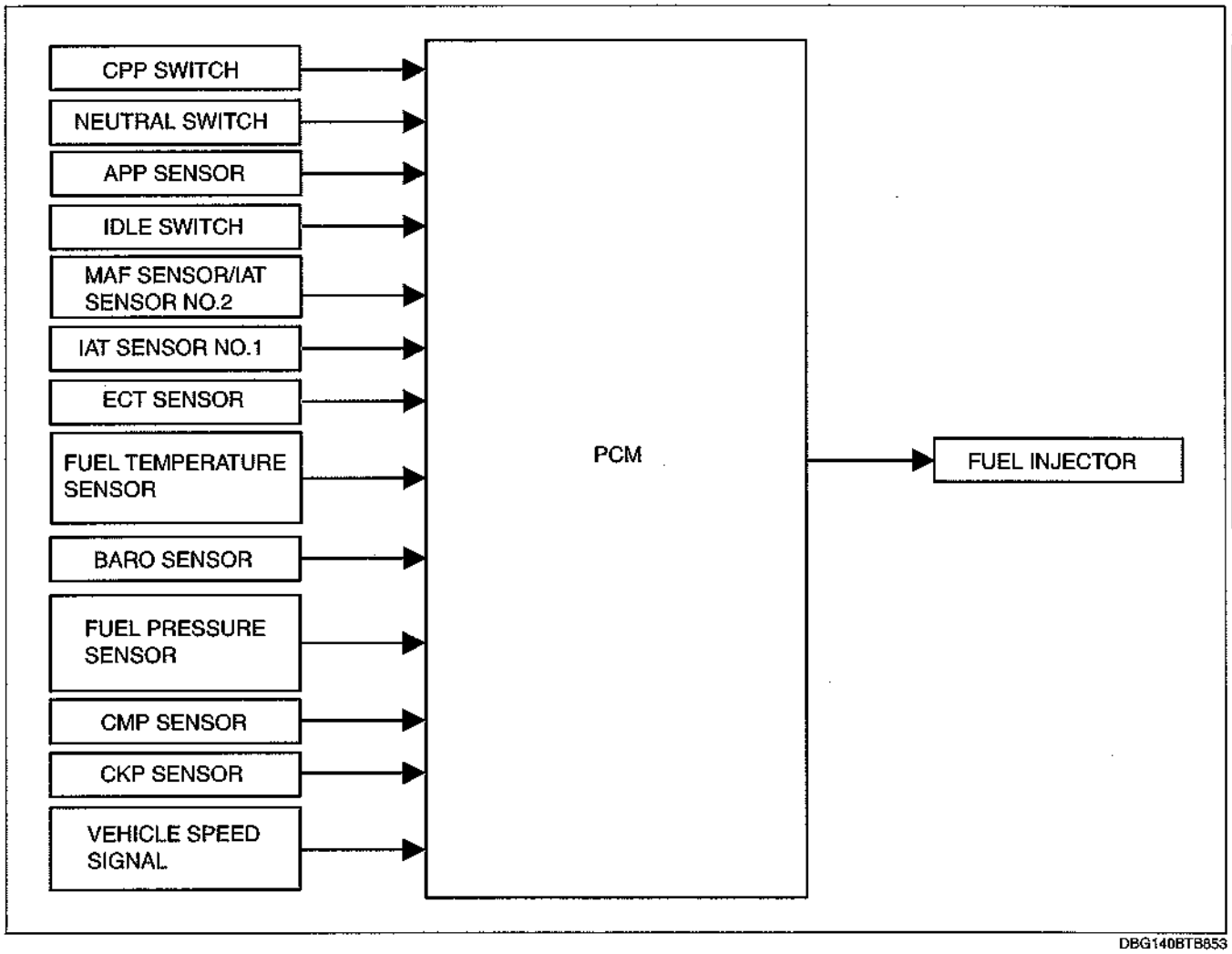

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FUEL INJECTION AMOUNT CONTROL OPERATION [WL-C, WE-C]

dcf014000000l39

Basic Injection Amount

Operation

- Fuel injection amount is controlled based on the fuel injector nozzle opening period.

Injection amount calculation

- The PCM calculates the optimum fuel injection amount according to engine operation conditions.
- The following two amount values are compared and the one of less amount is selected for the final injection amount.

Basic injection amount

- The logically necessary injection amount is calculated based on the accelerator opening angle and engine speed.

Maximum injection amount

- The maximum injection amount is calculated by correcting the basic injection amount based on driving conditions such as mass air flow, intake air temperature, and barometric pressure, intake air temperature and engine coolant temperature.

FUEL INJECTION TIMING CONTROL OUTLINE [WL-C, WE-C]

dcf014000000l40

- The PCM determines and controls the optimum fuel injection timing according to engine operation conditions based on the signals from each input sensor.

FUEL INJECTION TIMING CONTROL BLOCK DIAGRAM [WL-C, WE-C]

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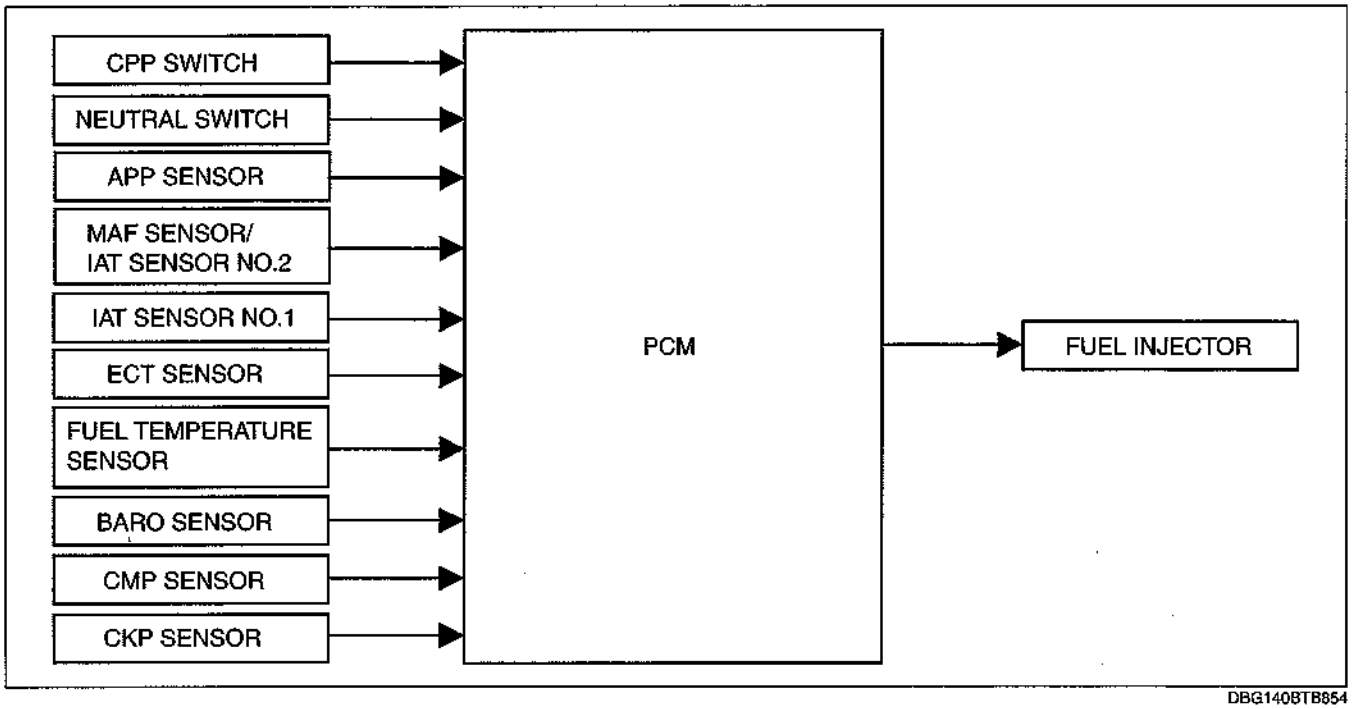

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FUEL INJECTION TIMING CONTROL OPERATION [WL-C, WE-C]

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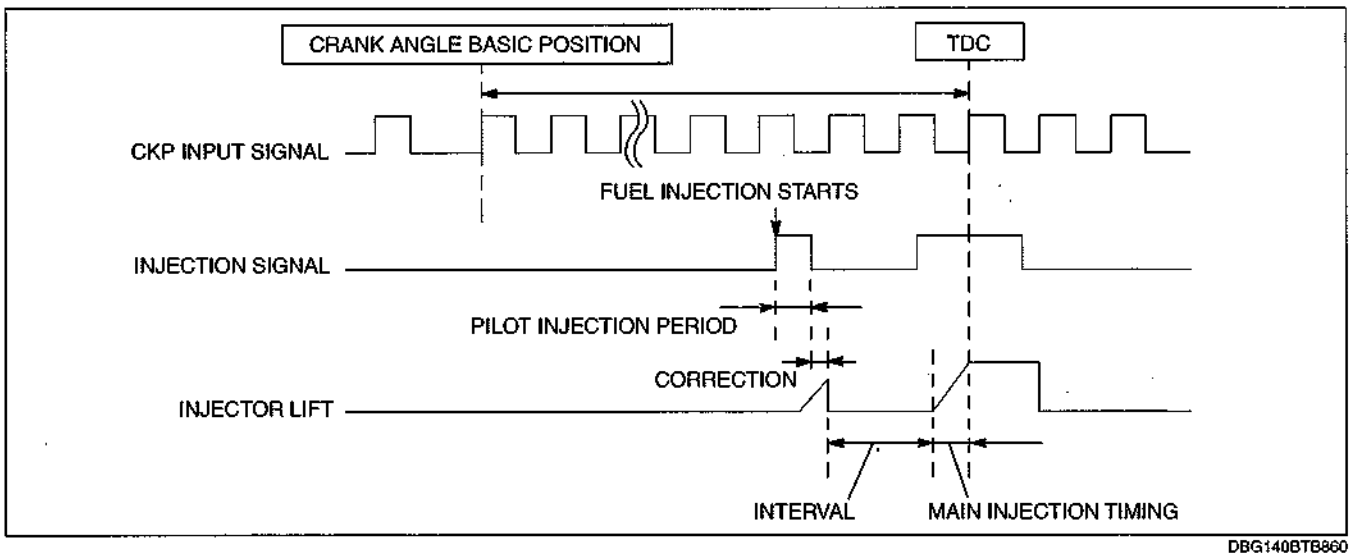
- Fuel injection start timing is determined based on the fuel injection amount and crank angle signals input from the crankshaft position sensor.



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Determination of Fuel Injection Timing

- The PCM calculates the optimum fuel injection timing based on the predetermined target fuel injection timing and input signals from each sensor.

Target Fuel Injection Timing

- Target fuel injection timing is calculated based on engine speed and fuel injection amount.

Injection Timing Correction

- Actual fuel injection timing is corrected based on the input signals from each sensor such as intake air temperature, engine coolant temperature, and barometric pressure.

MULTIPLE FUEL INJECTION CONTROL OUTLINE [WL-C, WE-C]

dcf014000000t43

- Pilot injection: To reduce noise and NOx, the PCM performs multiple fuel injections before the main injection according to the vehicle driving conditions.

MULTIPLE FUEL INJECTION CONTROL BLOCK DIAGRAM [WL-C, WE-C]

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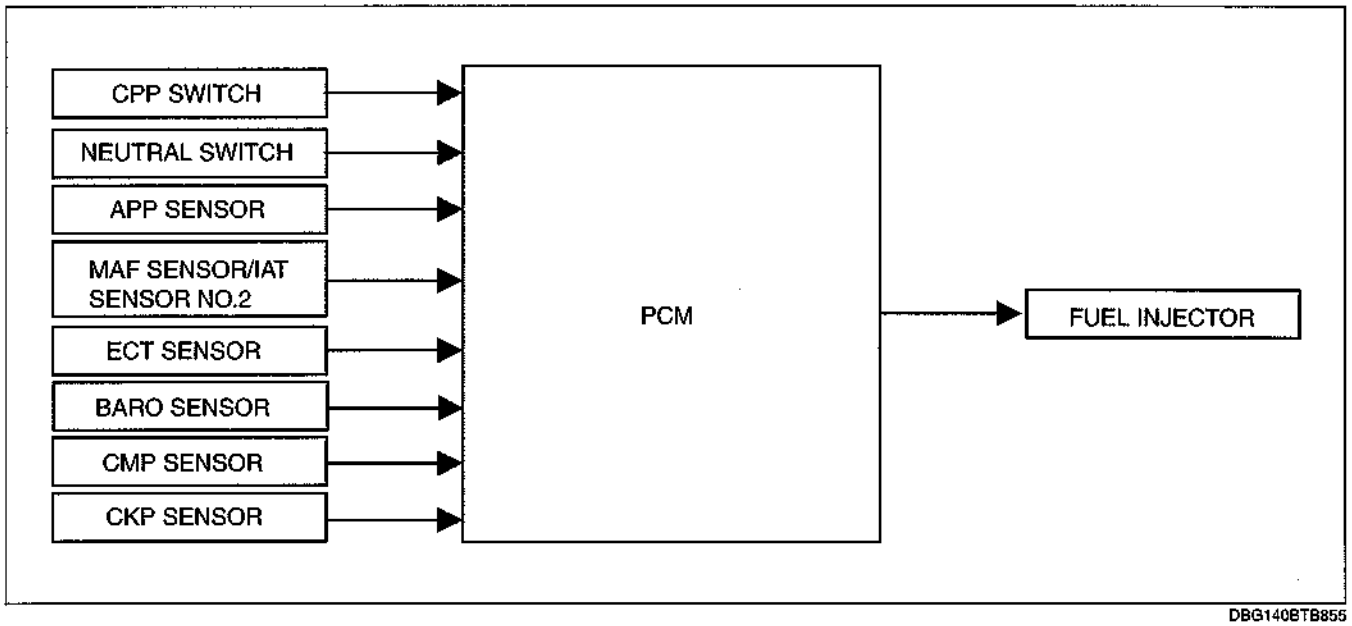

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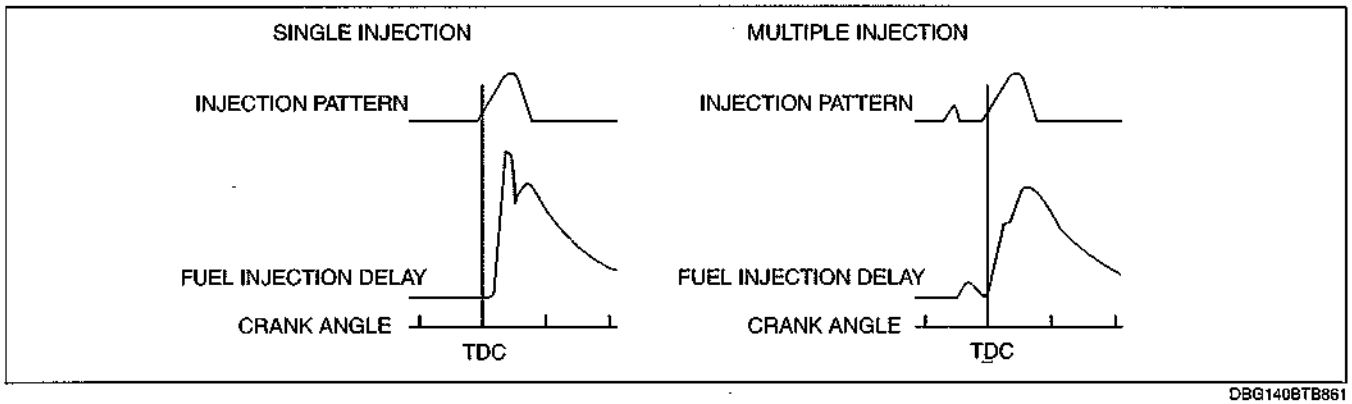
MULTIPLE FUEL INJECTION CONTROL OPERATION [WL-C, WE-C]

dcf014000000t45

Function

- In single injection, ignition delay becomes longer and much fuel is injected before ignition since the ignition has started. Therefore, the fuel is combusted rapidly at a high temperature and a high pressure, resulting in increased noise and NOx.
- To prevent this, the PCM performs multiple fuel injection. Due to this, the fuel is combusted slowly and the occurrence of noise and NOx is suppressed.



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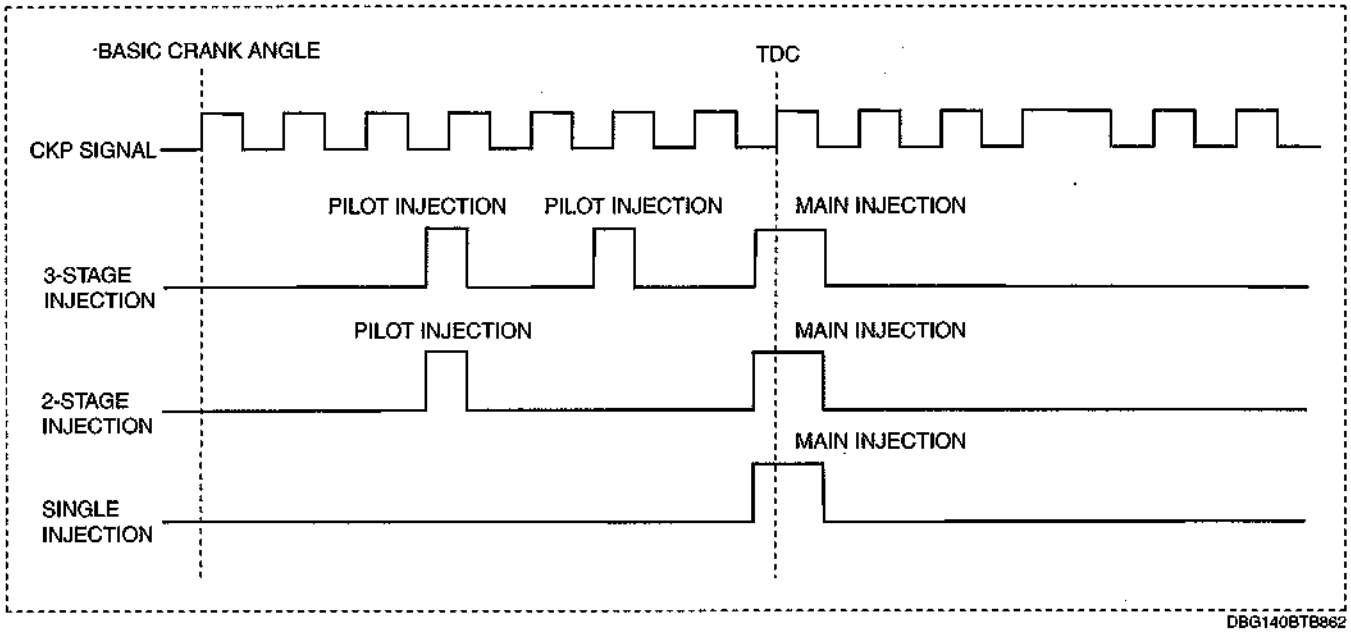
Operation

- Injection patterns of the multistage injection control according to the combination of injection times are shown in the figure. The PCM selects the optimum injection pattern based on the vehicle conditions and performs injection for 3 times at maximum.
- While in a driving condition at low engine speed and low engine load, the fuel injection time is increased up to 3 times to reduce knocking noise which occurs during combustion.
- While in a driving condition at high engine speed and high engine load, the fuel injection time is reduced to one time at minimum to improve output and fuel economy.



Operation condition

- The PCM determines the number of times fuel injection occurs based on the engine speed, fuel injection amount, and signals from each sensor.
- When the engine is started, the PCM calculates the number of times fuel injection occurs based on the engine coolant temperature, engine speed and fuel injection amount.

FUEL PRESSURE CONTROL OUTLINE [WL-C, WE-C]

dcf014000000t46

- The PCM performs the feedback control of the fuel pressure in the common rail to gain optimum fuel injection pressure according to engine operation conditions.
- Because the fuel pressure can be controlled regardless of engine operation conditions, high pressure fuel injection even with low engine speed is possible. Due to this, generation of NOx and particulate matter can be reduced.

FUEL PRESSURE CONTROL BLOCK DIAGRAM [WL-C, WE-C]

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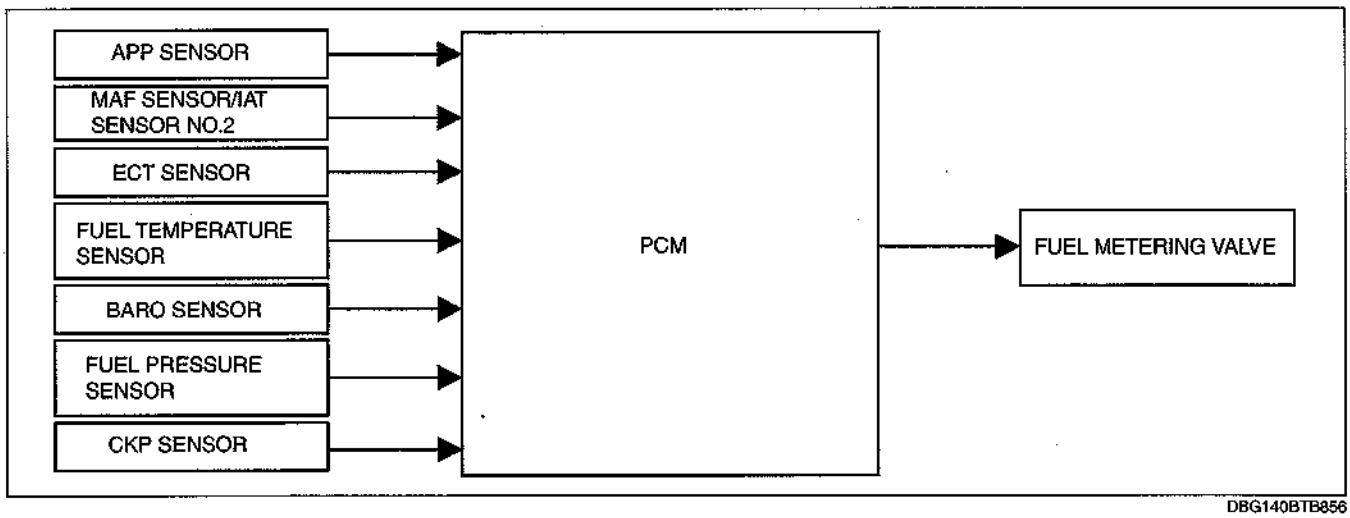

FUEL PRESSURE CONTROL OPERATION [WL-C, WE-C]

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- The PCM calculates the target fuel pressure based on the engine speed and fuel injection amount.
- The PCM operates the fuel metering valve which is installed to the supply pump to adjust the fuel pressure in the common rail to the target fuel pressure.
- By controlling the amount of pumped fuel from the supply pump with the fuel metering valve, the fuel pressure in the common rail is controlled and a constant, optimum injection pressure has been realized.

EGR CONTROL OUTLINE [WL-C, WE-C]

dcf014000000l49

- The PCM controls duty-cycle type solenoid valves and an ON/OFF type solenoid valve to control the EGR valve in order to obtain the optimum EGR amount for the actual engine operating condition. Due to this, emission performance and driveability has been improved.
- When introducing the exhaust gas during low engine speed, the PCM controls the intake shutter solenoid valve (half) to control the intake shutter valve opening angle. Thus the exhaust gas is channelled into the combustion chamber efficiently. Due to this, emission performance and driveability has been improved. (WE-C)
- As the MAF sensor deteriorates and an error margin is created between the target and the actual intake air amount, the PCM conducts learning and correction.

EGR CONTROL BLOCK DIAGRAM [WL-C, WE-C]

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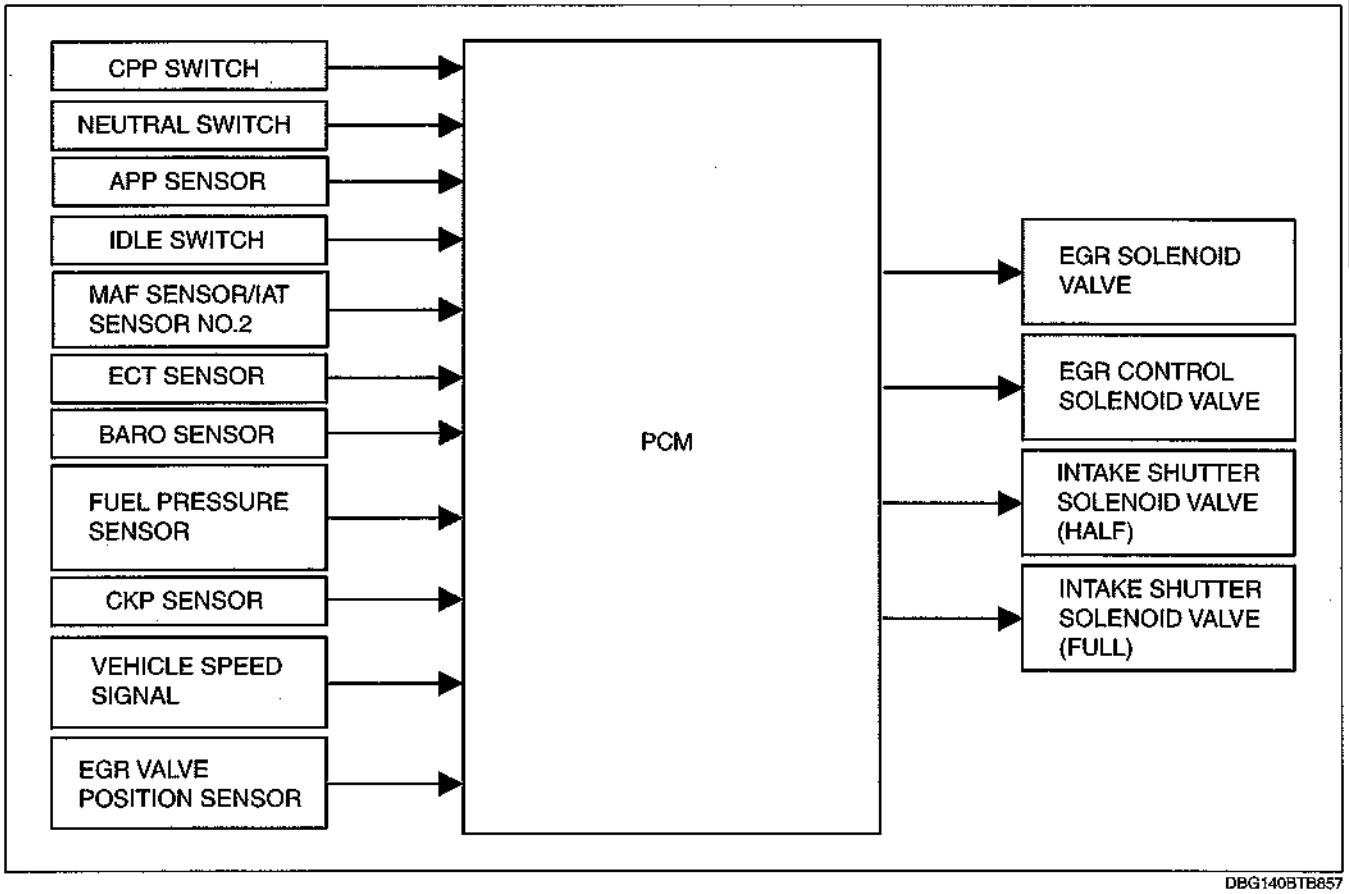

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EGR CONTROL OPERATION [WL-C, WE-C]

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EGR Valve Operation

- To improve emission performance, target EGR valve position is decided based on intake air flow, engine speed, engine coolant temperature and fuel injection amount.
- The flow amount of the EGR is calculated from the difference between the following amounts.
  - — Target intake air amount that is mainly calculated from engine speed and fuel injection amount
  - — Actual intake air amount that is mainly detected by MAF sensor/IAT sensor No.2
- The PCM controls the vacuum applied to the EGR valve by opening and closing a two-duty solenoid valve.

Intake Shutter Valve Operation

Close condition

- The PCM turns on the intake shutter solenoid valve (half) and the intake shutter solenoid valve (full) in order to close the intake shutter valve when the engine switch is at OFF.

Halfway open condition (WE-C)
- The PCM turns the intake shutter solenoid valve (half) on when all of the following conditions are met.
  - — Engine coolant temperature is above threshold level.
  - — Intake air temperature is threshold level.
  - — Barometric pressure is above threshold level.
  - — Engine speed is below threshold level.
  - — Vehicle speed is below threshold level.
  - — Fuel injection amount is below threshold level.

Full open condition
- For conditions other than closed and halfway open, the PCM turns off the intake shutter solenoid valve (half) and the intake shutter solenoid valve (full) in order to open the intake shutter valve.

MAF Learning
- After learning is initiated, the PCM calculates the actual intake air amount for the complete learning period.
- The PCM calculates the deviation between the target and actual intake air amount, then, based on the deviation, derives the learning factor. The PCM stores the learning factor and uses it to correct the intake air amount. Due to this, the error margin of the MAF sensor is resolved. If the deviation factor is less than the specified amount, the PCM does not calculate nor update the learning factor.
- The PCM stores the learning factor until the next time the factor is updated. The factor is erased using the M-MDS.

Using the M-MDS for learning
- By using the M-MDS, the learning function can be freely controlled. Due to this, even if the PCM or MAF sensor/IAT sensor No.2 is replaced, the learning factor can be stored again.
- When using the M-MDS to control the MAF learning function, learning is performed at the following three engine speed levels.
  - — 720 rpm
  - — 1,850 rpm
  - — 2,500 rpm

Without using the M-MDS for learning
- By shorting circuit the DLC terminal TEN five times within 5 s, the learning function can be freely controlled. Due to this, even if the PCM or MAF sensor/IAT sensor No.2 is replaced, the learning factor can be stored again.
- The glow indicator light illuminates while MAF learning is performed, and flashes five times after it is completed.

A/C CUT-OFF CONTROL OUTLINE [WL-C, WE-C]

dcf014000000t52

- The A/C relay is turned on and off according to engine operation conditions to improve drivability.

A/C CUT-OFF CONTROL BLOCK DIAGRAM [WL-C, WE-C]

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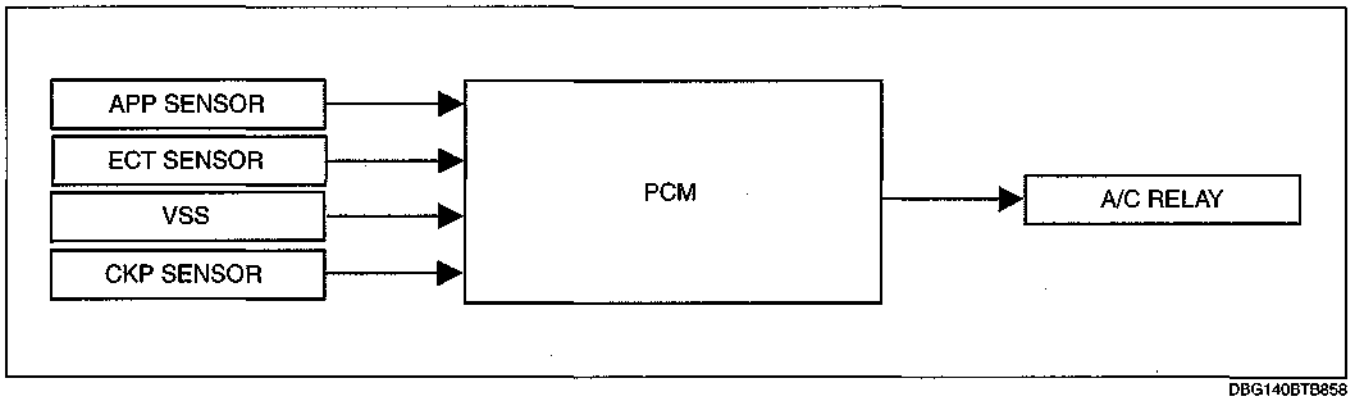

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A/C CUT-OFF CONTROL OPERATION [WL-C, WE-C]

dcf014000000t54

- When the accelerator opening angle is 87.5 % or more, the PCM cuts the power supply to the A/C relay for 3 s.
- When the engine coolant temperature is 113 °C {235 °F} or more, the PCM turns off the power supply to the A/C relay until the engine coolant temperature is less than 110 °C {230 °F}.

IMMOBILIZER SYSTEM OUTLINE [WL-C, WE-C]

dcf014000000t55

- While the immobilizer system is operating, the PCM cuts off fuel delivery and stops pressure feeding fuel to the common rail.

IMMOBILIZER SYSTEM BLOCK DIAGRAM [WL-C, WE-C]

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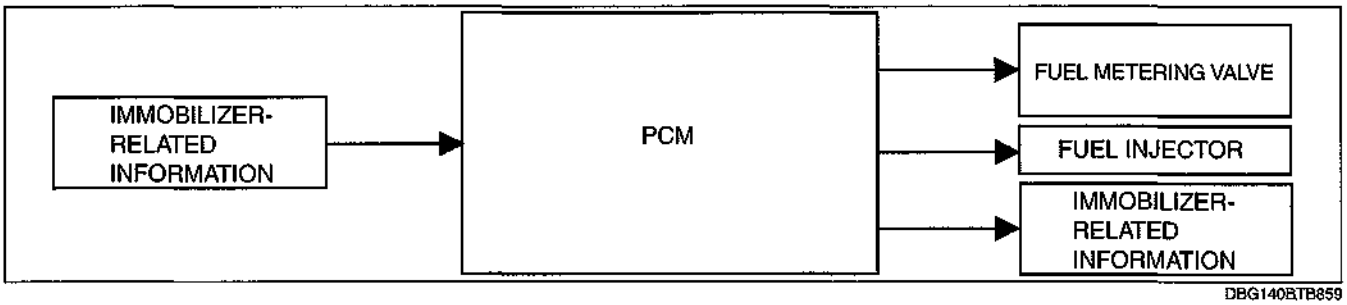

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IMMOBILIZER SYSTEM OPERATION [WL-C, WE-C]

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- When the immobilizer system is activated, the following controls are carried out.
  - — Fuel injector: OFF (Set fuel quantity to zero.)
  - — Fuel metering valve: ON (Set minimum common rail pressure.)

PCM FUNCTION [WL-C, WE-C]

dcf014018880t03

Function Table

- Control descriptions are as follows:

Function	Contents
Idle speed control	Performs feedback control of idle speed by calculating fuel injection amount so that idle speed is at target idle speed corresponding to driving conditions.
Glow control	Controls glow plug operation time via glow plug relay to improve engine startability.
Boost pressure control	Controls turbocharger guide blade angle according to engine operation conditions to improve turbocharger response, acceleration performance, and fuel economy.
Fuel injection amount control	Performs optimum fuel injection according to engine operation conditions by controlling signals to open/close fuel injector nozzle.
Fuel injection timing control	Controls optimum fuel injection timing according to engine operation conditions.
Multiple fuel injection control	Performs multiple fuel injection according to engine operation conditions to reduce noise and NOx.
Fuel pressure control	Adjusts to optimum fuel pressure according to engine operation conditions.
Intake shutter valve control	Adjusts intake shutter valve to optimum opening angle according to engine operation conditions.
EGR control	Controls EGR valve so that EGR volume is optimized according to engine operation conditions.
A/C cut-off control	Controls operation of A/C according to engine operation conditions to assure drivability.
Immobilizer system	Inhibits engine starting by cutting fuel injection and pressure feeding fuel to common rail when immobilizer system is activated.

PCM CONSTRUCTION [WL-C, WE-C]

dcf014018880t04

- A 154-pin (two block) PCM connector has been adopted.
- The PCM has a built into piezoelectric element BARO sensor.

MASS AIR FLOW (MAF) SENSOR FUNCTION [WL-C, WE-C]

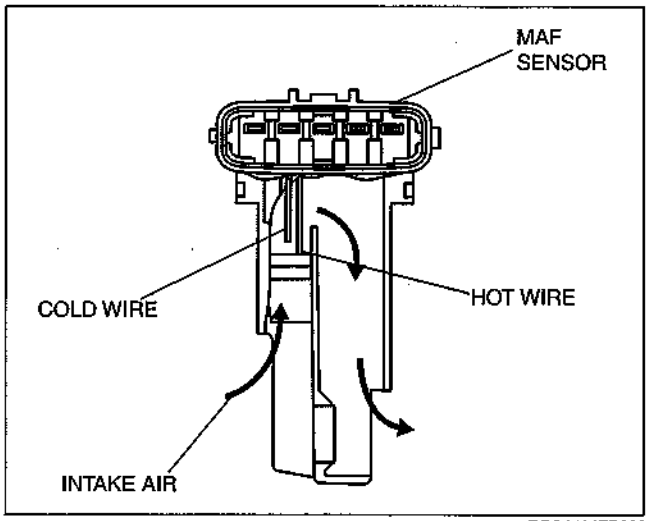
dcf014013215i03

- Detects the intake air amount (mass airflow amount).

MASS AIR FLOW (MAF) SENSOR CONSTRUCTION/OPERATION [WL-C, WE-C]

dcf014013215i04

- Installed to the air cleaner.
- With built-in IAT sensor No.2
- Converts the mass intake airflow amount to voltage.
- When the temperature of the metal decreases, the resistance decreases. Using this characteristic, the hot wire captures heat from the flow of intake air and converts the intake airflow amount to voltage.
- The cold wire converts intake air density to voltage from the ambient temperature of the cold wire, using the characteristic of air whereby the intake air density decreases due to the increase in intake air temperature.
- The voltages obtained by the hot wire (intake airflow amount) and the cold wire are compared and the electric potential becomes stable by supplying the difference in voltage to the transistor. The voltage supplied to the hot wire is output as the mass intake airflow amount.



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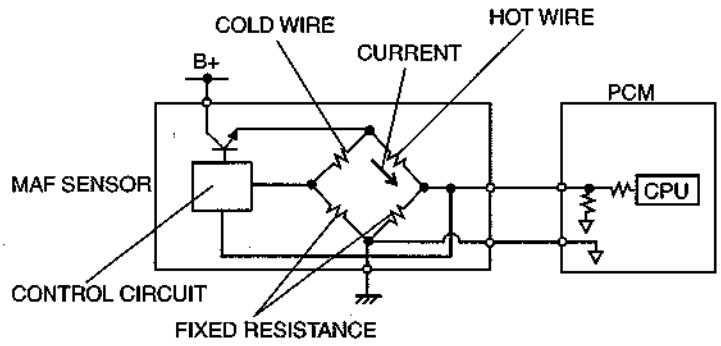
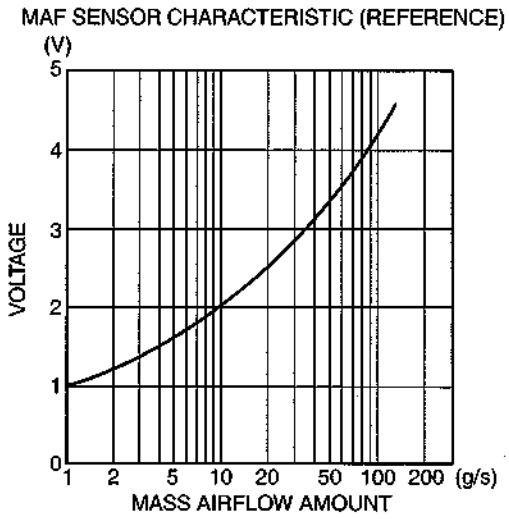




DBG140ATB304

INTAKE AIR TEMPERATURE (IAT) SENSOR NO.2 FUNCTION [WL-C, WE-C]

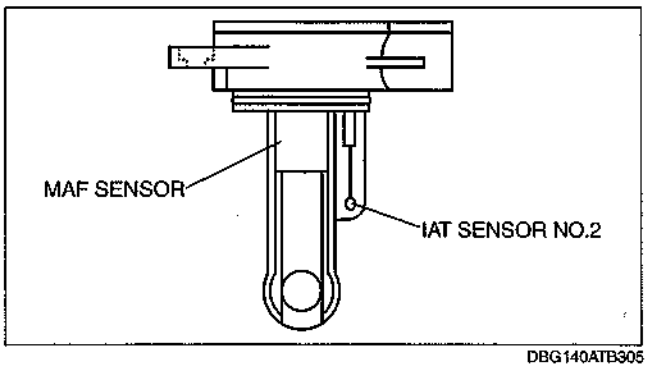
dcf014018842t05

- Detects the intake air temperature, and sends it to the PCM as an intake air temperature signal.

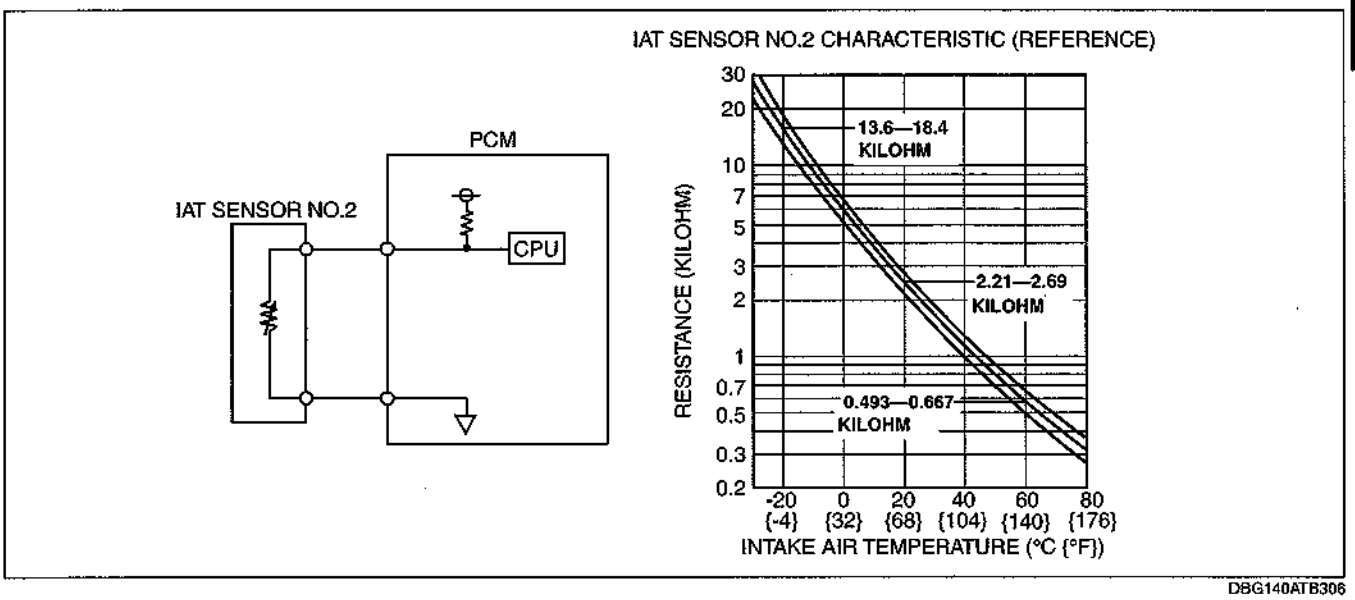
INTAKE AIR TEMPERATURE (IAT) SENSOR NO.2 CONSTRUCTION/OPERATION [WL-C, WE-C]

dcf014018842t06

- Installed to the air cleaner.
- Built into the mass airflow sensor.
- The thermistor type IAT sensor No.2 changes resistance according to the intake air temperature.
- The resistance decreases if the intake air temperature increases and, conversely, increases if the intake air temperature decreases.



DBG140ATB305



DBG140ATB306

INTAKE AIR TEMPERATURE (IAT) SENSOR NO.1 FUNCTION [WL-C, WE-C]

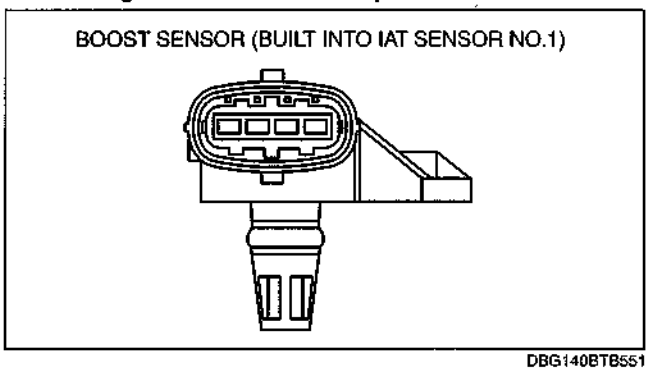
dcf014018842t07

- The IAT sensor No.1 detects the intake air temperature which has passed through the charge air cooler, and sends it to the PCM as an intake air temperature signal.

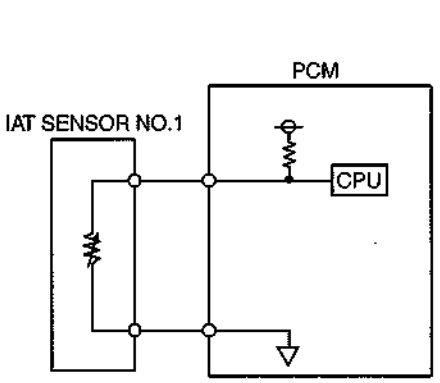
INTAKE AIR TEMPERATURE (IAT) SENSOR NO.1 CONSTRUCTION/OPERATION [WL-C, WE-C]

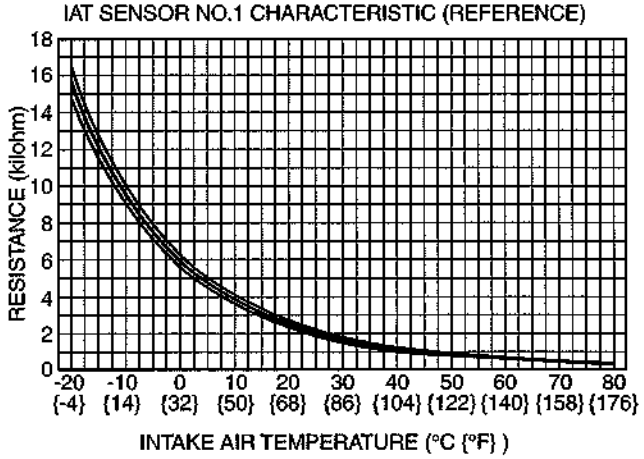
dcf014018842t08

- Built into the boost sensor.
- The boost sensor is installed to the intake manifold.
- The thermistor type IAT sensor No.1 changes resistance according to the intake air temperature.
- The resistance decreases if the intake air temperature increases and, conversely, increases if the intake air temperature decreases.



DBG140BTB551





DBG140BTB302

BOOST SENSOR FUNCTION [WL-C, WE-C]

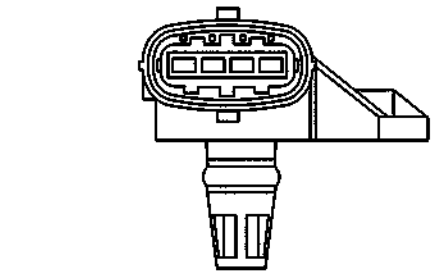
dcf014018212t03

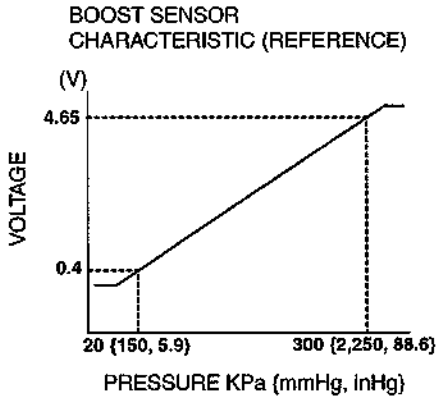
- The boost sensor detects the intake air pressure as an absolute pressure, and sends it to the PCM as an intake air pressure signal.

BOOST SENSOR CONSTRUCTION/OPERATION [WL-C, WE-C]

dcf014018212t04

- The boost sensor is installed to the intake manifold.
- The boost sensor is filled with crystal (silicon) and it is the semi-conductor pressure sensor which utilizes the characteristic of the electrical resistance that changes when the crystal is pressurized.
  *Absolute pressure is the pressure when vacuum is set as **0 kPa {0 mmHg, 0 inHg}**.
- With built-in IAT sensor No.2



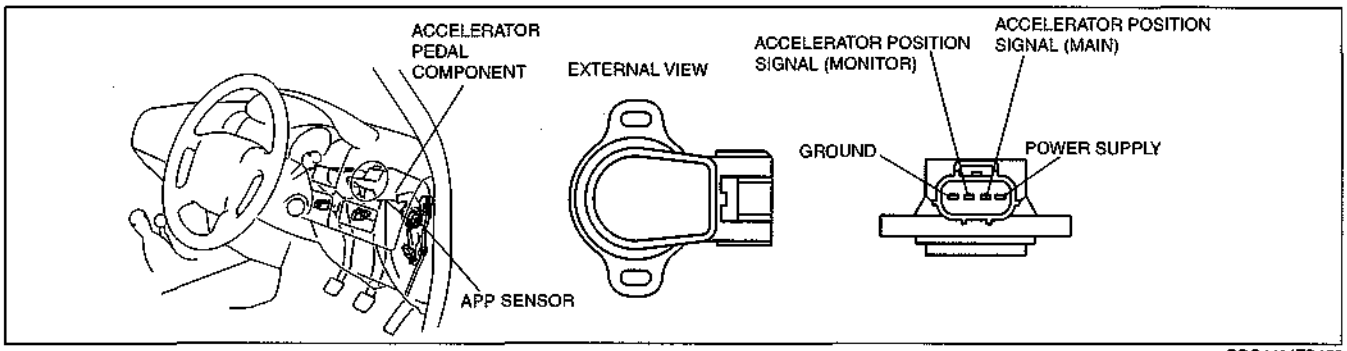


DBG140BTB301

ACCELERATOR PEDAL POSITION (APP) SENSOR FUNCTION [WL-C, WE-C]

dcf014041609t03

- The APP sensor is installed on the accelerator pedal, and detects how much the accelerator pedal is being depressed from the change in the resistance value (variable resistance).

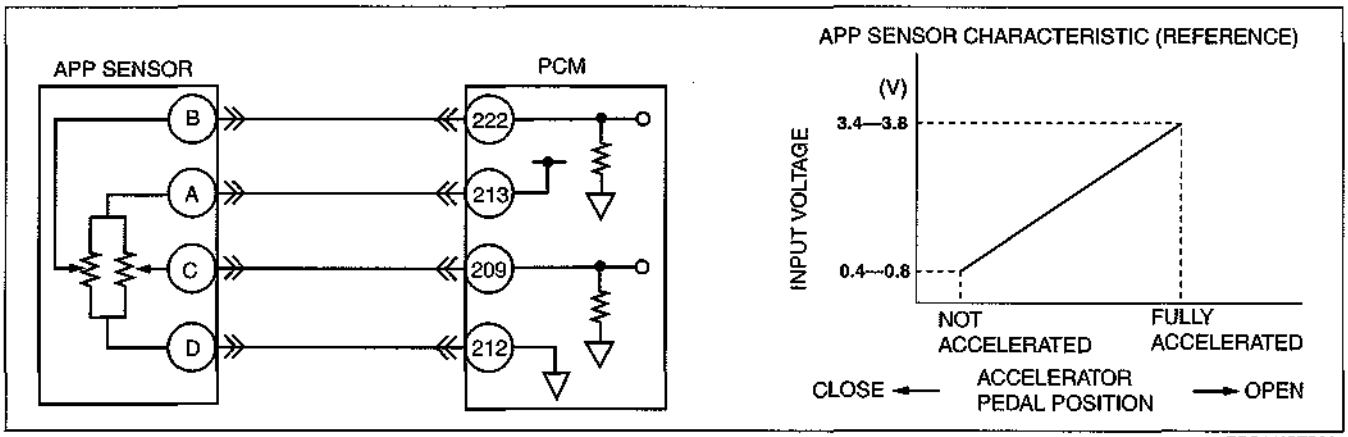


DBG140ATB459

ACCELERATOR PEDAL POSITION (APP) SENSOR DESCRIPTION [WL-C, WE-C]

dcf014041609t04

- The APP sensor is a potentiometer type and works is the same way as the throttle position sensor.
- The APP sensor contains two circuits for detecting accelerator position: main circuit and monitor circuit. The main circuit is used for the controls operated by the PCM (e.g. fuel injection amount control). The monitor circuit is used for detecting malfunctions in the APP sensor.
- When voltage difference between the main and monitor circuits increases, the PCM determines that the APP sensor is malfunctioning and stores DTC. Thus, a detection condition item has been added to DTC.
- The input voltage characteristic of the APP sensor is as shown.

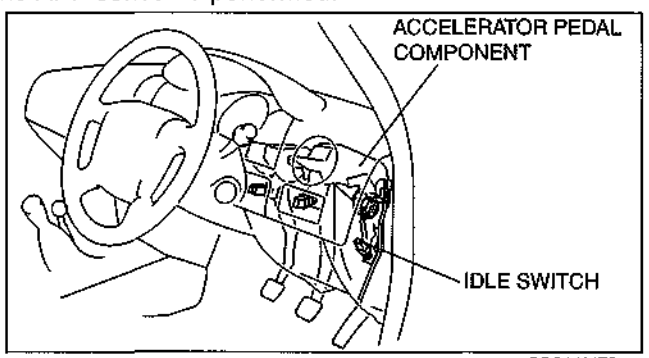


DBG140BTB307

IDLE SWITCH FUNCTION [WL-C, WE-C]

dcf014066470t03

- The idle switch is mounted to the accelerator pedal and inputs to the PCM whether the accelerator pedal is depressed or released. The PCM detects the idle switch signal as an idle signal.
- The idle signal inputted to the PCM is compared with the accelerator opening signal detected from the APP sensor, and on-board diagnostic of the idle switch and the APP sensor is performed.

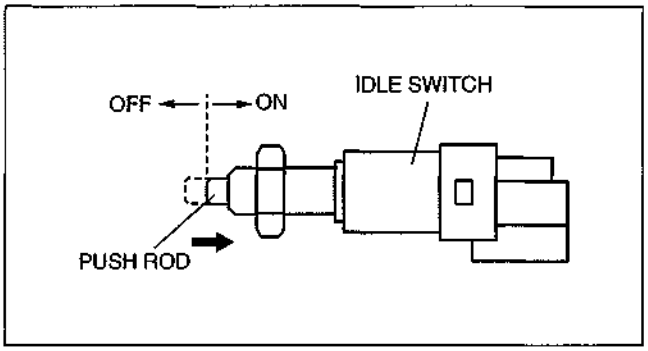


DBG140ATB002

IDLE SWITCH DESCRIPTION [WL-C, WE-C]

dcf014066470t04

- When the push rod is pushed in (the accelerator pedal is released) a preset amount, the contact of the idle switch closes, and the PCM determines that the engine is idling. When the contact of the idle switch is open (OFF), the PCM determines that the engine is not idling.



DBG140ATB455

FUEL TEMPERATURE SENSOR FUNCTION [WL-C, WE-C]

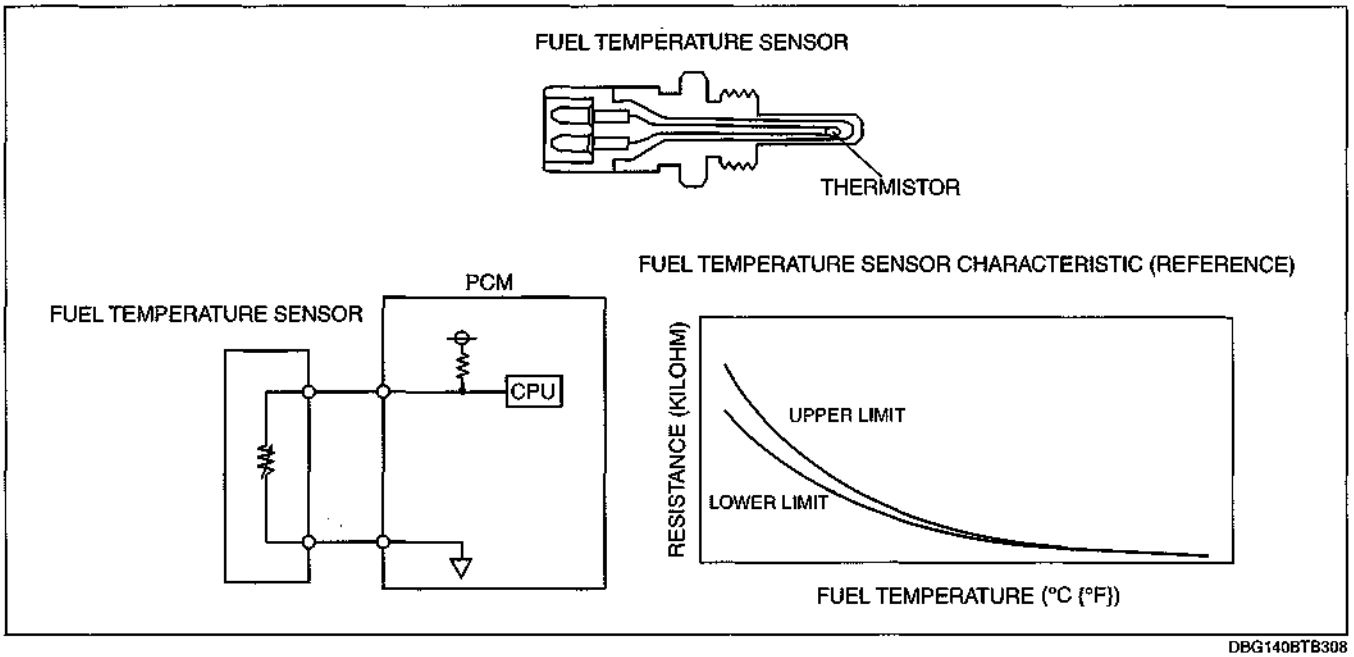
dcf014018843t03

- The fuel temperature sensor detects fluctuations in resistance of the thermistor to detect the fuel temperature which is necessary for the fuel injection amount correction.

FUEL TEMPERATURE SENSOR CONSTRUCTION/OPERATION [WL-C, WE-C]

dcf014018843t04

- Installed to the supply pump.
- The thermistor type fuel temperature sensor changes resistance according to the fuel temperature.
- The resistance decreases if the fuel temperature increases and, conversely, increases if the fuel temperature decreases.



DBG140BTB308

FUEL PRESSURE SENSOR FUNCTION [WL-C, WE-C]

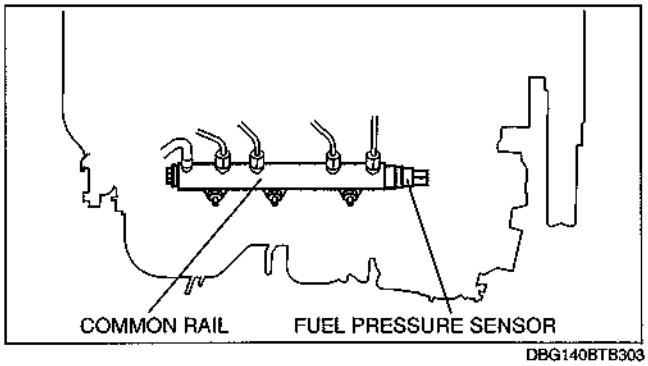
dcf014018213t01

- Measures the fuel pressure in the common rail.
- Measured fuel pressure is used for the fuel pressure control.

FUEL PRESSURE SENSOR CONSTRUCTION/OPERATION [WL-C, WE-C]

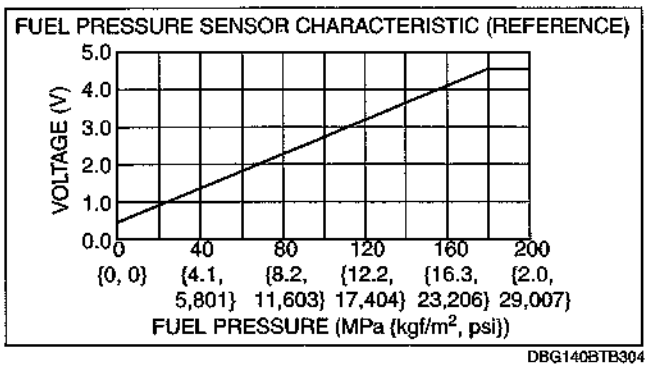
dcf014018213t02

- Installed on the common rail.



DBG140BTB303

- Converts the fuel pressure in the common rail to a voltage signal and outputs it to the PCM.



DBG140BTB304

ENGINE COOLANT TEMPERATURE (ECT) SENSOR FUNCTION [WL-C, WE-C]

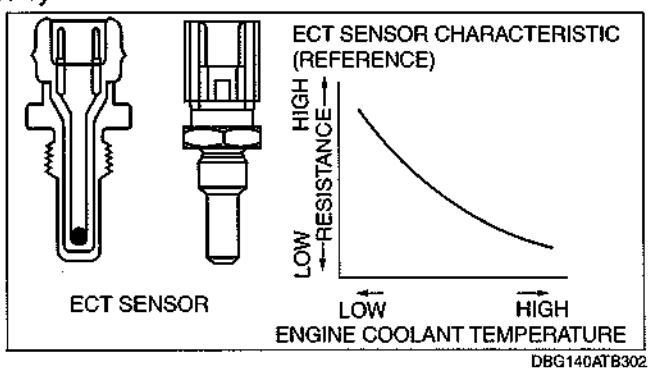
dcf014018841t03

- The ECT sensor detects the engine coolant temperature.

ENGINE COOLANT TEMPERATURE (ECT) SENSOR CONSTRUCTION/OPERATION [WL-C, WE-C]

dcf014018841t04

- The ECT sensor is thermistor type, and is installed in the cylinder head.
- The ECT sensor inputs the thermistor resistance, which changes according to the engine coolant temperature, to the PCM as a voltage.



DBG140ATB302

CAMSHAFT POSITION (CMP) SENSOR FUNCTION [WL-C, WE-C]

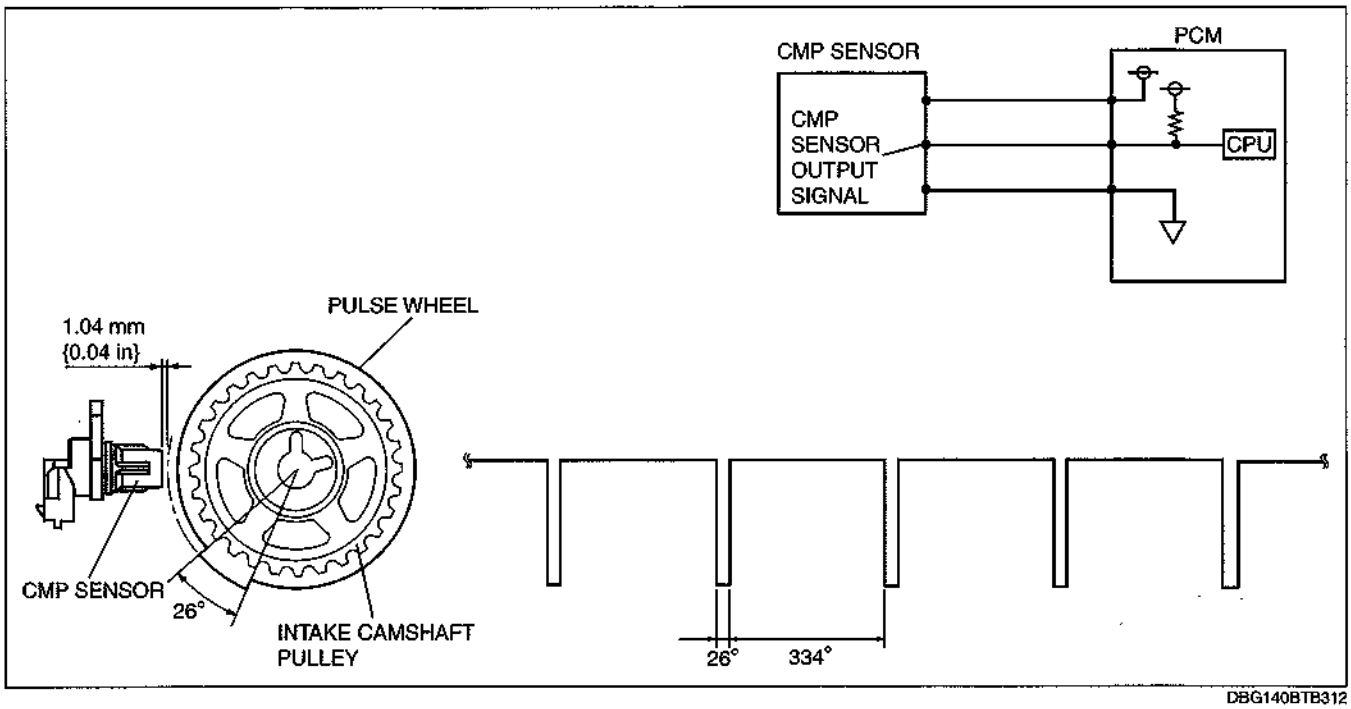
dcf014018230t01

- The CMP sensor detects pulse wheel of intake camshaft pulley rotational signals as cam angle signals.

CAMSHAFT POSITION (CMP) SENSOR CONSTRUCTION/OPERATION [WL-C, WE-C]

dcf014018230l02

- The CMP sensor is installed on the cylinder head on the front side of engine.
- The CMP sensor consists of a Hall element with a magnetic sensor, and a processing circuit that performs signal amplification and identification.
- CMP sensor is a hall-element type and it detects hall voltage generated by the change in magnetic flux of the magnet inside the sensor and hall element as the camshaft angle signal.
- One pulse are detected per one rotation of the camshaft by the projections on the intake camshaft pulley.
- If the CMP sensor is removed/installed or replaced, magnetized objects such as metal shavings adhering to the sensor could cause fluctuation in the magnetic flux of the magneto resistance element, causing abnormal sensor output which could adversely affect engine control.



DBG140BTB312

CRANKSHAFT POSITION (CKP) SENSOR FUNCTION [WL-C, WE-C]

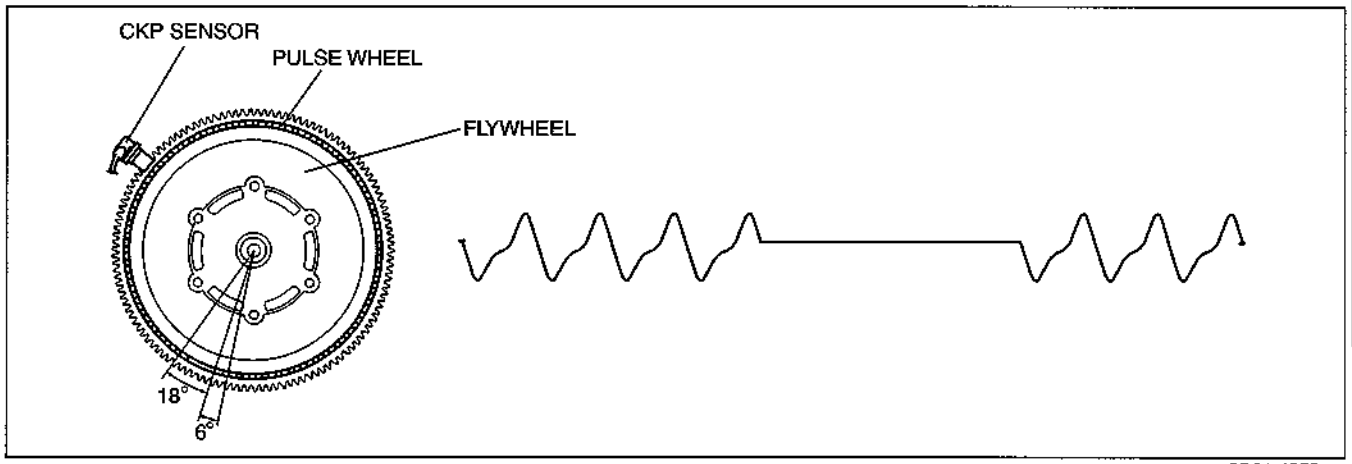
dcf014018220t03

- The CKP sensor detects pulse wheel rotational signals as crank angle signals.

CRANKSHAFT POSITION (CKP) SENSOR CONSTRUCTION/OPERATION [WL-C, WE-C]

dcf014018220t04

- The CKP sensor is installed to the clutch housing.
- The pulse wheel which is installed to the dual-mass flywheel has 58 projections and spaces with 6° of crank angle between each projection.
- The fluctuation in magnetic flux density detected by the magnetic pickup coil in the crankshaft position sensor is input to the PCM as a sensor output signal.
- If the crankshaft position sensor is removed/installed or replaced, magnetized objects such as metal shavings adhering to the sensor could cause fluctuation in the magnetic flux of the magnetic pickup coil, causing abnormal sensor output which could adversely affect engine control.

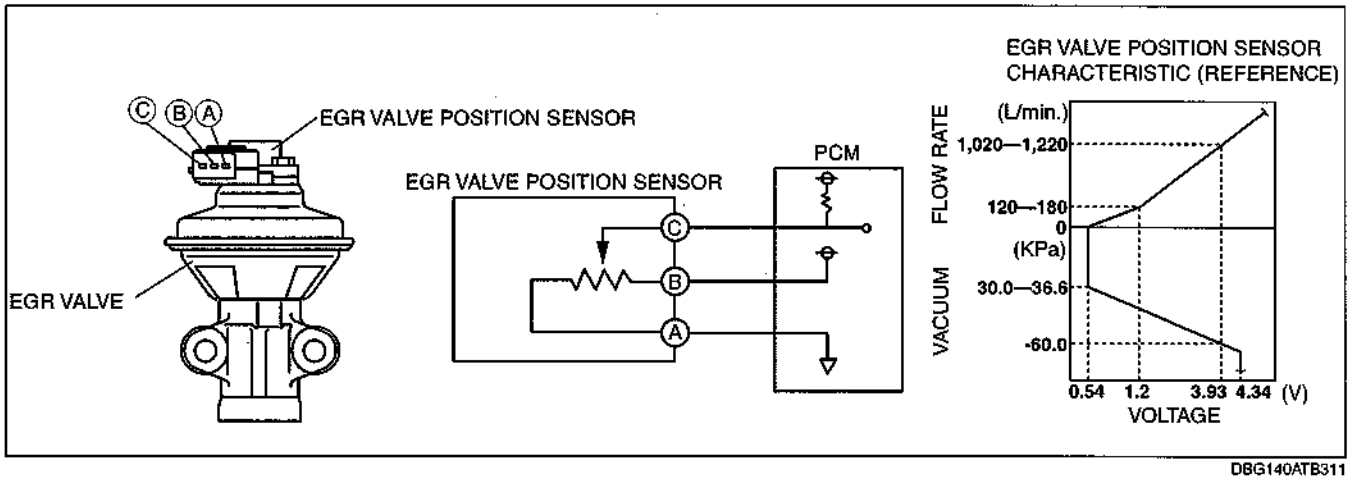


DBG140BTB313

EGR VALVE POSITION SENSOR FUNCTION [WL-C, WE-C]

dcf014020300t02

- The EGR valve position sensor measures EGR valve lift amount and sends signal to the PCM, allowing the PCM to diagnose a EGR system malfunction when there is a discrepancy between target and actual opening angles of the EGR valve.



DBG140ATB311

CLUTCH PEDAL POSITION (CPP) SWITCH FUNCTION [WL-C, WE-C]

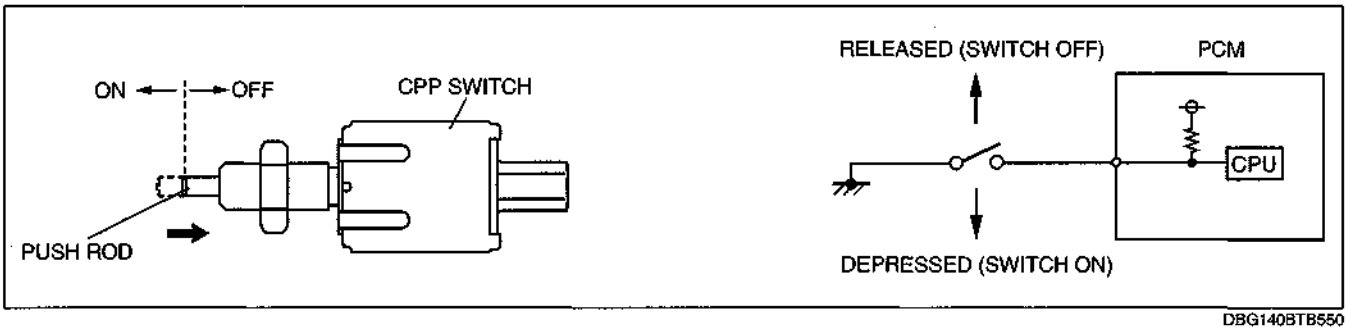
dcf014018660t03

- The CPP switch detects the clutch connection condition.

CLUTCH PEDAL POSITION (CPP) SWITCH DESCRIPTION [WL-C, WE-C]

dcf014018660t04

- The CPP switch is mounted to the top of the clutch pedal. When the clutch pedal is depressed, the contact of the CPP switch closes (ON) and the PCM detects below 1.0V. When the clutch pedal is released, the contact opens (OFF) and the PCM detects B+.



DBG140BTB550

NEUTRAL SWITCH FUNCTION [WL-C, WE-C]

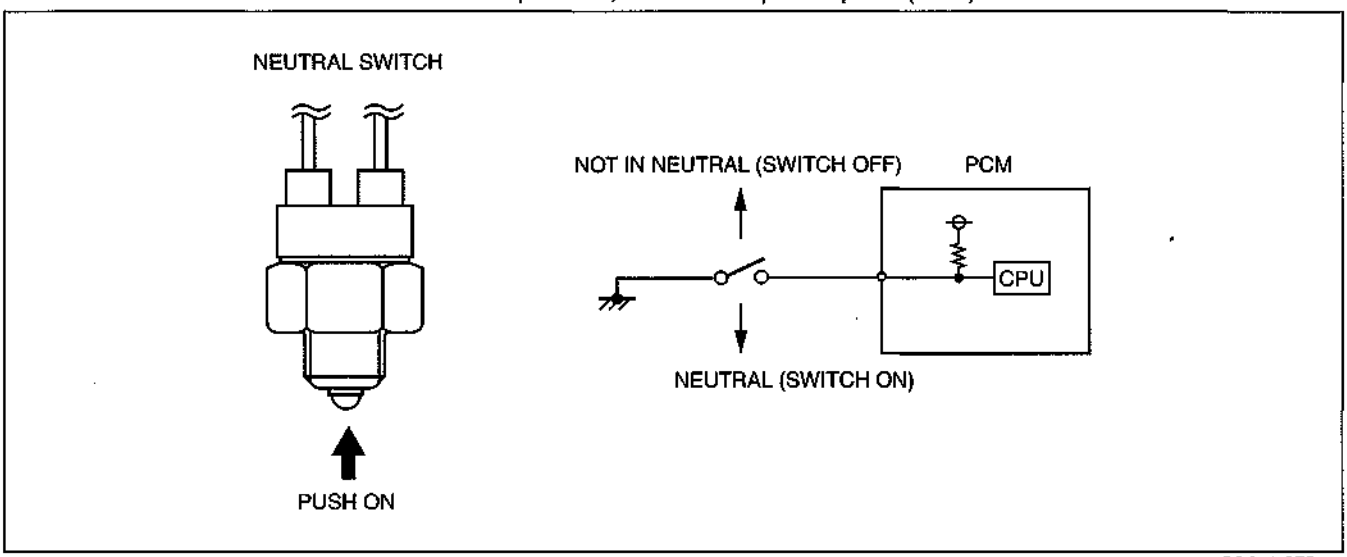
dcf014017640t03

- Detects shift lever neutral position.

NEUTRAL SWITCH CONSTRUCTION/OPERATION [WL-C, WE-C]

dcf014017640t04

- While the shift lever is in the neutral position, the contact point closes (ON) and the PCM detects below 1.0 V. While the shift lever is not in the neutral position, the contact point opens (OFF) and the PCM detects B+.



DBG140BTB305

SUSPENSION

02
SECTION

OUTLINE 02-00
WHEEL ALIGNMENT 02-11
WHEEL AND TIRES 02-12
FRONT SUSPENSION 02-13
REAR SUSPENSION 02-14

02-00 OUTLINE

SUSPENSION ABBREVIATIONS 02-00–1
SUSPENSION FEATURES 02-00–1
SUSPENSION SPECIFICATIONS 02-00–2

SUSPENSION ABBREVIATIONS

dcf020000000t01

4x2	4-Wheel 2-Drive
4x4	4-Wheel 4-Drive

02

SUSPENSION FEATURES

dcf020000000t02

Improved driveability	• Double wishbone suspension with torsion bar spring (front) has been adopted
Improved riding comfort	• Parallel arranged lower arm and tie rod (4x2 models) • Bias mount shock absorber (rear)
Improved serviceability	• Vehicle height adjustment by anchor bolt
Precision wheel alignment	• Camber and caster adjustment by shims

SUSPENSION SPECIFICATIONS[Australian Specs.]

id020000100304

SPECIFICATIONS

Suspension

Item			4x2	4x4
Front suspension				
Suspension Type			Double wishbone	
Spring type			Torsion bar spring	
Stabilizer	Type		Torsion bar	
	Diameter	(mm {in})	Except Hi-Rider: 27 {1.06} Hi-Rider: 28 {0.94}	28 {0.94}
Shock absorber type			Cylindrical, double-acting	
Front wheel alignment (*Unloaded condition)	Maximum steering angle	Inner	Except Hi-Rider: 33°00′—37°00′ Hi-Rider:31°30′—35°30′	31°30′—35°30′
		Outer	Except Hi-Rider: 30°00′—35°00′ Hi-Rider:27°00′—32°00′	27°00′—32°00′
	Total toe-in	(mm {in})	2—8 {0.08—0.31}	3—9 {0.12—0.35}
	Camber angle		Regular cab: 0°35′ ±1° Hi-Rider (Stretch cab (with Rear Access System)): 0°44′ ±1° Hi-Rider (Double cab): 0°45′ ±1°	Regular cab and Stretch cab (with Rear Access System): 0°44′ ±1° Double cab: 0°45′ ±1°
	Caster angle		Regular cab: 1°56′±1° Hi-Rider (Stretch cab (with Rear Access System)): 2°07′±1° Hi-Rider (Double cab): 2°06′ ±1°	Regular cab and Stretch cab (with Rear Access System): 2°07′±1° Double cab: 2°06′±1°
	Steering axis inclination		Regular cab: 8°25′ Hi-Rider (Stretch cab (with Rear Access System)): 10°37′ Hi-Rider (Double cab)): 10°35′	Regular cab and Stretch cab (with Rear Access System): 10°37′ Double cab: 10°35′
Rear suspension				
Suspension Type			Leaf spring	
Spring type			Semi elliptic leaf spring	
Shock absorber type			Cylindrical, double-acting	

* : Fuel tank full; engine coolant and engine oil at specified level, and spare tire, jack, and tools in designated position.

Wheel and tires

Item			Specification			
Wheel	Size		15 × 61/2J		15 × 6 1/2J	16 × 7J
	Offset	(mm {in})	20 {0.79}		25 {0.98}	10 {0.39}
	Pitch circle diameter	(mm {in})	139.7 {5.500}			
	Material		Steel	Aluminum alloy	Steel	Aluminum alloy
Tire	Size		215/70R15C 106/104S		235/75R15 109S	245/70R16 111S

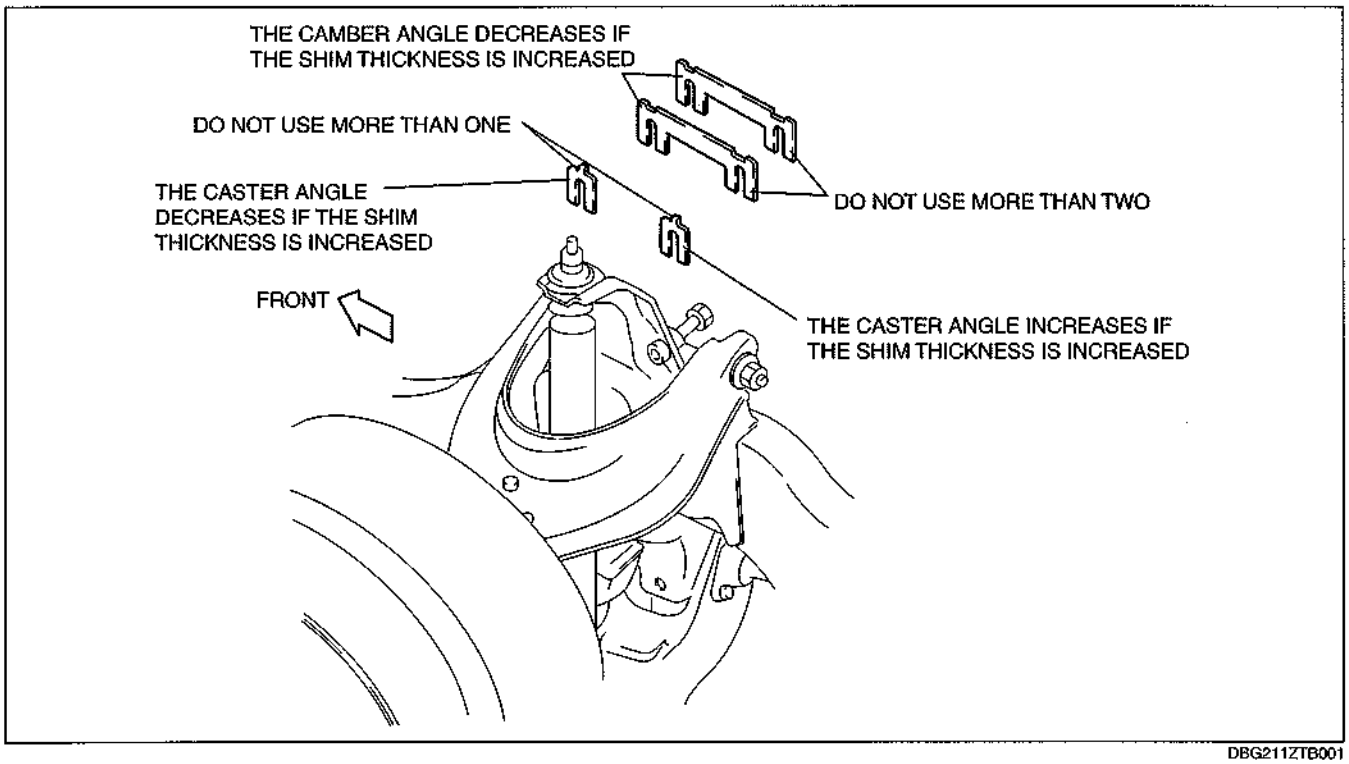
02-11 WHEEL ALIGNMENT

FRONT WHEEL ALIGNMENT
DESCRIPTION 02-11–1

FRONT WHEEL ALIGNMENT DESCRIPTION

dcf021100000101

CAMBER AND CASTER



DBG211ZTB001

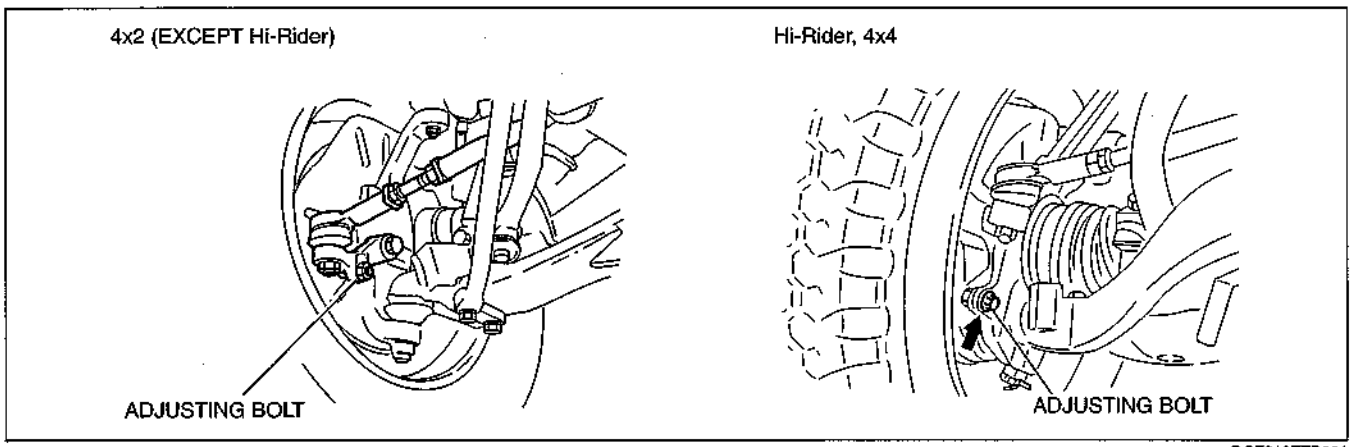
- To adjust the camber and caster angles, loosen the bolts of the upper arm shaft and insert or remove the adjustment shims.
- The amount of change of the camber and caster due to a **1 mm {0.039 in}** shim increase or decrease is as follows:

Camber: 1 mm {0.039 in} shim = 15'
Caster: 1 mm {0.039 in} shim = 30'

Shim

Thickness (mm {in})	
For camber adjustment	1.0 {0.039}
	1.6 {0.063}
	2.0 {0.079}
	3.2 {0.126}
	4.0 {0.157}
For caster adjustment	1.0 {0.039}
	1.6 {0.063}
	2.0 {0.079}
	3.2 {0.126}
	4.0 {0.157}
	0.6 {0.024}

MAXIMUM STEERING ANGLE

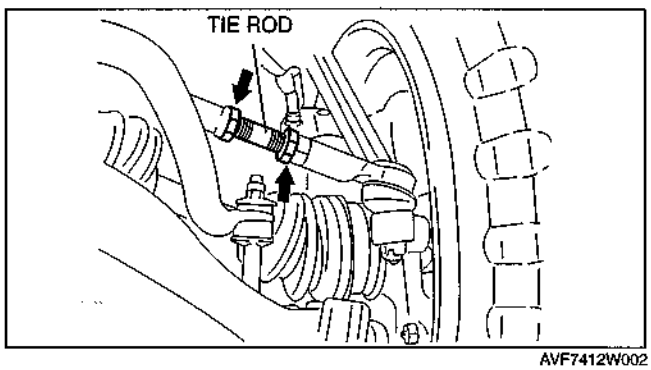


DCF213ZTB001

- The maximum steering angle can be adjusted by turning the adjusting bolts.

TOTAL TOE-IN

- The total toe-in can be adjusted by turning the tie rods.
- The left and right tie rods are both right threaded.To increase the toe-in, turn the right tie rod toward the front of the vehicle, and turn the left tie rod by the same amount toward the rear.
- One turn of the tie rod (both sides) changes the toe-in by **about 30 mm {1.18 in}**.



AVF7412W002

02-12 WHEEL AND TIRES

WHEEL AND TIRES OUTLINE..... 02-12–1
WHEEL AND TIRES STRUCTURAL VIEW 02-12–1

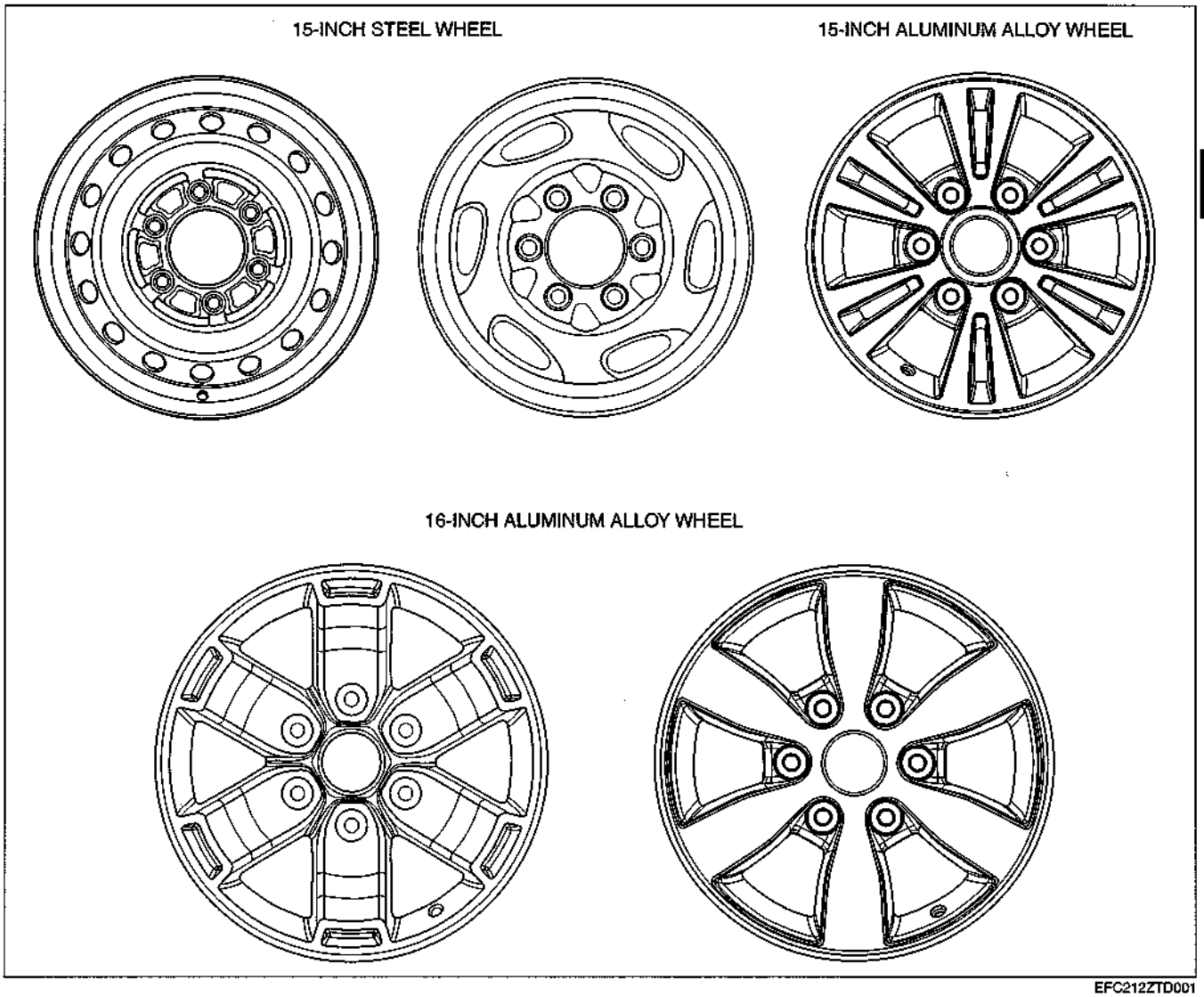
WHEEL AND TIRES OUTLINE

dcf021200000t01

- In consideration of the environment, an adhesive-type balance weight made of steel has been adopted to reduce amount of lead used in the vehicle (aluminum alloy wheel).
- An adhesive-type balance weight is fastened on the inner side of the wheel. Since it is not visible from the styled side of the wheel, the design of the wheel is favoured.

WHEEL AND TIRES STRUCTURAL VIEW

id0212001042b3



EFC212ZTD001

02-13 FRONT SUSPENSION

FRONT SUSPENSION OUTLINE 02-13–1
FRONT SUSPENSION
STRUCTURAL VIEW 02-13–1
FRONT SUSPENSION DESCRIPTION. . 02-13–3
FRONT LOWER ARM AND TIE ROD
CONSTRUCTION
[4x2 (EXCEPT Hi-Rider)] 02-13–3

FRONT SUSPENSION OUTLINE

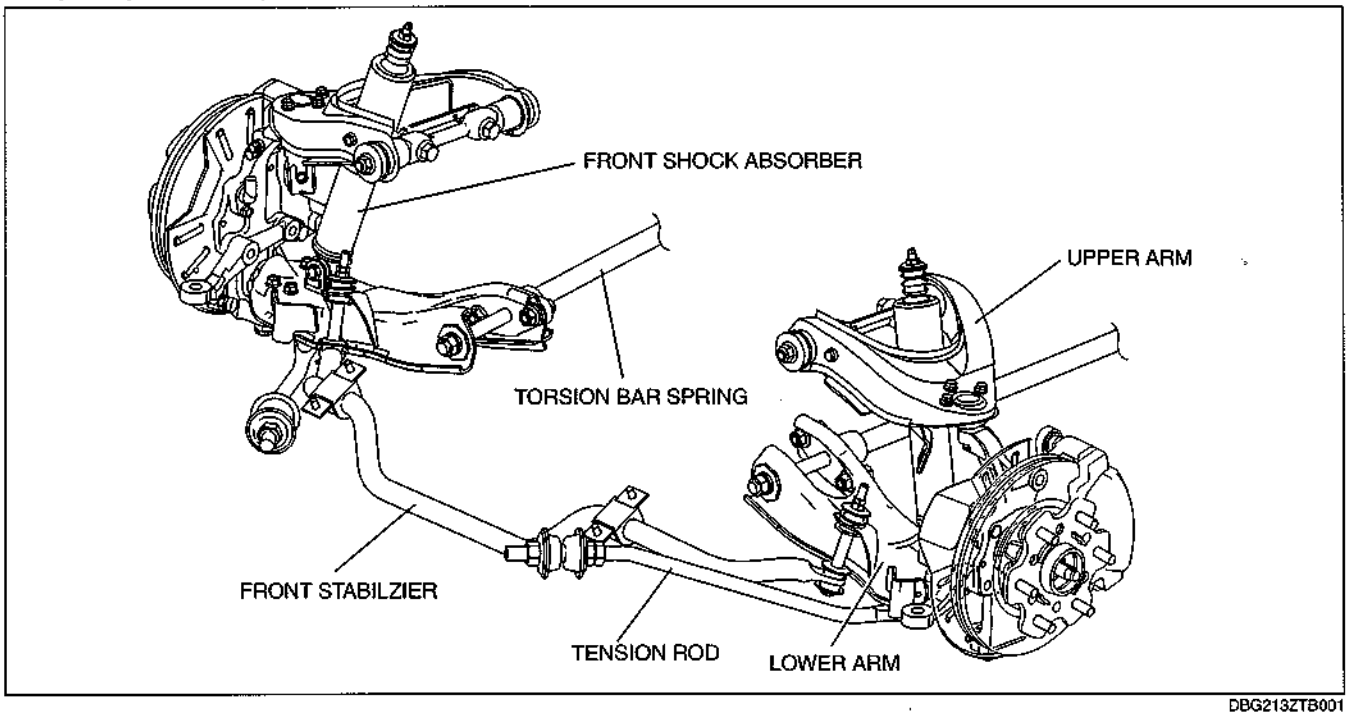
dcf021300000t01

- The double wishbone suspension, which has I-shape lower arms and tension rods, is used for the front suspension of 4x2 models.
- The double wishbone suspension, which has A-shape lower arms, is used for the front suspension of Hi-Rider and 4x4 models. A-shape lower arms have high rigidly and durability.
- The torsion bar springs are used for both 4x2 and 4x4 models.
  The torsion bar spring is per-coiled in one direction. It therefore gives ample spring performance when installed correctly, but only half if installed in reverse.
  An R (right) or L (left) is marked on the rear end of the bar to distinguish one form the other.
  The left and right, and 4x2 and 4x4 torsion bar springs are not interchangeable.

FRONT SUSPENSION STRUCTURAL VIEW

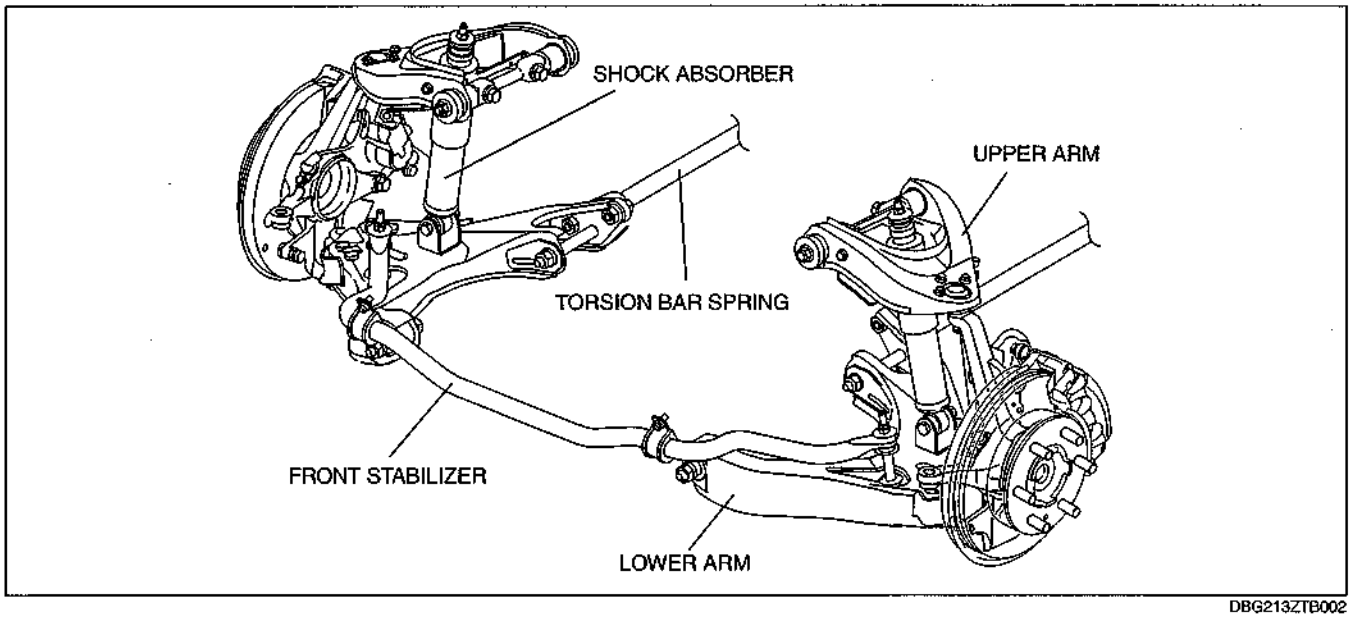
dcf021300000t02

4x2 (Except Hi-Rider)



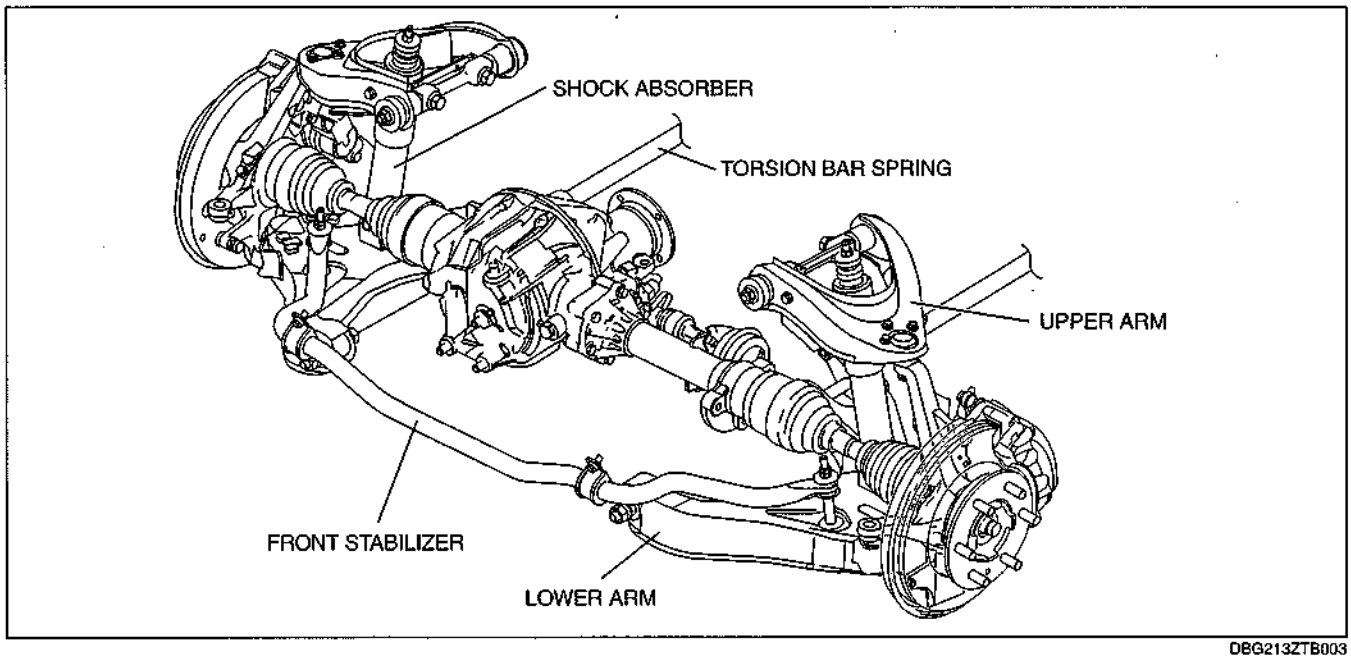
DBG213ZTB001

Hi-Rider



DBG213ZTB002

4x4

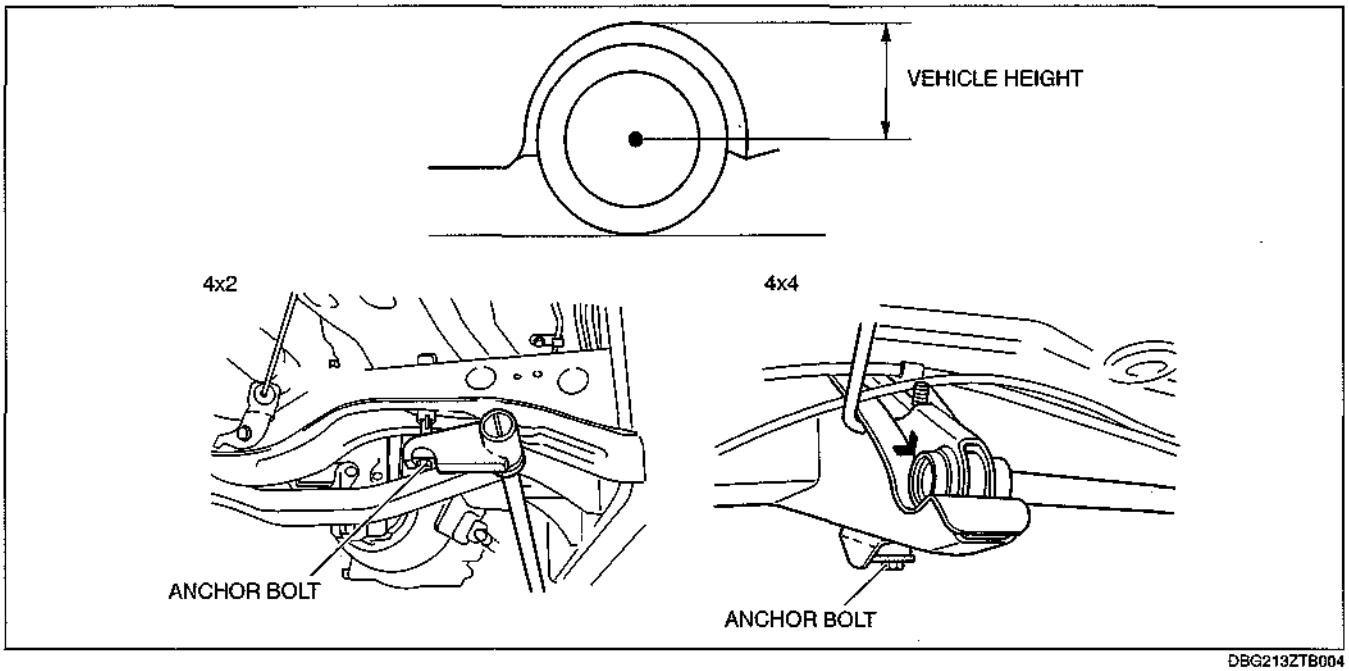


DBG213ZTB003

FRONT SUSPENSION DESCRIPTION

dcf021300000t03

- The vehicle height can be adjusted by turning the torsion bar spring anchor bolt. When adjustment is required, adjust the vehicle height as follows:
  1. Place the vehicle on level ground.
  2. Inspect the front and rear tire pressure and adjust it if necessary.
  3. Measure the distance form the center of each front wheel to the fender brim.
     4x2 (Except Hi-Rider): **416—456 mm {16.4—17.9 in}**
     Hi-Rider: **512—552 mm {20.2—21.7 in}**
     4x4 (Stretch cab (with Rear Access Systetm)): **512—552 mm {20.2—21.7 in}**
     4x4 (Double cab): **502—542 mm {19.8—21.3 in}**
     *Difference between left and right: **10 mm {0.39in} max.**
  4. If the difference between left and right is not within the specification, adjust the vehicle height by turning the torsion bar spring anchor bolt.

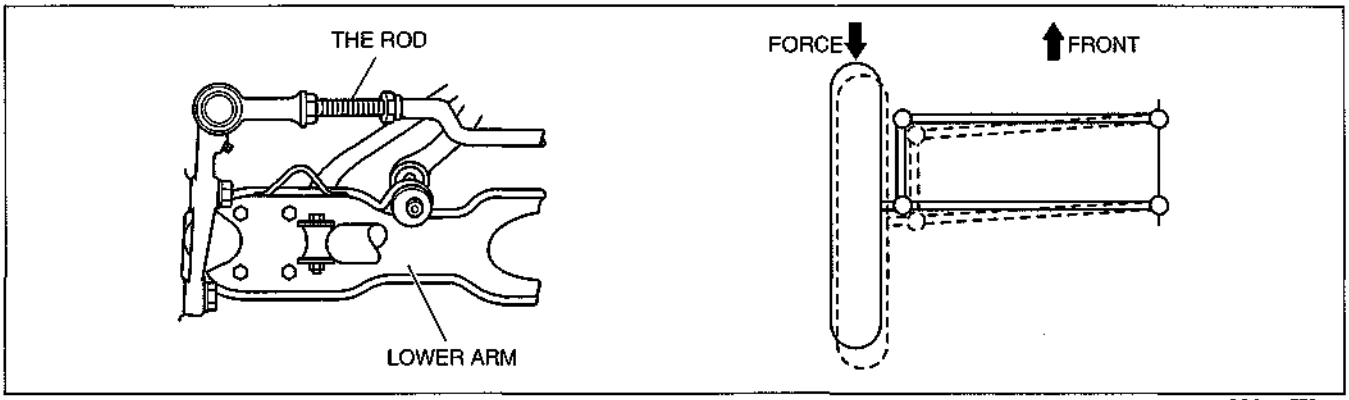


DBG213ZTB004

FRONT LOWER ARM AND TIE ROD CONSTRUCTION [4x2 (EXCEPT Hi-Rider)]

dcf021300000t04

- To prevent shimmy, the lower arm and tie rod are arranged in parallel.



DBG213ZTB005

- By aligning the lower arm and tie rod in parallel, a change in toe-in, which is the cause of shimmy, does not occur.
- The theory of why the tor-in change does not occur is that when force is applied to the tires form the front, they move backward, thus resulting in the rectangle (formed by the links) becoming a parallelogram configuration. As a result, the tires move in parallel to the inside and, although there is a slight change in the vehicle tread width, there is no change in tor-in.

02-14 REAR SUSPENSION

REAR SUSPENSION OUTLINE 02-14–1
REAR SUSPENSION STRUCTURAL VIEW 02-14–1

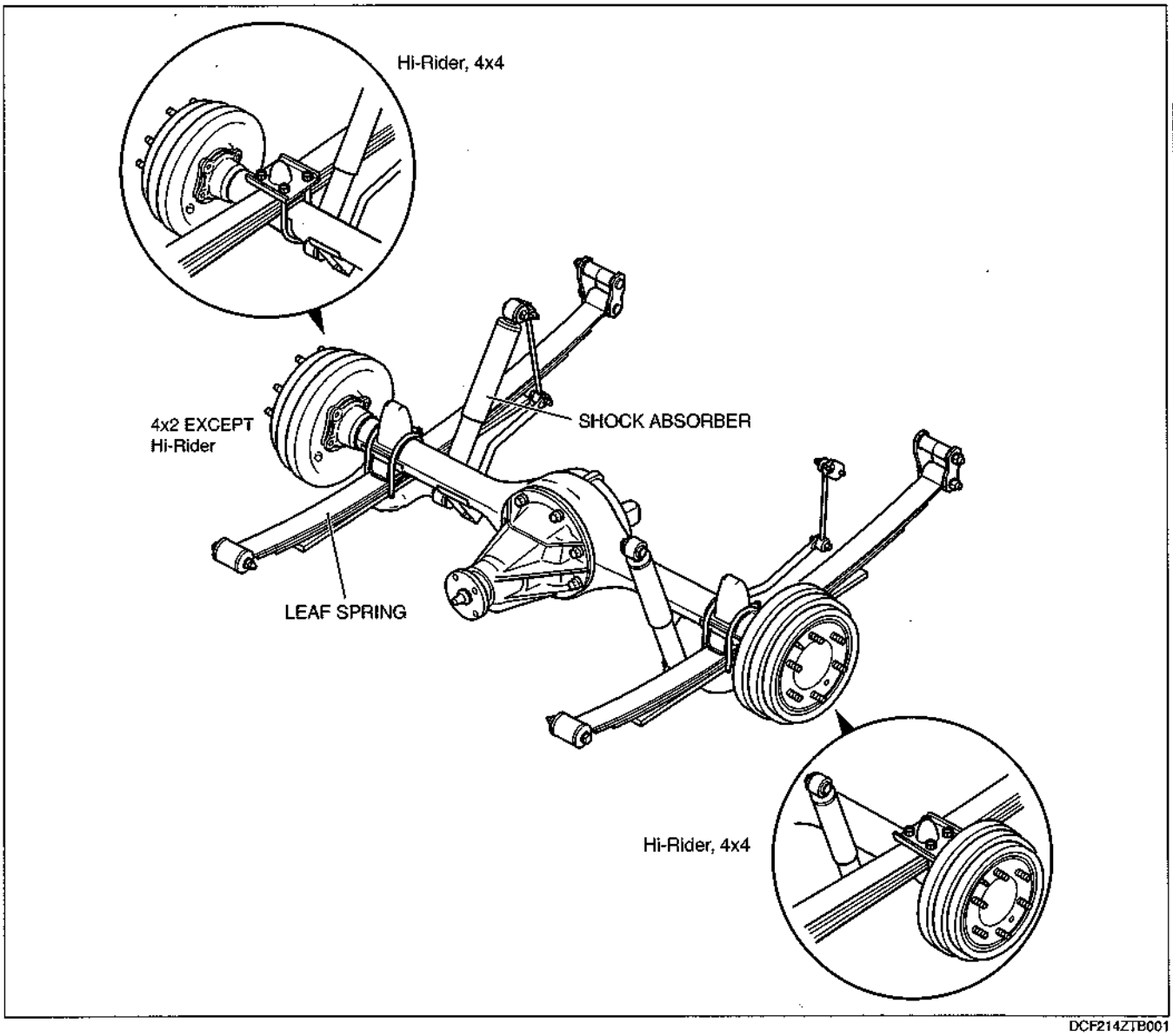
REAR SUSPENSION OUTLINE

dcf021400000t01

- The rigid axle suspension with leaf spring is used for the rear suspension.
- To prevent wind-up of the leaf springs during rapid acceleration or deceleration, the shock absorber on the right side is mounted at the rear of the axle and the left one is mounted at the front of the axle, (bias mount).In order to increase the rigidity in the lateral direction, wide shackle plates are used in the frame mounting.
- For Hi-Rider and 4x4 models, the rear springs are mounted on top of the axle housing to raise the center of gravity. Thus, the shock absorbers attach directly to brackets welded to the axle housing.

REAR SUSPENSION STRUCTURAL VIEW

dcf021400000t02



DCF214ZTB001

DRIVELINE/AXLE

03 SECTION

OUTLINE 03-00
ON-BOARD DIAGNOSTIC. . . . 03-02
FRONT AXLE. 03-11
REAR AXLE. 03-12
DRIVE SHAFT. 03-13
DIFFERENTIAL. 03-14
TRANSFER. 03-16
4-WHEEL DRIVE 03-18

03-00 OUTLINE

DRIVELINE/AXLE ABBREVIATIONS. . . 03-00–1
DRIVELINE/AXLE FEATURES 03-00–1
DRIVELINE/AXLE SPECIFICATIONS . . . 03-00–2

DRIVELINE/AXLE ABBREVIATIONS

dcf030000000t01

ABS	Antilock Brake System
API	American Petroleum Institute
DLC-2	Data Link Connector-2
DTC	Diagnostic Trouble Code
LSD	Limited Slip Differential
OFF	Switch Off
ON	Switch On
PCM	Powertrain Control Module
RFW	Remote Freewheel
SAE	Society of Automotive Engineers
4x2	4-Wheel 2-Drive
4x4	4-Wheel 4-Drive

DRIVELINE/AXLE FEATURES

dcf030000000t02

Improved rigidity, reduced noise and vibration	• Constant velocity joint type rear drive shaft adopted • 2-part, 3-joint type propeller shaft with a center bearing support has been adopted (4×2, 4×4 rear) • 1-part type propeller shaft has been adapted (4×4 front) • Double offset-shaped constant velocity joint adopted for differential-side joint of front drive shaft • Bell-shaped constant velocity joint adopted for wheel-side joint of front drive shaft
Improved durability	• Unit-design taper roller bearing has been adopted
Improved reliability	• A spring-tensioned clip-type method of fixing the universal joint has been adopted (4×2, 4×4 rear)
Improved operability	• A direct control type transfer shift lever adopted • Remote freewheel (RFW) has been adopted • Electronic control type transfer case adopted
Improved serviceability	• Unit-design taper roller bearing has been adopted
Improved driveability	• LSD has been adopted

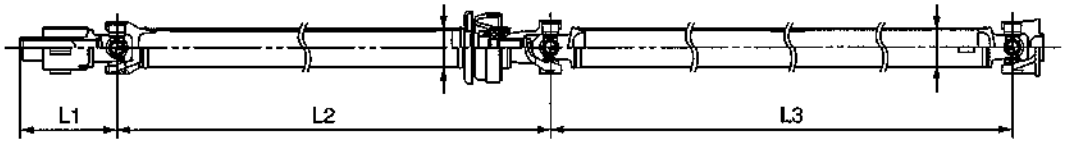
DRIVELINE/AXLE SPECIFICATIONS

dcf030000000l03

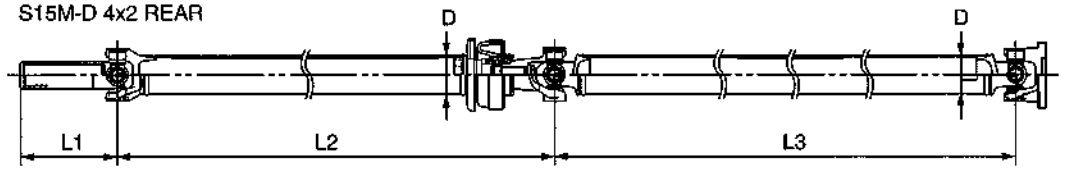
Item				Specification			
Engine				**WL-3**	**WL-C**		**WE-C**
Transmission type				**R15M-D**	**S15M-D**		**S15MX-D**
Vehicle type				**4×2**	**4×2**	**4×2 Hi-Rider**	**4×4**
Front axle							
Bearing type				Taper roller bearing			
Rear axle							
Bearing type				Taper roller bearing			
Support type				Semi-floating			
Casing				Banjo type			
Length			(mm {in})	739 {29.1}			
Diameter			(mm {in})	35.0 {1.4}			
Rear differential							
Reduction gear				Hypoid gear			
Differential gear				Straight bevel gear			
Ring gear size			(Inches)	8.0	8.9		
Final gear ratio				3.909	3.416	3.727	
Differential oil	Type	Grade		API service GL-5			
		Viscosity		SAE 90			
		Capacity (L {US qt, Imp qt})		1.40 {1.48, 1.23}	2.45 {2.32, 2.04}	2.35 {2.22, 1.96}	
Front differential							
Reduction gear				–			Hypoid gear
Differential gear				–			Straight bevel gear
Ring gear size			(Inches)	–			8.00
Final gear ratio				–			3.727
Differential oil	Type	Grade		–			API service GL-5
		Viscosity		–			Above -18 °C {0 °F}: SAE90 Below -18 °C {0 °F}: SAE80
		Capacity (L {US qt, Imp qt})		–			1.9 {1.8, 1.6}
				–			
Front drive shaft							
Joint type		Wheel side		–			Ball joint
		Differential side		–			Double offset joint
Shaft diameter			(mm {in})	–			30.0 {1.18}
Front propeller shaft							
Length (front)			L1	–			45.3 {1.78}
			L2	–			552.1 {21.74}
			L3	–			45.3 {1.78}
Outer diameter (front)			(mm {in}) D	–			63.5 {2.50}
Rear propeller shaft							
Length (rear)			L1	159 {6.26}	163.4 {6.433}		41.1 {1.62}
			L2	666.1 {26.22}	670.6 {26.40}		443.6 {17.46}
			L3	956.1 {37.64}	909.8 {35.82}	890.3 {35.05}	896.3 {35.29}
Outer diameter (rear)			(mm {in}) D	63.5 {2.50}			
Joint type				Cross-shaped joint			

Item	Specification			
Engine	WL-3	WL-C		WE-C
Transmission type	R15M-D	S15M-D		S15MX-D
Vehicle type	4×2	4×2	4×2 Hi-Rider	4×4

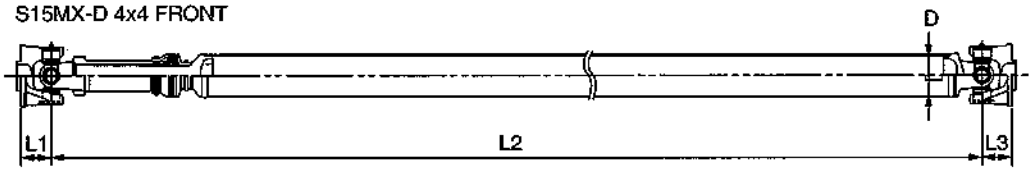
R15M-D



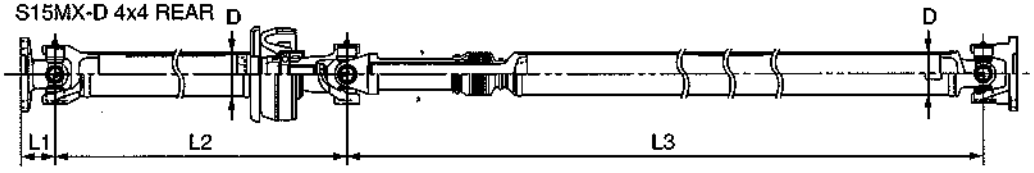
S15M-D 4x2 REAR



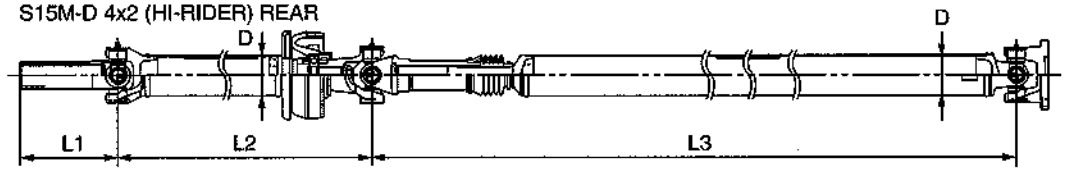
S15MX-D 4x4 FRONT



S15MX-D 4x4 REAR



S15M-D 4x2 (HI-RIDER) REAR

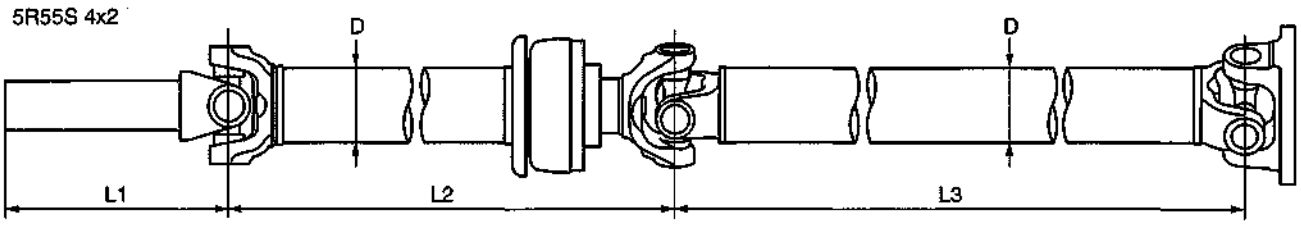
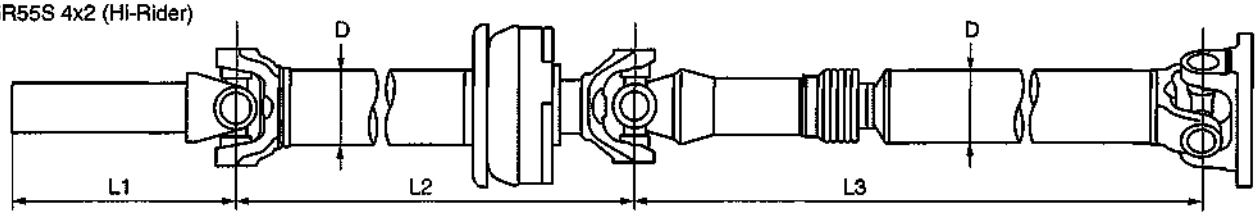
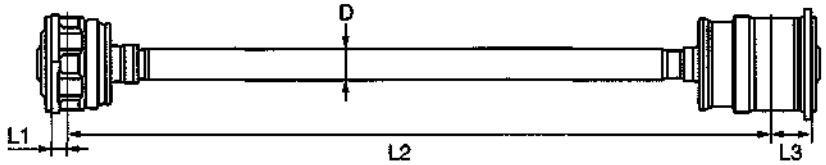
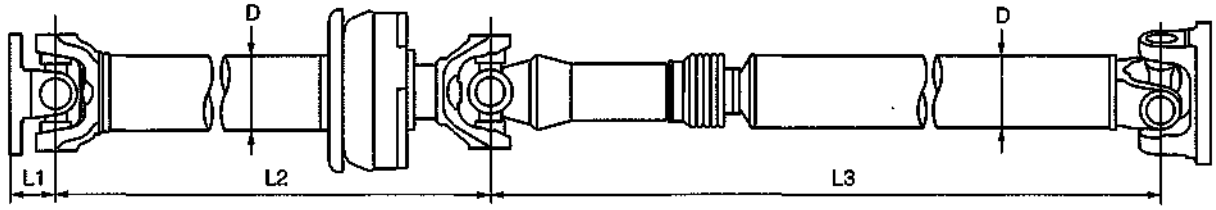


Item		Specification			
Engine		**WL-3**	**WL-C**		**WE-C**
Transmission type		**R15M-D**	**S15M-D**		**S15MX-D**
Vehicle type		**4×2**	**4×2**	**4×2 Hi-Rider**	**4×4**
Transfer					
Transfer oil	Type	–			Mercon® Multi-purpose AFT XT-2-QDX
	Oil capacity (approx. quantity) (L {US qt, Imp qt})	–			1.85 {1.95, 1.63}

DRIVELINE/AXLE SPECIFICATIONS [RANGER (5R55S)]

id030000100211

Item			Specification		
Engine			**WL-C**	**WE-C**	
Transmission type			**5R55S**		
Vehicle type			**4×2**	**4×2 Hi-Rider**	**4×4**
Front axle					
Bearing type			Taper roller bearing		
Rear axle					
Bearing type			Taper roller bearing		
Support type			Semi-floating		
Casing			Banjo type		
Length (mm {in})			739 {29.1}		
Diameter (mm {in})			35.0 {1.4}		
Rear differential					
Reduction gear			Hypoid gear		
Differential gear			Straight bevel gear		
Ring gear size (Inches)			8.9		
Final gear ratio			3.416	3.727	
Differential oil	Type	Grade	API service GL-5		
		Viscosity	SAE 90		
		Capacity (approx. quantity) (L {US qt, Imp qt})	2.45 {2.32, 2.04}	2.35 {2.22, 1.96}	
Front differential					
Reduction gear			–		Hypoid gear
Differential gear			–		Straight bevel gear
Ring gear size (Inches)			–		8.00
Final gear ratio			–		3.727
Differential oil	Type	Grade	–		API service GL-5
		Viscosity	–		Above -18 °C {0 °F}: SAE90 Below -18 °C {0 °F}: SAE80
		Capacity (approx. quantity) (L {US qt, Imp qt})	–		1.9 {1.8, 1.6}
Front drive shaft					
Joint type		Wheel side	–		Ball joint
		Differential side	–		Double offset joint
Shaft diameter (mm {in})			–		30.0 {1.18}
Front propeller shaft					
Length (front) (mm {in})		L1	–		13.2 {0.52}
		L2	–		588.4 {23.17}
		L3	–		34.3 {1.35}
Outer diameter (front) (mm {in})		D	–		26.5 {1.04}
Rear propeller shaft					
Length (rear) (mm {in})		L1	192.5 {7.579}		41.1 {1.62}
		L2	677.6 {26.68}	691.6 {27.23}	443.6 {17.46}
		L3	909.8 {35.82}	890.3 {35.05}	896.3 {35.29}
Outer diameter (rear) (mm {in})		D	63.5 {2.50}		
Joint type			Cross-shaped joint		

Item		Specification		
Engine		WL-C	WE-C	
Transmission type		5R55S		
Vehicle type		4×2	4×2 Hi-Rider	4×4
5R55S 4x2 				
5R55S 4x2 (Hi-Rider) 				
5R55S 4x4 FRONT 				
5R55S 4x4 REAR 				
Transfer case				
Gear ratio	High		–	1.000
	Low		–	2.480
Transfer case oil	Type		–	Mercon® V
	Oil capacity (approx. quantity)	(L {US qt, Imp qt})	–	1.2 {1.3, 1.1}

03-02 ON-BOARD DIAGNOSTIC

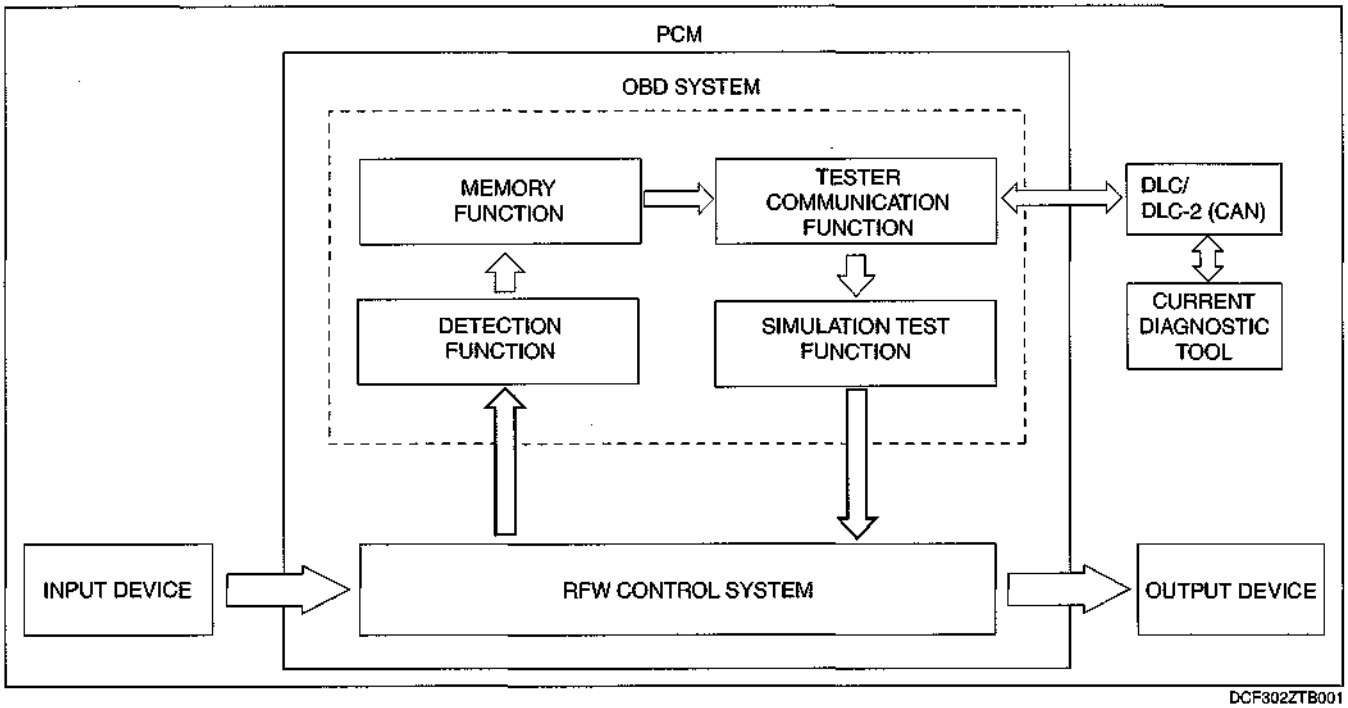
ON-BOARD DIAGNOSTIC OUTLINE
[REMOTE FREEWHEEL (RFW)] 03-02–1

ON-BOARD DIAGNOSTIC OUTLINE [REMOTE FREEWHEEL (RFW)]

dcf030227100101

- The on-board diagnostic function allows for detecting malfunctions in the input/output signals when the engine switch is at the ON position.
- The DLC/DLC-2, which combines the failure detection and detection maintenance connectors, has been adopted to improve serviceability. By connecting a current diagnostic tool to the DLC/DLC-2, malfunction diagnosis can be carried out.
- Using a current diagnostic tool, DTCs can be retrieved or erased depending on the screen display, thus improving serviceability.
- The on-board diagnostic function of remote freewheel (RFW) is controlled by PCM.

Block Diagram



DCF302ZTB001

DTC Table (Related to the RFW)

DTC	Malfunction location	DTC stored in memory
P1812	RFW Lock solenoid valve circuit failure	X
P1813	RFW Lock solenoid valve open circuit	X
P1814	RFW Lock solenoid valve circuit/short to battery	X
P1815	RFW Lock solenoid valve circuit/short to ground	X
P1878	RFW Free solenoid valve circuit failure	X
P1879	RFW Free solenoid valve open circuit	X
P1880	RFW Free solenoid valve circuit/short to battery	X
P1885	RFW Free solenoid valve circuit/short to ground	X

Simulation Item Table (Related to the RFW)

Item	Output part	Operation	Test condition
4WDMODE_L	4x4 indicator light	Off/On	Engine switch at ON
HUBLOCK	RFW lock solenoid valve	Off/On	
HUBLOCK_L	RFW free solenoid valve	Off/On	
NTFLAMP	RFW indicator light	Off/On	

03-02 ON-BOARD DIAGNOSTIC

ON-BOARD DIAGNOSTIC OUTLINE
[4x4 control module] 03-02–1

ON-BOARD DIAGNOSTIC OUTLINE [4x4 control module]

id0302a1100100

Special Features

- When a 4x4 control system malfunction is detected, the 4x4 indicator light and 4L indicator light are flashed to notify the occurrence of the malfunction.

Memory Function

- The memory function records signal systems which have been determined to be abnormal by the malfunction detection function, and the recorded malfunction information is not cleared even when the engine switch is turned off (LOCK position) or the malfunction is repaired.
- Refer to the Workshop Manual for the DTC clearing procedure.

Malfunction Indication Function

- The malfunction indication function flashes the 4x4 indicator light and 4L indicator light as a DTC based on the signal determined to be a malfunction by the malfunction detection function.

DTC Table

DTC No.	Malfunction location	DTC stored in memory
1	4x4 control module malfunction	X
2	Motor component (shift motor) malfunction	X
3	Clutch coil malfunction	X
4	Speed sensor malfunction	X
5	Solenoid valve malfunction	X
6	4x4 switch malfunction	X
7	Motor component (position sensor) malfunction	X

03-11 FRONT AXLE

FRONT AXLE OUTLINE 03-11–1
FRONT AXLE CROSS-SECTIONAL VIEW 03-11–1

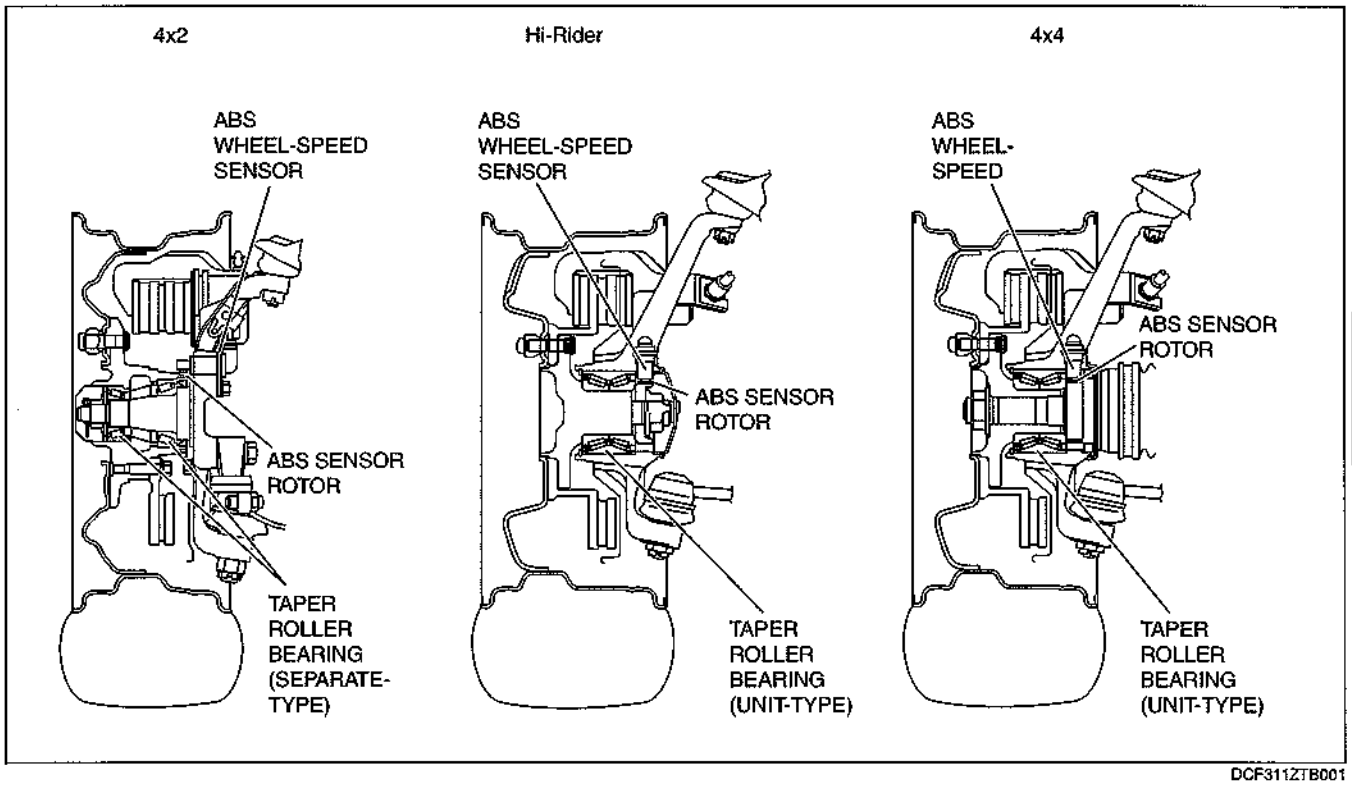
FRONT AXLE OUTLINE

dcf031104000t01

- Taper roller bearings, which have a large load capacity, are used as wheel bearings, thus preload adjustment is necessary.

FRONT AXLE CROSS-SECTIONAL VIEW

dcf031104000t02



DCF311ZTB001

03-12 REAR AXLE

REAR AXLE OUTLINE 03-12–1
REAR AXLE CROSS-SECTIONAL VIEW 03-12–1

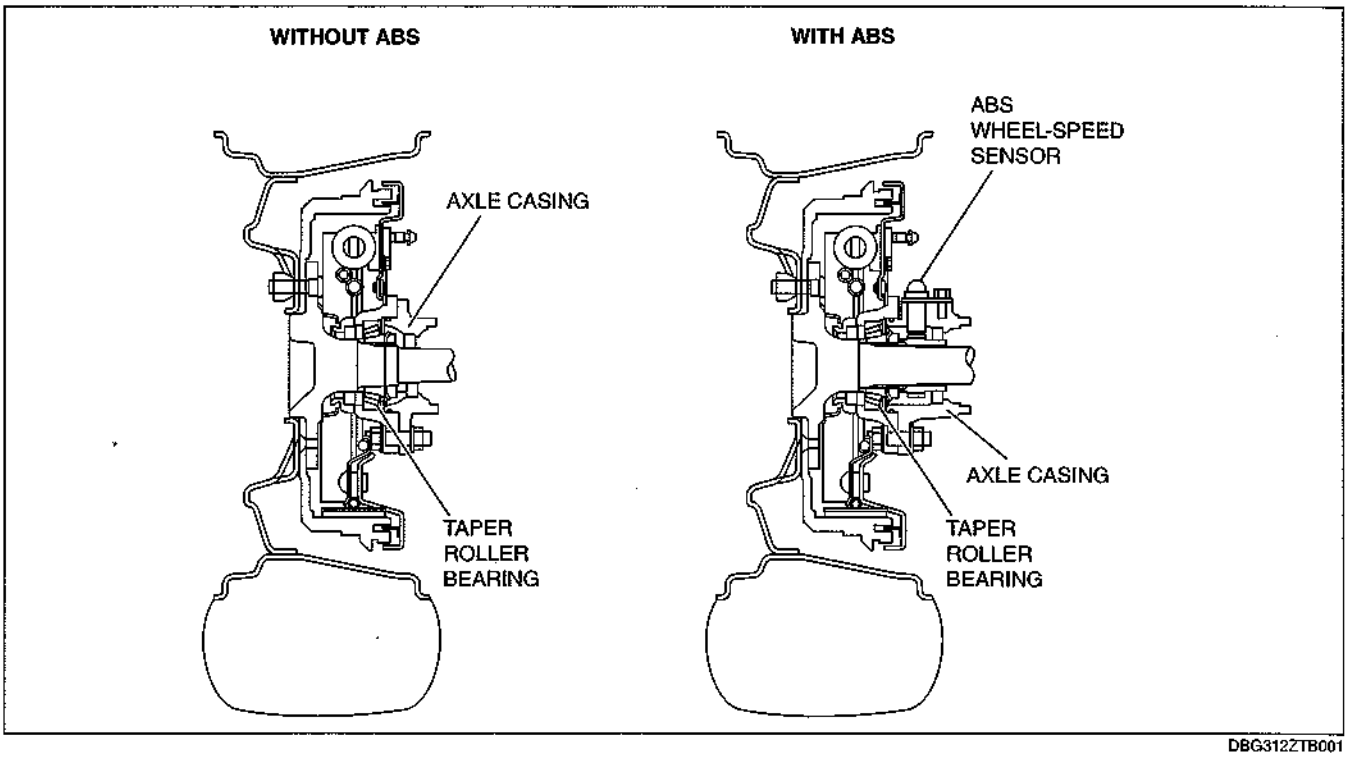
REAR AXLE OUTLINE

dcf031205000t01

- Taper roller bearings are used as wheel bearings.
- Bearing end play in the axial direction is adjusted using shims between the rear wheel hub and the axle casing.

REAR AXLE CROSS-SECTIONAL VIEW

dcf031205000t02



DBG312ZTB001

03-13 DRIVE SHAFT

FRONT DRIVE SHAFT OUTLINE..... 03-13–1
FRONT DRIVE SHAFT CROSS-SECTIONAL VIEW 03-13–1

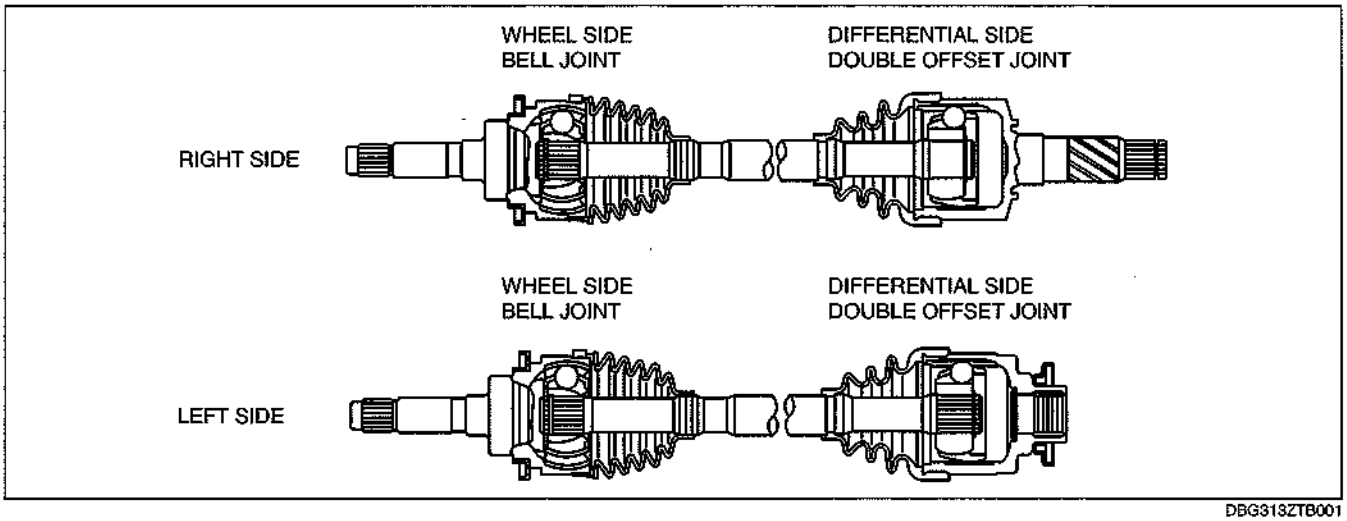
FRONT DRIVE SHAFT OUTLINE

dcf031325500t01

- The bell joint has been adopted on the wheel side and the double offset joint has been adopted on the differential side to reduce noise and vibration.

FRONT DRIVE SHAFT CROSS-SECTIONAL VIEW

dcf031325500t02



DBG313ZTB001

03-14 DIFFERENTIAL

REAR DIFFERENTIAL OUTLINE 03-14–1
REAR DIFFERENTIAL CROSS-SECTIONAL VIEW 03-14–1

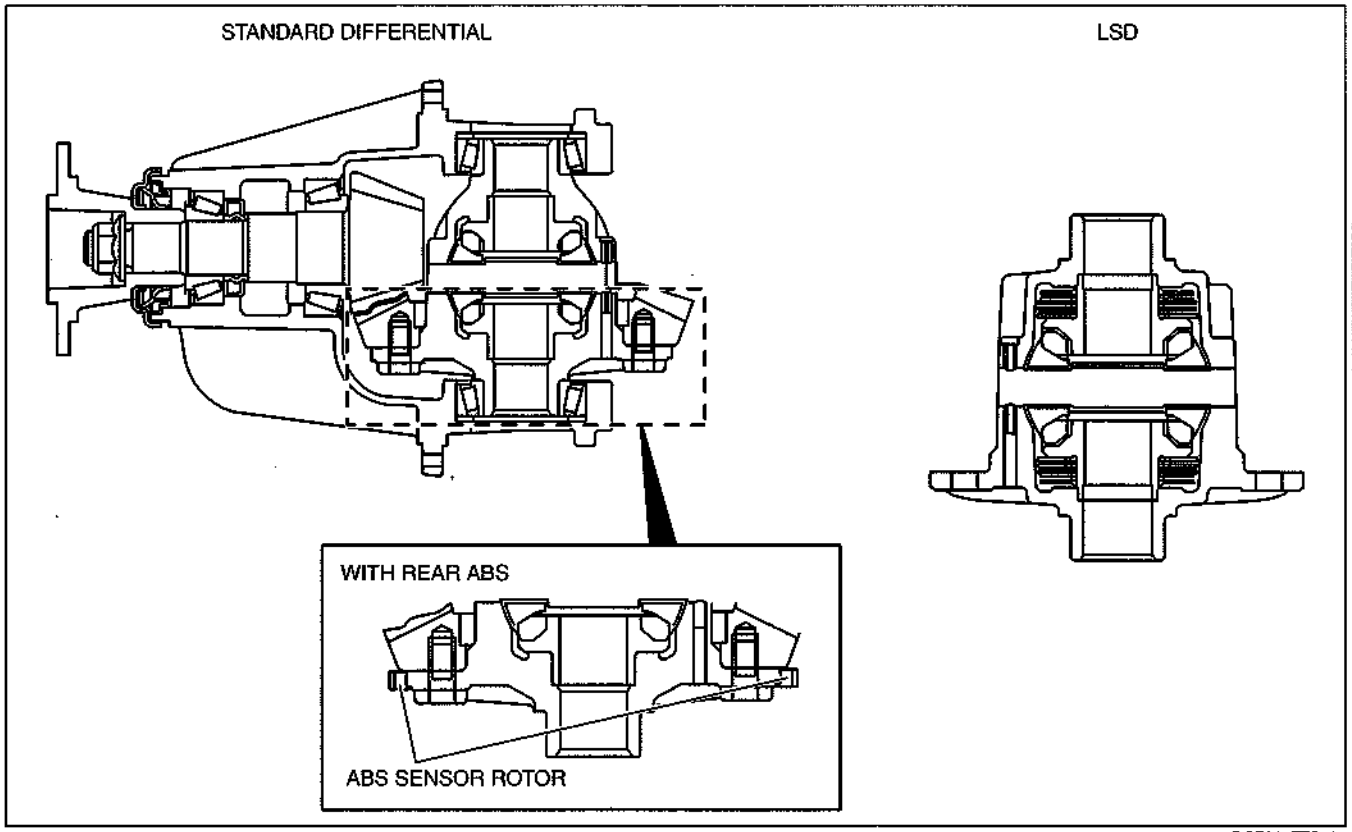
REAR DIFFERENTIAL OUTLINE

dcf031427100t01

- There are two types of differentials available, standard differential and limited slip differential (LSD).
- The purpose of the LSD is to provide driving force to both tires by preventing either tire from slipping.
- With a standard differential, if a tire starts spinning due to poor traction such as mud or snow, the driving force is exerted on that tire by the action of the differential. With the LSD, the differential action is automatically limited and driving force is exerted on both tires.

REAR DIFFERENTIAL CROSS-SECTIONAL VIEW

dcf031427100t02



DCF314ZTB001

03-16 TRANSFER [5R55S]

TRANSFER CASE
OUTLINE [5R55S]..... 03-16–1
TRANSFER CASE
STRUCTURAL VIEW [5R55S] 03-16–1
TRANSFER CASE
POWER FLOW [5R55S] 03-16–4
TRANSFER CASE
ELECTRONIC CONTROL SYSTEM
OUTLINE [5R55S]..... 03-16–8
TRANSFER CASE
SYSTEM WIRING DIAGRAM
[5R55S] 03-16–8
SPEED SENSOR
CONSTRUCTION [5R55S].....03-16–9
MOTOR POSITION
DETECTION SWITCH
FUNCTION [5R55S].....03-16–9
MOTOR POSITION
DETECTION SWITCH
CONSTRUCTION/OPERATION
[5R55S].....03-16–10
MOTOR CONSTRUCTION [5R55S].....03-16–10
CLUTCH COIL
CONSTRUCTION [5R55S].....03-16–11

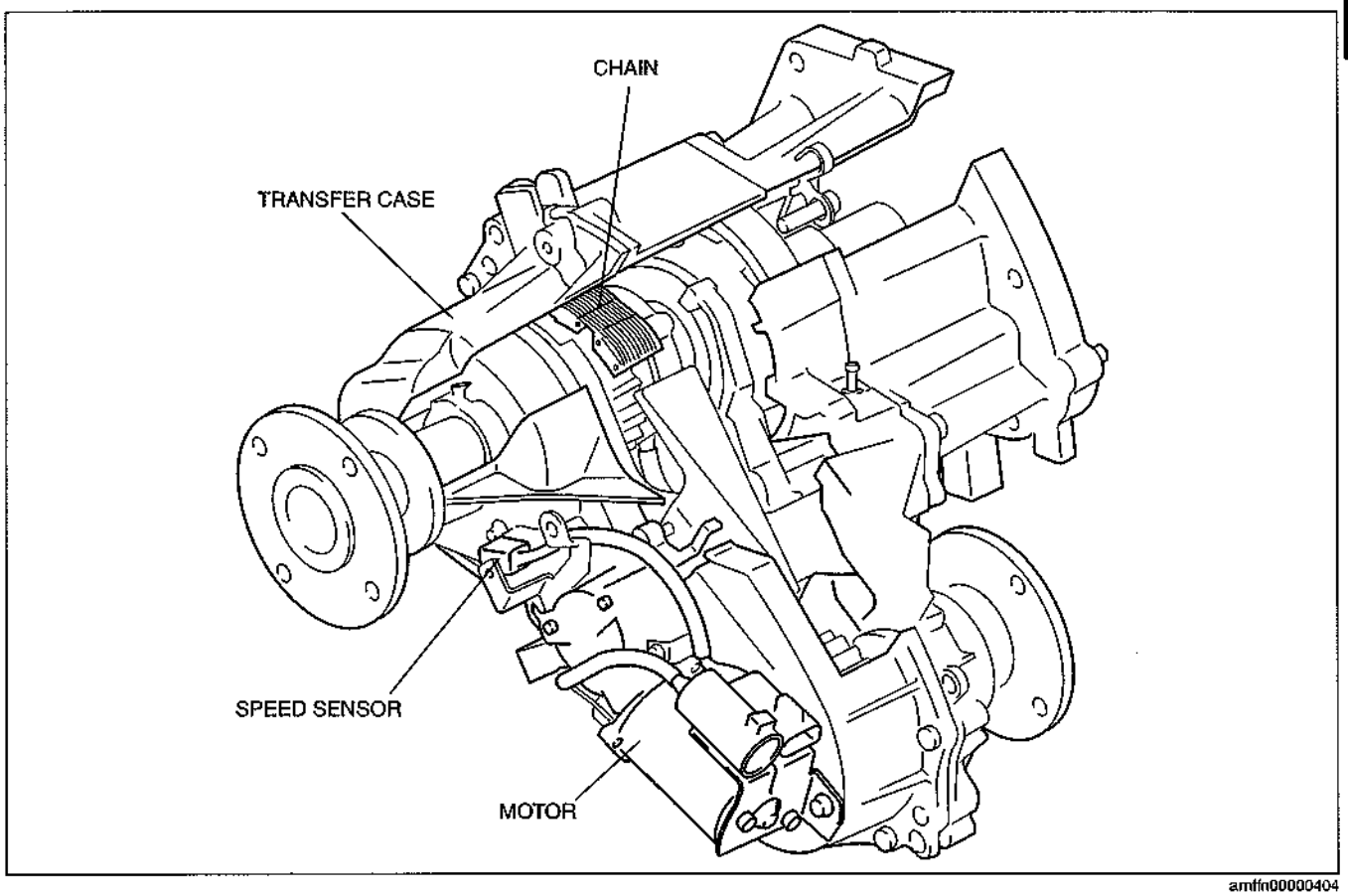
TRANSFER CASE OUTLINE [5R55S]

id0316c1137500

- A chain-type transfer drive has been adopted for 4x4 driving to improve noise suppression. In addition, the drive sprocket, which drives the chain, rotates only during 4x4 driving to improve noise suppression during 4x2 driving.
- Shifting between 4x2 HIGH, 4x4 HIGH, and 4x4 LOW is performed by the motor for improved operability.

TRANSFER CASE STRUCTURAL VIEW [5R55S]

id0316c1100500



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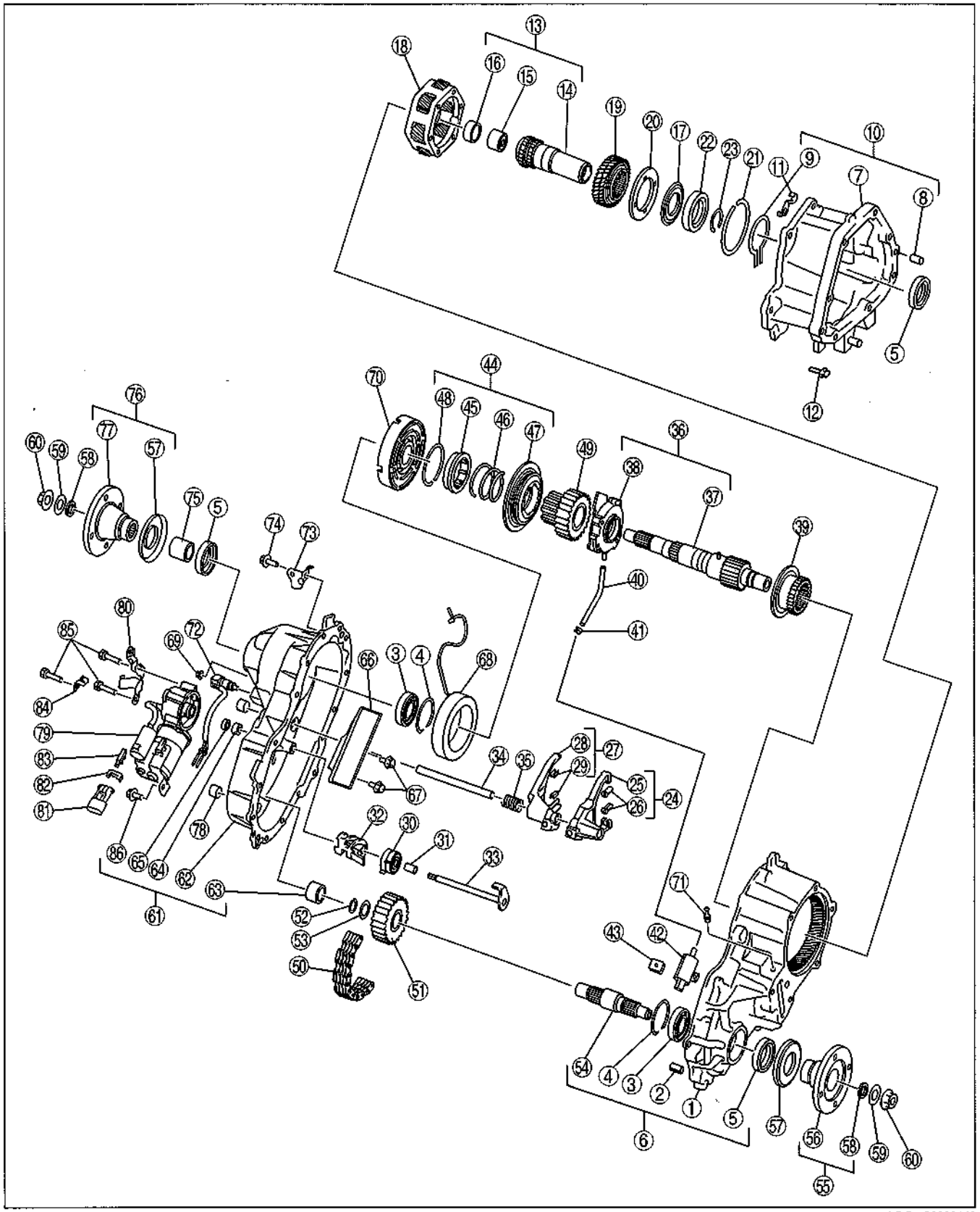
Exploded view



b5r5za00000446

1	Center transfer case
2	Dowel pin
3	Bearing
4	Snap ring
5	Oil seal

6	Center transfer case component
7	Front transfer case
8	Dowel pin
9	Snap ring
10	Front transfer case component

11	Clip
12	Bolt
13	Input shaft component
14	Input shaft
15	Needle bearing
16	Bushing
17	Thrust washer
18	Planetary gear component
19	Sun gear
20	Thrust plate
21	Snap ring
22	Ball bearing
23	Snap ring
24	Reduction shift fork component
25	Reduction shift fork
26	Reduction shift fork facing
27	Lockup shift fork component
28	Lockup shift fork
29	Lockup shift fork facing
30	Spring
31	Spacer
32	Cam
33	Shift shaft
34	Rail shift
35	Return spring
36	Output shaft and gerotor pump component
37	Output shaft component
38	Gerotor pump component
39	Reduction hub
40	Pump hose
41	Hose clamp
42	Oil strainer
43	Magnet
44	Lockup component
45	Lockup hub
46	Spring
47	Lockup collar
48	Snap ring

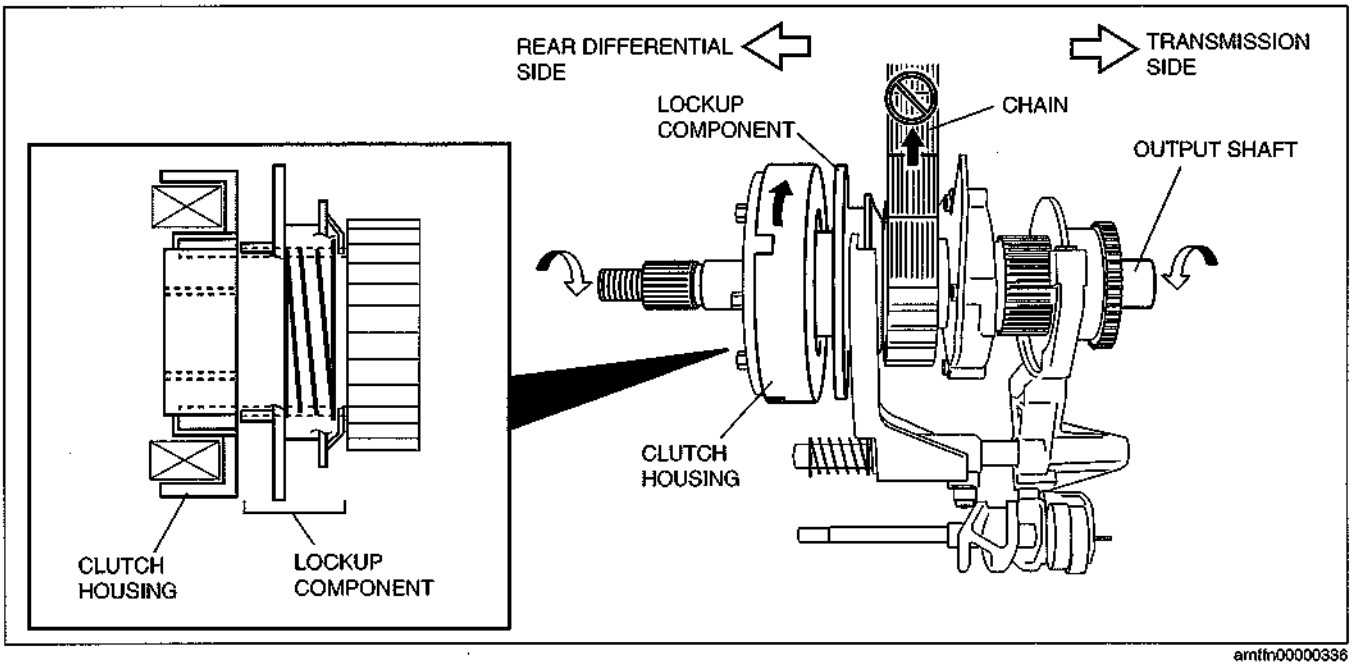
49	Drive sprocket
50	Drive chain
51	Driven sprocket
52	Snap ring
53	Spacer
54	Lower output shaft
55	Front output flange component
56	Front output flange
57	Deflector
58	Oil seal
59	Washer
60	Locknut
61	Rear transfer case component
62	Rear transfer case
63	Needle bearing
64	Sleeve
65	Seal
66	Snubber
67	Bolt
68	Clutch coil
69	Nut
70	Clutch housing
71	Breather pipe
72	Speed sensor component
73	Bracket
74	Bolt
75	Spacer
76	Rear companion flange component
77	Rear companion flange
78	Oil plug
79	Motor component
80	Bracket
81	Terminal connector
82	Clip
83	Bracket
84	Clip
85	Bolt
86	Bolt

TRANSFER CASE POWER FLOW [5R55S]

id0316c1100600

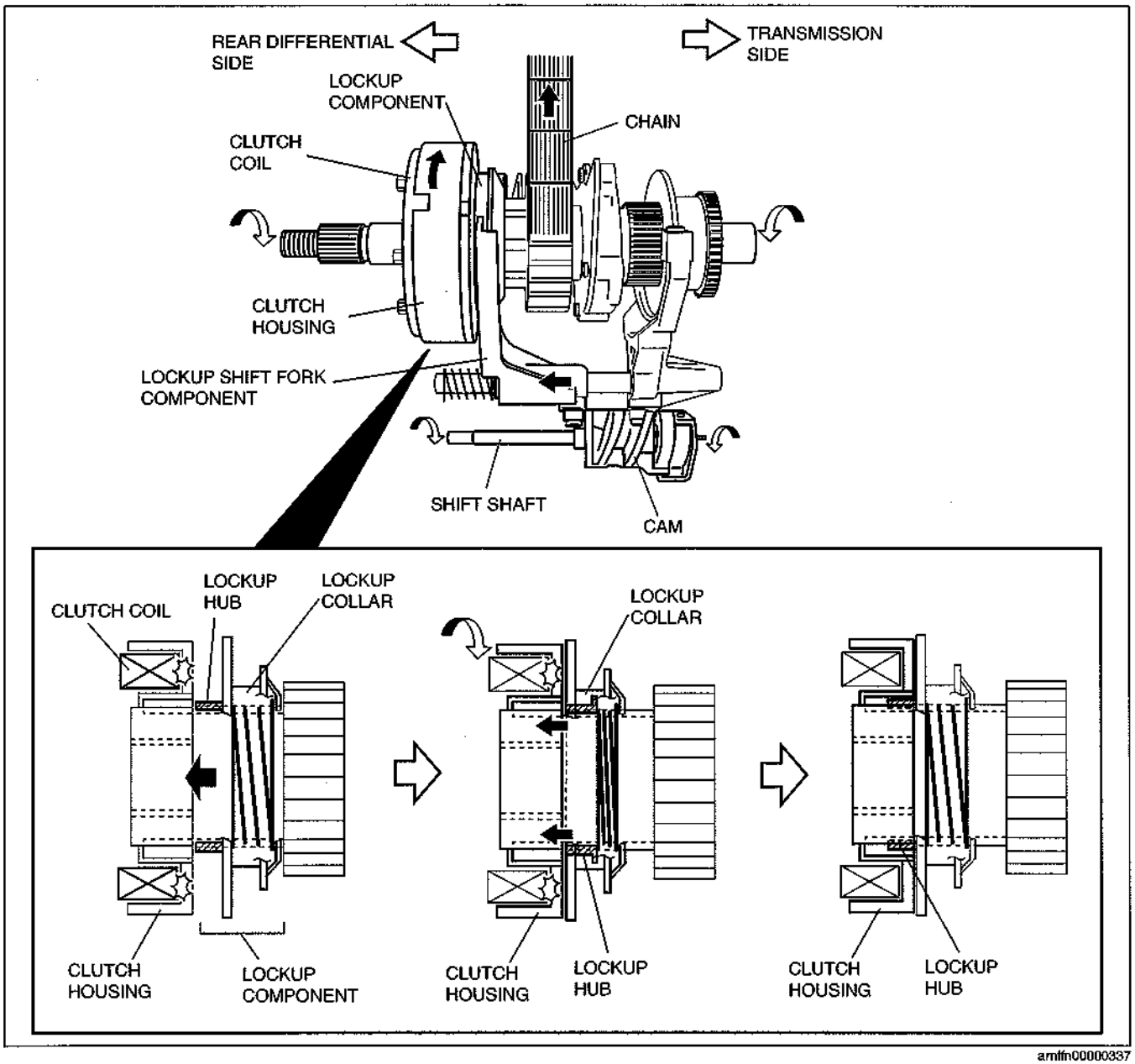
Shifting From 4x2 HIGH to 4x4 HIGH

- During 4x2 driving, drive force from the transmission is transmitted from the input shaft to the output shaft through the reduction hub, and the drive force from the output shaft is transmitted to the rear differential Shifting between 4x2 and 4x4 is performed using the lockup component operation. During 4x2 driving, drive force is not transmitted to the chain because the lockup component does not contact the clutch housing, therefore, the drive force is not transmitted to the front differential.



amtfn00000336

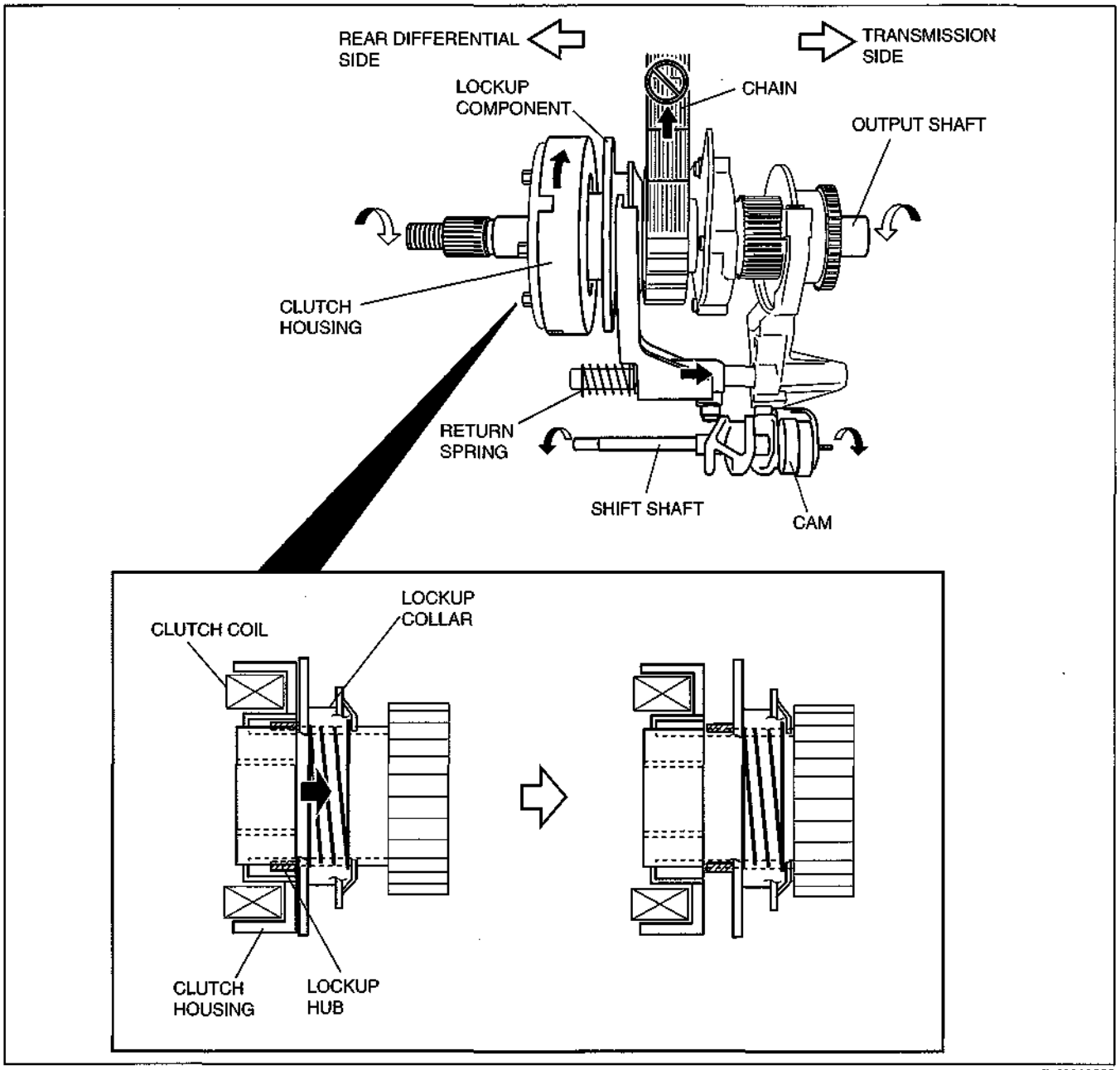
- When the 4x4 switch is switched to the 4H position during 4x2 driving, the motor rotates from the 2H to 4H position. Due to the motor rotation, the cam rotates via the shift shaft. When the cam rotates, the lockup shift fork component slides to the clutch housing side. In conjunction with this operation, the clutch coil is energized and magnetic force is generated, and the lockup shift fork component is pulled toward the clutch housing. In the lockup shift fork component operation, the lockup hub contacts the clutch housing first, then the lockup collar slides to the lockup housing side. At this time, if the lockup hub is not engaged with the clutch housing spline, the lock up hub is pressed into the lockup collar. If the clutch housing rotates in this condition, such as when the vehicle is being driven, the lockup hub engages with the clutch housing spline. The lockup shift fork component is engaged with the drive sprocket and the clutch housing is engaged with the output shaft, therefore, drive force from the output shaft is transmitted to the lower output shaft via the chain. Due to this, drive force is transmitted to the front differential.



amtfn00000337

Shifting From 4x4 HIGH to 4x2 HIGH

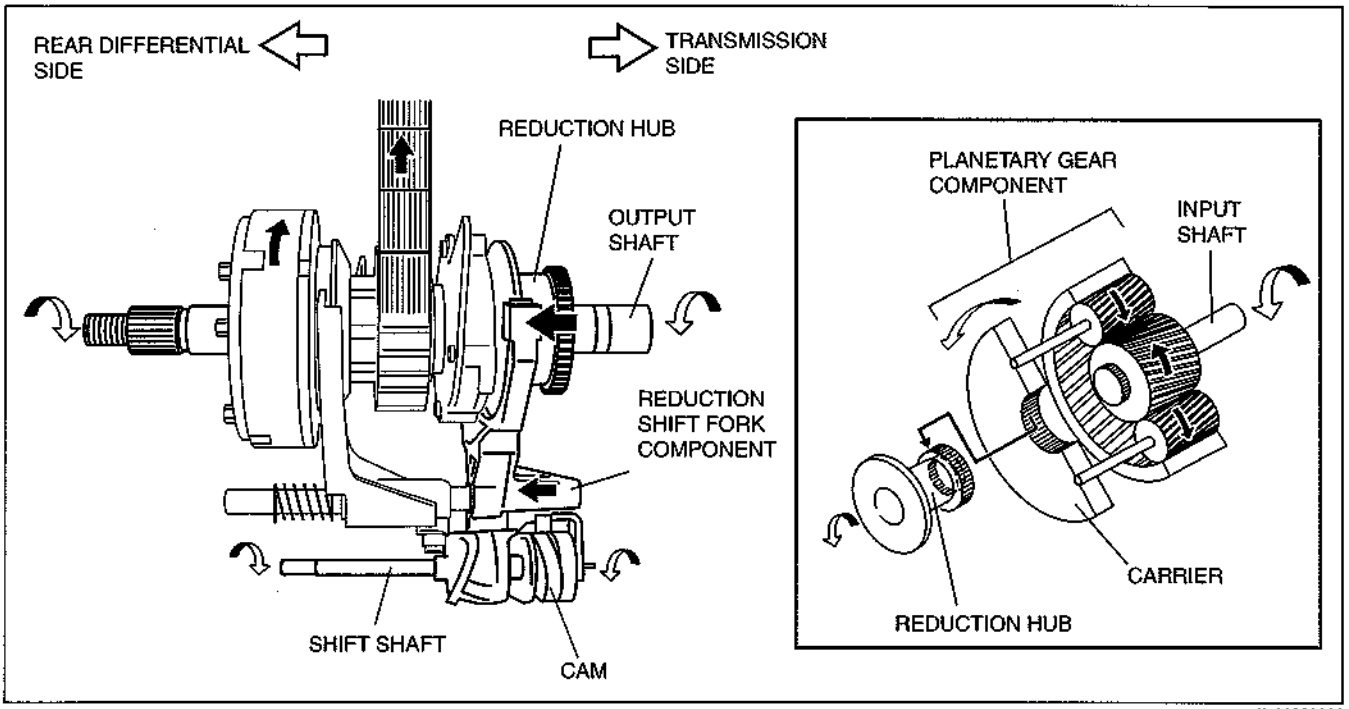
- When the 4x4 switch is switched to the 2H position while in 4x4 HIGH, the motor rotates from the 4H to 2H position. Due to the motor rotation, the cam rotates via the shift shaft. The lockup shift fork component slides due to the cam rotation and spring force of the return spring, and separates from the clutch housing. At this time, the clutch coil is not energized.When the lockup shift fork component separates from the clutch housing, drive force transmission to the lower output side is interrupted, and drive force is transmitted only to the rear differential.



amfm00000338

Shifting From 4x4 HIGH to 4x4 LOW

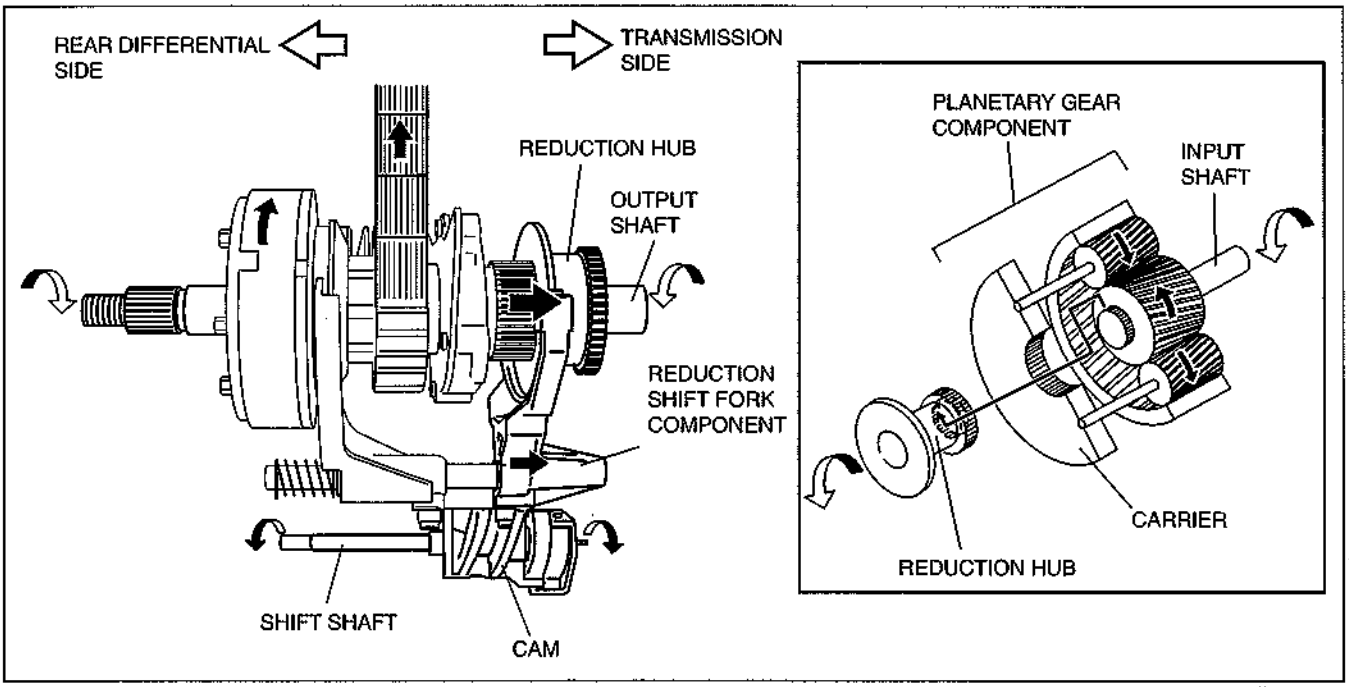
- When the 4x4 switch is switched to the 4L position while in 4x4 HIGH, the motor rotates from the 4H to 4L position. Due to the motor rotation, the cam rotates via the shift shaft. When the cam rotates the reduction shift fork component, which is fitted into the cam groove, slides, and the reduction hub engages with the spline which is inside the carrier of the planetary gear component. If the drive force is transmitted to the input shaft in this condition, the output speed is reduced due to the planetary gear operation, and the rotational torque increases.This drive force is transmitted to the front and rear differentials.



amfln00000339

Shifting From 4x4 LOW to 4x4 HIGH

- When the 4x4 switch is switched to the 4H position while in 4x4 LOW, the motor rotates from the 4L to 4H position. Due to the motor rotation, the cam rotates via the shift shaft. When the cam rotates the reduction shift fork component, which is fitted into the cam groove, slides, and the reduction hub engages with the input shaft spline. Due to this, the drive force from the input shaft is transmitted to the output shaft without being input to the planetary gear, and then it is transmitted to the front and rear differential with the output speed and rotational torque remaining unchanged.



amfln00000340

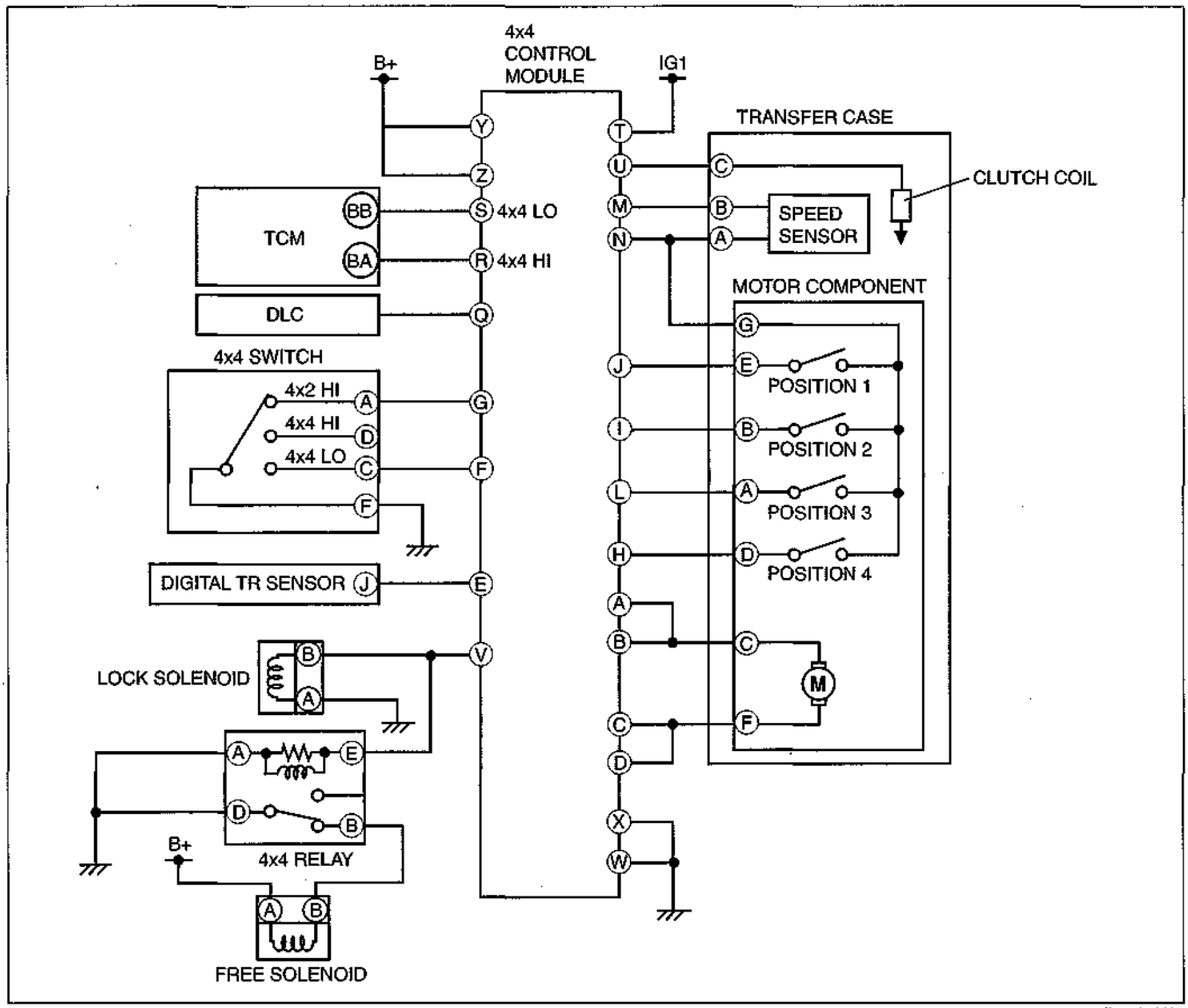
TRANSFER CASE ELECTRONIC CONTROL SYSTEM OUTLINE [5R55S]

id0316c1137600

- A 4x4 control module has been adopted which operates the motor according to signals from the speed sensor and motor position detection switch to control shifting between 4x2 HIGH, 4x4 HIGH, and 4x4 LOW.

TRANSFER CASE SYSTEM WIRING DIAGRAM [5R55S]

id0316c1137700

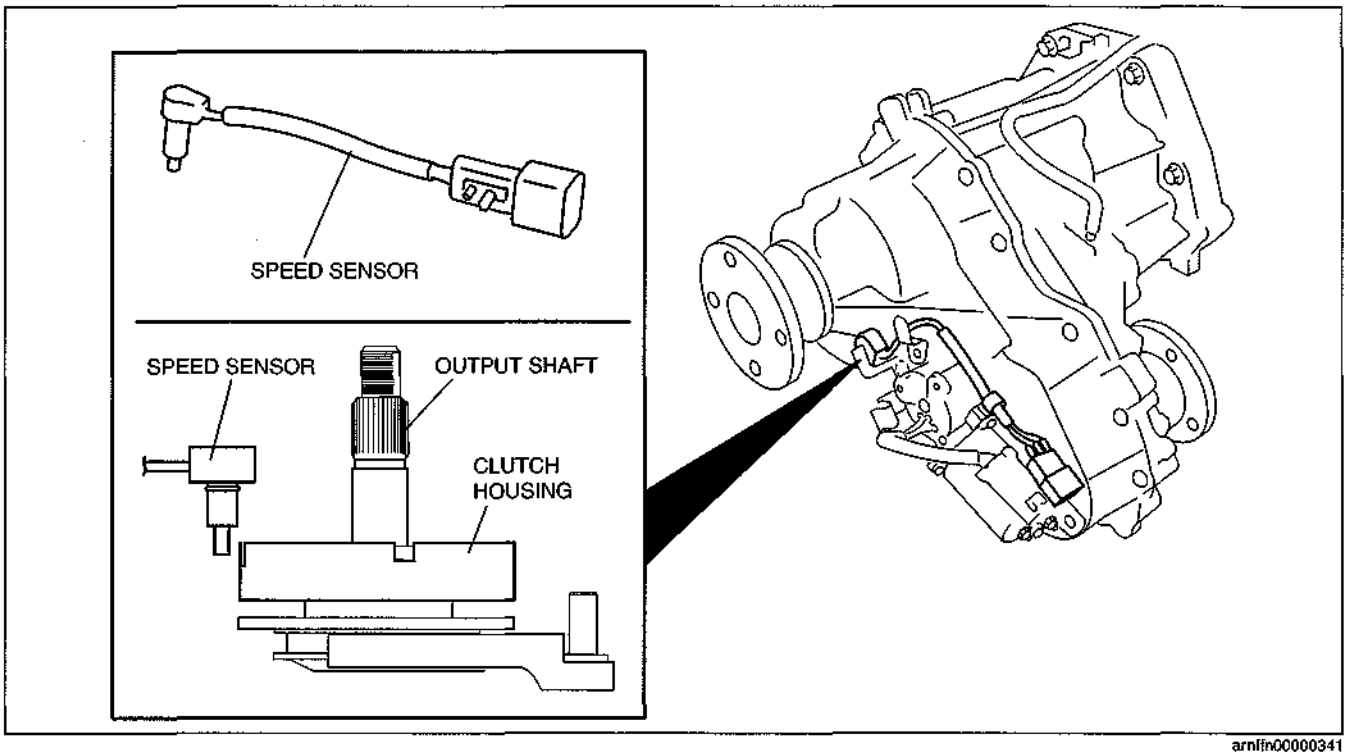


amftw00001937

SPEED SENSOR CONSTRUCTION [5R55S]

id0316c1137000

- The speed sensor detects the output shaft rotation speed, and the signal is input to the 4x4 control module.
- Signals from the speed sensor are used by the 4x4 control module to perform each control.



arnlfn00000341

MOTOR POSITION DETECTION SWITCH FUNCTION [5R55S]

id0316c1137100

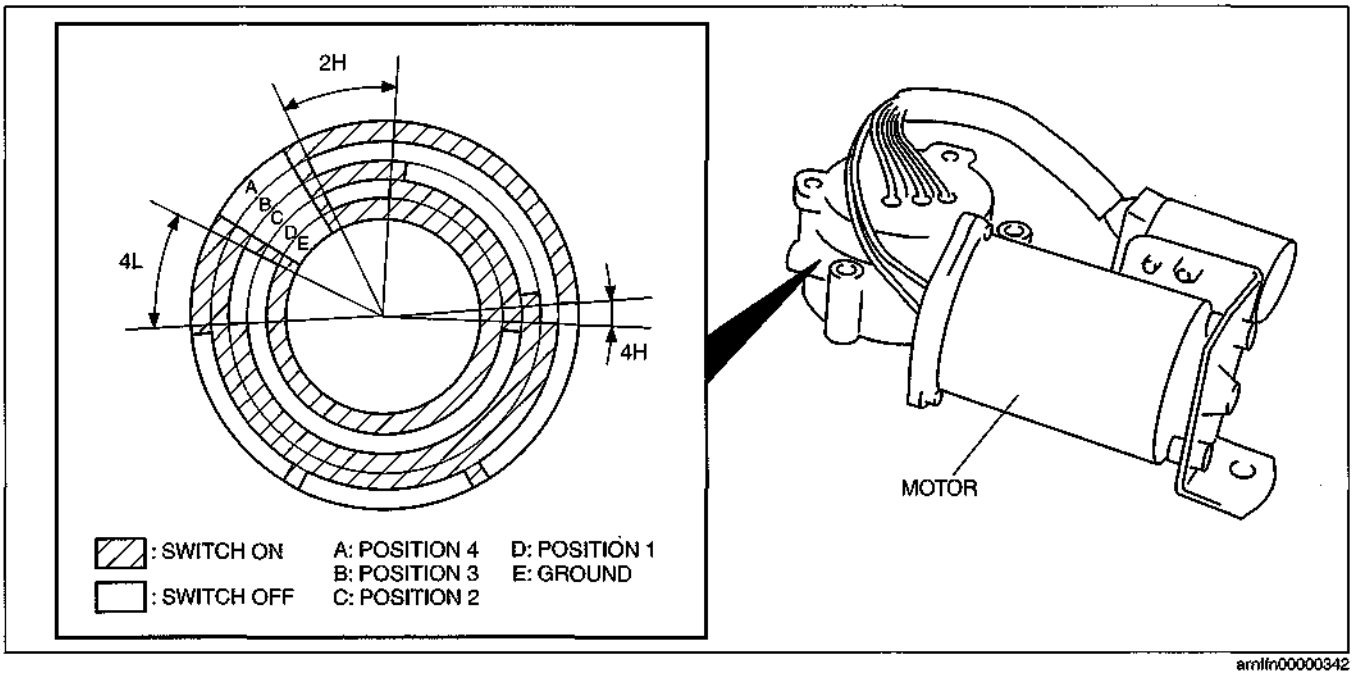
- The motor position detection switch detects the motor position and outputs control signals to the 4x4 control module.
- The 4x4 control module determines the motor position according to the signals from the motor position detection switch.

MOTOR POSITION DETECTION SWITCH CONSTRUCTION/OPERATION [5R55S]

id0316c1137200

- The motor position detection switch is integrated into the motor, and turns on or off according to the motor position.
- The motor position detection switch detects the motor position using a combination of four switches.

Motor Position	Position 1	Position 2	Position 3	Position 4
2H	Off	On	Off	On
4H	On	On	Off	Off
4L	Off	Off	On	On

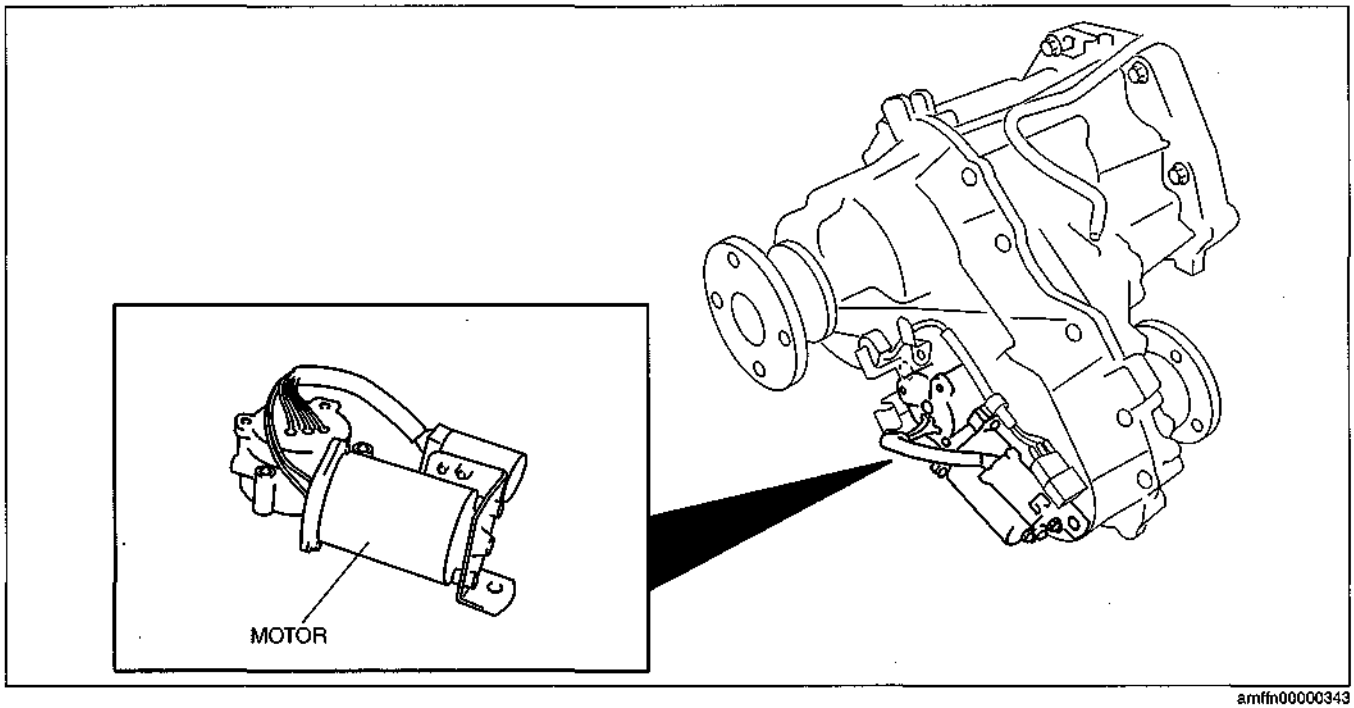


amlfn00000342

MOTOR CONSTRUCTION [5R55S]

id0316c1137300

- The motor switches between 4x2 HIGH, 4x4 HIGH, and 4x4 LOW according to the signals from the 4x4 control module.
- A switch for motor position detection is integrated in the motor.

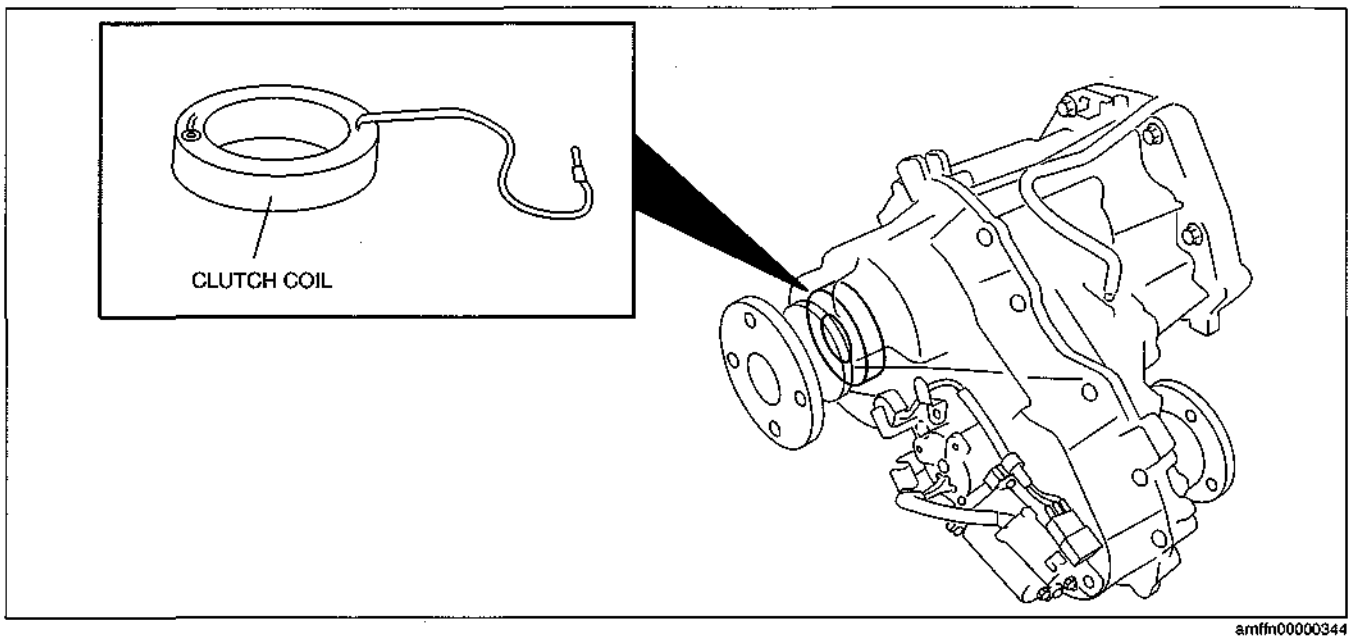


amffn00000343

CLUTCH COIL CONSTRUCTION [5R55S]

id0316c1137400

- The clutch coil is integrated in the transfer.
- When a 4x4 shift signal is input to the 4x4 control module, electricity flows from the control module to the clutch coil and magnetic force is generated. Using the magnetic force, the lockup collar is pulled toward the clutch housing, shifting from 4x2 to 4x4.



amfm00000344

03-16 TRANSFER

TRANSFER OUTLINE..... 03-16–1
TRANSFER
CROSS-SECTIONAL VIEW 03-16–1
TRANSFER POWER FLOW.....03-16–2

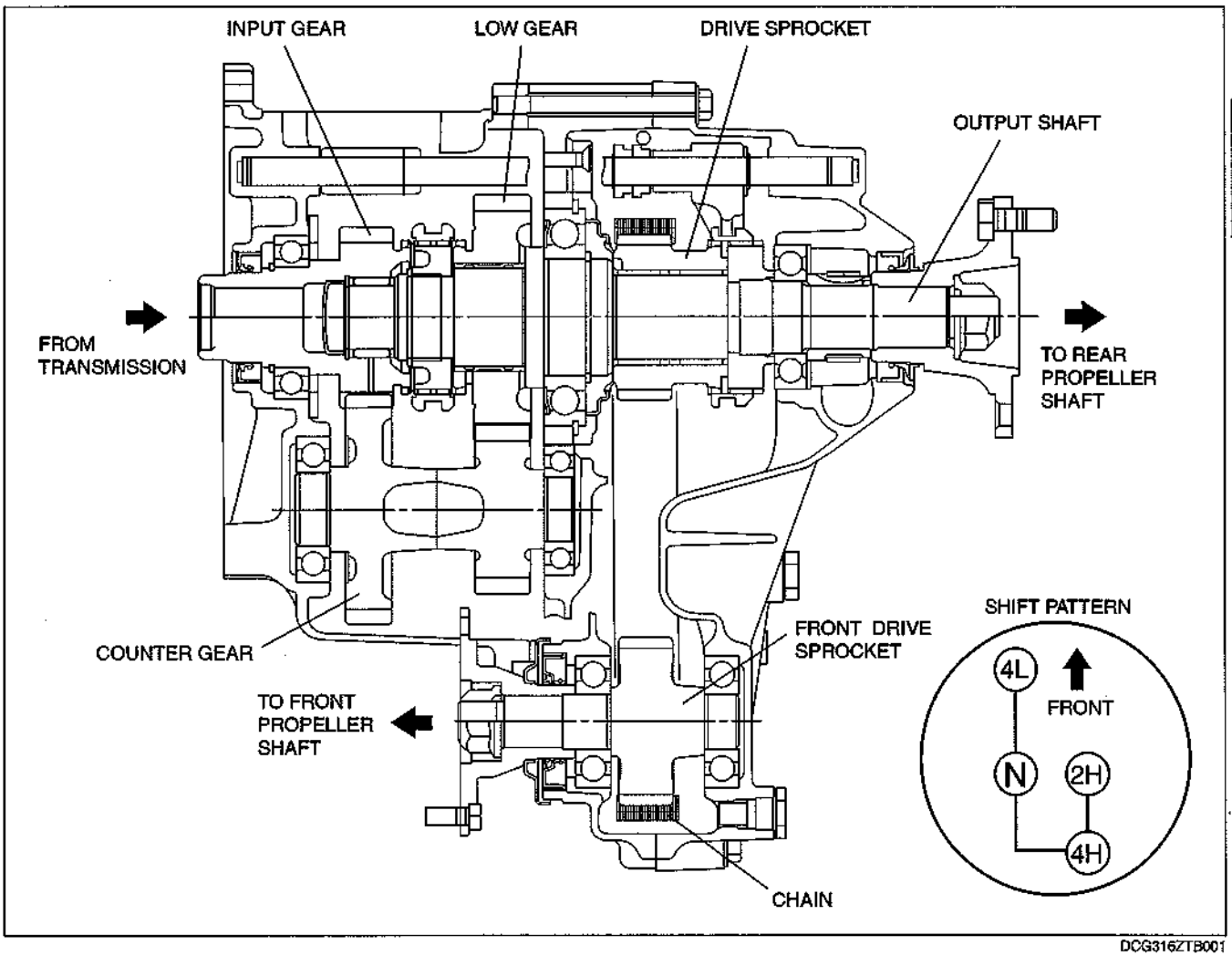
TRANSFER OUTLINE

dcf031600000t01

- The transfer of S15MX-D manual transmission is a chain-drive part-time transfer in which the shift activates mechanically.
- The speed selection is controlled by a single-lever shift mechanism that provides N, 2H, 4H and 4L.
- The purpose of the transfer is for transmission of driving force to either the rear differential only or to the front and rear differentials simultaneously.
- The transfer employs a chain to transfer the driving force to the front differential.
- The transfer is a non-synchro type transmission.
- The chain is a maintenance-free type, requiring no tension adjustment.

TRANSFER CROSS-SECTIONAL VIEW

dcf031600000t02

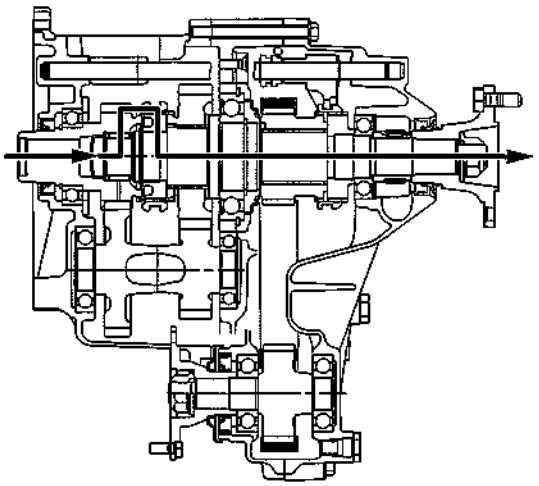


DCG316ZTB001

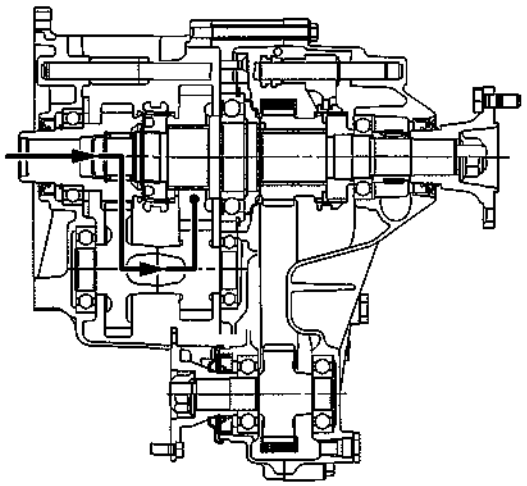
TRANSFER POWER FLOW

dcf031600000t03

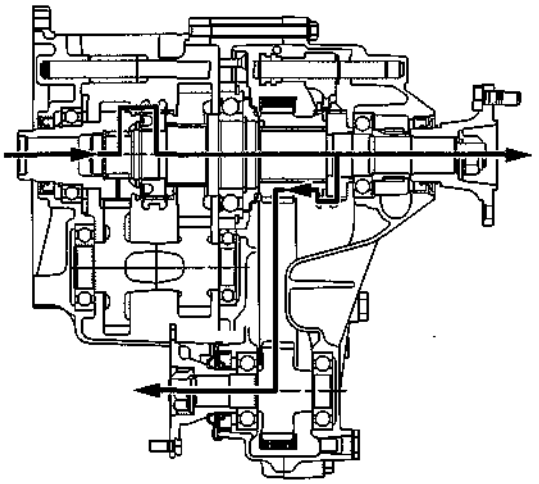
2H (2-HIGH)



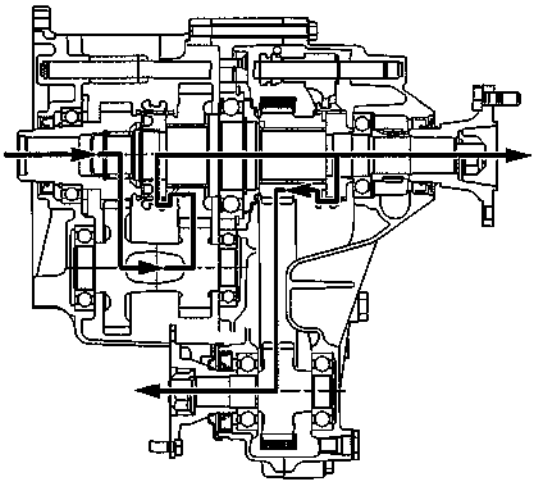
N (NEUTRAL)



4H (4-HIGH)



4L (4-LOW)



DCG316ZTB002

03-18 4-WHEEL DRIVE

REMOTE FREEWHEEL (RFW) OUTLINE 03-18–1
REMOTE FREEWHEEL (RFW) CONSTRUCTION 03-18–1
REMOTE FREEWHEEL (RFW) COMPONENTS AND FUNCTIONS.... 03-18–2
REMOTE FREEWHEEL (RFW) SYSTEM DIAGRAM 03-18–3
REMOTE FREEWHEEL (RFW) SYSTEM WIRING DIAGRAM..... 03-18–4
REMOTE FREEWHEEL (RFW) OPERATION 03-18–4

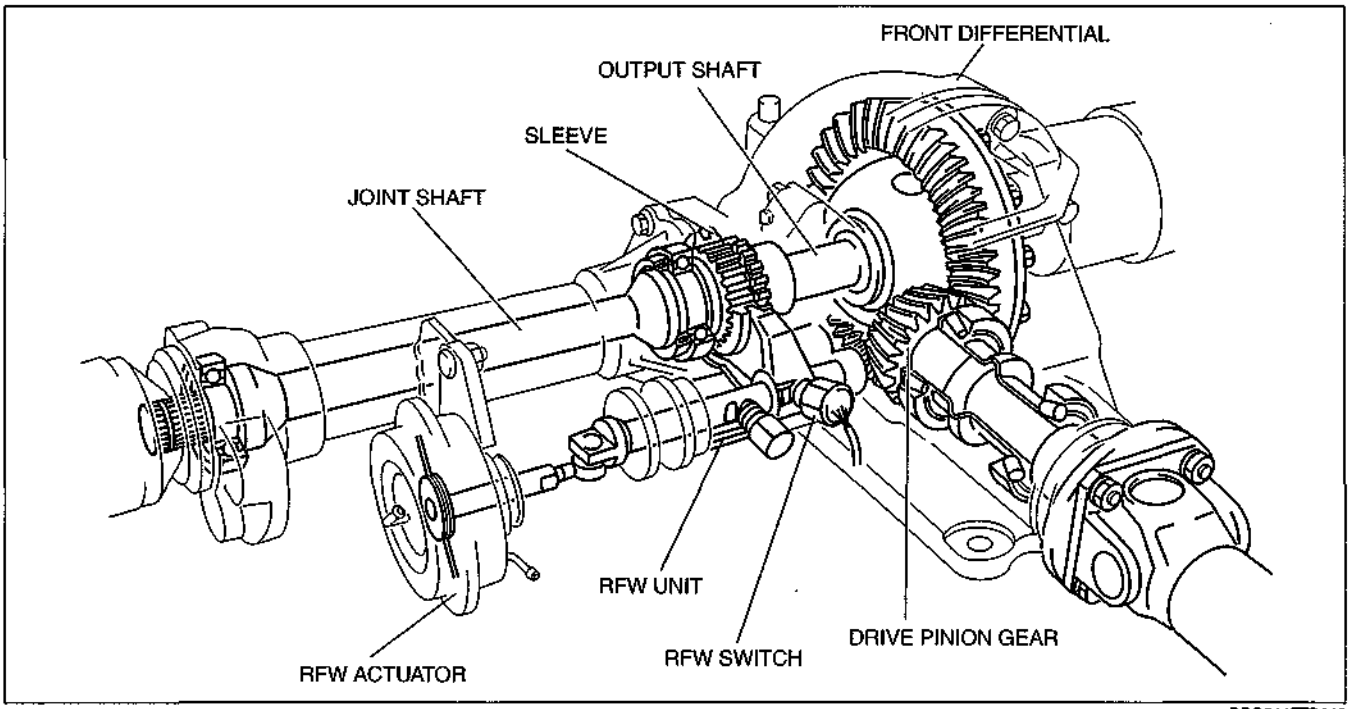
REMOTE FREEWHEEL (RFW) OUTLINE

dcf03182730t01

- The PCM receives signals from the transfer case switch and other switches. It then activates one of two solenoids, causing a vacuum from the vacuum pump to be applied to the RFW actuator, and switching the remote freewheel (RFW) unit to lock or free.
- To prevent reduced performance of the actuator as a result of a decrease in engine vacuum or vacuum pump, such as during acceleration or at high altitude operation, the actuation system includes a one-way check valve.
- The switching mechanism of the RFW unit is a mechanical dog clutch on the left side of the front differential.
- The RFW operation is controlled by PCM.

REMOTE FREEWHEEL (RFW) CONSTRUCTION

dcf03182730t02



DBG314ZTB012

03

REMOTE FREEWHEEL (RFW) COMPONENTS AND FUNCTIONS

dcf03182730003

Electrical component

Part name			Function
PCM (RFW control)			• Sends ON/OFF signals to lock and free solenoids and indicator lights according to signals from various switches
Input	Transfer neutral switch		• Detects transfer select lever N position
	4x4 indicator light		• Detects transfer select lever 2H position
	RFW switch		• Detects RFW unit "lock"
	RFW main switch		• Creates RFW unit "free"
Output	Solenoid		• Switched ON/OFF by electrical signals from PCM • Regulates RFW unit "lock" or "free"
		Lock	• Switched ON when "locked"
		Free	• Switched ON when "free"
	4x4 indicator light		• Illuminates when 4H or 4L selected
	RFW indicator light		• Illuminates when RFW unit locked

Mechanical component

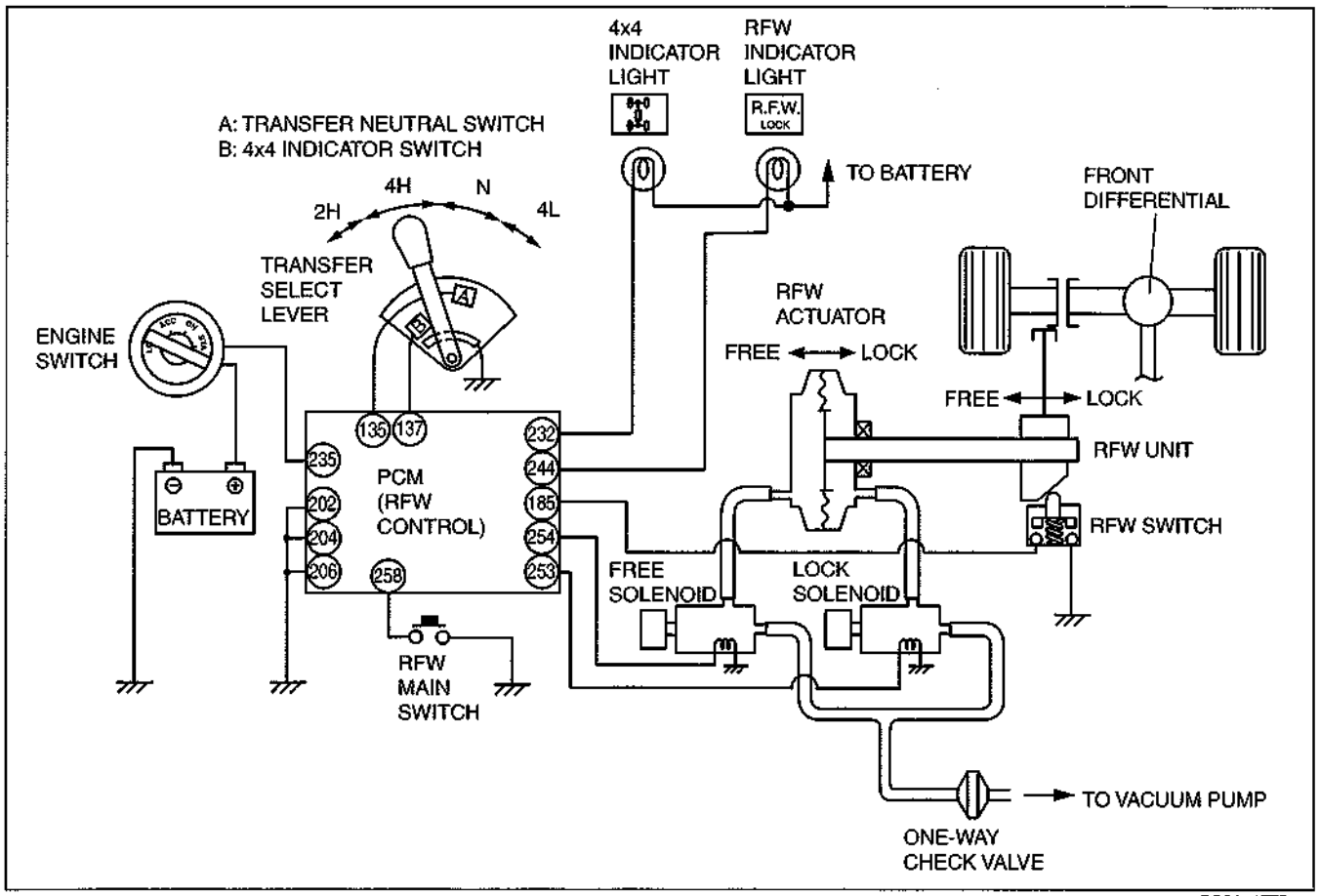
Part name	Function
Transfer select lever	• Sets transfer case operation mode (2H, 4H, N, or 4L)
RFW unit	• Transmits front propeller shaft rotation to front tires
RFW actuator	• "Locks" or "free" RFW unit
One-way check valve	• Prevents leakage of vacuum

Relationship of Component and Function

Part name / Function	Input				Output			
	Transfer neutral switch	4x4 indicator switch	RFW switch	RFW main switch	Lock solenoid	Free solenoid	4x4 indicator light	RFW indicator light
Controlled by driver	x	x		x				
Controlled by RFW unit			x					
Controlled by PCM					x	x	x	x

REMOTE FREEWHEEL (RFW) SYSTEM DIAGRAM

dcf031827300104

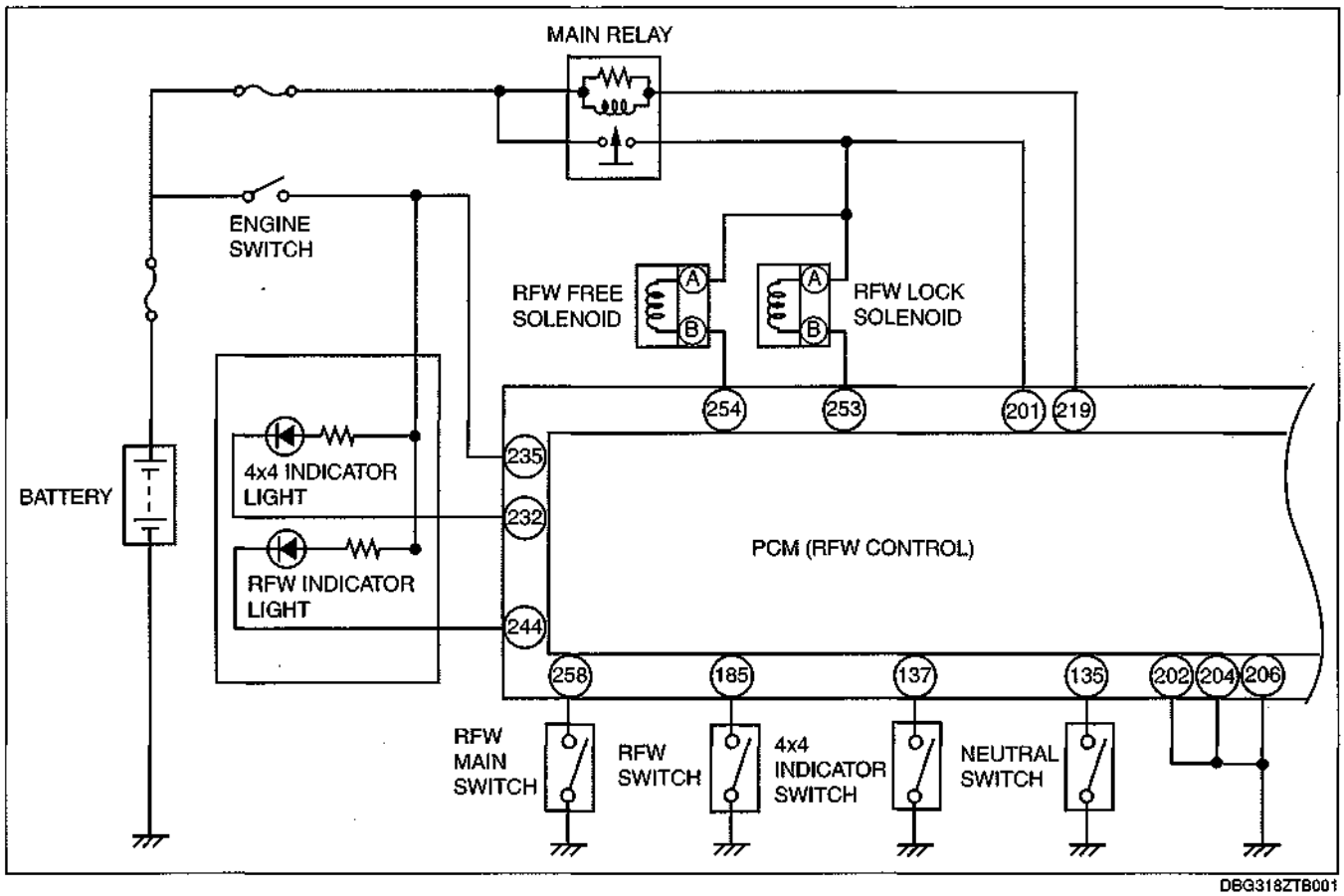


DBG314ZTB003

03

REMOTE FREEWHEEL (RFW) SYSTEM WIRING DIAGRAM

dcf03182730005



DBG318ZTB001

REMOTE FREEWHEEL (RFW) OPERATION

dcf03182730006

2H (free) to 4H Selection

- The remote freewheel (RFW) unit is automatically locked when the select lever is moved from 2H to 4H while the vehicle is stopped. At this time, the 4x4 indicator light and the RFW indicator light illuminate to inform the drive that the vehicle is in four-wheel-drive mode and that the RFW unit is locked.

Caution

- **The changeover from 2H (free) to 4H (locked) MUST NOT be made while the vehicle is moving because it may result in damage to the front differential and RFW components.**
  If such a shift is made by mistake, a ratching noise may be heard. In this case return the select lever to 2H and press the RFW main switch.

4H to 2H (free) Selection

- The RFW unit will be automatically freed when the RFW main switch is pressed once after the select lever is moved (while the vehicle is moving or while the vehicle is stopped) from 4H to 2H. At this time, the 4x4 indicator light and the RFW indicator light go OFF to inform the driver that the vehicle is in 4x2 mode and that the RFW unit has been freed.

Note

- The RFW unit will remain locked only if the RFW main switch is pressed while the vehicle is operating in 4H or 4L.

2H (lock) to 4H, or 4H to 2H (lock) Selection

- If the RFW unit is locked, the transfer case can be changed from 2H to 4H or vice versa while the vehicle is running. At this time, the RFW indicator light remains illuminated to inform the driver that the RFW unit remains locked.

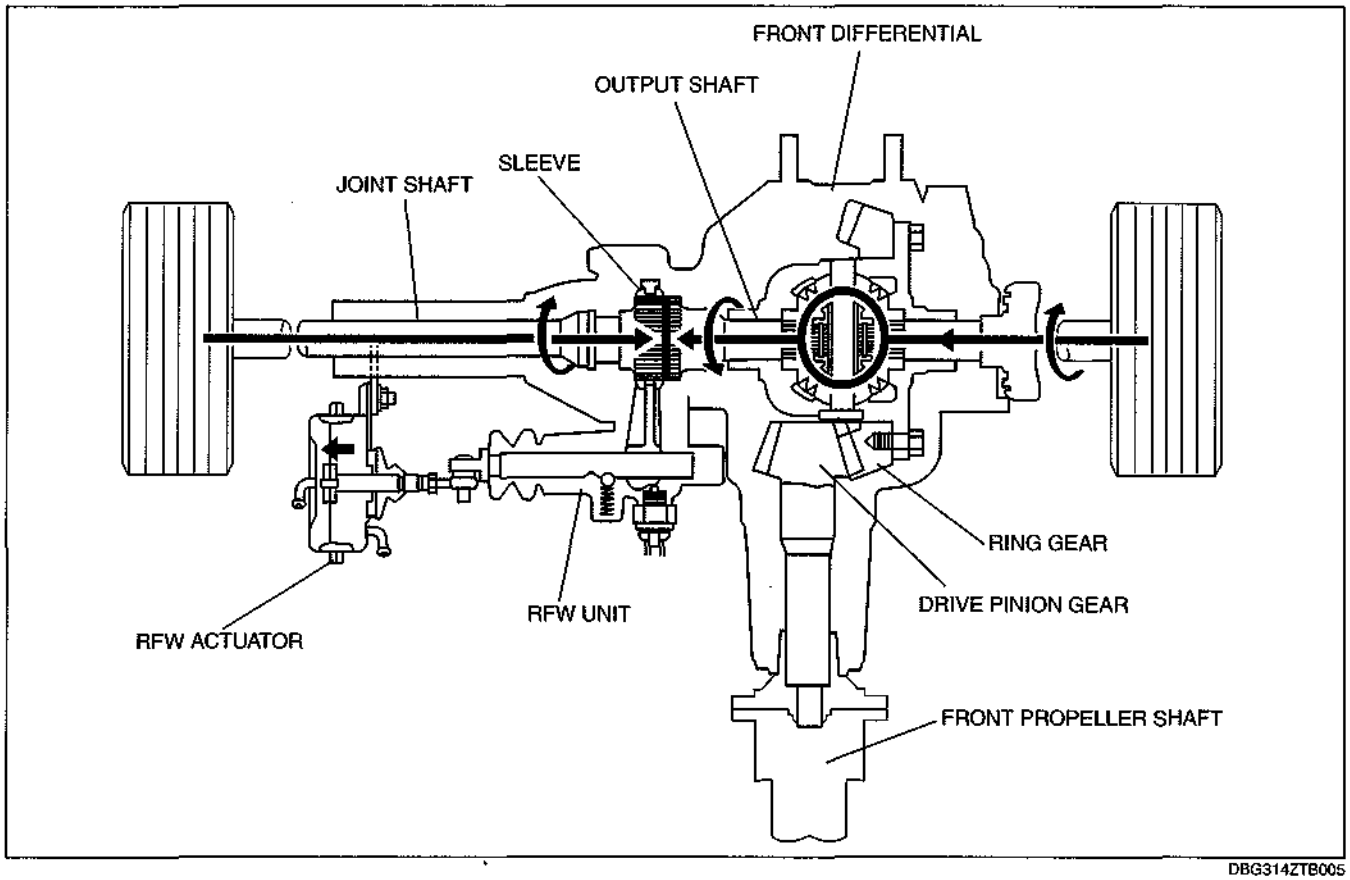
4H to 4L, or 4L to 4H Selection

- As with a conventional 4x4, the transfer case can be shifted from 4H to 4L or vice versa when depressing the clutch while the vehicle is stopped and the engine is running. At this time, the RFW unit remains locked, and the 4x4 and RFW indicator lights remain illuminated.

Transmission Oil Temperature Increase Prevention

- If the vehicle is driven at high speed with the RFW locked, the temperature of the oil for operating the transmission, transfer, and front differential increases, resulting in internal part damage. Due to this, the RFW indicator light flashes (**0.3 s** intervals) to alert the driver when the following condition is met:
  - — Vehicle is driven at **100 km/h {62 MPH} or more** with the RFW locked.
  - — When the vehicle speed decreases to less than **95 km/h {59 MPH}** from the above condition, the RFW indicator light illuminates again. (Normal indication)

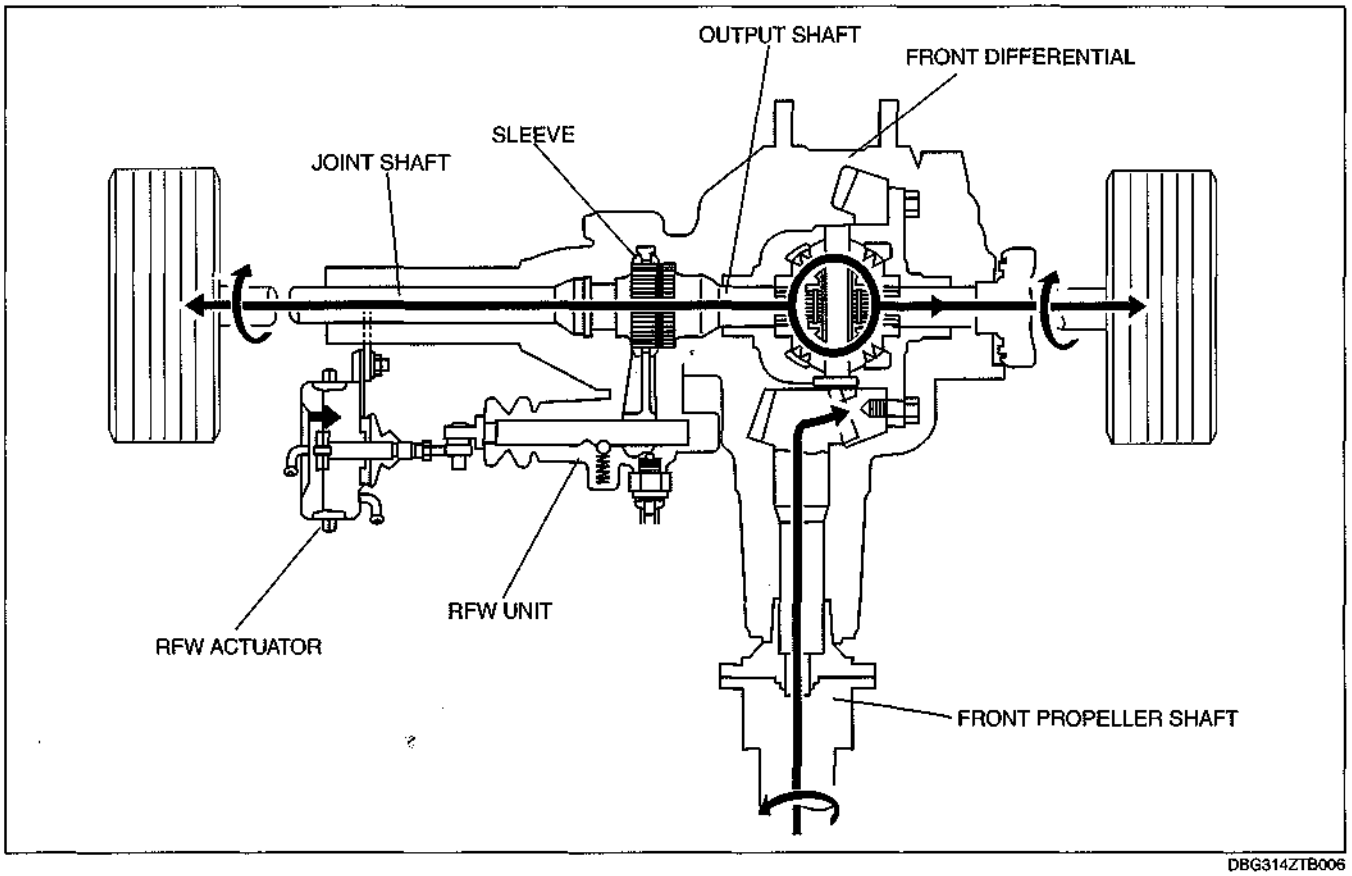
Remote Freewheel Unit: FREE



DBG314ZTB005

- The RFW actuator pulls the sleeve away from the front differential output shaft, allowing the front differential to rotate freely.
  The rotation of the right front tire is absorbed by the front differential, with the result that the ring gear, drive pinion gear, and front propeller shaft do not turn.

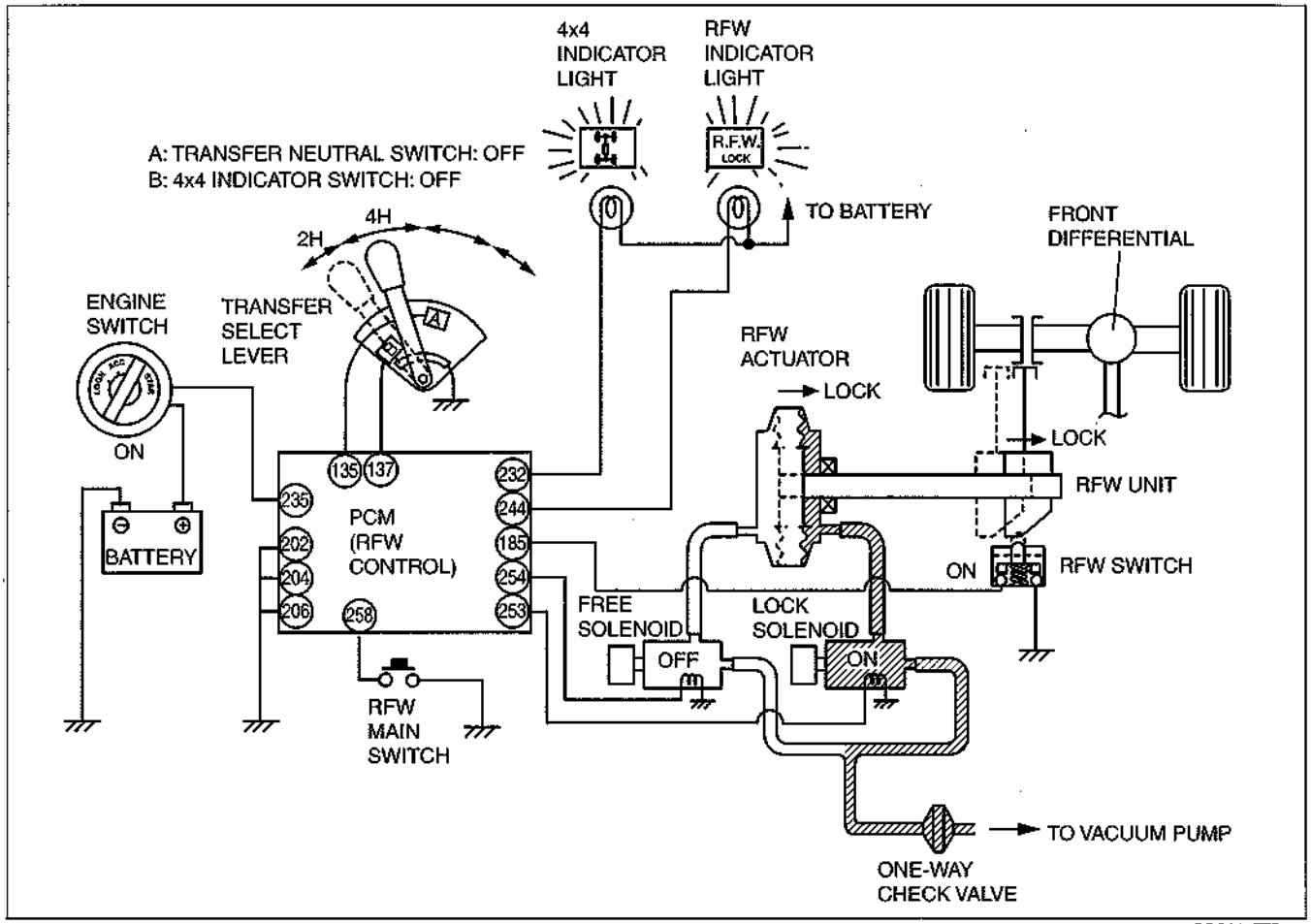
Remote Freewheel Unit: LOCK



DBG314ZTB006

- The RFW actuator pushes the sleeve over the output shaft, and the front differential output shaft and joint shaft are coupled together.
  If the sleeve and the output shaft are not aligned when actuated, the RFW actuator applies pressure to the sleeve unit it can slide into place.
  The rotation of the front propeller shaft is then transferred, via the front differential, to the front tires, and four-wheel-drive operation is possible.

2H (free) to 4H Selection

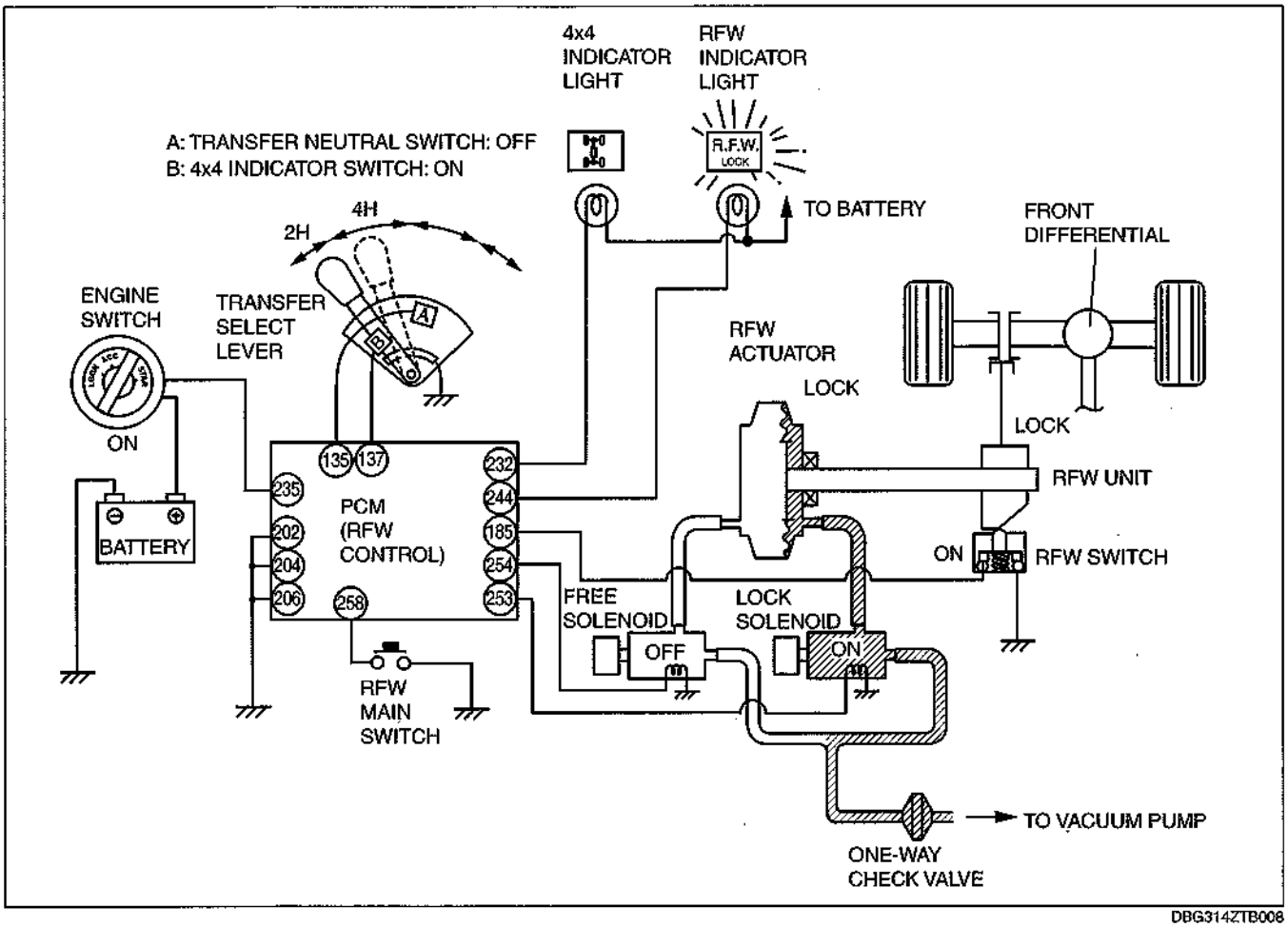


DBG314ZTB007

Part name / Condition	Input				Output				RFW actuator Position
	Transfer neutral switch	4x4 indicator switch	RFW switch	RFW main switch	Lock solenoid	Free solenoid	4x4 indicator light	RFW indicator light	
2H-F	OFF	ON	OFF	-	OFF	ON	OFF	OFF	Free
4H-L_1	OFF	OFF	OFF	-	ON	OFF	ON	OFF	Lock
4H-L	OFF	OFF	ON	-	ON	OFF	ON	ON	Lock

- When the select lever is moved from 2H (2H-F in PCM) to 4H, the 4x4 indicator switch (in the transfer case switch) changes from ON to OFF. As a result, the PCM establishes a condition known as 4H-L_1, and the lock solenoid is switched ON, causing the actuator to move toward the lock side. At the same time, the 4x4 indicator light is illuminated.
  When the RFW unit is fully locked, the RFW switch is switched ON, and condition 4H-L is established in the PCM. The RFW indicator light illuminates to notify the driver that the RFW is locked.

4H to 2H (lock) Selection

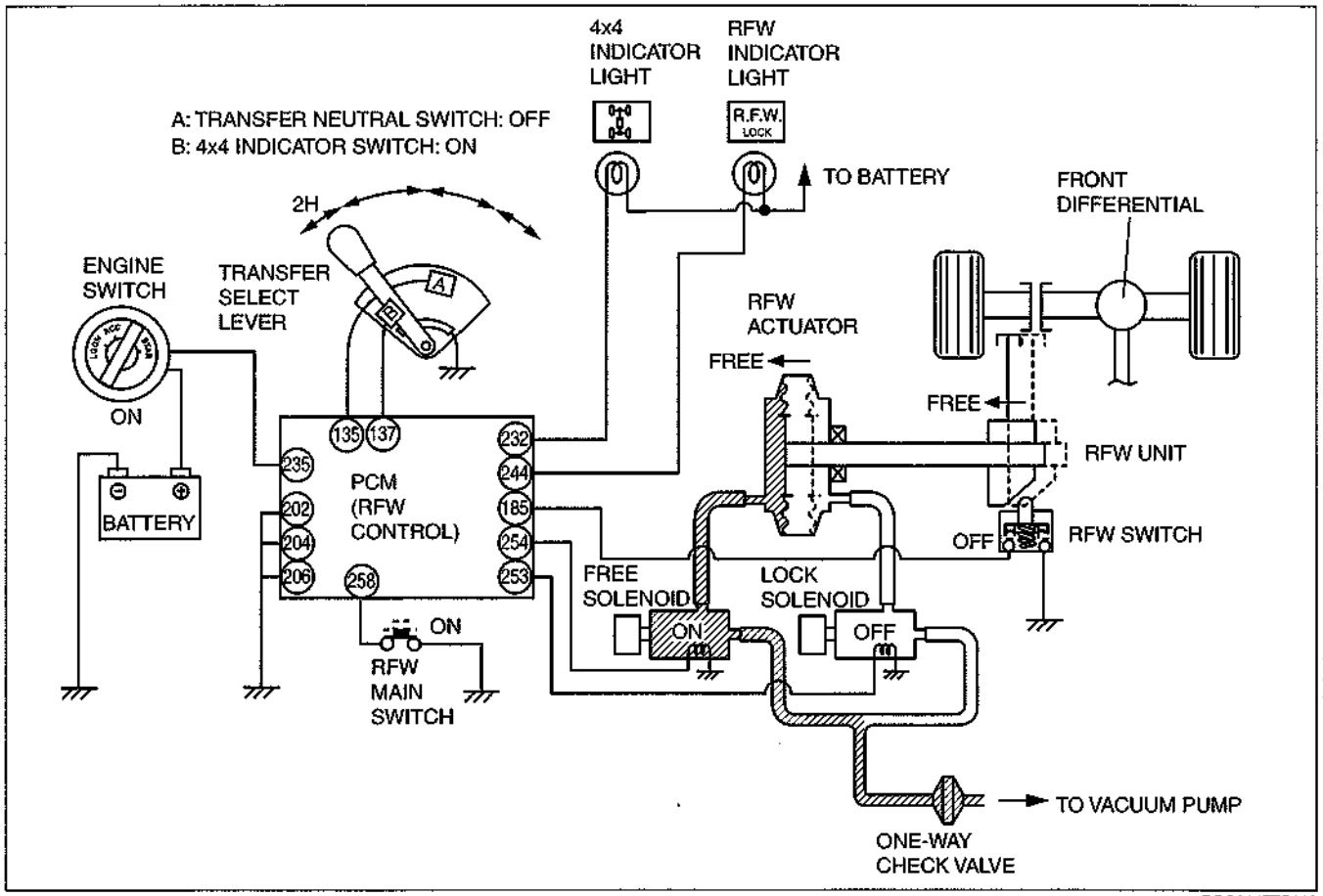


DBG314ZTB008

Part name / Condition	Input				Output				RFW actuator Position
	Transfer neutral switch	4x4 indicator switch	RFW switch	RFW main switch	Lock solenoid	Free solenoid	4x4 Indicator light	RFW indicator light	
4H-F	OFF	OFF	ON	-	ON	OFF	ON	ON	Lock
2H-L	OFF	ON	ON	OFF	ON	OFF	OFF	ON	Lock

- When the select lever is moved from 4H (4H-L condition) to 2H, the 4x4 indicator switch (in the transfer case switch) changes from OFF to ON.
  If the RFW main switch is in the OFF position, condition 2H-L is established, the lock solenoid remains ON, and the RFW actuator is held at the lock position. At this time, the 4x4 indicator light is switched OFF.

2H (lock) to 2H (free) Selection

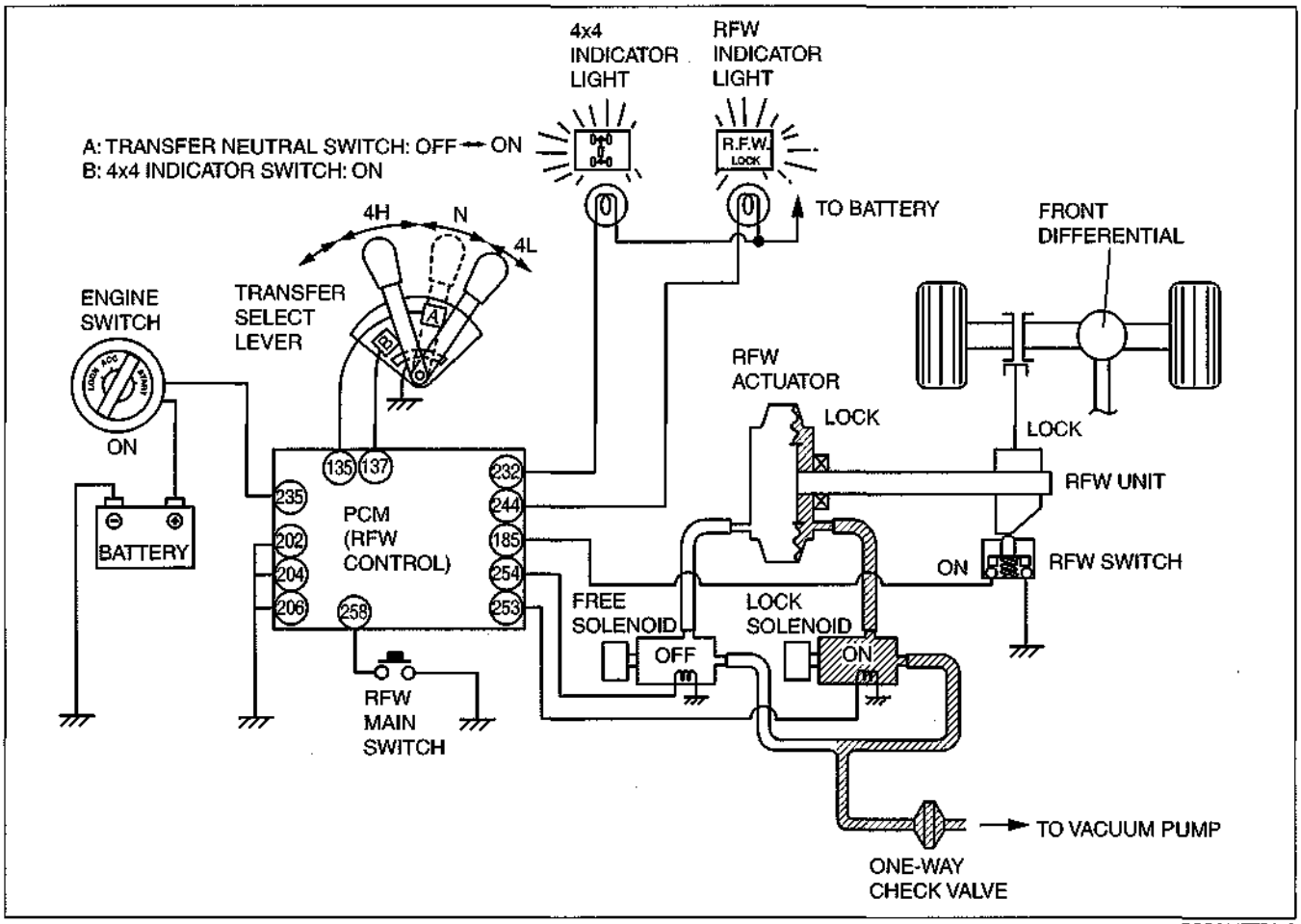


DBG314ZTB009

Part name / Condition	Input				Output				RFW actuator Position
	Transfer neutral switch	4x4 indicator switch	RFW switch	RFW main switch	Lock solenoid	Free solenoid	4x4 indicator light	RFW indicator light	
2H-L	OFF	ON	ON	OFF	ON	OFF	OFF	ON	Lock
2H-F_1	OFF	ON	OFF	ON	OFF	ON	OFF	OFF	Free
2H-F	OFF	ON	OFF	-	OFF	ON	OFF	OFF	Free

- When the above condition (2H-L) the RFW main switch is pressed once (ON), condition 2H-F_1 is established, the RFW indicator light is switched OFF, and, same time, the free solenoid is switched ON, and the actuator is pulled to the free side. When the RFW unit becomes fully free, the RFW switch is turned OFF, and 2H-F condition is established.

4H to 4L or 4L to 4H Selection

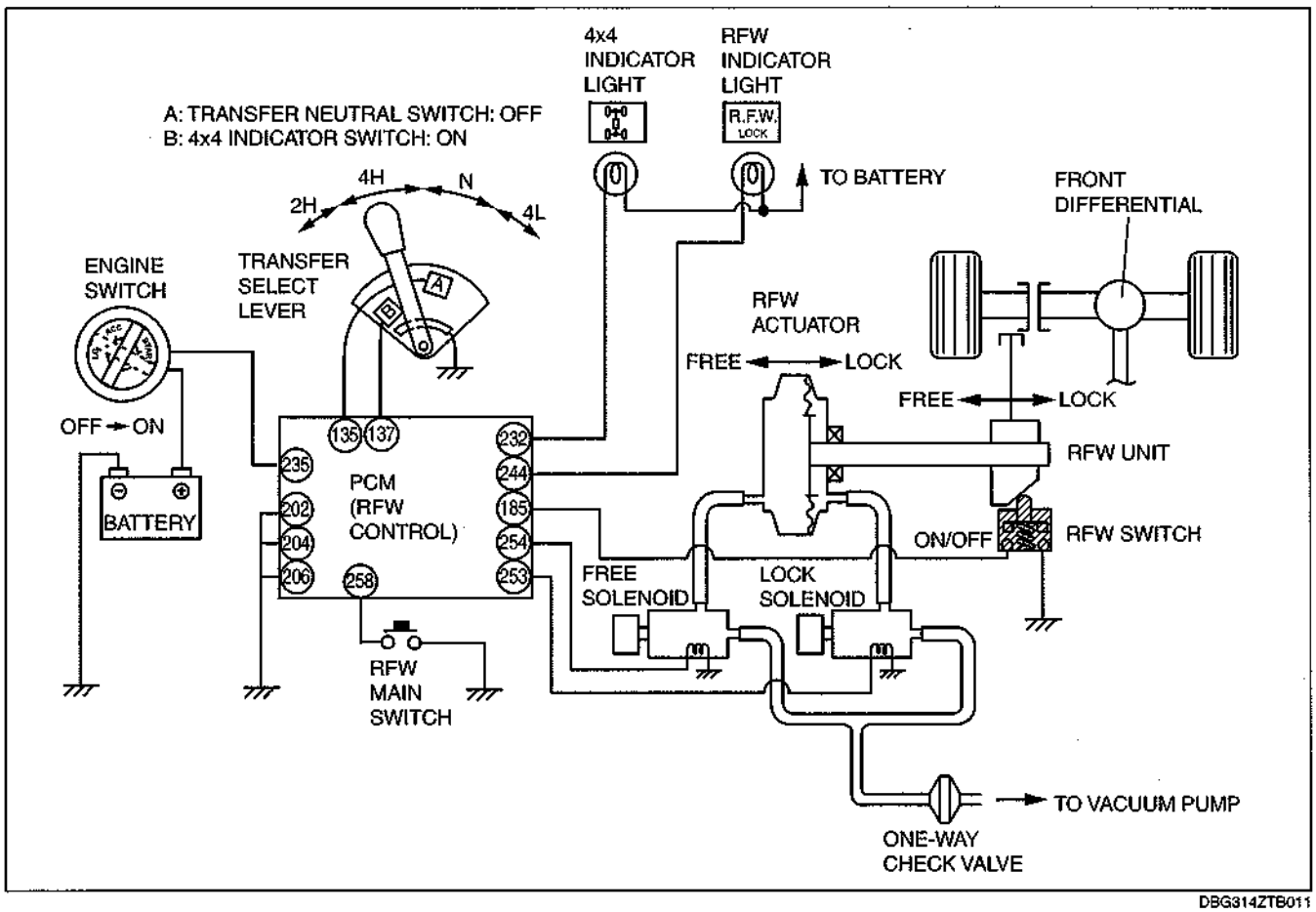


DBG314ZTB010

Part name / Condition	Input				Output				RFW actuator Position
	Transfer neutral switch	4x4 indicator switch	RFW switch	RFW main switch	Lock solenoid	Free solenoid	4x4 indicator light	RFW indicator light	
4H-L	OFF	OFF	ON	-	ON	OFF	ON	ON	Lock
N	ON	OFF	ON	-	ON	OFF	OFF	ON	Lock

- When the select lever is moved from 4H to 4L (both 4H-L in the PCM) or vice versa, there is a change to the neutral condition midway through the changeover thereby momentarily switching ON the transfer neutral switch (in the transfer case switch), and switching OFF the 4x4 indicator light.
  During 4H or 4L operation, the lock solenoid is ON (as a result of 4H-L condition), and the RFW actuator is held in the lock position. If the RFW main switch is pressed at this time, there is no effect upon the RFW actuator.

Engine Switch Turned from OFF to ON



DBG314ZTB011

Part name / Condition	Input				Output				RFW actuator Position
	Transfer neutral switch	4x4 indicator switch	RFW switch	RFW main switch	Lock solenoid	Free solenoid	4x4 indicator light	RFW indicator light	
4H-L	OFF	OFF	ON	-	ON	OFF	ON	ON	Lock
2H-L	OFF	ON	OFF	-	OFF	ON	OFF	OFF	Free
2H-L	OFF	ON	OFF	OFF	OFF	ON	OFF	OFF	Free

- When the ignition switch is turned from OFF to ON, the switches and solenoid are activated to provide the same RFW condition as when it was turned off.

03-18 4-WHEEL DRIVE [AT (5R55S)]

4x4 CONTROL SYSTEM OUTLINE [AT (5R55S)] 03-18–1
4x4 CONTROL SYSTEM CONSTRUCTION [AT (5R55S)] 03-18–1
4x4 CONTROL SYSTEM COMPONENTS AND FUNCTIONS [AT (5R55S)] 03-18–2
4x4 CONTROL SYSTEM SYSTEM DIAGRAM [AT (5R55S)] 03-18–3
4x4 CONTROL SYSTEM SYSTEM WIRING DIAGRAM [AT (5R55S)] 03-18–4
4x4 CONTROL SYSTEM OPERATION [AT (5R55S)] 03-18–4

4x4 CONTROL SYSTEM OUTLINE [AT (5R55S)]

id0318d2164200

- A special 4x4 control module has been adopted for the 4x4 control system control, and it operates the transfer motor according to the signals from the speed sensor, 4x4 switch, and digital TR sensor to perform shifting between 2H, 4H and 4L.
- The 4x4 CM receives signals from the transfer case sensor and other switches. It then activates one of two solenoids, causing a vacuum from the vacuum pump to be applied to the RFW actuator, and switching the remote freewheel (RFW) unit to lock or free.
- To prevent reduced performance of the actuator as a result of a decrease in engine vacuum or vacuum pump, such as during acceleration or at high altitude operation, the actuation system includes a one-way check valve.
- The switching mechanism of the RFW unit is a mechanical dog clutch on the left side of the front differential.
- The RFW operation is controlled by 4x4 CM.

4x4 CONTROL SYSTEM CONSTRUCTION [AT (5R55S)]

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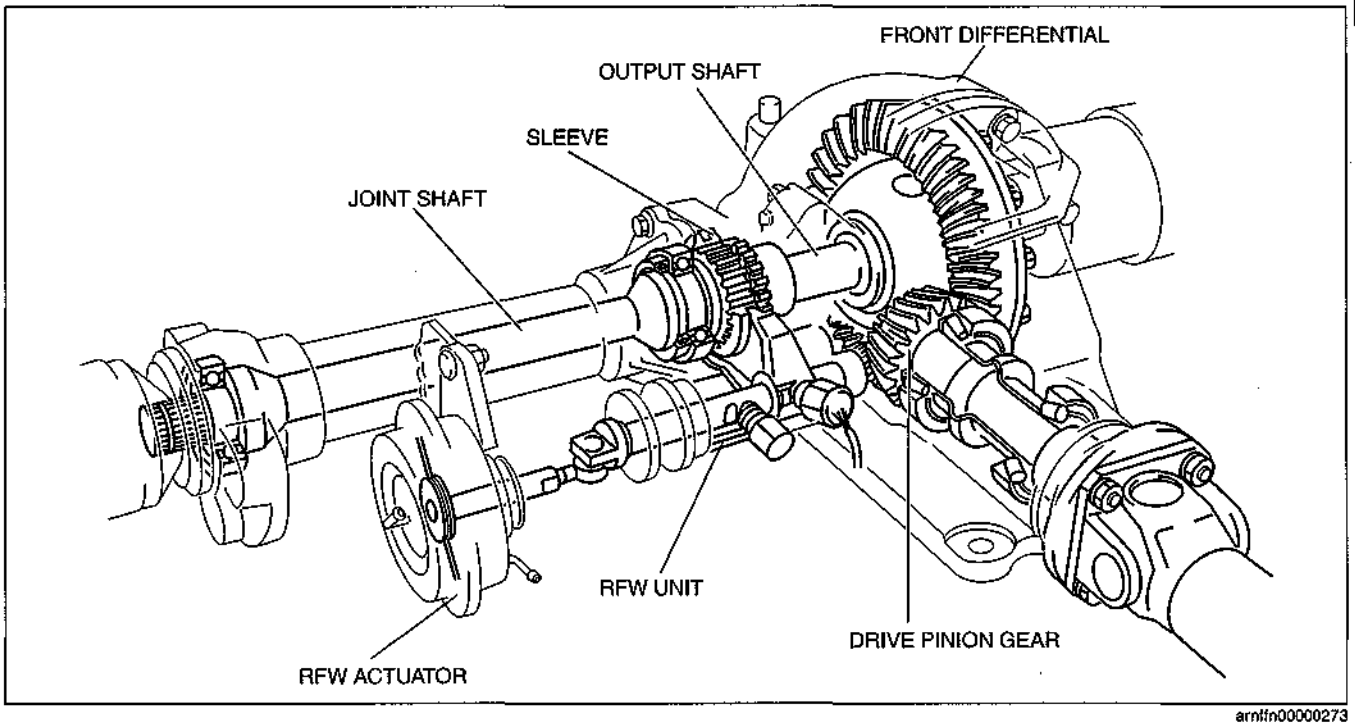

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4x4 CONTROL SYSTEM COMPONENTS AND FUNCTIONS [AT (5R55S)]

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Electrical component

Part name			Function
4x4 CM			• Sends ON/OFF signals to lock and free solenoids and indicator lights according to signals from various switches
Input	Digital TR sensor		• Detects selector lever N position
	4x4 switch		• Detects 4x4 switch 2H, 4H or 4L position
	Speed sensor		• Detects output shaft speed
Output	Solenoid		• Switched ON/OFF by electrical signals from 4x4 CM • Regulates RFW unit "lock" or "free"
		Lock	• Switched ON when "locked"
		Free	• Switched ON when "free"
	Motor component (transfer case)		• Sets transfer case operation mode (2H, 4H or 4L)
	Clutch coil (transfer case)		• Operates when 4H or 4L selected
	4x4 indicator light		• Illuminates when 4H or 4L selected
	4L indicator light		• Illuminates when 4L selected

Mechanical component

Part name	Function
RFW unit	• Transmits front propeller shaft rotation to front tires
RFW actuator	• "Locks" or "free" RFW unit
One-way check valve	• Prevents leakage of vacuum
Motor component (transfer case)	• Motor operates to slide each shift fork
Clutch coil (transfer case)	• Magnetic force occur in clutch coil during operation to pull the lockup component

Relationship of Component and Function

Part name / Function	Input			Output					
	Digital TR sensor	4x4 switch	Speed sensor	Lock solenoid	Free solenoid	Motor component	Clutch coil	4x4 indicator light	4L indicator light
Controlled by driver	x	x							
Controlled by 4x4 CM			x	x	x	x	x	x	x

4x4 CONTROL SYSTEM SYSTEM DIAGRAM [AT (5R55S)]

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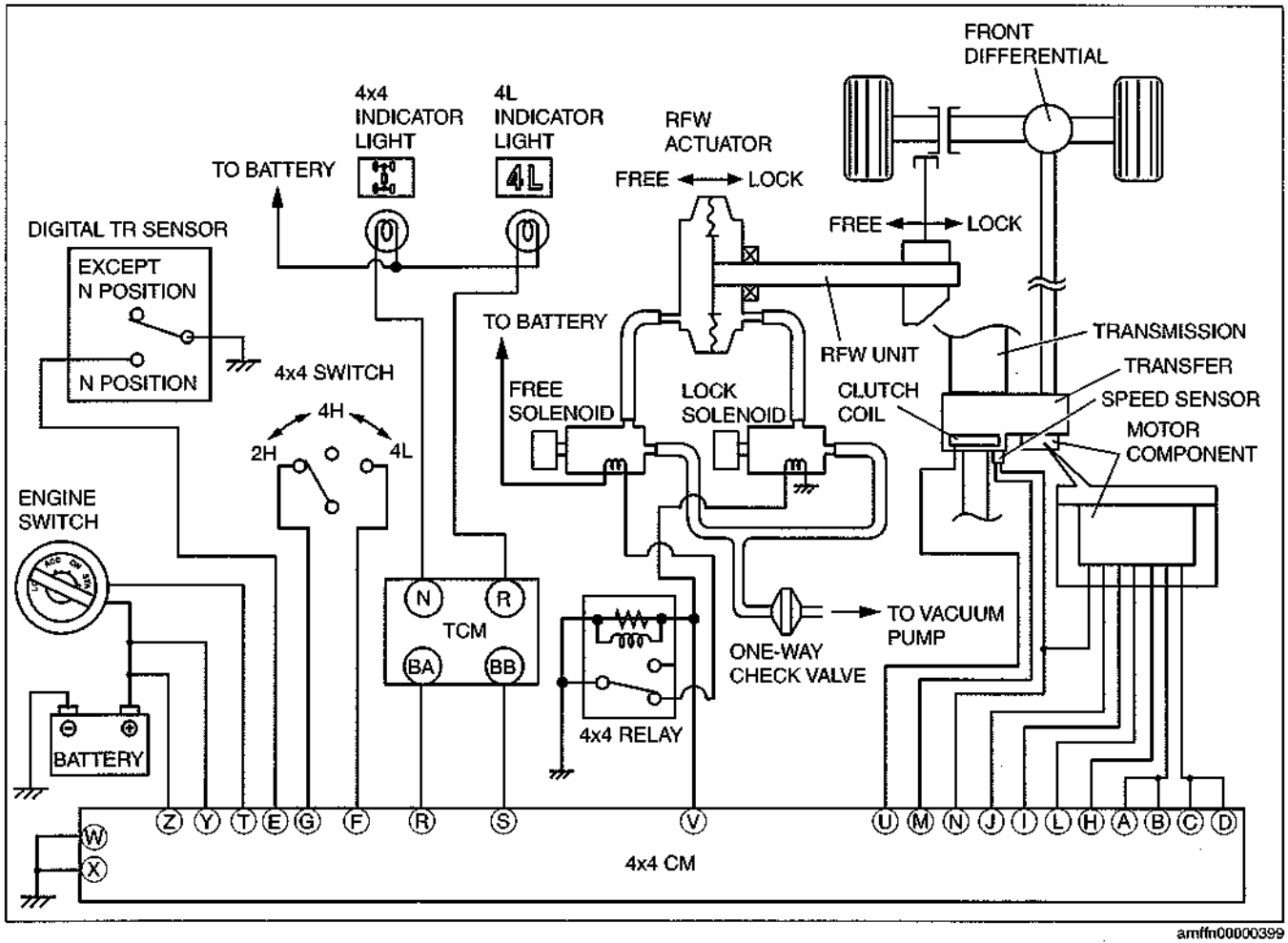

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4x4 CONTROL SYSTEM SYSTEM WIRING DIAGRAM [AT (5R55S)]

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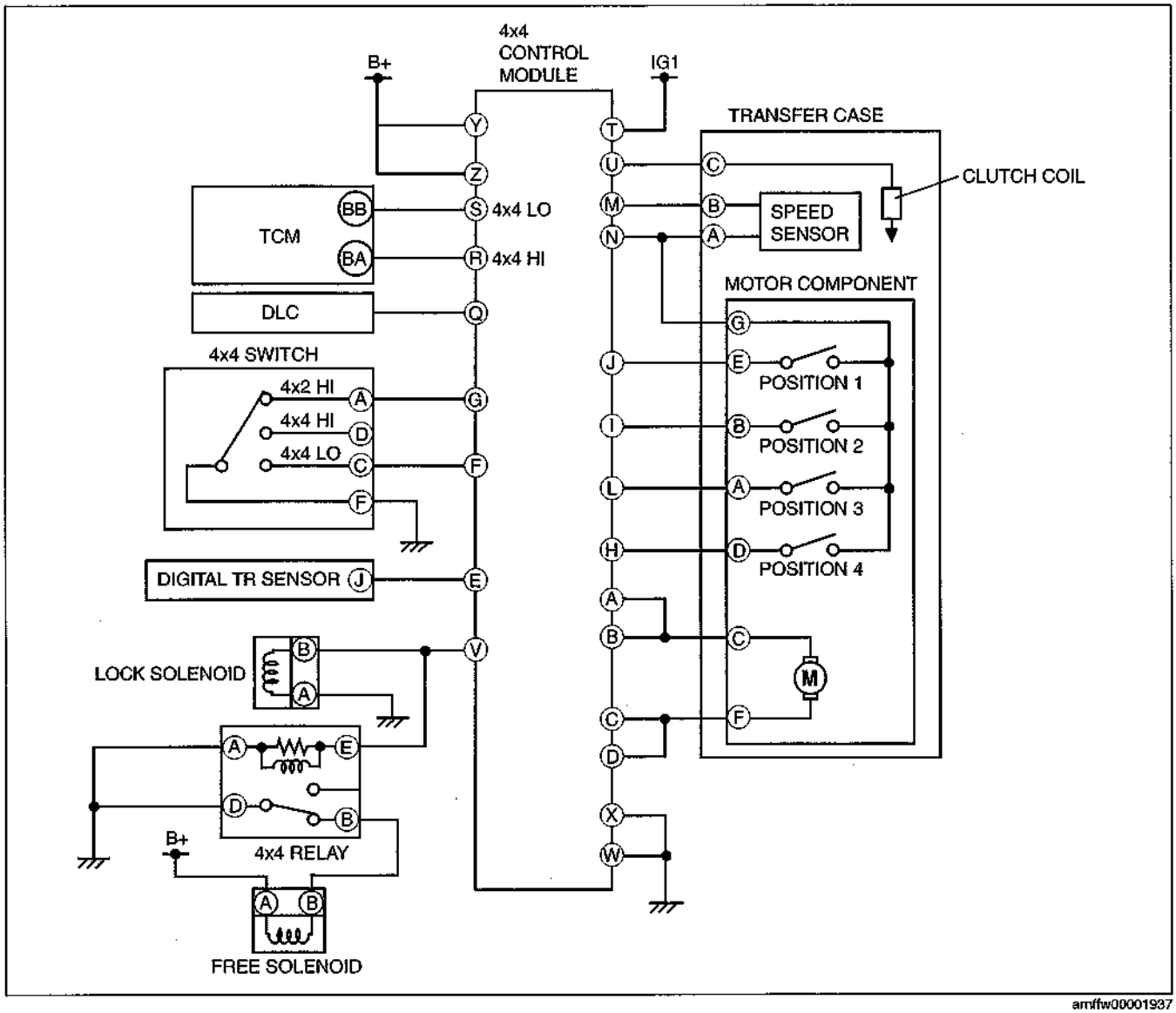

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4x4 CONTROL SYSTEM OPERATION [AT (5R55S)]

id0318d2165000

Note
- Shifting from 2H to 4H or 4H to 2H can be performed whether the vehicle is stopped or driving.

2H to 4H Selection
- When the 4x4 switch is switched from 2H to 4H, the clutch coil and motor in the transfer operate, the lockup shift fork slides to establish the 4H condition and the RFW unit locks automatically. At this time, the 4x4 indicator light illuminates to inform the driver that the vehicle is in four-wheel-drive mode.

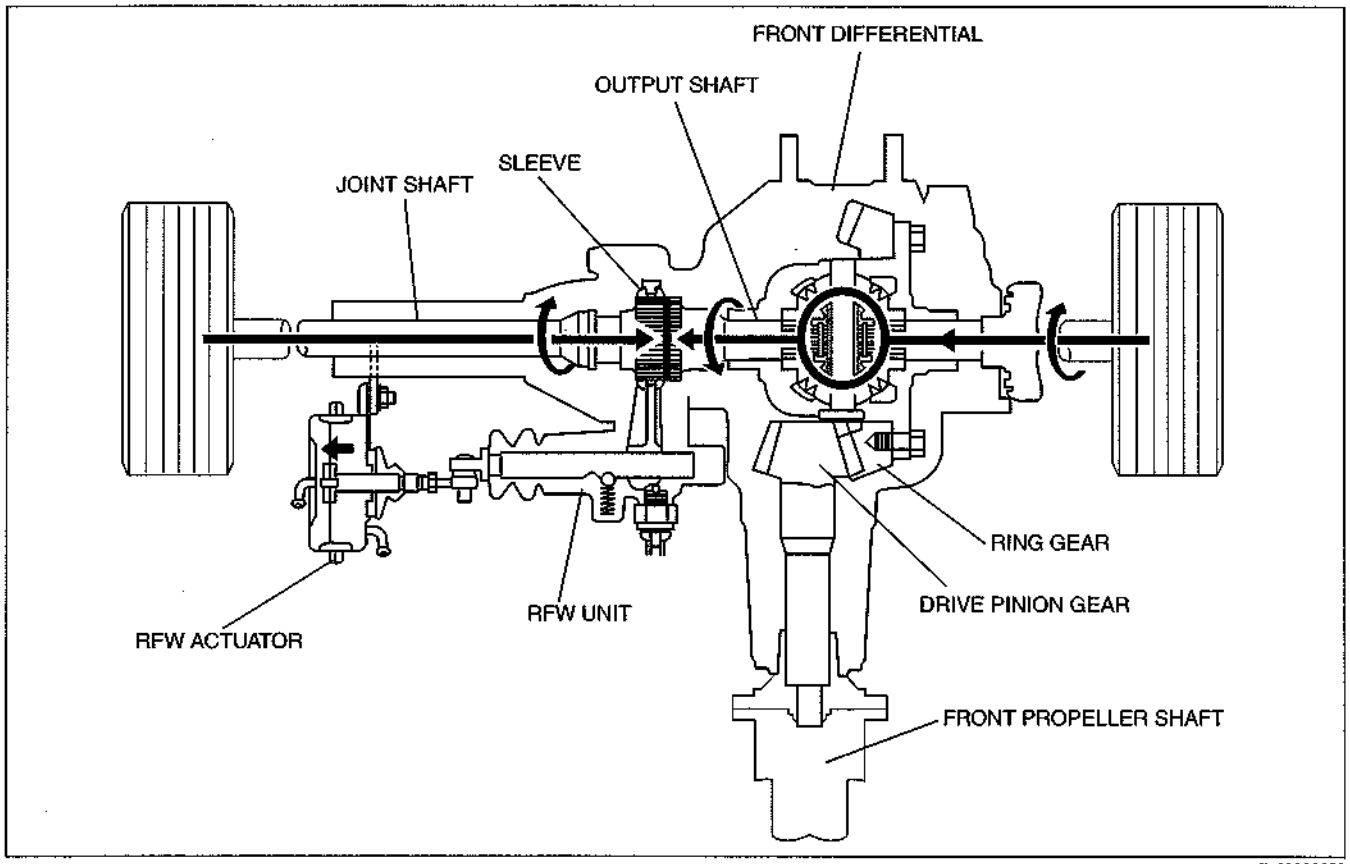
4H to 2H Selection
- When the 4x4 switch is switched from 4H to 2H, the clutch coil in the transfer stops operation but the motor operates to slide the lockup shift fork and establish the 2H condition. Also, the RFW unit unlocks automatically. At this time, the 4x4 indicator light turns off to inform the driver that the vehicle is in 4x2 mode.

4H to 4L Selection
- Shifting from 4H to 4L can be performed only when the vehicle is stopped with the selector lever in the N position. When the 4x4 switch is switched from 4H to 4L, the motor in the transfer operates and the reduction shift fork slides to establish the 4L condition. At this time, the RFW unit remains locked and the 4x4 indicator light remains illuminated and, in addition, the 4L indicator light illuminates.

4L to 4H Selection

- Shifting from 4L to 4H can be performed only when the vehicle is stopped with the selector lever in the N position. When the 4x4 switch is switched from 4L to 4H, the motor in the transfer operates and the reduction shift fork slides to establish the 4H condition. At this time, the RFW unit remains locked and the 4x4 indicator light remains illuminated, but the 4L indicator light turns off.

Remote Freewheel Unit: FREE



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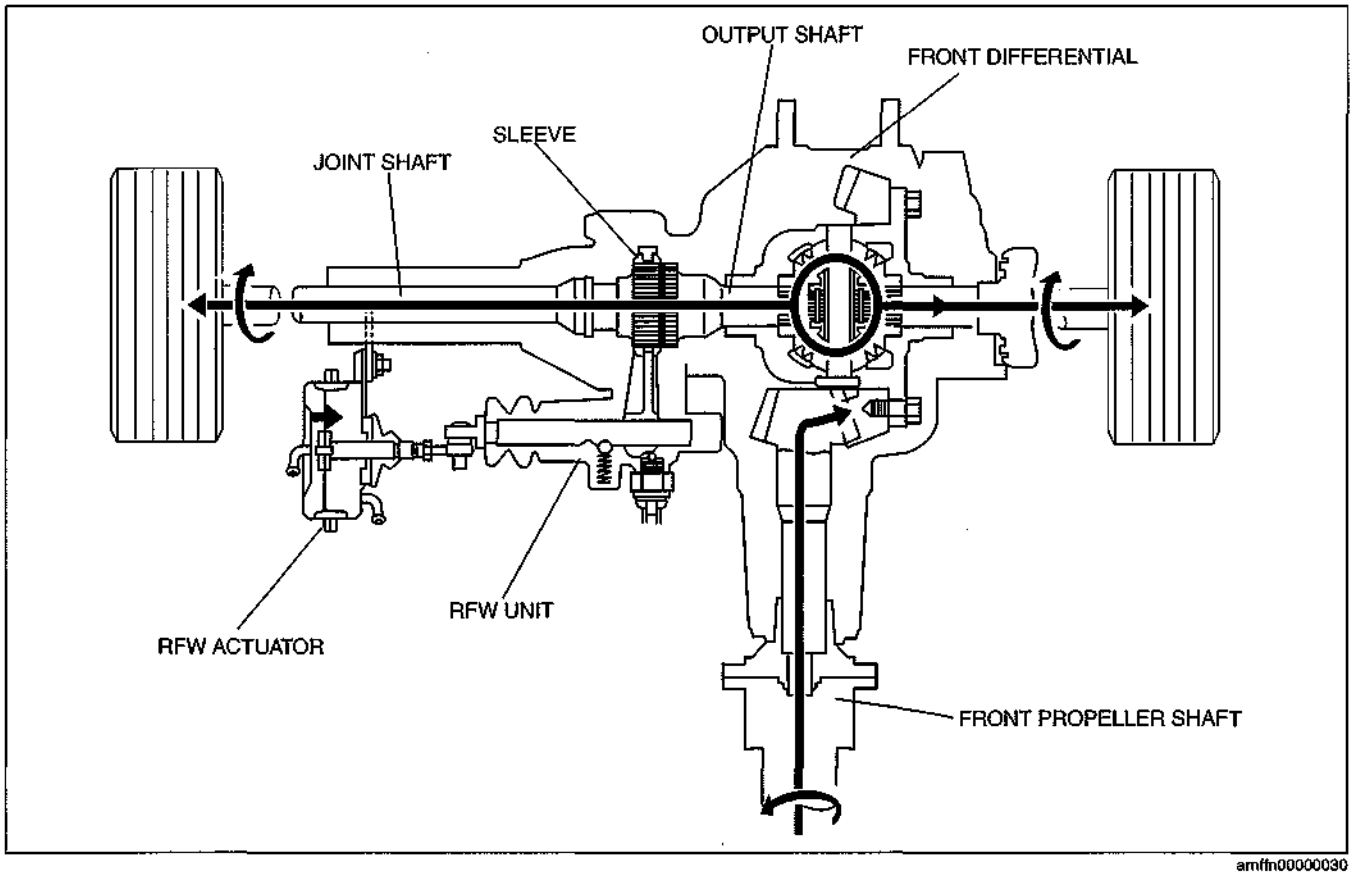
- The RFW actuator pulls the sleeve away from the front differential output shaft, allowing the front differential to rotate freely.
  The rotation of the right front tire is absorbed by the front differential, with the result that the ring gear, drive pinion gear, and front propeller shaft do not turn.

Remote Freewheel Unit: LOCK



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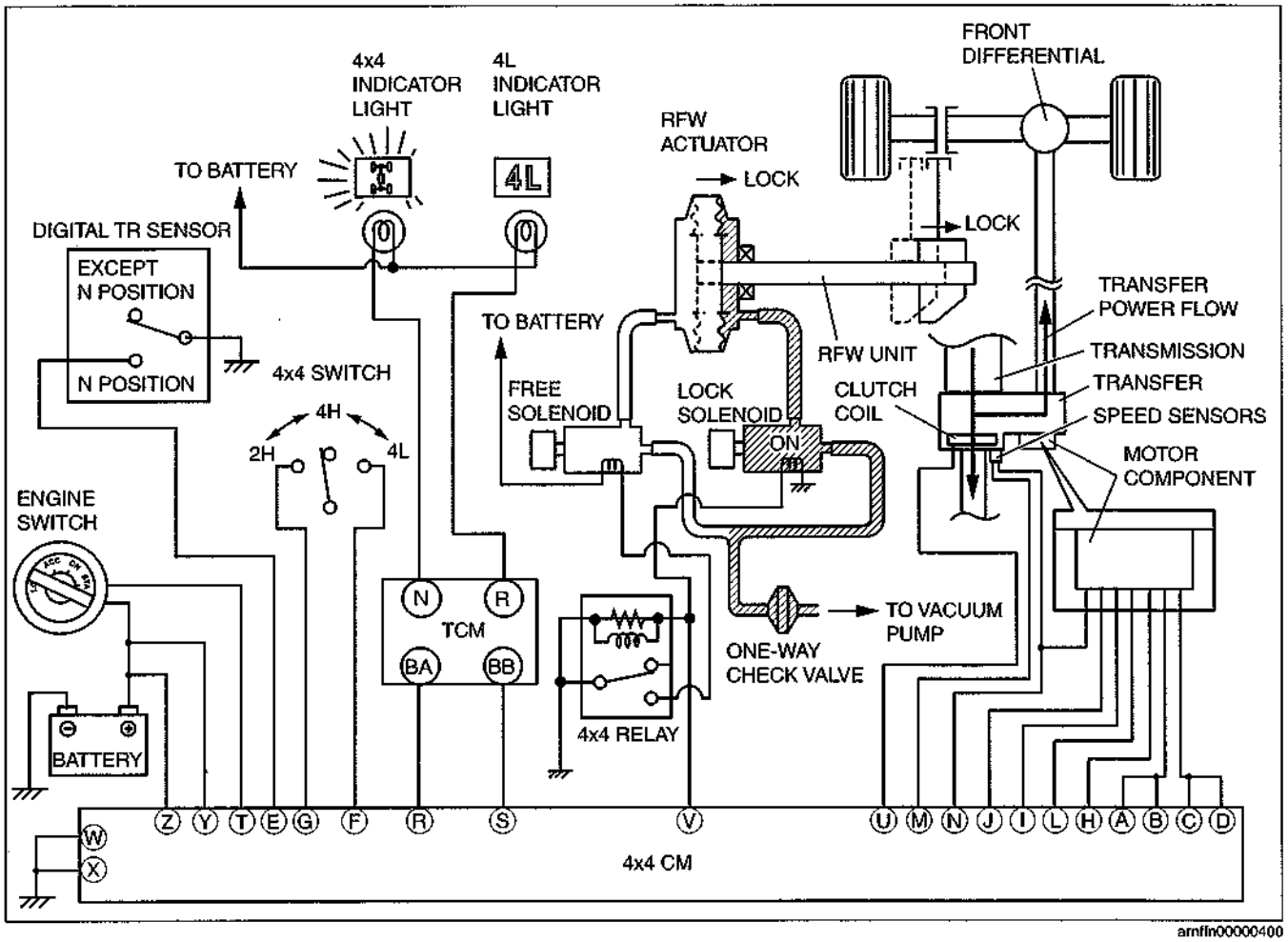
- The RFW actuator pushes the sleeve over the output shaft, and the front differential output shaft and joint shaft are coupled together.
  If the sleeve and the output shaft are not aligned when actuated, the RFW actuator applies pressure to the sleeve unit it can slide into place.
  The rotation of the front propeller shaft is then transferred, via the front differential, to the front tires, and four-wheel-drive operation is possible.

2H to 4H Selection



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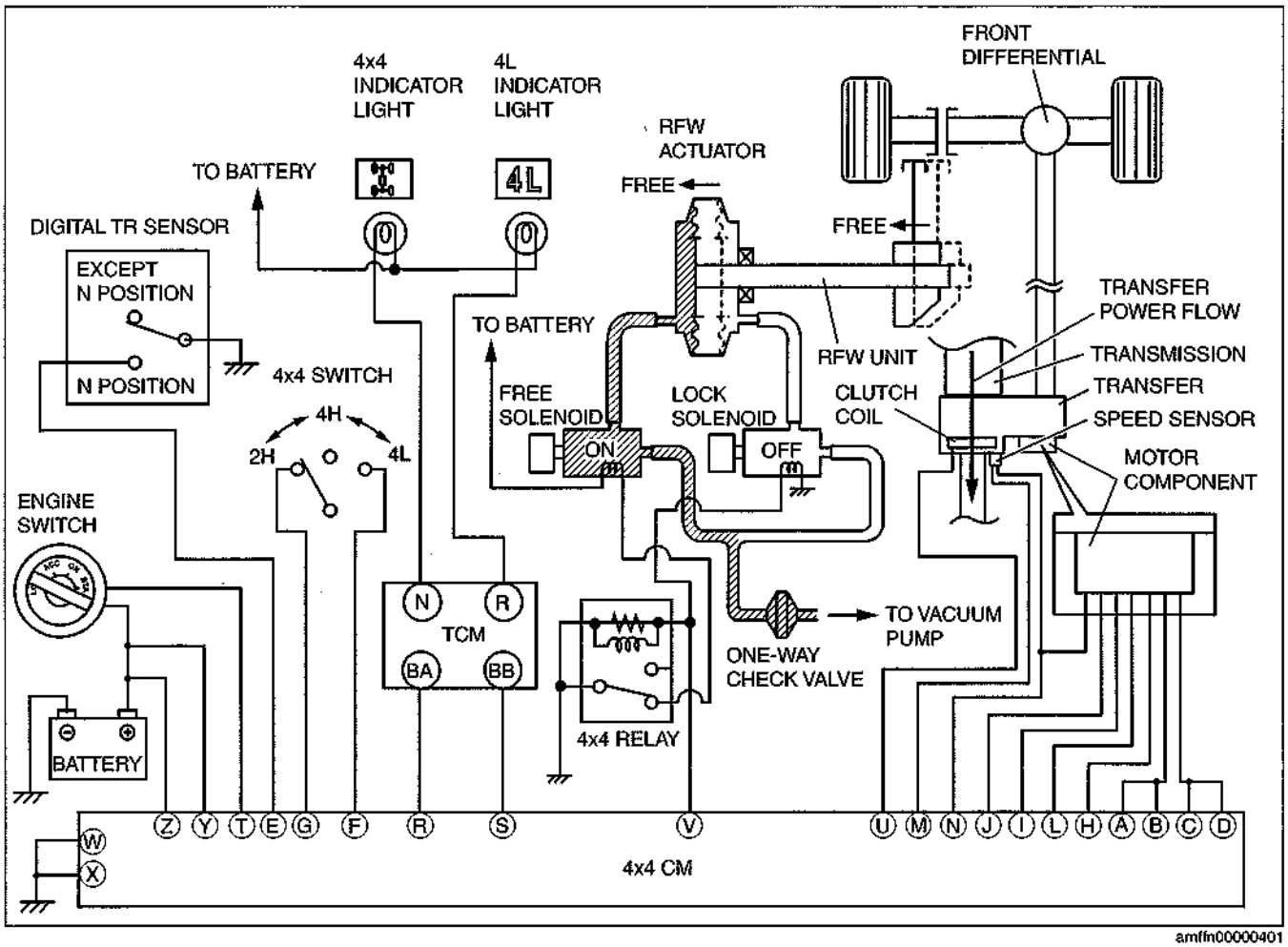
Part name / Condition	Input			Output						RFW actuator Position
	Digital TR sensor	4x4 switch	Speed sensor	Lock solenoid	Free solenoid	Motor component	Clutch coil	4x4 indicator light	4L indicator light	
2H	-	2H	-	OFF	ON	2H	OFF	OFF	OFF	Free
4H	-	4H	-	ON	OFF	4H	ON	ON	OFF	Lock

- When the 4x4 switch is switched from 2H to 4H, the clutch coil and motor in the transfer operate, the lockup shift fork slides to establish the 4H condition and the RFW unit locks automatically. At this time, the 4x4 indicator light illuminates to inform the driver that the vehicle is in four-wheel-drive mode.

4H to 2H Selection



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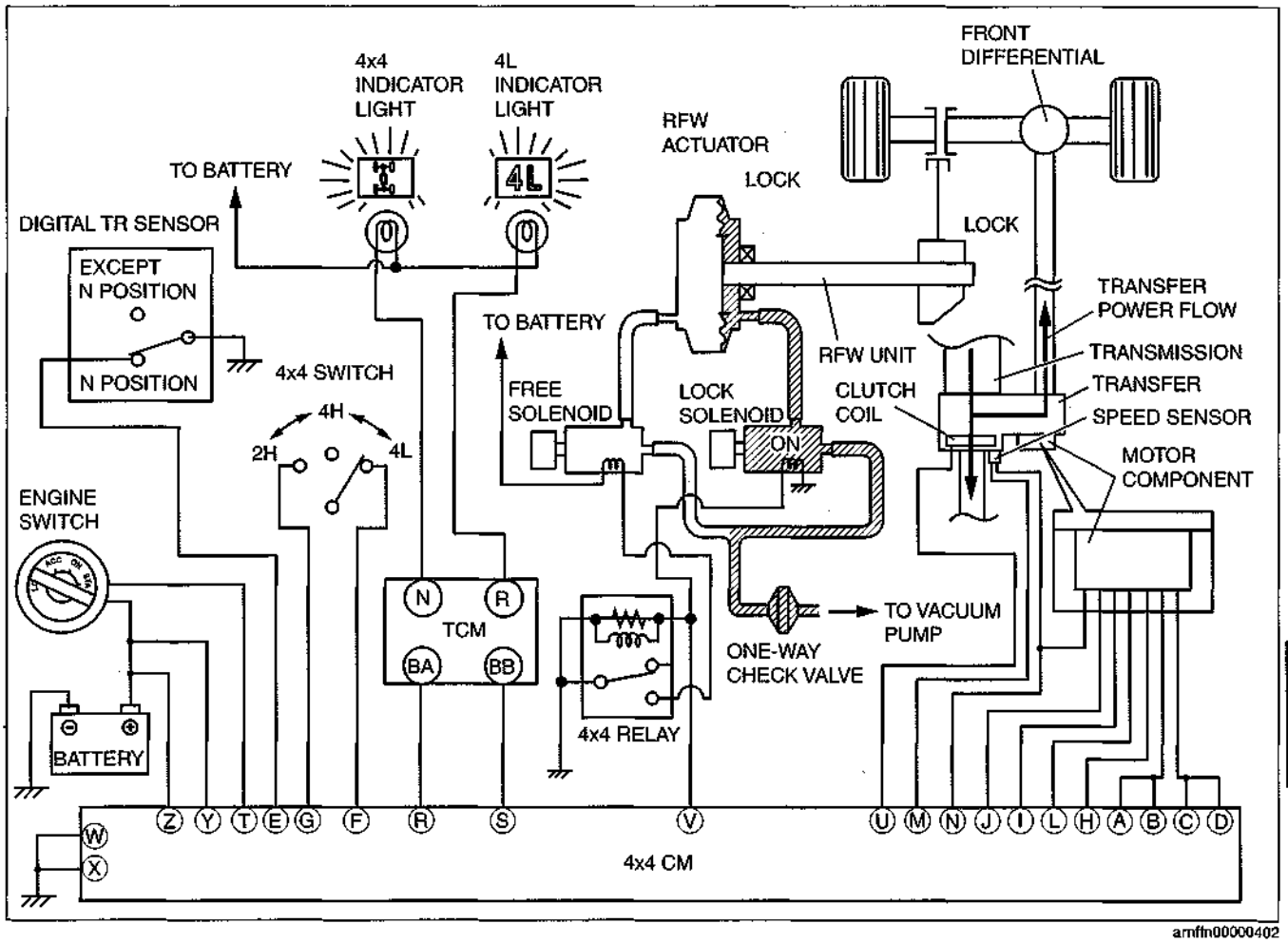
Part name / Condition	Input			Output						RFW actuator Position
	Digital TR sensor	4x4 switch	Speed sensor	Lock solenoid	Free solenoid	Motor component	Clutch coil	4x4 Indicator light	4L Indicator light	
4H	-	4H	-	ON	OFF	4H	ON	ON	OFF	Lock
2H	-	2H	-	OFF	ON	2H	OFF	OFF	OFF	Free

- When the 4x4 switch is switched from 4H to 2H, the clutch coil in the transfer stops operation but the motor operates to slide the lockup shift fork and establish the 2H condition. Also, the RFW unit unlocks automatically. At this time, the 4x4 indicator light turns off to inform the driver that the vehicle is in 4x2 mode.

4H to 4L Selection



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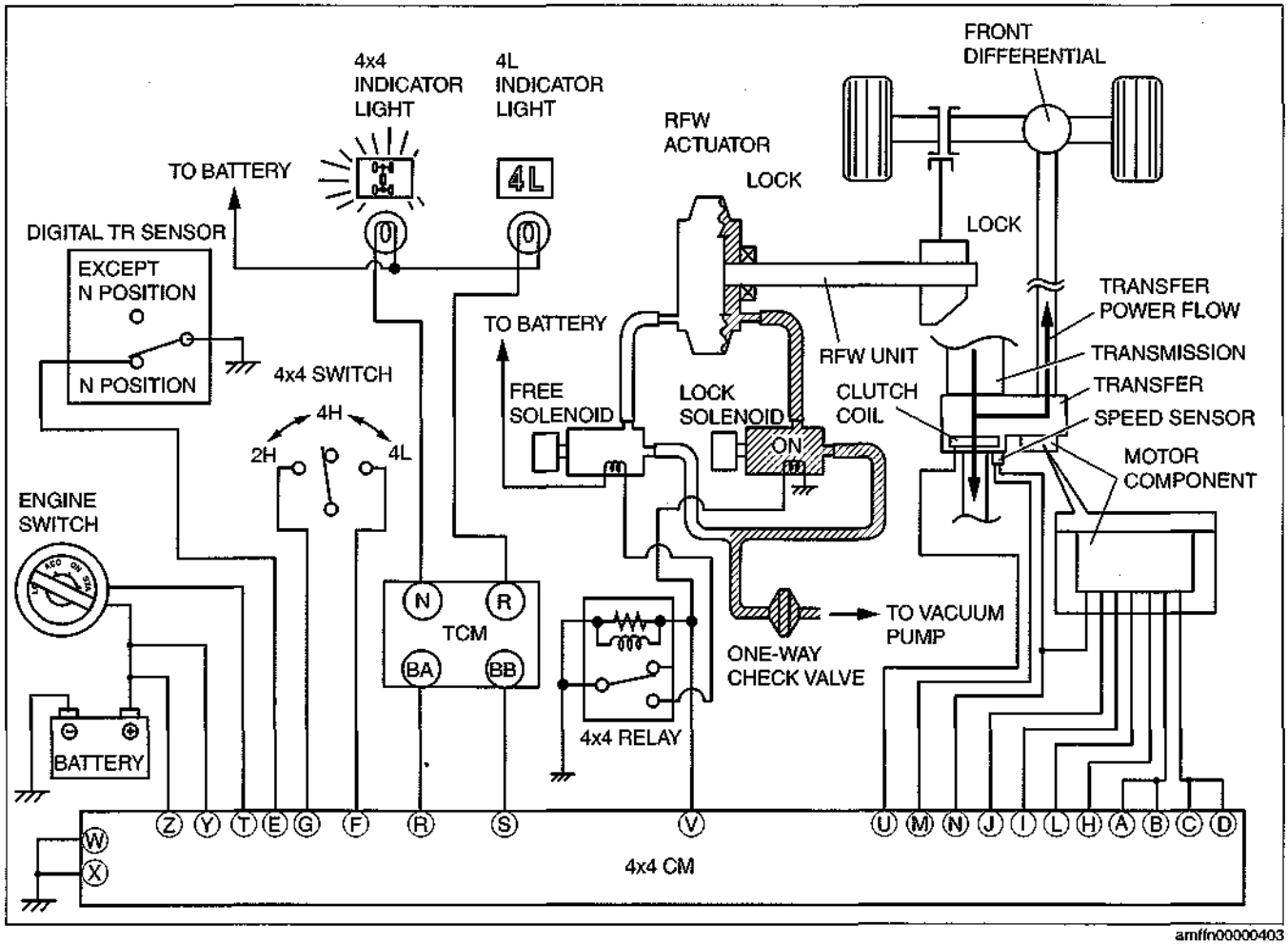
Part name / Condition	Input			Output						RFW actuator Position
	Digital TR sensor	4x4 switch	Speed sensor	Lock solenoid	Free solenoid	Motor component	Clutch coil	4x4 Indicator light	4L indicator light	
4H	N	4H	vehicle stop	ON	OFF	4H	ON	ON	OFF	Lock
4L	N	4L	vehicle stop	ON	OFF	4L	ON	ON	ON	Lock

- Shifting from 4H to 4L can be performed only when the vehicle is stopped with the selector lever in the N position. When the 4x4 switch is switched from 4H to 4L, the motor in the transfer operates and the reduction shift fork slides to establish the 4L condition. At this time, the RFW unit remains locked and the 4x4 indicator light remains illuminated and, in addition, the 4L indicator light illuminates.

4L to 4H Selection



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Part name / Condition	Input			Output						RFW actuator Position
	Digital TR sensor	4x4 switch	Speed sensor	Lock solenoid	Free solenoid	Motor component	Clutch coil	4x4 indicator light	4L indicator light	
4L	N	4L	vehicle stop	ON	OFF	4L	ON	ON	ON	Lock
4H	N	4H	vehicle stop	ON	OFF	4H	ON	ON	OFF	Lock

- Shifting from 4L to 4H can be performed only when the vehicle is stopped with the selector lever in the N position. When the 4x4 switch is switched from 4L to 4H, the motor in the transfer operates and the reduction shift fork slides to establish the 4H condition. At this time, the RFW unit remains locked and the 4x4 indicator light remains illuminated, but the 4L indicator light turns off.

BRAKES

04
SECTION

OUTLINE 04-00
ON-BOARD DIAGNOSTIC [REAR ANTILOCK BRAKE SYSTEM (ABS)] 04-02A
ON-BOARD DIAGNOSTIC [4-WHEEL ANTILOCK BRAKE SYSTEM (4W-ABS)] 04-02B
CONVENTIONAL BRAKE SYSTEM 04-11
PARKING BRAKE SYSTEM 04-12
ANTILOCK BRAKE SYSTEM [REAR ANTILOCK BRAKE SYSTEM (ABS)] 04-13A
ANTILOCK BRAKE SYSTEM [4-WHEEL ANTILOCK BRAKE SYSTEM (4W-ABS)] 04-13B

04-00 OUTLINE

BRAKE ABBREVIATIONS 04-00–1
BRAKE FEATURES 04-00–1
BRAKE SPECIFICATIONS 04-00–2

BRAKE ABBREVIATIONS

dcf040000000t01

ABS	Antilock Brake System
CM	Control Module
HU	Hydraulic Unit
IDS	Integrated Diagnostic Software
LF	Left Front
LR	Left Rear
LSPV	Load Sensing Proportioning Valve
PID	Parameter Identification
PDS	Portable Diagnostic Software
RF	Right Front
RR	Right Rear
SW	Switch
4W-ABS	4-Wheel Antilock Brake System
4x2	4-wheel 2-drive
4x4	4-wheel 4-drive

BRAKE FEATURES

dcf040000000t02

Improved safety	• 4-wheel antilock brake system (4W-ABS) adopted • Rear antilock brake system (ABS) adopted
Improved braking force	• Tandem diaphragm power brake unit adopted • Load sensing proportioning valve (LSPV) has been adopted • Large diameter front disc brakes adopted • Two-piston type front disc brake caliper adopted (Hi-Rider, 4x4) • Wide width lining for the rear brake drum adopted • Vacuum pump adopted
Improved serviceability	• Automatic adjustment mechanism rear brake (drum) has been adopted
Size and weight reduction	• Integrated construction of the hydraulic unit (HU) and control module (CM) adopted for the ABS HU/CM (4W-ABS)

BRAKE SPECIFICATIONS

dcf040000000t03

Item			Specification	
			4x2 (except HI-Rider)	Hi-Rider, 4x4
Brake pedal	Type		Suspended design	
	Pedal lever ratio		3.68	
	Max. stroke	(mm {in})	129 {5.08}	
Master cylinder	Type		Tandem (with level sensor)	
	Cylinder bore	(mm {in})	25.4 {1.00}	
Front brake (disc)	Type		Ventilated disc	
	Cylinder bore	(mm {in})	60.5 {2.38}	42.86 {1.687} x 2
	Pad dimensions (area x thickness)	(mm^2 x mm {in^2 x in})	4,950 {7.673} x 10 {0.39}	5,500 {8.525} x 9 {0.35}
	Disc plate dimensions (outer diameter x thickness)	(mm {in})	256 {10.1} x 24 {0.94}	289 {11.4} x 28 {1.1}
Rear brake (drum)	Type		Leading-trailing	
	Wheel cylinder bore	(mm {in})	23.81 {0.9374}	
	Lining dimensions (width x length x thickness)	(mm {in})	55 {2.2} x 271 {10.7} x 5.5 {0.22}	55 {2.2} x 296 {11.7} x 5.5 {0.22}
	Drum inner diameter	(mm {in})	270 {10.6}	295 {11.6}
	Shoe clearance adjustment		Automatic adjuster	
Power brake unit	Type		Vacuum multiplier Tandem diaphragm	
	Outer diameter	(mm {in})	188.4 {7.417} + 215.2 {8.472}	
Rear wheel braking force control device	Type		Load sensing proportioning valve	
Parking brake	Type		Mechanical two-rear-wheel control	
	Operation system		Stick lever type	
Brake fluid	Type		SAE J1703, FMVSS 116 DOT-3	

04-02B ON-BOARD DIAGNOSTIC [4-WHEEL ANTILOCK BRAKE SYSTEM (4W-ABS)]

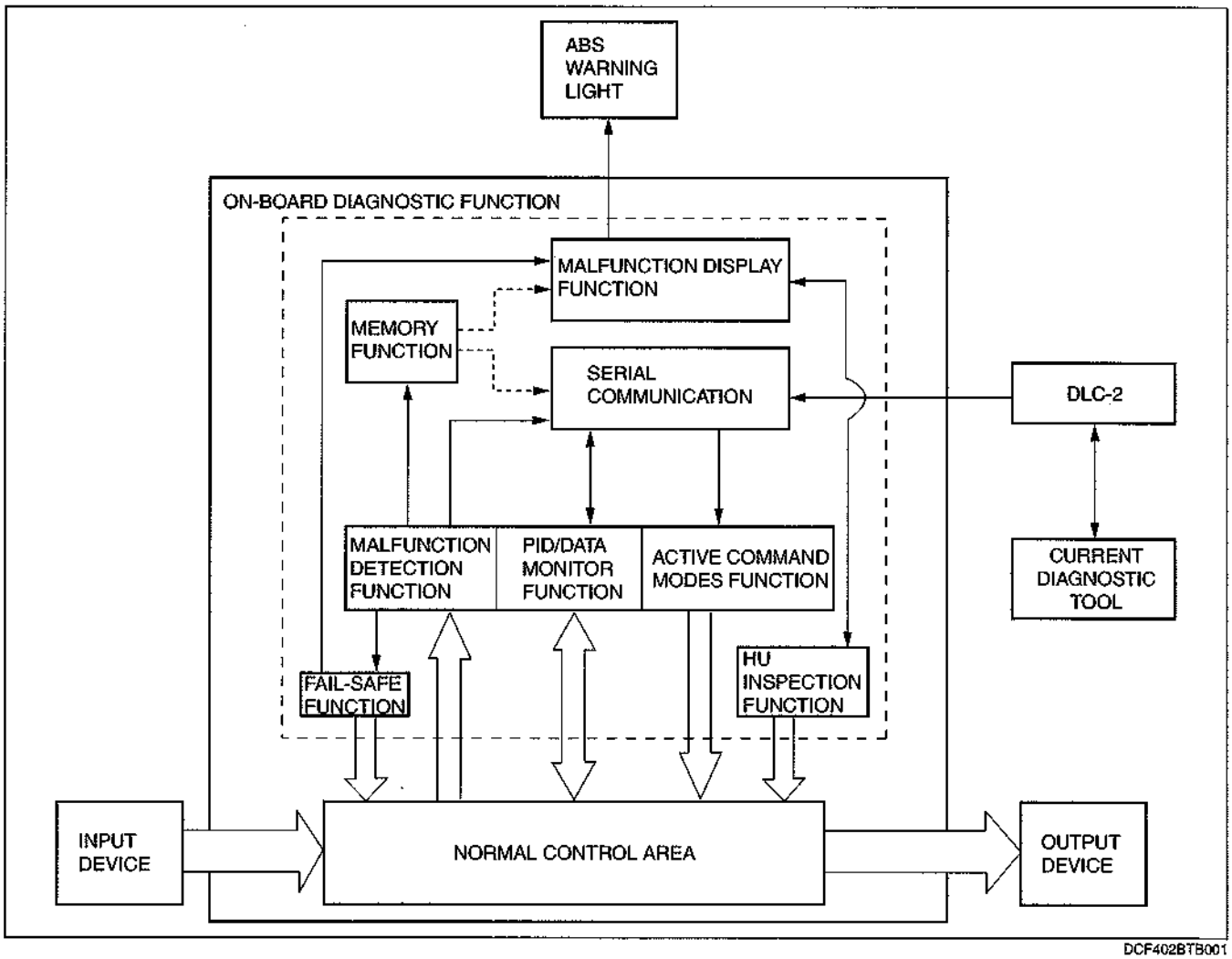
ON-BOARD DIAGNOSTIC SYSTEM OUTLINE [4W-ABS] 04-02B–1
ON-BOARD DIAGNOSTIC SYSTEM FUNCTION [4W-ABS] 04-02B–2
ON-BOARD DIAGNOSTIC SYSTEM PID/DATA MONITOR FUNCTION [4W-ABS] 04-02B–3
ON-BOARD DIAGNOSTIC SYSTEM ACTIVE COMMAND MODES FUNCTION [4W-ABS] 04-02B–3
ON-BOARD DIAGNOSTIC SYSTEM EXTERNAL TESTER COMMUNICATION FUNCTION [4W-ABS] 04-02B–4
DLC-2 CONSTRUCTION [4W-ABS] 04-02B–5

ON-BOARD DIAGNOSTIC SYSTEM OUTLINE [4W-ABS]

dcf040243750t04

- The on-board diagnostic system consists of a malfunction detection system that detects abnormalities in input/output signals when the ignition switch is at the ON position, a data monitor function that reads out specified input/output signals and a simulation function that allows for override operation of output parts (such as solenoid valves).
- The data link connector 2 (DLC-2), which groups together all the connectors used for malfunction diagnosis and detecting/repair into a single location, has been adopted, thereby improving serviceability. Diagnosis is performed by connecting the current diagnostic tool to the DLC-2.
- In addition to DTC read-out, the current diagnostic tool is used to clear DTCs using the display screen of the diagnostic tester, and to access the PID/data monitor and simulation functions, providing enhanced malfunction diagnosis and improved serviceability.

Block Diagram



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ON-BOARD DIAGNOSTIC SYSTEM FUNCTION [4W-ABS]

dcf040243750t05

Malfunction Detection Function

- The malfunction detection function detects malfunctions in the input/output signal system of the ABS HU/CM when the engine switch is at the ON position.
- When the ABS HU/CM are started up, the following malfunction detections are performed.
  - — The ABS warning light illuminate for **approx. 3 s** when the engine switch is turned to the ON position. At the same time, the fail-safe relay is operated, and the input/output signals of each part is monitored for malfunction diagnosis. After starting to drive, the first time the vehicle speed is **approx. 12 km/h {7.5 mph} or more** the pump motor is operated and malfunction diagnosis is performed again.
- When malfunctions are detected, the corresponding lights are illuminated to alert the driver. Using the external tester communication function, DTCs can be output through the KLN of the DLC-2. At the same time, malfunction detection results are sent to the memory and fail-safe functions.

Memory Function

- The memory function stores DTCs of malfunctions in input/output signal systems. With this function, once a DTC is stored it is not cleared after the engine switch has been turned off (LOCK position), even if the malfunctioning signal system has returned to normal.
- Since the ABS HU/CM has a built-in non-volatile memory, DTCs are not cleared even if the battery is removed. Therefore, it is necessary to clear the memory after performing repairs. Refer to the Workshop Manual for the DTC clearing procedure.

Fail-safe Function

- When the malfunction detection function determines a malfunction, each light illuminates to advise the driver. At this time, the fail-safe function controls the ABS as shown in the fail-safe function table.

Fail-safe Function Malfunction Contents

Malfunction location	DTC number	Fail-safe function	
		Warning light illumination status	Control status
		ABS warning light	ABS control
Power supply system	B1317	Illuminated*1	Control disabled*2
	B1318		
ABS HU/CM system	B1342	Illuminated	Control disabled
Brake switch signal system	B1484	Not illuminated	Control enabled
Pump motor, motor relay systems	C1095	Illuminated	Control disabled
	C1096		
ABS wheel-speed sensor system	C1145	Illuminated	Control disabled
	C1155		
	C1165		
	C1175		
Fail-safe relay system	C1186	Illuminated	Control disabled
Solenoid valve system	C1194	Illuminated	Control disabled
	C1198		
	C1202		
	C1206		
	C1210		
	C1214		
ABS wheel-speed sensor (slip monitor) system	C1222	Illuminated	Control disabled
ABS wheel-speed sensor/ABS sensor rotor systems	C1233	Illuminated	Control disabled
	C1234		
	C1235		
	C1236		
Incorrect ABS HU/CM installed	C1414	Illuminated	Control disabled
G sensor system*3	C1730	Illuminated	Control disabled
	C1949		
	C1950		

*1 : If the ignition voltage returns to normal, the light goes out.

*2 : If the ignition voltage returns to normal, control is enabled.

*3 : Hi-Rider, 4x4

ON-BOARD DIAGNOSTIC SYSTEM PID/DATA MONITOR FUNCTION [4W-ABS]

dcf040243750t06

- The PID/data monitor function is used for optionally selecting input/output signal monitor items preset in the ABS HU/CM and reading them out in real-time.

PID/data monitor item	Input/output part	Unit/Condition (Tester display)
ABS_LAMP	ABS warning light	On/Off
ABS_VOLT	Battery	V
ACCLMTR*	G sensor	G
BOO_ABS	Brake switch	On/Off
CCNTABS	Number of continuous DTCs	—
PMP_MOTOR	Pump motor	On/Off
RLY_PMP	Pump motor relay	On/Off
RLY_VLV	Solenoid valve relay	On/Off
V_LF_INL	LF inlet solenoid valve	On/Off
V_LF_OTL	LF outlet solenoid valve	On/Off
V_RF_INL	RF inlet solenoid valve	On/Off
V_RF_OTL	RF outlet solenoid valve	On/Off
V_Rear_INL	Rear inlet solenoid valve	On/Off
V_Rear_OTL	Rear outlet solenoid valve	On/Off
WSPD_LF	ABS wheel-speed sensor (LF)	KPH, MPH
WSPD_LR	ABS wheel-speed sensor (LR)	KPH, MPH
WSPD_RF	ABS wheel-speed sensor (RF)	KPH, MPH
WSPD_RR	ABS wheel-speed sensor (RR)	KPH, MPH

* : Hi-Rider, 4x4

04

ON-BOARD DIAGNOSTIC SYSTEM ACTIVE COMMAND MODES FUNCTION [4W-ABS]

dcf040243750t07

- The active command modes function is used for optionally selecting active command modes items of input/output parts preset in the ABS HU/CM, and to operate them regardless of CM control.
- To protect the hydraulic unit interior, operate output related parts for only **10 s or less** when using the active command modes function.

Active Command Modes Table

Command name	Output part name	Operation	Operation condition
PMP_MOTOR	Pump motor	On/Off	Engine switch at ON
V_LF_INL	LF inlet solenoid valve		
V_LF_OTL	LF outlet solenoid valve		
V_Rear_INL	Rear inlet solenoid valve		
V_Rear_OTL	Rear outlet solenoid valve		
V_RF_INL	RF inlet solenoid valve		
V_RF_OTL	RF outlet solenoid valve		

ON-BOARD DIAGNOSTIC SYSTEM EXTERNAL TESTER COMMUNICATION FUNCTION [4W-ABS]

dcf04024375l08

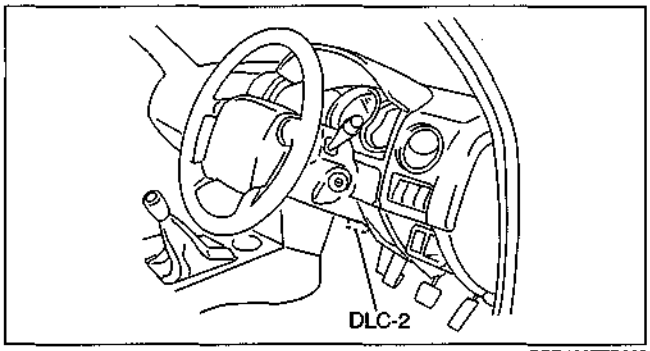
- The external tester communication function enables communication of diagnostic data (DTC read-outs, input/output signal read-outs, and operation of input/output parts) between the ABS HU/CM and an external tester.

Connections and Communication Contents

	External tester	
	Current diagnostic tool	
	Connection	Communication method
On-board diagnostic (malfunction detection) function	Input/output: KLN	Serial communication
PID/DATA monitor function	Input/output: KLN	Serial communication
Active command modes function	Input/output: KLN	Serial communication

Serial communication

- Serial communication (two-way communication) allows for multiple data to be sent and received instantly along the same line.
- By connecting the current diagnostic tool to the DLC-2, diagnostic data can be sent and received between the current diagnostic tool and the ABS HU/CM using the KLN terminals (within the DLC-2).
- The ABS HU/CM receives the command signals of the malfunction detection function, PID/data monitor function, and the active command modes function from the current diagnostic tool, and sends DTCs and data regarding the operating condition and status of each input/output part to the current diagnostic tool.



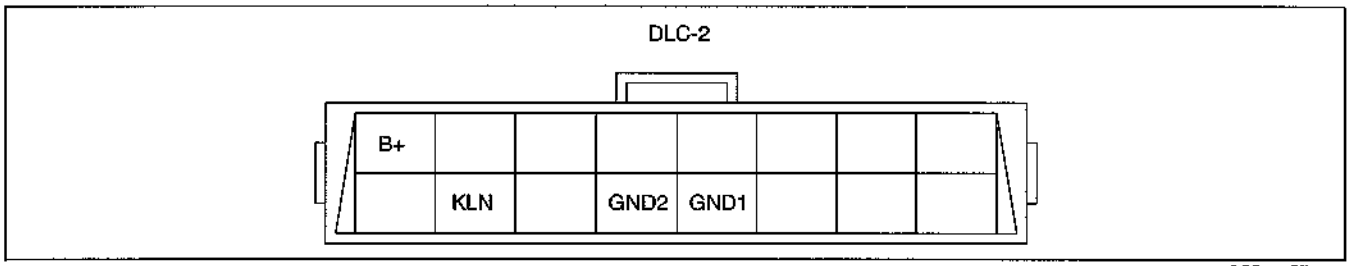
DBR402ZTB003

Diagnostic function name	Signal received	Signal sent
Malfunction detection function	DTC verification signal	DTC
PID/data monitor function	Command signal to read selected monitor item	Monitored data for requested monitor item
Active command modes function	Operation command signal for selected active command modes item	Input/output part name

DLC-2 CONSTRUCTION [4W-ABS]

dcf04024375t009

- A connector (DLC-2) conforming to International Organization for Standardization (ISO) standards has been added.
- Shape and terminal arrangement as stipulated by the ISO 15031-3 (SAE J1962) international standard has been adopted for this connector. The connector has a 16-pin construction that includes the KLN, GND1, GND2 and B+ terminals.



DBR402ZTB002

Terminal	Function
KLN	Serial communication KLN terminal
GND1	Body ground terminal
GND2	Serial communication ground terminal
B+	Battery power supply terminal

04-11 CONVENTIONAL BRAKE SYSTEM

CONVENTIONAL BRAKE SYSTEM OUTLINE 04-11–1
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MASTER CYLINDER CONSTRUCTION 04-11–2
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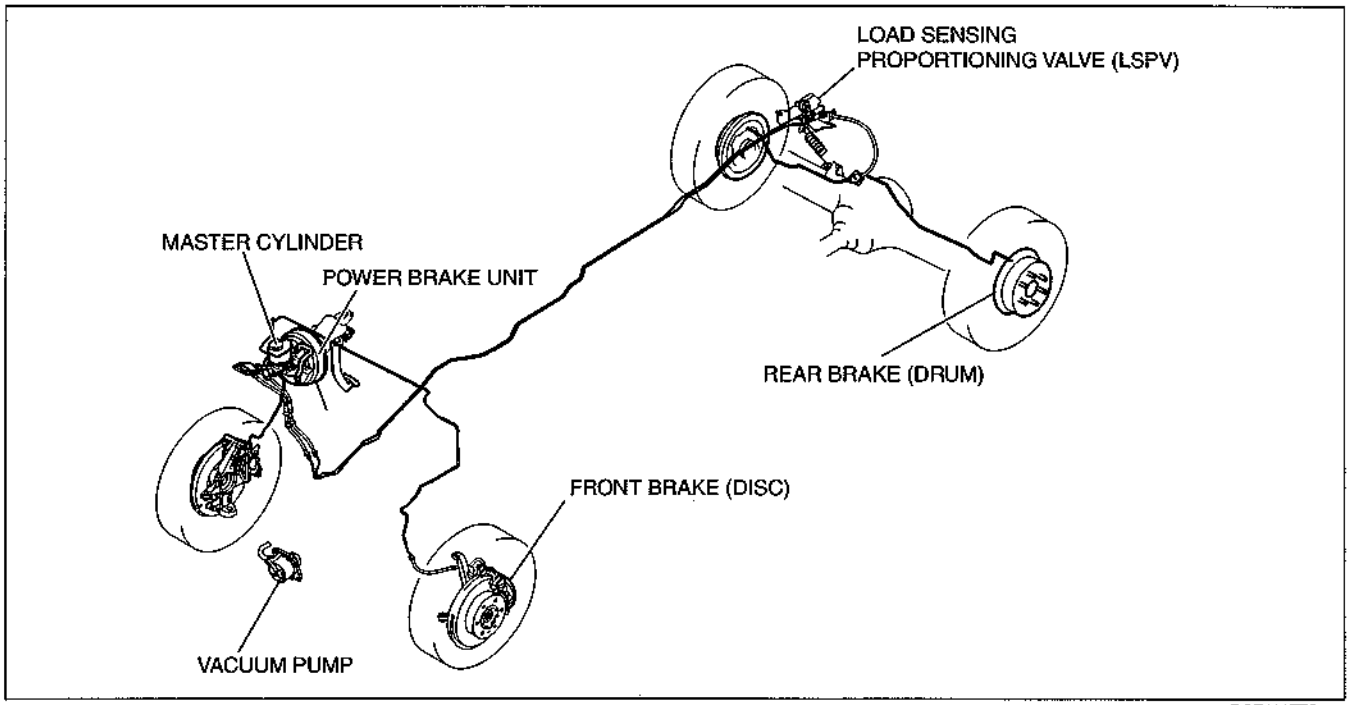
CONVENTIONAL BRAKE SYSTEM OUTLINE

dcf041100000t01

- A tandem-type master cylinder has been adopted, improving braking force.
- A large diameter, tandem diaphragm power brake unit has been adopted, improving braking force.
- A large diameter, ventilated disc-type front brake has been adopted, improving braking force.
- A two-piston type front disc brake caliper has been adopted, improving braking force. (Hi-Rider, 4x4)
- A wide width lining for the rear brake drum has been adopted, improving braking force.
- An Automatic adjustment mechanism rear brake (drum) has been adopted, improving serviceability
- A vacuum pump has been adopted, improving braking force.

CONVENTIONAL BRAKE SYSTEM STRUCTURAL VIEW

dcf041100000t02

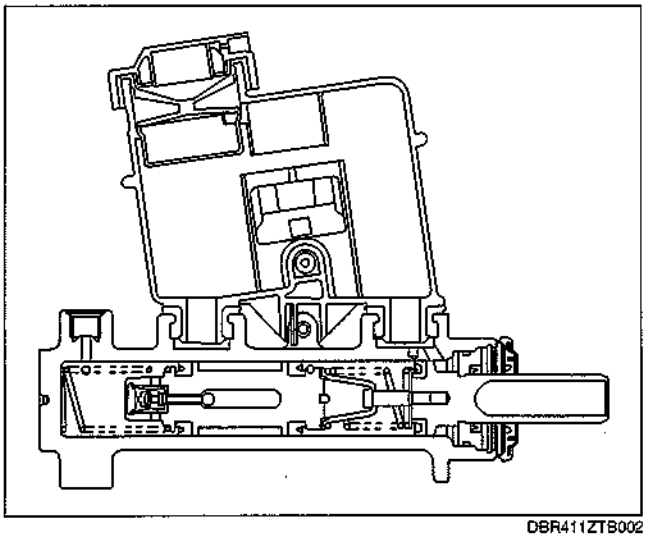


DCF411ZTB001

MASTER CYLINDER CONSTRUCTION

- A tandem-type master cylinder with a **25.4 mm {1.00 in}** bore has been adopted, improving braking force.

dcf04114340t01

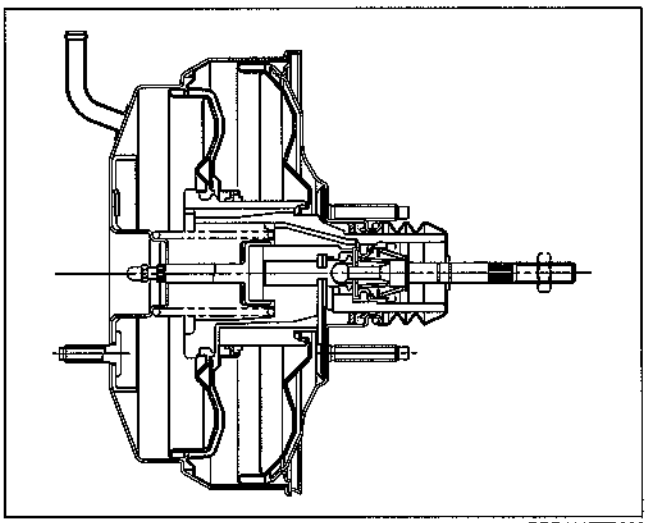


DBR411ZTB002

POWER BRAKE UNIT CONSTRUCTION

- A tandem diaphragm type power brake unit has been adopted for all models, achieving compatibility between high braking performance and excellent brake feeling.

dcf04114380t01

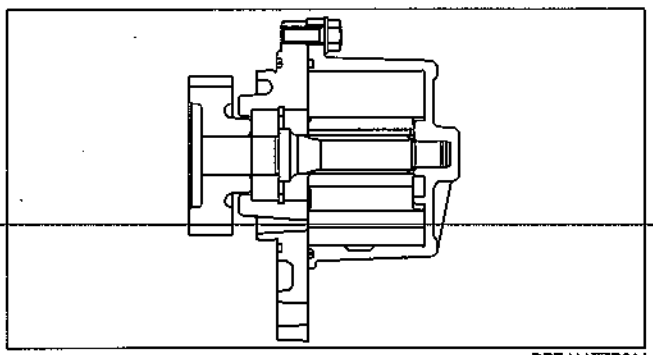


DBR411ZTB003

VACUUM PUMP CONSTRUCTION

- A gear-driven vacuum pump has been adopted, improving braking force.

dcf04111877 7t01

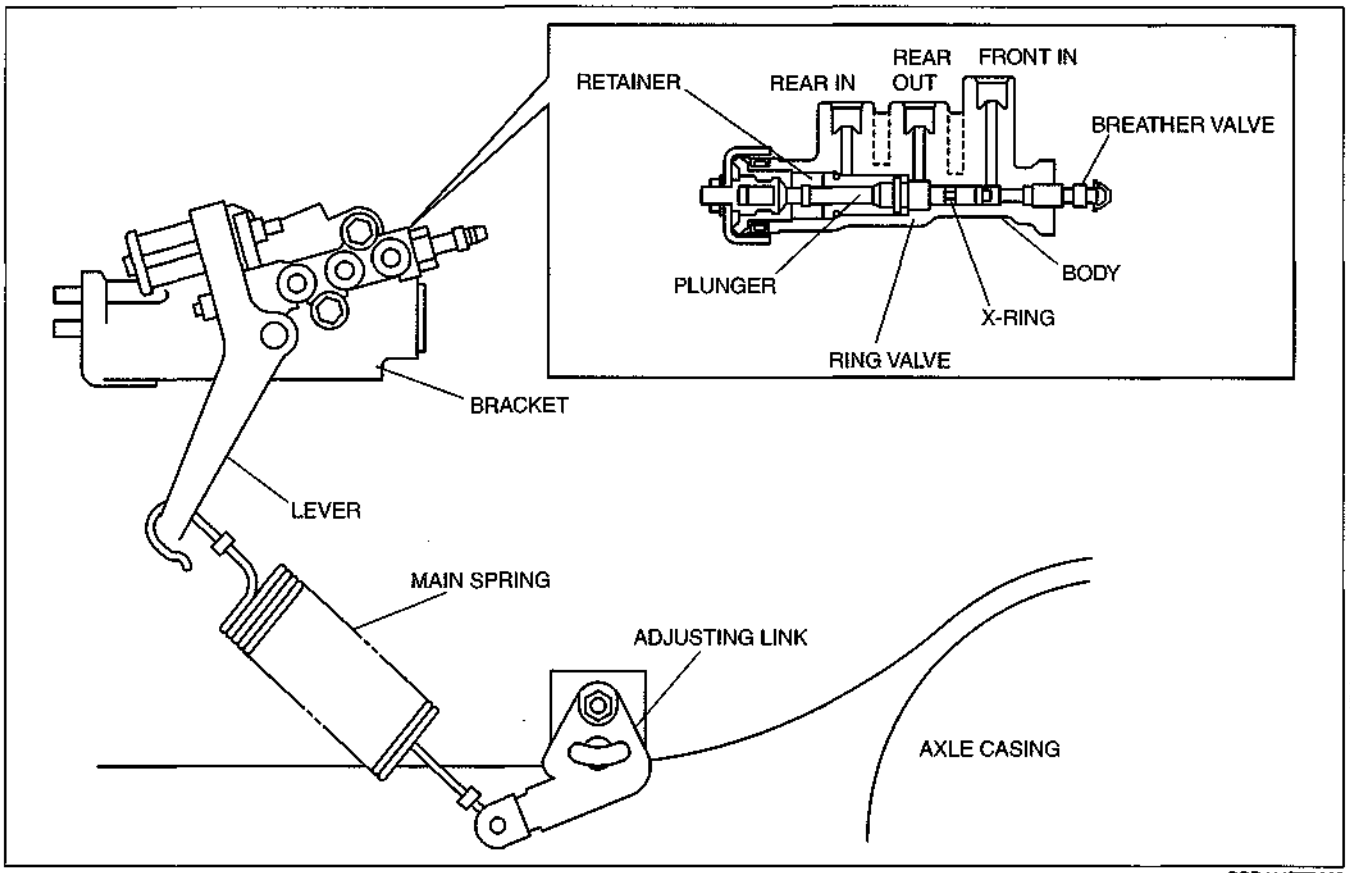


DBR411ZTB014

LOAD SENSING PROPORTIONING VALVE (LSPV) CONSTRUCTION

dcf04114390301

- This valves is to proportion the braking force to the front and rear wheels as ideally as possible for higher safety at the time of the brakes being applied, it controls the brake fluid pressure to the rear brakes according to the load on the rear axle so that the rear end of the vehicle may not spin due to locking of the rear wheels in advance of the fronts.
- This valve also incorporates a bypass passage that prevents pressure reduction so that rear wheels will still have plenty of braking force to stop the vehicle in the event of a front master cylinder malfunction.



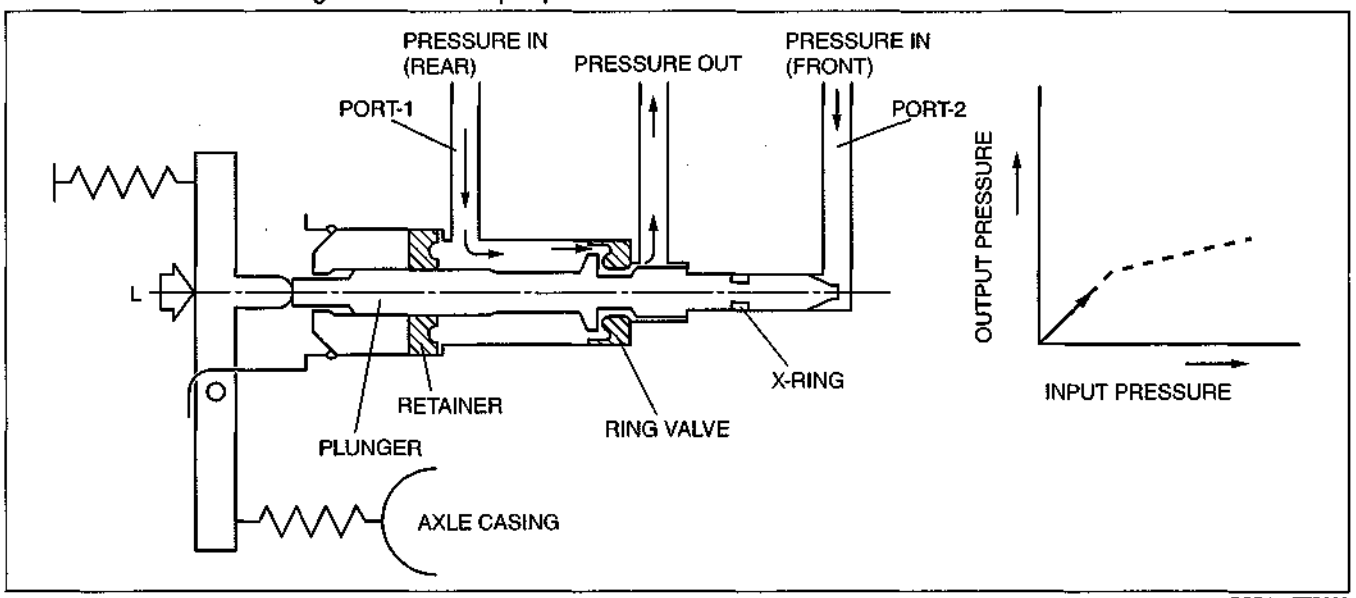
DBR411ZTB008

LOAD SENSING PROPORTIONING VALVE (LSPV) OPERATION

dcf04114390 3t02

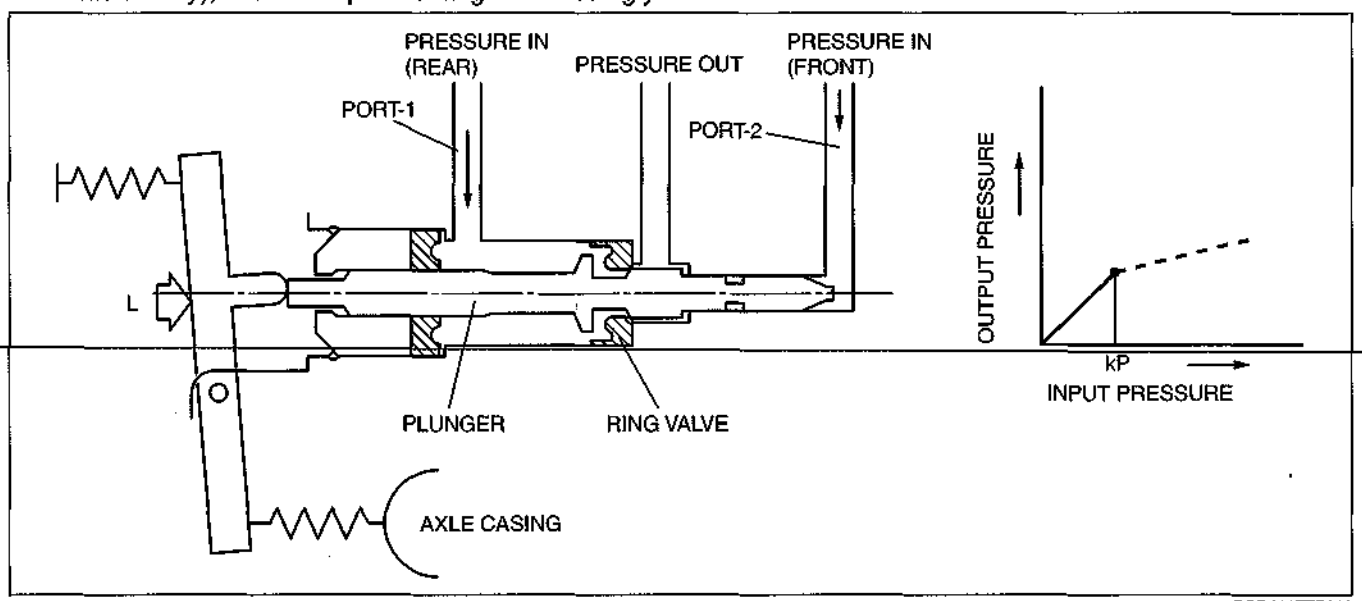
Braking When Vehicle Empty

- The hydraulic pressure generated at the rear section of the master cylinder is applied, via input port 1, to the hydraulic-pressure control section of the LSPV.
  The hydraulic pressure generated at the front section of the master cylinder is applied to the front brakes, and to the bypass section of the LSPV via input port 2. The rear wheel and front wheel hydraulic pressure are separated by the X-ring of the plunger. Since port 1 hydraulic pressure is normally equal to port 2 hydraulic pressure, the plunger is pressed against the cylinder base by L.
  When port 1 hydraulic pressure is applied to the plunger, the plunger tries to move to the left. But, because there is also at the same time force applied in the right direction by the lever link (force L), the plunger is held against the cylinder base. The result is that the hydraulic pressure at the output side is the same as at the input side when force L is higher than the input pressure.



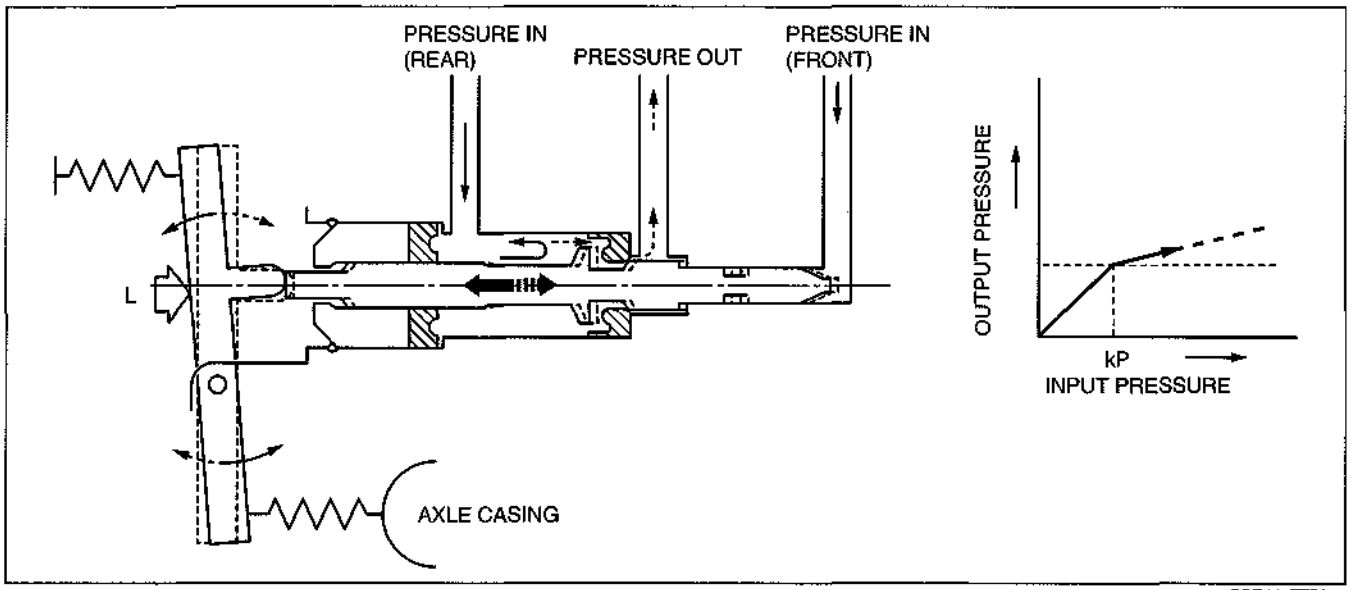
DBR411ZTB009

- When the input hydraulic pressure increases further and overcomes force L, the plunger is moved slightly leftward, sealing it against the ring valve. This temporarily separates the input side from the output side. The output pressure at this time is called the break point. If force L from the lever link changes (i.e. lowering of the vehicle body), this break point changes accordingly.



DBR411ZTB010

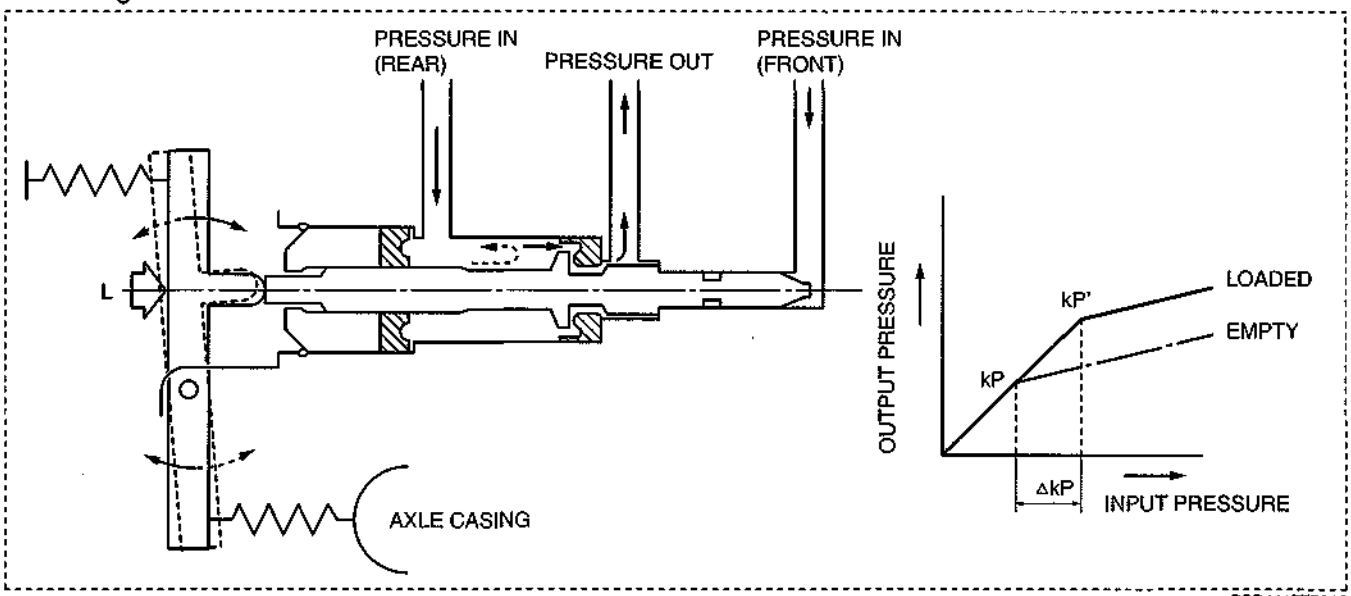
- When the input pressure passes the break point, the plunger is moved back against the cylinder base. The output port is opened, and hydraulic pressure generated at the rear section of the master cylinder is applied to the rear wheel cylinders.
  As the output pressure continues to increase, the plunger is again moved toward the left against the ring valve, thus separating the input and output side again.
  This action is repeated to control the output pressure.



DBR411ZTB011

Braking When Vehicle Loaded

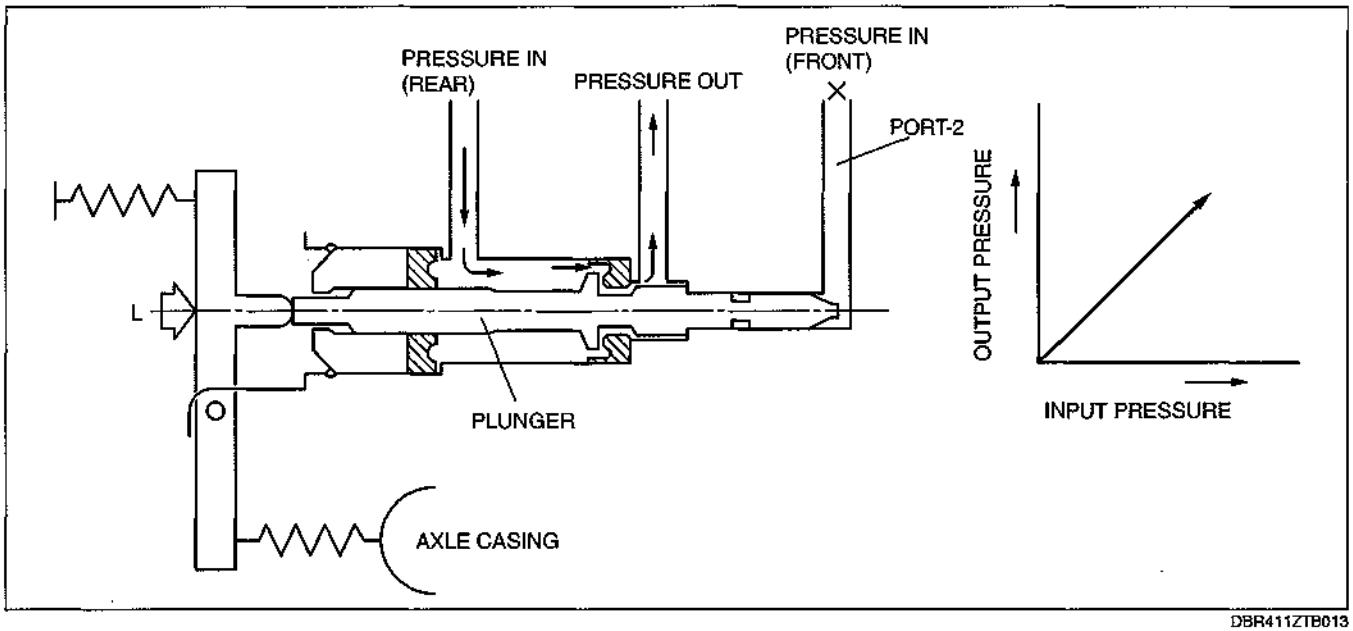
- The vehicle height (from the ground) decreases when cargo is loaded into the vehicle. This causes the force of the spring connected to the axle casing to decrease and the force of the spring on the LSPV to increase force L, increasing the pressure holding the plunger to the right.
  The master cylinder hydraulic pressure (input) needed to cause the plunger to move back to the left also becomes equally higher as a result.
  This causes the break point to be increased and extra barking power is provided in accordance with the weight of cargo loaded.



DBR411ZTB012

If Malfunction Of Front Hydraulic System

- If there is a malfunction of the front-brake hydraulic system, the hydraulic pressure from input port 2 becomes zero. The result is that the input pressure presses the plunger to the right, opening the bypass passage. The output pressure thus equals the input pressure, and there is so pressure reduction.



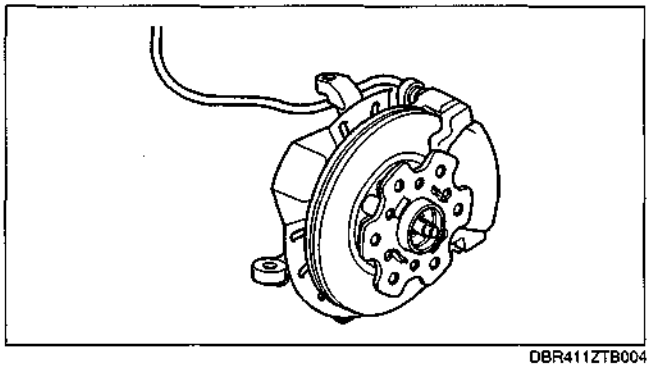
DBR411ZTB013

FRONT BRAKE (DISC) CONSTRUCTION

dcf04113980t01

4x2 (Except Hi-Rider)

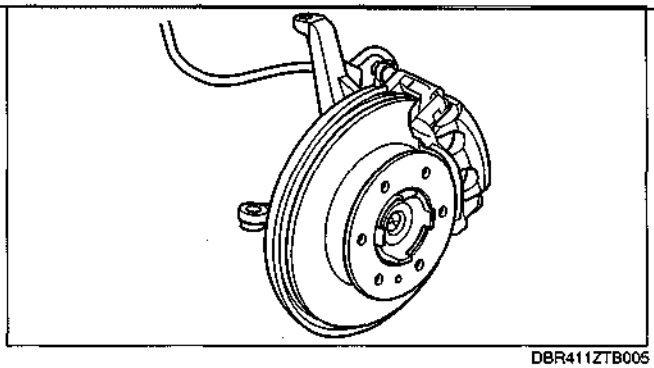
- Large diameter, ventilated disc type front brakes with a **256 mm {10.1 in}** diameter and **24 mm {0.94 in}** thickness have been adopted, improving braking force and fade resistance.



DBR411ZTB004

Hi-Rider, 4x4

- Two-piston type front disc brake caliper has been adopted, improving braking force.
- Large diameter, ventilated disc type front brakes with a **289 mm {11.4 in}** diameter and **28 mm {1.1 in}** thickness have been adopted, improving braking force and fade resistance.

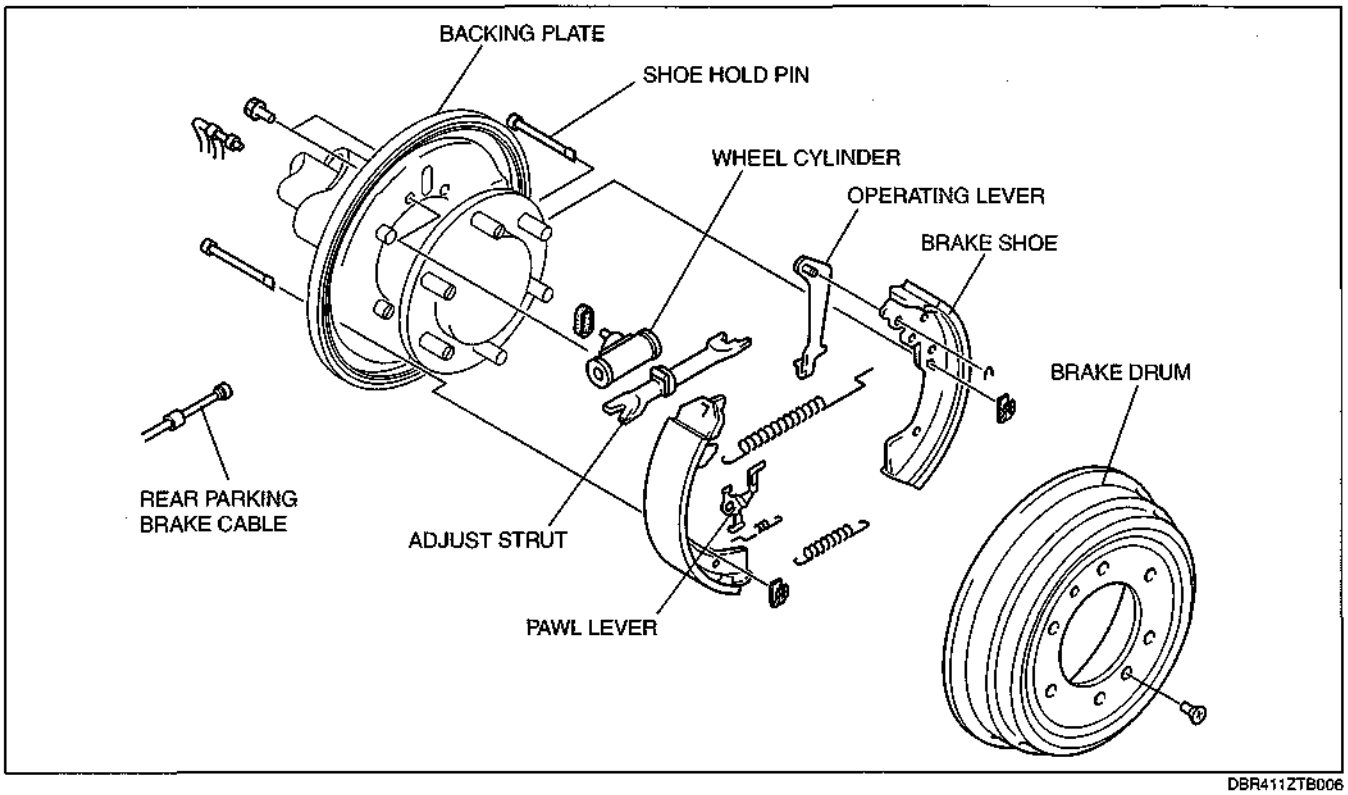


DBR411ZTB005

REAR BRAKE (DRUM) CONSTRUCTION

dcf04112625001

- A leading/trailing type rear drum brake, with a **270 mm {10.6 in}** (4x2 (except Hi-Rider)) or **295 mm {11.6 in}** (Hi-Rider, 4x4) drum inner diameter and **23.81 mm {0.937 in}** wheel cylinder inner diameter, has been adopted, improving braking force and fade resistance.
- Braking stability is ensured by use of **55 mm {2.16 in}** width linings.
- If has an incremental automatic adjustment mechanism of shoe clearance to improve serviceability.



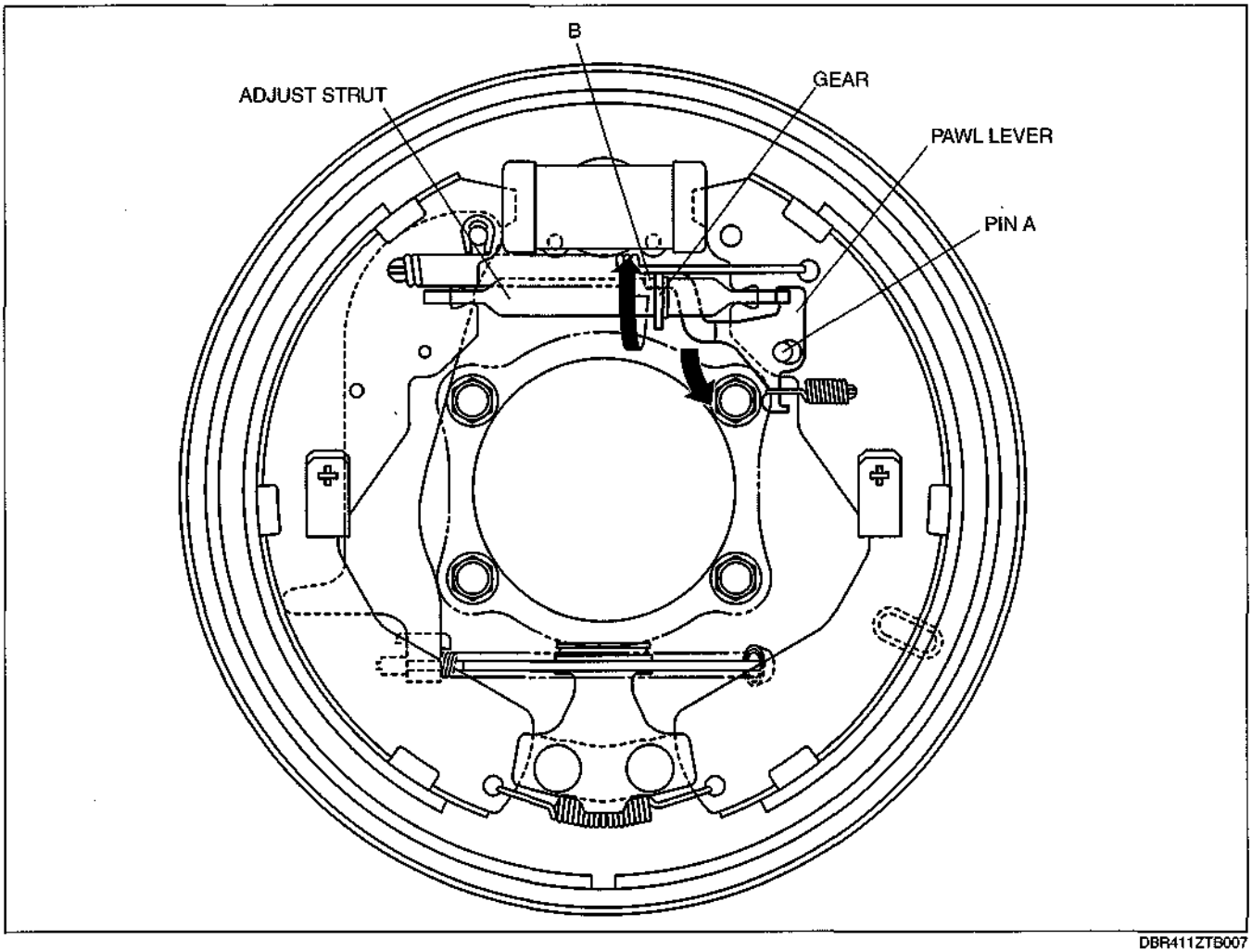
DBR411ZTB006

REAR BRAKE (DRUM) OPERATION

dcf04112625002

Automatic Adjustment Mechanism

- This brake is equipped with an auto adjust mechanism, which automatically adjusts shoe clearance when the brake pedal is depressed.The auto adjust mechanism is composed of an adjust strut and pawl lever.



DBR411ZTB007

When there is large clearance

- The end of the adjust strut receives the rotation force against the pawl lever caused by the spring which has pin A as its fulcrum.When the brake pedal is depressed, the pawl lever moves in the direction of the arrow with pin A as the fulcrum, because the length of the adjust strut does not change in response to the increase in shoe space.
- The gear rotates because the end B of the pawl lever is engaged with the gear of the adjust strut. Because the gears and the body are engaged by the bolt and nut, the total length of the adjust strut increases when the gear rotates in the direction indicated in the figure. When there is a large clearance, the gear rotates one notch each time the brake pedal is depressed.

When clearance is proper

- When the clearance is proper, clearance is maintained because the shoe does not stroke (the pawl lever does not tilt) enough at rotate the gear one notch, even when the brake pedal is depressed.

04-12 PARKING BRAKE SYSTEM

PARKING BRAKE SYSTEM OUTLINE. . 04-12–1
PARKING BRAKE SYSTEM STRUCTURAL VIEW 04-12–1

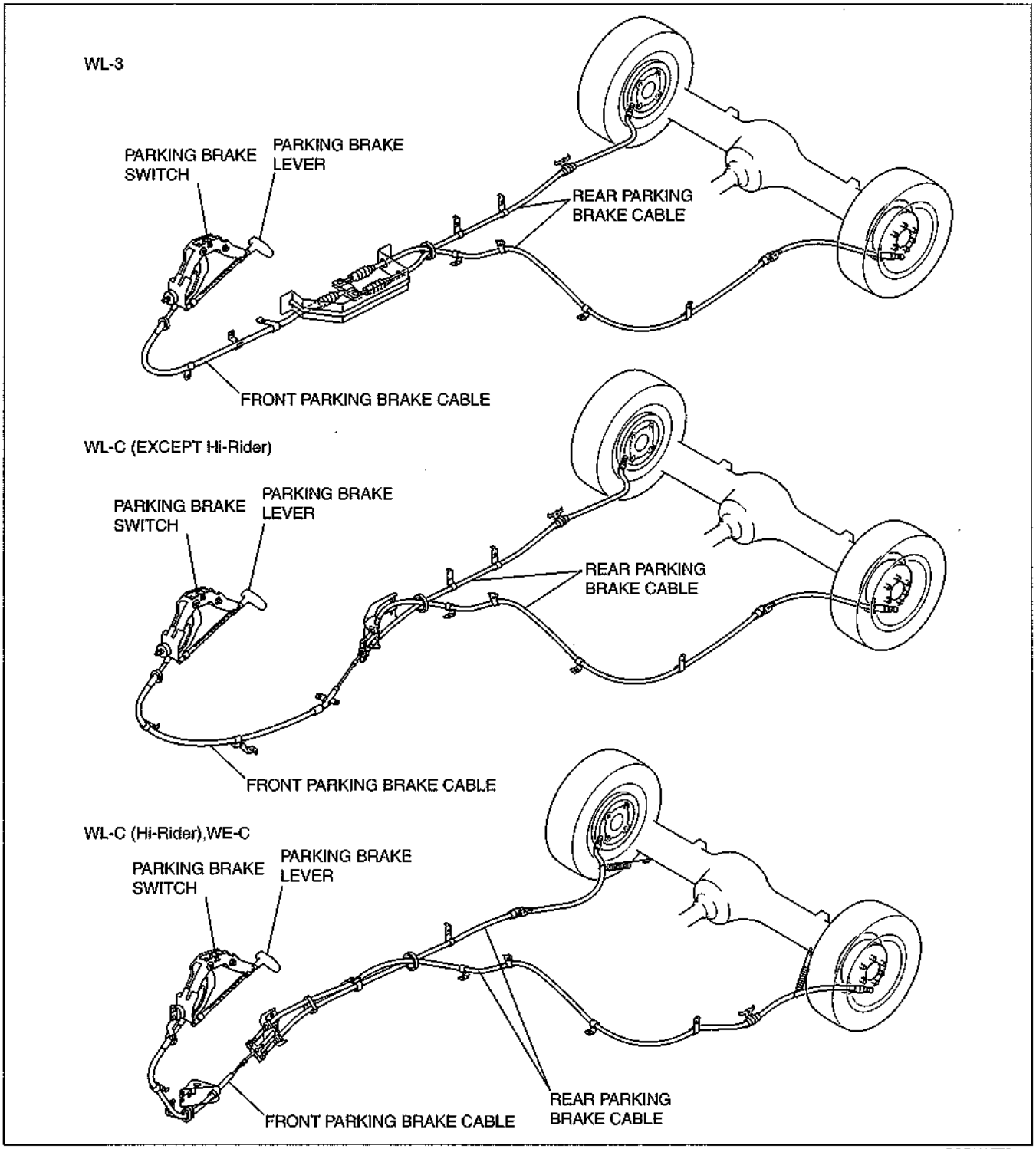
PARKING BRAKE SYSTEM OUTLINE

dcf041200000t01

- A stick lever type parking brake has been adopted, improving operability.

PARKING BRAKE SYSTEM STRUCTURAL VIEW

dcf041200000t02



DCF412ZTB001

04-13B ANTILOCK BRAKE SYSTEM [4-WHEEL ANTILOCK BRAKE SYSTEM (4W-ABS)]

ABS OUTLINE [4W-ABS] 04-13B–1
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ABS HU PART CONSTRUCTION/ OPERATION [4W-ABS] 04-13B–3
ABS CM PART FUNCTION [4W-ABS] .. 04-13B–5
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G SENSOR FUNCTION [4W-ABS] 04-13B–7
G SENSOR CONSTRUCTION/ OPERATION [4W-ABS] 04-13B–7

ABS OUTLINE [4W-ABS]

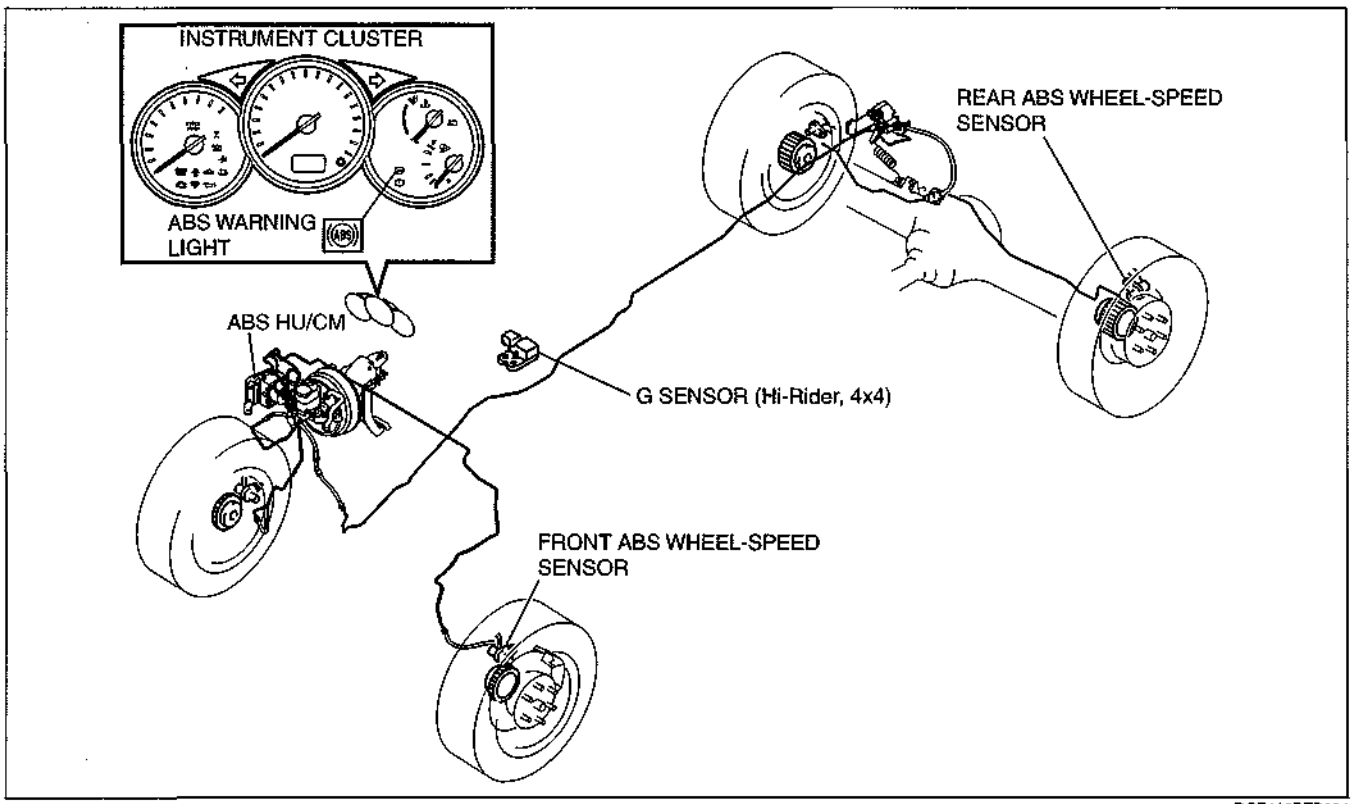
dcf041300000t04

- The ABS HU/CM, integrating both the hydraulic unit (HU) and control module (CM), has been adopted, resulting in size and weight reduction.
- Select-low controlled-4-wheel anti-lock brake system with 4-sensor and 3-channel has been adopted, and has the following features.
  - — The integrated ABS Hydraulic Unit/Control Module (HU/CM) system is compact, lightweight and highly reliable.
  - — Combined use of the current diagnostic tool and the ABS HU/CM allows the following functions to improve serviceability:
    - 4-digit DTC display
    - PID/DATA monitor function
    - Active command modes function

04

ABS STRUCTURAL VIEW [4W-ABS]

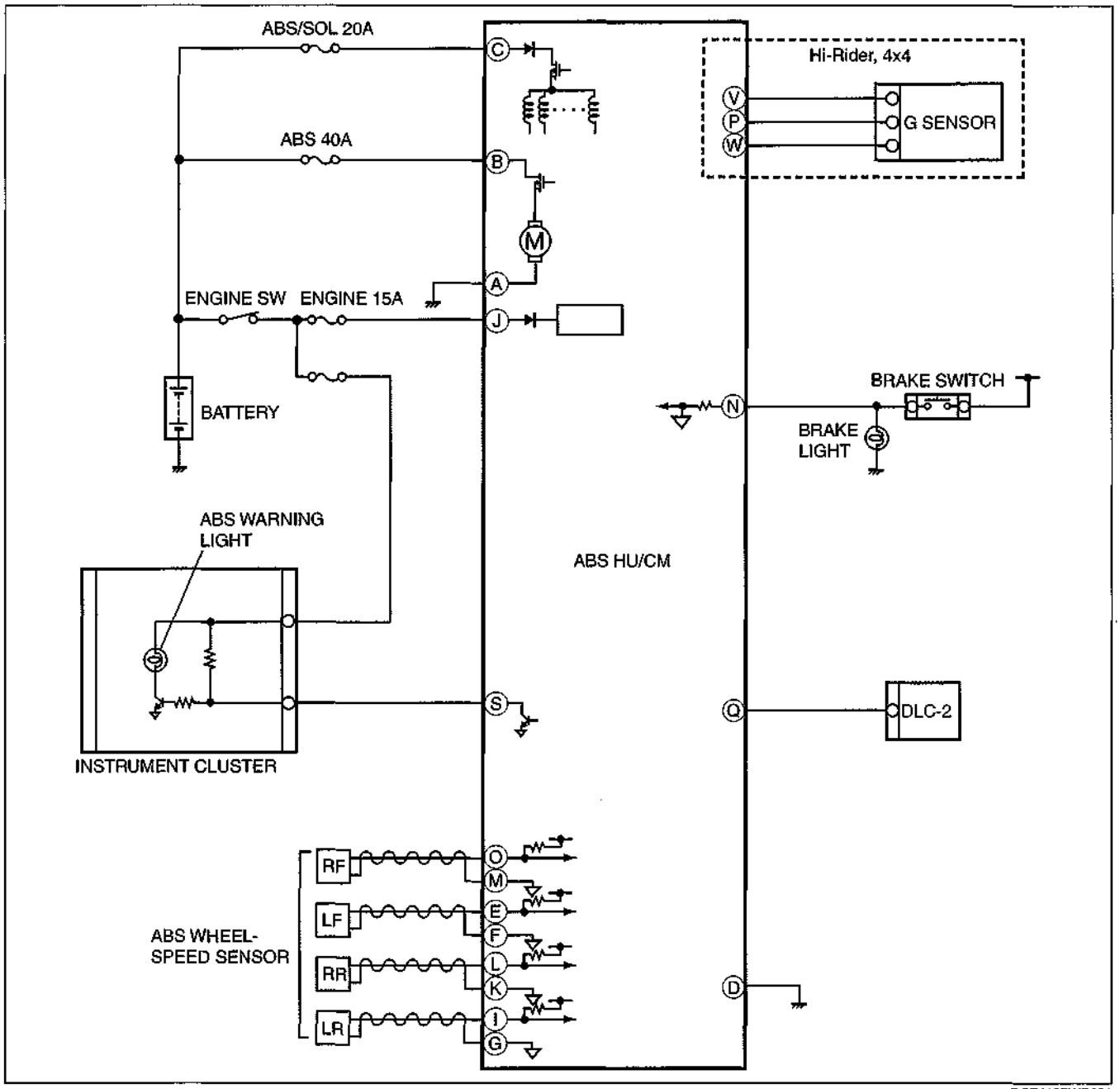
dcf041300000t05



DCF413BTB001

ABS SYSTEM WIRING DIAGRAM [4W-ABS]

dcf04130000t06

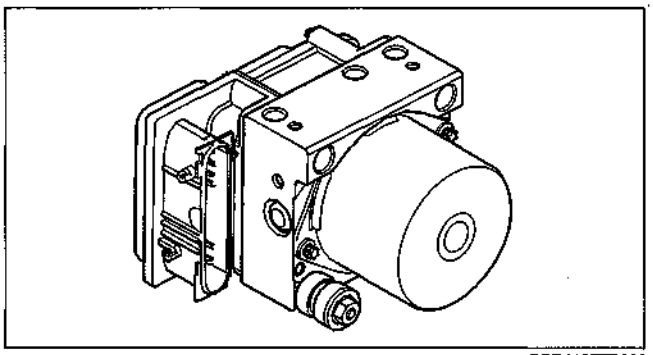


DCF413BWB001

ABS HU/CM CONSTRUCTION [4W-ABS]

dcf04134379t08

- A high reliability, reduced size and weight ABS HU/CM, integrating both the ABS HU and ABS CM, has been adopted.



DBR413ZTB002

ABS HU PART FUNCTION [4W-ABS]

dcf041343750t09

- The ABS HU adjusts the fluid pressure to the caliper pistons by controlling (on/off) each solenoid valve and pump motor according to signals from the ABS CM.

ABS HU PART CONSTRUCTION/OPERATION [4W-ABS]

dcf041343750t10

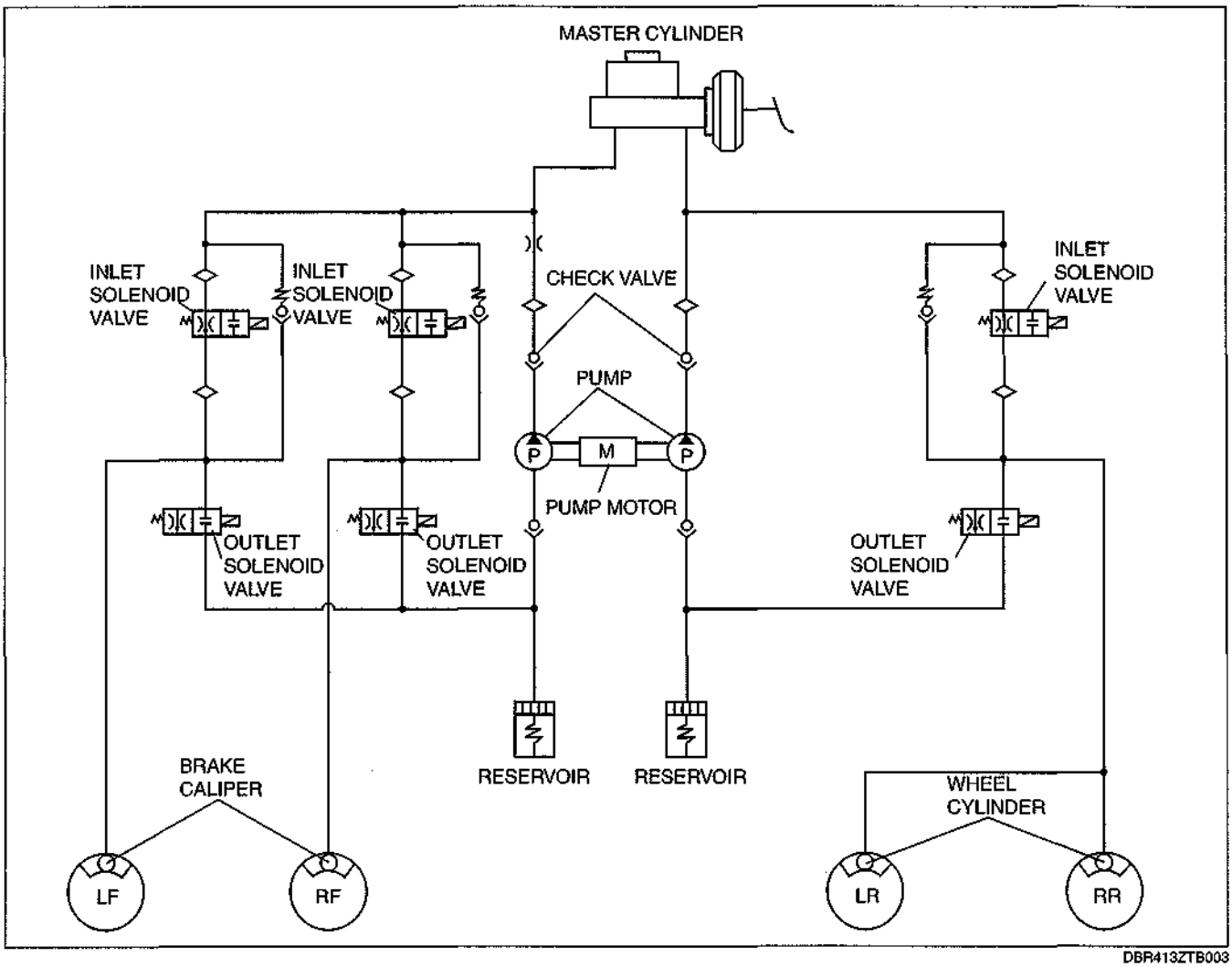
Construction

- The integrated ABS HU/CM system controls the ABS. The ABS are an independent front wheel control, rear axle control, 4-sensor, 3-channel system.

Function of main component Parts

Part name	Function
Inlet solenoid valve, outlet solenoid valve	• The solenoid valves control the fluid pressure at individual brake calipers (wheel cylinders) in accordance with the signal received from the ABS CM. • There are six solenoid valves in total and two solenoid valves in each wheel (one for retaining pressure and one for reducing pressure) are used. There are four valves for the front wheel, and the left and right wheels are controlled separately. There are two valves used to control the rear wheels simultaneously.
Reservoir	• The reservoirs temporarily store the hydraulic pressure which flows from the brake caliper (wheel cylinder) through the outlet solenoid valve during pressure reduction.
Pump	• The pump returns brake fluid from the reservoir to the master cylinder.
Pump motor	• Operates the pump according to ABS CM signals.

Hydraulic circuit diagram

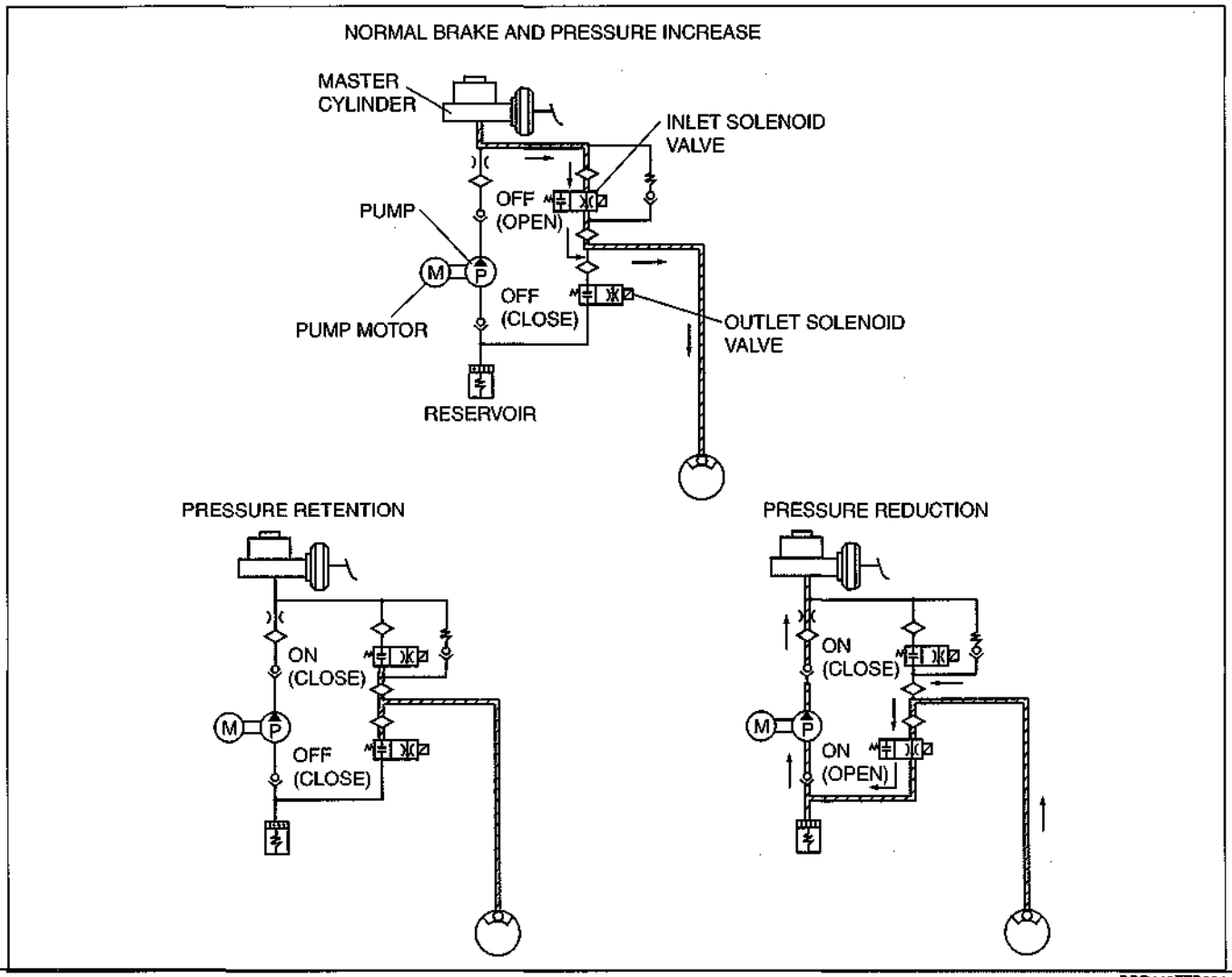


DBR413ZTB003

Operating

- The ABS HU/CM detects wheel-speed and driving condition based on the ABS wheel-speed sensors, and outputs on/off electronic signals to the inlet solenoid valves and outlet solenoid valves to control the ABS control.
- The ABS HU/CM controls ABS by calculating wheel slip from ABS wheel-speed sensor signals, and adjusting the brake pressure.

	Solenoid valve (Inlet)	Solenoid valve (Outlet)	Pump motor, pump
Normal brake	Off (open)	Off (close)	Stopped
Pressure reduction	On (close)	On (open)	Operating
Pressure retention	On (close)	Off (close)	Stopped
Pressure increase	Off (open)	Off (close)	Stopped



DBR413ZTB004

ABS CM PART FUNCTION [4W-ABS]

dcf041343750t11

- The ABS CM detects the vehicle wheel speeds based on the signals from the four ABS wheel- speed sensors. The CM calculates the rotation condition of each wheel from the relation between the detected vehicle wheel speed and the estimated (based on the detected speed) vehicle speed from there on. It then accordingly controls brake fluid pressure to each wheel to prevent lock-up.

Function Table

Function name	Contents
ABS control function	• Controls brake fluid pressure when braking to maintain directional stability, ensure steerability and reduce stopping distance.
On-board diagnostic system	• Main components of the ABS control system have a self-diagnosis function. In case a malfunction occurs, warning lights illuminate to alert the driver, and at the same time a DTC is stored in the ABS HU/CM. • When a malfunction is determined as a result of on-board diagnosis, system control is suspended or limited to prevent any dangerous situation while driving.

ABS CONTROL OUTLINE [4W-ABS]

dcf041343750t12

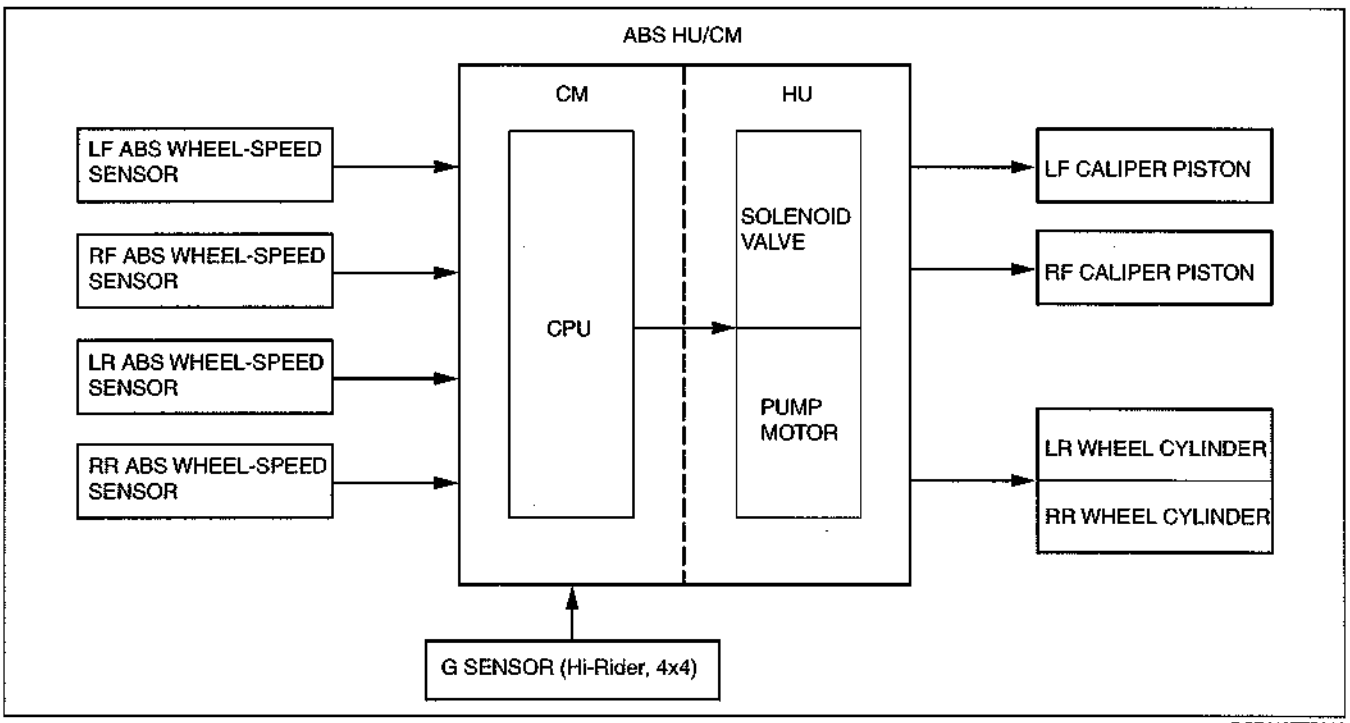
- ABS control occurs when wheel slip is determined by the ABS CM (based on the four ABS wheel-speed sensors). Then, the ABS HU inlet and outlet solenoid valves are operated and brake fluid pressure is controlled accordingly to prevent wheel lock-up.
- Use of ABS control during emergency braking or on slippery road surfaces allows directional stability to be maintained, steerability ensured and stopping distance to be reduced.
- The ABS control system has independent front wheel control and unified control (select low) for the rear wheels.

Note

- Select low control: A control system in which the left and right vehicle wheel speeds are compared and brake fluid pressure is controlled according to the wheel most likely to lock-up.

04

Block Diagram



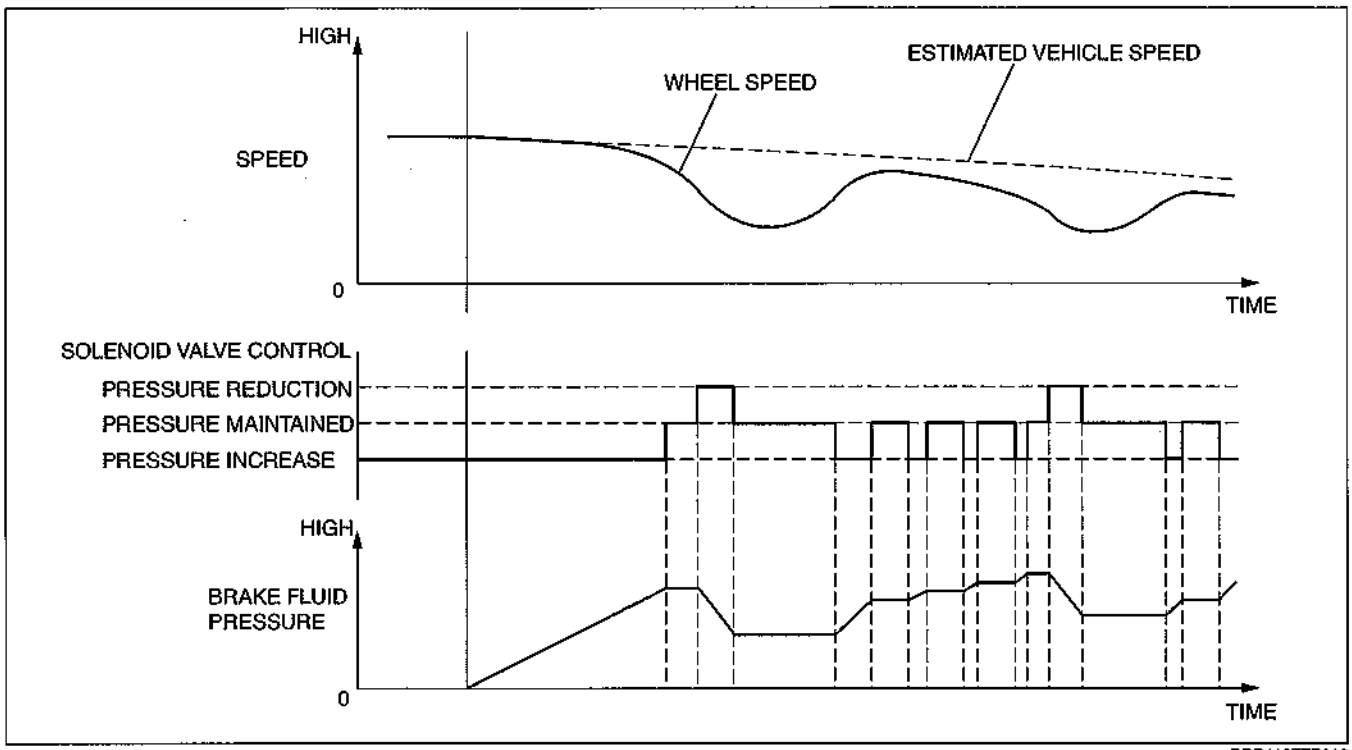
DCF413ZTB012

ABS CONTROL OPERATION [4W-ABS]

dcf041343750t13

- When the ABS CM determines wheel slip conditions based on the signals from the ABS wheel-speed sensors during braking, the ABS CM operates the ABS HU inlet and outlet solenoid valves, reducing and maintaining brake fluid pressure in accordance with the wheel slip factors. Then, when the wheel slip condition has passed, brake fluid pressure is increased and maintained, ensuring braking with a constantly stable brake force.

Operating Condition Transition Diagram



DBR413ZTB012

ABS WHEEL-SPEED SENSOR AND ABS SENSOR ROTOR FUNCTION [4W-ABS]

dcf041343720t03

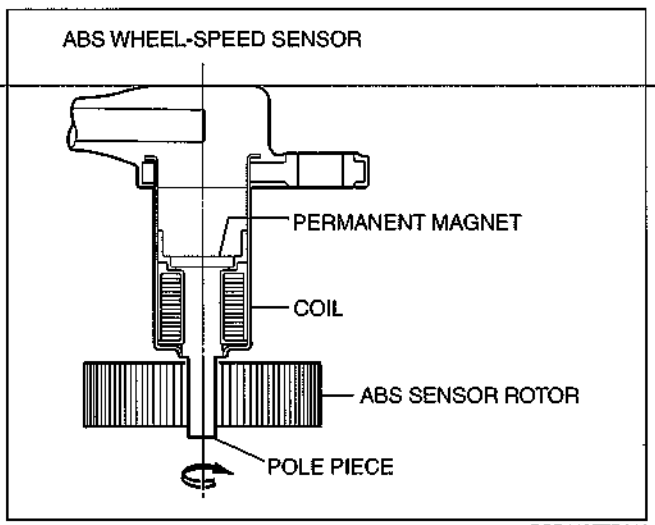
- The ABS wheel-speed sensor, which has a magnetic pick-up, transmits the rotation condition of each wheel to the ABS HU/CM.

ABS WHEEL-SPEED SENSOR AND ABS SENSOR ROTOR CONSTRUCTION/OPERATION [4W-ABS]

dcf041343720t04

Construction

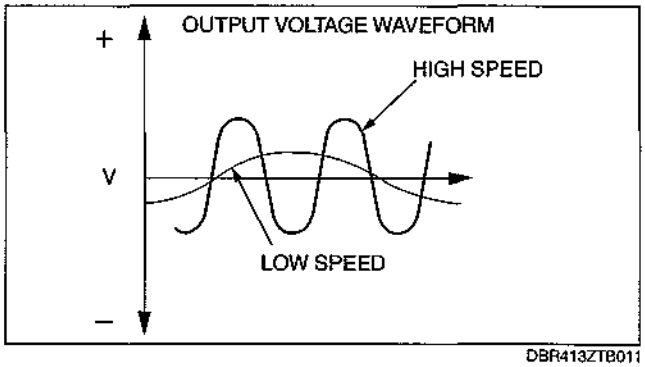
- The front ABS wheel-speed sensor is installed on the steering knuckle and the front ABS sensor rotor is integrated with the front wheel hub (4x2 except Hi-Rider) or drive shaft (Hi-Rider, 4x4).
- The rear ABS wheel-speed sensor is installed on the hub spindle and the rear ABS sensor rotor is integrated with the rear axle shaft.



DBR413ZTB010

Operation

- As the ABS sensor rotor rotates, magnetic flux formed from the permanent magnet varies and alternating current is formed with an electromagnetic conductor. Using this alternating current, rotation speed is expressed as a varying proportional cycle and from detection of this cycle the CM part of the ABS HU/CM can then detect the wheel rotation speed. While the structures of the front and rear ABS wheel-speed sensor differ, the operation is the same.



DBR413ZTB011

G SENSOR FUNCTION [4W-ABS]

dcf041343770l01

Note

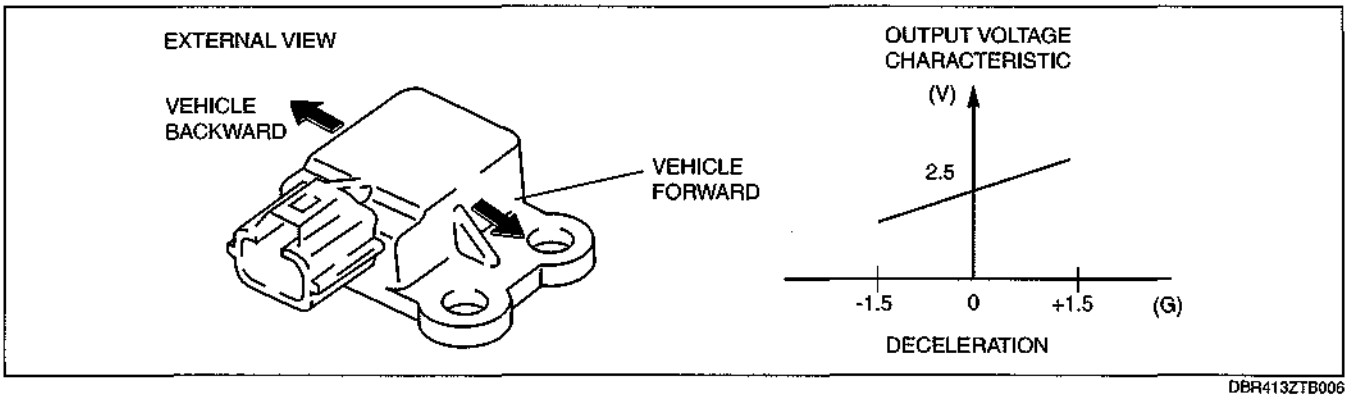
- Because the Hi-Rider vehicle is based on the 4x4 vehicle, the 4x4 vehicle ABS system has been adopted. Therefore, the G-sensor, which is generally installed to 4x4 vehicles only, is installed to the Hi-Rider.
- Because the 4x4 vehicle ABS system has been adopted on the Hi-Rider, the ABS is controlled in the same way as the 4x4 vehicle.

- In the Hi-Rider and 4x4 vehicle, the G sensor detects and calculates the vehicle G force (acceleration and deceleration G force), and outputs the change in voltage to the ABS HU/CM.

G SENSOR CONSTRUCTION/OPERATION [4W-ABS]

dcf041343770t02

- The G sensor is installed under the RH front seat and detects vehicle movement during a brake lockup event that is transferred to other wheels through the powertrain, and transmits the signal to the ABS HU/CM.
- The drive train of 4x4 vehicles delivers driving force to all four wheels, and due to this interlocking, the speed of all wheels during braking is the same. When driving on road surfaces with especially low m (friction coefficient), it is difficult to estimate the vehicle speed based on the wheel speed, and ABS braking becomes unreliable. (For 4x2 vehicles, the front and rear wheels are independent, so it is possible to accurately estimate the vehicle speed by measuring the difference between the rotation speeds of the front and rear tires.) A G sensor is installed to overcome this situation. When braking, the change in G-force is detected, and the road surface m is judged (low m, high m), enabling a correction of the vehicle speed estimation.
- The output characteristics are based on **2.5 V** with the vehicle in a stopped or driven with constant speed, and the subsequent fluctuation is depending on the situation whereby the G force occurs.



DBR413ZTB006

TRANSMISSION/TRANSAXLE

05 SECTION

OUTLINE 05-00
CLUTCH 05-10
MANUAL TRANSMISSION [R15M-D] 05-11A
MANUAL TRANSMISSION [S15M-D, S15MX-D] 05-11B

05-00 OUTLINE

TRANSMISSION/TRANSAXLE ABBREVIATIONS 05-00–1
TRANSMISSION/TRANSAXLE FEATURES 05-00–1
TRANSMISSION/TRANSAXLE SPECIFICATIONS 05-00–1

TRANSMISSION/TRANSAXLE ABBREVIATIONS

dcf050000000t01

MT	Manual Transmission
1GR	First Gear
2GR	Second Gear
5GR	Fifth Gear

TRANSMISSION/TRANSAXLE FEATURES

dcf050000000t02

CLUTCH	
Reduced noise and vibration	• Dual-mass flywheel adopted. (S15M-D, S15MX-D)
Improved durability	• Clutch cover with wear assurance function adopted.
Improved startability	• One-way valve that fits inside a clutch master cylinder adopted.
MT [R15M-D]	
Improved operability	• A double cone synchronizer mechanism has been adopted for 2nd gear.
Improved reliability	• A double engagement prevention mechanism (interlock mechanism) has been adopted.
Mis-shift prevention	• A stopper pin-type reverse lock-out mechanism has been adopted.
MT [S15M-D, S15MX-D]	
Improved operability	• A linked, triple cone synchronizer mechanism has been adopted for 1st and 2nd gears. • A linked, double cone synchronizer mechanism has been adopted for 3rd gear.
Improved reliability	• A double engagement prevention mechanism (interlock mechanism) has been adopted.
Mis-shift prevention	• A cam-type reverse lock-out mechanism has been adopted.

TRANSMISSION/TRANSAXLE SPECIFICATIONS

dcf050000000t03

Clutch

Item			Specifications	
Manual transmission type			**R15M-D**	**S15M-D, S15MX-D**
Clutch control			Hydraulic	
Clutch cover	Spring type		Diaphragm	
	Set load	(N {kgf, lbf})	5,290 {539, 1,189}	10,100 {1,030, 2,271}
Clutch disc	Outer diameter	(mm {in})	240 {9.45}	250 {9.84}
	Inner diameter	(mm {in})	160 {6.30}	155 {6.10}
Clutch pedal	Type		Suspended	
	Pedal ratio		6.0	5.2
	Full stroke	(mm {in})	152 {5.984}	
Clutch master cylinder inner diameter		(mm {in})	15.87 {0.6248}	

Item		Specifications	
Manual transmission type		**R15M-D**	**S15M-D, S15MX-D**
Clutch release cylinder inner diameter	(mm {in})	19.05 {0.7500}	22.23 {0.8752}
Clutch fluid type		SAE J1703, FMVSS 116 DOT-3	

Manual Transmission [R15M-D]

Item			Specifications
Transmission type			**R15M-D**
Transmission control			Floor-shift
Shift assist			Synchromesh
Gear ratio	1GR		4.250
	2GR		2.356
	3GR		1.428
	4GR		1.000
	5GR		0.827
	Reverse		3.656
Oil	Grade		API service GL-4 or GL-5
	Viscosity	All season	SAE 75W-90
		Above 10°C {50°F}	SAE 80W-90
	Capacity (approx. quantity)	(L {US qt, Imp qt})	2.8 {3.0, 2.5}

Manual Transmission [S15M-D, S15MX-D]

Item			Specifications
Transmission type			**S15M-D, S15MX-D**
Transmission control			Floor-shift
Shift assist			Synchromesh
Gear ratio	1GR		3.905
	2GR		2.248
	3GR		1.491
	4GR		1.000
	5GR		0.800
	Reverse		3.391
Oil	Type		Mercon® Multi-purpose AFT XT-2-QDX
	Capacity (approx. quantity)	(L {US qt, Imp qt})	3.55 {3.75, 3.12}

TRANSMISSION/TRANSAXLE

05 SECTION

OUTLINE 05-00
ON-BOARD DIAGNOSTIC[5R55S] 05-02
AUTOMATIC TRANSMISSION [5R55S] 05-13
AUTOMATIC TRANSMISSION SHIFT MECHANISM 05-14

05-00 OUTLINE

TRANSMISSION/TRANSAXLE FEATURES [5R55S] 05-00–1
TRANSMISSION/TRANSAXLE SPECIFICATIONS [5R55S] 05-00–1

TRANSMISSION/TRANSAXLE FEATURES [5R55S]

id0500001002f1

Improved marketability	• Five-speed 5R55S automatic transmission has been adopted. • A water-cooling type and an air-cooling type AT oil cooler has been adopted
Superior shift quality	• Adaptive learn strategy system has been adopted • Engine-transaxle total control system has been adopted

TRANSMISSION/TRANSAXLE SPECIFICATIONS [5R55S]

id0500001006f1

Item			Specification
Transmission type			5R55S
Transmission control			Floor-shift
Gear ratio	1GR		3.22
	2GR		2.29
	3GR		1.55
	4GR		1.00
	5GR		0.71
	Reverse		3.07
ATF	Type		Mercon® V
	Capacity (approx. quantity)	(L {US qt, Imp qt})	9.93 {10.49, 8.74}
Hydraulic system(Number of drive/driven gear plates)	Forward clutch		5/5
	Coast clutch		2/2
	Direct clutch		5/5

05-02 ON-BOARD DIAGNOSTIC [5R55S]

ON-BOARD DIAGNOSTIC (OBD) SYSTEM OUTLINE [5R55S] 05-02–1
ON-BOARD DIAGNOSTIC (OBD) SYSTEM BLOCK DIAGRAM [5R55S] 05-02–1
MALFUNCTION DETECTION FUNCTION [5R55S] 05-02–2
MEMORY FUNCTION [5R55S] 05-02–3
MALFUNCTION INDICATION FUNCTION [5R55S] 05-02–3
FAIL-SAFE FUNCTION [5R55S] 05-02–3
PARAMETER IDENTIFICATION (PID) DATA MONITORING FUNCTION [5R55S] 05-02–4
SIMULATION FUNCTION [5R55S] 05-02–4
DLC-2 OUTLINE [5R55S] 05-02–5

ON-BOARD DIAGNOSTIC (OBD) SYSTEM OUTLINE [5R55S]

id0502c1100100

- The OBD system has the following functions:
  - — Malfunction detection function: Detects malfunctions of the input/output devices and system components of the AT.
  - — Fail-safe function: Fixes the output device function and input value of the sensors/switches to ensure minimum vehicle driveability when a malfunction is detected.
  - — Memory function: Stores the DTC when a malfunction is detected.
  - — PID data monitored function: Monitors the input/output signal and calculated value of the TCM, and sends the monitoring data to the IDS/PDS.
  - — Simulation function: Allows override operation of simulation items for input/output system parts preset in the TCM.

ON-BOARD DIAGNOSTIC (OBD) SYSTEM BLOCK DIAGRAM [5R55S]

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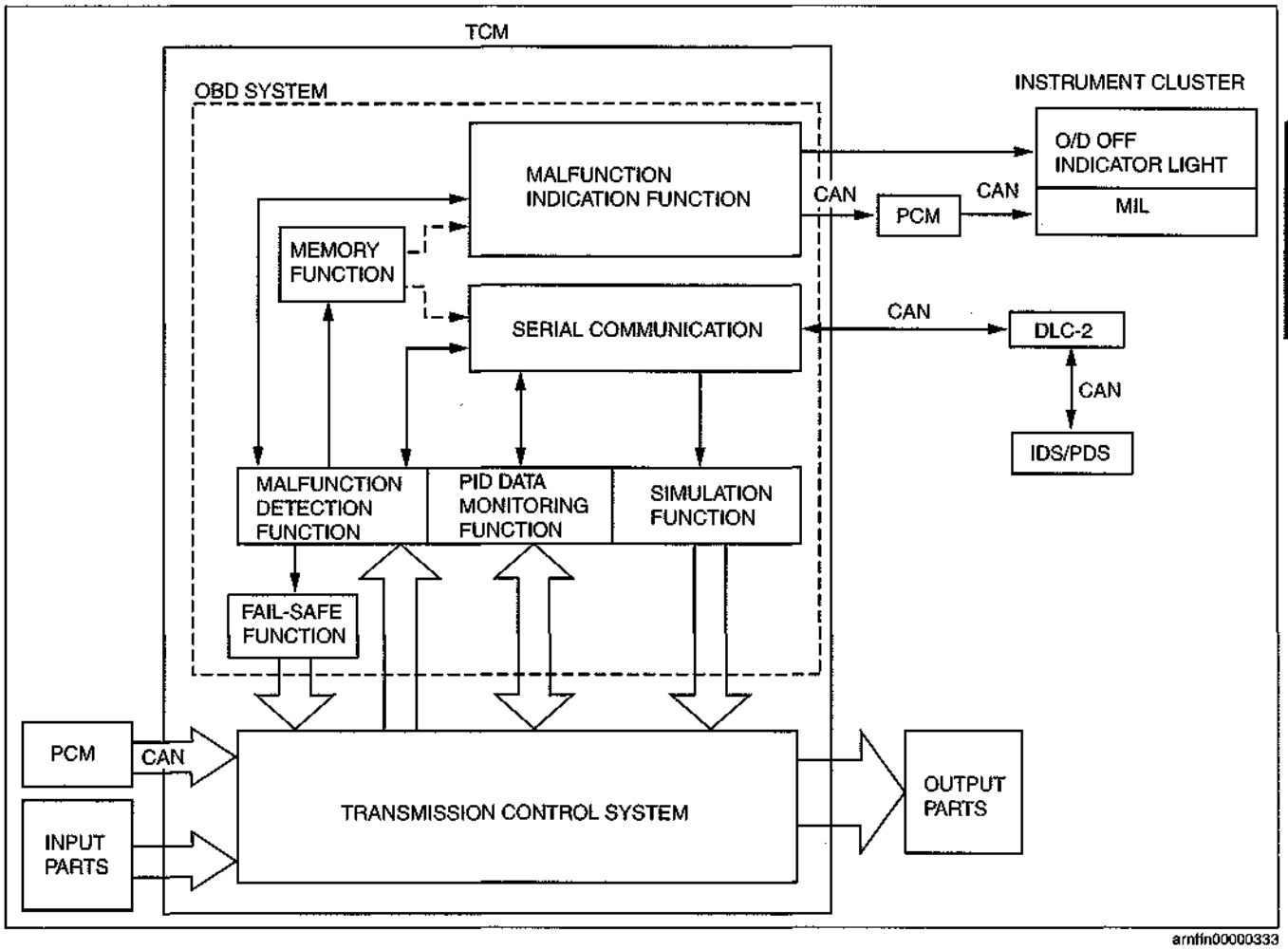

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MALFUNCTION DETECTION FUNCTION [5R55S]

id0502c1100300

Malfunction Detection Function

- In the malfunction detection function, the TCM detects malfunctions in the automatic transmission while driving.
- When vehicle driving conditions correspond with a preset malfunction detection condition, the TCM determines that the automatic transmission has a malfunction and stores the corresponding DTC.
- When a malfunction is detected, stored DTCs can be retrieved using the IDS/PDS connected to the DLC-2.

DTC Table

DTC No.	Condition
P0657	Solenoid valve power supply circuit open
P0658	Solenoid valve power supply circuit voltage low
P0705	Digital transmission range (TR) sensor circuit malfunction (invalid bit pattern)
P0708	Digital transmission range (TR) sensor circuit malfunction (TR3A circuit open)
P0711	Transmission fluid temperature (TFT) sensor malfunction (ATF temperature no change)
P0712	Transmission fluid temperature (TFT) sensor circuit malfunction (short to ground)
P0713	Transmission fluid temperature (TFT) sensor circuit malfunction (open circuit)
P0715	Turbine shaft speed (TSS) sensor malfunction
P0717	Turbine shaft speed (TSS) sensor signal is not input
P0718	Turbine shaft speed (TSS) sensor signal noise
P0720	Output shaft speed (OSS) sensor malfunction
P0721	Output shaft speed (OSS) sensor signal noise
P0722	Output shaft speed (OSS) sensor signal is not input
P0731	Gear 1 incorrect
P0732	Gear 2 incorrect
P0733	Gear 3 incorrect
P0734	Gear 4 incorrect
P0735	Gear 5 incorrect
P0740	Torque converter clutch (TCC) control solenoid circuit malfunction (open circuit)
P0741	Torque converter clutch (TCC) control solenoid circuit malfunction (stuck off)
P0742	Torque converter clutch (TCC) control solenoid circuit malfunction (stuck on)
P0743	Torque converter clutch (TCC) control solenoid circuit malfunction (open or short circuit)
P0744	Torque converter clutch (TCC) control solenoid circuit malfunction (short to power)
P0745	Pressure control solenoid A malfunction (low pressure)
P0748	Pressure control solenoid A circuit malfunction (non-operation)
P0750	Shift solenoid A circuit malfunction (open or short circuit)
P0753	Shift solenoid A circuit malfunction (open or short circuit)
P0755	Shift solenoid B circuit malfunction (open or short circuit)
P0757	Shift solenoid B malfunction (stuck on)
P0758	Shift solenoid B circuit malfunction (open or short circuit)
P0760	Shift solenoid C circuit malfunction (open or short circuit)
P0762	Shift solenoid C malfunction (stuck on)
P0763	Shift solenoid C circuit malfunction (open or short circuit)
P0765	Shift solenoid D circuit malfunction (open or short circuit)
P0768	Shift solenoid D circuit malfunction (open or short circuit)
P0775	Pressure control solenoid B malfunction (low pressure)
P0778	Pressure control solenoid B circuit malfunction (non-operation)
P0791	Intermediate shaft speed (ISS) sensor malfunction
P0794	Intermediate shaft speed (ISS) sensor signal noise
P0795	Pressure control solenoid C malfunction (low pressure)
P0798	Pressure control solenoid C circuit malfunction (non-operation)
P0960	Pressure control solenoid A circuit malfunction (open circuit)
P0962	Pressure control solenoid A circuit malfunction (short to ground)
P0963	Pressure control solenoid A circuit malfunction (short to power supply)
P0964	Pressure control solenoid B circuit malfunction (open circuit)
P0966	Pressure control solenoid B circuit malfunction (short to ground)
P0967	Pressure control solenoid B circuit malfunction (short to power supply)

DTC No.	Condition
P0968	Pressure control solenoid C circuit malfunction (open circuit)
P0970	Pressure control solenoid C circuit malfunction (short to ground)
P0971	Pressure control solenoid C circuit malfunction (short to power supply)
P1635	Tire/axle ratio out of acceptable range
P1700	Transmission indeterminate malfunction
P1702	Digital transmission range (TR) sensor circuit intermittent
P1704	Digital transmission range (TR) sensor circuit not indicating P or N position during on-board diagnostic
P1705	Digital transmission range (TR) sensor circuit not indicating P or N position during on-board diagnostic
P1711	ATF temperature out of on-board diagnostic range
P1780	O/D OFF switch circuit malfunction (open or short circuit)
P1783	ATF overheating
U0100	Communication error to PCM
U0294	Communication error to PCM

MEMORY FUNCTION [5R55S]

id0502c1100400

- The memory function stores malfunction information detected in the malfunction detection function. Once malfunction information is stored, the memory will not be cleared even when the engine switch is turned off (LOCK position) or the malfunction is repaired.
- The stored memory (malfunction information) can be cleared using the IDS/PDS, or by disconnecting the negative battery cable.

MALFUNCTION INDICATION FUNCTION [5R55S]

id0502c1100500

- The malfunction indication function illuminates the MIL or flashing the O/D OFF indicator light when the malfunction detection function determines that there is a malfunction.

FAIL-SAFE FUNCTION [5R55S]

id0502c1100600

- In the fail-safe function, minimum vehicle driveability is obtained by changing the signals that are determined to be irregular by the malfunction detection function to the preset values, and limiting TCM control.

PARAMETER IDENTIFICATION (PID) DATA MONITORING FUNCTION [5R55S]

id0502c1100700

- The PID mode allows access to certain data values, analog and digital input and output, calculations and system state information.

PID/DATA MONITOR AND RECORD function table

Monitor Item	Definition	Unit/ Condition	TCM terminal
BPP	Brake switch	on/off	N/A
FIRM_ST	Firm shaft control (FSC) status requested	0/1	N/A
GEAR	Calculated gear range in TCM	1/2/3/4/5	N/A
GEAR_OSC	PID used to command gear changes during Simulation Function	1/2/3/4/5	N/A
ISS	ISS sensor	rpm	AM, AS
OSS	OSS sensor	rpm	AD, AG
PCA	Pressure control solenoid A	pis	I, CK
PCB	Pressure control solenoid B	pis	J, CK
PCC	Pressure control solenoid C	pis	M, CK
RPM	Engine speed	rpm	N/A
SSA	Shift solenoid A	on/off	B, CK
SSB	Shift solenoid B	on/off	C, CK
SSC	Shift solenoid C	on/off	F, CK
SSD	Shift solenoid D	on/off	D, CK
TCC	TCC control solenoid	%	A, CK
TCCRAT	Torque converter speed ratio	ratio	N/A
TFT	ATF temperature	°C, °F	AY, BH
TR_D	Digital TR sensor signal		AX, BU, BY, CA
TR_V	Digital TR sensor signal voltage	V	AX, BU, BY, CA
TR1	TR1 switch	0/1	BY
TR2	TR2 switch	0/1	BU
TR3A	TR3 switch	0/1	AX
TR4	TR4 switch	0/1	CA
TSS	TSS sensor	rpm	AH, AP
VSS	Vehicle speed	mph	AD, AG

SIMULATION FUNCTION [5R55S]

id0502c1100800

- By using the IDS/PDS, simulation items for input/output parts preset in the TCM can be optionally selected and operated regardless of TCM control conditions.

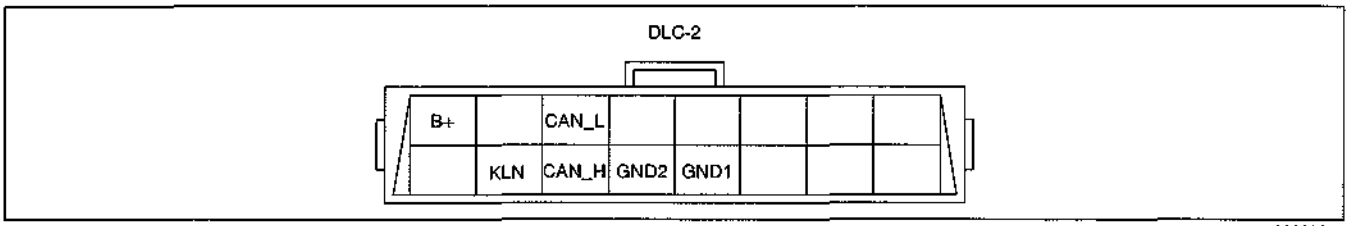
Simulation item table

Simulation item	Applicable component	Unit	TCM terminal
PCA	Pressure control solenoid A	pis	I, CK
PCB	Pressure control solenoid B	pis	J, CK
PCC	Pressure control solenoid C	pis	M, CK
SSA	Shift solenoid A	on/off	B, CK
SSB	Shift solenoid B	on/off	C, CK
SSC	Shift solenoid C	on/off	F, CK
SSD	Shift solenoid D	on/off	D, CK
TCC	TCC control solenoid	%	A, CK

DLC-2 OUTLINE [5R55S]

id0502c1100900

- A connector (DLC-2) conforming to International Organization for Standardization (ISO) standards has been adopted.
- The shape and terminal arrangement as stipulated by the ISO 15031-3 (SAE J1962) international standard has been adopted for this connector. The connector has a 16-pin construction that includes the B+, CAN_H, CAN_L, GND1, GND2 and KLN terminals.



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Terminal	Function
B+	Battery power supply terminal
CAN_L	Serial communication terminal (Lo)
CAN_H	Serial communication terminal (Hi)
GND1	Body ground terminal
GND2	Serial communication ground terminal
KLN	Serial communication terminal (Malfunction diagnosis use)

05-10 CLUTCH

CLUTCH STRUCTURAL VIEW..... 05-10–1
CLUTCH MASTER CYLINDER CONSTRUCTION 05-10–2
CLUTCH RELEASE CYLINDER construction..... 05-10–2
CLUTCH COVER OUTLINE [S15M-D, S15MX-D].....05-10–2
DUAL-MASS FLYWHEEL FUNCTION [S15M-D, S15MX-D].....05-10–3

CLUTCH STRUCTURAL VIEW

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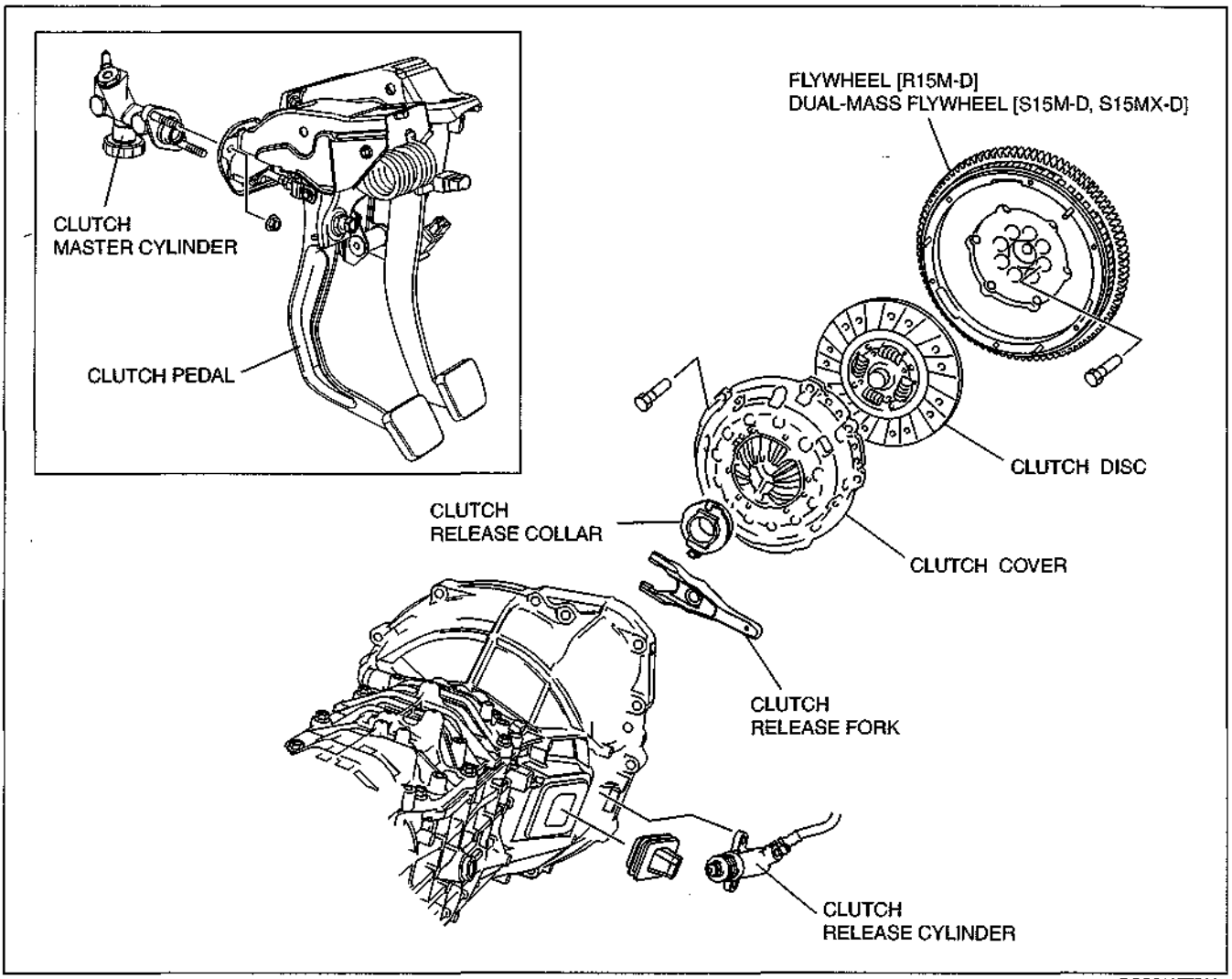

DCG510ZT8001

CLUTCH MASTER CYLINDER CONSTRUCTION

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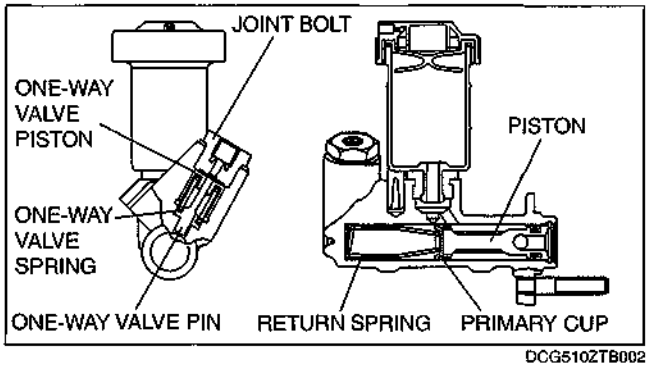
- A clutch master cylinder with a built-in one-way valve has been adopted preventing sudden clutch engagement and ensuring smooth startability.

Vehicles without clutch damper



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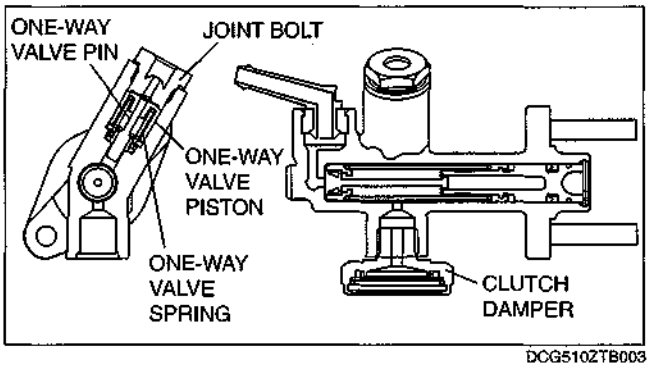
Vehicles with clutch damper

- The clutch damper controls hydraulic pulsation during clutch operation, reducing harsh vibration transmitted to the clutch pedal and operation noise.

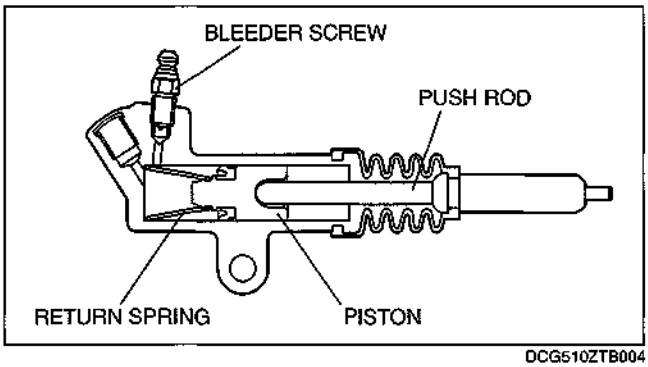


DCG510ZTB003

CLUTCH RELEASE CYLINDER construction

dcf051000000t04

- The clutch release cylinder consists of a return spring, piston, push rod and a bleeder screw for bleeding air.
- Due to spring pressure maintaining play between the push rod end and the release fork at zero, an automatic adjusting, maintenance-free design has been achieved.



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CLUTCH COVER OUTLINE [S15M-D, S15MX-D]

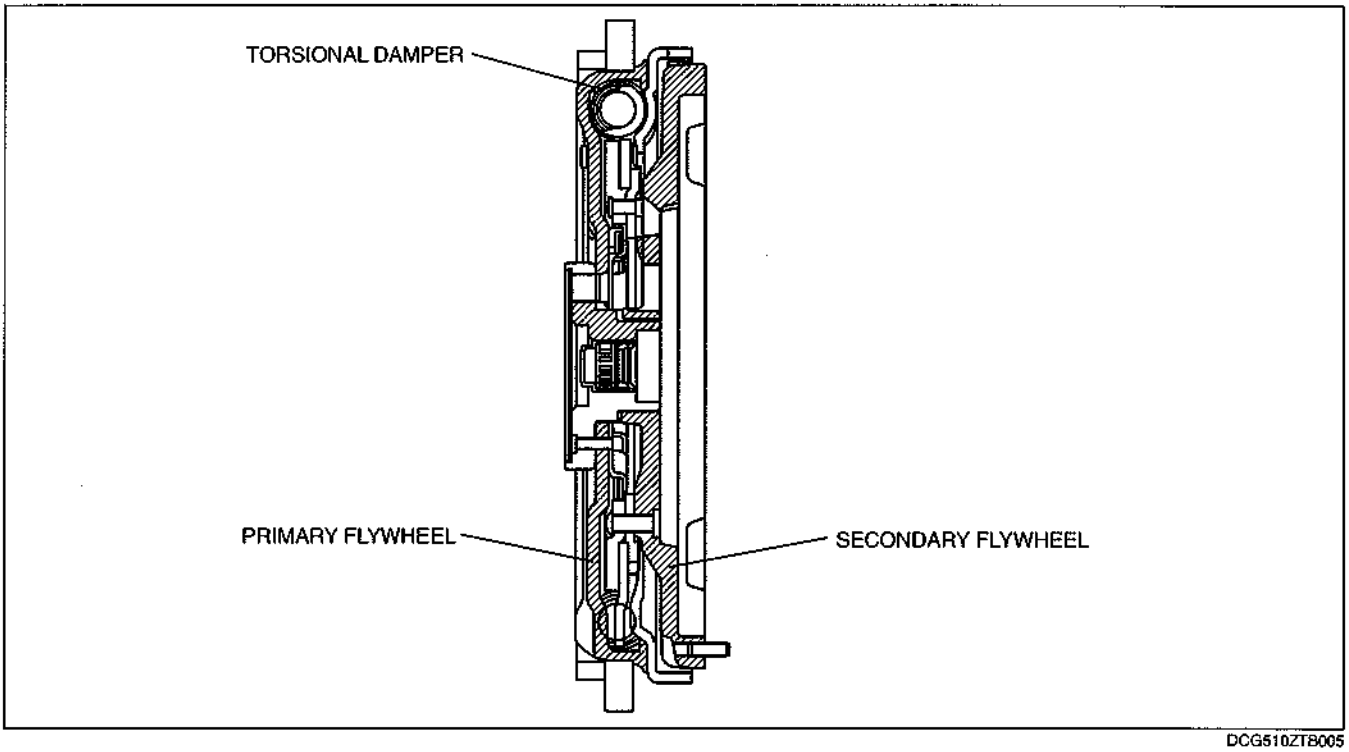
dcf051000000t05

- The wear assurance function of the clutch cover maintains the set load of the clutch cover unchanged even as the clutch disc becomes worn, thereby extending disc life.

DUAL-MASS FLYWHEEL FUNCTION [S15M-D, S15MX-D]

dcf051000000t06

- The dual-mass flywheel has separated primary and secondary flywheel, and a torsional damper that is located inside the flywheel. Due to this structure, the transmission main drive gear shaft rotation can be stabilized, decreasing noise inside the transmission (gear teeth rattling) created by engine speed fluctuation, and thereby greatly reducing vehicle booming noise also.



DCG510ZTB005

05-11B MANUAL TRANSMISSION [S15M-D, S15MX-D]

MANUAL TRANSMISSION OUTLINE [S15M-D, S15MX-D] 05-11B–1
MANUAL TRANSMISSION CROSS-SECTIONAL VIEW [S15M-D, S15MX-D] 05-11B–2
MANUAL TRANSMISSION POWER FLOW [S15M-D, S15MX-D]..... 05-11B–3
SHIFT MECHANISM OUTLINE [S15M-D, S15MX-D] 05-11B–4
TRIPLE CONE SYNCHRONIZER MECHANISM STRUCTURE [S15M-D, S15MX-D] 05-11B–5
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DOUBLE CONE SYNCHRONIZER MECHANISM CONSTRUCTION/ OPERATION [S15M-D, S15MX-D].....05-11B–7
SHIFT INTERLOCK MECHANISM FUNCTION [S15M-D, S15MX-D] 05-11B–7
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REVERSE LOCKOUT MECHANISM FUNCTION [S15M-D, S15MX-D] 05-11B–8
REVERSE LOCKOUT MECHANISM CONSTRUCTION/OPERATION [S15M-D, S15MX-D].....05-11B–8

MANUAL TRANSMISSION OUTLINE [S15M-D, S15MX-D]

dcf051100000l33

- A linked, triple cone synchronizer mechanism has been adopted for 1st and 2nd gears.
- A linked, double cone synchronizer mechanism has been adopted for 3rd gear.
- A cam-type reverse lockout mechanism has been adopted.

MANUAL TRANSMISSION CROSS-SECTIONAL VIEW [S15M-D, S15MX-D]

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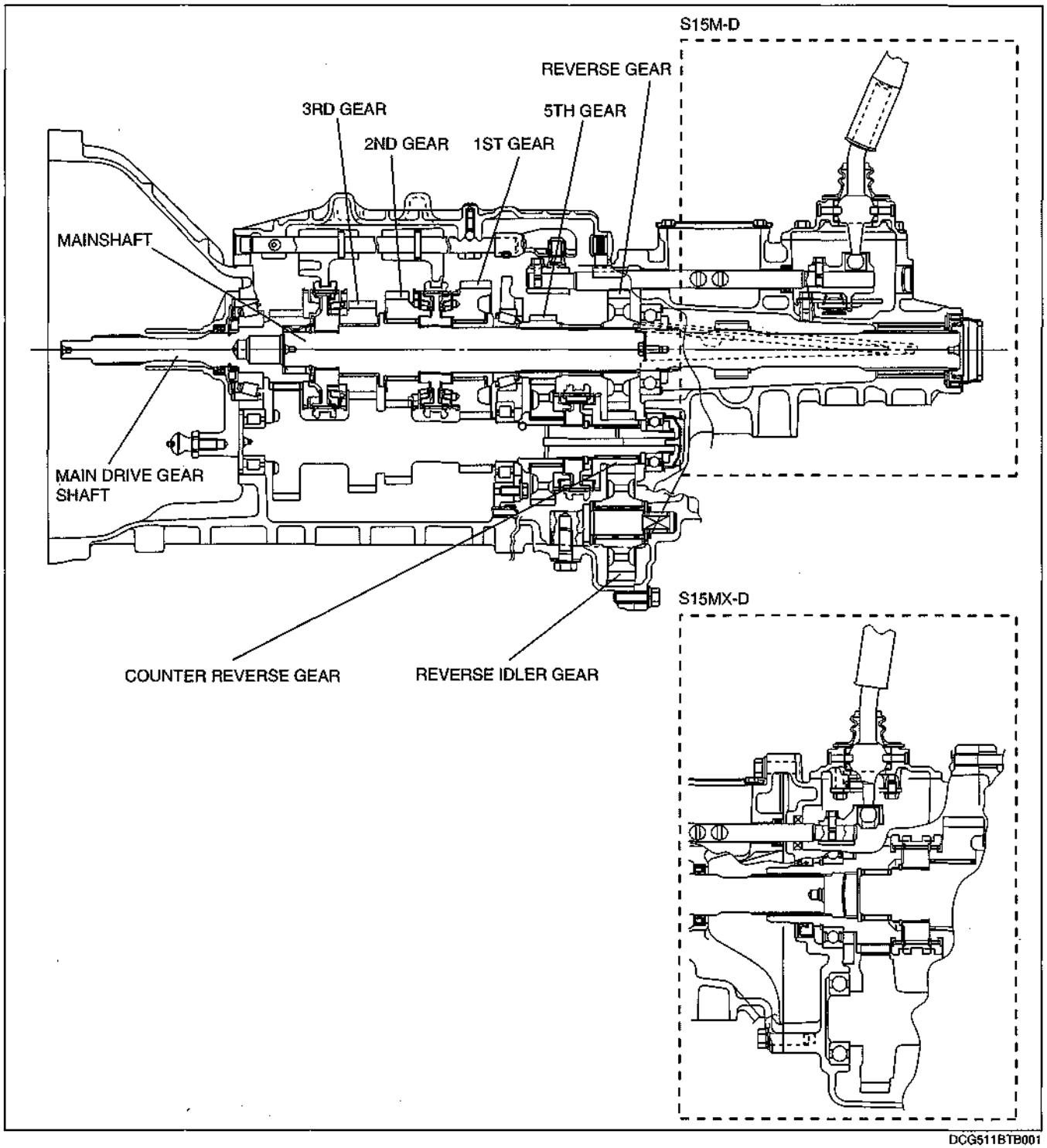

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MANUAL TRANSMISSION POWER FLOW [S15M-D, S15MX-D]

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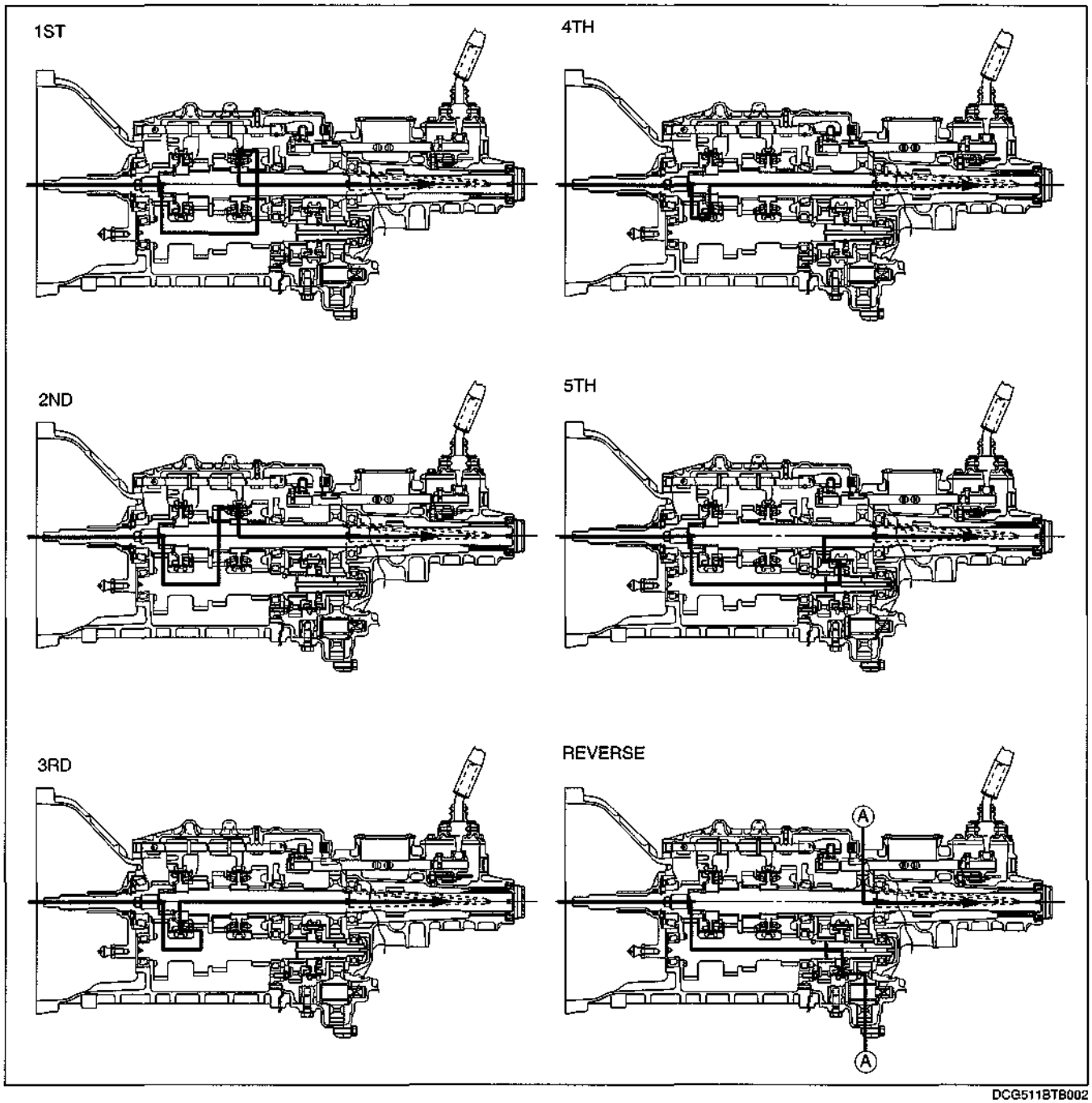

DCG511BTB002

SHIFT MECHANISM OUTLINE [S15M-D, S15MX-D]

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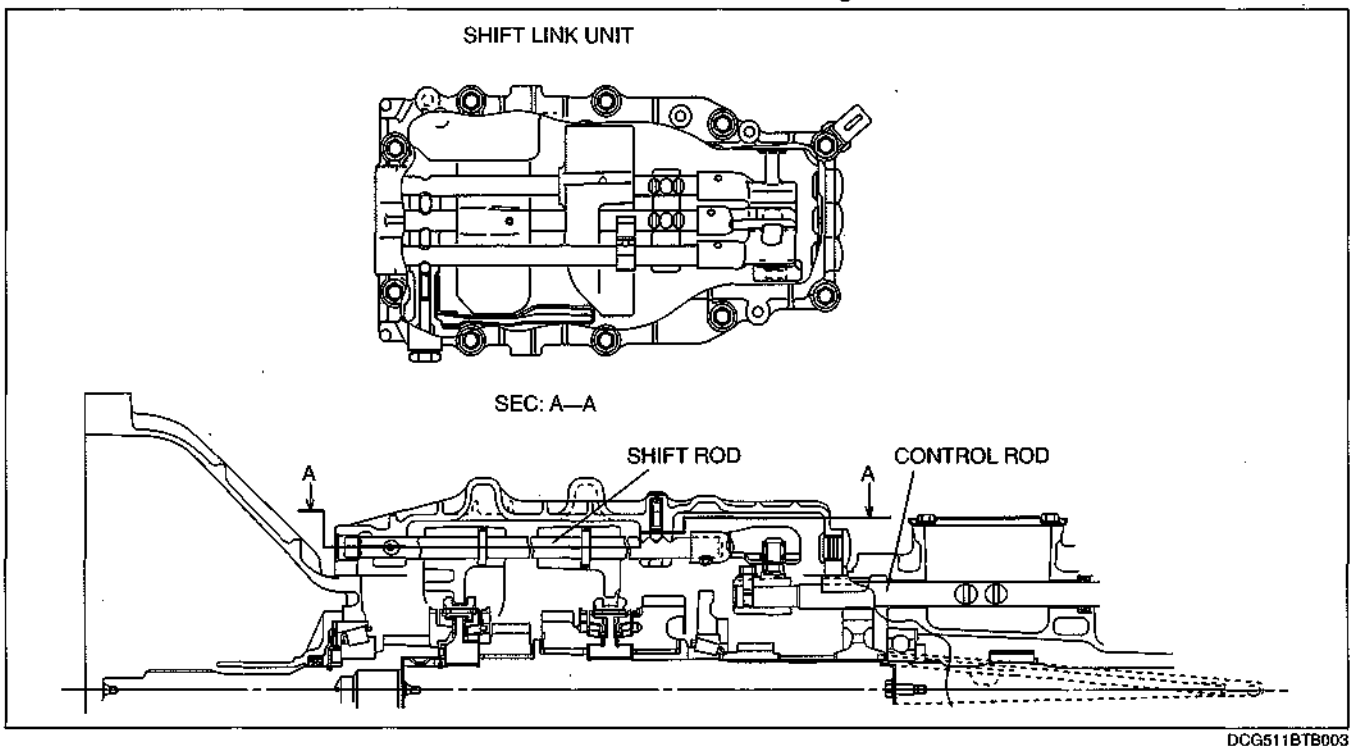
- To realize assured shift feel, the shift link mechanism has been integrated.



DCG511BTB003

TRIPLE CONE SYNCHRONIZER MECHANISM STRUCTURE [S15M-D, S15MX-D]

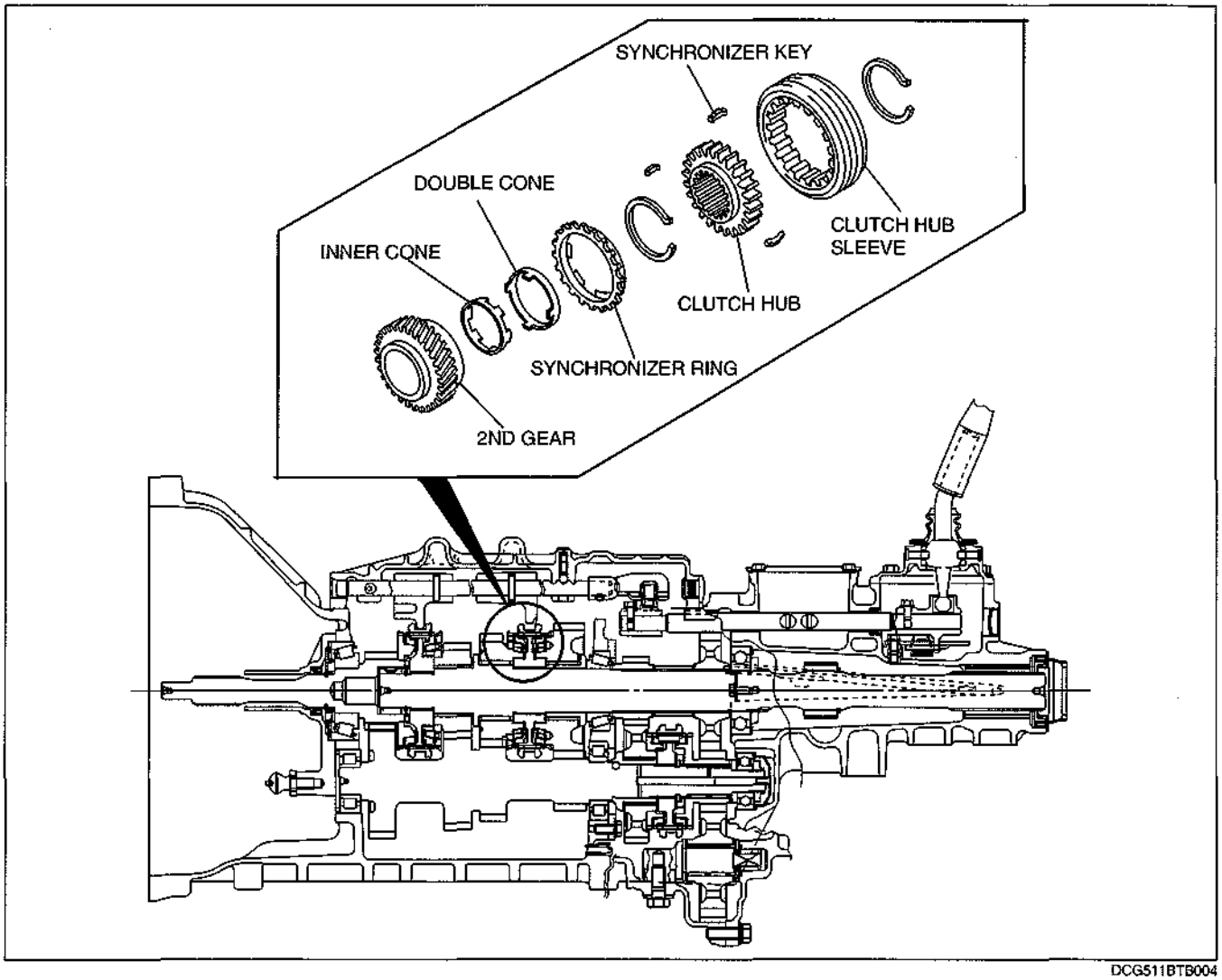
dcf051100000037

Features

- A triple cone synchronizer mechanism is used for the 1st and 2nd gears.
- The triple cone synchronizer mechanism is a compact device capable of heavy duty meshing.
- The synchro mechanism reduces meshing time and improves operation.
- The triple cone synchro mechanism includes a synchronizer ring, a double cone, and an inner cone.

Structure

Structural view



DCG511BTB004

TRIPLE CONE SYNCHRONIZER MECHANISM OPERATION [S15M-D, S15MX-D]

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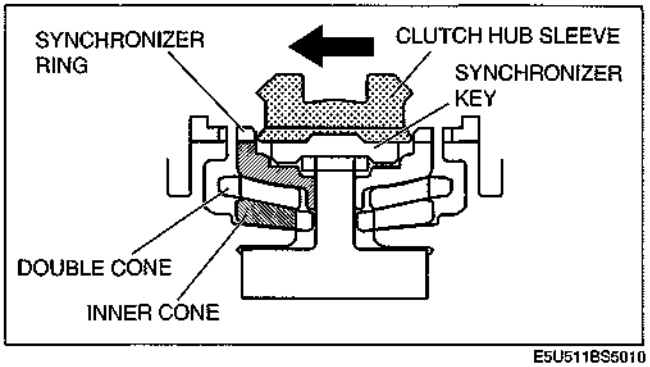
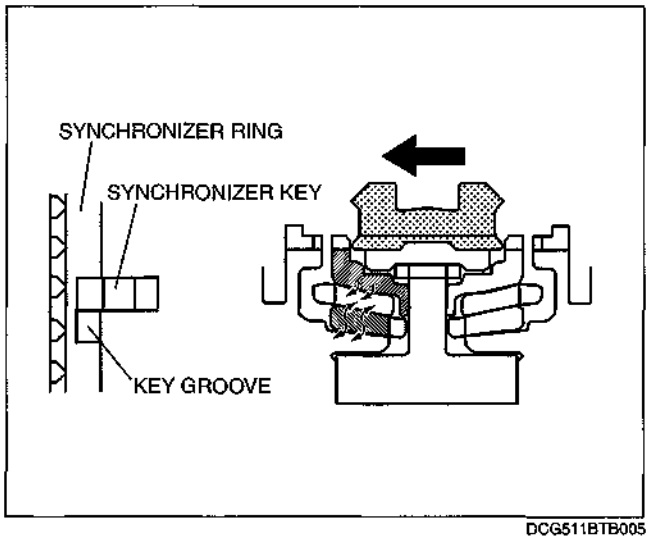
1. When the hub sleeve moves to the left (in the direction of the arrow), the synchronizer key presses against the synchronizer ring.



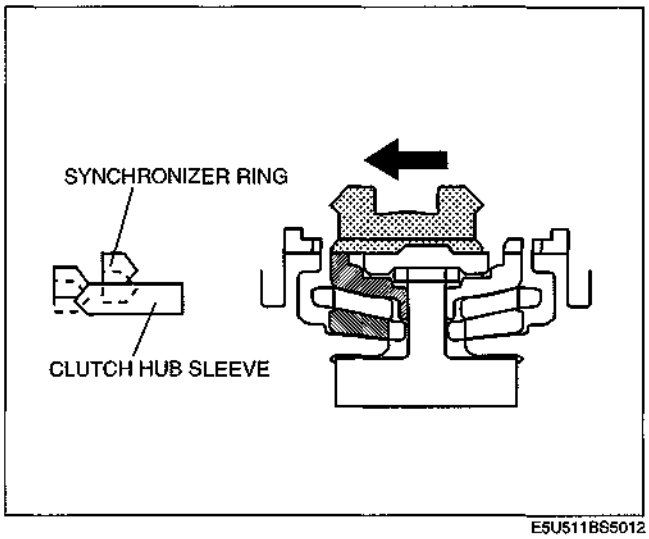
E5U511BS5010

2. As the hub sleeve continues moving to the left, the key causes friction between the synchronizer ring, double cone, and inner cone and 2nd gear. The synchronizer ring turns only the distance that the key groove gap allows, aligning the teeth of the hub sleeve and the synchronizer ring. As the hub sleeve continues moving, the friction between the cones becomes greater, and the difference between the rotational speeds of the synchronizer ring, inner cone, and double cone (unified with the gear) gradually disappears.



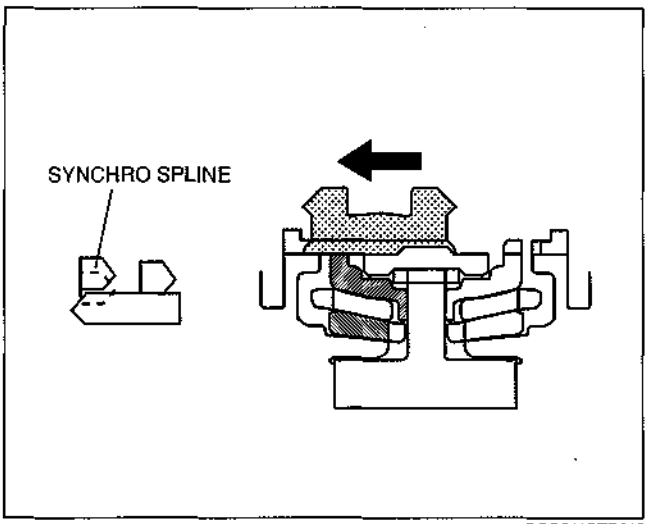
DCG511BTB005

3. The hub sleeve then moves up onto the synchronizer key and engages the synchronizer ring.



E5U511BS5012

4. The hub sleeve then engages the synchro spline of the gear to complete shifting.



DCG511BTB015

DOUBLE cone SYNCHRONIZER MECHANISM OUTLINE [S15M-D, S15MX-D]

dcf051100000t44

- A linked, double cone synchronizer mechanism has been adopted for 3rd gear.
- The double cone synchronizer mechanism consists of a synchronizer ring, double cone, and inner cone the same as a triple cone synchronizer mechanism.

DOUBLE CONE SYNCHRONIZER MECHANISM CONSTRUCTION/OPERATION [S15M-D, S15MX-D]

dcf051100000t45

- The basic construction of the double cone synchronizer mechanism is the same as a triple cone synchronizer mechanism except that the inner side of the inner cone is not used as a friction surface.
- The basic construction of the double cone synchronizer mechanism is the same as a triple cone synchronizer mechanism except that friction force is not generated because there is no contact surface between the inner cone and each gear.
- For the double cone synchronizer mechanism operation, refer to the triple cone synchronizer mechanism. (See 05-11B-5 TRIPLE CONE SYNCHRONIZER MECHANISM OPERATION [S15M-D, S15MX-D].)

SHIFT INTERLOCK MECHANISM FUNCTION [S15M-D, S15MX-D]

dcf051100000t39

- This provides reliable double-engagement prevention.

SHIFT INTERLOCK MECHANISM OPERATION [S15M-D, S15MX-D]

dcf051100000t40

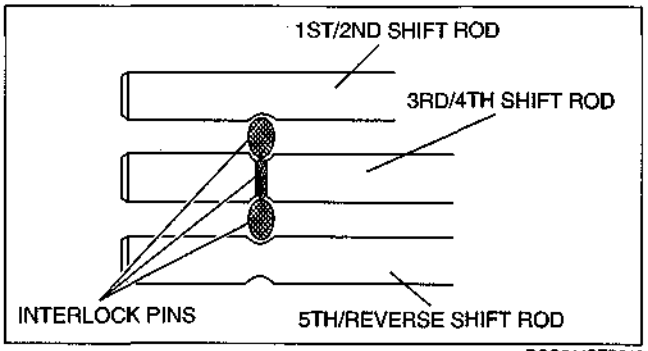
Structure

- During shifting, the shift rods, except for the one in operation, are locked in the neutral position by the interlock pins.

Operation

Neutral

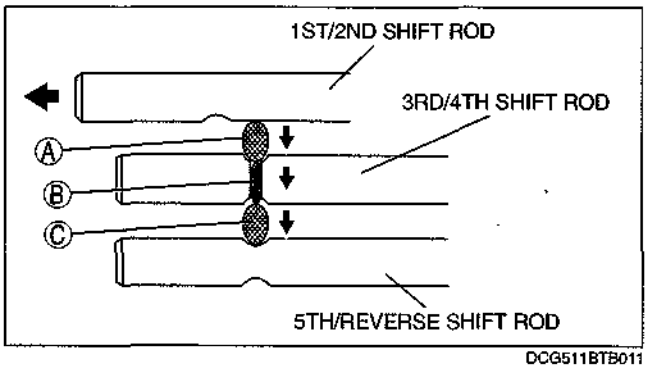
- Because no shift rod is operated, the interlock pins are seated in the grooves.



DCG511BTB010

1st/2nd shifting

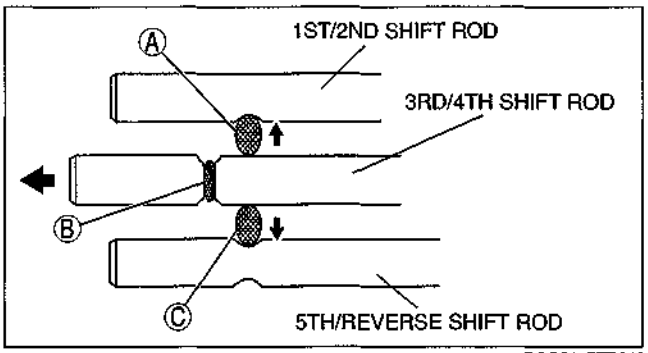
- Movement of the 1st/2nd shift rod forces interlock pin A out of the 1st/2nd shift rod groove, and locks the 3rd/4th shift rod. Pin B, forced by pin A, pushes out pin C to lock the 5th/Reverse shift rod.



DCG511BTB011

3rd/4th shifting

- Movement of the 3rd/4th shift rod forces out pins A and C, and locks the 1st/2nd and 5th/Reverse shift rods. Pin B does not affect the other pins or shift rods during 3rd/4th shifting.



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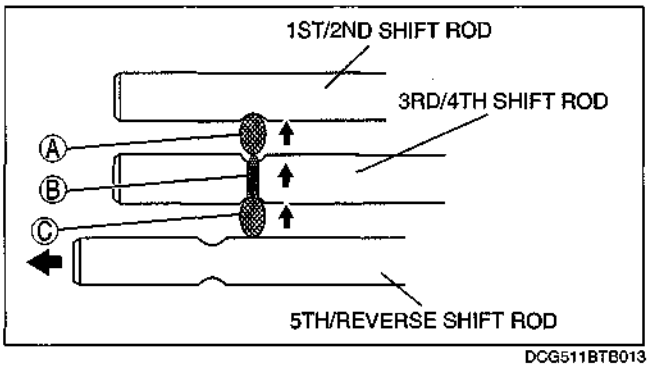
5th/Reverse shifting

- When performing 5th/Reverse shifting, the interlock pins function the same way as in 1st/2nd shifting, except the pin movement order is in reverse, and the 3rd/4th and 1st/2nd shift rods are locked.



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REVERSE LOCKOUT MECHANISM FUNCTION [S15M-D, S15MX-D]

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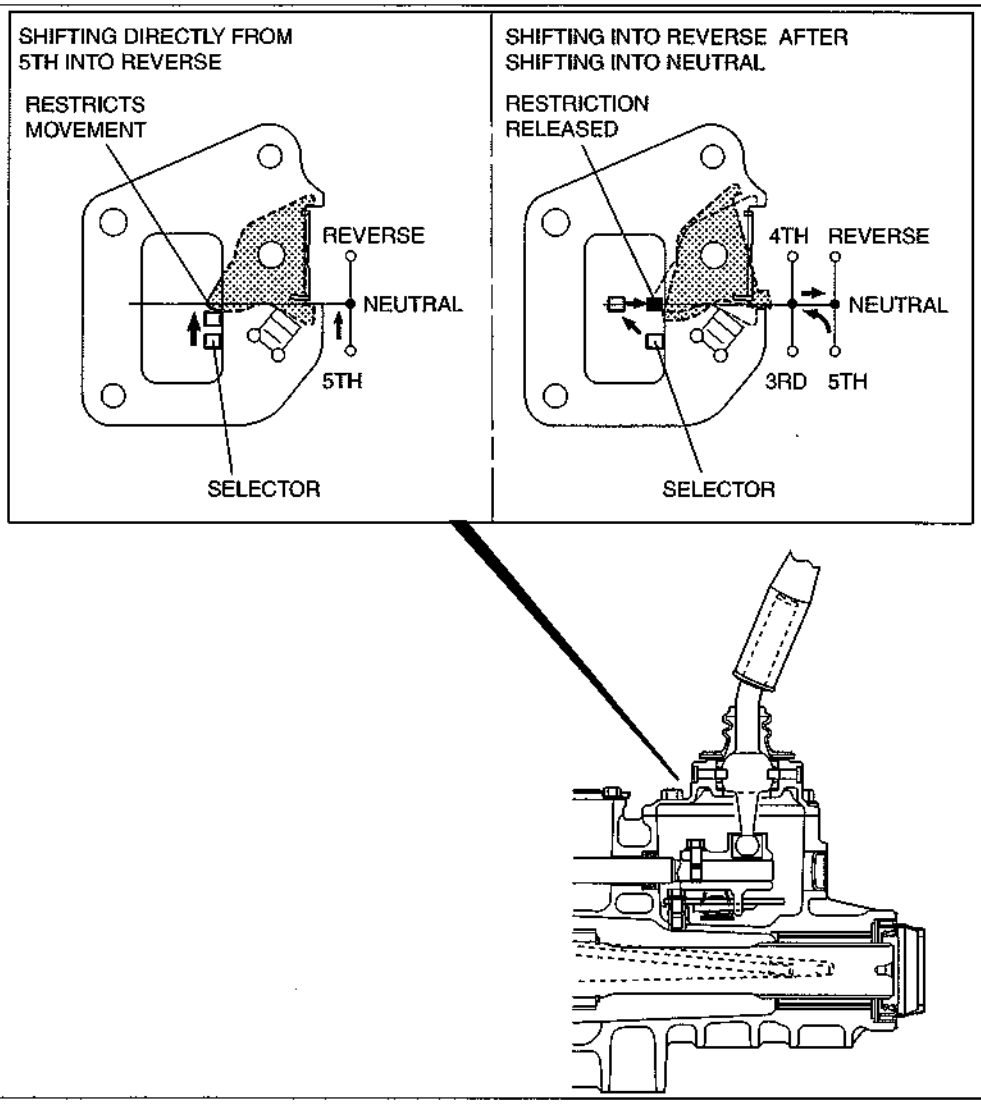
- The reverse lockout mechanism prevents the driver from accidentally shifting into reverse gear when downshifting from 5th to 4th gear.

REVERSE LOCKOUT MECHANISM CONSTRUCTION/OPERATION [S15M-D, S15MX-D]

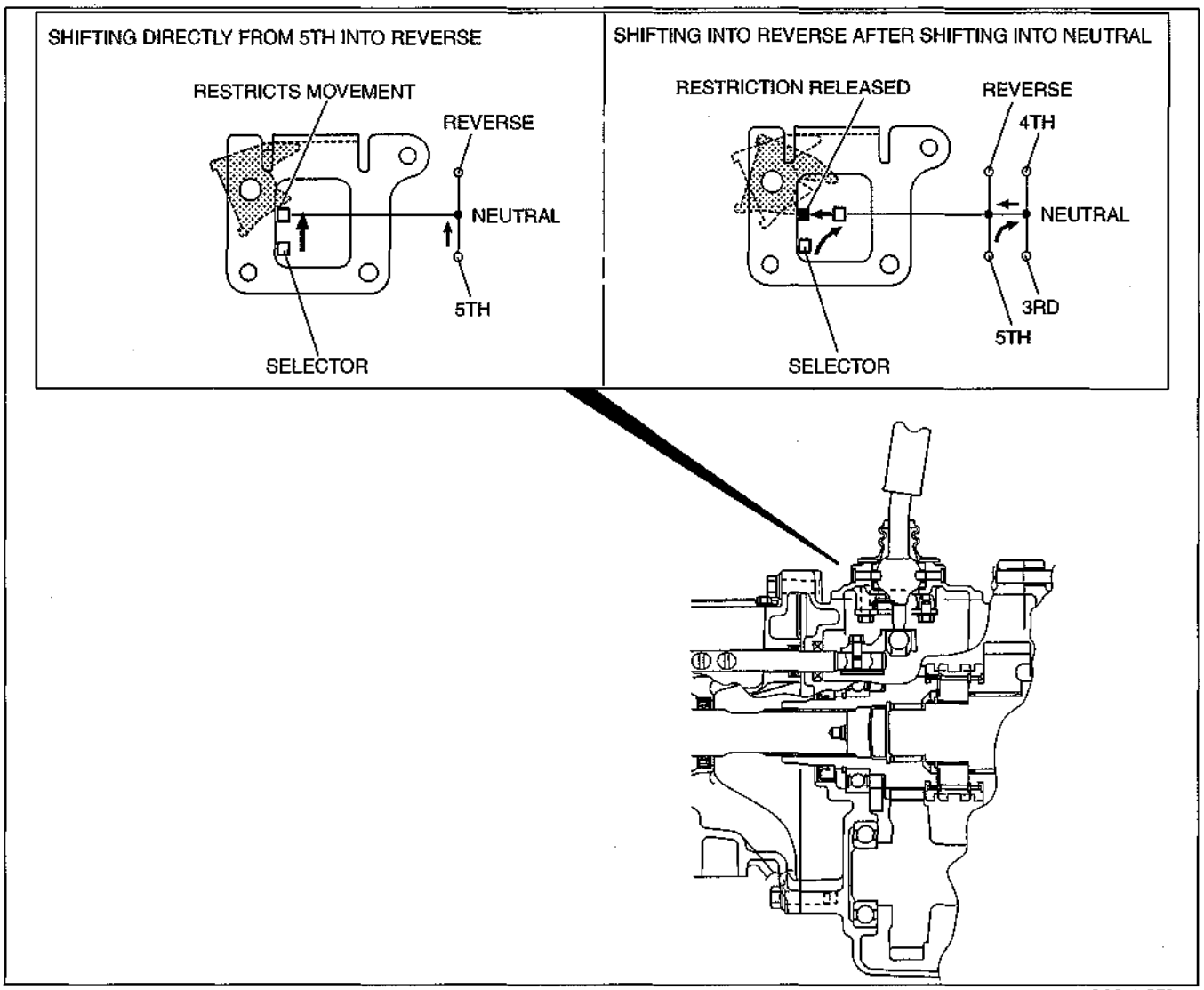
dcf051117570t10

- A cam-type reverse lockout mechanism is adopted to ensure reliability.
- A cam, which is installed to the shift guide plate in the shift control case, restricts the selector movement to prevent the driver from miss shifting.
- When shifting into reverse, by shifting the selector back into the neutral position once and then shifting to the 5th/reverse direction, the selector pushes the cam outward to release the shifting restriction, and shifting into reverse is made possible.

S15M-D


SHIFTING DIRECTLY FROM
5TH INTO REVERSE
RESTRICTS
MOVEMENT
REVERSE
NEUTRAL
5TH
SELECTOR
SHIFTING INTO REVERSE AFTER
SHIFTING INTO NEUTRAL
RESTRICTION
RELEASED
4TH
REVERSE
NEUTRAL
3RD
5TH
SELECTOR
DCG511BTB009

S15MX-D


SHIFTING DIRECTLY FROM 5TH INTO REVERSE
RESTRICTS MOVEMENT
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NEUTRAL
5TH
SELECTOR
SHIFTING INTO REVERSE AFTER SHIFTING INTO NEUTRAL
RESTRICTION RELEASED
REVERSE
4TH
NEUTRAL
3RD
5TH
SELECTOR
DCG511BTB014

05-13 AUTOMATIC TRANSMISSION [5R55S]

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AUTOMATIC TRANSMISSION CROSS-SECTIONAL VIEW [5R55S]..... 05-13–2
AUTOMATIC TRANSMISSION CONTROL SYSTEM WIRING DIAGRAM [5R55S]..... 05-13–3
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AUTOMATIC TRANSMISSION OUTLINE [5R55S]

- This transmission has the following features:
  - — Five forward speeds
  - — Electronic shift, pressure and torque converter clutch controls
  - — Three compound planetary gearsets
  - — Three bands (overdrive, intermediate, low/reverse)
  - — Three multi-plate clutches (coast, direct, forward)
  - — Two one-way clutches (Overdrive, low/reverse)
- All hydraulic functions are directed by electronic solenoids. The solenoids control:
  - — Static engagement feel.
  - — Shift feel.
  - — Shift scheduling.
  - — Modulated torque converter clutch (TCC) applications.
  - — Engine braking utilizing the coast clutch and band.
  - — Manual 1st and 2nd timing.
  - — Reverse inhibit timing.

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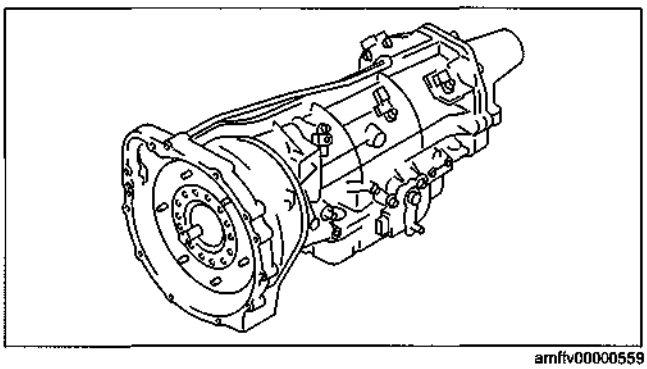

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AUTOMATIC TRANSMISSION CROSS-SECTIONAL VIEW [5R55S]

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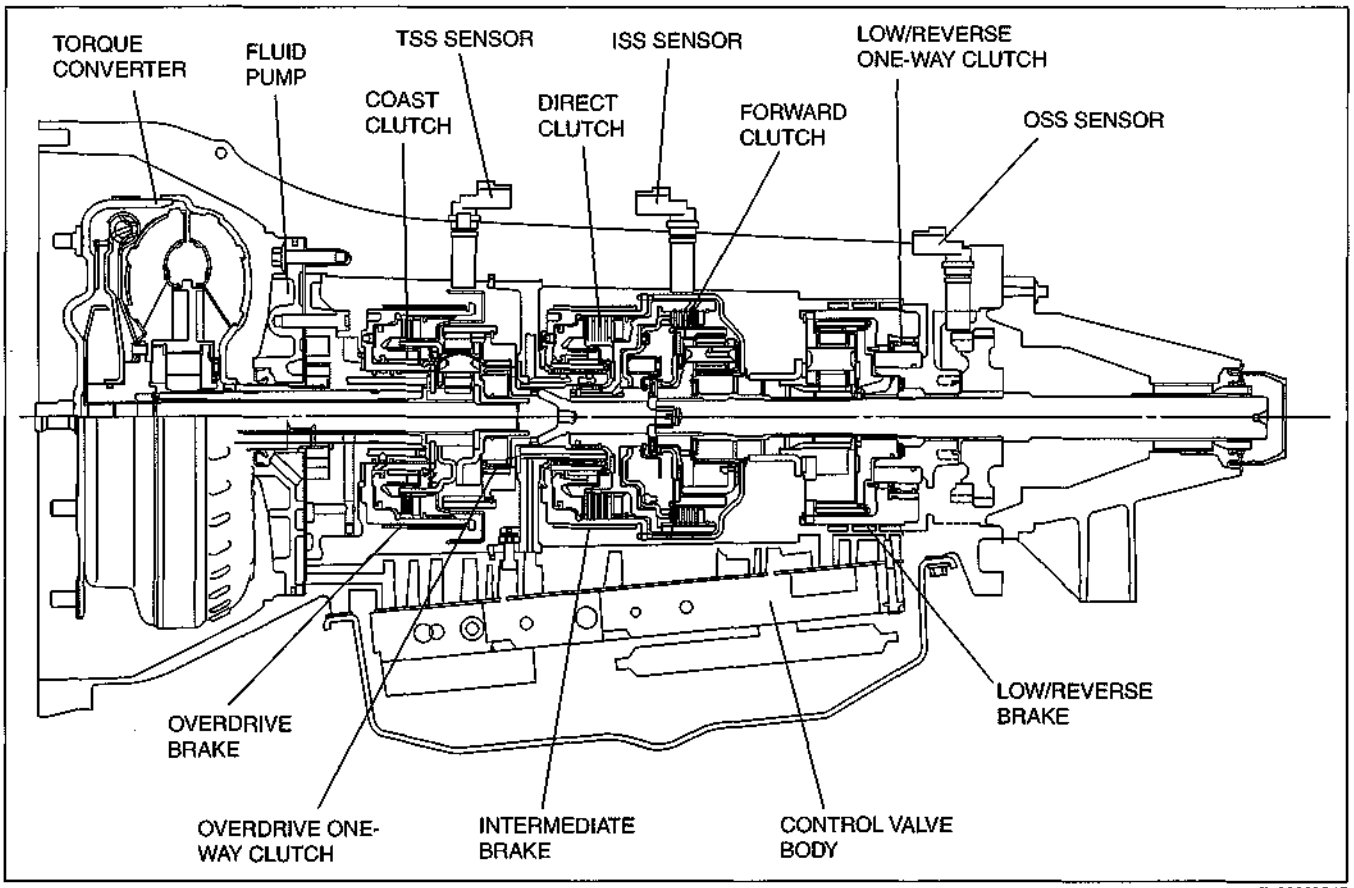

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AUTOMATIC TRANSMISSION CONTROL SYSTEM WIRING DIAGRAM [5R55S]

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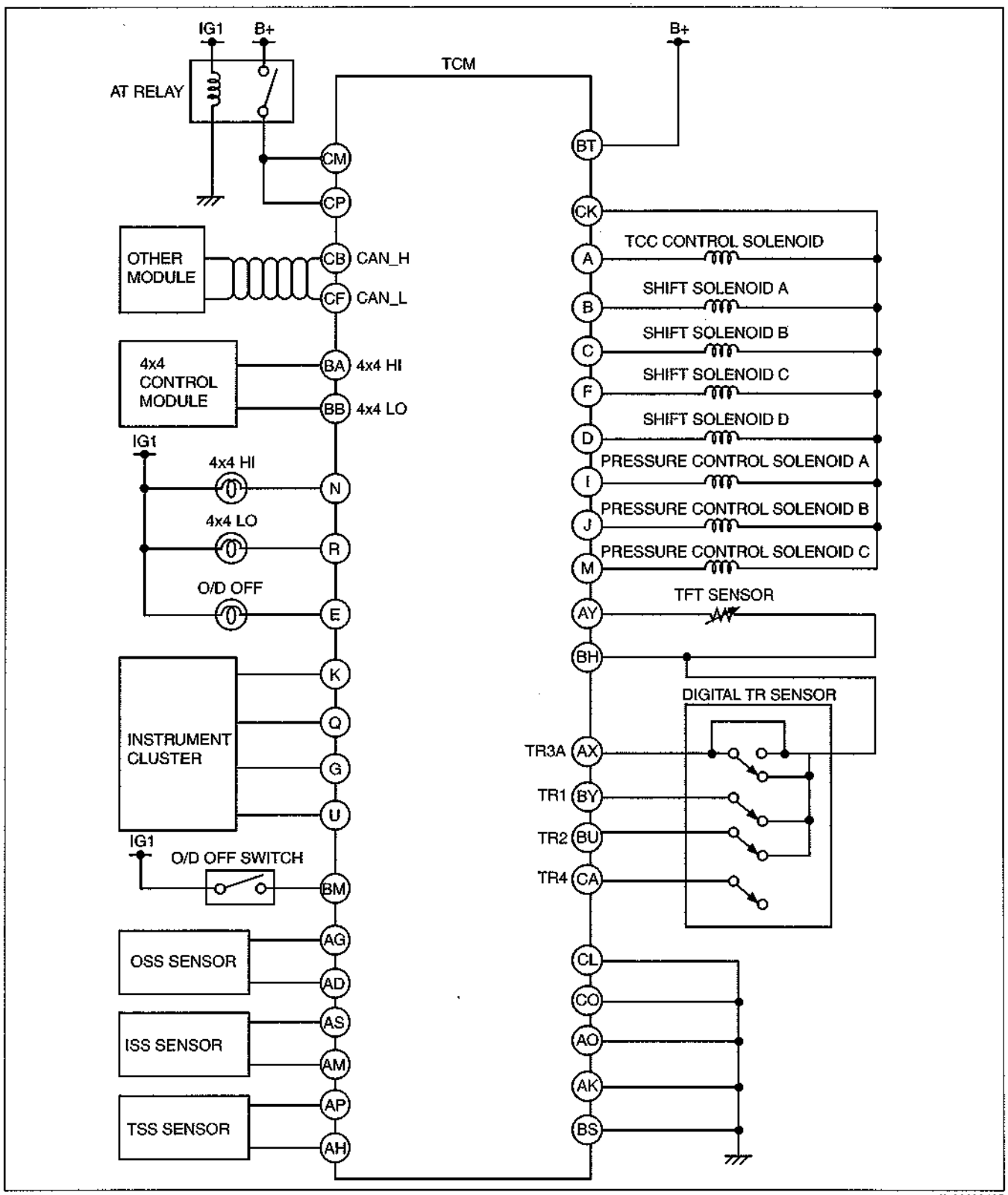

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EC-AT OPERATION CHART [5R55S]

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Solenoid Operation Chart

Selector position		Gear position	Shift solenoid A	Shift solenoid B	Shift solenoid C	Shift solenoid D	Pressure control solenoid A	Pressure control solenoid B	Pressure control solenoid C
P	—	—	On	Off	Off	On	Low	High/Low	Low
R	—	Reverse	On	Off	Off	On	Low/High	Low	High
N	—	—	On	Off	Off	On	Low	High/Low	Low
D	Normal	1GR	On	Off	Off	On	High	High/Low	Low
		2GR	On	Off	On	On	Low/High	High	Low
		3GR	On	On	Off	On	High	Low/High	Low
		4GR	Off	Off	Off	On	High	Low/High	High
		5GR	Off	Off	On	On	High	High/Low	High
	O/D OFF	1GR	On	Off	Off	On	High	High/Low	Low
		2GR	On	Off	On	On	Low/High	High	Low
		3GR	On	On	Off	On	High	Low/High	Low
		4GR	Off	Off	Off	Off	Low/High	High	High
3	—	3GR	On	On	Off	Off	High	Low	High/Low
2	—	2GR	On	Off	On	Off	High	Low	High/Low
1	—	1GR	On	Off	Off	Off	High	Low	High/Low

Band and Clutch Application Chart A

Selector position		Gear position	Overdrive band	Intermediate band	Low/reverse band	Forward clutch	Direct clutch	Coast clutch
P	—	—	—	—	—	—	—	—
R	—	Reverse	—	—	A	—	A	Ac
N	—	—	—	—	—	—	—	—
D	Normal	1GR	—	—	—	A	—	—
		2GR	A	—	—	A	—	—
		3GR	—	A	—	A	—	—
		4GR	—	—	—	A	A	—
		5GR	A	—	—	A	A	—
	O/D OFF	1GR	—	—	—	A	—	—
		2GR	A	—	—	A	—	—
		3GR	—	—	—	A	—	—
		4GR	—	—	—	A	A	Ac
3	—	3GR		Ac	—	A	—	Ac
2	—	2GR	A	—	Ac	A	—	—
1	—	1GR	—	—	Ac	A	—	Ac

A : Applied
Ac : Applied to carry coast torque.
— : N/A

Band and Clutch Application Chart B

Selector position		Gear position	Direct one-way clutch		Low/reverse one-way clutch		Engine braking
			Drive	Coast	Drive	Coast	
P	—	—	—	—	—	—	—
R	—	Reverse	H	NE	NE	NE	No
N	—	—	—	—	—	—	—
D	Normal	1GR	H	NE	H	NE	No
		2GR	OR	OR	H	NE	No
		3GR	H	NE	OR	OR	No
		4GR	H	NE	OR	OR	No
		5GR	OR	OR	OR	OR	Yes
	O/D OFF	1GR	H	NE	H	NE	Yes
		2GR	OR	OR	H	NE	Yes
		3GR	H	NE	OR	OR	Yes
		4GR	H	NE	OR	OR	Yes
3	—	3GR	H	NE	OR	OR	Yes
2	—	2GR	OR	OR	H	NE	Yes
1	—	1GR	H	NE	H	NE	Yes

H : Hold
NE: No effect
OR: Overrunning
— : N/A

IDENTIFICATION TAG OUTLINE [5R55S]

- All vehicles are equipped with a vehicle certification label, located on the driver side door lock post. Refer to the code in the space marked TR. For model, service ID level or build date information, refer to the transmission service ID tag located on the transmission case.

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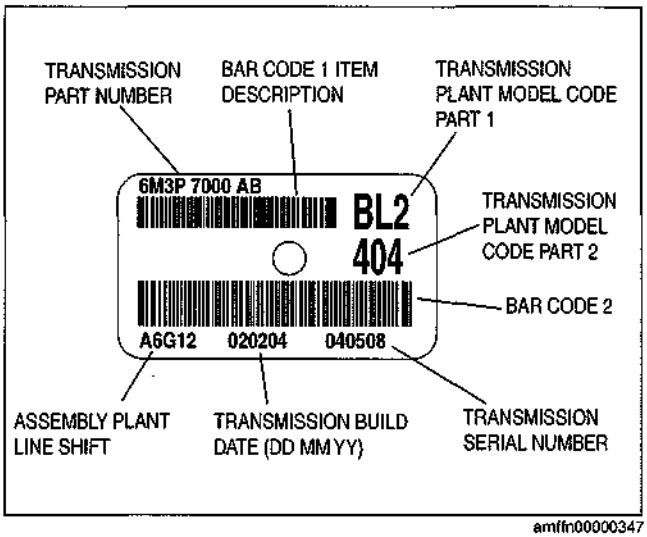

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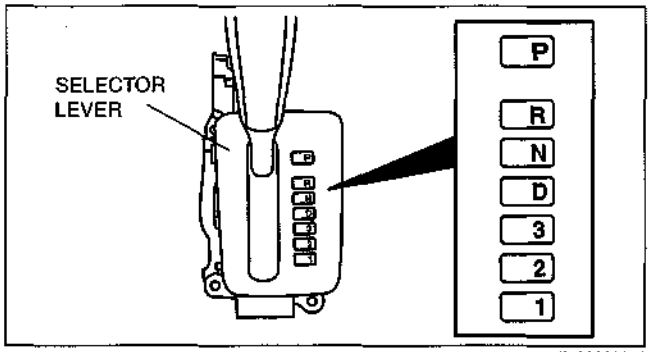
RANGE SELECTION [5R55S]

- The transmission has 7 range positions: P, R, N, D, 3, 2 and 1.



Park (P Position)
- In the P position:
  - — There is no power flow through the transmission.
  - — The parking pawl locks the output shaft to the case.
  - — The engine may be started.
  - — The ignition key may be removed.

Reverse (R Position)
- In the R position:
  - — The vehicle may be operated in a rearward direction, at a reduced gear ratio.

Neutral (N Position)
- In the N position:
  - — There is no power flow through the transmission.
  - — The output shaft is not held and is free to turn.
  - — The engine may be started.

Drive—Overdrive Enabled (D range)
- D range (overdrive enabled) is the normal position for most forward driving.
- The D range provides:
  - — Automatic shifts 1—5 and 5—1.
  - — Apply and release of the torque converter clutch.
  - — Maximum fuel economy during normal operation.
  - — Engine braking in 5GR

Drive—Overdrive Canceled (D range, O/D OFF mode)
- The D range provides:
  - — Automatic shifts 1—4 and 4—1.
  - — Apply and release of the torque converter clutch.
  - — Maximum fuel economy during normal operation.
  - — Engine braking in 4GR

Manual 3 (3 range)
- The 3 range provides:
  - — 3GR start and hold.
  - — Torque converter clutch apply and release.
  - — Improved traction on slippery roads.
  - — Engine braking.

Manual 2 (2 range)
- If this position is selected at normal road speeds, the transmission will downshift into the next lower gear and continue downshifting until the vehicle reaches 2GR.
- The 2 range provides:
  - — 2GR start and hold.
  - — Torque converter clutch apply and release.
  - — Improved traction on slippery roads.
  - — Engine braking.

Manual 1 (1 range)
- If this position is selected at normal road speeds, the transmission will downshift into the next lower gear and continue downshifting until the vehicle reaches 1GR.
- This position provides:
  - — 1GR operation only.
  - — Engine braking for descending steep grades.

SHIFT PATTERNS [5R55S]

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Upshifts

- Transmission upshifting is controlled by the TCM. The TCM receives inputs from various engine or vehicle sensors and driver demands to control shift scheduling, shift feel and torque converter clutch (TCC) operation.
- The TCM has an adaptive learn strategy to electronically control the transmission which will automatically adjust the shift feel.
- Even if the battery is disconnected or a new battery installed, transmission operating parameters are kept. The TCM must relearn these parameters.

Downshifts

- Under certain conditions the transmission will downshift automatically to a lower gear range (without moving the range selector lever).
- There are 3 categories of automatic downshifts: coastdown, torque demand and forced or kickdown shifts.

Coastdown

- The coastdown downshift occurs when the vehicle is coasting down to a stop.

Torque Demand

- The torque demand downshift occurs (automatically) during part throttle acceleration when the demand for torque is greater than the engine can provide at that gear ratio.
- If applied, the transmission will disengage the TCC to provide added acceleration.

Kickdown

- For maximum acceleration, the driver can force a downshift by pressing the accelerator pedal to the floor.
- A forced downshift into a lower gear is possible below calibrated speeds.
- Specifications for downshift speeds are subject to variations due to tire size and engine and transmission calibration requirements.

POWERFLOW OPERATION [5R55S]

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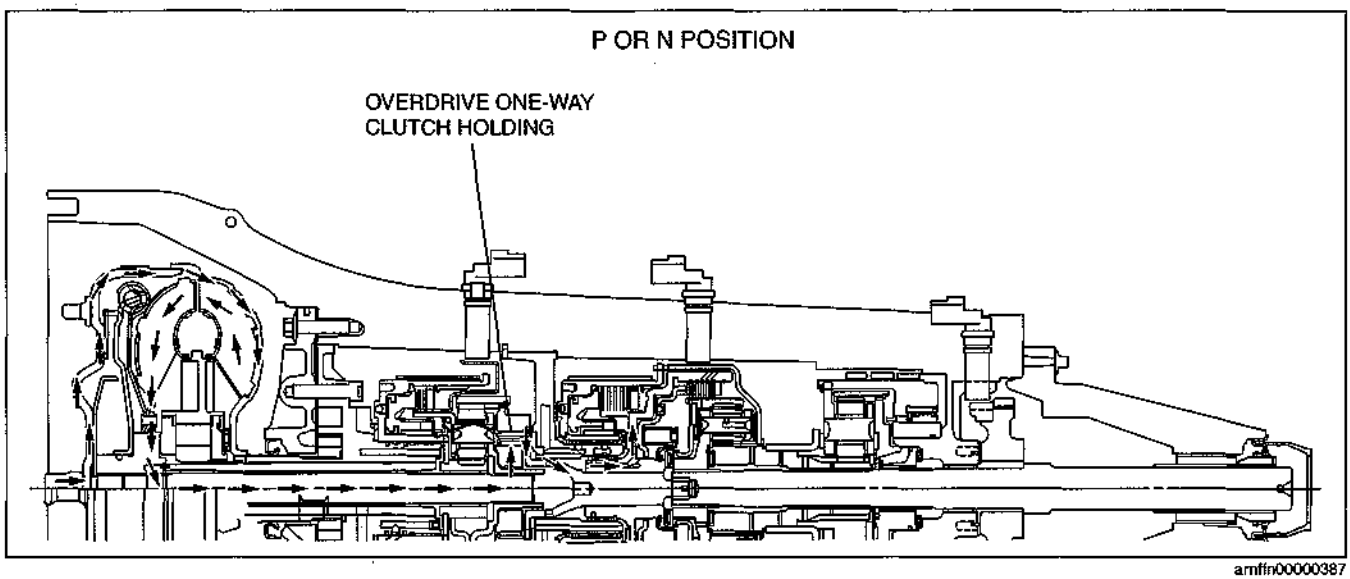
P or N Position

Apply component operation

- Overdrive one-way clutch holding
- Output shaft stationary with the parking pawl holding the parking gear (transmission shifter in P position)

Planetary gearset operation

- Overdrive gearset indirect
- Forward/Reverse gearset driving member:
  — None
- Forward/Reverse gearset driven member:
  — None
- Forward/Reverse gearset held member:
  — None
- Forward/Reverse gearset member also rotating:
  — None



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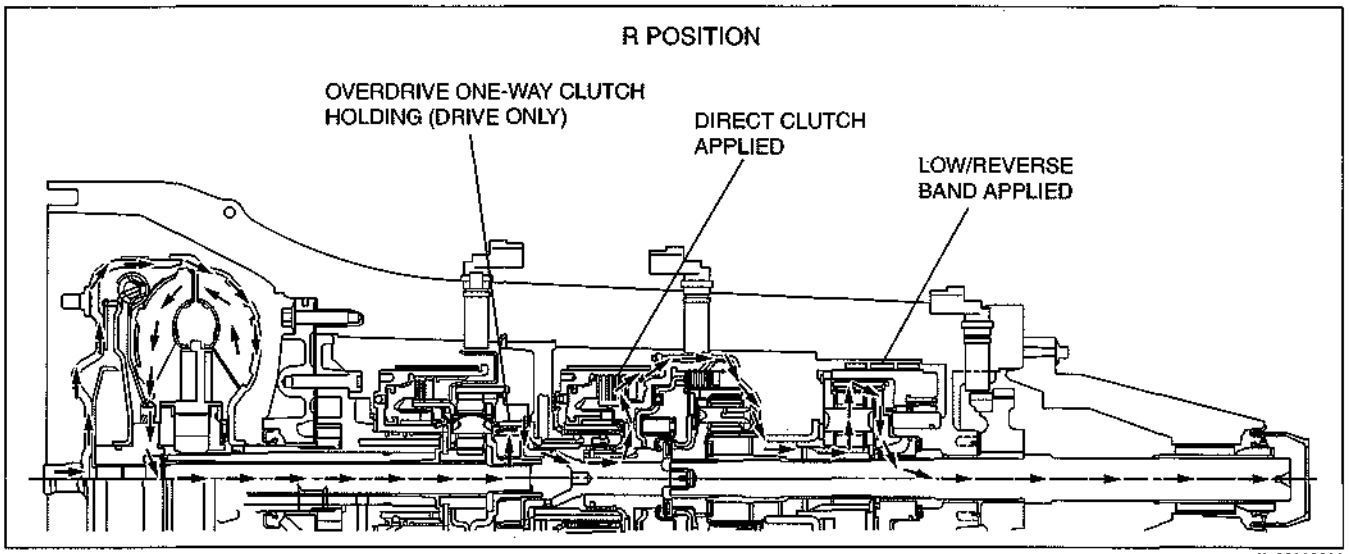
R Position

Apply component operation

- Overdrive one-way clutch holding (drive)
- Direct clutch applied
- Low/reverse band applied

Planetary gearset operation

- Overdrive gearset indirect
- Forward/Reverse gearset driving member:
  — Forward/reverse sun gear
- Forward/Reverse gearset driven member:
  — Forward planetary carrier component and reverse ring gear
- Forward/Reverse gearset held member:
  — Reverse planetary carrier component
- Forward/Reverse gearset member also rotating:
  — Forward ring gear



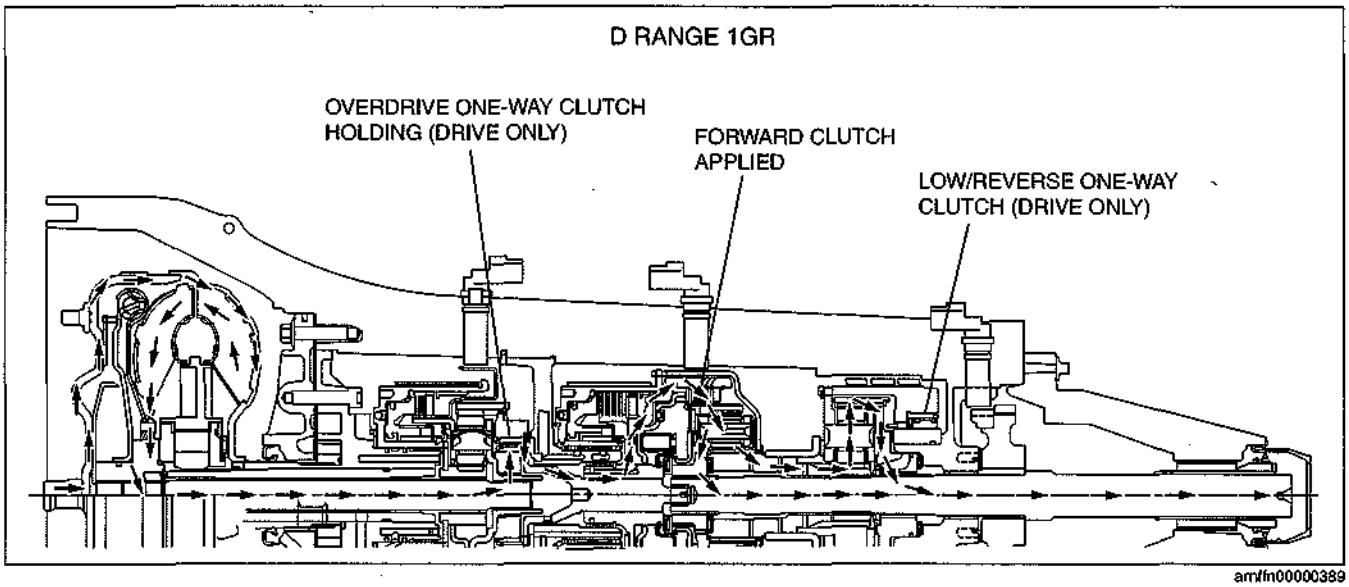
D Range 1GR

Apply component operation

- Overdrive one-way clutch holding (drive)
- Forward clutch applied
- Low/reverse one-way clutch holding (drive)

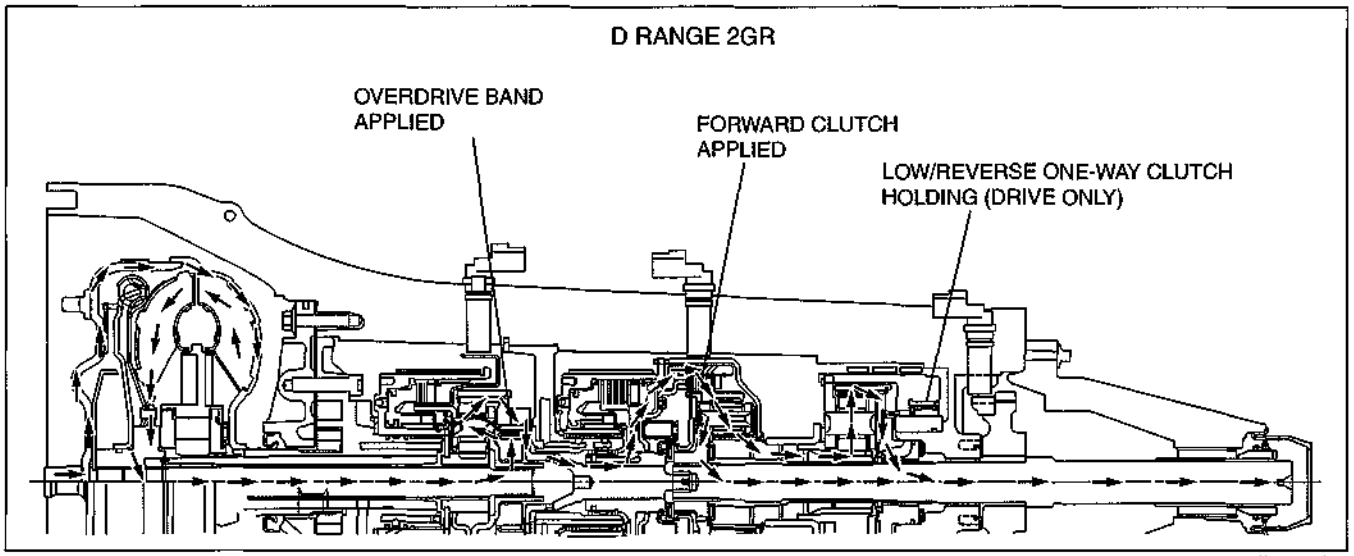
Planetary gearset operation

- Overdrive gearset indirect
- Forward/Reverse gearset driving member:
  - — Forward ring gear
- Forward/Reverse gearset driven member:
  - — Forward planetary carrier component and reverse ring gear
- Forward/Reverse gearset held member:
  - — Reverse planetary carrier component
- Forward/Reverse gearset member also rotating:
  - — Forward/reverse sun gear



D Range 2GR
Apply component operation
- Overdrive band applied
- Forward clutch applied
- Low/reverse one-way clutch holding (drive)

Planetary gearset operation
- Overdrive gearset in overdrive
- Forward/Reverse gearset driving member:
  — Forward ring gear
- Forward/Reverse gearset driven member:
  — Forward planetary carrier component and reverse ring gear
- Forward/Reverse gearset held member:
  — Reverse planetary carrier component
- Forward/Reverse gearset member also rotating:
  — Forward/reverse sun gear



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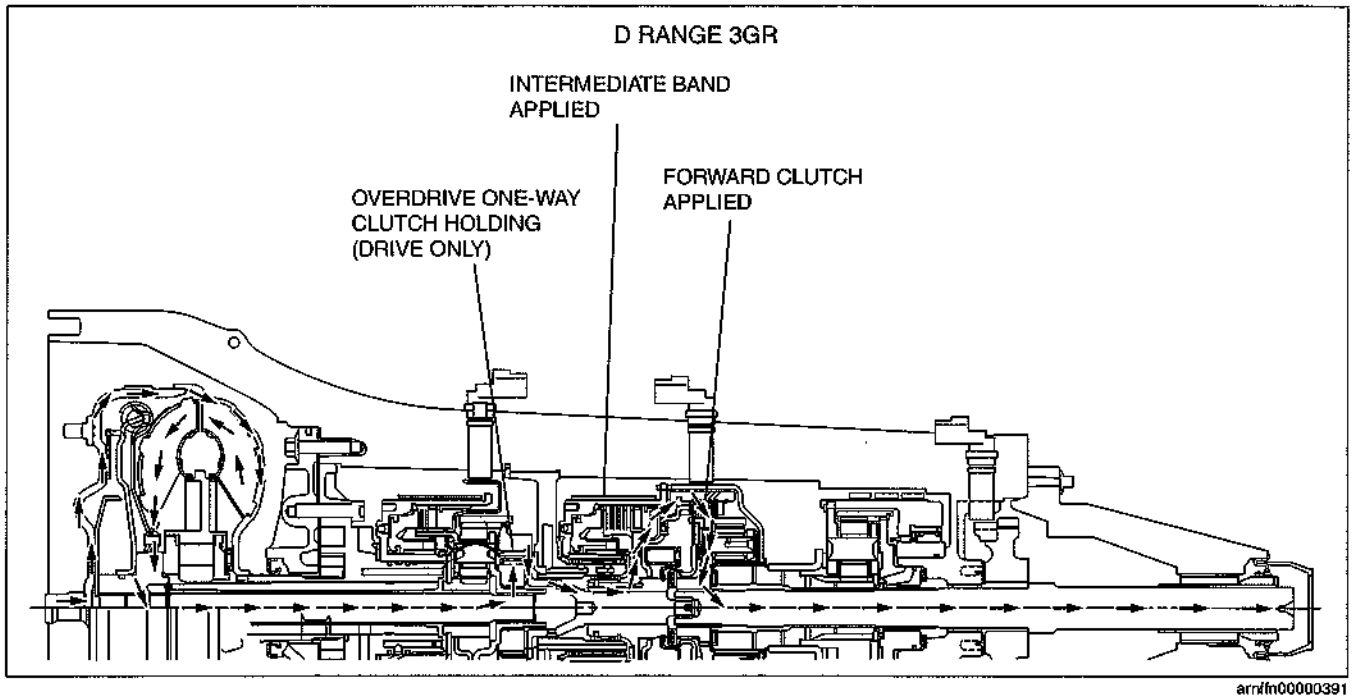
D Range 3GR
Apply component operation
- Overdrive one-way clutch holding (drive)
- Forward clutch applied
- Intermediate band applied

Planetary gearset operation
- Overdrive gearset indirect
- Forward/Reverse gearset driving member:
  — Forward ring gear
- Forward/Reverse gearset driven member:
  — Forward planetary carrier component and reverse ring gear
- Forward/Reverse gearset held member:
  — Forward/reverse sun gear
- Forward/Reverse gearset member also rotating:
  — Reverse planetary carrier component



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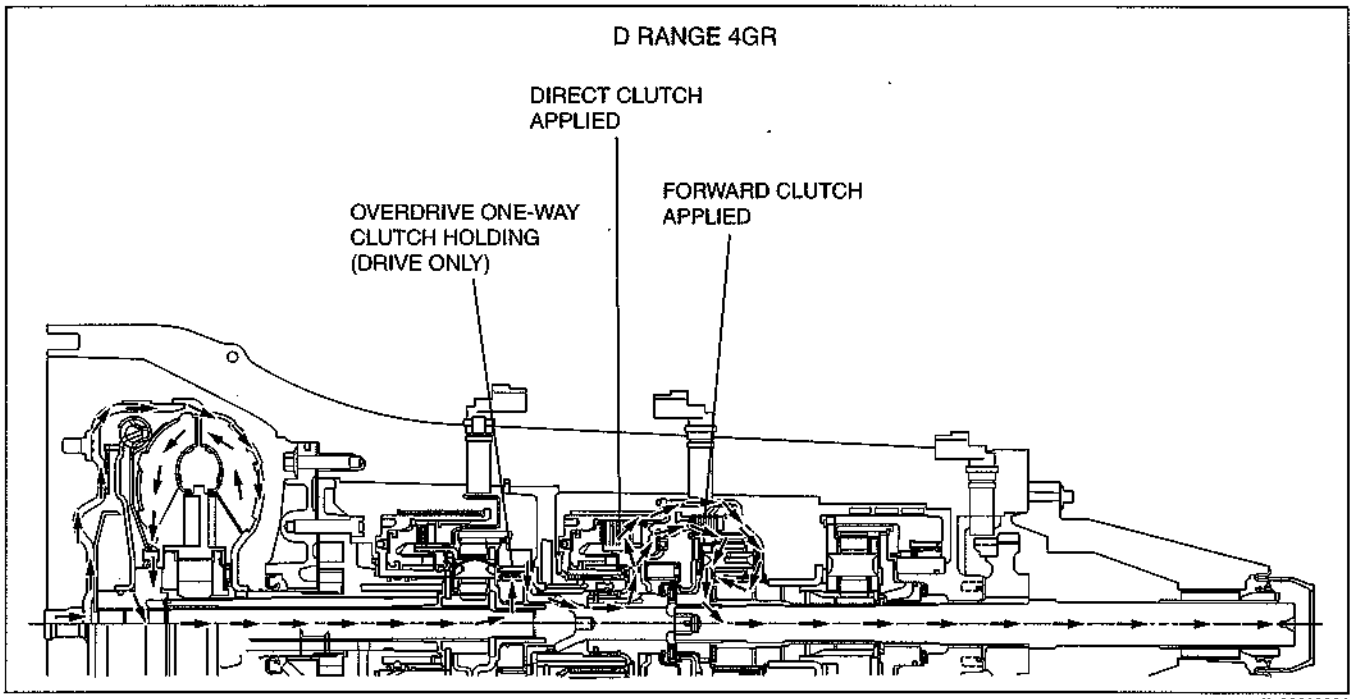
D Range 4GR
Apply component operation
- Overdrive one-way clutch holding (drive)
- Forward clutch applied
- Direct clutch applied

Planetary gearset operation
- Overdrive gearset indirect
- Forward/Reverse gearset driving member:
  - — Forward ring gear
  - — Forward/reverse sun gear
- Forward/Reverse gearset driven member:
  - — Forward planetary carrier component and reverse ring gear
- Forward/Reverse gearset held member:
  - — None
- Forward/Reverse gearset member also rotating:
  - — Reverse planetary carrier component



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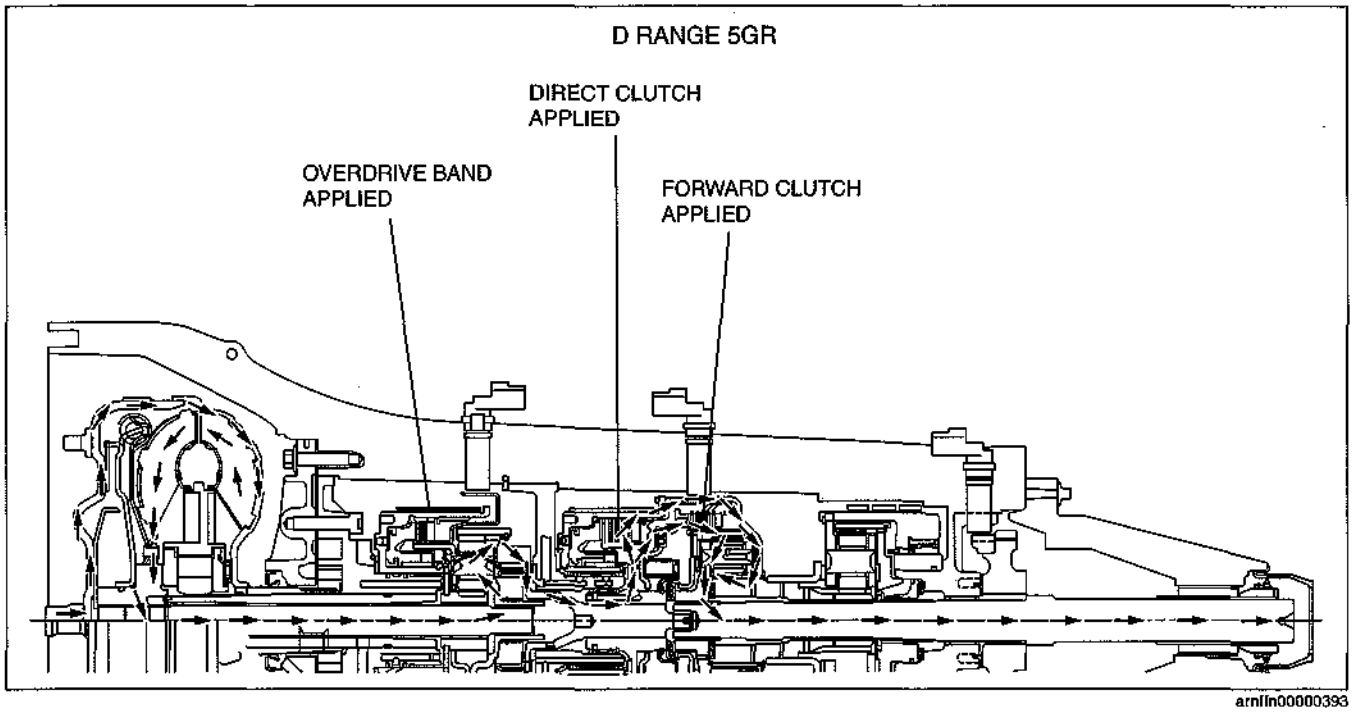
D Range 5GR
Apply component operation
- Overdrive band applied
- Forward clutch applied
- Direct clutch applied

Planetary gearset operation
- Overdrive gearset in overdrive
- Forward/Reverse gearset driving member:
  — Forward ring gear
  — Forward/reverse sun gear
- Forward/Reverse gearset driven member:
  — Forward planetary carrier component and reverse ring gear
- Forward/Reverse gearset held member:
  — None
- Forward/Reverse gearset member also rotating:
  — Reverse planetary carrier component



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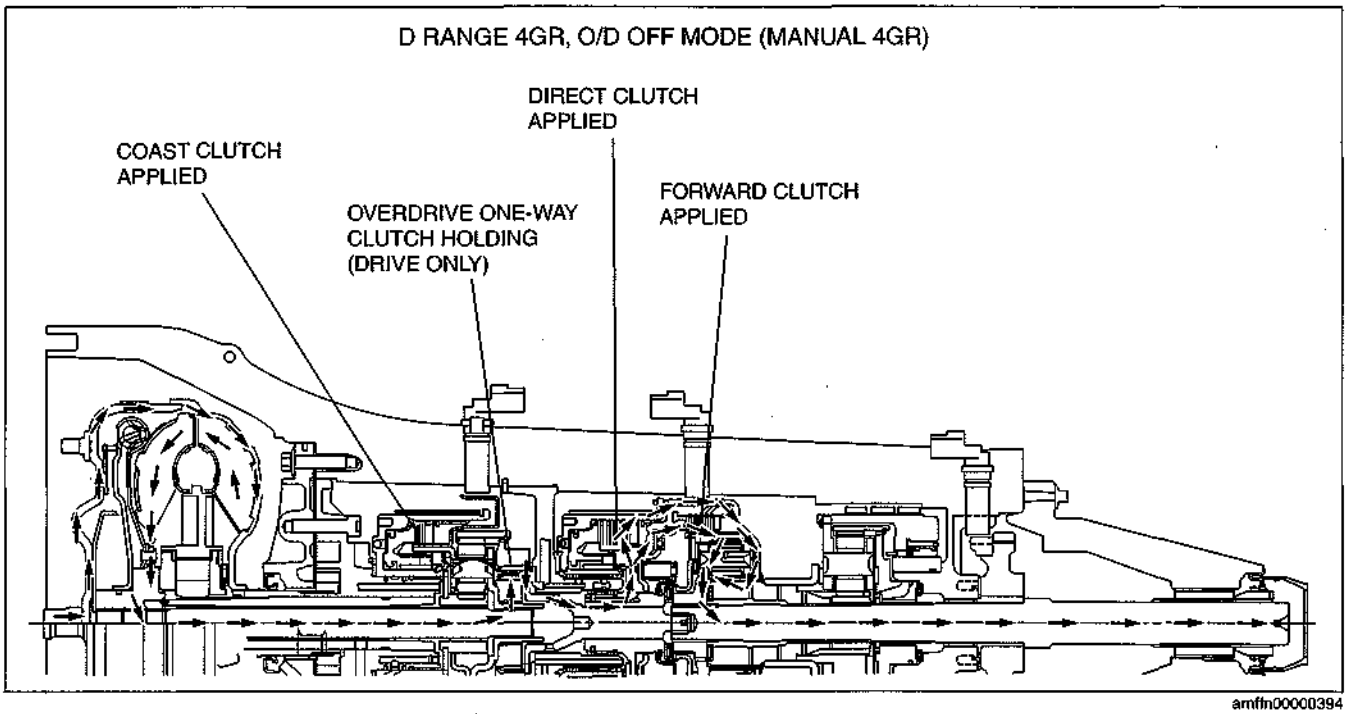
D Range 4GR, O/D OFF Mode (Manual 4GR)
Apply component operation
- Coast clutch applied
- Overdrive one-way clutch holding (drive)
- Forward clutch applied
- Direct clutch applied

Planetary gearset operation
- Overdrive gearset indirect
- Forward/Reverse gearset driving member:
  — Forward ring gear
  — Forward/reverse sun gear
- Forward/Reverse gearset driven member:
  — Forward planetary carrier component and reverse ring gear
- Forward/Reverse gearset held member:
  — None
- Forward/Reverse gearset member also rotating:
  — Reverse planetary carrier component



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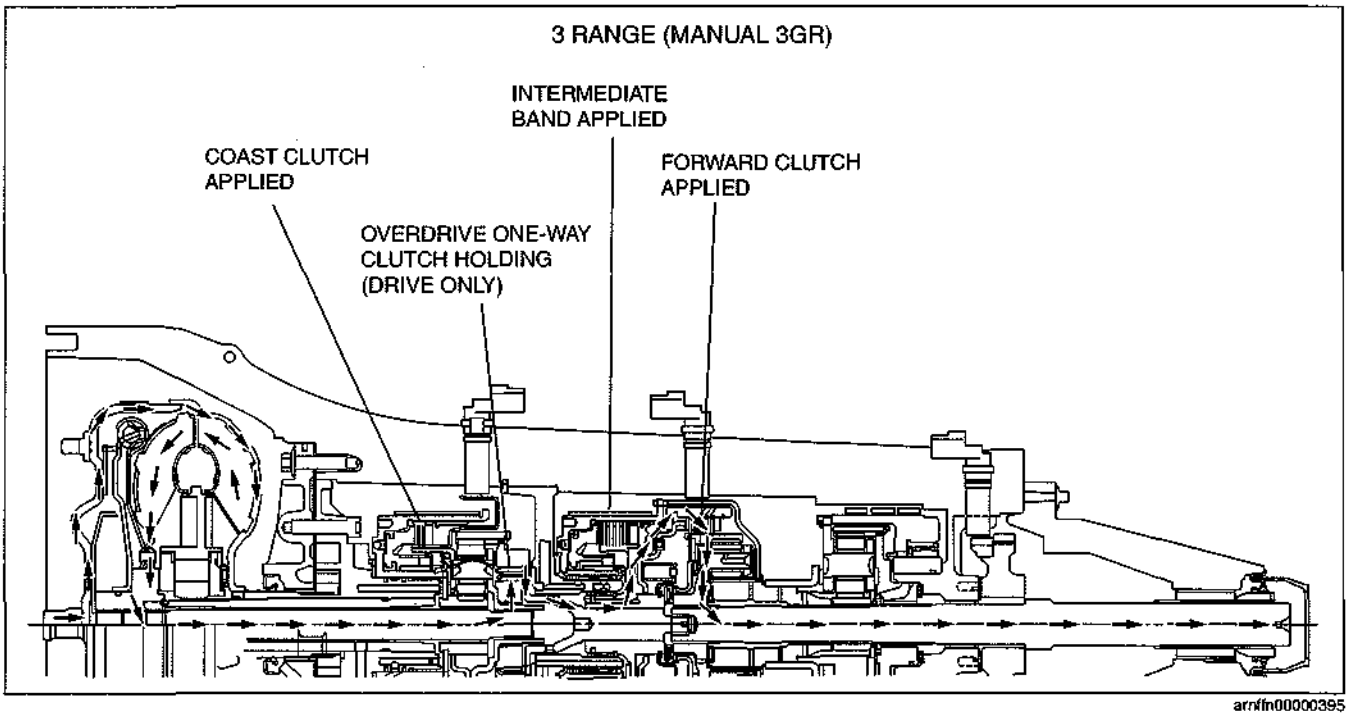
3 Range (Manual 3GR)
Apply component operation
- Coast clutch applied
- Overdrive one-way clutch holding (drive)
- Forward clutch applied
- Intermediate band applied

Planetary gearset operation
- Overdrive gearset indirect
- Forward/Reverse gearset driving member:
  — Forward ring gear
- Forward/Reverse gearset driven member:
  — Forward planetary carrier component and reverse ring gear
- Forward/Reverse gearset held member:
  — Forward/reverse sun gear
- Forward/Reverse gearset member also rotating:
  — Reverse planetary carrier component



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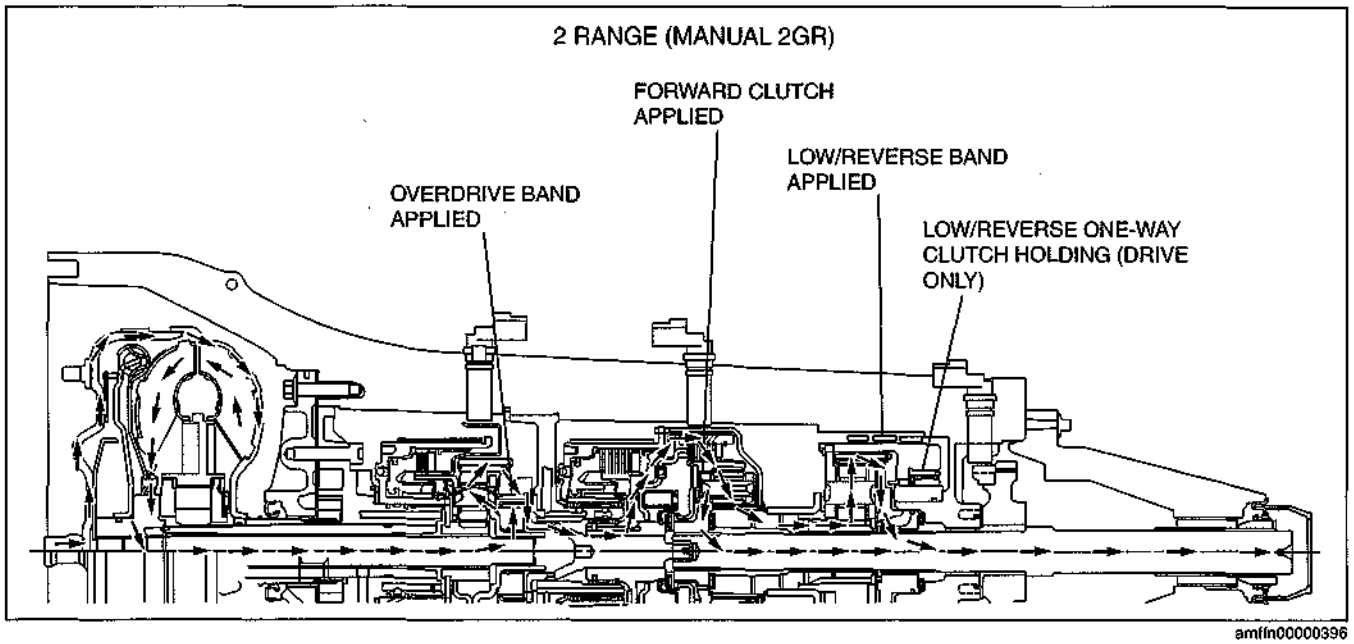
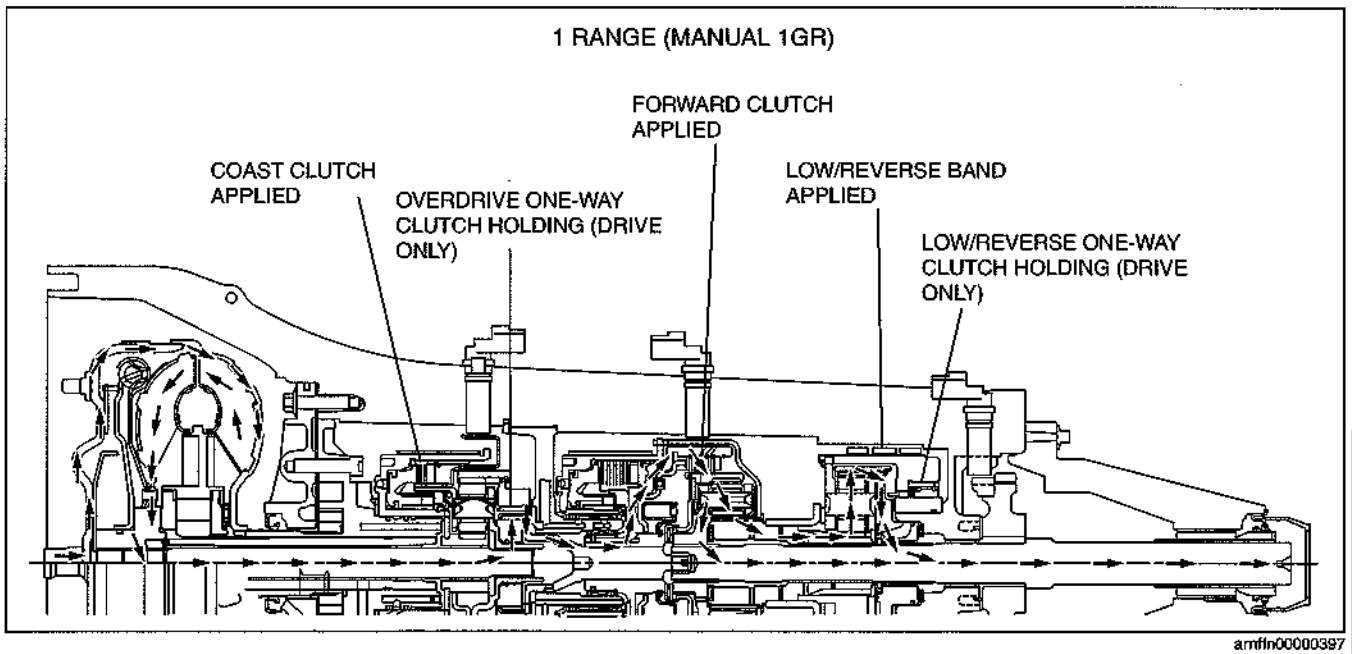
2 Range (Manual 2GR)
Apply component operation
- Overdrive band applied
- Forward clutch applied
- Low/reverse one-way clutch holding (drive)
- Low/reverse band applied

Planetary gearset operation
- Overdrive gearset in overdrive
- Forward/Reverse gearset driving member:
  — Forward ring gear
- Forward/Reverse gearset driven member:
  — Forward planetary carrier component and reverse ring gear
- Forward/Reverse gearset held member:
  — Reverse planetary carrier component
- Forward/Reverse gearset member also rotating:
  — Forward/reverse sun gear



1 Range (Manual 1GR)
Apply component operation
- Coast clutch applied
- Overdrive one-way clutch holding (drive)
- Forward clutch applied
- Low/reverse one-way clutch holding (drive)
- Low/reverse band applied

Planetary gearset operation
- Overdrive gearset in overdrive
- Forward/Reverse gearset driving member:
  — Forward ring gear
- Forward/Reverse gearset driven member:
  — Forward planetary carrier component and reverse ring gear
- Forward/Reverse gearset held member:
  — Reverse planetary carrier component
- Forward/Reverse gearset member also rotating:
  — Forward/reverse sun gear



TORQUE CONVERTER OUTLINE [5R55S]

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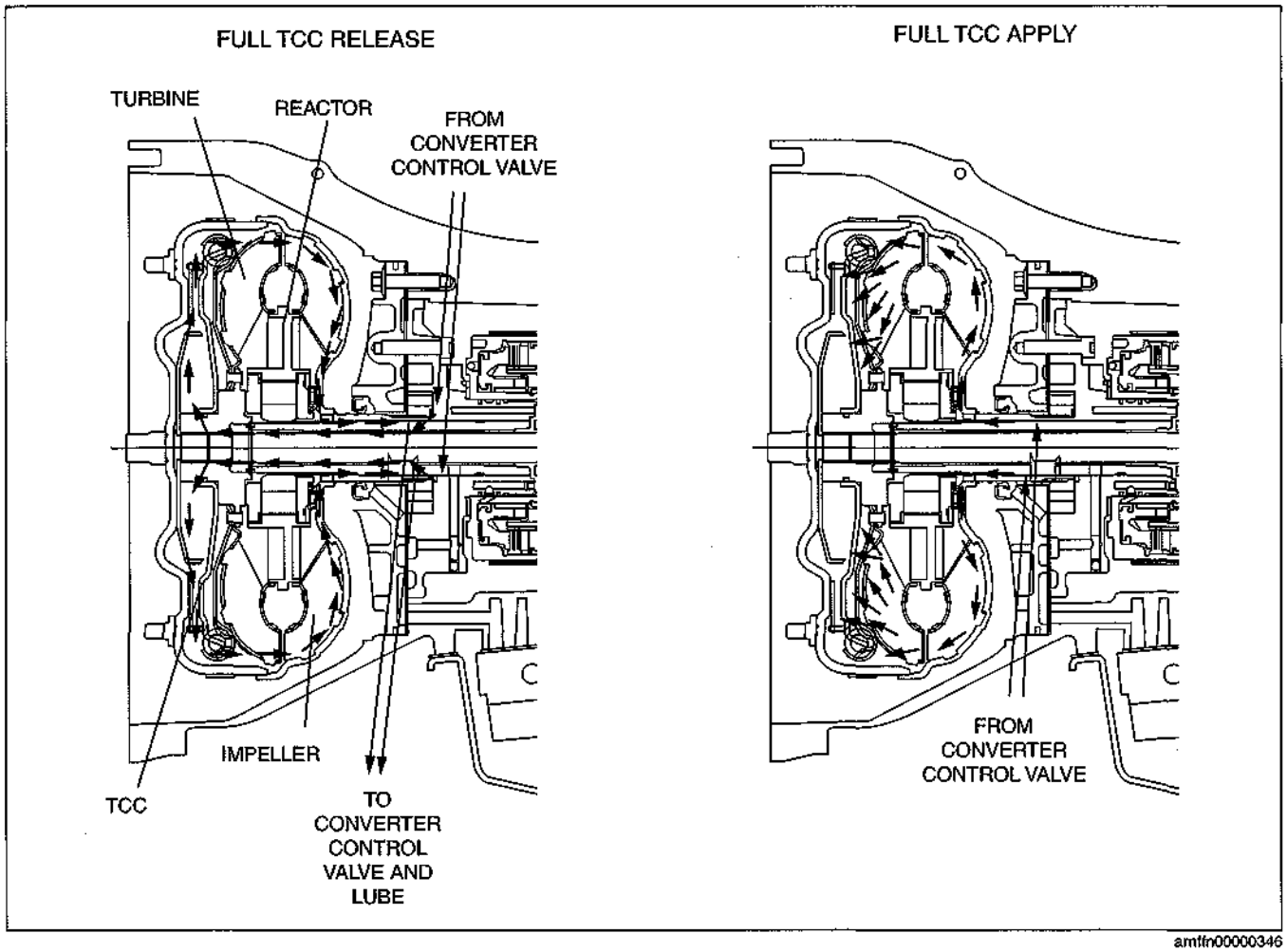
- The torque converter of the 5R55S transmission is a four-element component. It contains an impeller, a turbine and a reactor, plus TCC (torque converter clutch) for increased fuel economy.
- The impeller and cover assembly drives the impeller blades and fluid pump. It contains hydraulic fluid and provides a mating surface for the TCC damper assembly.
- The turbine is driven by fluid from the impeller and transmits power to the turbine shaft and planetary gearsets.
- The reactor redirects fluid flow returned from the turbine to the impeller so that it rotates in the same direction as the impeller. This action assists in torque multiplication.
- The reactor has a one-way clutch to hold it stationary during torque multiplication (at lower vehicle speeds) and allow it to rotate (at higher vehicle speeds).
- TCC has the following features:
  - — A piston with damper assembly that connects to the turbine and transmission input shaft
  - — A friction paper surface on the piston (or on a ring connected to the piston) that makes contact with the torque converter cover when TCC is applied
  - — Fluid that flows through the torque converter and pushes the TCC piston away from the torque converter cover during TCC release
  - — Fluid that flows through the torque converter and pushes the TCC piston into contact with the torque converter cover during TCC apply
- TCC operates in three stages:
  - — Full release
  - — Controlled modulation
  - — Full apply
- The TCM controls TCC operation, using the TCC control solenoid.
- TCC control solenoid operation provides the modulation of hydraulic pressure to change the position of the control valves. The control valves change the pressure and direction of fluid flow in the torque converter.
- TCC may be applied in 2nd gear, 3rd gear, 4th gear and 5th gear.



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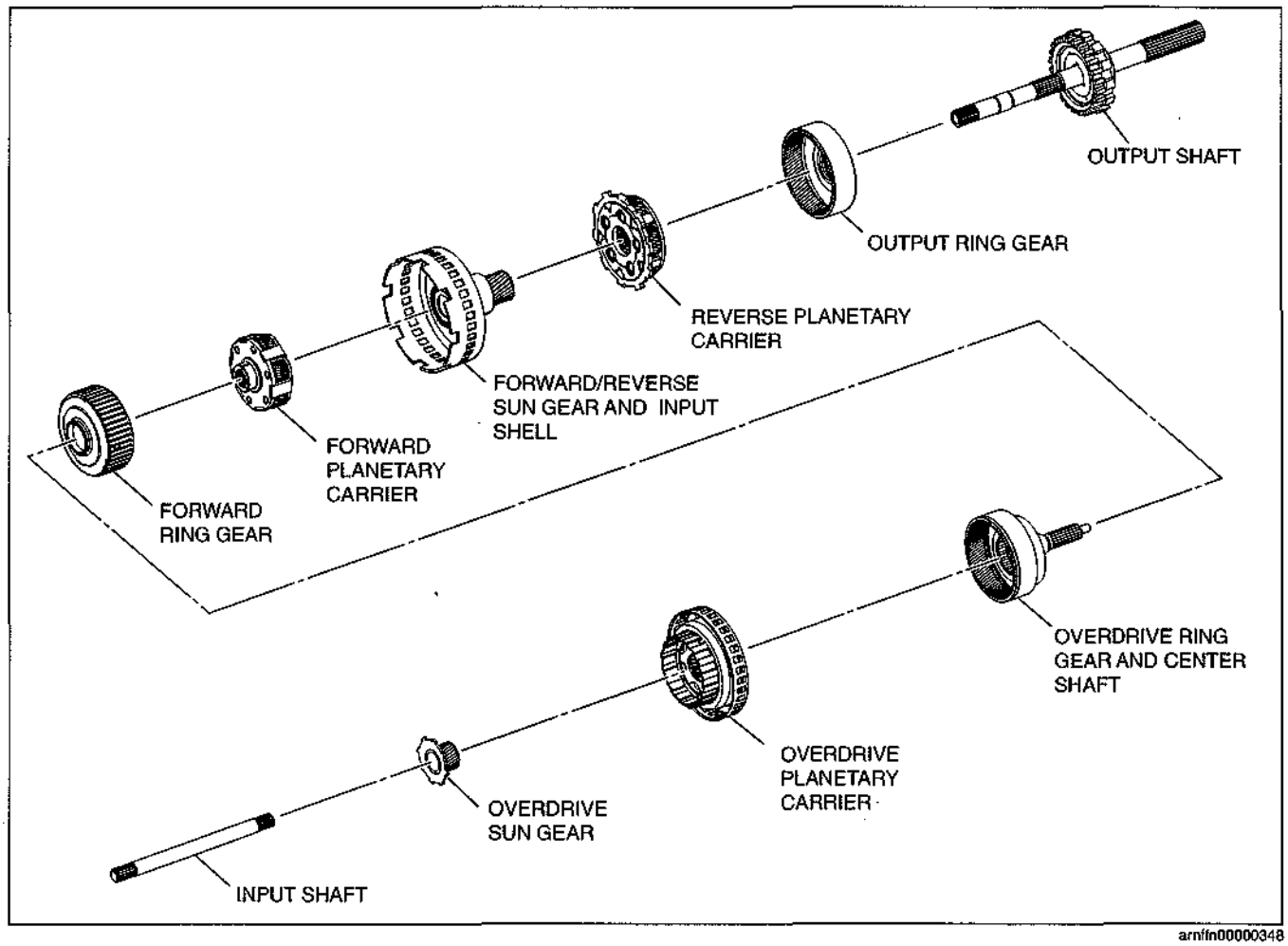
PLANETARY GEARSETS CONSTRUCTION [5R55S]

id0513c1321100

- The 5R55S transmission has three planetary gearsets to provide operation in reverse and in five forward speeds.
- The overdrive planetary gearset has the following parts:
  - — Overdrive sun gear
  - — Overdrive planetary carrier component
  - — Overdrive ring gear
- The input shaft rotates the overdrive planetary carrier component as a driving member. The input shaft may also drive the overdrive ring gear directly with a 1.00 to 1 ratio.
- When the transmission case holds the overdrive sun gear stationary, the overdrive planetary carrier drives the overdrive ring gear with an overdrive ring gear with an overdrive ratio of either 0.71 to 1.
- The forward and reverse planetary gearsets have the following parts:
  - — Forward/reverse sun gear
  - — Forward planetary carrier component
  - — Forward ring gear
  - — Reverse planetary carrier component
  - — Output ring gear
- The forward/reverse sun gear is a driving member in reverse. The forward ring gear is a driving member in each forward gear.
- The forward/reverse sun gear and forward ring gear are driving members for a 1.00 to 1 ratio in 4GR and 5GR.
- The forward planetary carrier component and output ring gear are both connected to the output shaft and are driven members in reverse and in all forward speeds.
- The transmission case holds the reverse planetary carrier component stationary in 1GR and 2GR.
- The reverse planetary carrier component is a member that rotates at a different speed that the driving and driven members in 3GR.
- The reverse planetary carrier component rotates at the same speed as the forward/reverse sun gear and forward ring gear as part of the 1.00 to 1 ratio in 4GR and 5GR.



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APPLY COMPONENTS CONSTRUCTION [5R55S]

id0513c1321200

Clutch/Band Operation

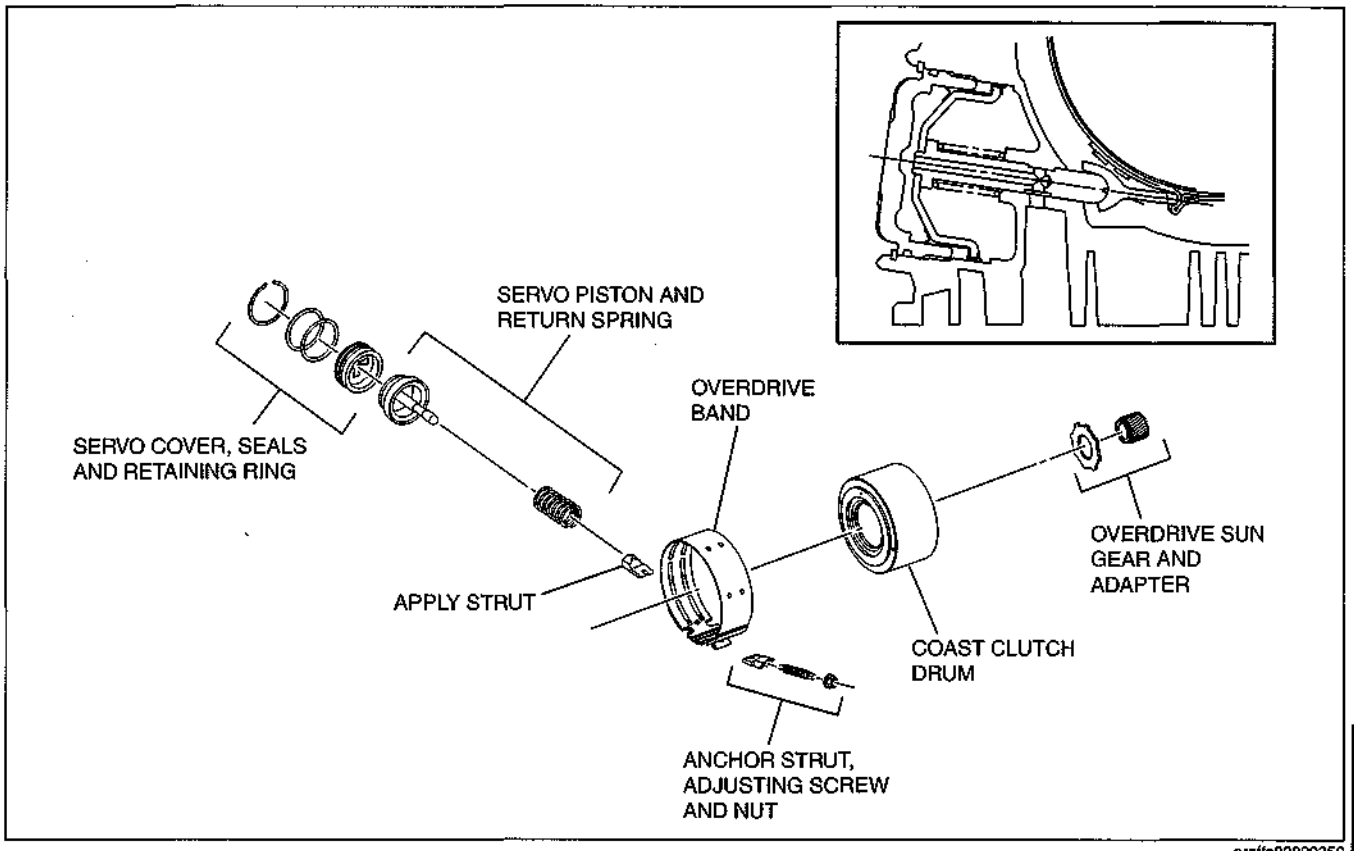
- The apply components of the 5R55S transmission work together to provide a flow of power.
- The coast clutch is applied to provide coast braking in manual 1GR, manual 3GR and manual 4GR. Coast braking occurs without the use of the coast clutch in manual 2GR and in 5GR.

Position/Range		R	D					D (O/D OFF)	3	2	1	Planetary component
Gear position		Reverse	1GR	2GR	3GR	4GR	5GR	Manual 4GR	Manual 3GR	Manual 2GR	Manual 1GR	
Overdrive band				A			A			A		OS
Intermediate band					A				A			FRS
Low/reverse band		A								A	A	RP
Coast clutch								A	A		A	OS
Direct clutch		A				A	A	A				FRS
Forward clutch			A	A	A	A	A	A	A	A	A	FR
Overdrive one-way clutch	Drive	H	H	OR	H	H	OR	H	H	OR	H	OS
	Coast	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	
Low/ reverse one-way clutch	Drive		H	H	OR	OR	OR	OR	OR	H	H	RP
	Coast		OR	OR	OR	OR	OR	OR	OR	OR	OR	

A : Applied
H : Holding
OR: Overrunning
OS: Overdrive sun gear
RP: Reverse planetary carrier component
FRS:Forward/reverse sun gear
FR: Forward ring gear

Overdrive Band

- The overdrive band connects the overdrive sun gear to the transmission case.
- The overdrive band is applied in 2GR and 5GR, as well as in manual 2GR.
- During 2GR and 5GR operation, hydraulic pressure is applied to the overdrive servo.
  - — This pressure causes the piston to move and apply force to the band.
  - — This action causes the overdrive band to hold the overdrive drum.
  - — This causes the overdrive sun gear to be held stationary through the adapter plate and the overdrive drum.



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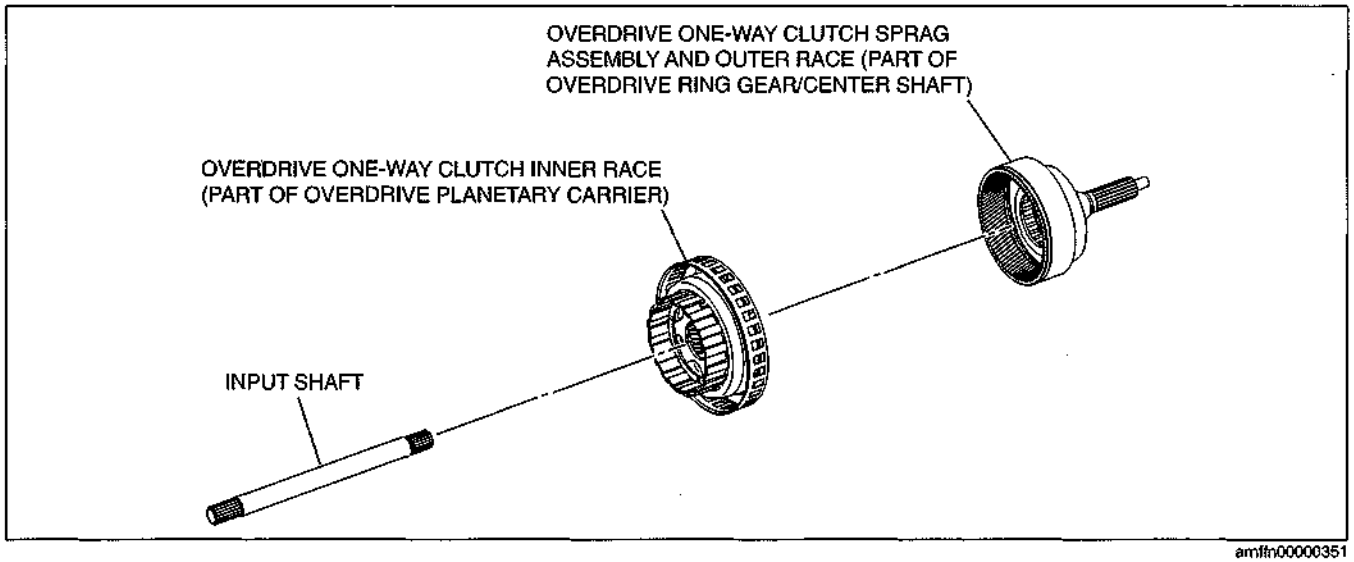
Overdrive One-Way Clutch

- The overdrive one-way clutch connects the input shaft to the center shaft during drive operation.
- The overdrive one-way clutch transmits torque in Reverse, 1GR, 3GR and 4GR, as well as in manual 3GR.
- The direct one-way clutch is a sprag-type one-way clutch that is pressed into the center shaft.
  - — The overdrive one-way clutch is driven by the ring gear of the overdrive planetary carrier.
  - — The overdrive one-way clutch holds and drives the outer splines of the center shaft in 1GR, 3GR, 4GR and Reverse gears.
  - — The overdrive one-way clutch overruns during all coast operations and at all times in 2GR and 5GR.



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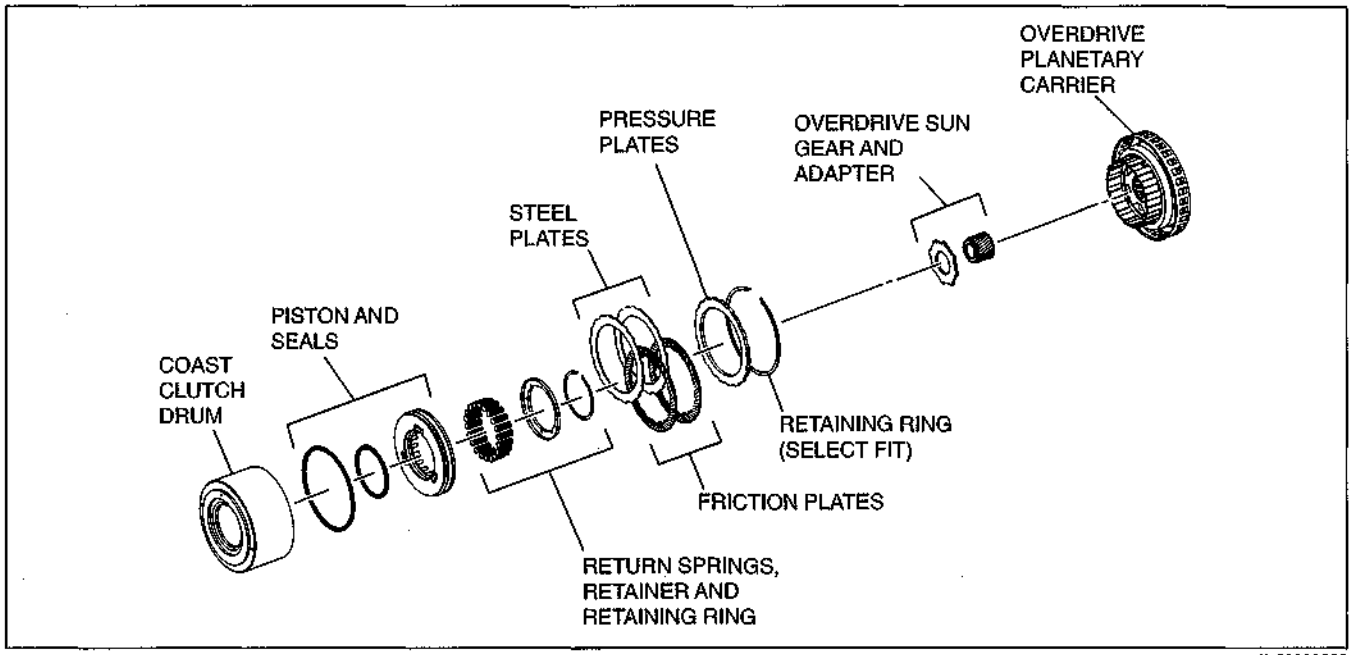
Coast Clutch

- The coast clutch connects the overdrive planetary carrier component to the overdrive sun gear.
- The coast clutch is applied in manual 1GR, manual 3GR, manual 4GR (D range O/D OFF mode) and Reverse positions.
- The coast clutch is a multi-disc clutch made up of steel and friction plates.
  - — The coast clutch is applied with hydraulic pressure and disengaged by return springs and the exhaust of the hydraulic pressure.
  - — The coast clutch is housed in the overdrive drum.
  - — When applied, the coast clutch locks the overdrive sun gear to the overdrive planetary carrier, thus preventing the one-way clutch from overrunning when the vehicle is coasting.
  - — This allows the use of engine compression to help slow the vehicle and provide engine braking.



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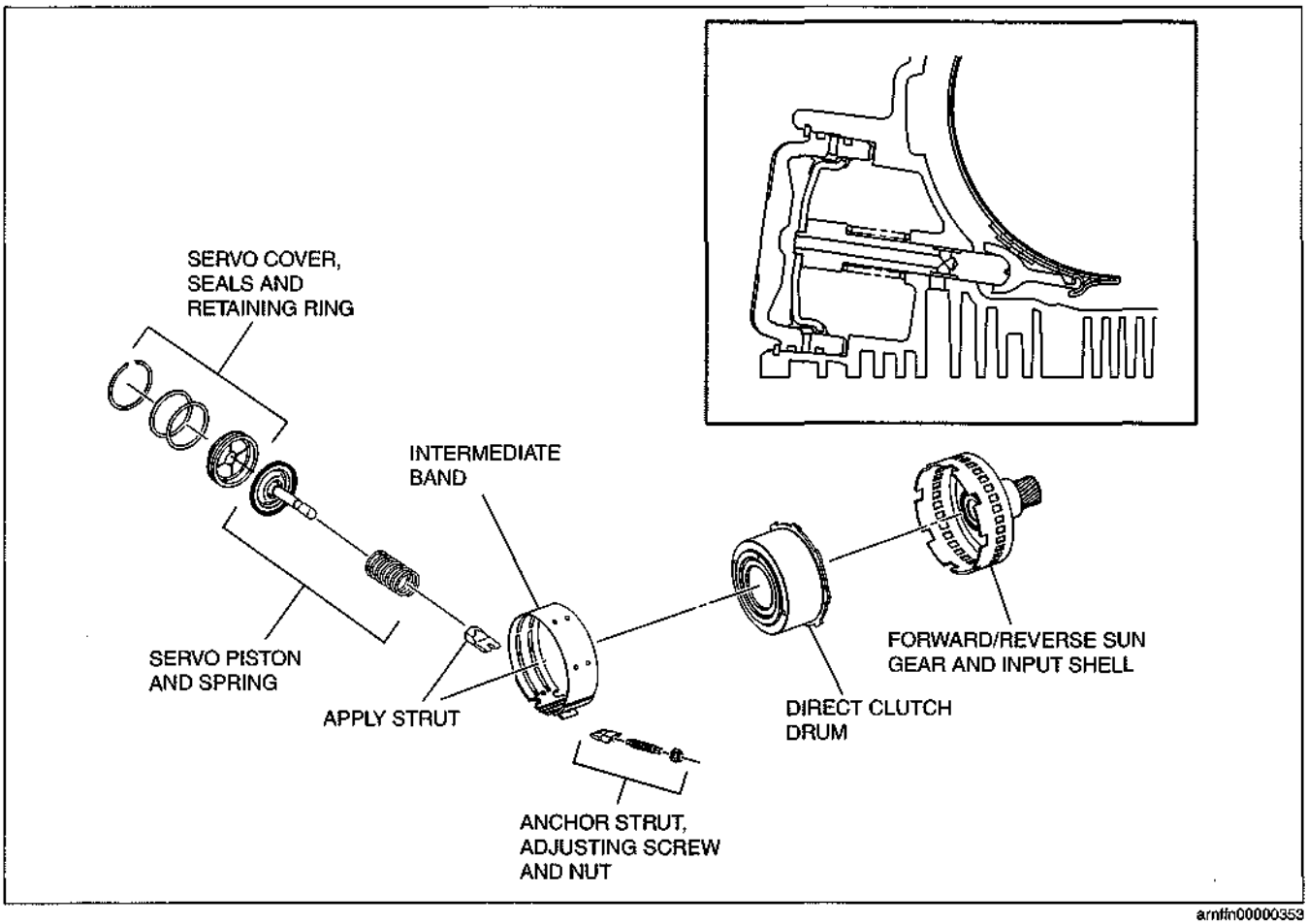
Intermediate Band

- The intermediate band connects the forward/reverse sun gear to the transmission case.
- The intermediate band is applied in 3GR, as well as in manual 3GR.
- During 3GR operation, hydraulic pressure is applied to the intermediate servo.
  - — This pressure causes the servo to move and apply force to the intermediate band.
  - — This action causes the direct clutch drum to be held.
  - — The intermediate band holds the intermediate brake and direct clutch drum to the case in 3GR.
  - — This causes the input shell and forward sun gear to be held stationary.



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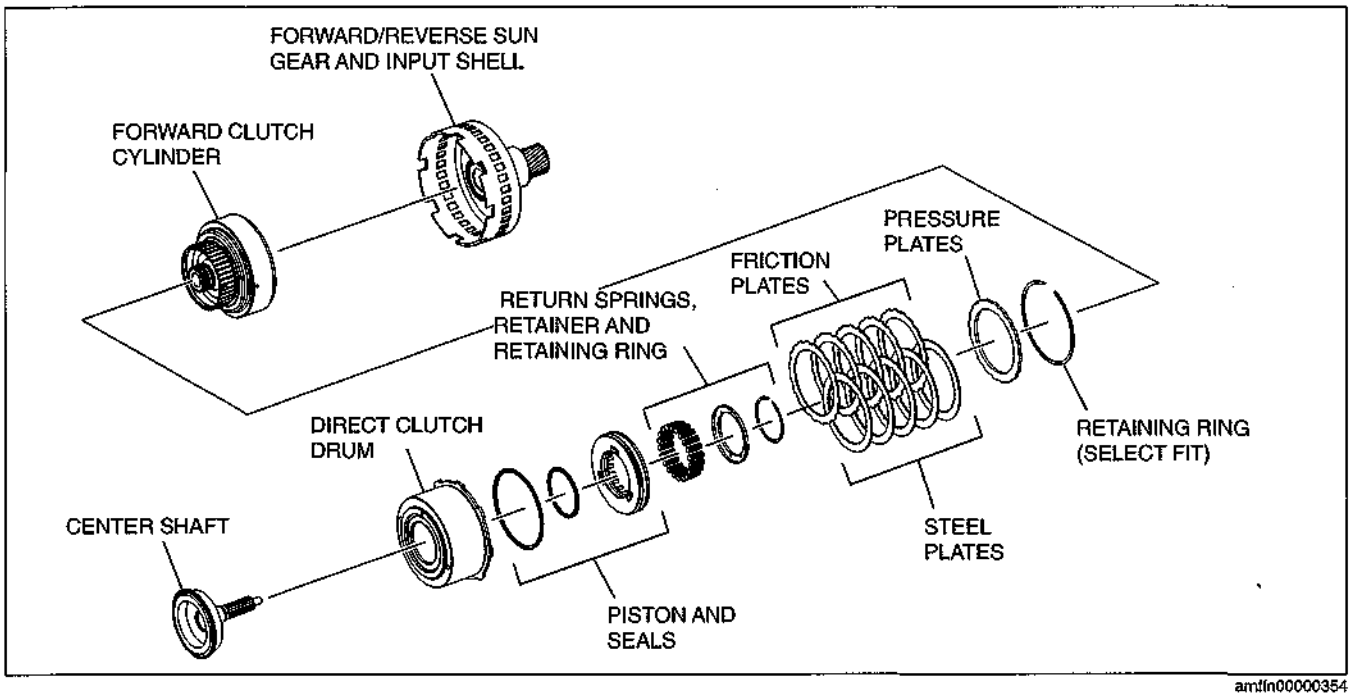
Direct Clutch

- The direct clutch connects the center shaft to the forward/reverse sun gear.
- The direct clutch is applied in Reverse, 4GR and 5GR, as well as in manual 4GR (D range O/D OFF mode).
- The direct clutch is a multi-disc clutch made up of steel and friction plates.
  - — The direct clutch is applied with hydraulic pressure and disengaged by return springs and the exhaust of the hydraulic pressure.
  - — It is housed in the direct clutch drum.
  - — During 4GR, 5GR and Reverse gear application, the direct clutch is applied transferring torque from the forward clutch cylinder to the direct clutch drum.
  - — This action causes the forward sun gear to drive the pinions of the low/reverse planetary carrier.



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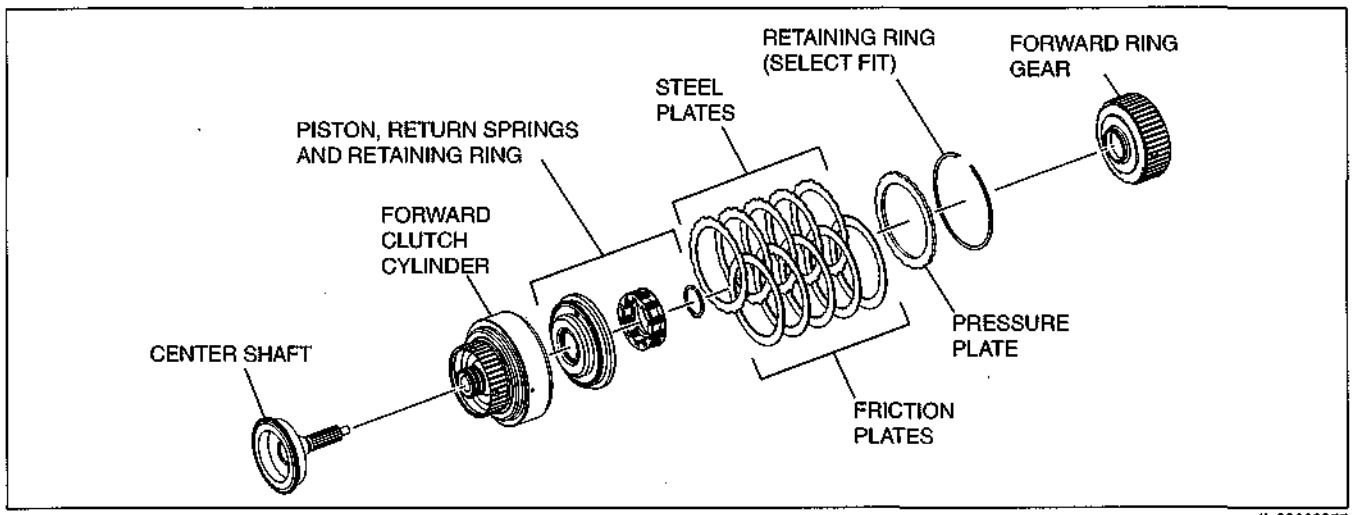
Forward Clutch

- The forward clutch connects the center shaft to the forward ring gear.
- The forward clutch is applied in all forward gears.
- The forward clutch is a multi-disc clutch made up of steel and friction plates.
  - — The forward clutch is applied with hydraulic pressure and disengaged by return springs and the exhaust of the hydraulic pressure.
  - — When applied, the forward clutch provides a direct mechanical coupling between the center shaft and the forward ring gear and hub.



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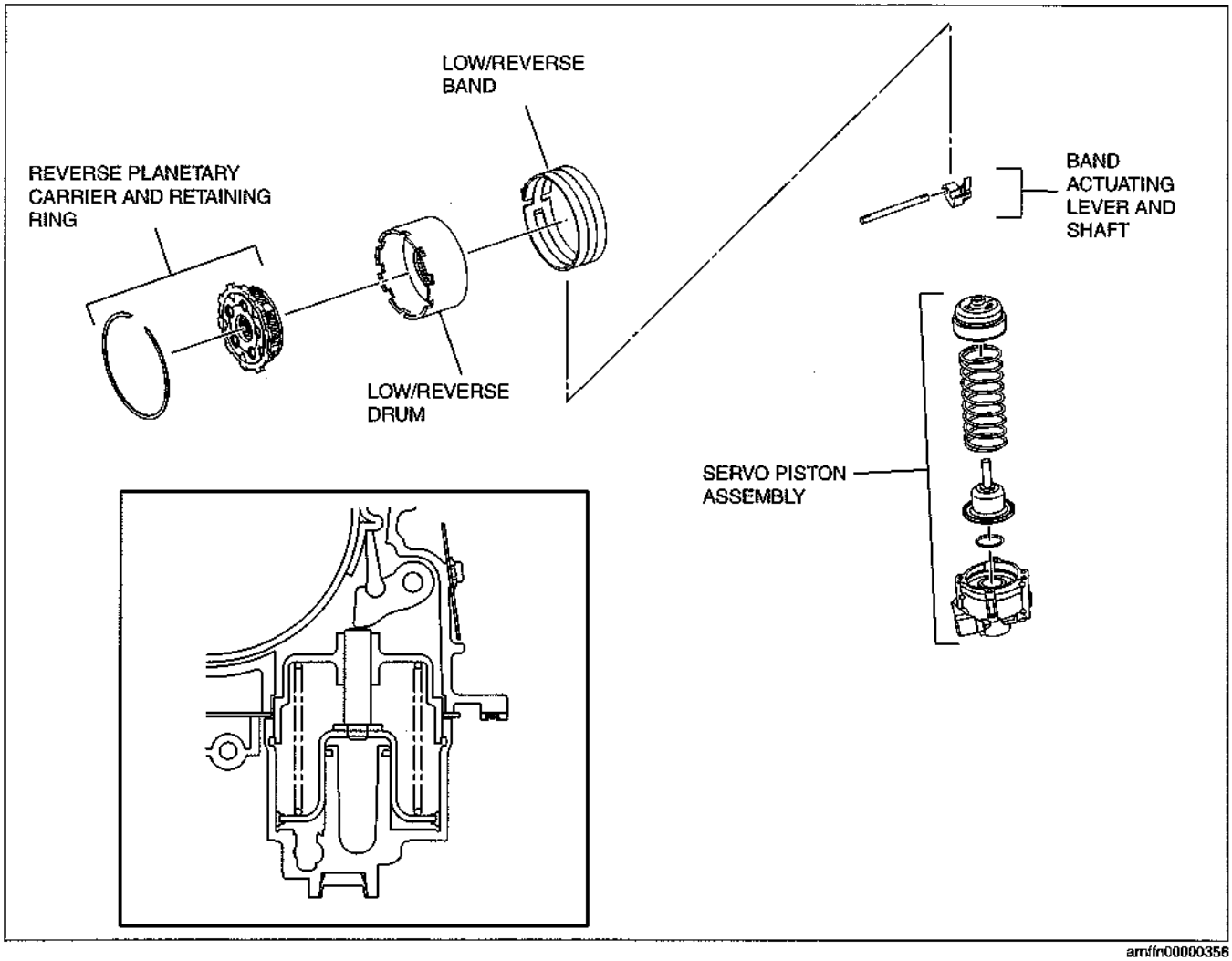
Low/Reverse Band

- The low/reverse band connects the reverse planetary carrier to the transmission case.
- The low/reverse band is applied in Reverse, as well as in manual 1GR and manual 2GR.
- During 2GR operation, 1GR operation and Reverse, hydraulic pressure is applied to the low/reverse servo.
  - — This pressure causes the servo to move and apply force to the low/reverse band.
  - — This action causes the low/reverse brake drum to be held.
  - — This action causes the low/reverse planetary assembly to be held stationary.



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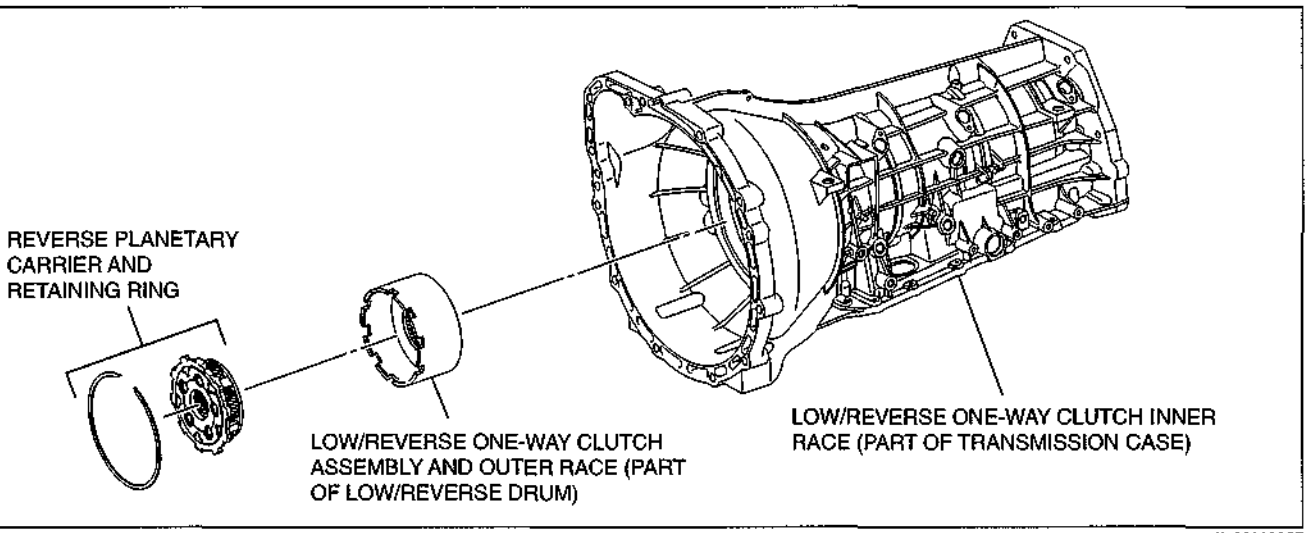
Low/Reverse One-Way Clutch

- The low/reverse one-way clutch connects the reverse planetary carrier to the transmission case during drive operation.
- The low/reverse one-way clutch transmits torque in 1GR and 2GR, as well as in manual 1GR and manual 2GR.
- The low/reverse one-way clutch is a sprag-type one-way clutch.
  - — The low/reverse one-way clutch holds the low/reverse drum and low/reverse planetary assembly to the case in 1GR and 2GR.
  - — In all other gears the low/reverse one-way clutch overruns.



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PARKING LOCK CONSTRUCTION [5R55S]

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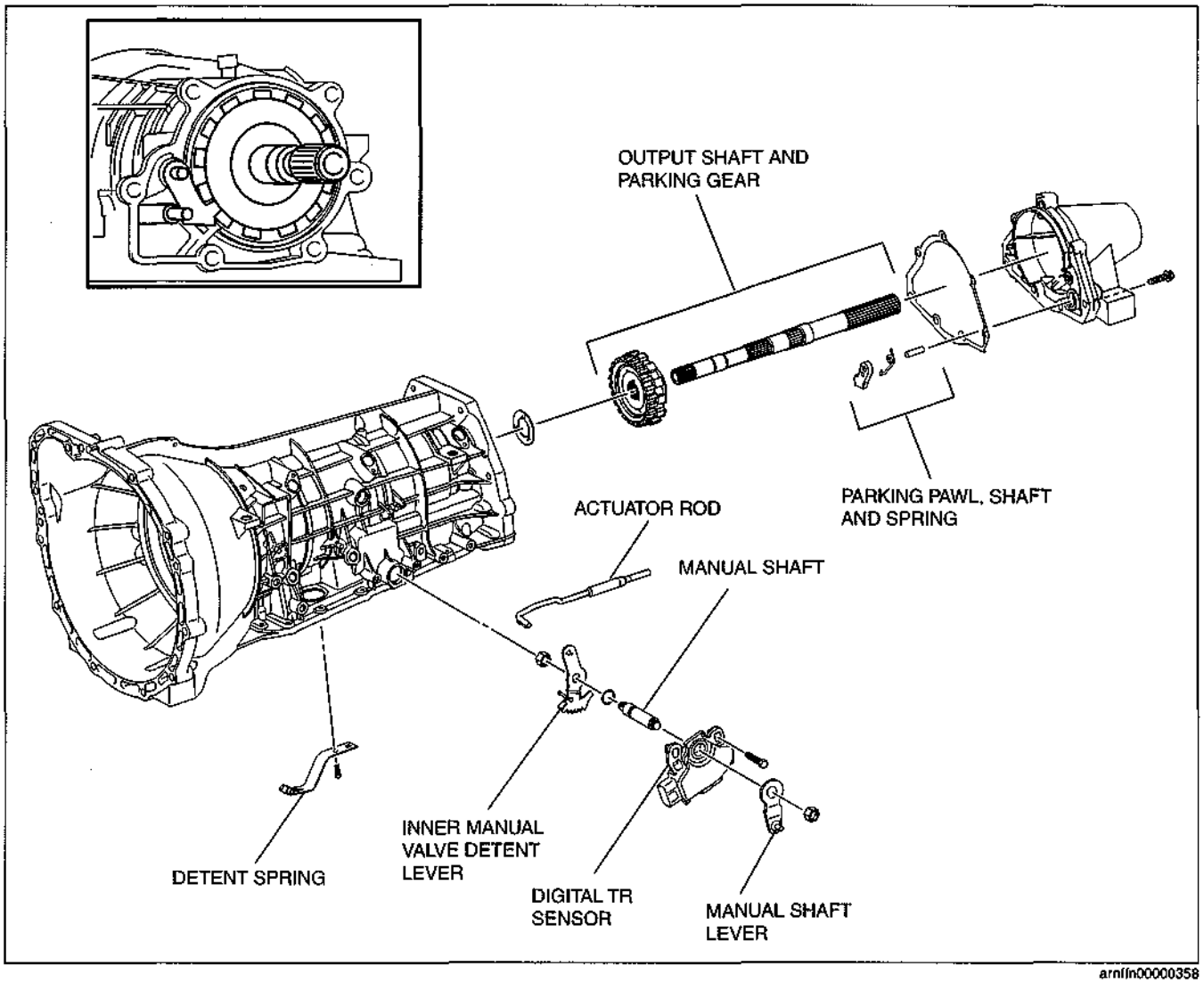
- The parking gear is connected to the output shaft. The parking gear has lugs on its outer surface to allow the operation of the parking lock.
- The parking lock prevents the vehicle wheels from rotating by allowing the transmission case to hold the output shaft stationary through the parking gear. When the parking pawl engages the parking gear, it holds the gear stationary.
- When the manual control lever is rotated to the P position, the parking lock works as follows:
  - — The inner manual control valve detent lever (connected to the manual control shaft) rotates, pushing a spring-loaded actuator rod.
  - — The actuator rod pivots the parking pawl into alignment between the lugs of the parking gear.
  - — The parking pawl (connected to the transmission case) holds the parking gear.



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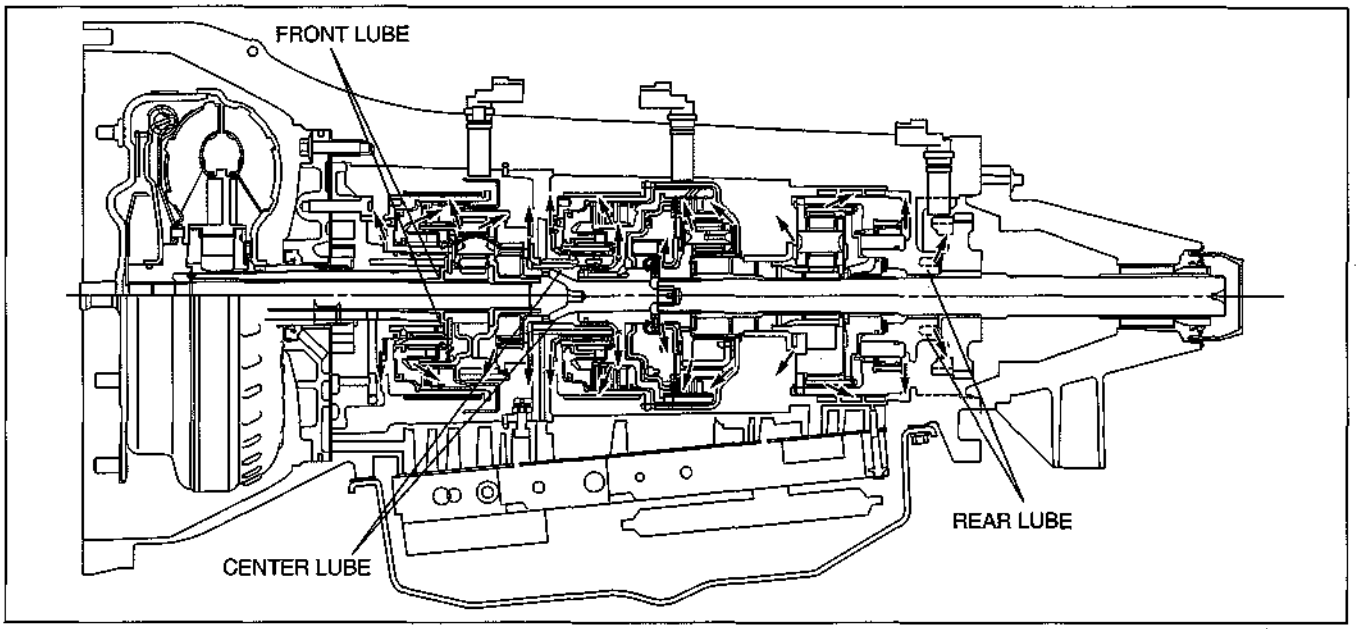
LUBRICATION [5R55S]

id0513c1321500

- The 5R55S transmission provides lubrication for rotating mechanical components through three hydraulic circuits to the front, center and rear areas. Fluid in the torque converter hydraulic circuit provides fluid to lubricate the impeller hub bushing.
- Fluid in this circuit also flows from the transmission case, through a tube, to a cooler located at the front of the vehicle. Fluid from the cooler returns through another tube into the transmission and then through the three lube circuits.
- When the temperature of fluid that exits the torque converter contains less heat, the action of a thermostatically controlled valve in the main control causes the cooler to be bypassed. Fluid flows directly from the torque converter into the lube circuits.
- As transmission fluid temperature increases, the thermostatically controlled valve allows directs the flow of fluid exiting the torque converter to pass through the cooler before it enters the lube circuits.



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FLUID PUMP CONSTRUCTION [5R55S]

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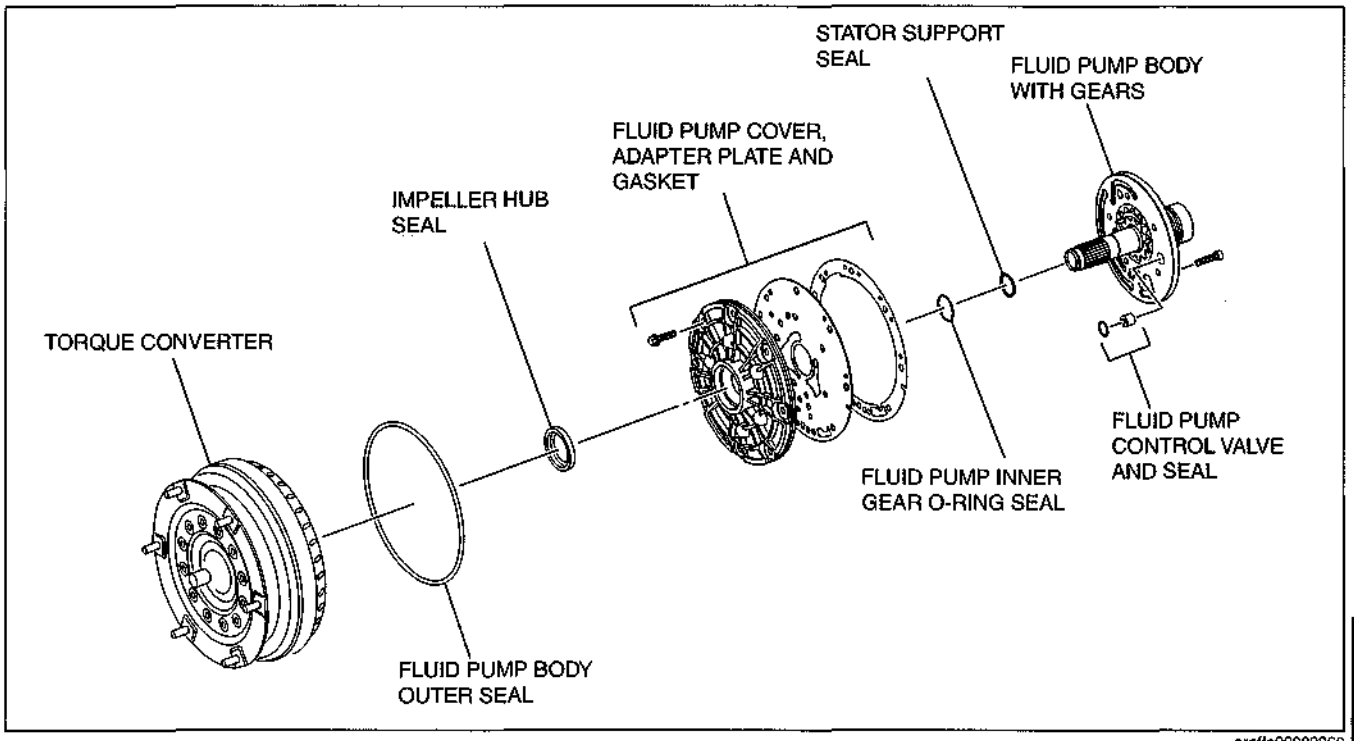
- The 5R55S transmission has a gear type pump that supplies fluid under pressure to the hydraulic system.
- The fluid pump provides the fluid pressure necessary to charge the torque converter, main control assembly, transmission cooling system, lubrication system and apply devices.
- The torque converter impeller hub rotates the drive gear of the pump. The drive gear has an O-ring on its impeller hub contact surface.
- The fluid pump has the following parts:
  - — Pump cover
  - — Adapter plate
  - — Pump assembly, with drive and driven gears and an integral stator support



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FLUID FILTER CONSTRUCTION [5R55S]

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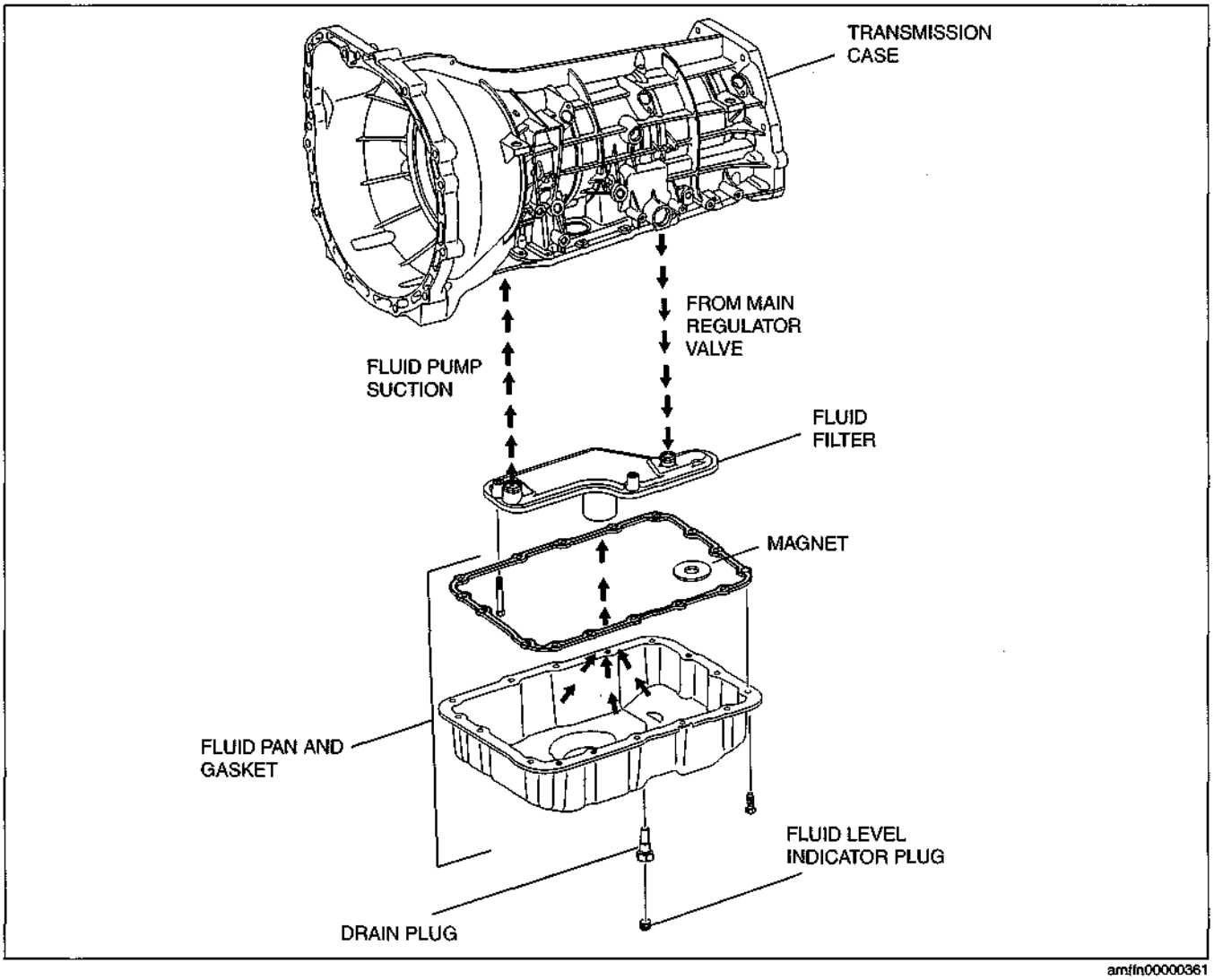
- Fluid in a sump area formed by the fluid pan flows from a filter, through passages in the valve body and transmission case, to the suction port of the fluid pump.
- The transmission fluid filter and its accompanying seals are part of the fluid path from the sump (pan) to the fluid pump.
  - — The transmission fluid filter has a bypass section which allows fluid vented at the main regulator valve to be recirculated to the fluid pump, without passing through the transmission fluid filter.
- A magnet attached to the inside of the fluid pan collects unwanted magnetic material.



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CONTROL VALVE BODY OUTLINE [5R55S]

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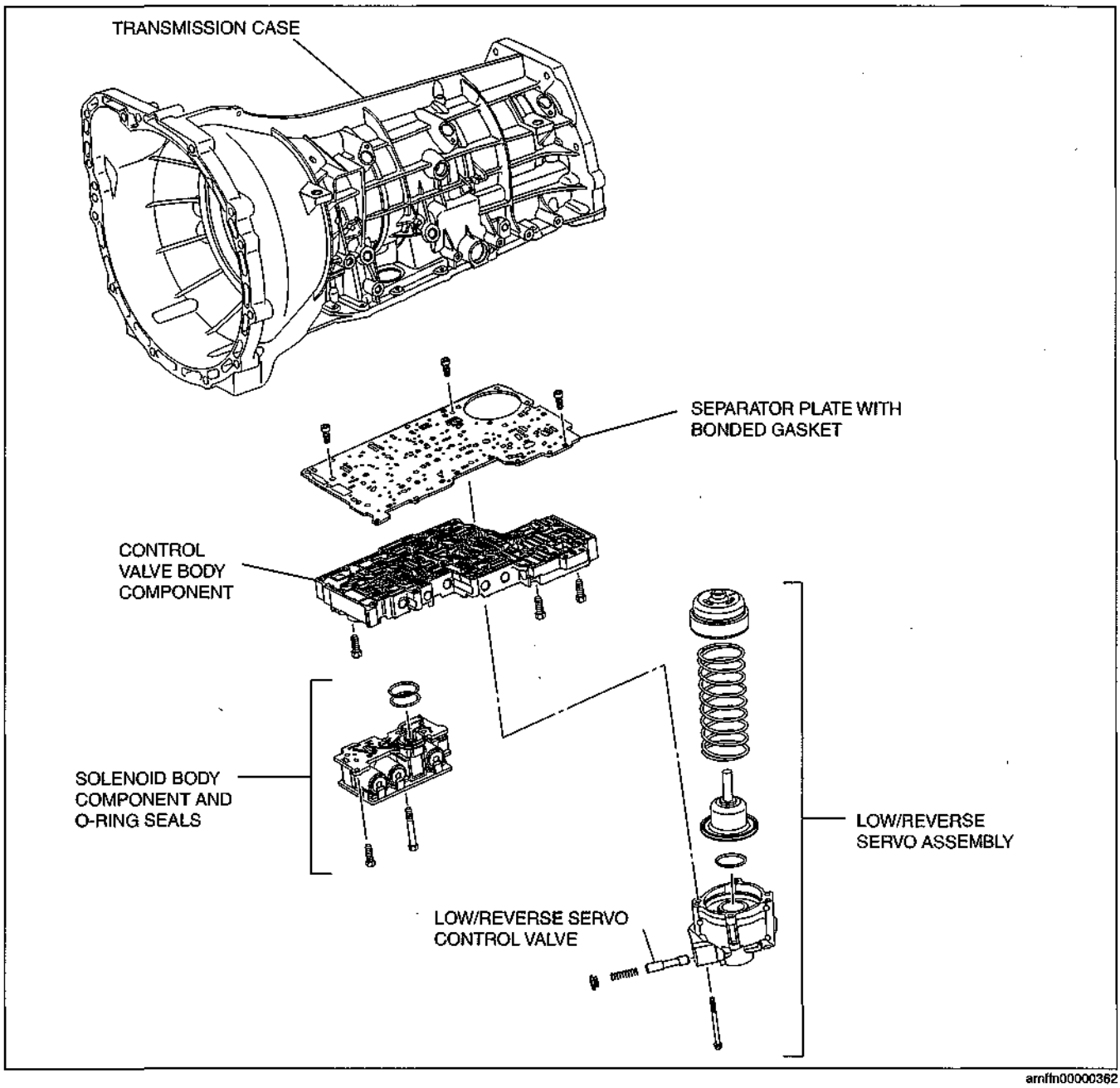
- The control valve body component and related components are part of the pressure side of the hydraulic system.
- The control valve body component consists of the solenoids, the valve body assembly and the separator plate.
- These components combine to convert electrical signals into hydraulic actions.
  - — All valves in the control valve body component are anodized aluminum and cannot be sanded, filed or dressed in any other way. If there is any damage to the valves that prevents or restricts their movement, install a new control valve body component.



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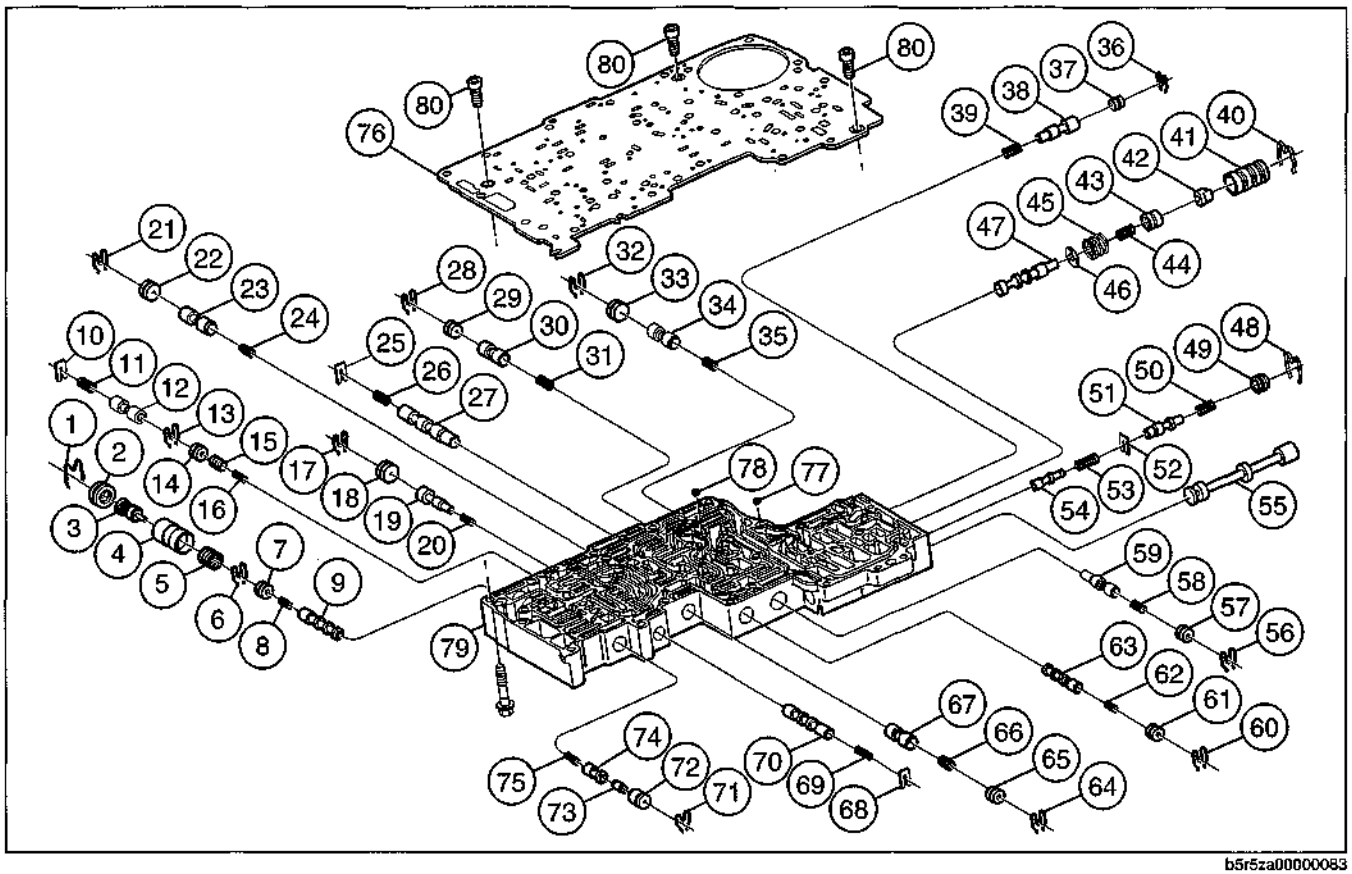
Control Valve Body Component Exploded View



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1	Retainer clip
2	Retainer plug
3	Thermo valve component
4	Fluid cooler bypass valve
5	Fluid cooler bypass spring
6	Retainer clip
7	Retainer plug
8	Converter clutch control valve spring
9	Converter clutch control valve
10	Plate
11	Coast clutch control spring
12	Coast clutch control valve
13	Retainer clip
14	Retainer plug
15	Converter clutch back pressure valve
16	Converter clutch back pressure spring
17	Retainer clip
18	Retainer plug
19	VFS2 modulator valve
20	VFS2 modulator valve spring
21	Retainer clip
22	Retainer plug
23	Intermediate servo release valve
24	Intermediate servo release valve spring
25	Plate
26	High clutch control spring
27	High clutch control Valve
28	Retainer plug
29	Retainer clip

30	Reverse modulator valve
31	Reverse modulator valve spring
32	Retainer clip
33	Retainer plug
34	Reverse engagement valve
35	Reverse engagement valve spring
36	Retainer clip
37	Retainer plug
38	VFS1 modulator valve
39	VFS1 modulator valve spring
40	Retainer clip
41	Sleeve
42	Booster valve
43	Booster valve
44	Inner spring
45	Outer spring
46	Retainer spring
47	Main regulator valve
48	Retainer clip
49	Retainer plug
50	Converter limit spring
51	Converter limit valve
52	Plate
53	Solenoid regulator valve spring
54	Solenoid regulator valve
55	Manual valve
56	Retainer clip
57	Retainer plug
58	Rear servo control valve spring

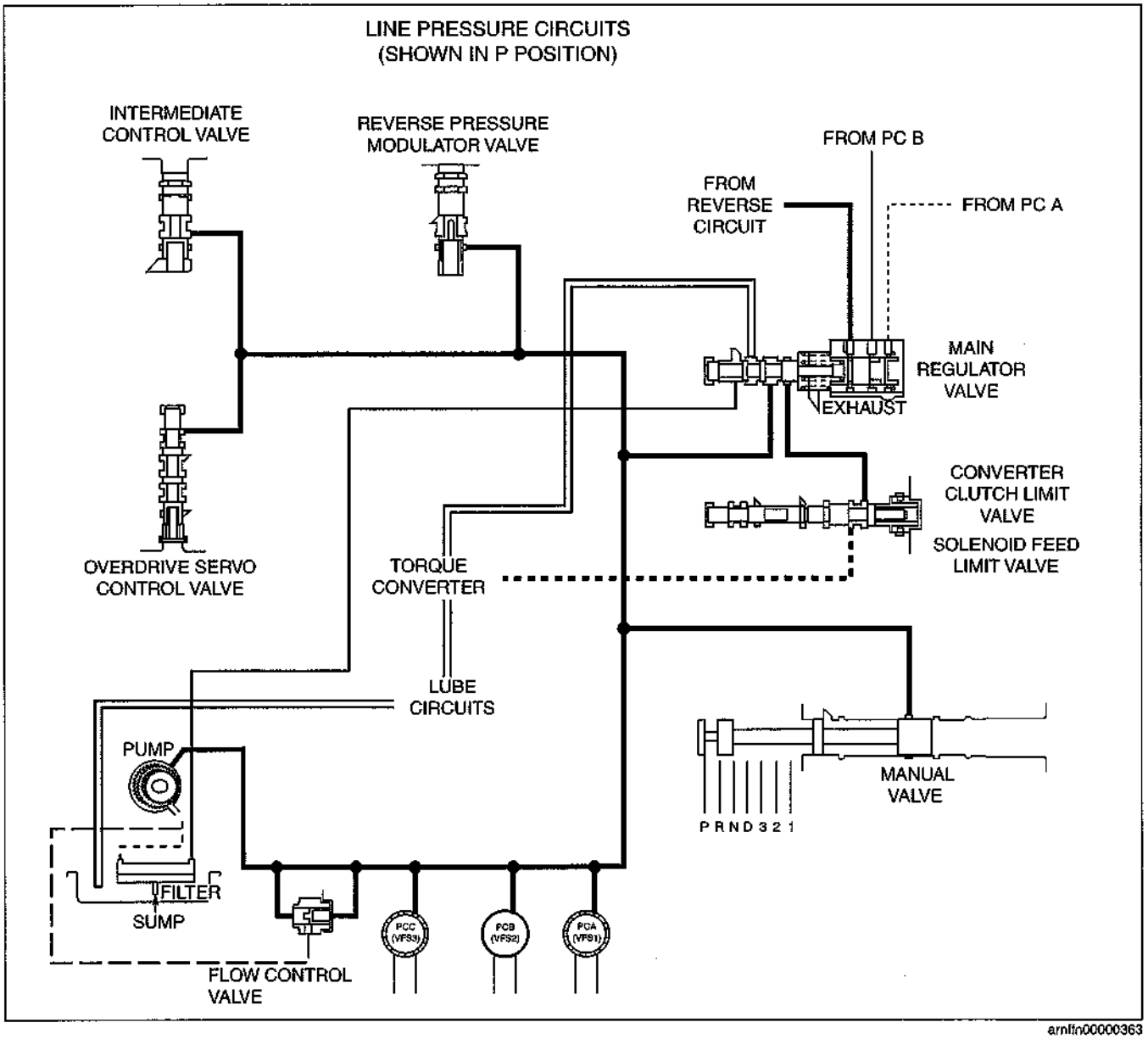
59	Rear servo control valve
60	Retainer clip
61	Retainer plug
62	RS ISA select valve spring
63	RS ISA select valve
64	Retainer clip
65	Retainer plug
66	Forward engagement control valve spring
67	Forward engagement control valve
68	Plate
69	Overdrive servo control spring
70	Overdrive servo control valve
71	Clip retainer
72	Converter clutch modulator control sleeve
73	Converter clutch modulator control valve
74	Converter clutch modulator valve
75	Converter clutch modulator control spring
76	Separator plate
77	Lubrication check ball
78	Shuttle valve ball
79	Lower control valve body
80	Bolt

PRESSURE CONTROL HYDRAULIC CIRCUITS CONSTRUCTION [5R55S]

id0513c1321800

Line Pressure Hydraulic Circuit

- Fluid under pressure from the pump flows to several hydraulic controls in the valve body, including the main regulator valve. The main regulator valve varies line pressure as part of controlling shift feel and efficient apply component operation.
- The TCM controls the position of the main regulator valve with the pressure control solenoid A and B.
- When pressure control solenoid A and B pressures are lower, the main regulator valve position provides lower line pressure. As the fluid pressures from pressure control solenoid A and B increase, the main regulator valve provides higher line pressure.
- When the transmission shifter is in the R position, fluid under pressure from the manual valve to the apply components also affects the position of the main regulator valve. This results in a pressure boost.



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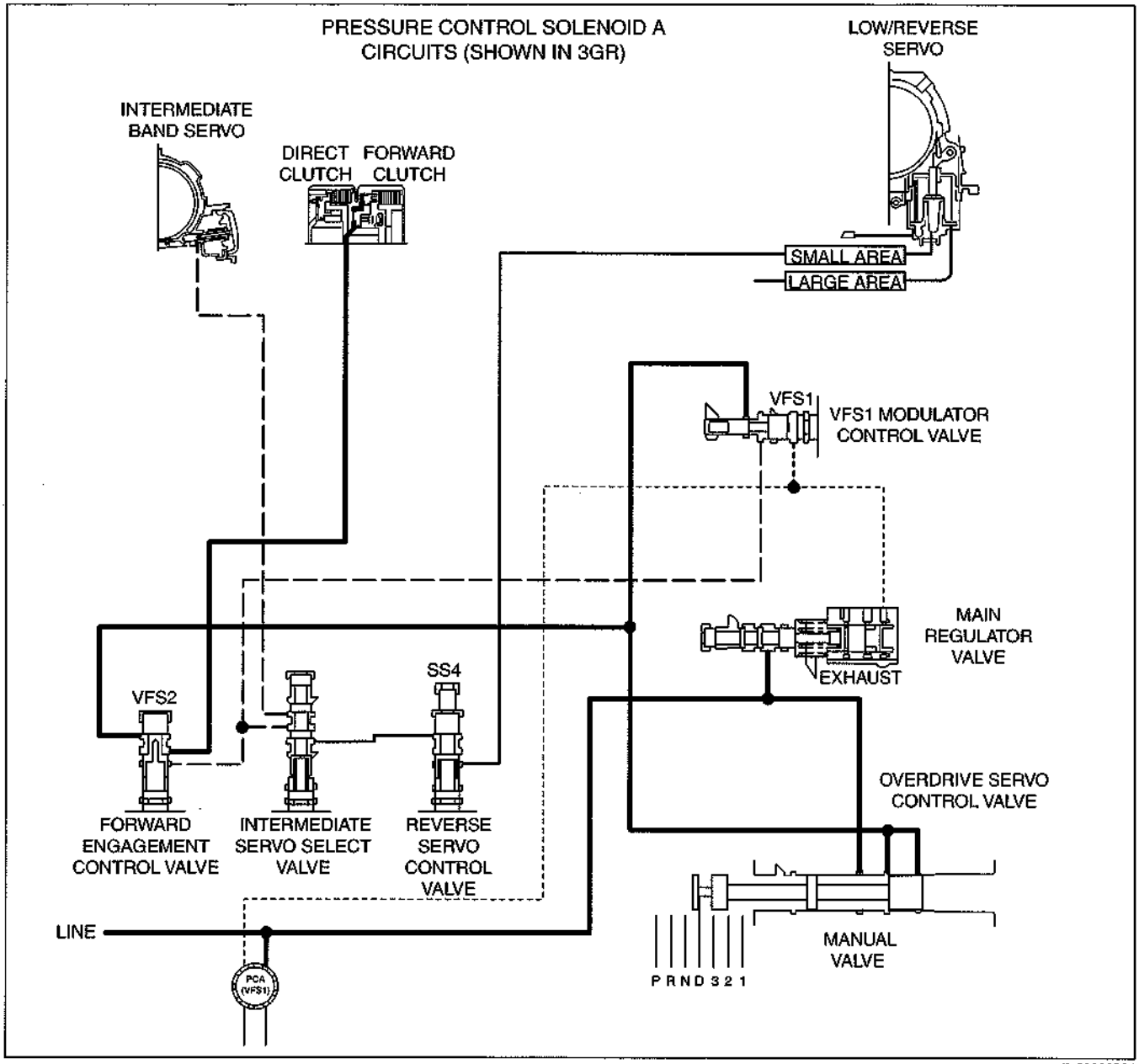
Pressure Control Solenoid A Hydraulic Circuit

- In the 5R55S transmission, pressure control solenoid A affects the operation of the main regulator valve and the VFS1 modulator control valve.
- VFS1 pressure indirectly affects the feel of the forward clutch engagement. VFS1 pressure is directly applied to the intermediate servo. It is also directly applied to the low/reverse servo in manual 1GR and manual 2GR.



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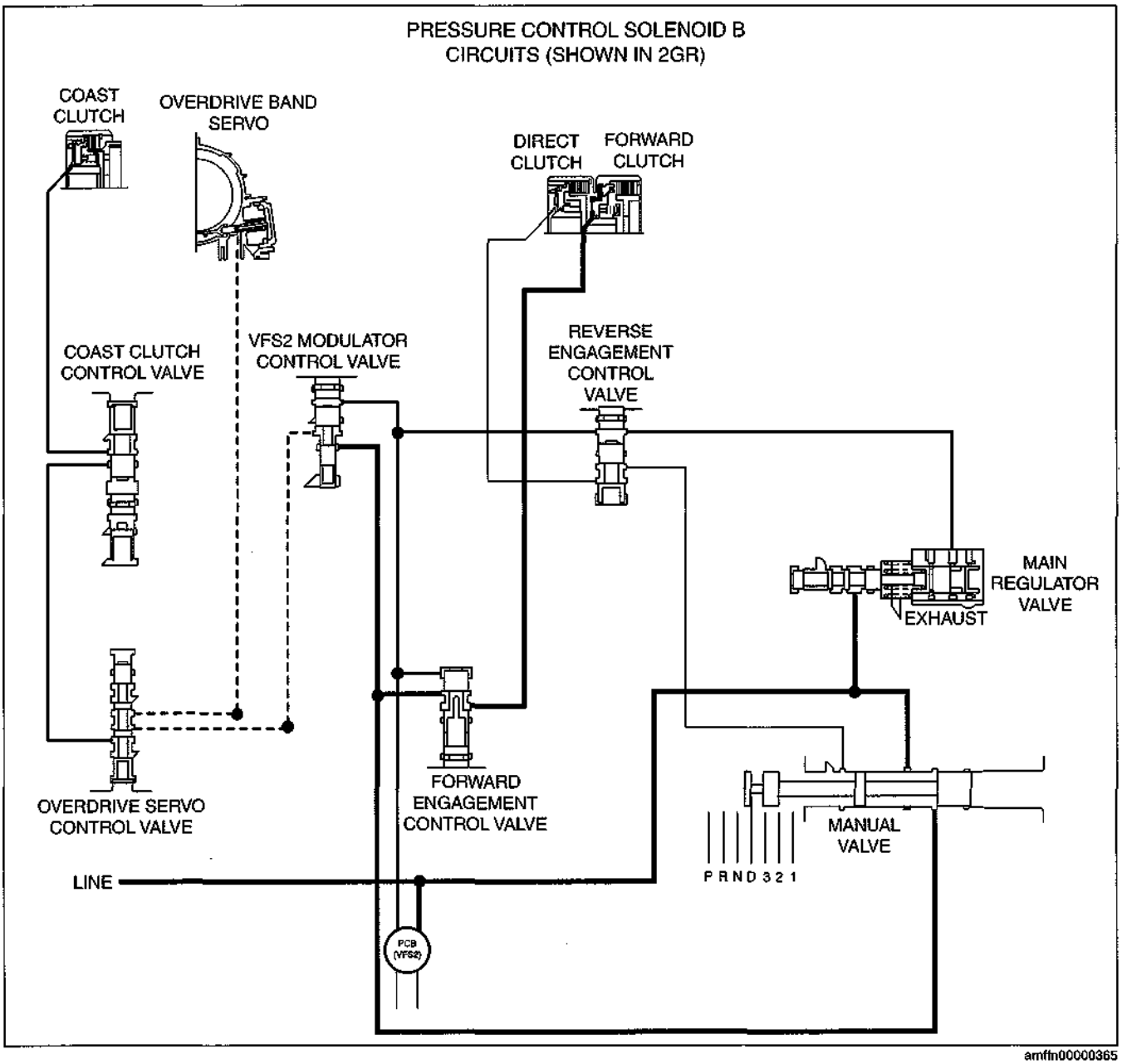
Pressure Control B Solenoid B Hydraulic Circuit

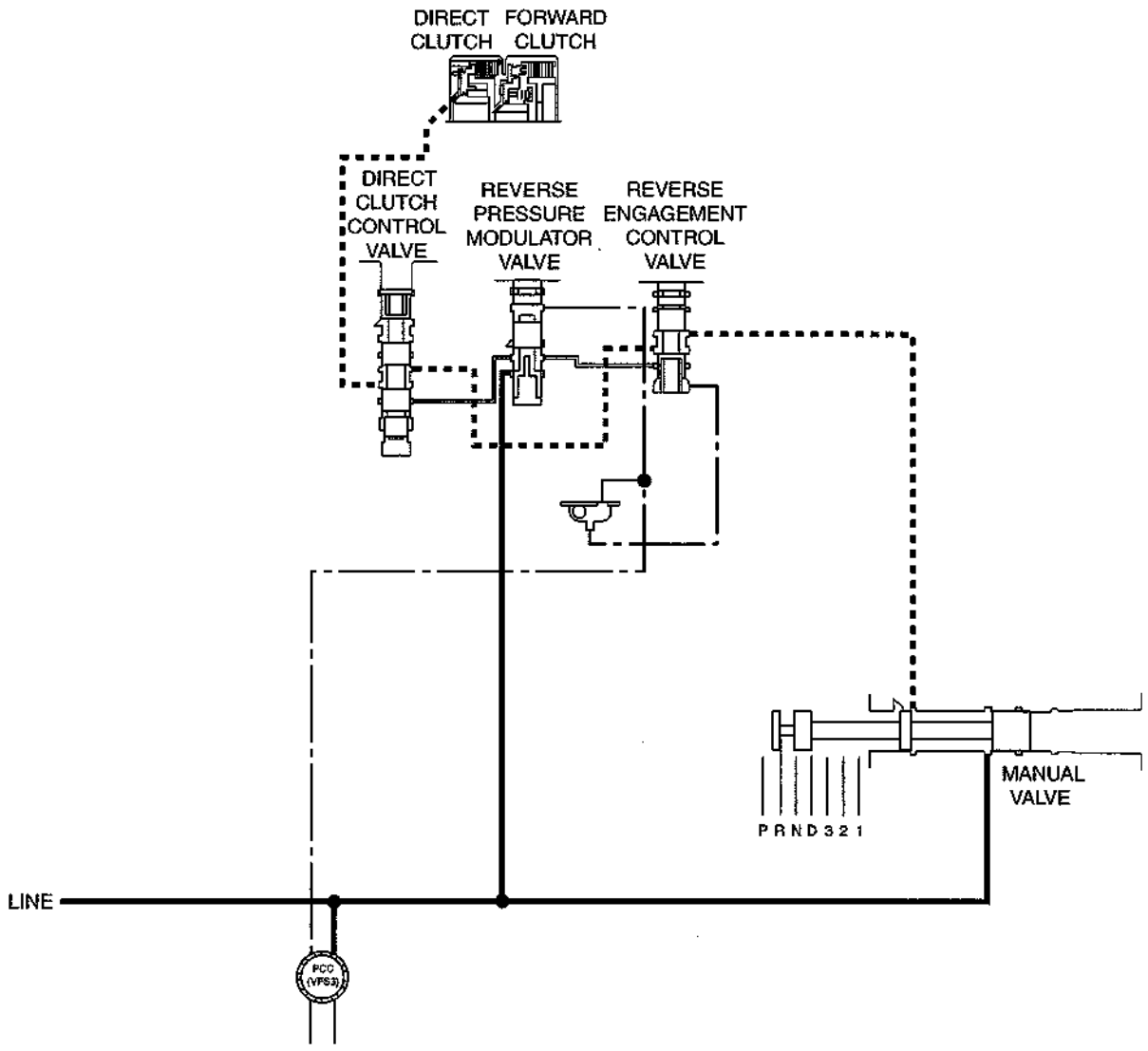
- In the 5R55S transmission, pressure control solenoid B affects the operation of the main regulator valve, the VFS2 modulator control valve, the forward engagement control valve and the reverse engagement control valve.
- VFS2 pressure indirectly affects the feel of the forward clutch engagement, as well as the direct clutch engagement in reverse. VFS2 pressure is directly applied to the overdrive servo or the coast clutch.



Pressure Control Solenoid C Hydraulic Circuit

- In the 5R55S transmission, pressure control solenoid C solenoid affects the operation of the reverse pressure modulator valve and the reverse engagement control valve.
- Pressure control solenoid C pressure indirectly affects the feel of direct clutch engagement in reverse. Pressure control solenoid C pressure is directly applied to the direct clutch in 4GR and 5GR.

PRESSURE CONTROL SOLENOID C
CIRCUITS (SHOWN IN R POSITION)



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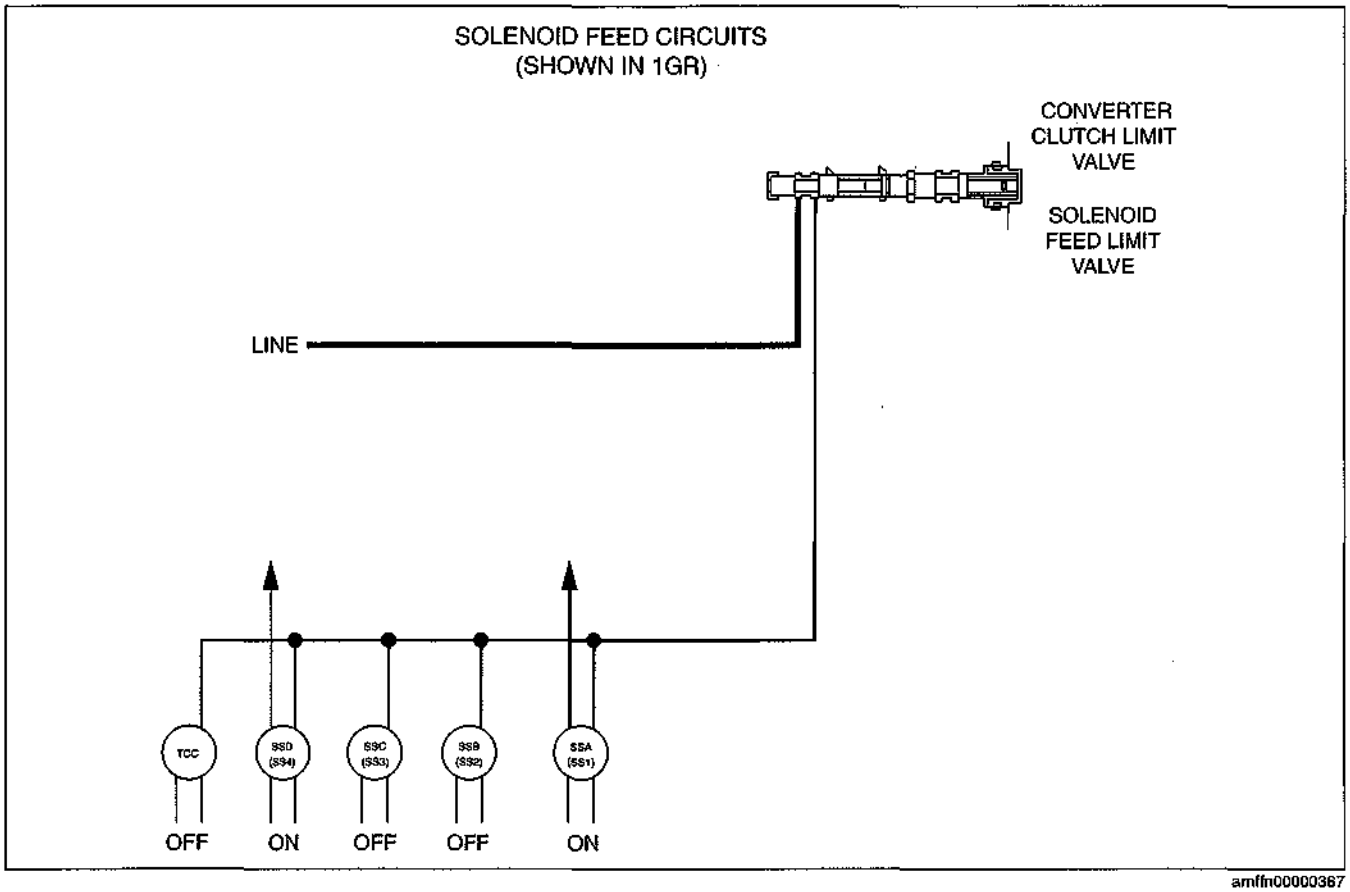
SHIFT SOLENOID HYDRAULIC CIRCUITS CONSTRUCTION [5R55S]

id0513c1321900

Solenoid Feed Hydraulic Circuit

- In the 5R55S transmission, fluid under line pressure moves to the solenoid feed limit valve. The solenoid feed limit valve provides fluid under a steady regulated pressure to the shift solenoids and TCC control solenoid.
- The TCM operates the shift solenoids with on/off control. When the TCM turns off each solenoid, fluid flow is blocked. When the TCM turns on each solenoid, full fluid flow occurs.
- The TCM operates the TCC control solenoid with varying Pulse-Width Modulation (PWM) control. This results in variable fluid flow and pressure from the TCC control solenoid to the hydraulic valve it controls.



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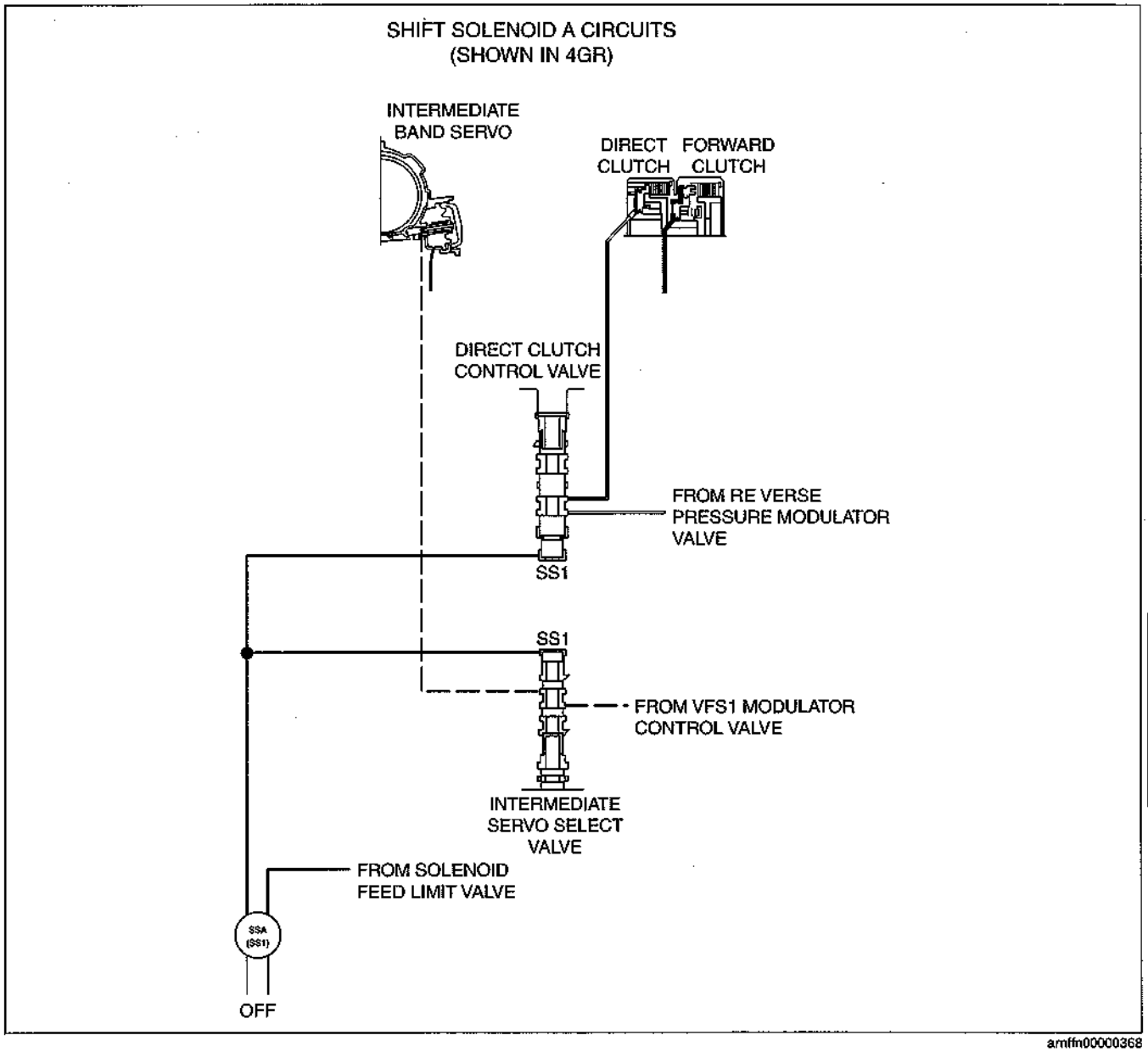
Shift Solenoid A Hydraulic Circuit

- In the 5R55S transmission, shift solenoid A affects the operation of the direct clutch. When shift solenoid A is on in forward speeds, the direct clutch is released. When shift solenoid A is turned off, the direct clutch is applied. shift solenoid A is also related to the operation of the intermediate band.
- When the transmission shifter is moved to the R position under conditions that may cause transmission damage, the TCM turns off shift solenoid A to inhibit reverse operation. This affects various hydraulic control valves in order to keep the direct clutch released.



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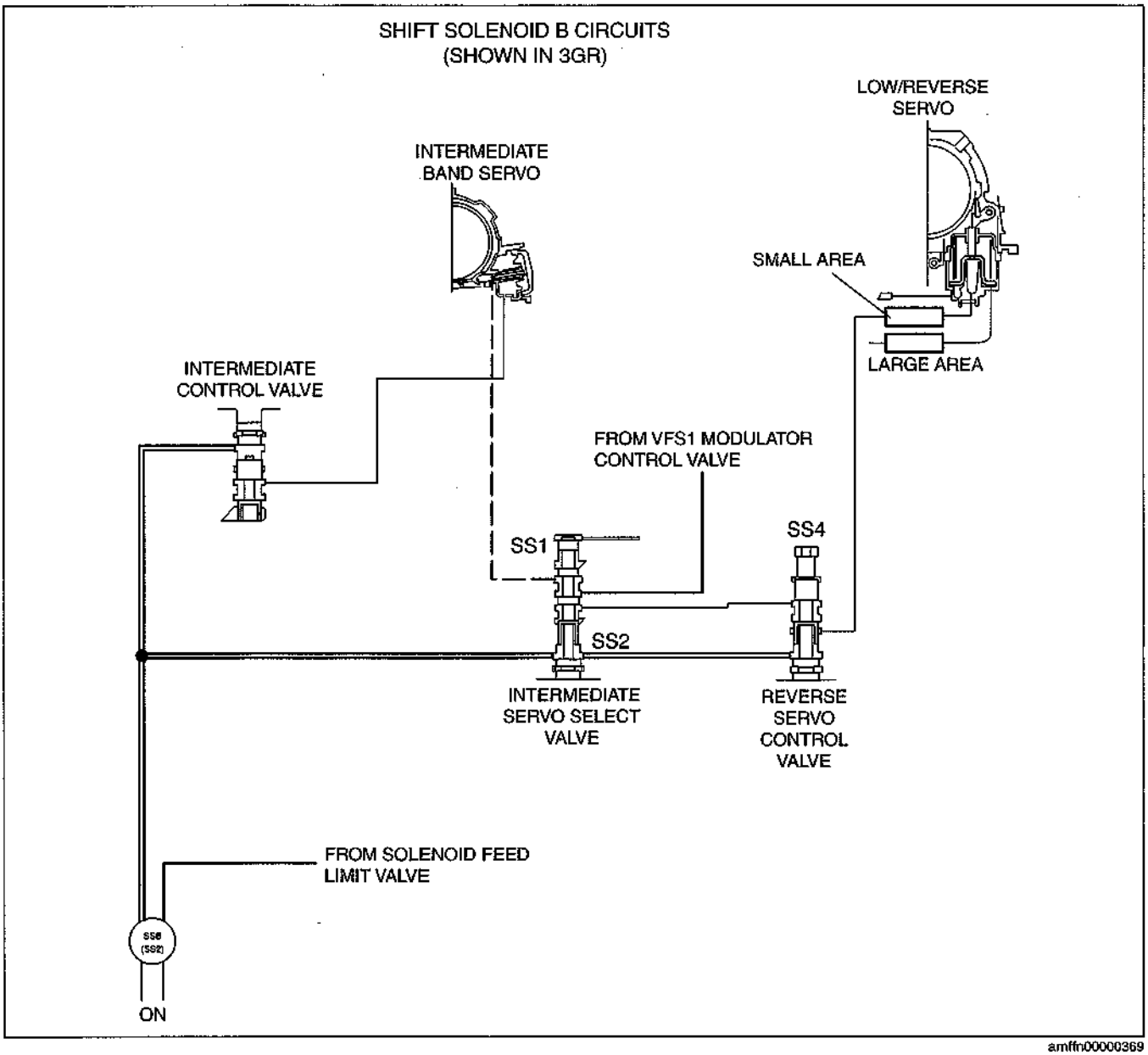
Shift Solenoid B Hydraulic Circuit

- In the 5R55S transmission, shift solenoid B affects the operation of the intermediate band. When shift solenoid B is on, the intermediate band is applied. When shift solenoid B is turned off, the intermediate band is released. shift solenoid B is also related to the operation of the low/reverse band in manual 1st gear and manual 2nd gear.
- The TCM does not use shift solenoid B to inhibit reverse operation in 5R55S transmission.



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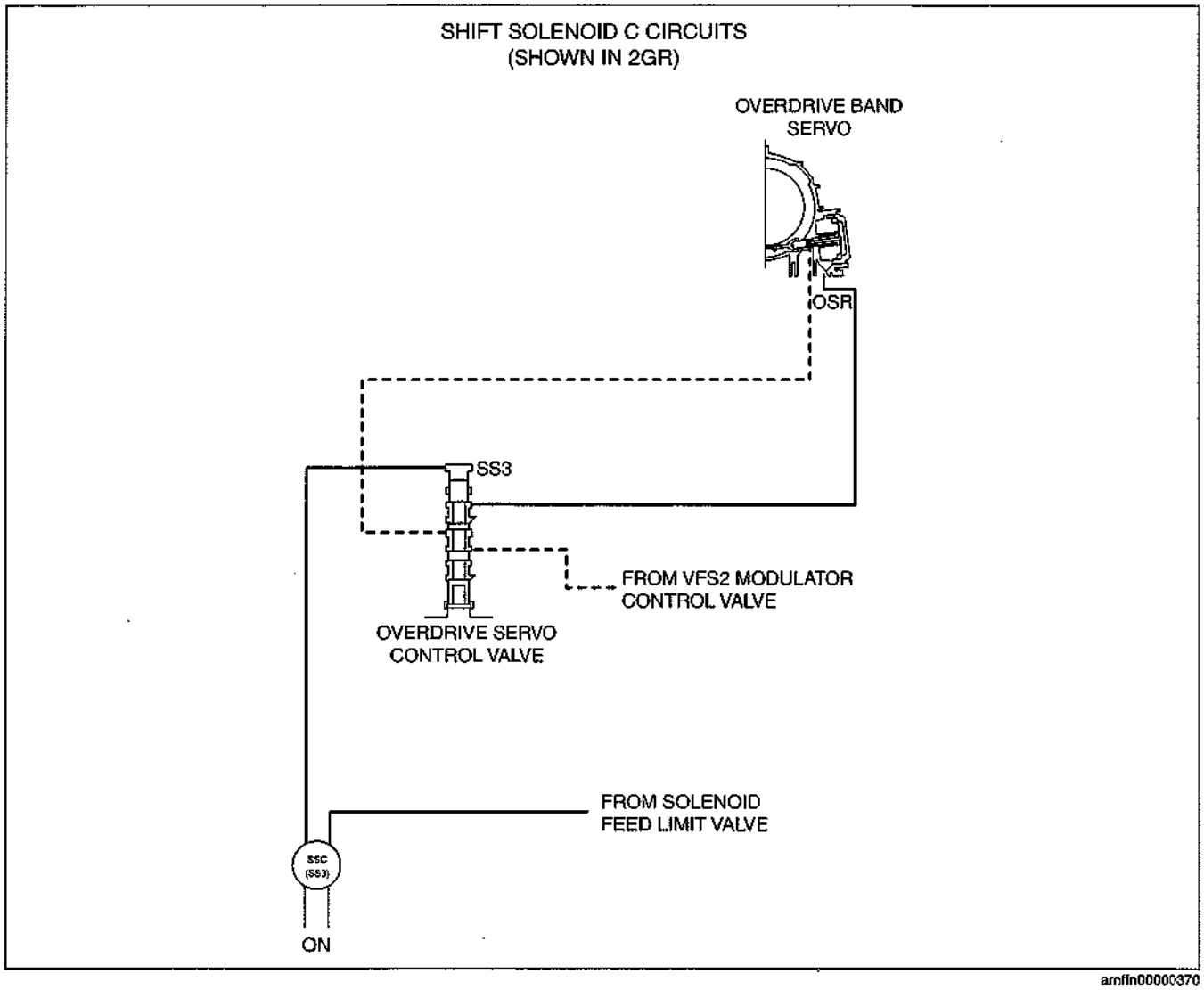
Shift Solenoid C Hydraulic Circuit

- In the 5R55S transmission, shift solenoid C affects the operation of the overdrive band. When shift solenoid C is on, the overdrive band is applied. When shift solenoid C is turned off, the overdrive band is released.



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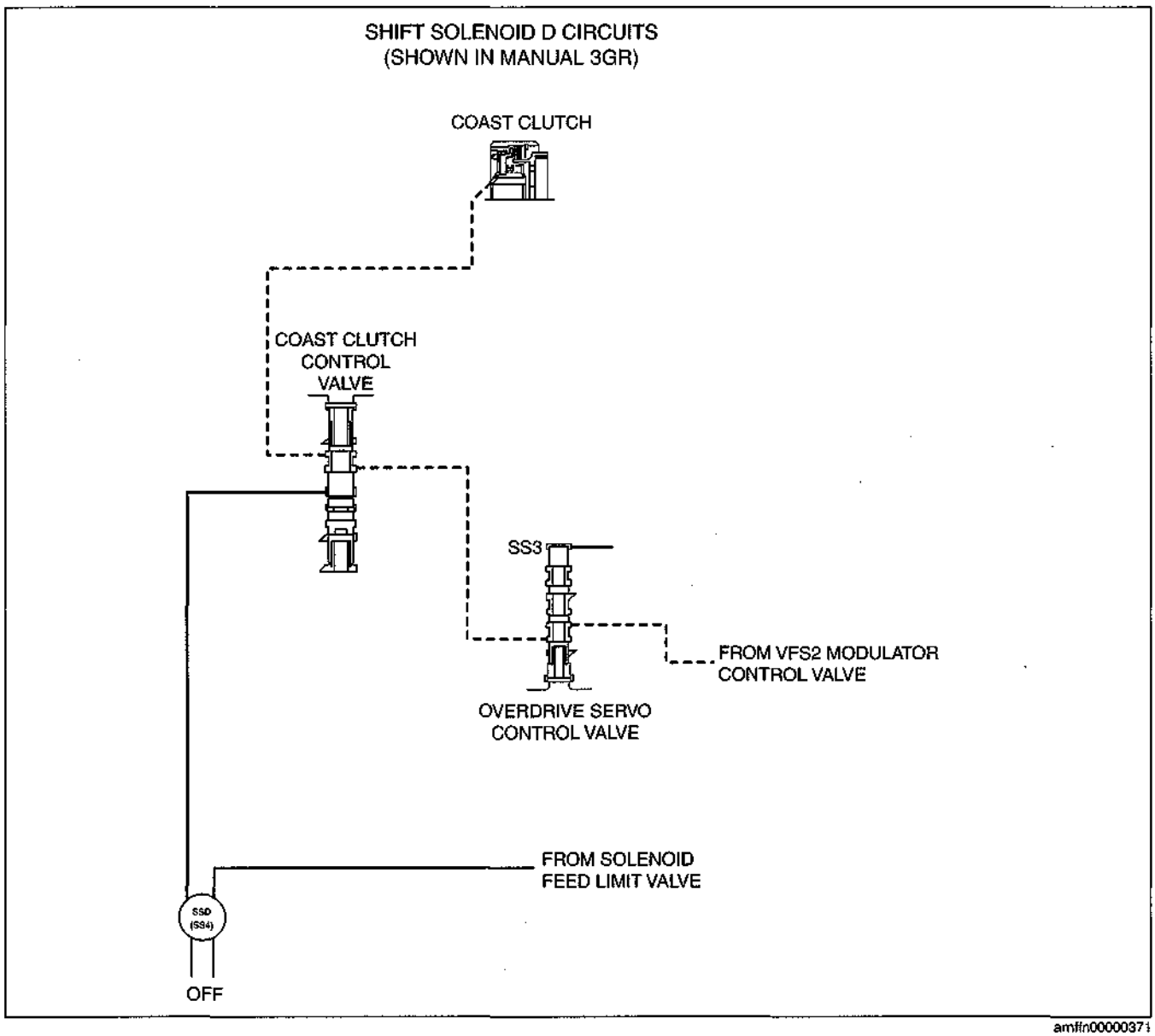
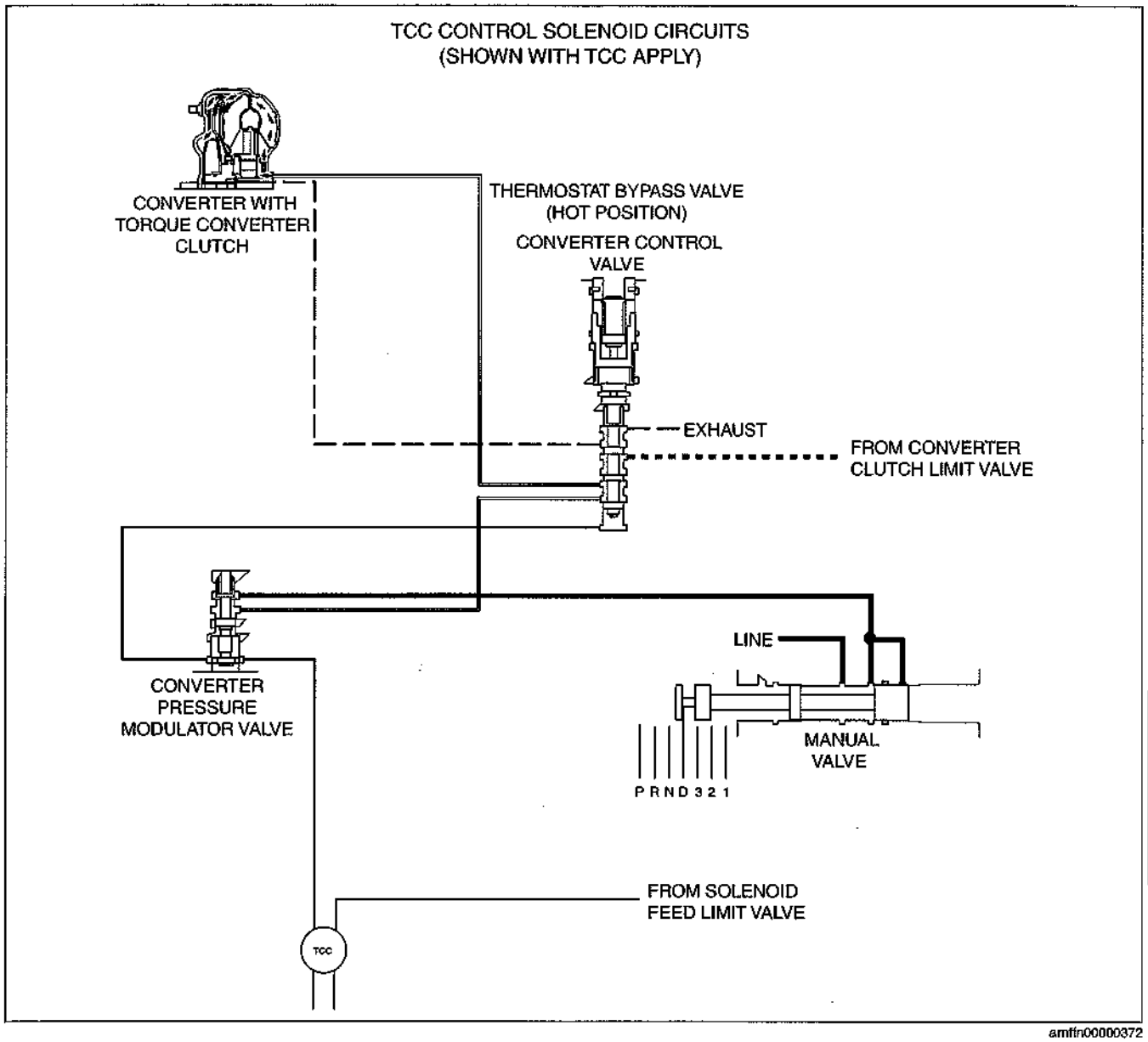
Shift Solenoid D Hydraulic Circuit

- In the 5R55S transmission, shift solenoid D affects the operation of the coast clutch. When shift solenoid D is on, the coast clutch is released. When shift solenoid D is turned off, the coast clutch is applied.



Torque Converter Clutch (TCC) Control Solenoid Hydraulic Circuit

- In the 5R55S transmission, the TCC control solenoid affects the operation of the torque converter clutch in forward speeds.
- TCC pressure affects the positions of the converter pressure modulator valve and the converter control valve.



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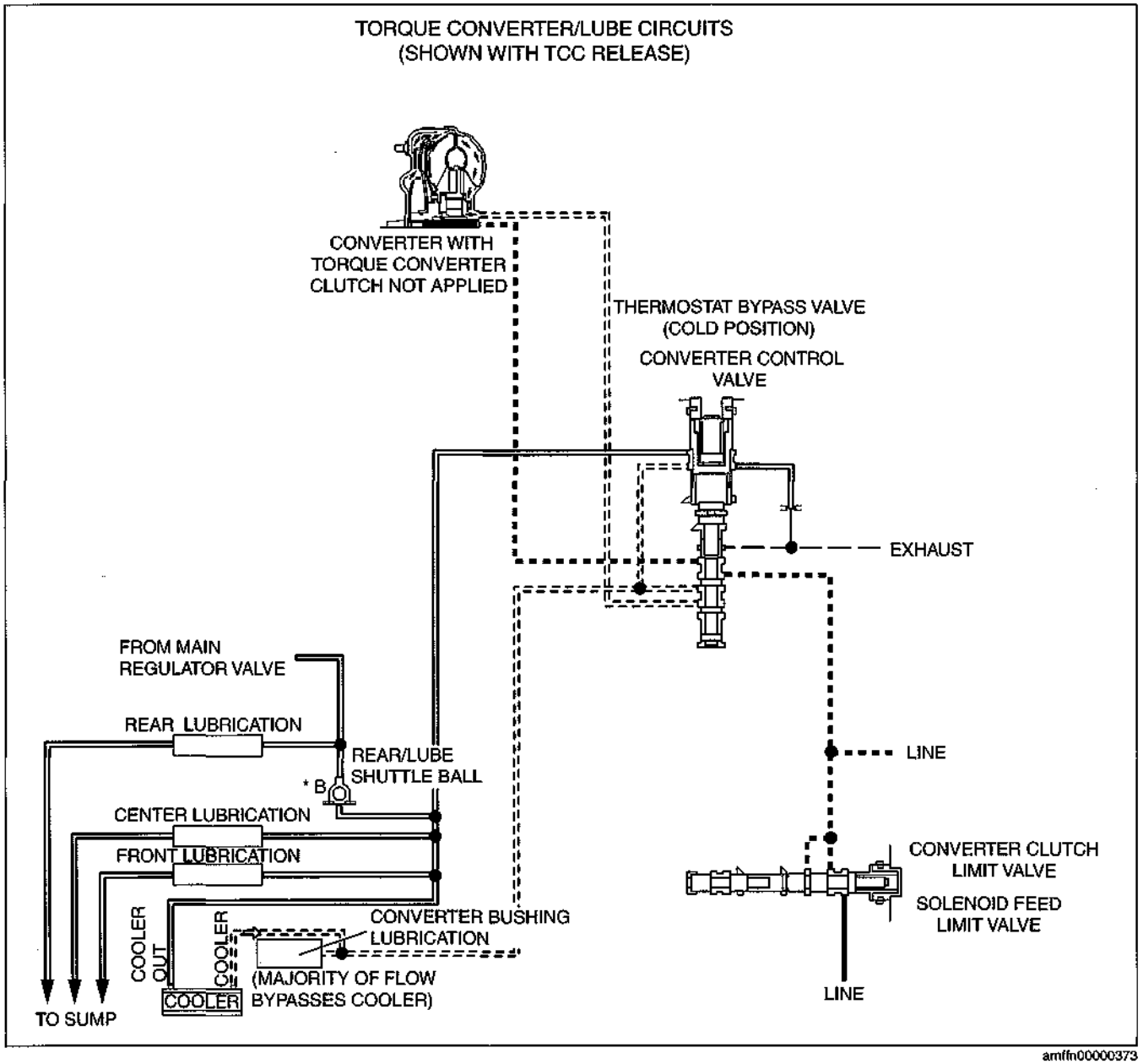
TORQUE CONVERTER/LUBE HYDRAULIC CIRCUITS CONSTRUCTION [5R55S]

id0513c1322000

- In the 5R55S transmission, fluid for torque converter operation flows as follows during TCC release:
  - — From the LINE circuit, through the converter clutch limit valve, through the converter control valve, to the torque converter
  - — From the torque converter, through the converter control valve, into the lube circuits
- The thermostat bypass valve allows fluid from the torque converter to bypass the fluid cooler and enter into the lube circuits when fluid temperature is cold.



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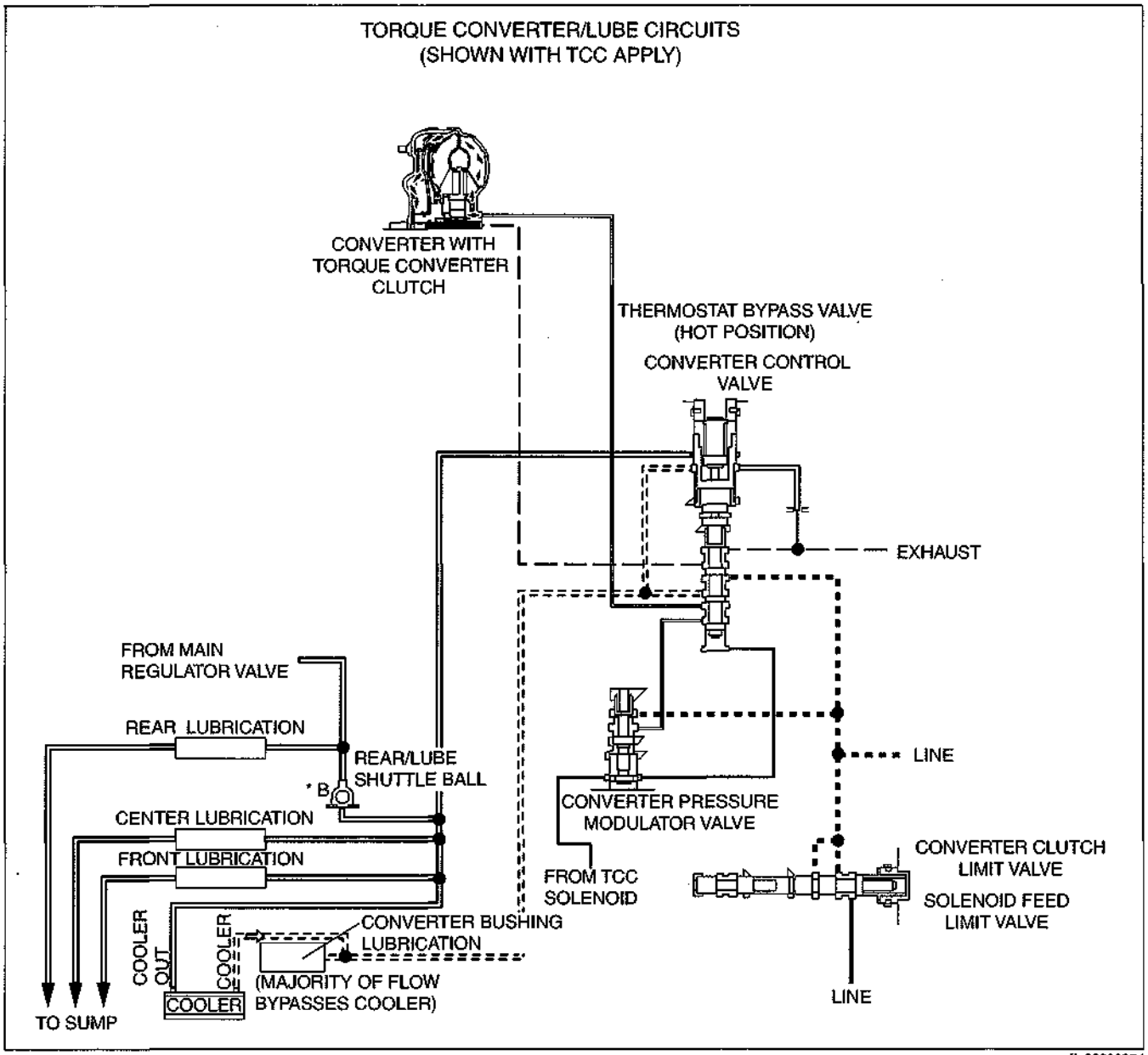
- When TCC is applied, fluid for torque converter operation flows as follows:
  - — From the LINE circuit, through the converter clutch limit valve, through the converter control valve, into the lube circuits
  - — From the LINE circuit, through the converter pressure modulator valve, through the converter control valve, to the torque converter



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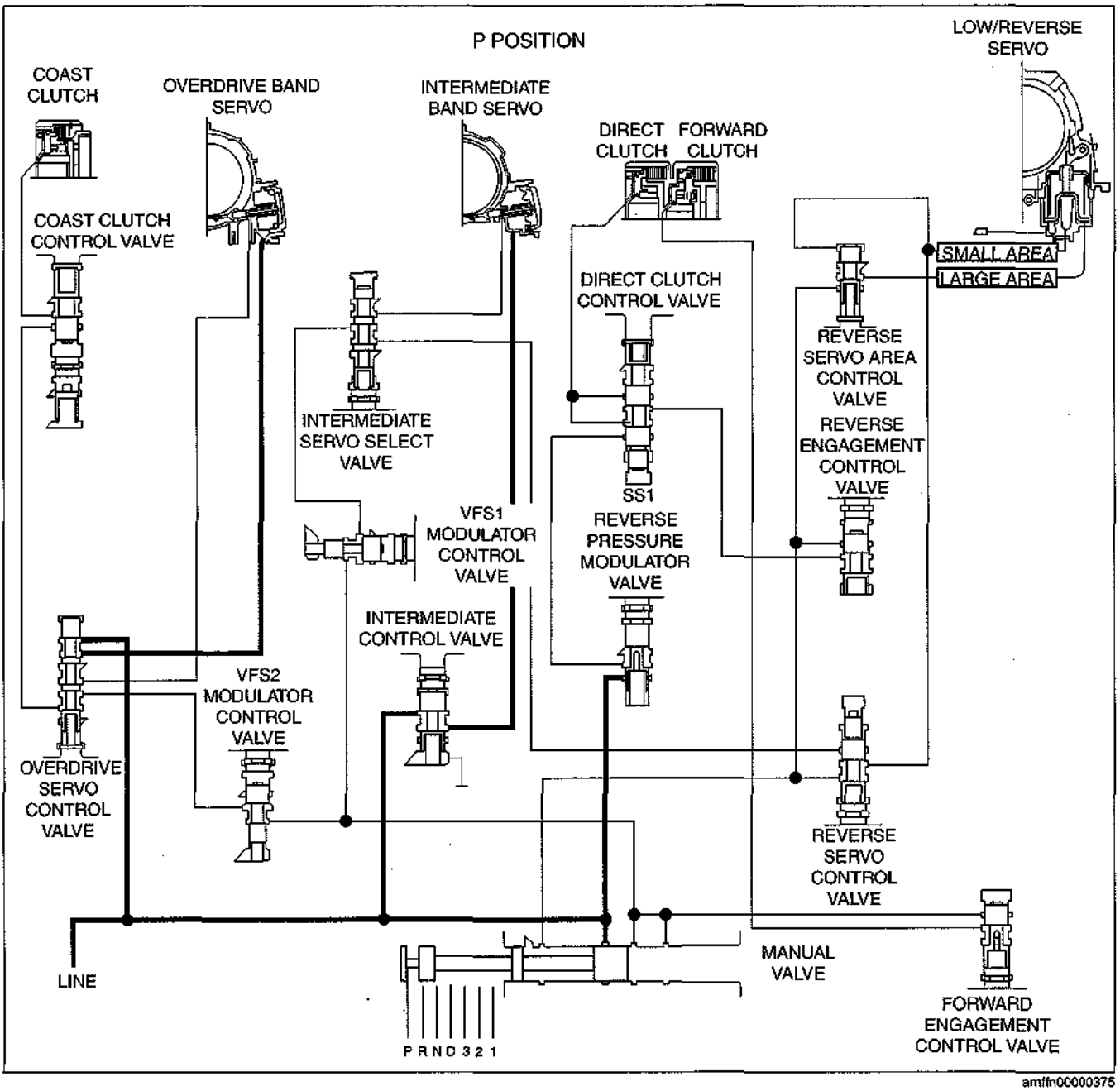
APPLY COMPONENT HYDRAULIC CIRCUITS CONSTRUCTION [5R55S]

id0513c1322100

P and N Positions (Park and Neutral)

- With the transmission in the P or N position, fluid under pressure is present at the following components:
  - — Overdrive servo-release
  - — Intermediate servo-release



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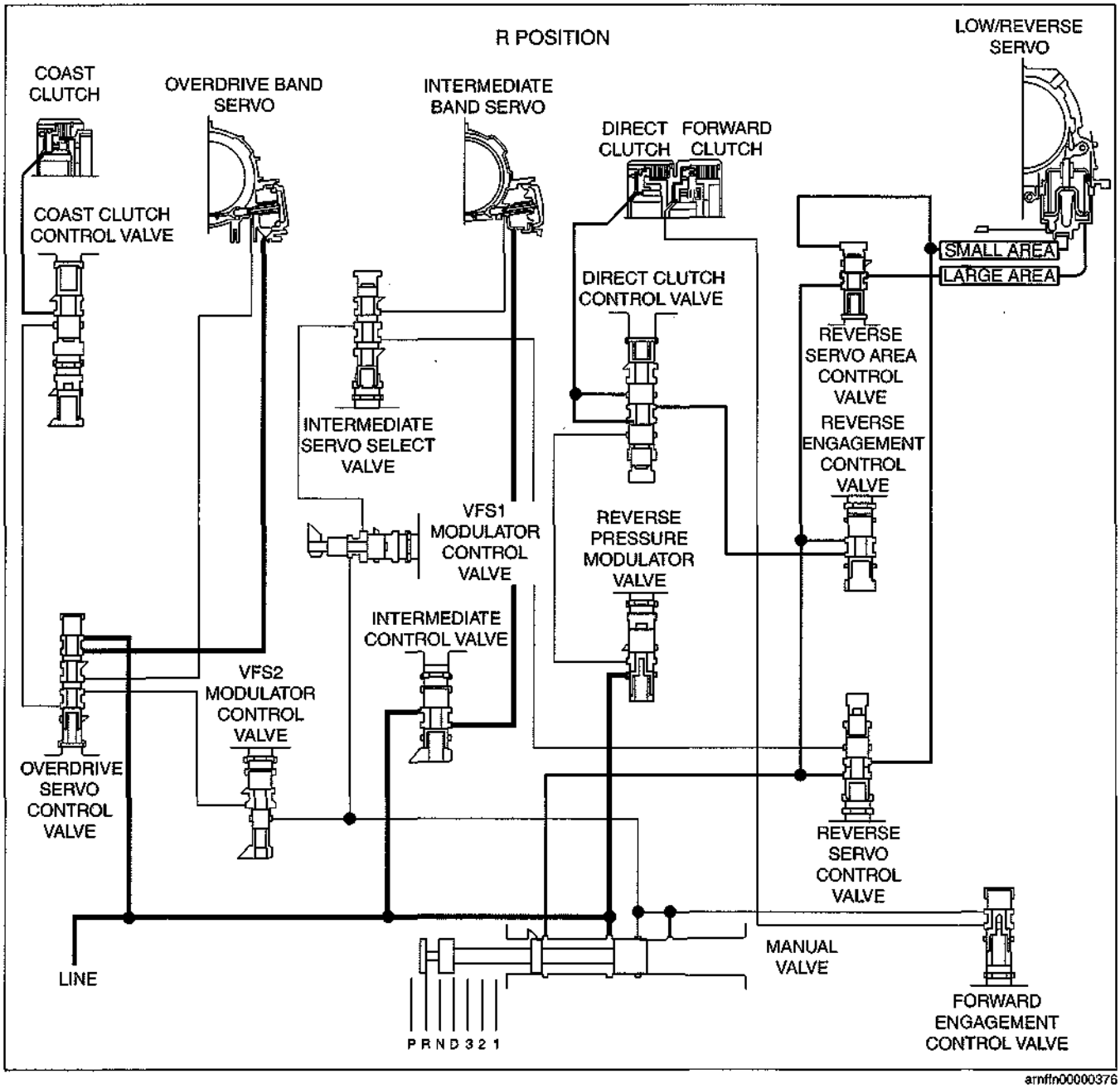
R Position (Reverse)

- With the transmission in the R position, fluid under pressure is present at the following components:
  - — Overdrive servo-release
  - — Intermediate servo-release
  - — Direct clutch
  - — Low/reverse servo-apply



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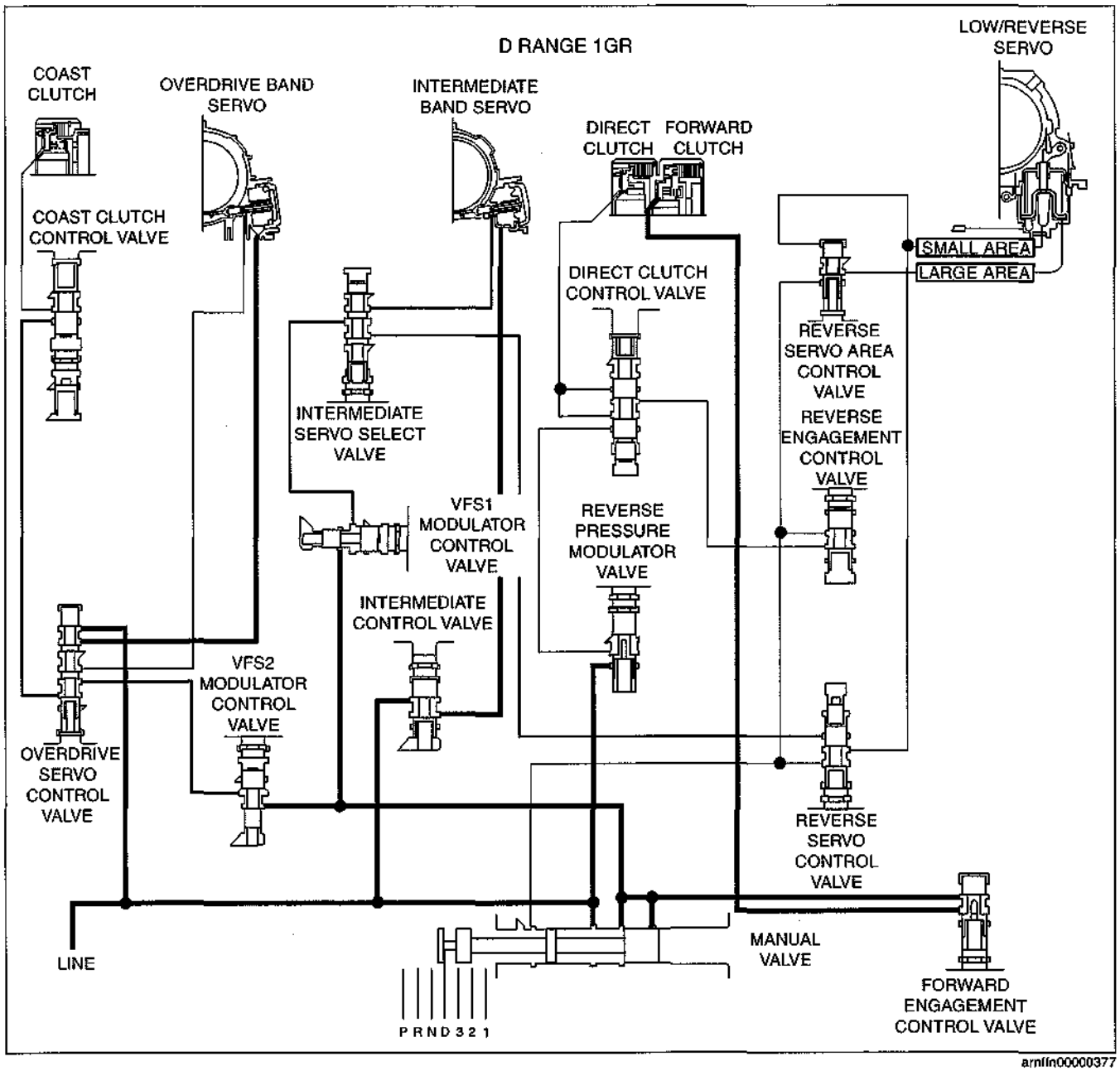
D Range, 1GR

- With the transmission in the D range, fluid under pressure is present at the following components in 1GR:
  - — Overdrive servo-release
  - — Intermediate servo-release
  - — Forward clutch



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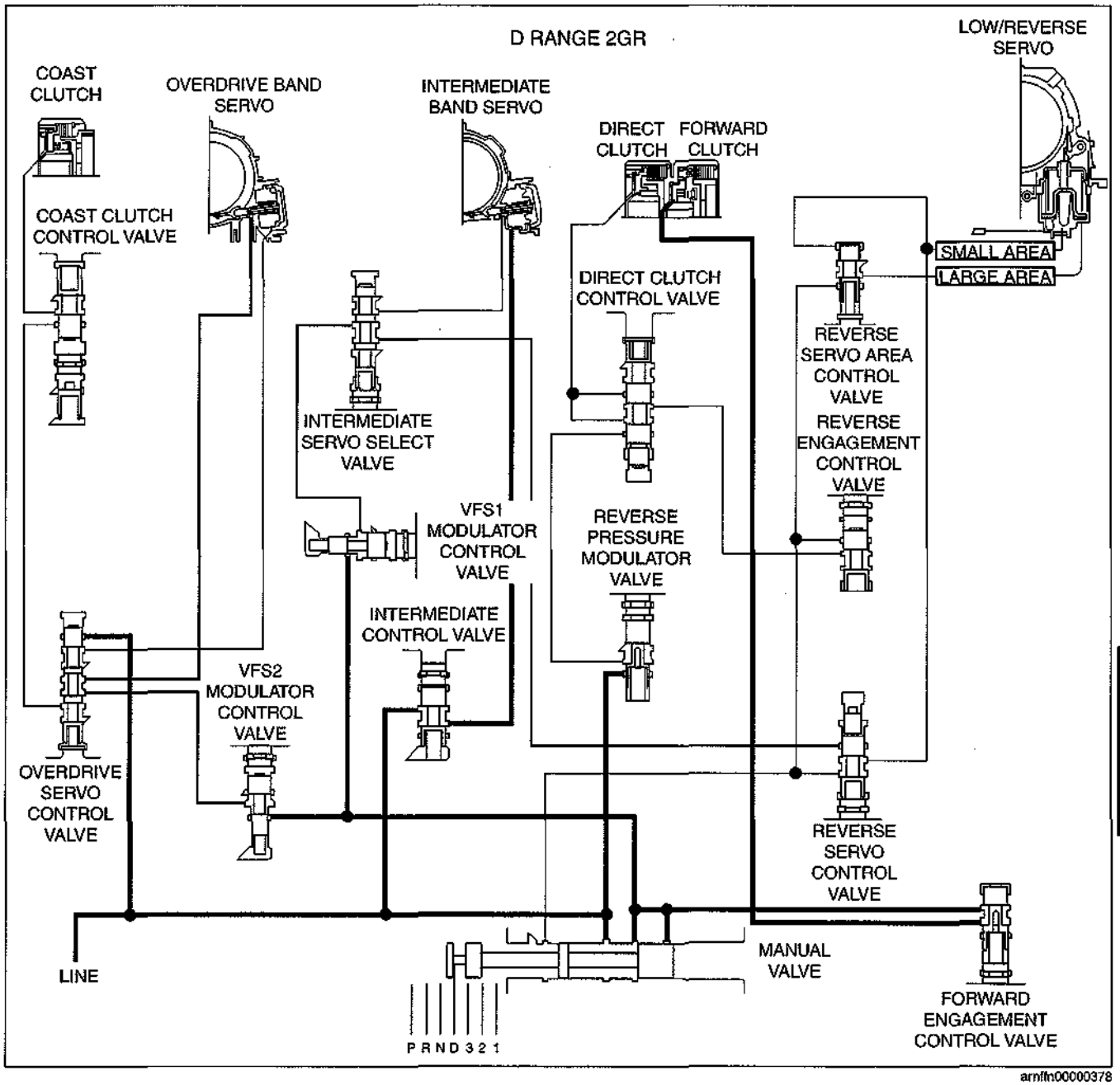
D Range, 2GR

- With the transmission in the D range, fluid under pressure is present at the following components in 2GR:
  - — Overdrive servo-apply
  - — Intermediate servo-release
  - — Forward clutch



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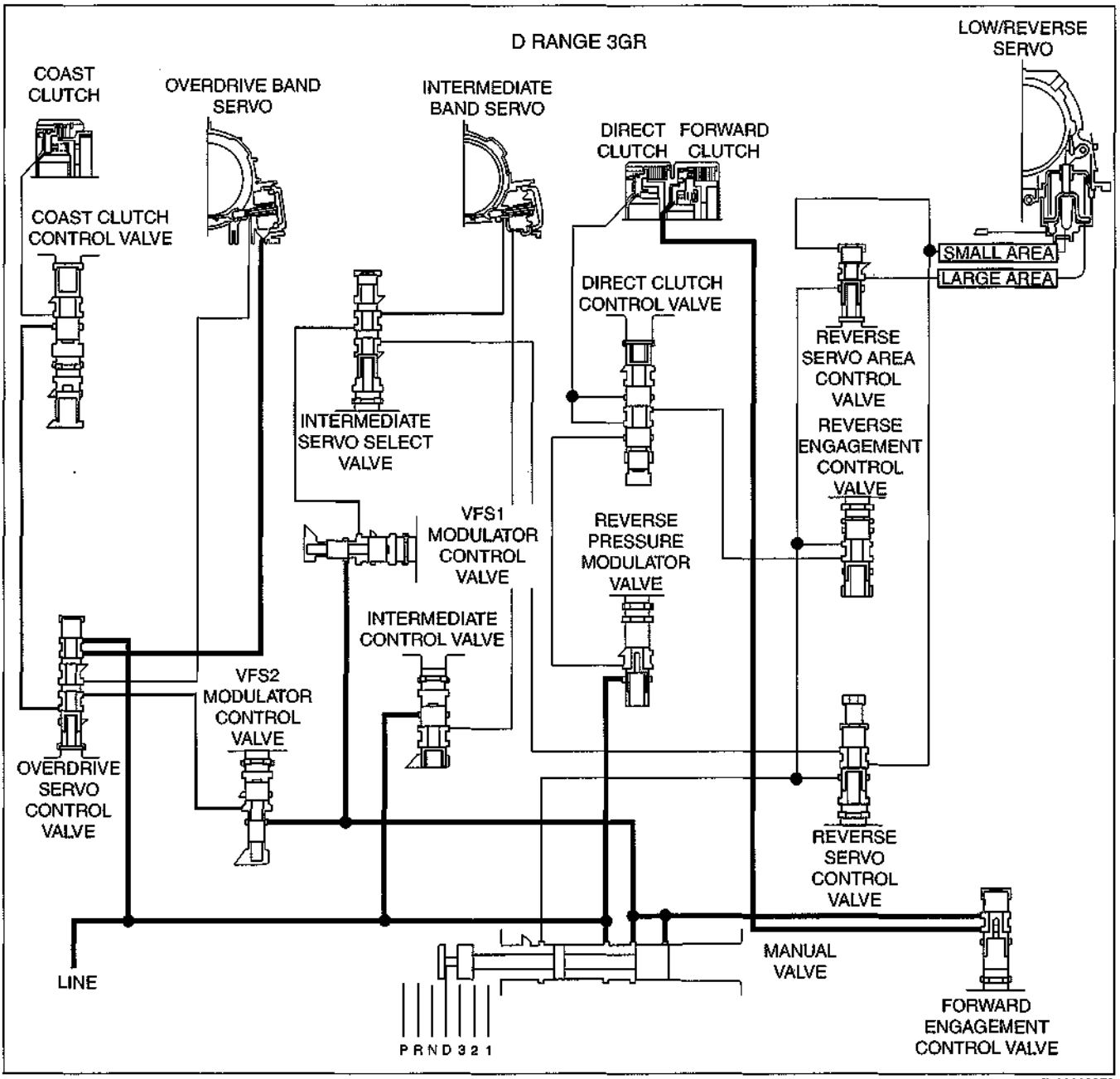
D range, 3GR

- With the transmission in the D range, fluid under pressure is present at the following components in 3GR:
  - — Overdrive servo-release
  - — Intermediate servo-apply
  - — Forward clutch



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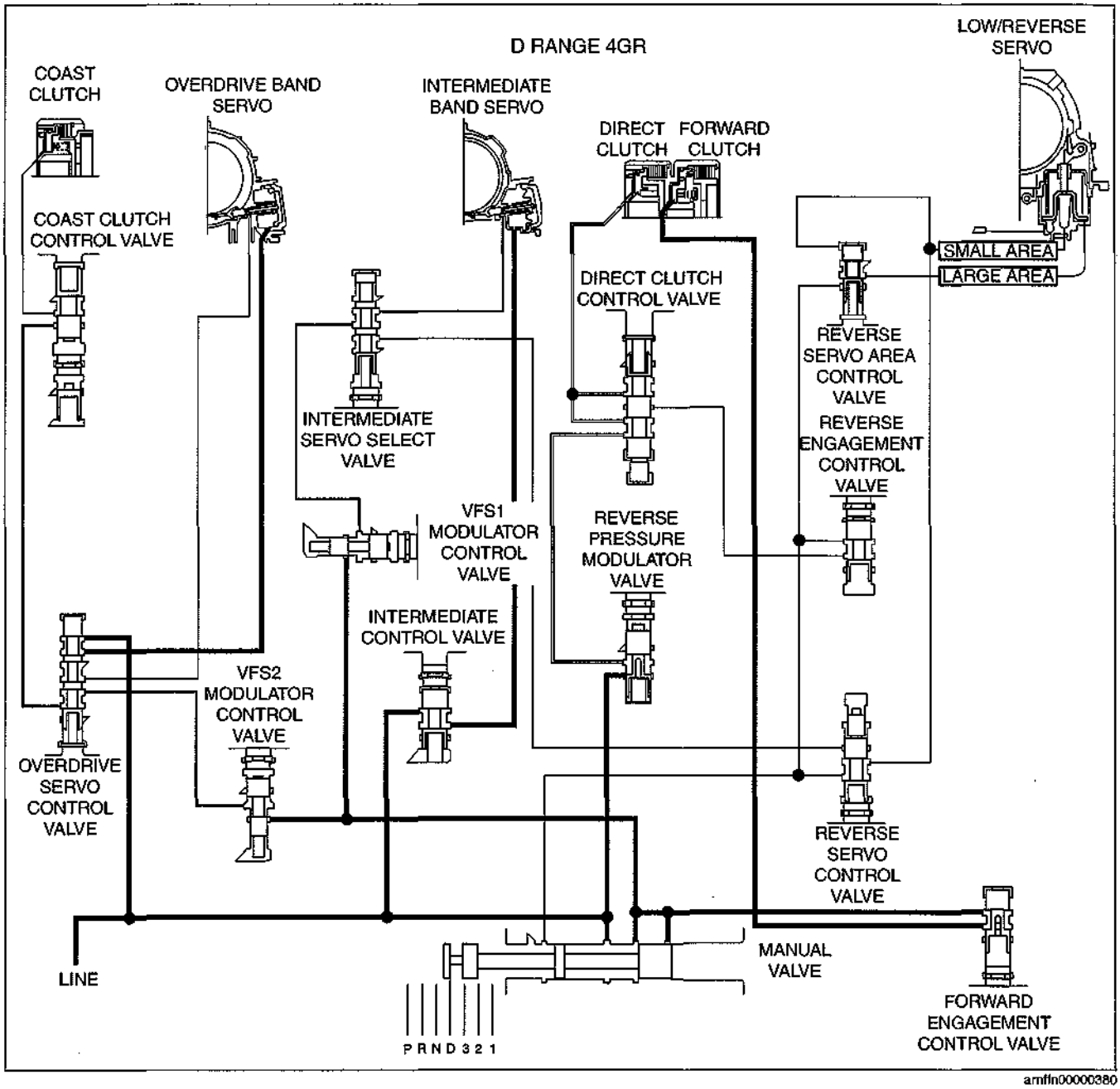
D range, 4GR

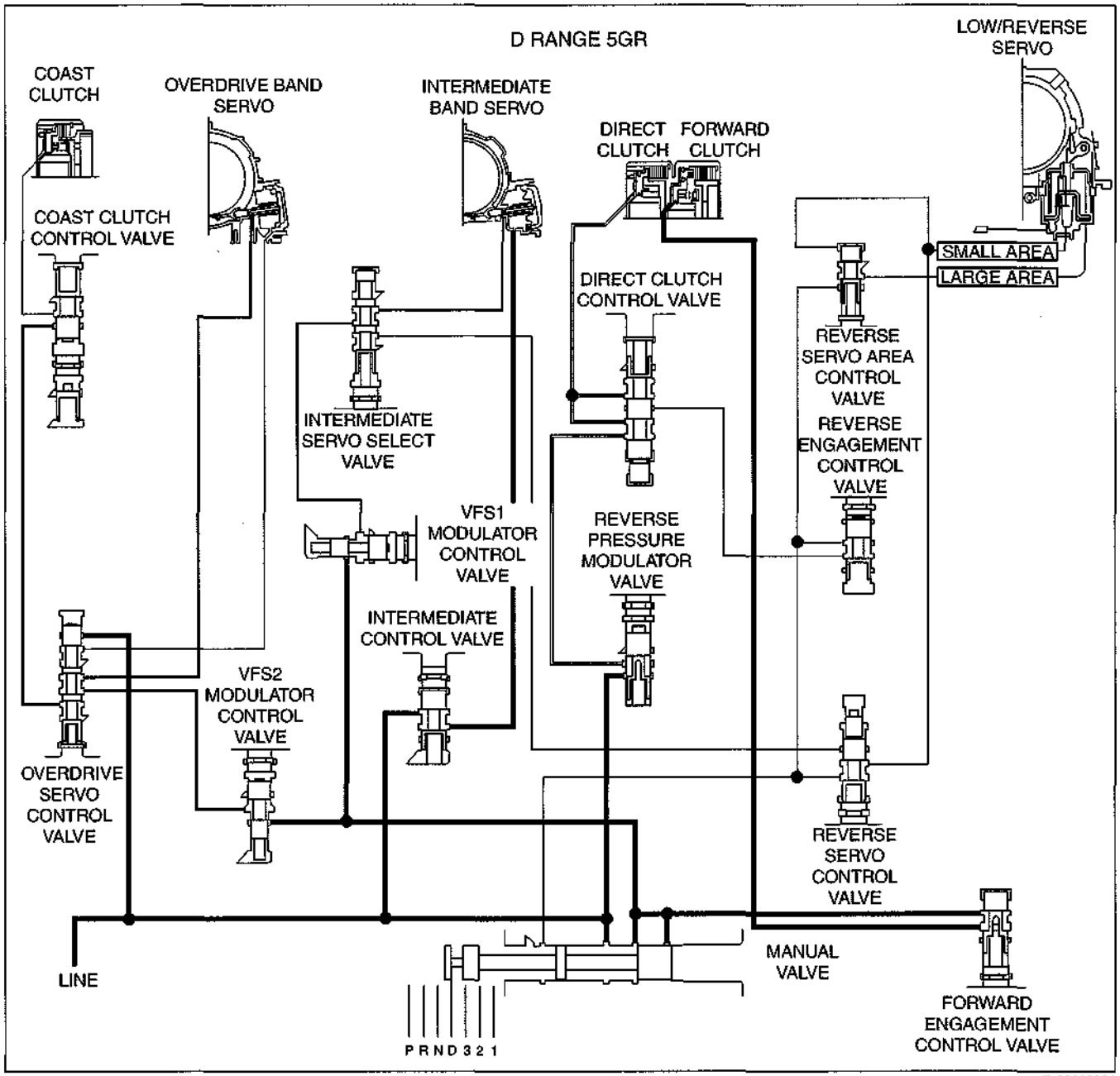
- With the transmission in the D range, fluid under pressure is present at the following components in 4GR:
  - — Overdrive servo-release
  - — Intermediate servo-release
  - — Forward clutch
  - — Direct clutch



amfln00000380

D range, 5GR

- With the transmission in the D range, fluid under pressure is present at the following components in 5GR:
  - — Overdrive servo-apply
  - — Intermediate servo-release
  - — Forward clutch
  - — Direct clutch



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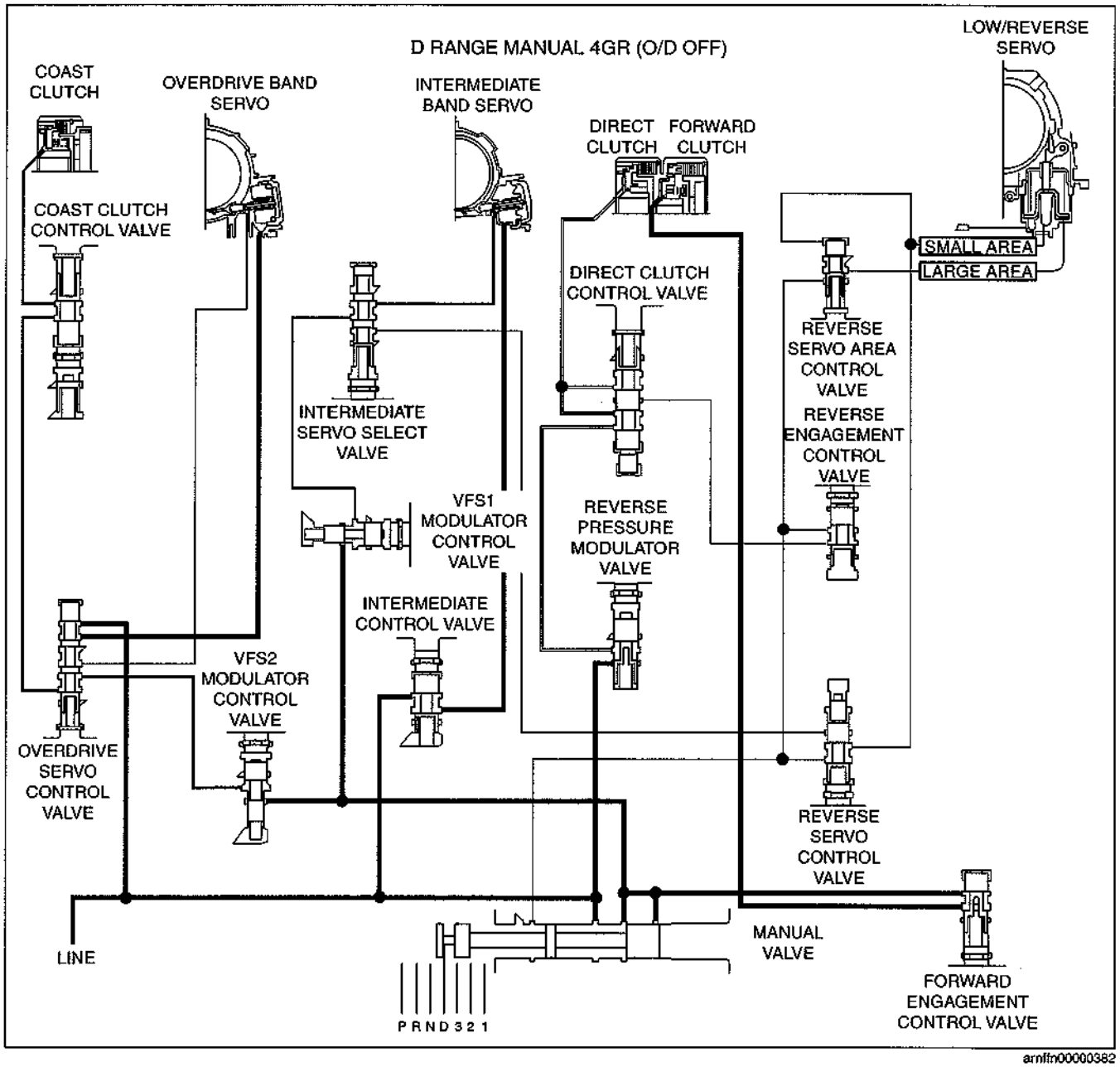
D range O/D OFF Mode, 4GR (Manual 4GR)

- With the transmission in the D range (O/D OFF mode), fluid under pressure is present at the following components in manual 4GR:
  - — Overdrive servo-release
  - — Intermediate servo-release
  - — Forward clutch
  - — Direct clutch
  - — Coast clutch



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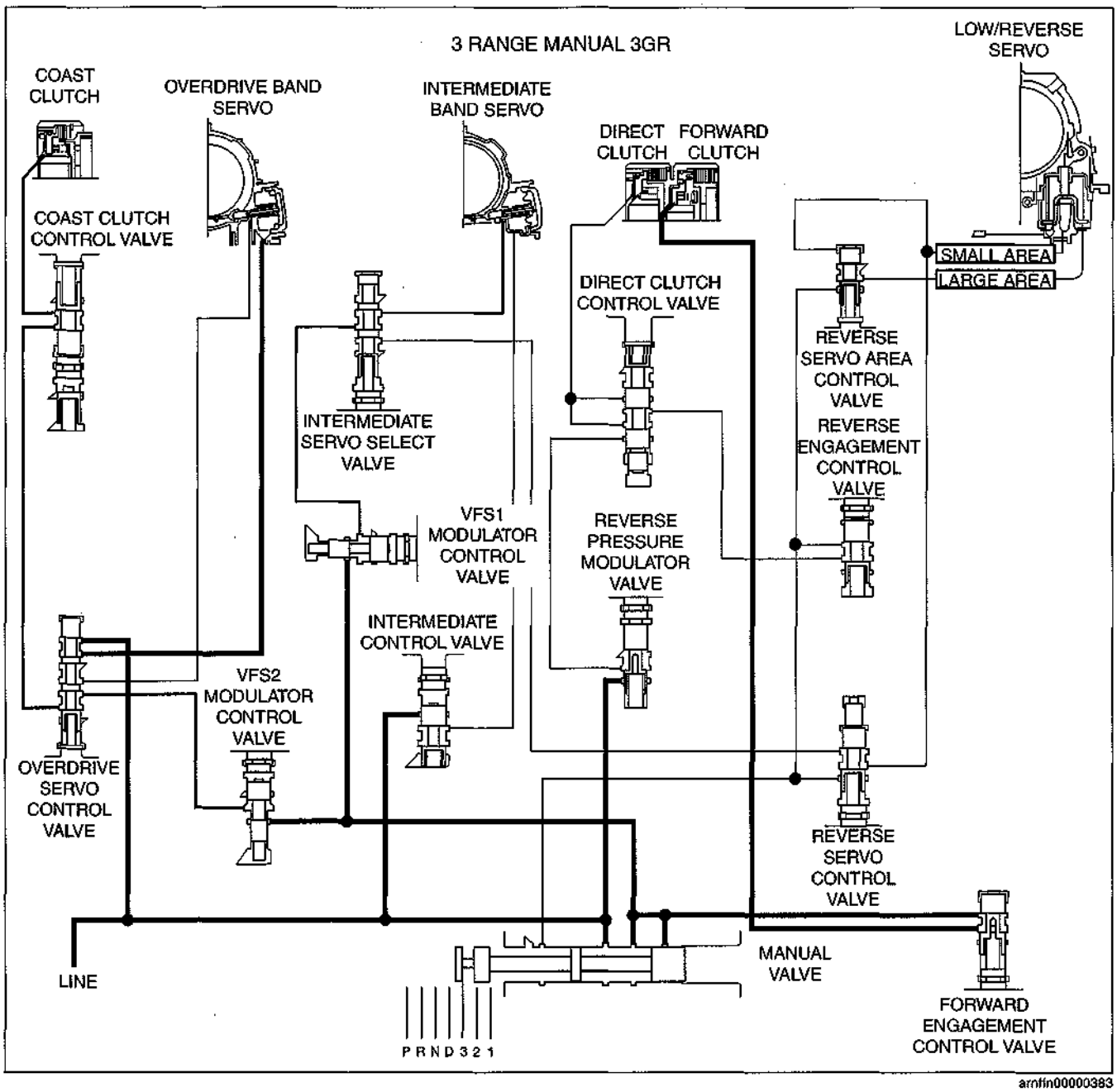
3 Range (Manual 3GR)

- With the transmission in the 3 range, fluid under pressure is present at the following components in manual 3GR:
  - — Overdrive servo-release
  - — Intermediate servo-apply
  - — Forward clutch
  - — Coast clutch



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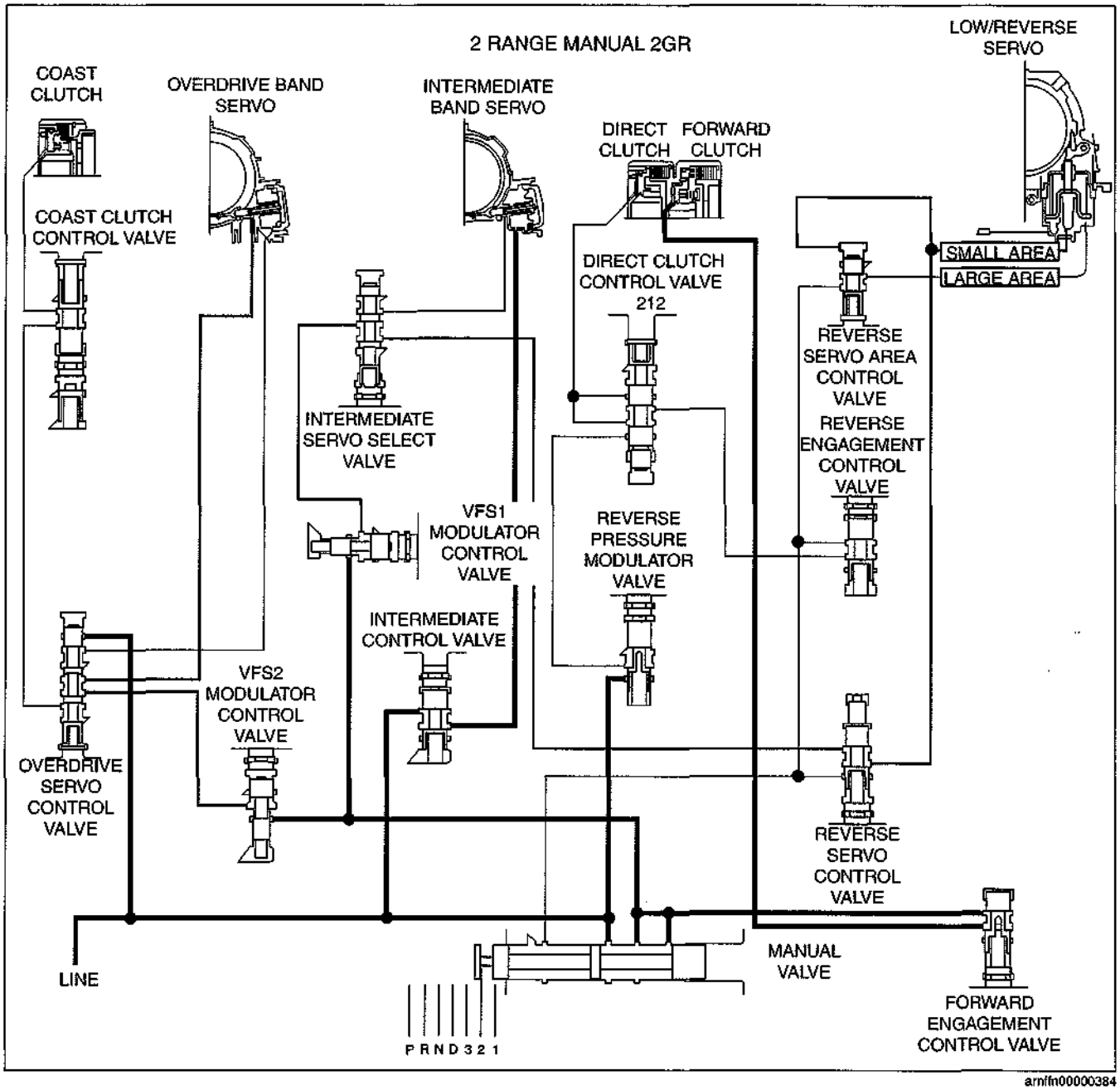
2 Range (Manual 2GR)

- With the transmission in the 2 range, fluid under pressure is present at the following components in manual 2GR:
  - — Overdrive servo-apply
  - — Intermediate servo-release
  - — Forward clutch
  - — Low/reverse servo-apply



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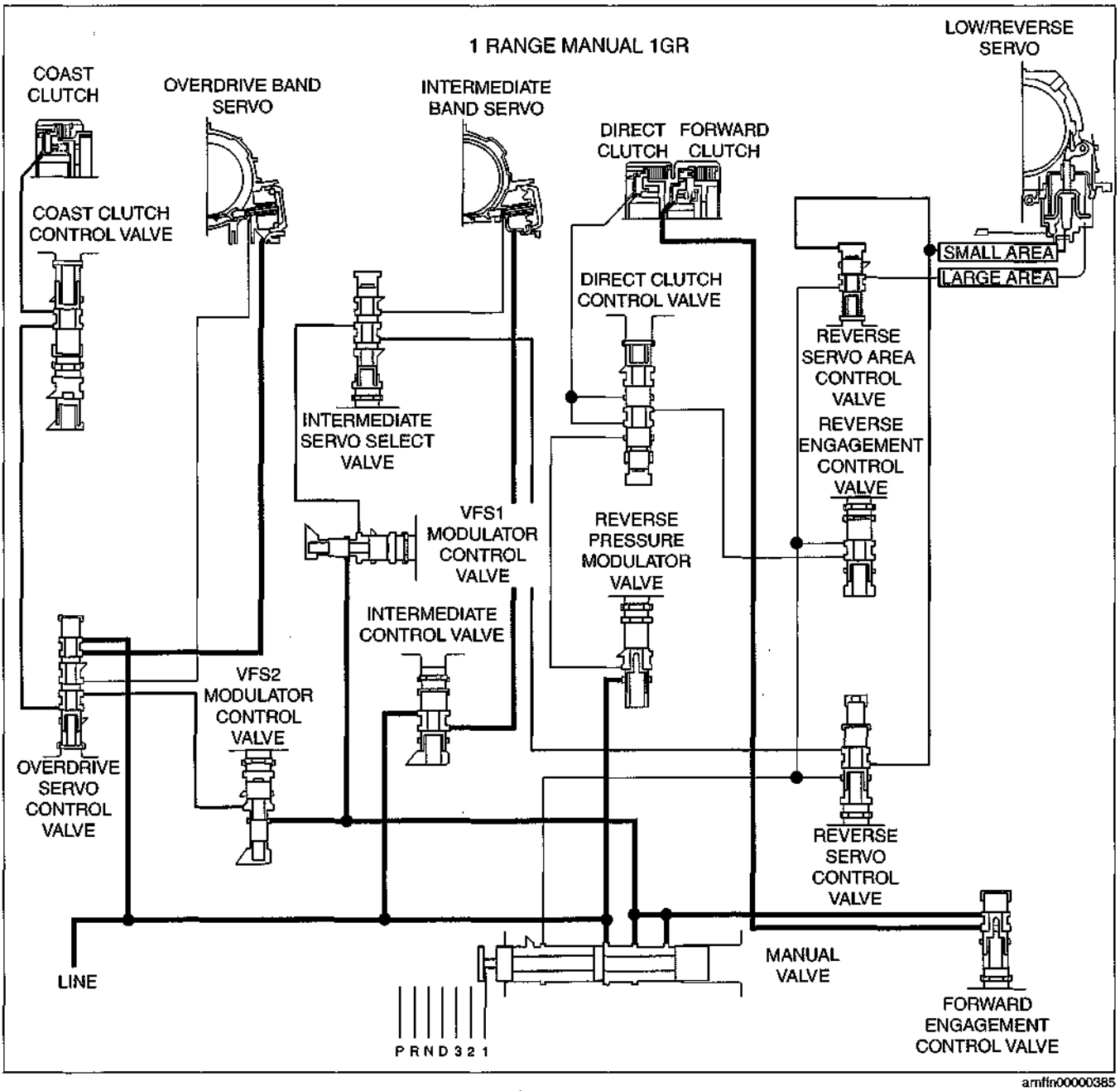
1 Range (Manual 1GR)

- With the transmission in the 1 range, fluid under pressure is present at the following components in manual 1GR:
  - — Overdrive servo-release
  - — Intermediate servo-release
  - — Forward clutch
  - — Coast clutch
  - — Low/reverse servo-apply



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ELECTRONIC CONTROL SYSTEM OUTLINE [5R55S]

id0513c1221600

- The TCM and its input/output network control the following transmission operations:
  - — Shift timing
  - — Line pressure (shift feel)
  - — Torque converter clutch
- The transmission control strategy combined with the engine control provides optimum powertrain operation under all conditions.
- When determining the best operating strategy for transmission operation, the TCM uses input information from the PCM via the CAN bus. In addition, the TCM receives input signals from certain transmission-related sensors and switches.
- The TCM also uses these signals when determining transmission operating strategy.
- Using all of these input signals, the TCM can determine when the time and conditions are right for a shift or when to apply or release the torque converter clutch.
- It will also determine the pressure needed to optimize shift feel.
- To accomplish this the PCM uses 3 pressure controls, 1 torque converter clutch and 4 shift solenoids to control transmission operation.

ELECTRONIC CONTROL SYSTEM BLOCK DIAGRAM [5R55S]

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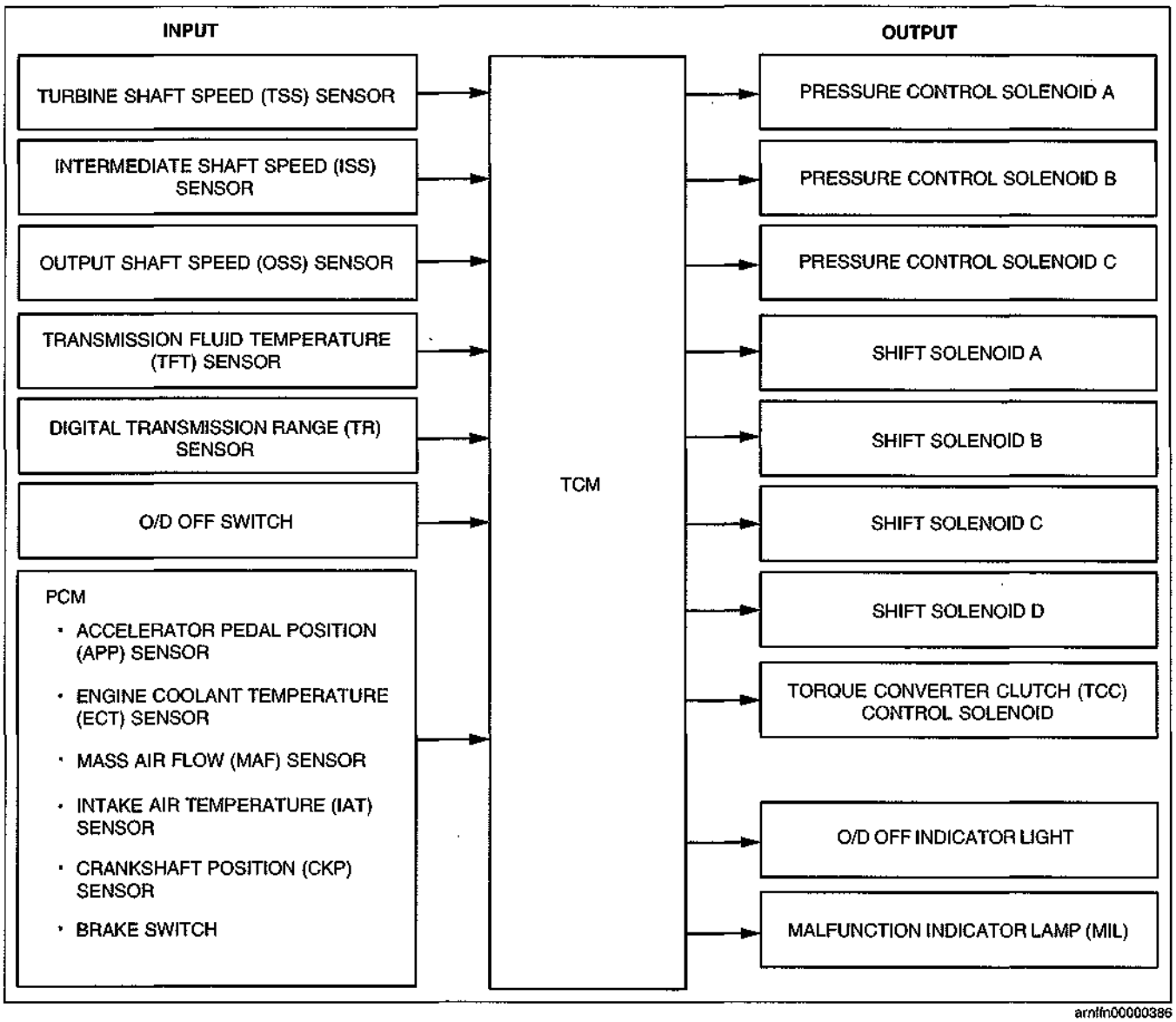

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ELECTRONIC CONTROL SYSTEM STRUCTURE [5R55S]

id0513c1221900

TCM
- The operation of the transmission is controlled by the TCM.
- Many input sensors provide information to the TCM. The TCM then controls the actuators which determine transmission operation.

Air Conditioning (A/C) Clutch
- An electromagnetic clutch is energized when the clutch cycling pressure switch closes.
- The switch is located on the suction accumulator/drier.
- The closing of the switch completes the circuit to the clutch and draws it into engagement with the compressor driveshaft.
- When the A/C is engaged, operating pressures are adjusted to compensate for additional load on the engine.

Brake Switch
- The brake switch tells the PCM when the brakes are applied.
- The PCM sends this message to TCM via CAN bus.
- The torque converter clutch disengages when the brakes are applied.
- The brake switch closes when the brakes are applied and opens when they are released.

Engine Coolant Temperature (ECT) Sensor
- The ECT sensor detects temperature of engine coolant and supplies the information to the PCM.
- The PCM sends this message to TCM via CAN bus.
- The ECT sensor is used to control torque converter clutch (TCC) operation.

Crankshaft Position (CKP) Sensor
- The CKP sensor detects pulse wheel rotational signals as crank angle signals.
- The PCM sends this message to TCM via CAN bus.
- The PCM uses engine speed signal in the transmission strategy, wide-open throttle (WOT) shift control, torque converter clutch control and operating pressures.

Mass Air Flow (MAF) Sensor
- The MAF sensor measures the mass of air flowing into the engine.
- The PCM sends this message to TCM via CAN bus.
- The MAF sensor output signal is used by the PCM to calculate injector pulse width.
- For transmission strategies, the MAF sensor is used to regulate electronic pressure control, shift and torque converter clutch scheduling.

O/D OFF Switch
- The O/D OFF switch is a momentary contact switch that allows the driver to cancel operation of 5GR.
- The O/D OFF switch is located on the left side of the selector lever.
- When the driver initially presses the O/D OFF switch a signal is sent to the TCM.
- The TCM uses the shift solenoids to disengage/disable 5GR operation and activate the coast clutch. At the same time, the TCM illuminates the O/D OFF Indicator Light to notify the driver that 5GR is canceled.
- When the O/D OFF switch is pressed again, 5GR operation is enabled, the coast clutch is released and the O/D OFF indicator light is turned off.
- Whenever the ignition is cycled (vehicle shut off, then started again), the O/D OFF switch is turned off and 5GR will be enabled, even if the O/D OFF switch had been on when the ignition was shut off.

O/D OFF Indicator Light
- The O/D OFF indicator light is located in the instrument panel and is labeled O/D OFF. It is illuminated in conjunction with the O/D OFF switch.

Accelerator Pedal Position (APP) Sensor
- The APP sensor is mounted on the accelerator pedal. The APP sensor detects the position of the accelerator pedal and inputs this information as a voltage to the PCM.
- The PCM sends this message to TCM via CAN bus.
- The TCM uses the APP sensor information to aid in determining shift scheduling, presser control and torque converter control.

Digital Transmission Range (TR) Sensor
- The digital TR sensor is located on the outside of the transmission at the manual lever.
- The digital TR sensor completes the start circuit in PARK, NEUTRAL and the back-up lamp circuit in REVERSE.
- The digital TR sensor also opens and closes a set of 4 switches that are monitored by the TCM to determine the position of the manual lever (P, R, N, D, 3, 2, 1).

Turbine Shaft Speed (TSS) Sensor
- The TSS sensor is a magnetic pickup that sends the TCM torque converter turbine speed information.
- The TSS sensor is mounted externally on the case.
- The TCM uses TSS information to help determine appropriate operating pressures and TCC operation.

Output Shaft Speed (OSS) Sensor
- The OSS sensor is a magnetic pickup, located at the park gear trigger wheel assembly, that sends a signal to the TCM to indicate transmission output shaft speed.
- The OSS sensor is mounted externally on the case.
- The OSS is used for torque converter clutch control, shift scheduling and to determine pressure control.

Intermediate Shaft Speed (ISS) Sensor
- The ISS sensor is a magnetic pickup that sends planetary sun gear speed information to the TCM.
- It is mounted externally on the center of the case.
- The TCM uses the intermediate shaft speed sensor information to aid in determining pressure requirements.

Pressure Control Solenoid A, B and C
- The pressure control solenoids are a variable-force style (VFS) solenoid. The VFS-type solenoid is an electro-hydraulic actuator combining a solenoid and a regulating valve.
- The line pressure tap is used to verify output pressure from pressure control solenoid A or B by turning either one off while verifying the output from the other solenoid.
- The second pressure tap is used to verify the output from the pressure control solenoid C.
- There are 3 pressure control solenoids located in the solenoid body assembly used to control line pressure, band and clutch application pressure within the transmission.
- The TCM varies the current to the pressure control solenoid.
- The TCM has an adaptive learn strategy to electronically control the transmission which will automatically adjust the shift feel. When the battery has been disconnected or a new battery installed, certain transmission operating parameters may be lost. The TCM must relearn these parameters.
- During this learning process you may experience slightly firm shifts, delayed or early shifts. This operation is considered normal and will not affect the function of the transmission. Normal operation will return once these parameters are stored by the TCM.

Torque Converter Clutch (TCC) Control Solenoid
- The TCC control solenoid is a pulse width modulating type solenoid which is used to control the apply and release of the TCC.

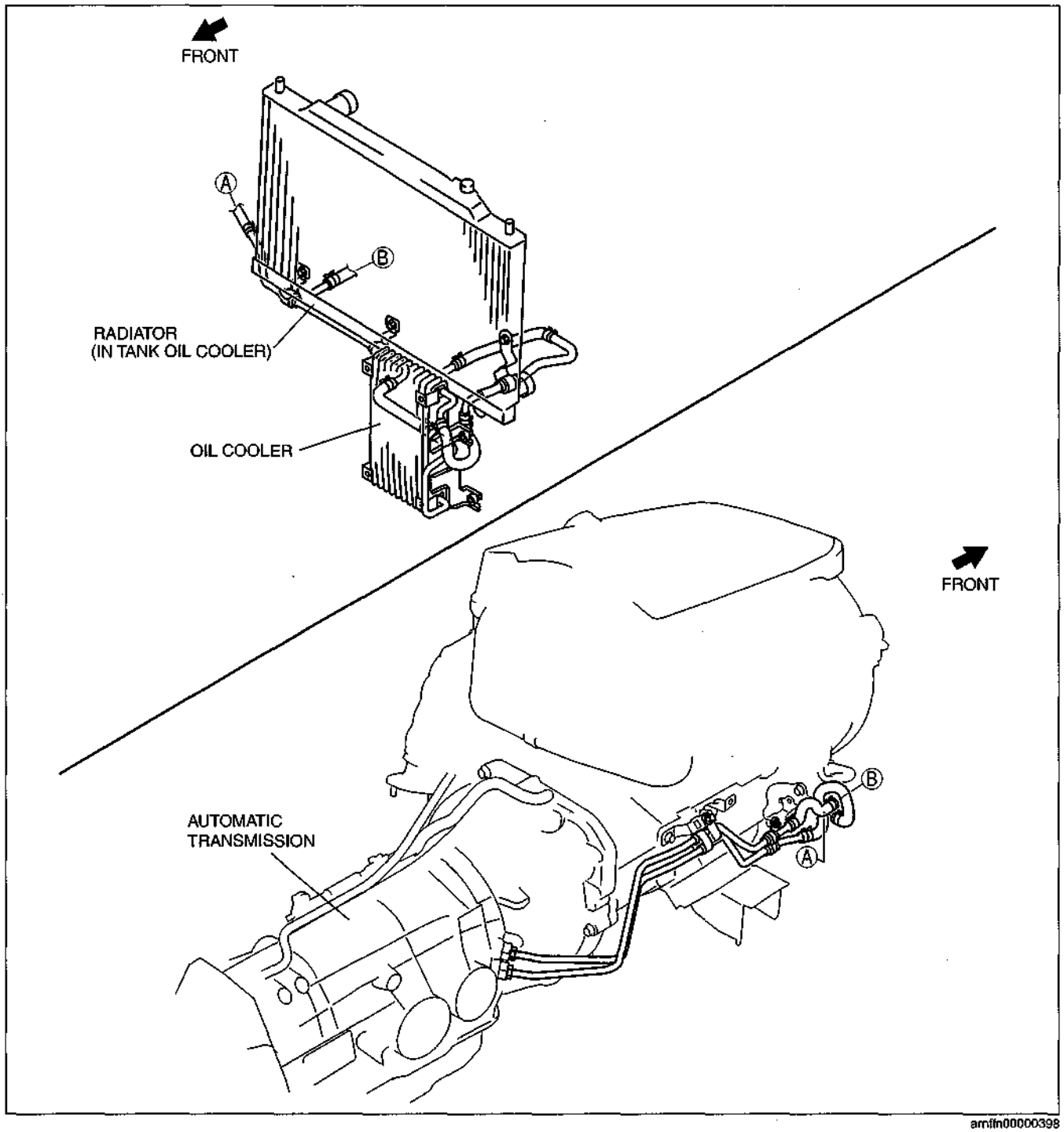
Shift Solenoid A, B, C and D
- Four ON/OFF shift solenoids allow the TCM to control shift scheduling.
  - — The solenoids are 3-way, normally open style.
  - — The shift solenoids shift solenoid A, B, C and D provide gear selection of 1GR through 5GR and REVERSE gears by directing pressure control pressures to the appropriate elements.
- Coast braking and manual gears are also controlled by the shift solenoids.

Transmission Fluid Temperature (TFT) Sensor
- The TFT sensor is a thermistor-type sensor that varies a reference voltage signal. The resistance in the TFT varies with temperature.
- The TCM monitors the voltage signal across the TFT and uses this information to determine the transmission fluid temperature.
- The TFT is located on the solenoid body.
- The TCM uses the TFT signal to help determine shift scheduling, torque converter clutch operation and pressure control requirements.
- It sends a voltage signal to the TCM. The voltage signal varies with transmission fluid temperature. The TCM uses this signal to determine whether a cold start shift schedule is necessary. The shift schedule is compensated when the transmission fluid temperature is cold. The TCM also inhibits TCC operation at low transmission fluid temperatures and uses it to determine PC solenoid operations.

OIL COOLER CONSTRUCTION [5R55S]

id0513c1221500

- A water-cooling type AT oil cooler has been adopted and is installed in the radiator. The oil cooler cools the heated ATF in the AT.
- An air-cooling type AT oil cooler has also adopted.



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05-14 AUTOMATIC TRANSMISSION SHIFT MECHANISM

AUTOMATIC TRANSMISSION SHIFT MECHANISM OUTLINE..... 05-14–1
AUTOMATIC TRANSMISSION SHIFT MECHANISM STRUCTURAL VIEW 05-14–1

AUTOMATIC TRANSMISSION SHIFT MECHANISM OUTLINE

id051400219700

- The cable type shift mechanism has been adopted.
- The floor-shift type selector lever has been adopted.

AUTOMATIC TRANSMISSION SHIFT MECHANISM STRUCTURAL VIEW

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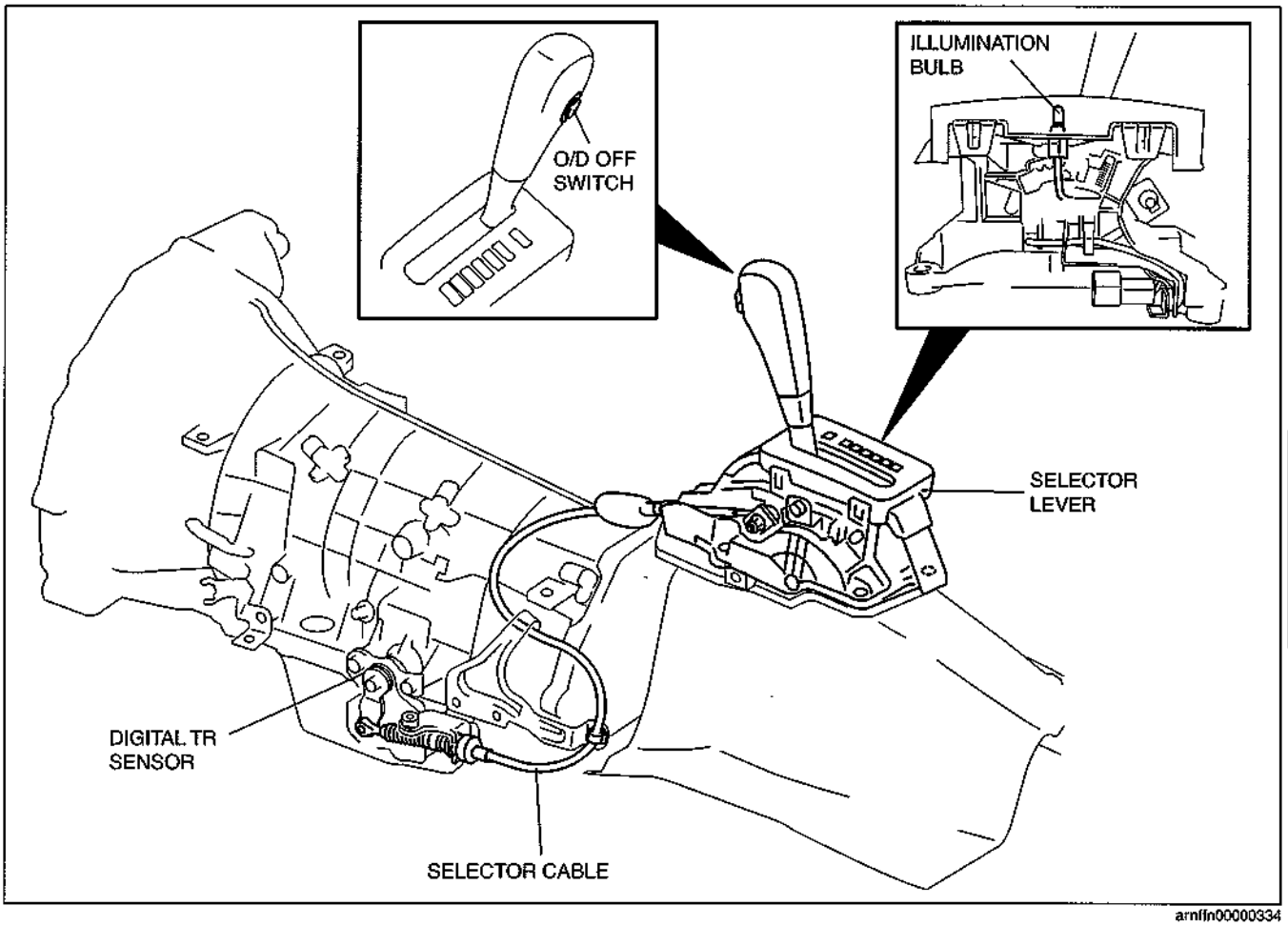

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STEERING

06 SECTION

OUTLINE 06-00
POWER STEERING 06-14

06-00 OUTLINE

STEERING ABBREVIATION. 06-00–1
STEERING FEATURES. 06-00–1
STEERING SPECIFICATIONS. 06-00–1

STEERING ABBREVIATION

dcf060000000l01

ATF	Automatic Transmission Fluid

STEERING FEATURES

dcf060000000l02

Improved handling stability	• Engine speed sensing power steering adopted
Improved operability	• Steering shaft with a tilt mechanism adopted (Some models)
Improved safety	• Collapsible steering shaft adopted

STEERING SPECIFICATIONS

dcf060000000l03

Item			Specification
Steering wheel	Outer diameter (mm {in})		380 {15.0} [with air bag], 390 {15.4} [without air bag]
	Lock-to-lock (turns)		3.7
Steering column and shaft	Shaft type		Collapsible
	Joint type (mm {in})		Rubber coupling
	Amount of tilt (mm {in})		30 {1.2}
Steering gear and linkage	Type		Ball nut
Power steering system	Power assist type		Engine speed sensing
	Power steering fluid	Type	ATF M-III or equivalent (e.g. Dexron®II)
		Fluid capacity*1 (approx quantity) (L {US qt, Imp qt})	1.1 {1.2, 1.0}

*1 : When fluid reservoir is at maximum volume.

06-14 POWER STEERING

POWER STEERING OUTLINE 06-14–1
POWER STEERING STRUCTURAL VIEW 06-14–2
STEERING GEAR AND LINKAGE CONSTRUCTION 06-14–3
POWER STEERING OIL PUMP CONSTRUCTION 06-14–4
STEERING SHAFT CONSTRUCTION ... 06-14–5

POWER STEERING OUTLINE

dcf061400000101

- With the adoption of an engine speed sensing power steering mechanism, handling stability has been improved.
- With the adoption of a steering column with a tilt mechanism, operability has been improved. (some models)
- With the adoption of a steering shaft with an energy absorbing mechanism, safety has been improved.

POWER STEERING STRUCTURAL VIEW

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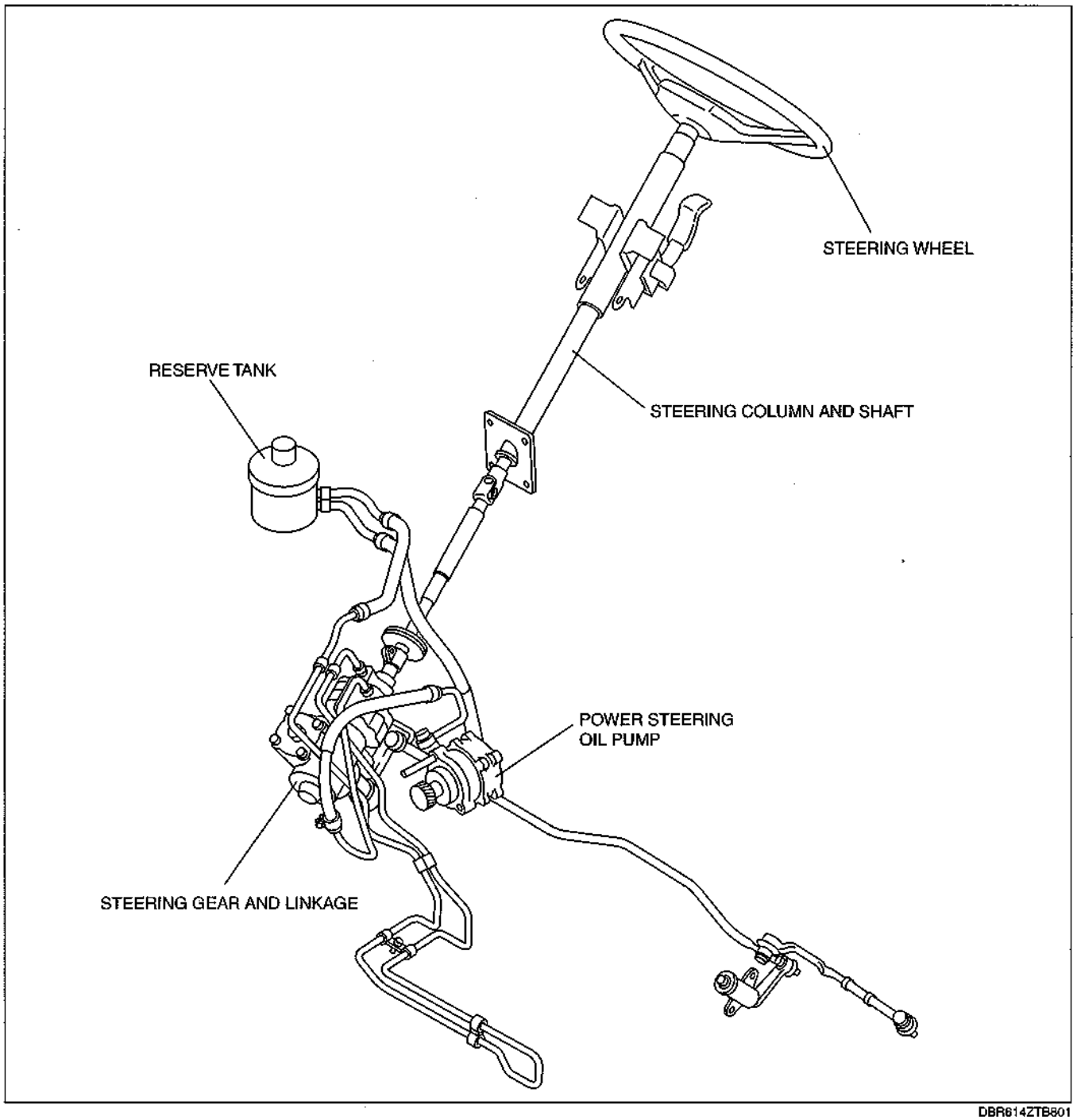
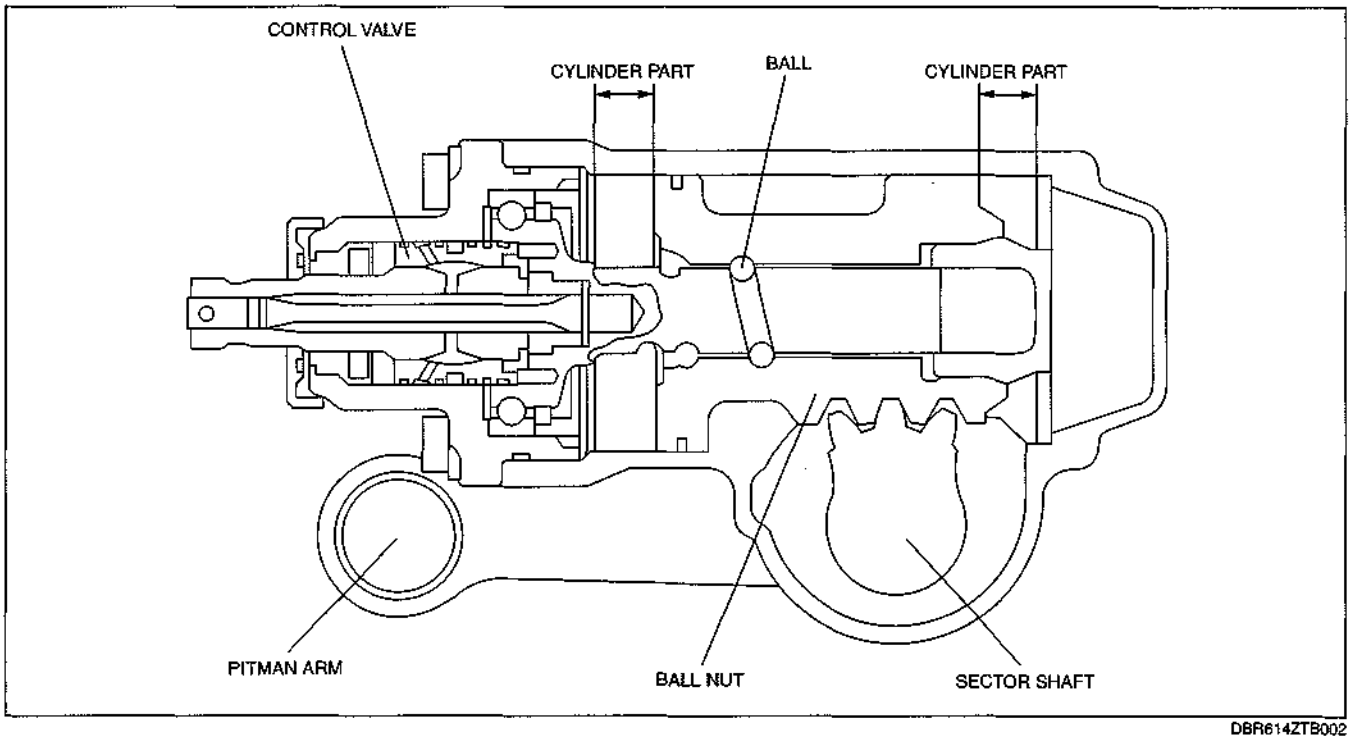


DBR614ZTB801

STEERING GEAR AND LINKAGE CONSTRUCTION

dcf06143296010l

- A ball nut type steering gear has been adopted.
- The hydraulic pressure from the oil pump is transmitted to the cylinder part by the control valve according to the operation of the steering wheel.
- The ball nut rotation resistance is reduced in proportion to the amount of the hydraulic pressure transmitted to the cylinder part.

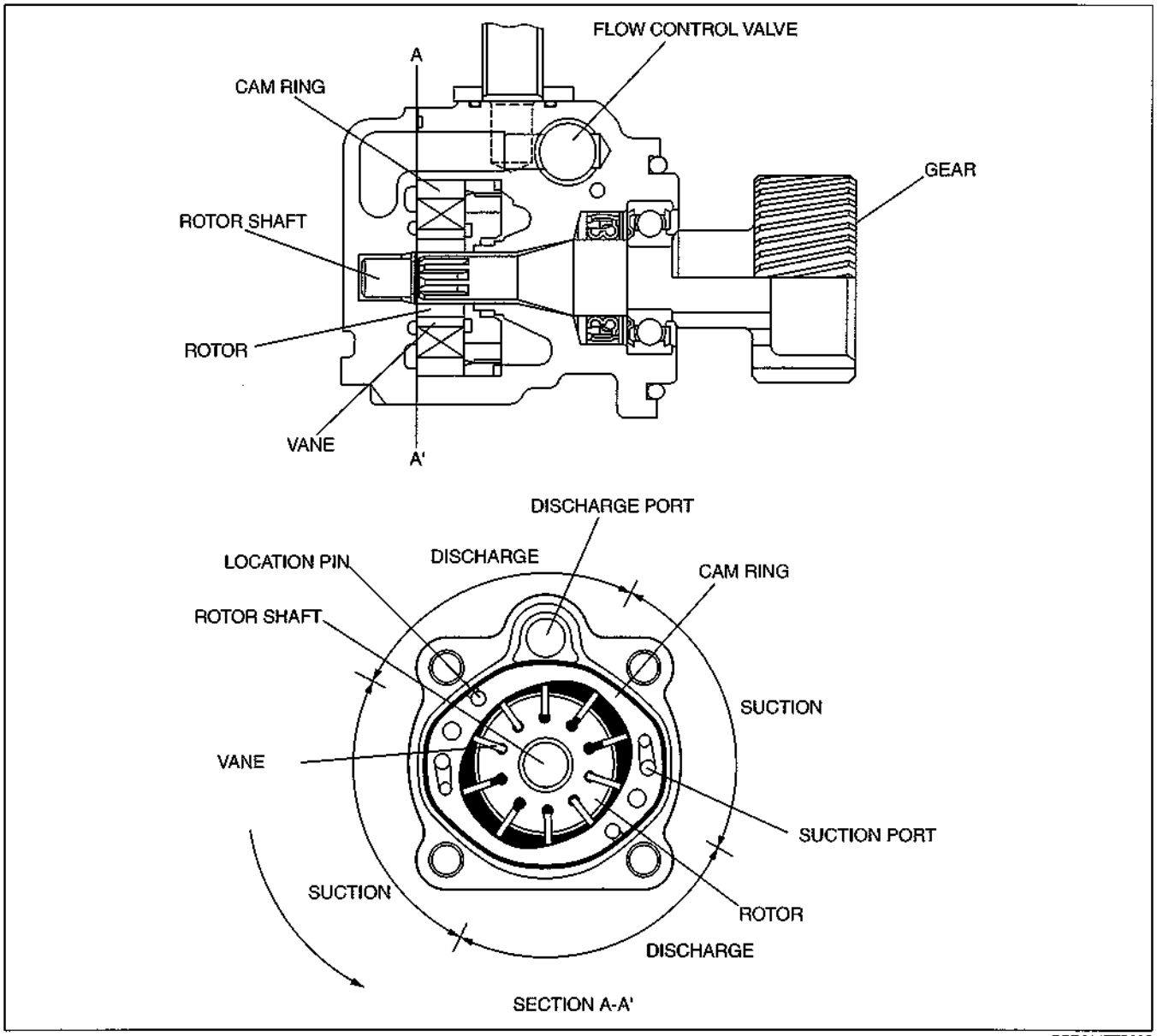


DBR614ZTB002

POWER STEERING OIL PUMP CONSTRUCTION

dcf06143265t01

- The oil pump is driven through the crankshaft (timing gear), idle gear, and vacuum pump gear. As a result, a lowering of performance due to belt slippage or breakage has been eliminated.
- A flow control valve which adjusts the amount of oil sent to the steering gear has been designed in the oil pump to control hydraulic pressure fluctuation according to engine speed.

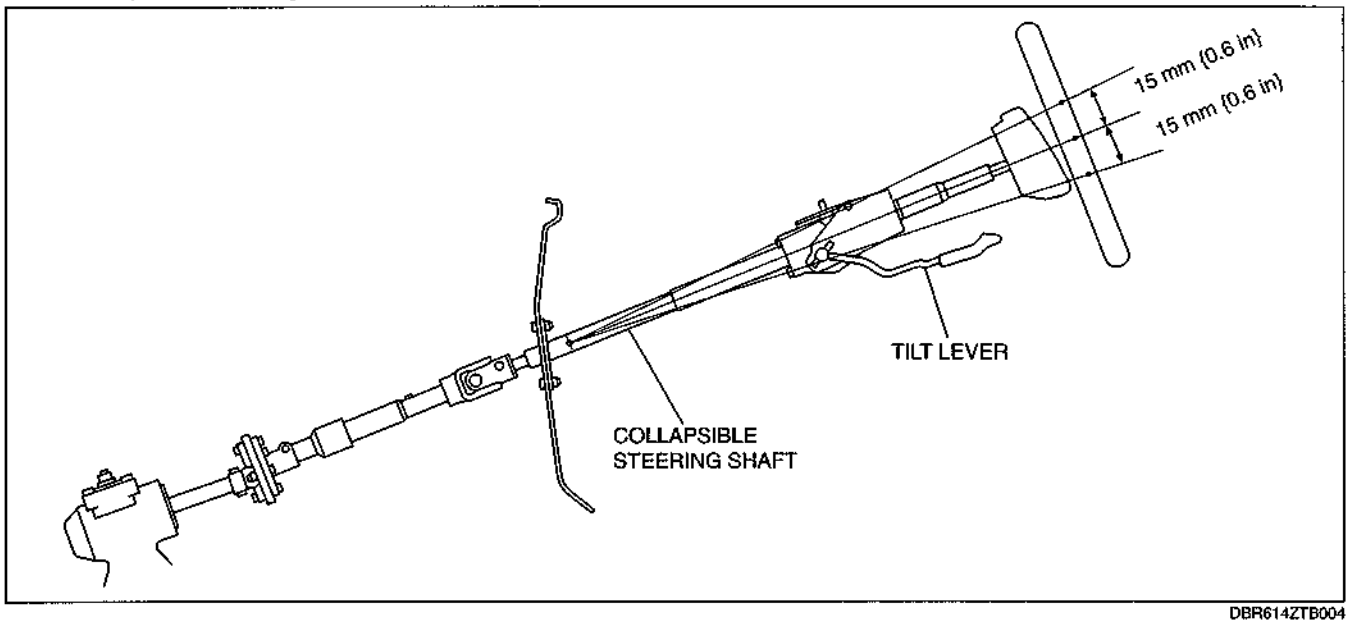


DBR614ZTB003

STEERING SHAFT CONSTRUCTION

dcf06143201001

- Tilt steering has been optionally equipped to adjust the position of the steering wheel to suit the driver's particular body shape and driving posture.
- The tilt system is adjustable by 30mm {1.2 in} in the up/down direction.
- A collapsible steering shaft has been adopted to minimize driver injury in the event of a frontal collision.



DBR614ZTB004

HEATER, VENTILATION & AIR CONDITIONING (HVAC)

07 SECTION

OUTLINE 07-00
BASIC SYSTEM. 07-11
CONTROL SYSTEM 07-40

07-00 OUTLINE

HVAC ABBREVIATION 07-00–1
HVAC FEATURES 07-00–1
HVAC SPECIFICATIONS 07-00–1

HVAC ABBREVIATION

dcf070000000t01

A/C	Air Conditioning
B+	Battery Positive Voltage
DEF	Defroster
HI	High
LOW	Low
M	Motor
MAX	Maximum
OFF	Switch Off
ON	Switch On
REC	Recirculate

HVAC FEATURES

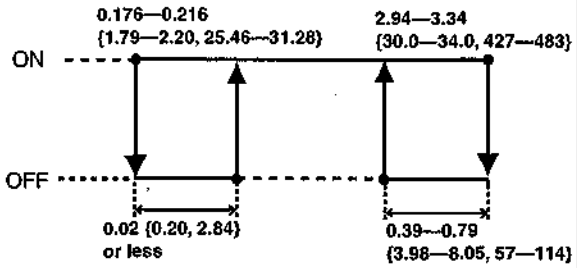
dcf070000000t02

Improved air conditioning performance	• Sub-cooling system to multi-flow condenser adopted

HVAC SPECIFICATIONS

dcf070000000t03

Item				Specification
Cooling capacity			(kW {kcal/h})	4.012 {3,450}
Airflow volume (during air conditioner operation)	Blower motor		(m^3/h)	450
Electricity consumption (during air conditioner operation)	Blower motor		(W)	220
	Magnetic clutch		(W)	48
Blower motor	Type			Sirocco fan
Refrigerant	Type			R-134a
	Regular amount (approx. quantity)		(g {oz})	475 {16.8}
A/C compressor	Type			Swash-plate
	Discharge capacity		(ml {cc, fl oz})	154 {154, 5.16}
	Max. allowable speed		(rpm)	7,000
	Lube oil	Type		FD46XG
		Sealed volume (approx. quantity)	(ml {cc, fl oz})	180 {180, 6.08}
	Magnetic clutch clearance		mm {in}	0.35—0.75 {0.014—0.029}

Item			Specification
Condenser	Type		Multiflow (sub-cooling type)
	Radiated heat	(kW {kcal/h})	10.46 {8,996}
	Receiver/drier capacity	(ml {cc, fl oz})	220 {220, 7.44}
	Desiccant		Synthetic zeolite
Expansion valve	Type		Internal pressure equalizar
Evaporator	Type		Single-tank drawn cup
Refrigerant pressure switch	Type		Dual-pressure type
	Operating pressure	(MPa {kgf/cm^2, psi})	
Fusible plug	Melting point	(°C (°F))	102—107 {216—224}

07-11 BASIC SYSTEM

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BLOWER UNIT
CONSTRUCTION/OPERATION 07-11–2
COOLING UNIT
CONSTRUCTION/OPERATION 07-11–3
A/C COMPRESSOR
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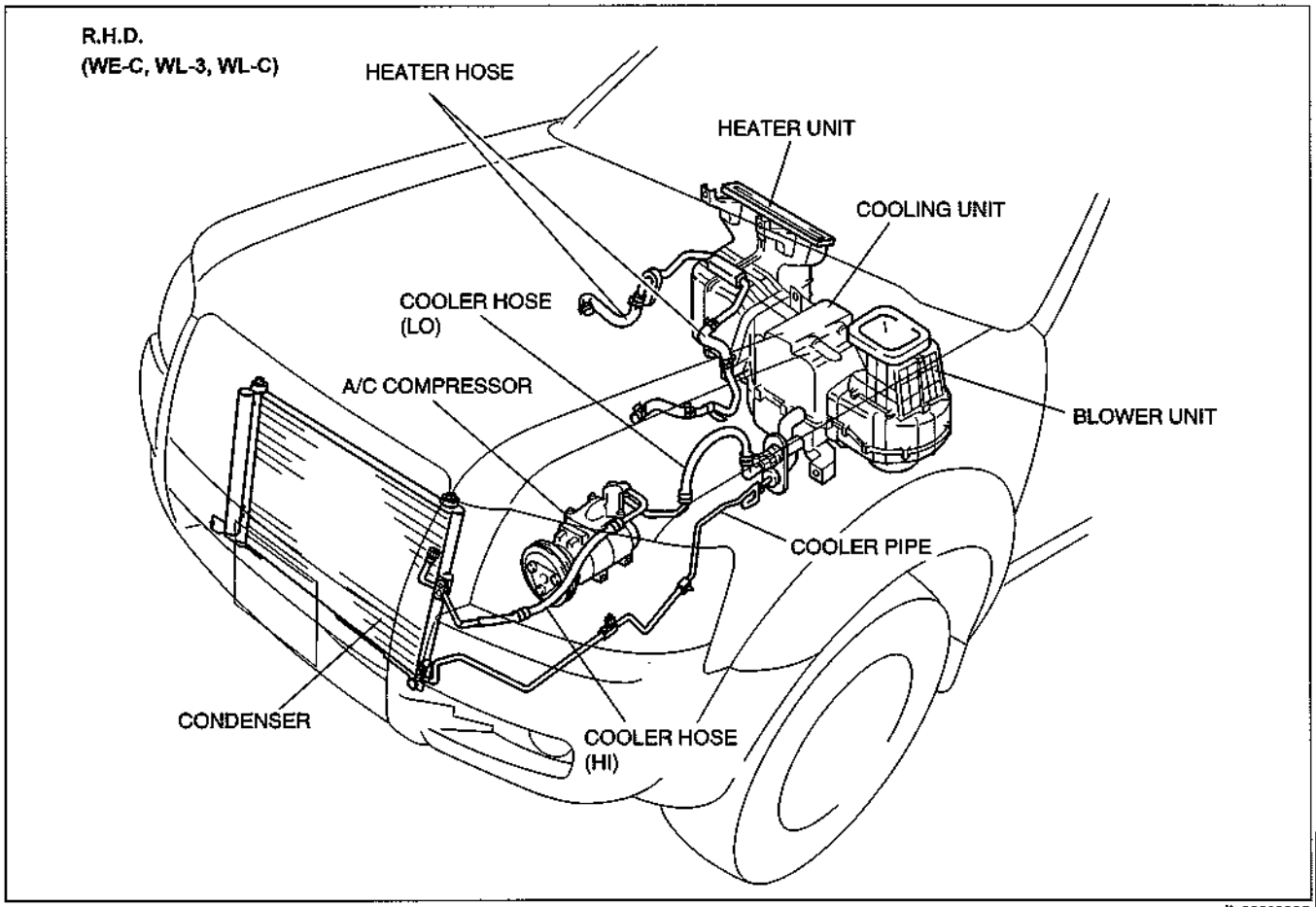
REFRIGERANT LINE
CONSTRUCTION.....07-11–5

BASIC SYSTEM LOCATION INDEX

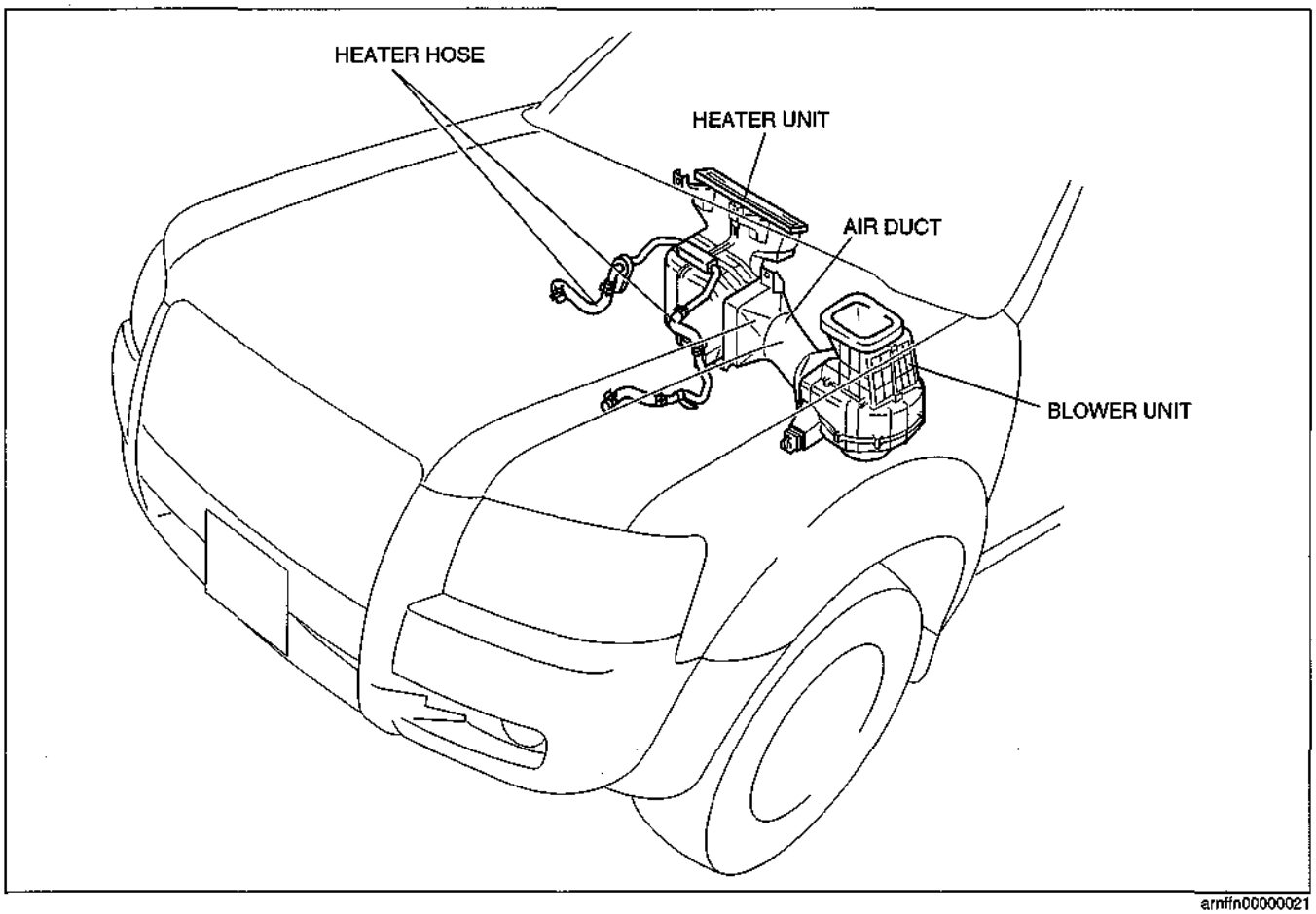
dcf071100000t01



arnfin00000055

07

Without A/C



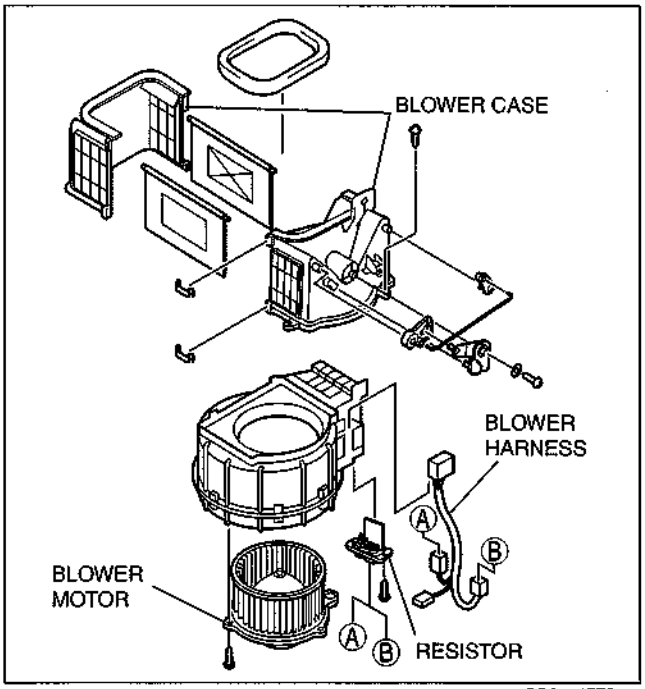
arnffn00000021

BLOWER UNIT CONSTRUCTION/OPERATION

dcl07116133t01

- The blower unit consists of a blower motor, resistor, blower harness, blower case.

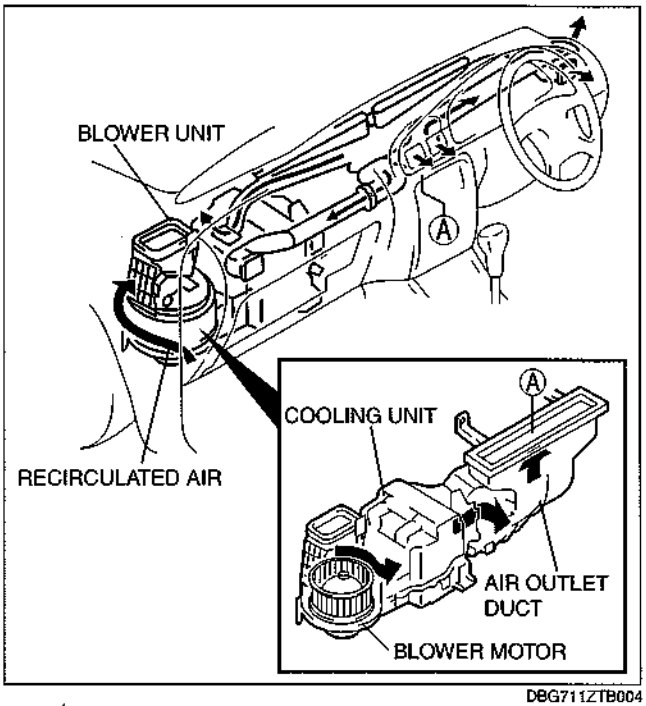
Construction



DBG711ZTB016

Operation

- The blower unit blows recirculated air into the passenger compartment.

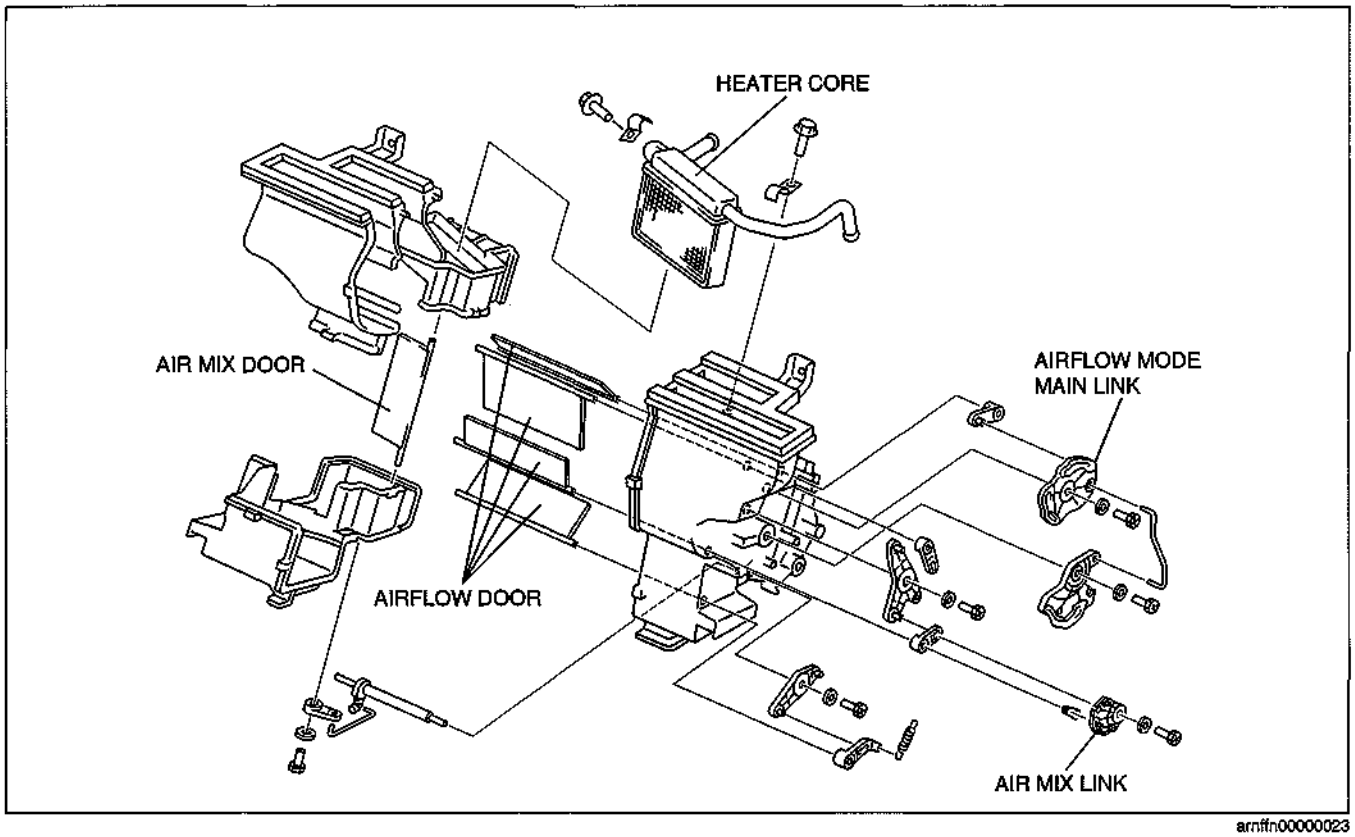


DBG711ZTB004

HEATER UNIT CONSTRUCTION

Id071100806100

- The heater unit consists of a heater core, airflow mode main link, air mix link etc.
- The heater unit regulates the airflow mode and the outlet airflow temperature.

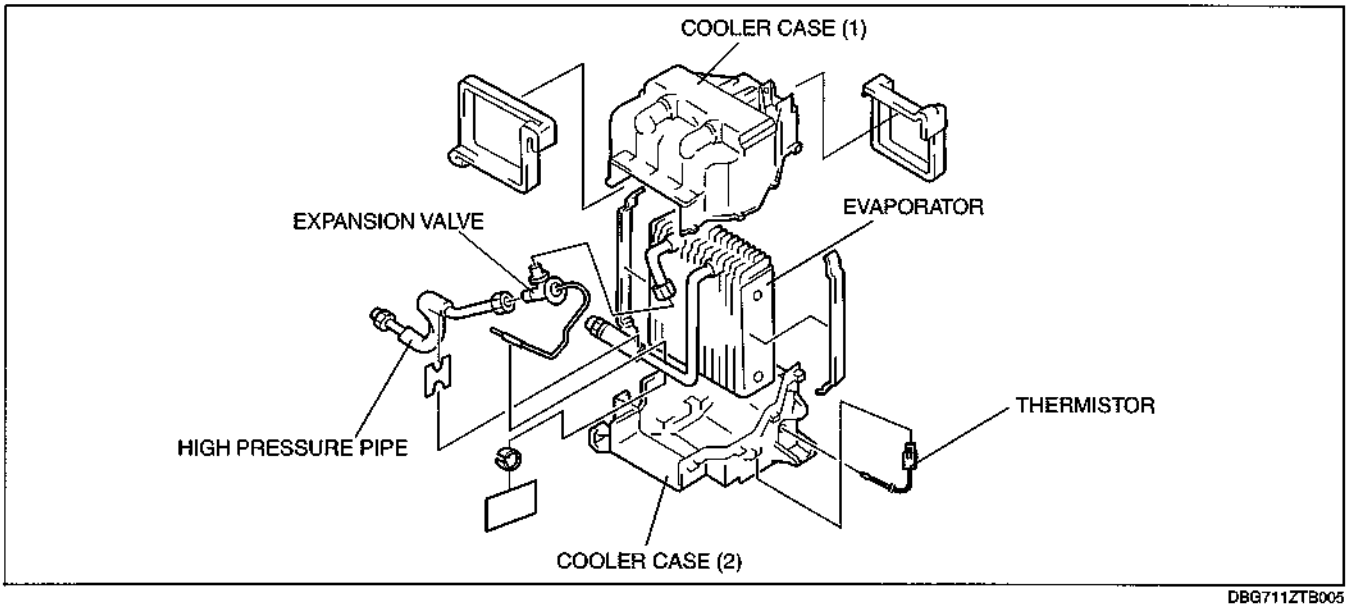


arnffn00000023

COOLING UNIT CONSTRUCTION/OPERATION

dcf07116152001

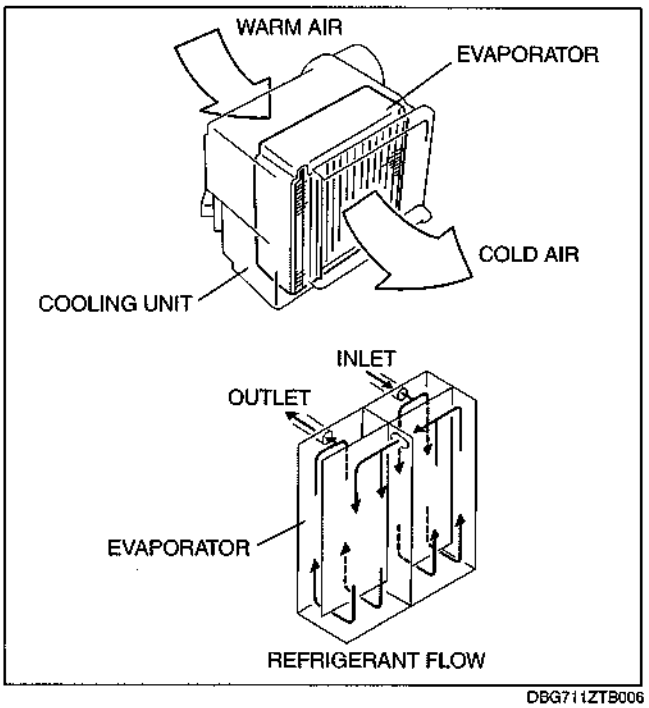
- The cooling unit consists of an evaporator, expansion valve, high pressure pipe, cooler case.
- The cooling unit cools and dehumidifies the airflow from the blower unit.
- The thermistor is built into the cooling unit and controls the A/C compressor.



DBG711ZTB005

Evaporator

- The evaporator vaporizes the refrigerant flowing inside it. The latent heat of the vaporized refrigerant cools the air passing through the evaporator. At the same time, moisture in the air condensates. In this way, dehumidified air is supplied to the passenger compartment.
- The evaporator is a single tank drawn cup type. Because refrigerant flows through several separate tubes, flow path resistance is kept low and the surface area for heat exchange is increased, improving air conditioning efficiency.

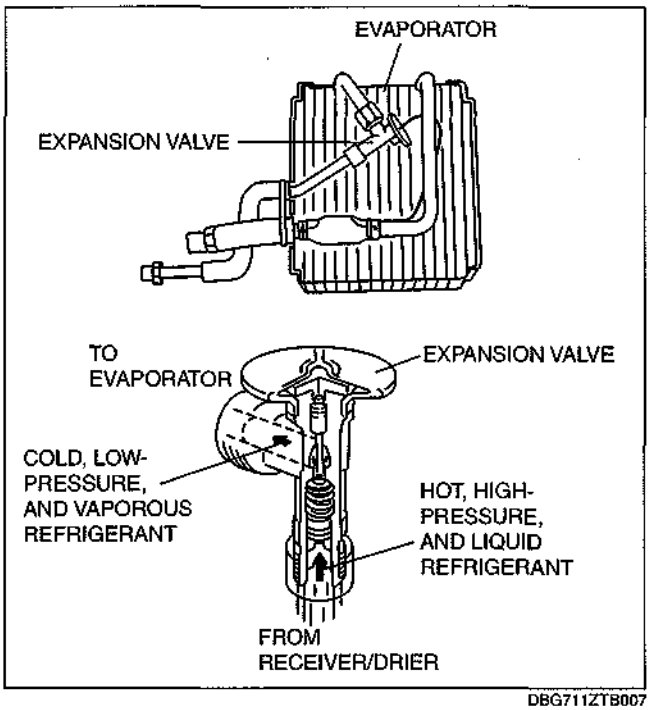


DBG711ZTB006

07

Expansion valve

- The expansion valve causes a sudden decrease in the pressure of the liquid refrigerant. This atomizes the refrigerant, making it easier for the evaporator to vaporize it. The expansion valve also regulates the flow volume of the refrigerant sent to the evaporator.
- An internal pressure equalizer expansion valve is used. It regulates the flow volume of the refrigerant supplied to the evaporator so that the heat absorption process of the evaporator is utilized efficiently.

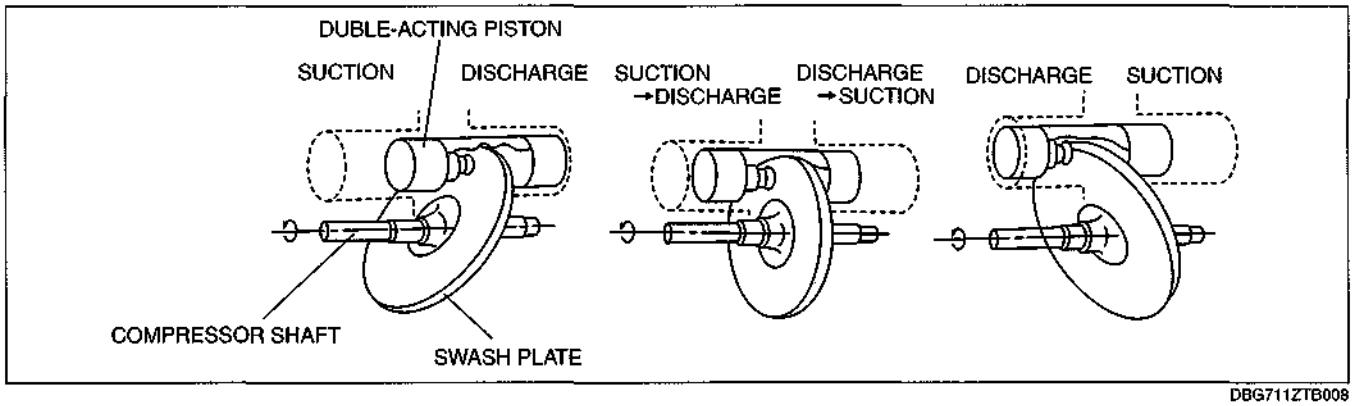


DBG711ZTB007

A/C COMPRESSOR CONSTRUCTION

dcf071161450t01

- The A/C compressor compresses the low-pressure gaseous refrigerant vaporized from the evaporator into a high-pressure gas so that the condenser can liquidize it more easily. A swash-plate of the A/C compressor is used to reduce weight and vibration and to improve driving performance when the A/C compressor is operating.
- The A/C compressor is belt-driven via the engine crankshaft pulley.
- Five double-acting pistons positioned axially around the compressor shaft are actuated by a swash plate that is pressed onto the compressor shaft. The swash plate changes the rotating action of the shaft to reciprocating movement of the five pistons. This driving force is applied to the midpoint of each of the double-ended pistons.

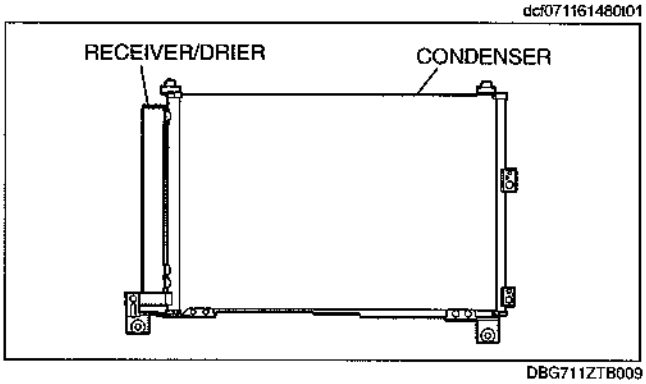


DBG711ZTB008

CONDENSER CONSTRUCTION

- The receiver/drier, main condenser, and sub-condenser are integrated into the sub-cooling system multi-flow condenser.
- The sub-cooling system multi-flow condenser sends refrigerant cooled in the main condenser to the receiver/drier and re-cools it in the sub-condenser for a more efficient cooling process.

dcf071161460l01

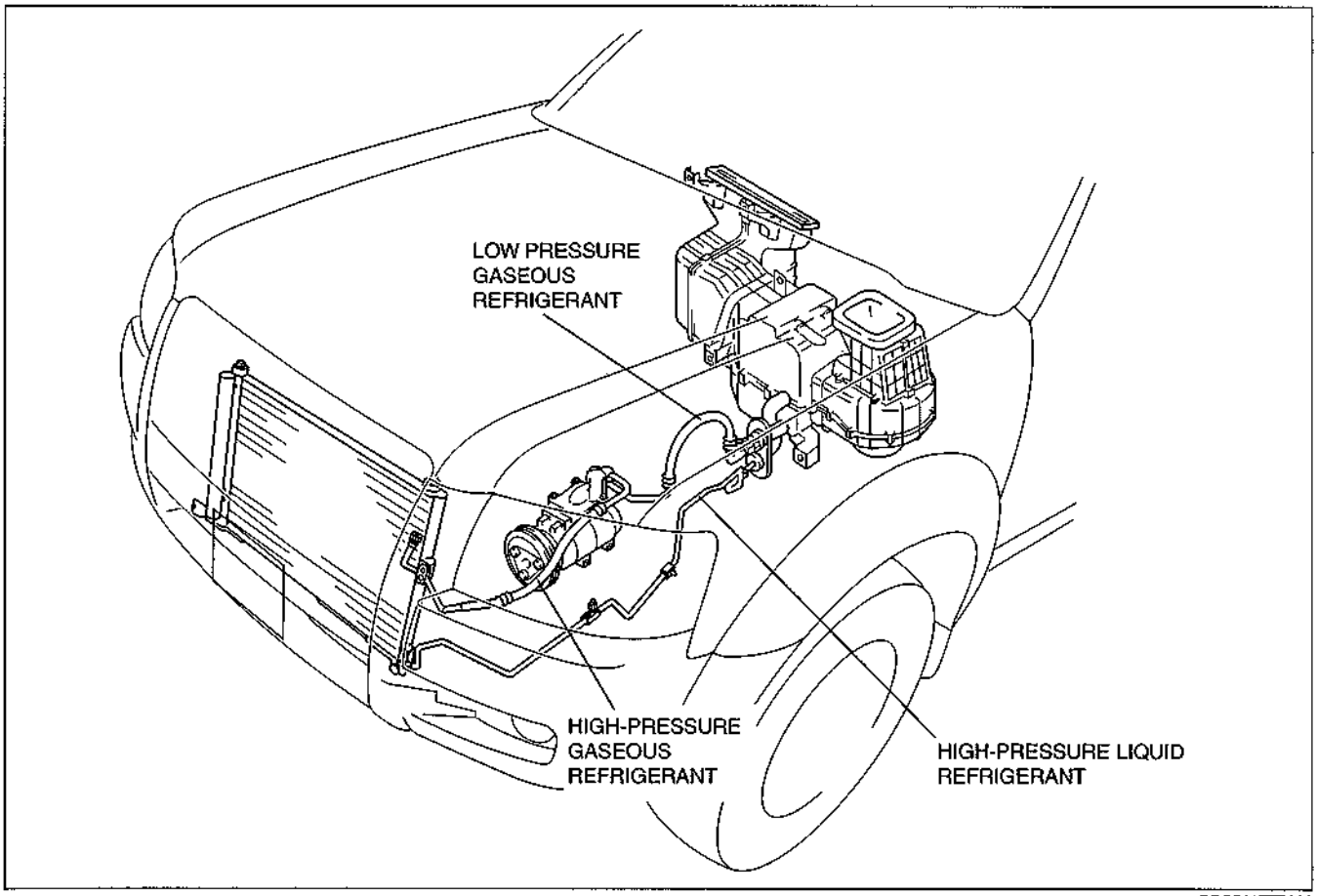


DBG711ZTB009

REFRIGERANT LINE CONSTRUCTION

dcf071161460l01

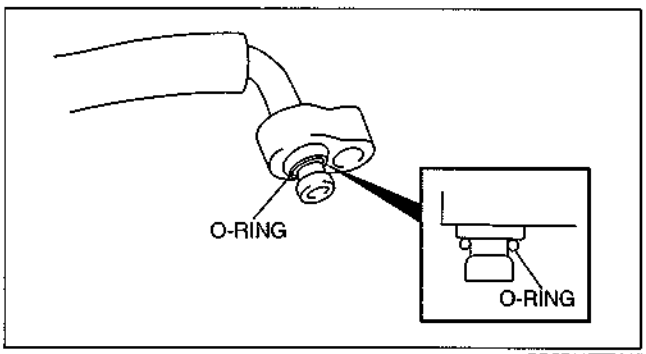
- Cooler pipes and cooler hoses are refrigerant passages.
- Refrigerant flows inside of each pipe and hose in the form of high-pressure gas from the A/C compressor to condenser, in the form of high-pressure liquid from the condenser to the expansion valve, and in the from of low-pressure gaseous from the expansion valve to the A/C compressor.
- The diameter of each pipe is different according to the state of the refrigerant.



DBG711ZTB022

Piping Connection

- To prevent O-rings from falling off while piping work is being performed, stay-on O-rings are used at the piping connections.



DBG711ZTB015

07-40 CONTROL SYSTEM

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CONTROL SYSTEM LOCATION INDEX 07-40–1
CONTROL SYSTEM WIRING DIAGRAM 07-40–2
BLOWER MOTOR CONSTRUCTION... 07-40–2
RESISTOR CONSTRUCTION..... 07-40–3
MAGNETIC CLUTCH CONSTRUCTION.....07-40–3
REFRIGERANT PRESSURE SWITCH CONSTRUCTION.....07-40–4
CLIMATE CONTROL UNIT CONSTRUCTION.....07-40–4
MANUAL AIR CONDITIONER CONTROL SYSTEM.....07-40–4

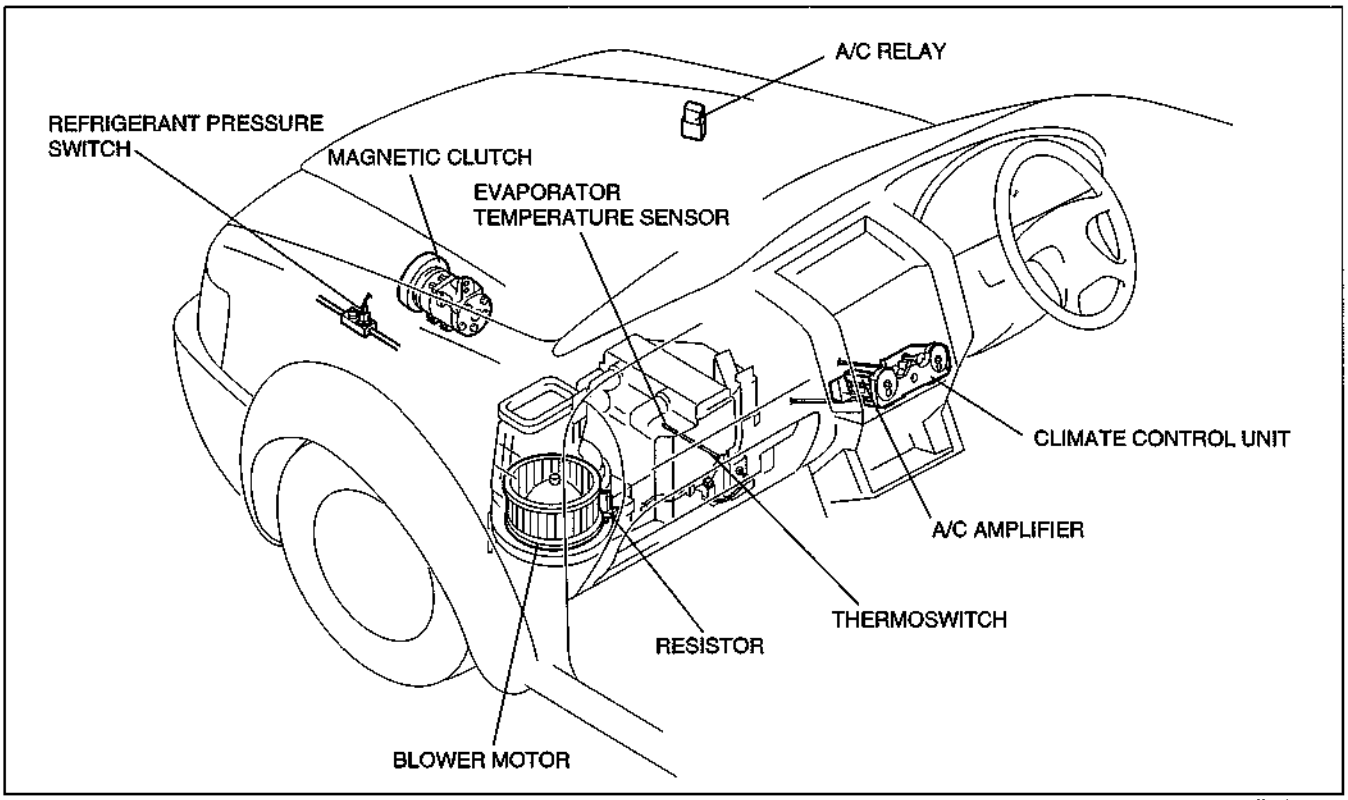
CONTROL SYSTEM OUTLINE

dcf074000000t01

Improved operability	• Climate control unit with enlarged operation dial and switch adopted

CONTROL SYSTEM LOCATION INDEX

dcf074000000t02



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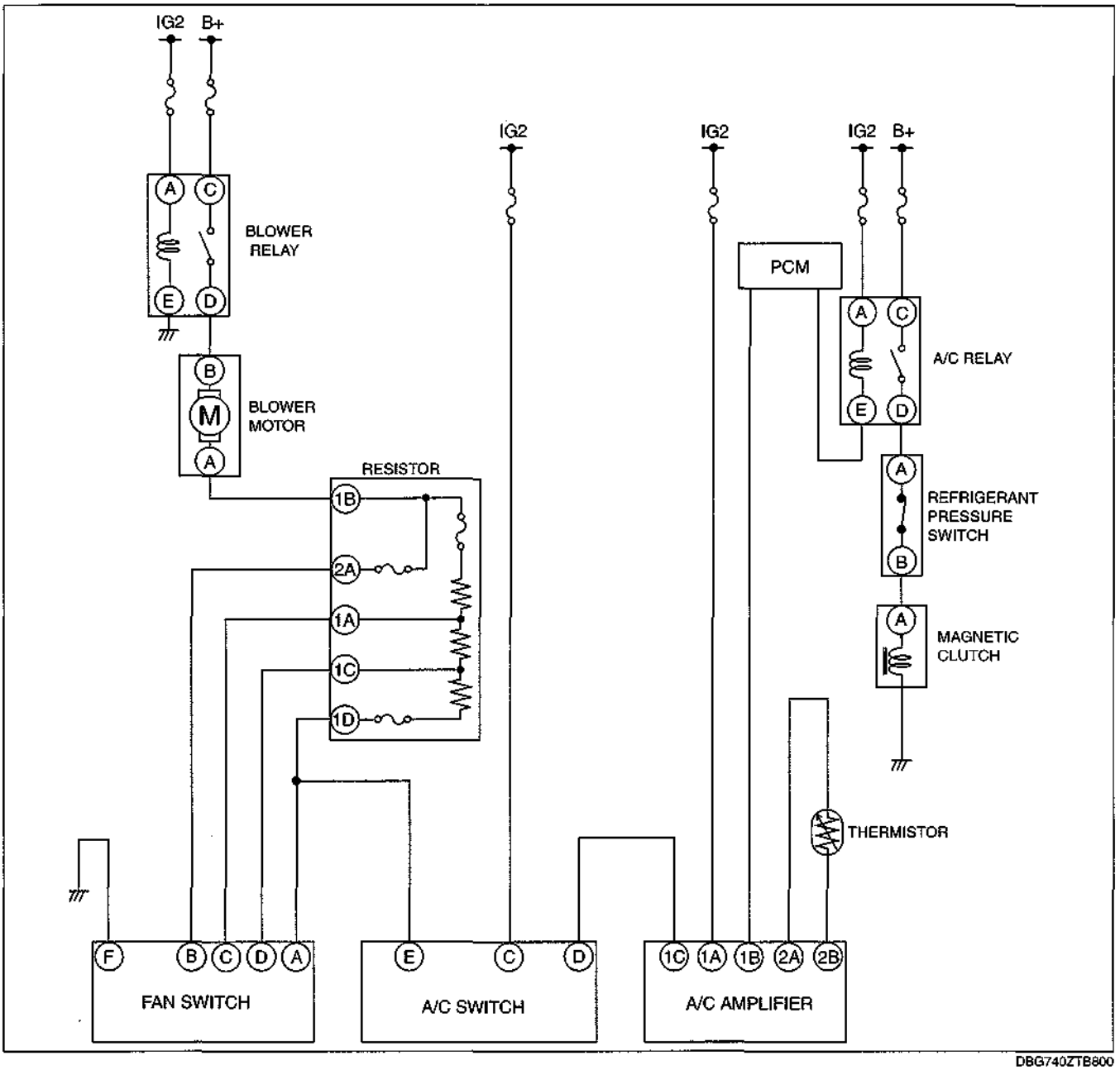
CONTROL SYSTEM WIRING DIAGRAM

dcf07400000t03

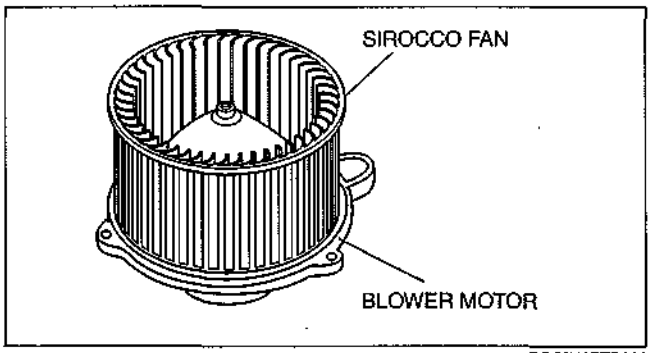


DBG740ZTB800

BLOWER MOTOR CONSTRUCTION

- The blower motor rotates the blower fan to blow air into the passenger compartment.
- The blower fan is a sirocco-type fan.
- To prevent a blower motor from burning by overheating, the blower air always blows inside of the blower motor from the air duct when the blower motor is operated.

dcf07406102001

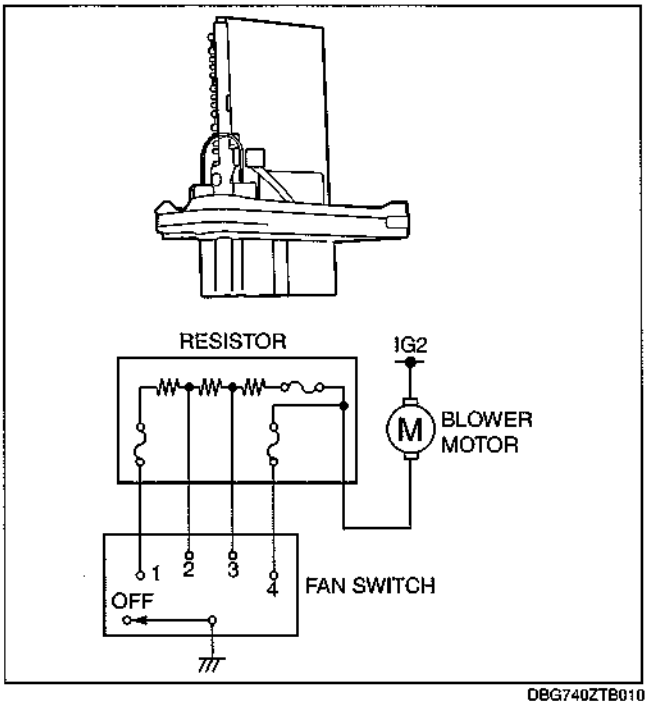


DBG740ZTB009

RESISTOR CONSTRUCTION

dcf074061015t01

- The resistor controls the voltage applied to blower motor, corresponding to fan switch operation. The resistor controls the rotation speed (airflow volume) in 4 stage.

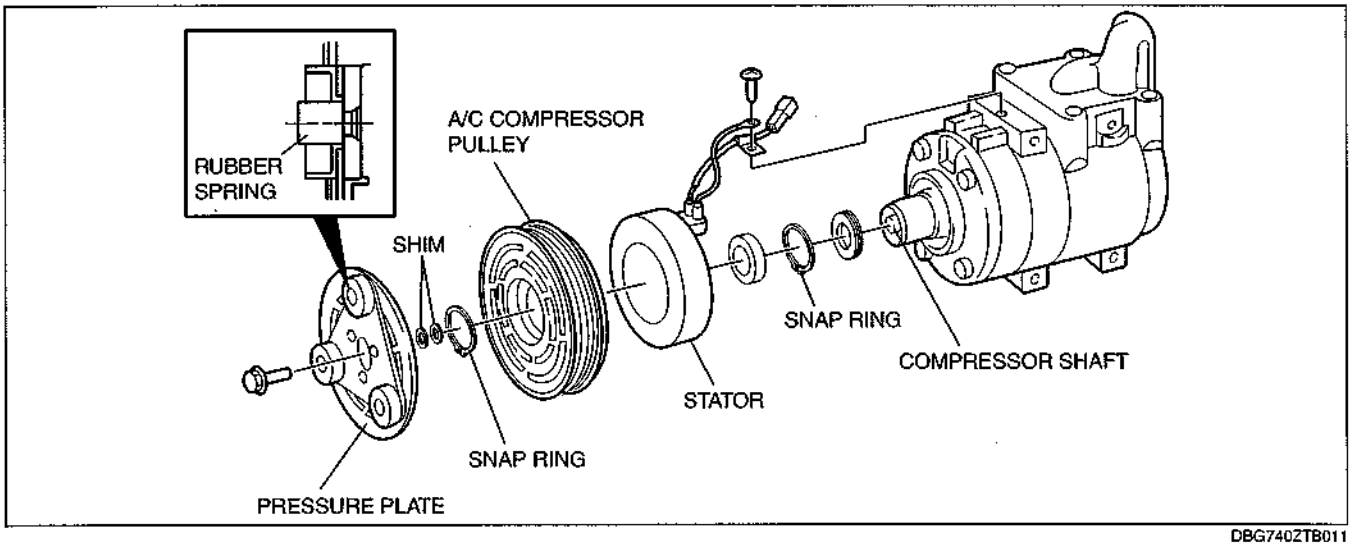


DBG740ZTB010

MAGNETIC CLUTCH CONSTRUCTION

dcf074061010t01

- A magnetic clutch drives the compressor shaft.
- When voltage is applied to the stator, the magnetic force locks the pressure plate and the pulley together as one unit. As a result the compressor shaft then turns with the pulley.
- When voltage is removed from the stator, the pressure plate returns from the pulley by the rubber spring force. As a result the the compressor shaft does not turn.



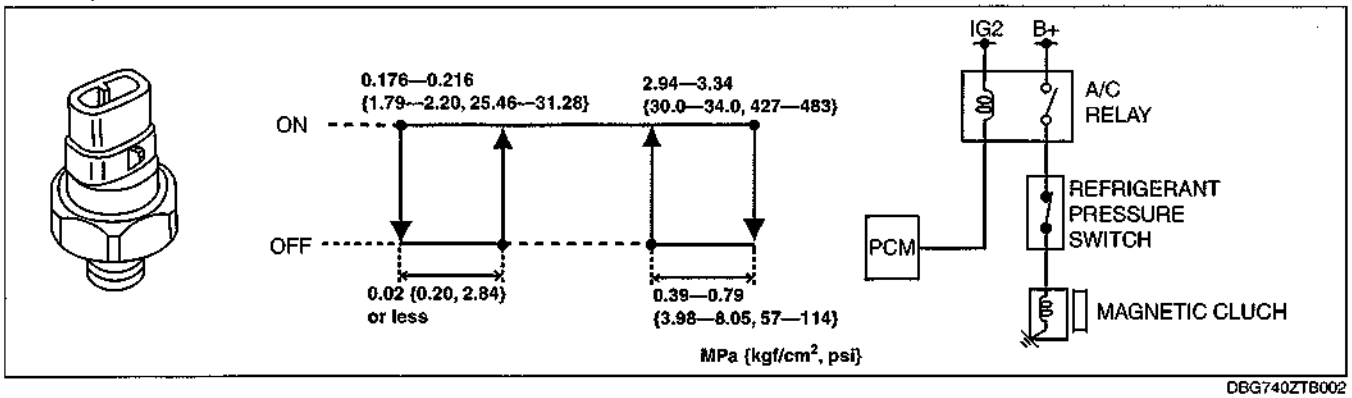
DBG740ZTB011

07

REFRIGERANT PRESSURE SWITCH CONSTRUCTION

dcf074061503t01

- The refrigerant pressure switch is fitted to the cooler pipe and senses the refrigerant pressure.
- A dual-pressure refrigerant pressure switch is used to respond to both abnormally high and abnormally low pressures.
- When pressure is abnormal, the refrigerant pressure switch turns off and cuts the voltage sent from the magnetic clutch, thereby stopping the A/C compressor.

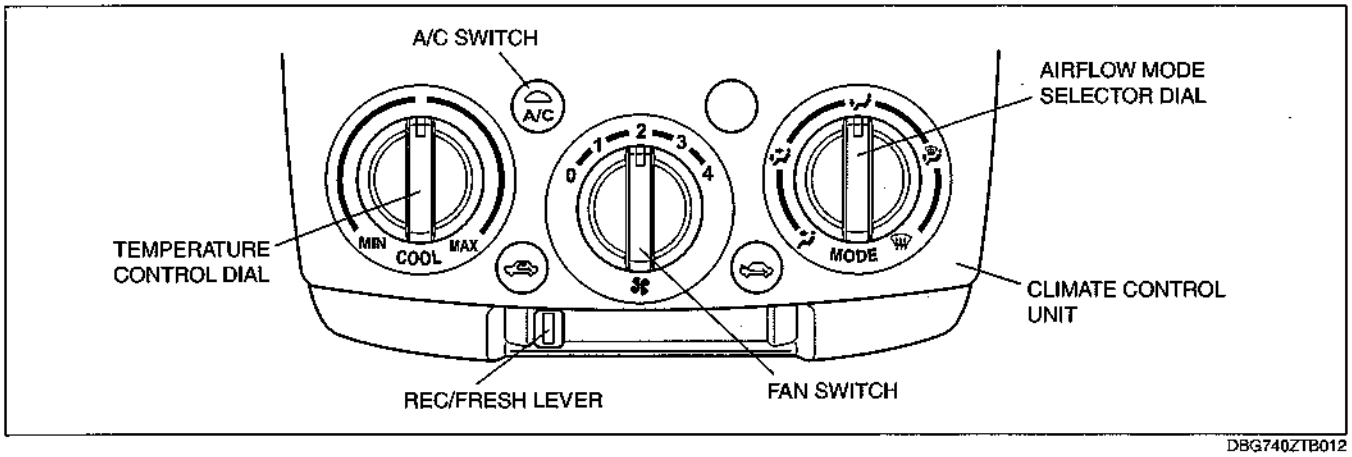


DBG740ZTB002

CLIMATE CONTROL UNIT CONSTRUCTION

dcf074061190l01

- Each switches and dials have been enlarged to improve ease of operation.



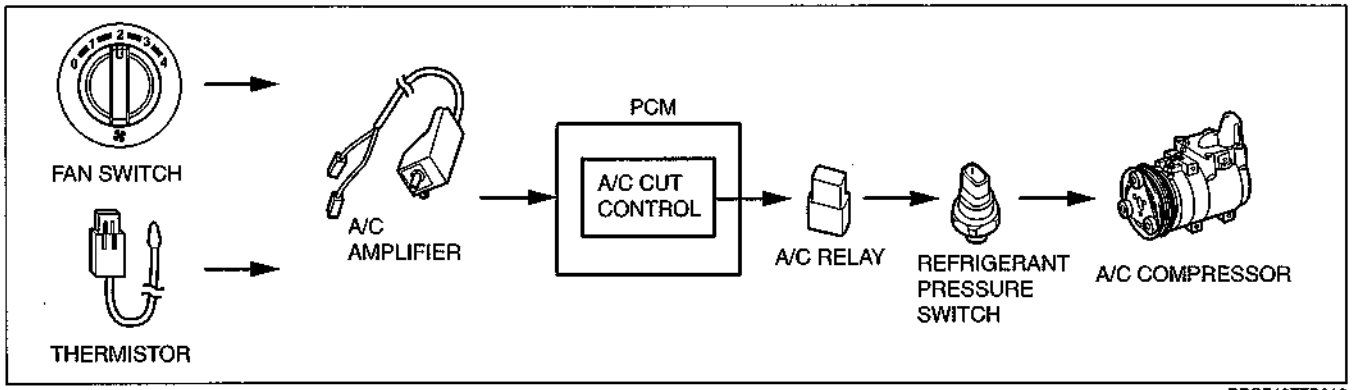
DBG740ZTB012

MANUAL AIR CONDITIONER CONTROL SYSTEM

dcf074000005t01

Block Diagram

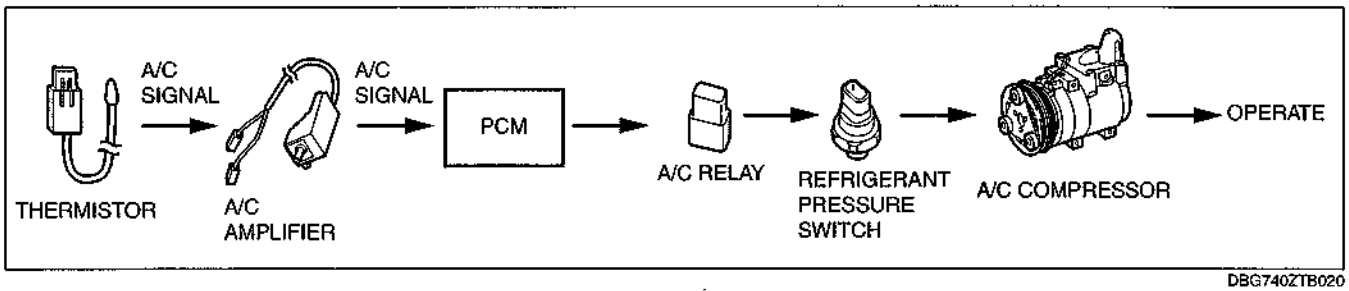
- The fan switch and thermistor sends an A/C signal to the PCM via the A/C amplifer.



DBG740ZTB019

A/C Compressor Control

- The A/C signal from the thermistor and A/C amplifer controls the magnetic clutch via the PCM, A/C relay and refrigerant pressure switch.



DBG740ZTB020

RESTRAINTS

08
SECTION

OUTLINE 08-00
ON-BOARD DIAGNOSTIC. . . . 08-02
AIR BAG SYSTEM 08-10
SEAT BELT 08-11

08-00 OUTLINE

RESTRAINTS ABBREVIATIONS 08-00–1
RESTRAINTS FEATURES 08-00–1

RESTRAINTS ABBREVIATIONS

dcf0800000001

DLC	Data Link Connector
DTC	Diagnostic Trouble Code
ELR	Emergency Locking Retractor
GND	Ground
PID	Parameter Identification
SAS	Sophisticated Air Bag Sensor

RESTRAINTS FEATURES

dcf0800000002

Improved safety	• A driver-side air bag module has been adopted. • A passenger-side air bag module has been adopted. • A side air bag module has been adopted. • A pre-tensioner seat belt has been adopted.

08-02 ON-BOARD DIAGNOSTIC

ON-BOARD DIAGNOSTIC FUNCTION OUTLINE 08-02–1
ON-BOARD DIAGNOSTIC FUNCTION [AIR BAG SYSTEM] 08-02–1

ON-BOARD DIAGNOSTIC FUNCTION OUTLINE

dcf080200000l01

- The air bag system has an on-board diagnostic function to facilitate the system diagnosis.
- The on-board diagnostic function consists of the following functions: a malfunction detection function, which detects overall malfunctions in the air bag system-related parts; a memory function, which stores detected DTCs; a display function, which indicates system malfunctions by DTC display; a PID/data monitoring function, which reads out specific input/output signals.
- Using the current diagnostic tool, DTCs can be read out and deleted, and the PID/data monitoring function can be activated.
- The system has a fail-safe function to prevent the accidental activation of the air bags in case of an air bag system malfunction.

ON-BOARD DIAGNOSTIC FUNCTION [AIR BAG SYSTEM]

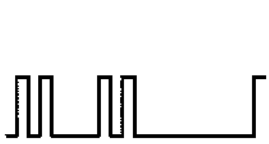
dcf080200000t02

Self-Malfunction Diagnostic Function

- The self-diagnostic function determines that there is a malfunction, outputs a signal, as a DTC, to the DLC-2, and at the same time, flashes the air bag system warning light to advise the driver of a malfunction.
- The air bag system warning light illuminates or flashes to indicate a single DTC according to the present malfunction. (If there is more than one present malfunction, only one DTC will be displayed according to the preset priority ranking.)
- The air bag system warning light will flash the DTC pattern for five cycles, and then will remain illuminated until the engine switch is turned to the LOCK position.
- The self-diagnostic function consists of a present malfunction diagnostic and a past malfunction diagnostic.

DTC table

DTC				Malfunction location
Current diagnostic tool display	Air bag system warning light			
	Flashing pattern		Priority ranking	
B1231	13		3	SAS control module activation (deployment) control freeze
B1317	—	Air bag system warning light is illuminated all the time.	—	The SAS control module power supply voltage increases (16.1 V or more)
B1318	—	Air bag system warning light is illuminated all the time	—	The SAS control module power supply voltage decreases (less than 9 V)
B1342	12		2	SAS control module
	—	Air bag system warning light is illuminated all the time.	1	SAS control module (DTC 12 detection circuit malfunction)
B1869	—	Air bag system warning light is illuminated all the time.	1	Air bag system warning light system circuit open
	—	Air bag system warning light is illuminated does not illuminate.	—	Air bag system warning light system circuit short to ground
B1870	—	Air bag system warning light is illuminated all the time.	1	Air bag system warning light system circuit short to power supply
B1877	33		10	Driver-side pre-tensioner seat belt circuit resistance high
B1878				Driver-side pre-tensioner seat belt circuit short to power supply
B1879				Driver-side pre-tensioner seat belt circuit short to ground

DTC				Malfunction location
Current diagnostic tool display	Air bag system warning light			
	Flashing pattern		Priority ranking	
B1881	34		9	Passenger-side pre-tensioner seat belt circuit resistance high
B1882				Passenger-side pre-tensioner seat belt circuit short to power supply
B1883				Passenger-side pre-tensioner seat belt circuit short to ground
B1885	33		10	Driver-side pre-tensioner seat belt circuit resistance low
B1886	34		9	Passenger-side pre-tensioner seat belt circuit resistance low
B1913	19		8	Driver-side air bag module circuit short to body ground
	21		7	Passenger-side air bag module circuit short to body ground
B1916	19		8	Driver-side air bag module circuit short to power supply
B1925	21		7	Passenger-side air bag module system circuit short to power supply
B1932	19		8	Driver-side air bag module circuit resistance high
B1933	21		7	Passenger-side air bag module circuit resistance high
B1934	19		8	Driver-side air bag module circuit resistance low
B1935	21		7	Passenger-side air bag module circuit resistance low
B1992	22		12	Driver-side side air bag module circuit short to power supply
B1993				Driver-side side air bag module circuit short to ground
B1994				Driver-side side air bag module circuit resistance high
B1995				Driver-side side air bag module circuit resistance low
B1996	23		11	Passenger-side side air bag module circuit short to power supply
B1997				Passenger-side side air bag module circuit short to body ground
B1998				Passenger-side side air bag module circuit resistance high
B1999				Passenger-side side air bag module circuit resistance low

DTC				Malfunction location
Current diagnostic tool display	Air bag system warning light			
	Flashing pattern		Priority ranking	
B2228 B2230 B2232 B2234	19		8	Driver-side air bag module assembly incorrect
B2229 B2231 B2233 B2235	21		7	Passenger-side air bag module assembly incorrect
B2444	43		6	Driver-side side air bag sensor system (internal circuit disabled)
B2445	44		5	Passenger-side side air bag sensor system (internal circuit disabled)
B2867	31		4	Poor connection of any SAS control module connectors
U2017	43		6	Driver-side side air bag sensor (communication error)
U2018	44		5	Passenger-side side air bag sensor (communication error)

PID/Data Monitoring Function

- By using the PID/data monitoring function, the monitored item of the input/output signal, as set on the SAS control module, can be freely selected and read out in real-time.
- An current diagnostic tool is used to read out PID/data monitor information.

PID name (definition)	Unit/condition	Condition/specification	terminal
CONT_RCM (Number of continuous DTC)	—	• DTC is detected: 1—255 • DTC is not detected: 0	—
CRSH_ST_D1 (Driver-side air bag sensor communication state)	OK/ FAULT	• Sensor normal: OK • Sensor communication error: FAULT	2Z, 2AA
CRSH_ST_D2 (Driver-side air bag sensor circuit state)	OK/ FAULT	• Sensor normal: OK • Sensor internal circuit error: FAULT	2Z, 2AA
CRSH_ST_P1 (Passenger-side air bag sensor communication state)	OK/ FAULT	• Sensor normal: OK • Sensor communication error: FAULT	2B, 2C
CRSH_ST_P2 (Passenger-side air bag sensor circuit state)	OK/ FAULT	• Sensor normal: OK • Sensor internal circuit error: FAULT	2B, 2C
D_PTENSFLT (Driver-side pre-tensioner seat belt circuit state)	SQ_LOWRES OPEN SHRT_B+ SHRT_GND Normal	• Air bag module circuit resistance low: SQ_LOWRES • Related wiring harness circuit open: OPEN • Related wiring harness short to power supply: SHRT_B+ • Related wiring harness short to ground: SHRT_GND • Related wiring harness normal: Normal	2P, 2S
DABAGR (Driver-side air bag module resistance)	ohm	Under any condition: 1.5—3.7 ohm	1S, 1V
DR_PTENS (Driver-side pre-tensioner seat belt resistance)	ohm	Under any condition: 1.5—3.1 ohm	2P, 2S

PID name (definition)	Unit/condition	Condition/specification	terminal
DS_AB (Driver-side side air bag module resistance)	ohm	Under any condition: 1.4—3.2 ohm	2M, 2O
DS_AB_ST (Driver-side side air bag module circuit state)	SHRT_B+ SHRT_GND OPEN SQ_LOWRES Normal	• Related wiring harness short to power supply: SHRT_B+ • Related wiring harness short to ground: SHRT_GND • Related wiring harness circuit open: OPEN • Air bag module circuit resistance low: SQ_LOWRES • Related wiring harness normal: Normal	2M, 2O
DS1_STAT (Driver-side air bag module circuit state)	SHRT_GND SHRT_B+ OPEN SQ_LOWRES Normal	• Related wiring harness short to ground: SHRT GND • Related wiring harness short to power supply: SHRT B+ • Related wiring harness circuit open: OPEN • Air bag module circuit resistance low: SQ_LOWRES • Related wiring harness normal: Normal	1S, 1V
DSB_P_ST (On demand driver-side pre-tensioner seat belt circuit state)	SQ_LOWRES OPEN SHRT_B+ SHRT_GND Normal	• Air bag module circuit resistance low: SQ_LOWRES • Related wiring harness circuit open: OPEN • Related wiring harness short to power supply: SHRT_B+ • Related wiring harness short to ground: SHRT_GND • Related wiring harness normal: Normal	2P, 2S
IG_V_2 (System IG1 voltage value)	V	engine switch to ON position: B+	1W
OD_CRST_D1 (On demand driver-side side air bag sensor communication state)	OK/ FAULT	• Sensor normal: OK • Sensor communication error: FAULT	2Z, 2AA
OD_CRST_D2 (On demand driver-side side air bag sensor circuit state)	OK/ FAULT	• Sensor normal: OK • Sensor internal circuit error: FAULT	2Z, 2AA
OD_CRST_P1 (On demand passenger-side side air bag sensor communication state)	OK/ FAULT	• Sensor normal: OK • Sensor communication error: FAULT	2B, 2C
OD_CRST_P2 (On demand passenger-side side air bag sensor circuit state)	OK/ FAULT	• Sensor normal: OK • Sensor internal circuit error: FAULT	2B, 2C
OD_DAB1_ST (On demand driver-side air bag module circuit state)	SHRT_GND SHRT_B+ OPEN SQ_LOWRES Normal	• Related wiring harness short to ground: SHRT_GND • Related wiring harness short to power supply: SHRT_B+ • Related wiring harness circuit open: OPEN • Air bag module circuit resistance low: SQ_LOWRES • Related wiring harness normal: Normal	1S, 1V
OD_DSAB_ST (On demand driver-side side air bag circuit state)	SHRT_B+ SHRT_GND OPEN SQ_LOWRES Normal	• Related wiring harness short to power supply: SHRT_B+ • Related wiring harness short to ground: SHRT_GND • Related wiring harness circuit open: OPEN • Air bag module circuit resistance low: SQ_LOWRES • Related wiring harness normal: Normal	2M, 2O
OD_PAB1_ST (On demand passenger-side air bag module circuit state)	SHRT_GND SHRT_B+ OPEN SQ_LOWRES Normal	• Related wiring harness short to ground: SHRT_GND • Related wiring harness short to power supply: SHRT_B+ • Related wiring harness circuit open: OPEN • Air bag module circuit resistance low: SQ_LOWRES • Related wiring harness normal: Normal	1M, 1P
OD_PSAB_ST (On demand passenger-side side air bag sensor circuit state)	SHRT_B+ SHRT_GND OPEN SQ_LOWRES Normal	• Related wiring harness short to power supply: SHRT_B+ • Related wiring harness short to ground: SHRT_GND • Related wiring harness circuit open: OPEN • Air bag module circuit resistance low: SQ_LOWRES • Related wiring harness normal: Normal	2I, 2L
P_PTENSFLT (Passenger-side pre-tensioner seat belt circuit state)	SQ_LOWRES OPEN SHRT_B+ SHRT_GND Normal	• Air bag module circuit resistance low: SQ_LOWRES • Related wiring harness circuit open: OPEN • Related wiring harness short to power supply: SHRT_B+ • Related wiring harness short to ground: SHRT_GND • Related wiring harness normal: Normal	2G, 2J
PABAGR (Passenger-side air bag module resistance)	ohm	Under any condition: 1.4—2.9 ohm	1M, 1P
PS_AB (Passenger-side side air bag module resistance)	ohm	Under any condition: 1.4—3.2 ohm	2I, 2L

PID name (definition)	Unit/condition	Condition/specification	terminal
PS_AB_ST (Passenger-side side air bag sensor circuit state)	SHRT_B+ SHRT_GND OPEN SQ_LOWRES Normal	• Related wiring harness short to power supply: SHRT_B+ • Related wiring harness short to ground: SHRT_GND • Related wiring harness circuit open: OPEN • Air bag module circuit resistance low: SQ_LOWRES • Related wiring harness normal: Normal	2I, 2L
PS_PTENS (Passenger-side pre-tensioner seat belt resistance)	ohm	Under any condition: 1.5—3.1 ohm	2G, 2J
PS1_STAT (Passenger-side air bag module circuit state)	SHRT_GND SHRT_B+ OPEN SQ_LOWRES Normal	• Related wiring harness short to ground: SHRT_GND • Related wiring harness short to power supply: SHRT_B+ • Related wiring harness circuit open: OPEN • Air bag module circuit resistance low: SQ_LOWRES • Related wiring harness normal: Normal	1M, 1P
PSB_P_ST (On demand passenger-side pre-tensioner seat belt circuit state)	SQ_LOWRES OPEN SHRT_B+ SHRT_GND Normal	• Air bag module circuit resistance low: SQ_LOWRES • Related wiring harness circuit open: OPEN • Related wiring harness short to power supply: SHRT_B+ • Related wiring harness short to ground: SHRT_GND • Related wiring harness normal: Normal	2G, 2J

08-10 AIR BAG SYSTEM

AIR BAG SYSTEM OUTLINE 08-10–1
AIR BAG SYSTEM STRUCTURAL VIEW 08-10–2
AIR BAG SYSTEM WIRING DIAGRAM 08-10–2
SAS CONTROL MODULE FUNCTION 08-10–3
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DRIVER-SIDE AIR BAG MODULE FUNCTION 08-10–4
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PRE-TENSIONER SEAT BELT CONSTRUCTION/OPERATION 08-10–7

AIR BAG SYSTEM OUTLINE

dcf081000000t01

- The air bag system is a device that supplements the passenger restraint function of the seat belts. The air bag system will not have the designed effect if the seat belts are not worn properly.
- The air bag system is composed of the following parts:

Item	Outline
SAS control module	• Recognizes actually equipped air bag module or pre-tensioner seat belt based on module configuration.
Side air bag sensor	• Detects degree of impact, converts to an electrical signal, and sends the signal to the SAS control module. For operation, refer to SAS control module, Air Bag Module and Pre-tensioner Seat Belt Deployment Operation. (See 08-10-3 SAS CONTROL MODULE CONSTRUCTION/OPERATION)
Driver-side air bag module	• Adopted to improve safety in frontal collisions.
Passenger-side air bag module	
Side air bag module	• Chest-protection type side air bag module has been adopted.
Pre-tensioner seat belt	• Piston-type pre-tensioner seat belt has been adopted.

AIR BAG SYSTEM STRUCTURAL VIEW

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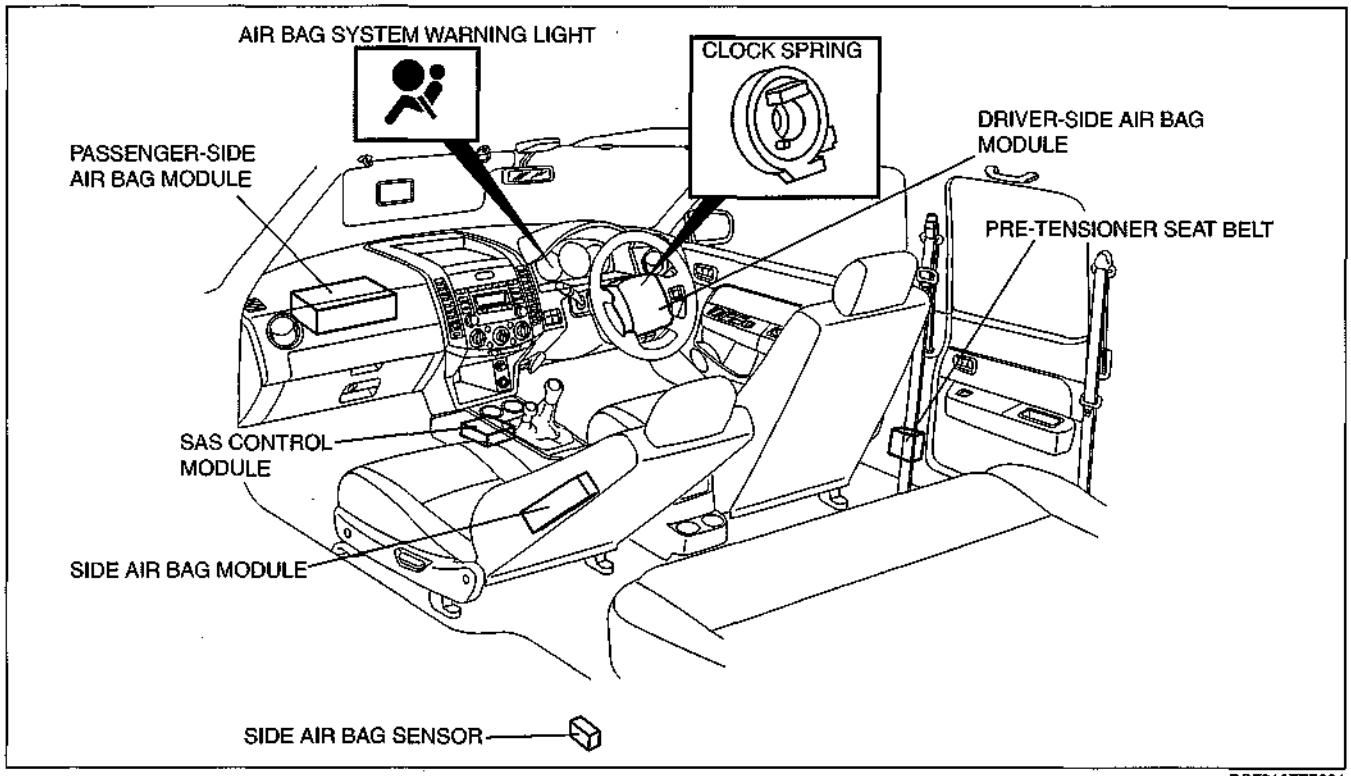

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AIR BAG SYSTEM WIRING DIAGRAM

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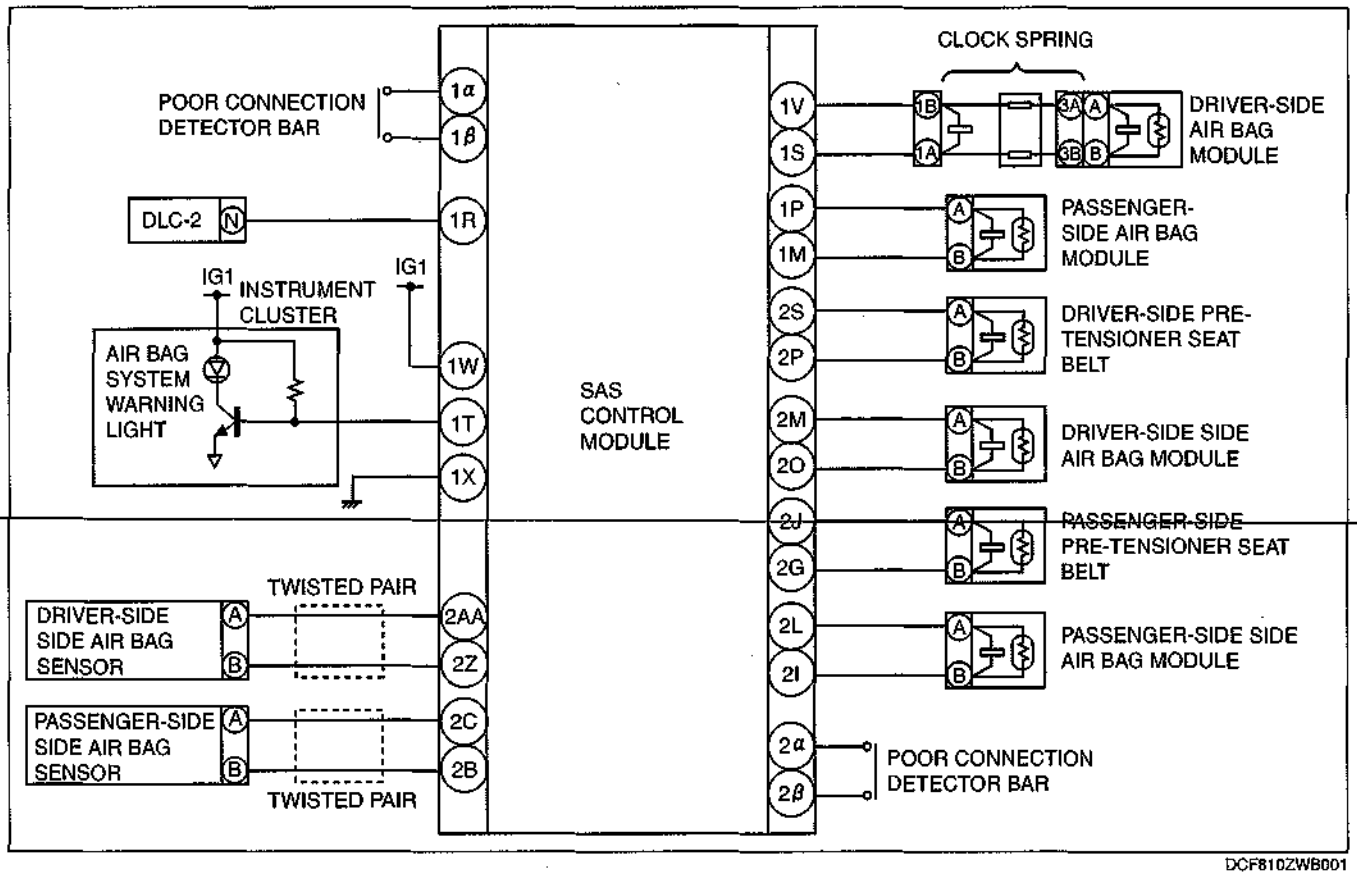

DCF810ZWB001

SAS CONTROL MODULE FUNCTION

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Outline

Sensing function

- Safing and the crush sensors are built into the SAS control module.
- If the degree of impact detected by the safing and the crush sensors exceeds the set value during a collision, the SAS control module sends an operation (deployment) signal to the air bag module and the pre-tensioner seat belt.

Backup power supply function

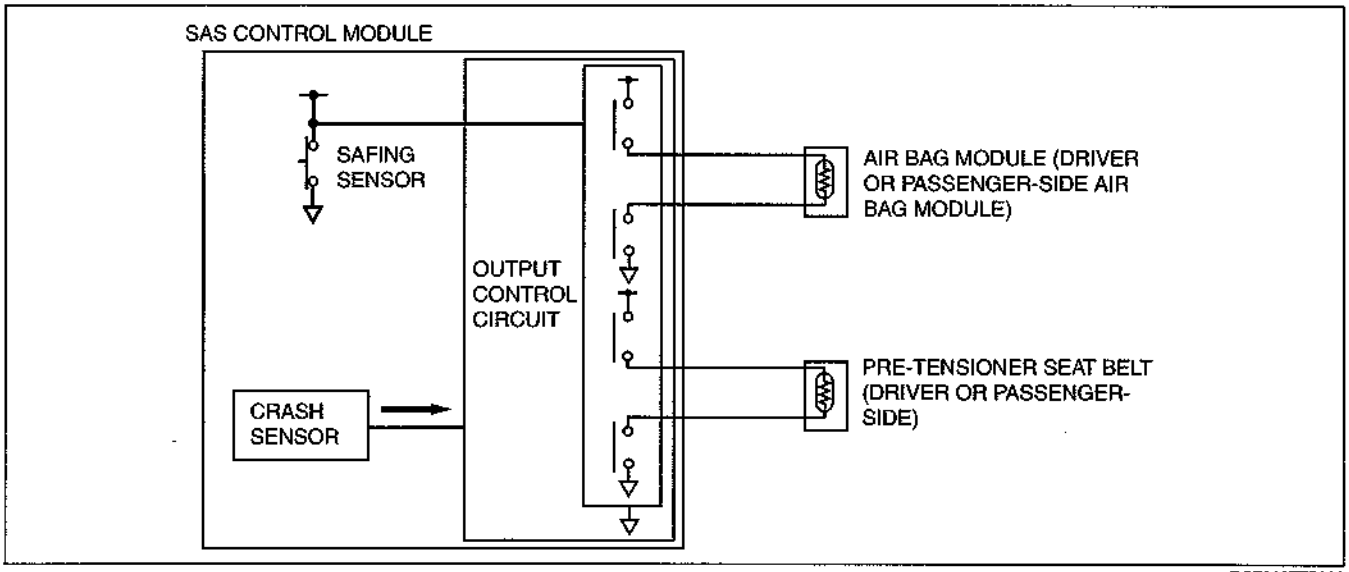
- The backup power supply function enables the condenser to discharge and supply power to assure air bag system operation/deployment properly for a specified time even if the power supply to the SAS control module is cut due to a collision.

SAS CONTROL MODULE CONSTRUCTION/OPERATION

dcf08105703002

Air Bag System

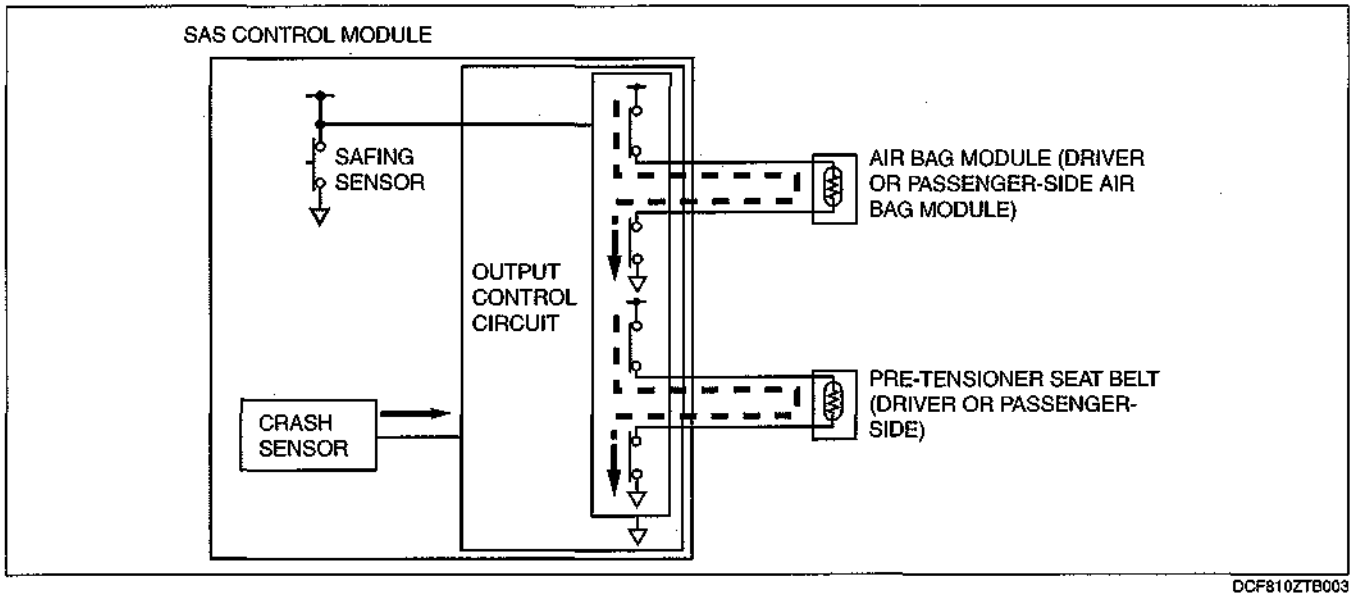
1. The impact of a frontal or frontal offset collision to the vehicle is transmitted to the SAS control module.
2. The safing sensor inside the SAS control module detects the collision and activates. In addition, the crash sensor determines the impact and converts it to an electronic signal and outputs it to the output control circuit.



DCF810ZTB002

3. The output control circuit calculates the electronic signals from the crash sensor and the valve is compared with the preset valve. If the output signal received from the crash sensors exceeds the preset value, an ignition circuit is completed and an operation (deployment) signal is sent to both the driver and passenger-side air bag modules.

4. In conjunction with both the driver and passenger-side air bag module deployment, an ignition circuit for the pre-tensioner seat belt is completed and an operation (deployment) signal is sent to the pre-tensioner seat belt.



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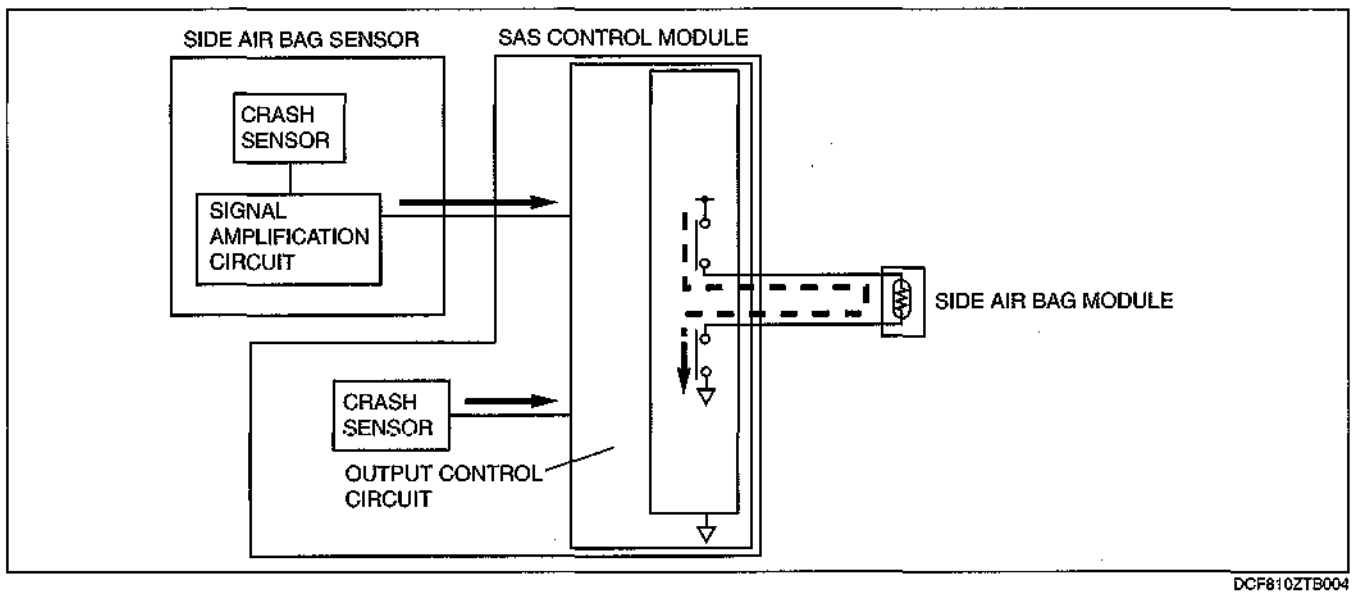
Side air bag system

1. During a lateral collision to the vehicle, the crash sensors in the side air bag sensor and SAS control module detect the collision.
2. The degree of impact detected by the crash sensor in the side air bag sensor is converted to an electrical signal and sent to the SAS control module through the signal amplification circuit.
3. Simultaneously, the SAS control module crash sensor converts the degree of impact detected to an electrical signal.
4. The SAS control module processes the calculations for the two electrical signals at the output control circuit and compares the value to a preset value.
5. The output control circuit determines the degree of impact to the vehicle by the value from the crash sensors, completes a side air bag module ignition circuit, and sends the deployment signal to the air bag modules.



DCF810ZTB004

DRIVER-SIDE AIR BAG MODULE FUNCTION

dcf08105701001

Outline

- During a frontal or front offset collision, an operation signal from the SAS control module is received and the front air bag operates (deploys), softening the impact to the head and face areas of the driver.

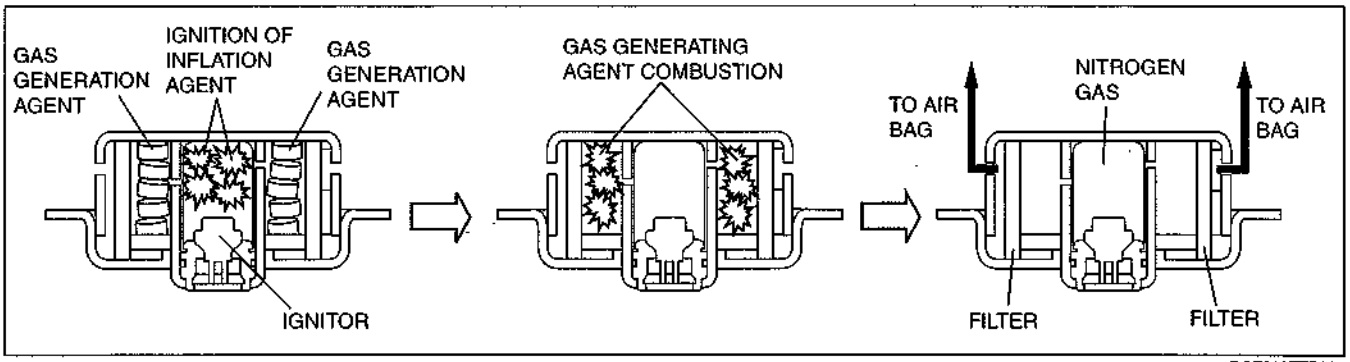
DRIVER-SIDE AIR BAG MODULE CONSTRUCTION/OPERATION

dcf081057010t02

- Installed in the center of the steering wheel.
- The inflator operates in the following order.

Inflator Operation

1. When an operation (deployment) signal is received from the SAS control module, the igniter built into the inflator generates heat and ignites the ignition agent.
2. The ignition of the ignition agent causes the combustion of a gas generating agent which forms nitrogen gas.
3. The nitrogen gas is cooled at the filter and the filtrate is injected into the air bag.



DCF810ZTB005

PASSENGER-SIDE AIR BAG MODULE FUNCTION

dcf081057050t01

Outline

- During a frontal or front offset collision, an operation signal from the SAS control module is received and the air bag operates (deploys), softening the impact to the head and face areas of the front passenger.

PASSENGER-SIDE AIR BAG MODULE CONSTRUCTION/OPERATION

dcf081057050t02

- Installed in the dashboard.
- The inflator operation is the same as the driver's side air bag. (See 08-10-5 DRIVER-SIDE AIR BAG MODULE CONSTRUCTION/OPERATION.)

SIDE AIR BAG MODULE FUNCTION

dcf081000147t01

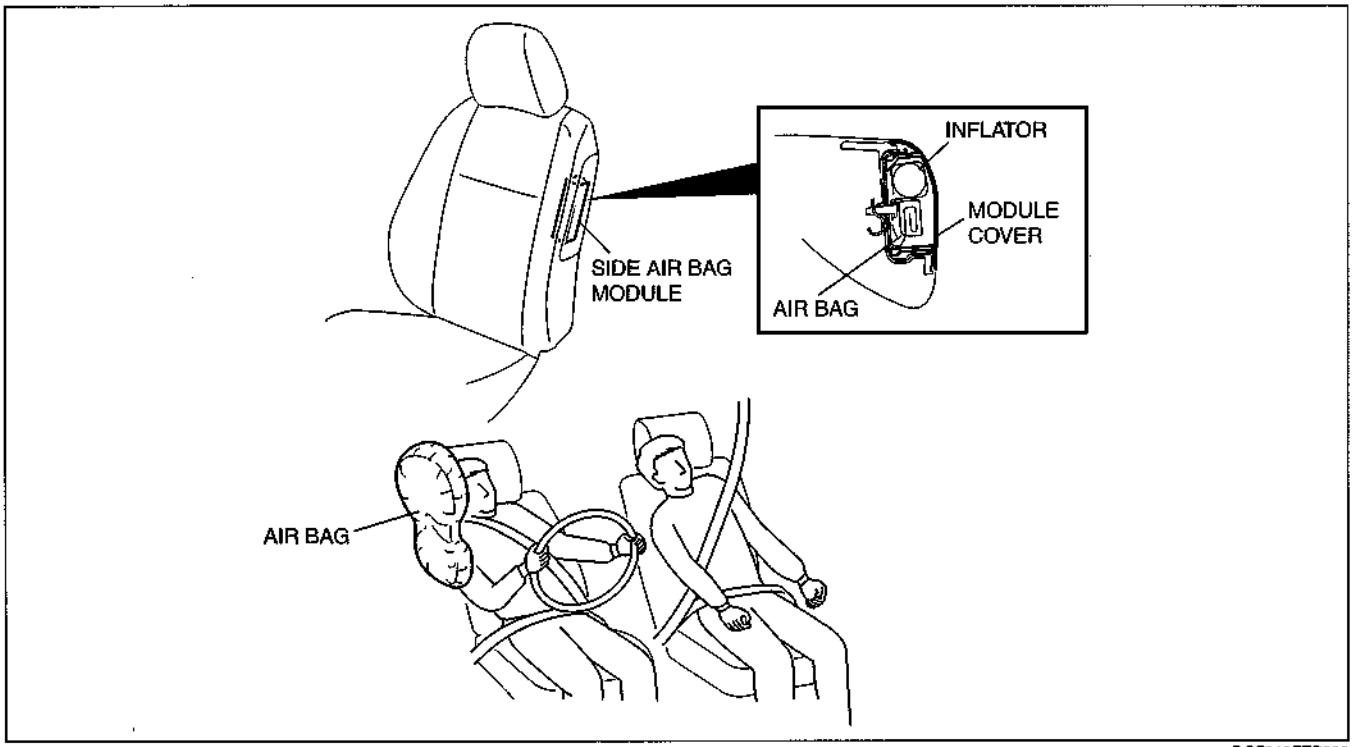
- During a collision to the side of the vehicle, the air bag operates (deploys) after receiving an operation signal from the SAS unit, defusing impact to the chest area of the driver and front passenger.

SIDE AIR BAG MODULE CONSTRUCTION/OPERATION

dcf081000147t03

Construction

- Side air bag modules are installed on the outboard sides of the seat backs.
- The side air bag module is composed of an inflator, module cover and air bag.
- When an air bag deploys, the side air bag module cover is spread apart by the generation of argon gas from the inflator, inflating the air bag.



DCF810ZTB006

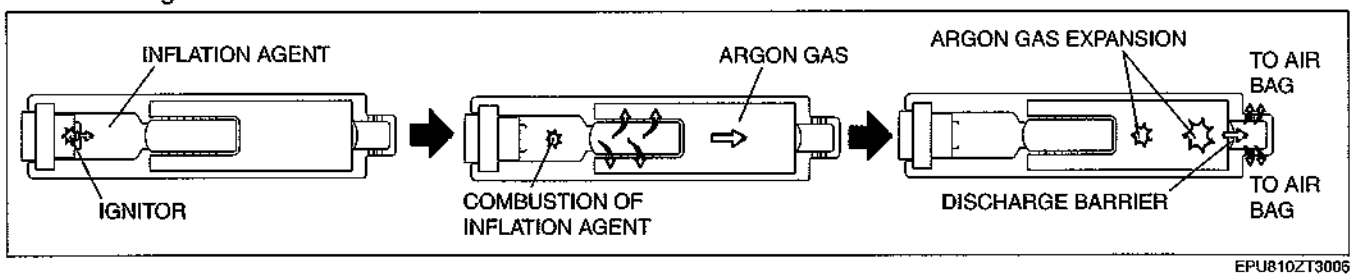
Operation

Air bag module deployment operation

- Refer to the SAS control module, Air Bag Module and Pre-tensioner Seat Belt Deployment Operation. (See 08-10-3 SAS CONTROL MODULE CONSTRUCTION/OPERATION.)

Inflator operation

1. The igniter built into the inflator begins to build up heat when the operation (deployment) signal is sent from the SAS control module. The inflation agent is ignited by the build up of heat in the igniter.
2. The argon gas expands due to the heat of the ignited inflation agent.
3. The expanding argon gas breaks the discharge barrier, is cooled and filtered by the filter, and then injected into the air bag.



EPU810ZT3005

PRE-TENSIONER SEAT BELT FUNCTION

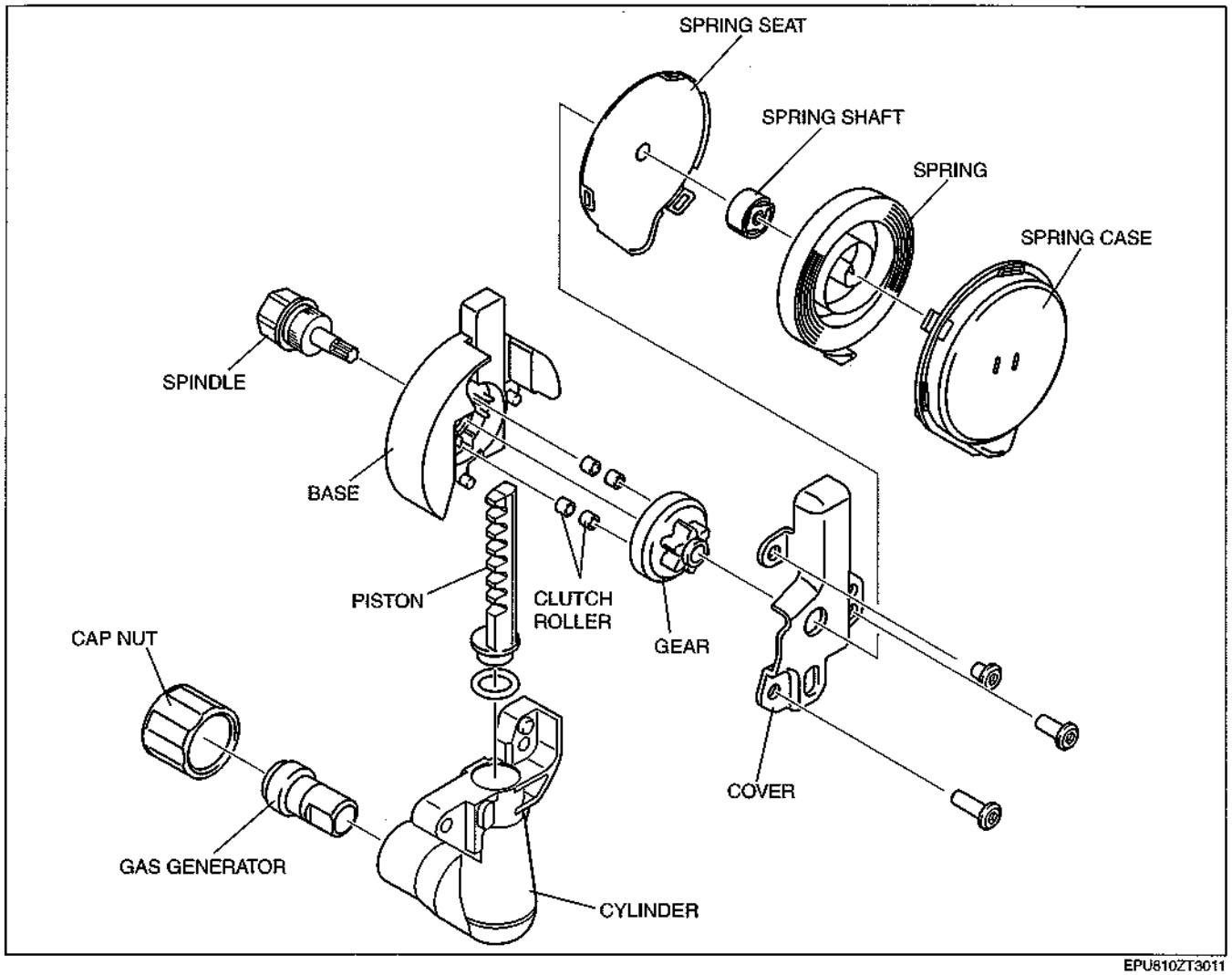
dcf081057630t01

- When a vehicle is involved in a frontal or frontal offset collision and the seat belts are buckled, the pre-tensioner seat belt system receives an operation signal from the SAS control module, retracting and tightening the belt webbing instantly on the driver and passenger restraints.

PRE-TENSIONER SEAT BELT CONSTRUCTION/OPERATION

dcf081057630t02

Construction

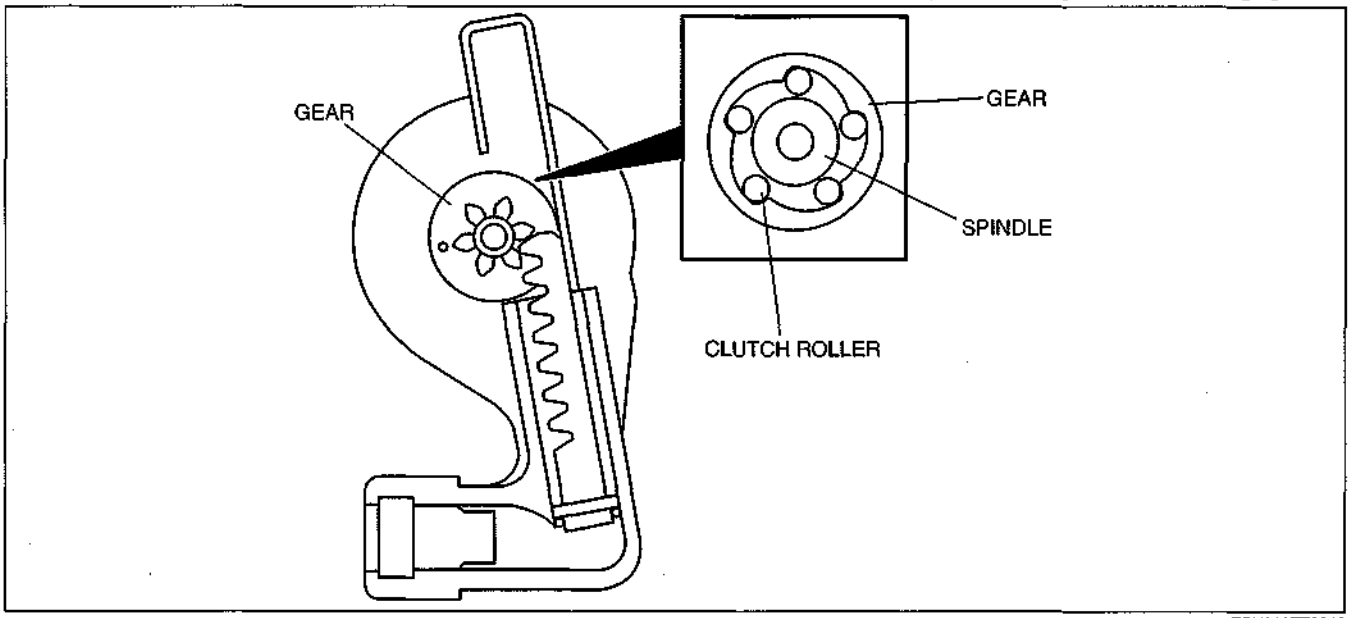


EPU810ZT3011

Operation

Normal (Seat Belt Pretensioners Not Operating)

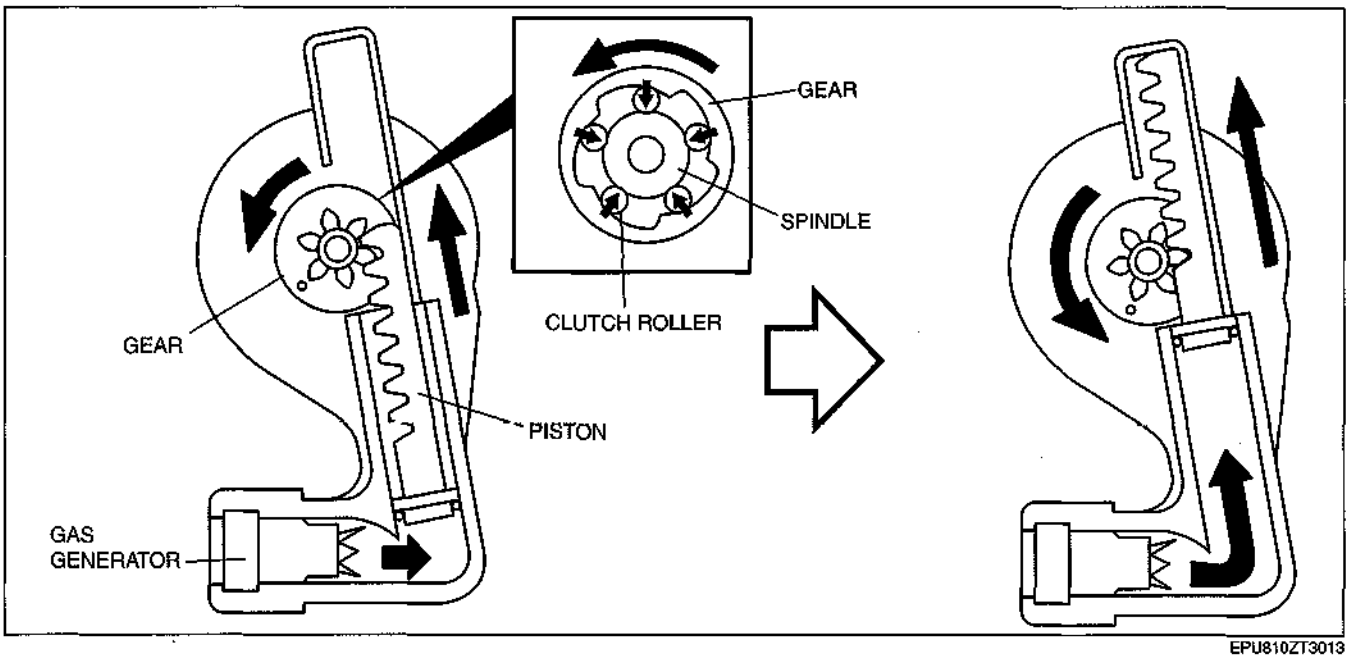
- Normally, the clutch roller installed to the outer circumference of the spindle sits in the recess of the gear and does not interfere with the spindle.
- The gear does not rotate when the belt is pulled or retracted because the spindle and gear are not engaged.



EPU810ZT3012

Seat Belt Pretensioners Operating

1. When an operation signal is received from the SAS control module, the gas generator produces gas. Due to the pressure from the gas, the piston in the cylinder is pressed up.
2. The gear rotates while the piston moves up.
3. Based on the gear rotation, the clutch roller in the gear presses against the spindle.Due to this, the gear and spindle are engaged.
4. The belt is retracted in conjunction with the gear rotation.



EPU810ZT3013

08-11 SEAT BELT

SEAT BELT OUTLINE..... 08-11–1
SEAT BELT STRUCTURAL VIEW 08-11–1
LOAD LIMITER RETRACTOR CONSTRUCTION/OPERATION.....08-11–1

SEAT BELT OUTLINE

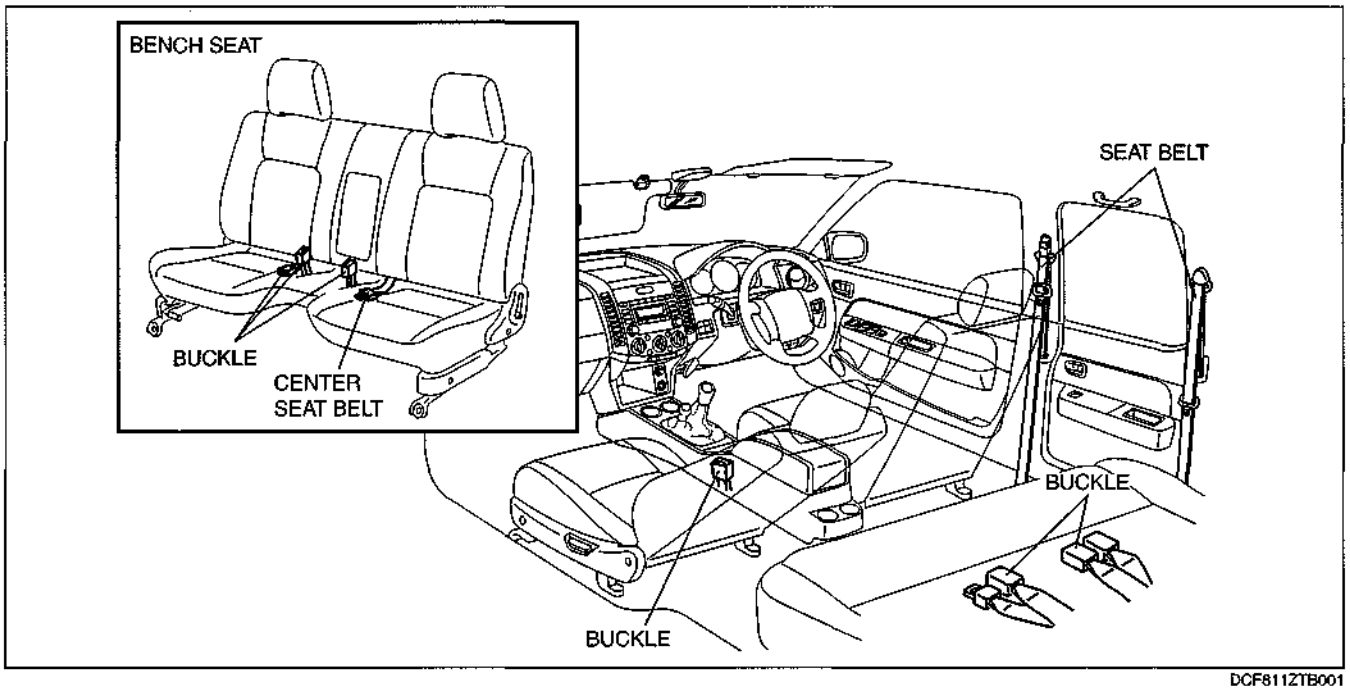
dcf08115700t01

Features

Improved safety	• Three-point seat belt with the following functions for driver and passeger seat adopted — ELR (Emergency Locking Retractor: emergency locking mechanism) — Pre-tensioner seat belt (vehicle with pre-tensioner seat belt) (See 08-10-7 PRE-TENSIONER SEAT BELT CONSTRUCTION/OPERATION.) — Load limiter, which adjusts restraint force of the seat belt to reduce the possibility of injury to passengers caused by excess seat belt pressure after pre-tensioner operation. (vehicle with pre-tensioner seat belt) • Three-point seat belt with the following functions for rear seat passengers adopted (Double cab) — ELR

SEAT BELT STRUCTURAL VIEW

dcf08115700t02



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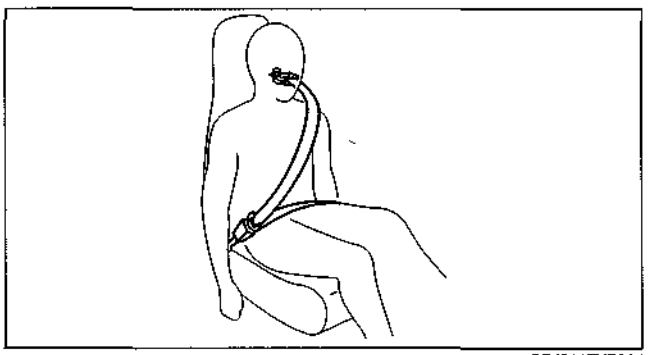
LOAD LIMITER RETRACTOR CONSTRUCTION/OPERATION

dcf08115700t03

1. Initial state



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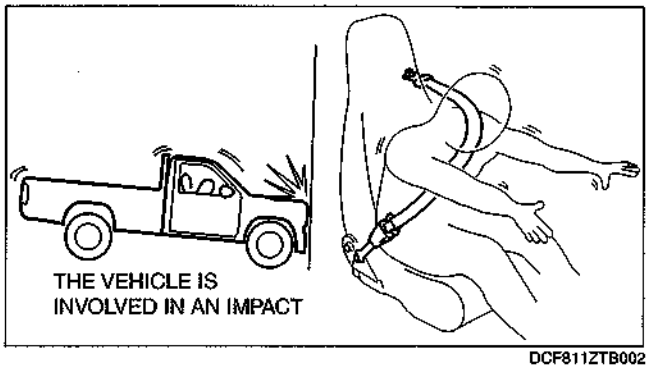
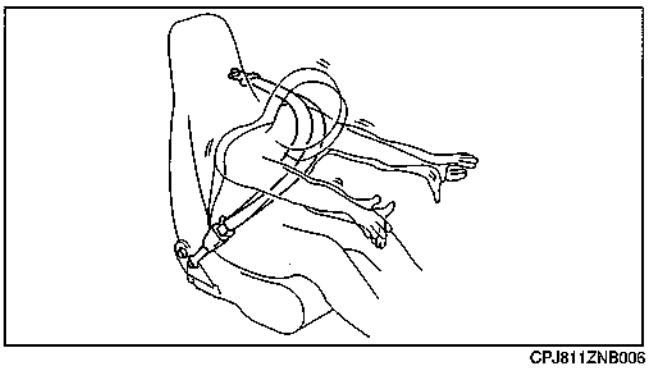
2. ELR operation
   When the force of impact is transfered to the belt, the retractor changes to the ELR condition, locking the belt and securing the passenger's body.



DCF811ZTB002

3. Load limiter operation
   After locking, if the force of impact transferred to the belt is strong enough to cause injury to the chest of the occupant, an adequate amount of belt is released to absorb the load applied to the chest.


CPJ811ZNB006

BODY & ACCESSORIES

09 SECTION

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09-00 OUTLINE

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BODY AND ACCESSORIES FEATURES 09-00–1

BODY AND ACCESSORIES ABBREVIATIONS

dcf090000000t01

4W-ABS	4-Wheel Antilock Brake System
ABS	Antilock Brake System
ACC	Accessories
ALC	Auto Level Control
CM	Control Module
GND	Ground
HI	High
HU	Hydraulic Unit
IG	Ignition
INT	Intermittent
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LH	Left Hand
LO	Low
M	Motor
OFF	Switch Off
ON	Switch On
PCM	Powertrain Control Module
RFW	Remote Free Wheel
RH	Right Hand
SW	Switch
TNS	Tail Number Side Lights

BODY AND ACCESSORIES FEATURES

dcf090000000t02

Improved marketability	• Power window system adopted • Power door lock system adopted • Keyless entry system adopted
Improved security	• Immobilizer system adopted • Theft-deterrent system adopted
Improved convenience	• A center panel unit, composed of the installed audio unit and the audio switches built into the center panel, has been adopted

09-10 BODY PANELS

BODY PANEL OUTLINE 09-10–1
BODY PANEL STRUCTURAL VIEW 09-10–1

BODY PANEL OUTLINE

dcf091056100i01

- Front and Rear Bumper has been changed.

BODY PANEL STRUCTURAL VIEW

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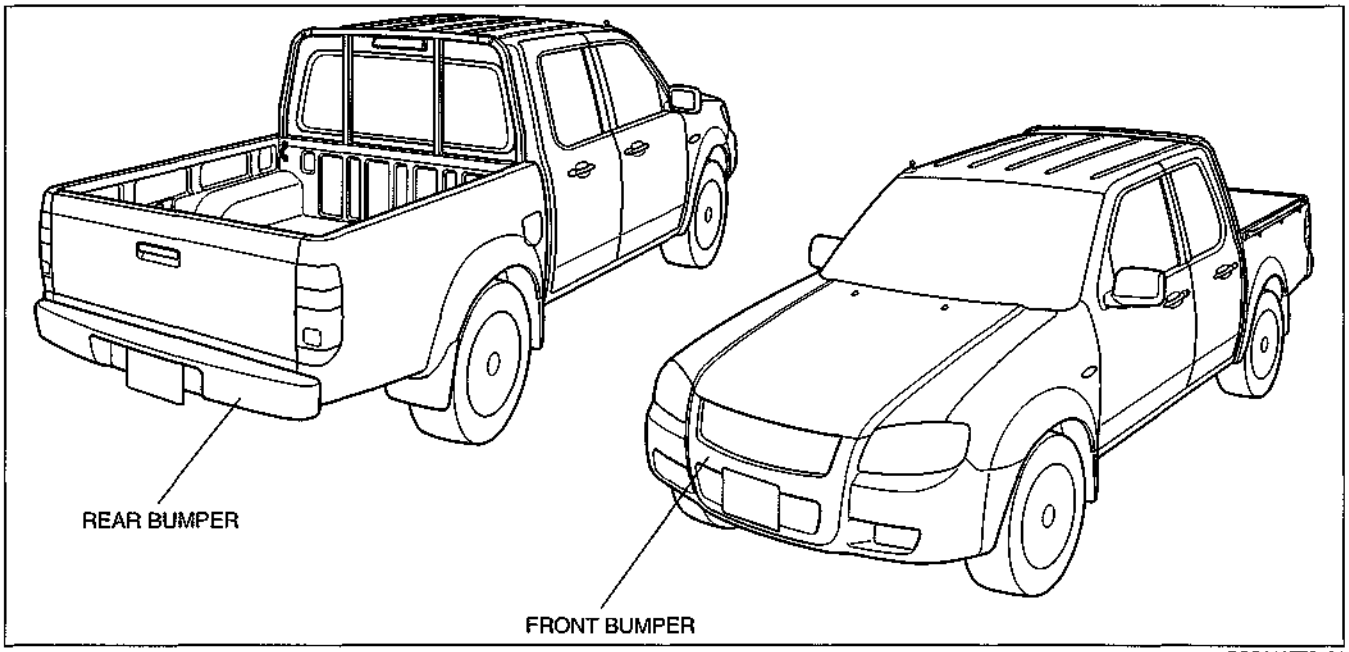

DBG910ZTB001

09-12 GLASS/WINDOWS/MIRRORS

REAR WINDOW DEFROSTER OUTLINE 09-12–1
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POWER OUTER MIRROR OPERATION.....09-12–5

REAR WINDOW DEFROSTER OUTLINE

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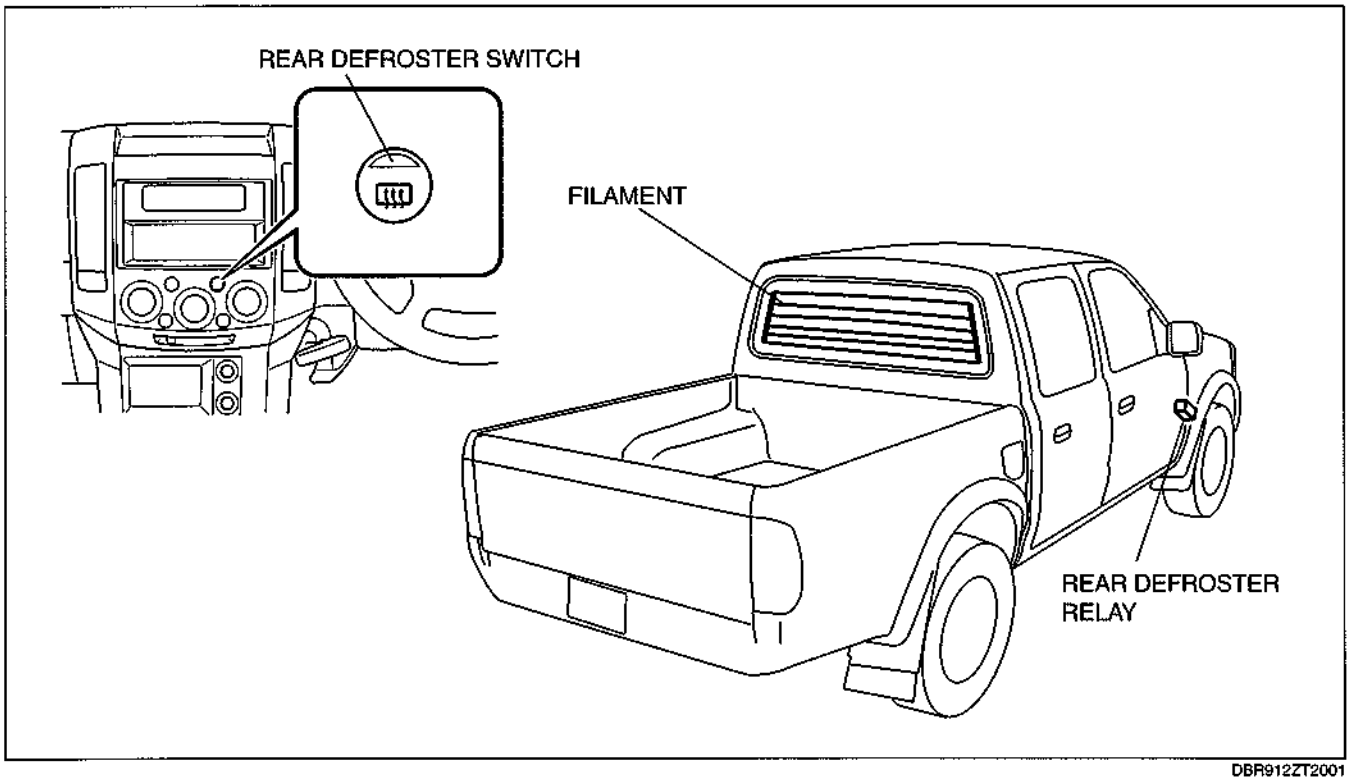
- Rear window defroster system has been adopted.

REAR WINDOW DEFROSTER STRUCTURAL VIEW

dcf091263000t02



DBR912ZT2001

REAR WINDOW DEFROSTER SYSTEM WIRING DIAGRAM

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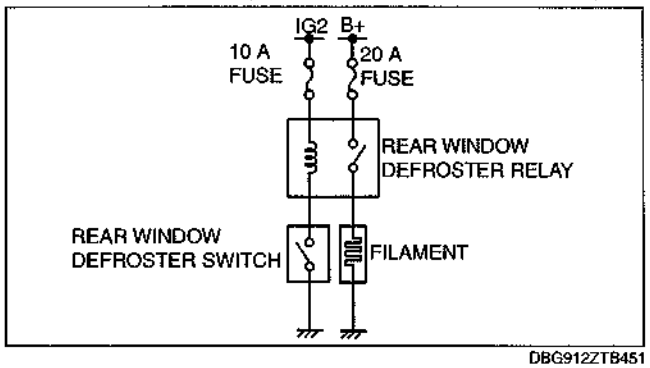


DBG912ZTB451

09

REAR WINDOW DEFROSTER SYSTEM OPERATION

dcf091263000t04

- When the rear window defroster switch is pressed, the rear window defroster turns on.
- Fogging is cleared from the rear window and outer mirror glass by heating of the filament.
- If the rear window defroster switch is pressed again with the rear window defroster on, defrosting will stop. Defroster operation also stops if the engine switch is turned to LOCK while the system is operating

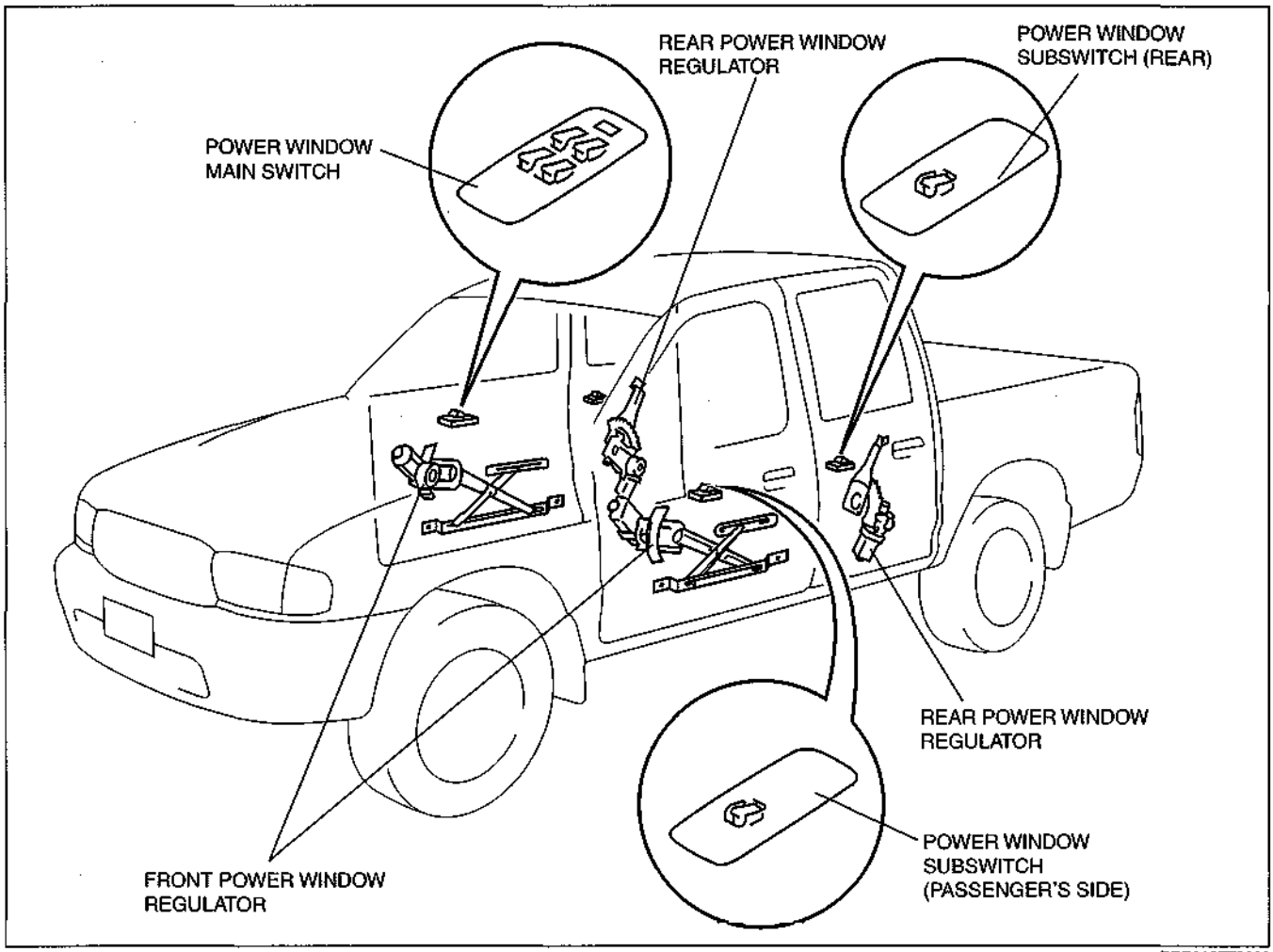
POWER WINDOW SYSTEM OUTLINE

dcf091258000t07

- The following functions have been adopted for all windows.
  - — Manual open/close function
  - — Auto-open function
- A power-cut function that permits disabling the operation of all window switches from the driver's seat has been adopted.

POWER WINDOW SYSTEM STRUCTURAL VIEW

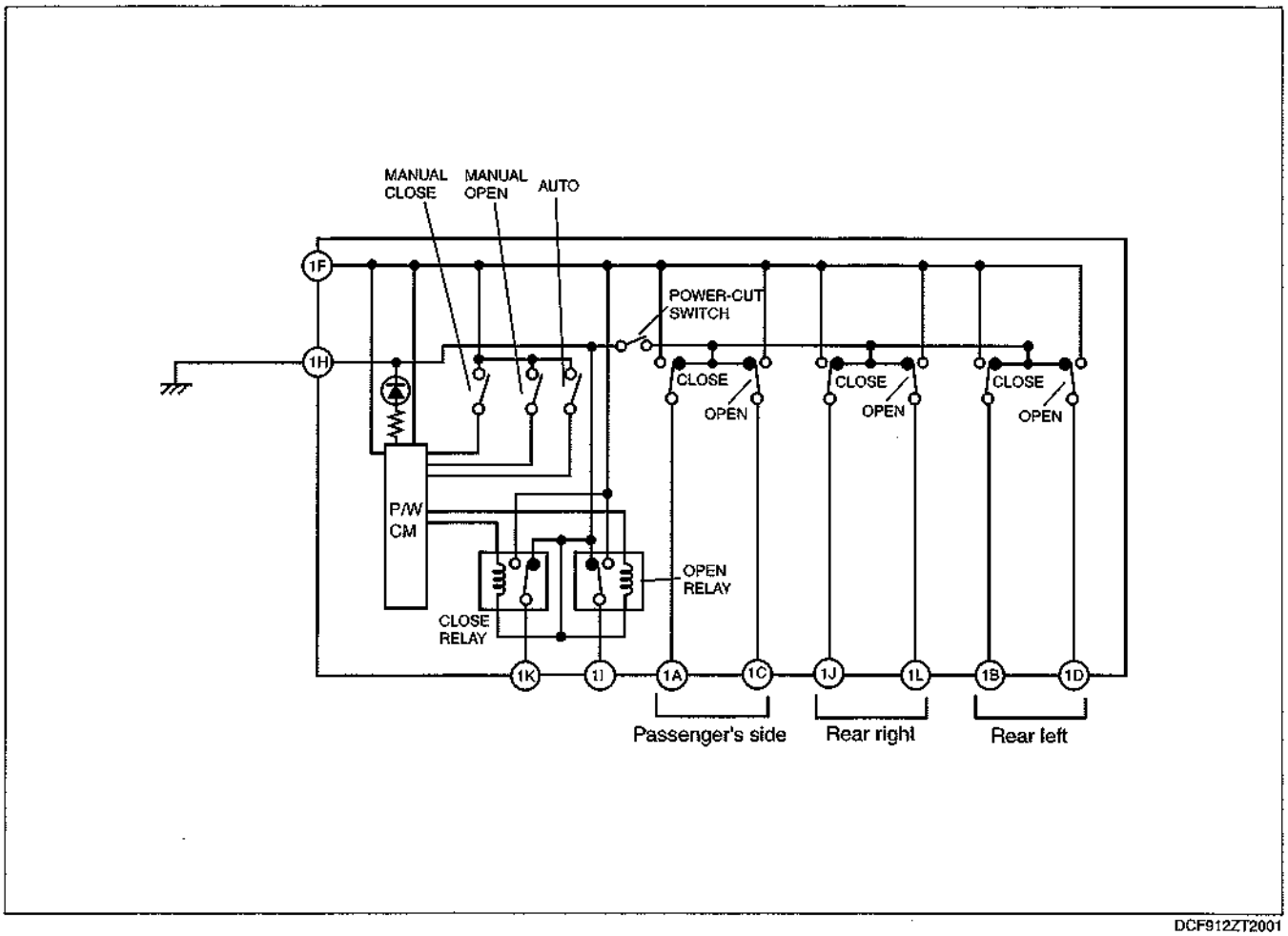
dcf091258000t02



DBR912ZT2002

POWER WINDOW SYSTEM WIRING DIAGRAM

dcf091258000t03



DCF912ZT2001

POWER WINDOW SYSTEM OPERATION

dcf091258000t05

Manual Open/Close

- The window opens/closes according to the down (push) or up (pull) operation of the power window main switches and the power window subswitches.

Auto-Open

- The window automatically moves to a fully-opened position when the power window main switches is operated to fully open positions, either down (push).

POWER OUTER MIRROR OUTLINE

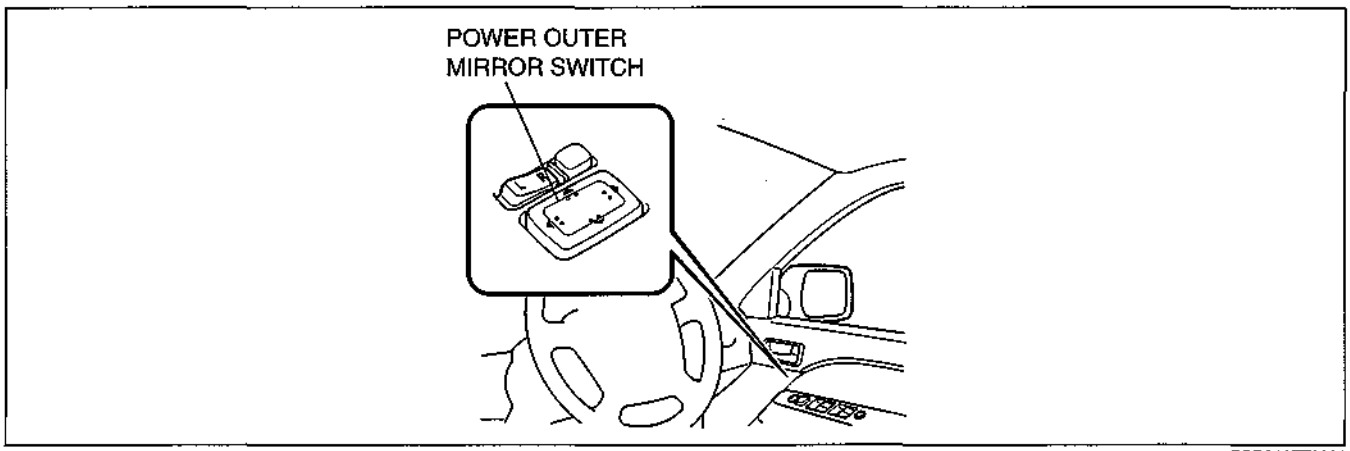
dcf091269100t01

Improved convenience	• Power outer mirror (mirror glass adjusting function) adopted

09

POWER OUTER MIRROR STRUCTURAL VIEW

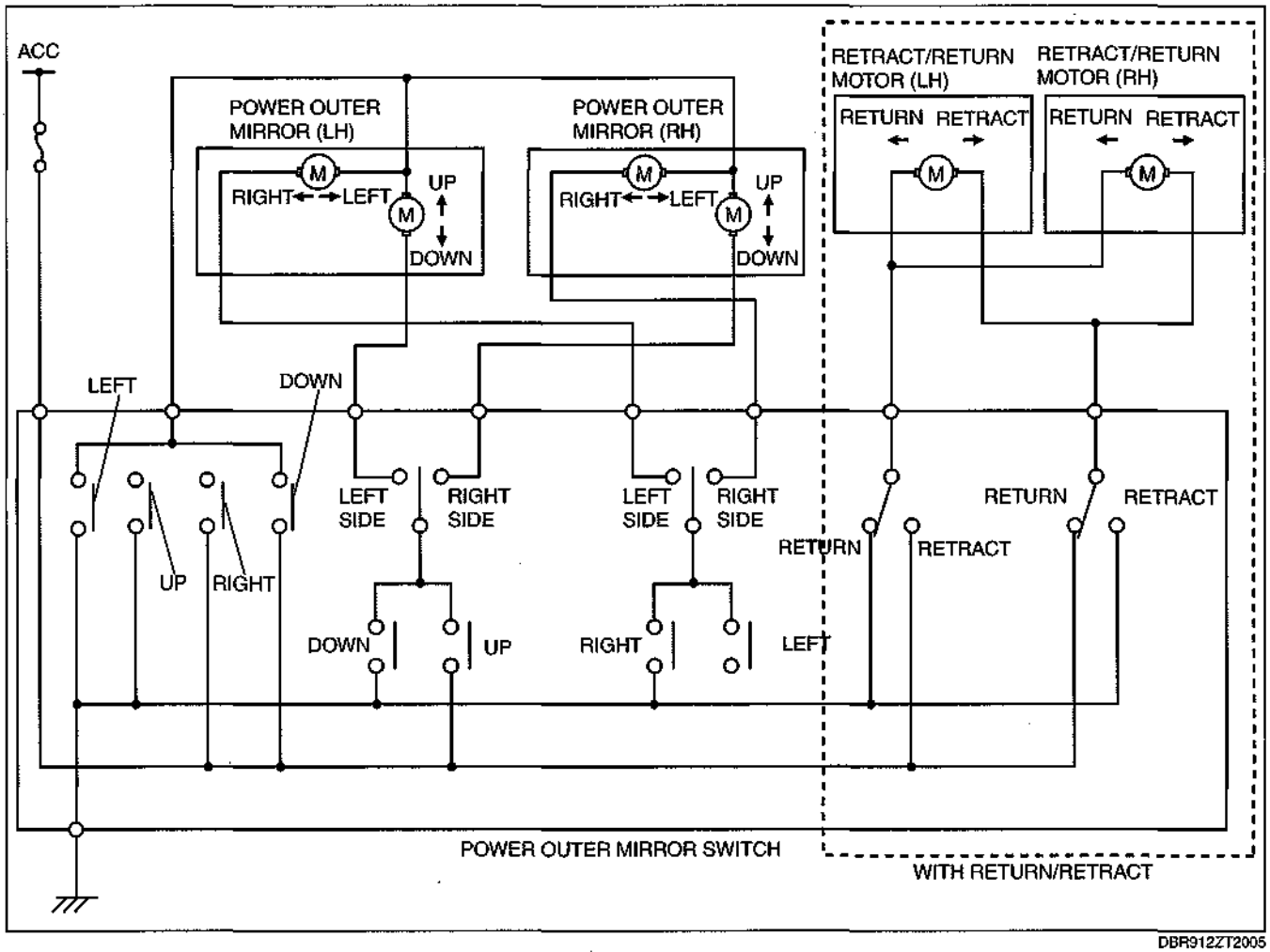
dcf091269100102



DBR912ZT2004

POWER OUTER MIRROR SYSTEM WIRING DIAGRAM

dcf091269100103



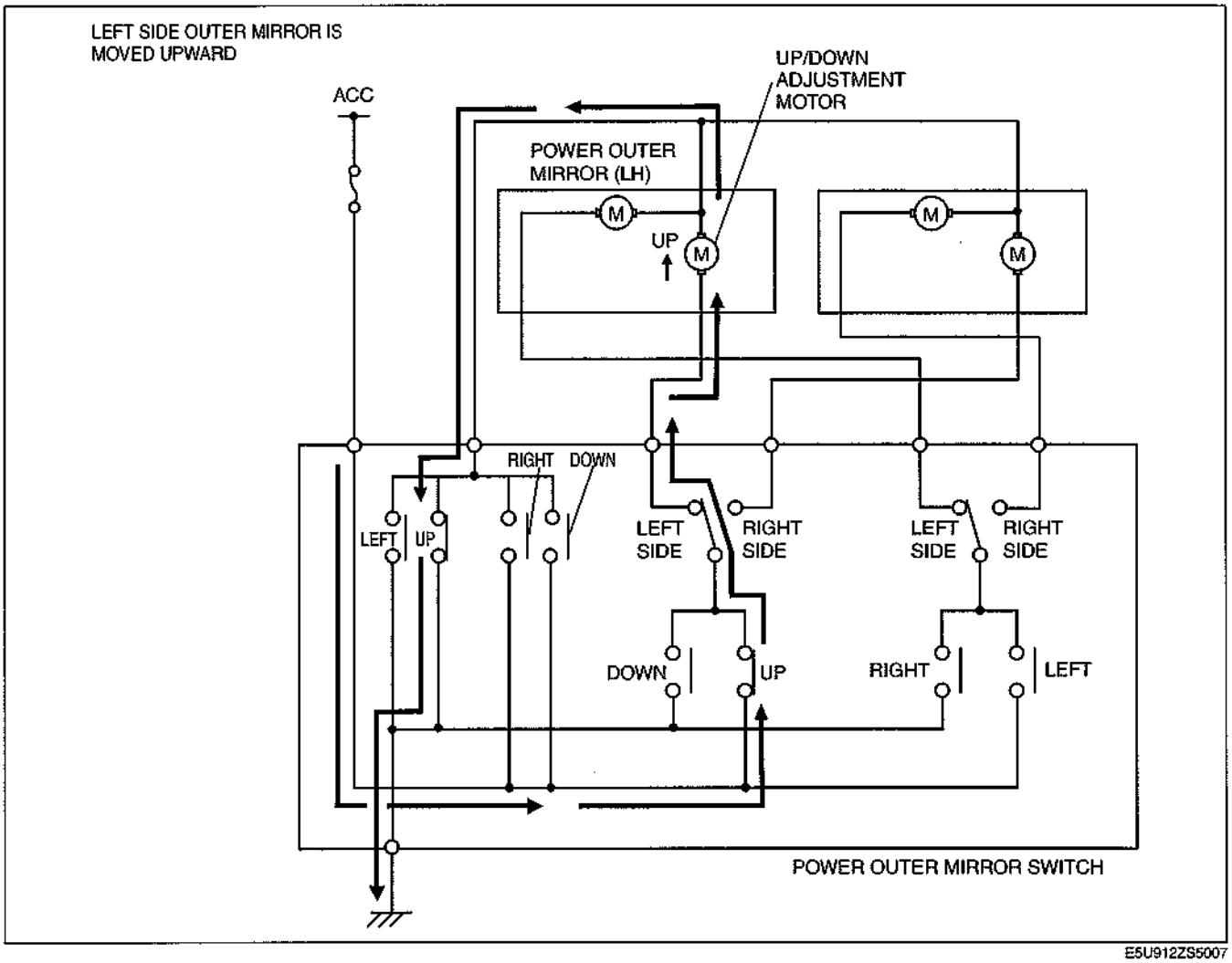
DBR912ZT2005

POWER OUTER MIRROR OPERATION

dcf091269100t04

Mirror Glass Adjustment

- The left/right selection switch establishes left or right side outer mirror circuit and current is supplied in either one of the four directions according to the position of the mirror glass adjustment switch. Due to this, the motor rotates either up or down, left or right.



E5U912ZS5007

09

09-13 SEATS

SEATS OUTLINE..... 09-13–1
SEATS SPECIFICATION..... 09-13–1
SEATS STRUCTURAL VIEW.....09-13–2

SEATS OUTLINE

dcf091357000t01

FEATURES

Improved marketability	• Two types of have been adopted for the driver and passenger seats. — Separate type — Bench type

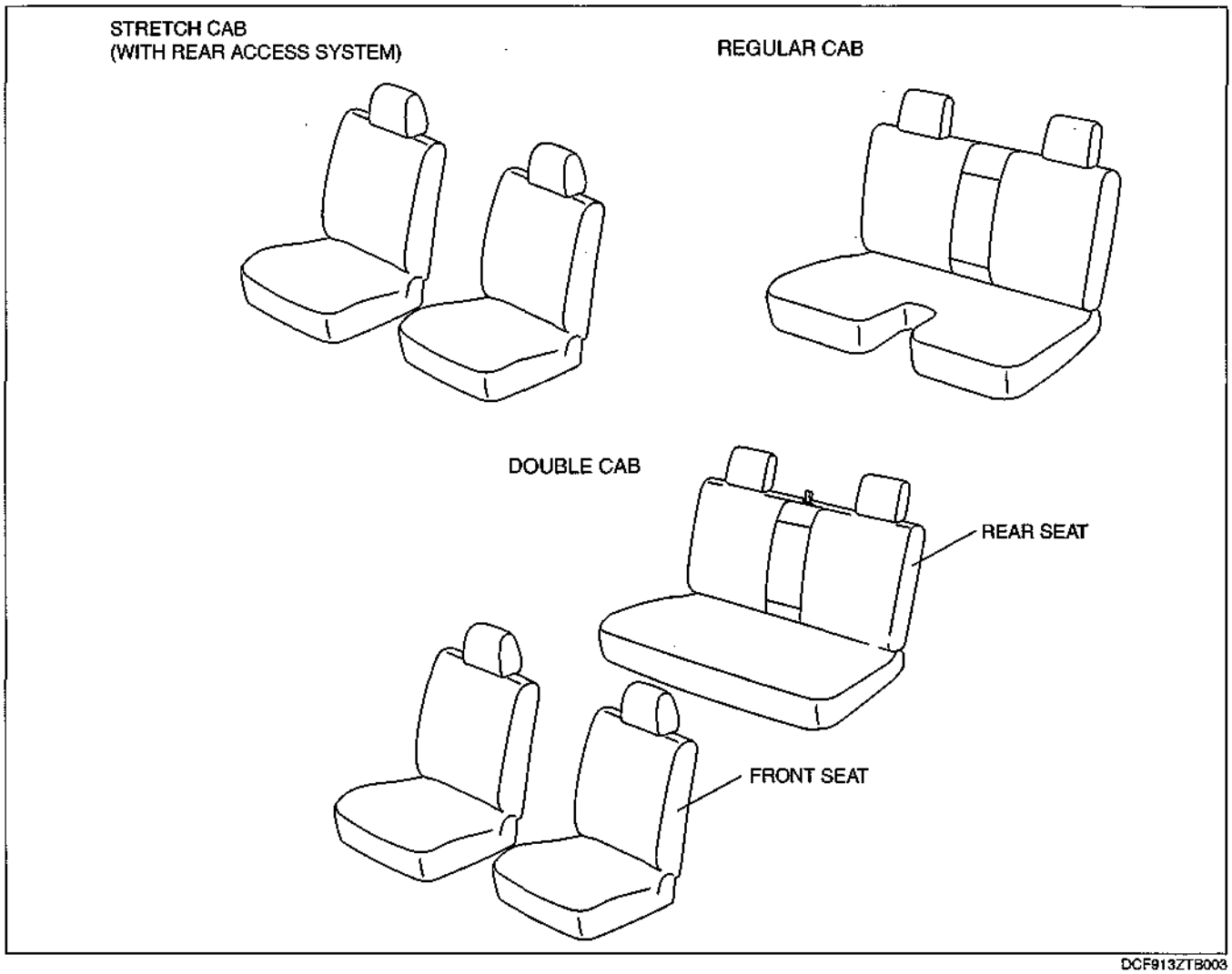
SEATS SPECIFICATION

dcf091357000t02

Body type	Item	Function
Stretch cab	Seat	Recliner
		Slide
		Side air bag module (See 08-10-5 SIDE AIR BAG MODULE FUNCTION.)
Regular cab	Seat	Recliner
		Slide
		Armrest
Double cab	Front seat	Recliner
		Slide
		Side air bag module (See 08-10-5 SIDE AIR BAG MODULE FUNCTION.)
	Rear seat	Armrest

SEATS STRUCTURAL VIEW

dcf091357000103



DCF913ZTB003

09-14 SECURITY AND LOCKS

SECURITY AND LOCKS OUTLINE 09-14–1
KEYLESS ENTRY SYSTEM OUTLINE 09-14–1
KEYLESS ENTRY SYSTEM STRUCTURAL VIEW 09-14–1
KEYLESS ENTRY SYSTEM WIRING DIAGRAM 09-14–2
KEYLESS ENTRY SYSTEM OPERATION 09-14–2
THEFT-DETERRENT SYSTEM OUTLINE 09-14–2
THEFT-DETERRENT SYSTEM STRUCTURAL VIEW 09-14–3
THEFT-DETERRENT SYSTEM SYSTEM WIRING DIAGRAM 09-14–3
THEFT-DETERRENT SYSTEM INPUT/OUTPUT DIAGRAM 09-14–4
THEFT-DETERRENT SYSTEM CONDITION 09-14–4
THEFT-DETERRENT SYSTEM PHASE 09-14–5
IMMOBILIZER SYSTEM OUTLINE 09-14–7
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IMMOBILIZER SYSTEM OPERATION 09-14–10
ON-BOARD DIAGNOSTIC SYSTEM [IMMOBILIZER SYSTEM] 09-14–11

SECURITY AND LOCKS OUTLINE

dcf091400001t01

Improved marketability	• Power door lock system adopted • Keyless entry system adopted
Improved security	• Theft-deterrent system adopted • Immobilizer system adopted

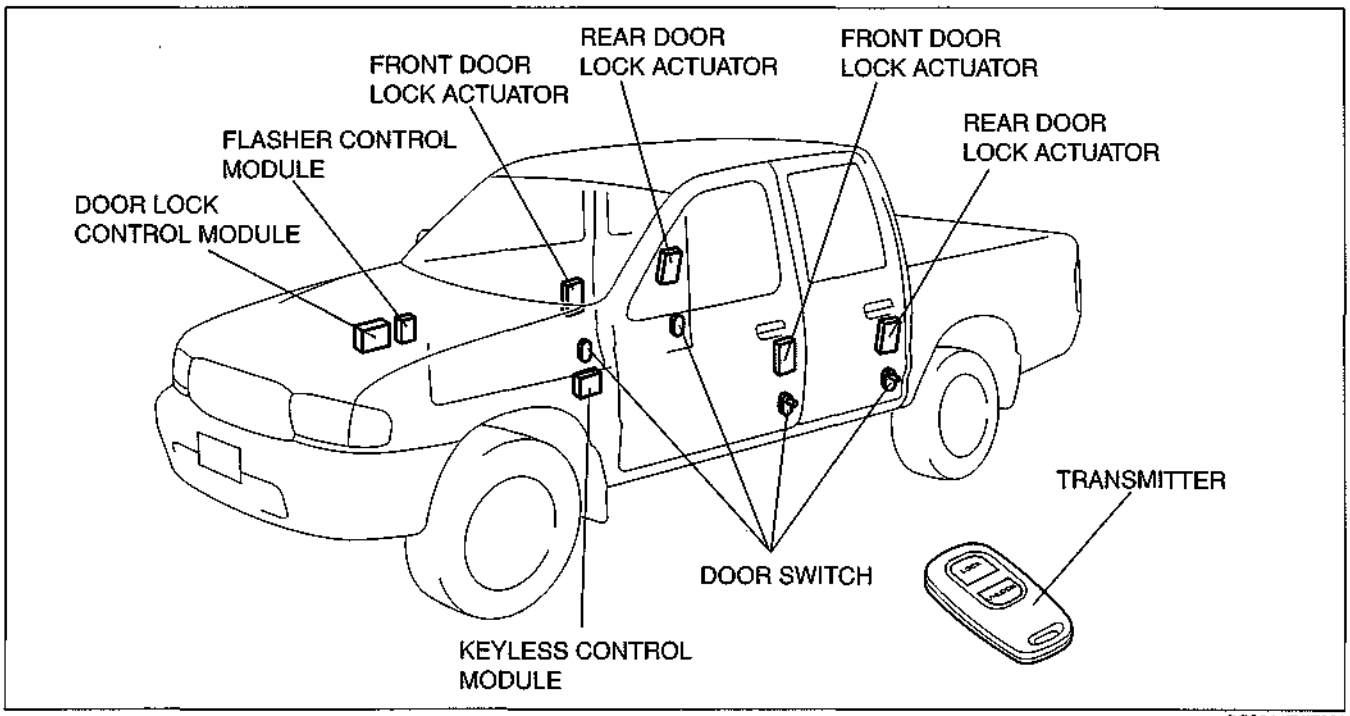
KEYLESS ENTRY SYSTEM OUTLINE

dcf091466000t01

- The doors also can be locked/unlocked by operating the key or transmitter.
- The answer-back function has been adopted where the hazard warning lights flash and a buzzer sounds to confirm that the doors are locked/unlocked.
- A rolling code type transmitter has been adopted to prevent theft by radiowave interception.
- To prevent improper operation while the vehicle is moving, the doors cannot be locked/unlocked by operating the transmitter if the ignition key is not in the LOCK position.

KEYLESS ENTRY SYSTEM STRUCTURAL VIEW

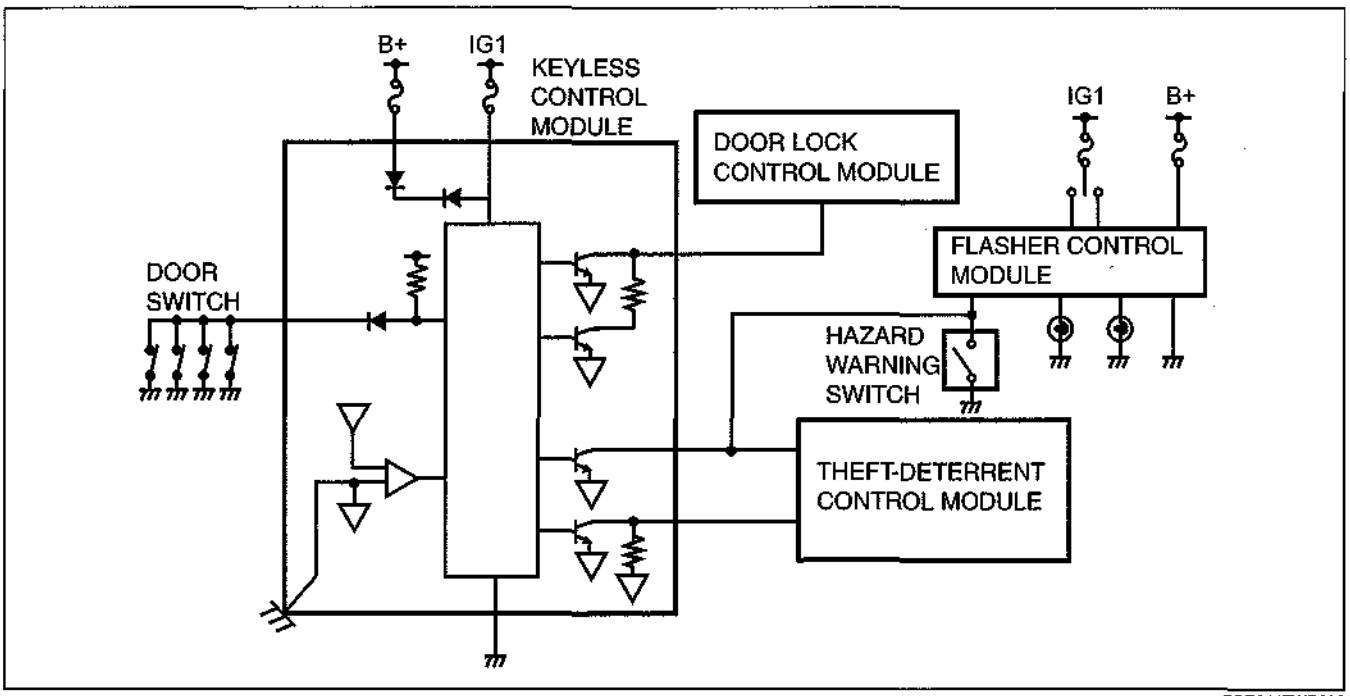
dcf091466000t02



DFC914ZWZ001

KEYLESS ENTRY SYSTEM WIRING DIAGRAM

dcf091466000t03



DBR914ZWB002

KEYLESS ENTRY SYSTEM OPERATION

dcf091466000t04

- When the transmitter LOCK/UNLOCK button is pushed, all doors lock/unlock.
- In response to transmitter operation (lock/unlock), the hazard warning lights flash to enable visual verification of operation.
  - — When the transmitter LOCK button is pushed, the hazard warning lights flash once.
  - — When the transmitter UNLOCK button is pushed, the hazard warning lights flash twice.
- When any door is not opened within 30 s after the transmitter UNLOCK button is pressed, the UNLOCK signal is cancelled and the doors are locked.

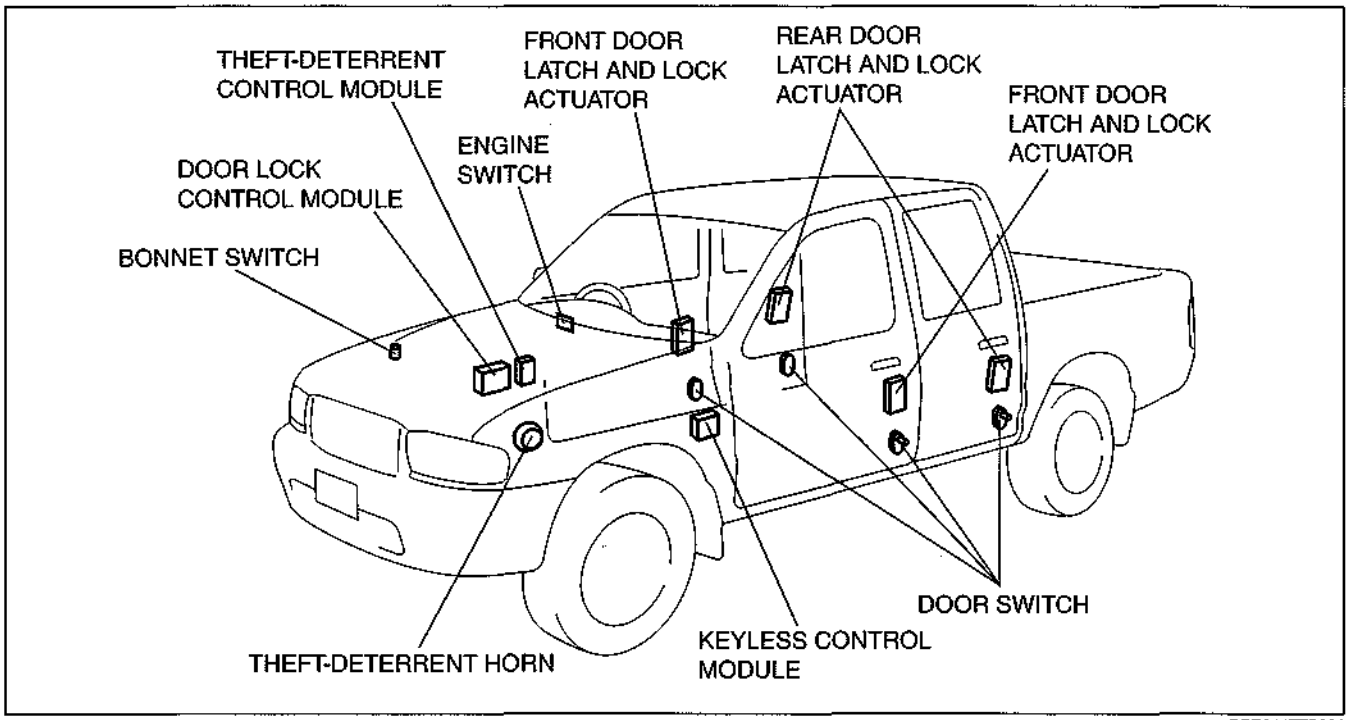
THEFT-DETERRENT SYSTEM OUTLINE

dcf091450000t01

- The theft-deterrent system includes sound and light alarms that activate when the bonnet or a door is opened by means other than the key. The turn lights flash and the theft-deterrent horn sounds. When the key is inserted into the door key cylinder and turned to unlock, the warnings stop.

THEFT-DETERRENT SYSTEM STRUCTURAL VIEW

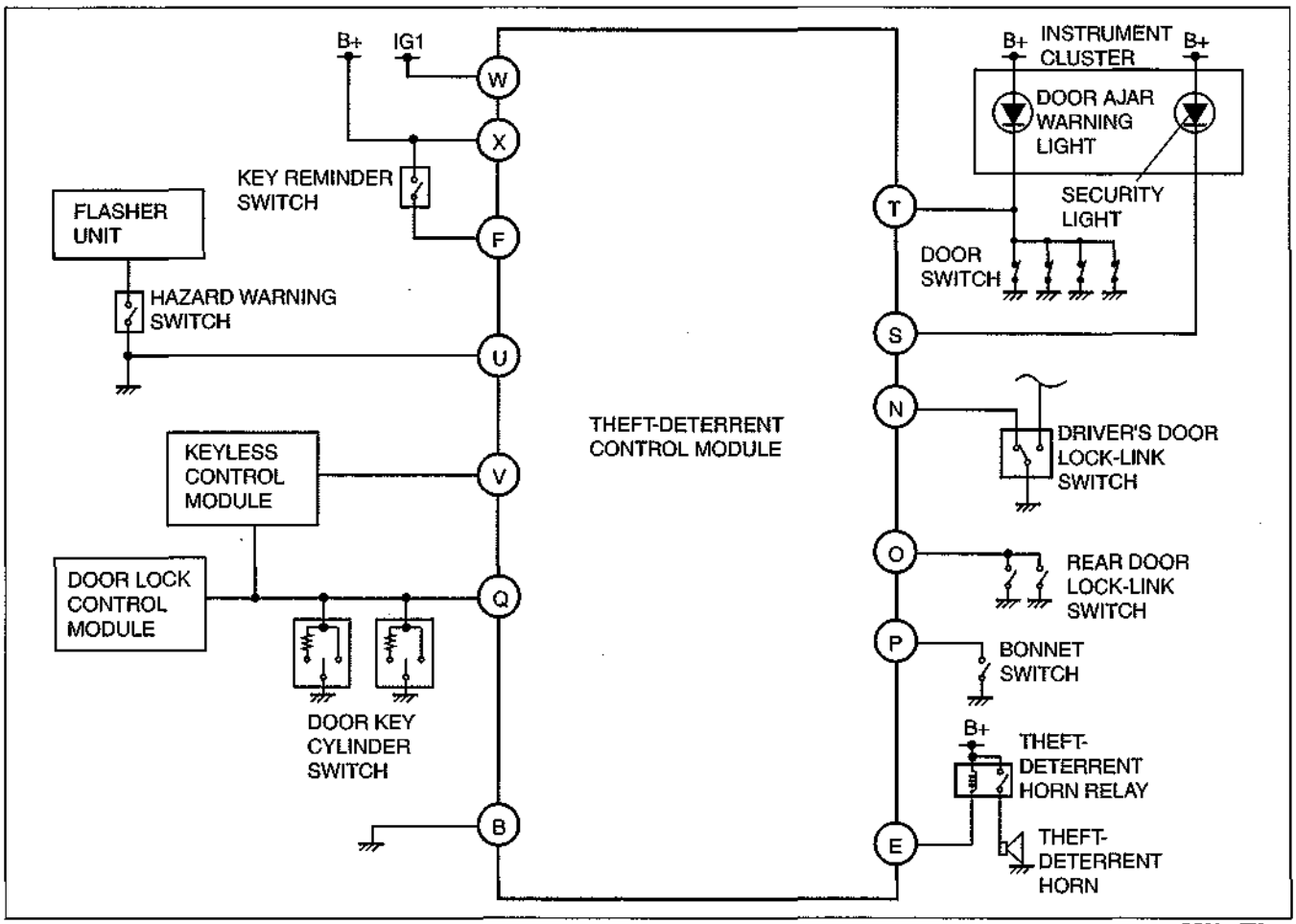
dcf091450000t02



DBR914ZTB006

THEFT-DETERRENT SYSTEM SYSTEM WIRING DIAGRAM

dcf091450000t03



DFC914ZTB111

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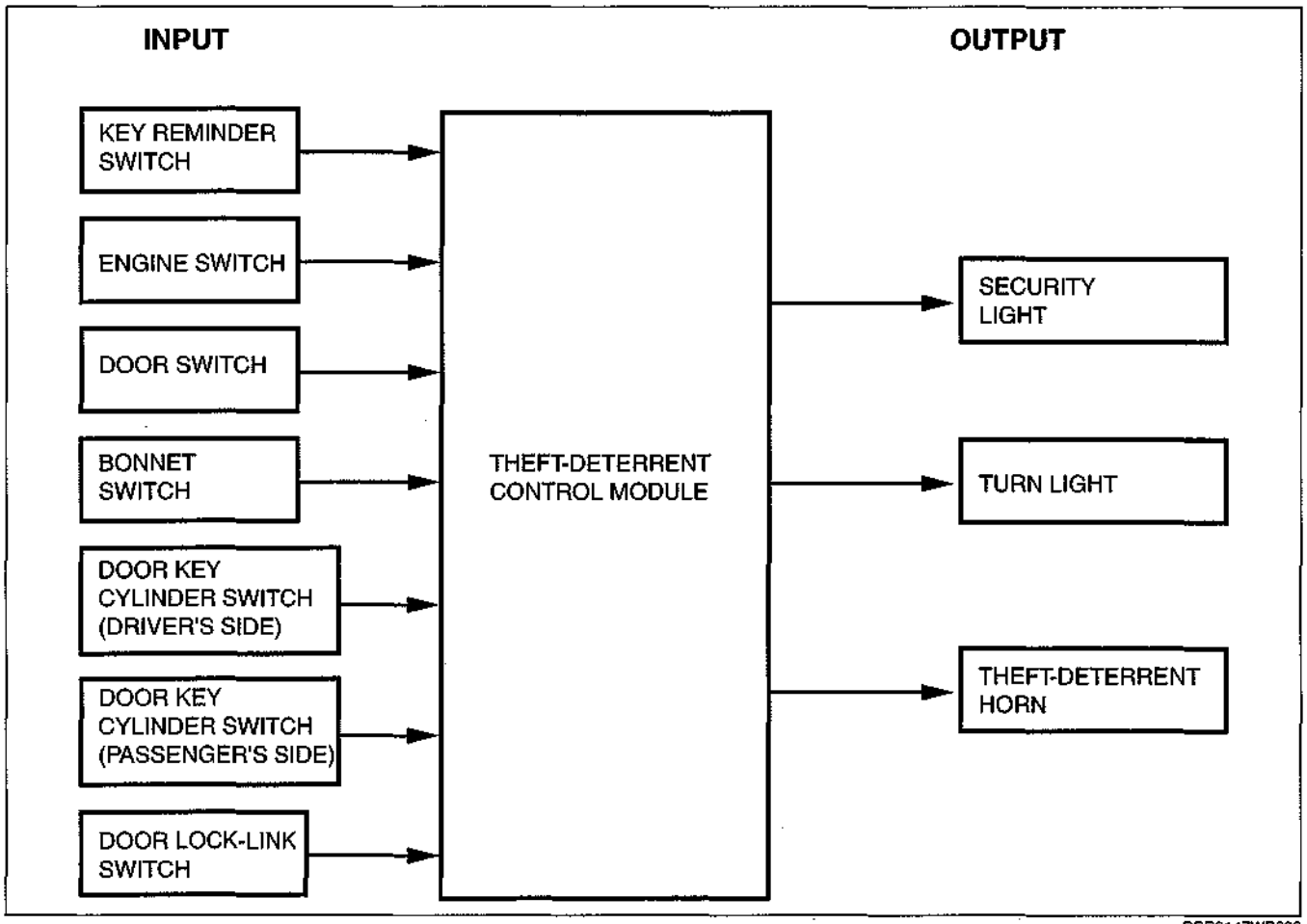
THEFT-DETERRENT SYSTEM INPUT/OUTPUT DIAGRAM

dcf091450000l04



D8R914ZWB003

THEFT-DETERRENT SYSTEM CONDITION

dcf091450000t05

System phase		Dead	Initial	Prearming 1	Prearming 2	Arming	Alarm 1	Alarm 2
INPUT	Timer period	–	–	–	–	–	*1	–
	Key reminder switch	On (at least one is on)	Off	Off	Off	Off	–	–
	Engine switch		Off	Off	Off	Off	On or Off (at least one is on)	On or Off
	Door switch	–	Off	On (at least one is on)	On or Unlock (at least one is on or lock)	Off		On or Off
	Bonnet switch	–	Off			Off		On or Off
	Door lock-link switch	–	–	–		Off		On or Off
	Driver's and passenger's door key cylinder switch	–	–	–	–	Off/Lock	Off/Lock	Off/Lock
OUTPUT	Theft-deterrent horn	Off	Off	Off	Off	Off		Off
	Turn light	Off	Off	Off	Off	Off		Off
	Security light	Off	Off	Off	Off		Off	Off

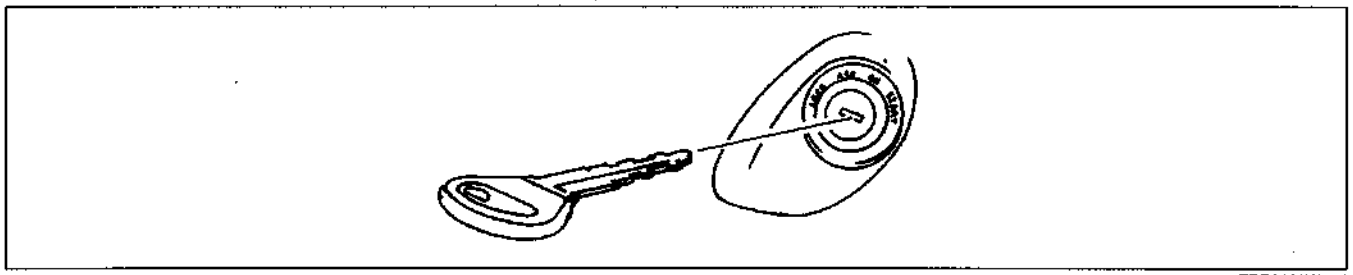
*1: Theft-deterrent horn timer period is 25 s. Turn light timer period is 4.5 min.

THEFT-DETERRENT SYSTEM PHASE

dcf091450000t06

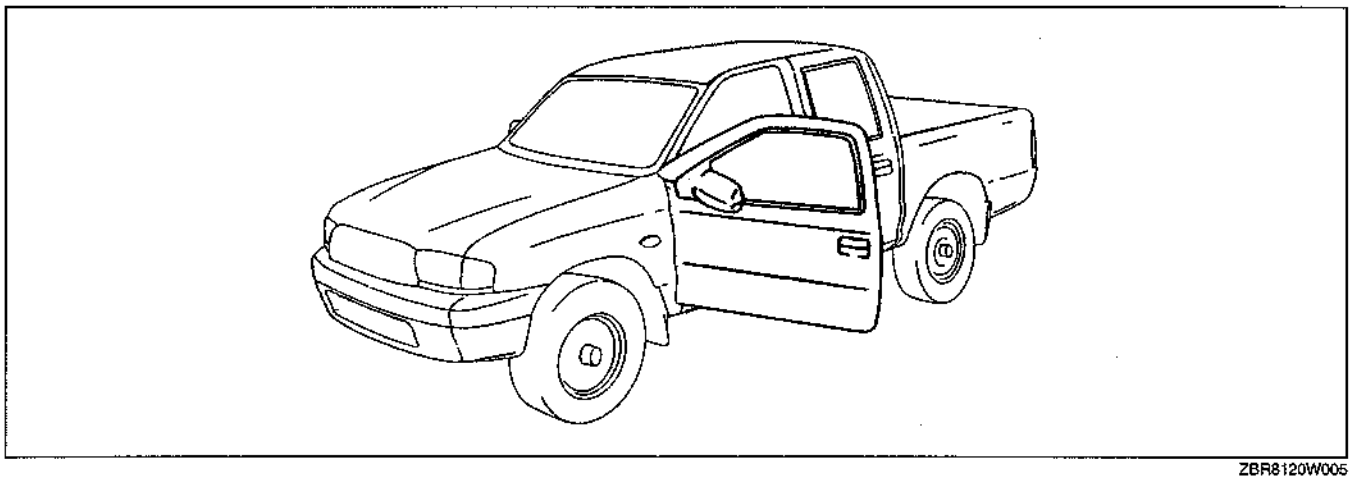
Dead
- The condition before the key is removed from the steering lock. (The key is at either ON position, ACC position, or LOCK position.)
- The security light is not lit at this time.

Initial
- The condition after the key is removed from the steering lock (with all doors and the bonnet closed).
- The security light is not lit at this time.



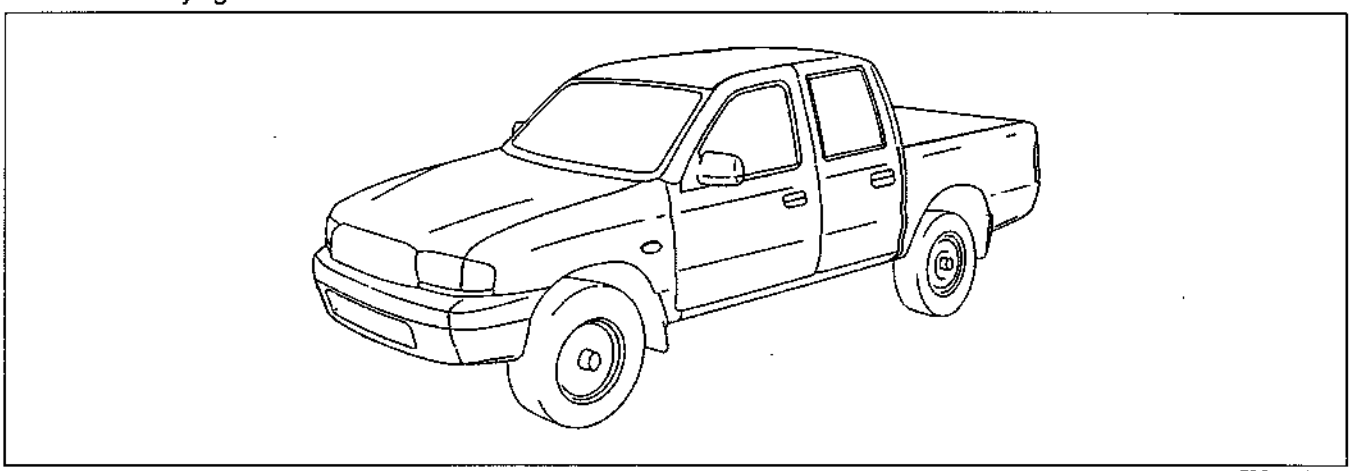
ZBR8120W004

Prearming 1
- The key is removed from the steering lock and a door or a bonnet is open.
- The security light is not lit at this time.



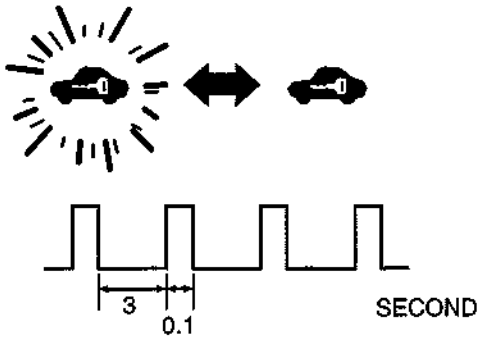
ZBR8120W005

Prearming 2
- The key is removed from the steering lock and a door is opened or not locked, and the bonnet is opened.
- The security light is not lit at this time.



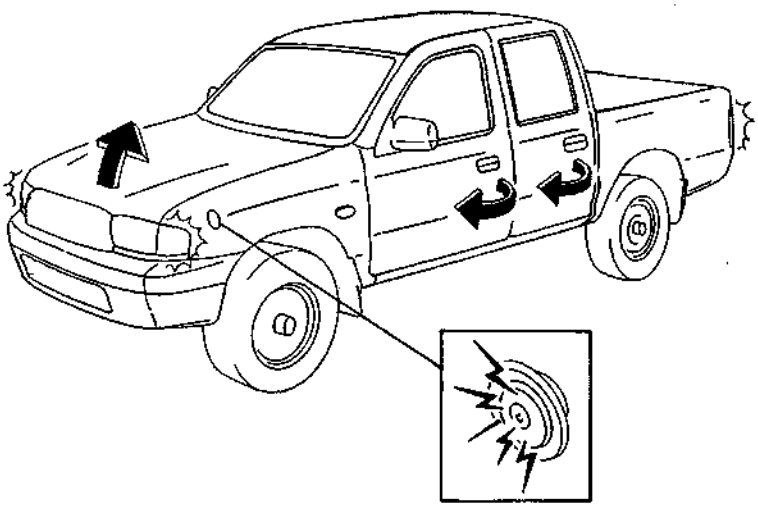
ZBR8120W006

Arming 1
- The doors are locked with the key after all doors and the bonnet are closed.
- The turn lights have been flashed for 2 s shifting to "Arming 1" phase from "Prearming 2" phase.
- The security light is flashes at an interval of 3 s. The alarm system is fully set.



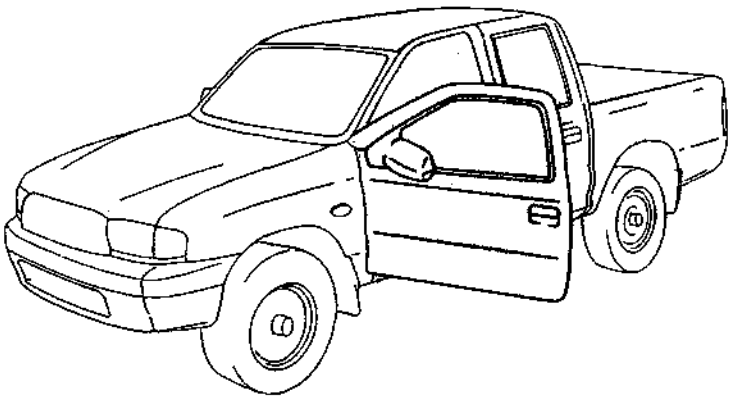
DBR914ZWB004

Alarm 1
- A door or the bonnet is opened without using the key, or the ignition circuit is short-circuited. The theft-deterrent horn sounds intermittently for 25 s and the turn lights flash intermittently for 4.5 min.
- The theft-deterrent horn sounds intermittently for 25 s and turn lights flash intermittently for 4.5 min again when a door or the bonnet is opened or closed without using the key from the period of 25 s until 4.5 min.



ZBR8120W008

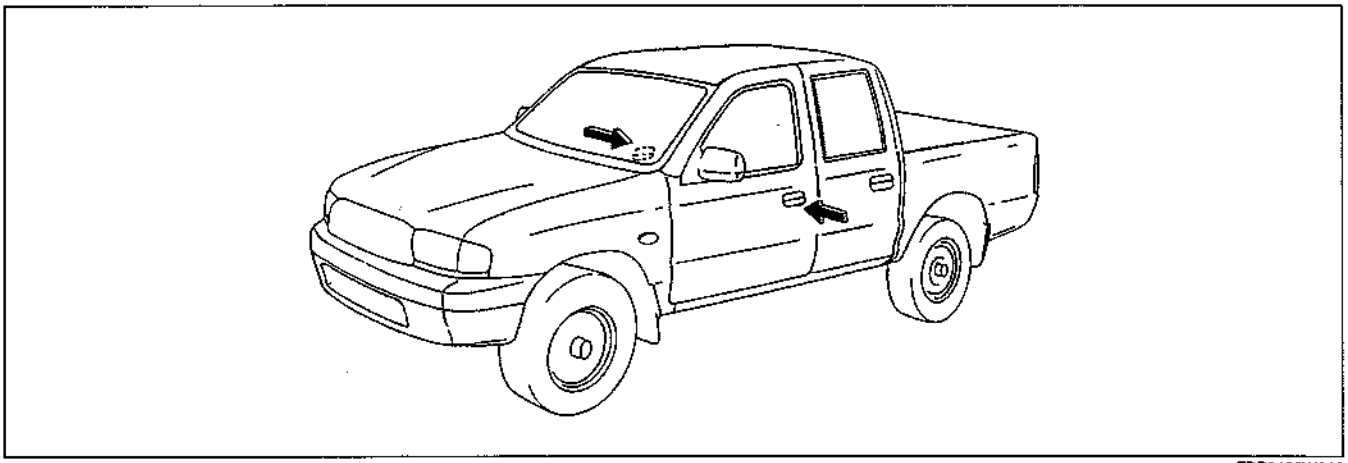
Alarm 2
- The condition (after 4.5 min have passed from the time "Alarm 1" phase was activated) in which the warning system is deactivated.
- When the door or the bonnet is opened again, the condition returns to "Alarm 1" phase.



ZBR8120W009

Alarm Stop Phase (Initial)

- The warning system is cancelled and the condition returns to "Initial" phase when either front door is unlocked with the key.



ZBR8120W010

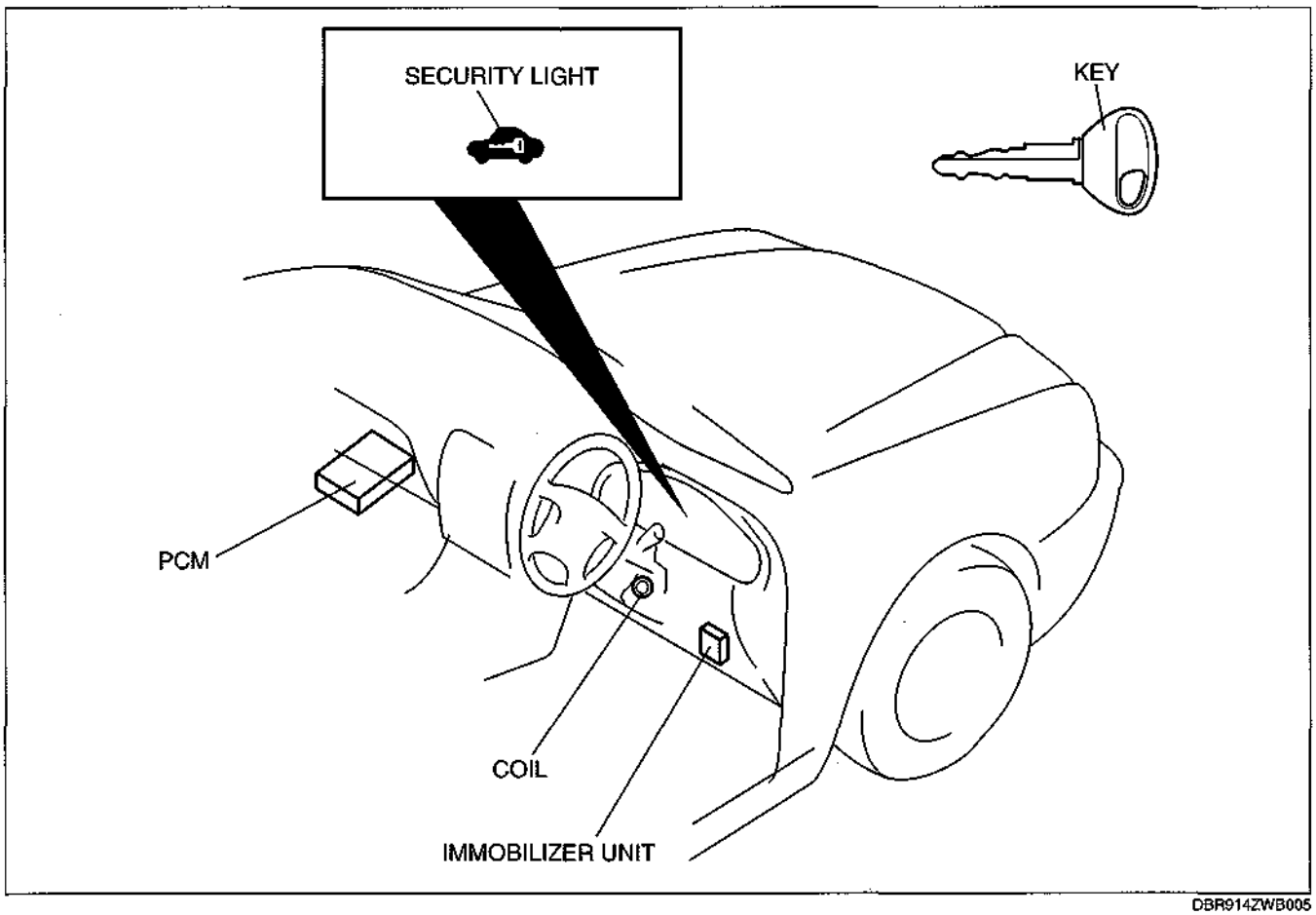
IMMOBILIZER SYSTEM OUTLINE

dcf09146700001

- The immobilizer system prevents the engine from starting even if the engine switch is short-circuited. As a result, it keeps the vehicle from being stolen.
- The system is composed of a special key, the security light, the coil, the immobilizer unit, and PCM. The engine can be started using the key, which has an ID number registered in its transponder and which uses an algorithmic verification method.
- The code word is input to the immobilizer unit and PCM. The vehicle dose not start if the code word is not newly input when parts are replaced.
- The procedure for registering the ID number and the procedure for inputting the code word are different according to the parts being replaced and the number of the registered keys.

IMMOBILIZER SYSTEM STRUCTURAL VIEW

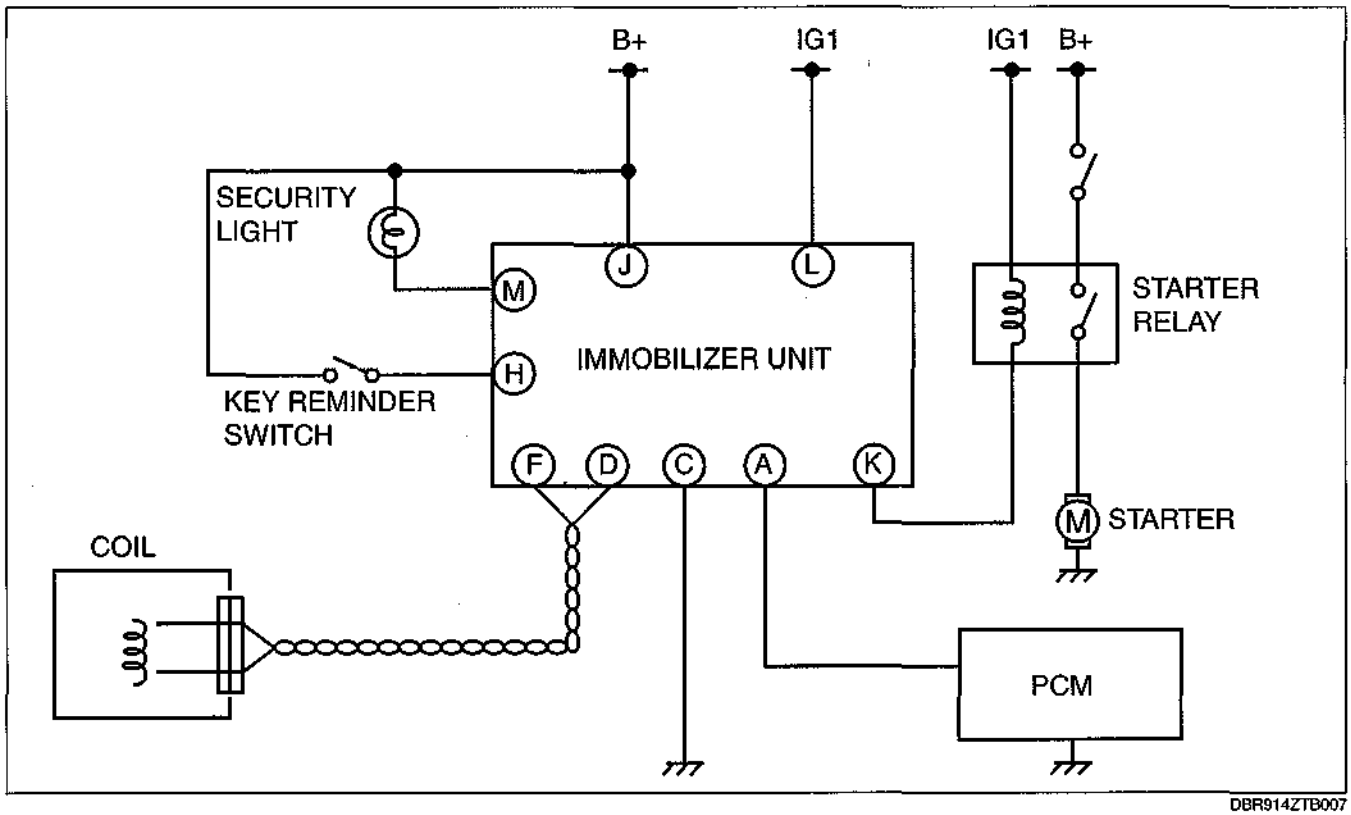
dcf091467000t02



DBR914ZWB005

IMMOBILIZER SYSTEM WIRING DIAGRAM

dcf091467000t03



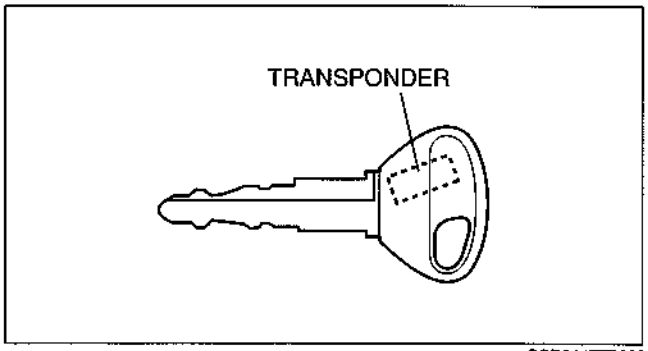
DBR914ZTB007

IMMOBILIZER SYSTEM SYSTEM COMPONENT

dcf091467000l04

Key

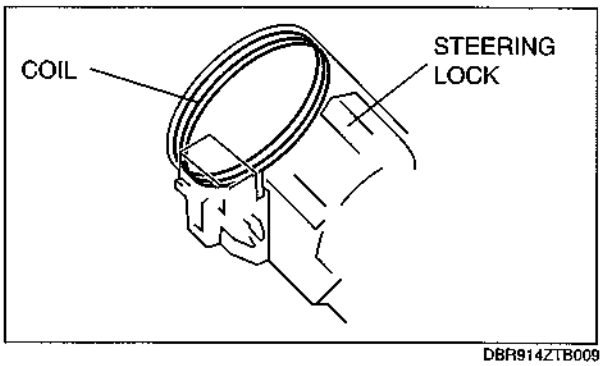
- The transponder in the key has a registered ID number.



DBR914ZTB008

Coil

- The coil is located in the steering lock.
- The coil has an antenna function and sends the ID number to the immobilizer unit.



DBR914ZTB009

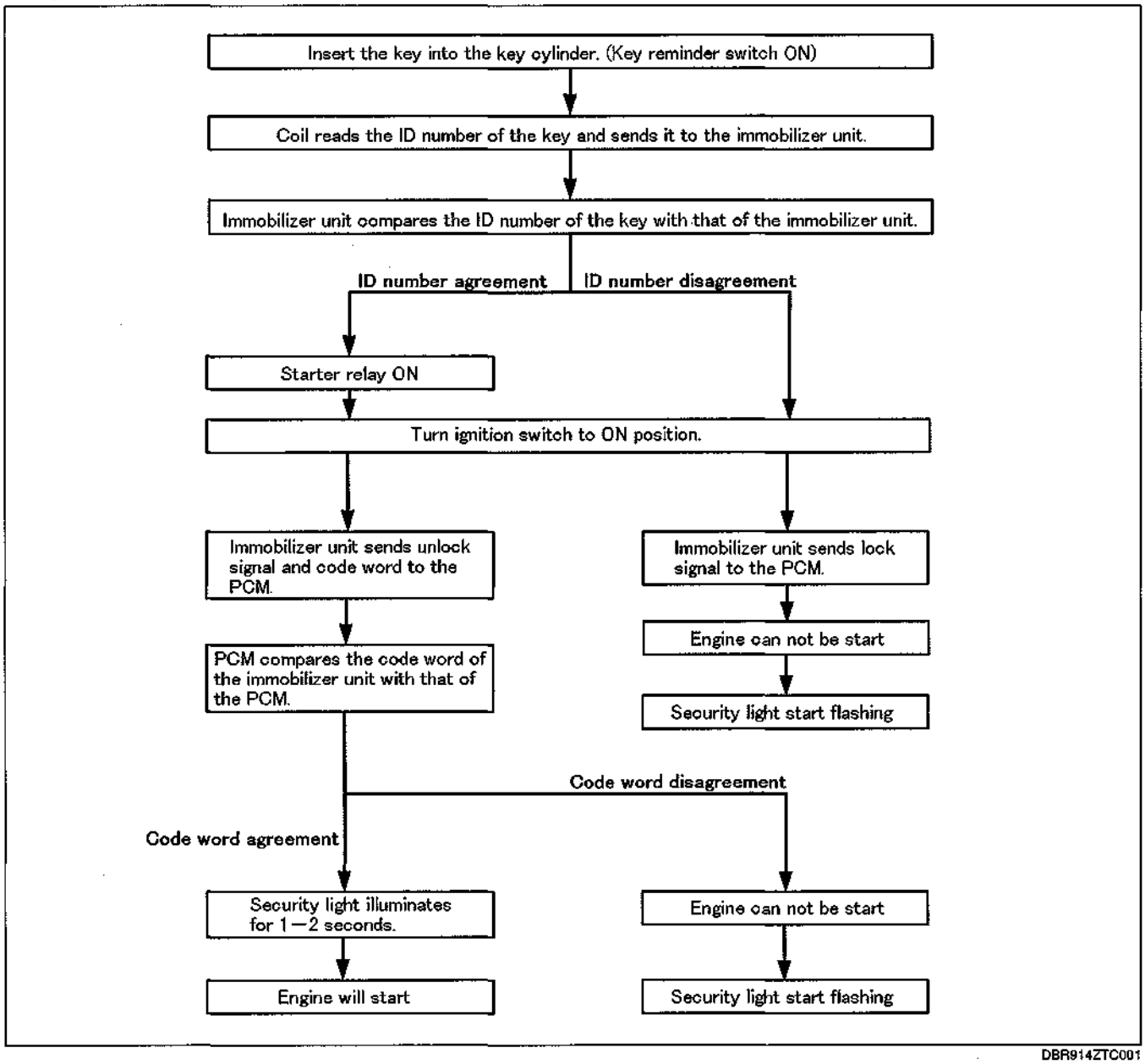
Immobilizer Unit

- The immobilizer unit compares the ID number and the algorithmic verification method of the key with those of the immobilizer unit.
- When the ID number and the algorithmic verification method are correct, the immobilizer unit sends the code word to the PCM
- When there is a malfunction in the immobilizer system, the immobilizer unit flashes the security light.

IMMOBILIZER SYSTEM OPERATION

dcf09146700l05

- This is a conceptual flow chart for understanding how the immobilizer system operates. It shows how the system decides whether or not to start the vehicle when the engine switch is turned to ON position.



DBR914ZTC001

ON-BOARD DIAGNOSTIC SYSTEM [IMMOBILIZER SYSTEM]

dcf091467000l06

Outline

- If the immobilizer system has a malfunction, the on-board diagnostic system displays the diagnostic trouble code number by flashing the security light when the engine switch is at ON position.

DTC Table

DTC	Output pattern	Description
01		ID number unregistered in immobilizer unit is input after engine switch is turned to ON position or cranking engine .
02		ID number format error (voltage range, frequency)
03		ID number is not input into immobilizer unit after engine switch is turned to ON position or cranking engine.
11		Coil or wiring harness between immobilizer unit and coil is open circuit.
21		Code word/ID number stored in immobilizer unit EEPROM cannot be read.
24		Open or short circuit in wiring harness between immobilizer unit and PCM.
30		PCM is defective. (Malfunction of communication line inside PCM)

09-16 EXTERIOR TRIM

EXTERIOR TRIM OUTLINE 09-16–1
EXTERIOR TRIM STRUCTURAL VIEW 09-16–1

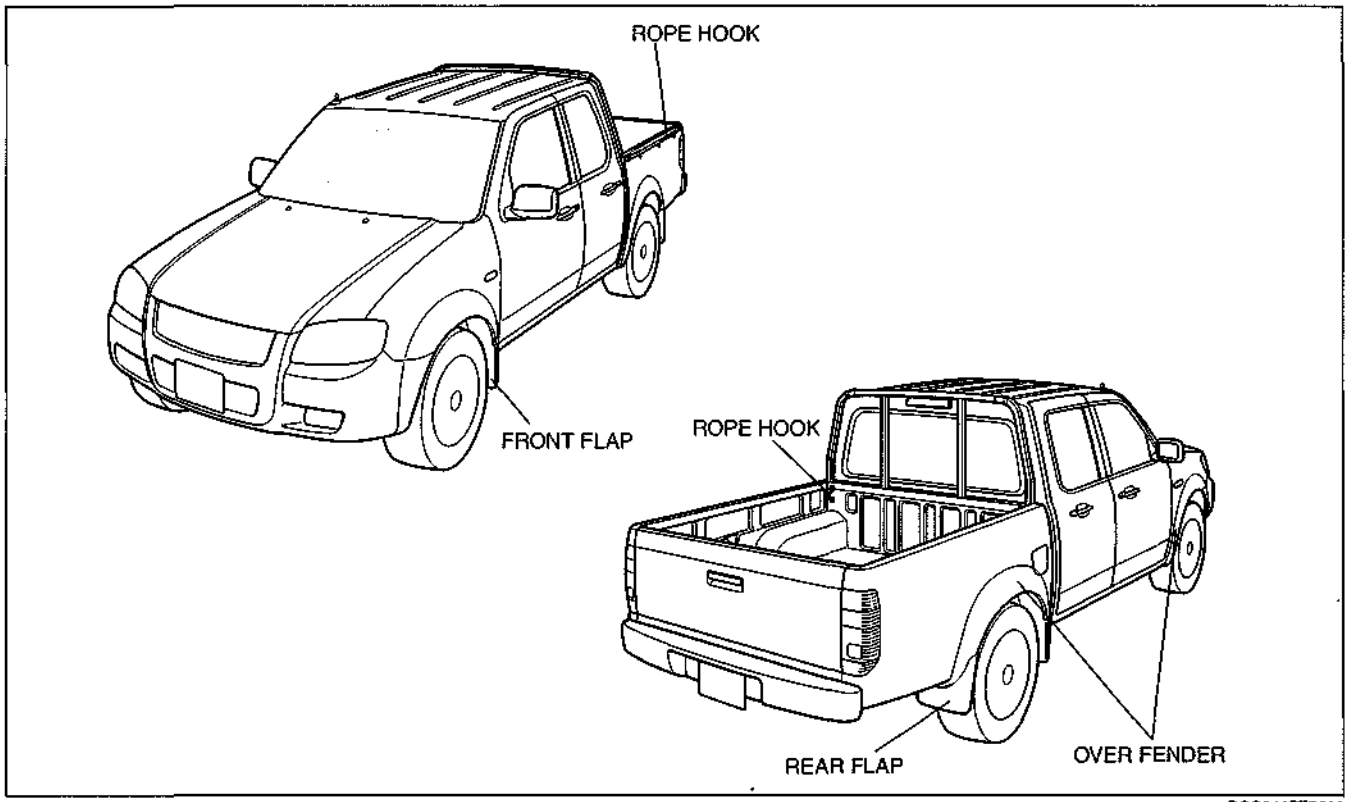
EXTERIOR TRIM OUTLINE

dcf091600000t01

- Front and rear flaps have been adopted.
- Over fender has been adopted.
- Rope hook has been adopted.

EXTERIOR TRIM STRUCTURAL VIEW

dcf091600000t02



DCG9162TB000

09-17 INTERIOR TRIM

INTERIOR TRIM OUTLINE 09-17–1
INTERIOR TRIM STRUCTURAL VIEW . . 09-17–1

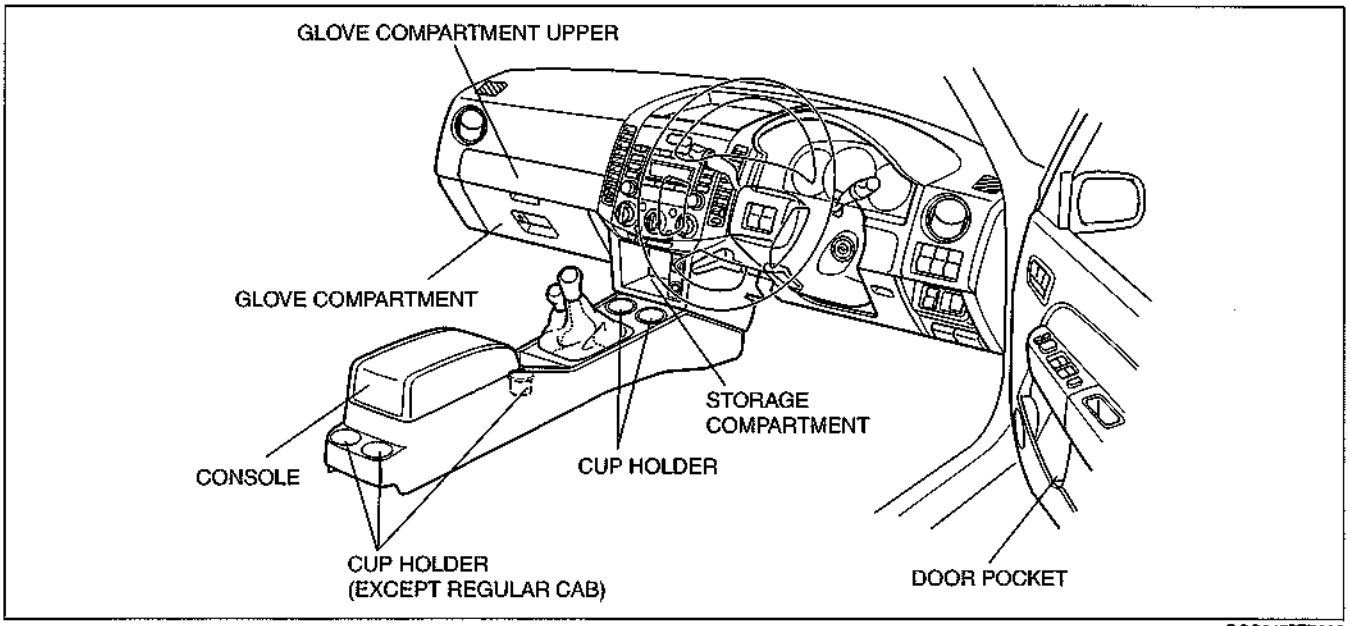
INTERIOR TRIM OUTLINE

dcf091755000t01

- Glove compatment upper have been added.
- Various storage spaces have been added.

INTERIOR TRIM STRUCTURAL VIEW

dcf091755000t02



DCG917ZTB000

09-18 LIGHTING SYSTEMS

LIGHTING SYSTEM OUTLINE 09-18–1
LIGHTING SYSTEMS SPECIFICATION 09-18–1
LIGHTING SYSTEM STRUCTURAL VIEW 09-18–2
FRONT COMBINATION LIGHT CONSTRUCTION 09-18–3
REAR COMBINATION LIGHT STRUCTURAL VIEW 09-18–4

LIGHTING SYSTEM OUTLINE

dcf091800000t01

- Headlight with built-in front turn and parking light has been adopted.
- A projector type has been adopted to the headlight (low-beam).
- Stepped reflectors have been adopted to the rear combination lights.

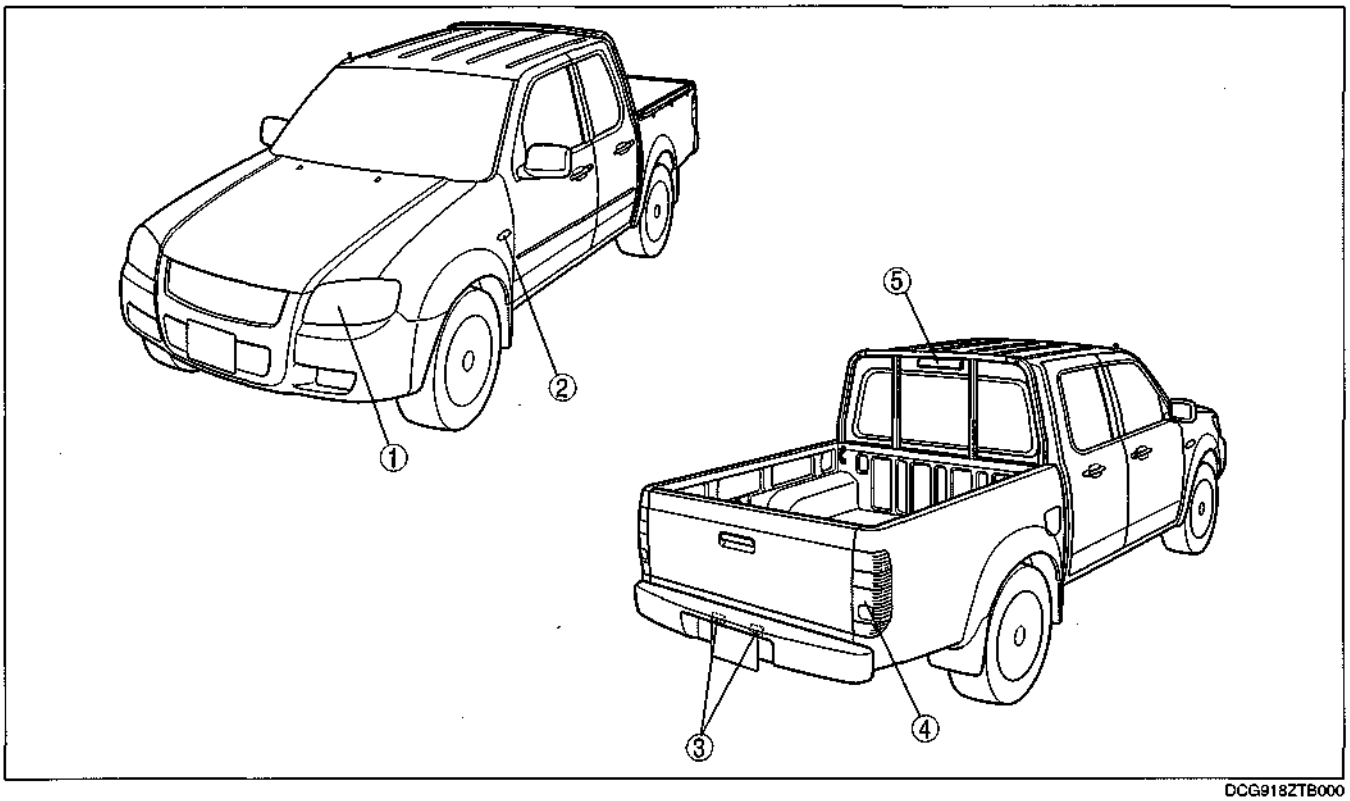
LIGHTING SYSTEMS SPECIFICATION

dcf091800000t03

Item			Specifications (W) × number
Exterior light bulb capacity	Headlight bulb	High-beam	60 × 2
		Low-beam	55 × 2
	Front turn light bulb		21 × 2
	Parking light bulb		5 × 2
	Front fog light bulb		55 × 2
	Front side turn light bulb		5 × 2
	Brake/taillight bulb		21/5 × 2
	Rear turn light bulb		21 × 2
	Back-up light bulb		21 × 2
	License plate light bulb		5 × 2
	High-mount brake light bulb		5 × 4
Interior light bulb capacity	Map light bulb		5 × 2
	Interior light bulb		8 × 1
	Glove compartment light bulb		1.7 × 1
	fG key illumination bulb		1.4 × 1
	Console illumination bulb		1.4 × 1

LIGHTING SYSTEM STRUCTURAL VIEW

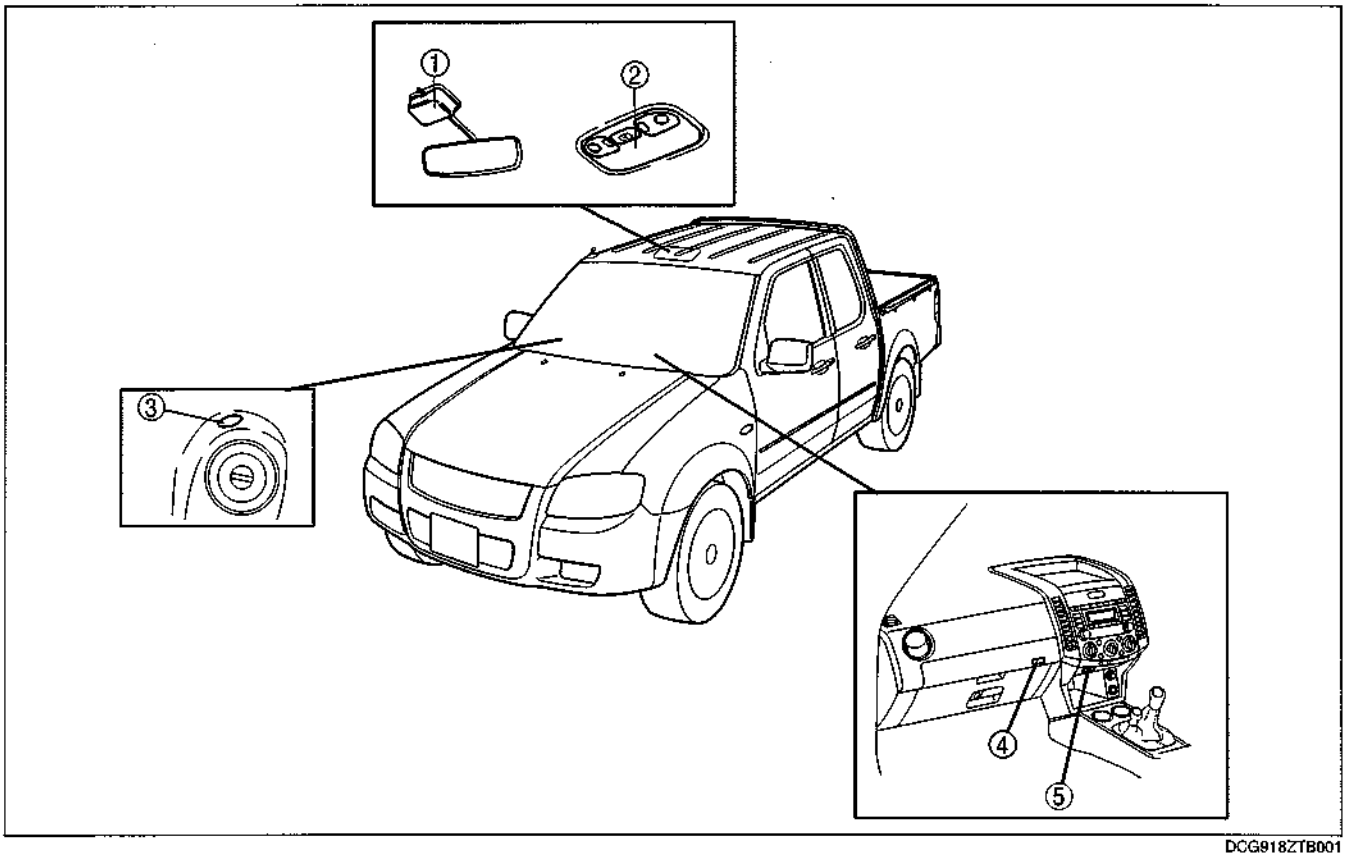
dcf091800000t02



DCG918ZTB000

1	Front combination light
2	Front side turn light
3	License plate light

4	Rear combination light
5	High-mount brake light



DCG918ZTB001

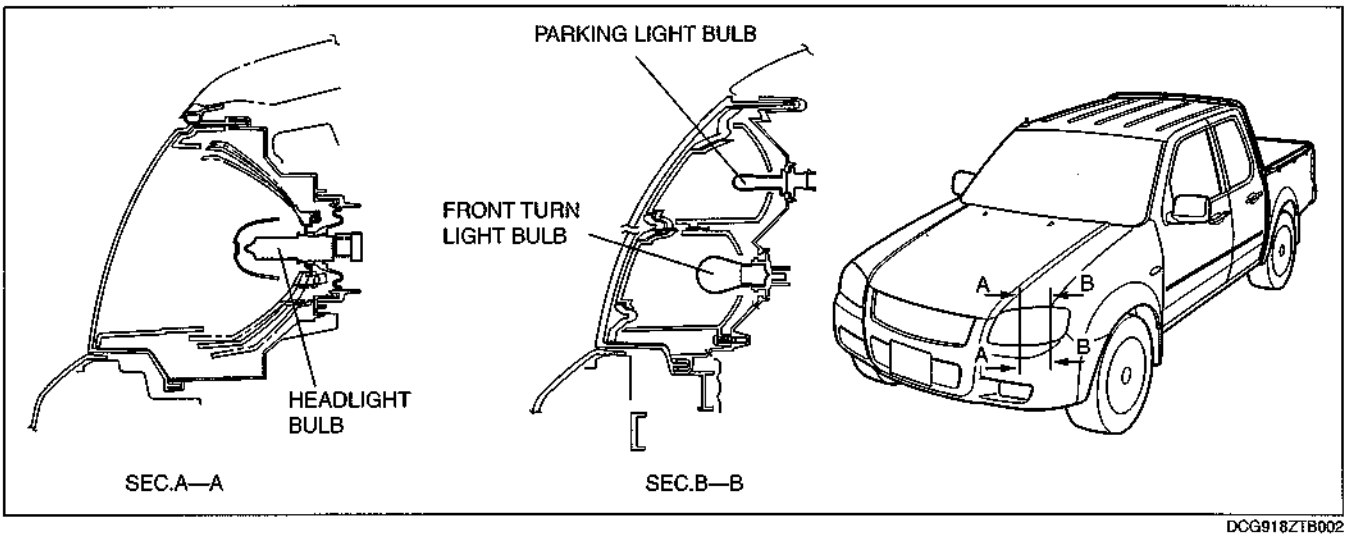
1	Interior light (regular cab)
2	Interior light (except regular cab)
3	IG key illumination

4	Glove compartment light
5	Console illumination

FRONT COMBINATION LIGHT CONSTRUCTION

dcf09185106t01

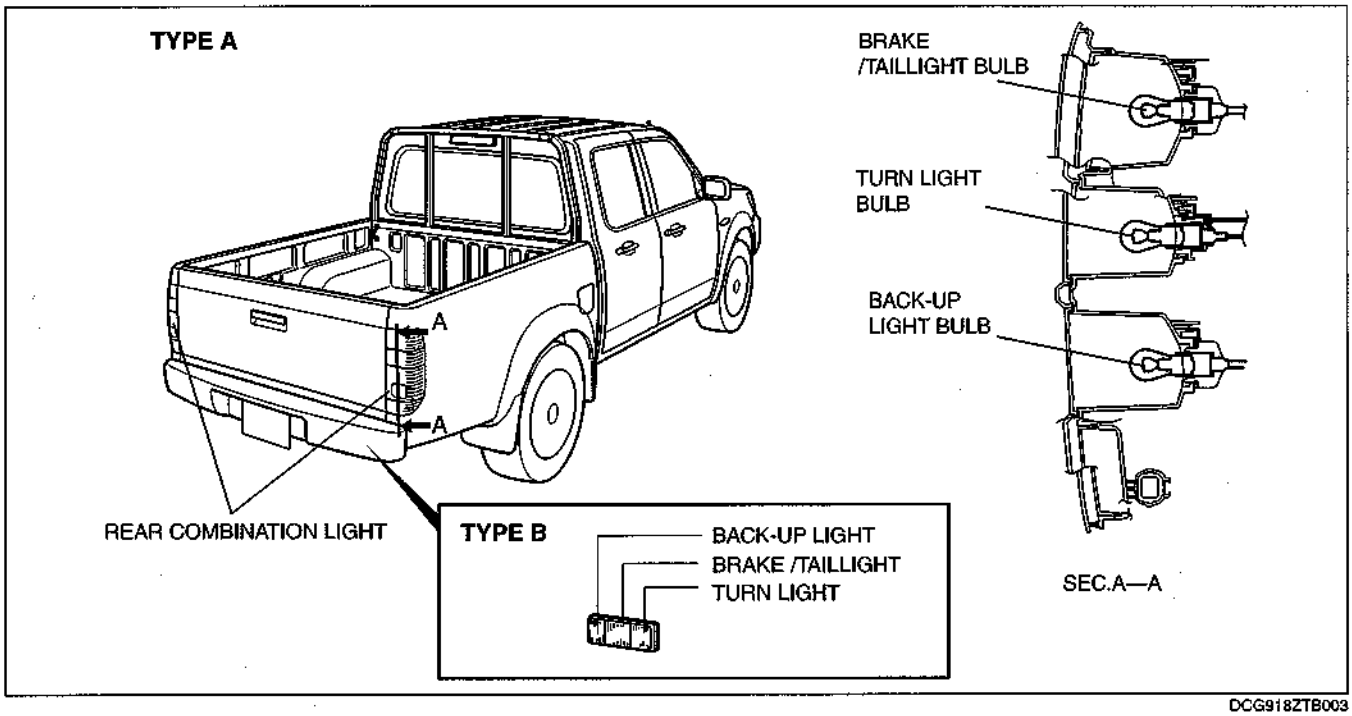
- Projector type headlights (low-beam) have been adopted, and these have been incorporated, along with the front turn light and the parking light, into a single unit to improve size reduction.



DCG918ZTB002

REAR COMBINATION LIGHT STRUCTURAL VIEW

dcf09185115t003



DCG918ZTB003

09-20 ENTERTAINMENT

AUDIO SYSTEM OUTLINE 09-20–1
AUDIO SYSTEM STRUCTURAL VIEW 09-20–1
AUDIO SYSTEM BLOCK DIAGRAM ... 09-20–2
AUDIO SYSTEM SPECIFICATIONS 09-20–2
CENTER PANEL UNIT OUTLINE 09-20–3
CENTER PANEL UNIT CONSTRUCTION 09-20–3
AUTO LEVEL CONTROL (ALC) FUNCTION 09-20–5
AUTO LEVEL CONTROL (ALC) OPERATION 09-20–5
ON-BOARD DIAGNOSTIC SYSTEM OUTLINE 09-20–6
ON-BOARD DIAGNOSTIC SYSTEM FUNCTION 09-20–6
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AUDIO SYSTEM OUTLINE

dcf092000001t01

Type A

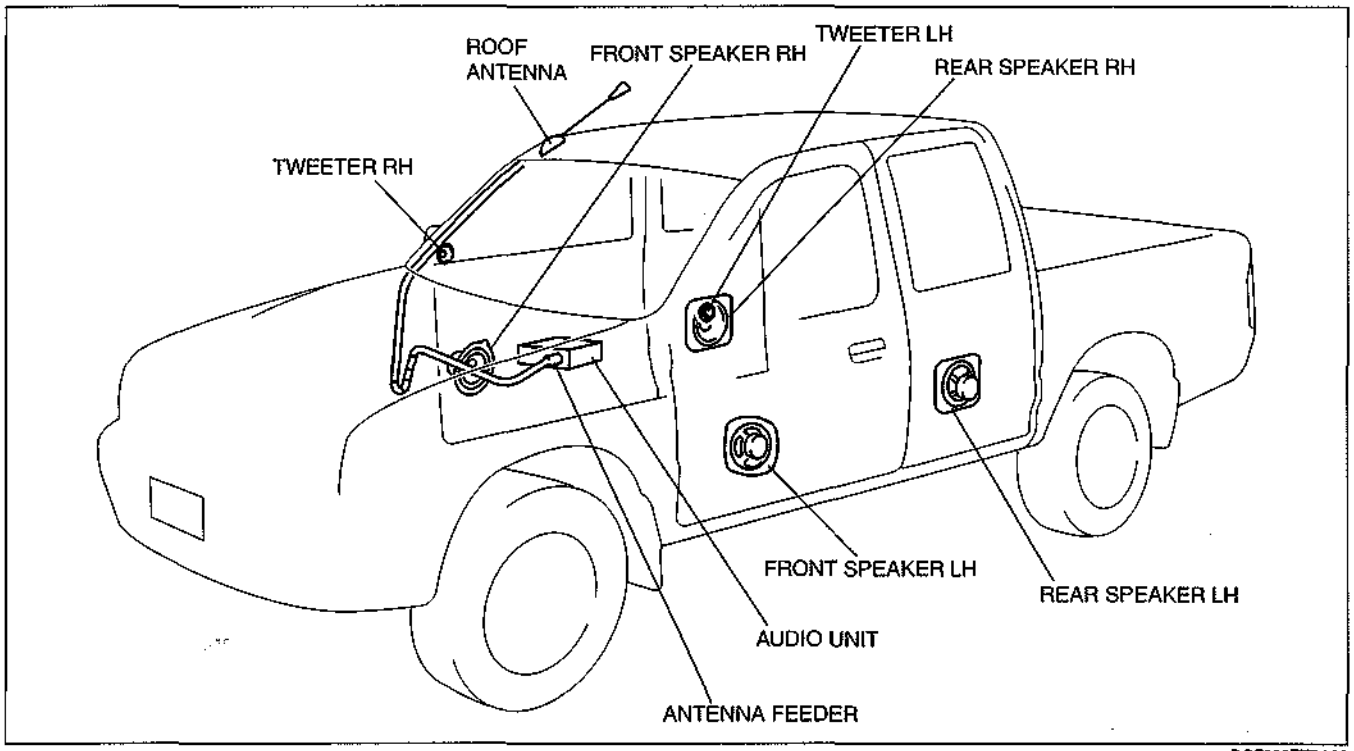
- A center panel unit, composed of the installed audio unit and the audio switches built into the center panel, has been adopted.
- Module availability depends on vehicle grade.
- The auto level control (ALC) function has been adopted.

Type B

- AM/FM radio with the CD player has been adopted.

AUDIO SYSTEM STRUCTURAL VIEW

dcf092000001t02

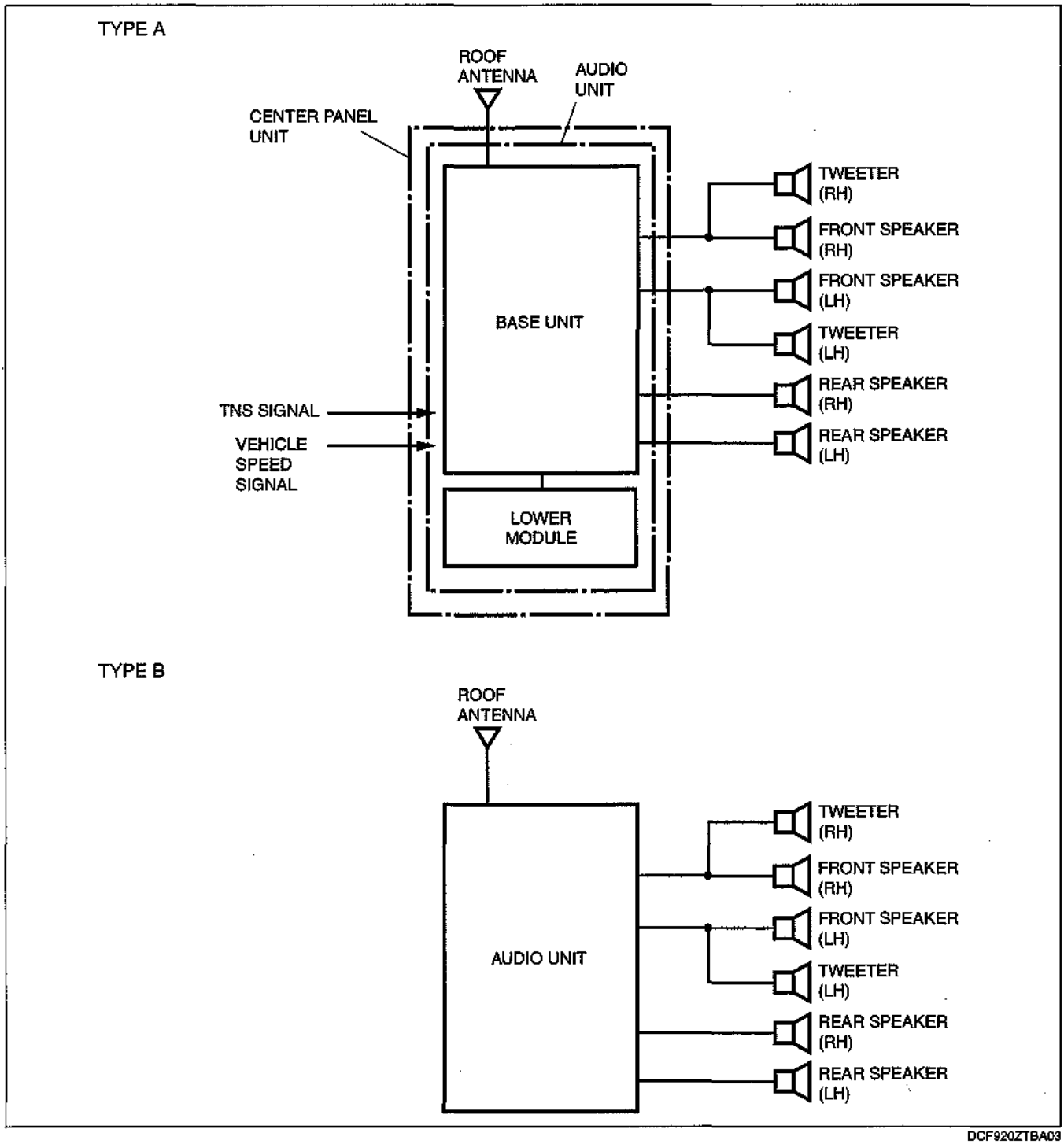


DCF920ZTBA02

09

AUDIO SYSTEM BLOCK DIAGRAM

dcf092000001t03



DCF920ZTBA03

AUDIO SYSTEM SPECIFICATIONS

id092000100400

Audio Unit

Item				Specification		
				Type A		Type B
				With RDS	Without RDS	
Rated voltage			(V)	12		
Frequency band	AM	LW	(kHz)	153—279	—	
		MW	(kHz)	531—1602	522—1629/ 530—1620	531—1629
	FM		(MHz)	87.5—108		
Audio amplifier maximum output power			(W)	35×4		
Output impedance			(ohm)	4		

Speaker

Item		Specification			
		Front speaker	Rear speaker		Tweeter
			Double cab	Freestyle cab	
Maximum input	(W)	25			
Impedance	(ohm)	4			
Size	(mm)	160	100	160	30

CENTER PANEL UNIT OUTLINE

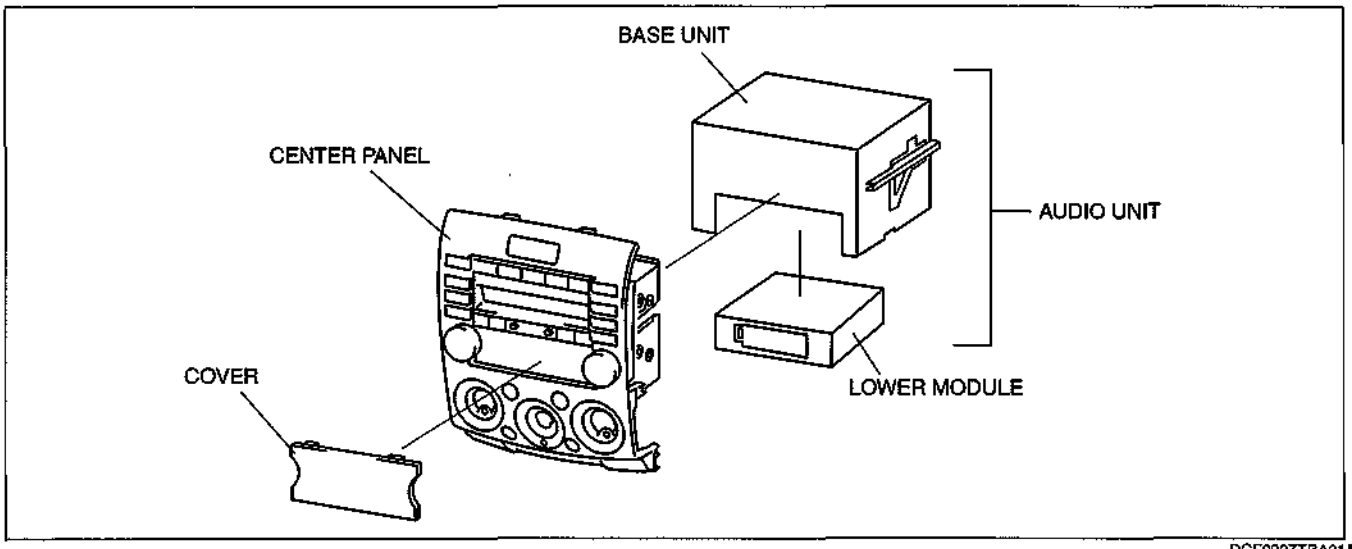
dcf092066900t01

- The center panel unit is composed of the installed audio unit and the audio switches built into the center panel.

CENTER PANEL UNIT CONSTRUCTION

dcf092066900t02

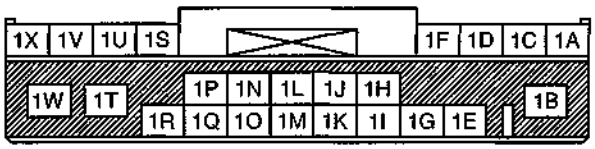
Structural View

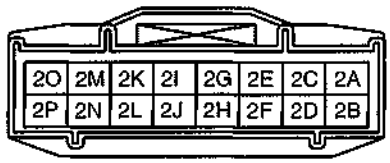


DCF920ZTBA01

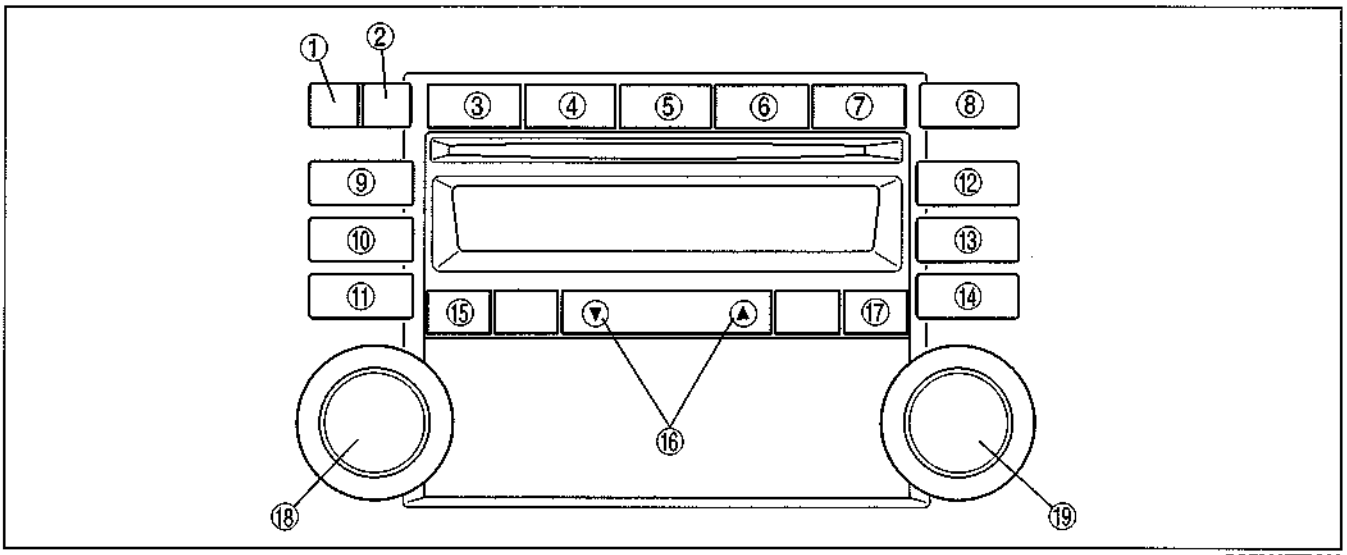
09

Terminal Layout and Signal
Audio unit

Terminal		Signal
	1A	Front speaker LH (+)
	1B	B+ (Power back up)
	1C	Front speaker LH (–)
	1D	Front speaker RH (+)
	1E	TNS (+)
	1F	Front speaker RH (–)
	1G	Illumination (–)
	1H	Antenna control
	1I	Vehicle speed signal
	1J	—
	1K	UART–1
	1L	—
	1M	UART–2
	1N	—
	1O	—
	1P	—
	1Q	—
	1R	ACC
	1S	Rear speaker LH (+)
	1T	—
	1U	Rear speaker LH (–)
	1V	Rear speaker RH (+)
	1W	Power ground
	1X	Rear speaker RH (–)

Terminal		Signal
	2A	Power ground
	2B	System mute
	2C	Input signal RH (+)
	2D	Input signal RH (–)
	2E	Input signal LH (+)
	2F	Input signal LH (–)
	2G	Signal ground
	2H	TEXT DATA
	2I	TEXT CLK
	2J	TNS (+)
	2K	BUS (–)
	2L	BUS (+)
	2M	AUX control
	2N	—
	2O	ACC
	2P	+B

Button and switch Location



DCF920ZTBS03

1	CLOCK button
2	LOAD button
3	FM 1 button
4	FM 2 button
5	AM button
6	CD button
7	MEDIA button
8	EJECT button
9	Preset button 1
10	Preset button 2

11	Preset button 3
12	Preset button 4
13	Preset button 5
14	Preset button 6
15	DISP/AUTO-M button
16	SEEK/APC/TRACK switch
17	Traffic information button
18	AUDIO CONT/TUNE/TEXT button
19	POWER/VOLUME button

AUTO LEVEL CONTROL (ALC) FUNCTION

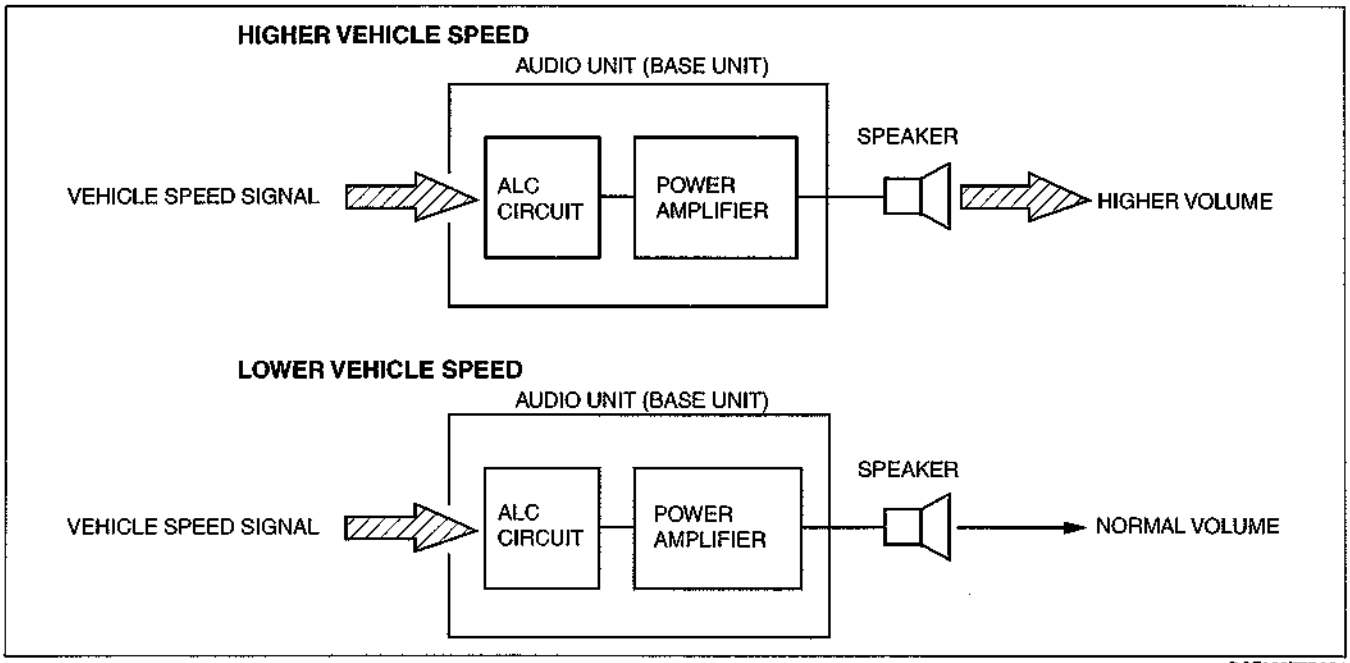
dcf092066900t03

- Adjusts the audio volume so that the sound is balanced against wind and road noise while driving.

AUTO LEVEL CONTROL (ALC) OPERATION

dcf092066900t04

- The audio unit changes the volume automatically based on the vehicle speed signal sent from the instrument cluster.



DCF920ZTBA04

09

- The ALC function is divided into four modes that can be used effectively to match the driving conditions.

Mode	Condition
ALC OFF	ALC function cancelled
ALC LEVEL1	Outside road noise low
ALC LEVEL2	Outside road noise slightly high
ALC LEVEL3	Outside road noise high

ON-BOARD DIAGNOSTIC SYSTEM OUTLINE

dcf092066900t05

- The on-board diagnostic system has a self-diagnostic function and diagnostic assist function to help technicians locate malfunctions.

ON-BOARD DIAGNOSTIC SYSTEM FUNCTION

dcf092066900t06

Self-diagnostic Function

Malfunction detection function

- The malfunction detection section detects malfunctions occurring in the system.

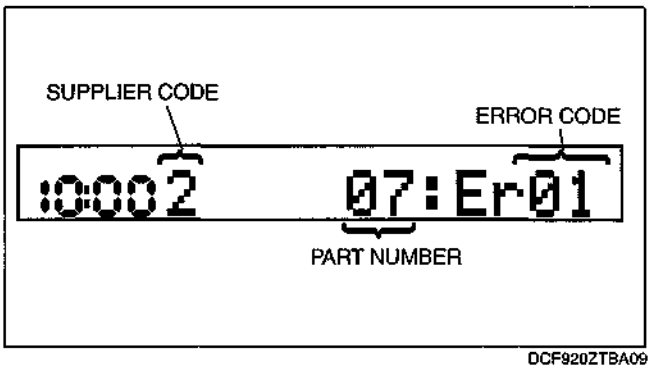
Memory function

- The memory function detects a malfunction, changes it to a DTC, and stores it in the memory. The memory can store a maximum of three DTCs. If another malfunction is detected when three DTCs are already stored, the memory function clears the oldest DTC and stores the new one.
- Once a DTC is stored, it can only be cleared by the designated procedure; not by turning the ignition switch to the LOCK position or disconnecting the negative battery cable. The procedure is mentioned in the Service Section.

Display function

- When the self-diagnostic function is activated, the information display displays the DTC stored in the memory.
- The DTC consists of the following codes and numbers:
  - — Supplier code (indicates manufacturer)
  - — Part number (indicates malfunctioning part)
  - — Error code (indicates malfunction description)
- Refer to the Service Section for the display method.

Supplier code	Supplier name
1	SANYO Automedia
2	Panasonic
3	Clarion
4	Pioneer



DCF920ZTBA09

Parts number	Parts name
03	CD player
05	CD changer (external)
06	CD changer (upper module)
07	MD player (lower module)
09	Base unit
10	MP3 applicable CD player
21	Center panel
22	MP3 applicable CD changer

Error code	Malfunction description
01	Internal mechanism error
02	Servo mechanism error
07	Disc reading error
08	Blank media

Error code	Malfunction description
09	Unplayable files or tracks
10	BUS line (communication line) error
17	Incorrect combination
18	Incorrect combination
19	Communication line
20	Insufficient power supply
21	Amplifier related circuit
22	Tuner error

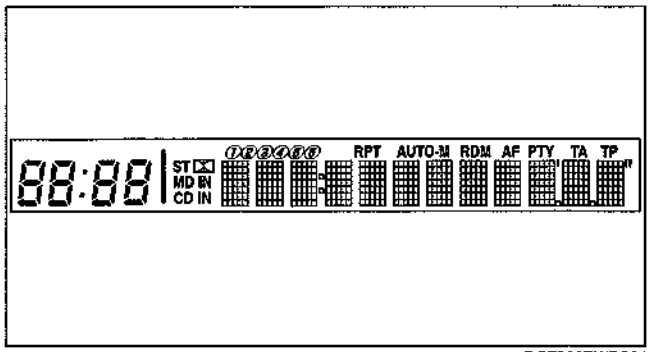
Screen display		Malfunction location
DTC	Output signal	
03: Er01	—	CD player system
03: Er02	CHECK CD	CD player system
03: Er07	CHECK CD	CD player system
03: Er10	—	CD player communication circuit system
05: Er01	—	CD changer system
05: Er07	CHECK CD	CD changer system
05: Er10	—	CD changer communication circuit system
06: Er01	—	CD changer system
06: Er02	CHECK CD	CD changer system
06: Er07	CHECK CD	CD changer system
06: Er10	—	CD changer communication circuit system
07: Er01	—	MD player system
07: Er02	CHECK MD	MD player system
07: Er07	CHECK MD	MD player system
07: Er08	—	MD system
07: Er10	—	MD player communication circuit system
09: Er20	—	Power supply circuit to base unit
09: Er21	—	Base unit (peripheral circuit for power amplifier)
09: Er22	—	Base unit (peripheral circuit for tuner)
10: Er01	—	MP3 applicable CD player system
10: Er02	CHECK CD	MP3 applicable CD player system
10: Er07	CHECK CD	MP3 applicable CD player system
10: Er09	CHECK CD	MP3 applicable CD data
10: Er10	—	MP3 applicable CD player communication circuit system
21: Er17	—	Center panel system
21: Er18	—	Center panel system
21: Er19	—	Center panel system
22: Er01	—	CD system
22: Er02	—	CD system
22: Er07	—	CD system
22: Er09	CHECK CD	MP3 applicable CD data
22: Er10	—	MP3 applicable CD changer system
no Err	—	No DTCs stored

Diagnostic Assist Function

- The diagnostic assist function displays the operating condition of the following functions (components) and forces them to operate in order to examine whether they are malfunctioning or not.
- For the start procedure of each mode, refer to the Service Section.

Information display

- The diagnostic assist function illuminates all characters in the information display to check for truncated or faint characters.



DCF902ZWBS04

Speaker

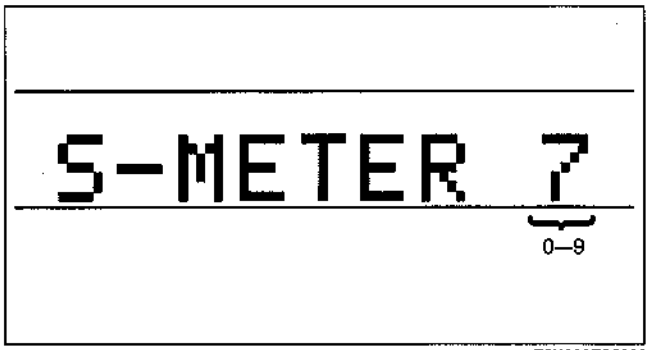
- The diagnostic assist function outputs sound to the speakers in the following order to determine the operating condition of the speakers and wiring harnesses between the base unit and each speaker.

1. Front speaker and tweeter (LH)
2. Front speaker and tweeter (RH)
3. Rear speaker*1 (LH)
4. Rear speaker*1 (RH)

*1 : May or may not be equipped, depending on the vehicle.

Radio

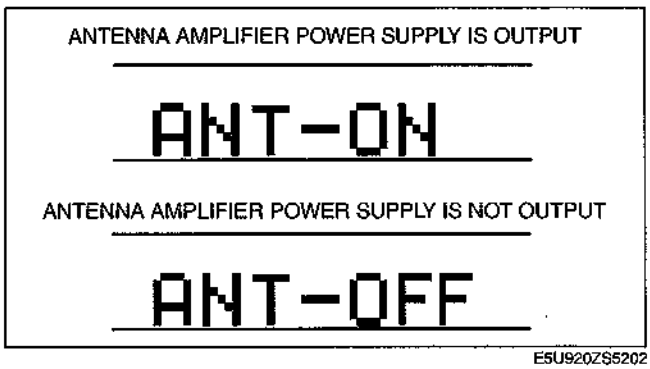
- The diagnostic assist function displays the radio reception condition in 10 levels (0-9) to assist in determining the condition of the antenna, antenna feeders, and base unit (tuner).



E5U920ZS5008

Antenna control condition

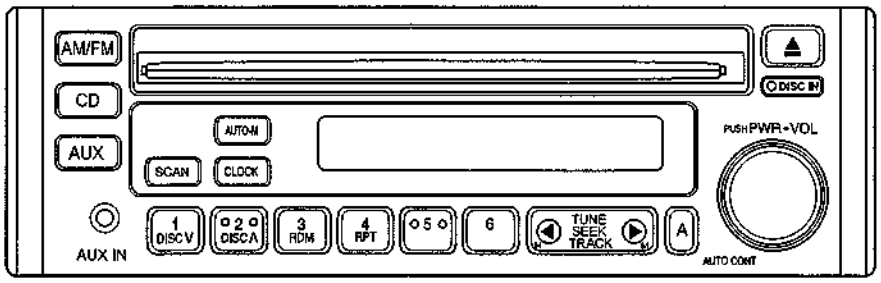
- The diagnostic assist function displays the output state of the antenna amplifier power supply to determine the condition of the antenna amplifier, base unit, and wiring harness between the base unit and antenna amplifier.



E5U920ZS5202

AUDIO UNIT STRUCTURAL VIEW

dcf092065900t07



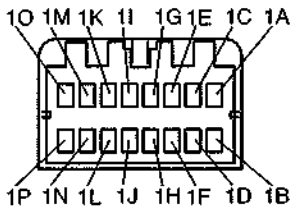
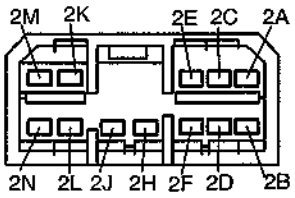
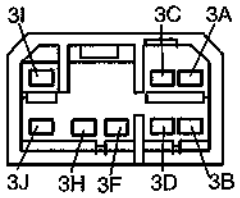
CBF920ZW4001

AUDIO UNIT CONSTRUCTION

dcf092065900t08

Terminal Layout and Signals

AM/FM radio with CD player

Terminal		Signal
	1A	Input RH (+)
	1B	Signal ground
	1C	Input LH (+)
	1D	Combi cont
	1E	—
	1F	Aux cont
	1G	Bus ground
	1H	Bus line
	1I	ACC
	1J	Power ground
	1K	B+ (power back up)
	1L	System mute (input)
	1M	TNS (+)
	1N	Illumination (–)
	1O	—
	1P	—
	2A	ACC
	2B	—
	2C	B+ (power back up)
	2D	—
	2E	TNS (+)
	2F	—
	2H	—
	2J	—
	2K	Front speaker LH (+)
	2L	Front speaker LH (–)
	2M	Front speaker RH (+)
	2N	Front speaker RH (–)
	3A	Rear speaker LH (+)
	3B	Rear speaker LH (–)
	3C	—
	3D	—
	3F	Rear speaker RH (+)
	3H	Rear speaker RH (–)
	3I	—
	3J	—
4A	4A	Ground (power)

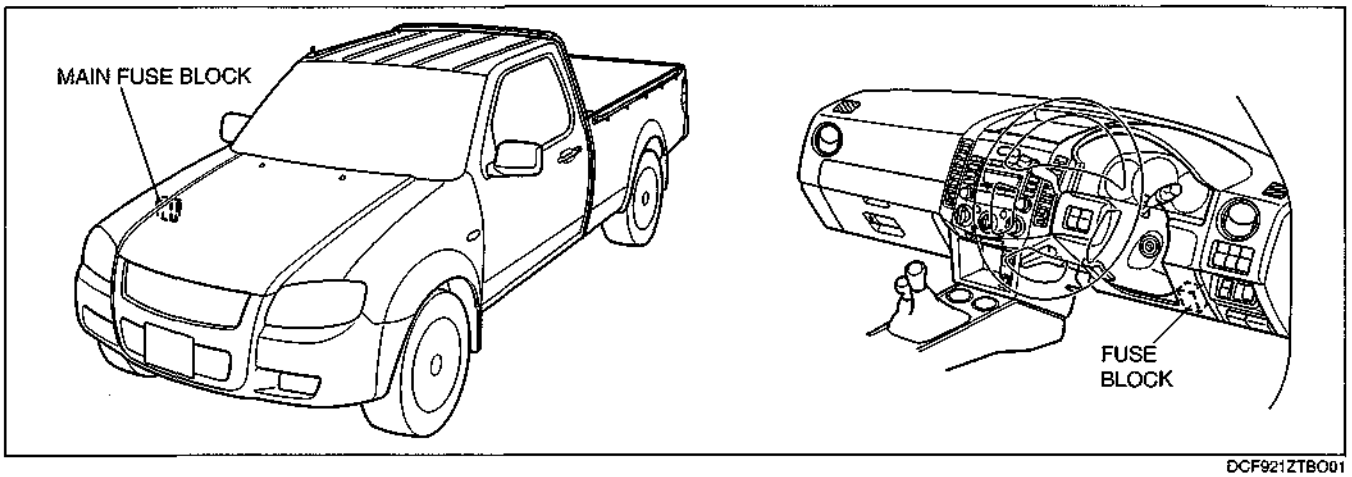
09

09-21 POWER SYSTEMS

POWER SYSTEMS STRUCTURA
VIEW 09-21–1

POWER SYSTEMS STRUCTURAL VIEW

dcf092167730t02



DCF921ZTBO01

09-22 INSTRUMENTATION/DRIVER INFO.

INSTRUMENT CLUSTER OUTLINE.... 09-22-1
INSTRUMENT CLUSTER SPECIFICATIONS..... 09-22-1
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LIGHTS-ON REMINDER WARNING ALARM CONSTRUCTION/ OPERATION 09-22-6
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TACHOMETER CONTROL OUTLINE ...09-22-8
TACHOMETER CONTROL CONSTRUCTION/OPERATION.....09-22-8
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WATER TEMPERATURE GAUGE CONTROL OUTLINE 09-22-9
WATER TEMPERATURE GAUGE CONTROL CONSTRUCTION/ OPERATION.....09-22-9
HORN CONSTRUCTION 09-22-9

INSTRUMENT CLUSTER OUTLINE

dcf092255430t01

- LEDs have been adopted for warning and indicator lights installed on the instrument cluster.
- A flat-type horn has been adopted.

INSTRUMENT CLUSTER SPECIFICATIONS

dcf092255430t02

Instrument Cluster

Item			Specification
Speedometer	Meter type		Stepping motor type
	Indication range	(km/h)	0—180
	Input signal source		Speedometer sensor
	Rated voltage	(V)	DC 12
Tachometer	Meter type		Stepping motor type
	Indication range	(rpm)	0—5,000
	Red zone	(rpm)	4,500—5,000 (WL-3, WL-C) 4,250—5,000(WE-C)
	Input signal source		PCM
	Rated voltage	(V)	DC 12
Fuel gauge	Meter type		Stepping motor type (Reset-to-zero type)
	Input signal source		Fuel gauge sender unit
	Rated voltage	(V)	DC 12
Water temperature gauge	Meter type		Stepping motor type (Medium range stabilized type)
	Input signal source		Water temperature sender unit (WL-3) ECT sensor (WL-C, WE-C)
	Rated voltage	(V)	DC 12
Odometer/ Tripmeter	Display		LCD
	Indication digits		Odometer: 6 digits, Tripmeter: 4 digits
	Rated voltage	(V)	DC 12
Warning alarms	Sound frequency	(Hz)	2,000—2,200
	Output sound pressure level	(dB)	67.5

Clock

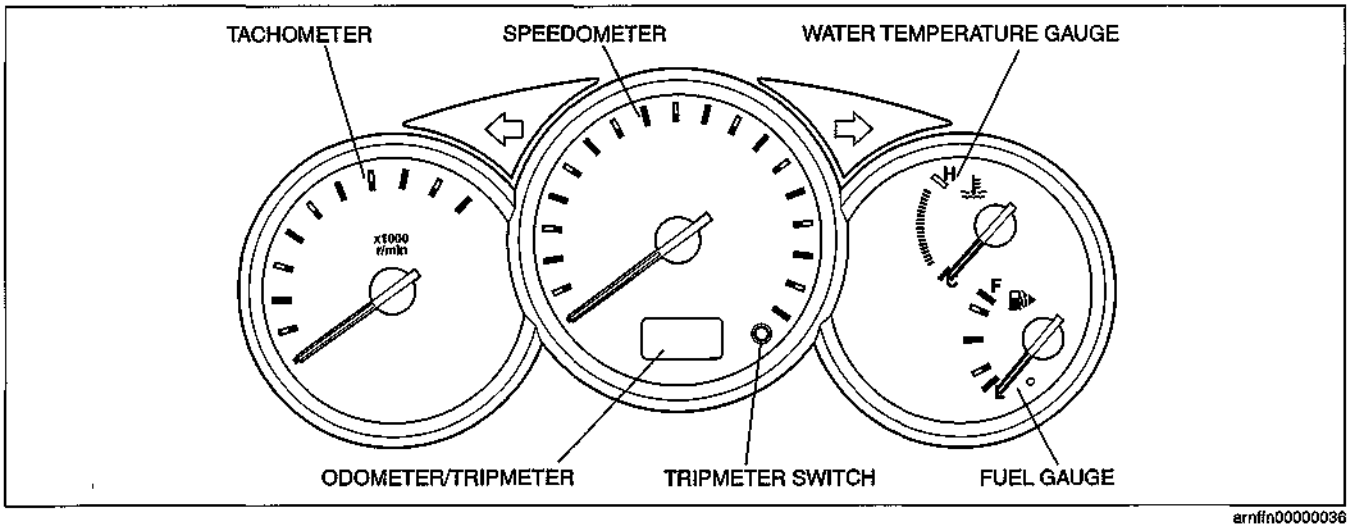
Item		Specification
Clock accuracy (Reference value)*	(s/day)	-1.5—1.5

* : If the clock accuracy varies largely from the reference value, battery deterioration or an audio unit (base unit) malfunction may have occurred.

INSTRUMENT CLUSTER STRUCTURAL VIEW

id092200101200

Meter And Gauge



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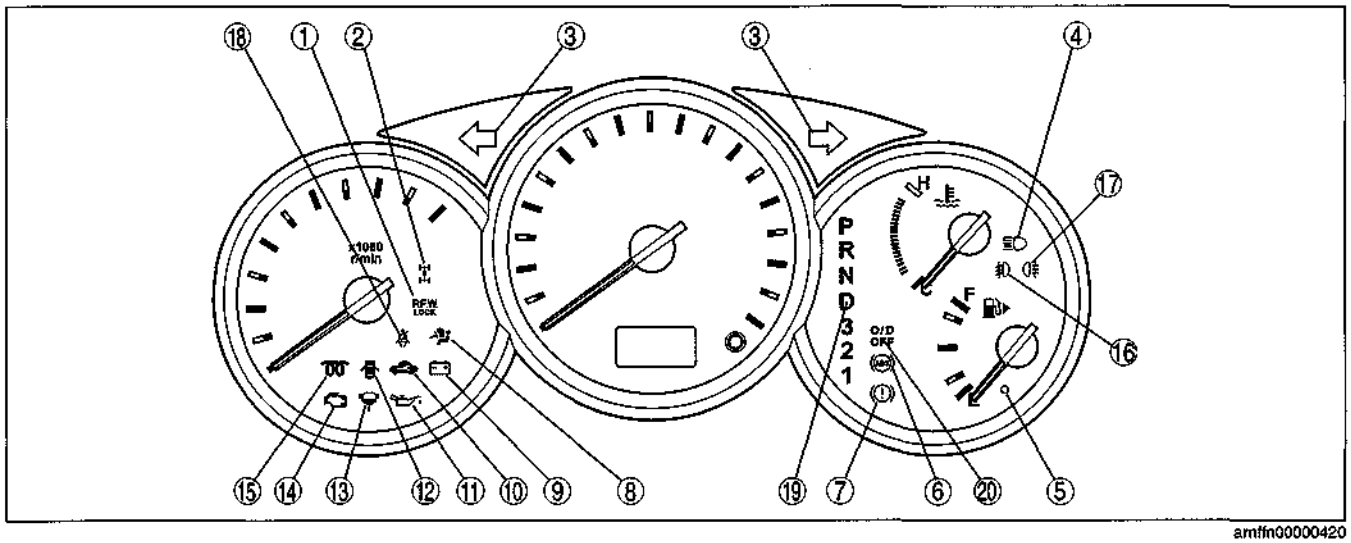
Warning And Indicator Light

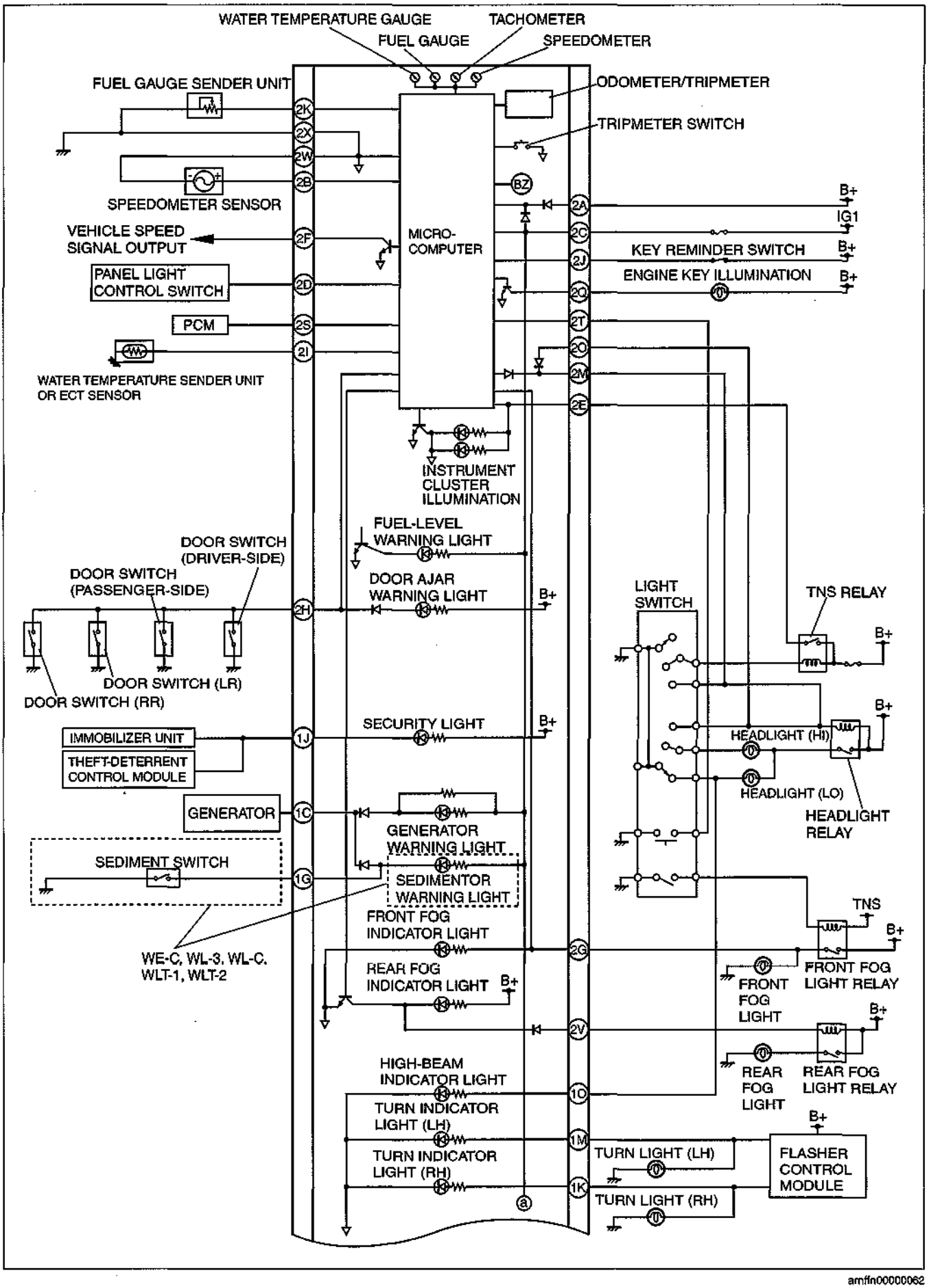


amfin00000420

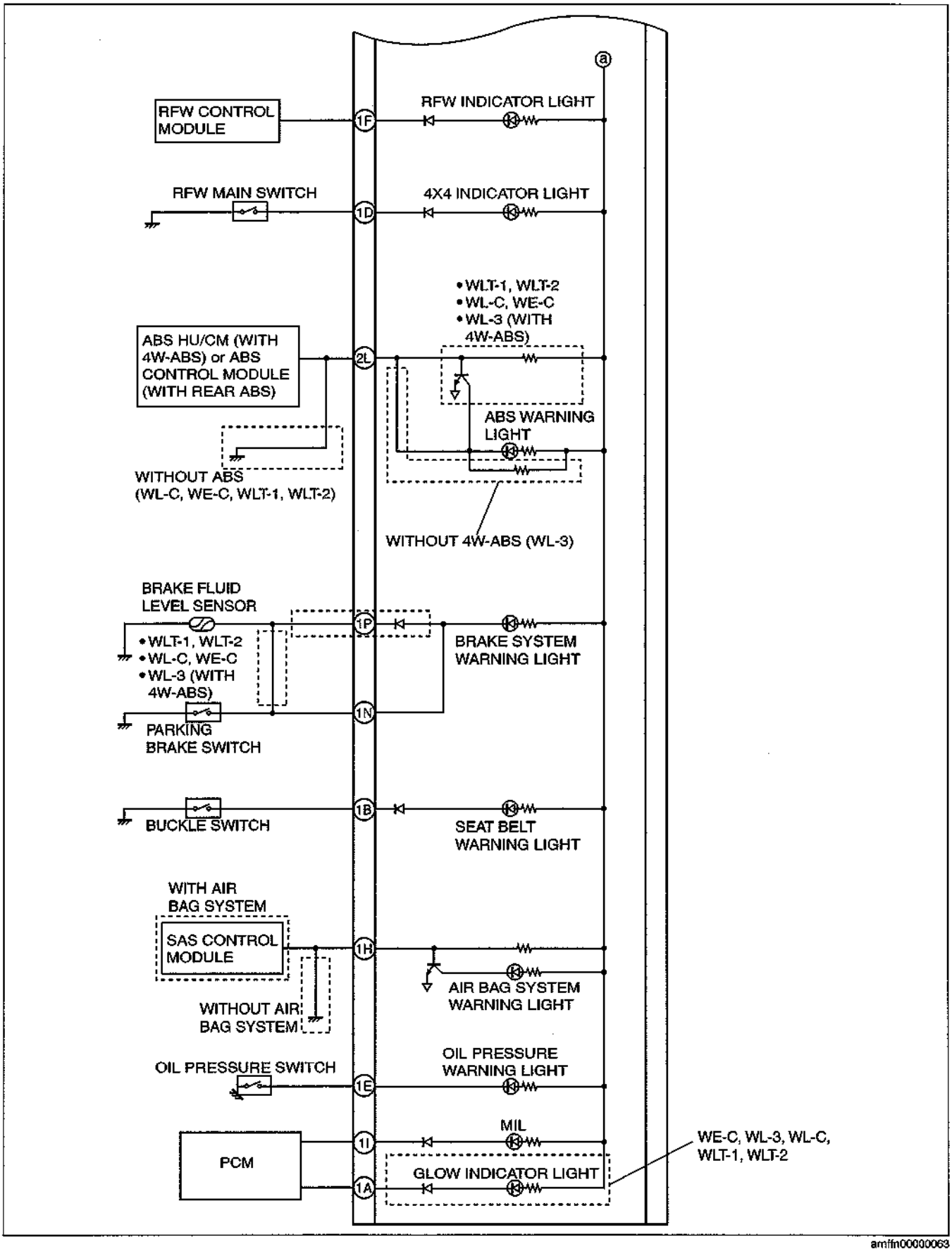
No.	Warning and indicator light	Input signal source	Note
1	RFW indicator light	RFW control module	4x4
2	4x4 indicator light	RFW main switch	4x4
3	Turn indicator light	Flasher control module	—
4	High-beam indicator light	Headlight (HI)	—
5	Fuel-level warning light	Fuel gauge sender unit	—
6	ABS warning light	• ABS HU/CM (with 4-W ABS) • ABS control module (with rear ABS)	With ABS
7	Brake system warning light	• Parking brake switch • Brake fluid level sensor • ABS HU/CM (with 4-W ABS) • ABS control module (with rear ABS)	—
8	Air bag system warning light	SAS control module	With air bag system
9	Generator warning light	Generator	—
10	Security light	• Immobilizer unit • Theft deterrent control module	—
11	Oil pressure warning light	Oil pressure switch	—
12	Door ajar warning light	Door switches	—
13	Sedimentor warning light	Sediment switch	WE-C, WL-3, WL-C, WLT-1, WLT-2
14	MIL	PCM	—
15	Glow indicator light	PCM	WE-C, WL-3, WL-C, WLT-1, WLT-2
16	Front fog indicator light	Front fog light relay	With front fog light
17	Rear fog indicator light	Rear fog light relay	—
18	Seat belt warning light	Buckle switch	—
19	Selector indicator light	TCM	AT
20	O/D OFF indicator light	TCM	AT

INSTRUMENT CLUSTER SYSTEM WIRING DIAGRAM

id092200101300



amfln00000062



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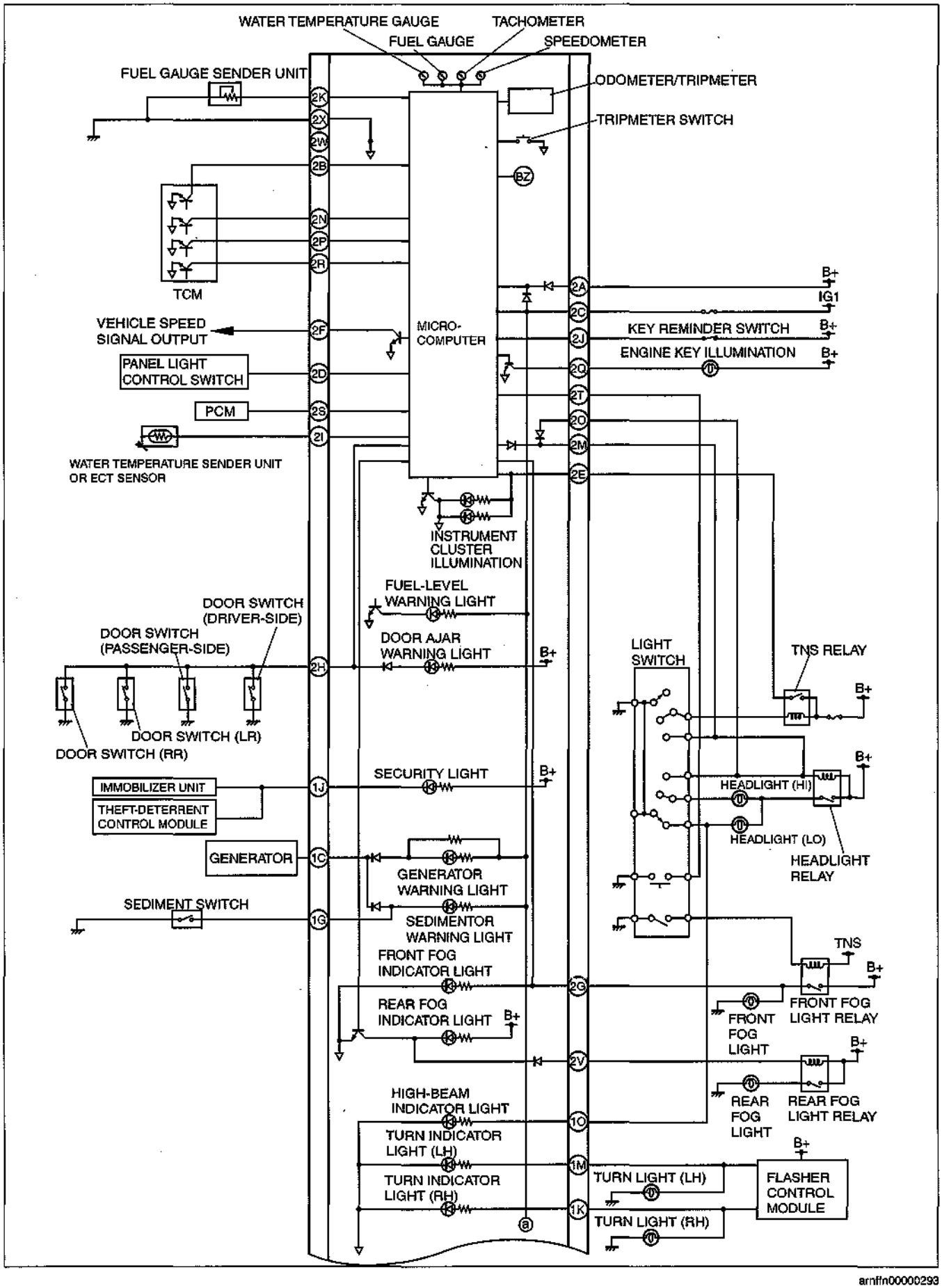
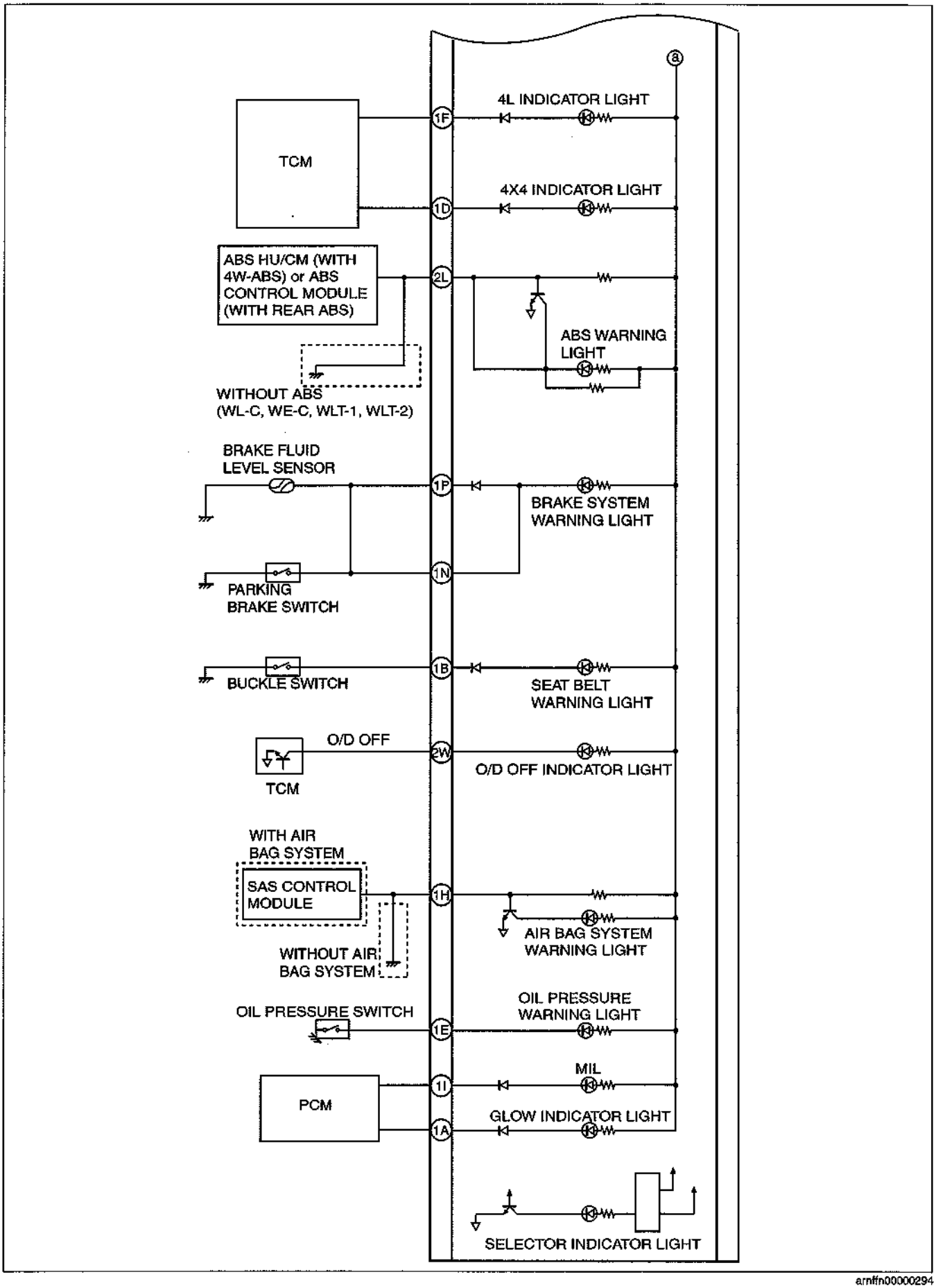
09

INSTRUMENT CLUSTER SYSTEM WIRING DIAGRAM[5R55S]

ld0922001013z3



arnffn00000293



arnffn00000294

INPUT/OUTPUT CHECK MODE OUTLINE

dcf09225543005

- The microcomputer built into instrument cluster detects the quality of input signals and individual parts.
- Input/output check mode has both input circuit inspection and individual part inspection functions.

INPUT/OUTPUT CHECK MODE OPERATION

dcf09225543006

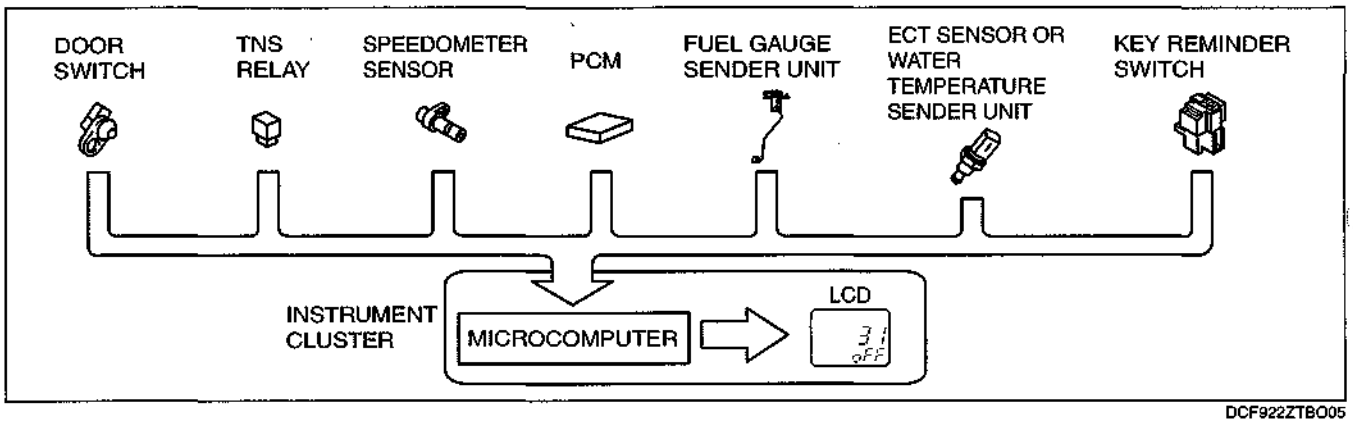
Operation procedure

- Refer to Workshop Manual.

Input circuit check

- When the parts listed in the chart are operated and a signal is output to the instrument cluster, the built-in microcomputer determines the operability of the input circuit based on that signal.

Check code	Parts sending input signal
04	Door switch
08	TNS relay
10	Vehicle speed signal
11	Engine speed signal
22	Fuel gauge sender unit
24	• ECT sensor • Water temperature sender unit
31	Key reminder switch



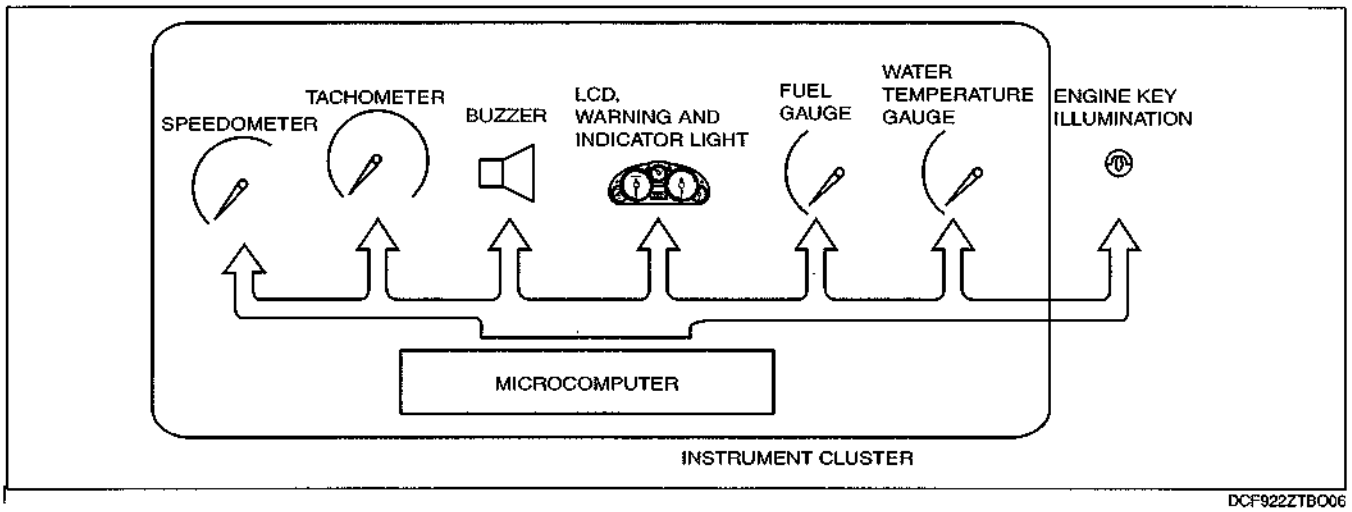
DCF922ZTBO05

09

Individual circuit check

- By operating the parts listed in the chart, the built-in microcomputer determines the operability of the individual parts.

Check code	Parts sending input signal
12	Speedometer
13	Tachometer
14	Buzzer
16	Fuel-level warning light
18	Engine key illumination output
23	Fuel gauge
25	Water temperature gauge
26	LCD, warning and indicator light



DCF922ZTBO06

LIGHTS-ON REMINDER WARNING ALARM OUTLINE

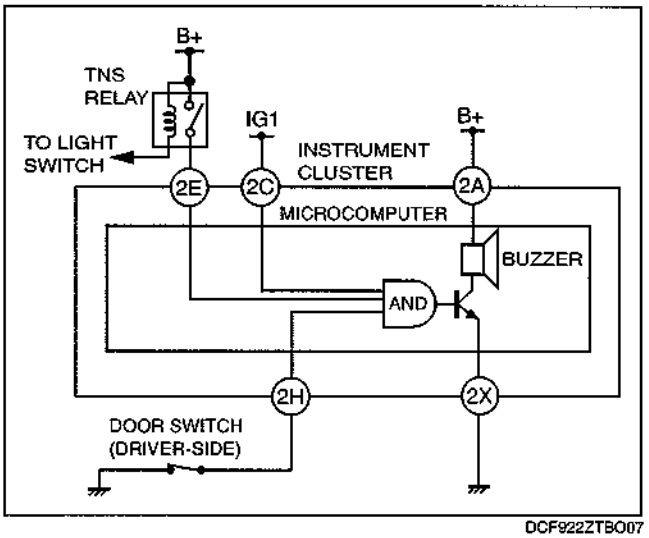
dcf092255430t07

- Warns the driver that the headlights or TNS are on when the driver-side door is opened.

LIGHTS-ON REMINDER WARNING ALARM CONSTRUCTION/OPERATION

dcf092255430t08

System Wiring Diagram



DCF922ZTBO07

Operation

- The buzzer in the instrument cluster sounds continuously when all the following three conditions are met:
  - — The engine switch is in the LOCK or ACC position.
  - — The headlight switch is in the TNS or headlight position.
  - — The driver-side door is open (driver-side door switch is on).

KEY REMINDER WARNING ALARM OUTLINE

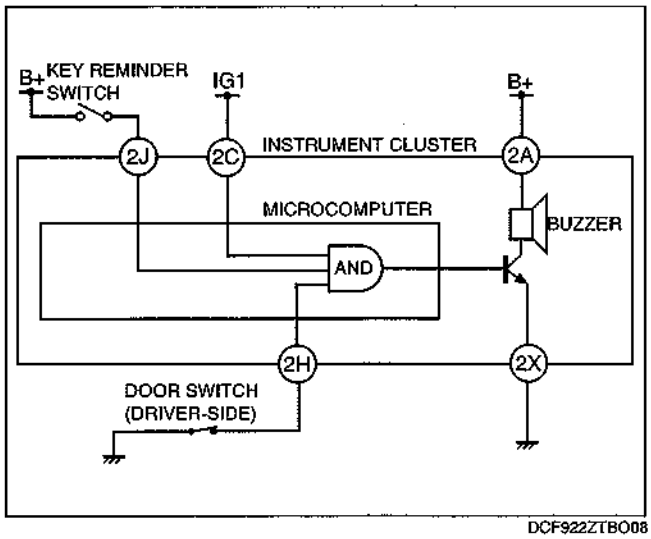
dcf092255430t11

- Warns the driver that the key is in the steering lock when the driver-side door is opened.

KEY REMINDER WARNING ALARM CONSTRUCTION/OPERATION

dcf092255430t12

System Wiring Diagram



DCF922ZTBO08

Operation

- The buzzer in the instrument cluster sounds when all the following three conditions are met:
  - — The engine switch is in the LOCK or ACC position.
  - — The key is in the steering lock (key reminder switch is on).
  - — The driver-side door is open (driver-side door switch is on).

SPEEDOMETER CONTROL OUTLINE

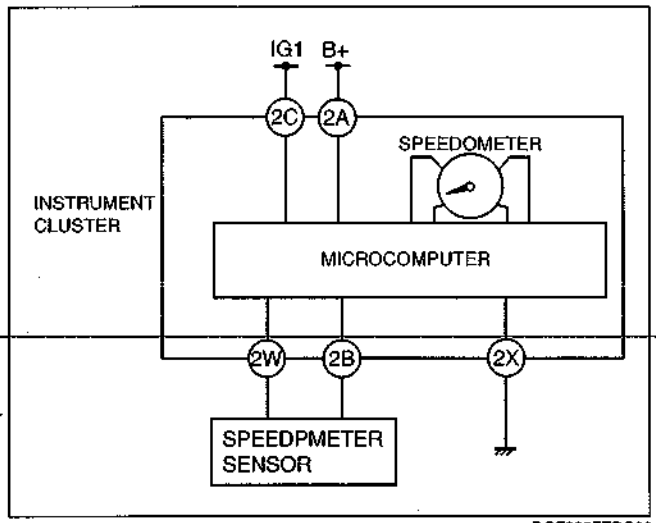
dcf092255430t15

- The vehicle speed signal is output from the speedometer sensor to the microcomputer in the instrument cluster.

SPEEDOMETER CONTROL CONSTRUCTION/OPERATION

dcf092255430t16

System Wiring Diagram



DCF922ZTBO09

Operation

- The vehicle speed signal sent from the speedometer sensor is input to the microcomputer in the instrument cluster. The microcomputer calculates the current vehicle speed based on the vehicle speed signal, and sends an output signal to the speedometer.

TACHOMETER CONTROL OUTLINE

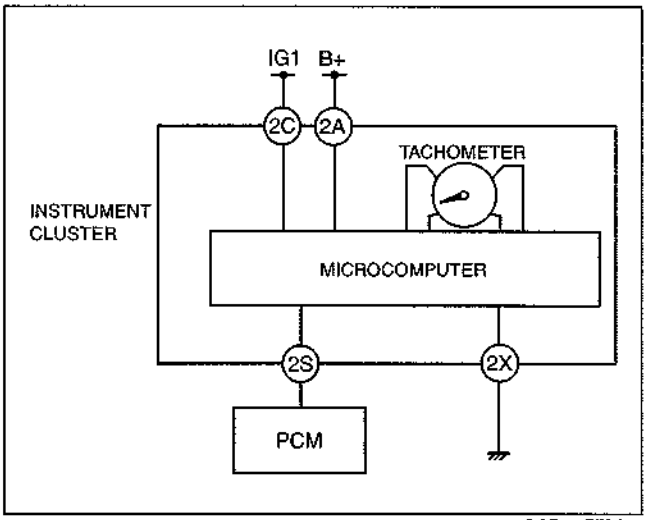
dcf092255430t17

- The engine speed signal is output from the PCM to the microcomputer in the instrument cluster.

TACHOMETER CONTROL CONSTRUCTION/OPERATION

dcf092255430t18

System Wiring Diagram



DCF922ZTBO10

Operation

- The engine speed signal sent from the PCM is input to the microcomputer in the instrument cluster. The microcomputer calculates the current engine speed based on the engine speed signal, and sends an output signal to the tachometer.

FUEL GAUGE CONTROL OUTLINE

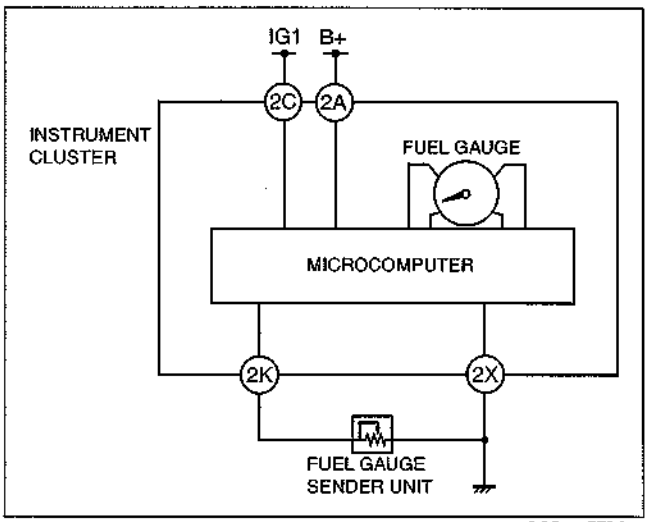
dcf092255430t19

- The fuel level signal is output from the fuel gauge sender unit to the microcomputer in the instrument cluster. Fuel gauge variation caused by fluctuating fuel level when cornering or driving on a slope, is reduced by microcomputer control.

FUEL GAUGE CONTROL CONSTRUCTION/OPERATION

dcf092255430t20

System Wiring Diagram



DCF922ZTBO11

Operation

- A resistance according to fuel level is sent from the fuel gauge sender unit to the microcomputer. The microcomputer calculates the average resistance within a specified time, and sends the output signal to the fuel gauge based on the calculated value.

WATER TEMPERATURE GAUGE CONTROL OUTLINE

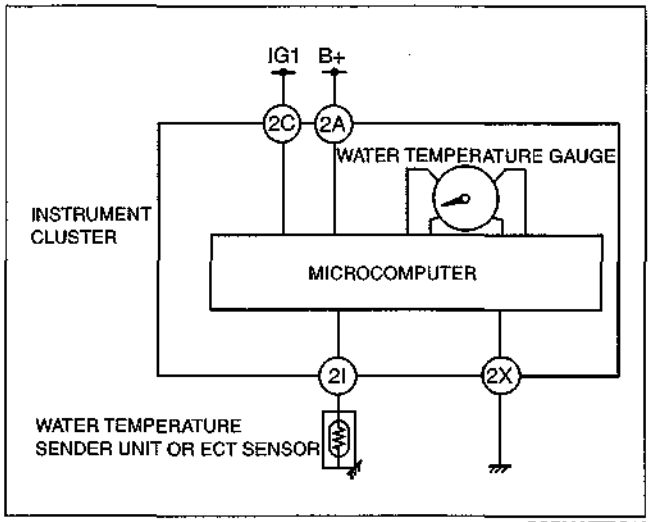
dcf092255430l21

- The engine coolant temperature signal is output from the water temperature sender unit or ECT sensor to the microcomputer in the instrument cluster.

WATER TEMPERATURE GAUGE CONTROL CONSTRUCTION/OPERATION

dcf092255430t22

System Wiring Diagram



DCF922ZTBO12

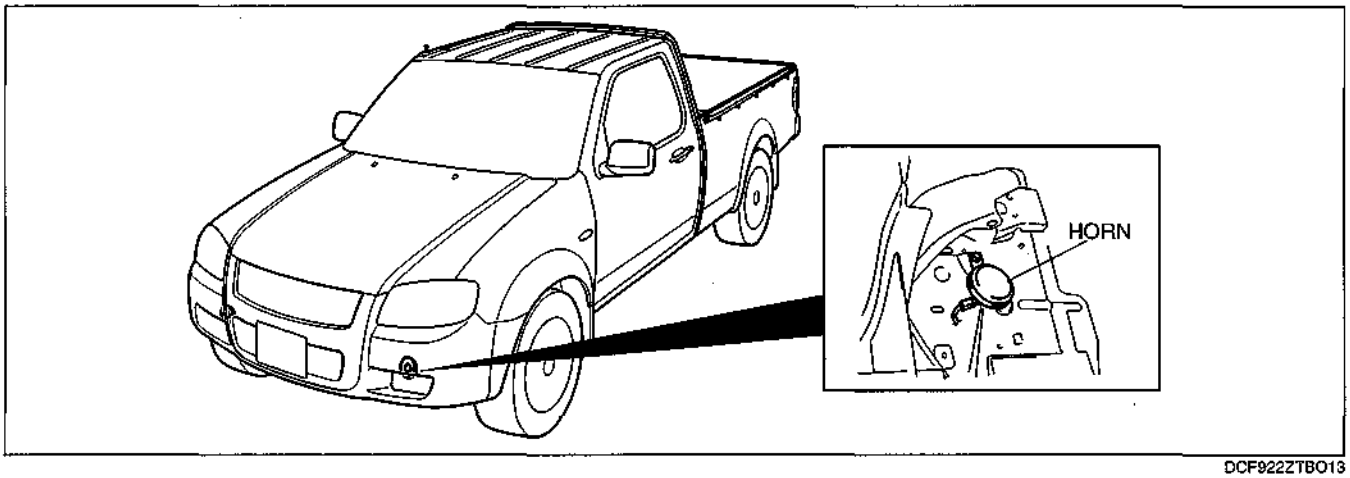
Operation

- The engine coolant temperature signal sent from the water temperature sender unit or ECT sensor is input to the microcomputer in the instrument cluster. The microcomputer calculates the current engine coolant temperature based on the engine coolant temperature signal, and sends an output signal to the water temperature gauge.

HORN CONSTRUCTION

dcf092266790t01

- A flat-type horn has been adopted.



DCF922ZTBO13

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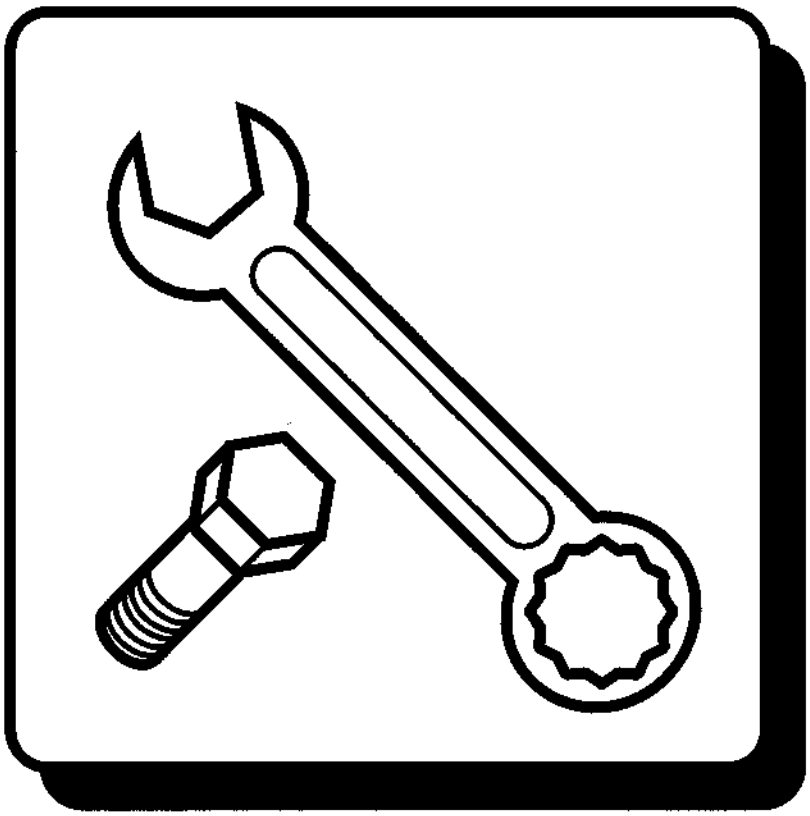
SERVICE PROCEDURES



WARNING

Servicing a vehicle can be dangerous. If you have not received service-related training, the risks of injury, property damage, and failure of servicing increase. The recommended servicing procedures for the vehicle in this workshop manual were developed with Ford-trained technicians in mind. This manual may be useful to non-Ford trained technicians, but a technician with our service-related training and experience will be at less risk when performing service operations. However, all users of this manual are expected to at least know general safety procedures.

This manual contains "Warnings" and "Cautions" applicable to risks not normally encountered in a general technician's experience. They should be followed to reduce the risk of injury and the risk that improper service or repair may damage the vehicle or render it unsafe. It is also important to understand that the "Warnings" and "Cautions" are not exhaustive. It is impossible to warn of all the hazardous consequences that might result from failure to follow the procedures.

The procedures recommended and described in this manual are effective methods of performing service and repair. Some require tools specifically designed for a specific purpose. Persons using procedures and tools which are not recommended by Ford Motor Company must satisfy themselves thoroughly that neither personal safety nor safety of the vehicle will be jeopardized.

The contents of this manual, including drawings and specifications, are the latest available at the time of printing, and Ford Motor Company reserves the right to change the vehicle designs and alter the contents of this manual without notice and without incurring obligation.

Parts should be replaced with genuine Ford replacement parts or with parts which match the quality of genuine Ford replacement parts. Persons using replacement parts of lesser quality than that of genuine Ford replacement parts must satisfy themselves thoroughly that neither personal safety nor safety of the vehicle will be jeopardized.

Ford Motor Company is not responsible for any problems which may arise from the use of this manual. The cause of such problems includes but is not limited to insufficient service-related training, use of improper tools, use of replacement parts of lesser quality than that of genuine Ford replacement parts, or not being aware of any revision of this manual.

VEHICLE IDENTIFICATION NUMBERS (VIN)

MNA BS******
MNA DS******
MNA LS******
MNA US******

RELATED MATERIALS

RANGER Training Manual F340–10–05L
RANGER Overhaul Manual F198–20–05L
RANGER Body Measurement Chart Manual F340–20–05L
RANGER Wiring Diagrams..... F198–30–05L

PJ Ranger
Overhaul Manual

(Part No. 0HM380)

Ford

WARNING

Servicing a vehicle can be dangerous. If you have not received service-related training, the risks of injury, property damage, and failure of servicing increase. The recommended servicing procedures for the vehicle in this workshop manual were developed with Ford-trained technicians in mind. This manual may be useful to non-Ford trained technicians, but a technician with our service-related training and experience will be at less risk when performing service operations. However, all users of this manual are expected to at least know general safety procedures.

This manual contains "Warnings" and "Cautions" applicable to risks not normally encountered in a general technician's experience. They should be followed to reduce the risk of injury and the risk that improper service or repair may damage the vehicle or render it unsafe. It is also important to understand that the "Warnings" and "Cautions" are not exhaustive. It is impossible to warn of all the hazardous consequences that might result from failure to follow the procedures.

The procedures recommended and described in this manual are effective methods of performing service and repair. Some require tools specifically designed for a specific purpose. Persons using procedures and tools which are not recommended by Ford Motor Company must satisfy themselves thoroughly that neither personal safety nor safety of the vehicle will be jeopardized.

The contents of this manual, including drawings and specifications, are the latest available at the time of printing, and Ford Motor Company reserves the right to change the vehicle designs and alter the contents of this manual without notice and without incurring obligation.

Parts should be replaced with genuine Ford replacement parts or with parts which match the quality of genuine Ford replacement parts. Persons using replacement parts of lesser quality than that of genuine Ford replacement parts must satisfy themselves thoroughly that neither personal safety nor safety of the vehicle will be jeopardized.

Ford Motor Company is not responsible for any problems which may arise from the use of this manual. The cause of such problems includes but is not limited to insufficient service-related training, use of improper tools, use of replacement parts of lesser quality than that of genuine Ford replacement parts, or not being aware of any revision of this manual.

RANGER Overhaul Manual

- ENGINE
- MANUAL TRANSMISSION

FOREWORD

This Manual explains the disassembly, inspection, repair, and reassembly procedures for the above-indicated engines and manual transmissions. In order to do these procedures safely, quickly, and correctly, you must first read this manual and any other relevant service materials carefully.

The information in this manual is current up to DECEMBER 2005. Any changes that occur after that time will not be reflected in this particular manual. Therefore, the contents of this manual may not exactly match the mechanism that you are currently servicing.

Ford Motor Company

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F198–20–05L

GENERAL INFORMATION

00
SECTION

GENERAL INFORMATION . . . 00-00

00–00 GENERAL INFORMATION

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HOW TO USE THIS MANUAL

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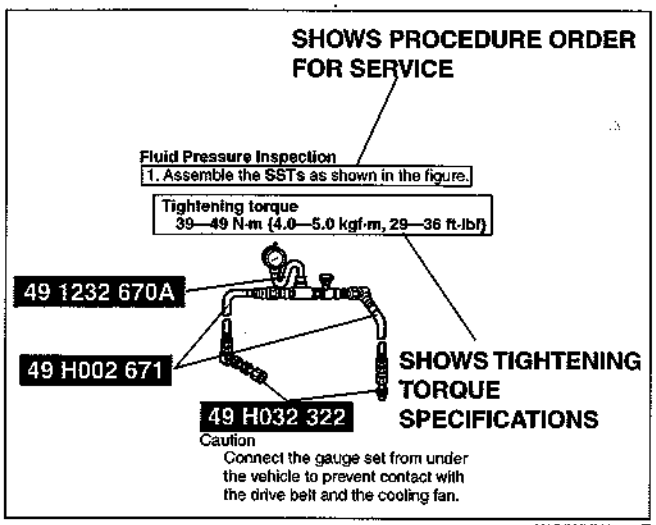
Range of Topics

- This manual contains procedures for performing all required service operations. The procedures are divided into the following five basic operations:
  - — Removal/Installation
  - — Disassembly/Assembly
  - — Replacement
  - — Inspection
  - — Adjustment
- Simple operations which can be performed easily just by looking at the vehicle (i.e., removal/installation of parts, jacking, vehicle lifting, cleaning of parts, and visual inspection) have been omitted.

Service Procedure

Inspection, adjustment

- Inspection and adjustment procedures are divided into steps. Important points regarding the location and contents of the procedures are explained in detail and shown in the illustrations.



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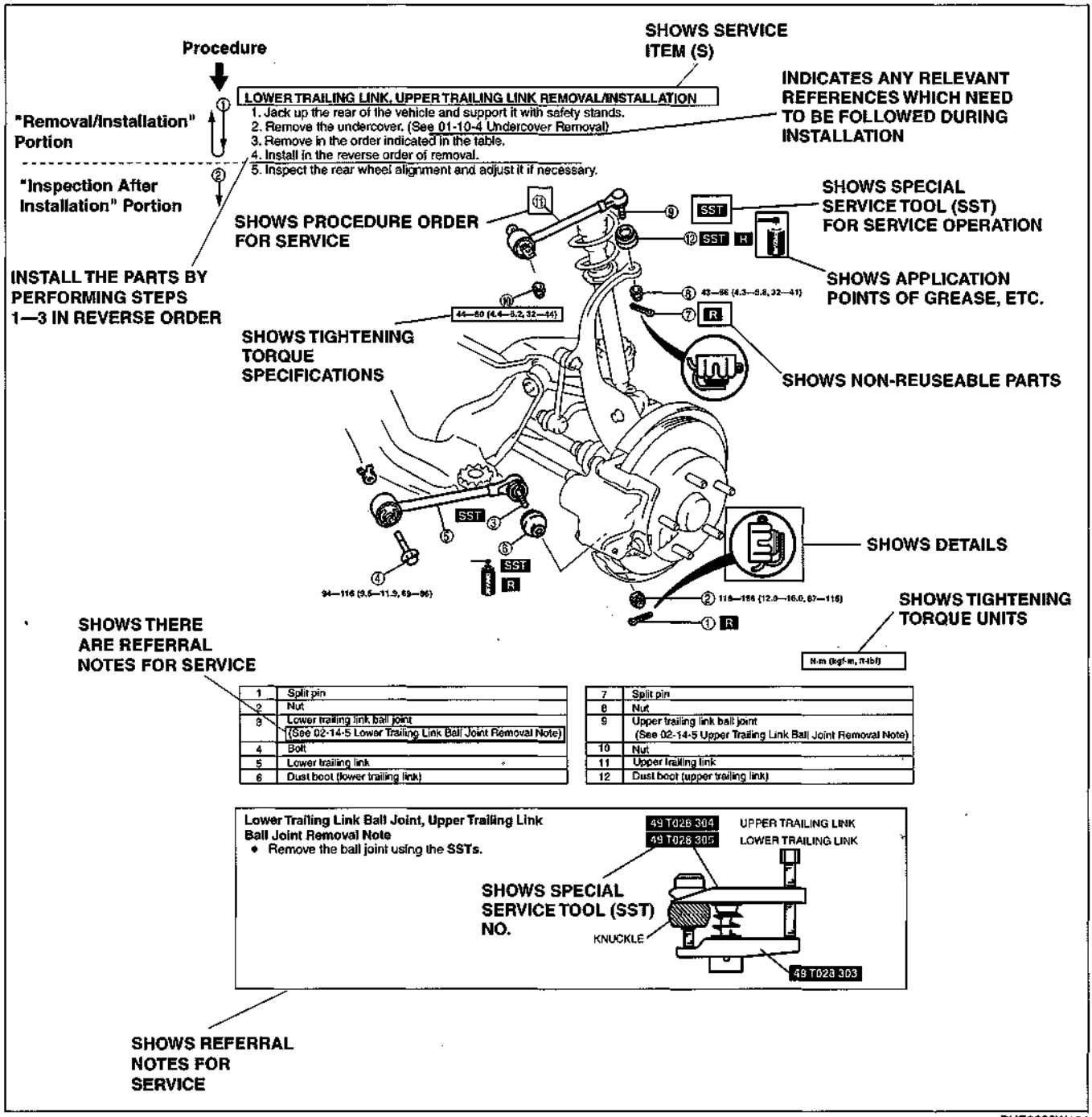
Repair procedure

1. Most repair operations begin with an overview illustration. It identifies the components, shows how the parts fit together, and describes visual part inspection. However, only removal/installation procedures that need to be performed methodically have written instructions.
2. Expendable parts, tightening torques, and symbols for oil, grease, and sealant are shown in the overview illustration. In addition, symbols indicating parts requiring the use of special service tools or equivalent are also shown.
3. Procedure steps are numbered and the part that is the main point of that procedure is shown in the illustration with the corresponding number. Occasionally, there are important points or additional information concerning a procedure. Refer to this information when servicing the related part.



1	Split pin	7	Split pin
2	Nut	8	Nut
3	Lower trailing link ball joint (See 02-14-5 Lower Trailing Link Ball Joint Removal Note)	9	Upper trailing link ball joint (See 02-14-5 Upper Trailing Link Ball Joint Removal Note)
4	Bolt	10	Nut
5	Lower trailing link	11	Upper trailing link
6	Dust boot (lower trailing link)	12	Dust boot (upper trailing link)

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Symbols

- There are eight symbols indicating oil, grease, fluids, sealant, and the use of **SST** or equivalent. These symbols show application points or use of these materials during service.

Symbol	Meaning	Kind
	Apply oil	New appropriate engine oil or gear oil
	Apply brake fluid	New appropriate brake fluid
	Apply automatic transaxle/ transmission fluid	New appropriate automatic transaxle/ transmission fluid
	Apply grease	Appropriate grease
	Apply sealant	Appropriate sealant
	Apply petroleum jelly	Appropriate petroleum jelly
R	Replace part	O-ring, gasket, etc.
SST	Use SST or equivalent	Appropriate tools

Advisory Messages

- You will find several **Warnings**, **Cautions**, **Notes**, **Specifications** and **Upper and Lower Limits** in this manual.

Warning

- A Warning indicates a situation in which serious injury or death could result if the warning is ignored.

Caution

- A Caution indicates a situation in which damage to the vehicle or parts could result if the caution is ignored.

Note

- A Note provides added information that will help you to complete a particular procedure.

Specification

- The values indicate the allowable range when performing inspections or adjustments.

Upper and lower limits

- The values indicate the upper and lower limits that must not be exceeded when performing inspections or adjustments.

UNITS

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Electric current	A (ampere)
Electric power	W (watt)
Electric resistance	ohm
Electric voltage	V (volt)
Length	mm (millimeter)
	in (inch)
Negative pressure	kPa (kilo pascal)
	mmHg (millimeters of mercury)
	inHg (inches of mercury)
Positive pressure	kPa (kilo pascal)
	kgf/cm^2 (kilogram force per square centimeter)
	psi (pounds per square inch)
Number of revolutions	rpm (revolutions per minute)

Torque	N·m (Newton meter)
	kgf·m (kilogram force meter)
	kgf·cm (kilogram force centimeter)
	ft·lbf (foot pound force)
	in·lbf (inch pound force)
Volume	L (liter)
	US qt (U.S. quart)
	Imp qt (Imperial quart)
	ml (milliliter)
	cc (cubic centimeter)
	cu in (cubic inch)
	fl oz (fluid ounce)
Weight	g (gram)
	oz (ounce)

Conversion to SI Units (Système International d'Unités)

- All numerical values in this manual are based on SI units. Numbers shown in conventional units are converted from these values.

Rounding Off

- Converted values are rounded off to the same number of places as the SI unit value. For example, if the SI unit value is 17.2 and the value after conversion is 37.84, the converted value will be rounded off to 37.8.

Upper and Lower Limits

- When the data indicates upper and lower limits, the converted values are rounded down if the SI unit value is an upper limit and rounded up if the SI unit value is a lower limit. Therefore, converted values for the same SI unit value may differ after conversion. For example, consider 2.7 kgf/cm^2 in the following specifications:

  210—260 kPa {2.1—2.7 kgf/cm^2, 30—38 psi}
  270—310 kPa {2.7—3.2 kgf/cm^2, 39—45 psi}

- The actual converted values for 2.7 kgf/cm^2 are 264 kPa and 38.4 psi. In the first specification, 2.7 is used as an upper limit, so the converted values are rounded down to 260 and 38. In the second specification, 2.7 is used as a lower limit, so the converted values are rounded up to 270 and 39.

FUNDAMENTAL PROCEDURES

Preparation of Tools and Measuring Equipment

- Be sure that all necessary tools and measuring equipment are available before starting any work.

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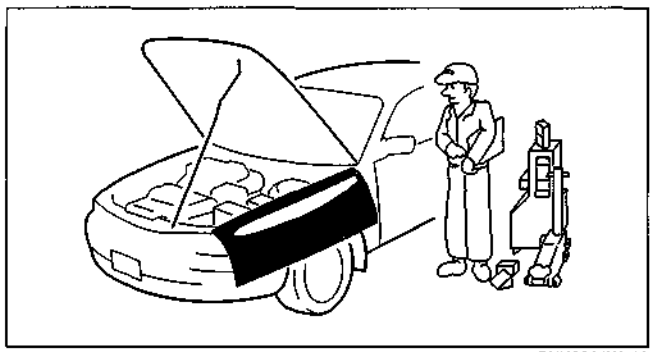
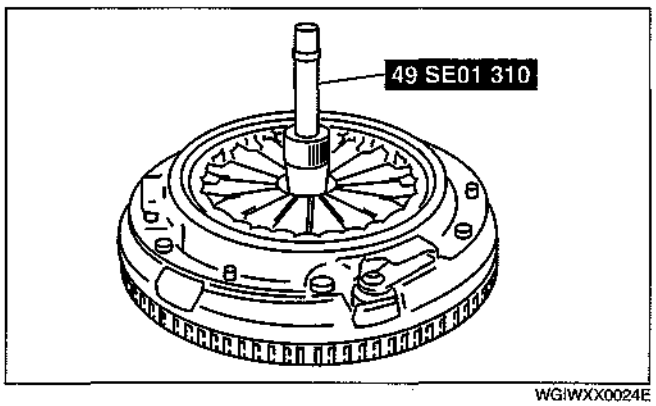


CHU0014W003

Special Service Tools

- Use special service tools or equivalent when they are required.



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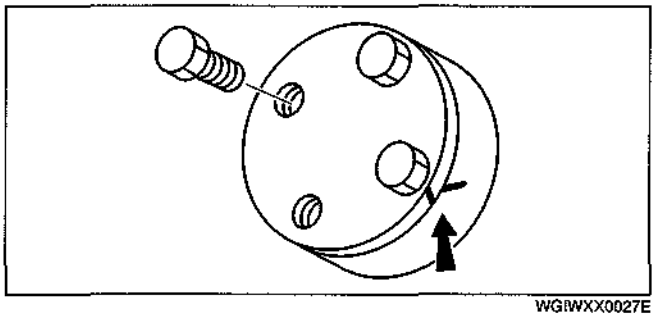
Disassembly

- If the disassembly procedure is complex, requiring many parts to be disassembled, all parts should be marked in a place that will not affect their performance or external appearance and identified so that reassembly can be performed easily and efficiently.



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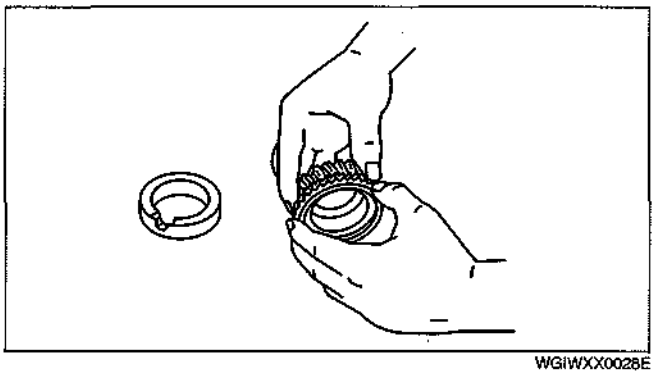
Inspection During Removal, Disassembly

- When removed, each part should be carefully inspected for malfunction, deformation, damage and other problems.



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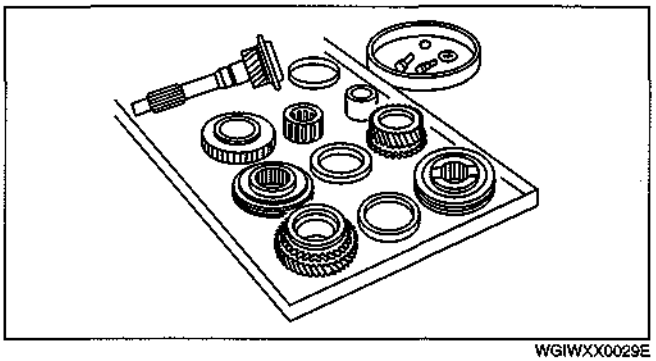
Arrangement of Parts

- All disassembled parts should be carefully arranged for reassembly.
- Be sure to separate or otherwise identify the parts to be replaced from those that will be reused.



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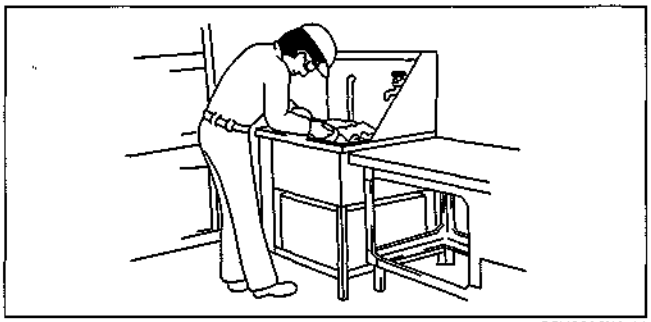
Cleaning of Parts

- All parts to be reused should be carefully and thoroughly cleaned in the appropriate method.

Warning

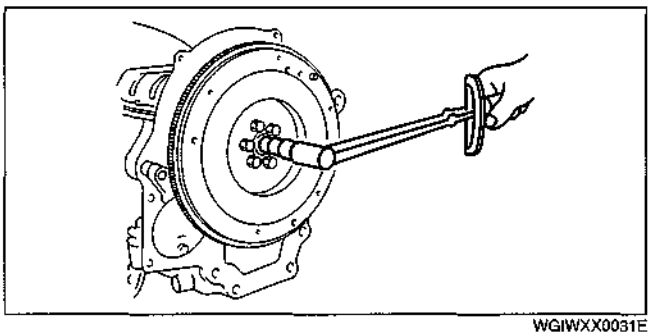
- **Using compressed air can cause dirt and other particles to fly out causing injury to the eyes. Wear protective eye wear whenever using compressed air.**



C5U0000W001

Reassembly

- Standard values, such as torques and certain adjustments, must be strictly observed in the reassembly of all parts.
- If removed, the following parts should be replaced with new ones:
  - — Oil seals
  - — Gaskets
  - — O-rings
  - — Lockwashers
  - — Cotter pins
  - — Nylon nuts



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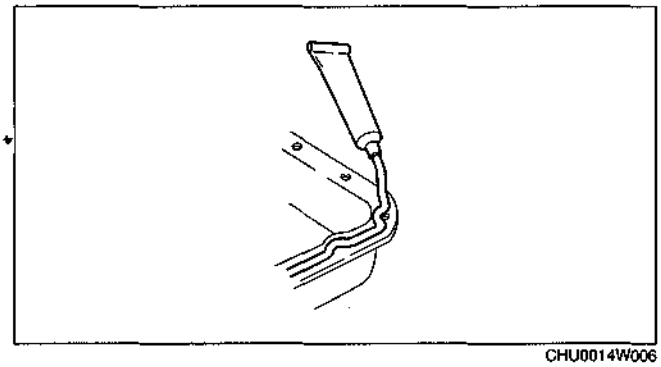
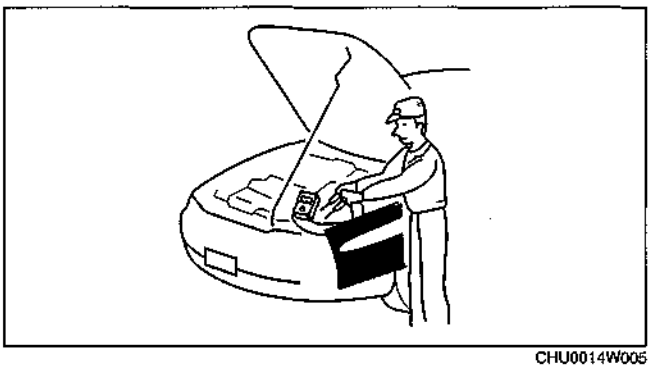
- Depending on location:
  - — Sealant and gaskets, or both, should be applied to specified locations. When sealant is applied, parts should be installed before sealant hardens to prevent leakage.
  - — Oil should be applied to the moving components of parts.
  - — Specified oil or grease should be applied at the prescribed locations (such as oil seals) before reassembly.



CHU0014W006

Adjustment

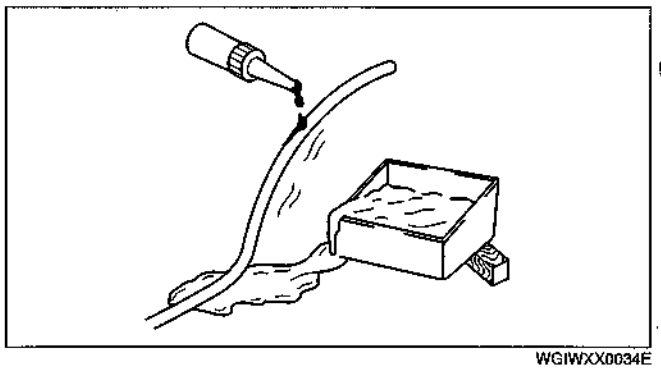
- Use suitable gauges and testers when making adjustments.



CHU0014W005

Rubber Parts and Tubing

- Prevent gasoline or oil from getting on rubber parts or tubing.



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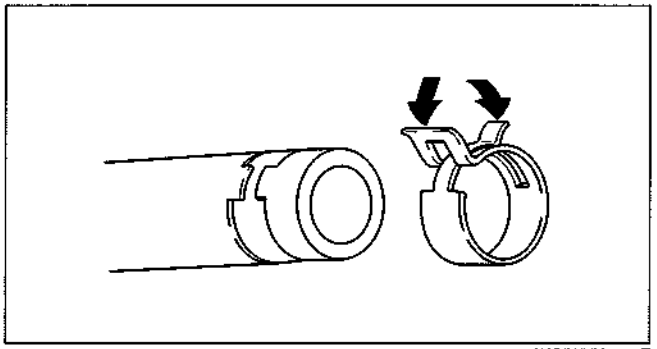
Hose Clamps

- When reinstalling, position the hose clamp in the original location on the hose and squeeze the clamp lightly with large pliers to ensure a good fit.



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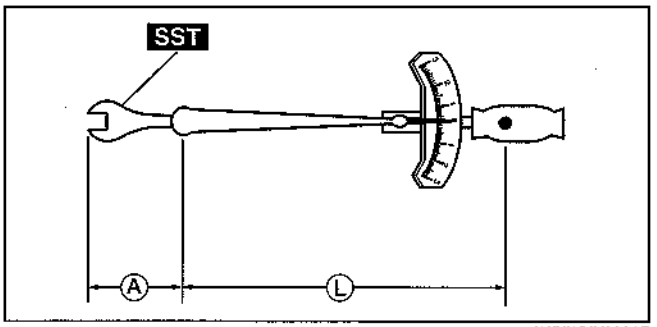
Torque Formulas

- When using a torque wrench-**SST** or equivalent combination, the written torque must be recalculated due to the extra length that the **SST** or equivalent adds to the torque wrench. Recalculate the torque by using the following formulas. Choose the formula that applies to you.

Torque Unit	Formula
N·m	N·m × [L/ (L+A)]
kgf·m	kgf·m × [L/ (L+A)]
kgf·cm	kgf·cm × [L/ (L+A)]
ft·lbf	ft·lbf × [L/ (L+A)]
in·lbf	in·lbf × [L/ (L+A)]



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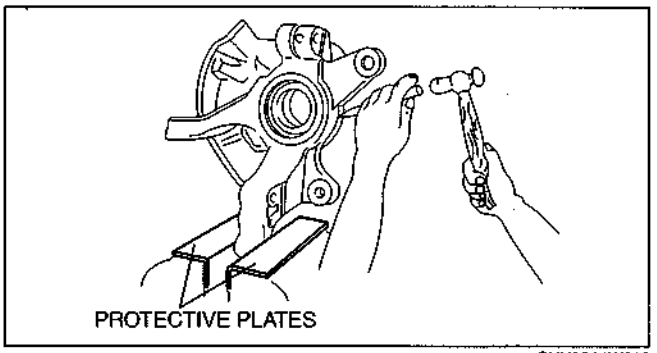
A : The length of the **SST** past the torque wrench drive.
L : The length of the torque wrench.

Vise

- When using a vise, put protective plates in the jaws of the vise to prevent damage to parts.



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ELECTRICAL SYSTEM

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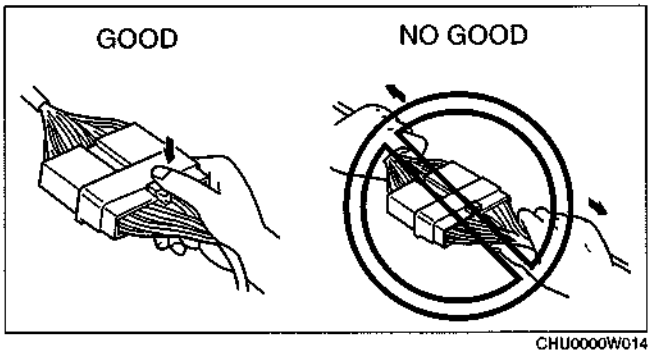
Connectors

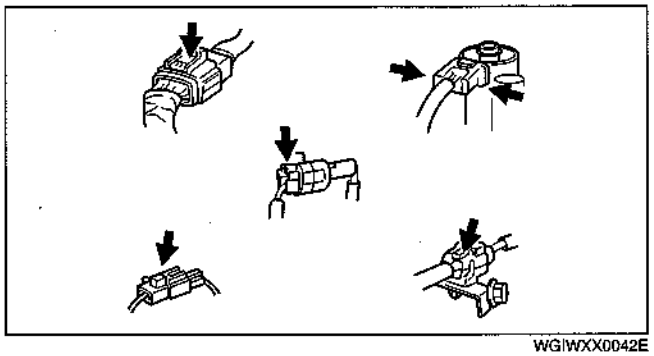
Disconnecting connectors

- When disconnecting connector, grasp the connectors, not the wires.



CHU0000W014

- Connectors can be disconnected by pressing or pulling the lock lever as shown.



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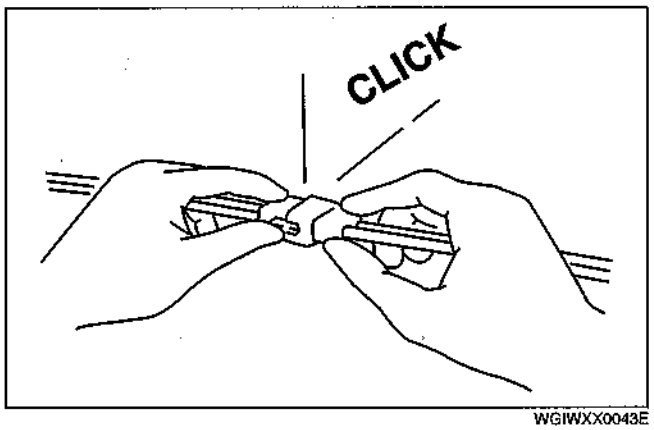
Locking connector

- When locking connectors, listen for a click indicating they are securely locked.



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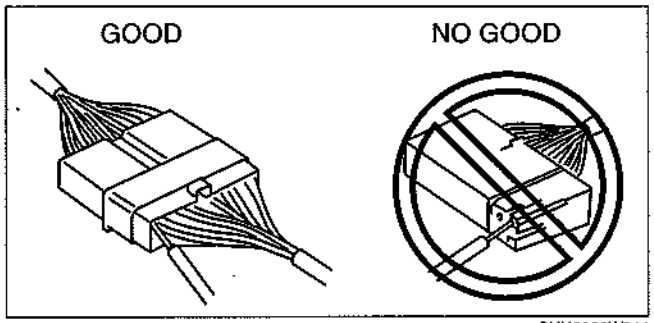
Inspection

- When a tester is used to inspect for continuity or measuring voltage, insert the tester probe from the wiring harness side.



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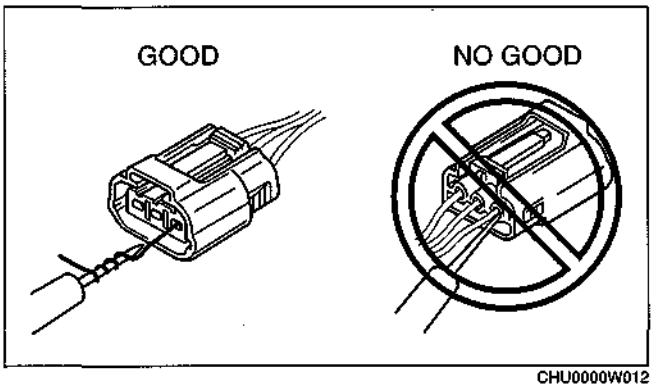
- Inspect the terminals of waterproof connectors from the connector side since they cannot be accessed from the wiring harness side.

Caution
- **To prevent damage to the terminal, wrap a thin wire around the tester probe before inserting into terminal.**



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NEW STANDARDS

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- Following is a comparison of the previous standard and the new standard.

New Standard		Previous Standard		Remark
Abbreviation	Name	Abbreviation	Name	
AP	Accelerator Pedal	—	Accelerator Pedal	
ACL	Air Cleaner	—	Air Cleaner	
A/C	Air Conditioning	—	Air Conditioning	
BARO	Barometric Pressure	—	Atmospheric Pressure	
B+	Battery Positive Voltage	Vb	Battery Voltage	
—	Brake Switch	—	Stoplight Switch	
—	Calibration Resistor	—	Corrected Resistance	#6
CMP sensor	Camshaft Position Sensor	—	Crank Angle Sensor	
CAC	Charge Air Cooler	—	Intercooler	
CLS	Closed Loop System	—	Feedback System	
CTP	Closed Throttle Position	—	Fully Closed	
CPP	Clutch Pedal Position	—	Idle Switch	
CIS	Continuous Fuel Injection System	—	Clutch Position	
CS sensor	Control Sleeve Sensor	CSP sensor	Control Sleeve Position Sensor	#6
CKP sensor	Crankshaft Position Sensor	—	Crank Angle Sensor 2	
DLC	Data Link Connector	—	Diagnosis Connector	
DTM	Diagnostic Test Mode	—	Test Mode	#1
DTC	Diagnostic Trouble Code(s)	—	Service Code(s)	
DI	Distributor Ignition	—	Spark Ignition	
DLI	Distributorless Ignition	—	Direct Ignition	
EI	Electronic Ignition	—	Electronic Spark Ignition	#2
ECT	Engine Coolant Temperature	—	Water Thermo	
EM	Engine Modification	—	Engine Modification	
—	Engine Speed Input Signal	—	Engine RPM Signal	
EVAP	Evaporative Emission	—	Evaporative Emission	
EGR	Exhaust Gas Recirculation	—	Exhaust Gas Recirculation	
FC	Fan Control	—	Fan Control	
FF	Flexible Fuel	—	Flexible Fuel	
4GR	Fourth Gear	—	Overdrive	
—	Fuel Pump Relay	—	Circuit Opening Relay	#3
FSO solenoid	Fuel Shut Off Solenoid	FCV	Fuel Cut Valve	#6
GEN	Generator	—	Alternator	
GND	Ground	—	Ground/Earth	
HO2S	Heated Oxygen Sensor	—	Oxygen Sensor	With heater
IAC	Idle Air control	—	Idle Speed Control	
—	IDM Relay	—	Spill Valve Relay	#6

New Standard		Previous Standard		Remark
Abbreviation	Name	Abbreviation	Name	
—	Incorrect Gear Ratio	—	—	
—	Injection Pump	FIP	Fuel Injection Pump	#6
—	Input/Turbine Speed Sensor	—	Pulse Generator	
IAT	Intake Air Temperature	—	Intake Air Thermo	
KS	Knock Sensor	—	Knock Sensor	
MIL	Malfunction Indicator Lamp	—	Malfunction Indicator Light	
MAP	Manifold Absolute Pressure	—	Intake Air Pressure	
MAF sensor	Mass Air Flow Sensor	—	Airflow Sensor	
MFL	Multiport Fuel Injection	—	Multiport Fuel Injection	
OBD	On-Board Diagnostic	—	Diagnosis/SelfDiagnosis	
OL	Open Loop	—	Open Loop	
—	Output Speed Sensor	—	Vehicle Speed Sensor 1	
OC	Oxidation Catalytic Converter	—	Catalytic Converter	
O2S	Oxygen Sensor	—	Oxygen Sensor	
PNP	Park/Neutral Position	—	Park/Neutral Range	
—	PCM Control Relay	—	Main Relay	#6
PSP	Power Steering Pressure	—	Power Steering Pressure	
PCM	Powertrain Control Module	ECU	Engine Control Unit	#4
—	Pressure Control Solenoid	—	Line Pressure Solenoid Valve	
PAIR	Pulsed Secondary Air Injection	—	Secondary Air Injection System	Pulsed injection
—	Pump Speed Sensor	—	NE Sensor	#6
AIR	Secondary Air Injection	—	Secondary Air Injection System	Injection with air pump
SAPV	Secondary Air Pulse Valve	—	Reed Valve	
SFI	Sequential Multipoint Fuel Injection	—	Sequential Fuel Injection	
—	Shift Solenoid A	—	12 Shift Solenoid Valve	
		—	Shift A Solenoid Valve	
—	Shift Solenoid B	—	23 Shift Solenoid Valve	
		—	Shift B Solenoid Valve	
—	Shift Solenoid C	—	34 Shift Solenoid Valve	
3GR	Third Gear	—	3rd Gear	
TWC	Three Way Catalytic Converter	—	Catalytic Converter	
TB	Throttle Body	—	Throttle Body	
TP sensor	Throttle Position Sensor	—	Throttle Sensor	
TCV	Timer Control Valve	TCV	Timing Control Valve	#6
TCC	Torque Converter Clutch	—	Lockup Position	
TCM	Transmission (Transaxle) Control Module	—	EC-AT Control Unit	
—	Transmission (Transaxle) Fluid Temperature Sensor	—	ATF Thermosensor	
TR	Transmission (Transaxle) Range	—	Inhibitor Position	
TC	Turbocharger	—	Turbocharger	
VSS	Vehicle Speed Sensor	—	Vehicle Speed Sensor	
VR	Voltage Regulator	—	IC Regulator	
VAF sensor	Volume Air Flow Sensor	—	Air flow Sensor	
WUTWC	Warm Up Three Way Catalytic Converter	—	Catalytic Converter	#5
WOT	Wide Open Throttle	—	Fully Open	

#1 : Diagnostic trouble codes depend on the diagnostic test mode
#2 : Controlled by the PCM
#3 : In some models, there is a fuel pump relay that controls pump speed. That relay is now called the fuel pump relay (speed).
#4 : Device that controls engine and powertrain
#5 : Directly connected to exhaust manifold
#6 : Part name of diesel engine

ABBREVIATIONS

DCF000000000W06

ATDC	After Top Dead Center
BTDC	Before Top Dead Center
EX	Exhaust
HLA	Hydraulic Lash Adjuster
IN	Intake
SST	Special Service Tool
TDC	Top Dead Center
VRS	Vibration Reducing Stiffener
VSS	Vehicle Speed Sensor
4x2	4-wheel 2-drive
4x4	4-wheel 4-drive

ENGINE

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CYLINDER HEAD DISASSEMBLY (II) [WL-3] 01–10A–8
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CYLINDER BLOCK DISASSEMBLY (II) [WL-3] 01–10A–10
CYLINDER BLOCK DISASSEMBLY (III) [WL-3] 01–10A–15
CYLINDER HEAD INSPECTION/REPAIR [WL-3] 01–10A–16
VALVE INSPECTION [WL-3] 01–10A–17
VALVE GUIDE INSPECTION [WL-3] . . . 01–10A–18
VALVE GUIDE REPLACEMENT [WL-3] . 01–10A–19
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CAMSHAFT INSPECTION [WL-3] 01–10A–21
CAMSHAFT OIL CLEARANCE INSPECTION [WL-3] 01–10A–21
CAMSHAFT END PLAY INSPECTION [WL-3] 01–10A–22
CYLINDER BLOCK INSPECTION/REPAIR [WL-3] 01–10A–22
OIL JET VALVE, NOZZLE INSPECTION [WL-3] 01–10A–23
PISTON INSPECTION [WL-3] 01–10A–23
PISTON CLEARANCE INSPECTION/REPAIR [WL-3] 01–10A–23
PISTON RING CLEARANCE INSPECTION [WL-3] 01–10A–23
PISTON PIN CLEARANCE INSPECTION [WL-3] 01–10A–24
CRANKSHAFT INSPECTION [WL-3] . . . 01–10A–25
CRANKSHAFT OIL CLEARANCE INSPECTION/REPAIR [WL-3] 01–10A–26
CRANKSHAFT END PLAY INSPECTION/REPAIR [WL-3] 01–10A–26
CONNECTING ROD INSPECTION [WL-3] 01–10A–26
CONNECTING ROD OIL CLEARANCE INSPECTION/REPAIR [WL-3] 01–10A–27
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BOLT INSPECTION [WL-3] 01–10A–28
TENSIONER SPRING INSPECTION [WL-3] 01–10A–28
VALVE CLEARANCE INSPECTION [WL-3] 01–10A–29
VALVE CLEARANCE ADJUSTMENT [WL-3] 01–10A–29
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GEAR CLEARANCE INSPECTION [WL-3] 01–10A–32
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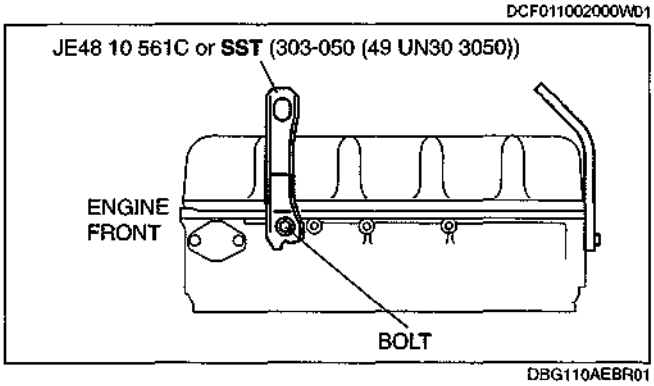
CYLINDER BLOCK ASSEMBLY (II) [WL-3] 01–10A–36
CYLINDER BLOCK ASSEMBLY (III) [WL-3] 01–10A–42
CYLINDER HEAD ASSEMBLY (I) [WL-3] 01–10A–44
CYLINDER HEAD ASSEMBLY (II) [WL-3] 01–10A–46
TIMING BELT ASSEMBLY [WL-3] 01–10A–51

ENGINE MOUNTING [WL-3]

1. Install the engine hanger (JE48 10 561C) or **SST** (303-050 (49 UN30 3050)) to the cylinder head using the bolt (99794 0820 or **M8X1.25, 6T**, length **20mm {0.79 in}**) as shown in the figure.

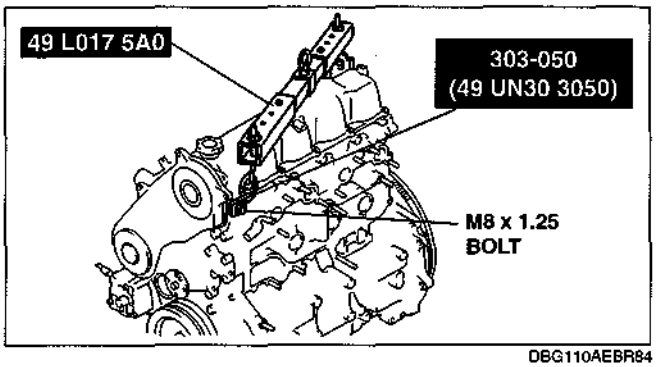
   Tightening torque
   18.6—25.5 N·m {1.90—2.60 kgf·m, 13.8—18.8 ft·lbf}

DCF011002000W01



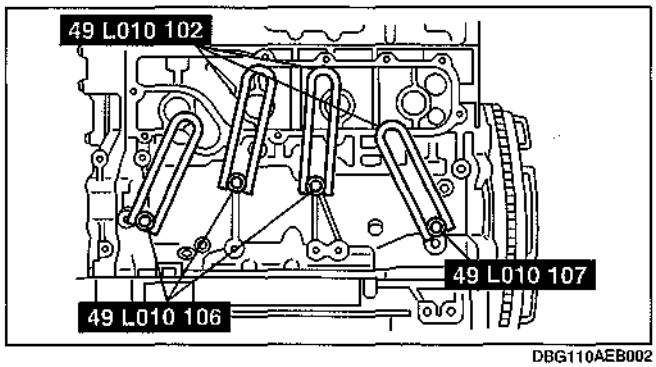
DBG110AEBR01

2. If the **SST** (303-050 (49 UN30 3050)) is used, use the **SST** (49 L017 5A0) when suspending the engine.



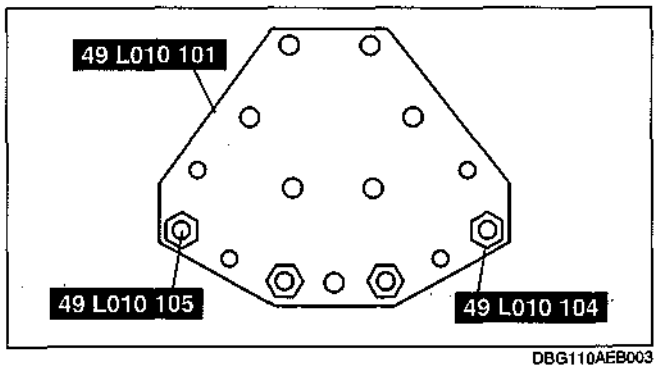
DBG110AEBR84

3. Install the **SST** (arms) to the holes as shown in the figure, and hand tighten the **SST** (bolts).



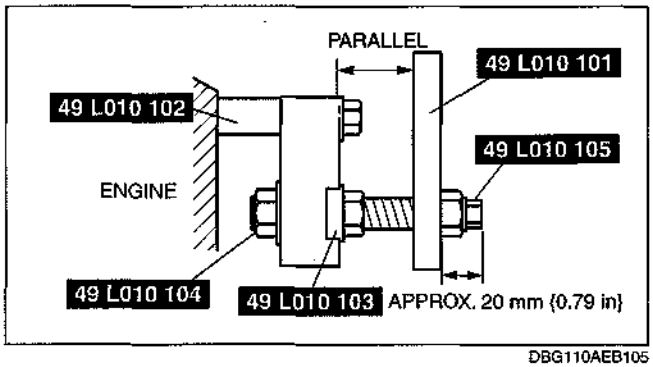
DBG110AEB002

4. Assemble the **SSTs** (bolts, nuts and plate) to the specified positions.



DBG110AEB003

5. Adjust the **SST** (bolts) so that **20 mm {0.79 in}** or more of thread is exposed.
6. Align the **SSTs** (plate and arms) so that they are parallel by adjusting the **SSTs** (bolts and nuts).
7. Tighten the **SSTs** (bolts and nuts) to affix the **SST** firmly.
8. Mount the engine on the **SST** (engine stand).

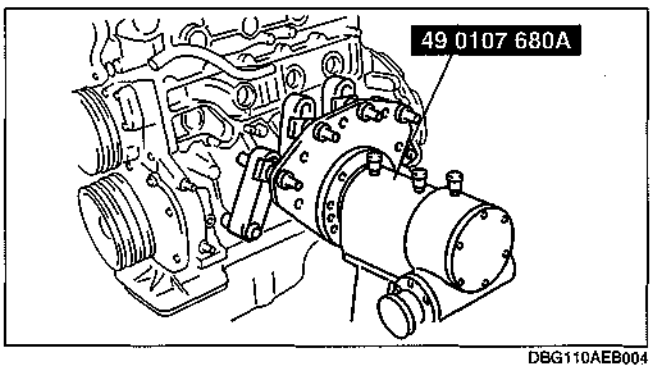


DBG110AEB105

Warning
- **The self-locking brake system for the engine stand may not operate if the engine is held in an unbalanced position. This could lead to sudden, rapid movement of the engine and mounting stand handle and cause serious injury. Never hold the engine in an unbalanced position, and always grasp the rotating handle firmly when turning the engine.**

9. Remove the engine hanger (JE48 10 561C) or **SST** (303-050 (49 UN30 3050)).
10. Drain the engine oil into a container.
11. Install the drain plug using new washer.

Tightening torque
29.4—41.2 N·m {3.00—4.20 kgf·m, 21.7—30.3 ft·lbf}



DBG110AEB004

ENGINE DISMOUNTING [WL-3]

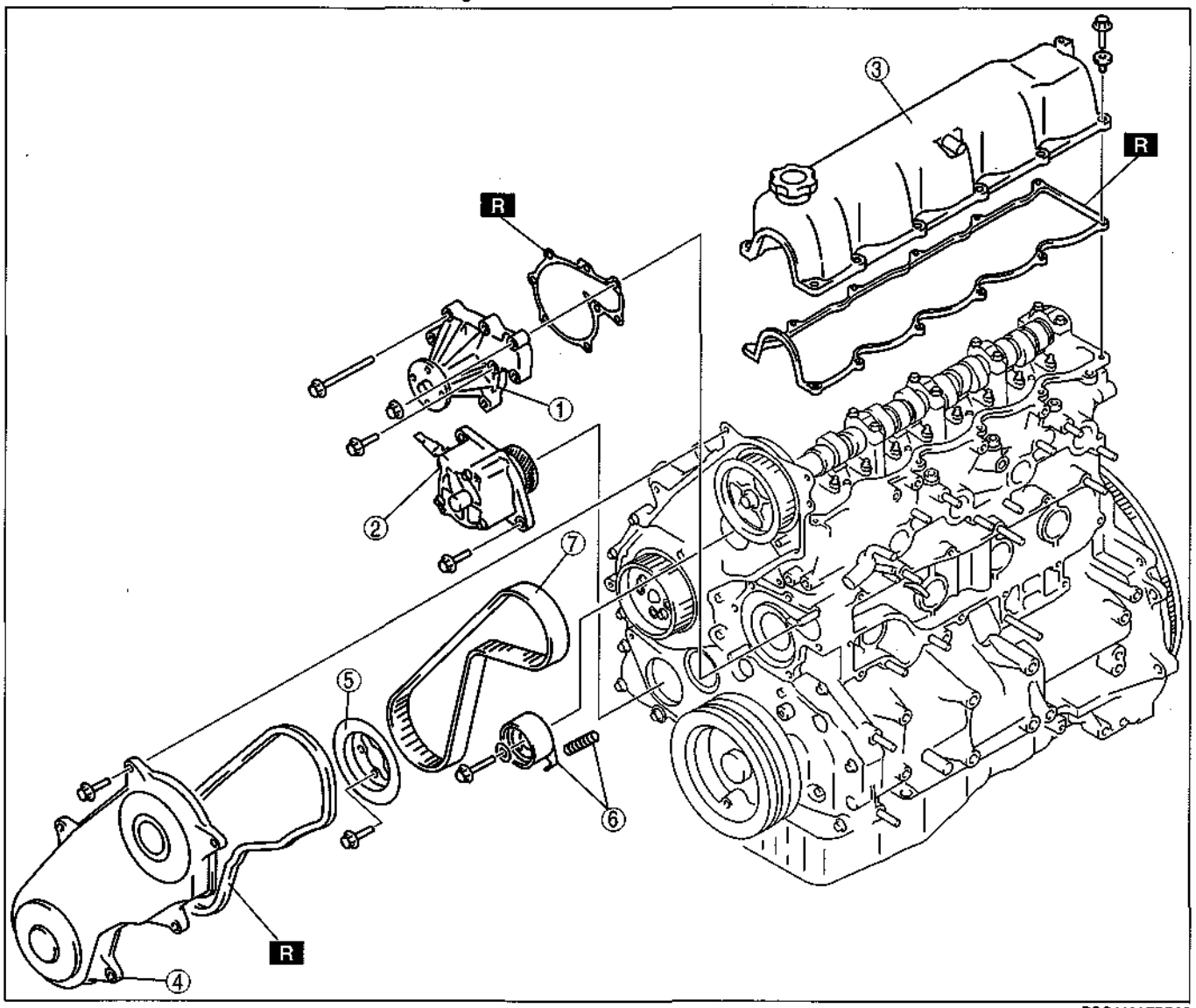
DCF011002000W02

1. Dismount in the reverse order of mounting.

TIMING BELT DISASSEMBLY [WL-3]

DCF011002000W03

1. Disassemble in the order shown in the figure.



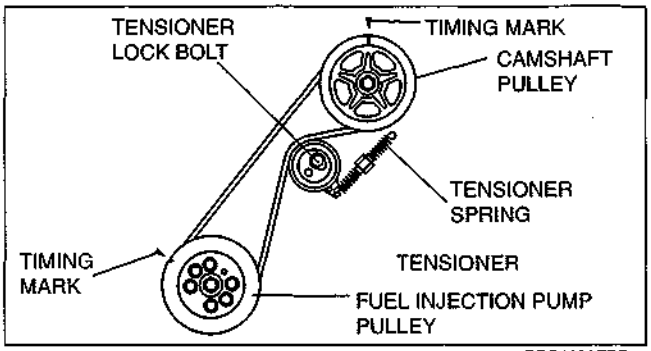
DBG110AEBR05

1	Water pump
2	Vacuum pump
3	Cylinder head cover
4	Timing belt cover
5	Pulley plate

6	Tensioner, tensioner spring (See 01–10A–5 Tensioner, Tensioner Spring Disassembly Note.)
7	Timing belt (See 01–10A–5 Timing Belt Disassembly Note.)

Tensioner, Tensioner Spring Disassembly Note

1. Turn the crankshaft clockwise and align the timing marks as shown in the figure.



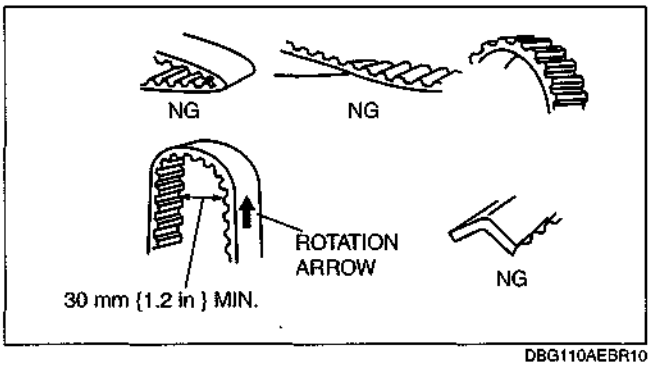
DBG110AEBR11

Timing Belt Disassembly Note

1. Mark the timing belt rotation on the belt for proper reinstallation.

Caution

- **The following will damage the timing belt and shorten its life; forcefully twisting it, turning it inside out, or getting oil or grease on it.**
- **After removing the timing belt, do not move the crankshaft and/or camshaft pulley from this position because it can cause the valve and piston to contact and damage them.**

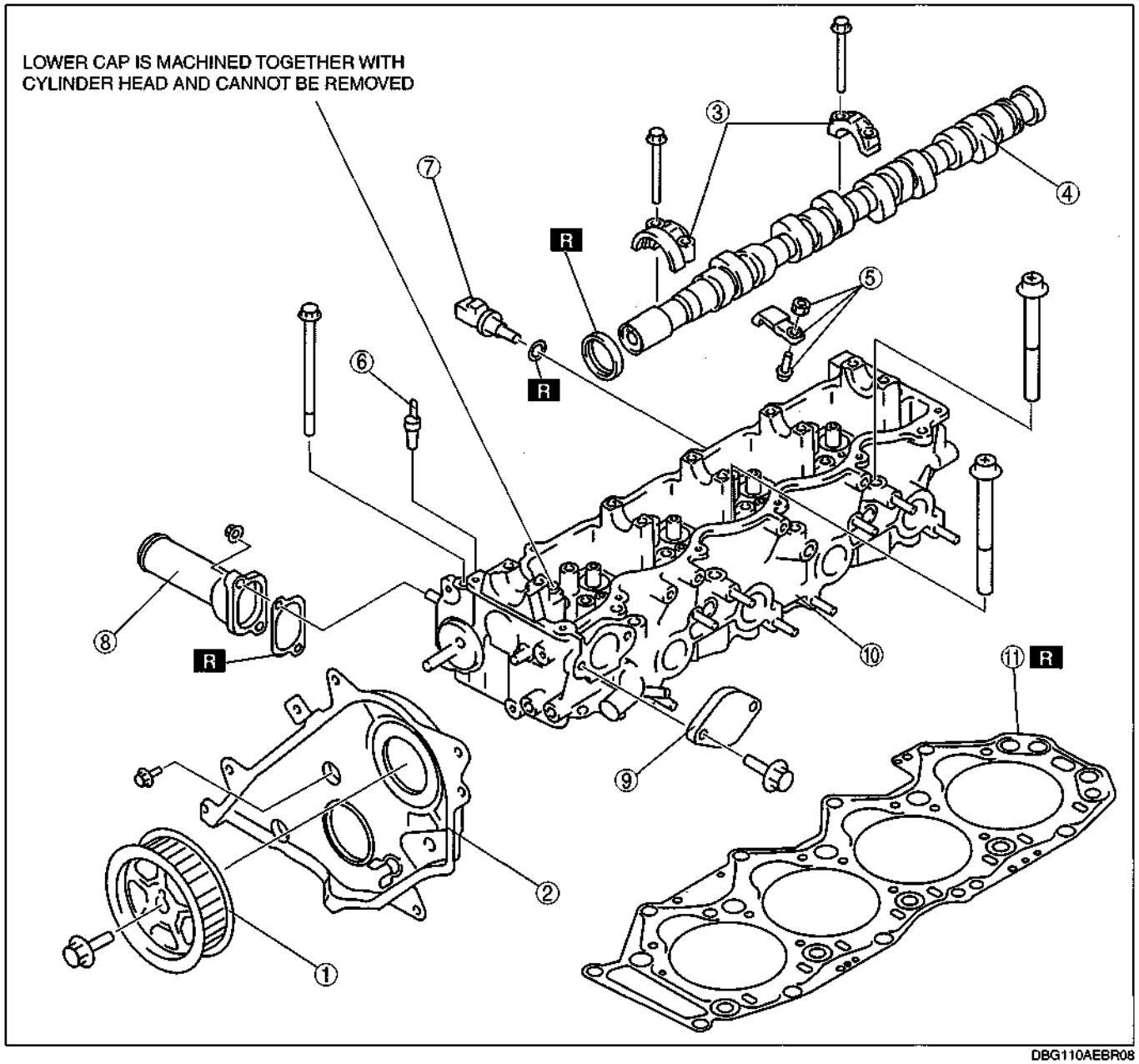


DBG110AEBR10

CYLINDER HEAD DISASSEMBLY(I) [WL-3]

DCF011002000W04

1. Disassemble in the order shown in the figure.



DBG110AEBR08

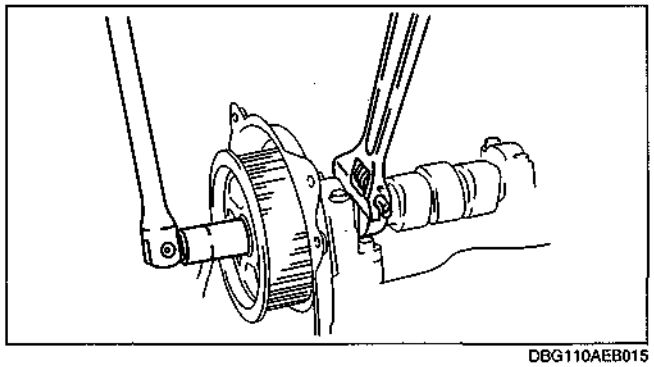
1	Camshaft pulley (See 01–10A–7 Camshaft Pulley Disassembly Note.)
2	Seal plate
3	Camshaft cap (See 01–10A–7 Camshaft Cap Disassembly Note.)
4	Camshaft (See 01–10A–7 Camshaft Disassembly Note.)

5	Rocker arm
6	Water temperature sender unit
7	ECT sensor
8	Water outlet pipe
9	Blind cover
10	Cylinder head (See 01–10A–7 Cylinder Head Disassembly Note.)
11	Cylinder head gasket

Camshaft Pulley Disassembly Note

Caution
- **Do not move the camshaft from this position because it can cause the valve and piston to contact each other and damage them.**

1. Hold the camshaft by using a wrench on the cast hexagon.



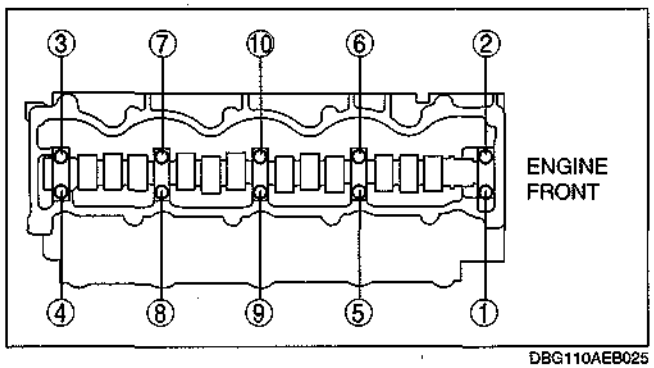
DBG110AEB015

Camshaft Cap Disassembly Note

Caution
- **Removing the camshaft cap under load can break the camshaft. When removing the camshaft cap, loosen the locknut and the adjust screw to prevent the camshaft from pressing down the rocker arm.**

Note
- Mark the camshaft cap so that they can be reinstalled in the position from which they were removed.

1. Loosen the camshaft cap bolts in three or four steps in the order shown in the figure.



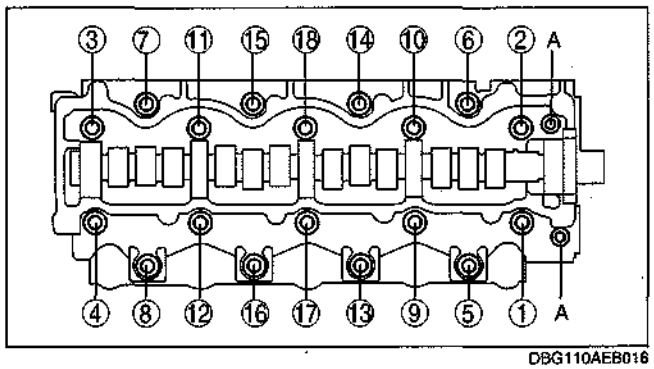
DBG110AEB025

Camshaft Disassembly Note

1. Before removing the camshaft, inspect the camshaft oil clearance. (See 01–10A–21 CAMSHAFT OIL CLEARANCE INSPECTION [WL-3].)

Cylinder Head Disassembly Note

1. Remove bolts A.
2. Loosen the cylinder head bolts in two or three steps in the order shown in the figure.

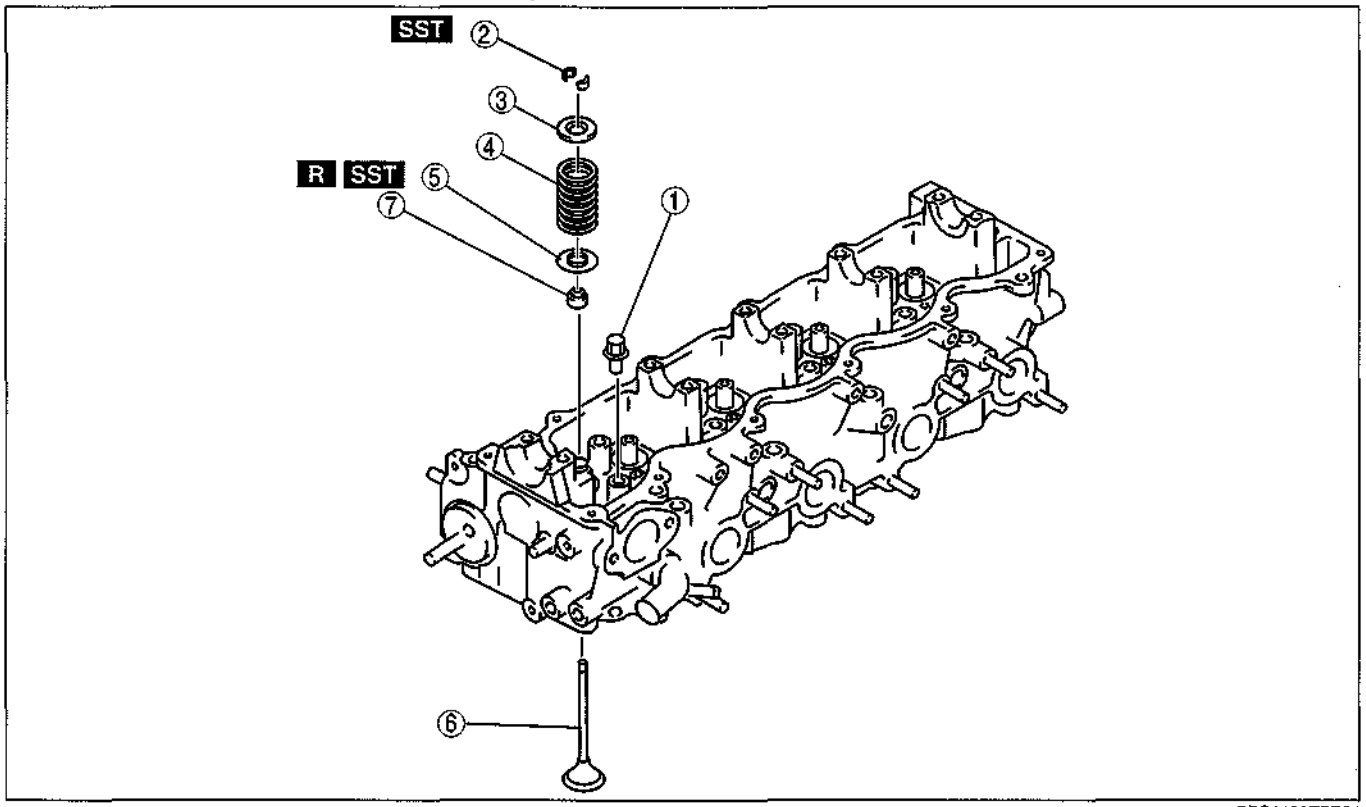


DBG110AEB016

CYLINDER HEAD DISASSEMBLY (II) [WL-3]

DCF011002000W05

1. Disassemble in the order shown in the figure.



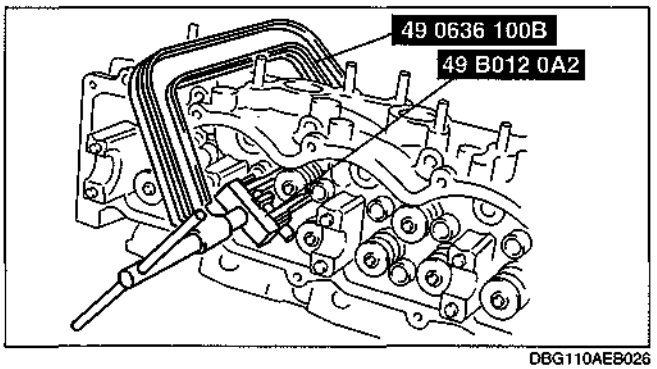
DBG110AEBR24

1	Pivot
2	Valve keeper (See 01–10A–8 Valve Keeper Disassembly Note.)
3	Upper valve spring seat
4	Valve spring

5	Lower valve spring seat
6	Valve
7	Valve seal (See 01–10A–9 Valve Seal Disassembly Note.)

Valve Keeper Disassembly Note

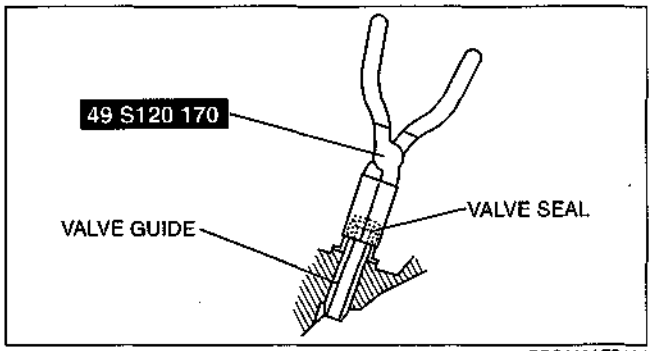
1. Remove the valve keeper using the **SST**.



DBG110AEB026

Valve Seal Disassembly Note

1. Remove the valve seal using the **SST**.

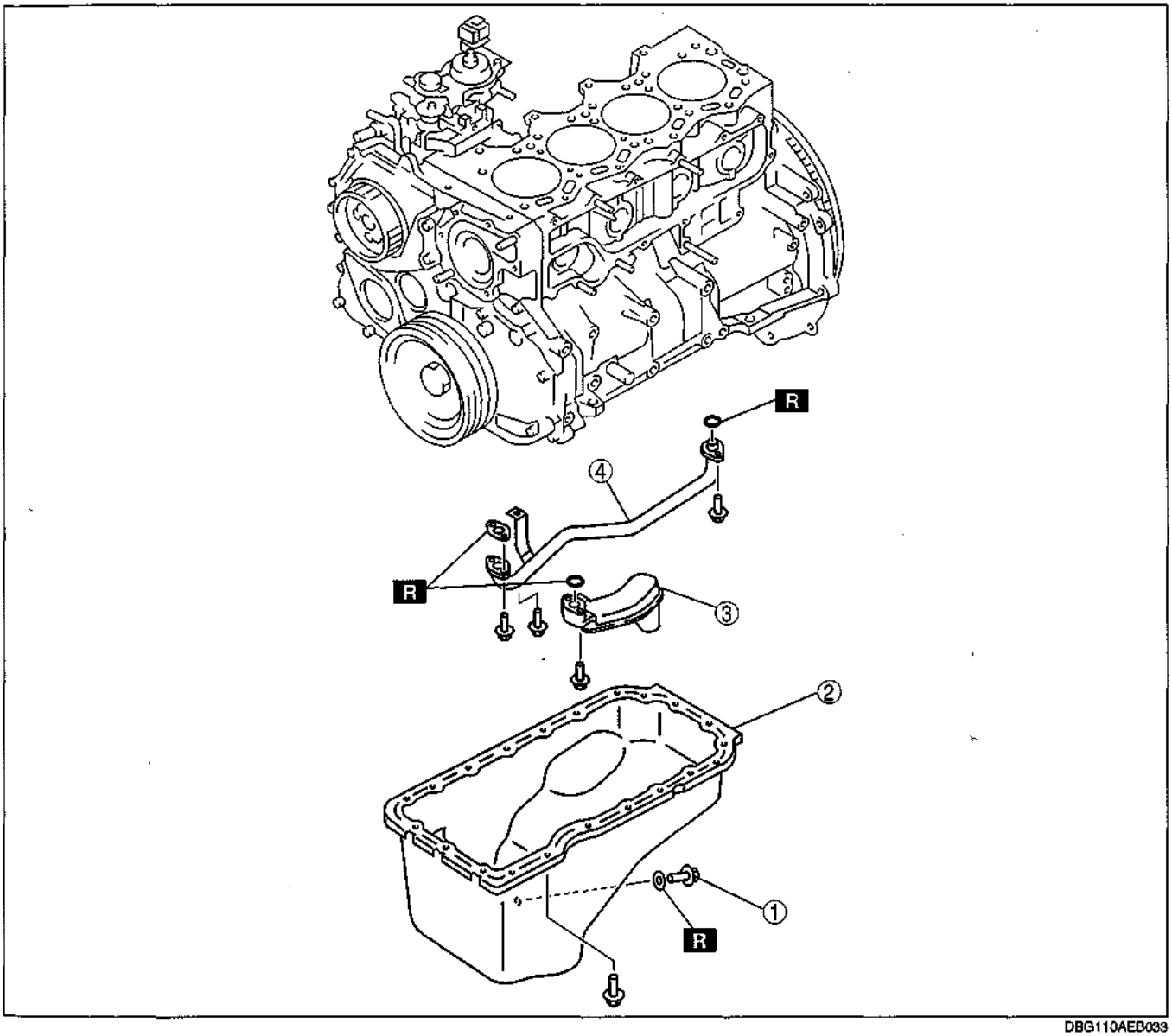


DBG110AEB104

CYLINDER BLOCK DISASSEMBLY (I) [WL-3]

DCF011002000W06

1. Disassemble in the order shown in the figure.



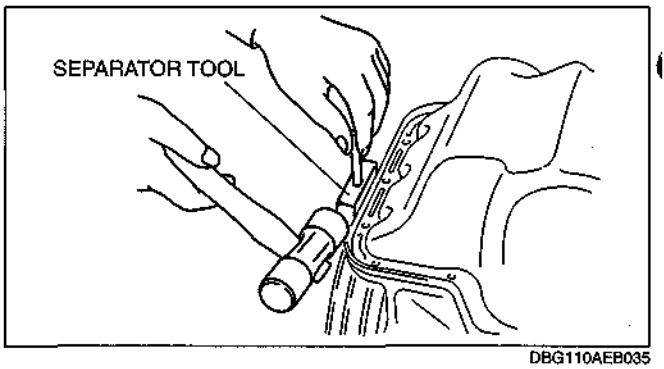
DBG110AEB033

1	Oil drain plug
2	Oil pan (See 01–10A–10 Oil Pan Disassembly Note.)

3	Oil strainer
4	Oil pipe

Oil Pan Disassembly Note

1. Remove the oil pan using a separator tool.

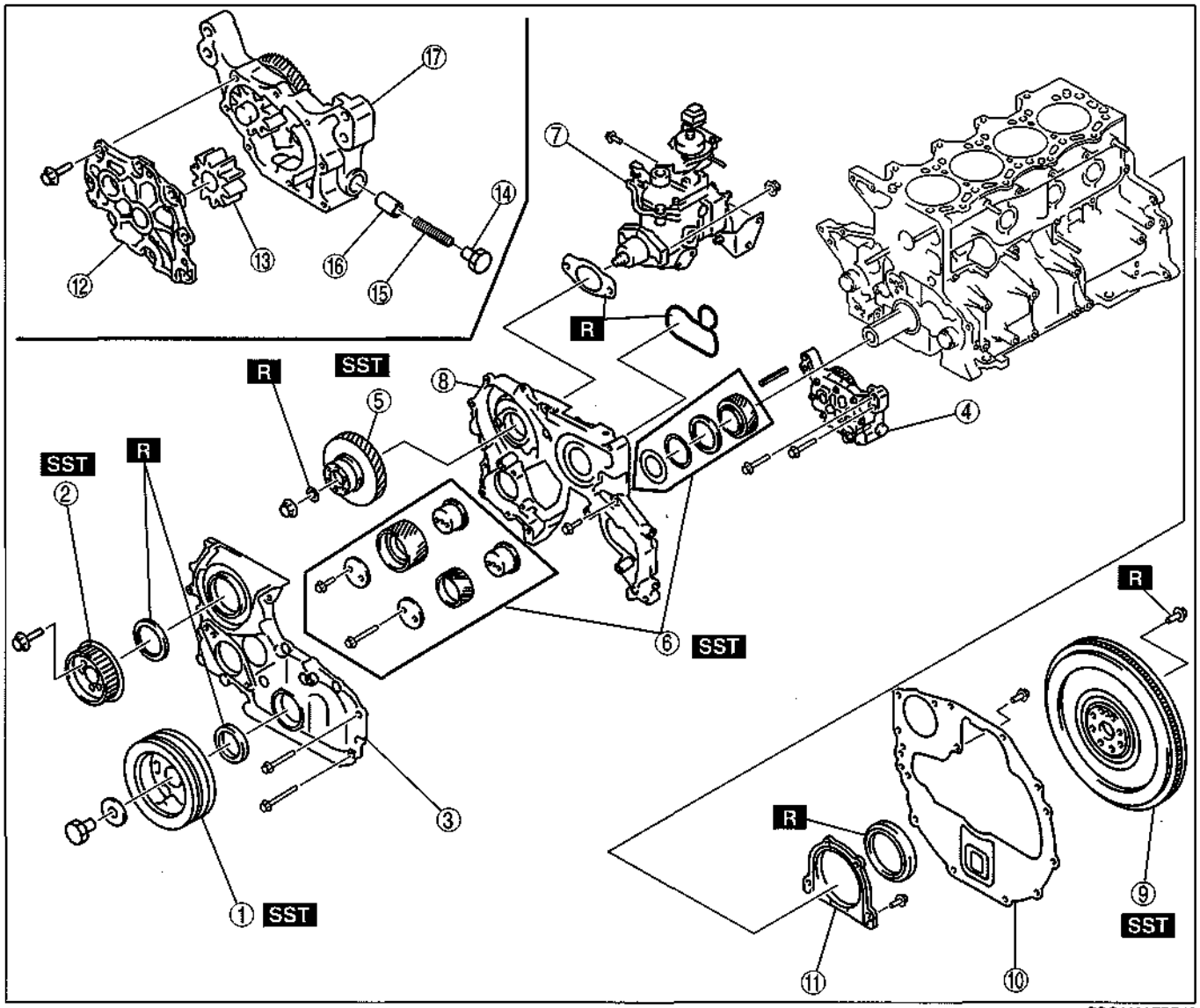


DBG110AEB035

CYLINDER BLOCK DISASSEMBLY (II) [WL-3]

DCF011002000W07

1. Disassemble in the order shown in the figure.



DBG110AEBR40

1	Crankshaft pulley (See 01–10A–11 Crankshaft Pulley Disassembly Note.)
2	Fuel injection pump pulley (See 01–10A–11 Fuel Injection Pump Pulley Disassembly Note.)
3	Timing gear cover (See 01–10A–12 Timing Gear Cover Disassembly Note.)

4	Oil pump
5	Fuel injection pump gear (See 01–10A–12 Fuel Injection Pump Gear Disassembly Note.)
6	Timing gear
7	Fuel injection pump

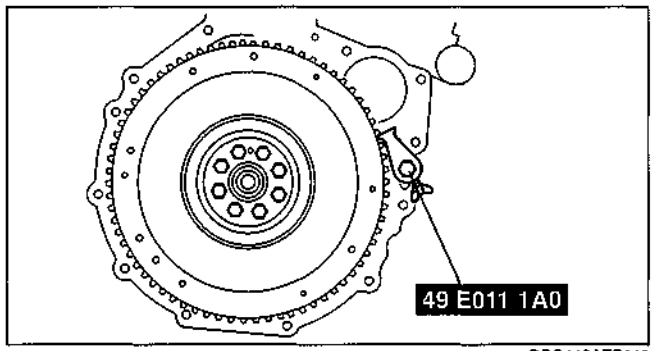
8	Timing gear case (See 01–10A–14 Timing Gear Case Disassembly Note.)
9	Flywheel (See 01–10A–14 Flywheel Disassembly Note.)
10	End plate
11	Rear cover (See 01–10A–14 Rear Cover Disassembly Note.)
12	Oil pump cover
13	Driven gear
14	Plug
15	Plunger spring
16	Control plunger
17	Oil pump body

Crankshaft Pulley Disassembly Note

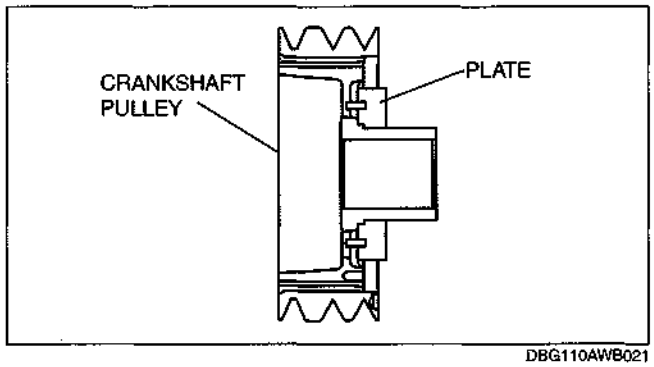
1. Remove the crankshaft pulley using the **SST**.

Caution

- **The CKP sensor plate is a very important part for engine operation control; any deformation of the plate may disable the operation control.**
  When disassembling/assembling the crankshaft pulley, be very careful not to deform the plate by interference with other parts or improper handling.



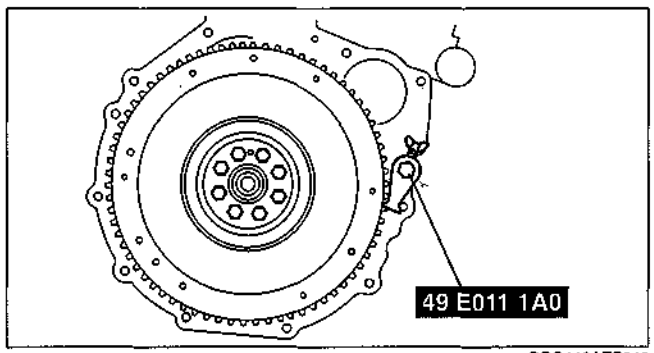
DBG110AEB042



DBG110AWB021

Fuel Injection Pump Pulley Disassembly Note

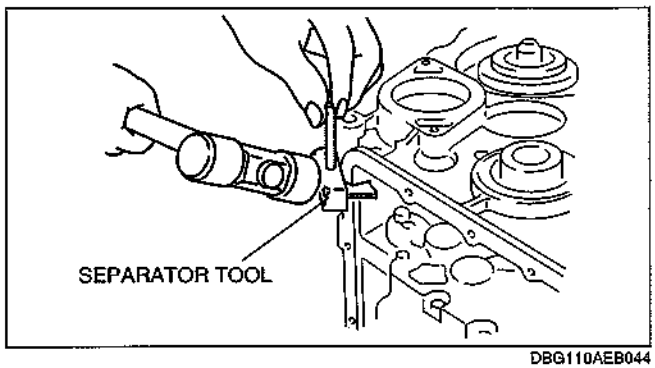
1. Remove the fuel injection pump pulley using the **SST**.



DBG110AEB043

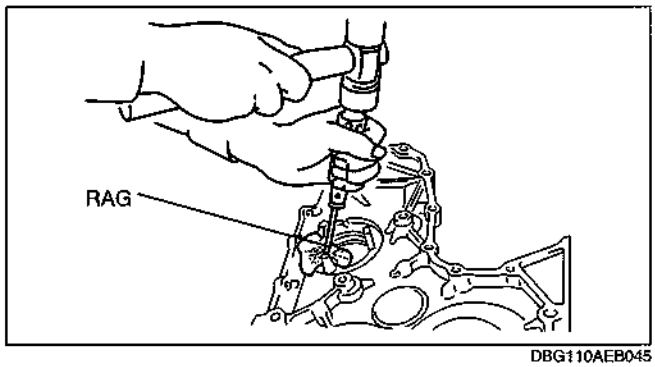
Timing Gear Cover Disassembly Note

1. Remove the timing gear cover using a separator tool.



DBG110AEB044

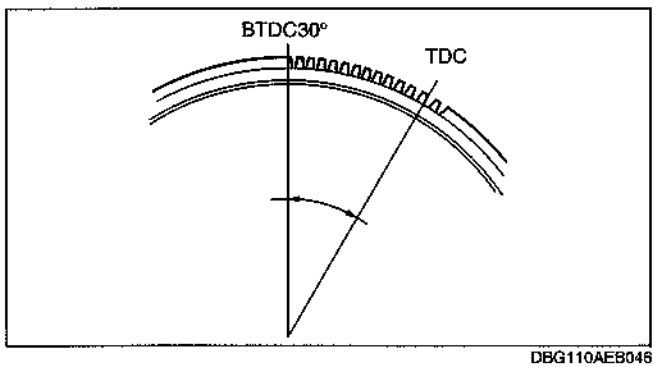
2. Remove the oil seal using a screwdriver protected with a rag.



DBG110AEB045

Fuel Injection Pump Gear Disassembly Note

1. Set the No.1 cylinder to TDC of compression.
2. Rotate the flywheel ring gear from TDC to approximately **30°** BTDC (about 13 teeth on the gear).

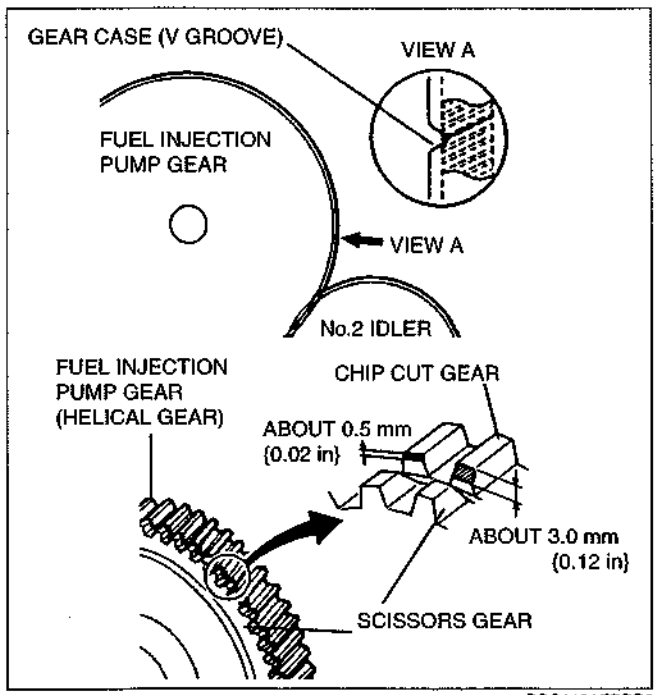


DBG110AEB046

3. Verify that the end-gap (V groove) of the timing gear case and the chip cut gear of the fuel injection pump gear are aligned.

Note

- If the chip cut gear is hard to find, move the fuel injection pump gear on notch back and forth, then check the chip cut gear.



DBG110AEBRR8

4. Fix the scissors gear to the fuel injection pump gear using a lock bolt (**M8×1.25**; length under the bolt head is approximately **14 mm {0.55 in}**).

Warning

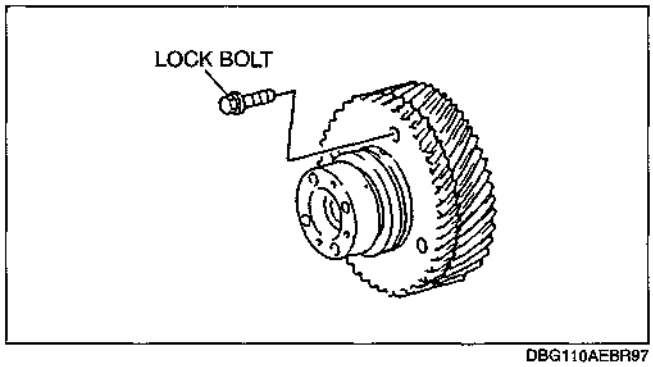
- **When removing the fuel injection pump gear, be sure to secure the scissors gear to the fuel injection pump gear using a lock bolt (M8×1.25; length under the bolt head is approximately 14 mm {0.55 in}). Otherwise, the scissors gear will rotate with the spring force, causing personal injury.**

Caution

- **When removing the fuel injection pump gear, be sure to secure the scissors gear to the fuel injection pump gear using a look bolt (M8×1.25; length under the bolt head is approximately 14 mm {0.55 in}) to prevent the scissors gear form rotating with the spring force. Otherwise, the scissors gear will not align with the fuel injection pump gear, and the fuel injection pump gear with the scissors gear will not engage with the idler gear.**

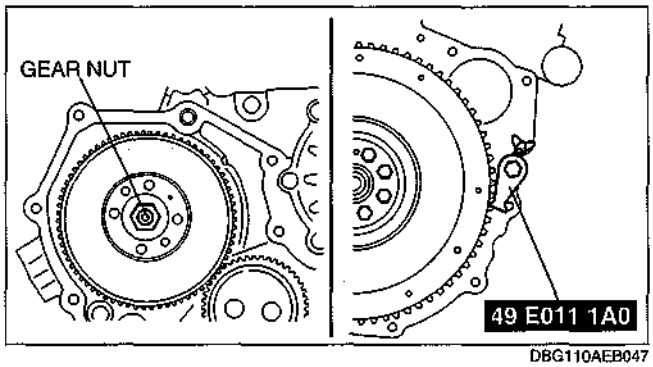
Note

- The fuel injection pump gear with a scissors gear has a lock bolt hole.



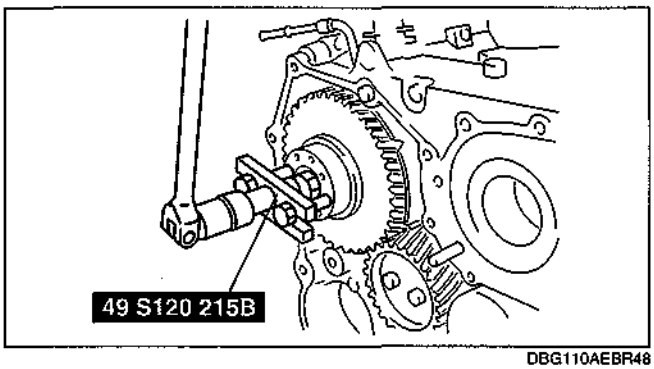
DBG110AEBR97

5. Hold the crankshaft using the **SST** and loosen the gear nut.



DBG110AEB047

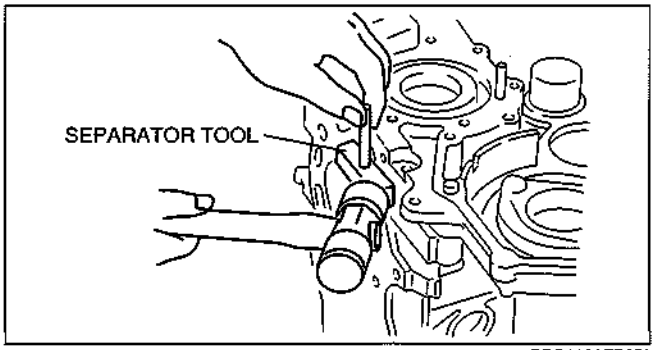
6. Remove the fuel injection pump gear using the **SST**.



DBG110AEBR48

Timing Gear Case Disassembly Note

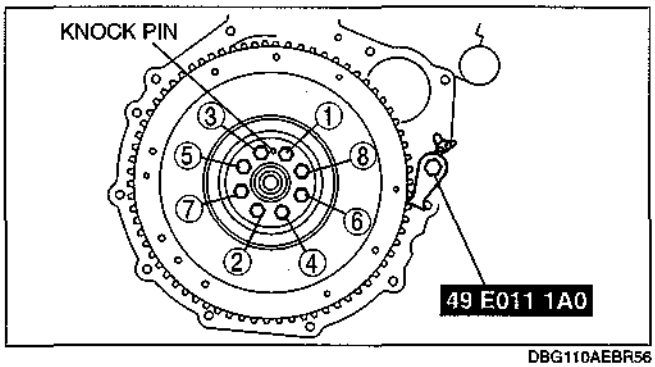
1. Remove the timing gear case using the separator tool.



DBG110AEB050

Flywheel Disassembly Note

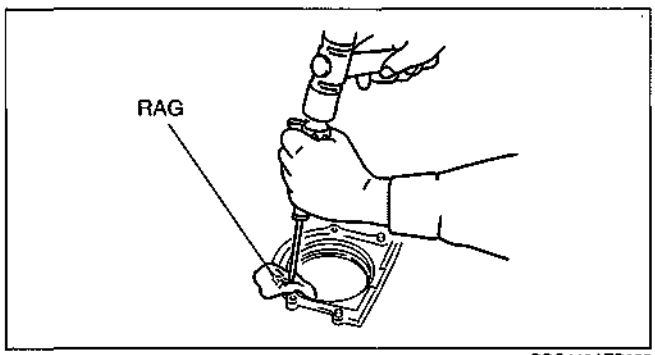
1. Remove the flywheel using the **SST**.



DBG110AEBR56

Rear Cover Disassembly Note

1. Remove the oil seal using a screwdriver protected with a rag.

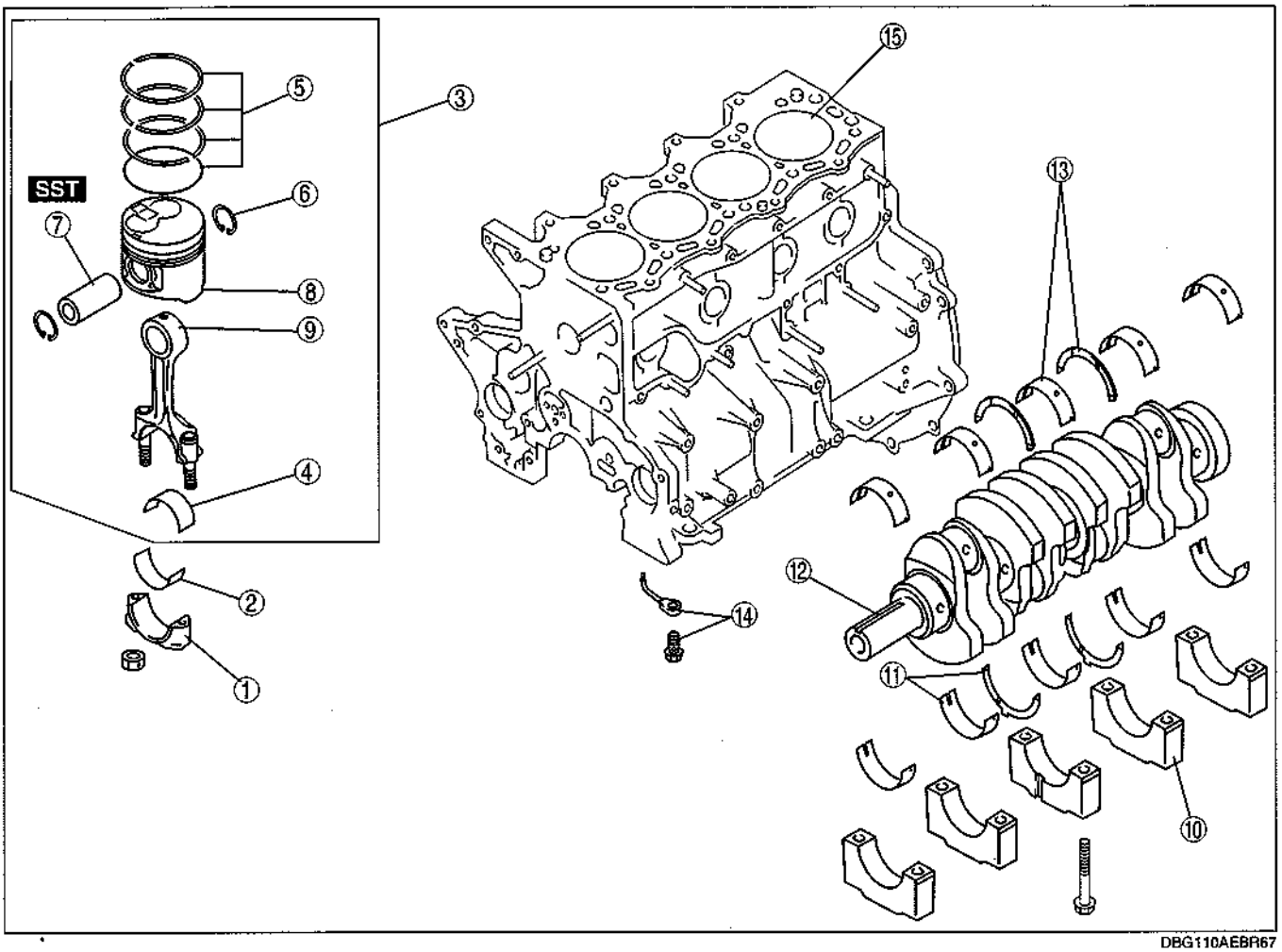


DBG110AEB052

CYLINDER BLOCK DISASSEMBLY (III) [WL-3]

DCF011002000W08

1. Disassemble in the order shown in the figure.



DBG110AEBR67

1	Connecting rod cap (See 01–10A–15 Connecting Rod Cap Disassembly Note.)
2	Lower connecting rod bearing
3	Piston, connecting rod (See 01–10A–15 Piston, Connecting Rod Disassembly Note.)
4	Upper connecting rod bearing
5	Piston ring
6	Piston pin clip
7	Piston pin (See 01–10A–16 Piston Pin Disassembly Note.)

8	Piston
9	Connecting rod
10	Main bearing cap (See 01–10A–16 Main Bearing Cap Disassembly Note.)
11	Lower main bearing, lower thrust bearing
12	Crankshaft (See 01–10A–16 Crankshaft Disassembly Note.)
13	Upper main bearing, upper thrust bearing
14	Oil jet valve, nozzle
15	cylinder block

Connecting Rod Cap Disassembly Note

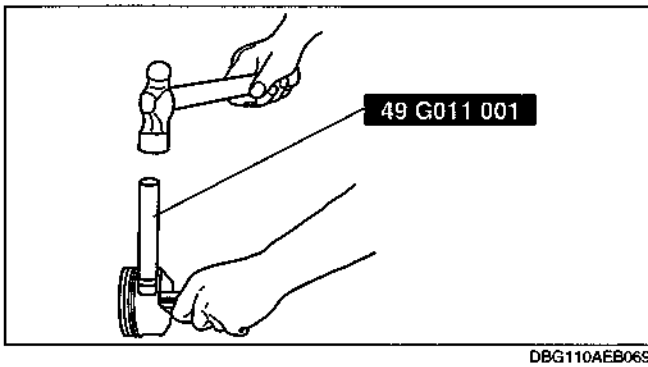
1. Before removing the connecting rod cap, inspect the connecting rod side clearance. (See 01–10A–27 CONNECTING ROD SIDE CLEARANCE INSPECTION [WL-3].)

Piston, Connecting Rod Disassembly Note

1. Before removing the piston and connecting rod, inspect the connecting rod oil clearance. (See 01–10A–27 CONNECTING ROD OIL CLEARANCE INSPECTION/REPAIR [WL-3].)
2. Inspect the oscillation torque. (See 01–10A–28 PISTON AND CONNECTING ROD INSPECTION [WL-3].)

Piston Pin Disassembly Note

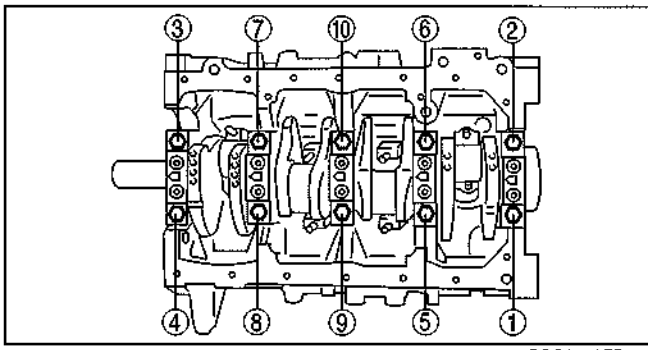
1. Remove the piston pin using the **SST**.



DBG110AEB069

Main Bearing Cap Disassembly Note

1. Before removing the main bearing cap, inspect the crankshaft end play. (See 01–10A–26 CRANKSHAFT END PLAY INSPECTION/REPAIR [WL-3].)
2. Loosen the main bearing cap bolts in two or three steps in the order shown in the figure.



DBG110AEB070

Crankshaft Disassembly Note

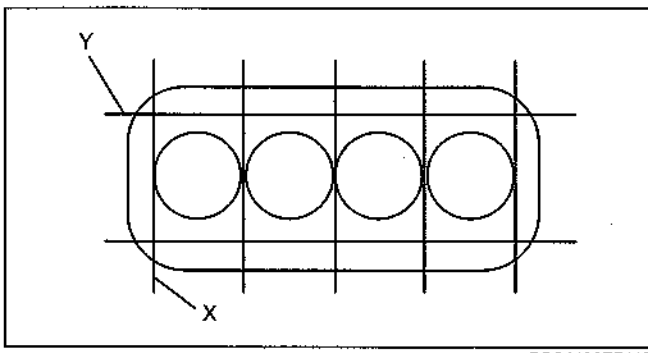
1. Before removing the crankshaft, inspect the main journal oil clearance. (See 01–10A–26 CRANKSHAFT OIL CLEARANCE INSPECTION/REPAIR [WL-3].)

CYLINDER HEAD INSPECTION/REPAIR [WL-3]

DCF011010100W01

1. Inspect the cylinder head surface for cracks. Replace the cylinder head if necessary.
2. Inspect for the following and repair or replace.
   (1) Sunken valve seats
   (2) Excessive camshaft oil clearance and end play
3. Measure the cylinder head for distortion in the seven directions as shown in the figure.

   Maximum cylinder head distortion
   X distortion: 0.02 mm {0.0008 in}
   Y distortion: 0.05 mm {0.0020 in}

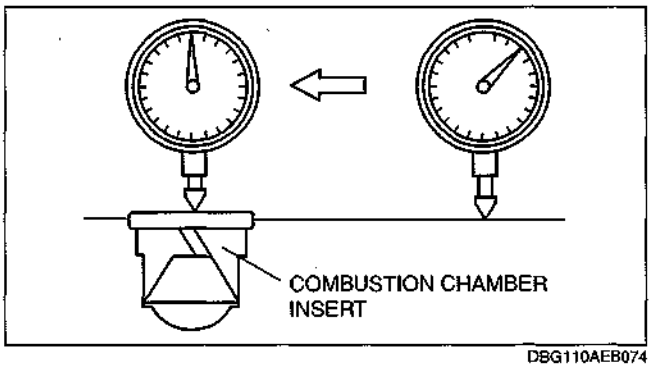


DBG110AEB115

4. Measure the receded or projected amount of combustion chamber insert from the cylinder head surface.
   - If it exceeds the maximum specification, replace the cylinder head.

   Maximum combustion chamber recession
   0.02 mm {0.0008 in}

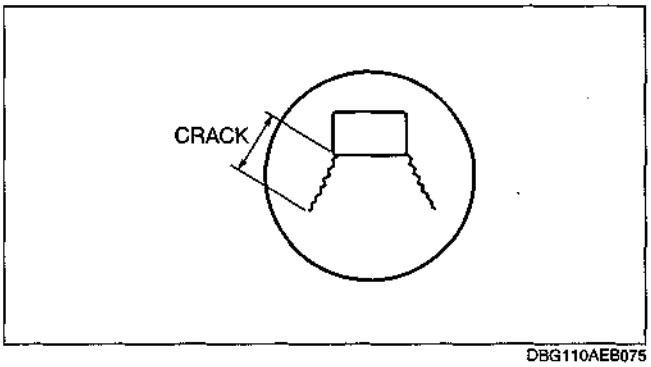
   Maximum combustion chamber projection
   0.005 mm {0.0002 in}



DBG110AEB074

5. Inspect the combustion chamber insert crack.
   - If it exceeds the limit specification, replace the cylinder head.

   Combustion chamber crack
   Limit: 10mm {0.39 in}

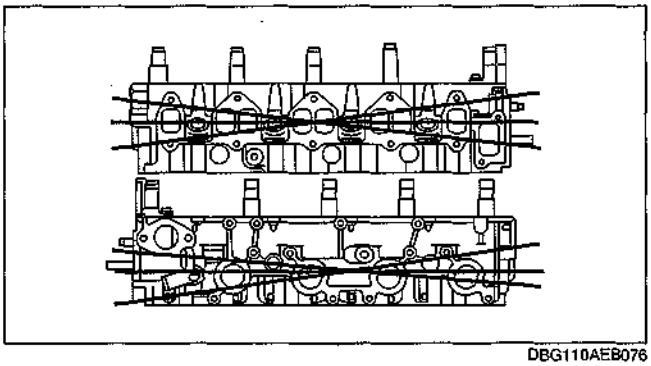


DBG110AEB075

6. Measure the manifold contact surface distortion as shown in the figure.
   - If the distortion exceeds the maximum specification, grind the surface or replace the cylinder head.

   Maximum manifold contact surface distortion
   0.05 mm {0.0020 in}

   Maximum manifold contact surface grinding
   0.15 mm {0.0059 in}



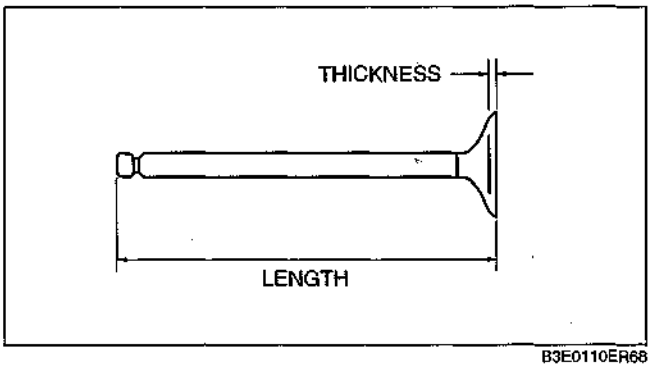
DBG110AEB076

VALVE INSPECTION [WL-3]

DCF011012111W01

1. Measure the valve head margin thickness of each valve.
   - If it exceeds the standard specification, replace the valve.

   Standard valve margin thickness
   IN: 1.5 mm {0.059 in}
   EX: 0.75 mm {0.030 in}



B3E0110ER68

2. Measure the length of each valve. Replace the valve if necessary.
   - If it is less than the minimum specification, replace the valve.

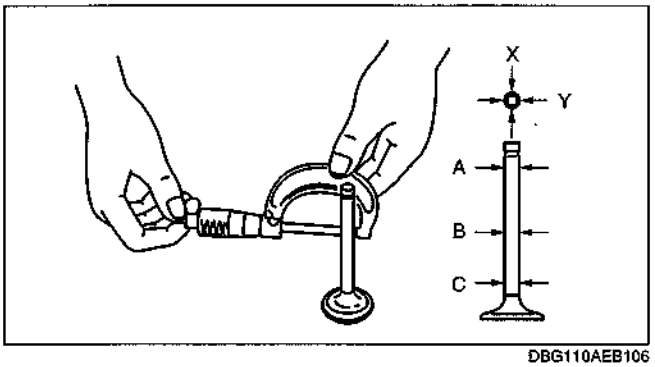
   Standard valve length
   IN: 111.6—112.1 mm {4.394—4.413 in}
   EX: 111.5—112.0 mm {4.390—4.409 in}

   Minimum valve length
   IN: 111.35 mm {4.384 in}
   EX: 111.25 mm {4.380 in}

3. Measure the stem diameter of each valve in the X and Y directions at the three points (A, B, and C) shown in the figure.
   - If it is less than the minimum specification, replace the valve.

   Standard valve stem diameter
   IN: 6.970—6.985 mm {0.2745—0.2749 in}
   EX: 6.965—6.980 mm {0.2743—0.2748 in}

   Minimum valve stem diameter
   IN: 6.920 mm {0.2724 in}
   EX: 6.915 mm {0.2722 in}



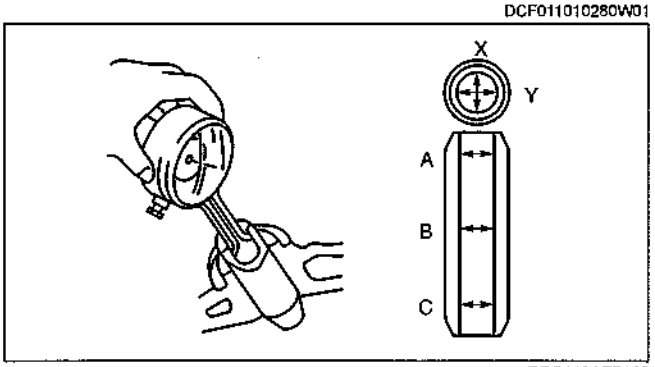
DBG110AEB106

VALVE GUIDE INSPECTION [WL-3]

DCF011010280W01

1. Measure the inner diameter of each valve guide in the X and Y directions at the three points (A, B, and C) shown in the figure.
   - If it is not within the specification, replace the valve guide.

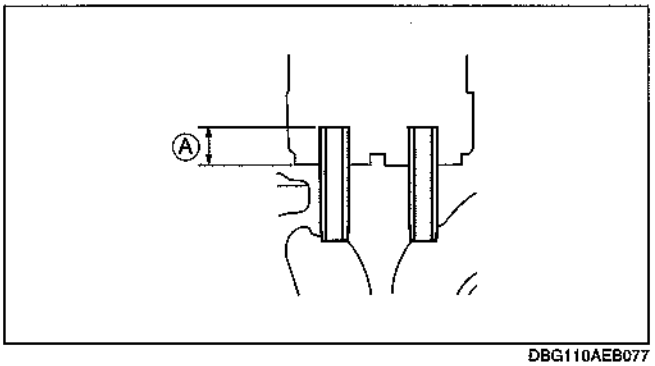
   Standard valve guide inner diameter
   7.025—7.045 mm {0.2766—0.2773 in}



DBG110AEB108

2. Measure the protrusion height (dimension A) of each valve guide without lower valve spring seat.
   - If it is not within the specification, replace the valve guide.

   Standard valve guide height
   14.0—14.5 mm {0.552—0.570 in}



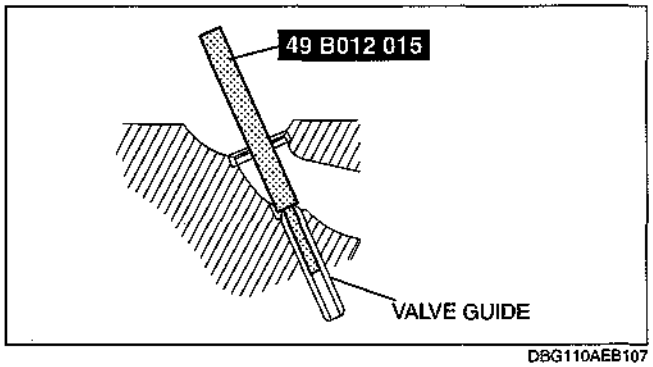
DBG110AEB077

VALVE GUIDE REPLACEMENT [WL-3]

DCF011010280W02

Valve Guide Removal

1. Remove the valve guide from the combustion chamber side using the **SST**.

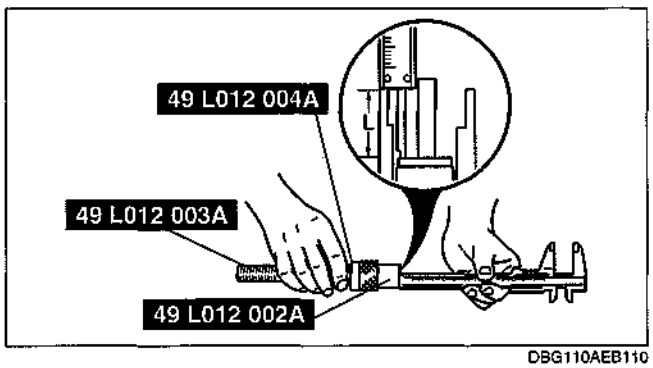


DBG110AEB107

Valve Guide Installation

1. Assemble the **SSTs** so that depth L is as specified.

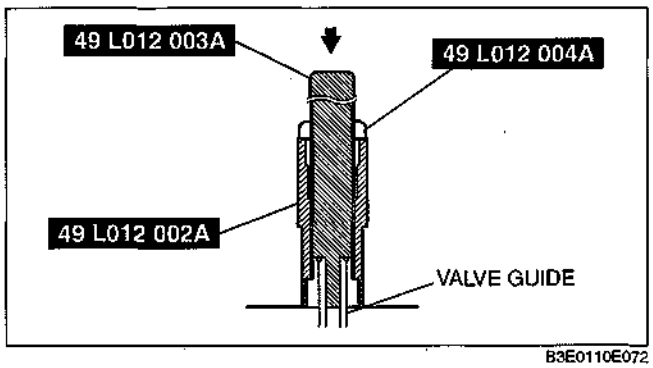
   Depth L
   14.0—14.5 mm {0.552—0.570 in}



DBG110AEB110

2. Tap the valve guide in from the side opposite the combustion chamber until the **SST** contacts the cylinder head.
3. Verify that the valve guide projection height is within the specification.

   Standard valve guide height
   14.0—14.5 mm {0.552—0.570 in}



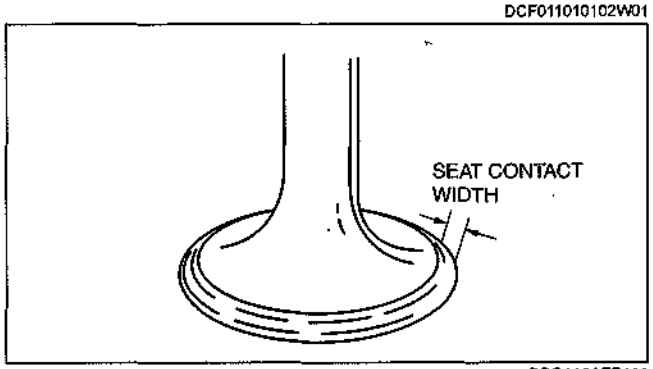
B3E0110E072

VALVE SEAT INSPECTION/REPAIR [WL-3]

DCF011010102W01

1. Measure the seat contact width.
   - If it is not within the specification, resurface the valve seat using the **45°** valve seat cutter.

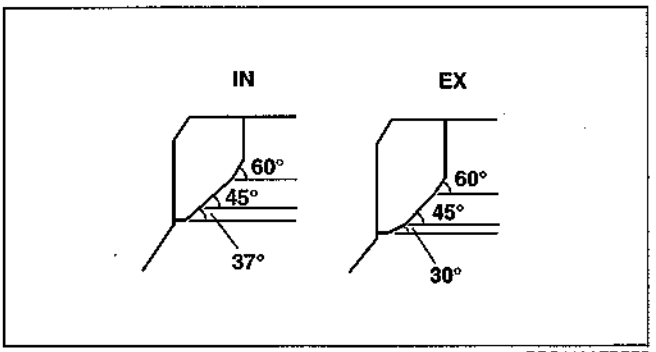
   Standard valve seat contact width
   IN: 1.6—2.2 mm {0.063—0.086 in}
   EX: 1.7—2.3 mm {0.067—0.090 in}



DBG110AEB109

2. Verify that the valve seating position is at the center of the valve face.
   - If the seating position is too high, correct the valve seat using a **60°** cutter, and then a **45°** cutter.
   - If the seating position is too low, correct the valve seat using a **37°** (IN) or **30°** (EX) cutter, and a **45°** cutter.

   Valve seat angle
   IN: 45°
   EX: 45°

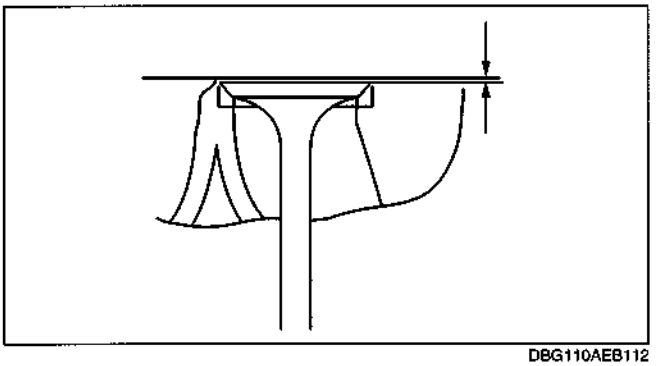


DBG110AEBR75

3. Measure the receded amount from the cylinder head surface.
   - If it exceeds the maximum specification, replace the cylinder head.

   Standard valve recession
   IN: 0.61—1.09 mm {0.025—0.042 in}
   EX: 0.71—1.19 mm {0.028—0.046 in}

   Maximum valve recession
   IN: 1.50 mm {0.059 in}
   EX: 1.60 mm {0.063 in}


DBG110AEB112

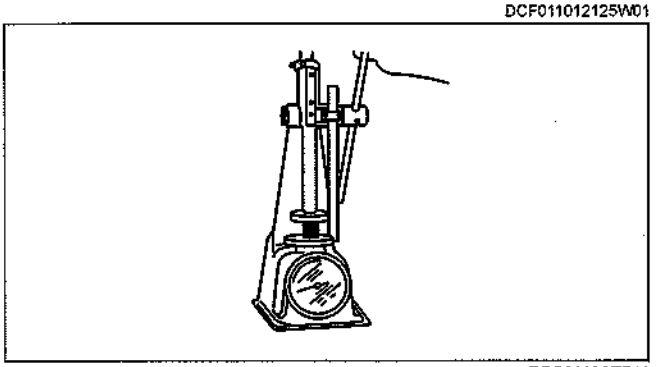
VALVE SPRING INSPECTION [WL-3]

DCF011012125W01

1. Apply a pressing force to the pressure spring and check the spring height.
   - If it is not within the specification, replace the valve spring.

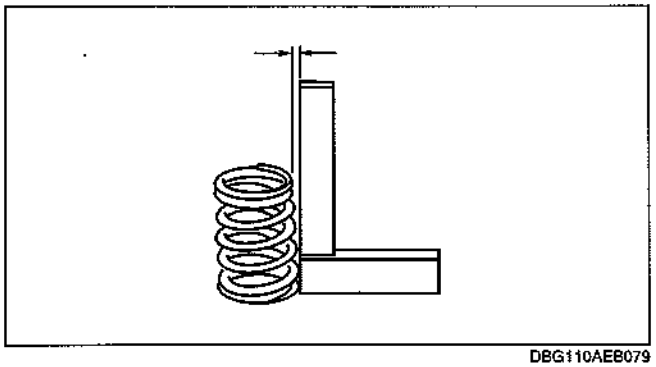
   Valve spring installation pressing force
   238—269 N {25—27 kgf, 54—60 lbf}

   Valve spring installation height
   35.5 mm {1.40 in}


DBG0110AEB11

2. Measure the amount the valve spring is out-of-square.
   - If it exceeds the maximum specification, replace the valve spring.

   Maximum valve spring out-of-square
   2.0° (1.70mm {0.067 in})

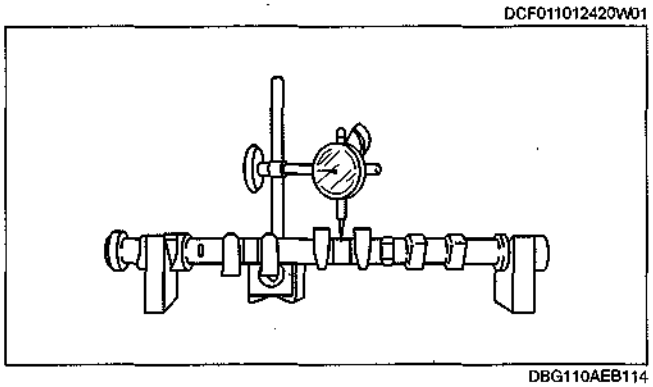

DBG110AEB079

CAMSHAFT INSPECTION [WL-3]

DCF011012420W01

1. Set the No.1 and No.5 journals on V-blocks. Measure the camshaft runout.
   - If it exceeds the maximum specification, replace the camshaft.

   Maximum camshaft runout
   0.03 mm {0.0012 in}

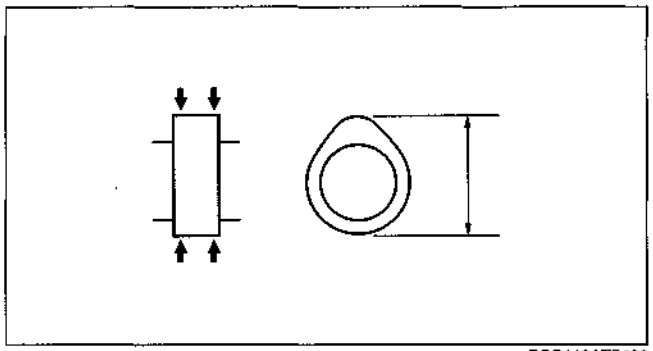


DBG110AEB114

2. Measure the cam lobe height at the two points as shown in the figure.
   - If it is less than the minimum specification, replace the camshaft.

   Standard cam lobe height
   IN: 42.400—42.500 mm {1.6692—1.6732 in}
   EX: 42.395—42.495 mm {1.6691—1.6730 in}

   Minimum cam lobe height
   IN: 42.050 mm {1.6555 in}
   EX: 42.045 mm {1.6711 in}

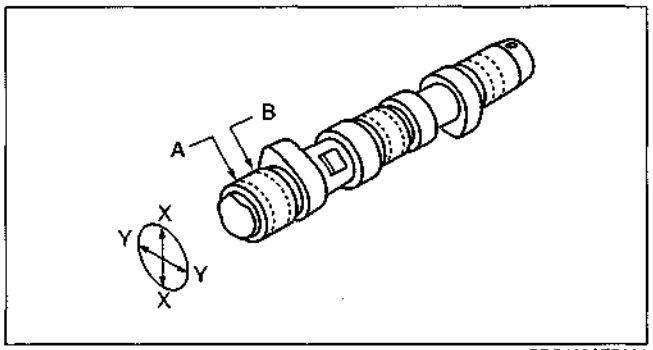


DBG110AEB080

3. Measure the journal diameters in the X and Y directions at the two points (A and B) as shown in the figure.
   - If it is less than the minimum specification, replace the camshaft.

   Standard cam journal diameter
   No.1, No.5: 25.940—25.965 mm {1.0213—1.0222 in}
   No.2—No.4: 25.910—25.935 mm {1.0201—1.0210 in}

   Minimum cam journal diameter
   No.1, No.5: 25.890 mm {1.0193 in}
   No.2—No.4: 25.860 mm {1.0181 in}



DBG110AEB081

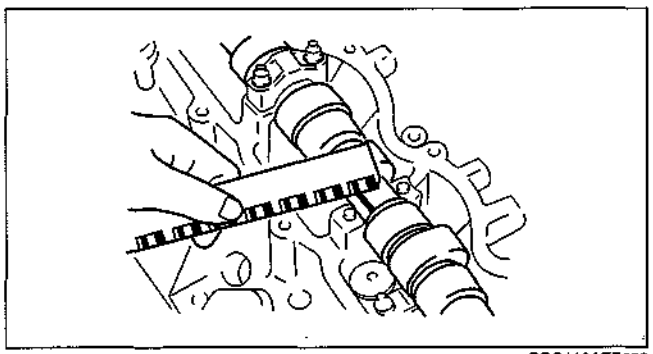
CAMSHAFT OIL CLEARANCE INSPECTION [WL-3]

DCF011012420W02

1. Position a plastigage on top of the journals in the axial direction.
2. Install the camshaft cap. (See 01–10A–49 Camshaft Cap Assembly Note.)
3. Remove the camshaft cap. (See 01–10A–7 Camshaft Cap Disassembly Note.)
4. Measure the oil clearance.
   - If it exceeds the maximum specification, replace the camshaft.

   Standard camshaft clearance
   No.1, 5: 0.035—0.081 mm {0.0014—0.0031 in}
   No.2—4: 0.065—0.111 mm {0.0026—0.0043 in}

   Maximum camshaft clearance
   No.1, 5: 0.12 mm {0.0047 in}
   No.2—4: 0.15 mm {0.0059 in}



DBG110AEB082

CAMSHAFT END PLAY INSPECTION [WL-3]

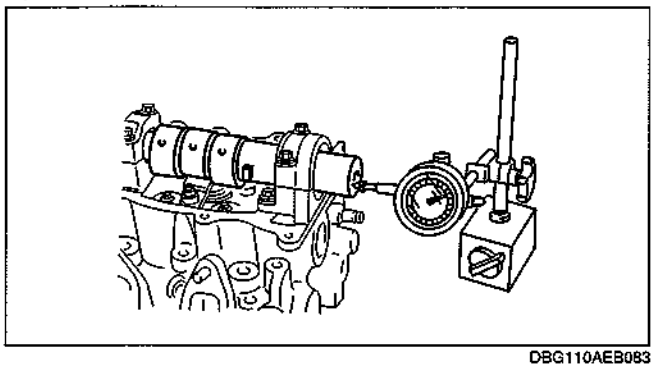
DCF011012420W03

1. Install the camshaft cap. (See 01–10A–49 Camshaft Cap Assembly Note.)
2. Measure the camshaft end play.
   - If it exceeds the maximum specification, replace the cylinder head or camshaft.

Standard camshaft end play
0.030—0.160 mm {0.0012—0.0062 in}

Maximum camshaft end play
0.20 mm {0.0079 In}

3. Remove the camshaft cap. (See 01–10A–7 Camshaft Cap Disassembly Note.)



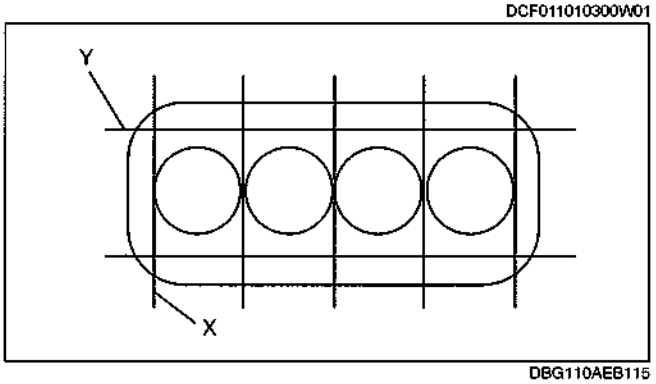
DBG110AEB083

CYLINDER BLOCK INSPECTION/REPAIR [WL-3]

DCF011010300W01

1. Measure the distortion of the cylinder block top surface in the seven directions as shown in the figure.
   - If the distortion exceeds the maximum specification, replace the cylinder head.

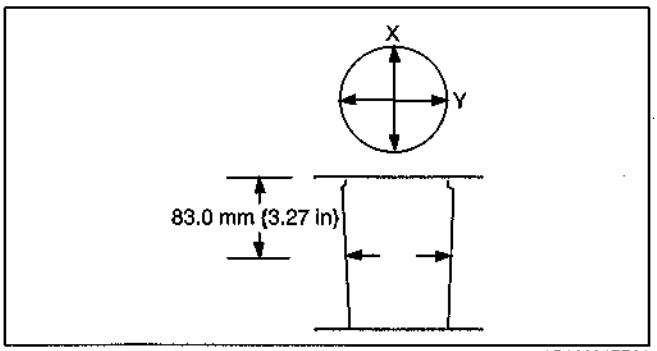
Maximum cylinder block distortion
X direction: 0.02 mm {0.0008 in}
Y direction: 0.05 mm {0.0020 in}



DBG110AEB115

2. Measure the cylinder bore using the cylinder gauge. Measurement positions are in the X and Y directions at **83 mm {3.27 in}** below the top surface of the cylinder.
   - If the cylinder bore exceeds the wear limit, replace the cylinder block or rebore the cylinder and install the oversized pistons so that the specified piston-to-cylinder clearance is obtained.

Note
- Base the boring diameter on the diameter of an oversized piston. All cylinders must be the same diameter.



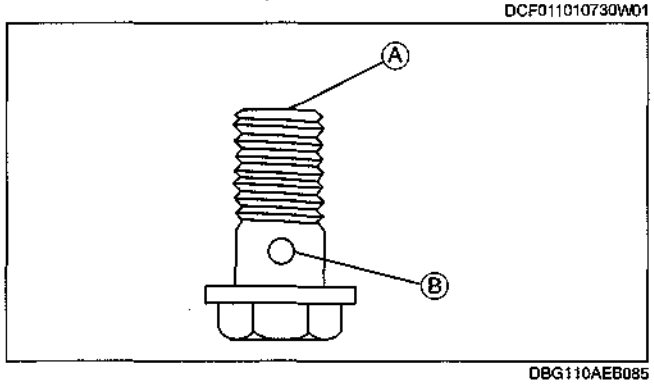
ADA2224ER91

Cylinder bore size
Standard: 93.000—93.022 mm {3.6615—3.6622 in}
0.25 {0.01} oversize: 93.250—93.272 mm {3.6713—3.6721 in}
0.50 {0.02} oversize: 93.500—93.522 mm {3.6811—3.6819 in}

Cylinder bore wear limit
0.15 mm {0.0059 in}

OIL JET VALVE, NOZZLE INSPECTION [WL-3]

DCF011010730W01



DBG110AEB085

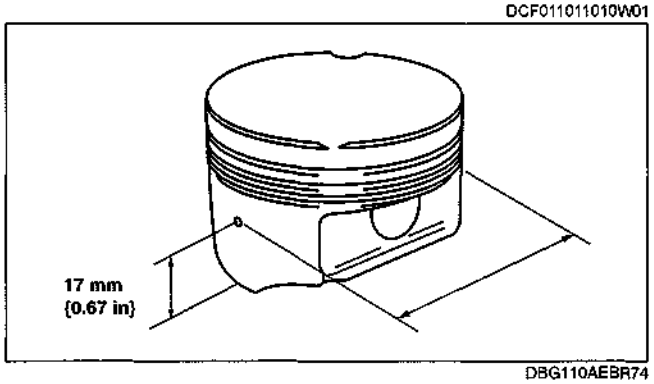
1. Apply compressed air to oil jet valve A and verify that air passes through oil jet valve B.
   - If it is not within the specification, replace the oil jet.

   Oil jet air pressure
   137.6—196.4 kPa {1.5—2.0 kgf/cm^2, 20—28 psi}

2. Check the oil jet nozzle for clogs. Replace the nozzle if necessary.

PISTON INSPECTION [WL-3]

DCF011011010W01



DBG110AEBR74

1. Measure the outer diameter of each piston at right angle (90°) to the piston pin, **17 mm {0.67 in}** from the lower end of the piston.
   - If it is not within the specification, replace the piston.

   Piston diameter
   Standard: 92.951—92.977 mm {3.6595—3.6605 in}
   0.25 {0.0098} oversize: 93.186—93.212 mm {3.6688—3.6697 in}
   0.50 {0.02} oversize: 93.436—93.462 mm {3.6786—3.6795 in}

PISTON CLEARANCE INSPECTION/REPAIR [WL-3]

DCF011011010W02

1. Measure the piston-to-cylinder clearance.
   - If it exceeds the maximum specification, replace the piston or rebore the cylinders to fit the oversized piston.

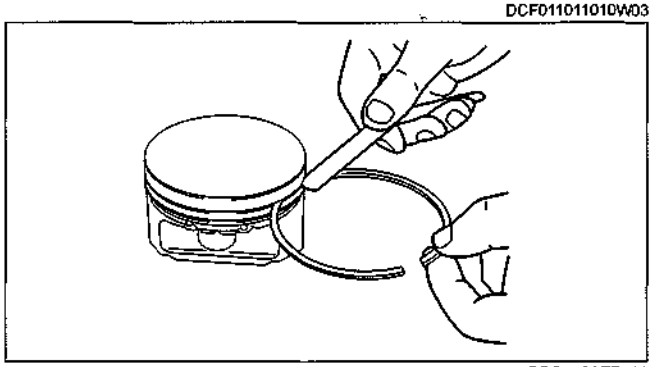
   Standard piston clearance
   0.055—0.073 mm {0.0022—0.0028 in}

   Maximum piston clearance
   0.15 mm {0.0059 in}

2. If the piston is replaced, the piston rings must also be replaced.

PISTON RING CLEARANCE INSPECTION [WL-3]

DCF011011010W03



DBG110AEB116

1. Measure the piston ring-to-ring land clearance around the entire circumference.
   - If it exceeds the maximum specification, replace the piston and piston ring.

   Standard piston ring clearance
   Top: 0.06—0.10 mm {0.0024—0.0039 in}
   Second: 0.04—0.08 mm {0.0016—0.0031 in}
   Oil: 0.03—0.07 mm {0.0012—0.0027 in}

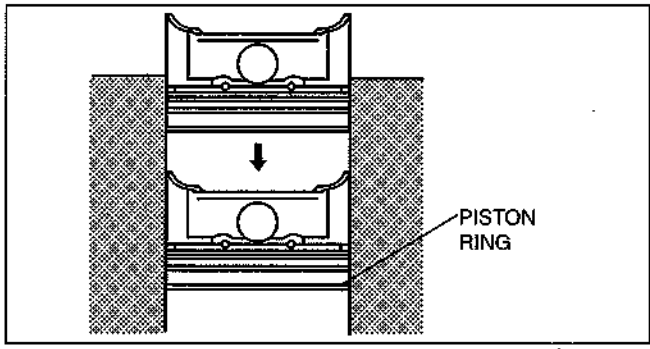
   Maximum piston ring clearance
   0.15 mm {0.0059 in}

2. Insert the piston ring into the cylinder by hand and use the piston to push it to the bottom of the ring travel.

3. Measure each piston ring end gap with a feeler gauge.
   - If it exceeds the maximum specification, replace the piston ring.

   Standard piston ring end gap
   Top: 0.22—0.32 mm {0.0087—0.0125 in}
   Second: 0.32—0.47 mm {0.0126—0.0185 In}
   Oil: 0.22—0.37 mm {0.0087—0.0145 in}

   Maximum piston ring end gap
   1.0 mm {0.039 in}



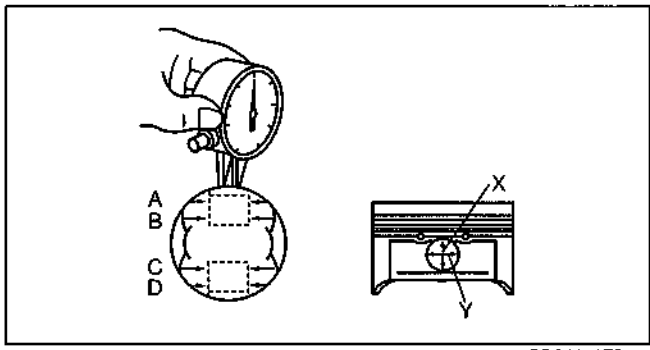
DBG110AEB087

PISTON PIN CLEARANCE INSPECTION [WL-3]

DCF011011010W04

1. Measure each piston pin bore diameter in the X and Y directions at the four points (A, B, C, and D) as shown in the figure.

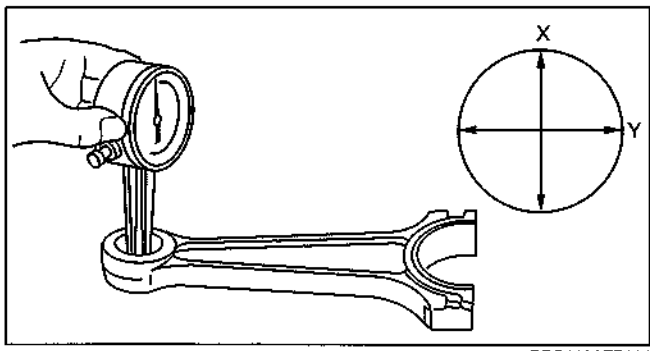
   Standard piston pin bore diameter
   31.997—32.007 mm {1.2598—1.2601 in}



DBG110AEB088

2. Measure each connecting rod small end inner diameter in the X and Y directions as shown in the figure.

   Standard connecting rod small end inner diameter
   32.012—32.033 mm {1.2604—1.2611 in}



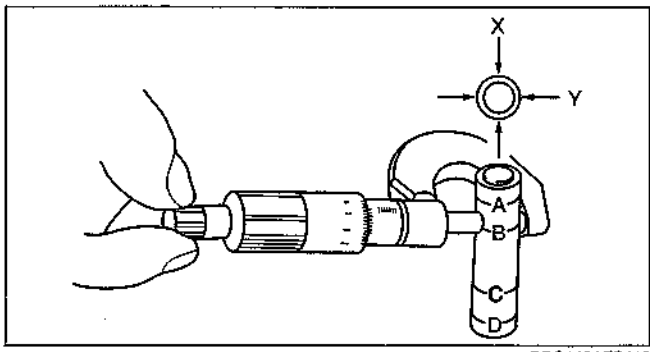
DBG110AEB117

3. Measure each piston pin diameter in the X and Y directions at the four points (A, B, C and D) as shown in the figure.

   Standard piston pin diameter
   31.994—32.000 mm {1.25961—1.25984 in}

4. Calculate the piston pin-to-piston pin bore clearance.
   - If it is not within the specification, replace the piston or the piston pin.

   Standard piston pin-to-piston pin bore clearance
   –0.003—0.013 mm {–0.00011—0.00051 in}



DBG110AEB118

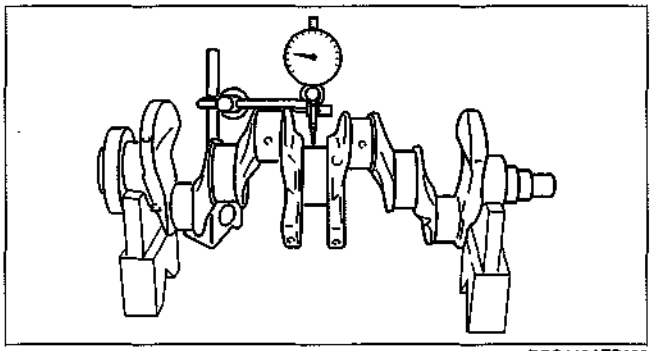
5. Calculate the connecting rod small end-to-piston pin clearance.
   - If it is not within the specification, replace the connecting rod or the piston pin.

   Standard connecting rod small end-to-piston pin clearance
   0.012—0.039 mm {0.00048—0.00153 in}

CRANKSHAFT INSPECTION [WL-3]

1. Measure the crankshaft runout.
   - If it exceeds the maximum specification, replace the crankshaft.

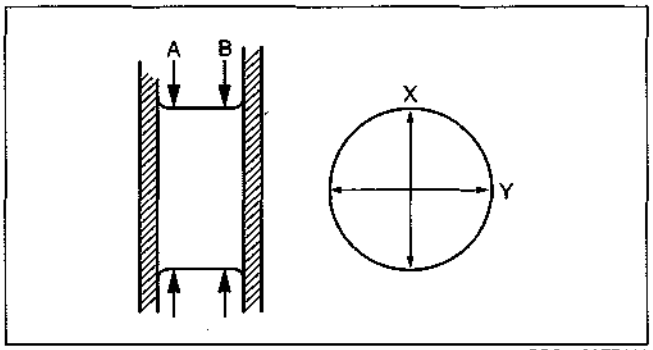
DCF011011301W01



DBG110AEB089

Maximum crankshaft runout
0.05 mm {0.0020 in}

2. Measure the main journal or crank pin diameter in the X and Y directions at the two points (A and B) as shown in the figure.
   - If it is not within the specification or if it exceeds the maximum off-round, grind the main journal or crank pin with an undersized bearing.



DBG110AEB090

Main journal diameter
Standard
No.1, 2, 4, 5: 66.937—66.955 mm {2.6354—2.6360 in}
No.3: 66.920—66.938 mm {2.6347—2.6353 in}
0.25 {0.01} undersize
No.1, 2, 4, 5: 66.687—66.705 mm {2.6255—2.6261 in}
No.3: 66.670—66.688 mm {2.6248—2.6255 in}
0.50 {0.02} undersize
No.1, 2, 4, 5: 66.437—66.455 mm {2.6157—2.6163 in}
No.3: 66.420—66.438 mm {2.6150—2.6156 in}
0.75 {0.03} undersize
No.1, 2, 4, 5: 66.187—66.205 mm {2.6058—2.6064 In}
No.3: 66.170—66.188 mm {2.6052—2.6058 in}

Main journal wear limit
0.05 mm {0.0020 in}

Main journal out-of-round
0.03 mm {0.0012 in}

Crank pin diameter
Standard: 54.940—54.955 mm {2.1630—2.1635 in}
0.25 {0.01} undersize: 54.690—54.705 mm {2.1532—2.1537 in}
0.50 {0.02} undersize: 54.440—54.455 mm {2.1434—2.1438 in}
0.75 {0.03} undersize: 54.190—54.205 mm {2.1335—2.134 In}

Crank pin wear limit
0.05 mm {0.0020 in}

Crank pin out-of-round
0.03 mm {0.0012 in}

CRANKSHAFT OIL CLEARANCE INSPECTION/REPAIR [WL-3]

DCF011011301W02

1. Position a plastigage on top of the journals in the axial direction.
2. Install the main bearing cap. (See 01–10A–34 Main Bearing Cap Assembly Note.)
3. Remove the main bearing cap. (See 01–10A–16 Main Bearing Cap Disassembly Note.)
4. Measure the main journal oil clearance.
   - If the clearance exceeds the maximum specification, replace the main bearing or grind the main journal and install the undersize bearings so that the specified oil clearance is obtained.

Standard main journal clearance
No.1, 2, 4, 5: 0.027—0.046 mm {0.0011—0.0018 in}
No.3: 0.044—0.063 mm {0.0018—0.0025 in}

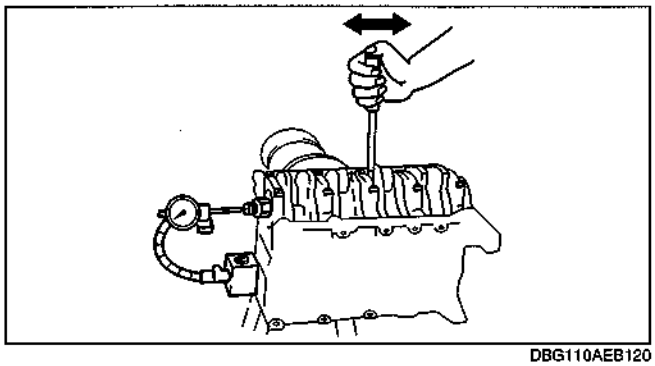
Maximum main journal clearance
0.08 mm {0.0031 in}

Main bearing thickness
Standard: 2.006—2.021 mm {0.0790—0.0795 in}
0.25 {0.01} undersize: 2.124—2.134 mm {0.0837—0.0840 in}
0.50 {0.02} undersize: 2.249—2.259 mm {0.0886—0.0889 in}
0.75 {0.03} undersize: 2.374—2.384 mm {0.0935—0.0938 in}

CRANKSHAFT END PLAY INSPECTION/REPAIR [WL-3]

DCF011011301W03

1. Install the main bearing cap. (See 01–10A–34 Main Bearing Cap Assembly Note.)
2. Measure the crankshaft end play.
   - If the end play exceeds the maximum specification, replace the thrust bearing or grind the crankshaft and install an oversized bearing so that the specified end play is obtained.



DBG110AEB120

Standard crankshaft end play
0.040—0.282 mm {0.0016—0.0111 in}

Maximum crankshaft end play
0.3 mm {0.012 in}

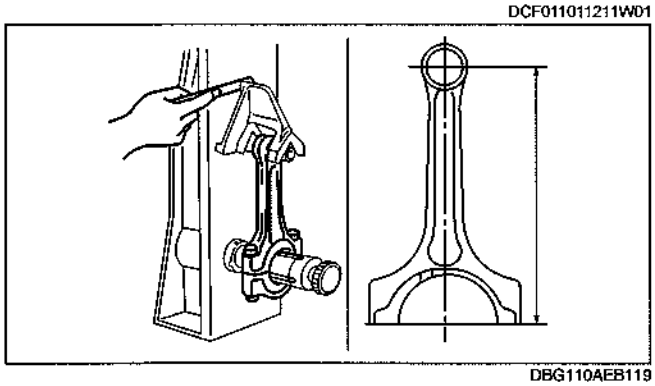
Thrust bearing thickness
Standard: 2.454—2.506 mm {0.0967—0.0986 in}
0.35 {0.014} oversize: 2.629—2.681 mm {0.1036—0.1055 in}

3. Remove the main bearing cap. (See 01–10A–16 Main Bearing Cap Disassembly Note.)

CONNECTING ROD INSPECTION [WL-3]

DCF011011211W01

1. Measure each connecting rod for bending and distortion.
   - If it exceeds the maximum specification, replace the connecting rod.



DBG110AEB119

Maximum connecting rod bending
0.075 mm {0.0030 in} /50 mm {2.0 in}

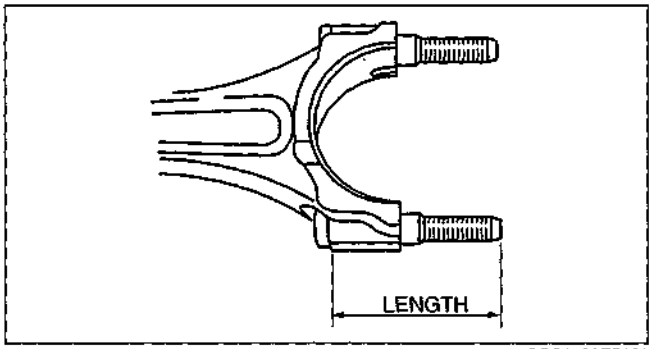
Maximum connecting rod distortion
0.18 mm {0.0071 in} /50 mm {2.0 in}

Connecting rod center-to-center distance
151.96—152.04 mm {5.9827—5.9858 In}

2. Measure the length of the connecting rod bolt.
   - If it exceeds the maximum specification, replace the connecting rod and connecting rod cap.

Standard connecting rod bolt length
67.5—68.5 mm {2.66—2.69 in}

Maximum connecting rod bolt length
69 mm {2.7 in}

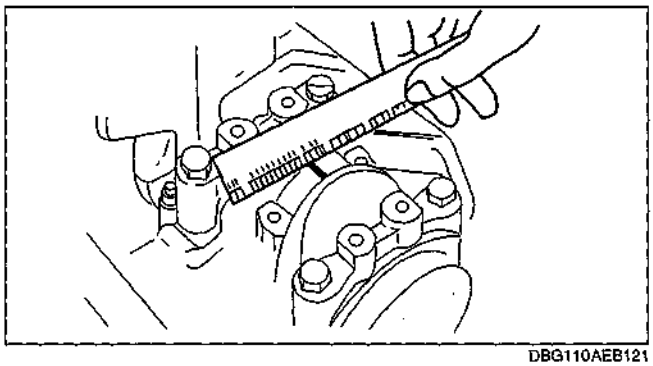


DBG110AEB092

CONNECTING ROD OIL CLEARANCE INSPECTION/REPAIR [WL-3]

DCF011011211W02

1. Position a plastigage on top of the journals in the axial direction.
2. Install the connecting rod cap. (See 01–10A–35 Piston, Connecting Rod Assembly Note.)
3. Remove the connecting rod cap.
4. Measure the crankpin oil clearance.
   - If the clearance exceeds the maximum, replace the connecting rod bearing or grind the crankpin and use undersized bearings so that the specified clearance is obtained.


DBG110AEB121

Standard connecting rod oil clearance
0.025—0.052 mm {0.0010—0.0020 in}

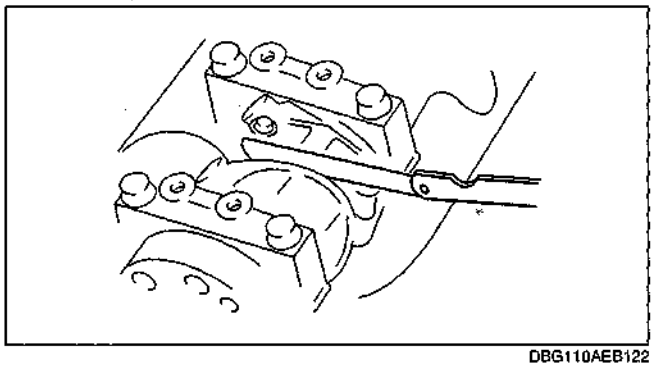
Maximum connecting rod oil clearance
0.08 mm {0.0031 in}

Connecting rod bearing thickness
Standard: 1.507—1.516 mm {0.0594—0.0596 in}
0.25 {0.01} undersize: 1.624—1.634 mm {0.0640—0.0643 in}
0.50 {0.02} undersize: 1.749—1.759 mm {0.0689—0.0692 in}
0.75 {0.03} undersize: 1.874—1.884 mm {0.0738—0.0741 in}

CONNECTING ROD SIDE CLEARANCE INSPECTION [WL-3]

DCF011011211W03

1. Install the connecting rod cap. (See 01–10A–35 Piston, Connecting Rod Assembly Note.)
2. Measure the connecting rod large end side clearance.
   - If it exceeds the maximum specification, replace the connecting rod and connecting rod cap.


DBG110AEB122

Standard connecting rod side clearance
0.110—0.262 mm {0.0044—0.0103 in}

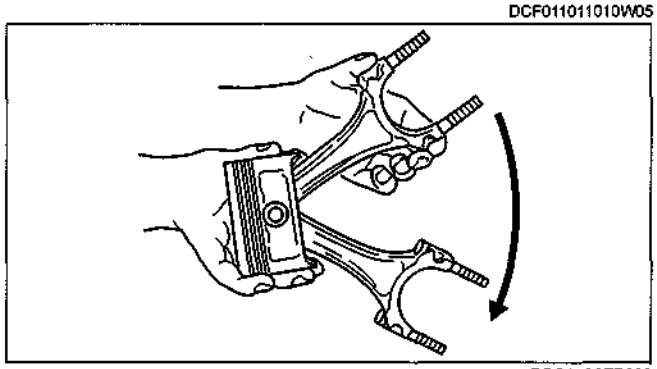
Maximum connecting rod side clearance
0.35 mm {0.014 in}

3. Remove the connecting rod cap.

PISTON AND CONNECTING ROD INSPECTION [WL-3]

1. Check the oscillation torque as shown in the figure. If the large end does not drop by its own weight, replace the piston or the piston pin.

DCF011011010W05



DBG110AEB093

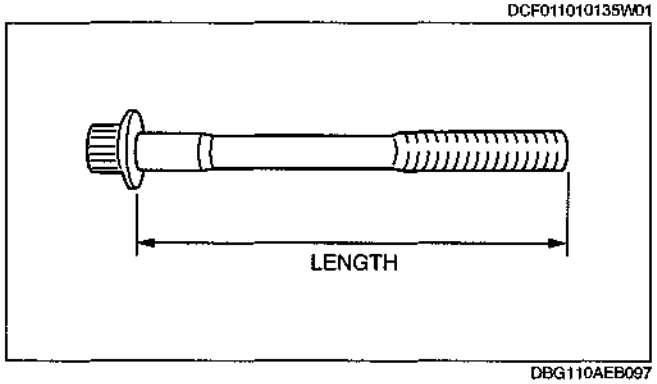
BOLT INSPECTION [WL-3]

1. Measure the length of each bolt.
   - If it exceeds the maximum specification, replace the bolt.

Cylinder head bolt length
Bolt head mark W
Standard length: 101.2—101.8 mm {3.985—4.007 in}
Maximum length: 102.5 mm {4.035 in}
Bolt head mark N
Standard length: 113.2—113.8 mm {4.457—4.480 in}
Maximum length: 114.5 mm {4.508 in}

Main bearing cap bolt length
Standard length: 84.7—85.3 mm {3.34—3.35 in}
Maximum length: 86.0 mm {3.39 in}

DCF011010135W01



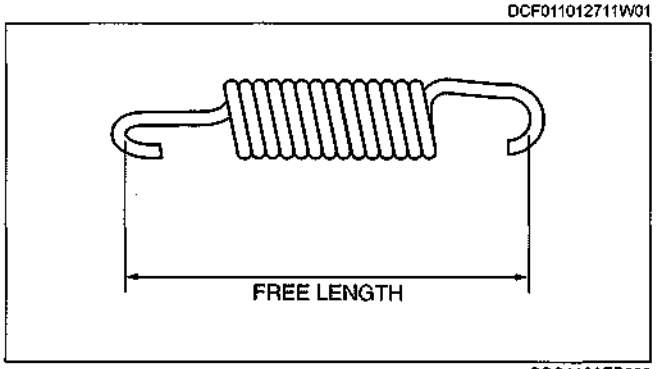
DBG110AEB097

TENSIONER SPRING INSPECTION [WL-3]

1. Measure the free length of the tensioner spring.
   - If it exceeds the standard specification, replace the tensioner spring.

Standard tensioner spring length
63.0 mm {2.48 in}

DCF011012711W01

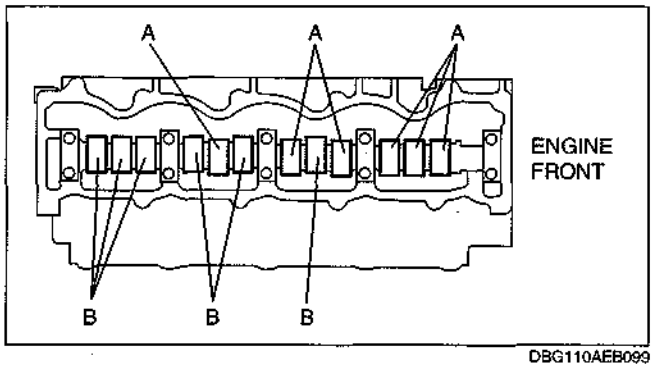


DBG110AEB098

VALVE CLEARANCE INSPECTION [WL-3]

DCF011012111W02

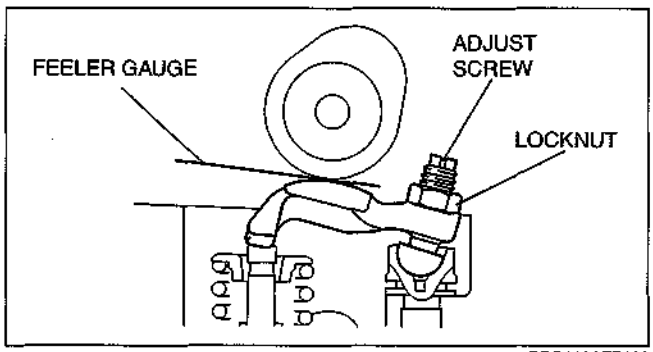
1. Turn the crankshaft and align the timing mark so that the piston of the No.1 or No.4 cylinder is at TDC of compression.
2. Measure valve clearances A with the No.1 cylinder at TDC of compression, and those of B with the No.4 cylinder at TDC of compression.
   - If it is not within the specification, adjust and recheck the valve clearance.



DBG110AEB099

Valve clearance (engine cold)
IN: 0.05—0.15 mm {0.0020—0.0059 in}
EX: 0.15—0.25 mm {0.0060—0.0098 in}

3. Turn the crankshaft one full turn and measure the remaining valve clearances. Adjust if necessary.



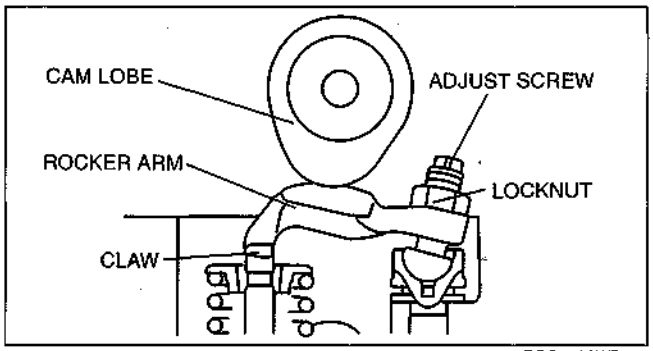
DBG110AEB100

VALVE CLEARANCE ADJUSTMENT [WL-3]

DCF011012111W03

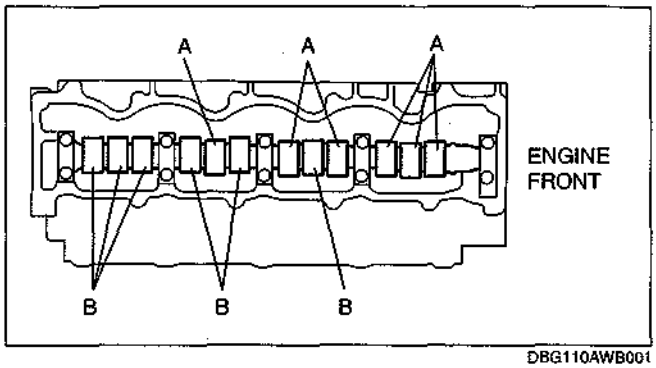
Caution
- **Loosening the locknut and the adjust screw while the cam lobe is not pressing down the rocker arm will damage the claw of the rocker arm. When loosening the locknut and the adjust screw, rotate the crankshaft clockwise and be sure that the cam lobe presses down the rocker arm firmly as shown in the figure.**

1. Remove the cylinder head cover.
2. Turn the crankshaft and align the timing mark so that the piston of the No. 1 or No. 4 cylinders is at TDC of the compression.



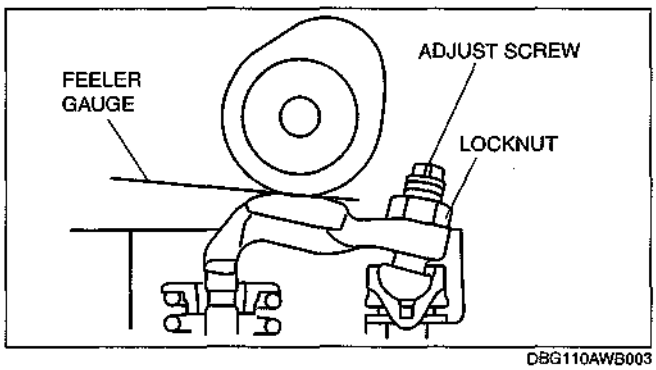
DBG110AWB002

3. Adjust the valve clearances A with the No.1 cylinder at TDC of compression, and those of B with the No.4 cylinder at TDC of compression.



DBG110AWB001

Valve clearance
IN: 0.05 — 0.15 mm {0.0020 — 0.0059 in}
[Engine cold]
0.15 mm {0.0059 in}
[Engine hot (reference)]
EX: 0.15 —0.25 mm {0.0060 — 0.0098 in}
[Engine cold]
0.25 mm {0.0098 in}
[Engine hot (reference)]



DBG110AWB003

Tightening torque (locknut)
16—20 N·m {1.7—2.0 kgf·m, 12—14 ft·lbf}

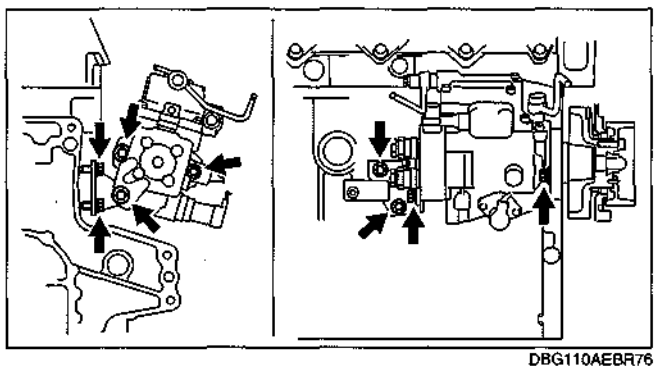
4. Turn the crankshaft one full turn and adjust the remaining valve clearances.

INJECTION TIMING ADJUSTMENT [WL-3]

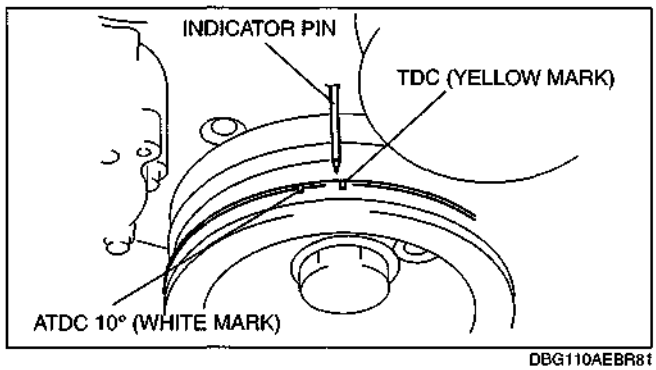
DCF011002000W09

Caution
- **Excessive tension on the timing belt may cause damage to the timing belt and camshaft. If the bolt and nuts of the fuel injection pump are temporarily loosened, re-tension the timing belt.**

1. Loosen the bolts and nuts of the fuel injection pump and bracket.

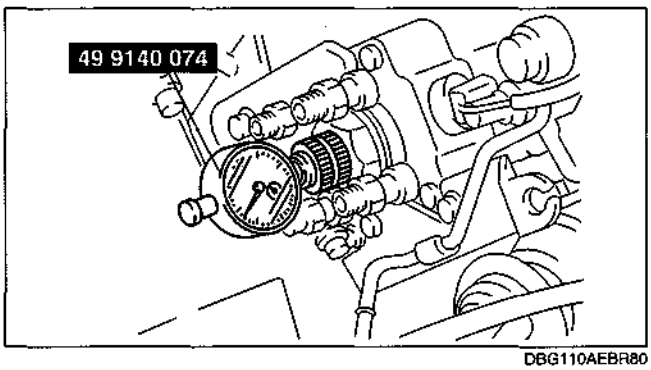

DBG110AEBR76

2. Rotate the crankshaft clockwise and align the crankshaft pulley TDC mark (yellow mark) with the indicator pin.
3. Remove the hydraulic head plug of the fuel injection pump.



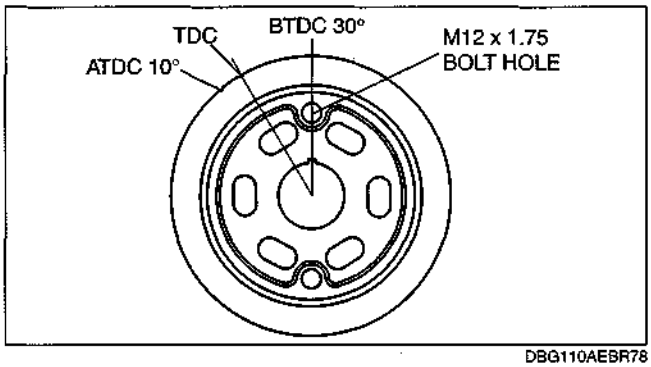
DBG110AEBR81

4. Insert the **SST** into the hydraulic head plug hole and install it so that the dial gauge indicates approx. **2 mm {0.08 in}**.



DBG110AEBR80

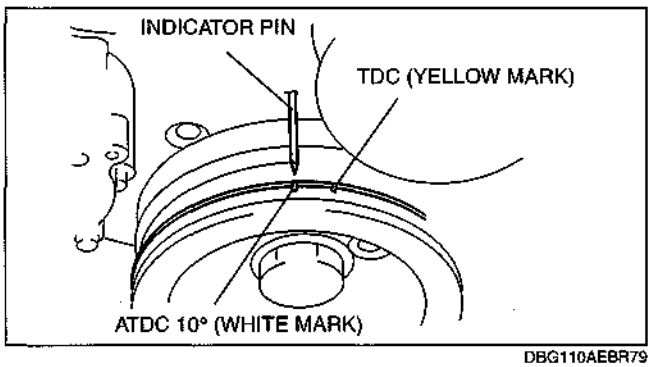
5. Rotate the crankshaft counterclockwise and find the place where the dial gauge needle does not move near approx. **30° BTDC**. (**SST** installation bolt hole of crankshaft pulley and indicator pin align at approx. **30° BTDC**)
6. Set the dial gauge to **0 mm {0 in}**.



DBG110AEBR78

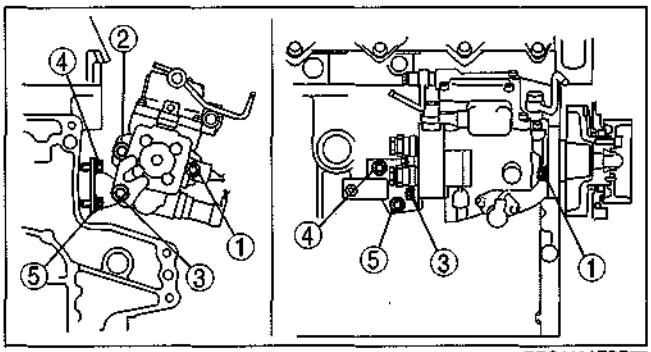
7. Rotate the crankshaft clockwise and read the dial gauge when the **10° ATDC** mark (white mark) of the crankshaft pulley and the indicator pin align.
8. Adjust the dial gauge within the specification.

Fuel injection pump plunger adjustment value
0.95—1.05 mm {0.038—0.041 in}



DBG110AEBR79

9. Tighten the fuel injection pump in the order shown in the figure.
10. Remove the **SST** and install the hydraulic head plug through a new gasket.
11. Re-tension the timing belt.



DBG110AEBR77

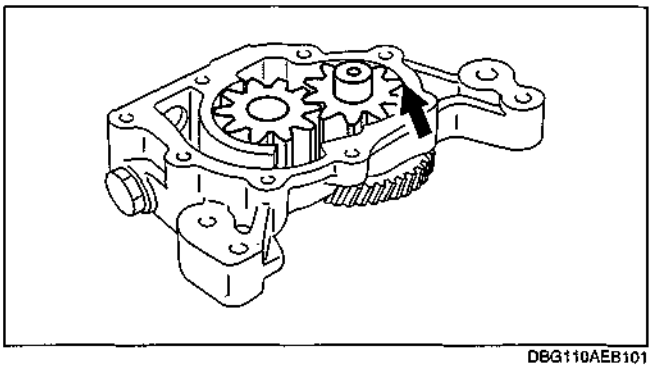
GEAR CLEARANCE INSPECTION [WL-3]

DCF011019220W01

1. Measure the following clearance.
   - If it exceeds the maximum specification, replace the gear and/or pump body.

Standard oil pump tip clearance
0.10—0.19 mm {0.0040—0.0074 in}

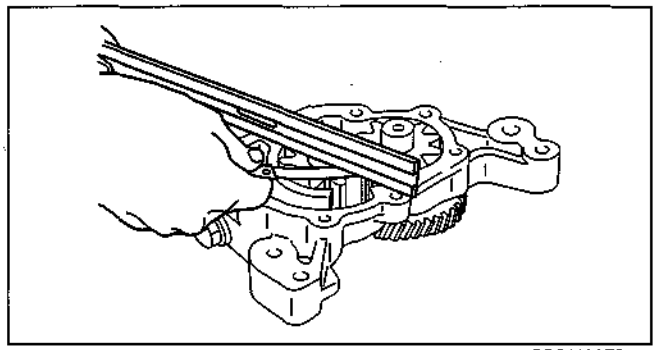
Maximum oil pump tip clearance
0.20 mm {0.0079 in}



DBG110AEB101

Standard oil pump side clearance
0.04—0.09 mm {0.0016—0.0035 in}

Maximum oil pump side clearance
0.15 mm {0.0059 in}



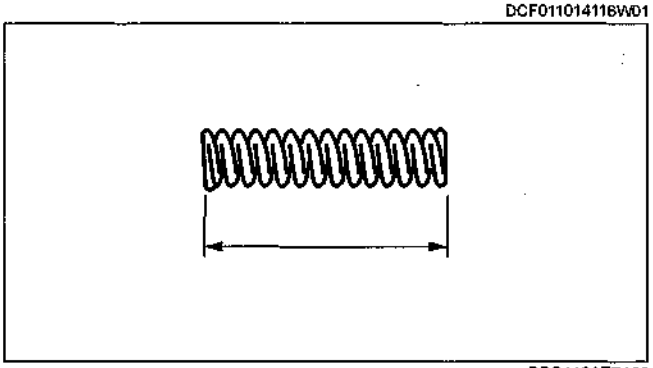
DBG110AEB102

PLUNGER SPRING INSPECTION [WL-3]

DCF011014116W01

1. Measure the free length of plunger spring.
   - If it exceeds the standard specification, replace the plunger spring.

Standard plunger spring length
43.8 mm {1.72 in}

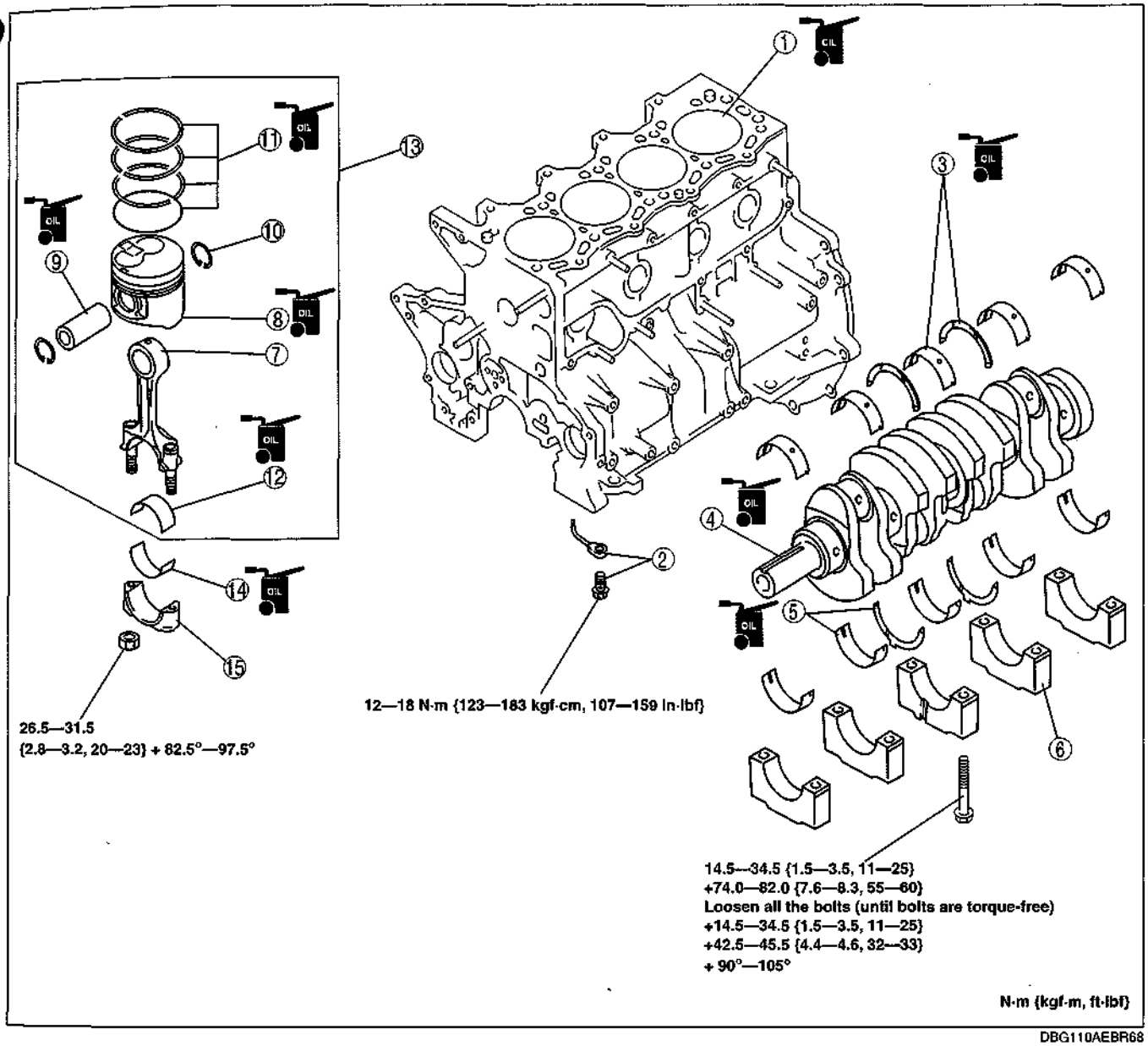


DBG110AEB103

CYLINDER BLOCK ASSEMBLY (I) [WL-3]

DCF011002000W10

1. Assemble in the order indicated in the table.



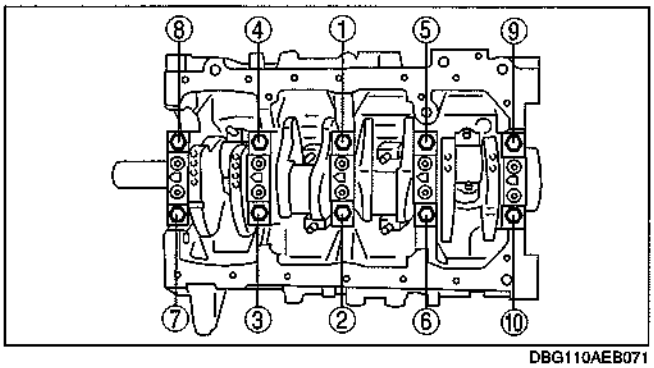
DBG110AEBR68

1	Cylinder block
2	Oil jet valve, nozzle
3	Upper main bearing, upper thrust bearing
4	Crankshaft
5	Lower main bearing, lower thrust bearing
6	Main bearing cap (See 01–10A–34 Main Bearing Cap Assembly Note.)
7	Connecting rod (See 01–10A–34 Piston, Connecting Rod, Piston Pin Assembly Note.)
8	Piston (See 01–10A–34 Piston, Connecting Rod, Piston Pin Assembly Note.)

9	Piston pin (See 01–10A–34 Piston, Connecting Rod, Piston Pin Assembly Note.)
10	Piston pin clip
11	Piston ring (See 01–10A–35 Piston Ring Assembly Note.)
12	Upper connecting rod bearing
13	Piston, connecting rod (See 01–10A–35 Piston, Connecting Rod Assembly Note.)
14	Lower connecting rod bearing
15	Connecting rod cap

Main Bearing Cap Assembly Note

1. Apply clean engine oil to the bolt threads and seat faces of the lower cylinder block bolts.
2. Tighten the bolts in two or three steps in the order shown in the figure.

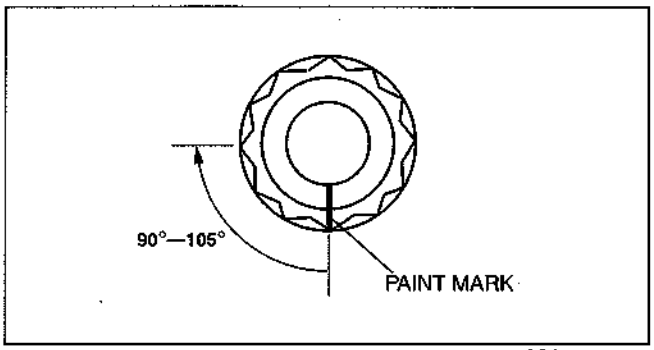


DBG110AEB071

Tightening procedure

(1) 14.5—34.5 N·m {1.5—3.5 kgf·m, 11—25 ft·lbf}
(2) 74.0—82.0 N·m {7.6—8.3 kgf·m, 55—60 ft·lbf}
(3) Loosen all the bolts (until bolts are torque-free).
(4) 14.5—34.5 N·m {1.5—3.5 kgf·m, 11—25 ft·lbf}
(5) 42.5—45.5 N·m {4.4—4.6 kgf·m, 32—33 ft·lbf}

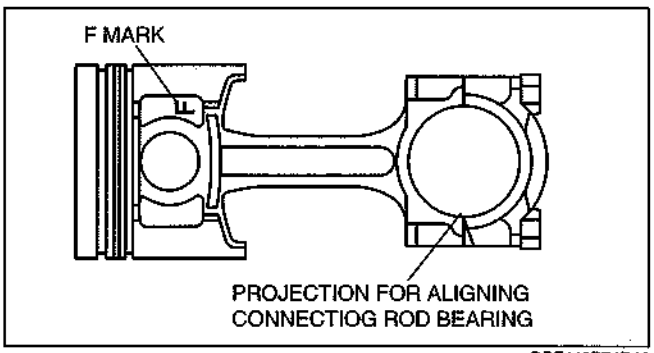
3. Put a paint mark on each bolt head.
4. Using the marks as a reference, tighten the bolts by turning each **90°—105°** as in Step 2.



DBG110AEBR72

Piston, Connecting Rod, Piston Pin Assembly Note

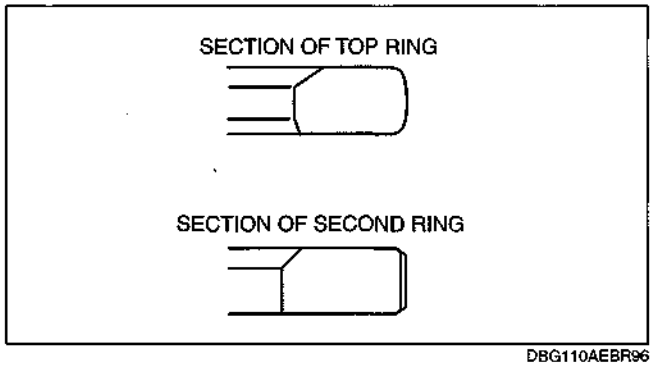
1. Install one piston pin clip.
2. Assemble the piston and connecting rod in the direction indicated in the figure.
3. Apply clean engine oil to the piston pin.
4. Install the piston pin until the pin contacts the clip as shown. If the pin cannot be installed easily, heat the piston.



DPE110ZE1R18

Piston Ring Assembly Note

1. Install the oil ring.
2. Install the second ring with tapered face side upward.
3. Install the top ring with tapered face side upward.



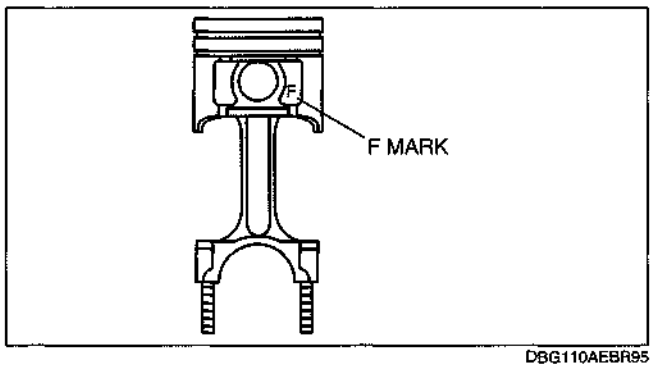
DBG110AEBR96

Piston, Connecting Rod Assembly Note

1. Insert the piston and connecting rod assembly into the cylinder with the F mark facing the front of the engine.
2. Tighten the connecting rod cap nuts in two or three steps.

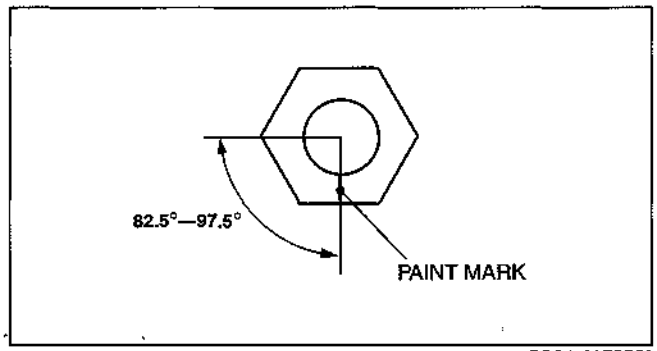
   Tightening torque
   26.5—31.5 N·m {2.8—3.2 kgf·m, 20—23 ft·lbf}

3. Put a paint mark on each nut.



DBG110AEBR95

4. Using the marks as a reference, tighten the nuts by turning each **82.5°—97.5°**

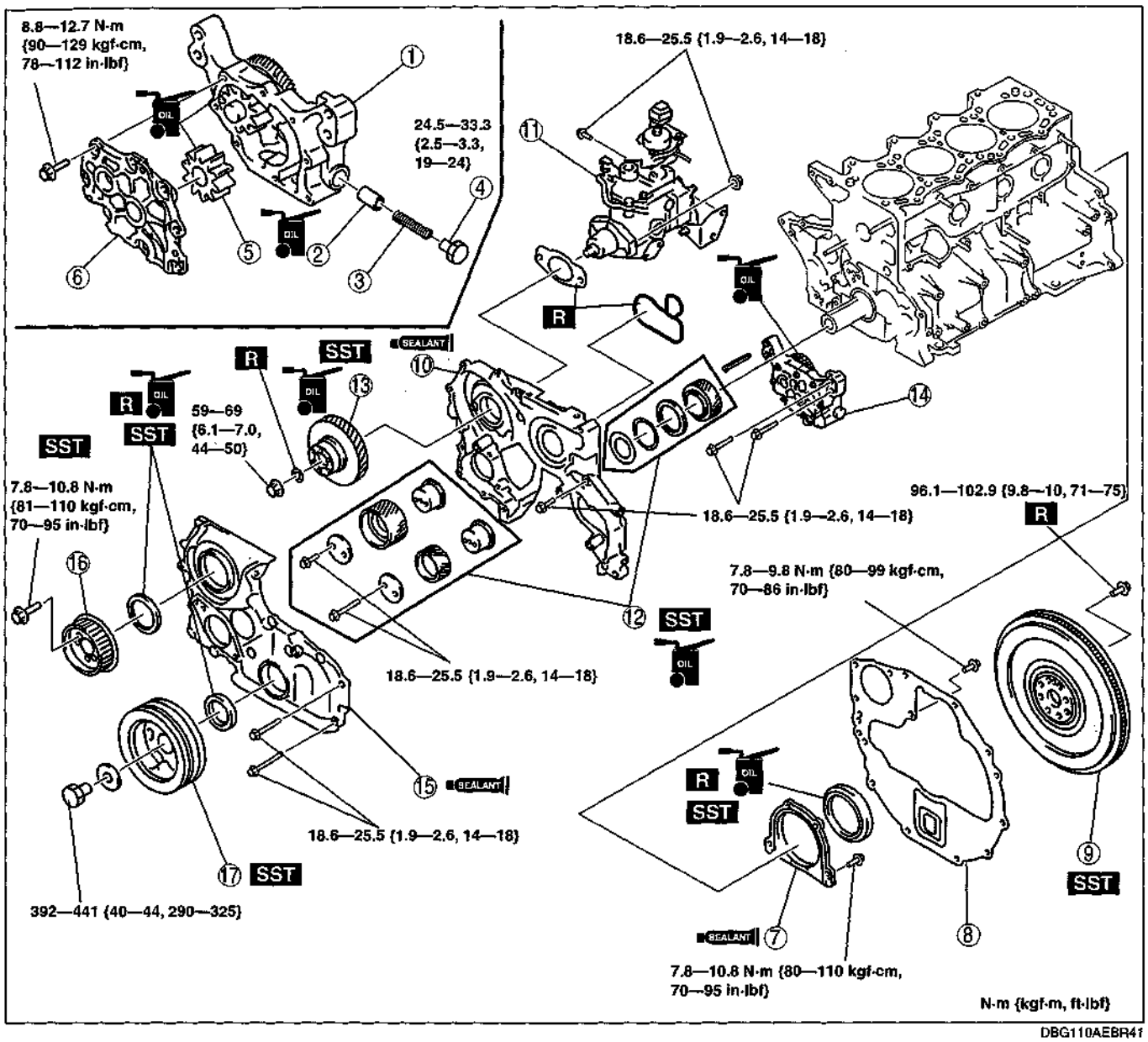


DBG110AEBR73

CYLINDER BLOCK ASSEMBLY (II) [WL-3]

DCF011002000W11

1. Assemble in the order indicated in the table.



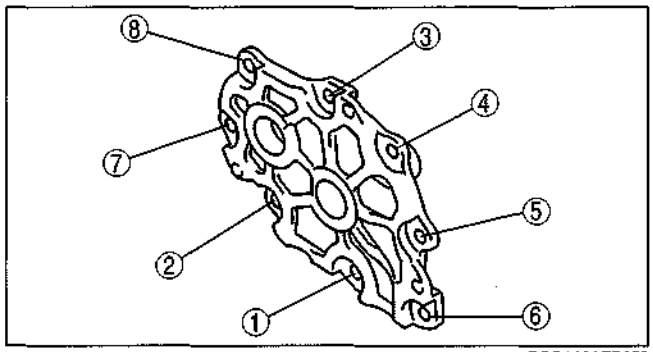
DBG110AEBR41

1	Oil pump body
2	Control plunger
3	Plunger spring
4	Plug
5	Driven gear
6	Oil pump cover (See 01–10A–37 Oil Pump Cover Assembly Note.)
7	Rear cover, end plate (See 01–10A–37 Rear Cover, End Plate Assembly Note.)
8	End plate (See 01–10A–37 Rear Cover, End Plate Assembly Note.)
9	Flywheel (See 01–10A–38 Flywheel Assembly Note.)
10	Timing gear case (See 01–10A–38 Timing Gear Case Assembly Note.)

11	Fuel injection pump
12	Timing gear (See 01–10A–38 Timing Gear, Fuel Injection Pump Gear Assembly Note.)
13	Fuel injection pump gear (See 01–10A–38 Timing Gear, Fuel Injection Pump Gear Assembly Note.)
14	Oil pump
15	Timing gear cover (See 01–10A–40 Timing Gear Cover Assembly Note.)
16	Fuel injection pump pulley (See 01–10A–41 Fuel Injection Pump Pulley Assembly Note.)
17	Crankshaft pulley (See 01–10A–41 Crankshaft Pulley Assembly Note.)

Oil Pump Cover Assembly Note

1. Tighten the bolts in two or three steps in the order shown in the figure.

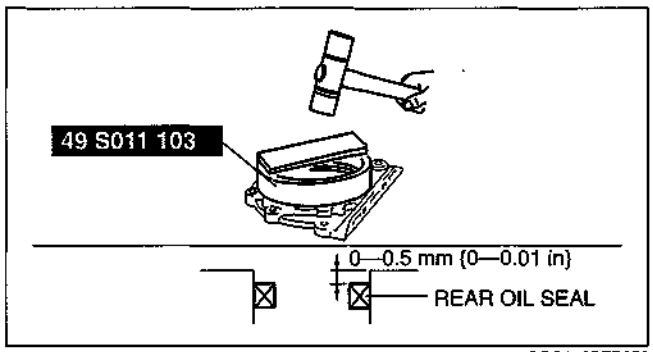


DBG110AEB053

Rear Cover, End Plate Assembly Note

1. Apply soapy water along the perimeter of the new oil seal.
2. Push the oil seal slightly in by hand.
3. Tap the oil seal in evenly by using the **SST** and a hammer.
4. To ensure that the oil seal is installed correctly, measure the distance between the end of the rear cover and the face of the oil seal.

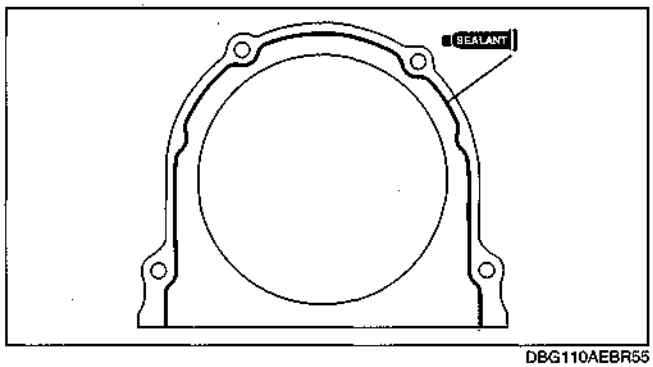
   Rear oil seal press-in amount
   0—0.5 mm {0—0.01 in}



DBG110BEB059

5. Apply silicone sealant to the rear cover as shown in the figure.

   Thickness
   ϕ2.0—3.0 mm {0.079—0.118 in}

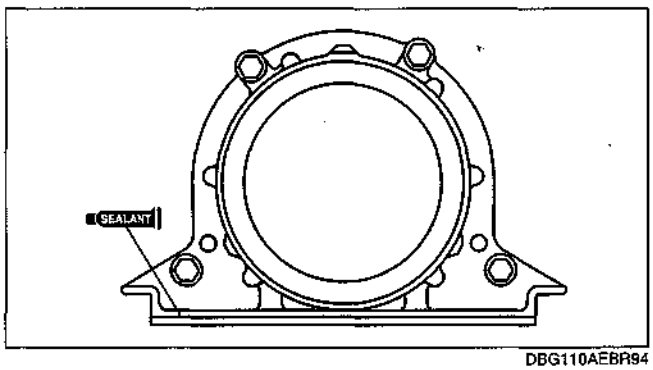


DBG110AEBR55

6. Apply silicone sealant to the rear cover as shown in the figure.

   Thickness
   ϕ2.0—3.0 mm {0.079—0.118 in}

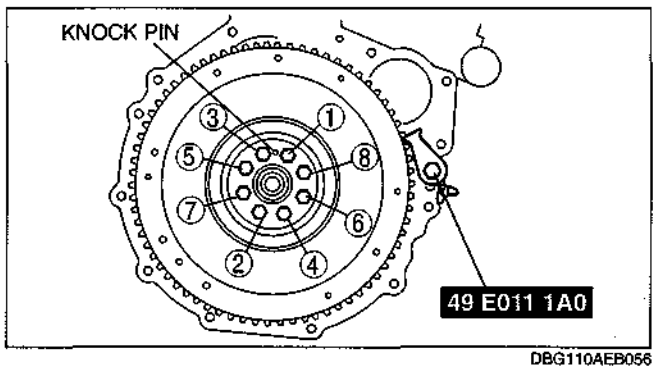
7. Install the end plate.



DBG110AEBR94

Flywheel Assembly Note

1. Hold the crankshaft using the **SST**.
2. Tighten the bolts in the order shown in the figure.

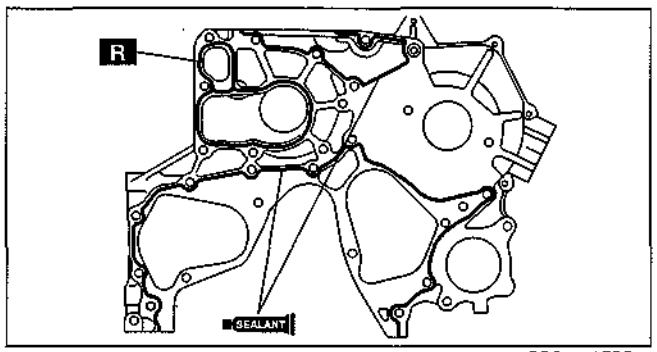


DBG110AEB056

Timing Gear Case Assembly Note

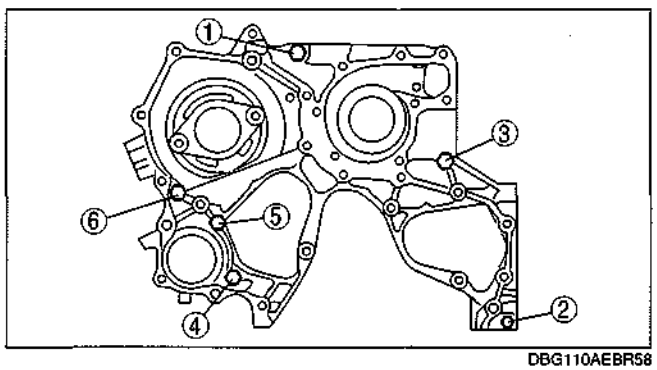
1. Install the new O-ring.
2. Apply silicone sealant to the timing gear case as shown in the figure. Do not apply sealant to the O-ring.

   Thickness
   ϕ2.0—3.0 mm {0.079—0.118 in}



DBG110AEBR57

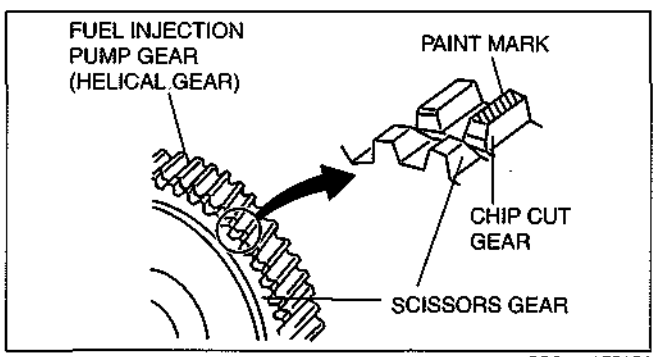
3. Tighten the bolts in two or three steps in the order shown in the figure.



DBG110AEBR58

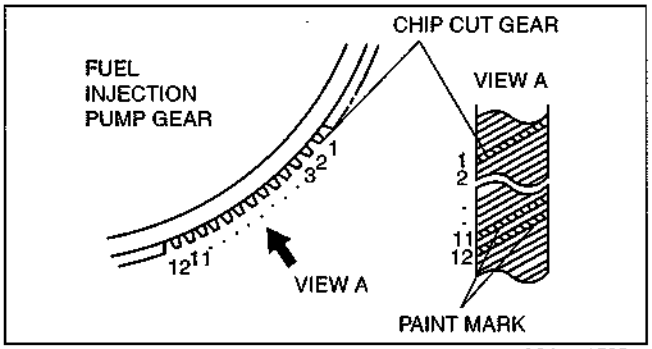
Timing Gear, Fuel Injection Pump Gear Assembly Note

1. Put a paint mark on the chip cut gear of the fuel injection pump gear.



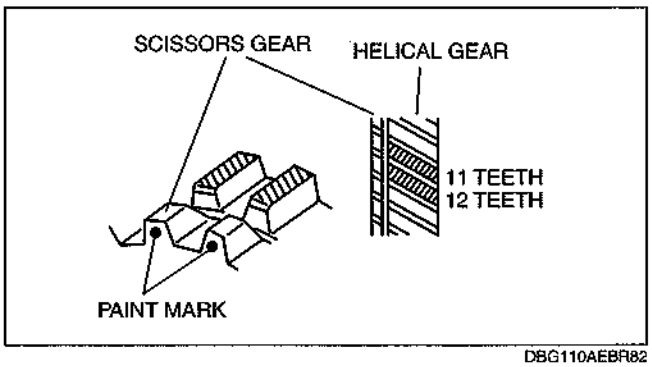
DBG110AEB9R3

2. Put a paint mark on the 11th and 12th teeth of the helical gear counting clockwise from the chip cut gear.



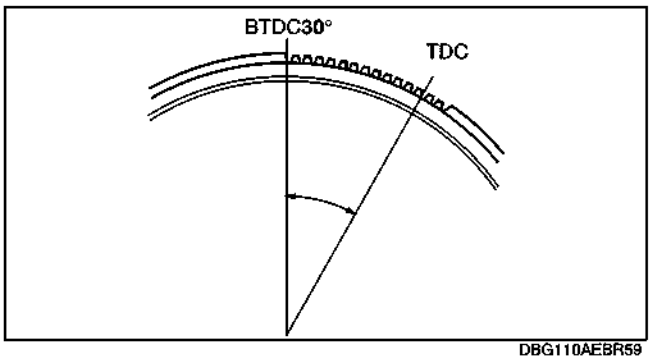
DBG110AEBR83

3. Verify that the 11th and 12th teeth of fuel injection pump gear (helical gear) and the teeth of the scissors gear are aligned, then put a paint mark on the scissors gear.
4. Set the No.1 cylinder to TDC of compression.



DBG110AEBR82

5. Rotate the flywheel ring gear from TDC to approximately **30°** BTDC (13 teeth on the gear).

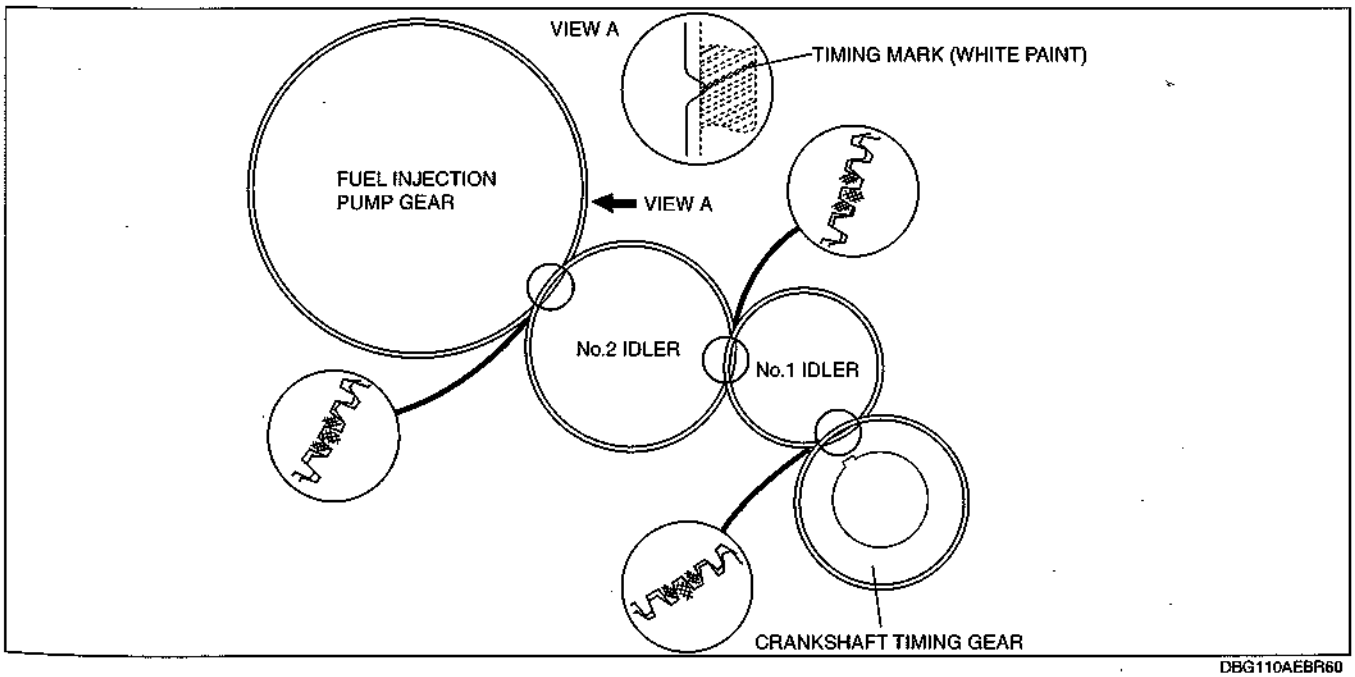


DBG110AEBR59

6. Align the timing marks. For the fuel injection pump gear, align the timing mark as shown in the figure (View A).

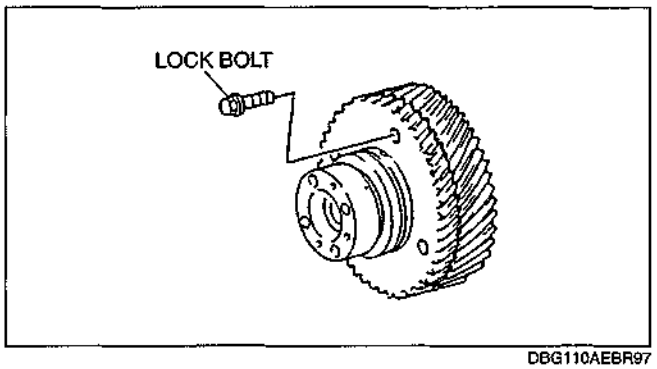
Note

- The helical gears except for the fuel injection pump gear have a punch mark as the timing mark. The timing mark of each gear can be aligned easily if the paint mark is made on the punch mark.



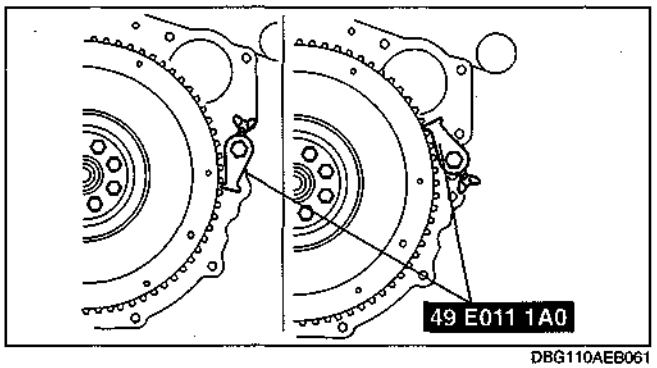
DBG110AEBR60

7. Remove the lock bolt.



DBG110AEBR97

8. Tighten the bolts using the **SST**.



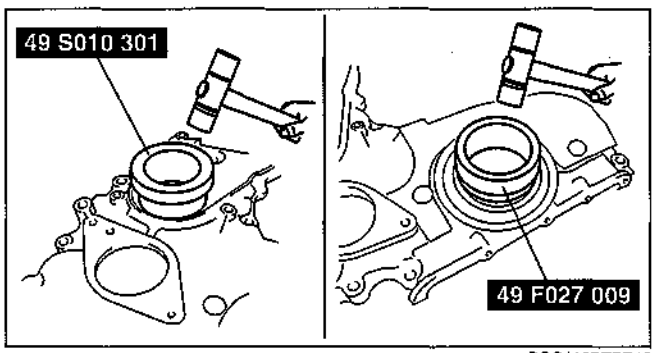
DBG110AEB061

Timing Gear Cover Assembly Note

1. Apply soapy water along the perimeter of the new oil seal.
2. Push the oil seal slightly in by hand.
3. Tap the oil seal in evenly using the **SST** and a hammer.
4. To ensure that the oil seal is installed correctly, measure the distance between the end of the timing gear cover and the face of the oil seal.

   Front oil seal press-in amount
   0—0.4 mm {0—0.01 in}

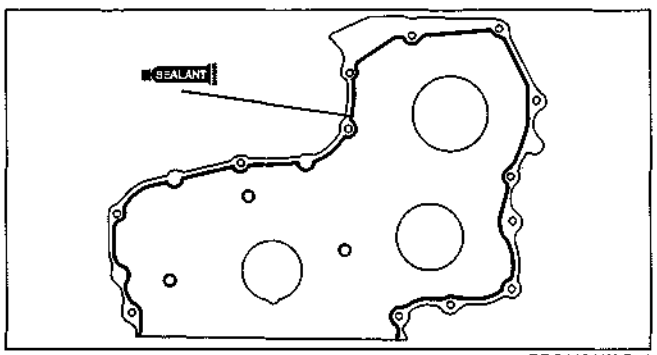
   Fuel injection pump oil seal press-in amount
   0—0.4 mm {0—0.01 in}



DBG110BEBR12

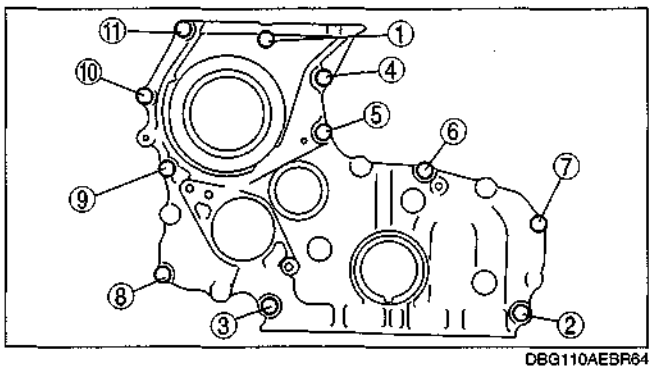
5. Apply silicone sealant to the timing gear cover as shown in the figure.

   Thickness
   ϕ2.0—3.0 mm {0.079—0.118 in}



DBG110AEBR63

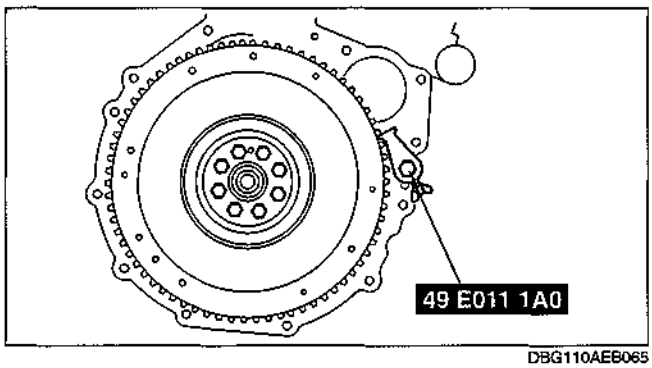
6. Tighten the bolts in two or three steps in the order shown in the figure.



DBG110AEBR64

Fuel Injection Pump Pulley Assembly Note

1. Install the fuel injection pump pulley using the **SST**.

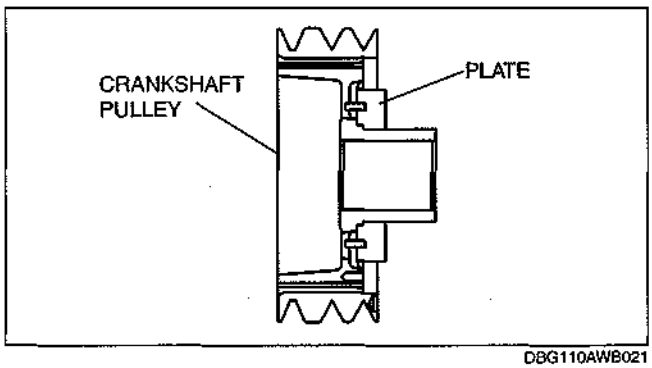


DBG110AEB065

Crankshaft Pulley Assembly Note

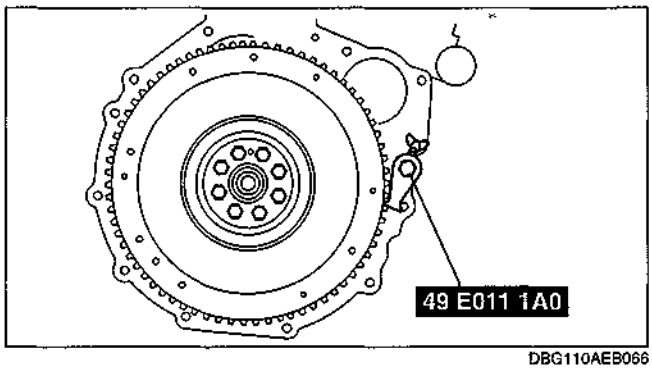
Caution

- **The CKP sensor plate is a very important part for engine operation control; any deformation of the plate may disable the operation control.**
  When disassembling/assembling the crankshaft pulley, be very careful not to deform the plate by interference with other parts or improper handling.



DBG110AWB021

1. Install the crankshaft pulley using the **SST**.

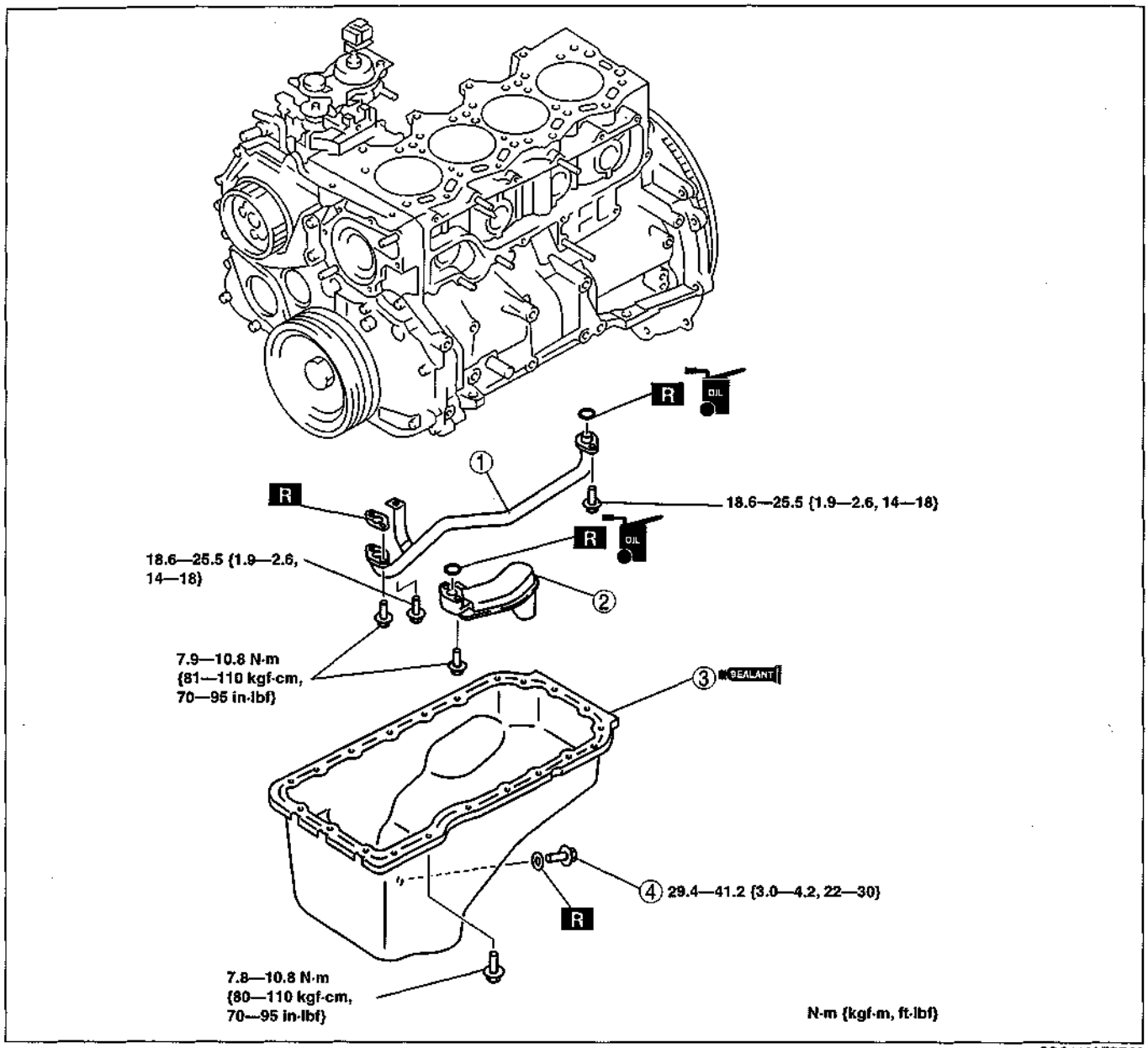


DBG110AEB066

CYLINDER BLOCK ASSEMBLY (III) [WL-3]

DCF011002000W12

1. Assemble in the order indicated in the table.



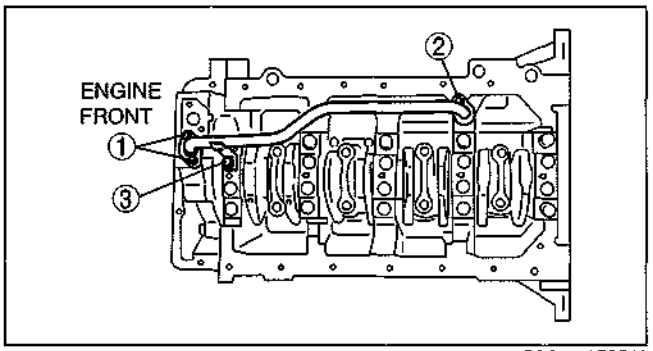
DBG110AEBR90

1	Oil pipe (See 01–10A–43 Oil Pipe Assembly Note.)
2	Oil strainer

3	Oil pan (See 01–10A–43 Oil Pan Assembly Note.)
4	Oil drain plug

Oil Pipe Assembly Note

1. Tighten the bolts in two or three steps in the order shown in the figure.

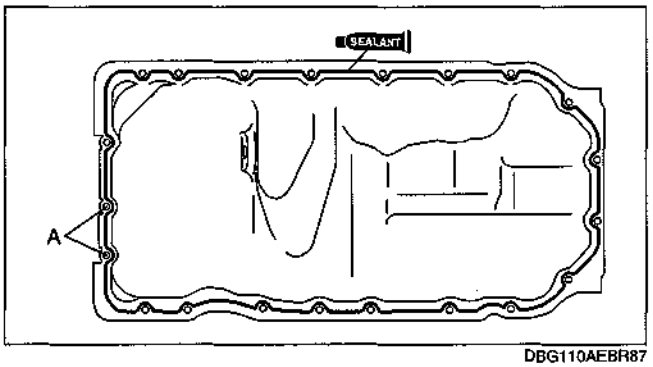


DBG110AEBR89

Oil Pan Assembly Note

1. Apply silicone sealant to the oil pan as shown in the figure.

   Thickness
   ϕ2.0—3.0 mm {0.08—0.118 in}

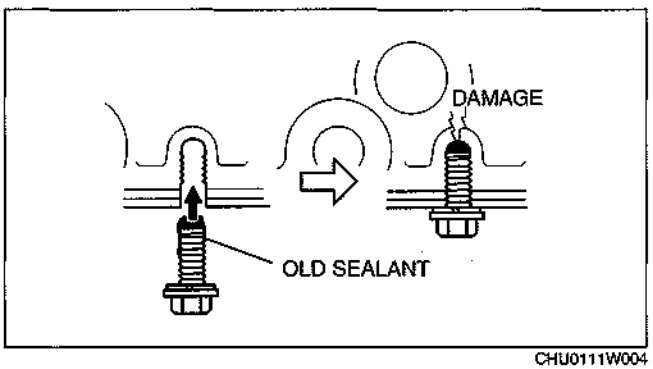


DBG110AEBR87

2. Tighten the oil pan bolts A as shown in the figure.

   Caution
   - **If the bolts are reused, remove the old sealant from the bolt threads. Tightening a bolt that has old sealant on it can cause bolt hole damage.**

3. Tighten the remaining oil pan bolts in several passes.

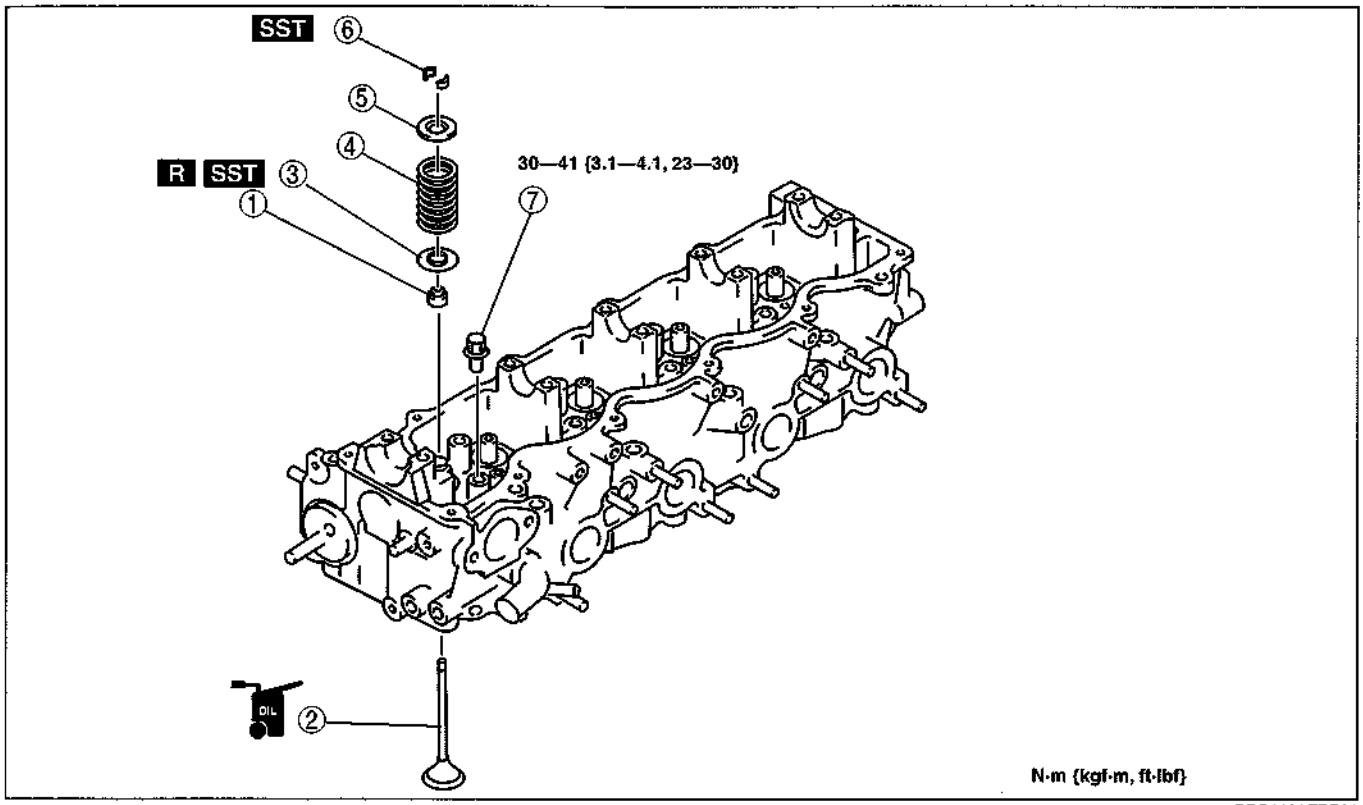


CHU0111W004

CYLINDER HEAD ASSEMBLY (I) [WL-3]

DCF011002000W13

1. Assemble in the order indicated in the table.



DBG110AEBR27

1	Valve seal (See 01–10A–44 Valve Seal Assembly Note.)
2	Valve
3	Lower valve spring seat
4	Valve spring

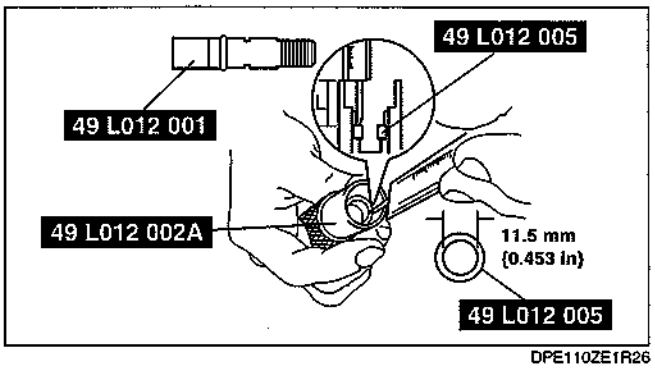
5	Upper valve spring seat
6	Valve keeper (See 01–10A–45 Valve Keeper Assembly Note.)
7	Pivot

Valve Seal Assembly Note

1. Assemble the **SSTs** so that depth L is as specified.

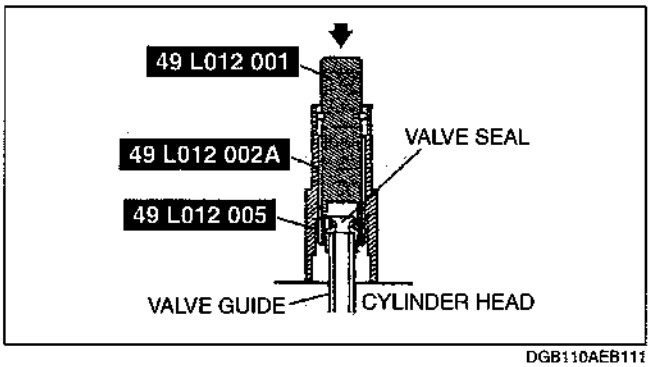
   Depth L
   15.6 mm {0.614 in}

2. Press the valve seal onto the valve guide by hand.



DPE110ZE1R26

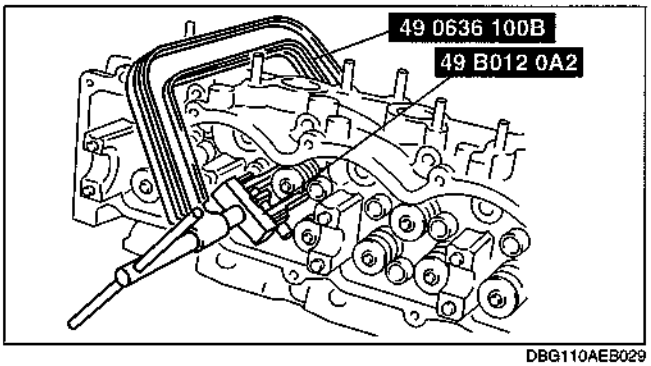
3. Tap the **SST** using a plastic hammer until its lower end touches the cylinder head.



DGB110AEB111

Valve Keeper Assembly Note

1. Install the valve keeper using the **SST**.

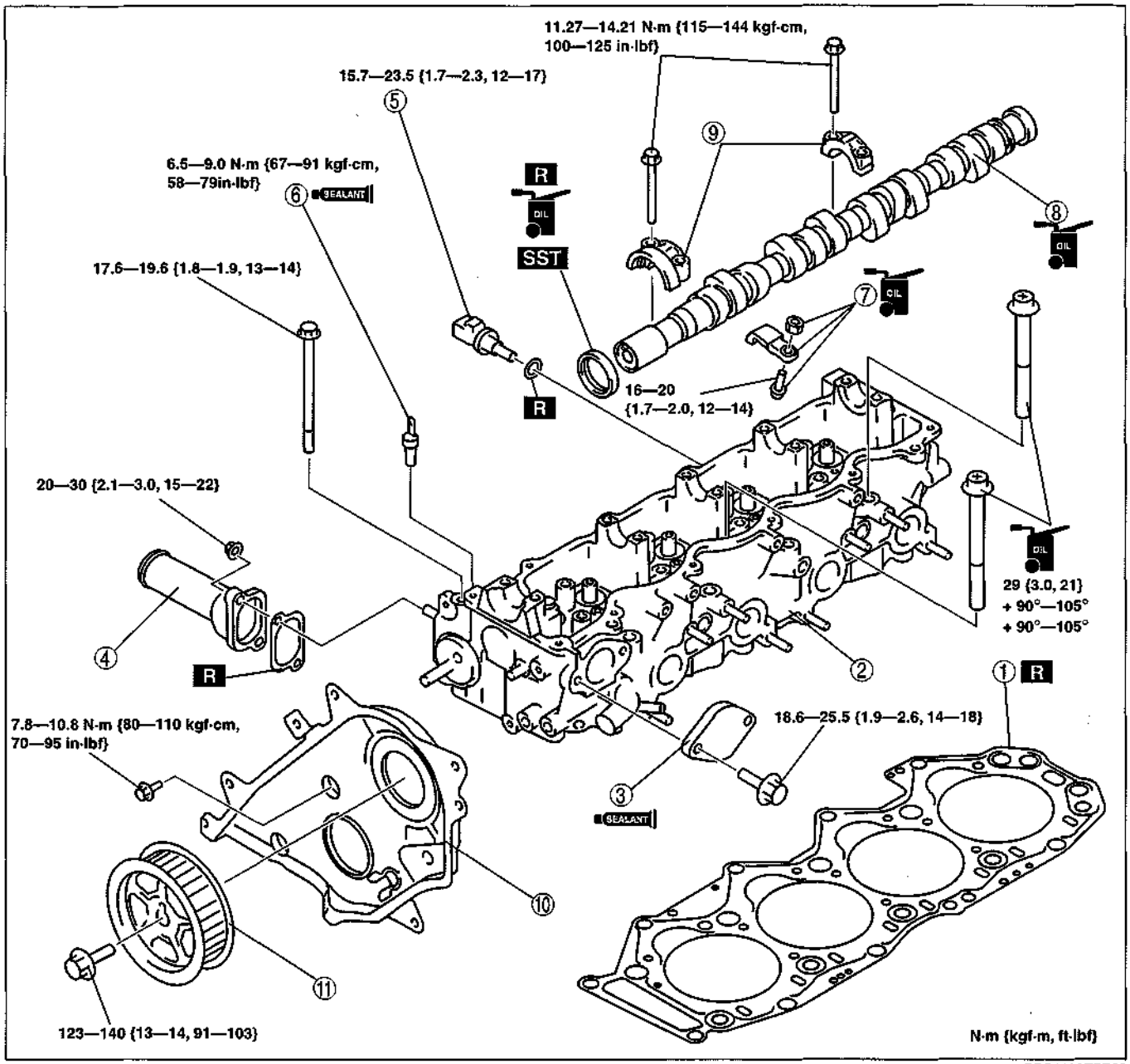


DBG110AEB029

CYLINDER HEAD ASSEMBLY (II) [WL-3]

DCF011002000WH14

1. Assemble in the order indicated in the table.



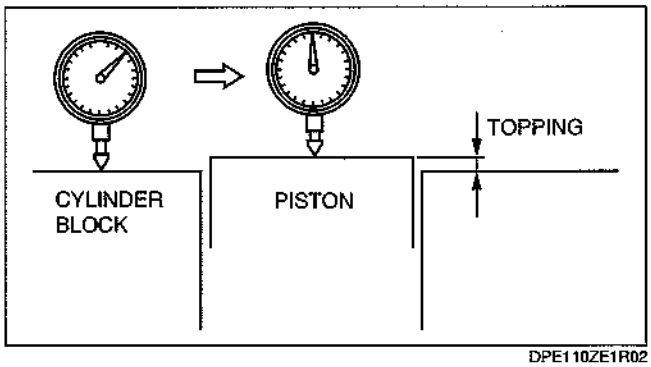
DBG110AEBR09

1	Cylinder head gasket (See 01–10A–47 Cylinder Head Gasket Assembly Note.)
2	Cylinder head (See 01–10A–48 Cylinder Head Assembly Note.)
3	Blind cover (See 01–10A–48 Blind Cover Assembly Note.)
4	Water outlet pipe
5	ECT sensor
6	Water temperature sender unit (See 01–10A–48 Water Temperature Sender Unit Assembly Note.)

7	Rocker arm (See 01–10A–49 Rocker Arm Assembly Note.)
8	Camshaft
9	Camshaft cap (See 01–10A–49 Camshaft Cap Assembly Note.)
10	Seal plate (See 01–10A–50 Seal Plate Assembly Note.)
11	Camshaft pulley (See 01–10A–50 Camshaft Pulley Assembly Note.)

Cylinder Head Gasket Assembly Note

1. Measure the piston topping of all the cylinders.

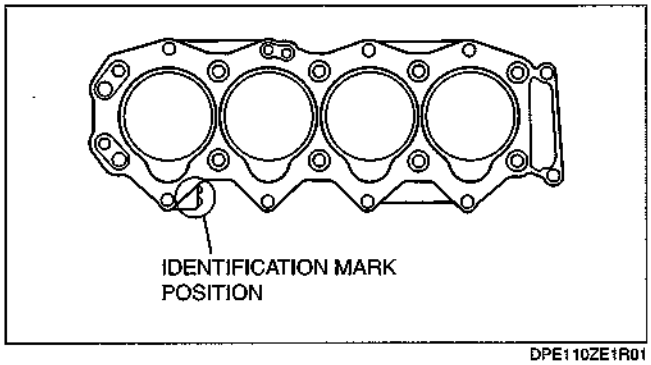


DPE110ZE1R02

2. Choose the gasket according to each measured piston topping.

Cylinder head gasket select table

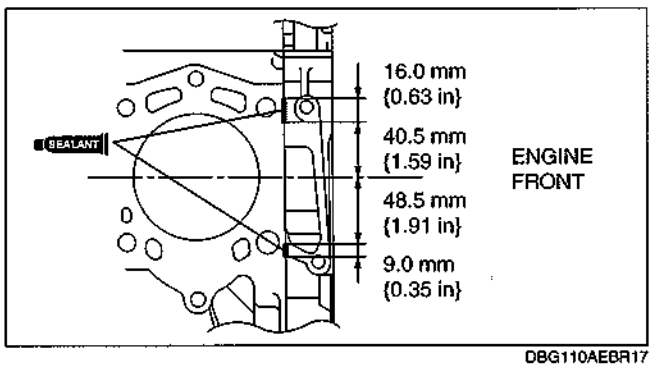
Piston topping (mm {in})	Cylinder head gasket identification mark
0.205—0.325 {0.081—0.127}	
0.265—0.385 {0.105—0.151}	
0.325—0.445 {0.128—0.175}	



DPE110ZE1R01

3. Apply silicone sealant to the cylinder block as shown in the figure.

Thickness
ϕ2.0—3.0 mm {0.079—0.118 in}



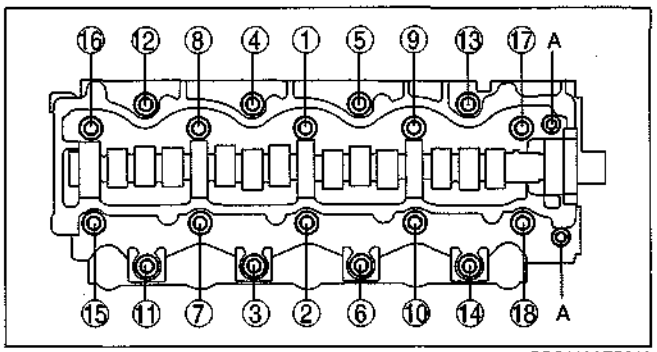
DBG110AEBR17

Cylinder Head Assembly Note

1. Before installing the cylinder head bolts, inspect their length. (See 01–10A–28 BOLT INSPECTION [WL-3].)
2. Apply clean engine oil to the threads and the seat face of each bolt and install them.
3. Tighten the cylinder head bolts in the order indicated in the figure in several passes.

   Tightening torque
   29 N·m {3.0 kgf·m, 2.1 ft·lbf}

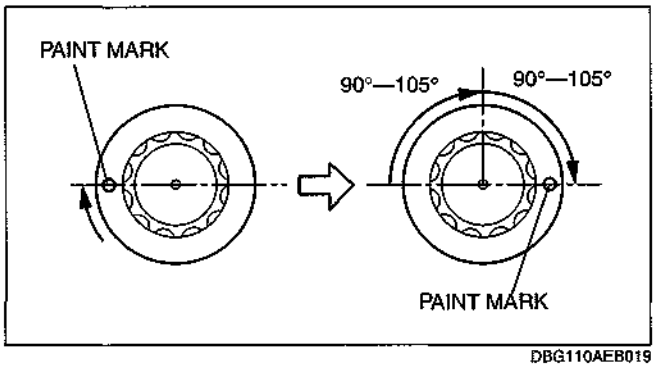
4. Retighten the bolts in the order shown in the figure until all the bolts are tightened to **29 N·m {3.0 kgf·m, 2.1 ft·lbf}**.



DBG110AEB018

5. Put a paint mark on each bolt head.
6. Using the marks as a reference, tighten the cylinder head bolts by turning each **90°—105°** in the order indicated in Step 3.
7. Further tighten each bolt by turning another **90°—105°** in the order indicated in Step 3.
8. Tighten the bolts A.

   Tightening torque
   17.6—19.6 N·m {1.8—1.9 kgf·m, 13—14 ft·lbf}

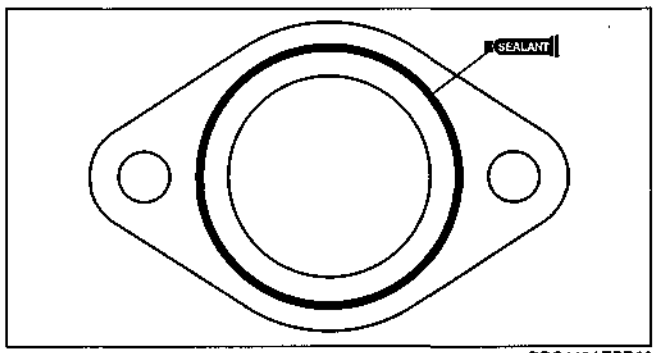


DBG110AEB019

Blind Cover Assembly Note

1. Apply silicone sealant to the blind cover as shown in the figure.

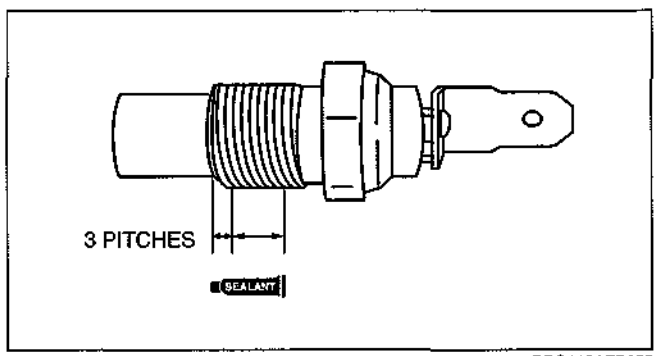
   Thickness
   ϕ1.5—2.5 mm {0.059—0.098 in}



DBG110AEBR23

Water Temperature Sender Unit Assembly Note

1. Apply silicone sealant to the thread of the water temperature sender unit as shown in the figure.

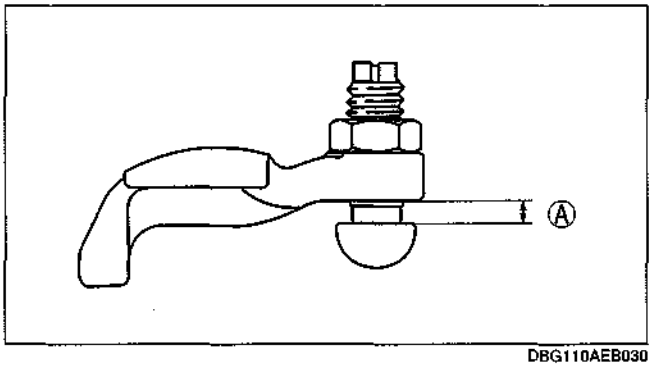


DBG110AEB022

Rocker Arm Assembly Note

1. If new rocker arm is used, set dimension A as follows.

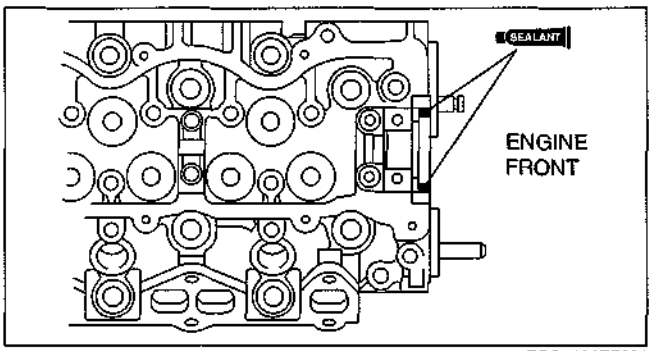
   Dimension A
   0.0—4.0 mm {0.0—0.15 in}



DBG110AEB030

Camshaft Cap Assembly Note

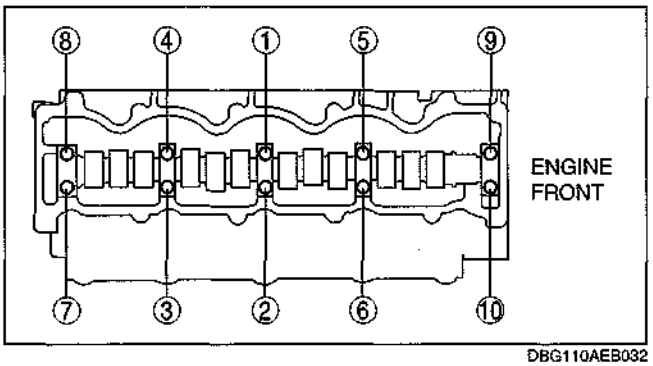
1. Apply silicone sealant to the front camshaft cap mounting surfaces as indicated in the figure. Avoid getting sealant onto the camshaft journal, camshaft oil seal surface, and camshaft thrust surface.



DBG110AEB031

2. Tighten the camshaft cap bolts gradually in three or four steps in the order shown in the figure.

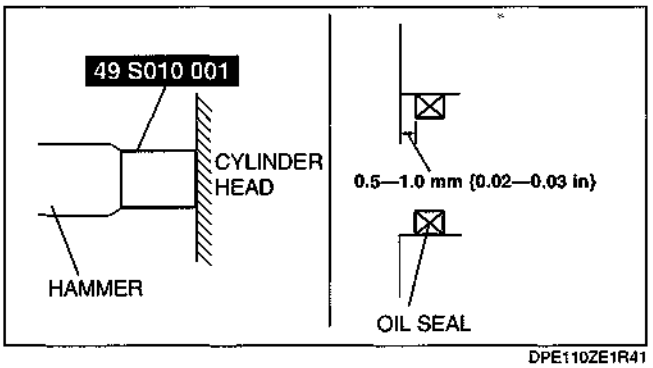
   Caution
   - **Because there is little camshaft thrust clearance, the camshaft must be held horizontally while it is installed. Otherwise, excessive force will be applied to the thrust area, causing burrs on the thrust receiving area of the cylinder head journal. To avoid this, the following procedure must be observed.**



DBG110AEB032

3. Apply soapy water along the perimeter of the new oil seal.
4. Push the oil seal slightly in by hand.
5. Tap the oil seal lightly into the cylinder head using the **SST** and a hammer.
6. To ensure that the oil seal is installed correctly, measure the distance between the end of the cylinder head and the face of the oil seal.

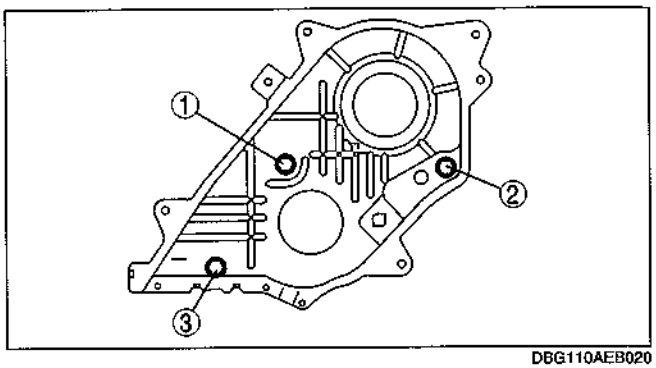
   Camshaft oil seal press-in amount
   0.5—1.0 mm {0.02—0.03 in}



DPE110ZE1R41

Seal Plate Assembly Note

1. Tighten the seal plate bolts in the order indicated in the figure.

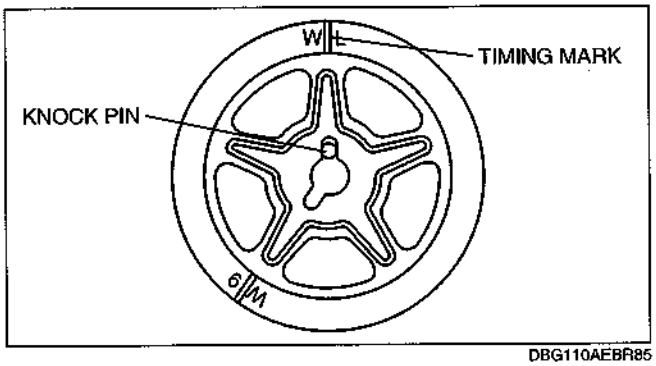


DBG110AEB020

Camshaft Pulley Assembly Note

1. Install the camshaft pulley on the camshaft with the knock pin fitted into the hole at the timing mark.

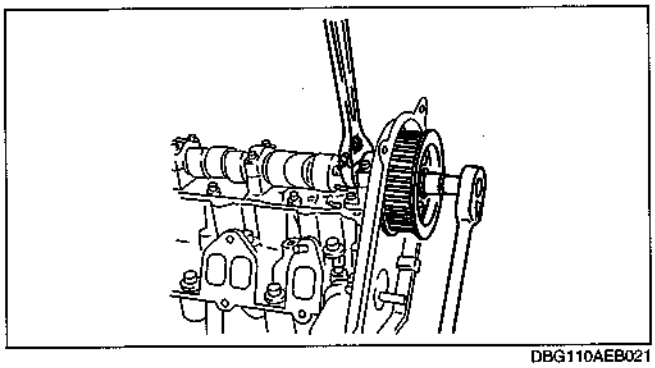
   Timing mark
   WL



DBG110AEBR85

2. Hold the camshaft using a wrench on the cast hexagon and tighten the pully lock bolt.

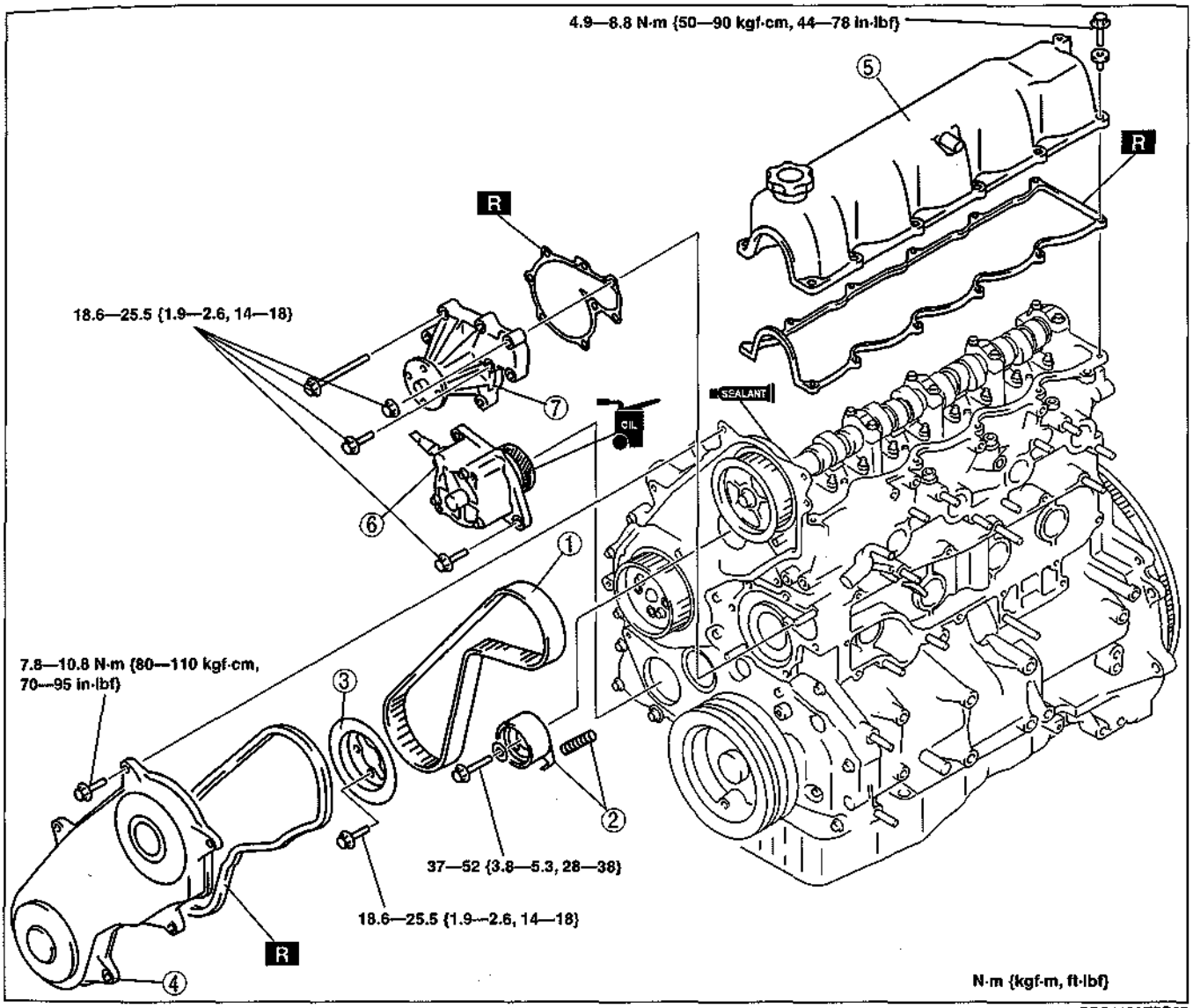
   Caution
   - **Do not move the camshaft from this position because it can cause the valve and piston to contact each other and damage them.**


DBG110AEB021

TIMING BELT ASSEMBLY [WL-3]

DCF011002000W15

1. Assemble in the order indicated in the table.



DBG110AEBR07

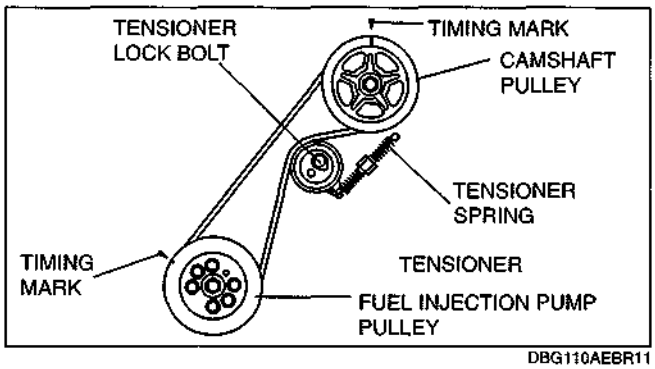
1	Timing belt (See 01–10A–52 Timing Belt, Tensioner, Tensioner Spring Assembly Note.)
2	Tensioner, tensioner spring (See 01–10A–52 Timing Belt, Tensioner, Tensioner Spring Assembly Note.)
3	Pulley plate

4	Timing belt cover (See 01–10A–52 Timing Belt Cover Assembly Note.)
5	Cylinder head cover (See 01–10A–52 Cylinder Head Cover Assembly Note.)
6	Vacuum pump
7	Water pump

Timing Belt, Tensioner, Tensioner Spring Assembly Note

Caution
- **Overtensioning of the timing belt can cause breakage of the belt and the camshaft.**

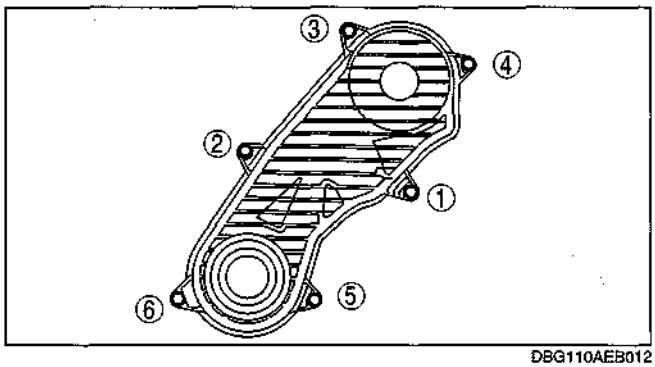
1. Align the timing marks as shown in the figure.
2. Verify that the fuel injection pump attaching bolts and nuts are tightened to the specified torque. This must be done to prevent overtensioning of the timing belt after it has been installed.
3. Install the timing belt.
4. Install the tensioner, tensioner spring, and the lock bolt.
5. Tighten the tensioner lock bolt.
6. Turn the crankshaft clockwise twice, and align the timing marks. If they are not aligned, remove the timing belt and repeat from Step 1.
7. Loosen the tensioner lock bolt to apply tension to the belt. Do not apply tension other than that of the tensioner spring.
8. Tighten the tensioner lock bolt. Be sure the tensioner does not move together with the bolt rotation.



DBG110AEBR11

Timing Belt Cover Assembly Note

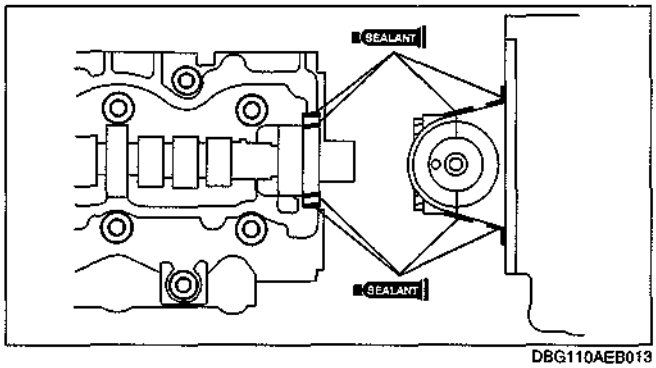
1. Tighten the timing belt cover bolts in the order shown in the figure.



DBG110AEB012

Cylinder Head Cover Assembly Note

1. Before installing the cylinder head cover, inspect the valve clearance. (See 01–10A–29 VALVE CLEARANCE INSPECTION [WL-3].)
2. Apply silicone sealant to the cylinder head as shown.



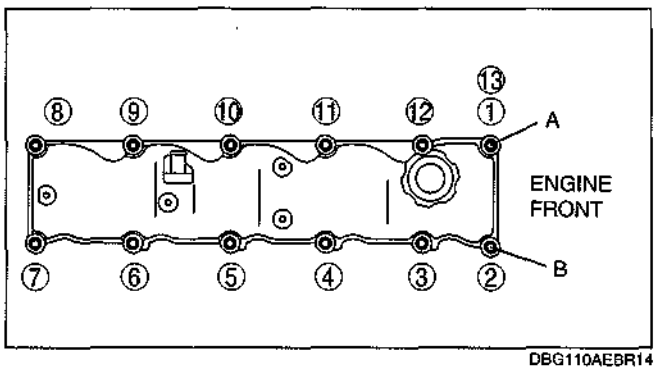
DBG110AEB013

3. Tighten cylinder head cover bolts A and B.

   Tightening torque
   1.5—2.9 N·m {16—29 kgf·cm, 14—25 in·lbf}

4. Tighten the cylinder head cover bolts in the order shown in the figure.

   Tightening torque
   4.9—8.8 N·m {50—89 kgf·cm, 44—77 in·lbf}



DBG110AEBR14

01–10B MECHANICAL [WL-C, WE-C]

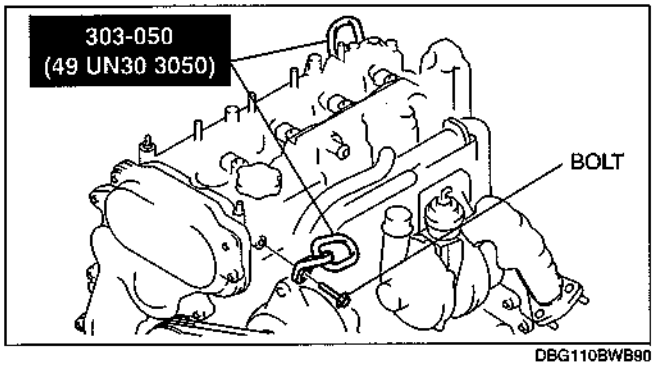
ENGINE MOUNTING [WL-C, WE-C] ... 01–10B–2
ENGINE DISMOUNTING [WL-C, WE-C] ... 01–10B–3
TIMING BELT DISASSEMBLY [WL-C, WE-C] ... 01–10B–4
CYLINDER HEAD DISASSEMBLY(I) [WL-C, WE-C] ... 01–10B–6
CYLINDER HEAD DISASSEMBLY (II) [WL-C, WE-C] ... 01–10B–8
CYLINDER BLOCK DISASSEMBLY (I) [WL-C, WE-C] ... 01–10B–9
CYLINDER BLOCK DISASSEMBLY (II) [WL-C, WE-C] ... 01–10B–10
CYLINDER BLOCK DISASSEMBLY (III) [WL-C, WE-C] ... 01–10B–15
CYLINDER HEAD INSPECTION/REPAIR [WL-C, WE-C] ... 01–10B–16
VALVE INSPECTION [WL-C, WE-C] ... 01–10B–17
VALVE GUIDE INSPECTION [WL-C, WE-C] ... 01–10B–18
VALVE GUIDE REPLACEMENT [WL-C, WE-C] ... 01–10B–18
VALVE SEAT INSPECTION/REPAIR [WL-C, WE-C] ... 01–10B–19
VALVE SPRING INSPECTION [WL-C, WE-C] ... 01–10B–20
CAMSHAFT INSPECTION [WL-C, WE-C] ... 01–10B–20
CAMSHAFT OIL CLEARANCE INSPECTION [WL-C, WE-C] ... 01–10B–21
CAMSHAFT END PLAY INSPECTION [WL-C, WE-C] ... 01–10B–21
CYLINDER BLOCK INSPECTION/REPAIR [WL-C, WE-C] ... 01–10B–22
DUAL-MASS FLYWHEEL INSPECTION [WL-C, WE-C] ... 01–10B–22
OIL JET VALVE, NOZZLE INSPECTION [WL-C, WE-C] ... 01–10B–25
PISTON INSPECTION [WL-C, WE-C] ... 01–10B–25
PISTON CLEARANCE INSPECTION/REPAIR [WL-C, WE-C] ... 01–10B–25
PISTON RING CLEARANCE INSPECTION [WL-C, WE-C] ... 01–10B–26
PISTON PIN CLEARANCE INSPECTION [WL-C, WE-C] ... 01–10B–26
CRANKSHAFT INSPECTION [WL-C, WE-C] ... 01–10B–27
CRANKSHAFT OIL CLEARANCE INSPECTION/REPAIR [WL-C, WE-C] ... 01–10B–28
CRANKSHAFT END PLAY INSPECTION/REPAIR [WL-C, WE-C] ... 01–10B–28
CONNECTING ROD INSPECTION [WL-C, WE-C] ... 01–10B–29
CONNECTING ROD OIL CLEARANCE INSPECTION/REPAIR [WL-C, WE-C] ... 01–10B–29
CONNECTING ROD SIDE CLEARANCE INSPECTION [WL-C, WE-C] ... 01–10B–29
PISTON AND CONNECTING ROD INSPECTION [WL-C, WE-C] ... 01–10B–30
BALANCE SHAFT INSPECTION [WL-C, WE-C] ... 01–10B–30
BOLT INSPECTION [WL-C, WE-C] ... 01–10B–31
VALVE CLEARANCE INSPECTION [WL-C, WE-C] ... 01–10B–31
VALVE CLEARANCE ADJUSTMENT [WL-C, WE-C] ... 01–10B–32
GEAR CLEARANCE INSPECTION [WL-C, WE-C] ... 01–10B–33
PLUNGER SPRING INSPECTION [WL-C, WE-C] ... 01–10B–33
CYLINDER BLOCK ASSEMBLY (I) [WL-C, WE-C] ... 01–10B–34
CYLINDER BLOCK ASSEMBLY (II) [WL-C, WE-C] ... 01–10B–37
CYLINDER BLOCK ASSEMBLY (III) [WL-C, WE-C] ... 01–10B–43
CYLINDER HEAD ASSEMBLY (I) [WL-C, WE-C] ... 01–10B–45
CYLINDER HEAD ASSEMBLY (II) [WL-C, WE-C] ... 01–10B–47
TIMING BELT ASSEMBLY [WL-C, WE-C] ... 01–10B–51

ENGINE MOUNTING [WL-C, WE-C]

1. Install the **SST** to the cylinder head using the bolt (99784 1020 or **M10X1.25**, **8T**, length **20mm {0.79 in}**) as shown in the figure.

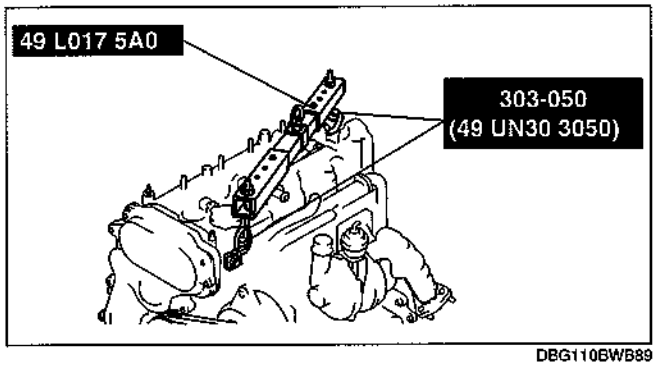
   Tightening torque
   43.1—60.8 N·m {4.40—6.10 kgf·m, 31.8—44.8 ft·lbf}

DCF011002000W16



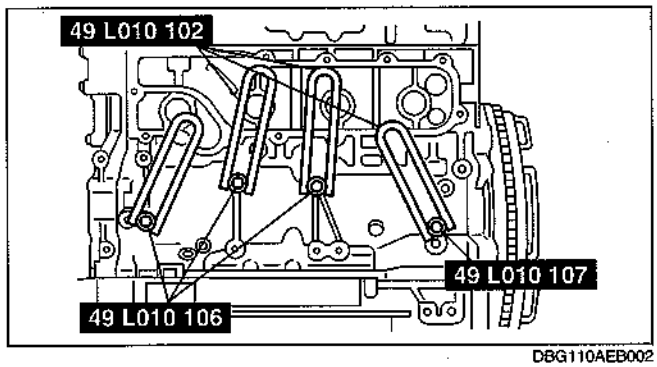
DBG110BWB90

2. Suspend the engine using the **SST**.



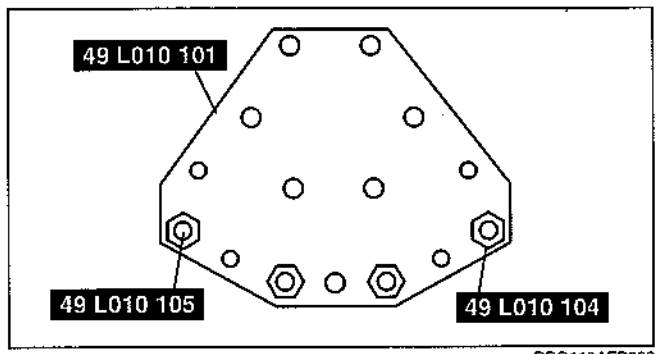
DBG110BWB89

3. Install the **SST** (arms) to the holes as shown in the figure, and hand tighten the **SST** (bolts).



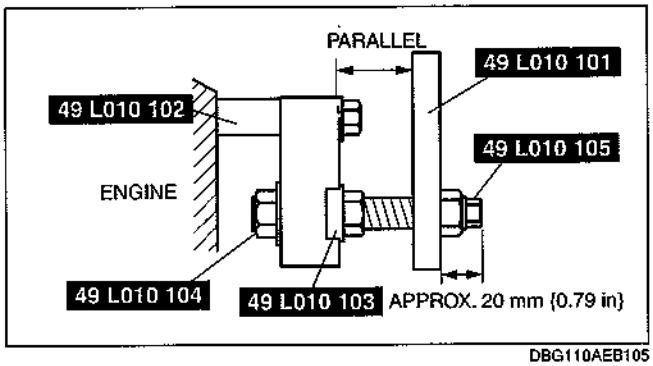
DBG110AEB002

4. Assemble the **SSTs** (bolts, nuts and plate) to the specified positions.



DBG110AEB003

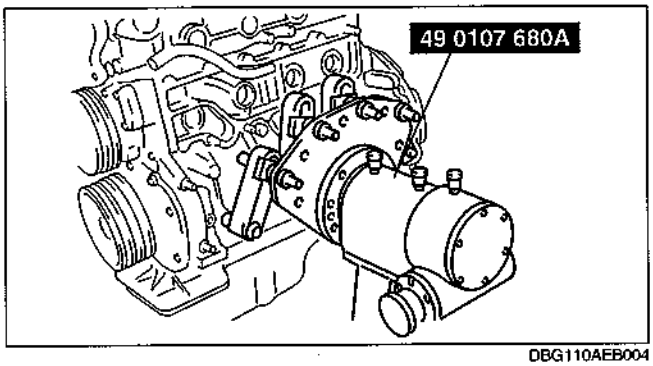
5. Adjust the **SST** (bolts) so that **20 mm {0.79 in}** or more of thread is exposed.
6. Align the **SSTs** (plate and arms) so that they are parallel by adjusting the **SSTs** (bolts and nuts).
7. Tighten the **SSTs** (bolts and nuts) to affix the **SST** firmly.



DBG110AEB105

8. Mount the engine on the **SST** (engine stand).

Warning
- **The self-locking brake system for the engine stand may not operate if the engine is held in an unbalanced position. This could lead to sudden, rapid movement of the engine and mounting stand handle and cause serious injury. Never hold the engine in an unbalanced position, and always grasp the rotating handle firmly when turning the engine.**



DBG110AEB004

9. Remove the **SST** (303-050 (49 UN30 3050)).
10. Drain the engine oil into a container.
11. Install the drain plug using new washer.

Tightening torque
29.4—41.2 N·m {3.0—4.2 kgf·m, 22—30 ft·lbf}

ENGINE DISMOUNTING [WL-C, WE-C]

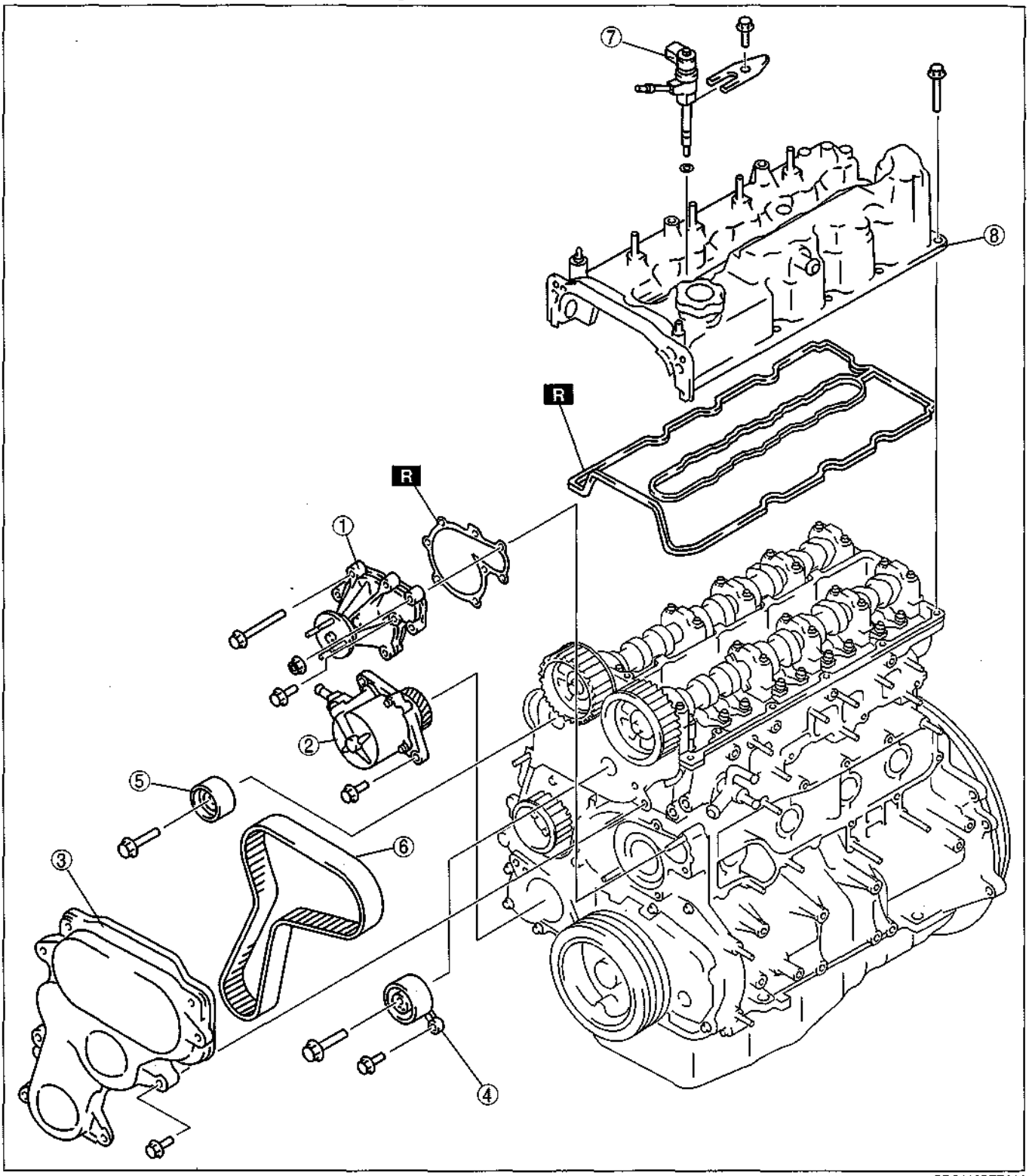
DCF011002000W17

1. Dismount in the reverse order of mounting.

TIMING BELT DISASSEMBLY [WL-C, WE-C]

DCF011002000W18

1. Disassemble in the order shown in the figure.



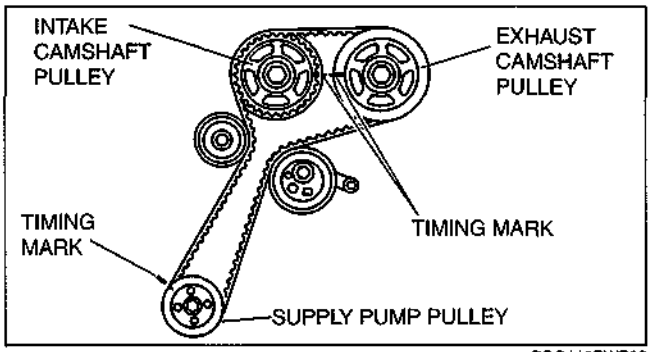
DBG110BEB014

1	Water pump
2	Vacuum pump
3	Timing belt cover
4	Tensioner (See 01–10B–5 Tensioner Disassembly Note.)

5	Idler
6	Timing belt (See 01–10B–5 Timing Belt Disassembly Note.)
7	Injector
8	Cylinder head cover

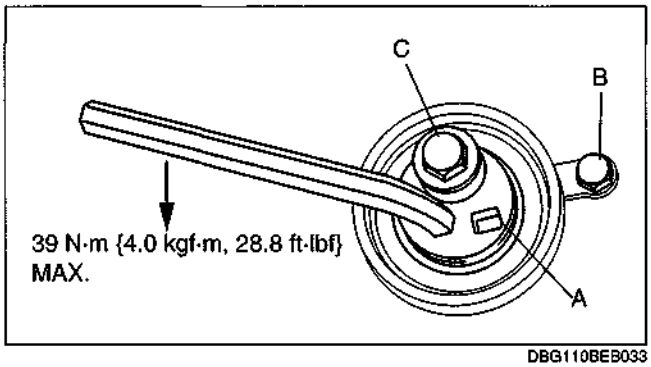
Tensioner Disassembly Note

1. Turn the crankshaft clockwise and align the timing marks as shown in the figure.



DBG110BWB998

2. Turn the auto tensioner counterclockwise using an Allen wrench. (Rotate the auto tensioner with a force of **39 N·m {4.0 kgf·m, 28.8 ft·lbf}** or less.)
3. Insert a fixing pin of approx. **6 mm {0.24 in}** diameter into hole A to secure the auto tensioner.
4. Remove the bolts in the order of B and C, then remove the auto tensioner.

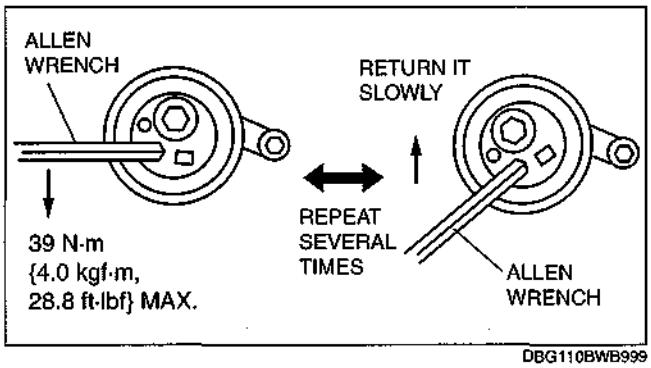


DBG110BEB033

Note

- If the rod projects suddenly while removing the auto tensioner, the air flows into the pressure chamber and the rod could move slightly. If this occurs, bleed the air from the pressure chamber using the following procedure.

5. Assemble the auto tensioner to the engine.
6. Turn the auto tensioner with a force of **39 N·m {4.0 kgf·m, 28.8 ft·lbf}** or less using an Allen wrench, then turn it back slowly. Repeat this procedure several times.
7. Verify that the rod has resistance when it is in the most projected position. If there is no resistance, repeat the above procedure.



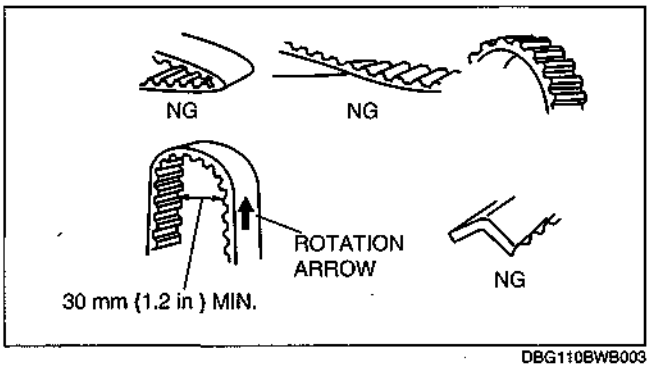
DBG110BWB999

Timing Belt Disassembly Note

Caution

- **The following will damage the timing belt and shorten its life; forcefully twisting it, turning it inside out, or getting oil or grease on it.**
- **After removing the timing belt, do not move the crankshaft and/or camshaft pulley from this position because it can cause the valve and piston to contact and damage them.**

1. Mark the timing belt rotation on the belt for proper reinstallation.

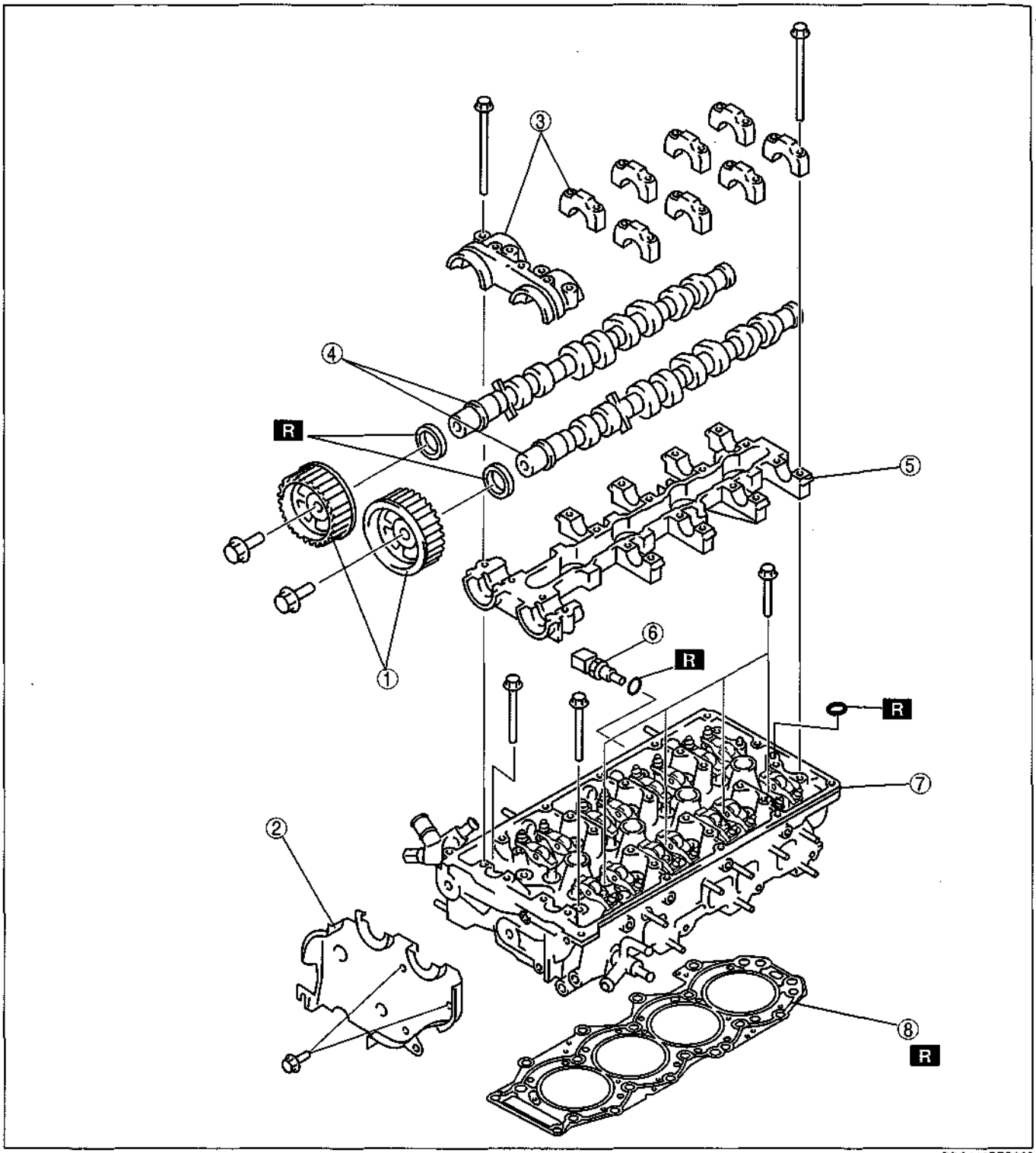


DBG110BWB003

CYLINDER HEAD DISASSEMBLY(I) [WL-C, WE-C]

DCF011002000W19

1. Disassemble in the order shown in the figure.



DBG110BEB062

1	Camshaft pulley (See 01–10B–7 Camshaft Pulley Disassembly Note.)
2	Seal plate
3	Camshaft cap upper (See 01–10B–7 Camshaft Cap Upper Disassembly Note.)
4	Camshaft

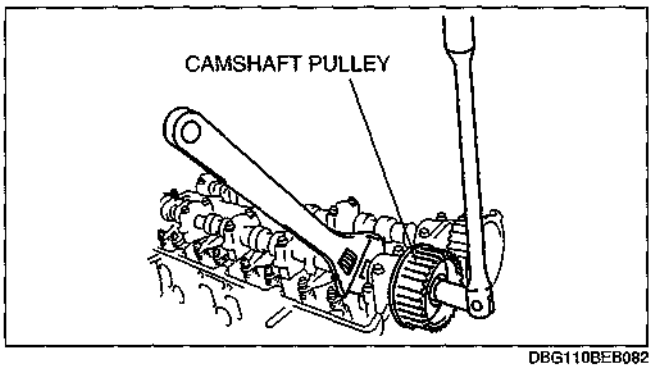
5	Camshaft cap Lower
6	ECT sensor
7	Cylinder head (See 01–10B–7 Cylinder Head Disassembly Note.)
8	Cylinder head gasket

Camshaft Pulley Disassembly Note

1. Hold the camshaft using a wrench on the cast hexagon.

Caution

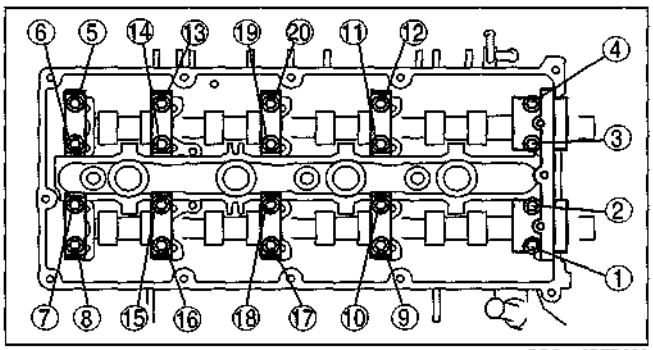
- **Do not move the camshaft from this position because it can cause the valve and piston to contact each other and damage them.**



DBG110BEB082

Camshaft Cap Upper Disassembly Note

1. Loosen the camshaft cap bolts in three or four steps in the order shown in the figure.



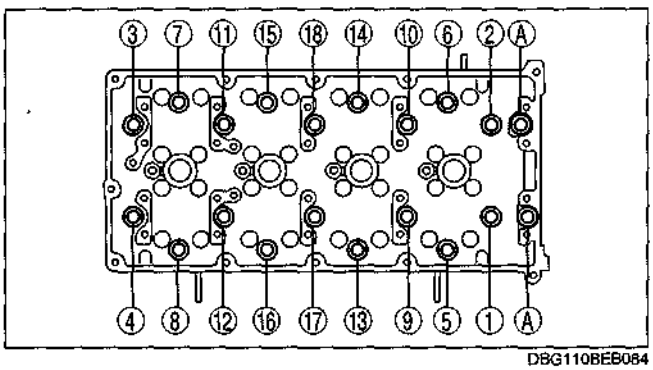
DBG110BEB083

Camshaft Disassembly Note

1. Before removing the camshaft, inspect the camshaft oil clearance. (See 01–10B–21 CAMSHAFT OIL CLEARANCE INSPECTION [WL-C, WE-C].)

Cylinder Head Disassembly Note

1. Remove bolts A.
2. Loosen the cylinder head bolts in two or three steps in the order shown in the figure.

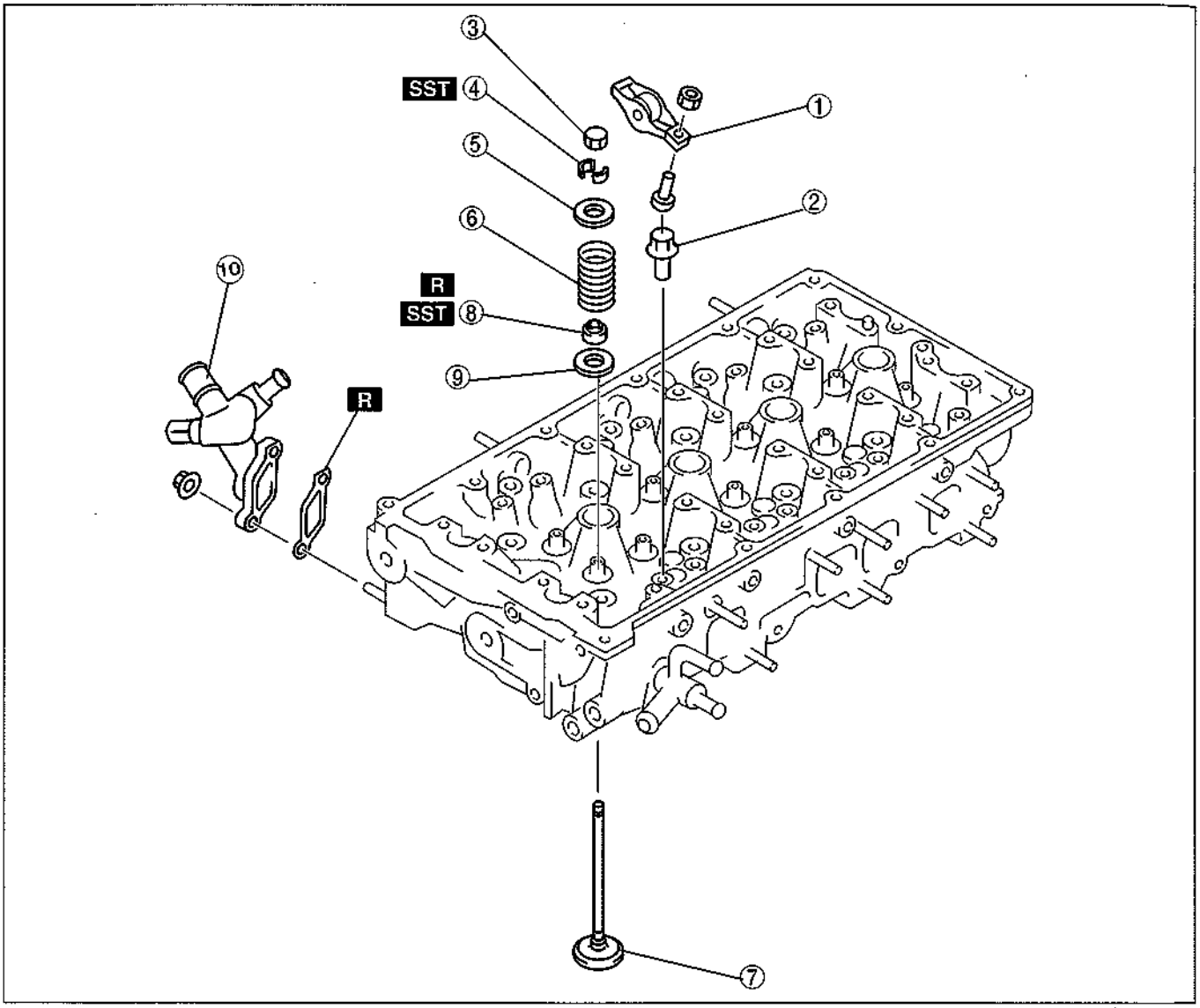


DBG110BEB084

CYLINDER HEAD DISASSEMBLY (II) [WL-C, WE-C]

DCF011002000W20

1. Disassemble in the order shown in the figure.



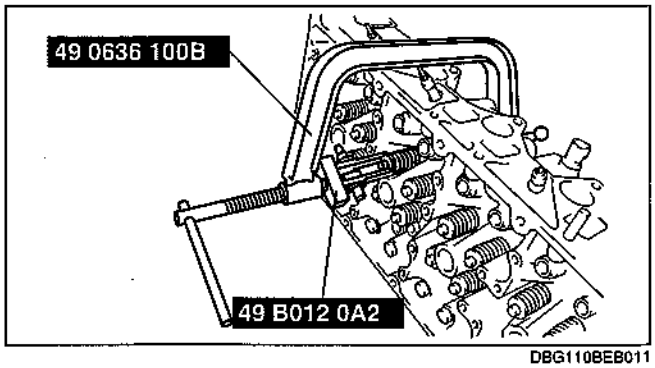
DBG110BEB016

1	Rocker arm
2	Pivot
3	Valve cap
4	Valve keeper (See 01–10B–8 Valve Keeper Disassembly Note.)
5	Upper valve spring seat

6	Valve spring
7	Valve
8	Valve seal (See 01–10B–9 Valve Seal Disassembly Note.)
9	Lower valve spring seat
10	Water outlet pipe

Valve Keeper Disassembly Note

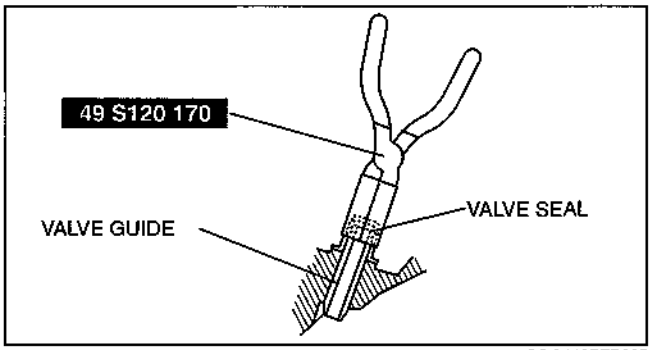
1. Remove the valve keeper using the **SST**.



DBG110BEB011

Valve Seal Disassembly Note

1. Remove the valve seal using the **SST**.

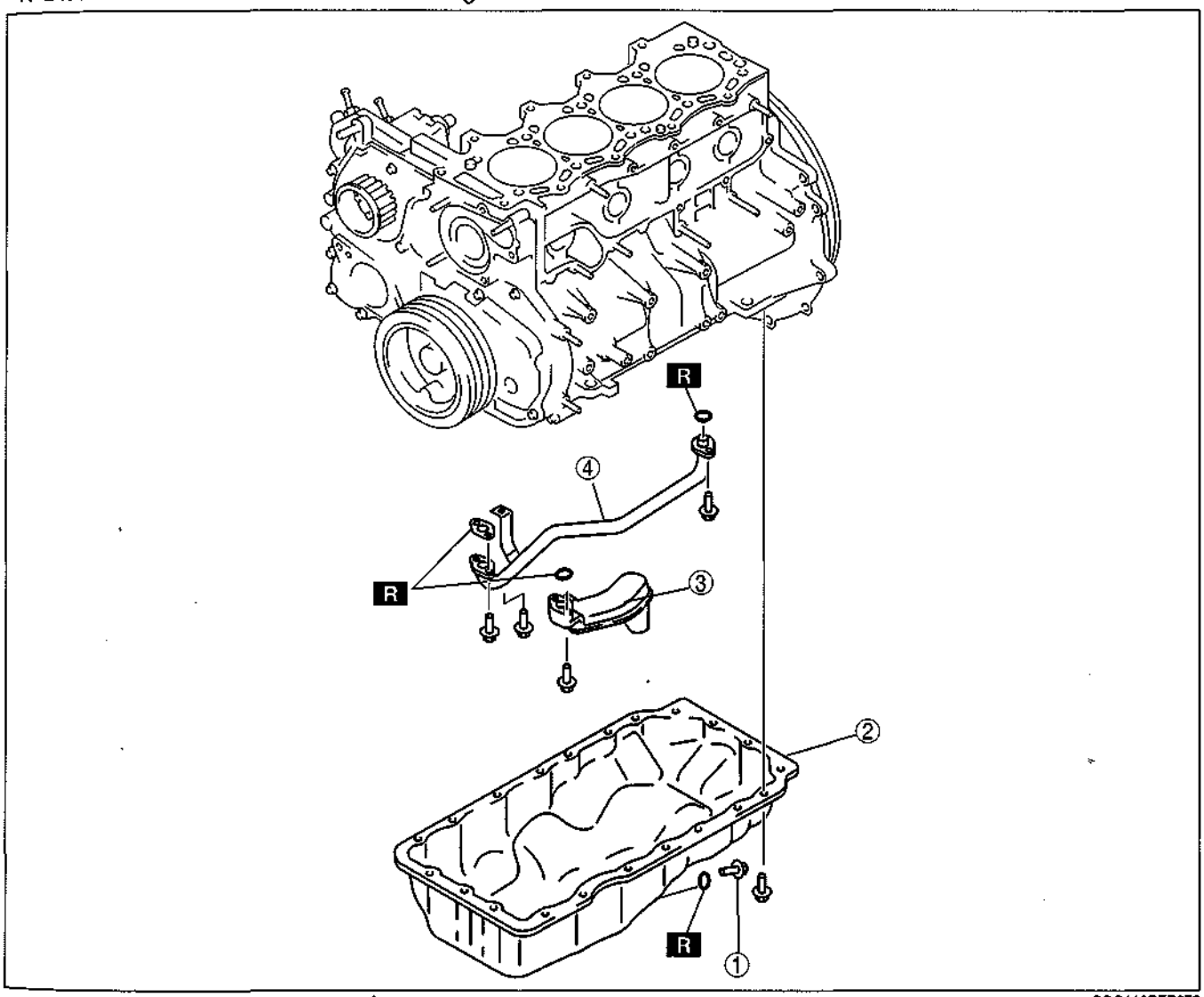


DBG110BEB085

CYLINDER BLOCK DISASSEMBLY (I) [WL-C, WE-C]

DCF011002000W21

1. Disassemble in the order shown in the figure.



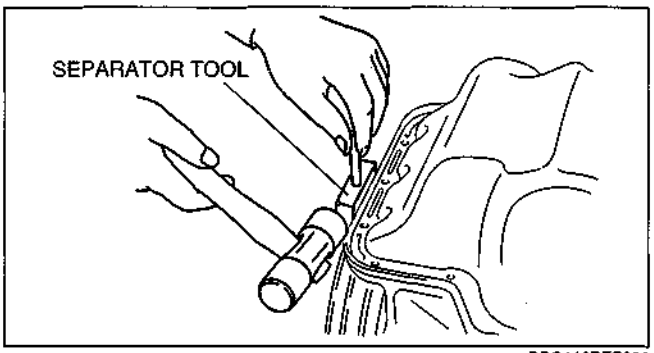
DBG110BEB075

1	Oil drain plug
2	Oil pan (See 01–10B–10 Oil Pan Disassembly Note.)

3	Oil strainer
4	Oil pipe

Oil Pan Disassembly Note

1. Remove the oil pan using a separator tool.

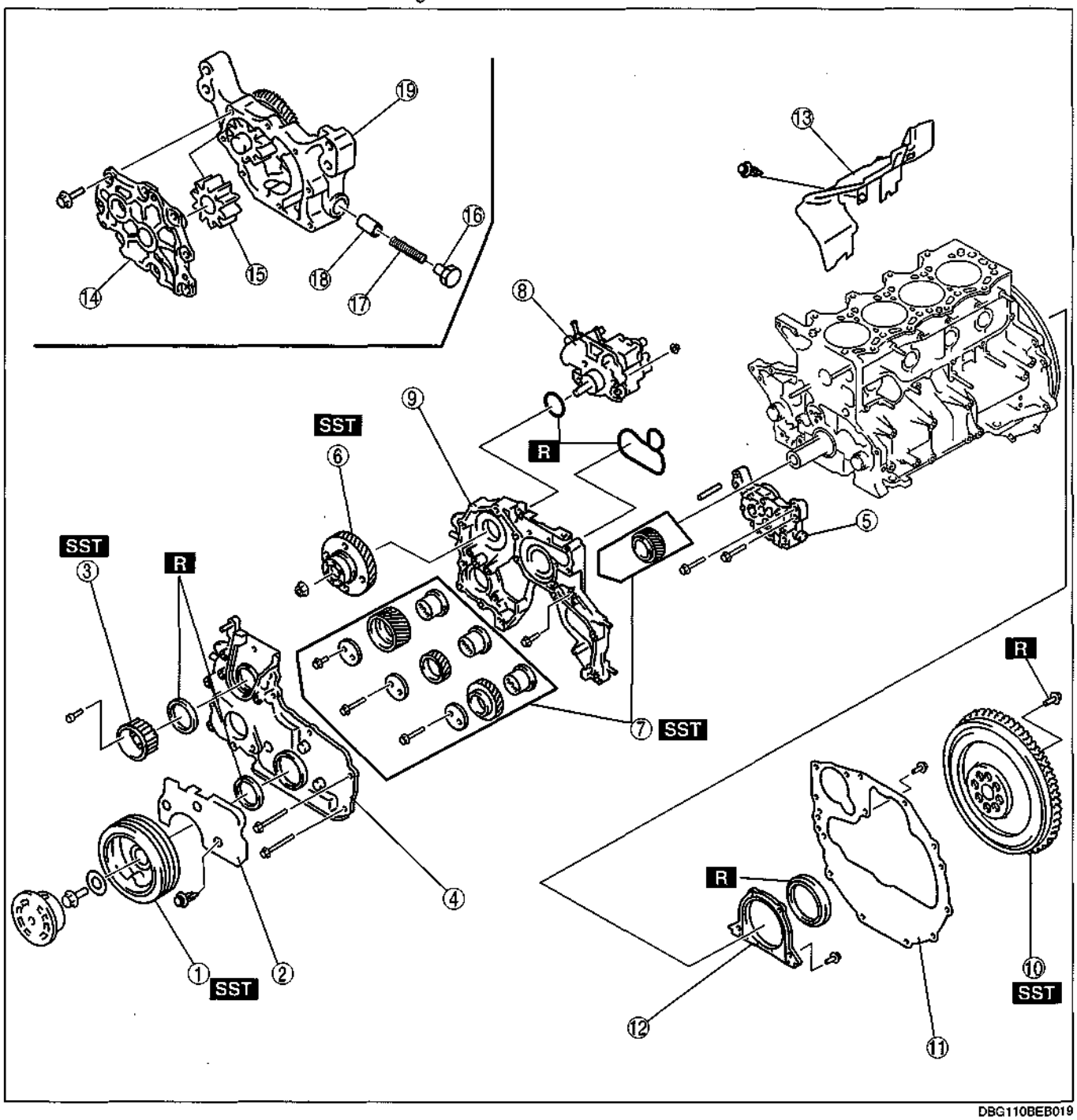


DBG110BEB086

CYLINDER BLOCK DISASSEMBLY (II) [WL-C, WE-C]

DCF011002000W22

1. Disassemble in the order shown in the figure.



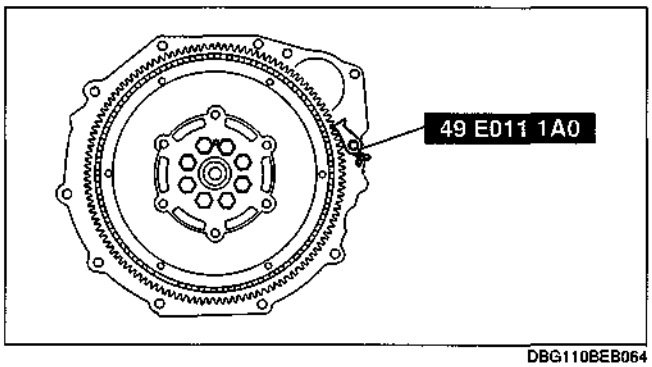
DBG110BEB019

1	Crankshaft pulley (See 01–10B–11 Crankshaft Pulley Disassembly Note.)
2	Seal plate
3	Supply pump pulley (See 01–10B–11 Supply Pump Pulley Disassembly Note.)
4	Timing gear cover (See 01–10B–11 Timing Gear Cover Disassembly Note.)
5	Oil pump
6	Supply pump gear (See 01–10B–12 Supply Pump Gear Disassembly Note.)
7	Timing gear
8	Supply pump

9	Timing gear case (See 01–10B–14 Timing Gear Case Disassembly Note.)
10	Dual-mass flywheel (See 01–10B–14 Dual-mass flywheel Disassembly Note.)
11	End plate
12	Rear cover (See 01–10B–14 Rear Cover Disassembly Note.)
13	Seal plate
14	Oil pump cover
15	Driven gear
16	Plug
17	Plunger spring
18	Control plunger
19	Oil pump body

Crankshaft Pulley Disassembly Note

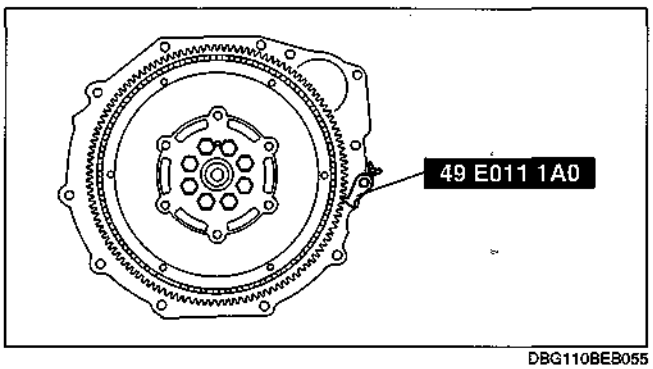
1. Remove the crankshaft pulley using the **SST**.



DBG110BEB064

Supply Pump Pulley Disassembly Note

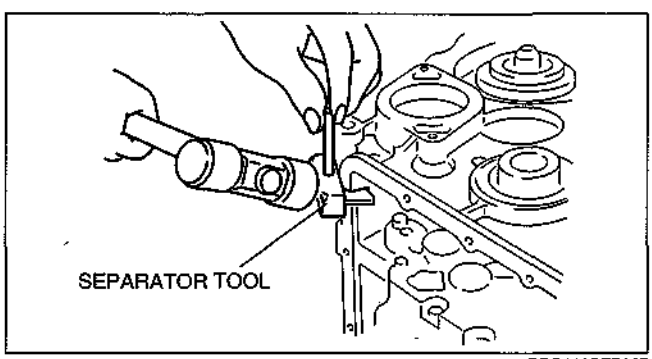
1. Remove the supply pump pulley using the **SST**.



DBG110BEB055

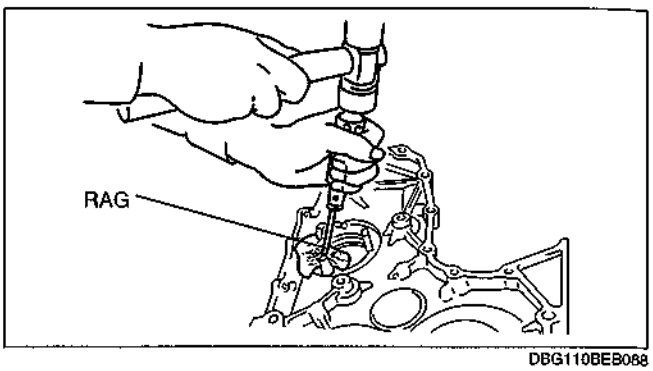
Timing Gear Cover Disassembly Note

1. Remove the timing gear cover using a separator tool.



DBG110BEB087

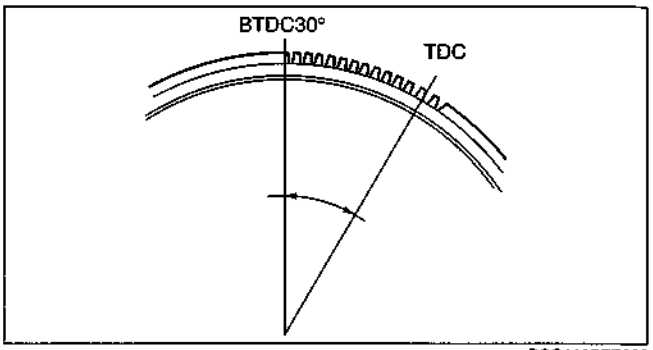
2. Remove the oil seal using a screwdriver protected with a rag,



DBG110BEB088

Supply Pump Gear Disassembly Note

1. Set the No.1 cylinder to TDC of compression.
2. Rotate the flywheel ring gear from TDC to approximately **30°** BTDC (about 13 teeth on the gear).

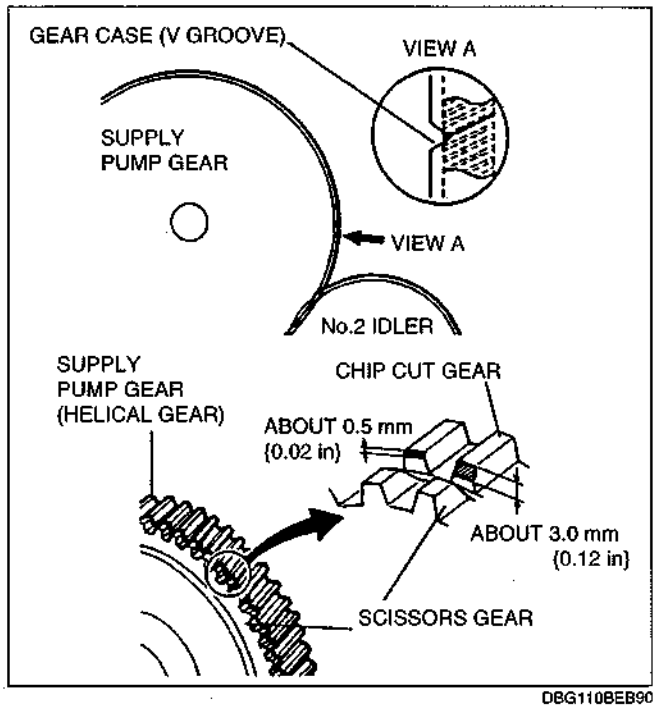


DBG110BEB089

3. Verify that the end-gap (V groove) of the timing gear case and the chip cut gear of the fuel injection pump gear are aligned.

Note

- If the chip cut gear is hard to find, move the supply pump gear on notch back and forth, then check the chip cut gear.



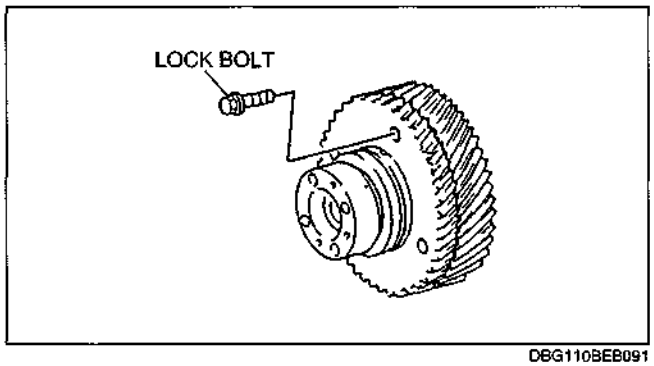
DBG110BEB90

4. Fix the scissors gear to the supply pump gear using a lock bolt (**M6×1.0**; length under the bolt head is approximately **16 mm {0.63 in}**).

Warning
- **When removing the supply pump gear, be sure to secure the scissors gear to the supply pump gear using a lock bolt (M6×1.0; length under the bolt head is approximately 16 mm {0.63 in}). Otherwise, the scissors gear will rotate with the spring force, causing personal injury.**

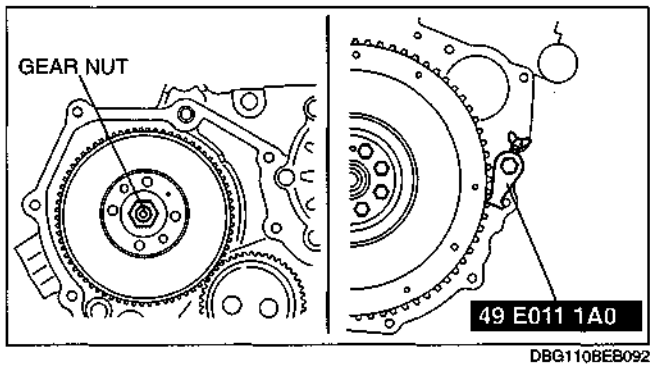
Caution
- **When removing the supply pump gear, be sure to secure the scissors gear to the supply pump gear using a look bolt (M6×1.0; length under the bolt head is approximately 16 mm {0.63 in}) to prevent the scissors gear form rotating with the spring force. Otherwise, the scissors gear will not align with the supply pump gear, and the supply pump gear with the scissors gear will not engage with the idler gear.**

Note
- **The supply pump gear with a scissors gear has a lock bolt hole.**



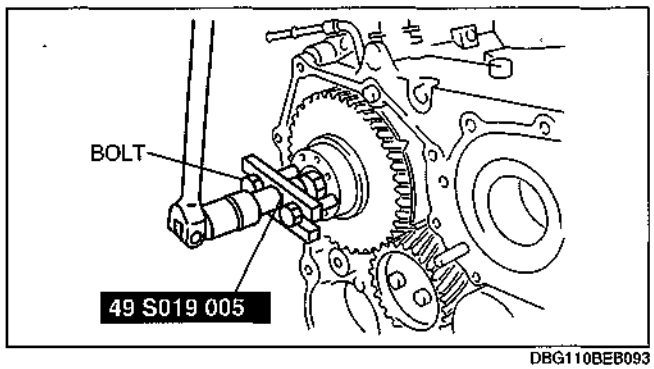
DBG110BEB091

5. Hold the crankshaft using the **SST** and loosen the gear nut.



DBG110BEB092

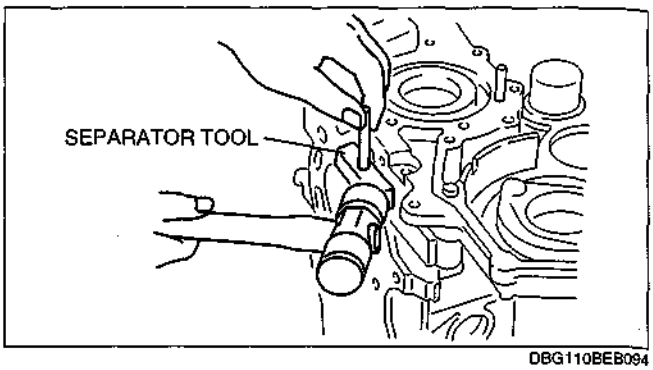
6. Remove the supply pump gear using the **SST** and bolt (**M6X1.0**, Length **30mm {1.18 in}**).



DBG110BEB093

Timing Gear Case Disassembly Note

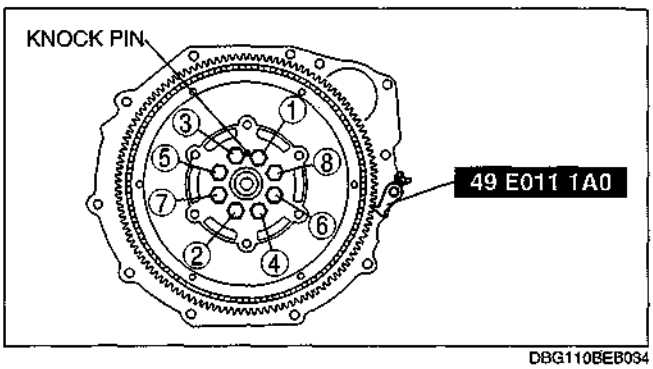
1. Remove the timing gear case using the separator tool.



DBG110BEB094

Dual-mass flywheel Disassembly Note

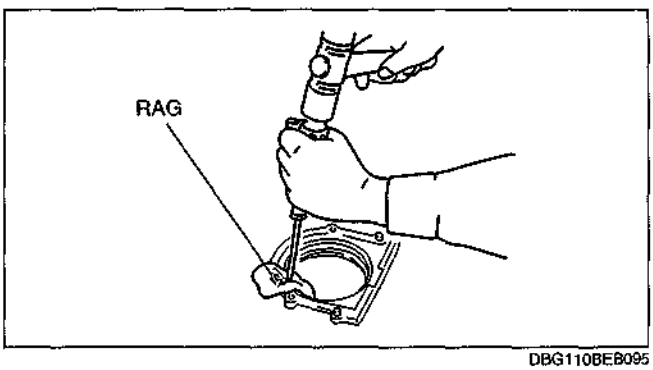
1. Remove the Dual-mass flywheel using the **SST**.



DBG110BEB034

Rear Cover Disassembly Note

1. Remove the oil seal using a screwdriver protected with a rag.

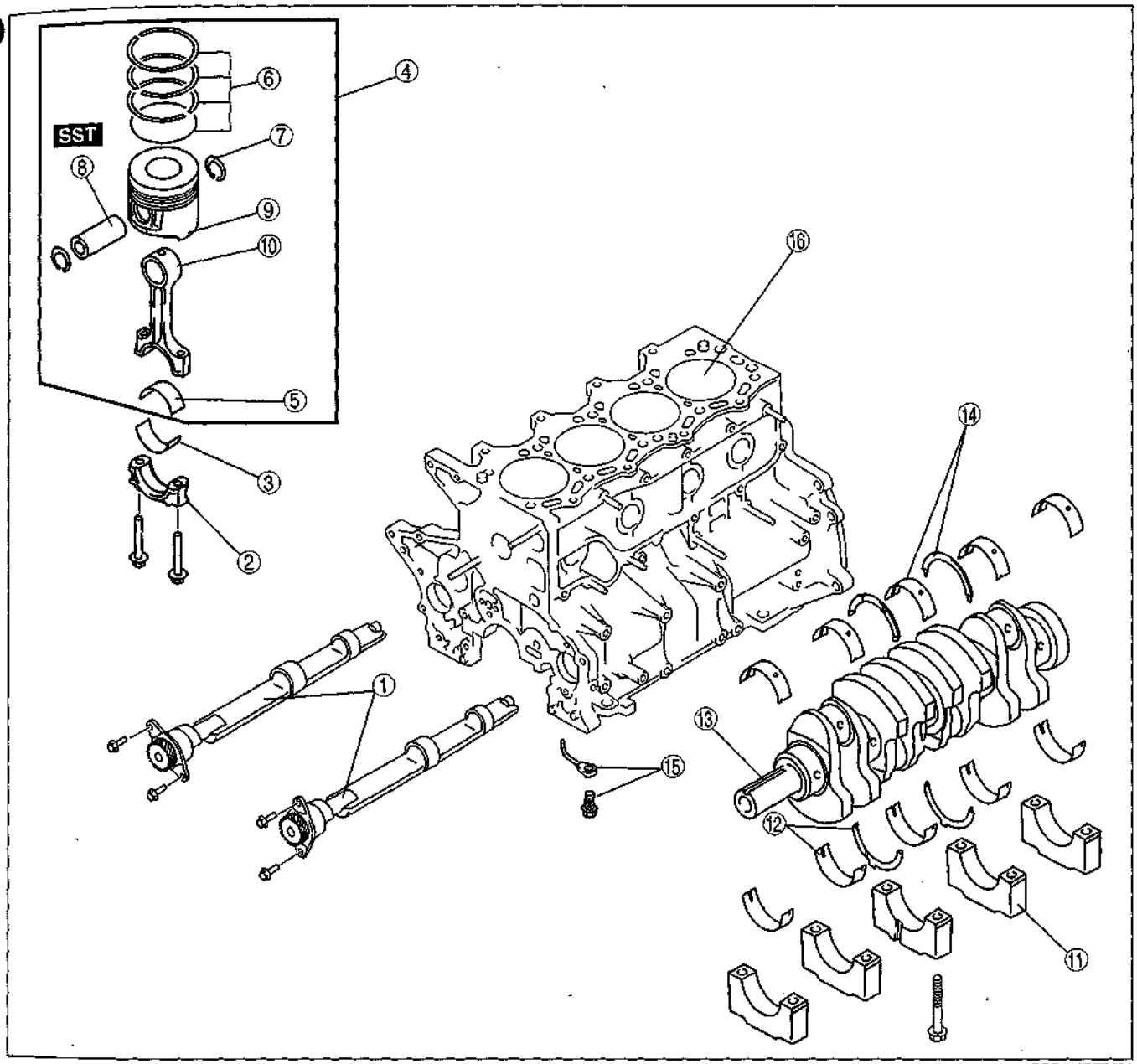


DBG110BEB095

CYLINDER BLOCK DISASSEMBLY (III) [WL-C, WE-C]

DCF011002000W23

1. Disassemble in the order shown in the figure.



DBG110BEB021

1	Balance shaft
2	Connecting rod cap (See 01–10B–16 Connecting Rod Cap Disassembly Note)
3	Lower connecting rod bearing
4	Piston, connecting rod (See 01–10B–16 Piston, Connecting Rod Disassembly Note)
5	Upper connecting rod bearing
6	Piston ring
7	Piston pin clip
8	Piston pin (See 01–10B–16 Piston Pin Disassembly Note)

9	Piston
10	Connecting rod
11	Main bearing cap (See 01–10B–16 Main Bearing Cap Disassembly Note)
12	Lower main bearing, lower thrust bearing
13	Crankshaft (See 01–10A–16 Crankshaft Disassembly Note)
14	Upper main bearing, upper thrust bearing
15	Oil jet valve, nozzle
16	Cylinder block

Connecting Rod Cap Disassembly Note

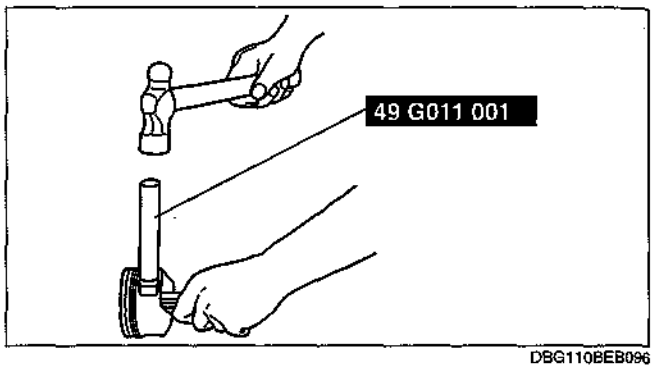
1. Before removing the connecting rod cap, inspect the connecting rod side clearance. (See 01–10B–29 CONNECTING ROD SIDE CLEARANCE INSPECTION [WL-C, WE-C].)

Piston, Connecting Rod Disassembly Note

1. Before removing the piston and connecting rod, inspect the connecting rod oil clearance. (See 01–10B–29 CONNECTING ROD OIL CLEARANCE INSPECTION/REPAIR [WL-C, WE-C].)
2. Inspect the oscillation torque. (See 01–10B–30 PISTON AND CONNECTING ROD INSPECTION [WL-C, WE-C].)

Piston Pin Disassembly Note

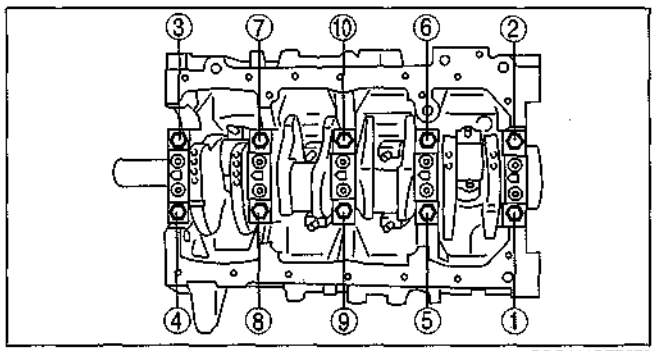
1. Remove the piston pin using the **SST**.



DBG110BEB096

Main Bearing Cap Disassembly Note

1. Before removing the main bearing cap, inspect the crankshaft end play. (See 01–10B–28 CRANKSHAFT END PLAY INSPECTION/REPAIR [WL-C, WE-C].)
2. Loosen the main bearing cap bolts in two or three steps in the order shown in the figure.



DBG110BEB079

Crankshaft Disassembly Note

1. Before removing the crankshaft, inspect the main journal oil clearance. (See 01–10B–28 CRANKSHAFT OIL CLEARANCE INSPECTION/REPAIR [WL-C, WE-C].)

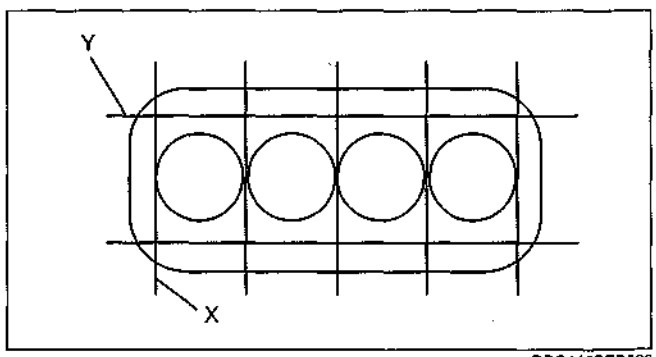
CYLINDER HEAD INSPECTION/REPAIR [WL-C, WE-C]

DCF011010100W02

1. Inspect the cylinder head surface for cracks. Replace the cylinder head if necessary.
2. Inspect for the following and repair or replace.
   (1) Sunken valve seats
   (2) Excessive camshaft oil clearance and end play
3. Measure the cylinder head for distortion in the seven directions as shown in the figure.

   Maximum cylinder head distortion
   X distortion: 0.02 mm {0.0008 in} max.
   Y distortion: 0.05 mm {0.0020 in} max.

4. If the cylinder head distortion exceeds the maximum, replace the cylinder head. Do not attempt to repair a cylinder head by milling or grinding.



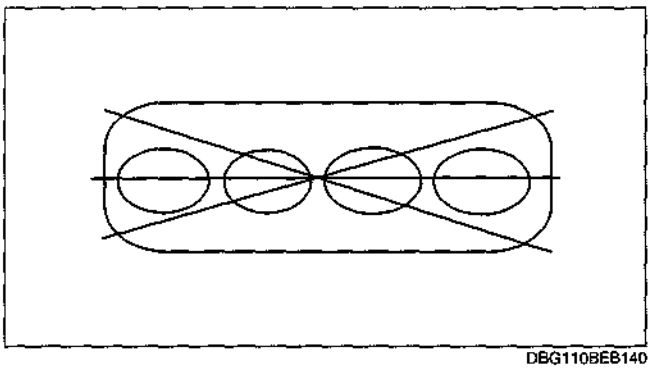
DBG110BEB080

5. Measure the manifold contact surface distortion as shown in the figure.

   Maximum manifold contact surface distortion
   0.05 mm {0.002 in} max.

6. If the distortion exceeds the maximum, grind the surface or replace the cylinder head.

   Maximum manifold contact surface grinding
   0.15 mm {0.0059 in} max.



DBG110BEB140

VALVE INSPECTION [WL-C, WE-C]

DCF011012111W04

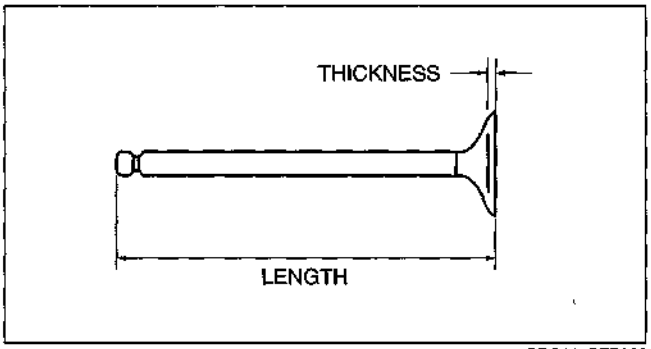
1. Measure the valve head margin thickness of each valve. Replace the valve if necessary.

   Standard valve margin thickness
   IN: 1.55—1.85 mm {0.061—0.072 in}
   EX: 1.80—2.10 mm {0.070—0.082 in}

2. Measure the length of each valve. Replace the valve if necessary.

   Standard valve length
   IN: 111.65—112.25 mm {4.394—4.413 in}
   EX: 111.6—112.2 mm {4.390—4.409 in}

   Minimum valve length
   IN: 111.50 mm {4.390 in}
   EX: 111.45 mm {4.388 in}

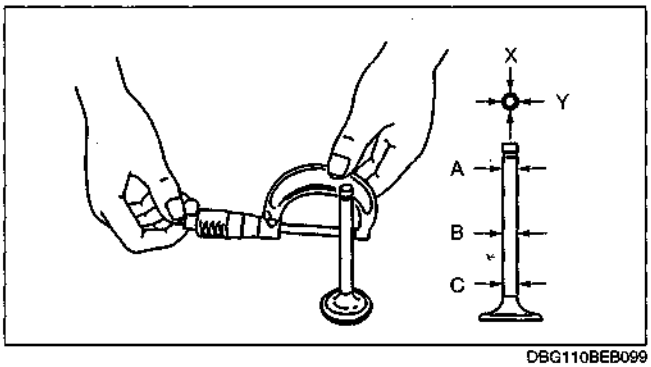


DBG110BEB098

3. Measure the stem diameter of each valve in the X and Y directions at the three points (A, B, and C) shown in the figure. Replace the valve if necessary.

   Standard valve stem diameter
   IN: 5.970—5.985 mm {0.2350—0.2356 in}
   EX: 5.965—5.980 mm {0.2348—0.2354 in}

   Minimum valve stem diameter
   IN: 5.920 mm {0.2330 in}
   EX: 5.915 mm {0.2328 in}



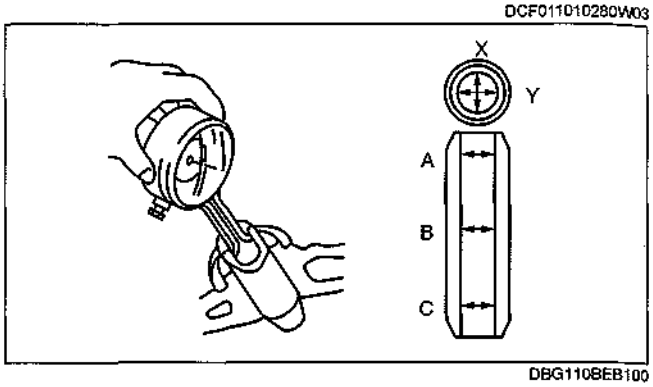
DBG110BEB099

VALVE GUIDE INSPECTION [WL-C, WE-C]

DCF011010280W03

1. Measure the inner diameter of each valve guide in the X and Y directions at the three points (A, B, and C) shown in the figure. Replace the valve guide if necessary.

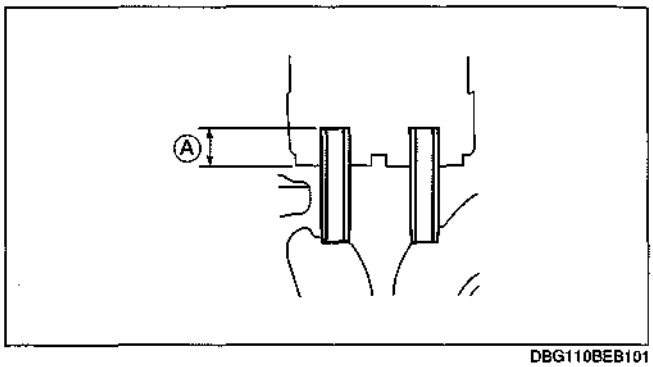
   Standard valve guide inner diameter
   6.025—6.045 mm {0.2372—0.2379 in}



DBG110BEB100

2. Measure the protrusion height (dimension A) of each valve guide without lower valve spring seat. Replace the valve guide if necessary.

   Standard valve guide height
   IN: 15.0—15.5 mm {0.59—0.61 in}
   EX: 17.0—17.5 mm {0.67—0.69 in}



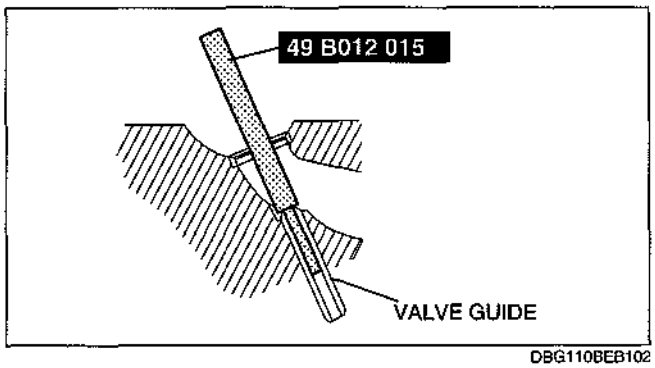
DBG110BEB101

VALVE GUIDE REPLACEMENT [WL-C, WE-C]

DCF011010280W04

Valve Guide Removal

- Remove the valve guide from the combustion chamber side using the **SST**.

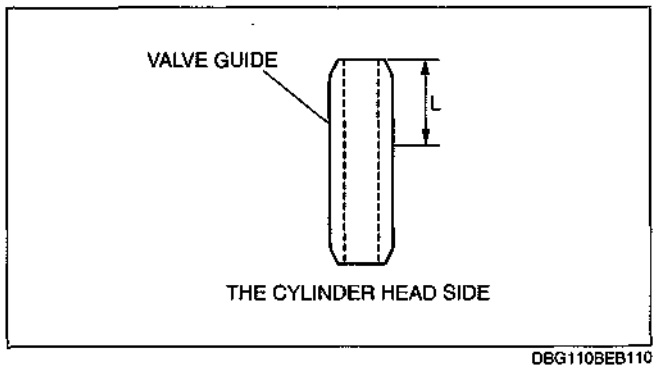


DBG110BEB102

Valve Guide Installation

1. Mark the dimension L position on the valve guide.

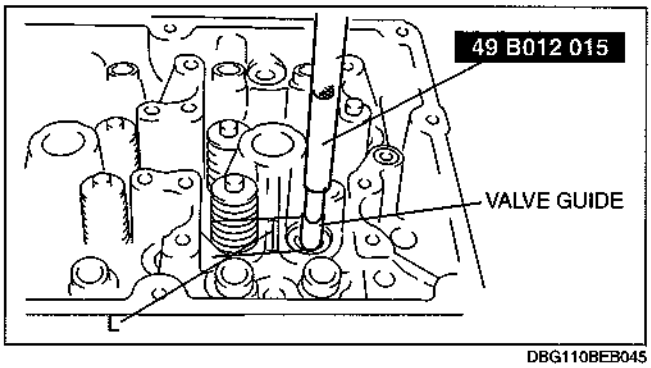
   Depth L
   IN: 15.0—15.5 mm {0.59—0.61 in}
   EX: 17.0—17.5 mm {0.67—0.68 in}



DBG110BEB110

2. When the valve guide nears the dimension L position while it is being tapped in, verify the dimension L position again with vernier calipers to prevent deviation in insertion.
3. Verify that the valve guide projection height is within the specification.

Standard valve guide height
IN: 15.0—15.5 mm {0.59—0.61 in}
EX: 17.0—17.5 mm {0.67—0.68 in}



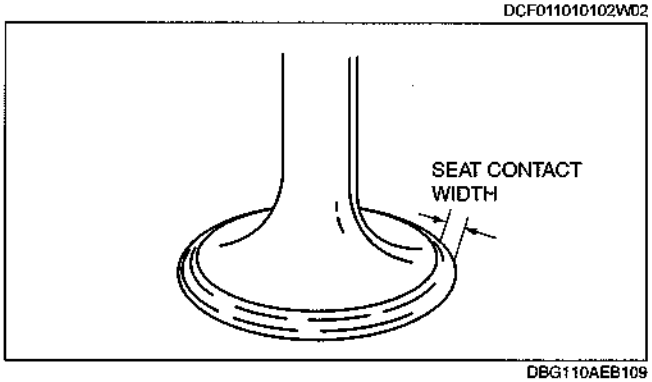
DBG110BEB045

VALVE SEAT INSPECTION/REPAIR [WL-C, WE-C]

1. Measure the seat contact width. If necessary, resurface the valve seat using a **45°** valve seat cutter and/or resurface the valve face.

Standard valve seat contact width
1.3—1.9 mm {0.052—0.074 in}

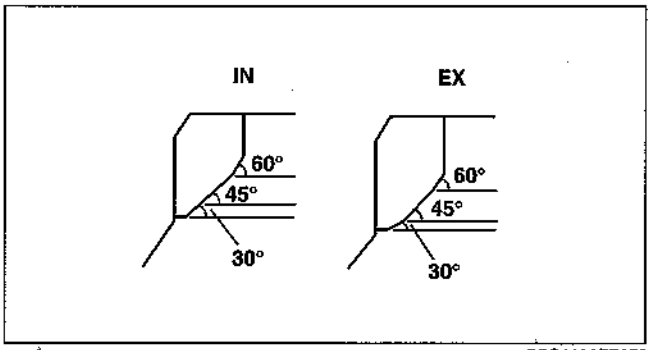
DCF011010102W02



DBG110AEB109

2. Verify that the valve seating position is at the center of the valve face.
   1. If the seating position is too high, correct the valve seat using a **60°** cutter, and then a **45°** cutter.
   2. If the seating position is too low, correct the valve seat using a **30°** cutter, and a **45°** cutter.

Valve seat angle
IN: 45°
EX: 45°

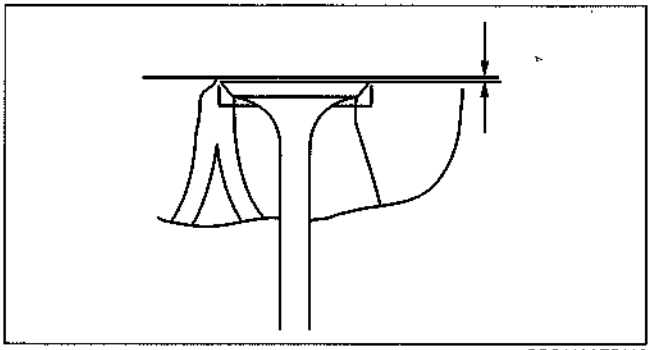


DBG110AEB078

3. Measure the receded amount from the cylinder head surface. If it exceeds the maximum, replace the cylinder head.

Standard valve recession
IN: 0.79—1.27 mm {0.039—0.050 in}
EX: 0.84—1.32 mm {0.033—0.051 in}

Maximum valve recession
IN: 1.68 mm {0.066 in}
EX: 1.73 mm {0.062 in}


DBG110AEB112

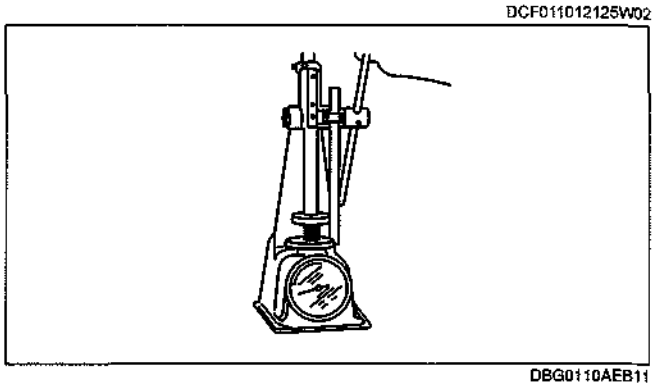
VALVE SPRING INSPECTION [WL-C, WE-C]

1. Apply a pressing force to the pressure spring and check the spring height. Replace the valve spring if necessary.

   Valve spring installation pressing force
   172.9—195.6 N {15.67—17.74 kgf, 34.48—39.02 lbf}

   Valve spring installation height
   39.0 mm {1.53 in}

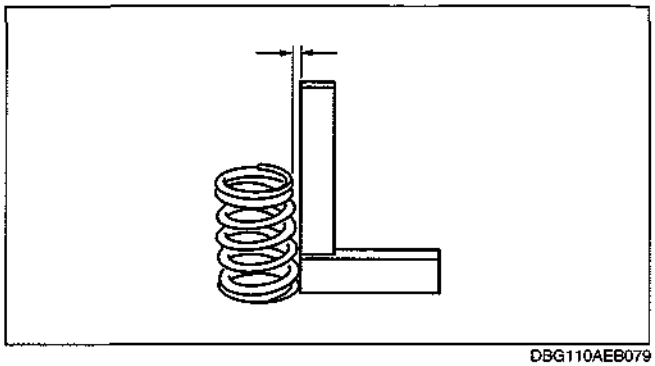
DCF011012125W02



DBG0110AEB11

2. Measure the amount the valve spring is out-of-square. Replace the valve spring if necessary.

   Maximum valve spring out-of-square
   2.0° (1.60mm {0.062 in})



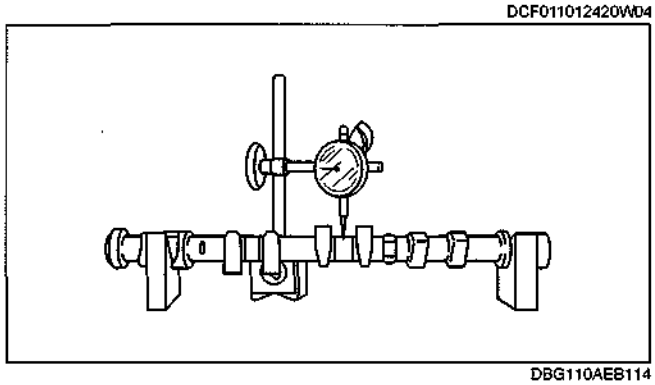
DBG110AEB079

CAMSHAFT INSPECTION [WL-C, WE-C]

1. Set the No.1 and No.5 journals on V-blocks. Measure the camshaft runout. Replace the camshaft if necessary.

   Maximum camshaft runout
   0.03 mm {0.001 In} max.

DCF011012420W04

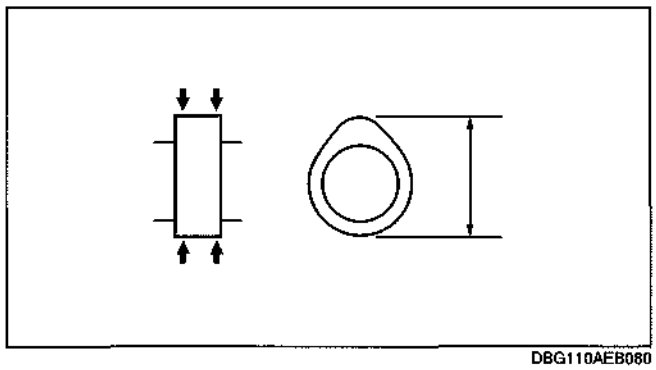


DBG110AEB114

2. Measure the cam lobe height at the two points as shown in the figure. Replace the camshaft if necessary.

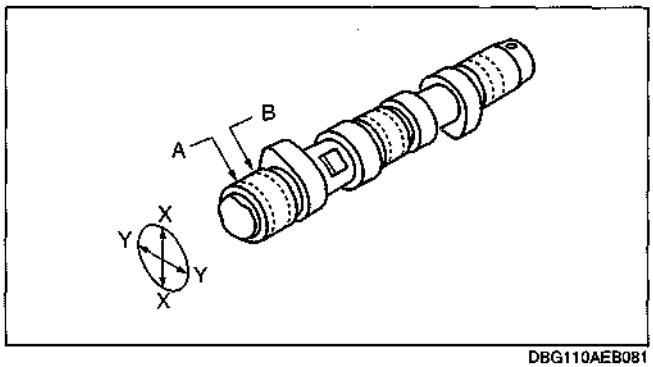
   Standard cam lobe height
   IN: 42.067—42.167 mm {1.6561—1.6601 In}
   EX: 41.949—42.049 mm {1.6515—1.6554 In}

   Minimum cam lobe height
   IN: 41.717 mm {1.6424 in}
   EX: 41.599 mm {1.6377 in}



DBG110AEB080

3. Measure the journal diameters in the X and Y directions at the two points (A and B) as shown in the figure. Replace the camshaft if necessary.



DBG110AEB081

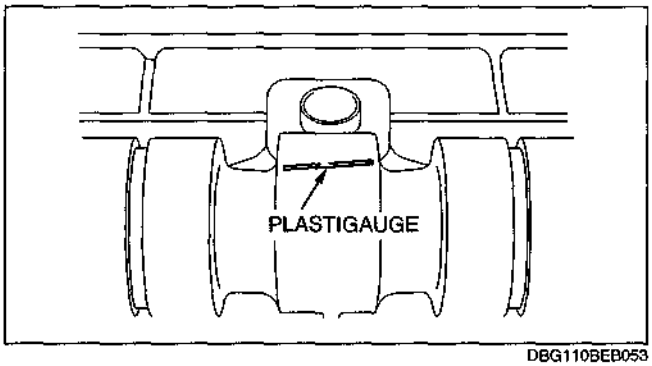
Standard cam journal diameter
No.1: 31.940—31.965 mm {1.2575—1.2582 in}
No.2—No.4: 25.910—25.935 mm {1.0201—1.0210 in}
No.5: 25.940—25.965 mm {1.0212—1.0222 In}

Minimum cam journal diameter
No.1: 31.890 mm {1.2555 in}
No.2—No.4: 25.860 mm {1.0181 in}
No.5: 25.890 mm {1.0193 in}

CAMSHAFT OIL CLEARANCE INSPECTION [WL-C, WE-C]

DCF011012420W05

1. Position a plastigage on top of the journals in the axial direction.
2. Install the camshaft cap. (See 01–10B–49 Camshaft Cap Upper Assembly Note.)
3. Remove the camshaft cap. (See 01–10B–7 Camshaft Cap Upper Disassembly Note.)
4. Measure the oil clearance. Replace the cylinder head if necessary.



DBG110BEB053

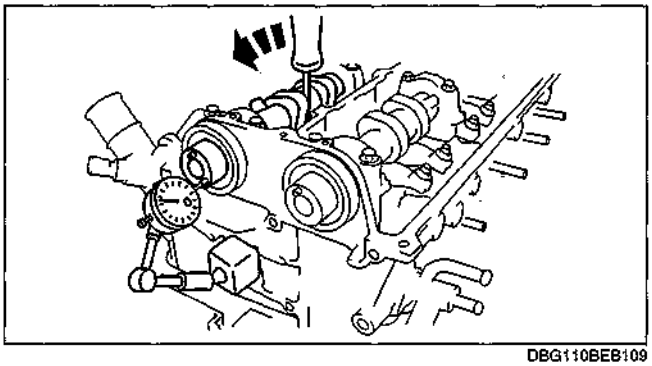
Standard camshaft clearance
No.1: 0.035—0.081 mm {0.0014—0.0031 in}
No.2—4: 0.065—0.111 mm {0.0026—0.0043 in}
No.5: 0.056—0.081 mm {0.0014—0.0031 in}

Maximum camshaft clearance
No.1: 0.12 mm {0.0047 In}
No.2—4: 0.15 mm {0.0059 in}
No.5: 0.16 mm {0.0063 in}

CAMSHAFT END PLAY INSPECTION [WL-C, WE-C]

DCF011012420W06

1. Install the camshaft cap. (See 01–10B–49 Camshaft Cap Upper Assembly Note.)
2. Measure the camshaft end play. Replace the cylinder head or camshaft if necessary.



DBG110BEB109

Standard camshaft end play
0.030—0.160 mm {0.0012—0.0062 in}

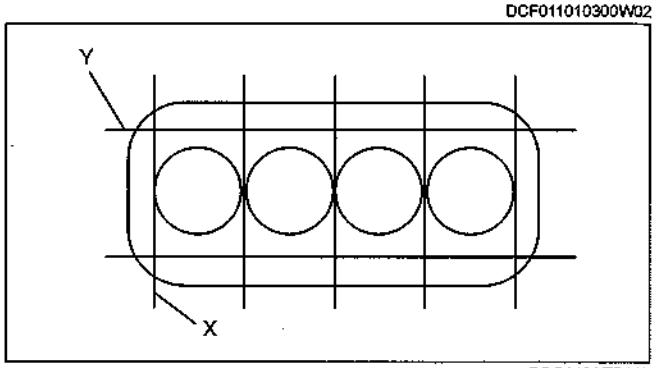
Maximum camshaft end play
0.20 mm {0.0078 in}

3. Remove the camshaft cap. (See 01–10B–7 Camshaft Cap Upper Disassembly Note.)

CYLINDER BLOCK INSPECTION/REPAIR [WL-C, WE-C]

DCF011010300W02

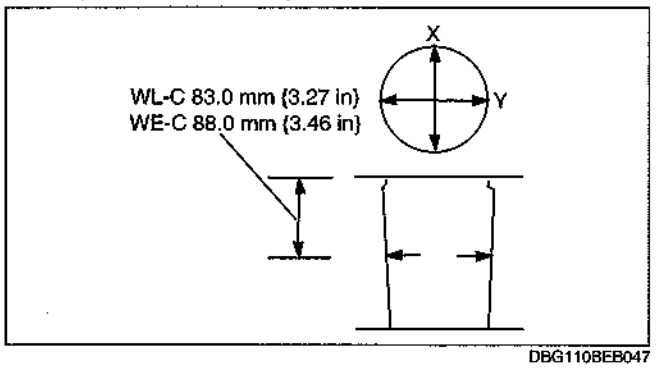
1. Measure the distortion of the cylinder block top surface in the seven directions as shown in the figure. Replace if necessary.



DBG110AEB115

Maximum cylinder block distortion
X direction: 0.02 mm {0.0008 in}
Y direction: 0.05 mm {0.002 in}

2. Measure the cylinder bore using the cylinder gauge. Measurement positions are in the X and Y directions at **83 mm {3.27 in}** (WL-C) or **88 mm {3.46 in}** (WE-C) below the top surface of the cylinder.
   - If the cylinder bore exceeds the wear limit, replace the cylinder block or rebore the cylinder and install the oversized pistons so that the specified piston-to-cylinder clearance is obtained.



DBG1108EB047

Note
- Base the boring diameter on the diameter of an oversized piston. All cylinders must be the same diameter.

Cylinder bore size [WL-C]
Standard: 93.000—93.022 mm {3.6615—3.6622 in}
0.25 {0.01} oversize: 93.250—93.272 mm {3.6713—3.6721 in}
0.50 {0.02} oversize: 93.500—93.522 mm {3.6811—3.6819 in}

Cylinder bore size [WE-C]
Standard: 96.000—96.022 mm {3.6615—3.6622 in}
0.25 {0.01} oversize: 96.250—96.272 mm {3.7893—3.7902 in}
0.50 {0.02} oversize: 96.500—96.522 mm {3.7992—3.8000 in}

Cylinder bore wear limit
0.15 mm {0.0059 in}

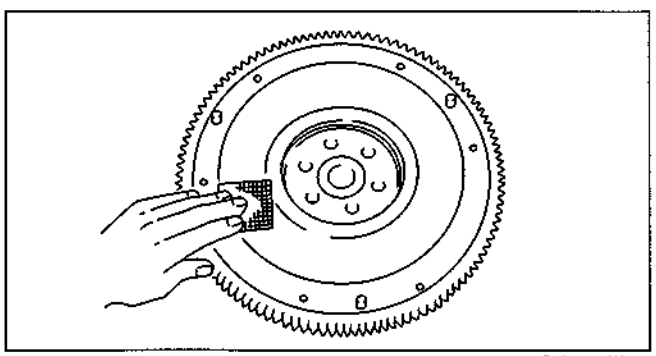
DUAL-MASS FLYWHEEL INSPECTION [WL-C, WE-C]

DCF011011500W01

Caution
- **Do not rework the flywheel if it is distorted.**
- **Do not clean the dual mass flywheel with any kind of fluid. Clean the flywheel with a dry cloth only.**
- **Do not clean the gap between the primary and secondary mass. Only clean the bolt connection surface and the clutch surface.**

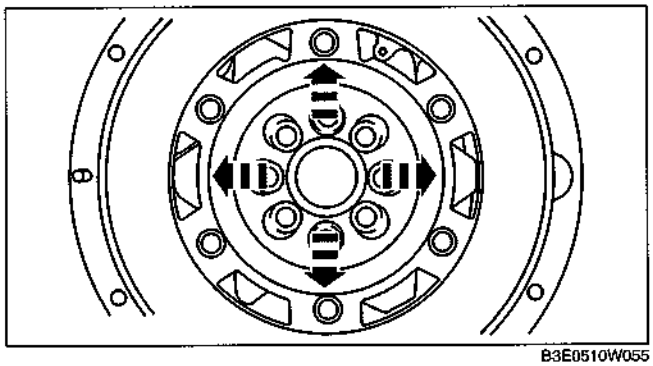
Note
- Correct slight scratches and discoloration using sandpaper.
- Inspect the runout of the surface that contacts the clutch disc with the flywheel installed to the crankshaft.

1. Inspect the flywheel.
   — Cracks
   — Worn ring gear teeth
   — Chipped or cracked ring gear teeth
   — Surface that contacts the clutch disc for scratches, nicks, and discoloration.
   - If there is any malfunction, replace the flywheel.



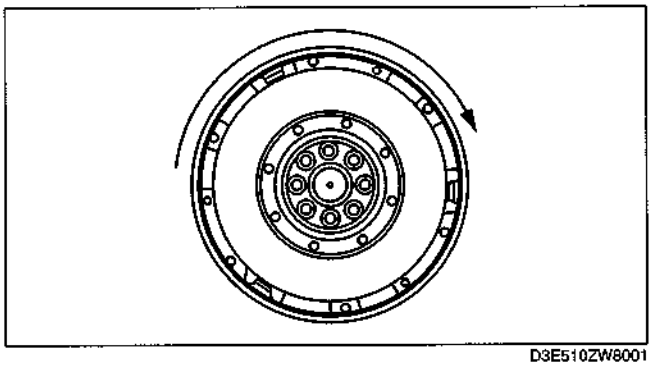
C3U0510W004

2. Verify that the center of the flywheel does not move.
   (1) Rotate the flywheel or attempt to move it up and down, and left and right to verify that the center of the flywheel does not move.
      - If there is any movement as indicated by the arrows in the figure, replace the flywheel with a new one.



B3E0510W055

3. Verify that the secondary mass rotates by 15 teeth or more.
   - If it rotates by 15 teeth or more, replace the dual-mass flywheel.

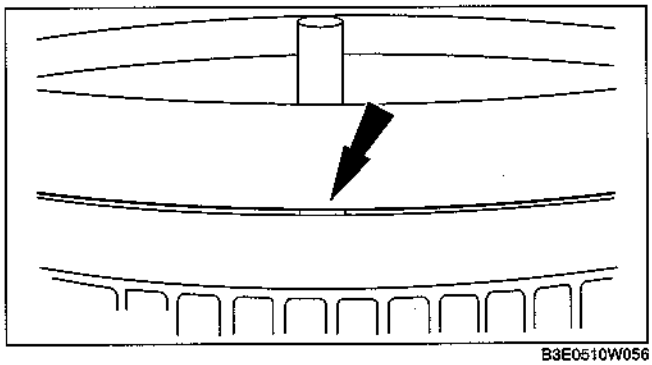


D3E510ZW8001

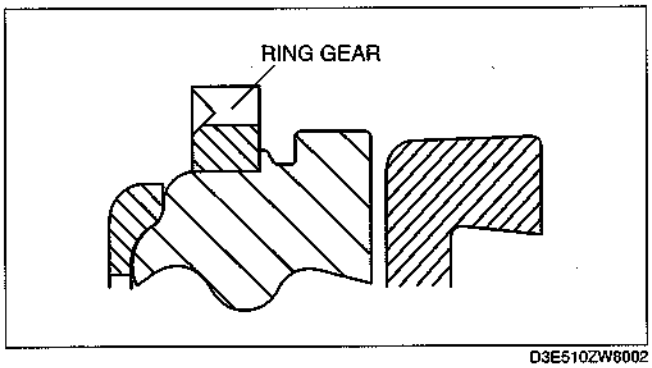
4. Inspect for locating dowels touching the primary mass of the flywheel.

   Caution
   - **Make sure that the three locating dowels are installed.**

   - If the locating dowels are touching the primary mass of the flywheel, replace the flywheel with a new one.
5. Visually inspect the secondary mass.
   - If there is any damage, replace the dual-mass flywheel.
6. Visually inspect the ring gear on the dual-mass flywheel.
   - If there is any damage, replace the dual-mass flywheel.

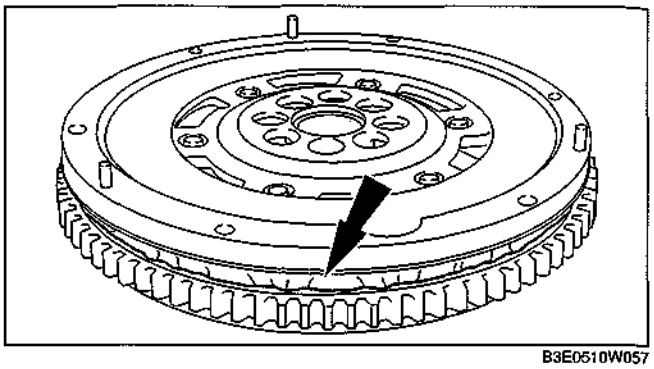


B3E0510W056



D3E510ZW8002

7. Inspect the welded area of the dual-mass flywheel for grease leakage.
   - If there is grease leakage, replace the dual-mass flywheel.

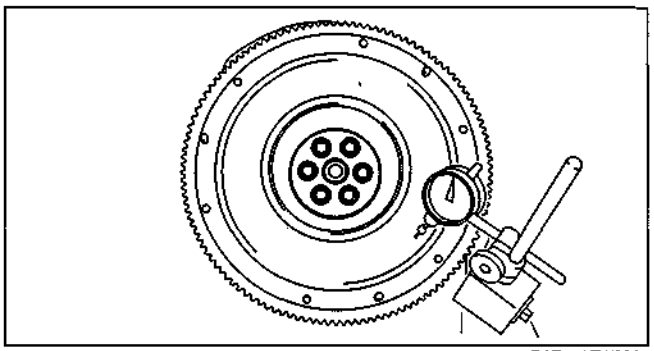


B3E0510W057

8. Inspect the dual-mass flywheel runout.

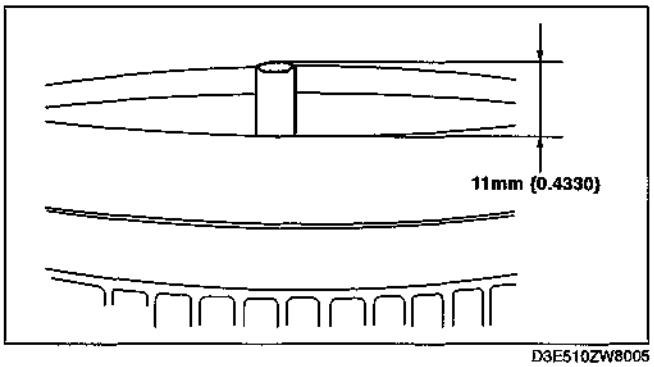
   Flywheel maximum runout
   1.5 mm {0.059 in}

   - If it is more than the maximum specification, replace the dual-mass flywheel.



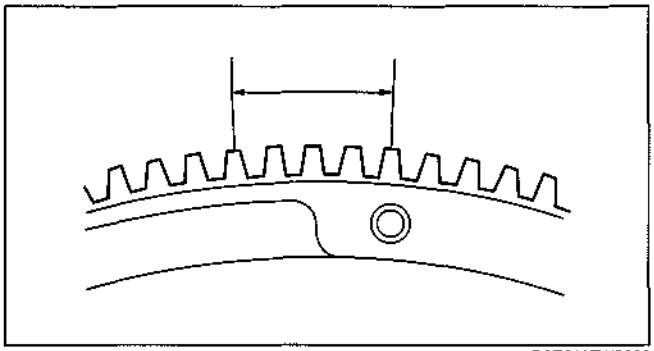
D3E510ZW8007

9. Inspect the dual-mass flywheel for the amount of guide pin projection.
   - If not within the specification, replace the dual-mass flywheel.



D3E510ZW8005

10. Rotate the secondary mass left and right and verify that it rotates within a range of five teeth without resistance.
    - If there is any malfunction, replace the dual-mass flywheel.
11. Inspect the dual-mass flywheel for cracks.
    - If there are cracks, replace the dual-mass flywheel.



D3E510ZW8006

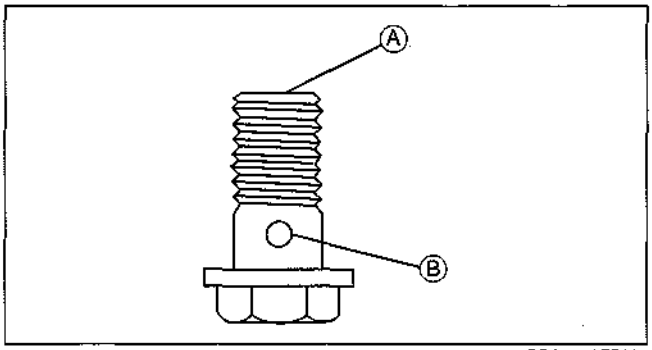
OIL JET VALVE, NOZZLE INSPECTION [WL-C, WE-C]

DCF011010730W02

1. Apply compressed air to oil jet valve A and verify that air passes through oil jet valve B. If not, replace the oil jet valve.

Oil jet air pressure
137.6—196.4 kPa {1.4—2.0 kgf/cm^2, 20—28 psi}

2. Check the oil jet nozzle for clogs. Replace the nozzle if necessary.



DBG110AEB085

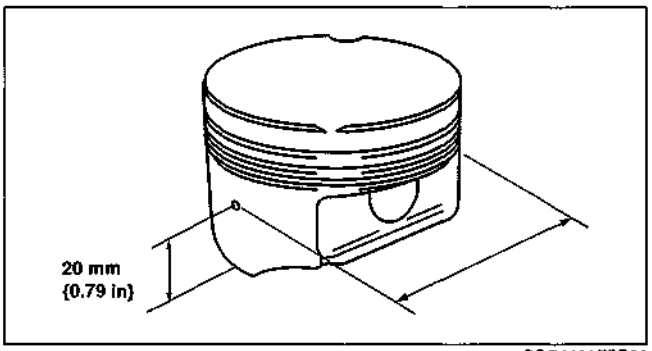
PISTON INSPECTION [WL-C, WE-C]

DCF011011010W06

1. Measure the outer diameter of each piston at right angle (**90°**) to the piston pin, **20 mm {0.79 in}** below the oil ring land lower edge.

Piston diameter [WL-C]
Standard: 92.918—92.944 mm {3.6582—3.6592 in}
0.25 {0.010} oversize: 93.153—93.179 mm {3.6675—3.6684 in}
0.50 {0.020} oversize: 93.403—93.429 mm {3.6773—3.6782 in}

Piston diameter [WE-C]
Standard: 95.918—95.944 mm {3.7763—3.7773 in}
0.25 {0.010} oversize: 96.153—96.179 mm {3.7856—3.7865 in}
0.50 {0.020} oversize: 96.403—96.429 mm {3.7954—3.7964 in}



DBG110AEBR86

PISTON CLEARANCE INSPECTION/REPAIR [WL-C, WE-C]

DCF011011010W07

1. Measure the piston-to-cylinder clearance. Replace the piston or rebore the cylinders to fit the oversized piston if necessary.

Standard piston clearance
0.071—0.089 mm {0.0015—0.0022 in}

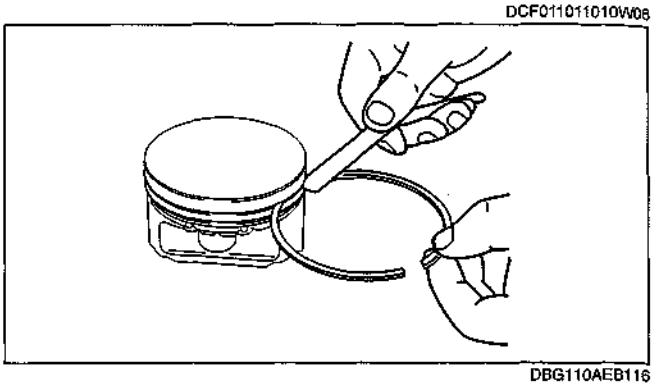
Maximum piston clearance
0.15 mm {0.0059 in}

2. If the piston is replaced, the piston rings must also be replaced.

PISTON RING CLEARANCE INSPECTION [WL-C, WE-C]

DCF011011010W08

1. Measure the piston ring-to-ring land clearance around the entire circumference. Replace the piston and piston ring if necessary.



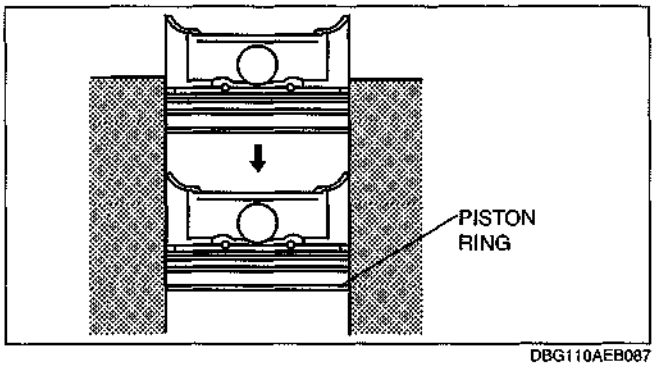
DBG110AEB116

Standard piston ring clearance [WL-C]
Top: 0.06—0.10 mm {0.0024—0.0039 in}
Second: 0.04—0.08 mm {0.0016—0.0031 in}
Oil: 0.02—0.06 mm {0.0012—0.0023 in}

Standard piston ring clearance [WE-C]
Top: 0.06—0.10 mm {0.0024—0.0039 in}
Second: 0.04—0.08 mm {0.0016—0.0031 in}
Oil: 0.02—0.06 mm {0.0008—0.0023 in}

Maximum piston ring clearance
0.15 mm {0.0059 in}

2. Insert the piston ring into the cylinder by hand and use the piston to push it to the bottom of the ring travel.
3. Measure each piston ring end gap with a feeler gauge. Replace the piston ring, if necessary.



DBG110AEB087

Standard piston ring end gap [WL-C]
Top: 0.22—0.32 mm {0.0087—0.0125 in}
Second: 0.49—0.64 mm {0.0193—0.0251 in}
Oil: 0.22—0.52 mm {0.0087—0.0204 in}

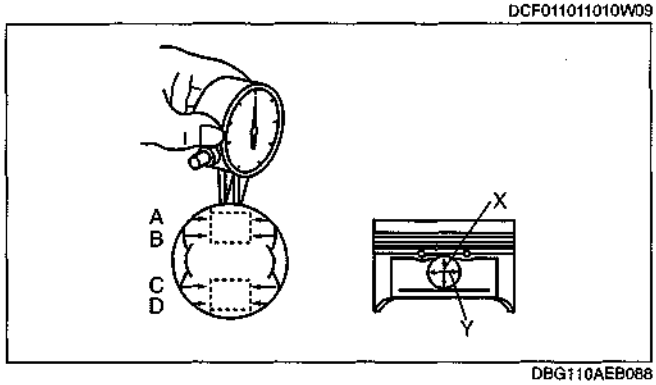
Standard piston ring end gap [WE-C]
Top: 0.23—0.33 mm {0.0091—0.0129 in}
Second: 0.50—0.65 mm {0.0197—0.0255 in}
Oil: 0.22—0.52 mm {0.0087—0.0204 in}

Maximum piston ring end gap
1.0 mm {0.039 in}

PISTON PIN CLEARANCE INSPECTION [WL-C, WE-C]

DCF011011010W09

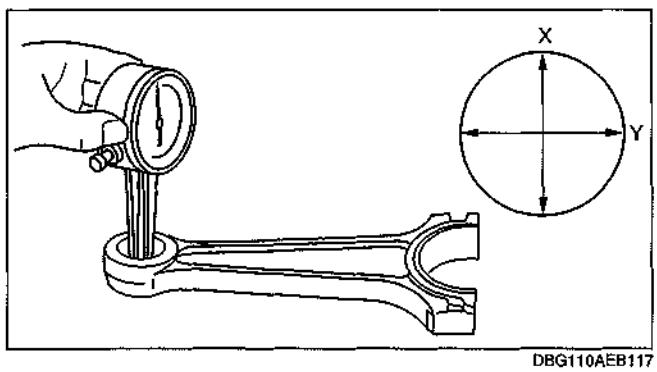
1. Measure each piston pin bore diameter in the X and Y directions at the four points (A, B, C, and D) as shown in the figure.



DBG110AEB088

Standard piston pin bore diameter
33.997—34.007 mm {1.3384—1.3388 in}

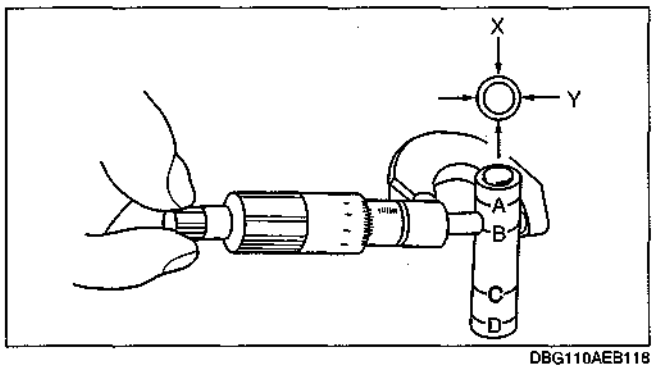
2. Measure each connecting rod small end inner diameter in the X and Y directions as shown in the figure.



DBG110AEB117

Standard connecting rod small end inner diameter
34.012—34.033 mm {1.3391—1.3398 in}

3. Measure each piston pin diameter in the X and Y directions at the four points (A, B, C and D) as shown in the figure.



DBG110AEB118

Standard piston pin diameter
33.994—34.000 mm {1.3384—1.3385 in}

4. Calculate the piston pin-to-piston pin bore clearance. Replace the piston and/or piston pin if necessary.

Standard piston pin-to-piston pin bore clearance
–0.003—0.013 mm {–0.0001—0.0005 in}

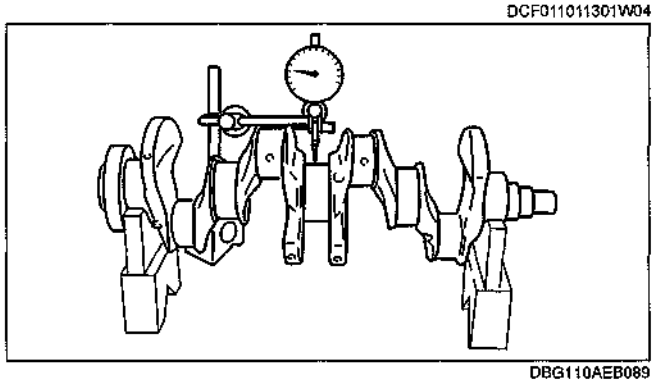
5. Calculate the connecting rod small end-to-piston pin clearance. Replace the connecting rod or piston pin.

Standard connecting rod small end-to-piston pin clearance
0.012—0.039 mm {0.00048—0.0015 in}

CRANKSHAFT INSPECTION [WL-C, WE-C]

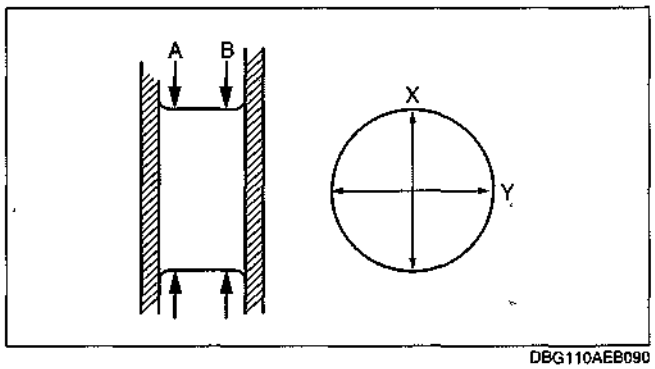
1. Measure the crankshaft runout. Replace the crankshaft if necessary.

DCF011011301W04


DBG110AEB089

Maximum crankshaft runout
0.05 mm {0.002 in}

2. Measure the journal diameter in the X and Y directions at the two points (A and B) as shown in the figure. Replace the crankshaft or grind the journal and install the undersize bearing if necessary.



DBG110AEB090

Main journal diameter [No.1,2,4,5]
Standard: 66.937—66.955 mm {2.6354—2.6360 in}
0.25 {0.010} undersize: 66.687—66.705 mm {2.6255—2.6261 in}
0.50 {0.020} undersize: 66.437—66.455 mm {2.6157—2.6163 in}
0.75 {0.030} undersize: 66.187—66.205 mm {2.6058—2.6064 in}

Main journal diameter [No.3]
Standard: 66.920—66.938 mm {2.6347—2.6353 in}
0.25 {0.010} undersize: 66.670—66.688 mm {2.6367—2.6373 in}
0.50 {0.020} undersize: 66.420—66.438 mm {2.6150—2.6156 in}
0.75 {0.030} undersize: 66.170—66.188 mm {2.6052—2.6058 in}

Main journal wear limit
0.05 mm {0.002 in}

Main journal out-of-round
0.03 mm {0.001 in}

Crank pin diameter [WL-C]
Standard: 54.940—54.955 mm {2.1630—2.1635 in}
0.25 {0.010} undersize: 54.690—54.705 mm {2.1532—2.1537 In}
0.50 {0.020} undersize: 54.440—54.455 mm {2.1434—2.1438 in}
0.75 {0.030} undersize: 54.190—54.205 mm {2.1335—2.1340 In}

Crank pin diameter [WE-C]
Standard: 56.940—56.955 mm {2.2417—2.2423 in}
0.25 {0.010} undersize: 56.690—56.705 mm {2.2318—2.2324 In}
0.50 {0.020} undersize: 56.440—56.455 mm {2.2220—2.2226 in}
0.75 {0.030} undersize: 56.190—56.205 mm {2.2122—2.2128 in}

Crank pin wear limit
0.05 mm {0.0020 In}

Crank pin out-of-round
0.03 mm {0.0012 In}

CRANKSHAFT OIL CLEARANCE INSPECTION/REPAIR [WL-C, WE-C]

DCF011011301W05

1. Position a plastigage on top of the journals in the axial direction.
2. Install the main bearing cap. (See 01–10B–35 Main Bearing Cap Assembly Note.)
3. Remove the main bearing cap. (See 01–10B–16 Main Bearing Cap Disassembly Note.)
4. Measure the main journal oil clearance. If the clearance exceeds the maximum, replace the main bearing or grind the main journal and install the undersize bearings so that the specified oil clearance is obtained.

Standard main journal clearance
No.1, 2, 4, 5: 0.027—0.045 mm {0.0010—0.0017 in}
No.3: 0.044—0.062 mm {0.0017—0.0024 in}

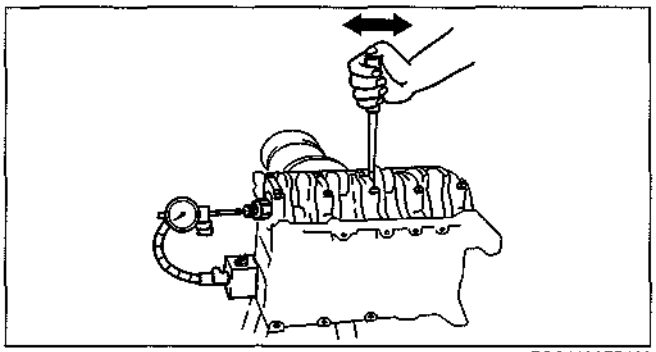
Maximum main journal clearance
0.08 mm {0.003 in}

Main bearing thickness
Standard: 2.006—2.021 mm {0.0789—0.0794 In}
0.25 {0.010} undersize: 2.124—2.134 mm {0.0836—0.0838 In}
0.50 {0.020} undersize: 2.249—2.259 mm {0.0885—0.0888 In}
0.75 {0.030} undersize: 2.374—2.384 mm {0.0934—0.0937 In}

CRANKSHAFT END PLAY INSPECTION/REPAIR [WL-C, WE-C]

DCF011011301W06

1. Install the main bearing cap. (See 01–10B–35 Main Bearing Cap Assembly Note.)
2. Measure the crankshaft end play. If the end play exceeds the maximum, replace the thrust bearing or grind the crankshaft and install an oversized bearing so that the specified end play is obtained.



DBG110AEB120

Standard crankshaft end play
0.040—0.282 mm {0.0016—0.0111 in}

Maximum crankshaft end play
0.3 mm {0.01 in}

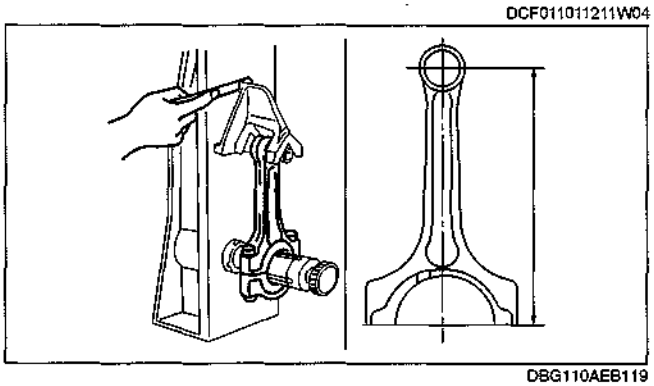
Thrust bearing thickness
Standard: 2.455—2.505 mm {0.0967—0.986 In}
0.35 {0.010} oversize: 2.630—2.680 mm {0.1036—0.1055 in}

3. Remove the main bearing cap. (See 01–10B–16 Main Bearing Cap Disassembly Note.)

CONNECTING ROD INSPECTION [WL-C, WE-C]

DCF011011211W04

1. Measure each connecting rod for bending and distortion. Replace the connecting rod if necessary.



DBG110AEB119

Connecting rod bending
0.075 mm {0.0030 in} max./50 mm {1.968 in}

Connecting rod distortion
0.18 mm {0.0070 in} max./50 mm {1.968 in}

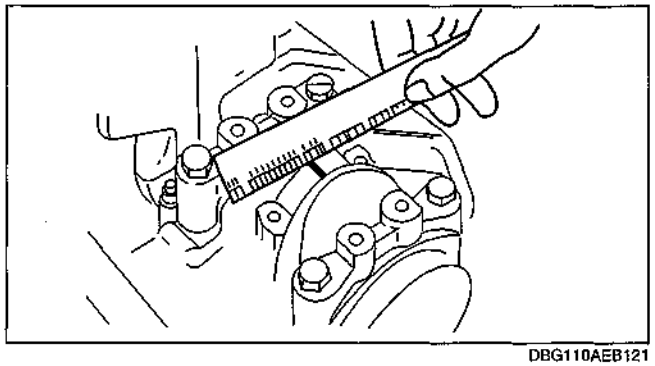
Connecting rod center-to-center distance [WL-C]
162.96—163.04 mm {6.416—6.418 in}

Connecting rod center-to-center distance [WE-C]
157.96—158.04 mm {6.219—6.222 in}

CONNECTING ROD OIL CLEARANCE INSPECTION/REPAIR [WL-C, WE-C]

DCF011011211W05

1. Position a plastigage on top of the journals in the axial direction.
2. Install the connecting rod cap. (See 01–10B–36 Piston, Connecting Rod Assembly Note.)
3. Remove the connecting rod cap.
4. Measure the crankpin oil clearance. If the clearance exceeds the maximum, replace the connecting rod bearing or grind the crankpin and use undersized bearings so that the specified clearance is obtained.



DBG110AEB121

Standard connecting rod oil clearance
0.025—0.052 mm {0.0009—0.0020 in}

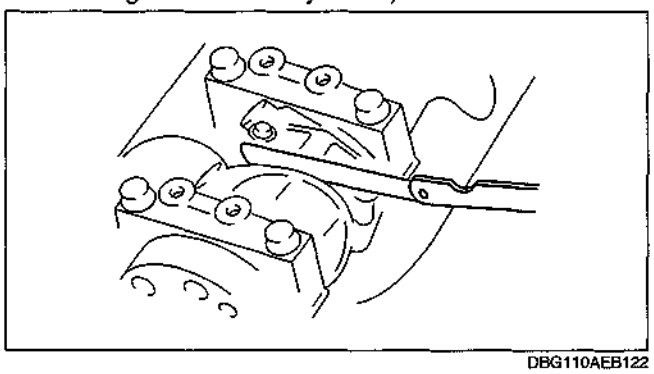
Maximum connecting rod oil clearance
0.08 mm {0.003 in}

Connecting rod bearing thickness
Standard: 1.507—1.516 mm {0.0592—0.0595 in}
0.25 {0.010} undersize: 1.624—1.634 mm {0.0638—0.0642 In}
0.50 {0.020} undersize: 1.749—1.759 mm {0.0687—0.0691 In}
0.75 {0.030} undersize: 1.874—1.884 mm {0.0737—0.0740 In}

CONNECTING ROD SIDE CLEARANCE INSPECTION [WL-C, WE-C]

DCF011011211W06

1. Install the connecting rod cap. (See 01–10B–36 Piston, Connecting Rod Assembly Note.)
2. Measure the connecting rod large end side clearance. Replace the connecting rod and cap if necessary.



DBG110AEB122

Standard connecting rod side clearance
0.110—0.262 mm {0.0043—0.0103 In}

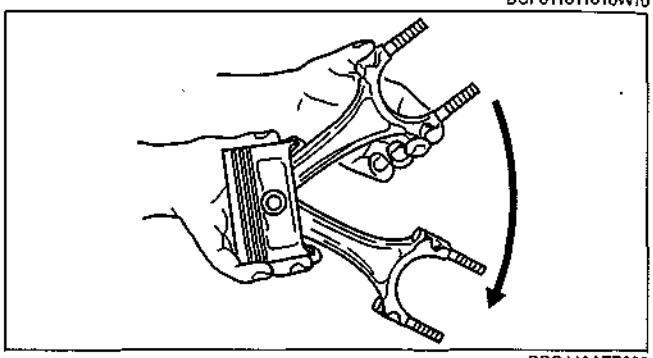
Maximum connecting rod side clearance
0.35 mm {0.014 in}

3. Remove the connecting rod cap.

PISTON AND CONNECTING ROD INSPECTION [WL-C, WE-C]

DCF011011010W10

- Check the oscillation torque as shown. If the large end does not drop by its own weight, replace the piston or the piston pin.



DBG110AEB093

BALANCE SHAFT INSPECTION [WL-C, WE-C]

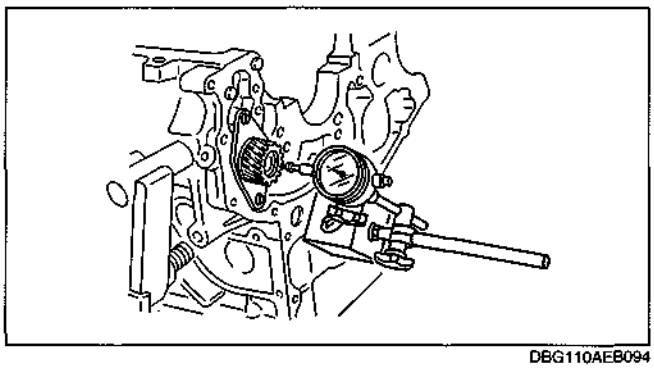
DCF011010300W03

1. Install the balance shaft and tighten the thrust plate fitting bolt.

   Tightening torque
   7.85—10.8 N·m {80—110 kgf·m, 70—95 in·lbf}

2. Measure the balance shaft end play. Replace the balance shaft and/or cylinder block if necessary.

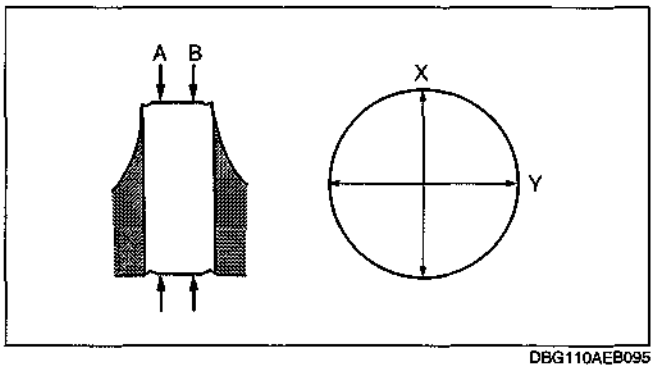
   Balance shaft Standard end play
   0.04—0.16 mm {0.002—0.006 in}



DBG110AEB094

3. Measure the journal diameters in the X and Y directions at the two points (A and B) as shown in the figure. Replace the balance shaft if necessary.

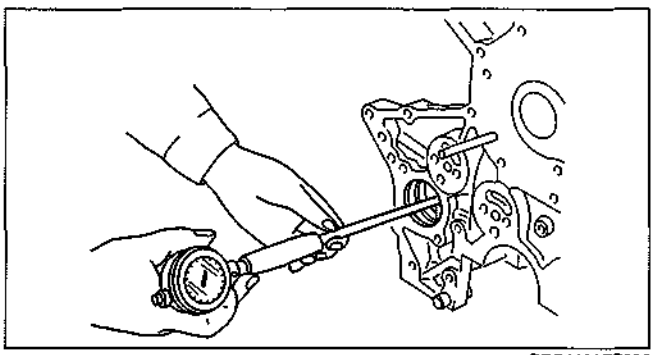
   Standard diameter
   Front: 41.945—41.960 mm {1.6514—1.6519 in}
   Center: 39.945—39.960 mm {1.5727—1.5732 in}
   Rear: 37.975—37.990 mm {1.4951—1.4956 in}



DBG110AEB095

4. Measure the balance shaft bore in the cylinder block. Calculate the balance shaft-to-balance shaft bore clearance. Replace the balance shaft and/or cylinder block if necessary.

   Standard clearance
   Front, rear: 0.050—0.115 mm {0.0020—0.0045 in}
   Center: 0.080—0.145 mm {0.0032—0.0057 in}

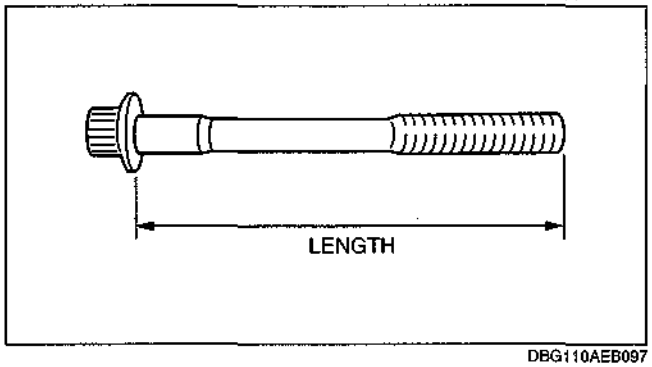


DBG110AEB096

BOLT INSPECTION [WL-C, WE-C]

DCF011010135W02

- Measure the length of each bolt. Replace the bolt if necessary.



DBG110AEB097

Cylinder head bolt length
Bolt head mark W
Standard length: 101.2—101.8 mm {3.985—4.007 in}
Maximum length: 102.5 mm {4.035 in}
Bolt head mark N
Standard length: 113.2—113.8 mm {4.457—4.480 in}
Maximum length: 114.5 mm {4.508 in}
Bolt head mark I
Standard length: 149.0—150.0 mm {5.866—5.905 in}
Maximum length: 150.5 mm {5.925 in}

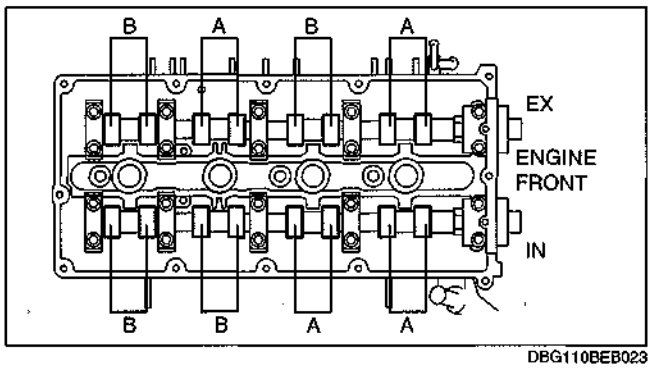
Main bearing cap bolt length
Standard length: 84.7—85.3 mm {3.34—3.35 in}
Maximum length: 86.0 mm {3.39 in}

Connecting rod cap bolt length
Standard length: 55.45—56.05 mm {2.19—2.20 in}
Maximum length: 56.75 mm {2.23 in}

VALVE CLEARANCE INSPECTION [WL-C, WE-C]

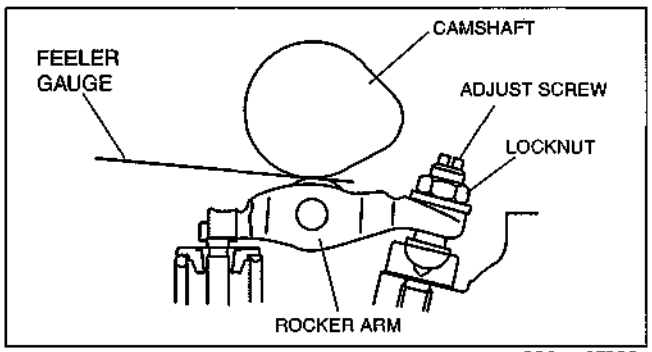
DCF011012111W05

1. Remove the cylinder head cover.
2. Turn the crankshaft and align the timing mark so that the piston of the No. 1 or No. 4 cylinders is at TDC of compression.
3. Measure valve clearances A with the No.1 cylinder at TDC of compression, and those of B with the No.4 cylinder at TDC of compression.
   - If it is not within the specification, adjust and recheck the valve clearance. (See 01–10B–32 VALVE CLEARANCE ADJUSTMENT [WL-C, WE-C].)



DBG110BEB023

Valve clearance [Engine cold]
IN: 0.10—0.16 mm {0.0040—0.0062 in}
EX: 0.17—0.23 mm {0.0067—0.0090 in}



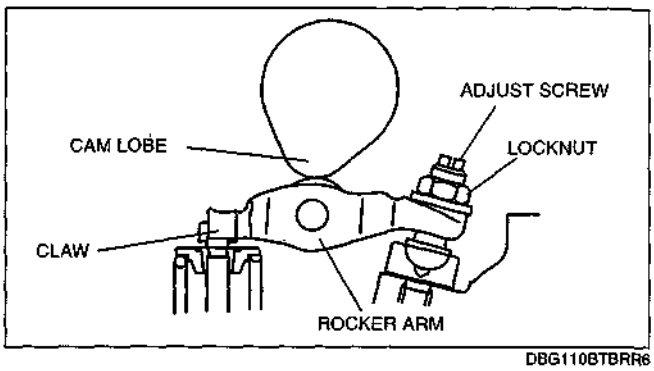
DBG110BTBRR5

4. Turn the crankshaft one full turn and measure the remaining valve clearances. Adjust if necessary.
5. Install the cylinder head cover.

VALVE CLEARANCE ADJUSTMENT [WL-C, WE-C]

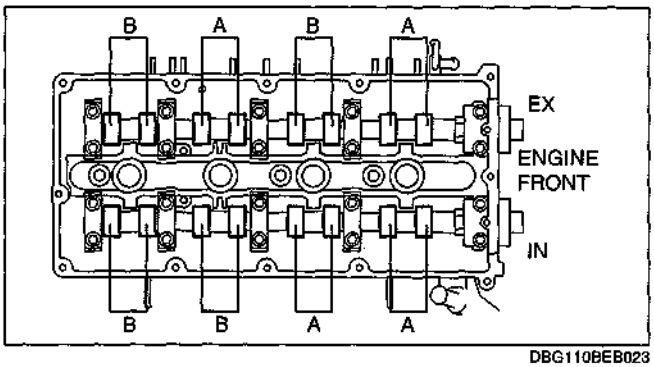
DCF011012111W06

Caution
- **Loosening the locknut and the adjust screw while the cam lobe is not pressing down the rocker arm will damage the claw of the rocker arm. When loosening the locknut and the adjust screw, rotate the crankshaft clockwise and be sure that the cam lobe presses down the rocker arm firmly as shown in the figure.**



DBG110BTBRR6

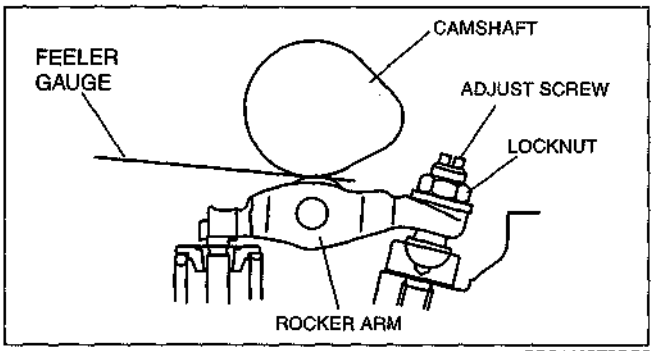
1. Remove the cylinder head cover.
2. Turn the crankshaft and align the timing mark so that the piston of the No. 1 or No. 4 cylinders is at TDC of compression.
3. Adjust the valve clearances A with the No.1 cylinder at TDC of compression, and those of B with the No.4 cylinder at TDC of compression.



DBG110BEB023

Valve clearance [Engine cold]
IN: 0.10—0.16 mm {0.0040—0.0062 In}
EX: 0.17—0.23 mm {0.0067—0.0090 in}

Tightening torque (lock nut)
20—24 N·m {2.1—2.4 kgf·m, 15—17 ft·lbf}



DBG110BTBRR5

4. Turn the crankshaft one full turn and measure the remaining valve clearances. Adjust if necessary.
5. Install the cylinder head cover.

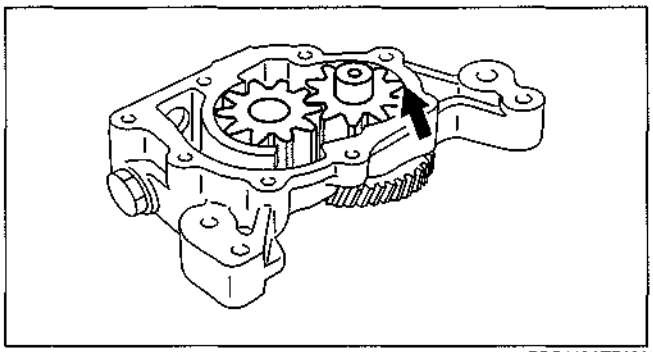
GEAR CLEARANCE INSPECTION [WL-C, WE-C]

DCF011019220W02

1. Measure the following clearance.
   - If it exceeds the maximum specification, replace the gear and/or pump body.

Standard oil pump tip clearance
0.10—0.19 mm {0.0040—0.0074 in}

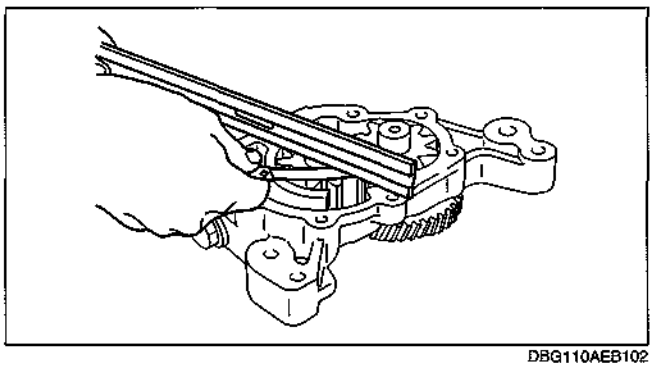
Maximum oil pump tip clearance
0.20 mm {0.008 in}



DBG110AEB101

Standard oil pump side clearance
0.04—0.09 mm {0.0016—0.0035 in}

Maximum oil pump side clearance
0.15 mm {0.0059 in}



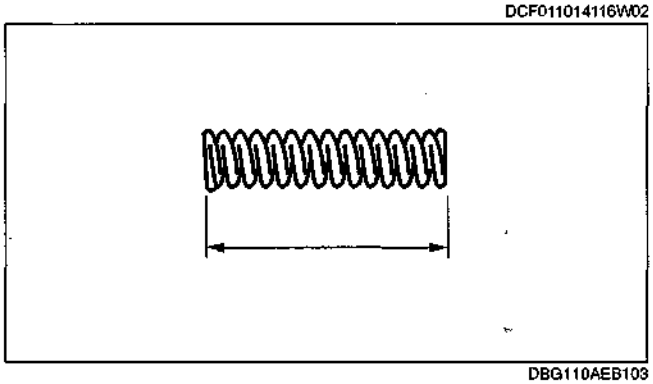
DBG110AEB102

PLUNGER SPRING INSPECTION [WL-C, WE-C]

DCF011014116W02

1. Apply pressing force to the pressure spring and check the spring height. Replace the plunger spring if necessary.

Standard plunger spring length
43.8 mm {1.72 in}

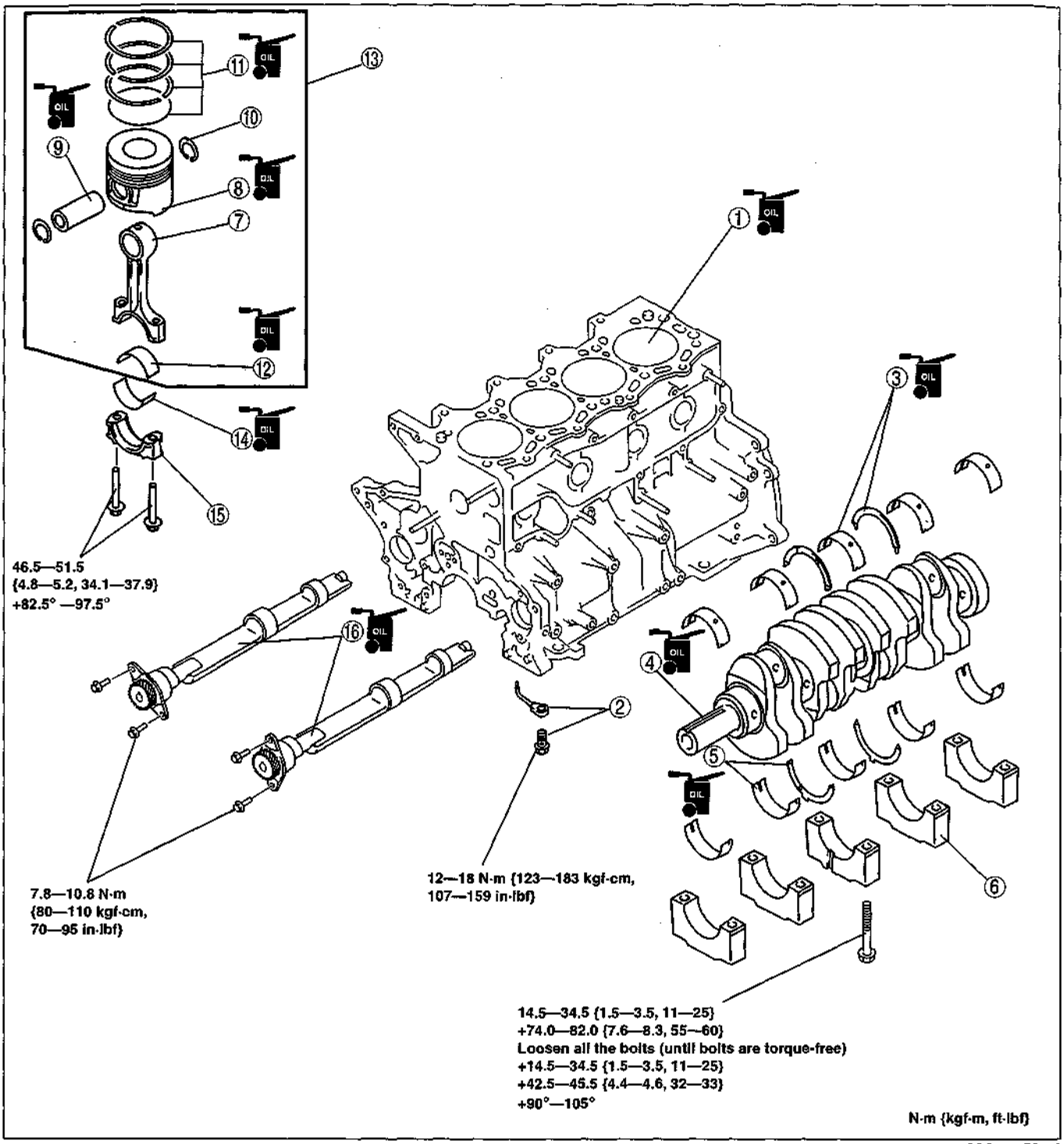


DBG110AEB103

CYLINDER BLOCK ASSEMBLY (I) [WL-C, WE-C]

DCF011002000W24

1. Assemble in the order indicated in the table.



DBG110BEB052

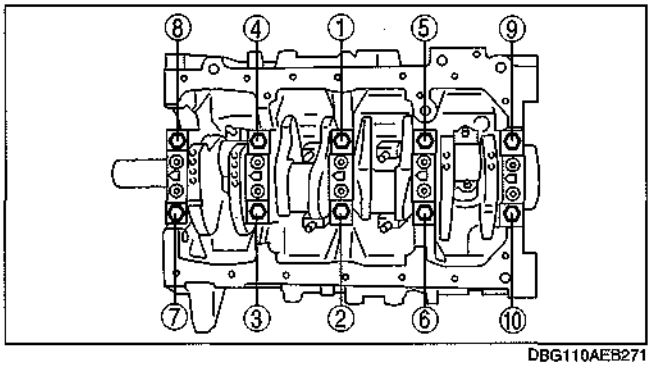
1	Cylinder block
2	Oil jet valve, nozzle
3	Upper main bearing, upper thrust bearing
4	Crankshaft
5	Lower main bearing, lower thrust bearing
6	Main bearing cap (See01–10B–35 Main Bearing Cap Assembly Note.)
7	Connecting rod (See01–10B–35 Piston, Connecting Rod, Piston Pin Assembly Note.)

8	Piston (See01–10B–35 Piston, Connecting Rod, Piston Pin Assembly Note.)
9	Piston pin (See01–10B–35 Piston, Connecting Rod, Piston Pin Assembly Note.)
10	Piston pin clip
11	Piston ring (See01–10B–36 Piston Ring Assembly Note.)
12	Upper connecting rod bearing

13	Piston, connecting rod (See01–10B–36 Piston, Connecting Rod Assembly Note.)
14	Lower connecting rod bearing
15	Connecting rod cap
16	Balance shaft

Main Bearing Cap Assembly Note

1. Apply clean engine oil to the bolt threads and seat faces of the lower cylinder block bolts.
2. Tighten the bolts in two or three steps in the order shown in the figure.

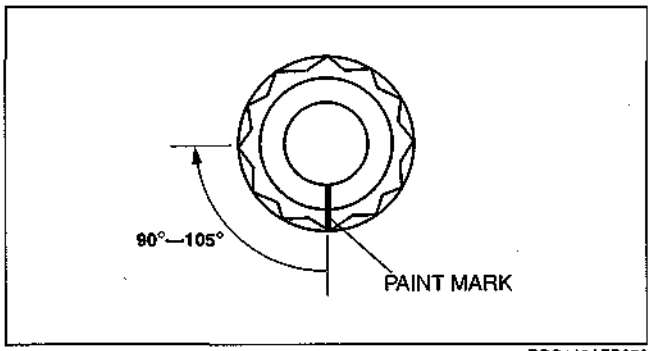


DBG110AEB271

Tightening procedure

(1) 14.5—34.5 N·m {1.5—3.5 kgf·m, 11—25 ft·lbf}
(2) 74.0—82.0 N·m {7.6—8.3 kgf·m, 55—60 ft·lbf}
(3) Loosen all the bolts (until bolts are torque-free).
(4) 14.5—34.5 N·m {1.5—3.5 kgf·m, 11—25 ft·lbf}
(5) 42.5—45.5 N·m {4.4—4.6 kgf·m, 32—33 ft·lbf}

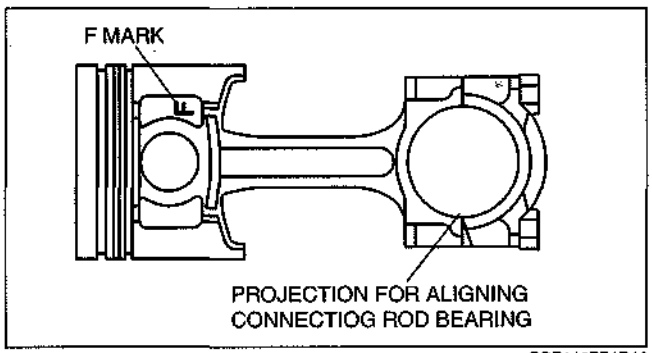
3. Put a paint mark on each bolt head.
4. Using the marks as a reference, tighten the bolts by turning each **90°—105°** as in Step 2.



DBG110AEB072

Piston, Connecting Rod, Piston Pin Assembly Note

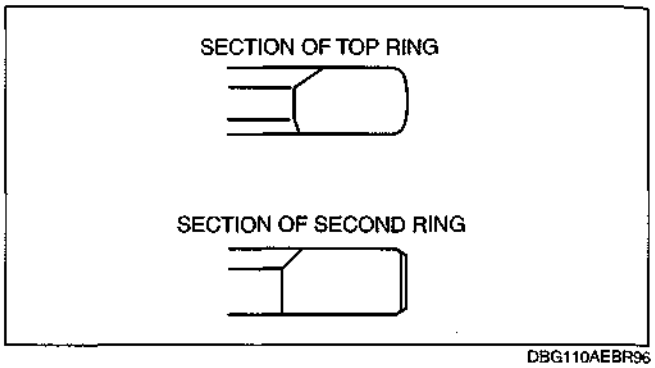
1. Install one piston pin clip.
2. Assemble the piston and connecting rod in the direction indicated in the figure.
3. Apply clean engine oil to the piston pin.
4. Install the piston pin until the pin contacts the clip as shown. If the pin cannot be installed easily, heat the piston.



DPE110ZE1R18

Piston Ring Assembly Note

1. Install the oil ring.
2. Install the second ring with R mark side upward.
3. Install the top ring with tapered face side upward.



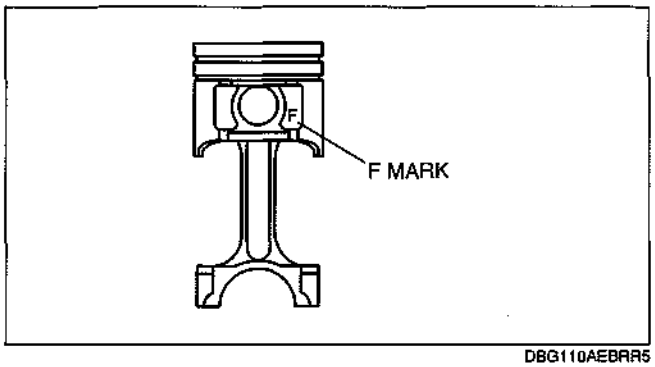
DBG110AEBR96

Piston, Connecting Rod Assembly Note

1. Insert the piston and connecting rod assembly into the cylinder with the F mark facing the front of the engine.
2. Tighten the connecting rod cap bolts in two or three steps.

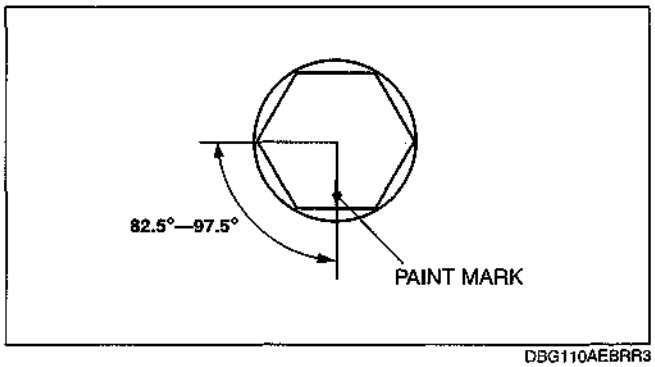
   Tightening torque
   46.5—51.5 N·m {4.8—5.2 kgf·m, 34.3—37.9 ft·lbf}

3. Put a paint mark on each bolt.



DBG110AEBRR5

4. Using the marks as a reference, tighten the bolts by turning each **82.5°—97.5°**

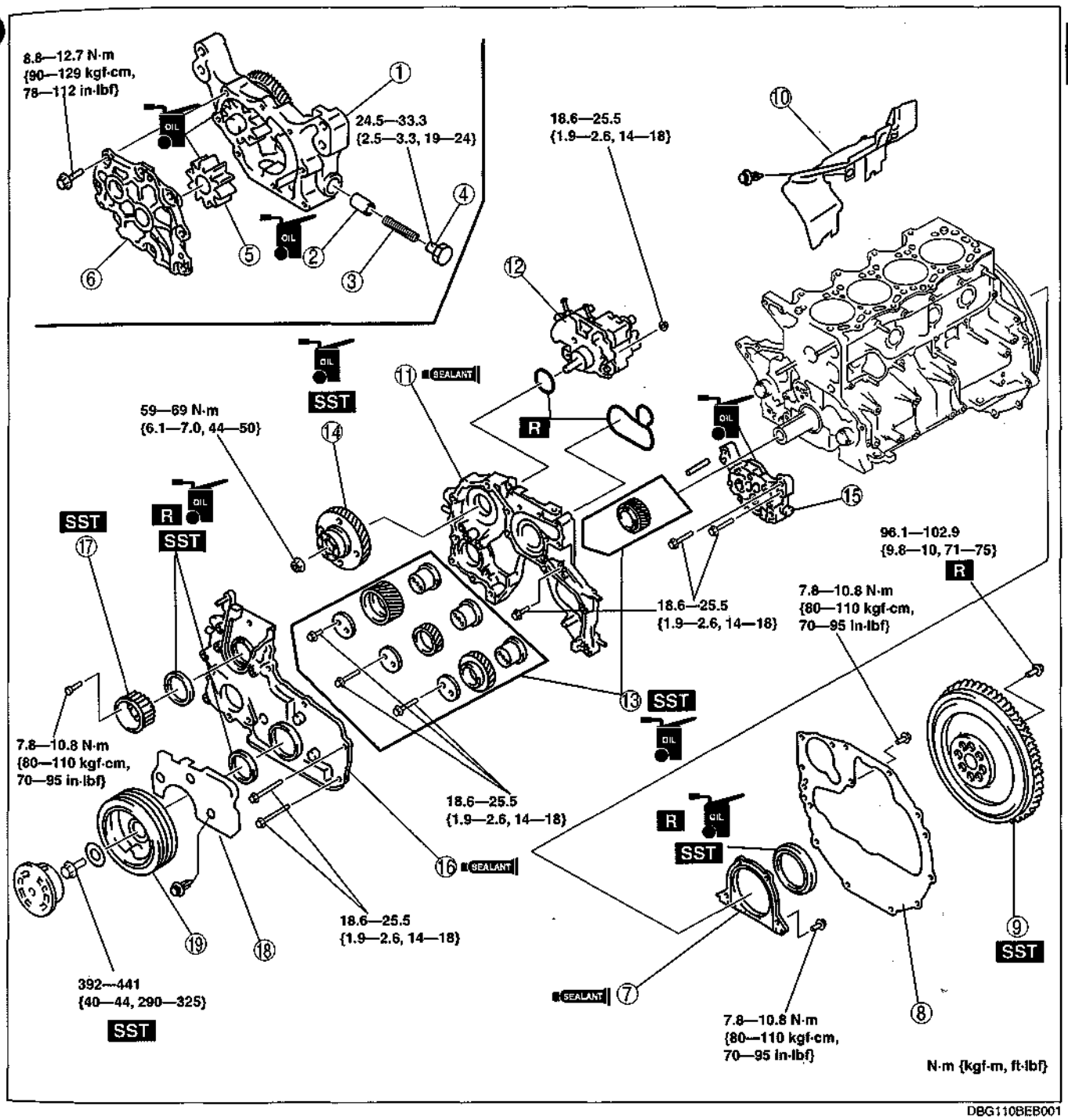


DBG110AEBRR3

CYLINDER BLOCK ASSEMBLY (II) [WL-C, WE-C]

DCF011002000W25

1. Assemble in the order indicated in the table.



DBG110BEB001

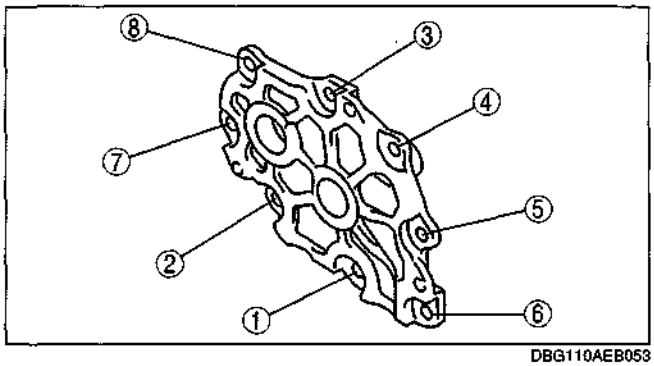
1	Oil pump body
2	Control plunger
3	Plunger spring
4	Plug
5	Driven gear
6	Oil pump cover (See01–10B–38 Oil Pump Cover Assembly Note.)
7	Rear cover (See01–10B–38 Rear Cover, End Plate Assembly Note.)

8	End plate (See01–10B–38 Rear Cover, End Plate Assembly Note.)
9	Dual-mass flywheel (See01–10B–39 Dual-mass Flywheel Assembly Note.)
10	Seal plate
11	Timing gear case (See01–10B–39 Timing Gear Case Assembly Note.)
12	Supply pump

13	Timing gear (See01–10B–40 Timing Gear, Supply Pump Gear Assembly Note.)
14	Supply pump gear (See01–10B–40 Timing Gear, Supply Pump Gear Assembly Note.)
15	Oil pump
16	Timing gear cover (See01–10B–42 Timing Gear Cover Assembly Note.)
17	Supply pump pulley (See01–10B–42 Supply Pump Pulley Assembly Note.)
18	Seal plate
19	Crankshaft pulley (See01–10B–43 Crankshaft Pulley Assembly Note.)

Oil Pump Cover Assembly Note

1. Tighten the bolts in two or three steps in the order shown in the figure.

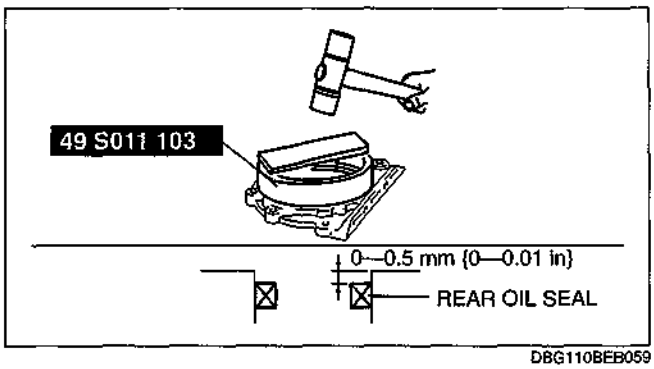


DBG110AEB053

Rear Cover, End Plate Assembly Note

1. Apply soapy water along the perimeter of the new oil seal.
2. Push the oil seal slightly in by hand.
3. Tap the oil seal in evenly using the **SST** and a hammer
4. To ensure that the oil seal is installed correctly, measure the distance between the end of the rear cover and the face of the oil seal.

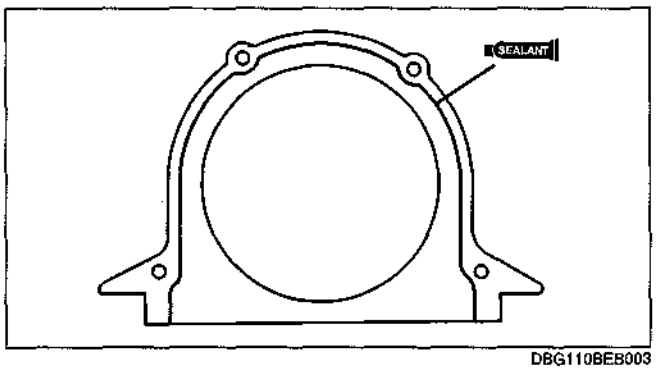
   Rear oil seal press-in amount
   0—0.5 mm {0—0.01 in}



DBG110BEB059

5. Apply silicone sealant to the rear cover as shown.

   Thickness
   ϕ2.0—3.0 mm {0.07—0.12 in}

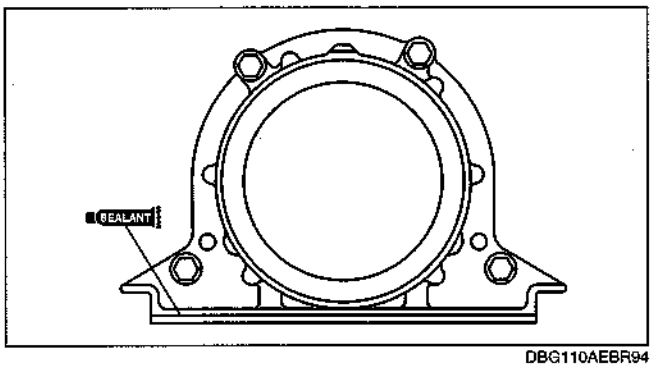


DBG110BEB003

6. Apply silicone sealant to the rear cover as shown in the figure.

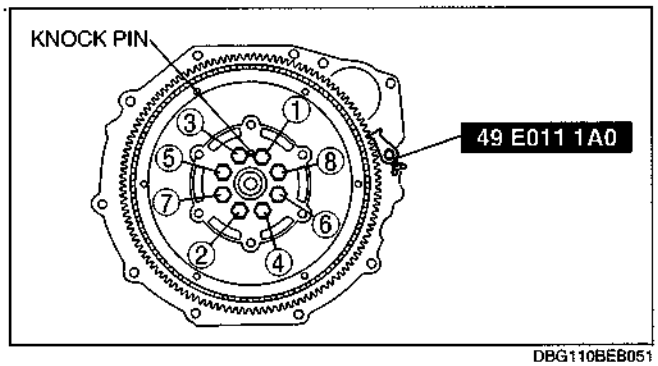
Thickness
ϕ2.0—3.0 mm {0.07—0.12 in}

7. Install the end plate.



DBG110AEBR94

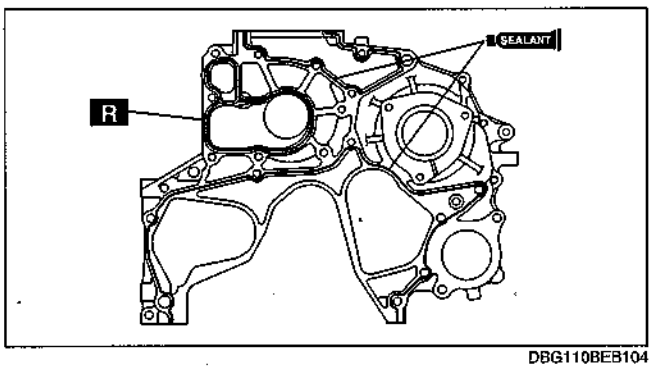
Dual-mass Flywheel Assembly Note
1. Hold the crankshaft using the **SST**.
2. Tighten the bolts in the order shown in the figure.



DBG110BEB051

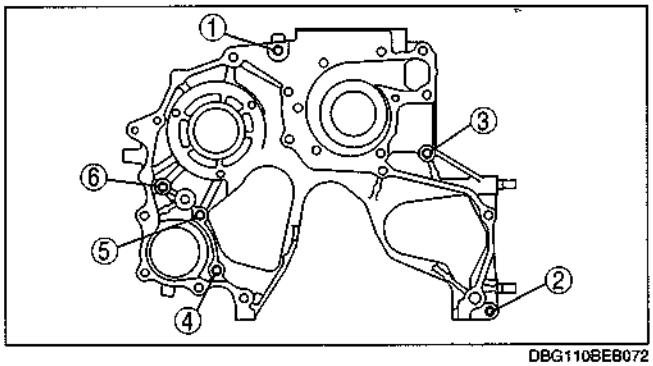
Timing Gear Case Assembly Note
1. Install the new O-ring.
2. Apply silicone sealant to the timing gear case as shown in the figure. Do not apply sealant to the O-ring.

Thickness
ϕ2.0—3.0 mm {0.07—0.12 in}



DBG110BEB104

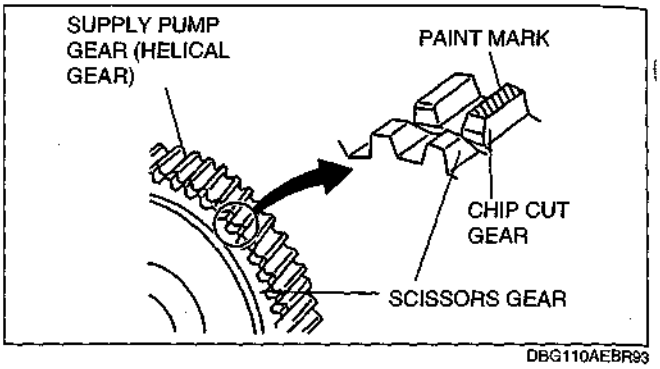
3. Tighten the bolts in two or three steps in the order shown in the figure.



DBG110BEB072

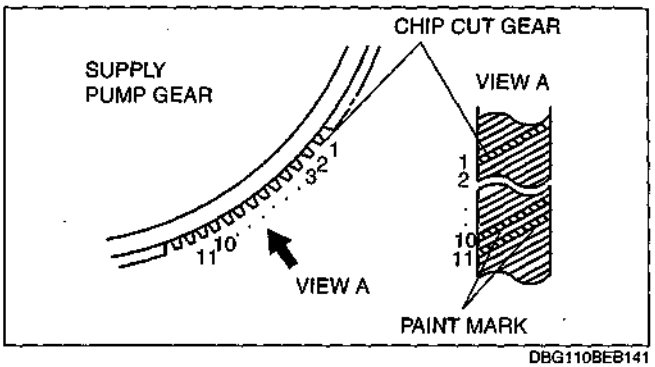
Timing Gear, Supply Pump Gear Assembly Note

1. Put a paint mark on the chip cut gear of the supply pump gear.



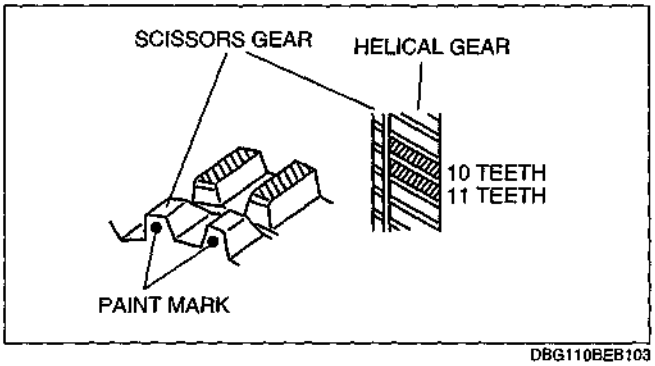
DBG110AEBR93

2. Put a paint mark on the 10th and 11th teeth of the helical gear counting clockwise from the chip cut gear.



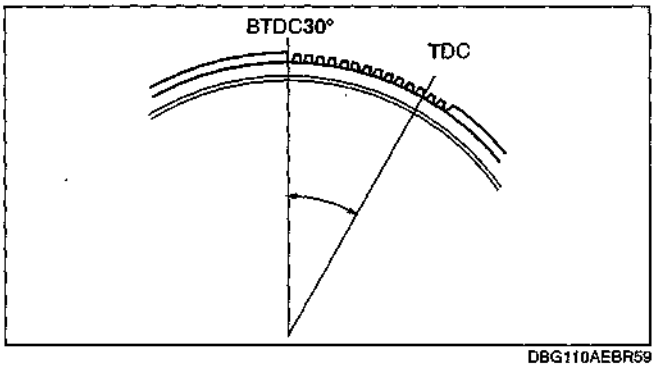
DBG110BEB141

3. Verify that the 10th and 11th teeth of supply pump gear (helical gear) and the teeth of the scissors gear are aligned, then put a paint mark on the scissors gear.
4. Set the No.1 cylinder to TDC of compression.



DBG110BEB103

5. Rotate the flywheel ring gear from TDC to approximately **30°** BTDC (13 teeth on the gear).

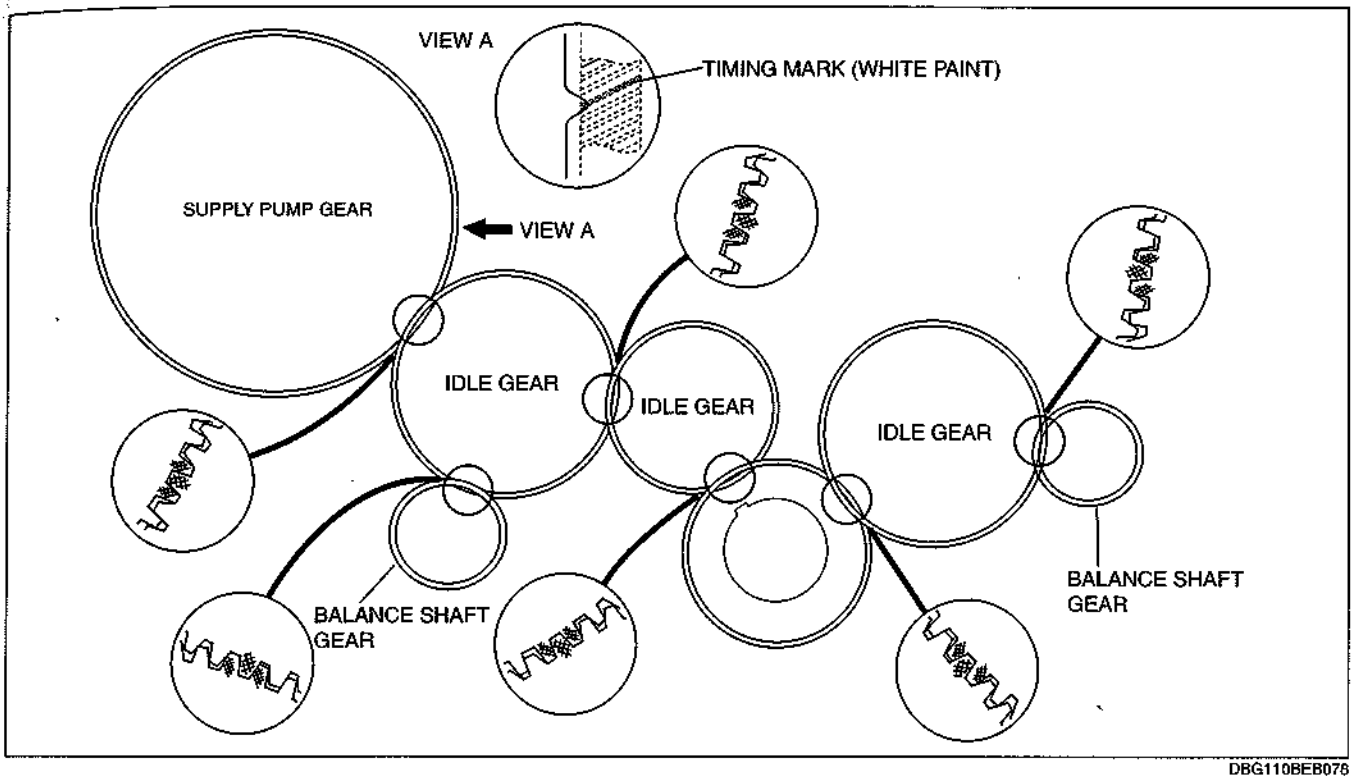


DBG110AEBR59

6. Align the timing marks. For the supply pump gear, align the timing mark as shown in the figure (View A).

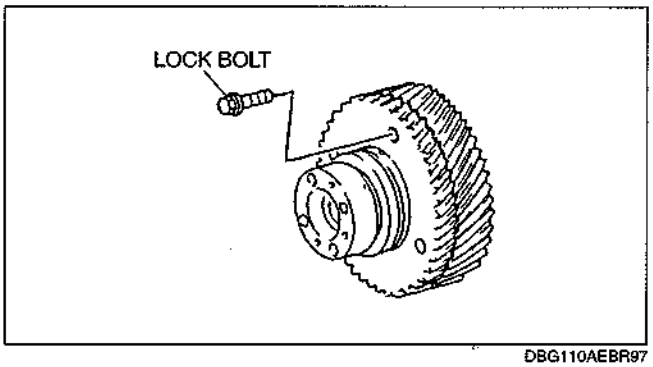
Note

- The helical gears except for the supply pump gear have a punch mark as the timing mark. The timing mark of each gear can be aligned easily if the paint mark is made on the punch mark.



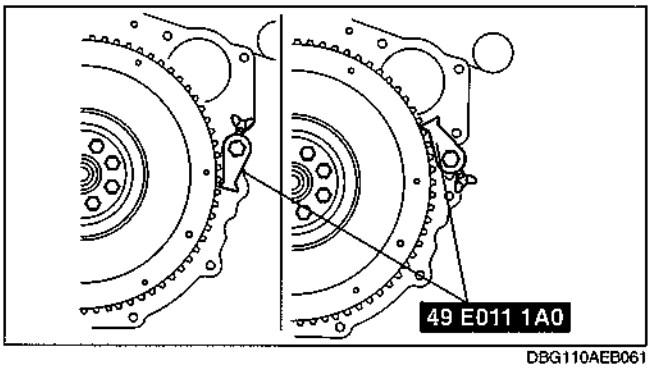
DBG110BEB078

7. Remove the lock bolt.



DBG110AEBR97

8. Tighten the bolts using the **SST**.



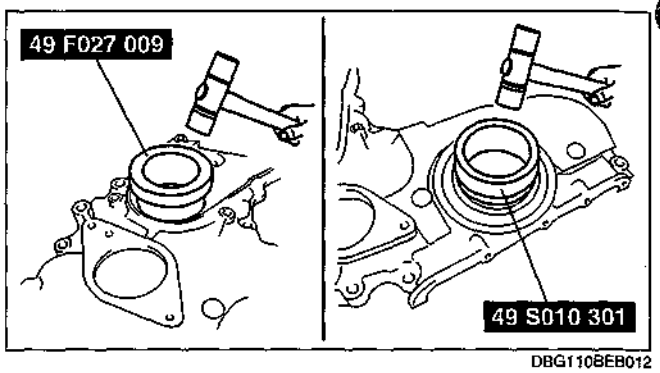
DBG110AEB061

Timing Gear Cover Assembly Note

1. Apply soapy water along the perimeter of the new oil seal.
2. Push the oil seal slightly in by hand.
3. Tap the oil seal in evenly using the **SST** and a hammer.
4. To ensure that the oil seal is installed correctly, measure the distance between the end of the timing gear cover and the face of the oil seal.

   Front oil seal press-in amount
   0.0—0.40 mm {0.0—0.015 in}

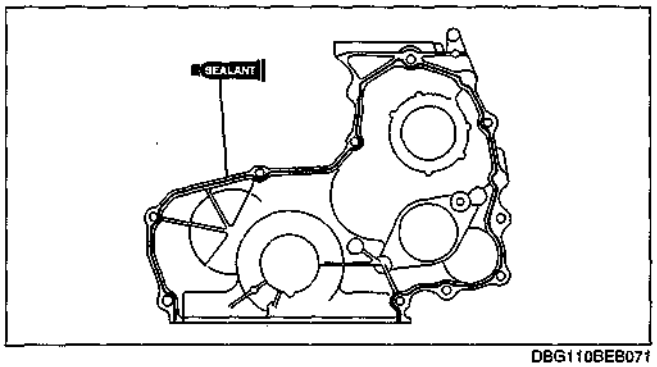
   Fuel injection pump oil seal press-in amount
   0.0—0.40 mm {0.0—0.015 in}



DBG110BEB012

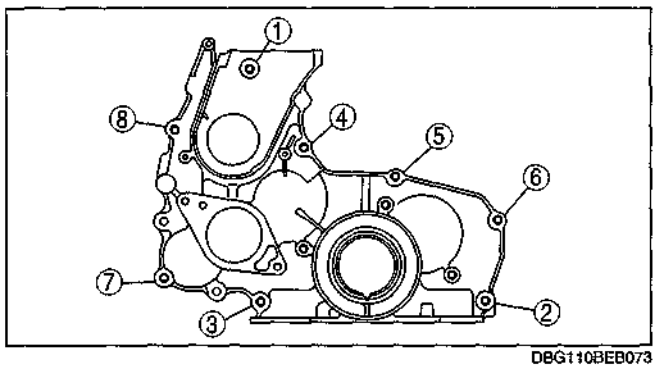
5. Apply silicone sealant to the timing gear cover as shown.

   Thickness
   ϕ2.0—3.0 mm {0.079—0.118 in}



DBG110BEB071

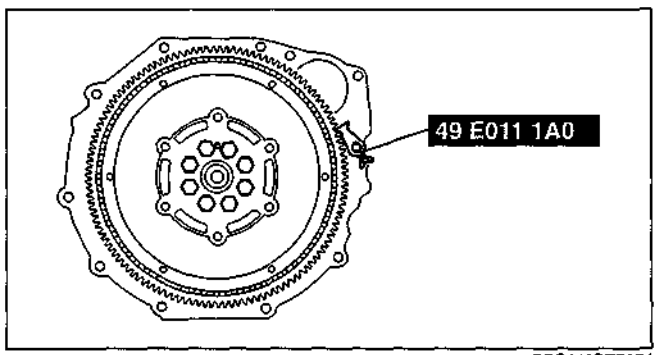
6. Tighten the bolts in two or three steps in the order shown in the figure.



DBG110BEB073

Supply Pump Pulley Assembly Note

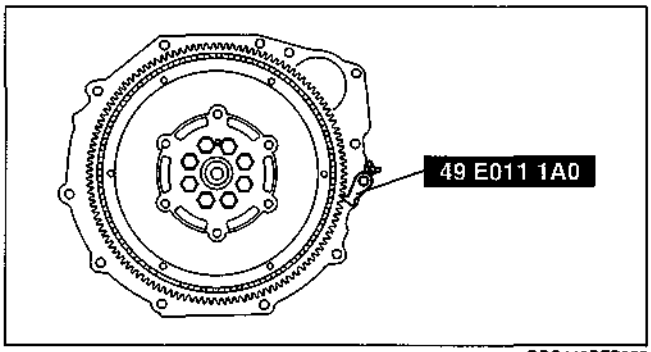
1. Install the supply pump pulley using the **SST**.



DBG110BEB054

Crankshaft Pulley Assembly Note

1. Install the crankshaft pulley using the **SST**.

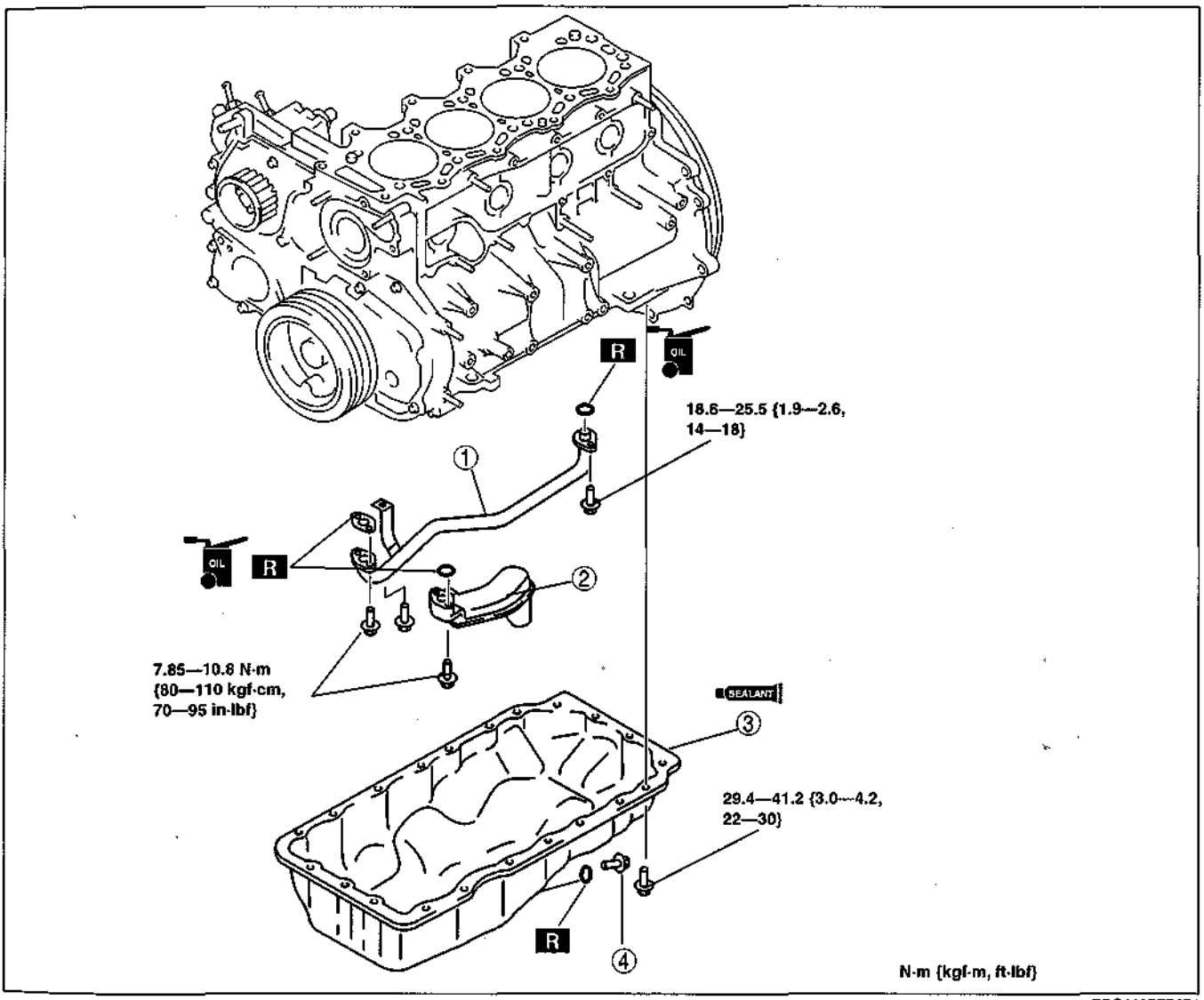


DBG110BEB055

CYLINDER BLOCK ASSEMBLY (III) [WL-C, WE-C]

DCF011002000W26

1. Assemble in the order indicated in the table.



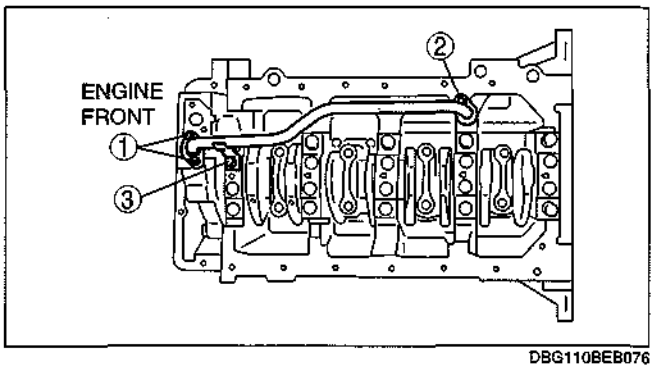
DBG110BEB074

1	Oil pipe (See01–10B–44 Oil Pipe Assembly Note.)
2	Oil strainer

3	Oil pan (See01–10B–44 Oil Pan Assembly Note.)
4	Oil drain plug

Oil Pipe Assembly Note

1. Tighten the bolts in two or three steps in the order shown in the figure.



DBG110BEB076

Oil Pan Assembly Note

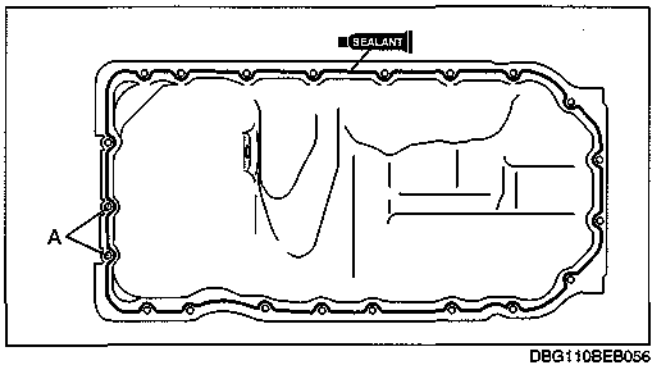
1. Apply silicone sealant to the oil pan as shown in the figure.

   Thickness
   ϕ2.0—3.0 mm {0.07—0.12 in}

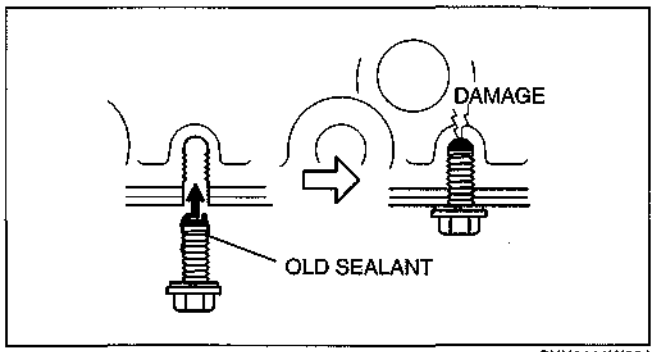
2. Tighten the oil pan bolts A as shown in the figure.

   Caution
   - **If the bolts are reused, remove the old sealant from the bolt threads. Tightening a bolt that has old sealant on it can cause bolt hole damage.**

3. Tighten the remaining oil pan bolts in several passes.



DBG110BEB056

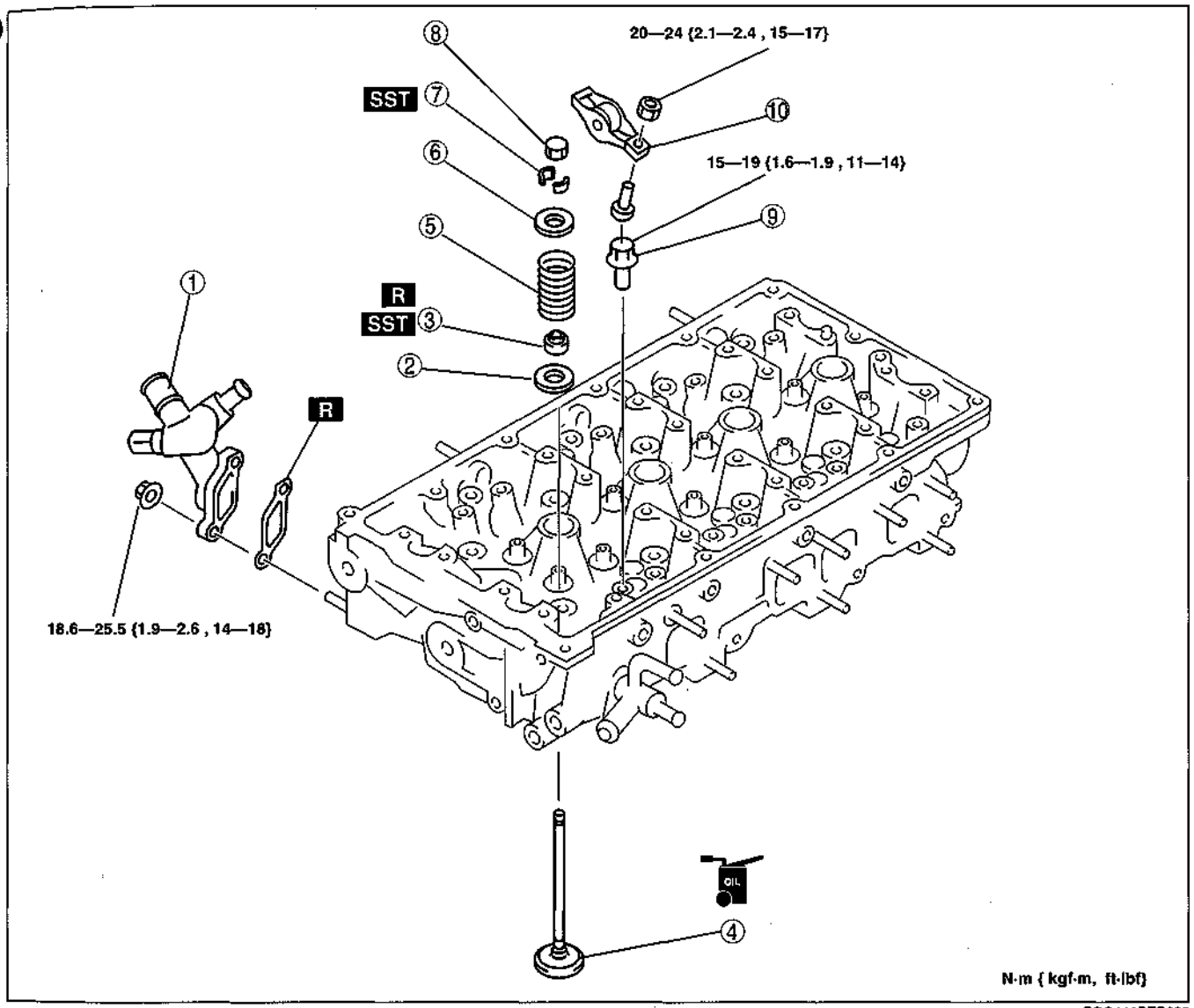


CHU0111W004

CYLINDER HEAD ASSEMBLY (I) [WL-C, WE-C]

DCF011002000W27

1. Assemble in the order indicated in the table.



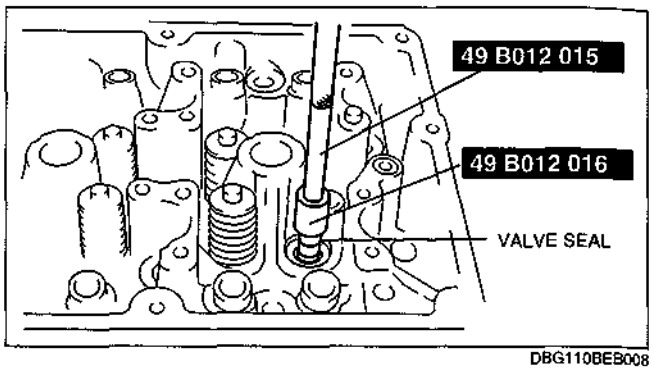
DBG110BEB065

1	Water outlet pipe
2	Lower valve spring seat
3	Valve seal (See01–10B–46 Valve Seal Assembly Note.)
4	Valve
5	Valve spring
6	Upper valve spring seat

7	Valve keeper (See01–10B–46 Valve Keeper Assembly Note.)
8	Valve cap
9	Pivot (See01–10B–46 Pivot Assembly Note.)
10	Rocker arm (See 01–10B–46 Rocker Arm Assembly Note.)

Valve Seal Assembly Note

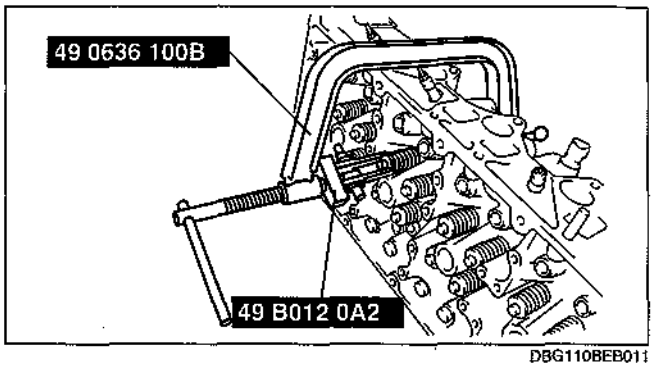
1. Tap the **SST** using a plastic hammer.



DBG110BEB008

Valve Keeper Assembly Note

1. Install the valve keeper using the **SST**.



DBG110BEB011

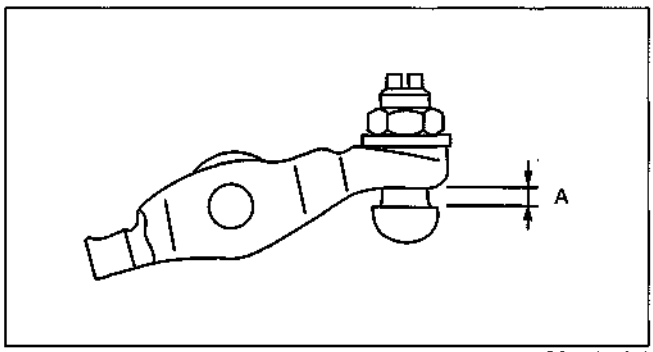
Pivot Assembly Note

1. Apply adhesive to the thread of the pivot.

Rocker Arm Assembly Note

1. If a new rocker arm is used, set dimension A as follows.

   Dimension A
   0.0—4.0 mm {0.0—0.115 in}

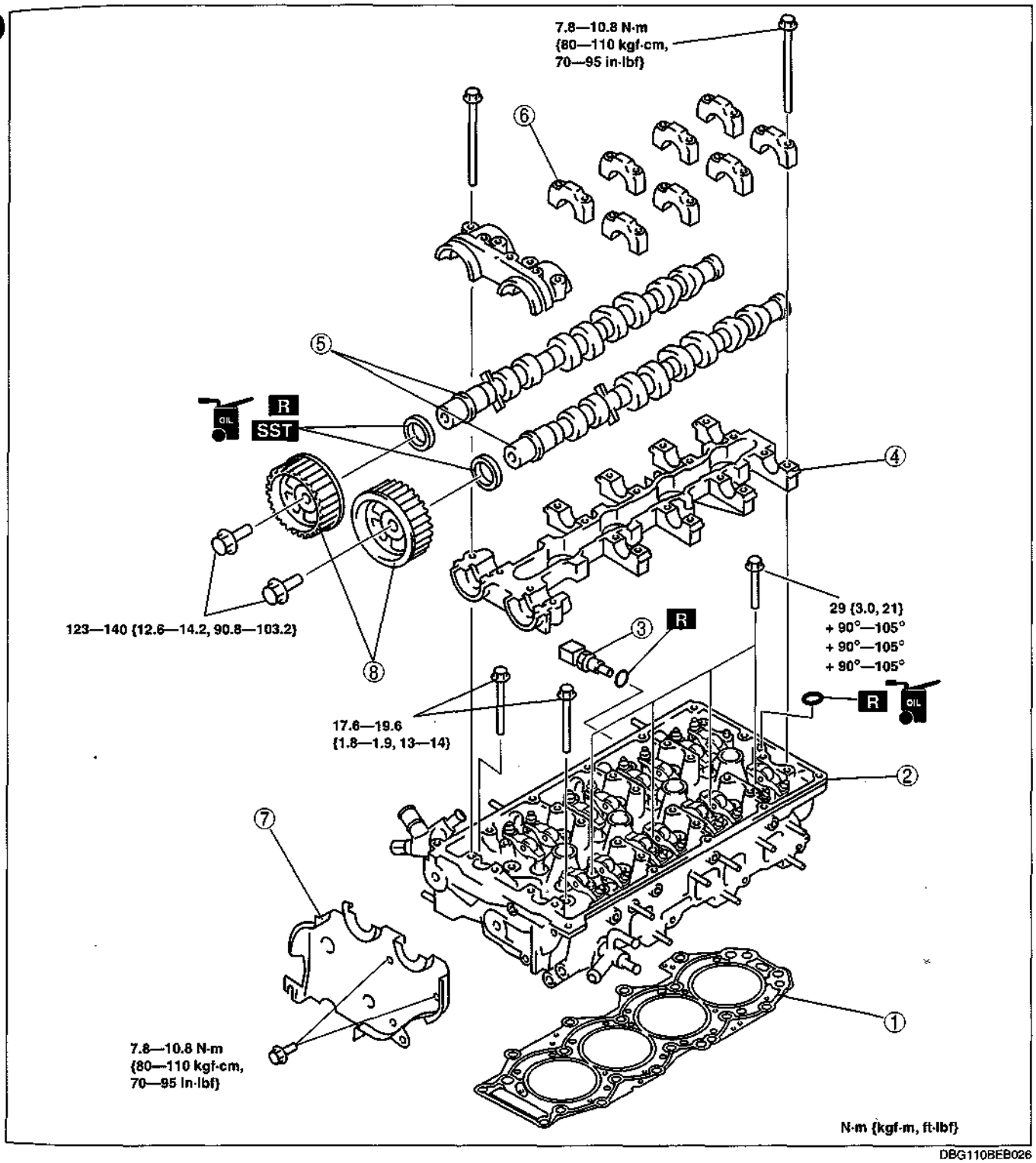


DBG110BWB92

CYLINDER HEAD ASSEMBLY (II) [WL-C, WE-C]

DCF011002000W28

1. Assemble in the order indicated in the table.



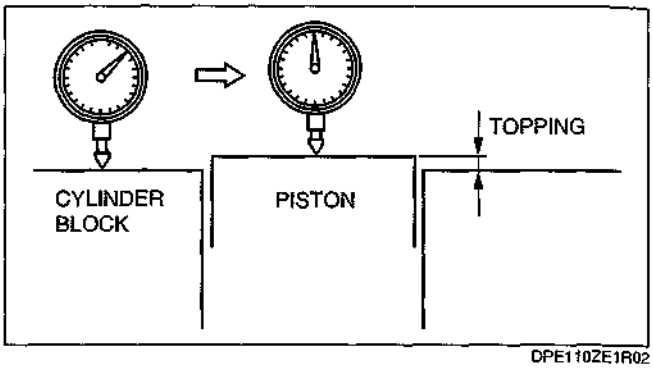
DBG110BEB026

1	Cylinder head gasket (See 01–10B–48 Cylinder Head Gasket Assembly Note.)
2	Cylinder head (See 01–10B–48 Cylinder Head Assembly Note.)
3	ECT sensor
4	Camshaft cap lower (See 01–10B–49 Camshaft Cap Lower Assembly Note.)

5	Camshaft
6	Camshaft cap upper (See 01–10B–49 Camshaft Cap Upper Assembly Note.)
7	Seal plate (See 01–10B–50 Seal Plate Assembly Note.)
8	Camshaft pulley (See 01–10B–50 Camshaft Pulley Assembly Note.)

Cylinder Head Gasket Assembly Note

1. Measure the piston topping of all the cylinders.

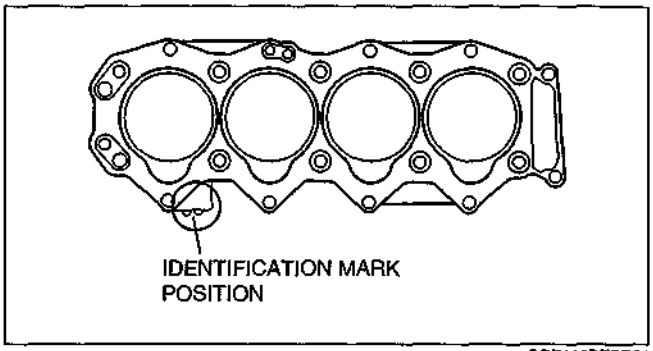


DPE110ZE1R02

2. Choose the gasket according to each measured piston topping.

Cylinder head gasket select table

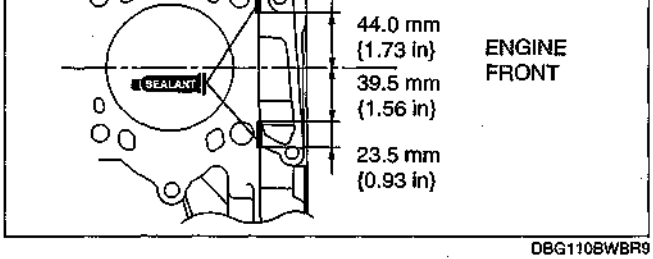
Piston topping (mm {in})	Cylinder head gasket identification mark
0.080—0.190 {0.004—0.007}	
0.135—0.255 {0.006—0.010}	
0.200—0.310 {0.008—0.012}	



DPE110BEBR94

3. Apply silicone sealant to the cylinder block as shown in the figure.

Thickness
ø2.0—3.0 mm {0.08—0.11 in}



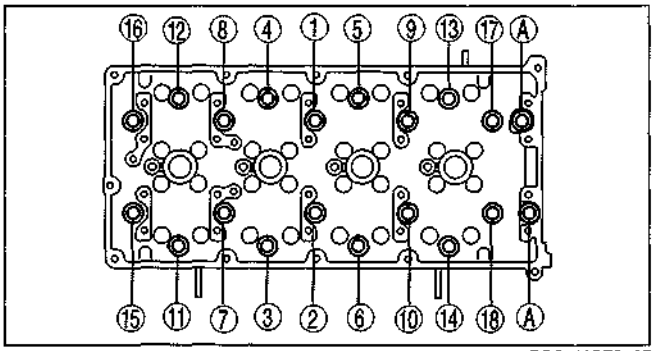
DBG110BWBR9

Cylinder Head Assembly Note

1. Before installing the cylinder head bolts, inspect their length. (See01–10B–31 BOLT INSPECTION [WL-C, WE-C].)
2. Apply clean engine oil to the threads and the seat face of each bolt and install them.
3. Tighten the bolts in two or three steps in the order shown in the figure.

Tighten torque
29 N·m {3.0 kgf·m, 21 ft·lbf}

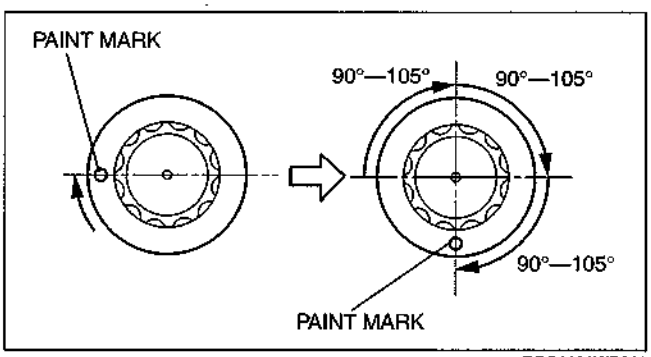
4. Retighten the bolts in the order shown in the figure until all the bolts are tightened to **29 N·m {3.0 kgf·m, 2.1 ft·lbf}**.



DBG110BEB027

5. Put a paint mark on each bolt head.
6. Using the marks as a reference, tighten the bolts by turning each **90°—105°** in the sequence shown.
7. Further tighten each bolt by turning another **90°—105°**.
8. Further tighten each bolt by turning another **90°—105°**.
9. Apply adhesive to the thread of bolt A.
10. Tighten bolts A.

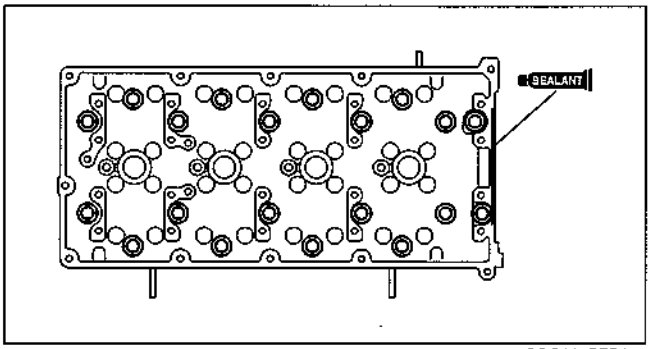
Tighten torque
17.6—19.6 N·m {1.8—1.9 kgf·m, 13—14 ft·lbf}



DBG110AWB311

Camshaft Cap Lower Assembly Note

1. Apply silicone sealant to the cylinder head as shown in the figure.

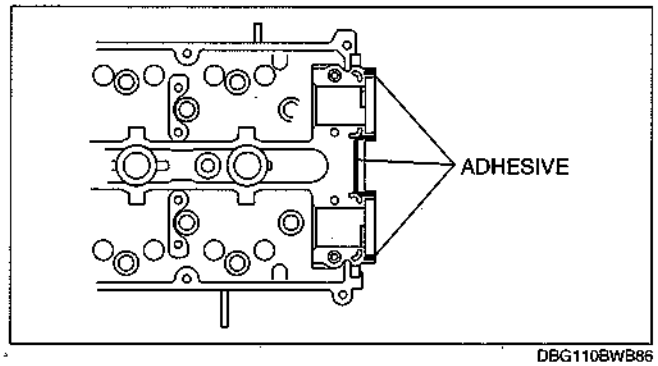


DBG110BEB105

Camshaft Cap Upper Assembly Note

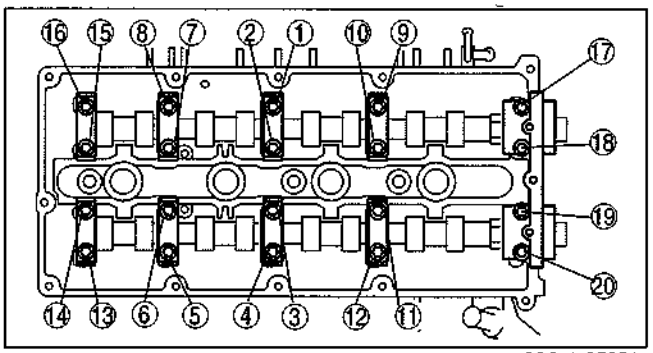
1. Apply adhesive to the front camshaft cap mounting surfaces as shown in the figure.
2. Tighten the camshaft cap bolts gradually in three or four steps in the order shown in the figure.

Caution
- **Because there is little camshaft thrust clearance, the camshaft must be held horizontally while it is installed. Otherwise, excessive force will be applied to the thrust area, causing burrs on the thrust receiving area of the cylinder head journal. To avoid this, the following procedure must be observed.**



DBG110BWB86

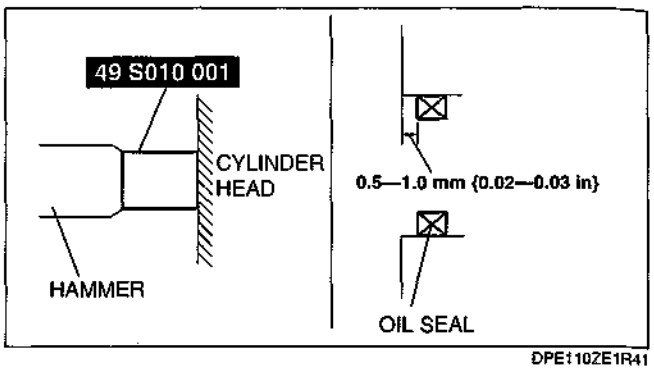
3. Apply soapy water along the perimeter of the new oil seal.
4. Push the oil seal slightly in by hand.



DBG110BEBR25

5. Tap the oil seal lightly into the cylinder head using the **SST** and a hammer.
6. To ensure that the oil seal is installed correctly, measure the distance between the end of the cylinder head and the face of the oil seal.

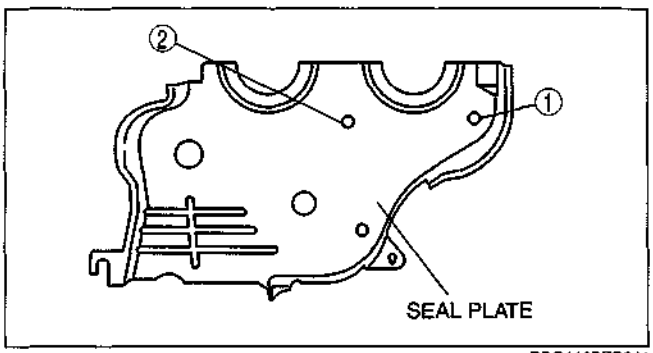
   Camshaft oil seal press-in amount
   0.5—1.0 mm {0.020—0.039 in}



DPE110ZE1R41

Seal Plate Assembly Note

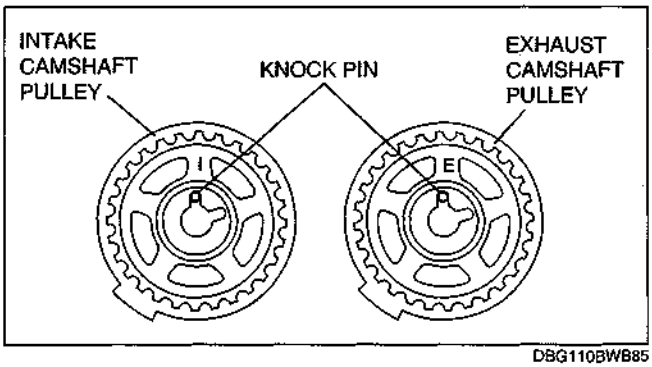
1. Tighten the seal plate bolts in the order indicated in the figure.



DBG110BEB041

Camshaft Pulley Assembly Note

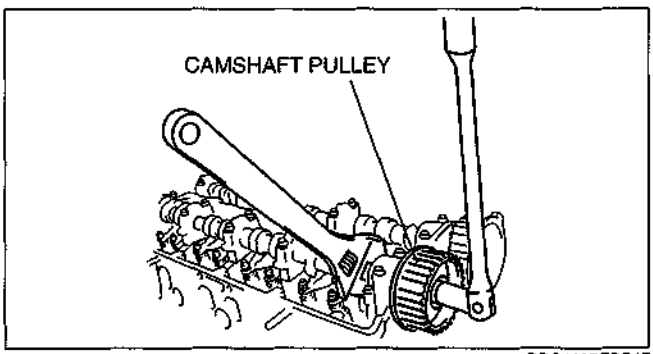
1. Install the camshaft pulleys, positioning the knock pins as shown in the figure.



DBG110BWB85

2. Hold the camshaft using a wrench on the cast hexagon.

   Caution
   - **Do not move the camshaft from this position because it can cause the valve and piston to contact each other and damage them.**

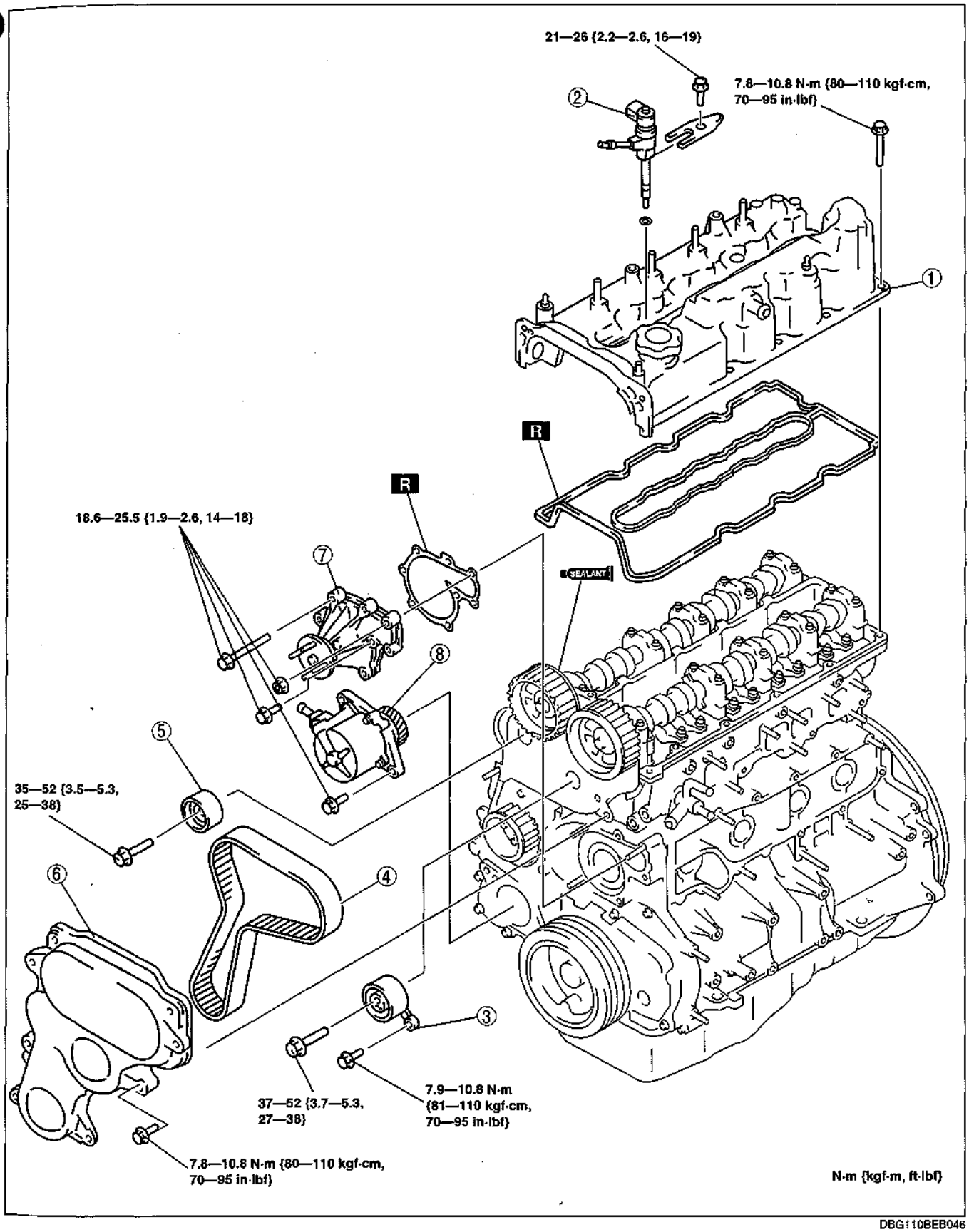


DBG110BEBR17

TIMING BELT ASSEMBLY [WL-C, WE-C]

DCF011002000W29

1. Assemble in the order indicated in the table.



DBG110BEB046

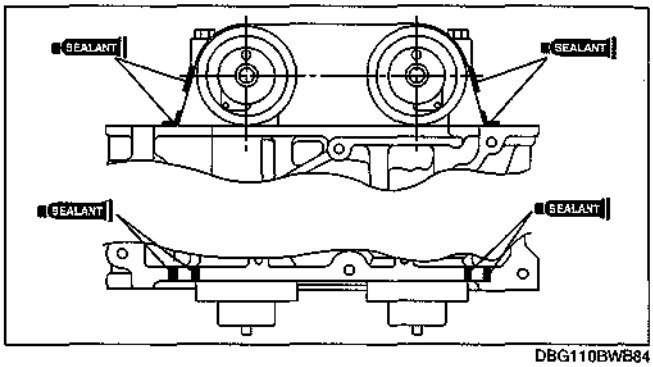
1	Cylinder head cover
2	Injector
3	Auto tensioner (See 01–10B–52 Timing Belt Assembly Note.)

4	Timing belt (See01–10B–52 Timing Belt Assembly Note.)
5	Idler (See01–10B–52 Timing Belt Assembly Note.)
6	Timing belt cover (See 01–10B–53 Timing Belt Cover Assembly Note.)
7	Water pump
8	Vacuum pump

Cylinder Head Cover Assembly Note

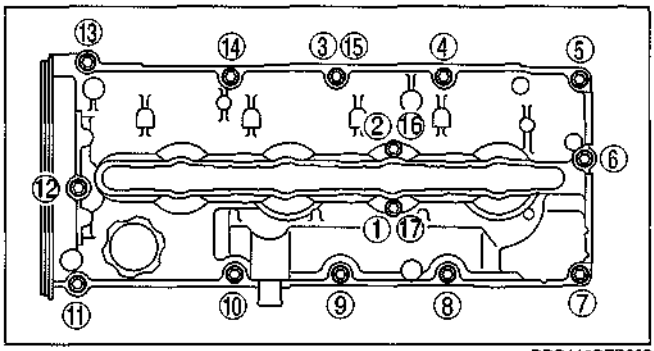
1. Apply silicone sealant to the cylinder head as shown in the figure.

   Thickness
   ø2.0—3.0 mm {0.08—0.11 in}



DBG110BWB84

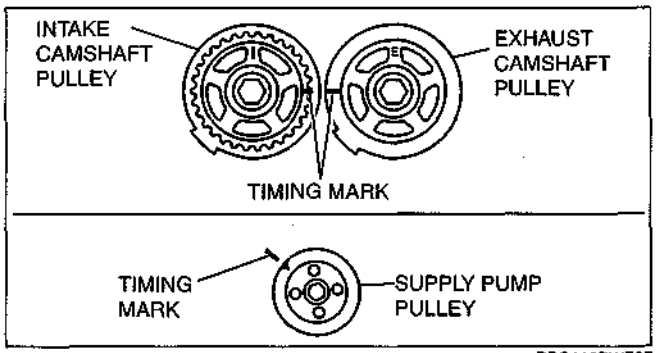
2. Tighten the cylinder head cover bolts in the order shown in the figure.



DBG110BEB005

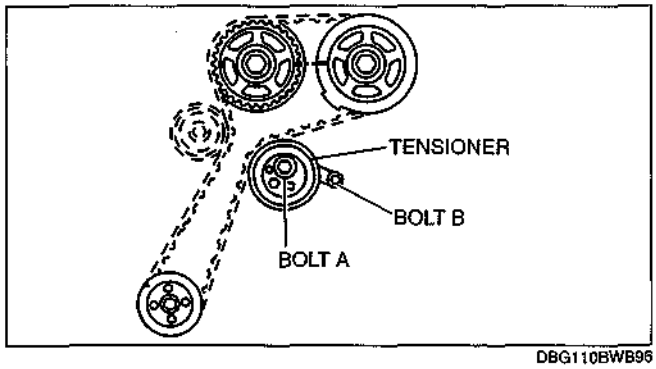
Timing Belt Assembly Note

1. Align the timing marks as shown in the figure.
2. Verify that the supply pump attaching bolts and nuts are tightened to the specified torque. This must be done to prevent over-tensioning of the timing belt after it has been installed.



DBG110BWB97

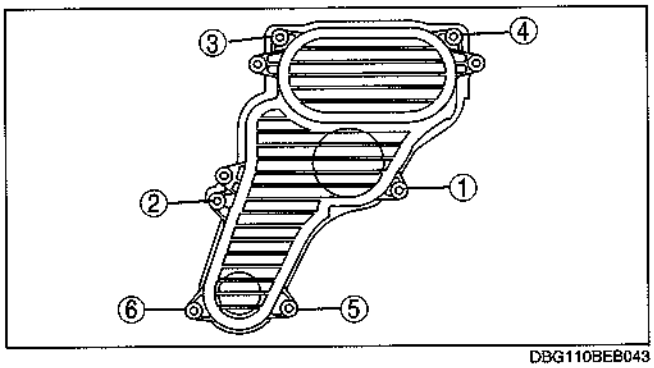
3. Install the tensioner and hand-tighten lock bolts A and B.
4. Install the timing belt.
5. Install the idler.
6. Tighten the lock bolt A.
7. Tighten the lock bolt B.
8. Remove the set pin from the tensioner.
9. Turn the crankshaft clockwise twice, and align the camshaft pully timing marks. If they are not aligned, remove the timing belt and repeat from Step 1.



DBG110BWB96

Timing Belt Cover Assembly Note

1. Tighten the timing belt cover bolts in the order shown in the figure.



DBG110BEB043

01–50A TECHNICAL DATA [WL-3]

ENGINE TECHNICAL DATA [WL-3].... 01–50A–1

ENGINE TECHNICAL DATA [WL-3]

DCF015000000W01

Item	Specification
Maximum cylinder head distortion	X distortion: 0.02 mm {0.0008 in} Y distortion: 0.05 mm {0.0020 in}
Maximum combustion chamber recession	0.02 mm {0.0008 in}
Maximum combustion chamber projection	0.005 mm {0.0002 in}
Combustion chamber crack	Limit: 10mm {0.39 in}
Maximum manifold contact surface distortion	0.05 mm {0.0020 in}
Maximum manifold contact surface grinding	0.15 mm {0.0059 in}
Standard valve margin thickness	IN: 1.5 mm {0.059 in} EX: 0.75 mm {0.030 in}
Standard valve length	IN: 111.6—112.1 mm {4.394—4.413 in} EX: 111.5—112.0 mm {4.390—4.409 in}
Minimum valve length	IN: 111.35 mm {4.384 in} EX: 111.25 mm {4.380 in}
Standard valve stem diameter	IN: 6.970—6.985 mm {0.2745—0.2749 in} EX: 6.965—6.980 mm {0.2743—0.2748 in}
Minimum valve stem diameter	IN: 6.920 mm {0.2724 in} EX: 6.915 mm {0.2722 in}
Standard valve guide inner diameter	7.025—7.045 mm {0.2766—0.2773 in}
Standard valve guide height	14.0—14.5 mm {0.552—0.570 in}
Standard valve seat contact width	IN: 1.6—2.2 mm {0.063—0.086 in} EX: 1.7—2.3 mm {0.067—0.090 in}
Valve seat angle	IN: 45° EX: 45°
Standard valve recession	IN: 0.61—1.09 mm {0.025—0.042 in} EX: 0.71—1.19 mm {0.028—0.046 in}
Maximum valve recession	IN: 1.50 mm {0.059 in} EX: 1.60 mm {0.063 in}
Valve spring installation pressing force	238—269 N {25—27 kgf, 54—60 lbf}
Valve spring installation height	35.5 mm {1.40 in}
Maximum valve spring out-of-square	2.0° (1.70mm {0.067 in})
Maximum camshaft runout	0.03 mm {0.0012 in}
Standard cam lobe height	IN: 42.400—42.500 mm {1.6692—1.6732 in} EX: 42.395—42.495 mm {1.6691—1.6730 in}
Minimum cam lobe height	IN: 42.050 mm {1.6555 in} EX: 42.045 mm {1.6711 in}
Standard cam journal diameter	No.1, No.5: 25.940—25.965 mm {1.0213—1.0222 in} No.2—No.4: 25.910—25.935 mm {1.0201—1.0210 in}
Minimum cam journal diameter	No.1, No.5: 25.890 mm {1.0193 in} No.2—No.4: 25.860 mm {1.0181 in}
Standard camshaft clearance	No.1, 5: 0.035—0.081 mm {0.0014—0.0031 in} No.2—4: 0.065—0.111 mm {0.0026—0.0043 in}
Maximum camshaft clearance	No.1, 5: 0.12 mm {0.0047 in} No.2—4: 0.15 mm {0.0059 in}
Standard camshaft end play	0.030—0.160 mm {0.0012—0.0062 in}
Maximum camshaft end play	0.20 mm {0.0079 in}
Maximum cylinder block distortion	X direction: 0.02 mm {0.0008 in} Y direction: 0.05 mm {0.0020 in}
Cylinder bore size	Standard: 93.000—93.022 mm {3.6615—3.6622 in} 0.25 {0.01} oversize: 93.250—93.272 mm {3.6713—3.6721 in} 0.50 {0.02} oversize: 93.500—93.522 mm {3.6811—3.6819 in}
Cylinder bore wear limit	0.15 mm {0.0059 in}
Oil jet air pressure	137.6—196.4 kPa {1.5—2.0 kgf/cm^2, 20—28 psi}

Item	Specification
Piston diameter	Standard: 92.951—92.977 mm {3.6595—3.6605 in} 0.25 {0.0098} oversize: 93.186—93.212 mm {3.6688—3.6697 in} 0.50 {0.02} oversize: 93.436—93.462 mm {3.6786—3.6795 in}
Standard piston clearance	0.055—0.073 mm {0.0022—0.0028 in}
Maximum piston clearance	0.15 mm {0.0059 in}
Standard piston ring clearance	Top: 0.06—0.10 mm {0.0024—0.0039 in} Second: 0.04—0.08 mm {0.0016—0.0031 in} Oil: 0.03—0.07 mm {0.0012—0.0027 in}
Maximum piston ring clearance	0.15 mm {0.0059 in}
Standard piston ring end gap	Top: 0.22—0.32 mm {0.0087—0.0125 in} Second: 0.32—0.47 mm {0.0126—0.0185 in} Oil: 0.22—0.37 mm {0.0087—0.0145 in}
Maximum piston ring end gap	1.0 mm {0.039 in}
Standard piston pin bore diameter	31.997—32.007 mm {1.2598—1.2601 in}
Standard connecting rod small end inner diameter	32.012—32.033 mm {1.2604—1.2611 in}
Standard piston pin diameter	31.994—32.000 mm {1.25961—1.25984 in}
Standard piston pin-to-piston pin bore clearance	–0.003—0.013 mm {–0.00011—0.00051 in}
Standard connecting rod small end-to-piston pin clearance	0.012—0.039 mm {0.00048—0.00153 in}
Maximum crankshaft runout	0.05 mm {0.0020 in}
Main journal diameter	Standard No.1, 2, 4, 5: 66.937—66.955 mm {2.6354—2.6360 in} No.3: 66.920—66.938 mm {2.6347—2.6353 in} 0.25 {0.01} undersize No.1, 2, 4, 5: 66.687—66.705 mm {2.6255—2.6261 in} No.3: 66.670—66.688 mm {2.6248—2.6255 in} 0.50 {0.02} undersize No.1, 2, 4, 5: 66.437—66.455 mm {2.6157—2.6163 in} No.3: 66.420—66.438 mm {2.6150—2.6156 in} 0.75 {0.03} undersize No.1, 2, 4, 5: 66.187—66.205 mm {2.6058—2.6064 in} No.3: 66.170—66.188 mm {2.6052—2.6058 in}
Main journal wear limit	0.05 mm {0.0020 in}
Main journal out-of-round	0.03 mm {0.0012 in}
Crank pin diameter	Standard: 54.940—54.955 mm {2.1630—2.1635 in} 0.25 {0.01} undersize: 54.690—54.705 mm {2.1532—2.1537 in} 0.50 {0.02} undersize: 54.440—54.455 mm {2.1434—2.1438 in} 0.75 {0.03} undersize: 54.190—54.205 mm {2.1335—2.134 in}
Crank pin wear limit	0.05 mm {0.0020 in}
Crank pin out-of-round	0.03 mm {0.0012 in}
Standard main journal clearance	No.1, 2, 4, 5: 0.027—0.046 mm {0.0011—0.0018 in} No.3: 0.044—0.063 mm {0.0018—0.0025 in}
Maximum main journal clearance	0.08 mm {0.0031 in}
Main bearing thickness	Standard: 2.006—2.021 mm {0.0790—0.0795 in} 0.25 {0.01} undersize: 2.124—2.134 mm {0.0837—0.0840 in} 0.50 {0.02} undersize: 2.249—2.259 mm {0.0886—0.0889 in} 0.75 {0.03} undersize: 2.374—2.384 mm {0.0935—0.0938 in}
Standard crankshaft end play	0.040—0.282 mm {0.0016—0.0111 in}
Maximum crankshaft end play	0.3 mm {0.012 in}
Thrust bearing thickness	Standard: 2.454—2.506 mm {0.0967—0.0986 in} 0.35 {0.014} oversize: 2.629—2.681 mm {0.1036—0.1055 in}
Maximum connecting rod bending	0.075 mm {0.0030 in} /50 mm {2.0 in}
Maximum connecting rod distortion	0.18 mm {0.0071 in} /50 mm {2.0 in}
Connecting rod center-to-center distance	151.96—152.04 mm {5.9827—5.9858 in}
Standard connecting rod bolt length	67.5—68.5 mm {2.66—2.69 in}
Maximum connecting rod bolt length	69 mm {2.7 in}
Standard connecting rod oil clearance	0.025—0.052 mm {0.0010—0.0020 in}
Maximum connecting rod oil clearance	0.08 mm {0.0031 in}

Item	Specification
Connecting rod bearing thickness	Standard: 1.507—1.516 mm {0.0594—0.0596 in} 0.25 {0.01} undersize: 1.624—1.634 mm {0.0640—0.0643 in} 0.50 {0.02} undersize: 1.749—1.759 mm {0.0689—0.0692 in} 0.75 {0.03} undersize: 1.874—1.884 mm {0.0738—0.0741 in}
Standard connecting rod side clearance	0.110—0.262 mm {0.0044—0.0103 in}
Maximum connecting rod side clearance	0.35 mm {0.014 in}
Cylinder head bolt length	Bolt head mark W Standard length: 101.2—101.8 mm {3.985—4.007 in} Maximum length: 102.5 mm {4.035 in} Bolt head mark N Standard length: 113.2—113.8 mm {4.457—4.480 in} Maximum length: 114.5 mm {4.508 in}
Main bearing cap bolt length	Standard length: 84.7—85.3 mm {3.34—3.35 in} Maximum length: 86.0 mm {3.39 in}
Standard tensioner spring length	63.0 mm {2.48 in}
Valve clearance (engine cold)	IN: 0.05—0.15 mm {0.0020—0.0059 in} EX: 0.15—0.25 mm {0.0060—0.0098 in}
Fuel injection pump plunger adjustment value	0.95—1.05 mm {0.038—0.041 in}
Standard oil pump tip clearance	0.10—0.19 mm {0.0040—0.0074 in}
Maximum oil pump tip clearance	0.20 mm {0.0079 in}
Standard oil pump side clearance	0.04—0.09 mm {0.0016—0.0035 in}
Maximum oil pump side clearance	0.15 mm {0.0059 in}
Standard plunger spring length	43.8 mm {1.72 in}
Front oil seal press-in amount	0—0.4 mm {0—0.01 in}
Fuel injection pump oil seal press-in amount	0—0.4 mm {0—0.01 in}
Camshaft oil seal press-in amount	0.5—1.0 mm {0.02—0.03 in}

01–50B TECHNICAL DATA [WL-C, WE-C]

ENGINE TECHNICAL DATA
[WL-C, WE-C] 01–50B–1

ENGINE TECHNICAL DATA [WL-C, WE-C]

DCF015000000W02

Item	Specification
Maximum cylinder head distortion	X distortion: 0.02 mm {0.0008 in} max. Y distortion: 0.05 mm {0.0020 in} max.
Maximum manifold contact surface distortion	0.05 mm {0.002 in} max.
Maximum manifold contact surface grinding	0.15 mm {0.0059 in} max.
Standard valve margin thickness	IN: 1.55—1.85 mm {0.061—0.072 in} EX: 1.80—2.10 mm {0.070—0.082 in}
Standard valve length	IN: 111.65—112.25 mm {4.394—4.413 in} EX: 111.6—112.2 mm {4.390—4.409 in}
Minimum valve length	IN: 111.50 mm {4.390 in} EX: 111.45 mm {4.388 in}
Standard valve stem diameter	IN: 5.970—5.985 mm {0.2350—0.2356 in} EX: 5.965—5.980 mm {0.2348—0.2354 in}
Minimum valve stem diameter	IN: 5.920 mm {0.2330 in} EX: 5.915 mm {0.2328 in}
Standard valve guide inner diameter	6.025—6.045 mm {0.2372—0.2379 in}
Standard valve guide height	IN: 15.0—15.5 mm {0.59—0.61 in} EX: 17.0—17.5 mm {0.67—0.69 in}
Standard valve guide height	IN: 15.0—15.5 mm {0.59—0.61 in} EX: 17.0—17.5 mm {0.67—0.68 in}
Standard valve seat contact width	1.3—1.9 mm {0.052—0.074 in}
Valve seat angle	IN: 45° EX: 45°
Standard valve recession	IN: 0.79—1.27 mm {0.039—0.050 in} EX: 0.84—1.32 mm {0.033—0.051 in}
Maximum valve recession	IN: 1.68 mm {0.066 in} EX: 1.73 mm {0.062 in}
Valve spring installation pressing force	172.9—195.6 N {15.67—17.74 kgf, 34.48—39.02 lbf}
Valve spring installation height	39.0 mm {1.53 in}
Maximum valve spring out-of-square	2.0° (1.60mm {0.062 in})
Maximum camshaft runout	0.03 mm {0.001 in} max.
Standard cam lobe height	IN: 42.067—42.167 mm {1.6561—1.6601 in}. EX: 41.949—42.049 mm {1.6515—1.6554 in}
Minimum cam lobe height	IN: 41.717 mm {1.6424 in} EX: 41.599 mm {1.6377 in}
Standard cam journal diameter	No.1: 31.940—31.965 mm {1.2575—1.2582 in} No.2—No.4: 25.910—25.935 mm {1.0201—1.0210 in} No.5: 25.940—25.965 mm {1.0212—1.0222 in}
Minimum cam journal diameter	No.1: 31.890 mm {1.2555 in} No.2—No.4: 25.860 mm {1.0181 in} No.5: 25.890 mm {1.0193 in}
Standard camshaft clearance	No.1: 0.035—0.081 mm {0.0014—0.0031 in} No.2—4: 0.065—0.111 mm {0.0026—0.0043 in} No.5: 0.056—0.081 mm {0.0014—0.0031 in}
Maximum camshaft clearance	No.1: 0.12 mm {0.0047 in} No.2—4: 0.15 mm {0.0059 in} No.5: 0.16 mm {0.0063 in}
Standard camshaft end play	0.030—0.160 mm {0.0012—0.0062 in}
Maximum camshaft end play	0.20 mm {0.0078 in}
Maximum cylinder block distortion	X direction: 0.02 mm {0.0008 in} Y direction: 0.05 mm {0.002 in}
Cylinder bore size [WL-C]	Standard: 93.000—93.022 mm {3.6615—3.6622 in} 0.25 {0.01} oversize: 93.250—93.272 mm {3.6713—3.6721 in} 0.50 {0.02} oversize: 93.500—93.522 mm {3.6811—3.6819 in}

Item	Specification
Cylinder bore size [WE-C]	Standard: 96.000—96.022 mm {3.6615—3.6622 in} 0.25 {0.01} oversize: 96.250—96.272 mm {3.7893—3.7902 in} 0.50 {0.02} oversize: 96.500—96.522 mm {3.7992—3.8000 in}
Cylinder bore wear limit	0.15 mm {0.0059 in}
Flywheel maximum runout	1.5 mm {0.059 in}
Oil jet air pressure	137.6—196.4 kPa {1.4—2.0 kgf/cm^2, 20—28 psi}
Piston diameter [WL-C]	Standard: 92.918—92.944 mm {3.6582—3.6592 in} 0.25 {0.010} oversize: 93.153—93.179 mm {3.6675—3.6684 in} 0.50 {0.020} oversize: 93.403—93.429 mm {3.6773—3.6782 in}
Piston diameter [WE-C]	Standard: 95.918—95.944 mm {3.7763—3.7773 in} 0.25 {0.010} oversize: 96.153—96.179 mm {3.7856—3.7865 in} 0.50 {0.020} oversize: 96.403—96.429 mm {3.7954—3.7964 in}
Standard piston clearance	0.071—0.089 mm {0.0015—0.0022 in}
Maximum piston clearance	0.15 mm {0.0059 in}
Standard piston ring clearance [WL-C]	Top: 0.06—0.10 mm {0.0024—0.0039 in} Second: 0.06—0.08 mm {0.0024—0.0031 in} Oil: 0.02—0.06 mm {0.0012—0.0023 in}
Standard piston ring clearance [WE-C]	Top: 0.06—0.10 mm {0.0024—0.0039 in} Second: 0.04—0.08 mm {0.0016—0.0031 in} Oil: 0.02—0.06 mm {0.0008—0.0023 in}
Maximum piston ring clearance	0.15 mm {0.0059 in}
Standard piston ring end gap [WL-C]	Top: 0.22—0.32 mm {0.0087—0.0125 in} Second: 0.49—0.64 mm {0.0193—0.0251 in} Oil: 0.22—0.52 mm {0.0087—0.0204 in}
Standard piston ring end gap [WE-C]	Top: 0.23—0.33 mm {0.0091—0.0129 in} Second: 0.50—0.65 mm {0.0197—0.0255 in} Oil: 0.22—0.52 mm {0.0087—0.0204 in}
Maximum piston ring end gap	1.0 mm {0.039 in}
Standard piston pin bore diameter	33.997—34.007 mm {1.3384—1.3388 in}
Standard connecting rod small end inner diameter	34.012—34.033 mm {1.3391—1.3398 in}
Standard piston pin diameter	33.994—34.000 mm {1.3384—1.3385 in}
Standard piston pin-to-piston pin bore clearance	−0.003—0.013 mm {−0.0001—0.0005 in}
Standard connecting rod small end-to-piston pin clearance	0.012—0.039 mm {0.00048—0.0015 in}
Maximum crankshaft runout	0.05 mm {0.002 in}
Main journal diameter [No.1,2,4,5]	Standard: 66.937—66.955 mm {2.6354—2.6360 in} 0.25 {0.010} undersize: 66.687—66.705 mm {2.6255—2.6261 in} 0.50 {0.020} undersize: 66.437—66.455 mm {2.6157—2.6163 in} 0.75 {0.030} undersize: 66.187—66.205 mm {2.6058—2.6064 in}
Main journal diameter [No.3]	Standard: 66.920—66.938 mm {2.6347—2.6353 in} 0.25 {0.010} undersize: 66.670—66.688 mm {2.6367—2.6373 in} 0.50 {0.020} undersize: 66.420—66.438 mm {2.6150—2.6156 in} 0.75 {0.030} undersize: 66.170—66.188 mm {2.6052—2.6058 in}
Main journal wear limit	0.05 mm {0.002 in}
Main journal out-of-round	0.03 mm {0.001 in}
Crank pin diameter [WL-C]	Standard: 54.940—54.955 mm {2.1630—2.1635 in} 0.25 {0.010} undersize: 54.690—54.705 mm {2.1532—2.1537 in} 0.50 {0.020} undersize: 54.440—54.455 mm {2.1434—2.1438 in} 0.75 {0.030} undersize: 54.190—54.205 mm {2.1335—2.1340 in}
Crank pin diameter [WE-C]	Standard: 56.940—56.955 mm {2.2417—2.2423 in} 0.25 {0.010} undersize: 56.690—56.705 mm {2.2318—2.2324 in} 0.50 {0.020} undersize: 56.440—56.455 mm {2.2220—2.2226 in} 0.75 {0.030} undersize: 56.190—56.205 mm {2.2122—2.2128 in}
Crank pin wear limit	0.05 mm {0.0020 in}
Crank pin out-of-round	0.03 mm {0.0012 in}
Standard main journal clearance	No.1, 2, 4, 5: 0.027—0.045 mm {0.0010—0.0017 in} No.3: 0.044—0.062 mm {0.0017—0.0024 in}
Maximum main journal clearance	0.08 mm {0.003 in}

Item	Specification
Main bearing thickness	Standard: 2.006—2.021 mm {0.0789—0.0794 in} 0.25 {0.010} undersize: 2.124—2.134 mm {0.0836—0.0838 in} 0.50 {0.020} undersize: 2.249—2.259 mm {0.0885—0.0888 in} 0.75 {0.030} undersize: 2.374—2.384 mm {0.0934—0.0937 in}
Standard crankshaft end play	0.040—0.282 mm {0.0016—0.0111 in}
Maximum crankshaft end play	0.3 mm {0.01 in}
Thrust bearing thickness	Standard: 2.455—2.505 mm {0.0967—0.986 in} 0.35 {0.010} oversize: 2.630—2.680 mm {0.1036—0.1055 in}
Connecting rod bending	0.075 mm {0.0030 in} max./50 mm {2.0 in}
Connecting rod distortion	0.18 mm {0.0070 in} max./50 mm {1.968 in}
Connecting rod center-to-center distance [WL-C]	162.96—163.04 mm {5.983—5.986 in}
Connecting rod center-to-center distance [WE-C]	157.96—158.04 mm {5.983—5.986 in}
Standard connecting rod oil clearance	0.025—0.052 mm {0.0009—0.0020 in}
Maximum connecting rod oil clearance	0.08 mm {0.003 in}
Connecting rod bearing thickness	Standard: 1.507—1.516 mm {0.0592—0.0595 in} 0.25 {0.010} undersize: 1.624—1.634 mm {0.0638—0.0642 in} 0.50 {0.020} undersize: 1.749—1.759 mm {0.0687—0.0691 in} 0.75 {0.030} undersize: 1.874—1.884 mm {0.0737—0.0740 in}
Standard connecting rod side clearance	0.110—0.262 mm {0.0043—0.0103 in}
Maximum connecting rod side clearance	0.35 mm {0.014 in}
Balance shaft Standard end play	0.04—0.16 mm {0.002—0.006 in}
Standard diameter	Front: 41.945—41.960 mm {1.6514—1.6519 in} Center: 39.945—39.960 mm {1.5727—1.5732 in} Rear: 37.975—37.990 mm {1.4951—1.4956 in}
Standard clearance	Front, rear: 0.050—0.115 mm {0.0020—0.0045 in} Center: 0.080—0.145 mm {0.0032—0.0057 in}
Cylinder head bolt length	Bolt head mark W Standard length: 101.2—101.8 mm {3.985—4.007 in} Maximum length: 102.5 mm {4.035 in} Bolt head mark N Standard length: 113.2—113.8 mm {4.457—4.480 in} Maximum length: 114.5 mm {4.508 in} Bolt head mark I Standard length: 149.0—150.0 mm {5.866—5.905 in} Maximum length: 150.5 mm {5.925 in}
Main bearing cap bolt length	Standard length: 84.7—85.3 mm {3.34—3.35 in} Maximum length: 86.0 mm {3.39 in}
Connecting rod cap bolt length	Standard length: 55.45—56.05 mm {2.19—2.20 in} Maximum length: 56.75 mm {2.23 in}
Valve clearance [Engine cold]	IN: 0.10—0.16 mm {0.0040—0.0062 in} EX: 0.17—0.23 mm {0.0067—0.0090 in}
Valve clearance [Engine cold]	IN: 0.10—0.16 mm {0.0040—0.0062 in} EX: 0.17—0.23 mm {0.0067—0.0090 in}
Standard oil pump tip clearance	0.10—0.19 mm {0.0040—0.0074 in}
Maximum oil pump tip clearance	0.20 mm {0.008 in}
Standard oil pump side clearance	0.04—0.09 mm {0.0016—0.0035 in}
Maximum oil pump side clearance	0.15 mm {0.0059 in}
Standard plunger spring length	43.8 mm {1.72 in}
Front oil seal press-in amount	0.0—0.40 mm {0.0—0.015 in}
Fuel injection pump oil seal press-in amount	0.0—0.40 mm {0.0—0.015 in}
Camshaft oil seal press-in amount	0.5—1.0 mm {0.020—0.039 in}

01–60A SERVICE TOOLS [WL-3]

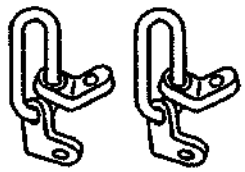
ENGINE [WL-3] 01–60A–1

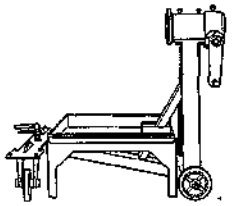
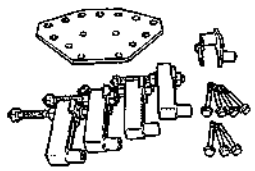
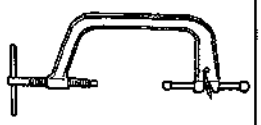
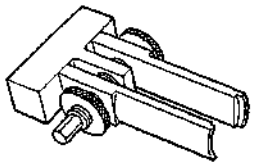
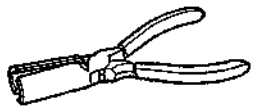
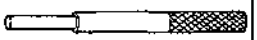
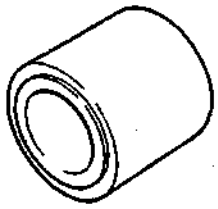
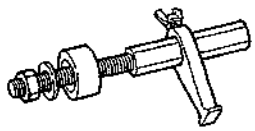
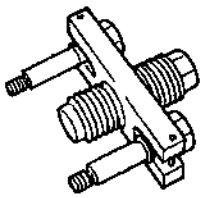
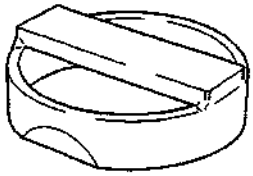
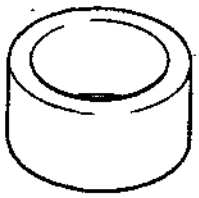
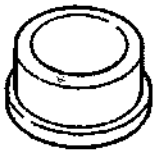
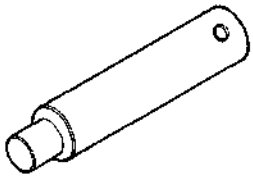
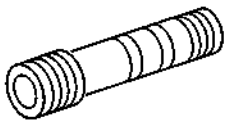
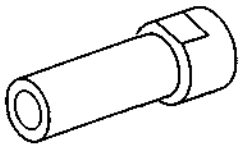
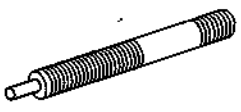
ENGINE [WL-3]

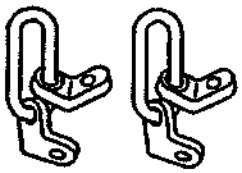
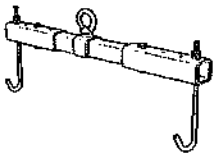
DCF016000000W01

1: Mazda SST number
2: Global SST number

Example

1:49 UN30 3050 2:303-050 Engine lifting brackets	

1:49 0107 680A 2:– Engine stand 	1:49 L010 1A0 2:– Engine hanger set 	1:49 0636 100B 2:– Valve spring lifter arm 
1:49 B012 0A2 2:– Pivot 	1:49 S120 170 2:– Valve seal remover 	1:49 B012 015 2:– Installer (Part of 49 B012 0A3) 
1:49 S010 001 2:– Oil seal installer 	1:49 E011 1A0 2:– Ring gear brake set 	1:49 S120 215B 2:– Pulley puller 
1:49 S011 103 2:– Oil seal installer 	1:49 S010 301 2:– Oil seal installer 	1:49 F027 009 2:– Oil seal installer 
1:49 G011 001 2:– Piston pin replacer 	1:49 L012 001 2:– Installer (Part of 49 L012 0A0B) 	1:49 L012 002A 2:– Body (Part of 49 L012 0A0B) 
1:49 L012 005 2:– Spacer (Part of 49 L012 0A0B) 	1:49 L012 003A 2:– Installer (Part of 49 L012 0A0B) 	1:49 L012 004A 2:– Nut (Part of 49 L012 0A0B)

1:49 UN30 3050 2:303-050 Engine lifting brackets 	1:49 L017 5A0 2:– Support hanger 	1:49 9140 074 2:– Cam lift measuring device

01–60B SERVICE TOOLS [WL-C, WE-C]

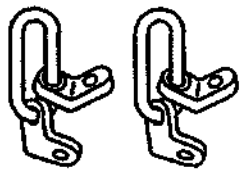
ENGINE SERVICE TOOLS
[WL-C, WE-C] 01–60B–1

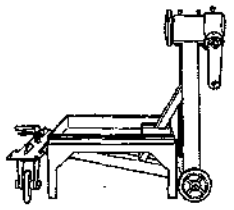
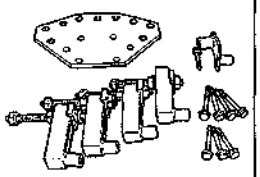
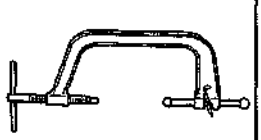
ENGINE SERVICE TOOLS [WL-C, WE-C]

DCF016000000W02

1: Mazda SST number
2: Global SST number

Example

1:49 UN30 3050 2:303-050 Engine lifting brackets	

1:49 0107 680A 2:– Engine stand	1:49 L010 1A0 2:– Engine stand hanger set	1:49 0636 100B 2:– Valve spring lifter arm
		
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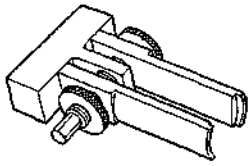
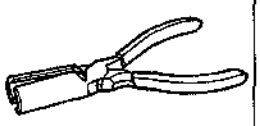
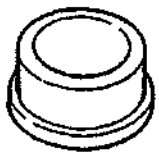
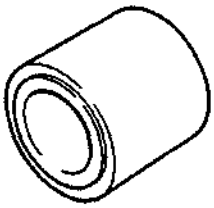
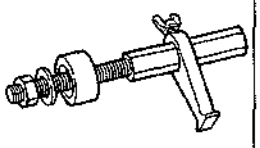
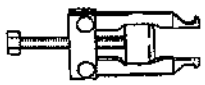
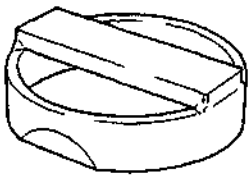
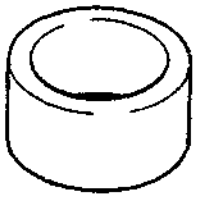
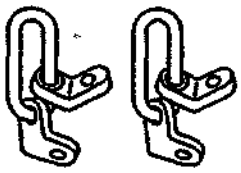
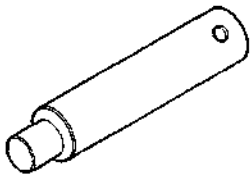
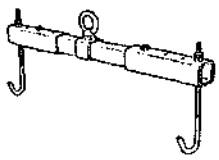
		
1:49 S010 001 2:– Oil seal installer	1:49 E011 1A0 2:– Ring gear brake set	1:49 S120 215B 2:– Pulley puller
		
1:49 S011 103 2:– Oil seal installer	1:49 S010 301 2:– Oil seal installer	1:49 UN30 3050 2:– Engine lifting brackets
		
1:49 G011 001 2:– Piston pin replacer	1:49 B012 015 2:– Valve guide remover and installer	1:49 L017 5A0 2:– Support hanger
		

1:49 B012 016 2:– Valve seal installer		

DRIVELINE/AXLE

03
SECTION

TRANSFER 03-16
TECHNICAL DATA 03-50
SERVICE TOOLS 03-60

03

03–16 TRANSFER

TRANSFER CLEANING 03–16–1
TRANSFER DISASSEMBLY 03–16–2
TRANSFER ASSEMBLY 03–16–8

TRANSFER CLEANING

DCF031600000W01

Cleaning Precautions

1. Clean the surface of the transfer using steam and cleaning fluids when disassembly.

   Warning
   - **Always wear safety glasses when using compressed air since the foreign material could be blown by the compression air and damage your eyes.**

2. Clean removed components with cleaning fluids and use compressed air to blow off the oil. Clean the oil holes and passages with compressed air.

TRANSFER DISASSEMBLY

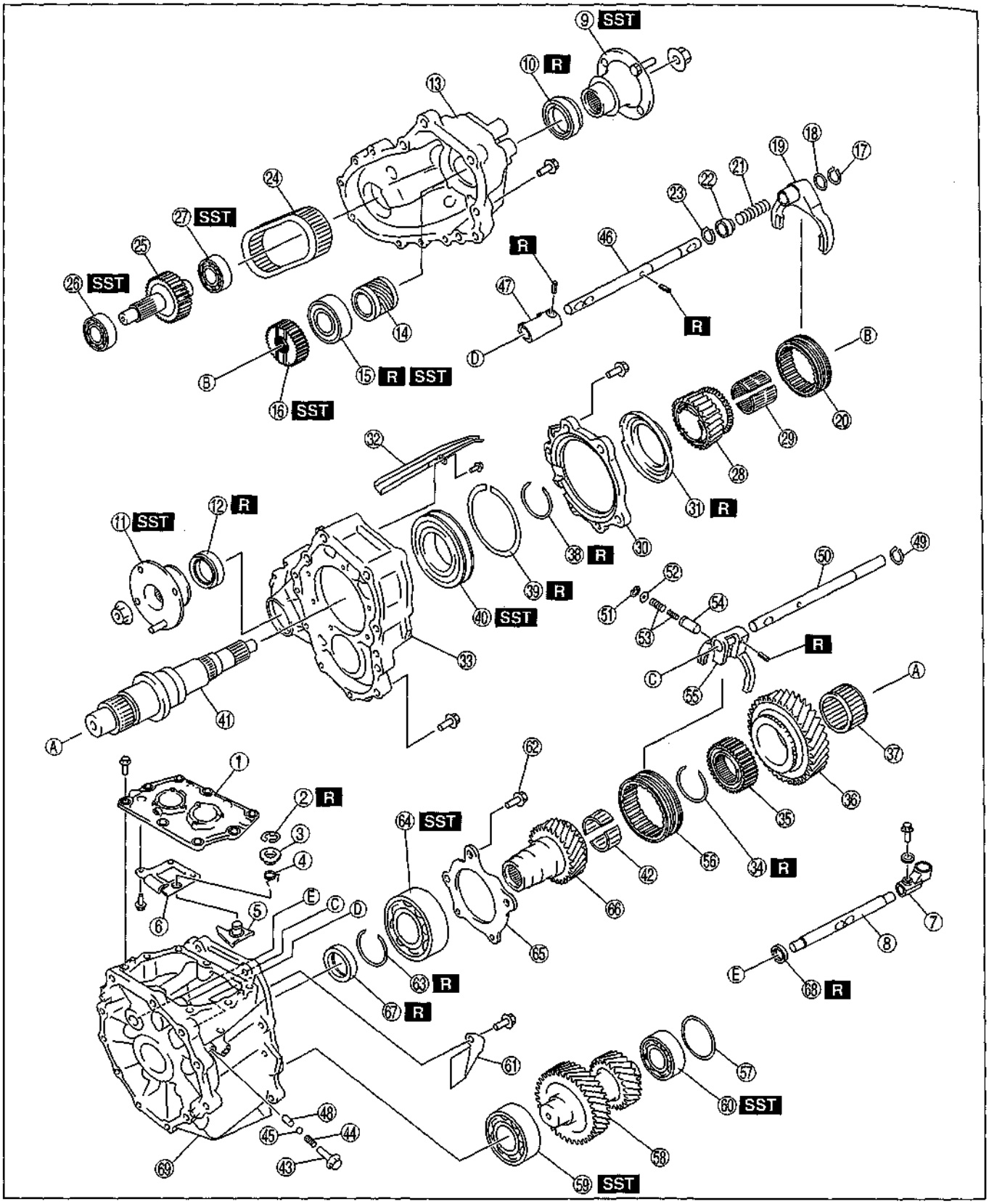
DCF031600000W02

Before Service Precautions

- To prevent foreign material from entering the transfer, perform disassembly and servicing in a clean, dust-free environment.
- Inspect the each part while disassembling.

Transfer Disassembly

1. Disassemble in the order shown in the figure.



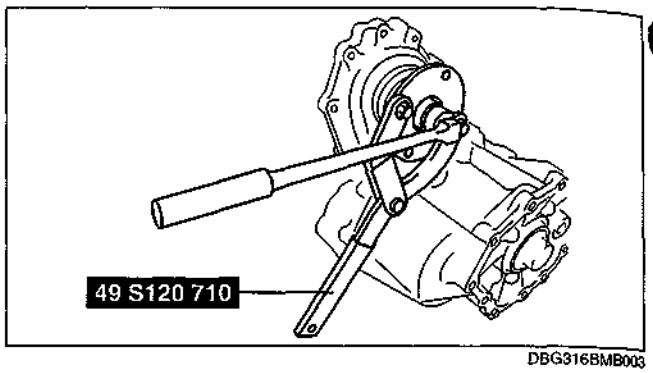
DBG316BMB026

1	Control case
2	E-ring
3	Spacer
4	Reverse gate spring
5	Reverse gate lever
6	Guide plate
7	Control rod end
8	Control rod
9	Companion flange (rear case side) (See 03–16–4 Companion Flange Disassembly Note.)
10	Oil seal (rear case)
11	Companion flange (center case side) (See 03–16–4 Companion Flange Disassembly Note.)
12	Oil seal (center case)
13	Rear case
14	Speed drive gear
15	Mainshaft rear bearing (See 03–16–5 Mainshaft Rear Bearing Disassembly Note.)
16	2W/4W clutch hub (See 03–16–5 2W/4W Clutch Hub Disassembly Note.)
17	Snap ring
18	Spacer
19	2W/4W shift fork
20	2W/4W hub sleeve
21	Spring
22	Collar
23	Snap ring
24	Chain (See 03–16–6 Chain, Front Drive Shaft and Sprocket Disassembly Note.)
25	Front drive shaft (See 03–16–6 Chain, Front Drive Shaft and Sprocket Disassembly Note.)
26	Front drive shaft bearing (center case side) (See 03–16–6 Front Drive Shaft Bearing Disassembly Note.)
27	Front drive shaft bearing (rear case side) (See 03–16–6 Front Drive Shaft Bearing Disassembly Note.)
28	Sprocket (See 03–16–6 Chain, Front Drive Shaft and Sprocket Disassembly Note.)
29	Needle bearing
30	Center bearing retainer
31	Oil catcher
32	Oil passage
33	Center case
34	Retaining ring
35	H/L clutch hub
36	Low gear
37	Needle bearing
38	Retaining ring
39	Retaining ring
40	Mainshaft center bearing (See 03–16–7 Mainshaft Center Bearing Disassembly Note.)
41	Mainshaft
42	Needle bearing
43	Retaining bolt
44	Spring
45	Steel ball
46	2W/4W shift rod
47	2W/4W shift end
48	Interlock pin
49	Snap ring
50	H/L shift rod
51	Snap ring
52	Plain washer
53	Spring
54	Plunger
55	H/L shift fork
56	H/L hub sleeve
57	Adjustment shim
58	Countershaft
59	Countershaft front bearing (front case side) (See 03–16–7 Countershaft Bearing Disassembly Note.)
60	Countershaft rear bearing (center case side) (See 03–16–7 Countershaft Bearing Disassembly Note.)
61	Baffle plate
62	Retaining bolt
63	Retaining ring
64	Maindrive gear bearing (See 03–16–7 Maindrive Gear Bearing Disassembly Note.)
65	Retainer
66	Maindrive gear
67	Oil seal (control rod)
68	Oil seal (front case)
69	Front case

Companion Flange Disassembly Note

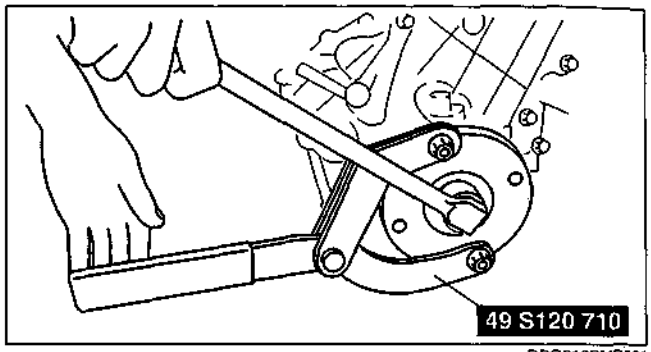
1. Hold the companion flange using the **SST**.

Center case side



DBG316BMB003

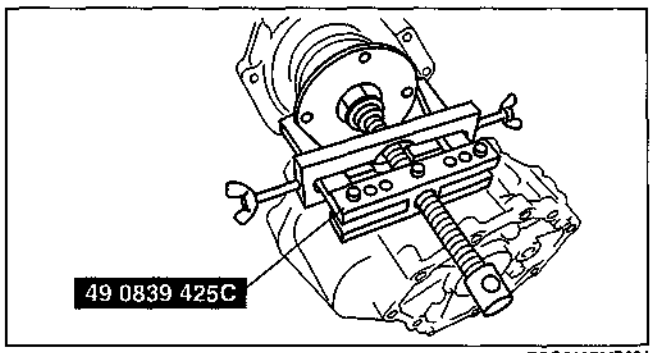
Rear case side



DBG316BMB001

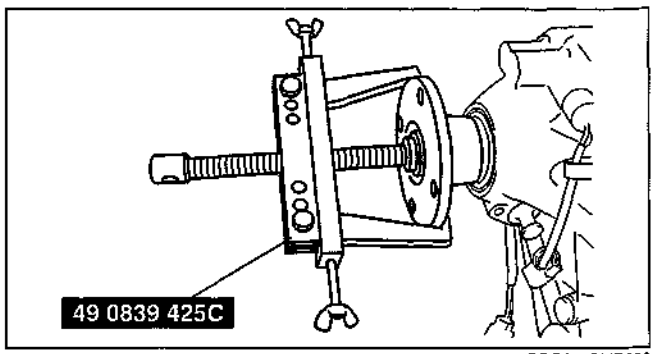
2. Remove the locknut.
3. Remove the companion flange using the **SST**.

Center case side



DBG316BMB004

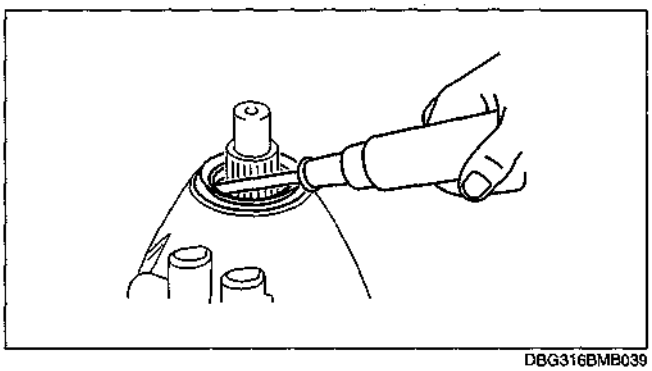
Rear case side



DBG316BMB002

Oil Seal (Rear Case) Disassembly Note

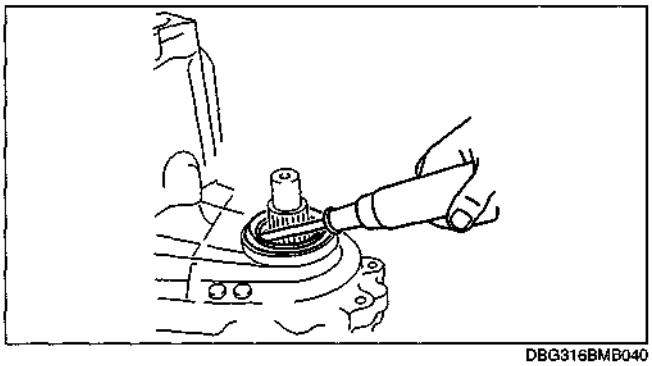
1. Remove the oil seal (rear case) using a flathead screwdriver as shown in the figure.



DBG316BMB039

Oil Seal (Center Case) Disassembly Note

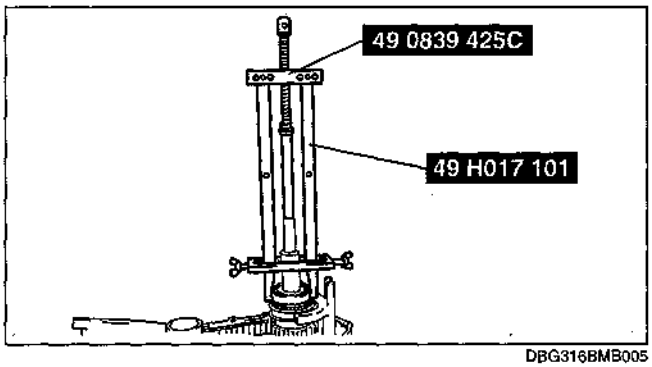
1. Remove the oil seal (center case) using a flathead screwdriver as shown in the figure.



DBG316BMB040

Mainshaft Rear Bearing Disassembly Note

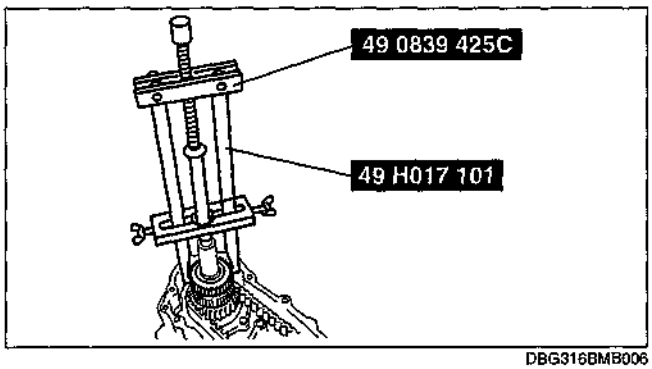
1. Remove the mainshaft rear bearing using the **SSTs**.



DBG316BMB005

2W/4W Clutch Hub Disassembly Note

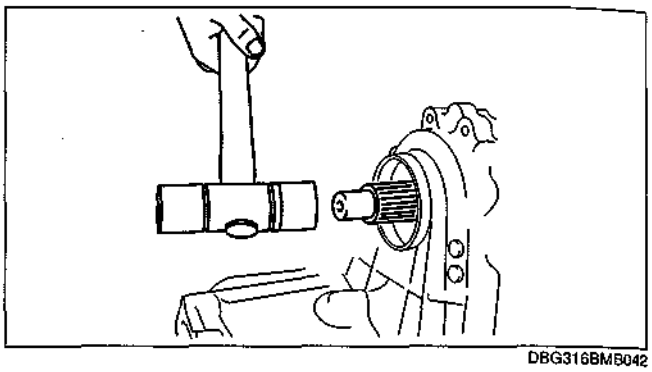
1. Remove the 2W/4W clutch hub using the **SSTs**.



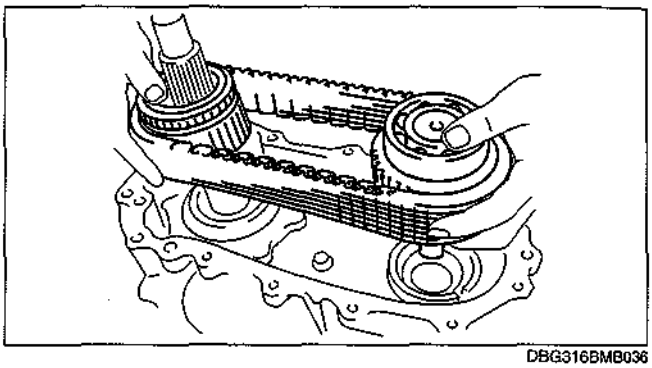
DBG316BMB006

Chain, Front Drive Shaft and Sprocket Disassembly Note

1. Remove the front drive shaft using the plastic hammer.


DBG316BMB042

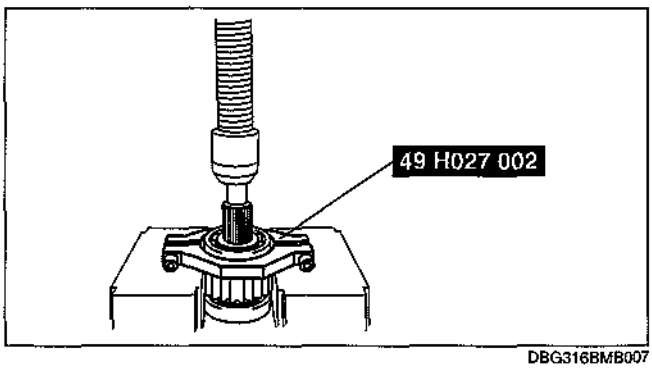
2. Remove the chain, front drive shaft and sprocket as a single unit.


DBG316BMB036

Front Drive Shaft Bearing Disassembly Note

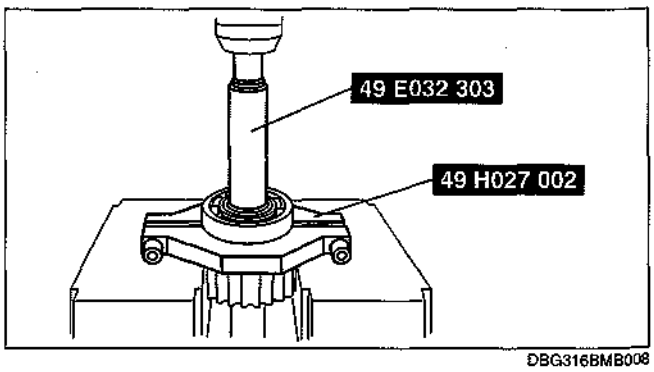
1. Remove the front drive shaft bearing using the **SSTs** and press.

Center case side



DBG316BMB007

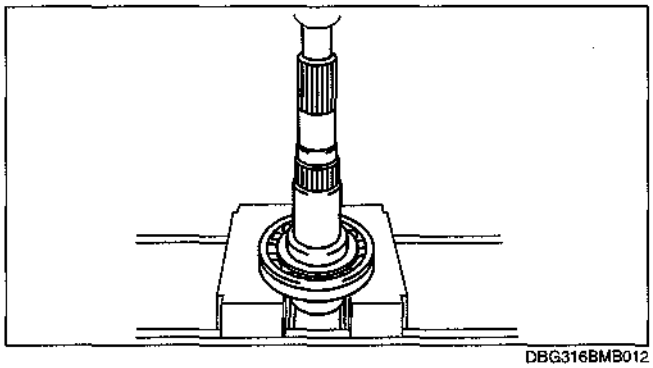
Rear case side



DBG316BMB008

Mainshaft Center Bearing Disassembly Note

1. Remove the mainshaft front bearing using the press.

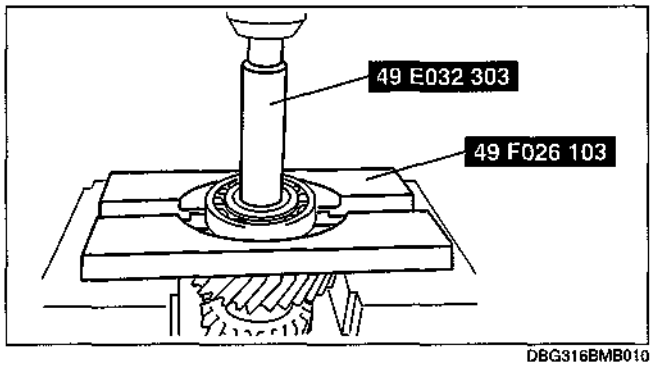


DBG316BMB012

Countershaft Bearing Disassembly Note

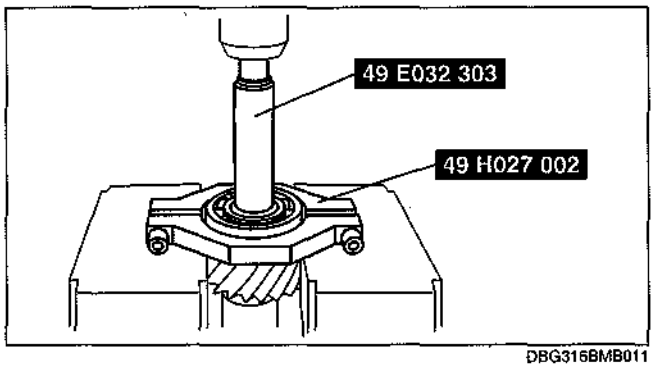
1. Remove the countershaft bearing using the **SSTs** and press.

Front case side



DBG316BMB010

Center case side



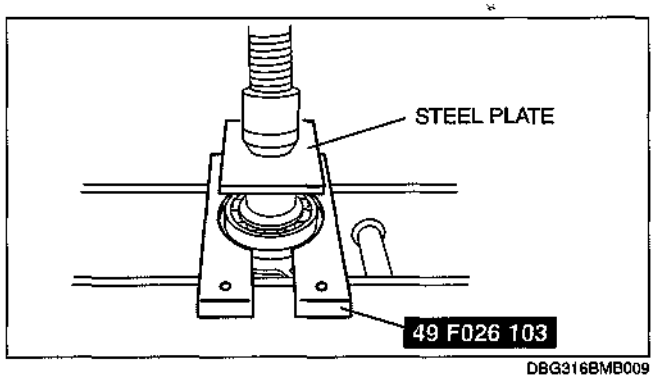
DBG316BMB011

Maindrive Gear Bearing Disassembly Note

1. Remove the maindrive gear bearing using the **SST**, press and steel plate.

Note

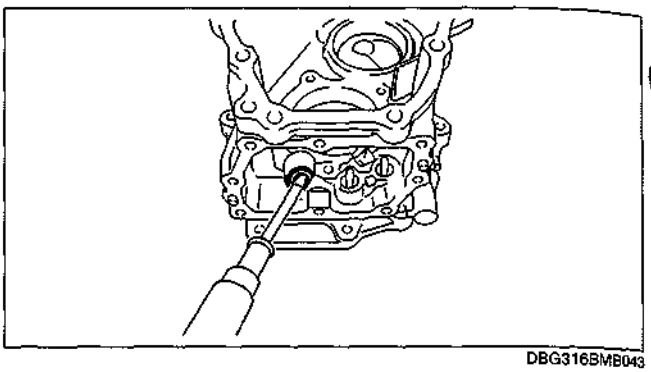
- Steel plate height: **10 mm {0.39 in}** or more.



DBG316BMB009

Oil Seal (Control Rod) Disassembly Note

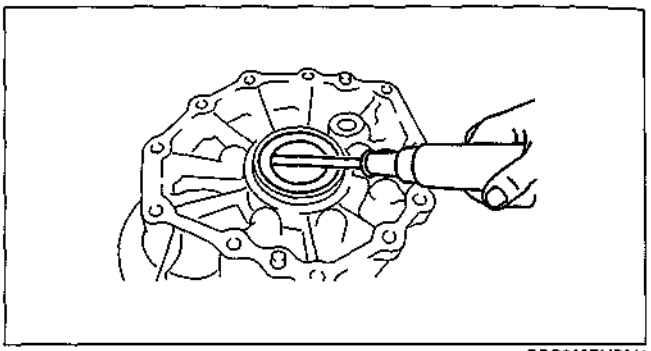
1. Remove the oil seal (control rod) using a flathead screwdriver as shown in the figure.



DBG316BMB043

Oil Seal (Front Case) Disassembly Note

1. Remove the oil seal (front case) using a flathead screwdriver as shown in the figure.



DBG316BMB041

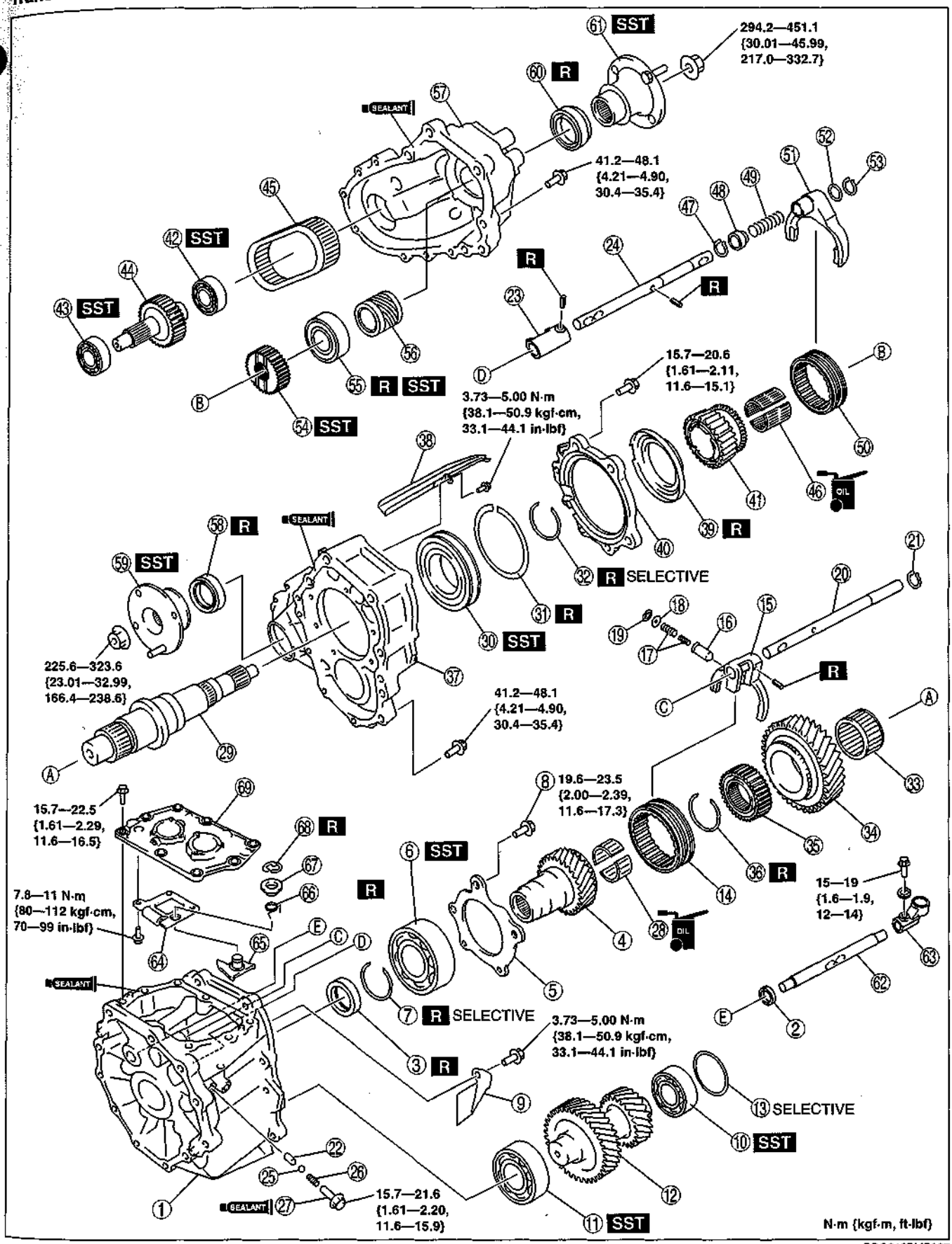
TRANSFER ASSEMBLY

DCF031600000W03

Before Service Precautions

- Assemble with bare hands or using vinyl gloves. To prevent foreign material from entering the transfer, do not use cotton work gloves or a rag.
- Apply sufficient gear oil to the sliding surfaces and O-rings, and be careful not to damage when assembling.
- Replace the transfer with a new one if the case alignment surface is damaged. Be careful not to damage it since it may cause oil leakage.
- When installing silicone sealant, clean off the old sealant adhering to the sealing area and clean the sealing area with cleaning fluids.
- After installing a seal, leave the parts alone for **2 h or more.** Do not add oil or operate the vehicle during this time.

Transfer Assembly



DBG316BMB027

1	Front case

2	Oil seal (control rod) (See 03–16–11 Oil Seal (control rod) Assembly Note.)

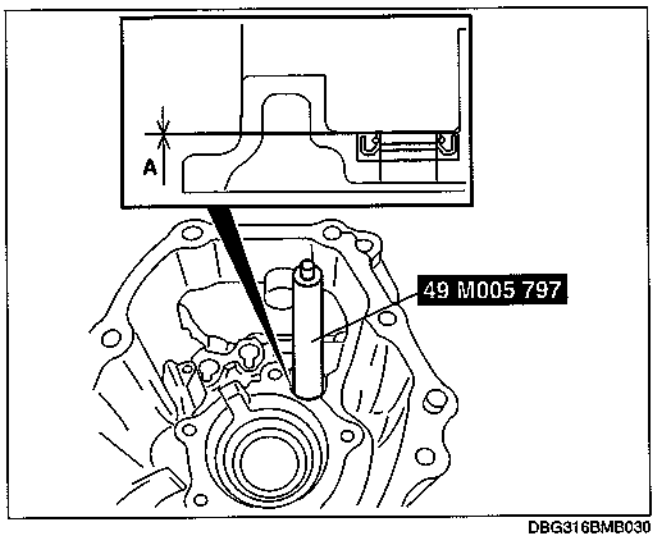
3	Oil seal (front case) (See 03–16–11 Oil Seal (front case) Assembly Note.)
4	Maindrive gear
5	Retainer
6	Maindrive gear bearing (See 03–16–11 Maindrive Gear Bearing Assembly Note.)
7	Retaining ring (See 03–16–11 Maindrive Gear Bearing Assembly Note.)
8	Retaining bolt
9	Baffle plate
10	Countershaft rear bearing (center case side) (See 03–16–12 Countershaft Bearing Assembly Note.)
11	Countershaft front bearing (front case side) (See 03–16–12 Countershaft Bearing Assembly Note.)
12	Countershaft (See 03–16–12 Countershaft Assembly Note.)
13	Adjustment shim (See 03–16–12 Countershaft Assembly Note.)
14	H/L hub sleeve
15	H/L shift fork
16	Plunger
17	Spring
18	Plain washer
19	Snap ring
20	H/L shift rod
21	Snap ring
22	Interlock pin
23	2W/4W shift end
24	2W/4W shift rod
25	Steel ball
26	Spring
27	Retaining bolt
28	Needle bearing
29	Mainshaft (See 03–16–13 Mainshaft and Mainshaft Center Bearing Assembly Note.)
30	Mainshaft center bearing (See 03–16–13 Mainshaft and Mainshaft Center Bearing Assembly Note.)
31	Retaining ring
32	Retaining ring (See 03–16–13 Mainshaft and Mainshaft Center Bearing Assembly Note.)
33	Needle bearing
34	Low gear
35	H/L clutch hub
36	Retaining ring
37	Center case (See 03–16–13 Center Case Assembly Note.)
38	Oil passage (See 03–16–14 Oil Passage Assembly Note.)
39	Oil catcher (See 03–16–14 Oil Catcher Assembly Note.)
40	Center bearing retainer
41	Sprocket (See 03–16–14 Chain, Front Drive Shaft and Sprocket Assembly Note.)
42	Front drive shaft bearing (rear case side) (See 03–16–15 Front Drive Shaft Bearing Assembly Note.)
43	Front drive shaft bearing (center case side) (See 03–16–15 Front Drive Shaft Bearing Assembly Note.)
44	Front drive shaft (See 03–16–14 Chain, Front Drive Shaft and Sprocket Assembly Note.)
45	Chain (See 03–16–14 Chain, Front Drive Shaft and Sprocket Assembly Note.)
46	Needle bearing (See 03–16–14 Chain, Front Drive Shaft and Sprocket Assembly Note.)
47	Snap ring
48	Collar
49	Spring
50	2W/4W hub sleeve
51	2W/4W shift fork
52	Spacer
53	Snap ring
54	2W/4W clutch hub (See 03–16–15 2W/4W Clutch Hub Assembly Note.)
55	Mainshaft rear bearing (See 03–16–16 Mainshaft Rear Bearing Assembly Note.)
56	Speed drive gear
57	Rear case (See 03–16–16 Rear Case Assembly Note.)
58	Oil seal (center case) (See 03–16–16 Oil Seal (center case) Assembly Note.)
59	Companion flange (center case side)
60	Oil seal (rear case) (See 03–16–17 Oil Seal (rear case) Assembly Note.)
61	Companion flange (rear case side)
62	Control rod
63	Control rod end
64	Guide plate
65	Reverse gate lever
66	Reverse gate spring
67	Spacer
68	E-ring
69	Control case (See 03–16–17 Control Case Assembly Note.)

Oil Seal (control rod) Assembly Note

Caution
- **Assemble the oil seal being careful not to assemble it in the incorrect direction.**

1. Apply specified grease to the lip of a new oil seal.
2. Install the oil seal (control rod) using the **SST**.

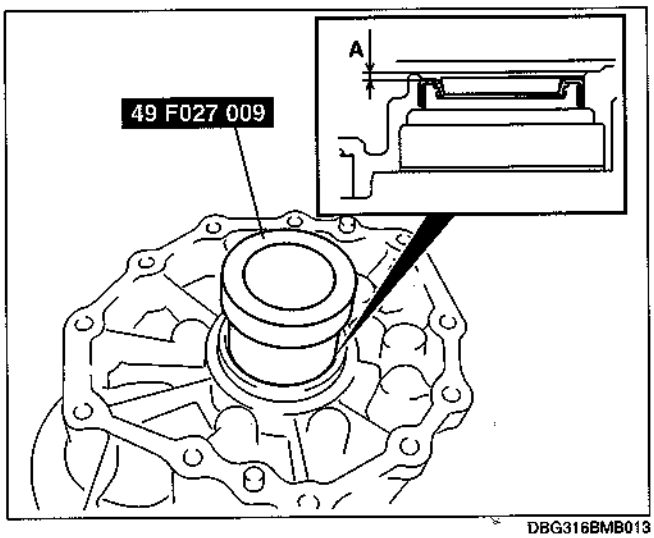
Installation depth A: 0 mm {0 in}



DBG316BMB030

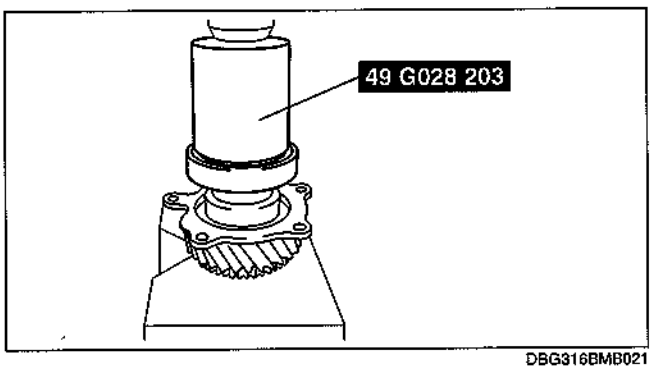
Oil Seal (front case) Assembly Note
1. Apply specified grease to the lip of a new oil seal.
2. Install the oil seal (front case) using the **SST**.

Installation depth A: 2.4—3.0 mm {0.095—0.118 in}



DBG316BMB013

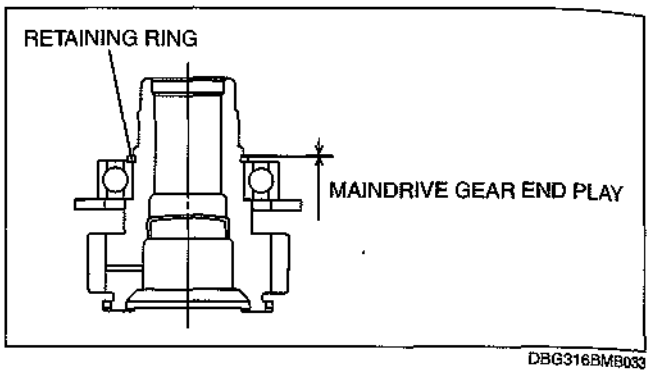
Maindrive Gear Bearing Assembly Note
1. Assemble the maindrive gear bearing using the **SST** and press.
2. Install the retaining ring.



DBG316BMB021

3. Measure the clearance between the retaining ring and groove of the maindrive gear.
   - If not within the specification, adjust by choosing the proper retaining ring.

Maindrive gear bearing end play
0—0.15 mm {0.0—0.0059 in}



DBG316BMB033

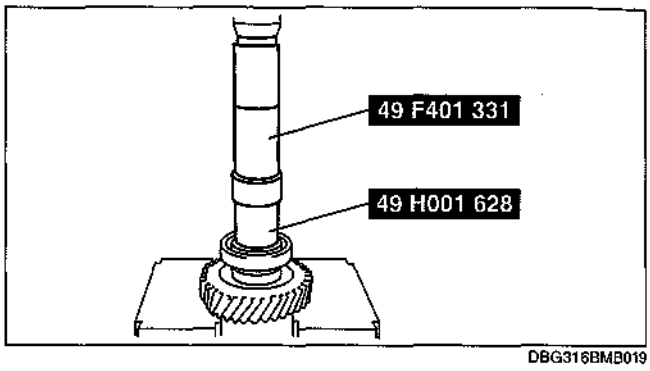
Maindrive gear bearing retaining ring

Thickness (mm {in})
2.60 {0.102}
2.67 {0.105}
2.74 {0.108}

Countershaft Bearing Assembly Note

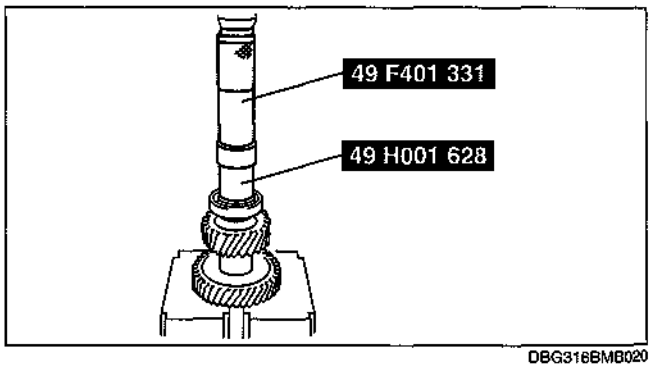
1. Assemble the countershaft bearing using the **SSTs** and press.

Front case side



DBG316BMB019

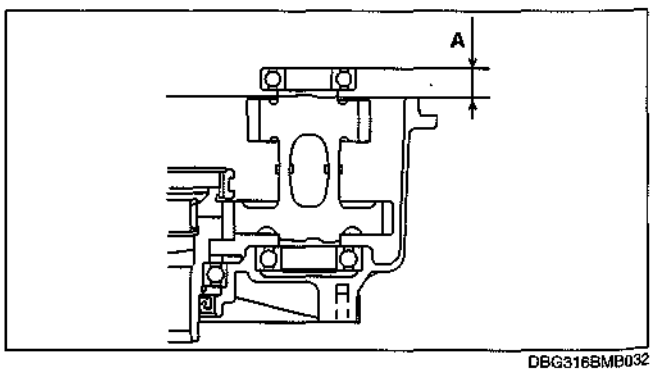
Center case side



DBG316BMB020

Countershaft Assembly Note

1. Assemble the countershaft to the front case.
2. Measure the depth A as shown in the figure.
3. Select the correct countershaft adjustment shim thickness.



DBG316BMB032

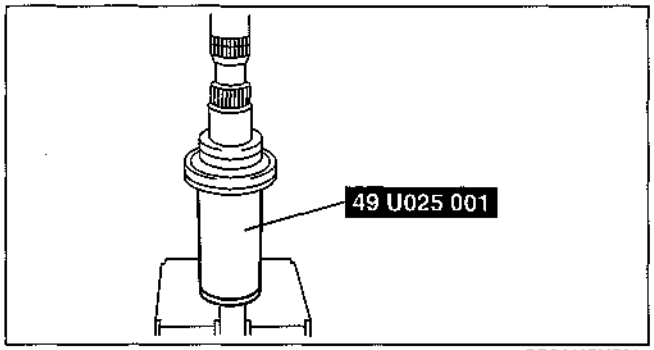
Countershaft adjustment shim selective chart

Dimension A (mm {in})	Shim thickness (mm {in})
25.0—25.1 {0.985—0.988}	0.5 {0.020}
25.1—25.2 {0.989—0.992}	0.4 {0.016}
25.2—25.3 {0.993—0.996}	0.3 {0.012}
25.3—25.4 {0.997—1.000}	0.2 {0.008}
25.4—25.5 {1.000—1.003}	0.1 {0.004}
25.5—25.6 {1.004—1.007}	-

4. Install the adjustment shim.

Mainshaft and Mainshaft Center Bearing Assembly Note

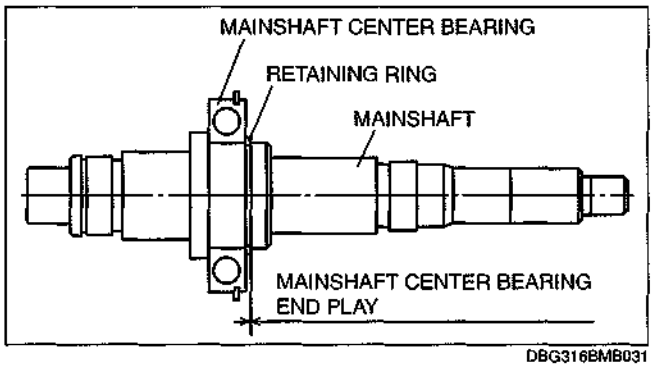
1. Assemble the mainshaft center bearing using the **SST** and press.



DBG316BMB018

2. Measure the clearance between the retaining ring and groove of the mainshaft.
   - If not within the specification, adjust by choosing the proper retaining ring.

Mainshaft center bearing end play
0—0.15 mm {0.0—0.0059 in}



DBG316BMB031

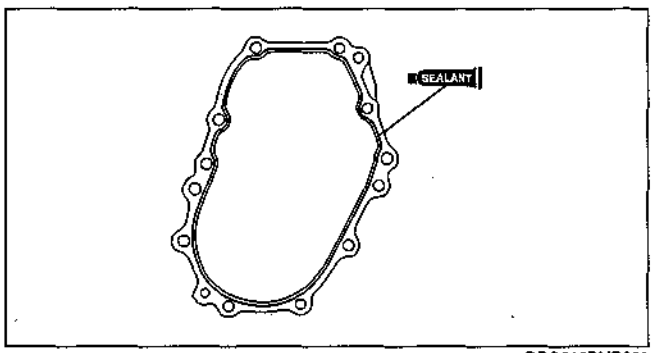
Mainshaft center bearing retaining ring

Thickness (mm {in})
3.1 {0.122}
3.2 {0.126}
3.3 {0.130}

3. Assemble the mainshaft to the center case using the plastic hammer.

Center Case Assembly Note

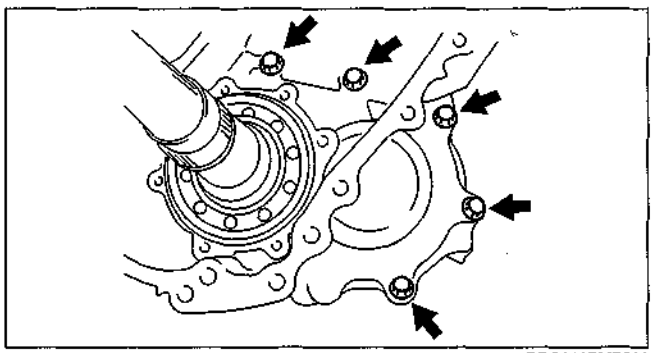
1. Apply sealant to the contact surfaces of the front case and center case as shown in the figure.



DBG316BMB028

2. Assemble the center case.

Bolt length (measured from below the head)
43 mm {1.69 in}



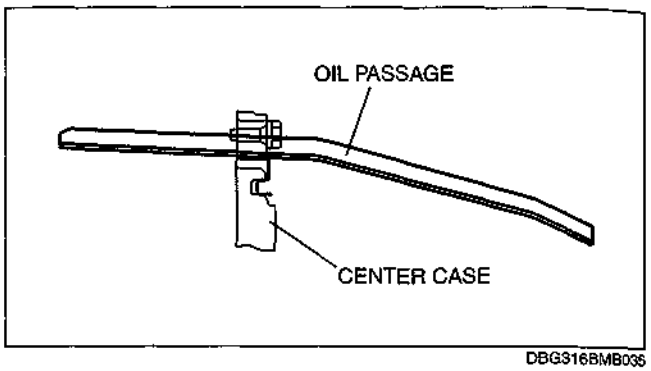
DBG316BMB038

Oil Passage Assembly Note

1. Assemble the oil passage to the center case.

Note

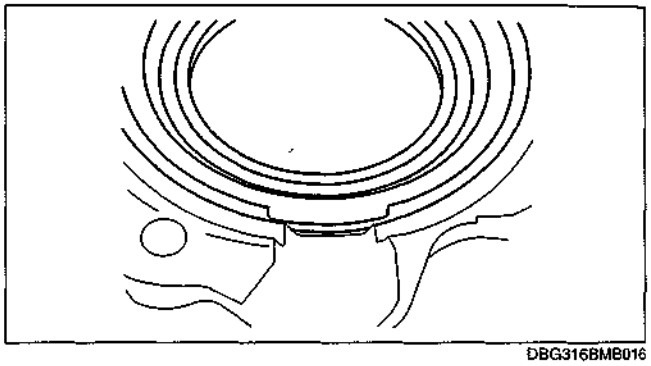
- Align the oil passage of the center case groove as shown in the figure.



DBG316BMB035

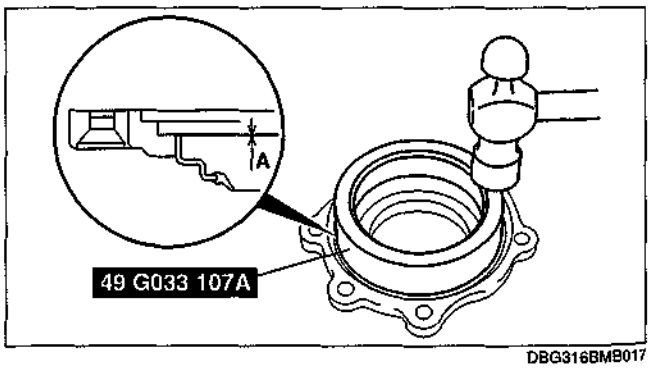
Oil Catcher Assembly Note

1. Align the oil catcher groove as shown in the figure.
2. Apply specified grease to the lip of a new oil seal.


DBG316BMB016

3. Install the oil catcher using the **SST**.

Installation depth A: 0 mm {0 in}



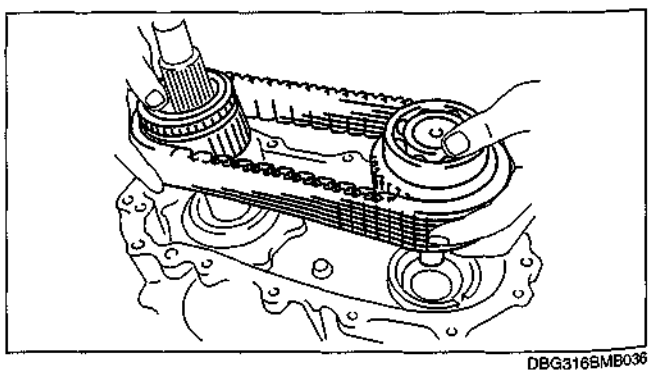
DBG316BMB017

Chain, Front Drive Shaft and Sprocket Assembly Note

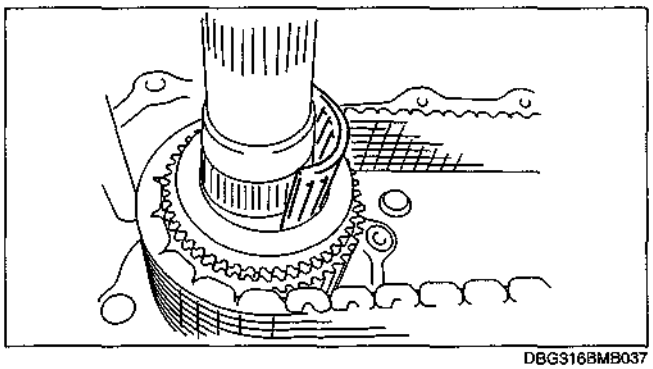
1. Assemble the chain, front drive shaft and sprocket as a single unit.

Note

- Assemble the front drive shaft using the plastic hammer.


DBG316BMB036

2. Install the needle bearings while turning the mainshaft.

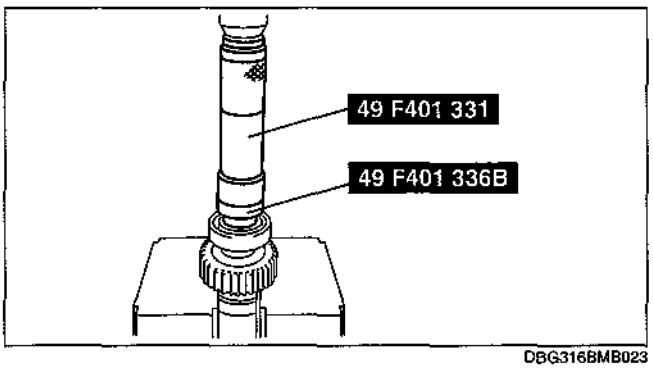


DBG316BMB037

Front Drive Shaft Bearing Assembly Note

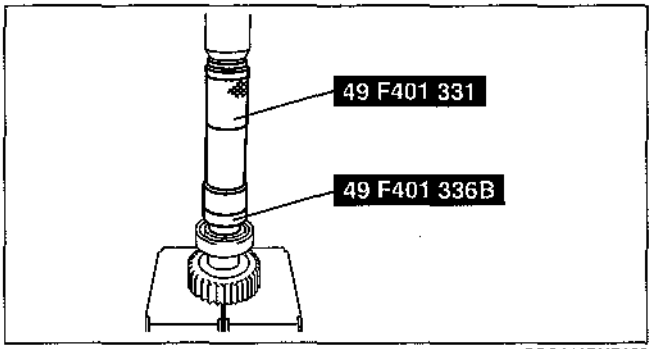
1. Assemble the front drive shaft bearing using the **SSTs** and press.

Center case side



DBG316BMB023

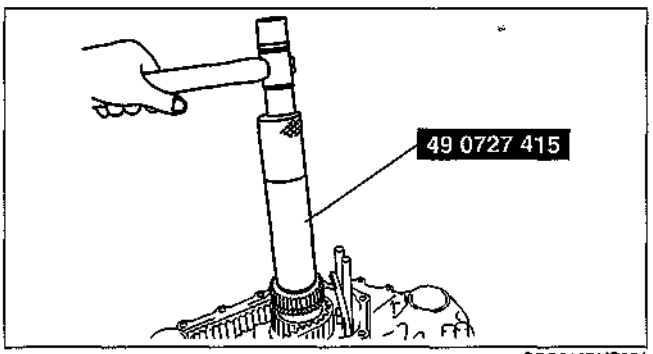
Rear case side



DBG316BMB022

2W/4W Clutch Hub Assembly Note

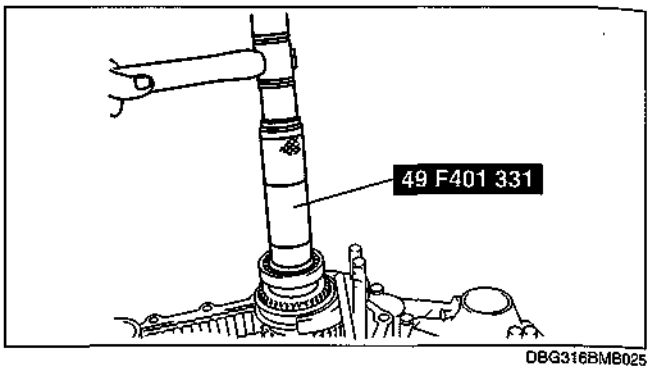
1. Assemble the 2W/4W clutch hub using the **SST**.



DBG316BMB024

Mainshaft Rear Bearing Assembly Note

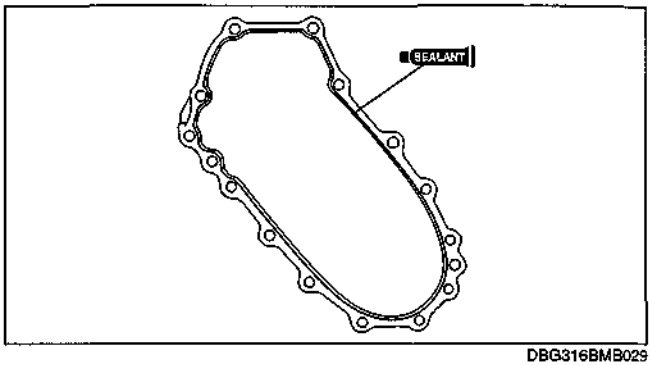
1. Assemble the mainshaft rear bearing using the **SST**.



DBG316BMB025

Rear Case Assembly Note

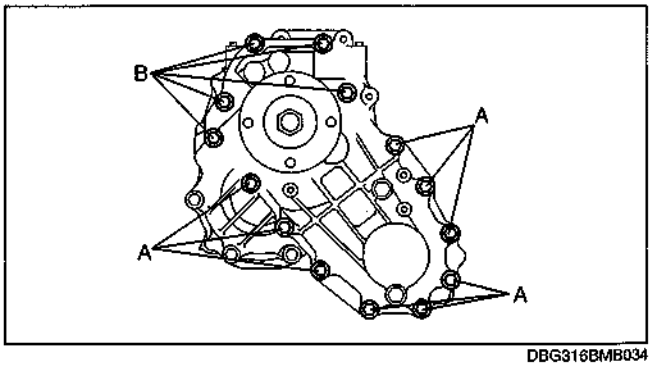
1. Apply sealant to the contact surfaces of the center case and rear case as shown in the figure.



DBG316BMB029

2. Assemble the rear case.

Bolt length (measured from below the head)
A: 58 mm {2.28 in}
B: 113 mm {4.45 in}

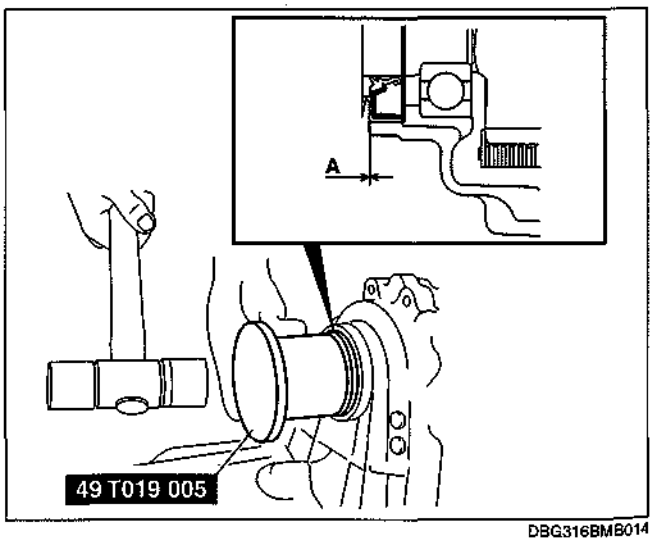


DBG316BMB034

Oil Seal (center case) Assembly Note

1. Apply specified grease to the lip of a new oil seal.
2. Install the oil seal (center case) using the **SST**.

Installation depth A: 0 mm {0 in}

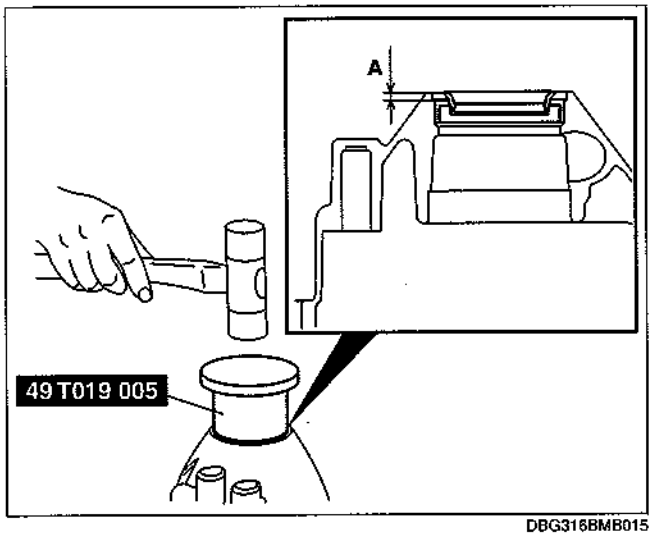


DBG316BMB014

Oil Seal (rear case) Assembly Note

1. Apply specified grease to the lip of a new oil seal.
2. Install the oil seal (rear case) using the **SST**.

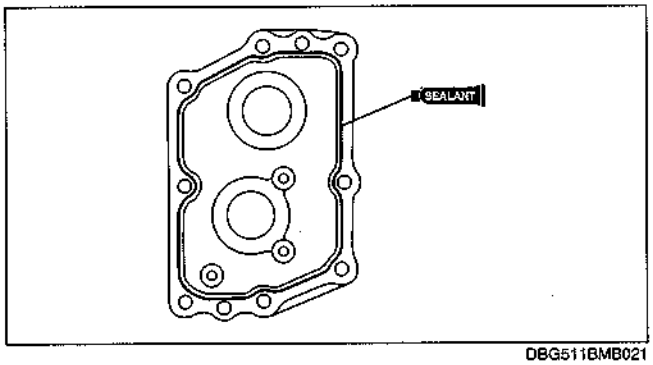
Installation depth A: 6.7—7.3 mm {0.27—0.28 in}



DBG316BMB015

Control Case Assembly Note

1. Apply sealant to the contact surfaces of the control case and transfer case as shown in the figure.
2. Install the control case to the transfer case.



DBG511BMB021

03-16 TRANSFER [5R55S]

TRANSFER CASE CLEANING [5R55S] 03-16–1
TRANSFER CASE DISASSEMBLY [5R55S] 03-16–2
TRANSFER CASE ASSEMBLY [5R55S] 03-16–14
TRANSFER CASE INSPECTION [5R55S] 03-16–26

TRANSFER CASE CLEANING[5R55S]

id0316c1501000

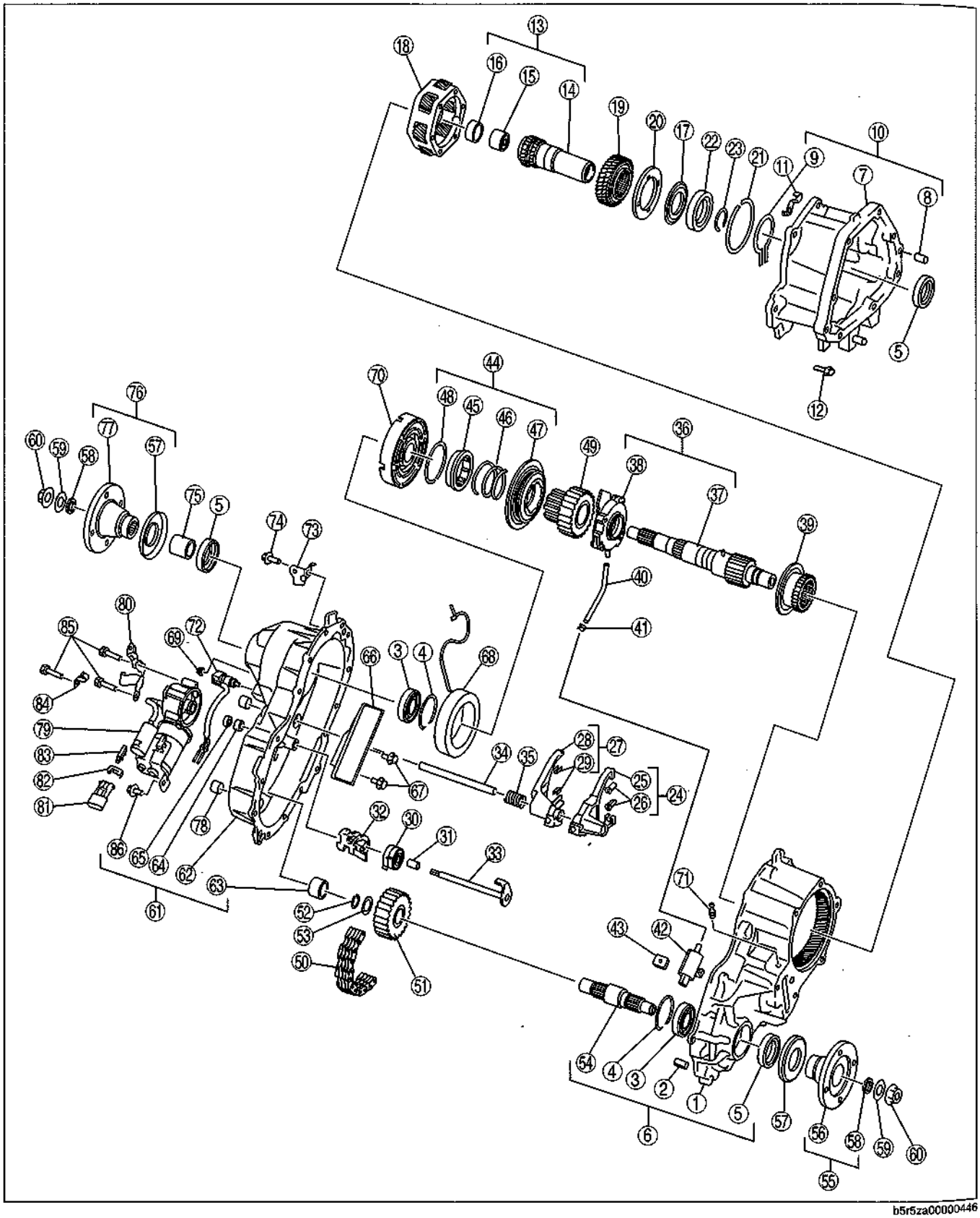
Note
- Before cleaning, check the magnet for the presence of metal particles which indicate internal chipping of the transfer case.

1. Using a cleaning solvent, clean the old oil and dirt deposits.
2. After cleaning dry the parts with low pressure (138 kPa {1.41 kgf/cm^2, 20 psi maximum}) compressed air.
3. Lubricate the ball bearings and needle bearing with oil. Protect lubricated bearings from dust.

TRANSFER CASE DISASSEMBLY[5R55S]

id0316c1501100

Exploded View



b5r5za00000446

1	Center transfer case
2	Dowel pin
3	Bearing
4	Snap ring

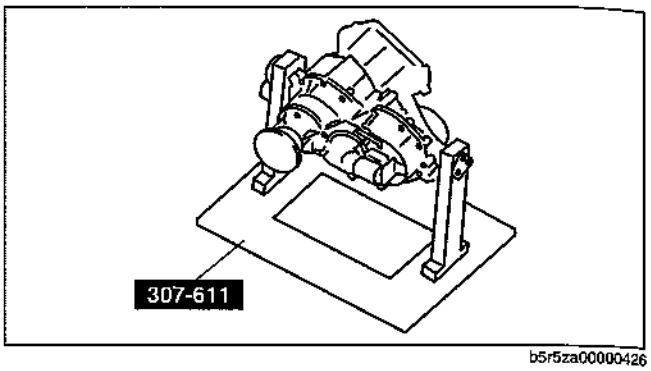
5	Oil seal
6	Center transfer case component
7	Front transfer case
8	Dowel pin

9	Snap ring
10	Front transfer case component
11	Clip
12	Bolt
13	Input shaft component
14	Input shaft
15	Needle bearing
16	Bushing
17	Thrust washer
18	Planetary gear component
19	Sun gear
20	Thrust plate
21	Snap ring A
22	Ball bearing
23	Snap ring B
24	Reduction shift fork component
25	Reduction shift fork
26	Reduction shift fork facing
27	Lockup shift fork component
28	Lockup shift fork
29	Lockup shift fork facing
30	Spring
31	Spacer
32	Cam
33	Shift shaft
34	Rail shift
35	Return spring
36	Output shaft and gerotor pump component
37	Output shaft component
38	Gerotor pump component
39	Reduction hub
40	Pump hose
41	Hose clamp
42	Oil strainer
43	Magnet
44	Lockup component
45	Lockup hub
46	Spring
47	Lockup collar

48	Snap ring
49	Drive sprocket
50	Drive chain
51	Driven sprocket
52	Snap ring
53	Spacer
54	Lower output shaft
55	Front output flange component
56	Front output flange
57	Deflector
58	Oil seal
59	Washer
60	Locknut
61	Rear transfer case component
62	Rear transfer case
63	Needle bearing
64	Sleeve
65	Seal
66	Snubber
67	Bolt
68	Clutch coil
69	Nut
70	Clutch housing
71	Breather pipe
72	Speed sensor component
73	Bracket
74	Bolt
75	Spacer
76	Rear companion flange component
77	Rear companion flange
78	Oil plug
79	Motor component
80	Bracket
81	Terminal connector
82	Clip
83	Bracket
84	Clip
85	Bolt
86	Bolt

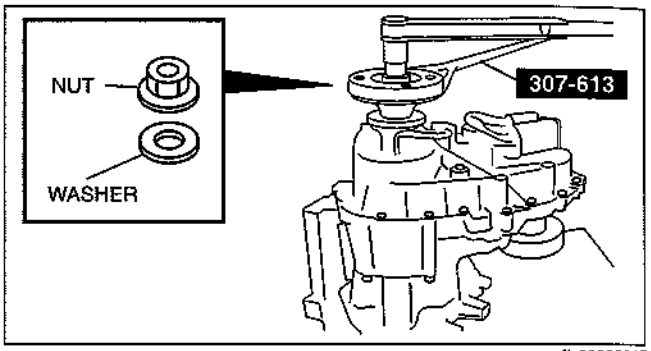
Disassembly Procedure

1. Using the **SST**, set the transfer case as shown in the figure.



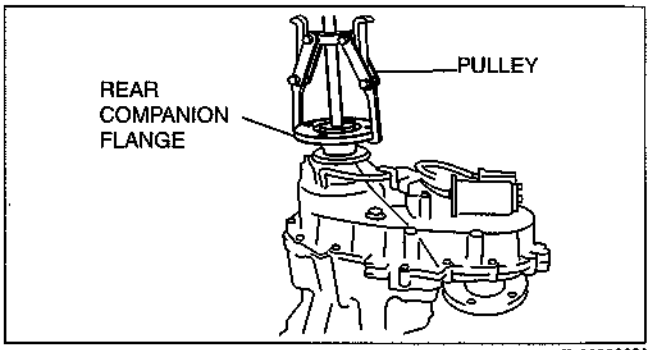
b5r5za00000426

2. Secure the rear companion flange component using the **SST**.
3. Remove the nut and washer.



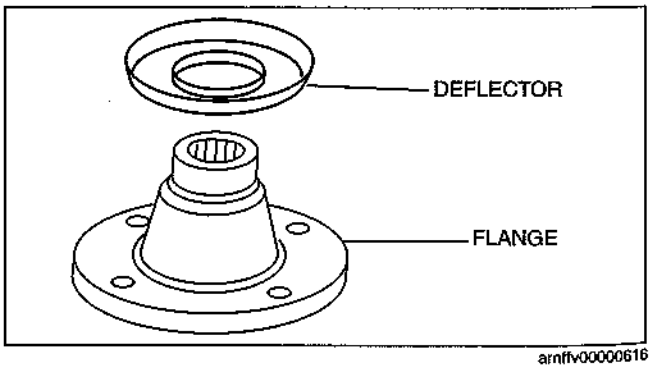
arnffv00000617

4. Remove the rear companion flange using the pulley.



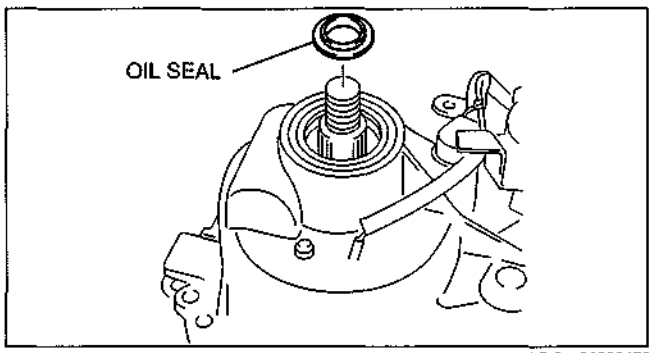
arnffv00000624

5. Remove the deflector from the flange.



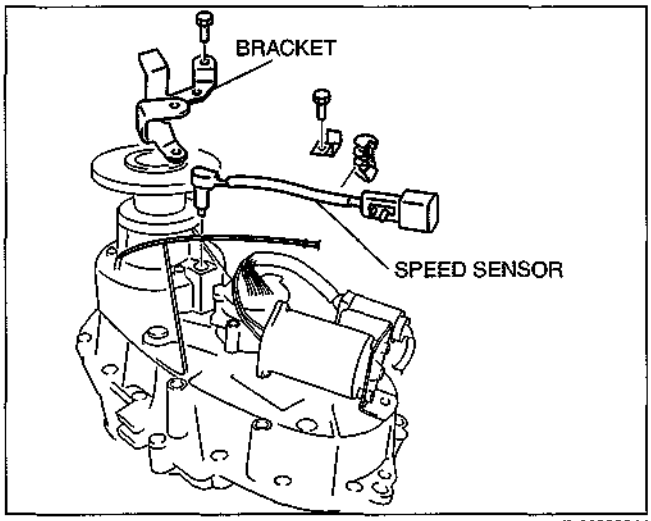
arnffv00000616

6. Remove the oil seal from the output shaft.



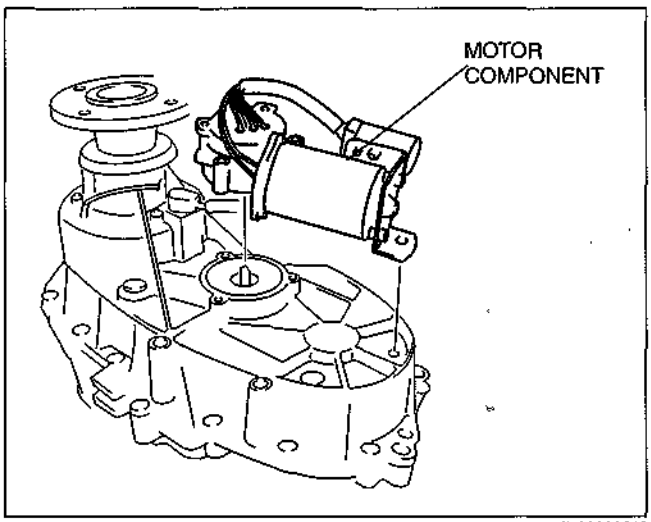
b5r5za00000456

7. Remove the bracket and speed sensor.



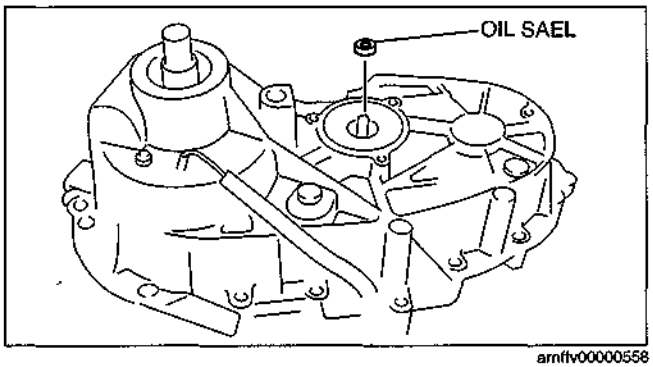
arnffv00000614

8. Remove the motor component.



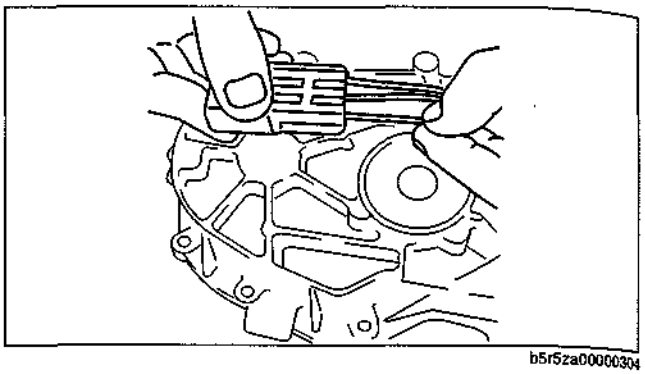
arnffv00000619

9. Remove the oil seal.

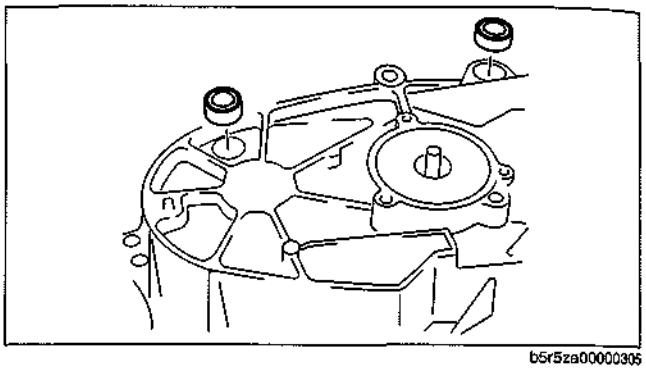


arnffv00000558

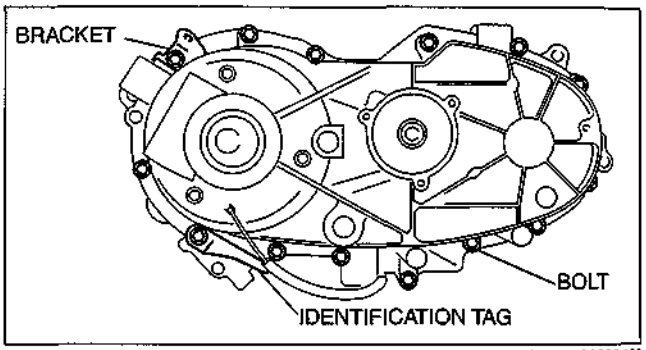
10. Remove the clutch coil terminal from the connector and pull out the wiring harness from the sleeve.


b5r5za0000030

11. Remove the two oil plugs from the rear transfer case.


b5r5za0000030

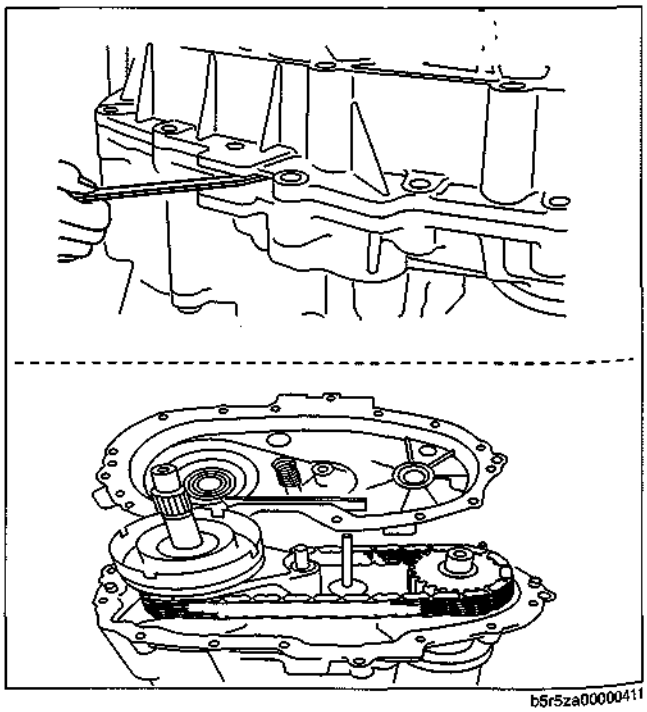
12. Remove the 14 bolts and the identification tag.



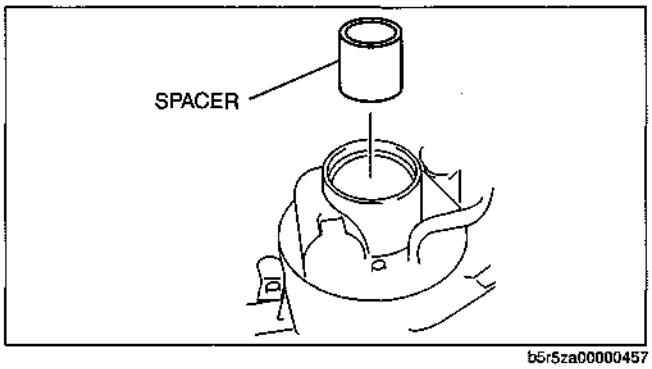
b5r5za0000042

13. Pry at the transfer case projection as shown in the figure a flathead screwdriver, and remove the rear transfer case from the center transfer case.

Caution
- **When prying at the transfer case, be careful not to damage the case.**

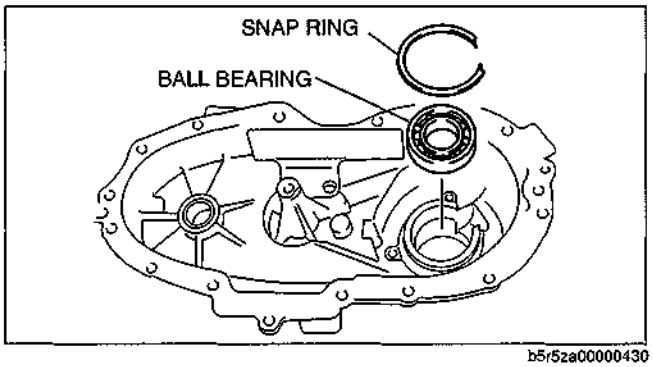

b5r5za0000041

14. Remove the spacer.
15. Using a flathead screwdriver, remove the oil seal.



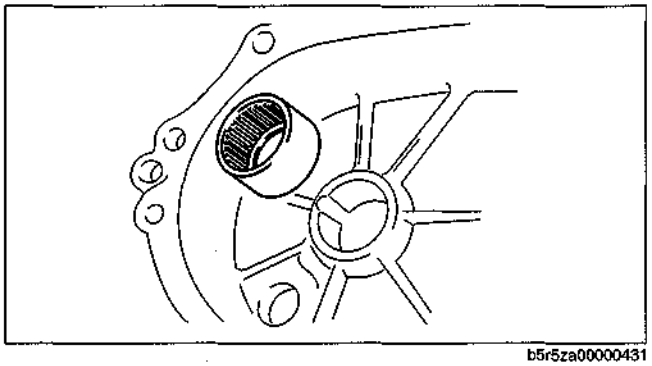
b5r5za00000457

16. Remove the snap ring.
17. Pull out the ball bearing from the rear transfer case.

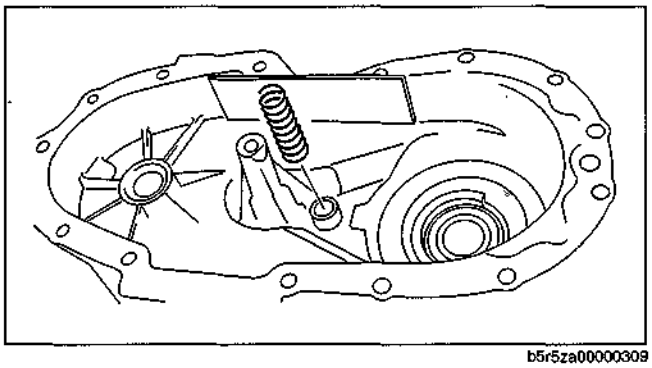


b5r5za00000430

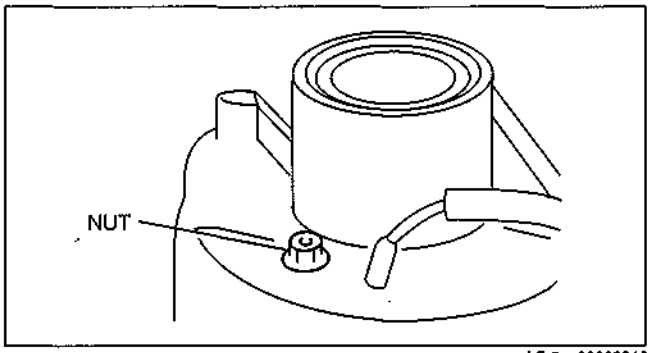
18. Pull out the needle bearing from the rear transfer case.


b5r5za00000431

19. Remove the return spring.


b5r5za00000309

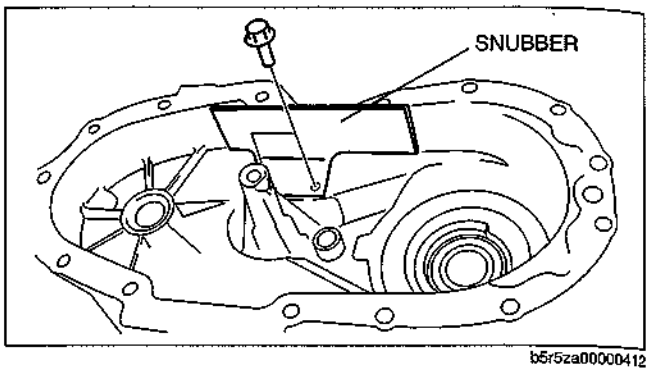
20. Remove the 3 nuts.
21. Remove the clutch coil from the rear transfer case.



b5r5za00000310

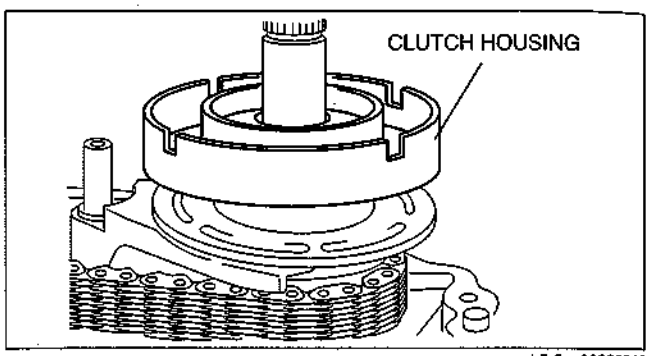
22. Remove the snubber from the rear transfer case.
23. Clean and remove the sealant of the rear transfer case and center transfer case.

Caution
- **Be careful not to damage the metal surface.**



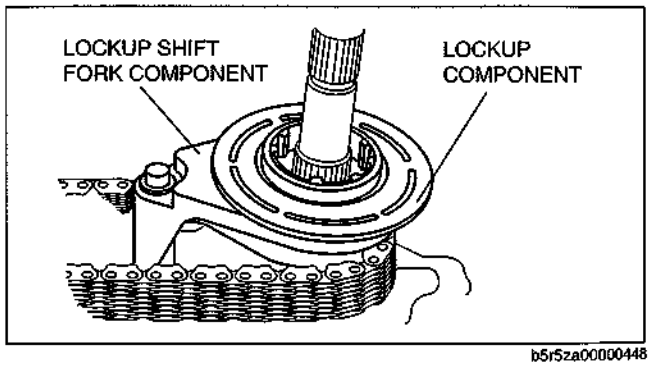
b5r5za00000412

24. Remove the clutch housing from the output shaft.



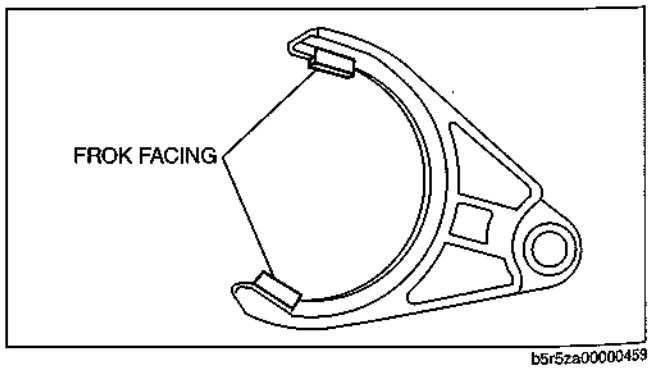
b5r5za00000312

25. Slide the lockup component and the lockup shift fork component as a single unit to remove the lockup component from the output shaft.
26. Remove the lockup shift fork component from the lockup component.



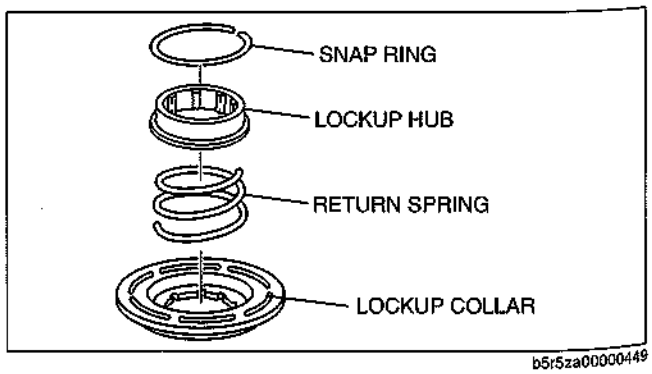
b5r5za00000448

27. Remove the two fork facings from the lockup shift fork.



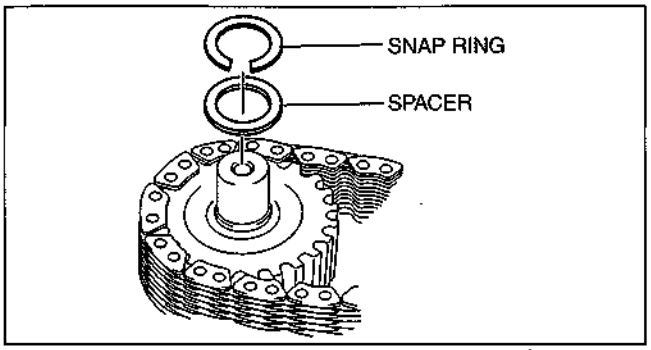
b5r5za00000459

28. Remove the snap ring, lockup hub and return spring from the lockup collar.



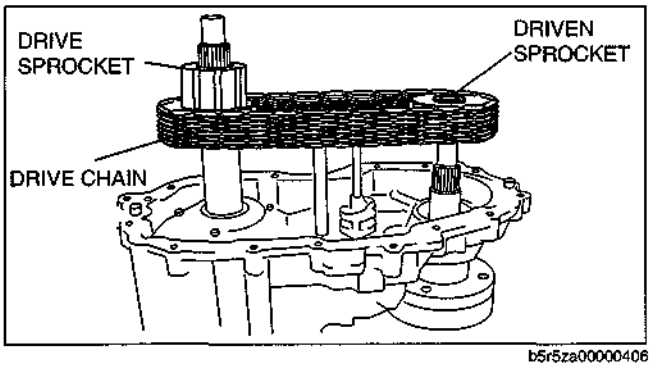
b5r5za00000449

29. Remove the snap ring and spacer from the output shaft.



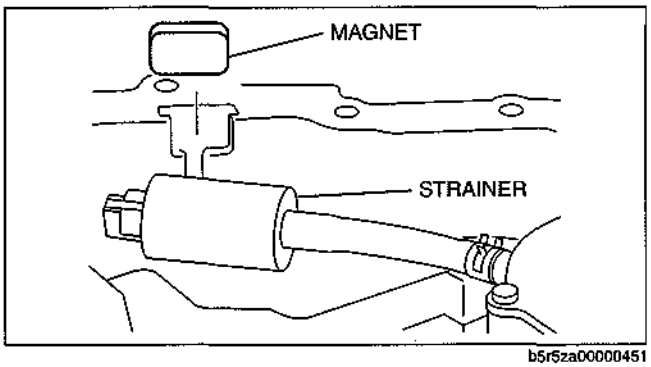
b5r5za00000450

30. Remove the drive chain, driven sprocket and drive sprocket from the output shaft at a time.
31. Separate the drive chain and sprockets.



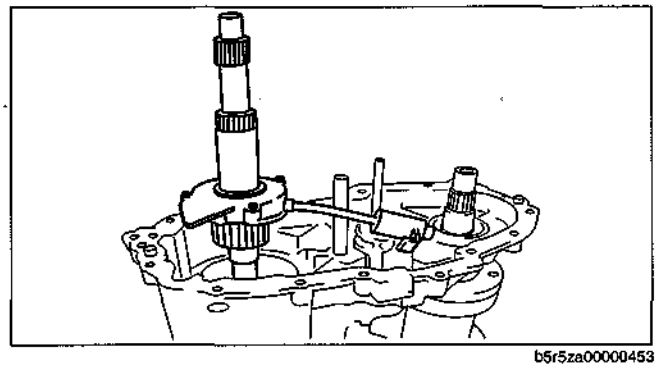
b5r5za00000406

32. Remove the magnet from the slot in the center transfer case.
33. Remove the strainer from the center transfer case.



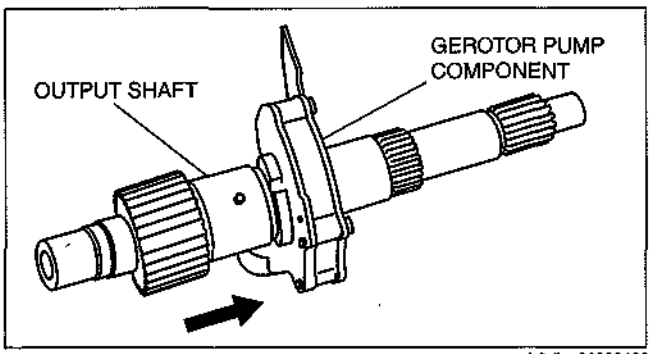
b5r5za00000451

34. Remove the output shaft component and gerotor pump component from the center transfer case.



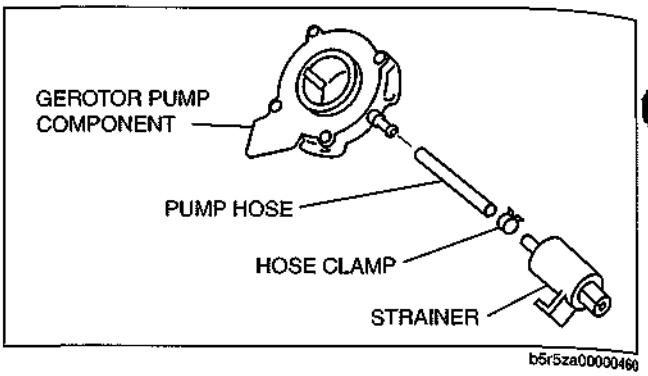
b5r5za00000453

35. Remove the gerotor pump component from the output shaft.
36. Loosen the hose clamp and remove the pump hose from the gerotor pump component.



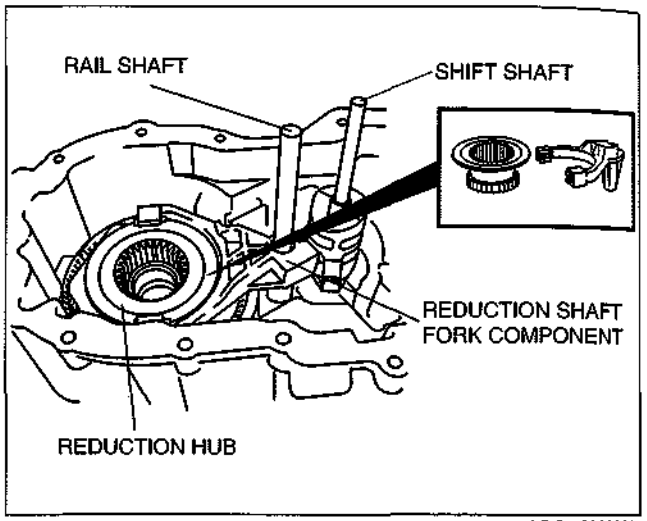
b5r5za00000408

37. Remove the hose clamp, pump hose and strainer.



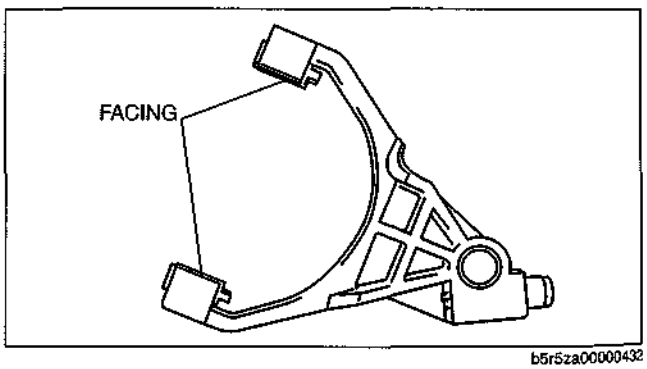
b5r5za00000460

38. Remove the reduction hub, reduction shift fork component, rail shaft and shift shaft component from the center transfer case.



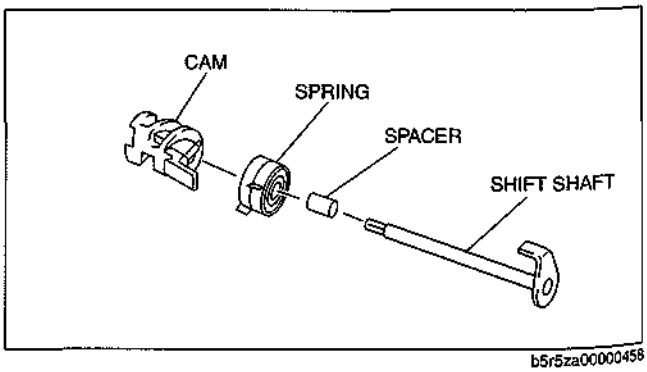
b5r5za00000320

39. Remove the two shift fork facings from the reduction shift fork component.



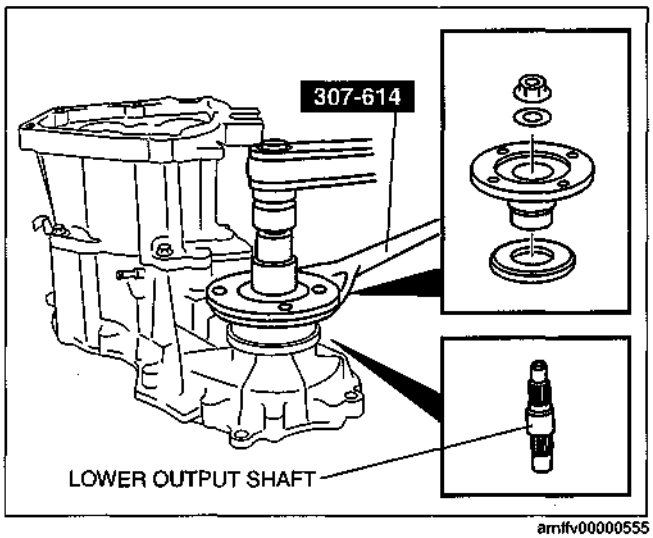
b5r5za00000432

40. Disassemble the cam, spring, spacer, and shift shaft.



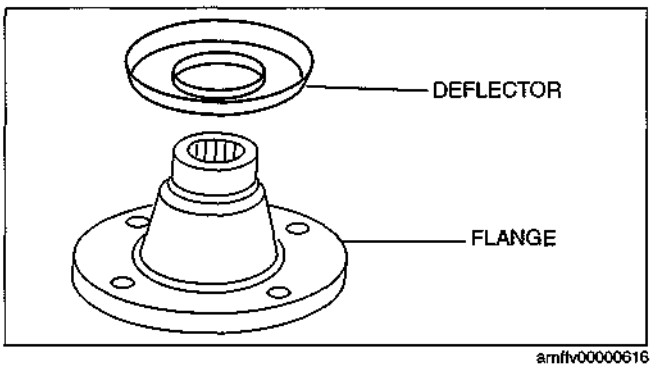
b5r5za00000458

41. Secure the flange using the **SST**.
42. Remove the nut and washer.



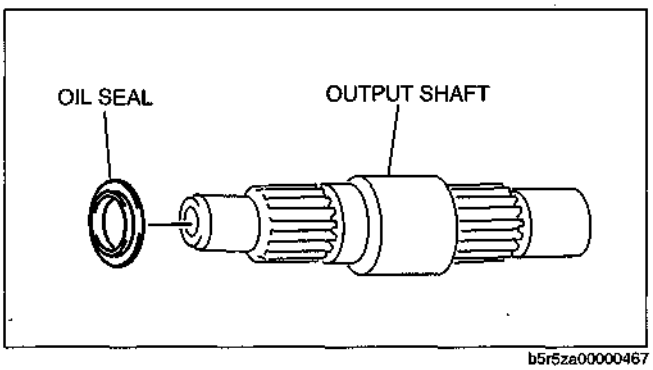
amlfv00000555

43. Remove the deflector from the flange.
44. Pull out the front output flange component.
45. Remove the lower output shaft.



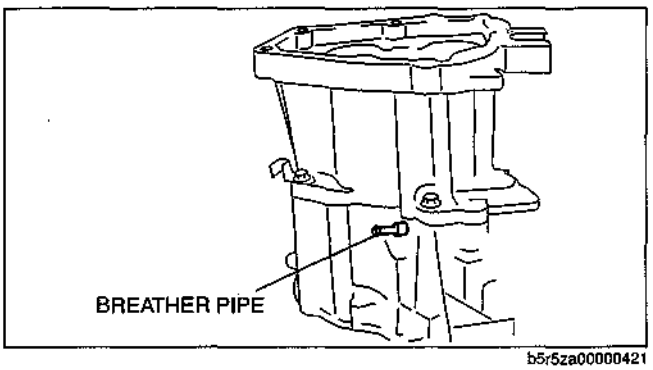
amlfv00000616

46. Remove the oil seal from the lower output shaft.
47. Remove the deflector from the flange only when replacement is necessary.



b5r5za00000467

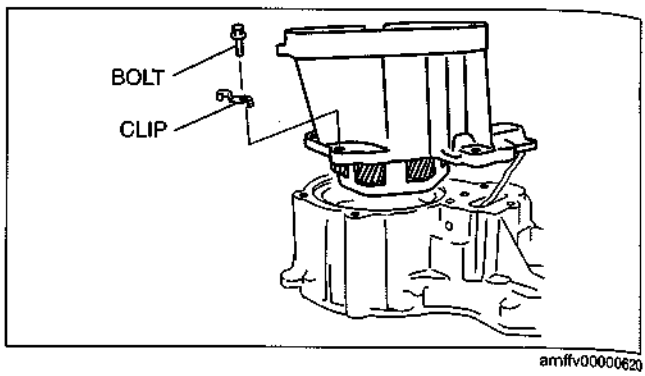
48. Remove the breather pipe.



b5r5za00000421

49. Remove the front transfer case six bolts.
50. Remove the front transfer case by separating the adapter sealer bond using a flathead screwdriver.

Caution
- **When prying at the transfer case, be careful not to damage the case.**

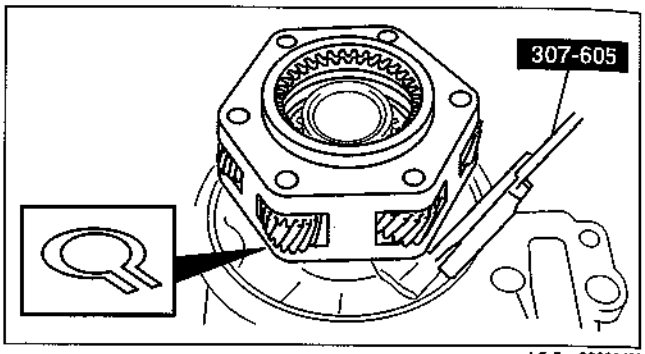


arnffv00000620

51. Remove the input shaft component and planetary gear component from the front transfer case.

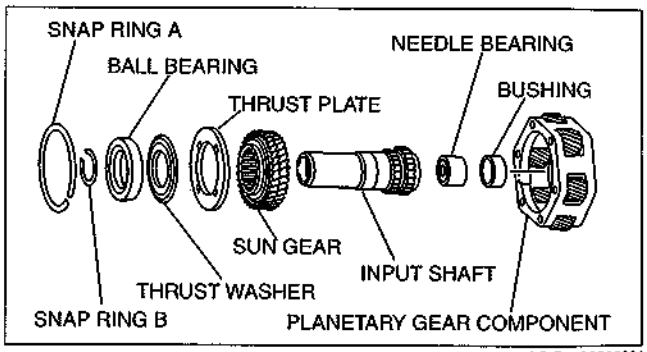
Note
- Expand the snap ring using the **SST**, and separate the planetary gear component and the input shaft component from the front transfer case.

52. Remove the snap ring and oil seal from the front transfer case.



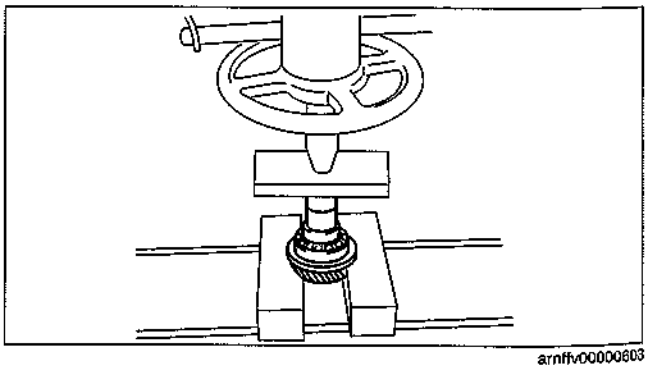
b5r5za00000409

53. Remove the snap ring A.
54. Pull out the input shaft component and sun gear from the planetary gear component.
55. Remove the snap ring B.

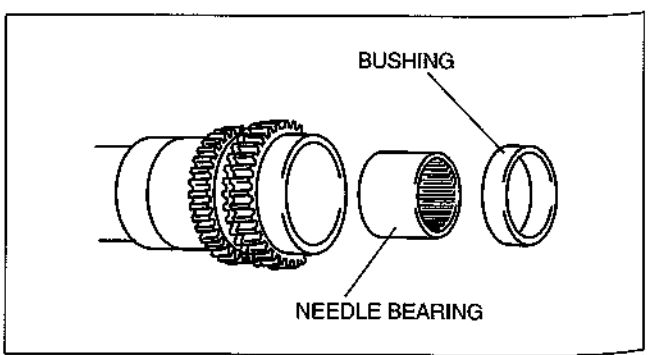


b5r5za00000324

56. Remove the ball bearing, thrust washer, thrust plate and from the input shaft using the press.

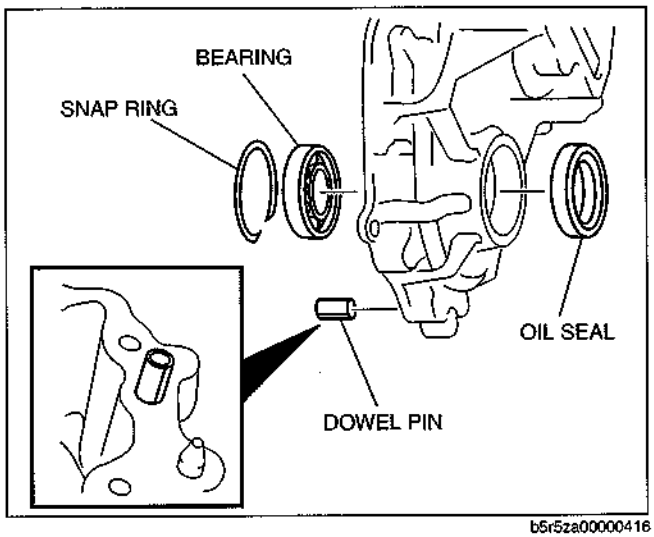

arnffv00000603

57. Remove the needle bearing and bushing from the input shaft component.



arnffv00000621

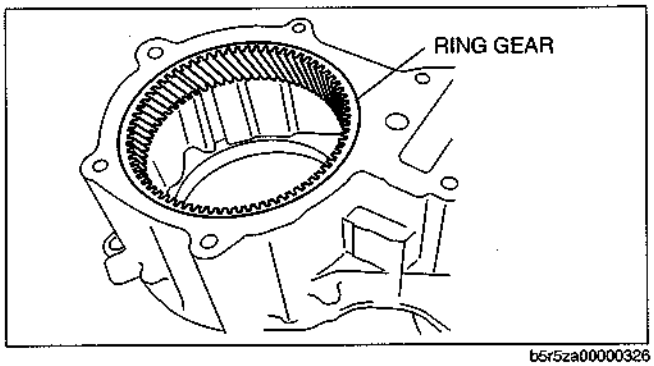
58. Using a flathead screwdriver, remove the oil seal.
59. Remove the snap ring.
60. Remove the ball bearing.



b5r5za00000416

61. Remove the dowel pins from the center transfer case.

Note
- Do not remove the ring gear from the center transfer case.

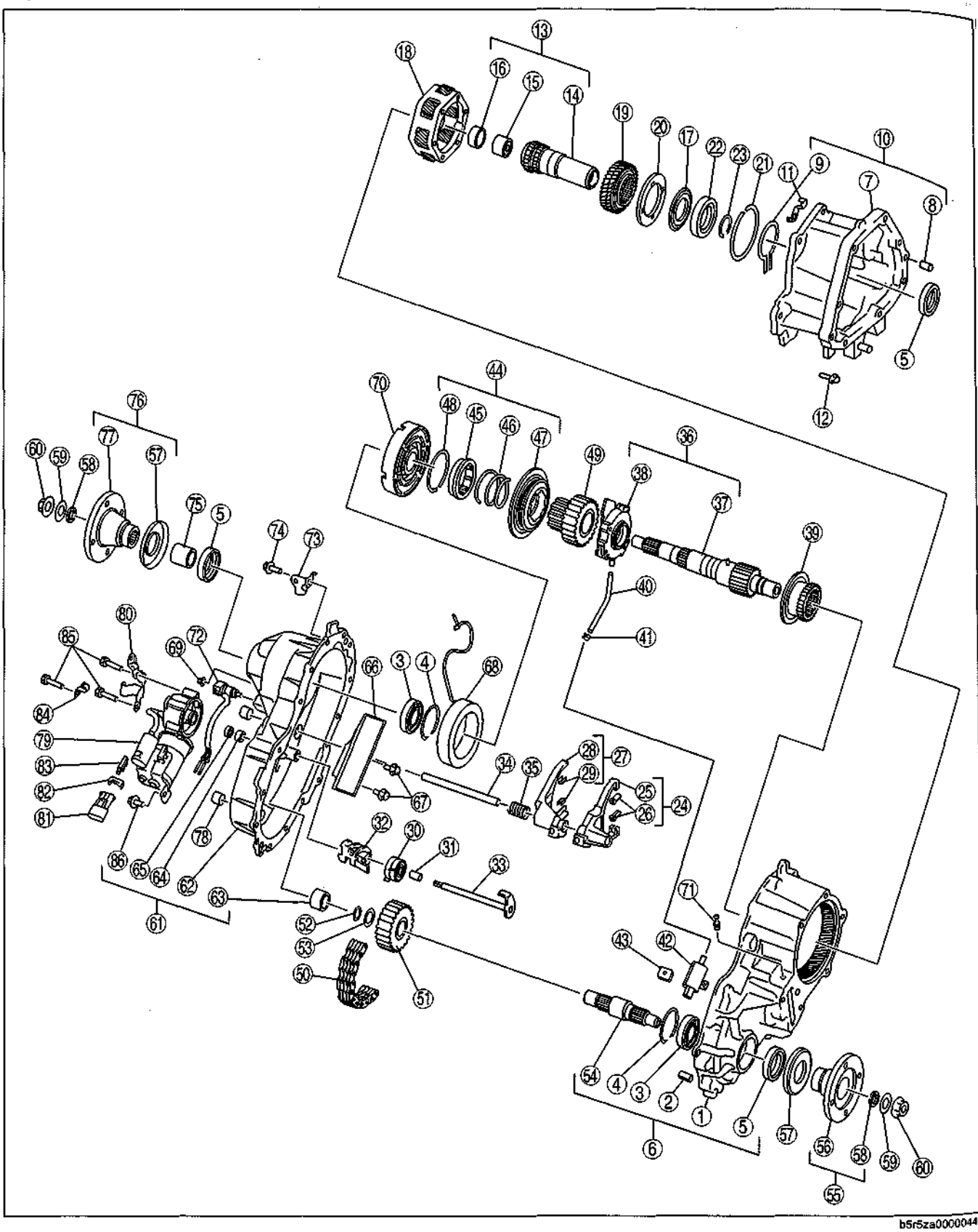


b5r5za00000326

TRANSFER CASE ASSEMBLY[5R55S]

id0316c1501200

Exploded View



b5r5za0000044

1	Center transfer case
2	Dowel pin
3	Bearing
4	Snap ring

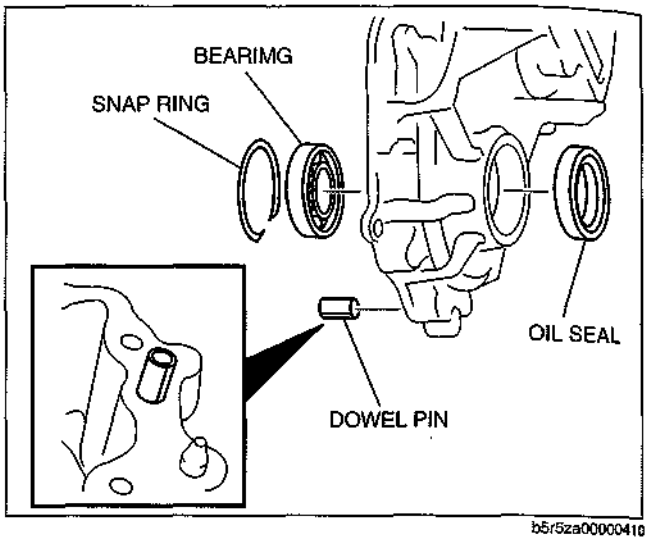
5	Oil seal
6	Center transfer case component
7	Front transfer case
8	Dowel pin

9	Snap ring
10	Front transfer case component
11	Clip
12	Bolt
13	Input shaft component
14	Input shaft
15	Needle bearing
16	Bushing
17	Thrust washer
18	Planetary gear component
19	Sun gear
20	Thrust plate
21	Snap ring A
22	Ball bearing
23	Snap ring B
24	Reduction shift fork component
25	Reduction shift fork
26	Reduction shift fork facing
27	Lockup shift fork component
28	Lockup shift fork
29	Lockup shift fork facing
30	Spring
31	Spacer
32	Cam
33	Shift shaft
34	Rail shift
35	Return spring
36	Output shaft and gerotor pump component
37	Output shaft component
38	Gerotor pump component
39	Reduction hub
40	Pump hose
41	Hose clamp
42	Oil strainer
43	Magnet
44	Lockup component
45	Lockup hub
46	Spring
47	Lockup collar

48	Snap ring
49	Drive sprocket
50	Drive chain
51	Driven sprocket
52	Snap ring
53	Spacer
54	Lower output shaft
55	Front output flange component
56	Front output flange
57	Deflector
58	Oil seal
59	Washer
60	Locknut
61	Rear transfer case component
62	Rear transfer case
63	Needle bearing
64	Sleeve
65	Seal
66	Snubber
67	Bolt
68	Clutch coil
69	Nut
70	Clutch housing
71	Breather pipe
72	Speed sensor component
73	Bracket
74	Bolt
75	Spacer
76	Rear companion flange component
77	Rear companion flange
78	Oil plug
79	Motor component
80	Bracket
81	Terminal connector
82	Clip
83	Bracket
84	Clip
85	Bolt
86	Bolt

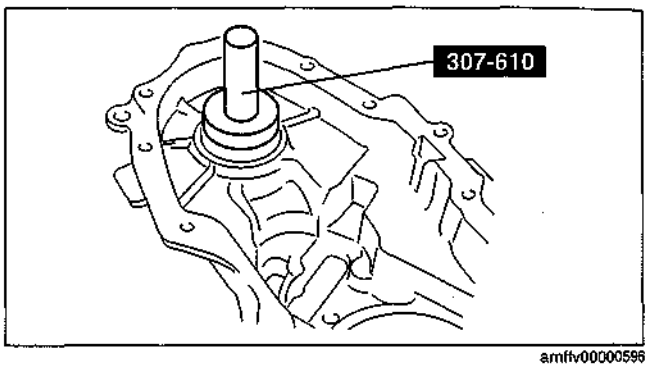
Assembly Procedure

1. Insert two new dowel pins.



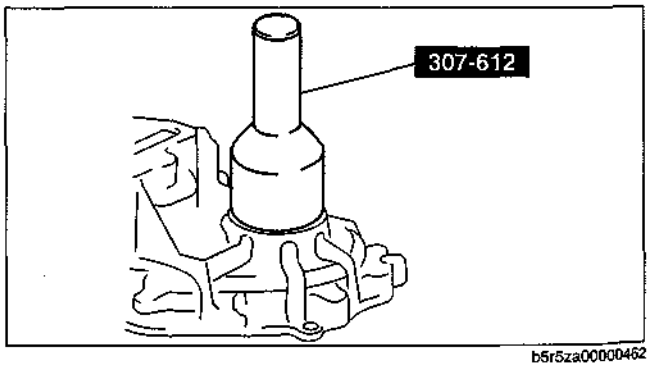
b5r5za00000418

2. Press the ball bearing into the center transfer case using the **SST**.
3. Install the snap ring.



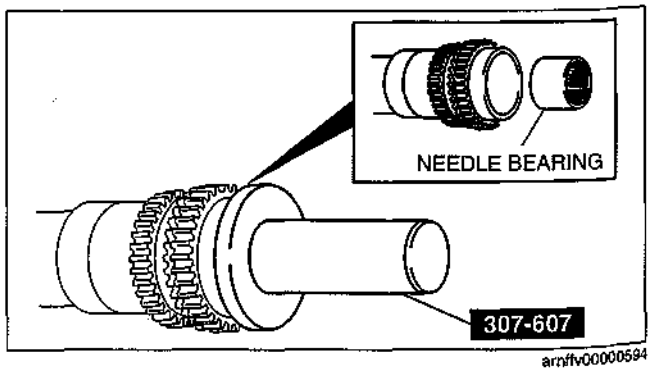
amffv00000596

4. Install the new oil seal, by pressing it into the center transfer case using the **SST**.



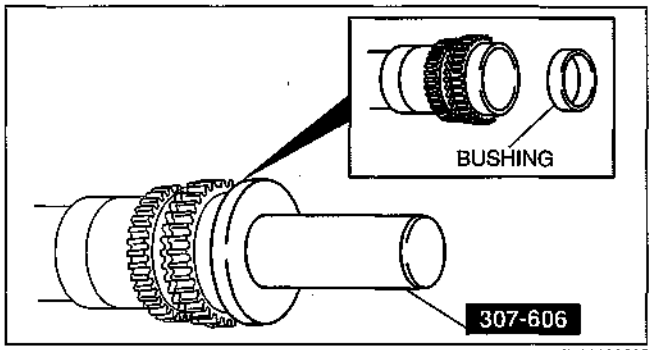
b5r5za00000462

5. Press the new needle bearing into the input shaft using the **SST**.



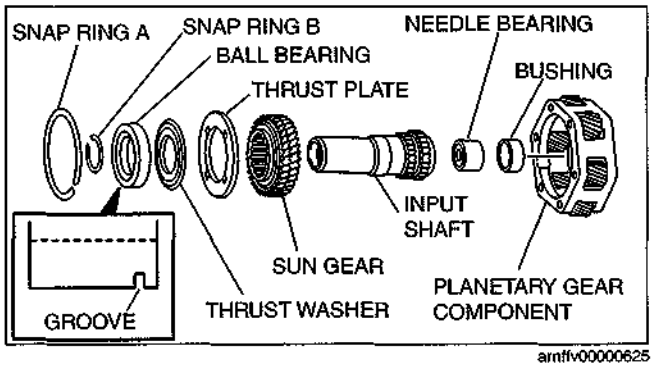
amffv00000594

6. Press the new bushing into the input shaft using the **SST**.



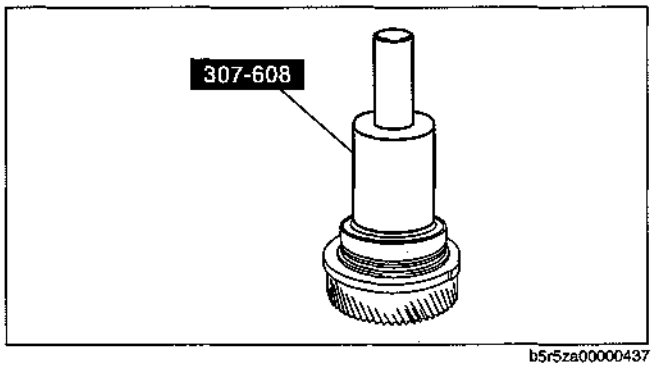
amtfv00000595

7. Assemble the sun gear and thrust plate to the input shaft.



amtfv00000625

8. Assemble the thrust washer and ball bearing to the input shaft using the **SST**.
9. Install the snap ring B.

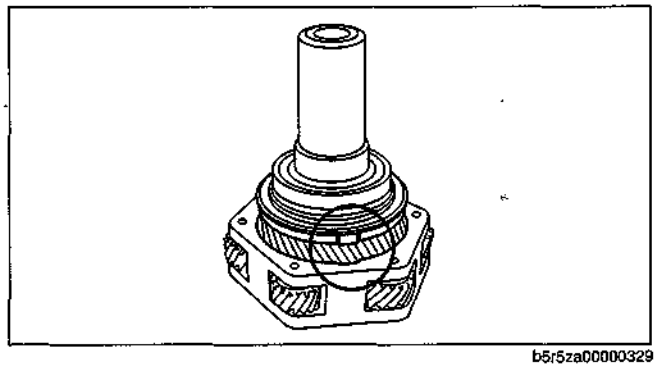


b5r5za00000437

10. Assemble the planetary gear component to the planet carrier as shown in the figure.

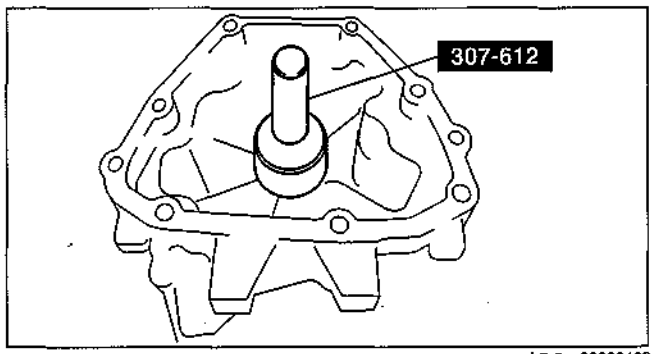
Note
- Verify that the retaining ring is assembled to the upper groove of the planetary gear component on the workbench.

11. Install the snap ring A to the planetary gear component.



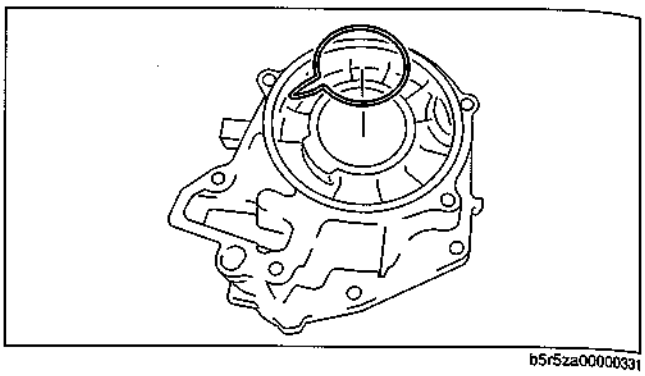
b5r5za00000329

12. Press the new oil seal into the front transfer case using the **SST**.

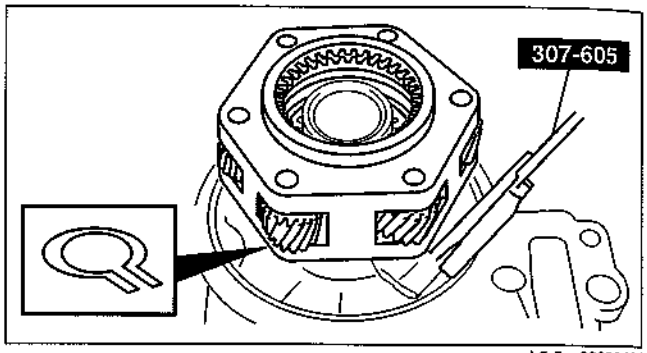


b5r5za00000463

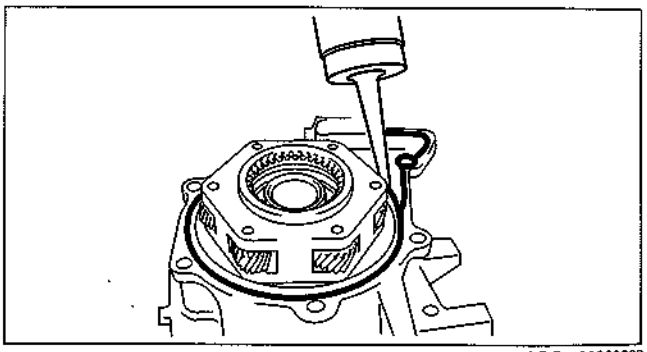
13. Install the snap ring by making sure that the snap ring is correctly installed into the groove.



14. Place the input shaft component onto the front transfer case, and assemble the planetary gear component to the groove while expanding the ends of the snap ring using the **SST**.

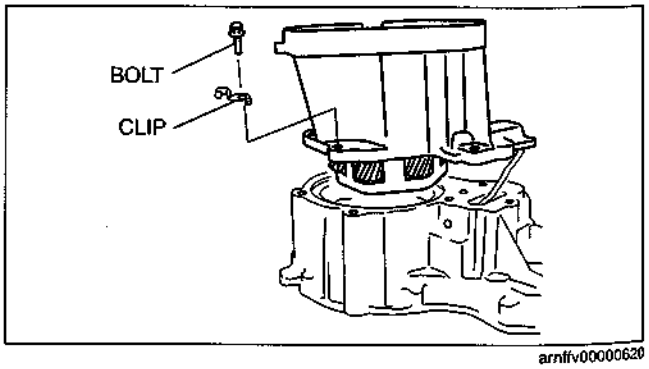


15. Apply sealant to the front transfer case as shown in the figure.



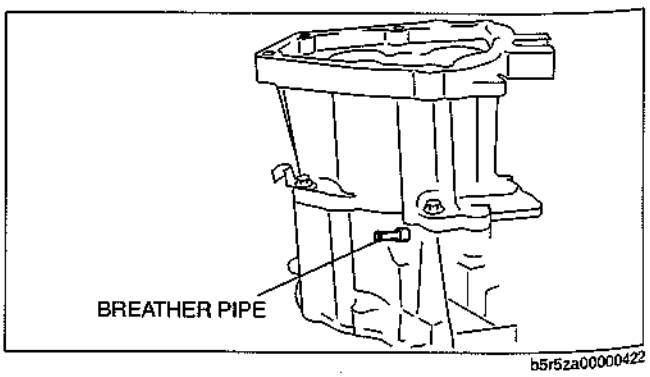
16. Install the front transfer case on the center transfer case.
17. Install the six bolts and clip.

Tightening torque
34—41 N·m {3.5—4.1 kgf·m, 26—30 ft·lbf}

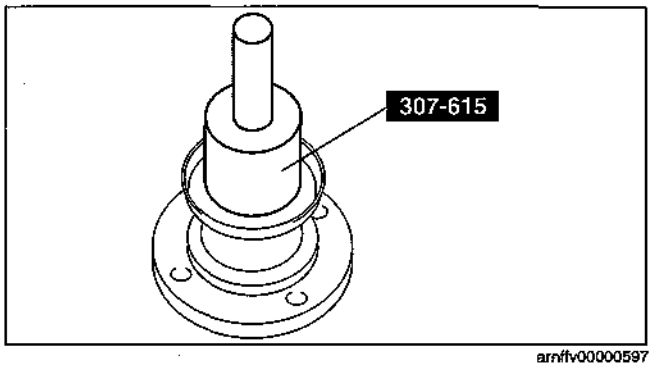


18. Install the breather pipe on the center transfer case.

Tightening torque
4—7 N·m {41—71 kgf·cm, 36—61 in·lbf}



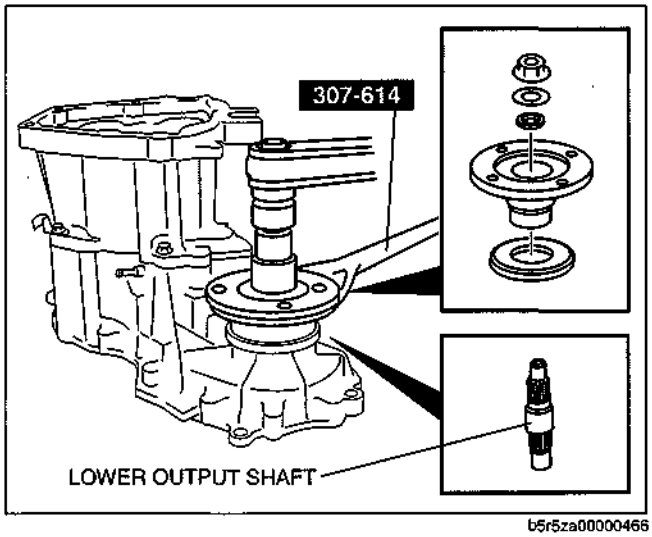
19. Press in the new deflector to the flange using the **SST**.



arnffv00000597

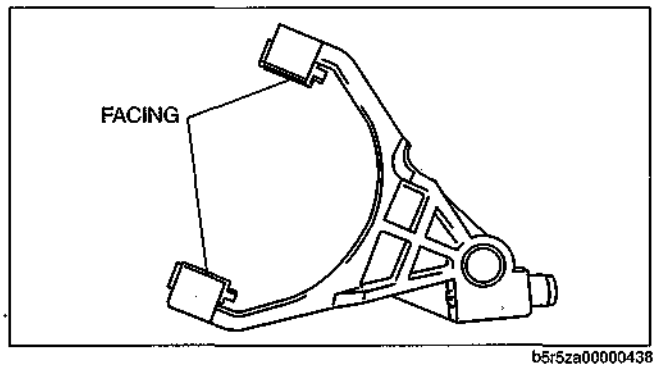
20. Assemble the lower output shaft to the center transfer case.
21. Assemble the front output flange component, oil seal, washer, and nut.
22. Secure the flange using the **SST**.
23. Tighten the nut.

Tightening torque
305—332 N·m {31.2—33.8 kgf·m, 225—244 ft·lbf}



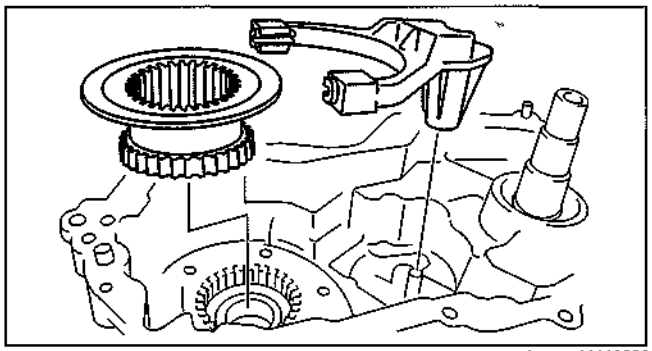
b5r5za00000466

24. Install the two-fork facing on the reduction shift fork component.



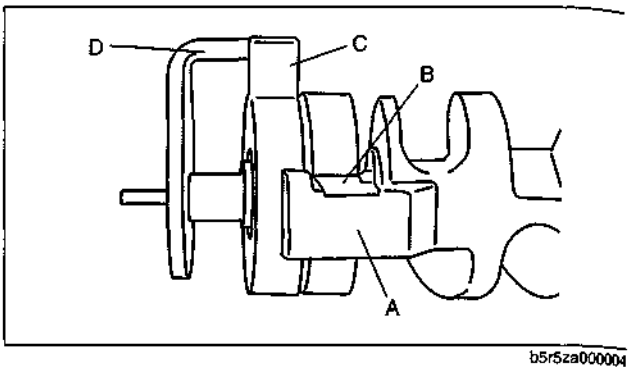
b5r5za00000438

25. Install the reduction hub to the shift fork.
26. Install the reduction hub and shift fork component to the planetary gear component.



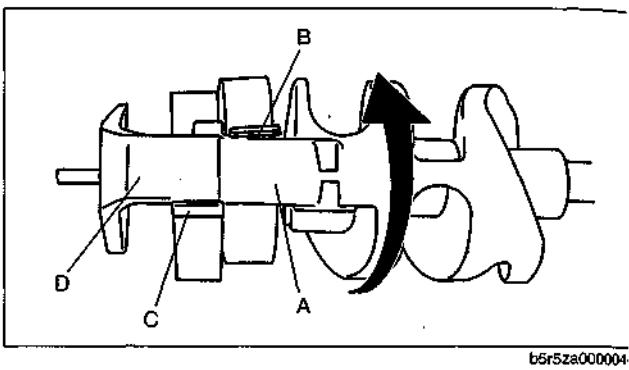
b5r5za00000336

27. Insert the spacer torsion spring and cam into the shift shaft.



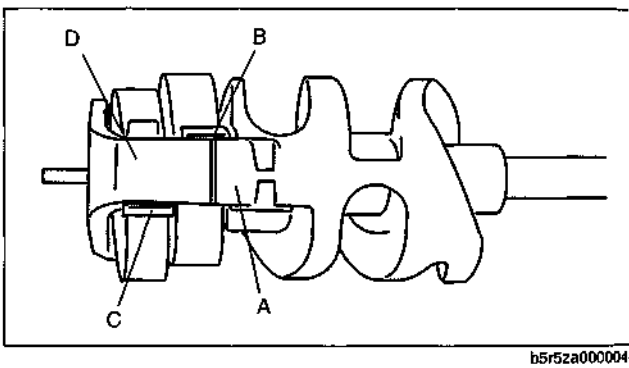
b5r5za000004

28. Press them in until area A of the cam contacts area B of the torsion spring, and area C of the torsion spring contacts area D of the shift shaft.



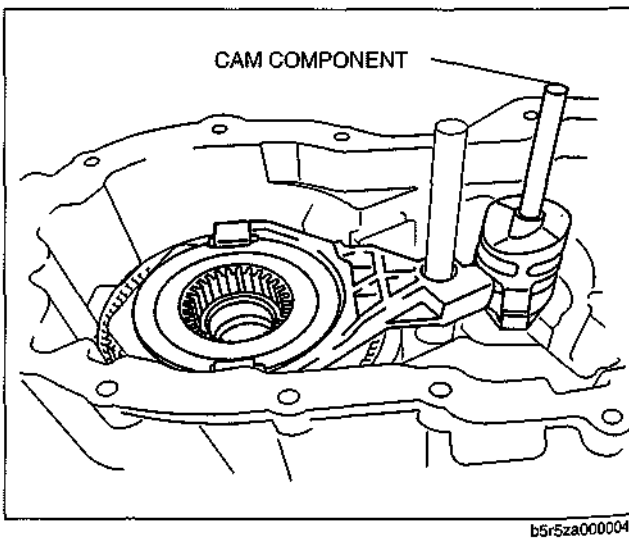
b5r5za000004

29. Rotate the cam to the position indicated in the figure, and press it to the shift shaft side until it contacts the torsion spring.



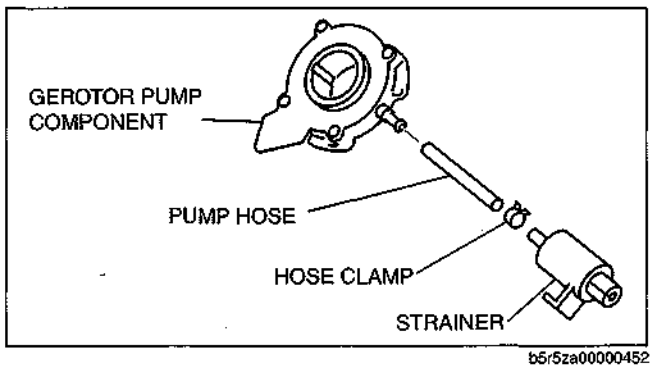
b5r5za000004

30. Install the cam component in the case as shown in the picture.
31. Verify that the reduction fork roller is seated in the cam groove as shown in the figure.
32. Assemble the rail shift to the reduction fork bore.



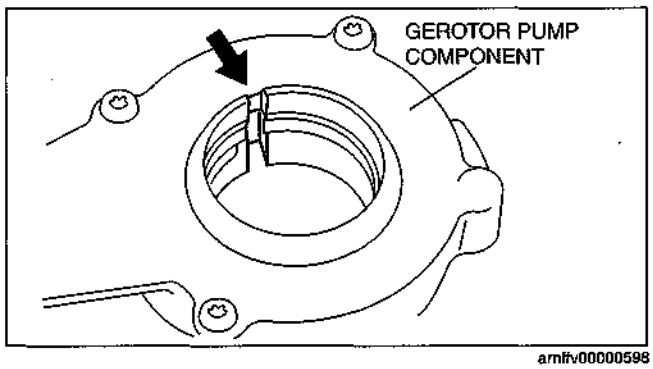
b5r5za000004

33. Using a hose clamp, tighten the pump hose at the end where it is coupled with the strainer.



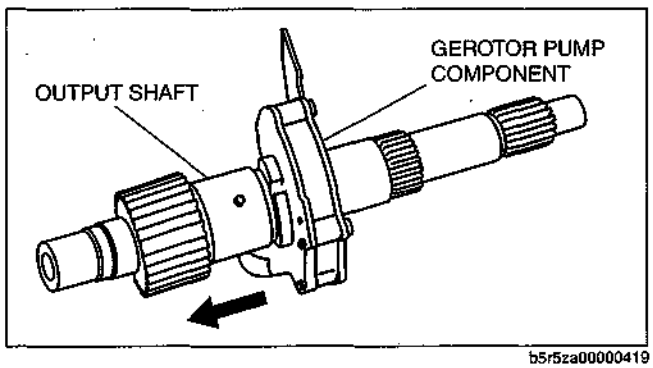
b5r5za00000452

34. Align the gerotor pump rotor slot and the pump body slot so that they are in a single line.



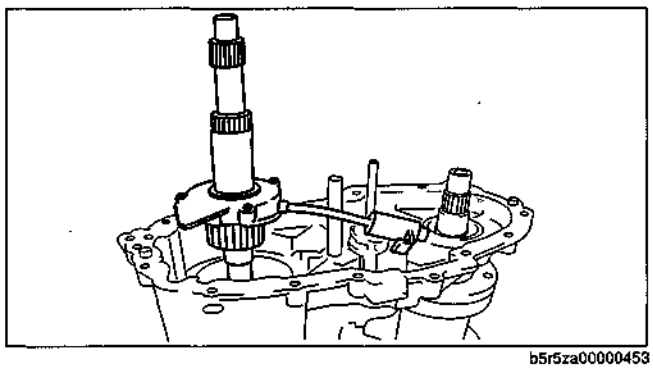
arnffv00000598

35. Slide the gerotor pump component on the output shaft over pump pin.

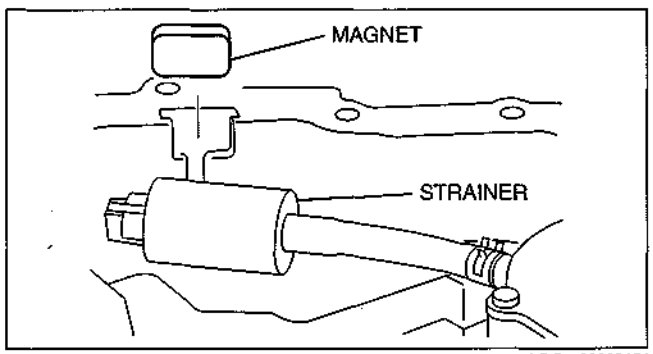


b5r5za00000419

36. Assemble the output shaft from the center transfer case.
37. Assemble the output shaft spline to the reduction hub.
38. Engage the output shaft end with the input shaft bearing.

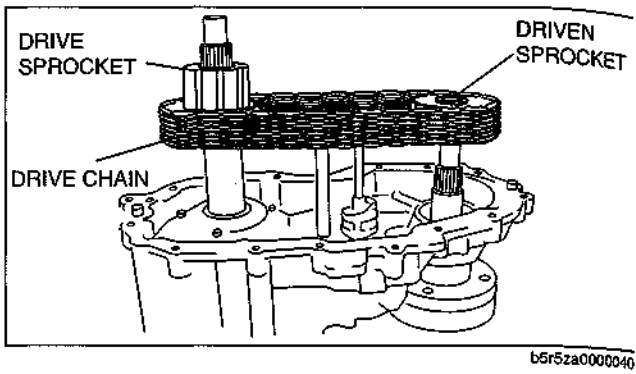

b5r5za00000453

39. Couple the strainer with the case and insert the magnet into the transfer case slot.
40. Assemble the drive sprocket to the output shaft.
41. Assemble the lower output shaft to the driven sprocket.



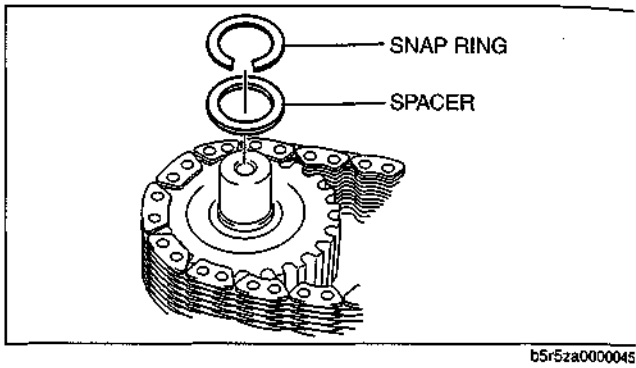
b5r5za00000451

42. Install the drive chain onto the sprockets.
43. While keeping the tension of the drive chain, assemble the transfer case and drive chain component in parallel.
44. While rotating the driven sprocket, engage it with the front output shaft spline.



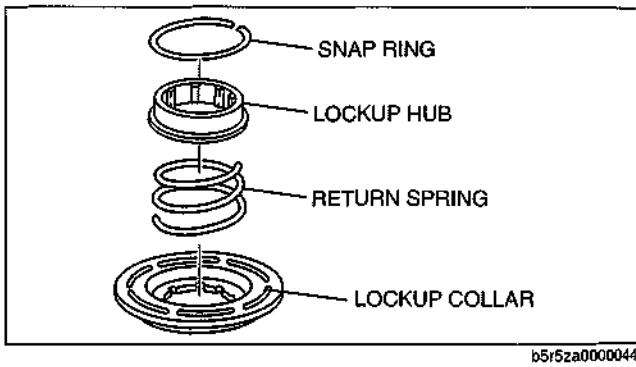
b5r5za0000040

45. Assemble the spacer to the front output shaft.
46. Assemble the snap ring into the groove.



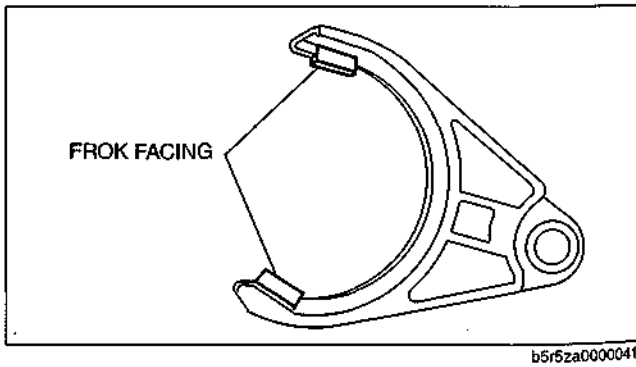
b5r5za0000045

47. Install the lockup hub and return spring to the lock up collar and insert the snap ring.



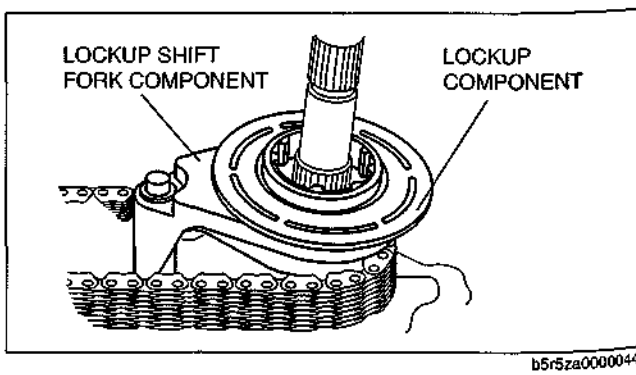
b5r5za0000044

48. Install the two new facings to the fork.



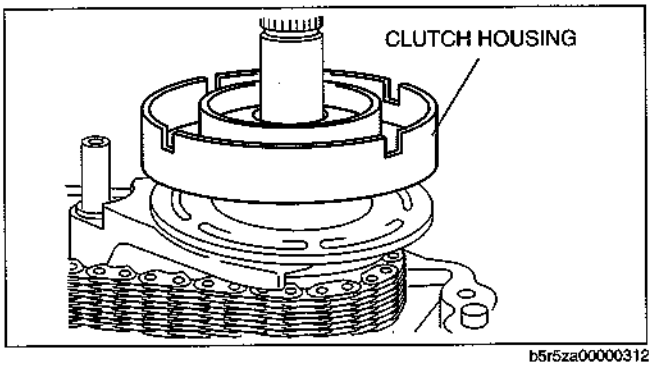
b5r5za0000041

49. Assemble the lockup component to the lockup fork, and assemble them to the drive shaft and the rail shaft.



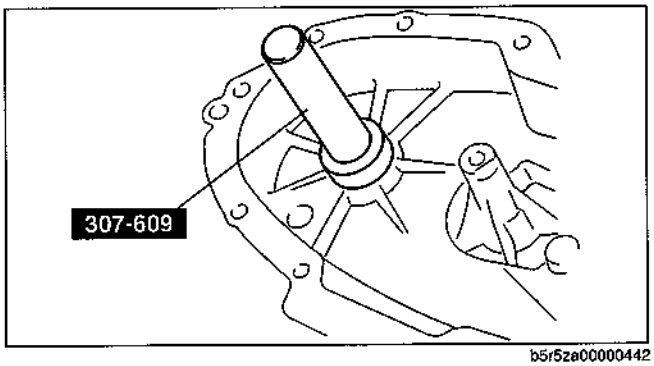
b5r5za0000043

50. Install the clutch housing on the output shaft.



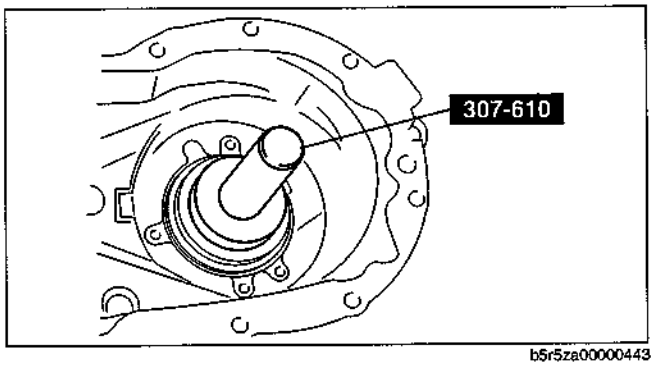
b5r5za00000312

51. Position the end of the new needle bearing with the identification mark facing upwards and press it into the cover using the **SST**.



b5r5za00000442

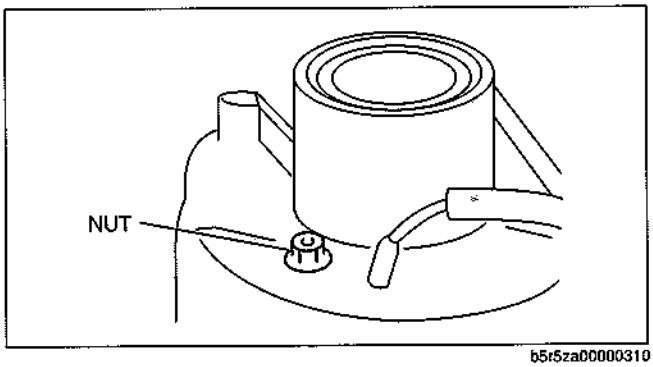
52. Press the ball bearing into the rear transfer case using the **SST** and install the snap ring.



b5r5za00000443

53. Install the coil inside the rear transfer case.
54. Install the three nuts.

Tightening torque
8—11 N·m {82—112 kgf·cm, 71—97 in·lbf}

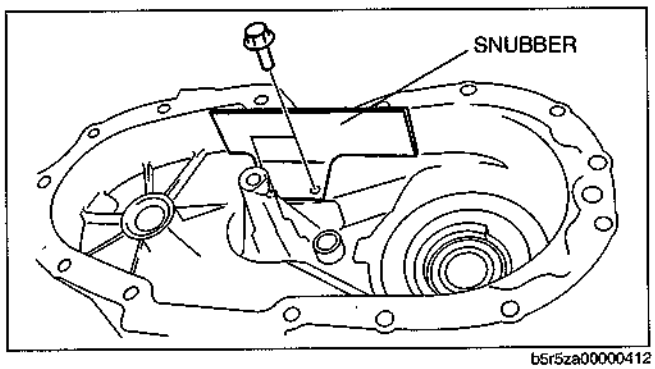


b5r5za00000310

55. Install the snubber.

Tightening torque
8—11 N·m {82—112 kgf·cm, 71—97 in·lbf}

56. Install the return spring over rail shaft in the rear transfer case.

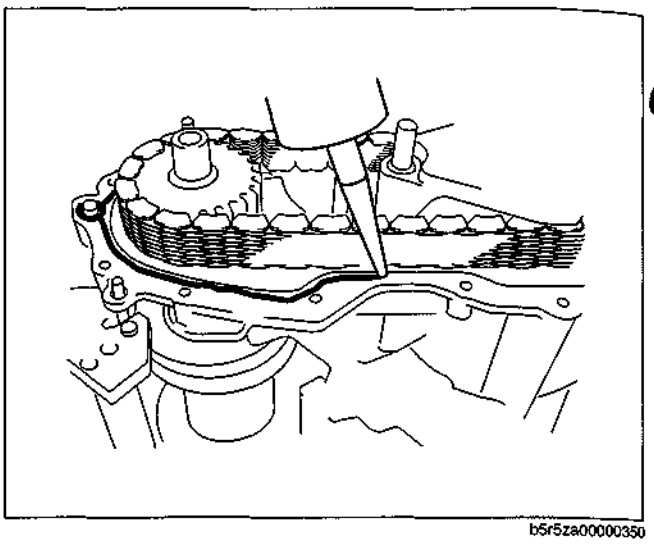


b5r5za00000412

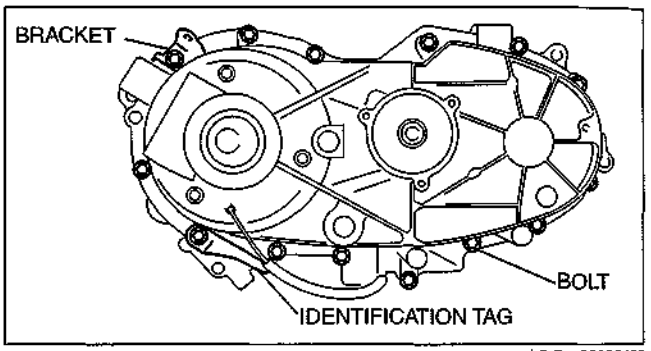
57. Apply a **1.6 mm {0.063 in}** bead of sealant to the transfer case mounting surface, and assemble the cover and the transfer case.

Caution
- **Do not use excessive force.**

Note
- For installation of cover, align the cover with transfer case.

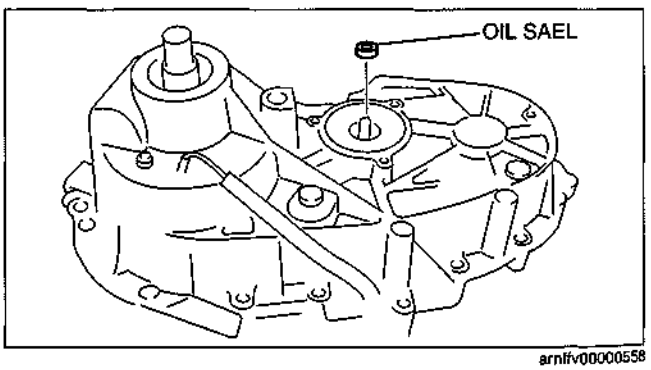

b5r5za00000350

58. Install the rear transfer case onto the center transfer case as follows.
    (1) Align the cover holes with the transfer case dowel pins.
    (2) Align the cover bearings with output shafts.
    (3) Align the shift shaft with cover boss.
    (4) Align the cover blind hole with rail shaft and make sure that return spring is not cocked.
59. Install the 14 bolts identification tag and bracket.



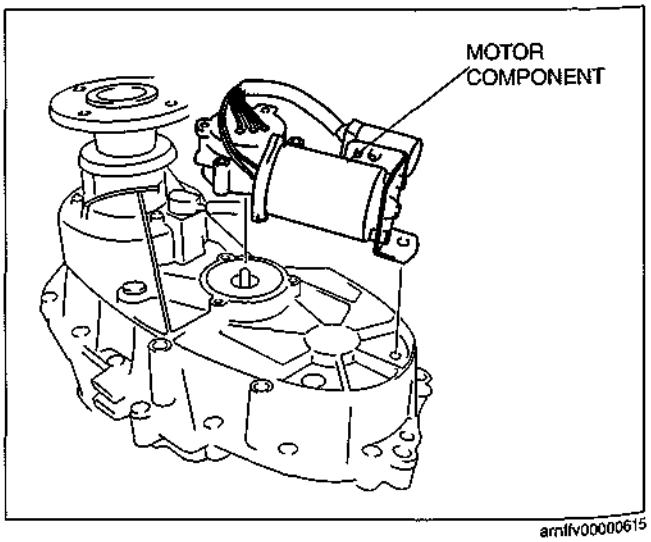
b5r5za00000429

60. Install the new oil seal.



arnlfv00000558

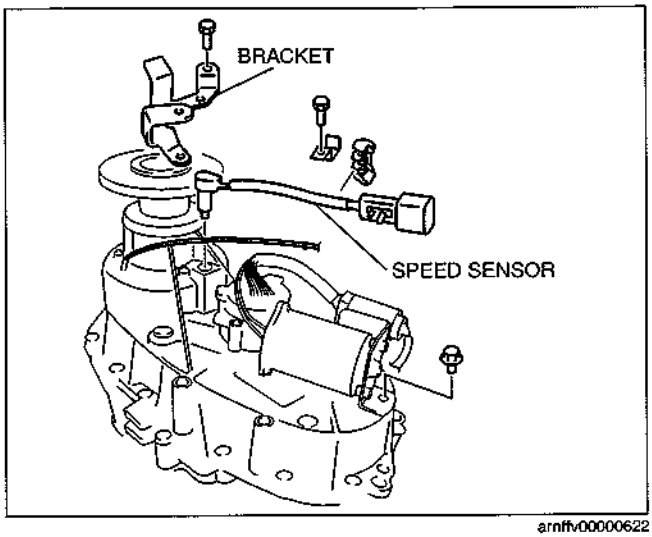
61. Align the motor component with the shift shaft and assemble it to the rear transfer case.
62. Rotate the motor in clockwise direction to check correct engagement.



arnlfv00000615

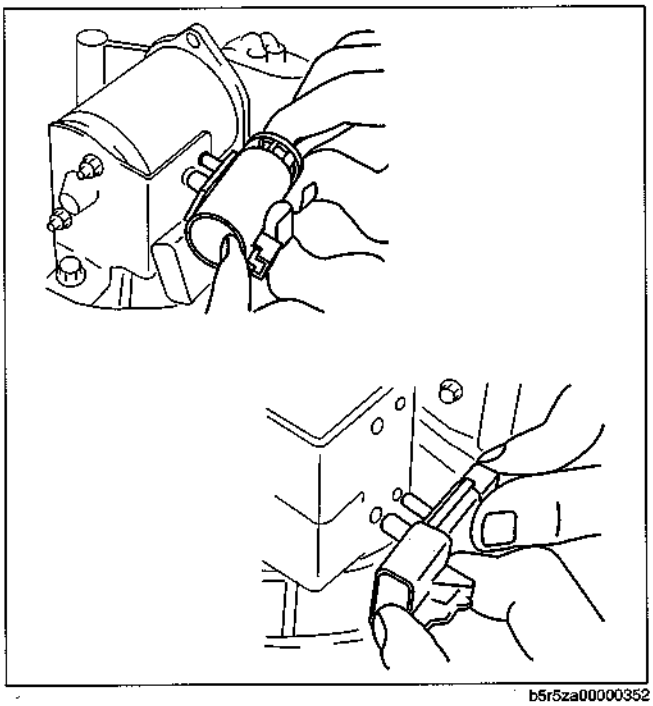
63. Install the speed sensor in the rear transfer case.
64. Install the bracket and bolts to the motor component.

Tightening torque
8—11 N·m {82—112 kgf·cm, 71—97 in·lbf}



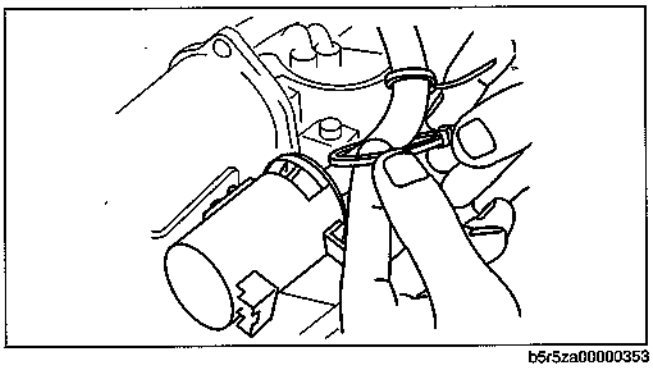
arnffv00000622

65. Pass the clutch coil wiring harness through the sensor harness sleeve, and connect the coil terminal to the connector.
66. Install the motor connector and sensor connector to the motor bracket.

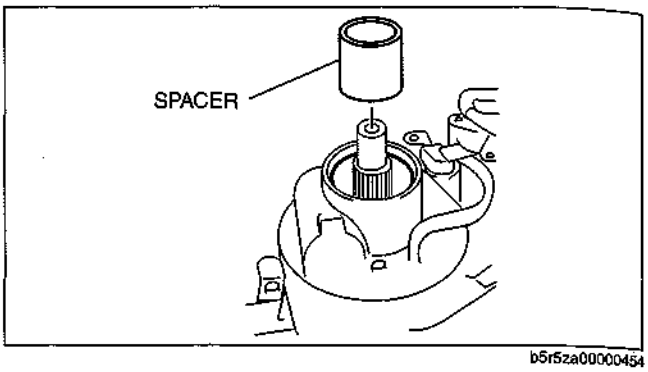

b5r5za00000352

67. Bundle the wiring harness between the speedometer component and terminal connector using a wiring harness protector and tie wraps.
68. Install the oil plug to the rear transfer case.

Tightening torque
19—30 N·m {2.0—3.0 kgf·m, 15—22 ft·lbf}

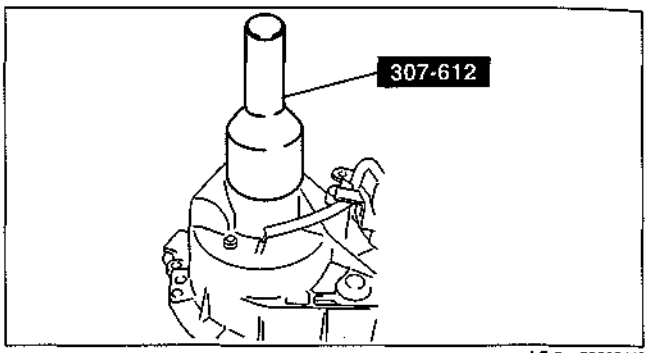

b5r5za00000353

69. Install the spacer over output shaft spline.



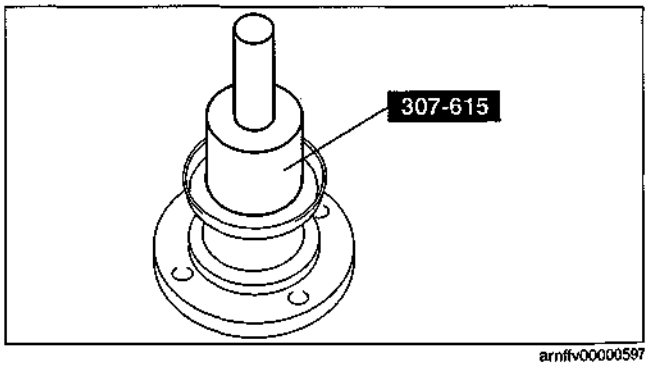
b5r5za00000454

70. Press the new oil seal into the rear transfer case component using the **SST**.



b5r5za00000445

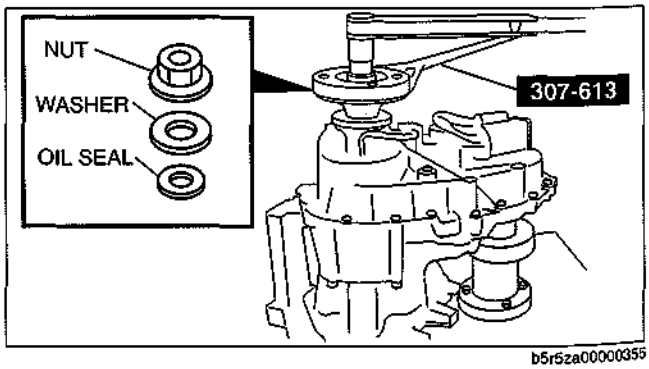
71. Press in the new deflector to the flange using the **SST**.



arnffv00000597

72. Install the rear companion flange component, oil seal, washer and nut.
73. Holding the rear companion flange using the **SST**, tighten the nut.

Tightening torque
305—332 N·m {31.2—33.8 kgf·cm, 225—244 in·lbf}



b5r5za00000355

TRANSFER CASE INSPECTION[5R55S]

id0316c1501300

Note
- Always replace the hose coupling, O-ring and oil seal with new parts.

1. Visually check all the parts for damage.
2. Referring to normal gear tooth face, specifically inspect the uneven wear and chips of gear tooth, replace if necessary.

03–50 TECHNICAL DATA

TECHNICAL DATA 03–50–1

TECHNICAL DATA

DCF035000000W01

Item	Specification
Maindrive gear bearing end play	00.15 mm {0.00.0059 in}
Mainshaft center bearing end play	00.15 mm {0.00.0059 in}

Maindrive gear bearing retaining ring

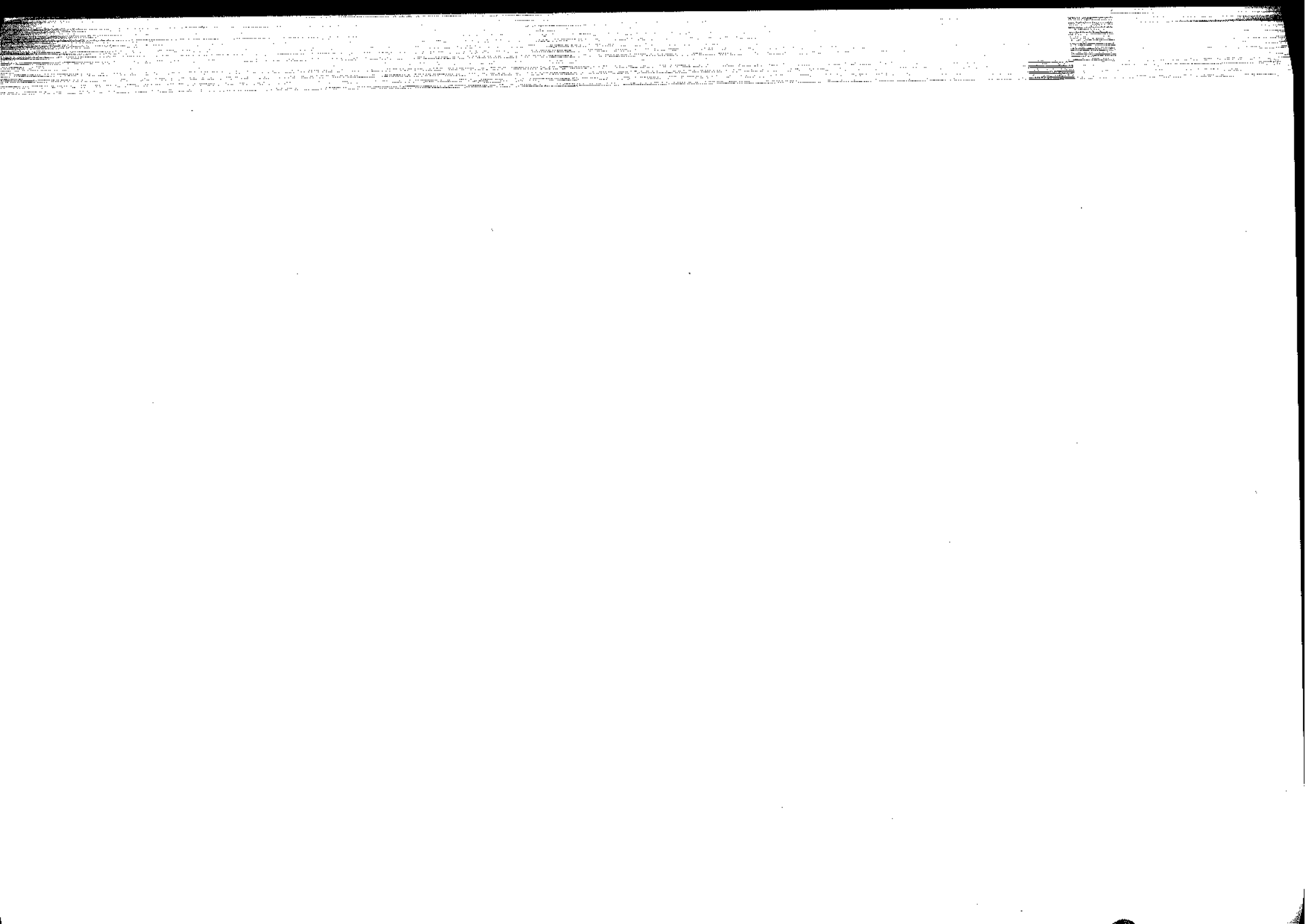
Thickness (mm {in})
2.60 {0.102}
2.67 {0.105}
2.74 {0.108}

Countershaft adjustment shim selective chart

Dimension A (mm {in})	Shim thickness (mm {in})
25.025.1 {0.9850.988}	0.5 {0.020}
25.125.2 {0.9890.992}	0.4 {0.016}
25.225.3 {0.9930.996}	0.3 {0.012}
25.325.4 {0.9971.000}	0.2 {0.008}
25.425.5 {1.0001.003}	0.1 {0.004}
25.525.6 {1.0041.007}	-

Mainshaft center bearing retaining ring

Thickness (mm {in})
3.1 {0.122}
3.2 {0.126}
3.3 {0.130}

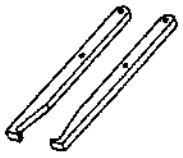
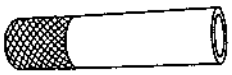
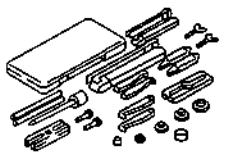
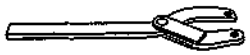
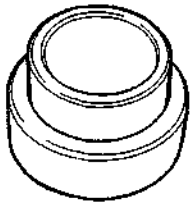
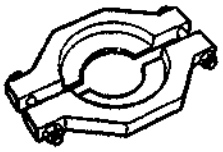
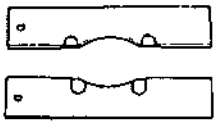
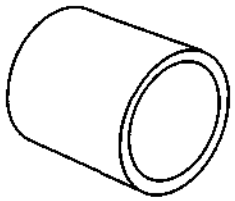
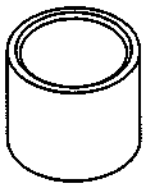
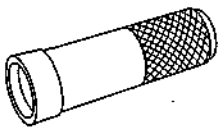
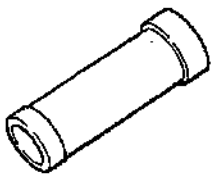
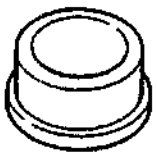
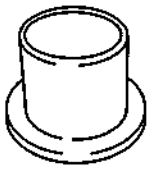
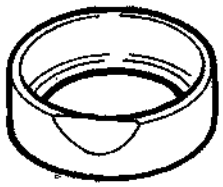
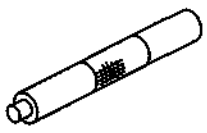


03–60 SERVICE TOOLS

SERVICE TOOLS 03–60–1

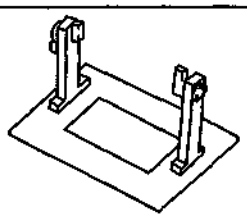
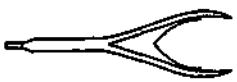
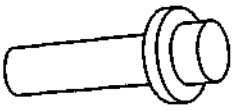
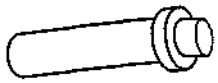
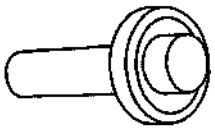
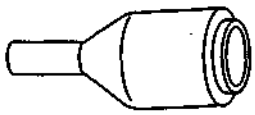
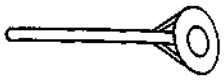
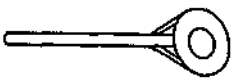
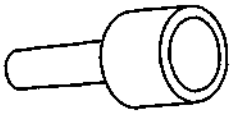
SERVICE TOOLS

DCF036000000W01

49 H017 101 Hook 	49 0727 415 Bearing Installer 	49 0839 425C Bearing puller set 
49 E032 303 Bearing Remover 	49 S120 710 Coupling flange holder 	49 F401 336B Attachment 
49 H027 002 Bearing remover 	49 F026 103 Wheel Hub Puller 	49 G028 203 Support 
49 H001 628 Guide Pin 	49 F401 331 Body 	49 U025 001 Installer Protector 
49 F027 009 Attachment 68 And 77 	49 T019 005 Support Block 	49 G033 107A Installer Dust Cover 
49 M005 797 Installer oil seal 		

SERVICE TOOLS[5R55S]

id0360e150102

307-611 Repair fixture 	307-605 Snap ring pliers-adapter 	307-607 Drift NRB input shaft
307-606 Drift bush Input shaft 	307-608 Drift ball bearing input shaft 	307-609 Drift NRB fitting cover 
307-610 Drift ball bearing 	307-612 Seal driver 	307-614 Flange holder front 
307-613 Flange holder rear 	307-615 Dust deflector press tool 	—

TRANSMISSION/TRANSAXLE

05
SECTION

MANUAL TRANSMISSION
[R15M-D] 05-11A
MANUAL TRANSMISSION
[S15M-D, S15MX-D] 05-11B
TECHNICAL DATA
[R15M-D] 05-50A
TECHNICAL DATA
[S15M-D, S15MX-D] 05-50B
SERVICE TOOLS
[R15M-D] 05-60A
SERVICE TOOLS
[S15M-D, S15MX-D] 05-60B

05–11B MANUAL TRANSMISSION [S15M-D, S15MX-D]

PRECAUTION [S15M-D, S15MX-D] 05–11B–1
TOP COVER COMPONENT AND EXTENSION HOUSING DISASSEMBLY [S15M-D, S15MX-D] 05–11B–2
REVERSE GEAR COMPONENT AND 3RD/4TH GEAR COMPONENT DISASSEMBLY [S15M-D, S15MX-D] 05–11B–9
MAINSHAFT COMPONENT, COUNTERSHAFT COMPONENT AND TRANSMISSION CASE DISASSEMBLY [S15M-D, S15MX-D] 05–11B–13
1ST/2ND GEAR COMPONENT, 3RD/4TH GEAR COMPONENT AND COUNTERSHAFT DISASSEMBLY [S15M-D, S15MX-D] 05–11B–16
SHIFT COMPONENT DISASSEMBLY [S15M-D, S15MX-D] 05–11B–19
MANUAL TRANSMISSION PARTS INSPECTION [S15M-D, S15MX-D] 05–11B–21
SHIFT COMPONENT ASSEMBLY [S15M-D, S15MX-D].....05–11B–23
1ST/2ND GEAR COMPONENT, 3RD/4TH GEAR COMPONENT AND COUNTERSHAFT ASSEMBLY [S15M-D, S15MX-D].....05–11B–26
MAINSHAFT COMPONENT, COUNTERSHAFT COMPONENT AND TRANSMISSION CASE ASSEMBLY [S15M-D, S15MX-D].....05–11B–31
REVERSE GEAR COMPONENT AND 3RD/4TH GEAR COMPONENT ASSEMBLY [S15M-D, S15MX-D].....05–11B–37
TOP COVER COMPONENT AND EXTENSION HOUSING ASSEMBLY [S15M-D, S15MX-D].....05–11B–44

PRECAUTION [S15M-D, S15MX-D]

DCF051100000W04

1. Clean the transmission exterior thoroughly using a steam cleaner or cleaning solvents before disassembly.

Warning
- **Using compressed air can cause dirt and other particles to fly out, causing injury to the eyes. Wear protective eye wear whenever using compressed air.**

Caution
- **Cleaning sealed bearings using cleaning fluids or a steam cleaner can wash the grease out of the bearing.**

2. Clean the removed parts using cleaning solvent, and dry them using compressed air.
3. Clean out all holes and passages using compressed air, and check that there are no obstructions.
4. Make sure each part is cleaned before assembling.
5. Coat all movable parts with the specified oil.
6. Replace parts whenever required.
7. Remove old sealant from contact surfaces before applying new sealant.
8. Assemble the parts within **10 min** after applying sealant. Allow all sealant to cure at least **30 min** after assembling before filling the transmission with transmission oil.

Warning
- **Although the stand has a self-locking brake system, there is a possibility that the brake may not hold when the transmission is held in a lopsided position on the stand. This would cause the transmission to turn suddenly, causing serious injury. Never keep the transmission tilted to one side. Always hold the rotating handle firmly when turning the transmission.**

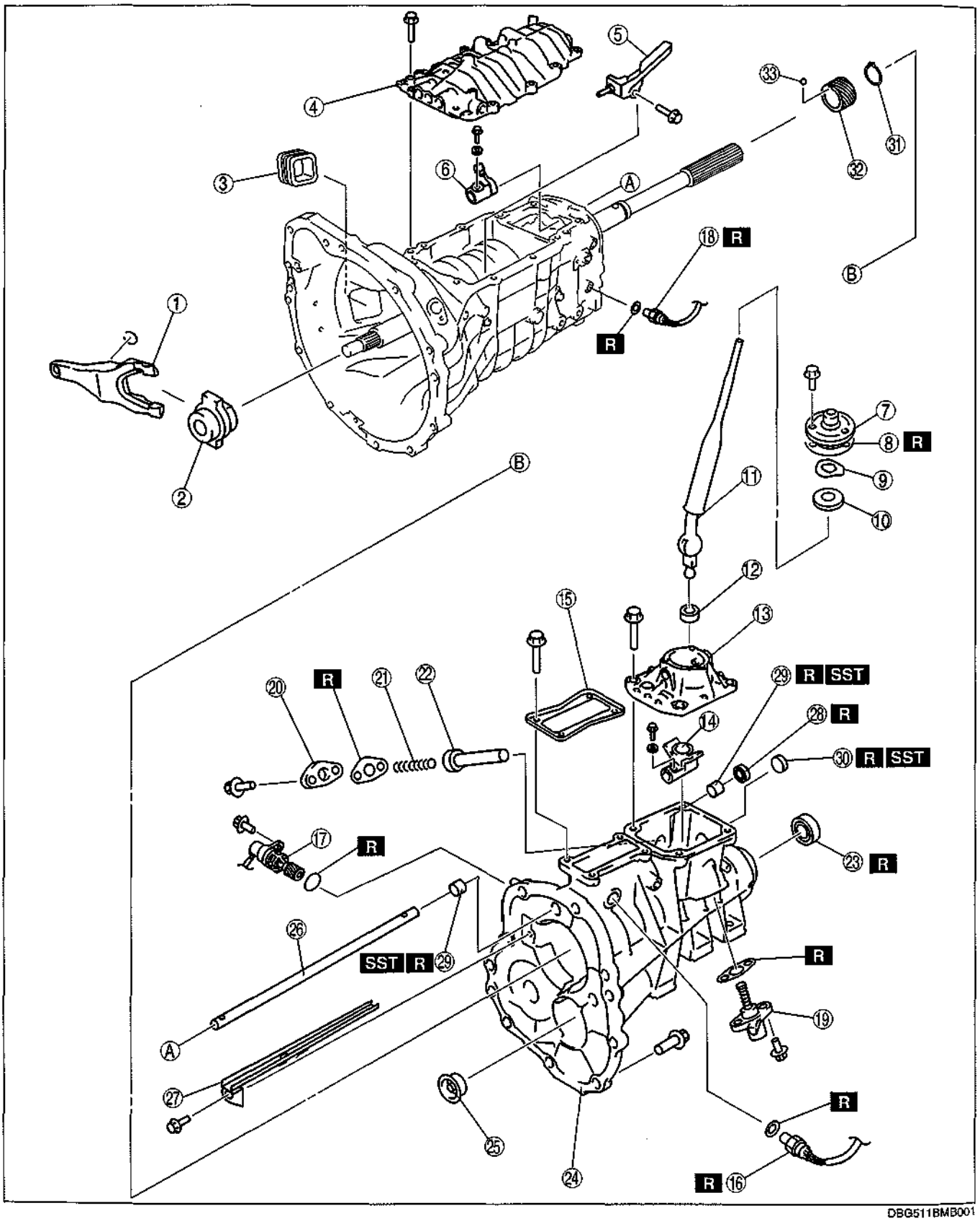
TOP COVER COMPONENT AND EXTENSION HOUSING DISASSEMBLY [S15M-D, S15MX-D]

DCF051117011W06

Caution
- **Remove the oil seal (extension housing and control rod) only if there is a malfunction.**

1. Disassemble in the order indicated in the table.

4x2

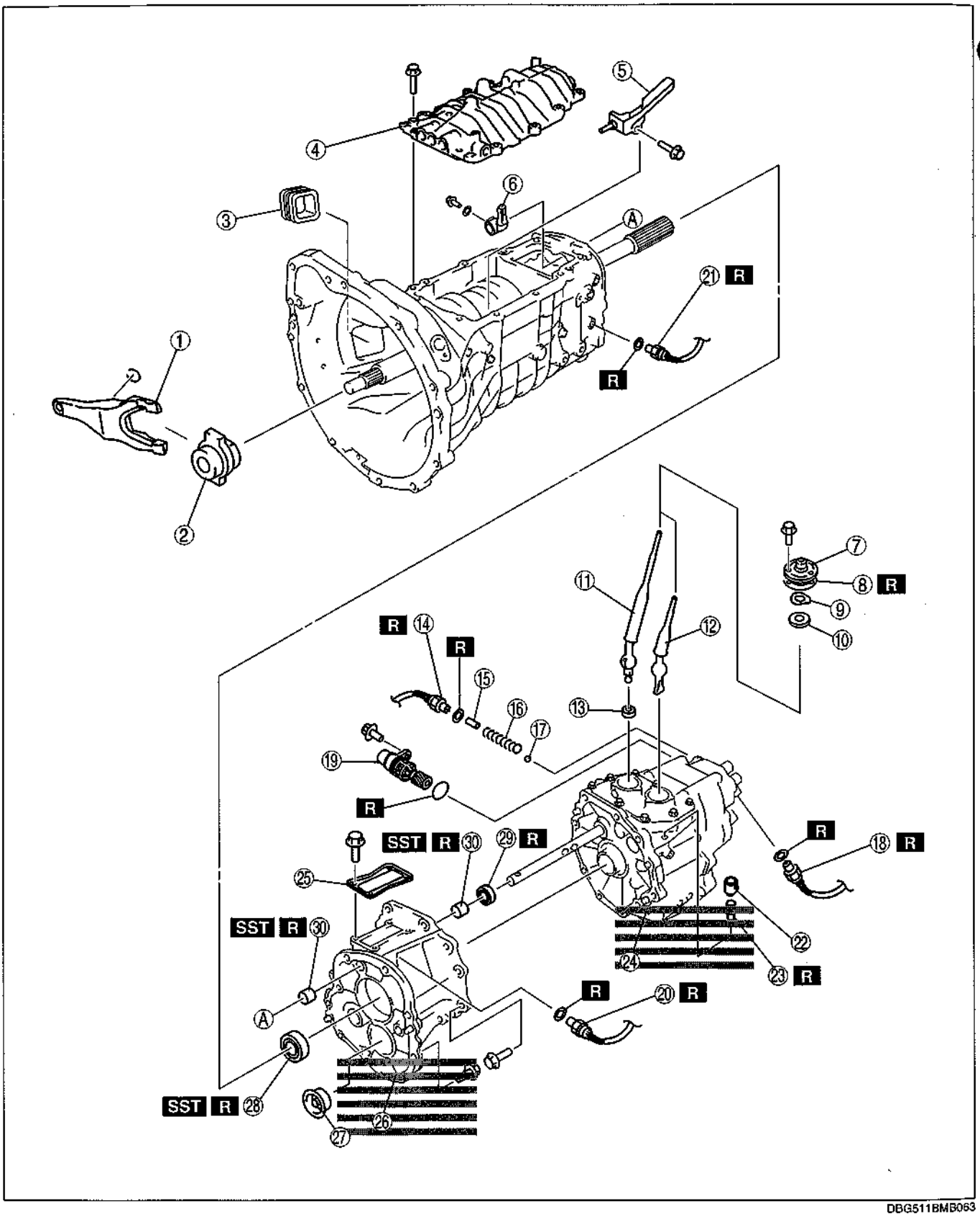


DBG511BMB001

1	Release fork
2	Release collar
3	Dust boot
4	Top cover, shift component (See 05–11B–5 Top Cover Disassembly Note.)
5	Oil passage
6	Control lever
7	Dust boot
8	Gasket
9	Wave washer
10	Change bush
11	Shift lever
12	Change seat
13	Control case
14	Control rod end
15	Blind cover
16	Neutral switch
17	Vehicle speed sensor
18	Back-up light switch
19	Select spindle component

20	Spring cap
21	Select lock spindle spring
22	Select lock spindle
23	Oil seal (extension housing) (See 05–11B–5 Oil Seal (extension housing) Removal Note.)
24	Extension housing (See 05–11B–6 Extension Housing Disassembly Note.)
25	Funnel
26	Control rod
27	Oil passage
28	Oil seal (control rod) (See 05–11B–6 Oil Seal (control rod) Disassembly Note.)
29	Bush (See 05–11B–7 Bush Disassembly Note.)
30	Sealing cap (See 05–11B–7 Sealing Cap Disassembly Note.)
31	Retaining ring
32	Speed drive gear
33	Steel ball

4x4



1	Release fork
2	Release collar
3	Dust boot
4	Top cover, shift component (See 05–11B–5 Top Cover Disassembly Note.)

5	Oil passage
6	Control rod end
7	Dust boot
8	Gasket
9	Wave washer

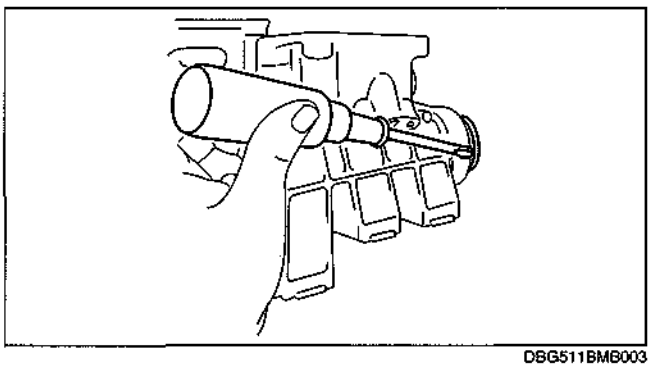
10	Change bush
11	Shift lever
12	Transfer shift lever
13	Change seat
14	Transfer neutral switch
15	Switch pin
16	Spring
17	Steel ball
18	4x4 indicator switch
19	Vehicle speed sensor
20	Neutral switch
21	Back-up light switch
22	Breather dust boot

23	Breather
24	Transfer
25	Blind cover
26	Extension housing (See 05–11B–6 Extension Housing Disassembly Note.)
27	Funnel
28	Oil seal (extension housing) (See 05–11B–5 Oil Seal (extension housing) Removal Note.)
29	Oil seal (control rod) (See 05–11B–6 Oil Seal (control rod) Disassembly Note.)
30	Bush (See 05–11B–7 Bush Disassembly Note.)

Oil Seal (extension housing) Removal Note

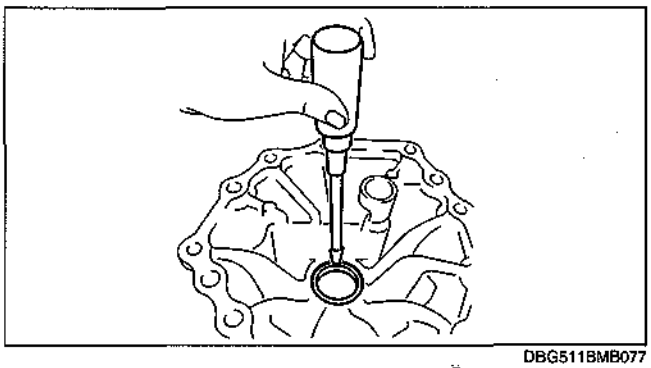
1. Remove the oil seal using a flathead screwdriver as shown in the figure.

4x2



DBG511BMB003

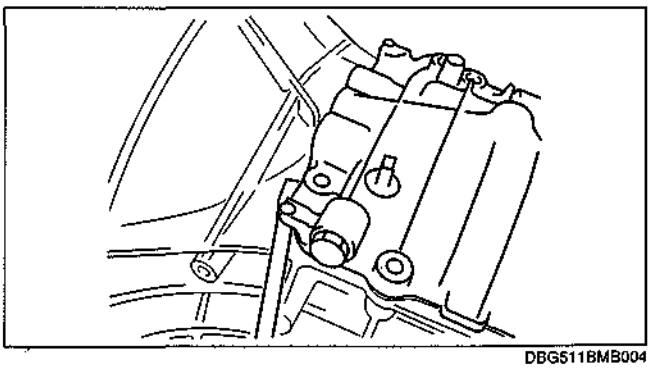
4x4



DBG511BMB077

Top Cover Disassembly Note

1. Pry the seal open at the projection on the case using a flathead screwdriver or similar tool as shown in the figure, and then remove the top cover.



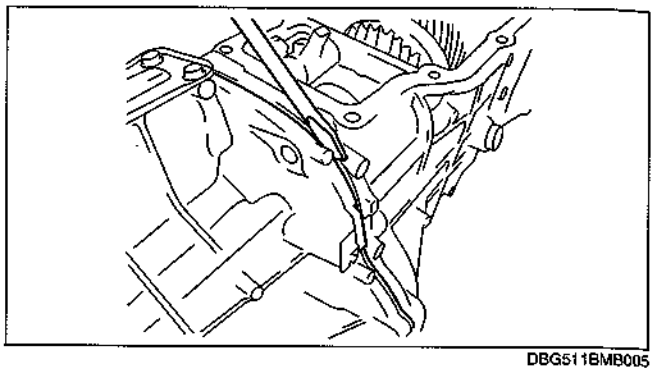
DBG511BMB004

Extension Housing Disassembly Note

1. Remove the extension housing component.

Note

- Pry open the seal at the projection on the case using a flathead screwdriver or similar tool as shown in the figure, and then remove the extension housing.

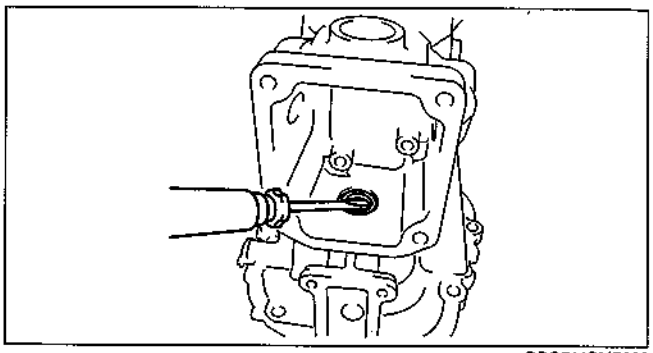


DBG511BMB005

Oil Seal (control rod) Disassembly Note

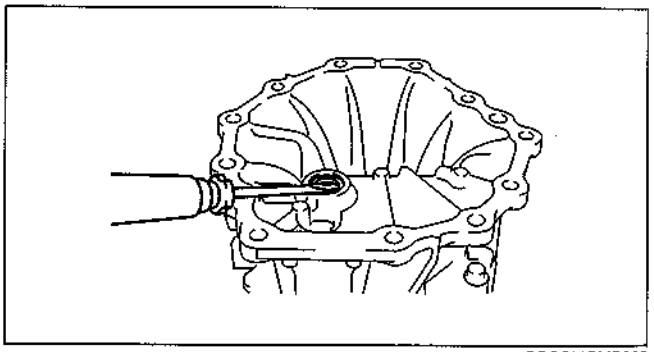
1. Using a flathead screwdriver, remove the oil seal as shown in the figure.

4x2



DBG511BMB006

4x4



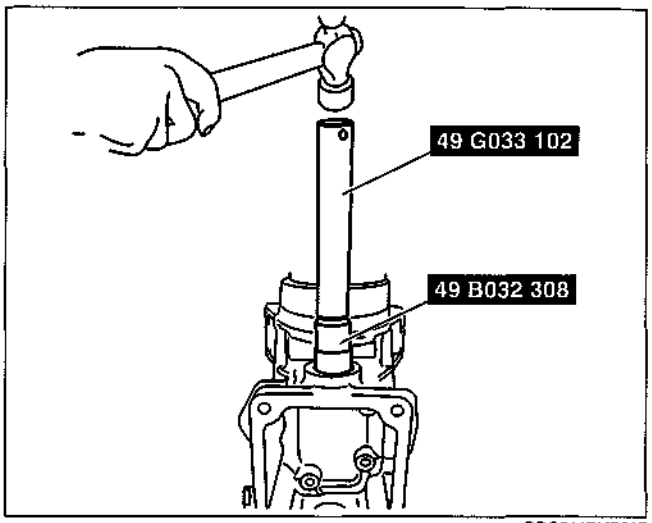
DBG511BMB068

Sealing Cap Disassembly Note

1. Remove the sealing cap using the **SST**.

Caution

- **Remove the sealing cap only if there is malfunction.**

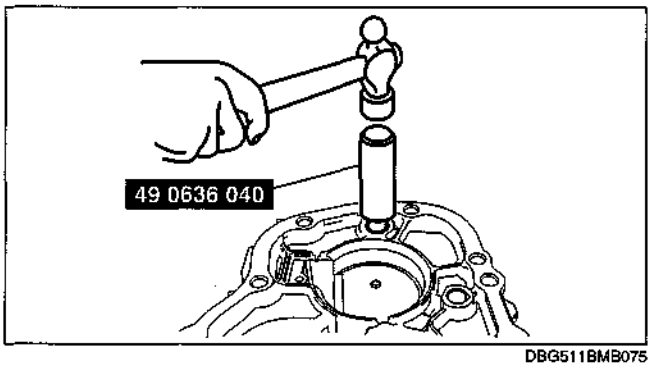


DBG511BMB007

Bush Disassembly Note

4x2

1. Remove the bush using the **SST**.

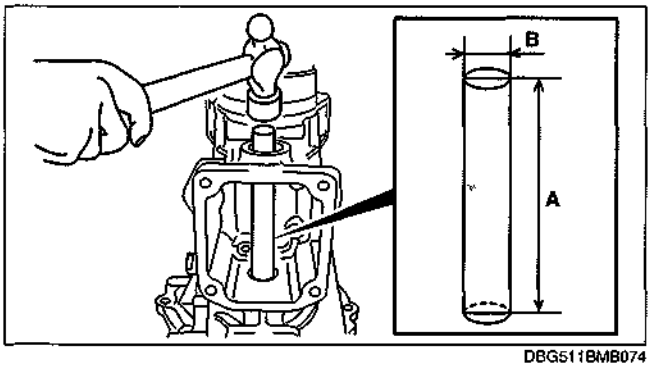


DBG511BMB075

2. Remove the bush using the suitable steel bar through the sealing cap hole as shown in the figure.

   Distance A: Approx. 200 mm {7.87 in}

   Distance B: Approx. 17.0—17.5 mm {0.670—0.688 in}

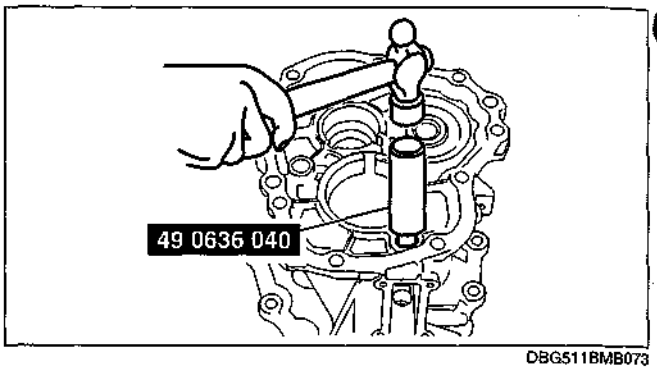


DBG511BMB074

4x4

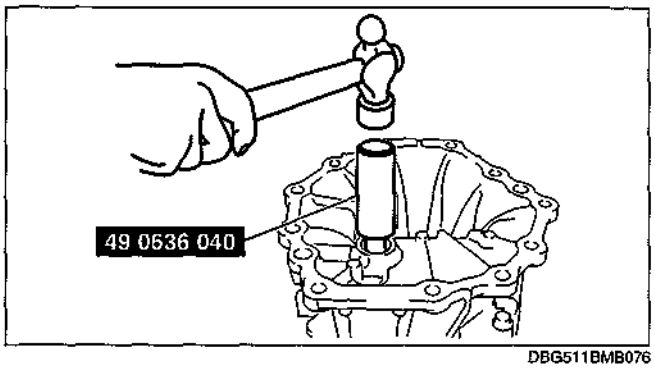
1. Remove the bush using the **SST**.

Front side



DBG511BMB073

Rear side

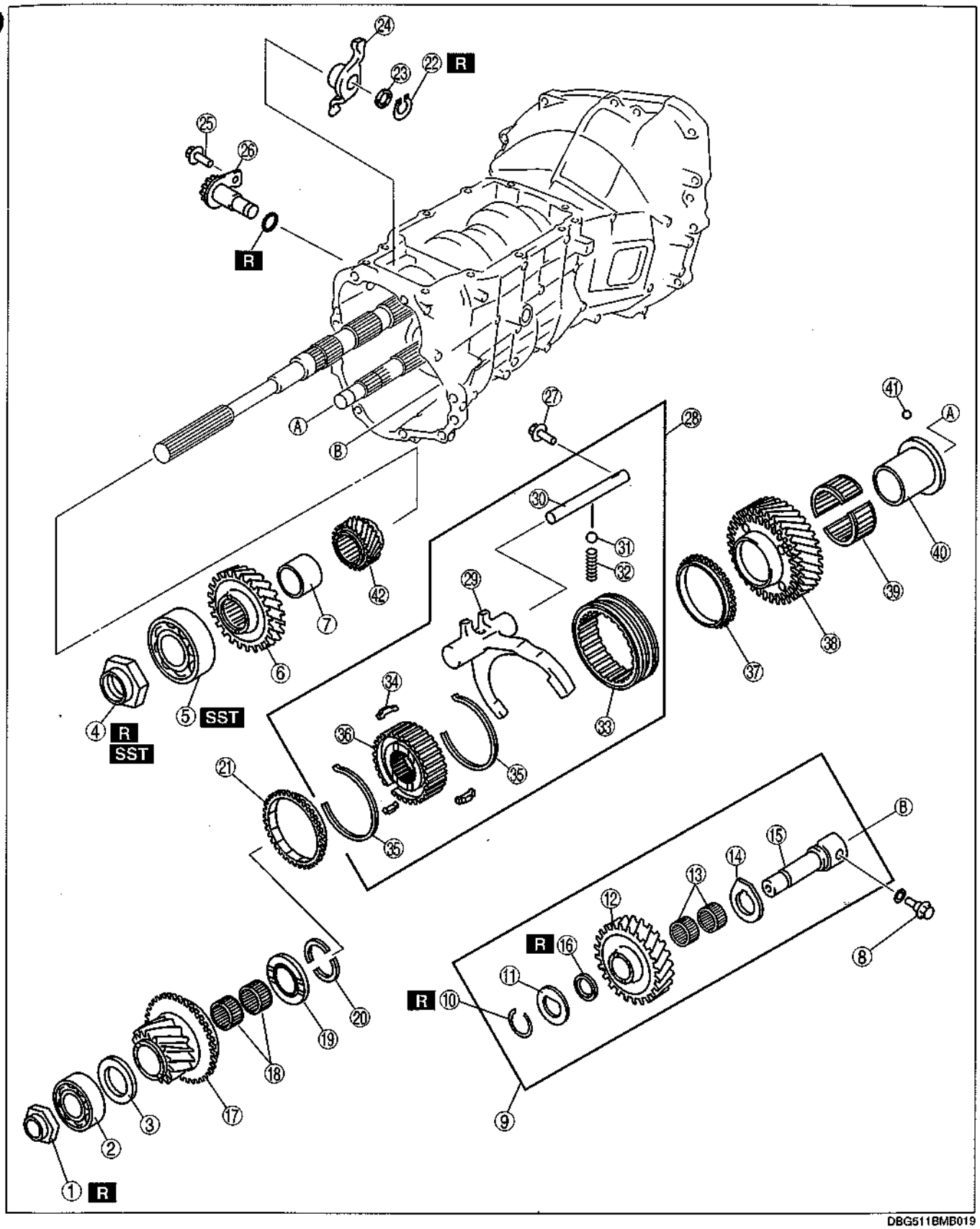


DBG511BMB076

REVERSE GEAR COMPONENT AND 3RD/4TH GEAR COMPONENT DISASSEMBLY [S15M-D, S15MX-D]

DCF051117030W11

1. Disassemble in the order indicated in the table.



DBG511BMB019

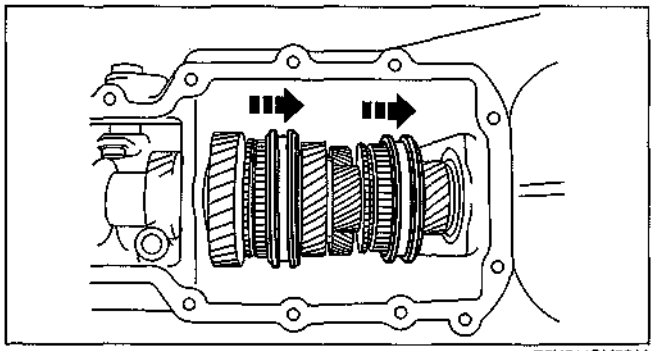
1	Locknut (See 05–11B–10 Mainshaft Rear Bearing locknut and Countershaft Rear Bearing locknut Disassembly Note.)
2	Countershaft rear bearing
3	Thrust washer

4	Locknut (See 05–11B–10 Mainshaft Rear Bearing locknut and Countershaft Rear Bearing locknut Disassembly Note.)
5	Mainshaft rear bearing (See 05–11B–11 Mainshaft Rear Bearing Disassembly Note.)
6	Reverse counter gear
7	Spacer
8	Retaining bolt
9	Reverse idler gear shaft component (See 05–11B–11 Reverse Idler Gear Shaft Component Disassembly Note.)
10	Retaining ring
11	Thrust washer
12	Reverse idler gear
13	Needle bearing
14	Thrust washer
15	Reverse idler gear shaft
16	Friction damper (See 05–11B–11 Reverse Idler Gear Friction Damper Disassembly Note.)
17	Reverse gear
18	Needle bearing
19	Thrust washer
20	Thrust washer
21	Synchronizer ring

22	Retaining ring
23	Washer
24	Counter lever (See 05–11B–12 Counter Lever Disassembly Note.)
25	Retaining bolt
26	Counter lever shaft component (See 05–11B–12 Counter Lever Disassembly Note.)
27	Retaining bolt
28	5th/reverse clutch hub and shift fork component (See 05–11B–12 5th/reverse Shift Fork Disassembly Note.)
29	5th/reverse shift fork
30	5th/reverse shift rod
31	Detent ball
32	Detent spring
33	Clutch hub sleeve
34	Synchronizer key
35	Synchronizer key spring
36	5th/reverse clutch hub
37	Synchronizer ring
38	5th gear
39	Needle bearing
40	5rd gear bearing inner race
41	Steel ball
42	5th counter gear

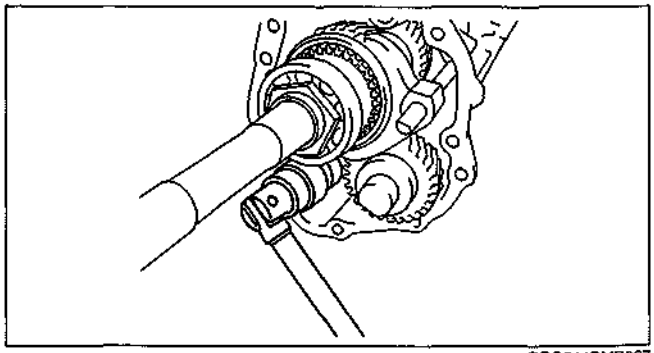
Mainshaft Rear Bearing locknut and Countershaft Rear Bearing locknut Disassembly Note

1. Slide the 3rd/4th and 1st/2nd clutch hub sleeves to lock the transmission into 4th and 2nd gears.



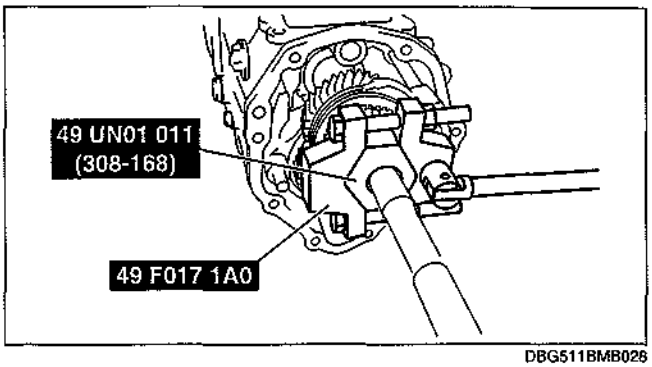
E5U511BM5011

2. Remove the countershaft rear bearing locknut by rotating it clockwise.



DBG511BMB027

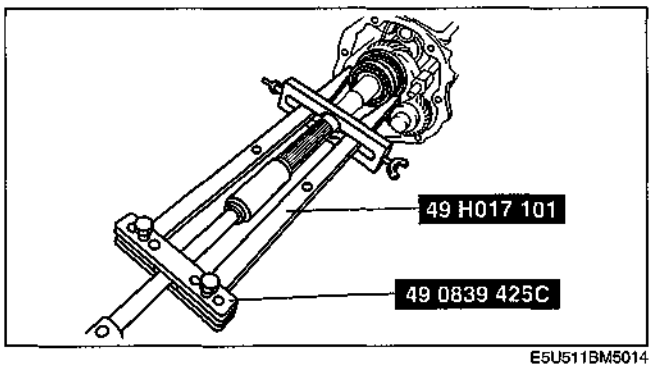
3. Remove the mainshaft rear bearing locknut by rotating it counterclockwise using the **SST**.



DBG511BMB026

Mainshaft Rear Bearing Disassembly Note

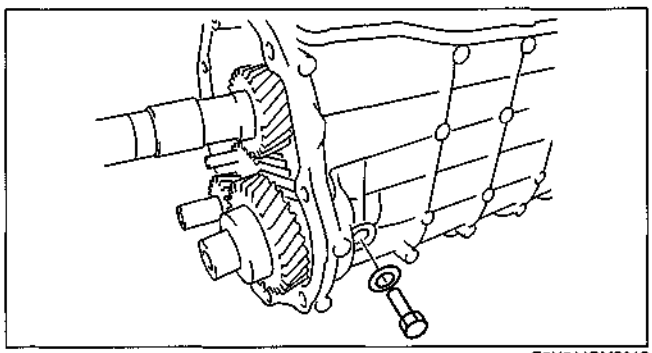
1. Using the **SSTs** remove the mainshaft rear bearing.



E5U511BM5014

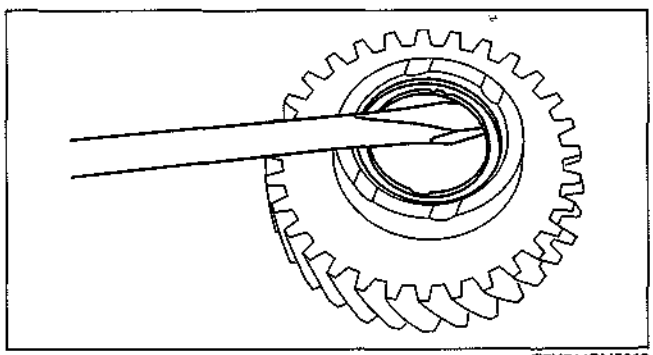
Reverse Idler Gear Shaft Component Disassembly Note

1. Remove the reverse idler gear shaft retaining bolt and then remove the reverse idler gear shaft component from the transmission case.


E5U511BM5015

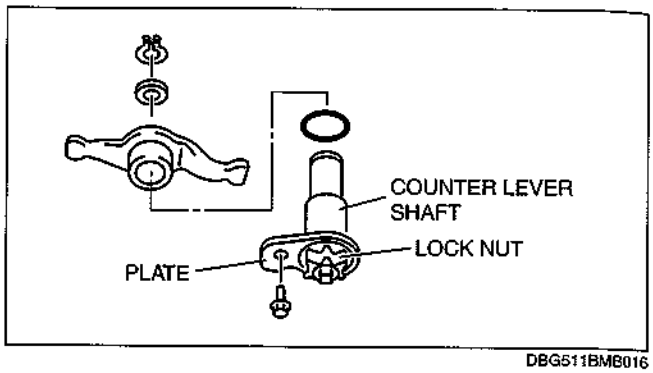
Reverse Idler Gear Friction Damper Disassembly Note

1. Remove the friction damper using a flathead screwdriver.


E5U511BM5019

Counter Lever Disassembly Note

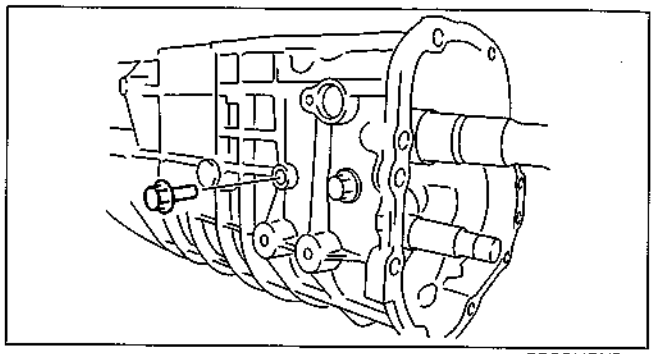
Caution
- **To prevent the shaft position from deviating when removing the counter lever, remove the countershaft lever component without loosening the locknut unless it is necessary.**



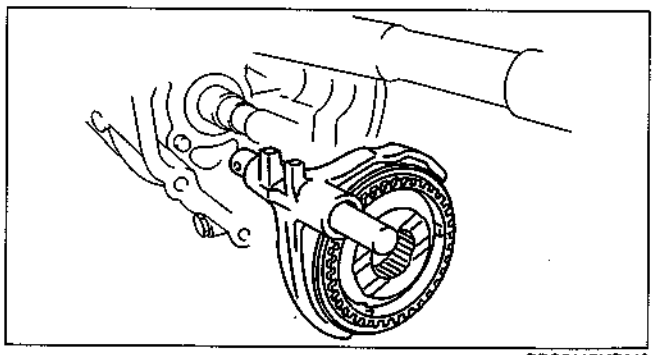
DBG511BMB016

5th/reverse Shift Fork Disassembly Note

1. Remove the 5th/reverse shift rod retaining bolt.


DBG511BMB017

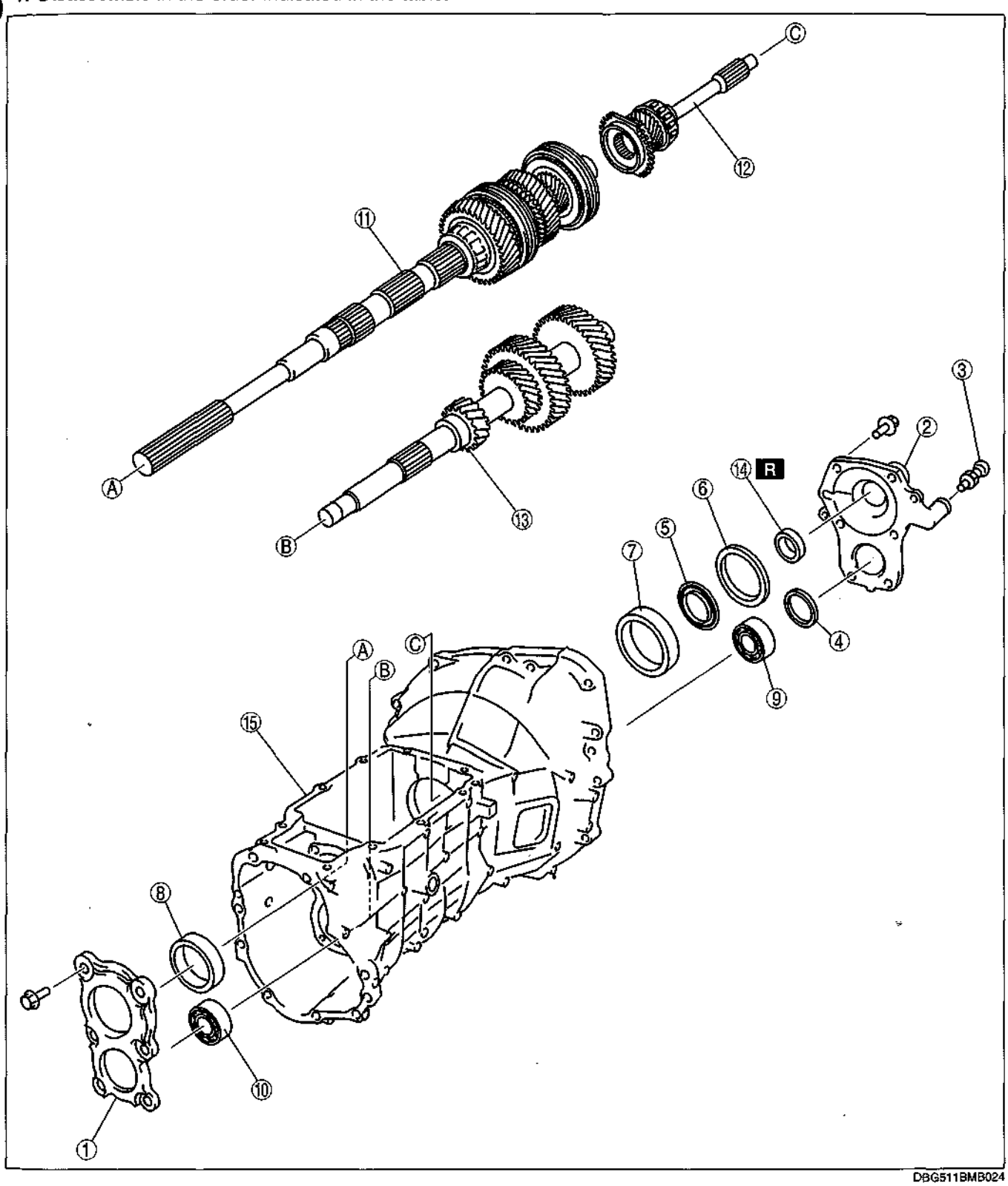
2. Remove the 5th/reverse shift fork component and 5th/reverse clutch hub component at the same time.


DBG511BMB018

MAINSHAFT COMPONENT, COUNTERSHAFT COMPONENT AND TRANSMISSION CASE DISASSEMBLY [S15M-D, S15MX-D]

DCF051117030W12

1. Disassemble in the order indicated in the table.



DBG511BMB024

1	Bearing cover
2	Front cover (See 05–11B–14 Front Cover Disassembly Note.)
3	Pivot pin
4	Bearing shim
5	Oil baffle

6	Bearing shim
7	Maindrive gear bearing race (See 05–11B–14 Bearing Race Disassembly Note.)
8	Mainshaft bearing race (See 05–11B–14 Bearing Race Disassembly Note.)
9	Countershaft front bearing

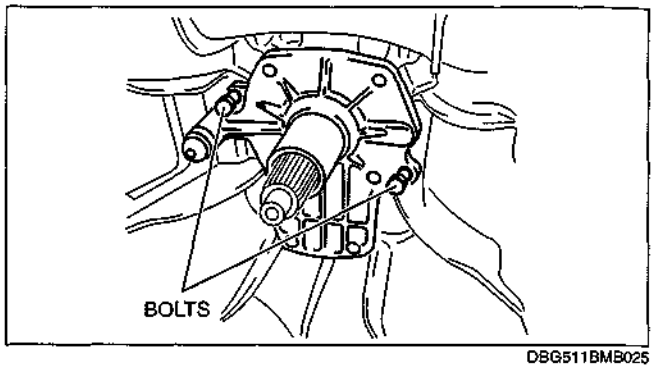
10	Countershaft rear bearing
11	Mainshaft component (See 05–11B–14 Mainshaft Component and Countershaft Component Disassembly Note.)
12	Maindrive gear (See 05–11B–14 Mainshaft Component and Countershaft Component Disassembly Note.)
13	Countershaft component (See 05–11B–14 Mainshaft Component and Countershaft Component Disassembly Note.)
14	Front oil seal
15	Transmission case

Front Cover Disassembly Note

1. Remove the front cover.

Caution

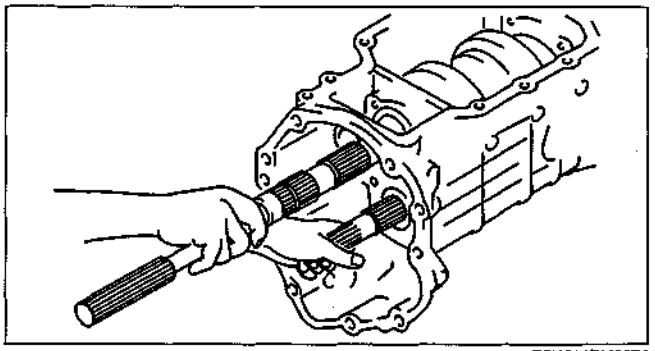
- **Insert the front cover tightening bolts into the bolt holes for the front cover disassembly, tighten the two bolts uniformly and, then remove the front cover.**



DBG511BMB025

Bearing Race Disassembly Note

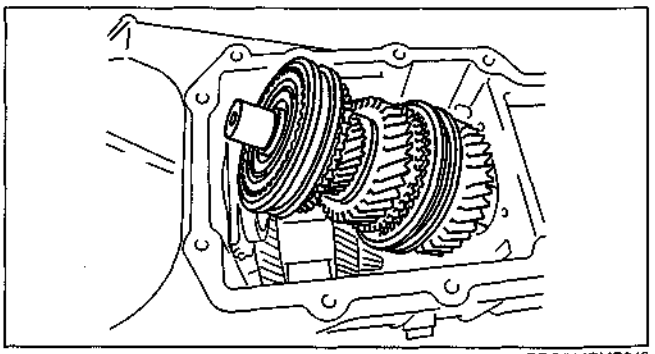
1. Grasping the mainshaft and countershaft, move them forward and back to remove the bearing races.



E5U511BM5074

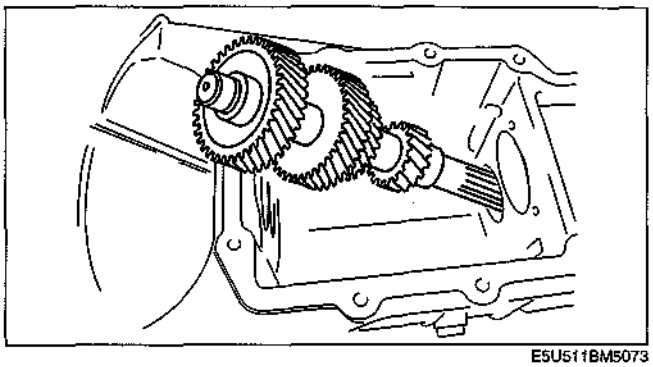
Mainshaft Component and Countershaft Component Disassembly Note

1. Tilt the mainshaft component as shown in the figure and remove it from the transmission case.
2. Remove the maindrive gear.



DBG511BMB049

3. Tilt the countershaft component as shown in the figure and remove it from the transmission case.



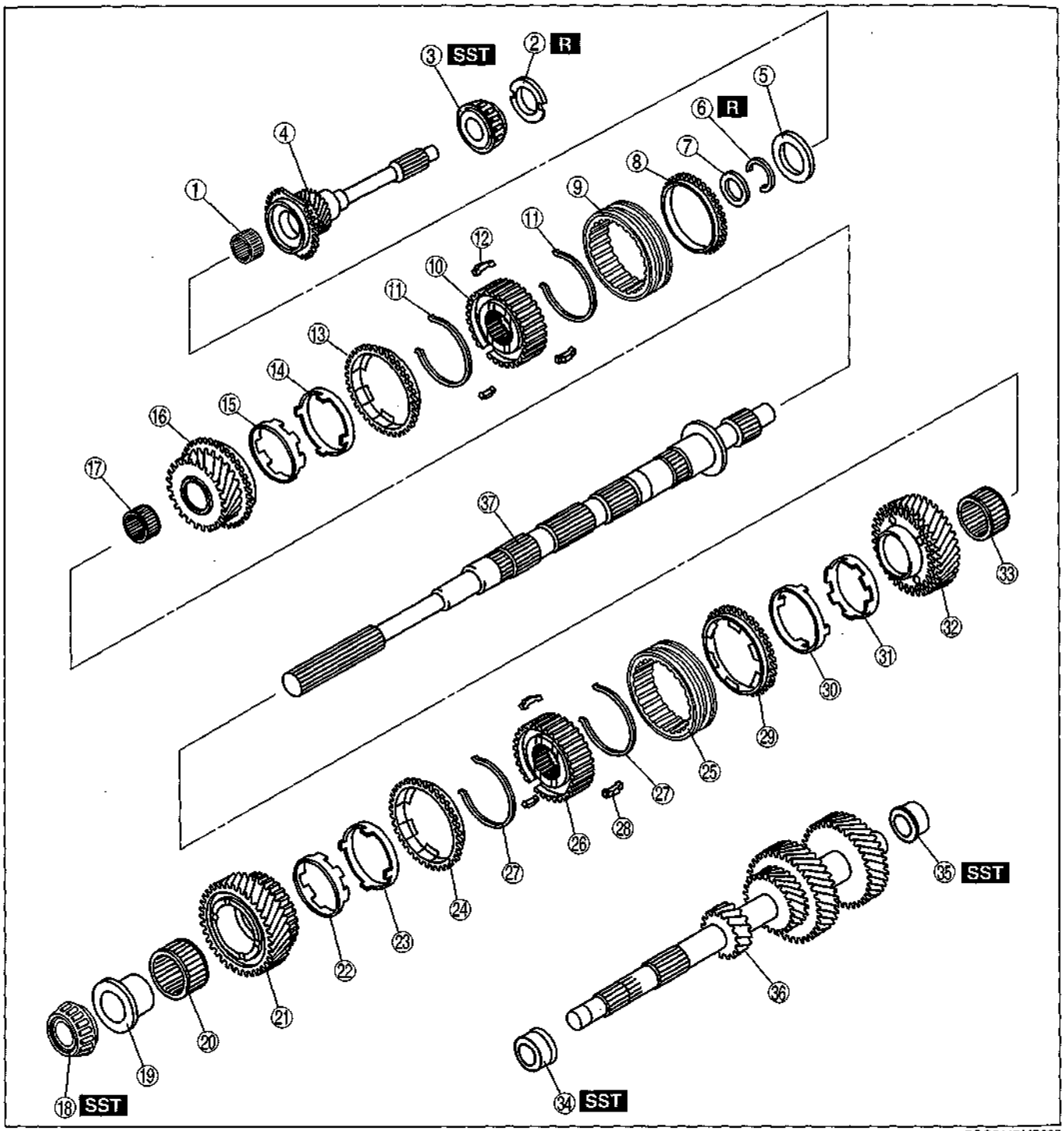
E5U511BM5073

1ST/2ND GEAR COMPONENT, 3RD/4TH GEAR COMPONENT AND COUNTERSHAFT DISASSEMBLY [S15M-D, S15MX-D]

DCF051117030W13

Caution
- **Remove the countershaft center bearing race only if there is a malfunction.**

1. Disassemble in the order indicated in the table.



DBG511BMB026

1	Needle bearing
2	Scoop ring
3	Maindrive gear shaft bearing (See 05–11B–18 Maindrive Gear Shaft Bearing Disassembly Note.)
4	Maindrive gear shaft
5	Needle bearing

6	Retaining ring (See 05–11B–17 3rd/4th Clutch Hub Component Disassembly Note.)
7	Spacer
8	Synchronizer ring
9	Clutch hub sleeve

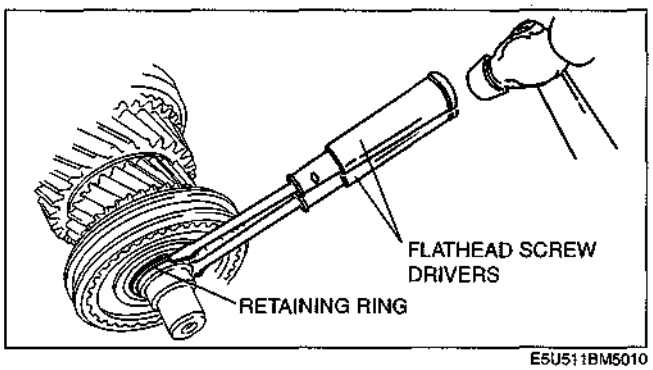
10	3rd/4th clutch hub (See 05–11B–17 3rd/4th Clutch Hub Component Disassembly Note.)
11	Synchronizer key spring
12	Synchronizer key
13	Synchronizer ring
14	Double cone
15	Inner cone
16	3rd gear
17	Needle bearing
18	Mainshaft center bearing (See 05–11B–17 1st/2nd Clutch Hub Component Disassembly Note.)
19	1st gear bearing inner race
20	Needle bearing
21	1st gear
22	Inner cone
23	Double cone
24	Synchronizer ring
25	Clutch hub sleeve
26	1st/2nd clutch hub (See 05–11B–17 1st/2nd Clutch Hub Component Disassembly Note.)
27	Synchronizer key spring
28	Synchronizer key
29	Synchronizer ring
30	Double cone
31	Inner cone
32	2nd gear
33	Needle bearing
34	Countershaft center bearing race (See 05–11B–18 Countershaft Center Bearing Race Disassembly Note.)
35	Countershaft front bearing race (See 05–11B–18 Countershaft Front Bearing Race Disassembly Note.)
36	Countershaft
37	Mainshaft

05

3rd/4th Clutch Hub Component Disassembly Note

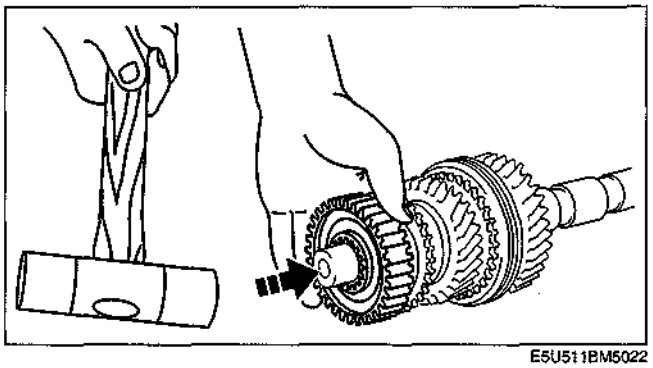
1. Remove the retaining ring using the two flathead screwdrivers.

Caution
- **Do not reuse the retaining ring.**



E5U511BM5010

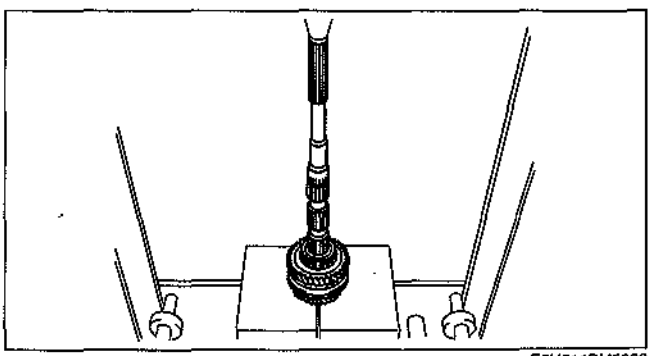
2. Supporting the 3rd/4th clutch hub with your hand as shown in the figure, tap the mainshaft with a plastic hammer to remove the 3rd/4th clutch hub.


E5U511BM5022

1st/2nd Clutch Hub Component Disassembly Note

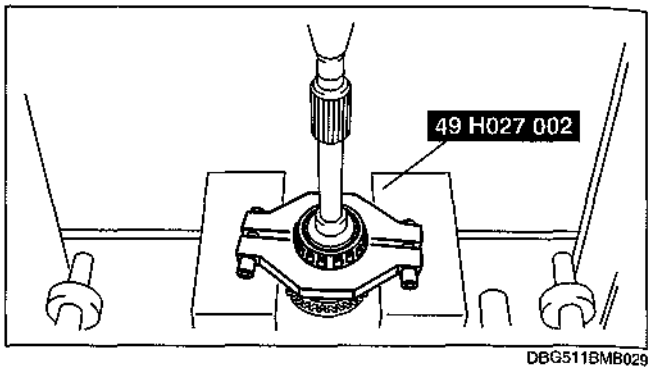
1. Using a press, remove the mainshaft center bearing, 1st gear, 1st synchronizer ring component, 1st/2nd clutch hub component, 2nd synchronizer ring component and 2nd gear at the same time.

Caution
- **Be sure to support the mainshaft component so that it does not fall.**


E5U511BM5023

Maindrive Gear Shaft Bearing Disassembly Note

1. Remove the maindrive gear shaft bearing using the **SST** and press.



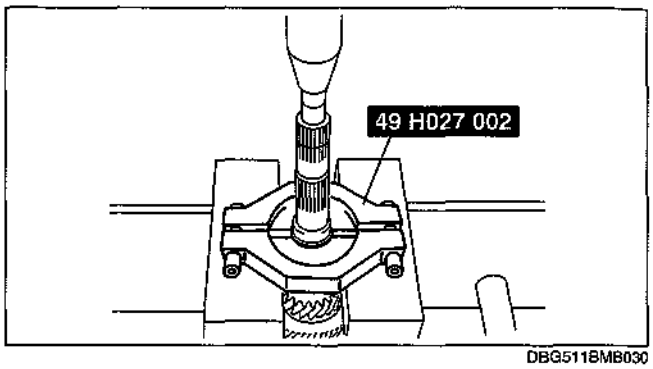
DBG511BMB029

Countershaft Center Bearing Race Disassembly Note

1. Remove the countershaft center bearing race using the **SST** and press.

Caution

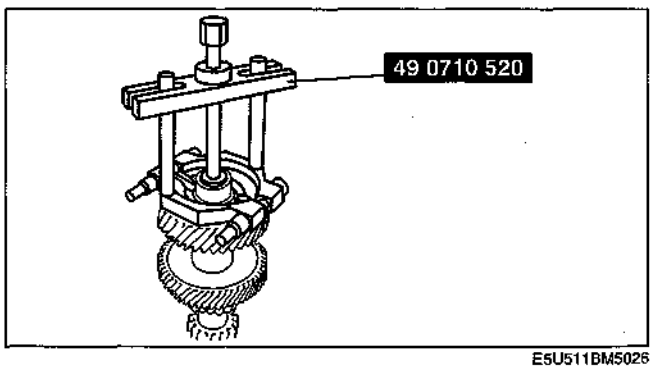
- **Be sure to support the countershaft so that it does not fall.**



DBG511BMB030

Countershaft Front Bearing Race Disassembly Note

1. Remove the countershaft front bearing race using the **SST**.



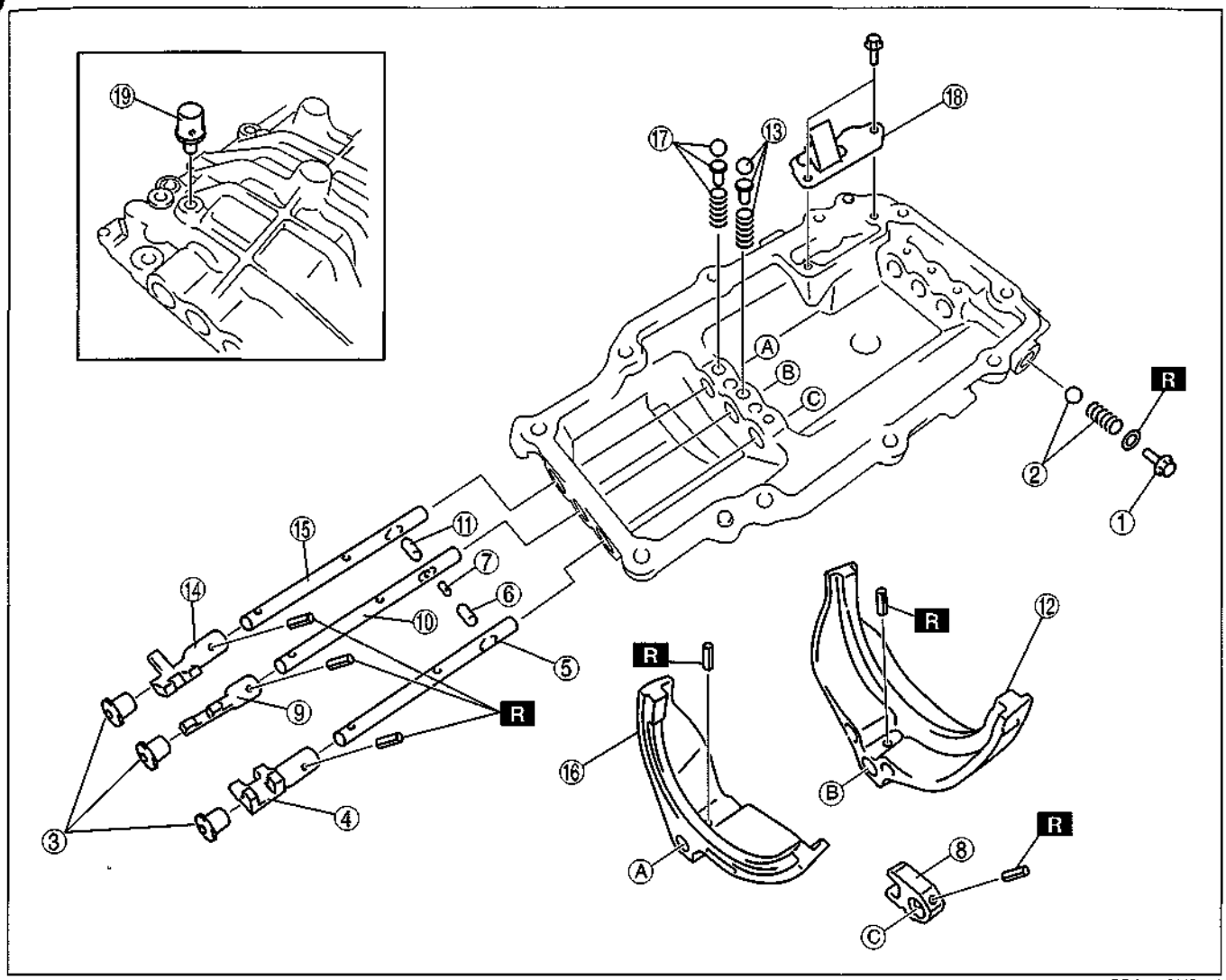
E5U511BM5026

SHIFT COMPONENT DISASSEMBLY [S15M-D, S15MX-D]

DCF051117030W14

1. Disassemble in the order indicated in the table.

4x2

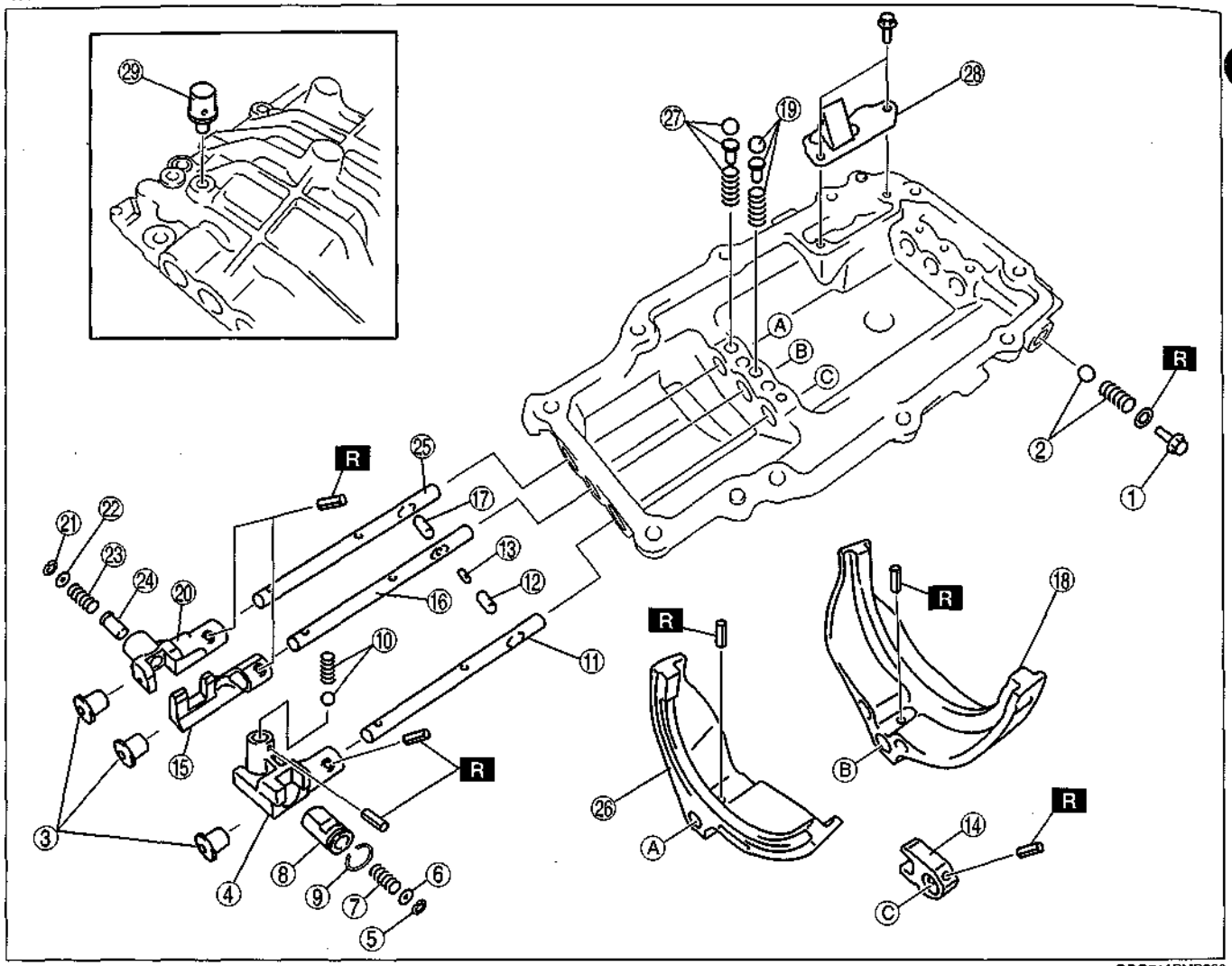


DBG511BMB031

1	Retaining bolt
2	Detent ball, spring
3	Rubber plug
4	5th/reverse shift rod end
5	5th/reverse shift rod (See 05–11B–21 Shift Rod Disassembly Note.)
6	Interlock pin
7	Interlock pin
8	Stopper block
9	3rd/4th shift rod end
10	3rd/4th shift rod (See 05–11B–21 Shift Rod Disassembly Note.)

11	Interlock pin
12	3rd/4th shift fork
13	Detent ball, spring seat, spring
14	1st/2nd shift rod end
15	1st/2nd shift rod (See 05–11B–21 Shift Rod Disassembly Note.)
16	1st/2nd shift fork
17	Detent ball, spring seat, spring
18	Baffle plate
19	Breather

4x4



DBG511BMB036

1	Retaining bolt
2	Detent ball, spring
3	Rubber plug
4	5th/reverse shift rod end
5	Retaining ring
6	Plain washer
7	Spring
8	Push pin
9	Retaining ring
10	Detent ball, spring
11	5th/reverse shift rod (See 05–11B–21 Shift Rod Disassembly Note.)
12	Interlock pin
13	Interlock pin
14	Stopper block
15	3rd/4th shift rod end

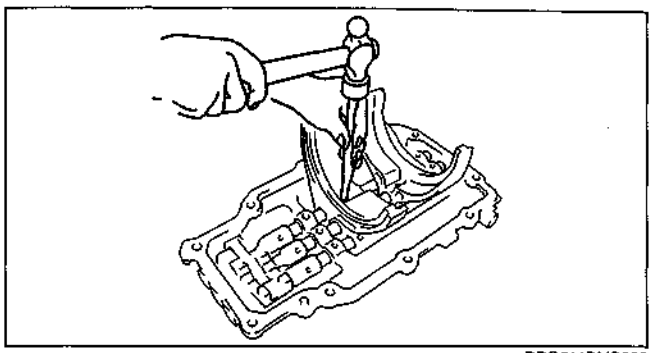
16	3rd/4th shift rod (See 05–11B–21 Shift Rod Disassembly Note.)
17	Interlock pin
18	3rd/4th shift fork
19	Detent ball, spring seat, spring
20	1st/2nd shift rod end
21	Retaining ring
22	Plain washer
23	Spring
24	Push pin
25	1st/2nd shift rod (See 05–11B–21 Shift Rod Disassembly Note.)
26	1st/2nd shift fork
27	Detent ball, spring seat, spring
28	Baffle plate
29	Breather

Shift Rod Disassembly Note

1. Remove the spring pins from each of the shift rods using a pin punch.
2. Place the shift mechanism in the neutral position.

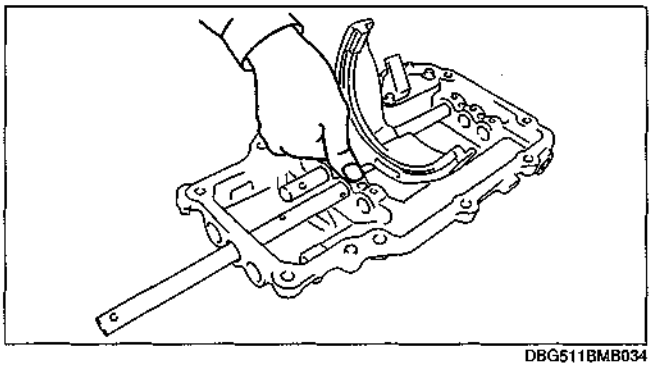
Caution

- **When pulling out the shift rods, press the top of each detent ball so that it doesn't spring out.**



DBG511BMB033

3. Pull out the shift rods from the top cover.



DBG511BMB034

MANUAL TRANSMISSION PARTS INSPECTION [S15M-D, S15MX-D]

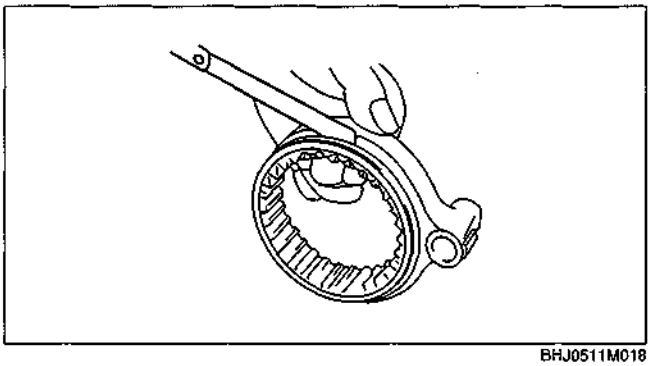
DCF051100000W05

Clutch Hub Component

1. Measure the clearance between each shift fork and clutch hub sleeve groove using a feeler gauge.
   - If not within the specification, replace the shift fork and clutch hub sleeve as a set.

Standard clearance between shift fork and clutch hub sleeve groove
0.05—0.40 mm {0.002—0.015 in}

Maximum clearance between shift fork and clutch hub sleeve groove
0.5 mm {0.020 in}



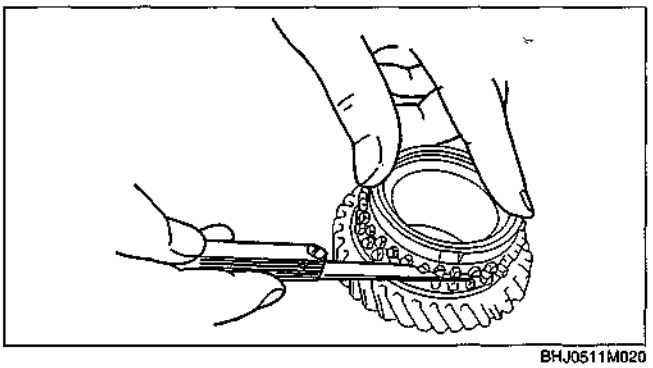
BHJ0511M018

Synchronizer Ring

1. Measure the clearance between the synchronizer ring and flank surface of the gear using a feeler gauge around the entire circumference.
   - If not within the specification, replace the synchronizer ring.

Standard clearance between synchronizer ring and flank surface of gear
1.5 mm {0.059 in}

Maximum clearance between synchronizer ring and flank surface of gear
0.8 mm {0.031 in}



BHJ0511M020

Note

- Set the synchronizer ring squarely in the gear.

Spring

1. Measure the free length of each spring.
   - If not within the specification, replace the spring.

Detent ball springs for 1st/2nd and 3rd/4th shift rods
Standard length: 22.5 mm {0.886 in}

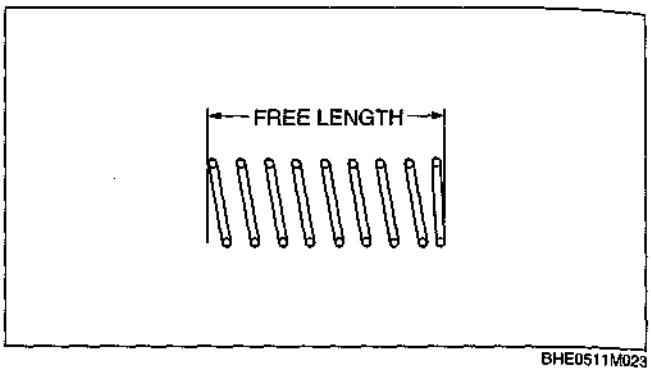
Detent ball spring for 5th/reverse shift rod
Standard length: 24.97 mm {0.9831 in}

1st/2nd select lock spindle spring [4x2]
Standard length: 57.5 mm {2.26 in}

Push pin spring for 1st/2nd shift rod end [4x4]
Standard length: 32.8 mm {1.29 in}

Push pin spring for 5th/reverse shift rod end [4x4]
Standard length: 41.0 mm {1.61 in}

Detent ball spring for 5th/reverse shift rod end [4x4]
Standard length: 24.97 mm {0.9831 in}

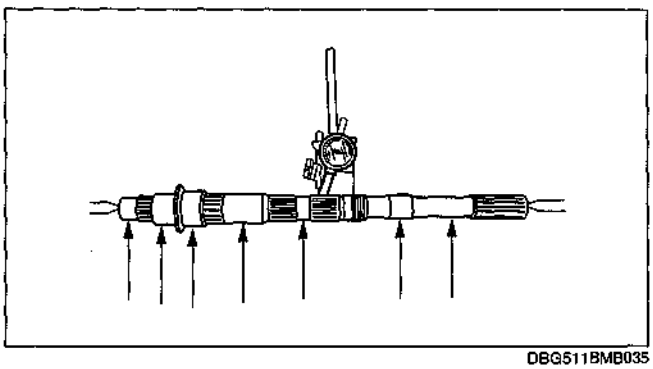


BHE0511M023

Mainshaft

1. Measure the mainshaft runout using a dial gauge.
   - If it exceeds the maximum specification, replace the mainshaft.

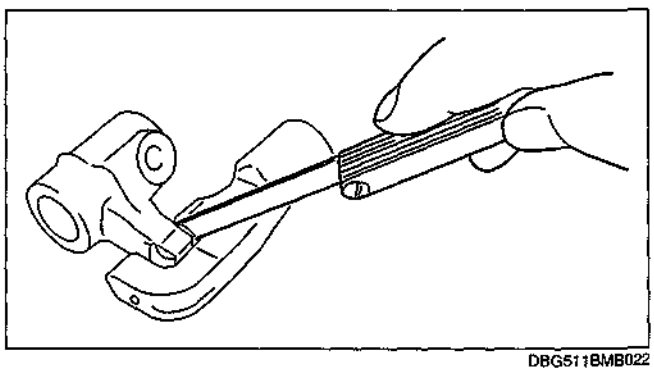
Mainshaft maximum runout
0.03 mm {0.0012 in}


DBG511BMB035

Shift Rod End, Control Lever

1. Measure the clearance between the shift rod end and control lever using a feeler gauge.
   - If not within the specification, replace the shift rod end or control lever as a set.

Standard clearance between shift rod end and control lever
0.5 mm {0.020 in} or less

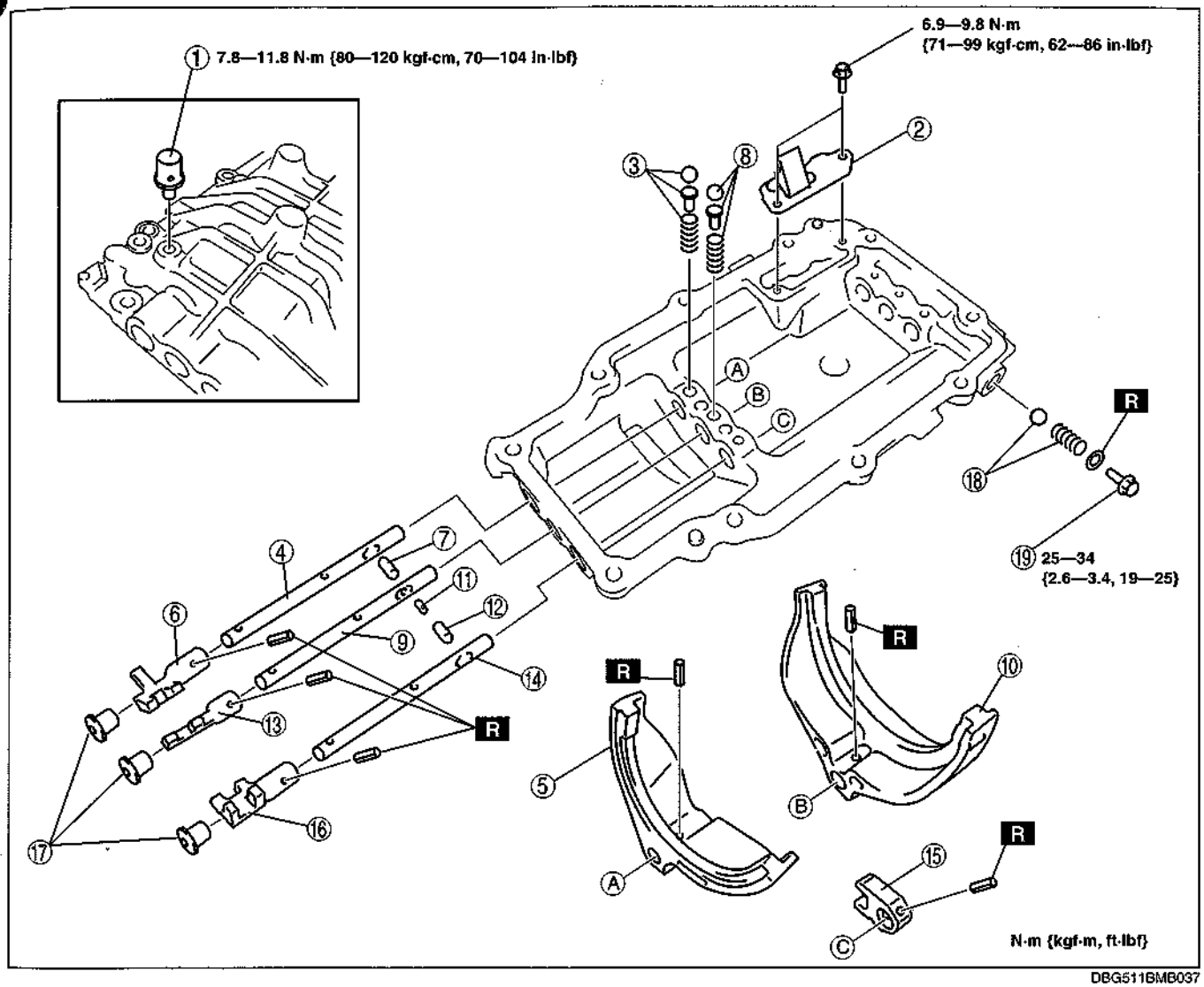

DBG511BMB022

SHIFT COMPONENT ASSEMBLY [S15M-D, S15MX-D]

DCF051117030W15

1. Assemble in the order indicated in the table.

4x2

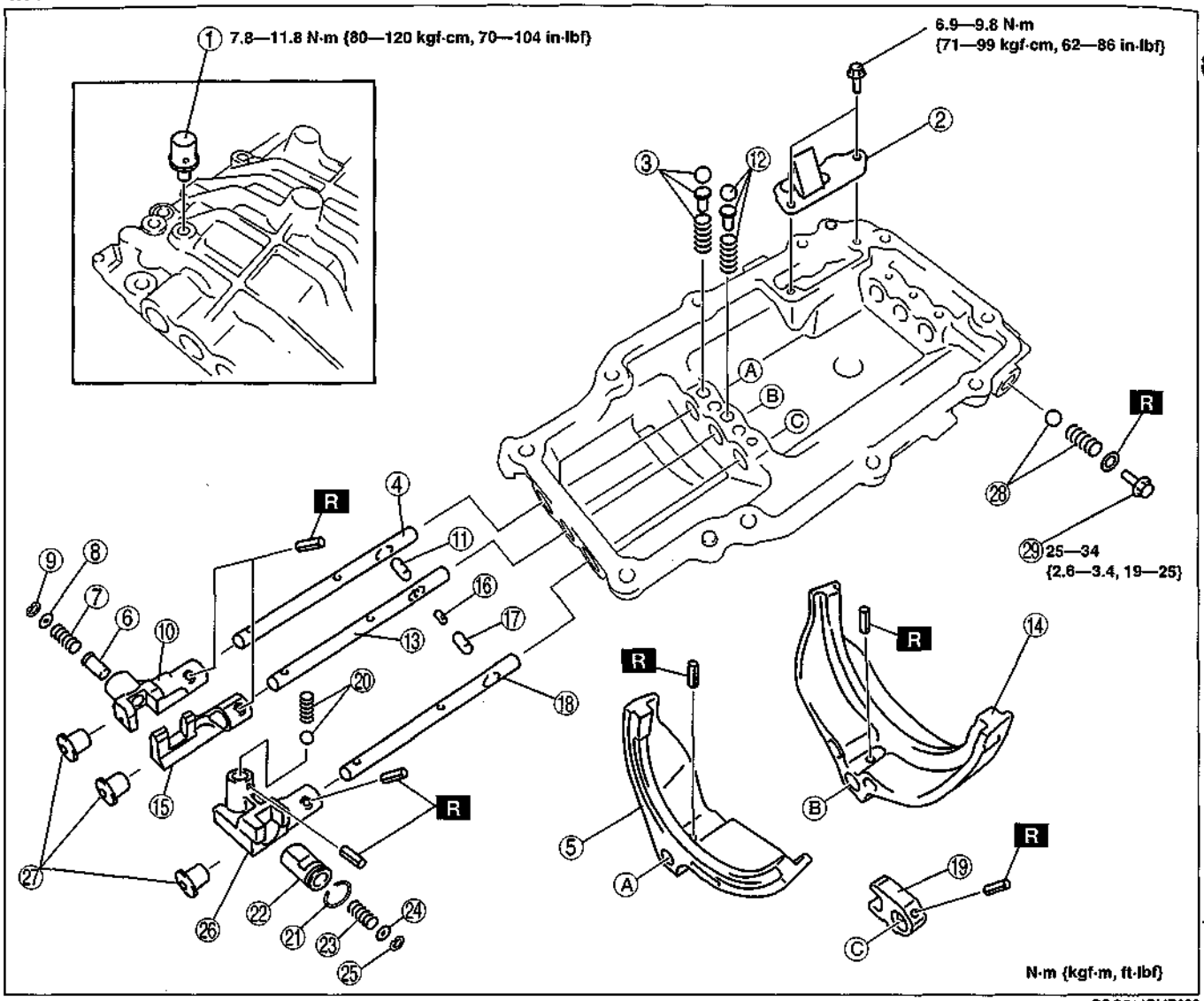


DBG511BMB037

1	Breather
2	Baffle plate
3	Detent ball, spring seat, spring
4	1st/2nd shift rod (See 05–11B–25 Shift Rod Assembly Note.)
5	1st/2nd shift fork
6	1st/2nd shift rod end
7	Interlock pin
8	Detent ball, spring seat, spring
9	3rd/4th shift rod (See 05–11B–25 Shift Rod Assembly Note.)

10	3rd/4th shift fork
11	Interlock pin
12	Interlock pin
13	3rd/4th shift rod end
14	5th/reverse shift rod (See 05–11B–25 Shift Rod Assembly Note.)
15	Stopper block
16	5th/reverse shift rod end
17	Rubber plug
18	Detent ball, spring
19	Retaining bolt

4x4



DBG511BMB038

1	Breather
2	Baffle plate
3	Detent ball, spring seat, spring
4	1st/2nd shift rod (See 05–11B–25 Shift Rod Assembly Note.)
5	1st/2nd shift fork
6	Push pin
7	Spring
8	Plain washer
9	Retaining ring
10	1st/2nd shift rod end
11	Interlock pin
12	Detent ball, spring seat, spring
13	3rd/4th shift rod (See 05–11B–25 Shift Rod Assembly Note.)
14	3rd/4th shift fork
15	3rd/4th shift rod end

16	Interlock pin
17	Interlock pin
18	5th/reverse shift rod (See 05–11B–25 Shift Rod Assembly Note.)
19	Stopper block
20	Detent ball, spring
21	Retaining ring
22	Push pin (See 05–11B–25 Push Pin Assembly Note.)
23	Spring
24	Plain washer
25	Retaining ring
26	5th/reverse shift rod end
27	Rubber plug
28	Detent ball, spring
29	Retaining bolt

Shift Rod Assembly Note

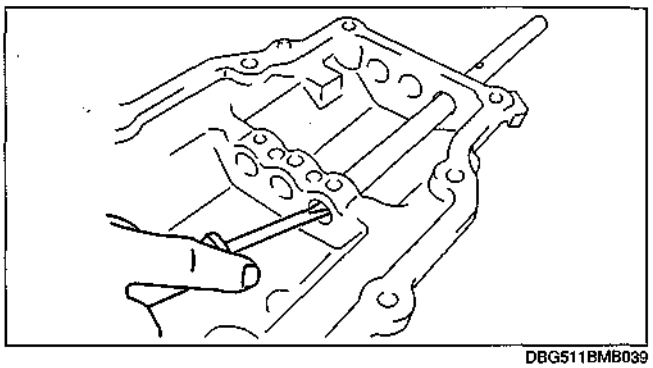
1. Install each shift rod.

Caution

- **Do not forget to insert the interlock pins.**

Note

- Insert the shift rod while pressing the detent ball with a flathead screwdriver as shown in the figure.



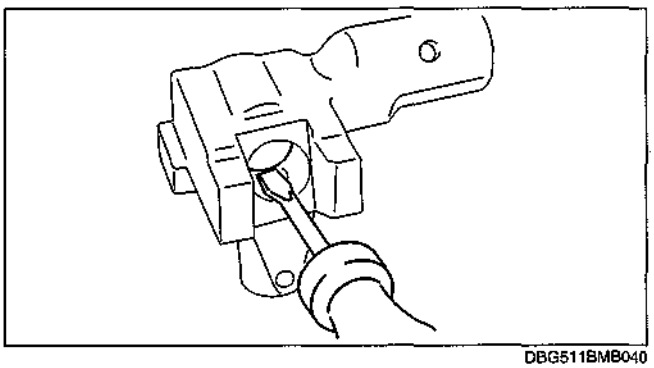
DBG511BMB039

Push Pin Assembly Note

1. Install the push pin.

Note

- Insert the push pin while pressing the detent ball with a flathead screwdriver as shown in the figure.

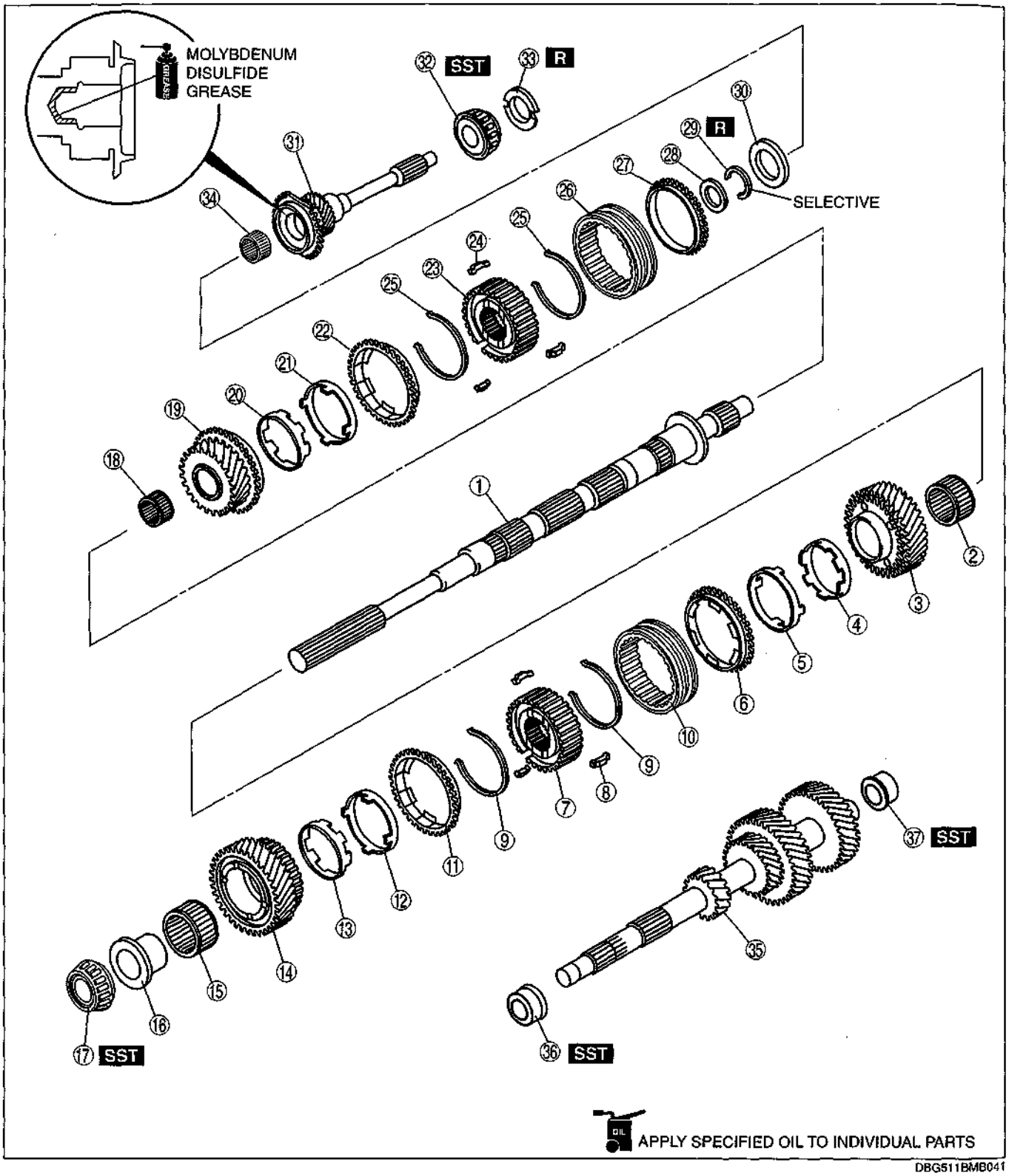


DBG511BMB040

1ST/2ND GEAR COMPONENT, 3RD/4TH GEAR COMPONENT AND COUNTERSHAFT ASSEMBLY [S15M-D, S15MX-D]

DCF051117040W07

1. Assemble in the order indicated in the table.



DBG511BMB041

1	Mainshaft
2	Needle bearing
3	2nd gear
4	Inner cone
5	Double cone
6	Synchronizer ring

7	1st/2nd clutch hub (See 05–11B–27 1st/2nd Clutch Hub Component Assembly Note.)
8	Synchronizer key
9	Synchronizer key spring
10	Clutch hub sleeve

11	Synchronizer ring
12	Double cone
13	Inner cone
14	1st gear
15	Needle bearing
16	1st gear bearing inner race
17	Mainshaft center bearing (See 05–11B–27 1st/2nd Clutch Hub Component Assembly Note.)
18	Needle bearing
19	3rd gear
20	Inner cone
21	Double cone
22	Synchronizer ring
23	Clutch hub (See 05–11B–28 3rd/4th Clutch Hub Component Assembly Note.)
24	Synchronizer key (See 05–11B–28 3rd/4th Clutch Hub Component Assembly Note.)
25	Synchronizer key spring (See 05–11B–28 3rd/4th Clutch Hub Component Assembly Note.)
26	Clutch hub sleeve (See 05–11B–28 3rd/4th Clutch Hub Component Assembly Note.)
27	Synchronizer ring
28	Spacer
29	Retaining ring (See 05–11B–28 3rd/4th Clutch Hub Component Assembly Note.)
30	Needle bearing
31	Maindrive gear
32	Maindrive gear shaft bearing (See 05–11B–29 Maindrive Gear Shaft Bearing Assembly Note.)
33	Scoop ring
34	Needle bearing
35	Countershaft
36	Countershaft center bearing race (See 05–11B–29 Countershaft Center Bearing Race Assembly Note.)
37	Countershaft front bearing race (See 05–11B–30 Countershaft Front Bearing Race Assembly Note.)

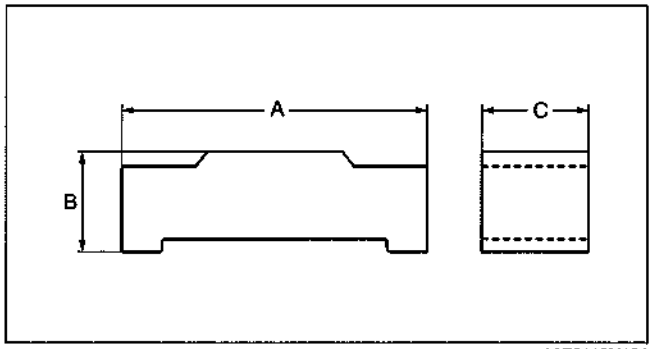
1st/2nd Clutch Hub Component Assembly Note

Caution

- **Be sure to assemble the clutch hub components and synchronizer ring components while aligning the synchronizer ring grooves with the synchronizer keys.**
- **The standard synchronizer key dimensions are as follows:**

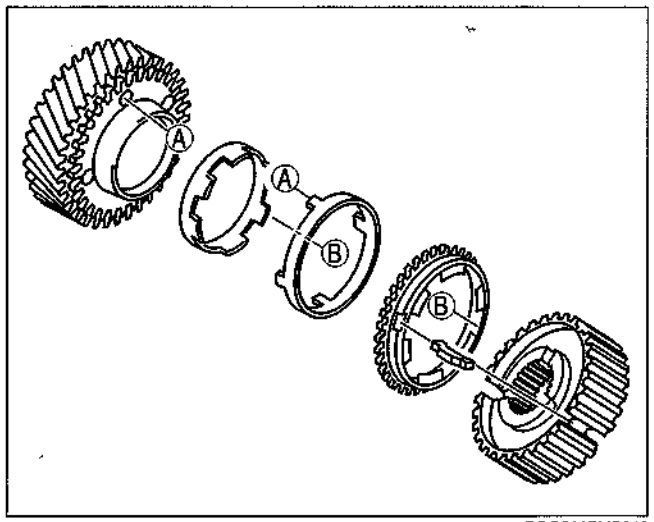
mm {in}

	A	B	C
1st/2nd	17.0 {0.669}	5.9 {0.23}	5.0 {0.20}



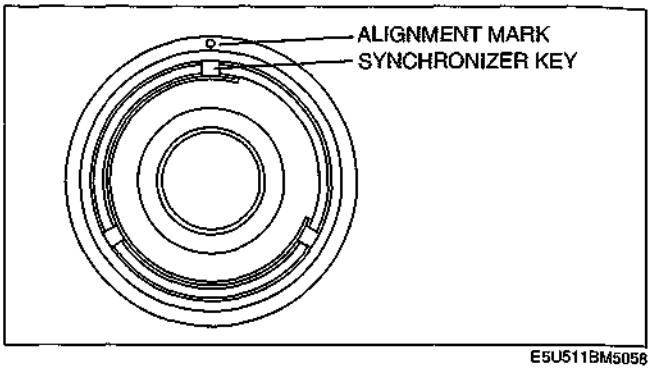
A6E5110M131

- **Be sure to align the synchronizer ring projections with the inner cone notches.**
- **Be sure to assemble the gears and the synchronizer ring components while aligning the double cone projections with the gear holes as shown in the figure.**



DBG511BMB042

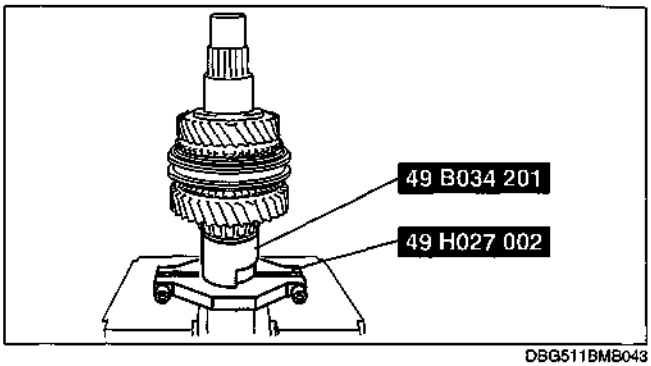
- **Align the clutch hub sleeve alignment mark with the clutch hub synchronizer key installation position and assemble.**



E5U511BM5058

Caution
- **When using a press, be careful not to damage the parts.**

1. Using a **SSTs** and press, assemble the needle bearing, 2nd gear, synchronizer ring component (2nd), 1st/2nd clutch hub component, synchronizer ring component (1st), 1st gear, needle bearing, needle bearing race and mainshaft center bearing to the mainshaft at the same time.



DBG511BMB043

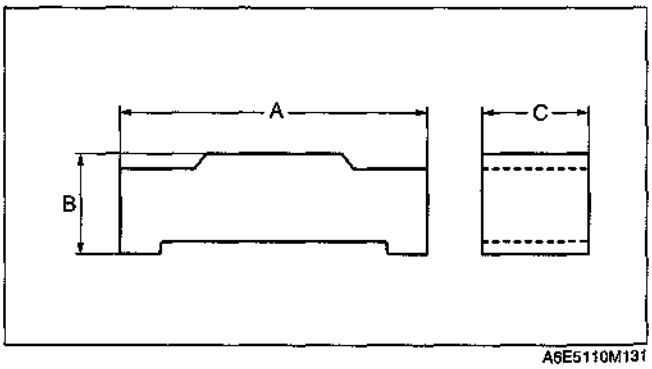
3rd/4th Clutch Hub Component Assembly Note

1. Assemble the 3rd/4th clutch hub component.

Caution
- **The standard synchronizer key dimensions are as follows:**

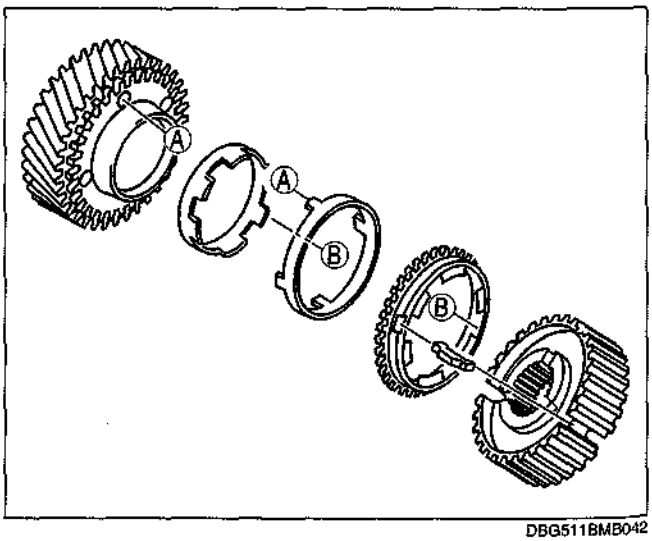
mm {in}

	A	B	C
3rd/4th	17.0 {0.669}	5.9 {0.23}	5.0 {0.20}



A6E5110M131

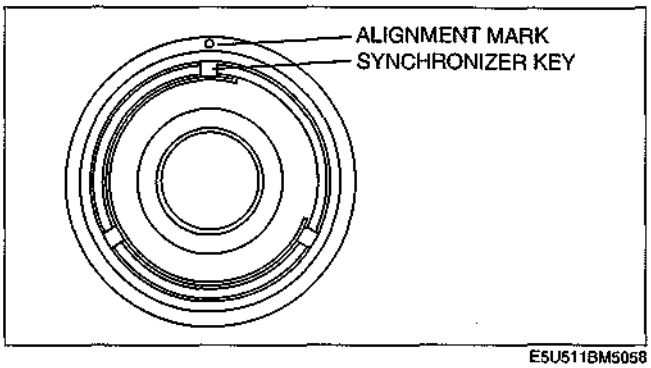
- **Be sure to align the synchronizer ring projections with the inner cone notches.**
- **Be sure to assemble the gears and the synchronizer ring components while aligning the double cone projections with the gear holes as shown in the figure.**



DBG511BMB042

- **Align the clutch hub sleeve alignment mark with the clutch hub synchronizer key installation position and assemble.**

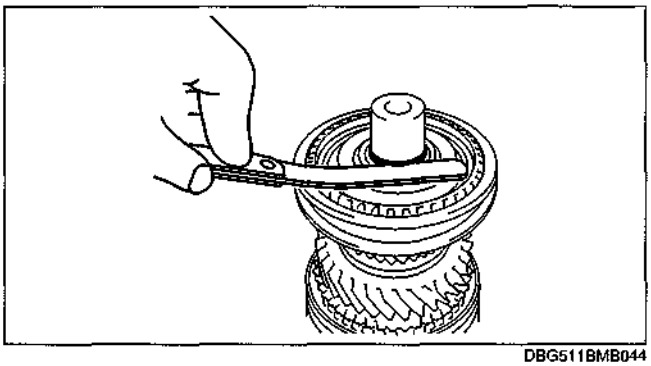
2. Install the 3rd/4th clutch hub component to the mainshaft.
3. Install the spacer.
4. Install the retaining ring.



E5U511BM5058

5. Measure the clearance between retaining ring and spacer.
   - If not within the specification, adjust by choosing the proper retaining ring.

3rd/4th clutch hub end play
0—0.05 mm {0.0—0.0019 in}

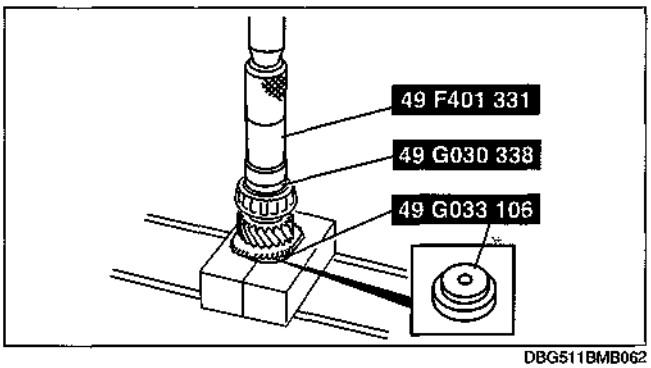

DBG511BMB044

3rd/4th clutch hub retaining ring

Thickness (mm {in})
1.50 {0.0591}
1.55 {0.0610}
1.60 {0.0630}
1.65 {0.0650}
1.70 {0.0669}
1.75 {0.0689}
1.80 {0.0709}
1.85 {0.0728}
1.90 {0.0748}
1.95 {0.0768}

Maindrive Gear Shaft Bearing Assembly Note

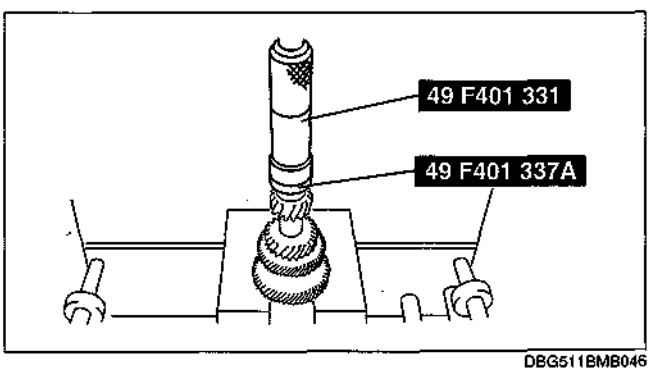
1. Assemble the maindrive gear shaft bearing using the **SSTs**.



DBG511BMB062

Countershaft Center Bearing Race Assembly Note

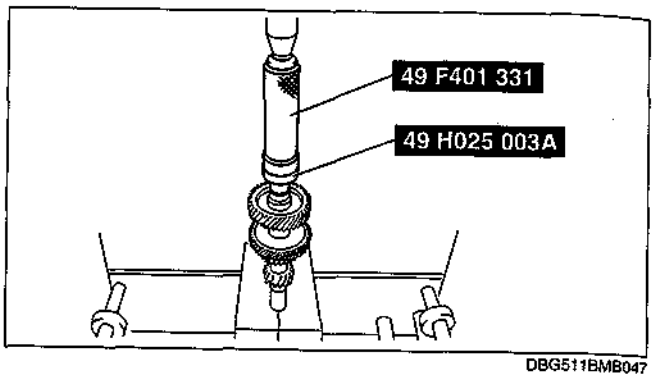
1. Assemble the countershaft center bearing race using the **SSTs**.



DBG511BMB046

Countershaft Front Bearing Race Assembly Note

1. Assemble the countershaft front bearing race using the **SSTs.**

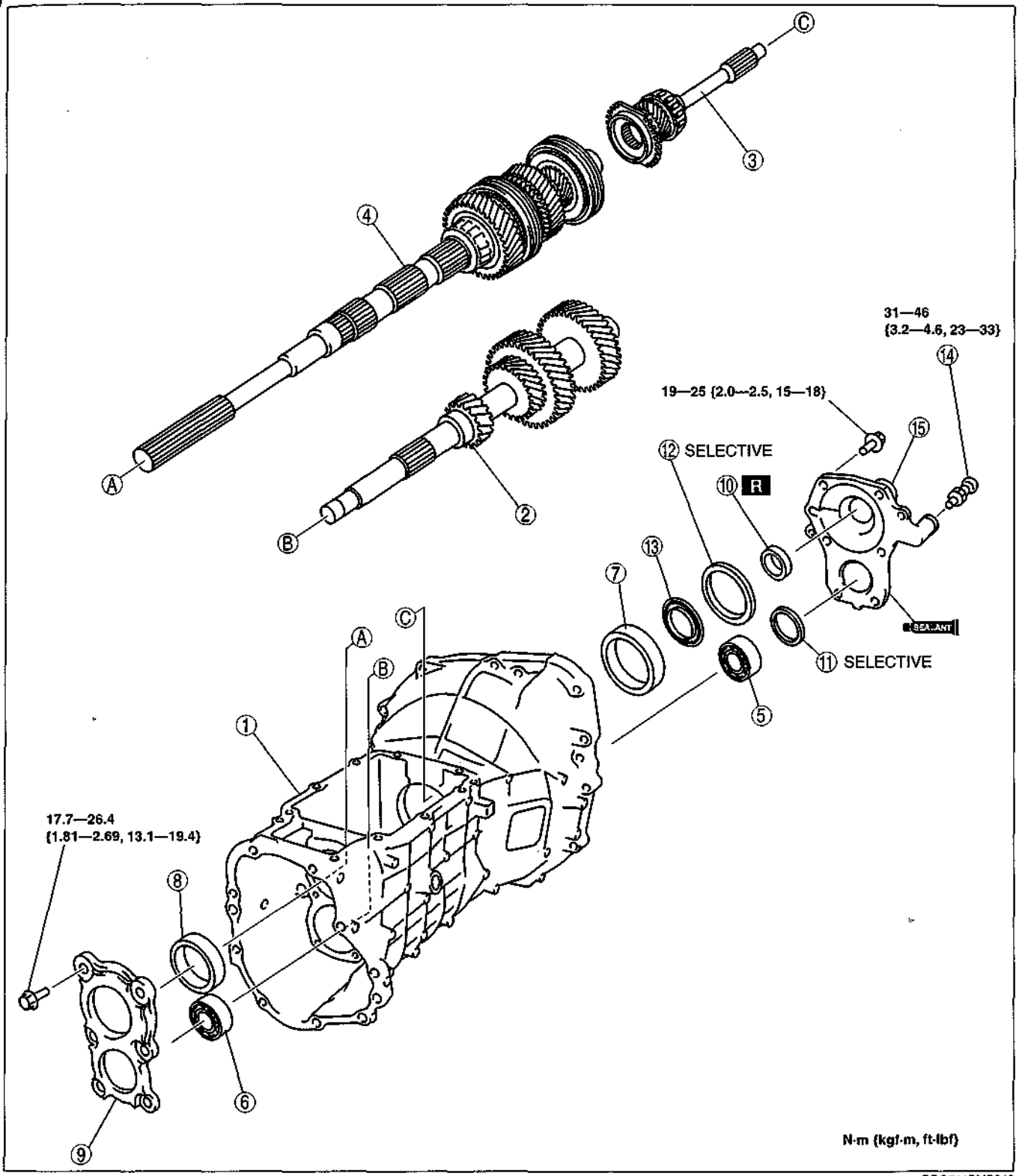


DBG511BMB047

MAINSHAFT COMPONENT, COUNTERSHAFT COMPONENT AND TRANSMISSION CASE ASSEMBLY [S15M-D, S15MX-D]

DCF051117040W08

1. Assemble in the order indicated in the table.



DBG511BMB048

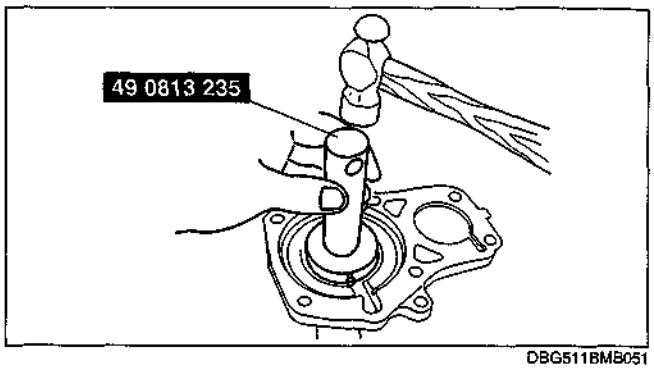
1	Transmission case
2	Countershaft component (See 05–11B–32 Maindrive Gear Component, Mainshaft Component and Countershaft Component Assembly Note.)
3	Mainshaft component (See 05–11B–32 Maindrive Gear Component, Mainshaft Component and Countershaft Component Assembly Note.)

4	Maindrive gear (See 05–11B–32 Maindrive Gear Component, Mainshaft Component and Countershaft Component Assembly Note.)
5	Countershaft front bearing
6	Countershaft rear bearing
7	Maindrive gear bearing race
8	Mainshaft bearing race
9	Bearing cover

10	Front oil seal (See 05–11B–32 Front Oil Seal Assembly Note.)
11	Bearing shim
12	Bearing shim
13	Oil baffle
14	Pivot pin
15	Front cover (See 05–11B–32 Maindrive Gear Component, Mainshaft Component and Countershaft Component Assembly Note.)

Front Oil Seal Assembly Note

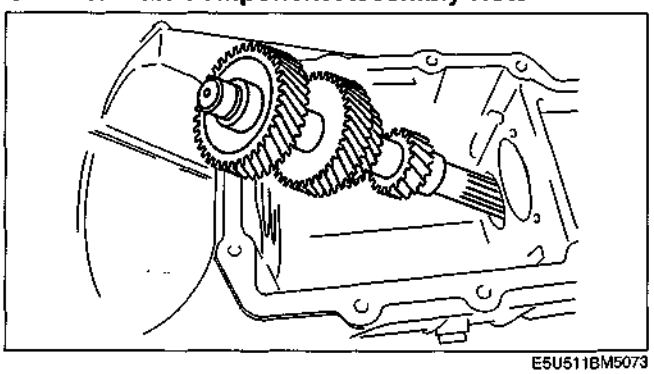
1. Apply specified grease to the lip of a new oil seal.
2. Install the oil seal to the front cover using the **SST**.



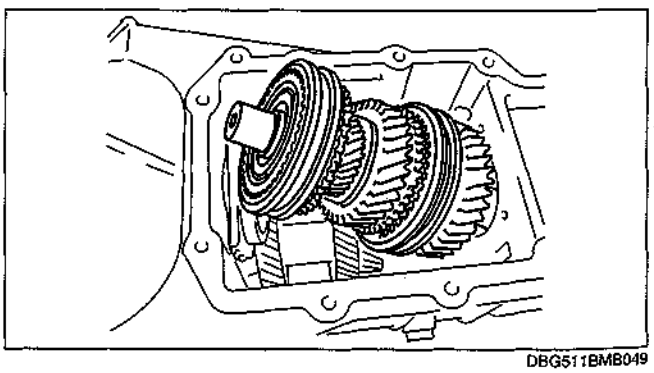
DBG511BMB051

Maindrive Gear Component, Mainshaft Component and Countershaft Component Assembly Note

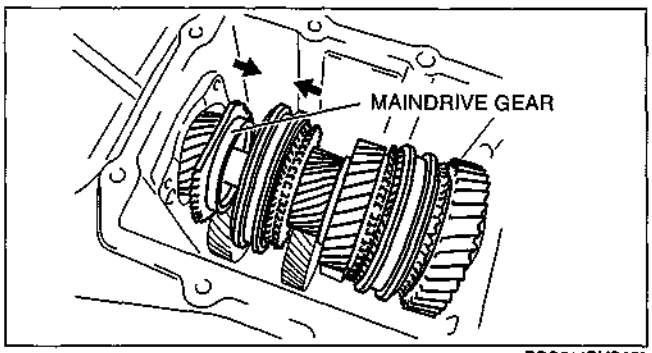
1. Install the countershaft component.
2. Install the maindrive gear.


E5U511BM5073

3. Install the mainshaft component.

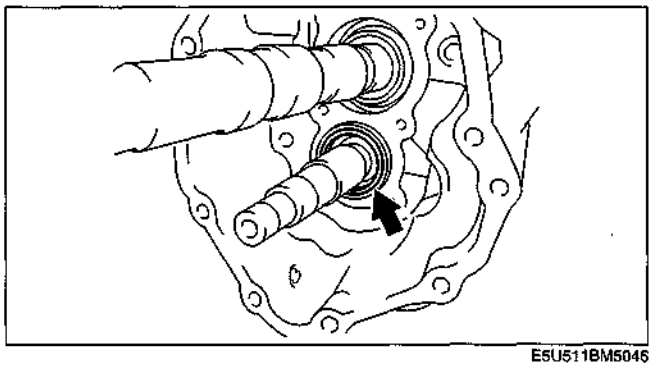

DBG511BMB049

4. Assemble the Mainshaft component and Maindrive gear.

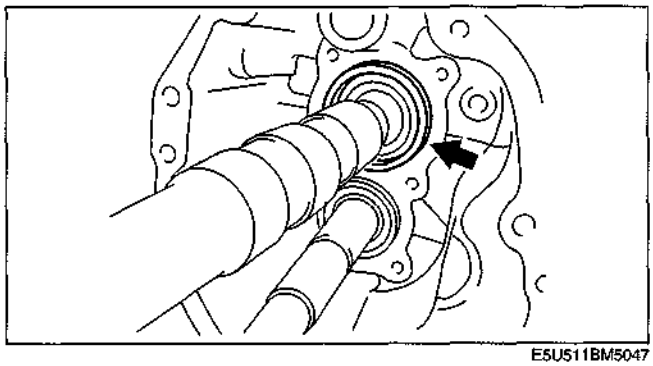


DBG511BMB050

5. Install the countershaft front and rear bearing.

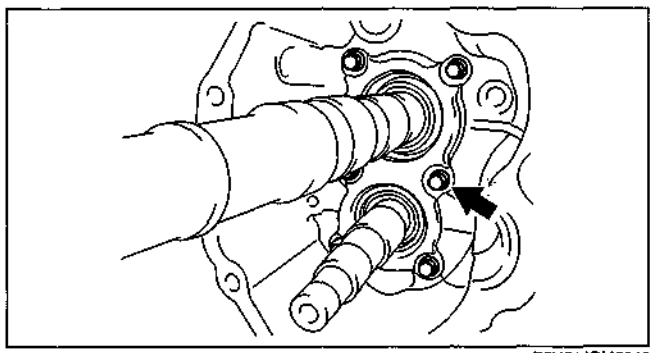

E5U511BM5046

6. Install the maindrive gear bearing race and mainshaft center bearing race.


E5U511BM5047

7. Install the bearing cover with the arrow pointing to the top of the case.

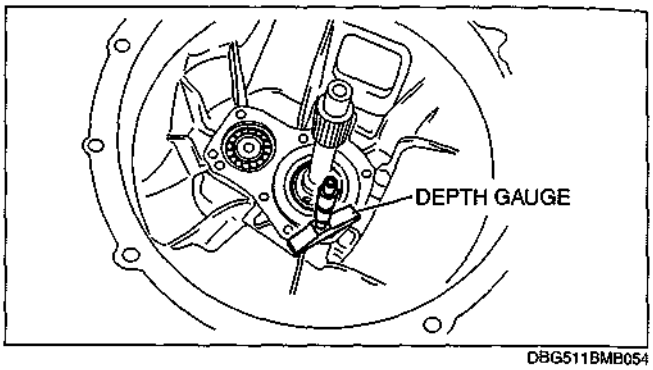
Tightening torque:
17.7—26.4 N·m {1.81—2.69 kgf·m, 13.1—19.4 ft·lbf}


E5U511BM5048

8. Select the mainshaft component and countershaft component bearing shims according to the following procedure.
   (1) Set the clutch housing side upward and level the transmission case.

Caution
- **Securely assemble the mainshaft, maindrive gear component, and countershaft component so that there is no looseness or play.**

   (2) Using a depth gauge, measure the maindrive gear bearing outer race height A.

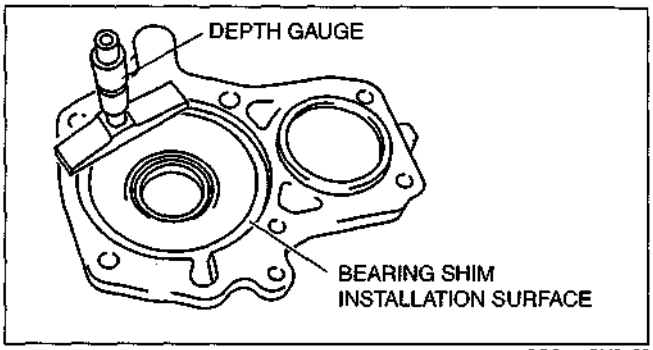


DBG511BMB054

   (3) Using a depth gage, measure the maindrive gear bearing retainer depth B.
   (4) Calculate and select the correct maindrive gear bearing shim thickness.

Formula: C = B - A

C: Dimension between the maindrive gear bearing and bore in the front cover
B: Depth of the maindrive gear bearing bore in the front cover
A: Maindrive gear bearing height



DBG511BMB055

- Refer to the maindrive gear bearing shim selective chart.

Maindrive gear bearing shim selective chart

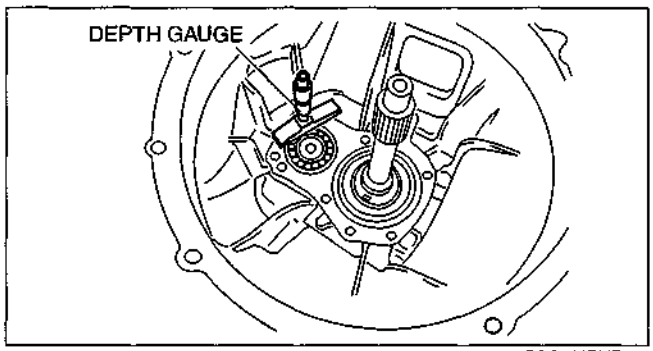
Dimension C (mm {in})	Shim thickness (mm {in})
1.45—1.55 {0.0571—0.0610}	1.4 {0.055}
1.55—1.65 {0.0611—0.0649}	1.5 {0.059}
1.65—1.75 {0.0650—0.0688}	1.6 {0.063}
1.75—1.85 {0.0689—0.0728}	1.7 {0.067}
1.85—1.95 {0.0729—0.0767}	1.8 {0.071}
1.95—2.05 {0.0768—0.0807}	1.9 {0.075}
2.05—2.15 {0.0808—0.0846}	2.0 {0.079}
2.15—2.25 {0.0847—0.0885}	2.1 {0.083}
2.25—2.35 {0.0886—0.0925}	2.2 {0.087}
2.35—2.45 {0.0926—0.0964}	2.3 {0.090}
2.45—2.55 {0.0965—0.1003}	2.4 {0.094}
2.55—2.65 {0.1004—0.1043}	2.5 {0.098}

Dimension C (mm {in})	Shim thickness (mm {in})
2.65—2.75 {0.1044—0.1082}	2.6 {0.102}
2.75—2.85 {0.1083—0.1122}	2.7 {0.106}
2.85—2.95 {0.1123—0.1161}	2.8 {0.110}
2.95—3.05 {0.1162—0.1200}	2.9 {0.114}
3.05—3.15 {0.1201—0.1240}	3.0 {0.118}

Maindrive gear shaft total end play
0.05—0.15 mm {0.002—0.0059 in}

(5) Using a depth gauge, measure the countershaft front bearing depth D.

Note
- The countershaft bearing is located below the contact surface of the case and front cover.



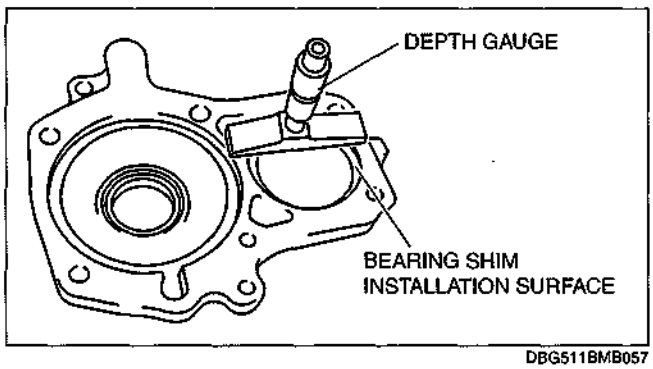
DBG511BMB056

(6) Using a depth gauge, measure the countershaft front bearing retainer depth E.
(7) Calculate and select the correct countershaft front bearing shim thickness.

Formula: F = E + D

F: Dimension between the countershaft front bearing and bore in the front cover
E: Depth of the countershaft front bearing bore in the front cover
D: Countershaft front bearing depth

- Refer to the countershaft front bearing shim selective chart.



DBG511BMB057

Countershaft front bearing shim selective chart

Dimension F (mm {in})	Shim thickness (mm {in})
3.15—3.25 {0.1240—0.1279}	3.0 {0.118}
3.25—3.35 {0.1280—0.1318}	3.1 {0.122}
3.35—3.45 {0.1319—0.1358}	3.2 {0.126}
3.45—3.55 {0.1359—0.1397}	3.3 {0.130}
3.55—3.65 {0.1398—0.1437}	3.4 {0.134}
3.65—3.75 {0.1438—0.1476}	3.5 {0.138}
3.75—3.85 {0.1477—0.1515}	3.6 {0.142}
3.85—3.95 {0.1516—0.1555}	3.7 {0.147}

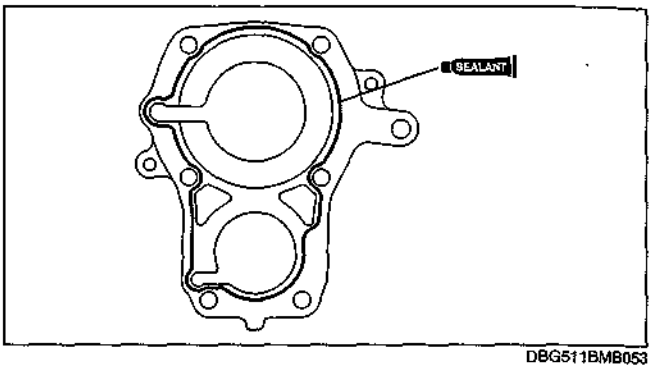
Countershaft total end play
0.15—0.25 mm {0.006—0.0098 in}

9. Position the maindrive gear bearing shim, oil baffle, and the countershaft bearing shim onto the front cover.

Note
- If necessary, apply a light coat of petroleum jelly to the shims and oil baffle.

10. Apply sealant to the contact surfaces of the transmission case and front cover as shown in the figure.
11. Install the pivot pin.

Tightening torque:
31—46 N·m {3.2—4.6 kgf·m, 23—33 ft·lbf}

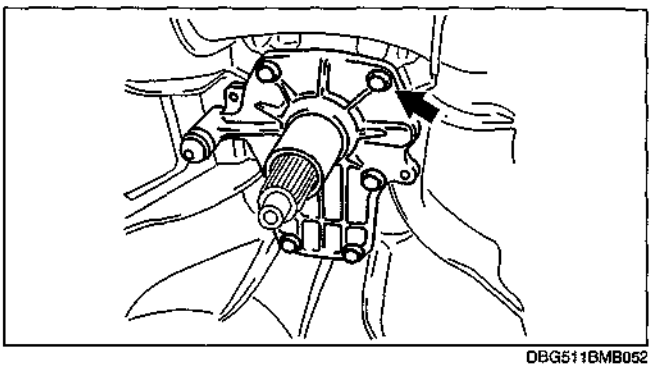


DBG511BMB053

12. Install the front cover to the transmission case.

Tightening torque:
19—25 N·m {2.0—2.5 kgf·m, 15—18 ft·lbf}

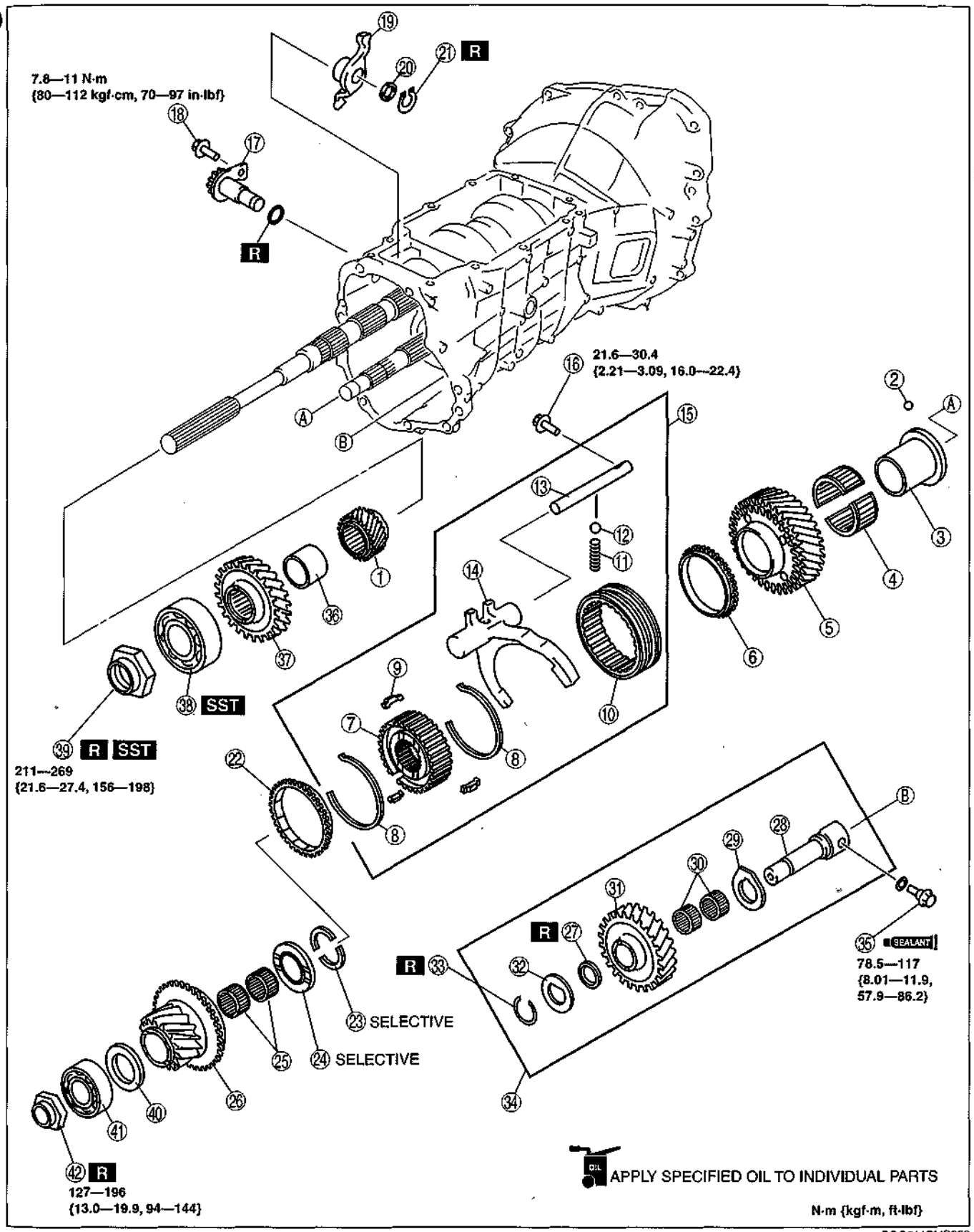
Note
- To prevent damage to the oil seal lip during assembly, tape maindrive gear shaft splines.


DBG511BMB052

REVERSE GEAR COMPONENT AND 3RD/4TH GEAR COMPONENT ASSEMBLY [S15M-D, S15MX-D]

DCF051117040W09

1. Assemble in the order indicated in the table.



DBG511BMB058

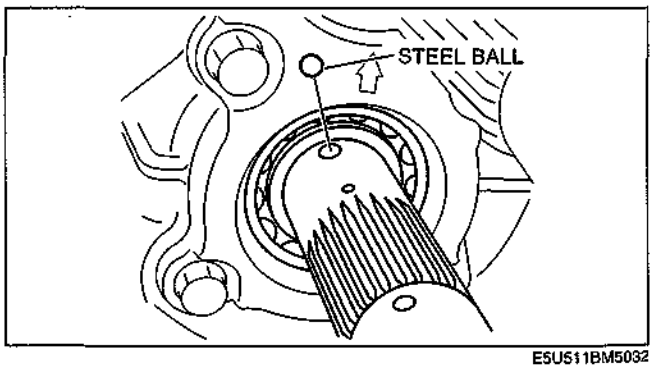
1	5th counter gear
2	Steel ball

3	5rd gear bearing inner race (See 05–11B–38 5th Gear Bearing Inner Race Assembly Note.)

4	Needle bearing
5	5th gear
6	Synchronizer ring
7	5th/reverse clutch hub
8	Synchronizer key spring
9	Synchronizer key
10	Clutch hub sleeve
11	Detent spring
12	Detent ball
13	5th/reverse shift rod
14	5th/reverse shift fork
15	5th/reverse clutch hub and shift fork component (See 05–11B–39 5th Counter Gear, 5th/Reverse Clutch Hub Component and 5th/Reverse Shift Fork Assembly Note.)
16	Retaining bolt
17	Counter lever shaft component (See 05–11B–41 Counter Lever Shaft Assembly Note.)
18	Retaining bolt
19	Counter lever
20	Washer
21	Retaining ring
22	Thrust washer
23	Thrust washer
24	Spacer
25	Needle bearing
26	Reverse gear (See 05–11B–40 Reverse Gear Assembly Note.)
27	Friction damper
28	Reverse idler gear shaft
29	Thrust washer
30	Needle bearing
31	Reverse idler gear
32	Thrust washer
33	Retaining ring
34	Reverse idler gear shaft component (See 05–11B–41 Reverse Idler Gear Component Assembly Note.)
35	Retaining bolt
36	Spacer
37	Reverse counter gear
38	Mainshaft rear bearing (See 05–11B–42 Mainshaft Rear Bearing and Countershaft Rear Bearing Locknut Assembly Note.)
39	Locknut (See 05–11B–42 Mainshaft Rear Bearing and Countershaft Rear Bearing Locknut Assembly Note.)
40	Thrust washer
41	Countershaft rear bearing (See 05–11B–42 Mainshaft Rear Bearing and Countershaft Rear Bearing Locknut Assembly Note.)
42	Locknut (See 05–11B–42 Mainshaft Rear Bearing and Countershaft Rear Bearing Locknut Assembly Note.)

5th Gear Bearing Inner Race Assembly Note

1. Install the steel ball to the countershaft.
2. Align the ball groove position of the 5rd gear bearing inner race and assemble it to the countershaft.



E5US11BM5032

5th Counter Gear, 5th/Reverse Clutch Hub Component and 5th/Reverse Shift Fork Assembly Note

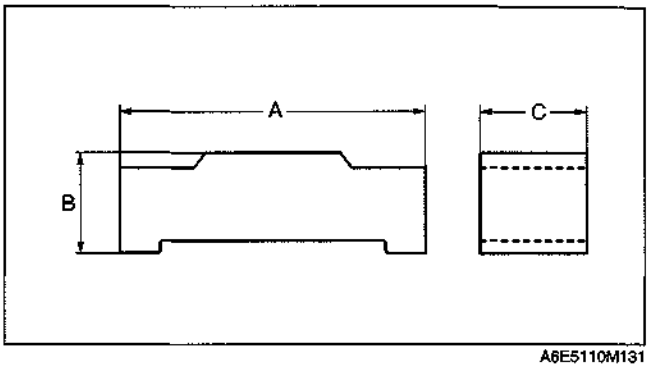
1. Assemble the 5th drive gear and 5th/reverse clutch hub component.

Caution

- **Be sure to assemble the clutch hub components and synchronizer ring components while aligning the synchronizer ring grooves with the synchronizer keys.**
- **The standard synchronizer key dimensions are as follows:**

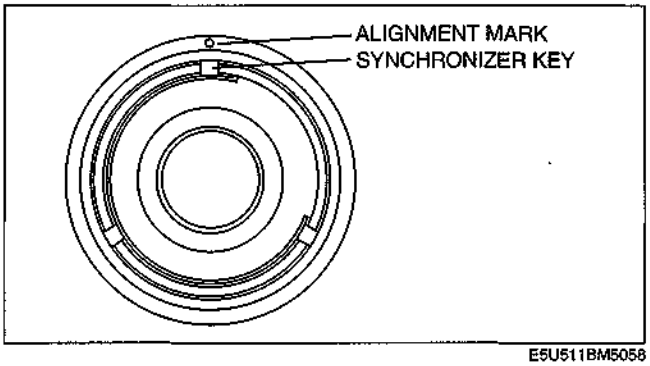
mm {in}

	A	B	C
5th/6th	18.0 {0.709}	5.45 {0.215}	6.0 {0.236}



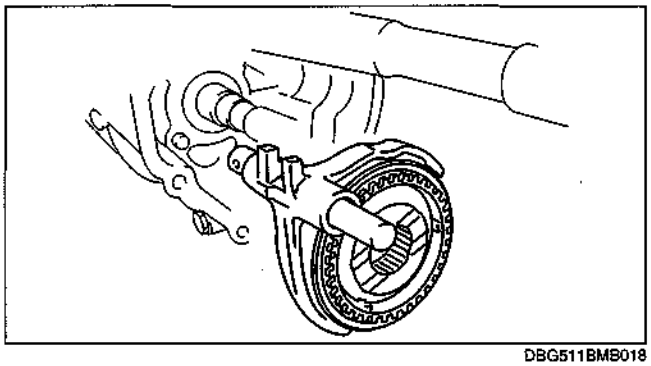
A6E5110M131

- **Align the clutch hub sleeve alignment mark with the clutch hub synchronizer key installation position and assemble.**



E5U511BM5058

2. Assemble the 5th counter gear component, 5th/reverse clutch hub component, and 5th/reverse shift fork component as a single unit.

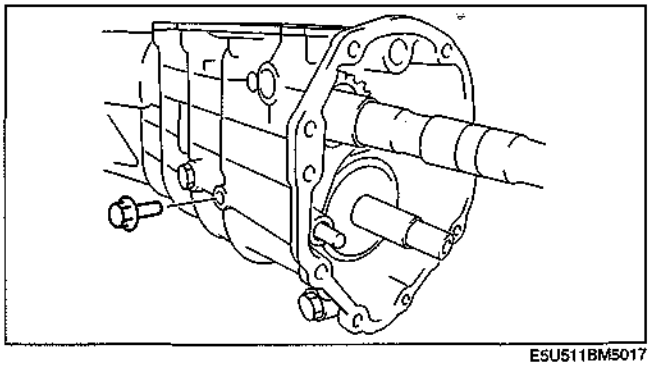


DBG511BMB018

3. Install the 5th/reverse shift rod retaining bolt.

   Tightening torque:
   21.6—30.4 N·m {2.21—3.09 kgf·m, 16.0—22.4 ft·lbf}

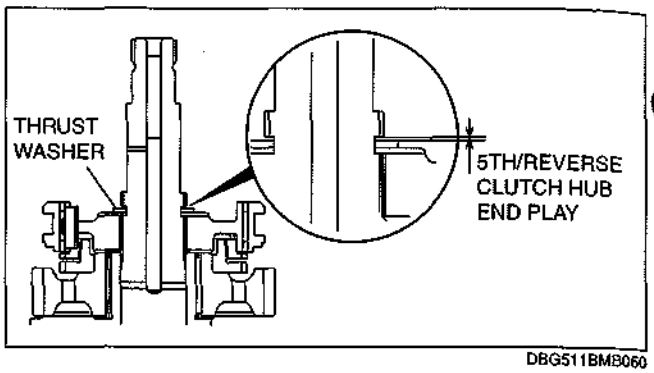
4. Install the thrust washer.



E5U511BM5017

5. Measure the clearance between thrust washer and groove of the countershaft.
   - If not within the specification, adjust by choosing the proper thrust washer.

5th/Reverse clutch hub end play
0—0.05 mm {0.0—0.0019 in}



DBG511BMB060

5th/Reverse clutch hub thrust washer

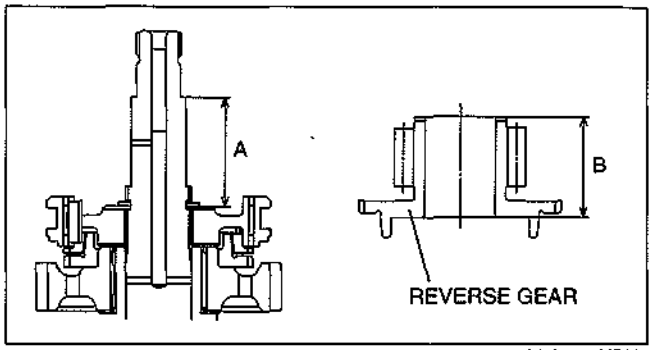
Thickness (mm {in})
3.00 {0.118}
3.05 {0.120}
3.10 {0.122}
3.15 {0.124}
3.20 {0.126}
3.25 {0.128}
3.30 {0.130}
3.35 {0.132}
3.40 {0.134}

Reverse Gear Assembly Note

1. Measure the clearance A and B.
   (1) Calculate and select the thrust washer thickness.

Formula: C = A - B

C: Dimension between the 5th/Reverse clutch hub and reverse gear
B: Reverse gear height
A: Dimension between the 5th/Reverse clutch hub and thrust washer



DBG511BMB061

- Refer to the reverse gear thrust washer selective chart.

Reverse gear thrust washer

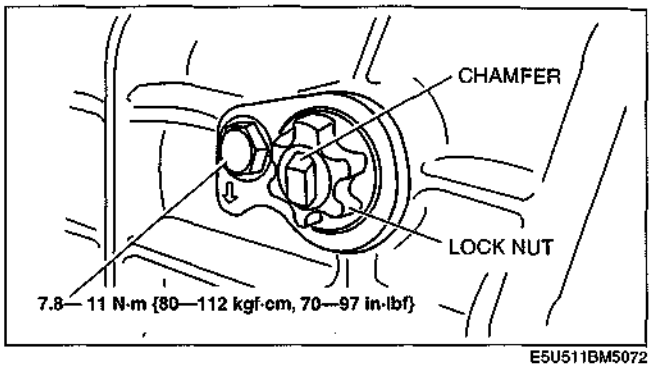
Dimension C (mm {in})	Thickness (mm {in})
7.60—7.70 {0.300—0.303}	7.35 {0.289}
7.70—7.80 {0.304—0.307}	7.45 {0.293}
7.80—7.90 {0.308—0.311}	7.55 {0.297}
7.90—8.00 {0.312—0.314}	7.65 {0.301}
8.00—8.10 {0.315—0.318}	7.75 {0.305}

Reverse gear end play
0.25—0.35 mm {0.002—0.0059 in}

2. Install the thrust washer.
3. Install the reverse gear.

Counter Lever Shaft Assembly Note

1. Install the counter lever shaft component.



E5U511BM5072

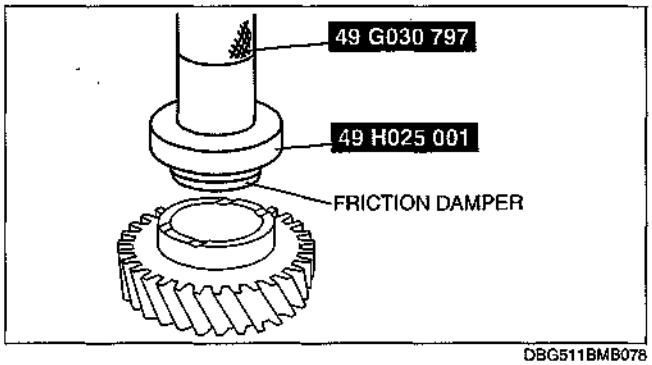
Caution

- **If the counter lever shaft has been replaced or the locknut is loose, assemble the counter lever shaft with the chamfer side of the shaft pointed straight upward.**
- **Apply sealant to the threads of the locknut.**
- **If there is an abnormality in the 3rd/4th shift stroke after assembling, loosen the locknut and readjust.**

Locknut tightening torque:
37.3—51.9 N·m {3.81—5.29 kgf·m, 27.6—38.2 ft·lbf}

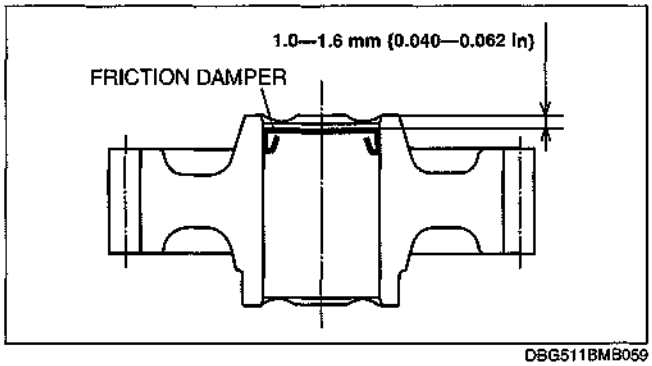
Reverse Idler Gear Component Assembly Note

1. Using the **SSTs**, install the friction damper to the reverse idler gear.



DBG511BMB078

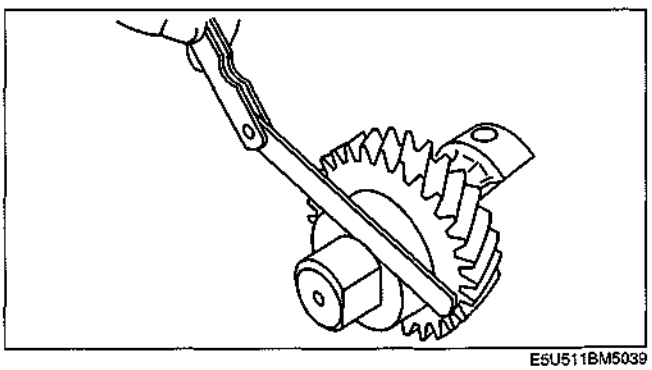
- Verify the depth of the friction damper installation position.



DBG511BMB059

2. Assemble the reverse idler gear component.
3. Measure the clearance between the retaining ring and thrust washer.
   - If not within the specification, adjust by choosing the proper retaining ring.

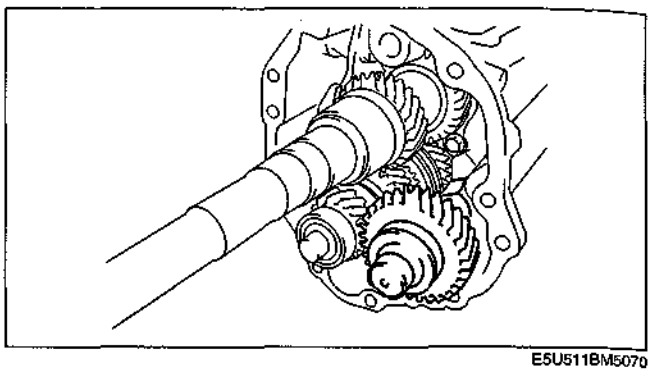
Reverse idler gear end play
0.1—0.2 mm {0.0040—0.0078 in}


E5U511BM5039

Reverse idler gear retaining ring

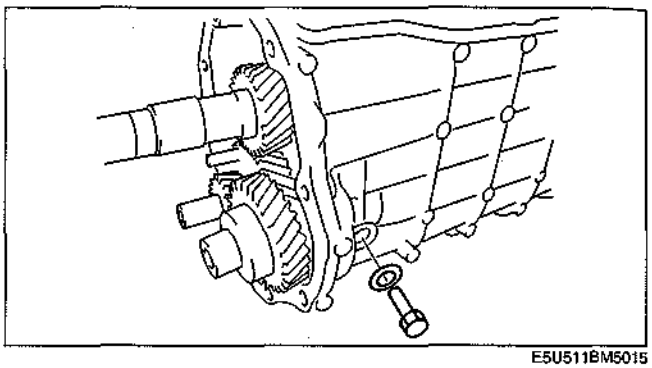
Thickness (mm {in})
1.5 {0.059}
1.6 {0.063}
1.7 {0.067}
1.8 {0.071}
1.9{0.075}

4. Install the reverse idler gear component to the transmission case.


E5U511BM5070

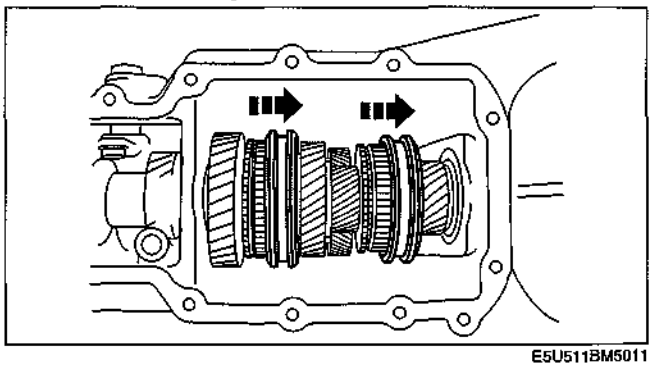
5. Install the reverse idler gear shaft retaining bolt.

Tightening torque
78.5—117 N·m {8.01—11.9 kgf·m, 57.9—86.2 ft·lbf}


E5U511BM5015

Mainshaft Rear Bearing and Countershaft Rear Bearing Locknut Assembly Note

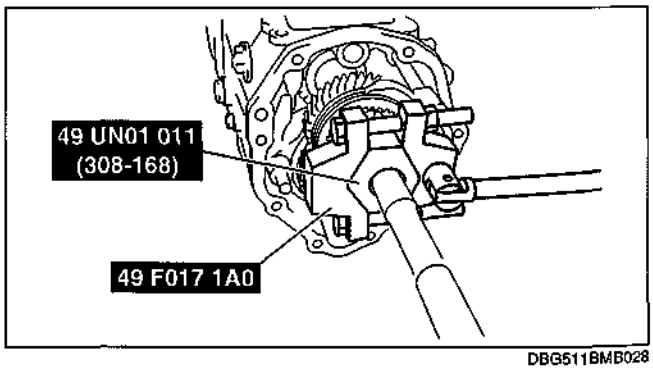
1. Slide the 3rd/4th and 1st/2nd clutch hub sleeves to lock the transmission into 4th and 2nd gears.
2. Insert the mainshaft rear bearing into the mainshaft and install the locknut.


E5U511BM5011

3. Attach the **SST** to the locknut and tighten the nut to the specified torque.

Caution
- **Attach the SST with the locknut seated in the bearing.**

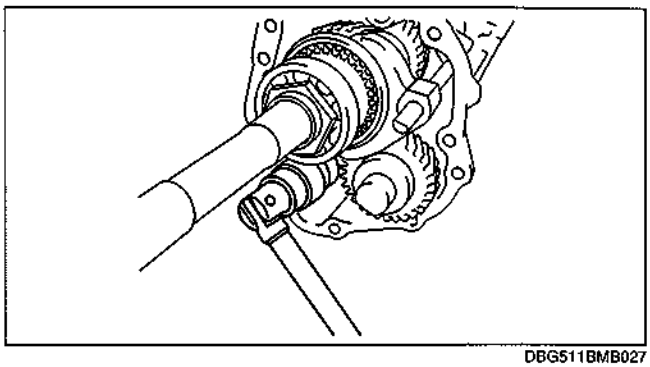
Tightening torque:
211—269 N·m {21.6—27.4 kgf·m, 156—198 ft·lbf}



DBG511BMB028

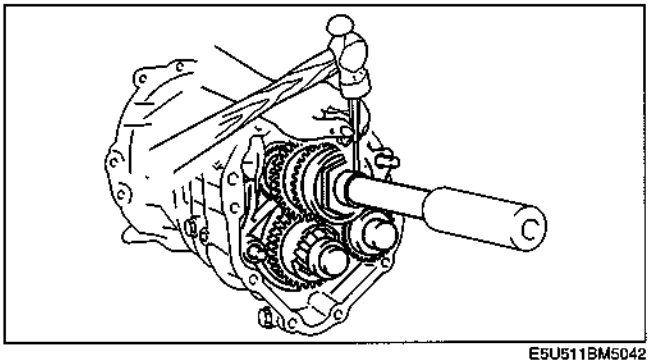
4. Tighten the countershaft locknut in the counterclockwise direction.

   Tightening torque:
   127—196 N·m {13.0—19.9 kgf·m, 94—144 ft·lbf}



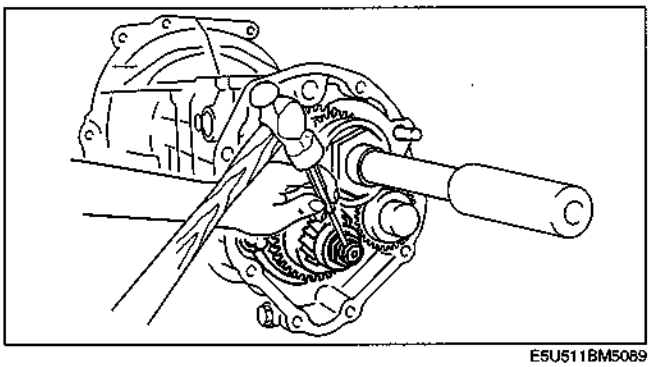
DBG511BMB027

5. Using the pin punch, stake the mainshaft rear bearing locknut.



E5U511BM5042

6. Using the pin punch, stake the countershaft rear bearing locknut.



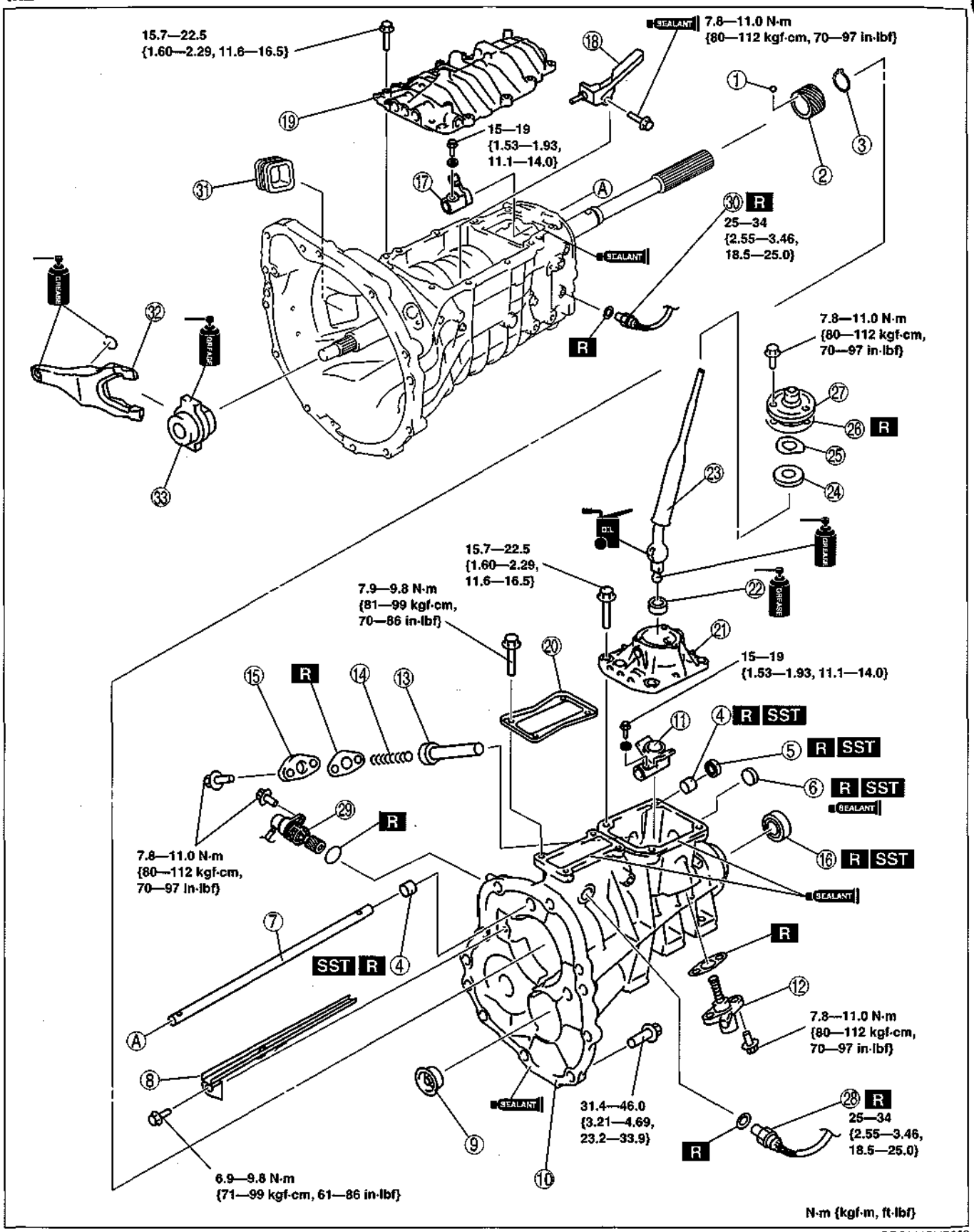
E5U511BM5089

TOP COVER COMPONENT AND EXTENSION HOUSING ASSEMBLY [S15M-D, S15MX-D]

DCF051117011W07

1. Assemble in the order indicated in the table.

4x2



DBG511BMB002

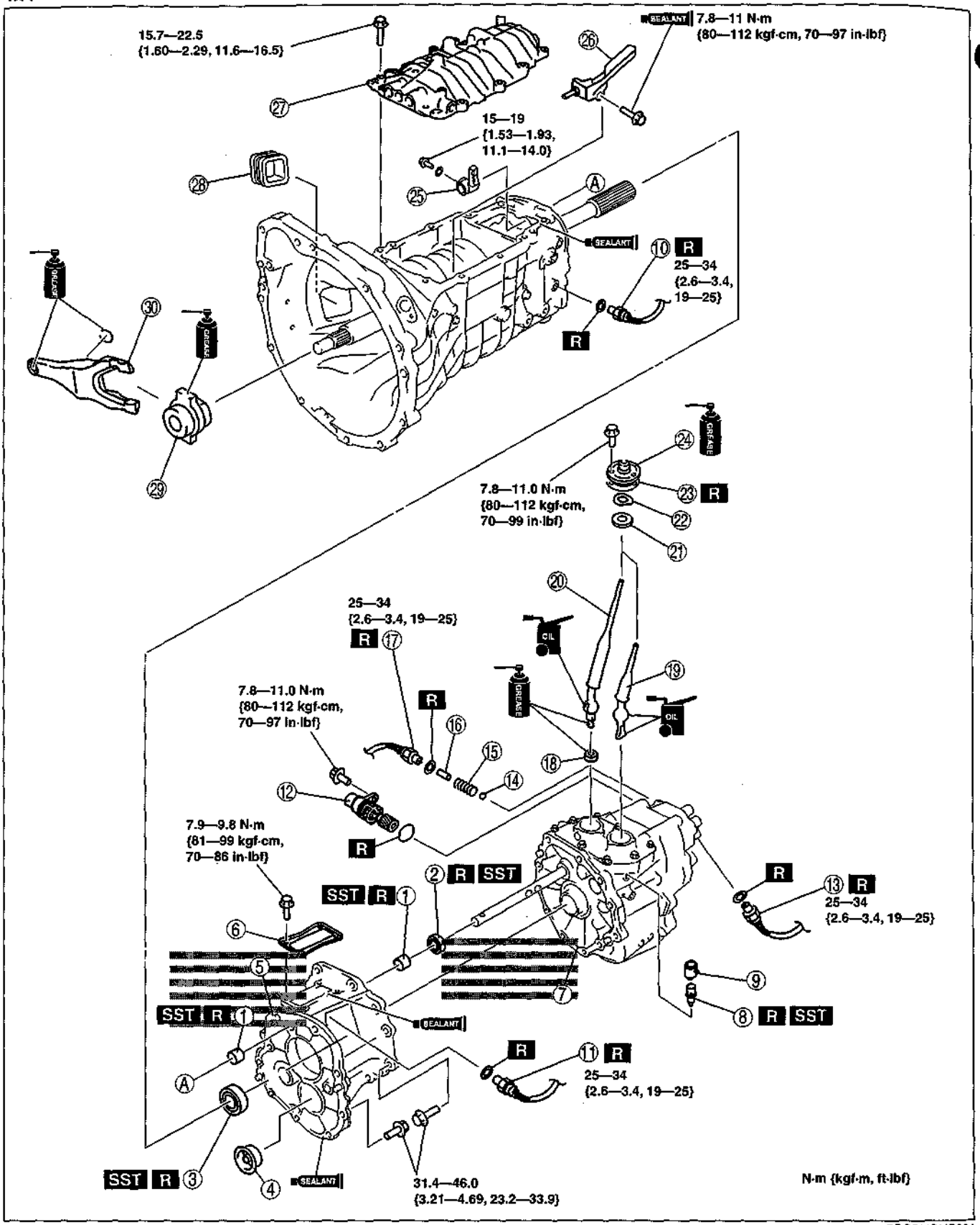
1	Steel ball
2	Speed drive gear

3	Retaining ring

4	Bush (see 05–11B–47 Bush Assembly Note.)
5	Oil seal (control rod) (see 05–11B–48 Oil Seal (control rod) Assembly Note.)
6	Sealing cap (see 05–11B–49 Sealing Cap Assembly Note.)
7	Control rod
8	Oil passage
9	Funnel
10	Extension housing (see 05–11B–50 Extension Housing Assembly Note.)
11	Control rod end
12	Select spindle component
13	Select lock spindle
14	Select lock spindle spring
15	Spring cap
16	Oil seal (extension housing) (see 05–11B–49 Oil Seal (Extension Housing) Assembly Note.)
17	Control lever
18	Oil passage

19	Top cover, shift component (see 05–11B–50 Top Cover Assembly Note.)
20	Blind cover (see 05–11B–51 Blind Cover Assembly Note.)
21	Control case
22	Change seat
23	Shift lever
24	Change bush
25	Wave washer
26	Gasket
27	Dust boot
28	Neutral switch
29	Vehicle speed sensor
30	Back-up light switch
31	Dust boot
32	Release fork (see 05–11B–51 Release Collar, Release Fork Assembly Note.)
33	Release collar (see 05–11B–51 Release Collar, Release Fork Assembly Note.)

4x4



DBG511BMB064

1	Bush (see 05–11B–47 Bush Assembly Note.)
2	Oil seal (control rod) (see 05–11B–48 Oil Seal (control rod) Assembly Note.)

3	Oil seal (extension housing) (see 05–11B–49 Oil Seal (Extension Housing) Assembly Note.)
4	Funnel

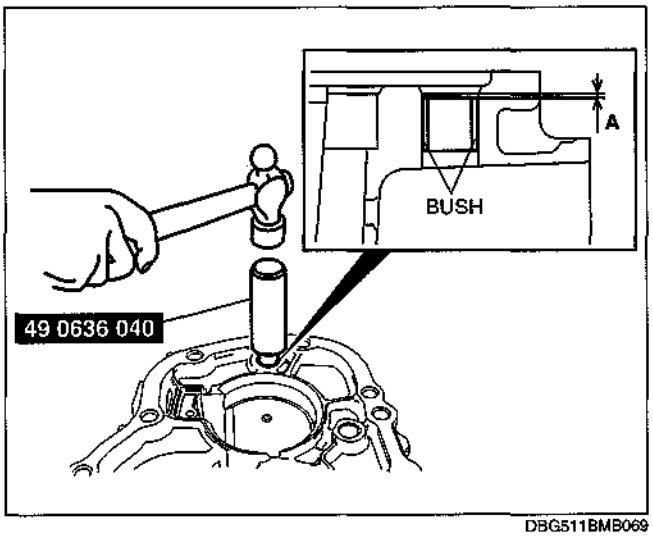
5	Extension housing (see 05–11B–50 Extension Housing Assembly Note.)
6	Blind cover (see 05–11B–51 Blind Cover Assembly Note.)
7	Transfer
8	Breather (see 05–11B–51 Breather Assembly Note.)
9	Breather dust boot
10	Back-up light switch
11	Neutral switch
12	Vehicle speed sensor
13	4X4 indicator switch
14	Steel ball
15	Spring
16	Switch pin
17	Transfer neutral switch
18	Change seat
19	Transfer shift lever
20	Shift lever
21	Change bush
22	Wave washer
23	Gasket
24	Dust boot
25	Control rod end
26	Oil passage
27	Top cover, shift component (see 05–11B–50 Top Cover Assembly Note.)
28	Dust boot
29	Release collar (see 05–11B–51 Release Collar, Release Fork Assembly Note.)
30	Release fork (see 05–11B–51 Release Collar, Release Fork Assembly Note.)

Bush Assembly Note

4x2

1. Install the bush using the **SST**.

   Installation depth A: 1—2 mm {0.040—0.078 in}



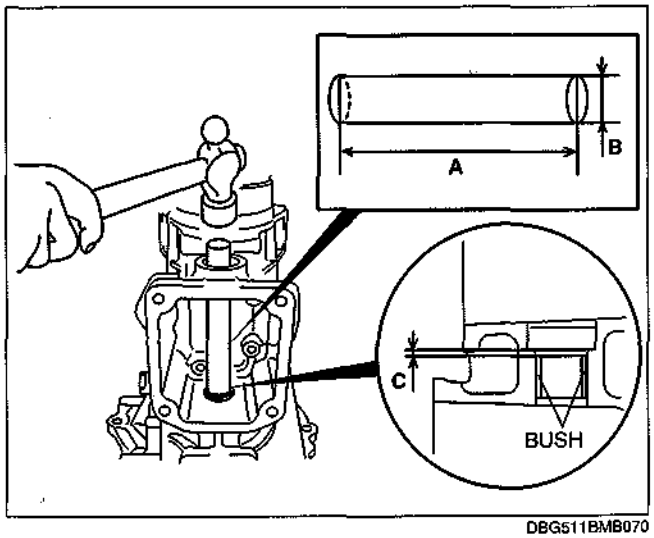
DBG511BMB069

2. Install the bush using the suitable steel bar through the sealing cap hole as shown in the figure.

   Distance A: Approx. 200 mm {7.87 In}

   Distance B: Approx. 17.0—17.5 mm {0.670—0.688 in}

   Installation depth C: 1—2 mm {0.040—0.078 In}



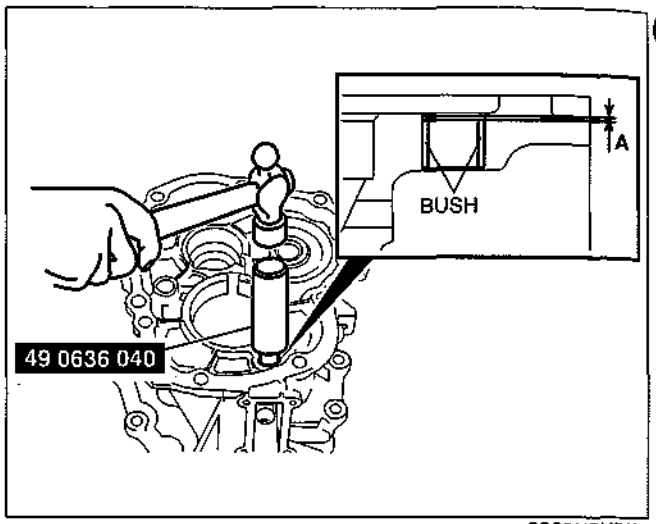
DBG511BMB070

4x4

1. Install the bush using the **SST**.

Front side

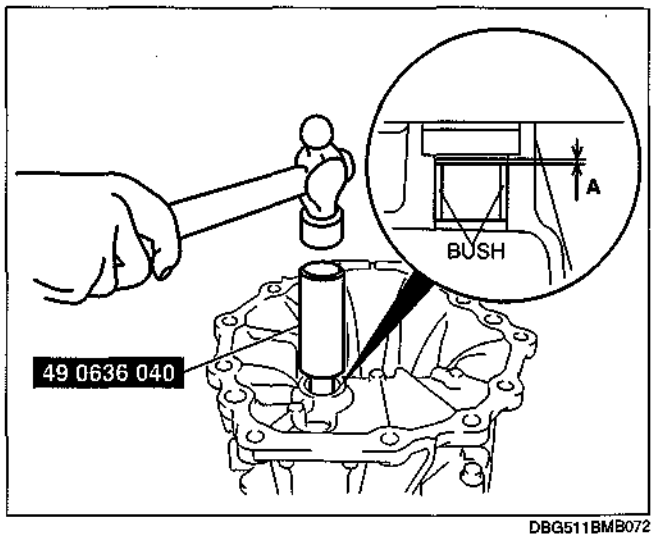
Installation depth A: 0—1 mm {0.0—0.039 in}



DBG511BMB071

Rear side

Installation depth A: 1—2 mm {0.040—0.078 in}



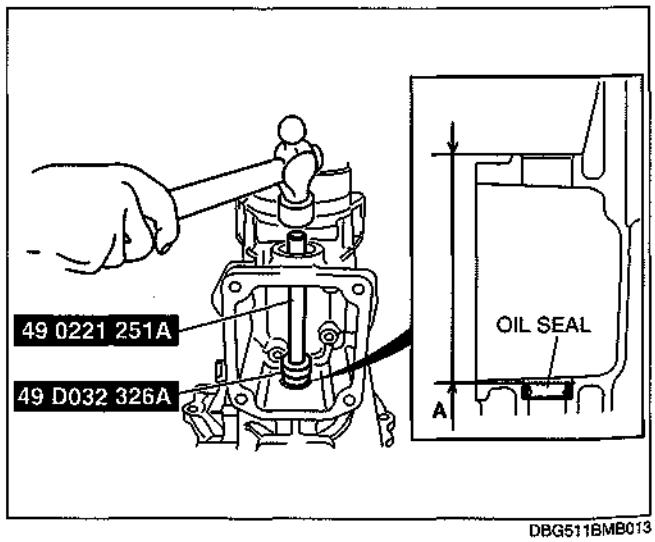
DBG511BMB072

Oil Seal (control rod) Assembly Note

4x2

1. Apply specified grease to the lip of a new oil seal.
2. Install the oil seal using the **SSTs** through the sealing cap hole as shown in the figure.

Installation depth A: 109.5—110.5 mm {4.312—4.350 in}

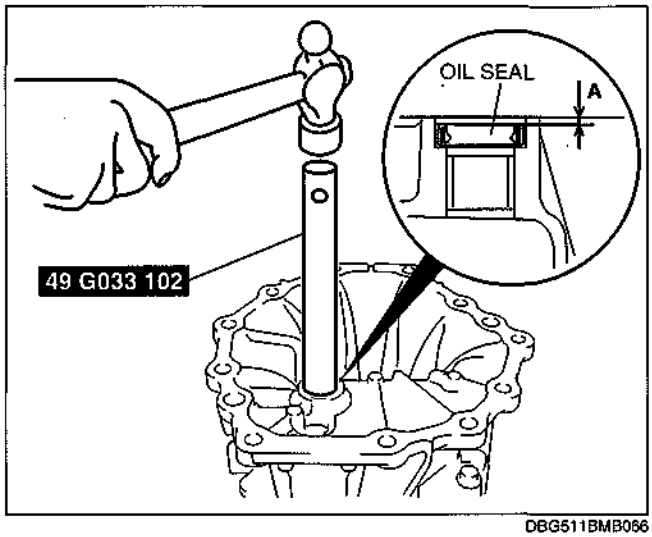


DBG511BMB013

4x4

1. Apply specified grease to the lip of a new oil seal.
2. Install the oil seal using the **SST**.

Installation depth A: 2.0—3.0 mm {0.079—0.118 in}



DBG511BMB056

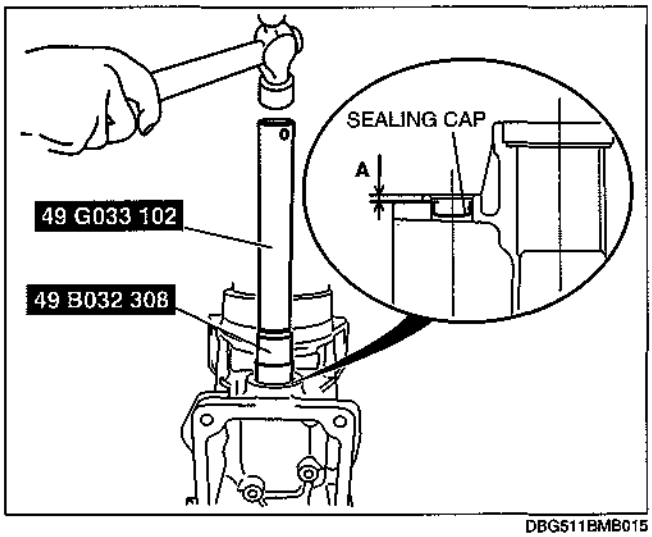
Sealing Cap Assembly Note

1. Install the sealing cap using the **SSTs**.

Caution

- **Apply silicone sealant to the sealing cap.**

Installation depth A: 0.5—2.0 mm {0.020—0.078 in}

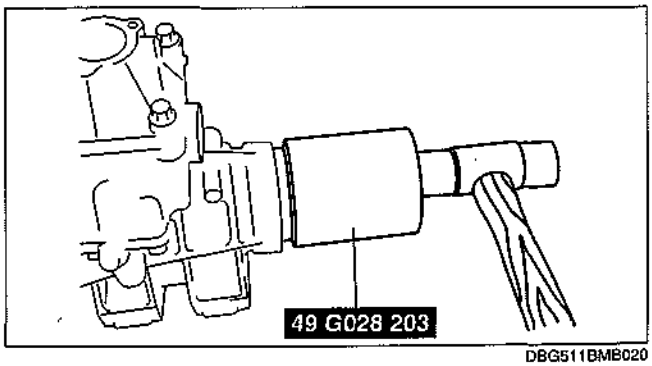


DBG511BMB015

Oil Seal (Extension Housing) Assembly Note

1. Apply specified grease to the lip of a new oil seal.
2. Install the oil seal evenly and gradually using the **SST** and a hammer.

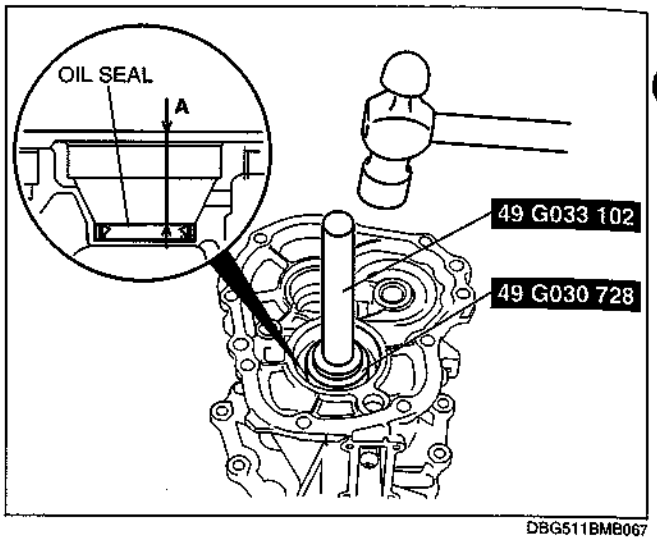
4x2



DBG511BMB020

4x4

Installation depth A: 48.5—49.5 mm {1.91—1.94 in}

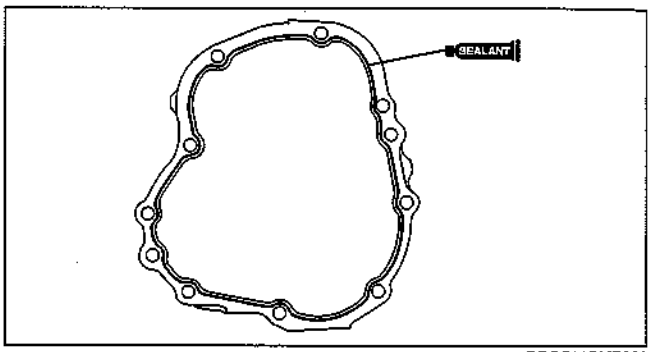


DBG511BMB067

Extension Housing Assembly Note

1. Apply sealant to the contact surfaces of the extension housing and transmission case as shown in the figure.
2. Install the extension housing to the transmission case.

Tightening torque:
31.4—46.0 N·m {3.21—4.69 kgf·m, 23.2—33.9 ft·lbf}

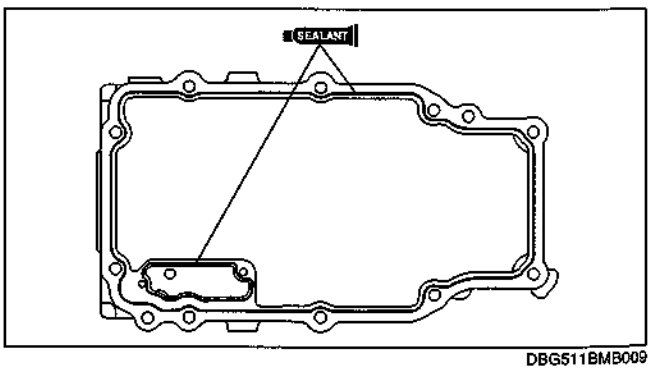


DBG511BMB008

Top Cover Assembly Note

1. Apply sealant to the contact surfaces of the transmission case and top cover as shown in the figure.
2. Install the top cover component to the transmission case.

Tightening torque:
15.7—22.5 N·m {1.60—2.29 kgf·m, 11.6—16.5 ft·lbf}

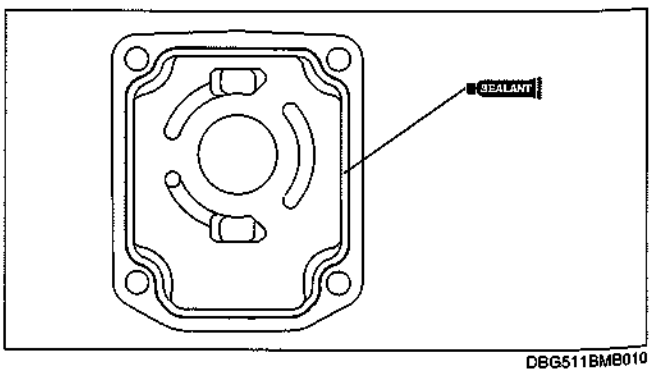


DBG511BMB009

Control Case Assembly Note

1. Apply sealant to the contact surfaces of the control case and extension housing as shown in the figure.
2. Install the control case to the extension housing.

Tightening torque:
15.7—22.5 N·m {1.60—2.29 kgf·m, 11.6—16.5 ft·lbf}

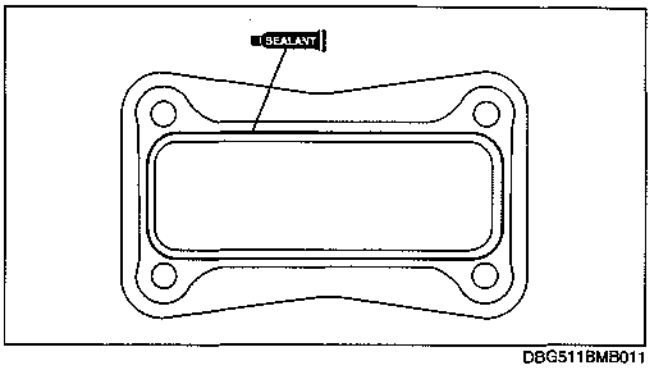


DBG511BMB010

Blind Cover Assembly Note

1. Apply sealant to the contact surfaces of the blind cover and extension housing as shown in the figure.
2. Install the blind cover to the extension housing.

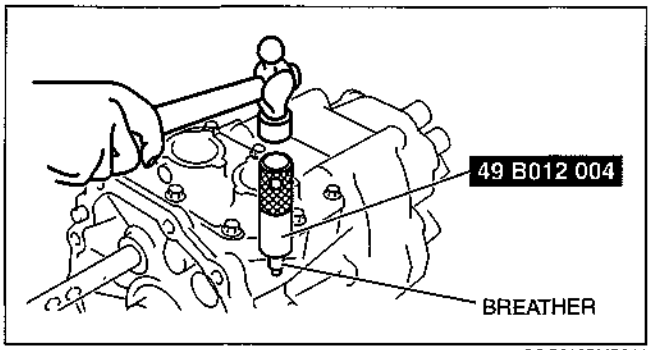
Tightening torque:
7.9—9.8 N·m {81—99 kgf·cm, 70—86 in·lbf}



DBG511BMB011

Breather Assembly Note

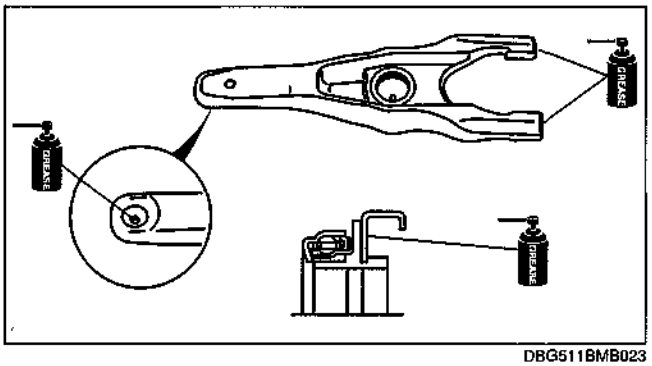
1. Install the new breather using the **SST**.



DBG316BMB044

Release Collar, Release Fork Assembly Note

1. Apply specified grease to the areas shown in the figure.
2. Install the release collar and release fork.



DBG511BMB023

05-13 AUTOMATIC TRANSMISSION [5R55S]

AUTOMATIC TRANSMISSION DISASSEMBLY[5R55S] 05-13–2
FLUID PUMP DISASSEMBLY [5R55S] 05-13–24
FLUID PUMP ASSEMBLY[5R55S] 05-13–26
OVERDRIVE BRAKE AND COAST CLUTCH DRUM COMPONENT DISASSEMBLY/ASSEMBLY [5R55S] 05-13–30
INTERMEDIATE BRAKE AND DIRECT CLUTCH DRUM COMPONENT DISASSEMBLY/ASSEMBLY [5R55S] 05-13–34
FORWARD CLUTCH DISASSEMBLY/ASSEMBLY [5R55S] 05-13–39
OVERDRIVE PLANETARY GEAR AND ONE-WAY CLUTCH COMPONENT DISASSEMBLY/ASSEMBLY [5R55S] 05-13–43
OUTPUT SHAFT RING GEAR AND HUB SHAFT COMPONENT DISASSEMBLY/ASSEMBLY [5R55S] 05-13–48
FORWARD RING GEAR COMPONENT DISASSEMBLY/ASSEMBLY [5R55S] 05-13–49
LOW/REVERSE BRAKE SERVO COMPONENT DISASSEMBLY/ASSEMBLY [5R55S] 05-13–50
CONTROL VALVE BODY DISASSEMBLY/ASSEMBLY [5R55S] 05-13–54
AUTOMATIC TRANSMISSION ASSEMBLY [5R55S] 05-13–57

AUTOMATIC TRANSMISSION DISASSEMBLY[5R55S]

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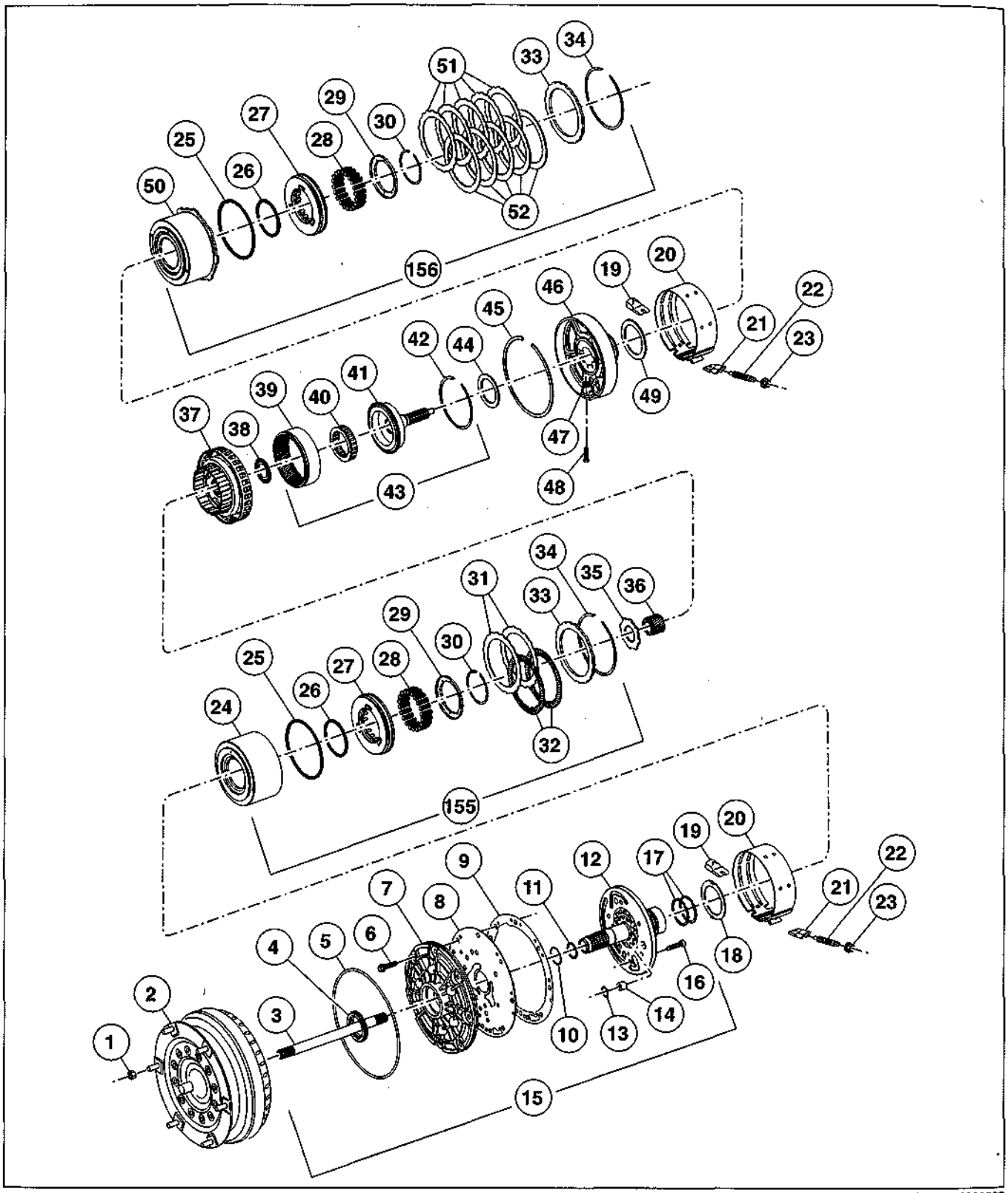
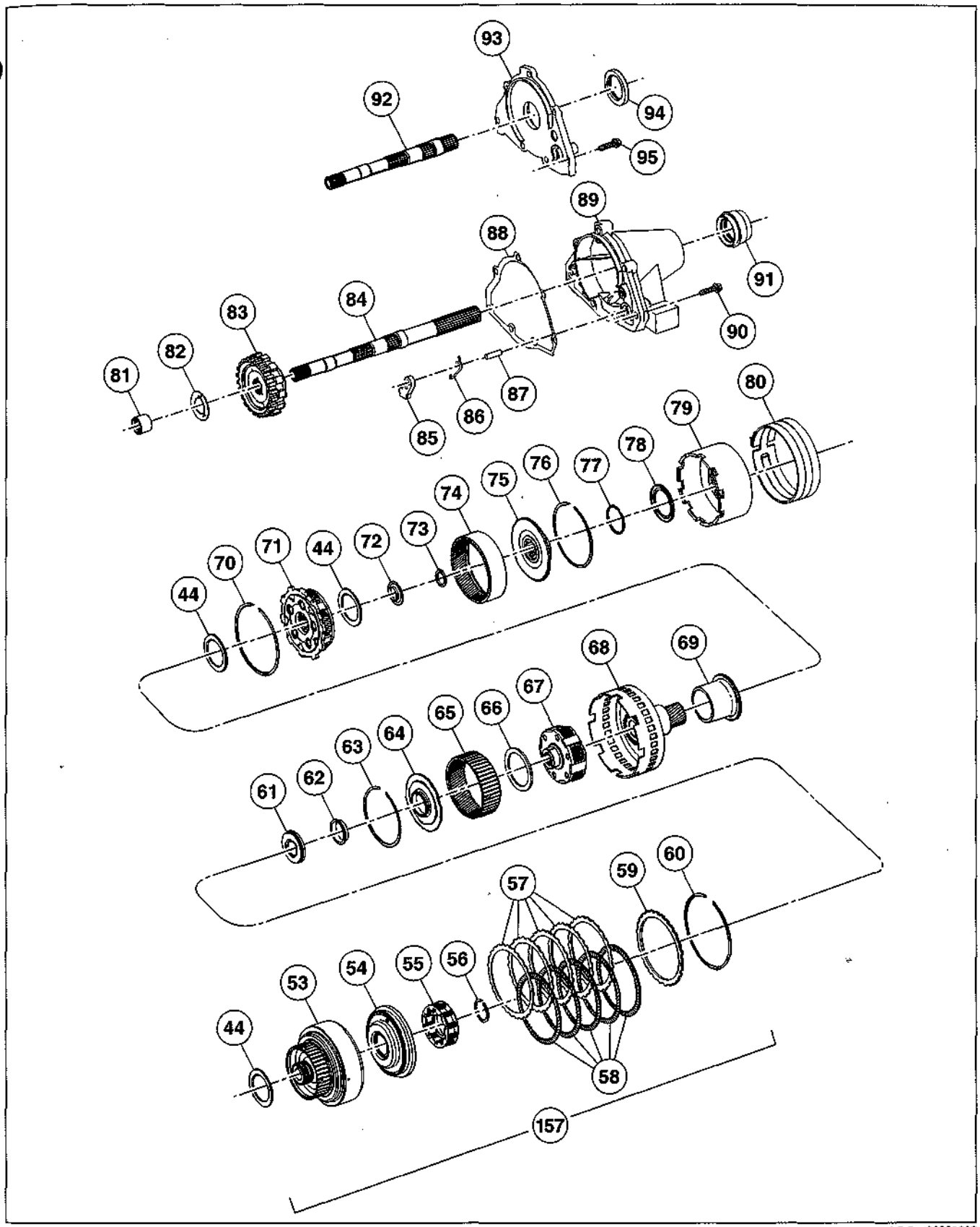
Exploded View



b5r5za00000382



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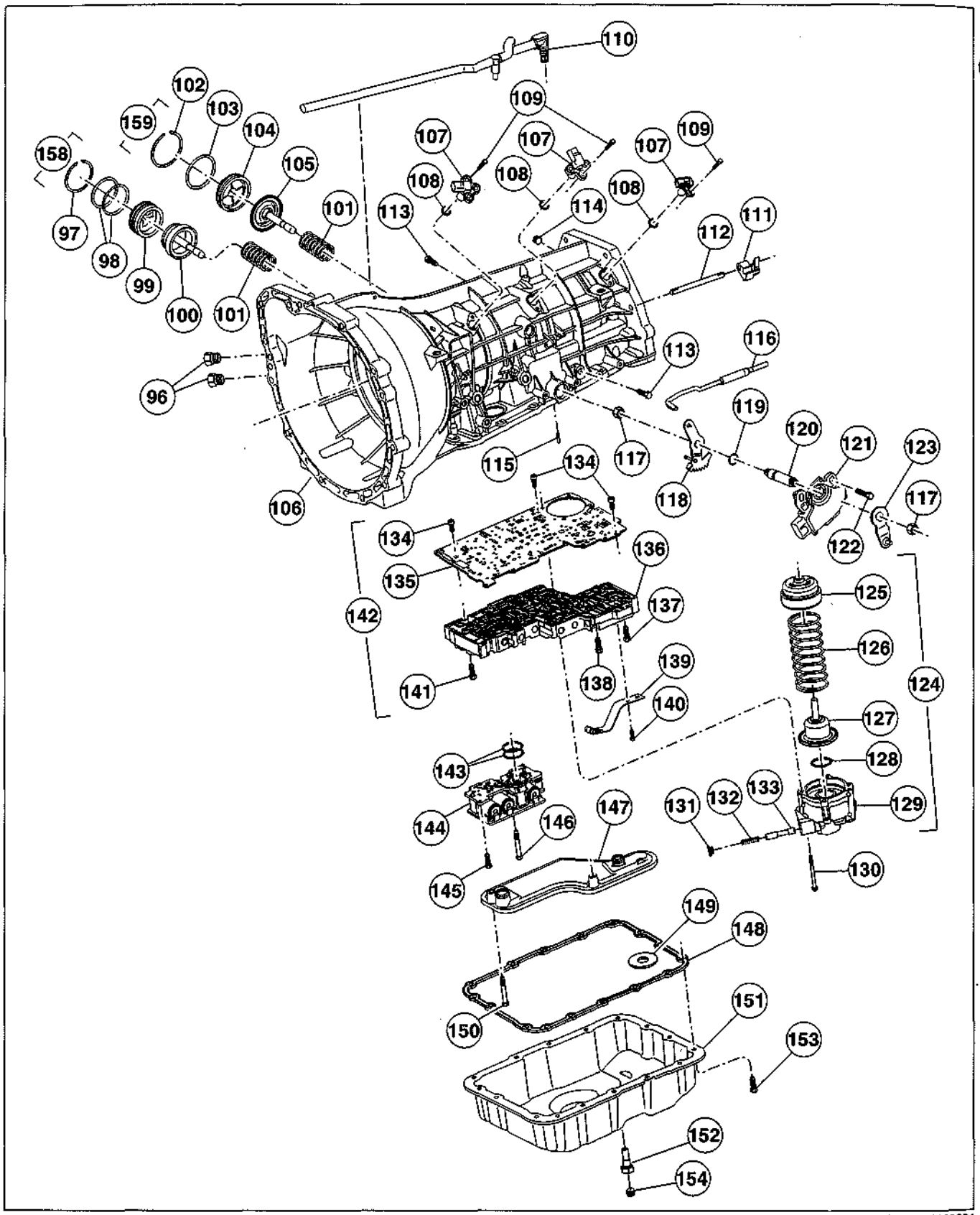


b5r5za00000384

1	Torque converter installation nut
2	Torque converter
3	Input shaft
4	Fluid pump seal
5	Fluid pump seal ring

6	Bolt and washer
7	Fluid pump cover
8	Fluid pump adapter plate
9	Fluid pump gasket
10	Seal ring

11	Stator support seal
12	Fluid pump support
13	O-ring
14	Fluid pump control valve
15	Fluid pump component
16	Bolt
17	Seal ring
18	Thrust washer (No.1)
19	Intermediate and overdrive brake band anchor strut
20	Intermediate and overdrive brake band
21	Intermediate and overdrive brake band apply strut
22	Intermediate and overdrive brake band adjusting screw
23	Locknut
24	Overdrive brake drum
25	Direct clutch and coast clutch piston outer seals
26	Direct clutch and coast clutch piston inner seals
27	Direct clutch and coast clutch pistons
28	Direct clutch and coast clutch piston spring
29	Direct clutch and coast clutch piston spring retainer
30	Retaining ring
31	Coast clutch external spline plate (steel)
32	Coast clutch internal spline friction plate (friction)
33	Direct clutch and coast clutch pressure plate
34	Retaining ring (select fit)
35	Carrier adapter
36	Overdrive sun gear
37	Overdrive planetary gear carrier component
38	Thrust bearing (No.2)
39	Overdrive ring gear
40	Overdrive one-way clutch
41	Overdrive center shaft
42	Retaining ring
43	Overdrive center shaft and ring gear component
44	Thrust bearing (No.3, No.5, No.8 and No.9)
45	Retaining ring
46	Center support
47	Nut and cage component
48	Bolt
49	Thrust bearing (No.4)
50	Intermediate brake drum
51	Direct clutch external spline plate (steel)
52	Direct clutch internal spline plate (friction)
53	Forward clutch cylinder
54	Forward clutch piston
55	Forward clutch piston spring component
56	Retaining ring
57	Forward clutch external spline plate (steel)
58	Forward clutch internal spline plate (friction)
59	Forward clutch pressure plate
60	Retaining ring (select fit)
61	Thrust bearing (No.6A)
62	Thrust washer (No.6B)
63	Retaining ring
64	Forward ring gear hub
65	Forward ring gear
66	Thrust bearing (No.7)
67	Forward planetary component
68	Input shell and sun gear component
69	Spacer
70	Retaining ring
71	Lower/reverse planetary component
72	Output shaft sleeve
73	Retaining ring
74	Output shaft ring gear
75	Output shaft hub
76	Retaining ring
77	Output shaft hub seal
78	Thrust bearing (No.10)
79	Low/reverse brake drum and one-way clutch component
80	Low/reverse brake band
81	Output shaft needle bearing
82	Thrust washer (No.11)
83	Parking gear
84	Output shaft (4x2)
85	Parking pawl
86	Parking pawl return spring
87	Parking pawl shaft
88	Extension housing gasket
89	Extension housing (4x2)
90	Bolt (4x2)
91	Extension housing seal (4x2)
92	Output shaft (4x4)
93	Extension housing (4x4)
94	Extension housing seal (4x4)
95	Bolt (4x4)
96	Oil pipe connector component
97	Retaining ring
98	Overdrive brake servo cover seal
99	Overdrive brake servo cover
100	Overdrive brake servo piston
101	Spring
102	Retaining ring
103	Intermediate brake servo cover seal
104	Intermediate brake servo cover
105	Intermediate brake servo piston
106	Transmission case
107	TSS sensor, ISS sensor and OSS sensor
108	O-ring
109	Bolt
110	Vent tube (4x2)
111	Low/reverse brake actuating lever
112	Low/reverse brake band actuating lever shaft
113	Pressure tap plug (pressure control solenoid C circuit)
114	Fluid fill plug
115	Manual shaft retaining pin
116	Parking pawl actuating rod
117	Manual shaft outer and inner nut
118	Manual valve inner lever
119	Manual shaft seal

120	Manual shaft
121	Digital transmission range (TR) sensor
122	Bolt and washer
123	Manual shaft lever
124	Reverse brake servo component
125	Reverse brake servo plate
126	Spring
127	Reverse brake servo piston and seal
128	O-ring
129	Reverse brake servo cover
130	Bolt
131	Control valve spring retainer
132	Spring
133	Reverse brake servo check valve
134	Bolt
135	Separating plate (bonded)
136	Lower control valve body
137	Bolt
138	Bolt
139	Detent spring
140	Bolt

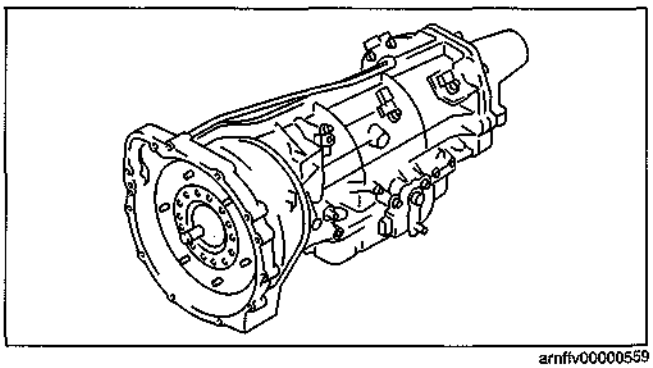
141	Bolt
142	Control valve body component
143	O-ring
144	Solenoid body
145	Bolt
146	Bolt
147	Transmission fluid filter
148	Transmission fluid pump gasket
149	Magnet
150	Bolt
151	Transmission fluid pump
152	Drain plug
153	Bolt
154	Fluid level indicating plug (short hex)
155	Overdrive brake and coast clutch drum component
156	Intermediate brake and direct clutch drum component
157	Forward clutch component
158	Overdrive brake servo
159	Intermediate brake servo

Disassembly

Note
- Tag and identify all parts during disassembly.

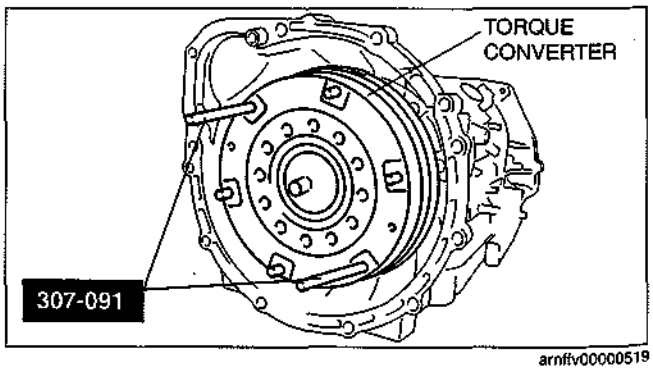
1. Place the transmission on a workbench.

Warning
- **The torque converter is heavy, especially when full of fluid.**



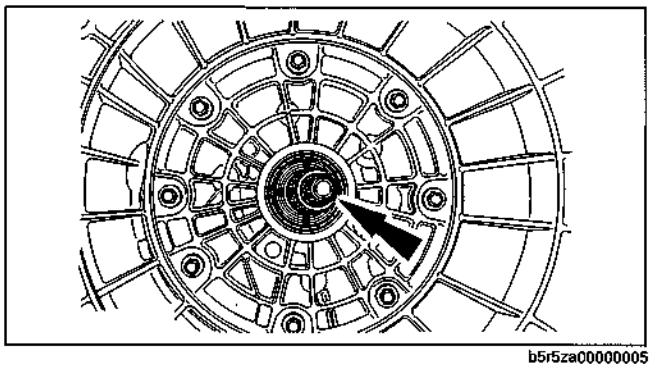
arnffv00000559

2. Using the **SSTs**, remove the torque converter.



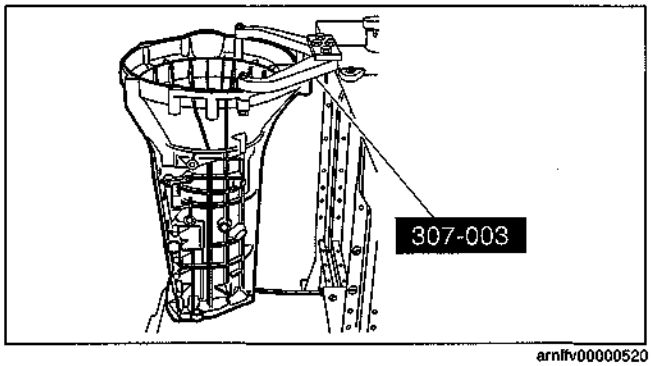
arnffv00000519

3. Remove the input shaft.



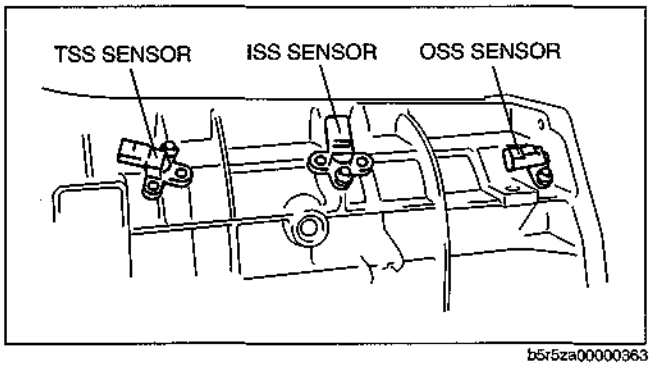
b5r5za00000005

4. Using the **SST**, install the transmission into the bench with the torque converter housing facing up.



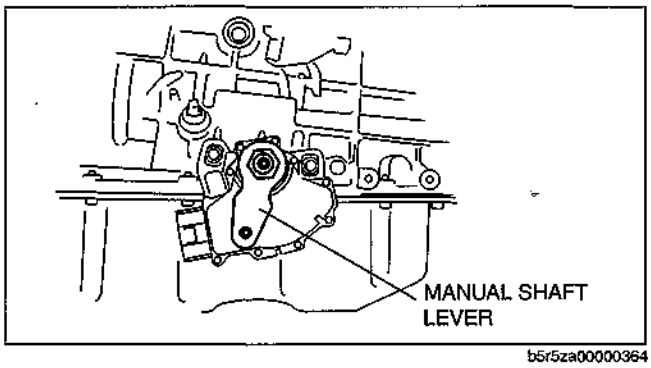
arnlfv00000520

5. Remove the sensors.



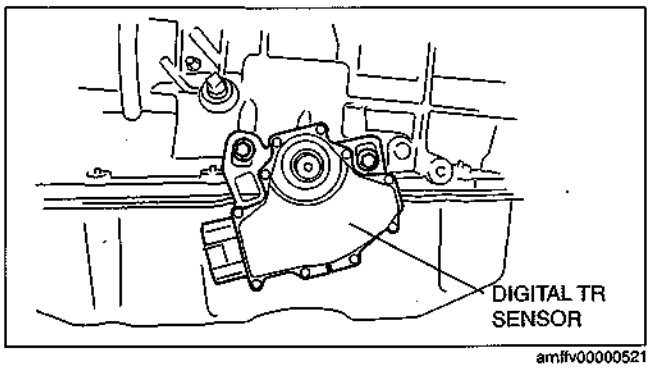
b5r5za00000363

6. Remove the manual shaft lever.



b5r5za00000364

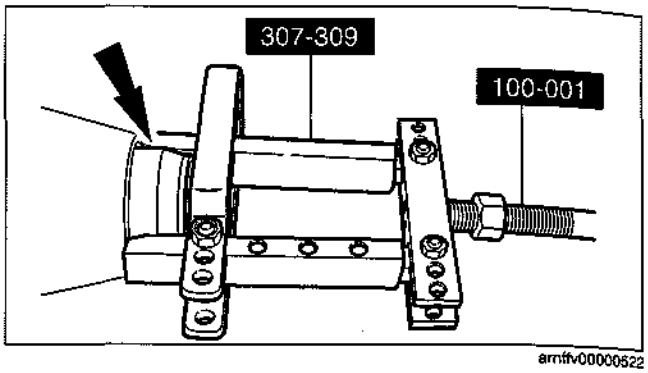
7. Remove the digital transmission range (TR) sensor.



amlfv00000521

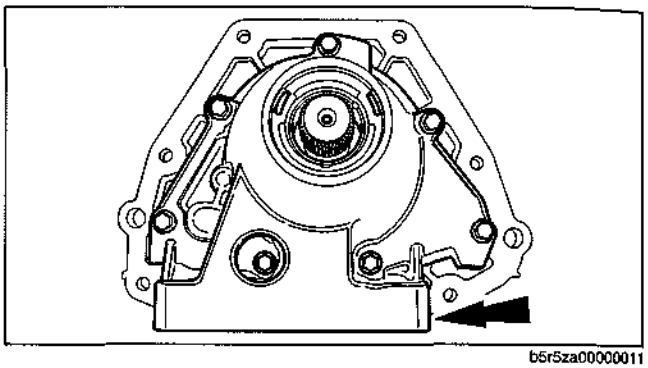
8. Using the **SST**, remove the extension housing seal. (4x2)

Caution
- **The parking pawl, parking pawl return spring and parking pawl shaft could fall out during removal of the extension housing.**



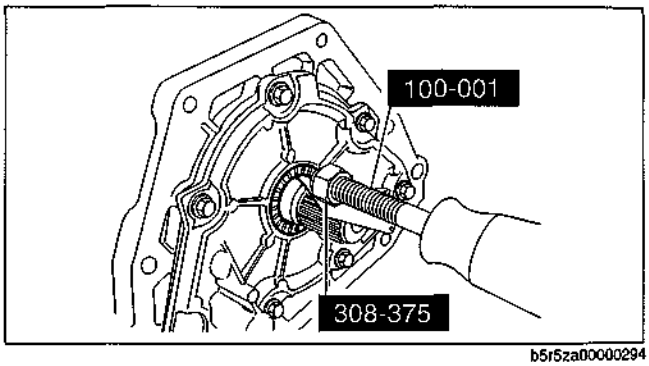
arnffv00000522

9. Remove the extension housing. (4x2)


b5r5za00000011

10. Using the **SSTs**, remove the extension housing seal. (4x4)

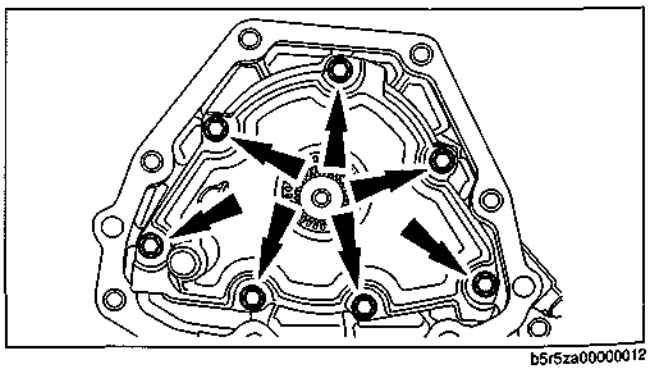
Caution
- **The parking pawl, parking pawl return spring and parking pawl shaft could fall out during removal of the extension housing.**



b5r5za00000294

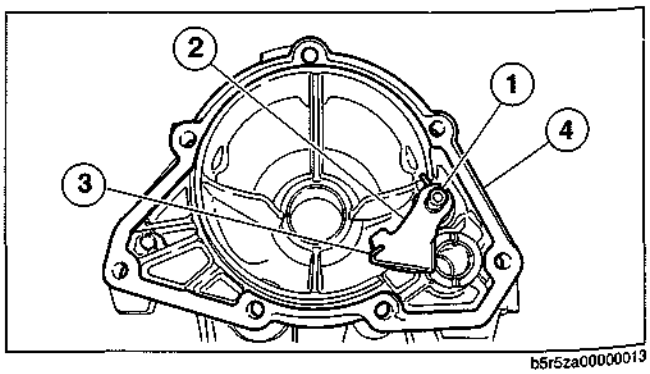
11. Remove the extension housing. (4x4)

Note
- 4x2 shown, 4x4 similar.


b5r5za00000012

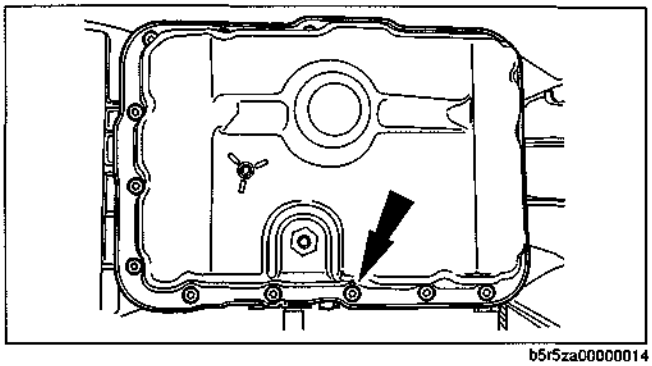
12. Remove the parking pawl component and discard the gasket.
    (1) Remove the parking pawl shaft.
    (2) Remove the parking pawl.
    (3) Remove the parking pawl return spring.
    (4) Remove and discard the gasket.

Note
- The transmission fluid pan gasket is reusable. Clean and inspect the gasket for damage. If not damaged, the gasket should be reused.



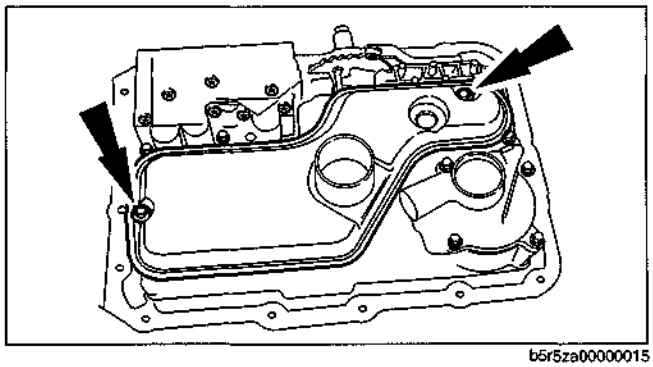
b5r5za00000013

13. Remove the screws, transmission fluid pan and gasket.



b5r5za00000014

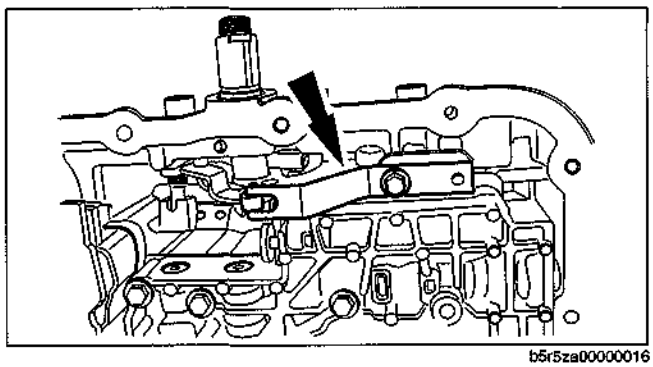
14. Remove the transmission fluid filter and seal component and discard.



b5r5za00000015

15. Remove the detent spring.

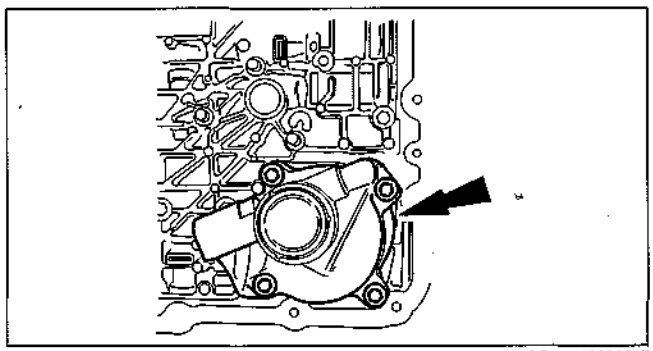
Warning
- **The upper and lower servo covers are under spring tension. Use care when removing the piston and cover component. Failure to follow these instructions can result in personal injury.**



b5r5za00000016

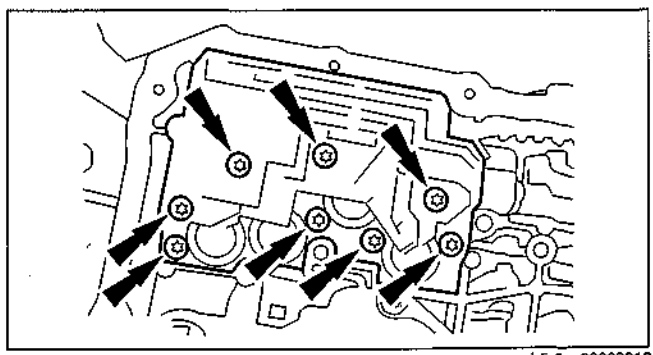
16. Remove the low/reverse brake servo component.

Caution
- **Do not damage solenoid body connector pins.**



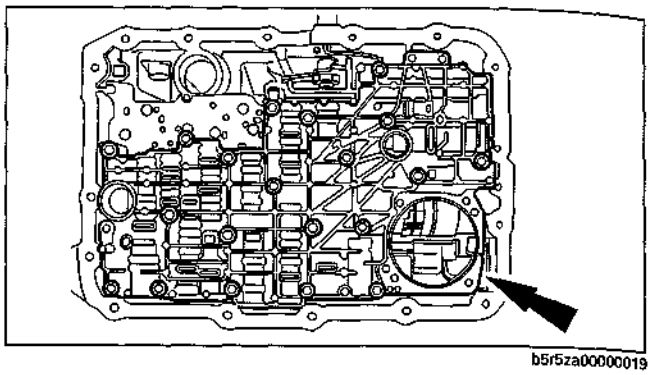
b5r5za00000017

17. Remove the solenoid body component by lifting on the body and pushing the connector from the other side of the case.



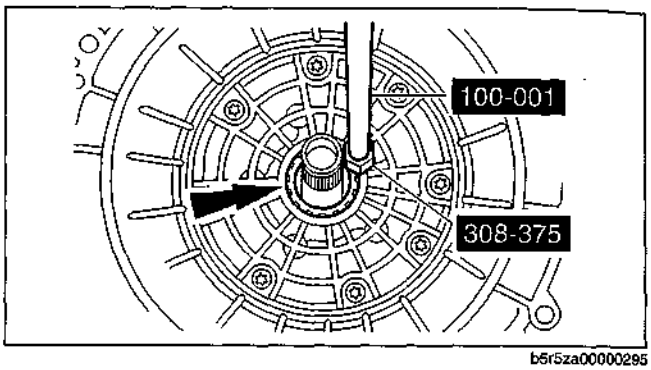
b5r5za00000018

18. Remove the main control valve body, separator plate and gasket.


b5r5za00000019

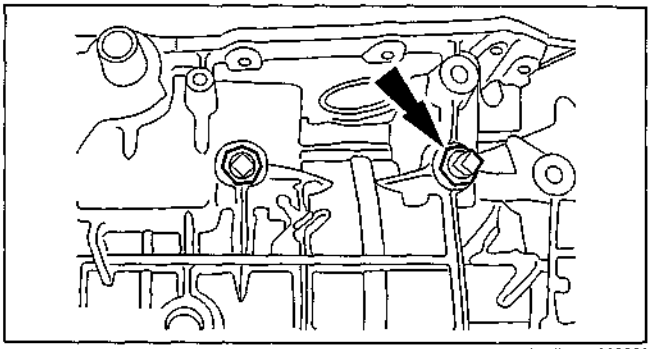
19. Using the **SST**, remove the fluid pump seal.

Caution
- **Failure to loosen the overdrive brake band adjusting screw prior to pump removal may cause damage to the pump and overdrive brake band.**
- **Throw the locknut away. The locknut are not reusable for assembly.**



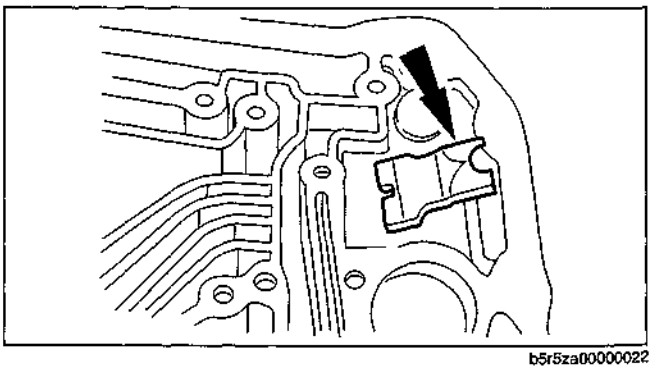
b5r5za00000295

20. Remove and discard the locknut, and loosen the overdrive brake band adjusting screw.

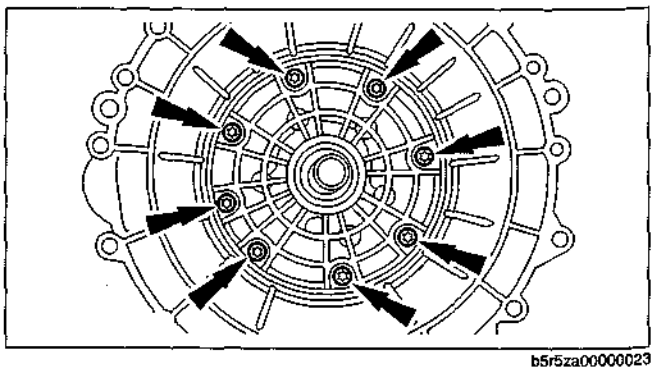

b5r5za00000021

21. Remove and tag the overdrive brake band anchor strut for assembly.

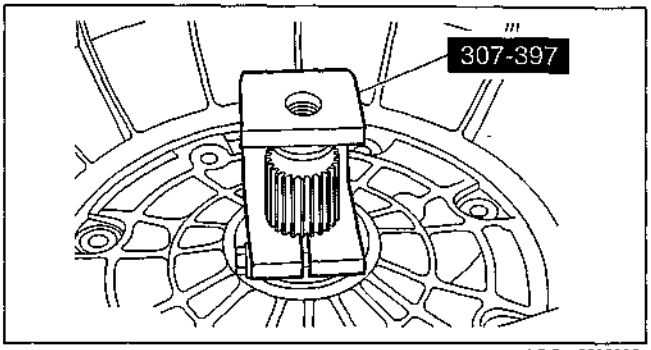
Caution
- **The screws are not reusable for assembly. Discard the screws. If the screws are reused, the housing may become separated from the transmission.**


b5r5za00000022

22. Remove and discard the screws.


b5r5za00000023

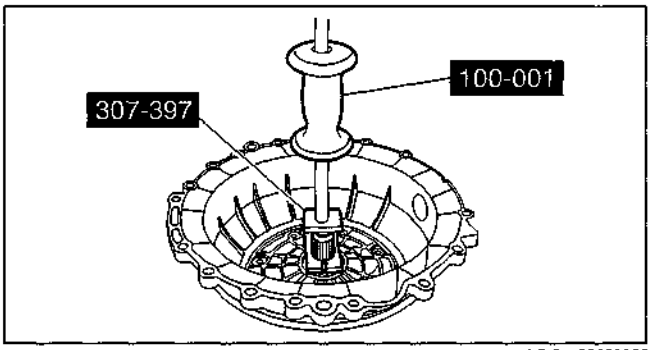
23. Install the **SST**.



b5r5za00000024

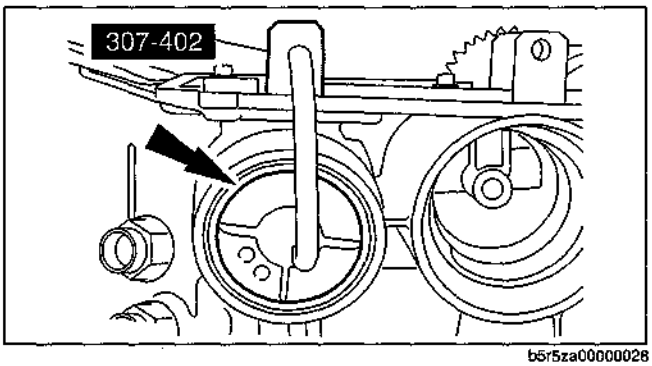
24. Using the **SST**, remove the fluid pump.

Caution
- **Servo cover is under spring tension.**



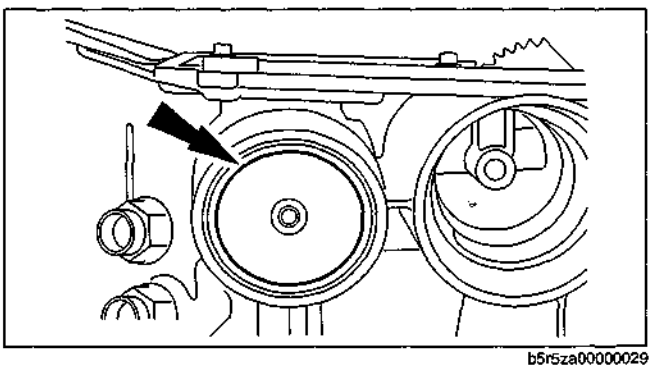
b5r5za00000025

25. Using the **SST**, remove the retaining ring and overdrive brake servo cover.



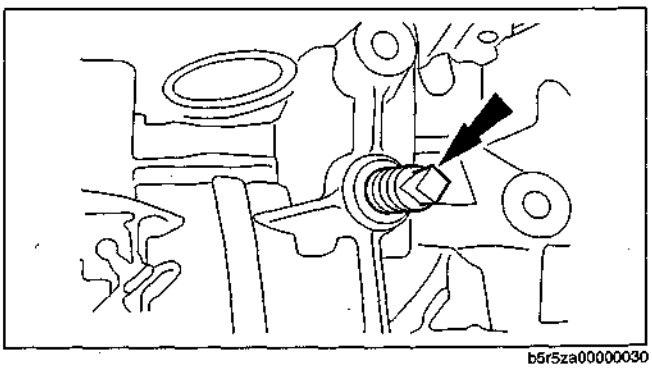
b5r5za00000026

26. Remove the overdrive brake servo piston and spring.



b5r5za00000029

27. Remove the screw.

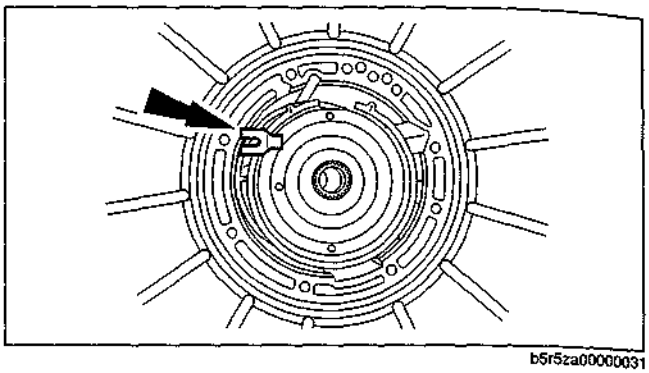


b5r5za00000030

28. Compress the overdrive brake band and remove the apply strut.

Note
- Tag and identify parts for reassembly.

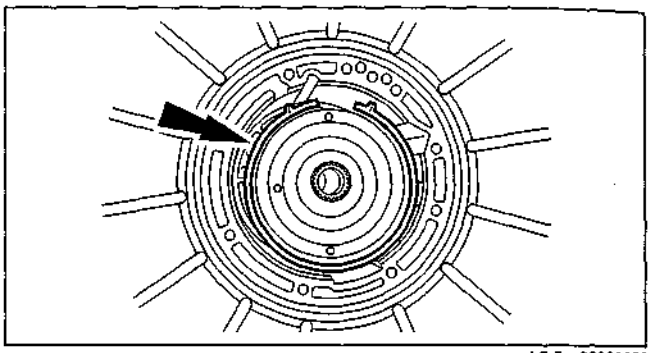
Caution
- **Identify the anchor and apply ends of the overdrive brake band.**



b5r5za00000031

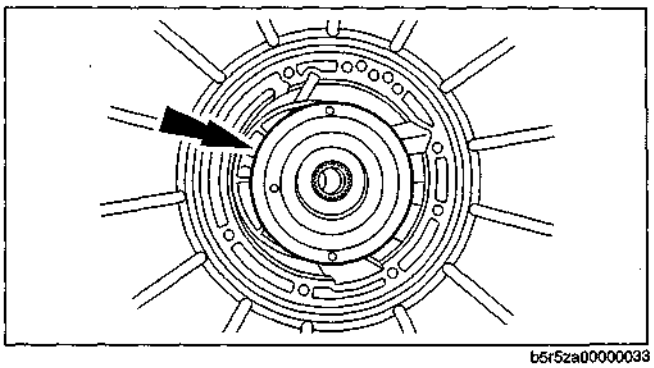
29. Remove and inspect the overdrive brake band. Check the following conditions for installing a new band:
- Inspect for glazing.
- Inspect for missing friction material.
- Inspect for material flaking.
- Inspect for damage to the anchor pins.

Note
- The new overdrive brake band is dark in color. This is a normal condition of the band. Hairline cracks in the band are also considered normal. Do not install a new band based solely on the color.


b5r5za00000032

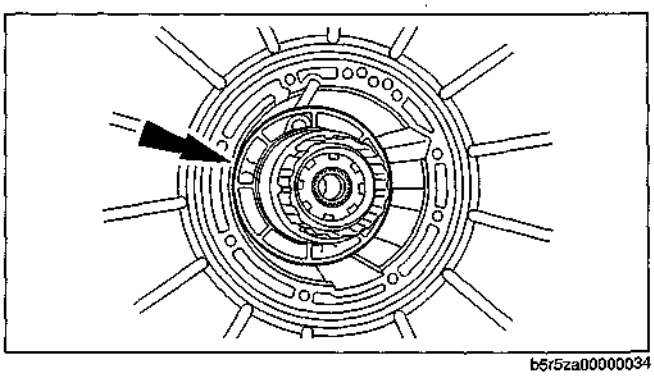
30. Remove the overdrive brake and coast clutch drum component.

Caution
- **Do not bend the trigger wheel.**

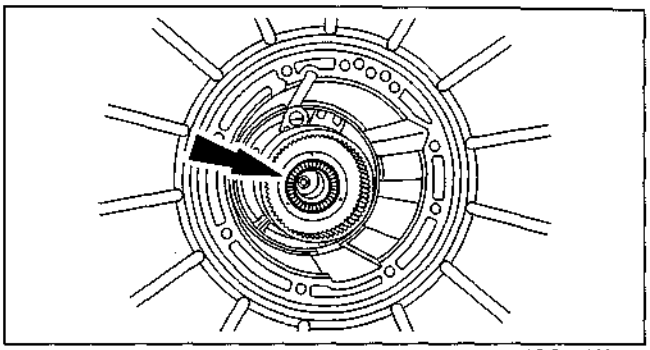

b5r5za00000033

31. Remove the overdrive planetary gear carrier.

Note
- The thrust bearing (No.12) is in this component.

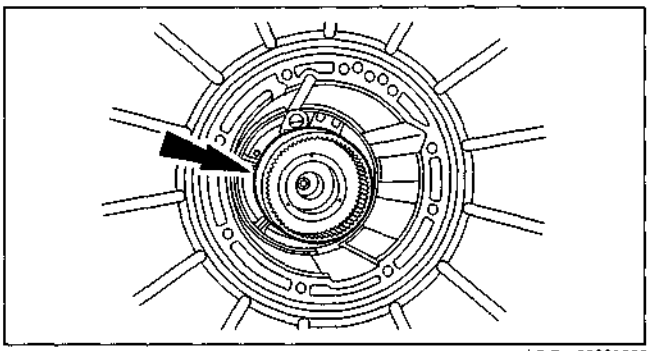

b5r5za00000034

32. Remove the thrust bearing (No.2).



b5r5za00000035

33. Remove the overdrive ring gear, overdrive one-way clutch component and center shaft as an assembly.

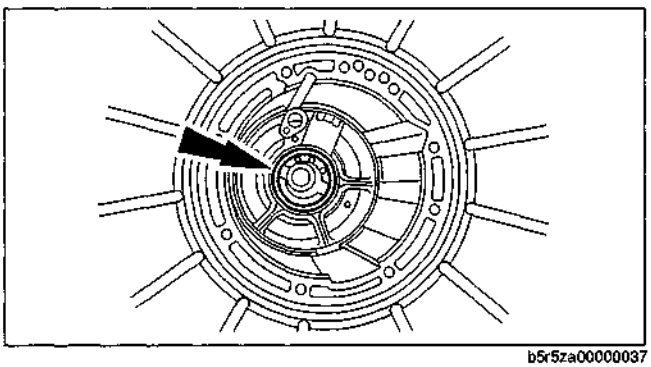


b5r5za00000036

34. Remove the thrust bearing (No.3).

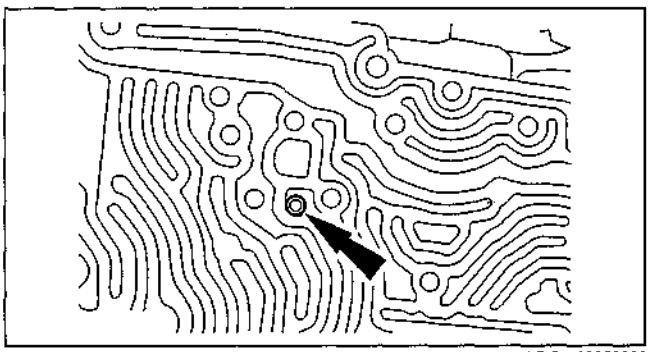
Note
- Tag and identify the thrust bearing (No.3) for assembly.

Caution
- **The center support nut could fall into the remaining assembly if not removed.**



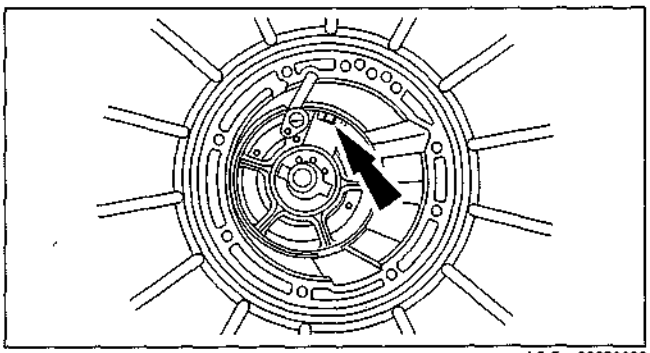
b5r5za00000037

35. Remove the screw.



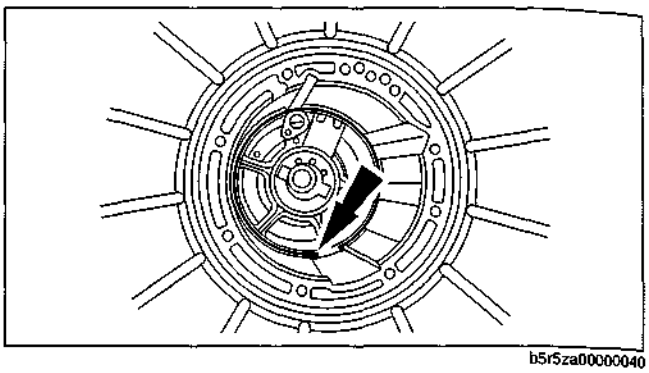
b5r5za00000038

36. Remove the nut and cage.



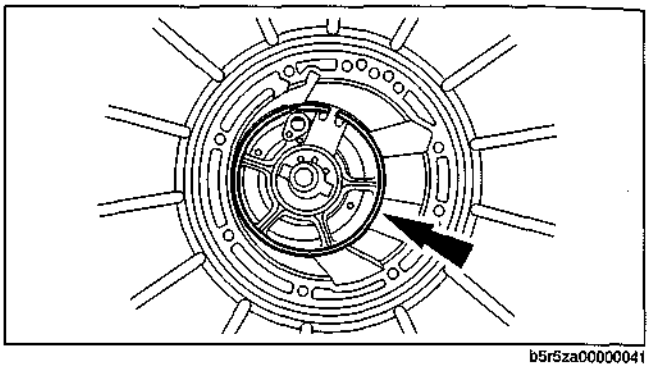
b5r5za00000039

37. Remove the retaining ring.

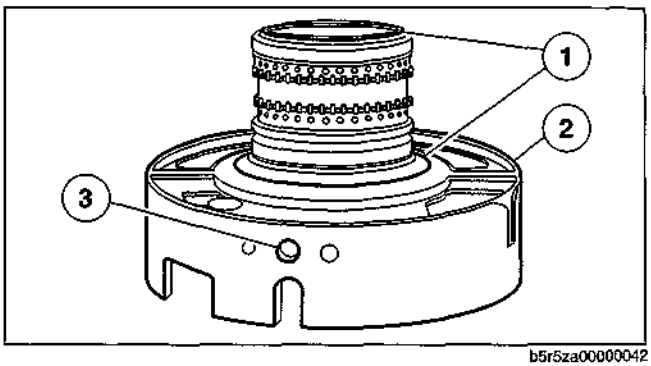

b5r5za00000040

38. Remove the center support.

Note
- The center support is repaired as an assembly. Any damage requires installing a new component.
- When removing the center support, pull evenly around the center support web.

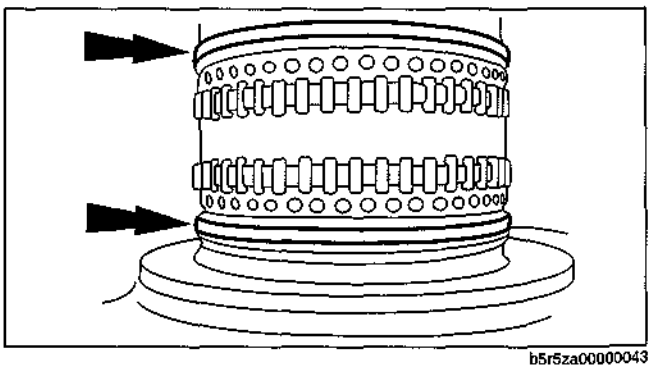

b5r5za00000041

39. Inspect the center support component for wear or damage.
    (1) Inspect the thrust surfaces for wear or damage.
    (2) Inspect the center support sealing surface.
    (3) Inspect the fluid passage for blockage or damage.

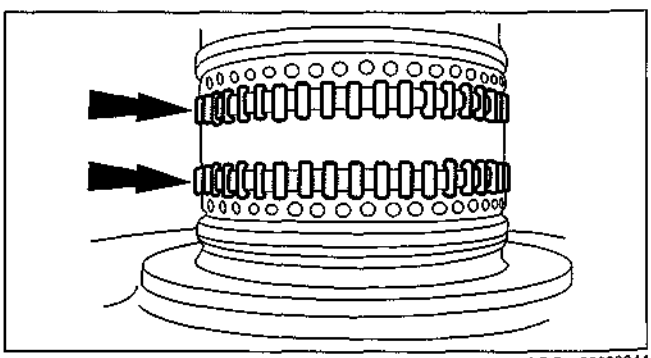


b5r5za00000042

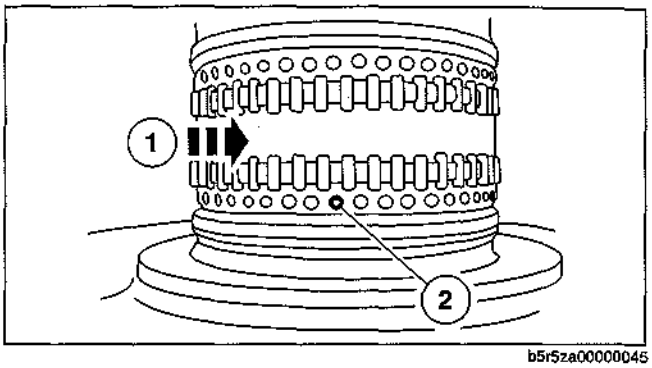
40. Inspect the seal rings for damage.


b5r5za00000043

41. Inspect the bearing for missing rollers or damage.


b5r5za00000044

42. Inspect the direct clutch feed hole for blockage or damage.
    (1) Rotate the center support bearing to locate the direct clutch feed hole.
    (2) Inspect the direct clutch feed hole for blockage or damage.

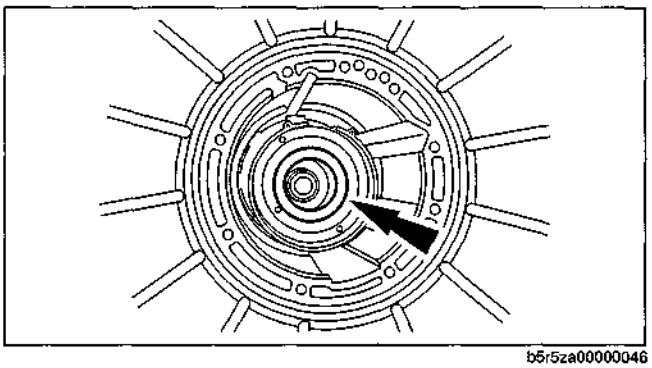


b5r5za00000045

43. Remove the thrust bearing (No.4).

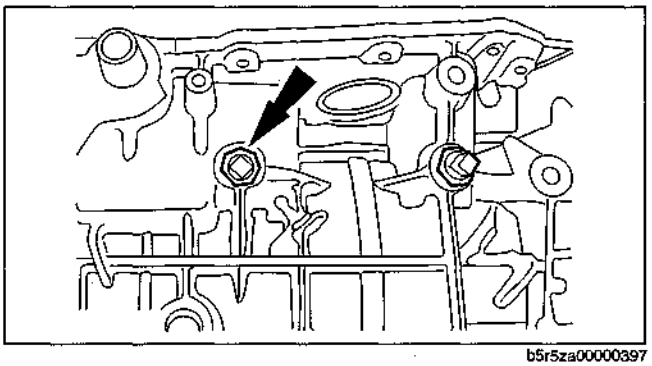
Note
- Tag and identify the thrust bearing (No.4).

Caution
- **Failure to loosen the intermediate brake band adjusting screw prior to pump removal may cause damage to the pump and intermediate brake band.**
- **Throw the locknut away. The locknut are not reusable for assembly.**

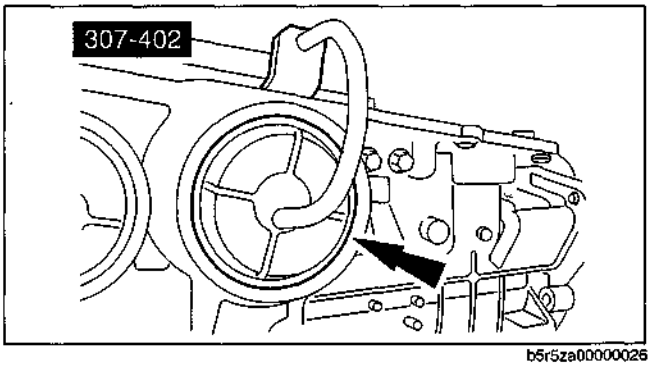

b5r5za00000046

44. Remove and discard the locknut, and loosen the intermediate brake band adjusting screw.

Caution
- **Servo cover is under spring tension.**

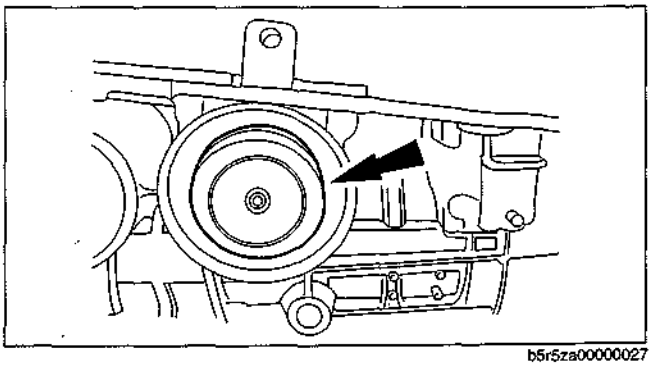

b5r5za00000397

45. Using the **SST**, remove the retaining ring and intermediate brake servo cover.



b5r5za00000026

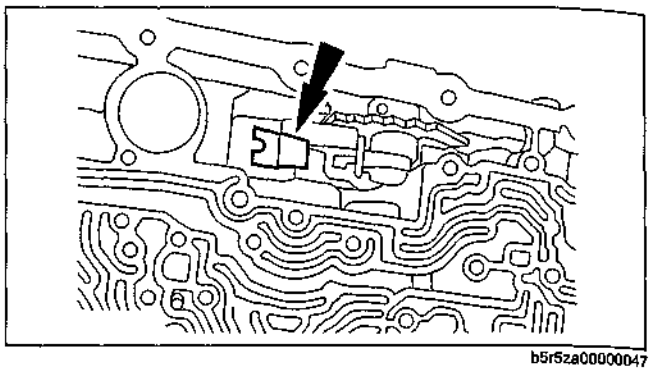
46. Remove the intermediate brake servo piston and spring.


b5r5za00000027

47. Remove and tag the intermediate brake band anchor strut for assembly.

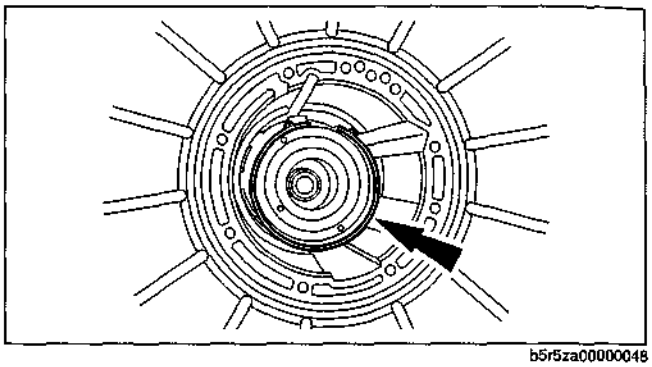
Caution
- **Identify the anchor and apply ends of the intermediate brake band.**

Note
- The new intermediate brake band is dark in color. This is a normal condition of the band. Hairline cracks in the band are also considered normal. Do not install a new band based solely on the color.

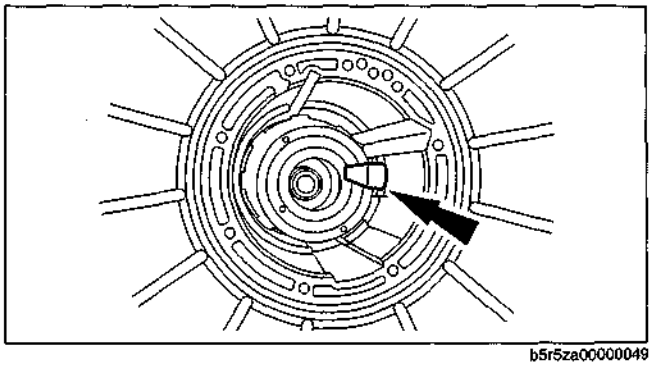


b5r5za00000047

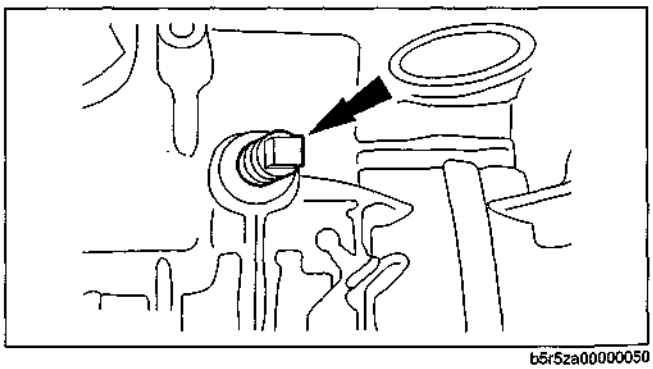
48. Remove and inspect the intermediate brake band. Check the following conditions for installing a new band:
    - Inspect for glazing.
    - Inspect for missing friction material.
    - Inspect for material flaking.
    - Inspect for damage to the anchor pins.


b5r5za00000048

49. Remove and tag the intermediate brake band apply strut for assembly.

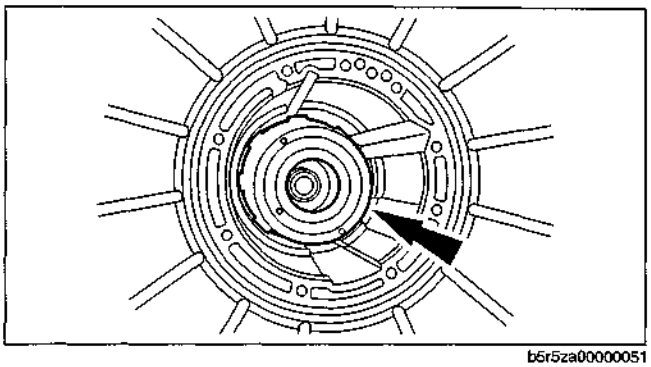

b5r5za00000049

50. Remove the screw.

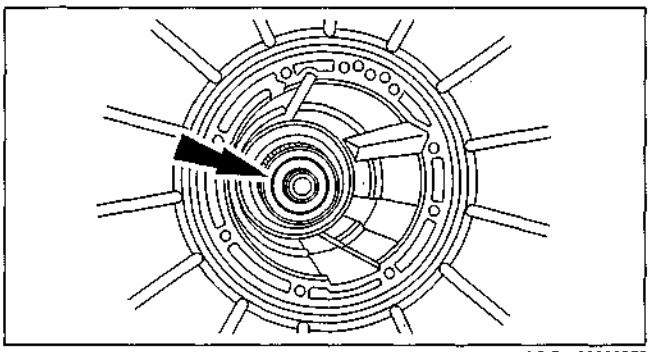

b5r5za00000050

51. Remove the intermediate brake and direct clutch drum component.

Note
- The thrust bearing (No.5) may come out with the intermediate brake and direct clutch drum.

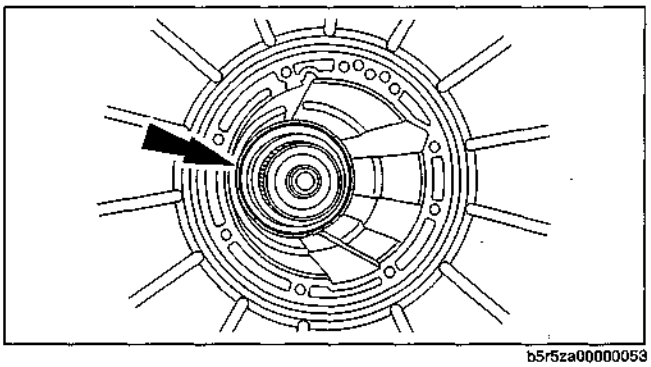

b5r5za00000051

52. Remove the thrust bearing (No.5), tag and identify.


b5r5za00000052

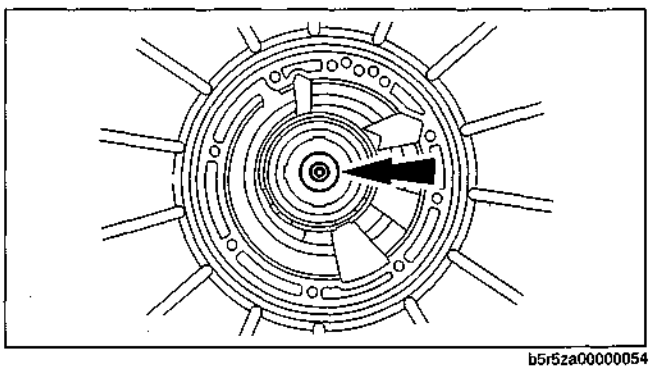
53. Remove the forward clutch cylinder.

Note
- The thrust bearing (No.6A) may come out with the cylinder. Tag for reassembly.


b5r5za00000053

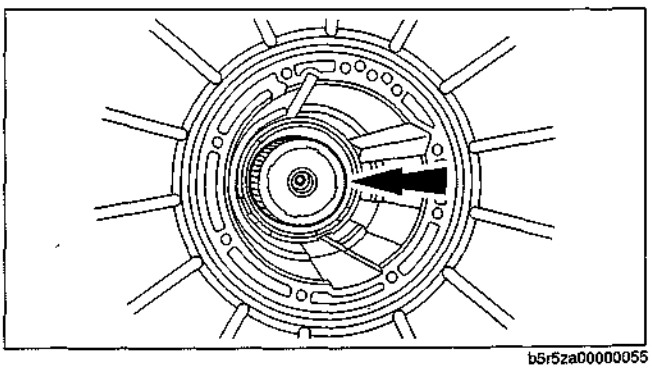
54. Remove the thrust bearing (No.6A).

Note
- The thrust bearing (No.6A) may have come out with the forward clutch cylinder.

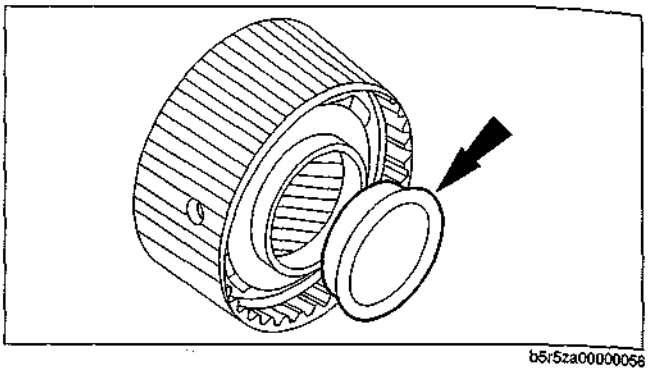

b5r5za00000054

55. Remove the forward ring gear and hub as an assembly.

Note
- The thrust bearing (No.7) may come out with the forward ring gear and hub component.

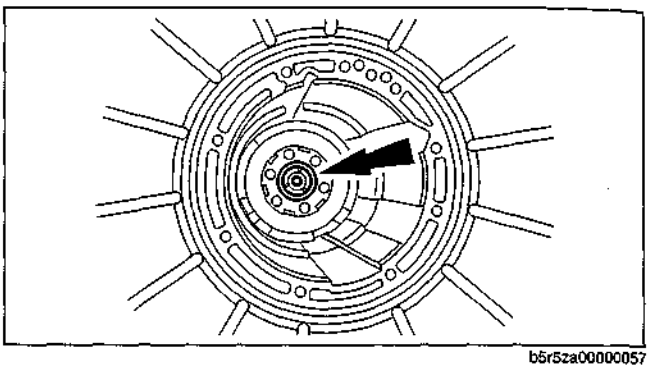

b5r5za00000055

56. Remove the thrust washer (No. 6B) from the forward ring gear hub.

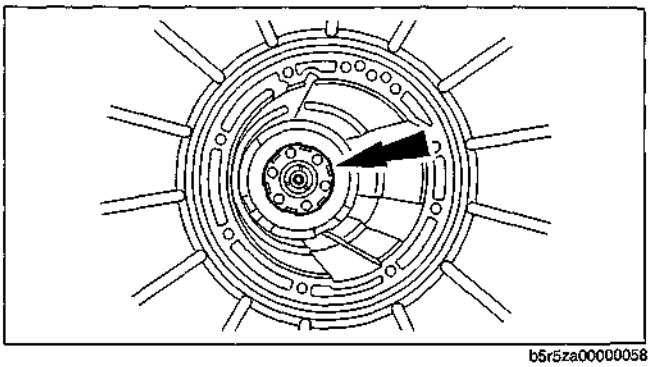

b5r5za00000058

57. Remove the thrust bearing (No.7).

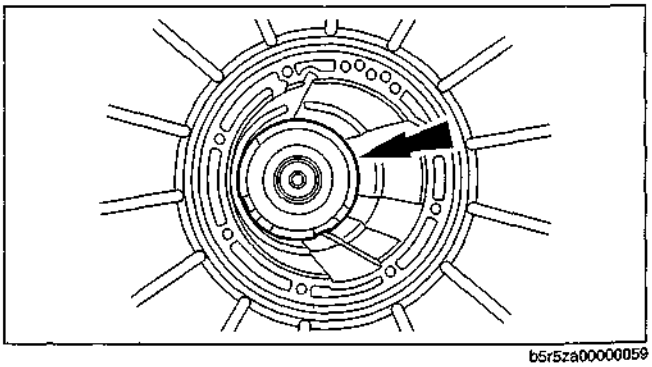
Note
- The thrust bearing (No.7) may come out with the forward ring gear and hub component.


b5r5za00000057

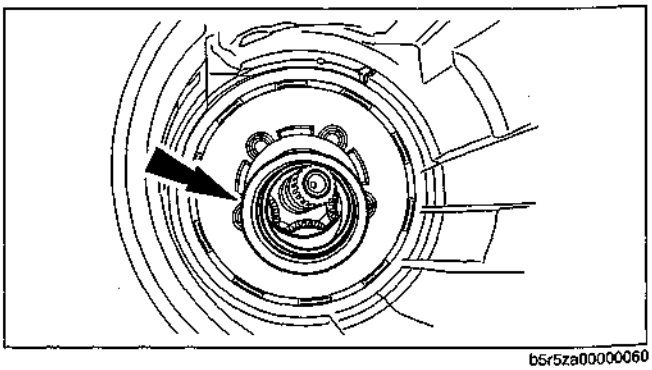
58. Remove the forward planetary component.


b5r5za00000058

59. Remove the input shell and sun gear component.

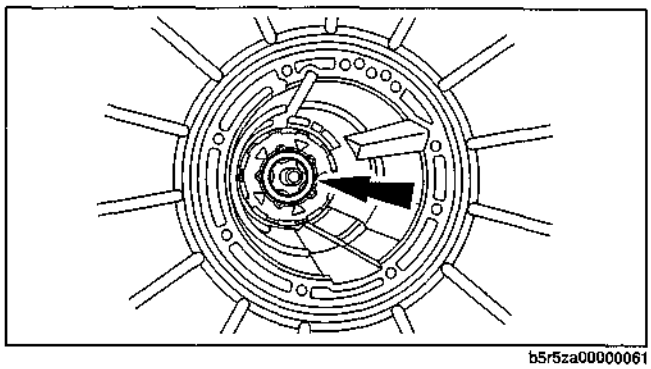

b5r5za00000059

60. Remove the spacer.

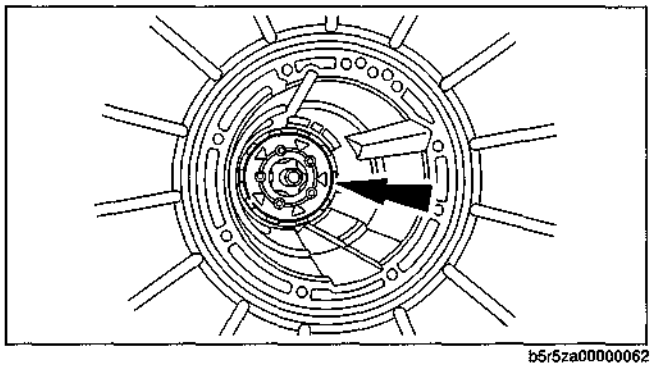

b5r5za00000060

61. Remove the thrust bearing (No.8).

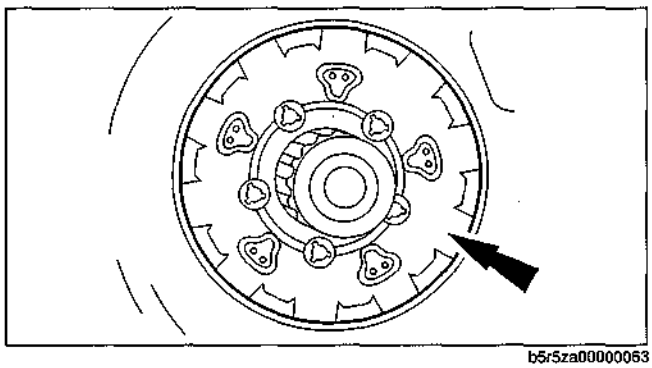
Note
- Tag and identify the thrust bearing (No.8).


b5r5za00000061

62. Remove the retaining ring.

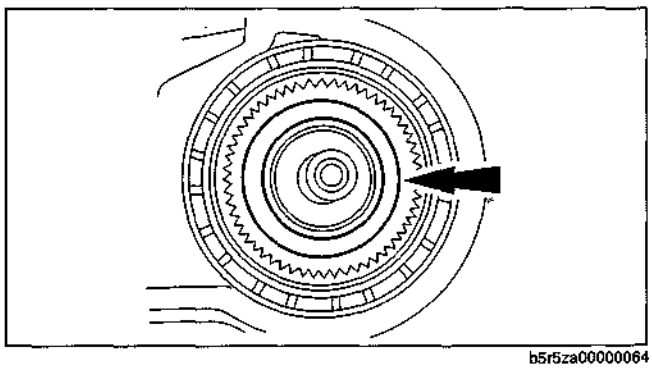

b5r5za00000062

63. Remove low/reverse planetary component.


b5r5za00000063

64. Remove the thrust bearing (No.9).

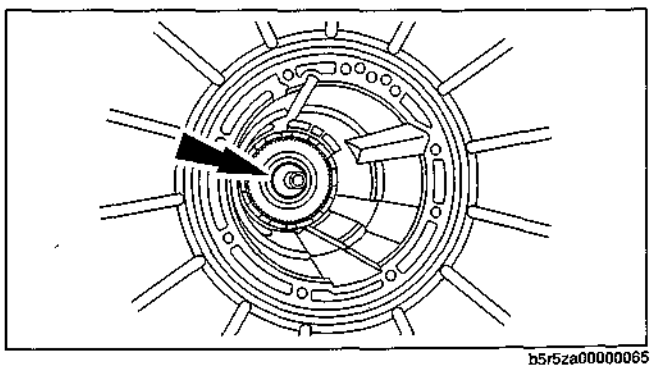
Note
- Tag and identify the thrust bearing (No.9).


b5r5za00000064

65. Using a small pick, remove the output shaft sleeve.

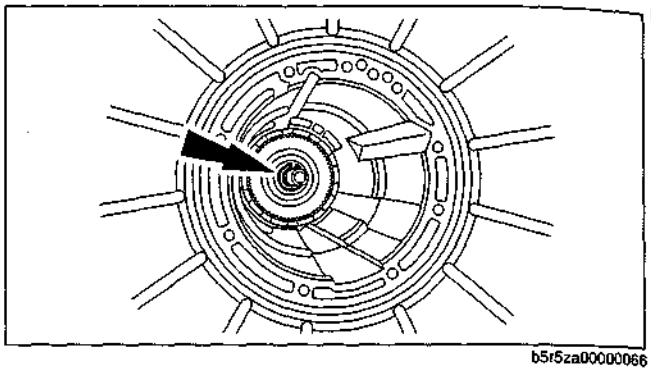
Note
- Use slots located around the outside of the sleeve.

Warning
- **The output shaft may fall out after removing the retaining ring. Failure to follow these instructions may result in personal injury.**

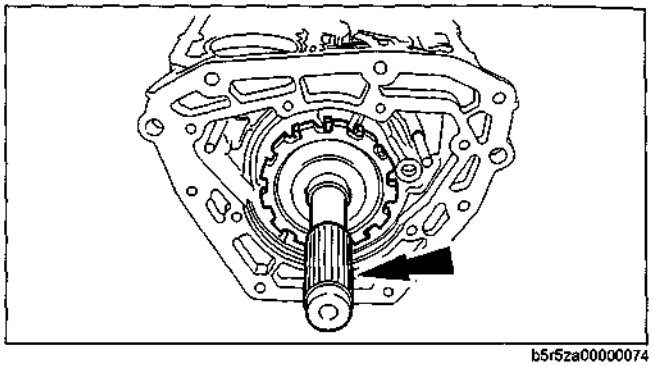

b5r5za00000065

Caution
- **Discard the retaining ring. A new retaining ring must be used for assembly.**

66. While holding the output shaft, remove and discard the retaining ring.

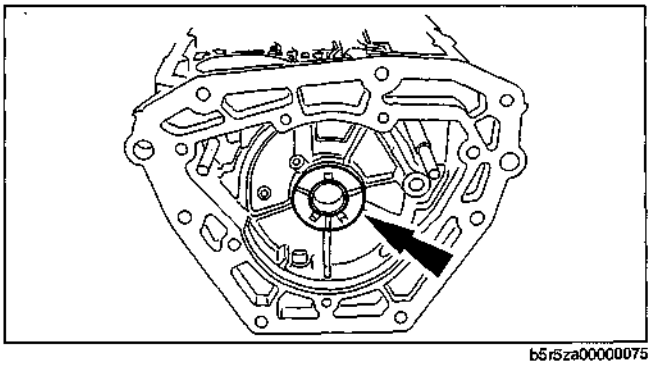

b5r5za00000066

67. Remove the output shaft and park gear.

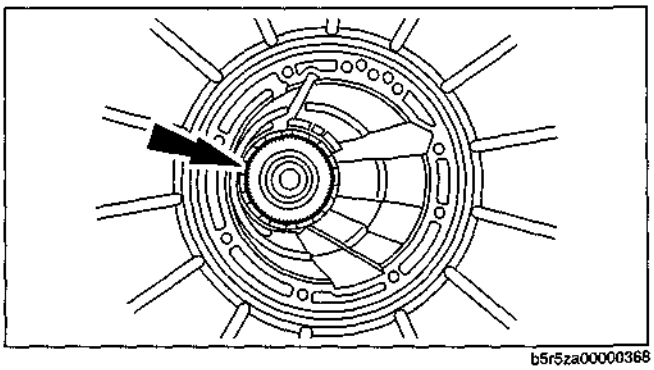

b5r5za00000074

68. Remove the output shaft thrust washer.

Note
- Tag and identify the thrust washer (No.11).

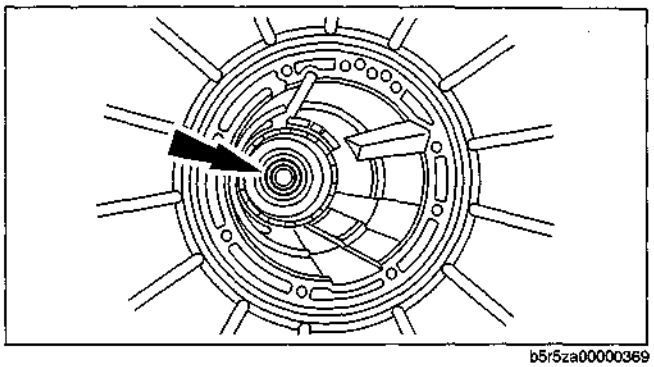

b5r5za00000075

69. Remove the output shaft ring gear and hub.


b5r5za00000368

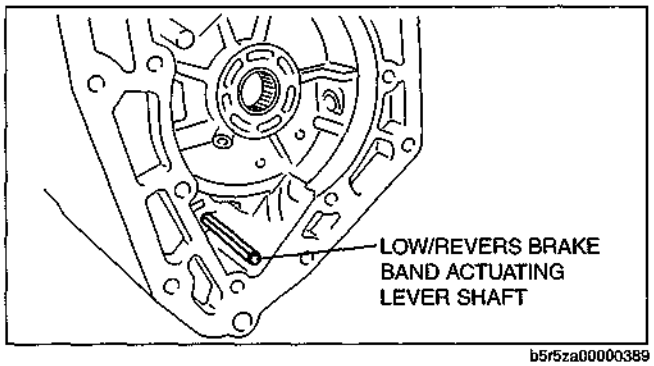
70. Remove the thrust bearing (No.10).

Caution
- **Do not pry on the outer edge of the case or damage to the gasket sealing surface could occur.**


b5r5za00000369

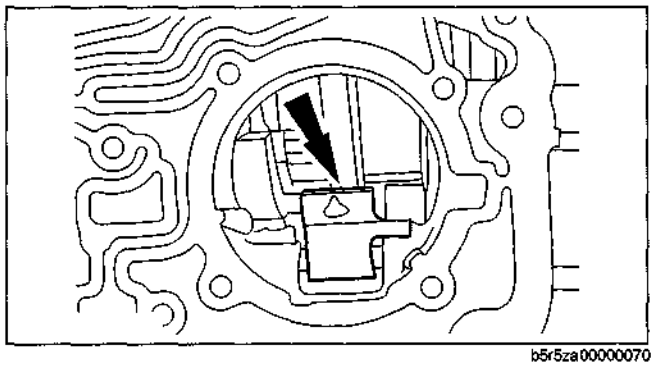
71. Using a pair of vice grips, hold the flat spots on the low/reverse brake band actuating lever shaft, wiggle it back and forth and remove the low/reverse brake band actuating lever shaft.

Note
- It may be necessary to grind flat spots on the edges of the low/reverse brake band actuating lever shaft in order to remove it.



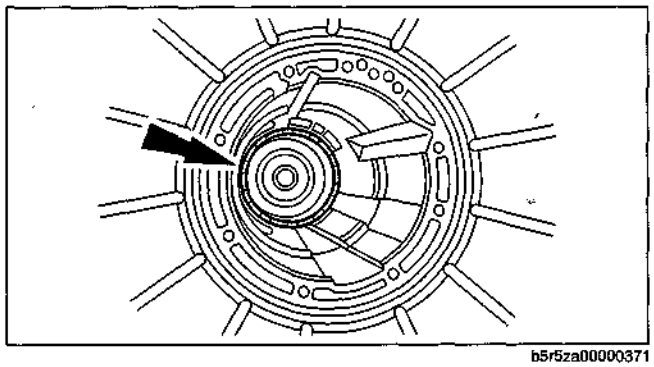
b5r5za00000389

72. Remove the low/reverse brake band actuating lever component.


b5r5za00000070

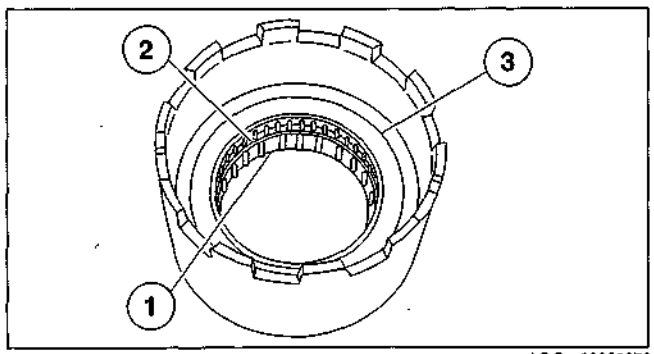
73. Remove the low/reverse brake drum and one-way clutch component by rotating it clockwise.

Note
- The inner race of the rear one-way clutch is not removable. It is repaired in the case.


b5r5za00000371

74. Inspect the low/reverse brake drum component and install a new low/reverse brake drum component if damaged.
(1) Inspect the low/reverse brake drum sprags.
(2) Inspect the low/reverse brake drum rollers.
(3) Inspect the low/reverse brake drum.

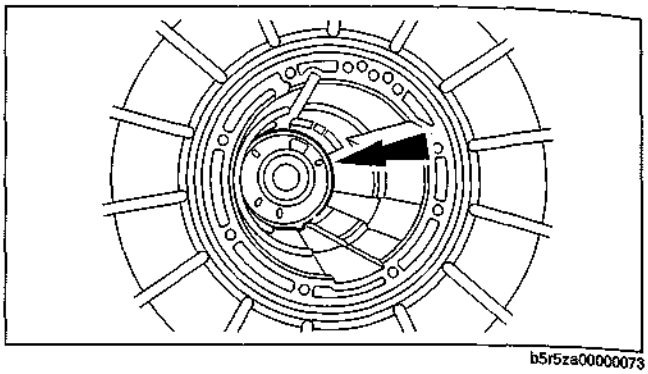
Note
- The reverse one-way clutch is part of the low/reverse brake drum component. Install a new low/reverse brake drum as an assembly only.



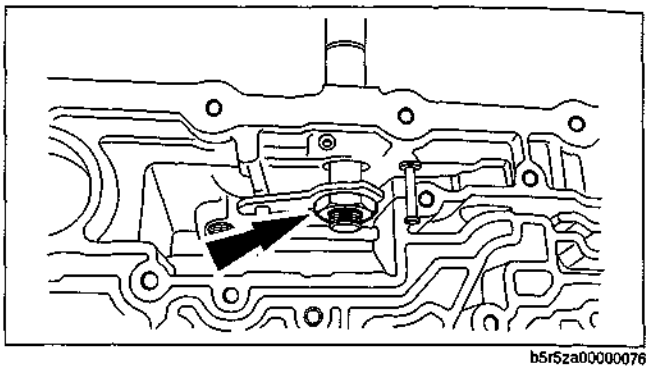
b5r5za00000072

75. Remove the low/reverse brake band.

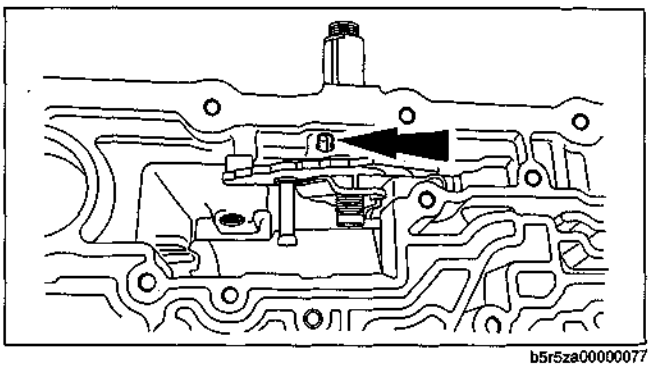
Caution
- **To avoid damage, make sure the wrench does not strike the manual valve inner lever pin.**


b5r5za00000073

76. Remove the nut.


b5r5za00000076

77. Remove the manual shaft retaining pin.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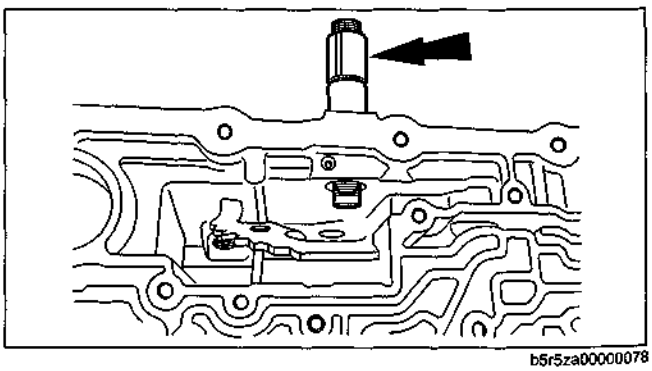
78. Remove the manual shaft.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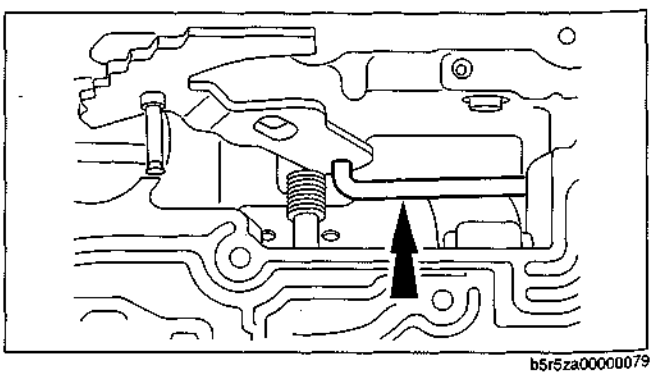
79. Disconnect the manual valve inner lever from the parking lever actuating rod.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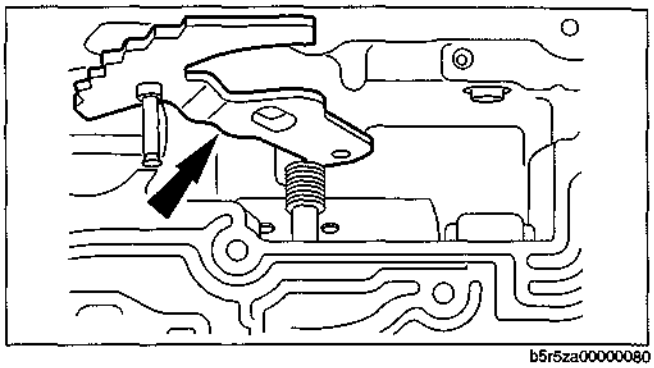
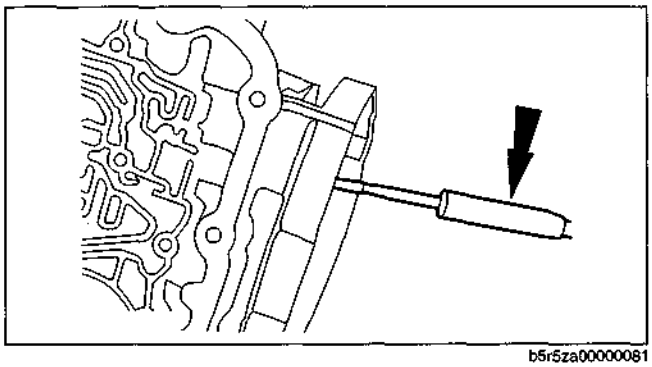
80. Remove the manual valve inner lever.



b5r5za00000080

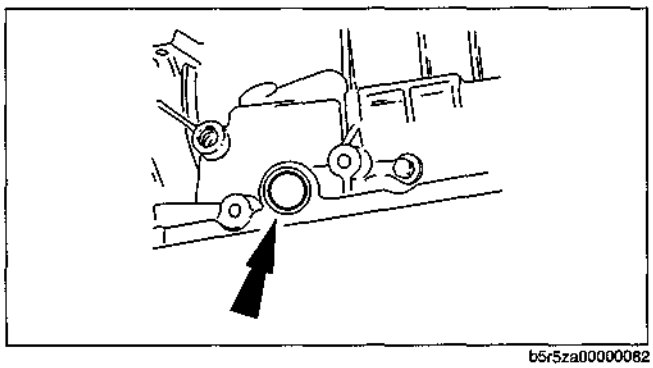
81. Remove the parking lever actuating rod.

Caution
- **Do not damage the bore.**



b5r5za00000081

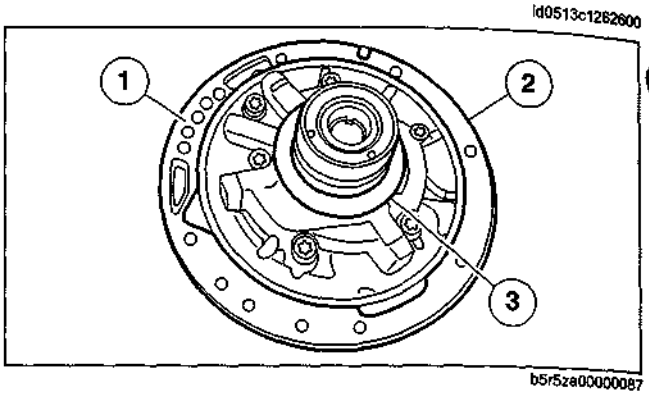
82. Remove the manual shaft seal.



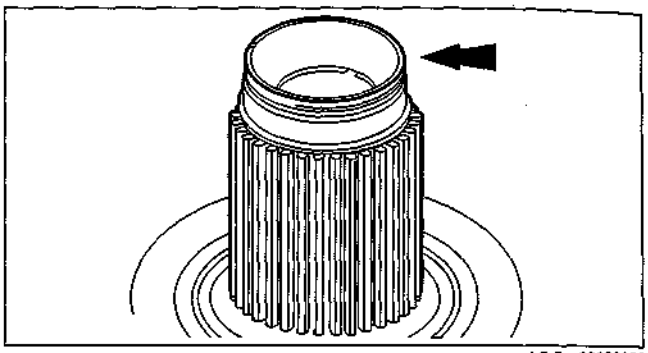
b5r5za00000082

FLUID PUMP DISASSEMBLY[5R55S]

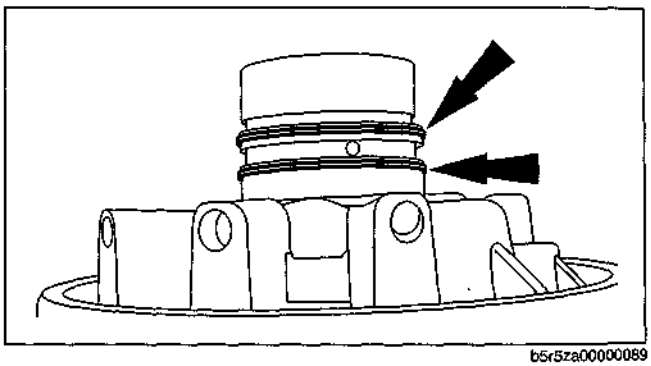
1. Remove the fluid pump gasket, fluid pump seal ring and the No.1 thrust washer.
   (1) Remove and discard the fluid pump gasket.
   (2) Remove and discard the fluid pump seal ring (square cut).
   (3) Remove and tag the thrust washer (No.1).



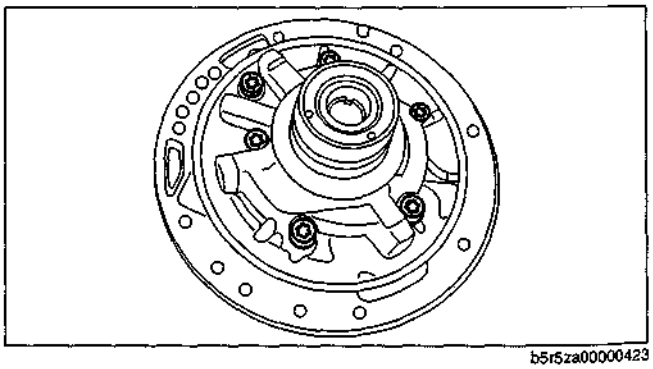
2. Remove the fluid pump support seal ring.



3. Remove the seal rings.

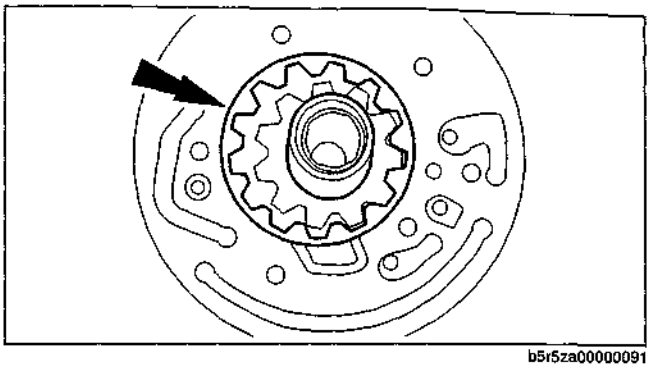


4. Remove the fluid pump support from the fluid pump cover.

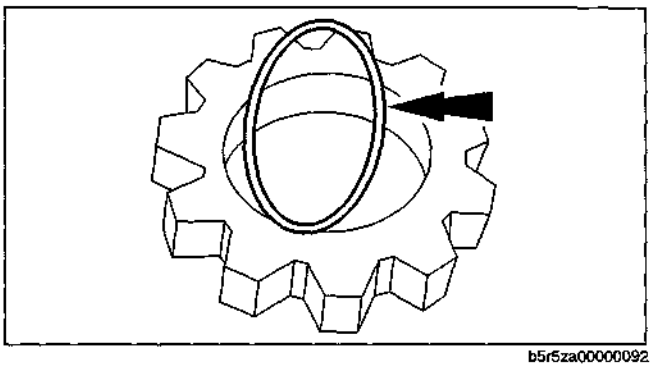


5. Remove the fluid pump gears.

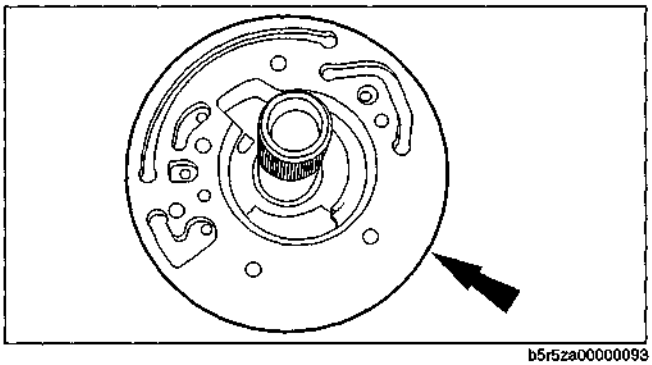
Note
- A rough casting on the pump surface crescent is not a flaw.
- The fluid pump gears are part of the pump component and are not repaired separately.


b5r5za00000091

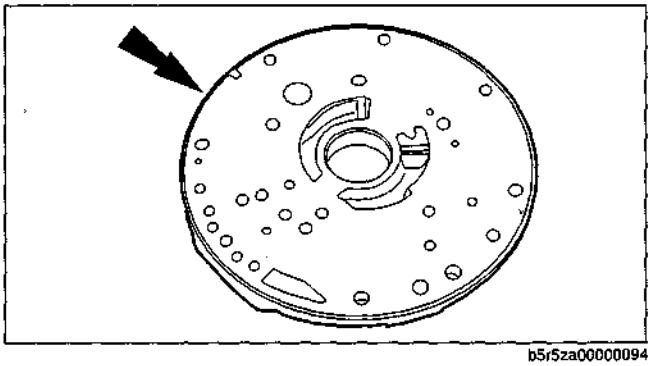
6. Remove the drive gear seal ring and discard. Inspect the fluid pump gears for cracks and scoring.


b5r5za00000092

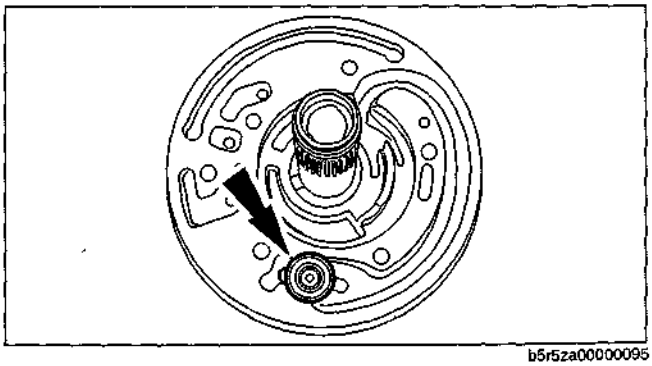
7. Inspect the overdrive pump.
   - Inspect the overdrive pump support gear pockets for scoring and wear.
   - Clean and inspect the overdrive and rear input shaft bushings.


b5r5za00000093

8. Inspect the fluid pump adapter plate for scoring and wear.


b5r5za00000094

9. Remove and discard the fluid pump control valve.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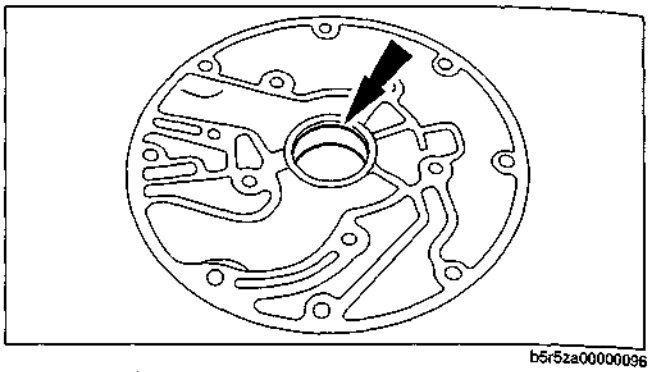
10. Inspect the fluid pump-to-converter housing bushing.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FLUID PUMP ASSEMBLY[5R55S]

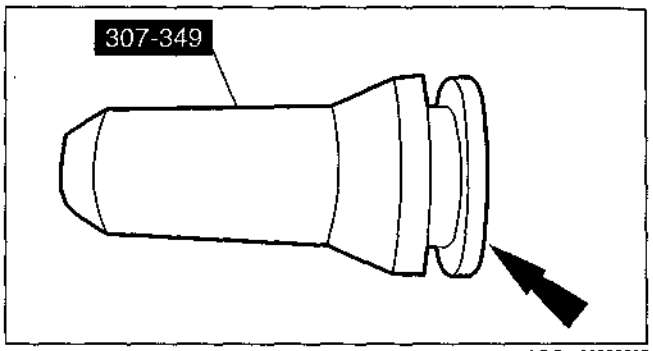
id0513c1262700

1. Inspect the fluid pump components for the following:
   - Pump body and case for burrs
   - Fluid passages for obstructions

   Note
   - Minor burrs and scoring may be removed with crocus cloth. If damage is found, install a new assembly.

2. Install a new seal onto the **SST**.

   Note
   - Check and make sure that the garter spring in the seal has not popped off of the converter hub seal.



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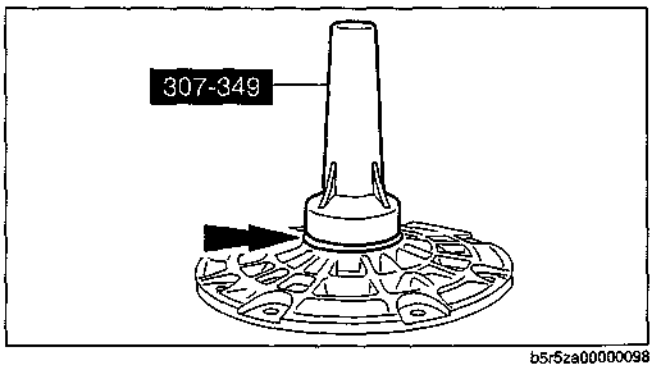
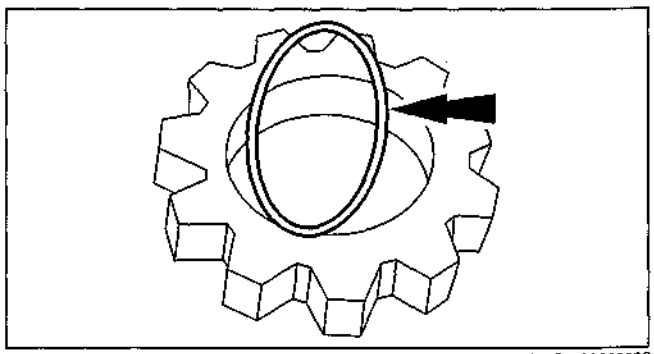
3. Using the **SST**, install the converter hub seal.



b5r5za00000098

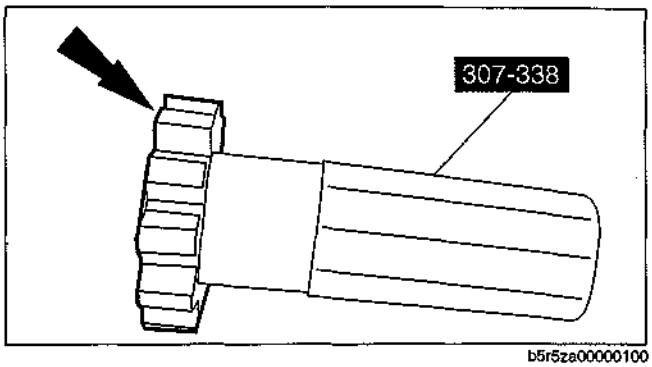
4. Install a new seal ring in fluid pump drive gear.

   Caution
   - **Lubricate the SST with multi-purpose grease.**


b5r5za00000099

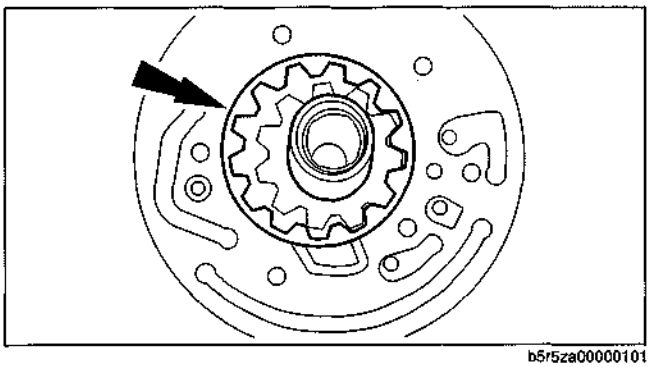
5. Using the **SST**, seat the O-ring in the pump gear.

Caution
- **The chamber on the inside edge of the small gear must be UP when in the pump housing gear pocket. The dimple on the larger gear must be DOWN when in the pump housing gear pocket.**

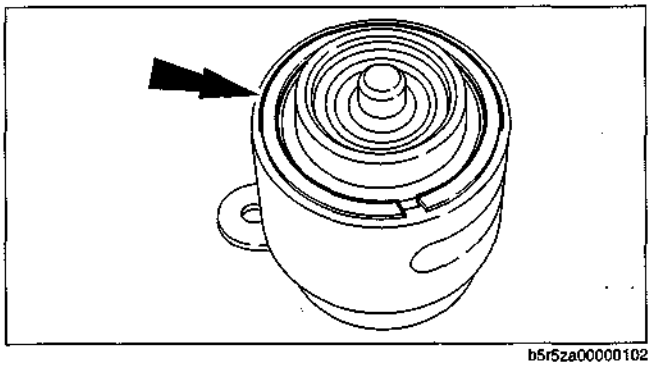


b5r5za00000100

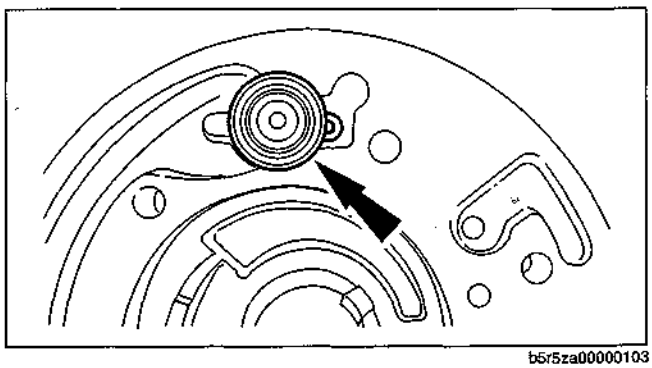
6. Install the pump gears into the fluid pump housing. Apply multi-purpose grease to the pump gear to prevent scoring at start up.


b5r5za00000101

7. Install a new O-ring on the new fluid pump control valve.

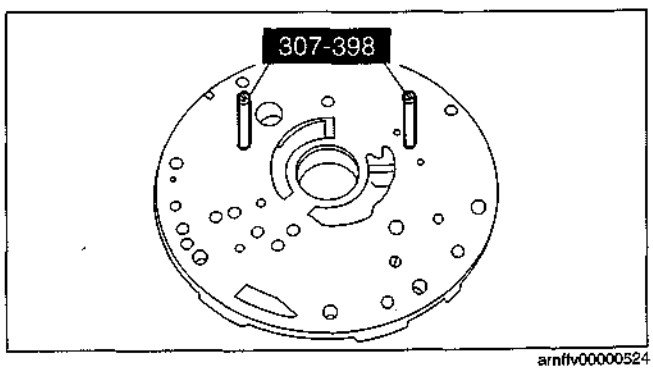

b5r5za00000102

8. Install a new valve with the tab facing down.


b5r5za00000103

9. First install the fluid pump adapter plate and then the alignment pins in their correct location.

Caution
- **The SST must be used to correctly align the pump with the adapter plate to reduce gear noise, bushing failure and leakage.**



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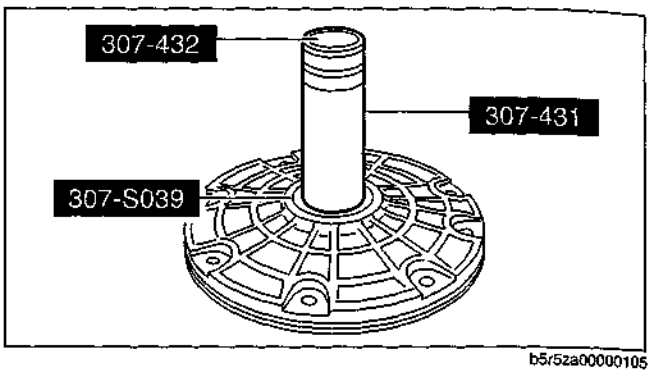
10. Using the **SST**, align the fluid pump to the adapter plate.



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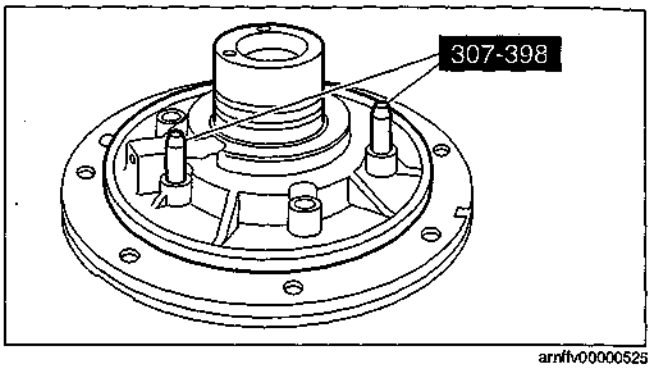
11. Using the **SST**, assemble the fluid pump.



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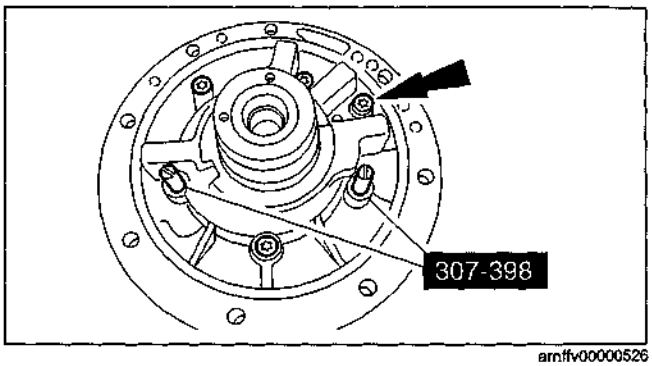
12. Loosely install the fluid pump housing screws in their correct location and remove the **SSTs**.



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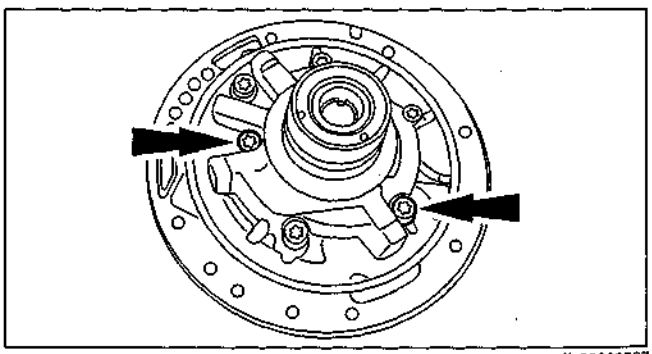
13. Install the 2 remaining screws and tighten all the screws in a star pattern.

Tightening torque
22—28 N·m {2.3—2.8 kgf·m, 17—20 ft· lbf}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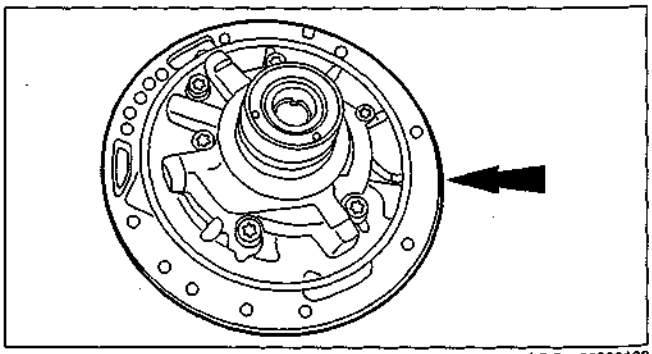
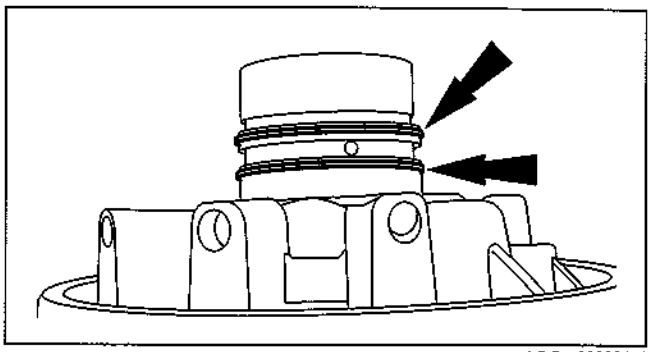
14. Install a new fluid pump seal ring.


b5r5za00000109

15. Install the new seal rings.

Caution
- **Be careful not to overstretch the seal ring past the seal ring groove. Damage to the seal will occur.**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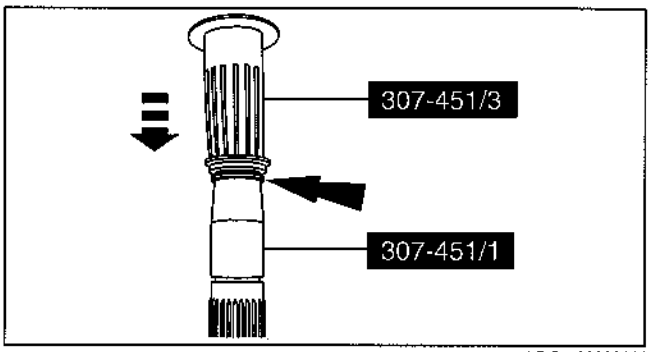
16. Using the **SST**, install the fluid pump seal ring.

Caution
- **Verify correct seal installation.**

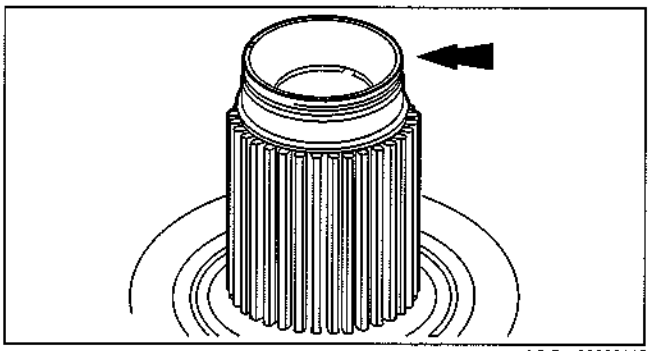


b5r5za00000111

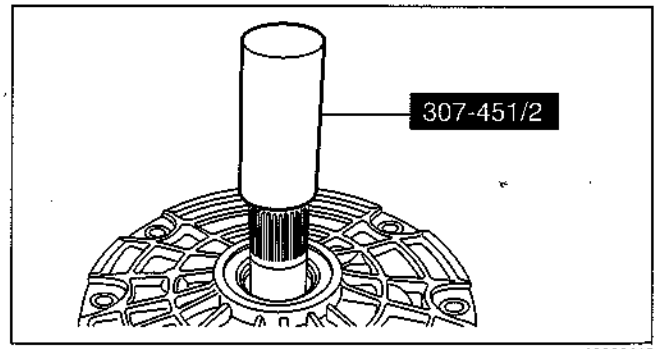
17. Verify that the seal is installed correctly.

Note
- Make sure seal grooves are clean and free of burrs. Make sure that the seal is seated into the groove.

Caution
- **Failure to correctly size the seal will cause damage to the seal when the torque converter is installed.**


b5r5za00000112

18. Using the **SST**, size the seal to the correct size. Leave the **SST** on the seal ring for **2 min** to obtain the correct seal size.

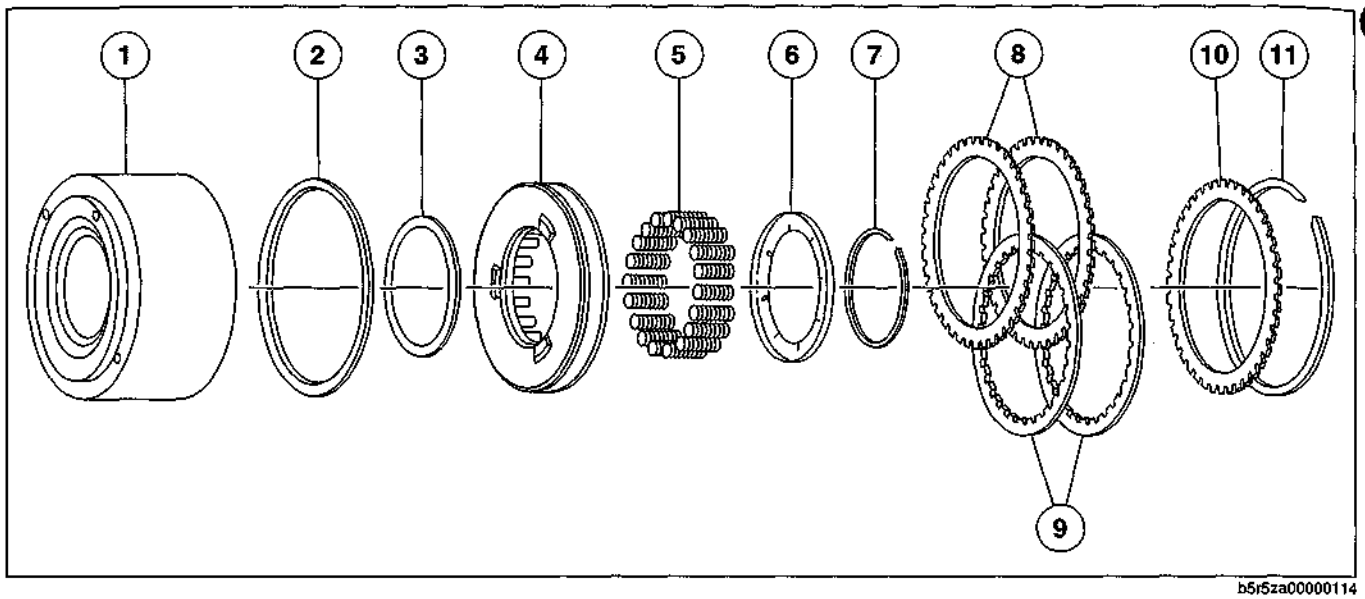


b5r5za00000113

OVERDRIVE BRAKE AND COAST CLUTCH DRUM COMPONENT DISASSEMBLY/ASSEMBLY[5R55S]

id0513c1262100

Overdrive Brake and Coast Clutch Drum Component



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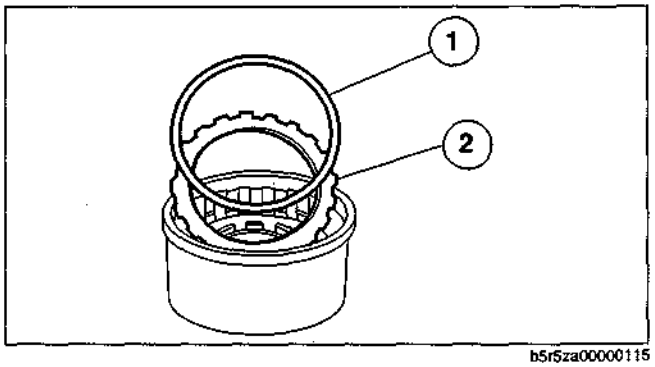
1	Overdrive brake drum
2	Coast clutch piston outer seal ring
3	Coast clutch piston inner seal ring
4	Coast clutch piston
5	Overdrive piston spring
6	Coast clutch piston spring retainer

7	Retaining ring
8	Coast clutch external spline plate (steel)
9	Coast clutch internal spline plate (friction)
10	Coast clutch pressure plate
11	Retaining ring (select fit)

Disassembly

1. Remove the coast clutch pressure plate.
   (1) Remove the retaining ring.
   (2) Remove the coast clutch pressure plate.



b5r5za00000115

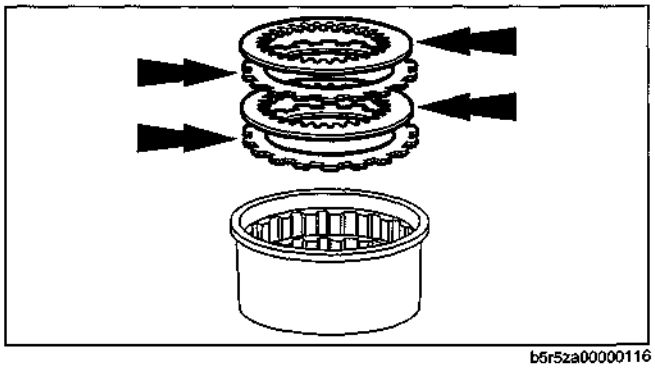
2. Remove the coast clutch disc pack.
   - Inspect for wear, install a new pack as necessary.

Warning

- **Use caution when releasing tool pressure on the piston spring. Failure to follow these instructions may result in personal injury.**

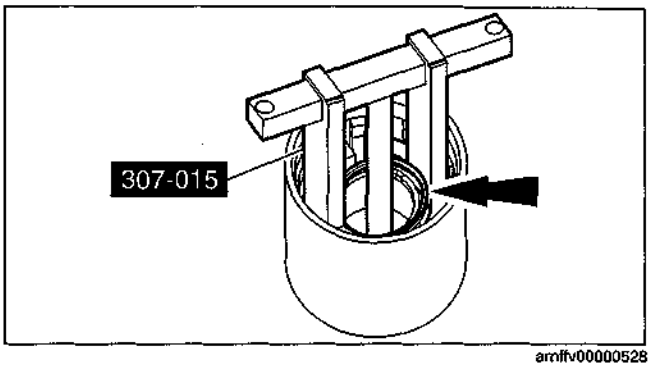
Caution

- **Do not fully compress the SST or damage to the spring retainer may occur.**



b5r5za00000116

3. Using the **SST**, remove the retaining ring.
4. Relieve the coast clutch spring tension and remove the **SST**.



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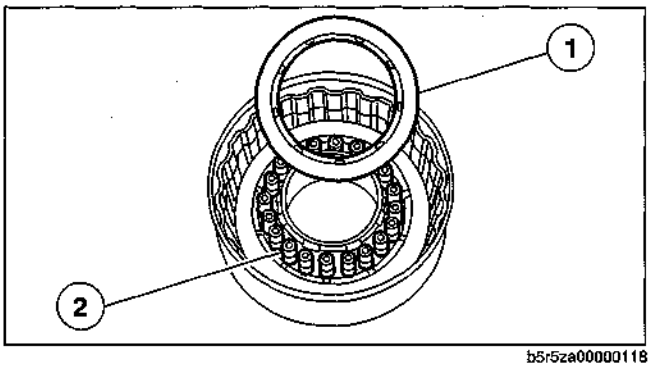
5. Remove the coast clutch piston springs.
   (1) Remove the coast clutch piston spring retainer.
   (2) Remove the coast clutch piston springs.

Warning
- **Air pressure must not exceed 138 kPa {1.4 kgf/cm^2, 20 psi}. Wear safety glasses when using compressed air and make sure the drum is facing down as shown. Failure to follow these instructions may result in personal injury.**



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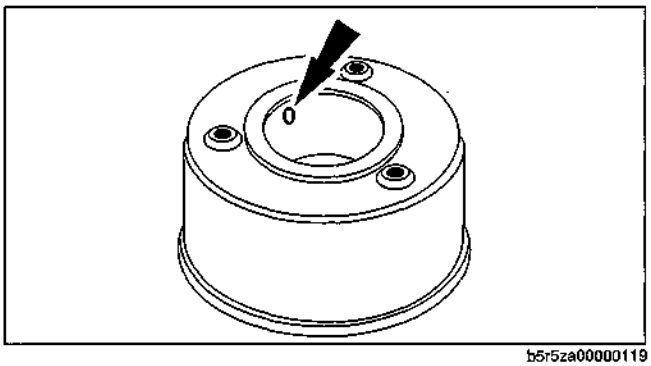
6. Remove the coast clutch piston.
   - Apply air pressure to the hole in the drum to remove the coast clutch piston while blocking the other hole with a finger.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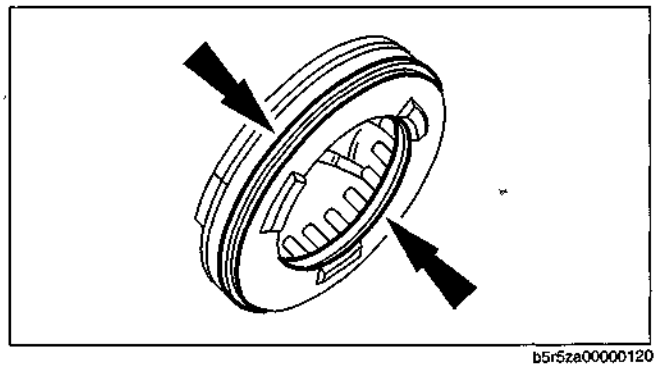
7. Remove and discard the coast clutch piston inner seal and the coast clutch piston outer seal.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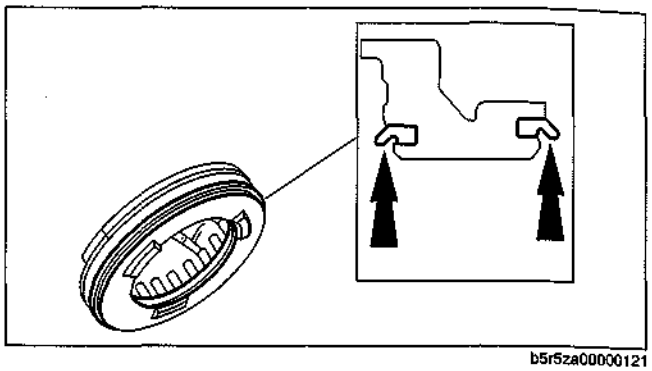
Assembly

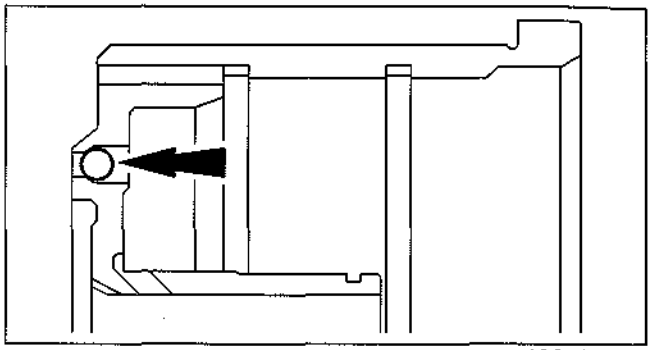
Caution
- **The lip seals must be positioned as shown. Care must be taken to prevent rollover of the lip seal.**

1. Install the new coast clutch piston inner and outer seal.

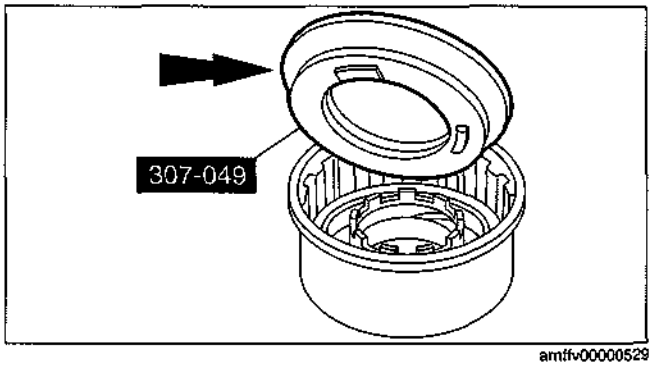

b5r5za00000121

2. Verify the check ball is free to move.

Caution
- **Care must be taken to prevent damage to the seals during installation.**


b5r5za00000122

3. Using the **SST**, install the coast clutch piston.
   - Lubricate the seals with transmission fluid.



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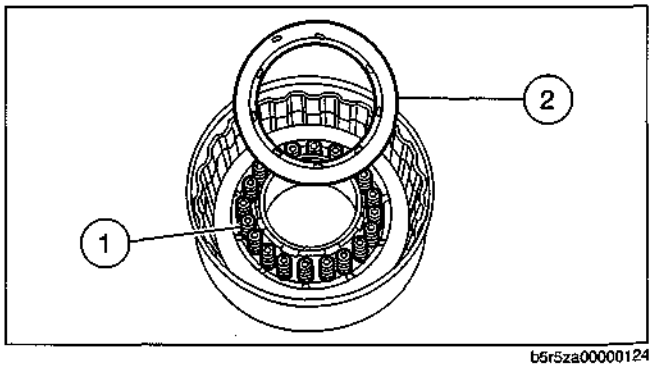
4. Install the coast clutch piston springs.
   (1) Install the coast clutch piston springs.
   (2) Install the coast clutch piston spring retainer.

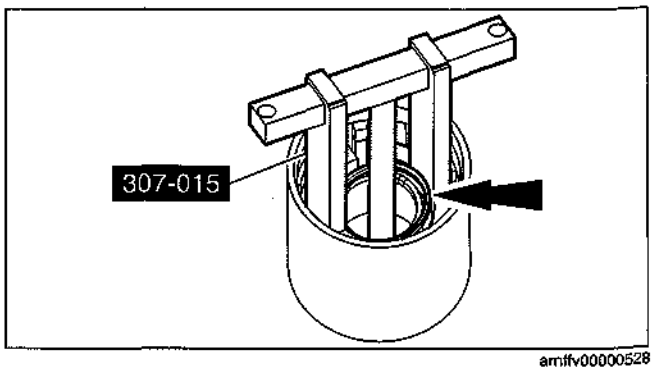
Caution
- **Do not fully compress the SST or damage to the coast clutch piston spring retainer may occur.**



b5r5za00000124

5. Using the **SST**, install the spring retainer ring.

Caution
- **Coast clutch friction plates are directional and must be installed with grooves clockwise (ID to OD). The word TOP should face up.**
- **If new clutch plates are being used, they should be soaked in clean ATF before assembly.**



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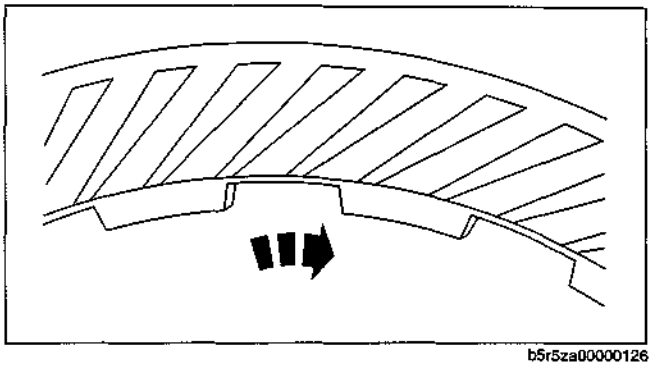
6. When installing friction plates, the word TOP should face up. If reusing plates, grooves must be installed clockwise. Install the coast clutch disc pack.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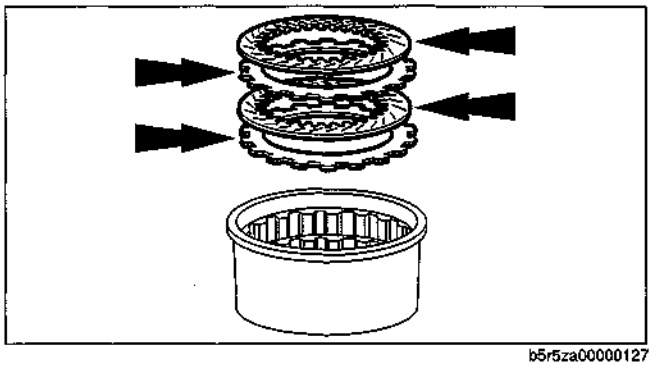
7. Install the 2 steel clutch plates and 2 friction clutch plates in alternating order starting with a steel clutch plate.

Caution
- **The retaining ring is select fit.**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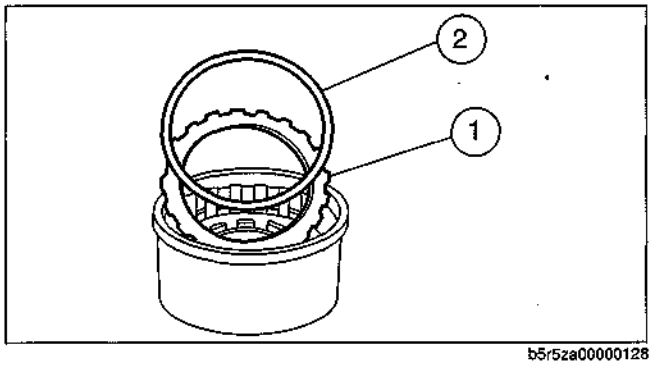
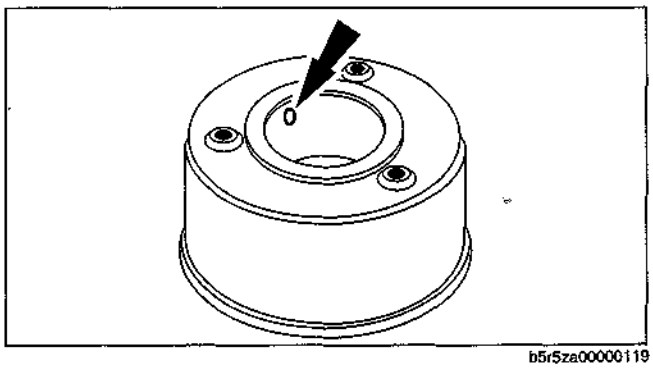
8. Install the coast clutch pressure plate.
   (1) Install the coast clutch pressure plate.
   (2) Install the original retaining ring.

Warning
- **Air pressure must not exceed 138 kPa {1.4 kgf/cm^2, 20 psi}. Wear safety glasses when using compressed air and make sure drum is facing down as shown. Failure to follow these instructions may result in personal injury.**



b5r5za00000128

9. Air check the assembly.
   - Apply air pressure to the hole in the drum while blocking the other hole with a finger.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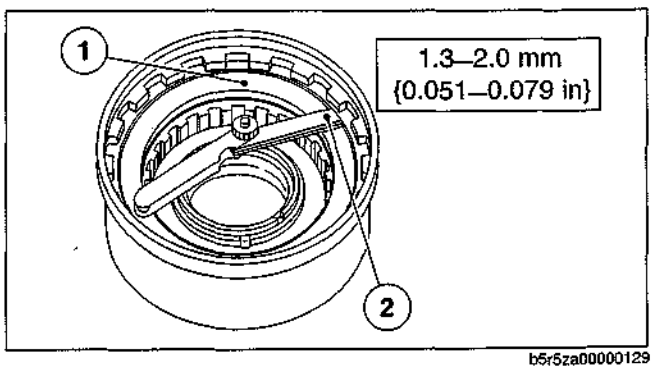
10. Check the coast clutch disc pack free play.
    (1) Push down on the coast pressure plate.
    (2) Check clearance between the coast clutch retaining ring and coast pressure plate. Clearance should be **1.3—2.0 mm {0.051—0.079 in}**. If clearance is not within the specification, install a correct coast clutch retaining ring that will provide the correct free play adjustment.

Coast clutch clearance
Standard: 1.3—2.0 mm {0.051—0.079 in}



b5r5za00000129

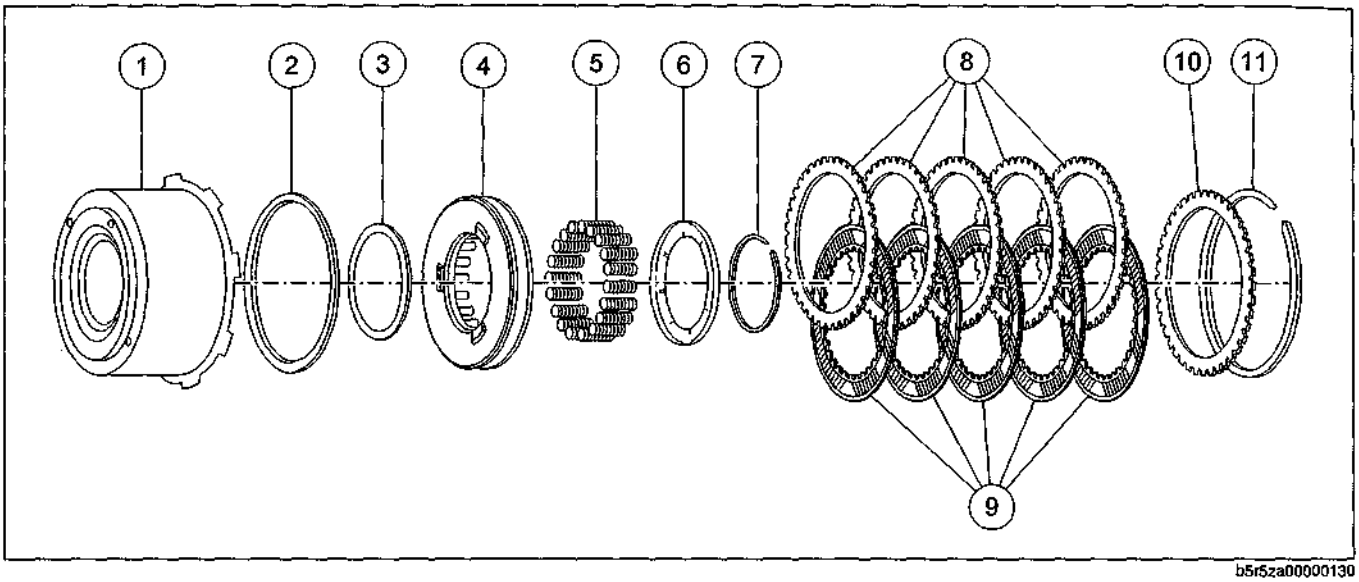
Retaining ring size for coast clutch clearance

Thickness		Diameter	
mm	in	mm	in
1.37	0.0539	130.1	5.122
1.73	0.0681	130.1	5.122
2.08	0.0819	130.1	5.122
2.44	0.0961	130.1	5.122

INTERMEDIATE BRAKE AND DIRECT CLUTCH DRUM COMPONENT DISASSEMBLY/ASSEMBLY[5R55S]

id0513c1262200

Intermediate Brake and Direct Clutch Drum Component



b5r5za00000130

1	Intermediate brake drum
2	Direct clutch piston outer seal ring
3	Direct clutch piston inner seal ring
4	Direct clutch piston
5	Direct clutch piston spring (20 required)
6	Direct clutch piston spring retainer

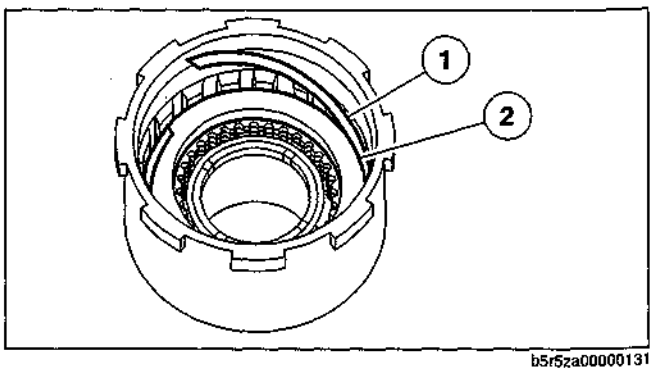
7	Retaining ring
8	Direct clutch external spline plate (steel)
9	Direct clutch internal spline plates (friction)
10	Direct clutch pressure plate
11	Retaining ring (select fit)

Disassembly

Caution
- **The retaining ring is a select fit. See assembly procedure if installation of new ring or clutch pack is required.**

1. Remove the retaining ring and the direct clutch pressure plate.
   (1) Remove the retaining ring.
   (2) Remove the direct clutch pressure plate.

Caution
- **Clutch plates are directional. Note the direction of the grooves for installation.**

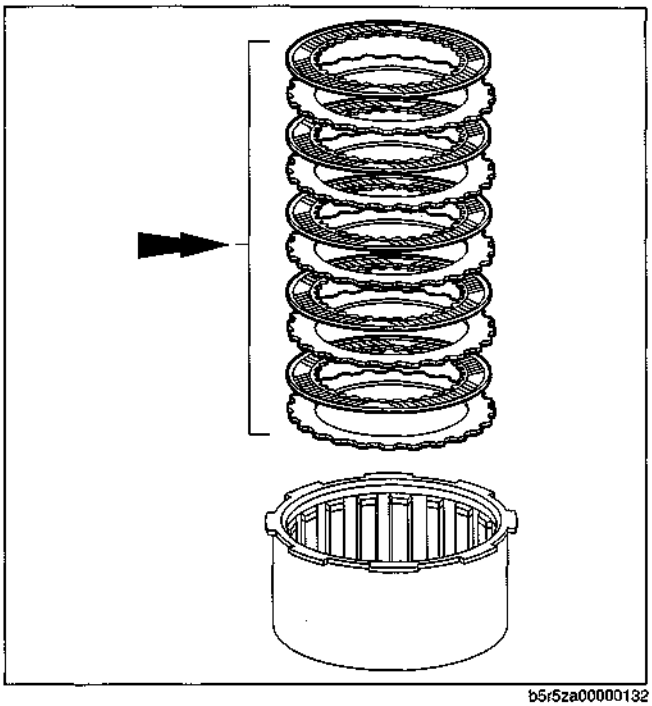


b5r5za00000131

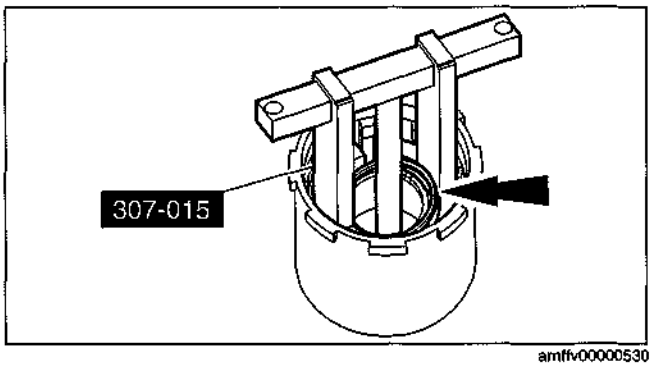
2. Remove the direct clutch disc pack.
   - Inspect and install new friction plates if worn, damaged or overheated.
   - Measure and record the thickness of the steel plates for assembly.

Warning
- **After removing the retaining ring, use care when releasing the pressure on the springs. Failure to follow these instructions may result in personal injury.**

Caution
- **Do not fully compress the SST or damage to the spring retainer may occur.**


b5r5za00000132

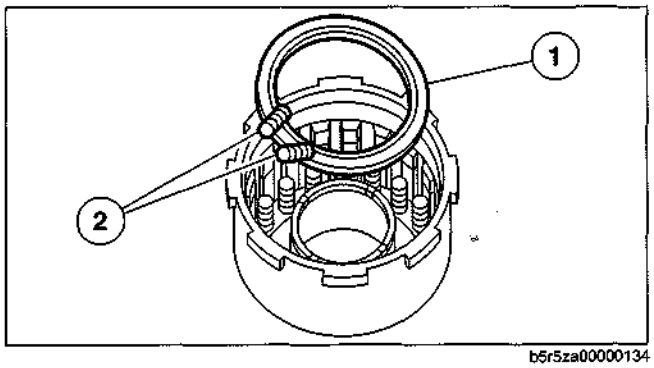
3. Using the **SST**, remove the retaining ring.
4. Relieve the direct clutch spring tension and remove the **SST**.



amffv00000530

5. Remove the direct clutch piston spring retainer and the direct clutch piston springs.
   (1) Remove the direct clutch piston spring retainer.
   (2) Remove the direct clutch piston springs.

Warning
- **Air pressure must not exceed 138 kPa {1.4 kgf/cm^2, 20 psi}. Wear safety glasses when using compressed air, and make sure the drum is facing down as shown. Failure to follow these instructions may result in personal injury.**



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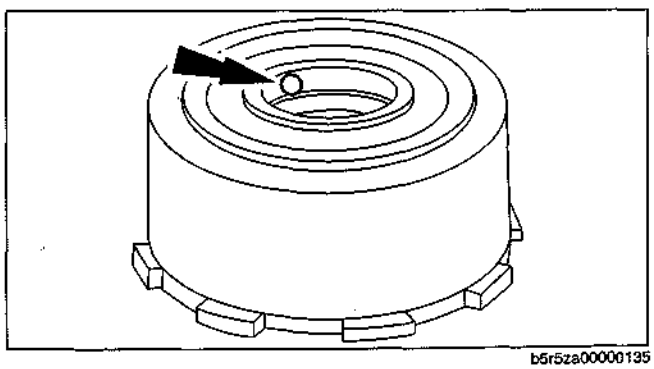
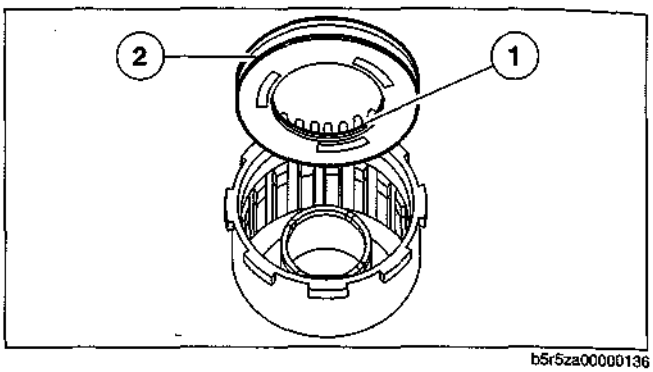
6. Using compressed air, remove the direct clutch piston from the intermediate brake drum.
   - Apply air pressure to the hole in the drum while blocking the other hole with a finger.


b5r5za00000135

7. Remove and discard the direct clutch piston inner and outer seal.
   (1) Remove and discard the direct clutch piston inner seal ring.
   (2) Remove and discard the direct clutch piston outer seal ring.
      • Clean the components as necessary.



b5r5za00000136

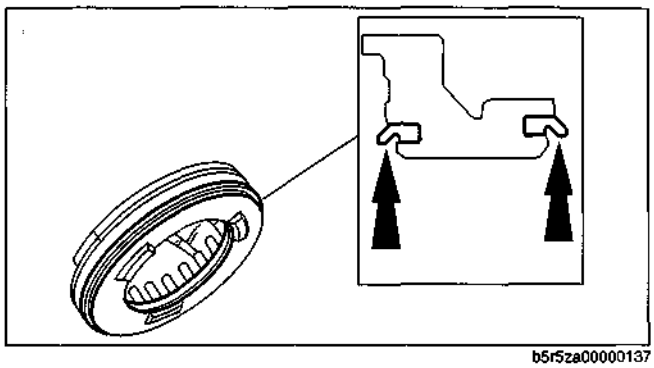
Assembly

Caution
- **The lip seals must be positioned as shown. Care must be taken to prevent rollover of the lip seal.**

1. Install the new direct clutch piston inner seal ring and the direct clutch piston outer seal ring.

Note
- Use new seals to help prevent seal failures.

Caution
- **Lubricate the direct clutch piston inner and outer seal rings with clean ATF.**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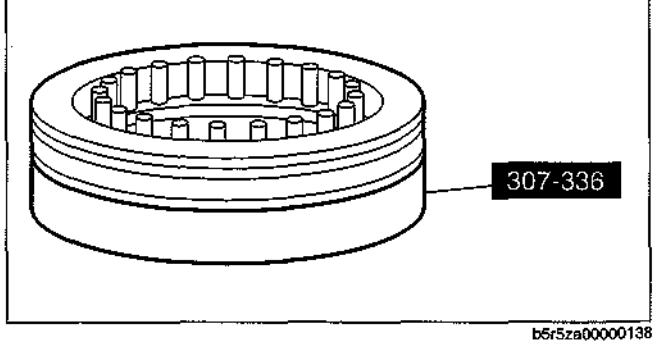
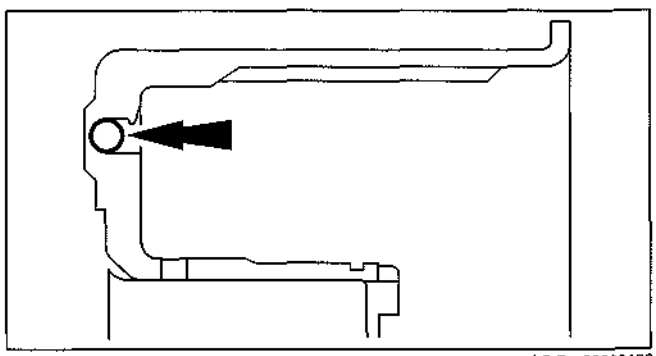
2. Install the direct clutch piston into the **SST**.



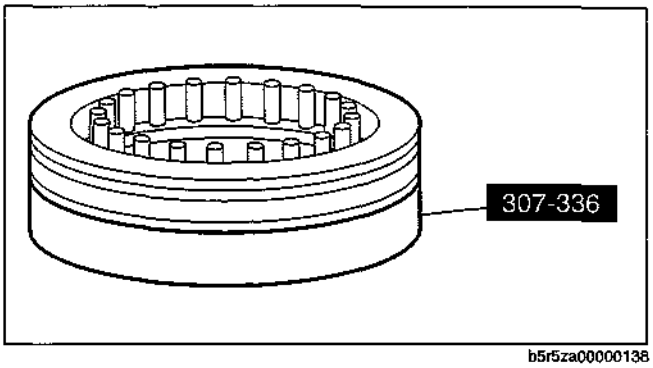
b5r5za00000138

3. Inspect the clutch components for damage or wear. Install new components as necessary.
   • Inspect the drum surface for damage.
   • Inspect the clutch piston bore and piston.
   • Check the fluid passages for obstructions. All fluid passages must be clean and free of obstructions.
   • Inspect the clutch plates for damage.
   • Inspect the clutch springs.
   • Verify the check ball is free to move.


b5r5za00000139

4. Carefully remove the direct clutch piston from the **SST**.

Caution
- **Care must be taken to prevent damage to the seals during installation.**



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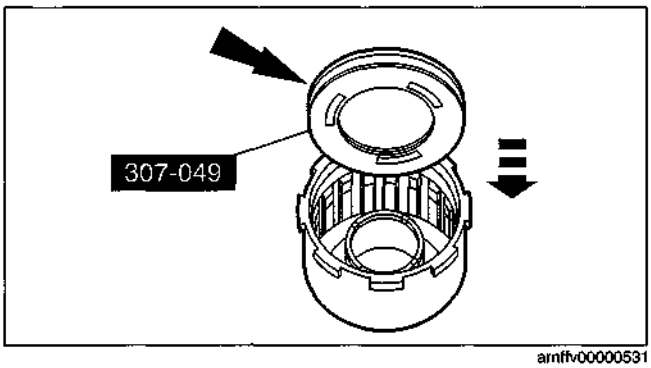
5. Using the **SST**, install the direct clutch piston.
   - Lubricate the seals with transmission fluid before installing.

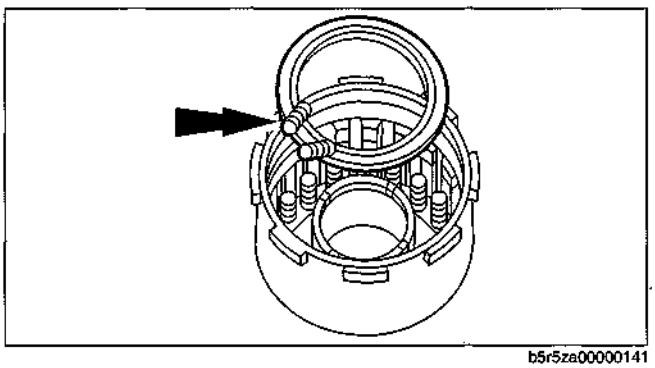


arnffv00000531

6. Install the direct clutch piston springs and the retainer.

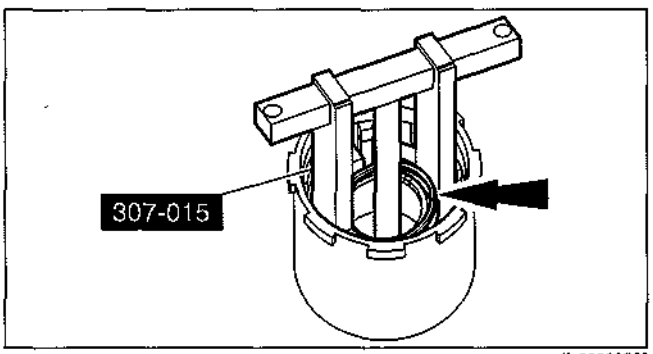
Warning
- **After removing the retaining ring, use care when releasing the pressure on the springs. Failure to follow these instructions may result in personal injury.**

Caution
- **Do not fully compress the SST or damage to the spring retainer may occur.**


b5r5za00000141

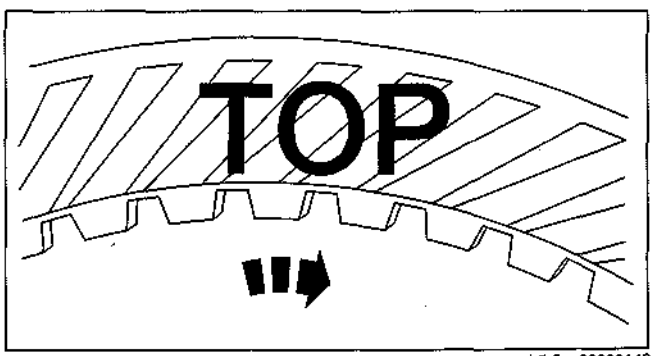
7. Using the **SST**, install the retaining ring.
8. Relieve the direct clutch spring tension and remove the **SST**.

Caution
- **The direct clutch friction plates are directional and must be installed with grooves pointing clockwise (ID to OD) and the word TOP facing up.**
- **If new plates are used, they should be soaked in clean ATF before assembly.**



arnffv00000530

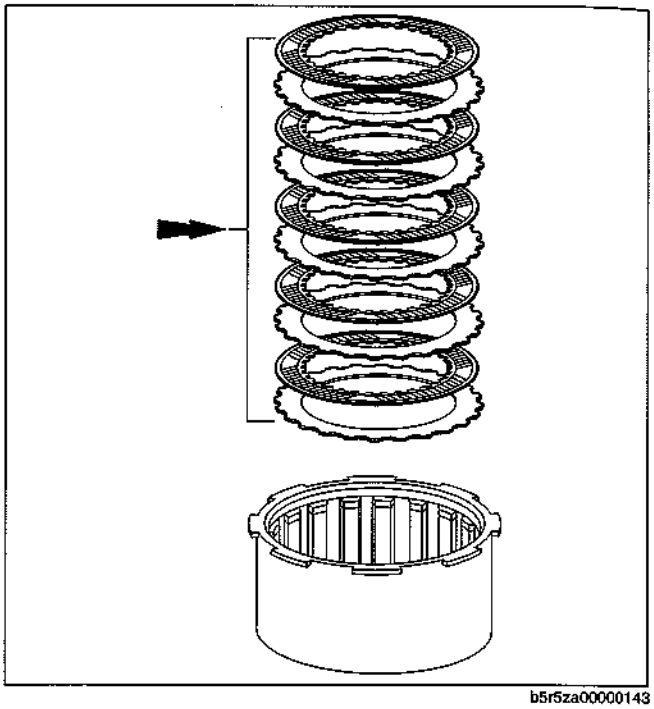
9. When installing friction plates, the word TOP should face up. If reusing plates, grooves must be installed clockwise. Install the direct clutch disc pack.



b5r5za00000142

10. Install the steel clutch plates and friction clutch plates in alternating order starting with a steel clutch plate.

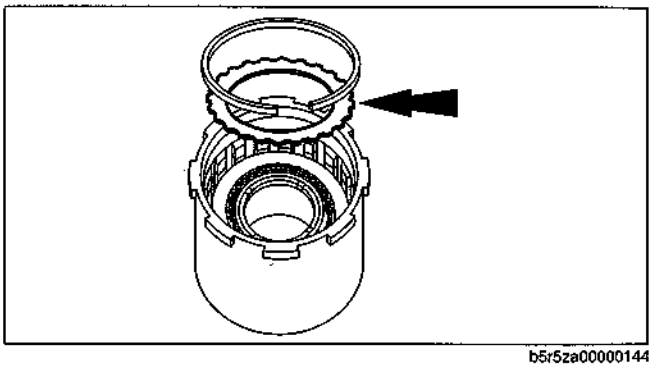
Caution
- **The retaining ring is a select fit.**


b5r5za00000143

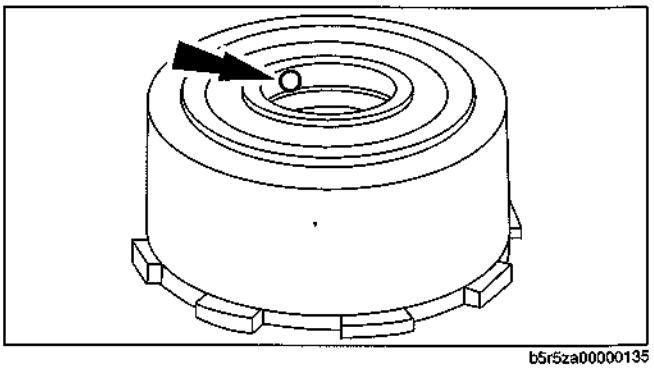
11. Install the direct clutch pressure plate using the original retaining ring.

Warning
- **Air pressure must not exceed 138 kPa {1.4 kgf/cm^2, 20 psi}. Wear safety glasses when using compressed air, and make sure drum is facing down as shown. Failure to follow these instructions may result in personal injury.**

Note
- The direct clutch piston must apply with air pressure and release when air is removed.

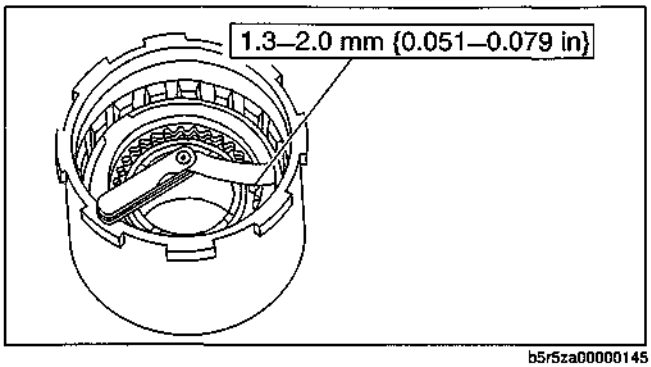

b5r5za00000144

12. Air check the assembly.
- Apply air pressure to the hole in the drum while blocking the other hole with a finger.


b5r5za00000135

13. Push down on the direct clutch disc pack and check the gap between the direct clutch retaining ring and the direct clutch pressure plate with a feeler gauge.
    - If the specifications do not match, use a select fit direct clutch retaining ring to match specifications and verify with a feeler gauge.

Direct clutch clearance
Standard: 1.3—2.0 mm {0.051—0.079 in}



b5r5za00000145

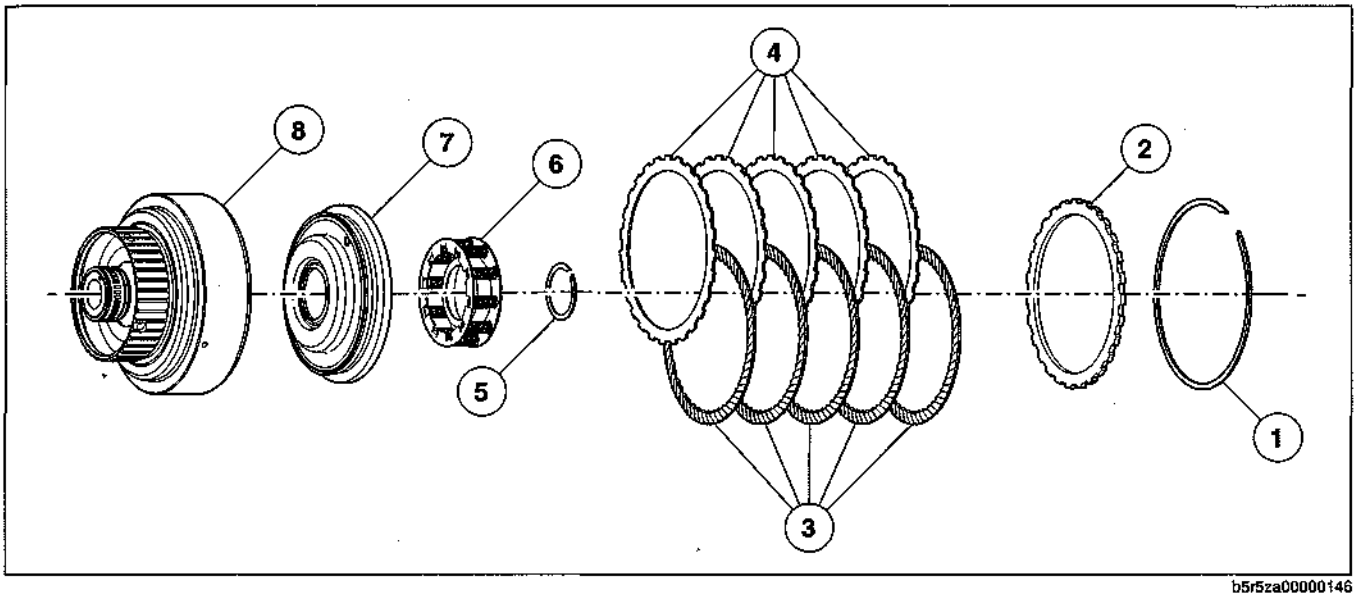
Retaining ring size for direct clutch clearance

Thickness		Diameter	
mm	in	mm	in
1.37	0.0539	130.1	5.122
1.73	0.0681	130.1	5.122
2.08	0.0819	130.1	5.122
2.44	0.0961	130.1	5.122

FORWARD CLUTCH DISASSEMBLY/ASSEMBLY[5R55S]

id0513c1262300

Forward Clutch Component



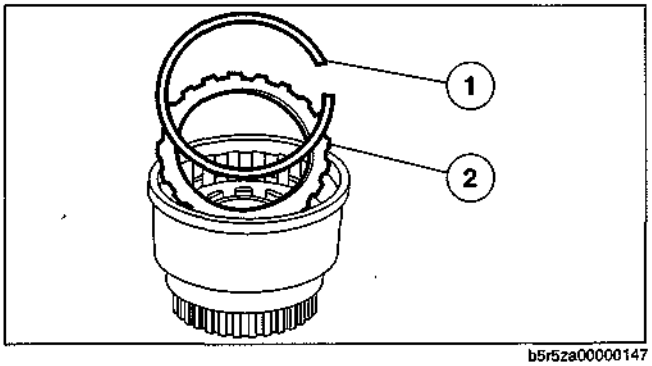
b5r5za00000146

1	Retaining ring (select fit)
2	Forward clutch pressure plate
3	Forward clutch internal spline plate (friction)
4	Forward clutch external spline plate (steel)

5	Retaining ring
6	Forward clutch piston spring component
7	Forward clutch piston
8	Forward clutch cylinder

Disassembly

1. Remove the pressure plate.
   (1) Remove the retaining ring.
   (2) Remove the pressure plate.

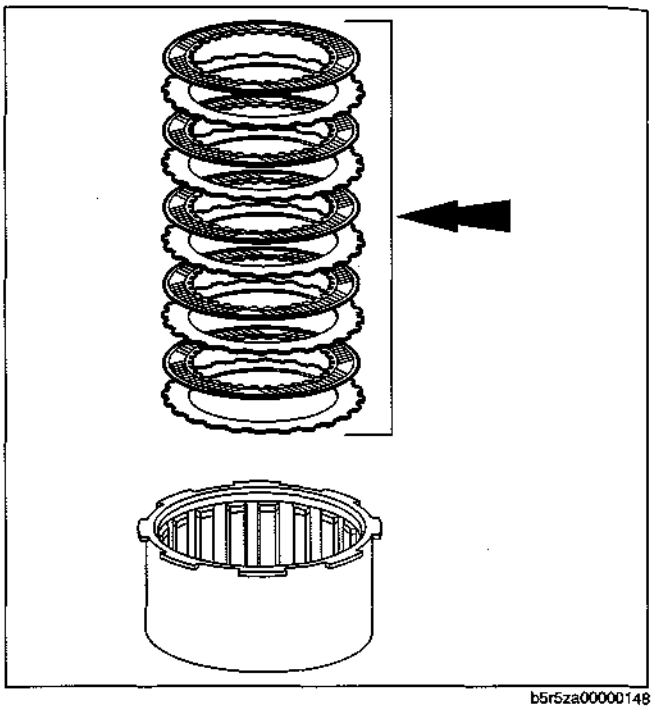


b5r5za00000147

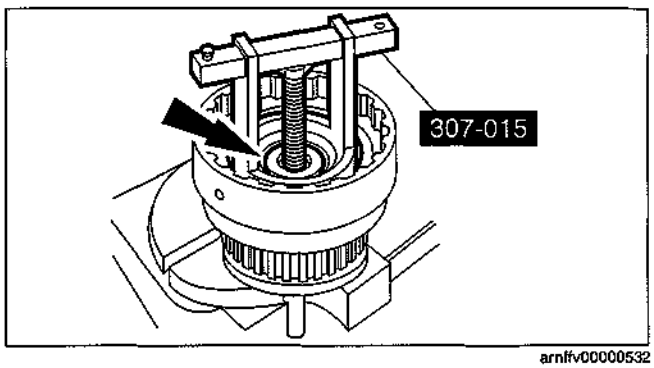
2. Remove the forward clutch disc pack.
   - Inspect the forward clutch plates for wear, damage or overheating.

Warning
- **Use caution when releasing tool pressure on the clutch piston springs. Failure to follow these instructions may result in personal injury.**

Caution
- **Do not fully depress the SST or damage to the spring retainer may occur.**


b5r5za00000148

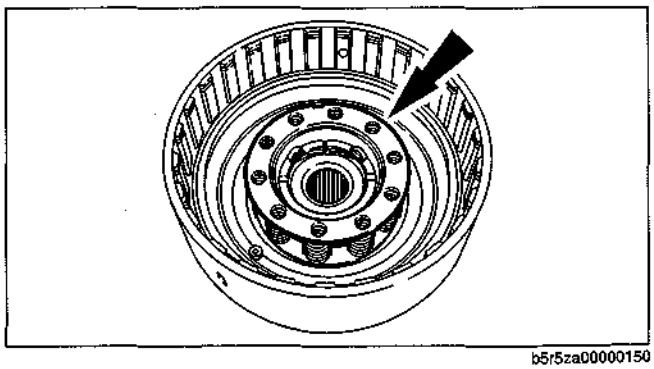
3. Using the **SST**, remove the retaining ring.
4. Relieve the forward clutch spring tension and remove the **SST**.



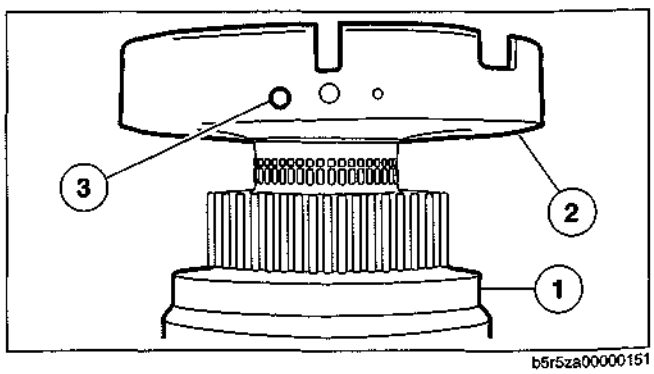
arnlfv00000532

5. Remove the forward clutch piston spring component.

Warning
- **Air pressure must not exceed 138 kPa {1.4 kgf·m, 20 psi}. Wear safety glasses when using compressed air. Make sure the cylinder is facing down as shown. Failure to follow these instructions may result in personal injury.**


b5r5za00000150

6. Remove the forward clutch piston.
   (1) Place the forward clutch cylinder with forward clutch piston facing down.
   (2) Install the center support on the forward clutch cylinder.
   (3) Apply air pressure to the left port of the center support.

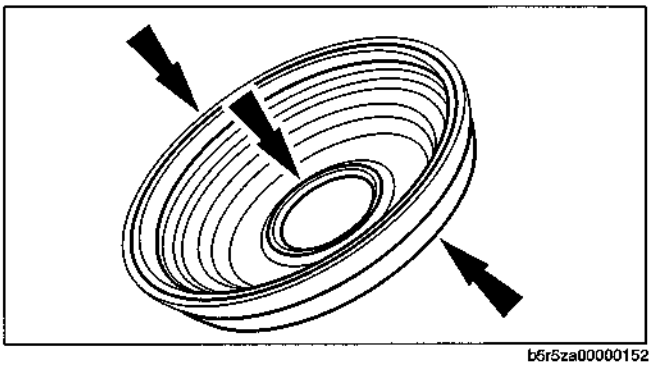


b5r5za00000151

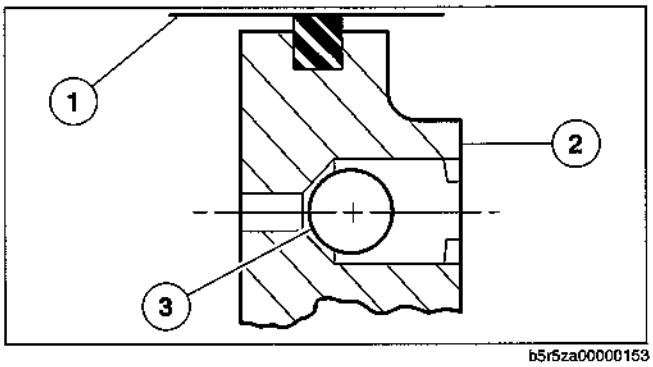
Assembly

1. Inspect the clutch components for damage or wear. Install new components as necessary.
   - Check the fluid passages for obstructions. All fluid passages must be clean and free of obstructions.
   - Inspect the clutch plates for damage.
   - Inspect the clutch piston springs.
   - Inspect the needle bearing and seal rings for damage.
   - Check clutch hub thrust surfaces for damage.
   - Check clutch plates for flatness and fit on the clutch hub serrations.
2. Inspect the forward clutch piston and seals.

   Note
   - If the seals on the forward clutch piston show any signs of damage, a new forward clutch piston will need to be installed.


b5r5za00000152

3. Inspect the forward clutch drum component.
   (1) Inspect the forward clutch cylinder surfaces for scores or burrs.
   (2) Inspect the forward clutch piston for scores or burrs.
   (3) Verify the check ball is free to move in the piston.

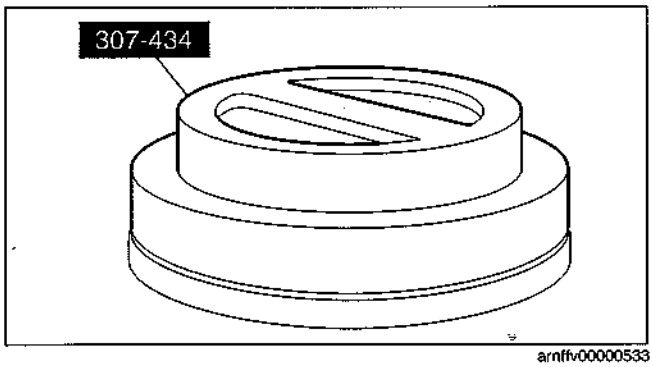


b5r5za00000153

4. Install the **SST** on the forward clutch piston.

   Note
   - The **SST** must be installed on the forward clutch piston for a couple of minutes prior to installing it into the forward clutch cylinder.

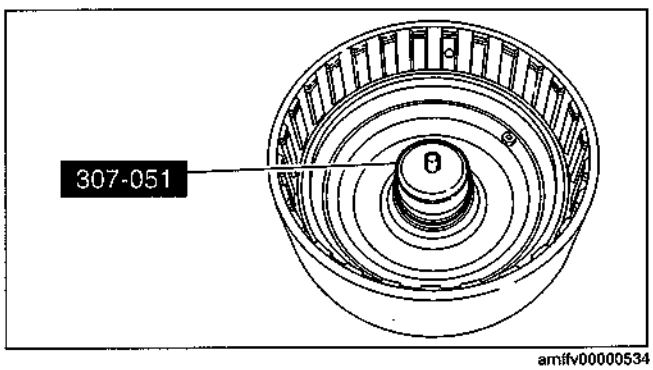
   Caution
   - **Care must be taken to prevent damage to the seals.**



amlfv00000533

5. Using the **SST**, install the forward clutch piston component into the forward clutch cylinder.

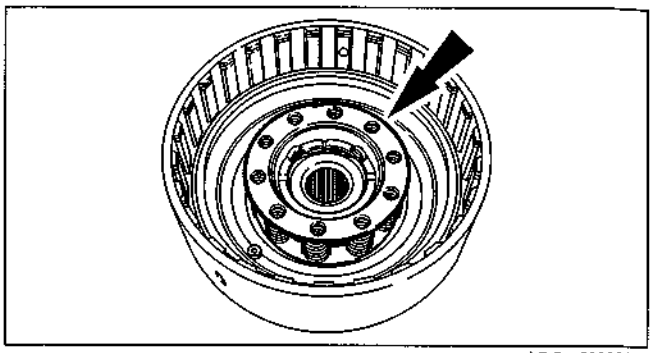
   Note
   - Lubricate the forward clutch piston inner and outer seal with clean ATF.



amlfv00000534

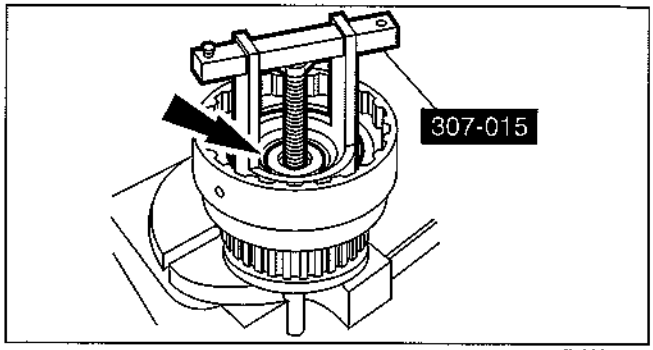
6. Install the forward clutch piston spring component.

Caution
- **Do not fully depress the clutch piston spring compressor or damage to the spring retainer may occur.**


b5r5za00000150

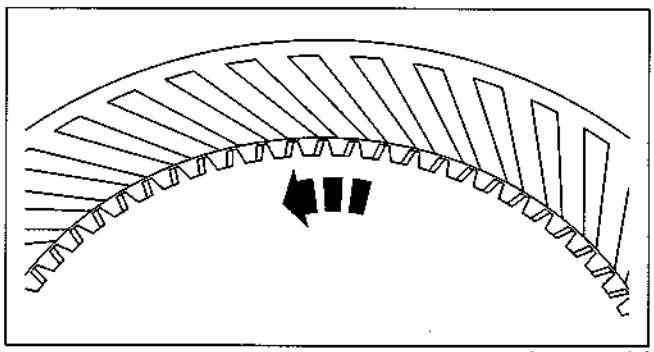
7. Using the **SST**, install the spring retaining ring.

Caution
- **The forward clutch friction plates are directional and must be installed with grooves pointing counterclockwise.**
- **If new plates are used, they should be soaked in clean ATF before assembly.**



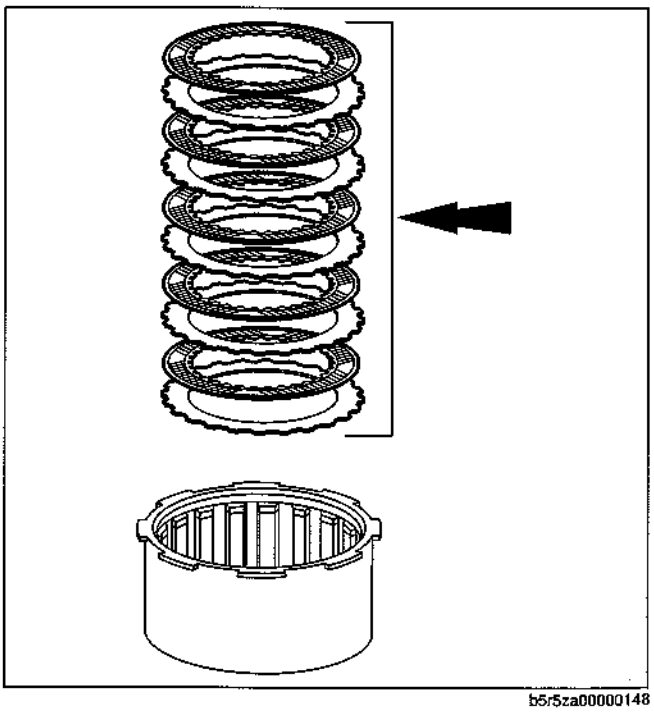
amffv00000532

8. If reusing plates, grooves must be installed counterclockwise. Install the direct clutch disc pack.


b5r5za00000156

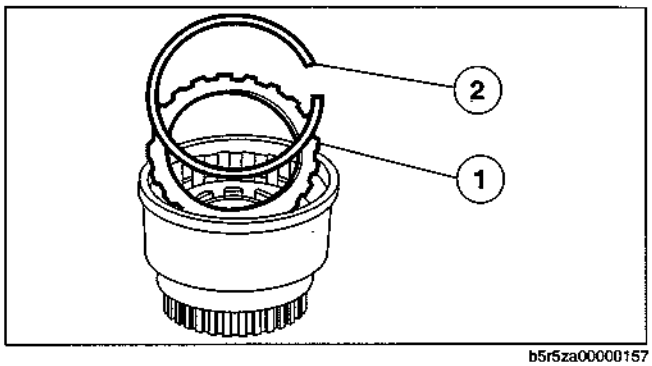
9. Install the steel clutch plates and friction clutch plates in alternating order starting with a steel clutch plate.

Caution
- **The retaining ring is a select fit.**


b5r5za00000148

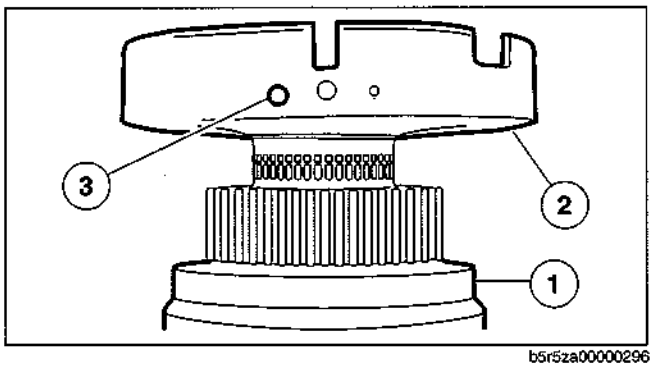
10. Install the original selective retaining ring.
    (1) Install the forward clutch pressure plate.
    (2) Install the original selective retaining ring.

Warning
- **Air pressure must not exceed 138 kPa {1.4 kgf/cm^2, 20 psi}. Wear safety glasses when using compressed air. Make sure the cylinder is facing down as shown. Failure to follow these instructions may result in personal injury.**



b5r5za00000157

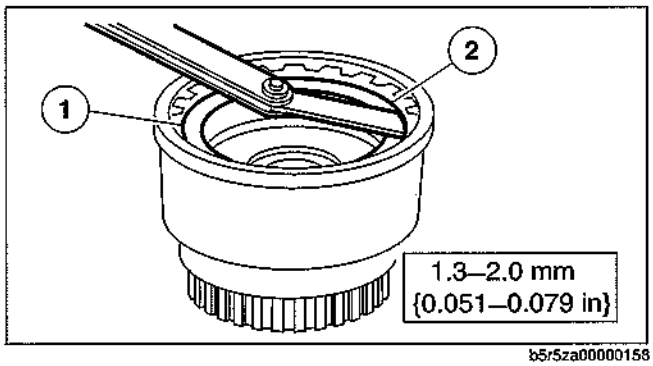
11. Air check the forward clutch piston.
    (1) Place the forward clutch cylinder with forward clutch piston facing down.
    (2) Install the transmission center support on the forward clutch cylinder.
    (3) Apply air pressure to the left port of the center support.



b5r5za00000296

12. Check the forward clutch disc pack free play.
    (1) Press down on the forward clutch disc pack.
    (2) Using a feeler gauge, check the gap between the forward clutch retaining ring and the forward clutch pressure plate.
        - If the clearance is not within specifications, install the correct size retaining ring.

Forward clutch clearance
Standard: 1.3—2.0 mm {0.051—0.079 in}



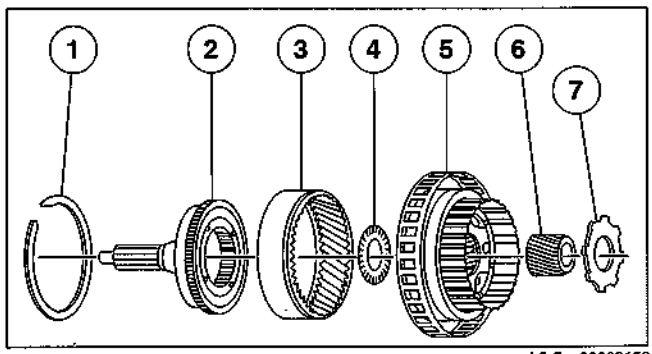
b5r5za00000158

Retaining ring size for forward clutch clearance

Thickness		Diameter	
mm	in	mm	In
1.73	0.0681	141.45	5.65
2.08	0.0819	141.45	5.65
2.44	0.0961	141.45	5.65

OVERDRIVE PLANETARY GEAR AND ONE-WAY CLUTCH COMPONENT DISASSEMBLY/ASSEMBLY[5R55S]
Id0513c1262400

1	Retaining ring
2	Overdrive center shaft
3	Overdrive ring gear
4	Thrust bearing (No.2)
5	Overdrive planetary gear carrier component
6	Overdrive sun gear
7	Carrier adapter



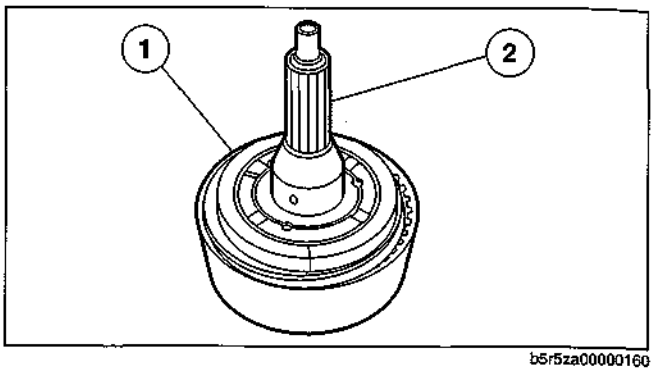
b5r5za00000159

Overdrive Center Shaft Component Disassembly

1. Remove the overdrive center shaft from the overdrive ring gear.
   (1) Remove the retaining ring.
   (2) While rotating counterclockwise remove the overdrive center shaft from the ring gear.

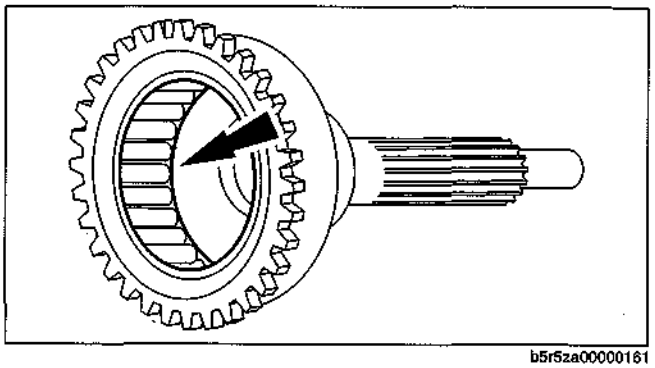
   Note
   - The overdrive one-way clutch is serviced with the overdrive center shaft component.

   Caution
   - **Do not remove the overdrive one-way clutch. Damage to the clutch may occur if it is removed.**

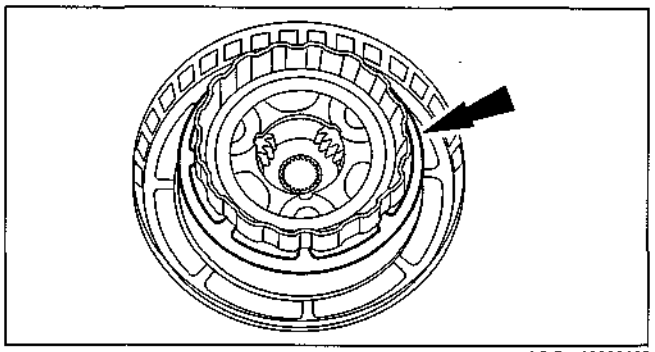


b5r5za00000160

2. Clean and inspect the overdrive one-way clutch and overdrive center shaft.
   - Inspect for cracks in the roller cage and wear on the roller clutch and the press fit of the one-way clutch to the overdrive center shaft.

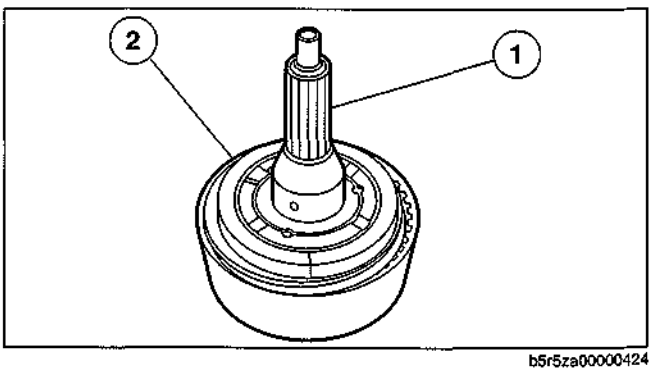

b5r5za00000161

3. Inspect the one-way clutch.
   - Temporarily insert the overdrive planetary gear carrier component into the one-way clutch rollers for verification of the one-way clutch.
   - The planetary gear must rotate counterclockwise and hold when rotated clockwise.
   - Remove the planetary gear carrier component.


b5r5za00000162

Overdrive Center Shaft Component Assembly

1. Install the overdrive center shaft and one-way clutch.
   (1) Install the overdrive center shaft and one-way clutch.
   (2) Install the retaining ring.

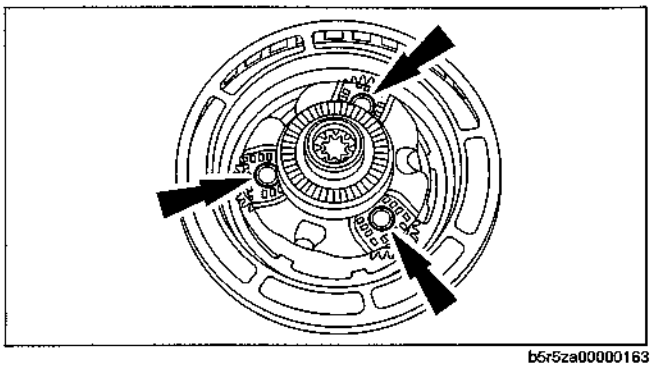


b5r5za00000424

Overdrive Planetary Gear Component Disassembly

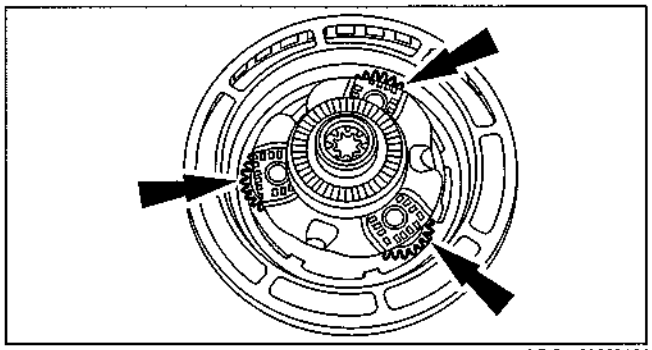
1. Before installing a planetary component, the shaft retaining pins should be checked for adequate staking. Check the pins and shafts in the planetary assemblies for loose fit and/or complete disengagement. Install a new planetary component if necessary.

   Note
   - Individual parts of the planetary carriers are not serviceable.



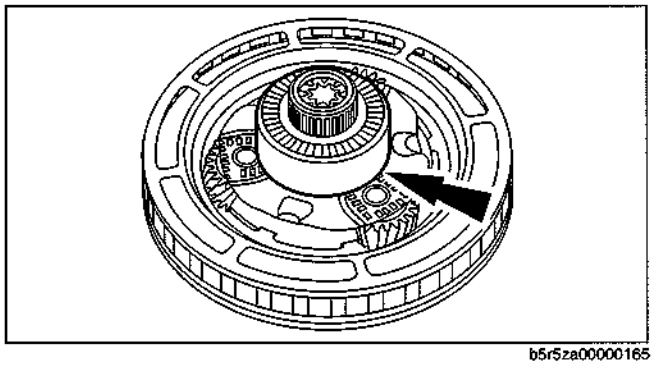
b5r5za00000163

2. Inspect the pinion gears for damaged or excessively worn teeth and for free rotation.



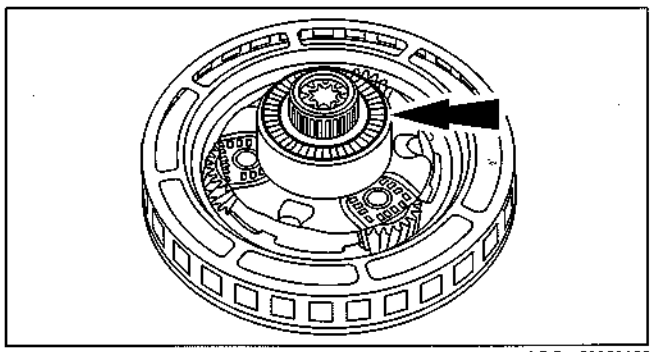
b5r5za00000164

3. Inspect the overdrive one-way clutch inner race and the inner and outer races for scored or damaged surface areas where the rollers contact the races.



b5r5za00000165

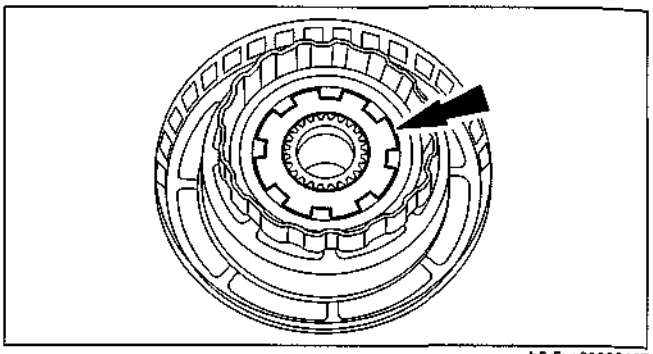
4. Remove and inspect the No.2 overdrive planetary thrust bearing on the nose of the overdrive planetary gear carrier component.



b5r5za00000166

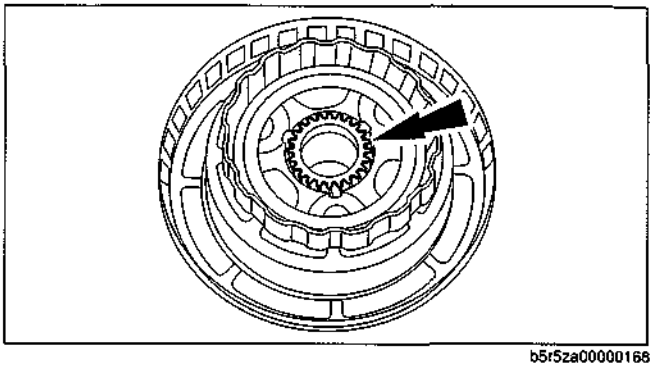
5. Remove the carrier adapter.

Note
- Inspect the sun gear for damaged or worn teeth.

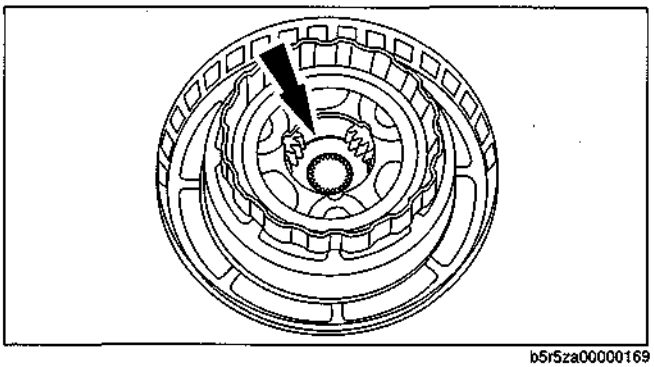

b5r5za00000167

6. Remove and inspect the overdrive sun gear.

Caution
- **Do not attempt to remove the thrust bearing (No.12) from behind the pinion gears.**


b5r5za00000168

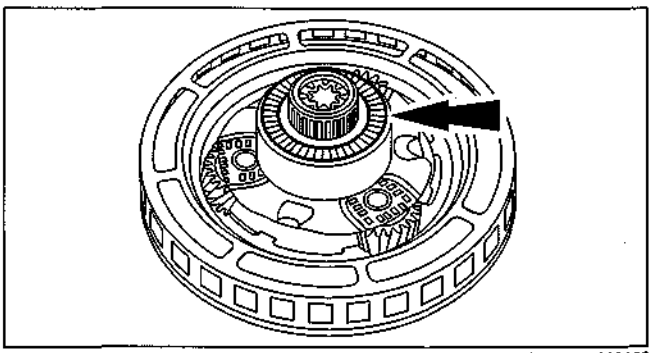
7. Inspect the thrust bearing (No. 12) for damage.


b5r5za00000169

Overdrive Planetary Gear Component Assembly

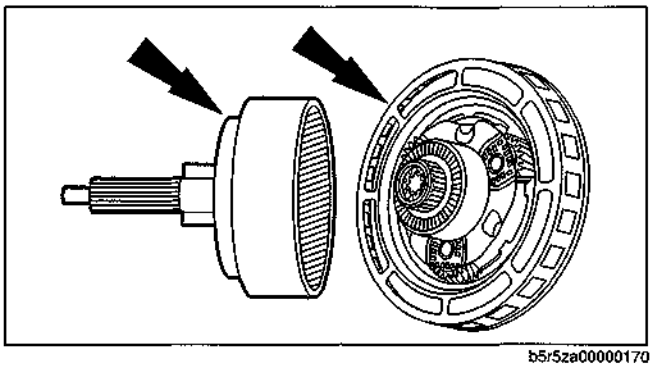
1. Install the No.2 overdrive planetary thrust bearing.

Note
- Thoroughly clean all parts and blow dry with moisture-free compressed air.
- Use petroleum jelly to hold the thrust bearing (No.2) in place.


b5r5za00000166

2. Install the overdrive planetary gear carrier into the center shaft and overdrive.

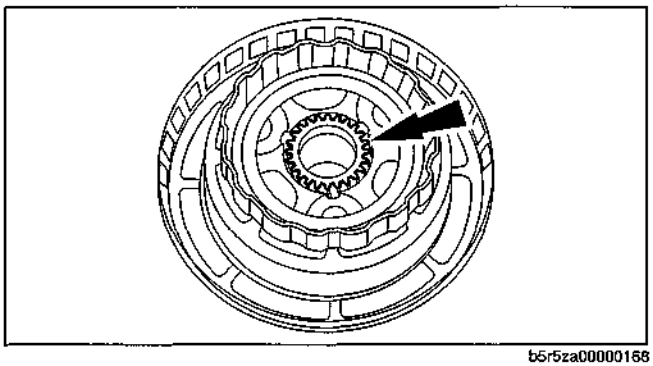
Caution
- **Make sure that the No.12 bearing is in place in the overdrive planetary prior to installing the overdrive sun gear.**



b5r5za00000170

3. Install the overdrive sun gear with the recessed gear teeth facing toward the adapter.

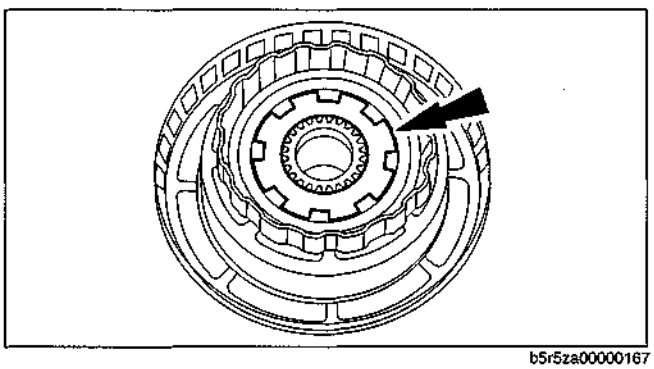
Caution
- **Adapter part number must not be visible after installation.**



b5r5za00000168

4. Install the carrier adapter.

Note
- Inspect the sun gear for damaged or worn teeth.

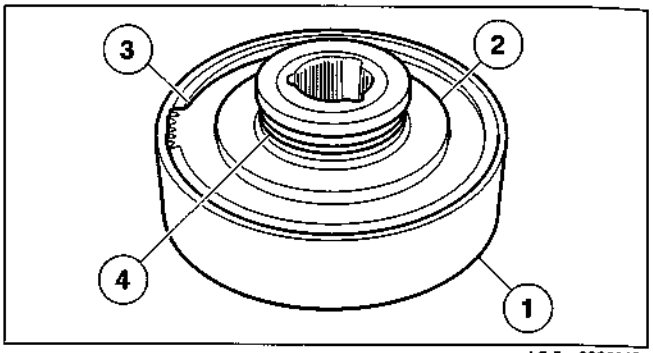


b5r5za00000167

OUTPUT SHAFT RING GEAR AND HUB SHAFT COMPONENT DISASSEMBLY/ASSEMBLY[5R55S]

id0513c1264500

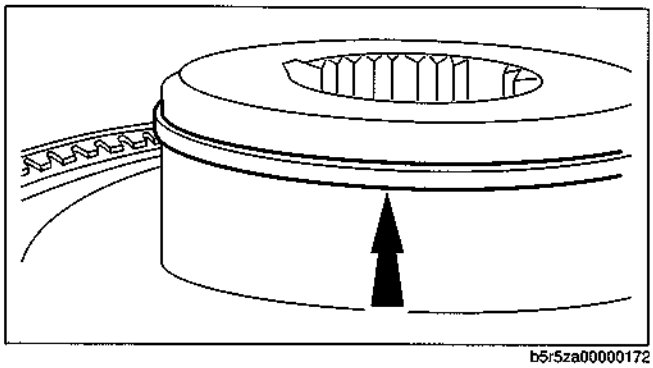
1	Retaining shaft ring gear
2	Center shaft hub
3	Retaining ring
4	Output shaft hub seal



b5r5za00000171

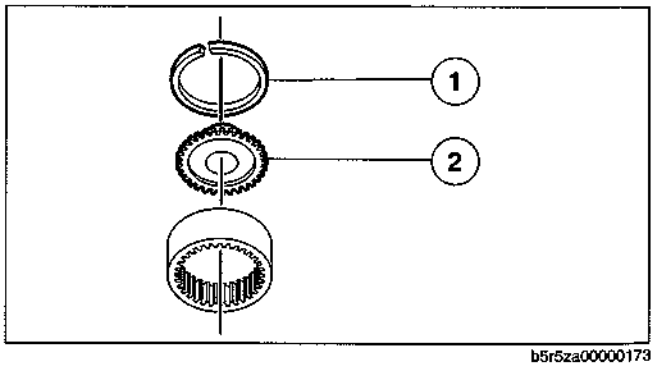
Disassembly

1. Inspect the output shaft ring gear and hub shaft component for damage.
   - If repair is necessary, use the following procedure.
2. Remove the seal.



b5r5za00000172

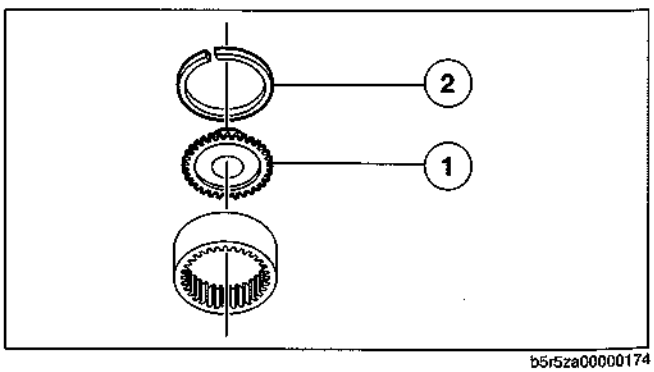
3. Remove the output shaft ring gear from the output shaft hub.
   (1) Remove the retaining ring.
   (2) Remove the output shaft ring gear.



b5r5za00000173

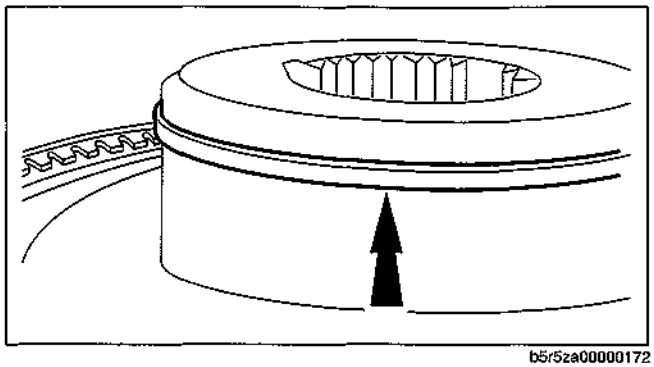
Assembly

1. Install the output shaft ring gear onto the output shaft hub.
   (1) Install the output shaft ring gear.
   (2) Install the retaining ring.



b5r5za00000174

2. Install the seal.



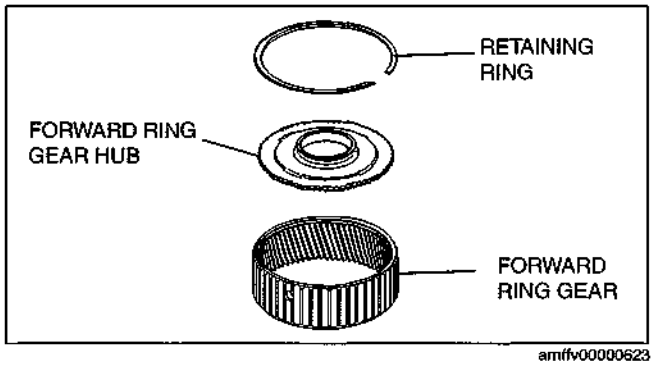
b5r5za00000172

FORWARD RING GEAR COMPONENT DISASSEMBLY/ASSEMBLY[5R55S]

id0513c1264900

Disassembly

1. Inspect the forward ring gear and hub component for damage.
   - If repair is necessary, use the following procedure.
2. Remove the forward ring gear hub from the forward ring gear.
   (1) Remove the retaining ring.
   (2) Remove the forward ring gear hub.



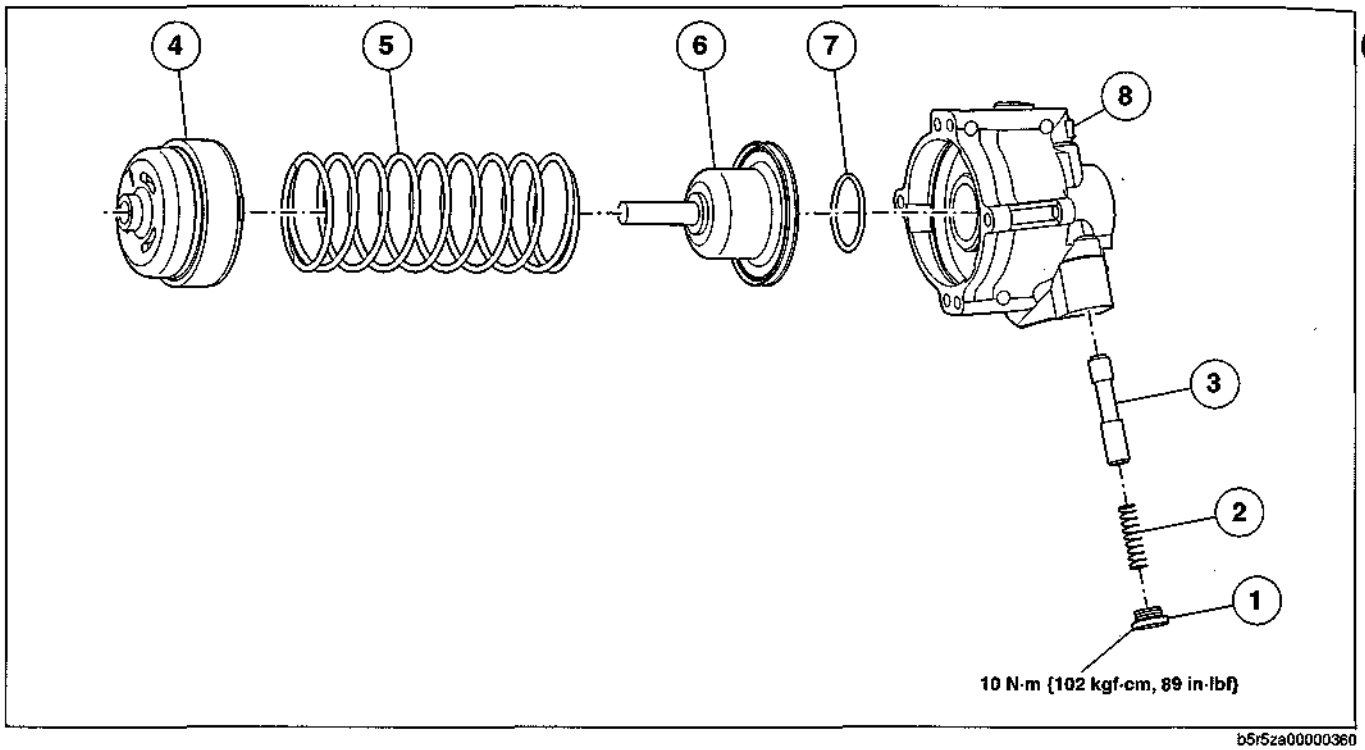
amfv00000623

Assembly

1. Install the forward ring gear hub onto the forward ring gear.
   (1) Install the forward ring gear hub
   (2) Install the retaining ring.

LOW/REVERSE BRAKE SERVO COMPONENT DISASSEMBLY/ASSEMBLY[5R55S]

id0513c1284600



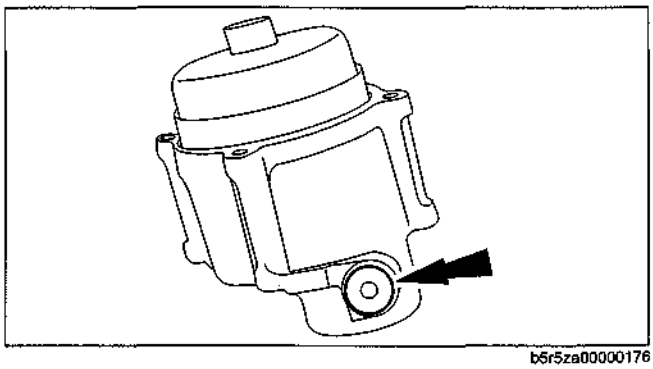
b5r5za00000360

1	Control valve spring retainer
2	Spring
3	Low/reverse brake servo check valve
4	Low/reverse brake servo plate

5	Spring
6	Low/reverse brake servo piston and seal
7	O-ring
8	Low/reverse brake servo cover

Disassembly

1. Remove the control valve spring retainer.

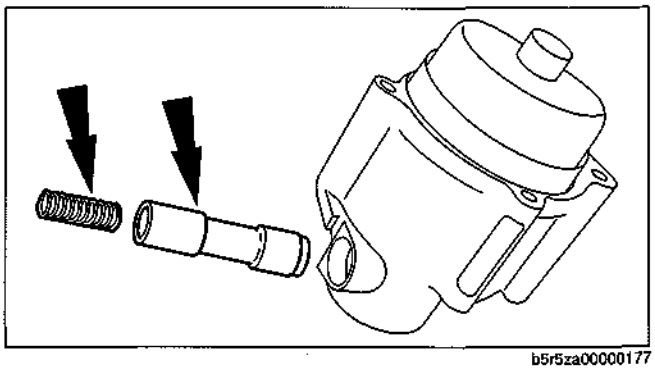


b5r5za00000176

2. Remove the low/reverse brake servo spring and check valve.

Warning

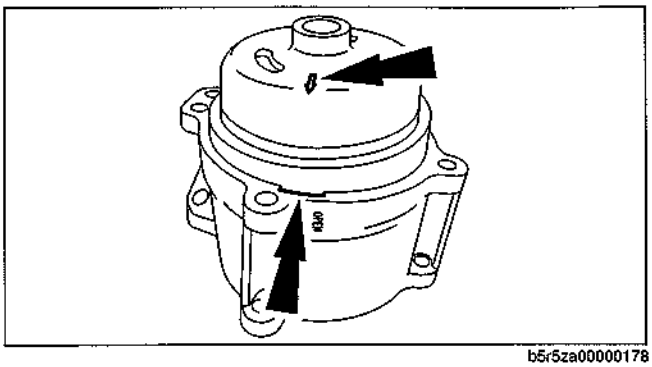
- **The upper and lower servo covers are under spring tension. Use care when separating the 2 halves. Failure to follow these instructions can result in personal injury.**



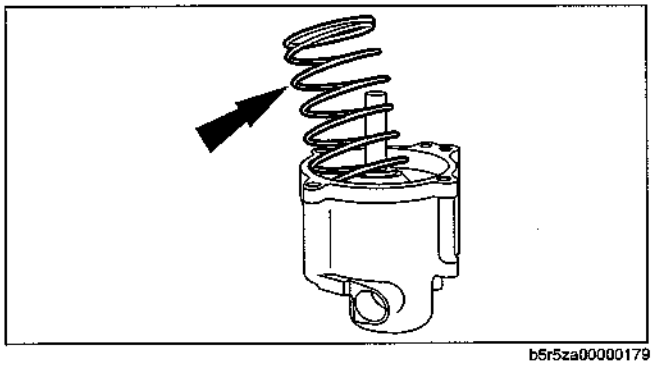
b5r5za00000177

3. Remove the low/reverse brake servo plate by turning in either direction to release.
   - Align the arrow on the servo plate with any slot on the cover.

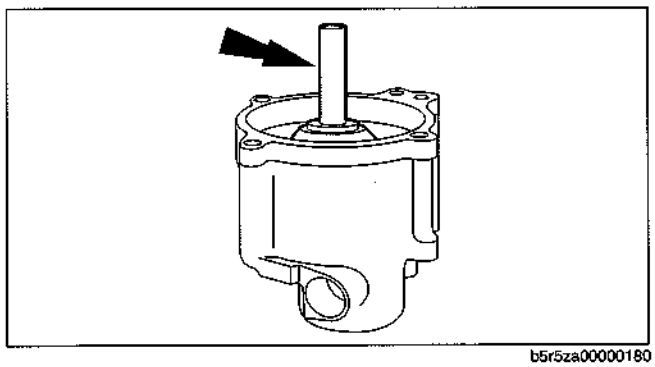
Note
- Tabs on servo plate mate with slots on cover every 120 degrees.


b5r5za00000178

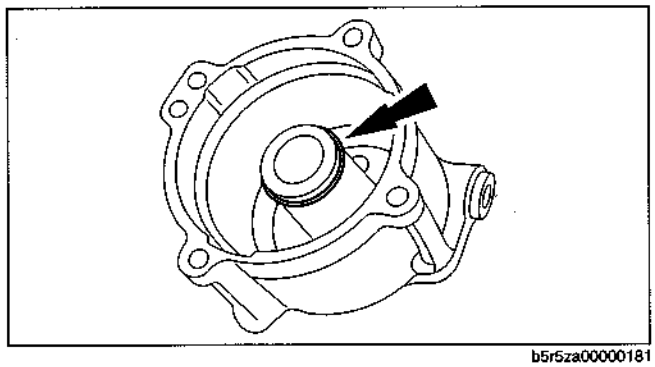
4. Remove the spring.


b5r5za00000179

5. Remove the low/reverse brake servo piston and seal component.
   - Inspect the seal for damage, install a new low/reverse brake servo piston if necessary.

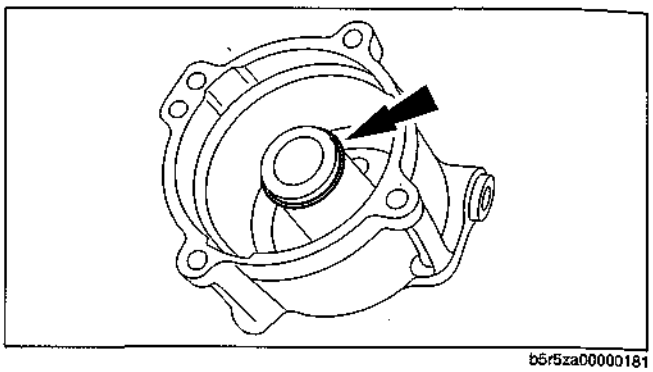

b5r5za00000180

6. Remove and discard the low/reverse brake servo piston seal.


b5r5za00000181

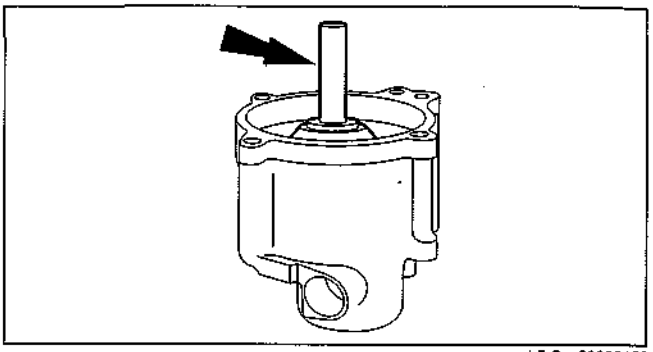
Assembly

1. Lubricate and install a new low/reverse brake servo piston seal.

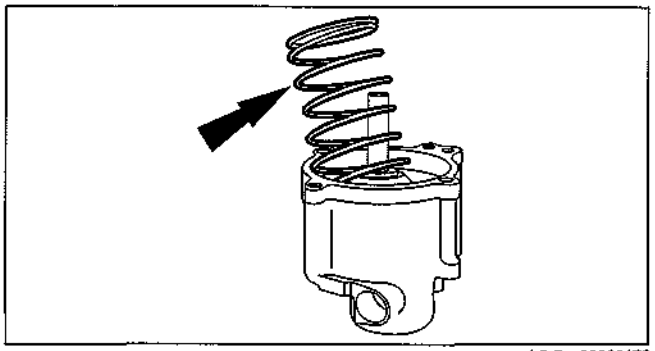

b5r5za00000181

Note
- Try not to roll the seal onto the housing when installing the seal, or damage to the seal can occur.

2. Lubricate and install the low/reverse brake servo piston and seal component.


b5r5za00000180

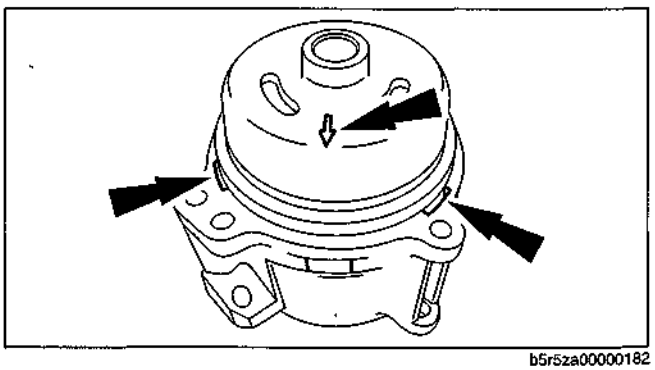
3. Install the spring.


b5r5za00000179

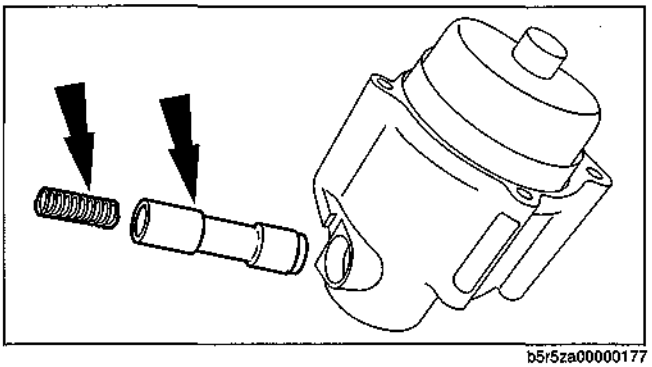
Warning
- **The upper and lower servo covers are under spring tension. Use care when assembling the 2 halves. Failure to follow these instructions can result in personal injury.**

Caution
- **The arrow on the servo plate must be aligned evenly between any 2 slots on the cover.**

4. Install the low/reverse brake servo plate.


b5r5za00000182

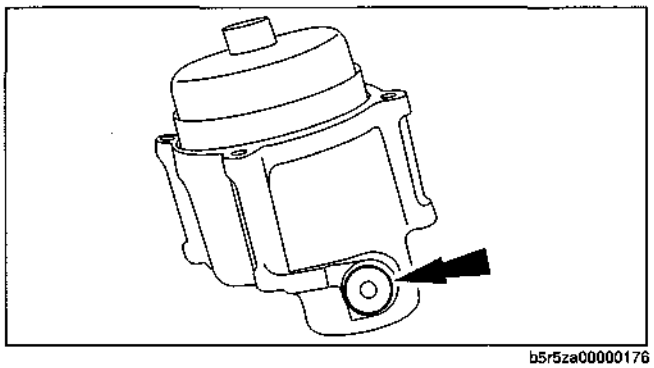
5. Install the spring and low/reverse brake servo check valve.



b5r5za00000177

6. Install the control valve spring retainer.

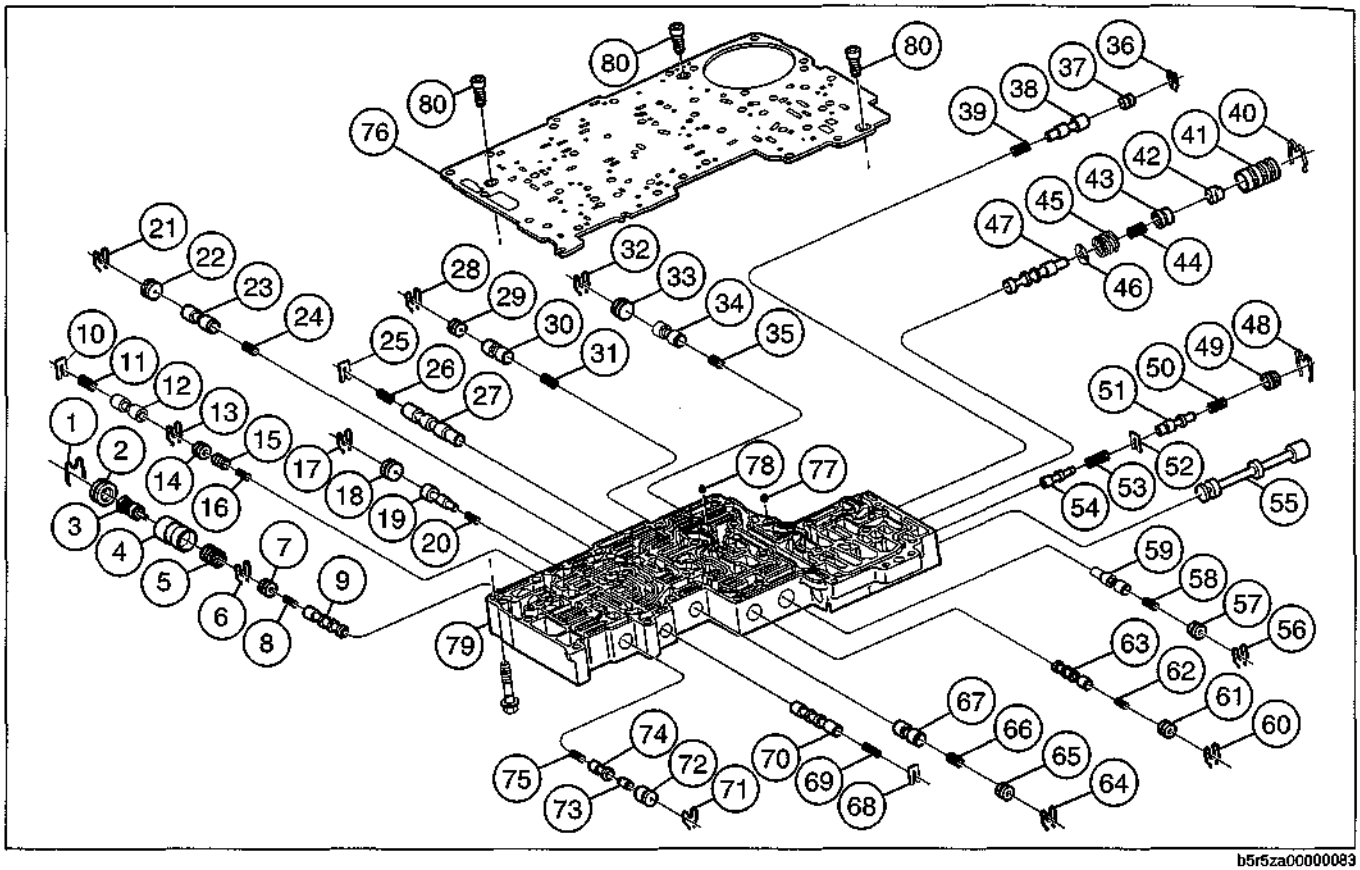
Tightening torque
10 N·m {102 kgf·cm, 89 in·lbf}



b5r5za00000176

CONTROL VALVE BODY DISASSEMBLY/ASSEMBLY[5R55S]

id0513c1261800



b5r5za00000083

1	Retainer clip
2	Retainer plug
3	Thermo valve component
4	Fluid cooler bypass valve
5	Fluid cooler bypass spring
6	Retainer clip
7	Retainer plug
8	Converter clutch control valve spring
9	Converter clutch control valve
10	Plate
11	Coast clutch control spring
12	Coast clutch control valve
13	Retainer clip
14	Retainer plug
15	Converter clutch back pressure valve
16	Converter clutch back pressure spring
17	Retainer clip
18	Retainer plug
19	VFS2 modulator valve
20	VFS2 modulator valve spring
21	Retainer clip
22	Retainer plug
23	Intermediate servo release valve
24	Intermediate servo release valve spring
25	Plate
26	High clutch control spring
27	High clutch control Valve
28	Retainer plug

29	Retainer clip
30	Reverse modulator valve
31	Reverse modulator valve spring
32	Retainer clip
33	Retainer plug
34	Reverse engagement valve
35	Reverse engagement valve spring
36	Retainer clip
37	Retainer plug
38	VFS1 modulator valve
39	VFS1 modulator valve spring
40	Retainer clip
41	Sleeve
42	Booster valve
43	Booster valve
44	Inner spring
45	Outer spring
46	Retainer spring
47	Main regulator valve
48	Retainer clip
49	Retainer plug
50	Converter limit spring
51	Converter limit valve
52	Plate
53	Solenoid regulator valve spring
54	Solenoid regulator valve
55	Manual valve
56	Retainer clip

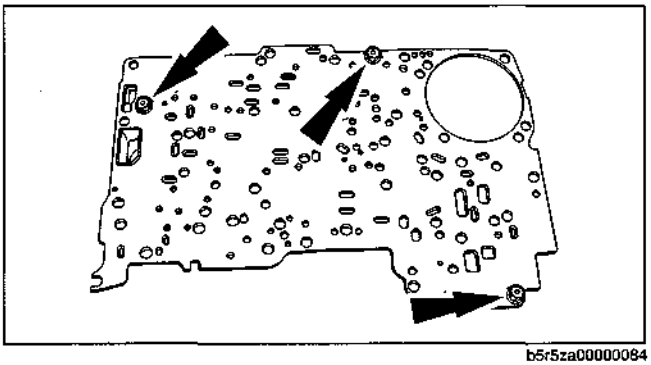
57	Retainer plug
58	Rear servo control valve spring
59	Rear servo control valve
60	Retainer clip
61	Retainer plug
62	RS ISA select valve spring
63	RS ISA select valve
64	Retainer clip
65	Retainer plug
66	Forward engagement control valve spring
67	Forward engagement control valve
68	Plate

69	Overdrive servo control spring
70	Overdrive servo control valve
71	Clip retainer
72	Converter clutch modulator control sleeve
73	Converter clutch modulator control valve
74	Converter clutch modulator valve
75	Converter clutch modulator control spring
76	Separator plate
77	Lubrication check ball
78	Shuttle valve ball
79	Lower control valve body
80	Bolt

Disassembly

1. Remove and discard the separator plate.

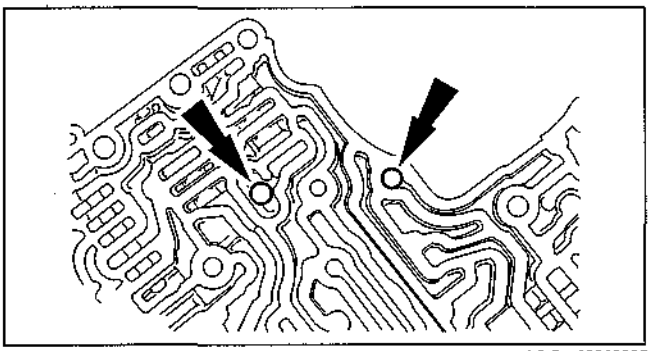
Note
- The valve body separator plate has a bonded gasket. Do not reuse. Discard the plate.



b5r5za00000084

2. Remove the check balls.
3. Disassemble the control valve body only if cleaning is required.

Note
- Refer to the disassembled view.



b5r5za00000085

Assembly

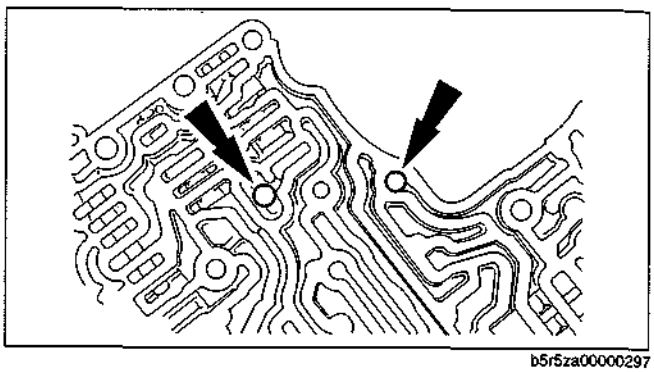
Caution
- **Do not lose parts when cleaning or repairing.**

1. Thoroughly clean all parts in solvent and blow dry with moisture-free compressed air.

Caution
- **Do not stone, file or sand the valves. This will remove the anodized finish and may result in further main control or transmission damage.**

2. After cleaning the control valve body, carry out the following:
   - Inspect all valve and plug bores for scoring or burrs
   - Check all fluid passages for obstructions
   - Inspect all valves and plugs for burrs
   - Inspect all mating surfaces for burrs or distortion
   - Inspect all springs for distortion
   - Check all valves and plugs for free movement in their respective bores
     — Valves and plugs, when dry, must fall from their own weight into their respective bores
   - Roll the manual valve on a flat surface to check for a bent condition
3. Assemble the main control valve body.

4. Install the control valve body check balls.

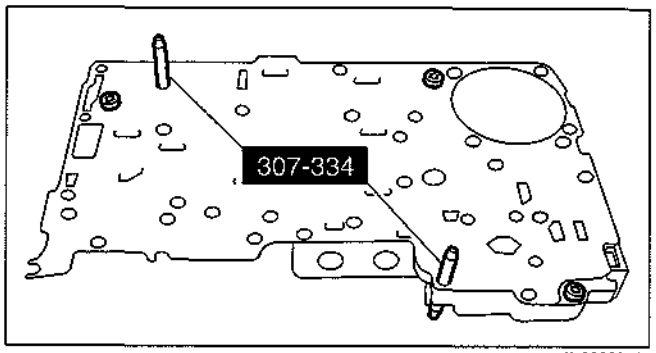


b5r5za00000297

5. Using the **SSTs**, install a new separator plate.

Tightening torque
6—8 N·m {62—81 kgf·cm, 54—70 in·lbf}

Note
- Use a new valve body separator plate for main control valve body installation.

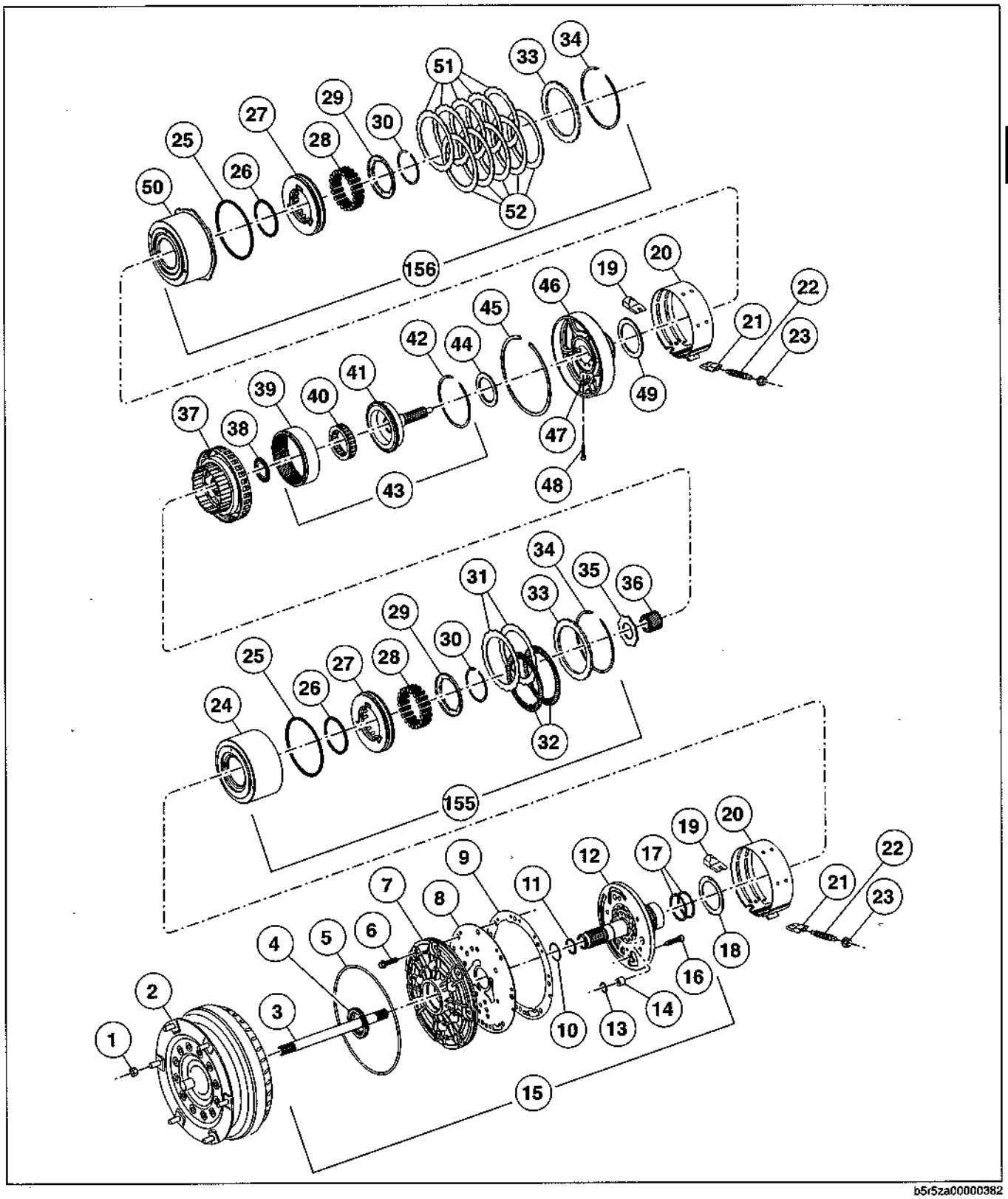


arnffv00000523

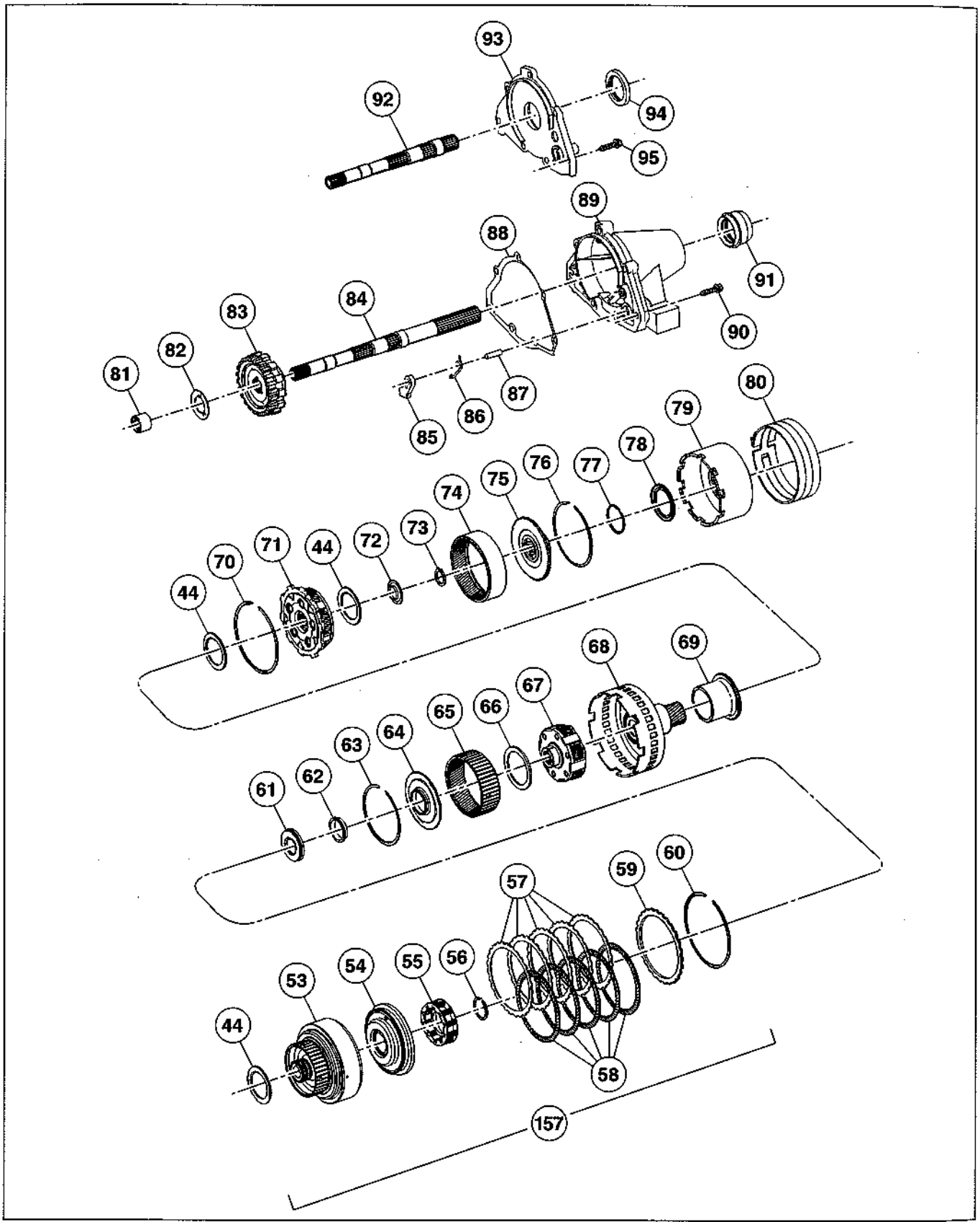
AUTOMATIC TRANSMISSION ASSEMBLY[5R55S]

id0513c1261900

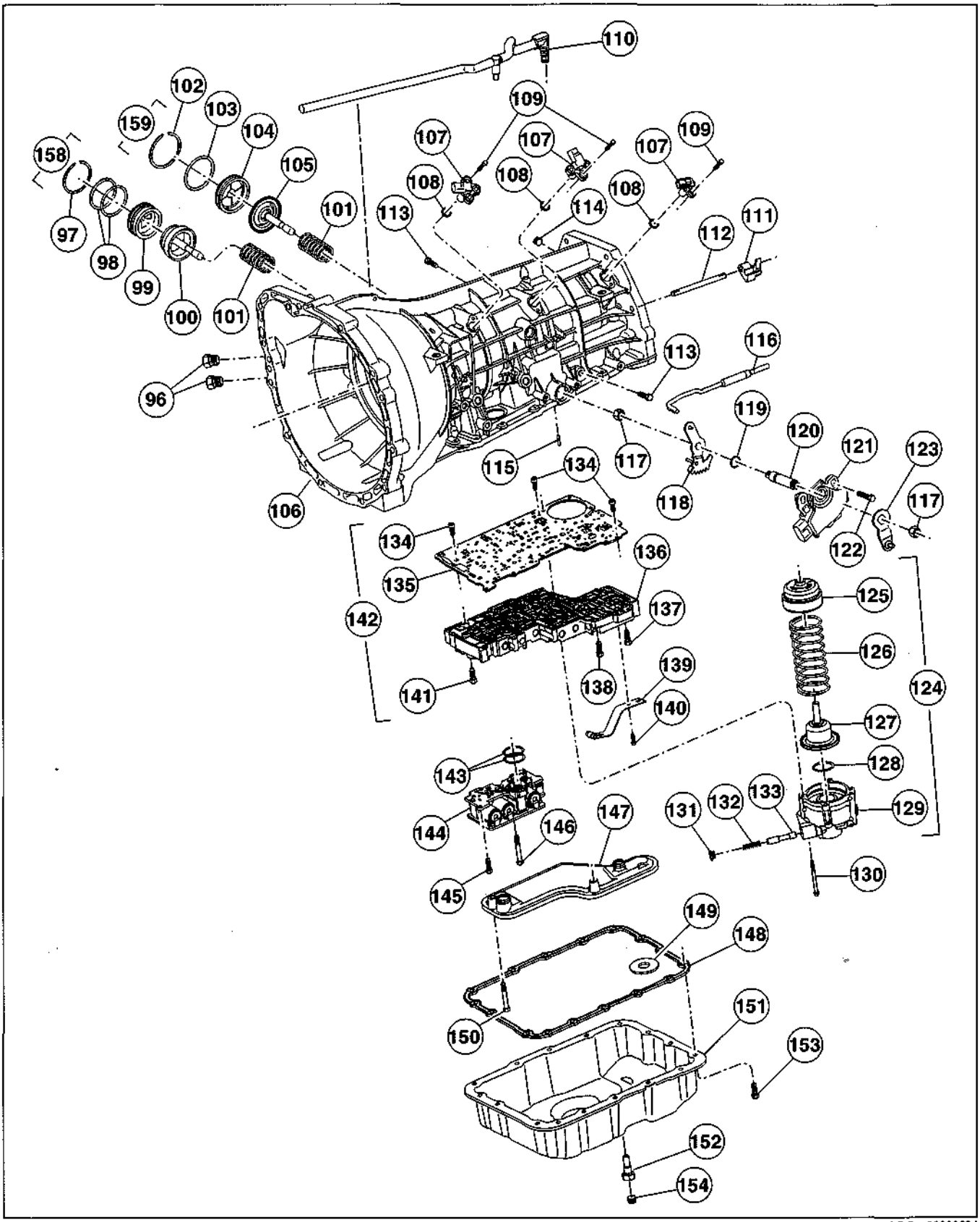
Exploded View



b5r5za00000382



b5r5za00000383



b5r5za00000384

1	Torque converter installation nut
2	Torque converter
3	Input shaft
4	Fluid pump seal
5	Fluid pump seal ring

6	Bolt and washer
7	Fluid pump cover
8	Fluid pump adapter plate
9	Fluid pump gasket
10	Seal ring

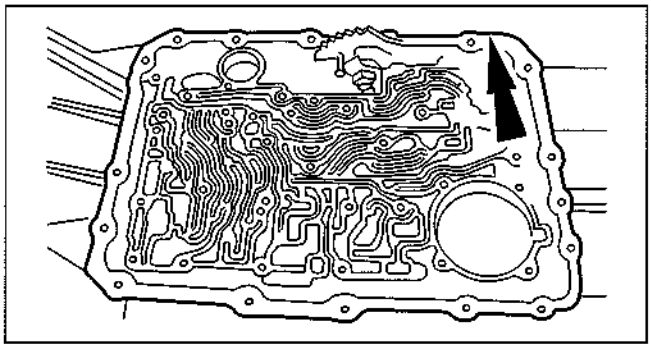
11	Stator support seal
12	Fluid pump support
13	O-ring
14	Fluid pump control valve
15	Fluid pump component
16	Bolt
17	Seal ring
18	Thrust washer (No.1)
19	Intermediate and overdrive brake band anchor strut
20	Intermediate and overdrive brake band
21	Intermediate and overdrive brake band apply strut
22	Intermediate and overdrive brake band adjusting screw
23	Locknut
24	Overdrive brake drum
25	Direct clutch and coast clutch piston outer seals
26	Direct clutch and coast clutch piston inner seals
27	Direct clutch and coast clutch pistons
28	Direct clutch and coast clutch piston spring
29	Direct clutch and coast clutch piston spring retainer
30	Retaining ring
31	Coast clutch external spline plate (steel)
32	Coast clutch internal spline friction plate (friction)
33	Direct clutch and coast clutch pressure plate
34	Retaining ring (select fit)
35	Carrier adapter
36	Overdrive sun gear
37	Overdrive planetary gear carrier component
38	Thrust bearing (No.2)
39	Overdrive ring gear
40	Overdrive one-way clutch
41	Overdrive center shaft
42	Retaining ring
43	Overdrive center shaft and ring gear component
44	Thrust bearing (No.3, No.5, No.8 and No.9)
45	Retaining ring
46	Center support
47	Nut and cage component
48	Bolt
49	Thrust bearing (No.4)
50	Intermediate brake drum
51	Direct clutch external spline plate (steel)
52	Direct clutch internal spline plate (friction)
53	Forward clutch cylinder
54	Forward clutch piston
55	Forward clutch piston spring component
56	Retaining ring
57	Forward clutch external spline plate (steel)
58	Forward clutch internal spline plate (friction)
59	Forward clutch pressure plate
60	Retaining ring (select fit)
61	Thrust bearing (No.6A)
62	Thrust washer (No.6B)
63	Retaining ring
64	Forward ring gear hub
65	Forward ring gear
66	Thrust bearing (No.7)
67	Forward planetary component
68	Input shell and sun gear component
69	Spacer
70	Retaining ring
71	Lower/reverse planetary component
72	Output shaft sleeve
73	Retaining ring
74	Output shaft ring gear
75	Output shaft hub
76	Retaining ring
77	Output shaft hub seal
78	Thrust bearing (No.10)
79	Low/reverse brake drum and one-way clutch component
80	Low/reverse brake band
81	Output shaft needle bearing
82	Thrust washer (No.11)
83	Parking gear
84	Output shaft (4x2)
85	Parking pawl
86	Parking pawl return spring
87	Parking pawl shaft
88	Extension housing gasket
89	Extension housing (4x2)
90	Bolt (4x2)
91	Extension housing seal (4x2)
92	Output shaft (4x4)
93	Extension housing (4x4)
94	Extension housing seal (4x4)
95	Bolt (4x4)
96	Oil pipe connector component
97	Retaining ring
98	Overdrive brake servo cover seal
99	Overdrive brake servo cover
100	Overdrive brake servo piston
101	Spring
102	Retaining ring
103	Intermediate brake servo cover seal
104	Intermediate brake servo cover
105	Intermediate brake servo piston
106	Transmission case
107	TSS sensor, ISS sensor and OSS sensor
108	O-ring
109	Bolt
110	Vent tube (4x2)
111	Low/reverse brake actuating lever
112	Low/reverse brake band actuating lever shaft
113	Pressure tap plug (pressure control solenoid C circuit)
114	Fluid fill plug
115	Manual shaft retaining pin
116	Parking pawl actuating rod
117	Manual shaft outer and inner nut
118	Manual valve inner lever
119	Manual shaft seal

120	Manual shaft
121	Digital transmission range (TR) sensor
122	Bolt and washer
123	Manual shaft lever
124	Reverse brake servo component
125	Reverse brake servo plate
126	Spring
127	Reverse brake servo piston and seal
128	O-ring
129	Reverse brake servo cover
130	Bolt
131	Control valve spring retainer
132	Spring
133	Reverse brake servo check valve
134	Bolt
135	Separating plate (bonded)
136	Lower control valve body
137	Bolt
138	Bolt
139	Detent spring
140	Bolt

141	Bolt
142	Control valve body component
143	O-ring
144	Solenoid body
145	Bolt
146	Bolt
147	Transmission fluid filter
148	Transmission fluid pump gasket
149	Magnet
150	Bolt
151	Transmission fluid pump
152	Drain plug
153	Bolt
154	Fluid level indicating plug (short hex)
155	Overdrive brake and coast clutch drum component
156	Intermediate brake and direct clutch drum component
157	Forward clutch component
158	Overdrive brake servo
159	Intermediate brake servo

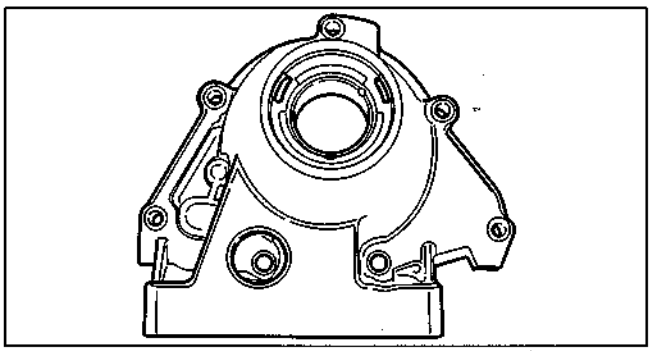
Assembly

1. Thoroughly clean the transmission case and extension housing in solvent and blow dry with compressed air.
2. Inspect the transmission case for the following:
   - Stripped bolt hole threads
   - Gasket and mating surfaces for burrs or nicks
   - Obstructions to vent and fluid passages
   - Cracks or warpage



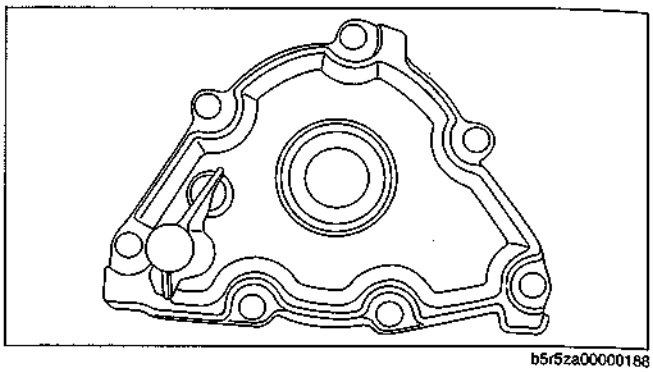
b5r5za00000186

3. Inspect the extension housing for cracks, burrs or warpage.(4x2)



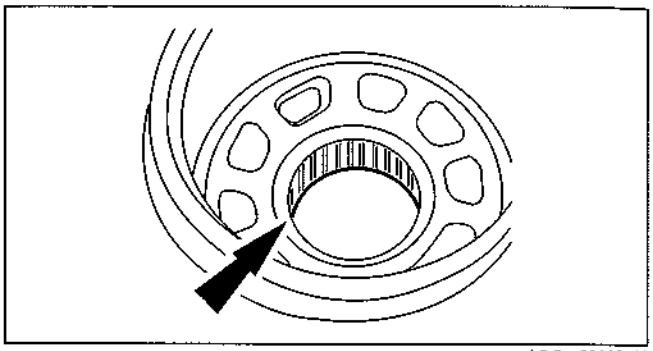
b5r5za00000187

4. Inspect the extension housing for cracks, burrs or warpage.(4x4)

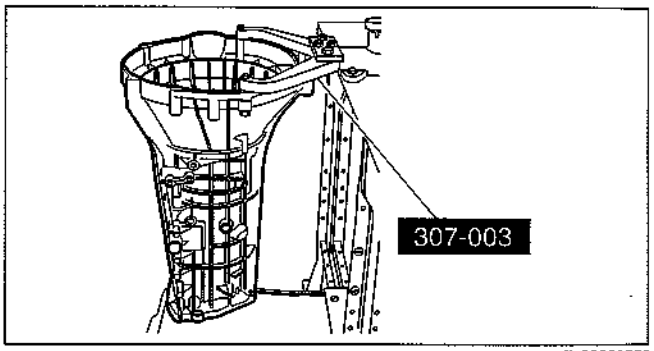

b5r5za00000188

5. Inspect the case bearing for damage. If damage to the case bearing is indicated, install a new case.

Warning
- **Make sure the lockpin on bench-mounted holding fixture is secure. Failure to follow these instructions may result in personal injury.**

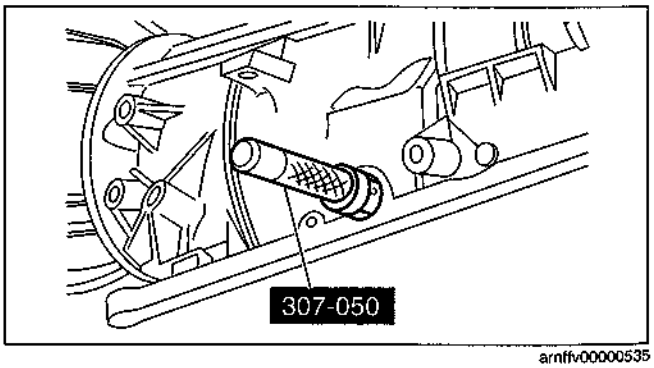

b5r5za00000189

6. Using the **SST**, install the transmission into the bench with the converter housing facing up.



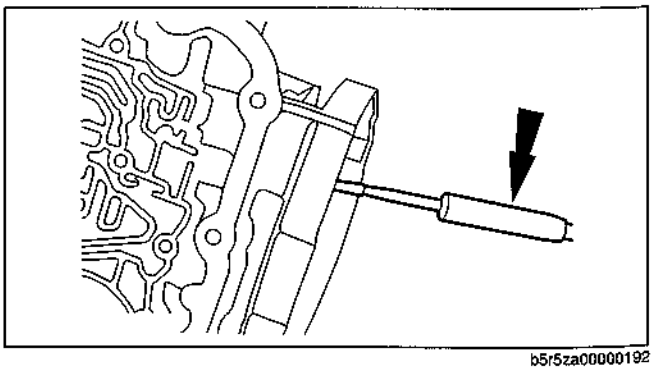
arnffv00000520

7. Using the **SST**, install the manual shaft seal and lubricate it with petroleum jelly.

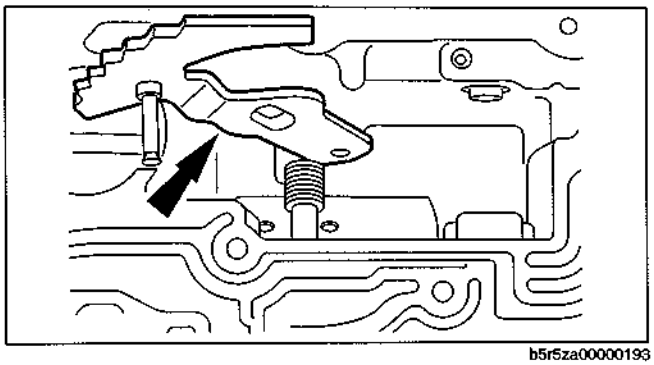


arnffv00000535

8. Install the parking lever rod.


b5r5za00000192

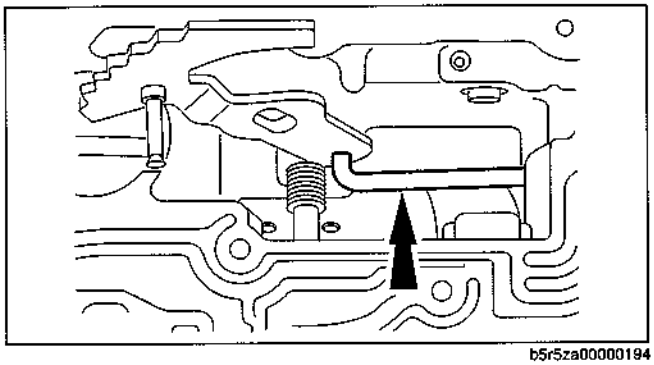
9. Install the manual control lever.



b5r5za00000193

10. Assemble the manual valve inner lever and parking lever actuating rod as shown.

Caution
- **Align the flats on the manual valve inner lever with the flats on the manual shaft.**



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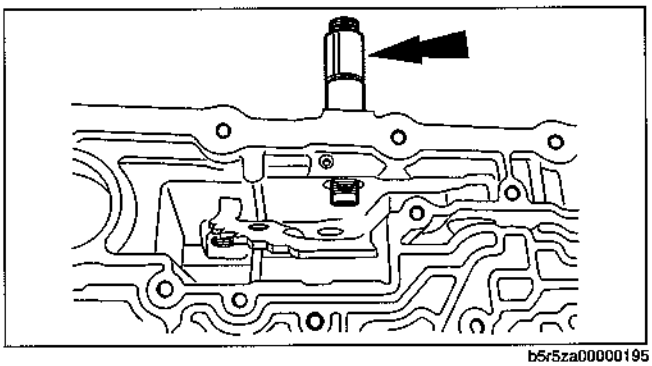
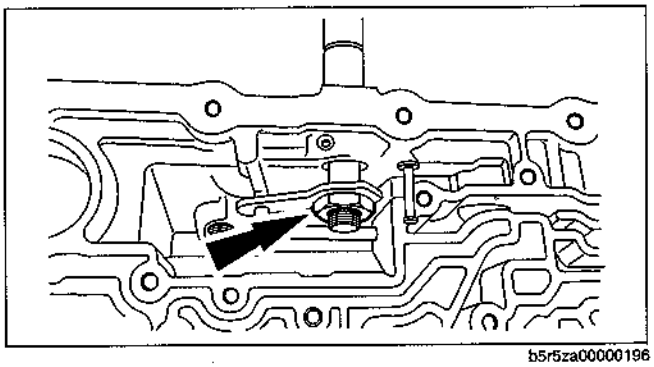
11. Install the manual shaft.



b5r5za00000195

12. Install the manual valve inner lever onto the manual shaft and loosely install the nut.

Caution
- **Use care not to damage the transmission fluid pump rail surface when installing the retaining pin.**

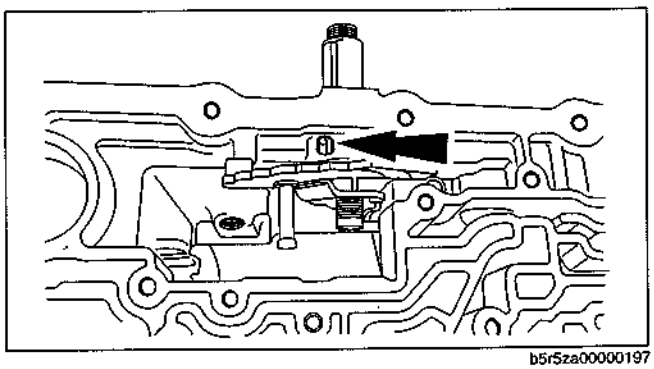


b5r5za00000196

13. Install the manual shaft retaining pin.
    - Tap the manual shaft retaining pin into the transmission case.

Note
- Align the manual shaft alignment groove with the manual shaft retaining pin bore in the transmission case.

Caution
- **To avoid damage, do not allow the wrench to strike the manual valve inner lever pin.**

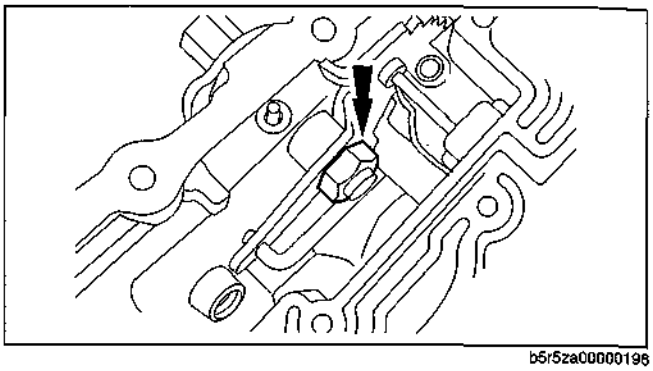


b5r5za00000197

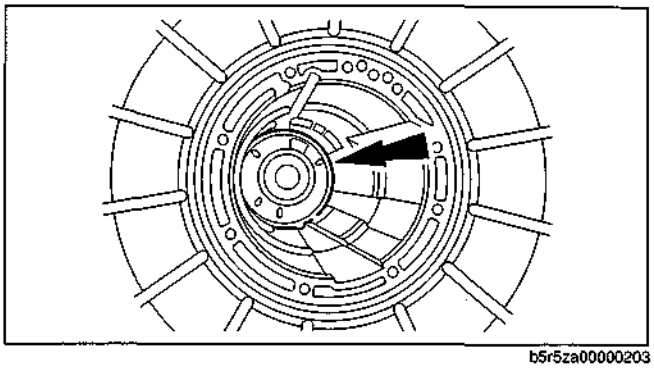
14. Tighten the nut.

Tightening torque
41—54 N·m {4.2—5.5 kgf·m, 31—39 ft·lbf}

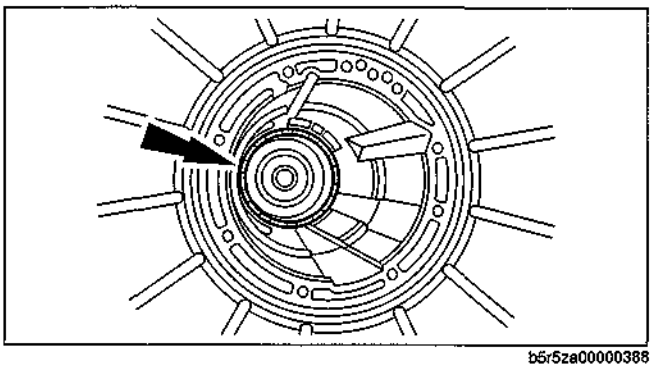
Caution
- **Make sure band is resting on the 2 anchor pins in the case.**


b5r5za00000196

15. Install the low/reverse brake band.

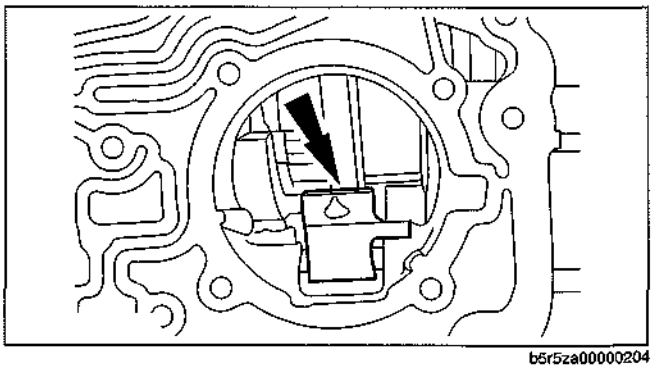

b5r5za00000203

16. Install the low/reverse brake drum and one-way clutch component.
    - Rotate the low/reverse brake drum clockwise to install.

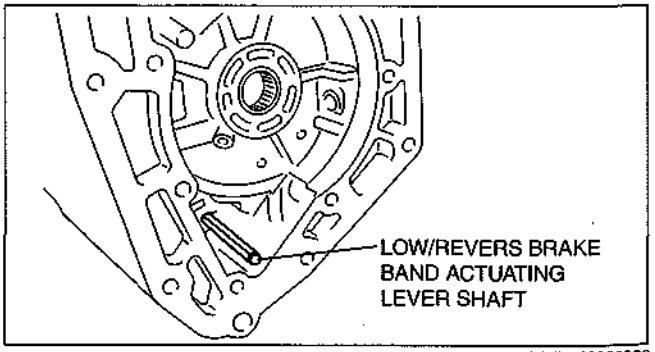

b5r5za00000388

17. Install the low/reverse brake band actuating lever into the low/reverse brake band.

Note
- The reverse band actuating lever must fit into the notches in the band.


b5r5za00000204

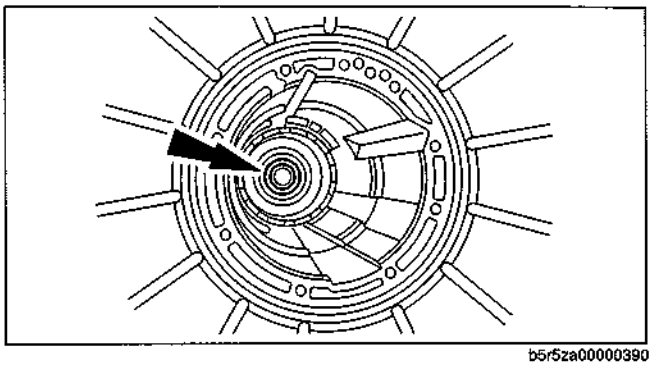
18. Install the low/reverse brake band actuating lever shaft into the case and into the low/reverse brake band actuating lever.



b5r5za00000389

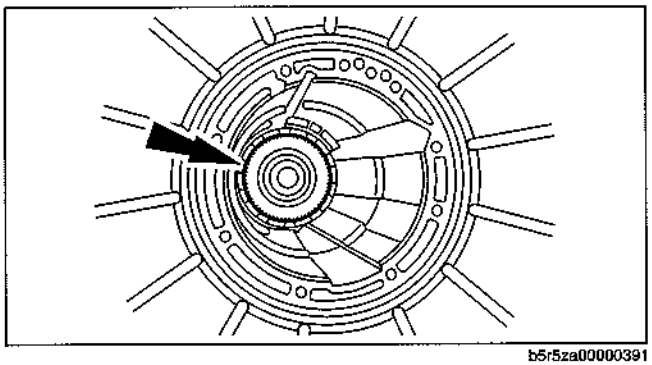
19. Install the thrust bearing (No.10) into the case.

Caution
- **Do not damage the seal against the case during assembly.**


b5r5za00000390

20. Install the output shaft ring gear, hub and seal.

Caution
- **The tabs on the output shaft thrust washer (No.11) point into the case. Make sure the thrust washer is correctly seated.**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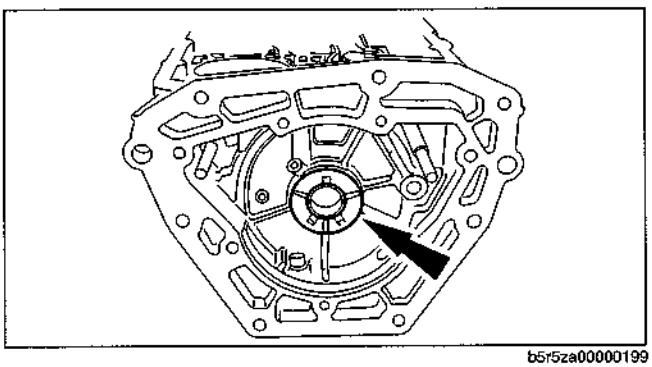
21. Install the output shaft thrust washer (No.11).
- Coat the output shaft thrust washer with petroleum jelly.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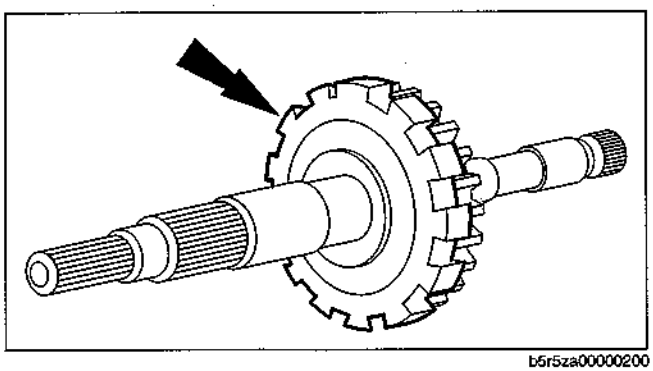
22. Install the park gear on the output shaft.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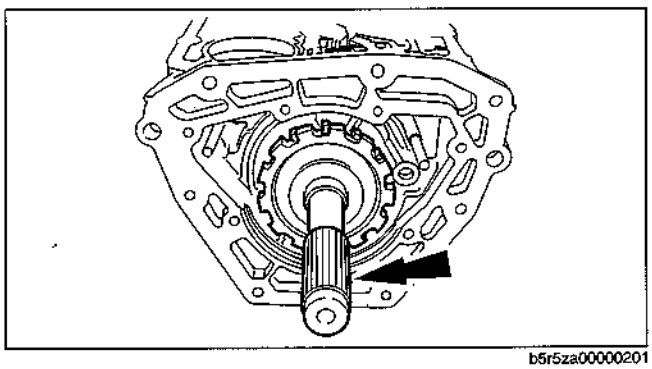
23. Install the output shaft and park gear.

Caution
- **Always install a new retaining ring.**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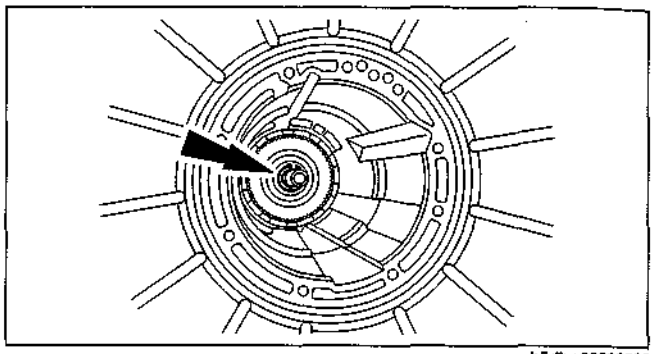
24. Install a new retaining ring.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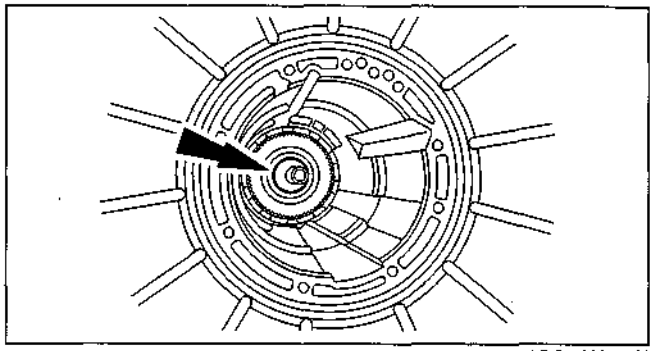
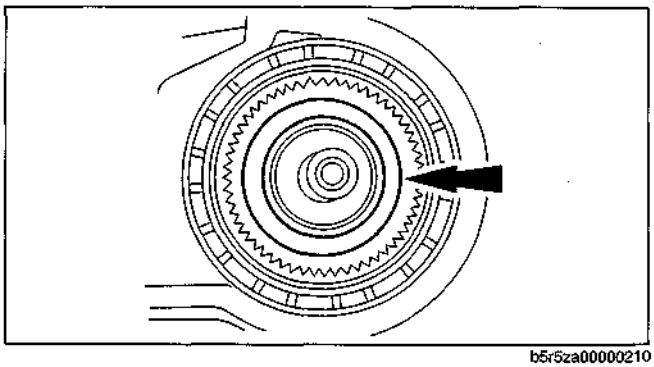
25. Install the output shaft sleeve.

Note
- Install the output shaft sleeve with the cone facing up. This sleeve will snap into place when correctly installed.


b5r5za00000209

26. Install the thrust bearing (No.9) onto the output shaft ring gear and hub component.

Caution
- **Make sure the needle bearings stay in place.**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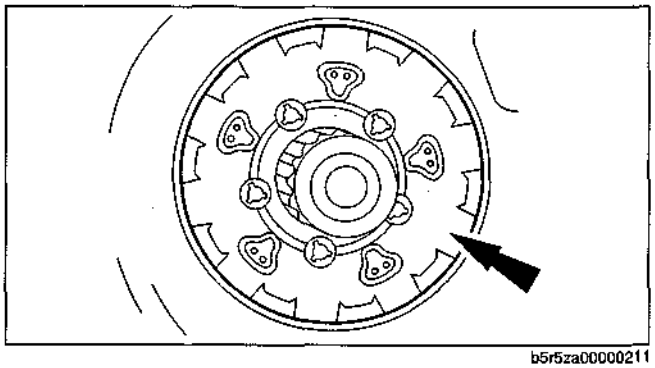
27. Install the low/reverse planetary component.

Caution
- **The low/reverse brake drum must be pulled forward to install the retaining ring.**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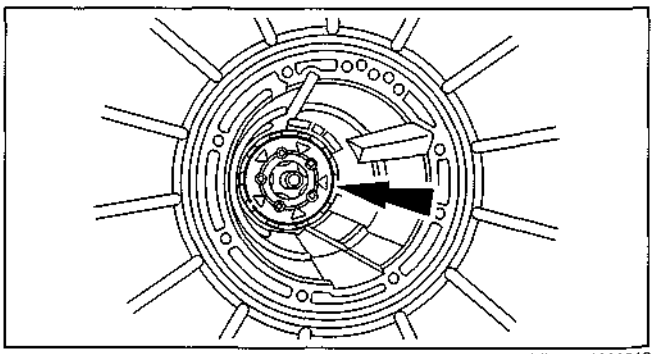
28. Install the retaining ring.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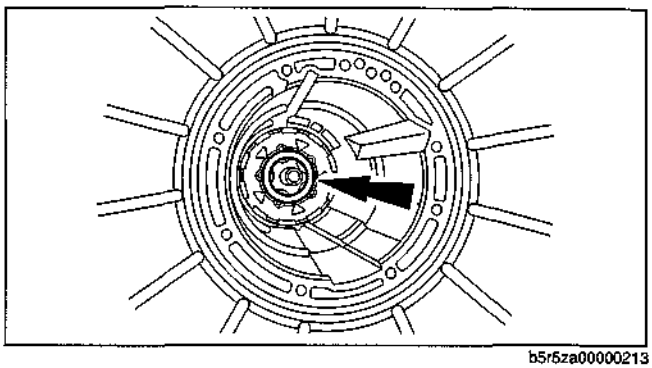
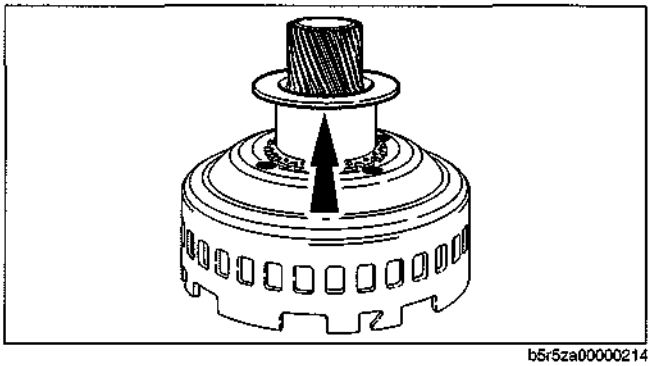
29. Install the thrust bearing (No.8).



b5r5za00000213

30. Install the spacer on the input shell, using petroleum jelly to hold it in place.



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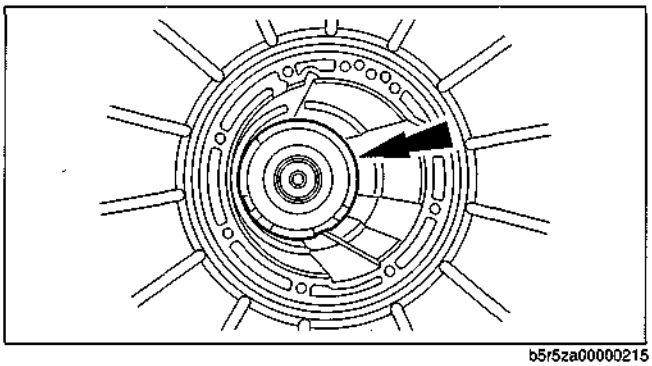
31. Install the input shell and sun gear component.



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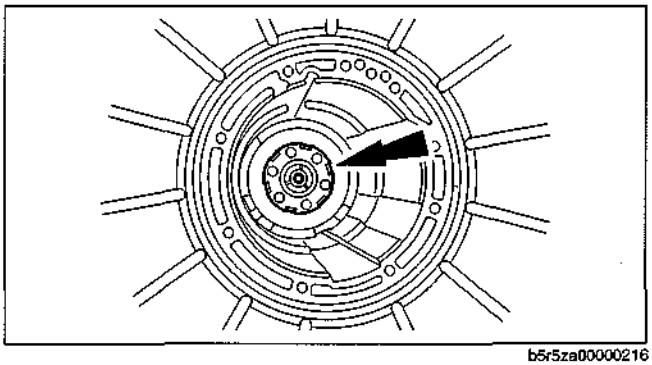
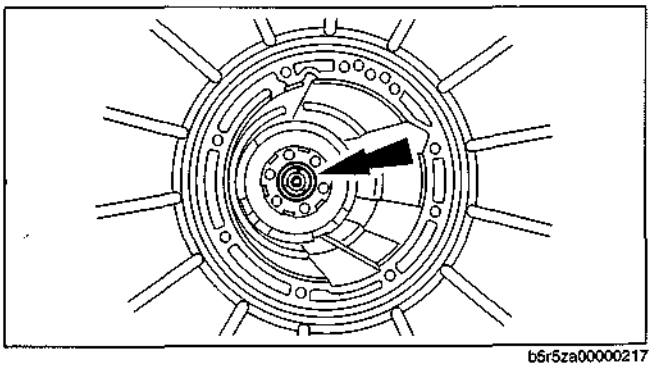
32. Install the forward planetary component.

Note
- The bearing (No.13) must be correctly seated in the forward planet component so the sun gear can be installed correctly.



b5r5za00000216

33. Install the thrust bearing (No.7) into the forward ring gear and hub component. Use petroleum jelly to hold the bearing in place.



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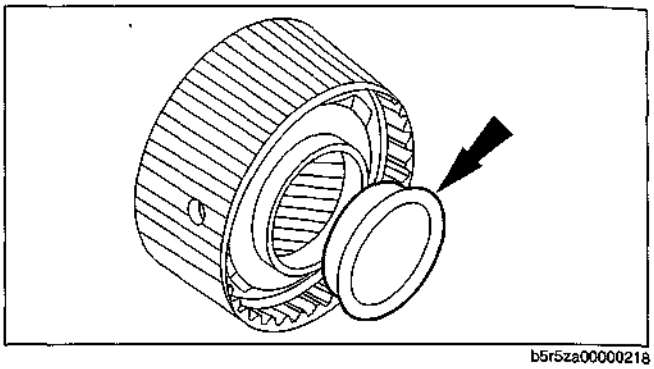
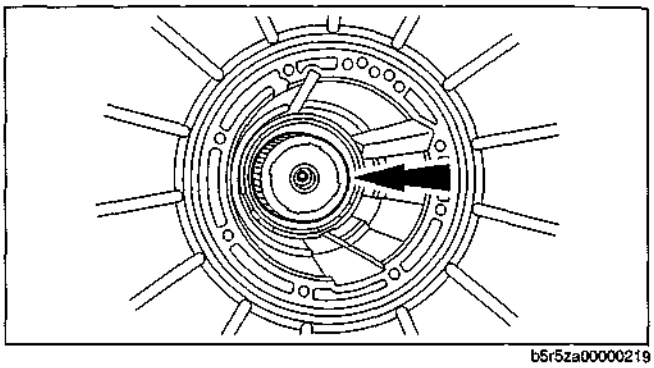
34. Install the thrust washer (No.6B) onto the forward ring gear hub.



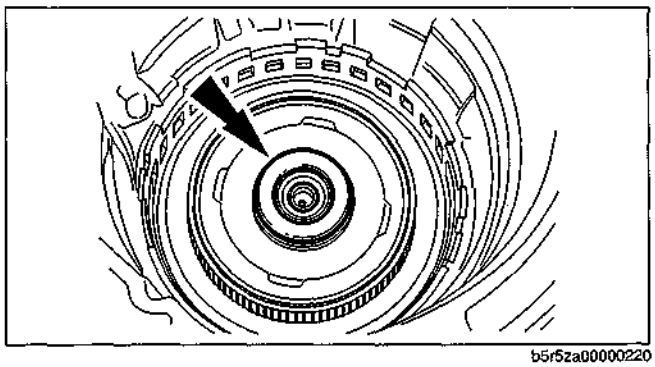
b5r5za00000218

35. Install the forward ring gear and hub as an assembly.



b5r5za00000219

36. Install the thrust bearing (No.6A) into the forward ring gear and hub.



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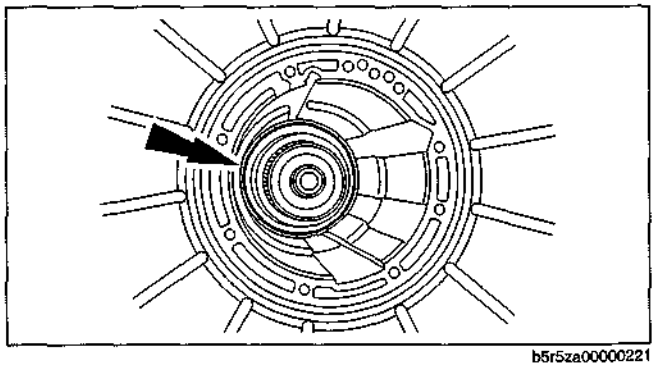
37. Install the forward clutch cylinder.



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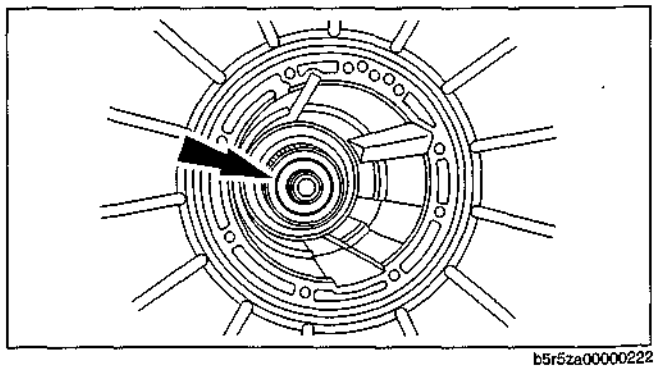
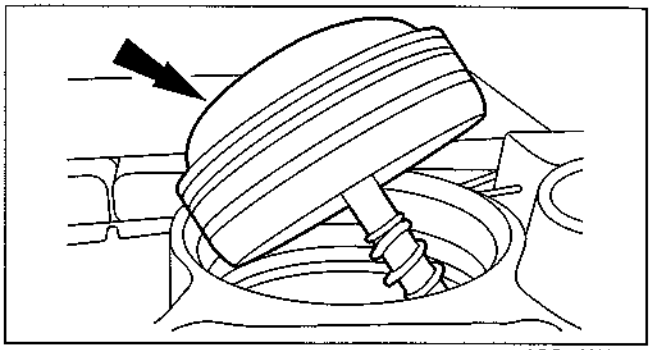
38. Install the thrust bearing (No.5).



b5r5za00000222

39. Install the intermediate brake servo piston and spring.
    - Lubricate the servo bore with clean ATF.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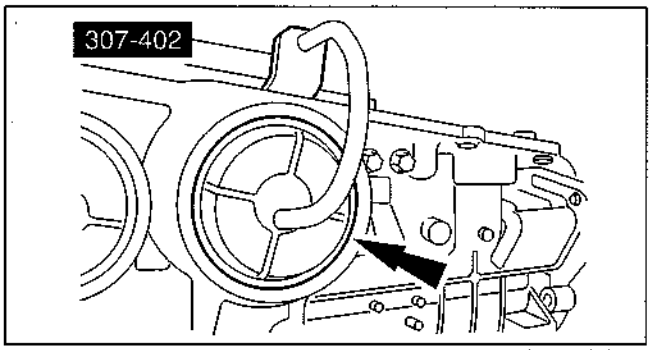
40. Using the **SST**, install the intermediate brake servo cover and retaining ring.



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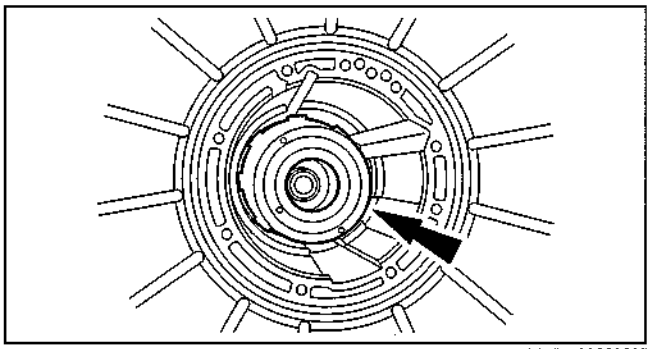
41. Install the intermediate brake and direct clutch drum component.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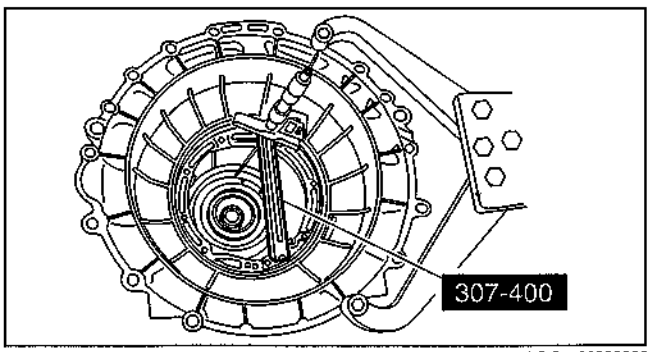
42. Using a depth micrometer with an appropriate length extension, measure from the top of the gauge bar to the center support ledge in the case at 4 places 90 degrees apart.
    - Add the 4 measurements, divide by 4 and record as dimension A.

    Caution
    - **The torque specifications are critical for this procedure. Failure to use the correct torque specifications may cause transmission damage.**



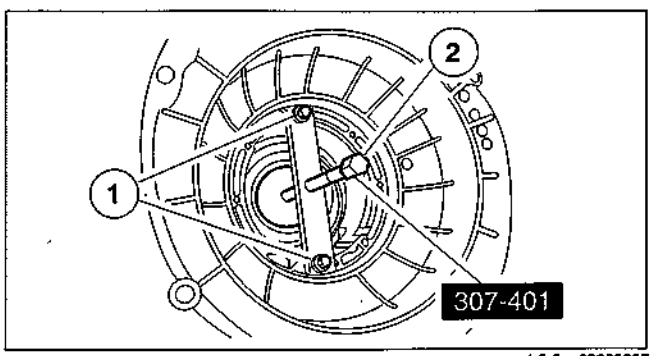
b5r5za00000226

43. Install the **SST**.
    (1) Install the **SST** and the bolts using the 2 pump bolt locations at approx. 6 and 12 o'lock positions.

    Tightening torque
    15 N·m {1.5 kgf·m,11 ft·lbf}

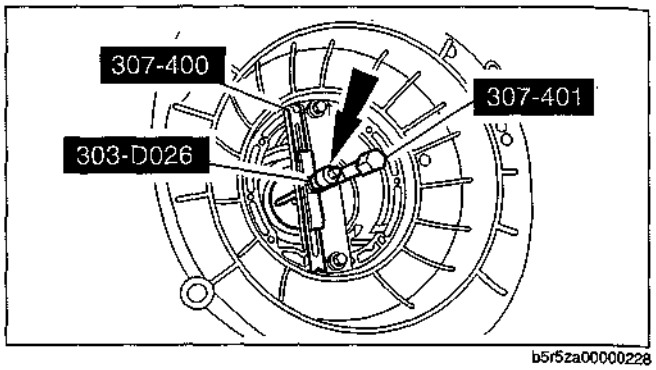
    (2) Tighten the center bolt.

    Tightening torque
    1.13 N·m {11.5 kgf·cm,10.0 in·lbf}



b5r5za00000227

44. Measure the distance from the top of the gauge bar to the drum bearing surface through the hole in the disc and record as dimension B. Repeat the measurement 180 degrees on the opposite side of the **SST** and record as dimension C.



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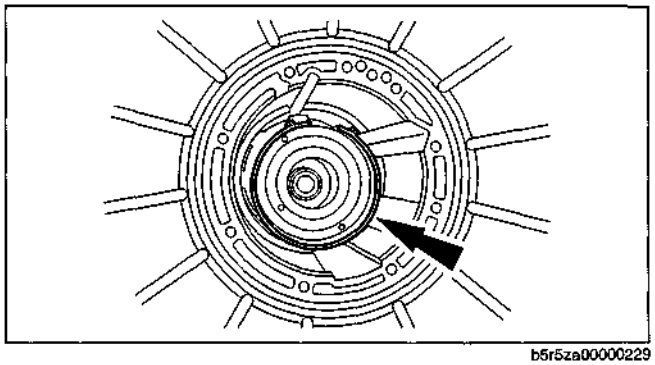
Note
- Align the disc holes on **SST** with the slot in gauge bar for correct measurement.

45. Add dimension B to C, divide by 2 and record as dimension D.
46. Subtract A from D and record as dimension E.
47. Select the bearing from the following chart, using dimension E.

Thrust bearing (No.4) size (intermediate brake drum)

Dimension E	Bearing Thickness	Identification (Notches)
1.69—1.87 mm {0.066—0.074 in}	2.65—2.80 mm {0.104—0.110 in}	None
1.88—2.04 mm {0.073—0.080 in}	2.83—2.98 mm {0.111—0.116 in}	1
2.05—2.22 mm {0.081— 0.088 in}	3.01—3.16 mm {0.118—0.124 in}	2
2.23—2.43 mm {0.088—0.096 in}	3.21—3.36 mm {0.126—0.132 in}	3

48. Install the intermediate brake band.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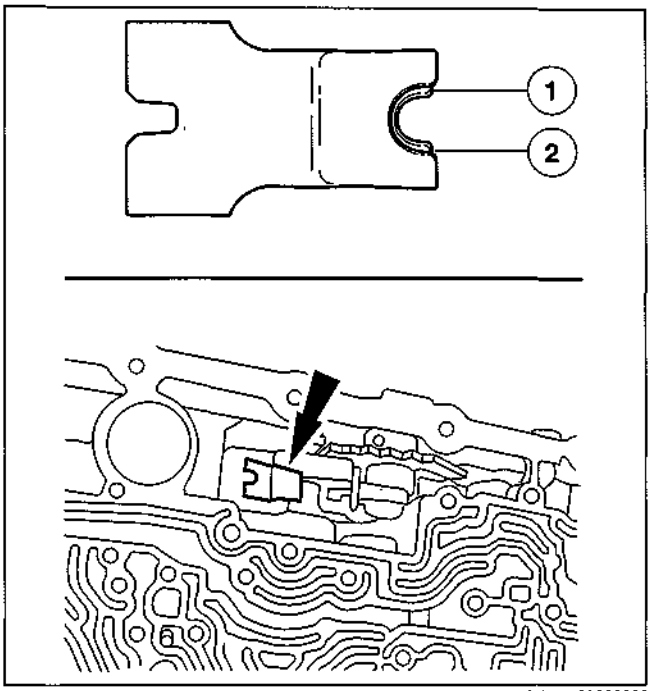
Note
- Make sure that the intermediate brake band apply strut is aligned with the band notch.
- If the intermediate brake band is reused, it must be installed in the same position as it was when removed.
- The new intermediate brake band is dark in color. This is a normal condition of the band. Hairline cracks in the band are also considered normal. Do not install a new band based solely on the color.

Caution
- **To avoid a fall out condition of the strut from the screw during assembly and function, the small U-shaped notch should be toward the band and the large U-shaped notch toward the main control side.**

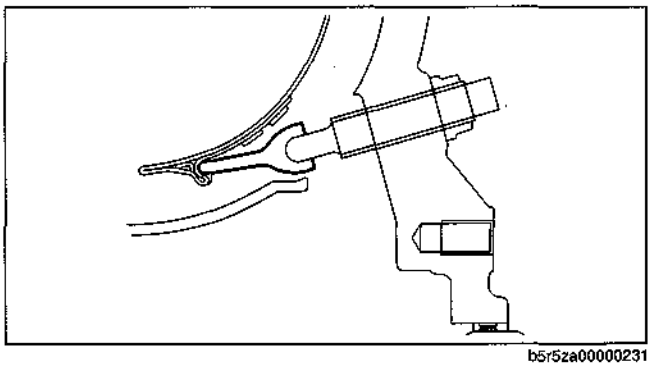
49. Install the intermediate brake band anchor strut.
    (1) Band/case side of anchor (small U notch).
    (2) Main control side of anchor (large U notch).

Caution
- **If the strut is installed incorrectly, transmission damage will occur.**

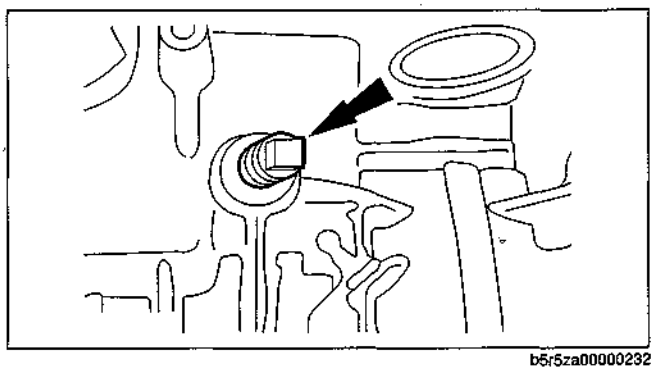


b5r5za00000230

50. Check to make sure that the intermediate brake band anchor strut is installed in the correct orientation to the case and adjustment screw.

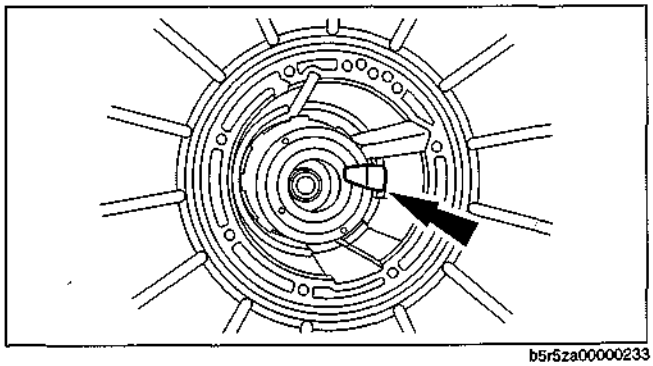

b5r5za00000231

51. Loosely install the screw.

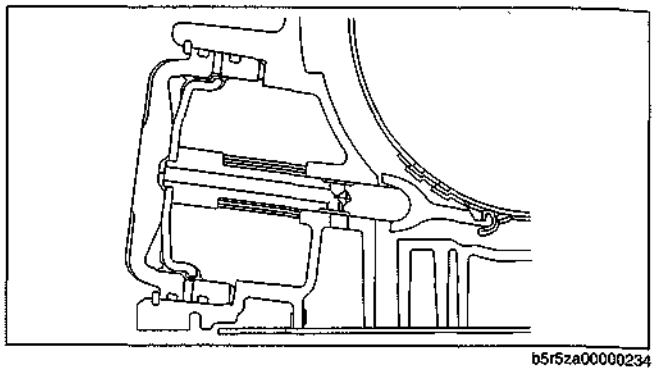

b5r5za00000232

52. Install the intermediate brake band apply strut.

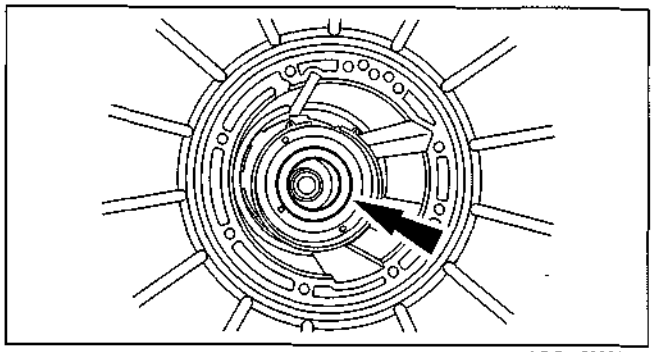
Caution
- **If the strut is installed incorrectly, transmission damage will occur.**


b5r5za00000233

53. Check to make sure that the intermediate brake band apply strut is installed in the correct orientation to the case and piston rod.

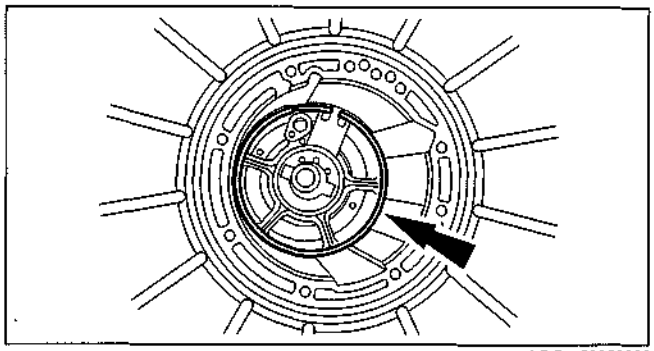

b5r5za00000234

54. Install the selected thrust bearing (No.4) on the direct clutch drum.
    - Coat the thrust bearing with petroleum jelly.

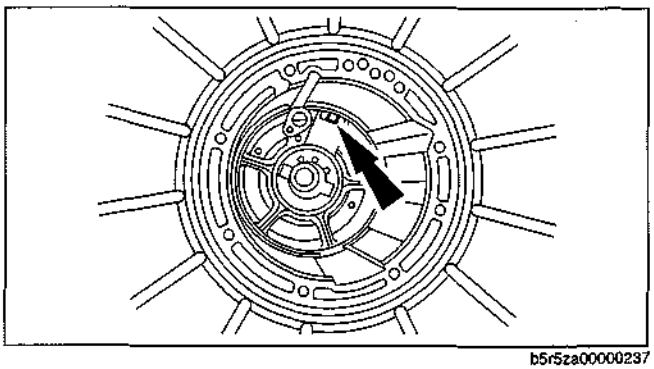

b5r5za00000235

55. Install the center support.

    Note
    - Align the center support bolt hole with correct case hole.

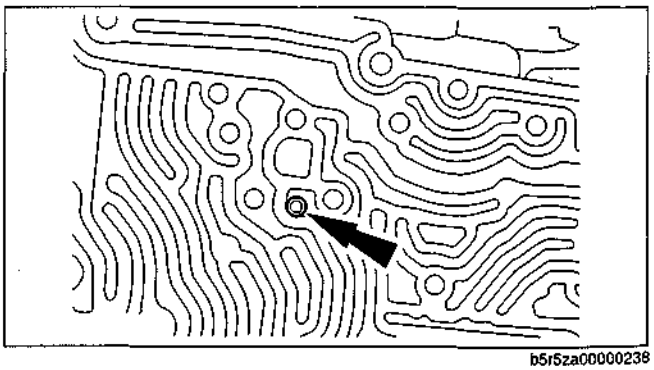

b5r5za00000236

56. Install the nut and cage.

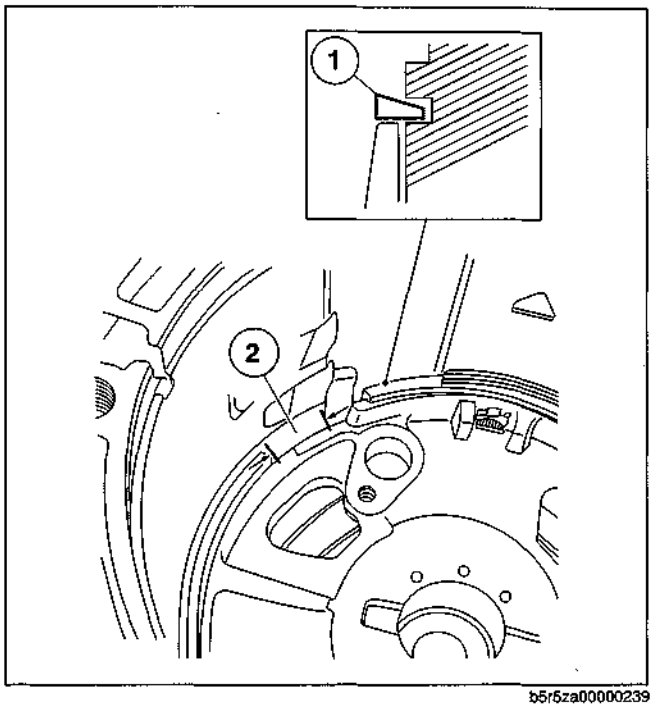

b5r5za00000237

57. Loosely install the bolt.

    Caution
    - **Install the retaining ring with the tapered side facing up.**
    - **Make sure the notch opening is not obstructed by the retaining ring.**

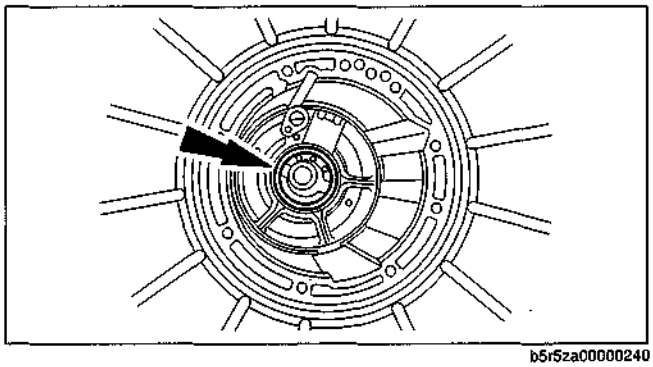

b5r5za00000238

58. Install the retaining ring.
    (1) Make sure the retaining ring is installed with the tapered side facing up.
    (2) Make sure the opening of the retaining ring is positioned correctly.



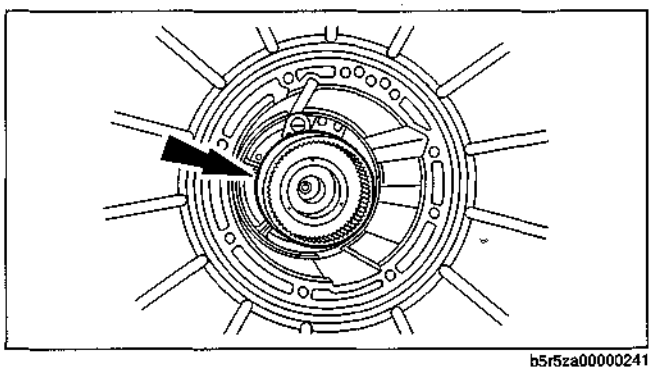
b5r5za00000239

59. Install the thrust bearing (No.3).

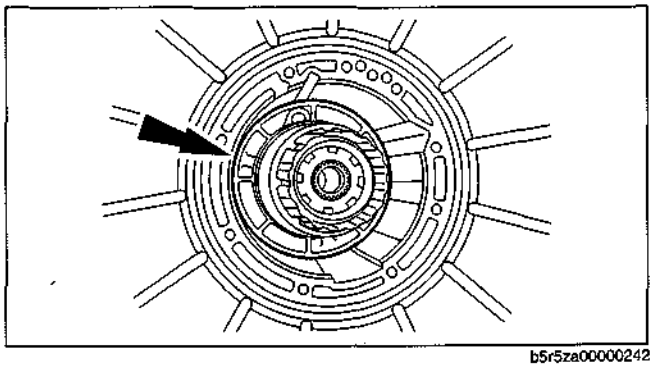

b5r5za00000240

60. Install the overdrive ring gear, overdrive one-way clutch and center shaft component.

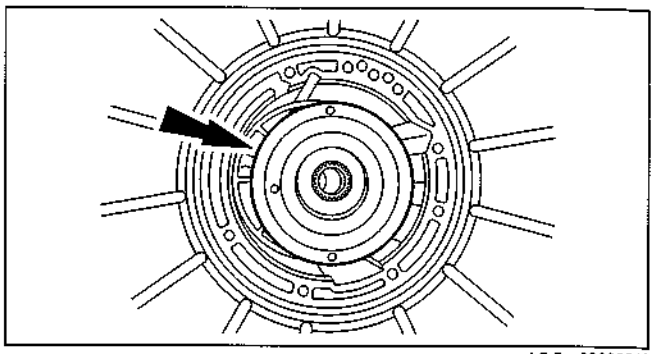
Caution
- **Do not bend the trigger wheel. Make sure that the thrust bearing (No.2) is in this assembly.**


b5r5za00000241

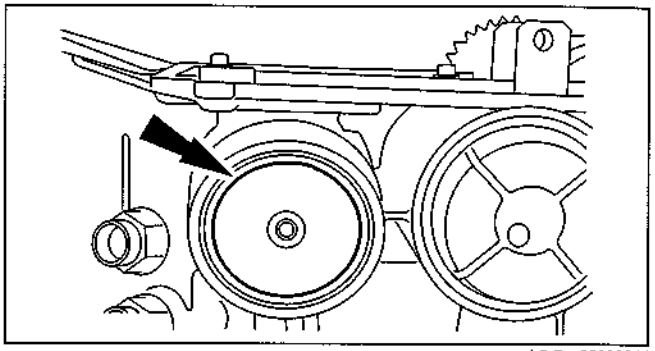
61. Install the overdrive planetary gear carrier.


b5r5za00000242

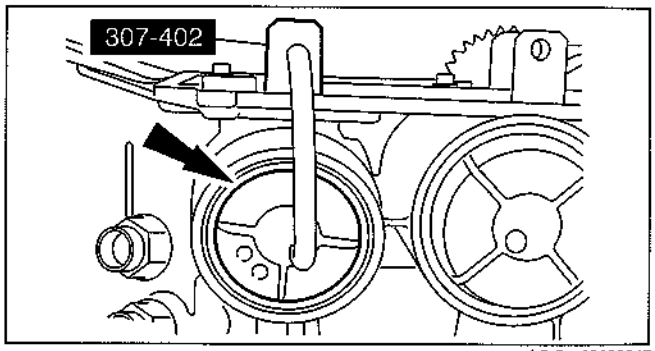
62. Install the overdrive brake and coast clutch drum component.


b5r5za00000243

63. Install the overdrive brake servo piston and spring.
    - Lubricate the servo bore with clean ATF.

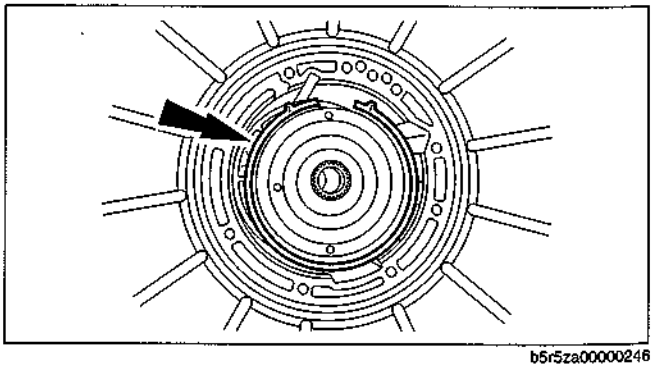

b5r5za00000244

64. Using the **SST**, install the overdrive brake servo cover and retaining ring.



b5r5za00000245

65. Install the overdrive brake band.

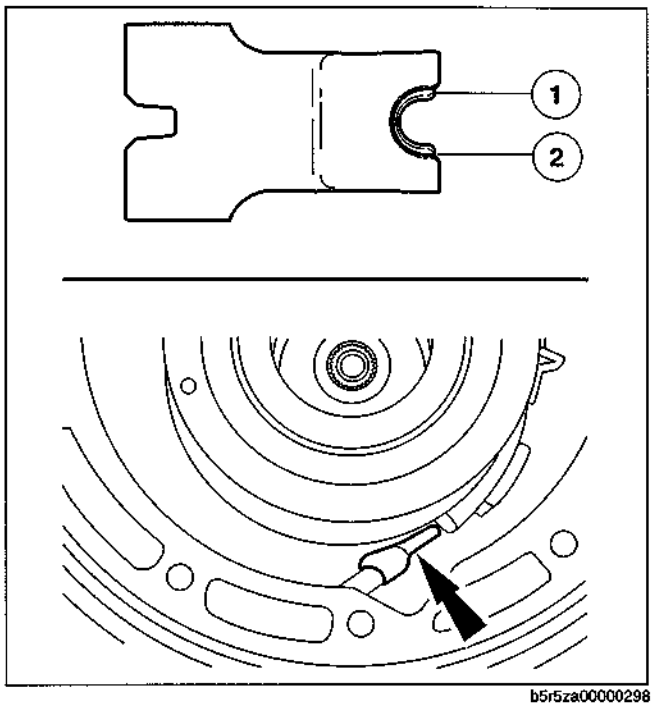

b5r5za00000246

Note
- If the overdrive brake band is reused, it must be installed in the same position as when removed.
- Make sure that the overdrive brake band apply strut is aligned with the band notch.
- The new overdrive brake band is dark in color. This is a normal condition of the band. Hairline cracks in the band are also considered normal. Do not install a new band based solely on the color.

Caution
- **To avoid a fall out condition of the strut from the screw during assembly and function, the small U-shaped notch should be toward the band and the large U-shaped notch toward the main control side.**

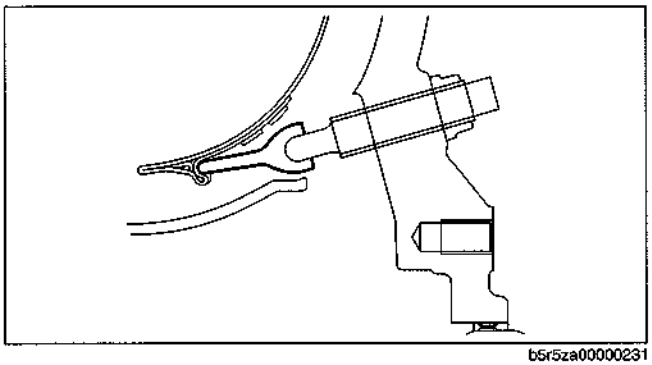
66. Install the overdrive brake band anchor strut.
    (1) Band/case side of anchor (small U notch).
    (2) Main control side of anchor (large U notch).

Caution
- **If the strut is installed incorrectly, transmission damage will occur.**

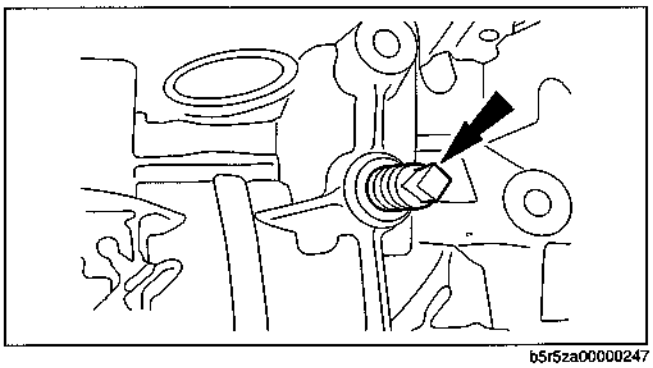


b5r5za00000298

67. Check to make sure that the overdrive brake band anchor strut is installed in the correct orientation to the case and adjustment screw.

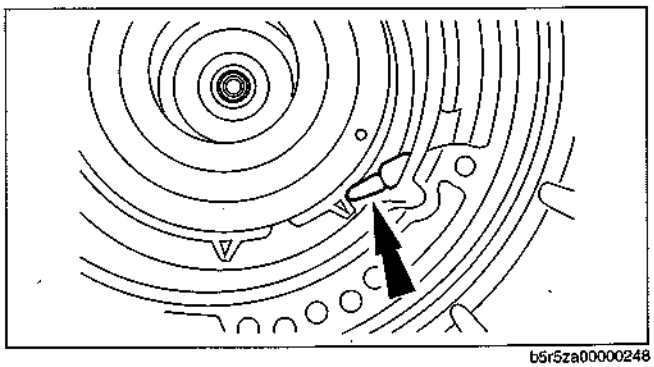

b5r5za00000231

68. Loosely install the screw.


b5r5za00000247

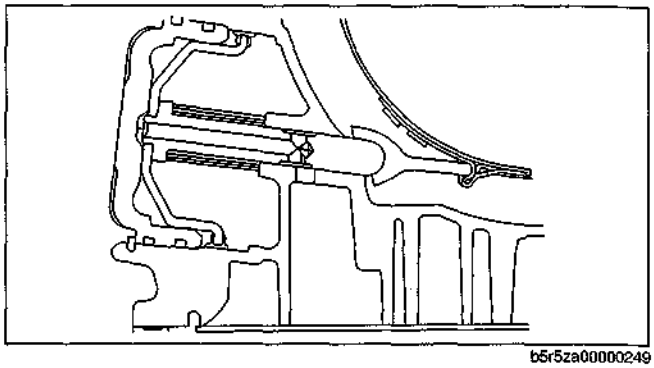
69. Install the overdrive brake band apply strut.

Caution
- **If the strut is installed incorrectly, transmission damage will occur.**


b5r5za00000248

70. Check to make sure that the overdrive brake band apply strut is installed in the correct orientation to the case and piston rod.

Caution
- **The torque specifications are critical for this procedure. Failure to use the correct torque specifications may cause transmission damage.**

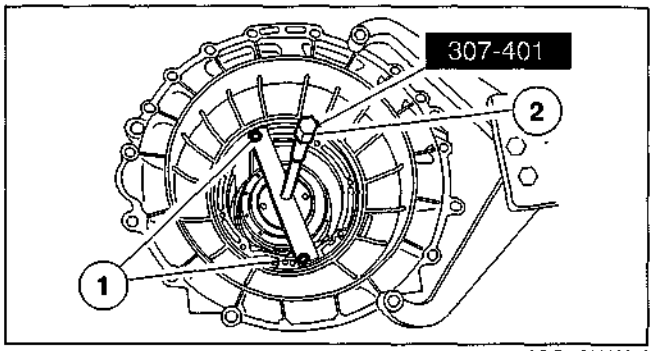

b5r5za00000249

71. Install the **SST**.
    (1) Install the **SST** and the bolts using the 2 pump bolt locations at approx. 6 and 12 o'lock positions.

Tightening torque
15 N·m {1.5 kgf·m, 11 ft·lbf}

    (2) Tighten the center bolt.

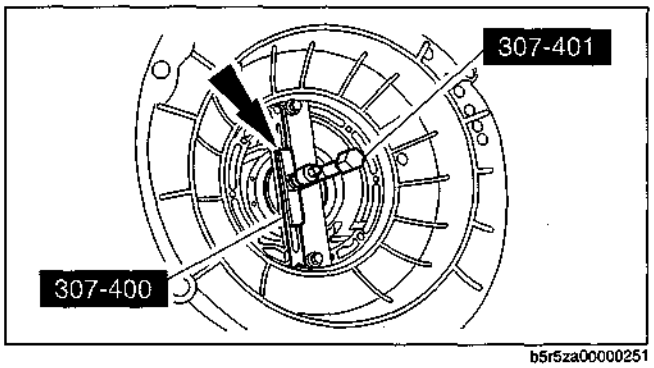
Tightening torque
1.13 N·m {11.5 kgf·cm, 10.0 in·lbf}



b5r5za00000250

72. Measure the distance from the top of the gauge bar to the drum bearing surface through the hole in the disc and record as dimension A. Repeat the measurement 180 degrees on the opposite side of the **SST** and record as dimension B.

Note
- Align the disc holes on **SST** with the slot in gauge bar for correct measurement.



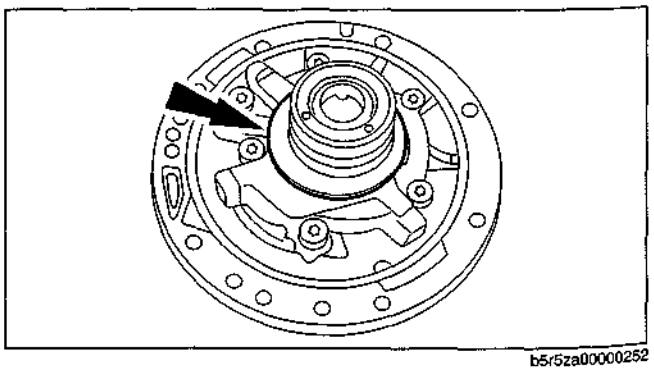
b5r5za00000251

73. Add dimension A to B, divide by 2 and record as dimension C.
74. Subtract the thickness of the gauge bar **17.78 mm {0.70 in}** from dimension C and record as dimension D.
75. Select the thrust washer (No.1) from the following chart using dimension D.

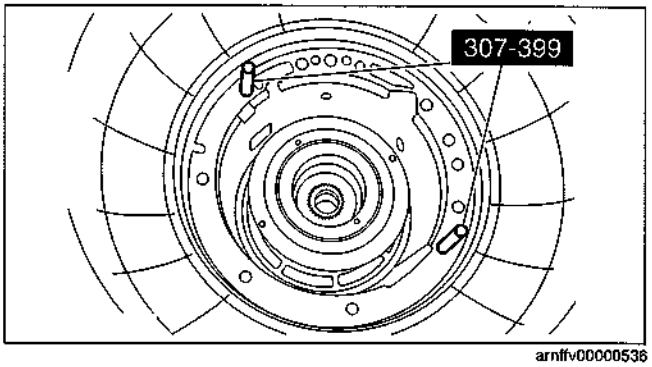
Thrust washer (No.1) size (overdrive brake drum)

Dimension E	Bearing Thickness	Identification (Color/ID)
38.05—38.13 mm {1.50 in}	1.55—1.60 mm {0.061—0.063 in}	White
38.14—38.28 mm {1.50—1.51 in}	1.75—1.80 mm {0.069—0.071 in}	Green
38.29—38.42 mm {1.51 in}	1.85—1.90 mm {0.073—0.075 in}	Red
38.43—38.61 mm {1.51—1.52 in}	2.05—2.10 mm {0.081-0.083 in}	Black
38.63—38.74 mm {1.52—1.53 in}	2.15—2.20 mm {0.095—0.097 in}	Yellow

76. Install the selected thrust washer (No.1).
    - Coat the thrust washer with petroleum jelly.


b5r5za00000252

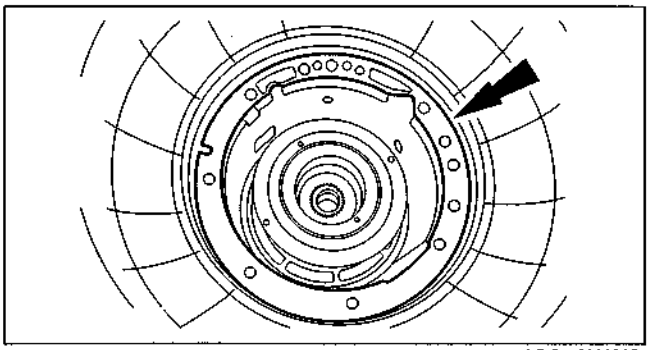
77. Install the **SSTs** into the transmission case.



arnffv00000536

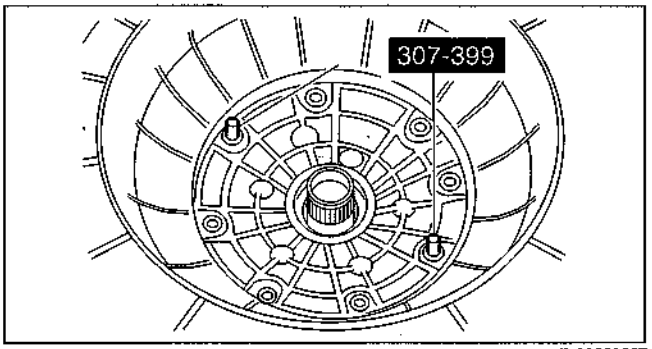
78. Install the pump gasket.

Caution
- **Make sure that the fluid pump inlet thrust washer (No.1), selective thrust washer, fluid pump gasket and the fluid pump-to-case O-ring remain in the correct position throughout this step.**


b5r5za00000254

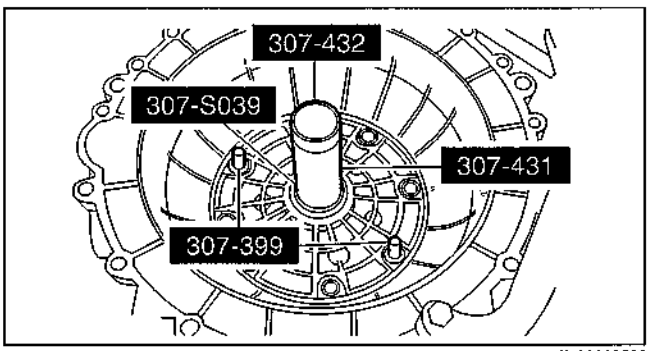
79. Install the fluid pump.

Caution
- **The special tools must be used to correctly align the pump with the adapter plate to reduce gear noise, bushing failure and leakage.**



arnffv00000537

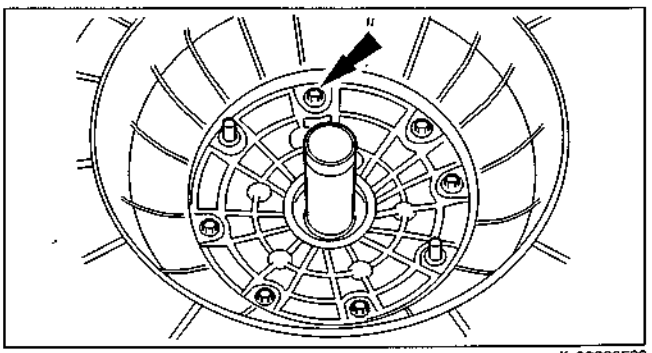
80. Using the **SST**, align the fluid pump to the adapter plate.



arnffv00000538

81. Install the 6 screws. Tighten the screws in a star pattern.

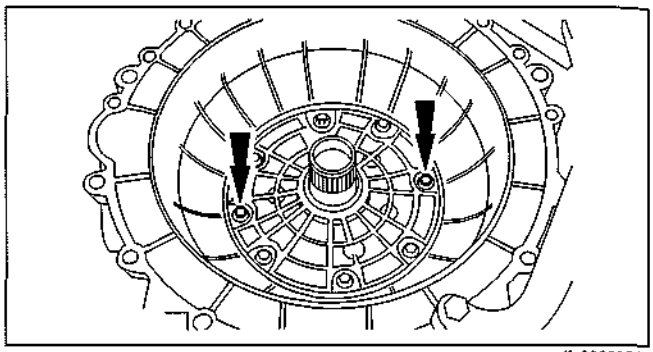
Tightening torque
22—28 N·m {2.3—2.8 kgf·m, 17—20 ft·lbf}


arnffv00000539

82. Remove the **SSTs** and install the 2 remaining screws.

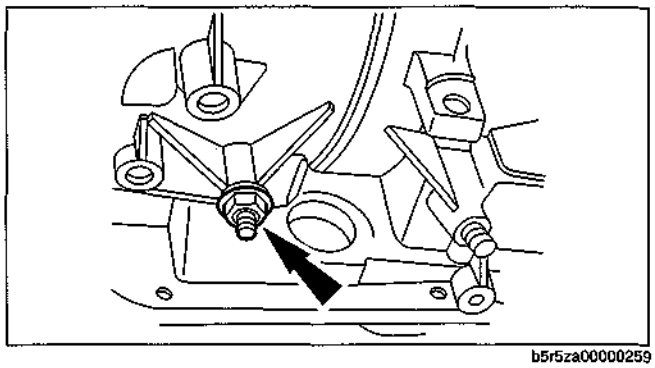
Tightening torque
22—28 N·m {2.3—2.8 kgf·m, 17—20 ft·lbf}

Caution
- **Do not allow overdrive brake band adjustment screw to back out. Band strut could fall out of position.**
- **Install, but do not tighten, a new locknut on the band adjustment screw. Apply petroleum jelly to the locknut seal.**


arnffv00000540

83. Install a new locknut on the band adjustment screw.

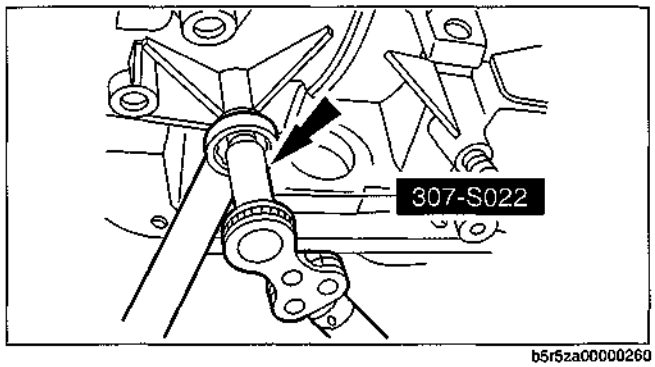
Caution
- **The overdrive servo must be installed prior to band adjustment.**


b5r5za00000259

84. Using the **SST**, tighten the intermediate brake band adjustment screw.

Tightening torque
12—14 N·m {123—142 kgf·cm, 107—123 in·lbf}

- Then back off the screw exactly 2 turns and hold that position.

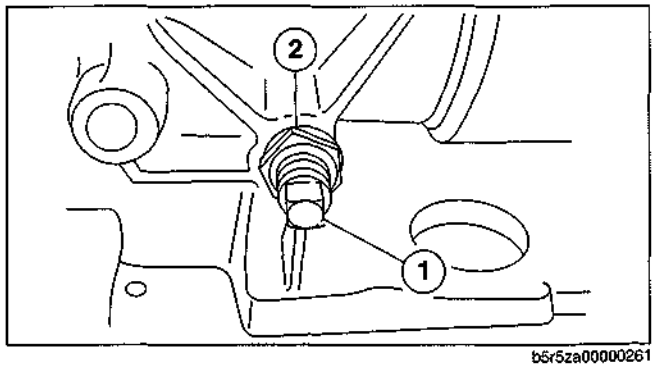


b5r5za00000260

85. Tighten the locknut.
(1) Hold the overdrive brake band adjustment screw stationary.
(2) Tighten the locknut.

Tightening torque
47—61 N·m {4.8—6.2 kgf·m, 35—44 ft·lbf}

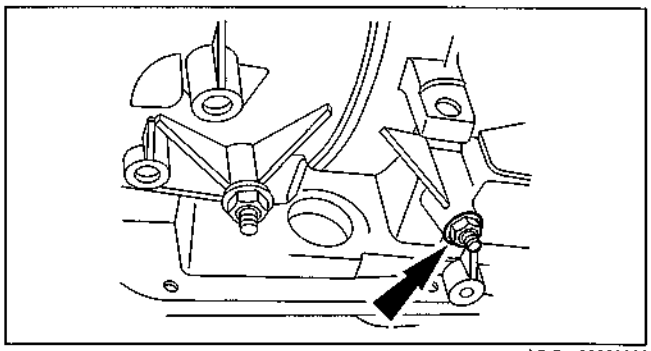
Caution
- **Do not allow the intermediate brake band adjusting screw to back out. Band strut could fall out of position.**
- **Install, but do not tighten, a new locknut on the band adjustment screw. Apply petroleum jelly to the locknut seal.**



b5r5za00000261

86. Install a new locknut on the band adjustment screw.

Caution
- **The intermediate brake servo must be installed prior to band adjustment.**

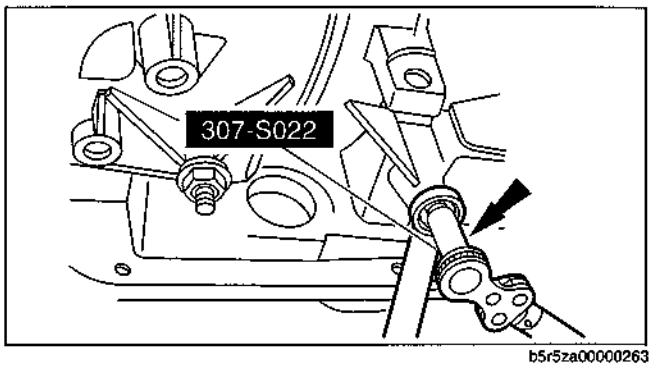


b5r5za00000262

87. Using the **SST**, tighten the overdrive brake band adjustment screw.

Tightening torque
12—14 N·m {123—142 kgf·cm, 107—123 in·lbf}

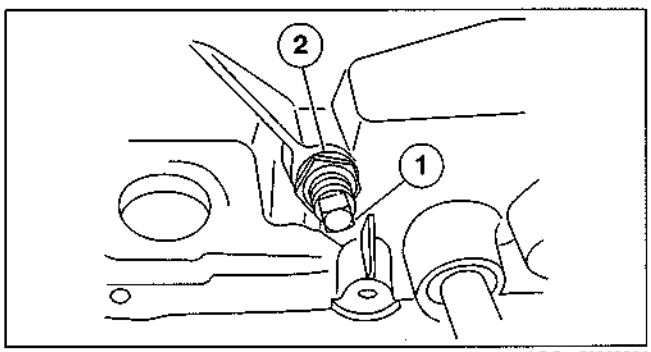
- Then back off the screw exactly 2 turns and hold that position.



b5r5za00000263

88. Tighten the locknut.
(1) Hold the intermediate brake band adjustment screw stationary.
(2) Tighten the locknut.

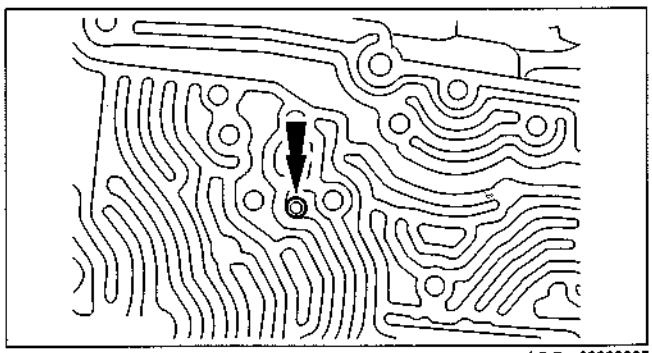
Tightening torque
47—61 N·m {4.8—6.2 kgf·m, 35—44 ft·lbf}



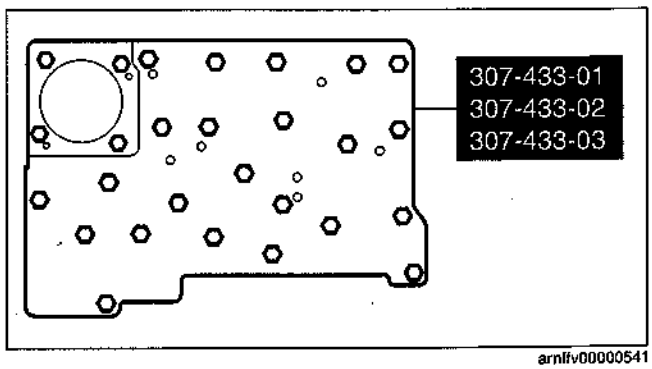
b5r5za00000264

89. Tighten the center support bolt.

Tightening torque
9—13 N·m {92—132 kgf·cm, 80—115 in·lbf}

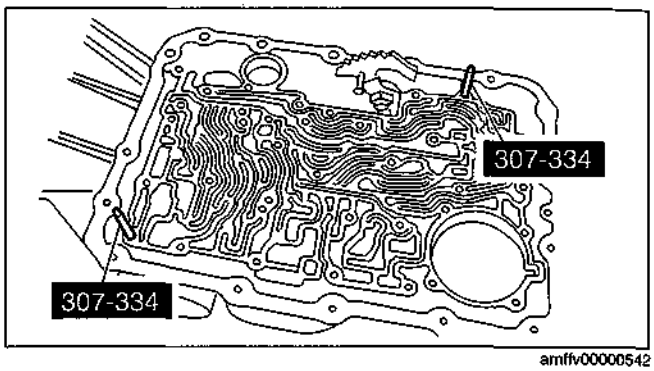

b5r5za00000265

90. Using the **SSTs**, Carry out the air pressure test procedure.



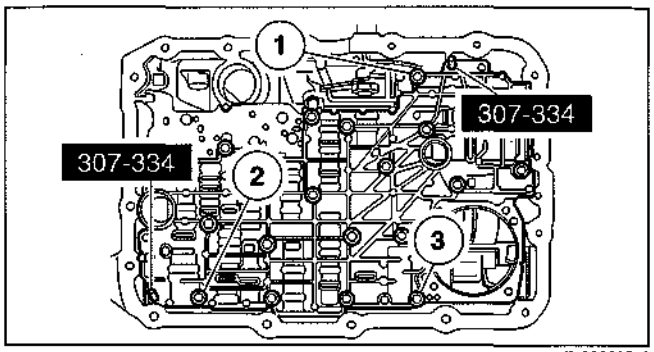
arnlfv00000541

91. Install the **SSTs** into the transmission case.



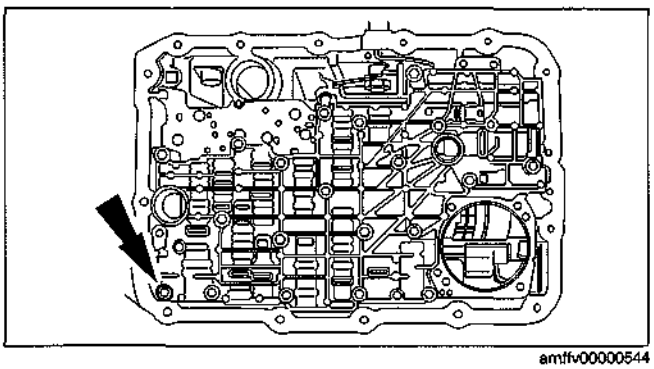
amffv00000542

92. Using the **SSTs**, Install the control valve body and loosely install the bolts.
    (1) Install the short bolt.
    (2) Install the bolt with the larger head.
    (3) Install the remaining bolts.



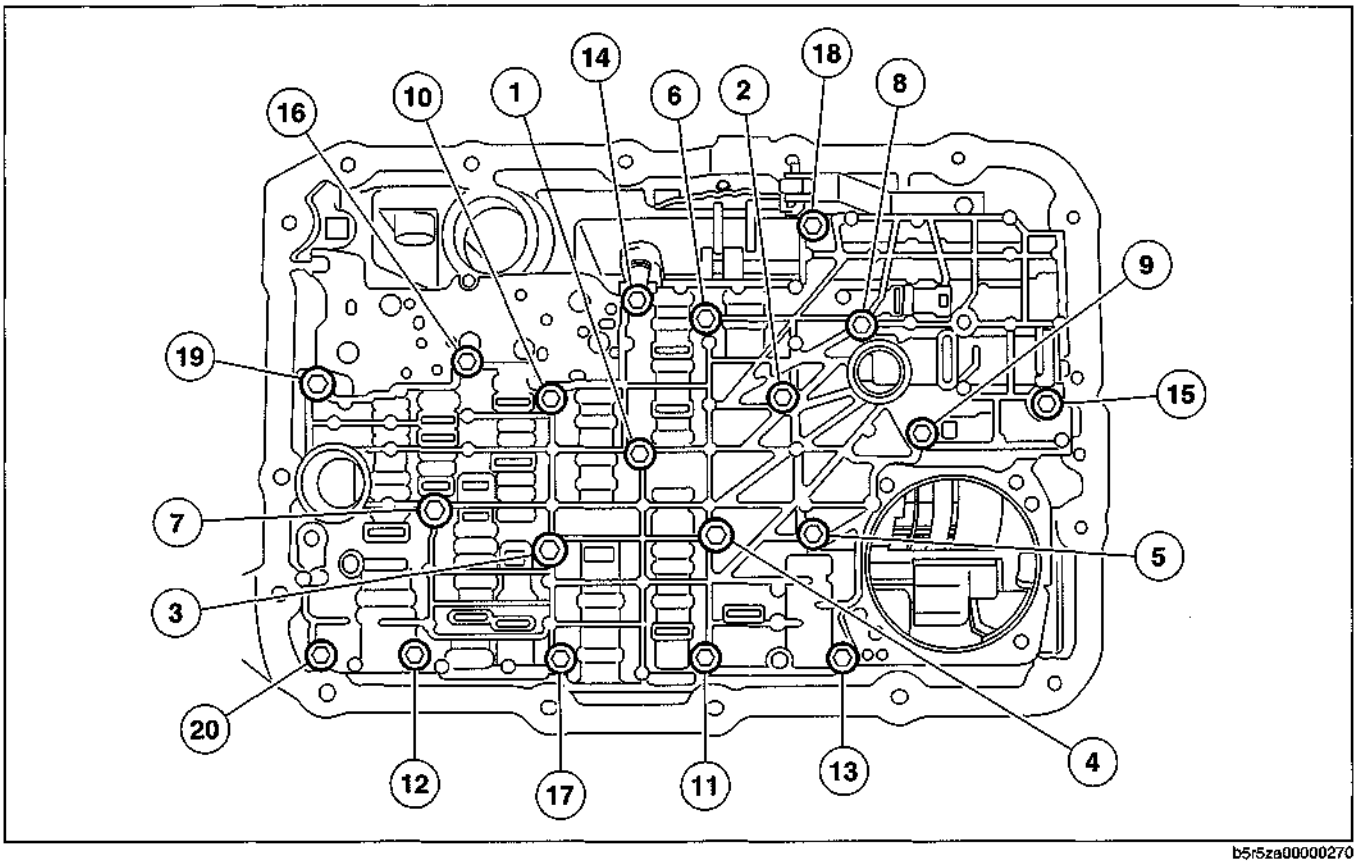
amffv00000543

93. Remove the **SSTs** and loosely install the screw.


amffv00000544

94. Tighten the bolts in the sequence shown.

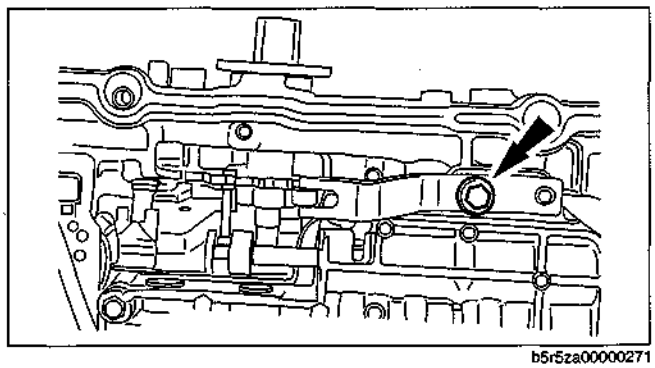
Tightening torque
9—11 N·m {92—112 kgf·cm, 80—97 in·lbf}



b5r5za00000270

95. With the manual lever in the N position, install the detent spring.

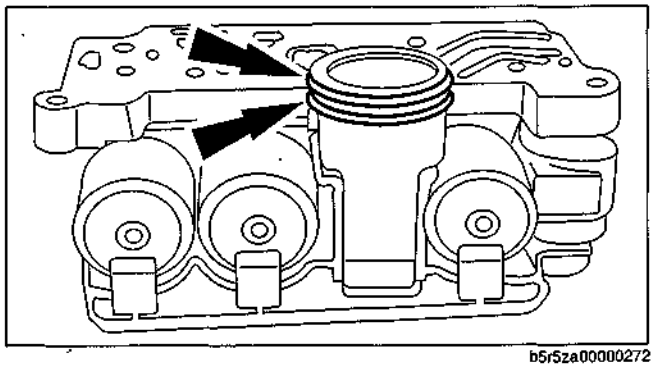
Tightening torque
9—11 N·m {92—112 kgf·cm, 80—97 in·lbf}



b5r5za00000271

96. Install new O-rings on the solenoid body connector. Lubricate the O-rings with clean ATF.

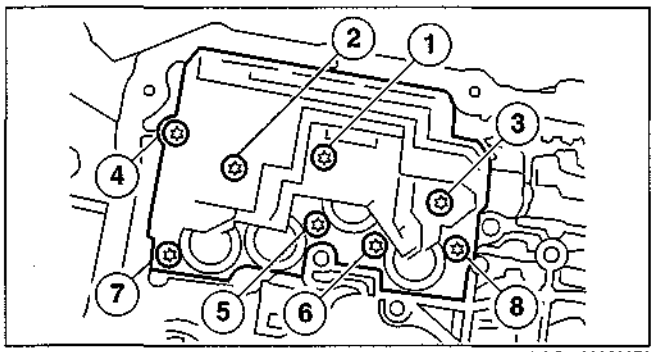
Caution
- **Inspect the transmission case bore to make sure it is free of foreign material and not damaged. If damaged, transmission leak may occur.**



b5r5za00000272

97. Install the solenoid body. Tighten bolts in the sequence shown.

Tightening torque
7—9 N·m {72—91 kgf·cm, 62—79 in·lbf}

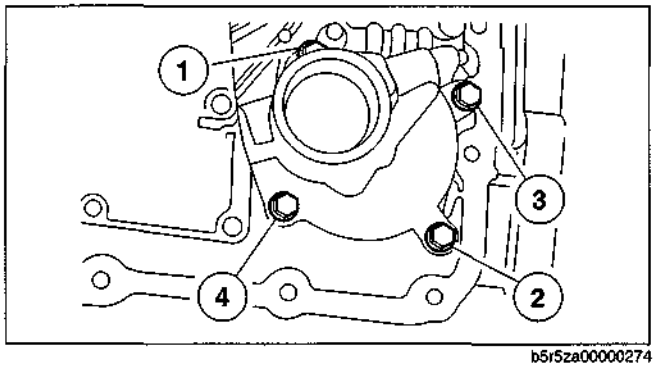


b5r5za00000273

98. Install the reverse servo. Tighten the bolts in the sequence shown in 2 stages.

Tightening torque
5 N·m {51 kgf·cm, 44 in·lbf}
10—12 N·m {102—122 kgf·cm, 89—106 in·lbf}

Caution
- **Lubricate the transmission fluid filter seals with clean ATF or they may be damaged.**

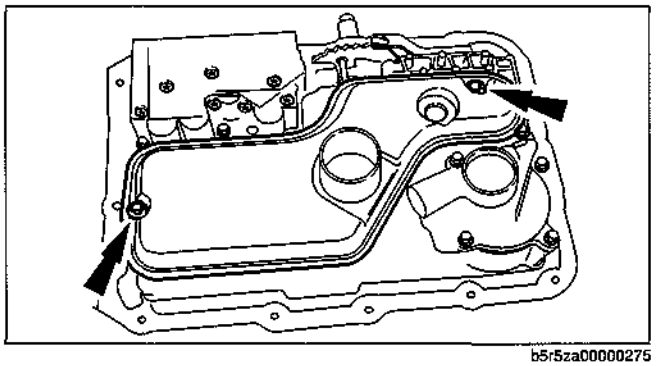


b5r5za00000274

99. Lubricate the seals and install the transmission fluid filter.

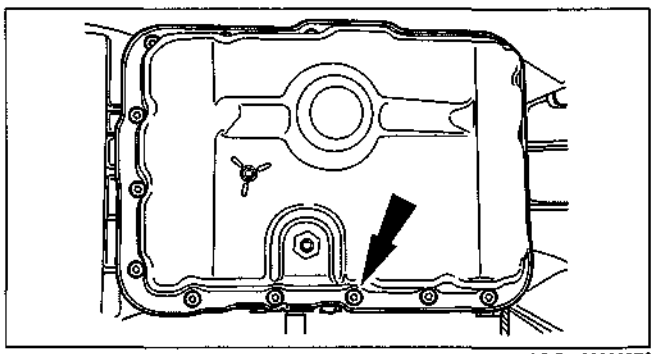
Tightening torque
9—11 N·m {92—112 kgf·cm, 80—97 in·lbf}

Note
- Make sure that the transmission fluid filter seals are correctly seated on the filter.


b5r5za00000275

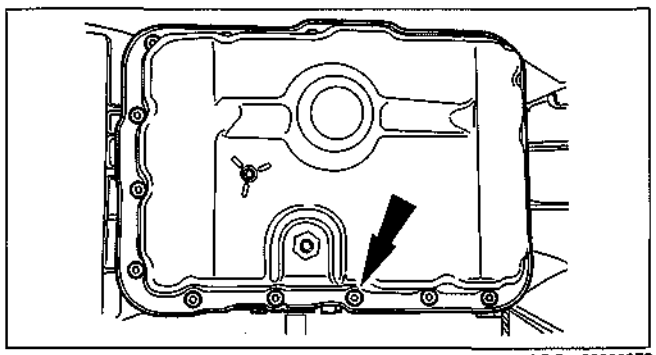
100. Install the transmission fluid pump and gasket, magnet and loosely install the bolts.

Note
- The transmission fluid pump gasket is reusable. Clean and inspect for damage. If not damaged, the gasket should be reused.

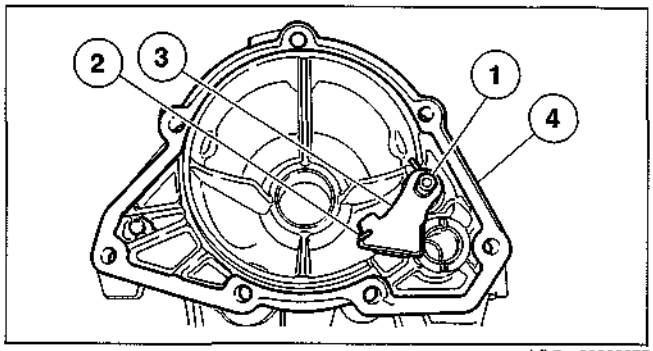

b5r5za00000276

101. Tighten the bolts in a crisscross sequence.

Tightening torque
9.5—11.5 N·m {97—117 kgf·cm, 85—101 in·lbf}


b5r5za00000276

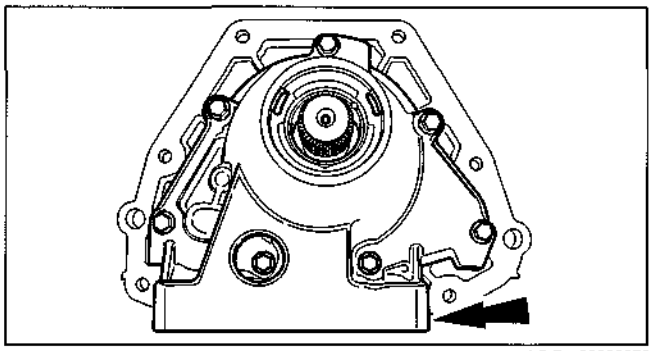
102.Install the parking pawl component and gasket.
(1) Install the parking pawl shaft.
(2) Install the parking pawl return spring.
(3) Install the parking pawl.
(4) Install a new gasket.



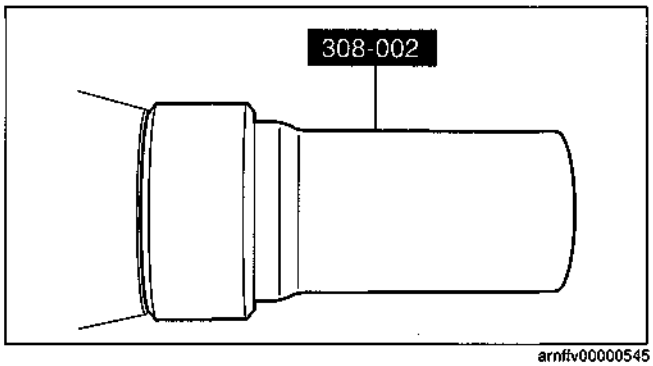
b5r5za00000277

103.Install the extension housing.(4x2)

Tightening torque
28—32 N·m {2.9—3.2 kgf·m, 21—23 ft·lbf}


b5r5za00000278

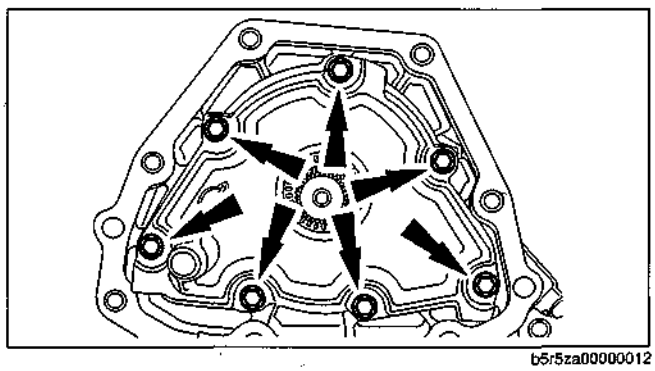
104.Using the **SST**, install the extension housing seal. (4x2)



arnffv00000545

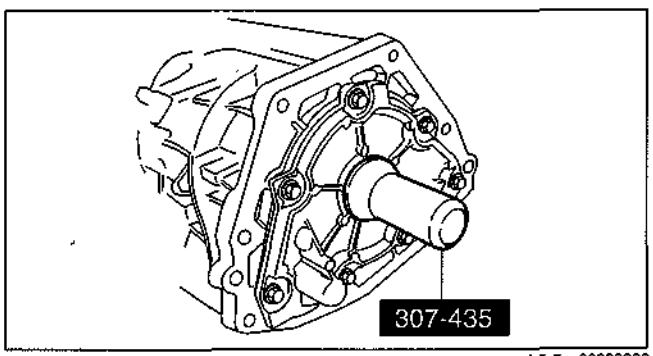
105.Install the extension housing.(4x4)

Tightening torque
28—32 N·m {2.9—3.2 kgf·m, 21—23 ft·lbf}


b5r5za00000012

106.Using the **SST**, install the extension housing seal. (4x4)

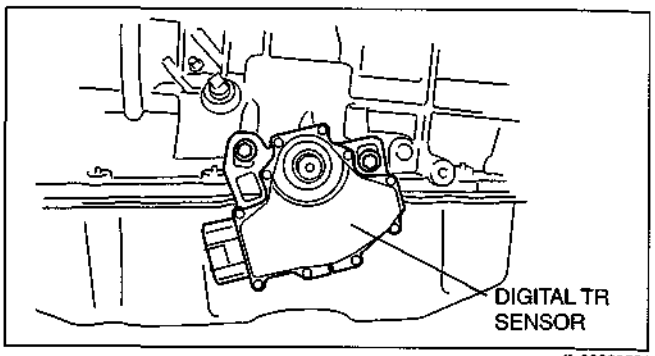
Caution
- **The digital TR sensor must fit flush against the boss on the case to prevent damage to the switch.**



b5r5za00000280

107.Install the digital TR sensor and loosely install the bolts.

Caution
- **Tightening one bolt before tightening the other may cause the sensor to bind or become damaged.**

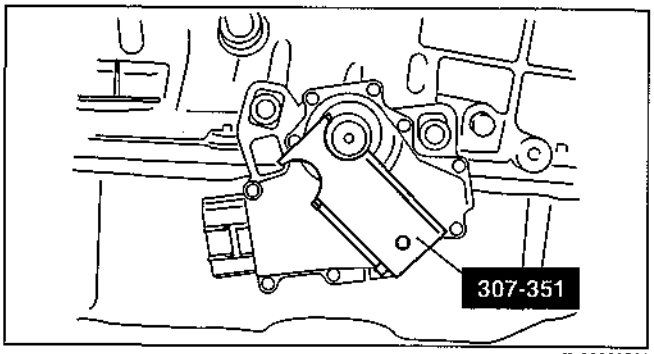


arnffv00000521

108.Using the **SST**, align the digital TR sensor and tighten the bolts in an alternating sequence.

Tightening torque
6.5—9.5 N·m {67—96 kgf·cm, 58—84 in·lbf}

Note
- The manual lever must be in the N position.

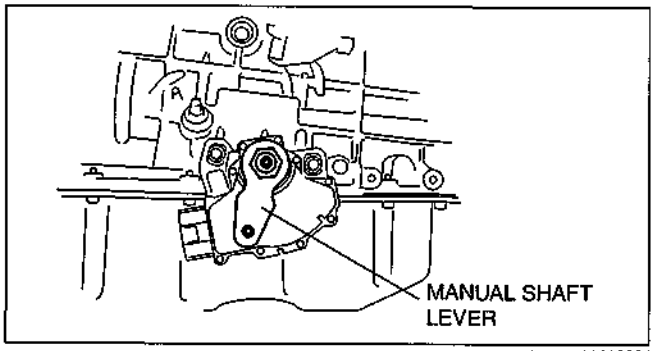


arnffv00000592

109.Install the manual shaft lever.

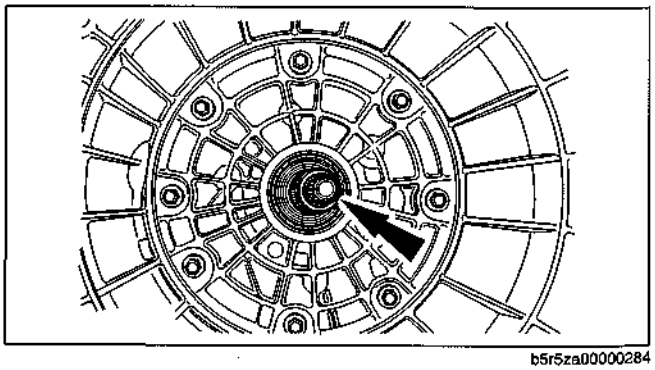
Tightening torque
41—54 N·m {4.2—5.5 kgf·m, 31—39 ft·lbf}

Caution
- **The splines of the input shaft are not the same length on both ends. The shaft end with the shorter splines goes into the fluid pump.**

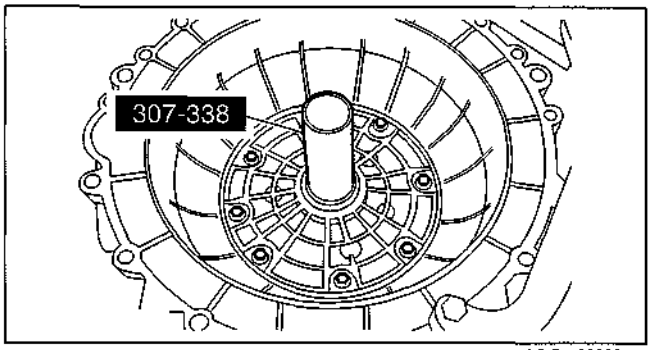


b5r5za00000394

110.Install the input shaft.


b5r5za00000284

111.Using the **SST**, make sure that the fluid pump gear seal ring is fully seated.

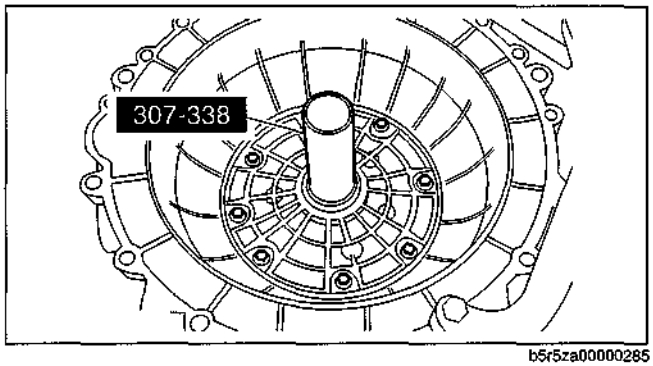


b5r5za00000285

112.Remove the **SST**.

Caution

- **Do not damage the fluid pump gear O-ring when installing torque converter.**
- **Make sure the converter hub is fully engaged in the pump support and gear and rotates freely. Do not damage the hub seal.**
- **If the torque converter slides out, the hub seal may be damaged.**

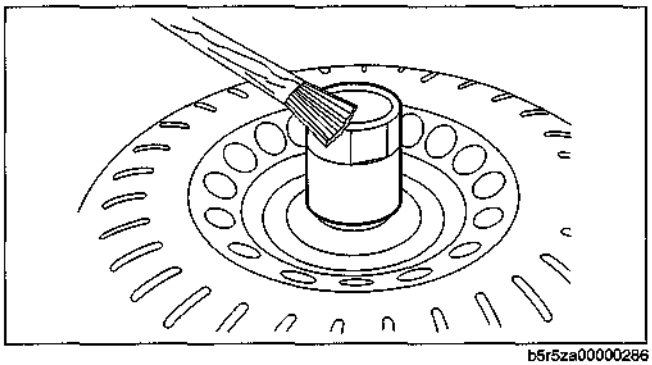


b5r5za00000285

113.Lubricate the converter hub with clean ATF.

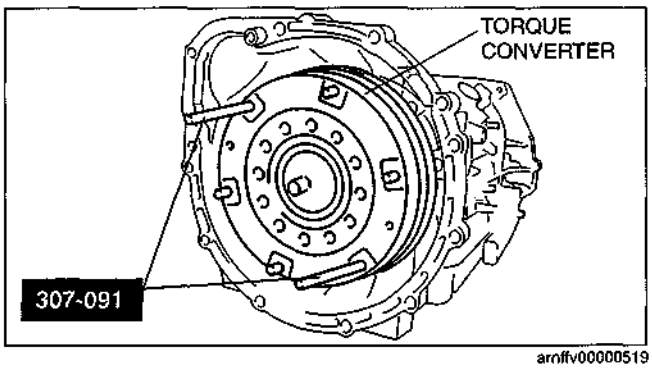
Warning

- **The torque converter can fall out if the transmission is tipped. Failure to follow these instructions may cause personal injury.**



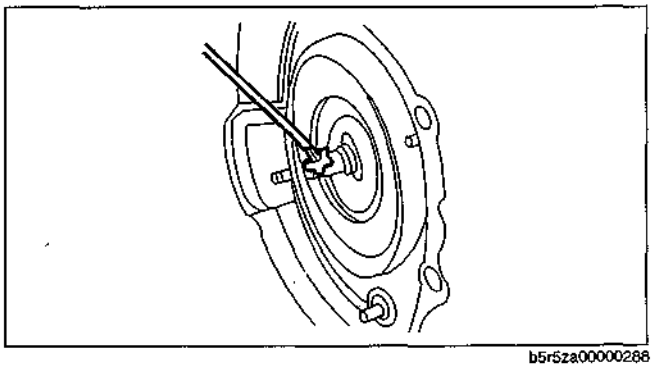
b5r5za00000286

114.Using the **SST**, install the torque converter by pushing and rotating.



arnffv00000519

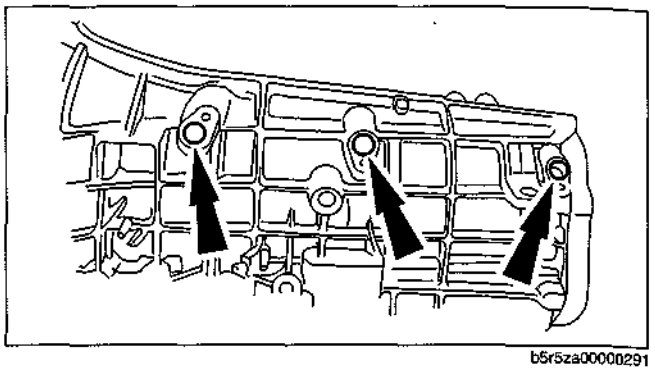
115.Lubricate the torque converter pilot hub with multi-purpose grease.



b5r5za00000288

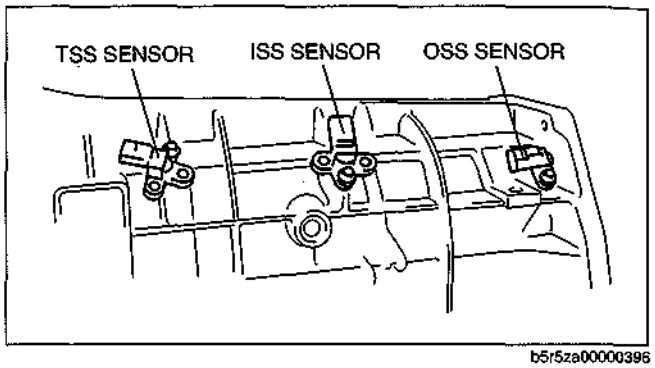
116.Using one of the sensor holes, fill the transmission with **8.5 L {9.0 US qt, 7.5 Imp qt}** of ATF.

Note
- Inspect O-rings for damage. Install new O-rings if damaged. Lubricate the O-rings with petroleum jelly to prevent damage to the O-rings.


b5r5za00000291

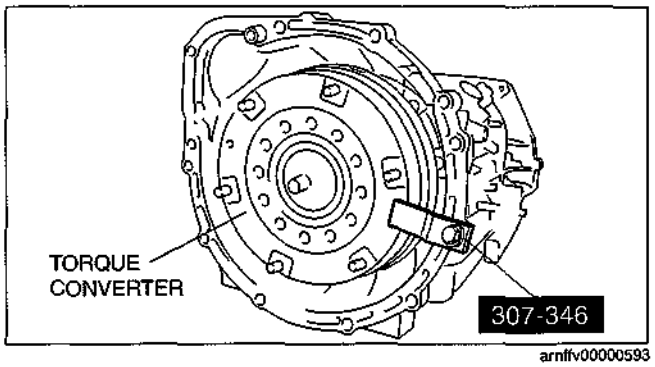
117.Install the sensors.

Tightening torque
TSS sensor, ISS sensor:
8—12 N·m
{82—122 kgf·cm, 71—106 in·lbf}
OSS sensor:
12—16 N·m
{123—163 kgf·cm, 107—141 in·lbf}



b5r5za00000396

118.Install the **SST**.



arnffv00000593

05-50 TECHNICAL DATA [5R55S]

TECHNICAL DATA[5R55S]..... 05-50–1

TECHNICAL DATA[5R55S]

id0550h1800500

Item	Specification
ATF	Type: Mercon® V Capacity (Approx. quantity): Refer to Repair Manual.
Coast clutch clearance	Standard: 1.3—2.0 mm {0.051—0.079 in}
Direct clutch clearance	Standard: 1.3—2.0 mm {0.051—0.079 in}
Forward clutch clearance	Standard: 1.3—2.0 mm {0.051—0.079 in}

Retaining ring size for coast clutch clearance

Thickness		Diameter	
mm	in	mm	in
1.37	0.0539	130.1	5.122
1.73	0.0681	130.1	5.122
2.08	0.0819	130.1	5.122
2.44	0.0961	130.1	5.122

Retaining ring size for direct clutch clearance

Thickness		Diameter	
mm	in	mm	in
1.37	0.0539	130.1	5.122
1.73	0.0681	130.1	5.122
2.08	0.0819	130.1	5.122
2.44	0.0961	130.1	5.122

Retaining ring size for forward clutch clearance

Thickness		Diameter	
mm	in	mm	in
1.73	0.0681	141.45	5.65
2.08	0.0819	141.45	5.65
2.44	0.0961	141.45	5.65

Thrust bearing (No.4) size (intermediate brake drum)

Dimension E	Bearing Thickness	Identification (Notches)
1.69—1.87 mm {0.066—0.074 in}	2.65—2.80 mm {0.104—0.110 in}	None
1.88—2.04 mm {0.073—0.080 in}	2.83—2.98 mm {0.111—0.116 in}	1
2.05—2.22 mm {0.081— 0.088 in}	3.01—3.16 mm {0.118—0.124 in}	2
2.23—2.43 mm {0.088—0.096 in}	3.21—3.36 mm {0.126—0.132 in}	3

Thrust washer (No.1) size (overdrive brake drum)

Dimension E	Bearing Thickness	Identification (Color/ID)
38.05—38.13 mm {1.50 in}	1.55—1.60 mm {0.061—0.063 in}	White
38.14—38.28 mm {1.50—1.51 in}	1.75—1.80 mm {0.069—0.071 in}	Green
38.29—38.42 mm {1.51 in}	1.85—1.90 mm {0.073—0.075 in}	Red
38.43—38.61 mm {1.51—1.52 in}	2.05—2.10 mm {0.081-0.083 in}	Black
38.63—38.74 mm {1.52—1.53 in}	2.15—2.20 mm {0.095—0.097 in}	Yellow

05–50B TECHNICAL DATA [S15M-D, S15MX-D]

TECHNICAL DATA
[S15M-D, S15MX-D] 05–50B–1

TECHNICAL DATA [S15M-D, S15MX-D]

DCF055000000W05

Item	Specification
Standard clearance between shift fork and clutch hub sleeve groove	0.05—0.40 mm {0.002—0.015 in}
Maximum clearance between shift fork and clutch hub sleeve groove	0.5 mm {0.020 in}
Standard clearance between synchronizer ring and flank surface of gear	1.5 mm {0.059 in}
Maximum clearance between synchronizer ring and flank surface of gear	0.8 mm {0.031 in}
Detent ball springs for 1st/2nd and 3rd/4th shift rods	Standard length: 22.5 mm {0.886 in}
Detent ball spring for 5th/reverse shift rod	Standard length: 24.97 mm {0.9831 in}
1st/2nd select lock spindle spring [4x2]	Standard length: 57.5 mm {2.26 in}
Push pin spring for 1st/2nd shift rod end [4x4]	Standard length: 32.8 mm {1.29 in}
Push pin spring for 5th/reverse shift rod end [4x4]	Standard length: 41.0 mm {1.61 in}
Detent ball spring for 5th/reverse shift rod end [4x4]	Standard length: 24.97 mm {0.9831 in}
Mainshaft maximum runout	0.03 mm {0.0012 in}
Standard clearance between shift rod end and control lever	0.5 mm {0.020 in} or less
3rd/4th clutch hub end play	0—0.05 mm {0.0—0.0019 in}
Maindrive gear shaft total end play	0.05—0.15 mm {0.002—0.0059 in}
Countershaft total end play	0.15—0.25 mm {0.006—0.0098 in}
5th/Reverse clutch hub end play	0—0.05 mm {0.0—0.0019 in}
Reverse gear end play	0.25—0.35 mm {0.002—0.0059 in}
Reverse idler gear end play	0.1—0.2 mm {0.0040—0.0078 in}

3rd/4th clutch hub retaining ring

Thickness (mm {in})
1.50 {0.0591}
1.55 {0.0610}
1.60 {0.0630}
1.65 {0.0650}
1.70 {0.0669}
1.75 {0.0689}
1.80 {0.0709}
1.85 {0.0728}
1.90 {0.0748}
1.95 {0.0768}

Maindrive gear bearing shim selective chart

Dimension C (mm {in})	Shim thickness (mm {in})
1.45—1.55 {0.0571—0.0610}	1.4 {0.055}
1.55—1.65 {0.0611—0.0649}	1.5 {0.059}
1.65—1.75 {0.0650—0.0688}	1.6 {0.063}
1.75—1.85 {0.0689—0.0728}	1.7 {0.067}
1.85—1.95 {0.0729—0.0767}	1.8 {0.071}
1.95—2.05 {0.0768—0.0807}	1.9 {0.075}
2.05—2.15 {0.0808—0.0846}	2.0 {0.079}
2.15—2.25 {0.0847—0.0885}	2.1 {0.083}
2.25—2.35 {0.0886—0.0925}	2.2 {0.087}
2.35—2.45 {0.0926—0.0964}	2.3 {0.090}
2.45—2.55 {0.0965—0.1003}	2.4 {0.094}
2.55—2.65 {0.1004—0.1043}	2.5 {0.098}
2.65—2.75 {0.1044—0.1082}	2.6 {0.102}
2.75—2.85 {0.1083—0.1122}	2.7 {0.106}
2.85—2.95 {0.1123—0.1161}	2.8 {0.110}
2.95—3.05 {0.1162—0.1200}	2.9 {0.114}
3.05—3.15 {0.1201—0.1240}	3.0 {0.118}

Countershaft front bearing shim selective chart

Dimension F (mm {in})	Shim thickness (mm {in})
3.15—3.25 {0.1240—0.1279}	3.0 {0.118}
3.25—3.35 {0.1280—0.1318}	3.1 {0.122}
3.35—3.45 {0.1319—0.1358}	3.2 {0.126}
3.45—3.55 {0.1359—0.1397}	3.3 {0.130}
3.55—3.65 {0.1398—0.1437}	3.4 {0.134}
3.65—3.75 {0.1438—0.1476}	3.5 {0.138}
3.75—3.85 {0.1477—0.1515}	3.6 {0.142}
3.85—3.95 {0.1516—0.1555}	3.7 {0.147}

5th/Reverse clutch hub thrust washer

Thickness (mm {in})
3.00 {0.118}
3.05 {0.120}
3.10 {0.122}
3.15 {0.124}
3.20 {0.126}
3.25 {0.128}
3.30 {0.130}
3.35 {0.132}
3.40 {0.134}

Reverse gear thrust washer

Dimension C (mm {in})	Thickness (mm {in})
7.60—7.70 {0.300—0.303}	7.35 {0.289}
7.70—7.80 {0.304—0.307}	7.45 {0.293}
7.80—7.90 {0.308—0.311}	7.55 {0.297}
7.90—8.00 {0.312—0.314}	7.65 {0.301}
8.00—8.10 {0.315—0.318}	7.75 {0.305}

Reverse idler gear retaining ring

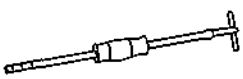
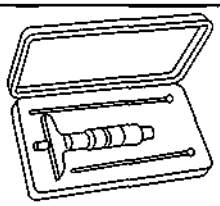
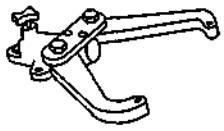
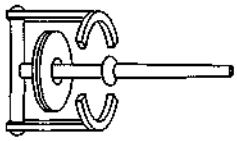
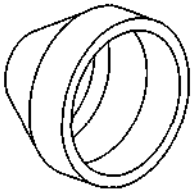
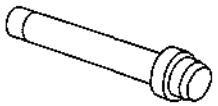
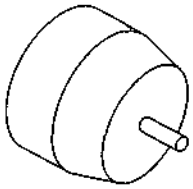
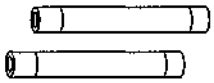
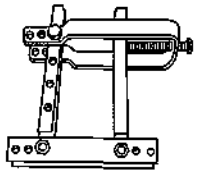
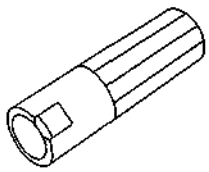
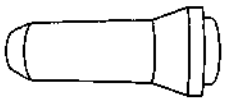
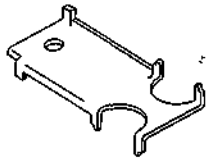
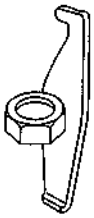
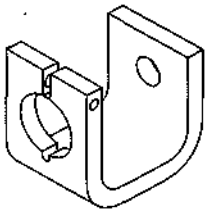
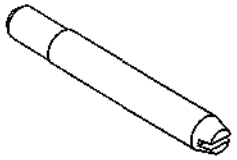
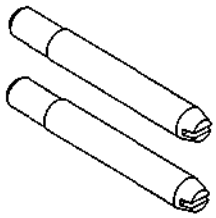
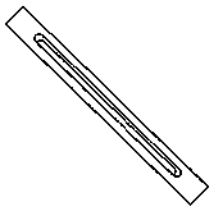
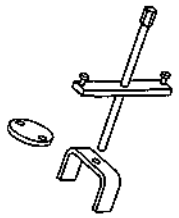
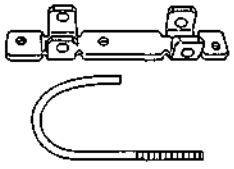
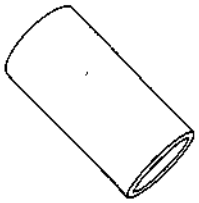
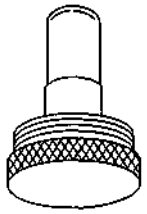
Thickness (mm {in})
1.5 {0.059}
1.6 {0.063}
1.7 {0.067}
1.8 {0.071}
1.9{0.075}

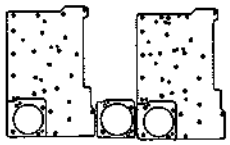
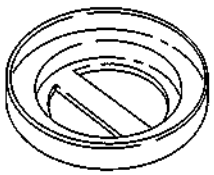
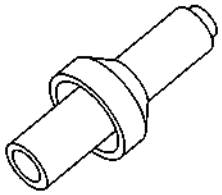
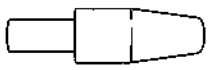
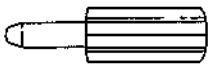
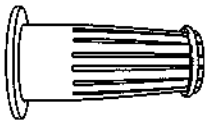
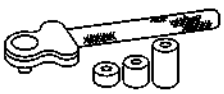
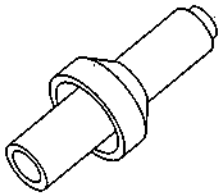
05-60 SERVICE TOOLS [5R55S]

SERVICE TOOLS[5R55S]..... 05-60–1

SERVICE TOOLS[5R55S]

id0560h1500400

100-001 Slide Hammer 	303-D026 Depth Micrometer 	307-003 Holding Fixture, Transmission 
307-015 Compressor, Clutch Spring 	307-049 Protector, Piston Seal 	307-050 Installer, Shift Shaft Fluid Seal 
307-051 Protector, Piston Seal 	307-091 Handle, Torque Converter 	307-309 Remover, Torque Converter Fluid Seal 
307-334 Aligner, Valve Body (2 required)	307-336 Sizer, Piston Seal	307-338 Sizer, Piston Seal 
307-346 Retainer, Torque Converter	307-349 Installer, Torque Converter Fluid Seal 	307-351 Alignment Gauge, TR Sensor 
308-375 Remover, Input Shaft Oil Seal 	307-397 Remover, Transmission Fluid Pump 	307-398 Alignment Pins, Transmission Pump 
307-399 Alignment Pins, Transmission Pump 	307-400 Gauge Bar 	307-401 Compressor, Cushion Spring 
307-402 Compressor, Servo Cover 	307-431 Aligner, Fluid Pump Handle 	307-432 Aligner, Fluid Pump Pilot 

307-433-01 307-433-02 307-433-03 Transmission Test Plate and Gasket 	307-434 Bonded Piston Seal Sizer 	307-435 Installer, Transmission Extension Housing Fluid Seal 
307-451/1 Transmission Fluid Pump Seal Aligner 	307-451/2 Transmission Fluid Pump Seal Sizer 	307-451/3 Transmission Fluid Pump Seal Installer 
307-S022 Adjustment Set, Transmission Band 	307-S039 Alignment Set, Fluid Pump	308-002 Installer, Transmission Extension Housing Oil Seal 

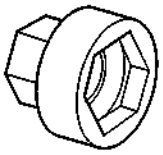
05–60B SERVICE TOOLS [S15M-D, S15MX-D]

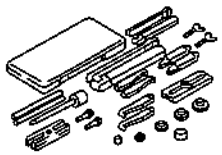
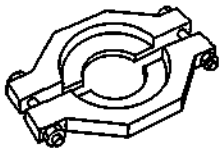
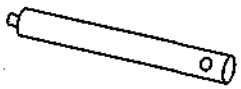
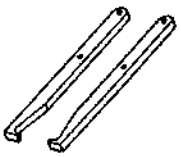
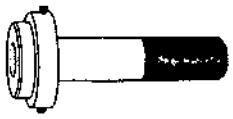
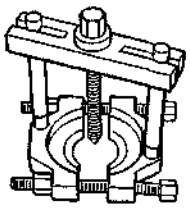
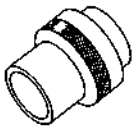
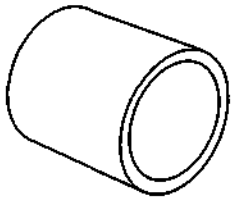
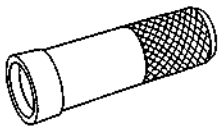
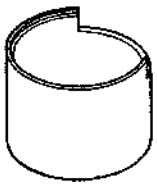
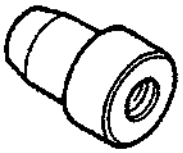
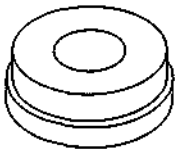
SERVICE TOOLS [S15M-D, S15MX-D]

DCF056000000W04

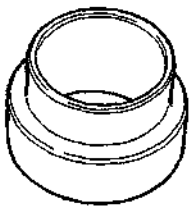
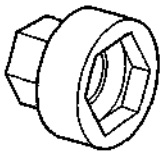
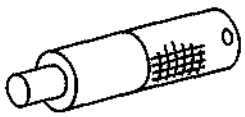
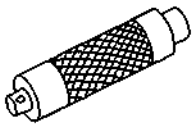
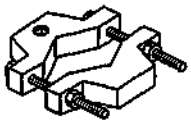
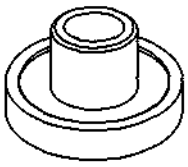
1: Mazda SST number
2: Global SST number

Example

1:49 UN01 011 2:308-168 Socket 

1:49 0839 425C 2: – Bearing Puller Set 	1:49 H027 002 2: – Remover, Bearing 	1:49 G033 106 2: – Attachment
1:49 G033 102 2: – Handle 	1:49 H017 101 2: – Hook 	1:49 0813 235 2: – Main Bearing Puller & Installer 
1:49 0710 520 2: – Bearing Puller 	1:49 H025 003A 2: – Bearing Installer 	1:49 G028 203 2: – Support 
1:49 F401 331 2: – Body 	1:49 B034 201 2: – Support Block 	1:49 G030 338 2: – Attachment E
1:49 B032 308 2: – Attachment A 	1:49 0221 251A 2: – Valve Guide Installer	1:49 D032 326A 2: – Attachment A 

SERVICE TOOLS [S15M-D, S15MX-D]

1:49 F401 337A 2: – Attachment C 	1:49 UN01 011 2:308-168 Socket 	1:49 0636 040 2:– Piston Pin Installer 
1:49 G030 797 2: – Handle 	1:49 F017 1A0 2: – Wrench 	1:49 G030 728 2: – Attachment B
1:49 H025 001 2: – Installer 	49 B012 004 Valve seal pusher	–

PROCEDURE FOR INSERTING KEY BARREL INTO REPLACEMENT STEERING COLUMN

Models:

2002-05 Model Year Focus (excluding ST170)

Summary:

The procedure outlined below should be followed to ensure the Focus steering column is not inadvertently locked when installing the key barrel into the steering column.

Information:

2002-05 Model Year Focus (excluding ST170) steering columns can inadvertently be permanently locked if the correct procedure for installing the key barrel is not followed.

Note: If the steering column is locked with the white spacer removed and no key barrel inserted, the column will be **permanently locked**. The column will then need to be scrapped.

Follow the procedure below to ensure the column does not become locked:

1. Confirm the ignition switch spindle is in the "accessories" position (as per Figure 1). When the ignition switch spindle is the accessories position the column is able to be turned freely.

If the ignition switch spindle is in the "locked" position (as per Figure 2), depress the spindle and turn the spindle clockwise to the "accessories" position. **Do not** remove the white spacer when the spindle is in the "locked" position as the anti-theft locking mechanism will be triggered and the column will be **permanently locked.**

Figure 1: Ignition switch spindle is in the "accessories" position

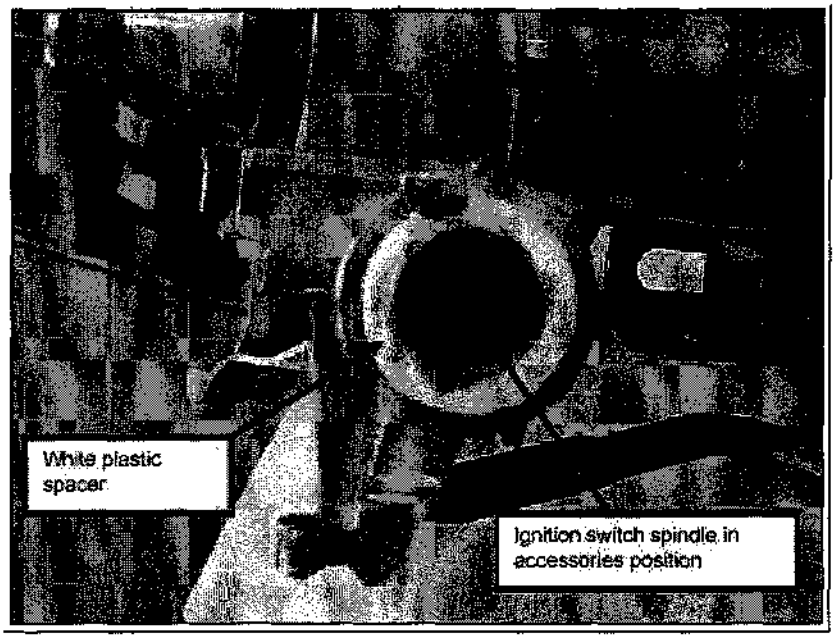
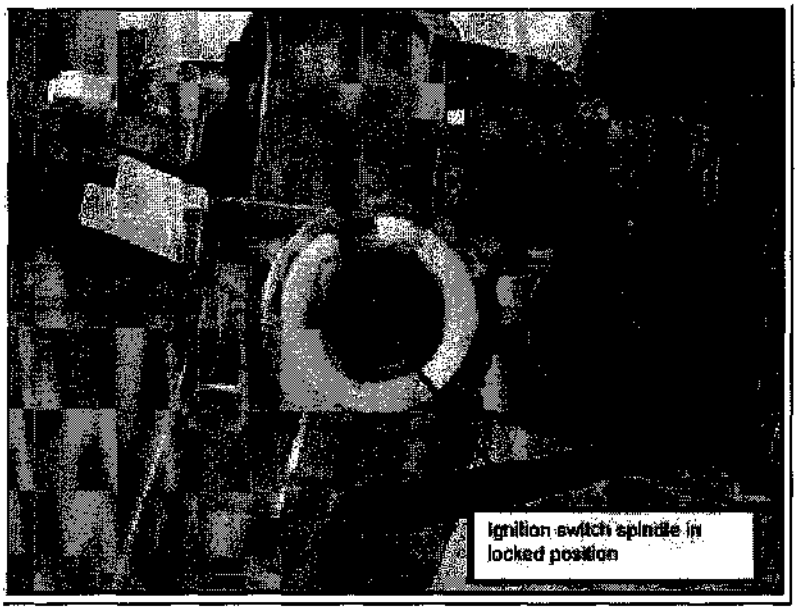
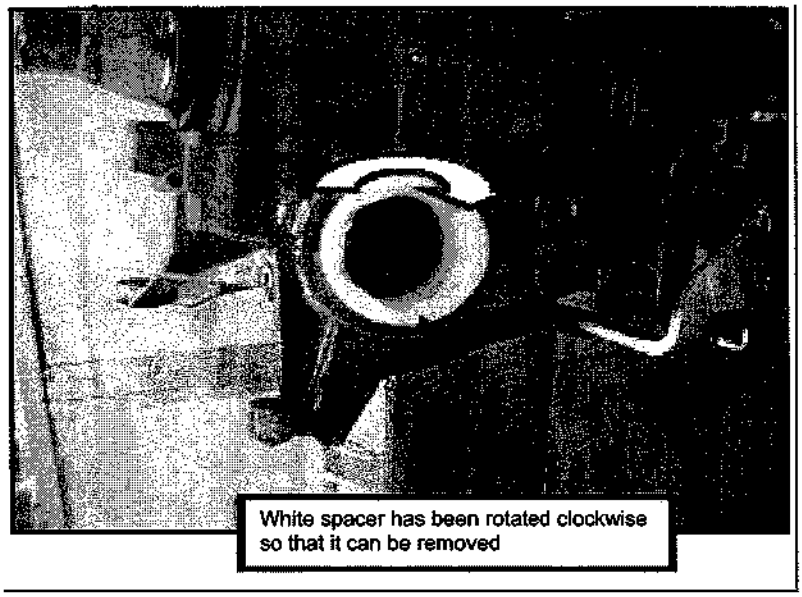


Figure 2: Ignition switch spindle is in the "locked" position – **DO NOT** remove white spacer whilst spindle is in "locked" position



2. With the spindle in the "accessories" postion, carefully rotate the white plastic spacer in the clockwise direction. Whilst rotating the white plastic spacer, watch the ignition switch spindle and ensure that the spindle is not rotated out of the "accessories" position. Rotate the white plastic spacer until it hits the stop position, as per Figure 3.

Figure 3: White spacer has been rotated clockwise until stop position. Spindle is now in correct position to be pulled out from steering column key barrel slot.



3. Carefully pull the white plastic spacer out from key barrel slot.

4. Confirm that the key barrel to be inserted into the column is in the "accessories" position. Carefully insert key barrel into the key barrel slot in the steering column.

5. When the key barrel is correctly inserted the locking pin in the key barrel will pop into the hole provided in the steering column lock assembly.

6. Confirm that column is able to be turned freely after inserting the key barrel.

GENERAL INFORMATION . . . 00-00

00-00 GENERAL INFORMATION

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VEHICLE IDENTIFICATION NUMBER (VIN) CODE

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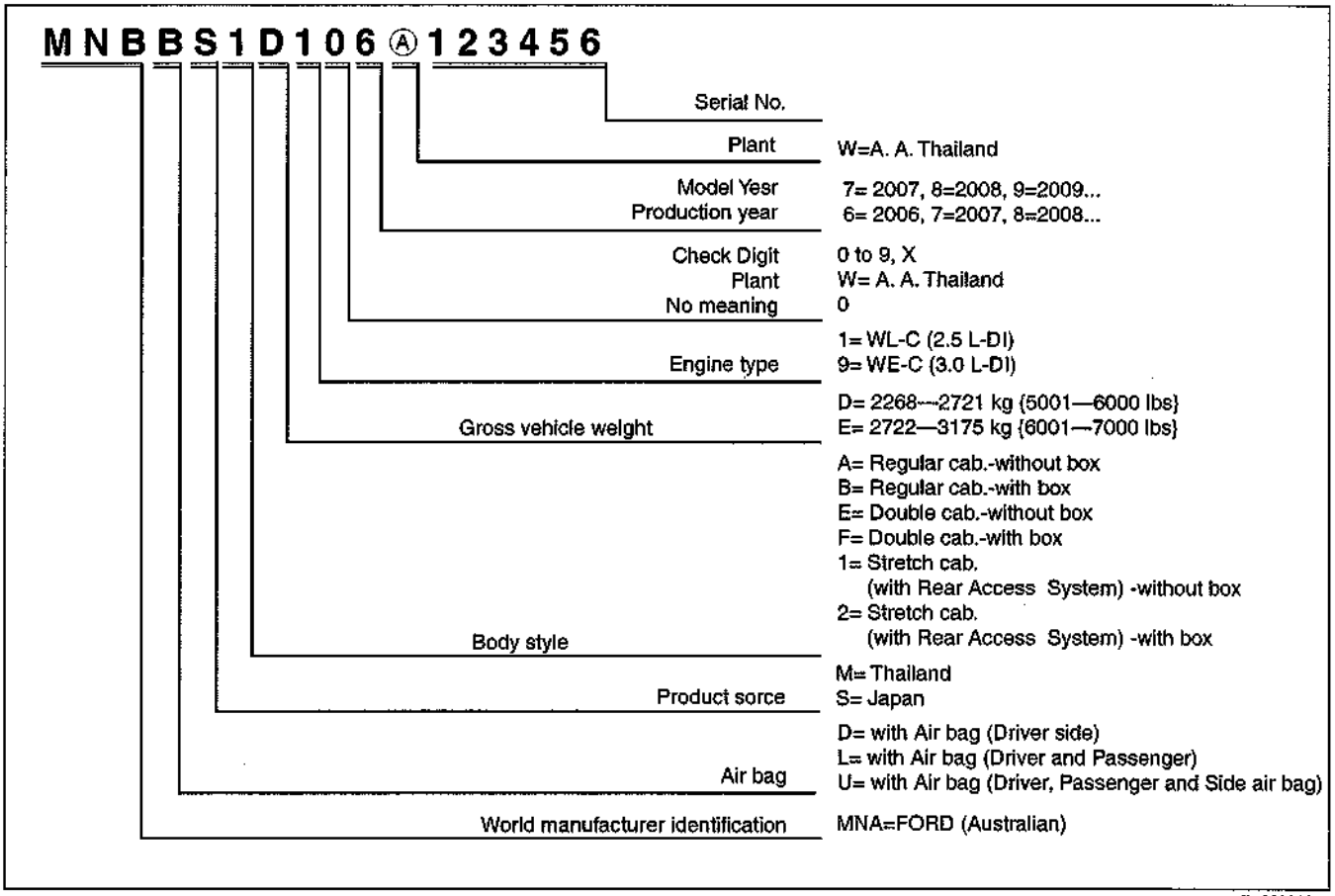

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VEHICLE IDENTIFICATION NUMBERS (VIN)

MNA BS******
MNA DS******
MNA LS******
MNA US******

HOW TO USE THIS MANUAL

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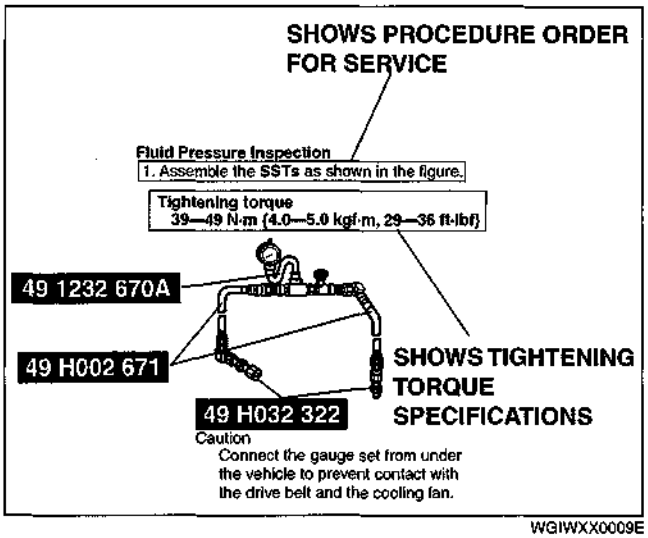
Range of Topics

- This manual contains procedures for performing all required service operations. The procedures are divided into the following five basic operations:
  - — Removal/Installation
  - — Disassembly/Assembly
  - — Replacement
  - — Inspection
  - — Adjustment
- Simple operations which can be performed easily just by looking at the vehicle (i.e., removal/installation of parts, jacking, vehicle lifting, cleaning of parts, and visual inspection) have been omitted.

Service Procedure

Inspection, adjustment

- Inspection and adjustment procedures are divided into steps. Important points regarding the location and contents of the procedures are explained in detail and shown in the illustrations.



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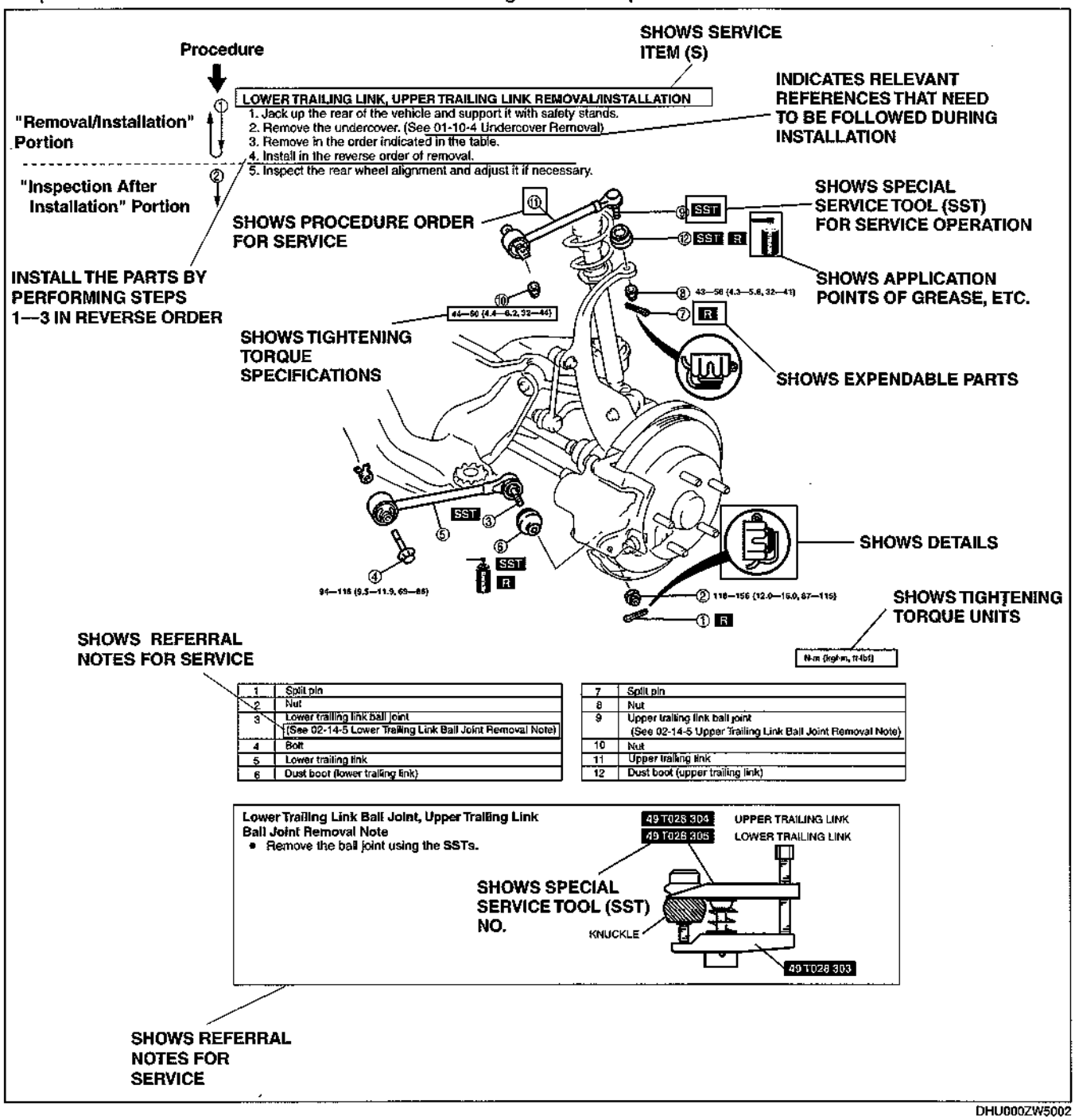
Repair procedure

1. Most repair operations begin with an overview illustration. It identifies the components, shows how the parts fit together, and describes visual part inspection. However, only removal/installation procedures that need to be performed methodically have written instructions.
2. Expendable parts, tightening torques, and symbols for oil, grease, and sealant are shown in the overview illustration. In addition, symbols indicating parts requiring the use of special service tools or equivalent are also shown.
3. Procedure steps are numbered and the part that is the main point of that procedure is shown in the illustration with the corresponding number. Occasionally, there are important points or additional information concerning a procedure. Refer to this information when servicing the related part.



1	Split pin
2	Nut
3	Lower trailing link ball joint (See 02-14-5 Lower Trailing Link Ball Joint Removal Note)
4	Bolt
5	Lower trailing link
6	Dust boot (lower trailing link)

7	Split pin
8	Nut
9	Upper trailing link ball joint (See 02-14-5 Upper Trailing Link Ball Joint Removal Note)
10	Nut
11	Upper trailing link
12	Dust boot (upper trailing link)

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Symbols

- There are eight symbols indicating oil, grease, fluids, sealant, and the use of **SST** or equivalent. These symbols show application points or use of these materials during service.

Symbol	Meaning	Kind
	Apply oil	New appropriate engine oil or gear oil
	Apply brake fluid	New appropriate brake fluid
	Apply automatic transaxle/ transmission fluid	New appropriate automatic transaxle/ transmission fluid
	Apply grease	Appropriate grease
	Apply sealant	Appropriate sealant
	Apply petroleum jelly	Appropriate petroleum jelly
R	Replace part	O-ring, gasket, etc.
SST	Use SST or equivalent	Appropriate tools

Advisory Messages

- You will find several **Warnings, Cautions, Notes, Specifications** and **Upper and Lower Limits** in this manual.

Warning

- A Warning indicates a situation in which serious injury or death could result if the warning is ignored.

Caution

- A Caution indicates a situation in which damage to the vehicle or parts could result if the caution is ignored.

Note

- A Note provides added information that will help you to complete a particular procedure.

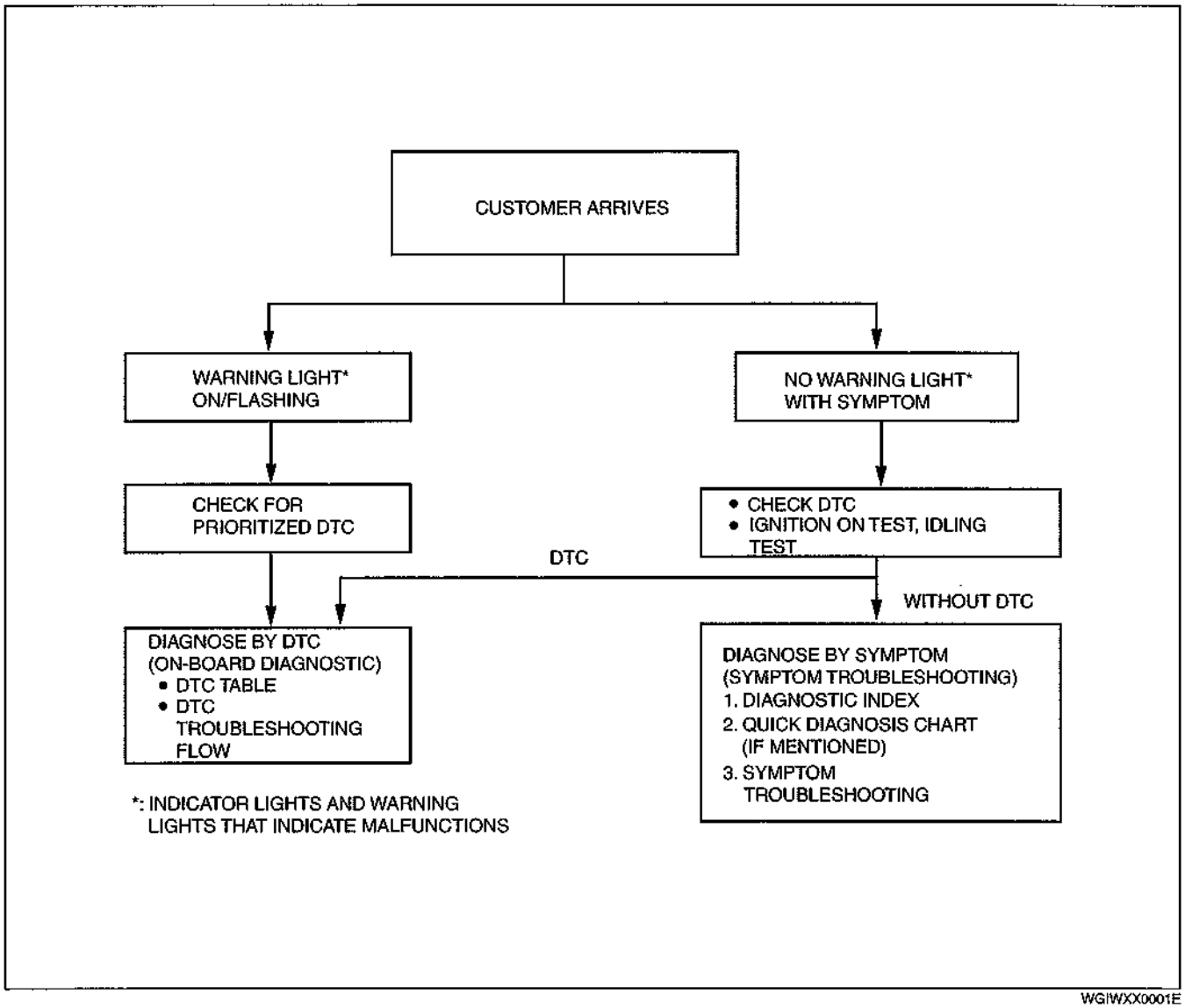
Specification

- The values indicate the allowable range when performing inspections or adjustments.

Upper and lower limits

- The values indicate the upper and lower limits that must not be exceeded when performing inspections or adjustments.

Troubleshooting Procedure
Basic flow of troubleshooting



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DTC troubleshooting flow (on-board diagnostic)
- Diagnostic trouble codes (DTCs) are important hints for repairing malfunctions that are difficult to simulate. Perform the specific DTC diagnostic inspection to quickly and accurately diagnose the malfunction.
- The on-board diagnostic function is used during inspection. When a DTC is shown specifying the cause of a malfunction, continue the diagnostic inspection according to the items indicated by the on-board diagnostic function.

Diagnostic index
- The diagnostic index lists the symptoms of specific malfunctions. Select the symptoms related or most closely relating to the malfunction.

Quick diagnosis chart (if mentioned)
- The quick diagnosis chart lists diagnosis and inspection procedures to be performed specifically relating to the cause of the malfunction.

Symptom troubleshooting
- Symptom troubleshooting quickly determines the location of the malfunction according to symptom type.

Procedures for Use

Using the basic inspection (section 05)

- Perform the basic inspection procedure before symptom troubleshooting.
- Perform each step in the order shown.
- The reference column lists the location of the detailed procedure for each basic inspection.
- Although inspections and adjustments are performed according to the reference column procedures, if the cause of the malfunction is discovered during basic inspection, continue the procedures as indicated in the action column.

SHOWS INSPECTION ORDER

SHOWS ITEM NAMES FOR DETAILED PROCEDURES

SHOW POINTS REQUIRING ATTENTION BASED ON INSPECTION RESULTS

BASIC INSPECTION

STEP	INSPECTION		ACTION
1	Perform the mechanical system test. (See 05-13-3 MECHANICAL SYSTEM TEST.) Is mechanical system normal?	Yes	Go to the next step.
		No	Repair or replace any malfunctioning parts according to the inspection result.
2	Turn the ignition switch to the ON position. When the selector lever is moved, does the selector illumination indicate synchronized position to the lever location? Also, when other ranges are selected from N or P during idling, does the vehicle move within 1—2 s?	Yes	Go to next step.
		No	Inspect the selector lever and TR switch. Repair or replace malfunctioning parts. (See 05-14-5 SELECTOR LEVER INSPECTION.) (See 05-13-10 TRANSMISSION RANGE (TR) SWITCH INSPECTION.) If the selector lever and TR switch are normal, go to the next step.
3	Inspect the ATF color condition. (See 05-13-8 AUTOMATIC TRANSMISSION FLUID (ATF) INSPECTION.) Are ATF color and odor normal?	Yes	Go to the next step.
		No	Repair or replace any malfunctioning parts according to the inspection result. Flush ATX and cooler line as necessary.
4	Perform the line pressure test. (See 05-13-3 Line Pressure Test.) Is the line pressure normal?	Yes	Go to the next step.
		No	Repair or replace any malfunctioning parts according to the inspection result.
5	Perform the stall test. (See 05-13-4 Stall Speed Test.) Is the stall speed normal?	Yes	Go to the next step.
		No	Repair or replace any malfunctioning parts according to the inspection result.
	Inspect the voltage at the following TCM terminals. (See 05-13-29 TCM INSPECTION.) • Terminal 2J (TFT sensor) • Terminals 1D, 2B, 2C, 2E (TR switch) • Terminal 2G (turbine sensor) • Terminal 2D (down switch) • Terminal 2I (up switch) • Terminal 1E (M range switch) • Terminal 1W (steering shift switch) Is the voltage normal?	Yes	Go to the next step.
		No	Repair or replace any malfunctioning parts according to the inspection result.

REFERENCE COLUMN

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Using the DTC troubleshooting flow

- DTC troubleshooting flow shows diagnostic procedures, inspection methods, and proper action to take for each DTC.

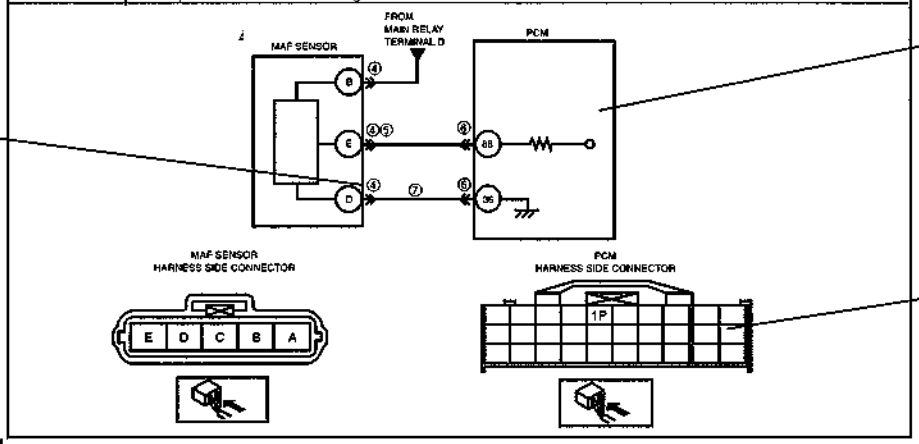
TROUBLE CONDITION

DETECTION CONDITION describes the condition under which the DTC is detected.

DTC P0103

DTC P0103	MAF circuit high input
DETECTION CONDITION	PCM monitors input voltage from TP sensor after ignition key is turned on. If input voltage at PCM terminal 68 is above 8.25 V, PCM determines that TP circuit has malfunction. Diagnostic support note • This is a continuous monitor (CCM). • MIL illuminates if PCM detects the above malfunction during first drive cycle. Therefore, PENDING CODE is not available. • FREEZE FRAME DATE is available. • DTC is stored in the PCM memory.
POSSIBLE CAUSE	• MAF sensor malfunction • Connector or terminal malfunction • Open circuit in wiring between MAF sensor terminal D and PCM terminal 36 • Open circuit in MAF sensor ground circuit

POSSIBLE CAUSE describes possible point(s) of malfunction



Indicates the circuit to be inspected (01 and 05 section)

Indicates the inspection step No. to be performed (01 and 05 section)

Indicates the connector related to the inspection

STEP shows the order of troubleshooting

ACTION describes the appropriate action to be taken according to the result (Yes/No) of the INSPECTION.

INSPECTION describes the method to quickly determine the malfunctioning part(s).

Reference item(s) to perform ACTION.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	VERIFY FREEZE FRAME DATA HAS BEEN RECORDED • Has FREEZE FRAME DATA been recorded?	Yes	Go to next step.
		No	Record FREEZE FRAME DATA on repair order, then go to next step.
2	VERIFY RELATED REPAIR INFORMATION AVAILABILITY • Are related Service Bulletins and/or on-line repair information available?	Yes	Perform repair or diagnosis according to available repair information. If vehicle is not repaired, then go to next step.
		No	Go to next step.
3	VERIFY CURRENT INPUT SIGNAL STATUS IS CONCERN INTERMITTENT OR CONSTANT • Connect diagnostic tool to DLC-2. • Start engine. • Access MAF V PID using diagnostic tool. • Is MAF V PID within 0.2 - 8.3 V?	Yes	Intermittent concern is existing. Go to INTERMITTENT CONCERNS TROUBLESHOOTING procedure. (See 01-03-33 INTERMITTENT CONCERN TROUBLESHOOTING)
		No	Go to next step.
4	INSPECT POOR CONNECTION OF MAF SENSOR CONNECTOR • Turn ignition key to OFF. • Disconnect MAF sensor connector. • Check for poor connection (damaged, pulled-out terminals, corrosion etc.). • Are there any malfunctions?	Yes	Repair or replace terminals, then go to Step 8.

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Using the diagnostic Index

- Malfunction symptoms are listed in the diagnostic index under symptom troubleshooting.
- The exact malfunction symptoms can be selected by following the index.

No.	TROUBLESHOOTING ITEM		DESCRIPTION	Page
1	Melting of main or other fuses		—	(See 01-03-6 MELT NO.1 MAIN OR OTHER FUSE)
2	MIL comes on		MIL is illuminated incorrectly.	(See 01-03-7 NO.2 MIL COMES ON)
3	Will not crank		Starter does not work.	(See 01-03-8 NO. 3 WILL NOT CRANK)
4	Hard start/long crank/erratic start/erratic crank		Starter cranks engine at normal speed but engine requires excessive cranking time before starting.	(See 01-03-9 NO. 4 HARD START/ LONG CRANK/ERRATIC CRANK)
5	Engine stalls.	After start/at idle	Engine stops unexpectedly at idle and/or after start.	(See 01-03-11 NO. 5 ENGINE-STALLS AFTER START/AT IDLE)
6	Cranks normally but will not start		Starter cranks engine at normal speed but engine will not run.	(See 01-03-15 NO.6 CRANKS NORMALLY BUT WILL NOT START)
7	Slow return to idle		Engine takes more time than normal to return to idle speed.	(See 01-03-19 NO. 7 SLOW RERUN TO IDLE)
8	Engine runs rough/rolling		Engine speed fluctuates between specified idle speed and lower speed and engine shakes excessively.	(See 01-03-20 NO. 8 ENGINE RUNS ROUGH/ROLLING IDLE)
9	Fast idle/runs on		Engine speed continues at fast idle after warm-up. Engine runs after ignition key is turned to OFF.	(See 01-03-23 NO. 9 FAST IDLE/RUNS ON)
10	Low idle/stalls during deceleration		Engine stops unexpectedly at beginning of deceleration or recovery from deceleration.	(See 01-03-24 NO. 10 LOW IDLE/ STALLS DURING DECELERATION)

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Using the quick diagnosis chart

- The chart lists the relation between the symptom and the cause of the malfunction.
- The chart is effective in quickly narrowing down the relation between symptom and cause of the malfunction. It also specifies a range of common causes when multiple malfunction symptoms occur.
- The appropriate diagnostic inspection relating to a malfunction cause as specified by the symptoms can be selected by looking down the diagnostic inspection column of the chart.

PARTS WHICH MAY BE THE CAUSE OF PROBLEMS

X: Applied

PART WHICH MAY BE THE SYMPTOM

CHOOSE THE ACTUAL SYMPTOM

	Possible factor / Troubleshooting item		Starter motor malfunction (Mechanical or electrical)	Starter circuit including ignition switch is open.	Starter interlock switch malfunction (MTX)	Improper engine oil level	Low or dead battery	Charging system malfunction	Improper engine compression	Improper valve timing	Hydrolocked engine	Improper engine oil viscosity	Improper dipstick	Base engine malfunction	Drive plate or flywheel are seized.	Improper tension or damaged drive belts	Improper engine coolant level	Water and anti-freeze mixture is improper.	Cooling system malfunction (Radiator, hoses, overflow system, thermostat, etc.)	Cooling fan system malfunction	Engine or transaxle mounts are improperly installed.	Cooling fan or condenser fan seat are improper.	Accelerator position sensor misadjustment	Cruise control system operation improperly	Fuel quality
1	Melting of main or other fuses																								
2	MIL illuminates																								
3	Will not crank		x	x	x		x	x			x				x										
4	Hard to start/long crank/erratic start/erratic crank		x																						x
5	Engine stalls.	After start/at idle							x	x															x
6	Cranks normally but will not start								x	x															x
7	Slow return to idle																		x						
8	Engine runs rough/rolling idle								x	x															x
9	Fast idle/runs on																						x	x	
10	Low idle/stalls during deceleration																						x		
11	Engine stalls/quits.	Acceleration/cruise							x	x													x		x
	Engine runs rough.	Acceleration/cruise							x	x															x
	Misses	Acceleration/cruise							x	x															x
	Buck/jerk	Acceleration/cruise/deceleration							x	x															x
	Hesitation/stumble	Acceleration							x	x															x
	Surges	Acceleration/cruise							x	x															x
12	Lack/loss of power	Acceleration/cruise							x	x															x
13	Knocking/pinging	Acceleration/cruise							x										x						
14	Poor fuel economy								x	x									x	x					x
15	Emission compliance								x	x				x					x						
16	High oil consumption/leakage											x	x	x											
17	Cooling system concerns	Overheating													x	x	x	x	x						
18	Cooling system concerns	Runs cold																	x	x					
19	Exhaust smoke								x					x					x						
20	Fuel odor (in engine compartment)																								
21	Engine noise					x								x		x									
22	Vibration concerns (engine)															x					x	x			
23	A/C does not work sufficiently.																								
24	A/C is always on or A/C compressor runs continuously.																								
25	A/C is not cut off under WOT conditions.																							x	
26	Exhaust sulfur smell																								x
27	Fuel refill concerns																								
28	Fuel filling shut off issues																								
29	Constant voltage																								
30	Spark plug condition								x																
31	ATX concerns	Upshift/downshift engagement	See Section 05-03A, TROUBLESHOOTING																						

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Using the symptom troubleshooting

- Symptom troubleshooting shows diagnostic procedures, inspection methods, and proper action to be taken for each trouble symptom.

DESCRIPTION describes what kind of TROUBLE SYMPTOM

TROUBLE SYMPTOM

14	**Engine flares up or slips when upshifting or down shifting**
DESCRIPTION	• When accelerator pedal is depressed for driveway, engine speed increase but vehicle speed increase slowly. • When accelerator is depressed while driving, engine speed increases but vehicle not.
POSSIBLE CAUSE	• There is clutch slip because clutch is stuck or line pressure is low. — Clutch stuck, slippage (forward clutch, 3-4 clutch, 2-4 brake band, one-way clutch 1, one-way clutch 2) • Line pressure low • Malfunction or mis-adjustment of TP sensor • Malfunction of VSS • Malfunction of input/turbine speed sensor • Malfunction of sensor ground • Malfunction of shift solenoid A, B or C • Malfunction of TCC solenoid valve • Malfunction of body ground • Malfunction of throttle cable • Malfunction of throttle valve body — Poor operating of mechanical pressure • Selector lever position disparity • TR switch position disparity Note • Before following troubleshooting steps, make sure that Automatic Transaxle On-board Diagnostic and Automatic Transaxle Basic Inspection are conducted.

POSSIBLE CAUSE describes possible point of malfunction

STEP shows the order of troubleshooting.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Is line pressure okay?	Yes	Go to next step.
		No	Repair or replace any defective parts according to inspection results.
2	• Is shift point okay? (See 05-17-5 ROAD TEST)	Yes	Go to next step
		No	Go to symptom troubleshooting No.9 "Abnormal shift".
3	• Stop engine and turn ignition switch on. • Connect diagnostic tool to DLC-2. • Simulate SHIFT A, SHIFT B and SHIFT C PIDs for ON. • Is operating sound of shift solenoids heard?	Yes	• Overhaul control valve body and repair or replace any defective parts. (See ATX Workshop Manual GF4A-EL (1666-1A-99F)) • If problem remains, replace or overhaul transaxle and repair or replace defective parts. (See 05-17-15 AUTOMATIC TRANSAXLE REMOVEVAL/INSTALLATION)
		No	• Inspect for bend, damage, corrosion or loose connection if shift solenoid A, B, or C terminal on ATX. • Inspect for shift solenoid mechanical stuck. (See 05-17-14 Inspection of Operation) • If shift solenoids are okay, inspect for open or short circuit between PCM connector terminal A, B or C.
4	• Verify test results. — If okay, return to diagnostic index to service any additional symptoms. — If malfunction remains, inspect related Service Bulletins and/or On-line Repair Information and perform repair or diagnosis. — If vehicle is repaired, troubleshooting completed. — If vehicle is not repaired or additional diagnostic information is not available, replace or reprogram PCM.		

Reference item(s) for additional information to perform INSPECTION.

INSPECTION describes the method to quickly determine the malfunctioning part(s).

ACTION describes the appropriate action to be taken according to the result (Yes/No) of the INSPECTION.

How to perform ACTION is described in the relative material shown.

Reference item(s) to perform ACTION.

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UNITS

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Electric current	A (ampere)
Electric power	W (watt)
Electric resistance	ohm
Electric voltage	V (volt)
Length	mm (millimeter)
	in (inch)
Negative pressure	kPa (kilo pascal)
	mmHg (millimeters of mercury)
	inHg (inches of mercury)
Positive pressure	kPa (kilo pascal)
	kgf/cm^2 (kilogram force per square centimeter)
	psi (pounds per square inch)
Number of revolutions	rpm (revolutions per minute)
Torque	N·m (Newton meter)
	kgf·m (kilogram force meter)
	kgf·cm (kilogram force centimeter)
	ft·lbf (foot pound force)
	in·lbf (inch pound force)
Volume	L (liter)
	US qt (U.S. quart)
	Imp qt (Imperial quart)
	ml (milliliter)
	cc (cubic centimeter)
	cu in (cubic inch)
	fl oz (fluid ounce)
Weight	g (gram)
	oz (ounce)

Conversion to SI Units (Système International d'Unités)

- All numerical values in this manual are based on SI units. Numbers shown in conventional units are converted from these values.

Rounding Off

- Converted values are rounded off to the same number of places as the SI unit value. For example, if the SI unit value is 17.2 and the value after conversion is 37.84, the converted value will be rounded off to 37.8.

Upper and Lower Limits

- When the data indicates upper and lower limits, the converted values are rounded down if the SI unit value is an upper limit, and rounded up if the SI unit value is a lower limit. Therefore, converted values for the same SI unit value may differ after conversion. For example, consider 2.7 kgf/cm^2 in the following specifications:

  210—260 kPa {2.1—2.7 kgf/cm^2, 30—38 psi}
  270—310 kPa {2.7—3.2 kgf/cm^2, 39—45 psi}

- The actual converted values for 2.7 kgf/cm^2 are 265 kPa and 38.4 psi. In the first specification, 2.7 is used as an upper limit, so the converted values are rounded down to 260 and 38. In the second specification, 2.7 is used as a lower limit, so the converted values are rounded up to 270 and 39.

SERVICE CAUTIONS

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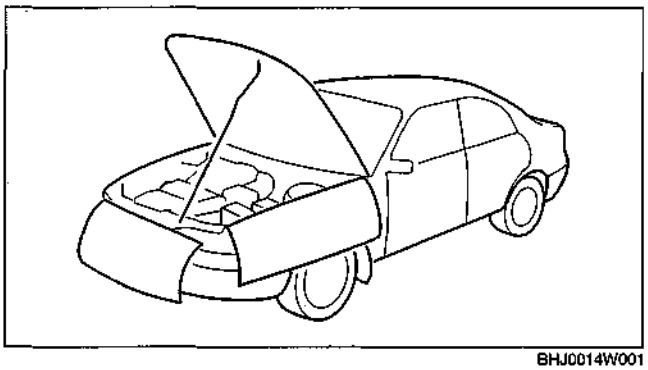
Protection of the Vehicle

- Always be sure to cover fenders, seats and floor areas before starting work.



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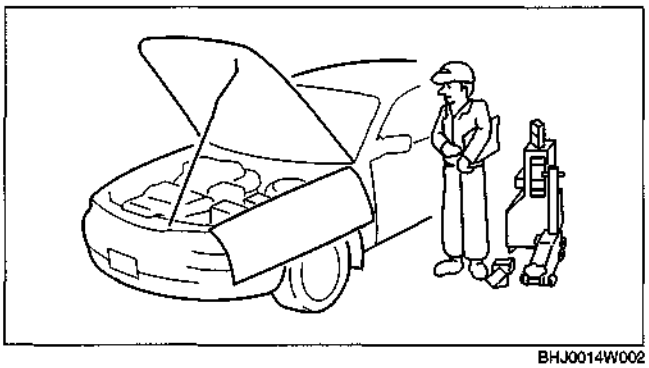
Preparation of Tools and Measuring Equipment

- Be sure that all necessary tools and measuring equipment are available before starting any work.



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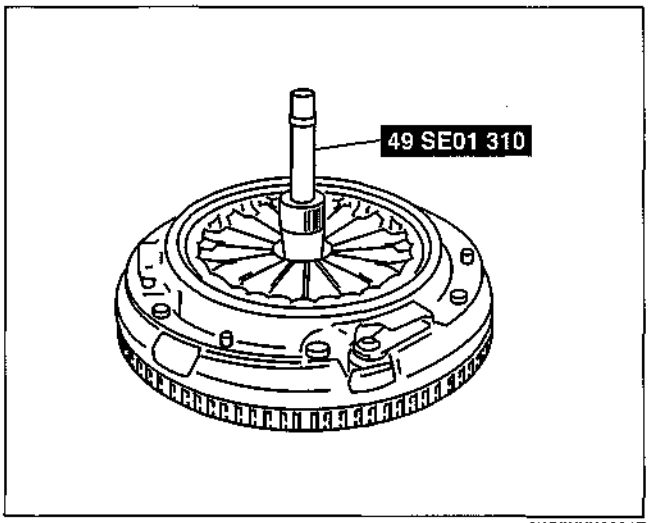
Special Service Tools

- Use special service tools or the equivalent when they are required.



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Disconnection of the Negative Battery Cable

- When working with the negative battery cable disconnected, wait for 1 min or more to allow the back up power supply of the SAS control module to deplete its stored power after the cable is disconnected.
- Disconnecting the battery cable will delete the memories of the clock, audio, and DTCs, etc. Therefore, it is necessary to note down the information stored in those memories before disconnecting the cable.
- If the battery had been disconnected during vehicle maintenance or for other reasons, the window will not fully close automatically. Initialize the power window system for the power window main switch.

Oil Leakage Inspection
- Use either of the following procedures to identify the type of oil that is leaking.

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Injury/damage Prevention Precautions
- Depending on the vehicle, the cooling fan may operate suddenly even when the engine switch is turned off. Therefore, keep hands and tools away from the cooling fan even if the cooling fan is not operating to prevent injury to personnel or damage to the cooling fan. Always disconnect the negative battery cable when servicing the cooling fan or parts near the cooling fan.

Malfunction Diagnosis System
- Use the current diagnostic tool for malfunction diagnosis.

Using UV light (black light)

1. Remove any oil on the engine or transaxle/transmission.

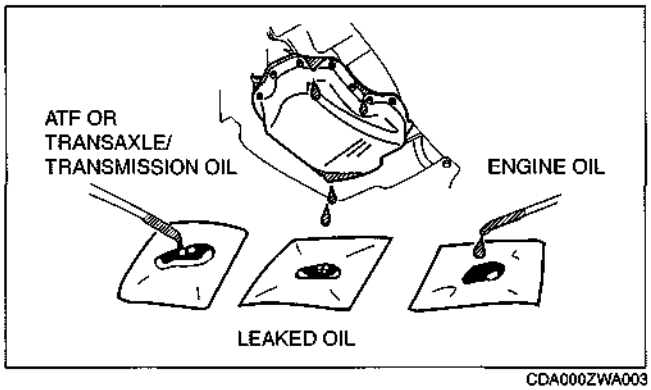
Note
- Referring to the fluorescent dye instruction manual, mix the specified amount of dye into the engine oil or ATF (or transaxle/transmission oil).

2. Pour the fluorescent dye into the engine oil or ATF (or transaxle/transmission oil).
3. Allow the engine to run for 30 min.
4. Inspect for dye leakage by irradiating with UV light (black light), and identify the type of oil that is leaking.
5. If no dye leakage is found, allow the engine to run for another 30 min. or drive the vehicle then reinspect.
6. Find where the oil is leaking from, then make necessary repairs.

Note
- To determine whether it is necessary to replace the oil after adding the fluorescent dye, refer to the fluorescent dye instruction manual.

Not using UV light (black light)

1. Gather some of the leaking oil using an absorbent white tissue.
2. Take samples of engine oil and ATF (or transaxle/transmission oil), both from the dipstick, and place them next to the leaked oil already on the tissue.
3. Compare the appearance and smell, and identify the type of oil that is leaking.
4. Remove any oil on the engine or transaxle/transmission.
5. Allow the engine to run for 30 min.
6. Check the area where the oil is leaking, then make necessary repairs.



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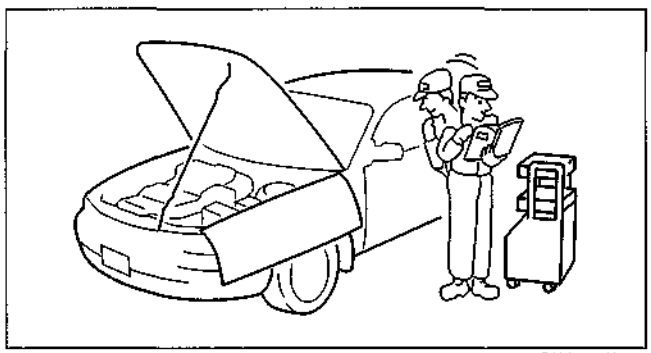
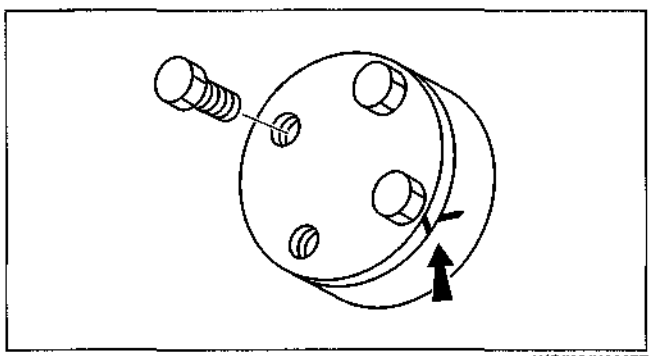
Removal of Parts

- While correcting a problem, also try to determine its cause. Begin work only after first learning which parts and sub-components must be removed and disassembled for replacement or repair. After removing the part, plug all holes and ports to prevent foreign material from entering.


BHJ0014W005

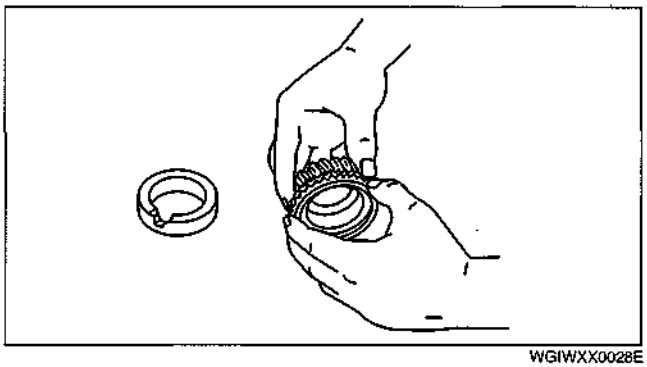
Disassembly

- If the disassembly procedure is complex, requiring many parts to be disassembled, all parts should be marked in a place that will not affect their performance or external appearance, and identified so that reassembly can be performed easily and efficiently.


WGIWXX0027E

Inspection During Removal, Disassembly

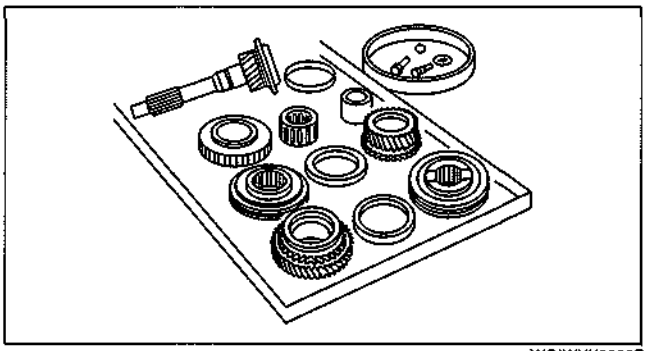
- When removed, each part should be carefully inspected for malfunction, deformation, damage and other problems.



WGIWXX0028E

Arrangement of Parts

- All disassembled parts should be carefully arranged for reassembly.
- Be sure to separate or otherwise identify the parts to be replaced from those that will be reused.



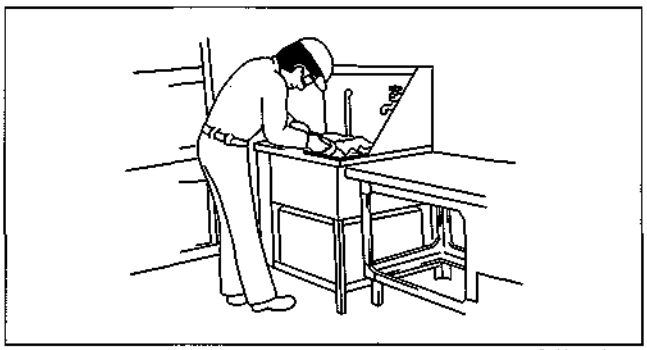
WGIWXX0029E

Cleaning of Parts

- All parts to be reused should be carefully and thoroughly cleaned in the appropriate method.

Warning

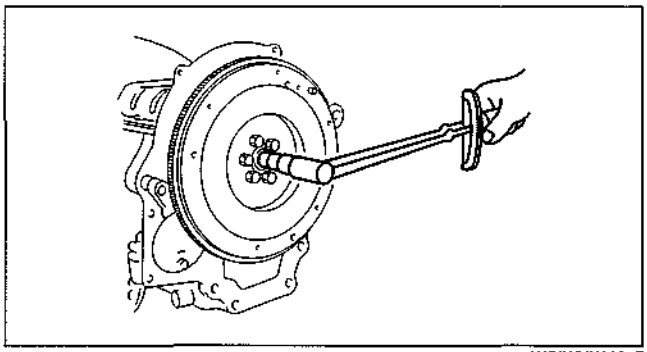
- **Using compressed air can cause dirt and other particles to fly out causing injury to the eyes. Wear protective eye wear whenever using compressed air.**



C5U0000W001

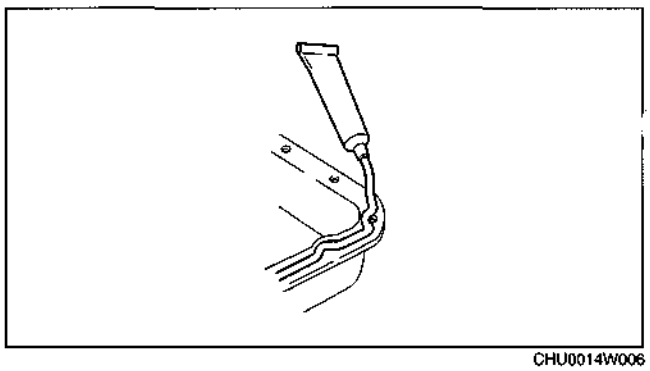
Reassembly

- Standard values, such as torques and certain adjustments, must be strictly observed in the reassembly of all parts.
- If removed, these parts should be replaced with new ones:
  - — Oil seals
  - — Gaskets
  - — O-rings
  - — Lock washers
  - — Cotter pins
  - — Nylon nuts



WGIWXX0031E

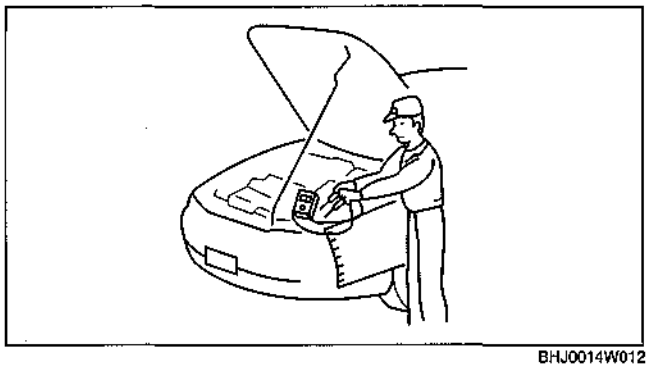
- Depending on location:
  - — Sealant and gaskets, or both, should be applied to specified locations. When sealant is applied, parts should be installed before sealant hardens to prevent leakage.
  - — Oil should be applied to the moving components of parts.
  - — Specified oil or grease should be applied at the prescribed locations (such as oil seals) before reassembly.



CHU0014W006

Adjustment

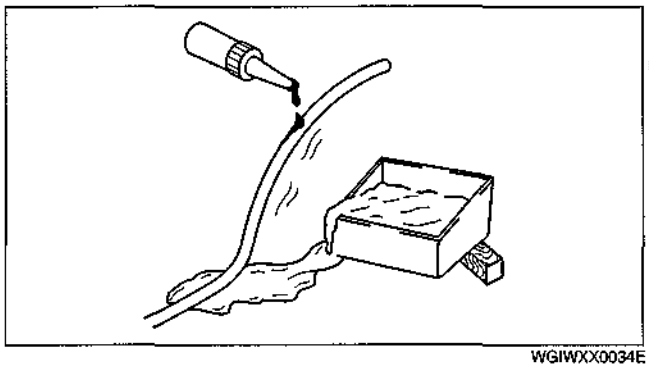
- Use suitable gauges and testers when making adjustments.



BHJ0014W012

Rubber Parts and Tubing

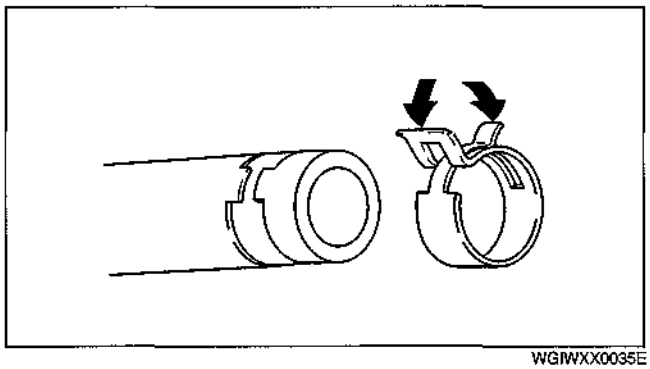
- Prevent gasoline or oil from getting on rubber parts or tubing.



WGIWXX0034E

Hose Clamps

- When reinstalling, position the hose clamp in the original location on the hose and squeeze the clamp lightly with large pliers to ensure a good fit.

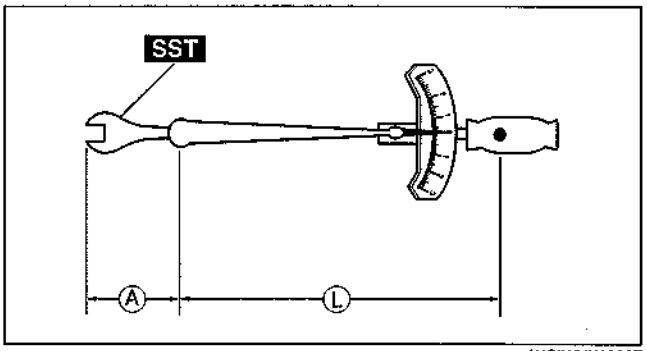


WGIWXX0035E

Torque Formulas

- When using a torque wrench-**SST** or equivalent combination, the specified torque must be recalculated due to the extra length that the **SST** or equivalent adds to the torque wrench. Recalculate the torque by using the following formulas. Choose the formula that applies to you.

Torque Unit	Formula
N·m	N·m × [L/(L+A)]
kgf·m	kgf·m × [L/(L+A)]
kgf·cm	kgf·cm × [L/(L+A)]
ft·lbf	ft·lbf × [L/(L+A)]
in·lbf	in·lbf × [L/(L+A)]

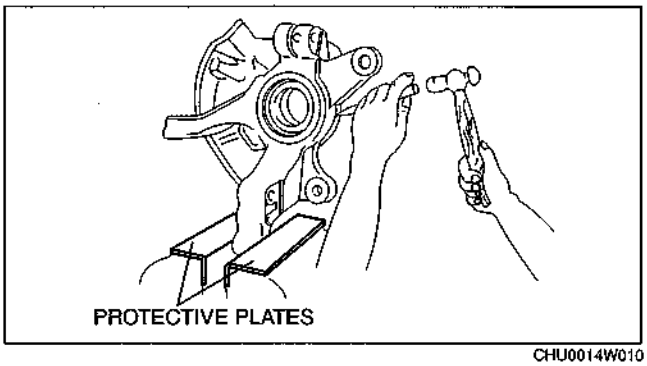


WGIWXX0036E

A : The length of the **SST** past the torque wrench drive.
L : The length of the torque wrench.

Vise

- When using a vise, put protective plates in the jaws of the vise to prevent damage to parts.



CHU0014W010

Dynamometer

- When inspecting and servicing the power train on the dynamometer or speedometer tester, pay attention to the following:
  - — Place a fan, preferably a vehicle-speed proportional type, in front of the vehicle.
  - — Make sure the vehicle is in a facility with an exhaust gas ventilation system.
  - — Since the rear bumper might deform from the heat, cool the rear with a fan. (Surface of the bumper must be below **70°C {158°F} degrees**.)
  - — Keep the area around the vehicle uncluttered so that heat does not build up.
  - — Watch the water temperature gauge and do not overheat the engine.
  - — Avoid added load to the engine and maintain normal driving conditions as much as possible.

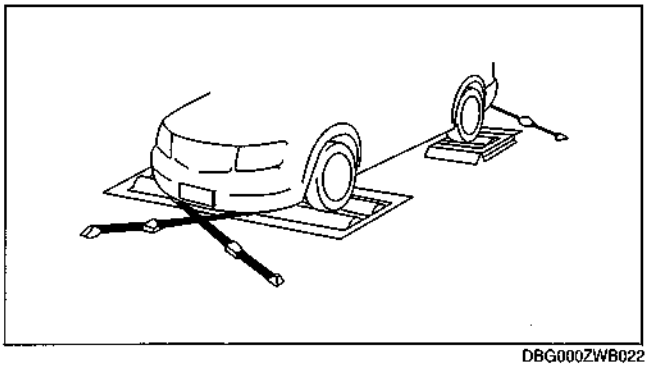
Note

- When only the front or rear wheels are rotated on a chassis dynamometer or equivalent, the ABS CM determines that there is a malfunction in the ABS and illuminates the following lights:
  - — Vehicles with ABS
    - ABS warning light
    - Brake system warning light
- If the above lights are illuminated, dismount the vehicle from the chassis dynamometer and turn the ignition switch to the LOCK position. Then, turn the ignition switch back to the ON position, run the vehicle at 10 km/h or more and verify that the warning lights go out. In this case, a DTC will be stored in the memory. Clear the DTC from the memory by following the memory clearing procedure [ABS] in the on-board diagnostic system. (See 04-02A-2 ON-BOARD DIAGNOSIS [REAR ABS].)(See 04-02B-2 ON-BOARD DIAGNOSIS [4W-ABS]

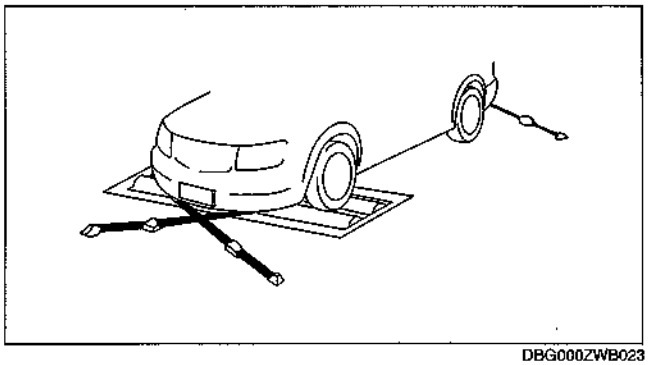
4WD inspection/service
Speedometer tester measurement

Caution
- **Install the tension bar (chain wire) to the tie down hook and secure the vehicle to prevent it from rolling and running off.**
- **Do not accelerate suddenly from a standstill or accelerate/decelerate rapidly.**

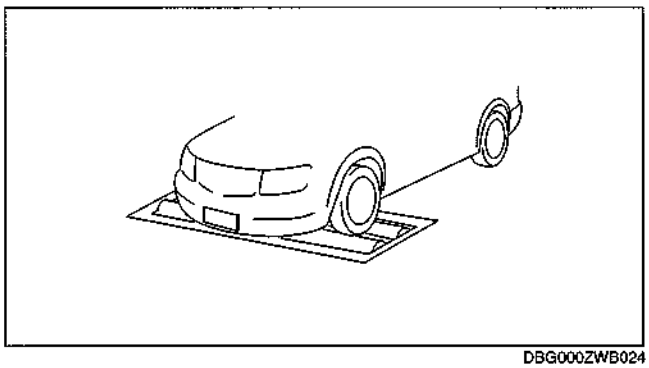
Free roller type
1. Align the free rollers with the wheel base and tread, then set them on the floor properly.
2. Drive the vehicle slowly onto the tester roller and free rollers.
3. Start the engine and accelerate gradually to inspect the speedometer.
4. After inspection, decelerate gradually with gentle braking.


DBG000ZWB022

Propeller shaft removal type
1. Remove the propeller shaft. (See 03-15-2 PROPELLER SHAFT REMOVAL/ INSTALLATION.)
2. Place the front wheels on the tester roller.
3. Accelerate gradually and inspect the speedometer.
4. After inspection, decelerate gradually with gentle braking.
5. Install the propeller shaft. (See 03-15-2 PROPELLER SHAFT REMOVAL/ INSTALLATION.)

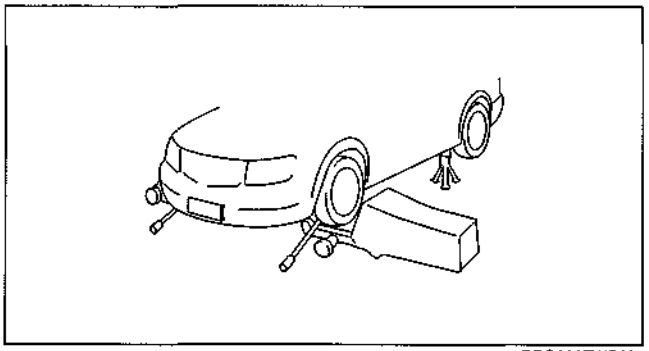

DBG000ZWB023

Brake tester measurement
1. Place the wheels (front or rear) to be measured on the tester roller.
2. Shift to the N position/neutral.
3. Activate the tester roller and measure braking force.
   If there is a large amount of brake drag force, the electronic control system coupling may be affected. Jack up all four wheels to eliminate the effect of the coupling and rotate each wheel by hand to verify the rotation condition.


DBG000ZWB024

Wheel balancer (on the vehicle balancer)

1. Jack up all four wheels.
2. Support the wheels (front or rear) on the side to be measured (near the wheels) using a wheel balancer sensor stand.
3. Support the wheels on the side not to be measured (near the wheels) using safety stands.
4. Set up the wheel balancer and rotate the wheels using engine drive to measure the wheel balance.

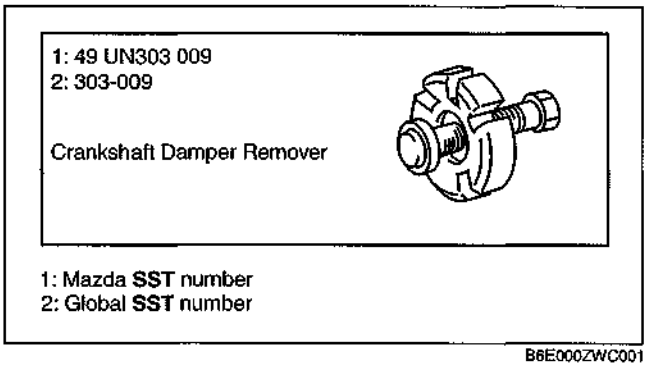


DBG000ZWB025

SST

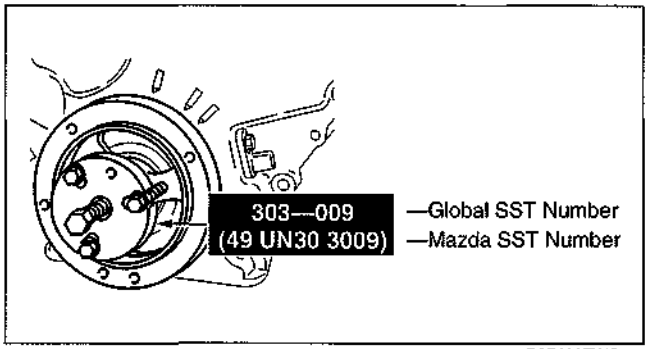
- Some global **SST** or equivalent are used as **SSTs** necessary for vehicle repair. Note that these **SSTs** are marked with global **SST** numbers.
- Note that a global **SST** number is written together with a corresponding Mazda **SST** number as shown below.

Example (SERVICE TOOLS)



B6E000ZWC001

Example (Except SERVICE TOOLS)



B6E000ZWC002

INSTALLATION OF RADIO SYSTEM

dcf000000000w21

- If a radio system is installed improperly or if a high-powered type system is used, the CIS and other systems may be affected. When the vehicle is to be equipped with a radio, observe the following precautions:
  - — Install the antenna at the farthest point from control modules.
  - — Install the antenna feeder as far as possible from the control module wiring harnesses.
  - — Ensure that the antenna and feeder are properly adjusted.
  - — Do not install a high-powered radio system.

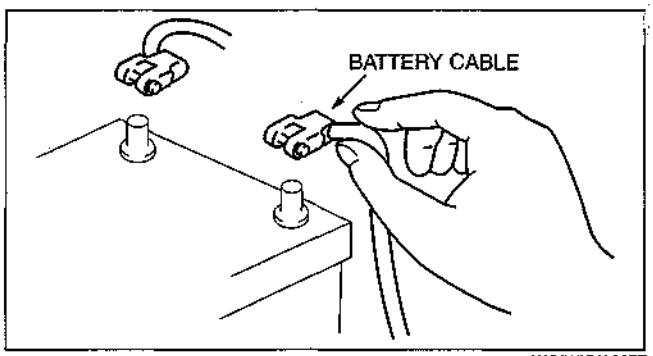
ELECTRICAL SYSTEM

dcf000000000w22

Electrical Parts

Battery cable

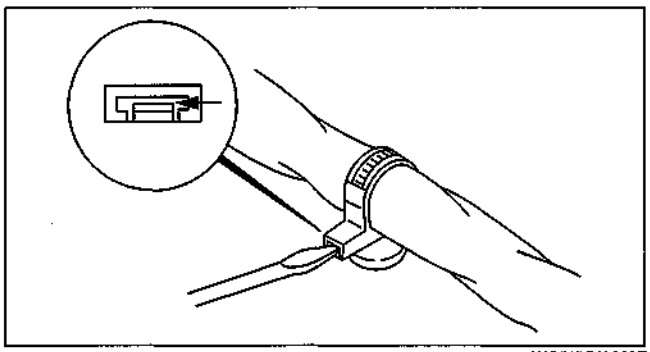
- Before disconnecting connectors or removing electrical parts, disconnect the negative battery cable.



WGIWXX0007E

Wiring Harness

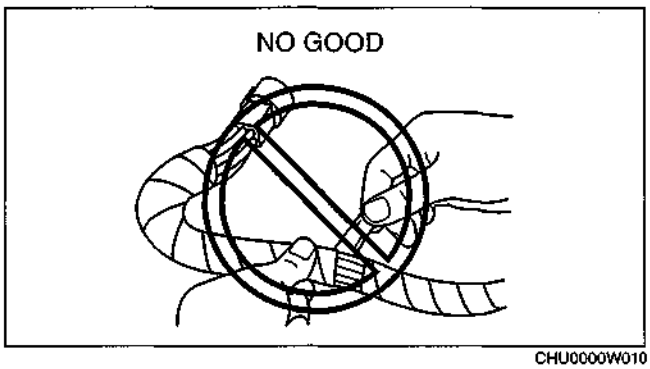
- To remove the wiring harness from the clip in the engine room, pry up the hook of the clip using a flathead screwdriver.



WGIWXX0039E

Caution

- **Do not remove the wiring harness protective tape. Otherwise, the wires could rub against the body, which could result in water penetration and electrical shorting.**

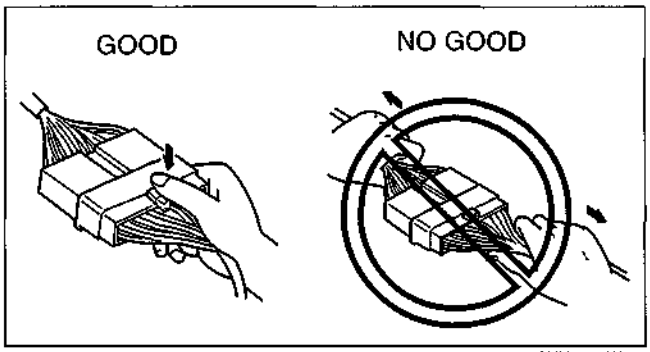


CHU0000W010

Connectors

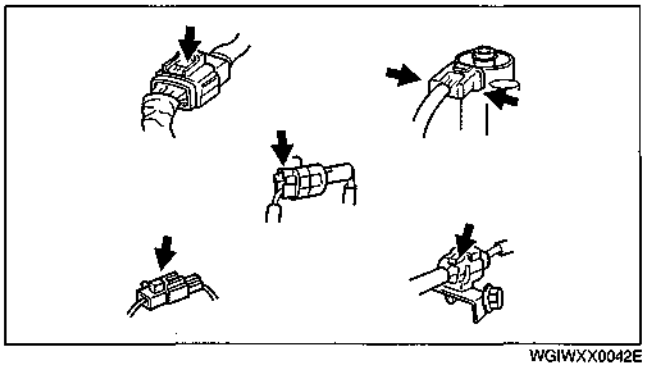
Disconnecting connectors

- When disconnecting a connector, grasp the connectors, not the wires.



CHU0000W014

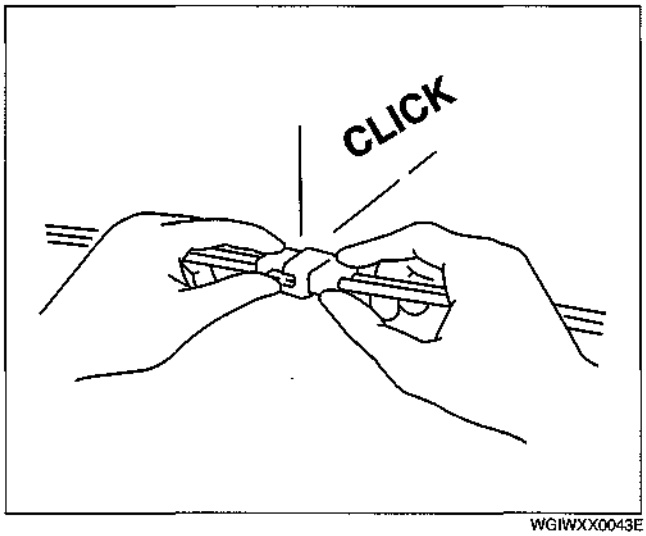
- Connectors can be disconnected by pressing or pulling the lock lever as shown.



WGIWXX0042E

Locking connector

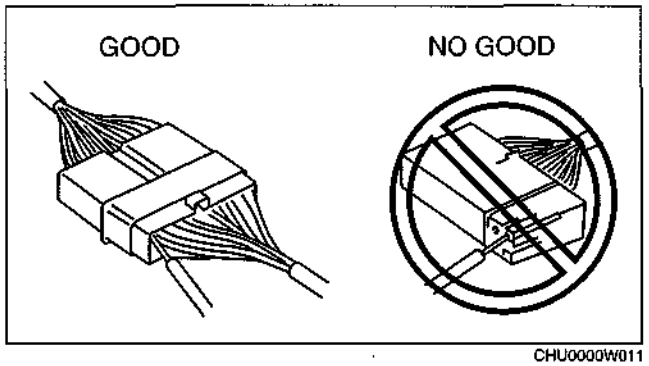
- When locking connectors, listen for a click indicating they are securely locked.



WGIWXX0043E

Inspection

- When a tester is used to inspect for continuity or measuring voltage, insert the tester probe from the wiring harness side.

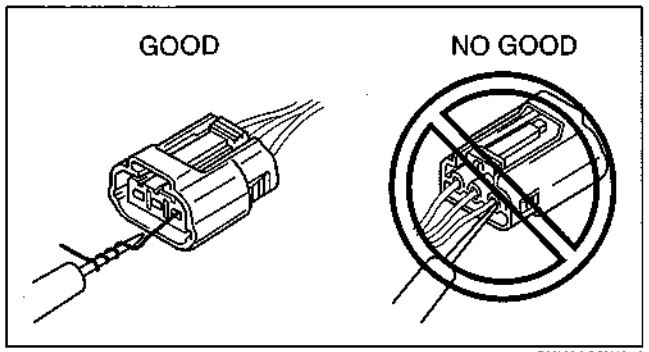


CHU0000W011

- Inspect the terminals of waterproof connectors from the connector side since they cannot be accessed from the wiring harness side.

Caution

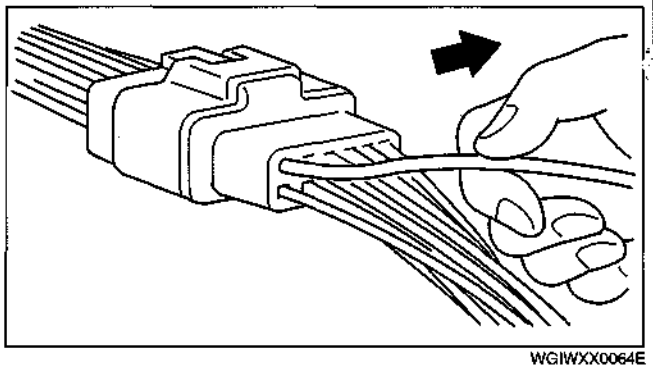
- **To prevent damage to the terminal, wrap a thin wire around the tester probe before inserting into terminal.**



CHU0000W012

Terminals
Inspection

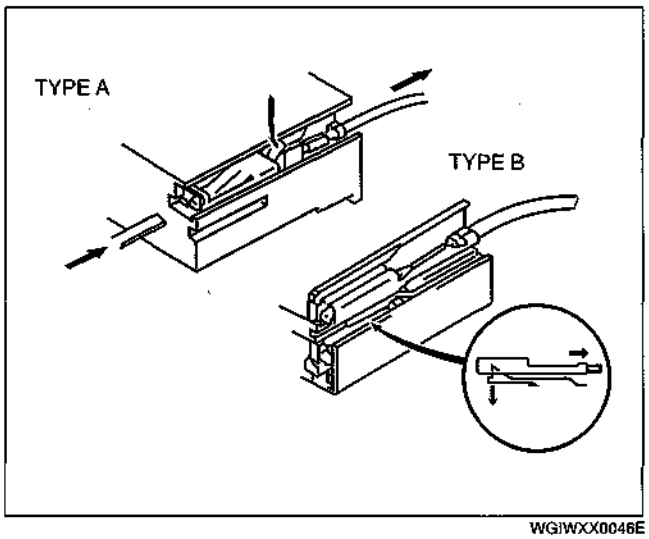
- Pull lightly on individual wires to verify that they are secured in the terminal.



WGIWXX0064E

Replacement

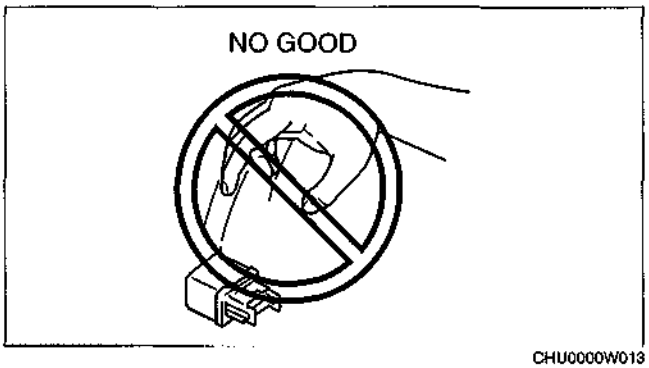
- Use the appropriate tools to remove a terminal as shown. When installing a terminal, be sure to insert it until it locks securely.
- Insert a thin piece of metal from the terminal side of the connector and with the terminal locking tab pressed down, pull the terminal out from the connector.



WGIWXX0046E

Sensors, Switches, and Relays

- Handle sensors, switches, and relays carefully. Do not drop them or strike them against other objects.

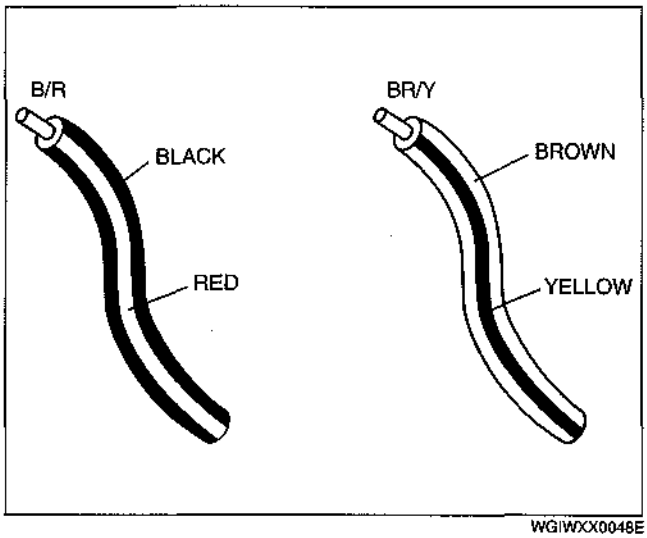


CHU0000W013

Wiring Harness
Wiring color codes

- Two-color wires are indicated by a two-color code symbol.
- The first letter indicates the base color of the wire and the second is the color of the stripe.

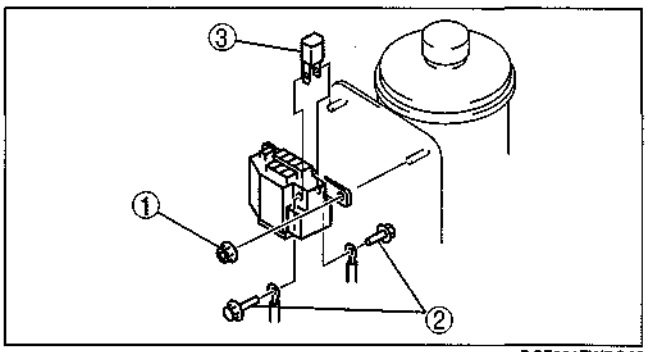
CODE	COLOR	CODE	COLOR
B	Black	O	Orange
BR	Brown	P	Pink
G	Green	R	Red
GY	Gray	V	Violet
L	Blue	W	White
LB	Light Blue	Y	Yellow
LG	Light Green		



WGIWXX0048E

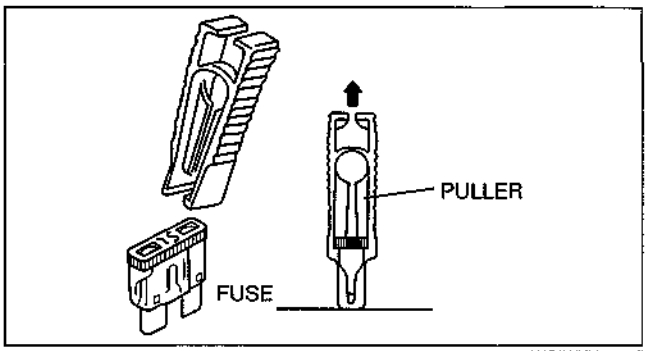
Fuse
Replacement

- When replacing a fuse, be sure to replace it with one of the same capacity. If a fuse malfunctions again, the circuit probably has a short and the wiring should be inspected.
- Be sure the negative battery terminal is disconnected before replacing a main fuse.



DCF921ZWBO05

- When replacing a pullout fuse, use the fuse puller.



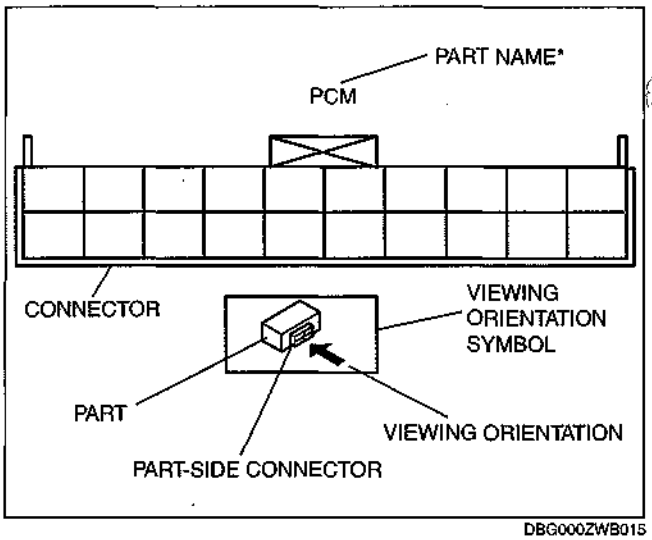
WGIWXX0050E

Viewing Orientation for Connectors

- The viewing orientation for connectors is indicated with a symbol.
- The figures showing the viewing orientation are the same as those used in Wiring Diagrams.
- The viewing orientations are shown in the following three ways.

Part-side connector
The viewing orientation for part-side connectors is from the terminal side.

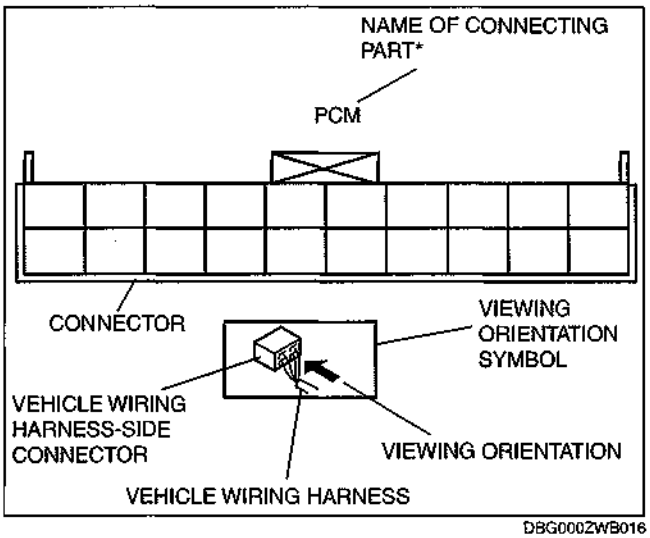
* : Part names are shown only when there are multiple connector drawings.



DBG000ZWB015

Vehicle harness-side connector
The viewing orientation for vehicle wiring harness-side connectors is from the wiring harness side.

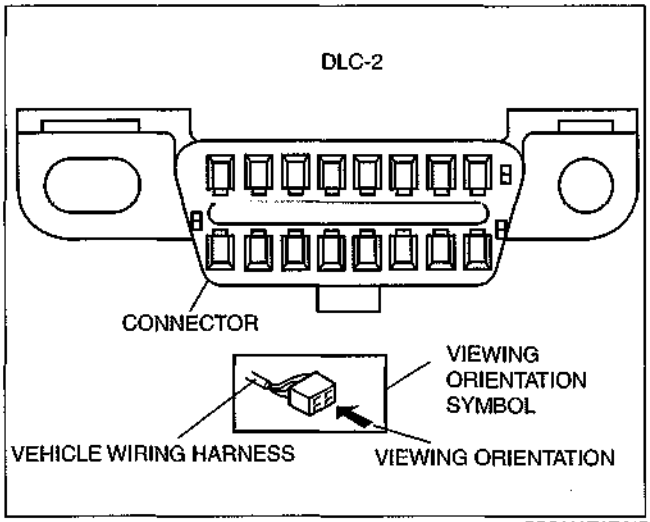
* : Part names are shown only when there are multiple connector drawings.



DBG000ZWB016

Other
When it is necessary to show the terminal side of the vehicle wiring harness-side connectors, such as the following connectors, the viewing orientation is from the terminal side.

- Main fuse block and the main fuse block relays
- Data link connector
- Check connector
- Relay box

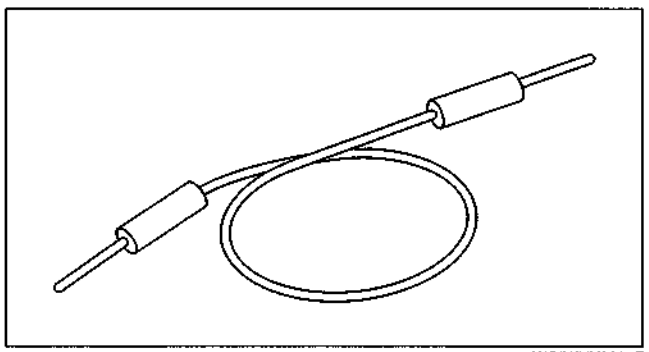


DBG000ZWB017

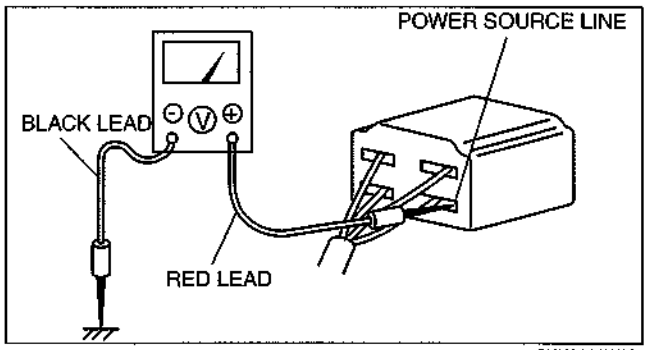
Electrical Troubleshooting Tools
Jumper wire

Caution
- **Do not connect a jumper wire from the power source line to a body ground. This may cause burning or other damage to wiring harnesses or electronic components.**

- A jumper wire is used to create a temporary circuit. Connect the jumper wire between the terminals of a circuit to bypass a switch.


WGIWXX0067E

Voltmeter
- The DC voltmeter is used to measure circuit voltage. A voltmeter with a range of **15 V or more** is used by connecting the positive (+) probe (red lead wire) to the point where voltage will be measured and the negative (-) probe (black lead wire) to a body ground.

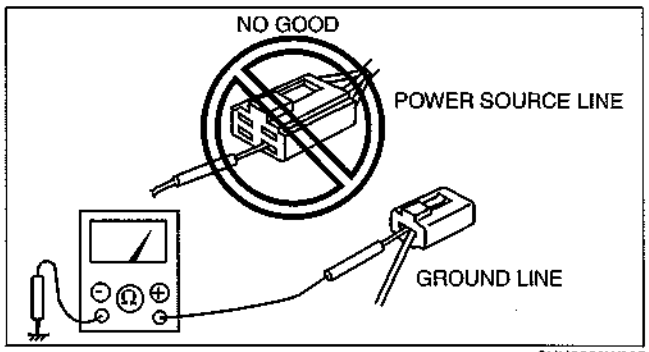


CHU0000W004

Ohmmeter

Caution
- **Do not connect the ohmmeter to any circuit where voltage is applied. This will damage the ohmmeter.**

- The ohmmeter is used to measure the resistance between two points in a circuit and to inspect for continuity and short circuits.

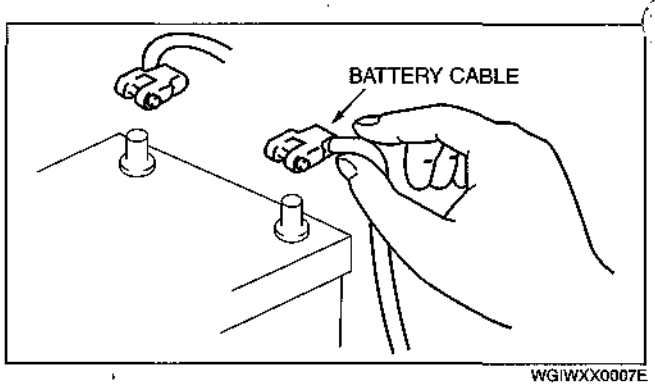


CHU0000W005

Precautions Before Welding

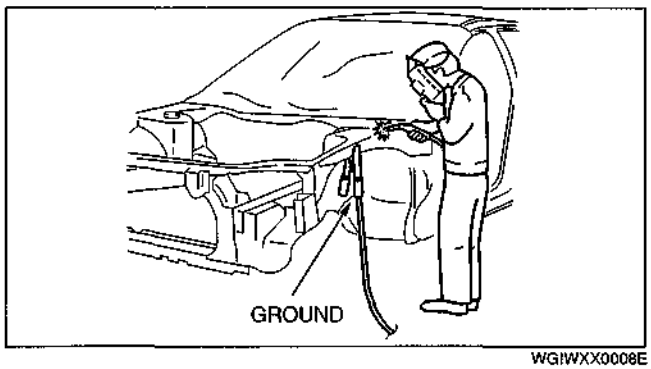
A vehicle has various electrical parts. To protect the parts from excessive current generated when welding, be sure to perform the following procedure.

1. Turn the ignition switch to the LOCK position.
2. Disconnect the battery cables.



WGIWXX0007E

3. Securely connect the welding machine ground near the welding area.
4. Cover the peripheral parts of the welding area to protect them from weld spatter.



WGIWXX0008E

JACKING POSITIONS

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Warning

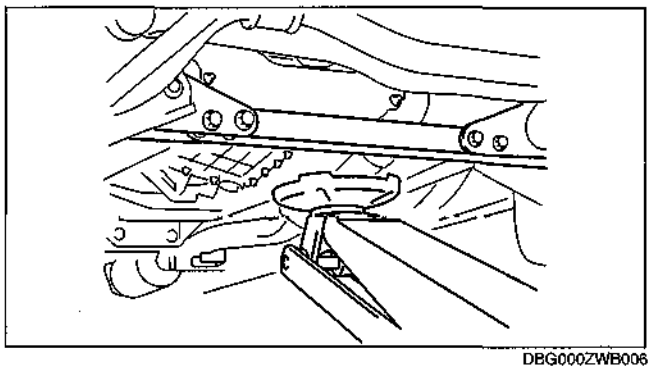
- **Lifting a vehicle that is not stabilized is dangerous. The vehicle can slip off the lift and cause serious injury and/or vehicle damage. Make sure that the vehicle is on the lift horizontally by adjusting the height of the support at the end of the arm of the lift.**

- Use safety stands to support the vehicle after it has been lifted.

Front

- Near the center of the crossmember.

2WD



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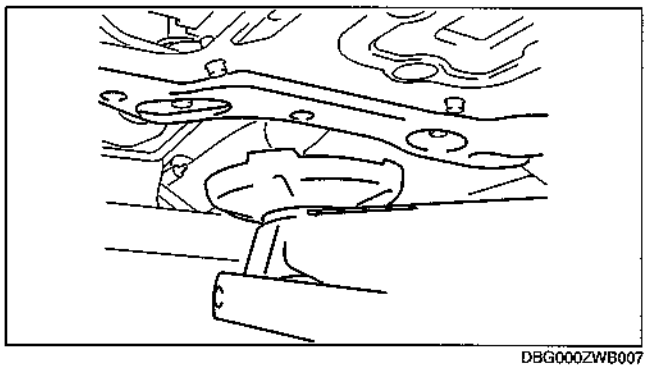
4WD



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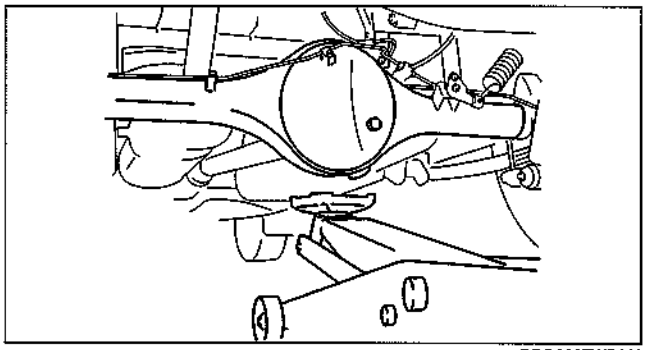
Rear

- At the center of the rear differential.



DBG000ZWB008

VEHICLE LIFT (2 SUPPORTS) AND SAFETY STAND (RIGID RACK) POSITION

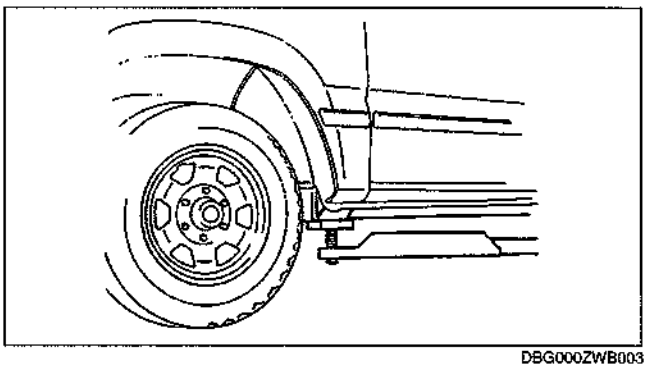
dcf000000000w24

Vehicle Lift Positions

Warning

- **Unstably lifting a vehicle is dangerous. The vehicle can slip off the lift and cause serious injury and/or vehicle damage. Make sure that the vehicle is on the lift horizontally by adjusting the height of support at the end of the arm of the lift.**

Front



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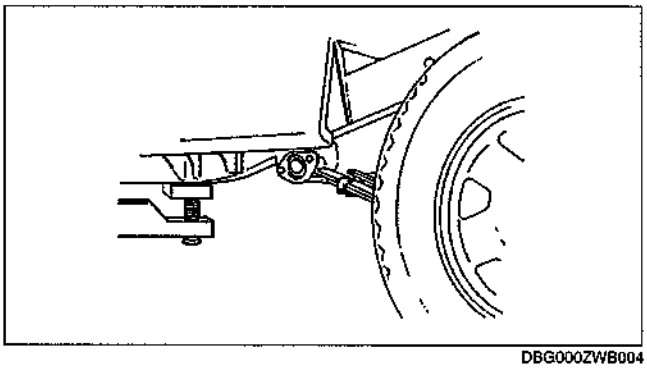
Rear



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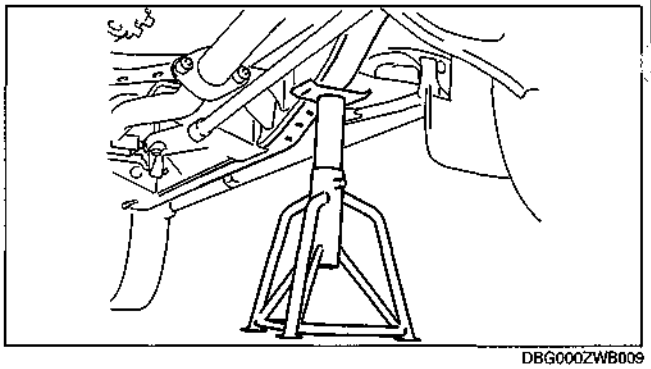
Safety Stand Positions
Front



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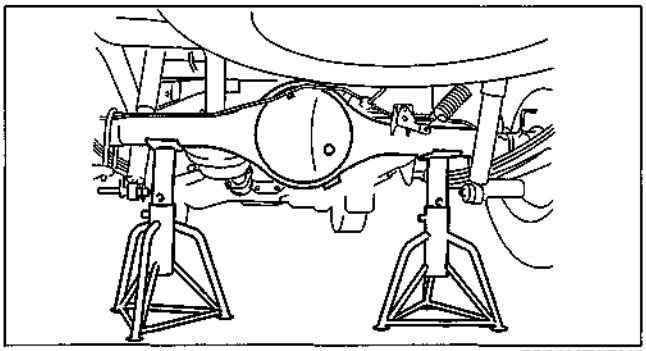
Rear



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TOWING

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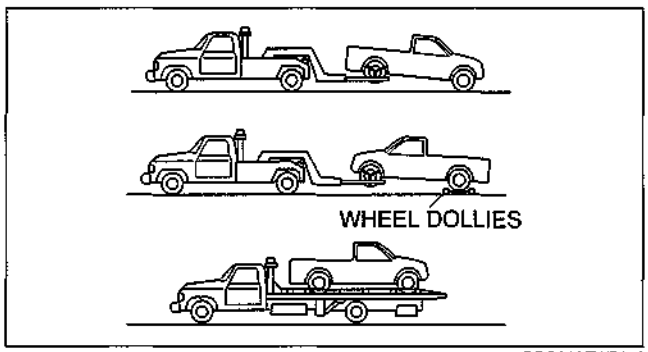
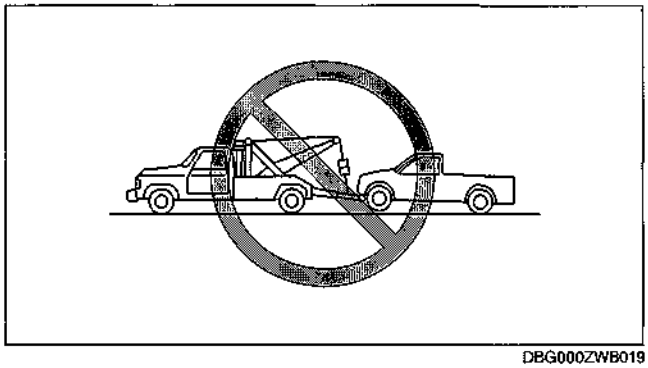
- Proper lifting and towing are necessary to prevent damage to the vehicle. Particularly when towing a 4WD vehicle, where all the wheels are connected to the drive train, proper transporting of the vehicle is absolutely essential to avoid damaging the drive system. Government and local laws must be followed.
- A towed vehicle usually should have its rear wheels off the ground. If excessive damage or other conditions prevent this, use wheel dollies.



DBG000ZWB018

Caution

- **Do not tow with sling-type equipment. This could damage the vehicle. Use wheel-lift or flatbed equipment.**



DBG000ZWB019

Caution

- **Follow these instructions when towing the vehicle with all wheels on the ground or with the front wheels on the ground and the rear wheels raised.**
  1. **Shift to neutral.**
  2. **Turn the ignition switch to the ACC position.**
  3. **Release the parking brake.**
- **Remember that power assist for the brakes and steering will not be available when the engine is not running.**

- If the transmission, 4WD system, rear axle, and steering system are not damaged, the vehicle may be towed on all four wheels. If any of these components are damaged, use wheel dollies or flatbed equipment.

Caution
- **Follow these instructions when towing the 4WD vehicle with all wheels on the ground or with the front wheels on the ground and the rear wheels raised.**
  1. **Put the transfer shift lever in 2H.**
  2. **Set the remote free-wheel system to FREE mode.**
- **Remember that power assist for the brakes and steering will not be available when the engine is not running.**

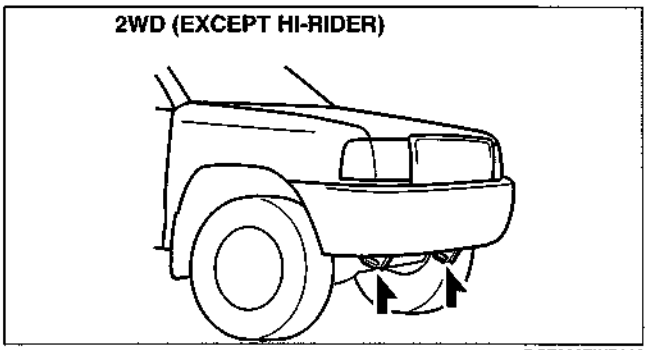
- If towing service is not available in an emergency, the vehicle may be towed with all four wheels on the ground using the towing hook at the front of the vehicle.
  Only tow the vehicle on paved surfaces for short distances at low speeds.

Towing/Tiedown Hooks

Caution
- **The towing hook should be used in an emergency (to get the vehicle out of a ditch for example).**
- **When using the towing hooks, always pull the cable or chain in a straight direction with respect to the hook. Apply no sideways force.**
- **Don't use the tiedown hooks under the front for towing. They are designed ONLY for tying down the vehicle when it's for towing will damage the bumper.**

Note
- When towing with chain or cable, wrap the chain or cable with a soft cloth near the bumper to prevent damage to the bumper.

Towing Hooks



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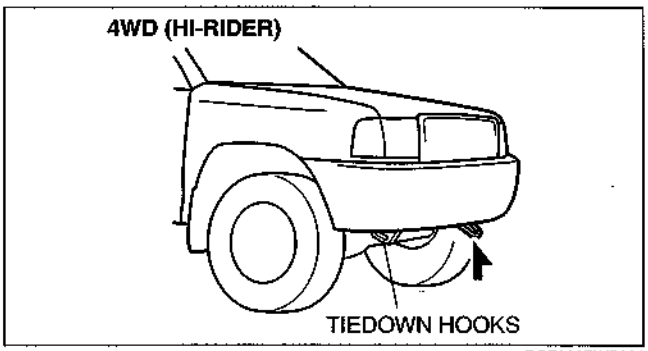

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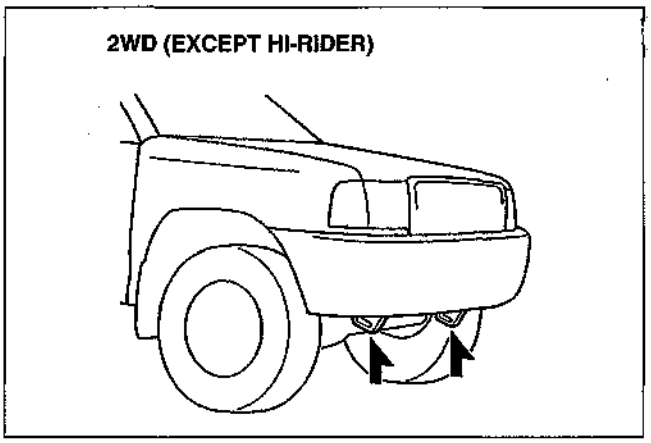
Tiedown Hooks

Caution

- **Do not use the hook loops under the front for towing. They are designed ONLY for tying down the vehicle when it is being transported. Using them for towing will damage the bumper.**



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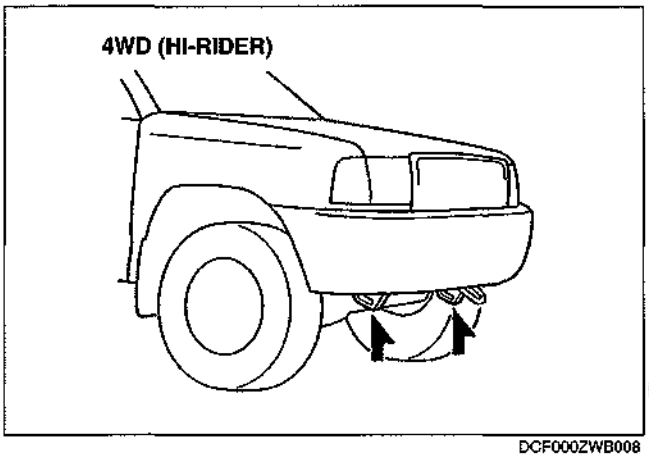

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IDENTIFICATION NUMBER LOCATIONS

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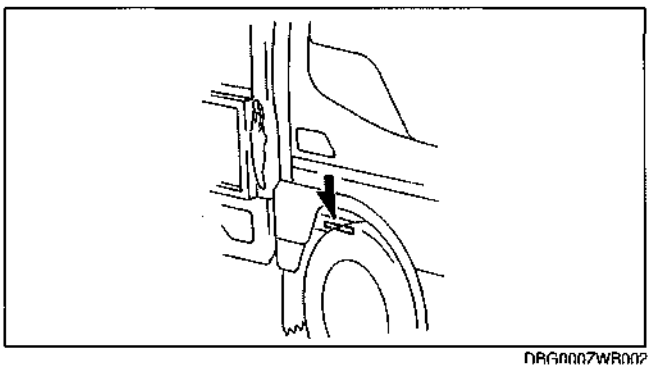
Vehicle Identification Number (VIN)



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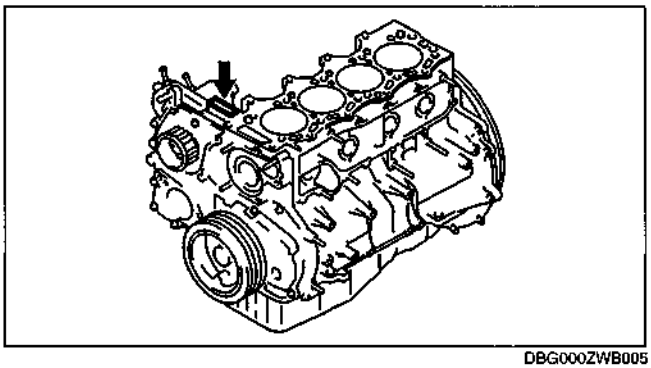
Engine Identification Number



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NEW STANDARDS

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- Following is a comparison of the previous standard and the new standard.

New Standard		Previous Standard		Remark
Abbreviation	Name	Abbreviation	Name	
AP	Accelerator Pedal	—	Accelerator Pedal	
APP	Accelerator Pedal Position	—	Accelerator Pedal Position	
ACL	Air Cleaner	—	Air Cleaner	
A/C	Air Conditioning	—	Air Conditioning	
BARO	Barometric Pressure	—	Atmospheric Pressure	
B+	Battery Positive Voltage	V_B	Battery Voltage	
—	Brake Switch	—	Stoplight Switch	
—	Calibration Resistor	—	Corrected Resistance	#6
CMP sensor	Camshaft Position Sensor	—	Crank Angle Sensor	
LOAD	Calculated Load Voltage	—	—	
CAC	Charge Air Cooler	—	Intercooler	
CLS	Closed Loop System	—	Feedback System	
CTP	Closed Throttle Position	—	Fully Closed	
CPP	Clutch Pedal Position	—	Clutch Position	
CIS	Continuous Fuel Injection System	EGI	Electronic Gasoline Injection System	
CS sensor	Control Sleeve Sensor	CSP sensor	Control Sleeve Position Sensor	#6
CKP sensor	Crankshaft Position Sensor	—	Crank Angle Sensor 2	
DLC	Data Link Connector	—	Diagnosis Connector	
DTM	Diagnostic Test Mode	—	Test Mode	#1
DTC	Diagnostic Trouble Code(s)	—	Service Code(s)	
DI	Distributor Ignition	—	Spark Ignition	
DLI	Distributorless Ignition	—	Direct Ignition	
EI	Electronic Ignition	—	Electronic Spark Ignition	#2
ECT	Engine Coolant Temperature	—	Water Thermo	
EM	Engine Modification	—	Engine Modification	
—	Engine Speed Input Signal	—	Engine RPM Signal	
EVAP	Evaporative Emission	—	Evaporative Emission	
EGR	Exhaust Gas Recirculation	—	Exhaust Gas Recirculation	
FC	Fan Control	—	Fan Control	
FF	Flexible Fuel	—	Flexible Fuel	
4GR	Fourth Gear	—	Overdrive	
—	Fuel Pump Relay	—	Circuit Opening Relay	#3
FSO solenoid	Fuel Shut Off Solenoid	FCV	Fuel Cut Valve	#6
GEN	Generator	—	Alternator	
GND	Ground	—	Ground/Earth	
HO2S	Heated Oxygen Sensor	—	Oxygen Sensor	With heater
IAC	Idle Air Control	—	Idle Speed Control	
—	IDM Relay	—	Spill Valve Relay	#6
—	Incorrect Gear Ratio	—	—	
—	Injection Pump	FIP	Fuel Injection Pump	#6
—	Input/Turbine Speed Sensor	—	Pulse Generator	
IAT	Intake Air Temperature	—	Intake Air Thermo	
KS	Knock Sensor	—	Knock Sensor	
MIL	Malfunction Indicator Lamp	—	Malfunction Indicator Light	
MAP	Manifold Absolute Pressure	—	Intake Air Pressure	
MAF	Mass Air Flow	—	Mass Air Flow	
MAF sensor	Mass Air Flow Sensor	—	Airflow Sensor	
MFI	Multiport Fuel Injection	—	Multiport Fuel Injection	
OBD	On-Board Diagnostic	—	Diagnosis/Self Diagnosis	
OL	Open Loop	—	Open Loop	

New Standard		Previous Standard		Remark
Abbreviation	Name	Abbreviation	Name	
—	Output Speed Sensor	—	Vehicle Speed Sensor 1	
OC	Oxidation Catalytic Converter	—	Catalytic Converter	
O2S	Oxygen Sensor	—	Oxygen Sensor	
PNP	Park/Neutral Position	—	Park/Neutral Range	
PID	Parameter Identification	—	Parameter Identification	
—	PCM Control Relay	—	Main Relay	#6
PSP	Power Steering Pressure	—	Power Steering Pressure	
PCM	Powertrain Control Module	ECU	Engine Control Unit	#4
—	Pressure Control Solenoid	—	Line Pressure Solenoid Valve	
PAIR	Pulsed Secondary Air Injection	—	Secondary Air Injection System	Pulsed injection
—	Pump Speed Sensor	—	NE Sensor	#6
RAM	Random Access Memory	—	—	
AIR	Secondary Air Injection	—	Secondary Air Injection System	Injection with air pump
SAPV	Secondary Air Pulse Valve	—	Reed Valve	
SFI	Sequential Multipoint Fuel Injection	—	Sequential Fuel Injection	
—	Shift Solenoid A	—	1–2 Shift Solenoid Valve	
		—	Shift A Solenoid Valve	
—	Shift Solenoid B	—	2–3 Shift Solenoid Valve	
		—	Shift B Solenoid Valve	
—	Shift Solenoid C	—	3–4 Shift Solenoid Valve	
3GR	Third Gear	—	3rd Gear	
TWC	Three Way Catalytic Converter	—	Catalytic Converter	
TB	Throttle Body	—	Throttle Body	
TP	Throttle Position	—	—	
TP sensor	Throttle Position Sensor	—	Throttle Sensor	
TCV	Timer Control Valve	TCV	Timing Control Valve	#6
TCC	Torque Converter Clutch	—	Lockup Position	
TCM	Transmission (Transaxle) Control Module	—	EC-AT Control Unit	
—	Transmission (Transaxle) Fluid Temperature Sensor	—	ATF Thermosensor	
TR	Transmission (Transaxle) Range	—	Inhibitor Position	
TC	Turbocharger	—	Turbocharger	
VSS	Vehicle Speed Sensor	—	Vehicle Speed Sensor	
VR	Voltage Regulator	—	IC Regulator	
VAF sensor	Volume Air Flow Sensor	—	Air Flow Sensor	
WUTWC	Warm Up Three Way Catalytic Converter	—	Catalytic Converter	#5
WOT	Wide Open Throttle	—	Fully Open	

#1: Diagnostic trouble codes depend on the diagnostic test mode
#2: Controlled by the PCM
#3: In some models, there is a fuel pump relay that controls pump speed. That relay is now called the fuel pump relay (speed).
#4: Device that controls engine and powertrain
#5: Directly connected to exhaust manifold
#6: Part name of diesel engine

ABBREVIATIONS

id0000001572a2

ABS	Antilock Brake System
A/C	Air Conditioning
AT	Automatic Transmission
ATDC	After Top Dead Center
ATF	Automatic Transmission Fluid
BTDC	Before Top Dead Center
CAN	Controller Area Network
CM	Control Module
ECT	Engine Coolant Temperature
ELR	Emergency Locking Retractor
ESA	Electronic spark advance
EX	Exhaust
GND	Ground
HI	High
HLA	Hydraulic lash adjuster
HU	Hydraulic Unit
IDS	Integrated Diagnostic Software
IN	Intake
INT	Intermittent
ISS	Intermediate Shaft Speed
KOEO	Key On Engine Off
KOER	Key On Engine Running
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LF	Left Front
LH	Left Hand
LO	Low
LR	Left Rear
LSD	Limited Slip Differential
LSPV	Load Sensing Proportioning Valve
M	Motor
MAX	Maximum
MIL	Malfunction Indicator Lamp
MIN	Minimum

O/D	Overdrive
OSS	Output Shaft Speed
PCM	Powertrain Control Module
PCV	Positive crankcase ventilation
PDS	Portable Diagnostic Software
PID	Parameter Identification
PRC	Pressure regulator control
P/S	Power Steering
P/W	Power Window
RF	Right Front
RFW	Remote Freewheel
RH	Right Hand
RR	Right Rear
SAS	Sophisticated Air Bag Sensor
SST	Special Service Tool
SW	Switch
TDC	Top Dead Center
TFT	Transmission Fluid Temperature
TNS	Tail Number Side Lights
TSS	Turbine Shaft Speed
VBC	Variable Boost Control
VENT	Ventilation
VSC	Variable Swirl Control
WDS	Worldwide Diagnostic System
W/M	Workshop Manual
1GR	First Gear
2GR	Second Gear
3GR	Third Gear
4GR	Fourth Gear
5GR	Fifth Gear
4W-ABS	4-Wheel Antilock Brake System
4×2	4-wheel 2-drive
4×4	4-wheel 4-drive

PRE-DELIVERY INSPECTION

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Pre-Delivery Inspection Table
Exterior
INSPECT and **ADJUST**, if necessary, the following part to specification:
❑Glass, exterior bright metal and paint for damage
❑Wheel lug nuts
❑All weatherstrips for damage or detachment
❑Operation of bonnet release and lock
❑Operation of fuel-filler lid
❑Door operation and alignment
❑Headlight aiming
TRUNK ROOM
❑Check spare tire and air pressure
INSTALL the following part:
❑Wheel caps (if equipped)
❑Mast antenna (if equipped)

Under bonnet—engine off
INSPECT and **ADJUST**, if necessary, the following part to specification:
❑Fuel, engine coolant, and hydraulic lines, fittings, connections, and components for leaks
❑Engine oil level
❑Power steering fluid level (if equipped)
❑Brake and clutch master cylinder fluid level
❑Washer tank fluid level
❑Radiator coolant level and specific gravity
❑Tightness of battery terminals
❑Drive belt tensions

Interior
INSPECT the operations of the following part:
❑Seat controls (slide and recline)
❑Seat belts
❑Air bag system using warning light
❑Cruise control system (if equipped)
❑Engine switch and steering lock
❑Starter interlock (if equipped)
❑Power door lock (if equipped)
❑Door locks
❑All lights including warning, and indicator lights
❑Horn, wipers, and washers
❑Wiper blades performance
❑Audio system
❑Power windows (if equipped)
❑Defroster, and air conditioner at various mode selections (if equipped)
INSPECT the following part:
❑Presence of spare fuse
❑Upholstery and interior finish
INSPECT and **ADJUST**, if necessary, the following part:
❑Pedal height and free play of brake and clutch pedal
❑Parking brake

Under bonnet—engine running at operating temperature
INSPECT the following items:
❑Ignition timing

On hoist
INSPECT the following part:
❑Underside fuel, engine coolant and hydraulic lines, fittings, connections, and components for leaks
❑Tires for cuts or bruises
❑Steering linkage, suspension, exhaust system, and all underside hardware for looseness or damage
❑Manual transmission oil level
❑Differential oil level
❑Transfer oil level

Road test
INSPECT the following part:
❑Brake operation
❑Clutch operation
❑Steering control
❑Engine general performance
❑Operation of transfer
❑Emergency locking retractors
❑Cruise control system (if equipped)
❑Operation of meters and gauges, squeaks, rattles, and unusual noises

After road test
INSPECT for necessary owner information materials, tools, and spare tire in vehicle
The following part must be completed just before delivery to your customer.
❑Load test battery and charge if necessary (Load test result: Volts)
❑Adjust tire pressure to specification
❑Clean outside of vehicle
❑Install fuses for accessories
❑Remove seat and cabin carpet protective covers
❑Vacuum inside of vehicle
❑Inspect installation of option parts with invoice

SCHEDULED MAINTENANCE

Scheduled Maintenance Table for Australia.

Maintenance Interval		Number of months or kilometers, whichever comes first															
	Months	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96
	×1000 km	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160
Engine valve clearance			I										I				
Engine timing belt *1		Replace every 120,000 km															
Engine timing belt auto tensioner		Replace every 120,000 km															
Engine oil *2		R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Engine oil filter *2		R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Drive belts *3		I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Cooling system (Including coolant level adjustment)			I		I		I		I		I		I		I		I
Engine coolant	FL22 type *4	Replace at first 200,000km or 10 years; after that, every 100,000 km or 5 years															
	Others	Replace at first 80,000 km or 4 years; after that, every 2 years															
Air cleaner element *5		C	C	R	C	C	R	C	C	R	C	C	R	C	C	R	C
Fuel filter			R		R		R		R		R		R		R		R
Fuel injection pump inlet filter			C		C		C		C		C		C		C		C
Fuel lines and hoses		I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Air intake system			I		I		I		I		I		I		I		I
Battery electrolyte level and specific gravity			I		I		I		I		I		I		I		I
Brake lines, hoses and connections			I		I		I		I		I		I		I		I
Brake fluid *6		I	I	I	R	I	I	I	R	I	I	I	R	I	I	I	R

Parking brake		I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Power brake unit (Brake booster) and hoses			I		I		I		I		I		I		I		I
Disc brakes *7		I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Drum brakes *7			I		I		I		I		I		I		I		I
Power steering fluid, lines, hoses and connections		I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Steering operation and linkages *7			I		I		I		I		I		I		I		I
Manual transmission oil *8					I				I		R				I		
Automatic transmission fluid *8 *9	Replace every 240,000 km																
Rear differential oil (for 4×2) *8					R				R				R				R
Front and rear differential oil (for 4×4) *8			R		I		R		I		R		I		R		I
Transfer oil (for 4×4)	for Manual Transmission *8				I				I		R				I		
	for Automatic Transmission *8 *9	Replace every 240,000 km															
Driveshaft dust boots (for 4×4)					I				I				I				I
Front and rear propeller shaft joints (for 4×4)			L		L		L		L		L		L		L		L
Front and rear suspension and ball joints			I		I		I		I		I		I		I		I
Front wheel bearing grease (for 4×2 except Hi-Rider)			R		R		R		R		R		R		R		R
Wheel bearing lateral play (front) and axial play (rear)			I		I		I		I		I		I		I		I
Exhaust system and heat shields	Inspect every 80,000km																
Bolts and nuts on chassis and body			T		T		T		T		T		T		T		T
Body condition (for rust, corrosion and perforation)	Inspect annually																
Tires (including spare tire)(with inflation pressure adjustment)		I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Tire rotation *9	Rotate every 10,000 km or 6 months																
Road test		I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Diagnostic check of Vehicle Management and Safety Systems			I		I		I		I		I		I		I		I

Chart symbols

I: Inspect: Inspect and clean, repair, adjust, or replace if necessary.
R: Replace
C: Clean
L: Lubricate
T: Tighten

Remarks

- Emission control and related systems
  The ignition and fuel systems are highly important to the emission control system and to efficient engine operation.
  All inspections and adjustments must be made by an expert repairer, we recommend an Authorized Ford Repairer.
- After the prescribed period, continue to follow the described maintenance at the recommended intervals.
- Refer below for a description of items marked* in the maintenance chart.
  *1: Replacement of the timing belt is required at every 120,000 km. Failure to replace the timing belt may result in damage to the engine.
  *2: If the vehicle is operated primarily under any of the following conditions, replace the engine oil and oil filter more often than the recommended intervals.
    a. Driving in dusty conditions
    b. Extended periods of idling or low speed operation
    c. Driving for long period in cold temperatures or driving regularly at short distance (less than 8 km) only
  *3: Also inspect and adjust the power steering and air conditioner drive belts, if installed.

*4: Use FL22 type coolant in vehicles with the inscription "FL22" on the radiator cap itself or the surrounding area. Use FL22 when replacing the coolant.
*5: If the vehicle is operated in very dusty or sandy areas, clean the air cleaner element at every 5,000 km or 3 months.
*6: If the brakes are used extensively (for example, continuous hard driving or mountain driving) or if the vehicle is operated in extremely humid climates, replace the brake fluid annually.
*7: If the vehicle is operated primarily under any of the following conditions, inspect the these items more often than the recommended intervals.
  a. Driving on bumpy roads, gravel roads, snowy roads or dirt roads
  b. Driving uphill and downhill frequently
  c. Repeated short-distance driving
*8: If this component(s) has been submerged in water, the oil should be replaced.
*9: If the vehicle is operated primarily under any of the following conditions, replace the fluid as follows.
  — Automatic transmission: Every 50,000 km.
  — Transfer case (attached to automatic transmission): Every 100,000 km.
  a. Towing a trailer
  b. Extension idling and/or low speed driving for long distances as in heavy commercial use such as delivery, taxi, patrol car or livery
  c. Operating in dusty conditions such as unpaved or dusty roads
  d. Off-road operations
*10: If the vehicle is operated primarily under any of the following conditions, rotate the tires more often than the recommended intervals.
  a. Driving on bumpy roads, gravel roads, snowy roads or dirt roads
  b. Driving uphill and downhill frequently
  c. Repeated short-distance driving

Scheduled Maintenance Service (Specific Work Required)

- The specific work required for each maintenance item is listed in the following table. (Please refer to the section applicable to the model serviced.)

Maintenance Item	Specific Work Required
ENGINE	
Engine valve clearance	Inspect engine vale clearance.
Engine timing belt	Replace engine timing belt.
Engine timing belt auto tensioner	Replace engine timing belt auto tensioner.
Drive belts	Inspect for wear, cracks, fraying and tension.
Engine oil	Replace engine oil and inspect for leakage.
Engine oil filter	Replace engine oil filter and inspect for leakage.
COOLING SYSTEM	
Cooling system (Including coolant level adjustment)	Check engine coolant level and quality, and inspect for leakage.
Radiator cap	Inspect radiator cap.
Engine coolant	Replace engine coolant.
FUEL SYSTEM	
Idle speed	Check engine idle rpm.
Idle mixture	Inspect the CO and HC concentrations (see W/M).
Choke system	Check system operation.
Air cleaner element	Inspect dirt, oil and damage. Clean air cleaner element (by blowing air). Replace air cleaner element.
Fuel filter	Replace fuel filter.
Fuel injection pump inlet filter	Clean fuel injection pump inlet filter.
Fuel lines and hoses Fuel lines, hoses and connections	Inspect for cracks, leakage and loose connection.
Fuel injection system	Update to injection amount correction with current diagnostic tool (see W/M).
Fuel system (Drain water)	Drain water in fuel system.
Diesel particulate filter	Replace diesel particulate filter.
Fuel additive for diesel particulate filter	Fill up fuel additive.
IGNITION SYSTEM	
Initial ignition timing	Check initial ignition timing.
Spark plugs	Inspect for wear, damage, carbon, plug gap and high-tension lead condition. Replace spark plugs.
Ignition cables condition/security	Inspect for damage, condition and connection.
EMISSION CONTROL SYSTEM	
Evaporative system Evaporative emission control system	Check system operation (see W/M), vapor lines, vacuum fitting hoses and connection.
Crankcase emission control system	Check system operation (see W/M), PCV valve, blow-by lines, vacuum fitting hoses and connection.
E.G.R system	Check system operation (see W/M), vacuum fitting hoses and connection. MZR-CD (RF turbo) engine: Update to MAF correction for E.G.R control with current diagnostic tool (see W/M).
Air intake system	Update to MAF correction (see W/M).
Throttle positioner system	Check the diaphragm and system operation, vacuum fitting hoses and connection.
Dash pot	Check system operation.
ELECTRICAL SYSTEM	
Battery electrolyte level and specific gravity	Check battery electrolyte level and specific gravity.
Battery condition	Check battery for corroded or loose connections and cracks.
Battery	Check battery for leakage and corrosion.
All electrical system Lighting system and windshield wipers and washer	Check function of lighting system, windshield wiper (including wiper blade condition), washer and power windows.
Head light alignment	Check head light alignment.
CHASSIS AND BODY	
Brake and clutch pedals Brake pedals	Check pedal height and free play.

Brake fluid	Check brake fluid level and for leakage. Replace brake fluid.
Clutch fluid	Check Clutch fluid level and for leakage.
Brake lines, hoses and connections	Inspect for cracks, damage, chafing, corrosion, scars, swelling and fluid leakage.
Parking brake	Check parking lever stroke.
Power brake unit and hoses Power brake unit (Brake booster) and hoses	Check vacuum lines, connections, and check valve for improper attachment, air tightness, cracks chafing and deterioration.
Disc brakes	Inspect caliper for correct operation and fluid leakage, brake pads for wear. Check disc plate condition and thickness. Test for judder and noise.
Drum brakes	Inspect brake drum for wear and scratches: brake lining for wear, peeling and cracks; wheel cylinder for fluid leakage. Test for judder and noise.
Manual steering gear oil	Check manual gear oil level.
Power steering fluid, lines, hoses and connections Power steering fluid and lines	Check power steering fluid level and lines for improper attachment, leakage, cracks, damage, loose connections, chafing and deterioration.
Steering operation and gear housing Steering linkages tie rod ends and arms Steering operation and linkages	Check that the steering wheel has the specified play. Be sure to check for changes, such as excessive play, hard steering or strange noises. Check gear housing and boots for looseness, damage and grease/gear oil leakage. Check ball joint, dust cover and other components for looseness, wear, damage and grease leakage.
Front and rear suspension and ball joints Front suspension ball joints Front and rear suspension, ball joints and wheel bearing axial play	Inspect for grease leakage, crack, damage and looseness. Inspect for grease leakage, crack, damage, looseness and wheel bearing play/ noise.
Wheel bearing axial play	Inspect for wheel bearing play/noise.
Manual transmission/transaxle oil	Check manual transmission/transaxle oil level and for leakage. Replace manual transmission/transaxle oil.
Automatic transmission/transaxle fluid level	Check automatic transmission/transaxle fluid level.
Automatic transmission/transaxle fluid	Replace automatic transmission/transaxle fluid.
Front and rear differential oil Front differential oil Front axle oil Rear differential oil Rear axle oil	Check front and rear differential oil level and inspect for leakage. Replace front and rear differential oil.
Transfer oil	Check transfer oil level inspect for leakage. Replace transfer oil
Front and rear wheel bearing grease Front wheel bearing grease	Remove wheel bearing and replace wheel bearing grease.
Wheel bearing axial play Wheel bearing axial play (rear) and lateral play (front)	Inspect wheel bearing play and noise.
Propeller shaft joints Front propeller shaft joints Rear propeller shaft joints	Lubricate propeller shaft joints.
Driveshaft dust boots	Inspect for grease leakage, crack, damage and looseness.
Wheel nuts	Tighten wheel nuts.
Bolts and nuts on chassis and body Bolts and nuts on seats	Tighten bolts and nuts fastening suspension components, members and seat frames.
Body condition (for rust, corrosion and perforation)	Inspect body surface for paint damage, rust, corrosion and perforation.
Exhaust system and heat shields Exhaust pipe connections	Inspect for damage, corrosion, looseness of connections and gas leakage.
Tire rotation	Rotate tires.
Tires (Including spare tire)(with inflation pressure adjustment)	Check air pressure and inspect tires for tread wear, damage, cracks; and wheels for damage and corrosion.
Flat tire repair kit	Check tire repair fluid expiration date.
Hinges and catches	Lubricate hinges and catches of doors, trunk lid and hood.
Underside of vehicle	Inspect underside of vehicle (floor pans, frames, fuel lines, around exhaust system etc.) for damage and corrosion.

Road test	Check brake operation/clutch operation/steering control/operation of meters and gauges/squeaks, rattles, or unusual noises/engine general performance/ emergency locking retractors.
Diagnostic trouble code by current diagnostic tool	Check diagnostic trouble code with current diagnostic tool (see W/M).
Diagnostic check of Vehicle Management and Safety Systems	Check the items below with WDS (see W/M). (1) Retrieve All CMDTCs (2) PCM function test (except diesel engine models) (3) PCM Input/Output Data Monitor (except diesel engine models) (4) Adviser Comment (except diesel engine models)
AIR CONDITIONER SYSTEM	
Cabin air filter	Replace cabin air filter.

ENGINE

01
SECTION

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01-00 OUTLINE

ENGINE TECHNICAL DATA [WL-3] 01-00–1

ENGINE TECHNICAL DATA [WL-3]

dcf010000000w01

Drive Belt Deflection

(mm {in})

Drive Belt		New*	Used	Limit
Generator		7.4—9.4 {0.30—0.37}	8.7—10.4 {0.35—0.40}	14.3 {0.56} or more
A/C	a	6.1—6.9 {0.24—0.27}	7.1—8.0 {0.28—0.31}	11.3{0.44} or more
	b	10.0—11.0 {0.40—0.43}	11.3—12.6 {0.45—0.49}	17.4 {0.69} or more

Drive Belt Tension

(N {kgf, lbf})

Drive Belt	New*	Used	Limit
Generator	490—637 {50.0—64.9, 111—143}	431—539 {44.0—54.9, 96.9—121}	225 {22.9, 50.6} or less
A/C	455—572 {46.4—58.3, 103—128}	353—431 {36.0—43.9, 79.4—96.8}	156 {15.9, 35.1} or less

Item	Specification
Valve clearance [Engine cold]	IN: 0.05 — 0.15 mm {0.0020 — 0.0059 in} EX: 0.15 —0.25 mm {0.0060 — 0.0098 in}
Compression (kPa {kgf/cm^2, psi} [rpm])	Standard: 2,942 {30, 427} [200] Minimum: 2,648 {27, 384} [200]
Standard tensioner spring length	63.0 mm {2.48 in}
Cylinder head bolt length	Bolt head mark W Standard length: 101.2—101.8 mm {3.985—4.007 in} Maximum length: 102.5 mm {4.035 in} Bolt head mark N Standard length: 113.2—113.8 mm {4.457—4.480 in} Maximum length: 114.5 mm {4.508 in}
Camshaft oil seal press-in amount	0.50—1.0 mm {0.020—0.039 in}
Front oil seal press-in amount	0.0—0.40 mm {0.0—0.015 in}
Fuel injection pump plunger adjustment value	0.95—1.05 mm {0.038—0.041 in}
Oil pressure [2,500 rpm]	410—570 kPa {4.19—5.81 kgf/cm^2, 59.6—82.6 psi}

Recommended engine oil

Item	Specification
Grade	API CD, CE or CF–4
Viscosity (SAE)	5W–30, 10W–30

Item	Specification
Oil capacity (approx. quantity)	Oil replacement: 5.5 {5.8 US qt, 4.8 Imp qt} Oil and oil filter replacement: 6.2 {6.6 US qt, 5.5 Imp qt} Total (dry engine): 6.7 {7.1 US qt, 5.9 Imp qt}
Front oil seal press-in amount	0.0—0.40 mm {0.0—0.015 in}
Fuel injection pump oil seal press-in amount	0.0—0.40 mm {0.0—0.015 in}
Standard oil pump tip clearance	0.10—0.19 mm {0.0040—0.0074 in}
Maximum oil pump tip clearance	0.20 mm {0.0079 in}
Standard oil pump side clearance	0.04—0.09 mm {0.0016—0.0035 in}
Maximum oil pump side clearance	0.15 mm {0.0059 in}
Standard plunger spring length	43.8 mm {1.72 in}
Engine coolant capacity (approx. quantity)	8.8 L {9.3 US qt, 7.7 Imp qt}
Cooling system cap valve opening pressure	93.2—122.6 kPa {0.95—1.25 kgf/cm^2, 13.5—17.8 psi}
Initial-opening temperature and lift of the valve	80—84 °C {176—183 °F}
Full open temperature	95 °C {203 °F}
Full open life	8.5 mm {0.33 in} or more
Battery electrolyte specific gravity [20 °C {68 °F}]	1.22—1.29
Battery load test current	65D31R (56): 165 A 95D31R (64): 250 A
Battery back-up current	Vehicles with immobilizer system: 5—25 mA Vehicles without immobilizer system: 10 mA or less
Battery slow charge current	65D31R (56): 4.0—5.0 A 95D31R (64): 6.5—8.0 A
Battery quick charge current [30 min.]	65D31R (56): 30 A 95D31R (64): 40 A
Tightening torque:	12—25 N·m {123—254 kgf·cm, 107—221 in·lbf}
Generator standard voltage [Engine switch ON]	Terminal B: B+ Terminal L: Approx. 1 V Terminal S: B+

Item	Specification
Generator standard voltage [Idle, 20 °C {68 °F}]	Terminal B: 14.1—14.7 V Terminal L: 13.0—14.0 V Terminal S: 14.1—14.7 V

Generator generated current (reference value) [Conditions] Ambient temperature: 20 °C {68 °F}, Voltage: 13.5 V, Engine hot

Engine speed (rpm)	Terminal B current (Lower limit of current must be more than 0 A.)
1,000	0—55 A
2,000	0—70 A

Item	Specification
Generator rotor resistance (between slip rings) [20 °C {68 °F}]	2.3—2.7 ohms
Generator brush length	Standard: 18.5 mm {0.73 in} Minimum: 5.0 mm {0.2 in}
Generator brush spring force	Standard: 4.8—6.0 N {0.49—0.61 kgf, 1.08—1.34 lbf} Minimum: 2.16 N {0.22 kgf, 0.49 lbf}
Starter no load test voltage	11 V
Starter no load test current	130 A or less
Starter pinion gap	0 mm {0 in}
Starter armature runout	0.1 mm {0.039 in} max.
Starter commutator diameter	Standard: 32 mm {1.26 in} Minimum: 31.4 mm {1.24 in}
Segment groove depth of starter commutator	Standard: 0.5 mm {0.020 in} Minimum: 0.2 mm {0.008 in}
Starter brush length	Standard: 17.5 mm {0.69 in} Minimum: 11 mm {0.43 in}
Starter brush spring force	Standard: 26.7—36.1 N {2.73—3.68 kgf, 6.01—8.11 lbf} Minimum: 14.7 N {1.5 kgf, 3.3 lbf}

01-02B ON-BOARD DIAGNOSTIC [WL-C, WE-C]

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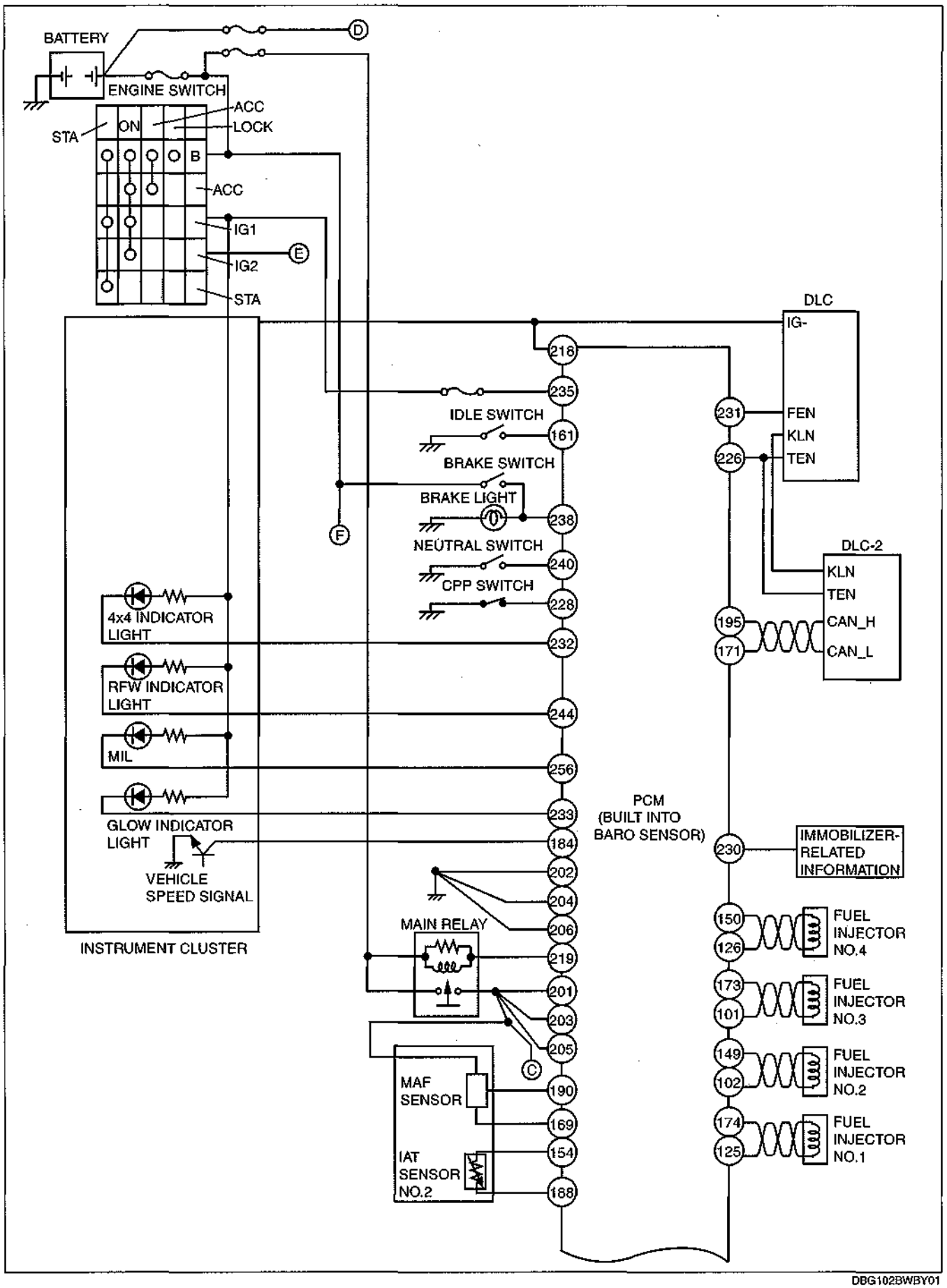
ON-BOARD DIAGNOSTIC WIRING DIAGRAM [WL-C, WE-C]

dcf010200000w23

With Immobilizer System



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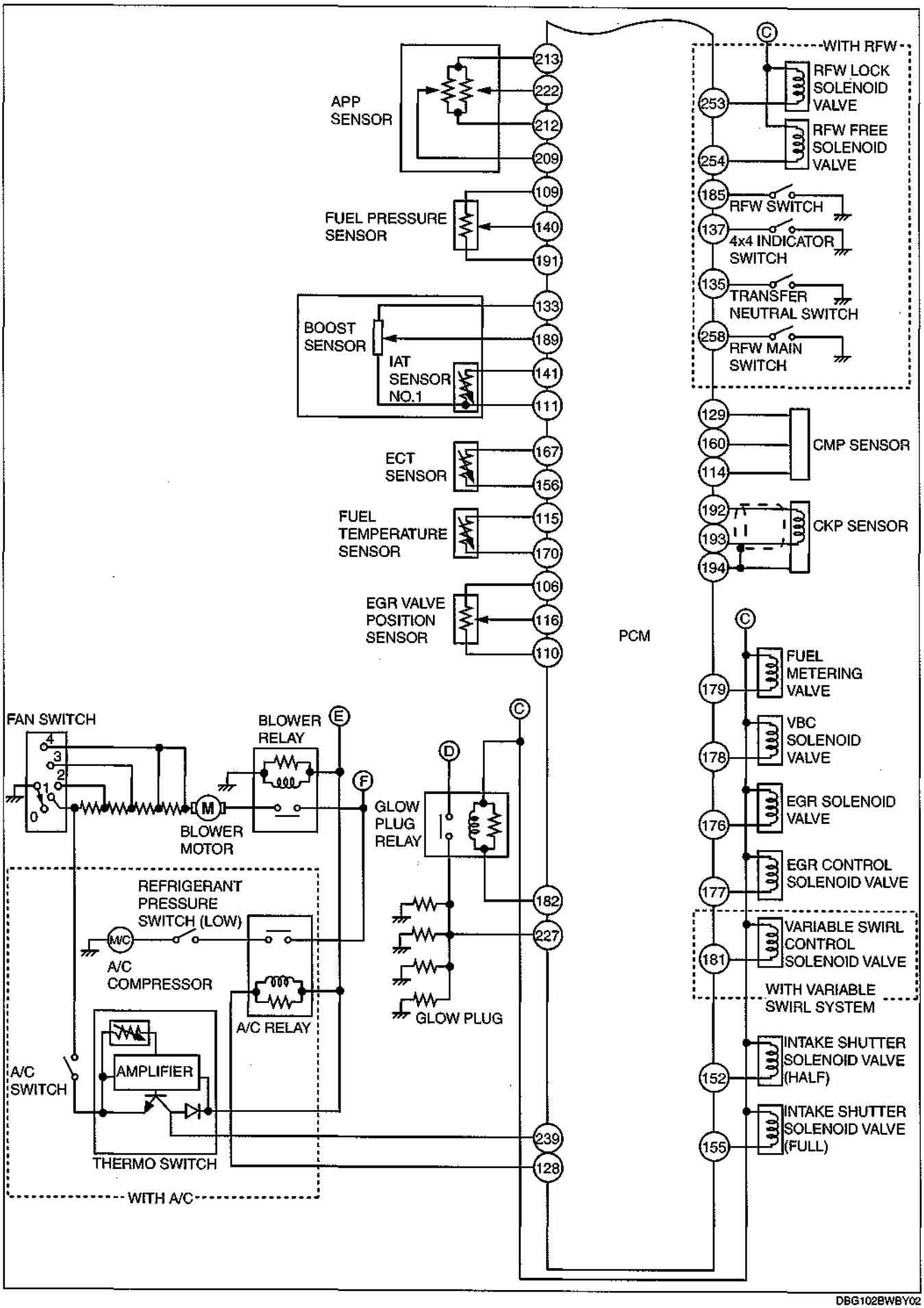

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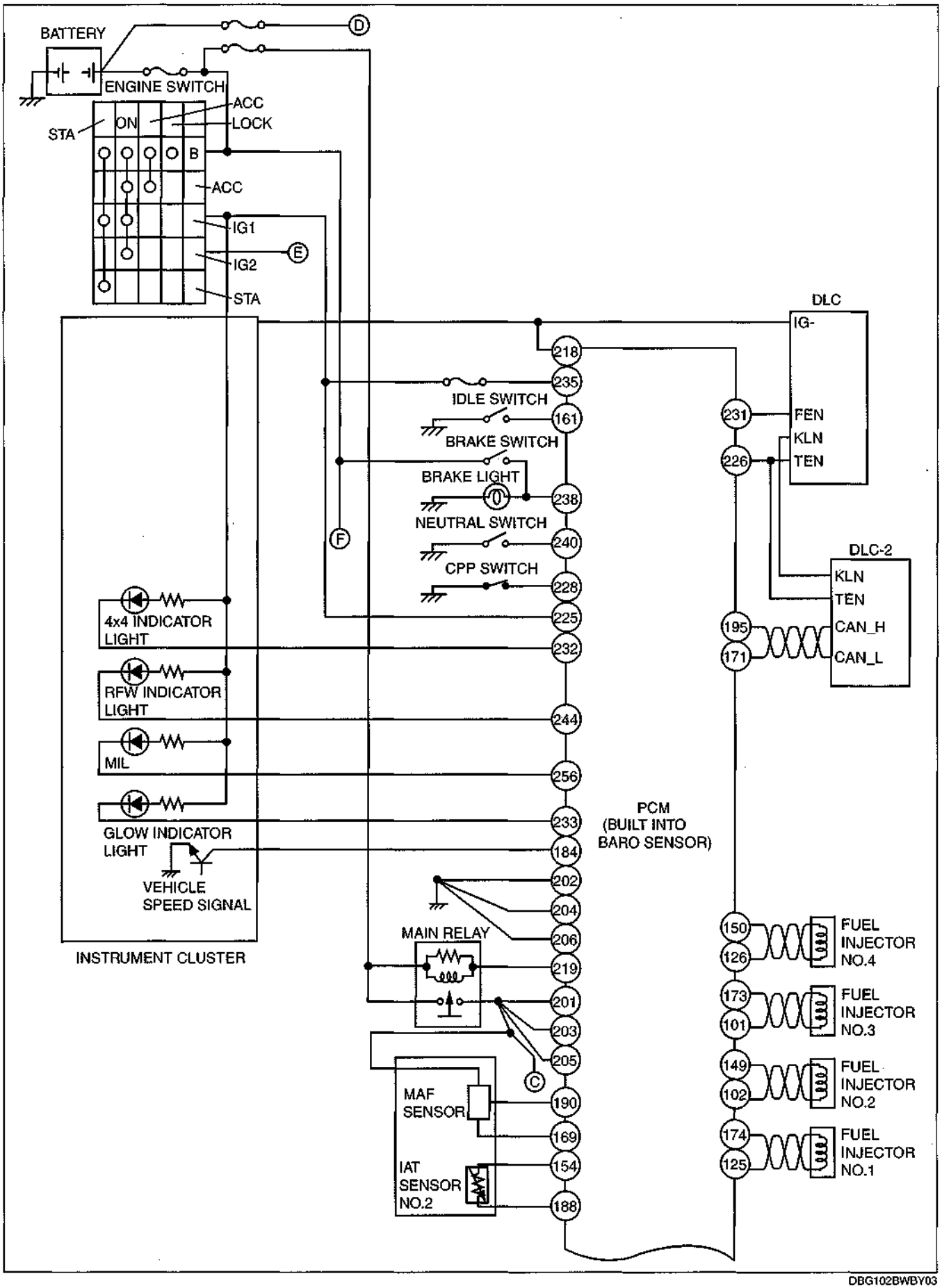
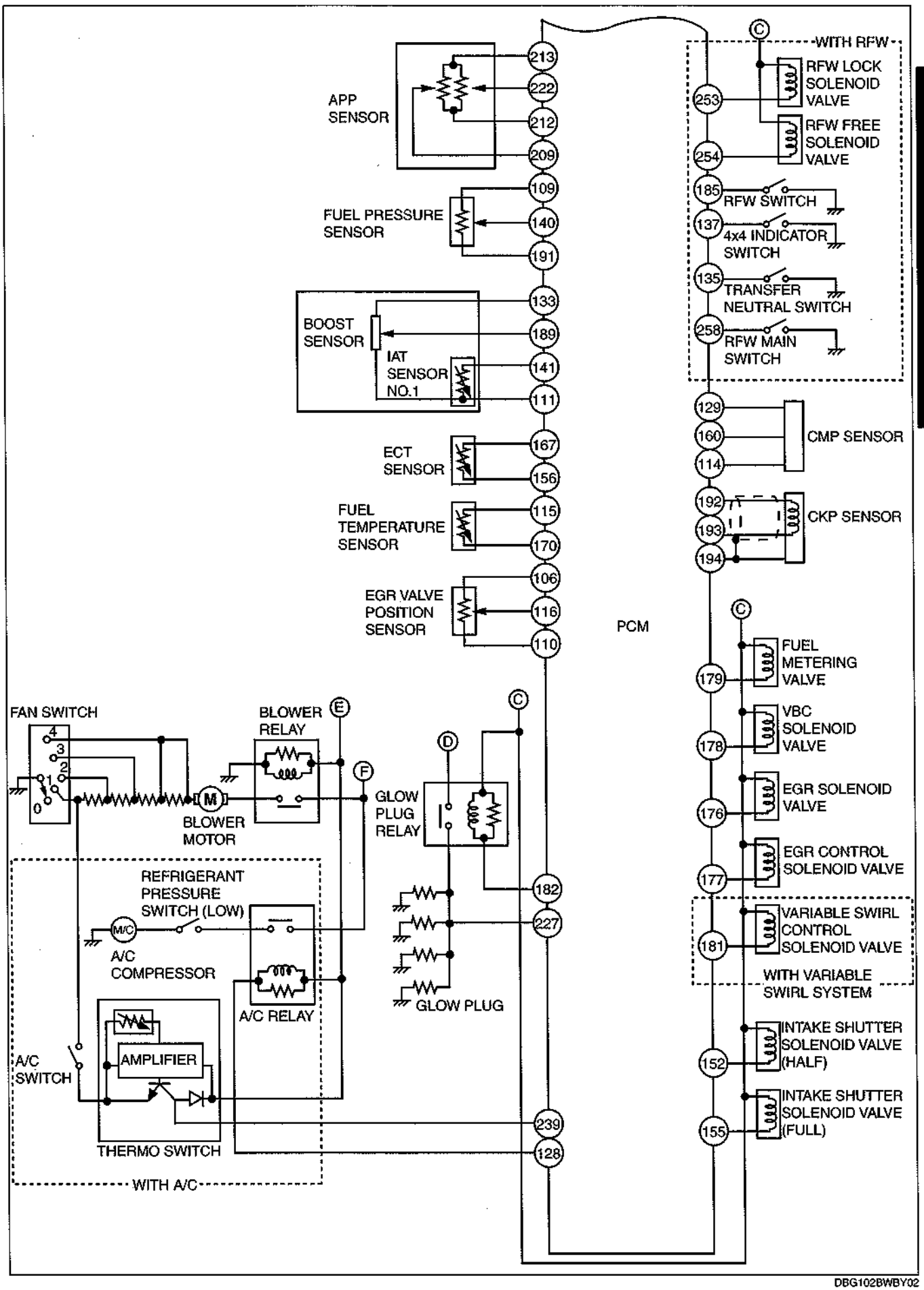
Without Immobilizer System



DBG102BWBY03

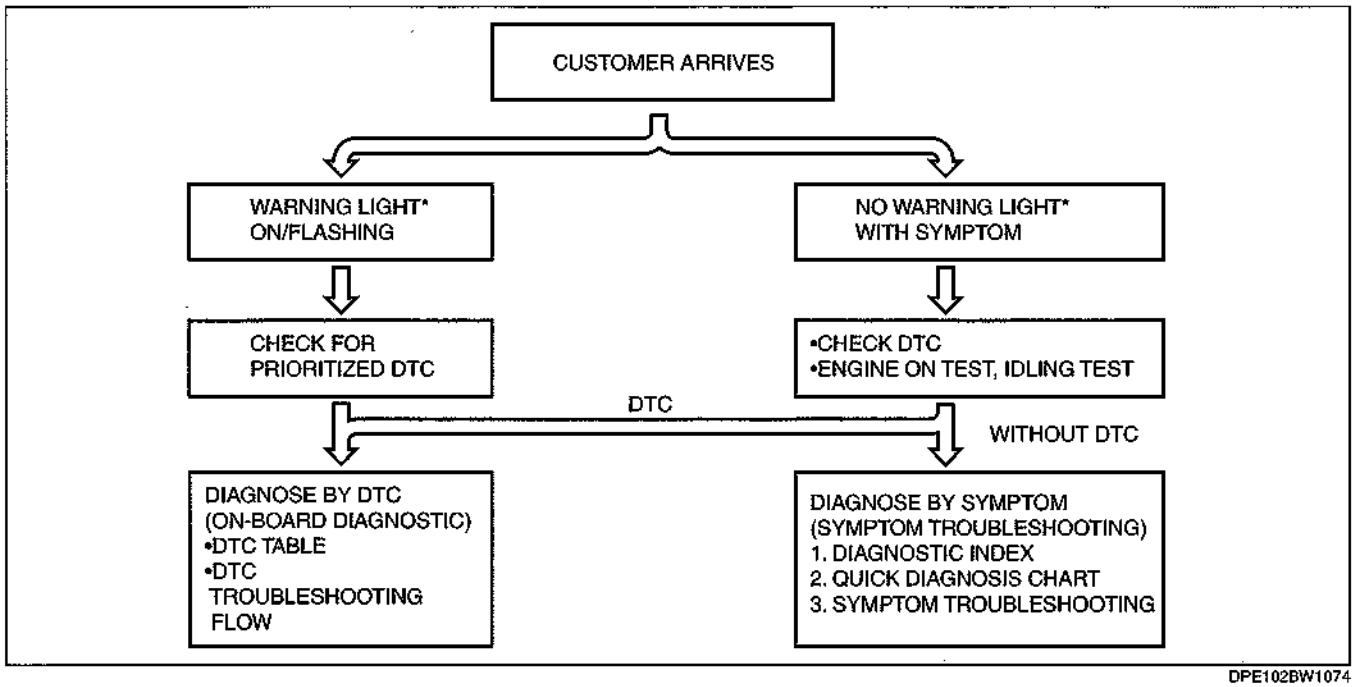


DBG102BWBY02

FOREWORD [WL-C, WE-C]

dcf010200000w24

- When the customer reports a vehicle malfunction, check the malfunction indicator light (MIL) indication and diagnostic trouble code (DTC), then diagnose the malfunction according to following flowchart.
  - — If the DTC exists, diagnose the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
  - — If the DTC does not exist and the MIL does not illuminate, diagnose the applicable symptom troubleshooting.



DPE102BW1074

*: Malfunction Indicator Light (MIL), Generator Warning Light, Security Light

PENDING TROUBLE CODES [WL-C, WE-C]

dcf010200000w25

- The MIL is illuminated when a malfunction is detected in two consecutive drive cycles. The code for a failed system is stored in the PCM memory in the first drive cycle. This code is called the pending code. If the malfunction is not found in the second drive cycle, the PCM determines that the system returned to normal or the malfunction was mistakenly detected, and deletes the pending code. If the malfunction is found in the second drive cycle too, the PCM determines that the system has failed, deletes the pending code, illuminates the MIL and stores the DTC.

FREEZE FRAME DATA [WL-C, WE-C]

dcf010200000w26

- This is the technical data which indicates the engine's condition at the time of the first malfunction. This data will remain in the memory.

READ/CLEAR DIAGNOSTIC TEST RESULTS [WL-C, WE-C]

dcf010200000w27

- This retrieves all stored DTCs in the PCM and clears the DTC, Freeze Frame Data, MIL, Distance Travelled While MIL and Pending Trouble Codes.

PARAMETER IDENTIFICATION (PID) ACCESS [WL-C, WE-C]

dcf010200000w28

- The PID mode allows access to certain data values, analog and digital inputs and outputs, calculated values and system status information. Since PID values for output devices are PCM internal data values, inspect each device to identify which output devices are malfunctioning.

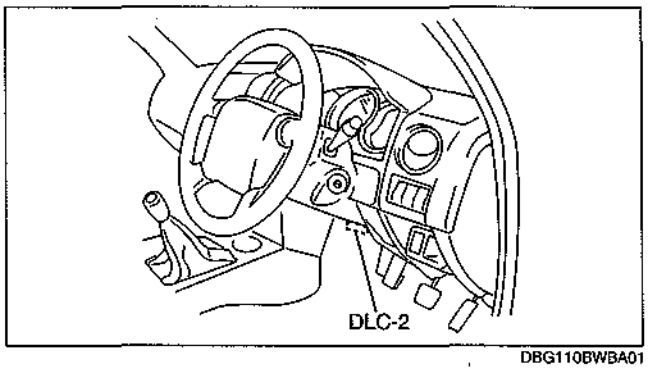
ON-BOARD DIAGNOSTIC TEST [WL-C, WE-C]

dcf010200000w15

DTC Reading Procedure

Using PDS/IDS

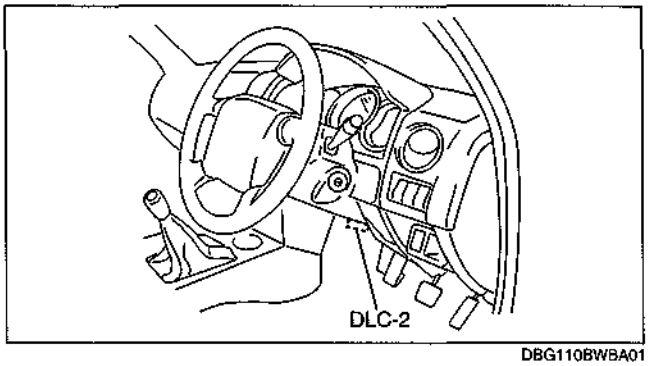
1. Connect the PDS/IDS to the DLC-2.
2. After the vehicle is identified, select the following items from the initial screen of the PDS/IDS.
   - When using the IDS (notebook PC)
     1. Select the "Toolbox" tab.
     2. Select "SelfTest".
     3. Select "Module".
     4. Select "PCM".
   - When using the PDS (pocket PC)
     1. Select "Module Tests".
     2. Select "PCM".
     3. Select "SelfTest".
3. Then, select the "Retrieve CMDTCs" and perform procedures according to directions on the PDS/IDS screen.
4. Verify the DTC according to the directions on the PDS/IDS screen.
   - If any DTCs are displayed, perform troubleshooting according to the corresponding DTC inspection.
5. After completion of repairs, clear all DTCs stored in the PCM, while referring to "AFTER REPAIR PROCEDURE".



DBG110BWBA01

Using WDS

1. Perform the necessary vehicle preparation and visual inspection.
2. Connect the WDS to the DLC-2.
3. Retrieve the DTCs using the WDS.

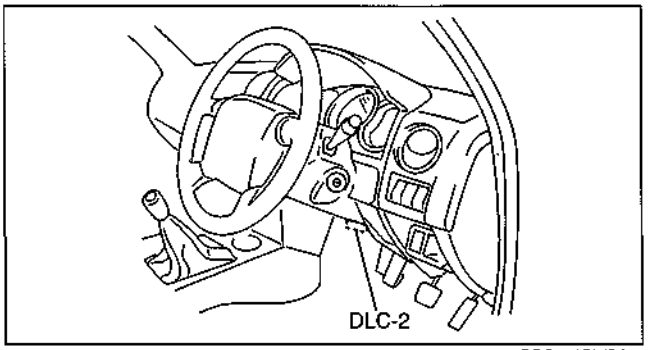


DBG110BWBA01

Pending Trouble Code Access Procedure

Using PDS/IDS

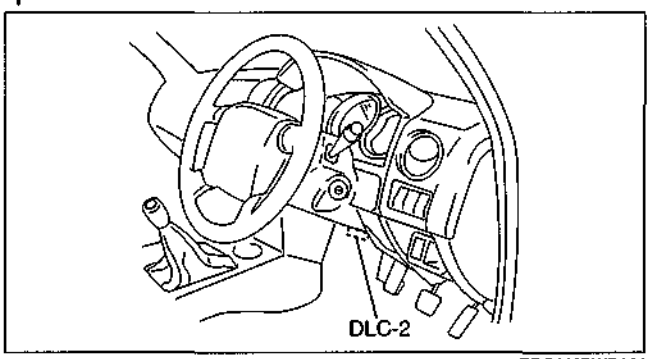
1. Connect the PDS/IDS to the DLC-2.
2. After the vehicle is identified, select the following items from the initial screen of the PDS/IDS.
   - When using the IDS (notebook PC)
     1. Select the "Toolbox" tab.
     2. Select "SelfTest".
     3. Select "Module".
     4. Select "PCM".
   - When using the PDS (pocket PC)
     1. Select "Module Tests".
     2. Select "PCM".
     3. Select "SelfTest".
3. Then, select the "Retrieve CMDTCs" and perform procedures according to directions on the PDS/IDS screen.
4. Retrieve the pending trouble codes according to the directions on the PDS/IDS screen.



DBG110BWBA01

Using WDS

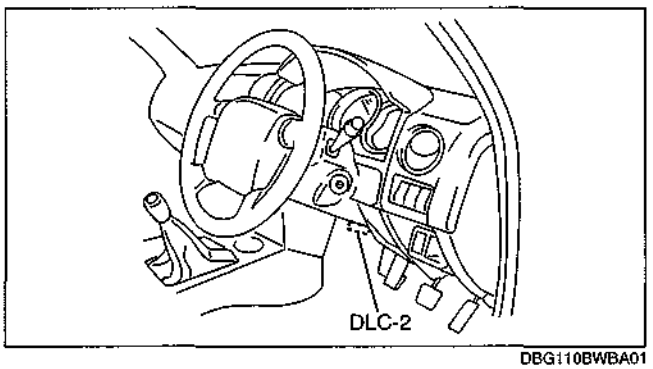
1. Perform the necessary vehicle preparation and visual inspection.
2. Connect the WDS to the DLC-2.
3. Retrieve the pending trouble codes using the WDS.



DBG110BWBA01

Freeze Frame PID Data Access Procedure
Using PDS/IDS

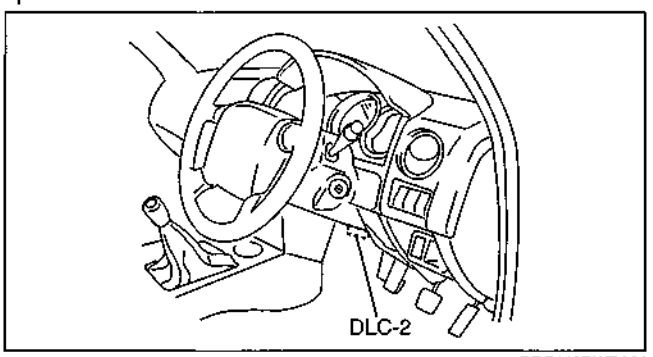
1. Connect the PDS/IDS to the DLC-2.
2. After the vehicle is identified, select the following items from the initial screen of the PDS/IDS.
   - When using the IDS (notebook PC)
     1. Select the "Toolbox" tab.
     2. Select "SelfTest".
     3. Select "Module".
     4. Select "PCM".
   - When using the PDS (pocket PC)
     1. Select "Module Tests".
     2. Select "PCM".
     3. Select "SelfTest".
3. Then, select the "Retrieve CMDTCs" and perform procedures according to directions on the PDS/IDS screen.
4. Retrieve the freeze frame PID data according to the directions on the PDS/IDS screen.



DBG110BWBA01

Using WDS

1. Perform the necessary vehicle preparation and visual inspection.
2. Connect the WDS to the DLC-2.
3. Record the freeze frame PID data using the WDS.



DBG110BWBA01

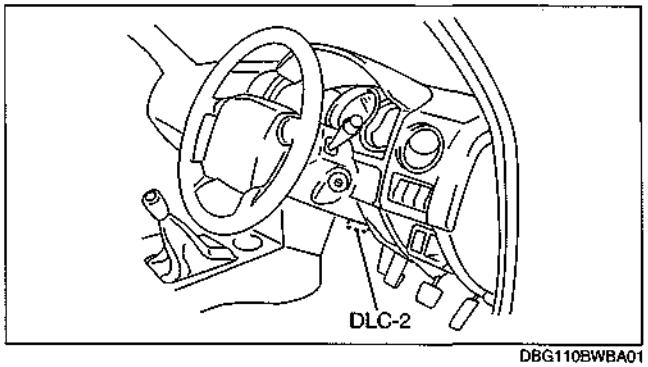
PID/DATA Monitor And Record Procedure

Note

- The PID/DATA MONITOR function monitors the calculated value of the input/output signals in the PCM. Therefore, an output device malfunction is not directly indicated as a malfunction of the monitored value for the output device. If a monitored value of an output device is out of specification, inspect the monitored value of the input device related to the output control.

Using PDS/IDS

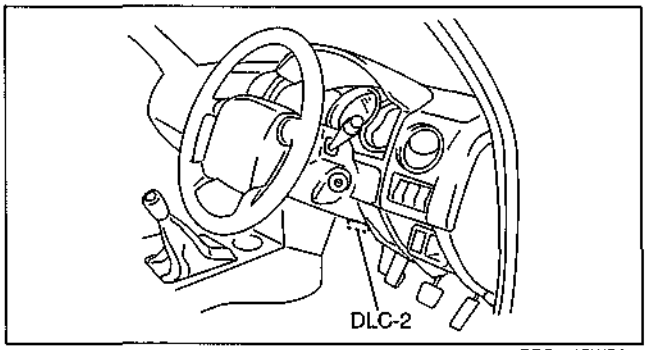
1. Connect the PDS/IDS to the DLC-2.
2. After the vehicle is identified, select the following items from the initial screen of the PDS/IDS.
   - When using the IDS (notebook PC)
     1. Select the "Toolbox" tab.
     2. Select "DataLogger".
     3. Select "Module".
     4. Select "PCM".
   - When using the PDS (pocket PC)
     1. Select "Module Tests".
     2. Select "PCM".
     3. Select "DataLogger".
3. Select the PID from the PID table.
4. Verify the PID data according to the directions on the PDS/IDS screen.



DBG110BWBA01

Using WDS

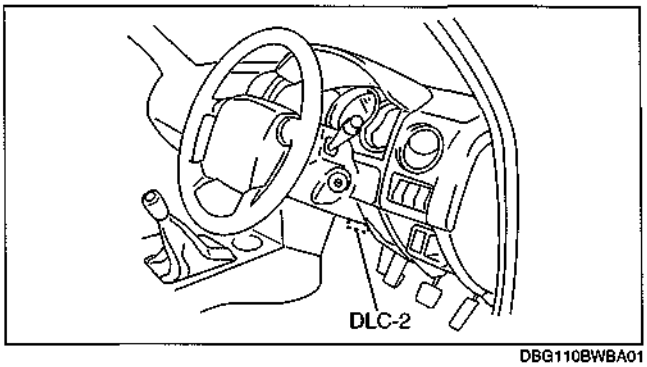
1. Perform the necessary vehicle preparation and visual inspection.
2. Connect the WDS to the DLC-2.
3. Access and monitor the PIDs using the WDS.



DBG110BWBA01

Simulation Function Procedure
Using PDS/IDS

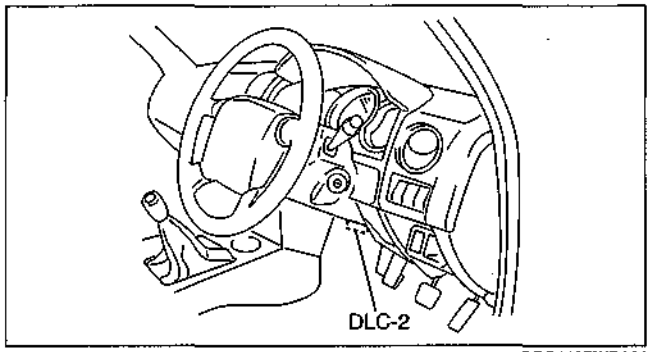
1. Connect the PDS/IDS to the DLC-2.
2. After the vehicle is identified, select the following items from the initial screen of the PDS/IDS.
   - When using the IDS (notebook PC)
     1. Select the "Toolbox" tab.
     2. Select "DataLogger".
     3. Select "Module".
     4. Select "PCM".
   - When using the PDS (pocket PC)
     1. Select "Module Tests".
     2. Select "PCM".
     3. Select "DataLogger".
3. Select the simulation items from the PID table.
4. Perform the simulation function, inspect the operations for each parts.
   - If there is no operation sound from the relay, motor, and solenoid after the simulation function inspection is performed, it is possible that there is an open or short circuit in the wiring harness, relay, motor or solenoid, or sticking and operation malfunction.



DBG110BWBA01

Using WDS

1. Perform the necessary vehicle preparation and visual inspection.
2. Connect the WDS to the DLC-2.
3. Select the simulation items from the PID table.
4. Perform the simulation function, inspect the operations for each parts.
   - If there is no operation sound from the relay, motor, and solenoid after the simulation function inspection is performed, it is possible that there is an open or short circuit in the wiring harness, relay, motor or solenoid, or sticking and operation malfunction.



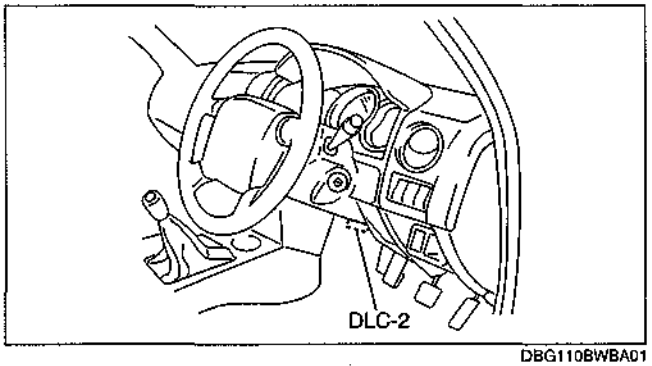
DBG110BWBA01

AFTER REPAIR PROCEDURE [WL-C, WE-C]

dcf010200000w16

Using PDS/IDS

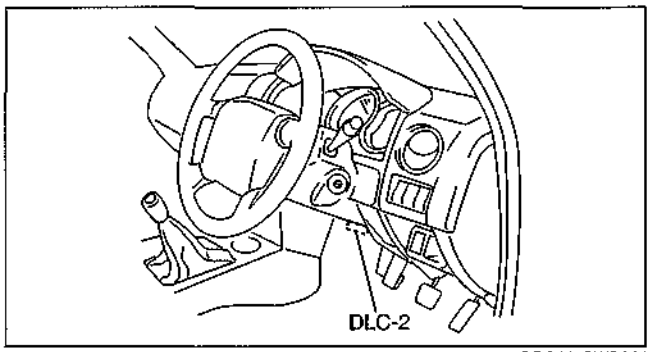
1. Connect the PDS/IDS to the DLC-2.
2. After the vehicle is identified, select the following items from the initial screen of the PDS/IDS.
   - When using the IDS (notebook PC)
     1. Select the "Toolbox" tab.
     2. Select "SelfTest".
     3. Select "Module".
     4. Select "PCM".
   - When using the PDS (pocket PC)
     1. Select "Module Tests".
     2. Select "PCM".
     3. Select "SelfTest".
3. Verify the DTC according to the directions on the PDS/IDS screen.
4. Press the clear button on the DTC screen to clear the DTC.
5. Verify that no DTCs are displayed.



DBG110BWBA01

Using WDS

1. Connect the WDS to the DLC-2.
2. Turn the engine switch to the ON position. (Engine off)
3. Record DTC if retrieved.
4. Erase all diagnostic data using the WDS.



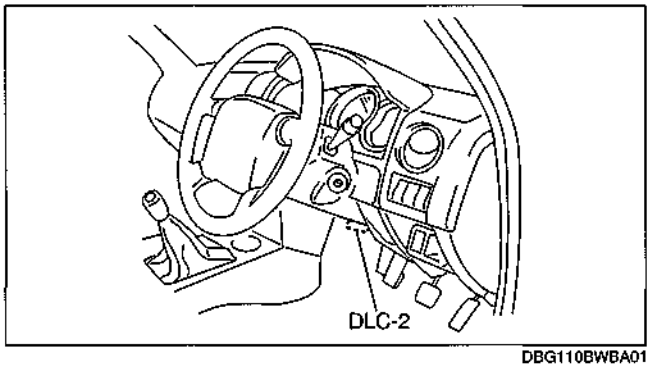
DBG110BWBA01

KOEO/KOER SELF TEST [WL-C, WE-C]

dcf010200000w17

Using PDS/IDS

1. Connect the PDS/IDS to the DLC-2.
2. After the vehicle is identified, select the following items from the initial screen of the PDS/IDS.
   - When using the IDS (notebook PC)
     1. Select the "Toolbox" tab.
     2. Select "SelfTest".
     3. Select "Module".
     4. Select "PCM".
   - When using the PDS (pocket PC)
     1. Select "Module Tests".
     2. Select "PCM".
     3. Select "SelfTest".

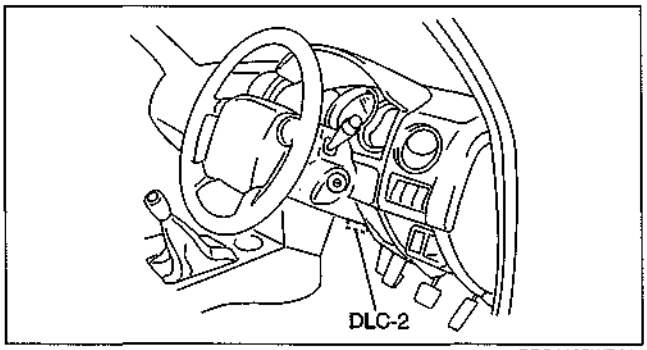


DBG110BWBA01

3. Then, select the "KOEO On Demand SelfTest" or "KOER On Demand SelfTest" and perform procedures according to directions on the PDS/IDS screen.
4. Verify the DTC according to the directions on the PDS/IDS screen.
   - If any DTCs are displayed, perform troubleshooting according to the corresponding DTC inspection.
5. After completion of repairs, clear all DTCs stored in the PCM, while referring to "AFTER REPAIR PROCEDURE".

Using WDS

1. Perform the necessary vehicle preparation and visual inspection.
2. Connect the WDS to the DLC-2.
3. Retrieve the KOEO/KOER DTCs using the WDS.



DBG110BWBA01

DTC TABLE[WL-C, WE-C]

id0102c4801500

×: Applicable —: Not applicable

DTC	Condition	MIL	DC	Self-test type*1	Memory function	Page
P0016	CKP-CMP correlation	ON	1	C/R	×	—
P0045	Variable boost control (VBC) solenoid valve control circuit open	ON	1	C/O/R	×	—
P0046	Variable boost control (VBC) solenoid valve circuit range/performance malfunction	ON	1	C/O/R	×	—
P0047	Variable boost control (VBC) solenoid valve control circuit low input	ON	1	C/O/R	×	—
P0048	Variable boost control (VBC) solenoid valve control circuit high input	ON	1	C/O/R	×	—
P0088	Fuel pressure system too high	ON	1	C	×	—
P0093	Fuel system leak detection	ON	1	C	×	—
P0097	Intake air temperature (IAT) sensor No.2 circuit low input	ON	1	C/O/R	×	—
P0098	Intake air temperature (IAT) sensor No.2 circuit high input	ON	1	C/O/R	×	—
P0101	Mass air flow (MAF) sensor range/performance problem	ON	2	—	×	—
P0102	Mass airflow (MAF) sensor circuit low input	ON	1	C/R	×	—
P0103	Mass airflow (MAF) sensor circuit high input	ON	1	C/R	×	—
P0106	Boost sensor range/performance malfunction	ON	1	C	×	—
P0107	Boost sensor circuit low input	ON	1	C/O/R	×	—
P0108	Boost sensor circuit high input	ON	1	C/O/R	×	—
P0111	Intake air temperature (IAT) sensor No.1 range/ perfomance malfunction	ON	2	C	×	(See 01-02C-9 DTC P0111[WL-C, WE-C].)
P0112	Intake air temperature (IAT) sensor No.1 circuit low input	ON	1	C/O/R	×	—
P0113	Intake air temperature (IAT) sensor No.1 circuit high input	ON	1	C/O/R	×	—
P0116	Engine coolant temperature (ECT) sensor range/ performance problem	ON	2	—	×	—
P0117	Engine coolant temperature (ECT) sensor circuit low input	ON	1	C/O/R	×	—
P0118	Engine coolant temperature (ECT) sensor circuit high input	ON	1	C/O/R	×	—
P0122	Accelerator pedal position (APP) sensor No.1 circuit low input	ON	1	C/O/R	×	—
P0123	Accelerator pedal position (APP) sensor No.1 circuit high input	ON	1	C/O/R	×	—
P0182	Fuel temperature sensor circuit low input	ON	1	C/O/R	×	—
P0183	Fuel temperature sensor circuit high input	ON	1	C/O/R	×	—
P0191	Fuel pressure sensor range/performance malfunction	ON	1	O	×	—
P0192	Fuel pressure sensor circuit low input	ON	1	C/O/R	×	—
P0193	Fuel pressure sensor circuit high input	ON	1	C/O/R	×	—
P0201	Fuel injector No.1 circuit open/short	ON	1	C/R	×	—
P0202	Fuel injector No.2 circuit open/short	ON	1	C/R	×	—
P0203	Fuel injector No.3 circuit open/short	ON	1	C/R	×	—
P0204	Fuel injector No.4 circuit open/short	ON	1	C/R	×	—
P0222	Accelerator pedal position (APP) sensor No.2 circuit low input	ON	1	C/O/R	×	—
P0223	Accelerator pedal position (APP) sensor No.2 circuit high input	ON	1	C/O/R	×	—
P0227	Idle switch circuit low input	ON	1	C	×	—
P0228	Idle switch circuit high input	ON	1	C	×	—

DTC	Condition	MIL	DC	Self-test type*1	Memory function	Page
P0300	Random misfire detected	ON	2	C/R	×	—
P0301	Cylinder No.1 misfire detection	ON	2	C/R	×	—
P0302	Cylinder No.2 misfire detection	ON	2	C/R	×	—
P0303	Cylinder No.3 misfire detection	ON	2	C/R	×	—
P0304	Cylinder No.4 misfire detection	ON	2	C/R	×	—
P0335	Crankshaft position (CKP) sensor circuit malfunction	ON	1	C/R	×	—
P0340	Camshaft position (CMP) sensor circuit malfunction	ON	1	C/R	×	—
P0380	Glow plug relay circuit malfunction	ON	1	C/O	×	—
P0401	EGR flow insufficient detected	ON	2	C	×	—
P0402	EGR flow excessive detected	ON	2	C	×	—
P0403	EGR solenoid valve circuit malfunction	ON	1	C/O/R	×	—
P0404	EGR valve stuck	ON	2	C/R	×	—
P0405	EGR valve position sensor circuit low input	ON	1	C/O/R	×	—
P0406	EGR valve position sensor circuit high input	ON	1	C/O/R	×	—
P0489	EGR solenoid valve control circuit low input	ON	1/2	C/O	×	—
P0490	EGR solenoid valve control circuit high input	ON	1/2	C/O	×	—
P0500	VSS circuit malfunction	ON	2	C	×	—
P0562	Battery voltage low input	ON	1	C/O/R	×	—
P0563	Battery voltage high input	ON	1	C/O/R	×	—
P0602	PCM programming error	ON	1	—	×	—
P0606	PCM malfunction	ON	1	C/O/R	×	—
P0607	PCM performance problem	ON	1/2	C/O/R	×	—
P0610	PCM vehicle options error	ON	1	—	×	—
P0627	Fuel metering valve control circuit open	ON	1	C/R	×	—
P0628	Fuel metering valve control circuit low input	ON	1	C/R	×	—
P0629	Fuel metering valve control circuit high input	ON	1	C/R	×	—
P0642	Fuel pressure sensor and boost sensor 5 V circuit low input	ON	1	C/O/R	×	—
P0643	Fuel pressure sensor and boost sensor 5 V circuit high input	ON	1	C/O/R	×	—
P0652	CMP sensor and APP sensor 5 V circuit low input	ON	1	C/O/R	×	—
P0653	CMP sensor and APP sensor 5 V circuit high input	ON	1	C/O/R	×	—
P0660	Intake shutter solenoid valve (half) control circuit open	ON	1	C/O	×	—
P0661	Intake shutter solenoid valve (half) control circuit low input	ON	1	C/O	×	—
P0662	Intake shutter solenoid valve (half) control circuit high input	ON	1	C/O	×	—
P0663	Intake shutter solenoid valve (full) control circuit open	ON	1	C/O	×	—
P0664	Intake shutter solenoid valve (full) control circuit low input	ON	1	C/O	×	—
P0665	Intake shutter solenoid valve (full) control circuit high input	ON	1	C/O	×	—
P0685	Main relay control circuit open	—	—	—	—	—
P0698	EGR valve position sensor 5 V circuit low input	ON	1	C/O/R	×	—
P0699	EGR valve position sensor 5 V circuit high input	ON	1	C/O/R	×	—
P1196	Key off voltage high input	—	—	—	—	—
P1259	IMMOBILIZER to PCM signal error	—	—	C/O	—	—
P1260	Theft detected Vehicle immobilizer	—	—	C/O	—	—
P1391	Glow plug control circuit low input	ON	1	C/O	×	—

DTC	Condition	MIL	DC	Self-test type*1	Memory function	Page
P1392	Glow plug control circuit high input	ON	1	C/O	×	—
P1528	Exhaust shutter solenoid valve circuit problem	—	1	C/O	—	(See 01-02C-11 DTC P1528[WL-C, WE-C].)
P1602	Immobilizer/PCM communication error	—	—	C/O	—	—
P1603	ID Number Unregistered	—	—	C/O	—	—
P1604	Code word unregistered	—	—	C/O	—	—
P1621	Immobilizer code word does not match	—	—	C/O	—	—
P1622	Immobilizer ID does not match	—	—	C/O	—	—
P1623	Immobilizer code word/ID number write failure	—	—	C/O	—	—
P1624	Anti-theft system	—	—	C/O	—	—
P1675	Injection quantity adjustment value writing error	ON	1	O	×	—
P1676	Injection quantity adjustment value checksum error	ON	1	O	×	—
P1812	RFW Lock solenoid valve circuit failure	—				
P1813	RFW Lock solenoid valve open circuit	—				
P1814	RFW Lock solenoid valve circuit/short to battery	—				
P1815	RFW Lock solenoid valve circuit/short to ground	—				
P1878	RFW Free solenoid valve circuit failure	—				
P1879	RFW Free solenoid valve open circuit	—				
P1880	RFW Free solenoid valve circuit/short to battery	—				
P1885	RFW Free solenoid valve circuit/short to ground	—				
P2008	Variable swirl control (VSC) solenoid valve circuit open	ON	1	C/O	×	—
P2009	Variable swirl control (VSC) solenoid valve circuit low input	ON	1	C/O	×	—
P2010	Variable swirl control (VSC) solenoid valve circuit high input	ON	1	C/O	×	—
P2135	Accelerator pedal position (APP) sensor No.1/ No.2 voltage correlation problem	ON	1	C/O/R	×	—
P2136	Accelerator pedal position (APP) sensor No.1/ idle switch voltage correlation problem	ON	1	C/O/R	×	—
P2143	EGR control solenoid valve control circuit open	ON	1/2	C/O	×	—
P2144	EGR control solenoid valve control circuit low input	ON	1/2	C/O/R	×	—
P2145	EGR control solenoid valve control circuit high input	ON	1/2	C/O/R	×	—
P2146	Fuel injector No.1 and No.4 power supply circuit malfunction	ON	1	C/R	×	—
P2147	Fuel injector No.1 and No.4 power supply circuit low input	ON	1	C/R	×	—
P2148	Fuel injector No.1 and No.4 power supply circuit high input	ON	1	C/R	×	—
P2149	Fuel injector No.2 and No.3 power supply circuit malfunction	ON	1	C/R	×	—
P2150	Fuel injector No.2 and No.3 power supply circuit low input	ON	1	C/R	×	—
P2151	Fuel injector No.2 and No.3 power supply circuit high input	ON	1	C/R	×	—
P2227	BARO sensor circuit range/performance malfunction	ON	1	C	×	—
P2228	BARO sensor circuit low input	ON	1	C/O/R	×	—
P2229	BARO sensor circuit high input	ON	1	C/O/R	×	—
P2263	Air charging system performance malfunction	—	1	C	×	—
P2530	PCM (engine switch circuit) malfunction	ON	1	O	×	—

*1 : C; CMDTC self test, O; KOEO self test, R; KOER self test

DTC P0016 [WL-C, WE-C]

dcf010200001w01

DTC P0016	CKP-CMP correlation
DETECTION CONDITION	• The PCM monitors the input pulses from the CKP and CMP sensors. If the pick-up timing input pulses do not match each other, the PCM determines that the camshaft position does not coincide with the crankshaft position.
POSSIBLE CAUSE	• Poor connection of connector • CMP sensor malfunction • CKP sensor malfunction • Damaged or scratched CMP sensor pulse wheel • Damaged or scratched CKP sensor pulse wheel • Foreign material on CMP sensor • Foreign material on CKP sensor • Improper valve timing

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has the FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform the repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**INSPECT CMP SENSOR CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the CMP sensor connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 13.
		No	Go to the next step.
4	**INSPECT CMP SENSOR FOR FOREIGN MATERIAL** • Remove the CMP sensor. • Inspect the CMP sensor for foreign material. • Is there any foreign material on the CMP sensor?	Yes	Remove foreign material from the CMP sensor, then go to Step 13.
		No	Go to the next step.
5	**INSPECT CMP SENSOR PULSE WHEEL** • Visually inspect the CMP sensor pulse wheel. • Is there any damage or scratching to the CMP sensor pulse wheel?	Yes	Replace the camshaft, then go to Step 13. (See 01-10B-9 CYLINDER HEAD GASKET REPLACEMENT [WL-C, WE-C].)
		No	Go to the next step.
6	**INSPECT CMP SENSOR** • Inspect the CMP sensor. (See 01-40B-37 CAMSHAFT POSITION (CMP) SENSOR INSPECTION [WL-C, WE-C].) • Is the CMP sensor normal?	Yes	Go to the next step.
		No	Replace the CMP, then go to Step 13. (See 01-40B-36 CAMSHAFT POSITION (CMP) SENSOR REMOVAL/INSTALLATION [WL-C, WE-C].)
7	**INSPECT CKP SENSOR CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the CKP sensor connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 13.
		No	Go to the next step.
8	**INSPECT CKP SENSOR FOR FOREIGN MATERIAL** • Remove the CKP sensor. • Inspect the CKP sensor for foreign material. • Is there any foreign material on the CKP sensor?	Yes	Remove foreign material from the CKP sensor, then go to Step 13.
		No	Go to the next step.
9	**INSPECT CKP SENSOR PULSE WHEEL** • Visually inspect the CKP sensor pulse wheel. • Is there any damage or scratching to the CKP sensor pulse wheel?	Yes	Replace the CKP sensor pulse wheel, then go to Step 13. (See 01-10B-7 TIMING BELT REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.

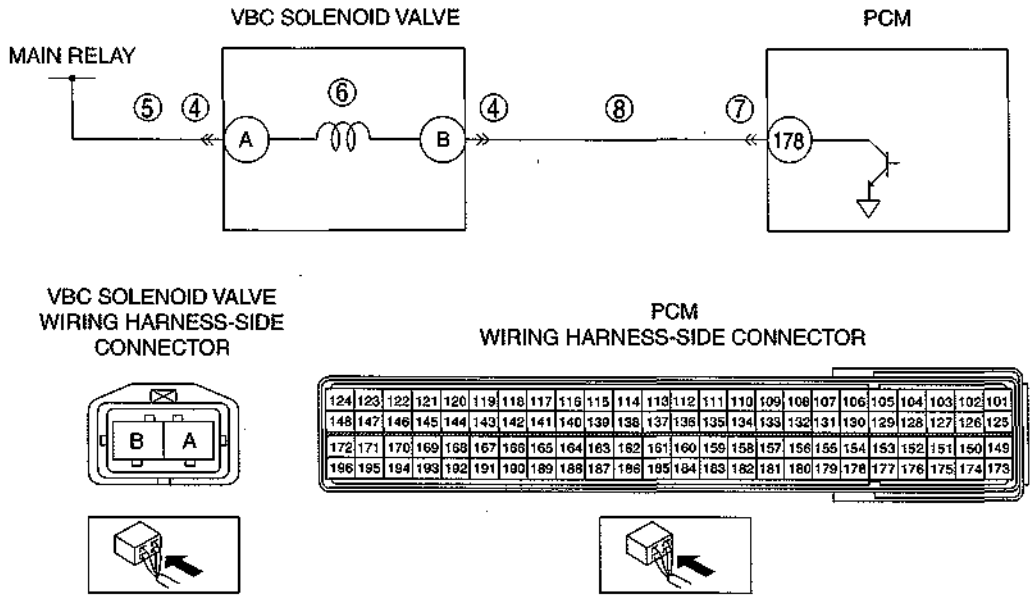
STEP	INSPECTION		ACTION
10	**INSPECT CKP SENSOR** • Inspect the CKP sensor. (See 01-40B-39 CRANKSHAFT POSITION (CKP) SENSOR INSPECTION [WL-C, WE-C].) • Is the CKP sensor normal?	Yes	Go to the next step.
		No	Replace the CKP sensor, then go to Step 13. (See 01-40B-38 CRANKSHAFT POSITION (CKP) SENSOR REMOVAL/INSTALLATION [WL-C, WE-C].)
11	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM sensor connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 13.
		No	Go to the next step.
12	**INSPECT VALVE TIMING** • Inspect valve timing. (See 01-10B-7 TIMING BELT REMOVAL/ INSTALLATION [WL-C, WE-C].) • Is valve timing normal?	Yes	Go to the next step.
		No	Adjust the valve timing properly, then go to the next step. (See 01-10B-7 TIMING BELT REMOVAL/INSTALLATION [WL-C, WE-C].)
13	**VERIFY TROUBLESHOOTING OF DTC P0016 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
14	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	DTC troubleshooting completed.

DTC P0045 [WL-C, WE-C]

dcf010200001w02

DTC P0045	Variable boost control (VBC) solenoid valve control circuit open
DETECTION CONDITION	• The PCM monitors the VBC solenoid valve control signal. If the VBC solenoid valve control voltage is **less than 5 V for 2 s** when the VBC solenoid valve is off, the PCM determines that there is a VBC solenoid valve control circuit malfunction (open circuit).
POSSIBLE CAUSE	• VBC solenoid valve malfunction • Connector or terminal malfunction • Open circuit in wiring harness between main relay and VBC solenoid valve terminal A • Open circuit in wiring harness between VBC solenoid valve terminal B and PCM terminal 178 • PCM malfunction

DTC P0045	Variable boost control (VBC) solenoid valve control circuit open



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**INSPECT VBC SOLENOID VALVE CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the VBC solenoid valve connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 9.
		No	Go to the next step.
5	**INSPECT VBC SOLENOID VALVE CONTROL CIRCUIT FOR OPEN CIRCUIT** • Turn the engine switch to the ON position (Engine off). • Measure the voltage between VBC solenoid valve terminal A (wiring harness-side) and body ground. • Is the voltage B+?	Yes	Go to the next step.
		No	Repair or replace the wiring harness for a possible open circuit, then go to Step 9.
6	**INSPECT VBC SOLENOID VALVE** • Inspect the VBC solenoid valve. (See 01-13B-6 VARIABLE BOOST CONTROL (VBC) SOLENOID VALVE INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the VBC solenoid valve, then go to Step 9. (See 01-13B-3 INTAKE-AIR SYSTEM REMOVAL/ INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.

STEP	INSPECTION		ACTION
7	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 9.
		No	Go to the next step.
8	**INSPECT VBC SOLENOID VALVE CONTROL CIRCUIT FOR OPEN CIRCUIT** • Turn the engine switch off. • Inspect for continuity between VBC solenoid valve terminal B (wiring harness-side) and PCM terminal 178 (wiring harness-side). • Is there continuity?	Yes	Go to the next step.
		No	Repair or replace the wiring harness for a possible open circuit, then go to the next step.
9	**VERIFY TROUBLESHOOTING OF DTC P0045 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
10	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	DTC troubleshooting completed.

DTC P0046 [WL-C, WE-C]

dcf010200001w03

DTC P0046	Variable boost control (VBC) solenoid valve circuit range/performance malfunction
DETECTION CONDITION	• The PCM monitors the driver IC temperature of the VBC solenoid valve. If the temperature of the VBC solenoid valve driver IC in the PCM exceeds **150 °C{320 °F)** while the VBC solenoid valve is operating, the PCM determines that there is a VBC solenoid value malfunction.
POSSIBLE CAUSE	• VBC solenoid valve malfunction • PCM malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has the FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERNS TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)

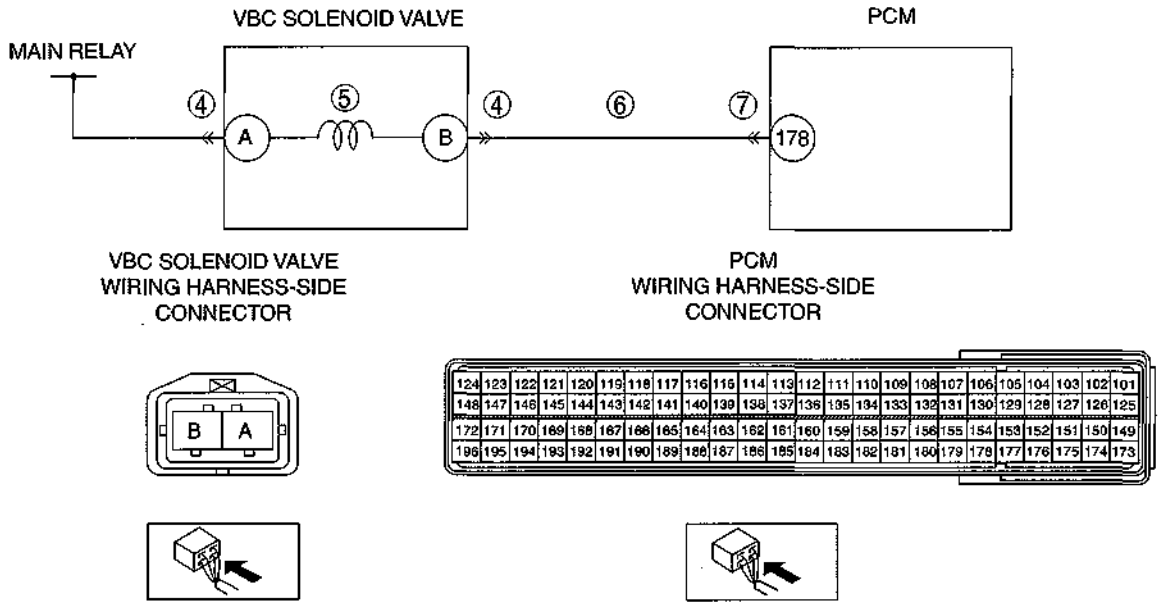
STEP	INSPECTION		ACTION
4	**INSPECT OPERATION OF VBC SOLENOID VALVE** • Connect the current diagnostic tool to DLC-2. • Start the engine at idle. • Access VBCV PID. • Visually inspect the guide blade actuator (rod) operation using the VBCV PID of simulation function. • Does the guide blade actuator (rod) move smoothly?	Yes	Go to the next step.
		No	Clean the guide blade actuator, then go to the next step.
5	**INSPECT VBC SOLENOID VALVE** • Inspect the VBC solenoid valve. (See 01-13B-6 VARIABLE BOOST CONTROL (VBC) SOLENOID VALVE INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the VBC solenoid valve, then go to the next step.
		No	Go to the next step.
6	**VERIFY THAT DTC P0046 TROUBLESHOOTING IS COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
7	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	DTC troubleshooting completed.

DTC P0047 [WL-C, WE-C]

dcf010200001w04

DTC P0047	Variable boost control (VBC) solenoid valve control circuit low input
DETECTION CONDITION	• The PCM monitors the VBC solenoid valve control signal. If the PCM turns VBC solenoid valve off but the voltage at PCM terminal 178 still remains low, the PCM determines that the VBC solenoid valve circuit has a malfunction (circuit short to ground).
POSSIBLE CAUSE	• VBC solenoid valve malfunction • Connector or terminal malfunction • Short to ground in the wiring harness between VBC solenoid valve terminal B and PCM terminal 178 • PCM malfunction

DTC P0047	Variable boost control (VBC) solenoid valve control circuit low input



Diagnostic procedure

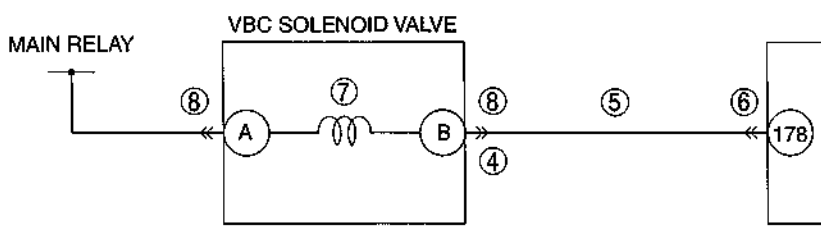
STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has the FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERNS TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**INSPECT VBC SOLENOID VALVE CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the VBC solenoid valve connector. • Inspect for poor connection (such as damaged/pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 8.
		No	Go to the next step.
5	**INSPECT VBC SOLENOID VALVE** • Inspect the VBC solenoid valve. (See 01-13B-6 VARIABLE BOOST CONTROL (VBC) SOLENOID VALVE INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the VBC solenoid valve, then go to Step 8.
		No	Go to the next step.
6	**INSPECT VBC SOLENOID VALVE CONTROL CIRCUIT FOR SHORT TO GROUND** • Turn the engine switch off. • Disconnect the PCM connector and VBC solenoid valve connector. • Inspect for continuity between VBC solenoid valve terminal B (wiring harness-side) and body ground. • Is there continuity?	Yes	Repair or replace the wiring harness for a short to ground between VBC solenoid valve terminal A (wiring harness-side) and PCM terminal 178, then go to Step 8.
		No	Go to the next step.

STEP	INSPECTION		ACTION
7	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to the next step.
		No	Go to the next step.
8	**VERIFY THAT DTC P0047 TROUBLESHOOTING IS COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
9	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	DTC troubleshooting completed.

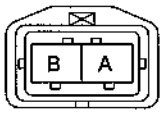
DTC P0048 [WL-C, WE-C]

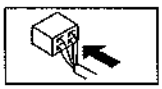
dcf010200001w05

DTC P0048	Variable boost control (VBC) solenoid valve control circuit high input
DETECTION CONDITION	• The PCM monitors the VBC solenoid valve control signal. If the PCM turns VBC solenoid valve on but the current at PCM terminal 178 still remains high, the PCM determines that the VBC solenoid valve circuit has a malfunction (circuit short to power supply).
POSSIBLE CAUSE	• VBC solenoid valve malfunction • Connector or terminal malfunction • Short to power supply in the wiring harness between VBC solenoid valve terminal B and PCM terminal 178 • PCM malfunction

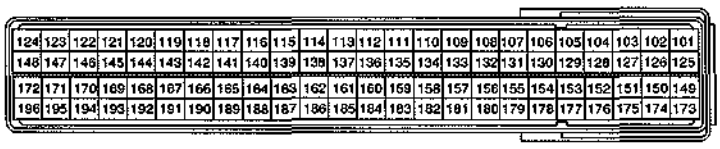


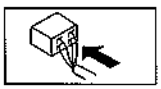
VBC SOLENOID VALVE WIRING HARNESS-SIDE CONNECTOR





PCM WIRING HARNESS-SIDE CONNECTOR





Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has the FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERNS TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**CLASSIFY MALFUNCTION FOR INSPECT VBC SOLENOID VALVE CONTROL CIRCUIT OR OTHER** • Turn the engine switch off. • Disconnect the VBC solenoid valve connector. • Turn the engine switch to the ON position (Engine off). • Measure the voltage between VBC solenoid valve terminal B (wiring harness-side) and body ground. • Is the voltage **B+**?	Yes	Go to the next step.
		No	Go to Step 7.
5	**INSPECT VBC SOLENOID VALVE CONTROL CIRCUIT FOR SHORT TO POWER SUPPLY** • Turn the engine switch off. • Disconnect the PCM connector and VBC solenoid valve connector. • Turn the engine switch to the ON position (Engine off). • Measure the voltage between PCM terminal 178 (wiring harness-side) and body ground. • Is the voltage **B+**?	Yes	Repair or replace the wiring harness for a short to power between VBC solenoid valve terminal A and PCM terminal 178, then go to Step 9.
		No	Go to the next step.
6	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 9.
		No	Go to Step 9.
7	**INSPECT VBC SOLENOID VALVE** • Inspect the VBC solenoid valve. (See 01-13B-6 VARIABLE BOOST CONTROL (VBC) SOLENOID VALVE INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the VBC solenoid valve, then go to Step 9.
		No	Go to the next step.
8	**INSPECT VBC SOLENOID VALVE CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the VBC solenoid valve connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to the next step.
		No	Go to the next step.

STEP	INSPECTION		ACTION
9	**VERIFY THAT DTC P0048 TROUBLESHOOTING IS COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
9	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	DTC troubleshooting completed.

DTC P0088 [WL-C, WE-C]

dcf010200001w06

DTC P0088	Fuel pressure system too high
DETECTION CONDITION	• The PCM monitors the fuel pressure in the common rail from the fuel pressure sensor while the engine is running. If the fuel pressure is more than the preprogrammed criteria, the PCM determines that the fuel pressure is too high.
POSSIBLE CAUSE	• Supply pump malfunction • Fuel pressure sensor malfunction • Fuel pressure limiter malfunction • Fuel pipe improper connection on fuel tank • PCM malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available Service Information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING".
4	**IDENTIFY TRIGGER DTC FOR FREEZE FRAME DATA** • Is P0628, P0629, P0191, P0192 or P0193 on FREEZE FRAME DATA?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Go to the next step.
5	**INSPECT FUEL PIPE CONNECTION ON FUEL TANK** • Inspect the fuel pipes for supply and return connection at fuel tank. • Are fuel pipes connected properly?	Yes	Go to the next step.
		No	Reconnect fuel pipes properly, then go to Step 9. (See 01-14B-7 Fuel Hose Installation Note.)
6	**INSPECT FUEL LINE** • Turn the engine switch off. • Inspect for fuel leakage or clogging in the following fuel lines for each cylinder: — Supply pump and common rail. — Common rail and fuel injector • Is there any malfunction?	Yes	Repair or replace suspect fuel line, then go to Step 9.
		No	Go to the next step.

STEP	INSPECTION		ACTION
7	**INSPECT FUEL PRESSURE SENSOR** • Inspect the fuel pressure sensor. (See 01-40B-33 FUEL PRESSURE SENSOR INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the common rail, go to Step 9.
		No	Go to the next step.
8	**INSPECT COMMON RAIL** • Inspect the common rail. • Is there any malfunction?	Yes	Replace the common rail, go to the next step.
		No	If DTC P0088 and P0093 are stored together, the possible cause could be a supply pump internal failure. Replace the supply pump, then go to the next step. (See 01-14B-11 SUPPLY PUMP REMOVAL/ INSTALLATION [WL-C, WE-C].) Go to the next step except for the above case.
9	**VERIFY TROUBLESHOOTING OF DTC P0088 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Replace the PCM, go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
10	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

DTC P0093 [WL-C, WE-C]

dcf010200001w07

DTC P0093	Fuel system leak detection
DETECTION CONDITION	• The PCM monitors the fuel pressure in the common rail from the fuel pressure sensor while the engine is running. If the fuel pressure is lower than the preprogrammed criteria, the PCM determines that there is leakage in the fuel system.
POSSIBLE CAUSE	• Fuel leakage or clogged fuel line • Supply pump malfunction • Fuel pressure sensor malfunction • Fuel injector malfunction • Fuel pipe improper connection on fuel tank • PCM malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related Service Information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available Service Information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING".
4	**IDENTIFY TRIGGER DTC FOR FREEZE FRAME DATA** • Is P0192 or P0193 on FREEZE FRAME DATA?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Go to the next step.

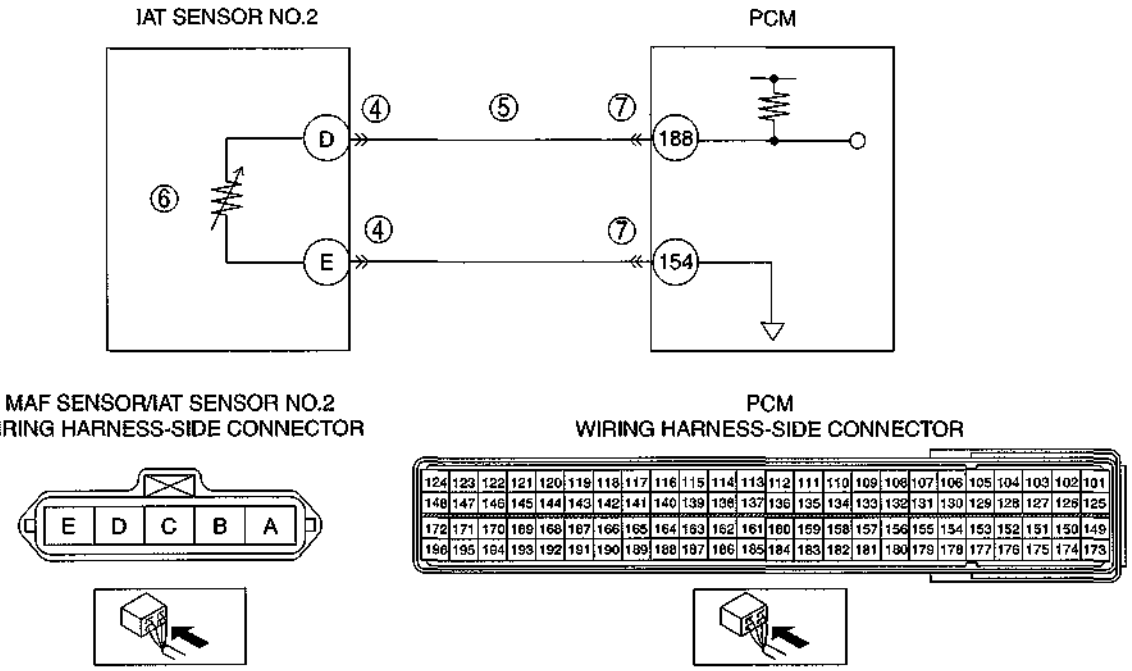
STEP	INSPECTION		ACTION
5	**INSPECT FUEL PIPE CONNECTION ON FUEL TANK** • Inspect the fuel pipes for supply and return connection at fuel tank. • Are fuel pipes connected properly?	Yes	Go to the next step.
		No	Reconnect fuel pipes properly, then go to Step 9. (See 01-14B-7 Fuel Hose Installation Note.)
6	**INSPECT FUEL LINE** • Turn the engine switch off. • Inspect for fuel leakage or clogging in the following fuel lines for each cylinder: — Supply pump and Common rail. — Common rail and fuel injector. • Is there any malfunction?	Yes	Repair or replace the suspected fuel line, go to Step 9.
		No	Go to the next step.
7	**INSPECT FUEL PRESSURE SENSOR** • Inspect the fuel pressure sensor. (See 01-40B-33 FUEL PRESSURE SENSOR INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the common rail, go to Step 9.
		No	Go to the next step.
8	**INSPECT FUEL INJECTOR** • Inspect the fuel injector. (See 01-14B-16 FUEL INJECTOR INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the fuel injector, go to the next step. (See 01-14B-15 FUEL INJECTOR REMOVAL/ INSTALLATION [WL-C, WE-C].)
		No	If DTC P0088 and P0093 are stored together, the possible cause could be a supply pump internal failure. Replace the supply pump, then go to the next step. (See 01-14B-11 SUPPLY PUMP REMOVAL/ INSTALLATION [WL-C, WE-C].) Go to the next step except for the above case.
9	**VERIFY TROUBLESHOOTING OF DTC P0093 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Replace the PCM, go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
10	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

DTC P0097 [WL-C, WE-C]

dcf010200001w08

DTC P0097	Intake air temperature (IAT) sensor No.2 circuit low input
DETECTION CONDITION	• The PCM monitors the input signal from intake air temperature sensor No.2. If the voltage from intake air temperature sensor No.2 is **less than 0.1 V for 2 s**, the PCM determines that there is a malfunction in the intake air temperature sensor No.2 circuit.
POSSIBLE CAUSE	• IAT sensor No.2 malfunction • Connector or terminal malfunction • Short to ground in wiring harness between IAT sensor No.2 terminal D and PCM terminal 188 • PCM malfunction

DTC P0097	Intake air temperature (IAT) sensor No.2 circuit low input



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**INSPECT MAF SENSOR/IAT SENSOR NO.2 CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the MAF sensor/IAT sensor No.2 connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 8.
		No	Go to the next step.
5	**INSPECT IAT SENSOR NO.2 SIGNAL CIRCUIT FOR SHORT TO GROUND** • Turn the engine switch off. • Inspect for continuity between IAT sensor No.2 terminal D (wiring harness-side) and body ground. • Is there continuity?	Yes	Repair or replace the wiring harness for a possible short to ground, then go to Step 8.
		No	Go to the next step.

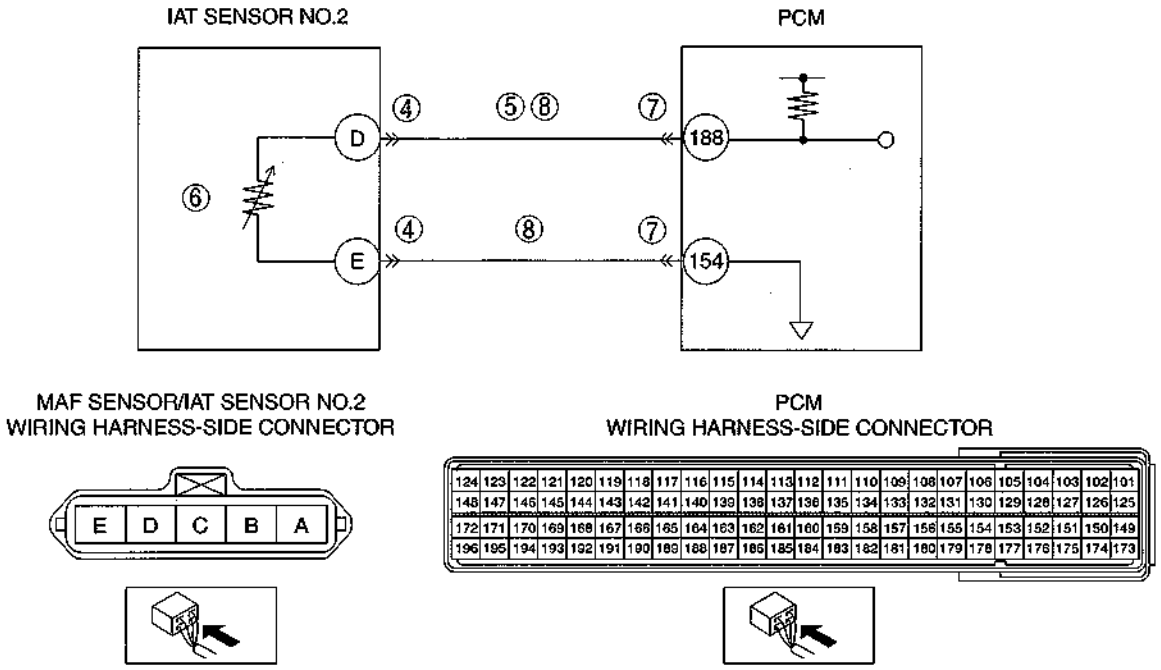
STEP	INSPECTION		ACTION
6	**INSPECT IAT SENSOR NO.2** • Inspect the IAT sensor No.2. (See 01-40B-23 MASS AIR FLOW (MAF) SENSOR/INTAKE AIR TEMPERATURE (IAT) SENSOR NO.2 INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the IAT sensor No.2, then go to Step 8.
		No	Go to the next step.
7	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to the next step.
		No	Go to the next step.
8	**VERIFY TROUBLESHOOTING OF DTC P0097 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
9	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	DTC troubleshooting completed.

DTC P0098 [WL-C, WE-C]

dcf010200001w09

DTC P0098	Intake air temperature (IAT) sensor No.2 circuit high input
DETECTION CONDITION	• The PCM monitors the input signal from intake air temperature sensor No.2. If the voltage from intake air temperature sensor No.2 is **more than 4.6 V for 1 s**, the PCM determines that there is a malfunction in the intake air temperature sensor No.2 circuit.
POSSIBLE CAUSE	• IAT sensor No.2 malfunction • Connector or terminal malfunction • Open circuit in wiring harness between IAT sensor No.2 terminal D and PCM terminal 188 • Short to power supply in wiring harness between IAT sensor No.2 terminal D and PCM terminal 188 • Open circuit in wiring harness between IAT sensor No.2 terminal E and PCM terminal 154 • PCM malfunction

DTC P0098	Intake air temperature (IAT) sensor No.2 circuit high input



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING". (See01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**INSPECT MAF SENSOR/IAT SENSOR NO.2 CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the MAF sensor/IAT sensor No.2 connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 9.
		No	Go to the next step.
5	**INSPECT IAT SENSOR NO.2 SIGNAL CIRCUIT FOR SHORT TO POWER SUPPLY** • Turn the engine switch to the ON position (Engine off). • Measure the voltage between IAT sensor No.2 terminal D (wiring harness-side) and body ground. • Is the voltage **B+**?	Yes	Repair or replace the wiring harness for a possible short to power supply, then go to Step 9.
		No	Go to the next step.

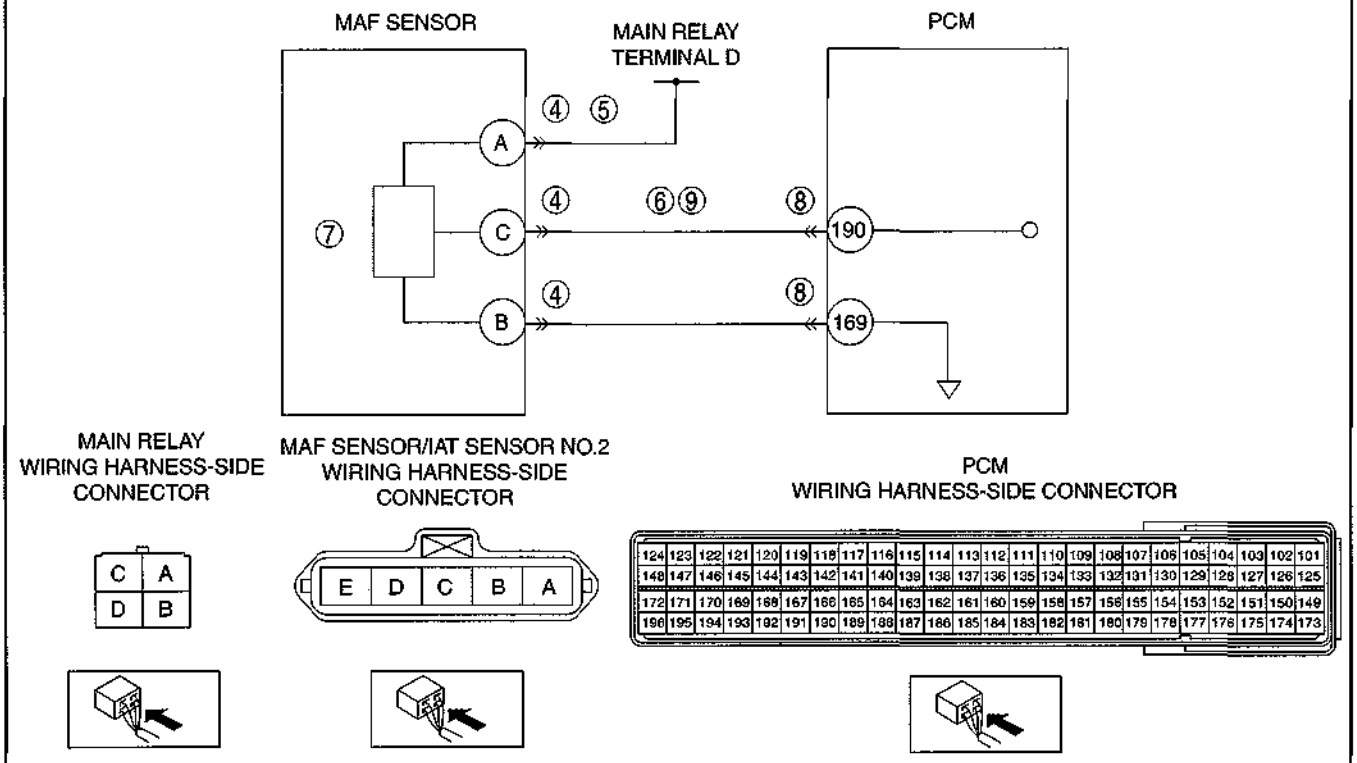
STEP	INSPECTION		ACTION
6	**INSPECT IAT SENSOR NO.2** • Inspect the IAT sensor No.2. (See 01-40B-23 MASS AIR FLOW (MAF) SENSOR/INTAKE AIR TEMPERATURE (IAT) SENSOR NO.2 INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the IAT sensor No.2, then go to Step 9.
		No	Go to the next step.
7	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 9.
		No	Go to the next step.
8	**INSPECT IAT SENSOR NO.2 CIRCUIT FOR OPEN CIRCUIT** • Turn the engine switch off. • Inspect for continuity between the following terminals: — IAT sensor No.2 terminal E (wiring harness-side) and PCM terminal 154 (wiring harness-side) — IAT sensor No.2 terminal D (wiring harness-side) and PCM terminal 188 (wiring harness-side) • Is there continuity?	Yes	Go to the next step.
		No	Repair or replace the wiring harness for a possible open circuit, then go to the next step.
9	**VERIFY TROUBLESHOOTING OF DTC P0098 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
10	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	DTC troubleshooting completed.

DTC P0102 [WL-C, WE-C]

dcf010200100w07

DTC P0102	Mass airflow (MAF) sensor circuit low input
DETECTION CONDITION	• The PCM calculates the intake air flow amount based on the airflow sensor. If the calculated intake air flow amount is **below 0.44 g/s {0.058 lb/min} for 2.0 s** while the engine is running, the PCM determines that the airflow sensor signal input is low.
POSSIBLE CAUSE	• MAF sensor malfunction • Connector or terminal malfunction • Open circuit in wiring harness between main relay terminal D and MAF sensor terminal A • Open circuit in wiring harness between MAF sensor terminal C and PCM terminal 190 • Short to ground in wiring harness between MAF sensor terminal C and PCM terminal 190 • PCM malfunction

DTC P0102	Mass airflow (MAF) sensor circuit low input



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**INSPECT MAF SENSOR/IAT SENSOR NO.2 CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the MAF sensor/IAT sensor No.2 connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 10.
		No	Go to the next step.
5	**INSPECT MAF SENSOR POWER CIRCUIT FOR OPEN CIRCUIT** • Turn the engine switch to the ON position (Engine off). • Measure the voltage between MAF sensor terminal A (wiring harness-side) and body ground. • Is the voltage B+?	Yes	Go to the next step.
		No	Repair or replace the wiring harness for a possible open circuit or short to ground, then go to Step 10.

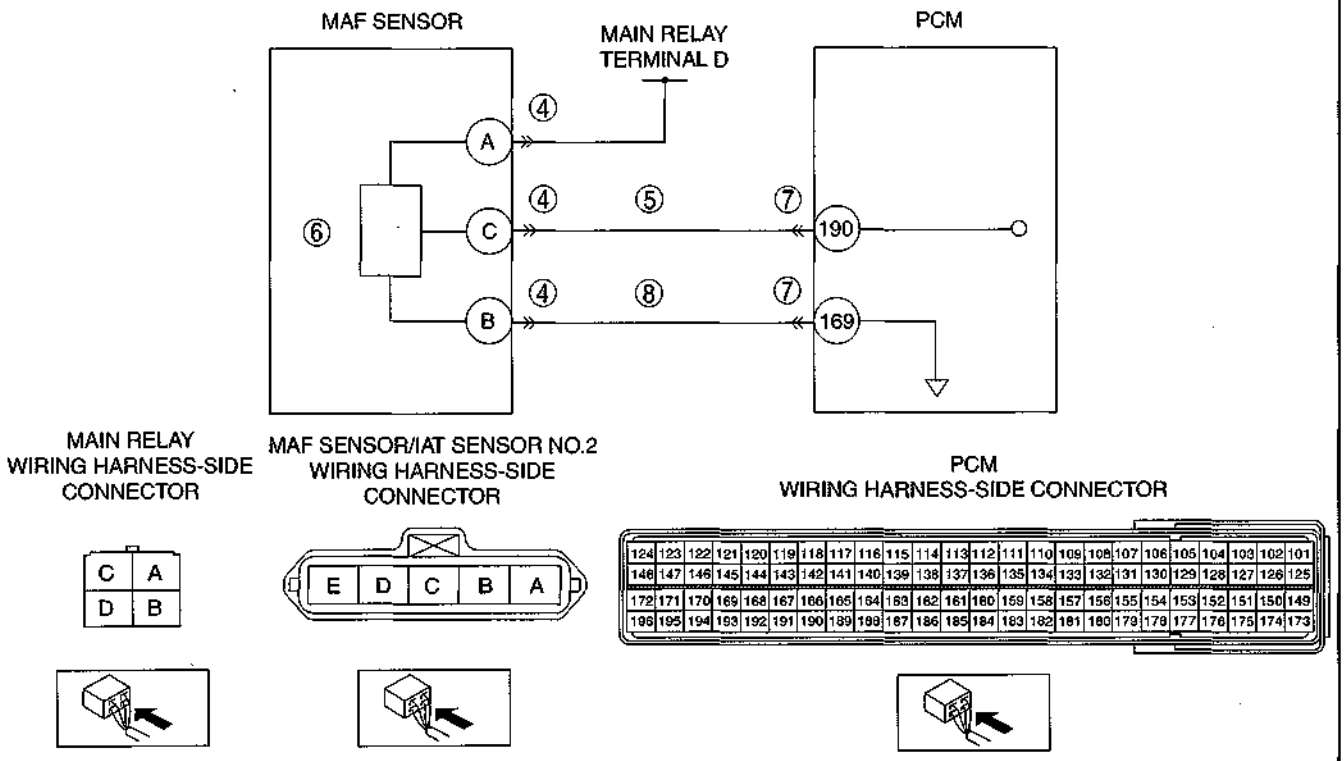
STEP	INSPECTION		ACTION
6	**INSPECT MAF SENSOR SIGNAL CIRCUIT FOR SHORT TO GROUND** • Turn the engine switch off. • Inspect for continuity between MAF sensor terminal C (wiring harness-side) and body ground. • Is there continuity?	Yes	Repair or replace the wiring harness for a possible short to ground, then go to Step 10.
		No	Go to the next step.
7	**INSPECT MAF SENSOR** • Inspect the MAF sensor. (See 01-40B-23 MASS AIR FLOW (MAF) SENSOR/INTAKE AIR TEMPERATURE (IAT) SENSOR NO.2 INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the MAF sensor, then go to Step 10. (See 01-13B-3 INTAKE-AIR SYSTEM REMOVAL/ INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
8	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 10.
		No	Go to the next step.
9	**INSPECT MAF SENSOR SIGNAL CIRCUIT FOR OPEN CIRCUIT** • Turn the engine switch off. • Inspect for continuity between MAF sensor terminal C (wiring harness-side) and PCM terminal 190 (wiring harness-side). • Is there continuity?	Yes	Go to the next step.
		No	Repair or replace the wiring harness for a possible open circuit, then go to the next step.
10	**VERIFY TROUBLESHOOTING OF DTC P0102 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
11	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	DTC troubleshooting completed.

DTC P0103 [WL-C, WE-C]

dcf010200100w08

DTC P0103	Mass airflow (MAF) sensor circuit high input
DETECTION CONDITION	• The PCM calculates the intake air flow amount based on the airflow sensor. If the calculated intake air flow amount is **above 170 g/s {22 lb/min} for 1.5 s** while driving other than under a fully open throttle condition, and the fuel injection quantity based on the engine speed is below the specification, the PCM determines that the airflow sensor signal input is high.
POSSIBLE CAUSE	• MAF sensor malfunction • Connector or terminal malfunction • Short to power supply in wiring harness between MAF sensor terminal C and PCM terminal 190 • Open circuit in wiring harness between MAF sensor terminal B and PCM terminal 169 • PCM malfunction

DTC P0103	Mass airflow (MAF) sensor circuit high input



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**INSPECT MAF SENSOR/IAT SENSOR NO.2 CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the MAF sensor/IAT sensor No.2 connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 9.
		No	Go to the next step.
5	**INSPECT MAF SENSOR SIGNAL CIRCUIT FOR SHORT TO POWER SUPPLY** • Turn the engine switch to the ON position (Engine off). • Measure the voltage between MAF sensor terminal C (wiring harness-side) and body ground. • Is the voltage **more than 4.9 V**?	Yes	Repair or replace the wiring harness for a possible short to power supply, then go to Step 9.
		No	Go to the next step.

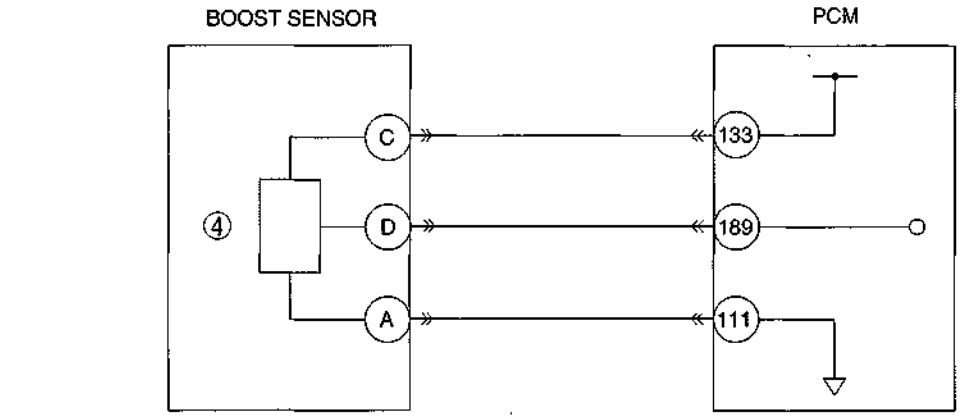
STEP	INSPECTION		ACTION
6	**INSPECT MAF SENSOR** • Inspect the MAF sensor. (See 01-40B-23 MASS AIR FLOW (MAF) SENSOR/INTAKE AIR TEMPERATURE (IAT) SENSOR NO.2 INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the MAF sensor, then go to Step 9. (See 01-13B-3 INTAKE-AIR SYSTEM REMOVAL/ INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
7	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 9.
		No	Go to the next step.
8	**INSPECT MAF SENSOR GROUND CIRCUIT FOR OPEN CIRCUIT** • Turn the engine switch off. • Inspect for continuity between MAF sensor/IAT sensor No.2 terminal B (wiring harness-side) and PCM terminal 169 (wiring harness-side). • Is there continuity?	Yes	Go to the next step.
		No	Repair or replace the wiring harness for a possible open circuit, then go to the next step.
9	**VERIFY TROUBLESHOOTING OF DTC P0103 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
10	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	DTC troubleshooting completed.

DTC P0106 [WL-C, WE-C]

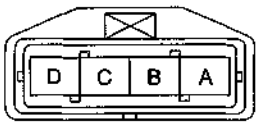
dcf010200100w09

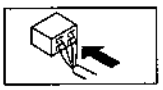
DTC P0106	Boost sensor range/performance malfunction
DETECTION CONDITION	• The PCM monitors and compares the intake manifold internal pressure via the boost sensor with the atmospheric pressure via the barometric pressure sensor (built into PCM) while the engine is not running. If the difference of these pressure is **above 11 kPa {0.11 bar, 1.6 psi}**, the PCM determines that there is a boost sensor characteristic malfunction. **Note** • If DTCs P0106 and P2227 are recorded simultaneously, the PCM determines that there is a boost sensor and barometric pressure sensor characteristic malfunction.
POSSIBLE CAUSE	• Boost sensor malfunction • PCM malfunction

DTC P0106	Boost sensor range/performance malfunction

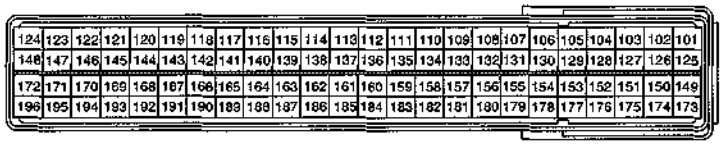


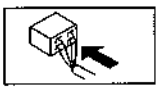
BOOST SENSOR/IAT SENSOR NO.1 WIRING HARNESS-SIDE CONNECTOR





PCM WIRING HARNESS-SIDE CONNECTOR





Diagnostic procedure

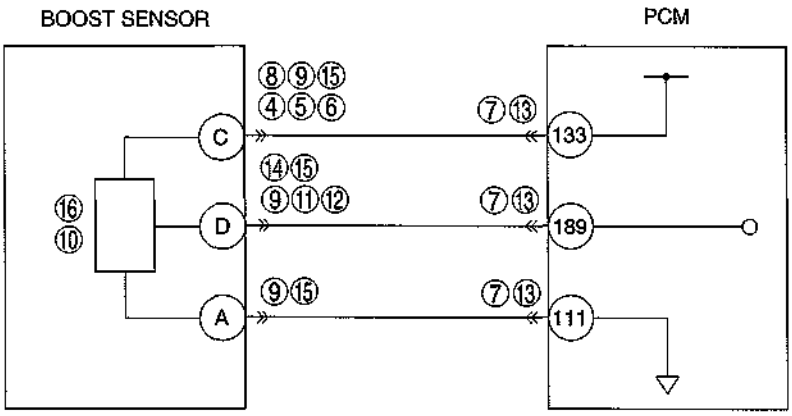
STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**INSPECT BOOST SENSOR** • Inspect the boost sensor. (See 01-40B-27 BOOST SENSOR INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the boost sensor, then go to Step 7.
		No	Go to the next step.
5	**VERIFY TROUBLESHOOTING OF DTC P0106 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.

STEP	INSPECTION		ACTION
6	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	DTC troubleshooting completed.

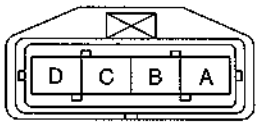
DTC P0107 [WL-C, WE-C]

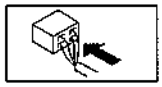
dcf010200100w10

DTC P0107	Boost sensor circuit low input
DETECTION CONDITION	• The PCM monitors the input signal from the boost sensor. If the voltage from the boost sensor is **less than 0.24 V for 2.0 s**, the PCM determines that there is a malfunction in the boost sensor circuit.
POSSIBLE CAUSE	• Boost sensor malfunction • Connector or terminal malfunction • Short to ground in wiring harness between boost sensor terminal C and PCM terminal 133 • Short to ground in wiring harness between boost sensor terminal D and PCM terminal 189 • Open circuit in wiring harness between boost sensor terminal C and PCM terminal 133 • Open circuit in wiring harness between boost sensor terminal D and PCM terminal 189 • PCM malfunction

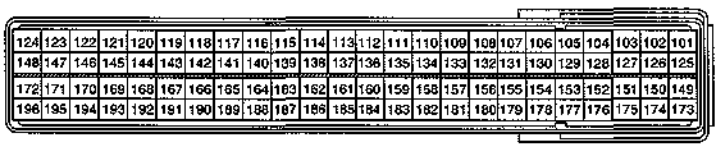


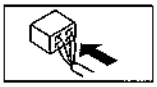
BOOST SENSOR/IAT SENSOR NO.1 WIRING HARNESS-SIDE CONNECTOR





PCM WIRING HARNESS-SIDE CONNECTOR





Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.

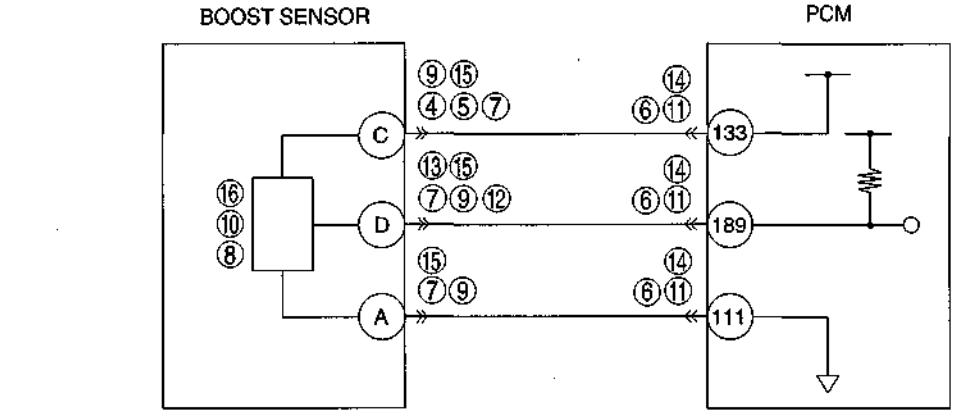
STEP	INSPECTION		ACTION
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**CLASSIFY 5V CONSTANT VOLTAGE CIRCUIT OR OTHER RELATED MALFUNCTION** • Turn the engine switch to the ON position (Engine off). • Measure the voltage between the boost sensor/IAT sensor No.1 terminal C (wiring harness-side) and body ground. • Is the voltage **5 V constant voltage** ?	Yes	Go to Step 11.
		No	Go to the next step.
5	**CLASSIFY 5V CONSTANT VOLTAGE CIRCUIT OR BOOST SENSOR/IAT SENSOR NO.1 RELATED MALFUNCTION** • Disconnect the boost sensor/IAT sensor No.1 connector. • Turn the engine switch to the ON position (Engine off). • Measure the voltage between the boost sensor terminal C (wiring harness-side) and body ground. • Is the voltage **5 V constant voltage** ?	Yes	Go to Step 9.
		No	Go to the next step.
6	**INSPECT BOOST SENSOR 5V CONSTANT VOLTAGE CIRCUIT FOR SHORT TO GROUND** • Turn the engine switch off. • Inspect for continuity between the boost sensor/IAT sensor No.1 terminal C (wiring harness-side) and body ground • Is there continuity?	Yes	Repair or replace the wiring harness for a possible short to ground, then go to Step 17.
		No	Go to the next step.
7	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 17.
		No	Go to the next step.
8	**INSPECT BOOST SENSOR 5V CONSTANT VOLTAGE CIRCUIT FOR OPEN** • Turn the engine switch off. • Inspect for continuity between the boost sensor/IAT sensor No.1 terminal C (wiring harness-side) and PCM terminal 133 (wiring harness-side). • Is there continuity?	Yes	Repair or replace the wiring harness for an open circuit, then go to Step 17.
		No	Go to Step 17.
9	**INSPECT BOOST SENSOR/IAT SENSOR NO.1 CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the boost sensor/IAT sensor No.1 connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 17.
		No	Go to the next step.
10	**INSPECT BOOST SENSOR** • Inspect the boost sensor/IAT sensor No.1. (See 01-40B-27 BOOST SENSOR INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the boost sensor/IAT sensor No.1, then go to Step 17.
		No	Go to Step 17.

STEP	INSPECTION		ACTION
11	**CLASSIFY SIGNAL CIRCUIT OR OTHER RELATED MALFUNCTION** • Turn the engine switch to the ON position (Engine off). • Measure the voltage between the boost sensor/IAT sensor No.1 terminal D (wiring harness-side) and body ground. • Is the voltage **more than 0.24 V** ?	Yes	Go to Step 13.
		No	Go to the next step.
12	**INSPECT BOOST SENSOR SIGNAL CIRCUIT FOR SHORT TO GROUND** • Turn the engine switch off. • Inspect for continuity between the boost sensor/IAT sensor No.1 terminal D (wiring harness-side) and body ground • Is there continuity?	Yes	Repair or replace the wiring harness for a possible short to ground, then go to Step 17.
		No	Go to Step 15.
13	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 17.
		No	Go to the next step.
14	**INSPECT BOOST SENSOR SIGNAL CIRCUIT FOR OPEN** • Turn the engine switch off. • Inspect for continuity between the boost sensor/IAT sensor No.1 terminal D (wiring harness-side) and PCM terminal 189 (wiring harness-side). • Is there continuity?	Yes	Repair or replace the wiring harness for an open circuit, then go to Step 17.
		No	Go to Step 17.
15	**INSPECT BOOST SENSOR/IAT SENSOR NO.1 CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the boost sensor/IAT sensor No.1 connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 17.
		No	Go to the next step.
16	**INSPECT BOOST SENSOR** • Inspect the boost sensor/IAT sensor No.1. (See 01-40B-27 BOOST SENSOR INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the boost sensor/IAT sensor No.1, then go to the next step.
		No	Go to the next step.
17	**VERIFY TROUBLESHOOTING OF DTC P0107 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
18	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	DTC troubleshooting completed.

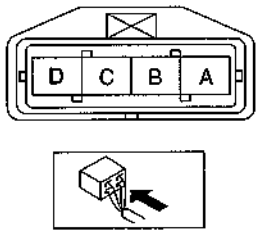
DTC P0108 [WL-C, WE-C]

dcf010200100w11

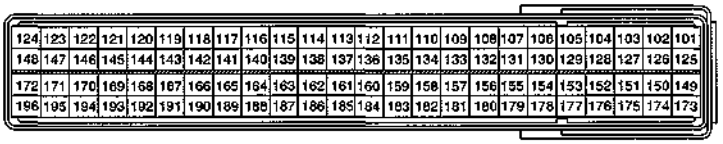
DTC P0108	Boost sensor circuit high input
DETECTION CONDITION	• The PCM monitors the input signal from the boost sensor. If the voltage from the boost sensor is **more than 4.9 V for 1.0 s**, the PCM determines that there is a malfunction in the boost sensor circuit.
POSSIBLE CAUSE	• Boost sensor malfunction • Connector or terminal malfunction • Short to power supply in wiring harness between boost sensor terminal D and PCM terminal 189 • Short to power supply in wiring harness between boost sensor terminal C and PCM terminal 133 • Open circuit in wiring harness between boost sensor terminal A and PCM terminal 111 • PCM malfunction



BOOST SENSOR/IAT SENSOR NO.1 WIRING HARNESS-SIDE CONNECTOR



PCM WIRING HARNESS-SIDE CONNECTOR



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**CLASSIFY 5V CONSTANT VOLTAGE CIRCUIT OR OTHER RELATED MALFUNCTION** • Turn the engine switch to the ON position (Engine off). • Measure the voltage between the boost sensor/IAT sensor No.1 terminal C (wiring harness-side) and body ground. • Is the voltage **5 V constant voltage** ?	Yes	Go to Step 9.
		No	Go to the next step.

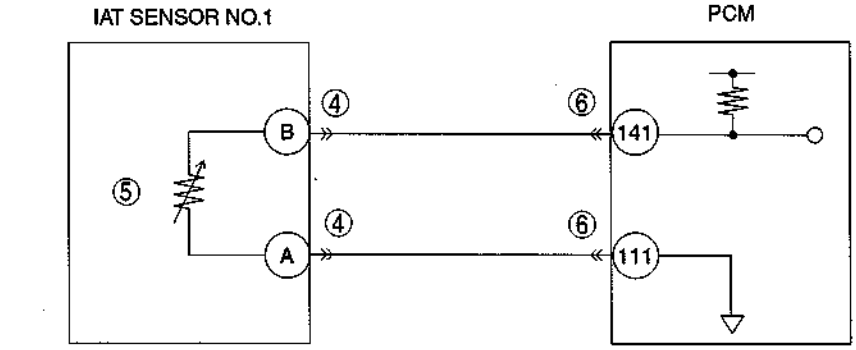
STEP	INSPECTION		ACTION
5	**CLASSIFY 5V CONSTANT VOLTAGE CIRCUIT OR BOOST SENSOR/IAT SENSOR NO.1 RELATED MALFUNCTION** • Disconnect the boost sensor/IAT sensor No.1 connector. • Turn the engine switch to the ON position (Engine off). • Measure the voltage between the boost sensor terminal C (wiring harness-side) and body ground. • Is the voltage **5 V constant voltage** ?	Yes	Go to Step 17.
		No	Go to the next step.
6	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 17.
		No	Repair or replace the wiring harness for a possible short to power supply, then go to Step 17.
7	**INSPECT BOOST SENSOR/IAT SENSOR NO.1 CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the boost sensor/IAT sensor No.1 connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 17.
		No	Go to the next step.
8	**INSPECT BOOST SENSOR** • Inspect the boost sensor/IAT sensor No.1. (See 01-40B-27 BOOST SENSOR INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the boost sensor/IAT sensor No.1, then go to Step 17.
		No	Go to Step 17.
9	**INSPECT BOOST SENSOR/IAT SENSOR NO.1 CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the boost sensor/IAT sensor No.1 connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 17.
		No	Go to the next step.
10	**INSPECT BOOST SENSOR GROUND CIRCUIT FOR OPEN CIRCUIT** • Turn the engine switch off. • Inspect for continuity between boost sensor terminal A and body ground. • Is there continuity?	Yes	Go to Step 12.
		No	Repair or replace the wiring harness for an open circuit, then go to the next step.
11	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 17.
		No	Repair or replace the wiring harness for an open circuit, then go to the Step 17.
12	**CLASSIFY SIGNAL CIRCUIT OR OTHER RELATED MALFUNCTION** • Turn the engine switch to the ON position (Engine off). • Measure the voltage between the boost sensor/IAT sensor No.1 terminal D (wiring harness-side) and body ground. • Is the voltage **less than 4.9 V** ?	Yes	Go to Step 17.
		No	Go to the next step.

STEP	INSPECTION		ACTION
13	**CLASSIFY SIGNAL CIRCUIT OR BOOST SENSOR/IAT SENSOR NO.1 RELATED MALFUNCTION** • Disconnect the boost sensor/IAT sensor No.1 connector. • Turn the engine switch to the ON position (Engine off). • Measure the voltage between the boost sensor terminal D (wiring harness-side) and body ground. • Is the voltage **less than 4.9 V** ?	Yes	Go to Step 15.
		No	Go to the next step.
14	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 17.
		No	Repair or replace the wiring harness for a possible short to power supply, then go to Step 17.
15	**INSPECT BOOST SENSOR/IAT SENSOR NO.1 CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the boost sensor/IAT sensor No.1 connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 17.
		No	Go to the next step.
16	**INSPECT BOOST/IAT SENSOR NO.1 SENSOR** • Inspect the boost sensor/IAT sensor No.1. (See 01-40B-27 BOOST SENSOR INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the boost sensor/IAT sensor No.1, then go to the step.
		No	Go to the step.
17	**VERIFY TROUBLESHOOTING OF DTC P0108 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
18	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	DTC troubleshooting completed.

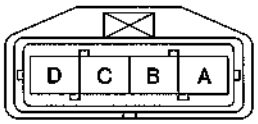
DTC P0111[WL-C, WE-C]

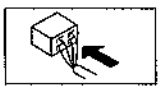
id0102c4803600

DTC P0111	Intake air temperature (IAT) sensor No.1 range/performance malfunction
DETECTION CONDITION	• The PCM monitors the input signal from the IAT sensor No.1. If the difference between the maximum and minimum value of the IAT sensor No.1 is **less than 0.3 °C {32.6 °F}**, the PCM determines that there is a malfunction in the IAT sensor No.1. **Diagnostic support note** • The MIL illuminates if the PCM detects the above malfunction condition in two consecutive drive cycles or in one drive cycle while the DTC for the same malfunction has been stored in the PCM. • PENDING CODE is available if the PCM detects the above malfunction condition during the first drive cycle. • FREEZE FRAME DATA is available. • The DTC is stored in the PCM memory.
POSSIBLE CAUSE	• IAT sensor No.1 malfunction • Connector or terminal malfunction • PCM malfunction

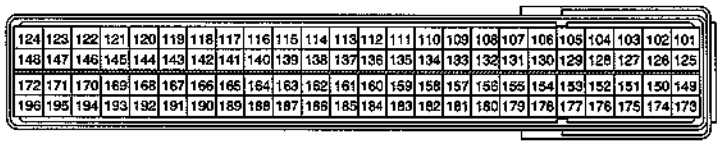


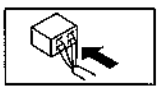
BOOST SENSOR/IAT SENSOR NO.1 WIRING HARNESS-SIDE CONNECTOR





PCM WIRING HARNESS-SIDE CONNECTOR





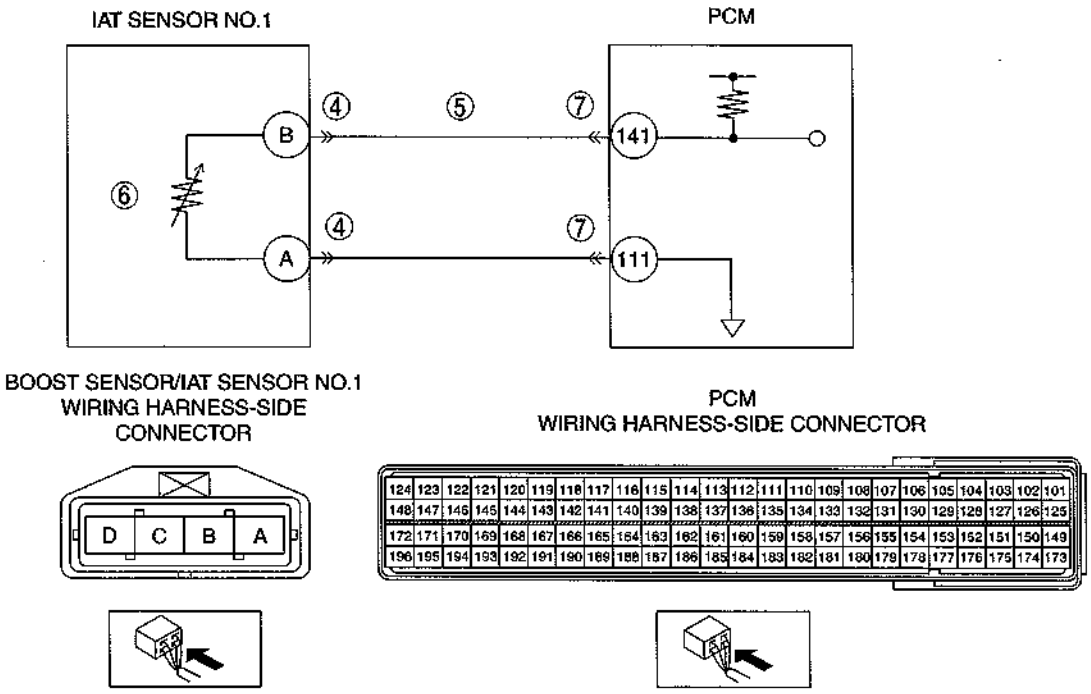
Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** • Verify related service information availability. • Is any related service information available?	Yes	Perform repair or diagnosis according to the available service information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the PENDING CODE for this DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING".
4	**INSPECT MAF/IAT SENSOR CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the MAF/IAT sensor connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 7.
		No	Go to the next step.
5	**INSPECT IAT SENSOR NO.1** • Inspect the IAT sensor No.1. • Is there any malfunction?	Yes	Replace the MAF/IAT sensor, then go to Step 7.
		No	Go to the next step.
6	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to the next step.
		No	Go to the next step.
7	**VERIFY TROUBLESHOOTING OF DTC P0111 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine and warm it up completely. • Is the PENDING CODE for this DTC present?	Yes	Replace the PCM, then go to the next step.
		No	Go to the next step.
8	**VERIFY AFTER REPAIR PROCEDURE** • Perform the Repair Verification Drive Mode. • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02C-6 DTC TABLE[WL-C, WE-C].)
		No	DTC troubleshooting completed.

DTC P0112 [WL-C, WE-C]

dcf010200100w12

DTC P0112	Intake air temperature (IAT) sensor No.1 circuit low input
DETECTION CONDITION	• The PCM monitors the input signal from IAT sensor No.1. If the voltage from IAT sensor No.1 is **less than 0.14 V for 2.0 s**, the PCM determines that there is a malfunction in the IAT sensor No.1 circuit.
POSSIBLE CAUSE	• IAT sensor No.1 malfunction • Connector or terminal malfunction • Short to ground in wiring harness between IAT sensor No.1 terminal B and PCM terminal 141 • PCM malfunction



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**INSPECT BOOST SENSOR/IAT SENSOR NO.1 CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the boost sensor/IAT sensor No.1 connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 8.
		No	Go to the next step.

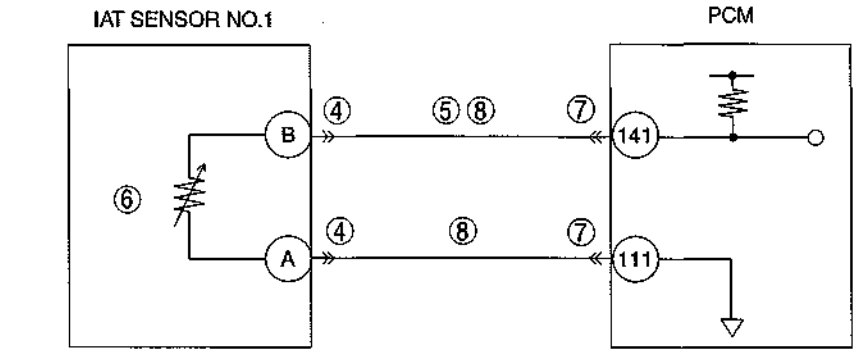
STEP	INSPECTION		ACTION
5	**INSPECT IAT SENSOR NO.1 SIGNAL CIRCUIT FOR SHORT TO GROUND** • Turn the engine switch off. • Inspect for continuity between IAT sensor No.1 terminal B (wiring harness-side) and body ground. • Is there continuity?	Yes	Repair or replace the wiring harness for a possible short to ground, then go to Step 8.
		No	Go to the next step.
6	**INSPECT IAT SENSOR NO.1** • Inspect the IAT sensor No.1. (See 01-40B-26 INTAKE AIR TEMPERATURE (IAT) SENSOR NO.1 INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the IAT sensor No.1, then go to Step 8. (See 01-13B-3 INTAKE-AIR SYSTEM REMOVAL/ INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
7	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to the next step.
		No	Go to the next step.
8	**VERIFY TROUBLESHOOTING OF DTC P0112 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
9	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	DTC troubleshooting completed.

DTC P0113 [WL-C, WE-C]

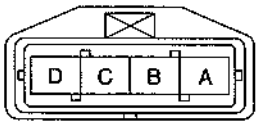
dcf010200100w13

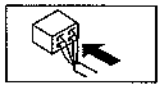
DTC P0113	Intake air temperature (IAT) sensor No.1 circuit high input
DETECTION CONDITION	• The PCM monitors the input signal from IAT sensor No.1. If the voltage from IAT sensor No.1 is **more than 4.90 V for 1.0 s**, the PCM determines that there is a malfunction in the IAT sensor No.1 circuit.
POSSIBLE CAUSE	• IAT sensor No.1 malfunction • Connector or terminal malfunction • Open circuit in wiring harness between IAT sensor No.1 terminal B and PCM terminal 141 • Short to power supply in wiring harness between IAT sensor No.1 terminal B and PCM terminal 141 • Open circuit in wiring harness between IAT sensor No.1 terminal A and PCM terminal 111 • PCM malfunction

DTC P0113	Intake air temperature (IAT) sensor No.1 circuit high input

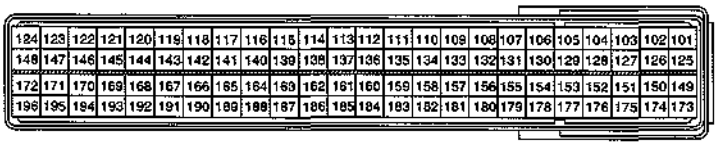


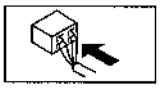
BOOST SENSOR/IAT SENSOR NO.1 WIRING HARNESS-SIDE CONNECTOR





PCM WIRING HARNESS-SIDE CONNECTOR





Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**INSPECT BOOST SENSOR/IAT SENSOR NO.1 CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the boost sensor/IAT sensor No.1 connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 9.
		No	Go to the next step.
5	**INSPECT IAT SENSOR NO.1 SIGNAL CIRCUIT FOR SHORT TO POWER SUPPLY** • Turn the engine switch to the ON position (Engine off). • Measure the voltage between IAT sensor No.1 terminal B (wiring harness-side) and body ground. • Is the voltage **more than 4.90 V**?	Yes	Repair or replace the wiring harness for a possible short to power supply, then go to Step 9.
		No	Go to the next step.

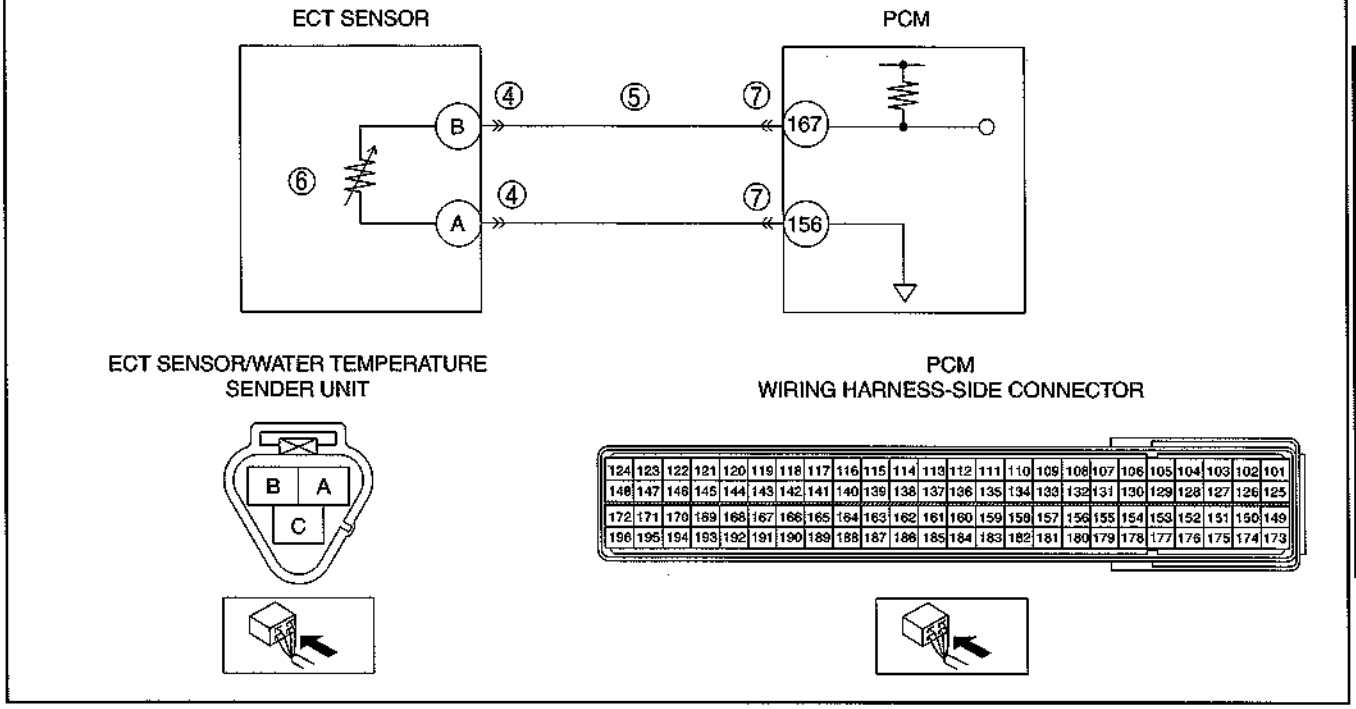
STEP	INSPECTION		ACTION
6	**INSPECT IAT SENSOR NO.1** • Inspect the IAT sensor No.1. (See 01-40B-26 INTAKE AIR TEMPERATURE (IAT) SENSOR NO.1 INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the IAT sensor No.1, then go to Step 9. (See 01-13B-3 INTAKE-AIR SYSTEM REMOVAL/ INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
7	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 9.
		No	Go to the next step.
8	**INSPECT IAT SENSOR NO.1 CIRCUIT FOR OPEN CIRCUIT** • Turn the engine switch off. • Inspect for continuity between the following terminals: — IAT sensor No.1 terminal B (wiring harness-side) and PCM terminal 141 (wiring harness-side) — IAT sensor No.1 terminal A (wiring harness-side) and PCM terminal 111 (wiring harness-side) • Is there continuity?	Yes	Go to the next step.
		No	Repair or replace the wiring harness for a possible open circuit, then go to the next step.
9	**VERIFY TROUBLESHOOTING OF DTC P0113 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
10	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	DTC troubleshooting completed.

DTC P0117 [WL-C, WE-C]

dcf010200100w14

DTC P0117	Engine coolant temperature (ECT) sensor circuit low input
DETECTION CONDITION	• The PCM monitors the input signal from the ECT sensor. If the voltage from the ECT sensor is **less than 0.20 V for 2.0 s**, the PCM determines that there is a malfunction in the ECT sensor circuit.
POSSIBLE CAUSE	• ECT sensor malfunction • Connector or terminal malfunction • Short to ground in wiring harness between ECT sensor terminal B and PCM terminal 167 • PCM malfunction

DTC P0117	Engine coolant temperature (ECT) sensor circuit low input



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**INSPECT ECT SENSOR/WATER TEMPERATURE SENDER UNIT CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the ECT sensor/water temperature sender unit connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 8.
		No	Go to the next step.
5	**INSPECT ECT SENSOR SIGNAL CIRCUIT FOR SHORT TO GROUND** • Turn the engine switch off. • Disconnect the ECT sensor connector. • Inspect for continuity between ECT sensor terminal B (wiring harness-side) and body ground. • Is there continuity?	Yes	Repair or replace the wiring harness for a possible short to ground, then go to Step 8.
		No	Go to the next step.

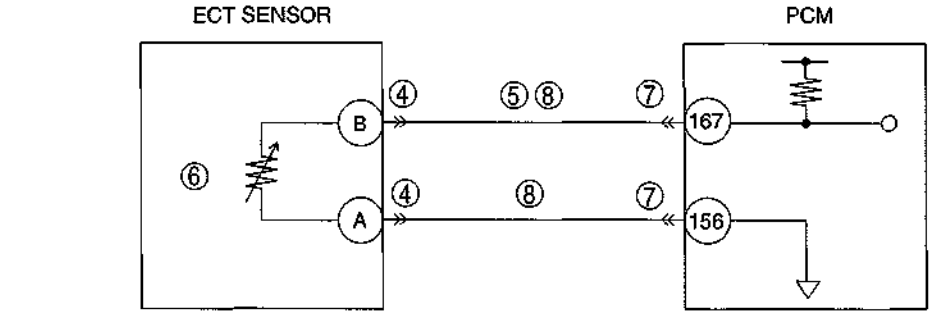
STEP	INSPECTION		ACTION
6	**INSPECT ECT SENSOR** • Inspect the ECT sensor. (See 01-40B-35 ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the ECT sensor, then go to Step 8.
		No	Go to the next step.
7	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to the next step.
		No	Go to the next step.
8	**VERIFY TROUBLESHOOTING OF DTC P0117 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
9	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	DTC troubleshooting completed.

DTC P0118 [WL-C, WE-C]

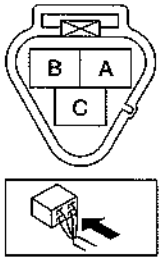
dcf010200100w15

DTC P0118	Engine coolant temperature (ECT) sensor circuit high input
DETECTION CONDITION	• The PCM monitors the input signal from the ECT sensor. If the voltage from the ECT sensor is **more than 4.91 V for 1.0 s**, the PCM determines that there is a malfunction in the ECT sensor circuit.
POSSIBLE CAUSE	• ECT sensor malfunction • Connector or terminal malfunction • Open circuit in wiring harness between ECT sensor terminal B and PCM terminal 167 • Short to power supply in wiring harness between ECT sensor terminal B and PCM terminal 167 • Open circuit in wiring harness between ECT sensor terminal A and PCM terminal 156 • PCM malfunction

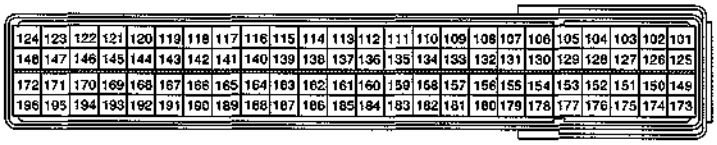
DTC P0118	Engine coolant temperature (ECT) sensor circuit high input



ECT SENSOR/WATER TEMPERATURE SENDER UNIT



PCM WIRING HARNESS-SIDE CONNECTOR



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**INSPECT ECT SENSOR/ WATER TEMPERATURE SENDER UNIT CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the ECT sensor/ water temperature sender unit connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 9.
		No	Go to the next step.
5	**INSPECT ECT SENSOR SIGNAL CIRCUIT FOR SHORT TO POWER SUPPLY** • Turn the engine switch to the ON position (Engine off). • Measure the voltage between ECT sensor terminal B (wiring harness-side) and body ground. • Is the voltage **more than 4.91 V**?	Yes	Repair or replace the wiring harness for a possible short to power supply, then go to Step 9.
		No	Go to the next step.

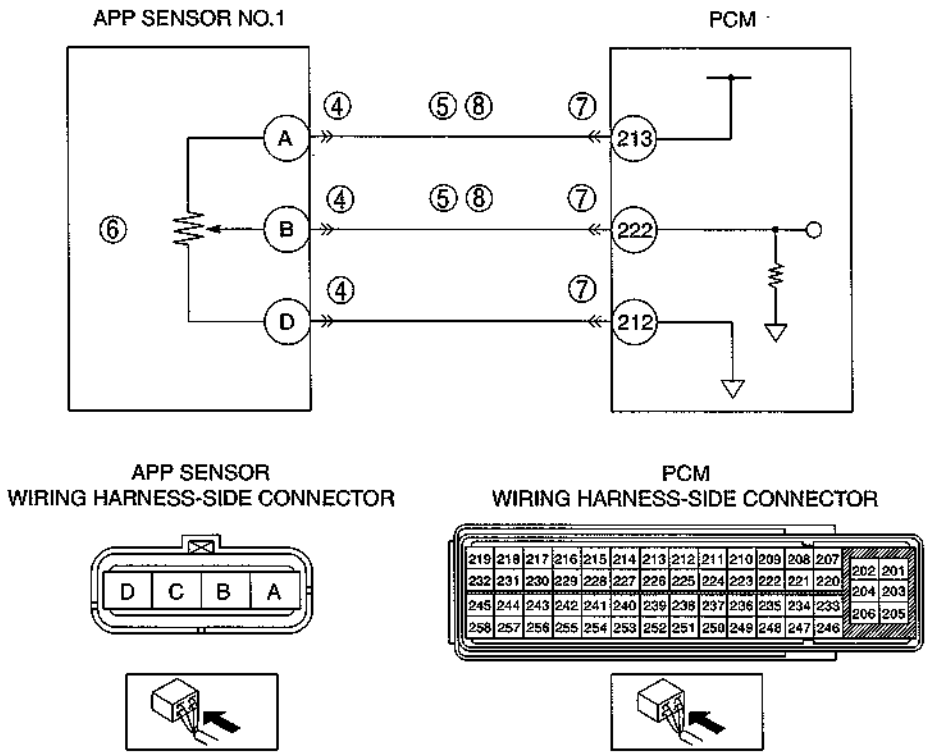
STEP	INSPECTION		ACTION
6	**INSPECT ECT SENSOR** • Inspect the ECT sensor. (See 01-40B-35 ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the ECT sensor, then go to Step 9.
		No	Go to the next step.
7	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 9.
		No	Go to the next step.
8	**INSPECT ECT SENSOR CIRCUIT FOR OPEN CIRCUIT** • Turn the engine switch off. • Inspect for continuity between the following terminals: — ECT sensor terminal B (wiring harness-side) and PCM terminal 167 (wiring harness-side) — ECT sensor terminal A (wiring harness-side) and PCM terminal 156 (wiring harness-side) • Is there continuity?	Yes	Go to the next step.
		No	Repair or replace the wiring harness for a possible open circuit, then go to the next step.
9	**VERIFY TROUBLESHOOTING OF DTC P0118 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
10	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	DTC troubleshooting completed.

DTC P0122 [WL-C, WE-C]

dcf010200100w16

DTC P0122	Accelerator pedal position (APP) sensor No.1 circuit low input
DETECTION CONDITION	• The PCM monitors the input signal from APP sensor No.1. If the voltage from APP sensor No.1 is **less than 0.29 V for 0.5 s** when the APP sensor No.1 power supply voltage is normal, the PCM determines that there is a malfunction in the APP sensor No.1 circuit.
POSSIBLE CAUSE	• APP sensor No.1 malfunction • Connector or terminal malfunction • Open circuit in wiring harness between APP sensor No.1 terminal A and PCM terminal 213 • Short to ground in wiring harness between APP sensor No.1 terminal A and PCM terminal 213 • Open circuit in wiring harness between APP sensor No.1 terminal B and PCM terminal 222 • Short to ground in wiring harness between APP sensor No.1 terminal B and PCM terminal 222 • PCM malfunction

DTC P0122	Accelerator pedal position (APP) sensor No.1 circuit low input



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**INSPECT APP SENSOR CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the APP sensor connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 9.
		No	Go to the next step.

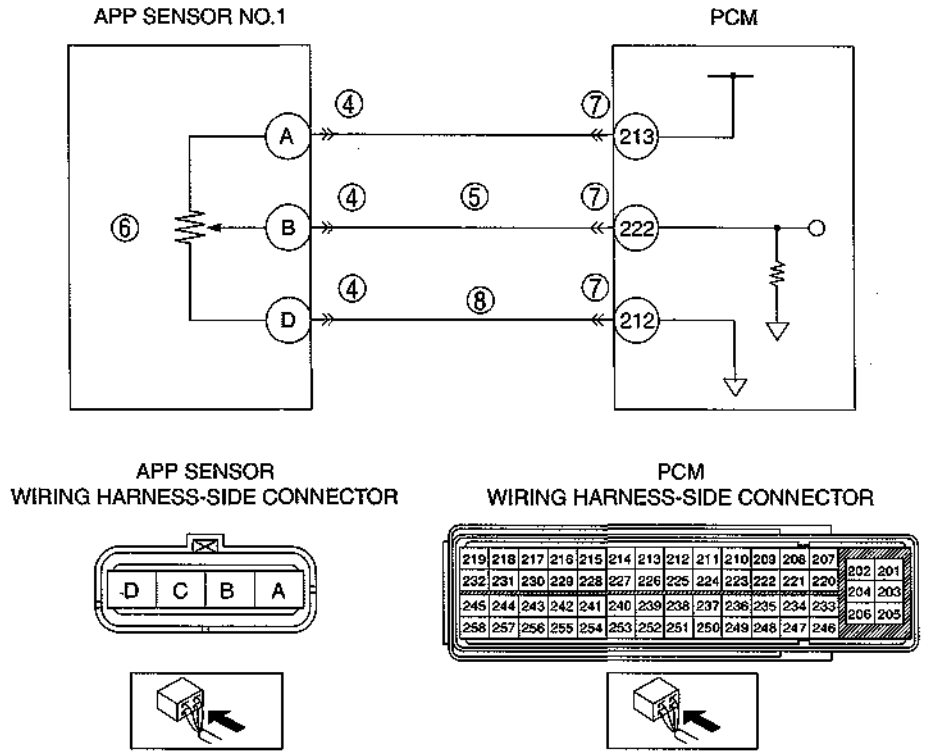
STEP	INSPECTION		ACTION
5	**INSPECT APP SENSOR NO.1 CIRCUIT FOR SHORT TO GROUND** • Turn the engine switch off. • Inspect for continuity between the following terminals and body ground: — APP sensor No.1 terminal A (wiring harness-side) and body ground — APP sensor No.1 terminal B (wiring harness-side) and body ground • Is there continuity?	Yes	Repair or replace the wiring harness for a possible short to ground, then go to Step 9.
		No	Go to the next step.
6	**INSPECT APP SENSOR NO.1** • Inspect the APP sensor No.1. (See 01-40B-28 ACCELERATOR PEDAL POSITION (APP) SENSOR INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the APP sensor, then go to Step 9.
		No	Go to the next step.
7	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 9.
		No	Go to the next step.
8	**INSPECT APP SENSOR NO.1 CIRCUIT FOR OPEN CIRCUIT** • Turn the engine switch off. • Inspect for continuity between the following terminals: — APP sensor No.1 terminal A (wiring harness-side) and PCM terminal 213 (wiring harness-side) — APP sensor No.1 terminal B (wiring harness-side) and PCM terminal 222 (wiring harness-side) • Is there continuity?	Yes	Go to the next step.
		No	Repair or replace the wiring harness for a possible open circuit, then go to the next step.
9	**VERIFY TROUBLESHOOTING OF DTC P0122 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
10	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	DTC troubleshooting completed.

DTC P0123 [WL-C, WE-C]

dcf010200100w17

DTC P0123	Accelerator pedal position (APP) sensor No.1 circuit high input
DETECTION CONDITION	• The PCM monitors the input signal from APP sensor No.1. If the voltage from APP sensor No.1 is **more than 4.80 V for 0.5 s** when the APP sensor No.1 power supply voltage is normal, the PCM determines that there is a malfunction in the APP sensor No.1 circuit.
POSSIBLE CAUSE	• APP sensor No.1 malfunction • Connector or terminal malfunction • Short to power supply in wiring harness between APP sensor No.1 terminal B and PCM terminal 222 • Open circuit in wiring harness between APP sensor No.1 terminal D and PCM terminal 212 • PCM malfunction

DTC P0123	Accelerator pedal position (APP) sensor No.1 circuit high input



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**INSPECT APP SENSOR CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the APP sensor connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 9.
		No	Go to the next step.
5	**INSPECT APP SENSOR NO.1 SIGNAL CIRCUIT FOR SHORT TO POWER SUPPLY** • Turn the engine switch to the ON position (Engine off). • Measure the voltage between APP sensor terminal B (wiring harness-side) and body ground. • Is the voltage **more than 4.80 V**?	Yes	Repair or replace the wiring harness for a possible short to power supply, then go to Step 9.
		No	Go to the next step.

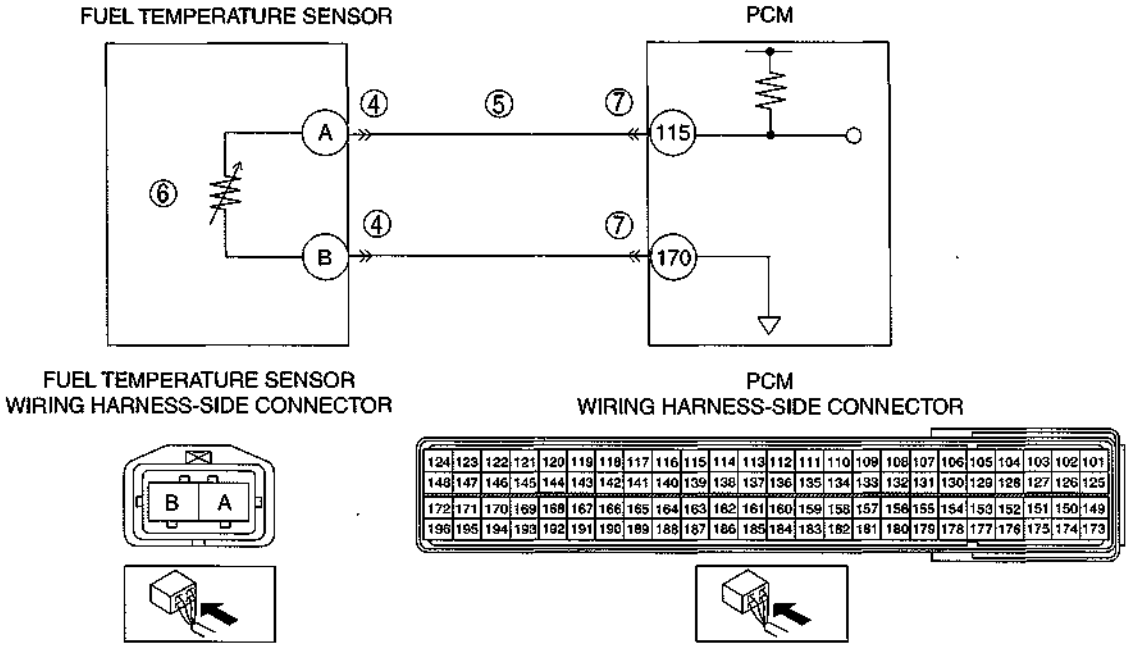
STEP	INSPECTION		ACTION
6	**INSPECT APP SENSOR NO.1** • Inspect the APP sensor No.1. (See 01-40B-28 ACCELERATOR PEDAL POSITION (APP) SENSOR INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the APP sensor, then go to Step 9.
		No	Go to the next step.
7	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 9.
		No	Go to the next step.
8	**INSPECT APP SENSOR NO.1 GROUND CIRCUIT FOR OPEN CIRCUIT** • Turn the engine switch off. • Inspect for continuity between APP sensor No.1 terminal D (wiring harness-side) and PCM terminal 212 (wiring harness-side). • Is there continuity?	Yes	Go to the next step.
		No	Repair or replace the wiring harness for a possible open circuit, then go to the next step.
9	**VERIFY TROUBLESHOOTING OF DTC P0123 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
10	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	DTC troubleshooting completed.

DTC P0182 [WL-C, WE-C]

dcf010200100w18

DTC P0182	Fuel temperature sensor circuit low input
DETECTION CONDITION	• The PCM monitors the input signal from the fuel temperature sensor. If the voltage from the fuel temperature sensor is **less than 0.2 V**, the PCM determines that there is a malfunction in the fuel temperature sensor circuit.
POSSIBLE CAUSE	• Fuel temperature sensor malfunction • Connector or terminal malfunction • Short to ground in wiring harness between fuel temperature sensor terminal A and PCM terminal 115 • PCM malfunction

DTC P0182	Fuel temperature sensor circuit low input



Diagnostic procedure

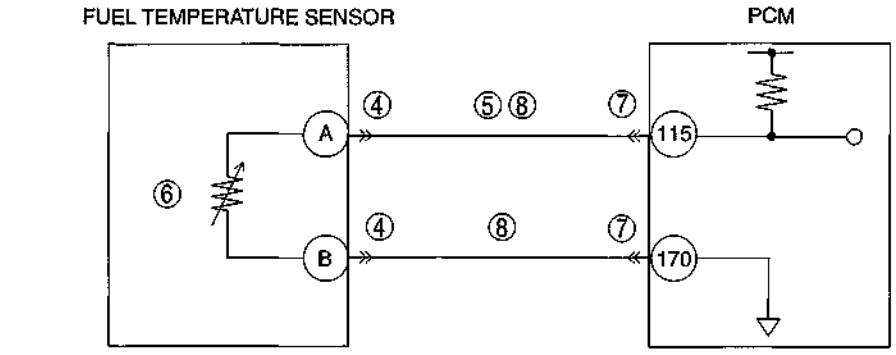
STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**INSPECT FUEL TEMPERATURE SENSOR CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the fuel temperature sensor connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 8.
		No	Go to the next step.
5	**INSPECT FUEL TEMPERATURE SENSOR SIGNAL CIRCUIT FOR SHORT TO GROUND** • Turn the engine switch off. • Disconnect the fuel temperature sensor connector. • Inspect for continuity between fuel temperature sensor terminal A (wiring harness-side) and body ground. • Is there continuity?	Yes	Repair or replace the wiring harness for a possible short to ground, then go to Step 8.
		No	Go to the next step.
6	**INSPECT FUEL TEMPERATURE SENSOR** • Inspect the fuel temperature sensor. (See 01-40B-32 FUEL TEMPERATURE SENSOR INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the fuel temperature sensor, then go to Step 8.
		No	Go to the next step.

STEP	INSPECTION		ACTION
7	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to the next step.
		No	Go to the next step.
8	**VERIFY TROUBLESHOOTING OF DTC P0182 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
9	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	DTC troubleshooting completed.

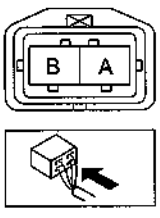
DTC P0183 [WL-C, WE-C]

dcf010200100w19

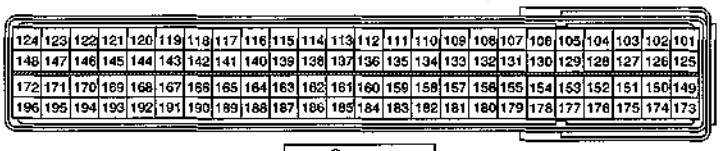
DTC P0183	Fuel temperature sensor circuit high Input
DETECTION CONDITION	• The PCM monitors the input signal from the fuel temperature sensor. If the voltage from the fuel temperature sensor is **more than 4.9 V**, the PCM determines that there is a malfunction in the fuel temperature sensor circuit.
POSSIBLE CAUSE	• Fuel temperature sensor malfunction • Connector or terminal malfunction • Open circuit in wiring harness between fuel temperature sensor terminal A and PCM terminal 115 • Short to power supply in wiring harness between fuel temperature sensor terminal A and PCM terminal 115 • Open circuit in wiring harness between fuel temperature sensor terminal B and PCM terminal 170 • PCM malfunction



FUEL TEMPERATURE SENSOR WIRING HARNESS-SIDE CONNECTOR



PCM WIRING HARNESS-SIDE CONNECTOR



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**INSPECT FUEL TEMPERATURE SENSOR CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the fuel temperature sensor connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 9.
		No	Go to the next step.
5	**INSPECT FUEL TEMPERATURE SENSOR SIGNAL CIRCUIT FOR SHORT TO POWER SUPPLY** • Turn the engine switch to the ON position (Engine off). • Measure the voltage between fuel temperature sensor terminal A (wiring harness-side) and body ground. • Is the voltage **more than 4.9 V**?	Yes	Repair or replace the wiring harness for a possible short to power supply, then go to Step 9.
		No	Go to the next step.
6	**INSPECT FUEL TEMPERATURE SENSOR** • Inspect the fuel temperature sensor. (See 01-40B-32 FUEL TEMPERATURE SENSOR INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the fuel temperature sensor, then go to Step 9.
		No	Go to the next step.
7	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 9.
		No	Go to the next step.
8	**INSPECT FUEL TEMPERATURE SENSOR CIRCUIT FOR OPEN CIRCUIT** • Turn the engine switch off. • Inspect for continuity between the following terminals: — Fuel temperature sensor terminal A (wiring harness-side) and PCM terminal 115 (wiring harness-side) — Fuel temperature sensor terminal B (wiring harness-side) and PCM terminal 170 (wiring harness-side) • Is there continuity?	Yes	Go to the next step.
		No	Repair or replace the wiring harness for a possible open circuit, then go to the next step.

STEP	INSPECTION		ACTION
9	**VERIFY TROUBLESHOOTING OF DTC P0183 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
10	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	DTC troubleshooting completed.

DTC P0191 [WL-C, WE-C]

dcf010200100w20

DTC P0191	Fuel pressure sensor range/performance malfunction
DETECTION CONDITION	• The PCM monitors the fuel pressure in the common rail via the fuel pressure sensor when the engine switch is turned to the ON position after the engine has not been run for several hours. If the fuel pressure is not **0 MPa {0 bar, 0 psi}**, the PCM determines that there is a fuel pressure sensor malfunction.
POSSIBLE CAUSE	• Fuel pressure sensor malfunction • PCM malfunction

Diagnostic procedure

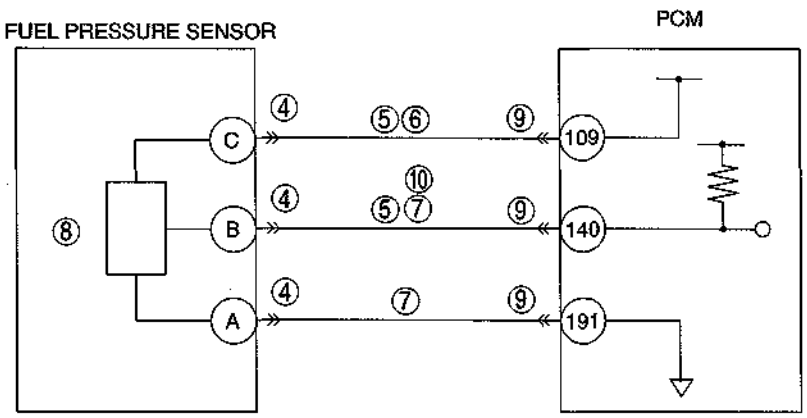
STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair Information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**CLASSIFY FUEL PRESSURE SENSOR MALFUNCTION OR PCM MALFUNCTION** • Access FRP PID. • Turn the engine switch to the ON position (Engine off). • Monitor the FRP PID. • Is the FRP PID value 0 MPa {0 Bar, 0 psi} [ECT: below 20 °C{68 °F}]	Yes	Go to Step 6.
		No	Go to the next step.
5	**INSPECT FUEL PRESSURE SENSOR** • Inspect the fuel pressure sensor. (See 01-40B-33 FUEL PRESSURE SENSOR INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the common rail, go to the next step.
		No	Go to the next step.

STEP	INSPECTION		ACTION
6	**VERIFY TROUBLESHOOTING OF DTC P0191 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
7	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

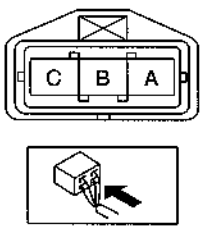
DTC P0192 [WL-C, WE-C]

dcf010200100w21

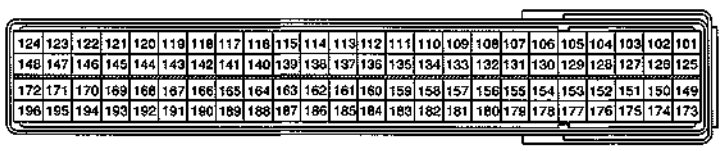
DTC P0192	Fuel pressure sensor circuit low input
DETECTION CONDITION	• The PCM monitors the input voltage from the fuel pressure sensor while the engine is running. If the input voltage from the fuel pressure sensor is **less than 0.2 V**, the PCM determines that there is a malfunction in the fuel pressure sensor circuit.
POSSIBLE CAUSE	• Fuel pressure sensor malfunction • Connector or terminal malfunction • Short to ground in wiring harness between fuel pressure sensor terminal C and PCM terminal 109 • Open circuit in wiring harness between fuel pressure sensor terminal C and PCM terminal 109 • Short to ground in wiring harness between fuel pressure sensor terminal B and PCM terminal 140 • Fuel pressure sensor signal and ground circuits are shorted each other. • PCM malfunction



FUEL PRESSURE SENSOR WIRING HARNESS-SIDE CONNECTOR



PCM WIRING HARNESS-SIDE CONNECTOR



Diagnostic procedure

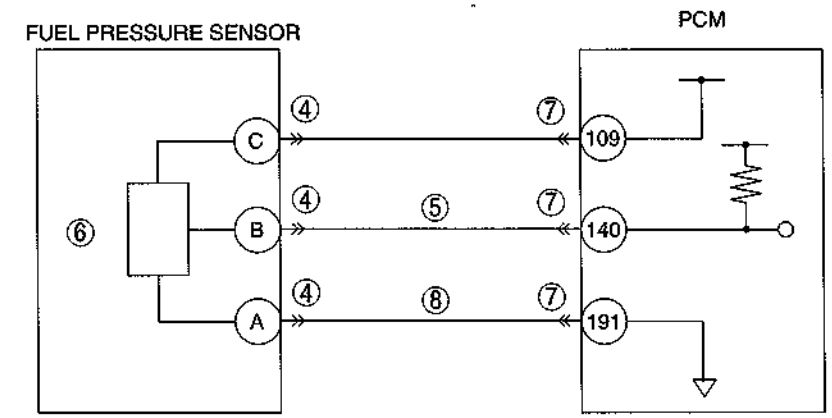
STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related Service Information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available Service Information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**INSPECT FUEL PRESSURE SENSOR CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Inspect for poor connection (such as damaged/ pulled-out terminals, corrosion). • Is there any malfunction?	Yes	Repair or replace the suspected terminal, go to Step 11.
		No	Go to the next step.
5	**INSPECT FUEL PRESSURE SENSOR SIGNAL CIRCUIT FOR SHORT TO GROUND** • Turn the engine switch off. • Inspect for continuity between the following terminals and body ground: — Fuel pressure sensor terminal C — Fuel pressure sensor terminal B • Is there continuity?	Yes	Repair or replace the wiring harness for a short to ground, go to Step 11.
		No	Go to the next step.
6	**INSPECT FUEL PRESSURE SENSOR POWER CIRCUIT FOR OPEN CIRCUIT** • Turn the engine switch to the ON position. (Engine off) • Inspect the voltage at fuel pressure sensor terminal C (wiring harness side). • Is the voltage **less than 0.2 V**?	Yes	Repair or replace the wiring harness for an open circuit, go to Step 11.
		No	Go to the next step.
7	**INSPECT FUEL PRESSURE SENSOR CIRCUIT FOR SHORT** • Turn the engine switch off. • Inspect for continuity between fuel pressure sensor terminals B and A. • Is there continuity?	Yes	Repair or replace wiring harness for a short, go to Step 11.
		No	Go to the next step.
8	**INSPECT FUEL PRESSURE SENSOR** • Inspect the fuel pressure sensor. (See 01-40B-33 FUEL PRESSURE SENSOR INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Repair the supply pump, go to Step 11. (See 01-14B-11 SUPPLY PUMP REMOVAL/ INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
9	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Inspect for poor connection (such as damaged/ pulled-out terminals, corrosion). • Is there any malfunction?	Yes	Repair or replace the suspected terminal, go to Step 11.
		No	Go to the next step.
10	**INSPECT FUEL PRESSURE SENSOR CIRCUIT FOR OPEN** • Turn the engine switch off. • Inspect for continuity between fuel pressure sensor terminal B and PCM terminal 140. • Is there continuity?	Yes	Repair or replace suspected terminal, go to the next step.
		No	Go to the next step.

STEP	INSPECTION		ACTION
11	**VERIFY TROUBLESHOOTING OF DTC P0192 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
12	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

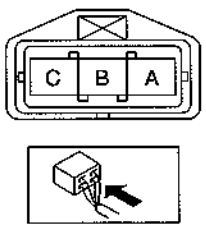
DTC P0193 [WL-C, WE-C]

dcf010200100w22

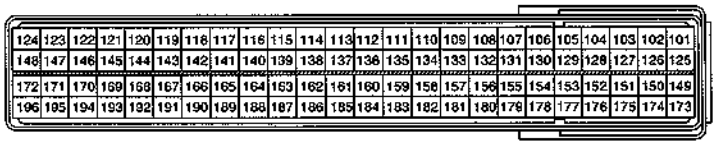
DTC P0193	Fuel pressure sensor circuit high input
DETECTION CONDITION	• The PCM monitors the input voltage from the fuel pressure sensor while the engine is running. If the input voltage from the fuel pressure sensor is **more than 4.8 V**, the PCM determines that there is a malfunction in the fuel pressure sensor circuit.
POSSIBLE CAUSE	• Fuel pressure sensor malfunction • Connector or terminal malfunction • Fuel pressure sensor power and signal circuits are shorted to each other. • Short to power supply in wiring between fuel pressure sensor terminal B and PCM terminal 140 • Open circuit in wiring between fuel pressure sensor terminal A and PCM terminal 191 • PCM malfunction



FUEL PRESSURE SENSOR WIRING HARNESS-SIDE CONNECTOR



PCM WIRING HARNESS-SIDE CONNECTOR



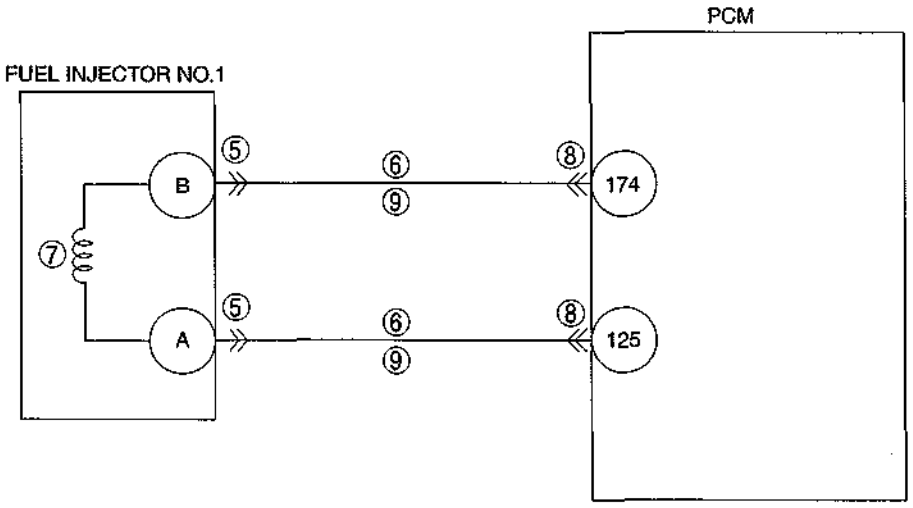
Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related Service Information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available Service Information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**INSPECT FUEL PRESSURE SENSOR CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Inspect for poor connection (such as damaged/ pulled-out terminals, corrosion). • Is there any malfunction?	Yes	Repair or replace the suspected terminal, go to Step 9.
		No	Go to the next step.
5	**INSPECT FUEL PRESSURE SENSOR SIGNAL CIRCUIT FOR SHORT TO POWER SUPPLY** • Turn the engine switch to the ON position (Engine off). • Measure the voltage between fuel pressure sensor terminal B (wiring harness-side) and body ground • Is the voltage **more than 4.8 V**	Yes	Repair or replace harness for short with each other, go to Step 9.
		No	Go to the next step.
6	**INSPECT FUEL PRESSURE SENSOR** • Inspect the fuel pressure sensor. (See 01-40B-33 FUEL PRESSURE SENSOR INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Repair the supply pump, go to Step 9. (See 01-14B-11 SUPPLY PUMP REMOVAL/ INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
7	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Inspect for poor connection (such as damaged/ pulled-out terminals, corrosion). • Is there any malfunction?	Yes	Repair or replace the suspected terminal, go to Step 9.
		No	Go to the next step.
8	**INSPECT FUEL PRESSURE SENSOR FOR OPEN CIRCUIT** • Turn the engine switch off. • Inspect for continuity between fuel pressure sensor terminal A and PCM terminal 191. • Is there continuity?	Yes	Go to the next step.
		No	Repair or replace the wiring harness for an open circuit, go to the next step.
9	**VERIFY TROUBLESHOOTING OF DTC P0193 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
10	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

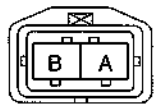
DTC P0201 [WL-C, WE-C]

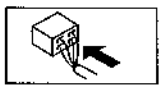
dcf010200200w02

DTC P0201	Fuel injector No.1 circuit open/short
DETECTION CONDITION	• The PCM monitors each cylinder fuel injector control signal current while the engine is running. If the PCM detects a control signal current of more or less than the preprogrammed criteria, the PCM determines that the fuel injector at No. 1cylinder has an open or short circuit.
POSSIBLE CAUSE	• Connector or terminal malfunction • Fuel injector No.1 malfunction • Short to ground in wiring between fuel injector No.1 terminal B and PCM terminal 174 • Open circuit in wiring between fuel injector No.1 terminal B and PCM terminal 174 • Open circuit in wiring between fuel injector No.1 terminal A and PCM terminal 125 • PCM malfunction

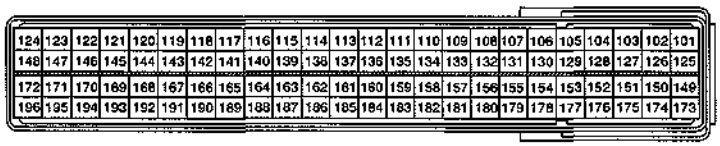


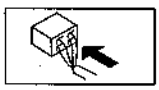
FUEL INJECTOR NO.1
WIRING HARNESS-SIDE CONNECTOR





PCM
WIRING HARNESS-SIDE CONNECTOR





Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING".
4	**IDENTIFY TRIGGER DTC FOR FREEZE FRAME DATA** • Is DTC P0201 on FREEZE FRAME DATA?	Yes	Go to the next step.
		No	Go to troubleshooting procedures for the DTC in FREEZE FRAME DATA.

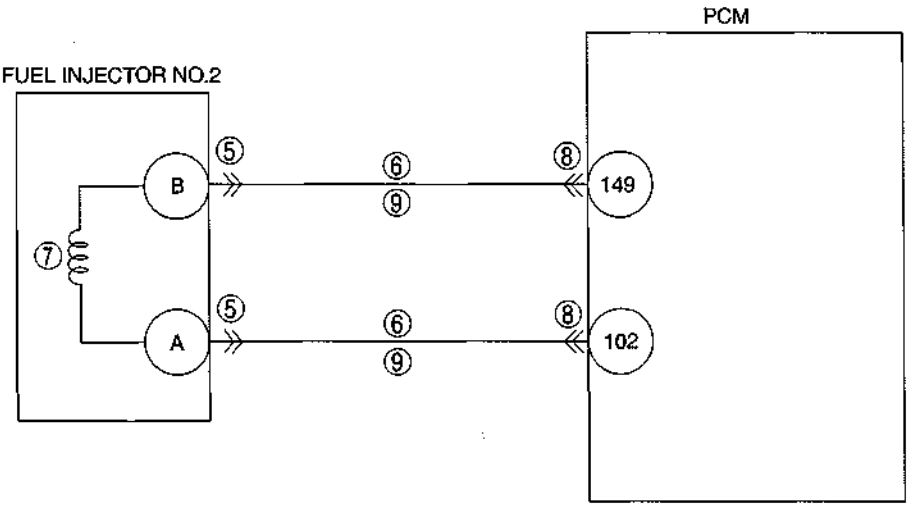
STEP	INSPECTION		ACTION
5	**INSPECT FUEL INJECTOR NO.1 CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Inspect for poor connection (such as damaged/ pulled-out terminals, corrosion). • Is there any malfunction?	Yes	Repair or replace the suspected terminal, then go to Step 10.
		No	Go to the next step.
6	**INSPECT FUEL INJECTOR NO.1 FOR SHORT TO GROUND** • Turn the engine switch off. • Disconnect fuel injector No.1 connector. • Inspect for continuity between the following fuel injector No.1 connector terminals and body ground. — Terminal A (wiring harness-side) — Terminal B (wiring harness-side) • Is there continuity?	Yes	Repair or replace the wiring harness for a short to ground, then go to Step 10.
		No	Go to the next step.
7	**INSPECT FUEL INJECTOR NO.1** • Inspect the fuel injector No.1. • Is there any malfunction?	Yes	Replace fuel injector No.1, then go to Step 10. (See 01-14B-15 FUEL INJECTOR REMOVAL/ INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
8	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Inspect for poor connection (such as damaged/ pulled-out terminals, corrosion). • Is there any malfunction?	Yes	Repair or replace the suspected terminal, then go to Step 10.
		No	Go to the next step.
9	**INSPECT FOR OPEN CIRCUIT BETWEEN FUEL INJECTOR NO.1 AND PCM** • Turn the engine switch off. • PCM and fuel injector No.1 connector disconnected. • Inspect for continuity between fuel injector No.1 and PCM at following wiring harness-side connector: — PCM terminal 174 and fuel injector No.1 terminal B — PCM terminal 125 and fuel injector No.1 terminal A • Is there continuity?	Yes	Go to the next step.
		No	Repair or replace the wiring harness for an open circuit, then go to the next step.
10	**VERIFY TROUBLESHOOTING OF DTC P0201 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear the DTC using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
11	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC troubleshooting. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

DTC P0202 [WL-C, WE-C]

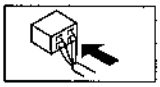
dcf010200200w03

DTC P0202	Fuel injector No.2 circuit open/short
DETECTION CONDITION	• The PCM monitors each cylinder fuel injector control signal current while the engine is running. If the PCM detects a control signal current of more or less than the preprogrammed criteria, the PCM determine that the fuel injector at No.2 cylinder has an open or short circuit.
POSSIBLE CAUSE	• Connector or terminal malfunction • Fuel injector No.2 malfunction • Short to ground in wiring between fuel injector No.2 terminal B and PCM terminal 149 • Open circuit in wiring between fuel injector No.2 terminal B and PCM terminal 149 • Open circuit in wiring between fuel injector No.2 terminal A and PCM terminal 102 • PCM malfunction

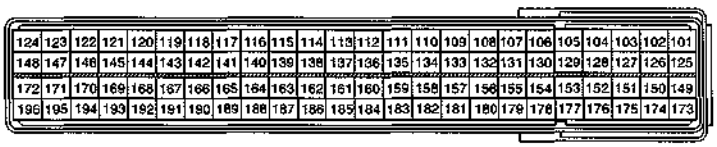
DTC P0202	Fuel injector No.2 circuit open/short

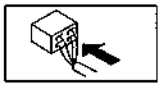


FUEL INJECTOR NO.2
WIRING HARNESS-SIDE CONNECTOR



PCM
WIRING HARNESS-SIDE CONNECTOR





Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING".
4	**IDENTIFY TRIGGER DTC FOR FREEZE FRAME DATA** • Is DTC P0202 on FREEZE FRAME DATA?	Yes	Go to the next step.
		No	Go to the troubleshooting procedures for the DTC in the FREEZE FRAME DATA.
5	**INSPECT FUEL INJECTOR NO.2 CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Inspect for poor connection (such as damaged/ pulled-out terminals, corrosion). • Is there any malfunction?	Yes	Repair or replace the suspected terminal, then go to Step 10.
		No	Go to the next step.

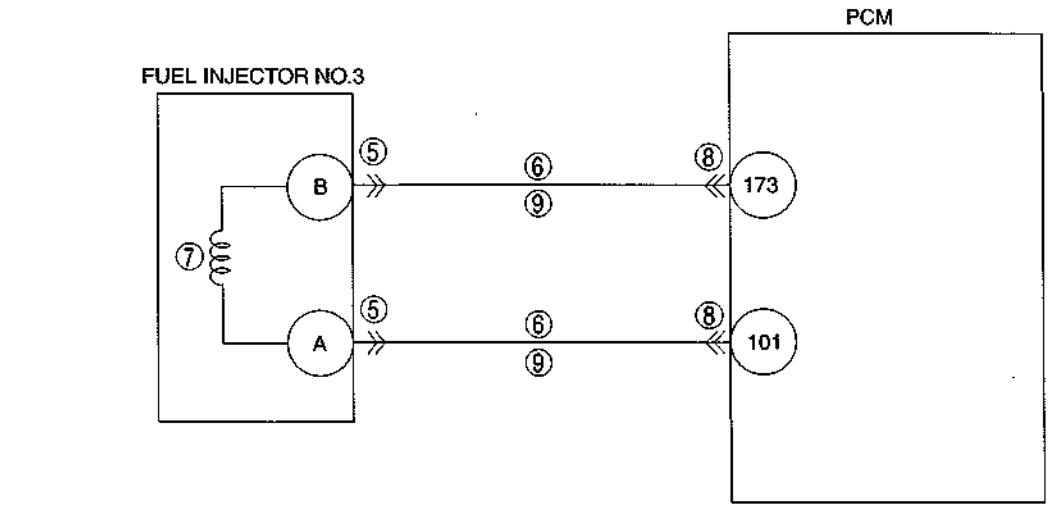
STEP	INSPECTION		ACTION
6	**INSPECT FUEL INJECTOR NO.2 FOR SHORT TO GROUND** • Turn the engine switch off. • Disconnect fuel injector No.2 connector. • Inspect for continuity between the following fuel injector No.2 terminals and body ground. — Terminal A (wiring harness-side) — Terminal B (wiring harness-side) • Is there continuity?	Yes	Repair or replace the wiring harness for a short to ground, then go to Step 10.
		No	Go to the next step.
7	**INSPECT FUEL INJECTOR NO.2** • Inspect the fuel injector No.2. • Is there any malfunction?	Yes	Replace fuel injector No.2, then go to Step 10. (See 01-14B-15 FUEL INJECTOR REMOVAL/ INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
8	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Inspect for poor connection (such as damaged/ pulled-out terminals, corrosion). • Is there any malfunction?	Yes	Repair or replace the suspected terminal, then go to Step 10.
		No	Go to the next step.
9	**INSPECT FOR OPEN CIRCUIT BETWEEN FUEL INJECTOR NO.2 AND PCM** • Turn the engine switch off. • PCM and fuel injector No.2 connector disconnected. • Inspect for continuity between fuel injector No.2 and PCM at following harness-side connector. — PCM terminal 149 and fuel injector No.2 terminal B — PCM terminal 102 and fuel injector No.2 terminal A • Is there continuity?	Yes	Go to the next step.
		No	Repair or replace the wiring harness for an open circuit, then go to the next step.
10	**VERIFY TROUBLESHOOTING OF DTC P0202 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear the DTC using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
11	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC troubleshooting. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

DTC P0203 [WL-C, WE-C]

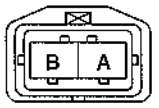
dcf010200200w04

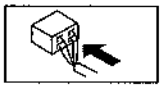
DTC P0203	Fuel injector No.3 circuit open/short
DETECTION CONDITION	• The PCM monitors each cylinder fuel injector control signal current while the engine is running. If the PCM detects a control signal current of more or less than the preprogrammed criteria, the PCM determines that the fuel injector at No.3 cylinder has an open or short circuit.
POSSIBLE CAUSE	• Connector or terminal malfunction • Fuel injector No.3 malfunction • Short to ground in wiring between fuel injector No.3 terminal B and PCM terminal 173 • Open circuit in wiring between fuel injector No.3 terminal B and PCM terminal 173 • Open circuit in wiring between fuel injector No.3 terminal A and PCM terminal 101 • PCM malfunction

DTC P0203	Fuel injector No.3 circuit open/short

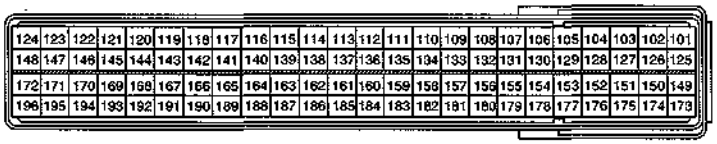


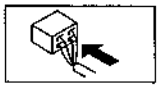
FUEL INJECTOR NO.3
WIRING HARNESS-SIDE CONNECTOR





PCM
WIRING HARNESS-SIDE CONNECTOR





Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING".
4	**IDENTIFY TRIGGER DTC FOR FREEZE FRAME DATA** • Is DTC P0203 on the FREEZE FRAME DATA?	Yes	Go to the next step.
		No	Go to the troubleshooting procedures for the DTC in the FREEZE FRAME DATA.
5	**INSPECT FUEL INJECTOR NO.3 CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Inspect for poor connection (such as damaged/ pulled-out terminals, corrosion). • Is there any malfunction?	Yes	Repair or replace the suspected terminal, then go to Step 10.
		No	Go to the next step.

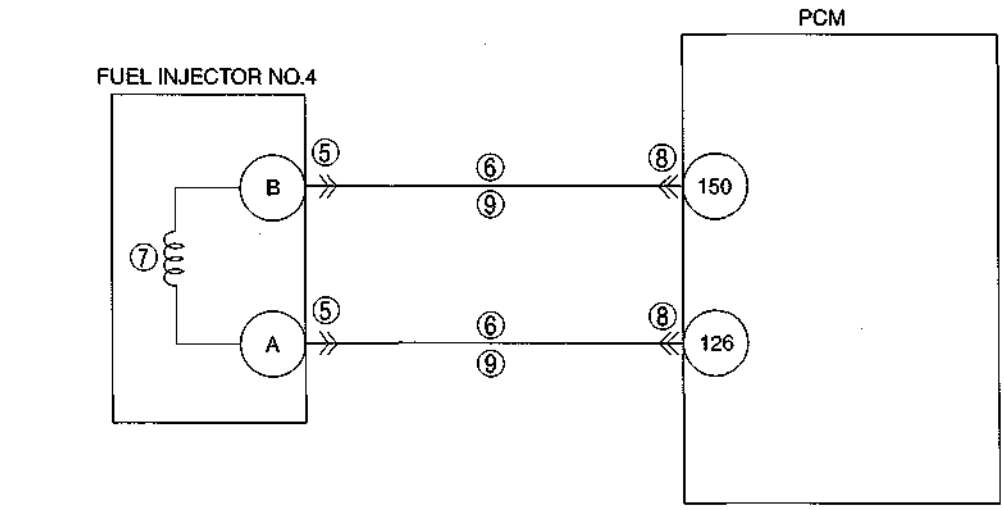
STEP	INSPECTION		ACTION
6	**INSPECT FUEL INJECTOR NO.3 FOR SHORT TO GROUND** • Turn the engine switch off. • Disconnect fuel injector No.3 connector. • Inspect for continuity between the following fuel injector No.3 terminals and body ground: — Terminal A (wiring harness-side) — Terminal B (wiring harness-side) • Is there continuity?	Yes	Repair or replace the wiring harness for a short to ground, then go to Step 10.
		No	Go to the next step.
7	**INSPECT FUEL INJECTOR NO.3** • Inspect the fuel injector No.3. • Is there any malfunction?	Yes	Replace fuel injector No.3, then go to Step 10. (See 01-14B-15 FUEL INJECTOR REMOVAL/ INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
8	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Inspect for poor connection (such as damaged/ pulled-out terminals, corrosion). • Is there any malfunction?	Yes	Repair or replace the suspected terminal, then go to Step 10.
		No	Go to the next step.
9	**INSPECT FOR OPEN CIRCUIT BETWEEN FUEL INJECTOR NO.3 AND PCM** • Turn the engine switch off. • PCM and fuel injector No.3 connector disconnected. • Inspect for continuity between fuel injector No.3 and PCM at following wiring harness-side connector: — PCM terminal 173 and fuel injector No.3 terminal B — PCM terminal 101 and fuel injector No.3 terminal A • Is there continuity?	Yes	Go to the next step.
		No	Repair or replace the wiring harness for an open circuit, then go to the next step.
10	**VERIFY TROUBLESHOOTING OF DTC P0203 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear the DTC using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
11	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC troubleshooting. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

DTC P0204 [WL-C, WE-C]

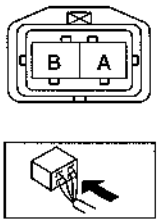
dcf010200200w05

DTC P0204	Fuel injector No.4 circuit open/short
DETECTION CONDITION	• The PCM monitors each cylinder fuel injector control signal current while the engine is running. If the PCM detects a control signal current of more or less than the preprogrammed criteria, the PCM determines that the fuel injector at No.4 cylinder has an open or short circuit.
POSSIBLE CAUSE	• Connector or terminal malfunction • Fuel injector No.4 malfunction • Short to ground in wiring between fuel injector No.4 terminal B and PCM terminal 150 • Open circuit in wiring between fuel injector No.4 terminal B and PCM terminal 150 • Open circuit in wiring between fuel injector No.4 terminal A and PCM terminal 126 • PCM malfunction

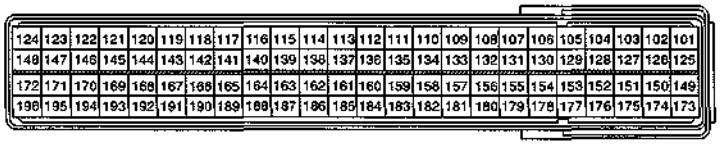
DTC P0204	Fuel injector No.4 circuit open/short

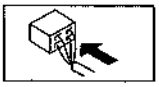


FUEL INJECTOR NO.4
WIRING HARNESS-SIDE CONNECTOR



PCM
WIRING HARNESS-SIDE CONNECTOR





Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING".
4	**IDENTIFY TRIGGER DTC FOR FREEZE FRAME DATA** • Is DTC P0204 on FREEZE FRAME DATA?	Yes	Go to the next step.
		No	Go to the troubleshooting procedures for the DTC in the FREEZE FRAME DATA.
5	**INSPECT FUEL INJECTOR NO.4 CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Inspect for poor connection (such as damaged/ pulled-out terminals, corrosion). • Is there any malfunction?	Yes	Repair or replace the suspected terminal, then go to Step 10.
		No	Go to the next step.

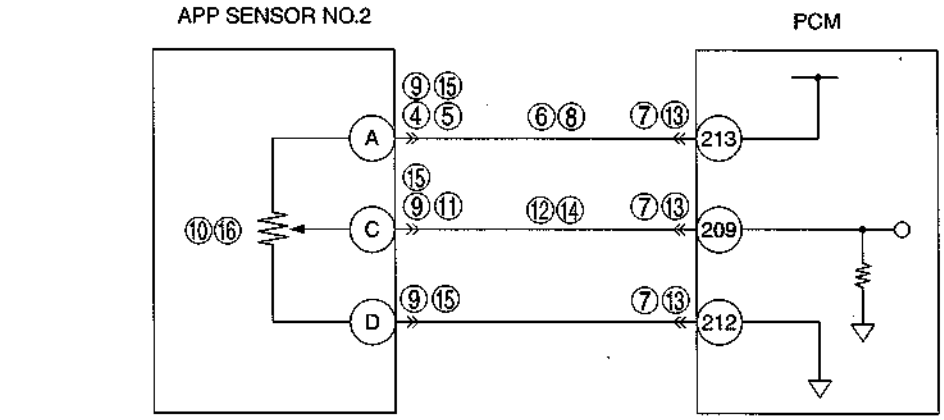
STEP	INSPECTION		ACTION
6	**INSPECT FUEL INJECTOR NO.4 FOR SHORT TO GROUND** • Turn the engine switch off. • Disconnect fuel injector No.4 connector. • Inspect for continuity between the following fuel injector No.4 terminals and body ground. — Terminal A (wiring harness-side) — Terminal B (wiring harness-side) • Is there continuity?	Yes	Repair or replace the wiring harness for a short to ground, then go to Step 10.
		No	Go to the next step.
7	**INSPECT FUEL INJECTOR NO.4** • Inspect the fuel injector No.4. • Is there any malfunction?	Yes	Replace fuel injector No.4, then go to Step 10. (See 01-14B-15 FUEL INJECTOR REMOVAL/ INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
8	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Inspect for poor connection (such as damaged/ pulled-out terminals, corrosion). • Is there any malfunction?	Yes	Repair or replace the suspected terminal, then go to Step 10.
		No	Go to the next step.
9	**INSPECT FOR OPEN CIRCUIT BETWEEN FUEL INJECTOR NO.4 AND PCM** • Turn the engine switch off. • PCM and fuel injector No.4 connector disconnected. • Inspect for continuity between fuel injector No.4 (wiring harness-side) and PCM at following wiring harness-side connector. — PCM terminal 150 and fuel injector No.4 terminal B — PCM terminal 126 and fuel injector No.4 terminal A • Is there continuity?	Yes	Go to the next step.
		No	Repair or replace the wiring harness for an open circuit, then go to the next step.
10	**VERIFY TROUBLESHOOTING OF DTC P0204 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear the DTC using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
11	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC troubleshooting. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

DTC P0222 [WL-C, WE-C]

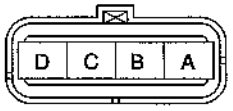
dcf010200200w06

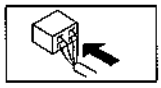
DTC P0222	Accelerator pedal position (APP) sensor No.2 circuit low input
DETECTION CONDITION	• The PCM monitors the input signal from APP sensor No.2. If the voltage from APP sensor No.2 is **less than 0.29 V for 0.5 s** when the APP sensor No.2 power supply voltage is normal, the PCM determines that there is a malfunction in the APP sensor No.2 circuit.
POSSIBLE CAUSE	• APP sensor No.2 malfunction • Connector or terminal malfunction • Open circuit in wiring harness between APP sensor No.2 terminal A and PCM terminal 213 • Short to ground in wiring harness between APP sensor No.2 terminal A and PCM terminal 213 • Open circuit in wiring harness between APP sensor No.2 terminal C and PCM terminal 209 • Short to ground in wiring harness between APP sensor No.2 terminal C and PCM terminal 209 • PCM malfunction

DTC P0222	Accelerator pedal position (APP) sensor No.2 circuit low input

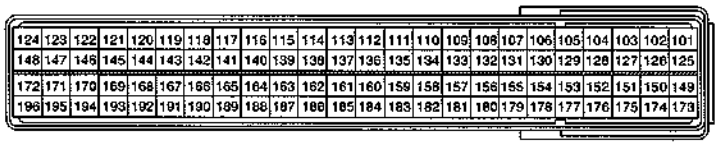


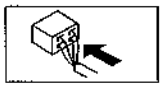
APP SENSOR
WIRING HARNESS-SIDE CONNECTOR





PCM
WIRING HARNESS-SIDE CONNECTOR





Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**CLASSIFY 5V CONSTANT VOLTAGE CIRCUIT OR OTHER RELATED MALFUNCTION** • Turn the engine switch to the ON position (Engine off). • Measure the voltage between the APP sensor terminal A (wiring harness-side) and body ground. • Is the voltage **5 V constant voltage** ?	Yes	Go to Step 11.
		No	Go to the next step.
5	**CLASSIFY 5V CONSTANT VOLTAGE CIRCUIT OR APP SENSOR RELATED MALFUNCTION** • Disconnect the APP sensor connector. • Turn the engine switch to the ON position (Engine off). • Measure the voltage between the APP sensor terminal A (wiring harness-side) and body ground. • Is the voltage **5 V constant voltage** ?	Yes	Go to Step 9.
		No	Go to the next step.

STEP	INSPECTION		ACTION
6	**INSPECT APP SENSOR 5V CONSTANT VOLTAGE CIRCUIT FOR SHORT TO GROUND** • Turn the engine switch off. • Inspect for continuity between the APP sensor terminal A (wiring harness-side) and body ground • Is there continuity?	Yes	Repair or replace the wiring harness for a possible short to ground, then go to Step 17.
		No	Go to the next step.
7	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 17.
		No	Go to the next step.
8	**INSPECT APP SENSOR 5V CONSTANT VOLTAGE CIRCUIT FOR OPEN** • Turn the engine switch off. • Inspect for continuity between the APP sensor terminal A (wiring harness-side) and PCM terminal 213 (wiring harness-side). • Is there continuity?	Yes	Go to step 17.
		No	Repair or replace the wiring harness for an open circuit, then go to Step 17.
9	**INSPECT APP SENSOR CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the APP sensor connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 17.
		No	Go to the next step.
10	**INSPECT APP SENSOR** • Inspect the APP sensor. (See 01-40B-28 ACCELERATOR PEDAL POSITION (APP) SENSOR INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the APP sensor, then go to Step 17.
		No	Go to step 17.
11	**CLASSIFY SIGNAL CIRCUIT OR OTHER RELATED MALFUNCTION** • Turn the engine switch to the ON position (Engine off). • Measure the voltage between the APP sensor terminal A (wiring harness-side) and body ground. • Is the voltage **more than 0.29 V** ?	Yes	Go to Step 13.
		No	Go to the next step.
12	**INSPECT APP SENSOR SIGNAL CIRCUIT FOR SHORT TO GROUND** • Turn the engine switch off. • Disconnect the APP sensor connector. • Inspect for continuity between the APP sensor terminal C (wiring harness-side) and body ground • Is there continuity?	Yes	Repair or replace the wiring harness for a possible short to ground, then go to Step 17.
		No	Go to Step 15.
13	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 17.
		No	Go to the next step.
14	**INSPECT APP SENSOR SIGNAL CIRCUIT FOR OPEN** • Turn the engine switch off. • Inspect for continuity between the APP sensor terminal C (wiring harness-side) and PCM terminal 209 (wiring harness-side). • Is there continuity?	Yes	Go to Step 17.
		No	Repair or replace the wiring harness for an open circuit, then go to Step 17.

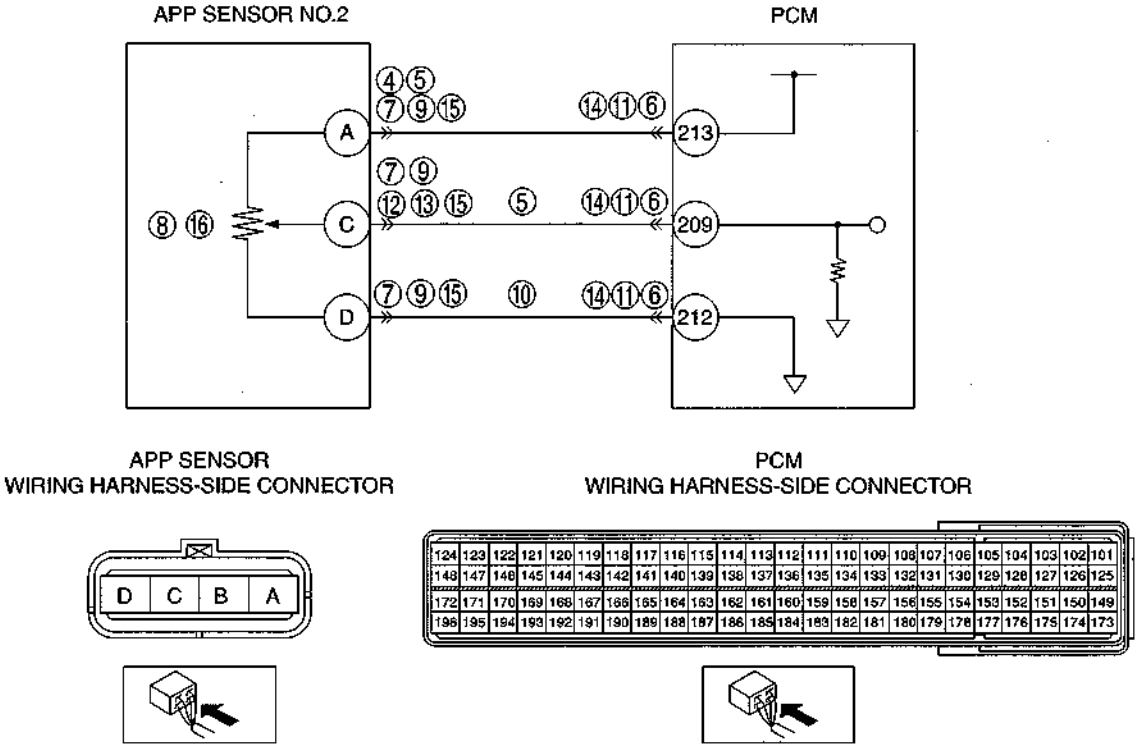
STEP	INSPECTION		ACTION
15	**INSPECT APP SENSOR CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the APP sensor connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 17.
		No	Go to the next step.
16	**INSPECT APP SENSOR** • Inspect the APP sensor. (See 01-40B-28 ACCELERATOR PEDAL POSITION (APP) SENSOR INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the APP sensor, then go to the next step.
		No	Go to the next step.
17	**VERIFY TROUBLESHOOTING OF DTC P0222 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
18	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	DTC troubleshooting completed.

DTC P0223 [WL-C, WE-C]

dcf010200200w07

DTC P0223	Accelerator pedal position (APP) sensor No.2 circuit high input
DETECTION CONDITION	• The PCM monitors the input signal from APP sensor No.2. If the voltage from APP sensor No.2 is **more than 4.80 V for 0.5 s** when the APP sensor no.2 power supply voltage is normal, the PCM determines that there is a malfunction in the APP sensor No.2 circuit.
POSSIBLE CAUSE	• APP sensor No.2 malfunction • Connector or terminal malfunction • Short to power supply in wiring harness between APP sensor No.2 terminal A and PCM terminal 213 • Short to power supply in wiring harness between APP sensor No.2 terminal C and PCM terminal 209 • Open circuit in wiring harness between APP sensor No.2 terminal D and PCM terminal 212 • PCM malfunction

DTC P0223	Accelerator pedal position (APP) sensor No.2 circuit high input



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**CLASSIFY 5V CONSTANT VOLTAGE CIRCUIT OR OTHER RELATED MALFUNCTION** • Turn the engine switch to the ON position (Engine off). • Measure the voltage between the APP sensor terminal A (wiring harness-side) and body ground. • Is the voltage **5 V constant voltage** ?	Yes	Go to Step 9.
		No	Go to the next step.
5	**CLASSIFY 5V CONSTANT VOLTAGE CIRCUIT OR APP SENSOR RELATED MALFUNCTION** • Disconnect the APP sensor connector. • Turn the engine switch to the ON position (Engine off). • Measure the voltage between the APP sensor terminal A (wiring harness-side) and body ground. • Is the voltage **5 V constant voltage** ?	Yes	Go to Step 15.
		No	Go to the next step.

STEP	INSPECTION		ACTION
6	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 17.
		No	Repair or replace the wiring harness for a possible short to power supply, then go to Step 17.
7	**INSPECT APP SENSOR CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the APP sensor connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 17.
		No	Go to the next step.
8	**INSPECT APP SENSOR** • Inspect the APP sensor. (See 01-40B-28 ACCELERATOR PEDAL POSITION (APP) SENSOR INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the APP sensor, then go to Step 17.
		No	Go to Step 17.
9	**INSPECT APP SENSOR CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the APP sensor connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 17.
		No	Go to the next step.
10	**INSPECT APP SENSOR GROUND CIRCUIT FOR OPEN CIRCUIT** • Turn the engine switch off. • Inspect for continuity between APP sensor terminal D and body ground. • Is there continuity?	Yes	Go to Step 12.
		No	Go to the next step.
11	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 17.
		No	Repair or replace the wiring harness for an open circuit, then go to the Step 17.
12	**CLASSIFY SIGNAL CIRCUIT OR OTHER RELATED MALFUNCTION** • Turn the engine switch to the ON position (Engine off). • Measure the voltage between the APP sensor terminal C (wiring harness-side) and body ground. • Is the voltage **less than 4.9 V** ?	Yes	Go to Step 17.
		No	Go to the next step.
13	**CLASSIFY SIGNAL CIRCUIT OR APP SENSOR RELATED MALFUNCTION** • Disconnect the APP sensor connector. • Turn the engine switch to the ON position (Engine off). • Measure the voltage between the APP sensor terminal C (wiring harness-side) and body ground. • Is the voltage **less than 4.9 V** ?	Yes	Go to the next step.
		No	Go to Step 15.
14	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 17.
		No	Repair or replace the wiring harness for a possible short to power supply, then go to Step 17.

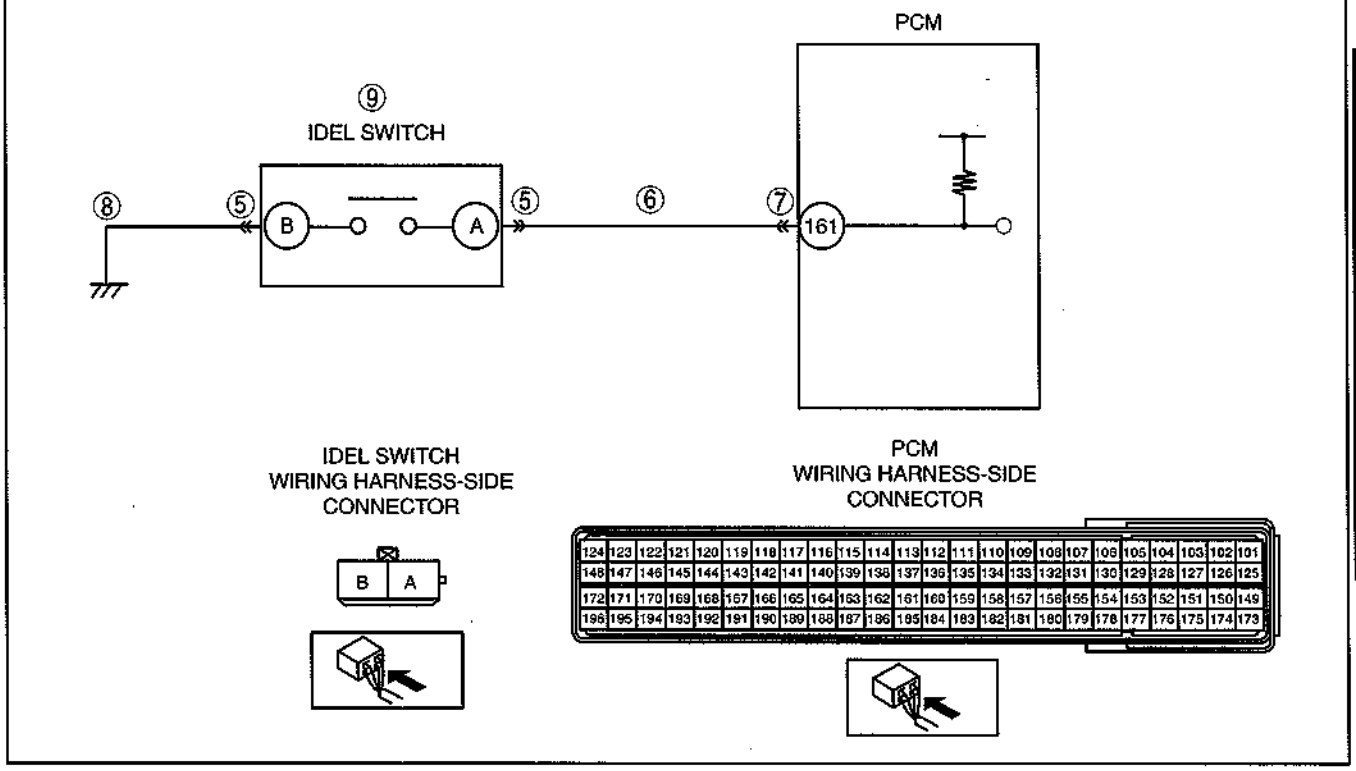
STEP	INSPECTION		ACTION
15	**INSPECT APP SENSOR CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the APP sensor connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 17.
		No	Go to the next step.
16	**INSPECT APP SENSOR** • Inspect the APP sensor. (See 01-40B-28 ACCELERATOR PEDAL POSITION (APP) SENSOR INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the APP sensor, then go to the step.
		No	Go to the step.
17	**VERIFY TROUBLESHOOTING OF DTC P0223 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
18	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	DTC troubleshooting completed.

DTC P0227 [WL-C, WE-C]

dcf010200200w08

DTC P0227	Idle switch circuit low input
DETECTION CONDITION	• The PCM monitors the input voltage from APP sensor No.1 when the idle switch is off. If the input voltage is **less than 0.86 V for 1.5 s**, the PCM determines that the idle switch circuit has a malfunction.
POSSIBLE CAUSE	• Idle switch malfunction. • Accelerator pedal misadjustment. • Connector or terminal malfunction • Open circuit in wiring harness between Idle switch terminal A and PCM terminal 161 • Open circuit in wiring harness between Idle switch terminal B and body ground. • PCM malfunction

DTC P0227	Idle switch circuit low input



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA AND DIAGNOSTIC MONITORING TEST RESULTS HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related Service Information availability. • Is any related Service Information available?	Yes	Perform repair or diagnosis according to the available Service information. If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**VERIFY RELATED PENDING CODE OR STORED DTC** • Is DTC P0122 present?	Yes	Go to the next step.
		No	Go to appropriate DTC troubleshooting procedure. (See 01-02B-48 DTC P0122 [WL-C, WE-C].)
5	**INSPECT IDLE SWITCH CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the idle switch connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 10.
		No	Go to the next step.
6	**INSPECT IDLE SWITCH POWER CIRCUIT FOR OPEN CIRCUIT** • Turn the engine switch to the ON position (Engine off). • Measure the voltage between the idle switch terminal A (wiring harness-side) and body ground. • Is the voltage B+ ?	Yes	Go to go to step 8.
		No	Go to the next Step.

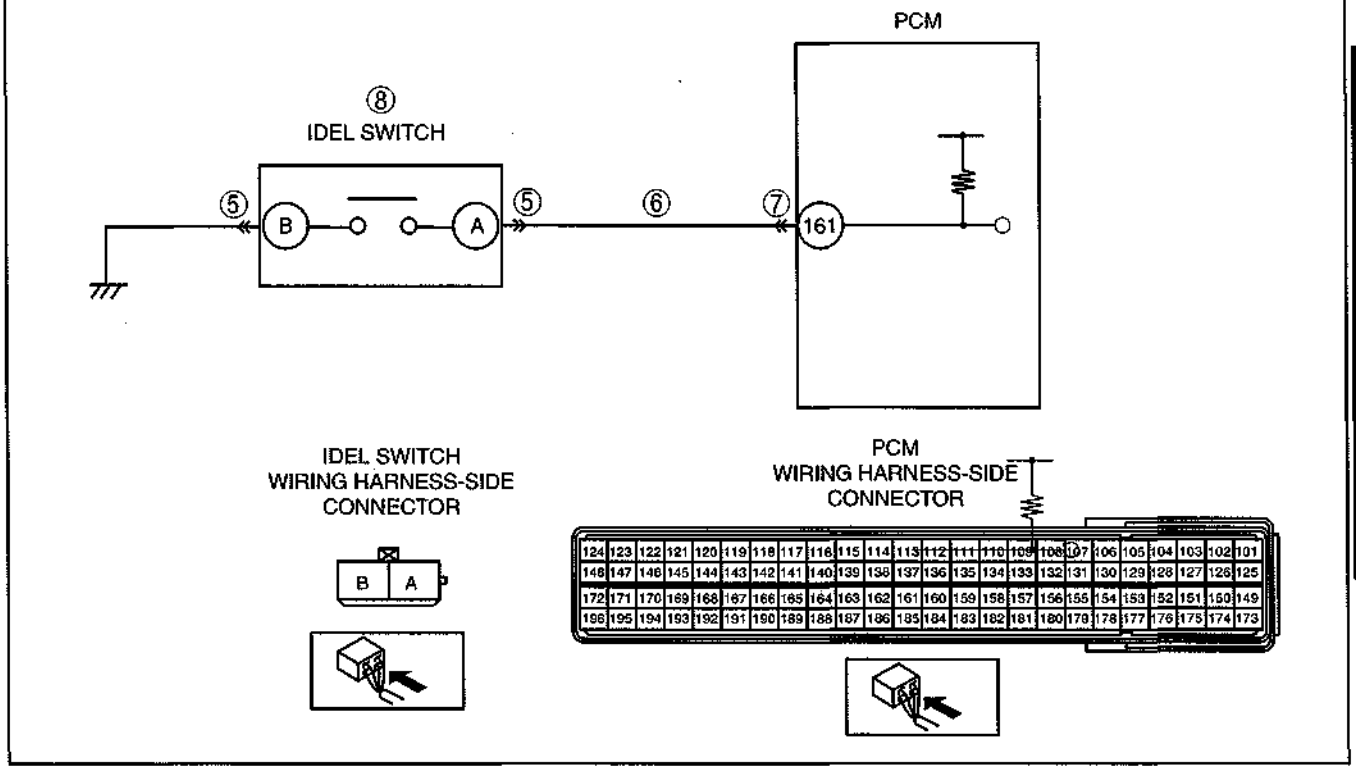
STEP	INSPECTION		ACTION
7	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion) • Is there any malfunction?	Yes	Repair or replace the terminal, then go to step 10.
		No	Repair or replace the wiring harness for an open circuit, then go to Step 10.
8	**INSPECT IDLE SWITCH GROUND CIRCUIT FOR OPEN CIRCUIT** • Turn the engine switch off. • Inspect for continuity between APP sensor terminal B and body ground. • Is there continuity?	Yes	Go to the next step.
		No	Repair or replace the wiring harness for an open circuit, then go to Step 10.
9	**INSPECT IDLE SWITCH** • Inspect idle switch. (See 01-40B-30 IDLE SWITCH INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the idle switch, then go to the next step. (See 01-13B-11 ACCELERATOR PEDAL COMPONENT REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Adjust the accelerator pedal, then go to the next step. (See 01-13B-12 ACCELERATOR PEDAL ADJUSTMENT [WL-C, WE-C].)
10	**VERIFY TROUBLESHOOTING OF DTC P0227 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
11	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	DTC troubleshooting completed.

DTC P0228 [WL-C, WE-C]

dcf010200200w09

DTC P0228	**Idle switch circuit high input**
DETECTION CONDITION	• The PCM monitors the input voltage from APP sensor No.1 when the idle switch is on. If the input voltage is **more than 1.35 V for 1.5 s**, the PCM determines that the idle switch circuit has a malfunction.
POSSIBLE CAUSE	• Idle switch malfunction. • Accelerator pedal misadjustment. • Short to ground in wiring harness between idle switch terminal A and PCM terminal 161 • PCM malfunction

DTC P0228	Idle switch circuit high input



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA AND DIAGNOSTIC MONITORING TEST RESULTS HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related Service Information availability. • Is any related Service Information available?	Yes	Perform repair or diagnosis according to the available Service information. If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**VERIFY RELATED PENDING CODE OR STORED DTC** • Is DTC P0123 present?	Yes	Go to the next step.
		No	Go to appropriate DTC troubleshooting procedure. (See 01-02B-50 DTC P0123 [WL-C, WE-C].)
5	**INSPECT IDLE SWITCH CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the idle switch connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 9.
		No	Go to the next step.
6	**INSPECT IDLE SWITCH POWER CIRCUIT FOR SHORT TO GROUND** • Turn the engine switch off. • Inspect for continuity between idle switch terminal A and body ground. • Is there continuity?	Yes	Go to next the step.
		No	Go to Step 8.

STEP	INSPECTION		ACTION
7	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 9.
		No	Repair or replace the wiring harness for a short to ground circuit, then go to Step 9.
8	**INSPECT IDLE SWITCH** • Inspect idle switch. (See 01-40B-30 IDLE SWITCH INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the idle switch, then go to the next step. (See 01-13B-11 ACCELERATOR PEDAL COMPONENT REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Adjust the accelerator pedal, then go to the next step. (See 01-13B-12 ACCELERATOR PEDAL ADJUSTMENT [WL-C, WE-C].)
9	**VERIFY TROUBLESHOOTING OF DTC P0228 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
10	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "AFTER REPAIR PROCEDURE". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Is any DTC present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	DTC troubleshooting completed.

DTC P0300 [WL-C, WE-C]

dcf010200300w02

DTC P0300	Random misfire detected
DETECTION CONDITION	• The PCM monitors the CKP sensor input signal interval time. The PCM calculates the deviation of the interval time for each cylinder. If the deviation of the interval time exceeds the preprogrammed criteria, the PCM detects a misfire in the corresponding cylinder. While the engine is running, the PCM counts the number of misfires and calculates the misfire ratio for each crankshaft revolution. If the ratio exceeds the preprogrammed criteria, the PCM determines that a misfire, which can affect emission performance, has occurred.
POSSIBLE CAUSE	• CKP sensor malfunction • CMP sensor malfunction • Fuel line clogged • Fuel filter clogged • Fuel leakage in fuel line • Fuel run out • Poor quality fuel • EGR valve malfunction • Related connector and terminal malfunction • Related wiring harness malfunction • Insufficient compression

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA AND DIAGNOSTIC MONITORING TEST RESULTS HAVE BEEN RECORDED** • Have FREEZE FRAME DATA and DIAGNOSTIC MONITORING TEST RESULTS been recorded?	Yes	go to the next step.
		No	Record the FREEZE FRAME DATA and DIAGNOSTIC MONITORING TEST RESULTS on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY RELATED PENDING CODE OR STORED DTC** • Turn the engine switch off, then ON position (Engine off). • Verify the related PENDING CODE or stored DTCs using current diagnostic tool. • Is other DTC present?	Yes	Go to appropriate DTC troubleshooting procedure. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	go to the next step.
4	**VERIFY CURRENT INPUT SIGNAL STATUS UNDER TROUBLESHOOTING CONDITION** • Access the BOO, ECT, IAT, MAF, RPM, APP, SEGRP and VSS PIDs using the current diagnostic tool. • Is any signal that is far out of specification when the engine switch is at the ON position and the engine idles?	Yes	Inspect the suspected circuit or part or both according to the inspection results. Then go to Step 12
		No	Go to the next step.
5	**VERIFY CURRENT INPUT SIGNAL STATUS UNDER TROUBLE CONDITION** • Inspect the same PIDs as in Step 4 while simulating the FREEZE FRAME DATA condition. • Is there any signal which cause drastic changes?	Yes	Inspect the suspected circuit or part or both according to the inspection results. Then go to Step 12
		No	Go to the next step.
6	**INSPECT CKP SENSOR** • Inspect the CKP sensor and the pulse wheel. • Is there any malfunction?	Yes	Repair or replace the suspected part according to the inspection results, then go to Step 12
		No	Go to the next step.
7	**INSPECT CMP SENSOR** • Inspect the CMP sensor. • Is there any malfunction?	Yes	Repair or replace the suspected part according to the inspection results, then go to Step 12
		No	Go to the next step.
8	**INSPECT OPERATION OF EGR VALVE** • Remove the EGR valve. • Visually inspect if the EGR valve is stuck open. Is the EGR valve stuck open?	Yes	Repair or replace the EGR valve, then go to Step 12
		No	go to the next step.
9	**INSPECT FUEL LINE** • Turn the engine switch off. Inspect the fuel lines for fuel leakage or clogging.	Yes	Repair or replace the suspected fuel line, then go to Step 12
		No	go to the next step.
10	**INSPECT ENGINE COOLANT PASSAGE FOR ENGINE COOLANT LEAKAGE** • Perform the engine coolant leakage inspection. Is there any malfunction?	Yes	Repair or replace the malfunctioning part according to the inspection results. Then go to Step 12
		No	go to the next step.
11	**INSPECT ENGINE COMPRESSION** • Inspect the engine compression for the suspected cylinder. Is the engine compression normal?	Yes	go to the next step.
		No	Overhaul the engine, then go to the next step.
12	**VERIFY TROUBLESHOOTING OF MISFIRE DTC COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	go to the next step.

STEP	INSPECTION		ACTION
13	**VERIFY AFTER REPAIR PROCEDURE** • Perform "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC troubleshooting. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

DTC P0301, P0302, P0303, P0304 [WL-C, WE-C]

dcf010200300w03

DTC P0301 **DTC P0302** **DTC P0303** **DTC P0304**	**Cylinder No.1 misfire detection** **Cylinder No.2 misfire detection** **Cylinder No.3 misfire detection** **Cylinder No.4 misfire detection**
DETECTION CONDITION	• The PCM monitors the CKP sensor input signal interval time. The PCM calculates the deviation of the interval time for each cylinder. If the deviation of the interval time exceeds the preprogrammed criteria, the PCM detects a misfire in the corresponding cylinder. While the engine is running, the PCM counts the number of misfires and calculates the misfire ratio for each crankshaft revolution. If the ratio exceeds the preprogrammed criteria, the PCM determines that a misfire, which can affect emission performance, has occurred.
POSSIBLE CAUSE	• Fuel injector malfunction • CKP sensor malfunction • CMP sensor malfunction • Inadequate engine compression due to engine internal malfunction • Related connector or terminal malfunction • Related wiring harness malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING".
4	**IDENTIFY TRIGGER DTC FOR FREEZE FRAME DATA** • Is DTC P0301, P0302, P0303 or P0304 on FREEZE FRAME DATA?	Yes	Go to the next step.
		No	Go to troubleshooting procedures for the DTC on the FREEZE FRAME DATA.
5	**INSPECT FUEL LINE** • Turn the engine switch off. • Inspect the fuel lines of the suspected cylinder for fuel leakage or clogging.	Yes	Repair or replace the suspected fuel line, then go to Step 13.
		No	Go to the next step.
6	**VERIFY CURRENT INPUT SIGNAL STATUS UNDER TROUBLESHOOTING CONDITION** • Access the BOO, ECT, IAT, MAF, RPM, APP, SEGRP and VSS PIDs using the current diagnostic tool. • Is any signal that is far out of specification when the engine switch is at the ON position and the engine idles?	Yes	Inspect the suspected circuit or part or both according to the inspection results. Then go to Step 13.
		No	Go to the next step.

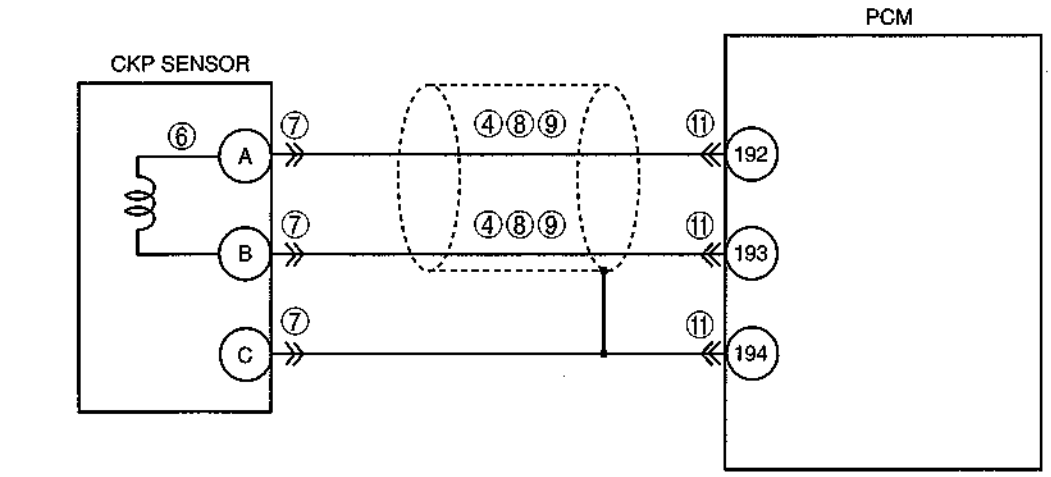
STEP	INSPECTION		ACTION
7	**VERIFY CURRENT INPUT SIGNAL STATUS UNDER TROUBLE CONDITION** • Inspect the same PIDs as in Step 6 while simulating the FREEZE FRAME DATA condition. • Is there any signal which cause drastic changes?	Yes	Inspect suspected circuit or part or both according to the inspection results. Then go to Step 13.
		No	Go to the next step.
8	**INSPECT CKP SENSOR** • Inspect the CKP sensor and the pulse wheel. • Is there any malfunction?	Yes	Repair or replace the suspected part according to the inspection results, then go to Step 13.
		No	Go to the next step.
9	**INSPECT CMP SENSOR** • Inspect the CMP sensor. • Is there any malfunction?	Yes	Repair or replace the suspected part according to the inspection results, then go to Step 13.
		No	Go to the next step.
10	**INSPECT ENGINE COOLANT PASSAGE FOR ENGINE COOLANT LEAKAGE** • Perform the engine coolant leakage inspection. • Is there any malfunction?	Yes	Repair or replace the malfunctioning part according to the inspection results. Then go to Step 13.
		No	Go to the next step.
11	**INSPECT ENGINE COMPRESSION** • Inspect the engine compression for the suspected cylinder. • Is the engine compression normal?	Yes	Go to the next step.
		No	Overhaul the engine, then go to Step 13.
12	**INSPECT FUEL INJECTOR** • Inspect the fuel injector and the related circuit for the suspected cylinder. • Is there any malfunction?	Yes	Repair or replace the suspected part according to the inspection results, then go to the next step.
		No	Go to the next step.
13	**VERIFY TROUBLESHOOTING OF MISFIRE DTC COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Access the ECT PID using the current diagnostic tool. • Warm-up the engine until the ECT PID is above 40 °C {104 °F}. • Idle engine for 5s or more. • Repeat the above mentioned for twice. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
14	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC troubleshooting. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

DTC P0335 [WL-C, WE-C]

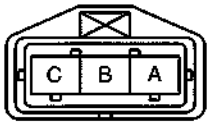
dcf010200300w04

DTC P0335	Crankshaft position (CKP) sensor circuit malfunction
DETECTION CONDITION	• The PCM monitors the input signal from the CKP sensor while the engine is running. If the following conditions are detected, the PCM determines that the CKP circuit has a malfunction. — The PCM receives no pulse from the CKP sensor — The PCM receives an improper pulse number from the CKP sensor
POSSIBLE CAUSE	• CKP sensor malfunction • Connector or terminal malfunction • Short to power supply between CKP sensor terminal B and PCM terminal 193 • Short to power supply between CKP sensor terminal A and PCM terminal 192 • Short to ground between CKP sensor terminal C and PCM terminal 194 • Short to ground between CKP sensor terminal B and PCM terminal 193 • Open circuit between CKP sensor terminal B and PCM terminal 193 • Open circuit between CKP sensor terminal A and PCM terminal 192 • Loose CKP sensor installation bole • CKP sensor pulse wheel malfunction • PCM malfunction

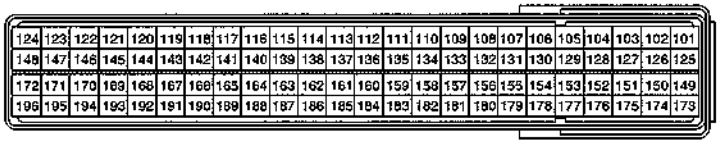
DTC P0335	Crankshaft position (CKP) sensor circuit malfunction



CKP SENSOR WIRING HARNESS-SIDE CONNECTOR



PCM WIRING HARNESS-SIDE CONNECTOR



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has the FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record FREEZE FRAME DATA on repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to available repair information. • If vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERNS TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**INSPECT CKP CIRCUIT FOR SHORT TO POWER SUPPLY** • Turn the engine switch off. • Disconnect the CKP sensor connector. • Turn the engine switch to the ON position. (Engine off). • Measure the voltage between the following terminals (wiring harness-side): — CKP sensor terminal A and body ground — CKP sensor terminal B and body ground • Is the voltage B+?	Yes	Repair or replace the wiring harness, then go to Step 12.
		No	Go to the next step.

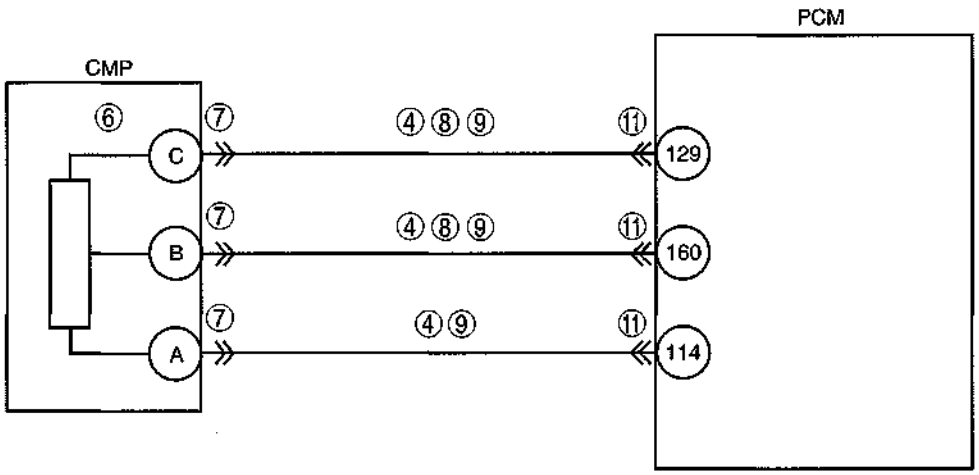
STEP	INSPECTION		ACTION
5	**VERIFY CKP SENSOR INSTALLATION CONDITION** • Inspect for CKP sensor looseness. • Is CKP sensor loosen?	Yes	Retighten the CKP sensor installation bolt, then go to Step 12. (See 01-40B-38 CRANKSHAFT POSITION (CKP) SENSOR REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
6	**INSPECT CKP SENSOR** • Turn the engine switch off. • Inspect the CKP sensor. (See 01-40B-39 CRANKSHAFT POSITION (CKP) SENSOR INSPECTION [WL-C, WE-C].) • Is the CKP sensor normal?	Yes	Go to the next step.
		No	Replace the CKP sensor, then go to Step 12. (See 01-40B-38 CRANKSHAFT POSITION (CKP) SENSOR REMOVAL/INSTALLATION [WL-C, WE-C].)
7	**INSPECT CKP SENSOR CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Verify that the CKP sensor connector is connected securely. • Is the connector normal?	Yes	Go to the next step.
		No	Reconnect the connector, then go to Step 12.
8	**INSPECT CKP CIRCUIT FOR SHORT TO GROUND** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for continuity the between the following terminals: — CKP sensor connector terminal A (wiring harness-side) and body ground — CKP sensor connector terminal B (wiring harness-side) and body ground • Is there continuity?	Yes	Repair or replace the wiring harness, then go to Step 12.
		No	Go to the next step.
9	**INSPECT CKP CIRCUIT FOR OPEN CIRCUIT** • Turn the engine switch off. • Inspect for continuity between the following terminals: — CKP sensor terminal A (wiring harness-side) and PCM terminal 192 (wiring harness-side) — CKP sensor terminal B (wiring harness-side) and PCM terminal 193 (wiring harness-side) • Is there continuity?	Yes	Go to the next step.
		No	Repair or replace the wiring harness, then go to Step 12.
10	**INSPECT DUAL-MASS FLYWHEEL** • Inspect the dual-mass flywheel for damage and/or cracks. • Is there any malfunction?	Yes	Replace the dual-mass flywheel, then go to Step 12. (See 05-10-12 CLUTCH UNIT REMOVAL/INSTALLATION.)
		No	Go to the next step.
11	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/pulled-out terminals, corrosion). • Is there any malfunction?	Yes	Repair the terminal, then go to the next step.
		No	Go to the next step.
12	**VERIFY THAT DTC P0335 TROUBLESHOOTING IS COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.

STEP	INSPECTION		ACTION
13	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	DTC troubleshooting completed.

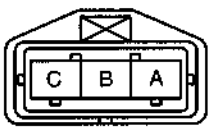
DTC P0340 [WL-C, WE-C]

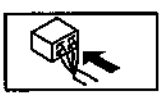
dcf010200300w05

DTC P0340	Camshaft position (CMP) sensor circuit malfunction
DETECTION CONDITION	• The PCM monitors the input signal from the CMP sensor while the engine is running. If the following conditions are detected, the PCM determines that the CMP circuit has a malfunction. — The PCM receives no pulse from the CMP sensor — The PCM receives an improper pulse number from the CMP sensor
POSSIBLE CAUSE	• CMP sensor malfunction • Connector or terminal malfunction • Short to power supply between CMP sensor terminal C and PCM terminal 129 • Short to power supply between CMP sensor terminal B and PCM terminal 160 • Short to power supply between CMP sensor terminal A and PCM terminal 114 • Short to ground between CMP sensor terminal C and PCM terminal 129 • Short to ground between CMP sensor terminal B and PCM terminal 160 • Open circuit between CMP sensor terminal C and PCM terminal 129 • Open circuit between CMP sensor terminal B and PCM terminal 160 • Open circuit between CMP sensor terminal A and PCM terminal 114 • Loose CMP sensor installation bolt • CMP sensor pulse wheel malfunction • PCM malfunction

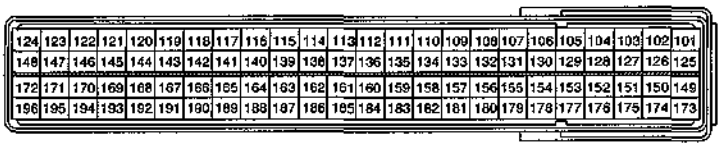


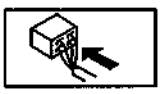
CMP SENSOR WIRING HARNESS-SIDE CONNECTOR





PCM WIRING HARNESS-SIDE CONNECTOR





Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has the FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record FREEZE FRAME DATA on repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to available repair information. • If vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERNS TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**INSPECT CMP CIRCUIT FOR SHORT TO POWER SUPPLY** • Turn the engine switch off. • Disconnect the CMP sensor connector. • Turn the engine switch to the ON position. (Engine off). • Measure the voltage between the following terminals (wiring harness-side): — CMP sensor terminal A and body ground — CMP sensor terminal B and body ground — CMP sensor terminal C and body ground • Is the voltage B+?	Yes	Repair or replace the wiring harness, then go to Step 12.
		No	Go to the next step.
5	**VERIFY CMP SENSOR INSTALLATION CONDITION** • Inspect for CMP sensor looseness. • Is CMP sensor loosen?	Yes	Retighten the CMP sensor installation bolt, then go the Step 12. (See 01-40B-36 CAMSHAFT POSITION (CMP) SENSOR REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
6	**INSPECT CMP SENSOR** • Turn the engine switch off. • Inspect the CMP sensor. (See 01-40B-37 CAMSHAFT POSITION (CMP) SENSOR INSPECTION [WL-C, WE-C].) • Is the CMP sensor normal?	Yes	Go to the next step.
		No	Replace the CMP sensor, then go to Step 12. (See 01-40B-38 CRANKSHAFT POSITION (CKP) SENSOR REMOVAL/INSTALLATION [WL-C, WE-C].)
7	**INSPECT CMP SENSOR CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Verify that the CMP sensor connector is connected securely. • Is the connector normal?	Yes	Go to the next step.
		No	Reconnect the connector, then go to Step 10.
8	**INSPECT CMP CIRCUIT FOR SHORT TO GROUND** • Turn the engine switch off. • Inspect for continuity the between the following terminals: — CMP sensor connector terminal C (wiring harness-side) and body ground — CMP sensor connector terminal B (wiring harness-side) and body ground • Is there continuity?	Yes	Repair or replace the wiring harness, then go to Step 10.
		No	Go to the next step.

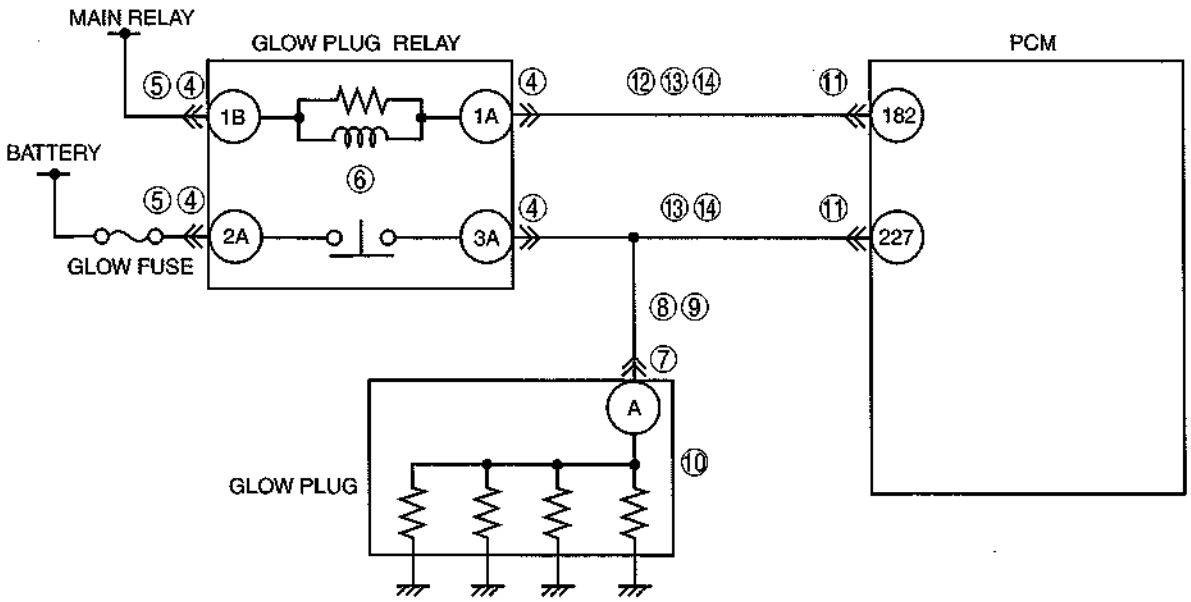
STEP	INSPECTION		ACTION
9	**INSPECT CMP CIRCUIT FOR OPEN CIRCUIT** • Turn the engine switch off. • Inspect for continuity between the following terminals: — CMP sensor terminal C (wiring harness-side) and PCM terminal 129 (wiring harness-side) — CMP sensor terminal B (wiring harness-side) and PCM terminal 160 (wiring harness-side) — CMP sensor terminal A (wiring harness-side) and PCM terminal 114 (wiring harness-side) • Is there continuity?	Yes	Go to Step the next step.
		No	Repair or replace the wiring harness, then go to Step 12.
10	**INSPECT CMP SENSOR PULSE WHEEL** • Inspect the CMP sensor pulse wheel for damage and/or cracks. • Is there any malfunction?	Yes	Replace the camshaft pulley, then go to Step 12. (See 01-10B-9 CYLINDER HEAD GASKET REPLACEMENT [WL-C, WE-C].)
		No	Go to the next step.
11	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out terminals, corrosion). • Is there any malfunction?	Yes	Repair the terminal, then go to the next step.
		No	Go to the next step.
12	**VERIFY THAT DTC P0340 TROUBLESHOOTING IS COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
13	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	DTC troubleshooting completed.

DTC P0380 [WL-C, WE-C]

dcf010200300w06

DTC P0380	Glow plug relay circuit malfunction
DETECTION CONDITION	• The PCM monitors the glow plug relay control signal. If the following conditions are detected, the PCM determines that the glow plug relay circuit has a malfunction. — The PCM turns the glow plug relay off but the voltage remains low — The PCM turns the glow plug relay on but the voltage remains high — The PCM internal driver IC temperature is **more than 150 °C {320 °F}** when the glow plug relay is on
POSSIBLE CAUSE	• Glow plug relay malfunction • Glow plug malfunction • Connector or terminal malfunction • Open circuit in wiring harness between glow plug relay terminal 2A and battery • Open circuit in wiring harness between glow plug relay terminal 1B and main relay • Open circuit in wiring harness between glow plug relay terminal 1A and PCM terminal 182 • Open circuit in wiring harness between glow plug relay terminal 3A and PCM terminal 227 • Open circuit in wiring harness between glow plug relay terminal 3A and glow plug terminals • Short to ground circuit in wiring harness between glow plug relay terminal 1A and PCM terminal 182 • Short to ground circuit in wiring harness between glow plug relay terminal 3A and PCM terminal 227 • Short to ground circuit in wiring harness between glow plug relay terminal 3A and glow plug terminals • Short to power supply between glow plug relay terminal 1A and PCM terminal 182 • Short to power supply between glow plug relay terminal 3A and PCM terminal 227 • PCM malfunction

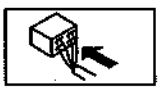
DTC P0380	Glow plug relay circuit malfunction



GLOW PLUG WIRING HARNESS-SIDE CONNECTOR

GLOW PLUG RELAY WIRING HARNESS-SIDE CONNECTOR

PCM WIRING HARNESS-SIDE CONNECTOR



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has the FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERNS TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**INSPECT GLOW PLUG RELAY CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the glow plug relay connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 15.
		No	Go to the next step.

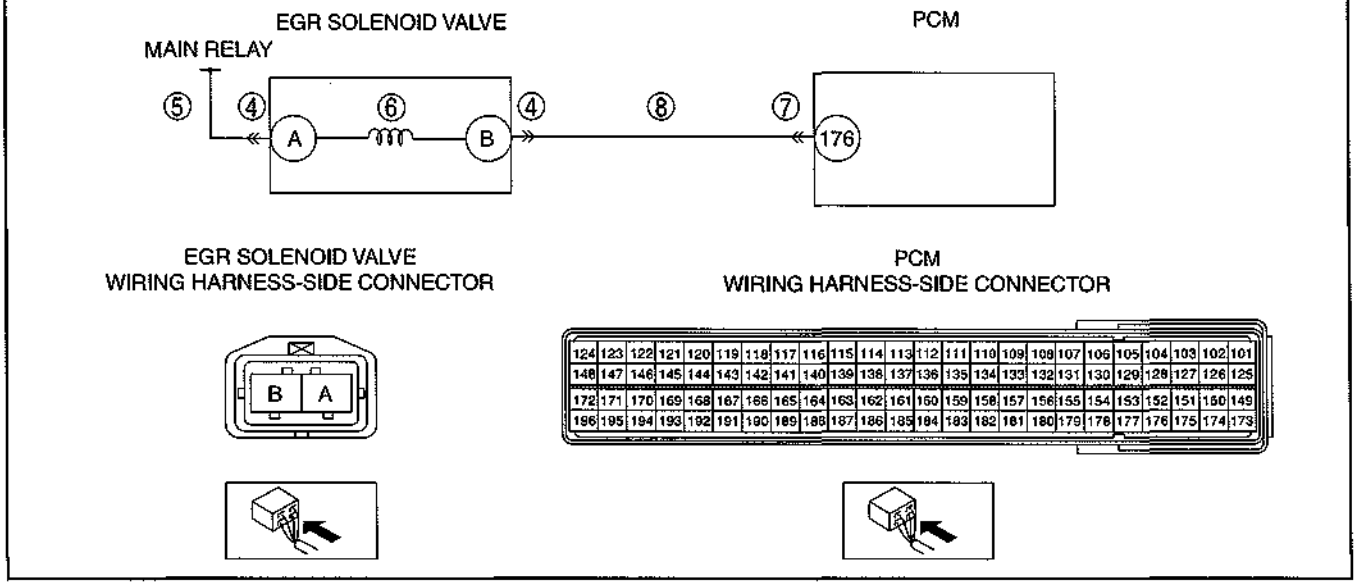
STEP	INSPECTION		ACTION
5	**INSPECT GLOW PLUG RELAY POWER SUPPLY FOR OPEN CIRCUIT** • Turn the engine switch off. • Measure the voltage between glow plug relay terminal 1B and body ground. • Measure the voltage between glow plug relay terminal 2A and body ground. • Is the voltage **B+**?	Yes	Go to the next step.
		No	Repair or replace the wiring harness for an open circuit, then go to Step 15.
6	**INSPECT GLOW PLUG RELAY** • Inspect the glow plug relay. • Is there any malfunction?	Yes	Go to the next step.
		No	Replace the glow plug, then go to Step 15.
7	**INSPECT GLOW PLUG CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Inspect for poor connection (such as damaged/ pulled-out terminals, corrosion). • Is there any malfunction?	Yes	Repair or replace the suspected terminal, then go to Step 15.
		No	Go to the next step.
8	**INSPECT GLOW PLUG RELAY CIRCUIT FOR SHORT TO GROUND** • Turn the engine switch off. • Inspect for continuity between glow plug relay terminal 3A and ground. • Is there continuity?	Yes	Repair or replace the wiring harness for a short to ground, then go to Step 15.
		No	Go to the next step.
9	**INSPECT GLOW PLUG RELAY CIRCUIT FOR OPEN CIRCUIT** • Turn the engine switch off. • Inspect for continuity between glow plug relay terminals and glow plug terminals. • Is there continuity?	Yes	Go to the next step
		No	Repair or replace the wiring harness for an open circuit, then go to Step 15.
10	**INSPECT GLOW PLUG** • Inspect the glow plug. (See 01-13B-9 GLOW PLUG INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Go to the next step.
		No	Replace the glow plug, then go to Step 15.
11	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Inspect for poor connection (such as damaged/ pulled-out terminals, corrosion). • Is there any malfunction?	Yes	Repair or replace the suspected terminal, then go to Step 15.
		No	Go to the next step.
12	**INSPECT GLOW PLUG RELAY CIRCUIT FOR SHORT TO GROUND** • Turn the engine switch off. • Inspect for continuity between glow plug relay terminal 1A and body ground. • Is there continuity?	Yes	Repair or replace the wiring harness for a short to ground, then go to Step 15.
		No	Go to the next step.
13	**INSPECT GLOW PLUG RELAY CIRCUIT FOR SHORT TO POWER SUPPLY** • Disconnect the glow plug relay connector and PCM connector. • Turn the engine switch to the ON position (Engine off.) • Inspected the voltage between the following terminals and body ground: — Glow plug relay terminal 1A (wiring harness-side) and body ground. — Glow plug relay terminal 3A (wiring harness-side) and body ground. • Is the voltage **B+**	Yes	Repair or replace the wiring harness for a short to power supply, go to Step 15.
		No	Go to the next step.

STEP	INSPECTION		ACTION
14	**INSPECT GLOW PLUG RELAY CIRCUIT FOR OPEN CIRCUIT** • Turn the engine switch off. • Inspect for continuity between the following terminals: — Glow plug relay terminal 1A and PCM terminal 182 — Glow plug relay terminal 3A and PCM terminal 227 • Is there continuity?	Yes	Go to the next step
		No	Repair or replace the wiring harness for an open circuit, then go to the next step.
15	**VERIFY THAT DTC P0380 TROUBLESHOOTING IS COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
16	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	DTC troubleshooting completed.

DTC P0403 [WL-C, WE-C]

dcf010200400w02

DTC P0403	EGR solenoid valve circuit malfunction
DETECTION CONDITION	• The PCM monitors the EGR solenoid valve control signal. If the following conditions are detected, the PCM determines that the EGR solenoid valve circuit has a malfunction (open circuit). — The PCM turns the EGR solenoid valve off but the voltage remains low — The PCM internal driver IC temperature is **more than 150 °C {320 °F}** when the EGR solenoid valve is on
POSSIBLE CAUSE	• EGR solenoid valve malfunction • Connector or terminal malfunction • Open circuit in wiring harness between main relay and EGR solenoid valve terminal A • Open circuit in wiring harness between EGR solenoid valve terminal B and PCM terminal 176 • PCM malfunction



Diagnostic procedure

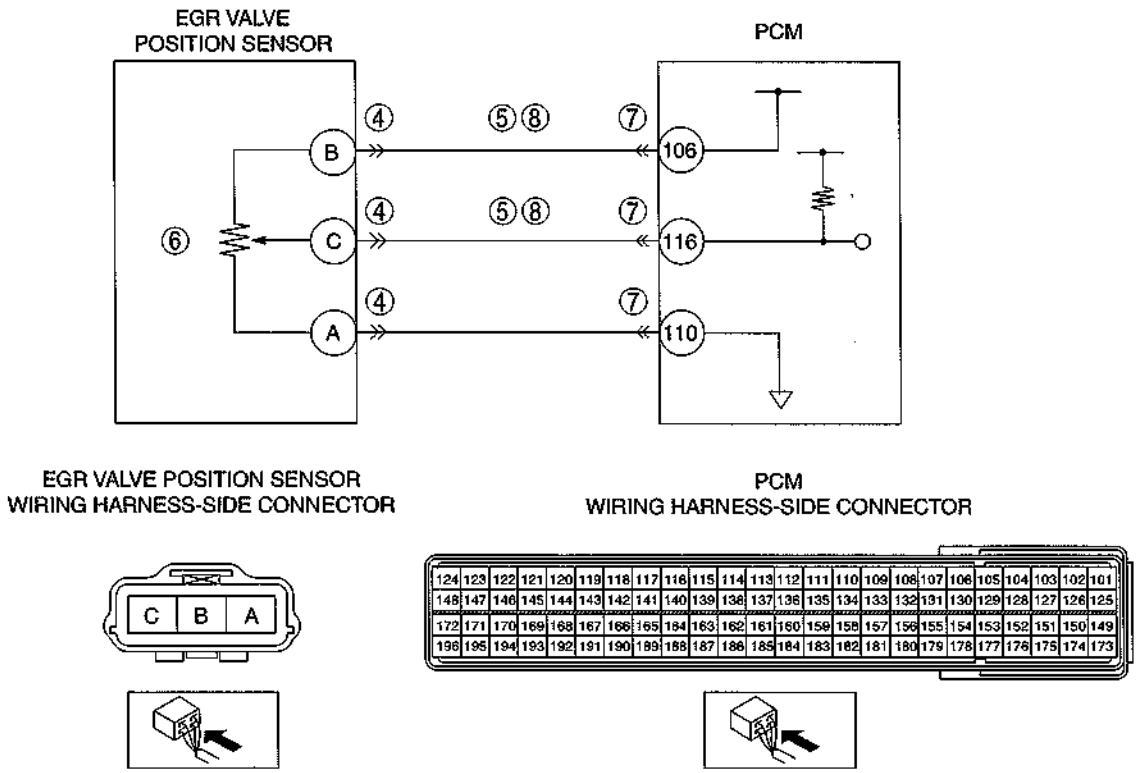
STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record FREEZE FRAME DATA on repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERNS TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**INSPECT EGR SOLENOID VALVE CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the EGR solenoid valve connector. • Inspect for poor connection (such as damaged/ pulled-out pins, and corrosion). • Is there any malfunction?	Yes	Repair or replace terminal, then go to Step 9.
		No	Go to the next step.
5	**INSPECT EGR SOLENOID VALVE CONTROL CIRCUIT FOR OPEN CIRCUIT** • Turn the engine switch to the ON position (Engine off). • Measure the voltage between EGR solenoid valve terminal A (wiring harness-side) and body ground. • Is the voltage **B+**?	Yes	Go to the next step.
		No	Repair or replace the wiring harness for a possible open circuit, then go to Step 9.
6	**INSPECT EGR SOLENOID VALVE** • Inspect the EGR solenoid valve. (See 01-16B-5 EGR SOLENOID VALVE INSPECTION [WL-C, WE-C].) • Is the EGR solenoid valve normal?	Yes	Go to the next step.
		No	Replace the EGR solenoid valve, then go to Step 9. (See 01-16B-4 EGR SYSTEM REMOVAL/INSTALLATION [WL-C, WE-C].)
7	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, and corrosion). • Is there any malfunction?	Yes	Repair or replace terminal, then go to the next step.
		No	Go to the next step.
8	**INSPECT EGR SOLENOID VALVE CONTROL CIRCUIT FOR OPEN CIRCUIT** • Turn the engine switch off. • Inspect for continuity between EGR solenoid valve terminal B (wiring harness-side) and PCM terminal 176 (wiring harness-side). • Is there continuity?	Yes	Go to the next step.
		No	Repair or replace the wiring harness for a possible open circuit, then go to the next step.
9	**VERIFY TROUBLESHOOTING OF DTC P0403 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Start the engine. • Retrieve DTCs using the current diagnostic tool. • Is the PENDING CODE for this DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.

STEP	INSPECTION		ACTION
10	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

DTC P0405 [WL-C, WE-C]

dcf010200400w03

DTC P0405	EGR valve position sensor circuit low input
DETECTION CONDITION	• The PCM monitors the input voltage from the EGR valve position sensor while the engine is running. If the input voltage is **less than 0.1 V**, the PCM determines that the EGR valve position sensor circuit has a malfunction.
POSSIBLE CAUSE	• EGR valve position sensor malfunction • Connector or terminal malfunction • Short to ground circuit between EGR valve position sensor terminal C and PCM terminal 116. • Short to ground circuit between EGR valve position sensor terminal B and PCM terminal 116. • Open circuit between EGR valve position sensor terminal C and PCM terminal 116. • Open circuit between EGR valve position sensor terminal B and PCM terminal 106. • PCM malfunction



Diagnostic procedure

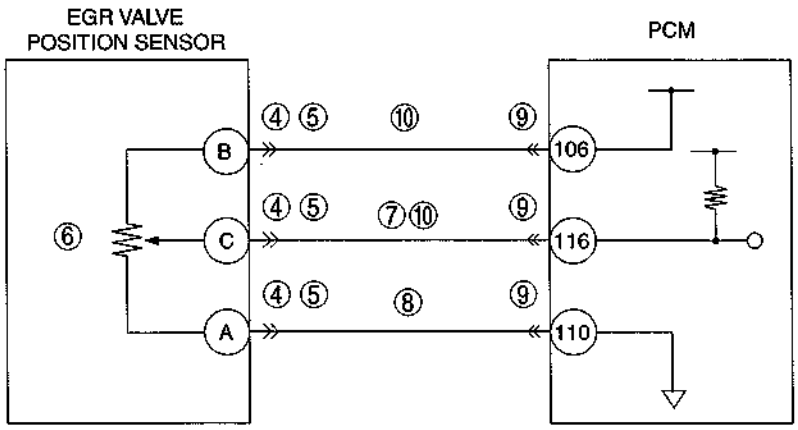
STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Check for related service repair information availability?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.

STEP	INSPECTION		ACTION
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERNS TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**INSPECT EGR VALVE POSITION SENSOR CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the EGR valve position sensor connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step9.
		No	Go to the next step.
5	**INSPECT EGR VALVE POSITION SENSOR CIRCUIT FOR SHORT TO GROUND** • Turn the engine switch off. • Inspect for continuity between the following terminals: — EGR valve position sensor terminal B (wiring harness-side) and body ground — EGR valve position sensor terminal C (wiring harness-side) and body ground • Is the EGR valve position sensor normal?	Yes	Repair or replace the wiring harness for a possible short to ground, then go to Step 9.
		No	Go to the next step.
6	**INSPECT EGR VALVE POSITION SENSOR** • Inspect the EGR valve position sensor. (See 01-40B-40 EGR VALVE POSITION SENSOR INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the EGR valve, then go to Step 9. (See 01-16B-4 EGR SYSTEM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
7	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to step9.
		No	Go to the next step.
8	**INSPECT EGR VALVE POSITION SENSOR CIRCUIT FOR OPEN CIRCUIT** • Turn the engine switch off. • Disconnect the PCM connector. — EGR valve position sensor terminal B (wiring harness-side) and PCM terminal 106 (wiring harness-side) — EGR valve position sensor terminal C (wiring harness-side) and PCM terminal 116 (wiring harness-side) • Is there continuity?	Yes	Go to the next step.
		No	Repair or replace the wiring harness for a possible open circuit, then go to the next step.
9	**VERIFY TROUBLESHOOTING OF DTC P0405 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
10	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

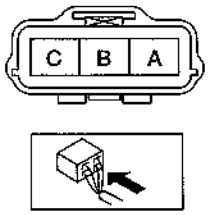
DTC P0406 [WL-C, WE-C]

dcf010200400w04

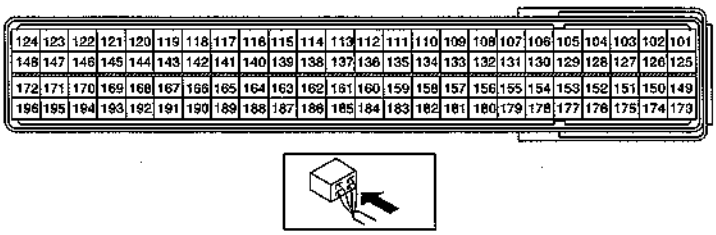
DTC P0406	EGR valve position sensor circuit high input
DETECTION CONDITION	• The PCM monitors the input voltage from the EGR valve position sensor while the engine is running. If the input voltage is **more than 4.9 V**, the PCM determines that the EGR valve position sensor circuit has a malfunction.
POSSIBLE CAUSE	• EGR valve position sensor malfunction • Connector or terminal malfunction • Open circuit between EGR valve position sensor terminal A and PCM terminal 110 • Short to constant voltage supply between EGR valve position sensor terminal C and PCM terminal 116



EGR VALVE POSITION SENSOR
WIRING HARNESS-SIDE CONNECTOR



PCM
WIRING HARNESS-SIDE CONNECTOR



Diagnostic procedure

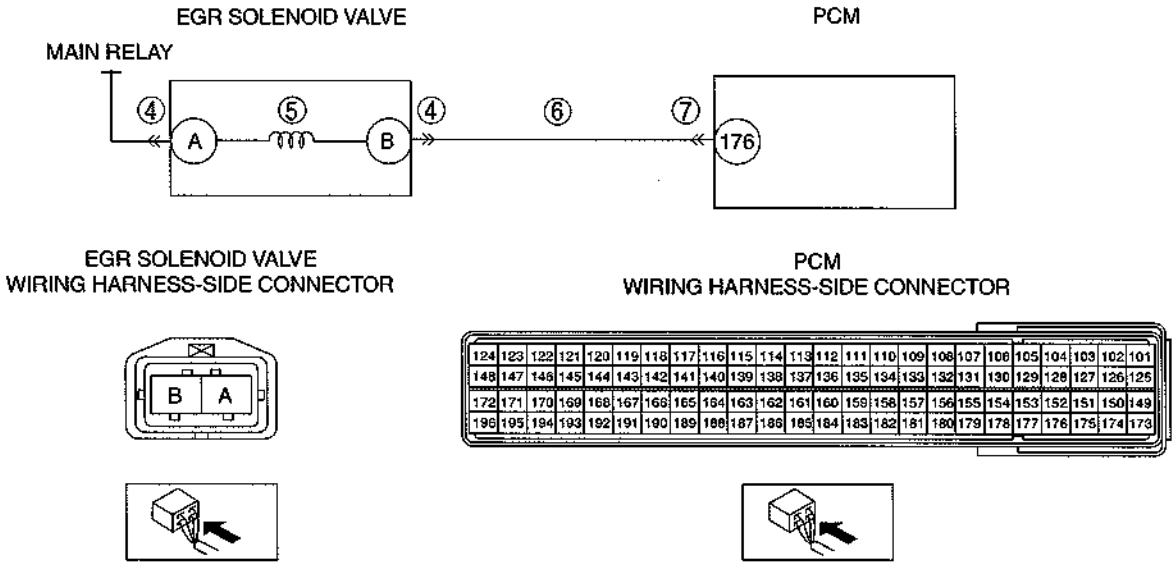
STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Check for related service repair information availability?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERNS TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**INSPECT EGR VALVE POSITION SENSOR CONNECTOR** • Turn the engine switch to off. • Verify that the EGR valve position sensor connector is connected securely. • Is connector normal?	Yes	Go to the next step.
		No	Connect the connector securely, then go to Step 11.

STEP	INSPECTION		ACTION
5	**INSPECT EGR VALVE POSITION SENSOR CONNECTOR FOR POOR CONNECTION** • Disconnect the EGR valve position sensor connector. • Inspect for poor connection (such as damaged, pulled-out terminals, corrosion). • Is there any malfunction?	Yes	Repair or replace suspected terminal, then go to Step 11.
		No	Go to the next step.
6	**INSPECT EGR VALVE POSITION SENSOR** • Perform EGR valve position sensor inspection. (See 01-40B-40 EGR VALVE POSITION SENSOR INSPECTION [WL-C, WE-C].) • Is the EGR valve position sensor normal?	Yes	Go to the next step.
		No	Replace the EGR valve position sensor, then go to Step 11. (See 01-16B-4 EGR SYSTEM REMOVAL/INSTALLATION [WL-C, WE-C].)
7	**INSPECT EGR VALVE POSITION SENSOR SIGNAL FOR SHORT TO POWER SUPPLY** • Turn the engine switch to ON (engine off). • Measure voltage between EGR valve position terminal C (wiring harness-side) and body ground. • Is voltage **more than 4.9V**?	Yes	Repair or replace for short to power supply, then go to Step 11.
		No	Go to the next step.
8	**VERIFY EGR VALVE POSITION SENSOR GROUND CIRCUIT FOR OPEN CIRCUIT** • inspect for continuity at wiring harness-side connector between EGR valve position sensor terminal A and PCM terminal 110. • Is there any continuity?	Yes	Go to the next step.
		No	Repair or replace for open circuit. Then go to Step 11.
9	**INSPECT PCM CONNECTORS FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, and corrosion). • Is there any malfunction?	Yes	Repair or replace terminal, then go to Step 11.
		No	Go to the next step.
10	**VERIFY EGR POSITION SIGNAL CIRCUIT FOR SHORT TO CONSTANT VOLTAGE CIRCUIT** • inspect for continuity at EGR valve position sensor wiring harness side connector between terminal B and C. • Is there continuity?	Yes	Repair or replace for short circuit, then go to the next step.
		No	Go to the next step.
11	**VERIFY TROUBLESHOOTING OF DTC P0406 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
12	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

DTC P0489 [WL-C, WE-C]

dcf010200400w05

DTC P0489	EGR solenoid valve control circuit low input
DETECTION CONDITION	• The PCM monitors the EGR solenoid valve control signal. If the PCM turns the EGR solenoid valve off but the voltage remains low, the PCM determines that EGR solenoid valve circuit has a malfunction (circuit short to ground).
POSSIBLE CAUSE	• EGR solenoid valve malfunction • Short to ground in wiring harness between EGR solenoid valve terminal B and PCM terminal 176 • Connector or terminal malfunction • PCM malfunction



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERNS TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**INSPECT EGR SOLENOID VALVE CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the EGR solenoid valve connector. • Inspect for poor connection (damaged/pulled-out pins, corrosion, etc.). • Is there malfunction?	Yes	Repair or replace the terminal, then go to Step 8.
		No	Go to the next step.
5	**INSPECT EGR SOLENOID VALVE MALFUNCTION** • Perform EGR solenoid valve inspection. (See 01-16B-5 EGR SOLENOID VALVE INSPECTION [WL-C, WE-C].) • Is EGR solenoid valve normal?	Yes	Go to the next step.
		No	Replace the EGR solenoid valve, then go to step 8.

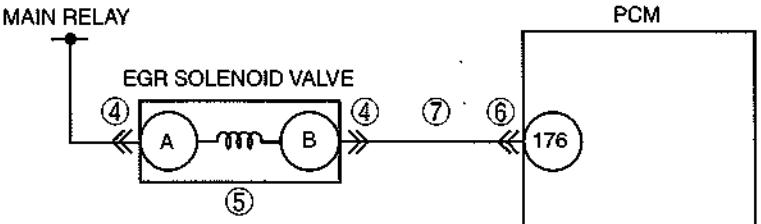
STEP	INSPECTION		ACTION
6	**INSPECT EGR SOLENOID VALVE CONTROL CIRCUIT FOR SHORT TO GROUND** • Turn the engine switch off. • Disconnect the EGR solenoid valve connector and PCM connector. • Inspect for continuity between EGR solenoid valve terminal B (wiring harness-side) and body ground. • Is there continuity?	Yes	Repair or replace the wiring harness for short to ground, then go to Step 9.
		No	Go to the next step.
7	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Disconnect the PCM connector. • Inspect for poor connection at terminal 176. (damaged/pulled-out pins, corrosion, etc.). • Is there malfunction?	Yes	Repair the terminal, then go to the next step.
		No	Go to the next step.
8	**VERIFY TROUBLESHOOTING OF DTC P0489 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Start the engine. • Retrieve DTCs using the current diagnostic tool. • Is the PENDING CODE for this DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
9	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTC present?	Yes	Go to the applicable DTC troubleshooting. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

DTC P0490 [WL-C, WE-C]

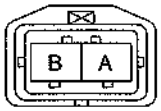
dcf010200400w06

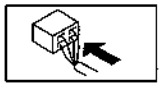
DTC P0490	EGR solenoid valve control circuit high input
DETECTION CONDITION	• The PCM monitors the EGR solenoid valve control signal. If the PCM turns the EGR solenoid valve on but the voltage remains high, the PCM determines that EGR solenoid valve circuit has a malfunction (circuit short to power supply).
POSSIBLE CAUSE	• EGR solenoid valve malfunction • Short to power supply in wiring harness between EGR solenoid valve terminal B and PCM terminal 176 • Connector or terminal malfunction • PCM malfunction

DTC P0490	EGR solenoid valve control circuit high input

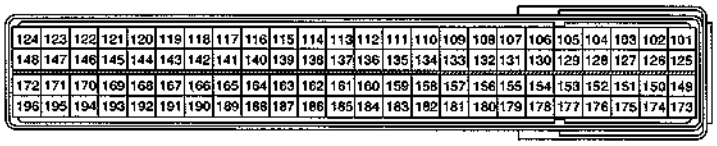


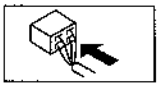
EGR SOLENOID VALVE
WIRING HARNESS-SIDE CONNECTOR





PCM
WIRING HARNESS-SIDE CONNECTOR





Diagnostic procedure

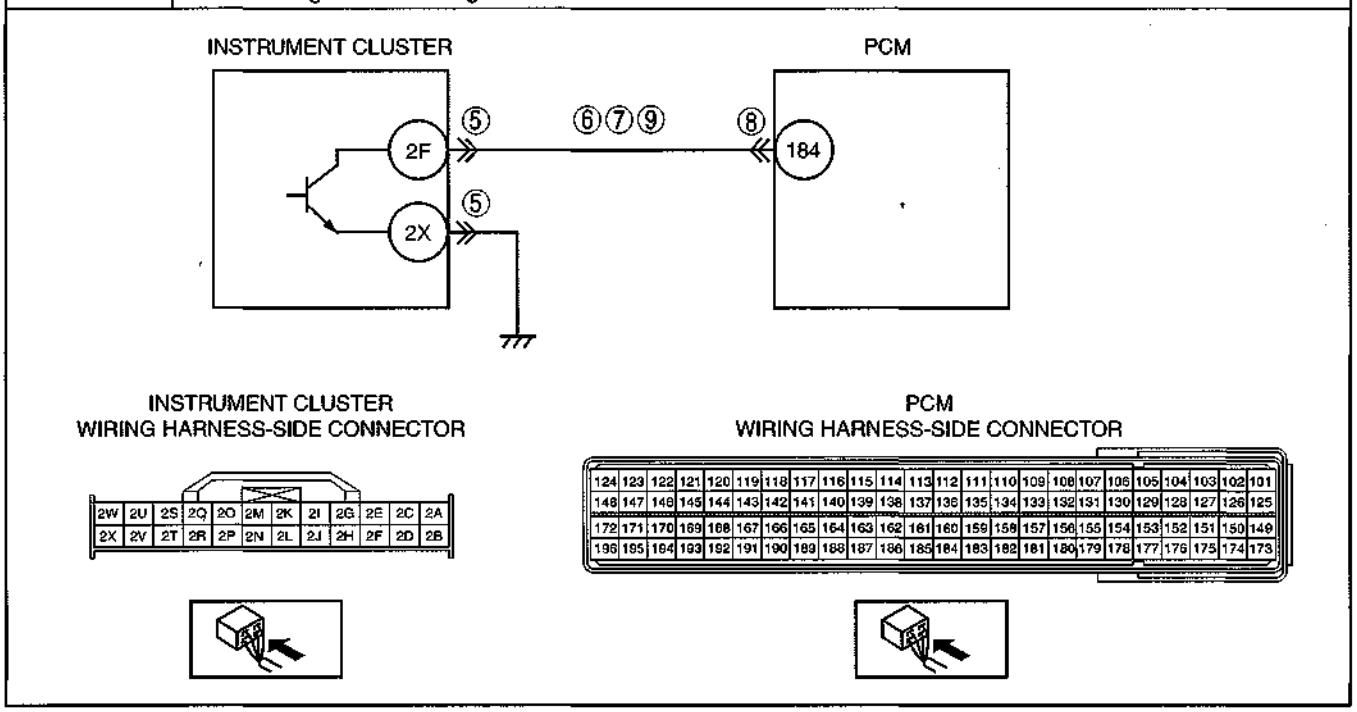
STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERNS TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**INSPECT EGR SOLENOID VALVE CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the EGR solenoid valve connector. • Inspect for poor connection (damaged/pulled-out pins, corrosion, etc.). • Is there malfunction?	Yes	Repair or replace the terminal, then go to Step 8.
		No	Go to the next step.
5	**INSPECT EGR SOLENOID VALVE MALFUNCTION** • Perform EGR solenoid valve inspection. (See 01-16B-5 EGR SOLENOID VALVE INSPECTION [WL-C, WE-C].) • Is the EGR solenoid valve normal?	Yes	Go to the next step.
		No	Replace the EGR solenoid valve, then go to Step 8.
6	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection at terminal 176. (such as damaged/pulled-out pins, corrosion). • Is there malfunction?	Yes	Repair the terminal, then go to Step 8.
		No	Go to the next step.

STEP	INSPECTION		ACTION
7	**INSPECT EGR SOLENOID VALVE CONTROL CIRCUIT SHORT TO POWER SUPPLY** • Turn the engine switch to the ON position (Engine off). • Measure the voltage between EGR solenoid valve terminal B (wiring harness-side) and body ground. • Is the voltage B+?	Yes	Repair or replace the wiring harness for short to power supply, then go to the next step.
		No	Go to the next step.
8	**VERIFY TROUBLESHOOTING OF DTC P0490 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Start the engine. • Retrieve DTCs using the current diagnostic tool. • Is the PENDING CODE for this DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
9	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTC present?	Yes	Go to the applicable DTC troubleshooting. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

DTC P0500 [WL-C, WE-C]

dcf010200500w03

DTC P0500	VSS circuit malfunction
DETECTION CONDITION	• The PCM monitors the input signal from the instrument cluster during set conditions. If the input signal is **less than 0 km/h {0 mph} for 25 s**, the PCM determines that there is a VSS circuit malfunction.
POSSIBLE CAUSE	• PCM malfunction • Connector or terminal malfunction • Instrument cluster malfunction • Open circuit in wiring harness between PCM terminal 184 and instrument cluster terminal 2F • Short to ground in wiring harness between PCM terminal 184 and instrument cluster terminal 2F



Diagnostic procedure

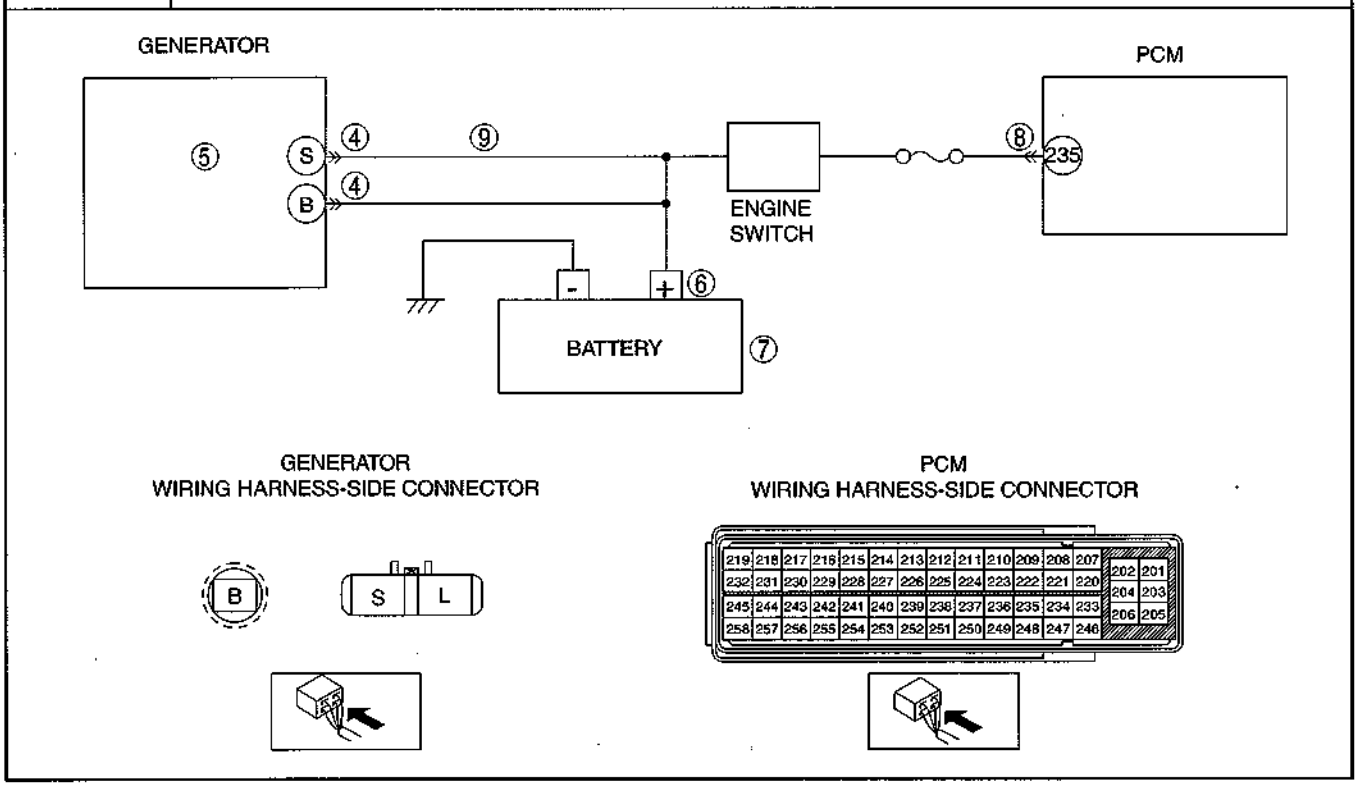
STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME PID DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME PID DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available service repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT INPUT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT** • Connect the current diagnostic tool to the DLC-2. • Start engine. • Access VSS PID. • Read the VSS PID when the vehicle is driving. • Is the VSS PID normal?	Yes	Intermittent concern exists. Perform the "INTERMITTENT CONCERNS TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
		No	Go to the next step.
4	**CHECK INPUT/OUTPUT CHECK MODE** • Turn the ignition switch to the ON position (Engine off). • Is instrument cluster DTCs 10 or 12 detected? (See 09-22-4 INSTRUMENT CLUSTER INPUT/OUTPUT CHECK MODE.)	Yes	DTC 10 and/or 12 displayed: Inspect instrument cluster. (See 09-22-4 INSTRUMENT CLUSTER INPUT/OUTPUT CHECK MODE.)
		No	Go to the next step.
5	**INSPECT INSTRUMENT CLUSTER CONNECTOR FOR POOR CONNECTION** • Turn the ignition switch off. • Disconnect instrument cluster connector. • Inspect for poor connections (damaged/pulled-out terminals, corrosion, etc.). • Are terminals normal?	Yes	Go to the next step.
		No	Repair or replace terminals, then go to Step 10.
6	**INSPECT VOLTAGE** • Turn the ignition switch to the ON position (Engine off). • Measure voltage at instrument cluster terminal 2F (wiring harness-side). • Is there **5 V** at instrument cluster terminal 2F (wiring harness-side)?	Yes	Replace instrument cluster, then go to Step 10. (See 09-22-2 INSTRUMENT CLUSTER REMOVAL/INSTALLATION.)
		No	Go to the next step.
7	**INSPECT VSS CIRCUIT FOR SHORT TO GROUND** • Turn the ignition switch off. • Inspect for continuity between instrument cluster terminal 2F (wiring harness-side) and body ground. • Is there continuity?	Yes	Repair or replace harness, then go to Step 10.
		No	Go to the next step.
8	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the ignition switch off. • Disconnect PCM connector. • Inspect for poor connection (damaged/pulled-out terminals, corrosion, etc.). • Are terminals normal?	Yes	Go to the next step.
		No	Repair or replace pin or connector, then go to Step 10.
9	**INSPECT VSS CIRCUIT FOR OPEN CIRCUIT** • Turn the ignition switch off. • Turn the ignition switch to the ON position (Engine off). • Inspect for continuity between instrument cluster terminal 2F (wiring harness-side) and PCM terminal 184 (wiring harness-side). • Is there continuity?	Yes	Replace instrument cluster then go to the next step.
		No	Repair or replace harness, then go to the next step.

STEP	INSPECTION		ACTION
10	**VERIFY TROUBLESHOOTING OF DTC P0500 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Start the engine. • Retrieve DTCs using the current diagnostic tool. • Is the PENDING CODE for this DTC present?	Yes	Replace PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
11	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTC present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

DTC P0563 [WL-C, WE-C]

dcf010200500w04

DTC P0563	Battery voltage high input
DETECTION CONDITION	• The PCM monitors the battery voltage. If the battery voltage is **more than 16 V**, the PCM determines that there is a malfunction in the battery charging system.
POSSIBLE CAUSE	• Generator malfunction • Battery malfunction • Connector or terminal malfunction • Open circuit in wiring harness between generator terminal S and battery positive terminal • Related wiring harness malfunction • PCM malfunction



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**INSPECT GENERATOR TERMINAL FOR POOR INSTALLATION** • Turn the engine switch off. • Inspect generator terminal B for looseness. • Is there any malfunction?	Yes	Connect generator terminal B correctly, then go to Step 10.
		No	Go to the next step.
5	**INSPECT GENERATOR** • Inspect the generator. (See 01-17-5 GENERATOR INSPECTION.) • Is there any malfunction?	Yes	Replace the generator, then go to Step 10. (See 01-17-4 GENERATOR REMOVAL/INSTALLATION.)
		No	Go to the next step.
6	**INSPECT BATTERY POSITIVE TERMINAL FOR POOR INSTALLATION** • Turn the engine switch off. • Inspect the battery positive terminal for looseness. • Is there any malfunction?	Yes	Connect the battery positive terminal correctly, then go to Step 10.
		No	Go to the next step.
7	**INSPECT BATTERY** • Inspect the battery. (See 01-17-2 BATTERY INSPECTION.) • Is there any malfunction?	Yes	Replace the battery, then go to Step 10. (See 01-17-2 BATTERY REMOVAL/INSTALLATION.)
		No	Go to the next step.
8	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Inspect for poor connection (such as damaged/ pulled-out terminals, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 6.
		No	Go to the next step.
9	**INSPECT GENERATOR CIRCUIT SHORT CIRCUIT** • Inspect for continuity between generator terminal S (wiring harness-side) and battery plus terminal. • Is there continuity?	Yes	Go to the next step.
		No	Repair or replace the wiring harness for short, then go to the next step.
10	**VERIFY TROUBLESHOOTING OF DTC P0563 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
11	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	DTC troubleshooting completed.

DTC P0602 [WL-C, WE-C]

dcf010200600w02

DTC P0602	PCM programming error
DETECTION CONDITION	• No configuration data in the PCM Note • When the configuration is completed, DTC P0602 is cleared.
POSSIBLE CAUSE	• Complete configuration has not been completed • PCM malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	VERIFY FREEZE FRAME DATA HAS BEEN RECORDED • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	VERIFY RELATED REPAIR INFORMATION AVAILABILITY • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	VERIFY TROUBLESHOOTING OF DTC P0602 COMPLETED • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
4	VERIFY AFTER REPAIR PROCEDURE • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTC present?	Yes	Go to the applicable DTC troubleshooting. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

DTC P0606, P2530 [WL-C, WE-C]

dcf010200600w03

DTC P0606 DTC P2530	PCM malfunction PCM (engine switch circuit) malfunction
DETECTION CONDITION	• PCM internal malfunction.
POSSIBLE CAUSE	• PCM malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	–	–	Replace the PCM. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)

DTC P0607 [WL-C, WE-C]

dcf010200600w04

DTC P0607	PCM performance problem
DETECTION CONDITION	• PCM internal malfunction.
POSSIBLE CAUSE	• PCM internal malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record FREEZE FRAME DATA on repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Check for related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to available repair information. • If vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY TROUBLESHOOTING OF P0607 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from PCM memory using the current diagnostic tool. • Start the engine. • Is same DTC present?	Yes	Replace the PCM, go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
4	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

01

DTC P0610 [WL-C, WE-C]

dcf010200600w05

DTC P0610	PCM vehicle options error
DETECTION CONDITION	• PCM data configuration error
POSSIBLE CAUSE	• Configuration procedure has not been completed • PCM malfunction

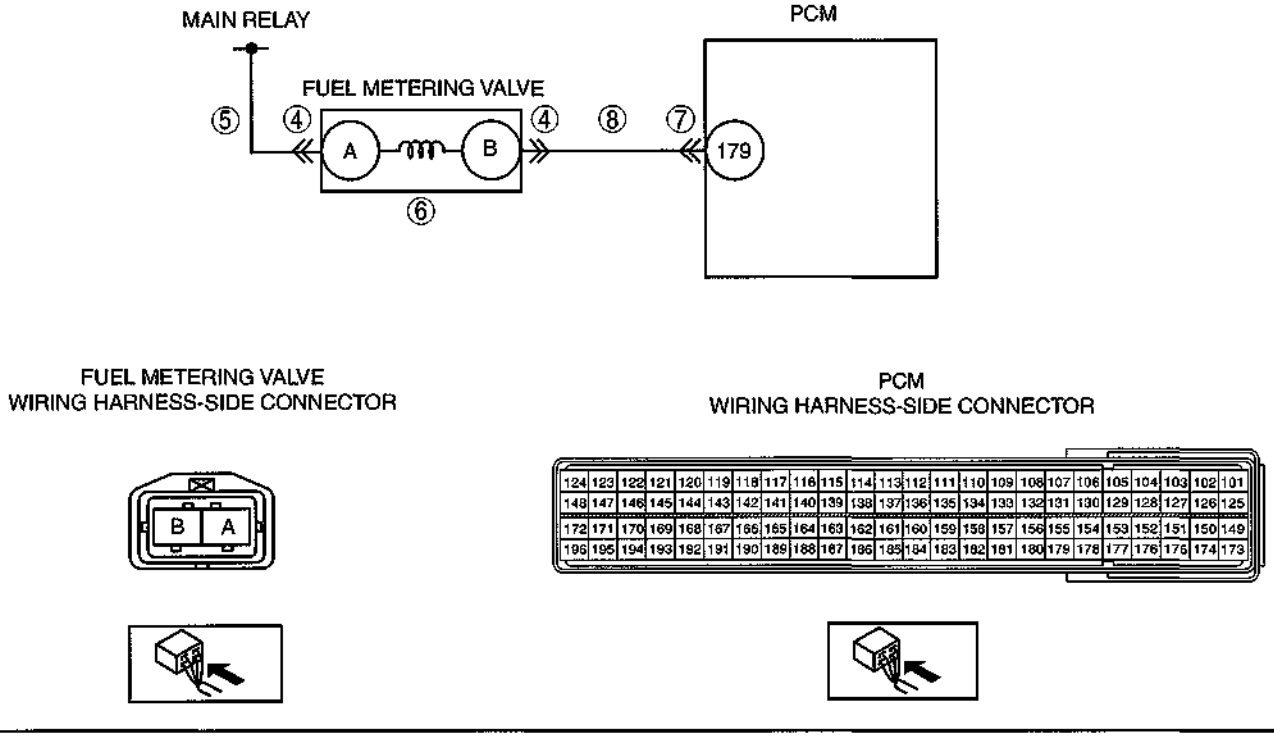
Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY TROUBLESHOOTING OF DTC P0610 COMPLETED** • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
4	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTC present?	Yes	Go to the applicable DTC troubleshooting. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

DTC P0627 [WL-C, WE-C]

dcf010200600w08

DTC P0627	Fuel metering valve control circuit open
DETECTION CONDITION	• The PCM monitors the fuel metering valve driver IC temperature in the PCM and the control voltage while the engine is running. If either of the following conditions is met, the PCM determines that there is a malfunction in the fuel metering valve range/performance. — The PCM monitors the fuel metering valve driver IC temperature in the PCM. If the fuel metering valve driver IC temperature is **more than 150 °C {320 °F}** during the fuel metering valve operation, the PCM determines that the fuel metering valve has a malfunction — The PCM monitors the fuel metering valve control voltage at the PCM terminals. If fuel metering valve control voltage is **less than 5 V** when fuel metering valve is not operating, the PCM determines that the fuel metering valve has a malfunction (open circuit)
POSSIBLE CAUSE	• Fuel metering valve malfunction • Connector or terminal malfunction • Open circuit in wiring harness between fuel metering valve terminal A and main relay • Open circuit in wiring harness between fuel metering valve terminal B and PCM terminal 179 • PCM malfunction



Diagnostic procedure

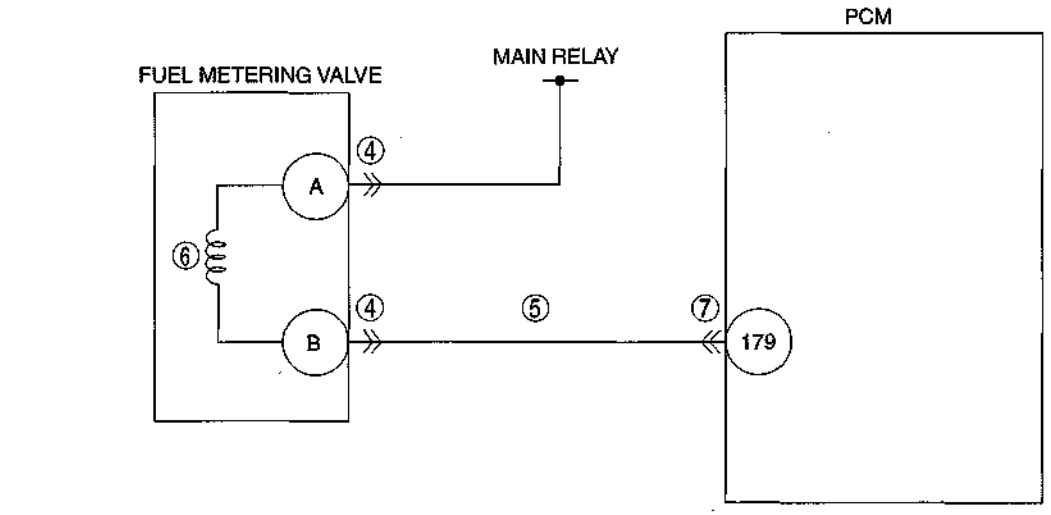
STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERNS TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)

STEP	INSPECTION		ACTION
4	**INSPECT FUEL METERING VALVE CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the fuel metering valve connector. • Inspect for poor connection (such as damaged/ pulled-out pins, and corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 9.
		No	Go to the next step.
5	**INSPECT FUEL METERING VALVE CONTROL CIRCUIT FOR OPEN CIRCUIT** • Turn the engine switch to the ON position (Engine off). • Measure the voltage between fuel metering valve terminal A (wiring harness-side) and body ground • Is the voltage **B+**?	Yes	Go to the next step.
		No	Repair or replace the wiring harness for a possible open circuit, then go to Step 9.
6	**INSPECT FUEL METERING VALVE** • Inspect the fuel metering valve. (See 01-14B-13 FUEL METERING VALVE INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Repair the supply pump, then go to Step 9. (See 01-14B-11 SUPPLY PUMP REMOVAL/ INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
7	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, and corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 9.
		No	Go to the next step.
8	**INSPECT FUEL METERING VALVE CONTROL CIRCUIT FOR OPEN CIRCUIT** • Turn the engine switch off. • Inspect for continuity between fuel metering valve terminal B (wiring harness-side) and PCM terminal 179 (wiring harness-side) • Is there continuity?	Yes	Go to the next step.
		No	Repair or replace the wiring harness for a possible open circuit, then go to the next step.
9	**VERIFY TROUBLESHOOTING OF DTC P0627 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
10	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC troubleshooting. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

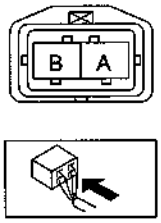
DTC P0628 [WL-C, WE-C]

dcf010200600w07

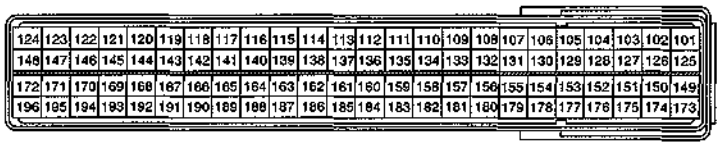
DTC P0628	Fuel metering valve control circuit low input
DETECTION CONDITION	• The PCM monitors the fuel metering valve circuit voltage while the engine is running. If the PCM detects that the circuit voltage is low when the fuel metering valve is off, the PCM determines that there is a malfunction in the fuel metering valve circuit (circuit short to ground).
POSSIBLE CAUSE	• Fuel metering valve malfunction • Connector or terminal malfunction • Short to ground in wiring harness between fuel metering valve terminal B and PCM terminal 179 • PCM malfunction



FUEL METERING VALVE
WIRING HARNESS-SIDE CONNECTOR



PCM
WIRING HARNESS-SIDE CONNECTOR



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related Service Information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available Service Information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**INSPECT POOR CONNECTION OF FUEL METERING VALVE CONNECTOR** • Turn the engine switch off. • Disconnect the fuel metering valve connector. • Inspect for poor connection (such as damaged/pulled-out terminals, corrosion). • Is there any malfunction?	Yes	Repair or replace the suspected terminal, go to Step 8.
		No	Go to the next step.

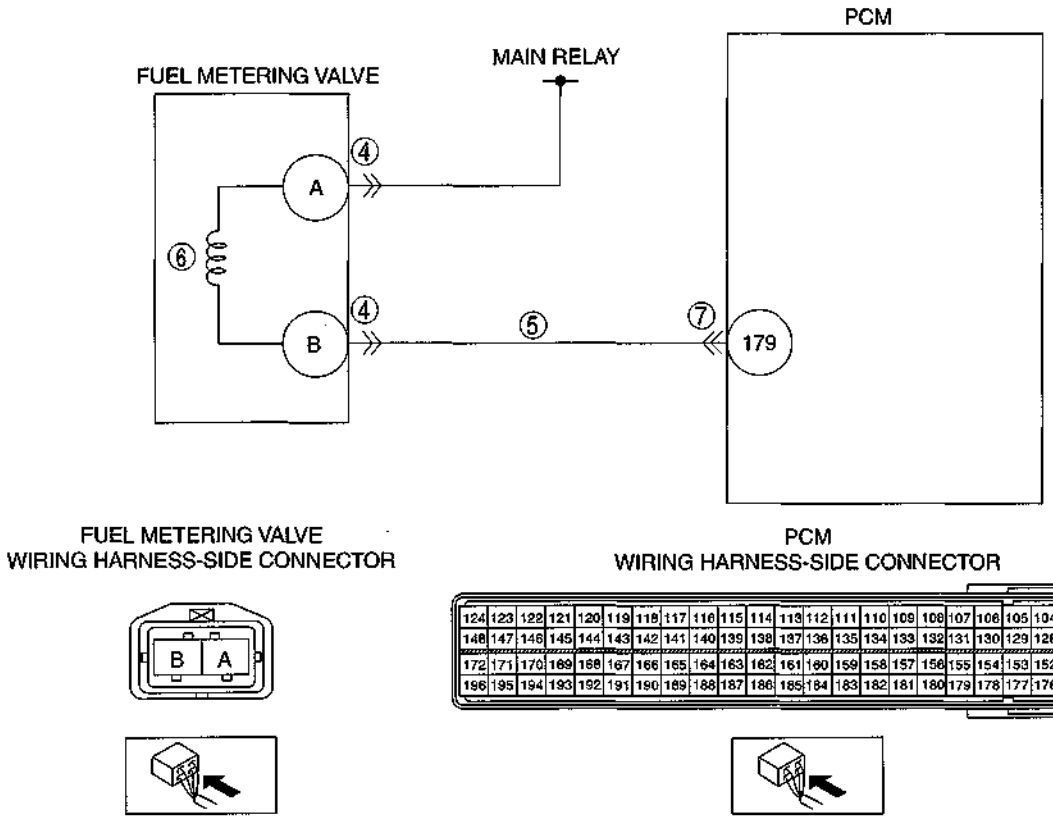
STEP	INSPECTION		ACTION
5	**INSPECT FUEL METERING VALVE CIRCUIT FOR A SHORT TO GROUND** • Turn the engine switch off. • Disconnect the fuel metering valve connector and PCM connector. • Inspect for continuity between fuel metering valve terminal B (wiring harness-side) and body ground. • Is there continuity?	Yes	Repair or replace the wiring harness for a short to ground, go to Step 8.
		No	Go to the next step.
6	**INSPECT FUEL METERING VALVE** • Inspect the fuel metering valve. (See 01-14B-13 FUEL METERING VALVE INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Repair the supply pump, go to Step 8. (See 01-14B-11 SUPPLY PUMP REMOVAL/ INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
7	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out terminals, corrosion). • Is there any malfunction?	Yes	Repair or replace the suspected terminal, go to the next step.
		No	Go to the next step.
8	**VERIFY TROUBLESHOOTING OF DTC P0628 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
9	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

DTC P0629 [WL-C, WE-C]

dcf010200600w08

DTC P0629	Fuel metering valve control circuit high input
DETECTION CONDITION	• The PCM monitors the fuel metering valve circuit voltage while the engine is running. If the PCM detects that the circuit voltage is high when the fuel metering valve is on, the PCM determines that there is a malfunction in the fuel metering valve circuit (circuit short to power supply).
POSSIBLE CAUSE	• Fuel metering valve malfunction • Connector or terminal malfunction • Short to power supply in wiring harness between fuel metering valve terminal B and PCM terminal 179 • PCM malfunction

DTC P0629	Fuel metering valve control circuit high input



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related Service Information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available Service Information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**INSPECT FUEL METERING VALVE CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the fuel metering valve connector. • Inspect for poor connection (such as damaged/ pulled-out terminals, corrosion). • Is there any malfunction?	Yes	Repair or replace the suspected terminal, go to Step 8.
		No	Go to the next step.
5	**INSPECT FUEL METERING VALVE CIRCUIT FOR SHORT TO POWER SUPPLY** • Disconnect the fuel metering valve connector and PCM connector. • Turn the engine switch to the ON position (Engine off). • Inspected the voltage between fuel metering valve terminal B (wiring harness-side) and body ground. • Is the voltage **B+**?	Yes	Repair or replace the wiring harness for a short to power supply, go to Step 8.
		No	Go to the next step.

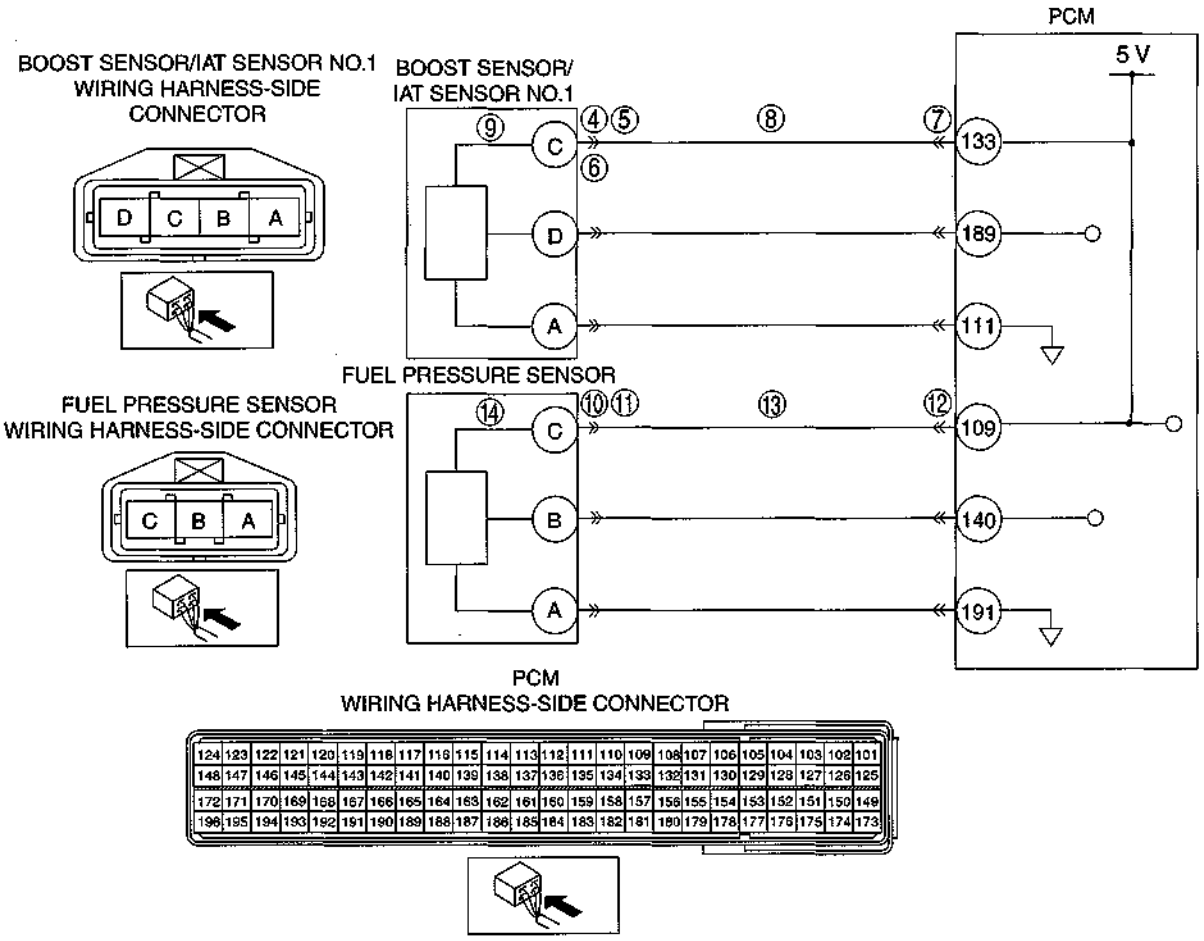
STEP	INSPECTION		ACTION
6	**INSPECT FUEL METERING VALVE** • Inspect the fuel metering valve. (See 01-14B-13 FUEL METERING VALVE INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Repair the supply pump, go to Step 8. (See 01-14B-11 SUPPLY PUMP REMOVAL/ INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
7	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out terminals, corrosion). • Is there any malfunction?	Yes	Repair or replace the suspected terminal, go to the next step.
		No	Go to the next step.
8	**VERIFY TROUBLESHOOTING OF DTC P0629 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
9	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

DTC P0642 [WL-C, WE-C]

dcf010200600w09

DTC P0642	Fuel pressure sensor and boost sensor 5 V circuit low input
DETECTION CONDITION	• The PCM monitors the fuel pressure sensor and the boost sensor 5 V circuit. If the fuel pressure sensor and boost sensor power voltage is **lower than 4.9 V**, the PCM determines that there is a fuel pressure sensor and boost sensor 5 V circuit malfunction.
POSSIBLE CAUSE	• Short to ground circuit between circuit in wiring between boost sensor terminal C and PCM terminal 133 • Short to ground circuit between circuit in wiring between fuel pressure sensor terminal C and PCM terminal 109 • Boost sensor malfunction • Fuel pressure sensor malfunction • PCM malfunction

DTC P0642	Fuel pressure sensor and boost sensor 5 V circuit low input



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has the FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERNS TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**CLASSIFY BOOST SENSOR/IAT SENSOR NO.1 OR FUEL PRESSURE SENSOR RELATED MALFUNCTION** • Turn the engine switch to the ON position (Engine off). • Measure the voltage between the boost sensor/IAT sensor No.1 terminal C (wiring harness-side) and body ground. • Is the voltage **4.9 V or less** ?	Yes	Go to the next step.
		No	Go to Step 10.

STEP	INSPECTION		ACTION
5	**INSPECT BOOST SENSOR/IAT SENSOR NO.1 CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the boost sensor/IAT sensor No.1 connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 15.
		No	Go to the next step.
6	**CLASSIFY BOOST SENSOR/IAT SENSOR NO.1 OR HARNESS RELATED MALFUNCTION** • Disconnect the boost sensor/IAT sensor No.1 connector. • Turn the engine switch to the ON position (Engine off). • Measure the voltage between the Boost sensor terminal C (wiring harness-side) and body ground. • Is the voltage **4.9 V or less** ?	Yes	Go to the next step.
		No	Go to Step 9.
7	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 15.
		No	Go to the next step.
8	**INSPECT BOOST SENSOR/IAT SENSOR NO.1 CIRCUIT FOR SHORT TO GROUND** • Turn the engine switch off. • Inspect for continuity between the boost sensor terminal C (wiring harness-side) and body ground. • Is there continuity?	Yes	Repair or replace the wiring harness for a possible short to ground, then go to Step 15.
		No	Go to Step 15.
9	**INSPECT BOOST SENSOR/IAT SENSOR NO.1** • Inspect the boost sensor/IAT sensor No.1. (See 01-40B-27 BOOST SENSOR INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the boost sensor/IAT sensor No.1, then go to Step 15.
		No	Go to Step 15.
10	**INSPECT FUEL PRESSURE SENSOR CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the fuel pressure sensor connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 15.
		No	Go to the next step.
11	**CLASSIFY FUEL PRESSURE SENSOR OR HARNESS RELATED MALFUNCTION** • Disconnect the fuel pressure sensor connector. • Turn the engine switch to the ON position (Engine off). • Measure the voltage between the fuel pressure sensor terminal C (wiring harness-side) and body ground. • Is the voltage **4.9 V or less** ?	Yes	Go to the next step.
		No	Go to Step 14.
12	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to the next step.
		No	Go to the next step.

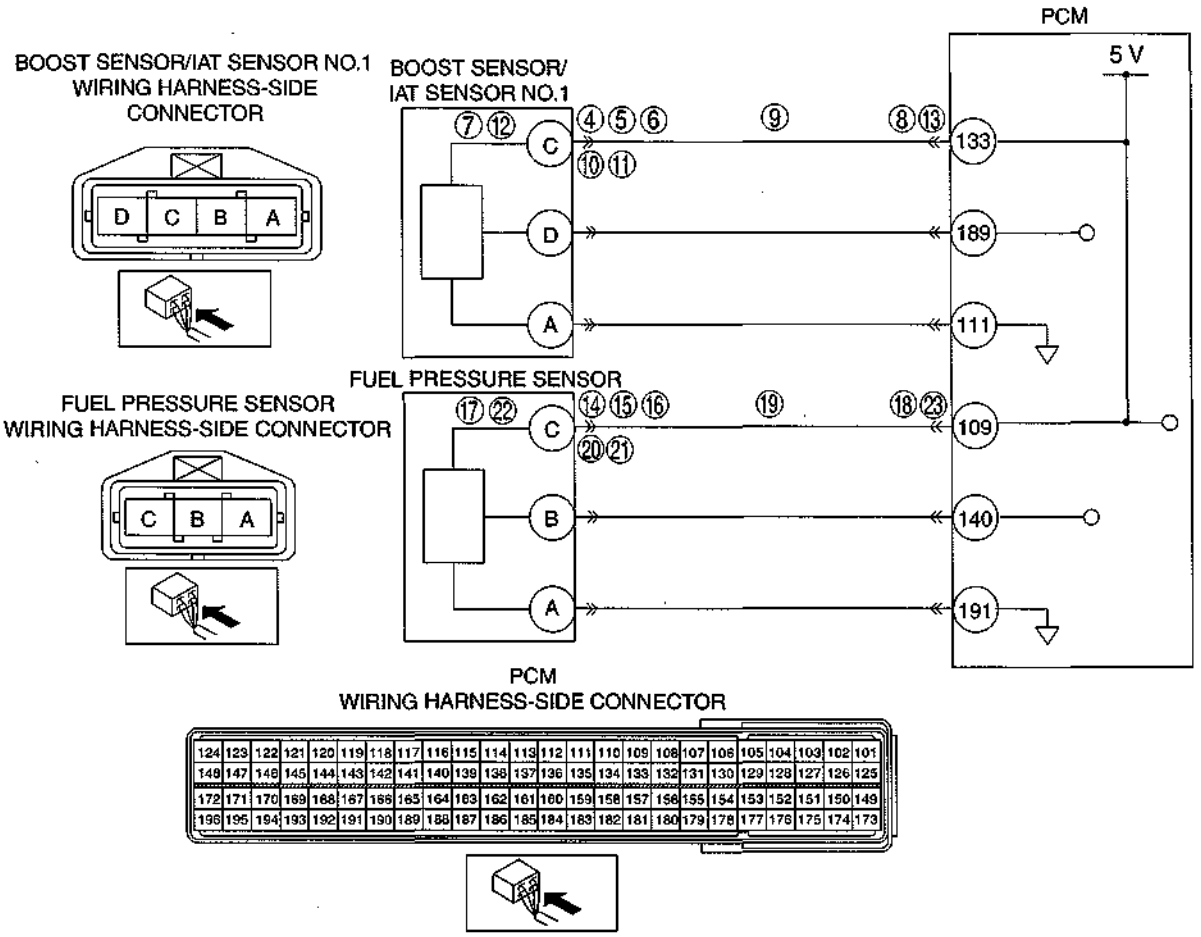
STEP	INSPECTION		ACTION
13	**INSPECT FUEL PRESSURE SENSOR CIRCUIT FOR SHORT TO GROUND** • Turn the engine switch off. • Inspect for continuity between the fuel pressure sensor terminal C (wiring harness-side) and body ground. • Is there continuity?	Yes	Repair or replace the wiring harness for a possible short to ground, then go to Step 15.
		No	Go to Step 15.
14	**INSPECT FUEL PRESSURE SENSOR** • Inspect the fuel pressure sensor. (See 01-40B-33 FUEL PRESSURE SENSOR INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the fuel pressure sensor, then go to the next step.
		No	Go to the next step.
15	**VERIFY TROUBLESHOOTING OF DTC P0642 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
16	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	DTC troubleshooting completed.

DTC P0643 [WL-C, WE-C]

dcf010200600w10

DTC P0643	**Fuel pressure sensor and boost sensor 5 V circuit high input**
DETECTION CONDITION	• The PCM monitors the fuel pressure sensor and boost sensor 5 V circuit. If the fuel pressure sensor and boost sensor power voltage is **higher than 4.9 V**, the PCM determines that there is a fuel pressure sensor and boost sensor 5 V circuit malfunction.
POSSIBLE CAUSE	• Short to power supply between boost sensor connector terminal C and PCM terminal 133 • Short to power supply between fuel sensor connector terminal C and PCM terminal 109 • Open circuit in wiring harness between boost sensor connector terminal C and PCM terminal 133 • Open circuit in wiring harness between fuel sensor connector terminal C and PCM terminal 109 • Boost sensor malfunction • Fuel pressure sensor malfunction • PCM malfunction

DTC P0643	Fuel pressure sensor and boost sensor 5 V circuit high input



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has the FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERNS TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**CLASSIFY BOOST SENSOR/IAT SENSOR NO.1 OR FUEL PRESSURE SENSOR RELATED MALFUNCTION** • Turn the engine switch to the ON position (Engine off). • Measure the voltage between the boost sensor/IAT sensor No.1 connector terminal C and body ground. • Is the voltage **5 V constant voltage** ?	Yes	Go to step 14
		No	If the voltage is **1.0 V or less**, go to the next step. If the voltage is **5.1 V or more**, go to Step 10.

STEP	INSPECTION		ACTION
5	**INSPECT POOR CONNECTION OF BOOST SENSOR/IAT SENSOR NO.1 CONNECTOR** • Turn the engine switch off. • Disconnect the boost sensor/IAT sensor No.1 connector. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there a malfunction?	Yes	Repair or replace the terminals, then go to Step 24.
		No	Go to the next step.
6	**CLASSIFY BOOST SENSOR/IAT SENSOR NO.1 OR HARNESS RELATED MALFUNCTION** • Disconnect the boost sensor/IAT sensor No.1 connector. • Turn the engine switch to the ON position (Engine off). • Measure the voltage between the boost sensor/IAT sensor No.1 connector terminal C and body ground. • Is the voltage **5 V constant voltage** ?	Yes	Go to the next step.
		No	Go to step 8
7	**INSPECT BOOST SENSOR/IAT SENSOR NO.1** • Inspect the boost sensor/IAT sensor No.1. (See 01-40B-27 BOOST SENSOR INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the boost sensor, then go to Step 24.
		No	Go to Step 24.
8	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there a malfunction?	Yes	Repair or replace the pins, then go to Step 24.
		No	Go to the next step.
9	**INSPECT BOOST SENSOR/IAT SENSOR NO.1 POWER CIRCUIT FOR OPEN** • Turn the engine switch off. • Inspect for continuity between the boost sensor/IAT sensor No.1 connector terminal C and PCM terminal 133 • Is there continuity?	Yes	Go to Step 24.
		No	Repair or replace the wiring harness for an open, go to Step 24.
10	**INSPECT POOR CONNECTION OF BOOST SENSOR/IAT SENSOR NO.1 CONNECTOR** • Turn the engine switch off. • Disconnect the boost sensor/IAT sensor No.1 connector. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there a malfunction?	Yes	Repair or replace the terminals, then go to Step 24.
		No	Go to the next step.
11	**CLASSIFY BOOST SENSOR/IAT SENSOR NO.1 OR HARNESS RELATED MALFUNCTION** • Disconnect the boost sensor/IAT sensor No.1 connector. • Turn the engine switch to the ON position (Engine off). • Measure the voltage between the boost sensor/IAT sensor No.1 connector terminal C and body ground. • Is the voltage **5.1 V or more** ?	Yes	Go to the Step 13.
		No	Go to the next step.
12	**INSPECT BOOST SENSOR/IAT SENSOR NO.1** • Inspect the boost sensor/IAT sensor No.1. (See 01-40B-27 BOOST SENSOR INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the boost sensor, then go to Step 24.
		No	Go to Step 24.

STEP	INSPECTION		ACTION
13	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there a malfunction?	Yes	Repair or replace the pins, then go to Step 24.
		No	Repair or replace the wiring harness for a short to power, go to the Step 24.
14	**CLASSIFY FUEL PRESSURE SENSOR OPEN CIRCUIT OR SHORT CIRCUIT RELATED MALFUNCTION** • Turn the engine switch to the ON position (Engine off). • Measure the voltage between the fuel pressure sensor connector terminal C and body ground. • Is the voltage **5 V constant voltage**?	Yes	Go to step 24
		No	If the voltage is **1.0 V or less**, go to the next step. If the voltage is **5.1 V or more**, go to Step 20.
15	**INSPECT POOR CONNECTION OF FUEL PRESSURE SENSOR CONNECTOR** • Turn the engine switch off. • Disconnect the fuel pressure sensor connector. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there a malfunction?	Yes	Repair or replace the terminals, then go to Step 24.
		No	Go to the next step.
16	**CLASSIFY FUEL PRESSURE SENSOR OR HARNESS RELATED MALFUNCTION** • Disconnect the fuel pressure sensor connector. • Turn the engine switch to the ON position (Engine off). • Measure the voltage between the fuel pressure sensor connector terminal C and body ground. • Is the voltage **5 V constant voltage** ?	Yes	Go to the next step.
		No	Go to step 18
17	**INSPECT FUEL PRESSURE SENSOR** • Inspect the fuel pressure sensor. (See 01-40B-33 FUEL PRESSURE SENSOR INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the fuel pressure sensor, then go to Step 24.
		No	Go to Step 24.
18	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there a malfunction?	Yes	Repair or replace the pins, then go to Step 24.
		No	Go to the next step.
19	**INSPECT FUEL PRESSURE SENSOR POWER CIRCUIT FOR OPEN** • Turn the engine switch off. • Inspect for continuity between the fuel pressure sensor connector terminal C and PCM terminal 109 • Is there continuity?	Yes	Go to Step 24.
		No	Repair or replace the wiring harness for an open, go to Step 24.
20	**INSPECT POOR CONNECTION OF FUEL PRESSURE SENSOR CONNECTOR** • Turn the engine switch off. • Disconnect the fuel pressure sensor connector. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there a malfunction?	Yes	Repair or replace the terminals, then go to Step 24.
		No	Go to the next step.

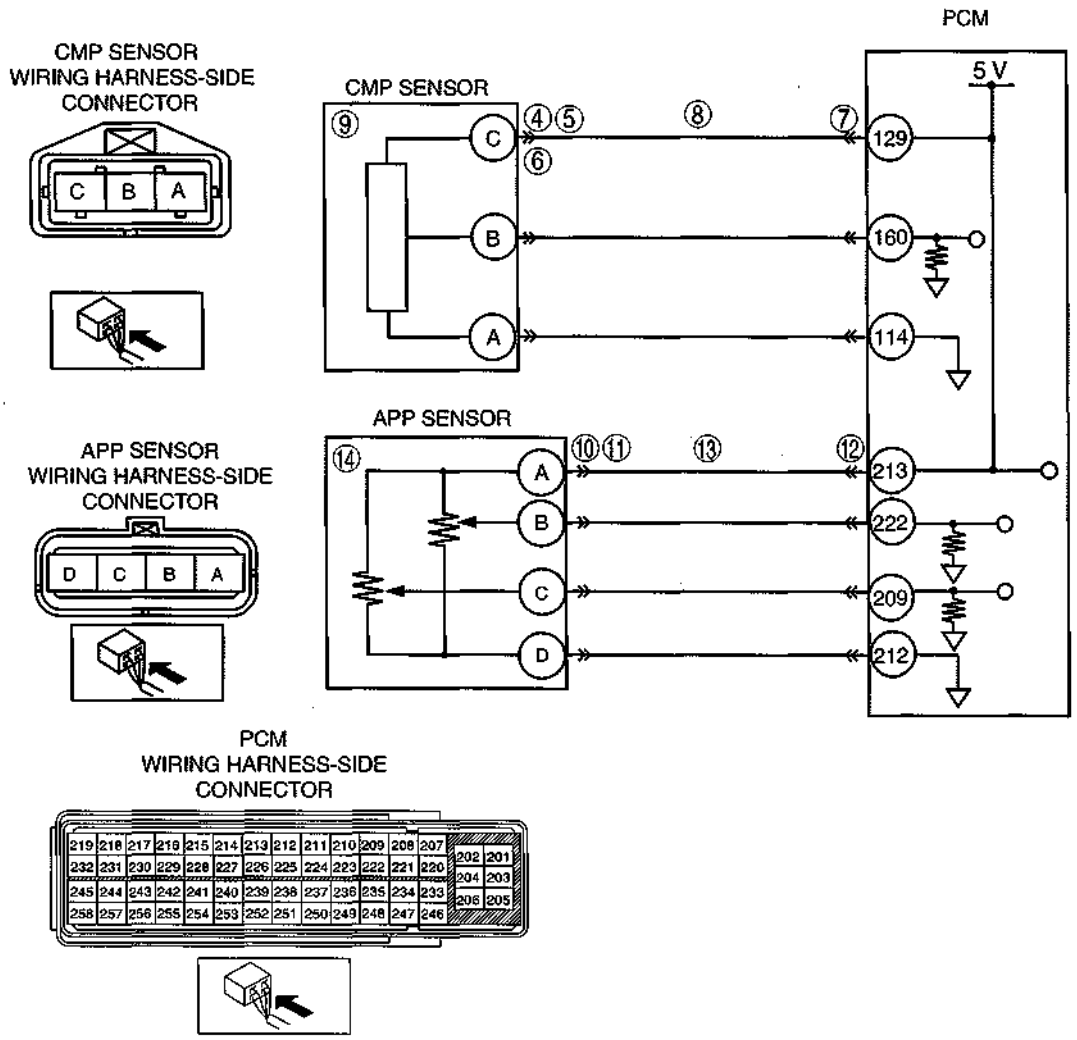
STEP	INSPECTION		ACTION
21	**CLASSIFY FUEL PRESSURE SENSOR OR HARNESS RELATED MALFUNCTION** • Disconnect the fuel pressure sensor connector. • Turn the engine switch to the ON position (Engine off). • Measure the voltage between the fuel pressure sensor connector terminal C and body ground. • Is the voltage **5.1 V or more** ?	Yes	Go to the Step 23.
		No	Go to the next step.
22	**INSPECT FUEL PRESSURE SENSOR** • Inspect the fuel pressure sensor. (See 01-40B-33 FUEL PRESSURE SENSOR INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the fuel pressure sensor, then go to Step 24.
		No	Go to Step 24.
23	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there a malfunction?	Yes	Repair or replace the pins, then go to the next step.
		No	Repair or replace the wiring harness for a short to power, go to the next step.
24	**VERIFY TROUBLESHOOTING OF DTC P0643 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
25	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	DTC troubleshooting completed.

DTC P0652 [WL-C, WE-C]

dcf010200600w11

DTC P0652	CMP sensor and APP sensor 5 V circuit low input
DETECTION CONDITION	• The PCM monitors the CMP sensor and APP sensor 5 V circuit. If the CMP sensor and APP sensor power voltage is **lower than 4.9 V**, the PCM determines that there is a CMP sensor and APP sensor 5 V circuit malfunction.
POSSIBLE CAUSE	• Short to ground circuit between circuit in wiring between CMP sensor terminal C and PCM terminal 129 • Short to ground circuit between circuit in wiring between APP sensor terminal A and PCM terminal 213 • CMP sensor malfunction • APP sensor malfunction • PCM malfunction

DTC P0652	CMP sensor and APP sensor 5 V circuit low input



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has the FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERNS TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)

STEP	INSPECTION		ACTION
4	**CLASSIFY CMP SENSOR OR APP SENSOR RELATED MALFUNCTION** • Turn the engine switch to the ON position (Engine off). • Measure the voltage between the CMP sensor terminal C (wiring harness-side) and body ground. • Is the voltage **4.9 V or less** ?	Yes	Go to the next step.
		No	Go to Step 10.
5	**INSPECT CMP SENSOR CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the CMP sensor connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 15.
		No	Go to the next step.
6	**CLASSIFY CMP SENSOR OR HARNESS RELATED MALFUNCTION** • Disconnect the CMP sensor connector. • Turn the engine switch to the ON position (Engine off). • Measure the voltage between the CMP sensor terminal C (wiring harness-side) and body ground. • Is the voltage **4.9 V or less** ?	Yes	Go to the next step.
		No	Go to Step 9.
7	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 15.
		No	Go to the next step.
8	**INSPECT CMP SENSOR CIRCUIT FOR SHORT TO GROUND** • Turn the engine switch off. • Inspect for continuity between the CMP sensor terminal C (wiring harness-side) and body ground. • Is there continuity?	Yes	Repair or replace the wiring harness for a possible short to ground, then go to Step 15.
		No	Go to Step 15.
9	**INSPECT CMP SENSOR** • Inspect the CMP sensor. (See 01-40B-37 CAMSHAFT POSITION (CMP) SENSOR INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the CMP sensor, then go to Step 15.
		No	Go to Step 15.
10	**INSPECT APP SENSOR CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the APP sensor connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 15.
		No	Go to the next step.
11	**CLASSIFY APP SENSOR OR HARNESS RELATED MALFUNCTION** • Disconnect the APP sensor connector. • Turn the engine switch to the ON position (Engine off). • Measure the voltage between the APP sensor terminal A (wiring harness-side) and body ground. • Is the voltage **4.9 V or less** ?	Yes	Go to the next step.
		No	Go to Step 14.

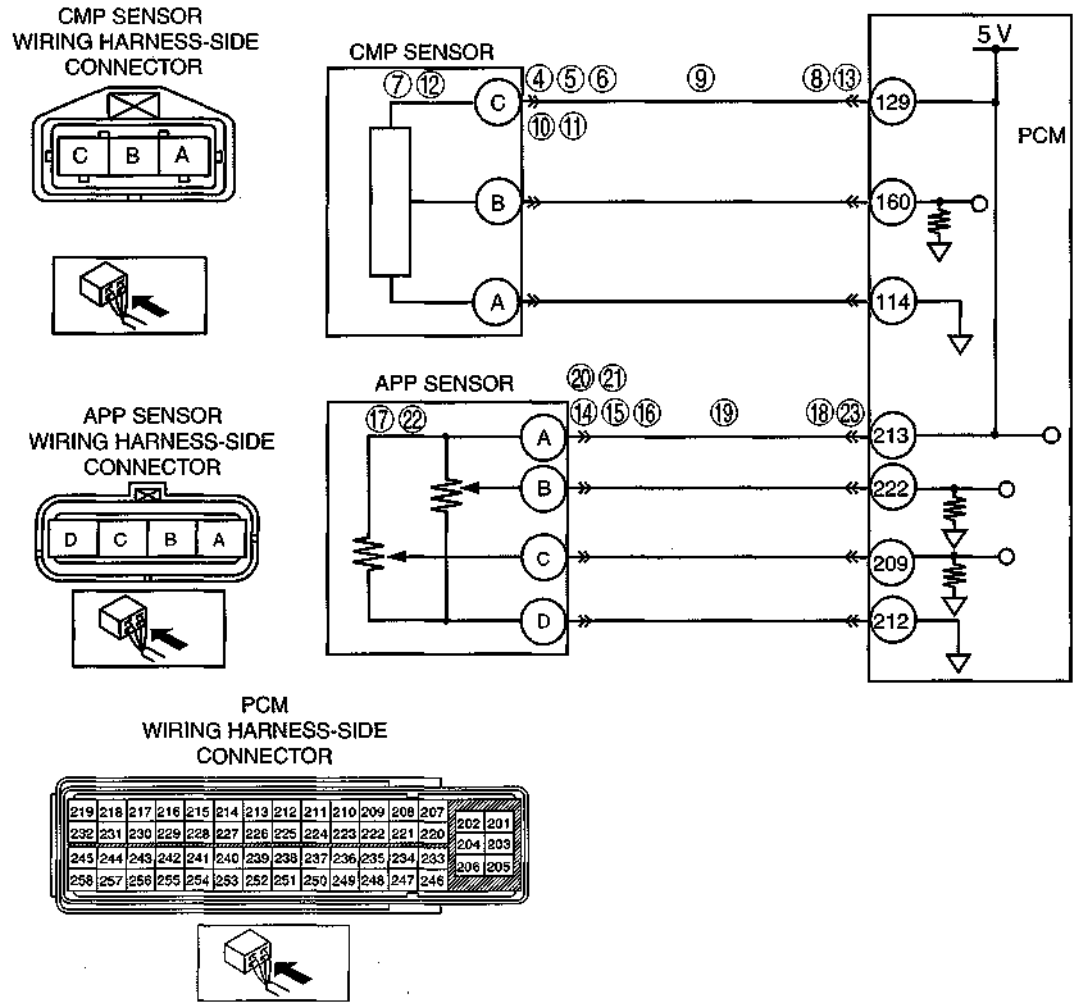
STEP	INSPECTION		ACTION
12	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to the next step.
		No	Go to the next step.
13	**INSPECT APP SENSOR CIRCUIT FOR SHORT TO GROUND** • Turn the engine switch off. • Inspect for continuity between the APP sensor terminal A (wiring harness-side) and body ground. • Is there continuity?	Yes	Repair or replace the wiring harness for a possible short to ground, then go to Step 15.
		No	Go to Step 15.
14	**INSPECT APP SENSOR** • Inspect the APP sensor. (See 01-40B-28 ACCELERATOR PEDAL POSITION (APP) SENSOR INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the APP sensor, then go to the next step.
		No	Go to the next step.
15	**VERIFY TROUBLESHOOTING OF DTC P0652 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
16	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	DTC troubleshooting completed.

DTC P0653 [WL-C, WE-C]

dcf010200600w12

DTC P0653	CMP sensor and APP sensor 5 V circuit high input
DETECTION CONDITION	• The PCM monitors the CMP sensor and APP sensor 5 V circuit. If the CMP sensor and APP sensor power voltage is **higher than 5.1 V**, the PCM determines that there is a CMP sensor and APP sensor 5 V circuit malfunction.
POSSIBLE CAUSE	• Short to power supply between CMP sensor connector terminal C and PCM terminal 133 • Short to power supply between APP sensor connector terminal A and PCM terminal 213 • Open circuit in wiring harness between CMP sensor connector terminal C and PCM terminal 133 • Open circuit in wiring harness between APP sensor connector terminal A and PCM terminal 213 • CMP sensor malfunction • APP sensor malfunction • PCM malfunction

DTC P0653	CMP sensor and APP sensor 5 V circuit high input



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has the FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERNS TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**CLASSIFY CMP SENSOR OR APP SENSOR RELATED MALFUNCTION** • Turn the engine switch to the ON position (Engine off). • Measure the voltage between the CMP sensor connector terminal C and body ground. • Is the voltage **5 V constant voltage** ?	Yes	Go to step 14
		No	If the voltage is **1.0 V or less**, go to the next step. If the voltage is **5.1 V or more**, go to Step 10.

STEP	INSPECTION		ACTION
5	**INSPECT POOR CONNECTION OF CMP SENSOR CONNECTOR** • Turn the engine switch off. • Disconnect the CMP sensor connector. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there a malfunction?	Yes	Repair or replace the terminals, then go to Step 24.
		No	Go to the next step.
6	**CLASSIFY CMP SENSOR OR HARNESS RELATED MALFUNCTION** • Disconnect the CMP sensor connector. • Turn the engine switch to the ON position (Engine off). • Measure the voltage between the CMP sensor connector terminal C and body ground. • Is the voltage **5 V constant voltage** ?	Yes	Go to the next step.
		No	Go to step 8
7	**INSPECT CMP SENSOR** • Inspect the CMP sensor. (See 01-40B-37 CAMSHAFT POSITION (CMP) SENSOR INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the CMP sensor, then go to Step 24.
		No	Go to Step 24.
8	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there a malfunction?	Yes	Repair or replace the pins, then go to Step 24.
		No	Go to the next step.
9	**INSPECT CMP SENSOR POWER CIRCUIT FOR OPEN** • Turn the engine switch off. • Inspect for continuity between the CMP sensor connector terminal C and PCM terminal 133 • Is there continuity?	Yes	Go to Step 24.
		No	Repair or replace the wiring harness for an open, go to Step 24.
10	**INSPECT POOR CONNECTION OF CMP SENSOR CONNECTOR** • Turn the engine switch off. • Disconnect the CMP sensor connector. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there a malfunction?	Yes	Repair or replace the terminals, then go to Step 24.
		No	Go to the next step.
11	**CLASSIFY CMP SENSOR OR HARNESS RELATED MALFUNCTION** • Disconnect the CMP sensor connector. • Turn the engine switch to the ON position (Engine off). • Measure the voltage between the CMP sensor connector terminal C and body ground. • Is the voltage **5.1 V or more** ?	Yes	Go to the Step 13.
		No	Go to the next step.
12	**INSPECT CMP SENSOR** • Inspect the CMP sensor. (See 01-40B-37 CAMSHAFT POSITION (CMP) SENSOR INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the CMP sensor, then go to Step 24.
		No	Go to Step 24.
13	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there a malfunction?	Yes	Repair or replace the pins, then go to Step 24.
		No	Repair or replace the wiring harness for a short to power, go to the Step 24.

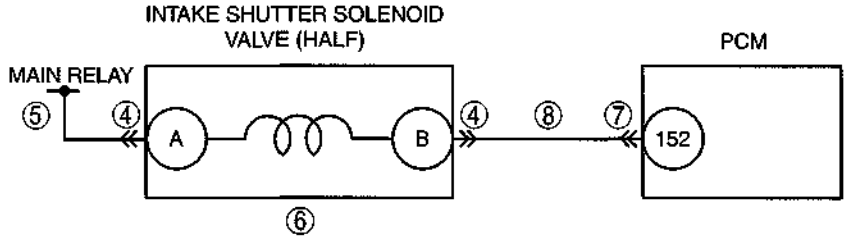
STEP	INSPECTION		ACTION
14	**CLASSIFY APP SENSOR OPEN CIRCUIT OR SHORT CIRCUIT RELATED MALFUNCTION** • Turn the engine switch to the ON position (Engine off). • Measure the voltage between the APP sensor connector terminal A and body ground. • Is the voltage **5 V constant voltage**?	Yes	Go to step 24
		No	If the voltage is **1.0 V or less**, go to the next step. If the voltage is **5.1 V or more**, go to Step 20.
15	**INSPECT POOR CONNECTION OF APP SENSOR CONNECTOR** • Turn the engine switch off. • Disconnect the APP sensor connector. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there a malfunction?	Yes	Repair or replace the terminals, then go to Step 24.
		No	Go to the next step.
16	**CLASSIFY APP SENSOR OR HARNESS RELATED MALFUNCTION** • Disconnect the APP sensor connector. • Turn the engine switch to the ON position (Engine off). • Measure the voltage between the APP sensor connector terminal A and body ground. • Is the voltage **5 V constant voltage** ?	Yes	Go to the next step.
		No	Go to step 18
17	**INSPECT APP SENSOR** • Inspect the APP sensor. (See 01-40B-28 ACCELERATOR PEDAL POSITION (APP) SENSOR INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the APP sensor, then go to Step 24.
		No	Go to Step 24.
18	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there a malfunction?	Yes	Repair or replace the pins, then go to Step 24.
		No	Go to the next step.
19	**INSPECT APP SENSOR POWER CIRCUIT FOR OPEN** • Turn the engine switch off. • Inspect for continuity between the APP sensor connector terminal A and PCM terminal 213. • Is there continuity?	Yes	Go to Step 24.
		No	Repair or replace the wiring harness for an open, go to Step 24.
20	**INSPECT POOR CONNECTION OF APP SENSOR CONNECTOR** • Turn the engine switch off. • Disconnect the APP sensor connector. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there a malfunction?	Yes	Repair or replace the terminals, then go to Step 24.
		No	Go to the next step.
21	**CLASSIFY APP SENSOR OR HARNESS RELATED MALFUNCTION** • Disconnect the APP sensor connector. • Turn the engine switch to the ON position (Engine off). • Measure the voltage between the APP sensor connector terminal A and body ground. • Is the voltage **5.1 V or more** ?	Yes	Go to the Step 23.
		No	Go to the next step.
22	**INSPECT APP SENSOR** • Inspect the APP sensor. (See 01-40B-28 ACCELERATOR PEDAL POSITION (APP) SENSOR INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the APP sensor, then go to Step 24.
		No	Go to Step 24.

STEP	INSPECTION		ACTION
23	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there a malfunction?	Yes	Repair or replace the pins, then go to the next step.
		No	Repair or replace the wiring harness for a short to power, go to the next step.
24	**VERIFY TROUBLESHOOTING OF DTC P0653 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
25	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	DTC troubleshooting completed.

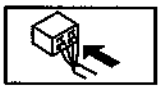
DTC P0660 [WL-C, WE-C]

dcf010200600w13

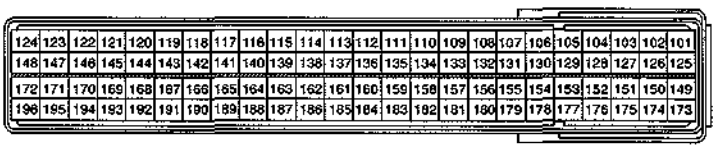
DTC P0660	Intake shutter solenoid valve (half) control circuit open
DETECTION CONDITION	• The PCM monitors the intake shutter solenoid valve (half) control signal. If the following conditions are detected, the PCM determines that the intake shutter solenoid valve (half) control circuit has a malfunction. — The PCM turns the intake shutter solenoid valve (half) off, but the intake shutter solenoid valve (half) control voltage is **less than 5 V for 2 s** (open circuit) — The PCM internal driver IC temperature is **more than 150 °C {320 °F}** when the intake shutter solenoid valve (half) is on
POSSIBLE CAUSE	• Intake shutter solenoid valve (half) malfunction • Connector or terminal malfunction • Open circuit in wiring harness between intake shutter solenoid valve (half) terminal A and main relay • Open circuit in wiring harness between intake shutter solenoid valve (half) terminal B and PCM terminal 152 • PCM malfunction

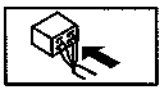


INTAKE SHUTTER SOLENOID VALVE (HALF) WIRING HARNESS-SIDE CONNECTOR



PCM WIRING HARNESS-SIDE CONNECTOR





Diagnostic procedure

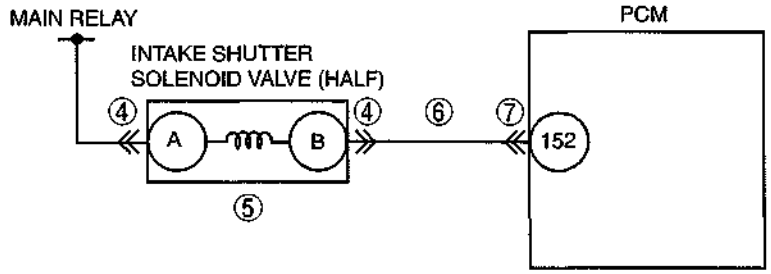
STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERNS TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**INSPECT INTAKE SHUTTER SOLENOID VALVE (HALF) CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the intake shutter solenoid valve (half) connector. • Inspect for poor connection (such as damaged/ pulled-out pins, and corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 9.
		No	Go to the next step.
5	**INSPECT INTAKE SHUTTER SOLENOID VALVE (HALF) CONTROL CIRCUIT FOR OPEN CIRCUIT** • Turn the engine switch to the ON position (Engine off). • Measure the voltage between intake shutter solenoid valve (half) terminal A (wiring harness-side) and body ground • Is the voltage B+?	Yes	Go to the next step.
		No	Repair or replace the wiring harness for a possible open circuit, then go to Step 9.
6	**INSPECT INTAKE SHUTTER SOLENOID VALVE (HALF)** • Inspect the intake shutter solenoid valve (half). (See 01-16B-6 INTAKE SHUTTER SOLENOID VALVE (HALF) INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the intake shutter solenoid valve (half), then go to Step 9. (See 01-13B-3 INTAKE-AIR SYSTEM REMOVAL/ INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
7	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, and corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 9.
		No	Go to the next step.
8	**INSPECT INTAKE SHUTTER SOLENOID VALVE (HALF) CONTROL CIRCUIT FOR OPEN CIRCUIT** • Turn the engine switch off. • Inspect for continuity between intake shutter solenoid valve (half) terminal B (wiring harness-side) and PCM terminal 152 (wiring harness-side) • Is there continuity?	Yes	Go to the next step.
		No	Repair or replace the wiring harness for a possible open circuit, then go to the next step.

STEP	INSPECTION		ACTION
9	**VERIFY TROUBLESHOOTING OF DTC P0660 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
10	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC troubleshooting. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

DTC P0661 [WL-C, WE-C]

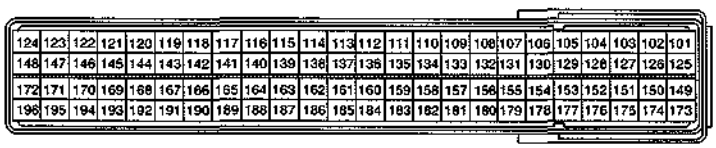
dcf010200600w14

DTC P0661	**Intake shutter solenoid valve (half) control circuit low input**
DETECTION CONDITION	• The PCM monitors the intake shutter solenoid valve (half) control signal at PCM terminal 152. If the PCM turns the intake shutter solenoid valve (half) off but the voltage at PCM terminal 152 remains low, the PCM determines that intake shutter solenoid valve (half) circuit has a malfunction (circuit short to ground).
POSSIBLE CAUSE	• Intake shutter solenoid valve malfunction • Short to ground in wiring harness between intake shutter solenoid valve (half) terminal B and PCM terminal 152 • Connector or terminal malfunction • PCM malfunction



INTAKE SHUTTER SOLENOID VALVE (HALF) WIRING HARNESS-SIDE CONNECTOR

PCM WIRING HARNESS-SIDE CONNECTOR



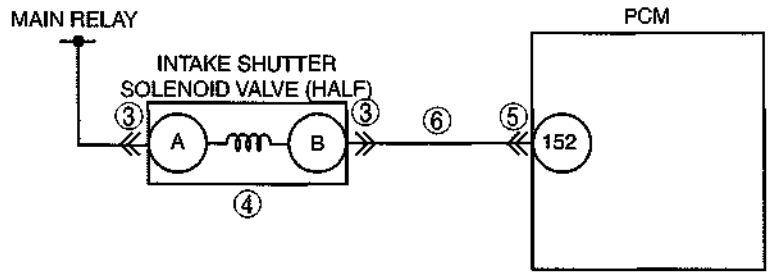
Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERNS TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**INSPECT INTAKE SHUTTER SOLENOID VALVE (HALF) CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the intake shutter solenoid valve (half). • Inspect for poor connection (damaged/pulled-out pins, corrosion, etc.). • Is there malfunction?	Yes	Repair or replace the terminal, then go to Step 8.
		No	Go to the next step.
5	**INSPECT INTAKE SHUTTER SOLENOID VALVE (HALF) MALFUNCTION** • Perform intake shutter solenoid valve (half) inspection. (See 01-16B-6 INTAKE SHUTTER SOLENOID VALVE (HALF) INSPECTION [WL-C, WE-C].) • Is intake shutter solenoid valve normal?	Yes	Go to the next step.
		No	Replace the intake shutter solenoid valve (half), then go to step 8.
6	**INSPECT INTAKE SHUTTER SOLENOID VALVE CONTROL CIRCUIT FOR SHORT TO GROUND** • Inspect for continuity between intake shutter solenoid valve (half) valve terminal B (wiring harness-side) and body ground. • Is there continuity?	Yes	Repair or replace the wiring harness for short to ground, then go to Step 8.
		No	Go to the next step.
7	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Disconnect the PCM connector. • Inspect for poor connection at terminal 152. (damaged/pulled-out pins, corrosion, etc.). • Is there malfunction?	Yes	Repair the terminal, then go to the next step.
		No	Go to the next step.
8	**VERIFY TROUBLESHOOTING OF DTC P0661 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
9	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTC present?	Yes	Go to the applicable DTC troubleshooting. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

DTC P0662 [WL-C, WE-C]

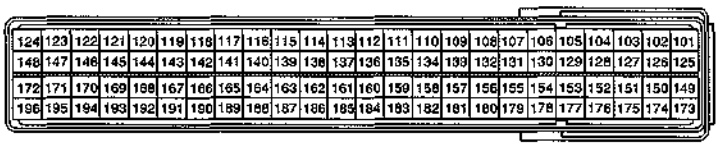
dcf010200600w15

DTC P0662	Intake shutter solenoid valve (half) control circuit high input
DETECTION CONDITION	• The PCM monitors the intake shutter solenoid valve (half) control signal at PCM terminal 152. If the PCM turns the intake shutter solenoid valve (half) on but the voltage at PCM terminal 152 remains high, the PCM determines that the intake shutter solenoid valve (half) circuit has a malfunction (circuit short to power supply).
POSSIBLE CAUSE	• Intake shutter solenoid valve (half) malfunction • Short to power supply in wiring harness between intake shutter solenoid valve (half) terminal B and PCM terminal 152 • Shorted intake shutter solenoid valve (half) or PCM connector • PCM malfunction



INTAKE SHUTTER SOLENOID VALVE (HALF) WIRING HARNESS-SIDE CONNECTOR

PCM WIRING HARNESS-SIDE CONNECTOR



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**INSPECT INTAKE SHUTTER SOLENOID VALVE (HALF) CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the intake shutter solenoid valve (half) connector. • Inspect for poor connection (damaged/pulled-out pins, corrosion, etc.). • Is there malfunction?	Yes	Repair or replace the terminal, then go to Step 7.
		No	Go to the next step.
4	**INSPECT INTAKE SHUTTER SOLENOID VALVE (HALF) MALFUNCTION** • Perform intake shutter solenoid valve (half) inspection. (See 01-16B-6 INTAKE SHUTTER SOLENOID VALVE (HALF) INSPECTION [WL-C, WE-C].) • Is the intake shutter solenoid valve (half) normal?	Yes	Go to the next step.
		No	Replace the intake shutter solenoid valve (half), then go to Step 7.

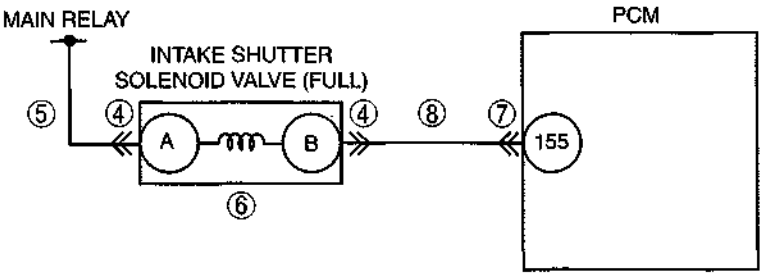
STEP	INSPECTION		ACTION
5	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection at terminal 152. (such as damaged/pulled-out pins, corrosion). • Is there malfunction?	Yes	Repair the terminal, then go to Step 7.
		No	Go to the next step.
6	**INSPECT INTAKE SHUTTER SOLENOID VALVE (HALF) CONTROL CIRCUIT SHORT TO POWER SUPPLY** • Turn the engine switch to the ON position (Engine off). • Measure the voltage between intake shutter solenoid valve (half) terminal B (wiring harness-side) and body ground. • Is the voltage **B+**?	Yes	Repair or replace the wiring harness for short to power supply, then go to the next step.
		No	Go to the next step.
7	**VERIFY TROUBLESHOOTING OF DTC P0662 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
8	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTC present?	Yes	Go to the applicable DTC troubleshooting. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

DTC P0663 [WL-C, WE-C]

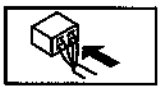
dcf010200600w16

DTC P0663	Intake shutter solenoid valve (full) control circuit open
DETECTION CONDITION	• The PCM monitors the intake shutter solenoid valve (full) control signal. If the following conditions are detected, the PCM determines that the intake shutter solenoid valve (full) control circuit has a malfunction. — The PCM turns the intake shutter solenoid valve (full) off, but the intake shutter solenoid valve (full) control voltage is **less than 5 V for 2 s** (open circuit) — The PCM internal driver IC temperature is **more than 150 °C (320 °F)** when the intake shutter solenoid valve (full) is on
POSSIBLE CAUSE	• Intake shutter solenoid valve (full) malfunction • Connector or terminal malfunction • Open circuit in wiring harness between intake shutter solenoid valve (full) terminal A and main relay • Open circuit in wiring harness between intake shutter solenoid valve (full) terminal B and PCM terminal 155 • PCM malfunction

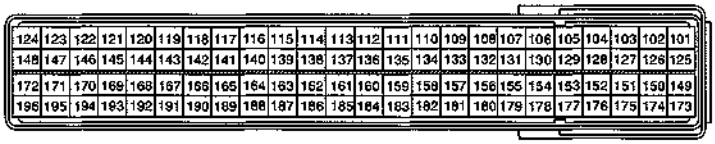
DTC P0663	Intake shutter solenoid valve (full) control circuit open



INTAKE SHUTTER SOLENOID VALVE (FULL) WIRING HARNESS-SIDE CONNECTOR



PCM WIRING HARNESS-SIDE CONNECTOR



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERNS TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**INSPECT INTAKE SHUTTER SOLENOID VALVE (FULL) CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the intake shutter solenoid valve (full) connector. • Inspect for poor connection (such as damaged/ pulled-out pins, and corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 9.
		No	Go to the next step.
5	**INSPECT INTAKE SHUTTER SOLENOID VALVE (FULL) CONTROL CIRCUIT FOR OPEN CIRCUIT** • Turn the engine switch to the ON position (Engine off). • Measure the voltage between Intake shutter solenoid valve (full) terminal A (wiring harness-side) and body ground • Is the voltage B+?	Yes	Go to the next step.
		No	Repair or replace the wiring harness for a possible open circuit, then go to Step 9.

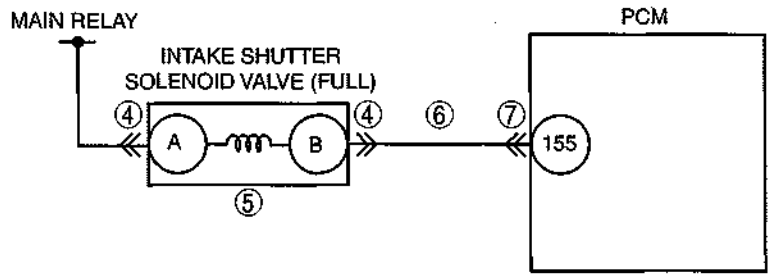
STEP	INSPECTION		ACTION
6	**INSPECT INTAKE SHUTTER SOLENOID VALVE (FULL)** • Inspect the intake shutter solenoid valve (full). (See 01-16B-7 INTAKE SHUTTER SOLENOID VALVE (FULL) INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the intake shutter solenoid valve (full), then go to Step 9. (See 01-13B-3 INTAKE-AIR SYSTEM REMOVAL/ INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
7	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, and corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 9.
		No	Go to the next step.
8	**INSPECT INTAKE SHUTTER SOLENOID VALVE (FULL) CONTROL CIRCUIT FOR OPEN CIRCUIT** • Turn the engine switch off. • Inspect for continuity between intake shutter solenoid valve (full) terminal B (wiring harness-side) and PCM terminal 155 (wiring harness-side) • Is there continuity?	Yes	Go to the next step.
		No	Repair or replace the wiring harness for a possible open circuit, then go to the next step.
9	**VERIFY TROUBLESHOOTING OF DTC P0663 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
10	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC troubleshooting. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

DTC P0664 [WL-C, WE-C]

dcf010200600w17

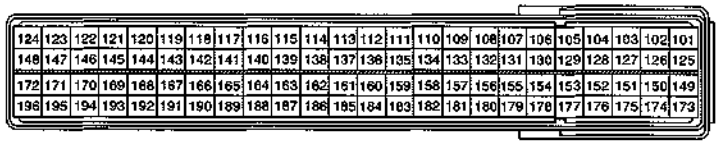
DTC P0664	Intake shutter solenoid valve (full) control circuit low input
DETECTION CONDITION	• The PCM monitors the intake shutter solenoid valve (full) control signal at PCM terminal 155. If the PCM turns the intake shutter solenoid valve (full) off, but the voltage at PCM terminal 155 remains low, the PCM determines that intake shutter solenoid valve (full) circuit has a malfunction (circuit short to ground).
POSSIBLE CAUSE	• Intake shutter solenoid valve (full) malfunction • Short to ground in wiring harness between intake shutter solenoid valve (full) terminal B and PCM terminal 155 • Connector or terminal malfunction • PCM malfunction

DTC P0664	Intake shutter solenoid valve (full) control circuit low input



INTAKE SHUTTER SOLENOID VALVE (FULL)
WIRING HARNESS-SIDE CONNECTOR

PCM
WIRING HARNESS-SIDE CONNECTOR



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERNS TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**INSPECT INTAKE SHUTTER SOLENOID VALVE (FULL) CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the intake shutter solenoid valve (full) connector. • Inspect for poor connection (damaged/pulled-out pins, corrosion, etc.). • Is there malfunction?	Yes	Repair or replace the terminal, then go to Step 8.
		No	Go to the next step.
5	**INSPECT INTAKE SHUTTER SOLENOID VALVE (FULL) MALFUNCTION** • Perform intake shutter solenoid valve (full) inspection. (See 01-16B-7 INTAKE SHUTTER SOLENOID VALVE (FULL) INSPECTION [WL-C, WE-C].) • Is intake shutter solenoid valve (full) normal?	Yes	Go to the next step.
		No	Replace the intake shutter solenoid valve (full), then go to step 8.

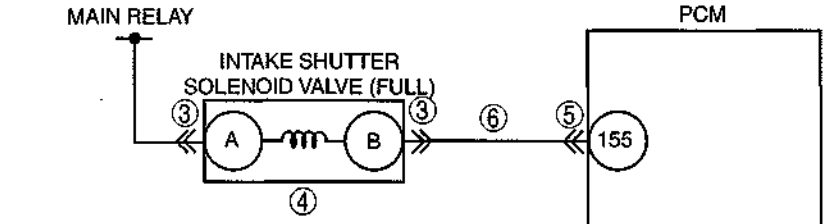
STEP	INSPECTION		ACTION
6	**INSPECT INTAKE SHUTTER SOLENOID VALVE (FULL) CONTROL CIRCUIT FOR SHORT TO GROUND** • Disconnect the intake shutter solenoid valve (full) connector and PCM connector. • Inspect for continuity between intake shutter solenoid valve (full) terminal B (wiring harness-side) and body ground. • Is there continuity?	Yes	Repair or replace the wiring harness for short to ground, then go to Step 8.
		No	Go to the next step.
7	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Disconnect the PCM connector. • Inspect for poor connection at terminal 155. (damaged/pulled-out pins, corrosion, etc.). • Is there malfunction?	Yes	Repair the terminal, then go to the next step.
		No	Go to the next step.
8	**VERIFY TROUBLESHOOTING OF DTC P0664 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
9	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTC present?	Yes	Go to the applicable DTC troubleshooting. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

DTC P0665 [WL-C, WE-C]

dcf010200600w18

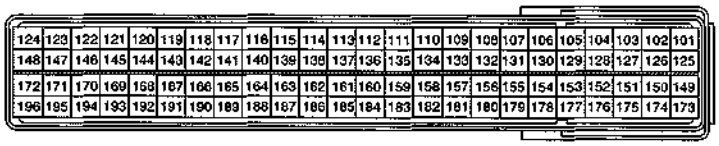
DTC P0665	Intake shutter solenoid valve (full) control circuit high input
DETECTION CONDITION	• The PCM monitors the intake shutter solenoid valve (full) control signal at PCM terminal 155. If the PCM turns the intake shutter solenoid valve (full) on, but the voltage at PCM terminal 155 remains high, the PCM determines that the intake shutter solenoid valve (full) circuit has a malfunction (circuit short to power supply).
POSSIBLE CAUSE	• Intake shutter solenoid valve (full) malfunction • Short to power supply in wiring harness between intake shutter solenoid valve (full) terminal B and PCM terminal 155 • Shorted intake shutter solenoid valve (full) or PCM connector • PCM malfunction

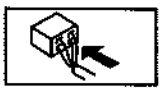
DTC P0665	Intake shutter solenoid valve (full) control circuit high input



INTAKE SHUTTER SOLENOID VALVE (FULL) WIRING HARNESS-SIDE CONNECTOR

PCM WIRING HARNESS-SIDE CONNECTOR





01

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**INSPECT INTAKE SHUTTER SOLENOID VALVE (FULL) CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the intake shutter solenoid valve (full) connector. • Inspect for poor connection (damaged/pulled-out pins, corrosion, etc.). • Is there malfunction?	Yes	Repair or replace the terminal, then go to Step 7.
		No	Go to the next step.
4	**INSPECT INTAKE SHUTTER SOLENOID VALVE (FULL) MALFUNCTION** • Perform intake shutter solenoid valve (full) inspection. (See 01-16B-7 INTAKE SHUTTER SOLENOID VALVE (FULL) INSPECTION [WL-C, WE-C].) • Is the intake shutter solenoid valve (full) normal?	Yes	Go to the next step.
		No	Replace the intake shutter solenoid valve (full), then go to Step 7.
5	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection at terminal 155. (such as damaged/pulled-out pins, corrosion). • Is there malfunction?	Yes	Repair the terminal, then go to Step 7.
		No	Go to the next step.

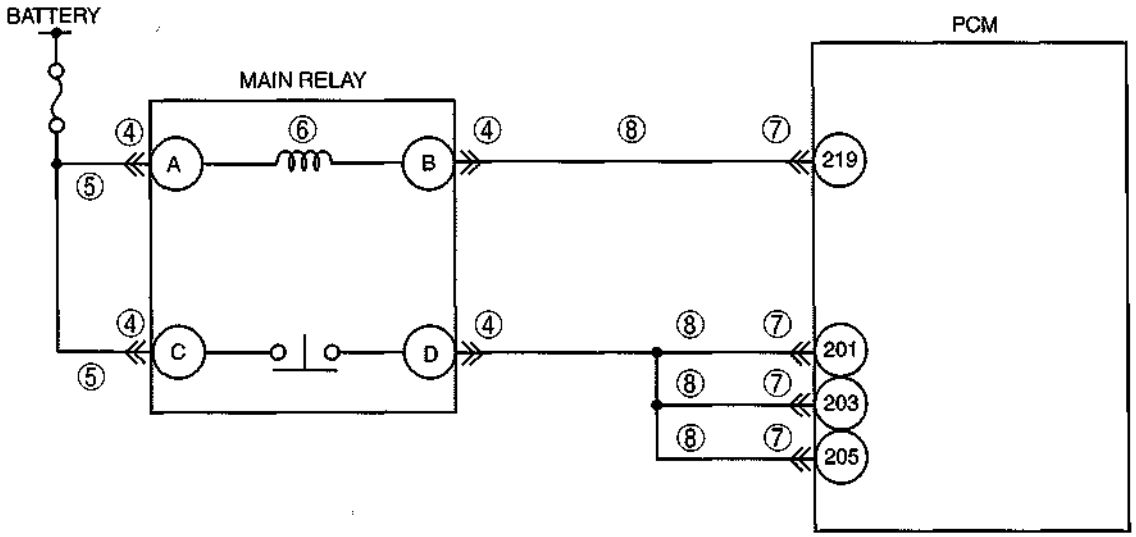
STEP	INSPECTION		ACTION
6	**INSPECT INTAKE SHUTTER SOLENOID VALVE (FULL) CONTROL CIRCUIT SHORT TO POWER SUPPLY** • Turn the engine switch to the ON position (Engine off). • Measure the voltage between intake shutter solenoid valve (full) terminal B (wiring harness-side) and body ground. • Is the voltage B+?	Yes	Repair or replace the wiring harness for short to power supply, then go to the next step.
		No	Go to the next step.
7	**VERIFY TROUBLESHOOTING OF DTC P0665 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
8	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTC present?	Yes	Go to the applicable DTC troubleshooting. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

DTC P0685 [WL-C, WE-C]

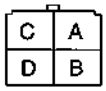
dcf010200600w19

DTC P0685	Main relay control circuit open
DETECTION CONDITION	• The PCM monitors the power supply to the PCM. If the power supply is shut down several times when the engine switch is turned to the ON position, the PCM determines that there is a power circuit malfunction (open circuit).
POSSIBLE CAUSE	• Connector or terminal malfunction • Open circuit in wiring harness between main relay terminal B and PCM terminal 219 • Open circuit in wiring harness between main relay terminal D and PCM terminal 201, 203, or 205 • Main relay malfunction • Open circuit in wiring between main relay terminal A, terminal C and battery • PCM malfunction

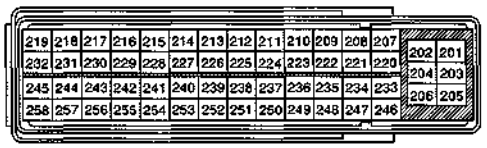
DTC P0685	Main relay control circuit open



MAIN RELAY WIRING HARNESS-SIDE CONNECTOR



PCM WIRING HARNESS-SIDE CONNECTOR



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has the FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERNS TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**INSPECT MAIN RELAY CONNECTOR FOR POOR CONNECTION** • Disconnect the generator connector. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there a malfunction?	Yes	Repair or replace the terminals, then go to Step 9.
		No	Go to the next step.

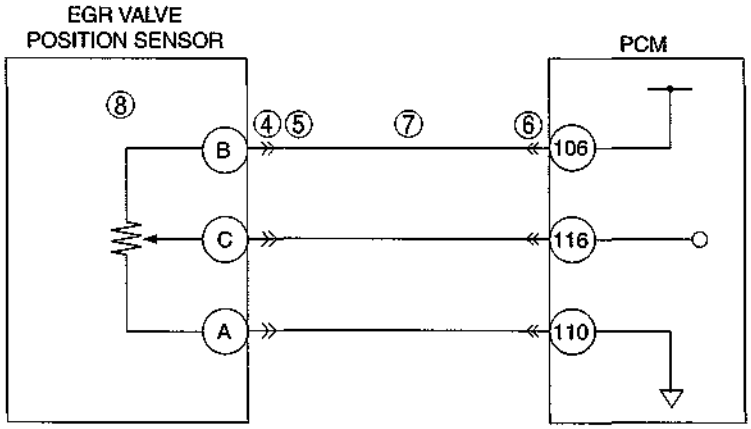
STEP	INSPECTION		ACTION
5	**INSPECT MAIN RELAY POWER CIRCUIT FOR OPEN CIRCUIT** • Measure the voltage between the following terminal: — Main relay terminal A and body ground. — Main relay terminal C and body ground. • Is the voltage **B+**?	Yes	Go to the next step.
		No	Repair or replace the wiring harness for open circuit, then go to Step 9.
6	**INSPECT MAIN RELAY** • Inspect the main relay. • Is there any malfunction?	Yes	Replace the main relay, then go to Step 9.
		No	Go to the next step.
7	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there a malfunction?	Yes	Repair terminals, then go to Step 9.
		No	Go to the next step.
8	**INSPECT MAIN RELAY CONTROL CIRCUIT FOR OPEN CIRCUIT** • Inspect for continuity between the following terminal: — Main relay terminal B and PCM terminal 219 — Main relay terminal D and PCM terminal 201, 203, or 205 • Is there continuity?	Yes	Go to the next step.
		No	Repair or replace the wiring harness for open circuit, then go to Step 9.
9	**VERIFY THAT DTC P0685 TROUBLESHOOTING IS COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
10	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	DTC troubleshooting completed.

DTC P0698 [WL-C, WE-C]

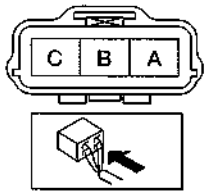
dcf010200600w20

DTC P0698	EGR valve position sensor 5 V circuit low input
DETECTION CONDITION	• The PCM monitors the EGR position sensor 5 V circuit. If the EGR position sensor power voltage is **lower than 4.9 V**, the PCM determines that there is a EGR position sensor 5 V circuit malfunction.
POSSIBLE CAUSE	• Short to ground circuit between circuit in wiring between EGR position sensor terminal B and PCM terminal 108 • EGR position sensor malfunction • PCM malfunction

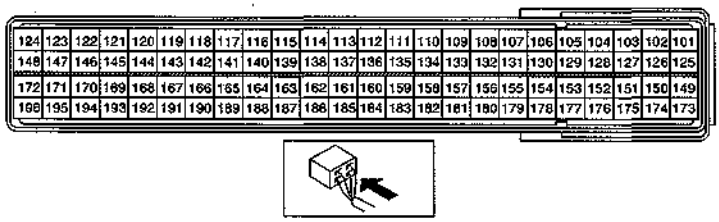
DTC P0698	EGR valve position sensor 5 V circuit low input



EGR VALVE POSITION SENSOR
WIRING HARNESS-SIDE CONNECTOR



PCM
WIRING HARNESS-SIDE CONNECTOR



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has the FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERNS TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**INSPECT EGR POSITION SENSOR CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the EGR position sensor connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 9.
		No	Go to the next step.

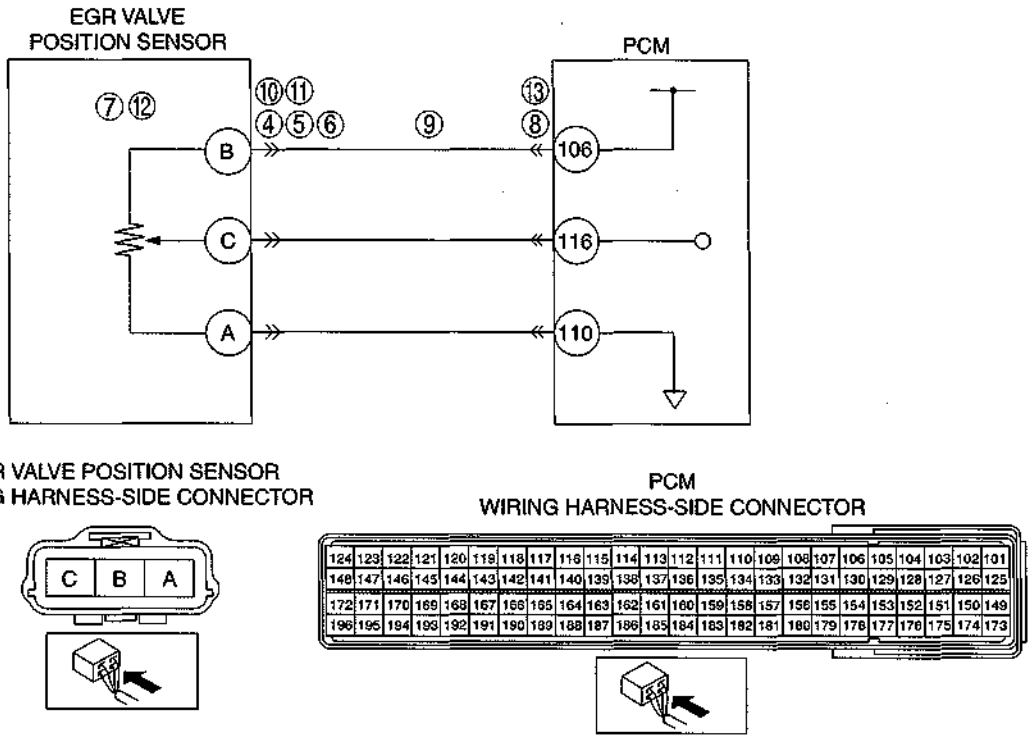
STEP	INSPECTION		ACTION
5	**CLASSIFY EGR POSITION SENSOR OR HARNESS RELATED MALFUNCTION** • Disconnect the EGR position sensor connector. • Turn the engine switch to the ON position (Engine off). • Measure the voltage between the EGR position sensor terminal B (wiring harness-side) and body ground. • Is the voltage **4.9 V or less** ?	Yes	Go to the next step.
		No	Go to Step 8.
6	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to the next step.
		No	Go to the next step.
7	**INSPECT EGR POSITION SENSOR CIRCUIT FOR SHORT TO GROUND** • Turn the engine switch off. • Inspect for continuity between the EGR position sensor terminal B (wiring harness-side) and body ground. • Is there continuity?	Yes	Repair or replace the wiring harness for a possible short to ground, then go to Step 9.
		No	Go to Step 9.
8	**INSPECT EGR POSITION SENSOR** • Inspect the EGR position sensor. (See 01-40B-40 EGR VALVE POSITION SENSOR INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the EGR position sensor, then go to the next step.
		No	Go to the next step.
9	**VERIFY TROUBLESHOOTING OF DTC P0698 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
10	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	DTC troubleshooting completed.

DTC P0699 [WL-C, WE-C]

dcf010200600w21

DTC P0699	EGR valve position sensor 5 V circuit high input
DETECTION CONDITION	• The PCM monitors the EGR position sensor 5 V circuit. If the EGR position sensor power voltage is **higher than 5.1 V**, the PCM determines that there is a EGR position sensor 5 V circuit malfunction.
POSSIBLE CAUSE	• Short to power supply between EGR position sensor connector terminal B and PCM terminal 108 • Open circuit in wiring harness between EGR position sensor connector terminal B and PCM terminal 108 • EGR position sensor malfunction • PCM malfunction

DTC P0699	EGR valve position sensor 5 V circuit high input



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has the FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERNS TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**CLASSIFY EGR POSITION SENSOR OPEN CIRCUIT OR SHORT CIRCUIT RELATED MALFUNCTION** • Turn the engine switch to the ON position (Engine off). • Measure the voltage between the EGR position sensor connector terminal B and body ground. • Is the voltage **5.1 V or more** ?	Yes	Go to step 10
		No	Go to the next step.
5	**INSPECT POOR CONNECTION OF EGR POSITION SENSOR CONNECTOR** • Turn the engine switch off. • Disconnect the EGR position sensor connector. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there a malfunction?	Yes	Repair or replace the terminals, then go to Step 14.
		No	Go to the next step.

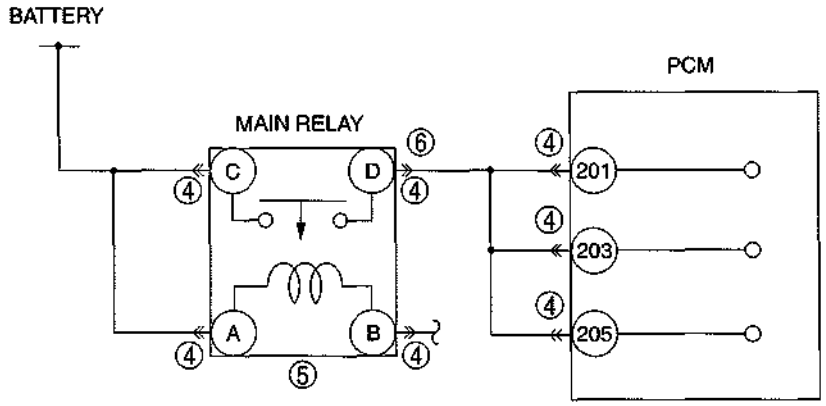
STEP	INSPECTION		ACTION
6	**CLASSIFY EGR POSITION SENSOR OR HARNESS RELATED MALFUNCTION** • Disconnect the EGR position sensor connector. • Turn the engine switch to the ON position (Engine off). • Measure the voltage between the EGR position sensor connector terminal B and body ground. • Is the voltage **5 V constant voltage** ?	Yes	Go to the next step.
		No	Go to step 8
7	**INSPECT EGR POSITION SENSOR** • Inspect the EGR position sensor. (See 01-40B-40 EGR VALVE POSITION SENSOR INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the EGR position sensor, then go to Step 14.
		No	Go to Step 14.
8	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there a malfunction?	Yes	Repair or replace the pins, then go to Step 14.
		No	Go to the next step.
9	**INSPECT EGR POSITION SENSOR POWER CIRCUIT FOR OPEN** • Turn the engine switch off. • Inspect for continuity between the EGR position sensor position sensor connector terminal B and PCM terminal 108. • Is there continuity?	Yes	Go to Step 14.
		No	Repair or replace the wiring harness for an open, go to Step 14.
10	**INSPECT POOR CONNECTION OF EGR POSITION SENSOR CONNECTOR** • Turn the engine switch off. • Disconnect the EGR position sensor connector. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there a malfunction?	Yes	Repair or replace the terminals, then go to Step 14.
		No	Go to the next step.
11	**CLASSIFY EGR POSITION SENSOR OR HARNESS RELATED MALFUNCTION** • Disconnect the EGR position sensor connector. • Turn the engine switch to the ON position (Engine off). • Measure the voltage between the EGR position sensor connector terminal B and body ground. • Is the voltage **5.1 V or more** ?	Yes	Go to the Step 13.
		No	Go to the next step.
12	**INSPECT EGR POSITION SENSOR** • Inspect the EGR position sensor. (See 01-40B-40 EGR VALVE POSITION SENSOR INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the EGR position sensor, then go to Step 14.
		No	Go to Step 14.
13	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there a malfunction?	Yes	Repair or replace the pins, then go to the next step.
		No	Repair or replace the wiring harness for a short to power, go to the next step.

STEP	INSPECTION		ACTION
14	**VERIFY TROUBLESHOOTING OF DTC P0699 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
15	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	DTC troubleshooting completed.

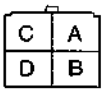
DTC P1196 [WL-C, WE-C]

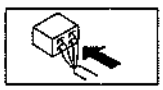
dcf010201100w05

DTC P1196	Key off voltage high input
DETECTION CONDITION	• The PCM monitors whether the main relay opens **after 2 s** when the engine switch is turned to the off position. If the main relay does not open **after 2 s**, the PCM determines that there is malfunction in the main relay circuit.
POSSIBLE CAUSE	• Main relay malfunction • Connector or terminal malfunction • Short to power supply between main relay terminal D and PCM terminal 201, 203, and 205 • PCM malfunction

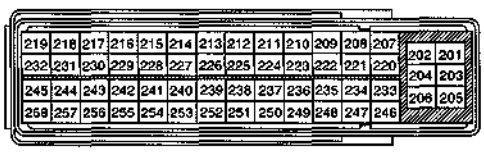


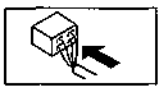
MAIN RELAY
WIRING HARNESS-SIDE CONNECTOR





PCM
WIRING HARNESS-SIDE CONNECTOR





Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**IDENTIFY TRIGGER DTC FOR FREEZE FRAME DATA** • Is DTC P1196 on FREEZE FRAME DATA?	Yes	Go to the next step.
		No	Go to troubleshooting procedures for DTC in FREEZE FRAME DATA. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
4	**INSPECT MAIN RELAY CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the main relay connector. • Inspect for poor connection (such as damaged/ pulled-out pins, and corrosion). • Is there any malfunction?	Yes	Repair or replace terminal, then go to Step 7.
		No	Go to the next step.
5	**INSPECT MAIN RELAY** • Inspect the main relay. • Is it normal?	Yes	Go to the next step.
		No	Install the sensor securely, then go to the Step 7.
6	**INSPECT MAIN RELAY CIRCUIT FOR SHORT TO POWER SUPPLY** • Turn the engine switch off. • Measure voltage between main relay terminal D (wiring harness-side) and body ground. • Is the voltage **B+**?	Yes	Repair or replace for short to power supply. Then, go to the next step.
		No	Go to the next step.
7	**VERIFY TROUBLESHOOTING OF DTC P1196 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
8	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

DTC P1259 [WL-C, WE-C]

dcf010201200w02

DTC P1259	IMMOBILIZER to PCM signal error
DETECTION CONDITION	• The PCM does not complete target ID transfer.
POSSIBLE CAUSE	• Immobilizer system malfunction • Communication error between immobilizer unit and PCM • PCM malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA AND DIAGNOSTIC MONITORING TEST RESULTS HAVE BEEN RECORDED** • Have FREEZE FRAME DATA and DIAGNOSTIC MONITORING TEST RESULTS been recorded?	Yes	go to the next step.
		No	Record the FREEZE FRAME DATA and DIAGNOSTIC MONITORING TEST RESULTS on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Go to appropriate DTC troubleshooting procedure. (See 09-02A-2 DTC TABLE [IMMOBILIZER SYSTEM].)
		No	go to the next step.
3	**INSPECT IMMOBILIZER UNIT CONNECTOR FOR POOR CONNECTION** • Turn engine switch off. • Disconnect the IMMOBILIZER UNIT connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the suspected terminal, then go to Step 8.
		No	Go to the next step.
4	**INSPECT COMMUNICATION LINE FOR SHORT TO GROUND** • Inspect for continuity between the following terminals and body ground: — IMOBILIZER unit connector terminal A (wiring harness-side) • Is there continuity?	Yes	Repair or replace the suspected wiring harness, then go to Step 8.
		No	Go to the next step.
5	**INSPECT COMMUNICATION LINE FOR SHORT TO POWER SUPPLY** • Measure the voltage between following terminals and body ground: — IMMOBILIZER unit connector terminal A (wiring harness-side) • Is the voltage B+?	Yes	Repair or replace the suspected wiring harness, then go to Step 8.
		No	Go to the next step.
6	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn engine switch off. • Disconnect the PCM connector. (See 01-40B-9 PCM REMOVAL/ INSTALLATION [WL-C, WE-C].) • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the suspected terminal, then go to Step 8.
		No	Go to the next step.
7	**INSPECT COMMUNICATION LINE FOR OPEN CIRCUIT** • Inspect for continuity between the following terminals: — IMMOBILIZER UNIT connector terminal A (wiring harness-side) and PCM connector terminal 230 (wiring harness-side) • Is there continuity?	Yes	Go to the next step.
		No	Repair or replace the suspected wiring harness, then go to the next step.
8	**VERIFY THAT DTC P1259 TROUBLESHOOTING IS COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine and warm-up to normal operating temperature. • Retrieve the DTC using the current diagnostic tool. • Is the PENDING CODE same DTC present?	Yes	Replace PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	go to the next step.
9	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

DTC P1260 [WL-C, WE-C]

dcf010201200w03

DTC P1260	Theft detected Vehicle immobilizer
DETECTION CONDITION	• Immobilizer system malfunction
POSSIBLE CAUSE	• Immobilizer system malfunction • PCM malfunction

Diagnostic procedure

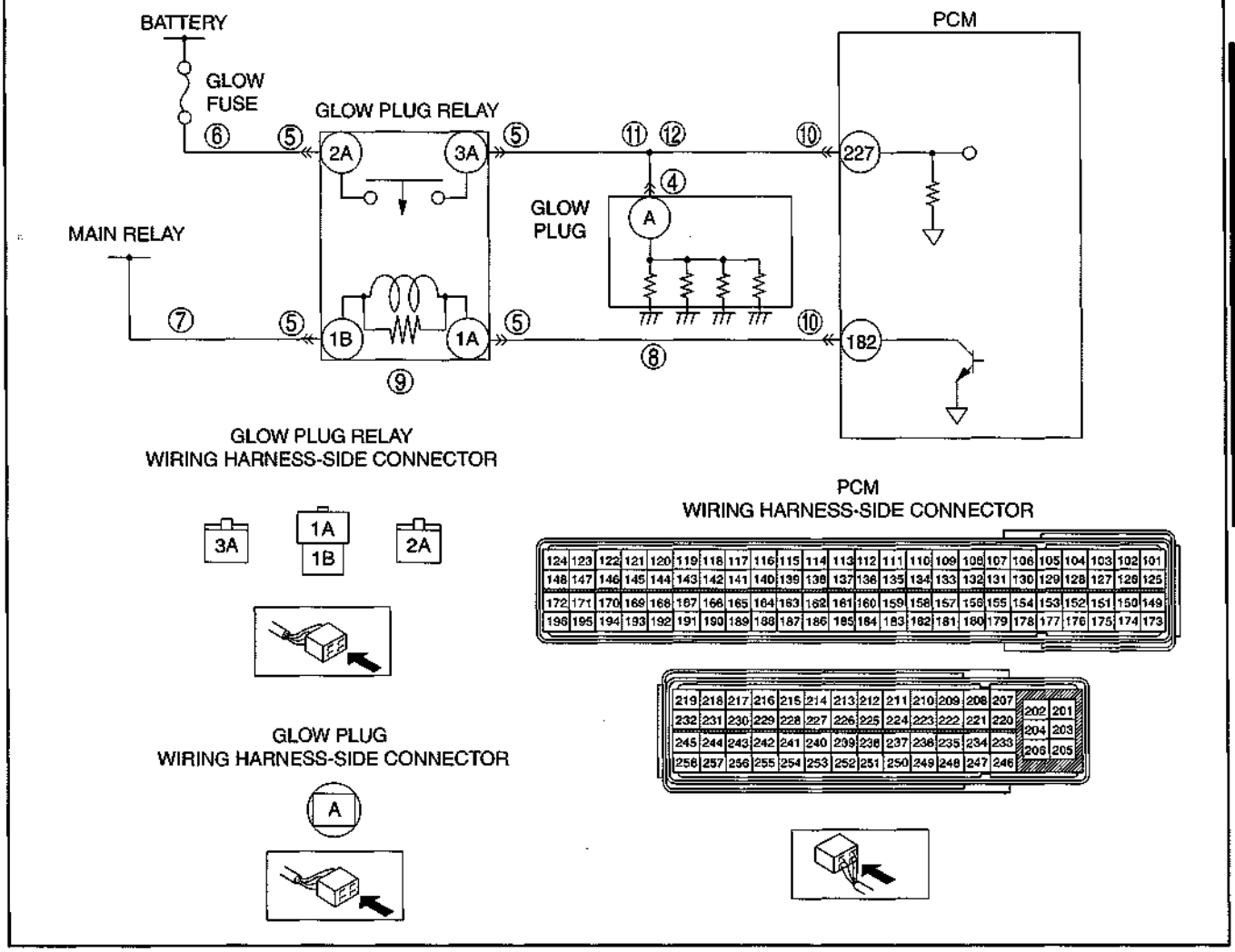
STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA AND DIAGNOSTIC MONITORING TEST RESULTS HAVE BEEN RECORDED** • Have FREEZE FRAME DATA and DIAGNOSTIC MONITORING TEST RESULTS been recorded?	Yes	go to the next step.
		No	Record the FREEZE FRAME DATA and DIAGNOSTIC MONITORING TEST RESULTS on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. If the vehicle is not repaired, go to the next step.
		No	go to the next step.
3	**VERIFY STORED DTC IN IMMOBILIZER SYSTEM** • Turn the engine switch to the ON position (Engine off). • Verify stored DTC in IMMOBILIZER SYSTEM. (See 09-02A-2 DTC TABLE [IMMOBILIZER SYSTEM].) • Are DTCs stored?	Yes	Go to appropriate DTC troubleshooting procedure. (See 09-02A-2 DTC TABLE [IMMOBILIZER SYSTEM].)
		No	go to the next step.
4	**VERIFY THAT DTC P1260 TROUBLESHOOTING IS COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine and warm-up to normal operating temperature. • Retrieve the DTC using the current diagnostic tool. • Is the PENDING CODE same DTC present?	Yes	Replace PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	go to the next step.
5	**VERIFY AFTER REPAIR PROCEDURE** • Perform "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Is there any DTC present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

DTC P1391 [WL-C, WE-C]

dcf010201300w03

DTC P1391	Glow plug control circuit low input
DETECTION CONDITION	• The PCM monitors the output signal to the glow plug relay when the glow plug relay is on. If the glow plug relay voltage is **less than 2 V for 1 s** when the glow plug relay is operating, The PCM determines that there is a malfunction in the glow plug relay circuit.
POSSIBLE CAUSE	• Glow plug relay malfunction • Melt or burnt glow fuse • PCM malfunction • Glow plug malfunction • Connector or terminal malfunction • Open circuit in wiring harness between glow plug relay terminal 3A and PCM terminal 227 • Open circuit in wiring harness between glow plug relay terminal 1A and PCM terminal 182 • Open circuit in wiring harness between glow plug relay terminal 1B and main relay • Open circuit in wiring harness between glow plug relay terminal 2A and battery • Short to ground circuit in wiring harness between glow plug relay terminal 3A and PCM terminal 227

DTC P1391 | Glow plug control circuit low input



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**GLOW PLUG CONNECTOR FOR POOR CONNECTION** • Turn the engine switch to the ON position. • Inspect for poor connection (such as damaged/ pulled- out terminals, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 13.
		No	Go to the next step.

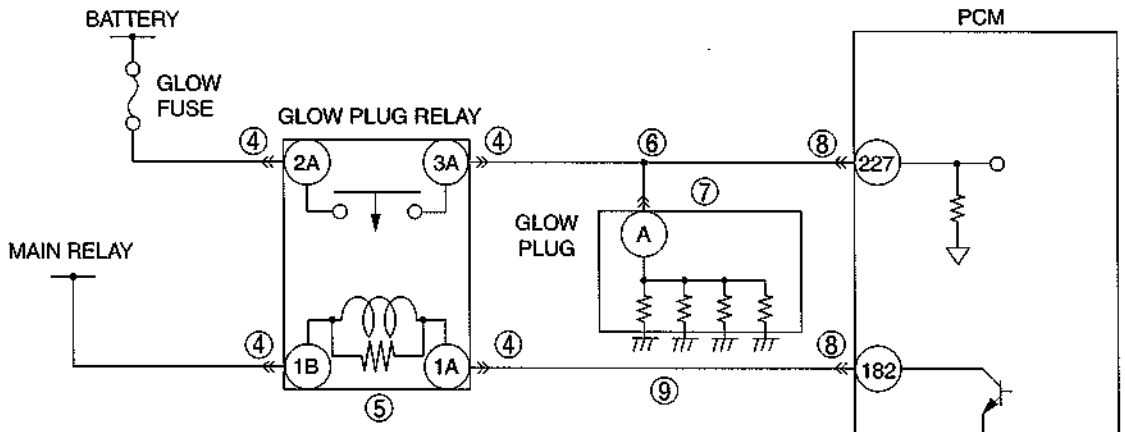
STEP	INSPECTION		ACTION
5	**INSPECT GLOW PLUG RELAY CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the glow plug relay connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to the next step.
		No	Go to the next step.
6	**INSPECT GLOW PLUG RELAY POWER SUPPLY FOR OPEN CIRCUIT** • Turn the engine switch off. • Measure the voltage between glow plug relay terminal 2A and body ground. • Is the voltage **B+**?	Yes	Go to the next step.
		No	Repair or replace the wiring harness for an open circuit, go to Step 13.
7	**INSPECT GLOW PLUG RELAY CONTROL POWER FOR OPEN CIRCUIT** • Turn the engine switch off. • Remove the glow plug relay. • Inspect for continuity between glow plug relay terminal 1B and ground. • Is there continuity?	Yes	Repair or replace the wiring harness for an open circuit, go to Step 13.
		No	Go to the next step.
8	**INSPECT GLOW PLUG RELAY SIGNAL FOR OPEN CIRCUIT** • Turn the engine switch to the ON position (Engine off). • Measure the voltage between glow plug relay terminal 1A. • Is voltage **less than 2 V**?	Yes	Repair or replace the wiring harness for an open circuit, go to Step 13.
		No	Go to the next step.
9	**INSPECT GLOW PLUG RELAY** • Inspect the glow plug relay. (See 01-13B-9 GLOW PLUG RELAY INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Go to the next step.
		No	Replace the glow plug relay, go to Step 13.
10	**INSPECT POOR CONNECTION OF PCM CONNECTOR** • Turn the engine switch off. • Inspect for poor connection (such as damaged/ pulled-out terminals, corrosion). • Is there any malfunction?	Yes	Repair or replace the suspected terminal, go to Step 13.
		No	Go to the next step.
11	**INSPECT GLOW PLUG RELAY SIGNAL CIRCUIT FOR SHORT TO GROUND** • Turn the engine switch off. • Remove the glow plug relay connector. • Inspect for continuity between glow plug relay terminal 3A and body ground. • Is there continuity?	Yes	Repair or replace the wiring harness for a short to ground, then go to Step 13.
		No	Go to the next step
12	**INSPECT GLOW PLUG RELAY SIGNAL CIRCUIT FOR OPEN CIRCUIT** • Turn the engine switch off. • Inspect for continuity between glow plug relay terminal 3A and PCM terminal 227. • Is there continuity?	Yes	Go to the next step
		No	Repair or replace the wiring harness for an open circuit, then go to the next step.
13	**VERIFY TROUBLESHOOTING OF DTC P1391 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.

STEP	INSPECTION		ACTION
14	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

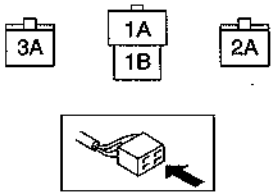
DTC P1392 [WL-C, WE-C]

dcf010201300w04

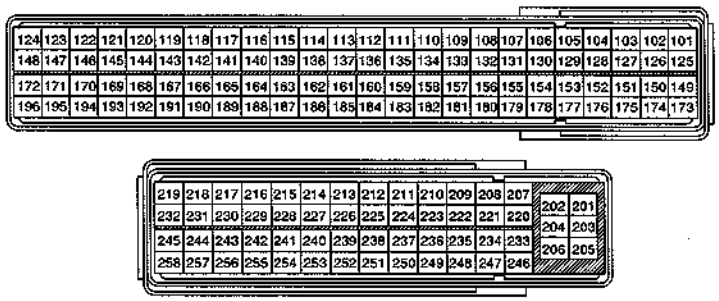
DTC P1392	Glow plug control circuit high input
DETECTION CONDITION	• The PCM monitors the output signal to the glow plug relay when the glow plug relay is off. If the glow plug relay voltage is **more than 2 V for 1 s** when the glow plug relay is off, The PCM determines that there is a malfunction in the glow plug relay control circuit.
POSSIBLE CAUSE	• Glow plug relay malfunction • Glow plug malfunction • PCM malfunction • Connector or terminal malfunction • Short to power supply in wiring harness between glow plug relay terminal 3A and PCM terminal 227 • Short to ground in wiring harness between glow plug relay terminal 1A and PCM terminal 182



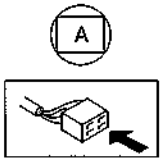
GLOW PLUG RELAY
WIRING HARNESS-SIDE CONNECTOR



PCM
WIRING HARNESS-SIDE CONNECTOR



GLOW PLUG
WIRING HARNESS-SIDE CONNECTOR



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**INSPECT GLOW PLUG RELAY CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the glow plug relay connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to the next step.
		No	Go to the next step.
5	**INSPECT GLOW PLUG RELAY** • Inspect the glow plug relay. (See 01-13B-9 GLOW PLUG RELAY INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the glow plug relay, go to Step 10.
		No	Go to the next step.
6	**INSPECT GLOW PLUG RELAY SIGNAL CIRCUIT FOR SHORT TO POWER** • Turn the engine switch to the ON position (Engine off). • Disconnect the PCM connector. • Measure the voltage between glow plug terminal 3A and body ground. • Is the voltage **more than 2 V**?	Yes	Repair or replace the wiring harness for a short to power supply, then go to Step 10.
		No	Go to the next step
7	**INSPECT GLOW PLUG** • Inspect glow plug. (See 01-13B-9 GLOW PLUG INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the glow plug, go to Step 10.
		No	Go to the next step.
8	**INSPECT POOR CONNECTION OF PCM CONNECTOR** • Turn the engine switch off. • Inspect for poor connection (such as damaged/ pulled-out terminals, corrosion). • Is there any malfunction?	Yes	Repair or replace the suspected terminal, go to the Step 10.
		No	Go to the next step.
9	**INSPECT GLOW PLUG RELAY CONTROL POWER CIRCUIT FOR SHORT TO GROUND** • Turn the engine switch to off. • Remove the glow plug relay. • Inspect for continuity between glow plug relay terminal 1A and body ground. • Is there continuity?	Yes	Repair or replace the wiring harness for a short to power supply, then go to the next step.
		No	Go to the next step

STEP	INSPECTION		ACTION
10	**VERIFY TROUBLESHOOTING OF DTC P1392 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
11	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

DTC P1602 [WL-C, WE-C]

dcf010201600w02

DTC P1602	Immobilizer/PCM communication error
DETECTION CONDITION	• PCM internal malfunction
POSSIBLE CAUSE	• PCM malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	—		Replace PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
2	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

DTC P1603 [WL-C, WE-C]

dcf010201600w03

DTC P1603	ID Number Unregistered
DETECTION CONDITION	• PCM internal malfunction
POSSIBLE CAUSE	• PCM malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	—		Replace PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
2	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

DTC P1604 [WL-C, WE-C]

dcf010201600w04

DTC P1604	Code word unregistered
DETECTION CONDITION	PCM internal malfunction
POSSIBLE CAUSE	PCM malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	—		Replace PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
2	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

DTC P1621, P1622, P1623, P1624 [WL-C, WE-C]

dcf010201600w05

DTC P1621 DTC P1622 DTC P1623 DTC P1624	**Immobilizer code word does not match** **Immobilizer ID does not match** **Immobilizer code word/ID number write failure** **Anti-theft system**
DETECTION CONDITION	• Cord word stored in immobilizer system and PCM does not to match. • ID number stored in immobilizer system and PCM does not to match.
POSSIBLE CAUSE	• Immobilizer system malfunction • PCM malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA AND DIAGNOSTIC MONITORING TEST RESULTS HAVE BEEN RECORDED** • Have FREEZE FRAME DATA and DIAGNOSTIC MONITORING TEST RESULTS been recorded?	Yes	go to the next step.
		No	Record the FREEZE FRAME DATA and DIAGNOSTIC MONITORING TEST RESULTS on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. If the vehicle is not repaired, go to the next step.
		No	go to the next step.
3	**VERIFY STORED DTC IN IMMOBILIZER SYSTEM** • Turn the engine switch to the ON position (Engine off). • Verify stored DTC in IMMOBILIZER SYSTEM. (See 09-02A-2 DTC TABLE [IMMOBILIZER SYSTEM].) • Are DTCs stored?	Yes	Go to appropriate DTC troubleshooting procedure. (See 09-02A-2 DTC TABLE [IMMOBILIZER SYSTEM].)
		No	go to the next step.
4	**VERIFY THAT DTC P1621/P1622/P1623/P1624 TROUBLESHOOTING IS COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine and warm-up to normal operating temperature. • Retrieve the DTC using the current diagnostic tool. • Is the PENDING CODE same DTC present?	Yes	Replace PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	go to the next step.

STEP	INSPECTION		ACTION
5	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

DTC P1675 [WL-C, WE-C]

dcf010201600w06

DTC P1675	Injection quantity adjustment value writing error
DETECTION CONDITION	• The fuel injector compensation data configuration has not been completed.
POSSIBLE CAUSE	• Fuel injector compensation data input procedure does not been completed. • PCM malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY FUEL INJECTOR COMPENSATION DATA INPUT PROCEDURE** • Does the fuel injector compensation data input procedure properly?	Yes	Go to the next step.
		No	Perform the fuel injector compensation data input procedure. (See 01-14B-15 FUEL INJECTOR REMOVAL/ INSTALLATION [WL-C, WE-C].)
4	**VERIFY TROUBLESHOOTING OF DTC P1675 COMPLETED** • Make sure to reconnect all disconnected connectors. • Turn the engine switch to ON position (engine off). • Clear the DTC from PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Replace the PCM, go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
5	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

DTC P1676 [WL-C, WE-C]

dcf010201600w07

DTC P1676	Injection quantity adjustment value checksum error
DETECTION CONDITION	• The fuel injector compensation data check sum error.
POSSIBLE CAUSE	• Fuel injector compensation data reprogramming error.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY FUEL INJECTOR COMPENSATION DATA INPUTTED PROPERLY** • Perform the fuel injector compensation data input procedure. (See 01-14B-15 FUEL INJECTOR REMOVAL/ INSTALLATION [WL-C, WE-C].) • Does the inputted fuel injector compensation data properly?	Yes	Go to the next step.
		No	Clear the learning data on PCM. Perform the fuel injector compensation data input procedure again.
4	**VERIFY TROUBLESHOOTING OF DTC P1676 COMPLETED** • Make sure to reconnect all disconnected connectors. • Turn the engine switch to ON position (engine off). • Clear the DTC from PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
5	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

DTC P2135 [WL-C, WE-C]

dcf010202100w01

DTC P2135	Accelerator pedal position (APP) sensor No.1/No.2 voltage correlation problem
DETECTION CONDITION	• The PCM monitors the input signals from accelerator pedal position sensor No.1 and accelerator pedal position sensor No.2. If the difference between accelerator pedal position sensor No.1 and accelerator pedal position sensor No.2 is **more than 0.9 V for 0.5 s**, the PCM determines that there is a malfunction in the accelerator pedal position sensor characteristic.
POSSIBLE CAUSE	• APP sensor malfunction • PCM malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.

STEP	INSPECTION		ACTION
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**INSPECT APP SENSOR** • Inspect the APP sensor. (See 01-40B-28 ACCELERATOR PEDAL POSITION (APP) SENSOR INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the APP sensor, then go to the next step.
		No	Go to the next step.
5	**VERIFY TROUBLESHOOTING OF DTC P2135 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
6	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	DTC troubleshooting completed.

DTC P2136 [WL-C, WE-C]

dcf010202100w02

DTC P2136	Accelerator pedal position (APP) sensor No.1/idle switch voltage correlation problem
DETECTION CONDITION	• The PCM compares the input voltage from APP sensor No.1 with the input voltage from the idle switch when the accelerator pedal is released (idle switch is on). If the difference is **more than 1.35 V for 0.5 s**, the PCM determines that there is an APP sensor No.1/idle switch angle correlation problem.
POSSIBLE CAUSE	• Accelerator pedal misadjustment. • APP sensor malfunction • Idle switch malfunction • Connector or terminal malfunction • PCM malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA AND DIAGNOSTIC MONITORING TEST RESULTS HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related Service Information availability. • Is any related Service Information available?	Yes	Perform repair or diagnosis according to the available Service information. If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)

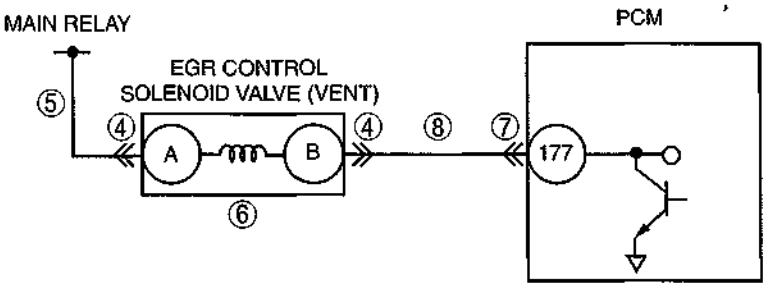
STEP	INSPECTION		ACTION
4	**VERIFY RELATED PENDING CODE OR STORED DTC** • Is DTC P0122, P0123, P0227 or P0228 present?	Yes	Go to the next step.
		No	Go to appropriate DTC troubleshooting procedure. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
5	**INSPECT APP SENSOR** • Inspect the APP sensor. (See 01-40B-28 ACCELERATOR PEDAL POSITION (APP) SENSOR INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the APP sensor, then go to Step 7. (See 01-13B-11 ACCELERATOR PEDAL COMPONENT REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
6	**INSPECT IDLE SWITCH** • Inspect idle switch. (See 01-40B-30 IDLE SWITCH INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the idle switch, then go to the next step. (See 01-13B-11 ACCELERATOR PEDAL COMPONENT REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Adjust the accelerator pedal, then go to the next step. (See 01-13B-12 ACCELERATOR PEDAL ADJUSTMENT [WL-C, WE-C].)
7	**VERIFY TROUBLESHOOTING OF DTC P2136 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
8	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	DTC troubleshooting completed.

DTC P2143 [WL-C, WE-C]

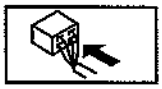
dcf010202100w03

DTC P2143	EGR control solenoid valve control circuit open
DETECTION CONDITION	• The PCM monitors the EGR control solenoid valve control signal. If the following conditions are detected, the PCM determines that the EGR control solenoid valve circuit has a malfunction. — The PCM turns the EGR control solenoid valve off but the voltage remains low (open circuit). — The PCM internal driver IC temperature is more than **150 °C {320 °F}** when the EGR control solenoid valve is on.
POSSIBLE CAUSE	• EGR control solenoid valve malfunction • Connector or terminal malfunction • Open circuit in wiring harness between EGR control solenoid valve (vent) terminal A and main relay • Open circuit in wiring harness between EGR control solenoid valve (vent) terminal B and PCM terminal 177 • PCM malfunction

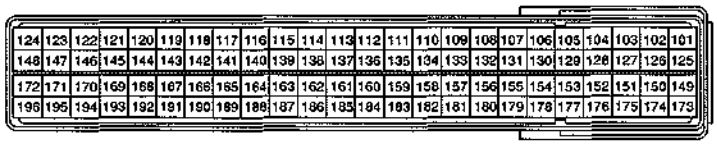
DTC P2143	EGR control solenoid valve control circuit open

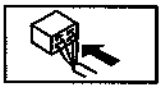


EGR CONTROL SOLENOID VALVE (VENT)
WIRING HARNESS-SIDE CONNECTOR



PCM
WIRING HARNESS-SIDE CONNECTOR





Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERNS TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**INSPECT EGR CONTROL SOLENOID VALVE CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the EGR control solenoid valve connector. • Inspect for poor connection (such as damaged/ pulled-out pins, and corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 9.
		No	Go to the next step.
5	**INSPECT EGR CONTROL SOLENOID VALVE CONTROL CIRCUIT FOR OPEN CIRCUIT** • Turn the engine switch to the ON position (Engine off). • Measure the voltage between EGR control solenoid valve terminal A (wiring harness-side) and body ground • Is the voltage **B+**?	Yes	Go to the next step.
		No	Repair or replace the wiring harness for a possible open circuit, then go to Step 9.

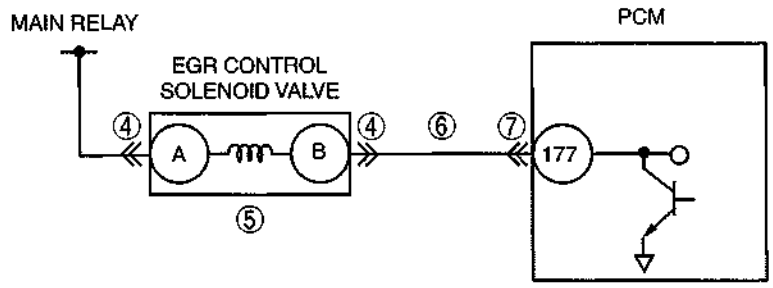
STEP	INSPECTION		ACTION
6	**INSPECT EGR CONTROL SOLENOID VALVE** • Inspect the EGR control solenoid valve. (See 01-16B-6 EGR CONTROL SOLENOID VALVE INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the EGR control solenoid valve, then go to Step 9. (See 01-13B-3 INTAKE-AIR SYSTEM REMOVAL/ INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
7	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, and corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 9.
		No	Go to the next step.
8	**INSPECT EGR CONTROL SOLENOID VALVE CONTROL CIRCUIT FOR OPEN CIRCUIT** • Turn the engine switch off. • Inspect for continuity between EGR control solenoid valve terminal B (wiring harness-side) and PCM terminal 177 (wiring harness-side) • Is there continuity?	Yes	Go to the next step.
		No	Repair or replace the wiring harness for a possible open circuit, then go to the next step.
9	**VERIFY TROUBLESHOOTING OF DTC P2143 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Start the engine. • Retrieve DTCs using the current diagnostic tool. • Is the PENDING CODE for this DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
10	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC troubleshooting. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

DTC P2144 [WL-C, WE-C]

dcf010202100w04

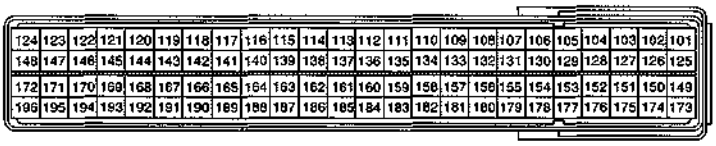
DTC P2144	EGR control solenoid valve control circuit low input
DETECTION CONDITION	• The PCM monitors the EGR control solenoid valve control signal. If the PCM turns the EGR control solenoid valve off but the voltage remains low, the PCM determines that the EGR control solenoid valve circuit has a malfunction (circuit short to ground).
POSSIBLE CAUSE	• EGR control solenoid valve malfunction • Short to ground in wiring harness between EGR control solenoid valve terminal B and PCM terminal 177 • Connector or terminal malfunction • PCM malfunction

DTC P2144	EGR control solenoid valve control circuit low input



EGR CONTROL SOLENOID VALVE WIRING HARNESS-SIDE CONNECTOR

PCM WIRING HARNESS-SIDE CONNECTOR



Diagnostic procedure

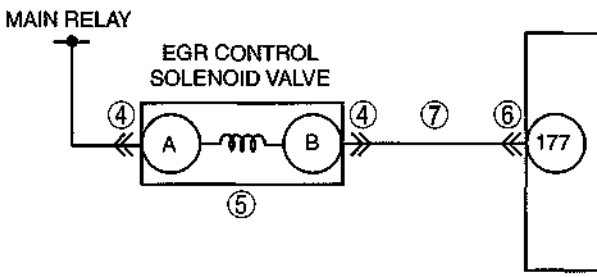
STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERNS TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**INSPECT EGR CONTROL SOLENOID VALVE CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the EGR control solenoid valve connector. • Inspect for poor connection (damaged/pulled-out pins, corrosion, etc.). • Is there malfunction?	Yes	Repair or replace the terminal, then go to Step 8.
		No	Go to the next step.
5	**INSPECT EGR CONTROL SOLENOID VALVE MALFUNCTION** • Perform EGR control solenoid valve inspection. (See 01-16B-6 EGR CONTROL SOLENOID VALVE INSPECTION [WL-C, WE-C].) • Is EGR control solenoid valve normal?	Yes	Go to the next step.
		No	Replace the EGR control solenoid valve, then go to step 8.
6	**INSPECT EGR CONTROL SOLENOID VALVE CONTROL CIRCUIT FOR SHORT TO GROUND** • Inspect for continuity between EGR control solenoid valve terminal B (wiring harness-side) and body ground. • Is there continuity?	Yes	Repair or replace the wiring harness for short to ground, then go to Step 8.
		No	Go to the next step.

STEP	INSPECTION		ACTION
7	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Disconnect the PCM connector. • Inspect for poor connection at terminal 177. (damaged/pulled-out pins, corrosion, etc.). • Is there malfunction?	Yes	Repair the terminal, then go to the next step.
		No	Go to the next step.
8	**VERIFY TROUBLESHOOTING OF DTC P2144 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Start the engine. • Retrieve DTCs using the current diagnostic tool. • Is the PENDING CODE for this DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
9	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTC present?	Yes	Go to the applicable DTC troubleshooting. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

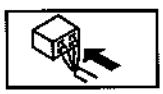
DTC P2145 [WL-C, WE-C]

dcf010202100w05

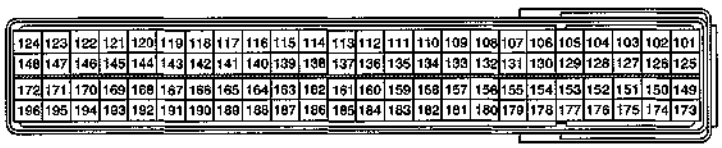
DTC P2145	EGR control solenoid valve control circuit high input
DETECTION CONDITION	• The PCM monitors the EGR control solenoid valve control signal. If the PCM turns the EGR control solenoid valve on but the voltage still remains high, the PCM determines that the EGR control solenoid valve circuit has a malfunction (circuit short to power supply).
POSSIBLE CAUSE	• EGR control solenoid valve malfunction • Short to power supply in wiring harness between EGR control solenoid valve terminal B and PCM terminal 177 • Connector or terminal malfunction • PCM malfunction

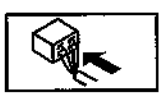


EGR CONTROL SOLENOID VALVE WIRING HARNESS-SIDE CONNECTOR



PCM WIRING HARNESS-SIDE CONNECTOR





Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERNS TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**INSPECT EGR CONTROL SOLENOID VALVE CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the EGR control solenoid valve connector. • Inspect for poor connection (damaged/pulled-out pins, corrosion, etc.). • Is there malfunction?	Yes	Repair or replace the terminal, then go to Step 8.
		No	Go to the next step.
5	**INSPECT EGR CONTROL SOLENOID VALVE MALFUNCTION** • Perform EGR control solenoid valve inspection. (See 01-16B-6 EGR CONTROL SOLENOID VALVE INSPECTION [WL-C, WE-C].) • Is the EGR solenoid valve (vent) normal?	Yes	Go to the next step.
		No	Replace the EGR control solenoid valve, then go to Step 8.
6	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection at terminal 177. (such as damaged/pulled-out pins, corrosion). • Is there malfunction?	Yes	Repair the terminal, then go to Step 8.
		No	Go to the next step.
7	**INSPECT EGR CONTROL SOLENOID VALVE CONTROL CIRCUIT SHORT TO POWER SUPPLY** • Turn the engine switch to the ON position (Engine off). • Measure the voltage between EGR control solenoid valve terminal B (wiring harness-side) and body ground. • Is the voltage **B+**?	Yes	Repair or replace the wiring harness for short to power supply, then go to the next step.
		No	Go to the next step.
8	**VERIFY TROUBLESHOOTING OF DTC P2145 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Start the engine. • Retrieve DTCs using the current diagnostic tool. • Is the PENDING CODE for this DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
9	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTC present?	Yes	Go to the applicable DTC troubleshooting. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

DTC P2146 [WL-C, WE-C]

dcf010202100w06

DTC P2146	Fuel injector No.1 and No.4 power supply circuit malfunction
DETECTION CONDITION	• The PCM monitors the fuel injector No.1 and No.4 power supply voltage when the engine is running. If the following conditions are detected 5 times, the PCM determines that the fuel injector No.1 and No.4 power supply circuit has a malfunction. — Fuel injector No.1 and No.4 power supply voltage is **less than 43 V** — Fuel injector No.1 and No.4 power supply voltage is **53 V or above**
POSSIBLE CAUSE	• PCM malfunction

Diagnostic procedure

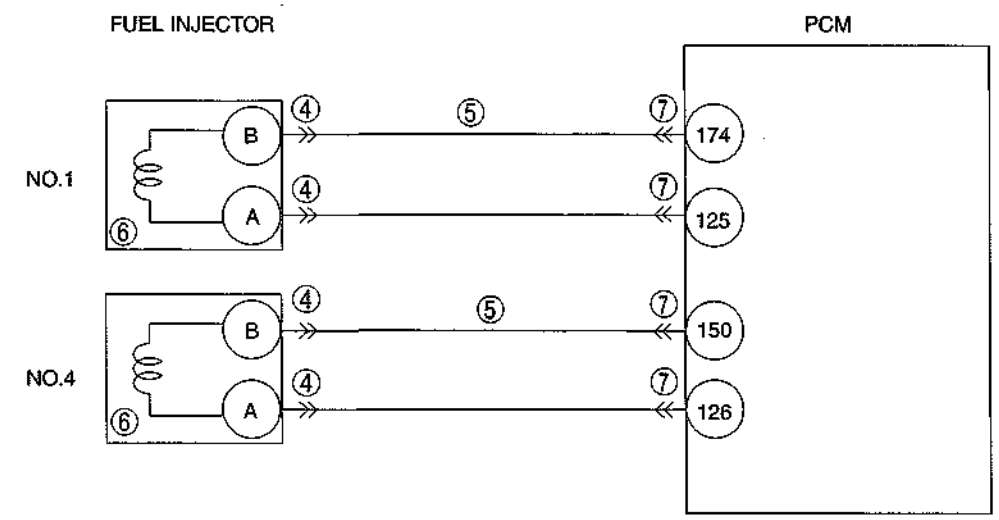
STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING".
4	**VERIFY TROUBLESHOOTING OF DTC P2146 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
5	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC troubleshooting. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

DTC P2147 [WL-C, WE-C]

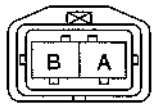
dcf010202100w07

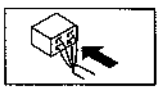
DTC P2147	Fuel injector No.1 and No.4 power supply circuit low input
DETECTION CONDITION	• The PCM monitors the fuel injector No.1 and No.4 power supply current when the engine is running. If the power supply current is **25 A or above 3 times** while other fuel injector power supply current is **25 A or above**, the PCM determines that the fuel injector No.1 and No.4 power supply current is too high.
POSSIBLE CAUSE	• Fuel injector malfunction • Connector or terminal malfunction • Short to ground in the wiring harness between the fuel injector No.1 terminal B and PCM terminal 174 • Short to ground in the wiring harness between the fuel injector No.4 terminal B and PCM terminal 150 • PCM malfunction

DTC P2147	Fuel injector No.1 and No.4 power supply circuit low input

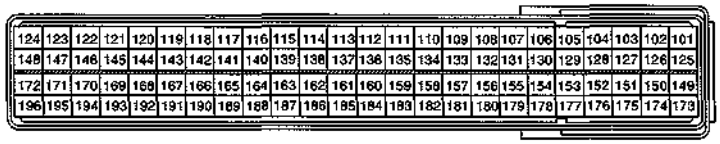


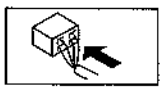
FUEL INJECTOR NO.1, NO.4
WIRING HARNESS-SIDE CONNECTOR





PCM
WIRING HARNESS-SIDE CONNECTOR





Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related Service Information availability. • Is any related repair information available?	Yes	Perform the repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**INSPECT FUEL INJECTOR CONNECTOR FOR POOR CONNECTION** • Turn the engine switch to off. • Inspect for poor connection (such as damaged/ pulled-out terminals, corrosion). • Is there any malfunction?	Yes	Repair or replace the suspected terminal, then go to Step 8.
		No	Go to the next step.
5	**INSPECT FUEL INJECTOR CIRCUIT FOR A SHORT TO GROUND** • Turn the engine switch to off. • Inspect for continuity between the following terminals (wiring harness-side) and body ground. — Fuel injector No.1 terminal B — Fuel injector No.4 terminal B • Is there continuity?	Yes	Repair or replace the wiring harness for a short to ground, then go to Step 8.
		No	Go to the next step.

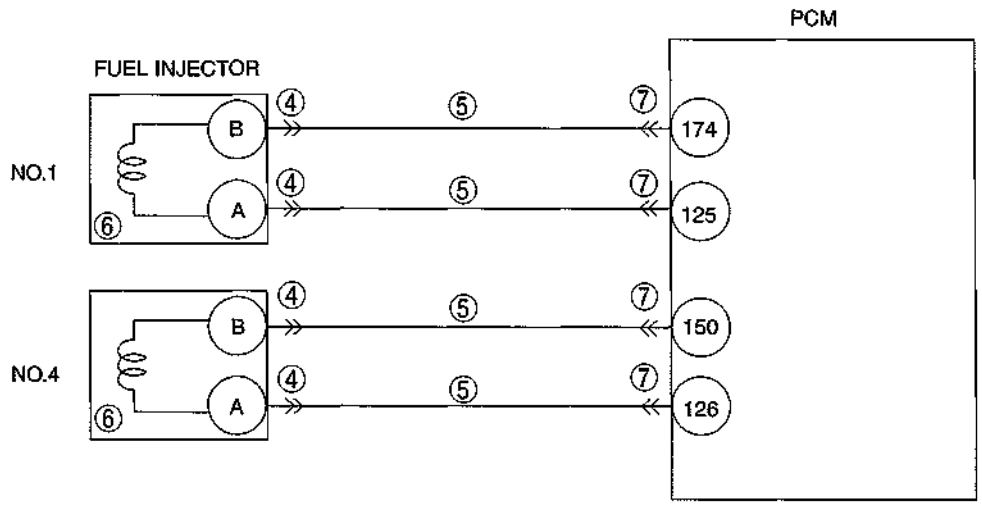
STEP	INSPECTION		ACTION
6	**INSPECT FUEL INJECTOR** • Inspect the fuel injector. (See 01-14B-16 FUEL INJECTOR INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the fuel injector, then go to Step 8. (See 01-14B-15 FUEL INJECTOR REMOVAL/ INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
7	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch to off. • Inspect for poor connection. (such as damaged/pulled-out terminals, corrosion). • Is there any malfunction?	Yes	Repair or replace the suspected terminal, then go to the next step.
		No	Go to the next step.
8	**VERIFY TROUBLESHOOTING OF DTC P2147 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
9	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

DTC P2148 [WL-C, WE-C]

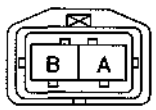
dcf010202100w08

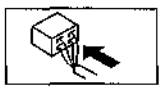
DTC P2148	Fuel injector No.1 and No.4 power supply circuit high input
DETECTION CONDITION	• The PCM monitors the fuel injector No.1 and No.4 power supply current when the engine is running. If the power supply current is **50 A or above 3 times**, the PCM determines that the fuel injector No.1 and No.4 power supply current is too high.
POSSIBLE CAUSE	• Fuel injector malfunction • Connector or terminal malfunction • Short to power in the wiring harness between the fuel injector No.1 terminal B and PCM terminal 174 • Short to power in the wiring harness between the fuel injector No.4 terminal B and PCM terminal 150 • Short to power in the wiring harness between the fuel injector No.1 terminal A and PCM terminal 125 • Short to power in the wiring harness between the fuel injector No.4 terminal A and PCM terminal 126 • PCM malfunction

DTC P2148	Fuel injector No.1 and No.4 power supply circuit high input

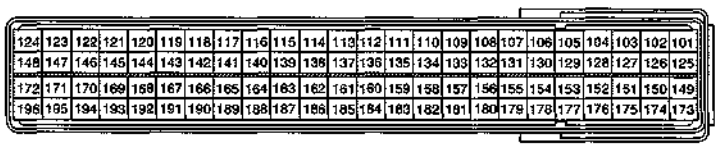


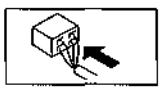
FUEL INJECTOR NO.1, NO.4
WIRING HARNESS-SIDE CONNECTOR





PCM
WIRING HARNESS-SIDE CONNECTOR





Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform the repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**INSPECT FUEL INJECTOR CONNECTOR FOR POOR CONNECTION** • Turn the engine switch to off. • Inspect for poor connection fuel injector for each cylinder (such as damaged/pulled-out terminals, corrosion). • Is there any malfunction?	Yes	Repair or replace the suspected terminal, then go to Step 8.
		No	Go to the next step.

STEP	INSPECTION		ACTION
5	**INSPECT FUEL INJECTORS CIRCUIT FOR SHORT TO POWER SUPPLY** • Turn the engine switch to the ON position (Engine off). • Disconnect the PCM connector. • Inspect the voltage between following terminals (wiring harness-side) and body ground: — Fuel injector No.1 terminal B — Fuel injector No.4 terminal B — Fuel injector No.1 terminal A — Fuel injector No.4 terminal A • Is the voltage **B+**?	Yes	Repair or replace the wiring harness for a short to power supply for the suspected cylinder, then go to Step 8.
		No	Go to the next step.
6	**INSPECT FUEL INJECTOR** • Inspect the fuel injector. (See 01-14B-16 FUEL INJECTOR INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the fuel injector, then go to Step 8. (See 01-14B-15 FUEL INJECTOR REMOVAL/ INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
7	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch to off. • Inspect for poor connection. (such as damaged/pulled-out terminals, corrosion). • Is there any malfunction?	Yes	Repair or replace the suspected terminal, then go the to Step.
		No	Go to the next step.
8	**VERIFY TROUBLESHOOTING OF DTC P2148 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
9	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC troubleshooting. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

DTC P2149 [WL-C, WE-C]

dcf010202100w09

DTC P2149	**Fuel injector No.2 and No.3 power supply circuit malfunction**
DETECTION CONDITION	• The PCM monitors the fuel injector No.2 and No.3 power supply voltage when the engine is running. If the following conditions are detected 5 times, the PCM determines that the fuel injector No.2 and No.3 power supply circuit has a malfunction. — Fuel injector No.2 and No.3 power supply voltage is **less than 43 V** — Fuel injector No.2 and No.3 power supply voltage is **53 V or above**
POSSIBLE CAUSE	• PCM malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.

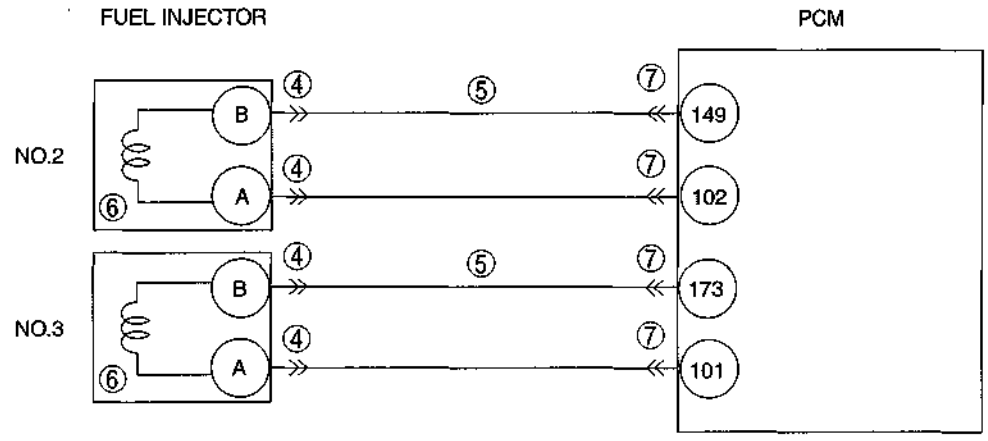
STEP	INSPECTION		ACTION
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING".
4	**VERIFY TROUBLESHOOTING OF DTC P2149 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
5	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC troubleshooting. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

DTC P2150 [WL-C, WE-C]

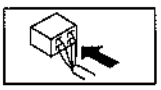
dcf010202100w10

DTC P2150	**Fuel Injector No.2 and No.3 power supply circuit low input**
DETECTION CONDITION	• The PCM monitors the fuel injector No.2 and No.3 power supply current when the engine is running. If the power supply current is **25 A or above 3 times** while other fuel injector power supply current is **25 A or above**, the PCM determines that the fuel injector No.2 and No.3 power supply current is too high.
POSSIBLE CAUSE	• Fuel injector malfunction • Connector or terminal malfunction • Short to ground in the wiring harness between the fuel injector No.2 terminal A and PCM terminal 102 • Short to ground in the wiring harness between the fuel injector No.3 terminal A and PCM terminal 101 • PCM malfunction

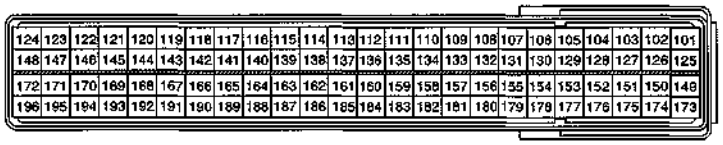
DTC P2150	Fuel injector No.2 and No.3 power supply circuit low input

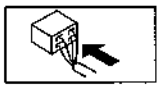


FUEL INJECTOR NO.2, NO.3
WIRING HARNESS-SIDE CONNECTOR



PCM
WIRING HARNESS-SIDE CONNECTOR





Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform the repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**INSPECT FUEL INJECTOR CONNECTOR FOR POOR CONNECTION** • Turn the engine switch to the ON position. • Inspect for poor connection. (such as damaged/pulled-out terminals, corrosion). • Is there any malfunction?	Yes	Go to the next step.
		No	Repair or replace the terminal, then go to Step 8.
5	**INSPECT FUEL INJECTORS CIRCUIT FOR SHORT TO GROUND** • Turn the engine switch to off. • Inspect for continuity between the following terminals and body ground. — Fuel injector No.2 terminal B — Fuel injector No.3 terminal B • Is there continuity?	Yes	Repair or replace the wiring harness for a short to ground, then go to Step 8.
		No	Go to the next step.

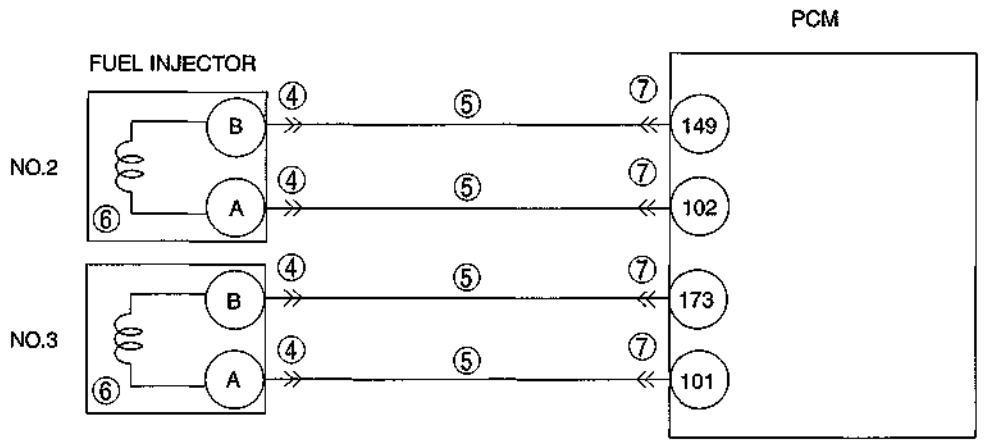
STEP	INSPECTION		ACTION
6	**INSPECT FUEL INJECTOR** • Inspect the fuel injector. (See 01-14B-16 FUEL INJECTOR INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the fuel injector, then go to Step 8. (See 01-14B-15 FUEL INJECTOR REMOVAL/ INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
7	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch to off. • Inspect for poor connection. (such as damaged/pulled-out terminals, corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to the next step.
		No	Go to the next step.
8	**VERIFY TROUBLESHOOTING OF DTC P2150 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
9	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

DTC P2151 [WL-C, WE-C]

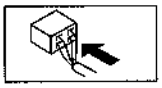
dcf010202100w11

DTC P2151	Fuel injector No.2 and No.3 power supply circuit high input
DETECTION CONDITION	• The PCM monitors the fuel injector No.2 and No.3 power supply current when the engine is running. If the power supply current is **50 A or above 3 times**, the PCM determines that the fuel injector No.2 and No.3 power supply current is too high.
POSSIBLE CAUSE	• Fuel injector malfunction • Connector or terminal malfunction • Short to power circuit in the wiring harness between the fuel injector No.2 terminal A and PCM terminal 102 • Short to power circuit in the wiring harness between the fuel injector No.3 terminal A and PCM terminal 101 • Short to power in the wiring harness between the fuel injector No.2 terminal B and PCM terminal 149 • Short to power in the wiring harness between the fuel injector No.3 terminal B and PCM terminal 173 • PCM malfunction

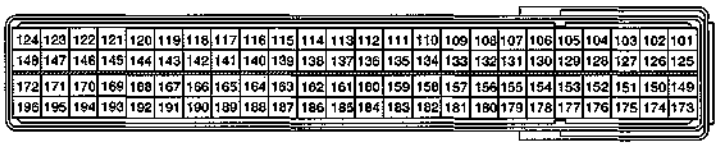
DTC P2151	Fuel injector No.2 and No.3 power supply circuit high input

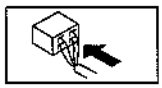


FUEL INJECTOR NO.2, NO.3
WIRING HARNESS-SIDE CONNECTOR



PCM
WIRING HARNESS-SIDE CONNECTOR





Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform the repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**INSPECT FUEL INJECTOR CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Inspect for poor connection fuel injector for each cylinder (such as damaged/pulled-out terminals, corrosion). • Is there any malfunction?	Yes	Repair or replace the suspected terminal, then go to Step 9.
		No	Go to the next step.
5	**INSPECT FUEL INJECTORS CIRCUIT FOR SHORT TO POWER SUPPLY** • Turn the engine switch to the ON position (Engine off). • Disconnect the PCM connector. • Inspect the voltage between following terminals (wiring harness-side) and body ground: — Fuel injectors No.2 terminal A — Fuel injectors No.2 terminal B — Fuel injectors No.3 terminal A — Fuel injectors No.3 terminal B • Is the voltage **B+**?	Yes	Repair or replace the wiring harness for a short to power supply for the suspected cylinder, then go to Step 8.
		No	Go to the next step.
6	**INSPECT FUEL INJECTOR** • Inspect the fuel injector. (See 01-14B-16 FUEL INJECTOR INSPECTION [WL-C, WE-C].) • Is there any malfunction?	Yes	Replace the fuel injector, then go to Step 8.
		No	Go to the next step.
7	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Inspect for poor connection. (such as damaged/pulled-out terminals, corrosion). • Is there any malfunction?	Yes	Repair or replace the suspected terminal, then go to the next step.
		No	Go to the next step.
8	**VERIFY TROUBLESHOOTING OF DTC P2151 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
9	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC troubleshooting. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

DTC P2227 [WL-C, WE-C]

dcf010202200w01

DTC P2227	BARO sensor circuit range/performance malfunction
DETECTION CONDITION	• The PCM monitors the input signal from the barometric pressure sensor. If the difference between the barometric pressure input from the barometric pressure sensor and the boost pressure is **more than 11 kPa {0.11 bar, 1.6 psi}**, the PCM determines that there is a malfunction in the barometric pressure sensor. **Note** • If DTCs P2227 and P0106 are recorded simultaneously, the PCM determines that there is a boost sensor and barometric pressure sensor characteristic malfunction.
POSSIBLE CAUSE	• BARO sensor (integrated in PCM) malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the PENDING CODE for this DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**VERIFY TROUBLESHOOTING OF DTC P2227 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	No concern is detected. Go to the next step.
6	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

DTC P2228 [WL-C, WE-C]

dcf010202200w02

DTC P2228	BARO sensor circuit low input
DETECTION CONDITION	• The PCM monitors the input signal for the barometric pressure. If the voltage from the barometric pressure sensor is **less than 2.2 V for 1 s**, the PCM determines that there is a malfunction in the barometric pressure sensor signal system.
POSSIBLE CAUSE	• BARO sensor (integrated in PCM) malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)
4	**VERIFY TROUBLESHOOTING OF DTC P2228 COMPLETED** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	No concern is detected. Go to the next step.
5	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

DTC P2229 [WL-C, WE-C]

dcf010202200w03

DTC P2229	BARO sensor circuit high input
DETECTION CONDITION	• The PCM monitors the input signal for the barometric pressure. If the voltage from the barometric pressure sensor is **more than 4.8 V for 1 s**, the PCM determines that there is a malfunction in the barometric pressure sensor signal system.
POSSIBLE CAUSE	• BARO sensor (integrated in PCM) malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related service repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY CURRENT SIGNAL STATUS: IS CONCERN INTERMITTENT OR CONSTANT?** • Connect the current diagnostic tool to the DLC-2. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Is the same DTC present?	Yes	Go to the next step.
		No	Intermittent concern exists. Perform the "INTERMITTENT CONCERN TROUBLESHOOTING". (See 01-03B-60 INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C].)

STEP	INSPECTION		ACTION
4	**VERIFY TROUBLESHOOTING OF DTC P2229 COMPLETED.** • Turn the engine switch off. • Make sure to reconnect all disconnected connectors. • Turn the engine switch to the ON position (Engine off). • Clear the DTC from the memory using the current diagnostic tool. • Run the vehicle under the FREEZE FRAME DATA stored condition. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	No concern is detected. Go to the next step.
5	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

01-03B SYMPTOM TROUBLESHOOTING [WL-C, WE-C]

SYMPTOM TROUBLESHOOTING WIRING DIAGRAM [WL-C, WE-C] 01-03B–2
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NO.3 WILL NOT CRANK [WL-C, WE-C] 01-03B–15
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NO.5 ENGINE STALLS-AFTER START/ AT IDLE [WL-C, WE-C] 01-03B–19
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NO.12 LACK/LOSS OF POWER-ACCELERATION/CRUISE [WL-C, WE-C] 01-03B–35
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NO.23 A/C DOES NOT WORK SUFFICIENTLY [WL-C, WE-C] 01-03B–57
NO.24 A/C ALWAYS ON OR A/C COMPRESSOR RUNS CONTINUOUSLY [WL-C, WE-C] 01-03B–59
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SYMPTOM TROUBLESHOOTING WIRING DIAGRAM [WL-C, WE-C]

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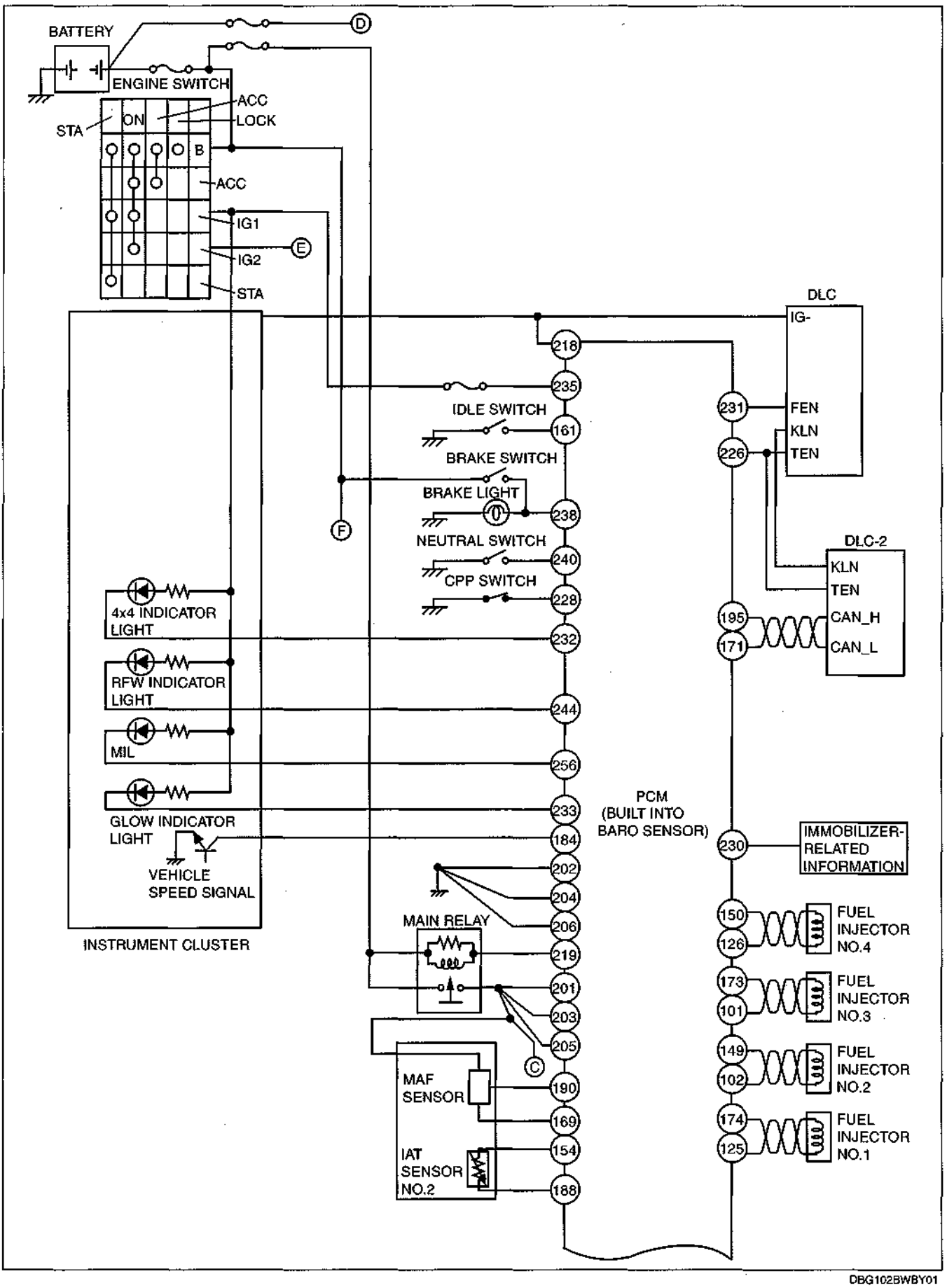
With Immobilizer System



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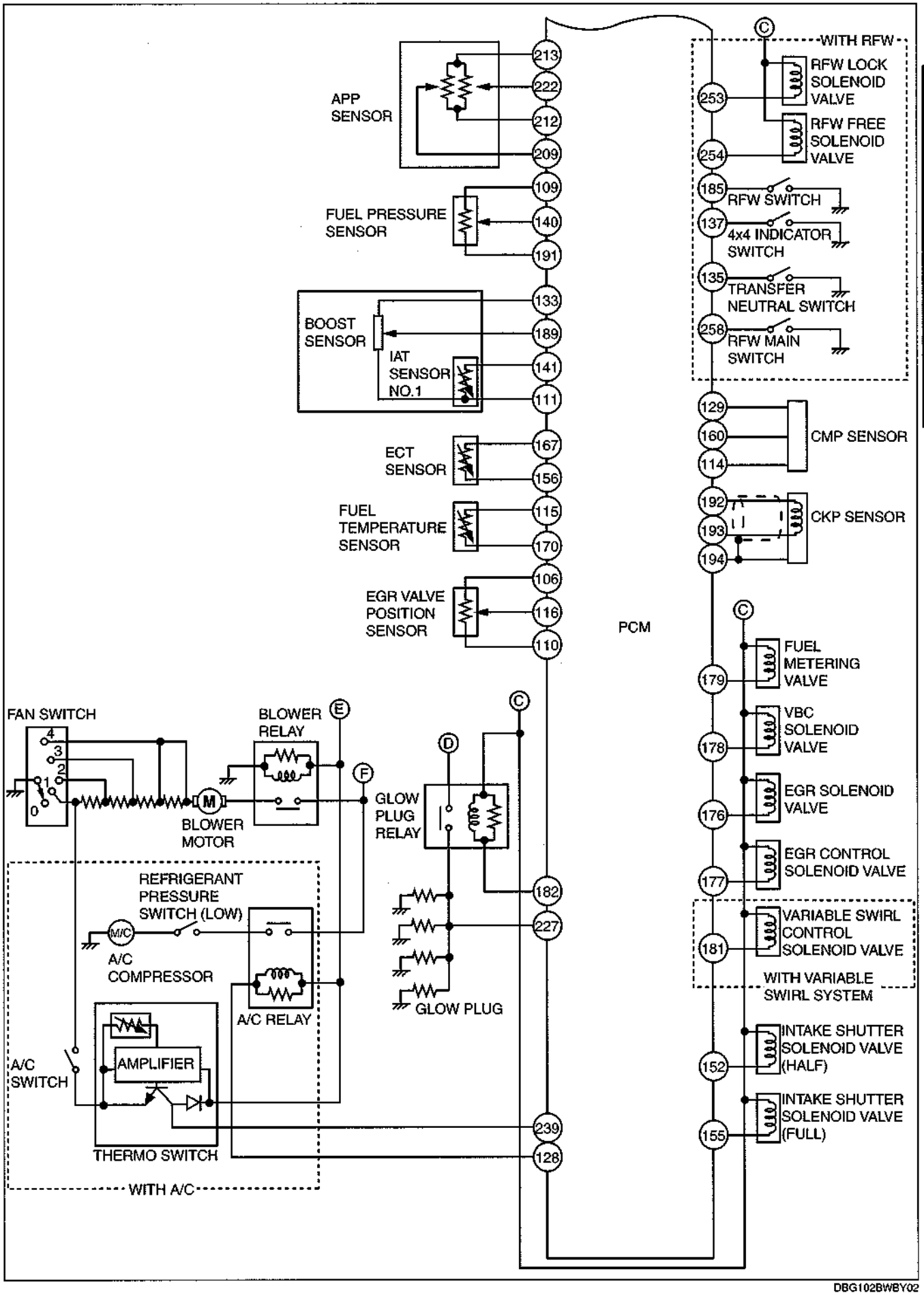

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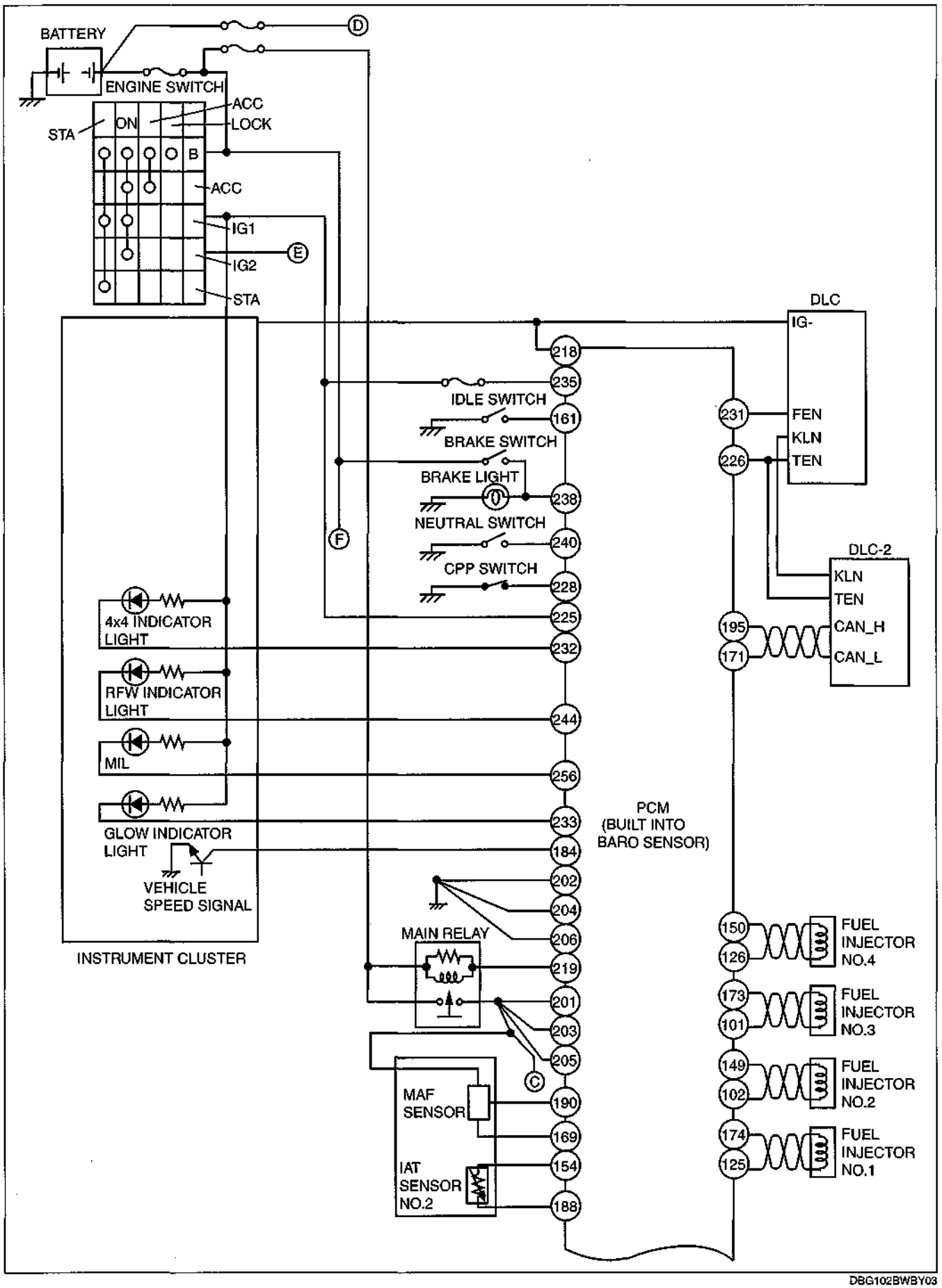
Without Immobilizer System



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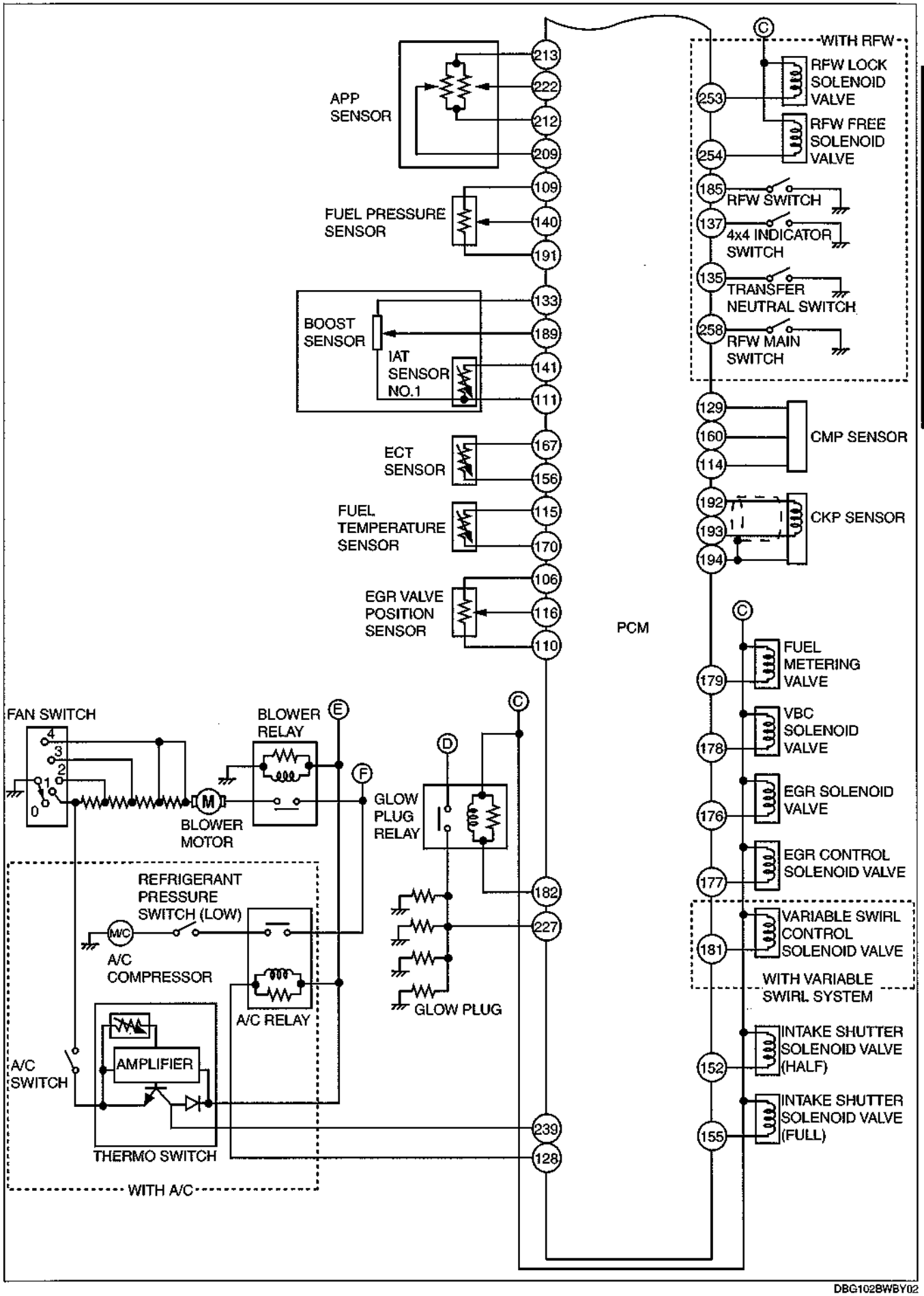

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SYMPTOM DIAGNOSTIC INDEX [WL-C, WE-C]

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No.	TROUBLESHOOTING ITEM		DESCRIPTION	PAGE
1	Melting of main or other fuses		—	(See 01-03B-14 NO.1 MELTING OF MAIN OR OTHER FUSES [WL-C, WE-C].)
2	Engine check lamp illuminates		Engine check lamp is illuminated incorrectly.	(See 01-03B-15 NO.2 ENGINE CHECK LAMP ILLUMINATES [WL-C, WE-C].)
3	Will not crank		Starter does not work.	(See 01-03B-15 NO.3 WILL NOT CRANK [WL-C, WE-C].)
4	Hard start/long crank/erratic start/ erratic crank		Starter cranks engine at normal speed but engine requires excessive cranking time before starting.	(See 01-03B-17 NO.4 HARD START/LONG CRANK/ ERRATIC START/ERRATIC CRANK [WL-C, WE-C].)
5	Engine stalls	After start/at idle	Engine stops unexpectedly at idle and/or after start.	(See 01-03B-19 NO.5 ENGINE STALLS-AFTER START/AT IDLE [WL-C, WE-C].)
6	Cranks normally but will not start		Starter cranks engine at normal speed but engine will not run.	(See 01-03B-22 NO.6 CRANKS NORMALLY BUT WILL NOT START [WL-C, WE-C].)
7	Slow return to idle		Engine takes more time than normal to return to idle speed.	(See 01-03B-24 NO.7 SLOW RETURN TO IDLE [WL-C, WE-C].)
8	Engine runs rough/rolling idle		Engine speed fluctuates between specified idle speed and lower speed and engine shakes excessively.	(See 01-03B-26 NO.8 ENGINE RUNS ROUGH/ROLLING IDLE [WL-C, WE-C].)
9	Fast idle/runs on		Engine speed continues at fast idle after warm-up. Engine runs after engine switch is turned to OFF.	(See 01-03B-28 NO.9 FAST IDLE/RUNS ON [WL-C, WE-C].)
10	Low idle/stalls during deceleration		Engine stops unexpectedly at beginning of deceleration or recovery from deceleration.	(See 01-03B-30 NO.10 LOW IDLE/STALLS DURING DECELERATION [WL-C, WE-C].)
11	Engine stalls/quits	Acceleration/ cruise	Engine stops unexpectedly at beginning of acceleration or during acceleration. Engine stops unexpectedly while cruising.	(See 01-03B-32 NO.11 ENGINE STALLS/QUITS, ENGINE RUNS ROUGH, MISSES, BUCK/JERK, HESITATION/STUMBLE, SURGES [WL-C, WE-C].)
	Engine runs rough	Acceleration/ cruise	Engine speed fluctuates during acceleration or cruising.	
	Misses	Acceleration/ cruise	Engine misses during acceleration or cruising.	
	Buck/jerk	Acceleration/ cruise/ deceleration	Vehicle bucks/jerks during acceleration, cruising, or deceleration.	
	Hesitation/stumble	Acceleration	Momentary pause at beginning of acceleration or during acceleration.	
	Surges	Acceleration/ cruise	Momentary minor irregularity in engine output.	
12	Lack/loss of power	Acceleration/ cruise	Performance is poor under load (e.g. power down when climbing hills).	(See 01-03B-35 NO.12 LACK/ LOSS OF POWER-ACCELERATION/CRUISE [WL-C, WE-C].)
13	Knocking/pinging		Excessive shrilly knocking sound from engine.	(See 01-03B-38 NO.13 KNOCKING/PINGING [WL-C, WE-C].)
14	Poor fuel economy		Fuel economy is unsatisfactory.	(See 01-03B-41 NO.14 POOR FUEL ECONOMY [WL-C, WE-C].)
15	Emissions compliance		Fails emissions test.	(See 01-03B-44 NO.15 EMISSION COMPLIANCE [WL-C, WE-C].)

No.	TROUBLESHOOTING ITEM		DESCRIPTION	PAGE
16	High oil consumption/leakage		Oil consumption is excessive.	(See 01-03B-47 NO.16 HIGH OIL CONSUMPTION/ LEAKAGE [WL-C, WE-C].)
17	Cooling system concerns	Overheating	Engine runs at higher than normal temperature/overheats.	(See 01-03B-48 NO.17 COOLING SYSTEM CONCERNS-OVERHEATING [WL-C, WE-C].)
18	Cooling system concerns	Runs cold	Engine does not reach normal operating temperature.	(See 01-03B-50 NO.18 COOLING SYSTEM CONCERNS-RUNS COLD [WL-C, WE-C].)
19	Excessive black smoke		Excessive black smoke is observed in exhaust gas.	(See 01-03B-50 NO.19 EXCESSIVE BLACK SMOKE [WL-C, WE-C].)
20	Fuel odor (in engine compartment)		Fuel smell or visible leakage.	(See 01-03B-53 NO.20 FUEL ODOR (IN ENGINE COMPARTMENT) [WL-C, WE-C].)
21	Engine noise		Engine noise from under hood.	(See 01-03B-54 NO.21 ENGINE NOISE [WL-C, WE-C].)
22	Vibration concerns (engine)		Vibration from under hood or driveline.	(See 01-03B-56 NO.22 VIBRATION CONCERNS (ENGINE) [WL-C, WE-C].)
23	A/C does not work sufficiently		A/C compressor magnetic clutch does not engage when A/C is turned on.	(See 01-03B-57 NO.23 A/C DOES NOT WORK SUFFICIENTLY [WL-C, WE-C].)
24	A/C always on or A/C compressor runs continuously		A/C compressor magnetic clutch does not disengage.	(See 01-03B-59 NO.24 A/C ALWAYS ON OR A/C COMPRESSOR RUNS CONTINUOUSLY [WL-C, WE-C].)
25	A/C does not cut off under wide open throttle conditions		A/C compressor magnetic clutch does not disengage under wide open throttle.	(See 01-03B-59 NO.25 A/C DOES NOT CUT OFF UNDER WIDE OPEN THROTTLE CONDITIONS [WL-C, WE-C].)

SYMPTOM QUICK DIAGNOSIS CHART [WL-C, WE-C]

dcf010300000w29

×: Applicable

	Troubleshooting item		Starter motor malfunction (Mechanical or electrical)	Starter circuit including engine switch is open	Improper engine oil level	Low or dead battery	Charging system malfunction	Low engine compression	Improper valve timing	Hydrolocked engine	Improper engine oil viscosity	Improper dipstick	Base engine malfunction	Seized dual-mass flywheel	Improper tension or damaged drivebelts
1	Melting of main or other fuses														
2	Engine check lamp illuminates														
3	Will not crank		×	×		×	×			×				×	
4	Hard start/long crank/erratic start/erratic crank		×	×				×	×						
5	Engine stalls	After start/at idle						×	×						
6	Cranks normally but will not start							×	×						
7	Slow return to idle														
8	Engine runs rough/rolling idle							×	×						
9	Fast idle/runs on				×										
10	Low idle/stalls during deceleration							×	×						
11	Engine stalls/quits	Acceleration/cruise						×	×						
	Engine runs rough	Acceleration/cruise						×	×						
	Misses	Acceleration/cruise						×	×						
	Buck/jerk	Acceleration/cruise/deceleration						×	×						
	Hesitation/stumble	Acceleration						×	×						
	Surges	Acceleration/cruise						×	×						
12	Lack/loss of power	Acceleration/cruise						×	×						
13	Knocking/pinging							×	×						
14	Poor fuel economy							×	×						
15	Emissions compliance							×	×				×		
16	High oil consumption/leakage				×						×	×	×		
17	Cooling system concerns	Overheating											×		×
18	Cooling system concerns	Runs cold													
19	Excessive black smoke							×	×				×		
20	Fuel odor (in engine compartment)														
21	Engine noise							×	×				×		×
22	Vibration concerns (engine)							×	×						×
23	A/C does not work sufficiently														
24	A/C always on or A/C compressor runs continuously														
25	A/C does not cut off under wide open throttle conditions														

×: Applicable

	Troubleshooting item		Improper engine coolant level	Water and anti-freeze mixture is improper	Cooling system malfunction (Radiator, hose, over-flow system, thermostat, etc.)	Cooling fan system malfunction	Engine or transaxle mounts are improperly installed	Cooling fan seat is improper	Fuel quality	Engine overheating	Intake-air system clogging or restriction	Air leakage from intake-air system	Vacuum leakage
1	Melting of main or other fuses												
2	Engine check lamp illuminates												
3	Will not crank												
4	Hard start/long crank/erratic start/erratic crank								×	×	×	×	
5	Engine stalls	After start/at idle							×	×	×		
6	Cranks normally but will not start								×		×		
7	Slow return to idle				×								
8	Engine runs rough/rolling idle								×	×	×	×	
9	Fast idle/runs on												
10	Low idle/stalls during deceleration								×		×		
11	Engine stalls/quits	Acceleration/cruise						×	×	×	×	×	
	Engine runs rough	Acceleration/cruise						×	×	×	×	×	
	Misses	Acceleration/cruise						×	×	×	×	×	
	Buck/jerk	Acceleration/cruise/deceleration						×	×	×	×	×	
	Hesitation/stumble	Acceleration						×	×	×	×	×	
	Surges	Acceleration/cruise						×	×	×	×	×	
12	Lack/loss of power	Acceleration/cruise						×	×	×	×	×	×
13	Knocking/pinging				×				×		×	×	
14	Poor fuel economy				×				×		×	×	×
15	Emissions compliance				×				×	×	×	×	×
16	High oil consumption/leakage												
17	Cooling system concerns	Overheating	×	×	×	×							
18	Cooling system concerns	Runs cold			×	×							
19	Excessive black smoke								×		×	×	×
20	Fuel odor (in engine compartment)												
21	Engine noise								×		×	×	×
22	Vibration concerns (engine)						×	×	×		×	×	×
23	A/C does not work sufficiently												
24	A/C always on or A/C compressor runs continuously												
25	A/C does not cut off under wide open throttle conditions												

×: Applicable

	Troubleshooting item		Turbocharger malfunction	Charge air cooler malfunction	VBC system malfunction	Glow system malfunction	Incorrect fuel injection timing	Incorrect idle speed	CKP sensor is damaged (e.g.: open or short circuits)	CKP sensor pulse wheel is damaged	Improper gap between CKP sensor and pulse wheel	Supply pump malfunction	Fuel pressure limiter malfunction	Fuel line restriction or clogging
1	Melting of main or other fuses													
2	Engine check lamp illuminates				×	×			×					
3	Will not crank													
4	Hard start/long crank/erratic start/erratic crank					×	×		×	×	×	×	×	×
5	Engine stalls	After start/at idle				×	×		×	×	×	×	×	×
6	Cranks normally but will not start					×	×		×	×	×	×	×	×
7	Slow return to idle						×	×	×	×	×	×	×	
8	Engine runs rough/rolling idle					×	×	×	×	×	×	×	×	×
9	Fast idle/runs on													
10	Low idle/stalls during deceleration					×	×	×	×	×	×	×	×	×
11	Engine stalls/quits	Acceleration/cruise	×				×		×	×	×	×	×	×
	Engine runs rough	Acceleration/cruise	×			×	×	×	×	×	×	×	×	×
	Misses	Acceleration/cruise	×			×	×	×	×	×	×	×	×	×
	Buck/jerk	Acceleration/cruise/ deceleration	×			×	×	×	×	×	×	×	×	×
	Hesitation/stumble	Acceleration	×			×	×	×	×	×	×	×	×	×
	Surges	Acceleration/cruise	×			×	×		×	×	×	×	×	×
12	Lack/loss of power	Acceleration/cruise	×	×	×		×	×	×	×	×	×	×	×
13	Knocking/pinging		×	×	×	×	×		×	×	×			×
14	Poor fuel economy		×	×	×		×	×	×	×	×	×		×
15	Emissions compliance		×	×	×	×	×	×	×	×	×	×	×	×
16	High oil consumption/leakage		×											
17	Cooling system concerns	Overheating												
18	Cooling system concerns	Runs cold												
19	Excessive black smoke		×	×	×		×		×	×	×	×	×	×
20	Fuel odor (in engine compartment)												×	
21	Engine noise						×		×	×	×			
22	Vibration concerns (engine)					×	×					×		×
23	A/C does not work sufficiently													
24	A/C always on or A/C compressor runs continuously													
25	A/C does not cut off under wide open throttle conditions													

×: Applicable

	Troubleshooting item		Fuel injectors malfunction (Leakage or clogging, inoperative)	Fuel leakage from fuel system (including insulator, fuel injector)	Fuel filter restriction or clogging	Fuel inlet-filter restriction or clogging	CMP sensor is damaged (e.g.: open or short circuit)	CMP sensor pulse wheel is damaged	Exhaust system restriction or clogging	Oxidation catalytic converter malfunction	EGR system malfunction	EGR cooler malfunction	V-reference voltage supply circuit malfunction
1	Melting of main or other fuses												
2	Engine check lamp illuminates		×				×						
3	Will not crank												
4	Hard start/long crank/erratic start/erratic crank		×	×	×	×	×	×	×		×		
5	Engine stalls	After start/at idle	×	×	×	×	×	×	×		×		×
6	Cranks normally but will not start		×	×	×	×	×	×			×		×
7	Slow return to idle		×				×	×					
8	Engine runs rough/rolling idle		×	×	×	×	×	×			×	×	×
9	Fast idle/runs on		×										
10	Low idle/stalls during deceleration		×	×	×	×	×	×			×		
11	Engine stalls/quits	Acceleration/cruise	×	×	×	×	×	×	×		×		×
	Engine runs rough	Acceleration/cruise	×	×	×	×	×	×	×		×		×
	Misses	Acceleration/cruise	×	×	×	×	×	×	×		×		×
	Buck/jerk	Acceleration/cruise/deceleration	×	×	×	×	×	×	×		×		×
	Hesitation/stumble	Acceleration	×	×	×	×	×	×	×		×		×
	Surges	Acceleration/cruise	×	×	×	×	×	×	×		×		×
12	Lack/loss of power	Acceleration/cruise	×	×	×	×	×	×	×		×		×
13	Knocking/pinging		×				×	×	×		×		
14	Poor fuel economy		×	×	×	×	×	×	×		×		
15	Emissions compliance		×				×	×	×	×	×	×	×
16	High oil consumption/leakage												
17	Cooling system concerns	Overheating											
18	Cooling system concerns	Runs cold											
19	Excessive black smoke		×						×		×		
20	Fuel odor (in engine compartment)			×									
21	Engine noise		×				×	×			×		
22	Vibration concerns (engine)		×				×	×			×		
23	A/C does not work sufficiently												
24	A/C always on or A/C compressor runs continuously												
25	A/C does not cut off under wide open throttle conditions												

×: Applicable

	Troubleshooting item		Main relay malfunction	ECT sensor or related circuit malfunction	Neutral switch or related circuit malfunction	MAF sensor/IAT sensor No.2 or related circuit malfunction	IAT sensor No.1 or related circuit malfunction	Boost sensor or related circuit malfunction	APP sensor or related circuit malfunction	Fuel warmer system malfunction	Fuel pressure sensor or related circuit malfunction	Improper refrigerant charging amount
1	Melting of main or other fuses											
2	Engine check lamp illuminates			×	×	×	×	×	×		×	
3	Will not crank											
4	Hard start/long crank/erratic start/erratic crank			×		×			×	×	×	
5	Engine stalls	After start/at idle	×	×					×	×	×	×
6	Cranks normally but will not start		×	×							×	
7	Slow return to idle			×		×			×			
8	Engine runs rough/rolling idle			×		×			×	×	×	×
9	Fast idle/runs on			×								
10	Low idle/stalls during deceleration			×					×	×	×	×
11	Engine stalls/quits	Acceleration/cruise		×					×	×	×	×
	Engine runs rough	Acceleration/cruise		×		×			×	×	×	×
	Misses	Acceleration/cruise		×		×			×	×	×	×
	Buck/jerk	Acceleration/cruise/deceleration		×		×	×	×	×	×	×	×
	Hesitation/stumble	Acceleration		×		×	×	×	×	×	×	×
	Surges	Acceleration/cruise		×		×	×	×	×	×	×	×
12	Lack/loss of power	Acceleration/cruise		×		×	×	×	×	×	×	×
13	Knocking/pinging			×		×	×	×	×		×	
14	Poor fuel economy			×		×	×	×	×		×	×
15	Emissions compliance			×		×	×	×	×		×	
16	High oil consumption/leakage											
17	Cooling system concerns	Overheating										×
18	Cooling system concerns	Runs cold										
19	Excessive black smoke						×	×			×	
20	Fuel odor (in engine compartment)										×	
21	Engine noise			×		×	×	×	×		×	
22	Vibration concerns (engine)			×		×			×	×	×	
23	A/C does not work sufficiently											×
24	A/C always on or A/C compressor runs continuously											
25	A/C does not cut off under wide open throttle conditions								×	×		

×: Applicable

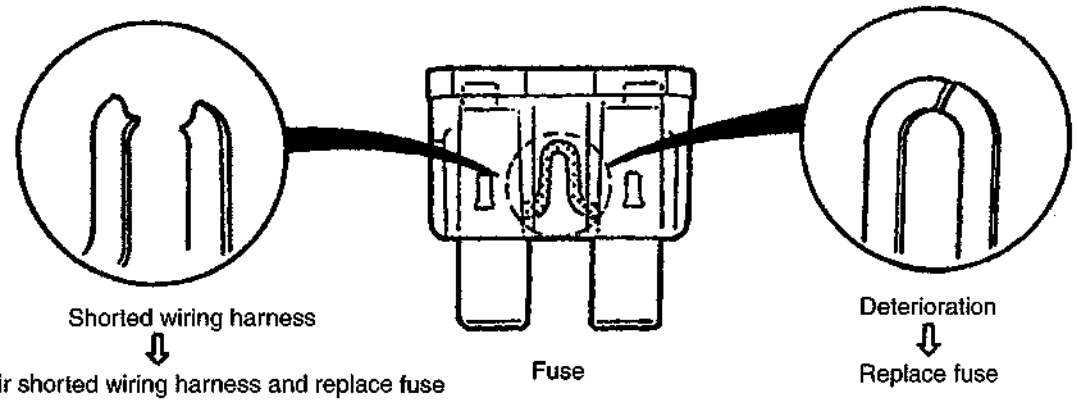
	Troubleshooting item		A/C relay (A/C control sigant) circuit malfunction	A/C magnetic clutch or related circuit malfunction	Cooling fan system malfunction	Clutch slippage	Air in power steering fluid line	VSS or related circuit malfunction	Brake dragging	Loose parts	Improper balance of wheel or tires	Drivetine malfunction	Suspension malfunction	Immobilizer system and/or circuit malfunction
1	Melting of main or other fuses													
2	Engine check lamp illuminates													
3	Will not crank													×
4	Hard start/long crank/erratic start/erratic crank													
5	Engine stalls	After start/at idle	×	×										×
6	Cranks normally but will not start													×
7	Slow return to idle													
8	Engine runs rough/rolling idle		×	×	×									
9	Fast idle/runs on													
10	Low idle/stalls during deceleration		×	×										
11	Engine stalls/quits	Acceleration/cruise	×	×		×		×						
	Engine runs rough	Acceleration/cruise	×	×		×		×						
	Misses	Acceleration/cruise	×	×		×		×						
	Buck/jerk	Acceleration/cruise/deceleration	×	×		×		×						
	Hesitation/stumble	Acceleration	×	×		×		×						
	Surges	Acceleration/cruise	×	×		×		×						
12	Lack/loss of power	Acceleration/cruise	×	×		×			×					
13	Knocking/pinging													
14	Poor fuel economy		×	×		×		×	×					
15	Emissions compliance							×						
16	High oil consumption/leakage													
17	Cooling system concerns	Overheating	×	×	×									
18	Cooling system concerns	Runs cold			×									
19	Excessive black smoke													
20	Fuel odor (in engine compartment)													
21	Engine noise						×			×				
22	Vibration concerns (engine)									×	×	×	×	
23	A/C does not work sufficiently		×	×										
24	A/C always on or A/C compressor runs continuously		×	×										
25	A/C does not cut off under wide open throttle conditions		×	×										

NO.1 MELTING OF MAIN OR OTHER FUSES [WL-C, WE-C]

dcf010300000w30

1	MELTING OF MAIN OR OTHER FUSES

[TROUBLESHOOTING HINTS]
Inspect condition of fuse.



Damaged fuse	Related wiring harness
MAIN	MAIN fuse • BTN1 fuse — Room fuse — DLC-2 • IGKEY2 fuse — Engine switch — PCM — Starter • Generator
IGKEY1	IGKEY1 fuse • Engine switch • METER fuse • ENGINE fuse — DLC — PCM
IGKEY2	IGN 2 fuse • Engine switch — PCM — Starter
BTN1	BTN1 fuse • ROOM fuse — DLC-2
INJ/FIP	INJ/FIP fuse • Generator • Main relay — PCM — Glow plug relay — MAF sensor/IAT sensor No.2 — Intake shutter solenoid valve (full) — Intake shutter solenoid valve (half) — Fuel metering valve — Variable swirl control solenoid valve*1 — EGR solenoid valve — EGR control solenoid valve — VBC solenoid valve — Lock solenoid
ROOM	ROOM fuse • DLC-2
ENGINE	ENGINE fuse • DLC • PCM
METER	METER fuse • DLC

Damaged fuse	Related wiring harness
GLOW	GLOW fuse • Glow plug relay — Glow plug

*1 : With variable swirl system

NO.2 ENGINE CHECK LAMP ILLUMINATES [WL-C, WE-C]

dcf010300000w31

2	ENGINE CHECK LAMP ILLUMINATES
DESCRIPTION	• Engine check lamp illuminates incorrectly.
POSSIBLE CAUSE	• PCM illuminates for emission-related concern (DTC is stored in PCM). • Instrument cluster malfunction.

Diagnostic procedure

STEP	INSPECTION	RESULTS	ACTION
1	Connect the current diagnostic tool to the DLC-2. Turn the engine switch to the ON position (Engine off). Retrieve any DTCs. Are any DTCs displayed?	Yes	**DTC is displayed:** • Go to the appropriate DTC test. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	**No DTC is displayed:** • Inspect the instrument cluster operation.
2	Verify test results. • If normal, return to the diagnostic index to service any additional symptoms. (See 01-03B-6 SYMPTOM DIAGNOSTIC INDEX [WL-C, WE-C].) • If the malfunction remains, inspect the related Service Information and perform repair or diagnosis. — If the vehicle is repaired, troubleshooting completed. — If the vehicle is not repaired or additional diagnostic information is not available, reprogram the PCM if later calibration is available. Retest.		

NO.3 WILL NOT CRANK [WL-C, WE-C]

dcf010300000w32

3	WILL NOT CRANK
DESCRIPTION	• Starter does not work.
POSSIBLE CAUSE	• Open starter circuit between engine switch and starter • Starter malfunction • Seized/hydrolocked engine, dual-mass flywheel • Immobilizer system and/or circuit malfunction (if equipped) • Immobilizer system operating properly (engine key is not registered) • Low or dead battery • Charging system malfunction

Diagnostic procedure

STEP	INSPECTION	RESULTS	ACTION
1	**Note** • The following test should be perform for vehicles with immobilizer system. Go to Step 10 for vehicles without immobilizer system. Connect the current diagnostic tool to the DLC-2. Do following conditions appear? • Engine is not completely started. • DTC P1260 is displayed.	Yes	**Both conditions appear:** Go to Step 4.
		No	**Either or other condition appears:** Go to the next step.
2	Is the coil connector securely connected to coil?	Yes	Go to the next step.
		No	Connect the coil connector securely. Return to Step 1.
3	Does the security light illuminate?	Yes	Go to the next step.
		No	Inspect the instrument cluster and wiring harness.

STEP	INSPECTION	RESULTS	ACTION
4	Connect the current diagnostic tool to the DLC-2 and retrieve the any DTCs. **DTC** **P1259, P1260, P1602, P1603, P1621, P1622, P1623, P1624**	Yes	Go to the appropriate DTC test.
		No	Go to the next step.
5	Is there continuity between PCM ground terminals 202, 204, 206 and ground?	Yes	Go to the next step.
		No	Repair or replace wiring harness.
6	Turn the engine switch to the ON position (Engine off). Access the VPWR PID. Is the VPWR PID normal? **Specification** **Battery voltage**	Yes	Go to the next step.
		No	Repair or replace wiring harness.
7	Inspect the following wiring harnesses and connectors. • Between immobilizer unit terminal F and coil terminal A • Between immobilizer unit terminal D and coil terminal C Is there any malfunction (open or short circuit, terminal corrosion, etc.)?	Yes	Repair or replace malfunctioning part.
		No	Go to the next step.
8	Inspect the following: • Battery connection • Battery condition • Fuses Are all items normal?	Yes	Go to the next step.
		No	Service if necessary. Repeat Step 12.
9	Is the clicking sound heard from starter when engine switch is turned to START?	Yes	Go to Step 11.
		No	Go to the next step.
10	Inspect the starting system. Is the starting system normal?	Yes	Inspect for seized/hydrolocked engine, dual-mass flywheel.
		No	Repair or replace components as required.
11	Do any other electrical accessories work?	Yes	Go to the next step.
		No	Inspect the charging system.
12	Connect the current diagnostic tool to the DLC-2. Turn the engine switch to the ON position (Engine off). Retrieve the any DTCs. Are any DTC displayed?	Yes	**DTC is displayed:** Go to the appropriate DTC test. **Communication error message is displayed:** inspect the following: • Open circuit between main relay and PCM terminal 201, 203, 205 • Open circuit main relay and PCM terminal 219 • Main relay stuck open • Open or poor ground circuit (PCM terminal 202, 204, 206) • Poor connection vehicle body ground
		No	**No DTC is displayed:** inspect the following: • START circuit in engine switch • Open circuit between engine switch and starter
13	Verify test results. • If normal, return to the diagnostic index to service any additional symptoms. (See 01-03B-6 SYMPTOM DIAGNOSTIC INDEX [WL-C, WE-C].) • If the malfunction remains, inspect the related Service Information and perform repair or diagnosis. — If the vehicle is repaired, the troubleshooting completed. — If the vehicle is not repaired or additional diagnostic information is not available, reprogram the PCM if later calibration is available. Retest.		

NO.4 HARD START/LONG CRANK/ERRATIC START/ERRATIC CRANK [WL-C, WE-C]

dcf010300000w33

4	HARD START/LONG CRANK/ERRATIC START/ERRATIC CRANK
DESCRIPTION	• Starter cranks engine at the normal speed but the engine requires excessive cranking time before starting. • Battery is in normal condition.
POSSIBLE CAUSE	• Poor fuel quality • Intake-air system restriction or clogging • Starting system malfunction • Inadequate fuel pressure • Fuel pressure limiter malfunction (built-in common rail) • Engine overheating • Glow system malfunction • Fuel filter clogging or restriction • Fuel line clogging or restriction • Fuel leakage • Exhaust system and/or oxidation catalytic converter restriction or clogging • Incorrect fuel injection timing • Erratic signal from CKP sensor • Erratic signal from CMP sensor • ECT sensor or related circuit malfunction • Accelerator pedal position (APP) sensor or related circuit malfunction • MAF sensor/IAT sensor No.2 or related circuit malfunction • Fuel pressure sensor or related circuit malfunction • Supply pump malfunction • Fuel injector malfunction • Low engine compression • EGR system malfunction **Warning** **The following troubleshooting flow chart contains the fuel system diagnosis and repair procedures. Read the following warnings before performing the fuel system services:** • **Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.** • **Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injury or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE REPAIR PROCEDURE" and "AFTER REPAIR PROCEDURE" described in this manual.**

Diagnostic Procedure

STEP	INSPECTION	RESULTS	ACTION
1	Inspect the following: • Fuel quality (e.g.: include water contamination, winter/summer blend) • Fuel line/fuel filter clogging • Intake-air system restriction Are all items normal?	Yes	Go to the next step.
		No	Service if necessary. Repeat Step 1.
2	Is the engine overheating?	Yes	Go to the symptom troubleshooting "NO.17 COOLING SYSTEM CONCERNS-OVERHEATING [WL-C, WE-C]".
		No	Go to the next step.
3	Connect the current diagnostic tool to the DLC-2. Turn the engine switch to the ON position (Engine off). Retrieve any DTCs. Are any DTCs displayed?	Yes	**DTC is displayed:** Go to the appropriate DTC test. (See 01-02B-11 DTC TABLE [WL-C, WE-C].) **Communication error message is displayed:** Inspect the following: • Open circuit between main relay and PCM terminal 201, 203, 205 • Open circuit main relay and PCM terminal 219 • Main relay stuck open • Open or poor ground circuit (PCM terminal 202, 204, 206) • Poor connection to vehicle body ground
		No	**No DTC is displayed:** Go to the next step.

STEP	INSPECTION	RESULTS	ACTION
4	Does the engine start normally after warm-up?	Yes	Inspect the glow system operation. (See 01-13B-9 GLOW PLUG RELAY INSPECTION [WL-C, WE-C].) Replace any malfunctioning part if necessary. If the glow system is normal, go to the next step.
		No	Go to the next step.
5	Is there any restriction in the exhaust system or oxidation catalytic converter?	Yes	Repair or replace if necessary.
		No	Go to the next step.
6	Inspect for fuel leakage from the fuel pipe. Is any fuel leakage found on the fuel pipe?	Yes	Repair or replace if necessary.
		No	Go to the next step.
7	Inspect the APP sensor. (See 01-40B-28 ACCELERATOR PEDAL POSITION (APP) SENSOR INSPECTION [WL-C, WE-C].) Is the APP sensor normal?	Yes	Go to the next step.
		No	Replace the accelerator pedal component.
8	Inspect the CKP sensor. (See 01-40B-39 CRANKSHAFT POSITION (CKP) SENSOR INSPECTION [WL-C, WE-C].) (See 01-40B-38 CRANKSHAFT POSITION (CKP) SENSOR REMOVAL/INSTALLATION [WL-C, WE-C].) Is the CKP sensor normal?	Yes	Go to the next step.
		No	Replace the CKP sensor. Then go to the next step.
9	Visually inspect the CMP sensor and teeth of pulse wheel. Are CMP sensor and teeth of pulse wheel normal?	Yes	Inspect following PIDs: (See 01-40B-10 PCM INSPECTION [WL-C, WE-C].) • ECT • IAT • MAF • RPM If the PID value is not as specified, repair or replace the malfunctioning parts. If the PID value is normal, go to the next step.
		No	Replace malfunctioning parts.
10	Inspect fuel pressure sensor. (See 01-40B-33 FUEL PRESSURE SENSOR INSPECTION [WL-C, WE-C].) Is fuel pressure normal?	Yes	Go to the next step.
		No	Replace common rail.
11	Is engine compression correct? (See 01-10B-6 COMPRESSION INSPECTION [WL-C, WE-C].)	Yes	Go to the next step.
		No	Inspect the following: • Damaged valve seat • Worn valve stem and valve guide • Worn or stuck piston ring • Worn piston, piston ring or cylinder Service if necessary.
12	Inspect fuel injector. (See 01-14B-16 FUEL INJECTOR INSPECTION [WL-C, WE-C].) Is fuel injector normal?	Yes	Go to the next step.
		No	Repair or replace if necessary. (See 01-14B-15 FUEL INJECTOR REMOVAL/INSTALLATION [WL-C, WE-C].)
13	Inspect the EGR system operation. Is the EGR system operation normal?	Yes	Go to the next step.
		No	Repair or replace the malfunctioning part according to the EGR system operation results.
14	Inspect starting system. Is the starting system normal?	Yes	Inspect for loose connectors or poor terminal contact. If normal, remove and inspect supply pump and common rail.
		No	Repair or replace components as required.
15	Verify test results. • If normal, return to the diagnostic index to service any additional symptoms. (See 01-03B-6 SYMPTOM DIAGNOSTIC INDEX [WL-C, WE-C].) • If the malfunction remains, inspect the related Service Information and perform repair or diagnosis. — If the vehicle is repaired, troubleshooting completed. — If the vehicle is not repaired or additional diagnostic information is not available, reprogram the PCM if later calibration is available. Retest.		

NO.5 ENGINE STALLS-AFTER START/AT IDLE [WL-C, WE-C]

dcf010300000w34

5	ENGINE STALLS-AFTER START/AT IDLE
DESCRIPTION	• Engine stops unexpectedly.
POSSIBLE CAUSE	• Poor fuel quality • Intake-air system restriction or clogging • Engine overheating • A/C system improper operation • Immobilizer system and/or circuit malfunction (if equipped) • Main relay malfunction • Glow system malfunction • Inadequate fuel pressure • Fuel pressure sensor related circuit malfunction • Fuel pressure limiter malfunction (built-in common rail) • Fuel leakage • Fuel line clogging or restriction • Fuel filter clogging or restriction • Incorrect fuel injection timing • Erratic signal from CKP sensor • Erratic signal from CMP sensor • Supply pump malfunction • Fuel injector malfunction • Low engine compression • Improper valve timing • Exhaust system and/or catalyst converter restriction or clogging • EGR system malfunction • ECT sensor or related circuit malfunction • Accelerator pedal position (APP) sensor or related circuit malfunction • MAF sensor/IAT sensor No.2 or related circuit malfunction • V-reference voltage supply circuit malfunction **Warning** **The following troubleshooting flow chart contains the fuel system diagnosis and repair procedures. Read the following warnings before performing the fuel system services:** • **Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.** • **Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injury or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE REPAIR PROCEDURE" and "AFTER REPAIR PROCEDURE" described in this manual.**

Diagnostic Procedure

STEP	INSPECTION	RESULTS	ACTION
1	**Note** • The following test should be perform for vehicles with immobilizer system. Go to Step 10 for vehicles without immobilizer system. Connect the current diagnostic tool to the DLC-2. Do following conditions appear? • Engine is not completely started. • DTC P1260 is displayed.	Yes	**Both conditions appear:** Go to Step 4.
		No	**Either or other condition appears:** Go to the next step.
2	Is the coil connector securely connected to coil?	Yes	Go to the next step.
		No	Connect the coil connector securely. Return to Step 1.
3	Does the security light illuminate?	Yes	Go to the next step.
		No	Inspect the instrument cluster and wiring harness.
4	Connect the current diagnostic tool to the DLC-2 and retrieve the any DTCs. **DTC** **P1259, P1260, P1602, P1603, P1621, P1622, P1623, P1624**	Yes	Go to the appropriate DTC test.
		No	Go to the next step.
5	Is there continuity between PCM ground terminals 202, 204, 206 and ground?	Yes	Go to the next step.
		No	Repair or replace wiring harness.

STEP	INSPECTION	RESULTS	ACTION
6	Turn the engine switch to the ON position (Engine off). Access the VPWR PID. Is the VPWR PID normal? **Specification** **Battery voltage**	Yes	Go to the next step.
		No	Repair or replace wiring harness.
7	Inspect the following wiring harnesses and connectors. • Between immobilizer unit terminal F and coil terminal A • Between immobilizer unit terminal D and coil terminal C Is there any malfunction (open or short circuit, terminal corrosion, etc.)?	Yes	Repair or replace malfunctioning part.
		No	Go to the next step.
8	Inspect the following: • Fuel quality (e.g.: include water contamination, winter/summer blend) • Fuel line/fuel filter clogging • Intake-air system restriction Are all items normal?	Yes	Go to the next step.
		No	Service if necessary. Repeat Step 8.
9	Is the engine overheating?	Yes	Go to symptom troubleshooting "NO.17 COOLING SYSTEM CONCERNS-OVERHEATING [WL-C, WE-C]".
		No	Go to the next step.
10	**Note** • Ignore DTC P0122, P0123, P0222 or P0223 while performing this test. Disconnect the APP sensor connector. Measure the voltage at the APP sensor connector the VREF terminal (terminal A) with the engine switch to the ON position. **Specification** **4.5—5.5 V** Is the voltage normal?	Yes	Go to the next step.
		No	Inspect the open or short circuit for wiring harness. • Between PCM terminal 213 and APP sensor terminal A
11	Connect the current diagnostic tool to the DLC-2. Turn the engine switch to the ON position (Engine off). Retrieve the any DTCs. Are any DTC displayed?	Yes	**DTC is displayed:** Go to the appropriate DTC test. **Communication error message is displayed:** Inspect the following: • Open circuit between main relay and PCM terminal 201, 203, 205 • Open circuit main relay and PCM terminal 219 • Main relay stuck open • Open or poor ground circuit (PCM terminal 202, 204, 206) • Poor connection vehicle body ground
		No	**No DTC is displayed:** Go to the next step.
12	Does the engine start normally after warm-up?	Yes	Inspect the glow system operation. (See 01-13B-9 GLOW PLUG RELAY INSPECTION [WL-C, WE-C].) Replace any malfunctioning part if necessary. If the glow system is normal, go to the next step.
		No	Go to the next step.
13	Is there any restriction in the exhaust system or the catalyst converter?	Yes	Repair or replace if necessary.
		No	Go to the next step.
14	Access the RPM PID. Is the RPM PID indicating engine speed during cranking engine?	Yes	Go to the next step.
		No	Go to Step 17.

STEP	INSPECTION	RESULTS	ACTION
15	**Note** • The following test should be performed on the vehicles with A/C system. If the following test cannot be performed due to engine stalling, go to the next step. • Go to the next step for the vehicle without A/C system. Connect the pressure gauge to the A/C line. Turn the blower and the A/C switches on. Is the pressure within specifications?	Yes	Go to the next step.
		No	**A/C is always on:** Go to symptom troubleshooting "NO.24 A/C ALWAYS ON OR A/C COMPRESSOR RUNS CONTINUOUSLY [WL-C, WE-C]". **Other symptoms:** Inspect following: • Refrigerant charging amount • Cooling fan No.1 and/or cooling fan No.2 operation
16	Inspect the adjustment of the APP sensor. (See 01-40B-28 ACCELERATOR PEDAL POSITION (APP) SENSOR INSPECTION [WL-C, WE-C].) Are APP sensor adjusted correctly?	Yes	Go to the next step.
		No	Adjust APP sensor correctly.
17	Depress the accelerator pedal slightly. Crank engine. Does the engine start now?	Yes	Inspect the idle speed. (See 01-10B-22 Idle Speed Inspection.)
		No	Go to the next step.
18	Inspect for fuel leakage from fuel pipe. Is any fuel leakage found on fuel pipe?	Yes	Repair or replace if necessary.
		No	Go to the next step.
19	Inspect the CKP sensor. (See 01-40B-39 CRANKSHAFT POSITION (CKP) SENSOR INSPECTION [WL-C, WE-C].) (See 01-40B-38 CRANKSHAFT POSITION (CKP) SENSOR REMOVAL/INSTALLATION [WL-C, WE-C].) Is the CKP sensor normal?	Yes	Go to the next step.
		No	Replace the CKP sensor. Then go to the next step.
20	Visually inspect the CMP sensor and teeth of the pulse wheel. Are the CMP sensor and teeth of pulse wheel normal?	Yes	Inspect following PIDs: (See 01-40B-10 PCM INSPECTION [WL-C, WE-C].) • ECT • IAT • MAF • RPM If the PID value is not as specified, repair or replace malfunctioning parts. If the PID value is normal, go to the next step.
		No	Replace malfunctioning parts.
21	Inspect the fuel pressure sensor. (See 01-40B-33 FUEL PRESSURE SENSOR INSPECTION [WL-C, WE-C].) Is the fuel pressure normal?	Yes	Go to the next step.
		No	Replace common rail.
22	Is the engine compression correct? (See 01-10B-6 COMPRESSION INSPECTION [WL-C, WE-C].)	Yes	Go to the next step.
		No	Inspect the following: • Damaged valve seat • Worn valve stem and valve guide • Worn or stuck piston ring • Worn piston, piston ring or cylinder • Improper valve timing Service if necessary.
23	Inspect the fuel injector. (See 01-14B-16 FUEL INJECTOR INSPECTION [WL-C, WE-C].) Is the fuel injector normal?	Yes	Go to the next step.
		No	Repair or replace if necessary.
24	Inspect the EGR system operation. Is the EGR system operation normal?	Yes	Go to the next step.
		No	Repair or replace malfunctioning part according to EGR system operation results.
25	Verify test results. • If normal, return to the diagnostic index to service any additional symptoms. (See 01-03B-6 SYMPTOM DIAGNOSTIC INDEX [WL-C, WE-C].) • If the malfunction remains, inspect the related Service Information and perform repair or diagnosis. — If the vehicle is repaired, the troubleshooting completed. — If the vehicle is not repaired or additional diagnostic information is not available, reprogram the PCM if later calibration is available. Retest.		

NO.6 CRANKS NORMALLY BUT WILL NOT START [WL-C, WE-C]

dcf010300000w35

6	CRANKS NORMALLY BUT WILL NOT START
DESCRIPTION	• Starter cranks engine at normal speed but engine will not run. • Refer to symptom troubleshooting "No.5 Engine stalls" if this symptom appears after engine stall. • Fuel is in fuel tank. • Battery is in normal condition.
POSSIBLE CAUSE	• Poor fuel quality • Intake-air system restriction • Fuel line restriction • EGR system malfunction • Glow system malfunction • Fuel pressure sensor or related circuit malfunction • Fuel pressure limiter malfunction (built-in common rail) • Fuel leakage • Fuel filter clogging • Incorrect fuel injection timing • Erratic signal from CKP sensor • Erratic signal from CMP sensor • V-reference supply circuit malfunction • ECT sensor or related circuit malfunction • Supply pump malfunction • Fuel injector malfunction • Immobilizer system and/or circuit malfunction (if equipped) • Low engine compression • Improper valve timing • Main repay malfunction **Warning** **The following troubleshooting flow chart contains the fuel system diagnosis and repair procedures. Read the following warnings before performing the fuel system services:** • **Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.** • **Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injury or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE REPAIR PROCEDURE" and "AFTER REPAIR PROCEDURE" described in this manual.**

Diagnostic Procedure

STEP	INSPECTION	RESULTS	ACTION
1	**Note** • The following test should be perform for vehicles with immobilizer system. Go to Step 10 for vehicles without immobilizer system. Connect the current diagnostic tool to the DLC-2. Do following conditions appear? • Engine is not completely started. • DTC P1260 is displayed.	Yes	**Both conditions appear:** Go to Step 4.
		No	**Either or other condition appears:** Go to the next step.
2	Is the coil connector securely connected to coil?	Yes	Go to the next step.
		No	Connect the coil connector securely. Return to Step **1**.
3	Does the security light illuminate?	Yes	Go to the next step.
		No	Inspect the instrument cluster and wiring harness.
4	Connect the current diagnostic tool to the DLC-2 and retrieve the any DTCs. **DTC** **P1259, P1260, P1602, P1603, P1621, P1622, P1623, P1624**	Yes	Go to the appropriate DTC test.
		No	Go to the next step.
5	Is there continuity between PCM ground terminals 202, 204, 206 and ground?	Yes	Go to the next step.
		No	Repair or replace wiring harness.

STEP	INSPECTION	RESULTS	ACTION
6	Turn the engine switch to the ON position (Engine off). Access the VPWR PID. Is the VPWR PID normal? **Specification** **Battery voltage**	Yes	Go to the next step.
		No	Repair or replace wiring harness.
7	Inspect the following wiring harnesses and connectors. • Between immobilizer unit terminal F and coil terminal A • Between immobilizer unit terminal D and coil terminal C Is there any malfunction (open or short circuit, terminal corrosion, etc.)?	Yes	Repair or replace malfunctioning part.
		No	Go to the next step.
8	Inspect the following: • Fuel quality (e.g.: include water contamination, winter/summer blend) • Fuel line/fuel filter clogging • Intake-air system restriction Are all items normal?	Yes	Go to the next step.
		No	Service if necessary. Repeat Step 8.
9	**Note** • Ignore DTC P0122, P0123, P0222 or P0223 while performing this test. Disconnect the APP sensor connector. Measure the voltage at APP sensor connector VREF terminal (terminal A) with the engine switch to the ON position. **Specification** **4.5—5.5 V** Is the voltage normal?	Yes	Go to the next step.
		No	Inspect the open or short circuit for wiring harness. • Between PCM terminal 213 and APP sensor terminal A
10	Connect the current diagnostic tool to the DLC-2. Turn the engine switch to the ON position (Engine off). Retrieve the any DTCs. Are any DTC displayed?	Yes	**DTC is displayed:** Go to the appropriate DTC test. **Communication error message is displayed:** Inspect the following: • Open circuit between main relay and PCM terminal 201, 203, 205 • Open circuit main relay and PCM terminal 219 • Main relay stuck open • Open or poor ground circuit (PCM terminal 202, 204, 206) • Poor connection vehicle body ground
		No	**No DTC is displayed:** Go to the next step.
11	Inspect the glow system operation. (See 01-13B-9 GLOW PLUG RELAY INSPECTION [WL-C, WE-C].) Is the glow system operation normal?	Yes	Go to the next step.
		No	Repair or replace malfunctioning part according to glow system operation results.
12	Inspect the fuel leakage from fuel pipe. Is any fuel leakage found on fuel pipe?	Yes	Repair or replace if necessary.
		No	Go to the next step.
13	Inspect the CKP sensor. (See 01-40B-39 CRANKSHAFT POSITION (CKP) SENSOR INSPECTION [WL-C, WE-C].) (See 01-40B-38 CRANKSHAFT POSITION (CKP) SENSOR REMOVAL/INSTALLATION [WL-C, WE-C].) Is the CKP sensor normal?	Yes	Go to the next step.
		No	Replace the CKP sensor. Then go to the next step.
14	Visually inspect the CMP sensor and teeth of the pulse wheel. Are the CMP sensor and teeth of the pulse wheel normal?	Yes	Inspect the following PIDs: (See 01-40B-10 PCM INSPECTION [WL-C, WE-C].) • ECT • RPM If the PID value is not as specified, repair or replace malfunctioning parts. If the PID value is normal, go to the next step.
		No	Replace malfunctioning parts.

STEP	INSPECTION	RESULTS	ACTION
15	Inspect the fuel pressure sensor. (See 01-40B-33 FUEL PRESSURE SENSOR INSPECTION [WL-C, WE-C].) Is the fuel pressure normal?	Yes	Go to the next step.
		No	Replace the common rail.
16	Is the engine compression correct? (See 01-10B-6 COMPRESSION INSPECTION [WL-C, WE-C].)	Yes	Go to the next step.
		No	Inspect the following: • Damaged valve seat • Worn valve stem and valve guide • Worn or stuck piston ring • Worn piston, piston ring or cylinder • Improper valve timing Service if necessary.
17	Inspect the fuel injector. (See 01-14B-16 FUEL INJECTOR INSPECTION [WL-C, WE-C].) Is the fuel injector normal?	Yes	Go to the next step.
		No	Repair or replace if necessary.
18	Inspect the EGR system operation. Is the EGR system operation normal?	Yes	Remove and inspect the supply pump and common rail.
		No	Repair or replace malfunctioning part according to EGR system operation results.
19	Verify test results. • If normal, return to the diagnostic index to service any additional symptoms. (See 01-03B-6 SYMPTOM DIAGNOSTIC INDEX [WL-C, WE-C].) • If malfunction remains, inspect the related Service Information and perform repair or diagnosis. — If the vehicle is repaired, the troubleshooting completed. — If the vehicle is not repaired or additional diagnostic information is not available, reprogram the PCM if later calibration is available. Retest.		

NO.7 SLOW RETURN TO IDLE [WL-C, WE-C]

dcf010300000w36

7	SLOW RETURN TO IDLE
DESCRIPTION	• Engine takes more time than normal to return to idle speed. • Engine speed continues at fast idle after warm-up.
POSSIBLE CAUSE	• Thermostat is stuck open • Fuel injection timing is incorrect • Erratic signal from CKP sensor • Erratic signal from CMP sensor • ECT sensor or related circuit malfunction • Accelerator pedal position (APP) sensor or related circuit malfunction • MAF sensor/IAT sensor No.2 or related circuit malfunction • Fuel pressure sensor or related circuit malfunction • Incorrect idle speed • Excessive fuel pressure • Supply pump malfunction • Fuel pressure limiter malfunction (built-in common rail) • Fuel injector malfunction (incorrect fuel regulate pressure) • A/C system malfunction **Warning** **The following troubleshooting flow chart contains the fuel system diagnosis and repair procedures. Read the following warnings before performing the fuel system services:** • **Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.** • **Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injury or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE REPAIR PROCEDURE" and "AFTER REPAIR PROCEDURE" described in this manual.**

Diagnostic Procedure

STEP	INSPECTION	RESULTS	ACTION
1	Connect the current diagnostic tool to the DLC-2. Turn the engine switch to the ON position (Engine off). Retrieve any DTCs. Are any DTCs displayed?	Yes	**DTC is displayed:** Go to the appropriate DTC test. (See 01-02B-11 DTC TABLE [WL-C, WE-C].) **Communication error message is displayed:** Inspect the following: • Open circuit between main relay and PCM terminal 201, 203, 205 • Open circuit main relay and PCM terminal 219 • Main relay stuck open • Open or poor ground circuit (PCM terminal 202, 204, 206) • Poor connection to vehicle body ground
		No	**No DTC is displayed:** Go to the next step.
2	Access ECT PID. Start and warm-up the engine to normal operating temperature. Is the ECT PID reading between **82—112 °C {180—233 °F}**?	Yes	Go to the next step.
		No	**ECT PID is higher than 112 °C {233 °F}:** Go to the symptom troubleshooting "NO.17 COOLING SYSTEM CONCERNS-OVERHEATING [WL-C, WE-C]". **ECT PID is less than 82 °C {180 °F}:** Go to the symptom troubleshooting "NO.18 COOLING SYSTEM CONCERNS-RUNS COLD [WL-C, WE-C]".
3	Inspect the idle speed. (See 01-10B-21 ENGINE TUNE-UP [WL-C, WE-C].) Is the idle speed correct?	Yes	Go to the next step.
		No	Repair or replace malfunctioning part according to idle speed inspection results.
4	Inspect the A/C system operation • Are A/C operation normal ?	Yes	Go to the next step.
		No	Go to the symptom trouble shooting "No.23 A/C DOES NOT WORK SUFFICIENTLY [WL-C, WE-C]" and "No.24 A/C ALWAYS ON OR A/C COMPRESSOR RUNS CONTINUOUSLY [WL-C, WE-C]".
5	Inspect the cooling fan control system operation. Does the cooling fan control operate properly?	Yes	Go to the next step.
		No	Repair or replace the malfunctioning part according to cooling fan No.2 control system operation inspection results.
6	Inspect the APP sensor. (See 01-40B-28 ACCELERATOR PEDAL POSITION (APP) SENSOR INSPECTION [WL-C, WE-C].) Is the APP sensor normal?	Yes	Go to the next step.
		No	Replace the accelerator pedal component.
7	Inspect the CKP sensor. (See 01-40B-39 CRANKSHAFT POSITION (CKP) SENSOR INSPECTION [WL-C, WE-C].) (See 01-40B-38 CRANKSHAFT POSITION (CKP) SENSOR REMOVAL/INSTALLATION [WL-C, WE-C].) Is the CKP sensor normal?	Yes	Go to the next step.
		No	Replace the CKP sensor. Then go to the next step.
8	Visually inspect the CMP sensor and the teeth of the pulse wheel. Are the CMP sensor and the teeth of the pulse wheel normal?	Yes	Inspect the following PIDs: (See 01-40B-10 PCM INSPECTION [WL-C, WE-C].) • ECT • IAT • MAF • RPM If the PID value is not as specified, repair or replace malfunctioning parts. If the PID value is normal, go to the next step.
		No	Replace malfunctioning parts.
9	Remove the thermostat and inspect the operation. (See 01-12B-7 THERMOSTAT REMOVAL/INSTALLATION [WL-C, WE-C].) (See 01-12B-8 THERMOSTAT INSPECTION [WL-C, WE-C].) Is the thermostat normal?	Yes	Go to the next step.
		No	Replace thermostat.

STEP	INSPECTION	RESULTS	ACTION
10	Inspect the fuel injector relief pressure. Is the fuel injector relief pressure normal?	Yes	Remove and inspect the supply pump and the common rail.
		No	Replace the fuel injector. (See 01-14B-15 FUEL INJECTOR REMOVAL/ INSTALLATION [WL-C, WE-C].)
11	Verify test results. • If normal, return to the diagnostic index to service any additional symptoms. (See 01-03B-6 SYMPTOM DIAGNOSTIC INDEX [WL-C, WE-C].) • If the malfunction remains, inspect the related Service Information and perform repair or diagnosis. — If the vehicle is repaired, troubleshooting completed. — If the vehicle is not repaired or additional diagnostic information is not available, reprogram the PCM if later calibration is available. Retest.		

NO.8 ENGINE RUNS ROUGH/ROLLING IDLE [WL-C, WE-C]

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8	ENGINE RUNS ROUGH/ROLLING IDLE
DESCRIPTION	• Engine the speed fluctuates between specified idle speed and a lower speed and the engine shakes excessively. • Idle speed is too slow and the engine shakes excessively.
POSSIBLE CAUSE	• Poor fuel quality • Air leakage from intake-air system • Intake-air system restriction • Incorrect idle speed • Engine overheating • Cooling fan system malfunction • A/C system improper operation • EGR system improper operation • EGR cooler malfunction • Fuel leakage • Inadequate fuel pressure • Fuel pressure sensor or related circuit malfunction • Fuel pressure limiter malfunction (built-in common rail) • Fuel filter clogging • Fuel line restriction • Incorrect fuel injection timing • Erratic signal from CKP sensor • Erratic signal from CMP sensor • ECT sensor or related circuit malfunction • APP sensor or related circuit malfunction • MAF sensor/IAT sensor No.2 malfunction • Neutral switch or related circuit malfunction • Supply pump malfunction • Fuel injector malfunction • Low engine compression • Improper valve timing • Engine compression excessive unbalance for each cylinder • Unbalanced fuel injection amount for each cylinder • Fuel injection learning improper **Warning** **The following troubleshooting flow chart contains the fuel system diagnosis and repair procedures. Read the following warnings before performing the fuel system services:** • **Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.** • **Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injury or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE REPAIR PROCEDURE" and "AFTER REPAIR PROCEDURE" described in this manual.**

Diagnostic Procedure

STEP	INSPECTION	RESULTS	ACTION
1	Inspect the following: • Fuel quality (e.g.: including water contamination, winter/summer blend) • Fuel line/fuel filter clogging • Loose bands on intake-air system • Cracks on intake-air system parts • Intake-air system restriction • Vacuum leakage • Cooling fan system operation Are all items normal?	Yes	Go to the next step.
		No	Service if necessary Repeat Step 1.
2	Is the engine overheating?	Yes	Go to symptom troubleshooting "NO.17 COOLING SYSTEM CONCERNS-OVERHEATING [WL-C, WE-C]."
		No	Go to the next step.
3	Connect the current diagnostic tool to the DLC-2. Turn the engine switch to the ON position (Engine off). Retrieve any DTCs. Are any DTCs displayed?	Yes	**DTC is displayed:** Go to the appropriate DTC test. (See 01-02B-11 DTC TABLE [WL-C, WE-C].) **Communication error message is displayed:** Inspect the following: • Open circuit between main relay and PCM terminal 201, 203, 205 • Open circuit main relay and PCM terminal 219 • Main relay stuck open • Open or poor ground circuit (PCM terminal 202, 204, 206) • Poor connection to vehicle body ground
		No	**No DTC is displayed:** Go to the next step.
4	**Note** • The following test should be performed on vehicles with the A/C system. If the following test cannot be performed due to engine stalling, go to the next step. • Go to the next step for vehicles without an A/C system. Connect the pressure gauge to the A/C line. Turn the blower and the A/C switches on. Is the pressure within specifications?	Yes	Go to the next step.
		No	**A/C is always on:** Go to the symptom troubleshooting "NO.24 A/C ALWAYS ON OR A/C COMPRESSOR RUNS CONTINUOUSLY [WL-C, WE-C]". **Other symptoms:** Inspect the following: • Refrigerant charging amount • Cooling fan operation
5	Depress the accelerator pedal slightly. Crank the engine. Does the engine start now?	Yes	Inspect the idle speed. (See 01-10B-21 ENGINE TUNE-UP [WL-C, WE-C].)
		No	Go to the next step.
6	Inspect the APP sensor. (See 01-40B-28 ACCELERATOR PEDAL POSITION (APP) SENSOR INSPECTION [WL-C, WE-C].) Is the APP sensor normal?	Yes	Go to the next step.
		No	Replace the accelerator pedal component.
7	Inspect for fuel leakage from the fuel pipe. Is any fuel leakage found on the fuel pipe?	Yes	Repair or replace if necessary.
		No	Go to the next step.
8	Inspect the CKP sensor. (See 01-40B-39 CRANKSHAFT POSITION (CKP) SENSOR INSPECTION [WL-C, WE-C].) (See 01-40B-38 CRANKSHAFT POSITION (CKP) SENSOR REMOVAL/INSTALLATION [WL-C, WE-C].) Is the CKP sensor normal?	Yes	Go to the next step.
		No	Replace the CKP sensor. Then go to the next step.

STEP	INSPECTION	RESULTS	ACTION
9	Visually inspect the CMP sensor and the teeth of the pulse wheel. Are the CMP sensor and the teeth of the pulse wheel normal?	Yes	Inspect the following PIDs: (See 01-40B-10 PCM INSPECTION [WL-C, WE-C].) • ECT • IAT • MAF • RPM If the PID value is not as specified, repair or replace malfunctioning parts. If the PID value is normal, go to the next step.
		No	Replace malfunctioning parts.
10	Inspect the fuel pressure sensor. (See 01-40B-33 FUEL PRESSURE SENSOR INSPECTION [WL-C, WE-C].) Is the fuel pressure normal?	Yes	Go to the next step.
		No	Replace common rail.
11	Is the engine compression correct? (See 01-10B-6 COMPRESSION INSPECTION [WL-C, WE-C].)	Yes	Go to the next step.
		No	Inspect the following: • Damaged valve seat • Worn valve stem and valve guide • Worn or stuck piston ring • Worn piston, piston ring or cylinder • Improper valve timing Service if necessary.
12	Inspect the fuel injector. (See 01-14B-16 FUEL INJECTOR INSPECTION [WL-C, WE-C].) Is the fuel injector normal?	Yes	Go to the next step.
		No	Repair or replace if necessary. (See 01-14B-15 FUEL INJECTOR REMOVAL/ INSTALLATION [WL-C, WE-C].)
13	Inspect the EGR system operation. Is the EGR system operation normal?	Yes	Go to the next step.
		No	Repair or replace the malfunctioning part according to EGR system operation results.
14	Inspect the EGR cooler for the following: • Coolant passage clogging/restriction • Exhaust gas clogging/restriction Is EGR cooler normal?	Yes	Remove and inspect the supply pump and common rail.
		No	Service if necessary.
15	Verify test results. • If normal, return to the diagnostic index to service any additional symptoms. (See 01-03B-6 SYMPTOM DIAGNOSTIC INDEX [WL-C, WE-C].) • If the malfunction remains, inspect the related Service Information and perform repair or diagnosis. — If the vehicle is repaired, troubleshooting completed. — If the vehicle is not repaired or additional diagnostic information is not available, reprogram the PCM if later calibration is available. Retest.		

NO.9 FAST IDLE/RUNS ON [WL-C, WE-C]

dcf010300000w38

9	RUNS IDLE/RUNS ON
DESCRIPTION	• Engine speed continues at fast idle after warm-up. • Engine runs after the engine switch is turned off.
POSSIBLE CAUSE	• ECT sensor or related circuit malfunction • Accelerator pedal position (APP) sensor or related circuit malfunction • Fuel injector malfunction • Vacuum leakage • Improper engine oil level **Warning** **The following troubleshooting flow chart contains the fuel system diagnosis and repair procedures. Read the following warnings before performing the fuel system services:** • **Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.** • **Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injury or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE REPAIR PROCEDURE" and "AFTER REPAIR PROCEDURE" described in this manual.**

Diagnostic Procedure

STEP	INSPECTION	RESULTS	ACTION
1	Verify the following: — Proper dipstick — Engine oil level Are all item normal?	Yes	Go to the next step.
		No	Service if necessary. Repeat Step 1.
2	Connect the current diagnostic tool to the DLC-2. Access the ECT PID. Start and warm-up the engine to normal operating temperature. Is the ECT PID reading between **82—112 °C {180—233 °F}**?	Yes	Go to the next step.
		No	**ECT PID is higher than 112 °C{233 °F}:** Go to the symptom troubleshooting "NO.17 COOLING SYSTEM CONCERNS-OVERHEATING [WL-C, WE-C]". **ECT PID is less than 82 °C{180 °F}:** Go to the symptom troubleshooting "NO.18 COOLING SYSTEM CONCERNS-RUNS COLD [WL-C, WE-C]".
3	Perform the self-test function using the current diagnostic tool. Turn the engine switch to the ON position (Engine off). Retrieve any DTCs. Are any DTCs displayed?	Yes	**DTC is displayed:** Go to the appropriate DTC test. (See 01-02B-11 DTC TABLE [WL-C, WE-C].) **Communication error message is displayed:** Inspect the following: • Open circuit between main relay and PCM terminal 201, 203, 205 • Open circuit main relay and PCM terminal 219 • Main relay stuck open • Open or poor ground circuit (PCM terminal 202, 204, 206) • Poor connection to vehicle body ground
		No	**No DTC is displayed:** Go to the next step.
4	Inspect the fuel injector. (See 01-14B-16 FUEL INJECTOR INSPECTION [WL-C, WE-C].) Is the fuel injector normal?	Yes	Go to the next step.
		No	Replace the fuel injector. (See 01-14B-15 FUEL INJECTOR REMOVAL/ INSTALLATION [WL-C, WE-C].)
5	Inspect the APP sensor. (See 01-40B-28 ACCELERATOR PEDAL POSITION (APP) SENSOR INSPECTION [WL-C, WE-C].) Is the APP sensor normal?	Yes	Inspect the vacuum leakage.
		No	Replace the accelerator component.
6	Verify test results. • If normal, return to the diagnostic index to service any additional symptoms. (See 01-03B-6 SYMPTOM DIAGNOSTIC INDEX [WL-C, WE-C].) • If the malfunction remains, inspect the related Service Information and perform repair or diagnosis. — If the vehicle is repaired, troubleshooting completed. — If the vehicle is not repaired or additional diagnostic information is not available, reprogram the PCM if later calibration is available. Retest.		

NO.10 LOW IDLE/STALLS DURING DECELERATION [WL-C, WE-C]

dcf010300000w39

10	LOW IDLE/STALLS DURING DECELERATION
DESCRIPTION	• Engine stops unexpectedly at the beginning of deceleration or recovery from deceleration.
POSSIBLE CAUSE	• Intake-air system restriction or clogging • Poor fuel quality • A/C system improper operation • Inadequate fuel pressure • Fuel pressure limiter malfunction (built-in common rail) • Fuel leakage • Fuel line restriction or clogging • Fuel filter restriction or clogging • Incorrect fuel injection timing • Incorrect idle speed • Erratic signal from CKP sensor • Erratic signal from CMP sensor • Supply pump malfunction • Fuel injector malfunction • Low engine compression • Improper valve timing • Glow system malfunction • EGR system malfunction • MAF sensor/IAT sensor No.2 or related circuit malfunction • ECT sensor or related circuit malfunction • Fuel pressure sensor or related circuit malfunction • Accelerator pedal position (APP) sensor or related circuit malfunction **Warning** **The following troubleshooting flow chart contains the fuel system diagnosis and repair procedures. Read the following warnings before performing the fuel system services:** • **Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.** • **Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injury or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE REPAIR PROCEDURE" and "AFTER REPAIR PROCEDURE" described in this manual.**

Diagnostic Procedure

STEP	INSPECTION	RESULTS	ACTION
1	Does the engine idle roughly?	Yes	Go to the symptom troubleshooting "NO.8 ENGINE RUNS ROUGH/ROLLING IDLE [WL-C, WE-C]".
		No	Go to the next step.
2	Inspect the following: • Fuel line/fuel filter clogging or restriction • Intake-air system restriction or clogging • Fuel quality (e.g.: include water contamination, winter/summer blend) Are all items normal?	Yes	Go to the next step.
		No	Service if necessary. Repeat Step 2.
3	Perform the self-test function using the current diagnostic tool. Turn the engine switch to the ON position (Engine off). Retrieve any DTCs. Are any DTCs displayed?	Yes	**DTC is displayed:** Go to the appropriate DTC test. (See 01-02B-11 DTC TABLE [WL-C, WE-C].) **Communication error message is displayed:** Inspect the following: • Open circuit between main relay and PCM terminal 201, 203, 205 • Open circuit main relay and PCM terminal 219 • Main relay stuck open • Open or poor ground circuit (PCM terminal 202, 204, 206) • Poor connection to vehicle body ground
		No	**No DTC is displayed:** Go to the next step.
4	Inspect idle speed. (See 01-10B-21 ENGINE TUNE-UP [WL-C, WE-C].) Is the idle speed correct?	Yes	Go to the next step.
		No	Repair or replace the malfunctioning part according to the idle speed inspection results.

STEP	INSPECTION	RESULTS	ACTION
5	Inspect the APP sensor. (See 01-40B-28 ACCELERATOR PEDAL POSITION (APP) SENSOR INSPECTION [WL-C, WE-C].) Is the APP sensor normal?	Yes	Go to the next step.
		No	Replace the accelerator pedal component.
6	Inspect the CKP sensor. (See 01-40B-39 CRANKSHAFT POSITION (CKP) SENSOR INSPECTION [WL-C, WE-C].) (See 01-40B-38 CRANKSHAFT POSITION (CKP) SENSOR REMOVAL/INSTALLATION [WL-C, WE-C].) Is the CKP sensor normal?	Yes	Go to the next step.
		No	Replace the CKP sensor. Then go to the next step.
7	Visually inspect the CMP sensor and the teeth of the pulse wheel. Are the CMP sensor and the teeth of the pulse wheel normal?	Yes	Inspect the following PIDs: (See 01-40B-10 PCM INSPECTION [WL-C, WE-C].) • ECT • IAT • MAF • RPM If the PID value is not as specified, repair or replace malfunctioning parts. If the PID value is normal, go to the next step.
		No	Replace malfunctioning parts.
8	Inspect the fuel pressure sensor. (See 01-40B-33 FUEL PRESSURE SENSOR INSPECTION [WL-C, WE-C].) Is the fuel pressure normal?	Yes	Go to the next step.
		No	Replace the common rail.
9	Is the engine compression correct? (See 01-10B-6 COMPRESSION INSPECTION [WL-C, WE-C].)	Yes	Go to the next step.
		No	Inspect the following: • Damaged valve seat • Worn valve stem and valve guide • Worn or stuck piston ring • Worn piston, piston ring or cylinder • Improper valve timing Service if necessary.
10	Inspect fuel injector. (See 01-14B-16 FUEL INJECTOR INSPECTION [WL-C, WE-C].) Is fuel injector normal?	Yes	Go to the next step.
		No	Repair or replace if necessary. (See 01-14B-15 FUEL INJECTOR REMOVAL/INSTALLATION [WL-C, WE-C].)
11	**Note** • The following test should be performed on vehicles with an A/C system. If the following test cannot be performed due to engine stalling, go to the next step. • Go to the next step for vehicles without an A/C system. Connect the pressure gauge to A/C line. Turn the blower and A/C switches on. Is the pressure within specifications?	Yes	Go to the next step.
		No	**A/C is always on:** Go to the symptom troubleshooting "NO.24 A/C ALWAYS ON OR A/C COMPRESSOR RUNS CONTINUOUSLY [WL-C, WE-C]". **Other symptoms:** Inspect the following: • Refrigerant charging amount • Cooling fan operation
12	Inspect the EGR system operation. Is the EGR system operation normal?	Yes	Go to the next step.
		No	Repair or replace the malfunctioning part according to EGR system operation results.
13	Inspect the glow system operation. (See 01-13B-9 GLOW PLUG RELAY INSPECTION [WL-C, WE-C].) Is glow system operation normal?	Yes	Remove and inspect the supply pump and common rail.
		No	Service if necessary.
14	Verify test results. • If normal, return to the diagnostic index to service any additional symptoms. (See 01-03B-6 SYMPTOM DIAGNOSTIC INDEX [WL-C, WE-C].) • If the malfunction remains, inspect the related Service Information and perform repair or diagnosis. — If the vehicle is repaired, troubleshooting completed. — If the vehicle is not repaired or additional diagnostic information is not available, reprogram the PCM if later calibration is available. Retest.		

NO.11 ENGINE STALLS/QUITS, ENGINE RUNS ROUGH, MISSES, BUCK/JERK, HESITATION/STUMBLE, SURGES [WL-C, WE-C]

dcf010300000w40

11	ENGINE STALLS/QUITS, ENGINE RUNS ROUGH, MISSES, BUCK/JERK, HESITATION/STUMBLE, SURGES
DESCRIPTION	• Engine stops unexpectedly at beginning of acceleration or during cruise. • Engine stops unexpectedly while cruising. • Engine speed fluctuates during acceleration or cruising. • Engine misses during acceleration or cruising. • Vehicle bucks/jerks during acceleration, during or deceleration. • Momentary pause at beginning of acceleration or during acceleration. • Momentary minor irregularity in engine output.
POSSIBLE CAUSE	• Poor fuel quality • Glow system malfunction • Air leakage from intake-air system • Intake-air system restriction or clogging • Engine overheating • A/C system improper operation • Turbocharger malfunction • EGR system malfunction • Neutral switch or related circuit malfunction • Cooling fan No.1 or cooling fan No.2 seat are improper • Fuel line restriction or clogging • Fuel filter restriction or clogging • Fuel inlet-filter restriction or clogging • Incorrect fuel injection timing • Erratic signal from CKP sensor • Erratic signal from CMP sensor • ECT sensor or related circuit malfunction • Boost sensor or related circuit malfunction • Accelerator pedal position (APP) sensor or related circuit malfunction • MAF sensor/IAT sensor No.2 or related circuit malfunction • IAT sensor No.1 or related circuit malfunction • VSS or related circuit malfunction • Incorrect idle speed • Inadequate fuel pressure • Fuel pressure sensor or related circuit malfunction • Fuel pressure limiter malfunction (built-in common rail) • Supply pump malfunction • Fuel injector malfunction • Low engine compression • Improper valve timing • Exhaust system and/or oxidation catalytic converter restriction • Clutch slippage **Warning** **The following troubleshooting flow chart contains the fuel system diagnosis and repair procedures. Read the following warnings before performing the fuel system services:** • **Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.** • **Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injury or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE REPAIR PROCEDURE" and "AFTER REPAIR PROCEDURE" described in this manual.**

Diagnostic Procedure

STEP	INSPECTION	RESULTS	ACTION
1	Is the idle speed stable?	Yes	Go to the next step.
		No	Go to symptom troubleshooting "NO.8 ENGINE RUNS ROUGH/ROLLING IDLE [WL-C, WE-C]".
2	Is the engine overheating?	Yes	Go to symptom troubleshooting "NO.17 COOLING SYSTEM CONCERNS-OVERHEATING [WL-C, WE-C]".
		No	Go to the next step.

STEP	INSPECTION	RESULTS	ACTION
3	Perform the self-test function using the current diagnostic tool. Turn the engine switch to the ON position (Engine off). Retrieve any DTCs. Are any DTCs displayed?	Yes	**DTC is displayed:** Go to the appropriate DTC test. (See 01-02B-11 DTC TABLE [WL-C, WE-C].) **Communication error message is displayed:** Inspect the following: • Open circuit between main relay and PCM terminal 201, 203, 205 • Open circuit main relay and PCM terminal 219 • Main relay stuck open • Open or poor ground circuit (PCM terminal 202, 204, 206) • Poor connection to vehicle body ground
		No	**No DTC is displayed:** Go to the next step.
4	Inspect the following: • Fuel quality (e.g.: including water contamination, winter/summer blend) • Fuel line/fuel filter clogging and/or restriction • Fuel inlet-filter clogging and/or restriction • Intake-air system restriction or clogging • Exhaust system and/or oxidation catalytic converter restriction • Cooling fan seat Are all items normal?	Yes	Go to the next step.
		No	Service if necessary. Repeat Step 4.
5	Does the engine run normal after warm-up?	Yes	Inspect the glow system operation. (See 01-13B-9 GLOW PLUG RELAY INSPECTION [WL-C, WE-C].) Replace any malfunctioning part if necessary. If the glow system is normal, go to the next step.
		No	Go to the next step.
6	**Note** • The following test should be performed on vehicles with an A/C system. If the following test cannot be performed due to engine stalling, go to the next step. • Go to the next step for the vehicles an without A/C system. Connect the pressure gauge to A/C line. Turn the blower and A/C switches on. Is the pressure within specifications?	Yes	Go to the next step.
		No	**A/C is always on:** Go to the symptom troubleshooting "NO.24 A/C ALWAYS ON OR A/C COMPRESSOR RUNS CONTINUITY [WL-C, WE-C]". **Other symptoms:** Inspect the following: • Refrigerant charging amount • Cooling fan operation
7	Inspect the hose bands between the following parts: • Turbocharger compressor housing and air cleaner • Turbocharger compressor housing and charge air cooler Are the hose bands loose?	Yes	Retighten the hose bands. If the concern is resolved, the inspection is complete. If the concern still exists, go to the next step.
		No	Go to the next step.
8	Inspect for improper operation, kinks, clogging or disconnection on the guide blade actuator. Is the guide blade actuator normal?	Yes	Turbocharger is normal. Go to the next step.
		No	Repair or replace if necessary. If concern is resolved, the inspection is complete. If concern still exists, the turbocharger is normal. Go to the next step.
9	Perform the EGR system inspection. Is the EGR system normal?	Yes	Go to the next step.
		No	Repair or replace the malfunctioning part according to The EGR system operation results.
10	Inspect the idle speed. (See 01-10B-21 ENGINE TUNE-UP [WL-C, WE-C].) Is the idle speed correct?	Yes	Go to the next step.
		No	Repair or replace the malfunctioning part according to idle speed inspection results.
11	Inspect the APP sensor. (See 01-40B-28 ACCELERATOR PEDAL POSITION (APP) SENSOR INSPECTION [WL-C, WE-C].) Is the APP sensor normal?	Yes	Go to the next step.
		No	Replace the accelerator pedal component.

STEP	INSPECTION	RESULTS	ACTION
12	Inspect the adjustment of the neutral switch. (See 01-40B-43 NEUTRAL SWITCH INSPECTION [WL-C, WE-C].) Is the neutral switch adjusted correctly?	Yes	Go to the next step.
		No	Adjust the neutral switch correctly.
13	Inspect the CKP sensor. (See 01-40B-39 CRANKSHAFT POSITION (CKP) SENSOR INSPECTION [WL-C, WE-C].) (See 01-40B-38 CRANKSHAFT POSITION (CKP) SENSOR REMOVAL/INSTALLATION [WL-C, WE-C].) Is the CKP sensor normal?	Yes	Go to the next step.
		No	Replace the CKP sensor. Then go to the next step.
14	Visually inspect the CMP sensor and the teeth of the pulse wheel. Are the CMP sensor and the teeth of the pulse wheel normal?	Yes	Inspect the following PIDs: (See 01-40B-10 PCM INSPECTION [WL-C, WE-C].) • ECT • IAT • MAF • RPM If the PID value is not as specified, repair or replace malfunctioning parts. If the PID value is normal, go to the next step.
		No	Replace malfunctioning parts.
15	Inspect the fuel pressure sensor. (See 01-40B-33 FUEL PRESSURE SENSOR INSPECTION [WL-C, WE-C].) Is the fuel pressure normal?	Yes	Go to the next step.
		No	Replace the common rail.
16	Is the engine compression correct? (See 01-10B-6 COMPRESSION INSPECTION [WL-C, WE-C].)	Yes	Go to the next step.
		No	Inspect the following: • Damaged valve seat • Worn valve stem and valve guide • Worn or stuck piston ring • Worn piston, piston ring or cylinder • Improper valve timing Service if necessary.
17	Inspect fuel injector. (See 01-14B-16 FUEL INJECTOR INSPECTION [WL-C, WE-C].) Is the fuel injector normal?	Yes	Go to the next step.
		No	Repair or replace if necessary. (See 01-14B-15 FUEL INJECTOR REMOVAL/INSTALLATION [WL-C, WE-C].)
18	Inspect the timing belt for the following: • Chipping of gear teeth • Low tension • Breakage damage or cracks Is the timing belt normal?	Yes	Inspect the following: • Clutch slippage • CKP sensor • VSS If normal, remove and inspect the supply pump and common rail.
		No	If the timing is incorrect, adjust the valve timing. If the timing belt is not normal, replace the timing belt.
19	Verify test results. • If normal, return to the diagnostic index to service any additional symptoms. (See 01-03B-6 SYMPTOM DIAGNOSTIC INDEX [WL-C, WE-C].) • If the malfunction remains, inspect the related Service Information and perform repair or diagnosis. — If the vehicle is repaired, troubleshooting completed. — If the vehicle is not repaired or additional diagnostic information is not available, reprogram the PCM if later calibration is available. Retest.		

NO.12 LACK/LOSS OF POWER-ACCELERATION/CRUISE [WL-C, WE-C]

dcf010300000w41

12	LACK/LOSS OF POWER-ACCELERATION CRUISE
DESCRIPTION	• Performance is poor under load (e.g., power down when climbing hills).
POSSIBLE CAUSE	• Poor fuel quality • Air leakage from intake-air system • Intake-air system restriction or clogging • Engine overheating • A/C system improper operation • Improper operation of A/C cut-off control • Variable boost control (VBC) system malfunction • EGR system malfunction • Vacuum leakage • Clutch slippage • Exhaust system and/or oxidation catalytic converter restriction • Fuel line or clogging or restriction • Fuel filter clogging or restriction • Fuel inlet-filter clogging or restriction • Incorrect fuel injection timing • Erratic signal from CKP sensor • Erratic signal from CMP sensor • ECT sensor or related circuit malfunction • Boost sensor or related circuit malfunction • Accelerator pedal position (APP) sensor or related circuit malfunction • MAF sensor/IAT sensor No.2 or related circuit malfunction • IAT sensor No.1 or related circuit malfunction • Incorrect idle speed • Inadequate fuel pressure • Fuel pressure sensor or related circuit malfunction • Fuel pressure limiter malfunction (built-in common rail) • Supply pump malfunction • Fuel injector malfunction • Low engine compression • Improper valve timing • Cooling fan seat is improper • Turbocharger malfunction • Charge air cooler malfunction • Brake system dragging • Intake shutter valve malfunction • Guide blade valve malfunction **Warning** **The following troubleshooting flow chart contains the fuel system diagnosis and repair procedures. Read the following warnings before performing the fuel system services:** • **Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.** • **Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injury or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE REPAIR PROCEDURE" and "AFTER REPAIR PROCEDURE" described in this manual.**

Diagnostic Procedure

STEP	INSPECTION	RESULTS	ACTION
1	Is the idle speed stable?	Yes	Go to the next step.
		No	Go to the symptom troubleshooting "NO.8 ENGINE RUNS ROUGH/ROLLING IDLE [WL-C, WE-C]".
2	Is the engine overheating?	Yes	Go to the symptom troubleshooting "NO.17 COOLING SYSTEM CONCERNS-OVERHEATING [WL-C, WE-C]".
		No	Go to the next step.

STEP	INSPECTION	RESULTS	ACTION
3	Perform the self-test function using the current diagnostic tool. Turn the engine switch to the ON position (Engine off). Retrieve any DTCs. Are any DTCs displayed?	Yes	**DTC is displayed:** Go to the appropriate DTC test. (See 01-02B-11 DTC TABLE [WL-C, WE-C].) **Communication error message is displayed:** Inspect the following: • Open circuit between main relay and PCM terminal 201, 203, 205 • Open circuit main relay and PCM terminal 219 • Main relay stuck open • Open or poor ground circuit (PCM terminal 202, 204, 206) • Poor connection to vehicle body ground
		No	**No DTC is displayed:** Go to the next step.
4	Inspect the following: • Fuel quality (e.g.: including water contamination, winter/summer blend) • Fuel line/fuel filter clogging and/or restriction • Fuel inlet-filter clogging and/or restriction • Intake-air system restriction • Exhaust system and/or oxidation catalytic converter restriction • Charge air cooler condition (restriction or damaged) • Vacuum leakage • Cooling fan seat Are all items normal?	Yes	Go to the next step.
		No	Service if necessary. Repeat Step 5.
5	Inspect the intake shutter valve operation. (See 01-03B-62 ENGINE CONTROL SYSTEM OPERATION INSPECTION [WL-C, WE-C].) Is there any malfunction?	Yes	Repair or replace if necessary.
		No	Go to the next step.
6	Inspect the guide blade valve operation. (See 01-03B-62 ENGINE CONTROL SYSTEM OPERATION INSPECTION [WL-C, WE-C].) Is there any malfunction?	Yes	Repair or replace if necessary.
		No	Go to the next step.
7	Inspect the A/C cut-off operation. Does the A/C cut-off work properly?	Yes	Go to the next step.
		No	Repair or replace the malfunctioning part according to A/C cut-off system inspection results.
8	Inspect the hose bands between the following parts: • Turbocharger compressor housing and air cleaner • Turbocharger compressor housing and charge air cooler Are the hose bands loose?	Yes	Retighten the hose bands. If the concern is resolved, the inspection is complete. If the concern still exists, go to the next step.
		No	Go to the next step.
9	Inspect for improper operation, kinks, clogging or disconnection on guide blade actuator. (See 01-03B-62 ENGINE CONTROL SYSTEM OPERATION INSPECTION [WL-C, WE-C].) Is actuator normal?	Yes	Go to the next step.
		No	Repair or replace if necessary. If the concern is resolved, the inspection is complete. If the concern still exists, the turbocharger is normal. Go to the next step.
10	Remove parts necessary to inspect the turbocharger. Do not remove the turbocharger. Inspect if the turbocharger compressor wheel is bent, damaged, or interfering with the housing on vehicle. Is there any malfunction?	Yes	Replace the turbocharger.
		No	Go to the next step.
11	Inspect if the turbocharger compressor wheel locknut is loose or has fallen down inside the turbocharger. Is there any malfunction?	Yes	Replace the turbocharger.
		No	Go to the next step.
12	Inspect if turbocharger compressor wheel by hand. Does wheel turn easily and smoothly?	Yes	Go to the next step.
		No	Replace the turbocharger.

STEP	INSPECTION	RESULTS	ACTION
13	Inspect if turbocharger turbine wheel is damaged, cracked or interfering with the housing on the vehicle. **Note** • Inspect all fins on each turbine wheel. Is there any malfunction?	Yes	Replace the turbocharger.
		No	Go to the next step.
14	Is any engine oil found inside the turbocharger turbine housing?	Yes	**Excessive amount of oil is found:** Replace the turbocharger. **Small amount of oil is found:** Wipe oil off of the vehicle, then go to the next step.
		No	Go to the next step.
15	Is any engine oil found inside the turbocharger compressor housing?	Yes	Wipe oil off of vehicle and install all removed parts in Step 11. Then, go to the next step.
		No	Turbocharger is normal. Install all the parts removed in Step11. Then, go to the next step.
16	Perform the EGR system inspection. Is the EGR system normal?	Yes	Go to the next step.
		No	Repair or replace the malfunctioning part according to the EGR system operation results.
17	Inspect idle speed. (See 01-10B-21 ENGINE TUNE-UP [WL-C, WE-C].) Is the idle speed correct?	Yes	Go to the next step.
		No	Repair or replace the malfunctioning part according to the idle speed inspection results.
18	Inspect the APP sensor. (See 01-40B-28 ACCELERATOR PEDAL POSITION (APP) SENSOR INSPECTION [WL-C, WE-C].) Is the APP sensor normal?	Yes	Go to the next step.
		No	Replace the accelerator pedal component.
19	Visually inspect the CKP sensor and the teeth of the pulse wheel. Are the CKP sensor and the teeth of the pulse wheel normal?	Yes	Go to the next step.
		No	Replace the malfunctioning parts.
20	Inspect the CKP sensor. (See 01-40B-39 CRANKSHAFT POSITION (CKP) SENSOR INSPECTION [WL-C, WE-C].) (See 01-40B-38 CRANKSHAFT POSITION (CKP) SENSOR REMOVAL/INSTALLATION [WL-C, WE-C].) Is the CKP sensor normal?	Yes	Go to the next step.
		No	Replace the CKP sensor. Then go to the next step.
21	Visually inspect the CMP sensor and the teeth of the pulse wheel. Are the CMP sensor and the teeth of the pulse wheel normal?	Yes	Inspect the following PIDs: (See 01-40B-10 PCM INSPECTION [WL-C, WE-C].) • ECT • IAT • MAF • MAP • RPM If the PID value is not as specified, repair or replace malfunctioning parts. If the PID value is normal, go to the next step.
		No	Replace malfunctioning parts.
22	Inspect the fuel pressure sensor. (See 01-40B-33 FUEL PRESSURE SENSOR INSPECTION [WL-C, WE-C].) Is the fuel pressure normal?	Yes	Go to the next step.
		No	Replace the common rail.
23	Is the engine compression correct? (See 01-10B-6 COMPRESSION INSPECTION [WL-C, WE-C].)	Yes	Go to the next step.
		No	Inspect the following: • Damaged valve seat • Worn valve stem and valve guide • Worn or stuck piston ring • Worn piston, piston ring or cylinder • Improper valve timing Service if necessary.

STEP	INSPECTION	RESULTS	ACTION
24	Inspect the fuel injector. (See 01-14B-16 FUEL INJECTOR INSPECTION [WL-C, WE-C].) Is fuel injector normal?	Yes	Go to the next step.
		No	Repair or replace if necessary. (See 01-14B-15 FUEL INJECTOR REMOVAL/ INSTALLATION [WL-C, WE-C].)
25	Inspect the timing belt for the following: • Chipping of gear teeth • Low tension • Breakage damage or cracks Is the timing belt normal?	Yes	Inspect the following: • Clutch slippage • CKP sensor • Boost sensor and related circuit • Brake system for dragging If normal, remove and inspect the supply pump and common rail.
		No	If the valve timing is incorrect, adjust the valve timing. If the timing belt is not normal, replace the timing belt.
26	Verify test results. • If normal, return to the diagnostic index to service any additional symptoms. (See 01-03B-6 SYMPTOM DIAGNOSTIC INDEX [WL-C, WE-C].) • If the malfunction remains, inspect the related Service Information and perform repair or diagnosis. — If the vehicle is repaired, troubleshooting completed. — If the vehicle is not repaired or additional diagnostic information is not available, reprogram the PCM if later calibration is available. Retest.		

NO.13 KNOCKING/PINGING [WL-C, WE-C]

dcf010300000w42

13	KNOCKING/PINGING
DESCRIPTION	• Excessive shrilly knocking sound from engine.
POSSIBLE CAUSE	• Poor fuel quality • Air leakage from intake-air system • Intake-air system restriction or clogging • Variable boost control (VBC) system malfunction • Intake shutter valve stuck close • Glow system malfunction • Low engine compression • Improper valve timing • Low coolant temperature • Incorrect fuel injection timing • Erratic signal from CKP sensor • Erratic signal from CMP sensor • ECT sensor or related circuit malfunction • MAF sensor/IAT sensor No.2 or related circuit malfunction • IAT sensor No.1 or related circuit malfunction • Boost sensor or related malfunction • Fuel pressure sensor or related circuit malfunction • Accelerator pedal position (APP) sensor or related circuit malfunction • Excessive fuel pressure • Fuel return line clogging or restriction • EGR system malfunction • Exhaust system and/or oxidation catalytic converter restriction • Turbocharger malfunction • Charge air cooler malfunction • Supply pump malfunction **Warning** **The following troubleshooting flow chart contains the fuel system diagnosis and repair procedures. Read the following warnings before performing the fuel system services:** • **Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.** • **Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injury or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE REPAIR PROCEDURE" and "AFTER REPAIR PROCEDURE" described in this manual.**

Diagnostic Procedure

STEP	INSPECTION	RESULTS	ACTION
1	Does the engine run cold?	Yes	Go to symptom troubleshooting "NO.18 COOLING SYSTEM CONCERNS-RUNS COLD [WL-C, WE-C]".
		No	Go to the next step.
2	Inspect the following: • Fuel quality (e.g.: including water contamination, winter/summer blend) • Fuel return line clogging and/or restriction • Intake-air system restriction or clogging • Exhaust system and/or oxidation catalytic converter restriction or clogging • Charge air cooler condition (restriction or damaged) Are all items normal?	Yes	Go to the next step.
		No	Service if necessary. Repeat Step 2.
3	Connect the current diagnostic tool to the DLC-2. Access ECT PID. Verify that the ECT PID is **above 80 °C {176 °F}**?	Yes	Go to the next step.
		No	Inspect the ECT PID.
4	Perform the self-test function using the current diagnostic tool. Turn the engine switch to the ON position (Engine off). Retrieve any DTCs. Are any DTCs displayed?	Yes	**DTC is displayed:** Go to the appropriate DTC test. (See 01-02B-11 DTC TABLE [WL-C, WE-C].) **Communication error message is displayed:** Inspect the following: • Open circuit between main relay and PCM terminal 201, 203, 205 • Open circuit main relay and PCM terminal 219 • Main relay stuck open • Open or poor ground circuit (PCM terminal 202, 204, 206) • Poor connection to vehicle body ground
		No	**No DTC is displayed:** Go to the next step.
5	Inspect the intake shutter valve operation. (See 01-03B-62 ENGINE CONTROL SYSTEM OPERATION INSPECTION [WL-C, WE-C].) Is there any malfunction?	Yes	Repair or replace if necessary.
		No	Go to the next step.
6	Inspect the guide blade valve operation. (See 01-03B-62 ENGINE CONTROL SYSTEM OPERATION INSPECTION [WL-C, WE-C].) Is there any malfunction?	Yes	Repair or replace if necessary.
		No	Go to the next step.
7	Inspect the hose bands between the following parts: • Turbocharger compressor housing and air cleaner • Turbocharger compressor housing and charge air cooler Are the hose bands loose?	Yes	Retighten hose bands. If the concern is resolved, the inspection is complete. If the concern still exists, go to the next step.
		No	Go to the next step.
8	Inspect for improper operation, kinks, clogging or disconnection on the guide blade actuator. (See 01-03B-62 ENGINE CONTROL SYSTEM OPERATION INSPECTION [WL-C, WE-C].) Is the actuator normal?	Yes	Go to the next step.
		No	Repair or replace if necessary. If the concern is resolved, the inspection is complete. If the concern still exists, the turbocharger is normal. Go to the next step.
9	Remove parts necessary to inspect the turbocharger. Do not remove the turbocharger. Inspect if the turbocharger compressor wheel is bent, damaged, or interfering with housing on vehicle. (See 01-13B-5 TURBOCHARGER INSPECTION [WL-C, WE-C].) Is there any malfunction?	Yes	Replace turbocharger.
		No	Go to the next step.
10	Inspect if turbocharger compressor wheel locknut is loose or has fallen down inside the turbocharger. Is there any malfunction?	Yes	Replace turbocharger.
		No	Go to the next step.

STEP	INSPECTION	RESULTS	ACTION
11	Inspect the turbocharger compressor wheel by hand. Does the wheel turn easily and smoothly?	Yes	Go to the next step.
		No	Replace the turbocharger.
12	Inspect if the turbocharger turbine wheel is damaged, cracked or interfering with housing on vehicle. **Note** • Inspect all fins on each turbine wheel. Is there any malfunction?	Yes	Replace the turbocharger.
		No	Go to the next step.
13	Is any engine oil found inside the turbocharger turbine housing?	Yes	**Excessive amount of oil is found:** Replace the turbocharger. **Small amount of oil is found:** Wipe oil off of vehicle, then go to the next step.
		No	Go to the next step.
14	Is any engine oil found inside the turbocharger compressor housing?	Yes	Wipe oil off of the vehicle and install all removed parts in Step 10. Then, go to the next step.
		No	Turbocharger is normal. Install all parts removed in Step10. Then, go to the next step.
15	Perform the EGR system inspection. Is the EGR system normal?	Yes	Go to the next step.
		No	Repair or replace the malfunctioning part according to EGR system operation results.
16	Inspect the glow system operation. (See 01-13B-9 GLOW PLUG RELAY INSPECTION [WL-C, WE-C].) Is the glow system operation normal?	Yes	Go to the next step.
		No	Repair or replace the malfunctioning part according to glow system operation results.
17	Inspect the CKP sensor. (See 01-40B-39 CRANKSHAFT POSITION (CKP) SENSOR INSPECTION [WL-C, WE-C].) (See 01-40B-38 CRANKSHAFT POSITION (CKP) SENSOR REMOVAL/INSTALLATION [WL-C, WE-C].) Is the CKP sensor normal?	Yes	Go to the next step.
		No	Replace the CKP sensor. Then go to the next step.
18	Visually inspect the CMP sensor and the teeth of the pulse wheel. Are the CMP sensor and the teeth of the pulse wheel normal?	Yes	Inspect the following PIDs: (See 01-40B-10 PCM INSPECTION [WL-C, WE-C].) • ECT • IAT • MAF • MAP • RPM If the PID value is not as specified, repair or replace malfunctioning parts. If the PID value is normal, go to the next step.
		No	Replace malfunctioning parts.
19	Is the engine compression correct? (See 01-10B-6 COMPRESSION INSPECTION [WL-C, WE-C].)	Yes	Go to the next step.
		No	Inspect the following: • Damaged valve seat • Worn valve stem and valve guide • Worn or stuck piston ring • Worn piston, piston ring or cylinder • Improper valve timing Service if necessary.
20	Inspect the supply pump. (See 01-14B-11 SUPPLY PUMP REMOVAL/INSTALLATION [WL-C, WE-C].) Is the supply pump normal?	Yes	Inspect the following: • Boost sensor • MAF sensor/IAT sensor No.2 • IAT sensor No.1 • Fuel pressure sensor • APP sensor
		No	Replace the supply pump. (See 01-14B-11 SUPPLY PUMP REMOVAL/INSTALLATION [WL-C, WE-C].)

STEP	INSPECTION	RESULTS	ACTION
21	Verify test results. • If normal, return to the diagnostic index to service any additional symptoms. (See 01-03B-6 SYMPTOM DIAGNOSTIC INDEX [WL-C, WE-C].) • If the malfunction remains, inspect the related Service Information and perform repair or diagnosis. — If the vehicle is repaired, troubleshooting completed. — If the vehicle is not repaired or additional diagnostic information is not available, reprogram the PCM if later calibration is available. Retest.		

NO.14 POOR FUEL ECONOMY [WL-C, WE-C]

dcf010300000w43

14	POOR FUEL ECONOMY
DESCRIPTION	• Fuel economy is unsatisfactory.
POSSIBLE CAUSE	• Incorrect idle speed • A/C system improper operation • Intake -air system clogging or restriction • Engine cooling system malfunction • Poor fuel quality • Improper coolant level • Erratic signal from CKP sensor • Erratic signal from CMP sensor • Fuel pressure sensor or related circuit malfunction • ECT sensor or related circuit malfunction • Boost sensor or related circuit malfunction • Accelerator pedal position (APP) sensor or related circuit malfunction • MAF sensor/IAT sensor No.2 or related circuit malfunction • IAT sensor No.1 or related circuit malfunction • VSS or related circuit malfunction • Turbocharger malfunction • Charge air cooler malfunction • Low engine compression • Improper valve timing • Exhaust system and/or oxidation catalytic converter clogging • Incorrect fuel injection timing • Fuel injector malfunction • Supply pump malfunction • Fuel leakage • Fuel line clogging or restriction • Fuel filter clogging or restriction • Fuel inlet-filter clogging or restriction • Brake dragging • EGR system malfunction • Vacuum leakage • Clutch slippage • Variable boost control (VBC) system malfunction • Coolant heater system malfunction **Warning** **The following troubleshooting flow chart contains the fuel system diagnosis and repair procedures. Read the following warnings before performing the fuel system services:** • **Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.** • **Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injury or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE REPAIR PROCEDURE" and "AFTER REPAIR PROCEDURE" described in this manual.**

Diagnostic Procedure

STEP	INSPECTION	RESULTS	ACTION
1	Inspect the following: • Fuel quality (e.g.: including water contamination, winter/summer blend) • Fuel line/fuel filter clogging and/or restriction • Fuel inlet-filter clogging and/or restriction • Fuel line leakage • Intake-air system restriction • Exhaust system and/or oxidation catalytic converter restriction • Charge air cooler condition (restriction or damaged) • Vacuum leakage Are all items normal?	Yes	Go to the next step.
		No	Service if necessary. Repeat Step 1.
2	Is the brake system functioning properly?	Yes	Go to the next step.
		No	Inspect for cause.
3	Perform the self-test function using the current diagnostic tool. Turn the engine switch to the ON position (Engine off). Retrieve any DTCs. Are any DTCs displayed?	Yes	**DTC is displayed:** Go to the appropriate DTC test. (See 01-02B-11 DTC TABLE [WL-C, WE-C].) **Communication error message is displayed:** Inspect the following: • Open circuit between main relay and PCM terminal 201, 203, 205 • Open circuit main relay and PCM terminal 219 • Main relay stuck open • Open or poor ground circuit (PCM terminal 202, 204, 206) • Poor connection to vehicle body ground
		No	**No DTC Is displayed:** Go to the next step.
4	**Note** • The following test should be performed on the vehicles with an A/C system. If the following test cannot be performed due to engine stalling, go to the next step. • Go to the next step for vehicles without n A/C system Connect the pressure gauge to the A/C line. Turn the blower and A/C switches on. Is the pressure within the specifications?	Yes	Go to the next step.
		No	**A/C is always on:** Go to the symptom troubleshooting "NO.24 A/C ALWAYS ON OR A/C COMPRESSOR RUNS CONTINUOUSLY [WL-C, WE-C]". **Other symptoms:** Inspect the following: • Refrigerant charging amount • Cooling fan operation
5	Access the ECT PID. Drive the vehicle while monitoring the PID. Is the PID within the specification?	Yes	Go to the next step.
		No	Inspect for coolant leakage, cooling fan operation or thermostat operation.
6	Inspect the idle speed. (See 01-10B-21 ENGINE TUNE-UP [WL-C, WE-C].) Is the idle speed normal?	Yes	Go to the next step.
		No	Go to symptom troubleshooting "NO.7 SLOW RETURN TO IDLE [WL-C, WE-C]".
7	Perform the EGR system inspection. Is the EGR system normal?	Yes	Go to the next step..
		No	Repair or replace the malfunctioning part according to the EGR system operation results.
8	Inspect the APP sensor. (See 01-40B-28 ACCELERATOR PEDAL POSITION (APP) SENSOR INSPECTION [WL-C, WE-C].) Is the APP sensor normal?	Yes	Go to the next step.
		No	Replace the accelerator pedal component.
9	Is the engine compression correct? (See 01-10B-6 COMPRESSION INSPECTION [WL-C, WE-C].)	Yes	Go to the next step.
		No	Inspect the following: • Damaged valve seat • Worn valve stem and valve guide • Worn or stuck piston ring • Worn piston, piston ring or cylinder • Improper valve timing Service if necessary.

STEP	INSPECTION	RESULTS	ACTION
10	Inspect the fuel injector. (See 01-14B-16 FUEL INJECTOR INSPECTION [WL-C, WE-C].) Is the fuel injector normal?	Yes	Go to the next step.
		No	Repair or replace if necessary. (See 01-14B-15 FUEL INJECTOR REMOVAL/INSTALLATION [WL-C, WE-C].)
11	Perform the turbocharger inspection. (See 01-13B-5 TURBOCHARGER INSPECTION [WL-C, WE-C].) Is the turbocharger normal?	Yes	Go to the next step.
		No	Replace the turbocharger.
12	Inspect the guide blade valve operation. (See 01-03B-62 ENGINE CONTROL SYSTEM OPERATION INSPECTION [WL-C, WE-C].) Is the there any malfunction?	Yes	Repair or replace if necessary.
		No	Go to the next step.
13	Inspect the CKP sensor. (See 01-40B-39 CRANKSHAFT POSITION (CKP) SENSOR INSPECTION [WL-C, WE-C].) (See 01-40B-38 CRANKSHAFT POSITION (CKP) SENSOR REMOVAL/INSTALLATION [WL-C, WE-C].) Is the CKP sensor normal?	Yes	Go to the next step.
		No	Replace the CKP sensor. Then go to the next step.
14	Visually inspect the CMP sensor and the teeth of the pulse wheel. Are the CMP sensor and the teeth of the pulse wheel normal?	Yes	Inspect the following PIDs: (See 01-40B-10 PCM INSPECTION [WL-C, WE-C].) • ECT • IAT • MAF • MAP • RPM • VSS If the PID value is not as specified, repair or replace malfunctioning parts. If the PID value is normal, go to the next step.
		No	Replace malfunctioning parts.
15	Inspect the timing belt for the following: • Chipping of gear teeth • Low tension • Breakage damage or cracks Is the timing belt normal?	Yes	Inspect the following: • Clutch slippage • CKP sensor • Boost sensor and related circuit • Brake system for dragging • Coolant heater system • Glow system If normal, remove and inspect supply pump.
		No	If the timing is incorrect, adjust the valve timing. If the timing belt is not normal, replace the timing belt.
16	Verify test results. • If normal, return to the diagnostic index to service any additional symptoms. (See 01-03B-6 SYMPTOM DIAGNOSTIC INDEX [WL-C, WE-C].) • If the malfunction remains, inspect the related Service Information and perform repair or diagnosis. — If the vehicle is repaired, troubleshooting completed. — If the vehicle is not repaired or additional diagnostic information is not available, reprogram the PCM if later calibration is available. Retest.		

NO.15 EMISSION COMPLIANCE [WL-C, WE-C]

dcf010300000w44

15	EMISSION COMPLIANCE
DESCRIPTION	• Fails emissions test.
POSSIBLE CAUSE	• Poor fuel quality • Vacuum leakage • Air leakage from intake-air system • Intake-air system restriction or clogging • Variable boost control (VBC) system malfunction • Intake shutter valve stuck close • Turbocharger malfunction • Guide blade valve malfunction • Charge air cooler malfunction • Glow system malfunction • EGR system malfunction • EGR cooler malfunction • Low coolant temperature • Engine overheating • Inadequate fuel pressure • Fuel pressure limiter malfunction (built-in common rail) • ECT sensor or related circuit malfunction • MAF sensor/IAT sensor No.2 related circuit malfunction • IAT sensor No.1 or related circuit malfunction • Fuel pressure sensor or related circuit malfunction • APP sensor or related circuit malfunction • Fuel line clogging or restriction • Supply pump malfunction • Fuel injector malfunction • Incorrect fuel injection timing • Incorrect idle speed • Erratic signal from CKP sensor • Erratic signal from CMP sensor • Boost sensor or related circuit malfunction • Neutral switch or related circuit malfunction • VSS or related circuit malfunction • Low engine compression • Improper valve timing • Base engine malfunction • Exhaust system and/or oxidation catalytic converter restriction • Oxidation catalytic converter malfunction **Warning** **The following troubleshooting flow chart contains the fuel system diagnosis and repair procedures. Read the following warnings before performing the fuel system services:** • **Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.** • **Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injury or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE REPAIR PROCEDURE" and "AFTER REPAIR PROCEDURE" described in this manual.**

Diagnostic Procedure

STEP	INSPECTION	RESULTS	ACTION
1	Is the engine overheating?	Yes	Go to the symptom troubleshooting "NO.17 COOLING SYSTEM CONCERNS-OVERHEATING [WL-C, WE-C]".
		No	Go to the next step.
2	Does the engine run cold?	Yes	Go to the symptom troubleshooting "NO.18 COOLING SYSTEM CONCERNS-RUNS COLD [WL-C, WE-C]".
		No	Go to the next step.
3	Connect the current diagnostic tool to the DLC-2. Perform the self-test function using the current diagnostic tool. Turn the engine switch to the ON position (Engine off). Retrieve any DTCs. Are any DTCs displayed?	Yes	**DTC is displayed:** Go to the appropriate DTC test. (See 01-02B-11 DTC TABLE [WL-C, WE-C].) **Communication error message is displayed:** Inspect the following: • Open circuit between main relay and PCM terminal 201, 203, 205 • Open circuit main relay and PCM terminal 219 • Main relay stuck open • Open or poor ground circuit (PCM terminal 202, 204, 206) • Poor connection to vehicle body ground
		No	**No DTC is displayed:** Go to the next step.
4	Inspect the following: • Fuel quality (e.g.: including water contamination, winter/summer blend) • Fuel return line clogging and/or restriction • Charge air cooler condition (restriction or damaged) • Intake-air system restriction • Exhaust system and/or oxidation catalytic converter restriction • Vacuum leakage Are all items normal?	Yes	Go to the next step.
		No	Service if necessary. Repeat Step 4.
5	Inspect the APP sensor. (See 01-40B-28 ACCELERATOR PEDAL POSITION (APP) SENSOR INSPECTION [WL-C, WE-C].) Is the APP sensor normal?	Yes	Go to the next step.
		No	Replace the accelerator pedal component.
6	Inspect the adjustment of neutral switch. (See 01-40B-43 NEUTRAL SWITCH INSPECTION [WL-C, WE-C].) Is the neutral switch adjusted correctly?	Yes	Go to the next step.
		No	Adjust the neutral switch correctly.
7	Inspect the intake shutter valve operation. (See 01-03B-62 ENGINE CONTROL SYSTEM OPERATION INSPECTION [WL-C, WE-C].) Is there any malfunction?	Yes	Repair or replace if necessary.
		No	Go to the next step.
8	Inspect the guide blade valve operation. (See 01-03B-62 ENGINE CONTROL SYSTEM OPERATION INSPECTION [WL-C, WE-C].) Is there any malfunction?	Yes	Repair or replace if necessary.
		No	Go to the next step.
9	Inspect the hose bands between the following parts: • Turbocharger compressor housing and air cleaner • Turbocharger compressor housing and charge air cooler Are the hose bands loose?	Yes	Retighten the hose bands. If the concern is resolved, the inspection is complete. If the concern still exists, go to the next step.
		No	Go to the next step.
10	Inspect for improper operation, kinks, clogging or disconnection on guide blade actuator. (See 01-03B-62 ENGINE CONTROL SYSTEM OPERATION INSPECTION [WL-C, WE-C].) Is the actuator normal?	Yes	Go to the next step.
		No	Repair or replace if necessary. If the concern is resolved, the inspection is complete. If the concern still exists, turbocharger is normal. Go to the next step.

STEP	INSPECTION	RESULTS	ACTION
11	Remove parts necessary to inspect the turbocharger. Do not remove the turbocharger. Inspect if the turbocharger compressor wheel is bent, damaged, or interfering with housing on vehicle. (See 01-13B-5 TURBOCHARGER INSPECTION [WL-C, WE-C].) Is there any malfunction?	Yes	Replace turbocharger.
		No	Go to the next step.
12	Inspect if the turbocharger compressor wheel locknut is loose or has fallen down inside the turbocharger. Is there any malfunction?	Yes	Replace the turbocharger.
		No	Go to the next step.
13	Inspect the turbocharger compressor wheel by hand. Does the wheel turn easily and smoothly?	Yes	Go to the next step.
		No	Replace the turbocharger.
14	Inspect if the turbocharger turbine wheel is damaged, cracked or interfering with the housing on vehicle. **Note** • Inspect all fins on each turbine wheel. Is there any malfunction?	Yes	Replace turbocharger.
		No	Go to the next step.
15	Is any engine oil found inside the turbocharger turbine housing?	Yes	**Excessive amount of oil is found:** Replace the turbocharger. **Small amount of oil is found:** Wipe oil off of the vehicle, then go to the next step.
		No	Go to the next step.
16	Is any engine oil found inside the turbocharger compressor hosing?	Yes	Wipe oil off of the vehicle and install all removed parts in Step 10. Then, go to the next step.
		No	Turbocharger is normal. Install all parts removed in Step10. Then, go to the next step.
17	Perform the EGR system inspection. Is the EGR system normal?	Yes	Go to the next step.
		No	Repair or replace the malfunctioning part according to EGR system operation results.
18	Inspect the EGR cooler for the following: • Coolant passage clogging/restriction • Exhaust gas clogging/restriction Is the EGR cooler normal?	Yes	Go to the next step.
		No	Service if necessary.
19	Inspect the glow system operation. (See 01-13B-9 GLOW PLUG RELAY INSPECTION [WL-C, WE-C].) Is the glow system operation normal?	Yes	Go to the next step.
		No	Repair or replace the malfunctioning part according to glow system operation results.
20	Inspect the CKP sensor. (See 01-40B-39 CRANKSHAFT POSITION (CKP) SENSOR INSPECTION [WL-C, WE-C].) (See 01-40B-38 CRANKSHAFT POSITION (CKP) SENSOR REMOVAL/INSTALLATION [WL-C, WE-C].) Is the CKP sensor normal?	Yes	Go to the next step.
		No	Replace the CKP sensor. Then go to the next step.
21	Visually inspect the CMP sensor and the teeth of the pulse wheel. Are the CMP sensor and the teeth of the pulse wheel normal?	Yes	Inspect the following PIDs: (See 01-40B-10 PCM INSPECTION [WL-C, WE-C].) • ECT • IAT • MAF • MAP • RPM • VSS If the PID value is not as specified, repair or replace malfunctioning parts. If the PID value is normal, go to the next step.
		No	Replace malfunctioning parts.

STEP	INSPECTION	RESULTS	ACTION
22	Inspect the fuel pressure sensor. (See 01-40B-33 FUEL PRESSURE SENSOR INSPECTION [WL-C, WE-C].) Is the fuel pressure normal?	Yes	Go to the next step.
		No	Replace the common rail.
23	Is the engine compression correct? (See 01-10B-6 COMPRESSION INSPECTION [WL-C, WE-C].)	Yes	Go to the next step.
		No	Inspect the following: • Damaged valve seat • Worn valve stem and valve guide • Worn or stuck piston ring • Worn piston, piston ring or cylinder • Improper valve timing Service if necessary.
24	Inspect the fuel injector. (See 01-14B-16 FUEL INJECTOR INSPECTION [WL-C, WE-C].) Is the fuel injector normal?	Yes	Go to the next step.
		No	Repair or replace if necessary. (See 01-14B-15 FUEL INJECTOR REMOVAL/ INSTALLATION [WL-C, WE-C].)
25	Inspect the timing belt for the following: • Chipping of gear teeth • Low tension • Breakage damage or cracks Is the timing belt normal?	Yes	Inspect the following: • ECT sensor • Boost sensor • MAF sensor/IAT sensor No.2 • Oxidation catalytic converter If normal, remove and inspect the supply pump and common rail.
		No	If the timing is incorrect, adjust the valve the timing. If the timing belt is not normal, replace the timing belt.
26	Verify test results. • If normal, return to the diagnostic index to service any additional symptoms. (See 01-03B-6 SYMPTOM DIAGNOSTIC INDEX [WL-C, WE-C].) • If the malfunction remains, inspect the related Service Information and perform repair or diagnosis. — If the vehicle is repaired, troubleshooting completed. — If the vehicle is not repaired or additional diagnostic information is not available, reprogram the PCM if later calibration is available. Retest.		

NO.16 HIGH OIL CONSUMPTION/LEAKAGE [WL-C, WE-C]

dcf010300000w45

16	HIGH OIL CONSUMPTION/LEAKAGE
DESCRIPTION	• Oil consumption is excessive.
POSSIBLE CAUSE	• Improper engine oil level • Improper dipstick • Improper engine oil viscosity • Engine internal parts malfunction • Oil leakage • Turbocharger malfunction

Diagnostic Procedure

STEP	INSPECTION	RESULTS	ACTION
1	Verify the following: • Proper dipstick • Proper engine viscosity • Engine oil level Are all items normal?	Yes	Go to the next step.
		No	Service if necessary. Repeat Step 1.
2	Remove if necessary to inspect the turbocharger. **Note** • Do not remove the turbocharger. Inspect if the turbocharger compressor wheel is bent, damaged, or interfering with housing on vehicle. Is there any malfunction?	Yes	Replace the turbocharger.
		No	Go to the next step.
3	Inspect if the turbocharger compressor wheel locknut is loose or has fallen down inside turbocharger. Is there any malfunction?	Yes	Replace the turbocharger.
		No	Go to the next step.

STEP	INSPECTION	RESULTS	ACTION
4	Turn the turbocharger compressor wheel by hand. Does the wheel turn easily and smoothly?	Yes	Go to the next step.
		No	Replace the turbocharger.
5	Inspect if the turbocharger turbine wheel is damaged, cracked or interfering with the housing on the vehicle. **Note** • Inspect all fins on each turbine wheel. Is there any malfunction?	Yes	Replace the turbocharger.
		No	Go to the next step.
6	Is any engine oil found inside the turbocharger turbine housing?	Yes	**Excessive amount of oil is found:** Replace the turbocharger. **Small amount of oil is found:** Wipe oil off of the vehicle, then go to the next step.
		No	Go to the next step.
7	Is any engine oil found inside the turbocharger compressor housing?	Yes	Wipe oil off of vehicle, then go to the next step.
		No	Go to the next step.
8	Is any engine oil found around oil pipes attached on turbocharger center housing?	Yes	If oil leaks from a damaged pipe, replace the oil pipe. Then, go to the next step.
		No	Go to the next step.
9	Is any engine oil found inside air intake pipes or hoses?	Yes	Wipe engine oil off.
		No	Turbocharger is normal. Install all parts removed in Step 2. Then go to the next step.
10	Is the engine compression correct? (See 01-10B-6 COMPRESSION INSPECTION [WL-C, WE-C].)	Yes	Inspect for oil leakage from outside of engine.
		No	Inspect the following: • Damaged valve seat • Worn valve stem and valve guide • Worn or stuck piston ring • Worn piston, piston ring or cylinder Service if necessary.
11	Verify test results. • If normal, return to the diagnostic index to service any additional symptoms. (See 01-03B-6 SYMPTOM DIAGNOSTIC INDEX [WL-C, WE-C].) • If the malfunction remains, inspect the related Service Information and perform repair or diagnosis. — If the vehicle is repaired, troubleshooting completed. — If the vehicle is not repaired or additional diagnostic information is not available, reprogram the PCM if later calibration is available. Retest.		

NO.17 COOLING SYSTEM CONCERNS-OVERHEATING [WL-C, WE-C]

dcf010300000w46

17	COOLING SYSTEM CONCERNS-OVERHEATING
DESCRIPTION	• Engine runs at higher than normal temperature/overheats.
POSSIBLE CAUSE	• Cooling fan malfunction • Low drive belt tension • Drive belt damage • Improper coolant level • Thermostat malfunction • Radiator clogging • Improper water/anti-freeze mixture • Improper or damaged radiator cap • Radiator hose damage • Coolant leakage (engine internal, turbocharger, external) • A/C system malfunction • EGR system malfunction • Coolant heater system malfunction

Diagnostic Procedure

STEP	INSPECTION	RESULTS	ACTION
1	Inspect the following: • Engine coolant level • Coolant leakage (around heater unit in passenger compartment, coolant hoses and/or radiator, and around coolant heater unit.) • Water and anti-freeze mixture • Radiator condition • Collapsed or restricted radiator hoses • Radiator pressure cap • Drive belt tension • Drive belt • Fan rotational direction Are all items normal?	Yes	Go to the next step.
		No	Service if necessary. Repeat Step 1.
2	Perform the self-test function using the current diagnostic tool. Turn the engine switch to the ON position (Engine off). Retrieve any DTCs. Are any DTCs displayed?	Yes	**DTC is displayed:** Go to the appropriate DTC test. (See 01-02B-11 DTC TABLE [WL-C, WE-C].) **Communication error message is displayed:** Inspect the following: • Open circuit between main relay and PCM terminal 201, 203, 205 • Open circuit main relay and PCM terminal 219 • Main relay stuck open • Open or poor ground circuit (PCM terminal 202, 204, 206) • Poor connection to vehicle body ground
		No	**No DTC is displayed:** Go to the next step.
3	**Note** • The following test should be performed on the vehicles with an A/C system. Go to the next step for vehicles without an A/C system Start the engine and run it at idle speed. Turn the A/C switch off. Does the A/C compressor disengage?	Yes	Go to the next step.
		No	Go to the symptom troubleshooting "NO.24 A/C ALWAYS ON OR A/C COMPRESSOR RUNS CONTINUOUSLY [WL-C, WE-C]".
4	Is the drive belt normal?	Yes	Go to the next step.
		No	Replace the drive belt.
5	Is there any leakage around heater unit in passenger compartment?	Yes	Inspect and service heater for leakage.
		No	Go to the next step.
6	Is there any leakage at coolant hoses and/or radiator?	Yes	Replace malfunction parts.
		No	Go to the next step.
7	Perform the EGR system inspection. Is the EGR system normal?	Yes	Go to the next step.
		No	Repair or replace the malfunctioning part according to the EGR system operation results.
8	Perform the coolant heater system inspection. (See 01-12B-8 THERMOSTAT INSPECTION [WL-C, WE-C].) Is the coolant heater system normal?	Yes	Go to the next step.
		No	Repair or replace the malfunctioning part according to the coolant heater system operation results.
9	Cool down engine. Remove the thermostat and inspect the operation. Is the thermostat normal?	Yes	Thermostat is normal. Inspect the cylinder block for leakage or blockage.
		No	Replace thermostat.
10	Verify test results. • If normal, return to the diagnostic index to service any additional symptoms. (See 01-03B-6 SYMPTOM DIAGNOSTIC INDEX [WL-C, WE-C].) • If the malfunction remains, inspect the related Service Information and perform repair or diagnosis. — If the vehicle is repaired, troubleshooting completed. — If the vehicle is not repaired or additional diagnostic information is not available, reprogram the PCM if later calibration is available. Retest.		

NO.18 COOLING SYSTEM CONCERNS-RUNS COLD [WL-C, WE-C]

dcf010300000w47

18	COOLING SYSTEM CONCERNS-RUNS COLD
DESCRIPTION	• Engine takes excessive period of time to reach normal operating temperature.
POSSIBLE CAUSE	• Thermostat malfunction • Cooling fan system malfunction • Coolant heater system malfunction

Diagnostic Procedure

STEP	INSPECTION	RESULTS	ACTION
1	Is the customer complaint "Lack of passenger compartment heat"?	Yes	Inspect the A/C heater system.
		No	Go to the next step.
2	Does the engine speed continue at fast idle?	Yes	Go to the symptom troubleshooting "NO.7 SLOW RETURN TO IDLE [WL-C, WE-C]".
		No	Go to the next step.
3	Remove the thermostat and inspect the operation. (See 01-12B-7 THERMOSTAT REMOVAL/ INSTALLATION [WL-C, WE-C].) (See 01-12B-8 THERMOSTAT INSPECTION [WL-C, WE-C].) Is the thermostat normal?	Yes	Go to the next step.
		No	Replace the thermostat.
4	Verify test results. • If normal, return to the diagnostic index to service any additional symptoms. (See 01-03B-6 SYMPTOM DIAGNOSTIC INDEX [WL-C, WE-C].) • If the malfunction remains, inspect the related Service Information and perform repair or diagnosis. — If the vehicle is repaired, troubleshooting completed. — If the vehicle is not repaired or additional diagnostic information is not available, reprogram the PCM if later calibration is available. Retest.		

NO.19 EXCESSIVE BLACK SMOKE [WL-C, WE-C]

dcf010300000w48

19	EXCESSIVE BLACK SMOKE
DESCRIPTION	• Excessive black smoke is observed in exhaust gas.
POSSIBLE CAUSE	• Intake-air system clogging or restriction • Air leakage from Intake-air system • Incorrect fuel injection timing • Erratic signal from CKP sensor • Fuel pressure sensor or related circuit malfunction • Boost sensor or related circuit malfunction • IAT sensor No.1 or related circuit malfunction • Fuel injector malfunction • Excessive fuel pressure • Fuel line clogging or restriction • Fuel pressure limiter malfunction (built-in common rail) • Low engine compression • Improper valve timing • Base engine malfunction • EGR system malfunction • Variable boost control (VBC) system malfunction • Vacuum leakage • Turbocharger malfunction • Charge air cooler malfunction • Intake shutter valve malfunction • Exhaust system and/or oxidation catalytic converter restriction or clogging • Mass airflow sensor malfunction **Warning** **The following troubleshooting flow chart contains the fuel system diagnosis and repair procedures. Read the following warnings before performing the fuel system services:** • **Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.** • **Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injury or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE REPAIR PROCEDURE" and "AFTER REPAIR PROCEDURE" described in this manual.**

Diagnostic Procedure

STEP	INSPECTION	RESULTS	ACTION
1	Inspect the following: • Intake-air system clogging or restriction • Exhaust system and/or oxidation catalytic converter restriction or clogging • Charge air cooler condition (restriction or damaged) Are all items normal?	Yes	Go to the next step.
		No	Service if necessary. Repeat Step 1.
2	Perform the self-test function using the current diagnostic tool. Turn the engine switch to the ON position (Engine off). Retrieve any DTCs. Are any DTCs displayed?	Yes	**DTC is displayed:** Go to the appropriate DTC test. (See 01-02B-11 DTC TABLE [WL-C, WE-C].) **Communication error message is displayed:** Inspect the following: • Open circuit between main relay and PCM terminal 201, 203, 205 • Open circuit main relay and PCM terminal 219 • Main relay stuck open • Open or poor ground circuit (PCM terminal 202, 204, 206) • Poor connection to vehicle body ground
		No	**No DTC is displayed:** Go to the next step.
3	Does any other symptom exist?	Yes	Go to appropriate flowchart.
		No	Go to the next step.
4	Inspect the air cleaner element for clogging. Is the air cleaner element normal?	Yes	Go to the next step.
		No	Repair or replace the air cleaner element.
5	Inspect intake shutter valve operation. (See 01-03B-62 ENGINE CONTROL SYSTEM OPERATION INSPECTION [WL-C, WE-C].) Is there any malfunction?	Yes	Repair or replace if necessary.
		No	Go to the next step.
6	Inspect the guide blade valve operation. (See 01-03B-62 ENGINE CONTROL SYSTEM OPERATION INSPECTION [WL-C, WE-C].) Is there any malfunction?	Yes	Repair or replace if necessary.
		No	Go to the next step.
7	Inspect the CKP sensor. (See 01-40B-39 CRANKSHAFT POSITION (CKP) SENSOR INSPECTION [WL-C, WE-C].) (See 01-40B-38 CRANKSHAFT POSITION (CKP) SENSOR REMOVAL/INSTALLATION [WL-C, WE-C].) Is the CKP sensor normal?	Yes	Go to the next step.
		No	Replace the CKP sensor. Then go to the next step.
8	Visually inspect the CMP sensor and the teeth of the pulse wheel. Are the CMP sensor and the teeth of the pulse wheel normal?	Yes	Inspect the following PIDs: (See 01-40B-10 PCM INSPECTION [WL-C, WE-C].) • IAT • MAP • RPM • MAF If the PID value is not as specified, repair or replace malfunctioning parts. If the PID value is normal, go to the next step.
		No	Replace malfunctioning parts.
9	Perform the EGR system inspection. Is the EGR system normal?	Yes	Go to the next step.
		No	Repair or replace the malfunctioning part according to EGR system operation results.
10	Inspect the hose bands between following parts: • Turbocharger compressor housing and air cleaner • Turbocharger compressor housing and charge air cooler Are the hose bands loose?	Yes	Retighten the hose bands. If the concern is resolved, the inspection is complete. If the concern still exists, go to the next step.
		No	Go to the next step.
11	Inspect for improper operation, kinks, clogging or disconnection on guide blade actuator. (See 01-03B-62 ENGINE CONTROL SYSTEM OPERATION INSPECTION [WL-C, WE-C].) Is the actuator normal?	Yes	Go to the next step.
		No	Repair or replace if necessary. If the concern is resolved, the inspection is complete. If the concern still exists, turbocharger is normal. Go to the next step.

STEP	INSPECTION	RESULTS	ACTION
12	Remove parts necessary to inspect the turbocharger. Do not remove the turbocharger. Inspect if the turbocharger compressor wheel is bent, damaged, or interfering with housing on vehicle. Is there any malfunction?	Yes	Replace turbocharger.
		No	Go to the next step.
13	Inspect if the turbocharger compressor wheel locknut is loose or has fallen down inside the turbocharger. Is there any malfunction?	Yes	Replace the turbocharger.
		No	Go to the next step.
14	Inspect the turbocharger compressor wheel by hand. Does wheel turn easily and smoothly?	Yes	Go to the next step.
		No	Replace the turbocharger.
15	Inspect if the turbocharger turbine wheel is damaged, cracked or interfering with the housing on vehicle. **Note** • Inspect all fins on each turbine wheel. Is there any malfunction?	Yes	Replace the turbocharger.
		No	Go to the next step.
16	Is any engine oil found inside the turbocharger compressor housing?	Yes	Wipe oil off of the vehicle and install all removed parts in Step 15. Then, go to the next step.
		No	Turbocharger is normal. Install all parts removed is Step 15. Then, go to the next step.
17	Is the engine compression correct? (See 01-10B-6 COMPRESSION INSPECTION [WL-C, WE-C].)	Yes	Go to the next step.
		No	Inspect the following: • Damaged valve seat • Worn valve stem and valve guide • Worn or stuck piston ring • Worn piston, piston ring or cylinder • Improper valve timing Service if necessary.
18	Inspect the fuel injector. (See 01-14B-16 FUEL INJECTOR INSPECTION [WL-C, WE-C].) Is the fuel injector normal?	Yes	Inspect the following: • Boost sensor • Fuel pressure limiter (built-in common rail) • Fuel pressure sensor • Fuel return line restriction or clogging Service if necessary.
		No	Repair or replace if necessary. (See 01-14B-15 FUEL INJECTOR REMOVAL/ INSTALLATION [WL-C, WE-C].)
19	Verify test results. • If normal, return to the diagnostic index to service any additional symptoms. (See 01-03B-6 SYMPTOM DIAGNOSTIC INDEX [WL-C, WE-C].) • If the malfunction remains, inspect the related Service Information and perform repair or diagnosis. — If the vehicle is repaired, troubleshooting completed. — If the vehicle is not repaired or additional diagnostic information is not available, reprogram the PCM if later calibration is available. Retest.		

NO.20 FUEL ODOR (IN ENGINE COMPARTMENT) [WL-C, WE-C]

dcf010300000w49

20	FUEL ODOR (IN ENGINE COMPARTMENT)
DESCRIPTION	• Fuel smell or visible leakage.
POSSIBLE CAUSE	• Excessive fuel pressure • Fuel pressure limiter malfunction (built-in common rail) • Fuel pressure sensor or related circuit malfunction • Fuel leakage **Warning** **The following troubleshooting flow chart contains the fuel system diagnosis and repair procedures. Read the following warnings before performing the fuel system services:** **• Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.** **• Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injury or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE REPAIR PROCEDURE" and "AFTER REPAIR PROCEDURE" described in this manual.**

Diagnostic Procedure

STEP	INSPECTION	RESULTS	ACTION
1	Visually inspect for fuel leakage at the fuel injector and fuel line. Is there any fuel leakage?	Yes	Service if necessary.
		No	Go to the next step.
2	Visually inspect for a damaged or cracked fuel filter. Is the fuel filter normal?	Yes	Go to the next step.
		No	Replace the fuel filter.
3	Inspect the fuel pressure sensor. (See 01-40B-33 FUEL PRESSURE SENSOR INSPECTION [WL-C, WE-C].) Is the fuel pressure normal?	Yes	Go to the next step.
		No	Repair or replace if necessary.
4	Perform the self-test function using the current diagnostic tool. Turn the engine switch to the ON position (Engine off). Retrieve any DTCs. Are any DTCs displayed?	Yes	**DTC is displayed:** Go to the appropriate DTC test. (See 01-02B-11 DTC TABLE [WL-C, WE-C].) **Communication error message is displayed:** Inspect the following: • Open circuit between main relay and PCM terminal 201, 203, 205 • Open circuit main relay and PCM terminal 219 • Main relay stuck open • Open or poor ground circuit (PCM terminal 202, 204, 206) • Poor connection to vehicle body ground
		No	**No DTC is displayed:** Remove and inspect common rail.
5	Verify test results. • If normal, return to the diagnostic index to service any additional symptoms. (See 01-03B-6 SYMPTOM DIAGNOSTIC INDEX [WL-C, WE-C].) • If the malfunction remains, inspect the related Service Information and perform repair or diagnosis. — If the vehicle is repaired, troubleshooting completed. — If the vehicle is not repaired or additional diagnostic information is not available, reprogram the PCM if later calibration is available. Retest.		

NO.21 ENGINE NOISE [WL-C, WE-C]

dcf010300000w50

21	ENGINE NOISE
DESCRIPTION	• Engine noise under hood.
POSSIBLE CAUSE	• Engine internal damage • Timing belt displacement • Fuel injector malfunction • Loose attaching bolts or worn parts • Improper drive belt tension • Air leakage from intake-air system • Incorrect injection timing • Erratic signal from CKP sensor • Erratic signal from CMP sensor • Fuel pressure sensor or related circuit malfunction • Boost sensor or related circuit malfunction • Accelerator pedal position (APP) sensor or related circuit malfunction • MAF sensor/IAT sensor No.2 or related circuit malfunction • ECT sensor or related circuit malfunction • EGR system or malfunction • IAT sensor No.1 or related circuit malfunction • Vacuum leakage • Air leakage from intake-air system • Air in power steering fluid line • Turbocharger operating noise • Solenoid valve operating noise **Warning** **The following troubleshooting flow chart contains the fuel system diagnosis and repair procedures. Read the following warnings before performing the fuel system services:** • **Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.** • **Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injury or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE REPAIR PROCEDURE" and "AFTER REPAIR PROCEDURE" described in this manual.**

Diagnostic Procedure

STEP	INSPECTION	RESULTS	ACTION
1	Is there a squeal, click or chirp sound present?	Yes	Inspect the engine oil level, solenoid valve installation or the drive belt.
		No	Go to the next step.
2	Is there a rumble or grind sound present?	Yes	Inspect the drive belt tension or the power steering system fluid level. If normal, perform power steering fluid line air bleed.
		No	Go to the next step.
3	Is there a rattle sound present?	Yes	Inspect the location of the rattle for loose parts.
		No	Go to the next step.
4	Is there a hiss sound present?	Yes	Inspect for vacuum leakage and intake-air system leakage.
		No	Go to the next step.
5	Is there a rap or roar sound present?	Yes	Inspect the exhaust system for loose parts.
		No	Go to the next step.
6	Perform the self-test function using the current diagnostic tool. Turn the engine switch to the ON position (Engine off). Retrieve any DTCs. Are any DTCs displayed?	Yes	**DTC is displayed:** Go to the appropriate DTC test. (See 01-02B-11 DTC TABLE [WL-C, WE-C].) **Communication error message is displayed:** Inspect the following: • Open circuit between main relay and PCM terminal 201, 203, 205 • Open circuit main relay and PCM terminal 219 • Main relay stuck open • Open or poor ground circuit (PCM terminal 202, 204, 206) • Poor connection to vehicle body ground
		No	**No DTC is displayed:** Go to the appropriate DTC test. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)

STEP	INSPECTION	RESULTS	ACTION
7	Access the ECT PID. Inspect the ECT PID while warming up the engine. Is the PID value correct?	Yes	Go to the next step.
		No	Inspect the ECT sensor and the related wiring harnesses.
8	Access the IAT PID. Inspect the IAT PID while running the engine. Is the PID value correct?	Yes	Go to the next step.
		No	Inspect the IAT sensor No.1 and the related wiring harnesses.
9	Inspect the CKP sensor. (See 01-40B-39 CRANKSHAFT POSITION (CKP) SENSOR INSPECTION [WL-C, WE-C].) (See 01-40B-38 CRANKSHAFT POSITION (CKP) SENSOR REMOVAL/INSTALLATION [WL-C, WE-C].) Is the CKP sensor normal?	Yes	Go to the next step.
		No	Replace the CKP sensor. Then go to the next step.
10	Visually inspect the CMP sensor and the teeth of the pulse wheel. Are the CMP sensor and the teeth of the pulse wheel normal?	Yes	Inspect the following PIDs: (See 01-40B-10 PCM INSPECTION [WL-C, WE-C].) • ECT • IAT • MAF • MAP • RPM If the PID value is not as specified, repair or replace malfunctioning parts. If the PID value is normal, go to the next step.
		No	Replace malfunctioning parts.
11	Perform the EGR system inspection. Is the EGR system normal?	Yes	Go to the next step.
		No	Repair or replace the malfunctioning part according to EGR system operation results.
12	Remove parts necessary to inspect the turbocharger. **Note** • Do not remove the turbocharger. Inspect if the turbocharger compressor wheel is bent, damaged, or interfering with housing on vehicle. Is there any malfunction?	Yes	Replace the turbocharger.
		No	Go to the next step.
13	Inspect if the turbocharger compressor wheel locknut is loose or has fallen down inside the turbocharger. Is there any malfunction?	Yes	Replace turbocharger.
		No	Go to the next step.
14	Turn the turbocharger compressor wheel by hand. Does the wheel turn easily and smoothly?	Yes	Go to the next step.
		No	Replace the turbocharger.
15	Inspect if the turbocharger turbine wheel is damaged, cracked or interfering with the housing on vehicle. **Note** • Inspect all fins on each turbine wheel. Is there any malfunction?	Yes	Replace the turbocharger.
		No	Go to the next step.
16	Is any engine oil found inside the turbocharger turbine housing?	Yes	**Excessive amount of oil is found:** Replace the turbocharger. **Small amount of oil is found:** Wipe oil off of the vehicle, then go to the next step.
		No	Go to the next step.
17	Is any engine oil found inside the turbocharger compressor housing?	Yes	Wipe oil off of the vehicle, then go to the next step.
		No	Go to the next step.
18	Is any exhaust gas leakage found around the location where the turbocharger is attached to the exhaust manifold?	Yes	Remove the turbocharger. Inspect for cracks on the center housing inlet surface. If cracks are found, replace the turbocharger.
		No	Go to the next step.

STEP	INSPECTION	RESULTS	ACTION
19	Are any center housing and turbine housing attaching bolts loose?	Yes	Retighten the loose bolts. If a bolt is found to be missing, attach appropriate new bolts.
		No	Turbocharger is normal. Install all parts removed in Step 12. Go to the next step.
20	Inspect the fuel injector and fuel injector gasket. (See 01-14B-16 FUEL INJECTOR INSPECTION [WL-C, WE-C].) Is the fuel injector normal?	Yes	Inspect the following: • Metal flow • Bent connecting rod • Damaged valve seat • Incorrect valve clearance
		No	Repair or replace if necessary. (See 01-14B-15 FUEL INJECTOR REMOVAL/ INSTALLATION [WL-C, WE-C].)
21	Verify test results. • If normal, return to the diagnostic index to service any additional symptoms. (See 01-03B-6 SYMPTOM DIAGNOSTIC INDEX [WL-C, WE-C].) • If the malfunction remains, inspect the related Service Information and perform repair or diagnosis. — If the vehicle is repaired, troubleshooting completed. — If the vehicle is not repaired or additional diagnostic information is not available, reprogram the PCM if later calibration is available. Retest.		

NO.22 VIBRATION CONCERNS (ENGINE) [WL-C, WE-C]

dcf010300000w51

22	VIBRATION CONCERNS (ENGINE)
DESCRIPTION	• Vibration from the under hood or driveline.
POSSIBLE CAUSE	• Loose attaching bolts or worn parts • Cooling fan seat are improper • Engine or transaxle mounts are improperly installed • Components malfunction such as worn parts • Erratic signal from CMP sensor • ECT sensor or related circuit malfunction • Accelerator pedal position (APP) sensor or related circuit malfunction • MAF sensor/IAT sensor No.2 or related circuit malfunction • Fuel injector malfunction • Vacuum leakage • Improper tension or damaged drive belts • Improper balance of wheels or tires • Driveline malfunction • Suspension malfunction **Warning** **The following troubleshooting flow chart contains the fuel system diagnosis and repair procedures. Read the following warnings before performing the fuel system services:** • **Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.** • **Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injury or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE REPAIR PROCEDURE" and "AFTER REPAIR PROCEDURE" described in this manual.**

Diagnostic Procedure

STEP	INSPECTION	RESULTS	ACTION
1	Inspect the following components for loose attaching bolts or worn parts: • Cooling fan • Cooling fan seat • Drive belt and pulley • Engine mounts • Exhaust system Are all items normal?	Yes	Go to the next step.
		No	Readjust or retighten the engine mount installation position. Service if necessary for other parts.
2	Inspect the vacuum leakage. Are the vacuum hoses normal?	Yes	Go to the next step.
		No	Service if necessary. Repeat Step 2.

STEP	INSPECTION	RESULTS	ACTION
3	Connect the current diagnostic tool to the DLC-2. Turn the engine switch to the ON position (Engine off). Retrieve any DTCs. Are any DTCs displayed?	Yes	**DTC is displayed:** Go to the appropriate DTC test. (See 01-02B-11 DTC TABLE [WL-C, WE-C].) **Communication error message is displayed:** Inspect following: • Open circuit between main relay and PCM terminal 201, 203, 205 • Open circuit main relay and PCM terminal 219 • Main relay stuck open • Open or poor ground circuit (PCM terminal 202, 204, 206) • Poor connection to vehicle body ground
		No	**No DTC is displayed:** Go to the next step.
4	Inspect the APP sensor. (See 01-40B-28 ACCELERATOR PEDAL POSITION (APP) SENSOR INSPECTION [WL-C, WE-C].) Is the APP sensor normal?	Yes	Go to the next step.
		No	Replace the accelerator pedal component.
5	Visually inspect the CMP sensor and the teeth of the pulse wheel. Are the CMP sensor and the teeth of the pulse wheel normal?	Yes	Inspect the following PIDs: (See 01-40B-10 PCM INSPECTION [WL-C, WE-C].) • ECT • IAT • MAF • RPM If the PID value is not as specified, repair or replace malfunctioning parts. If the PID value is normal, go to the next step.
		No	Replace malfunctioning parts.
6	Inspect the fuel injector. (See 01-14B-16 FUEL INJECTOR INSPECTION [WL-C, WE-C].) Is the fuel injector normal?	Yes	Inspect the following systems: • Wheels • Transaxle and mounts • Driveline • Suspension Service if necessary.
		No	Repair or replace if necessary. (See 01-14B-15 FUEL INJECTOR REMOVAL/ INSTALLATION [WL-C, WE-C].)
7	Verify test results. • If normal, return to the diagnostic index to service any additional symptoms. (See 01-03B-6 SYMPTOM DIAGNOSTIC INDEX [WL-C, WE-C].) • If the malfunction remains, inspect the related Service Information and perform repair or diagnosis. — If the vehicle is repaired, troubleshooting completed. — If the vehicle is not repaired or additional diagnostic information is not available, reprogram the PCM if later calibration is available. Retest.		

NO.23 A/C DOES NOT WORK SUFFICIENTLY [WL-C, WE-C]

dcf010300000w52

23	A/C DOES NOT WORK SUFFICIENTLY
DESCRIPTION	• A/C compressor magnetic clutch does not engage when the A/C switch is turned on.
POSSIBLE CAUSE	• Improper refrigerant charge amount • Open A/C switch magnetic clutch • Open circuit between A/C relay and A/C magnetic clutch • Poor ground of A/C magnetic clutch • Improper A/C magnetic clutch clearance • Refrigerant pressure switch is stuck open • A/C relay is stuck open • Improper A/C cut-off control • Open circuit between A/C switch and PCM through both refrigerant pressure switch and A/C amplifier

Diagnostic Procedure

STEP	INSPECTION	RESULTS	ACTION
1	Perform the self-test function using the current diagnostic tool. Turn the engine switch to the ON position (Engine off). Retrieve any DTCs. Are any DTCs displayed?	Yes	**DTC is displayed:** Go to the appropriate DTC test. (See 01-02B-11 DTC TABLE [WL-C, WE-C].) **Communication error message is displayed:** Inspect the following: • Open circuit between main relay and PCM terminal 201, 203, 205 • Open circuit main relay and PCM terminal 219 • Main relay stuck open • Open or poor ground circuit (PCM terminal 202, 204, 206) • Poor connection to vehicle body ground
		Yes	**No DTC is displayed:** Go to the appropriate DTC test. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
2	Disconnect the A/C compressor connector. Start the engine and turn the A/C switch to the ON position. Is there correct voltage at the terminal of the A/C compressor magnetic clutch connector? **Specification** **More than 10.5 V**	Yes	Inspect for ground condition of the magnetic clutch on the A/C compressor. If ground condition is normal, inspect the magnetic clutch coil for an open circuit.
		No	Go to the next step.
3	Disconnect the refrigerant pressure switch connector. Connect jumper wire between terminals of refrigerant pressure switch connector. Start the engine and turn the A/C switch to the ON position. Is there correct voltage at the terminal of the A/C compressor magnetic clutch connector? **Specification** **More than 10.5 V**	Yes	Inspect refrigerant pressure switch operation. If switch is normal, go to the next step.
		No	Inspect the following: • A/C switch is stuck open • Open circuit between refrigerant pressure switch and A/C relay • Open circuit of blower motor fan switch and resistor (if blower motor does not operate) • Evaporator temperature sensor and A/C amplifier
4	Inspect the A/C cut-off operation. Does the A/C cut-off work properly?	Yes	Go to the next step.
		No	Repair or replace the malfunctioning part according to the A/C cut-off system inspection results.
5	Remove the jumper wire from the switch connector. Reconnect the connector to the refrigerant pressure switch. Start the engine and turn the A/C switch on. Does the A/C operate?	Yes	Inspect for a stuck open A/C relay. Replace if necessary.
		No	Inspect following and repair or replace if necessary: • Refrigerant charging amount • Seized A/C compressor
6	Verify test results. • If normal, return to the diagnostic index to service any additional symptoms. (See 01-03B-6 SYMPTOM DIAGNOSTIC INDEX [WL-C, WE-C].) • If the malfunction remains, inspect the related Service Information and perform repair or diagnosis. — If the vehicle is repaired, troubleshooting completed. — If the vehicle is not repaired or additional diagnostic information is not available, reprogram the PCM if later calibration is available. Retest.		

NO.24 A/C ALWAYS ON OR A/C COMPRESSOR RUNS CONTINUOUSLY [WL-C, WE-C]

dcf010300000w53

24	A/C ALWAYS ON OR A/C COMPRESSOR RUNS CONTINUOUSLY
DESCRIPTION	• A/C compressor magnetic clutch does not disengage.
POSSIBLE CAUSE	• A/C compressor magnetic clutch stuck engagement • A/C relay is stuck closed • Improper A/C compressor magnetic clutch clearance • Short to ground circuit between A/C switch and PCM • Short to ground circuit between A/C relay and PCM • A/C relay to magnetic clutch circuit shorts to battery power

Diagnostic Procedure

STEP	INSPECTION	RESULTS	ACTION
1	Perform the self-test function using the current diagnostic tool. Turn the engine switch to the ON position (Engine off). Retrieve any DTCs. Are any DTCs displayed?	Yes	**DTC is displayed:** Go to the appropriate DTC test. (See 01-02B-11 DTC TABLE [WL-C, WE-C].) **Communication error message is displayed:** Inspect the following: • Open circuit between main relay and PCM terminal 201, 203, 205 • Open circuit main relay and PCM terminal 219 • Main relay stuck open • Open or poor ground circuit (PCM terminal 202, 204, 206) • Poor connection to vehicle body ground
		No	**No DTC is displayed:** Go to the appropriate DTC test. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
2	Start the engine and run it at idle. Turn the A/C switch on. Remove the A/C relay. Does the A/C magnetic clutch disengage?	Yes	Inspect the following: • A/C relay is stuck closed • Short to ground circuit between A/C relay and PCM terminal 128 If both items are normal, go to the next step.
		No	Inspect if circuit between A/C relay and magnetic clutch shorts to battery power circuit. If circuit is normal, inspect magnetic clutch stuck engagement or clearance or inspect for a stuck closed A/C switch.
3	Verify test results. • If normal, return to the diagnostic index to service any additional symptoms. (See 01-03B-6 SYMPTOM DIAGNOSTIC INDEX [WL-C, WE-C].) • If the malfunction remains, inspect the related Service Information and perform repair or diagnosis. — If the vehicle is repaired, troubleshooting completed. — If the vehicle is not repaired or additional diagnostic information is not available, reprogram the PCM if later calibration is available. Retest.		

NO.25 A/C DOES NOT CUT OFF UNDER WIDE OPEN THROTTLE CONDITIONS [WL-C, WE-C]

dcf010300000w54

25	A/C DOES NOT CUT OFF UNDER WIDE OPEN THROTTLE CONDITIONS
DESCRIPTION	• A/C compressor magnetic clutch does not disengage under a wide open throttle.
POSSIBLE CAUSE	• Accelerator pedal position (APP) sensor malfunction • Loosely installed APP sensor

Diagnostic Procedure

STEP	INSPECTION	RESULTS	ACTION
1	Does the A/C compressor disengage when the A/C switch is turned off?	Yes	Go to the next step.
		No	Go to symptom troubleshooting "NO.24 A/C ALWAYS ON OR A/C COMPRESSOR RUNS CONTINUOUSLY".

STEP	INSPECTION	RESULTS	ACTION
2	Perform the self-test function using the current diagnostic tool. Turn the engine switch to the ON position (Engine off). Retrieve any DTCs. Are any DTCs displayed?	Yes	**DTC is displayed:** Go to the appropriate DTC test. (See 01-02B-11 DTC TABLE [WL-C, WE-C].) **Communication error message is displayed:** Inspect the following: • Open circuit between main relay and PCM terminal 201, 203, 205 • Open circuit main relay and PCM terminal 219 • Main relay stuck open. • Open or poor ground circuit (PCM terminal 202, 204, 206) • Poor connection to vehicle body ground
		No	**No DTC is displayed:** Inspect APP sensor. (See 01-40B-28 ACCELERATOR PEDAL POSITION (APP) SENSOR INSPECTION [WL-C, WE-C].)
3	Verify test results. • If normal, return to the diagnostic index to service any additional symptoms. (See 01-03B-6 SYMPTOM DIAGNOSTIC INDEX [WL-C, WE-C].) • If the malfunction remains, inspect the related Service Information and perform repair or diagnosis. — If the vehicle is repaired, troubleshooting completed. — If the vehicle is not repaired or additional diagnostic information is not available, reprogram the PCM if later calibration is available. Retest.		

INTERMITTENT CONCERN TROUBLESHOOTING [WL-C, WE-C]

dcf010300000w55

Vibration Method

1. If a malfunction occurs or becomes worse while driving on a rough road, or due to engine vibration, perform the steps below.

Note

- There are several reasons why the vehicle or engine vibration could cause an electrical malfunction. Some of the things to check for are:
  - — Connectors not fully seated.
  - — Wire harnesses not having full play.
  - — Wires laying across brackets or moving parts.
  - — Wires routed too close to hot parts.
- An improperly routed, improperly clamped, or loose wiring harness can cause the wiring to become pinched between parts.
- The connector joints, points of vibration, and places where wire harnesses pass through the fire wall, body panels, etc. are the major areas to be checked.

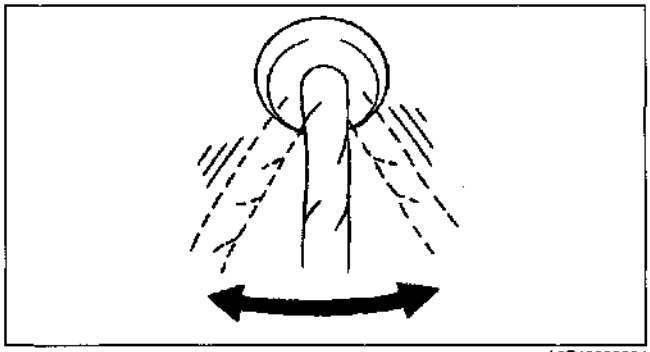
Inspection Method for Switch Connectors or Wires

1. Connect the current diagnostic tool to the DLC-2.
2. Turn the engine switch to the ON position (Engine off).

Note

- If the engine starts and runs, perform the following steps at idle.

3. Access the PIDs for the switch you are inspecting.
4. Turn the switch on manually.
5. Shake each connector or wiring harness a bit vertically and horizontally while monitoring the PID.
   - If the PID value is unstable, check for a poor connection.



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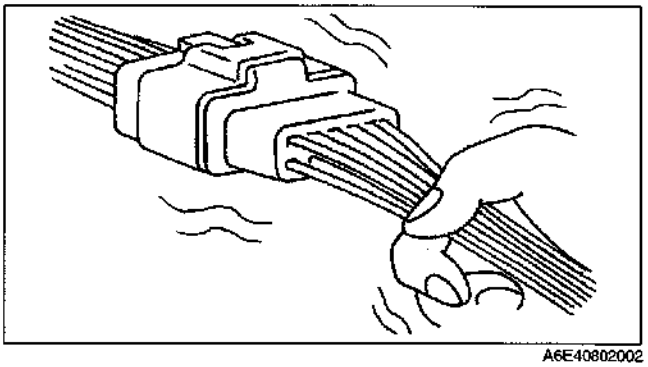
Inspection Method for Sensor Connectors or Wires

1. Connect the current diagnostic tool to the DLC-2.
2. Turn the engine switch to the ON position (Engine off).

Note
- If the engine starts and runs, perform the following steps at idle.

3. Access the PIDs for the switch you are inspecting.
4. Shake each connector or wiring harness a bit vertically and horizontally while monitoring the PID.
   - If the PID value is unstable, check for a poor connection.



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Inspection Method for Sensors

1. Connect the current diagnostic tool to the DLC-2.
2. Turn the engine switch to the ON position (Engine off).

Note
- If the engine starts and runs, perform the following steps at idle.

3. Access PIDs for the switch you are inspecting.
4. Shake the sensor slightly with your finger.
   - If the PID value is unstable or a malfunction occurs, check for a poor connection and/or poorly mounted sensor.

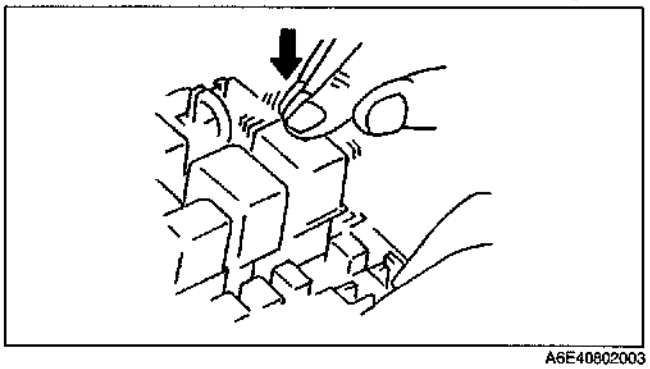
Inspection Method for Actuators or Relays

1. Connect the current diagnostic tool to the DLC-2.
2. Turn the engine switch to the ON position (Engine off).

Note
- If the engine starts and runs, perform the following steps at idle.

3. Prepare the Output State Control for the actuators or relays that you are inspecting.
4. Shake the actuator or relay with your finger for **3 seconds** after the Output State Control is activated.
   - If a variable click sound is heard, check for a poor connection and/or poorly mounted actuator or relay.

Note
- Shaking the relays too strongly may result in open relays.



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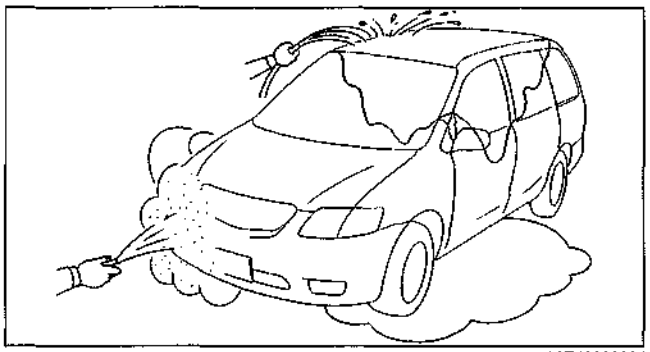
Water Sprinkling Method

Caution
- **Indirectly change the temperature and humidity by spraying water onto the front of the radiator.**
- **If a vehicle is subject to water leakage, the leakage may damage the control module. When testing a vehicle with a water leakage malfunction, special caution must be used.**

If a malfunction occurs only during high humidity or rainy/snowy weather, perform the following steps.
1. Connect the current diagnostic tool to the DLC-2 if you are inspecting sensors or switches.
2. Turn the engine switch to the ON position (Engine off).

Note
- If the engine starts and runs, perform the following steps at idle.

3. Access the PIDs for sensor or switch if you are inspecting sensors or switches.
4. If you are inspecting a switch, turn it on manually.
5. Spray water onto the vehicle or run it through a car wash.
   - If the PID value is unstable or a malfunction occurs, repair or replace the part if necessary.



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ENGINE CONTROL SYSTEM OPERATION INSPECTION [WL-C, WE-C]

dcf010300000w56

Guide Blade Actuator Operation Inspection
1. Connect current diagnostic tool to DLC-2.
2. Start the engine and run it at idle.
3. Access the VBCV PID.
4. Verify that the guide blade actuator rod moves when the VBCV PID **from 0 to 100 %** using simulation function.
   - If the rod movement cannot be verified inspect the followings;
     — Guide blade actuator (See 01-13B-6 GUIDE BLADE ACTUATOR INSPECTION [WL-C, WE-C].)
     — Vacuum hose connection between the vacuum chamber and the guide blade actuator through the VBC solenoid valve (See 01-13B-2 INTAKE-AIR SYSTEM VACUUM HOSE ROUTING DIAGRAM [WL-C, WE-C].)
     — VBC solenoid valve (See 01-13B-6 VARIABLE BOOST CONTROL (VBC) SOLENOID VALVE INSPECTION [WL-C, WE-C].)

Glow Plug Control Operation Inspection
1. Verify that the battery is charged fully.
2. If not, charge the battery.
3. Connect the current diagnostic tool to the DLC.
4. Turn the engine switch to the ON position (Engine off).
5. Access and monitor the VPWR and GPL PIDs.
6. Verify that the VPWR PID drops **0.3 V or more** while the GPL is turned on from off using the simulation function.
   - If it cannot be verified, inspect the followings;
     — Glow plug relay
     — Glow plug
     — Wiring harness for battery positive post—glow plug relay—glow plug
     — Wiring harness for PCM terminal 182—glow plug relay—ground

Intake Shutter Valve Operation Inspection

1. Connect the current diagnostic tool to the DLC-2.
2. Start the engine and run it at idle.
3. Access the IASV and IASV2 PID.
4. Verify that the Intake Shutter Valve actuator rod moves to half open when the IASV PID **from OFF to ON** and, full open when the IASV2 PID **from OFF to ON** using simulation function.
   - If the rod movement cannot be verified inspect the followings;
     — Intake Shutter Valve actuator
     — Vacuum hose connection between the vacuum chamber and the Intake Shutter Valve actuator through the ISV solenoid valve
     — ISV solenoid valve and related harness

Fuel Injector Operation Inspection

1. Connect the current diagnostic tool to the DLC-2.
2. Start the engine and warm it up to normal operating temperature.
3. Perform the KOER self-test. (See 01-02B-10 KOEO/KOER SELF TEST [WL-C, WE-C].)
4. Verify that DTCs P0200, P0201, P0202, P0203 and/or P0204 are not shown using the KOER self-test.
   - If DTC P0200, P0201, P0202, P0203 and/or P0204 are shown, perform the DTC troubleshooting procedure. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
5. Verify that the engine speed drops or stalls when each cylinder fuel injector turns to off from on using the simulation function.
   - If it cannot be verified, inspect the following for the suspected cylinder;
     — Fuel injector (See 01-14B-16 FUEL INJECTOR INSPECTION [WL-C, WE-C].)
     — Wiring harness for PCM—fuel injector

01-10B MECHANICAL [WL-C, WE-C]

MECHANICAL LOCATION INDEX [WL-C, WE-C]..... 01-10B–2
DRIVE BELT INSPECTION [WL-C, WE-C]..... 01-10B–3
DRIVE BELT ADJUSTMENT [WL-C, WE-C]..... 01-10B–4
VALVE CLEARANCE INSPECTION [WL-C, WE-C]..... 01-10B–5
VALVE CLEARANCE ADJUSTMENT [WL-C, WE-C]..... 01-10B–5
COMPRESSION INSPECTION [WL-C, WE-C]..... 01-10B–6
TIMING BELT REMOVAL/ INSTALLATION [WL-C, WE-C]..... 01-10B–7
CYLINDER HEAD GASKET REPLACEMENT [WL-C, WE-C]..... 01-10B–9
ROCKER ARM REMOVAL/ INSTALLATION [WL-C, WE-C] 01-10B–16
FRONT OIL SEAL REPLACEMENT [WL-C, WE-C]..... 01-10B–16
REAR OIL SEAL REPLACEMENT [WL-C, WE-C] 01-10B–18
ENGINE REMOVAL/ INSTALLATION [WL-C, WE-C] 01-10B–19
ENGINE DISASSEMBLY/ ASSEMBLY [WL-C, WE-C] 01-10B–21
ENGINE TUNE-UP [WL-C, WE-C]..... 01-10B–21

MECHANICAL LOCATION INDEX [WL-C, WE-C]

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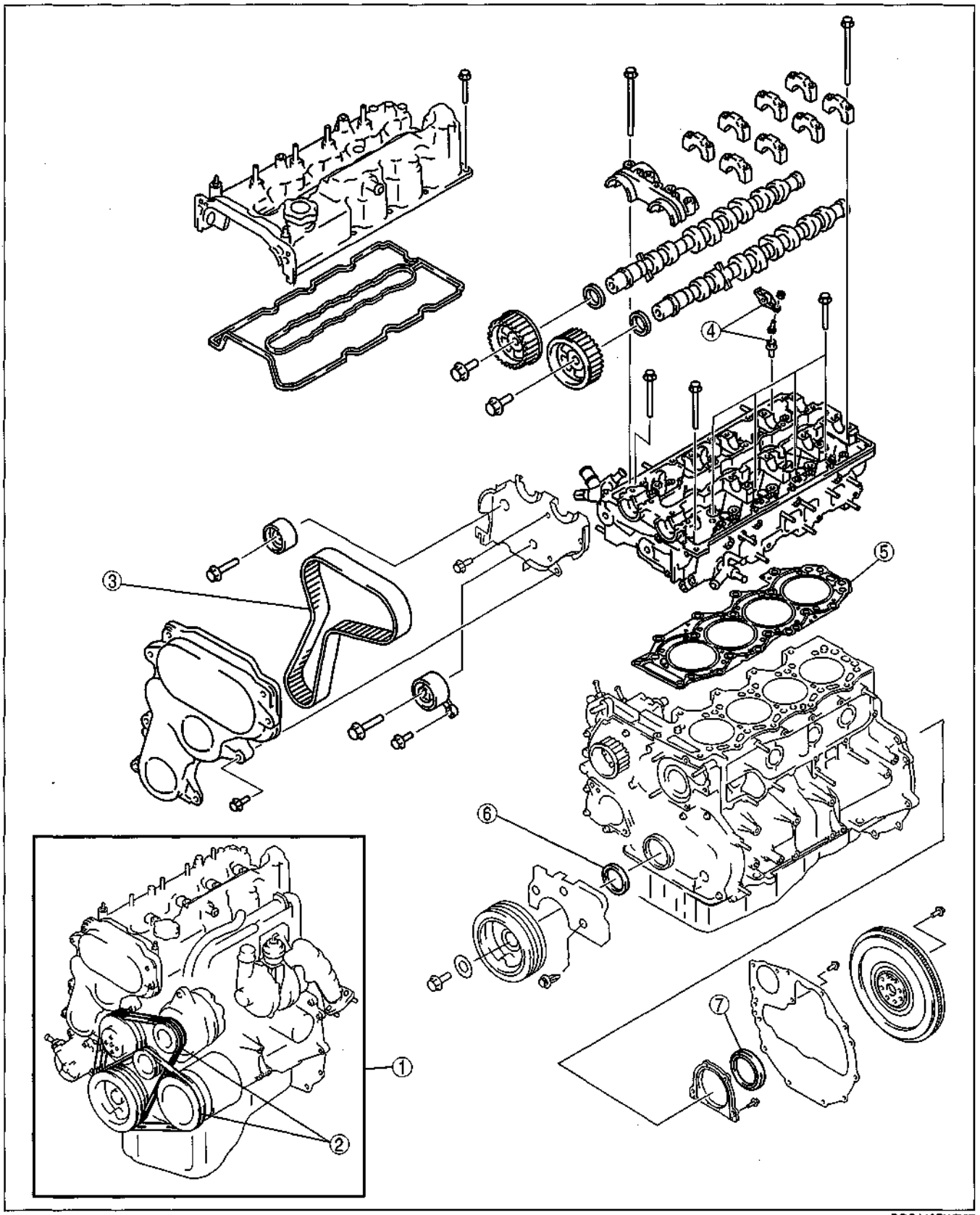

DBG110BWB87

1	Engine (See 01-10B-5 VALVE CLEARANCE INSPECTION [WL-C, WE-C].) (See 01-10B-5 VALVE CLEARANCE ADJUSTMENT [WL-C, WE-C].) (See 01-10B-6 COMPRESSION INSPECTION [WL-C, WE-C].) (See 01-10B-19 ENGINE REMOVAL/ INSTALLATION [WL-C, WE-C].) (See 01-10B-21 ENGINE DISASSEMBLY/ ASSEMBLY [WL-C, WE-C].)
2	Drive belt (See 01-10B-3 DRIVE BELT INSPECTION [WL-C, WE-C].) (See 01-10B-4 DRIVE BELT ADJUSTMENT [WL-C, WE-C].)
3	Timing belt (See 01-10B-7 TIMING BELT REMOVAL/ INSTALLATION [WL-C, WE-C].)
4	Rocker arm (See 01-10B-16 ROCKER ARM REMOVAL/ INSTALLATION [WL-C, WE-C].)
5	Cylinder head gasket (See 01-10B-9 CYLINDER HEAD GASKET REPLACEMENT [WL-C, WE-C].)
6	Front oil seal (See 01-10B-16 FRONT OIL SEAL REPLACEMENT [WL-C, WE-C].)
7	Rear oil seal (See 01-10B-18 REAR OIL SEAL REPLACEMENT [WL-C, WE-C].)

DRIVE BELT INSPECTION [WL-C, WE-C]

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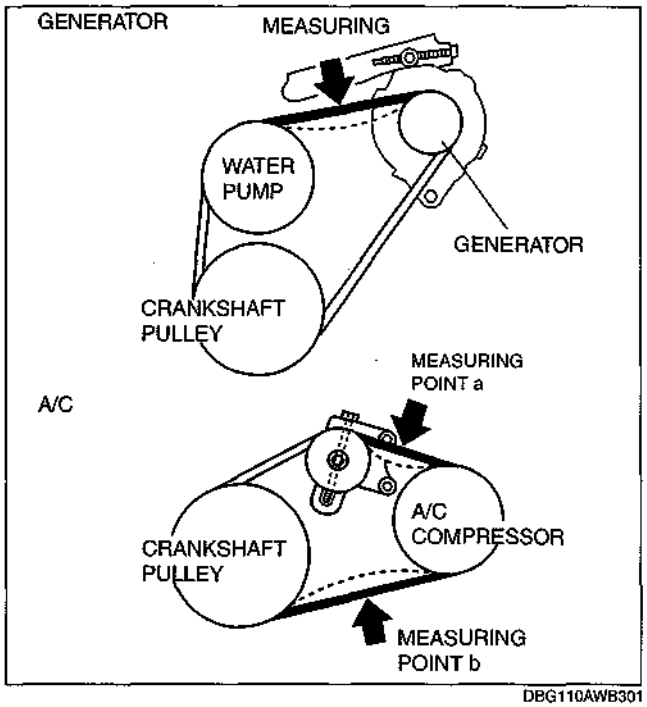
Drive Belt Deflection Check

1. Check the drive belt deflection when the engine is cold, or at least **30 minutes** after the engine has stopped. Apply pressure **98 N {10 kgf, 22 lbf}** midway between the specified pulleys.



DBG110AWB301

Drive Belt Deflection

(mm {in})

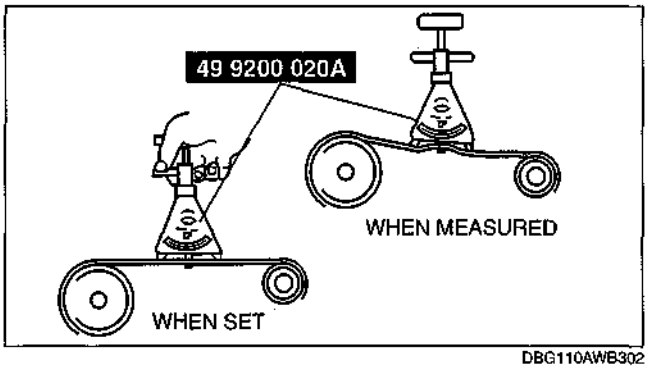
Drive Belt		New*	Used	Limit
Generator		7.4—9.4 {0.30—0.37}	8.7—10.4 {0.35—0.40}	14.3 {0.56} or more
A/C	a	6.1—6.9 {0.24—0.27}	7.1—8.0 {0.28—0.31}	11.3 {0.44} or more
	b	10.0—11.0 {0.40—0.43}	11.3—12.6 {0.45—0.49}	17.4 {0.69} or more

* : A belt that has been on a running engine for less than five minutes.

2. If the deflection is not within the specification, adjust it. (See 01-10B-4 DRIVE BELT ADJUSTMENT [WL-C, WE-C].)

Drive Belt Tension Check

1. Belt tension can be checked in place of belt deflection. Check the drive belt tension when the engine is cold, or at least **30 minutes** after the engine has stopped. Using the **SST**, check the belt tension between any two pulleys.



DBG110AWB302

Drive Belt Tension

(N {kgf, lbf})

Drive Belt	New*	Used	Limit
Generator	490—637 {50.0—64.9, 111—143}	431—539 {44.0—54.9, 96.9—121}	225 {22.9, 50.6} or less
A/C	455—572 {46.4—58.3, 103—128}	353—431 {36.0—43.9, 79.4—96.8}	156 {15.9, 35.1} or less

* : A belt that has been on a running engine for less than five minutes.

2. If the tension is not within the specification, adjust it. (See 01-10B-4 DRIVE BELT ADJUSTMENT [WL-C, WE-C].)

DRIVE BELT ADJUSTMENT [WL-C, WE-C]

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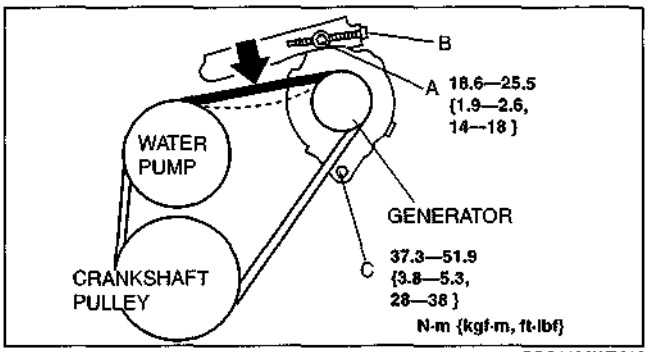
Generator

1. Loosen the mounting bolt C and locknut A.
2. Adjust the belt deflection or tension by turning adjusting bolt B. (See 01-10B-3 DRIVE BELT INSPECTION [WL-C, WE-C].)
3. Tighten the mounting bolt C and locknut A.
4. Tighten the adjust bolt B.

   Tightening torque
   7.84—9.80 N·m {80—100 kgf·cm, 69.4—86.7 in·lbf}

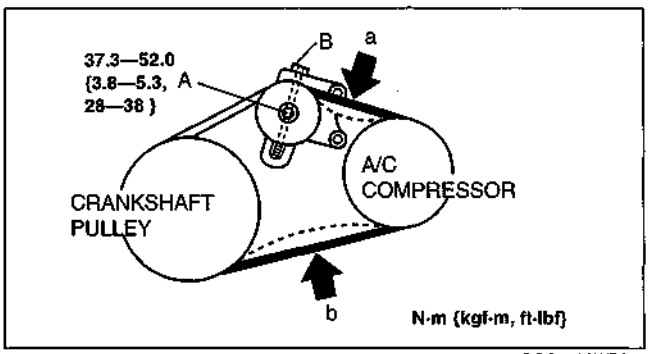
5. Inspect the belt deflection or tension. (See 01-10B-3 DRIVE BELT INSPECTION [WL-C, WE-C].)



DBG110AWB303

A/C

1. Loosen the locknut A.
2. Adjust the belt deflection or tension by turning adjusting bolt B. (See 01-10B-3 DRIVE BELT INSPECTION [WL-C, WE-C].)
3. Tighten the locknut A.
4. Inspect the belt deflection or tension. (See 01-10B-3 DRIVE BELT INSPECTION [WL-C, WE-C].)



DBG110AWB304

VALVE CLEARANCE INSPECTION [WL-C, WE-C]

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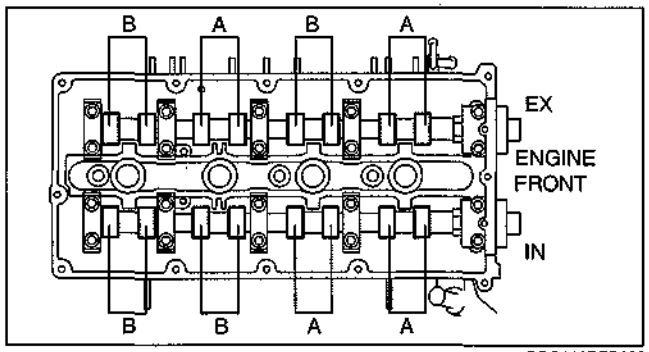
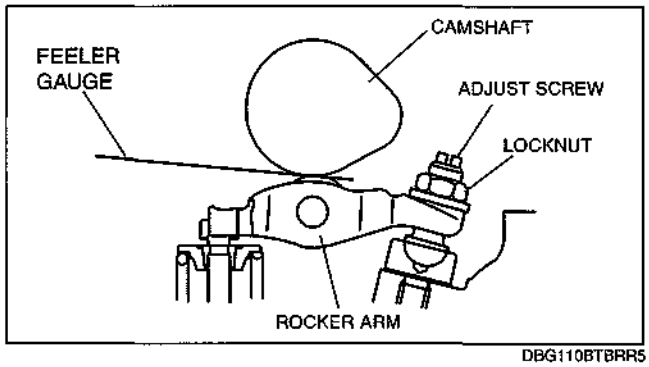
1. Remove the engine cover.
2. Remove the following parts to turn the crankshaft.
   1. Drive belt. (See 01-10B-4 DRIVE BELT ADJUSTMENT [WL-C, WE-C].)
   2. Cooling fan. (See 01-12B-8 COOLING FAN REMOVAL/INSTALLATION [WL-C, WE-C].)
   3. Water pump pulley.
3. Remove the fuel injector. (See 01-14B-15 FUEL INJECTOR REMOVAL/INSTALLATION [WL-C, WE-C].)
4. Remove the cylinder head cover.
5. Turn the crankshaft and align the timing mark so that the piston of the No. 1 or No. 4 cylinders is at TDC of compression.
6. Measure valve clearances A with the No.1 cylinder at TDC of compression, and those of B with the No.4 cylinder at TDC of compression.
   - If it is not within the specification, adjust and recheck the valve clearance. (See 01-10B-5 VALVE CLEARANCE ADJUSTMENT [WL-C, WE-C].)



DBG110BEB023

Valve clearance [Engine cold]
IN: 0.10—0.16 mm {0.0040—0.0062 in}
EX: 0.17—0.23 mm {0.0067—0.0090 in}



DBG110BTBRR5

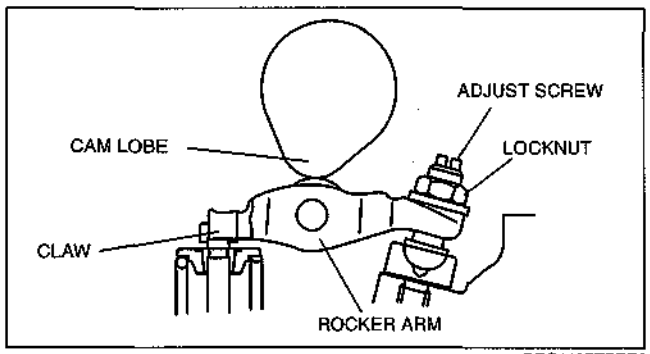
7. Turn the crankshaft one full turn and measure the remaining valve clearances. Adjust if necessary.
8. Install the cylinder head cover. (See 01-10B-9 CYLINDER HEAD GASKET REPLACEMENT [WL-C, WE-C].)
9. Install the fuel injector. (See 01-14B-15 FUEL INJECTOR REMOVAL/INSTALLATION [WL-C, WE-C].)
10. Install the water pump pulley, cooling fan and drive belt.
11. Adjust the drive belt deflection. (See 01-10B-4 DRIVE BELT ADJUSTMENT [WL-C, WE-C].)
12. Install the engine cover.

VALVE CLEARANCE ADJUSTMENT [WL-C, WE-C]

dcf011012111w04

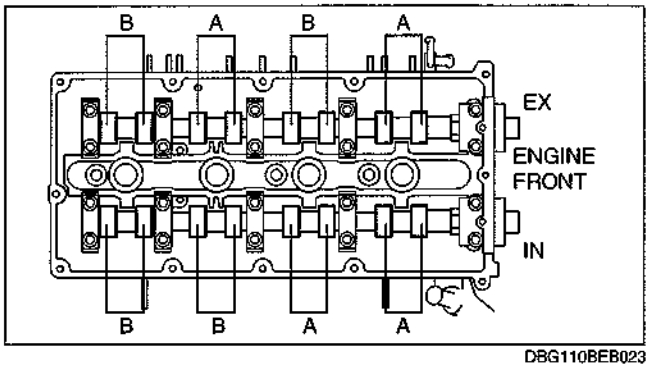
Caution
- **Loosening the locknut and the adjust screw while the cam lobe is not pressing down the rocker arm will damage the claw of the rocker arm. When loosening the locknut and the adjust screw, rotate the crankshaft clockwise and be sure that the cam lobe presses down the rocker arm firmly as shown in the figure.**

1. Remove the engine cover.
2. Remove the following parts to turn the crankshaft.
   1. Drive belt. (See 01-10B-4 DRIVE BELT ADJUSTMENT [WL-C, WE-C].)
   2. Cooling fan. (See 01-12B-8 COOLING FAN REMOVAL/INSTALLATION [WL-C, WE-C].)
   3. Water pump pulley.
3. Remove the fuel injector. (See 01-14B-15 FUEL INJECTOR REMOVAL/INSTALLATION [WL-C, WE-C].)
4. Remove the cylinder head cover.
5. Turn the crankshaft and align the timing mark so that the piston of the No. 1 or No. 4 cylinders is at TDC of compression.



DBG110BTBRR6

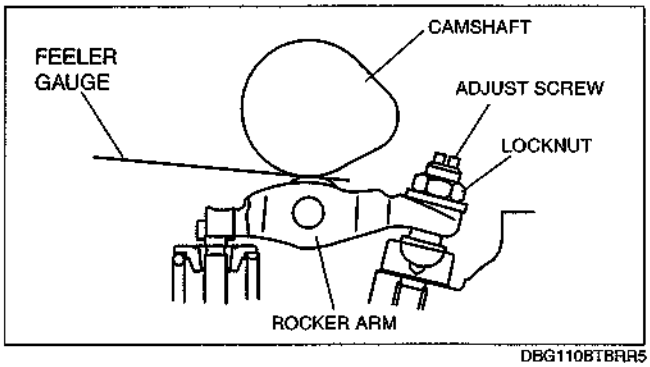
6. Adjust the valve clearances A with the No.1 cylinder at TDC of compression, and those of B with the No.4 cylinder at TDC of compression.



DBG110BEB023

Valve clearance [Engine cold]
IN: 0.10—0.16 mm {0.0040—0.0062 in}
EX: 0.17—0.23 mm {0.0067—0.0090 in}

Tightening torque (lock nut)
20—24 N·m {2.1—2.4 kgf·m, 15—17 ft·lbf}



DBG110BTBRR5

7. Turn the crankshaft one full turn and measure the remaining valve clearances. Adjust if necessary.
8. Install the cylinder head cover. (See 01-10B-9 CYLINDER HEAD GASKET REPLACEMENT [WL-C, WE-C].)
9. Install the fuel injector. (See 01-14B-15 FUEL INJECTOR REMOVAL/INSTALLATION [WL-C, WE-C].)
10. Install the water pump pulley, cooling fan and drive belt.
11. Adjust the drive belt deflection. (See 01-10B-4 DRIVE BELT ADJUSTMENT [WL-C, WE-C].)
12. Install the engine cover.

COMPRESSION INSPECTION [WL-C, WE-C]

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Warning
- **When the engine and the oil are hot, they can badly burn. Turn off the engine and wait until they are cool.**

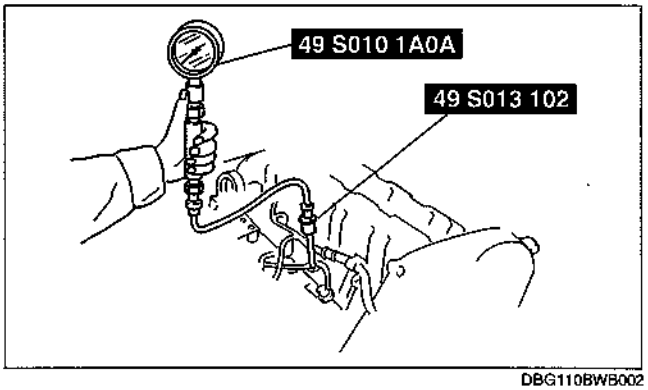
1. Verify that the battery is fully charged. Recharge it if necessary. (See 01-17-2 BATTERY INSPECTION.)
2. Warm up the engine to the normal operating temperature.
3. Stop the engine and allow it to cool down for about 10 minutes.

Warning
- **Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.**
- **Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injuries or death and damage, Fuel can also irritate skin and eyes. To prevent this, always complete the following "Fuel Line Safety Procedure". (See 01-14B-3 BEFORE REPAIR PROCEDURE [WL-C, WE-C].)**

4. Remove the engine cover.
5. Remove the common rail. (See 01-14B-11 SUPPLY PUMP REMOVAL/INSTALLATION [WL-C, WE-C])
6. Remove all the glow plugs. (See 01-13B-8 GLOW PLUG REMOVAL/INSTALLATION [WL-C, WE-C].)

7. Install the **SSTs** into the glow plug hole.
8. Crank the engine and note the maximum gauge reading.
9. Check each cylinder as above.

Compression (kPa {kgf/cm^2, psi} [rpm])
Standard: 2,942 {30, 427} [200]
Minimum: 2,648 {27, 384} [200]



DBG110BWB002

10. If the compression in one or more cylinders is low, pour a small amount of clean engine oil into the cylinder and recheck the compression.
    (1) If the compression increases, the piston, the piston rings, or cylinder wall may be worn and overhaul is required.
    (2) If the compression stays low, a valve may be stuck or improperly seated and overhaul is required.
    (3) If the compression in adjacent cylinders stays low, the cylinder head gasket may be damaged or the cylinder head distorted and overhaul is required.
11. Remove the **SST**.
12. Install the glow plug. (See 01-13B-8 GLOW PLUG REMOVAL/INSTALLATION [WL-C, WE-C].)
13. Install the common rail. (See 01-14B-11 SUPPLY PUMP REMOVAL/INSTALLATION [WL-C, WE-C])
14. Install the engine cover.

TIMING BELT REMOVAL/INSTALLATION [WL-C, WE-C]

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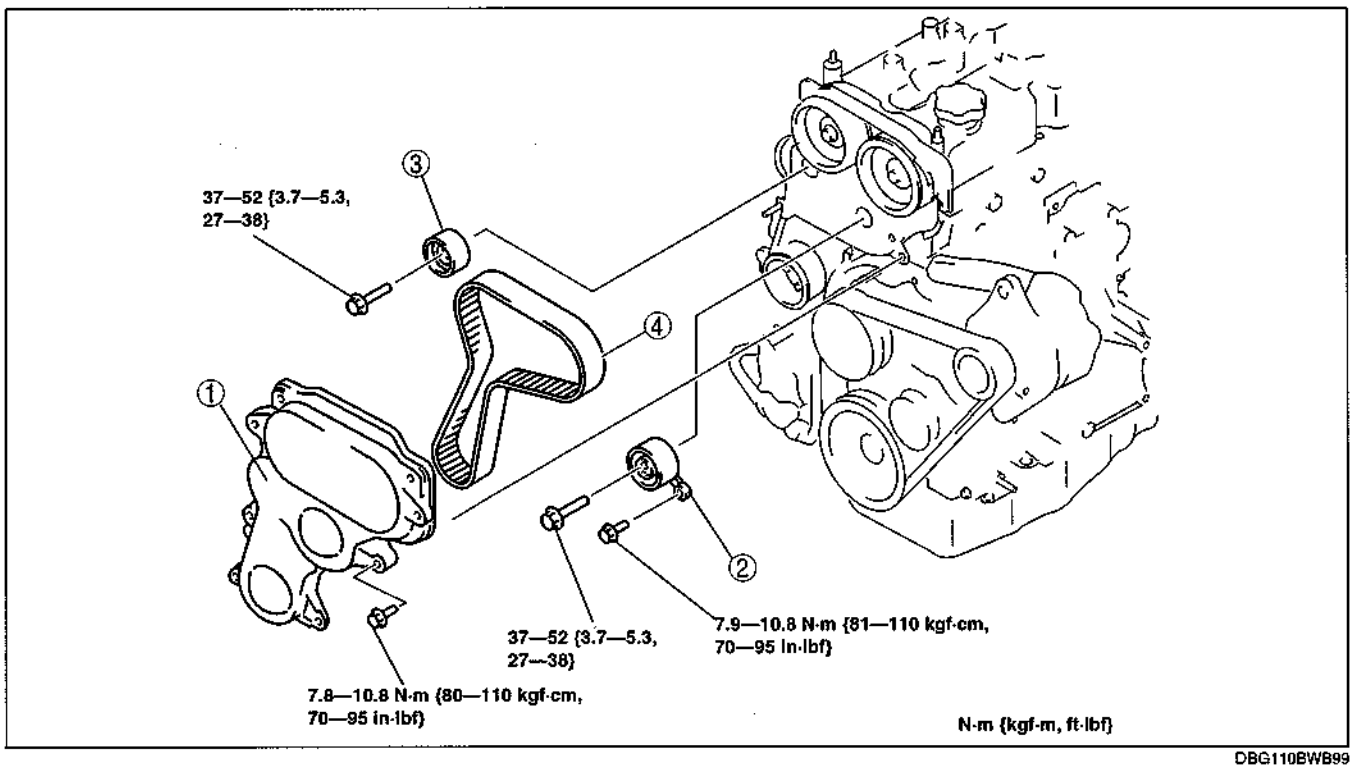
1. Remove the engine cover.
2. Disconnect the negative battery cable.
3. Remove in the order indicated in the table.
4. Install in the reverse order of removal.

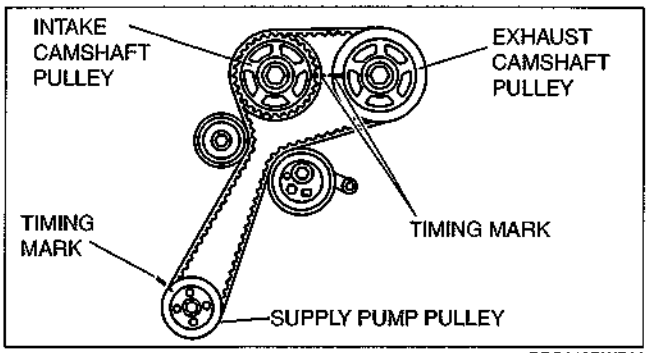


DBG110BWB99

1	Timing belt cover (See 01-10B-9 Timing Belt Cover Installation Note.)
2	Tensioner (See 01-10B-8 Tensioner Removal Note.) (See 01-10B-9 Timing Belt Installation Note.)
3	Idler
4	Timing belt (See 01-10B-8 Timing Belt Removal Note.) (See 01-10B-9 Timing Belt Installation Note.)

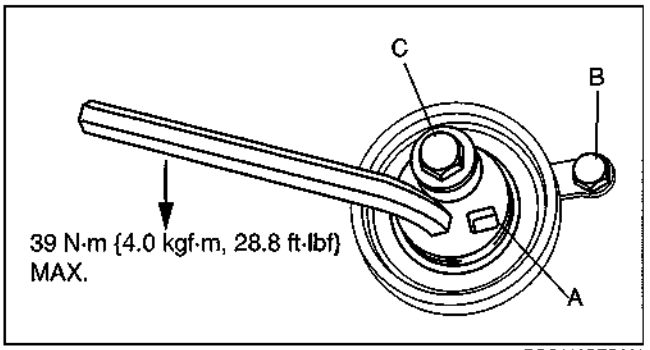
Tensioner Removal Note

1. Turn the crankshaft clockwise and align the timing marks as shown.



DBG110BWB998

2. Turn the auto tensioner counterclockwise using an Allen wrench. (Rotate the auto tensioner with a force of **39 N·m {4.0 kgf·m, 28.8 ft·lbf}** or less.)
3. Insert a fixing pin of approx. **6mm {0.24 in}** diameter into hole A to secure the auto tensioner.
4. Remove the bolts in the order of B and C, then remove the auto tensioner.

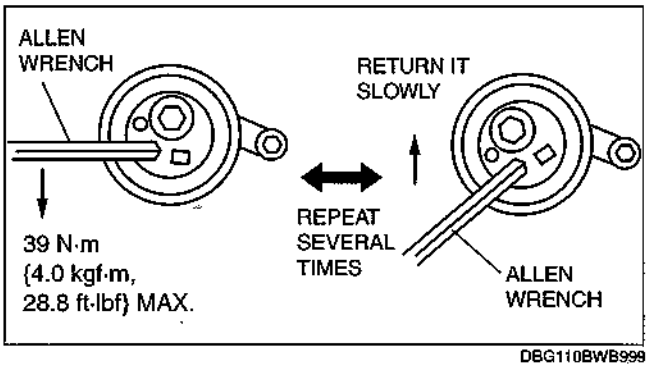


DBG110BEB033

Note

- If the rod projects suddenly while removing the auto tensioner, the air flows into the pressure chamber and the rod could move slightly. If this occurs, bleed the air from the pressure chamber using the following procedure.

5. Assemble the auto tensioner to the engine.
6. Turn the auto tensioner with a force of **39 N·m {4.0 kgf·m, 28.8 ft·lbf}** or less using an Allen wrench, then turn it back slowly. Repeat this procedure several times.
7. Verify that the rod has resistance when it is in the most projected position. If there is no resistance, repeat the above procedure.



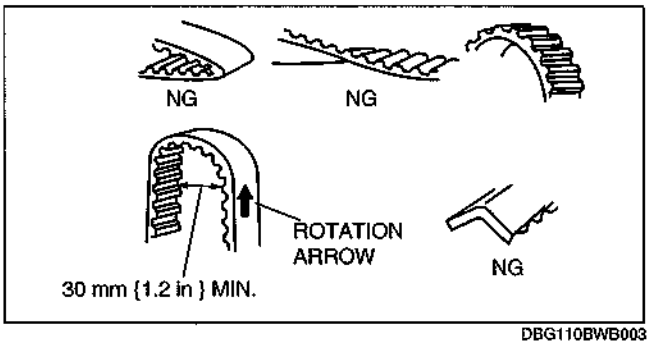
DBG110BWB999

Timing Belt Removal Note

Caution

- **The following will damage the timing belt and shorten its life; forcefully twisting it, turning it inside out, or getting oil or grease on it.**
- **After removing the timing belt, do not move the crankshaft and/or camshaft pulley from this position because it can cause the valve and piston to contact and damage them.**

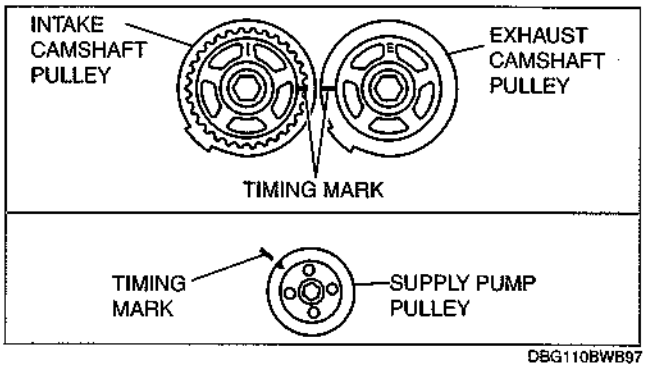
1. Mark the timing belt rotation on the belt for proper reinstallation.



DBG110BWB003

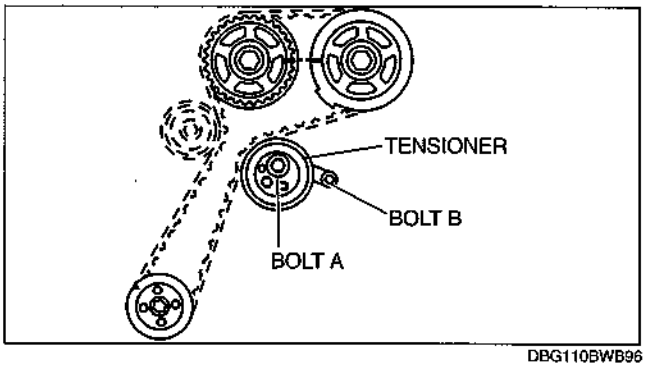
Timing Belt Installation Note

1. Align the timing marks as shown.
2. Verify that the supply pump attaching bolts and nuts are tightened to the specified torque. This must be done to prevent over-tensioning of the timing belt after it has been installed.



DBG110BWB97

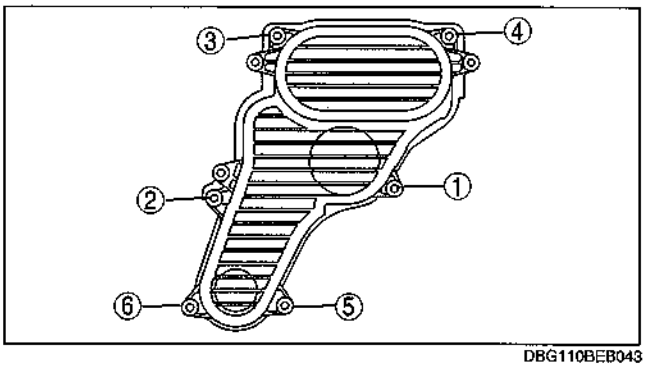
3. Install the tensioner and hand-tighten the lock bolt A and B.
4. Install the timing belt.
5. Install the idler.
6. Tighten the lock bolt A.
7. Tighten the lock bolt B.
8. Remove the set pin from the tensioner.
9. Turn the crankshaft clockwise twice, and align the camshaft pulley timing marks. If they are not aligned, remove the timing belt and repeat from Step 1.



DBG110BWB96

Timing Belt Cover Installation Note

1. Tighten the timing belt cover bolts in the order shown.



DBG110BEB043

CYLINDER HEAD GASKET REPLACEMENT [WL-C, WE-C]

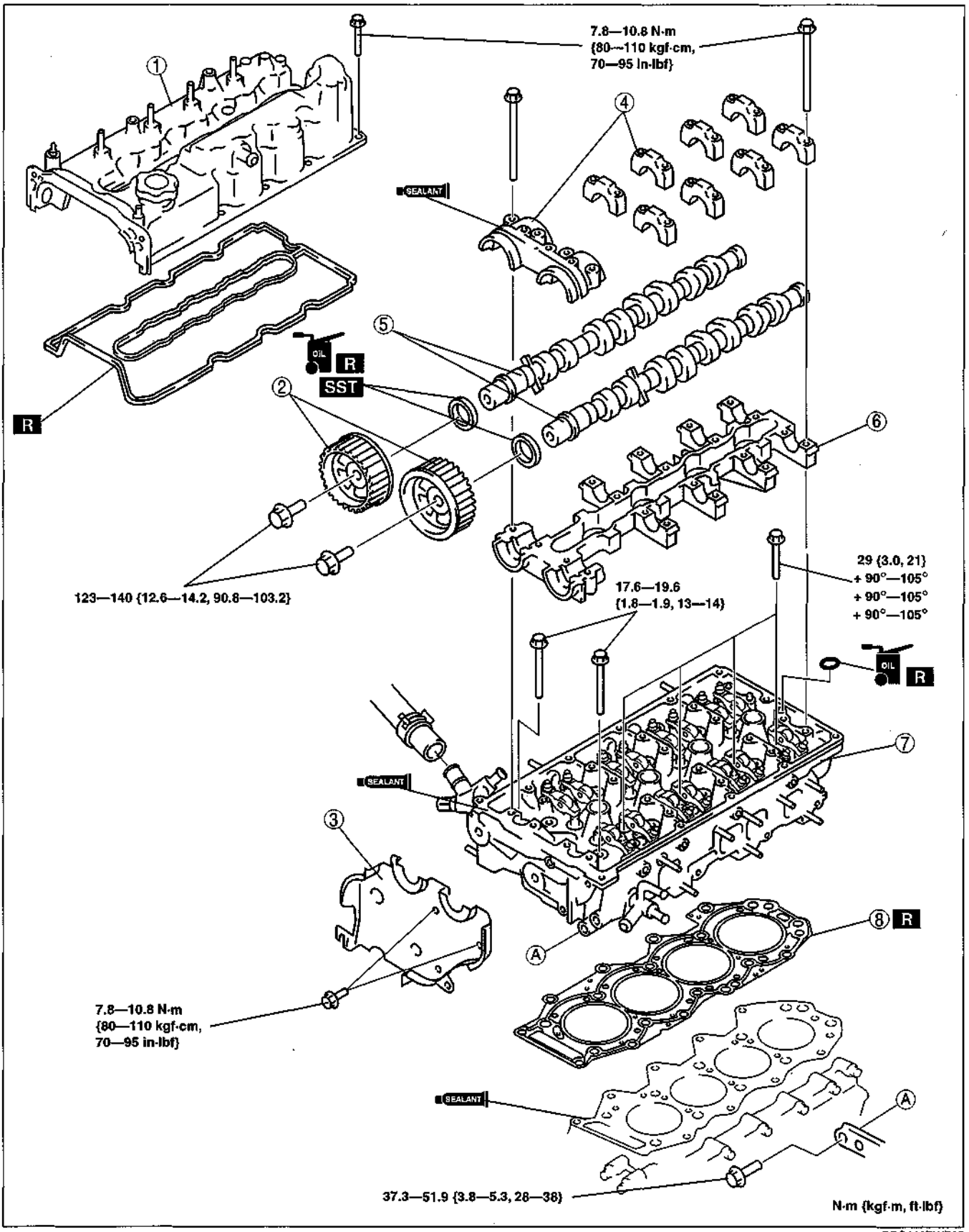
dcf011010271w02

Warning

- **Fuel vapor is hazardous. It can very easily ignite, causing serious injury and damage. Always keep speaks and flames away from fuel.**
- **Fuel line spills and leaks are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete the "Fuel Line Safety Procedures".**

1. Remove the engine cover.
2. Disconnect the negative battery cable.
3. Drain the engine coolant. (See 01-12B-2 COOLING SYSTEM SERVICE WARNINGS [WL-C, WE-C].)
4. Remove the intake manifold, air intake pipe and breather chamber. (See 01-13B-3 INTAKE-AIR SYSTEM REMOVAL/INSTALLATION [WL-C, WE-C].)
5. Remove the fuel injector. (See 01-14B-15 FUEL INJECTOR REMOVAL/INSTALLATION [WL-C, WE-C].)
6. Remove the turbocharger. (See 01-15B-2 EXHAUST SYSTEM REMOVAL/INSTALLATION [WL-C, WE-C].)
7. Remove the timing belt. (See 01-10B-7 TIMING BELT REMOVAL/INSTALLATION [WL-C, WE-C].)
8. Remove in the order indicated in the table.
9. Install in the reverse order of removal.
10. Adjust the drive belt deflection. (See 01-10B-4 DRIVE BELT ADJUSTMENT [WL-C, WE-C].)
11. Bleed air in the fuel line. (See 01-14B-4 AFTER REPAIR PROCEDURE [WL-C, WE-C].)

12. Start the engine and
    (1) Inspect for engine oil, engine coolant, and fuel leakage.
    (2) Inspect the idle speed.
13. Inspect the compression.



DBG110BWB95

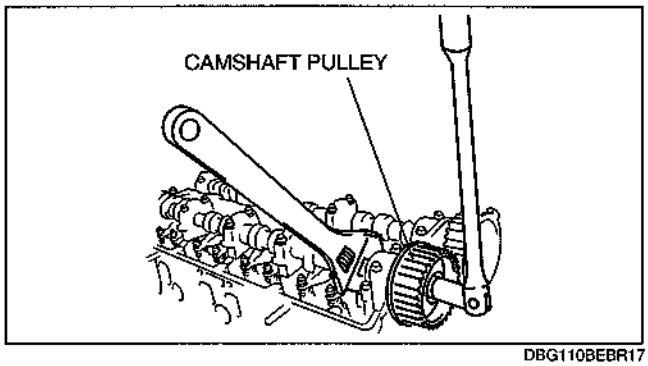
1	Cylinder head cover (See 01-10B-15 Cylinder Head Cover Installation Note.)
2	Camshaft pulley (See 01-10B-11 Camshaft Pulley Removal Note.) (See 01-10B-14 Camshaft Pulley Installation Note.)
3	Seal plate (See 01-10B-14 Seal Plate Installation Note.)
4	Camshaft cap upper (See 01-10B-11 Camshaft Cap Upper Removal Note.) (See 01-10B-13 Camshaft Cap Upper Installation Note.)
5	Camshaft
6	Camshaft cap lower (See 01-10B-13 Camshaft Cap Lower Installation Note.)
7	Cylinder head (See 01-10B-11 Cylinder Head Removal Note.) (See 01-10B-12 Cylinder Head Installation Note.)
8	Cylinder head gasket (See 01-10B-12 Cylinder Head Gasket Installation Note.)

Camshaft Pulley Removal Note

1. Hold the camshaft by using a wrench on the cast hexagon.

Caution

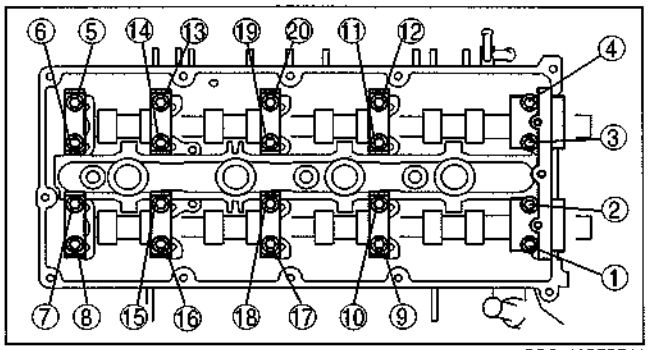
- **Do not move the camshaft from this position because it can cause the valve and piston to contact each other and damage them.**



DBG110BEBR17

Camshaft Cap Upper Removal Note

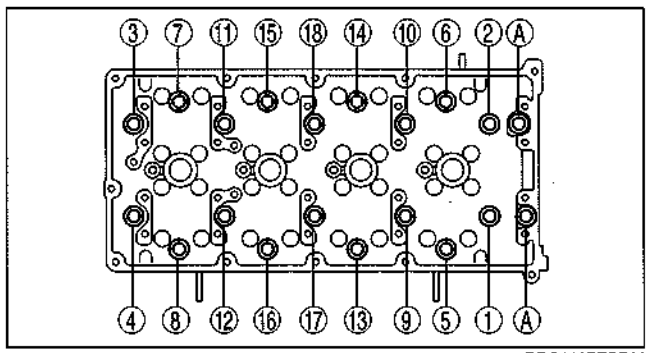
1. Loosen the camshaft cap bolts in three or four steps in the order shown.



DBG110BEBR20

Cylinder Head Removal Note

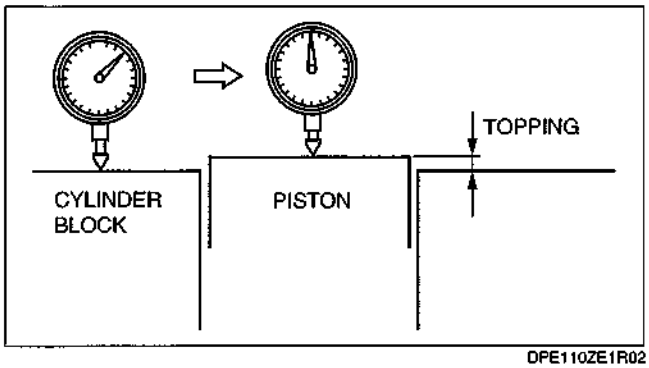
1. Remove bolts A.
2. Loosen the cylinder head bolts in two or three steps in the order shown.



DBG110BEBR09

Cylinder Head Gasket Installation Note

1. Measure the piston topping of all the cylinders.

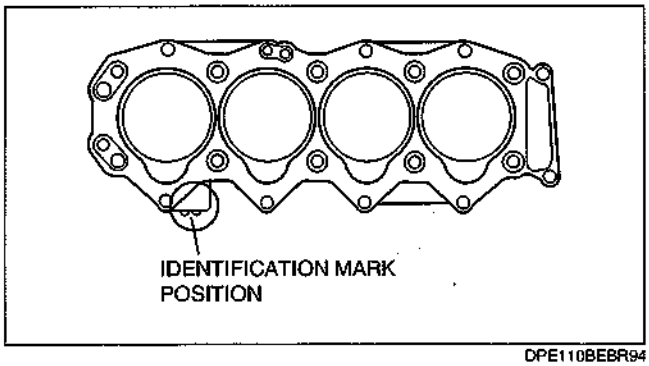


DPE110ZE1R02

2. Choose the gasket according to each measured piston topping.

Cylinder head gasket select table

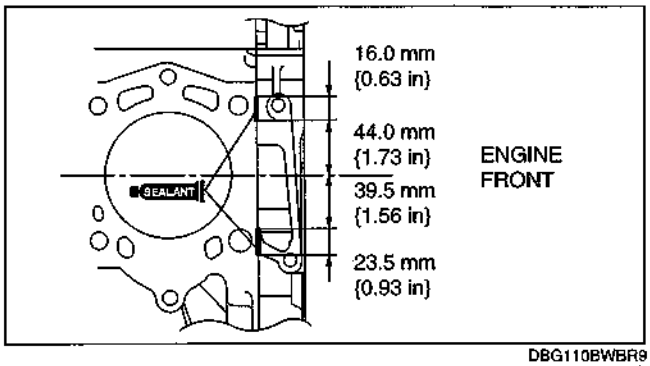
Piston topping (mm {in})	Cylinder head gasket identification mark
0.080—0.190 {0.004—0.007}	
0.135—0.255 {0.006—0.010}	
0.200—0.310 {0.008—0.012}	



DPE110BEBR94

3. Apply silicone sealant to the cylinder block as shown.

Thickness
ø2.0—3.0 mm {0.08—0.11 in}

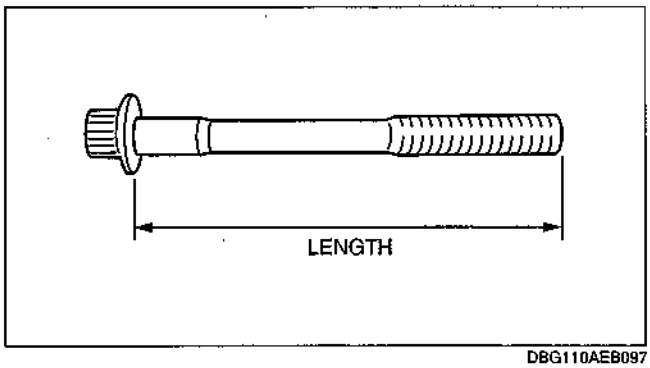


DBG110BWBR9

Cylinder Head Installation Note

1. Measure the length of each bolt. Replace the bolt if necessary.

Cylinder head bolt length
Bolt head mark W
Standard length: 101.2—101.8 mm {3.985—4.007 in}
Maximum length: 102.5 mm {4.035 in}
Bolt head mark N
Standard length: 113.2—113.8 mm {4.457—4.480 In}
Maximum length: 114.5 mm {4.508 in}
Bolt head mark I
Standard length: 149—150 mm {5.867—5.905 in}
Maximum length: 150.5 mm {5.925 In}



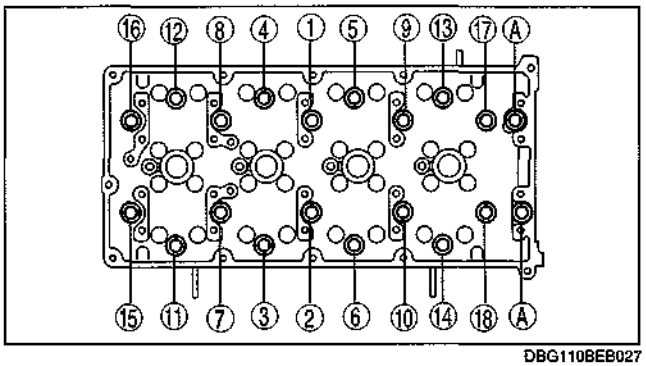
DBG110AEB097

2. Apply clean engine oil to the threads and the seat face of each bolt and install them.

3. Tighten the bolts in two or three steps in the order shown in the figure.

   Tighten torque
   29 N·m {3.0 kgf·m, 22 ft·lbf}

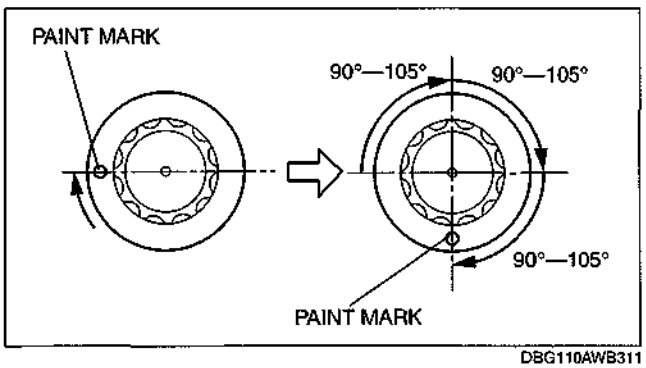
4. Retighten the bolts in the order shown in the figure until all the bolts are tightened to **29 N·m {3.0 kgf·m, 2.1 ft·lbf}**.



DBG110BEB027

5. Put a paint mark on each bolt head.
6. Using the marks as a reference, tighten the bolts by turning each **90°—105°** in the sequence shown.
7. Further tighten each bolt by turning another **90°—105°**.
8. Further tighten each bolt by turning another **90°—105°**.
9. Apply adhesive to the thread of bolt A.
10. Tighten bolts A.

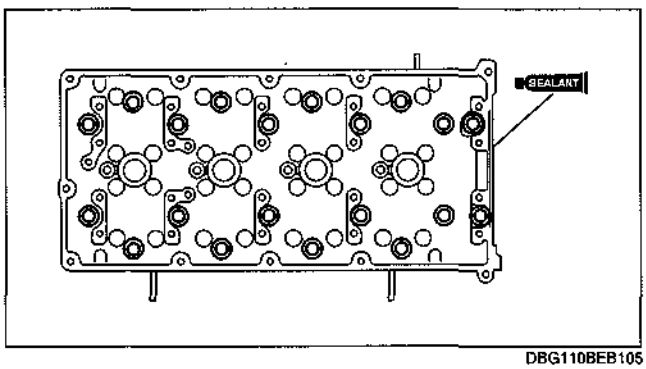
    Tightening torque
    17.6—19.6 N·m {1.80—1.99 kgf·m, 13.0—14.4 ft·lbf}



DBG110AWB311

Camshaft Cap Lower Installation Note

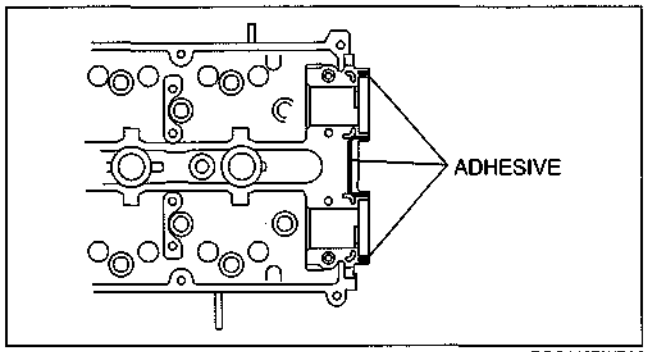
1. Apply silicone sealant to the cylinder head as shown in the figure.



DBG110BEB105

Camshaft Cap Upper Installation Note

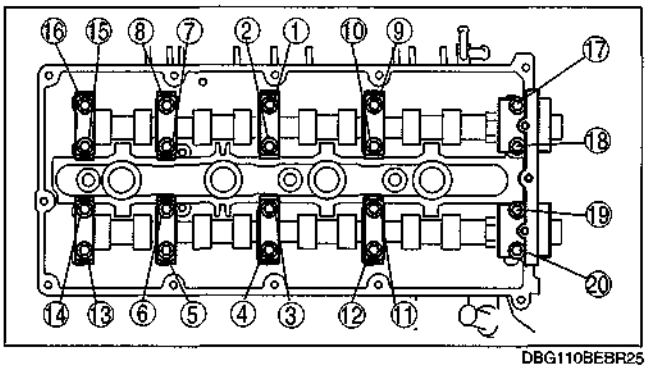
1. Apply adhesive to the front camshaft cap mounting surfaces as shown.



DBG110BWB86

2. Tighten the camshaft cap bolts gradually in three or four steps in the order shown.

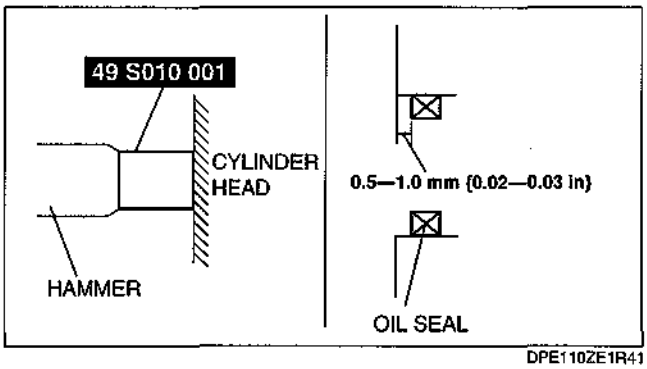
Caution
- **Because there is little camshaft thrust clearance, the camshaft must be held horizontally while it is installed. Otherwise, excessive force will be applied to the thrust area, causing burr on the thrust receiving area of the cylinder head journal. To avoid this, the following procedure must be observed.**



DBG110BEBR25

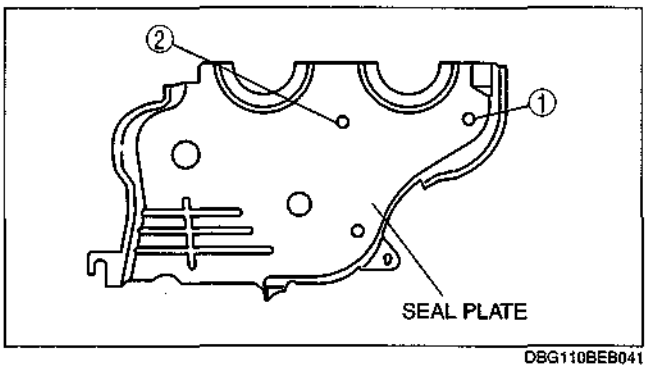
3. Apply soapy water along the perimeter of the new oil seal.
4. Push the oil seal slightly in by hand.
5. Tap the oil seal lightly into the cylinder head using the **SST** and a hammer.
6. To ensure that the oil seal is installed correctly, measure the distance between the end of the cylinder head and the face of the oil seal.

Camshaft oil seal press-in amount
0.5—1.0 mm {0.02—0.03 in}



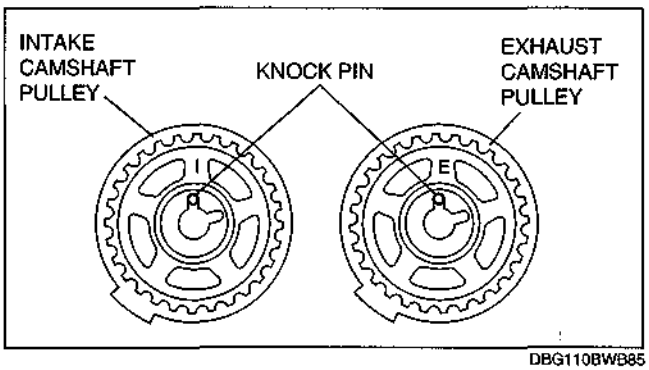
DPE110ZE1R41

Seal Plate Installation Note
1. Tighten the seal plate bolts in the order indicated in the figure.



DBG110BEB041

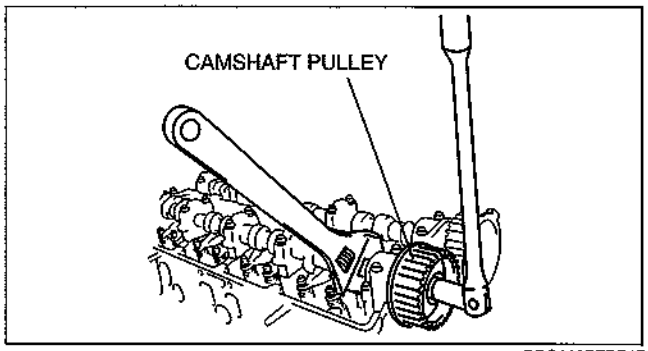
Camshaft Pulley Installation Note
1. Install the camshaft pulleys, positioning the knock pins as shown.



DBG110BWB85

2. Hold the camshaft using a wrench on the cast hexagon.

Caution
- **Do not move the camshaft from this position because it can cause the valve and piston to contact each other and damage them.**

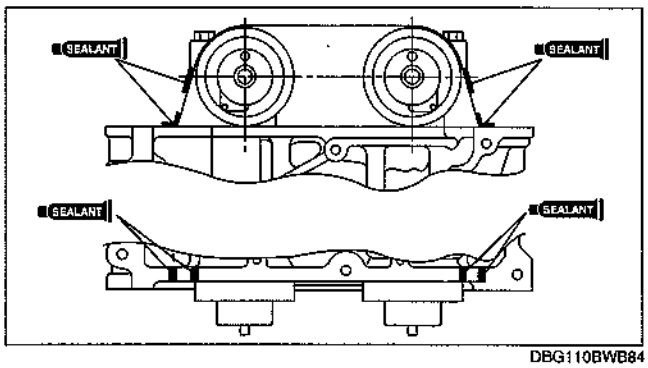


DBG110BEBR17

Cylinder Head Cover Installation Note

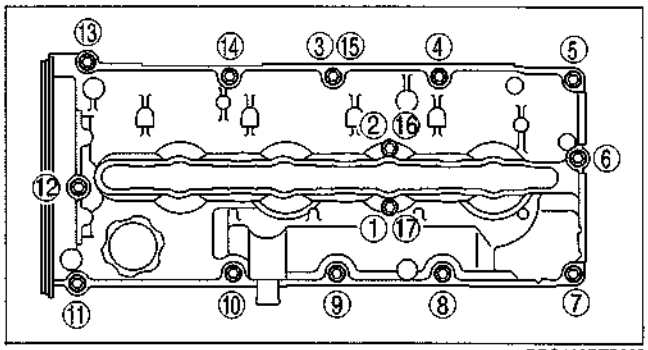
1. Apply silicone sealant to the cylinder head as shown.

Thickness
ø2.0—3.0 mm {0.08—0.11 in}



DBG110BWB84

2. Tighten the cylinder head cover bolts in the order shown.



DBG110BEB005

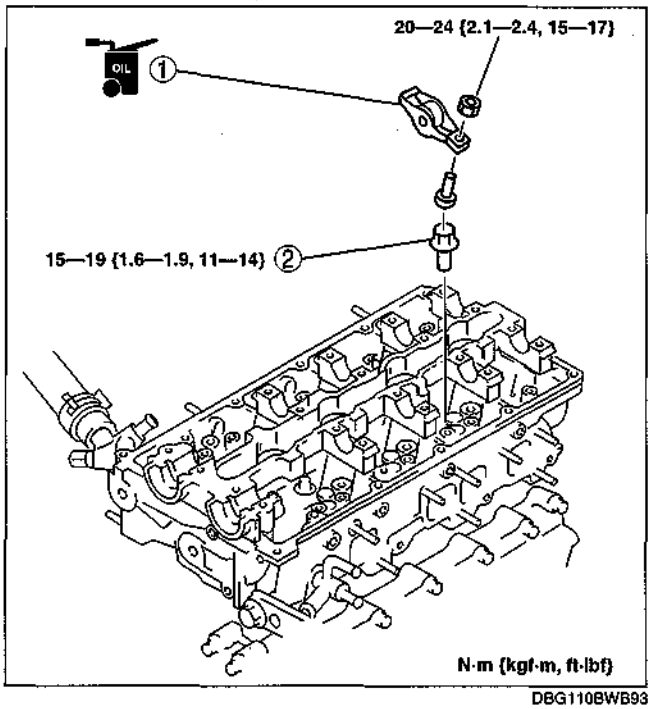
ROCKER ARM REMOVAL/INSTALLATION [WL-C, WE-C]

dcf011012010w02

Caution
- **Removing the camshaft under load can break the camshaft. When removing the camshaft, be sure to prevent the camshaft from pressing down the rocker arm. (See 01-10B-5 VALVE CLEARANCE ADJUSTMENT [WL-C, WE-C].)**

1. Remove the engine cover.
2. Disconnect the negative battery cable.
3. Remove the air intake pipe and breather chamber.
4. Remove the timing belt. (See 01-10B-7 TIMING BELT REMOVAL/INSTALLATION [WL-C, WE-C].)
5. Remove the camshaft. (See 01-10B-9 CYLINDER HEAD GASKET REPLACEMENT [WL-C, WE-C].)
6. Remove the order indicated in the table.
7. Install in the reverse order of removal.

1	Rocker arm (See 01-10B-16 Rocker Arm Installation Note.)
2	Pivot (See 01-10B-16 Pivot Installation Note.)

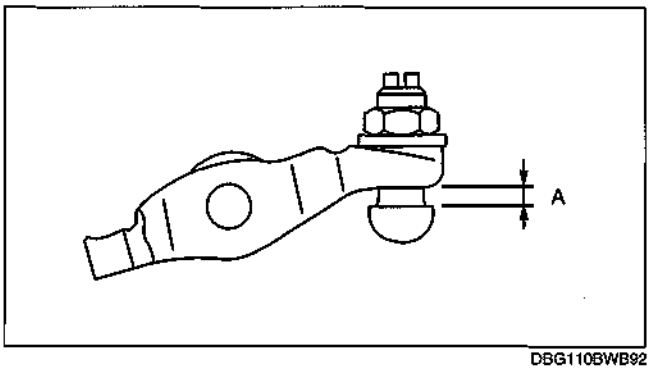


DBG110BWB93

Pivot Installation Note
1. Apply adhesive to the thread of the pivot.

Rocker Arm Installation Note
1. If a new rocker arm is used, set dimension A as follows.

Dimension A
0.0—4.0 mm {0.0—0.115 in}



DBG110BWB92

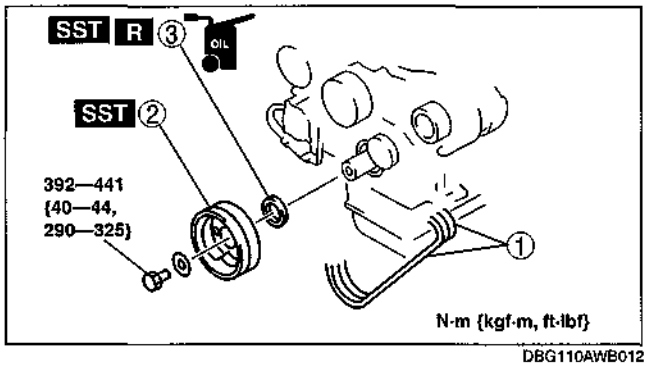
FRONT OIL SEAL REPLACEMENT [WL-C, WE-C]

dcf011010602w02

1. Disconnect the negative battery cable.
2. Drain the engine coolant. (See 01-12B-3 ENGINE COOLANT REPLACEMENT [WL-C, WE-C].)
3. Remove the upper radiator hose.
4. Remove the radiator cowling and cooling fan.
5. Remove in the order indicated in the table.
6. Install in the reverse order of removal.
7. Inspect the engine oil level.

8. Adjust the drive belt deflection. (See 01-10B-4 DRIVE BELT ADJUSTMENT [WL-C, WE-C].)

1	Drive belt
2	Crankshaft pulley (See 01-10B-17 Crankshaft pulley Removal Note.) (See 01-10B-18 Crankshaft pulley Installation Note.)
3	Front oil seal (See 01-10B-17 Front Oil Seal Removal Note.) (See 01-10B-17 Front Oil Seal Installation Note.)



DBG110AWB012

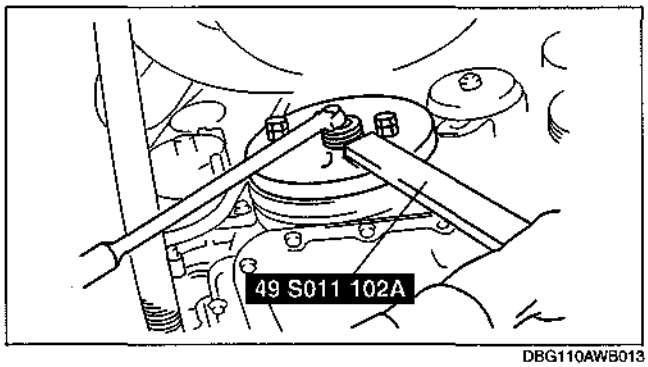
01

Crankshaft pulley Removal Note

1. Hold the crankshaft using the **SST**.

Caution

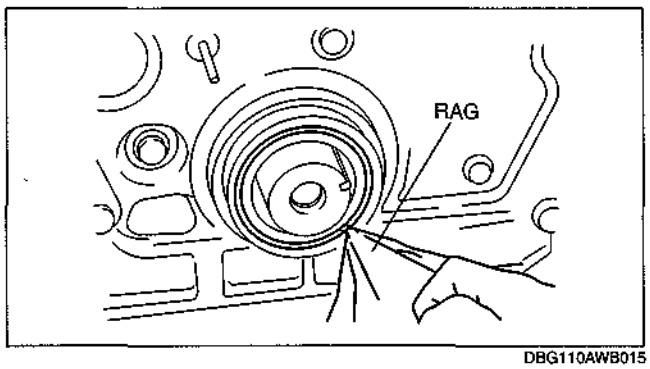
- **Turning the crankshaft after the crankshaft pulley is removed can dislocate the timing gear.**
- **Removing the key can cause the key groove to become misaligned.**



DBG110AWB013

Front Oil Seal Removal Note

1. Cut the oil seal lip using a razor knife.
2. Remove the oil seal using a screwdriver protected with a rag.

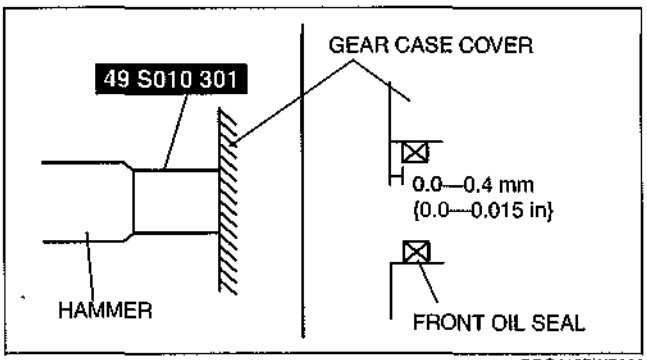


DBG110AWB015

Front Oil Seal Installation Note

1. Apply soapy water along the perimeter of the new oil seal.
2. Push the oil seal slightly in by hand.
3. Tap the oil seal in evenly using the **SST** and a hammer.
4. To ensure that the oil seal is installed correctly, measure the distance between the end of the gear case cover and the face of the front oil seal.

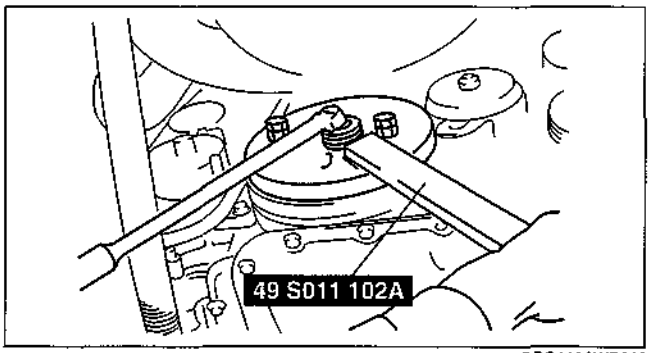
Pushing distance of the front oil seal
0.0—0.4 mm {0.0—0.015 in}



DBG110BWB006

Crankshaft pulley Installation Note

1. Hold the crankshaft using the **SST**.



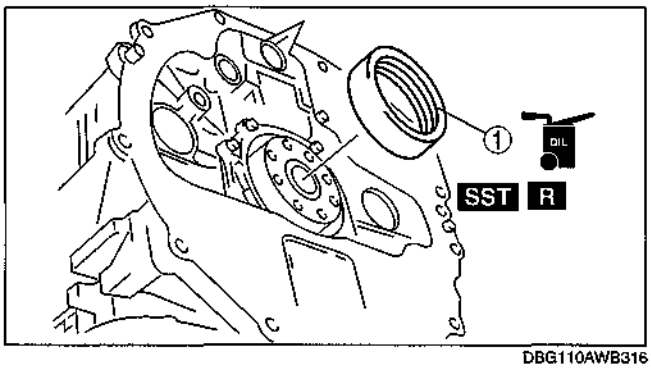
DBG110AWB013

REAR OIL SEAL REPLACEMENT [WL-C, WE-C]

dcf011011399w02

1. Disconnect the negative battery cable.
2. Remove the dual-mass flywheel. (See 05-10-12 CLUTCH UNIT REMOVAL/INSTALLATION.)
3. Remove in the order indicated in the table.
4. Install in the reverse order of removal.
5. Inspect the engine oil level. (See 01-11B-2 ENGINE OIL LEVEL INSPECTION [WL-C, WE-C].)

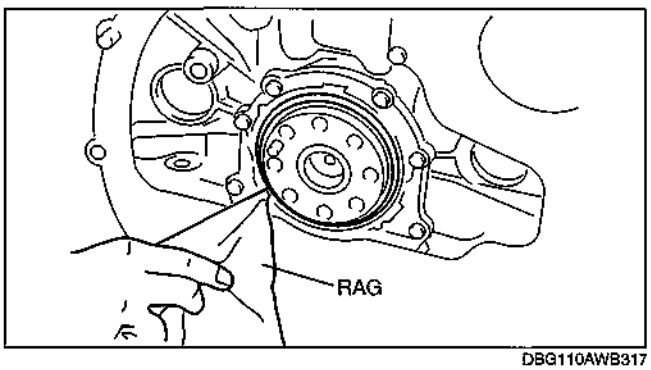
1	Rear oil seal (See 01-10B-18 Rear Oil Seal Removal Note.) (See 01-10B-19 Rear Oil Seal Installation Note.)



DBG110AWB316

Rear Oil Seal Removal Note

1. Cut the oil seal lip by using a razor knife.
2. Remove the oil seal by using a screwdriver protected with a rag.

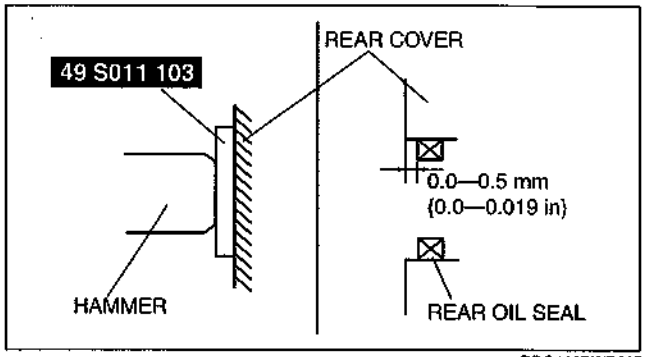


DBG110AWB317

Rear Oil Seal Installation Note

1. Apply soapy water along the perimeter of the new oil seal.
2. Push the oil seal slightly in by hand.
3. Tap the oil seal in evenly using the **SST** and a hammer.
4. To ensure that the oil seal is installed correctly, measure the distance between the end of the rear cover and the face of the rear oil seal.

   Pushing distance of the rear oil seal
   0.0—0.5 mm {0.0—0.019 in}



DBG110BWB007

ENGINE REMOVAL/INSTALLATION [WL-C, WE-C]

dcf011000000w05

Warning

- **Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.**
- **Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injuries or death and damage, Fuel can also irritate skin and eyes. To prevent this, always complete the following "Fuel Line Safety Procedure". (See 01-14B-3 BEFORE REPAIR PROCEDURE [WL-C, WE-C].)**

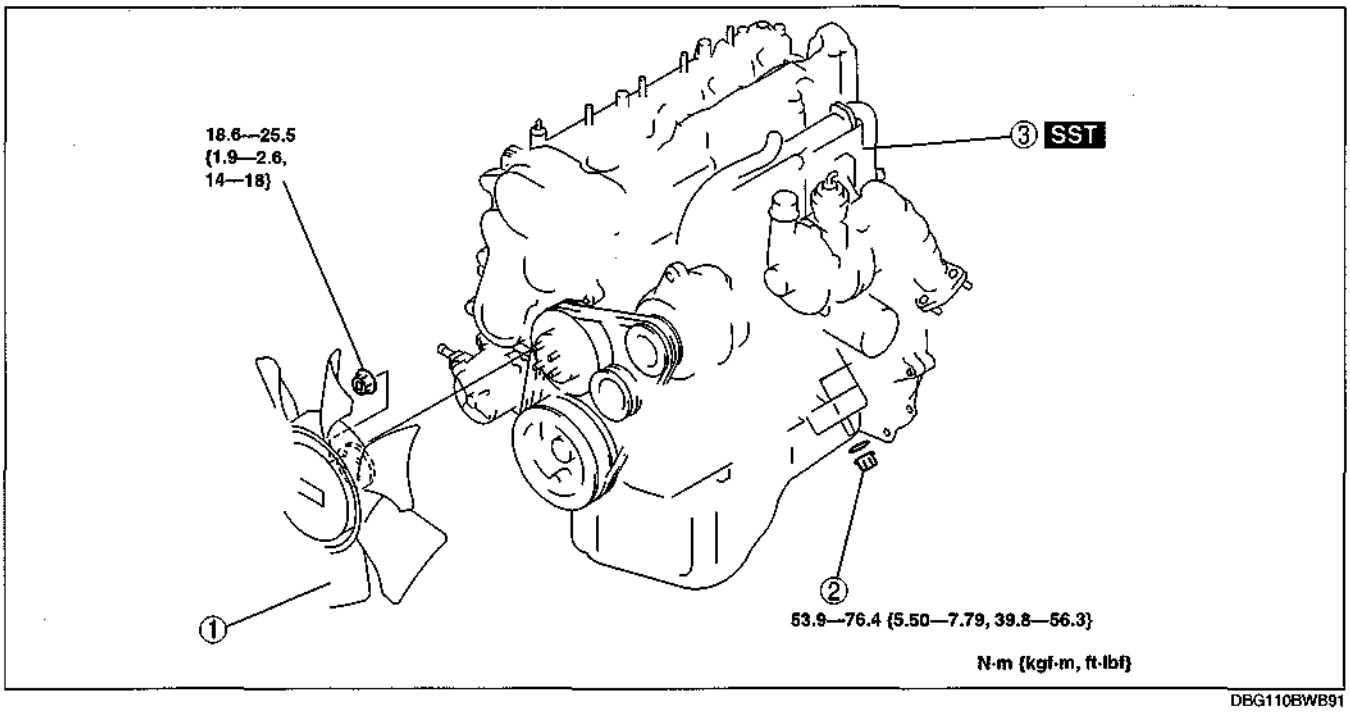
1. Remove the air intake pipe. (See 01-13B-3 INTAKE-AIR SYSTEM REMOVAL/INSTALLATION [WL-C, WE-C].)
2. Remove the battery. (See 01-17-2 BATTERY REMOVAL/INSTALLATION.)
3. Remove the radiator. (See 01-12B-6 RADIATOR REMOVAL/INSTALLATION [WL-C, WE-C].)
4. Remove the front pipe. (See 01-15B-2 EXHAUST SYSTEM REMOVAL/INSTALLATION [WL-C, WE-C].)
5. Remove the transmission. (See 05-11B-5 TRANSMISSION REMOVAL/INSTALLATION [S15M-D].) (See 05-11B-10 TRANSMISSION AND TRANSFER REMOVAL/INSTALLATION [S15MX-D].)
6. Remove the P/S oil pump with the oil hoses and pipes still connected. (See 06-14-14 POWER STEERING OIL PUMP REMOVAL/INSTALLATION.)

   Note
   - Position and secure the P/S oil pump out of the way with a rope.

7. Remove the A/C compressor with the pipes still connected. (See 07-11-6 A/C COMPRESSOR REMOVAL/INSTALLATION.)

   Note
   - Position and secure the A/C compressor out of the way with rope or wire.

8. Remove the order indicated in the table.
9. Install in the reverse order of removal.
10. Adjust the drive belt deflection. (See 01-10B-4 DRIVE BELT ADJUSTMENT [WL-C, WE-C].)
11. Bleed air in the fuel line. (See 01-14B-4 AFTER REPAIR PROCEDURE [WL-C, WE-C].)
12. Start the engine and
    (1) Inspect the engine oil, engine coolant, and fuel leakage.
    (2) Inspect the idle speed.
13. Perform a road test.



DBG110BWB91

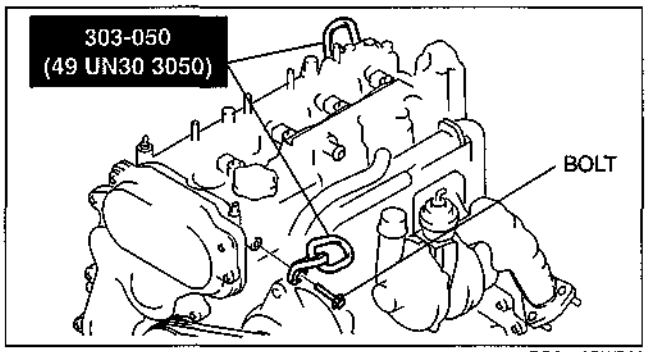
1	Cooling fan
2	Engine mount nut

3	Engine (See 01-10B-20 Engine Removal/Installation Note.)

Engine Removal/Installation Note

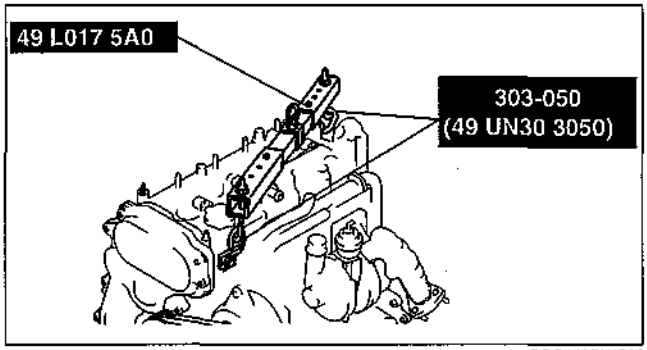
1. Install the **SST** to the cylinder head by using bolt (99784 1020 or **M10X1.25, 8T**, length **20mm {0.79 in}**) as shown.

   Tightening torque
   43.1—60.8 N·m {4.40—6.10 kgf·m, 31.8—44.8 ft·lbf}



DBG110BWB90

2. Suspend the engine using the **SST**.



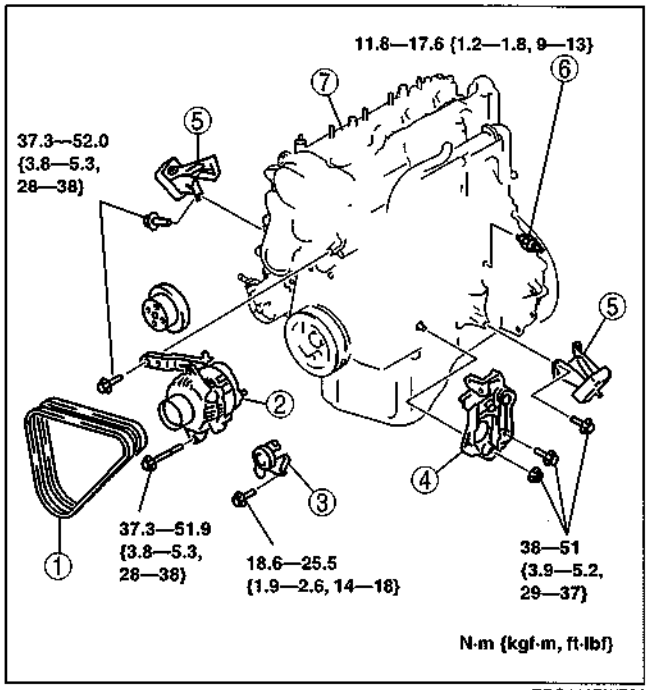
DBG110BWB89

ENGINE DISASSEMBLY/ASSEMBLY [WL-C, WE-C]

dcf011000000w06

1. Remove the intake-air system. (See 01-13B-3 INTAKE-AIR SYSTEM REMOVAL/INSTALLATION [WL-C, WE-C].)
2. Remove the exhaust system. (See 01-15B-2 EXHAUST SYSTEM REMOVAL/INSTALLATION [WL-C, WE-C].)
3. Remove the oil cooler. (See 01-11B-4 OIL COOLER REMOVAL/INSTALLATION [WL-C, WE-C].)
4. Disassemble in the order indicated in the table.
5. Assemble in the reverse order of disassembly.

1	Drive belt
2	Generator (See 01-17-5 Generator Installation Note.)
3	Idler
4	A/C compressor bracket
5	Engine mount
6	Oil pressure switch (See 01-11B-2 OIL PRESSURE INSPECTION [WL-C, WE-C].)
7	Water pump pulley



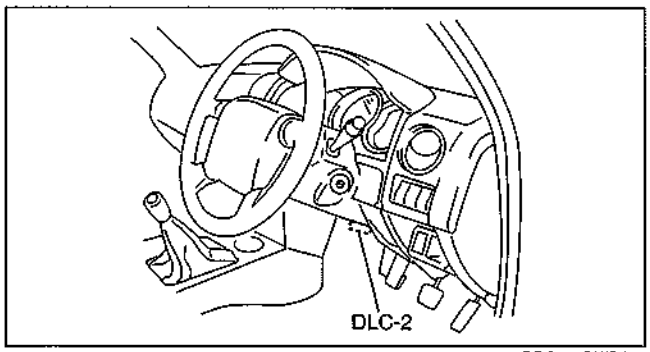
DBG110BWB88

ENGINE TUNE-UP [WL-C, WE-C]

dcf011002000w04

Engine Tune-up Preparation

1. Start the engine and warm up completely.
2. Verify that the gear is in neutral position.
3. Verify that the accelerator pedal is released.
4. Turn off the A/C switch. (if equipped)
5. Turn off all electrical loads.
6. Verify that no DTC is present.
7. Connect the current diagnostic tool to the DLC-2.



DBG110BWBA01

Idle Speed Inspection

1. Perform "Engine Tune-up Preparation". (See 01-10B-21 Engine Tune-up Preparation.)

Note
- Idle speed is not adjustable.
- Idle speed verification requires current diagnostic tool.

2. Verify that the idling speed (current diagnostic tool: RPM PID) is within the specification using the current diagnostic tool function.

Specification
No load: 695—745 rpm
A/C ON: 725—775 rpm

- If not as specified, inspect the following parts.
  - — APP sensor
  - — ECT sensor
  - — CMP sensor
  - — CKP sensor
  - — Fuel pressure sensor
  - — Fuel injector
  - — Supply pump
- If the parts are normal, replace the PCM.

Correction Procedure
MAF correction
Using PDS/IDS

Note
- Perform this procedure after replacing the MAF/IAT sensor No.2 or at the recommended interval as described under "E.G.R. system" in "SCHEDULED MAINTENANCE."

1. Perform "Engine Tune-up Preparation". (See 01-10B-21 Engine Tune-up Preparation.)
2. After the vehicle is identified, select the following items from the initial screen of the PDS/IDS.
   - When using the IDS (notebook PC)
     1. Select the "Powertrain".
     2. Select the "Engine Checks".
   - When using the PDS (pocket PC)
     1. Select "All Tests and Calibrations".
3. Then, select the "Learning", "MAF Correction" and perform procedures according to directions on the PDS/IDS screen.
4. Perform the MAF correction according to the directions on the PDS/IDS screen.

Using WDS

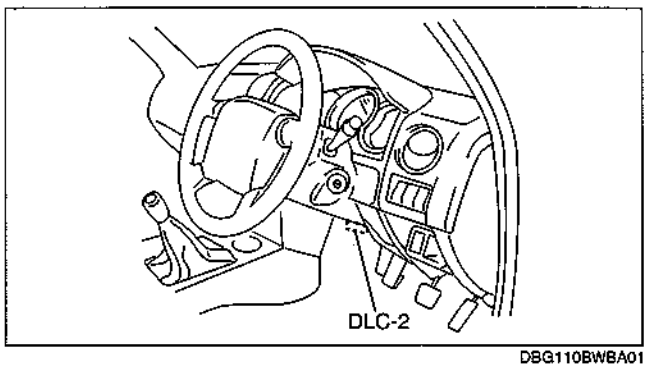
Note
- Perform this procedure after replacing the MAF sensor/IAT sensor No.2 or at the recommended interval as described under "E.G.R. system" in "SCHEDULED MAINTENANCE."

1. Perform "Engine Tune-up Preparation". (See 01-10B-21 Engine Tune-up Preparation.)
2. Set up the WDS (including the vehicle recognition).
3. Select the "Powertrain".
4. Select the "Engine Checks".
5. Select the "Learning".
6. Select the "MAF Correction" and perform procedures according to directions on the WDS screen.
7. Perform the MAF correction according to the directions on the WDS screen.

Without using current diagnostic tool

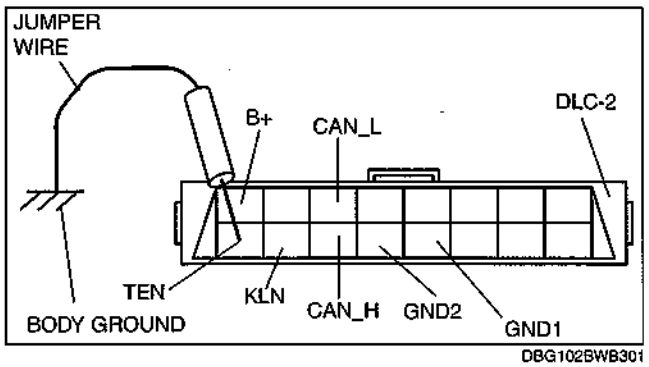
Note
- The glow indicator light illuminates while MAF learning is performed, and flashes five times after it is completed.

1. Short the DLC-2 terminal TEN to body ground using a jumper wire.



DBG110BWBA01

2. Short circuit the DLC-2 terminal TEN five times within 5 s.



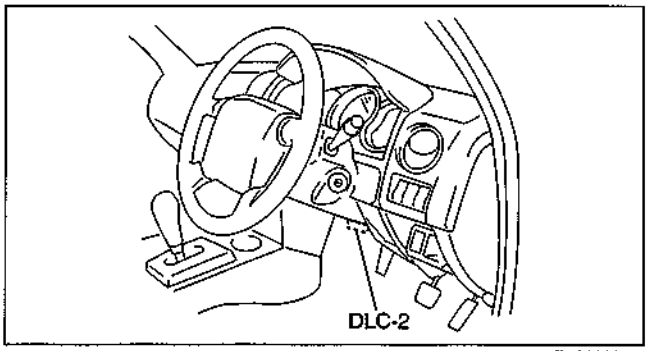
DBG102BWB301

ENGINE TUNE-UP[WL-C, WE-C (AT)]

id011099800600

Engine Tune-up Preparation

1. Start the engine and warm up completely.
2. Verify that the selector lever is in P position.
3. Verify that the accelerator pedal is released.
4. Turn off the A/C switch. (if equipped)
5. Turn off all electrical loads.
6. Verify that no DTC is present.
7. Connect the PDS/IDS to the DLC-2.



amffw00001573

Idle Speed Inspection

1. Perform "Engine Tune-up Preparation". (See 01-10B-2 Engine Tune-up Preparation.)

Note
- Idle speed is not adjustable.
- Idle speed verification requires PDS/IDS.

2. Verify that the idling speed (PDS/IDS: RPM PID) is within the specification using the PDS/IDS function.

Specification
No load: 725—775 rpm
A/C ON: 725—775 rpm

- If not as specified, inspect the following parts.
  - — APP sensor
  - — ECT sensor
  - — CMP sensor
  - — CKP sensor
  - — Fuel pressure sensor
  - — Fuel injector
  - — Supply pump
- If the parts are normal, replace the PCM.

Correction Procedure
MAF correction
Using PDS/IDS

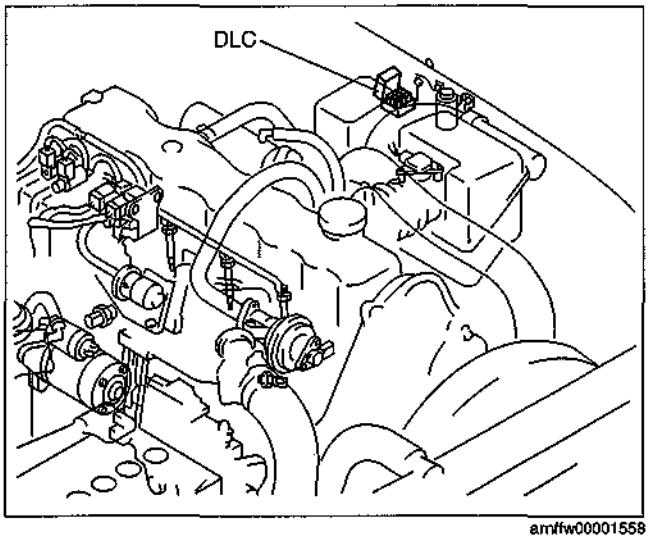
Note
- Perform this procedure after replacing the MAF/IAT sensor No.2 or at the recommended interval as described under "E.G.R. system" in "SCHEDULED MAINTENANCE."

1. Perform "Engine Tune-up Preparation". (See 01-10B-2 Engine Tune-up Preparation.)
2. After the vehicle is identified, select the following items from the initial screen of the PDS/IDS.
   - When using the IDS (notebook PC)
     1. Select the "Powertrain".
     2. Select the "Engine Checks".
   - When using the PDS (pocket PC)
     1. Select "All Tests and Calibrations".
3. Then, select the "Learning", "MAF Correction" and perform procedures according to directions on the PDS/IDS screen.
4. Perform the MAF correction according to the directions on the PDS/IDS screen.

Without using PDS/IDS

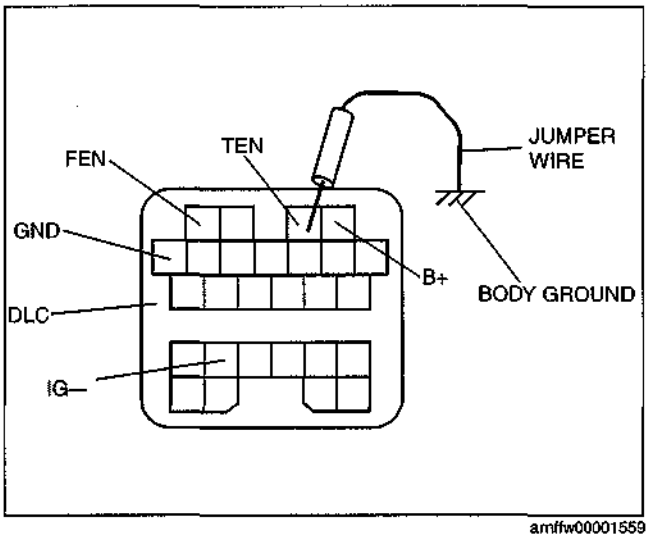
Note
- The glow indicator light illuminates while MAF learning is performed, and flashes five times after it is completed.

1. Short the DLC terminal TEN to body ground using a jumper wire.



amffw00001558

2. Short circuit the DLC terminal TEN five times within 5 s.



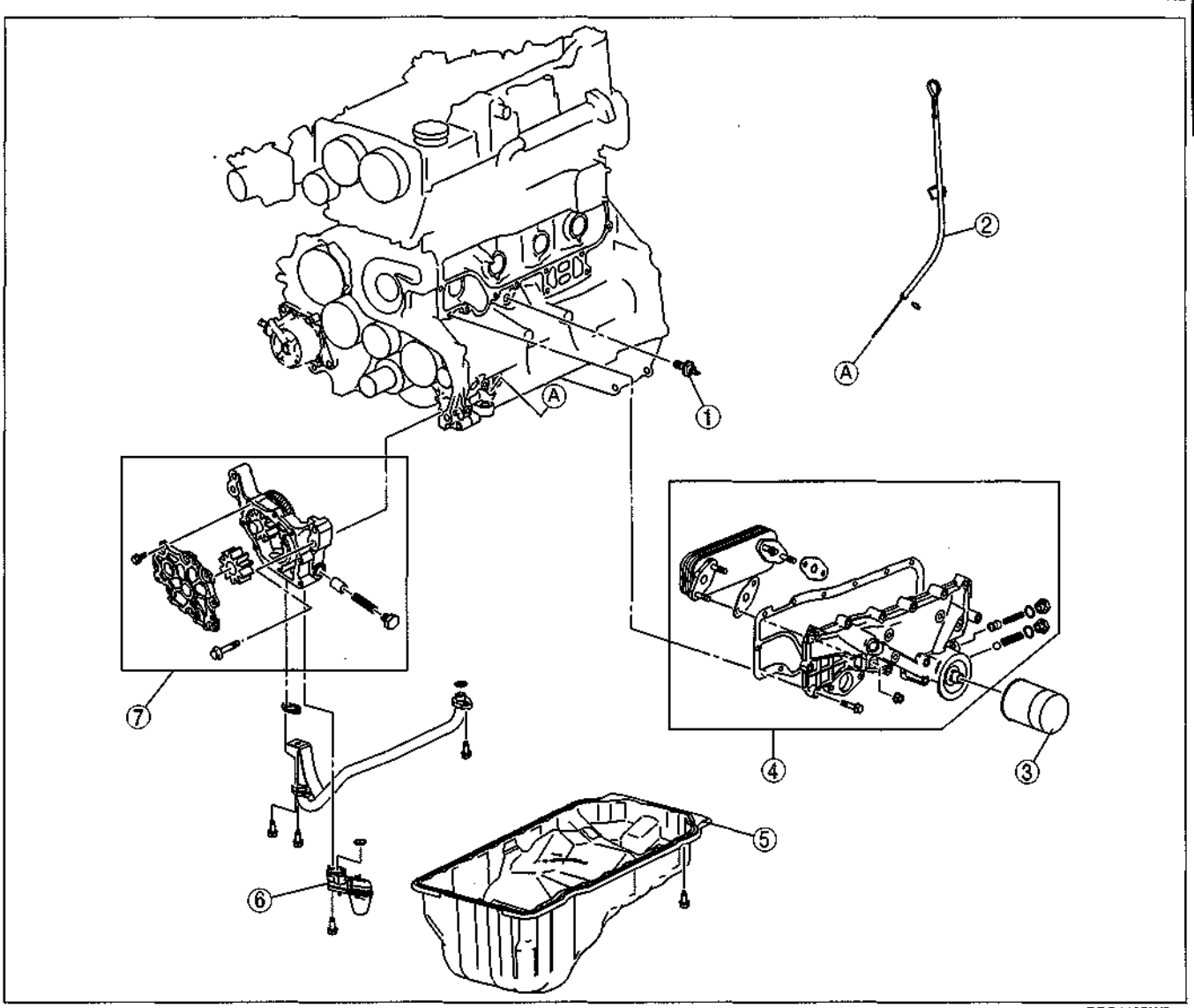
amffw00001559

01-11B LUBRICATION [WL-C, WE-C]

LOCATION INDEX [WL-C, WE-C] 01-11B–1
OIL PRESSURE INSPECTION [WL-C, WE-C]..... 01-11B–2
ENGINE OIL LEVEL INSPECTION [WL-C, WE-C] 01-11B–2
ENGINE OIL REPLACEMENT [WL-C, WE-C]..... 01-11B–3
OIL FILTER REPLACEMENT [WL-C, WE-C]..... 01-11B–3
OIL COOLER REMOVAL/ INSTALLATION [WL-C, WE-C] 01-11B–4
OIL COOLER BODY INSPECTION [WL-C, WE-C] 01-11B–5
OIL PAN REMOVAL/INSTALLATION [WL-C, WE-C] 01-11B–5
OIL PUMP REMOVAL/ INSTALLATION [WL-C, WE-C] 01-11B–7
OIL PUMP INSPECTION [WL-C, WE-C] 01-11B–10

LOCATION INDEX [WL-C, WE-C]

dcf011100000w02



DBG110BWB78

1	Oil pressure switch (See 01-11B-2 OIL PRESSURE INSPECTION [WL-C, WE-C].)
2	Oil level gauge (See 01-11B-2 ENGINE OIL LEVEL INSPECTION [WL-C, WE-C].) (See 01-11B-3 ENGINE OIL REPLACEMENT [WL-C, WE-C].)

3	Oil filter (See 01-11B-3 OIL FILTER REPLACEMENT [WL-C, WE-C].)
4	Oil cooler (See 01-11B-4 OIL COOLER REMOVAL/ INSTALLATION [WL-C, WE-C].) (See 01-11B-5 OIL COOLER BODY INSPECTION [WL-C, WE-C].)

5	Oil pan (See 01-11B-5 OIL PAN REMOVAL/INSTALLATION [WL-C, WE-C].)
6	Oil strainer (See 01-11B-7 OIL PUMP REMOVAL/ INSTALLATION [WL-C, WE-C].)

7	Oil pump component (See 01-11B-7 OIL PUMP REMOVAL/ INSTALLATION [WL-C, WE-C].) (See 01-11B-10 OIL PUMP INSPECTION [WL-C, WE-C].)

OIL PRESSURE INSPECTION [WL-C, WE-C]

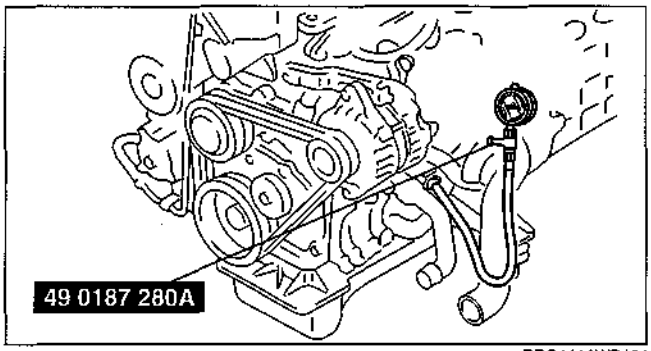
dcf011114000w02

Warning
- **Continuous exposure with USED engine oil has caused skin cancer in laboratory mice. Protect your skin by washing with soap and water immediately after this work.**
- **When the engine and the oil are hot, they can badly burn. Turn off the engine and wait until they are cool.**

1. Remove the oil pressure switch.
2. Screw the **SST** into the oil pressure switch installation hole.
3. Warm up the engine to normal operating temperature.
4. Run the engine at the specified speed, and note the gauge readings.

Note
- The oil pressure can vary with oil viscosity and temperature.

Oil pressure [2,500 rpm]
410—570 kPa {4.19—5.81 kgf/cm^2, 59.6—82.6 psi}

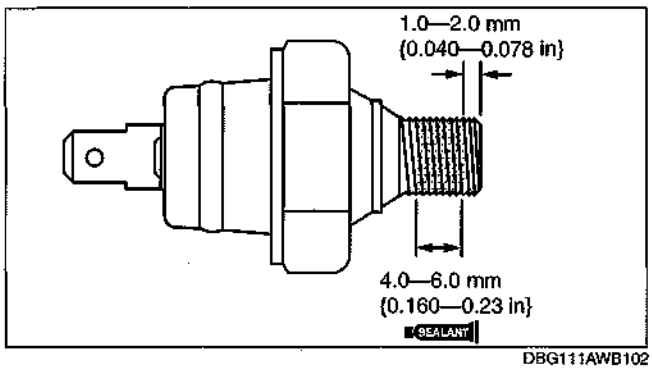


DBG111AWB101

5. If the pressure is not as specified, inspect for the cause and repair or replace as necessary.
6. Stop the engine and wait until it becomes cool.
7. Remove the **SST**.
8. Apply silicone sealant to the oil pressure switch threads as shown.
9. Install the oil pressure switch before the sealant hardens.

Tightening torque
11.8—17.6 N·m {1.2—1.8 kgf·m, 9—13 ft·lbf}

10. Start the engine and inspect for oil leakage.



DBG111AWB102

ENGINE OIL LEVEL INSPECTION [WL-C, WE-C]

dcf011114001w03

1. Position the vehicle on level ground.
2. Warm up the engine to normal operating temperature and stop it.
3. Wait for five minutes.
4. Remove the dipstick and inspect for oil level and condition. Verify that the oil level is within the F and L marks on the dipstick.
5. Add or replace oil if necessary.

ENGINE OIL REPLACEMENT [WL-C, WE-C]

dcf011114001w04

Warning
- **When the engine and the engine oil are hot, they can badly burn. Don't burn yourself with either.**
- **A vehicle that is lifted but not securely supported on safety stands is dangerous. It can slip or fall, causing death or serious injury. Never work around or under a lifted vehicle if it is not securely supported on safety stands.**
- **Continuous exposure with USED engine oil has caused skin cancer in laboratory mice. Protect your skin by washing with soap and water immediately after this work.**

1. Position the vehicle on level ground.
2. Remove the oil filler cap and the oil pan drain plug.
3. Drain the oil into a container.
4. Install the drain plug by using a new washer.

Tightening torque
29.4—41.2 N·m {3.00—4.20 kgf·m, 21.7—30.3 ft·lbf}

5. Refill the engine oil with the specified type and amount of engine oil.
6. Refit the oil filler cap.
7. Run the engine and inspect for oil leakage.
8. Inspect the oil level and add oil if necessary. (See 01-11B-2 ENGINE OIL LEVEL INSPECTION [WL-C, WE-C].)

Note
- The actual oil level may very from the specified capacity in some cases.

Recommended engine oil

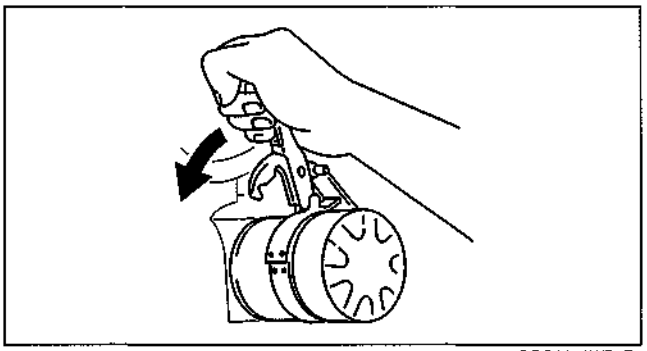
Item	Specification
Grade	API CD/CE/CF–4 or ACEA B1/B3/B5
Viscosity (SAE)	5W–30, 10W–30

Oil capacity (approx. quantity)
Oil replacement: 6.8 {7.2 US qt, 6.0 Imp qt}
Oil and oil filter replacement: 7.0 {7.4 US qt, 6.2 Imp qt}
Total (dry engine): 8.0 {8.5 US qt, 7.0 Imp qt}

OIL FILTER REPLACEMENT [WL-C, WE-C]

dcf011114300w02

1. Remove the oil filter by using the filter wrench.
2. Use a clean rag to wipe off the mounting surface on the oil filter body.
3. Apply engine oil to the O-ring and tighten the filter according to the installation directions on the side of the oil filter using the filter wrench.
4. Start the engine and inspect for oil leakage.
5. Inspect for the oil level and add oil if necessary. (See 01-11B-2 ENGINE OIL LEVEL INSPECTION [WL-C, WE-C].)(See 01-11B-3 ENGINE OIL REPLACEMENT [WL-C, WE-C].)

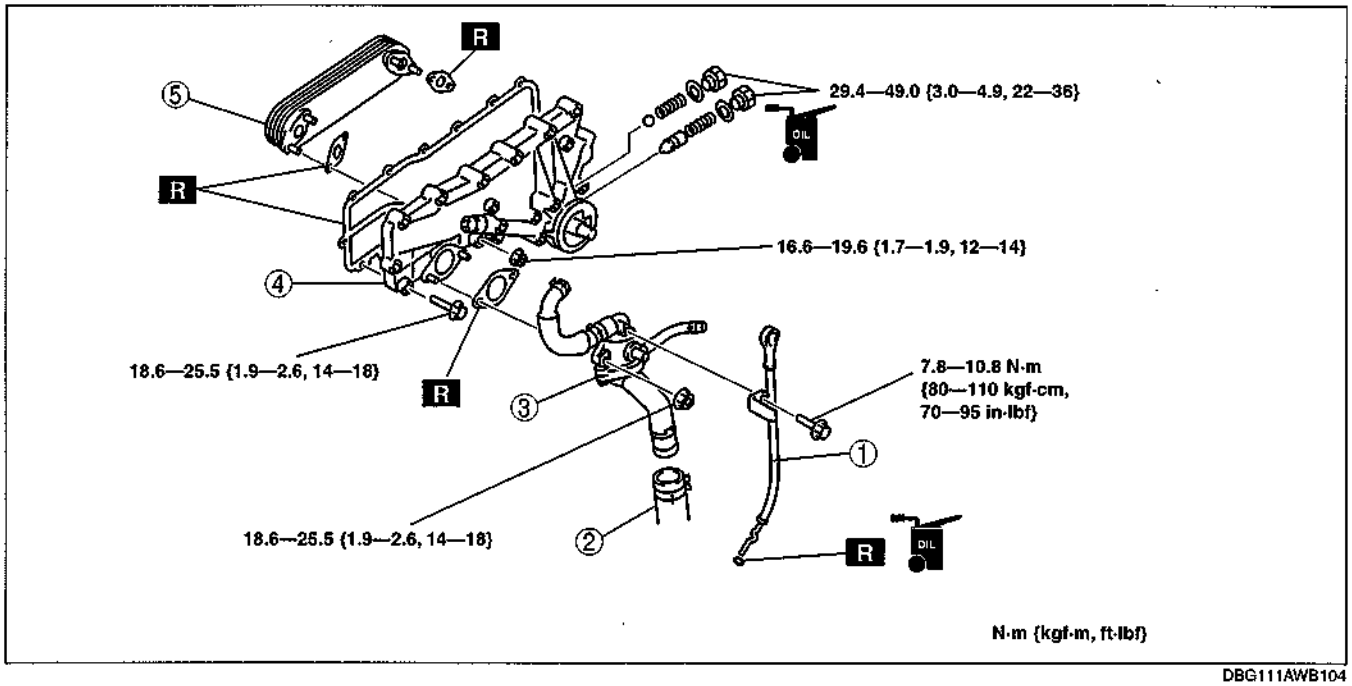


DBG111AWB1R3

OIL COOLER REMOVAL/INSTALLATION [WL-C, WE-C]

dcf011114700w03

1. Disconnect the negative battery cable.
2. Drain the engine coolant. (See 01-12B-3 ENGINE COOLANT REPLACEMENT [WL-C, WE-C].)
3. Remove the turbocharger. (See 01-15B-2 EXHAUST SYSTEM REMOVAL/INSTALLATION [WL-C, WE-C].)
4. Remove the oil filter. (See 01-11B-3 OIL FILTER REPLACEMENT [WL-C, WE-C].)
5. Remove in the order shown in the figure.
6. Install in the reverse order of removal.
7. Fill the radiator with the specified amount and type of engine coolant. (See 01-12B-3 ENGINE COOLANT REPLACEMENT [WL-C, WE-C].)
8. Inspect the engine oil level. (See 01-11B-2 ENGINE OIL LEVEL INSPECTION [WL-C, WE-C].)
9. Start the engine and inspect for engine coolant leakage.



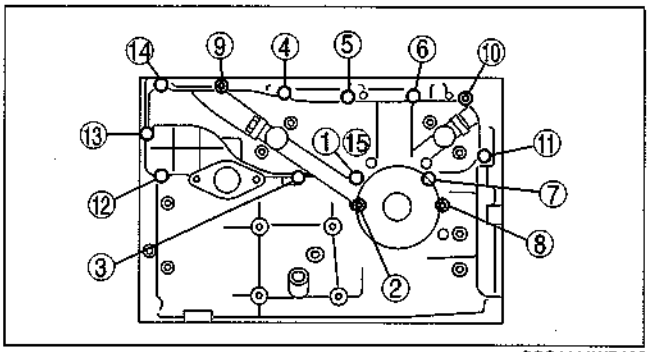
DBG111AWB104

1	Dipstick pipe
2	Radiator hose
3	Thermostat case

4	Oil cooler body (See 01-11B-4 Oil Cooler Body Installation Note.)
5	Oil cooler

Oil Cooler Body Installation Note

- Tighten the mounting bolts and nuts in the order shown.



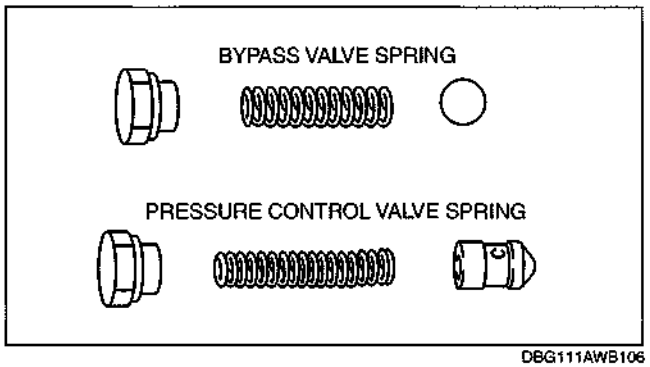
DBG111AWB105

OIL COOLER BODY INSPECTION [WL-C, WE-C]

dcf011114700w04

- Measure the spring free length. Replace the spring if necessary.

Standard free length
Bypass valve spring: 36.7 mm {1.44 in}
Pressure control valve spring: 54.7 mm {2.15 in}

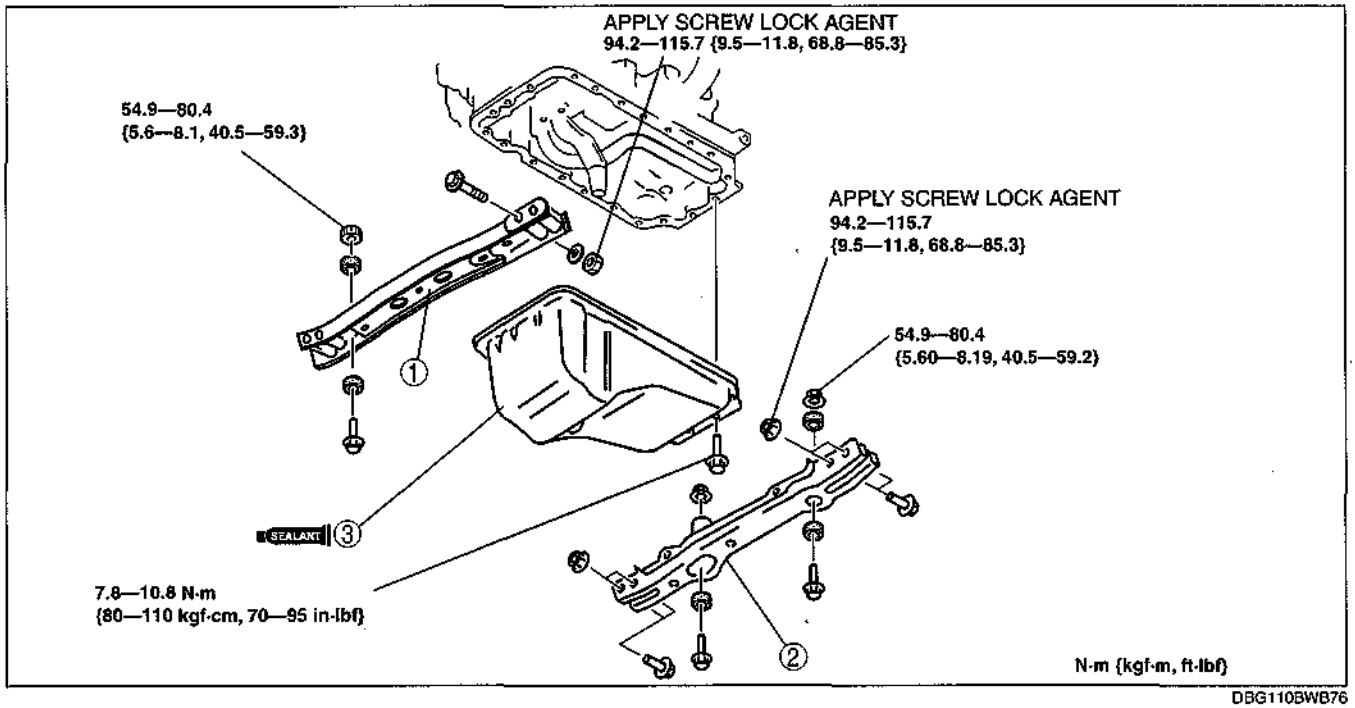


DBG111AWB106

OIL PAN REMOVAL/INSTALLATION [WL-C, WE-C]

dcf011110040w02

1. Disconnect the negative battery cable.
2. Drain the engine oil. (See 01-11B-3 ENGINE OIL REPLACEMENT [WL-C, WE-C].)
3. Remove the under cover.
4. Remove the front stabilizer. (See 02-13-16 FRONT STABILIZER AND TENSION ROD REMOVAL/INSTALLATION [4x2 (EXCEPT Hi-Rider)].) (See 02-13-17 FRONT STABILIZER REMOVAL/INSTALLATION [Hi-Rider, 4x4].)
5. Disconnect the center link on the left side of the vehicle. (See 06-14-10 STEERING GEAR AND LINKAGE REMOVAL/INSTALLATION.)
6. Remove in the order shown in the figure.
7. Install in the reverse order of removal.
8. Fill with the specified amount and type of engine oil. (See 01-11B-3 ENGINE OIL REPLACEMENT [WL-C, WE-C].)
9. Start the engine and inspect for engine oil leakage.

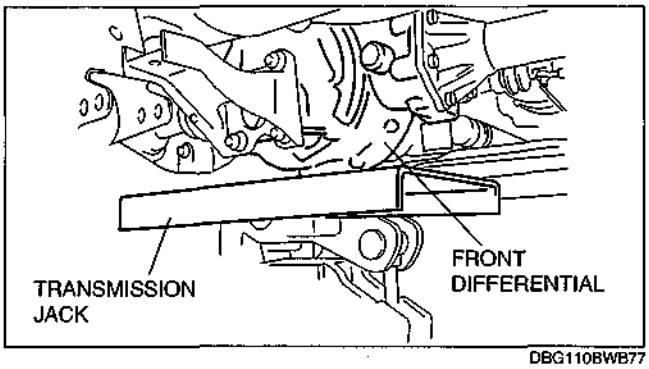


DBG110BWB76

1	Front crossmember
2	Rear crossmember (4x4) (See 01-11B-6 Rear Crossmember Removal Note.)
3	Oil pan (See 01-11B-6 Oil Pan Removal Note.) (See 01-11B-7 Oil Pan Installation Note.)

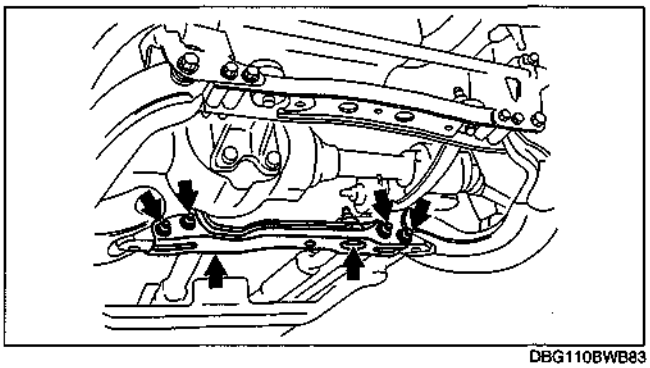
Rear Crossmember Removal Note

1. Set the transmission jack on the front differential.



DBG110BWB77

2. Remove the bolts and nuts indicated in the figure.



DBG110BWB83

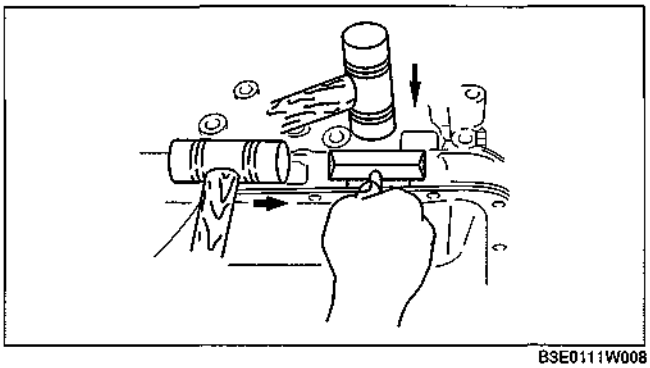
Oil Pan Removal Note

1. Remove the oil pan mounting bolts.

Caution

- **Pry tools can easily scratch the cylinder block and oil pan contact surfaces. Prying off the oil pan can also easily bend the oil pan flange.**

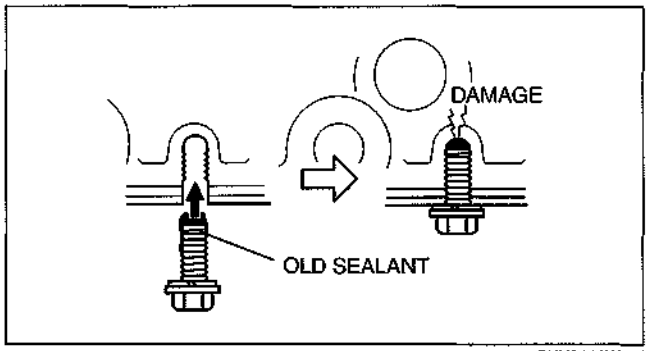
2. Use a separate tool to separate the oil pan.



B3E0111W008

Oil Pan Installation Note

Caution
- **If the bolts are reused, remove the old sealant from the bolt threads. Tightening a bolt that has old sealant on it can cause bolt hole damage.**

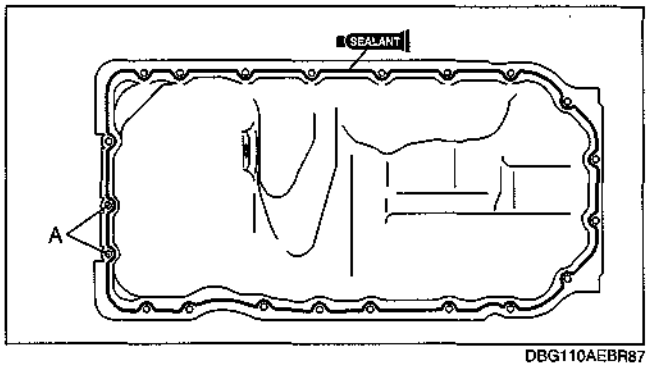


CHU0111W004

1. Apply silicone sealant to the oil pan along the inside of the bolt holes and overlap the ends.

   Thickness
   ø2.0—3.0 mm {0.08—0.11 in}

2. Tighten the oil pan bolts A as indicated in the figure.
3. Tighten the remaining oil pan bolts in several passes.

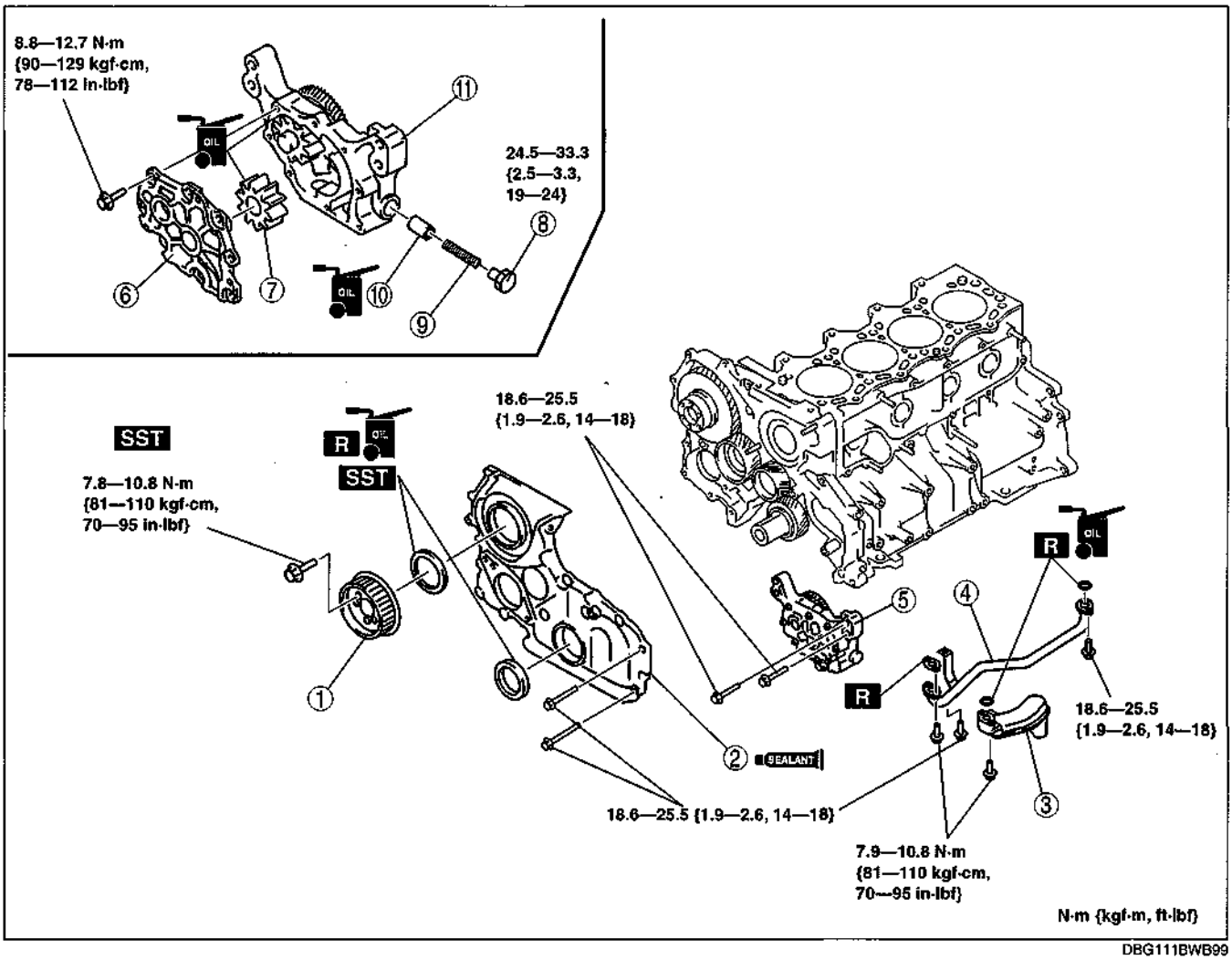


DBG110AEBR87

OIL PUMP REMOVAL/INSTALLATION [WL-C, WE-C]

dcf011114100w03

1. Disconnect the negative battery cable.
2. Drain the engine oil. (See 01-11B-3 ENGINE OIL REPLACEMENT [WL-C, WE-C].)
3. Remove the under cover.
4. Remove the oil pan. (See 01-11B-5 OIL PAN REMOVAL/INSTALLATION [WL-C, WE-C].)
5. Remove the timing belt. (See 01-10B-7 TIMING BELT REMOVAL/INSTALLATION [WL-C, WE-C].)
6. Remove the crankshaft pulley. (See 01-10B-16 FRONT OIL SEAL REPLACEMENT [WL-C, WE-C].)
7. Remove in the order shown in the figure.
8. Install in the reverse order of removal.
9. Fill with the specified amount and type of engine oil. (See 01-11B-3 ENGINE OIL REPLACEMENT [WL-C, WE-C].)
10. Start the engine and inspect for engine oil leakage.



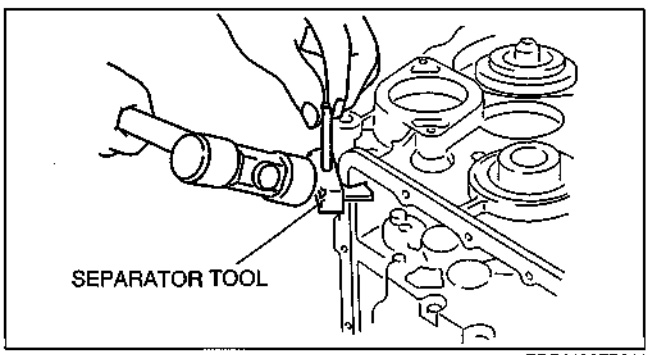
DBG111BWB99

1	Fuel injection pump pulley
2	Timing gear cover (See 01-11B-8 Timing Gear Cover Removal Note) (See01-11B-9 Timing Gear Cover Installation Note)
3	Oil strainer
4	Oil pipe (See01-11B-9 Oil Pipe Installation Note)
5	Oil pump

6	Oil pump cover (See01-11B-9 Oil Pump Cover Installation Note)
7	Driven gear
8	Plug
9	Plunger spring
10	Control plunger
11	Oil pump body

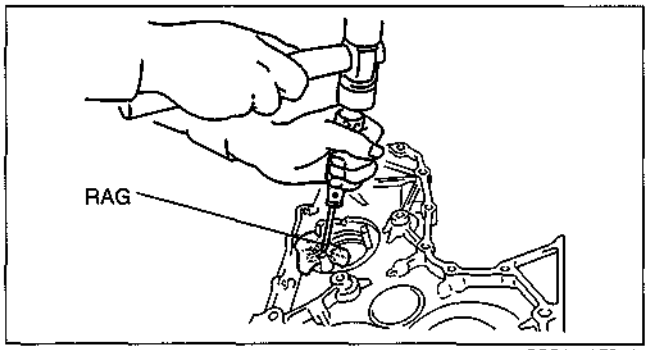
Timing Gear Cover Removal Note

1. Remove the timing gear cover by using a separator tool.



DBG110AEB044

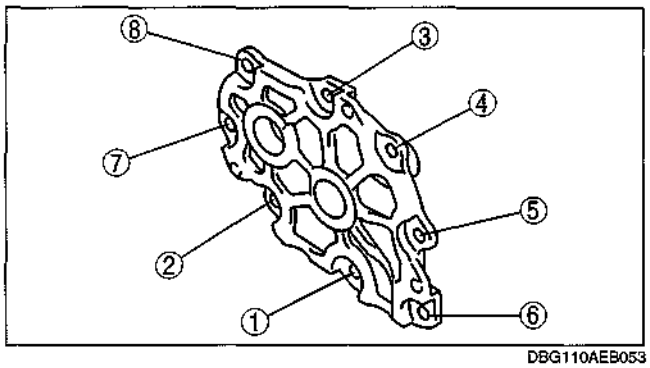
2. Remove the oil seal by using a screwdriver protected with a rag,



DBG110AEB045

Oil Pump Cover Installation Note

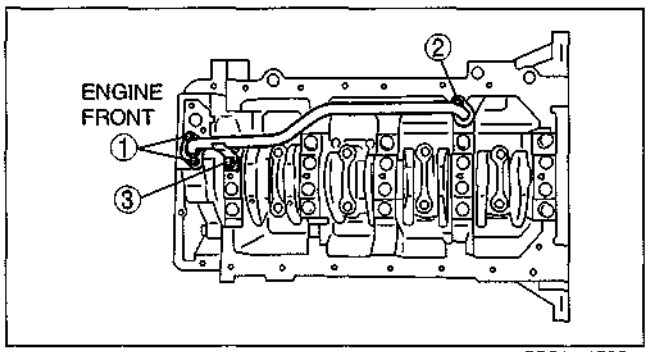
1. Tighten the bolts in two or three steps in the order shown.



DBG110AEB053

Oil Pipe Installation Note

1. Tighten the bolts in two or three steps in the order shown.

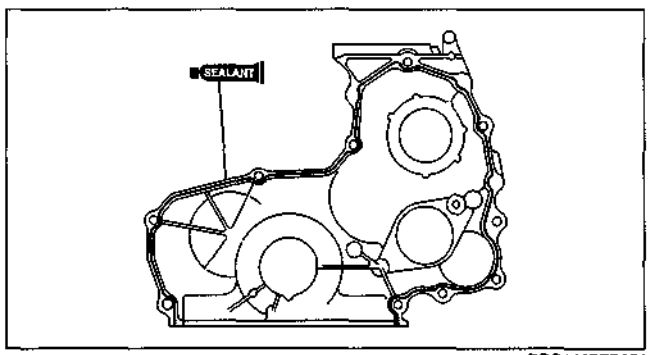


DBG110AEBR89

Timing Gear Cover Installation Note

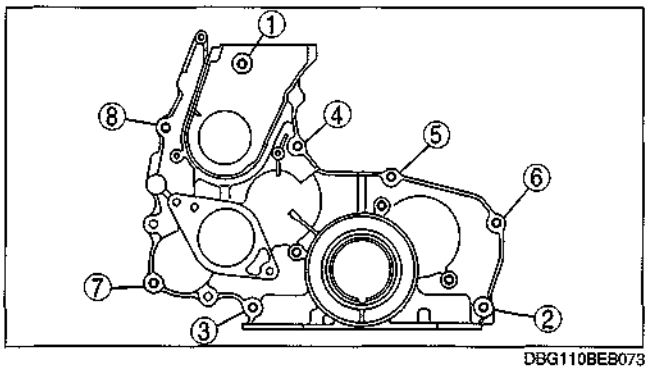
1. Apply silicone sealant to the timing gear cover as shown.

   Thickness
   ϕ2.0—3.0 mm {0.079—0.118 in}



DBG110BEB071

2. Tithe bolts in two or three steps in the order shown.
3. Apply soapy water along the perimeter of the new oil seal.
4. Push the oil seal slightly in by hand.

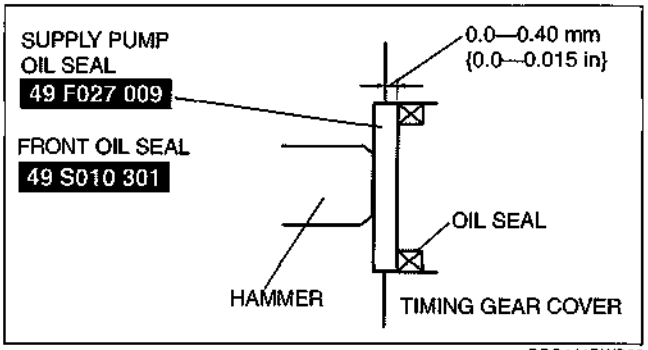


DBG110BEB073

5. Tap the oil seal in evenly using the **SST** and a hammer.
6. To ensure that the oil seal is installed correctly, measure the distance between the end of the timing gear cover and the face of the oil seal.

Front oil seal press-in amount
0.0—0.40 mm {0.0—0.015 in}

Fuel injection pump oil seal press-in amount
0.0—0.40 mm {0.0—0.015 in}



DBG111BWB98

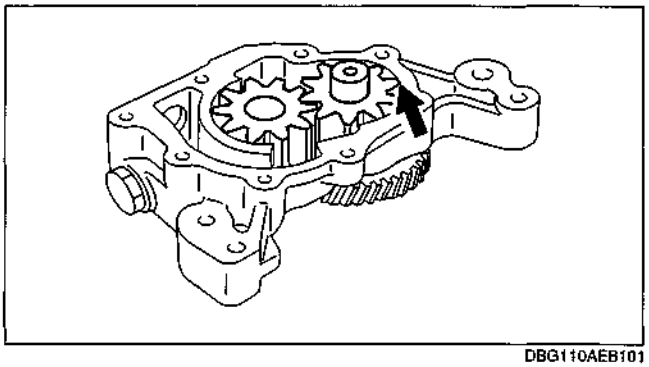
dcf011114100w04

OIL PUMP INSPECTION [WL-C, WE-C]

1. Measure the following clearance.
   - If it exceeds the maximum specification, replace the gear and/or pump body.

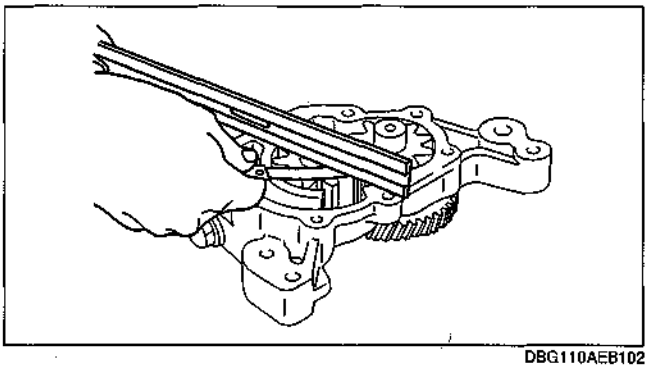
Standard oil pump tip clearance
0.10—0.19 mm {0.0040—0.0074 in}

Maximum oil pump tip clearance
0.20 mm {0.0079 in}


DBG110AEB101

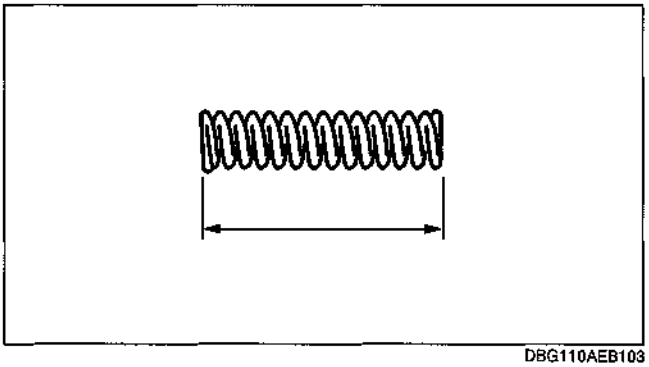
Standard oil pump side clearance
0.04—0.09 mm {0.0016—0.0035 in}

Maximum oil pump side clearance
0.15 mm {0.0059 in}


DBG110AEB102

2. Measure the free length of plunger spring.
   - If it exceeds the standard specification, replace the plunger spring.

Standard plunger spring length
43.8 mm {1.72 in}


DBG110AEB103

01-12B COOLING SYSTEM [WL-C, WE-C]

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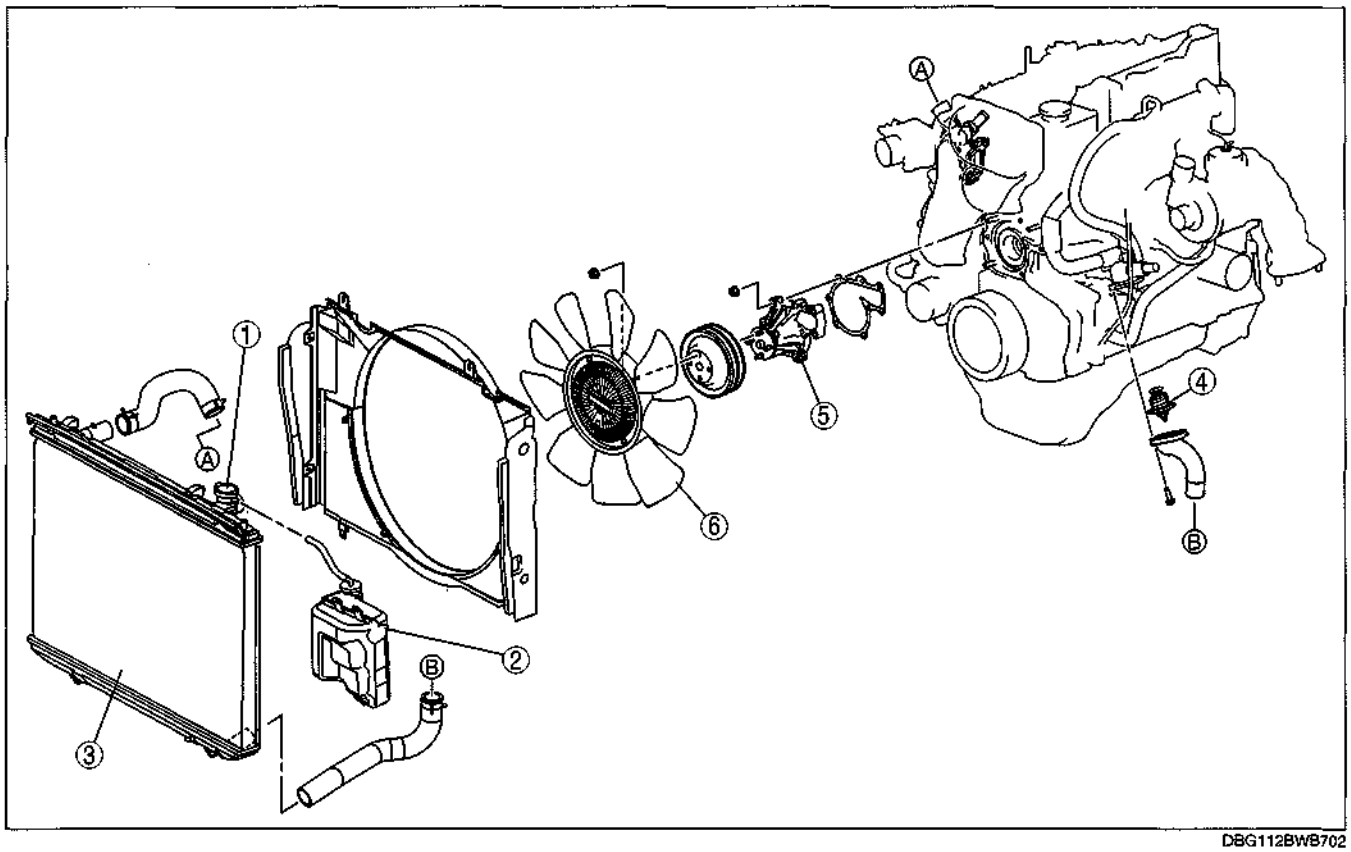


DBG112BWB702

1	Cooling system cap (See 01-12B-5 COOLING SYSTEM CAP INSPECTION [WL-C, WE-C].)
2	Coolant reserve tank (See 01-12B-6 COOLANT RESERVE TANK REMOVAL/INSTALLATION [WL-C, WE-C].)
3	Radiator (See 01-12B-6 RADIATOR REMOVAL/ INSTALLATION [WL-C, WE-C].)

4	Thermostat (See 01-12B-7 THERMOSTAT REMOVAL/ INSTALLATION [WL-C, WE-C].) (See 01-12B-8 THERMOSTAT INSPECTION [WL-C, WE-C].)
5	Water pump (See 01-12B-9 WATER PUMP REMOVAL/ INSTALLATION [WL-C, WE-C].)
6	Cooling fan (See 01-12B-8 COOLING FAN REMOVAL/ INSTALLATION [WL-C, WE-C]) (See 01-12B-8 COOLING FAN INSPECTION [WL-C, WE-C].)

COOLING SYSTEM SERVICE WARNINGS [WL-C, WE-C]

dcf011200000w04

Warning

- **Never remove the cooling system cap while the engine is running, or when the engine and radiator are hot. Scalding coolant and steam may shoot out and cause serious injury. It may also damage the engine and cooling system.**
- **Turn off the engine and wait until it is cool. Even then, be very careful when removing the cap. Wrap a thick cloth around it and slowly turn it counterclockwise to the first stop. Step back while the pressure escapes.**
- **When you are sure all the pressure is gone, press down on the cap using the cloth, turn it, and remove it.**

ENGINE COOLANT LEVEL INSPECTION [WL-C, WE-C]

dcf011215001w05

1. Remove the radiator cap.
2. Verify that the coolant level is near the radiator filler neck.
3. Verify that the coolant level in the radiator reservoir is between the FULL and LOW marks.
4. Add coolant if necessary.

ENGINE COOLANT PROTECTION INSPECTION [WL-C, WE-C]

dcf011215001w06

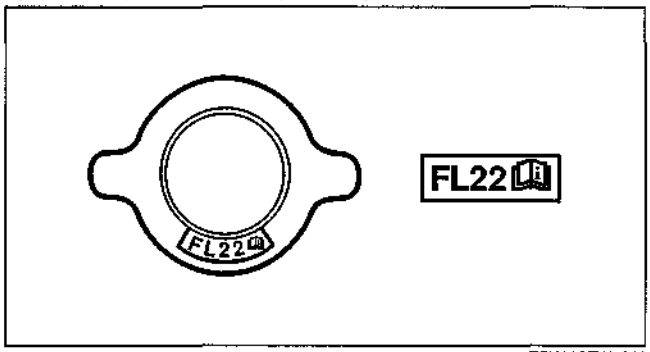
1. Measure the coolant temperature and specific gravity using a thermometer and a hydrometer.

Caution

- **Use engine coolant at a concentration that meets the environmental conditions in which the vehicle is driven, otherwise engine damage could occur.**
- **The engine has aluminum parts and must be protected by an ethylene-glycol-based coolant to prevent corrosion and freezing.**
- **Do not use coolants containing Alcohol, Methanol, Borate or Silicate. These coolants could damage the cooling system.**
- **Use only soft (demineralized) water in the coolant mixture. Water that contains minerals will cut down on the coolant's effectiveness.**
- **Engine coolant damages paint. If engine coolant does get on a painted surface, rinse it off quickly.**

Note

- If the "FL22" mark is shown on or near the cooling system cap, use FL22 type engine coolant.
- FL22 type engine coolant is shipped as a diluted solution (55% coolant, 45% water). Use the solution as is when replacing coolant.



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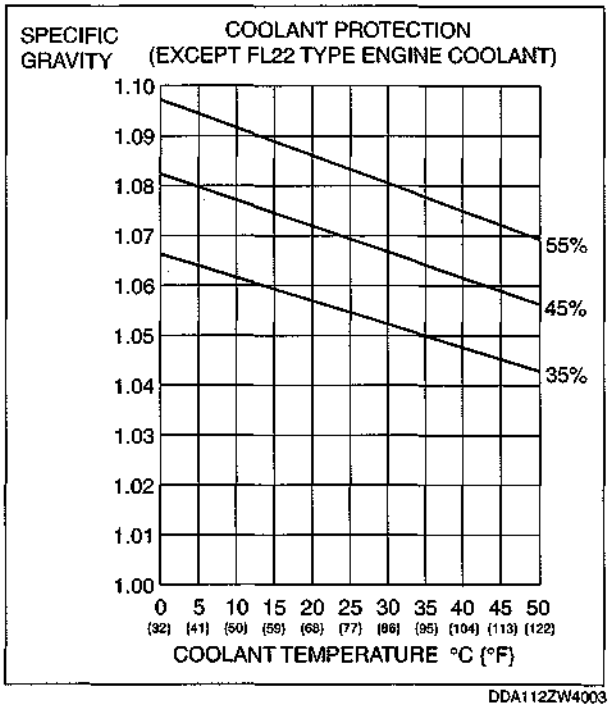
2. Determine the coolant protection level by referring to the graph shown.
   - If the coolant protection level is not correct, add water or coolant.



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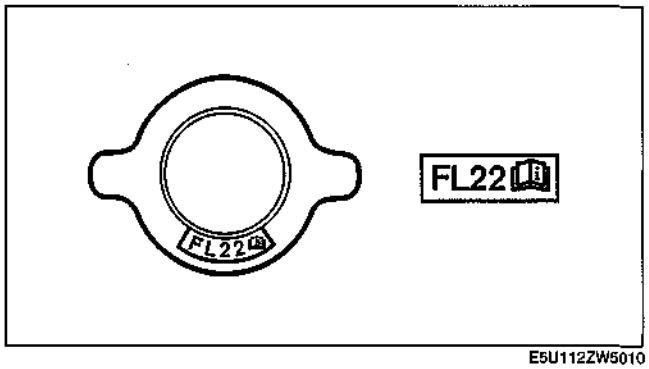
ENGINE COOLANT REPLACEMENT [WL-C, WE-C]

dcf011215001w07

Warning
- **Never remove the cooling system cap while the engine is running, or when the engine and radiator are hot. Scalding coolant and steam may shoot out and cause serious injury. It may also damage the engine and cooling system.**
- **Turn off the engine and wait until it is cool. Even then, be very careful when removing the cap. Wrap a thick cloth around it and slowly turn it counterclockwise to the first stop. Step back while the pressure escapes.**
- **When you are sure all the pressure is gone, press down on the cap using the cloth, turn it, and remove it.**

Caution
- **Use engine coolant at a concentration that meets the environmental conditions in which the vehicle is driven, otherwise engine damage could occur.**
- **The engine has aluminum parts and must be protected by an ethylene-glycol-based coolant to prevent corrosion and freezing.**
- **Do not use coolants containing Alcohol, Methanol, Borate or Silicate. These coolants could damage the cooling system.**
- **Use only soft (demineralized) water in the coolant mixture. Water that contains minerals will cut down on the coolant's effectiveness.**
- **Engine coolant damages paint. If engine coolant does get on a painted surface, rinse it off quickly.**

Note
- If the "FL22" mark is shown on or near the cooling system cap, use FL22 type engine coolant.
- FL22 type engine coolant is shipped as a diluted solution (55% coolant, 45% water). Use the solution as is when replacing coolant.

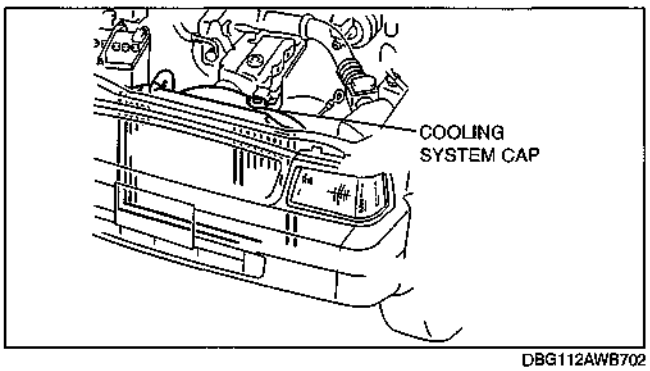


E5U112ZW5010

Engine coolant capacity (approx. quantity)
9.4 L {9.9 US qt, 8.3 Imp qt}

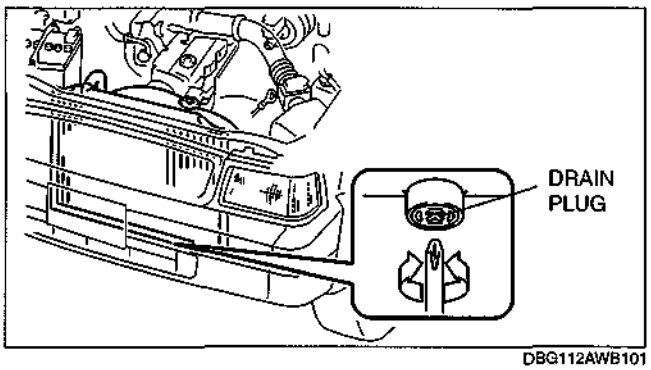
1. Remove the coolant reserve tank with the hose still connected.
2. Remove the coolant reserve tank cap and drain the engine coolant from the coolant reserve tank.

3. Remove the cooling system cap.



DBG112AWB702

4. Loosen the radiator drain plug and drain the engine coolant into a container.
5. Flush the cooling system with water until all traces of color are gone.
6. Let the system drain completely.
7. Tighten the radiator drain plug.
8. Referring to the following chart, select the correct volume percentage of the water and coolant.



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Antifreeze solution mixture percentage (Except FL22 type engine coolant)

Engine coolant protection	Volume percentage (%)		Gravity at 20 °C {68 °F}
	Water	Coolant	
Above -16 °C {3 °F}	65	35	1.057
Above -26 °C {-15 °F}	55	45	1.072
Above -40 °C {-40 °F}	45	55	1.086

9. Refill the coolant from the cooling system filler neck until it is close to the top of the cooling system filler neck.
10. Refill the coolant into the coolant reserve tank up to the F mark on the tank.
11. Install the cooling system cap.

Caution
- **If the water temperature gauge rises too high, stop the engine and decrease the water temperature to prevent overheating. Then, verify the malfunctioning part and repair or replace it.**

12. Start the engine and warm up the engine by idling.
13. After the engine warms up, perform the following steps. At this time, be careful of the coolant temperature to prevent overheating.
    (1) Run the engine at **approx. 2,500 rpm** for **5 min.**
    (2) Run the engine at **approx. 3,000 rpm** for 5 s, then idle.
    (3) Repeat step (2) 4—5 times.
14. Stop the engine, and inspect the coolant level after the coolant temperature decreases. If it is low, repeat steps 10—14.
15. Inspect for coolant leakage. (See 01-12B-5 ENGINE COOLANT LEAKAGE INSPECTION [WL-C, WE-C].)
    - If the coolant leaks, specify the malfunctioning part and repair or replace it.

ENGINE COOLANT LEAKAGE INSPECTION [WL-C, WE-C]

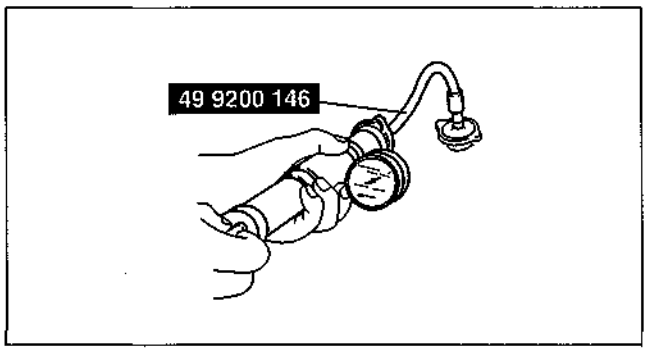
dcf011215001w08

Warning
- **Removing the radiator cap while the engine is running, or when the engine and radiator are hot is dangerous. Scalding coolant and steam may shoot out and cause serious injury. It may also damage the engine and cooling system.**
- **Turn off the engine and wait until it is cool. Even then, be very careful when removing the cap. Wrap a thick cloth around it and slowly turn it counterclockwise to the first stop. Step back while the pressure escapes.**
- **When you're sure all the pressure is gone, press down on the cap still using the cloth, turn it, and remove it.**

1. Inspect the engine coolant level. (See 01-12B-2 ENGINE COOLANT LEVEL INSPECTION [WL-C, WE-C].)
2. Remove the radiator cap.
3. Clean the installation parts of the cooling system cap.
4. Connect a radiator cap tester and the **SST** to the radiator filler neck.
5. Apply pressure to the radiator.

Pressure
122 kPa {1.25 kgf/cm^2, 17.7 psi}

Caution
- **Applying more than 122 kPa {1.25 kgf/cm^2, 17.7 psi} can damage the hoses, fittings, and other components, and cause leakage.**



DBG112BWB001

6. Verify that the pressure is help. If not, inspect the system for coolant leakage.

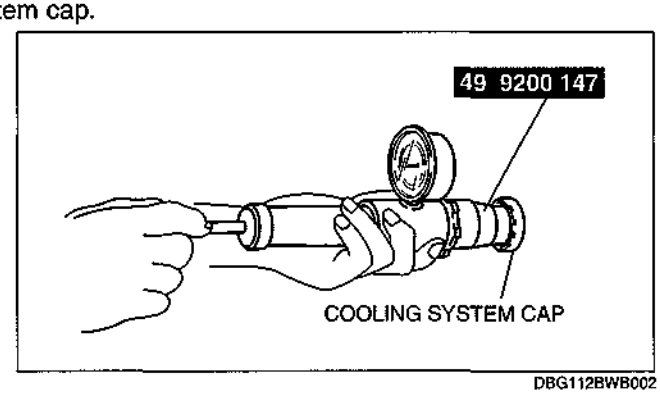
COOLING SYSTEM CAP INSPECTION [WL-C, WE-C]

dcf011215201w02

Warning
- **Removing the radiator cap while the engine is running, or when the engine and radiator are hot is dangerous. Scalding coolant and steam may shoot out and cause serious injury. It may also damage the engine and cooling system.**
- **Turn off the engine and wait until it is cool. Even then, be very careful when removing the cap. Wrap a thick cloth around it and slowly turn it counterclockwise to the first stop. Step back while the pressure escapes.**
- **When you're sure all the pressure is gone, press down on the cap still using the cloth, turn it, and remove it.**

1. Clean the cooling system cap and the sealed part.
2. Inspect the cooling system cap for cracks or everted seal.
   - If there is any malfunction, replace the cooling system cap.
3. Attach the cooling system cap to the **SST** and a radiator cap tester.
4. Hold the cooling system cap downward and apply pressure gradually. Verify that the pressure is held stable for **10 s.**
   - If the pressure is not held stable, replace the cooling system cap.

Cooling system cap valve opening pressure
93.2—122.6 kPa {0.95—1.25 kgf/cm^2, 13.5—17.8 psi}



DBG112BWB002

COOLANT RESERVE TANK REMOVAL/INSTALLATION [WL-C, WE-C]

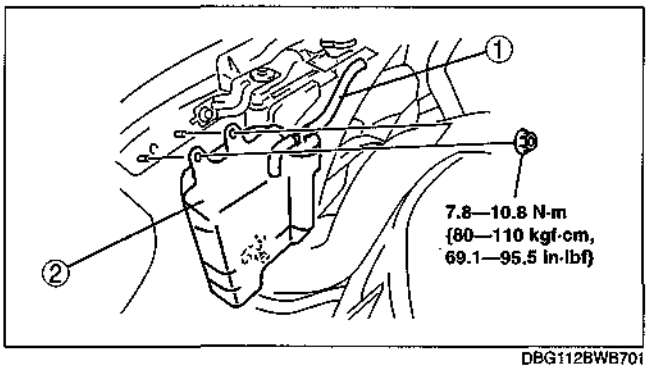
dcf011215030w02

Warning
- **Remove and install all parts when the engine is cold, otherwise they can cause severe burns or serious injury.**

1. Remove in the order indicated in the table.

1	Hose
2	Coolant reserve tank

2. Install in the reverse order of removal.



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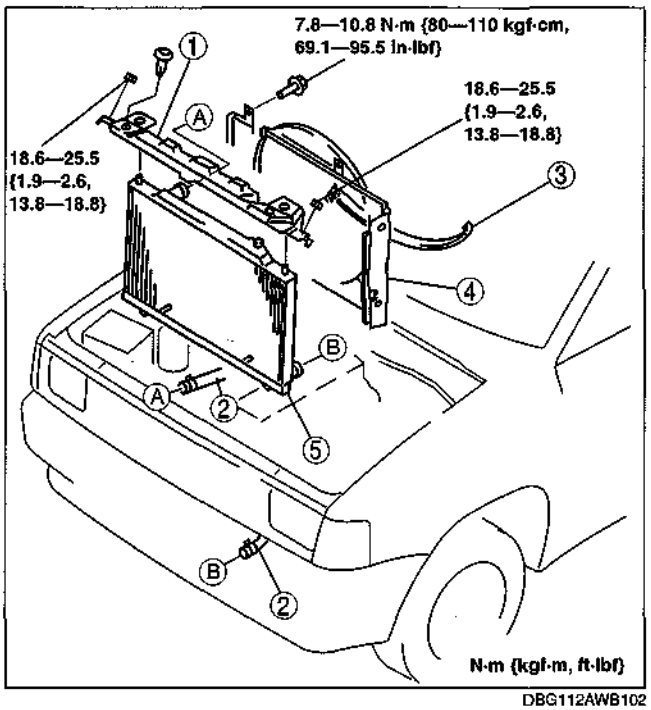
RADIATOR REMOVAL/INSTALLATION [WL-C, WE-C]

dcf011215200w02

Warning
- **Remove and install all parts when the engine is cold, otherwise they can cause severe burns or serious injury.**

1. Drain the engine coolant. (See 01-12B-3 ENGINE COOLANT REPLACEMENT [WL-C, WE-C].)
2. Remove in the order indicated in the table.
3. Install in the reverse order of removal.
4. Fill the radiator with the specified amount and type of engine coolant.(See 01-12B-3 ENGINE COOLANT REPLACEMENT [WL-C, WE-C].)

1	Radiator upper seal
2	Radiator hose
3	Lower radiator cowling
4	Radiator cowling
5	Radiator



DBG112AWB102

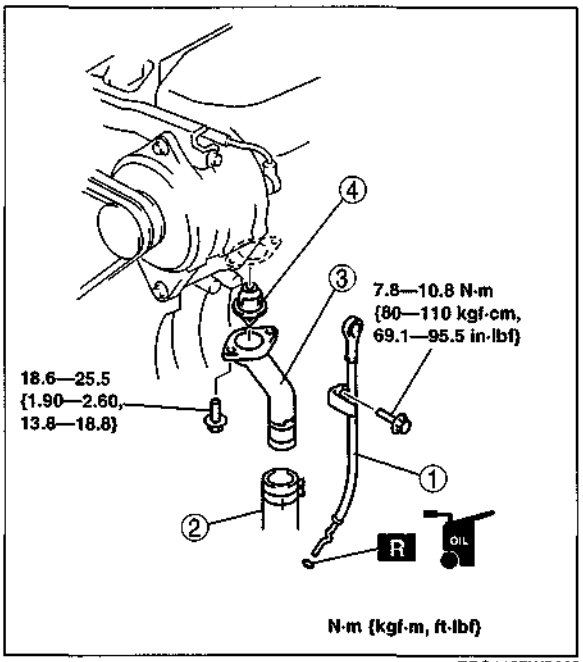
THERMOSTAT REMOVAL/INSTALLATION [WL-C, WE-C]

dcf011215171w03

Warning
- **Remove and Install all parts when the engine is cold, otherwise they can cause severe burns or serious injury.**

1. drain the engine coolant.(See 01-12B-3 ENGINE COOLANT REPLACEMENT [WL-C, WE-C].)
2. Remove in the order indicated in the table.
3. Install in the reverse order of removal.
4. Fill the radiator with the specified amount and type of engine coolant. (See 01-12B-3 ENGINE COOLANT REPLACEMENT [WL-C, WE-C].)

1	Dipstick pipe
2	Lower radiator hose
3	Thermostat cover
4	Thermostat (See 01-12B-7 Thermostat Installation Note.)



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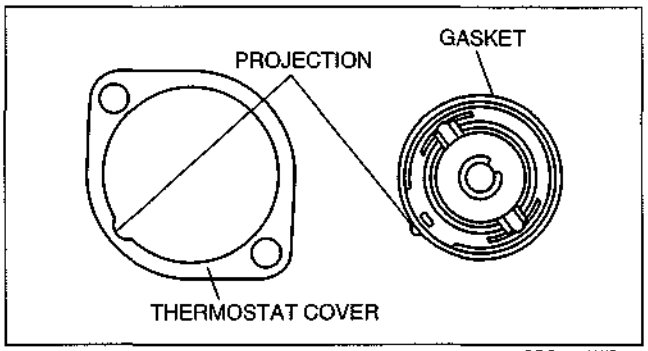
Thermostat Installation Note

- Install the thermostat into the thermostat cover, aligning the projection on the gasket to the thermostat cover as shown.



DBG112AWB104

THERMOSTAT INSPECTION [WL-C, WE-C]

dcf011215171w04

Warning
- **During inspection, the thermostat and water are extremely hot and they can badly burn. Do not touch the thermostat and water directly.**

Inspect the thermostat for the following and replace as necessary.
- Open valve in room temperature
- Opening temperature and lift of valve

Initial-opening temperature and lift of the valve
80—84 °C {176—183 °F}

Full open temperature
95 °C {203 °F}

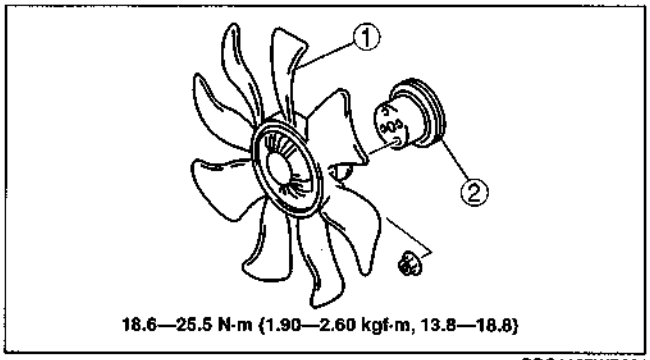
Full open life
8.5 mm {0.33 in} or more

COOLING FAN REMOVAL/INSTALLATION [WL-C, WE-C]

dcf011215140w03

1. Remove the drive belt.
2. Remove in the order indication in the table.
3. Install in the reverse order of removal.
4. Adjust the drive belt (generator) deflection. (See 01-10B-4 DRIVE BELT ADJUSTMENT [WL-C, WE-C].)

1	Cooling fan
2	Water pump pulley



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COOLING FAN INSPECTION [WL-C, WE-C]

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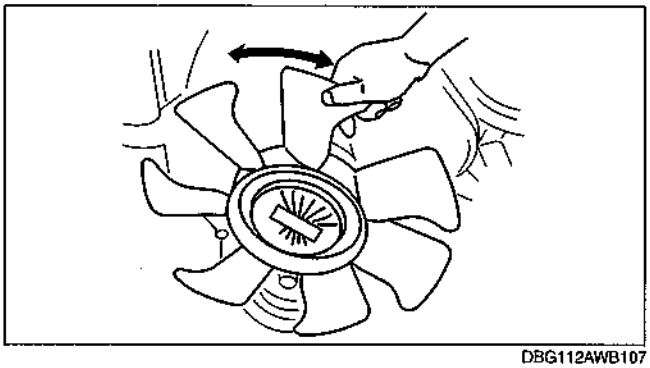
1. Rotate the cooling fan by hand and inspect for abnormal noise and looseness. Replace the cooling fan id necessary. (See 01-12A-8 COOLING FAN REMOVAL/INSTALLATION [WL-3].)



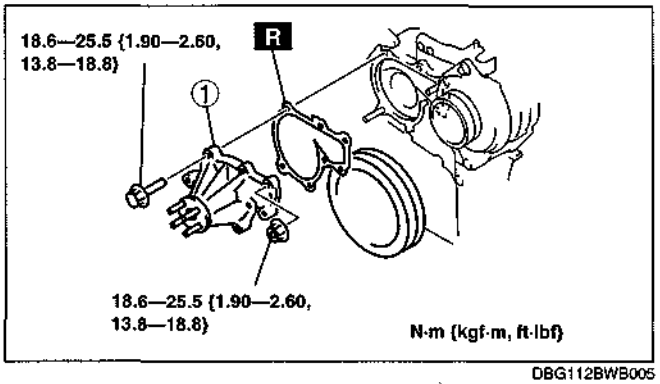
DBG112AWB107

WATER PUMP REMOVAL/INSTALLATION [WL-C, WE-C]

dcf011215010w02

1. Remove the cooling fan. (See 01-12B-8 COOLING FAN REMOVAL/INSTALLATION [WL-C, WE-C].)
2. Drain the engine coolant. (See 01-12B-3 ENGINE COOLANT REPLACEMENT [WL-C, WE-C]
3. Remove in the reverse order of removal.
4. Install in the reverse order of removal.
5. Fill the radiator with the specified amount and type of engine coolant. (See 01-12B-3 ENGINE COOLANT REPLACEMENT [WL-C, WE-C].)

1	Water pump



DBG112BWB005

01-13B INTAKE-AIR SYSTEM [WL-C, WE-C]

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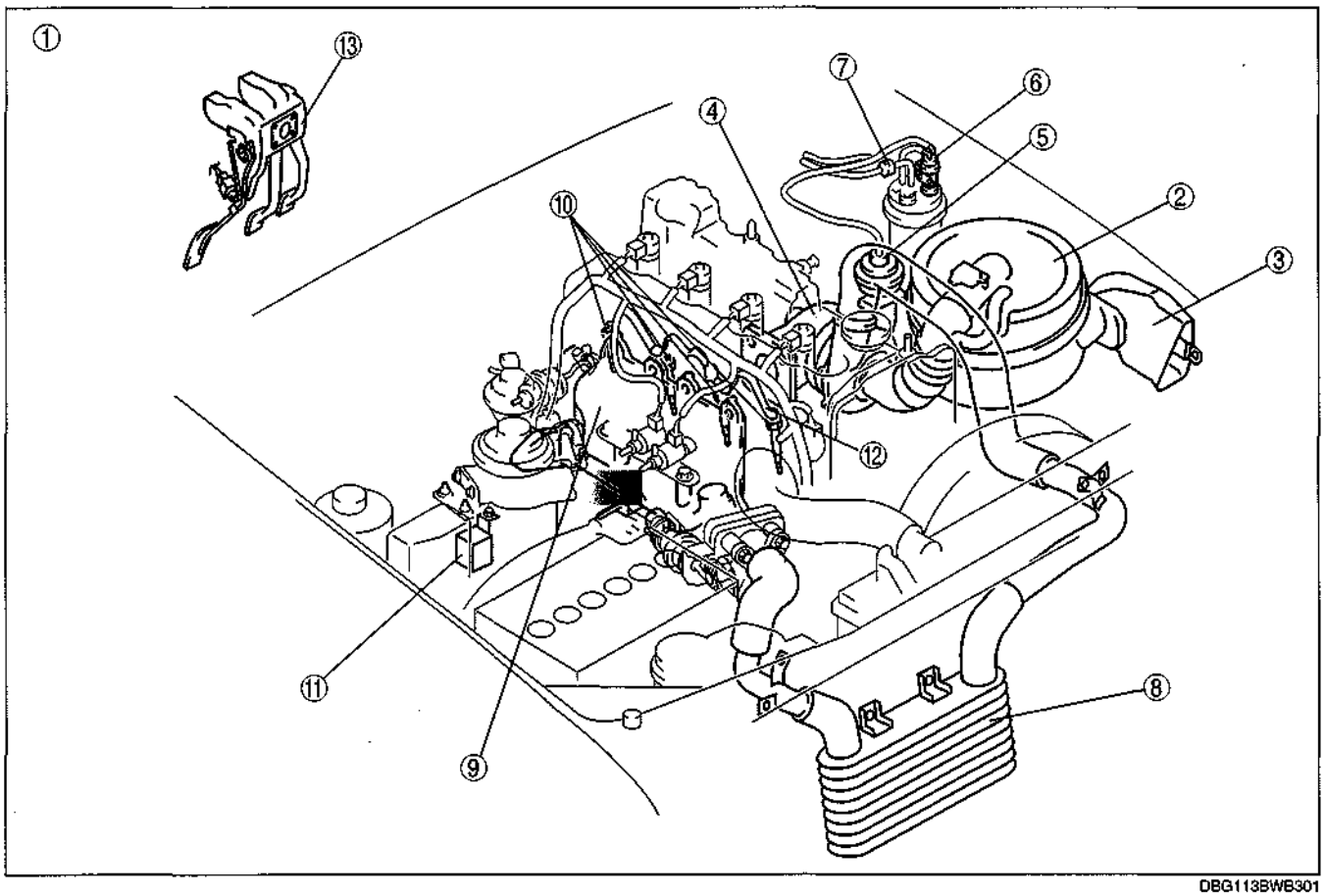
ADJUSTMENT [WL-C, WE-C] 01-13B–12

INTAKE-AIR SYSTEM LOCATION INDEX [WL-C, WE-C]

dcf011300000w04



DBG113BWB301

1	Intake-air system (See 01-13B-3 INTAKE-AIR SYSTEM REMOVAL/ INSTALLATION [WL-C, WE-C].)
2	Air cleaner (See 01-13B-5 AIR CLEANER ELEMENT INSPECTION [WL-C, WE-C].)
3	Fresh-air duct (See 01-13B-3 INTAKE-AIR SYSTEM REMOVAL/ INSTALLATION [WL-C, WE-C].)

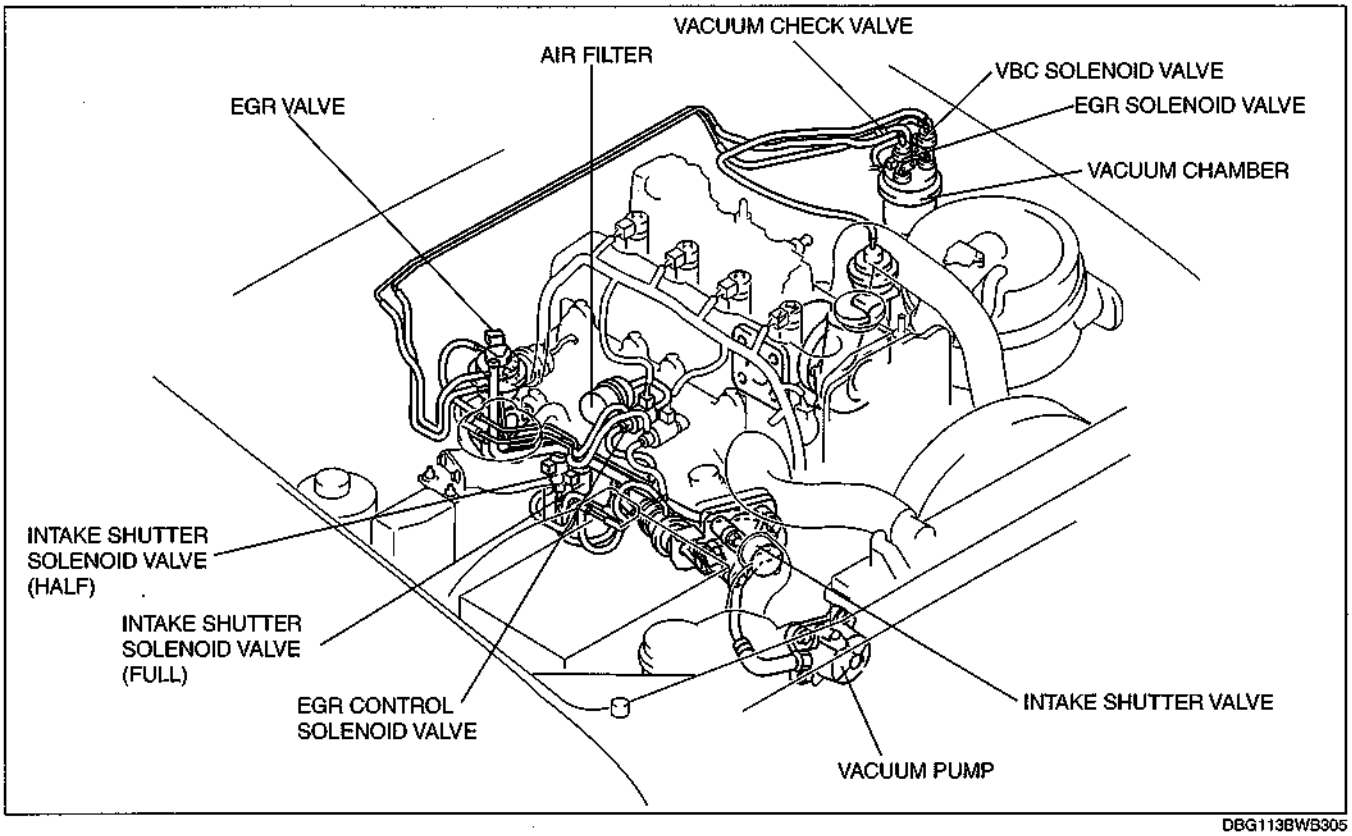
4	Turbocharger (See 01-13B-5 TURBOCHARGER INSPECTION [WL-C, WE-C].)
5	Guide blade actuator (See 01-13B-5 TURBOCHARGER INSPECTION [WL-C, WE-C].)
6	VBC solenoid valve (See 01-13B-6 VARIABLE BOOST CONTROL (VBC) SOLENOID VALVE INSPECTION [WL-C, WE-C].)

7	Vacuum check valve (See 01-13B-8 VACUUM CHECK VALVE INSPECTION [WL-C, WE-C].)
8	Charge air cooler (See 01-13B-3 INTAKE-AIR SYSTEM REMOVAL/ INSTALLATION [WL-C, WE-C].)
9	Intake manifold (See 01-13B-3 INTAKE-AIR SYSTEM REMOVAL/ INSTALLATION [WL-C, WE-C].)
10	Glow plug (See 01-13B-8 GLOW PLUG REMOVAL/ INSTALLATION [WL-C, WE-C].) (See 01-13B-9 GLOW PLUG INSPECTION [WL-C, WE-C].)

11	Glow plug relay (See 01-13B-9 GLOW PLUG RELAY REMOVAL/ INSTALLATION [WL-C, WE-C].) (See 01-13B-9 GLOW PLUG RELAY INSPECTION [WL-C, WE-C].)
12	Glow plug cord (See 01-13B-11 GLOW PLUG CORD INSPECTION [WL-C, WE-C].)
13	Accelerator pedal component (See 01-13B-11 ACCELERATOR PEDAL COMPONENT REMOVAL/INSTALLATION [WL-C, WE-C].)

INTAKE-AIR SYSTEM VACUUM HOSE ROUTING DIAGRAM [WL-C, WE-C]

dcf011300000w05



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INTAKE-AIR SYSTEM REMOVAL/INSTALLATION [WL-C, WE-C]

dcf011300000w06

Warning

- **A hot engine and intake-air system can cause severe burns. Turn off the engine and wait until they are cool before removing the intake-air system.**
- **Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.**
- **Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injuries or death and damage, Fuel can also irritate skin and eyes. To prevent this, always complete the following "Fuel Line Safety Procedure". (See 01-14B-3 BEFORE REPAIR PROCEDURE [WL-C, WE-C].)**

Note

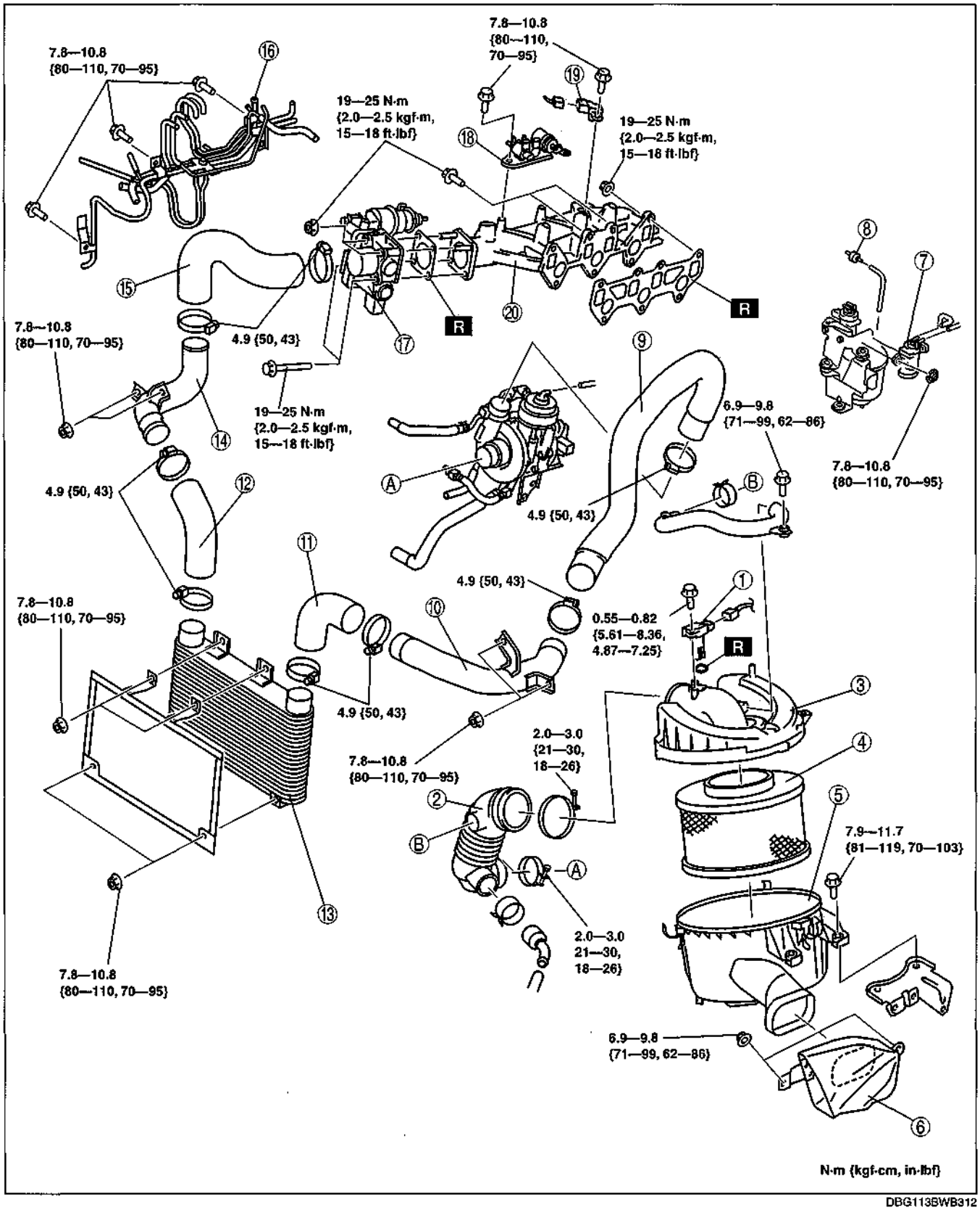
- If the MAF sensor is replaced, always perform each adjustment procedure using the following steps.

MAF sensor

STEP	ACTION	PAGE/CONDITION
1	Perform mass air flow (MAF) sensor data reset procedure.	(See 01-40B-22 MASS AIR FLOW (MAF) SENSOR DATA RESET [WL-C, WE-C].)
2	Perform KOEO self-test procedure.	(See 01-02B-10 KOEO/KOER SELF TEST [WL-C, WE-C].)
3	Turn the engine switch to the off position.	–
4	Wait for **5 s**.	–
5	Start the engine.	–
6	Perform KOER self-test procedure.	(See 01-02B-10 KOEO/KOER SELF TEST [WL-C, WE-C].)
7	Turn the engine switch to the off position.	–

1. Remove the engine cover.
2. Disconnect the negative battery cable.
3. Remove in the order indicated in the table.

4. Install in the reverse order of removal.



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1	MAF sensor/IAT sensor No.2
2	Air intake hose
3	Air cleaner cover
4	Air cleaner element
5	Air cleaner case

6	Fresh-air duct (See 01-13B-5 Fresh-Air Duct Removal Note.)
7	VBC solenoid valve
8	Vacuum check valve
9	Turbocharger air outlet hose
10	Turbocharger air outlet pipe

11	Charge air cooler inlet hose
12	Charge air cooler outlet hose
13	Charge air cooler
14	Charge air cooler air outlet pipe
15	Charge air cooler air outlet hose
16	Vacuum pipe

17	Intake shutter valve
18	EGR control solenoid valve bracket
19	Boost sensor/IAT sensor No.1
20	Intake manifold (See 01-13B-5 Intake Manifold Removal Note.)

Fresh-Air Duct Removal Note

1. Remove the front mud guard. (See 09-10-9 FRONT FENDER PANEL REMOVAL/INSTALLATION.)

Intake Manifold Removal Note

1. Set the fuel filter component slightly out of the way. (See 01-14B-9 FUEL FILTER REMOVAL/INSTALLATION [WL-C, WE-C].)
2. Remove the EGR valve and EGR pipe.
3. Remove the injection pipe. (See 01-14B-11 SUPPLY PUMP REMOVAL/INSTALLATION [WL-C, WE-C].)
4. Remove the common rail. (See 01-14B-11 SUPPLY PUMP REMOVAL/INSTALLATION [WL-C, WE-C].)

AIR CLEANER ELEMENT INSPECTION [WL-C, WE-C]

dcf011313300w02

1. Remove the air cleaner element. (See 01-13B-3 INTAKE-AIR SYSTEM REMOVAL/INSTALLATION [WL-C, WE-C].)
2. Inspect the following items:
   - If there is any malfunction, clean or replace the air cleaner element.
   - If the replacement interval has come, replace the air cleaner element.
     - — Is the air cleaner element soiled, damaged, or bent?
     - — Are the air cleaner case and the air cleaner element correctly sealed?
     - — Is the correct air cleaner element installed?

TURBOCHARGER INSPECTION [WL-C, WE-C]

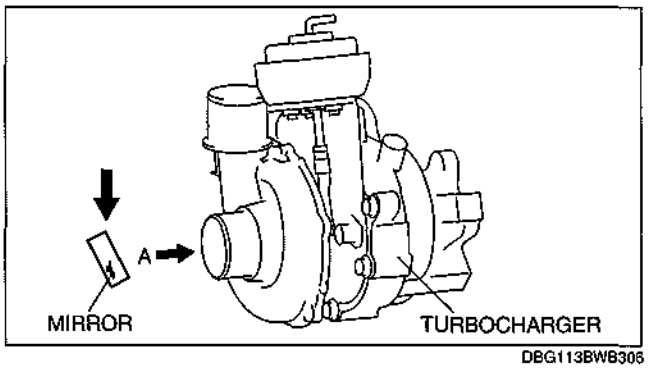
dcf011313700w02

Note

- Before performing the following inspection, make sure to follow the procedure as indicated in the troubleshooting flowchart. (See 00-00-5 Troubleshooting Procedure.)

Compressor Wheel Inspection

1. Remove the engine cover.
2. Remove the air intake hose between the air cleaner and the turbocharger. (See 01-13B-3 INTAKE-AIR SYSTEM REMOVAL/INSTALLATION [WL-C, WE-C].)
3. Visually inspect the compressor wheel from view A and verify that all fins are free from damage, cracks or bends.
   - If there are damaged fins, cracks or bends, replace the turbocharger. (See 01-15B-2 EXHAUST SYSTEM REMOVAL/INSTALLATION [WL-C, WE-C].)



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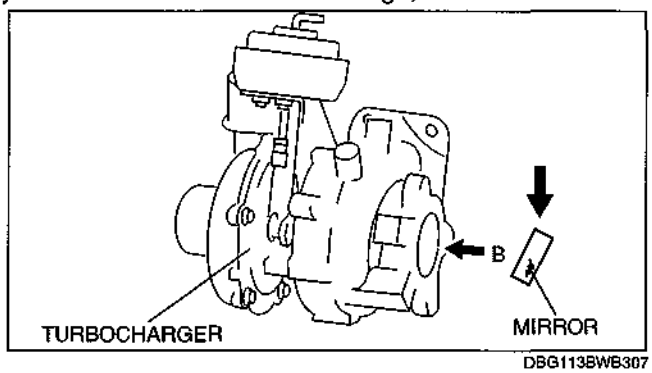
Note

- To make the inspection easier, set a small mirror as shown in the figure and use a penlight.
- If the compressor wheel is interfering with the compressor housing, it is likely that the fin edges are cracked, damaged, or bent.
- If the compressor wheel is damaged, check the following before replacing the turbocharger to avoid reoccurrence of the malfunction.
  - — Foreign material in intake air/exhaust system.
  - — Oil pipe clogging.

Turbine Wheel Inspection

1. Remove the engine cover.
2. Remove the joint pipe. (See 01-15B-2 EXHAUST SYSTEM REMOVAL/INSTALLATION [WL-C, WE-C].)
3. Visually inspect the turbine wheel from view B and verify that all fins are free from damage, cracks or bends.
   - If there are damaged fins, cracks or bends, replace the turbocharger. (See 01-15B-2 EXHAUST SYSTEM REMOVAL/ INSTALLATION [WL-C, WE-C].)



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Note

- To make the inspection easier, set a small mirror as shown in the figure and use a penlight.
- If the turbine wheel is interfering with the turbine housing, it is likely that the fin edges are cracked, damaged, or bent.
- If the turbine wheel is damaged, check the following before replacing the turbocharger to avoid reoccurrence of the malfunction.
  - — Foreign material in intake air/exhaust system.
  - — Oil pipe clogging.

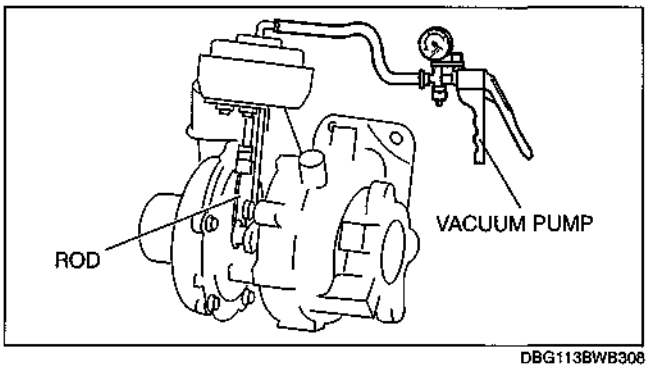
GUIDE BLADE ACTUATOR INSPECTION [WL-C, WE-C]

dcf011313700w03

1. Disconnect the vacuum hose from the guide blade actuator.
2. Connect the vacuum pump to the guide blade actuator.
3. Apply vacuum and verify that the rod moves as specified.
   - If not as specified, replace the turbocharger.

Specification

Vacuum (kPa {mmHg, inHg})	Rod movement
Below –14.2 {–106, –4.19}	Starts to move
Above –47.3 {–355, –14.0}	Fully pulled



DBG113BWB308

VARIABLE BOOST CONTROL (VBC) SOLENOID VALVE INSPECTION [WL-C, WE-C]

dcf011318748w01

Note

- Perform the following test only when directed.

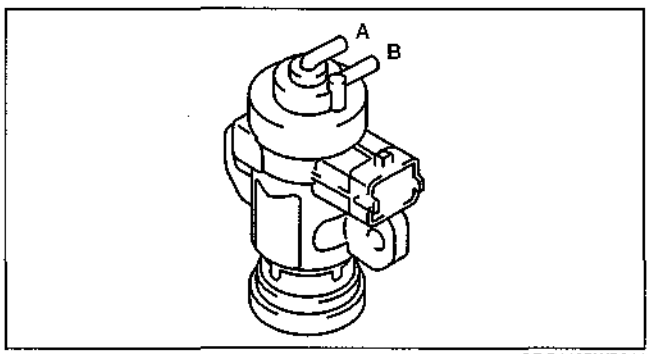
Airflow Inspection

1. Disconnect the negative battery cable.
2. Remove the VBC solenoid valve. (See 01-13B-3 INTAKE-AIR SYSTEM REMOVAL/INSTALLATION [WL-C, WE-C].)
3. Inspect airflow between the ports under the following conditions.
   - If not as specified, replace the VBC solenoid valve. (See 01-13B-3 INTAKE-AIR SYSTEM REMOVAL/ INSTALLATION [WL-C, WE-C].)
   - If as specified, carry out the "Resistance Inspection".

O—O : Continuity O═O : Airflow

Step	Terminal		Port	
	A	B	A	B
1	O—O			
2	B+	GROUND	O═O	

DBG113BWB322



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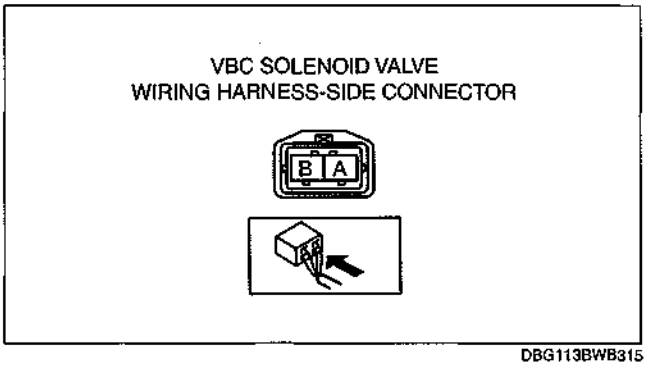
Resistance Inspection

1. Disconnect the negative battery cable.
2. Disconnect the VBC solenoid valve connector. (See 01-13B-3 INTAKE-AIR SYSTEM REMOVAL/INSTALLATION [WL-C, WE-C].)
3. Measure the resistance between the VBC solenoid valve terminals using an ohmmeter.
   - If not as specified, replace the VBC solenoid valve. (See 01-13B-3 INTAKE-AIR SYSTEM REMOVAL/INSTALLATION [WL-C, WE-C].)
   - If VBC solenoid valve is okay, perform the "Circuit Open/Short Inspection".

VBC solenoid valve resistance
12.6—15.4 ohms [20—30 °C {67—86 °F}]



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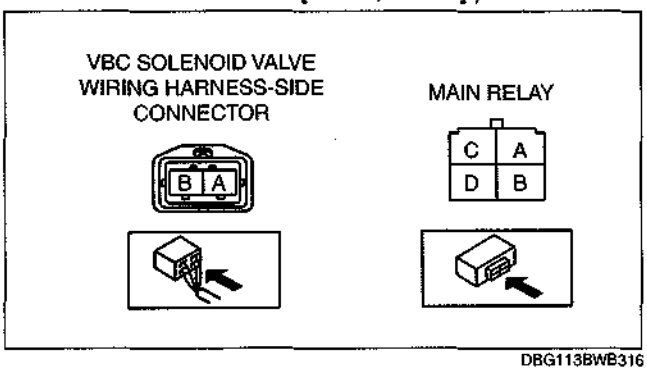
Circuit Open/Short Inspection

1. Disconnect the PCM connector. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
2. Inspect the following wiring harness for open or short circuit (continuity Inspection).



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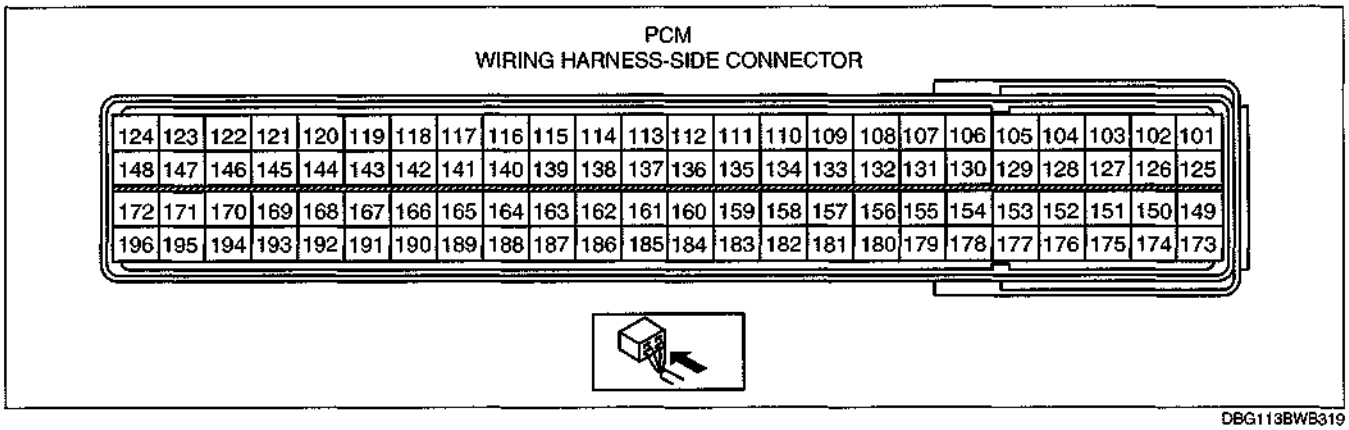

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Open circuit

- If there is no continuity, the circuit is open. Repair or replace the wiring harness.
  - — VBC solenoid valve terminal A and main relay terminal D
  - — VBC solenoid valve terminal B and PCM terminal 178

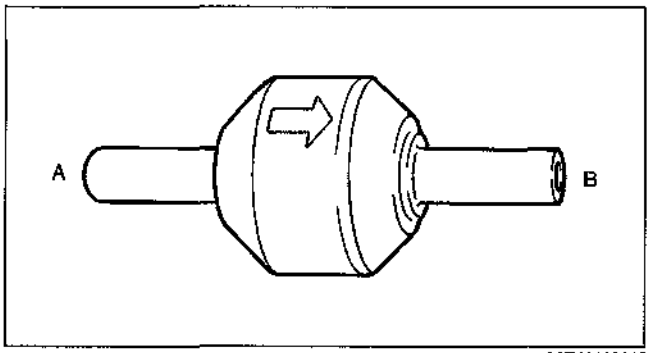
Short circuit

- If there is continuity, the circuit is shorted. Repair or replace the wiring harness.
  - — VBC solenoid valve terminal A and body ground
  - — VBC solenoid valve terminal B and power supply
  - — VBC solenoid valve terminal B and body ground

VACUUM CHECK VALVE INSPECTION [WL-C, WE-C]

dcf011318748w02

1. Remove the vacuum check valve. (See 01-13B-3 INTAKE-AIR SYSTEM REMOVAL/INSTALLATION [WL-C, WE-C].)
2. Blow through port A and verify that the airflows from port B.
   - If not as specified, replace the vacuum check valve. (See 01-13B-3 INTAKE-AIR SYSTEM REMOVAL/INSTALLATION [WL-C, WE-C].)
3. Blow through port B and verify that the air does not flow from port A.
   - If not as specified, replace the vacuum check valve. (See 01-13B-3 INTAKE-AIR SYSTEM REMOVAL/INSTALLATION [WL-C, WE-C].)



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GLOW PLUG REMOVAL/INSTALLATION [WL-C, WE-C]

dcf011318601w03

Warning

- **Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.**
- **Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injuries or death and damage, Fuel can also irritate skin and eyes. To prevent this, always complete the following "Fuel Line Safety Procedure". (See 01-14B-3 BEFORE REPAIR PROCEDURE [WL-C, WE-C].)**

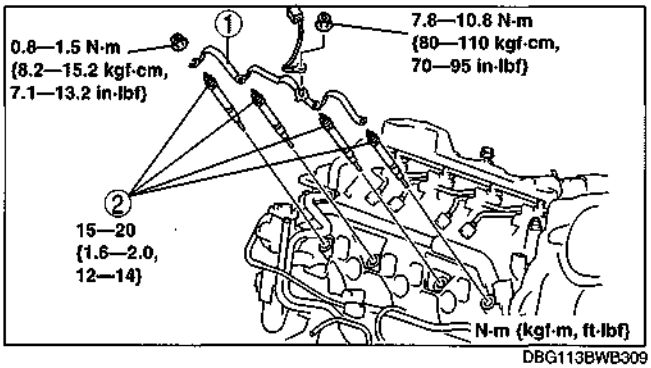
Caution

- **Do not damage the heated section of the glow plug.**
- **Do not reuse a glow plug that has been dropped over a height of 10 cm {3.9 in}, even when there are no scratches and resistance is normal (approx. 1.4 ohms [20 °C {68 °F}] (Reference value)).**
- **Do not remove the glow plug unless you are replacing it.**

1. Remove the engine cover.
2. Disconnect the negative battery cable.
3. Remove the common rail. (See 01-14B-11 SUPPLY PUMP REMOVAL/INSTALLATION [WL-C, WE-C].)
4. Remove in the order indicated in the table.

1	Glow plug cord
2	Glow plug (See 01-13B-8 Glow Plug Removal Note.) (See 01-13B-8 Glow Plug Installation Note.)

5. Install in the reverse order of removal.



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Glow Plug Removal Note

1. When removing the glow plug, first loosen it at least one pitch using a tool, then loosen by hand.

Glow Plug Installation Note

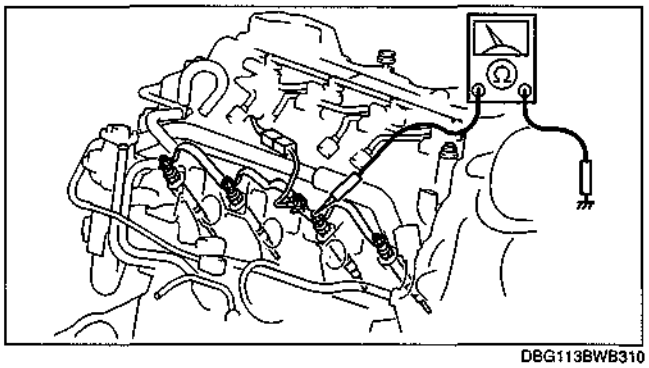
1. Tighten the glow plug it at least one pitch by hand, and continue tightening with a tool.

GLOW PLUG INSPECTION [WL-C, WE-C]

dcf011318601w04

1. Remove the glow plug cord. (See 01-13B-8 GLOW PLUG REMOVAL/INSTALLATION [WL-C, WE-C].)
2. Measure the resistance between the glow plug terminal and the cylinder head (body ground) using an ohmmeter.
   - If not as specified, replace the glow plug. (See 01-13B-8 GLOW PLUG REMOVAL/INSTALLATION [WL-C, WE-C].)

Glow plug resistance (Reference value)
Approx. 1.4 ohms [20°C {68°F}]



DBG113BWB310

GLOW PLUG RELAY REMOVAL/INSTALLATION [WL-C, WE-C]

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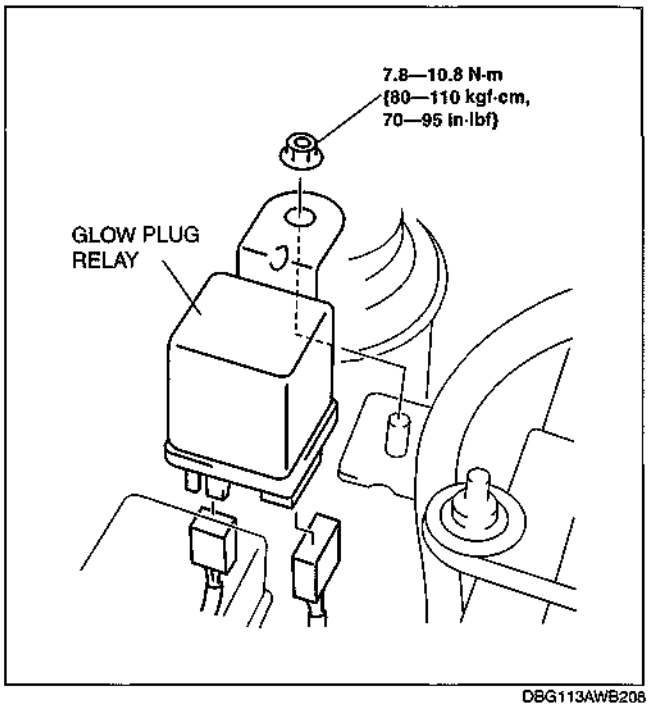
1. Disconnect the negative battery cable.
2. Remove the glow plug relay.
3. Install the glow plug relay.
4. Connect the negative battery cable.



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GLOW PLUG RELAY INSPECTION [WL-C, WE-C]

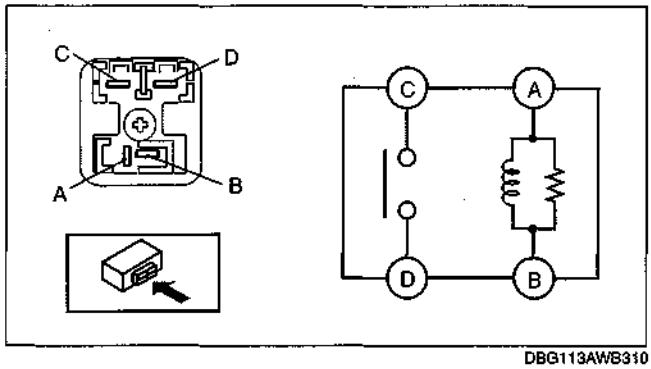
dcf011318611w05

Note
- Perform the following test only when directed.

System Inspection
1. Carry out the "Glow Plug Control Operation Inspection". (See 01-03B-62 Glow Plug Control Operation Inspection.)
2. If not as specified, perform the further inspection for the glow plug relay.

Continuity Inspection

1. Remove the glow plug relay. (See 01-13B-9 GLOW PLUG RELAY REMOVAL/INSTALLATION [WL-C, WE-C].)
2. Verify the continuity between the glow plug relay terminals.



DBG113AWB310

O—O : Continuity

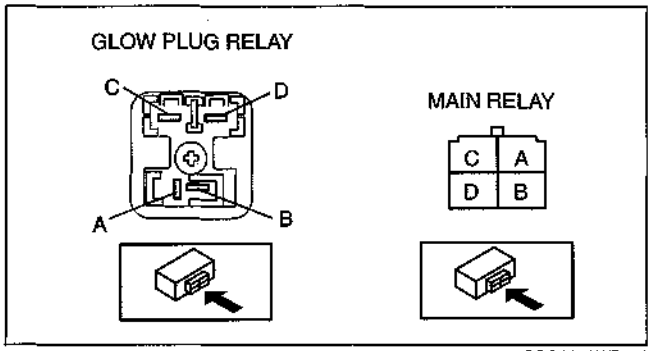
Step	Terminal			
	A	B	C	D
1	O	O		
2	B+	GND	O	O

CHU0921W006

- If not as indicated in the table, replace the glow plug relay. (See 01-13B-8 GLOW PLUG REMOVAL/INSTALLATION [WL-C, WE-C].)
- If as specified but the "System Inspection" is failed, perform the "Circuit Open/Short Inspection".

Circuit Open/Short Inspection

1. Disconnect the PCM connector. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
2. Inspect the following wiring harnesses for an open or short circuit. (Continuity inspection)



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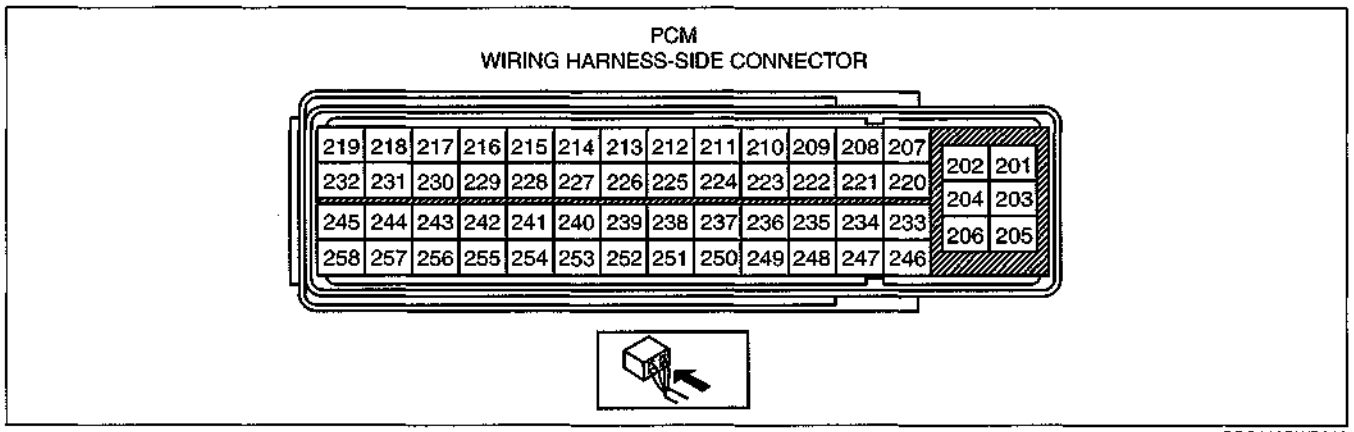

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Open circuit

- If there is no continuity in the following wiring harnesses, there is an open circuit. Repair or replace the wiring harness.
  - — Glow plug relay terminal A and PCM terminal 182
  - — Glow plug relay terminal B and main relay terminal D
  - — Glow plug relay terminal C and power supply
  - — Glow plug relay terminal D and PCM terminal 227
  - — Glow plug relay terminal D and glow plug cord

Short circuit

- If there is continuity in the following wiring harnesses, there is a short circuit. Repair or replace the wiring harness.
  - — Glow plug relay terminal A and power supply
  - — Glow plug relay terminal A and body ground
  - — Glow plug relay terminal B and body ground
  - — Glow plug relay terminal C and body ground
  - — Glow plug relay terminal D and body ground

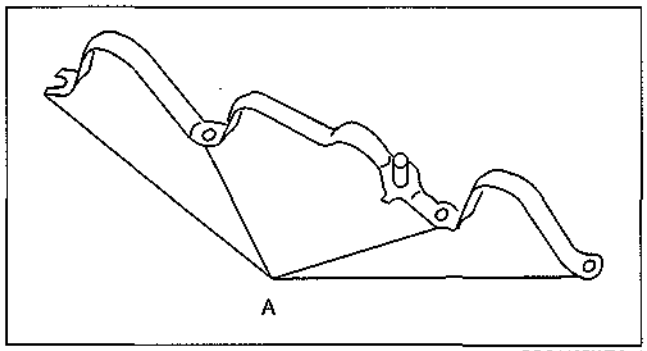
GLOW PLUG CORD INSPECTION [WL-C, WE-C]

dcf011318611w06

1. Remove the glow plug cord from glow plug. (See 01-13B-8 GLOW PLUG REMOVAL/INSTALLATION [WL-C, WE-C].)
2. Verify that the glow plug cord is not broken or bent.

Note
- When inspecting for continuity in the glow plug cord, do not let the uncovered parts (A) come into contact with other parts and be shorted.

3. Verify there is continuity at both ends of the glow plug cord.
   - If there is no continuity, replace the glow plug cord. (See 01-13B-8 GLOW PLUG REMOVAL/INSTALLATION [WL-C, WE-C].)



DBG113BWB314

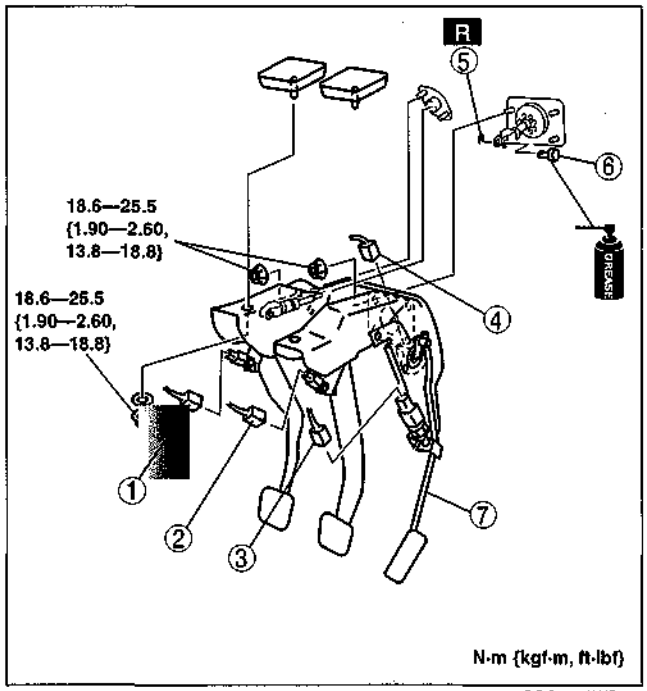
ACCELERATOR PEDAL COMPONENT REMOVAL/INSTALLATION [WL-C, WE-C]

dcf011341600w03

1. Disconnect the negative battery cable.
2. Set the power brake unit slightly out of the way. (See 04-11-10 POWER BRAKE UNIT REMOVAL/INSTALLATION.)
3. Set the clutch master cylinder slightly out of the way. (See 05-10-6 CLUTCH MASTER CYLINDER REMOVAL/INSTALLATION.)
4. Remove the column cover and steering shaft. (See 06-14-6 STEERING WHEEL AND COLUMN REMOVAL/INSTALLATION.)
5. Remove in the order indicated in the table.

1	Neutral switch connector
2	Brake switch connector
3	Idle switch connector
4	APP sensor connector
5	Spring pin
6	Clevis pin
7	Pedal component (See 01-13B-11 Pedal Component Installation Note.)

6. Install in the reverse order of removal.



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Pedal Component Installation Note
- Carry out the "BRAKE PEDAL INSPECTION" procedure after installing the pedal component. (See 04-11-6 BRAKE SWITCH INSPECTION.)
- Carry out the "CLUTCH PEDAL ADJUSTMENT" procedure after installing the pedal component. (See 05-10-4 CLUTCH PEDAL ADJUSTMENT.)

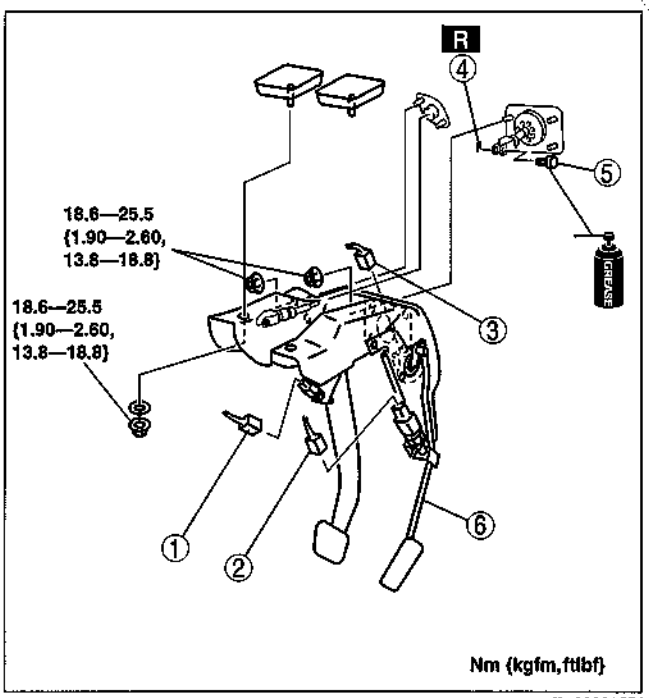
ACCELERATOR PEDAL COMPONENT REMOVAL/INSTALLATION[WL-C, WE-C (AT)]

Id011398807300

1. Disconnect the negative battery cable.
2. Remove the 4x4 control module. (4x4) (See 03-18-5 4x4 CONTROL MODULE REMOVAL/INSTALLATION [AT (5R55S)].)
3. Remove in the order indicated in the table.

1	Brake switch connector
2	Idle switch connector
3	APP sensor connector
4	Spring pin
5	Clevis pin
6	Pedal component (See 01-13B-1 Pedal Component Installation Note.)

4. Install in the reverse order of removal.



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Pedal Component Installation Note

1. Carry out the "BRAKE PEDAL INSPECTION" procedure after installing the pedal component.

ACCELERATOR PEDAL ADJUSTMENT [WL-C, WE-C]

dcf011341600w04

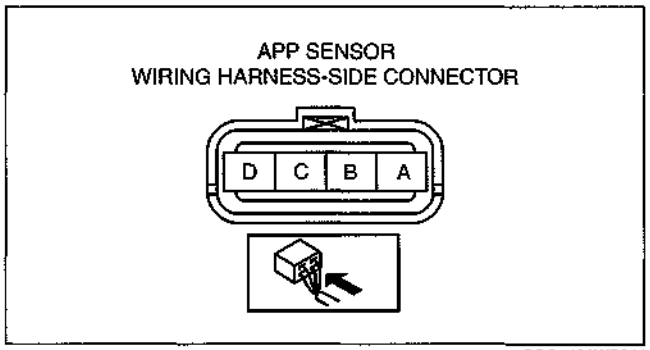
Caution

- **Adjusting the APP sensor and idle switch unnecessarily may adversely affect engine control. Therefore, adjust APP sensor and/or idle switch only when it is replaced.**

Note

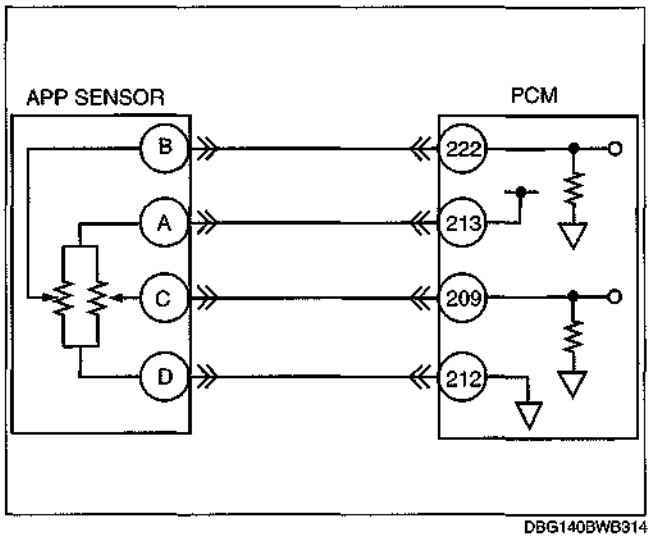
- Perform the following adjustment only when directed.

1. Temporarily install the APP sensor and the idle switch to the pedal assembly and verify that the APP sensor installation bolts and idle switch locknut are lightly tightened.
2. Connect the APP sensor and the idle switch connector.
3. Turn the engine switch to the ON position (Engine off).
4. Verify that the voltage between APP sensor terminals A and D is **between 4.9 to 5.1 V (target value 5.0 V)**.



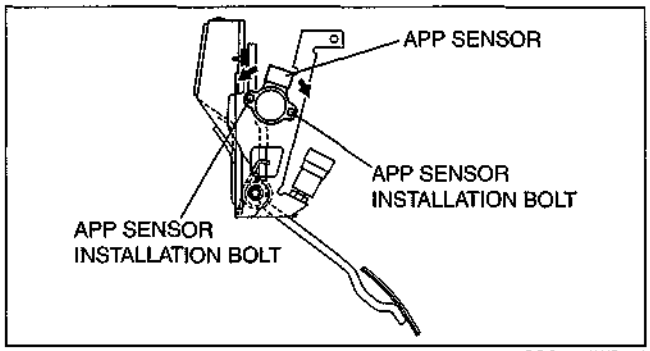
DBG140AWB311

5. Set the current diagnostic tool and monitor APP, APP2 and IVS PIDs.(See01-02B-8 PID/DATA Monitor And Record Procedure)



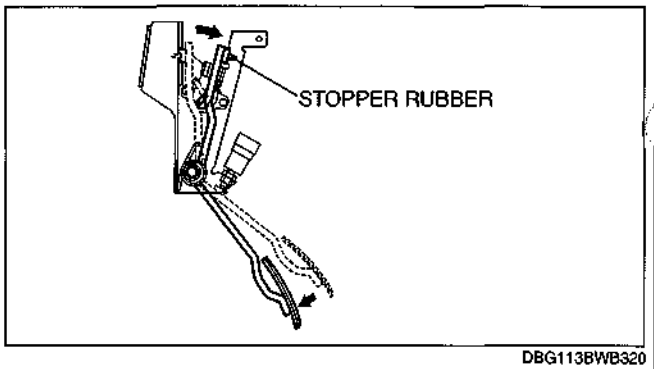
DBG140BWB314

6. Adjust the APP sensor installation position so that the APP and APP2 PIDs value is **between 0.5 to 0.7 V (target value 0.6 V)** with the accelerator pedal fully released, then tighten the APP sensor installation bolts



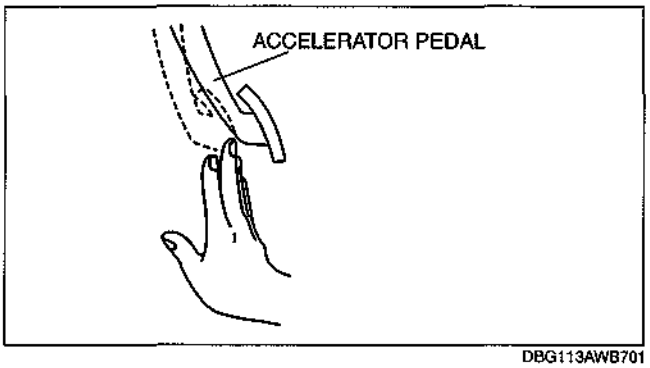
DBG140AWB332

7. While fully depressing the accelerator pedal until it contacts the stopper rubber, adjust the stopper rubber installation position so that the APP and APP2 value is **between 3.4 to 3.8 V (target value 3.6 V)**.



DBG113BWB320

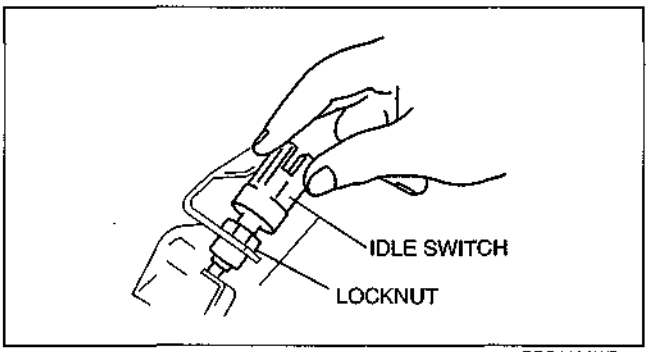
8. While slowly depressing the accelerator pedal by hand, adjust the idle switch installation position so that the IVS PID turns from ON to OFF with the APP and APP2 value is between 1.0 to 1.2 V (target value 1.1 V), then tighten the idle switch locknut.



DBG113AWB701

Tightening torque
13.7—17.6 N·m {1.40—1.79 kgf·m, 10.2—12.9 ft·lbf}

9. Verify that the IVS PID turns from OFF to ON when the accelerator pedal is full released.
10. While depressing the accelerator pedal again, verify that the IVS PID turns from ON to OFF with the APP and APP2 PIDs value is **between 1.0 to 1.2 V (target value 1.1 V)**.



DBG113AWB702

01-14B FUEL SYSTEM [WL-C, WE-C]

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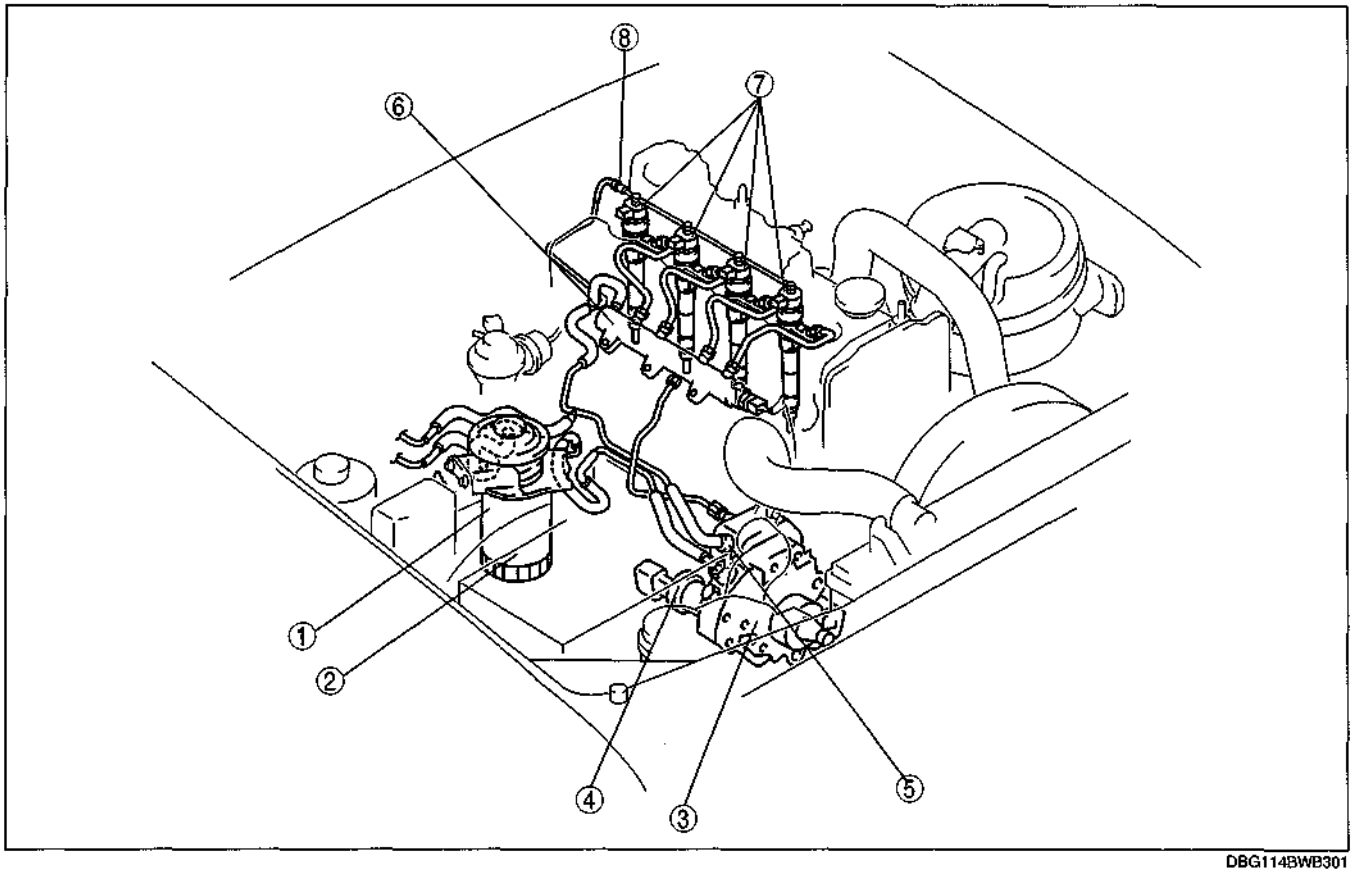
FUEL SYSTEM LOCATION INDEX [WL-C, WE-C]

dcf011400000w05

Engine Room Side



DBG114BWB301

1	Fuel filter (See 01-14B-9 FUEL FILTER REMOVAL/ INSTALLATION [WL-C, WE-C].) (See 01-14B-9 SEDIMENTOR WATER DRAINING [WL-C, WE-C].)
2	Sedimentor switch (See 01-14B-10 SEDIMENTOR SWITCH INSPECTION [WL-C, WE-C].)

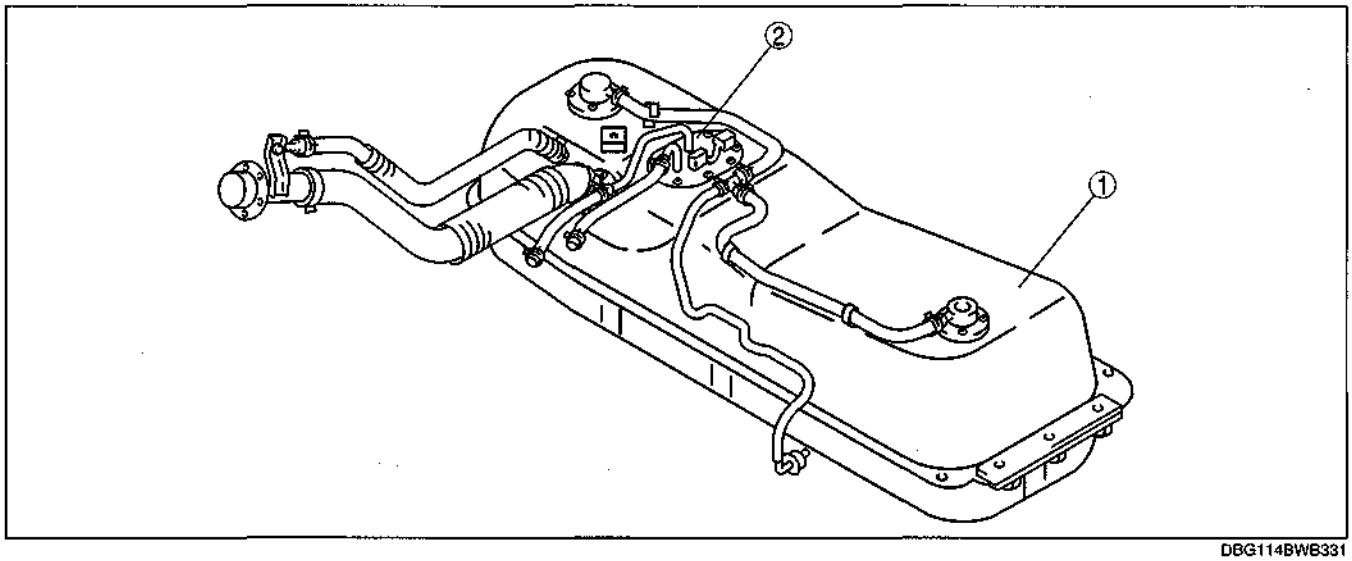
3	Supply pump (See 01-14B-11 SUPPLY PUMP REMOVAL/ INSTALLATION [WL-C, WE-C].) (See 01-14B-13 SUPPLY PUMP INSPECTION [WL-C, WE-C].)
4	Fuel metering valve (See 01-14B-13 FUEL METERING VALVE INSPECTION [WL-C, WE-C].)

5	Fuel-inlet filter (See 01-14B-14 FUEL-INLET FILTER REMOVAL/ INSTALLATION [WL-C, WE-C].)
6	Common rail (See 01-14B-14 COMMON RAIL INSPECTION [WL-C, WE-C].)

7	Fuel injector (See 01-14B-15 FUEL INJECTOR REMOVAL/ INSTALLATION [WL-C, WE-C].) (See 01-14B-16 FUEL INJECTOR INSPECTION [WL-C, WE-C].)
8	Check valve

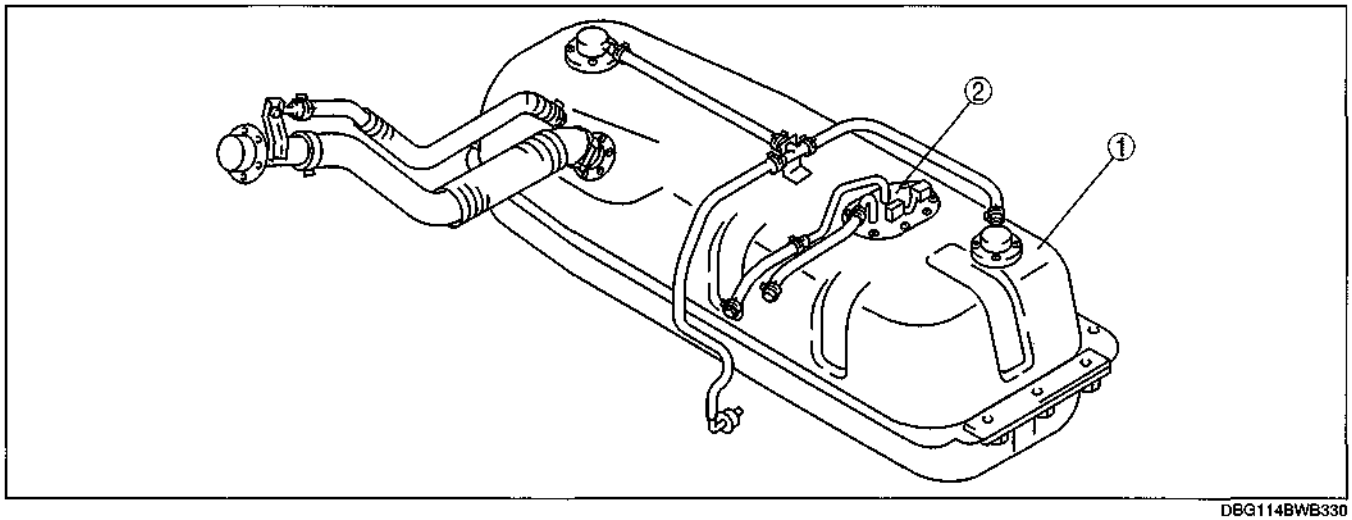
Fuel Tank Side

Double cab 4x2(except Hi-Rider), Stretch cab 4x2 (with rear access system (except Hi-Rider))



DBG114BWB331

Regular cab, Double cab 4x4, stretch cab 4x4 (with rear access system), Hi-Rider



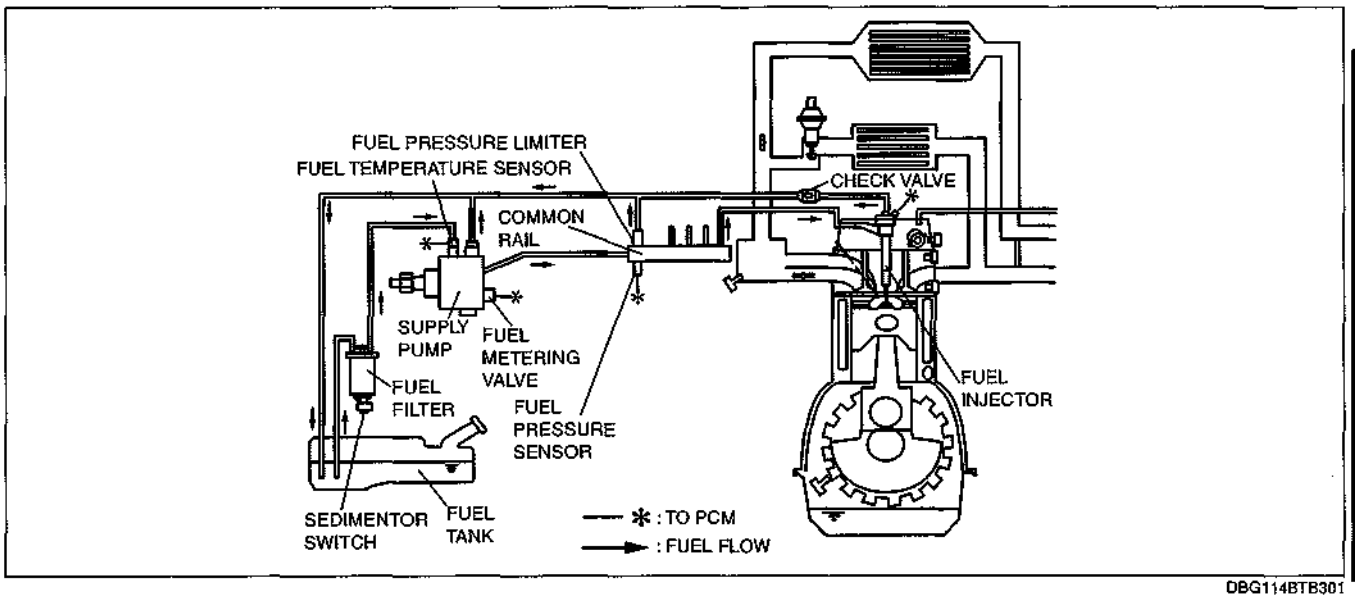
DBG114BWB330

1	Fuel tank (See 01-14B-4 FUEL TANK REMOVAL/ INSTALLATION [WL-C, WE-C].) (See 01-14B-8 FUEL TANK INSPECTION [WL-C, WE-C].)

2	Fuel gauge sender unit

FUEL SYSTEM DIAGRAM [WL-C, WE-C]

dcf011400000w06



DBG114BTB301

BEFORE REPAIR PROCEDURE [WL-C, WE-C]

dcf011400000w07

Warning

- **Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.**
- **Fuel line spills and leads are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete the following "Fuel Line Safety Procedures".**
- **A person charged with static electricity could cause a fire or explosion, resulting in death or serious injury. Before performing work on the fuel system, discharge static electricity by touching the vehicle body.**

Fuel Line Safety Procedures

1. Avoid fuel line spills and leaks by completing the following procedures.
   (1) Remove the fuel-filler cap and release the pressure in the fuel tank.
   (2) When disconnecting a fuel line hose, wrap a rag around it to protect against fuel leakage.
   (3) Plug the hose after removal.

AFTER REPAIR PROCEDURE [WL-C, WE-C]

dcf011400000w08

Warning
- **Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injuries or death and damage. When installing the fuel hose, observe "Fuel Hose Installation" described below.**

Caution
- **If fuel does not pass through the fuel filter, foreign material may have penetrated in the supply pump, and this may cause a malfunction resulting in damage to the supply pump. Therefore, do not install the fuel hoses (main and return side) in reverse. When installing the fuel hose, always follow the Fuel Hose Installation Note in the Workshop Manual and perform the procedure. (See 01-14B-13 Fuel Hose Installation Note.)**

Fuel Line Air Bleeding

Caution
- **Continuously cranking the engine for over 30 s can damage the battery and the starter.**

1. Continue cranking the engine for **30 s** and stop for **5—10 s** until the engine starts.

Fuel Hose Installation
1. Verify that there is no damage or deformation on the fuel hose and fuel pipe when installing.
2. When installing the fuel hose connected to the supply pump, verify each side (main and return), and install at the specified position. (See 01-14B-13 Fuel Hose Installation Note.)

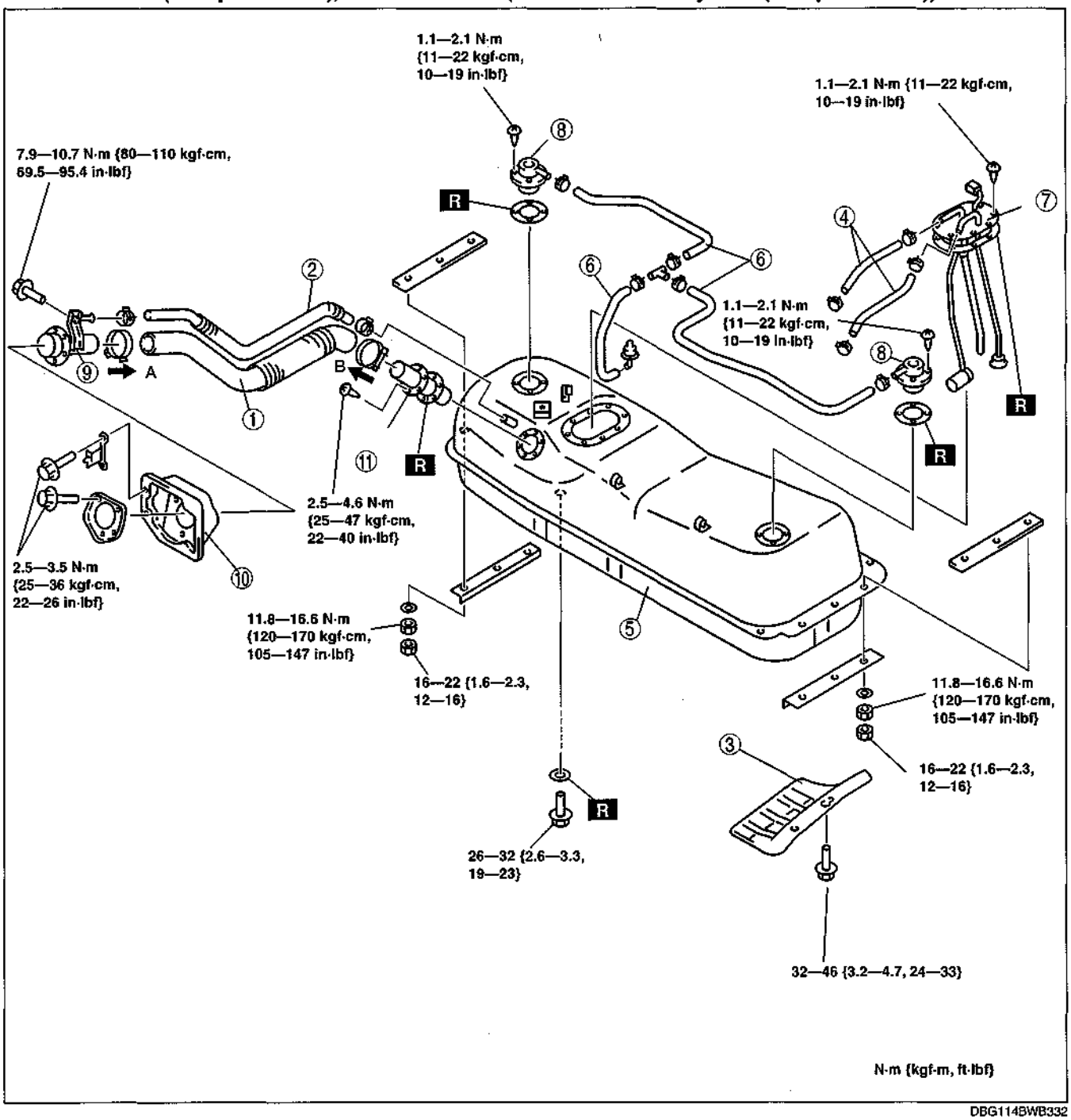
FUEL TANK REMOVAL/INSTALLATION [WL-C, WE-C]

dcf011442110w03

Warning
- **Repairing a fuel tank that has not been properly steam cleaned can be dangerous. Explosion or fire may cause death or serious injury. Always properly steam clean a fuel tank before repairing it.**
- **A person charged with static electricity could cause a fire or explosion, resulting in death or serious injury. Before draining fuel, make sure to discharge static electricity by touching the vehicle body.**

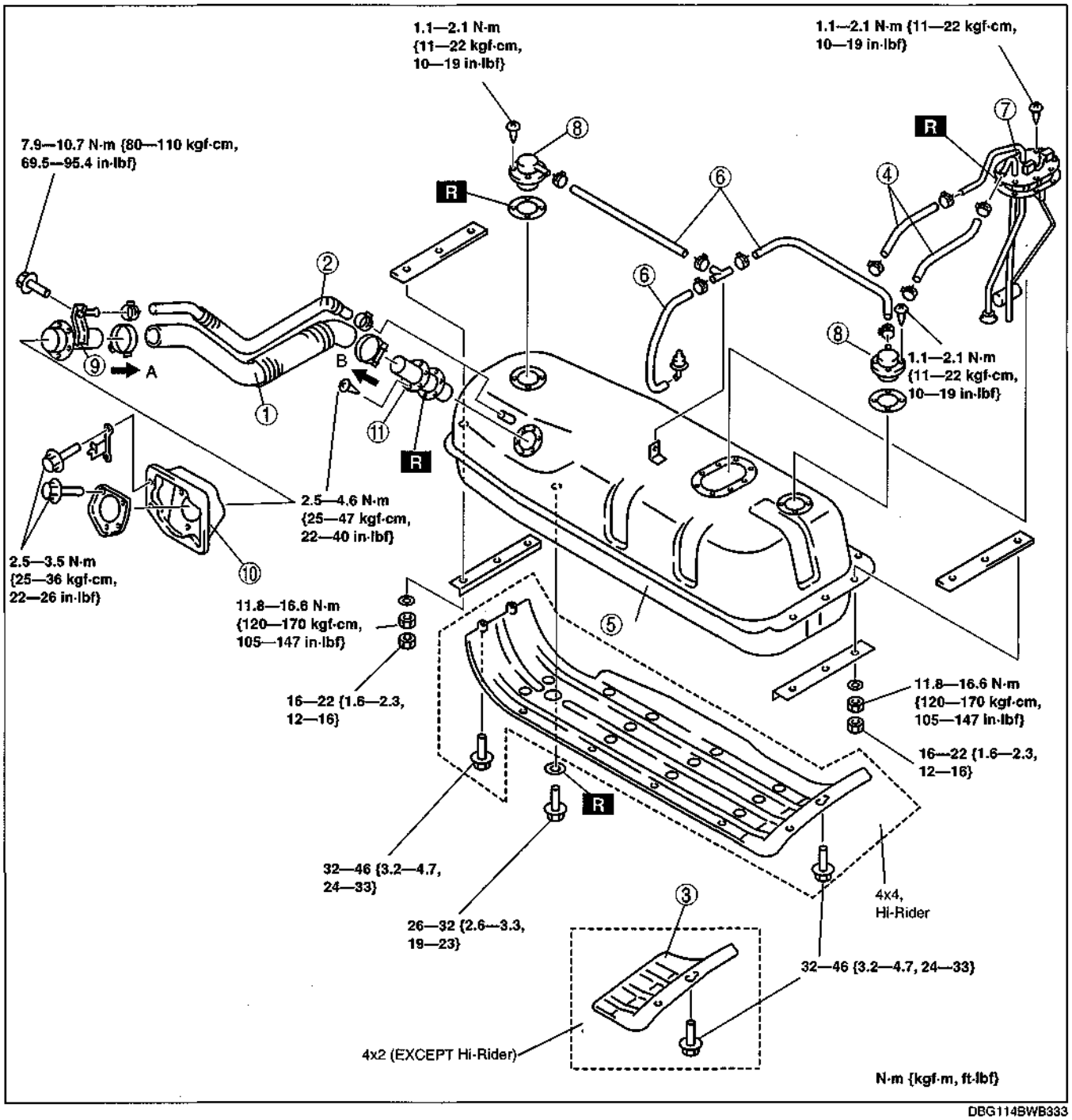
1. Disconnect the negative battery cable.
2. Complete the "BEFORE REPAIR PROCEDURE" (See01-14B-3 BEFORE REPAIR PROCEDURE [WL-C, WE-C].)
3. Remove the drain plug and drain the fuel from the fuel tank.
4. Remove the rear flap.
5. Remove in the reverse order indicated in the table.
6. Install in the reverse order indicated of removal.
7. Complete the "AFTER REPAIR PROCEDURE". (See 01-14B-4 AFTER REPAIR PROCEDURE [WL-C, WE-C].)

Double cab 4x2 (except Hi-Rider), Stretch cab 4x2 (with rear access system (except Hi-Rider))



DBG114BWB332

Regular cab, Double cab 4x4, stretch cab 4x4 (with rear access system), Hi-Rider



DBG114BWB333

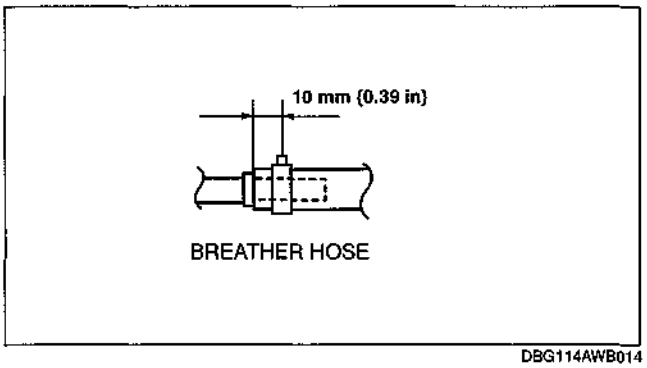
1	Joint hose (See 01-14B-7 Joint Hose Installation Note.)
2	Breather hose (See 01-14B-7 Breather Hose Installation Note.)
3	Under guard
4	Fuel hose (See 01-14B-7 Fuel Hose Installation Note.)
5	Fuel tank

6	Evaporative hose (See 01-14B-7 Evaporative Hose Installation Note.)
7	Fuel gauge sender unit
8	Rollover valve
9	Fuel-filler pipe
10	Dust cover
11	Fuel inlet pipe

Evaporative Hose Installation Note

- Fit each hose onto the respective fittings within the specification, and install clamps as shown.

Length
Evaporative hose: 25 mm {0.98 in}

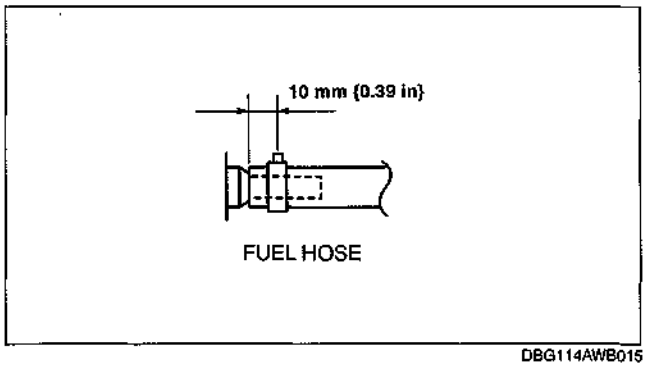


DBG114AWB014

Fuel Hose Installation Note

- Fit each onto the respective fittings within the specification, and install camp as shown.

Length
Fuel hose: 25mm {0.98 in}

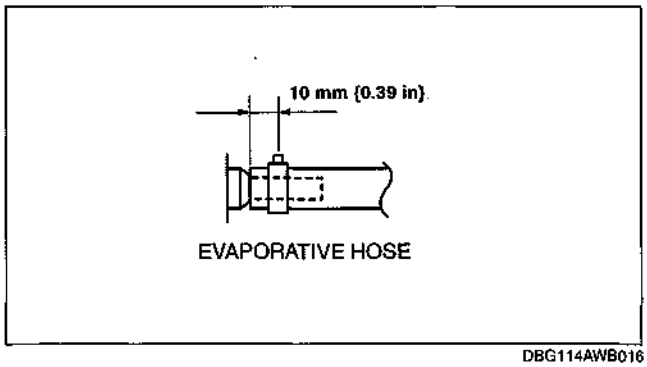


DBG114AWB015

Breather Hose Installation Note

- Fit each hose onto the respective fittings within the specification, and install clamp as shown.

Length
Breather hose: 25 mm {0.98 in}

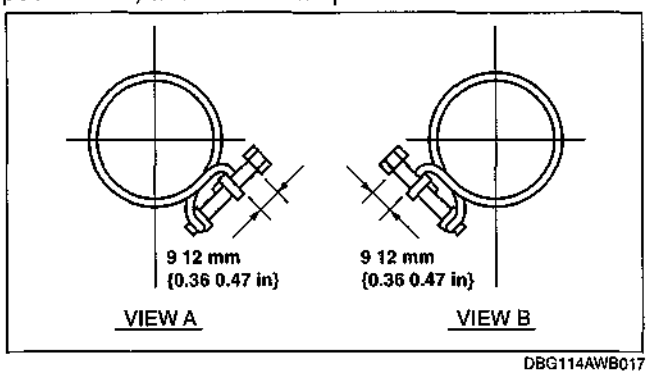


DBG114AWB016

Joint Hose Installation Note

- Fit the joint hose onto the respective fittings within the specification, and install clamps as shown.

Length
Joint hose: 35 {1.4 in]



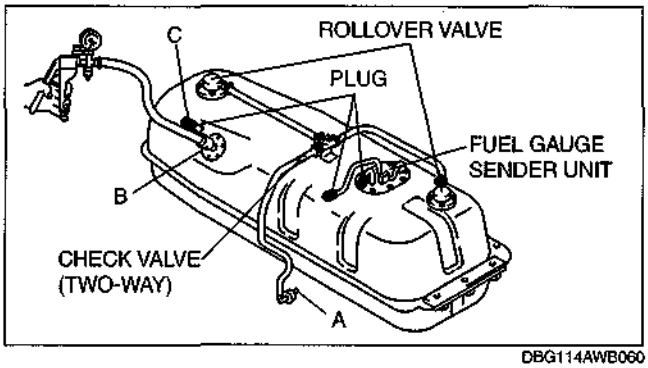
DBG114AWB017

FUEL TANK INSPECTION [WL-C, WE-C]

dcf011442110w04

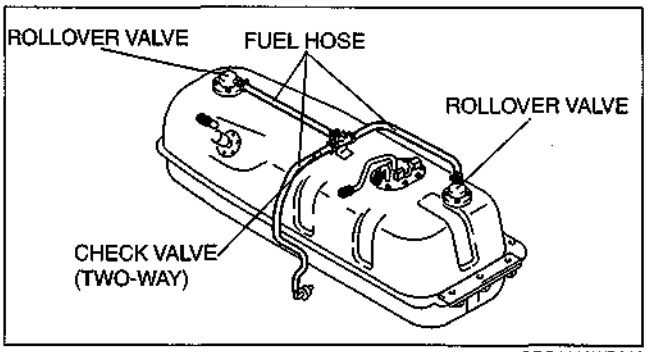
Note
- This inspection is for the two rollover valves and the check valve (two-way) which is integrated in the fuel hose.

1. Follow "BEFORE REPAIR PROCEDURE" before performing any work operations to prevent fuel from spilling from the fuel system. (See 01-14B-3 BEFORE REPAIR PROCEDURE [WL-C, WE-C].)
2. Disconnect the negative battery cable.
3. Remove the fuel tank. (See 01-14B-4 FUEL TANK REMOVAL/INSTALLATION [WL-C, WE-C].)
4. Plug the fuel pipe of the fuel gauge sender unit.
5. Plug port C.
6. Connect the pump to port B.
7. Level the fuel tank.



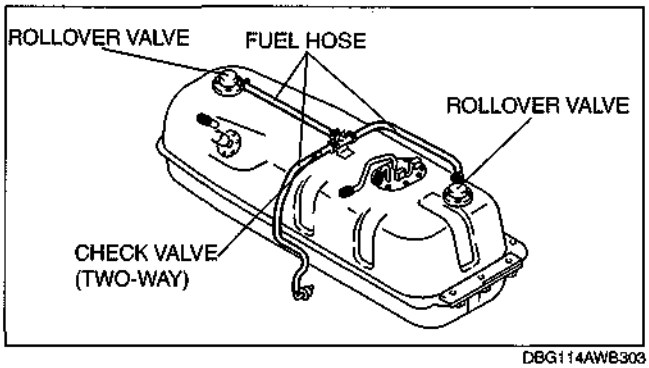
DBG114AWB060

8. Apply pressure of **5—6 kPa {38—45 mmHg, 1.5—1.7 inHg}** to port B.
   (1) Verify there is airflow from port A.
   - If there is no airflow, replace the two rollover valves and the three fuel hoses indicated in the figure.



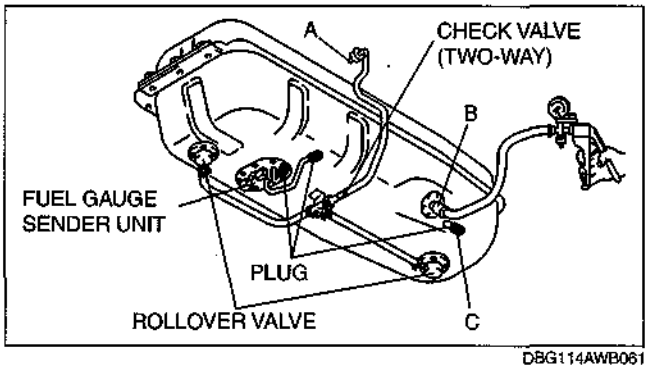
DBG114AWB303

9. Apply pressure of **–5— –6 kPa {–38— –45 mmHg, –1.5— –1.7 inHg}** to port B.
   - If there is no airflow, replace the two rollover valves and the three fuel hoses indicated in the figure.



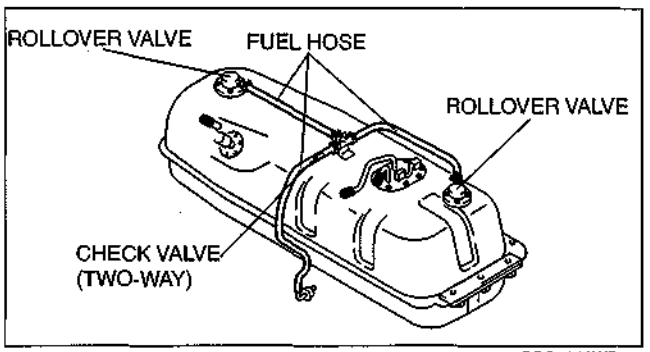
DBG114AWB303

   - If there is airflow, turn the fuel tank upside-down and proceed to next step.



DBG114AWB061

10. Apply pressure of **5—6 kPa {38—45 mmHg, 1.5—1.7 inHg}** to port B.
    (1) Verify there is no airflow from port A.
        • If there is airflow, replace the two rollover valves and the three fuel hoses indicated in the figure.



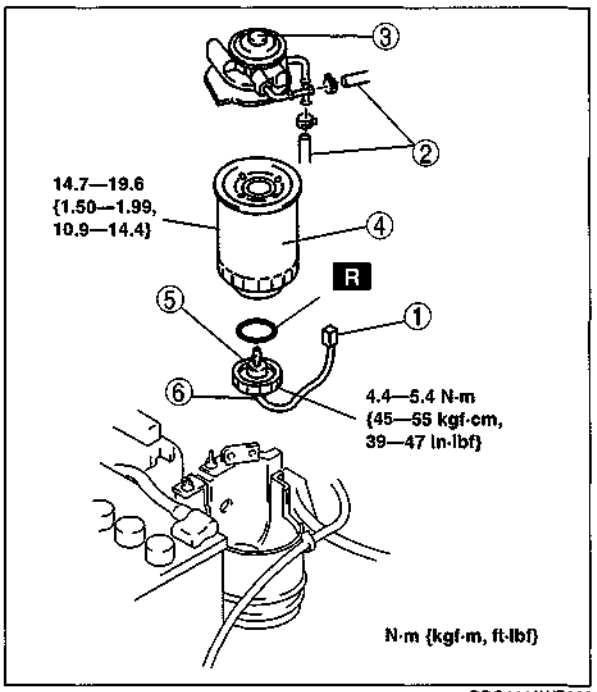
DBG114AWB303

FUEL FILTER REMOVAL/INSTALLATION [WL-C, WE-C]

dcf011420490w02

1. Disconnect the negative battery cable.
2. Complete the "BEFORE REPAIR PROCEDURE". (See 01-14B-3 BEFORE REPAIR PROCEDURE [WL-C, WE-C].)
3. Disassemble in the order indicated in the table.
4. Assemble in the reverse order of removal.
5. Complete the "AFTER REPAIR PROCEDURE". (See 01-14B-4 AFTER REPAIR PROCEDURE [WL-C, WE-C].)
6. Bleed air from the fuel filter.
7. Start the engine and verify that fuel does not leak from the fuel system.
8. If fuel leaks, reassemble the fuel filter.

1	Connector
2	Fuel hose
3	Priming pump
4	Fuel filter (See 01-14B-9 Fuel Filter Assembly Note.)
5	Sedimentor switch (See 01-14B-9 Sedimentor Switch Assembly Note.)
6	Drain plug



DBG114AWB038

Sedimentor Switch Assembly Note
- Apply a small amount of fuel to a new O-ring. Tighten the sedimentor switch enough to the fuel filter by hand.

Fuel Filter Assembly Note
- Apply a small amount of fuel to the fuel filter O-ring.Tighten the fuel filter **approx. 3/4** by hand after the O-ring contacts the priming pump.

SEDIMENTOR WATER DRAINING [WL-C, WE-C]

dcf011413080w02

1. Disconnect the negative battery cable.
2. Complete the "BEFORE REPAIR PROCEDURE". (See 01-14B-3 BEFORE REPAIR PROCEDURE [WL-C, WE-C].)
3. Loosen the drain plug located at the bottom of the fuel filter.
4. Pump the priming pump and drain the water.
5. After all the water has been drained, tighten the drain plug.
6. Complete the "AFTER REPAIR PROCEDURE". (See 01-14B-4 AFTER REPAIR PROCEDURE [WL-C, WE-C].)
7. Reconnect the negative battery cable.

SEDIMENTOR SWITCH INSPECTION [WL-C, WE-C]

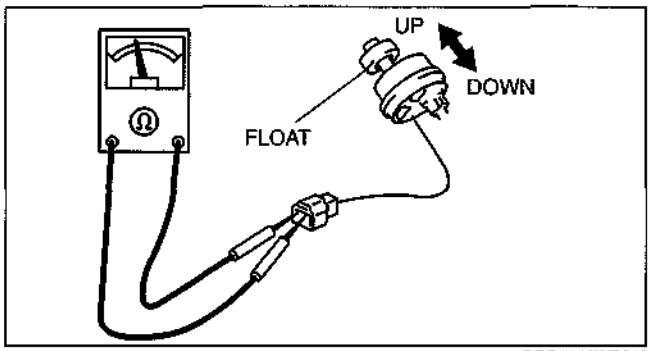
dcf011413081w02

Continuity Inspection

Note
- Perform the following test only when directed.

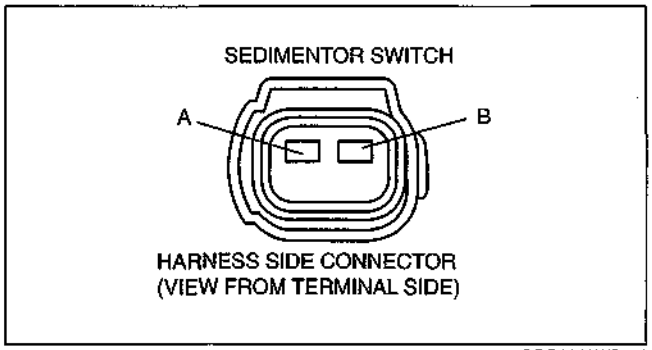
1. Disconnect the negative battery cable.
2. Drain fuel from the fuel filter. (See 01-14B-9 SEDIMENTOR WATER DRAINING [WL-C, WE-C].)
3. Remove the sedimentor switch.
4. Inspect continuity of the sedimentor switch by using an ohmmeter.

Float	Continuity
Up	Yes
Down	No



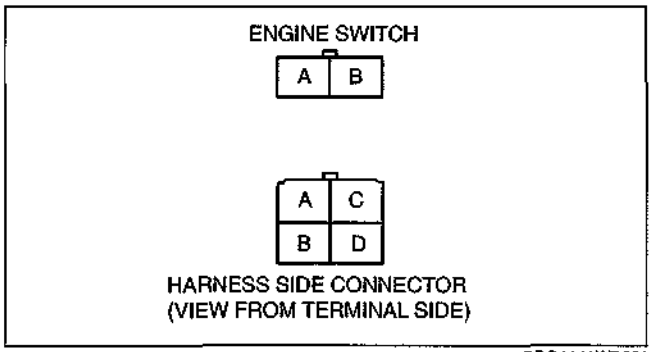
DBG114AWB019

5. If not as specified, replace the sedimentor switch.
   If as specified, inspect following:
   Open circuit
   - Ground circuit (Sedimentor switch connector terminal B and body ground)
   - Power circuit (Sedimentor switch connector terminal A and engine switch connector terminal C)



DBG114AWB020

   Short circuit
   - Ground circuit (Sedimentor switch connector terminal B and body ground to power circuit)
   - Power circuit (Sedimentor switch connector terminal A and engine switch connector terminal C to ground)
6. Repair or replace faulty areas.
7. Install the sedimentor switch.
8. Reconnect the negative battery cable.
9. Bleed air from the fuel filter.



DBG114AWB021

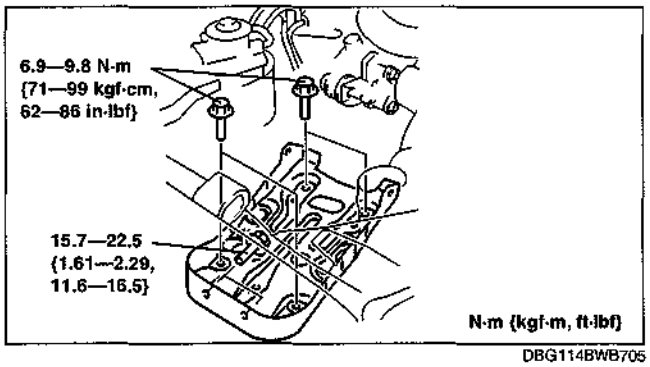
SUPPLY PUMP REMOVAL/INSTALLATION [WL-C, WE-C]

dcl011413350w01

Caution

- **Fuel line spills and leakage on the parts are dangerous. Fuel can ignite and also deteriorate the parts. To prevent this, always cover the mouths of the removed parts in the fuel system with rags to soak up the fuel.**
- **To prevent the fuel injection pipe from clogging, be careful that foreign material has not entered the pipe. Also, be sure to tighten the bolts with the specified tightening torque when installing the fuel injection pipe.**
- **To prevent fuel leakage, follow the procedure indicated in the workshop manual when removing and installing the fuel injector.**
- **The fuel injection pipe can be removed and reinstalled up to five times. Be sure to record in the service record when removing and installing the fuel injection pipe. If removing it for the sixth time, be sure to replace it with a new one.**
- **Always carry out the cleaning process before carrying out any repairs to the fuel injection system components to prevent foreign matter ingress to the components.**
- **If fuel does not pass through the fuel filter, foreign material may have penetrated in the supply pump, and this may cause a malfunction resulting in damage to the supply pump. Therefore, do not install the fuel hoses (main and return side) in reverse. When installing the fuel hose, always follow the Fuel Hose Installation Note in the Workshop Manual and perform the procedure. (See 01-14B-13 Fuel Hose Installation Note.)**

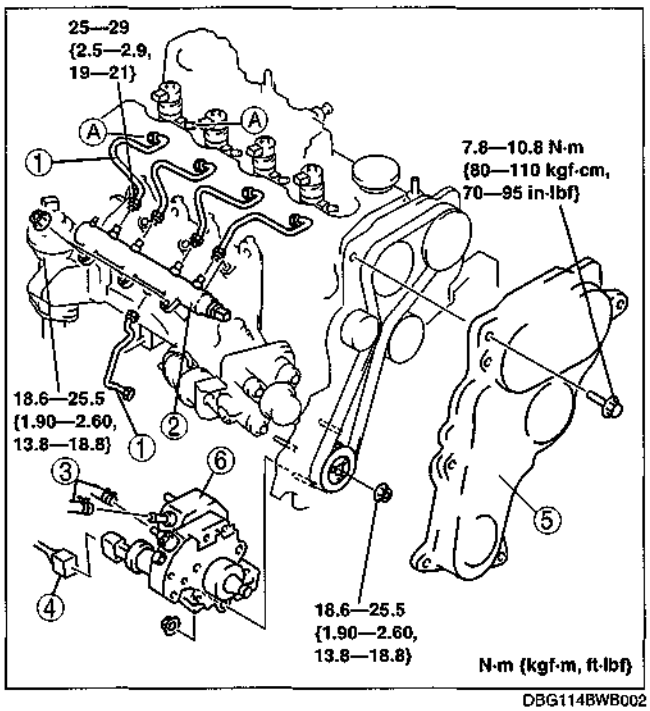
1. Disconnect the negative battery cable.
2. Complete the "BEFORE REPAIR PROCEDURE". (See 01-14B-3 BEFORE REPAIR PROCEDURE [WL-C, WE-C].)
3. Remove the battery and battery tray. (See 01-17-2 BATTERY REMOVAL/INSTALLATION.)
4. Remove the battery carrier.
5. Set the fuel filter component slightly out of the way. (See 01-14B-9 FUEL FILTER REMOVAL/INSTALLATION [WL-C, WE-C].)
6. Remove in the order indicated in the table.
7. Install in the reverse order of removal.
8. Complete the "AFTER REPAIR PROCEDURE". (See 01-14B-4 AFTER REPAIR PROCEDURE [WL-C, WE-C].)



DBG114BWB705

9. Start the engine and verify that fuel does not leak from the fuel system.

1	Injection pipe (See 01-14B-12 Injection Pipe Removal Note.)
2	Common real
3	Fuel hose (See 01-14B-13 Fuel Hose Installation Note.)
4	Connector
5	Timing belt cover (See 01-10B-9 Timing Belt Cover Installation Note.)
6	Supply pump (See 01-14B-12 Supply Pump Pulley Removal Note.)

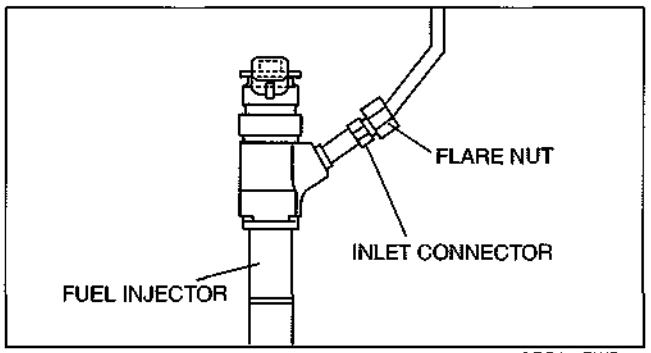


DBG114BWB002

Injection Pipe Removal Note

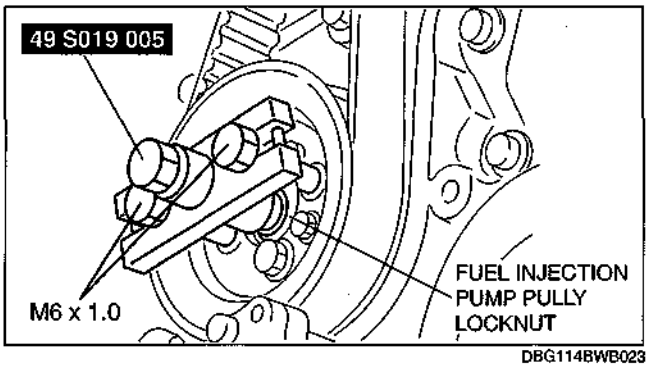
Caution
- **If the fuel injector inlet connector is not locked against rotation when removing the injection pipe, it may loosen and cause fuel leakage.**

1. Lock the fuel injector inlet connector against rotation.
2. Loosen the flare nut on the injection pipe while being careful not to allow the inlet connector to rotate.



DBG114BWB304

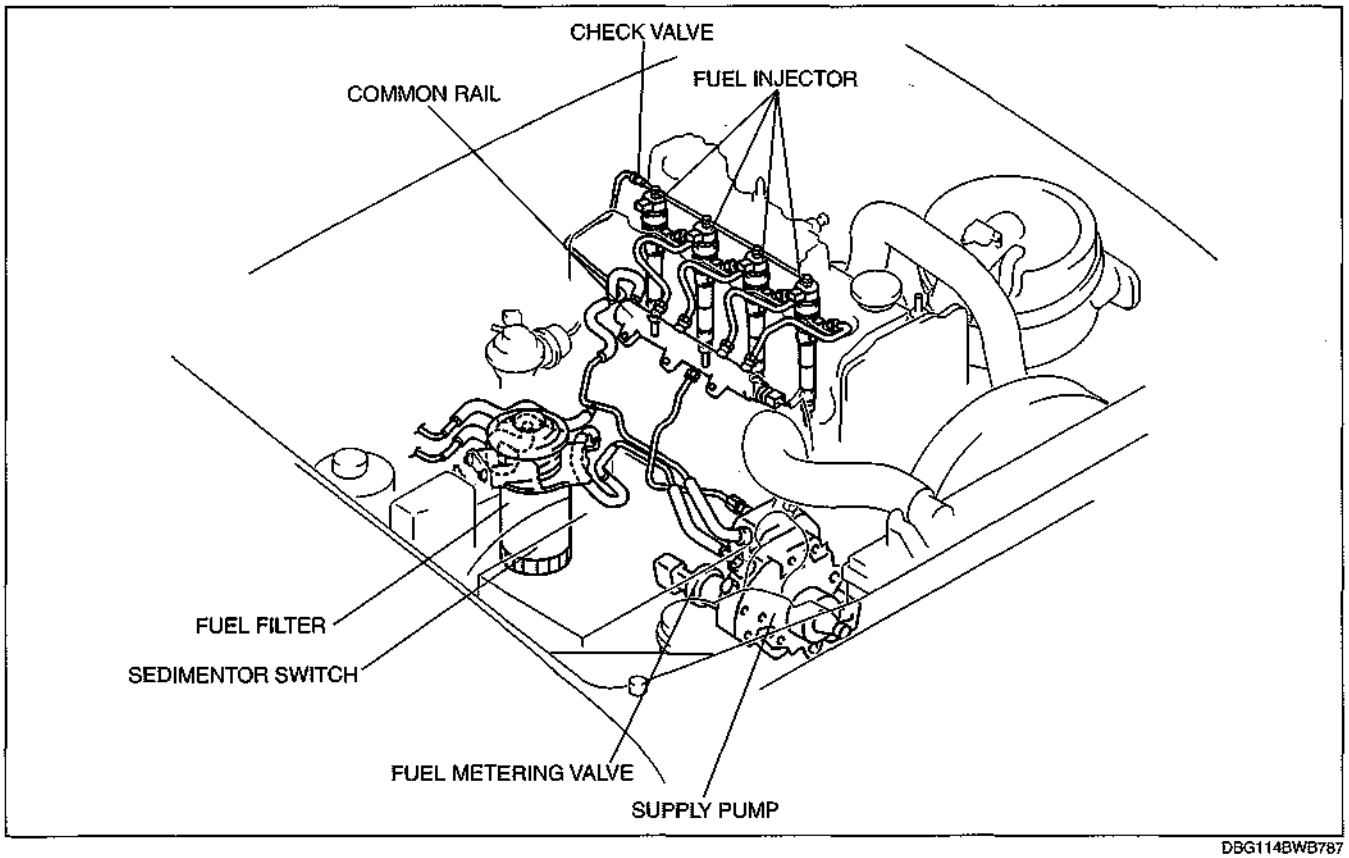
Supply Pump Pulley Removal Note
1. Removal the two supply pump pulley mounting bolts.
2. Loosen the fuel injection pump pulley locknut.
3. Remove the pulley with the **SST**.



DBG114BWB023

Fuel Hose Installation Note

- Install the fuel main hose and fuel return hose as shown in the figure.



DBG114BWB787

SUPPLY PUMP INSPECTION [WL-C, WE-C]

dcf011413350w02

Caution

- **The supply pump is sealed to maintain proper function. Special tools and testers are required when disassembling the supply pump. Disassembling the supply pump without special tools and testers will cause a malfunction.**
- **Consult authorized parts distributor for repair if any of the injection pump inner parts are possibly malfunctioning.**

1. Supply pump inner parts
2. Fuel metering valve
3. Fuel temperature sensor

FUEL METERING VALVE INSPECTION [WL-C, WE-C]

dcf011413350w03

Caution

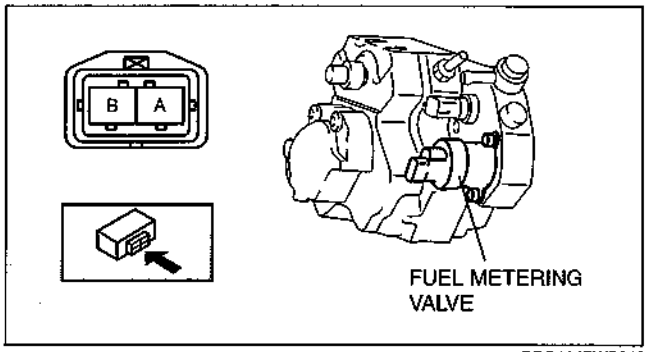
- **The supply pump is sealed to maintain proper function. Special tools and testers are required when disassembling the supply pump. Disassembling the supply pump without special tools and testers will cause a malfunction.**

Resistance Inspection

1. Disconnect the negative battery cable.
2. Disconnect the fuel metering valve connector.
3. Measure the resistance between the fuel metering valve terminals using an ohmmeter.
   - If not as specified, repair the supply pump. (See 01-14B-13 SUPPLY PUMP INSPECTION [WL-C, WE-C].)
   - If as specified, carry out the "Circuit Open/ Short Inspection".

Specification

Ambient temperature (°C {°F})	Resistance (ohm)
20 {68}	2.6—3.15



DBG114BWB012

Circuit Open/Short Inspection

1. Inspect for an open or short circuit in the following wiring harnesses.
   - If there is an open or short circuit, repair or replace wiring harnesses.

Open circuit

- Power circuit (fuel metering valve terminal A and main relay terminal D)
- Ground circuit (fuel metering valve terminal B and PCM terminal 179)

Short circuit

- Fuel metering valve terminal A and main relay terminal D to ground

FUEL-INLET FILTER REMOVAL/INSTALLATION [WL-C, WE-C]

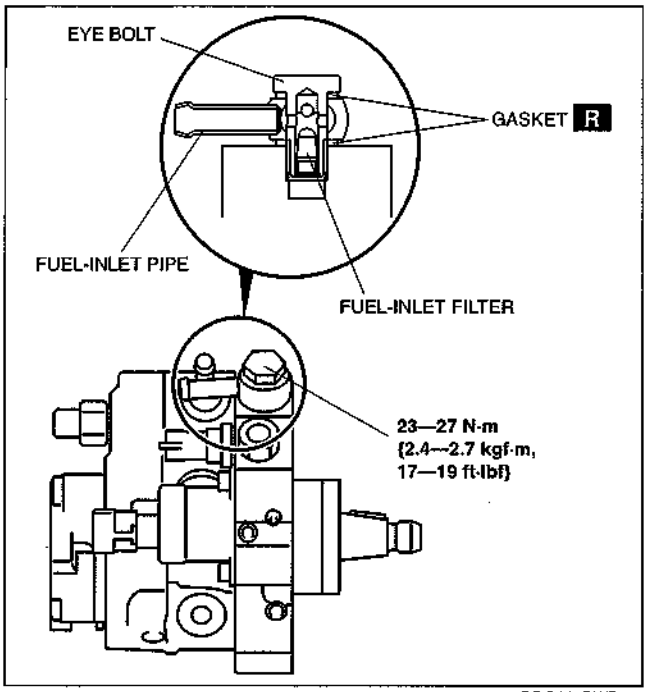
dcf011413350w04

1. Disconnect the negative battery cable.
2. Disconnect the fuel hose connecting to the fuel-inlet pipe.
3. Remove in the eye bolt.

Note

- The fuel-inlet filter cannot be removed as it is crimped to the eye bolt.

4. If there is any malfunction, clean the fuel-inlet filter.
5. Install in the reverse order of removal.



DBG114BWB004

COMMON RAIL INSPECTION [WL-C, WE-C]

dcf011413151w01

Caution

- **Do not remove the fuel pressure sensor nor the fuel pressure limiter from the common rail. Since fuel pressure in the common rail is extremely high, the fuel pressure sensor, fuel pressure limiter, or the common rail can be damaged, leading to fuel leakage if any of them are removed.**

1. Visually inspect the common rail for damage and cracks. Also verify that there is no extreme rust which will cause fuel leakage.
   - If either is observed, replace the common rail.

FUEL INJECTOR REMOVAL/INSTALLATION [WL-C, WE-C]

dcf011413250w01

Caution

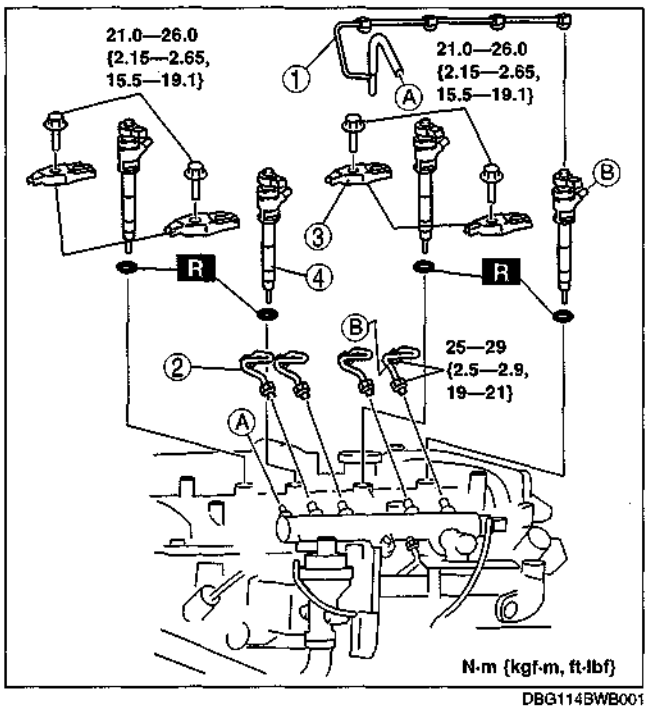
- **Fuel line spills and leakage on the parts are dangerous. Fuel can ignite and also deteriorate the parts. To prevent this, always cover the mouths of the removed parts in the fuel system with rags to soak up the fuel.**
- **To prevent the fuel injection pipe from clogging, be careful that foreign material has not entered the pipe. Also, be sure to tighten the bolts with the specified tightening torque when installing the fuel injection pipe.**
- **To prevent fuel leakage, follow the procedure indicated in the workshop manual when removing and installing the fuel injector.**
- **The fuel injection pipe can be removed and reinstalled up to five times. Be sure to record in the service record when removing and installing the fuel injection pipe. If removing it for the sixth time, be sure to replace it with a new one.**
- **Always carry out the cleaning process before carrying out any repairs to the fuel injection system components to prevent foreign matter ingress to the components.**

Note

- Perform "FUEL INJECTOR CODE PROGRAM" after replacing fuel injector. (See 01-40B-21 FUEL INJECTOR CODE PROGRAM [WL-C, WE-C].)

1. Disconnect the negative battery cable.
2. Complete the "BEFORE REPAIR PROCEDURE". (See 01-14B-3 BEFORE REPAIR PROCEDURE [WL-C, WE-C].)
3. Disconnect the CMP sensor connector.
4. Disconnect the ECT sensor connector.
5. Disconnect the fuel presser sensor connector.
6. Disconnect the fuel injector connector.
7. Remove in the order indicated in the table.
8. Install in the reverse order of removal.
9. Complete the "AFTER REPAIR PROCEDURE". (See 01-14B-4 AFTER REPAIR PROCEDURE [WL-C, WE-C].)

1	Fuel return hose
2	Fuel injection pipe
3	Injector bracket
4	Fuel injector



DBG114BWB001

FUEL INJECTOR INSPECTION [WL-C, WE-C]

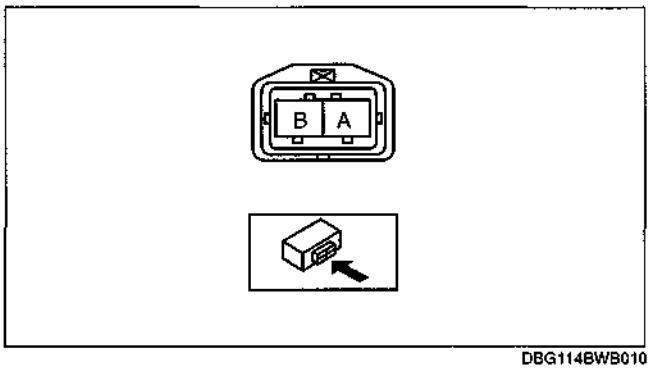
dcf011413250w02

Resistance Inspection

Note
- Perform the following test only when directed.

1. Disconnect the negative battery cable.
2. Disconnect the fuel injector connectors.
3. Measure the resistance of the fuel injector using an ohmmeter.
   - If not as specified, replace the fuel injector. (See 01-14B-15 FUEL INJECTOR REMOVAL/INSTALLATION [WL-C, WE-C].)
   - If as specified, carry out the "Circuit Open/Short Inspection".

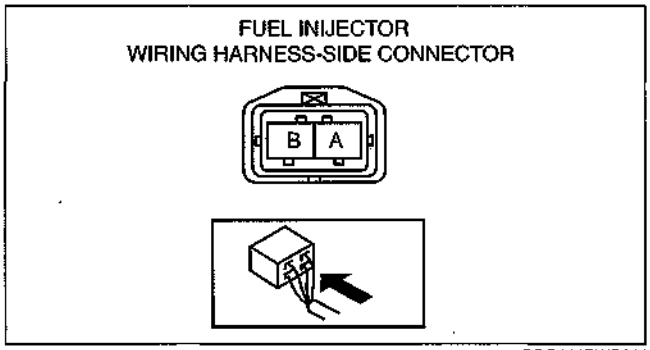
Resistance
Approx. 0.225 ohms



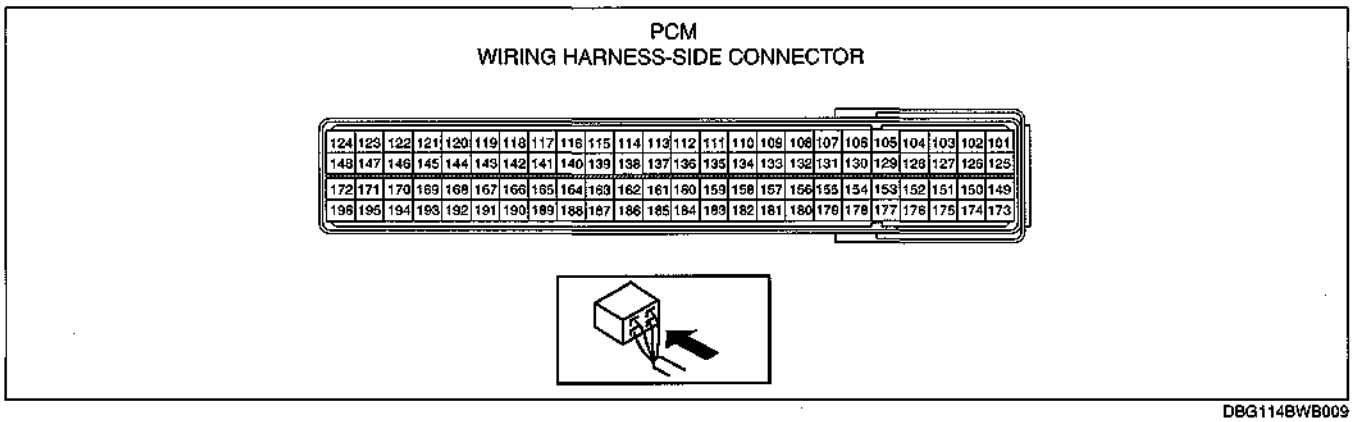
DBG114BWB010

Circuit Open/Short Inspection

1. Disconnect the PCM connector.
2. Inspect the following wiring harnesses for open or short (continuity check).



DBG114BWB011



DBG114BWB009

Open circuit

- If there is no continuity, the circuit is open. Repair or replace the wiring harness.
  - No.1 cylinder fuel injector terminal B and PCM terminal 174.
  - No.2 cylinder fuel injector terminal B and PCM terminal 149.
  - No.3 cylinder fuel injector terminal B and PCM terminal 173.
  - No.4 cylinder fuel injector terminal B and PCM terminal 150.
  - No.1 cylinder fuel injector terminal A and PCM terminal 125.
  - No.2 cylinder fuel injector terminal A and PCM terminal 102.
  - No.3 cylinder fuel injector terminal A and PCM terminal 101.
  - No.4 cylinder fuel injector terminal A and PCM terminal 126.

Short circuit

- If there is continuity, the circuit is short. Repair or replace the wiring harness.
  - No.1 cylinder fuel injector terminal B and body ground.
  - No.2 cylinder fuel injector terminal B and body ground.
  - No.3 cylinder fuel injector terminal B and body ground.
  - No.4 cylinder fuel injector terminal B and body ground.
  - No.1 cylinder fuel injector terminal A and body ground.
  - No.2 cylinder fuel injector terminal A and body ground.
  - No.3 cylinder fuel injector terminal A and body ground.
  - No.4 cylinder fuel injector terminal A and body ground.
  - No.1 cylinder fuel injector terminal B and power supply.
  - No.2 cylinder fuel injector terminal B and power supply.
  - No.3 cylinder fuel injector terminal B and power supply.
  - No.4 cylinder fuel injector terminal B and power supply.
  - No.1 cylinder fuel injector terminal A and power supply.
  - No.2 cylinder fuel injector terminal A and power supply.
  - No.3 cylinder fuel injector terminal A and power supply.
  - No.4 cylinder fuel injector terminal A and power supply.

01-15B EXHAUST SYSTEM [WL-C, WE-C]

EXHAUST SYSTEM INSPECTION [WL-C, WE-C]..... 01-15B–1
EXHAUST SYSTEM REMOVAL/INSTALLATION [WL-C, WE-C] 01-15B–2

EXHAUST SYSTEM INSPECTION [WL-C, WE-C]

dcf011500000w03

1. Start the engine and inspect each exhaust system component for exhaust gas leakage.
   - If leakage is found, repair or replace if necessary.

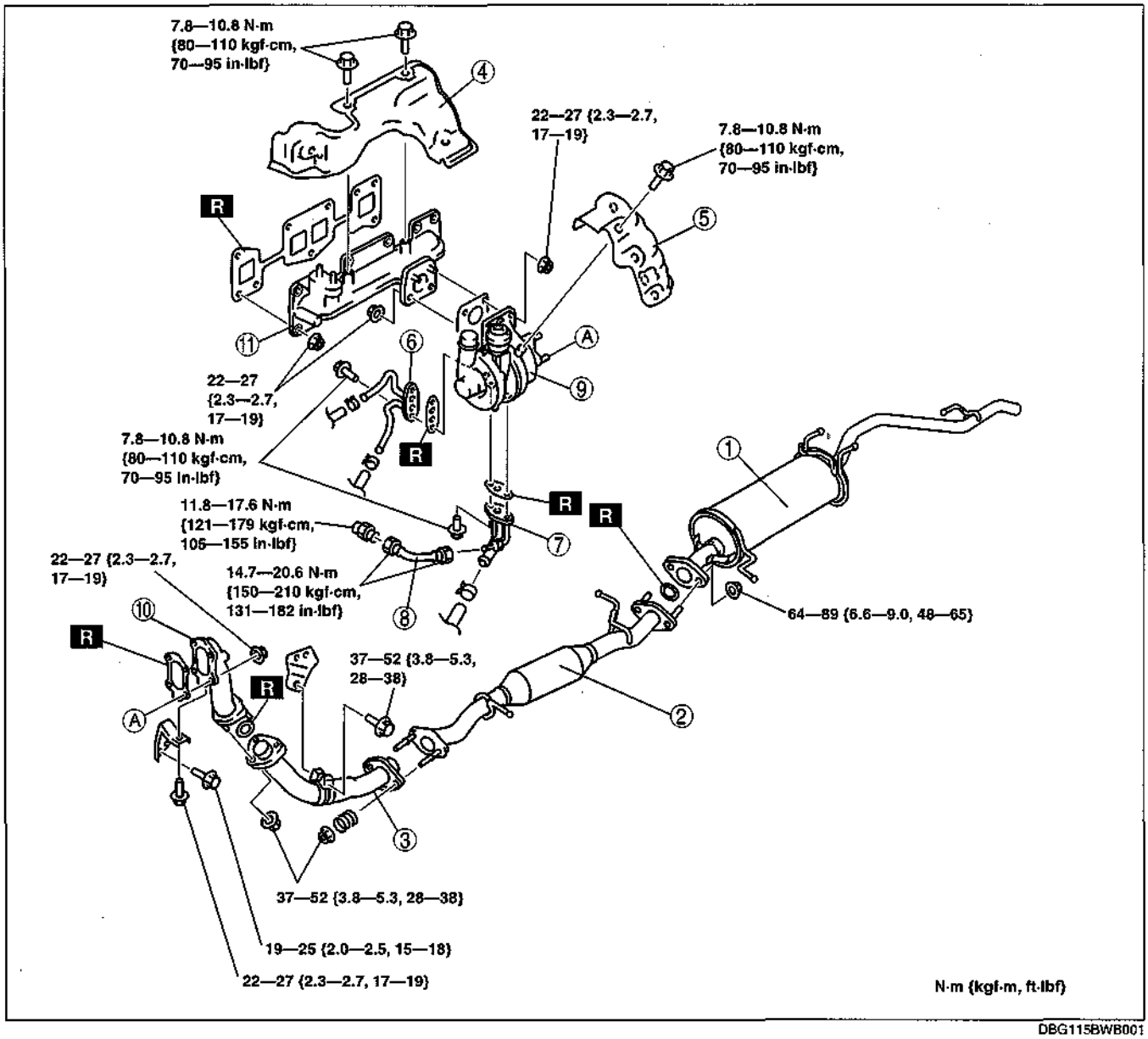
EXHAUST SYSTEM REMOVAL/INSTALLATION [WL-C, WE-C]

dcf011500000w04

Warning

- **When the engine and exhaust system are hot, they can cause severe burns or injury. Turn off the engine and wait until they are cool before removing the exhaust system.**

1. Disconnect the negative battery cable.
2. Remove the engine cover.
3. Remove the air cleaner. (See 01-13B-3 INTAKE-AIR SYSTEM REMOVAL/INSTALLATION [WL-C, WE-C].)
4. Remove the EGR cooler. (See 01-16B-4 EGR SYSTEM REMOVAL/INSTALLATION [WL-C, WE-C].)
5. Remove in the order indicated in the table.
6. Install in the reverse order of removal.
7. Start the engine and:
   (1) Inspect the exhaust gas leakage.
   (2) If any servicing around the turbocharger is performed, inspect around the turbocharger for oil or engine coolant leakage.



DBG115BWB001

1	Main silencer
2	Oxidation catalytic converter
3	Front pipe (See 01-15B-3 Front Pipe Installation Note.)
4	Exhaust manifold insulator
5	Turbocharger insulator

6	Water pipe (See 01-15B-3 Water Pipe Removal Note.) (See 01-15B-3 Water Pipe Installation Note.)
7	Oil pipe
8	Oil hose (supply) (See 01-15B-3 Oil Hose (Supply) Installation Note.)

9	Turbocharger
10	Joint pipe

11	Exhaust manifold

Water Pipe Removal Note

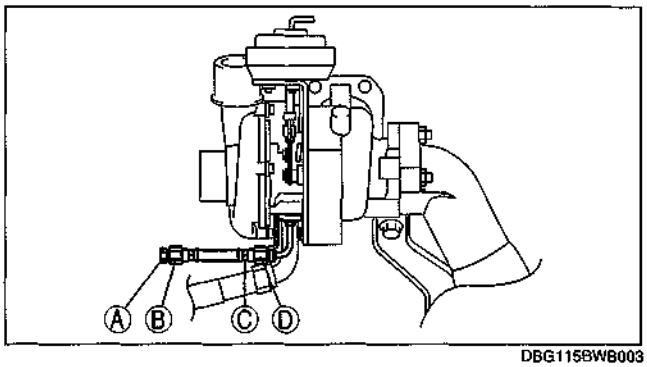
1. Drain the engine coolant before removing the water pipe. (See 01-12B-3 ENGINE COOLANT REPLACEMENT [WL-C, WE-C].)

Oil Hose (Supply) Installation Note

1. Secure section A using a spanner.
2. Tighten the nut at B.

   Tightening torque:
   B, D: 14.7—20.6 N·m {150—210 kg·cm, 131—182 in·lbf}

3. Hold section C using pliers.
4. Tighten the nut at D.



DBG115BWB003

Water Pipe Installation Note

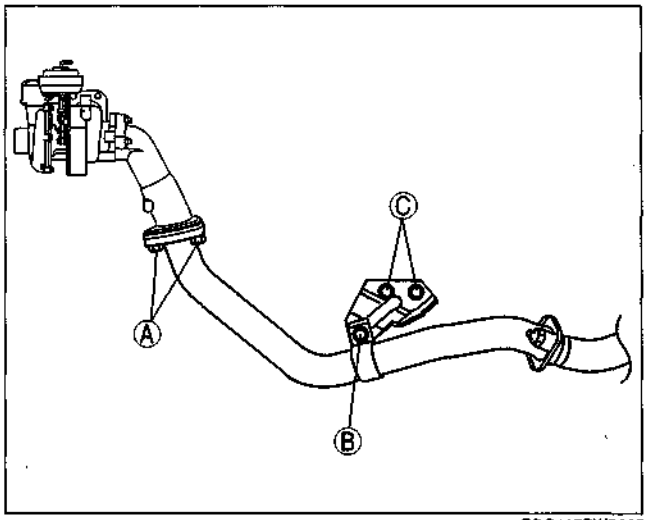
1. Refill the engine coolant after Installing the water pipe. (See 01-12B-3 ENGINE COOLANT REPLACEMENT [WL-C, WE-C].)

Front Pipe Installation Note

1. Temporarily tighten the nuts A.

   Tightening torque:
   A, B: 37—52 N·m {3.8—5.3 kg·m, 28—38 ft·lbf}
   C: 19—25 N·m {2.0—2.5 kg·m, 15—18 ft·lbf}

2. Temporarily tighten the bolts B and C.
3. Completely tighten the nuts A.
4. Completely tighten the bolts B and C.



DBG115BWB002

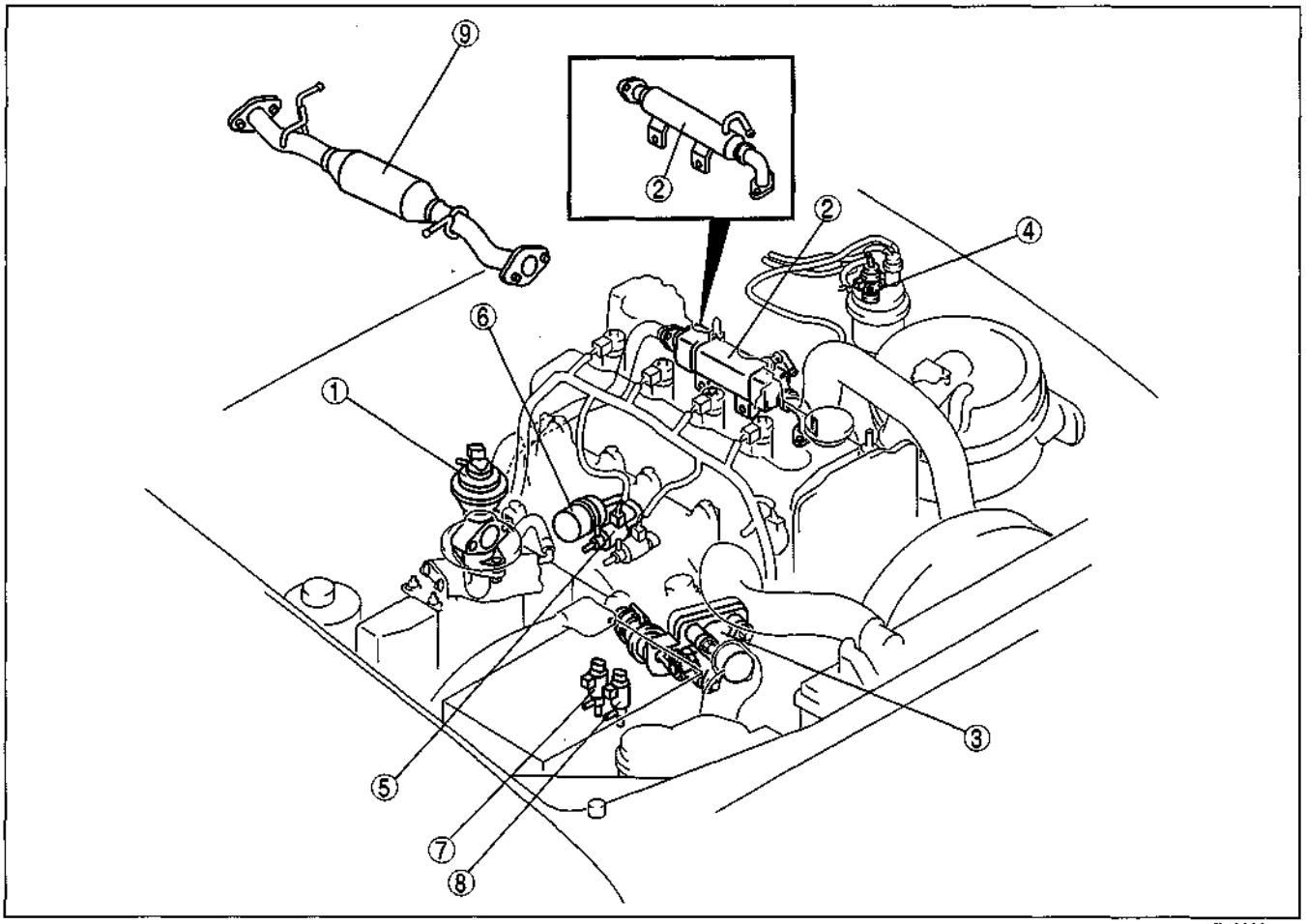
01-16B EMISSION SYSTEM [WL-C, WE-C]

EMISSION SYSTEM
LOCATION INDEX [WL-C, WE-C] 01-16B–1
EMISSION SYSTEM
DIAGRAM [WL-C, WE-C] 01-16B–3
EGR SYSTEM REMOVAL/
INSTALLATION [WL-C, WE-C]..... 01-16B–4
EGR VALVE INSPECTION
[WL-C, WE-C]..... 01-16B–5
EGR SOLENOID VALVE
INSPECTION [WL-C, WE-C] 01-16B–5
EGR CONTROL SOLENOID VALVE
INSPECTION [WL-C, WE-C] 01-16B–6
INTAKE SHUTTER SOLENOID VALVE
(HALF) INSPECTION [WL-C, WE-C] ..01-16B–6
INTAKE SHUTTER SOLENOID VALVE
(FULL) INSPECTION [WL-C, WE-C] ..01-16B–7
INTAKE SHUTTER VALVE
INSPECTION [WL-C, WE-C] 01-16B–7
ROLLOVER VALVE INSPECTION
[WL-C, WE-C] 01-16B–8

EMISSION SYSTEM LOCATION INDEX [WL-C, WE-C]

dcf011600000w03

Engine Room Side



arnffw00000460

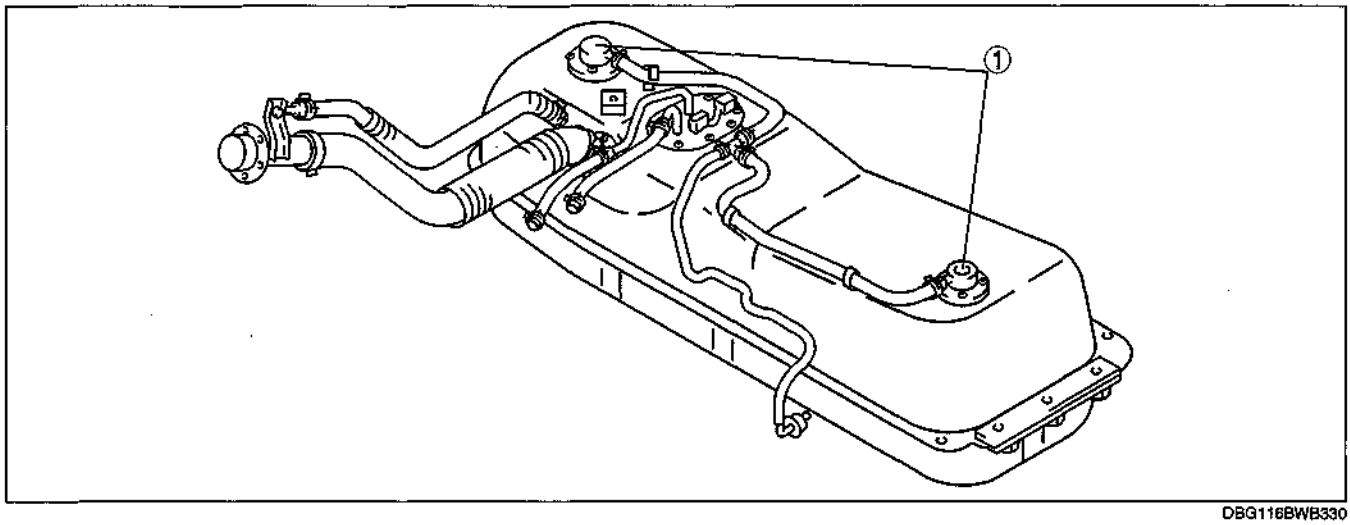
1	EGR valve (See 01-16B-4 EGR SYSTEM REMOVAL/ INSTALLATION [WL-C, WE-C].) (See 01-16B-5 EGR VALVE INSPECTION [WL-C, WE-C].)
2	EGR cooler (See 01-16B-4 EGR SYSTEM REMOVAL/ INSTALLATION [WL-C, WE-C].)
3	Intake shutter valve (See 01-13B-3 INTAKE-AIR SYSTEM REMOVAL/ INSTALLATION [WL-C, WE-C].) (See 01-16B-7 INTAKE SHUTTER VALVE INSPECTION [WL-C, WE-C].)

4	EGR solenoid valve (See 01-16B-5 EGR SOLENOID VALVE INSPECTION [WL-C, WE-C].)
5	EGR control solenoid valve (See 01-16B-6 EGR CONTROL SOLENOID VALVE INSPECTION [WL-C, WE-C].)
6	Air filter
7	Intake shutter solenoid valve (half) (See 01-16B-6 INTAKE SHUTTER SOLENOID VALVE (HALF) INSPECTION [WL-C, WE-C].)
8	Intake shutter solenoid valve (full) (See 01-16B-7 INTAKE SHUTTER SOLENOID VALVE (FULL) INSPECTION [WL-C, WE-C].)

9	Oxidation catalytic converter (See 01-15B-2 EXHAUST SYSTEM REMOVAL/ INSTALLATION [WL-C, WE-C].)

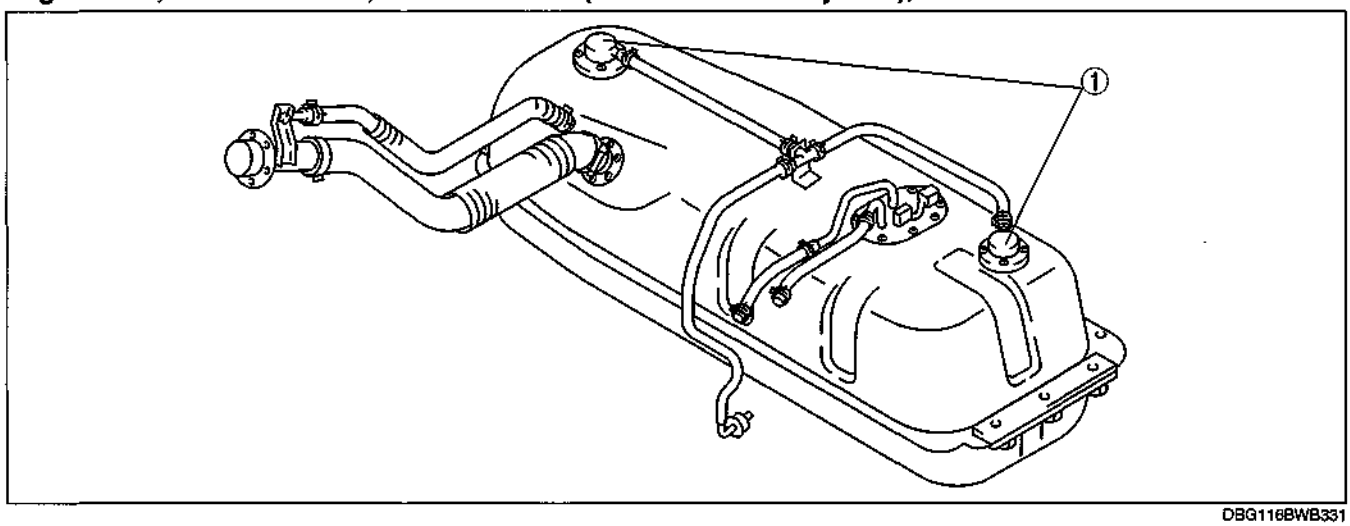
Fuel Tank Side

Double cab 4x2 (except Hi-Rider), Stretch cab 4x2 (with rear access system (except Hi-Rider))



DBG116BWB330

Regular cab, Double cab 4x4, stretch cab 4x4 (with rear access system), Hi-Rider

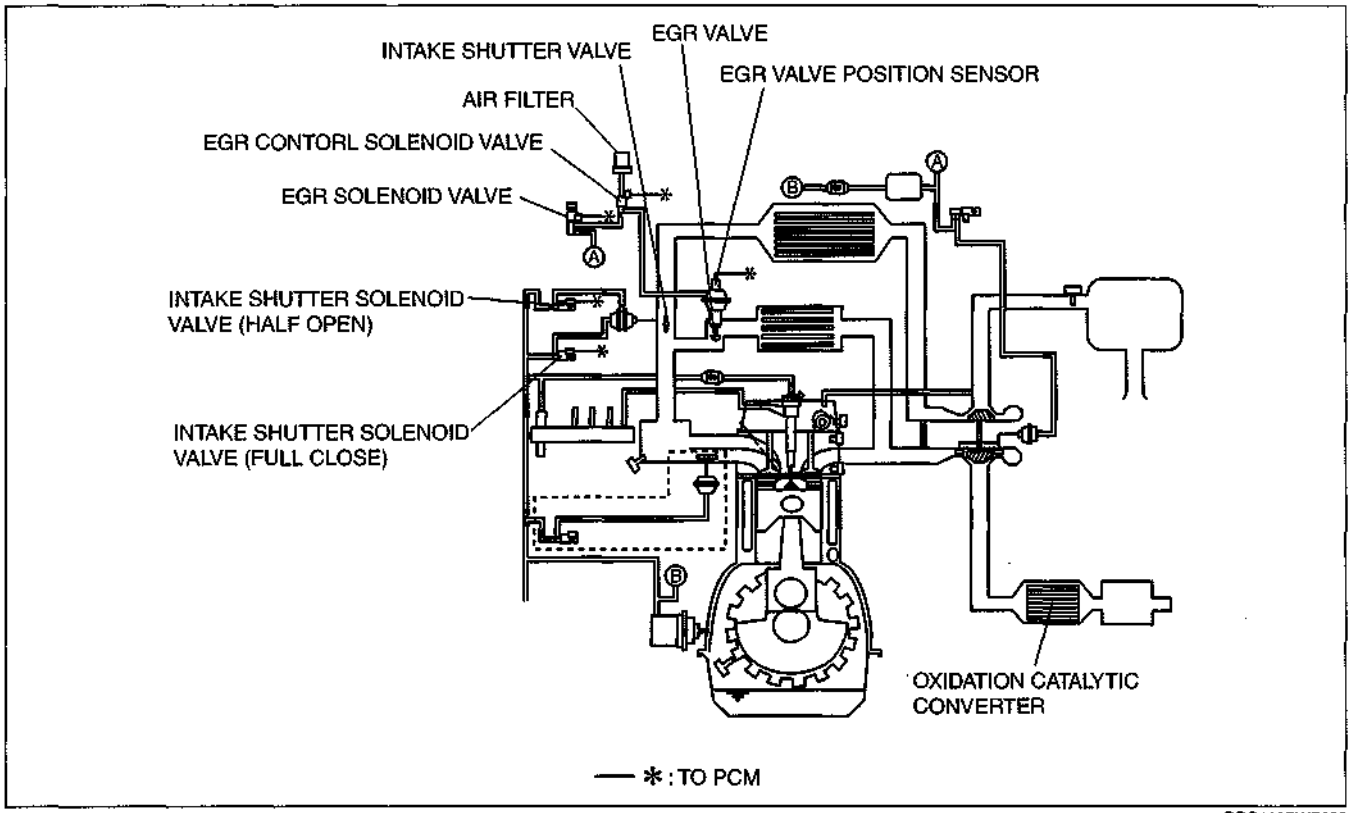


DBG116BWB331

1	Rollover valve (See 01-16B-8 ROLLOVER VALVE INSPECTION [WL-C, WE-C].)

EMISSION SYSTEM DIAGRAM [WL-C, WE-C]

dcf011600000w04

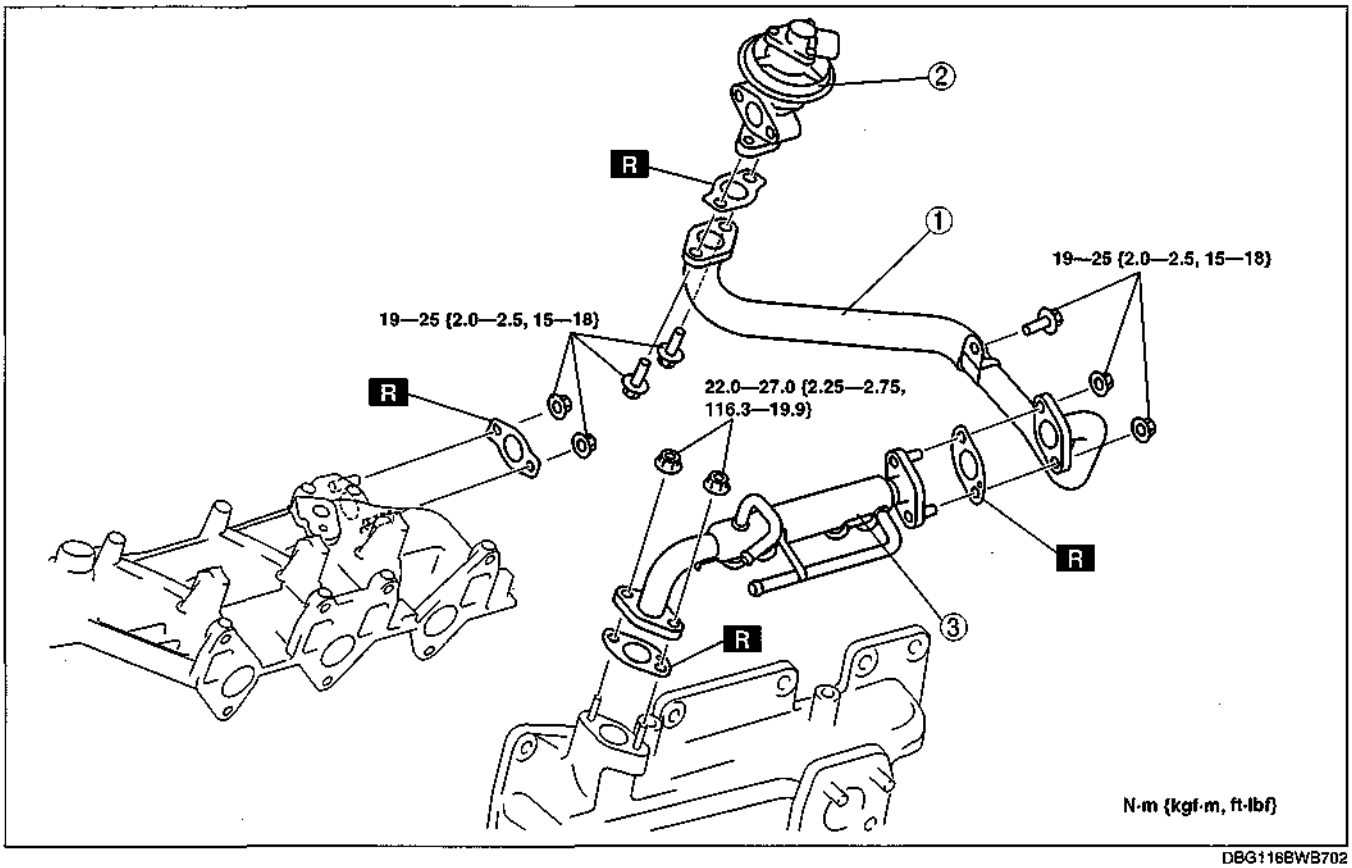


DBG116BWB332

EGR SYSTEM REMOVAL/INSTALLATION [WL-C, WE-C]

dcf011600020w02

1. Disconnect the negative battery cable.
2. Remove in the order indicated in the table.
3. Install in the reverse order of removal.



DBG116BWB702

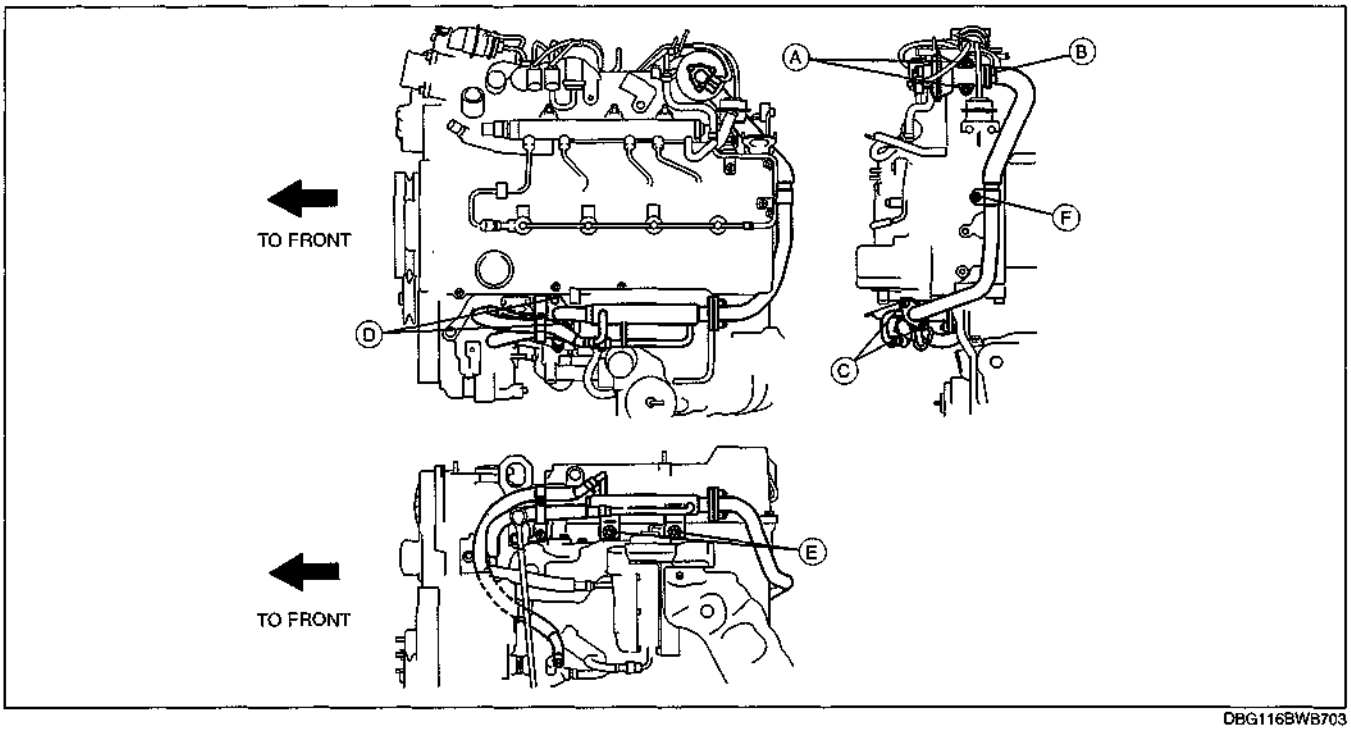
1	EGR pipe
2	EGR cooler

3	EGR valve

EGR system installation note

1. Temporarily tighten bolts and nuts in order of A to F.

2. Tighten the bolts and nuts in order of A to F.



DBG116BWB703

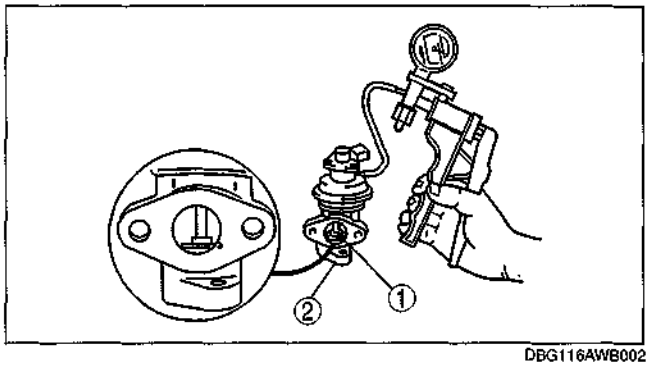
EGR VALVE INSPECTION [WL-C, WE-C]

dcf011620300w02

1. Inspect for airflow between 1 and 2 when vacuum is applied using a vacuum pump as shown in the figure.
   - If not as specified, replace the EGR valve.

Specification

Vacuum kPa {mmHg, inHg}	Airflow
Below –30.0— –36.6 {–226— –274,–8.90 — –10.8}	Yes
Except above	No

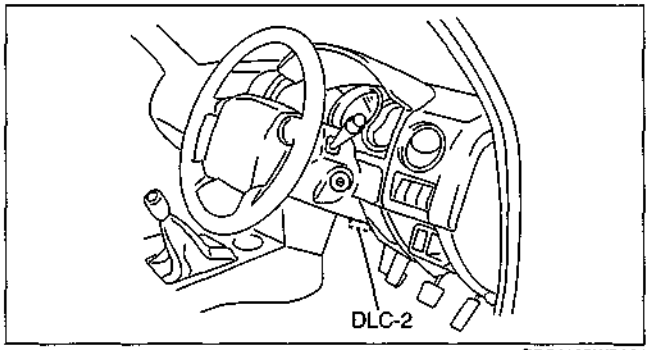


DBG116AWB002

EGR SOLENOID VALVE INSPECTION [WL-C, WE-C]

dcf011618741w04

1. Connect the current diagnostic tool to the DLC-2.
2. Monitor the following signals using the PID/data monitor.
   - EGR solenoid
   - Mass air flow (MAF)
3. Using the "SEGRP" simulation function, verify that the mass intake airflow amount changes.
   - If the mass airflow amount does not change, inspect the following:
     — EGR solenoid valve
     — Wiring harness and connector open circuit (main relay—EGR solenoid valve—PCM)
     — Vacuum hose disconnection or damage
4. Clear all DTCs stored in the PCM referring to the "AFTER REPAIR PROCEDURE".



DBG110BWBA01

EGR CONTROL SOLENOID VALVE INSPECTION [WL-C, WE-C]

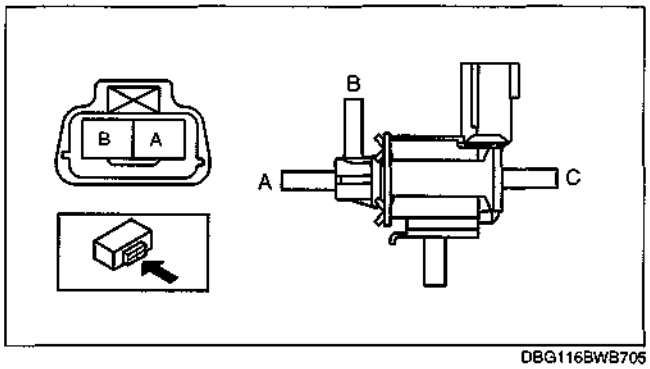
dcf011618741w05

1. Inspect airflow between the ports under the following conditions.
   - If not as specified, replace the EGR control solenoid valve.
   - If as specified, carry out the "Circuit Open/Short Inspection."

○—○ : Airflow

Step	Terminal		Port		
	A	B	A	B	C
1				○—○	
2	B+	GND	○—○		

YTA4114W105



DBG116BWB705

Circuit Open/Short Inspection

1. Inspect for an open or short circuit in the following wiring harnesses.
   - If there is an open or short circuit, repair or replace wiring harnesses.

Open circuit
- Power circuit (EGR control solenoid valve terminal A and main relay terminal D)
- Ground circuit (EGR control solenoid valve terminal B and PCM terminal 177)

Short circuit
- EGR control solenoid valve terminal A and main relay terminal D to ground

INTAKE SHUTTER SOLENOID VALVE (HALF) INSPECTION [WL-C, WE-C]

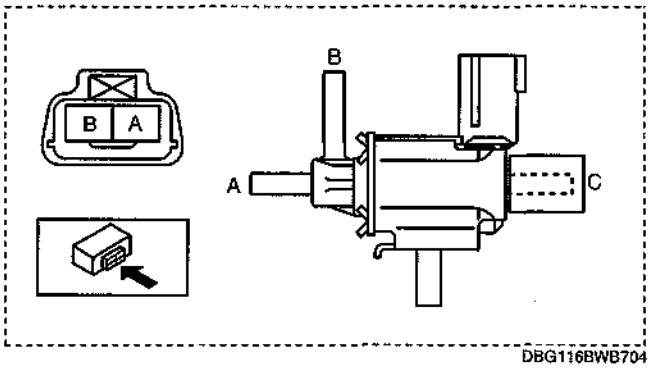
dcf011600000w05

1. Inspect airflow between the ports under the following conditions.
   - If not as specified, replace the intake shutter valve (half).
   - If as specified, carry out the "Circuit Open/Short Inspection."

○—○ : Airflow

Step	Terminal		Port		
	A	B	A	B	C
1				○—○	
2	B+	GND	○—○		

YTA4114W105



DBG116BWB704

Circuit Open/Short Inspection

1. Inspect for an open or short circuit in the following wiring harnesses.
   - If there is an open or short circuit, repair or replace wiring harnesses.

Open circuit
- Power circuit (intake shutter solenoid valve (half) terminal A and main relay terminal D)
- Ground circuit (intake shutter solenoid valve (half) terminal B and PCM terminal 152)

Short circuit
- Intake shutter solenoid valve (half) terminal A and main relay terminal D to ground

INTAKE SHUTTER SOLENOID VALVE (FULL) INSPECTION [WL-C, WE-C]

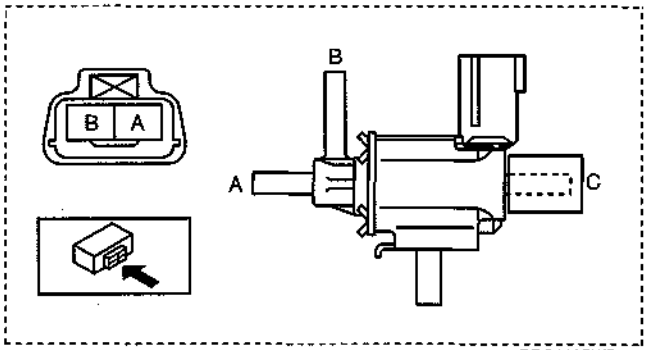
dcf011600000w06

1. Inspect airflow between the ports under the following conditions.
   - If not as specified, replace the intake shutter valve (full).
   - If as specified, carry out the "Circuit Open/Short Inspection."

○=○ : Airflow

Step	Terminal		Port		
	A	B	A	B	C
1				○=○	
2	B+	GND	○=○		

YTA4114W105



DBG116BWB704

Circuit Open/Short Inspection

1. Inspect for an open or short circuit in the following wiring harnesses.
   - If there is an open or short circuit, repair or replace wiring harnesses.

Open circuit

- Power circuit (intake shutter solenoid valve (full) terminal A and main relay terminal D)
- Ground circuit (intake shutter solenoid valve (full) terminal B and PCM terminal 155)

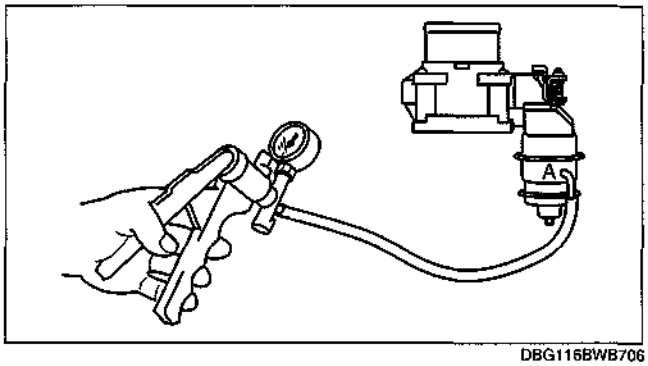
Short circuit

- Intake shutter valve (full) terminal A and main relay terminal D to ground

INTAKE SHUTTER VALVE INSPECTION [WL-C, WE-C]

dcf011600000w07

1. Disconnect the vacuum hose from the intake shutter valve.
2. Connect a vacuum pump to port A.
3. Apply vacuum and verify that the rod moves.
   - If the rod does not move, replace the intake shutter valve.



DBG116BWB706

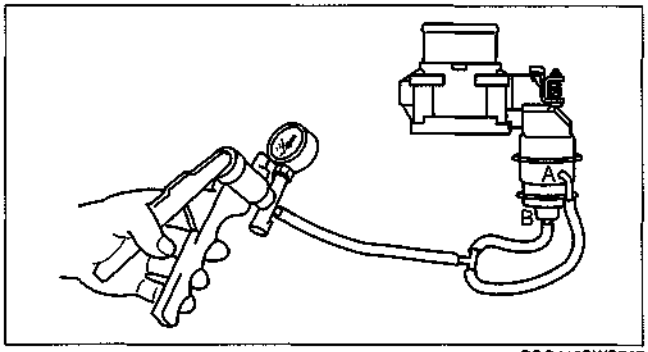
Specification (WL-C)

Vacuum kPa {mmHg, inHg}	Rod movement
Below –4 {–30, –1.2}	Start to move
Above –25.3 {–190, –7.47}	Fully pulled

Specification (WE-C)

Vacuum kPa {mmHg, inHg}	Rod movement
Below –3.6 {–27, –1.1}	Start to move
Above –27.9 {–209, –8.24}	Fully pulled

4. Connect a vacuum pump to port A and B.
5. Apply vacuum and verify that the rod moves.
   - If the rod does not move, replace the intake shutter valve.



DBG116BWB707

Specification (WL-C)

Vacuum kPa {mmHg, inHg}	Rod movement
Above –40 {–300, –11.8}	Fully pulled

Specification (WE-C)

Vacuum kPa {mmHg, inHg}	Rod movement
Above –44 {–330, –13.0}	Fully pulled

ROLLOVER VALVE INSPECTION [WL-C, WE-C]

dcf011642720w02

Note
- The rollover valve cannot be disassembled and inspected as it is integrated in the fuel tank.

1. Perform the fuel tank inspection. (See 01-14B-8 FUEL TANK INSPECTION [WL-C, WE-C].)

01-17 CHARGING SYSTEM

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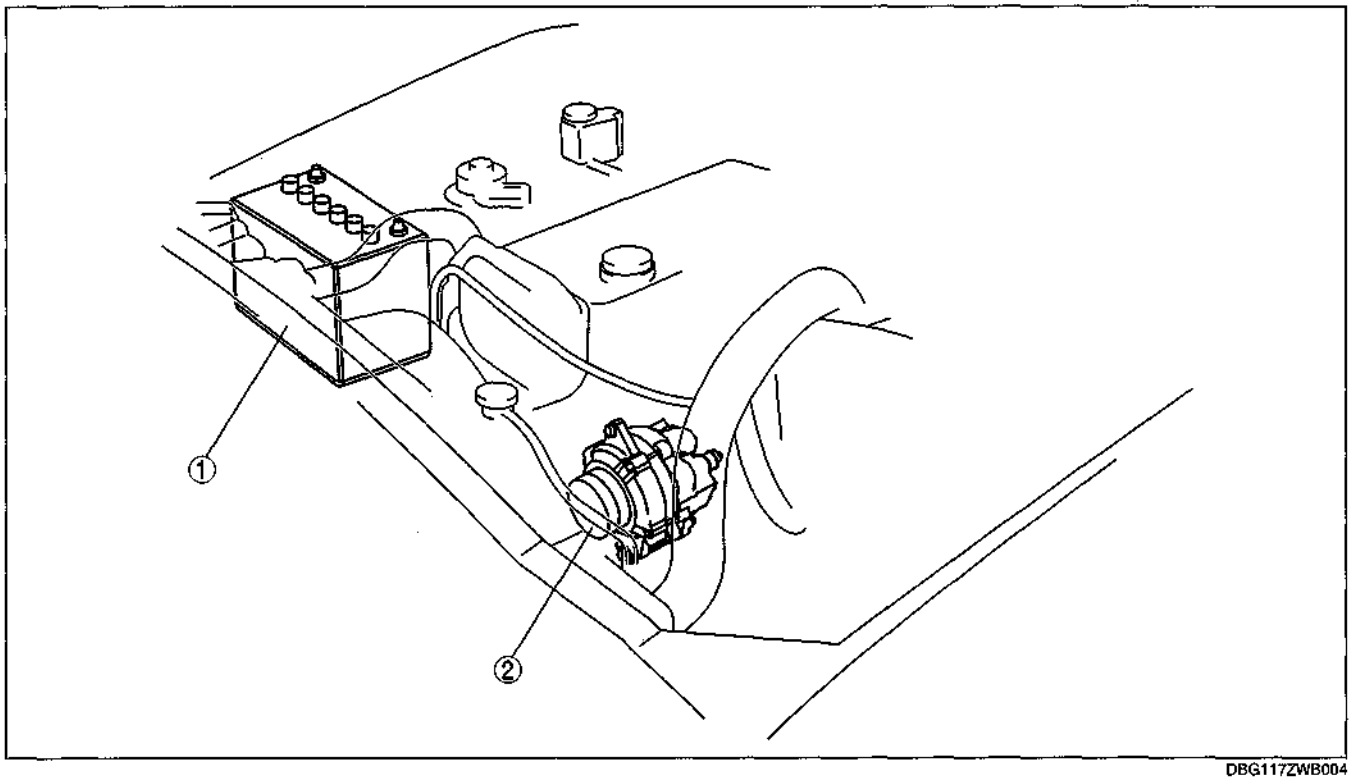
BATTERY REMOVAL/INSTALLATION . . 01-17–2
BATTERY INSPECTION 01-17–2
BATTERY RECHARGING. 01-17–4
GENERATOR
REMOVAL/INSTALLATION 01-17–4
GENERATOR INSPECTION. 01-17–5
GENERATOR
DISASSEMBLY/ASSEMBLY 01-17–8

CHARGING SYSTEM LOCATION INDEX

dcf011700000w01



DBG117ZWB004

1	Battery (See 01-17-2 BATTERY REMOVAL/ INSTALLATION.) (See 01-17-2 BATTERY INSPECTION.) (See 01-17-4 BATTERY RECHARGING.)

2	Generator (See 01-17-4 GENERATOR REMOVAL/ INSTALLATION.) (See 01-17-5 GENERATOR INSPECTION.) (See 01-17-8 GENERATOR DISASSEMBLY/ ASSEMBLY.)

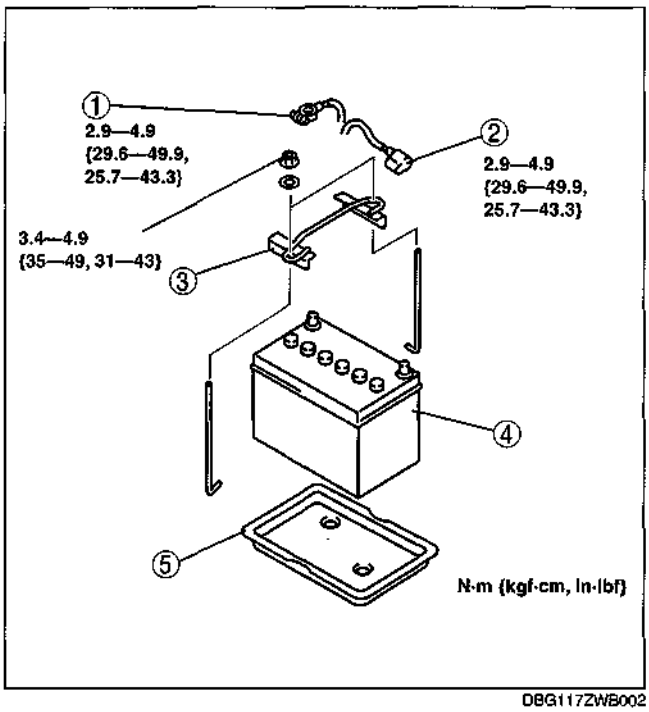
BATTERY REMOVAL/INSTALLATION

dcf011718520w01

1. Remove in the order indicated in the table.

1	Negative battery cable
2	Positive battery cable (See 01-17-2 Positive Battery Cable Installation Note.)
3	Battery clamp
4	Battery
5	Battery tray

2. Install in the reverse order of removal.



DBG117ZWB002

Positive Battery Cable Installation Note

Note
- Secure the positive battery cable to the battery clamp with the band.

BATTERY INSPECTION

dcf011718520w02

Warning
- **Since battery acid is toxic, be careful when handling the battery.**
- **Since battery acid is highly corrosive, be careful not to allow it to contact clothing or the vehicle.**
- **In case battery acid contacts skin, eyes, or clothing, flush it immediately with running water. Especially if the acid gets in the eyes, flush with water for more than 15 min and get prompt medical attention.**

Electrolyte specific gravity

1. Measure the electrolyte specific gravity using a hydrometer.
   - If it is less than the specification, recharge the battery. (See 01-17-4 BATTERY RECHARGING.)

Battery electrolyte specific gravity [20 °C {68 °F}]
1.22—1.29

Battery voltage

1. Inspect the battery as follows:

Step	Inspection		Action
1	Measure the battery positive voltage.	12.4 V or more	Go to Step 3.
		Less than 12.4 V	Go to the next step.
2	Quick charge for 30 min and recheck voltage.	12.4 V or more	Go to the next step.
		Less than 12.4 V	Replace the battery.

Step	Inspection		Action
3	Using the battery load tester, apply load current (see battery load test current) and record battery voltage after 15 s. Is voltage more than specification?	Yes	Normal
		No	Replace the battery.

Battery load test current

65D31R (56): 165 A
75D26R (52): 195 A
75D26L (52): 195 A
95D31R (64): 250 A

Standard specification

Battery temp. (°C {°F})	Minimum voltage (V)
4 {39}	9.3
10 {50}	9.4
16 {61}	9.5
21 {70}	9.6

Back-up current

1. Verify that the engine switch is off (key has been removed) and that all doors are closed.
2. Disconnect the negative battery cable.
3. Connect the tester between the negative battery terminal and negative battery cable, leave the battery undisturbed for **15 min.**, and then measure the back-up current.
   - If not within the specification, measure the back-up current while removing the fuses one by one from the inside of the main fuse block and the inside of the fuse block.

   Note
   - If the battery is not left undisturbed for **15 min.**, the tester will indicate a high value (**approx. 200 mA**).
   - If the key or any electrical accessory is operated within **approx. 15 min.** after the tester is connected, the battery must be left undisturbed for approx. 15 min. from that point.

   Caution
   - **Operating electrical loads while the back-up current is being measured can damage the tester.**

   Note
   - For the vehicles with the immobilizer system, periodically shifts synchronization of the security light flashing. Therefore, **25 mA (0.1 s)** current is supplied when the security light is illuminated, and **5 mA (2 s)** current is supplied when the security light is not illuminated. In addition, the measuring instrument, which shows the average value, indicates around **10 mA**.

   Battery back-up current

   Vehicles with immobilizer system: 5—25 mA
   Vehicles without immobilizer system: 10 mA or less

4. Inspect and repair wiring harnesses and connectors of the fuse where the current has decreased.

BATTERY RECHARGING

dcf011718520w03

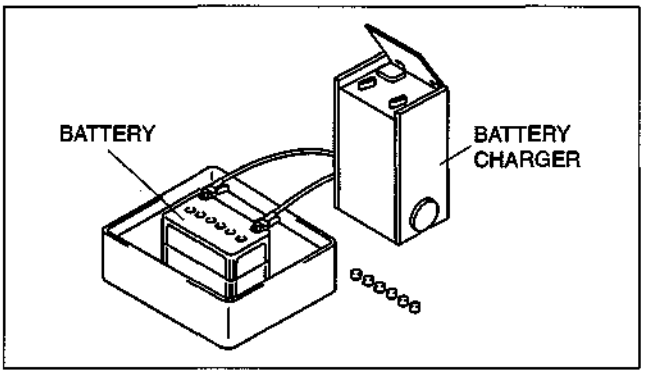
Warning
- **Keep all flames away from the battery, otherwise evaporated gas from the battery fluid may catch fire, and cause serious injury.**
- **Remove the battery filler caps when recharging to prevent battery deformation or damage.**

Caution
- **Do not quick charge for more than 30 min. It will damage the battery.**

1. Remove the battery and then place it in a pan of water.
2. Remove the battery filler caps.
3. Connect a battery charger to the battery and adjust the charging current as follows.

Battery slow charge current
65D31R (56): 4.0—5.0 A
75D26R (52): 5.0—6.0 A
75D26L (52): 5.0—6.0 A
95D31R (64): 6.5—8.0 A

Battery quick charge current [30 min]
65D31R (56): 30 A
75D26R (52): 35 A
75D26L (52): 35 A
95D31R (64): 40 A



CHU0117W004

4. After the battery is recharged, verify that the voltage is within the specification and remains at the same value for **1 h or more** after the recharging was completed.
   - If not within the specification, replace the battery.

Standard voltage
12.4 V or more

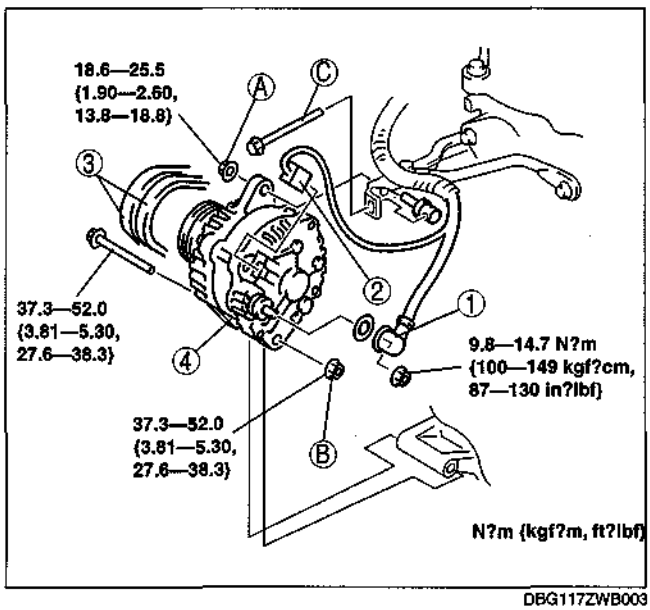
GENERATOR REMOVAL/INSTALLATION

dcf011718300w01

Warning
- **When the battery cables are connected, touching the vehicle body with generator terminal B will generate sparks. This can cause personal injury, fire, and damage to the electrical components. Always disconnect the battery negative cable before performing the following operation.**

1. Disconnect the negative battery cable.
2. Remove in the order indicated in the table.
3. Install in the reverse order of removal.
4. Inspect the drive belt deflection/tension. (See 01-10A-3 DRIVE BELT INSPECTION [WL-3].) (See 01-10B-3 DRIVE BELT INSPECTION [WL-C, WE-C].)

1	B terminal cable
2	Generator connector
3	Drive belt
4	Generator (See 01-17-5 Generator Installation Note.)



DBG117ZWB003

Generator Installation Note

1. Tighten locknut A by hand.
2. Tighten mounting nut B.

   Tightening torque:
   12—25 N·m {123—254 kgf·cm, 107—221 in·lbf}

3. Adjust the drive belt deflection or tension by turning adjusting bolt C. (See 01-10A-3 DRIVE BELT INSPECTION [WL-3].) (See 01-10B-3 DRIVE BELT INSPECTION [WL-C, WE-C].)
4. Tighten mounting nut B and locknut A.

GENERATOR INSPECTION

dcf011718300w02

Generator Warning Light

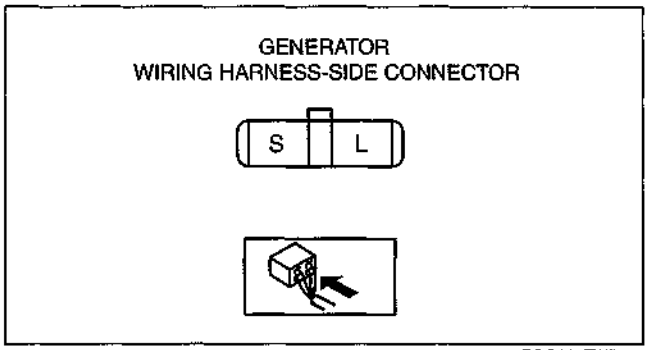
1. Verify that the battery is fully charged.
   - Charge if necessary.
2. Verify that the drive belt deflection/tension is within the specification. (See 01-10A-3 DRIVE BELT INSPECTION [WL-3].) (See 01-10B-3 DRIVE BELT INSPECTION [WL-C, WE-C].)
3. Turn the engine switch on and verify that the generator warning light illuminates.
   - If not as specified, inspect the generator warning light, and wiring harnesses between the battery and the generator warning light.
4. Verify that the generator warning light goes out after the engine is started.
   - If not as specified, inspect the generator.

Generator
Voltage

1. Verify that the battery is fully charged.
   - Charge if necessary.
2. Verify that the drive belt deflection/tension is within the specification. (See 01-10A-3 DRIVE BELT INSPECTION [WL-3].) (See 01-10B-3 DRIVE BELT INSPECTION [WL-C, WE-C].)
3. Turn off all electrical loads.
4. Turn the engine switch to start the engine and verify that the generator rotates smoothly without any noise while the engine is running.
5. Measure the voltage at each terminal using a tester.
   - If not as specified, repair or replace the generator if necessary.

   Generator standard voltage [Engine switch ON]
   Terminal B: B+
   Terminal L: Approx. 1 V
   Terminal S: B+

   Generator standard voltage [Idle, 20 °C {68 °F}]
   Terminal B: 14.1—14.7 V
   Terminal L: 13.0—14.0 V
   Terminal S: 14.1—14.7 V



DBG117ZWB850

Current

Note
- Since the charging current decreases rapidly after starting the engine, perform the following procedure quickly, and read the maximum current value.

1. Verify that the battery is fully charged.
   - Charge if necessary.
2. Verify that the drive belt deflection/tension is within the specification. (See 01-10A-3 DRIVE BELT INSPECTION [WL-3].) (See 01-10B-3 DRIVE BELT INSPECTION [WL-C, WE-C].)
3. Disconnect the negative battery cable.
4. Connect a tester, which can read **120 A or more**, between generator terminal B and the wiring harness.
5. Turn off all electrical loads.
6. Start the engine and increase the engine speed to **2,000—2,500 rpm**.
7. Turn the following electrical loads on and verify that the current reading increases.
   (1) Headlights
   (2) Blower motor
   (3) Rear window defroster
      - If generator terminal B current does not increase, repair or replace the generator if necessary.

Note
- Current required for generating power varies with the electrical loads applied.

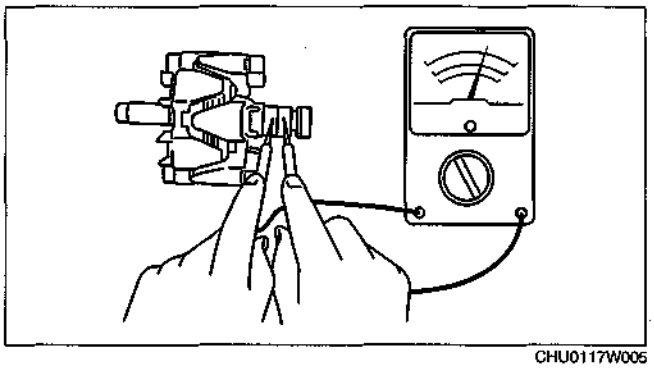
Generator generated current (reference value) [Conditions] Ambient temperature: 20 °C {68 °F}, Voltage: 13.5 V, Engine hot

Engine speed (rpm)	Terminal B current (Lower limit of current must be more than 0 A.)
1,000	0—55 A
2,000	0—70 A

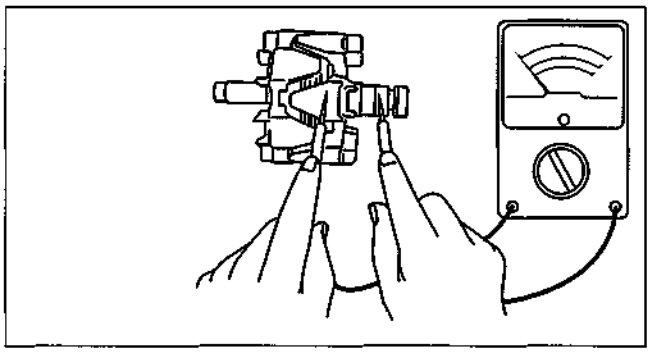
Generator Inner Parts
Rotor

1. Measure the resistance between the slip rings using a tester.
   - If not as specified, replace the rotor.

   Generator rotor resistance (between slip rings) [20 °C {68 °F}]
   2.3—2.7 ohms

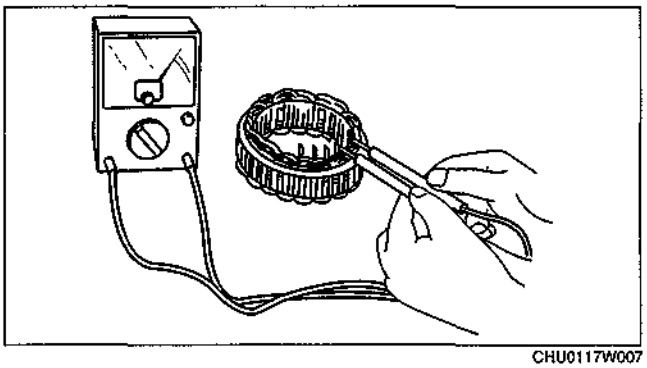

CHU0117W005

2. Verify that there is no continuity between the slip ring and core using a tester.
   - If there is continuity, replace the rotor.
3. Inspect the slip ring surface condition.
   - If the slip ring surface is rough, use a lathe or fine sandpaper to repair it.

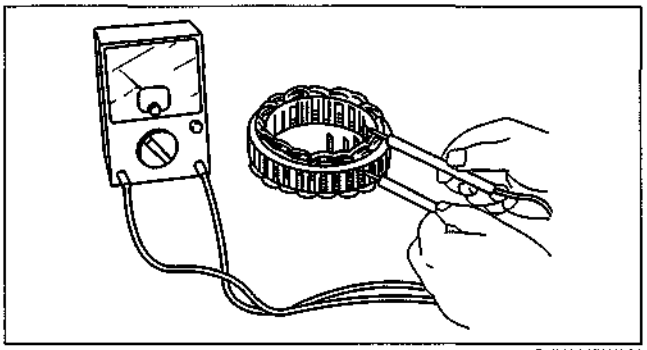

CHU0117W006

Stator coil

1. Inspect for continuity between the stator coil leads using a tester.
   - If there is no continuity, replace the stator.


CHU0117W007

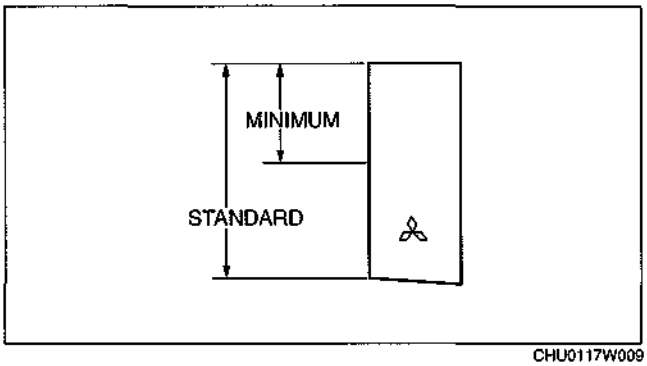
2. Verify that there is no continuity between the stator coil leads and the core using a tester.
   - If there is continuity, replace the stator coil.


CHU0117W008

Brush

1. Inspect brushes for wear.
   - If any brush is worn almost to or beyond the limit, replace all of the brushes.

Generator brush length
Standard: 18.5 mm {0.73 in}
Minimum: 5.0 mm {0.2 in}

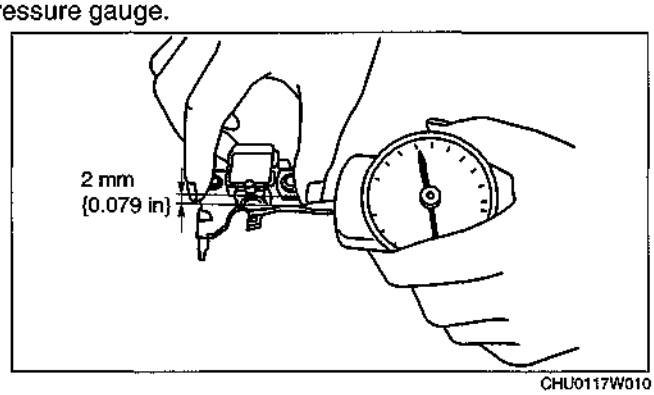


CHU0117W009

Brush spring

1. Measure the force of the brush spring using a spring pressure gauge.
2. Read the spring pressure gauge at the brush tip projection of **2 mm {0.079 in}**.
   - Replace the brush spring if necessary.

Generator brush spring force
Standard: 4.8—6.0 N {0.49—0.61 kgf, 1.08—1.34 lbf}
Minimum: 2.16 N {0.22 kgf, 0.49 lbf}



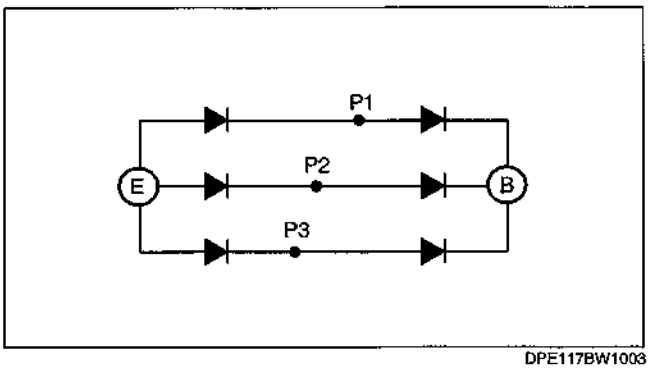
CHU0117W010

Rectifier

1. Inspect for continuity of the diodes using a tester.
   - If not as specified, replace the rectifier.

Specification

Tester		Continuity
Negative	Positive	
E	P1, P2, P3	Yes
B		No
P1, P2, P3	E	No
	B	Yes



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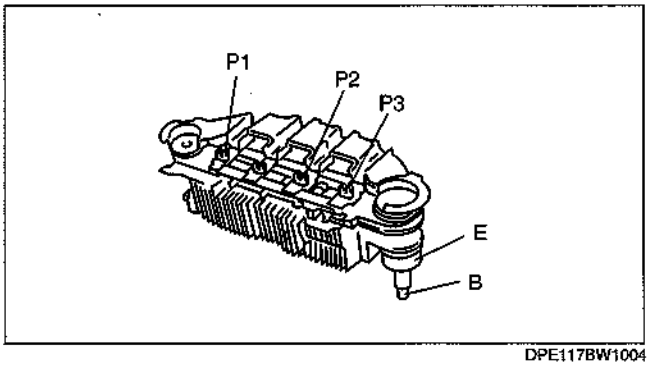
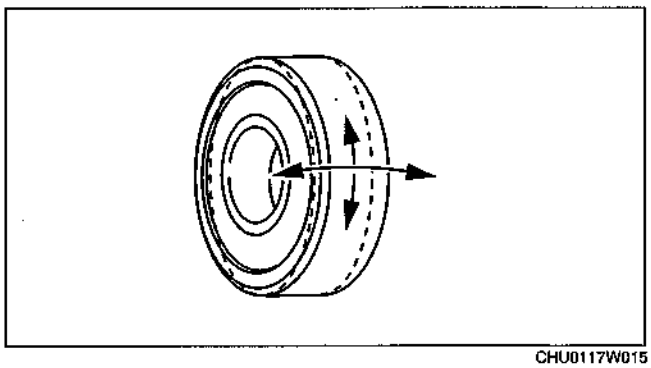


DPE117BW1004

Bearing

1. Inspect for abnormal noise, looseness, and sticking.
   - Replace the bearing if necessary.



CHU0117W015

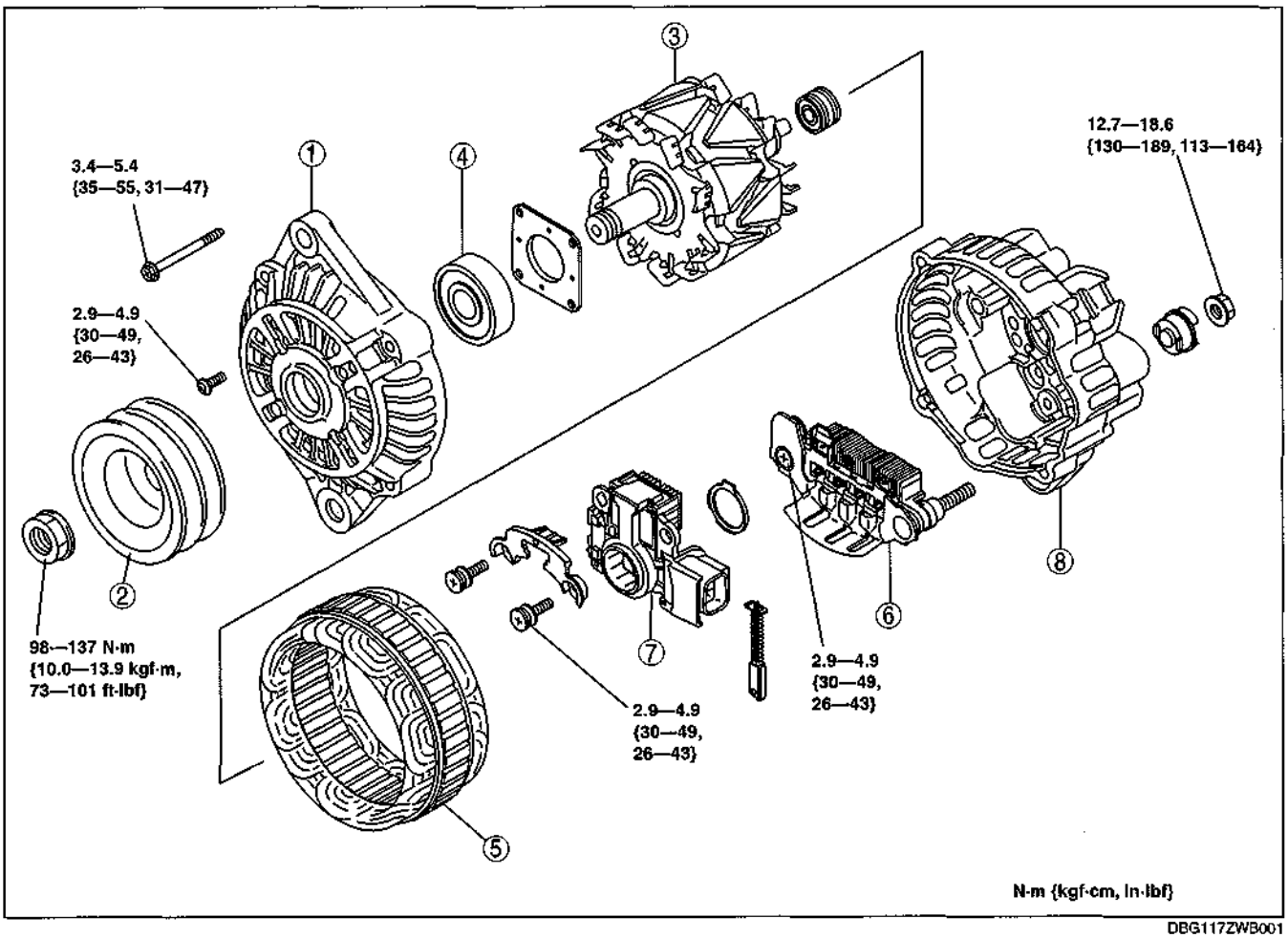
GENERATOR DISASSEMBLY/ASSEMBLY

dcf011718300w03

Caution

- **Melt the solder quickly, otherwise the diodes (rectifier) and regulator will be damaged by excessive heat.**

1. Disassemble in the order indicated in the table.
2. Assemble in the reverse order of disassembly.



DBG117ZWB001

1	Front cover
2	Pulley
3	Rotor
4	Bearing

5	Stator coil
6	Rectifier
7	Brush holder
8	Rear bracket

01-19 STARTING SYSTEM

STARTING SYSTEM
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INSTALLATION [WL-C, WE-C] 01-19–2
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STARTER
DISASSEMBLY/ASSEMBLY.....01-19–8

STARTING SYSTEM LOCATION INDEX

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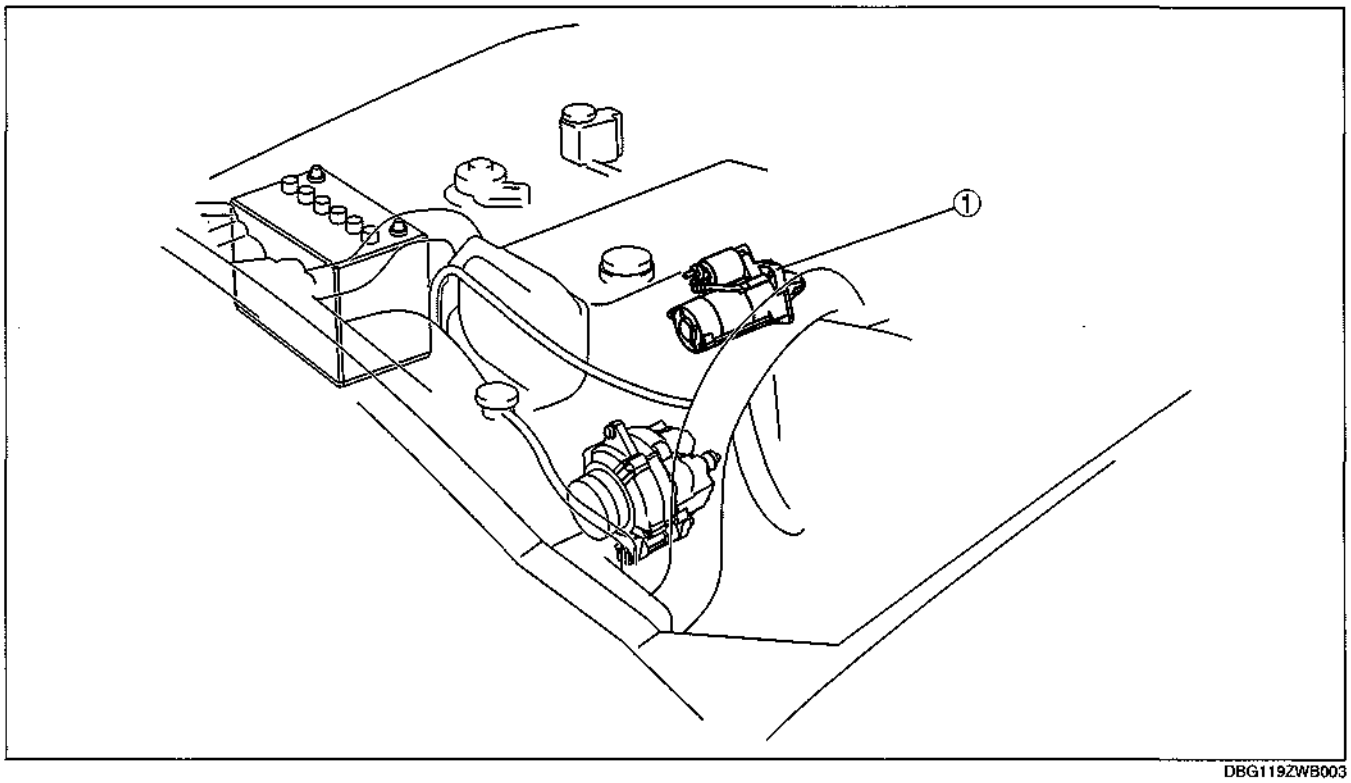


DBG119ZWB003

1	Starter (See 01-19-2 STARTER REMOVAL/INSTALLATION [WL-3].) (See 01-19-2 STARTER REMOVAL/INSTALLATION [WL-C, WE-C].) (See 01-19-3 STARTER INSPECTION.) (See 01-19-8 STARTER DISASSEMBLY/ ASSEMBLY.)

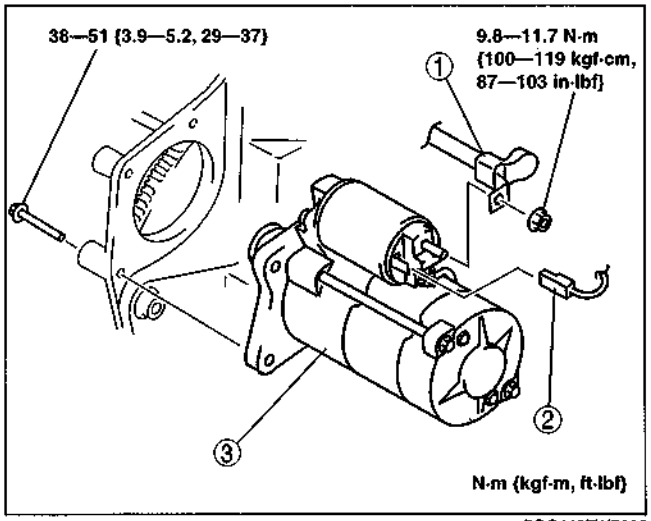
STARTER REMOVAL/INSTALLATION [WL-3]

dcf011918400w01

Warning
- **When the battery cables are connected, touching the vehicle body with starter terminal B will generate sparks. This can cause personal injury, fire, and damage to the electrical components. Always disconnect the negative battery cable before performing the following operation.**

1. Remove the battery. (See 01-17-2 BATTERY REMOVAL/INSTALLATION.)
2. Remove in the order indicated in the table.
3. Install in the reverse order of removal.

1	Terminal B cable
2	Terminal S connector
3	Starter (See 01-19-2 Starter Installation Note.)



DBG119ZWB002

Starter Installation Note
1. Temporarily tighten the installation bolts.
2. Tighten the installation bolts.

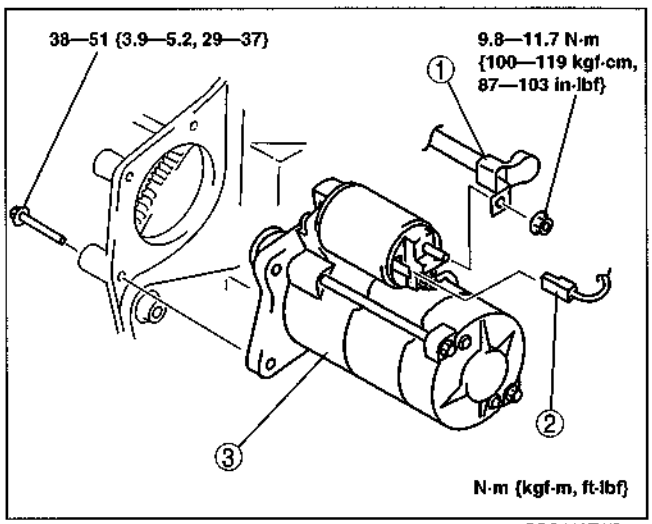
STARTER REMOVAL/INSTALLATION [WL-C, WE-C]

dcf011918400w02

Warning
- **When the battery cables are connected, touching the vehicle body with starter terminal B will generate sparks. This can cause personal injury, fire, and damage to the electrical components. Always disconnect the negative battery cable before performing the following operation.**

1. Remove the engine cover.
2. Remove the battery and battery tray. (See 01-17-2 BATTERY REMOVAL/INSTALLATION.)
3. Set the fuel filter component slightly out of the way. (See 01-14B-9 FUEL FILTER REMOVAL/INSTALLATION [WL-C, WE-C].)
4. Set the bracket that secure the intake shutter solenoid valve out of the way.
5. Remove in the order indicated in the table.
6. Install in the reverse order of removal.

1	Terminal B cable
2	Terminal S connector
3	Starter (See 01-19-3 Starter Installation Note.)



DBG119ZWB002

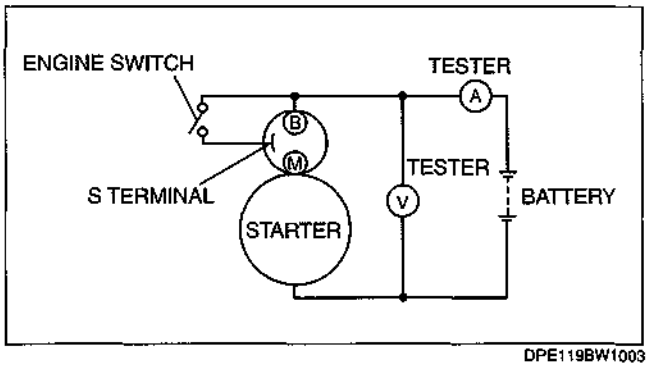
Starter Installation Note
1. Temporarily tighten the installation bolts.
2. Tighten the installation bolts.

STARTER INSPECTION

dcf011918400w03

On-vehicle Inspection
1. Verify that the battery is fully charged.
2. The starter is normal if it rotates smoothly and without any noise when the engine is cranked.
   - If the starter does not operate, inspect the following:
     — Remove the starter, and inspect the starter unit.
     — Inspect the related wiring harnesses and the engine switch.

No-load test
1. Verify that the battery is fully charged.
2. Connect the starter, battery, and a tester as shown in the figure.
3. Operate the starter and verify that it rotates smoothly.
   - If the starter does not rotate smoothly, inspect the starter unit.
4. Measure the voltage and current while the starter is operating.
   - If not within the specification, replace the starter.



DPE119BW1003

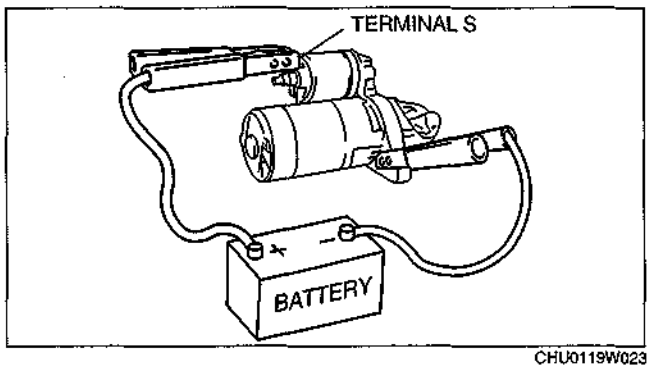
Starter no load test voltage
11 V

Starter no load test current
130 A or less

Magnetic Switch Operation Inspection
Pull-out test

Note
- Depending on the battery charge condition, the starter motor pinion may rotate while in a protracted state. This is due to current flowing to the starter motor through the pull-in coil to turn the starter motor, and does not indicate an abnormality.

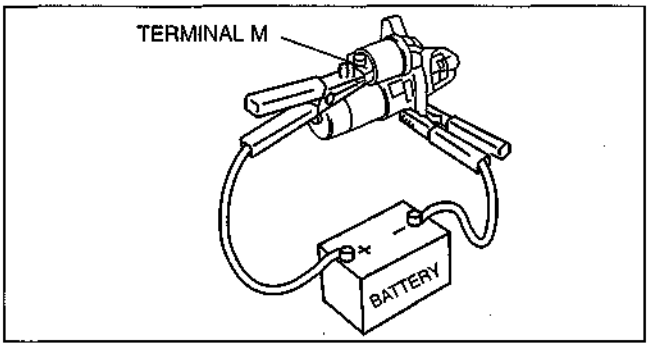
1. Verify that the starter motor pinion is protracted while battery positive voltage is connected to terminal S and the starter body is grounded.
   - If not pulled out, repair or replace the starter.



CHU0119W023

Return test
1. Disconnect the motor wire from terminal M.

2. Connect battery positive voltage to terminal M and ground the starter body.
3. Pull out the drive pinion with a screwdriver. Verify that it returns to its original position when released.
   - If it does not return, repair or replace the starter.

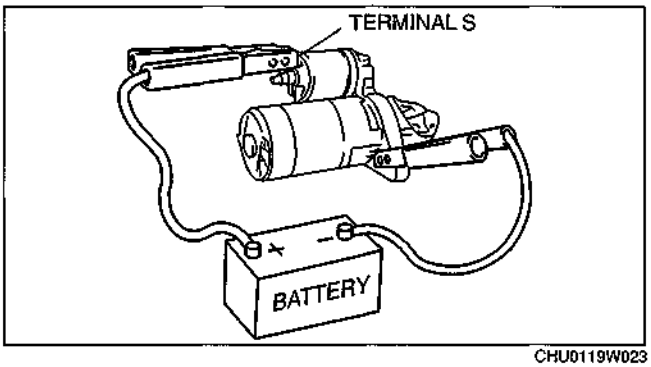


CHU0119W022

Pinion Gap Inspection

1. Pull out the drive pinion with the battery positive voltage connected to terminal S and the starter body grounded.

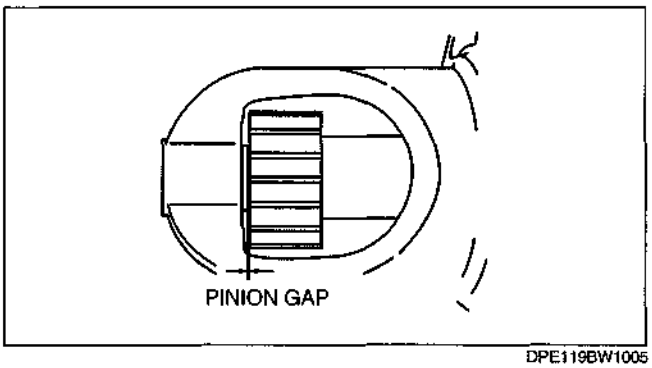
   Caution
   - **Applying power for more than 10 s can damage the starter. Do not apply power for more than 10 s.**



CHU0119W023

2. Measure the pinion gap while the drive pinion is pulled.
   - If not as specified, adjust with an adjustment washer (between drive housing front cover and magnetic switch).

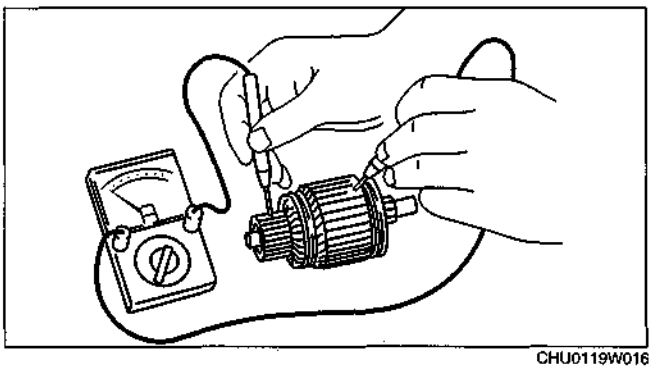
   Starter pinion gap
   0 mm {0 in}



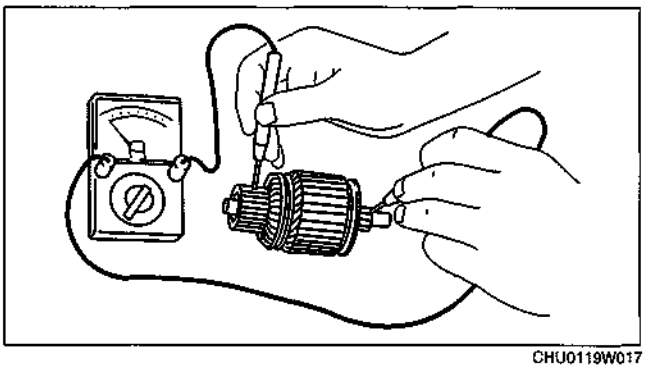
DPE119BW1005

Starter Inner Parts Inspection
Armature

1. Verify that there is no conductivity between the commutator and the core at each segment using a tester.
   - If there is conductivity, replace the armature.


CHU0119W016

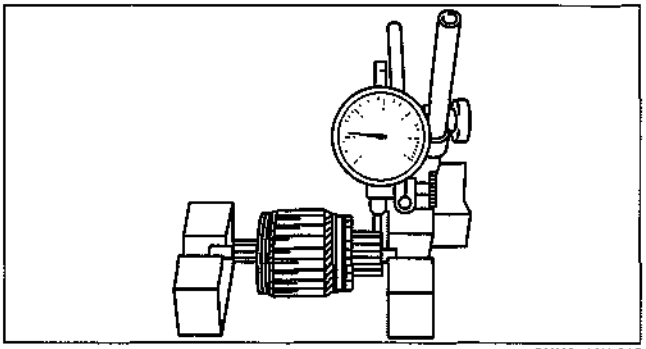
2. Verify that there is no conductivity between the commutator and the shaft using a tester.
   - If there is conductivity, replace the armature.



CHU0119W017

3. Place the armature on V-blocks, and measure the runout using a dial indicator.

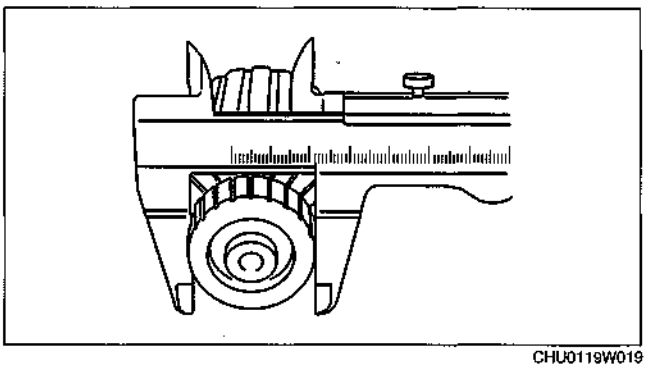
   Starter armature runout
   0.1 mm {0.039 in} max.



CHU0119W018

4. Measure the commutator diameter.
   - If not within the minimum specification, replace the armature.

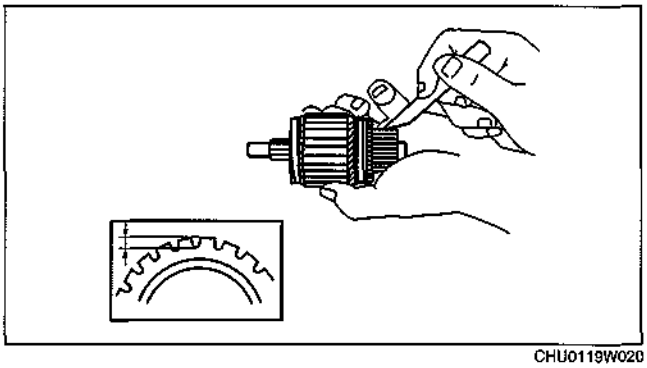
   Starter commutator diameter
   Standard: 32 mm {1.26 in}
   Minimum: 31.4 mm {1.24 in}



CHU0119W019

5. Measure the segment groove depth of the commutator.
   - If not within the minimum specification, undercut the grooves to the standard depth.

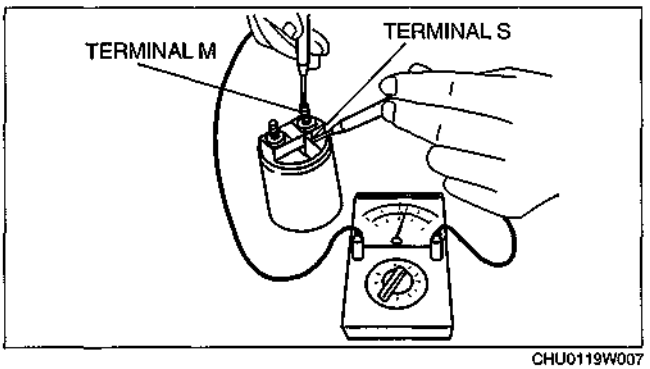
   Segment groove depth of starter commutator
   Standard: 0.5 mm {0.020 in}
   Minimum: 0.2 mm {0.008 in}



CHU0119W020

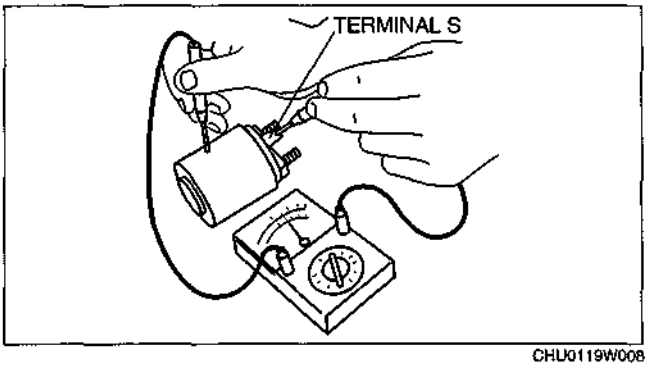
Magnetic switch

1. Inspect for conductivity between terminals S and M using a tester.
   - If there is no conductivity, replace the magnetic switch.



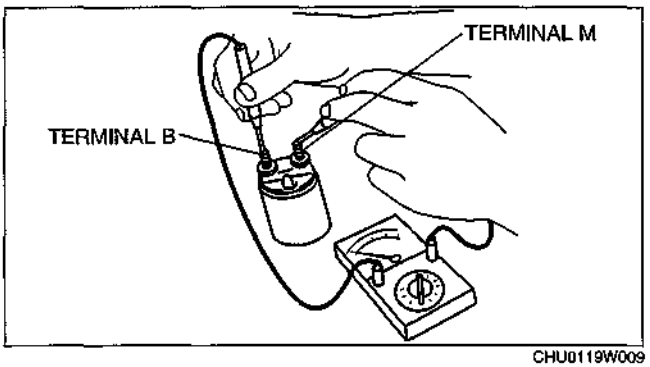
CHU0119W007

2. Inspect for conductivity between terminal S and the body using a tester.
   - If there is no conductivity, replace the magnetic switch.



CHU0119W008

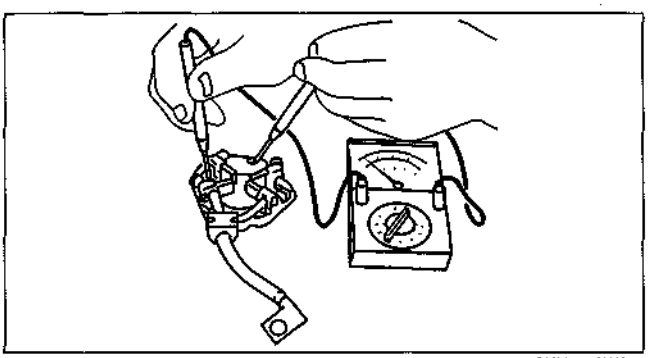
3. Verify that there is no conductivity between terminals M and B using a tester.
   - If there is conductivity, replace the magnetic switch.



CHU0119W009

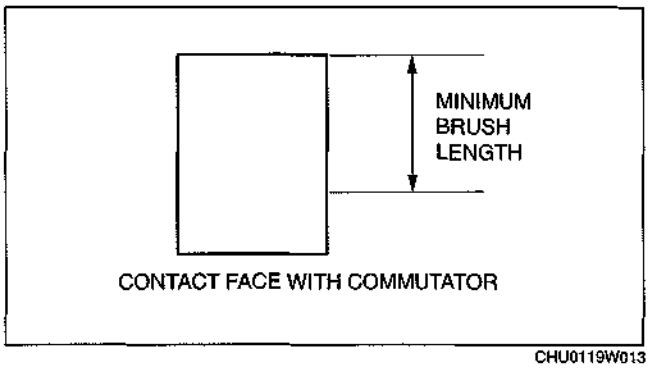
Brush and brush holder

1. Verify that there is no conductivity between each insulated brush and plate using a tester.
   - If there is conductivity, replace the brush holder.


CHU0119W012

2. Measure the brush length.
   - If any brush is worn almost to or beyond the minimum specification, replace all the brushes.

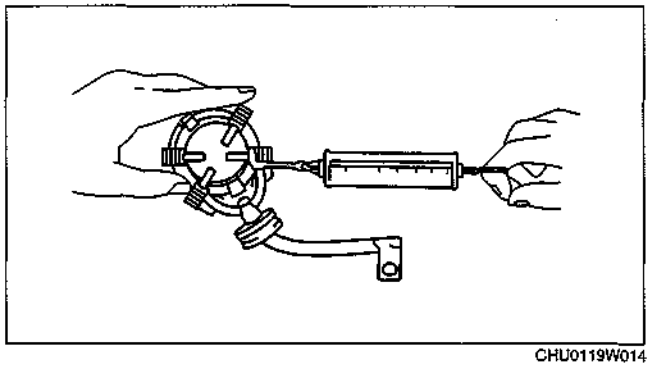
   Starter brush length
   Standard: 17.5 mm {0.69 in}
   Minimum: 11 mm {0.43 in}



CHU0119W013

3. Measure the brush spring force using a spring balance.
   - If not within the minimum specification, replace the brush spring.

   Starter brush spring force
   Standard: 26.7—36.1 N {2.73—3.68 kgf, 6.01—8.11 lbf}
   Minimum: 14.7 N {1.5 kgf, 3.3 lbf}

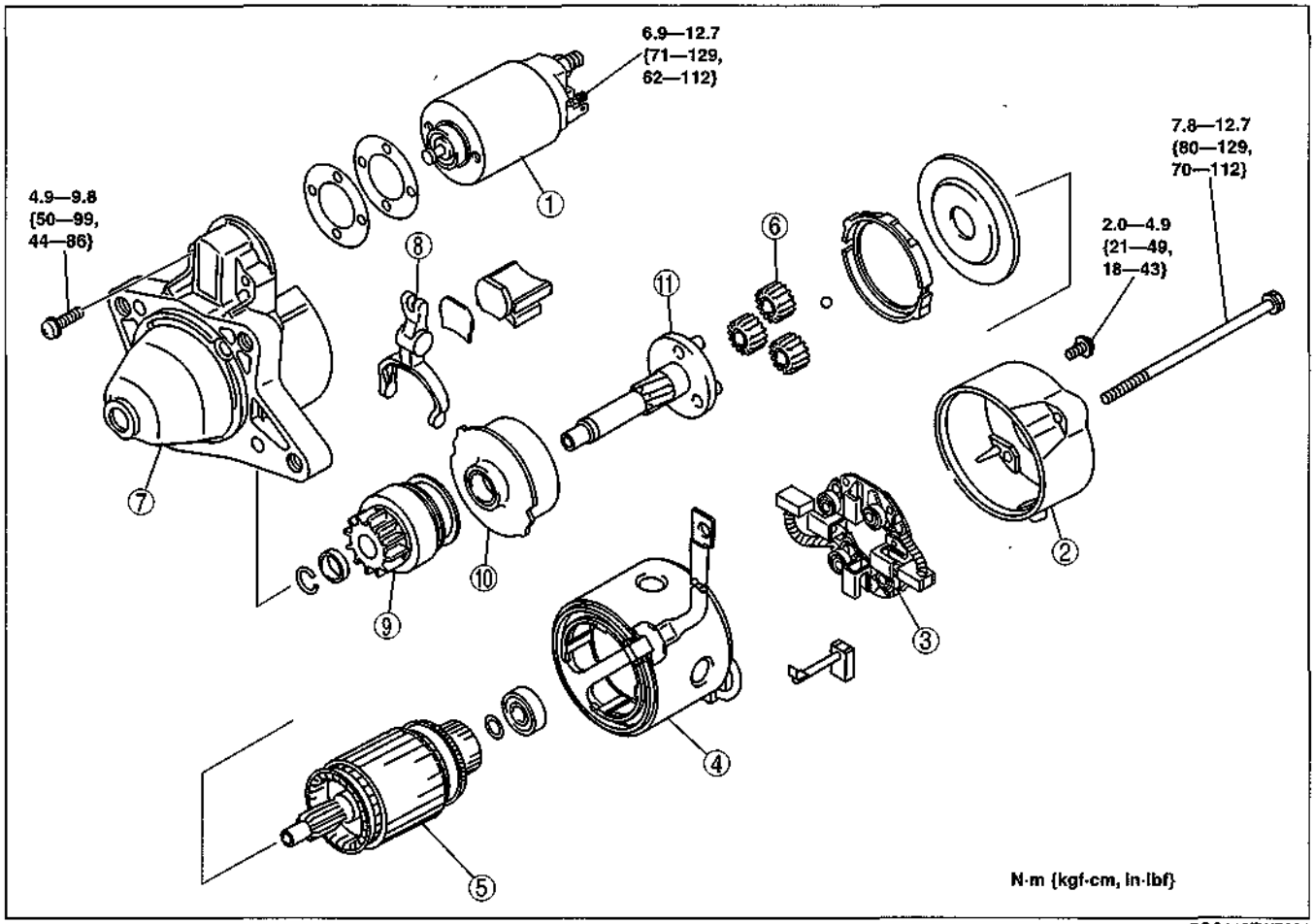


CHU0119W014

STARTER DISASSEMBLY/ASSEMBLY

dcf011918400w04

1. Disassemble in the order indicated in the table.
2. Assemble in the reverse order of disassembly.



DBG119ZWB001

1	Magnetic switch
2	Rear housing
3	Brush and brush holder
4	Armature
5	Yoke
6	Planetary gear
7	Front cover
8	Lever

9	Drive pinion
10	Internal gear
11	Gear shaft

01-40B CONTROL SYSTEM [WL-C, WE-C]

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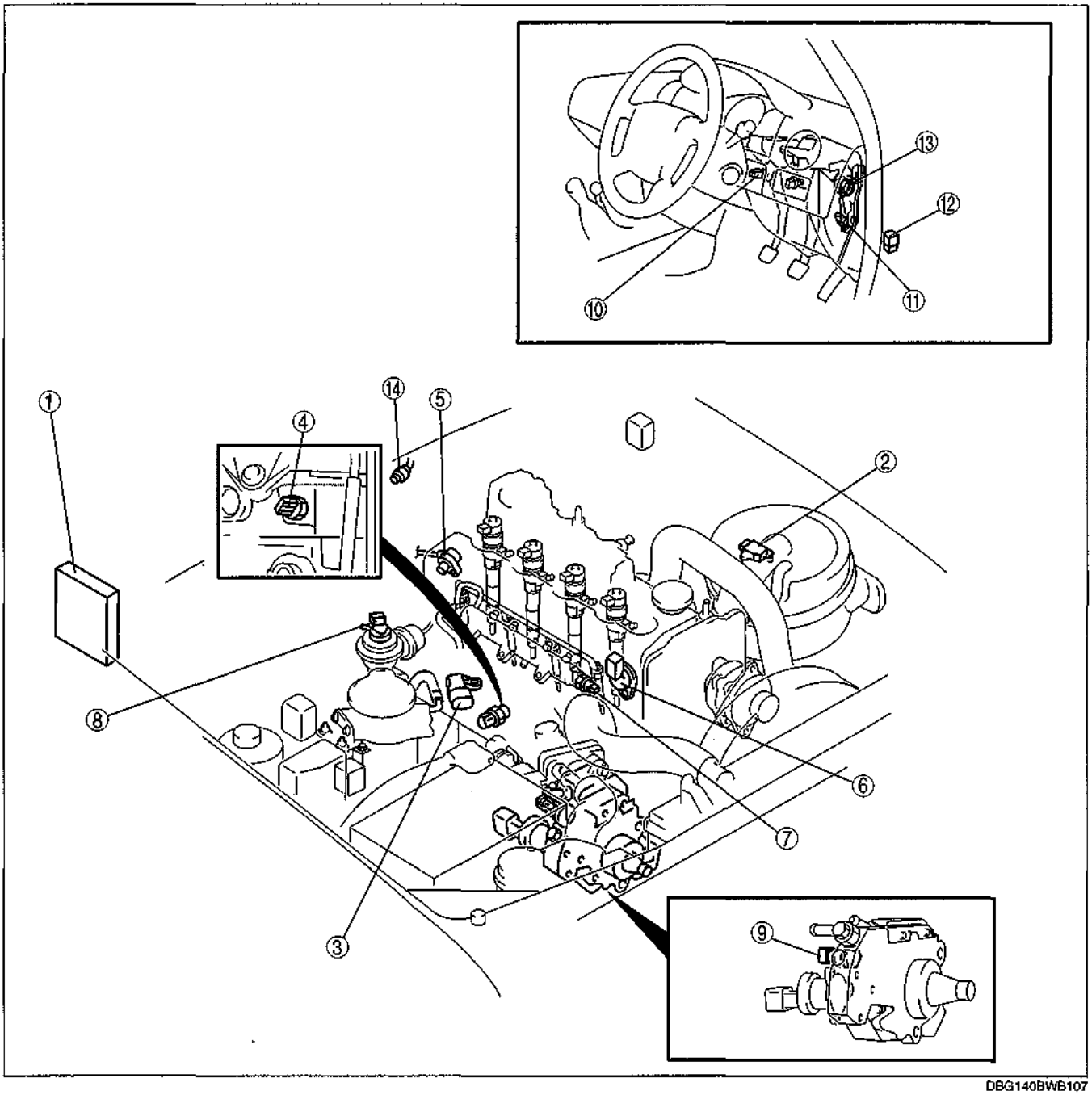
CONTROL SYSTEM LOCATION INDEX [WL-C, WE-C]

dcf014000000w05



DBG140BWB107

1	PCM (Built into BARO sensor) (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].) (See 01-40B-10 PCM INSPECTION [WL-C, WE-C].)
2	MAF sensor/IAT sensor No.2 (See 01-40B-23 MASS AIR FLOW (MAF) SENSOR/ INTAKE AIR TEMPERATURE (IAT) SENSOR NO.2 INSPECTION [WL-C, WE-C].)
3	Boost sensor/IAT sensor No.1 (See 01-40B-27 BOOST SENSOR INSPECTION [WL-C, WE-C].) (See 01-40B-26 INTAKE AIR TEMPERATURE (IAT) SENSOR NO.1 INSPECTION [WL-C, WE-C].)

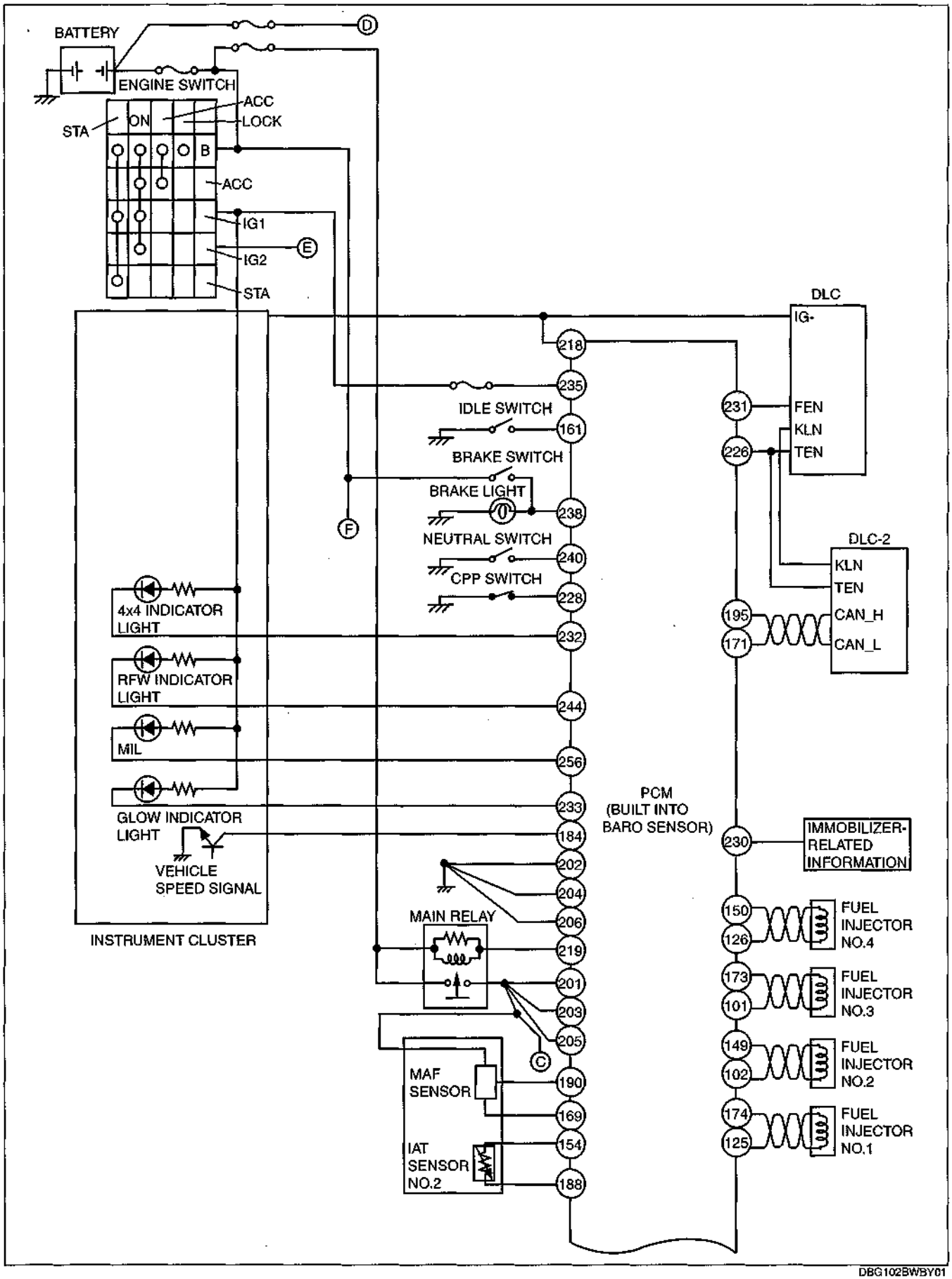
4	ECT sensor (See 01-40B-34 ENGINE COOLANT TEMPERATURE (ECT) SENSOR REMOVAL/ INSTALLATION [WL-C, WE-C].) (See 01-40B-35 ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION [WL-C, WE-C].)
5	CKP sensor (See 01-40B-38 CRANKSHAFT POSITION (CKP) SENSOR REMOVAL/INSTALLATION [WL-C, WE-C].) (See 01-40B-39 CRANKSHAFT POSITION (CKP) SENSOR INSPECTION [WL-C, WE-C].)

6	CMP sensor (See 01-40B-36 CAMSHAFT POSITION (CMP) SENSOR REMOVAL/INSTALLATION [WL-C, WE-C].) (See 01-40B-37 CAMSHAFT POSITION (CMP) SENSOR INSPECTION [WL-C, WE-C].)
7	Fuel pressure sensor (See 01-40B-33 FUEL PRESSURE SENSOR INSPECTION [WL-C, WE-C].)
8	EGR valve position sensor (See 01-40B-40 EGR VALVE POSITION SENSOR INSPECTION [WL-C, WE-C].)
9	Fuel temperature sensor (See 01-40B-32 FUEL TEMPERATURE SENSOR INSPECTION [WL-C, WE-C].)
10	CPP sensor (See 01-40B-42 CLUTCH PEDAL POSITION (CPP) SWITCH INSPECTION [WL-C, WE-C].)
11	Idle switch (See 01-40B-30 IDLE SWITCH INSPECTION [WL-C, WE-C].)
12	main relay (See 01-40B-23 MAIN RELAY INSPECTION [WL-C, WE-C].)
13	APP sensor (See 01-40B-28 ACCELERATOR PEDAL POSITION (APP) SENSOR INSPECTION [WL-C, WE-C].)
14	Neutral switch (See 01-40B-43 NEUTRAL SWITCH INSPECTION [WL-C, WE-C].)

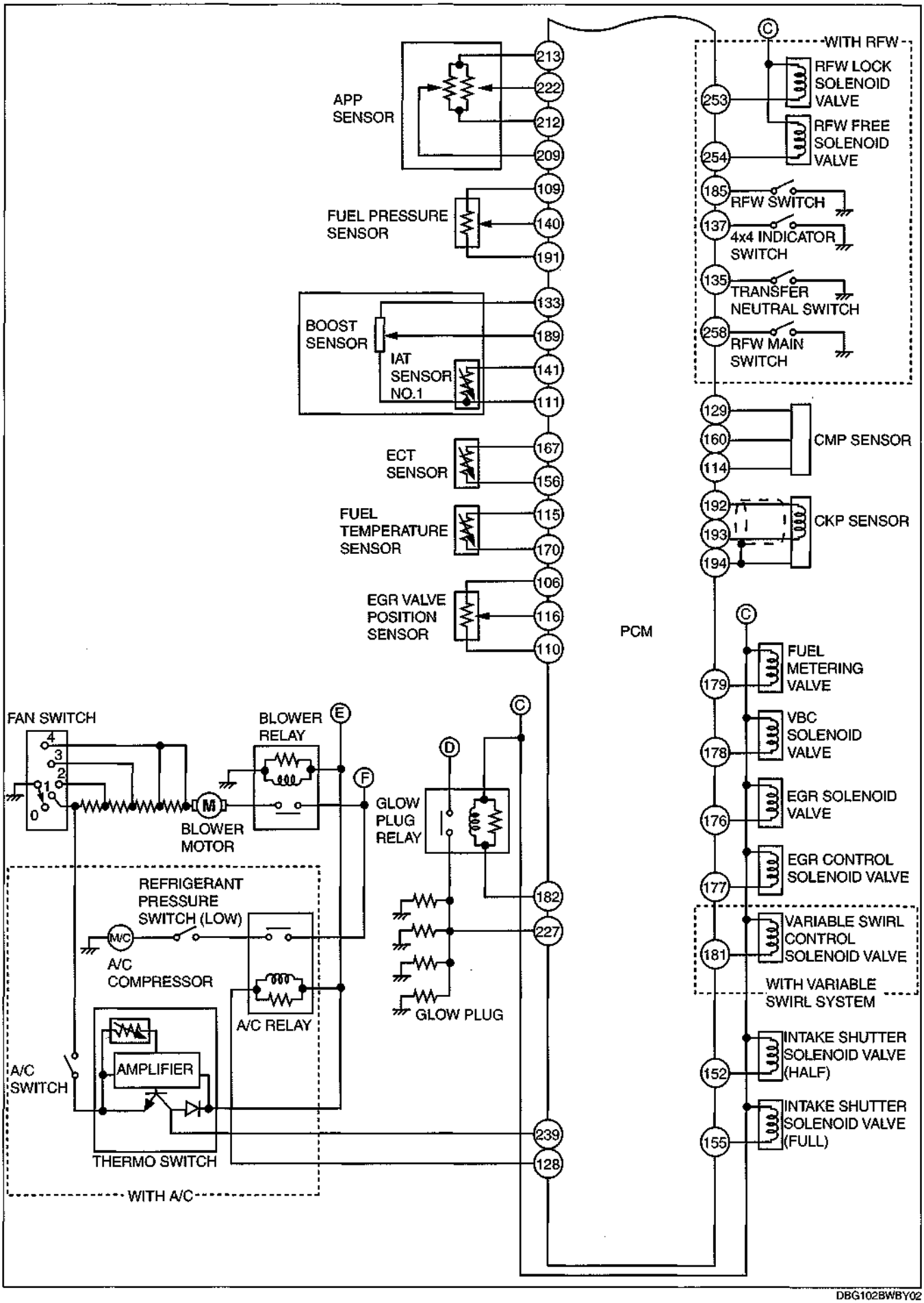
CONTROL SYSTEM WIRING DIAGRAM [WL-C, WE-C]

dcl014000000w06

With Immobilizer System

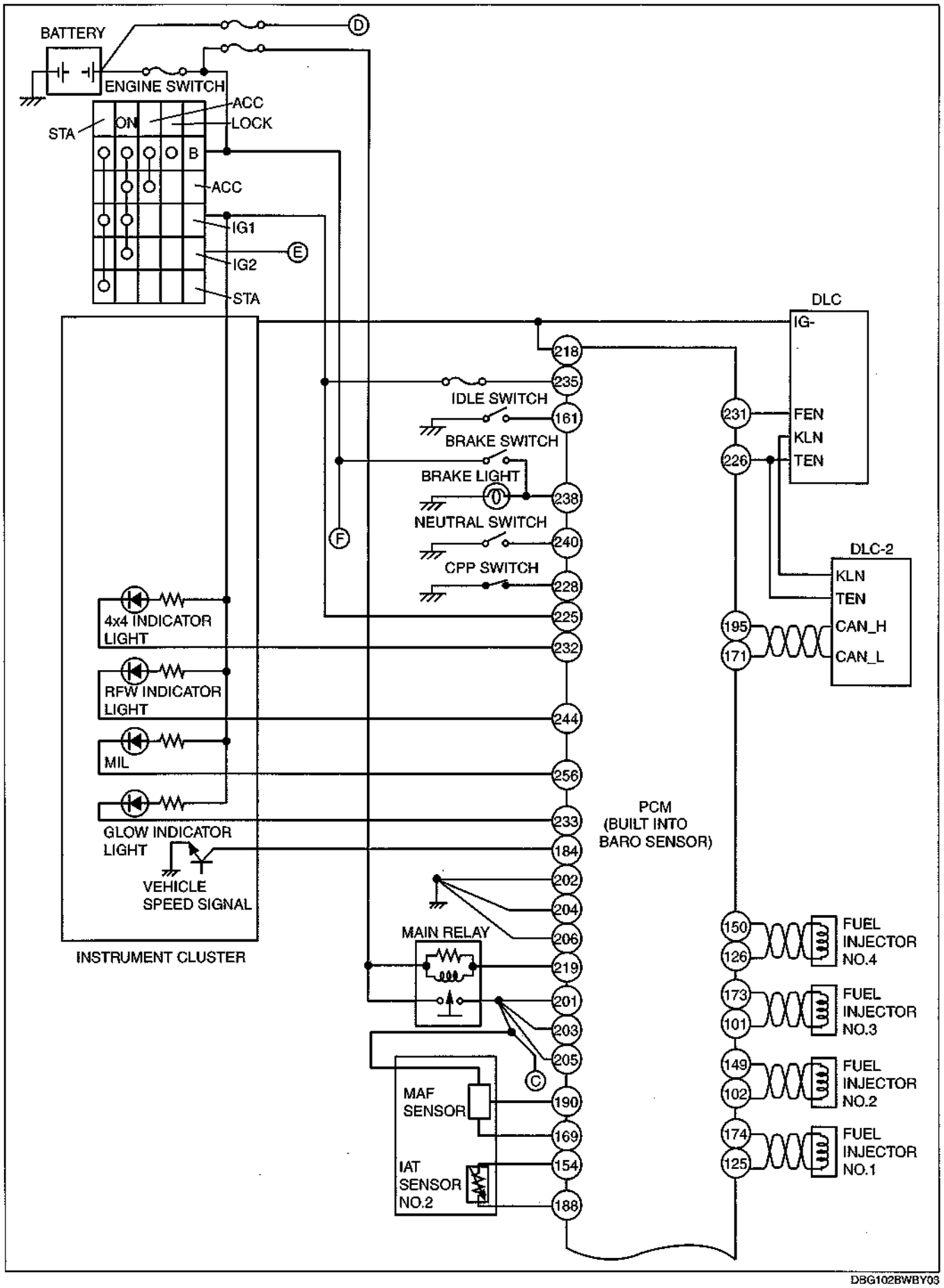


DBG102BWBY01

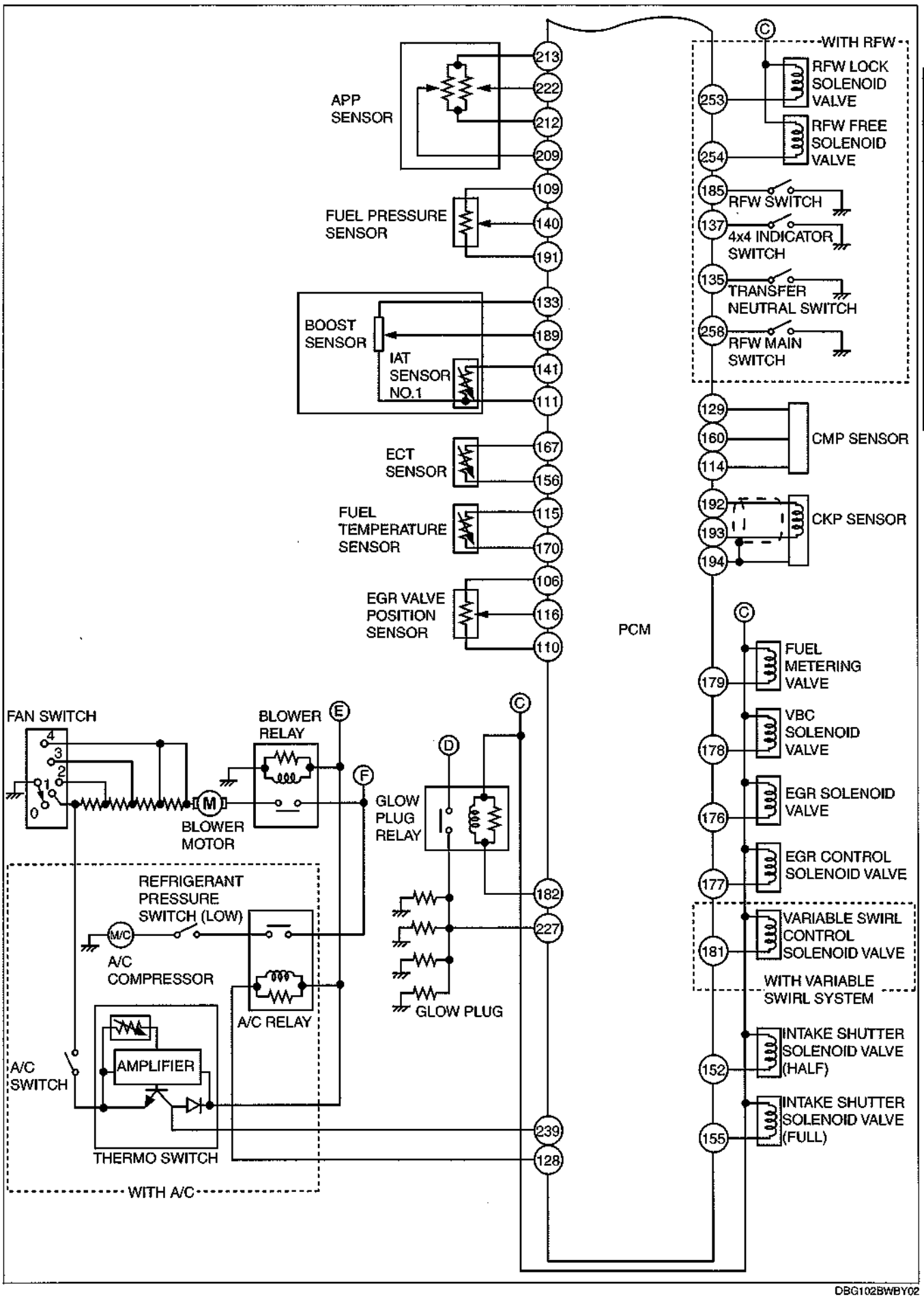


DBG102BWBY02

Without Immobilizer System



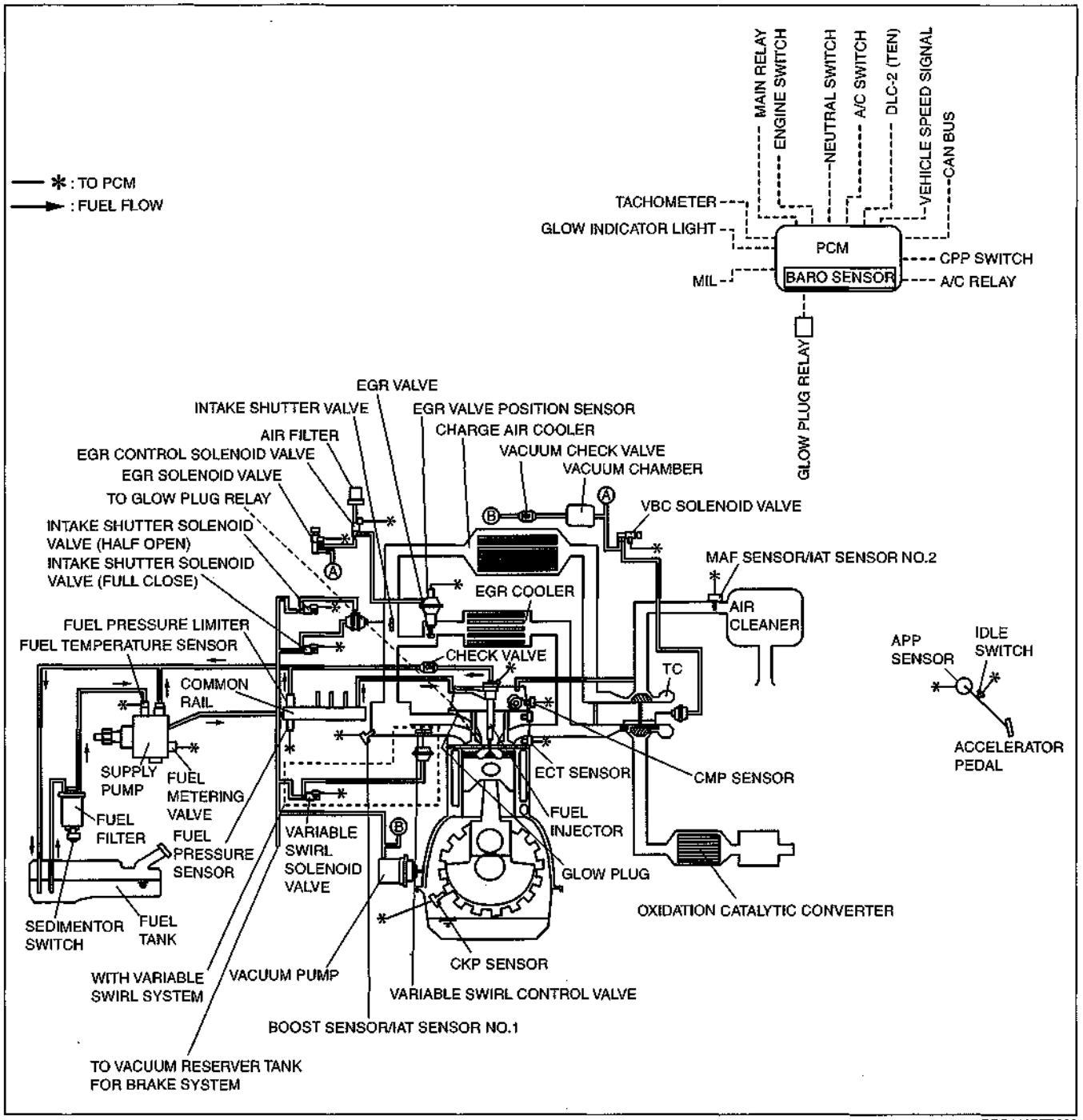
DBG102BWBY03



DBG102BWBY02

CONTROL SYSTEM DIAGRAM [WL-C, WE-C]

dcf014000000w07



DBG140BTB002

PCM REMOVAL/INSTALLATION [WL-C, WE-C]

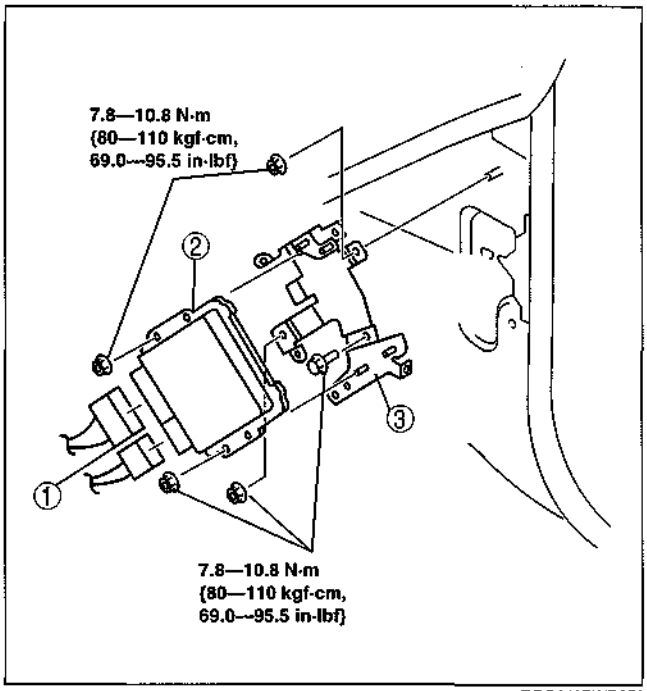
dcf014018880w09

Note
- If the PCM is replaced, always perform each adjustment procedure using the following steps.

STEP	ACTION	PAGE/CONDITION
1	Perform PCM configuration procedure.	(See 01-40B-20 PCM CONFIGURATION [WL-C, WE-C].)
2	Perform IMMOBILIZER SYSTEM programming.	(See 09-14-24 IMMOBILIZER SYSTEM REPROGRAM PROCEDURE.)
3	Perform PCM data reset procedure.	(See 01-40B-22 PCM DATA RESET [WL-C, WE-C].)
4	Perform After repair procedure.	(See 01-14B-4 AFTER REPAIR PROCEDURE [WL-C, WE-C].)
5	Start the engine.	–
6	Turn the engine switch to the off position.	–
7	Turn the engine switch to the ON position (Engine off).	–
8	Perform KOEO self-test procedure.	(See 01-02B-10 KOEO/KOER SELF TEST [WL-C, WE-C].)
9	Turn the engine switch to the off position.	–
10	Wait for **5 s**.	–
11	Start the engine.	–
12	Perform KOER self-test procedure.	(See 01-02B-10 KOEO/KOER SELF TEST [WL-C, WE-C].)
13	Turn the engine switch to the off position.	–

1. Disconnect the battery negative cable.
2. Remove the passenger's side front side trim.
3. Remove in the order indicated in the table.

1	PCM Connector
2	PCM
3	Bracket



DBG140BWB850

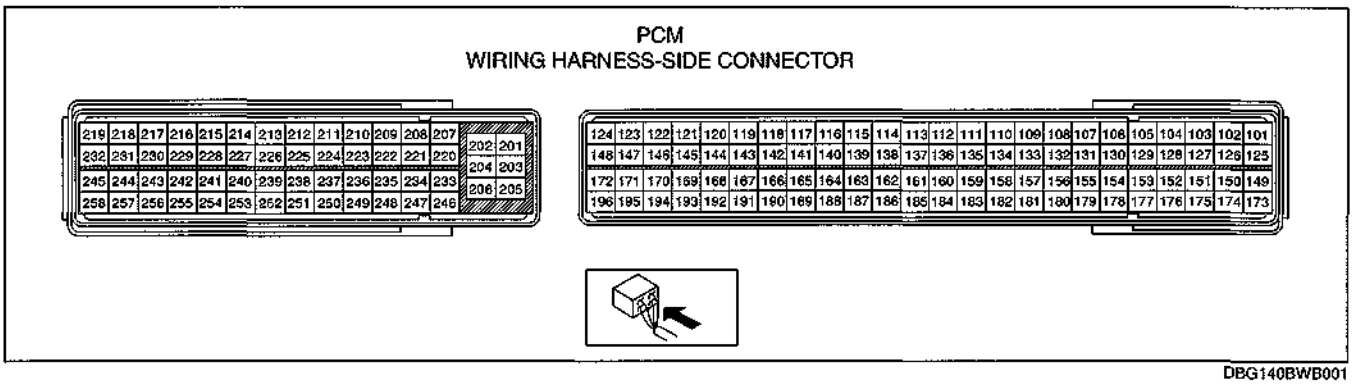
PCM INSPECTION [WL-C, WE-C]

dcf014018880w10

Without Using the current diagnostic tool

Note

- The PCM terminal voltage can vary with the conditions when measuring and changes due to aged deterioration on the vehicle, causing false diagnosis. Therefore determine comprehensively where the malfunction occurs among the input systems, output systems, and the PCM.



DBG140BWB001

Terminal voltage table (Reference)

Terminal	Signal	Connected to	Test condition		Voltage (V)	Inspection item
101	Fuel injector (#3)	Fuel injector No.3	Inspect using the wave profile. (See 01-40B-16 Inspection Using An Oscilloscope (Reference).)			• Inspect related wiring harness • Fuel injector No.3
102	Fuel injector (#2)	Fuel injector No.2	Inspect using the wave profile. (See 01-40B-16 Inspection Using An Oscilloscope (Reference).)			• Inspect related wiring harness • Fuel injector No.2
103	—	—	—		—	—
104	—	—	—		—	—
105	—	—	—		—	—
106	Constant voltage	EGR valve position sensor	Engine switch ON		Approx. 5	• Inspect related wiring harness • EGR valve position sensor
107	—	—	—		—	—
108	—	—	—		—	—
109	Constant voltage	Fuel pressure sensor	Engine switch ON		Approx. 5	• Inspect related wiring harness • Fuel pressure sensor
110	Ground	EGR valve position sensor	Under any condition		Below 1.0	• Inspect related wiring harness • EGR valve position sensor
111	Ground	Boost/IAT sensor No.1	Under any condition		Below 1.0	• Inspect related wiring harness • Boost/IAT sensor No.1
112	—	—	—		—	—
113	—	—	—		—	—
114	Ground	CMP sensor	Under any condition		Below 1.0	• Inspect related wiring harness • CMP sensor
115	Fuel temp	Fuel temperature sensor	Engine switch ON	Fuel temperature 40 °C {104 °F}	Approx. 2.5	• Inspect related wiring harness • Fuel temperature sensor
				Fuel temperature 45 °C {113 °F}	Approx. 2.3	

Terminal	Signal	Connected to	Test condition		Voltage (V)	Inspection item
116	EGR position	EGR valve	Engine switch ON		Below 1.0	• Inspect related wiring harness • EGR valve
			EGR valve opening angle 40%		Approx. 2	
117	—	—	—		—	—
118	—	—	—		—	—
119	—	—	—		—	—
120	—	—	—		—	—
121	—	—	—		—	—
122	—	—	—		—	—
123	—	—	—		—	—
124	—	—	—		—	—
125	Fuel injector (#1)	Fuel injector No.1	Inspect using the wave profile. (See 01-40B-16 Inspection Using An Oscilloscope (Reference).)			• Inspect related wiring harness • Fuel injector No.1
126	Fuel injector (#4)	Fuel injector No.4	Inspect using the wave profile. (See 01-40B-16 Inspection Using An Oscilloscope (Reference).)			• Inspect related wiring harness • Fuel injector No.4
127	—	—	—		—	—
128	A/C	A/C relay	A/C operating		Below 1.0	• Inspect related wiring harness • A/C relay
			A/C not operating		B+	
129	Constant voltage	CMP sensor	Engine switch ON		Approx. 5	• Inspect related wiring harness • CMP sensor
130	—	—	—		—	—
131	—	—	—		—	—
132	—	—	—		—	—
133	Constant voltage	Boost/IAT sensor No.1	Engine switch ON		Approx. 5	• Inspect related wiring harness • Boost/IAT sensor No.1
134	—	—	—		—	—
135	neutral switch	Transfer neutral switch	Transfer shift lever neutral position		Below 1.0	• Inspect related wiring harness • Transfer neutral switch
			Except above		B+	
136	—	—	—		—	—
137	4×4 indicator switch	4×4 indicator switch	Transfer shift lever 2H position		B+	• Inspect related wiring harness • 4×4 indicator switch
			Except above		Below 1.0	
138	—	—	—		—	—
139	—	—	—		—	—
140	Fuel pressure	Fuel pressure sensor	Idle		Approx. 1.2	• Inspect related wiring harness • Fuel pressure sensor
			Engine speed is 2,800 rpm		Approx. 2.5	
141	IAT	Boost/IAT sensor No.1	Engine switch ON	IAT 30 °C {86 °F}	Approx. 1.9	• Inspect related wiring harness • Boost/IAT sensor No.1
				IAT 50 °C {122 °F}	Approx. 1.2	
142	—	—	—		—	—
143	—	—	—		—	—
144	—	—	—		—	—
145	—	—	—		—	—
146	—	—	—		—	—
147	—	—	—		—	—
148	—	—	—		—	—

Terminal	Signal	Connected to	Test condition		Voltage (V)	Inspection item
149	Fuel injector (#2)	Fuel injector No.2	Inspect using the wave profile. (See 01-40B-16 Inspection Using An Oscilloscope (Reference).)			• Inspect related wiring harness • Fuel injector No.2
150	Fuel injector (#4)	Fuel injector No.4	Inspect using the wave profile. (See 01-40B-16 Inspection Using An Oscilloscope (Reference).)			• Inspect related wiring harness • Fuel injector No.4
151	—	—	—		—	—
152	Intake shutter solenoid valve (half)	Intake shutter solenoid valve (half)	Engine switch ON		B+	• Inspect related wiring harness • Intake shutter solenoid valve (half)
			Idle		B+ (WL-C)	
					Below 1.0 (WE-C)	
153	—	—	—		—	—
154	Ground	MAF/IAT sensor No.2	Under any condition		Below 1.0	• Inspect related wiring harness • MAF/IAT sensor No.2
155	Intake shutter solenoid valve (full)	Intake shutter solenoid valve (full)	Engine switch ON		B+	• Inspect related wiring harness • Intake shutter solenoid valve (full)
156	Ground	ECT sensor	Under any condition		Below 1.0	• Inspect related wiring harness • ECT sensor
157	—	—	—		—	
158	—	—	—		—	—
159	—	—	—		—	—
160	CMP	CMP sensor	Inspect using the wave profile. (See 01-40B-16 Inspection Using An Oscilloscope (Reference).)			• Inspect related wiring harness • CMP sensor
161	Idle	Idle switch	Engine switch On		B+	• Inspect related wiring harness • Idle switch
			Idle		Below 1.0	
162	—	—	—		—	—
163	—	—	—		—	—
164	—	—	—		—	—
165	—	—	—		—	—
166	—	—	—		—	—
167	ECT	ECT sensor	Engine switch ON	ECT 30 °C {86 °F}	Approx. 2.6	• Inspect related wiring harness • ECT sensor
				ECT 40 °C {104 °F}	Approx. 2.1	
				ECT 50 °C {122 °F}	Approx. 1.8	
				ECT 60 °C {140 °F}	Approx. 1.4	
168	—	—	—		—	—
169	Ground	MAF/IAT sensor No.2	Under any condition		Below 1.0	• Inspect related wiring harness • MAF/IAT sensor No.2
170	Ground	Fuel temperature sensor	Under any condition		Below 1.0	• Inspect related wiring harness • Fuel temperature sensor
171	CAN (L)	—	Because this terminal is for CAN, no valid determination of terminal voltage is possible			• Inspect related wiring harness
172	—	—	—		—	—
173	Fuel injector (#3)	Fuel injector No.3	Inspect using the wave profile. (See 01-40B-16 Inspection Using An Oscilloscope (Reference).)			• Inspect related wiring harness • Fuel injector No.3

Terminal	Signal	Connected to	Test condition		Voltage (V)	Inspection item
174	Fuel injector (#1)	Fuel injector No.1	Inspect using the wave profile. (See 01-40B-16 Inspection Using An Oscilloscope (Reference).)			• Inspect related wiring harness • Fuel injector No.1
175	—	—	—		—	—
176	EGR solenoid valve	EGR solenoid valve	Engine switch ON		B+	• Inspect related wiring harness • EGR solenoid valve
			Idle		Approx. 3.5	
177	EGR control solenoid valve	EGR control solenoid valve	Engine switch ON		B+	• Inspect related wiring harness • EGR control solenoid valve
			Idle		Below 1.0	
178	VBC solenoid valve	VBC solenoid valve	Inspect using the wave profile. (See 01-40B-16 Inspection Using An Oscilloscope (Reference).)			• Inspect related wiring harness • VBC solenoid valve
179	Fuel Metering Valve	Fuel Metering Valve	Inspect using the wave profile. (See 01-40B-16 Inspection Using An Oscilloscope (Reference).)			• Inspect related wiring harness • Fuel Metering Valve
180	—	—	—		—	—
181	Variable swirl control solenoid valve	Variable swirl control solenoid valve	Engine switch ON		Approx. 3.3	• Inspect related wiring harness • Variable swirl control solenoid valve
182	Glow	Glow plug relay	13 s from when engine switch is turned to ON position with ECT at 20 °C {68 °F} or less		B+	• Inspect related wiring harness • Glow plug relay
			Idle (2m or more after engine is started)		Below 1.0	
183	—	—	—		—	—
184	Vehicle speed	VSS	Inspect using the wave profile. (See 01-40B-16 Inspection Using An Oscilloscope (Reference).)			• Inspect related wiring harness • VSS
185	RFW switch	RFW Switch	RFW "LOCK"		Below 1.0	• Inspect related wiring harness • RFW switch
			RFW "FREE"		B+	
186	—	—	—		—	—
187	—	—	—		—	—
188	IAT	MAF/IAT sensor No.2	Engine switch ON	IAT 30 °C {86 °F}	Approx. 1.9	• Inspect related wiring harness • MAF/IAT sensor No.2
				IAT 50 °C {122 °F}	Approx. 1.2	
189	MAP	Boost/IAT sensor No.1	Engine switch ON		Approx. 1.6	• Inspect related wiring harness • Boost sensor
190	MAF	MAF/IAT sensor No.2	Engine switch ON		Below 1.0	• Inspect related wiring harness • MAF/IAT sensor No.2
			Idle		Approx. 1.8	
191	Ground	Fuel pressure sensor	Under any condition		Below 1.0	• Inspect related wiring harness • Fuel pressure sensor
192	CKP	CKP sensor	Inspect using the wave profile. (See 01-40B-16 Inspection Using An Oscilloscope (Reference).)			• Inspect related wiring harness • CKP sensor
193	CKP	CKP sensor	Inspect using the wave profile. (See 01-40B-16 Inspection Using An Oscilloscope (Reference).)			• Inspect related wiring harness • CKP sensor
194	Ground	CKP sensor	Under any condition		Below 1.0	• Inspect related wiring harness • CKP sensor

Terminal	Signal	Connected to	Test condition		Voltage (V)	Inspection item
195	CAN (H)	—	Because this terminal is for CAN, no valid determination of terminal			• Inspect related wiring harness
196	—	—	—		—	—
201	B+	Main relay	Main relay ON		B+	• Inspect related wiring harness • Main relay
			Main relay OFF		Below 1.0	
202	Ground	Body ground	Under any condition		Below 1.0	• Inspect related wiring harness
203	B+	Main relay	Main relay ON		B+	• Inspect related wiring harness • Main relay
			Main relay OFF		Below 1.0	
204	Ground	Body ground	Under any condition		Below 1.0	• Inspect related wiring harness
205	B+	Main relay	Main relay ON		B+	• Inspect related wiring harness • Main relay
			Main relay OFF		Below 1.0	
206	Ground	Body ground	Under any condition		Below 1.0	• Inspect related wiring harness
207	—	—	—		—	—
208	—	—	—		—	—
209	APP	APP sensor	Accelerator pedal released		Below 1.0	• Inspect related wiring harness • APP sensor
			Accelerator pedal depressed		Approx. 3.6	
210	—	—	—		—	—
211	—	—	—		—	—
212	Ground	APP sensor	Under any condition		Below 1.0	• Inspect related wiring harness • APP sensor
213	Constant voltage	APP sensor	Engine switch ON		Approx. 5	• Inspect related wiring harness • APP sensor
214	—	—	—		—	—
215	—	—	—		—	—
216	—	—	—		—	—
217	—	—	—		—	—
218	—	—	—		—	—
219	Main relay control	Main relay	Engine switch ON		Below 1.0	• Inspect related wiring harness • Main relay
			Engine switch OFF		B+	
220	—	—	—		—	—
221	—	—	—		—	—
222	APP	APP sensor	Accelerator pedal released		Below 1.0	• Inspect related wiring harness • APP sensor
			Accelerator pedal depressed		Approx. 3.6	
223	—	—	—		—	—
224	—	—	—		—	—
225	IG 1	Engine switch	Engine switch is ON and Start position		B+	• Inspect related wiring harness
			Engine switch is other position		Below 1.0	
226	Diagnostic test mode	Data link connector (DLC) (Terminal TEN)	Engine switch ON	Open terminal TEN	B+	• Inspect related wiring harness
				Short terminal TEN	Below 1.0	

Terminal	Signal	Connected to	Test condition		Voltage (V)	Inspection item
227	Glow system	Glow relay	ECT is below 60 °C {140 °F}	For less than approx. 13 seconds after turning engine switch ON.	B+	• Inspect related wiring harness • Glow relay
				Over approx. 13 seconds after turning engine switch ON.	Below 1.0	
				For less than 2 minutes starting engine.	B+	
				Over 2 minutes after starting engine.	Below 1.0	
				While cranking	B+	
			ECT is above 60 °C {140 °F}	For less than approx. 4 seconds after turning engine switch ON.	B+	
				Over approx. 4 seconds after turning engine switch ON.	Below 1.0	
				While cranking	Below 1.0	
228	Clutch	CPP switch	Clutch pedal released		B+	• Inspect related wiring harness • CPP switch
			Clutch pedal depressed		Below 1.0	
229	—	—	—		—	—
230	Coil (Immobilizer system)	Immobilizer-related information	No valid determination of terminal voltage is possible			• Inspect related wiring harness
231	DTC output	Data link connector (DLC) (Terminal TEN)	No DTC output		B+	• Inspect related wiring harness
			DTC output		Below 1.0	
232	4×4 indicator light	4×4 indicator light	4×4 indicator light OFF		Below 1.0	• Inspect related wiring harness • Instrument cluster (4×4 indicator light)
			4×4 indicator light ON		B+	
233	Glow indicator light	Glow indicator light	Engine switch OFF		Below 1.0	• Inspect related wiring harness • Glow indicator light
			Engine switch is ON and within approx. 0.5 sec. (25 °C {77 °F})			
			Over 0.5 seconds (25 °C {77 °F}) after turning engine switch ON		B+	
234	—	—	—		—	—
235	IG 1	Engine fuse	Engine switch ON		B+	• Inspect related wiring harness • Engine fuse
236	—	—	—		—	—
237	—	—	—		—	—
238	Brake light	Brake light	brake pedal released		Below 1.0	• Inspect related wiring harness • Brake light
			brake pedal depressed		B+	
239	Thermo	Thermo switch	A/C operating		Below 1.0	• Inspect related wiring harness • Thermo switch
			A/C not operating		B+	
240	Neutral	Neutral switch	Shift lever neutral position		Below 1.0	• Inspect related wiring harness • Neutral switch
			Except shift lever neutral position		B+	
241	—	—	—		—	—
242	—	—	—		—	—

Terminal	Signal	Connected to	Test condition	Voltage (V)	Inspection item
243	—	—	—	—	—
244	RFW indicator light	LOCK indicator light	LOCK indicator light OFF	B+	• Inspect related wiring harness • Instrument cluster (LOCK indicator light)
			LOCK indicator light ON	Below 1.0	
245	—	—	—	—	—
246	—	—	—	—	—
247	—	—	—	—	—
248	—	—	—	—	—
249	—	—	—	—	—
250	—	—	—	—	—
251	—	—	—	—	—
252	—	—	—	—	—
253	Lock solenoid valve	Lock solenoid valve	Lock solenoid valve operating	Below 1.0	• Inspect related wiring harness • Lock solenoid valve
			Lock solenoid valve not operating	B+	
254	Free solenoid valve	Free solenoid valve	Free solenoid valve operating	Below 1.0	• Inspect related wiring harness • Free solenoid valve
			Free solenoid valve not operating	B+	
255	—	—	—	—	—
256	MIL	Malfunction indicator light	Malfunction indicator light ON	Below 1.0	• Inspect related wiring harness • Malfunction indicator light
			Malfunction indicator light OFF	B+	
257	—	—	—	—	—
258	RFW main switch	RFW main switch	RFW main switch released (OFF)	B+	• Inspect related wiring harness • RFW main switch
			RFW main switch depressed (ON)	Below 1.0	

Inspection Using An Oscilloscope (Reference)

Fuel injector signal

PCM terminals

- Fuel injection (#1): 125, 174 (+)—body ground (–)
- Fuel injection (#2): 102, 149 (+)—body ground (–)
- Fuel injection (#3): 101, 173 (+)—body ground (–)
- Fuel injection (#4): 126, 150 (+)—body ground (–)

Oscilloscope setting

- 20 V/DIV (Y), 20 ms/DIV (X), DC range

Vehicle condition

- Idle after warm up

DBG140BWB105

CMP signal

PCM terminals

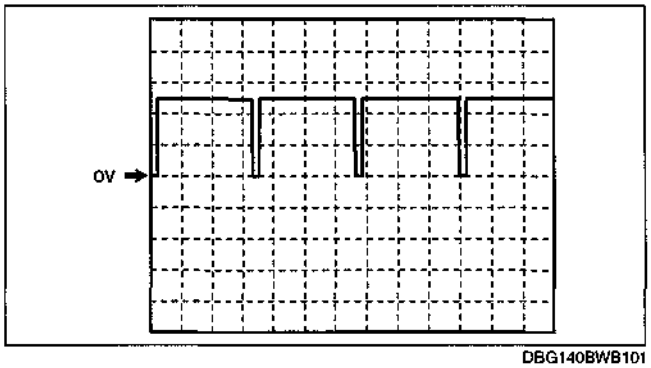
- 160 (+)—body ground (–)

Oscilloscope setting

- 2 V/DIV (Y), 50 ms/DIV (X), DC range

Vehicle condition

- Idle after warm up

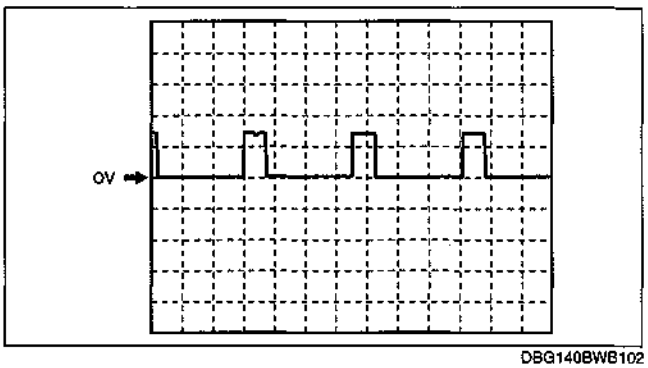


DBG140BWB101

VBC solenoid valve signal
PCM terminals
- 178 (+)—body ground (–)

Oscilloscope setting
- 10 V/DIV (Y), 2 ms/DIV (X), DC range

Vehicle condition
- Idle after warm up

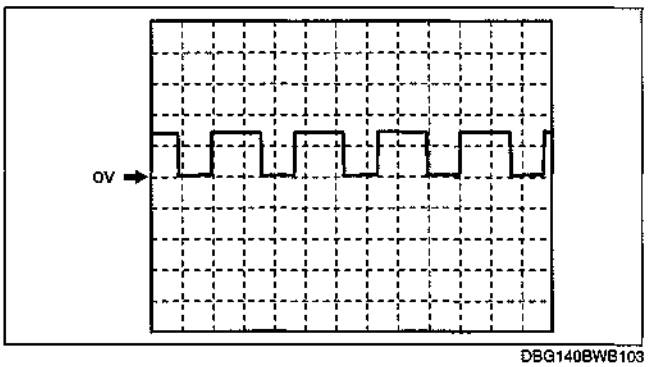


DBG140BWB102

Fuel Metering Valve signal
PCM terminals
- 179 (+)—body ground (–)

Oscilloscope setting
- 10 V/DIV (Y), 2 ms/DIV (X), DC range

Vehicle condition
- Idle after warm up, A/C ON

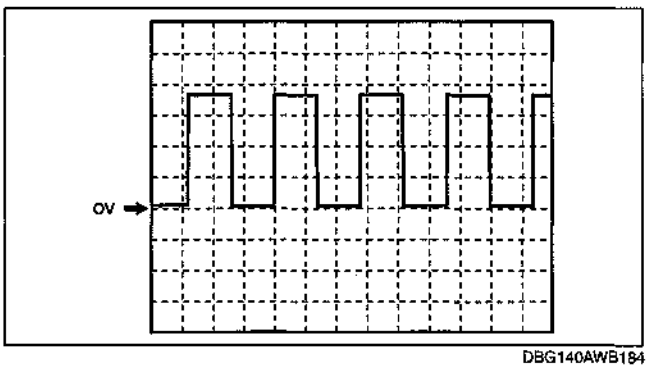


DBG140BWB103

Vehicle speed signal
PCM terminals
- 184 (+)—body ground (–)

Oscilloscope setting
- 1 V/DIV (Y), 2.5 ms/DIV (X), DC range

Vehicle condition
- Vehicle speed is 32 km/h {20 mph}.

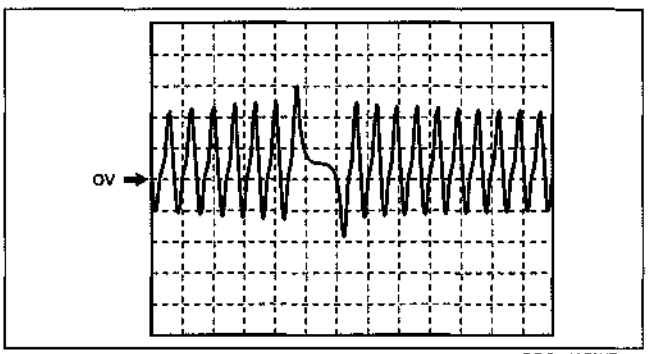


DBG140AWB184

CKP signal
PCM terminals
- 192, 193 (+)—body ground (–)

Oscilloscope setting
- 5 V/DIV (Y), 2 ms/DIV (X), DC range

Vehicle condition
- Idle after warm up



DBG140BWB104

Using the current diagnostic tool

Caution
- **The PCM terminal voltage vary with change in measuring conditions and vehicle conditions. Always carry out a total inspection of the input systems, output systems, and PCM to determine the cause of trouble. Otherwise, diagnosis will be incorrect.**

Note
- PIDs for the following parts are not available on this model. Go to the appropriate part inspection page.
  - — Fuel injector
  - — CMP sensor
  - — EGR valve position sensor
  - — EGR solenoid valve
  - — IAT sensor No.2

1. Connect the current diagnostic tool to the DLC. (See 01-02B-7 ON-BOARD DIAGNOSTIC TEST [WL-C, WE-C].)
2. Measure the PID value.
   - If PID value is not within the specification, follow the instructions in ACTION column.
3. Turn the engine switch to the ON position (Engine off).

Note
- The PID/DATA MONITOR function monitors the calculated value of the input/output signals in the PCM. Therefore, an output device malfunction is not directly indicated as a malfunction of the monitored value for the output device. If a monitored value of an output device is out of specification, inspect the monitored value of the input device related to the output control.
- For input/output signals except those of the monitoring items, use a voltmeter to measure the PCM terminal voltage.
- The simulation items that are used in the ENGINE CONTROL SYSTEM OPERATION INSPECTION are as follows.
  - — ACCS, EGRV2, GP_LMP, GPC, IASV, IASV2, INJ_1, INJ_2, INJ_3, INJ_4, SEGRP, VBCV

PID Monitor Table (Reference)

Monitor item (Definition)	Unit/Condition	Condition/Specification (Reference)	Inspection item	PCM terminal
AAT (Ambient temperature)	°C	Ambient temperature		—
AC_REQ (A/C request signal)	On/Off	Refrigerant pressure switch is off: Off Others: On	A/C switch	239
ACCS (Air conditioning compressor cycling switch)	On/Off	A/C switch ON and fan switch ON: On Others: Off	Inspect following PIDs: START_SW, CPP, CPP/PNP, IVS, AC_REQ, APS1, APS2, ECT, RPM	128
APP (Accelerator pedal position)	%	Accelerator pedal released: 0 % Accelerator pedal depressed: 100 %	Inspect following PIDs: APP1, APP2	209, 222
APP1 (Accelerator pedal position sensor No.1)	%	Accelerator pedal released: 0% Accelerator pedal depressed: 100%	APP sensor	222
	V	Accelerator pedal released: Below 1.0 V Accelerator pedal depressed: Approx. 3.6 V		
APP2 (Accelerator pedal position sensor No.2)	%	Accelerator pedal released: 0% Accelerator pedal depressed: 100%	APP sensor	209
	V	Accelerator pedal released: Below 1.0 V Accelerator pedal depressed: Approx. 3.6 V		
ARPMDES (Target engine speed)	RPM	No load: 695—745 rpm A/C ON: 725—775 rpm	Inspect following PIDs: IVS, AC_REQ, IAT, IAT2, ECT, BOOST_DSD, FRP, FRP_A, RPM, VSS	—
BARO (Barometric pressure)	kPa | Bar | psi	Indicate Barometric pressure	BARO sensor	—
	V	BARO 103 kPa {1.03 Bar, 14.9 psi}: Approx. 4.0 V		

Monitor item (Definition)	Unit/Condition	Condition/Specification (Reference)	Inspection item	PCM terminal
BOO (Brake switch)	On/Off	Brake pedal released: Off Brake pedal depressed: On	Brake switch	238
CPP (CPP switch)	On/Off	Clutch pedal released: On Clutch pedal depressed: Off	CPP switch	228
DTCCNT (DTC count)	—	Number of DTCs stored in the PCM is displayed.	Perform applicable DTC troubleshooting.	—
ECT (Engine coolant temperature)	°C	Engine coolant temperature is displayed	Inspect ECT sensor.	167
	V	ECT 30 °C {86 °F}: Approx. 2.6 V ECT 40 °C {104 °F}: Approx. 2.1 V ECT 50 °C {122 °F}: Approx. 1.8 V ECT 60 °C {140 °F}: Approx. 1.4 V		
EGRV2 (EGR control solenoid valve)	On/Off	Engine switch ON: ON Idle: OFF	Inspect EGR control solenoid valve	177
FIP_FL (Supply pump flow control)	A	Engine switch ON: 1.35 A Idle: Approx. 1.45 A	Inspect following PIDs: IVS, AC_REQ, IAT1, IAT2, ECT, BOOST_DSD, FRP, FRP_A, RPM, VSS	179
	%	Engine switch ON: 14.6 % Idle: 37.6 %		
FIP_SCV (Fuel metering valve)	A	Engine switch ON: Approx. 580 mA Idle: 1.45 A	Inspect following PIDs: IVS, AC_REQ, IAT1, IAT2, ECT, BOOST_DSD, FRP, FRP_A, RPM, VSS	179
FLT (Fuel temperature)	°C	Fuel temperature is displayed.	Fuel temperature sensor	115
FRP (Fuel pressure sensor)	kPa / Bar / psi	Engine switch ON: 0 kPa {0 psi, 0 Bar}	Fuel pressure sensor	140
		Idle: Approx. 32 MPa (WL-C), Approx. 33 MPa {330 Bar, 4,786 psi} (WE-C) 2,000 rpm: Approx. 58 MPa {580 Bar, 8,412 psi}		
GP_LMP (Glow indicator light)	On/Off	Glow indicator light Off: Off Glow indicator light ON: On	Inspect following PIDs: ECT, BOOST_DSD, VSS	233
GPC (Glow plug relay)	On/Off	13s from when engine switch is turned to ON position with ECT at 20 °C{68 °F} of less		182
		Cranking: On (ECT at 60 °{140 °F} or less) Idle: Off (2m or more after engine is started)		
IASV (Intake shutter solenoid valve (half))	On/Off	Engine switch ON: OFF Idle: OFF (WL-C), ON (WE-C)	Intake air shutter valve	152
IASV2 (Intake shutter solenoid valve (full))	On/Off	Engine switch ON: OFF		155
IAT (Intake air temperature (IAT sensor No.1))	V	30 °C {86 °F}: Approx. 1.4 V 50 °C {104 °F}: Approx. 1.2 V	IAT sensor	141
	°C	Intake air temperature is display		
INGEAR (Load/no load condition)	On/Off	Neutral: On Others: Off	Inspect following PIDs: CPP	240
IVS (Idle switch)	Idle/Off Idle	CTP: Idle Others: Off Idle	APP sensor	161
LOAD (Engine load)	%	Engine switch ON: 0% Idle: Approx. 22 %	MAF sensor	—
MAF (Mass airflow amount)	g/s	Engine switch ON: 2 g/s Idle: Approx. 8 g/s	MAF sensor	190
	V	Engine switch ON: Below 1.0 V Idle: Approx. 1.76 V		

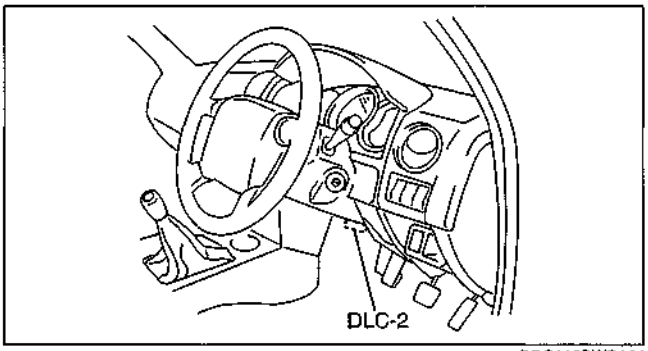
Monitor item (Definition)	Unit/Condition	Condition/Specification (Reference)	Inspection item	PCM terminal
MAP (Boost sensor)	kPa | Bar | psi	Manifold absolute pressure is displayed	MAP sensor	189
	V	Engine switch ON: Approx. 1.65 V Idle: Approx. 1.65 V		
MIL (Malfunction indicator lamp)	On/Off	Engine switch ON: On	Perform applicable DTC troubleshooting.	256
		Idle: Off		
MIL_DIS (The distance travelled since the MIL was activated)	Km	Indicate the travelled distance since the MIL illuminated		—
RPM (Engine speed)	rpm	Engine switch ON: 0 RPM	CKP sensor	193
		Idle: No load: 695—745 rpm A/C ON: 725—775 rpm		
SEGRP DSD (Desired EGR valve position)	%	Engine switch ON: Approx. 4.68 % Idle: Approx. 78 % Engine speed 2,000 rpm: Approx. 94 %	Desired SEGRP valve position	—
SELTESTDTC (Diagnostic trouble codes)	—	—	Perform applicable DTC troubleshooting	—
VBCV (VBC solenoid valve)	%	Engine switch ON: Approx. 4.99 % Idle: Approx. 79 %	Inspect following PIDs: IVS, MAF, ECT, RPM Inspect VBC solenoid valve.	178
VPWR (Module supply voltage)	V	Indicate the battery positive voltage	Battery Main relay	201, 203, 205
VSS (Vehicle speed)	km/h	Vehicle speed is displayed	Perform applicable DTC troubleshooting.	184

PCM CONFIGURATION [WL-C, WE-C]

dcf014018880w03

Using PDS/IDS

1. Connect the PDS/IDS to DLC-2.
2. After the vehicle is identified, select the following items from the initial screen of the PDS/IDS.
   - When using the IDS (notebook PC)
     1. Select the "Module Programming".
   - When using the PDS (pocket PC)
     1. Select "Programming".
     2. Select "Module Programming".
3. Then, select the "Programmable Module Installation", "PCM" and perform procedures according to directions on the PDS/IDS screen.



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Note

- If the PCM is replaced with a new one, the PCM stores DTCs P0602 and P1675, illuminates the MIL even though no malfunction is detected. When the configuration is completed, DTCs P0602 and P1675 are cleared.

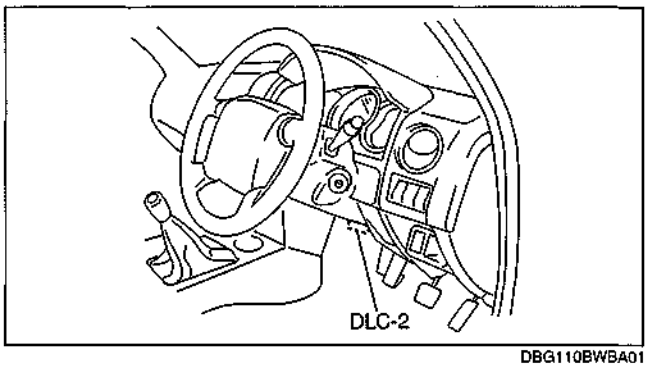
4. Retrieve DTC's using the PDS/IDS, then verify if DTCs are present.
   - If a DTC is present, perform the applicable DTC inspection.

Using WDS

1. Connect the WDS to DLC-2.
2. Set up the WDS (including the vehicle recognition).
3. Select "Module Programming."
4. Select "Programmable Module Installation."
5. Select "PCM" and perform procedures according to directions on the WDS screen.

Note

- If the PCM is replaced with a new one, the PCM stores DTCs P0602 and P1675, illuminates the MIL even though no malfunction is detected. When the configuration is completed, DTCs P0602 and P1675 are cleared.



DBG110BWBA01

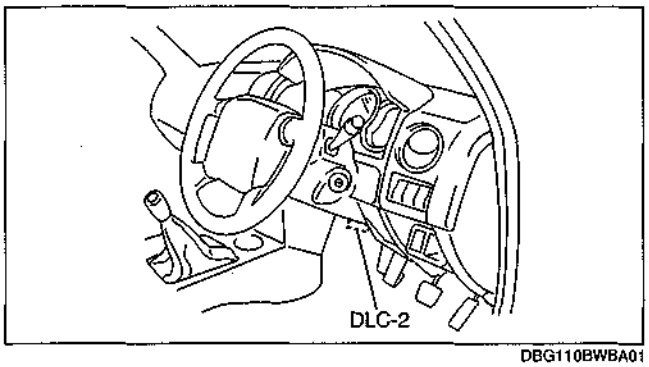
6. Retrieve DTC's using the WDS, then verify if DTCs are present.
   - If a DTC is present, perform the applicable DTC inspection.

FUEL INJECTOR CODE PROGRAM [WL-C, WE-C]

dcf014018880w04

Using PDS/IDS

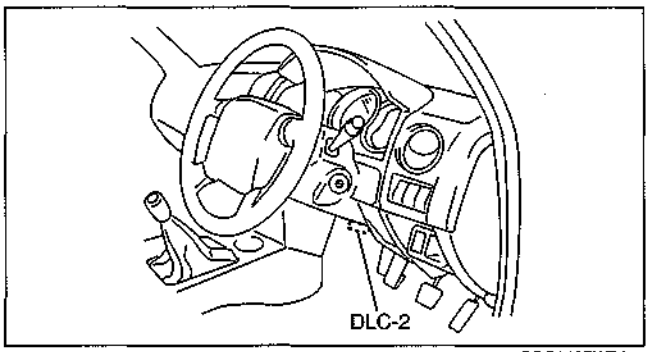
1. Connect the PDS/IDS to DLC-2.
2. After the vehicle is identified, select the following items from the initial screen of the PDS/IDS.
   - When using the IDS (notebook PC)
     1. Select the "Module Programming".
   - When using the PDS (pocket PC)
     1. Select "Programming".
     2. Select "Module Programming".
3. Then, select the "Programmable Parameters", "Injector Correction Factors" and perform procedures according to directions on the PDS/IDS screen.
4. Retrieve DTC's using the PDS/IDS, then verify if DTCs are present.
   - If a DTC is present, perform the applicable DTC inspection.



DBG110BWBA01

Using WDS

1. Connect the WDS to DLC-2.
2. Set up the WDS (including the vehicle recognition).
3. Select "Module Programming".
4. Select "Programmable Parameters".
5. Select "Injector Correction Factors" and perform procedures according to directions on the WDS screen.
6. Retrieve DTC's using the WDS, then verify if DTCs are present.
   - If a DTC is present, perform the applicable DTC inspection.

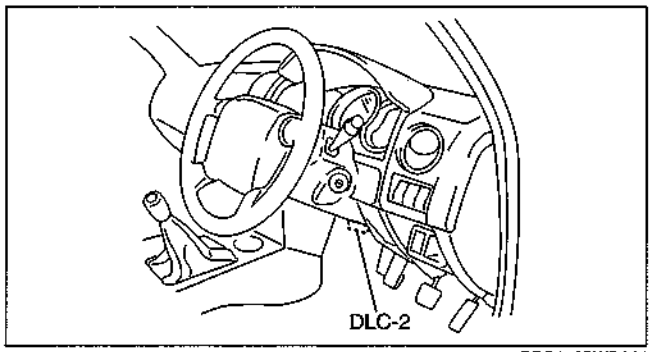


DBG110BWBA01

PCM DATA RESET [WL-C, WE-C]

dcf014018880w05

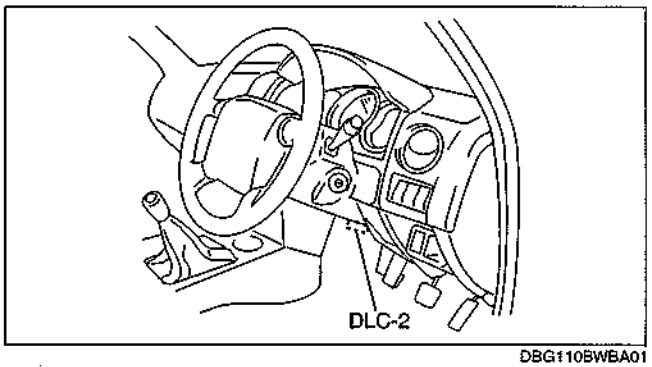
Using PDS/IDS



DBG110BWBA01

1. Connect the PDS/IDS to DLC-2.
2. After the vehicle is identified, select the following items from the initial screen of the PDS/IDS.
   - When using the IDS (notebook PC)
     1. Select the "Powertrain".
     2. Select the "Data Reset".
   - When using the PDS (pocket PC)
     1. Select "All Tests and Calibrations".
     2. Select "Data Reset".
3. Then, select the "PCM" and perform procedures according to directions on the PDS/IDS screen.
4. Perform the data reset according to the directions on the PDS/IDS screen.
5. Retrieve DTC's using the PDS/IDS, then if that DTCs are present.
   - If a DTC is present, perform the applicable DTC inspection.

Using WDS



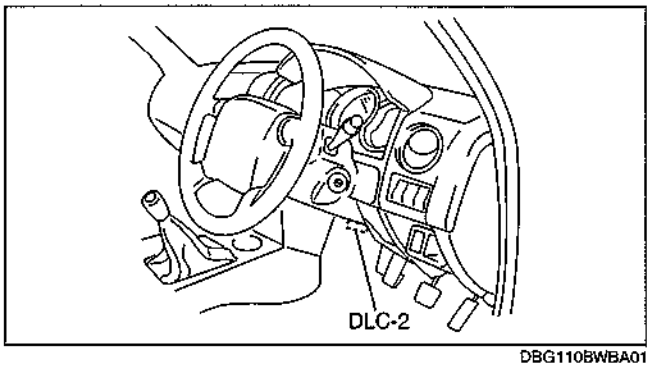
DBG110BWBA01

1. Connect the WDS to DLC-2.
2. Set up the WDS (including the vehicle recognition).
3. Select "Powertrain".
4. Select "Data Reset".
5. Select "PCM" and perform procedures according to directions on the WDS screen.
6. Retrieve DTC's using the WDS, then verify if DTCs are present.
   - If a DTC is present, perform the applicable DTC inspection.

MASS AIR FLOW (MAF) SENSOR DATA RESET [WL-C, WE-C]

dcf014018880w06

Using PDS/IDS

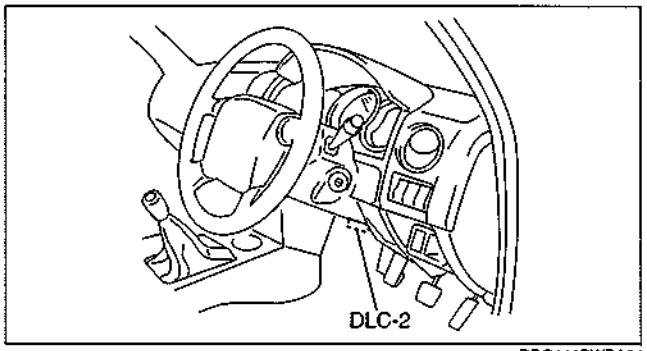


DBG110BWBA01

1. Connect the PDS/IDS to DLC-2.
2. After the vehicle is identified, select the following items from the initial screen of the PDS/IDS.
   - When using the IDS (notebook PC)
     1. Select the "Powertrain".
     2. Select the "Data Reset".
   - When using the PDS (pocket PC)
     1. Select "All Tests and Calibrations".
     2. Select "Data Reset".
3. Then, select the "MAF sensor" and perform procedures according to directions on the PDS/IDS screen.
4. Perform the data reset according to the directions on the PDS/IDS screen.
5. Retrieve DTC's using the PDS/IDS, then verify if DTCs are present.
   - If a DTC is present, perform the applicable DTC inspection.

Using WDS

1. Connect the WDS to DLC-2.
2. Set up the WDS (including the vehicle recognition).
3. Select "Powertrain".
4. Select "Data Reset".
5. Select "MAF sensor" and perform procedures according to directions on the WDS screen.
6. Retrieve DTC's using the WDS, then verify if DTCs are present.
   - If a DTC is present, perform the applicable DTC inspection.



DBG110BWBA01

MAIN RELAY INSPECTION [WL-C, WE-C]

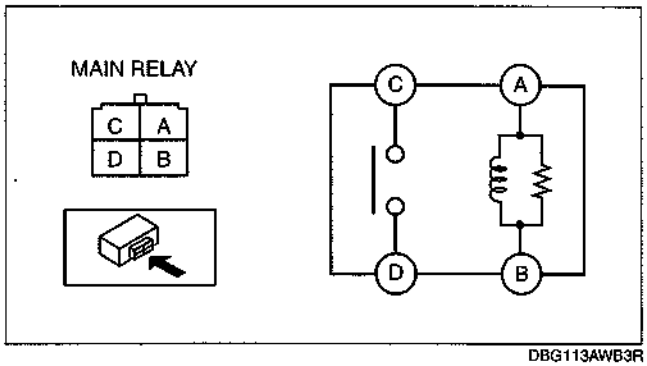
dcf014000000w08

1. Verify the continuity between the main relay terminals.

O—O : Continuity

Step	Terminal			
	A	B	C	D
1	O	O		
2	B+	GROUND	O	O

DBG113BWB321



DBG113AWB3R

- If not as indicated in the table, replace the main relay.

MASS AIR FLOW (MAF) SENSOR/INTAKE AIR TEMPERATURE (IAT) SENSOR NO.2 INSPECTION [WL-C, WE-C]

dcf014013215w02

Note

- Perform the following inspection only when directed.

MAF Sensor Voltage Inspection

1. Turn the engine switch to the ON position (Engine off).
2. Set the current diagnostic tool and monitor the MAF PID.(See 01-02B-8 PID/DATA Monitor And Record Procedure.)
   - If not as specified, perform the "Circuit Open/Short Inspection".
     — If there is no open/short circuit, replace the MAF sensor/IAT sensor No.2.01-13B-3 INTAKE-AIR SYSTEM REMOVAL/INSTALLATION [WL-C, WE-C].)

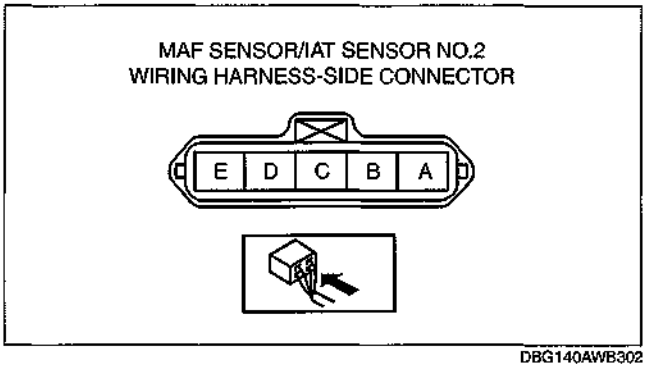
MAF PID (Reference)
below 1.0 V

3. Start the engine and warm up the engine completely.
4. Monitor the MAF PID at idle.
   - If not as specified, perform the "Circuit Open/Short Inspection".
     — If there is no open/short circuit, replace the MAF sensor/IAT sensor No.2.01-13B-3 INTAKE-AIR SYSTEM REMOVAL/INSTALLATION [WL-C, WE-C].)

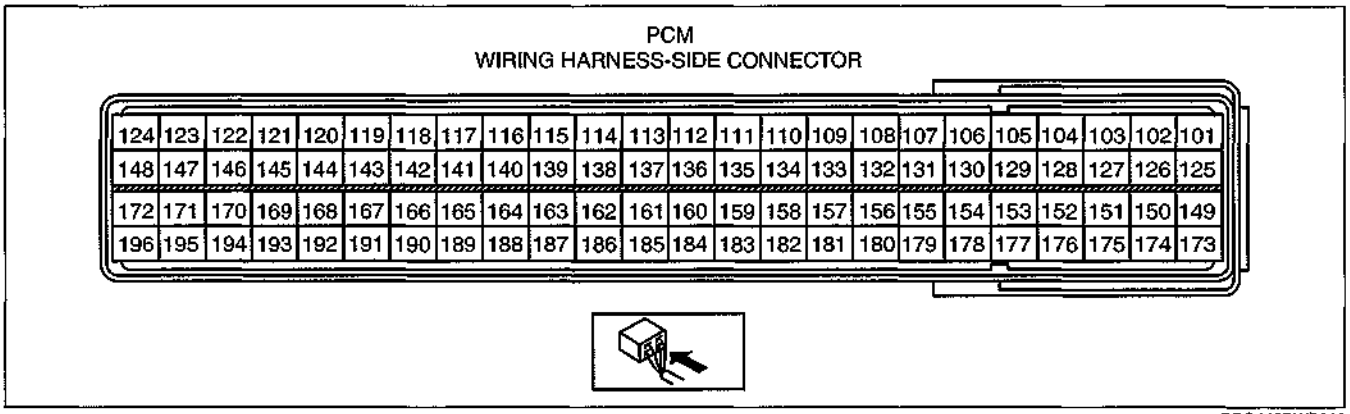
MAF PID (Reference)
1.6—2.0 V

Circuit Open/Short Inspection

1. Disconnect the MAF sensor/IAT sensor No.2 connector.
2. Disconnect the PCM connector.(See01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C]
3. Inspect for an open or short circuit in the following wiring harnesses.
   - If there is an open or short circuit, repair or replace wiring harnesses.



DBG140AWB302



DBG113BWB319

Open circuit

- Power circuit (MAF sensor/IAT sensor No.2 connector terminal A and main relay connector terminal D)
- Signal circuit (MAF sensor/IAT sensor No.2 connector terminal C and PCM connector terminal 190)
- Ground circuit (MAF sensor/IAT sensor No.2 connector terminal B and PCM connector terminal 169)

Short circuit

- MAF sensor/IAT sensor No.2 connector terminal A and main relay connector terminal D short to ground
- MAF sensor/IAT sensor No.2 connector terminal C and PCM connector terminal 190 short to ground

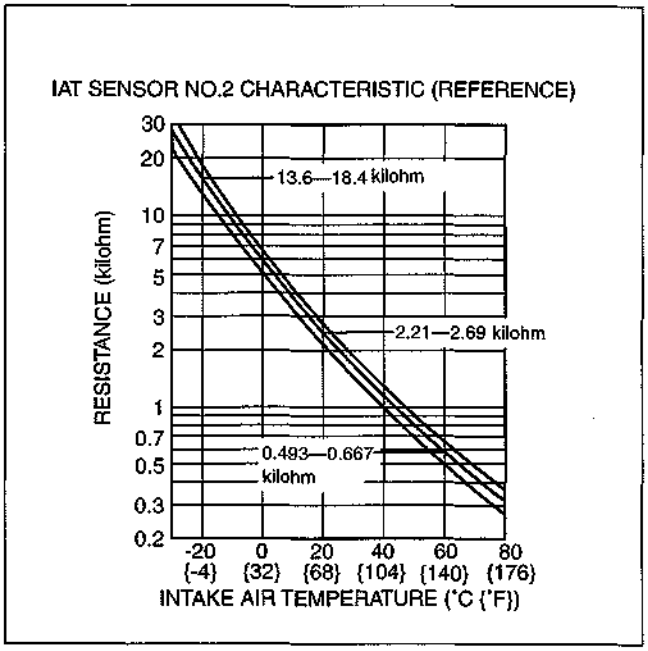
IAT Sensor No.2 Resistance Inspection

1. Disconnect the MAF sensor/IAT sensor No.2 connector.

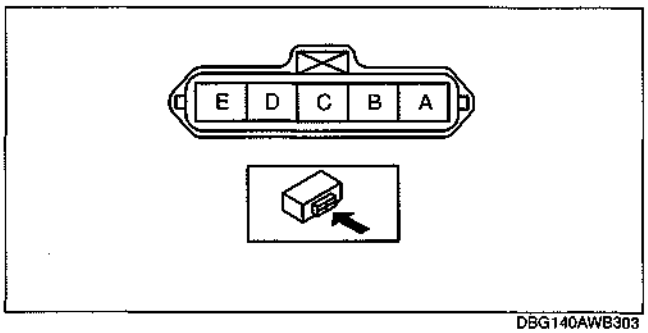
2. Measure the resistance between MAF sensor/IAT sensor No.2 terminals D and E using an ohmmeter.
   - If not as specified, replace the MAF sensor/IAT sensor No.2.
   - If as specified, carry out the "Circuit Open/Short Inspection".

Specification

Ambient temperature (°C {°F})	Resistance (kilohm)
20 {68}	2.21—2.69
60 {140}	0.493—0.667



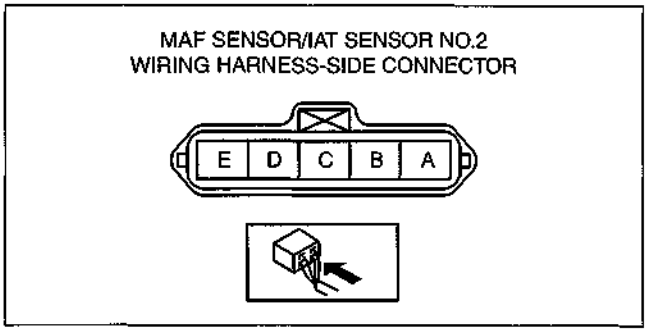
DBG140AWB321



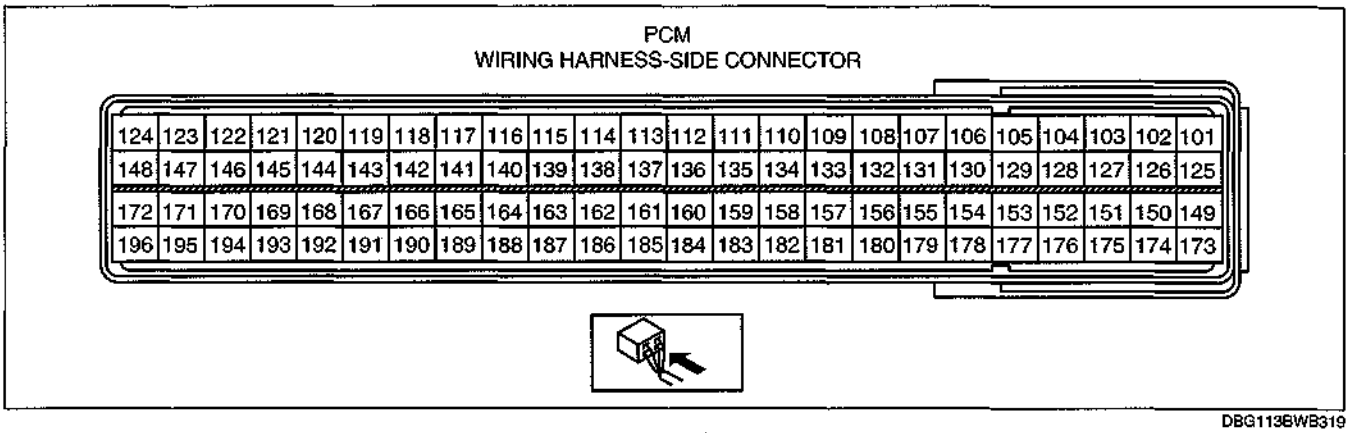
DBG140AWB303

Circuit Open/Short Inspection

1. Disconnect the MAF sensor/IAT sensor No.2 connector.
2. Disconnect the PCM connector.(See01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
3. Inspect for an open or short circuit in the following wiring harnesses.
   - If there is an open or short circuit, repair or replace wiring harnesses.



DBG140AWB302



DBG113BWB319

Open circuit
- Signal circuit (MAF sensor/IAT sensor No.2 connector terminal D and PCM connector terminal 188)
- Ground circuit (MAF sensor/IAT sensor No.2 connector terminal E and PCM connector terminal 154)

Short circuit
- MAF sensor/IAT sensor No.2 connector terminal D and PCM connector terminal 188 to GND

INTAKE AIR TEMPERATURE (IAT) SENSOR NO.1 INSPECTION [WL-C, WE-C]

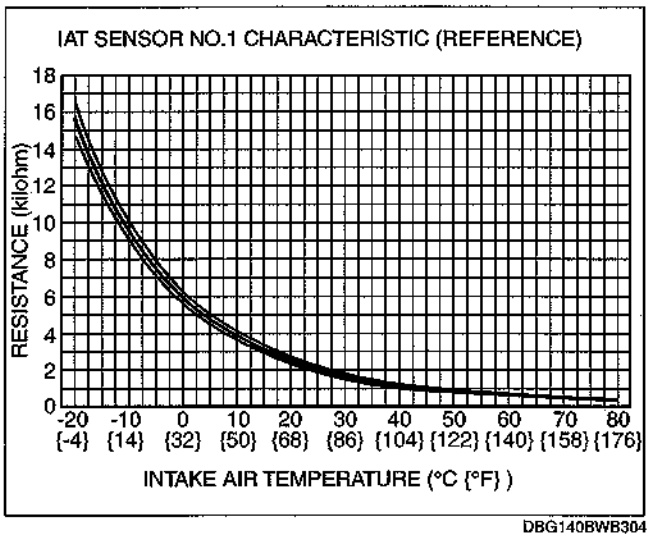
dcf014018842w02

Note
- Perform the following inspection only when directed.

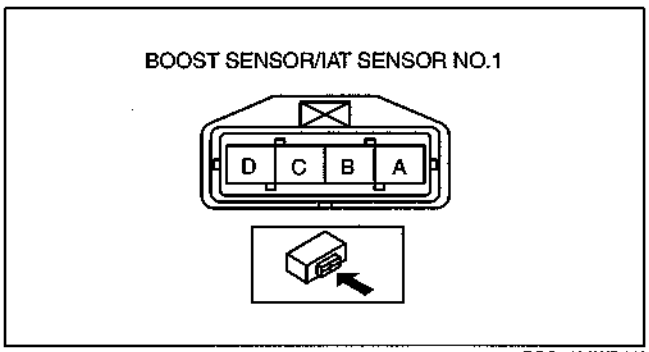
Resistance Inspection
1. Disconnect the boost sensor/IAT sensor No.1 connector.
2. Measure the resistance between IAT sensor No.1 terminals A and B using an ohmmeter.
   - If not as specified, replace the boost sensor/IAT sensor No.1.
   - If as specified, carry out the "Circuit Open/Short inspection".

Specification

Water temperature (°C {°F})	Resistance (kilohm)
20 {68}	2.41—2.61
80 {176}	0.32—0.34

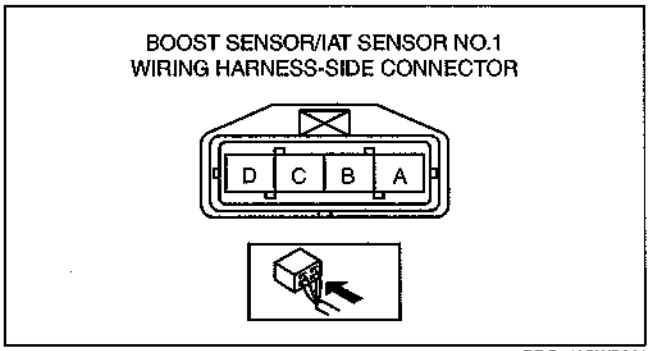


DBG140BWB304

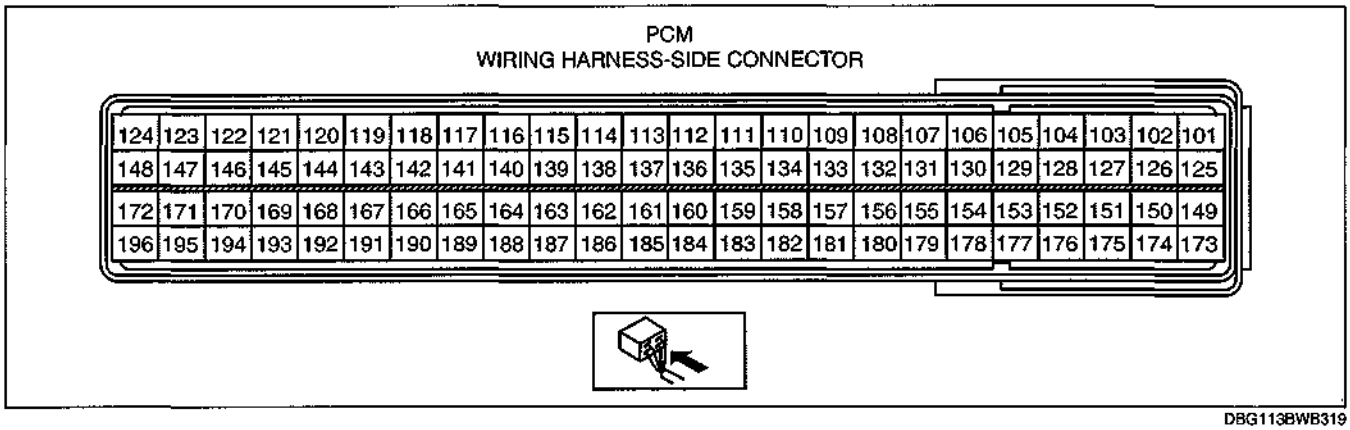


DBG140AWB556

Circuit Open/Short Inspection
1. Disconnect the boost sensor/IAT sensor No.1 connector.
2. Disconnect the PCM connector.(See01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
3. Inspect for an open or short circuit in the following siring harnesses.
   - If there is an open or short circuit, repair or replace wiring harnesses.



DBG140BWB301



DBG113BWB319

Open circuit
- Signal circuit (Boost sensor/IAT sensor No.1 connector terminal A and PCM connector terminal 111)
- Ground circuit (Boost sensor/IAT sensor No.1 connector terminal B and PCM connector terminal 141)

Short circuit
- IAT sensor No.1 connector terminal A and PCM connector terminal 111 to ground

BOOST SENSOR INSPECTION [WL-C, WE-C]

dcf014018212w02

Note
- Perform the following inspection only when directed.

Visual Inspection
1. Inspect the boost sensor for damage and cracks.
   - If there is any malfunction, replace the boost sensor/IAT sensor No.1.
   - If there is not any malfunction, perform the "Voltage Inspection".

Voltage Inspection
1. Turn the engine switch to the ON position (Engine off).
2. Set the current diagnostic tool and monitor the MAP PID.(See 01-02B-8 PID/DATA Monitor And Record Procedure.)
   - If not as specified, perform the "Circuit Open/Short Inspection".
     — If there is no open/short circuit, replace the boost sensor/IAT sensor No.1. (See 01-13B-3 INTAKE-AIR SYSTEM REMOVAL/INSTALLATION [WL-C, WE-C].)

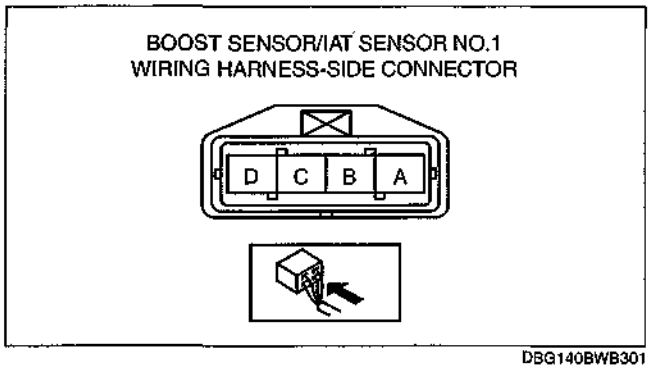
MAP PID (Reference)
Approx. 1.65 V [Atmospheric pressure 101 kPa {757.5 mmHg, 29.8 inHg}]

3. Start the engine and warm up the engine completely.
4. Monitor the MAP PID using the current diagnostic tool at idle.
   - If not as specified, perform the "Circuit Open/Short Inspection".
     — If there is no open/short circuit, replace the boost sensor/IAT sensor No.1. (See 01-13B-3 INTAKE-AIR SYSTEM REMOVAL/INSTALLATION [WL-C, WE-C].)

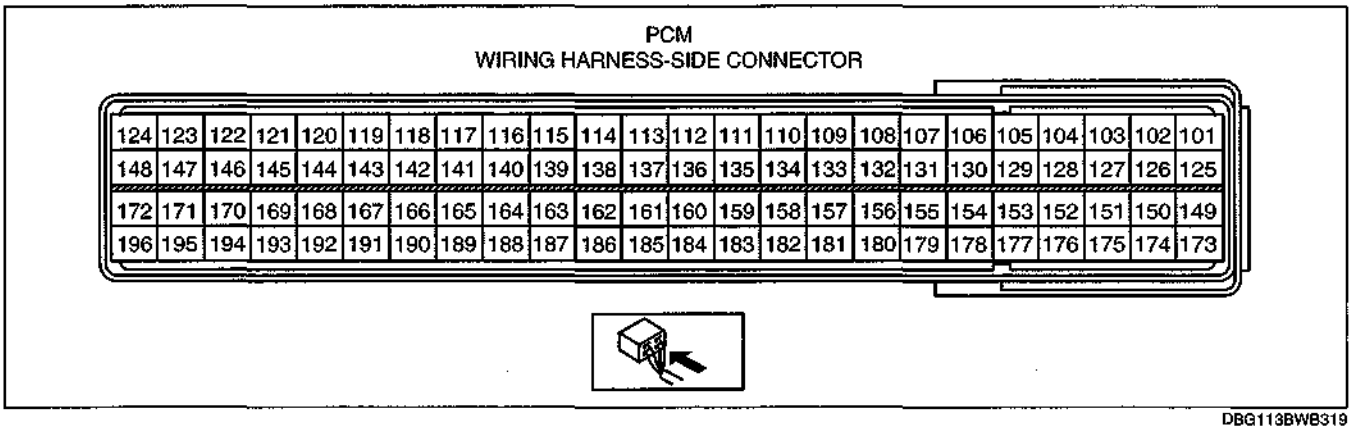
MAP PID (Reference)
Approx. 1.65 V [Atmospheric pressure 101 kPa {757.5 mmHg, 29.8 inHg}]

Circuit Open/Short Inspection

1. Disconnect the PCM connector. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
2. Disconnect the boost sensor/IAT sensor No.1 connector.
3. Inspect for open/short circuit in the following wiring harnesses.
   - If there is open/short circuit, repair or replace wiring harnesses.



DBG140BWB301



DBG113BWB319

Open circuit

- Power circuit (Boost sensor/IAT sensor No.1 connector terminal D and PCM connector terminal 189)
- Signal circuit (Boost sensor/IAT sensor No.1 connector terminal C and PCM connector terminal 133)
- Ground circuit (Boost sensor/IAT sensor No.1 connector terminal A and PCM connector terminal 111)

Short circuit

- Boost sensor/IAT sensor No.1 connector terminal A and PCM connector terminal 111 short to power supply
- Boost sensor/IAT sensor No.1 connector terminal C and PCM connector terminal 133 short to power supply
- Boost sensor/IAT sensor No.1 connector terminal C and PCM connector terminal 133 short to body ground
- Boost sensor/IAT sensor No.1 connector terminal D and PCM connector terminal 189 short to power supply
- Boost sensor/IAT sensor No.1 connector terminal D and PCM connector terminal 189 short to body ground

ACCELERATOR PEDAL POSITION (APP) SENSOR INSPECTION [WL-C, WE-C]

dcf014041609w02

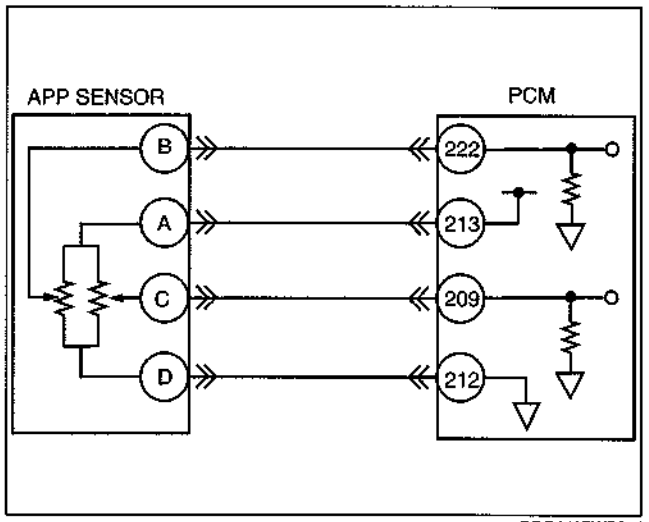
Note

- Perform the following inspection only when directed.

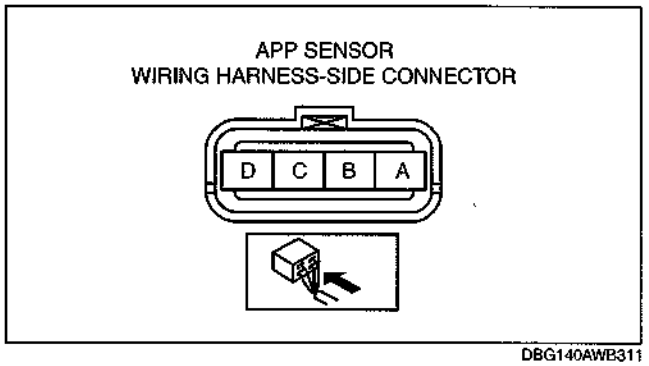
Voltage Inspection

1. Verify that the APP sensor is installed to the accelerator pedal properly.
2. Visually inspect all accelerator pedal components for looseness.

3. Check the power circuit voltage.
   (1) Verify that the voltage between the APP sensor terminals A (power circuit) and D (ground circuit) is **4.9—5.1 V**.

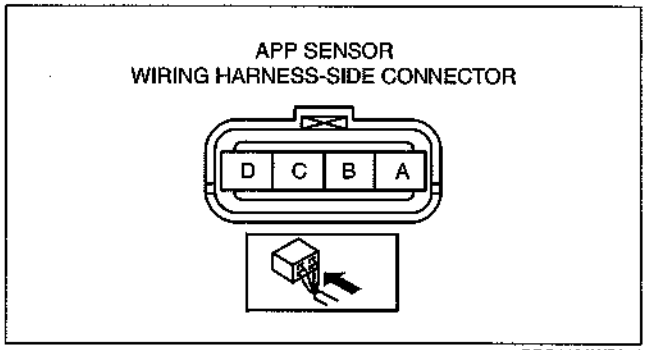


DBG140BWB314



DBG140AWB311

4. Verify that the voltage between the APP sensor terminals B—D, and C—D is as shown below according to the accelerator pedal conditions.
   - If not as specified, carry out the "Circuit Open/Short Inspection."
     — If there is no open/short circuit, replace the APP sensor.(See01-13B-3 INTAKE-AIR SYSTEM REMOVAL/ INSTALLATION [WL-C, WE-C]



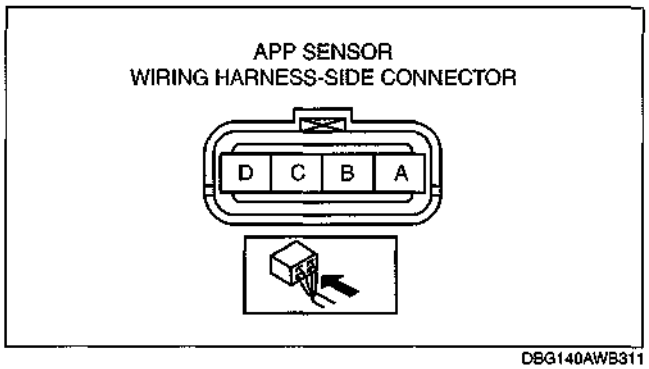
DBG140AWB311

Specification (Reference)

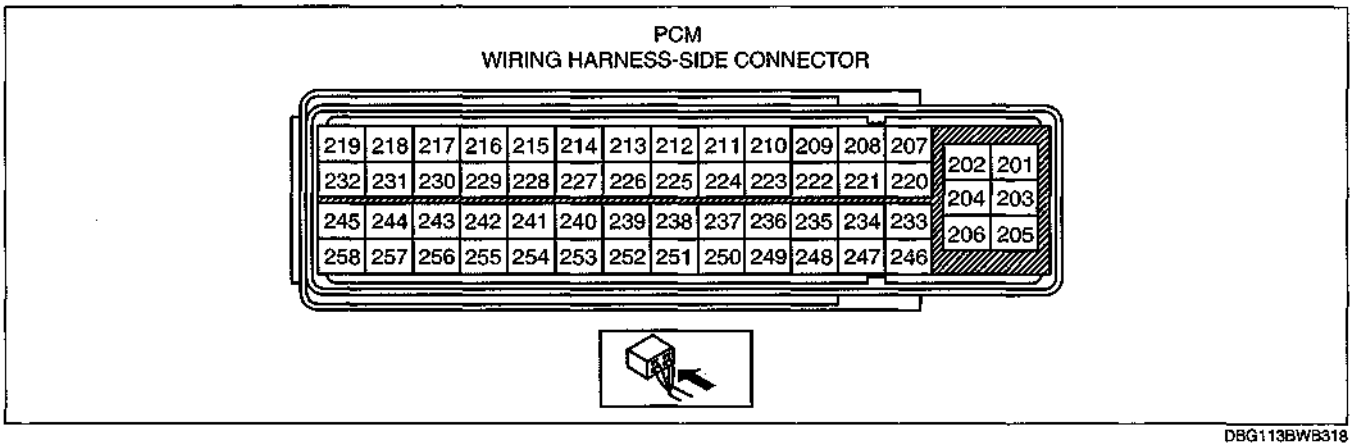
Accelerator pedal condition	Output voltage (V)
Fully released	0.4—0.8
Gradually depressed	Increases linearly
Fully depressed	3.4—3.8

Circuit Open/Short Inspection

1. Disconnect the PCM connector. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
2. Disconnect the APP sensor connector.
3. Inspect for an open or short circuit in the following wiring harnesses.
   - If there is an open or short circuit, repair or replace wiring harnesses.



DBG140AWB311



DBG113BWB318

Open circuit

- Power circuit (APP sensor connector terminal A and PCM connector terminal 213)
- Signal circuit (APP sensor connector terminal B and PCM connector terminal 222)
- Signal circuit (APP sensor connector terminal C and PCM connector terminal 209)
- Ground circuit (APP sensor connector terminal D and PCM connector terminal 212)

Short circuit

- APP sensor connector terminal A and PCM connector terminal 213 short to ground
- APP sensor connector terminal B and PCM connector terminal 222 short to power supply
- APP sensor connector terminal B and PCM connector terminal 222 short to ground
- APP sensor connector terminal C and PCM connector terminal 209 short to power supply
- APP sensor connector terminal C and PCM connector terminal 209 short to ground
- APP sensor connector terminal D and PCM connector terminal 212 short to power supply

IDLE SWITCH INSPECTION [WL-C, WE-C]

dcf014066470w02

Continuity Inspection

Note

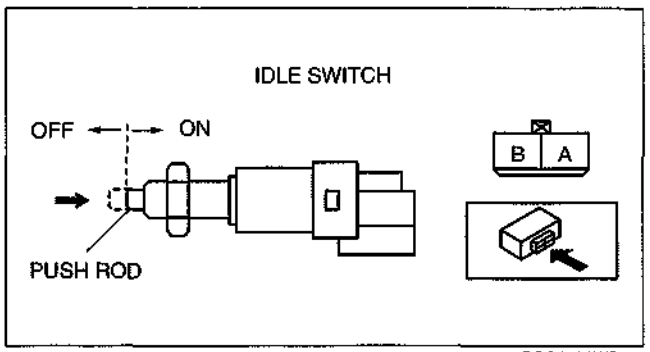
- Perform the following inspection only when directed.

1. Disconnect the idle switch connector.

2. Inspect continuity between the idle switch terminals A and B using an ohmmeter.
   - If not as specified, replace the idle switch.
     — If as specified, carry out the "Circuit Open/Short Inspection".

Specification

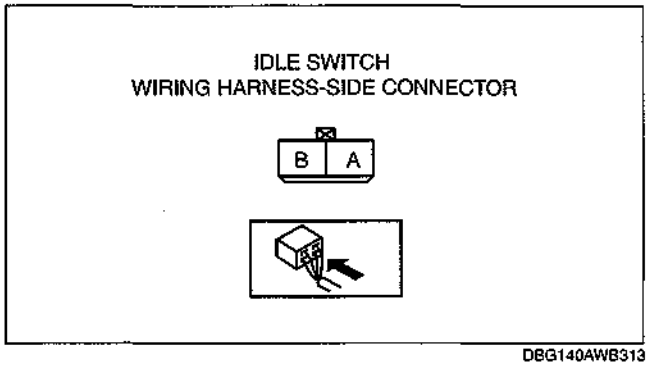
Idle switch	Accelerator pedal	Continuity condition
Push the rod	Released	Continuity
Except above	Depressed	No continuity



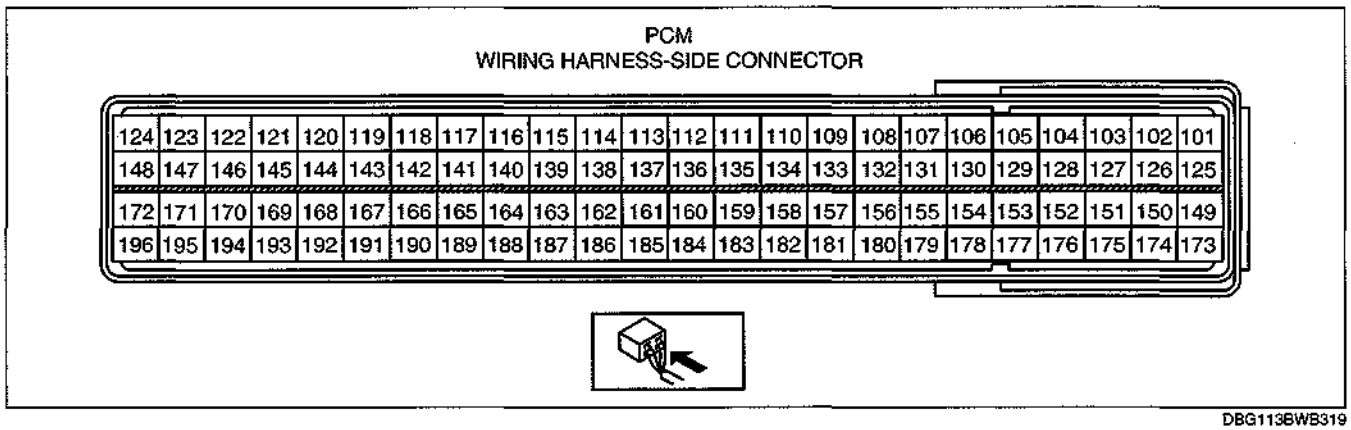
DBG140AWB555

Circuit open/short inspection

1. Disconnect the idle switch connector.
2. Disconnect the PCM connector. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C])
3. Inspect for an open or short circuit in the following wiring harnesses.
   - If there is an open or short circuit, repair or replace wiring harnesses.



DBG140AWB313



DBG113BWB319

Open circuit

- Power circuit (idle switch connector terminal A and PCM connector terminal 161)
- Ground circuit (idle switch connector terminal B and ground.)

Short circuit

- Idle switch connector terminal A and PCM connector terminal 161 short to ground

FUEL TEMPERATURE SENSOR INSPECTION [WL-C, WE-C]

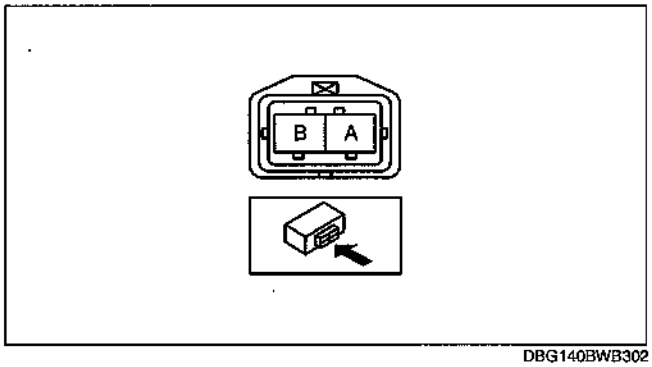
dcf014018843w02

Note
- Perform the following inspection only when directed.

Resistance Inspection
1. Remove the supply pump. (See 01-14B-11 SUPPLY PUMP REMOVAL/INSTALLATION [WL-C, WE-C].)
2. Measure the resistance between the fuel temperature sensor terminals using an ohmmeter.
   - If not as specified, repair the supply pump. (See 01-14B-13 SUPPLY PUMP INSPECTION [WL-C, WE-C].)
   - If as specified, carry out the "Circuit Open/ Short Inspection".

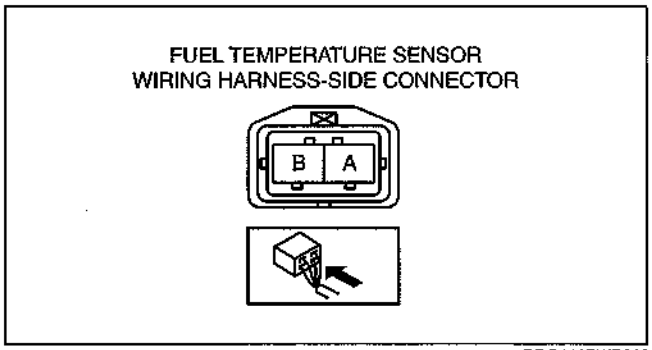
Specification

Ambient temperature (°C {°F})	Resistance (kilohm)
–10 {14}	8.244—10.661
20 {68}	2.262—2.760
80 {176}	0.304—0.342

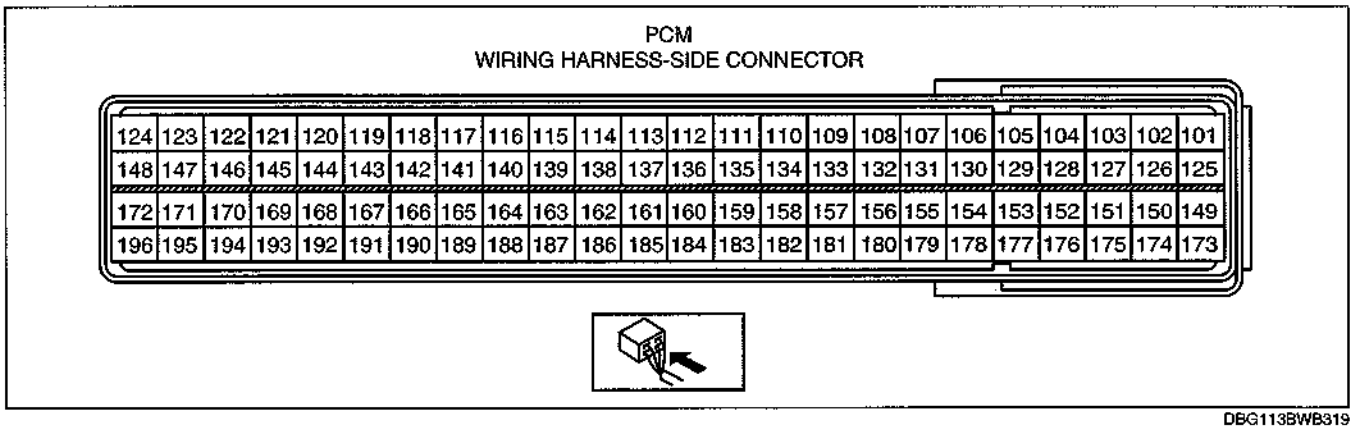


DBG140BWB302

Circuit Open/Short Inspection
1. Disconnect the PCM connector. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C])
2. Inspect for open/short circuit in the following wiring harnesses.
   - If there is open/short circuit, repair or replace wiring harness.



DBG140BWB303



DBG113BWB319

Open circuit
- Power circuit (Fuel temperature sensor connector terminal A and PCM connector terminal 115
- Ground circuit (Fuel temperature sensor connector terminal B and PCM connector terminal 170

Short circuit
- Fuel temperature sensor connector terminal A and PCM connector terminal 115 short to power
- Fuel temperature sensor connector terminal A and PCM connector terminal 115 short to ground
- Fuel temperature sensor connector terminal B and PCM connector terminal 170 short to power

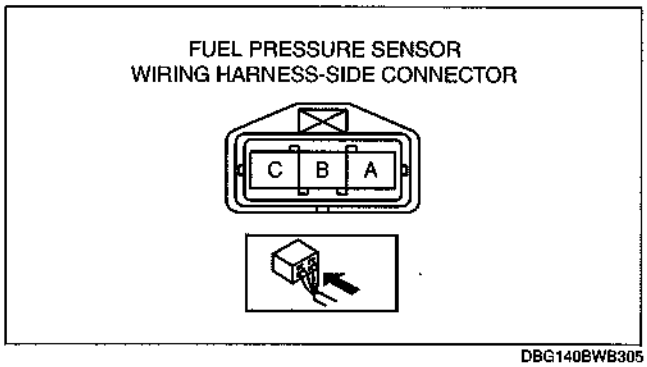
FUEL PRESSURE SENSOR INSPECTION [WL-C, WE-C]

dcf014018213w01

Note
- Perform the following inspection only when directed.

Voltage Inspection
1. Start the engine and warm up the engine completely.
2. Measure the voltage between fuel pressure sensor terminals A and B using a voltmeter at idle.
   - If not as specified, perform the "Circuit Open/Short Inspection".
     — If there is no open/short circuit, replace the common rail.

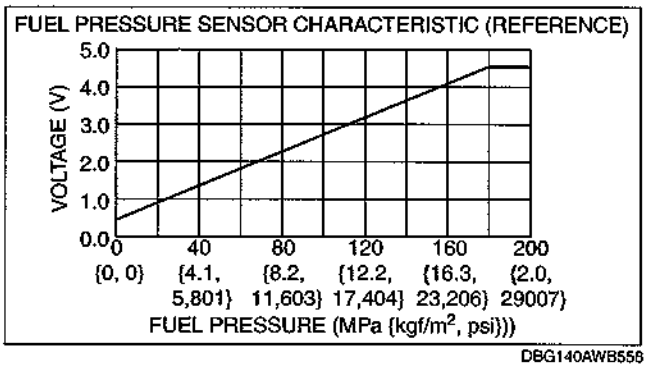
Specification (Reverence)
Approx. 1.25 V



DBG140BWB305

3. Turn off the engine and wait three minutes.
4. Turn the engine switch to the ON position (Engine off).
5. Measure the voltage between fuel pressure sensor terminals A and B using a voltmeter.
   - If not as specified, perform the "Circuit Open/Short Inspection".
     — If there is no open/short circuit, replace the common rail.

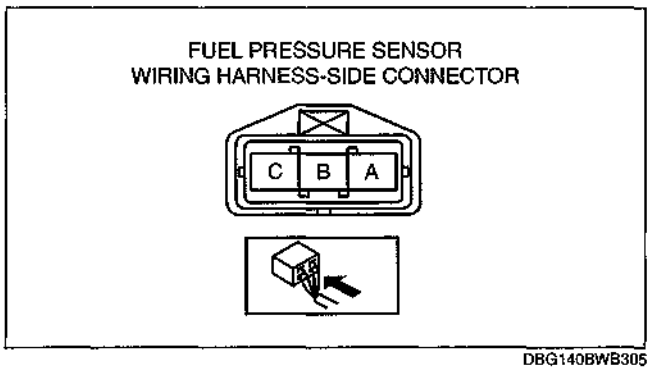
Specification (Reference)
0.494—0.506 V



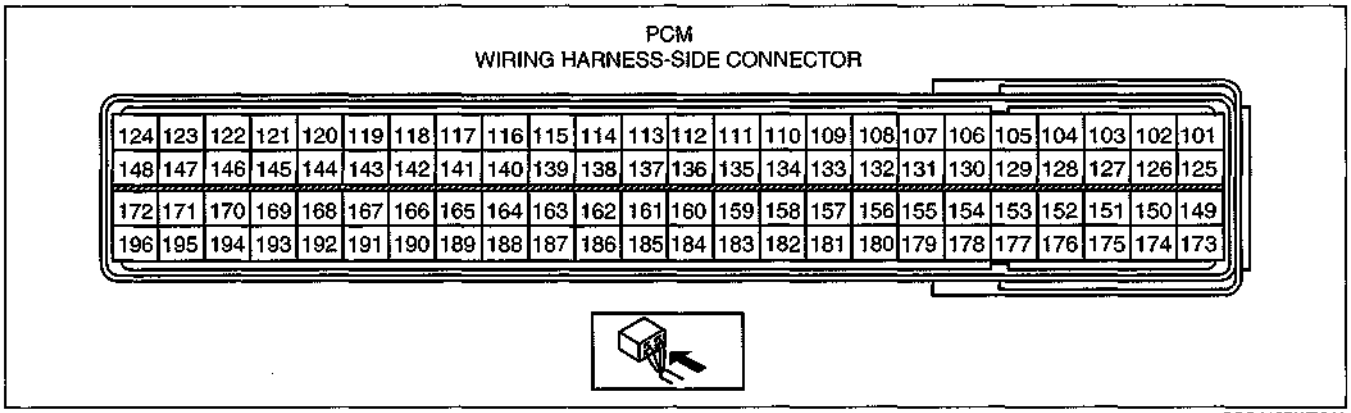
DBG140AWB556

Circuit Open/Short Inspection
1. Disconnect the fuel pressure sensor connector.
2. Disconnect the PCM connector. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C])

3. Inspect for open/short circuit in the following wiring harnesses.
   - If there is open/short circuit, repair or replace wiring harnesses.



DBG140BWB305



DBG113BWB319

Open circuit
- Power circuit (Fuel pressure sensor connector terminal C and PCM connector terminal 109)
- Signal circuit (Fuel pressure sensor connector terminal B and PCM connector terminal 140)
- Ground circuit (Fuel pressure sensor connector terminal A and PCM connector terminal 191)

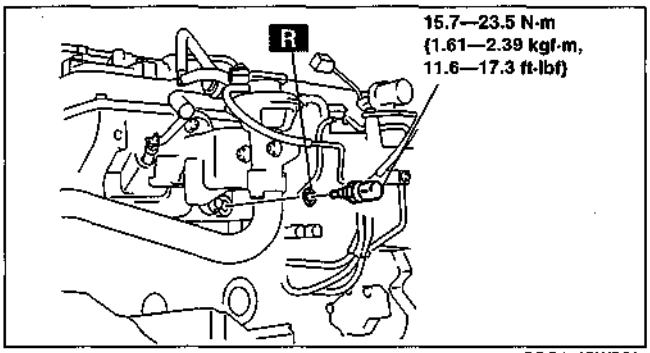
Short circuit
- Fuel pressure sensor connector terminal A and PCM connector terminal 191 short to power supply
- Fuel pressure sensor connector terminal B and PCM connector terminal 140 short to power supply
- Fuel pressure sensor connector terminal B and PCM connector terminal 140 short to body ground
- Fuel pressure sensor connector terminal C and PCM connector terminal 109 short to power supply
- Fuel pressure sensor connector terminal C and PCM connector terminal 109 short to body ground

ENGINE COOLANT TEMPERATURE (ECT) SENSOR REMOVAL/INSTALLATION [WL-C, WE-C]

dcf014018841w03

Warning
- **When the engine is hot, it can badly burn. Turn off the engine and wait until it is cool before removing the ECT sensor.**

1. Disconnect the negative battery cable.
2. Drain the engine coolant. (See 01-12B-3 ENGINE COOLANT REPLACEMENT [WL-C, WE-C].)
3. Remove the common rail. (See 01-14B-11 SUPPLY PUMP REMOVAL/INSTALLATION [WL-C, WE-C].)
4. Remove the ECT sensor.
5. Install in the reverse order of removal.



DBG116BWB201

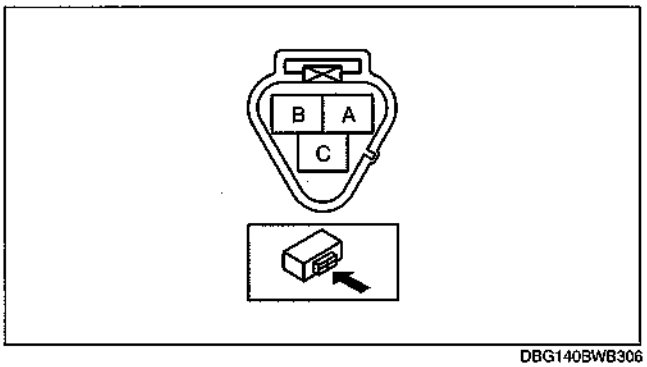
ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION [WL-C, WE-C]

dcf014018841w04

Note
- Perform the following inspection only when directed.

Resistance Inspection

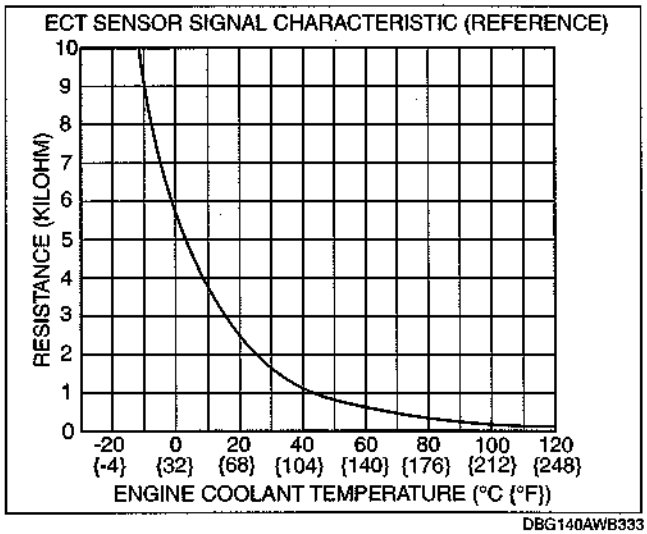
1. Remove the ECT sensor. (See01-40B-34 ENGINE COOLANT TEMPERATURE (ECT) SENSOR REMOVAL/ INSTALLATION [WL-C, WE-C]
2. Measure the resistance between the ECT sensor terminals A and B using an ohmmeter.
   - If not as specified, replace the ECT sensor.
   - If as specified, carry out the "Circuit Open/ Short Inspection".



DBG140BWB306

Specification

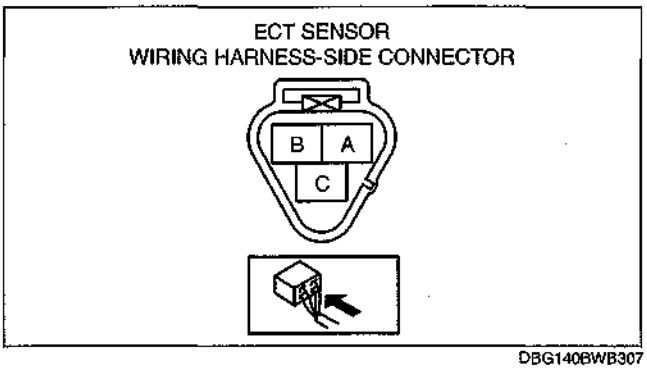
Engine coolant temperature (°C {°F})	Resistance (kilohm)
20 {68}	2.37—2.53
80 {176}	0.31—0.32
110 {176}	0.137—0.146



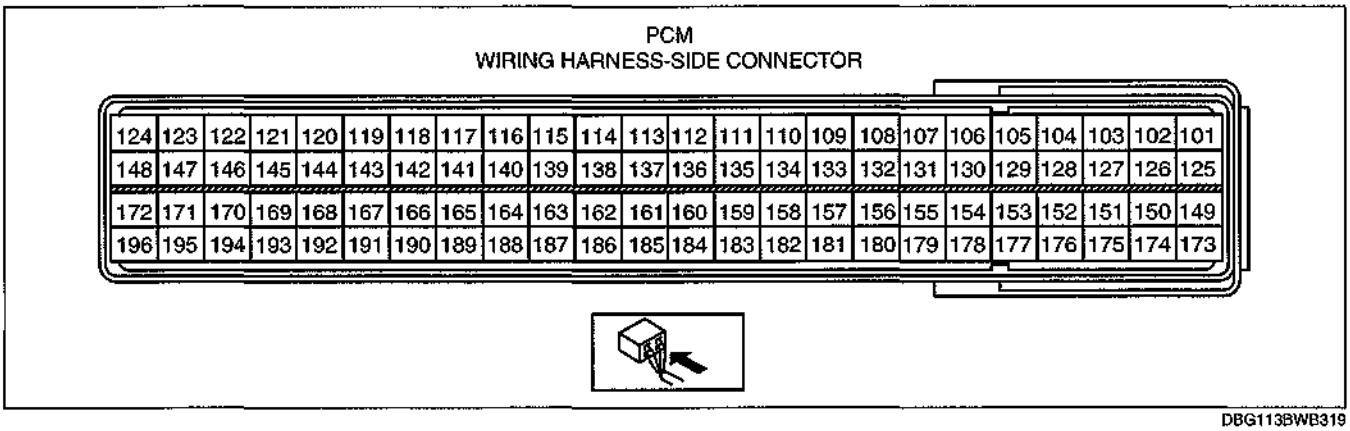
DBG140AWB333

Circuit Open/Short Inspection

1. Disconnect the PCM connector. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C])
2. Inspect for an open or short circuit in the following wiring harnesses.
   - If there is an open or short circuit, repair or replace wiring harness.



DBG140BWB307



DBG113BWB319

Open circuit

- Power circuit (ECT sensor connector terminal A and PCM connector terminal 156)
- Ground circuit (ECT sensor connector terminal B and PCM connector terminal 167)

Short circuit

- ECT sensor connector terminal A and PCM connector terminal 156 short to ground
- ECT sensor connector terminal A and PCM connector terminal 167 short to power

CAMSHAFT POSITION (CMP) SENSOR REMOVAL/INSTALLATION [WL-C, WE-C]

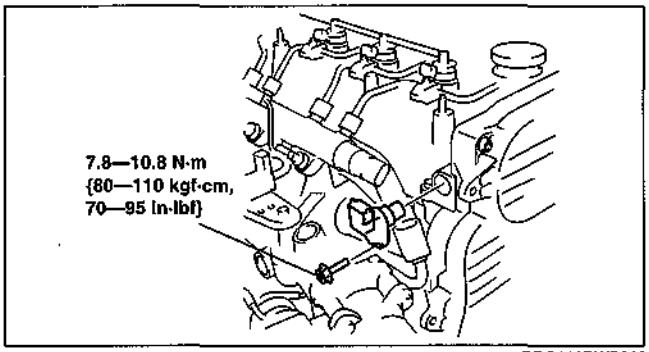
dcf014018230w01

Caution

- **When replacing the CKP sensor, make sure there is no foreign material on it such as metal shavings. If it is installed with foreign material, the sensor output signal will malfunction resulting from fluctuation in magnetic flux and cause a deterioration in engine control.**

1. Disconnect the negative battery cable.
2. Remove the CMP sensor.
3. Install in the reverse order of removal.

CMP sensor tightening torque
7.8—10.8 N·m {80—110 kgf·cm, 70—95 in·lbf}



DBG116BWB202

CAMSHAFT POSITION (CMP) SENSOR INSPECTION [WL-C, WE-C]

dcf014018230w02

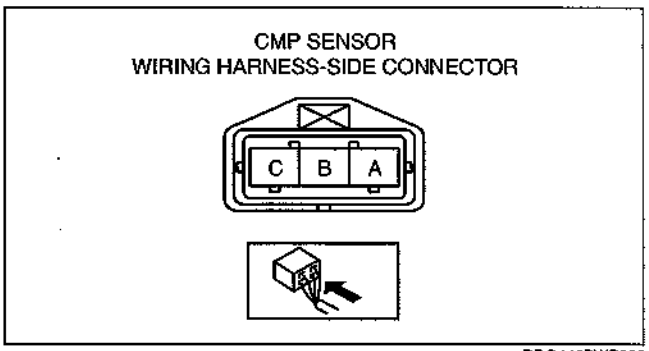
Note
- Before performing the following inspection, make sure to follow the procedure as indicated in the troubleshooting flowchart. (See 00-00-5 Troubleshooting Procedure.)

Visual Inspection
1. Remove the CMP sensor. (See 01-40B-36 CAMSHAFT POSITION (CMP) SENSOR REMOVAL/ INSTALLATION [WL-C, WE-C].)
2. Verify that there are no metal shavings on the sensor.
3. Install the CMP sensor. (See 01-40B-36 CAMSHAFT POSITION (CMP) SENSOR REMOVAL/INSTALLATION [WL-C, WE-C].)

Voltage Inspection
1. Idle the engine.

Caution
- **Water penetrating the connector will cause sensor malfunction. To prevent this, be careful not to damage the wiring harnesses or the waterproof connector so as to cause water penetration.**

2. Measure the output voltage using a oscilloscope.
   - If not within the specification, replace the CMP sensor. (See 01-40B-36 CAMSHAFT POSITION (CMP) SENSOR REMOVAL/ INSTALLATION [WL-C, WE-C].)
   - if there is an open or short circuit, repair or replace wiring harnesses.



DBG140BWB308

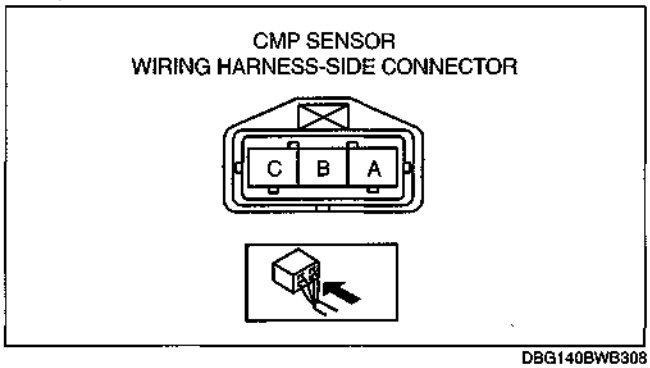
CMP sensor voltage

Terminal	Voltage (V)	Condition
A	approx. 0	Under any condition
B	approx. 5	High output*
	approx. 0	Low output*
C	approx. 5	Under any condition

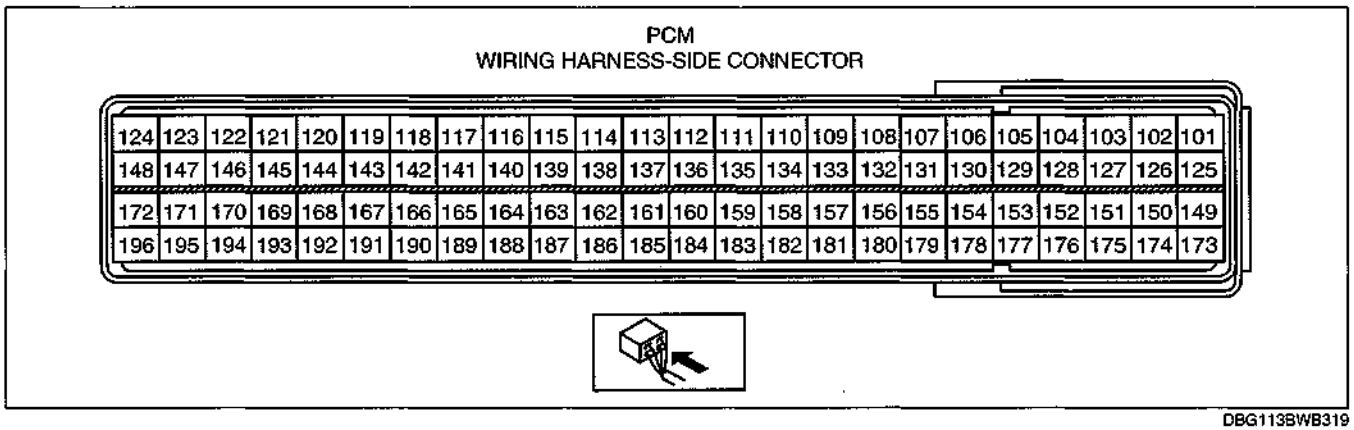
* : Output voltage varies with camshaft rotation.

Circuit Open/Short Inspection

1. Disconnect the PCM connector. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
2. Disconnect the CMP sensor connector.
3. Inspect the following wiring harness for open or short circuit (continuity check).
   - if there is an open or short circuit, repair or replace wiring harnesses.



DBG140BWB308



DBG113BWB319

Open circuit

- Power circuit (CMP sensor connector terminal C and PCM connector terminal 129)
- Signal circuit (CMP sensor connector terminal B and PCM connector terminal 160)
- Ground circuit (CMP sensor connector terminal A and PCM connector terminal 114)

Short circuit

- CMP sensor connector terminal A and PCM connector terminal 114 short to body ground
- CMP sensor connector terminal B and PCM connector terminal 160 short to power supply
- CMP sensor connector terminal B and PCM connector terminal 160 short to body ground
- CMP sensor connector terminal C and PCM connector terminal 129 short to power supply

CRANKSHAFT POSITION (CKP) SENSOR REMOVAL/INSTALLATION [WL-C, WE-C]

dcf014018220w03

Caution

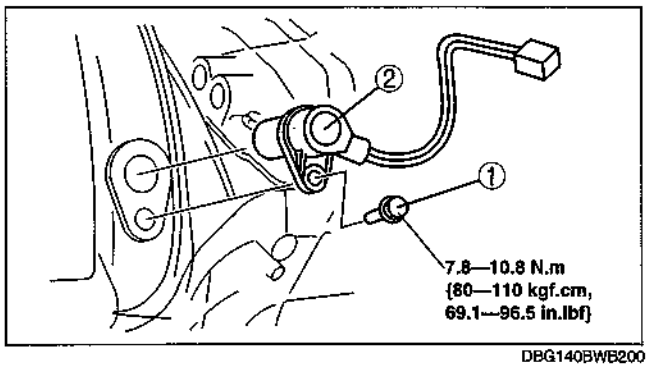
- **When foreign material, such as iron chips, gets on the CKP sensor, it can cause abnormal output from the sensor because of flux turbulence and adversely affect engine control. Be sure there is no foreign material on the CKP sensor when replacing.**
- **Do not forcefully pull the wiring harness of the CKP sensor. Doing so will break the wiring harness.**

1. Disconnect the negative battery cable.

2. Remove the under cover (AT).
3. Remove the insulator (AT).
4. Remove in the order indicated in the table.

1	CKP sensor installation bolt
2	CKP sensor (See 01-40B-1 CKP Sensor Installation Note.)

5. Install in the reverse order of removal.



DBG140BWB200

01

CKP Sensor Installation Note

1. Verify that there is no foreign material on the CKP sensor flange surface and the installation surface.
2. Verify that the O-ring is not damaged.
   - If there is a damage, replace the CKP sensor.
3. Apply a small amount of clean oil to the O-ring and the head cover.
4. Press in the CKP sensor until the CMP sensor flange surface firmly adheres to the installation surface.
5. Verify that the O-ring is installed correctly to the sensor installation hole.
6. Tighten the bolt.

CRANKSHAFT POSITION (CKP) SENSOR INSPECTION [WL-C, WE-C]

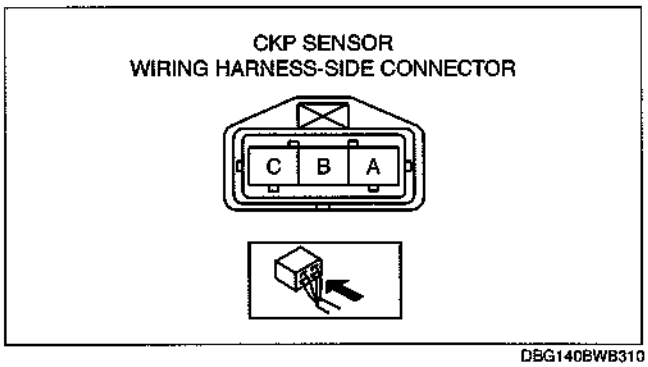
dcf014018220w04

Note

- Before performing the following inspection, make sure to follow the procedure as indicated in the troubleshooting flowchart.

Wave profile Inspection

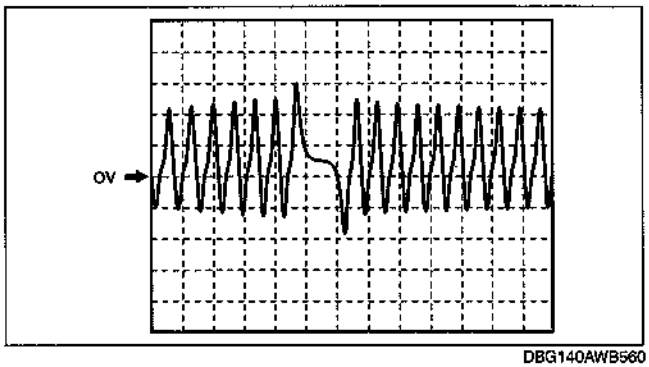
1. Measure the wave profile between CKP sensor connector terminal A—body ground, and CKP sensor connector terminal B—body ground.
   - If not within the specification, replace the CKP sensor.
   - If as specified, carry out the "Circuit Open/ Short Inspection".



DBG140BWB310

Wave profile (Reference)
Oscilloscope setting
- **5 V/DIV (Y), 2 ms/DIV (X), DC range**

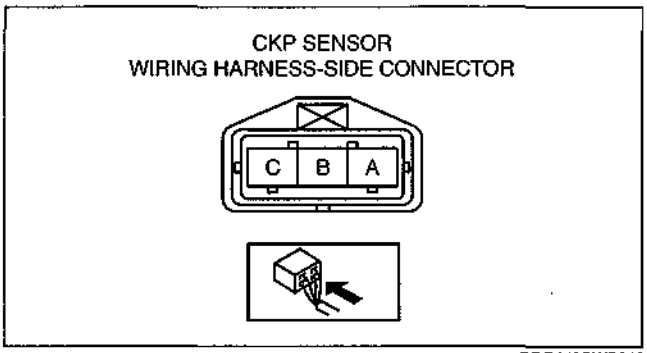
Vehicle condition
- **Idle after warm up**



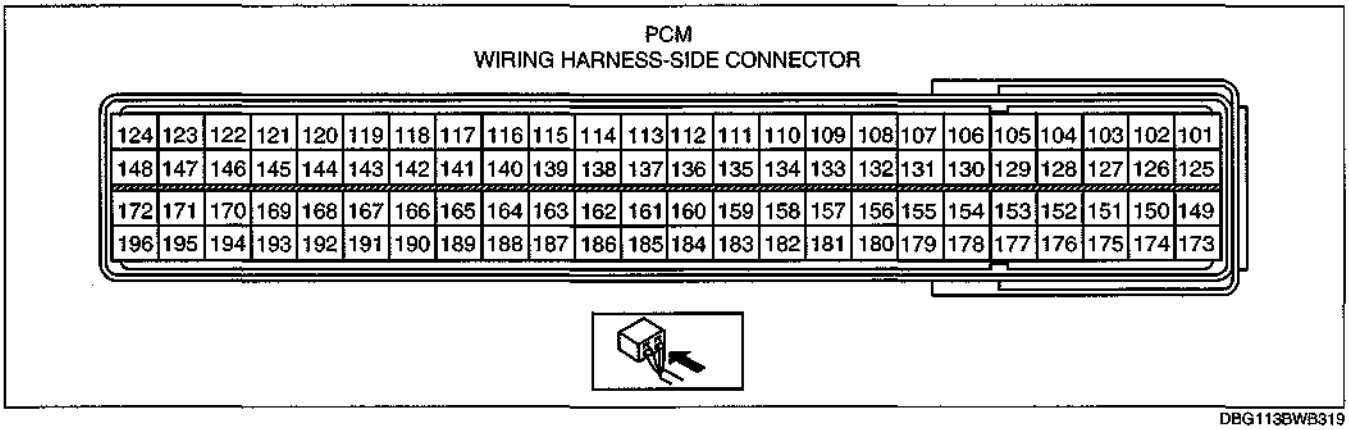
DBG140AWB560

Circuit Open/Short Inspection

1. Disconnect the PCM connector. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
2. Inspect the following wiring harnesses for an open or short circuit. (Continuity check)
   - if there is an open or short circuit, repair or replace wiring harnesses.



DBG140BWB310



DBG113BWB319

Open circuit

- Positive signal circuit (CKP sensor connector terminal A and PCM connector terminal 192)
- Negative signal circuit (CKP sensor connector terminal B and PCM connector terminal 193)

Short circuit

- CKP sensor connector terminal A and PCM connector terminal 192 short to power supply
- CKP sensor connector terminal A and PCM connector terminal 192 short to body ground
- CKP sensor connector terminal B and PCM connector terminal 193 short to power supply
- CKP sensor connector terminal B and PCM connector terminal 193 short to body ground

EGR VALVE POSITION SENSOR INSPECTION [WL-C, WE-C]

dcf014020300w02

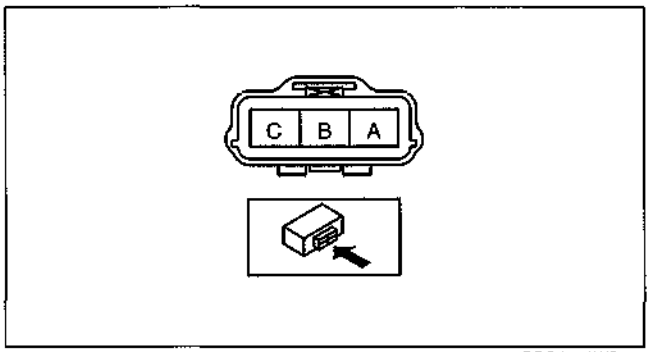
Note

- Perform the following inspection only when directed.

Resistance Inspection

1. Disconnect the EGR valve connector.
2. Measure the resistance between EGR valve connector terminals A and B.
   - If not within the specification, replace the EGR valve.
   - If as specified, carry out the "Circuit Open/Short Inspection".

Resistance
Approx. 5 kilohm



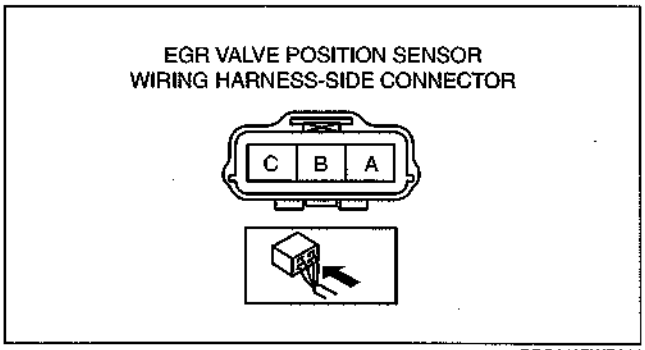
DBG140AWB557

Voltage Inspection

1. Disconnect the EGR valve connector.
2. Turn the engine switch to the ON position (Engine off).
3. Measure the voltage between EGR valve connector terminal C and body ground.
   - If not as specified, perform the "Circuit Open/short Inspection".
     — If there is no open/short circuit replace the EGR valve. (See 01-16B-4 EGR SYSTEM REMOVAL/INSTALLATION [WL-C, WE-C].)

   Specification (Reference)
   Approx. 0.6 V

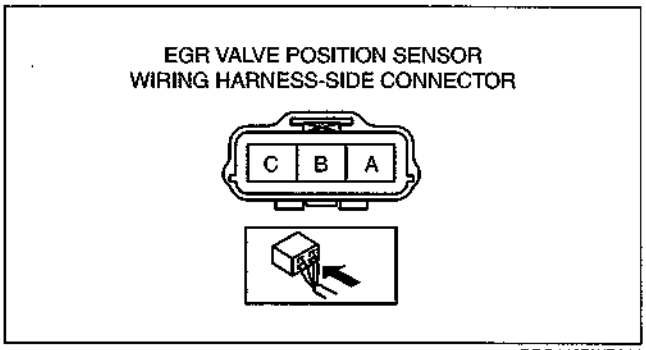
4. Start the engine and warm up the engine completely.



DBG140BWB311

5. Measure the voltage between EGR valve connector terminal C and body ground.
   - If not as specified, perform the "Circuit Open/Short inspection".
     — If there is no open/short circuit replace the EGR valve. (See 01-16B-4 EGR SYSTEM REMOVAL/INSTALLATION [WL-C, WE-C].)

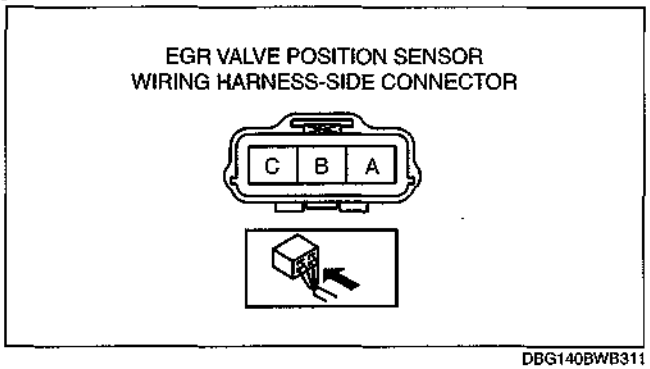
   Specification (Reference)
   Above 3.0 V



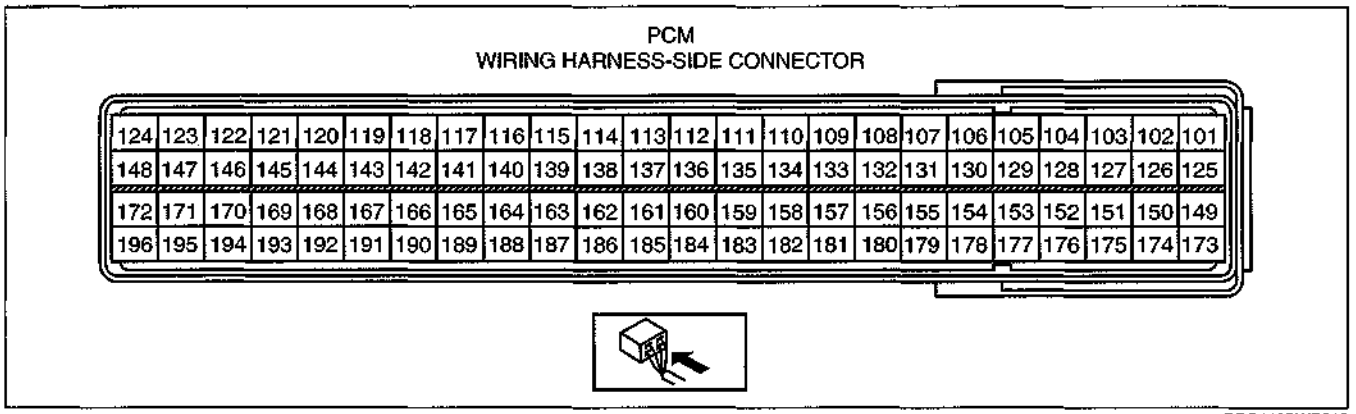
DBG140BWB311

Circuit Open/Short Inspection

1. Disconnect the EGR valve connector.
2. Disconnect the PCM connector. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C])
3. Inspect for an open or short circuit in the following wiring harnesses.
   - If there is an open or short circuit, repair or replace wiring harnesses.



DBG140BWB311



DBG113BWB319

Open circuit

- Power circuit (EGR valve position sensor connector terminal B and PCM connector terminal 106)
- Signal circuit (EGR valve position sensor connector terminal C and PCM connector terminal 116)
- Ground circuit (EGR valve position sensor connector terminal A and PCM connector terminal 110)

Short circuit

- EGR valve position sensor connector terminal B and PCM connector terminal 106 short to ground
- EGR valve position sensor connector terminal C and PCM connector terminal 116 short to ground

CLUTCH PEDAL POSITION (CPP) SWITCH INSPECTION [WL-C, WE-C]

dcf014018660w02

Note

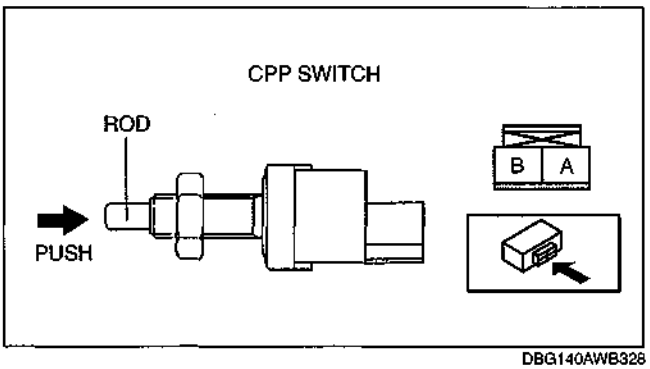
- Perform the following inspection only when directed.

Continuity Inspection

1. Disconnect the CPP switch connector.
2. Inspect for continuity between the CPP switch terminals A and B using an ohmmeter.
   - If not as specified, replace the CPP switch.
   - If as specified, carry out the "Circuit Open/ Short Inspection".

Specification

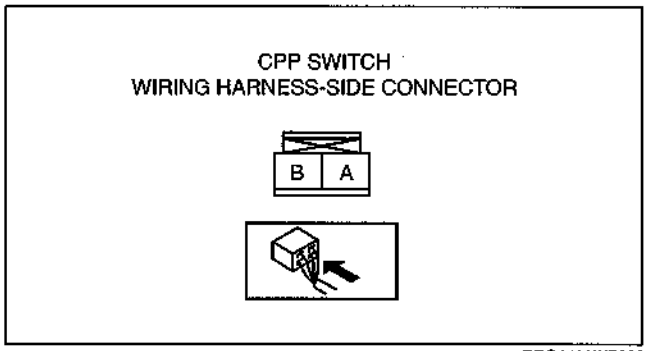
CPP switch	Clutch pedal	Continuity condition
Push the rod	Released	No continuity
Except above	Depressed	Continuity



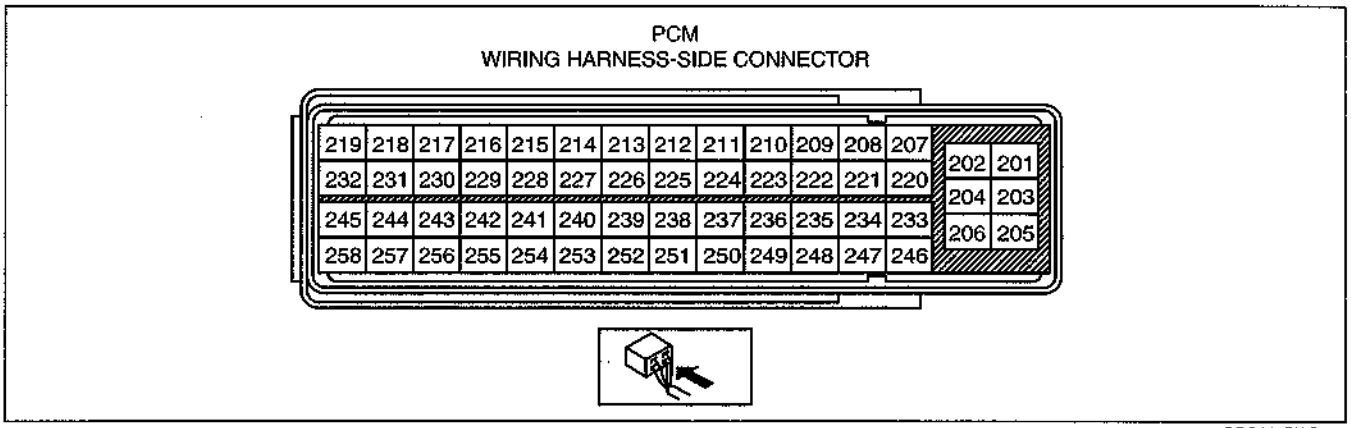
DBG140AWB328

Circuit Open/Short Inspection

1. Disconnect the PCM connector. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C])
2. Inspect for an open or short circuit in the following wiring harnesses.
   - If there is an open or short circuit, repair or replace wiring harnesses.



DBG140AWB329



DBG113BWB318

Open circuit

- Power circuit (CPP switch connector terminal A and PCM connector terminal 228)
- Ground circuit (CPP switch connector terminal B and ground.)

Short circuit

- CPP switch connector terminal A and PCM connector terminal 228 short to ground.

NEUTRAL SWITCH INSPECTION [WL-C, WE-C]

dcf014017640w02

Note

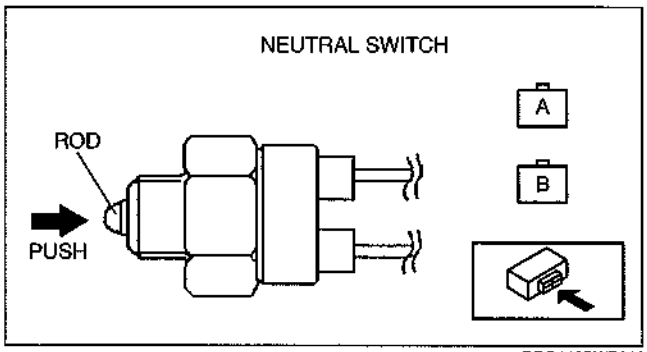
- Perform the following inspection only when directed.

Continuity Inspection

1. Disconnect the neutral switch connector.
2. Inspect for continuity between the neutral switch terminals using an ohmmeter.
   - If not as specified, replace the neutral switch.
   - If as specified, carry out the "Circuit Open/Short Inspection".

Specification

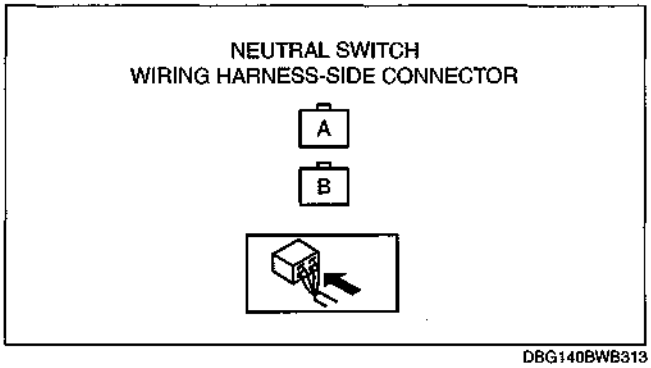
Neutral switch	Shift lever	Continuity condition
Push the rod	In neutral	Continuity
Except above	Others	No continuity



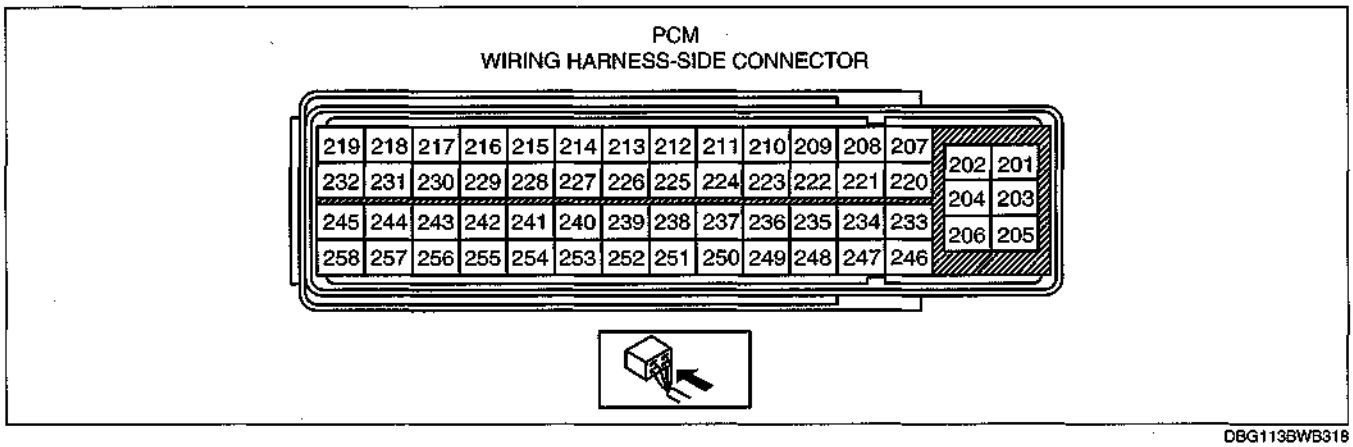
DBG140BWB312

Circuit Open/Short Inspection

1. Disconnect the PCM connector. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C])
2. Inspect for an open or short circuit in the following wiring harnesses.
   - If there is an open or short circuit, repair or replace wiring harnesses.



DBG140BWB313



DBG113BWB318

Open circuit

- Power circuit (neutral switch connector terminal A and PCM connector terminal 240)
- Ground circuit (neutral switch terminal B and ground)

Short circuit

- Neutral switch connector terminal A and PCM connector terminal 240 short to ground

01-50B TECHNICAL DATA [WL-C, WE-C]

ENGINE TECHNICAL DATA
[WL-C, WE-C] 01-50B–1

ENGINE TECHNICAL DATA[WL-C, WE-C]

id0150b6800100

Item	Specification
Valve clearance [Engine cold]	IN: 0.10—0.16 mm {0.0040—0.0062 in} EX: 0.17—0.23 mm {0.0067—0.0090 in}
Compression (kPa {kgf/cm^2, psi} [rpm])	Standard: 2,942 {30, 427} [200] Minimum: 2,648 {27, 384} [200]
Cylinder head bolt length	Bolt head mark W Standard length: 101.2—101.8 mm {3.985—4.007 in} Maximum length: 102.5 mm {4.035 in} Bolt head mark N Standard length: 113.2—113.8 mm {4.457—4.480 in} Maximum length: 114.5 mm {4.508 in} Bolt head mark I Standard length: 149—150 mm {5.867—5.905 in} Maximum length: 150.5 mm {5.925 in}
Pushing distance of the camshaft cap lower oil seal	0.0—0.4 mm {0.0—0.015 in}
Camshaft oil seal press-in amount	0.5—1.0 mm {0.02—0.03 in}
Pushing distance of the front oil seal	0.0—0.4 mm {0.0—0.015 in}
Pushing distance of the rear oil seal	0.0—0.5 mm {0.0—0.019 in}
Oil pressure [2,500 rpm]	410—570 kPa {4.19—5.81 kgf/cm^2, 59.6—82.6 psi}
Oil capacity (approx. quantity)	Oil replacement: 6.8 {7.2 US qt, 6.0 Imp qt} Oil and oil filter replacement: 7.0 {7.4 US qt, 6.2 Imp qt} Total (dry engine): 8.0 {8.5 US qt, 7.0 Imp qt}
Front oil seal press-in amount	0.0—0.40 mm {0.0—0.015 in}
Fuel injection pump oil seal press-in amount	0.0—0.40 mm {0.0—0.015 in}
Standard oil pump tip clearance	0.10—0.19 mm {0.0040—0.0074 in}
Maximum oil pump tip clearance	0.20 mm {0.0079 in}
Standard oil pump side clearance	0.04—0.09 mm {0.0016—0.0035 in}
Maximum oil pump side clearance	0.15 mm {0.0059 in}
Standard plunger spring length	43.8 mm {1.72 in}
Engine coolant capacity (approx. quantity)	Without heater: 8.8 L {9.3 US qt, 7.7 Imp qt} With heater: 9.4 L {9.9 US qt, 8.3 Imp qt}
Cooling system cap valve opening pressure	93.2—122.6 kPa {0.95—1.25 kgf/cm^2, 13.5—17.8 psi}
Initial-opening temperature and lift of the valve	80—84 °C {176—183 °F}
Full open temperature	95 °C {203 °F}
Full open life	8.5 mm {0.33 in} or more
Battery electrolyte specific gravity [20 °C {68 °F}]	1.22—1.29
Battery load test current	65D31R (56): 165 A 75D26R (52): 195 A 75D26L (55): 195 A 95D31R (64): 250 A
Battery back-up current	Vehicles with immobilizer system: 5—25 mA Vehicles without immobilizer system: 10 mA or less
Battery slow charge current	65D31R (56): 4.0—5.0 A 75D26R (52): 5.0—6.0 A 75D26L (55): 5.0—6.0 A 95D31R (64): 6.5—8.0 A
Battery quick charge current [30 min.]	65D31R (56): 30 A 75D26R (52): 35 A 75D26L (55): 35 A 95D31R (64): 40 A
Generator standard voltage [Engine switch ON]	Terminal B: B+ Terminal L: Approx. 1 V Terminal S: B+

Item	Specification
Generator standard voltage [Idle, 20 °C {68 °F}]	Terminal B: 14.1—14.7 V Terminal L: 13.0—14.0 V Terminal S: 14.1—14.7 V
Generator rotor resistance (between slip rings) [20 °C {68 °F}]	2.3—2.7 ohms
Generator brush length	Standard: 18.5 mm {0.73 in} Minimum: 5.0 mm {0.2 in}
Generator brush spring force	Standard: 4.8—6.0 N {0.49—0.61 kgf, 1.08—1.34 lbf} Minimum: 2.16 N {0.22 kgf, 0.49 lbf}
Starter no load test voltage	11 V
Starter no load test current	130 A or less
Starter pinion gap	0 mm {0 in}
Starter armature runout	0.1 mm {0.039 in} max.
Starter commutator diameter	Standard: 32 mm {1.26 in} Minimum: 31.4 mm {1.24 in}
Segment groove depth of starter commutator	Standard: 0.5 mm {0.020 in} Minimum: 0.2 mm {0.008 in}
Starter brush length	Standard: 17.5 mm {0.69 in} Minimum: 11 mm {0.43 in}
Starter brush spring force	Standard: 26.7—36.1 N {2.73—3.68 kgf, 6.01—8.11 lbf} Minimum: 14.7 N {1.5 kgf, 3.3 lbf}

Drive Belt Deflection

(mm {in})

Drive Belt		New*	Used	Limit
Generator		7.4—9.4 {0.30—0.37}	8.7—10.4 {0.35—0.40}	14.3 {0.56} or more
A/C	a	6.1—6.9 {0.24—0.27}	7.1—8.0 {0.28—0.31}	11.3 {0.44} or more
	b	10.0—11.0 {0.40—0.43}	11.3—12.6 {0.45—0.49}	17.4 {0.69} or more

* : A belt that has been on a running engine for less than five minutes.

Drive Belt Tension

(N {kgf, lbf})

Drive Belt	New*	Used	Limit
Generator	490—637 {50.0—64.9, 111—143}	431—539 {44.0—54.9, 96.9—121}	225 {22.9, 50.6} or less
A/C	455—572 {46.4—58.3, 103—128}	353—431 {36.0—43.9, 79.4—96.8}	156 {15.9, 35.1} or less

* : A belt that has been on a running engine for less than five minutes.

Recommended engine oil

Item	Specification	
	Europe	Except Europe
Grade	API CF-4 or ACEA B1/B3/B5	API CD/CE/CF–4 or ACEA B1/B3/B5
Viscosity (SAE)	5W–30	5W–30, 10W–30, 10W-40

Generator generated current (reference value) [Conditions] Ambient temperature: 20 °C {68 °F}, Voltage: 13.5 V, Engine hot

Engine speed (rpm)	Terminal B current (Lower limit of current must be more than 0 A.)
1,000	0—55 A
2,000	0—70 A

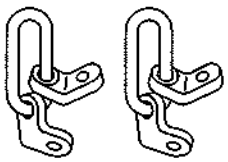
01-60B SERVICE TOOLS [WL-C, WE-C]

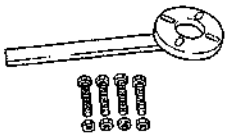
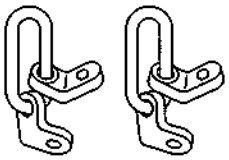
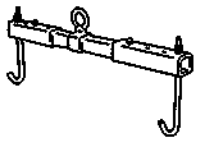
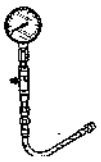
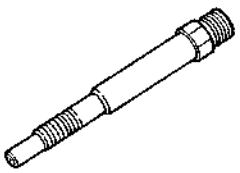
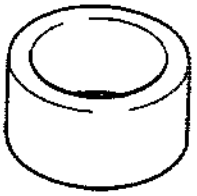
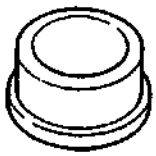
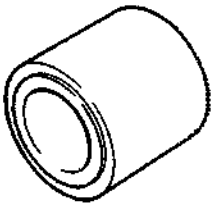
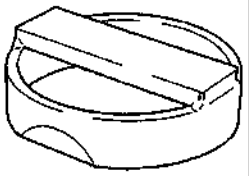
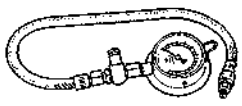
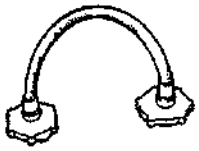
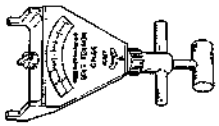
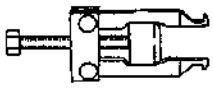
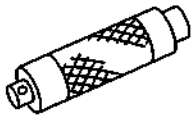
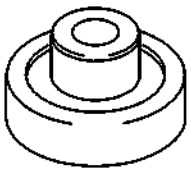
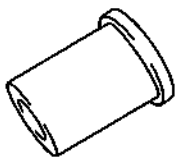
ENGINE SST[WL-C, WE-C] 01-60B–1

ENGINE SST[WL-C, WE-C]

id0160b6800100

1: Mazda **SST** number
2: Global **SST** number
Example

1:49 UN30 3050 2:303-050 Engine lifting brackets	

1:49 S011 102A 2:– Crankshaft lock tool	1:49 UN30 3050 2:303-050 Engine lifting brackets	1:49 L017 5A0 2:– Support hanger
		
1:49 S010 1A0 2:– Compression gauge set (Part of 49 S013 1A1A)	1:49 S013 102 2:– Adapter (Part of 49 S013 1A1A)	1:49 S010 301 2:– Oil seal installer
		
1:49 F027 009 2:– Oil seal installer	1:49 S010 001 2:– Oil seal installer	1:49 S011 103 2:– Oil seal installer
		
1:49 0187 280A 2:– Oil pressure gauge	1:49 9200 146 2:– Adapter A (Part of 49 9200 145)	1:49 9200 147 2:– Adapter B (Part of 49 9200 145)
		
1:49 9200 020A 2:– Belt tension gauge	1:49 S019 005 2:– Oil seal puller	1:49 G030 797 2:– Handle (Part of 49 B025 0A0)
		
1:49 H033 101 2:– Bearing remover	1:49 G028 208 2:– Installer (Part of 49 G028 2A1)	—
		

SUSPENSION

02
SECTION

GENERAL PROCEDURES . . . 02-10
WHEEL ALIGNMENT 02-11
WHEEL AND TIRES 02-12
FRONT SUSPENSION. 02-13
REAR SUSPENSION 02-14
TECHNICAL DATA 02-50
SERVICE TOOLS 02-60

02-10 GENERAL PROCEDURES

GENERAL PROCEDURES
(SUSPENSION) 02-10–1

GENERAL PROCEDURES (SUSPENSION)

dcf021000000w01

Wheel And Tire Installation

1. When installing the wheels and tires, tighten the wheel nuts in a criss-cross pattern to the following tightening torque.

   Tightening torque
   88.2—117.6 N·m {9.00—11.99 kgf·m, 65.06—86.73 ft·lbf}

Suspension Links Removal/Installation

1. For the joint sections with rubber bushings, raise the vehicle using a lift, and then temporarily tighten the installation bolts and nuts. Lower the vehicle to the ground and tighten them completely with the specified torque.

Connector Disconnection

1. Disconnect the negative battery cable before performing any work that requires handling of connectors.

02-11 WHEEL ALIGNMENT

VEHICLE HEIGHT
ADJUSTMENT [4x2] 02-11–1
VEHICLE HEIGHT
ADJUSTMENT [4x4] 02-11–2
WHEEL ALIGNMENT
PRE-INSPECTION 02-11–2
FRONT WHEEL ALIGNMENT [4x2] 02-11–3
FRONT WHEEL ALIGNMENT [4x4] 02-11–5

VEHICLE HEIGHT ADJUSTMENT [4x2]

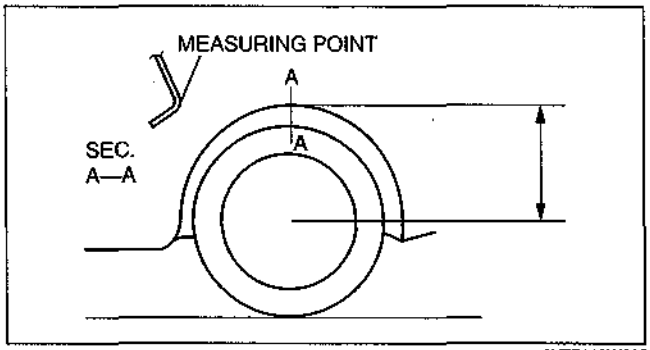
dcf021100000w01

Caution
- **If the vehicle height on a winch or towbar (bullbar or similar accessory) equipped vehicle is adjusted, it is possible that the vehicle height will drop below specification again or the tires will be subject to uneven wear. Without adjusting the vehicle height, adjust only the difference between the left and right sides and perform a wheel alignment to specification.**

1. Place the vehicle on level ground.
2. Inspect the front and rear tire pressure and adjust it as necessary.
3. Measure the distance from the center of each front wheel to the fender brim.

Standard vehicle height
Except Hi-Rider: 416—456 mm {16.4—17.9 in}
Hi-Rider: 512—552 mm {20.2—21.7 in}

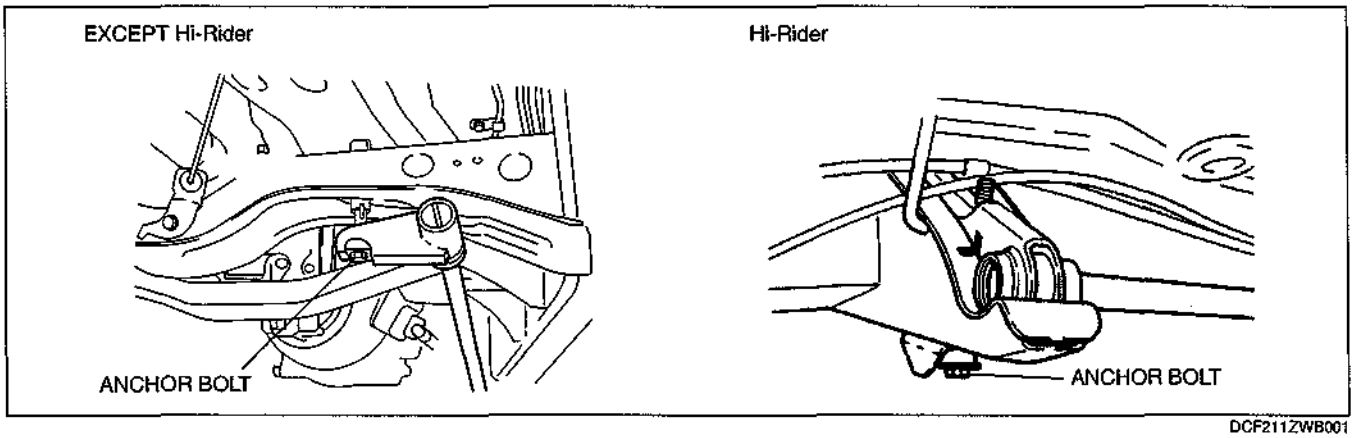
Left/right difference
10 mm {0.39 in} max.



AVF7412W005

Caution
- **Adjust the vehicle height at the left and right wheels at the same time. Otherwise, the vehicle height may not be adjusted correctly.**

4. If the difference between left and right is not within the specification, adjust the vehicle height by turning the torsion bar spring anchor bolt.



DCF211ZWB001

5. Move the vehicle forward and back to seat each part.
6. Verify that the vehicle height is within the standard.
   - If not, readjust the vehicle height.

VEHICLE HEIGHT ADJUSTMENT [4x4]

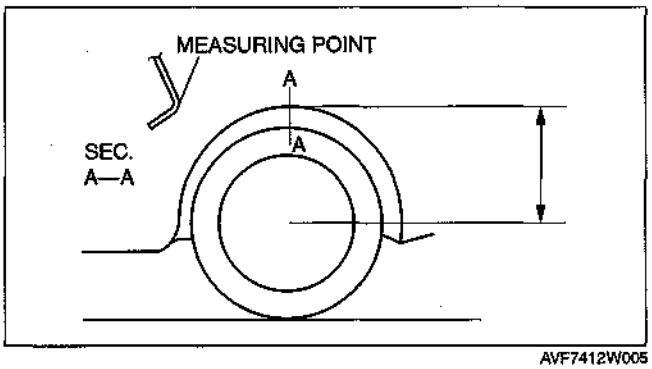
dcf021100000w02

Caution
- **If the vehicle height on a winch or towbar (bullbar or similar accessory) equipped vehicle is adjusted, it is possible that the vehicle height will drop below specification again or the tires will be subject to uneven wear. Without adjusting the vehicle height, adjust only the difference between the left and right sides and perform a wheel alignment to specification.**

1. Place the vehicle on level ground.
2. Inspect the front and rear tire pressure and adjust it as necessary.
3. Measure the distance from the center of each front wheel to the fender brim.

Standard vehicle height
Regular cab and Stretch cab (with Rear Access System): 512—552 mm {20.2—21.7 in}
Double cab: 502—542 mm {19.8—21.3 in}

Left/right difference
10 mm {0.39 in} max.



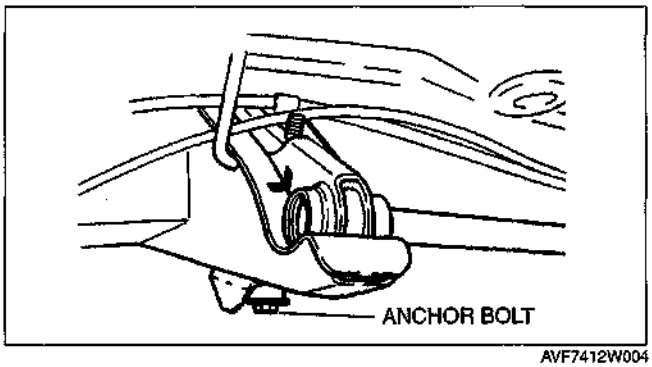
AVF7412W005

Caution
- **Adjust the vehicle height at the left and right wheels at the same time. Otherwise, the vehicle height may not be adjusted correctly.**

4. If the difference between left and right is not within the specification, adjust the vehicle height by turning the torsion bar spring anchor bolt.

Note
- The vehicle height increases/decreases **3.3 mm {0.13 in}** per anchor bolt rotation.

5. Move the vehicle forward and back to seat each part.
6. Verify that the vehicle height is within the standard.
   - If not, readjust the vehicle height.



AVF7412W004

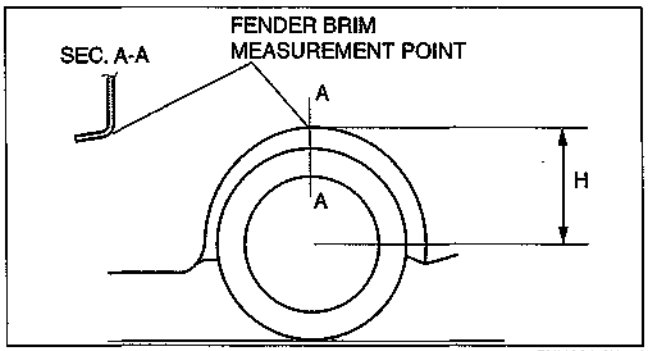
WHEEL ALIGNMENT PRE-INSPECTION

dcf021100000w03

1. Inspect the tire pressure.
   - Adjust to the recommended pressure if necessary. (See 02-50-1 SUSPENSION TECHNICAL DATA.)
2. Inspect the wheel bearing play.
   - Correct if necessary. (See 03-11-3 WHEEL HUB, STEERING KNUCKLE INSPECTION [4x2 (EXCEPT Hi-Rider)].) (See 03-11-4 WHEEL HUB, STEERING KNUCKLE INSPECTION [Hi-Rider, 4x4].) (See 03-12-1 REAR AXLE INSPECTION.)
3. Inspect the wheel runout.
   - Correct if necessary. (See 02-50-1 SUSPENSION TECHNICAL DATA.)
4. Inspect the ball joints and steering linkage for excessive looseness.
5. Park the vehicle on a level ground, in an unloaded condition*, and with the wheels straight forward.
   Unloaded vehicle.....Fuel tank is full. Engine coolant and engine oil are at specified level. Jack and tools are in designated position.

6. Measure height H from the center of the wheel to the fender brim.
7. Verify that the difference between the left and right dimension H is within the specification.
   - If it exceeds the specification, repeat the Step 2—6.

Standard
10 mm {0.39 in} or less



CHU0211W001

FRONT WHEEL ALIGNMENT [4x2]

dcf021100000w04

Front wheel alignment [4x2] (Unloaded)

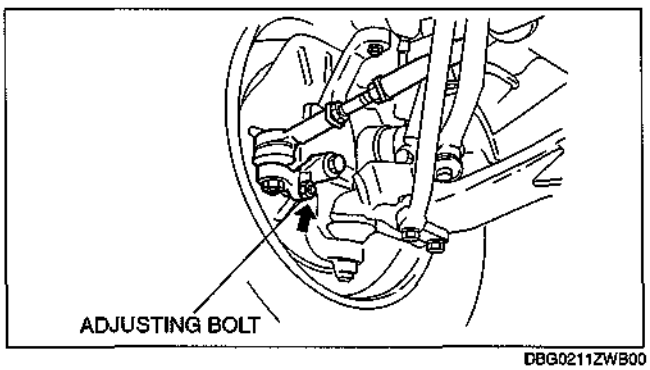
Item			Specifications			
			Regular cab	Double cab	Hi-Rider (Stretch cab (with Rear Access System)	Hi-Rider (Double cab)
Total toe-in	Tire [Tolerance ±3 {0.12}]	(mm {in})	5 {0.19}			
Maximum steering angle		Inner	33°00′—37°00′		31°30′—35°30′	
		Outer	30°00′—35°00′		27°00′—32°00′	
Camber angle [Tolerance ±1°]			0°35′		0°44′	0°45′
Caster angle [Tolerance ±1°]			1°56′	1°54′	2°07′	2°06′
Steering axis inclination (reference value)			8°25′		10°37′	10°35′

Note
- Unloaded vehicle: Fuel tank is full. Engine coolant and engine oil are at specified level. Jack and tools are in designated position.
- Difference between the left and right dimension for camber is within **30′**.
- Difference between the left and right dimension for caster is within **45′**.

Maximum Steering Angle Adjustment

1. Loosen the adjusting bolt locknut.
2. Turn the adjusting bolt to provide the correct turning angle.

Standard steering angle
Except Hi-Rider
Inner: 33°00′—37°00′
Outer: 30°00′—35°00′
Hi-Rider
Inner: 31°30′—35°30′
Outer: 27°00′—32°00′



DBG0211ZWB00

3. After adjustment, tighten the locknut to the specified torque.

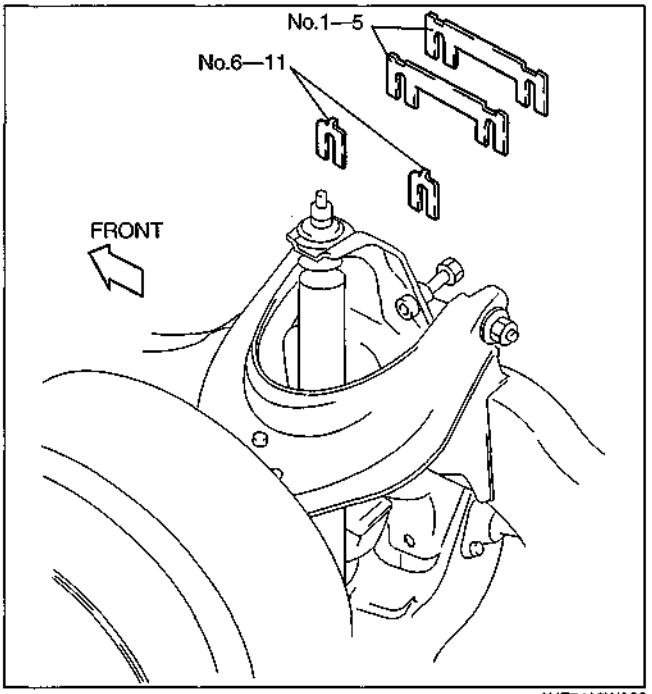
Tightening torque
39—59 N?m {4.0—6.0 kgf?m, 29—43 ft?lbf}

4. After adjusting the steering angle, always inspect and adjust the toe angle. (See 02-11-4 Total Toe-In Adjustment.)

Caster And Camber Adjustment

1. Loosen the upper arm shaft bolt and insert or remove adjustment shims to provide the correct angle.

No.	Thickness (mm {in})
1	1.0 {0.039}
2	1.6 {0.063}
3	2.0 {0.079}
4	3.2 {0.126}
5	4.0 {0.157}
6	0.6 {0.024}
7	1.0 {0.039}
8	1.6 {0.063}
9	2.0 {0.079}
10	3.2 {0.126}
11	4.0 {0.157}



AVF7412W003

Note

- Shims No.1—5 are used on either side. Do not use more than two.
- Shims No.6—11 are used at the front and rear of either sides. Do not use more than one.
- Camber (Shims No.1—5): A change of shim thickness of **1 mm {0.039 in}** results as follows:

Shim thickness	Variation/1 mm {0.039 in}
Add	Negative 15′
Reduce	Positive 15′

- Caster (Shims No.6—11): A change of shim thickness (at front or rear only) of **1 mm {0.039 in}** results as follows:

	Shim thickness	Variation/1 mm {0.039 in}
Front side	Add	Increase 30′
	Reduce	Decrease 30′
Rear side	Add	Decrease 30′
	Reduce	Increase 30′

2. After adjustment, tighten the upper arm shaft bolt to the specified torque.

Tightening torque
150—172 N·m {15.3—17.5 kgf·m, 111—126 ft·lbf}

Total Toe-in Adjustment

1. Loosen the locknut of the tie-rod end.
2. Turn the tie rods by the same amount in the opposite direction.

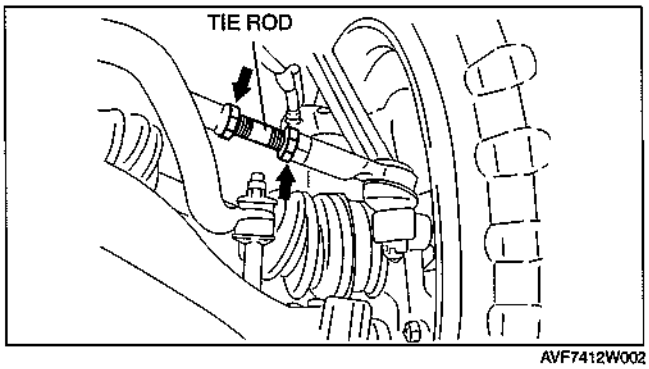
Total Toe-in Standard
2—8 mm {0.08—0.31 in}

Note

- One turn of the tie rod (both sides) changes the toe-in by about **approx. 30 mm {1.18 in}**.
- The left and right tie rods are both right threaded. To increase the toe-in, turn the right tie rod toward the front of the vehicle and the left tie rod equally toward the rear.

3. Tighten the tie-rod end locknuts.

Tightening torque
68.6—78.5 N?m {7.00—8.00 kgf?m, 50.6—57.8 ft?lbf}



AVF7412W002

FRONT WHEEL ALIGNMENT [4x4]

dcf021100000w05

Front wheel allgnment [4x4] (Unloaded)

Item			Specifications	
			Regular cab and Stretch cab (with Rear Access System)	Double cab
Total toe-in	Tire [Tolerance ±3 {0.12}]	(mm {in})	6 {0.23}	
Maximum steering angle		Inner	31°30′—35°30′	
		Outer	27°00′—32°00′	
Camber angle (reference value) [Tolerance ±1°]			0°44′	0°45′
Caster angle (reference value) [Tolerance ±1°]			2°07′	2°06′
Steering axis inclination (reference value)			10°37′	10°35′

Note
- Unloaded vehicle: Fuel tank is full. Engine coolant and engine oil are at specified level. Jack and tools are in designated position.
- Difference between the left and right dimension for camber is within **30′**.
- Difference between the left and right dimension for caster is within **45′**.

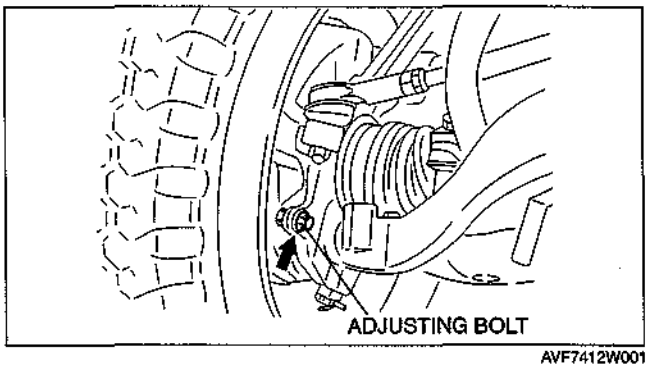
Maximum Steering Angle Adjustment
1. Remove the cap.
2. Loosen the adjusting bolt locknut.
3. Turn the adjusting bolt to provide the correct turning angle.

Standard steering angle
Inner: 31°30′—35°30′
Outer: 27°00′—32°00′

4. After adjustment, tighten the locknut to the specified torque.

Tightening torque
39—59 N?m {4.0—6.0 kgf?m, 29—43 ft?lbf}

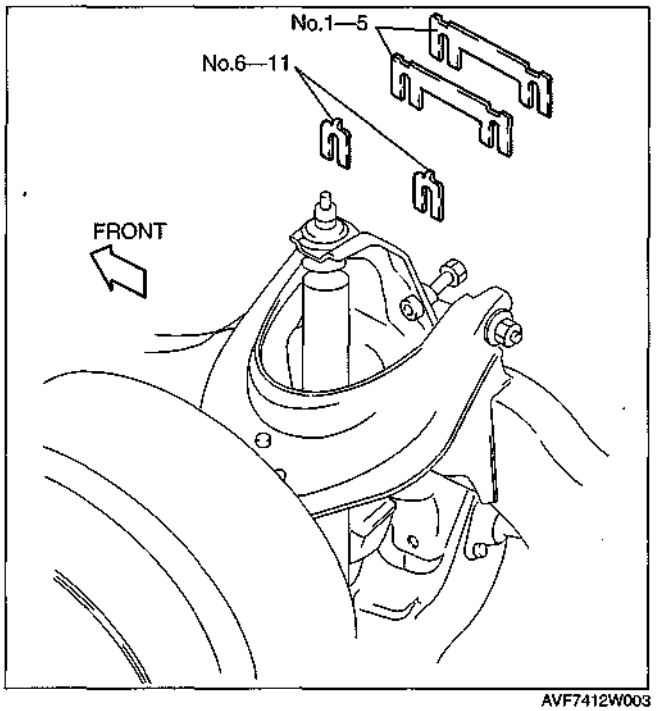
5. Install the cap.



AVF7412W001

Caster and Camber Adjustment

1. Loosen the upper arm shaft bolt and insert or remove adjustment shims to provide the correct angle.



AVF7412W003

Adjusting shim

No.	Thickness (mm {in})
1	1.0 {0.039}
2	1.6 {0.063}
3	2.0 {0.079}
4	3.2 {0.126}
5	4.0 {0.157}
6	0.6 {0.024}
7	1.0 {0.039}
8	1.6 {0.063}
9	2.0 {0.079}
10	3.2 {0.126}
11	4.0 {0.157}

Note

- Shims No.1—5 are used on either side. Do not use more than two.
- Shims No.6—11 are used at the front and rear of either sides. Do not use more than one.
- Camber (Shims No.1—5): A change of shim thickness of **1 mm {0.039 in}** results as follows:

Shim thickness	Variation/1 mm {0.039 in}
Add	Negative 15′
Reduce	Positive 15′

- Caster (Shims No.6—11): A change of shim thickness (at front or rear only) of **1 mm {0.039 in}** results as follows:

	Shim thickness	Variation/1 mm {0.039 in}
Front side	Add	Increase 30′
	Reduce	Decrease 30′
Rear side	Add	Decrease 30′
	Reduce	Increase 30′

2. After adjustment, tighten the upper arm shaft bolt to the specified torque.

Tightening torque
150—172 N·m {15.3—17.5 kgf·m, 111—126 ft·lbf}

3. Confirm the front wheel alignment as in the specification.
   - If not within the specification, adjust the front wheel alignment again.

Total Toe-in Adjustment

1. Loosen the tie-rod end locknuts.
2. Turn the tie rods by the same amount in the opposite direction.

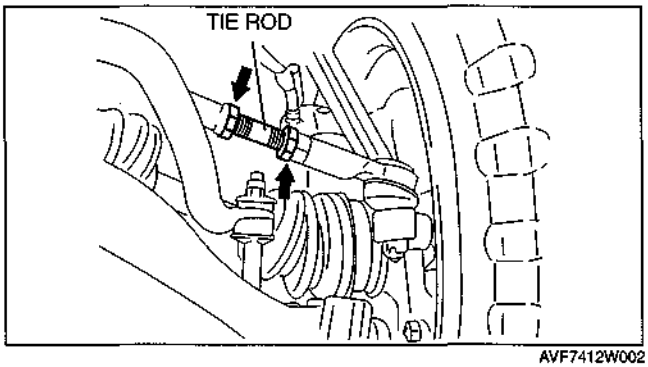
Total Toe-In Standard
3—9 mm {0.12—0.35 in}

Note

- One turn of the tie rod (both sides) changes the toe-in by about **30 mm {1.18 in}**.
- The left and right tie rods are both right threaded, to increase the toe-in, turn the right tie rod toward the front of the vehicle and the left tie rod equally toward the rear.

3. Tighten the tie-rod end locknuts.

Tightening torque
68.6—78.5 N·m {7.00—8.00 kgf·m, 50.6—57.8 ft·lbf}



AVF7412W002

02-12 WHEEL AND TIRES

WHEEL AND TIRE SPECIFICATION 02-12–1

WHEEL AND TIRE SPECIFICATION 02-12–1

WHEEL AND TIRE SPECIFICATION

id0212008001b1

Wheel and tires

Item				Specification			
Wheel	Size			15 × 6 1/2J		15 × 6 1/2J	16 × 7J
	Offset (mm {in})			20 {0.79}		25 {0.98}	10 {0.39}
	Pitch circle diameter (mm {in})			139.7 {5.500}			
	Material			Steel	Aluminum alloy	Steel	Aluminum alloy
Tire	Size			215/70R15C 106/104S		235/75R15 109S	245/70R16 111S
	Air pressure (kPa {(kgf/cm^2), <psi>})	Front	Up to full persons	220 {(2.2), <32>}		210 {(2.1), <30>}	210 {(2.1), <30>}
			Full load				
		Rear	Up to full persons	210 {(2.1), <30>}		210 {(2.1), <30>}	210 {(2.1), <30>}
			Full load	375 {(3.8), <54>}		290 {(2.9), <42>}	270 {(2.7), <39>}
	Remaining tread (mm {in})			1.6 {0.06}			
Wheel and tire	Lug nut tightening torque (N·m {kgf·m, ft·lbf})			88.2—117.6 {9.00—11.99, 65.06—86.73}			
	Wheel and tire runout (mm {in})		Radial direction	1.5 {0.06} max.			
			Lateral direction	2.0 {0.08} max.			
	Wheel imbalance*2 (g {oz})			10 {0.35} max.			

*1 : Total weight exceeds **120 g {4.24 oz}**.
*2 : One balance weight: **60 g {2.12 oz}** max. If the total weight exceeds **120 g {4.24 oz}** on one side, rebalance after moving the tire around on the rim. Do not use three or more balance weights.

WHEEL AND TIRE SPECIFICATION

id0212008001b2

Wheel and tires

Item				Specification			
Wheel	Size			15 × 6 1/2J		15 × 6 1/2J	16 × 7J
	Offset (mm {in})			20 {0.79}		25 {0.98}	10 {0.39}
	Pitch circle diameter (mm {in})			139.7 {5.500}			
	Material			Steel	Aluminum alloy	Steel	Aluminum alloy
Tire	Size			215/70R15C 106/104S		235/75R15 109S	245/70R16 111S
	Air pressure (kPa {(kgf/cm^2), <psi>})	Front	No loaded	220 {(2.2), <32>}		210 {(2.1), <30>}	210 {(2.1), <30>}
			Loaded				
		Rear	No loaded	210 {(2.1), <30>}		210 {(2.1), <30>}	210 {(2.1), <30>}
			Loaded	375 {(3.8), <54>}		290 {(2.9), <42>}	270 {(2.7), <39>}
	Remaining tread (mm {in})			1.6 {0.06}			
Wheel and tire	Lug nut tightening torque (N·m {kgf·m, ft·lbf})			88.2—117.6 {9.00—11.99, 65.06—86.73}			
	Wheel and tire runout (mm {in})		Radial direction	1.5 {0.06} max.			
			Lateral direction	2.0 {0.08} max.			
	Wheel imbalance*2 (g {oz})			10 {0.35} max.			

*1 : Total weight exceeds **120 g {4.24 oz}**.
*2 : One balance weight: **60 g {2.12 oz}** max. If the total weight exceeds **120 g {4.24 oz}** on one side, rebalance after moving the tire around on the rim. Do not use three or more balance weights.

02-13 FRONT SUSPENSION

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FRONT SUSPENSION LOCATION INDEX [Hi-Rider]..... 02-13–2
FRONT SUSPENSION LOCATION INDEX [4x4]..... 02-13–3
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FRONT SHOCK ABSORBER INSPECTION..... 02-13–4
FRONT SHOCK ABSORBER DISPOSAL..... 02-13–5
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FRONT SUSPENSION LOCATION INDEX [4x2 (EXCEPT Hi-Rider)]

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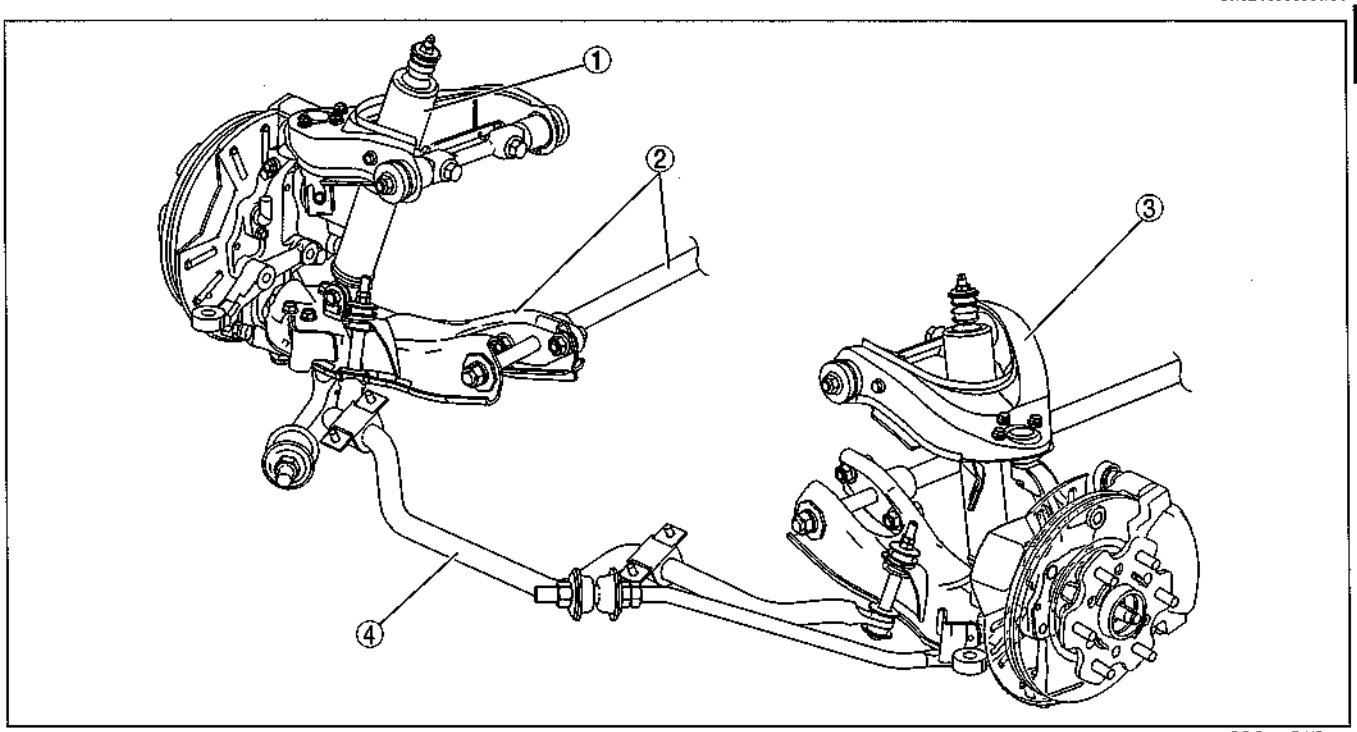

DBG213ZWB028

1	Front shock absorber (See 02-13-4 FRONT SHOCK ABSORBER REMOVAL/INSTALLATION.) (See 02-13-4 FRONT SHOCK ABSORBER INSPECTION.) (See 02-13-5 FRONT SHOCK ABSORBER DISPOSAL.)
2	Torsion bar spring, lower arm (See 02-13-5 TORSION BAR SPRING AND LOWER ARM REMOVAL/INSTALLATION [4x2 (EXCEPT Hi-Rider)].) (See 02-13-13 FRONT LOWER ARM INSPECTION.)

3	Front upper arm (See 02-13-14 FRONT UPPER ARM REMOVAL/INSTALLATION.) (See 02-13-16 FRONT UPPER ARM INSPECTION.)
4	Front stabilizer (See 02-13-16 FRONT STABILIZER AND TENSION ROD REMOVAL/INSTALLATION [4x2 (EXCEPT Hi-Rider)].)

FRONT SUSPENSION LOCATION INDEX [Hi-Rider]

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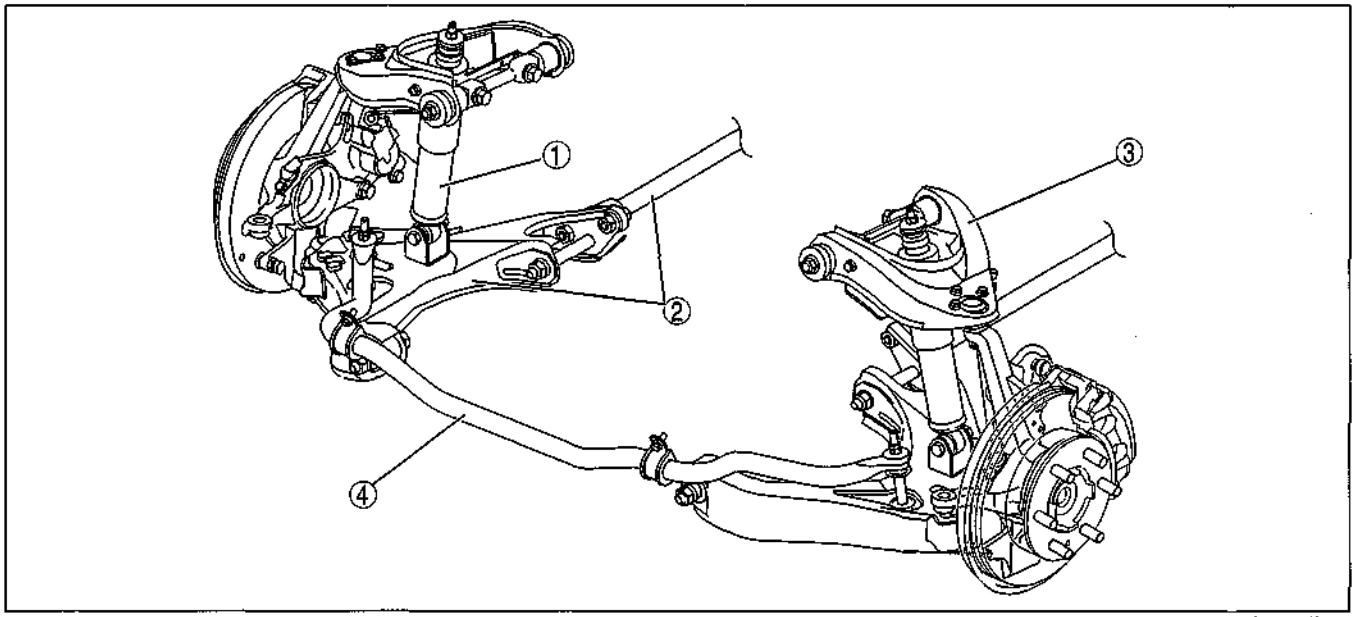

DBG213ZWB029

1	Front shock absorber (See 02-13-4 FRONT SHOCK ABSORBER REMOVAL/INSTALLATION.) (See 02-13-4 FRONT SHOCK ABSORBER INSPECTION.) (See 02-13-5 FRONT SHOCK ABSORBER DISPOSAL.)
2	Torsion bar spring, lower arm (See 02-13-9 TORSION BAR SPRING AND LOWER ARM REMOVAL/INSTALLATION [Hi-Rider, 4x4].) (See 02-13-13 FRONT LOWER ARM INSPECTION.)
3	Front upper arm (See 02-13-14 FRONT UPPER ARM REMOVAL/INSTALLATION.) (See 02-13-16 FRONT UPPER ARM INSPECTION.)
4	Front stabilizer (See 02-13-17 FRONT STABILIZER REMOVAL/INSTALLATION [Hi-Rider, 4x4].)

FRONT SUSPENSION LOCATION INDEX [4x4]

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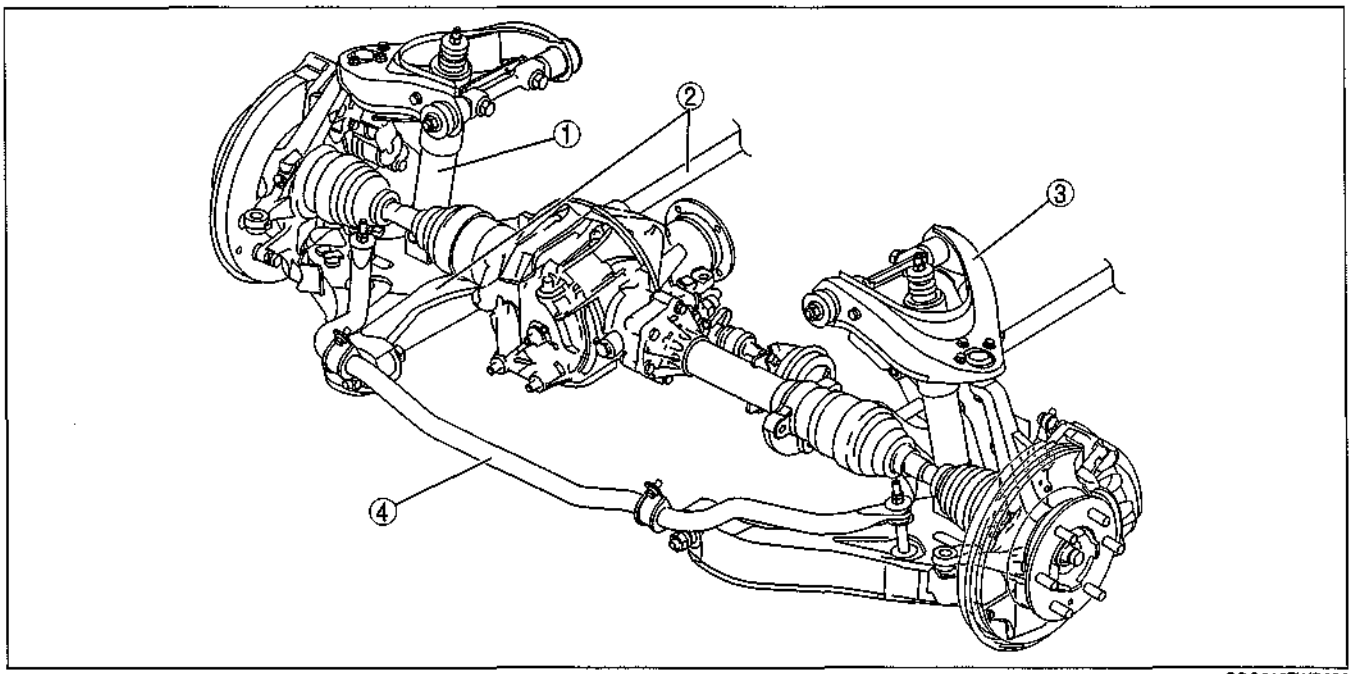


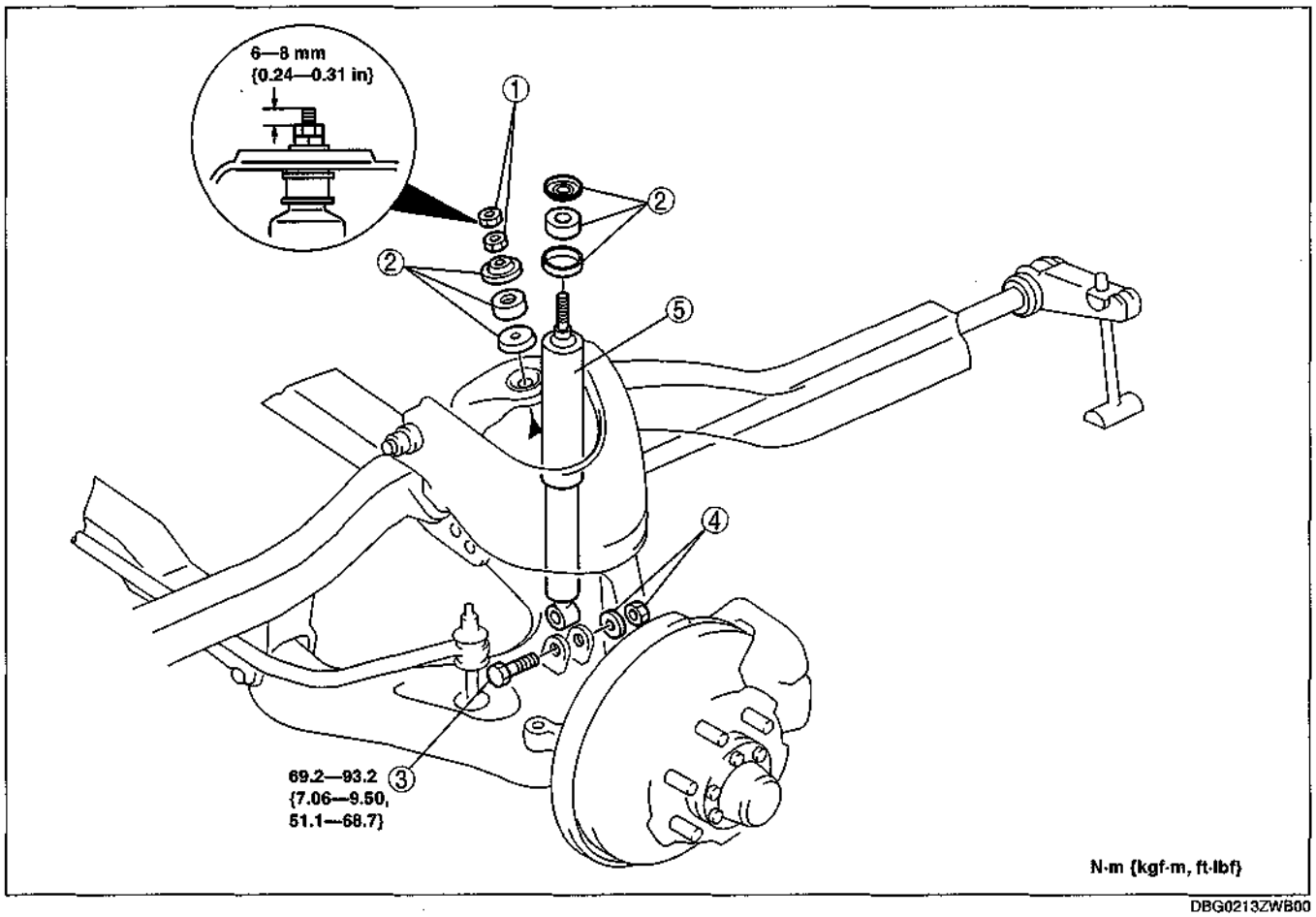
DBG213ZWB030

1	Front shock absorber (See 02-13-4 FRONT SHOCK ABSORBER REMOVAL/INSTALLATION.) (See 02-13-4 FRONT SHOCK ABSORBER INSPECTION.) (See 02-13-5 FRONT SHOCK ABSORBER DISPOSAL.)
2	Torsion bar spring, lower arm (See 02-13-9 TORSION BAR SPRING AND LOWER ARM REMOVAL/INSTALLATION [Hi-Rider, 4x4].) (See 02-13-13 FRONT LOWER ARM INSPECTION.)
3	Front upper arm (See 02-13-14 FRONT UPPER ARM REMOVAL/INSTALLATION.) (See 02-13-16 FRONT UPPER ARM INSPECTION.)
4	Front stabilizer (See 02-13-17 FRONT STABILIZER REMOVAL/INSTALLATION [Hi-Rider, 4x4].)

FRONT SHOCK ABSORBER REMOVAL/INSTALLATION

dcf021334700w01

1. Remove in the order indicated in the table.
2. Install in the reverse order of removal.

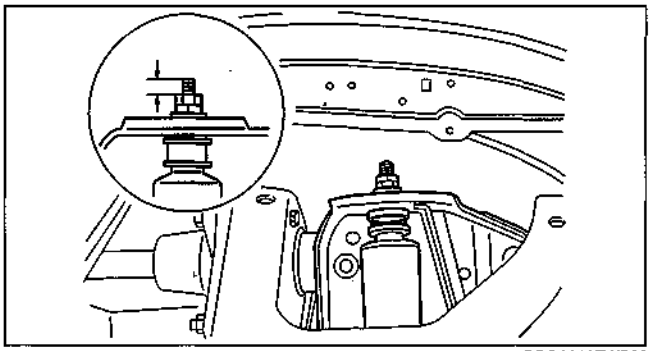


DBG0213ZWB00

1	Nut (See 02-13-4 Nut Installation Note.)
2	Retainer, bushing
3	Bolt
4	Washer and nut
5	Front shock absorber

Nut Installation Note

1. Tighten the nut so that the exposed thread of the shock absorber piston is **6—8 mm {0.24—0.31 in}**.



DBG0213ZWB00

FRONT SHOCK ABSORBER INSPECTION

dcf021334700w02

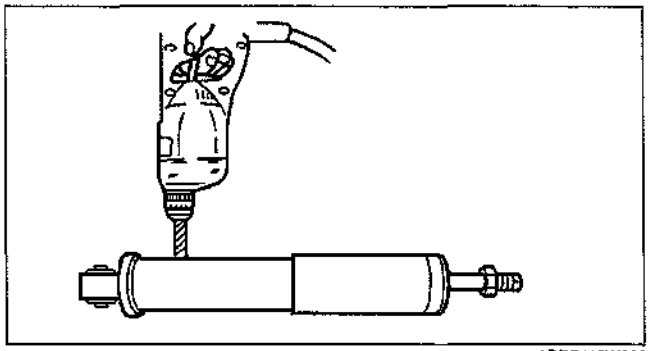
1. Remove the front shock absorber.
2. Inspect for damage and oil leakage.
3. Compress and extend the shock absorber piston rod at least three times at a steady speed. From the fourth compression stroke, verify that the operational force does not change and that there is no unusual noise.
   - If there is any malfunction, replace the shock absorber.

FRONT SHOCK ABSORBER DISPOSAL

dcl021334700w03

Warning
- **Whenever drilling into a shock absorber, wear protective eye wear. The gas in the shock absorber is pressurized, and could spray metal chips into the eyes and face when drilling.**

1. Clamp a shock absorber on a flat surface or with the piston pointing downwards.
2. Drill a **2—3 mm {0.08—0.12 in}** hole at a point **20—30 mm {0.8—1.2 in}** from the bottom of the tube, so that the gas can escape.
3. Turn the hole downwards.
4. The oil can be collected by moving the piston rod several times up and down and cutting the tube at the end.
5. Dispose of waste oil according to the waste disposal law.



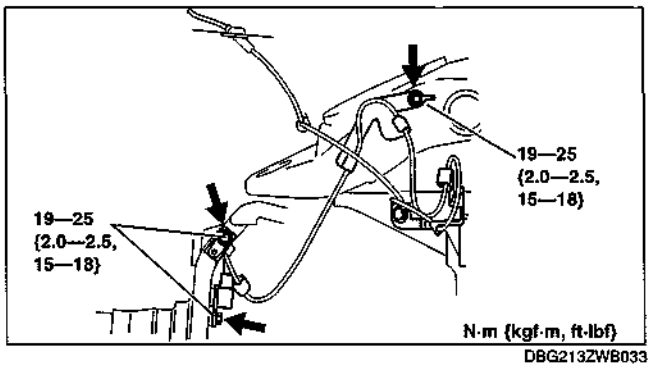
ABR7412W003

Note
- Shock absorber gas is nitrogen gas.
- Shock absorber oil is mineral oil.

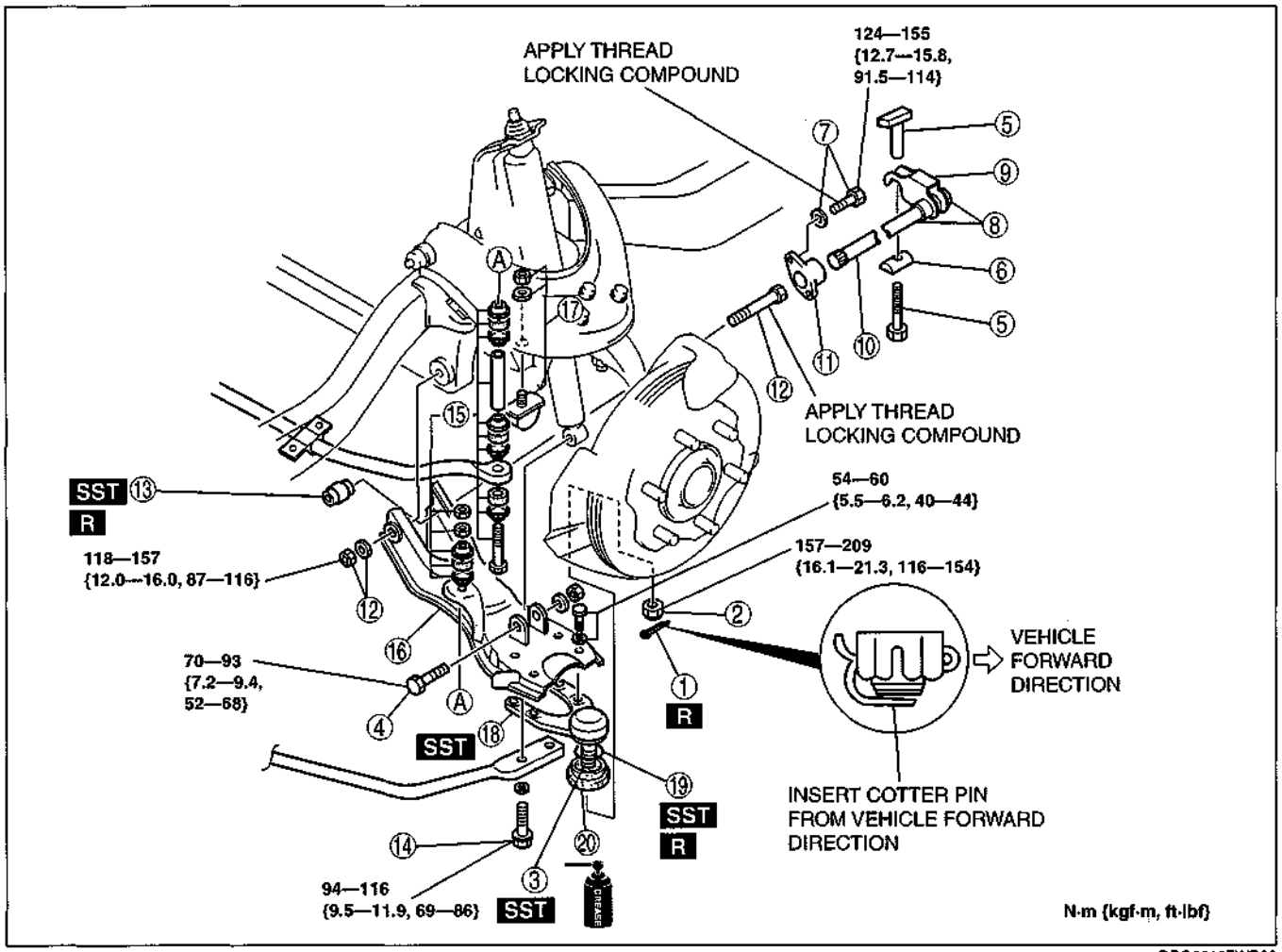
TORSION BAR SPRING AND LOWER ARM REMOVAL/INSTALLATION [4x2 (EXCEPT Hi-Rider)]

dcl021334130w01

1. Remove the ABS sensor wiring harness brackets installed to the upper arm and steering knuckle, then move aside the ABS sensor.
2. Remove in the order indicated in the table.
3. Install in the reverse order of removal.
4. Inspect the vehicle height and adjust it if necessary. (See 02-11-1 VEHICLE HEIGHT ADJUSTMENT [4x2].)
5. Inspect the front wheel alignment and adjust it if necessary. (See 02-11-3 FRONT WHEEL ALIGNMENT [4x2].)



DBG213ZWB033



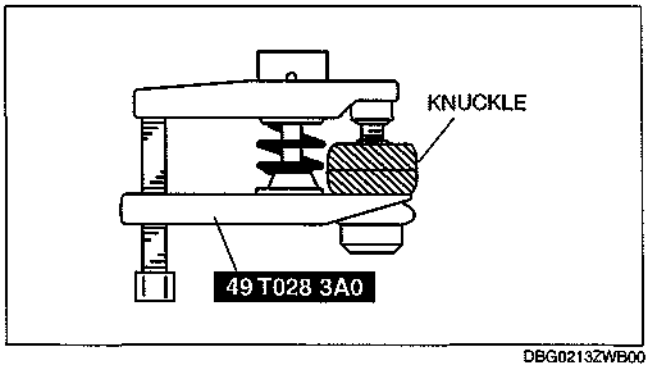
DBG0213ZWB00

1	Cotter pin
2	Nut
3	Front lower arm ball joint (See 02-13-7 Front Lower Arm Ball Joint Removal Note.)
4	Shock absorber lower bolt and nut
5	Anchor bolt (See 02-13-7 Anchor Bolt Removal Note.) (See 02-13-9 Anchor Bolt Installation Note.)
6	Anchor swivel
7	Bolt and washer
8	Torsion bar component
9	Anchor arm
10	Torsion bar spring (See 02-13-7 Torsion Bar Spring Removal Note.) (See 02-13-8 Torsion Bar Spring Installation Note.)
11	Torque plate

12	Lower arm spindle, washer, and nut
13	Rubber bushing (See 02-13-7 Rubber Bushing Removal Note.) (See 02-13-8 Rubber Bushing Installation Note.)
14	Tension rod bolt
15	Stabilizer bolt, bushing, retainer, spacer, and nut (See 02-13-8 Stabilizer Bolt, Bushing, Retainer, Spacer, And Nut Installation Note.)
16	Front lower arm
17	Bound stopper
18	Front lower arm ball joint
19	Clip (See 02-13-8 Clip Installation Note.)
20	Dust boot
21	Clip (See 02-13-8 Clip Installation Note.)
22	Dust boot

Front Lower Arm Ball Joint Removal Note

1. Separate the ball joint from the knuckle arm using the **SST**.



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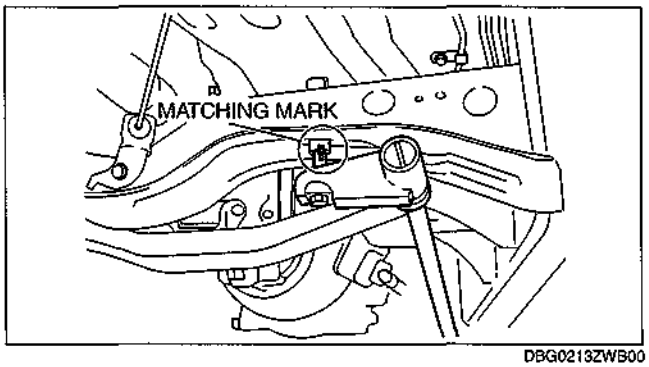
Anchor Bolt Removal Note

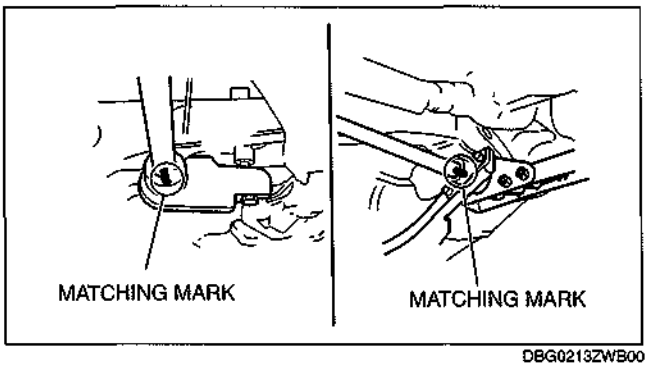
1. Mark the anchor bolt and swivel for reference during installation.



DBG0213ZWB00

Torsion Bar Spring Removal Note

1. Mark the torsion bar spring, anchor arm, the torsion bar spring and torque plate for reference during installation.



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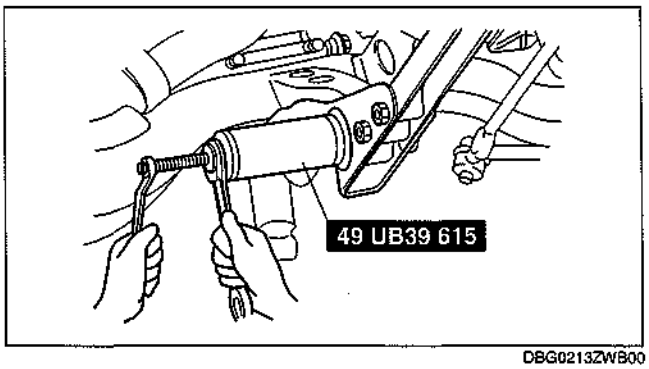
Rubber Bushing Removal Note

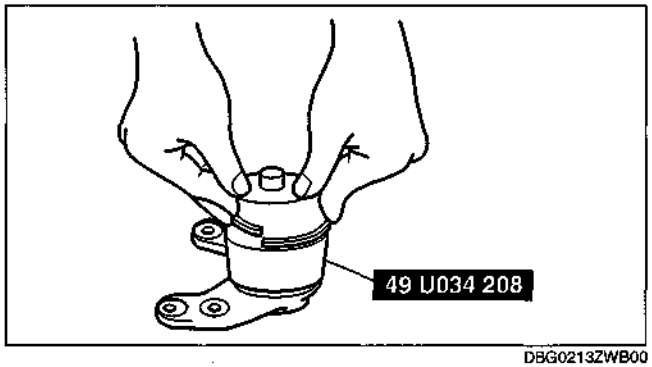
1. Remove the rubber bushing from the body using the **SST**.



DBG0213ZWB00

Clip Installation Note

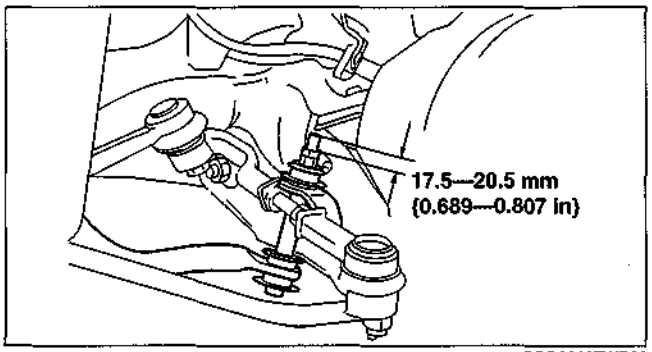
1. Install the **SST** to the ball joint stud with the stud stands straight up.
2. Install the clip in the dust boot groove.



DBG0213ZWB00

Stabilizer Bolt, Bushing, Retainer, Spacer, And Nut Installation Note

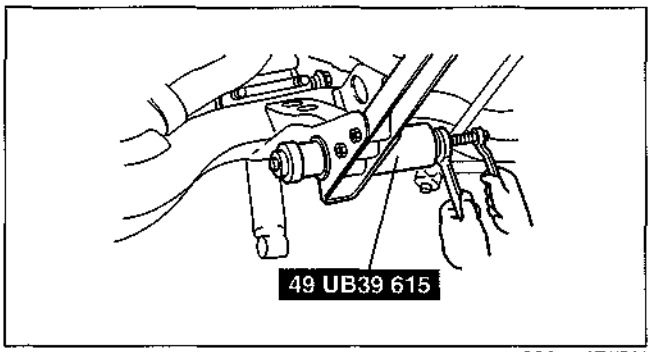
1. Tighten the nuts so that **17.5—20.5 mm {0.689—0.807 in}** of thread is exposed at the end of the bolt.



DBG0213ZWB00

Rubber Bushing Installation Note

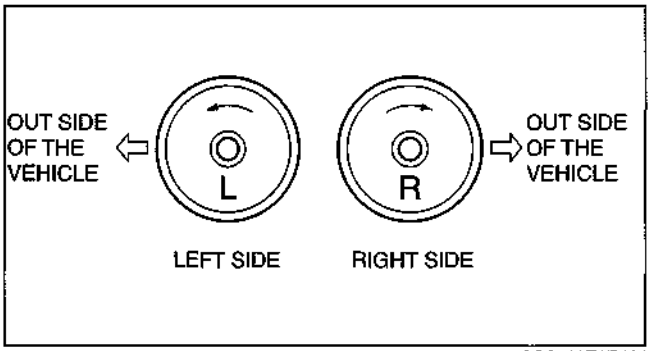
1. Install a new bushing using the **SST**.



DBG0213ZWB01

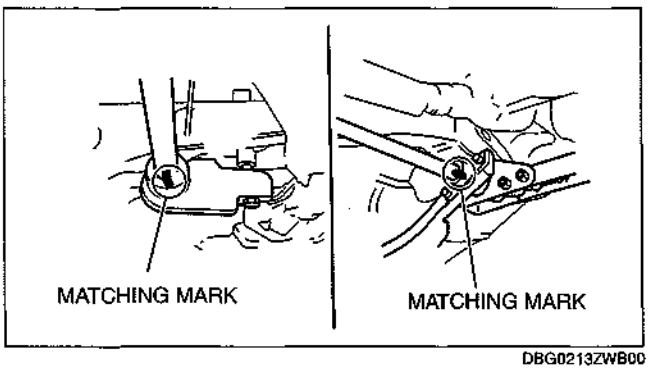
Torsion Bar Spring Installation Note

1. Before installation, check the identification mark on the end of the torsion bar spring.



DBG213ZWB031

2. Align the marks made during removal, and connect the torsion bar spring to the torque plate.



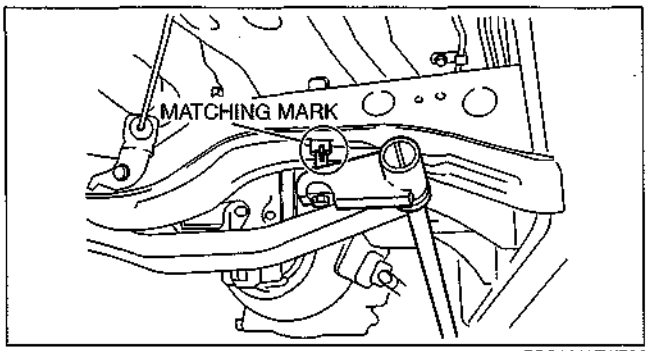
DBG0213ZWB00

Anchor Bolt Installation Note

1. Install the anchor bolt, and tighten it until the marks made during removal are aligned.

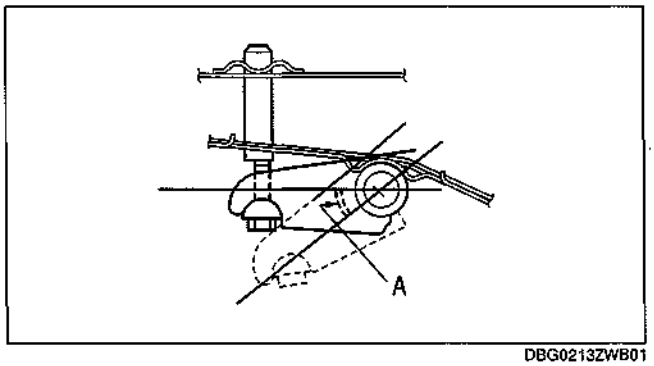
Note

- If the anchor bolt was not marked during removal, install it as follows:
  1. Lower the front suspension until the upper arm contacts the rebound stopper.



DBG0213ZWB00

2. Install the anchor arm so that the angle A is **25°—34°**.

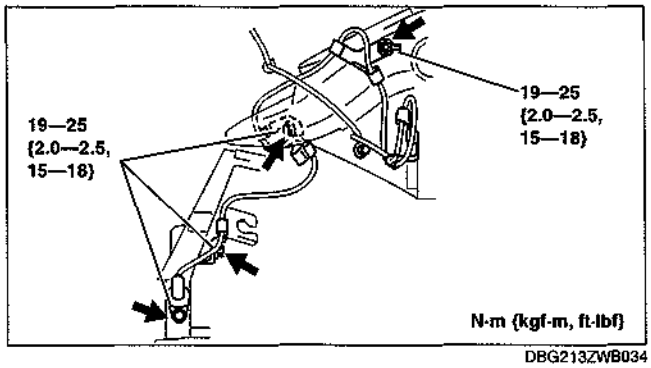


DBG0213ZWB01

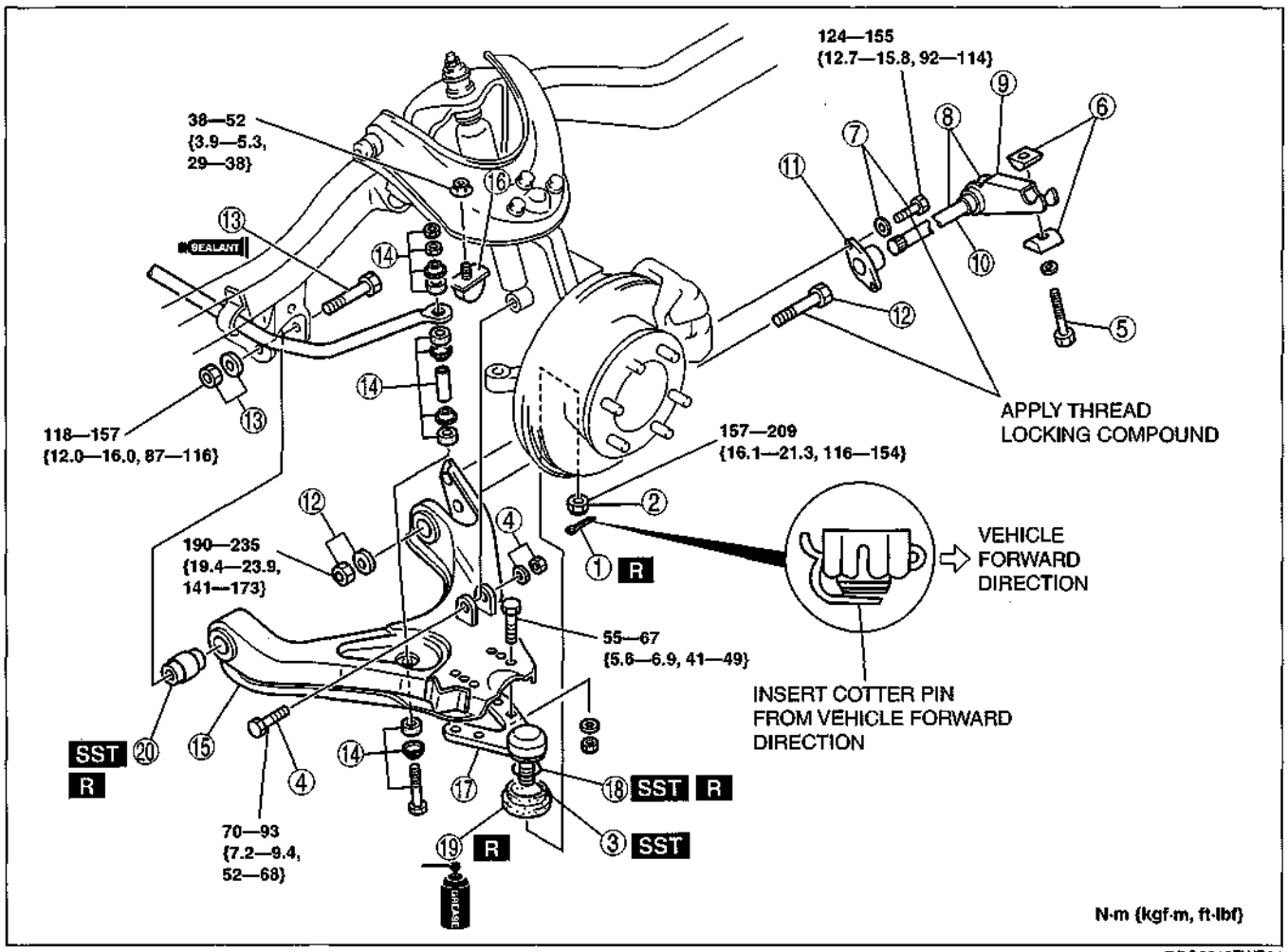
TORSION BAR SPRING AND LOWER ARM REMOVAL/INSTALLATION [Hi-Rider, 4x4]

dcf021334130w02

1. Remove the ABS sensor wiring harness brackets installed to the upper arm and steering knuckle, then move aside the ABS sensor.
2. Remove in the order indicated in the table.
3. Install in the reverse order of removal.
4. Inspect the vehicle height and adjust it as necessary. (See 02-11-2 VEHICLE HEIGHT ADJUSTMENT [4x4].)
5. Inspect the front wheel alignment as necessary. (See 02-11-5 FRONT WHEEL ALIGNMENT [4x4].)



DBG213ZWB034



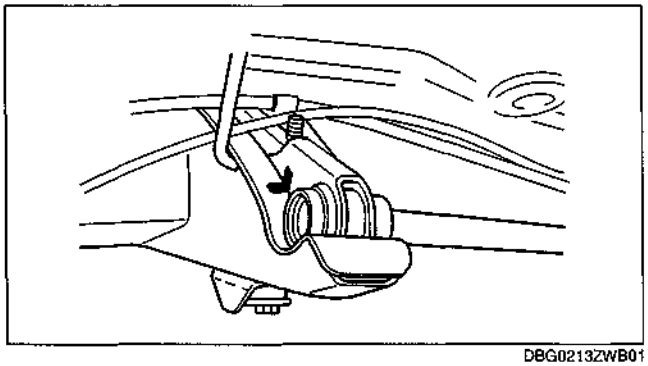
DBG0213ZWB01

1	Cotter pin
2	Nut
3	Front lower arm ball joint (See 02-13-7 Front Lower Arm Ball Joint Removal Note.)
4	Shock absorber lower bolt and nut
5	Anchor bolt (See 02-13-13 Anchor Bolt Installation Note.)
6	Anchor swivel
7	Bolt and washer
8	Torsion bar spring component
9	Anchor arm (See 02-13-11 Anchor Arm Removal Note.) (See 02-13-12 Anchor Arm Installation Note.)
10	Torsion bar spring (See 02-13-11 Torsion Bar Spring Removal Note.) (See 02-13-12 Torsion Bar Spring Installation Note.)

11	Torque plate
12	Lower arm spindle (rear), washer and nut
13	Lower arm spindle (front), washer and nut
14	Stabilizer bolt, bushing, retainer, spacer and nut (See 02-13-8 Stabilizer Bolt, Bushing, Retainer, Spacer, And Nut Installation Note.)
15	Front lower arm
16	Bound stopper
17	Front lower arm ball joint
18	Clip (See 02-13-8 Clip Installation Note.)
19	Dust boot
20	Front lower arm bushing (See 02-13-11 Front Lower Arm Bushing Removal Note.) (See 02-13-12 Front Lower Arm Bushing Installation Note.)

Anchor Arm Removal Note

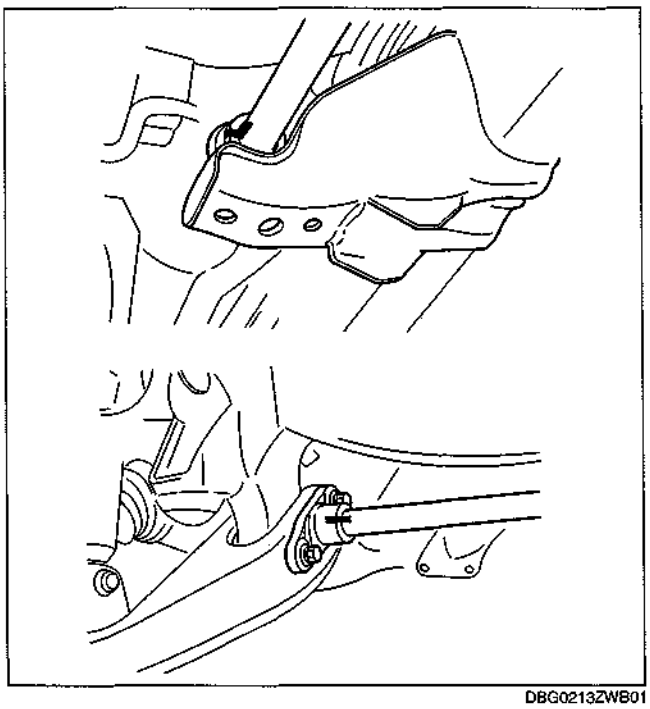
1. Mark the anchor arm and body for reference during installation.



DBG0213ZWB01

Torsion Bar Spring Removal Note

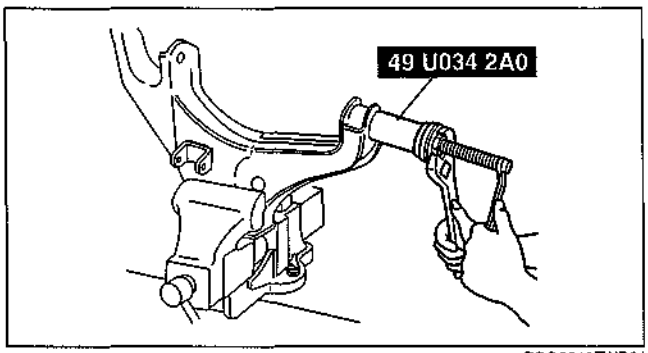
1. Mark the torsion bar spring and anchor arm, and torsion bar spring and torque plate for reference during installation.



DBG0213ZWB01

Front Lower Arm Bushing Removal Note

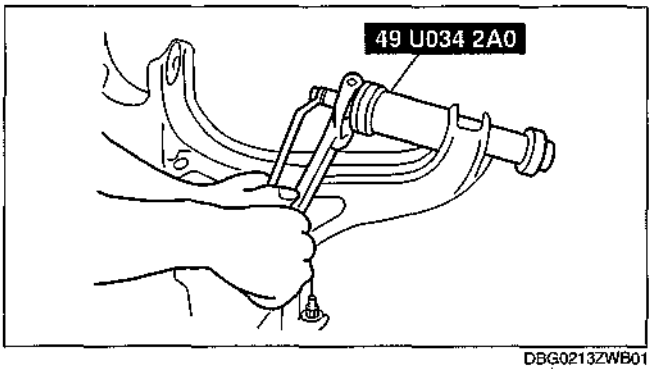
1. Remove the front lower arm bushing using the **SST**.



DBG0213ZWB01

Front Lower Arm Bushing Installation Note

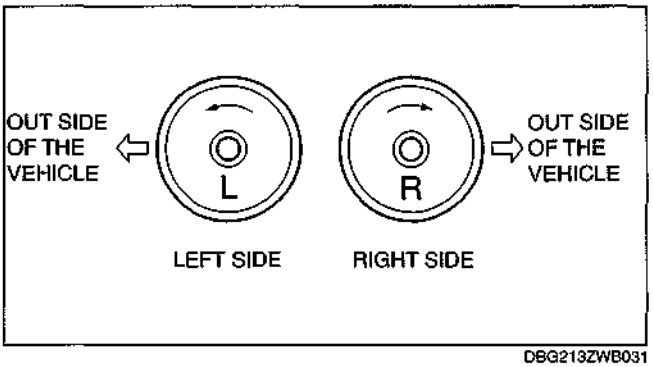
1. Apply soapy water to the new bushing.
2. Install the bushing using the **SST**.



DBG0213ZWB01

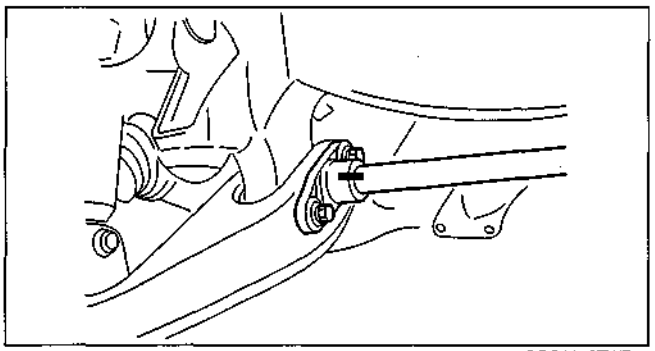
Torsion Bar Spring Installation Note

1. Before installation, check the identification mark on the end of the torsion bar spring.



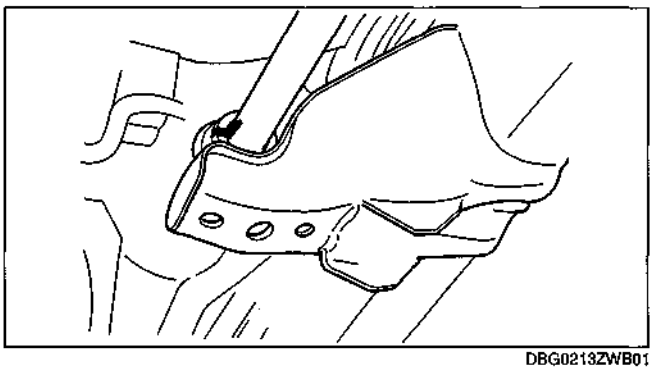
DBG213ZWB031

2. Align the marks made during removal, and connect the torsion bar spring to the torque plate.


DBG0213ZWB01

Anchor Arm Installation Note

1. Align the marks made during removal, and install the anchor arm onto the torsion bar spring.

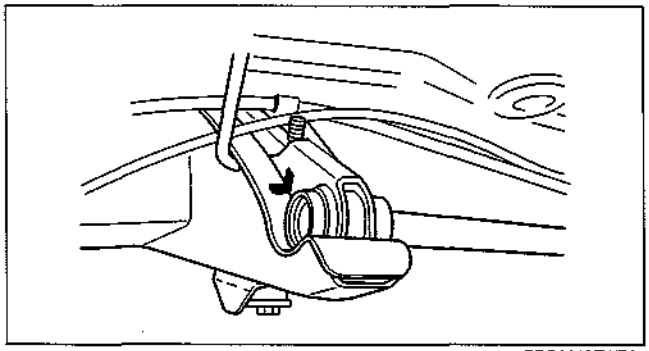

DBG0213ZWB01

Anchor Bolt Installation Note

1. Install the anchor bolt, and tighten it until the marks made during removal are aligned.

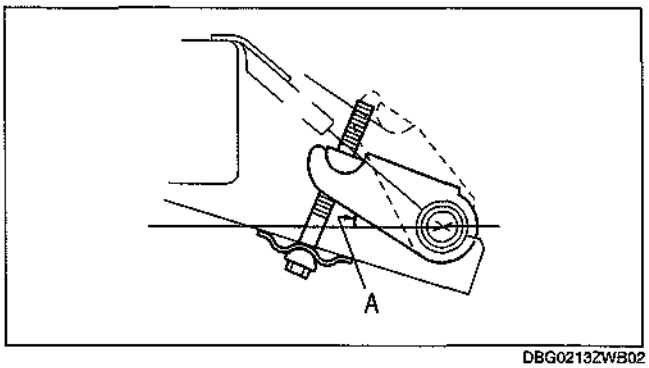
Note

- If the anchor bolt was not marked during removal, install it as follows:
  1. Lower the front suspension until the upper arm contacts the rebound stopper.



DBG0213ZWB01

2. Install the anchor arm so that the angle A is **55°30′—64°30′**.



DBG0213ZWB02

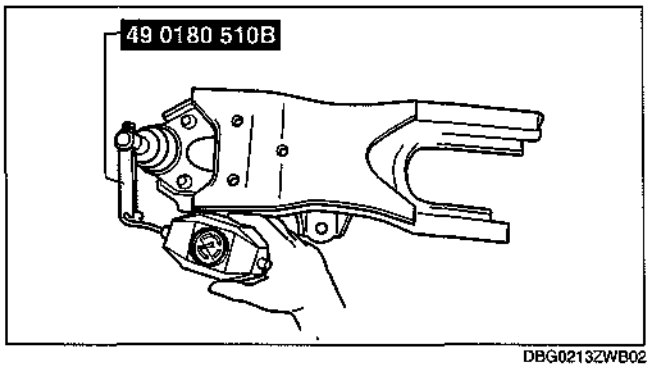
FRONT LOWER ARM INSPECTION

dcf021334130w03

1. Remove the front lower arm from the vehicle.
2. Inspect the front lower arm for bending or damage. If there is any malfunction, replace it.
3. Inspect the ball joint for excessive play. If there is any malfunction, replace the front lower arm.
4. Rotate the ball joint **5 times**.
5. Measure the ball-joint rotational torque using the **SST** and torque wrench.

Front lower arm ball joint rotational torque [pull scale reading]
20—34 N {2.0—3.5 kgf, 4.4—7.7 lbf}

- If not within the specification, replace the front lower arm.



DBG0213ZWB02

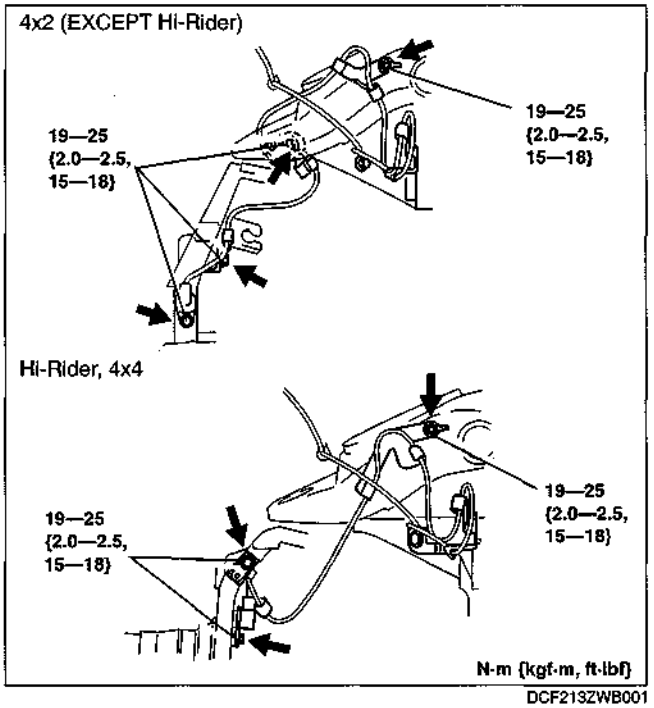
FRONT UPPER ARM REMOVAL/INSTALLATION

dcf021334200w01

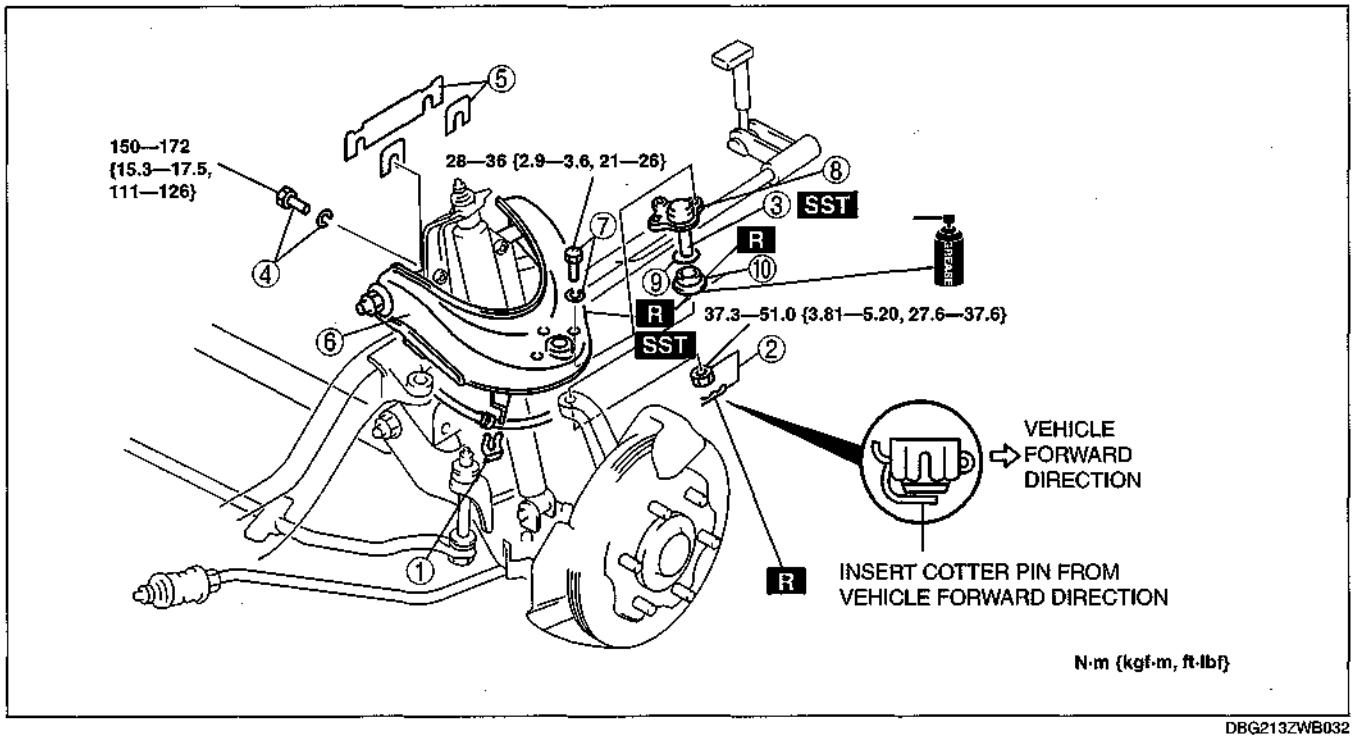
Caution

- **Performing the following procedures without first removing the ABS wheel-speed sensor may possibly cause an open circuit in the wiring harness if it is pulled by mistake. Before performing the following procedures, remove the ABS wheel-speed sensor (axle side) and fix it to an appropriate place where the sensor will not be pulled while servicing the vehicle.**

1. Remove the ABS sensor wiring harness brackets installed to the upper arm and steering knuckle, then move aside the ABS sensor.
2. Remove in the order indicated in the table.
3. Install in the reverse order of removal.
4. Inspect the front wheel alignment and adjust it as necessary. (See 02-11-3 FRONT WHEEL ALIGNMENT [4x2]) (See 02-11-5 FRONT WHEEL ALIGNMENT [4x4].)



DCF213ZWB001



DBG213ZWB032

1	Brake hose bracket
2	Cotter pin and nut
3	Front upper arm ball joint (See 02-13-15 Front Upper Arm Ball Joint Removal Note.)

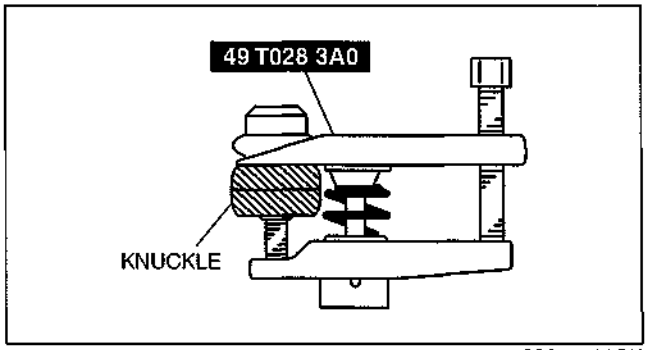
4	Bolt and washer (See 02-13-15 Bolt and Washer Installation Note.)
5	Adjustment shim (See 02-13-15 Adjustment Shim Removal Note.)
6	Front upper arm component
7	Bolt and washer

8	Front upper arm ball joint

9	Clip (See 02-13-15 Clip Installation Note.)
10	Dust boot

Front Upper Arm Ball Joint Removal Note

1. Separate the upper arm ball joint from the knuckle arm using the **SST**.



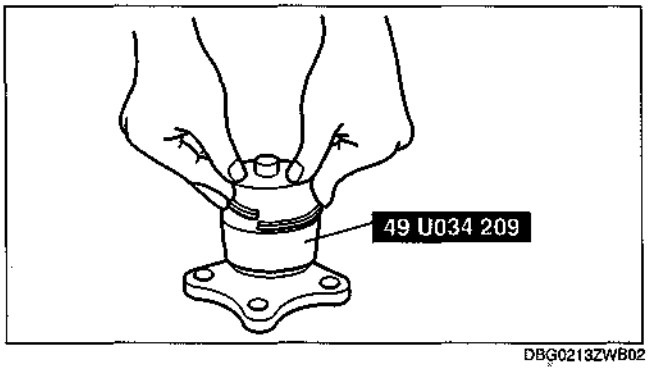
DBG0213ZWB02

Adjustment Shim Removal Note

1. Note the number, amount and position of the shims so that they are reinstalled in the correct positions.

Clip Installation Note

1. Install the **SST** to the ball joint stud with the stud stands straight up.
2. Install the clip in the dust boot groove using the **SST**.



DBG0213ZWB02

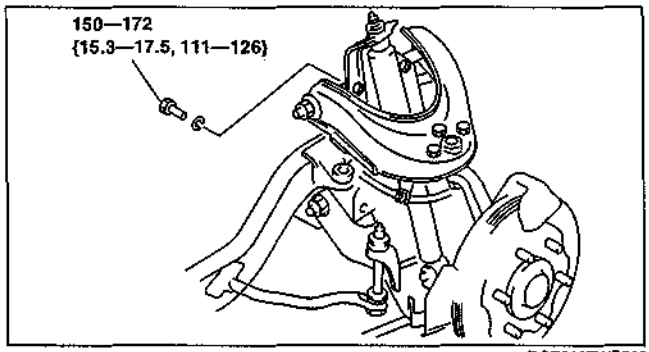
Bolt and Washer Installation Note

Note

- Be sure to use a pre-set torque wrench to precisely tighten the upper arm shaft.

1. Install the bolt and washer, and tighten the bolt to the specified torque.

Tightening torque
150—172 N·m {15.3—17.5 kgf·m, 111—126 ft·lbf}



DCF213ZWB300

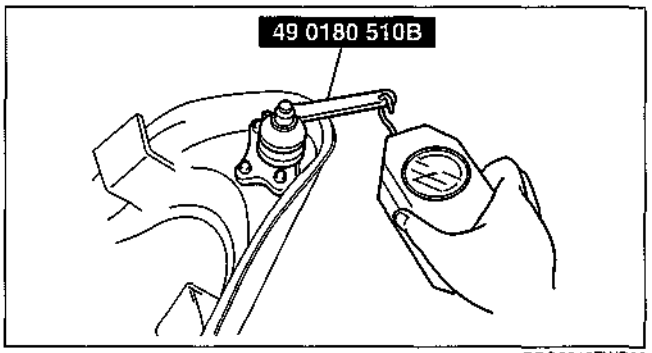
FRONT UPPER ARM INSPECTION

dcf021334200w02

1. Remove the front upper arm from the vehicle.
2. Inspect the front upper arm for bending or damage. If there is any malfunction, replace it.
3. Inspect the ball joint for excessive play, and if there is any malfunction, replace the front upper arm.
4. Rotate the ball joint **5 times**.
5. Measure the ball-joint rotational torque using the **SST** and pull scale.

Front upper arm ball joint rotational torque [pull scale reading]
4.9—25 N {0.5—2.5 kgf, 1.1—5.5 lbf}

- If not within the specification, replace the front upper arm.

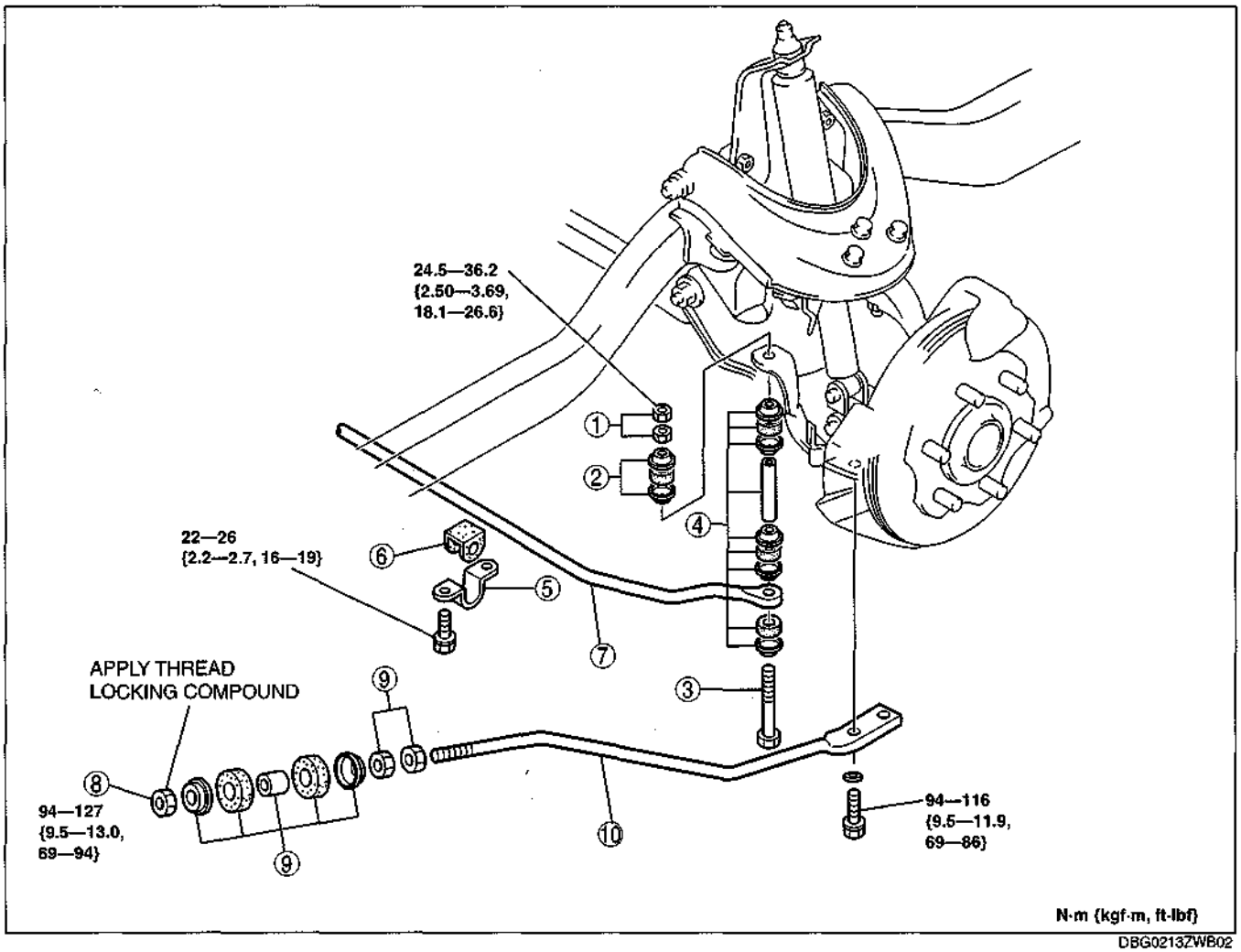


DBG0213ZWB02

FRONT STABILIZER AND TENSION ROD REMOVAL/INSTALLATION [4x2 (EXCEPT Hi-Rider)]

dcf021334100w01

1. Remove in the order indicated in the table.
2. Install in the reverse order of removal.



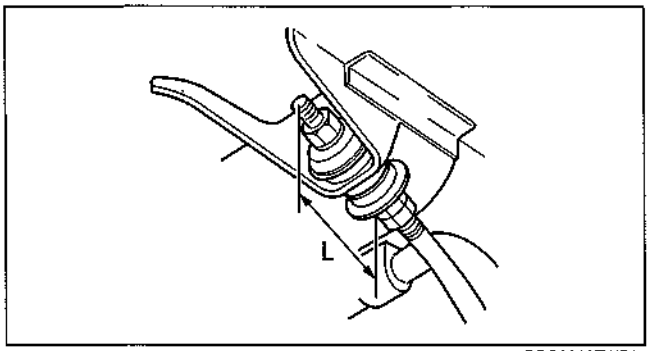
DBG0213ZWB02

1	Nut (See 02-13-8 Stabilizer Bolt, Bushing, Retainer, Spacer, And Nut Installation Note.)
2	Retainer
3	Bolt
4	Bushing, retainer and spacer
5	Stabilizer bracket

6	Stabilizer bushing
7	Front stabilizer
8	Tension rod nut (See 02-13-17 Tension Rod Nut Installation Note.)
9	Bushing and retainer
10	Tension rod

Tension Rod Nut Installation Note

1. Tighten the tension rod nuts so that length L is **98.5 mm {3.88 in}**.

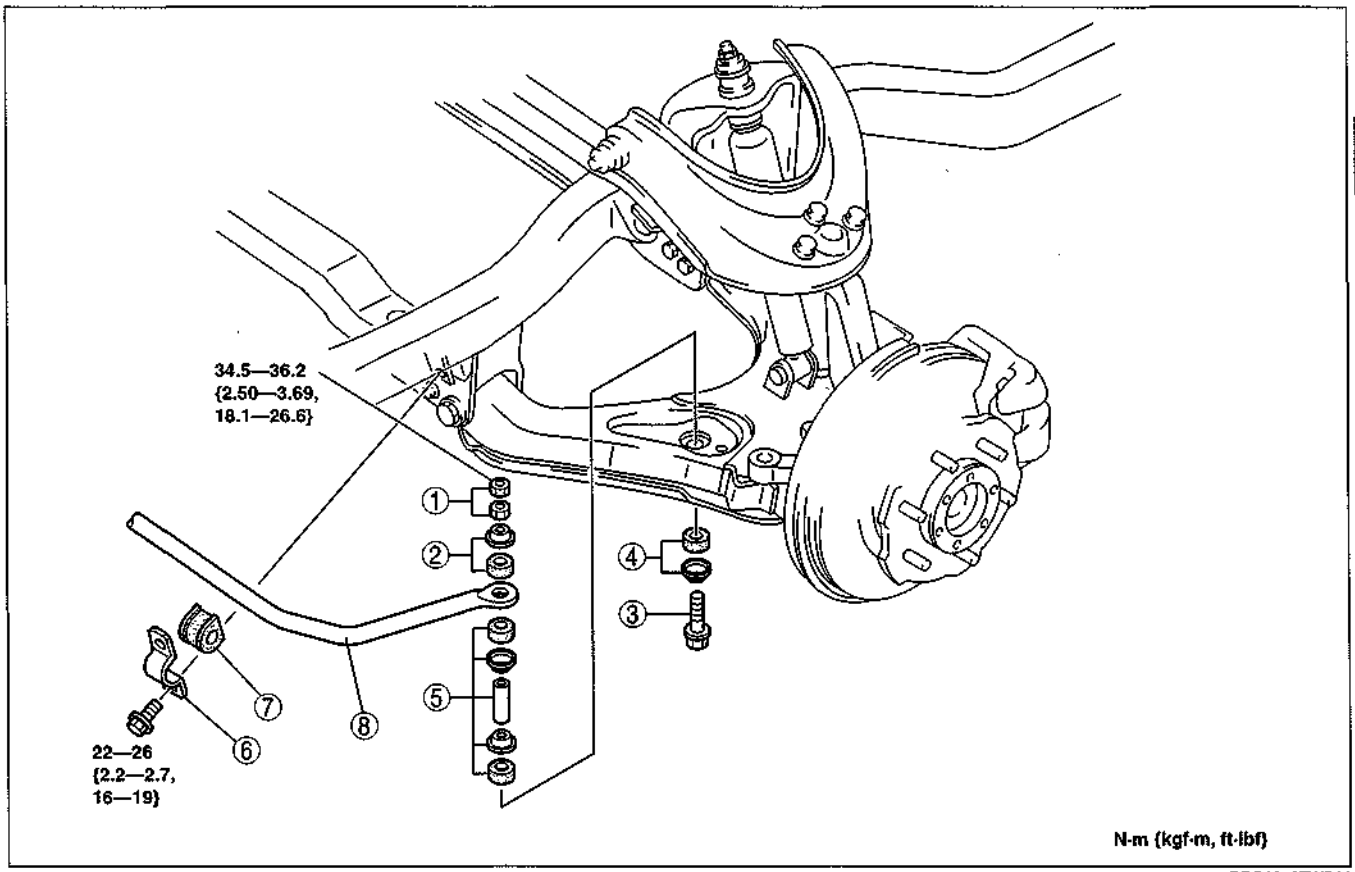


DBG0213ZWB02

FRONT STABILIZER REMOVAL/INSTALLATION [Hi-Rider, 4x4]

dcf021334100w02

1. Remove in the order indicated in the table.
2. Install in the reverse order of removal.



DBG0213ZWB02

1	Nut (See 02-13-8 Stabilizer Bolt, Bushing, Retainer, Spacer, And Nut Installation Note.)
2	Retainer and bushing
3	Bolt

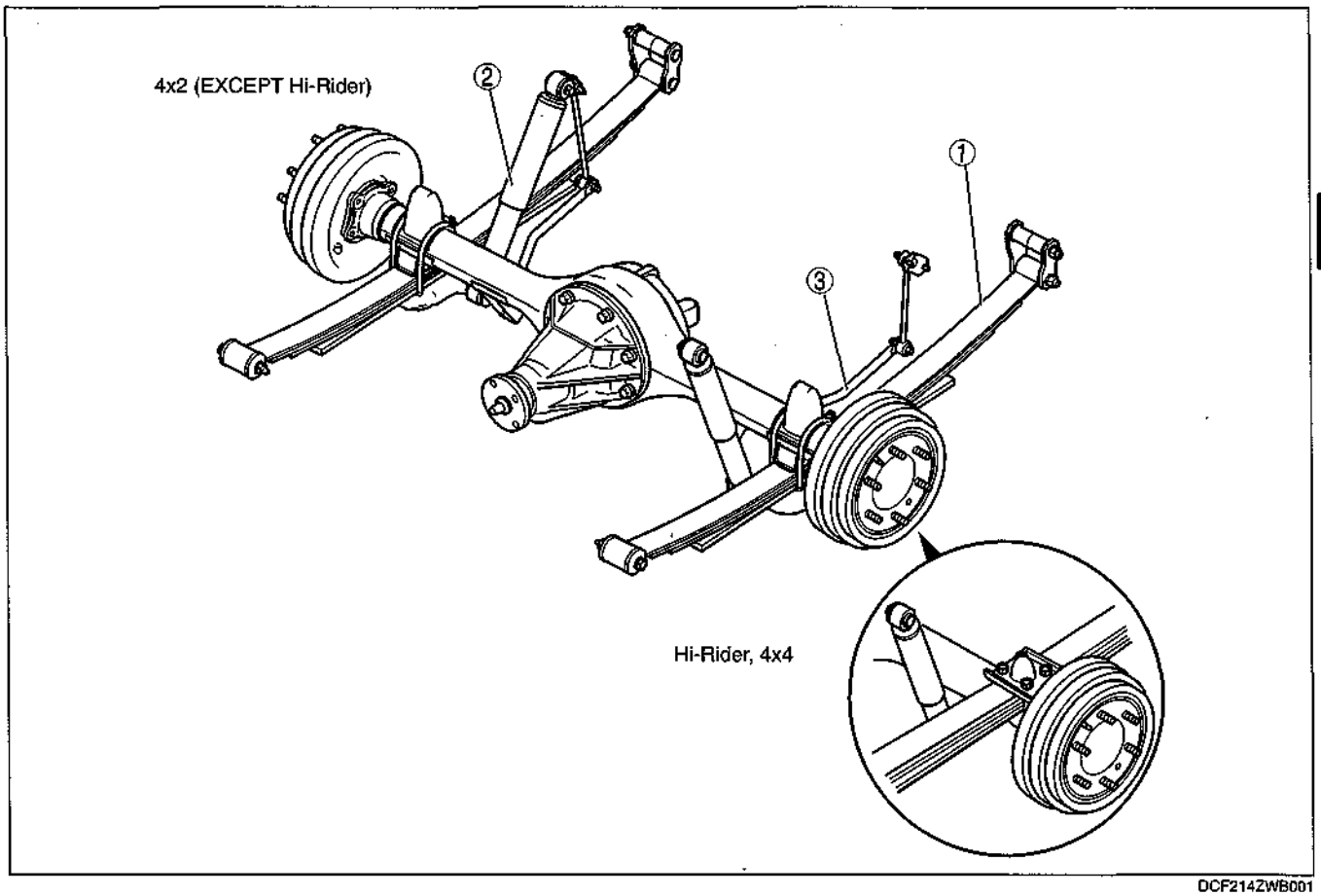
4	Retainer and bushing
5	Retainer, bushing, and spacer
6	Stabilizer bracket
7	Stabilizer bushing
8	Front stabilizer

02-14 REAR SUSPENSION

REAR SUSPENSION LOCATION INDEX..... 02-14–1
REAR SHOCK ABSORBER AND LEAF SPRING REMOVAL/INSTALLATION [4x2 (EXCEPT Hi-Rider)]..... 02-14–2
REAR SHOCK ABSORBER AND LEAF SPRING REMOVAL/INSTALLATION [Hi-Rider, 4x4] 02-14–3
REAR SHOCK ABSORBER INSPECTION.....02-14–4
REAR SHOCK ABSORBER DISPOSAL.....02-14–4
REAR STABILIZER REMOVAL/INSTALLATION [WL-C, WE-C] 02-14–5

REAR SUSPENSION LOCATION INDEX

dcf021400000w01



DCF214ZWB001

1	Leaf spring (See 02-14-2 REAR SHOCK ABSORBER AND LEAF SPRING REMOVAL/INSTALLATION [4x2 (EXCEPT Hi-Rider)].) (See 02-14-3 REAR SHOCK ABSORBER AND LEAF SPRING REMOVAL/INSTALLATION [Hi-Rider, 4x4].)

2	Rear shock absorber (See 02-14-4 REAR SHOCK ABSORBER INSPECTION.) (See 02-14-4 REAR SHOCK ABSORBER DISPOSAL.)
3	Rear stabilizer (WL-C and WE-C) (See 02-14-5 REAR STABILIZER REMOVAL/INSTALLATION [WL-C, WE-C].)

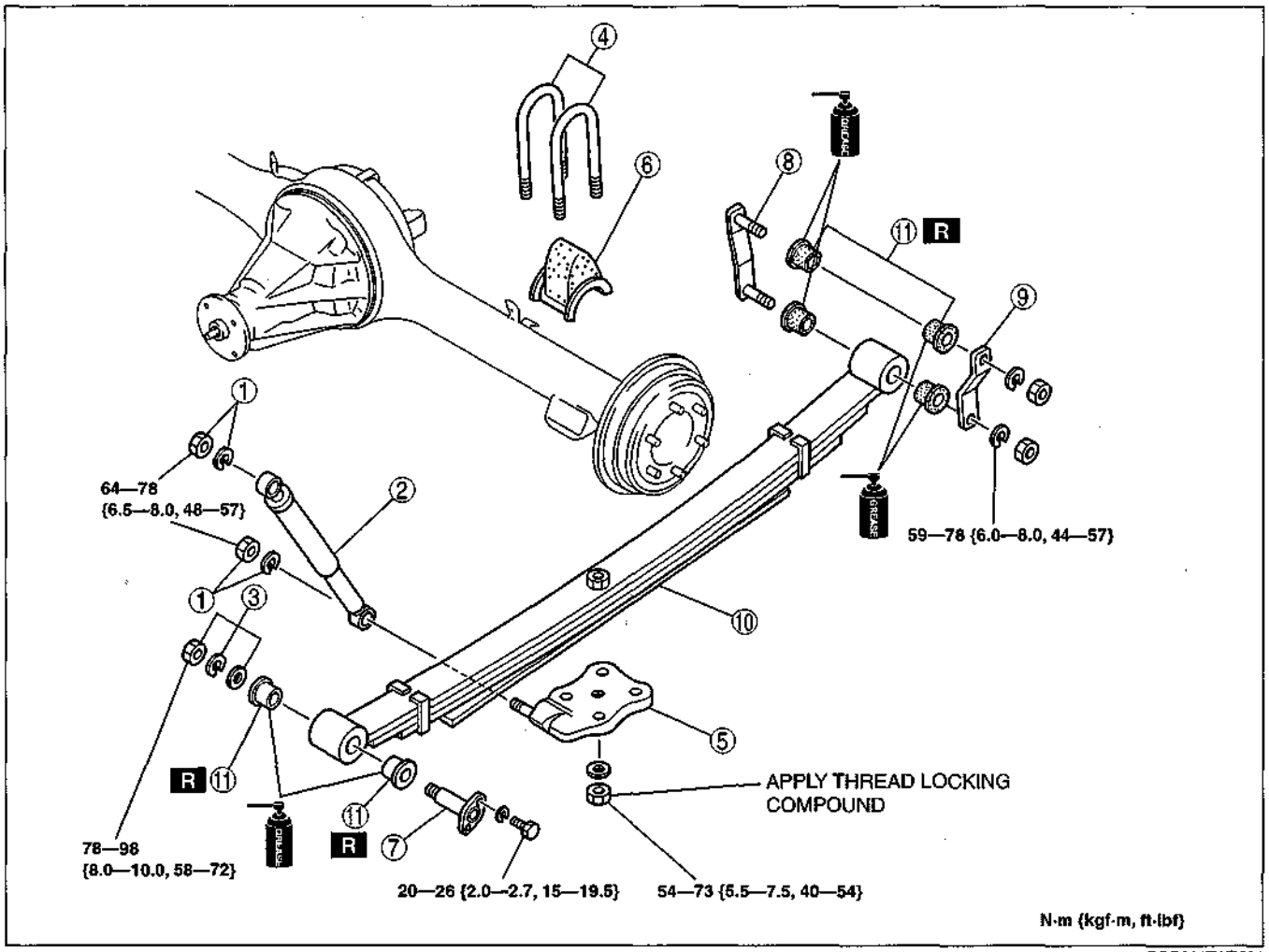
REAR SHOCK ABSORBER AND LEAF SPRING REMOVAL/INSTALLATION [4x2 (EXCEPT Hi-Rider)]

dcf02140591 0w01

Warning

- **Use safety stands for support of the left and right axle casings, and while supporting the differential casing with a jack, raise or lower the jack as necessary.**

1. Support the frame with safety stands and place a jack under the differential casing.
2. Remove in the order indicated in the table.
3. Install in the reverse order of removal.
4. After installation, tighten the bolt (leaf spring front side) completely on the ground.



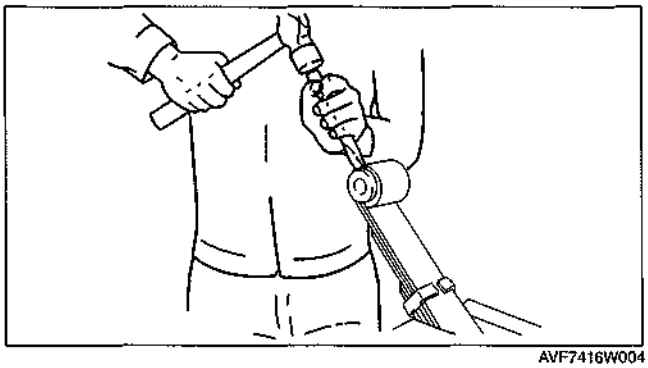
DBG214ZWB001

1	Nut and washer
2	Rear shock absorber
3	Nut
4	U-bolt
5	Spring clamp
6	Stopper rubber
7	Bolt

8	Shackle pin
9	Shackle plate
10	Leaf spring component
11	Leaf spring bushing (See 02-14-3 Leaf Spring Bushing Removal Note.) (See 02-14-3 Leaf Spring Bushing Installation Note.)

Leaf Spring Bushing Removal Note

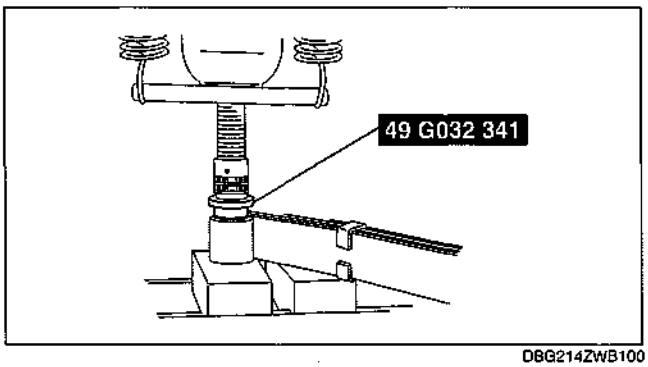
1. Secure the leaf spring in a vise and remove the bushing using a chisel.



AVF7416W004

Leaf Spring Bushing Installation Note

1. Press in the bushing using a suitable pipe.



DBG214ZWB100

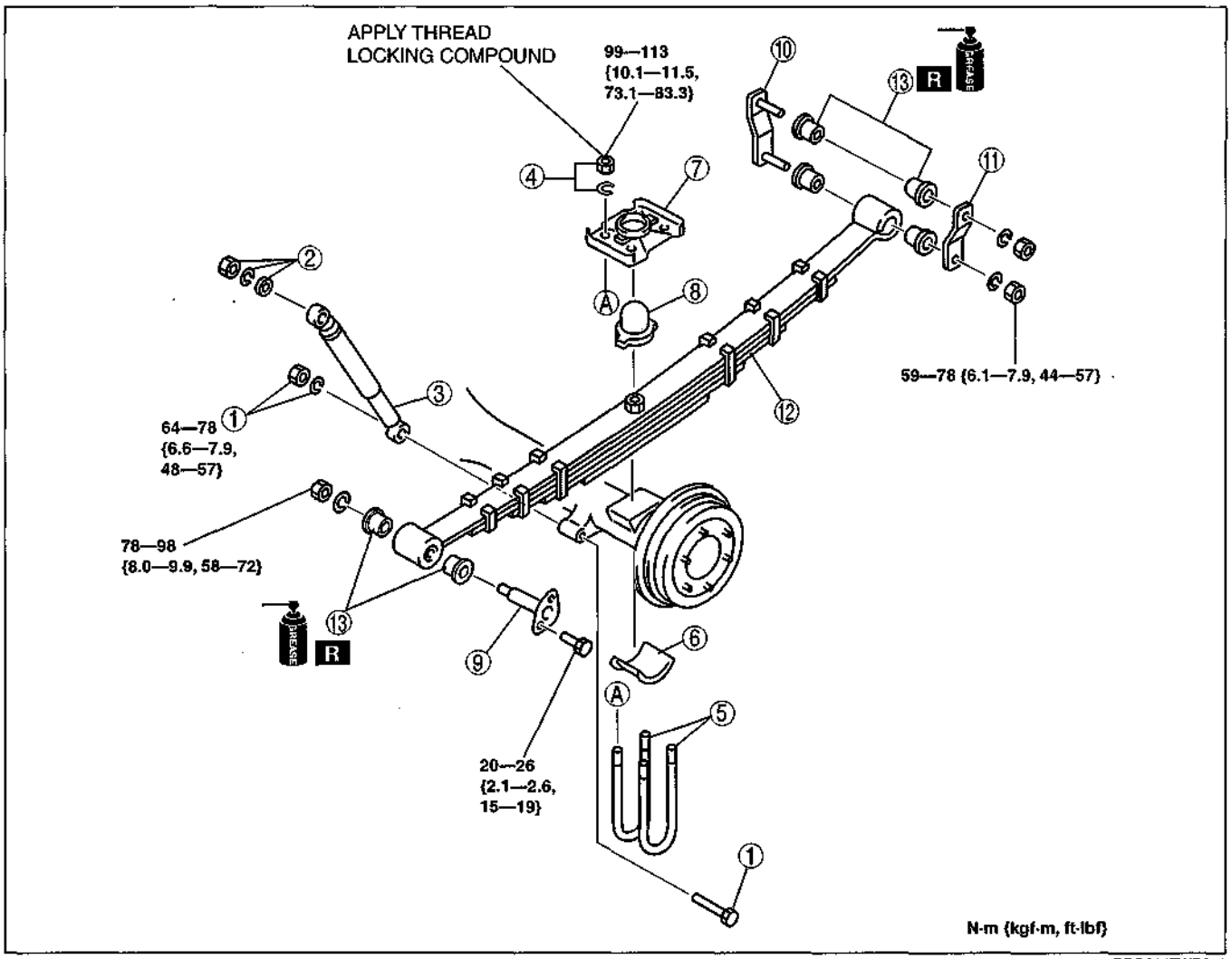
REAR SHOCK ABSORBER AND LEAF SPRING REMOVAL/INSTALLATION [Hi-Rider, 4x4]

dcf021405910w02

Warning

- **Use safety stands for support of the left and right axle casings, and while supporting the differential casing with a jack, raise or lower the jack as necessary.**

1. Support the frame with safety stands and place a jack under the differential casing.
2. Remove in the order indicated in the table.
3. Install in the reverse order of removal.
4. After installation, tighten the bolt (leaf spring front side) completely on the ground.



DBG214ZWB006

1	Bolt, washer and nut
2	Nut, washer, and retainer
3	Shock absorber
4	Nut and washer
5	U-bolt
6	Set plate
7	Spring clamp
8	Bound stopper

9	Bolt
10	Shackle pin
11	Shackle plate
12	Leaf spring component
13	Leaf spring bushing (See 02-14-3 Leaf Spring Bushing Removal Note.) (See 02-14-3 Leaf Spring Bushing Installation Note.)

REAR SHOCK ABSORBER INSPECTION

dcf021428700w01

1. Inspect the rear shock absorber in the same way as the front shock absorber. (See 02-13-4 FRONT SHOCK ABSORBER INSPECTION.)

REAR SHOCK ABSORBER DISPOSAL

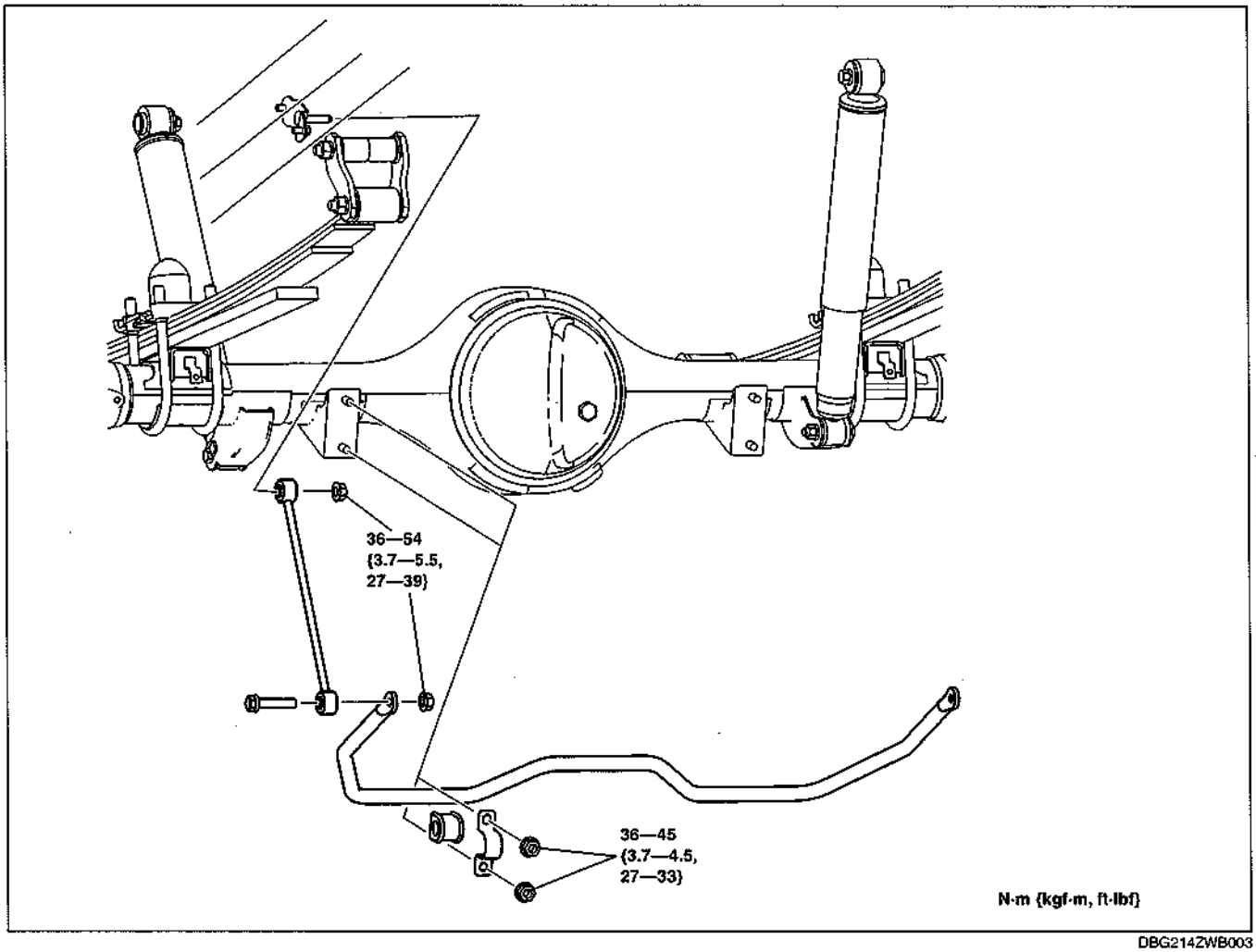
dcf021428700w02

1. Dispose the rear shock absorber in the same way as the front shock absorber. (See 02-13-5 FRONT SHOCK ABSORBER DISPOSAL.)

REAR STABILIZER REMOVAL/INSTALLATION [WL-C, WE-C]

dcf021428100w01

1. Remove in the order indicated in the table.
2. Install in the reverse order of removal.
3. After installation, tighten the control link installation bolt completely on the ground.

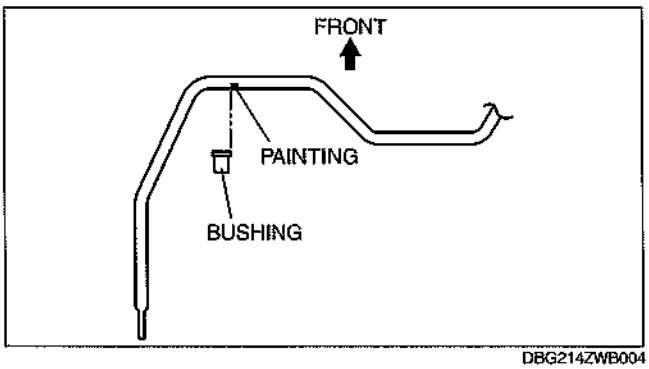


DBG214ZWB003

1	Rear stabilizer component (See 02-14-6 Rear Stabilizer Component Installation Note.)
2	Stabilizer control link (See 02-14-6 Stabilizer Control Link Installation Note.)
3	Stabilizer bracket
4	Bushing (See 02-14-5 Bushing Installation Note.)
5	Rear stabilizer

Bushing Installation Note

1. Install the bushings aligned with the painting part.



DBG214ZWB004

Stabilizer Control Link Installation Note

1. Install the stabilizer control link with the painted area pointing towards the under side and inside of the vehicle.

Rear Stabilizer Component Installation Note

1. Temporarily install the rear stabilizer component.
2. Tighten the stabilizer control link nut.
3. Tighten the stabilizer bracket nut.

02-50 TECHNICAL DATA

SUSPENSION TECHNICAL DATA 02-50–1

SUSPENSION TECHNICAL DATA

dcf025000000w01

Front wheel alignment [4x2] (Unloaded)

Item			Specifications			
			Regular cab	Double cab	Hi-Rider (Stretch cab (with Rear Access System)	Hi-Rider (Double cab)
Total toe-in	Tire [Tolerance ±3 {0.12}]	(mm {in})	5 {0.19}			
Maximum steering angle		Inner	33°00′—37°00′		31°30′—35°30′	
		Outer	30°00′—35°00′		27°00′—32°00′	
Camber angle [Tolerance ±1°]			0°35′		0°44′	0°45′
Caster angle [Tolerance ±1°]			1°56′	1°54′	2°07′	2°06′
Steering axis inclination (reference value)			8°25′		10°37′	10°35′

Note

- Unloaded vehicle: Fuel tank is full. Engine coolant and engine oil are at specified level. Jack and tools are in designated position.
- Difference between the left and right dimension for camber is within **30′**.
- Difference between the left and right dimension for caster is within **45′**.

Front wheel alignment [4x4] (Unloaded)

Item			Specifications	
			Stretch cab (with Rear Access System)	Double cab
Total toe-in	Tire [Tolerance ±3 {0.12}]	(mm {in})	6 {0.23}	
Maximum steering angle		Inner	31°30′—35°30′	
		Outer	27°00′—32°00′	
Camber angle (reference value) [Tolerance ±1°]			0°44′	0°45′
Caster angle (reference value) [Tolerance ±1°]			2°07′	2°06′
Steering axis inclination (reference value)			10°37′	10°35′

Note

- Unloaded vehicle: Fuel tank is full. Engine coolant and engine oil are at specified level. Jack and tools are in designated position.
- Difference between the left and right dimension for camber is within **30′**.
- Difference between the left and right dimension for caster is within **45′**.

Wheel and tires [Australian Specs.]

Item				Specification			
Wheel	Size			15 × 6 1/2J		15 × 6 1/2J	16 × 7J
	Offset (mm {in})			20 {0.79}		25 {0.98}	10 {0.39}
	Pitch circle diameter (mm {in})			139.7 {5.500}			
	Material			Steel	Aluminum alloy	Steel	Aluminum alloy
Tire	Size			215/70R15C 106/104S		235/75R15 109S	245/70R16 111S
	Air pressure (kPa {(kgf/cm^2), <psi>})	Front	Up to full persons	220 {(2.2), <32>}		210 {(2.1), <30>}	210 {(2.1), <30>}
			Full load				
		Rear	Up to full persons	210 {(2.1), <30>}		210 {(2.1), <30>}	210 {(2.1), <30>}
			Full load	375 {(3.8), <54>}		290 {(2.9), <42>}	270 {(2.7), <39>}
	Remaining tread (mm {in})			1.6 {0.06}			
Wheel and tire	Lug nut tightening torque (N?m {kgf?m, ft?lbf})			88.2—117.6 {9.00—11.99, 65.06—86.73}			
	Wheel and tire runout (mm {in})		Radial direction	1.5 {0.06} max.			
			Lateral direction	2.0 {0.08} max.			
	Wheel imbalance*2 (g {oz})			10 {0.35} max.			

*1 : Total weight exceeds **120 g {4.24 oz}**.
*2 : One balance weight: **60 g {2.12 oz}** max. If the total weight exceeds **120 g {4.24 oz}** on one side, rebalance after moving the tire around on the rim. Do not use three or more balance weights.

Suspension

Item	Specification
Front lower arm ball joint rotational torque [pull scale reading]	20—34 N {2.0—3.5 kgf, 4.4—7.7 lbf}
Front upper arm ball joint rotational torque [pull scale reading]	4.9—25 N {0.5—2.5 kgf, 1.1—5.5 lbf}

02-60 SERVICE TOOLS

SUSPENSION 02-60–1

SUSPENSION

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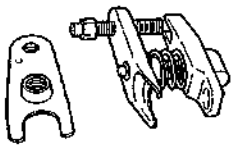
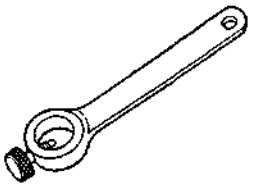
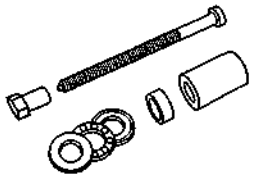
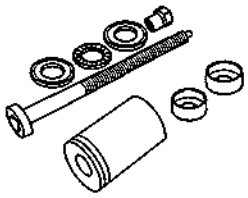
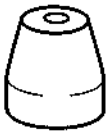
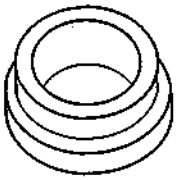
49 T028 3A0 Ball joint puller set 	49 0180 510B Preload measuring attachment 	49 U034 2A0 Lower arm bushing puller & installer set 
49 UB39 615 Bushing puller & installer set 	49 U034 208 Clip guide	49 U034 209 Clip guide 
49 G032 341 Oil seal installer 	—	—

DRIVELINE/AXLE

03 SECTION

ON-BOARD DIAGNOSTIC. . . . 03-02
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03-02 ON-BOARD DIAGNOSTIC

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RFW (REMOTE FREEWHEEL) ON-BOARD DIAGNOSIS 03-02–1
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DTC P1879 03-02–11
DTC P1880 03-02–12
DTC P1885 03-02–14

03

RFW (REMOTE FREEWHEEL) SYSTEM WIRING DIAGRAM

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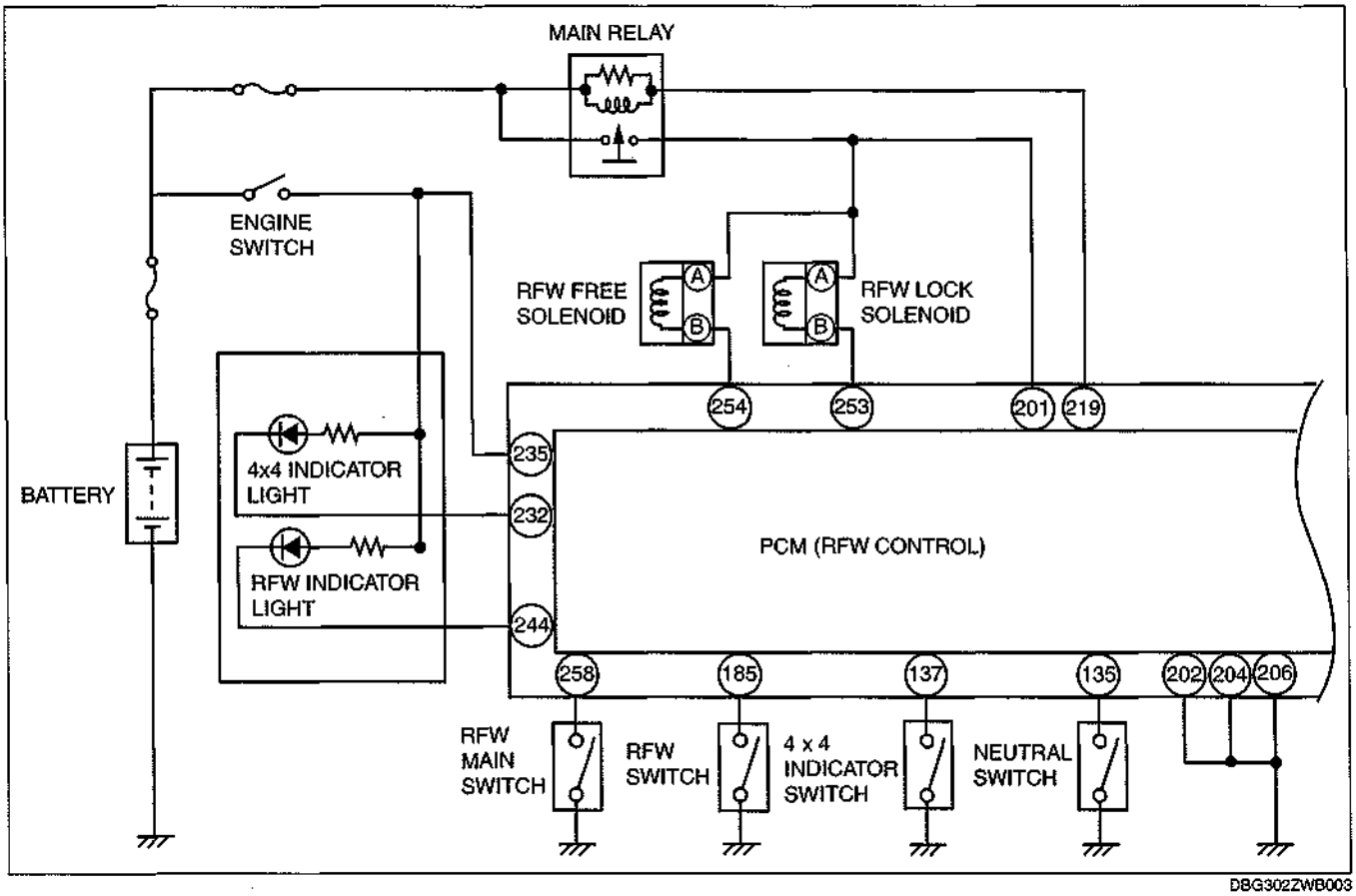


DBG302ZWB003

RFW (REMOTE FREEWHEEL) ON-BOARD DIAGNOSIS

dcf030227100w02

- The on-board diagnostic procedures are mentioned in Section 01. (See 01-02B-6 FOREWORD [WL-C, WE-C].)

DTC Table

DTC	Diagnosis system component	Page
P1812	RFW Lock solenoid valve circuit failure	(See 03-02-2 DTC P1812.)
P1813	RFW Lock solenoid valve open circuit	(See 03-02-4 DTC P1813.)
P1814	RFW Lock solenoid valve circuit/short to battery	(See 03-02-6 DTC P1814.)
P1815	RFW Lock solenoid valve circuit/short to ground	(See 03-02-8 DTC P1815.)
P1878	RFW Free solenoid valve circuit failure	(See 03-02-10 DTC P1878.)
P1879	RFW Free solenoid valve open circuit	(See 03-02-11 DTC P1879.)
P1880	RFW Free solenoid valve circuit/short to battery	(See 03-02-12 DTC P1880.)
P1885	RFW Free solenoid valve circuit/short to ground	(See 03-02-14 DTC P1885.)

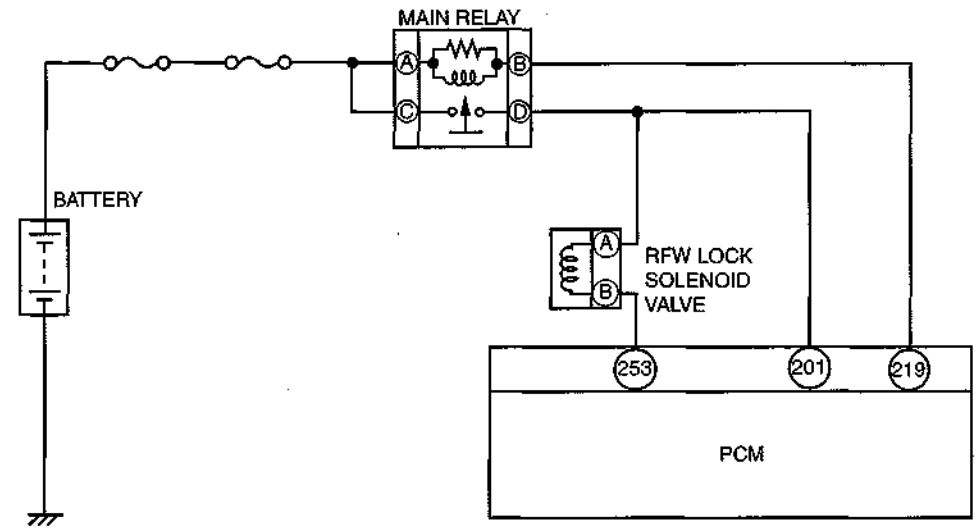
Simulation Item Table

Command name	Output part	Operation	Operating condition
4WDMODE_L	4x4 indicator light	On/Off	Engine switch at ON
HUBLOCK	RFW Lock solenoid valve		
HUBLOCK_L	RFW Free solenoid valve		
NTFLAMP	RFW indicator light		

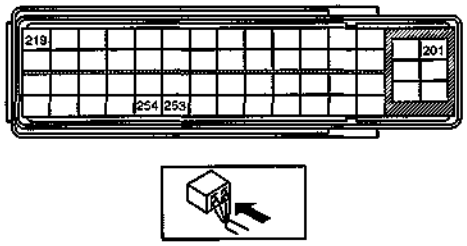
DTC P1812

dcf030227100w03

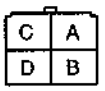
DTC P1812	RFW Lock solenoid valve circuit failure
DETECTION CONDITION	• Circuit malfunction has been detected in the Lock solenoid valve.
POSSIBLE CAUSE	• Lock solenoid valve malfunction • PCM malfunction



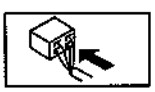
PCM WIRING HARNESS-SIDE CONNECTOR



MAIN RELAY WIRING HARNESS-SIDE CONNECTOR



RFW LOCK SOLENOID VALVE WIRING HARNESS-SIDE CONNECTOR



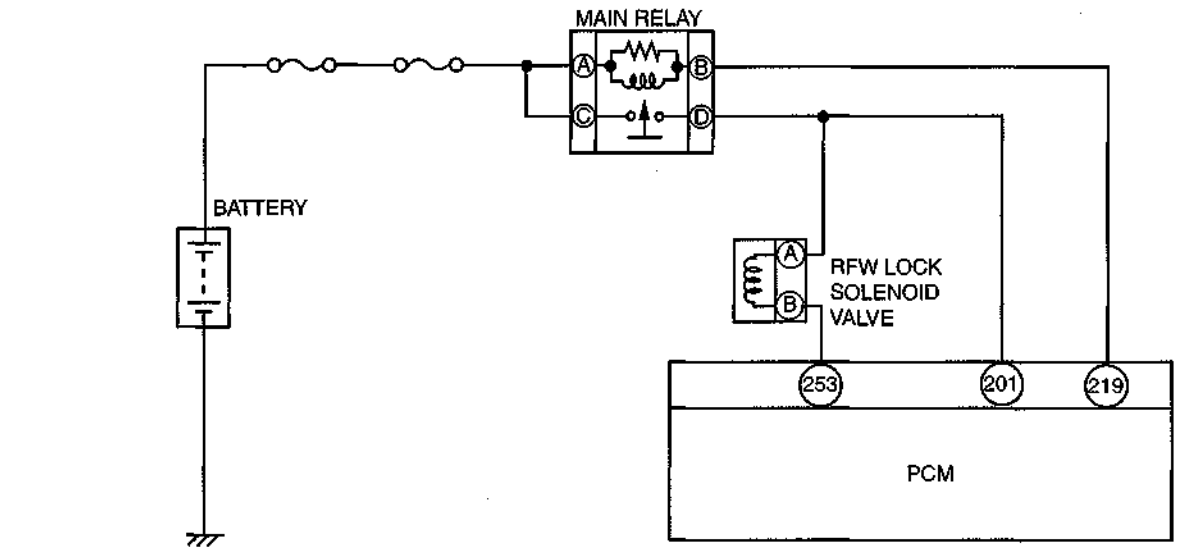
Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT LOCK SOLENOID VALVE** • Turn the engine switch off. • Remove the Lock solenoid valve. • Inspect the Lock solenoid valve. (See 03-18-4 LOCK AND FREE SOLENOID VALVES INSPECTION.) • Is there any malfunction?	Yes	Replace the Lock solenoid valve, then go to the next step.
		No	Go to the next step.
2	**VERIFY TROUBLESHOOTING OF DTC P1812 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Shift the transfer select lever. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
3	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC troubleshooting. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

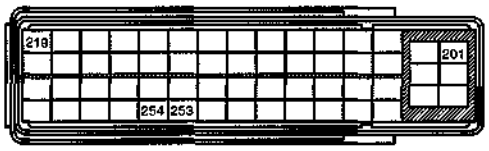
DTC P1813

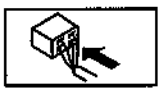
dcf030227100w04

DTC P1813	RFW Lock solenoid valve open circuit
DETECTION CONDITION	• Open circuit has been detected in the Lock solenoid valve wiring harness.
POSSIBLE CAUSE	• Lock solenoid valve malfunction • Connector or terminal malfunction • Open circuit in wiring harness between Lock solenoid valve terminal A and main relay • Open circuit in wiring harness between Lock solenoid valve terminal B and PCM terminal 253 • Short to ground in wiring harness between Lock solenoid valve terminal B and PCM terminal 253 • PCM malfunction

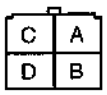


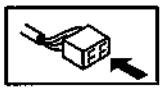
PCM WIRING HARNESS-SIDE CONNECTOR





MAIN RELAY WIRING HARNESS-SIDE CONNECTOR





RFW LOCK SOLENOID VALVE WIRING HARNESS-SIDE CONNECTOR

Diagnostic procedure

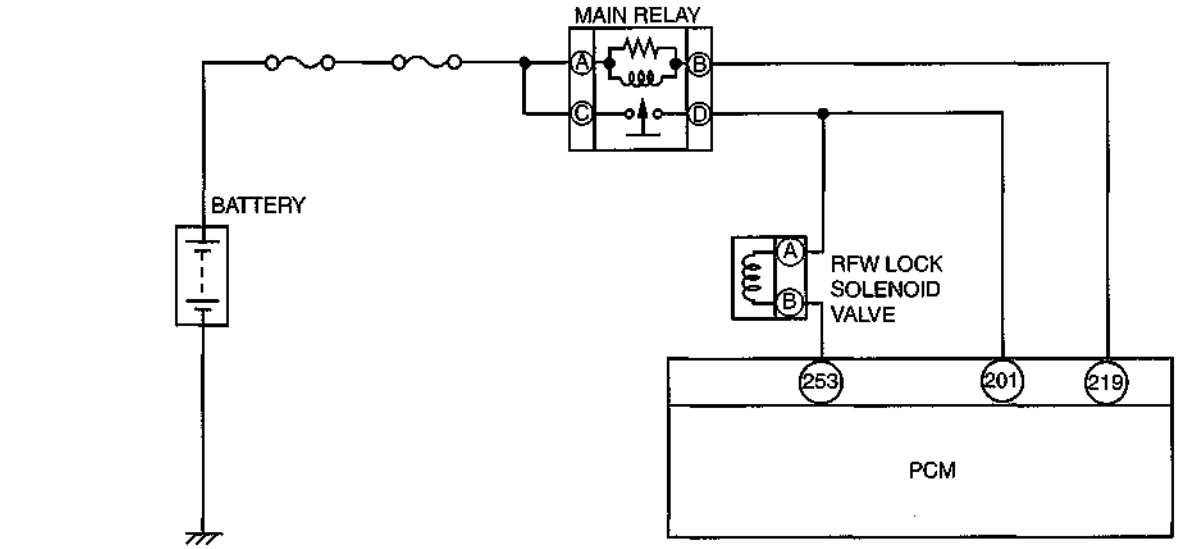
STEP	INSPECTION		ACTION
1	**INSPECT LOCK SOLENOID VALVE CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the Lock solenoid valve connector. • Inspect for poor connection (such as damaged/ pulled-out pins, and corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 6.
		No	Go to the next step.
2	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, and corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 6.
		No	Go to the next step.

STEP	INSPECTION		ACTION
3	**INSPECT LOCK SOLENOID VALVE CIRCUIT FOR OPEN CIRCUIT** • Turn the engine switch off. • Inspect for continuity between the following circuits: — Lock solenoid valve terminal A (wiring harness-side) and main relay terminal D (wiring harness-side) — Lock solenoid valve terminal B (wiring harness-side) and PCM terminal 253 (wiring harness-side) • Is there continuity?	Yes	Go to the next step.
		No	Repair or replace the wiring harness for a possible open circuit, then go to Step 6.
4	**INSPECT LOCK SOLENOID VALVE CIRCUIT FOR SHORT TO GROUND** • Turn the engine switch off. • Inspect for continuity between the following circuits: — Lock solenoid valve terminal A (wiring harness-side) and body ground — Lock solenoid valve terminal B (wiring harness-side) and body ground • Is there continuity?	Yes	Repair or replace the wiring harness for a possible short to ground, then go to Step 6.
		No	Go to the next step.
5	**INSPECT LOCK SOLENOID VALVE** • Inspect the Lock solenoid valve. (See 03-18-4 LOCK AND FREE SOLENOID VALVES INSPECTION.) • Is there any malfunction?	Yes	Replace the Lock solenoid valve, then go to the next step.
		No	Go to the next step.
6	**VERIFY TROUBLESHOOTING OF DTC P1813 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Shift the transfer select lever. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
7	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC troubleshooting. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

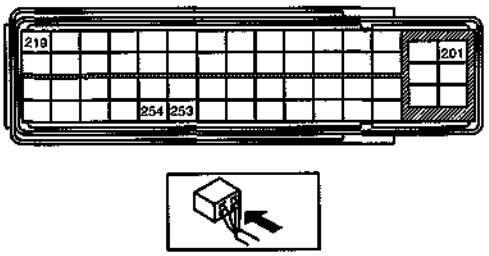
DTC P1814

dcf030227100w05

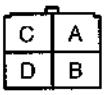
DTC P1814	RFW Lock solenoid valve circuit/short to battery
DETECTION CONDITION	• Short to power circuit has been detected in the Lock solenoid valve wiring harness.
POSSIBLE CAUSE	• Lock solenoid valve malfunction • Connector or terminal malfunction • Short to power supply in wiring harness between Lock solenoid valve terminal B and PCM terminal 253 • PCM malfunction



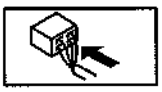
PCM WIRING HARNESS-SIDE CONNECTOR



MAIN RELAY WIRING HARNESS-SIDE CONNECTOR



RFW LOCK SOLENOID VALVE WIRING HARNESS-SIDE CONNECTOR



Diagnostic procedure

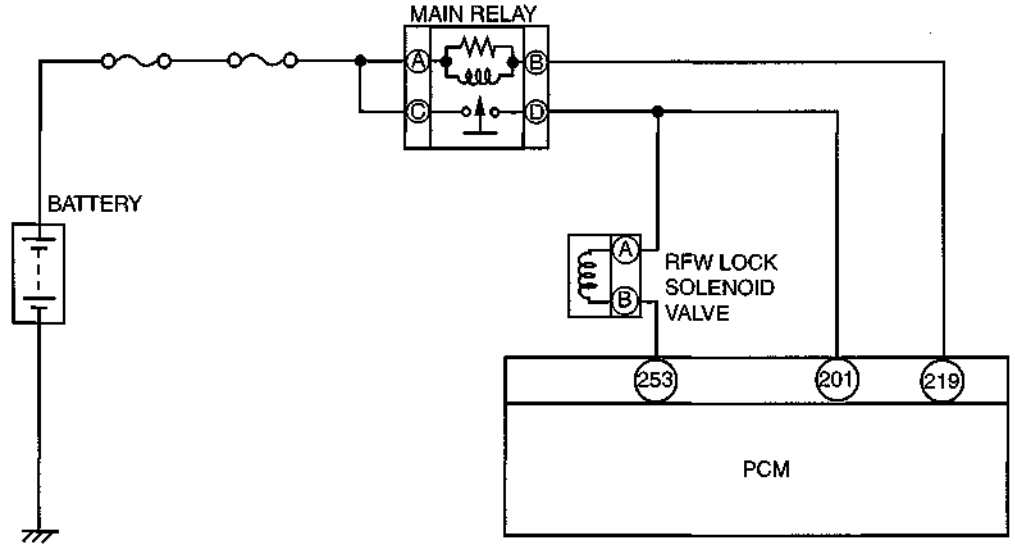
STEP	INSPECTION		ACTION
1	**INSPECT LOCK SOLENOID VALVE CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the Lock solenoid valve connector. • Inspect for poor connection (such as damaged/ pulled-out pins, and corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 5.
		No	Go to the next step.
2	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, and corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 5.
		No	Go to the next step.

STEP	INSPECTION		ACTION
3	**INSPECT LOCK SOLENOID VALVE CIRCUIT SHORT TO POWER SUPPLY** • Turn the engine switch to the ON position (Engine off). • Measure the voltage between the following circuits: — Lock solenoid valve terminal B (wiring harness-side) and body ground • Is the voltage **B+**?	Yes	Repair or replace the wiring harness for short to power supply, then go to the Step 5.
		No	Go to the next step.
4	**INSPECT LOCK SOLENOID VALVE** • Inspect the Lock solenoid valve. (See 03-18-4 LOCK AND FREE SOLENOID VALVES INSPECTION.) • Is there any malfunction?	Yes	Replace the Lock solenoid valve, then go to the next step.
		No	Go to the next step.
5	**VERIFY TROUBLESHOOTING OF DTC P1814 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Shift the transfer select lever. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
6	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC troubleshooting. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

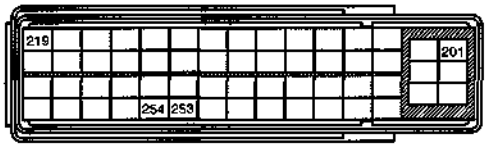
DTC P1815

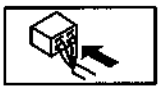
dcf030227100w06

DTC P1815	RFW Lock solenoid valve circuit/short to ground
DETECTION CONDITION	• Short to ground circuit has been detected in the Lock solenoid valve wiring harness.
POSSIBLE CAUSE	• Lock solenoid valve malfunction • Connector or terminal malfunction • Open circuit in wiring harness between Lock solenoid valve terminal A and main relay • Open circuit in wiring harness between Lock solenoid valve terminal B and PCM terminal 253 • Short to ground in wiring harness between Lock solenoid valve terminal B and PCM terminal 253 • PCM malfunction

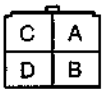


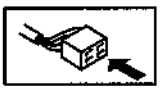
PCM WIRING HARNESS-SIDE CONNECTOR



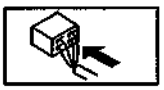


MAIN RELAY WIRING HARNESS-SIDE CONNECTOR





RFW LOCK SOLENOID VALVE WIRING HARNESS-SIDE CONNECTOR



Diagnostic procedure

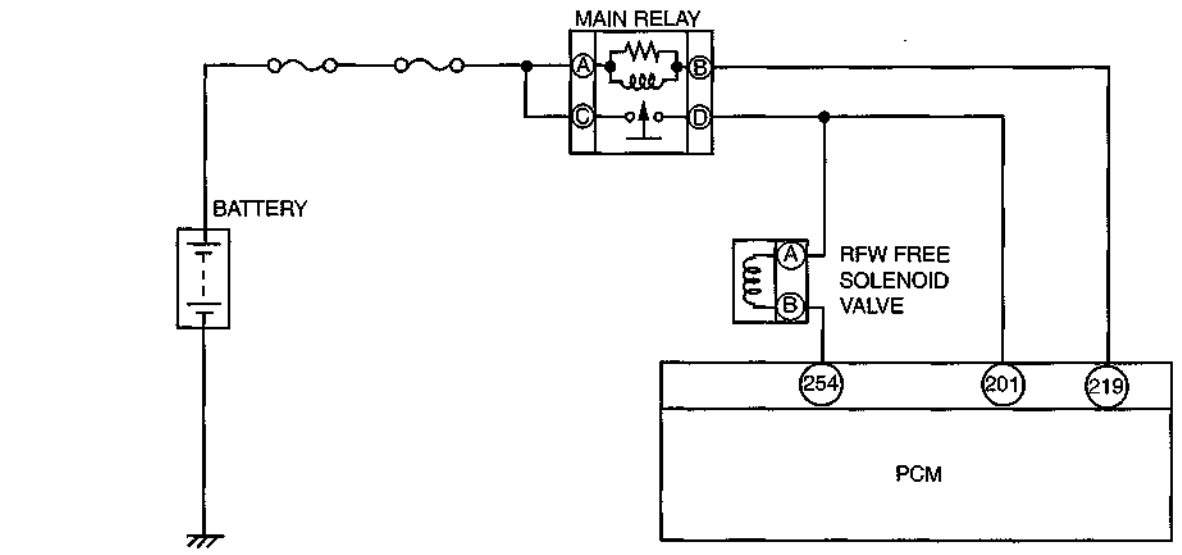
STEP	INSPECTION		ACTION
1	**INSPECT LOCK SOLENOID VALVE CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the Lock solenoid valve connector. • Inspect for poor connection (such as damaged/ pulled-out pins, and corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 7.
		No	Go to the next step.
2	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, and corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 7.
		No	Go to the next step.

STEP	INSPECTION		ACTION
3	**INSPECT LOCK SOLENOID VALVE POWER SUPPLY CIRCUIT FOR OPEN CIRCUIT** • Turn the engine switch to the ON position (Engine off). • Measure the voltage between Lock solenoid valve terminal A (wiring harness-side) and body ground. • Is the voltage **B+**?	Yes	Go to the next step.
		No	Repair or replace the wiring harness for open, then go to Step 7.
4	**INSPECT LOCK SOLENOID VALVE CIRCUIT FOR SHORT TO GROUND** • Turn the engine switch off. • Inspect for continuity between Lock solenoid valve terminal B (wiring harness-side) and body ground. • Is there continuity?	Yes	Repair or replace the wiring harness for a possible short to ground, then go to Step 7.
		No	Go to the next step.
5	**INSPECT LOCK SOLENOID VALVE CIRCUIT FOR OPEN CIRCUIT** • Turn the engine switch off. • Inspect for continuity between the following circuits: — Lock solenoid valve terminal B (wiring harness-side) and PCM terminal 253 (wiring harness-side) • Is there continuity?	Yes	Go to the next step.
		No	Repair or replace the wiring harness for a possible open circuit, then go to Step 7.
6	**INSPECT LOCK SOLENOID VALVE** • Inspect the Lock solenoid valve. (See 03-18-4 LOCK AND FREE SOLENOID VALVES INSPECTION.) • Is there any malfunction?	Yes	Replace the Lock solenoid valve, then go to the next step.
		No	Go to the next step.
7	**VERIFY TROUBLESHOOTING OF DTC P1815 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Shift the transfer select lever. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
8	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC troubleshooting. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

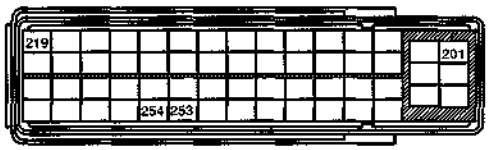
DTC P1878

dcf030227100w07

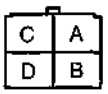
DTC P1878	RFW Free solenoid valve circuit failure
DETECTION CONDITION	• Circuit malfunction has been detected in the Free solenoid valve.
POSSIBLE CAUSE	• Free solenoid valve malfunction • PCM malfunction



PCM WIRING HARNESS-SIDE CONNECTOR



MAIN RELAY WIRING HARNESS-SIDE CONNECTOR



RFW FREE SOLENOID VALVE WIRING HARNESS-SIDE CONNECTOR

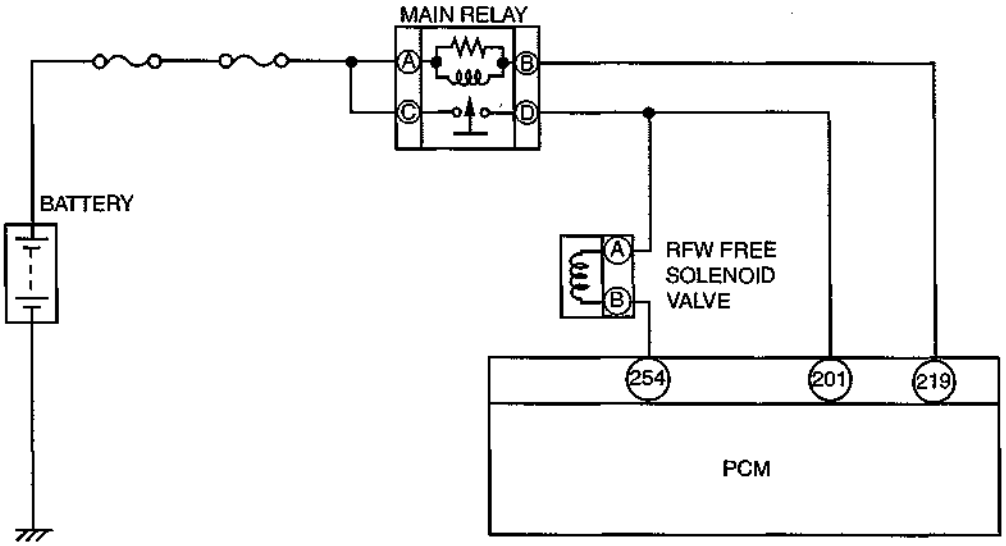
Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT FREE SOLENOID VALVE** • Turn the engine switch off. • Remove the Free solenoid valve. • Inspect the Free solenoid valve. (See 03-18-4 LOCK AND FREE SOLENOID VALVES INSPECTION.) • Is there any malfunction?	Yes	Replace the Free solenoid valve, then go to the next step.
		No	Go to the next step.
2	**VERIFY TROUBLESHOOTING OF DTC P1878 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Shift the transfer select lever. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
3	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC troubleshooting. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

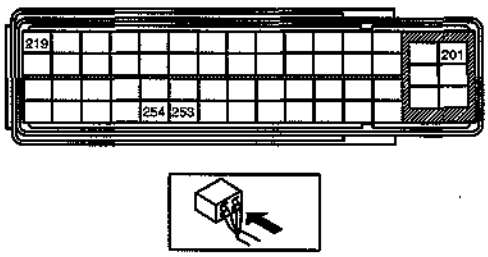
DTC P1879

dcf030227100w08

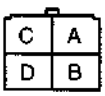
DTC P1879	RFW Free solenoid valve circuit/open
DETECTION CONDITION	• Open circuit has been detected in the Free solenoid valve wiring harness.
POSSIBLE CAUSE	• Free solenoid valve malfunction • Connector or terminal malfunction • Open circuit in wiring harness between Free solenoid valve terminal A and main relay • Open circuit in wiring harness between Free solenoid valve terminal B and PCM terminal 254 • Short to ground in wiring harness between Free solenoid valve terminal B and PCM terminal 254 • PCM malfunction

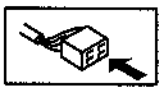


PCM WIRING HARNESS-SIDE CONNECTOR



MAIN RELAY WIRING HARNESS-SIDE CONNECTOR





RFW FREE SOLENOID VALVE WIRING HARNESS-SIDE CONNECTOR

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT FREE SOLENOID VALVE CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the Free solenoid valve connector. • Inspect for poor connection (such as damaged/ pulled-out pins, and corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 6.
		No	Go to the next step.
2	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, and corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 6.
		No	Go to the next step.

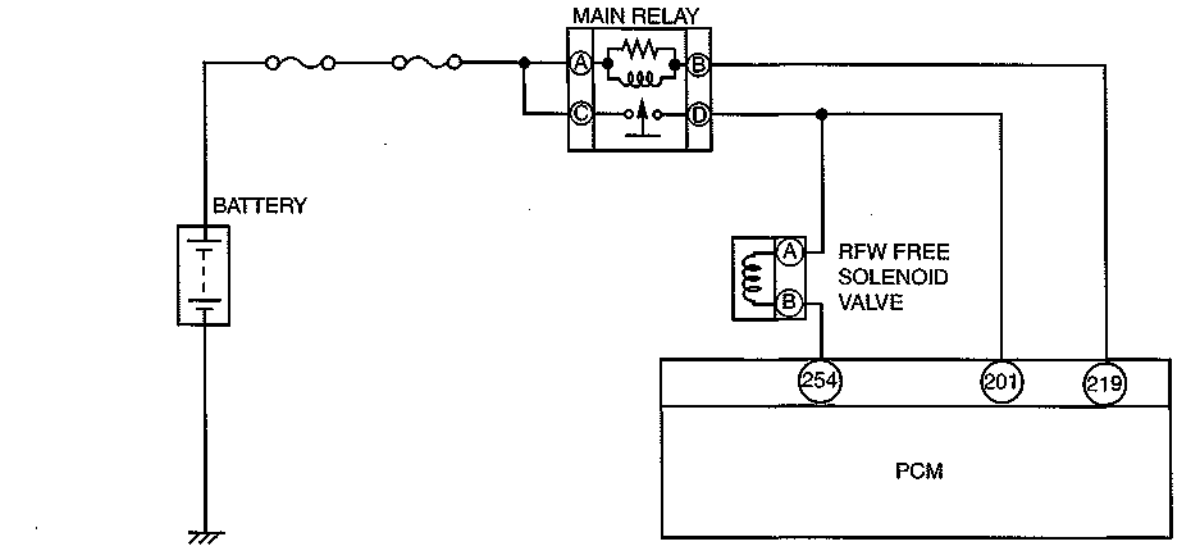
STEP	INSPECTION		ACTION
3	**INSPECT FREE SOLENOID VALVE CIRCUIT FOR OPEN CIRCUIT** • Turn the engine switch off. • Inspect for continuity between the following circuits: — Free solenoid valve terminal A (wiring harness-side) and main relay terminal D (wiring harness-side) — Free solenoid valve terminal B (wiring harness-side) and PCM terminal 254 (wiring harness-side) • Is there continuity?	Yes	Go to the next step.
		No	Repair or replace the wiring harness for a possible open circuit, then go to Step 6.
4	**INSPECT FREE SOLENOID VALVE CIRCUIT FOR SHORT TO GROUND** • Turn the engine switch off. • Inspect for continuity between the following circuits: — Free solenoid valve terminal A (wiring harness-side) and body ground — Free solenoid valve terminal B (wiring harness-side) and body ground • Is there continuity?	Yes	Repair or replace the wiring harness for a possible short to ground, then go to Step 6.
		No	Go to the next step.
5	**INSPECT FREE SOLENOID VALVE** • Inspect the Free solenoid valve. (See 03-18-4 LOCK AND FREE SOLENOID VALVES INSPECTION.) • Is there any malfunction?	Yes	Replace the Free solenoid valve, then go to the next step.
		No	Go to the next step.
6	**VERIFY TROUBLESHOOTING OF DTC P1879 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Shift the transfer select lever. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
7	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC troubleshooting. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

DTC P1880

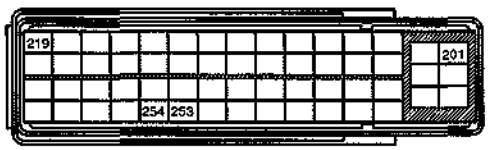
dcf030227100w09

DTC P1880	RFW Free solenoid valve circuit/short to battery
DETECTION CONDITION	• Short to power circuit has been detected in the Free solenoid valve wiring harness.
POSSIBLE CAUSE	• Free solenoid valve malfunction • Connector or terminal malfunction • Short to power supply in wiring harness between Free solenoid valve terminal B and PCM terminal 254 • PCM malfunction

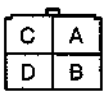
DTC P1880	RFW Free solenoid valve circuit/short to battery



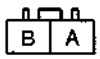
PCM
WIRING HARNESS-SIDE CONNECTOR

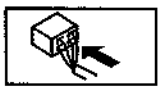


MAIN RELAY WIRING
HARNESS-SIDE CONNECTOR



RFW FREE SOLENOID VALVE
WIRING HARNESS-SIDE
CONNECTOR





Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT FREE SOLENOID VALVE CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the Free solenoid valve connector. • Inspect for poor connection (such as damaged/ pulled-out pins, and corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 5.
		No	Go to the next step.
2	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, and corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 5.
		No	Go to the next step.
3	**INSPECT FREE SOLENOID VALVE CIRCUIT SHORT TO POWER SUPPLY** • Turn the engine switch to the ON position (Engine off). • Measure the voltage between the following circuits: — Free solenoid valve terminal B (wiring harness-side) and body ground • Is the voltage B+?	Yes	Repair or replace the wiring harness for short to power supply, then go to the Step 5.
		No	Go to the next step.

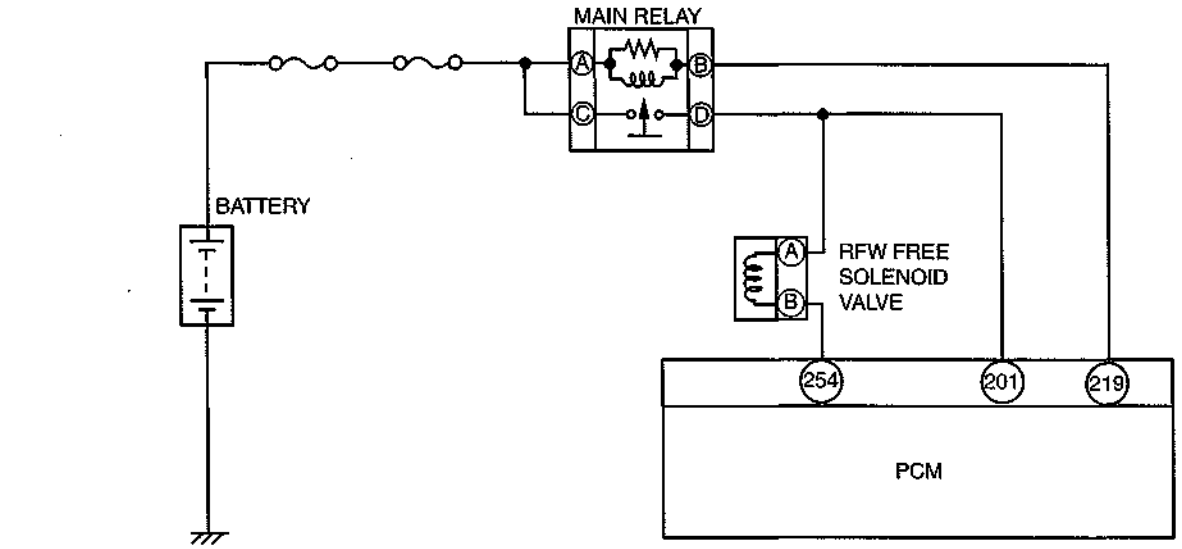
STEP	INSPECTION		ACTION
4	**INSPECT FREE SOLENOID VALVE** • Inspect the Free solenoid valve. (See 03-18-4 LOCK AND FREE SOLENOID VALVES INSPECTION.) • Is there any malfunction?	Yes	Replace the Free solenoid valve, then go to the next step.
		No	Go to the next step.
5	**VERIFY TROUBLESHOOTING OF DTC P1880 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Shift the transfer select lever. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
6	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC troubleshooting. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

DTC P1885

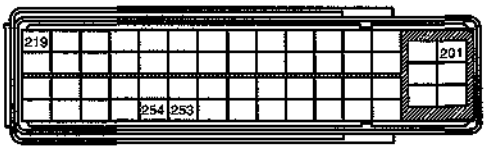
dcf030227100w10

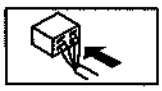
DTC P1885	RFW Free solenoid valve circuit/short to ground
DETECTION CONDITION	• Short to ground circuit has been detected in the Free solenoid valve wiring harness.
POSSIBLE CAUSE	• Free solenoid valve malfunction • Connector or terminal malfunction • Open circuit in wiring harness between Free solenoid valve terminal A and main relay • Open circuit in wiring harness between Free solenoid valve terminal B and PCM terminal 254 • Short to GND in wiring harness between Free solenoid valve terminal B and PCM terminal 254 • PCM malfunction

DTC P1885	RFW Free solenoid valve circuit/short to ground

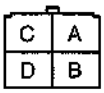


PCM
WIRING HARNESS-SIDE CONNECTOR





MAIN RELAY WIRING
HARNESS-SIDE CONNECTOR



RFW FREE SOLENOID VALVE
WIRING HARNESS-SIDE
CONNECTOR

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT FREE SOLENOID VALVE CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the Free solenoid valve connector. • Inspect for poor connection (such as damaged/ pulled-out pins, and corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 7.
		No	Go to the next step.
2	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, and corrosion). • Is there any malfunction?	Yes	Repair or replace the terminal, then go to Step 7.
		No	Go to the next step.
3	**INSPECT FREE SOLENOID VALVE POWER SUPPLY CIRCUIT FOR OPEN CIRCUIT** • Turn the engine switch to the ON position (Engine off). • Measure the voltage between Free solenoid valve terminal A (wiring harness-side) and body ground. • Is the voltage **B+**?	Yes	Go to the next step.
		No	Repair or replace the wiring harness for open, then go to Step 7.

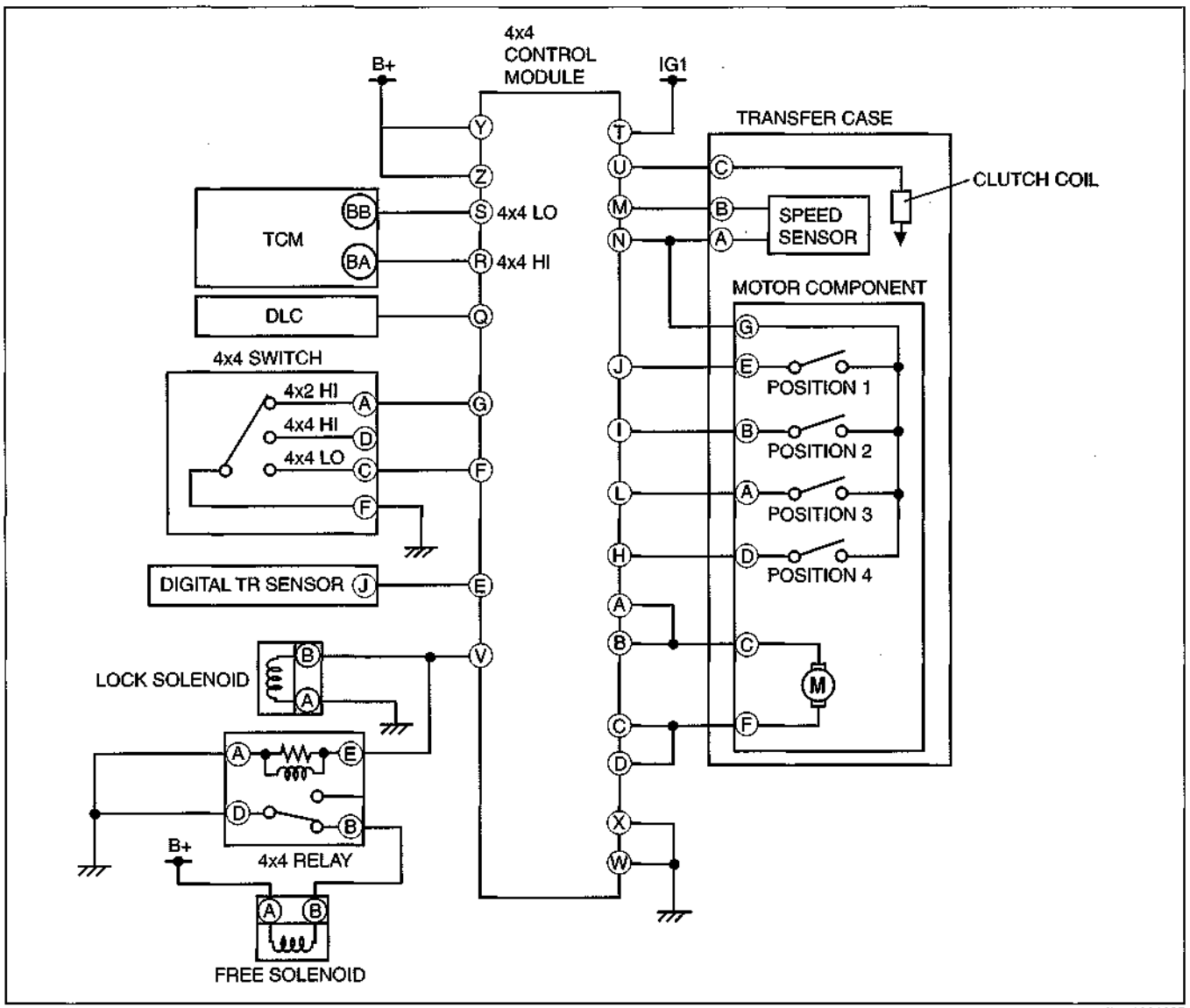
STEP	INSPECTION		ACTION
4	**INSPECT FREE SOLENOID VALVE CIRCUIT FOR SHORT TO GROUND** • Turn the engine switch off. • Inspect for continuity between Free solenoid valve terminal B (wiring harness-side) and body ground. • Is there continuity?	Yes	Repair or replace the wiring harness for a possible short to ground, then go to Step 7.
		No	Go to the next step.
5	**INSPECT FREE SOLENOID VALVE CIRCUIT FOR OPEN CIRCUIT** • Turn the engine switch off. • Inspect for continuity between the following circuits: — Free solenoid valve terminal B (wiring harness-side) and PCM terminal 254 (wiring harness-side) • Is there continuity?	Yes	Go to the next step.
		No	Repair or replace the wiring harness for a possible open circuit, then go to Step 7.
6	**INSPECT FREE SOLENOID VALVE** • Inspect the Free solenoid valve. (See 03-18-4 LOCK AND FREE SOLENOID VALVES INSPECTION.) • Is there any malfunction?	Yes	Replace the Free solenoid valve, then go to the next step.
		No	Go to the next step.
7	**VERIFY TROUBLESHOOTING OF DTC P1885 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear the DTC from the PCM memory using the current diagnostic tool. • Start the engine. • Shift the transfer select lever. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step. (See 01-40B-9 PCM REMOVAL/INSTALLATION [WL-C, WE-C].)
		No	Go to the next step.
8	**VERIFY AFTER REPAIR PROCEDURE** • Perform the "After Repair Procedure". (See 01-02B-10 AFTER REPAIR PROCEDURE [WL-C, WE-C].) • Are any DTCs present?	Yes	Go to the applicable DTC troubleshooting. (See 01-02B-11 DTC TABLE [WL-C, WE-C].)
		No	Troubleshooting completed.

03-02 ON-BOARD DIAGNOSTIC [4x4 control module]

4x4 CONTROL SYSTEM WIRING DIAGRAM [4x4 control module]..... 03-02–2
4x4 CONTROL SYSTEM ON-BOARD DIAGNOSIS [4x4 control module].... 03-02–2
DTC No.1 [4x4 control module]..... 03-02–4
DTC No.2 [4x4 control module]..... 03-02–5
DTC No.3 [4x4 control module] 03-02–6
DTC No.4 [4x4 control module] 03-02–8
DTC No.5 [4x4 control module] 03-02–9
DTC No.6 [4x4 control module] 03-02–11
DTC No.7 [4x4 control module] 03-02–12

4x4 CONTROL SYSTEM WIRING DIAGRAM [4x4 control module]

id0302a1801500



amnfw00001937

4x4 CONTROL SYSTEM ON-BOARD DIAGNOSIS[4x4 control module]

id0302a1801600

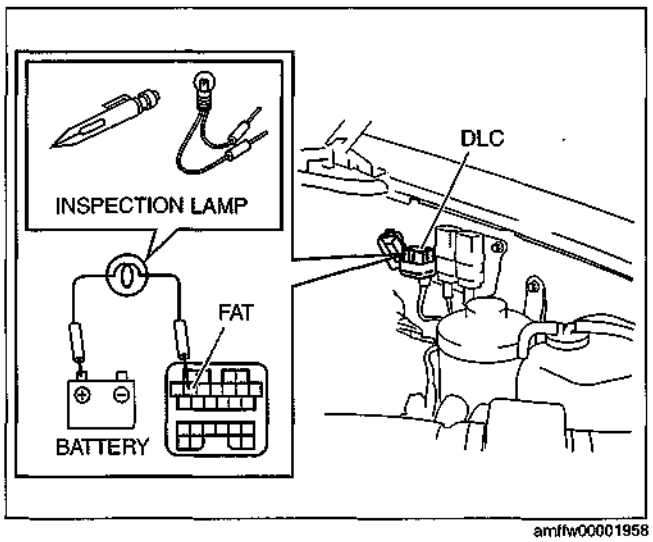
Reading DTC procedure

1. Turn the engine switch off.
2. Connect an inspection lamp to the DLC terminal FAT and battery.
3. Turn the engine switch to the ON position. (Engine off)
4. The inspection lamp will indicate a DTC by flashing.

Note

- A verified DTC is flashed 3 times repeatedly by the inspection lamp.
- If more than one DTC is detected, the first DTC is displayed, and then next one is displayed.

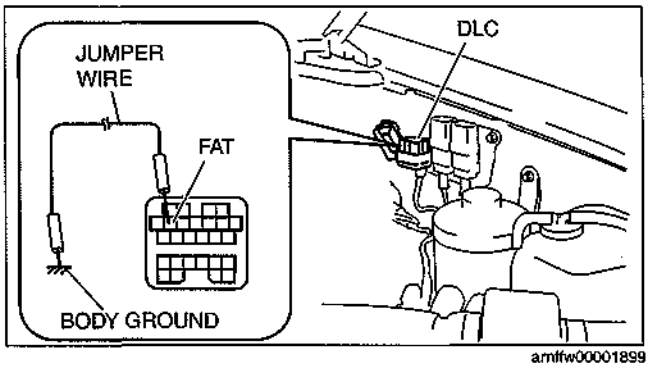
5. Repair the malfunctioning part using the verified DTC.
6. After completion of repairs, clear all DTCs from memory.



amnfw00001958

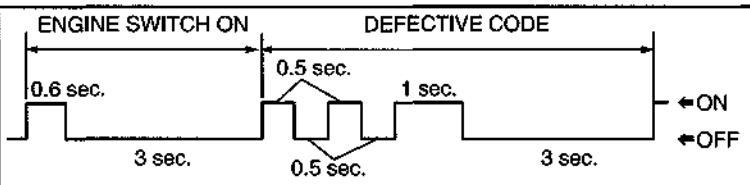
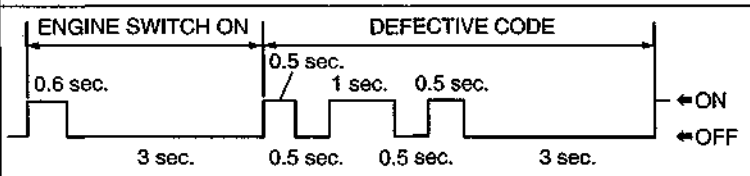
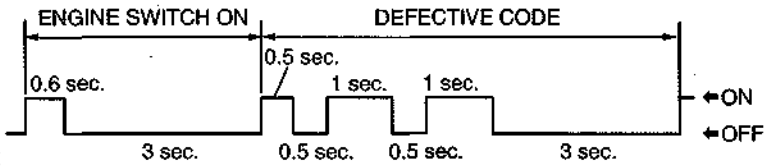
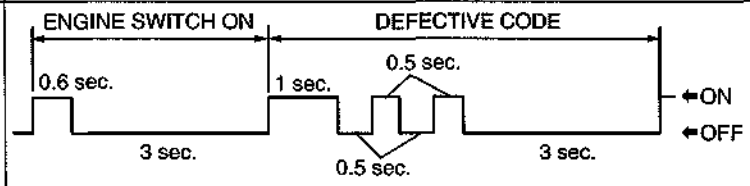
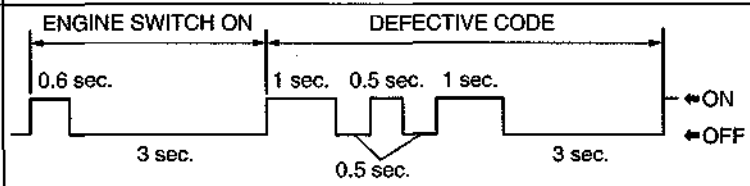
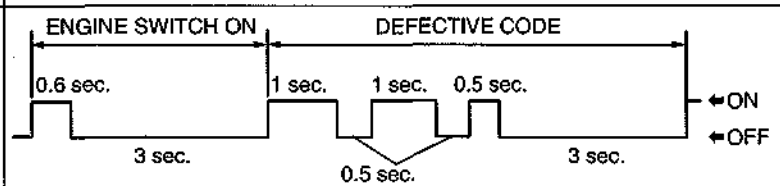
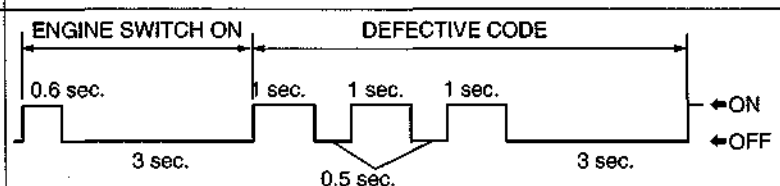
Clearing DTC procedure

1. Turn the engine switch off.
2. Attach a jumper wire to the DLC terminal FAT and ground.
3. Turn the engine switch to the ON position. (Engine off)
4. Turn the engine switch off after 5 s or more has elapsed.
5. Remove the jumper wire.
6. Verify that the same DTC is not present.



amlfw00001899

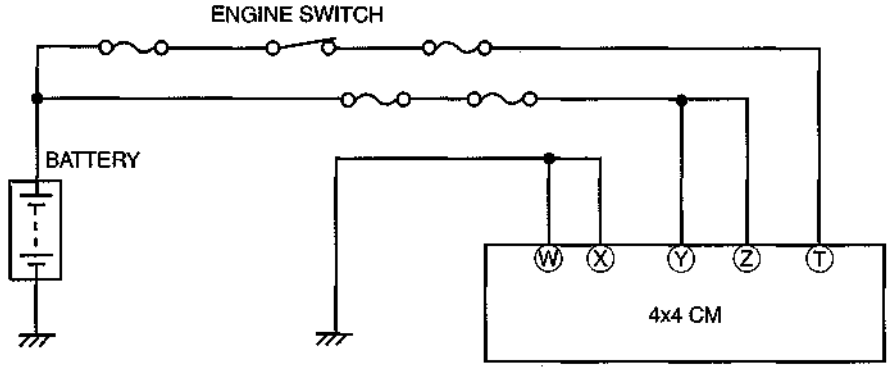
DTC Table

DTC No.	Inspection lamp flashing pattern	Possible cause	Page
1		4x4 control module malfunction	(See DTC No.1 [4x4 control module].)
2		Motor component (shift motor) malfunction	(See DTC No.2 [4x4 control module].)
3		Clutch coil malfunction	(See DTC No.3 [4x4 control module].)
4		Speed sensor malfunction	(See DTC No.4 [4x4 control module].)
5		Solenoid valve malfunction	(See DTC No.5 [4x4 control module].)
6		4x4 switch malfunction	(See DTC No.6 [4x4 control module].)
7		Motor component (position sensor) malfunction	(See DTC No.7 [4x4 control module].)

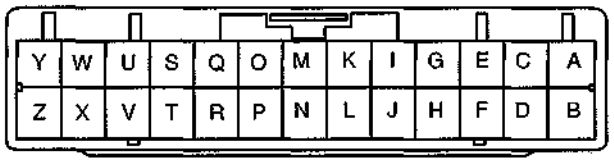
DTC No.1 [4x4 control module]

id0302a1801700

DTC No.1	4x4 CM malfunction
DETECTION CONDITION	• Open circuit or short to ground has been detected in the 4x4 CM wiring harness.
POSSIBLE CAUSE	• Open circuit or short to ground in the wiring harness between the following 4x4 CM terminals T, Y, Z and battery • Open circuit in the wiring harness between the following 4x4 CM terminals W, X and ground • 4x4 CM malfunction • Poor connection at connector (female terminal)



4x4 CM
WIRING HARNESS-SIDE CONNECTOR



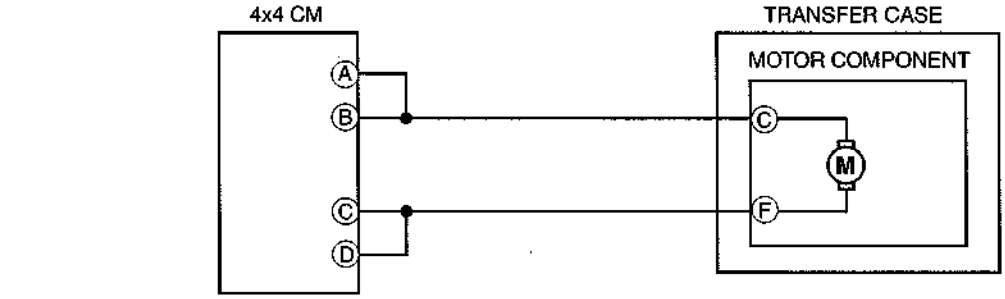
Diagnostic procedure

STEP	INSPECTION		ACTION
1	**MEASURE VOLTAGE BETWEEN 4x4 CONTROL MODULE CONNECTOR TERMINAL T, Y, Z AND GROUND** • Turn engine switch ON. • Is the voltage greater than 10 V?	Yes	Go to the next step.
		No	Repair or replace the wiring harness, then go to step 3.
2	**INSPECT FOR CONTINUITY BETWEEN 4x4 CONTROL MODULE CONNECTOR TERMINAL W, X AND GROUND** • Turn engine switch OFF. • Is there continuity?	Yes	Go to the next step.
		No	Repair or replace the wiring harness, then go to next step.
3	**VERIFY THAT THE SAME DTC IS NOT PRESENT** • Clear the DTCs from the memory. (See 03-02-2 4x4 CONTROL SYSTEM ON-BOARD DIAGNOSIS[4x4 control module].) • Are any DTCs present?	Yes	If the malfunction recurs, replace the 4x4 CM, then go to the next step. (See 03-18-5 4x4 CONTROL MODULE REMOVAL/ INSTALLATION [AT (5R55S)].)
		No	Go to the next step.
2	**VERIFY THAT NO OTHER DTCS ARE PRESENT** • Are any DTCs present?	Yes	Go to the applicable DTC troubleshooting. (See 03-02-2 4x4 CONTROL SYSTEM ON-BOARD DIAGNOSIS[4x4 control module].)
		No	Troubleshooting completed.

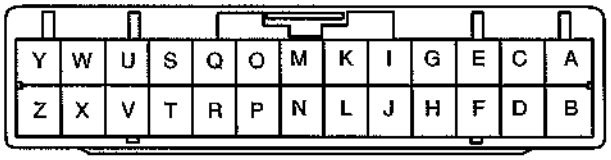
DTC No.2 [4x4 control module]

id0302a1801800

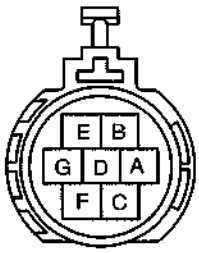
DTC No.2	Motor component (shift motor) malfunction
DETECTION CONDITION	• Open circuit or short to ground has been detected in the motor component (shift motor) wiring harness.
POSSIBLE CAUSE	• Open circuit or short to ground in the wiring harness between the following 4x4 CM terminals and the motor component (shift motor) terminals: — 4x4 CM terminal A— motor component (shift motor) terminal C — 4x4 CM terminal B— motor component (shift motor) terminal C — 4x4 CM terminal C— motor component (shift motor) terminal F — 4x4 CM terminal D— motor component (shift motor) terminal F • Motor component (shift motor) malfunction • Poor connection at connector (female terminal)

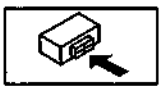


4x4 CM
WIRING HARNESS-SIDE CONNECTOR



MOTOR COMPONENT
WIRING HARNESS-SIDE CONNECTOR





Diagnostic procedure

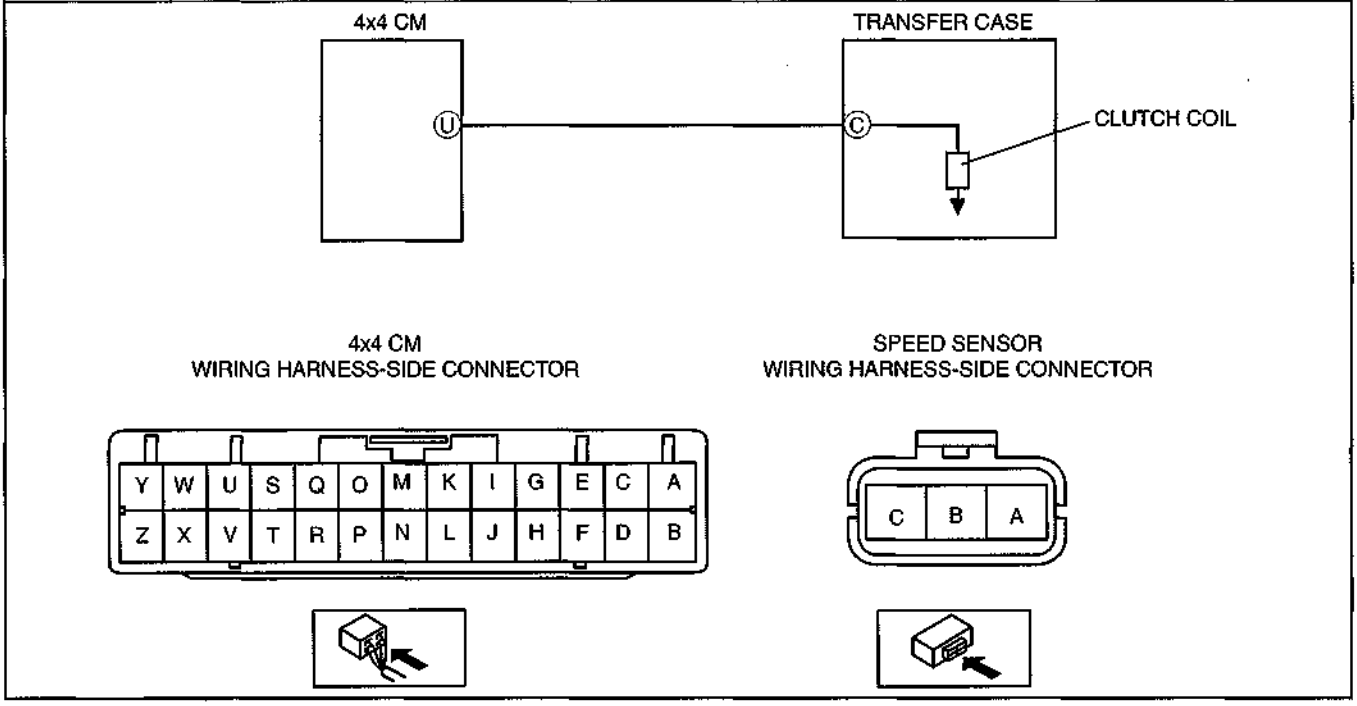
STEP	INSPECTION		ACTION
1	**INSPECT MOTOR COMPONENT (SHIFT MOTOR)** • Turn the engine switch off. • Inspect the motor component (shift motor). (See 03-16-4 MOTOR INSPECTION [5R55S].) • Is the motor component (shift motor)?	Yes	Go to the next step.
		No	Replace the motor component, then go to step 4.
2	**INSPECT MOTOR COMPONENT (SHIFT MOTOR) WIRING HARNESS FOR SHORT TO GROUND** • Disconnect the 4x4 CM connector. • Disconnect the motor component connector. • Inspect for continuity between the motor component connector terminals A, B, C, D (vehicle harness-side) and body ground. • Is there continuity?	Yes	Repair or replace the wiring harness, then go to Step 4.
		No	Go to the next step.

STEP	INSPECTION		ACTION
3	**INSPECT MOTOR COMPONENT (SHIFT MOTOR) WIRING HARNESS FOR OPEN CIRCUIT** • Inspect for continuity between the 4x4 CM connector (vehicle harness-side) and the following vehicle harness-side terminals of motor component: — 4x4 CM connector A— Motor component (shift motor) terminal C — 4x4 CM connector B— Motor component (shift motor) terminal C — 4x4 CM connector C— Motor component (shift motor) terminal F — 4x4 CM connector D— Motor component (shift motor) terminal F • Is there continuity?	Yes	Go to the next step.
		No	Repair or replace the wiring harness, then go to next step.
4	**VERIFY THAT THE SAME DTC IS NOT PRESENT** • Reconnect all disconnected connectors. • Clear the DTCs from the memory. (See 03-02-2 4x4 CONTROL SYSTEM ON-BOARD DIAGNOSIS[4x4 control module].) • Change the current transfer mode by operating the 4x4 switch.(2H-4H-4L) • Are any DTCs present?	Yes	Repeat the inspection from Step 1. If the malfunction recurs, replace the 4x4 CM, then go to the next step. (See 03-18-5 4x4 CONTROL MODULE REMOVAL/ INSTALLATION [AT (5R55S)].)
		No	Go to the next step.
5	**VERIFY THAT NO OTHER DTCS ARE PRESENT** • Are any DTCs present?	Yes	Go to the applicable DTC troubleshooting. (See 03-02-2 4x4 CONTROL SYSTEM ON-BOARD DIAGNOSIS[4x4 control module].)
		No	Troubleshooting completed.

DTC No.3 [4x4 control module]

id0302a1801900

DTC No.3	Clutch coil malfunction
DETECTION CONDITION	• Open circuit, short to ground or short to battery has been detected in the clutch coil wiring harness.
POSSIBLE CAUSE	• Open circuit in the wiring harness between 4x4 CM terminal U and clutch coil terminal C, short to battery or to ground • Clutch coil malfunction • Poor connection at connector (female terminal)



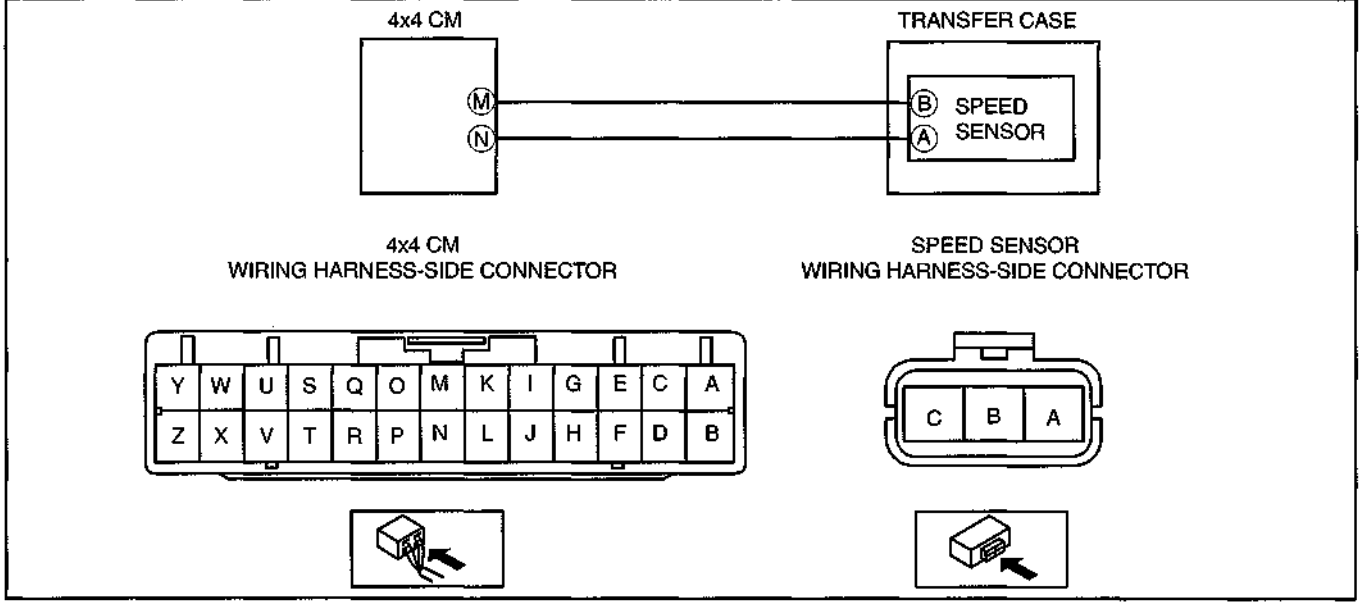
Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT CLUTCH COIL** • Turn the engine switch off. • Inspect the clutch coil. (See 03-16-6 CLUTCH COIL INSPECTION [5R55S].) • Is the clutch coil normal?	Yes	Go to the next step.
		No	Replace the clutch coil, then go to step 5.
2	**INSPECT CLUTCH COIL WIRING HARNESS FOR SHORT TO GROUND** • Disconnect the 4x4 CM connector. • Disconnect the clutch coil connector. • Inspect for continuity between the 4x4 CM connector terminal U (vehicle harness-side) and body ground. • Is there continuity?	Yes	Repair or replace the wiring harness, then go to step 5.
		No	Go to the next step.
3	**INSPECT CLUTCH COIL WIRING HARNESS FOR SHORT TO POWER SUPPLY CIRCUIT** • Measure voltage between the clutch coil connector terminal C (vehicle harness-side) and body ground. • Is the voltage **1 V** or less?	Yes	Go to the next step.
		No	Repair or replace the wiring harness, then go to step 5.
4	**INSPECT CLUTCH COIL WIRING HARNESS FOR OPEN CIRCUIT** • Inspect for continuity between the 4x4 CM connector U (vehicle harness-side) and the vehicle harness-side terminal C of clutch coil. • Is there continuity?	Yes	Go to the next step.
		No	Repair or replace the wiring harness, then go to step 5.
5	**VERIFY THAT THE SAME DTC IS NOT PRESENT** • Reconnect all disconnected connectors. • Clear the DTCs from the memory. (See 03-02-2 4x4 CONTROL SYSTEM ON-BOARD DIAGNOSIS[4x4 control module].) • Change the current transfer mode by operating the 4x4 switch.(2H-4H) • Are any DTCs present?	Yes	Repeat the inspection from step 1. If the malfunction recurs, replace the 4x4 CM, then go to the next step. (See 03-18-5 4x4 CONTROL MODULE REMOVAL/ INSTALLATION [AT (5R55S)].)
		No	Go to the next step.
6	**VERIFY THAT NO OTHER DTCS ARE PRESENT** • Are any DTCs present?	Yes	Go to the applicable DTC troubleshooting. (See 03-02-2 4x4 CONTROL SYSTEM ON-BOARD DIAGNOSIS[4x4 control module].)
		No	Troubleshooting completed.

DTC No.4 [4x4 control module]

id0302a1802000

DTC No.4	Speed sensor malfunction
DETECTION CONDITION	• Open circuit or short to ground has been detected in the speed sensor wiring harness.
POSSIBLE CAUSE	• Open circuit or short to ground in the wiring harness between the following 4x4 CM terminals and the speed sensor terminals: — 4x4 CM terminal M— speed sensor terminal B — 4x4 CM terminal N— speed sensor terminal A • Speed sensor malfunction • Poor connection at connector (female terminal)



Diagnostic procedure

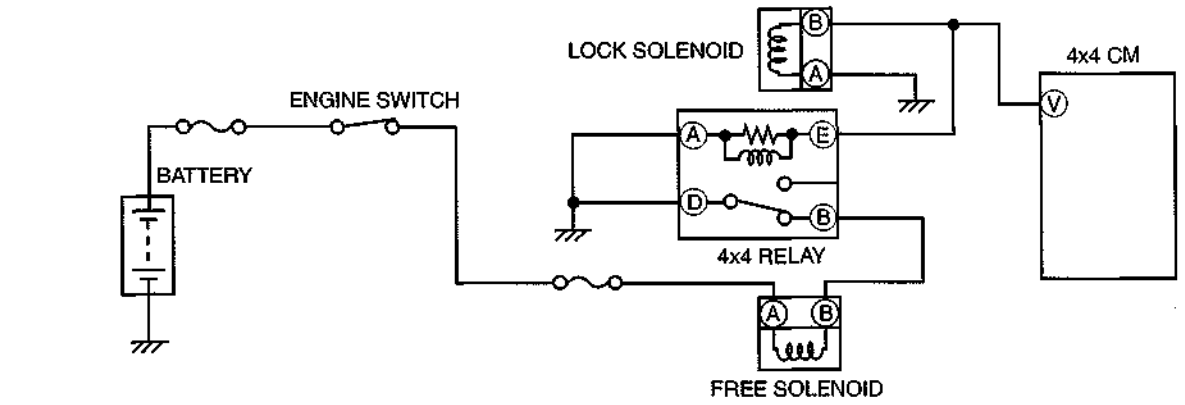
STEP	INSPECTION		ACTION
1	**INSPECT SPEED SENSOR** • Turn the engine switch off. • Inspect the speed sensor. (See 03-16-3 SPEED SENSOR INSPECTION [5R55S].) • Is the speed sensor normal?	Yes	Go to the next step.
		No	Replace the speed sensor, then go to step 4. (See 03-16-4 SPEED SENSOR REMOVAL/INSTALLATION [5R55S].)
2	**INSPECT SPEED SENSOR WIRING HARNESS FOR SHORT TO GROUND** • Disconnect the 4x4 CM connector. • Disconnect the speed sensor connector. • Inspect for continuity between the 4x4 CM connector terminals M, N (vehicle harness-side) and body ground. • Is there continuity?	Yes	Repair or replace the wiring harness, then go to step 4.
		No	Go to the next step.
3	**INSPECT SPEED SENSOR WIRING HARNESS FOR OPEN CIRCUIT** • Inspect for continuity between the 4x4 CM connector (vehicle harness-side) and the following vehicle harness-side terminals of speed sensor: — 4x4 CM connector M— speed sensor terminal B — 4x4 CM connector N— speed sensor terminal A • Is there continuity?	Yes	Go to the next step.
		No	Repair or replace the wiring harness, then go to next step.
4	**VERIFY THAT THE SAME DTC IS NOT PRESENT** • Reconnect all disconnected connectors. • Clear the DTCs from the memory. (See 03-02-2 4x4 CONTROL SYSTEM ON-BOARD DIAGNOSIS[4x4 control module].) • Are any DTCs present?	Yes	Repeat the inspection from step 1. If the malfunction recurs, replace the 4x4 CM, then go to the next step. (See 03-18-5 4x4 CONTROL MODULE REMOVAL/ INSTALLATION [AT (5R55S)].)
		No	Go to the next step.

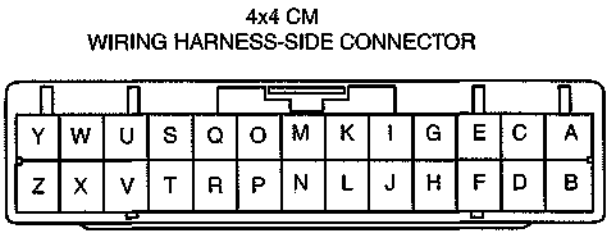
STEP	INSPECTION		ACTION
5	**VERIFY THAT NO OTHER DTCS ARE PRESENT** • Are any DTCs present?	Yes	Go to the applicable DTC troubleshooting. (See 03-02-2 4x4 CONTROL SYSTEM ON-BOARD DIAGNOSIS[4x4 control module].)
		No	Troubleshooting completed.

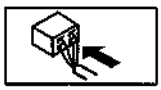
DTC No.5 [4x4 control module]

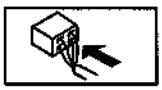
id0302a1802100

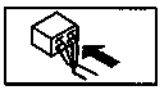
DTC No.5	Solenoid valve malfunction
DETECTION CONDITION	• Open circuit or short to ground has been detected in the solenoid valve wiring harness.
POSSIBLE CAUSE	• Open circuit or short to ground in the wiring harness between the 4x4 CM terminal V and the lock solenoid valve terminal B • Open circuit or short to ground in the wiring harness between the 4x4 CM terminal V and the 4x4 relay terminal E • Open circuit or short to ground in the wiring harness between the free solenoid valve terminal B and the 4x4 relay terminal B • Open circuit in the wiring harness between the lock solenoid valve terminal A and ground • Open circuit in the wiring harness between the 4x4 relay terminal A, D and ground • Open circuit in the wiring harness between the free solenoid valve terminal A and battery • lock solenoid malfunction • Poor connection at connector (female terminal)











Diagnostic procedure

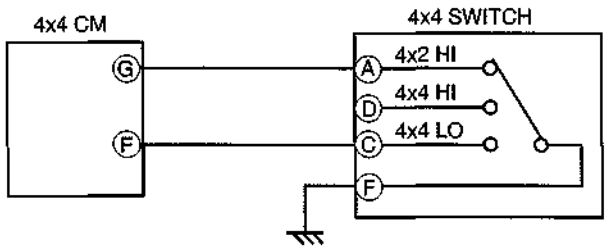
STEP	INSPECTION		ACTION
1	**INSPECT SOLENOID VALVE WIRING HARNESS FOR SHORT TO GROUND** • Turn the engine switch off. • Disconnect the 4x4 CM connector. • Disconnect the lock solenoid connector. • Disconnect the 4x4 relay connector. • Inspect for continuity between the 4x4 CM connector terminal V (vehicle harness-side) and body ground. • Inspect for continuity between the 4x4 relay connector terminal B (vehicle harness-side) and body ground. • Is there continuity?	Yes	Repair or replace the wiring harness, then go to step 6.
		No	Go to the next step.

STEP	INSPECTION		ACTION
2	**INSPECT SOLENOID VALVE WIRING HARNESS FOR OPEN CIRCUIT** • Inspect for continuity between the 4x4 CM connector terminal V (vehicle harness-side) and the vehicle harness-side terminal B of lock solenoid. • Inspect for continuity between the 4x4 CM connector terminal V (vehicle harness-side) and the vehicle harness-side terminal E of 4x4 relay. • Inspect for continuity between the lock solenoid connector terminal A (vehicle harness-side) and body ground. • Inspect for continuity between the 4x4 relay connector terminals A, D (vehicle harness-side) and body ground. • Inspect for continuity between the free solenoid connector terminal B (vehicle harness-side) and the vehicle harness-side terminal B of 4x4 relay. • Is there continuity?	Yes	Go to the next step.
		No	Repair or replace the wiring harness, then go to step 6.
3	**MEASURE VOLTAGE BETWEEN FREE SOLENOID VALVE CONNECTOR TERMINAL A AND GROUND** • Is the voltage greater than 10 V?	Yes	Go to the next step.
		No	Repair or replace the wiring harness, then go to step 6.
4	**INSPECT SOLENOID VALVE** • Inspect the lock and free solenoid valves. • Is the lock and free solenoid valves normal?	Yes	Go to the next step.
		No	Replace the solenoid valve, then go to the step 6.
5	**INSPECT 4x4 RELAY** • Inspect the 4x4 relay. • Is the 4x4 relay normal?	Yes	Go to the next step.
		No	Replace the 4x4 relay, then go to the next step.
6	**VERIFY THAT THE SAME DTC IS NOT PRESENT** • Reconnect all disconnected connectors. • Clear the DTCs from the memory. (See 03-02-2 4x4 CONTROL SYSTEM ON-BOARD DIAGNOSIS[4x4 control module].) • Change the current transfer mode by operating the 4x4 switch.(2H-4H) • Are any DTCs present?	Yes	Repeat the inspection from step 1. If the malfunction recurs, replace the 4x4 CM, then go to the next step. (See 03-18-5 4x4 CONTROL MODULE REMOVAL/ INSTALLATION [AT (5R55S)].)
		No	Go to the next step.
7	**VERIFY THAT NO OTHER DTCS ARE PRESENT** • Are any DTCs present?	Yes	Go to the applicable DTC troubleshooting. (See 03-02-2 4x4 CONTROL SYSTEM ON-BOARD DIAGNOSIS[4x4 control module].)
		No	Troubleshooting completed.

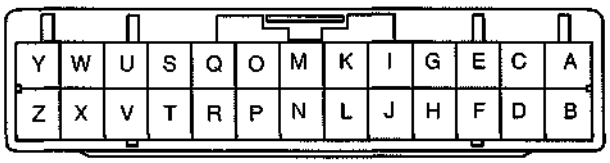
DTC No.6 [4x4 control module]

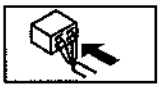
id0302a1802200

DTC No.6	4x4 switch malfunction
DETECTION CONDITION	• Open circuit or short to ground has been detected in the 4x4 switch wiring harness.
POSSIBLE CAUSE	• Open circuit or short to ground in the wiring harness between the following 4x4 CM terminals and the 4x4 switch terminals: — 4x4 CM terminal G— 4x4 switch terminal A — 4x4 CM terminal F— 4x4 switch terminal C • 4x4 switch malfunction • Poor connection at connector (female terminal)

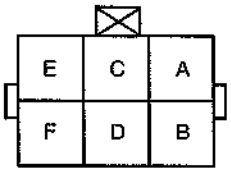


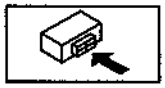
4x4 CM
WIRING HARNESS-SIDE CONNECTOR





4x4 SWITCH
WIRING HARNESS-SIDE CONNECTOR





Diagnostic procedure

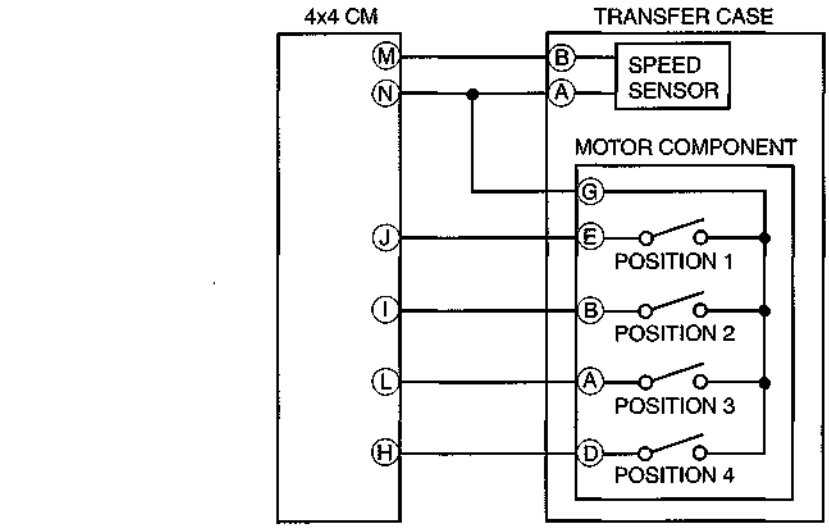
STEP	INSPECTION		ACTION
1	**INSPECT 4x4 SWITCH** • Turn the engine switch off. • Inspect the 4x4 switch. (See 03-18-2 4x4 SWITCH INSPECTION [AT (5R55S)].) • Is the 4x4 switch normal?	Yes	Go to the next step.
		No	Replace the 4x4 switch, then go to step 4. (See 03-18-3 4x4 SWITCH REMOVAL/INSTALLATION [AT (5R55S)].)
2	**INSPECT 4x4 SWITCH WIRING HARNESS FOR SHORT TO GROUND** • Disconnect the 4x4 CM connector. • Disconnect the 4x4 switch connector. • Inspect for continuity between the 4x4 CM connector terminals G, F (vehicle harness-side) and body ground. • Is there continuity?	Yes	Repair or replace the wiring harness, then go to step 4.
		No	Go to the next step.
3	**INSPECT 4x4 SWITCH WIRING HARNESS FOR OPEN CIRCUIT** • Inspect for continuity between the 4x4 CM connector (vehicle harness-side) and the following vehicle harness-side terminals of 4x4 switch: — 4x4 CM connector G— 4x4 switch terminal A — 4x4 CM connector F— 4x4 switch terminal C • Is there continuity?	Yes	Go to the next step.
		No	Repair or replace the wiring harness, then go to step 4.

STEP	INSPECTION		ACTION
4	**VERIFY THAT THE SAME DTC IS NOT PRESENT** • Reconnect all disconnected connectors. • Clear the DTCs from the memory. (See 03-02-2 4x4 CONTROL SYSTEM ON-BOARD DIAGNOSIS[4x4 control module].) • Change the current transfer mode by operating the 4x4 switch.(2H-4H-4L) • Are any DTCs present?	Yes	Repeat the inspection from step 1. If the malfunction recurs, replace the 4x4 CM, then go to the next step. (See 03-18-3 4x4 SWITCH REMOVAL/INSTALLATION [AT (5R55S)].)
		No	Go to the next step.
5	**VERIFY THAT NO OTHER DTCS ARE PRESENT** • Are any DTCs present?	Yes	Go to the applicable DTC troubleshooting. (See 03-02-2 4x4 CONTROL SYSTEM ON-BOARD DIAGNOSIS[4x4 control module].)
		No	Troubleshooting completed.

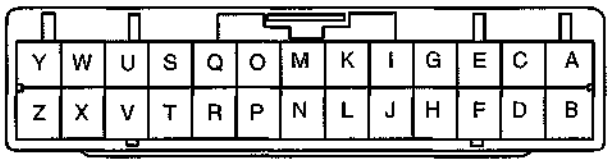
DTC No.7 [4x4 control module]

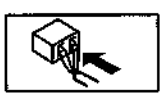
id0302a1802300

DTC No.2	Motor component (position sensor) malfunction
DETECTION CONDITION	• Open circuit or short to ground has been detected in the motor component (position sensor) wiring harness.
POSSIBLE CAUSE	• Open circuit or short to ground in the wiring harness between the following 4x4 CM terminals and the motor component (position sensor) terminals: — 4x4 CM terminal N— motor component (position sensor) terminal G — 4x4 CM terminal J— motor component (position sensor) terminal E — 4x4 CM terminal I— motor component (position sensor) terminal B — 4x4 CM terminal L— motor component (position sensor) terminal A — 4x4 CM terminal H— motor component (position sensor) terminal D • Motor component (position sensor) malfunction • Poor connection at connector (female terminal)

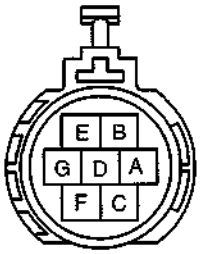


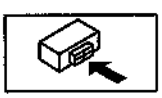
4x4 CM
WIRING HARNESS-SIDE CONNECTOR





MOTOR COMPONENT
WIRING HARNESS-SIDE CONNECTOR





Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT MOTOR COMPONENT (POSITION SENSOR)** • Turn the engine switch off. • Inspect the Motor component (position sensor) (See 03-16-4 MOTOR INSPECTION [5R55S].) • Is the Motor component (position sensor) normal?	Yes	Go to the next step.
		No	Replace the motor component, then go to the next step. (See 03-16-5 MOTOR REMOVAL/INSTALLATION [5R55S].)
2	**INSPECT MOTOR COMPONENT (POSITION SENSOR) FOR SHORT TO GROUND** • Disconnect the 4x4 CM connector. • Disconnect the motor component connector. • Inspect for continuity between the motor component connector terminals N, J, I, L, H (vehicle harness-side) and body ground. • Is there continuity?	Yes	Repair or replace the wiring harness, then go to step 4.
		No	Go to the next step.
3	**INSPECT MOTOR COMPONENT (POSITION SENSOR) WIRING HARNESS FOR OPEN CIRCUIT** • Inspect for continuity between the 4x4 CM connector (vehicle harness-side) and the following vehicle harness-side terminals of motor component: — 4x4 CM connector N— Motor component terminal G — 4x4 CM connector J— Motor component terminal E — 4x4 CM connector I— Motor component terminal B — 4x4 CM connector L— Motor component terminal A — 4x4 CM connector H— Motor component terminal D • Is there continuity?	Yes	Go to the next step.
		No	Repair or replace the wiring harness, then go to step 4.
4	**VERIFY THAT THE SAME DTC IS NOT PRESENT** • Reconnect all disconnected connectors. • Clear the DTCs from the memory. (See 03-02-2 4x4 CONTROL SYSTEM ON-BOARD DIAGNOSIS[4x4 control module].) • Change the current transfer mode by operating the 4x4 switch.(2H-4H-4L) • Are any DTCs present?	Yes	Repeat the inspection from step 1. If the malfunction recurs, replace the 4x4 CM, then go to the next step. (See 03-18-5 4x4 CONTROL MODULE REMOVAL/ INSTALLATION [AT (5R55S)].)
		No	Go to the next step.
5	**VERIFY THAT NO OTHER DTCS ARE PRESENT** • Are any DTCs present?	Yes	Go to the applicable DTC troubleshooting. (See 03-02-2 4x4 CONTROL SYSTEM ON-BOARD DIAGNOSIS[4x4 control module].)
		No	Troubleshooting completed.

03-03 SYMPTOM TROUBLESHOOTING [LSD (LIMITED SLIP DIFFERENTIAL)]

FOREWORD 03-03–1
PRECAUTION 03-03–2
SYMPTOM TROUBLESHOOTING 03-03–2
NO.1 NO RFW OPERATION FROM FREE TO LOCK (RFW INDICATOR LIGHT DOES NOT ILLUMINATE) 03-03–3
NO.2 NO RFW OPERATION FROM LOCK TO FREE (RFW INDICATOR LIGHT DOES NOT GO OFF) 03-03–5
NO.3 NOISE 03-03–7
NO.4 OIL LEAKAGE.....03-03–8

FOREWORD

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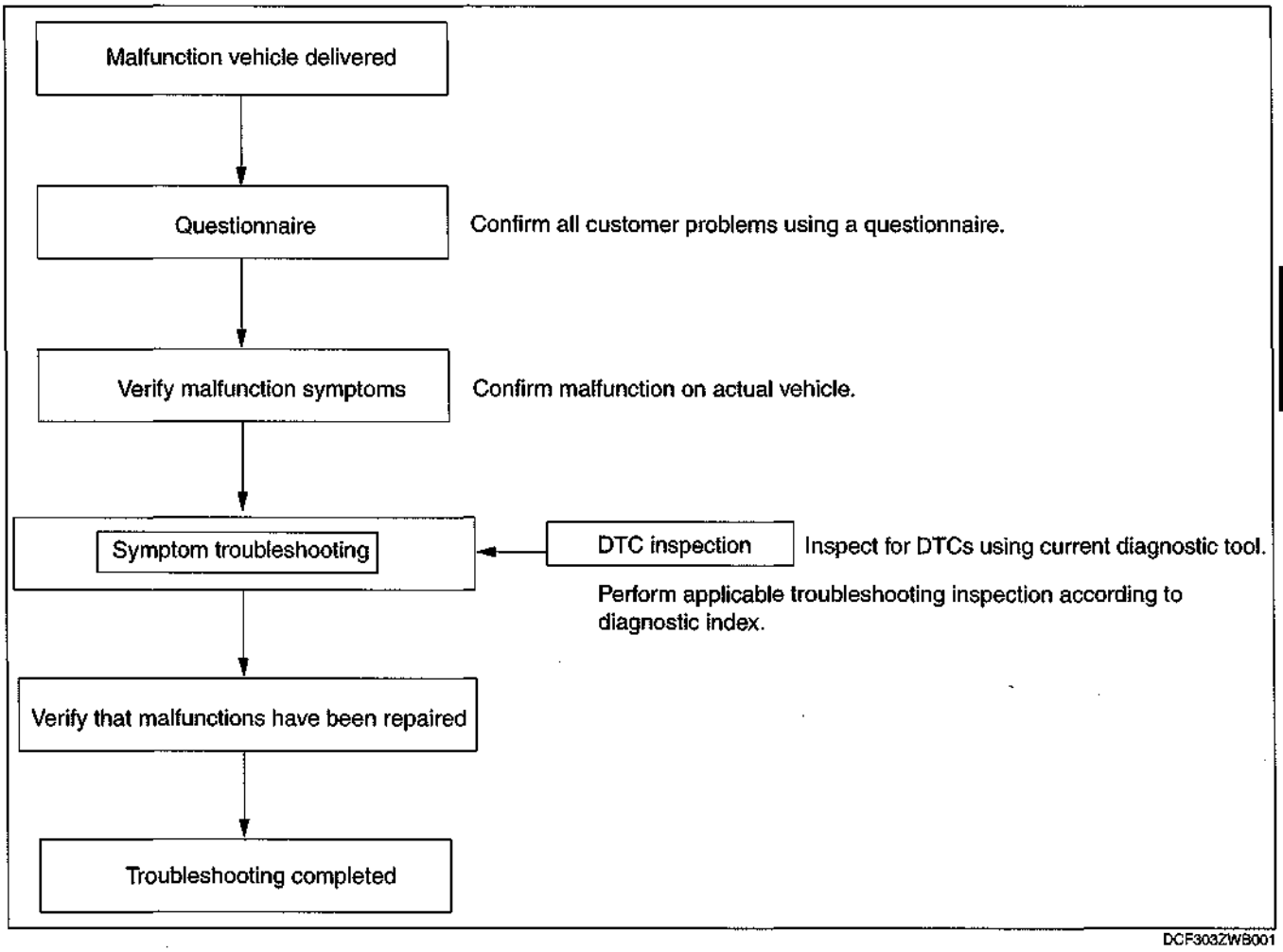

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SYMPTOM TROUBLESHOOTING [LSD (LIMITED SLIP DIFFERENTIAL)]

PRECAUTION

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- This section only mentions unique symptoms of the trouble caused by RFW. Inspect and repair if necessary for trouble caused by other sources.
- Inspect the connector and terminal connections when inspecting the wiring harness. (The cause of the malfunction may be a poor connection in the connectors, terminals, or wiring harness.)

Quick Diagnosis Chart

x: Applicable

Troubleshooting item	Possible factor	RFW indicator light bulb	RFW switch	RFW actuator	Print plate in instrument cluster	Main fuse	Transfer neutral switch	4x4 indicator switch	RFW main switch	PCM	Lock solenoid valve	Free solenoid valve	RFW control box	One-way check valve	Joint shaft bearing	RFW hub	Joint shaft	Conventional front differential parts	Vacuum hose	Related fuse and/or harnesses
1	No RFW operation from free to lock	X	X	X	X	X	X	X		X	X	X	X	X					X	X
2	No RFW operation from lock to free		X	X	X	X	X	X	X	X	X	X	X	X					X	X
3	Noise														X	X	X	X		
4	Oil leakage												X					X		

DBG303ZWB001

SYMPTOM TROUBLESHOOTING

dcf030327100w03

- Verify the symptoms, and perform troubleshooting according to the appropriate number.

No.	Symptom	Description
1	No RFW operation from free to lock (RFW indicator light does not illuminate.)	• Free solenoid valve malfunction • RFW indicator light bulb malfunction • RFW actuator malfunction • RFW switch malfunction • Print plate in instrument cluster malfunction • Main fuse malfunction • Transfer neutral switch malfunction • 4x4 indicator switch malfunction • PCM malfunction • Lock solenoid valve malfunction • RFW control box malfunction • Air leakage from vacuum hose • One-way check valve malfunction • Related fusses and/or harness malfunction

No.	Symptom	Description
2	No RFW operation from lock to free (RFW indicator light does not go off.)	• Lock solenoid valve malfunction • RFW switch malfunction • RFW actuator malfunction • Print plate in instrument cluster malfunction • Main fuse malfunction • RFW main switch malfunction • Transfer neutral switch malfunction • 4x4 indicator switch malfunction • Free solenoid valve malfunction • PCM malfunction • RFW control box malfunction • Air leakage from vacuum hose • One-way check valve malfunction • Related fuses and/or harness malfunction
3	Noise	• Joint shaft bearing abrasion or damage • RFW hub abrasion • Joint shaft abrasion
4	Oil leakage	• RFW control box is poorly installed

NO.1 NO RFW OPERATION FROM FREE TO LOCK (RFW INDICATOR LIGHT DOES NOT ILLUMINATE)

dcf030327100w04

1	NO RFW OPERATION FROM FREE TO LOCK (RFW INDICATOR LIGHT DOES NOT ILLUMINATE.)
DESCRIPTION	RFW does not change from free to lock.

[TROUBLESHOOTING HINTS]
- Transfer neutral switch malfunction
- 4x4 indicator switch malfunction
- PCM malfunction
- Lock solenoid valve malfunction
- Free solenoid valve malfunction
- RFW indicator light bulb malfunction
- RFW control box malfunction
- Main fuse and/or main relay malfunction
- Print plate in instrument cluster malfunction
- RFW switch malfunction
- RFW actuator malfunction
- Air leakage from vacuum hose
- One-way check valve malfunction
- Related fuses and/or harnesses malfunction

03

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT MAIN FUSE.** • Is it OK?	Yes	Go to next step.
		No	Replace main fuse, then go to Step 27.
2	**INSPECT RFW INDICATOR LIGHT BULB** • Is it OK?	Yes	Go to next step.
		No	Replace the RFW indicator light bulb, then go to Step 27.
3	**MEASURE VOLTAGE BETWEEN INSTRUMENT CLUSTER CONNECTOR TERMINAL 1F AND GROUND.** • Is the voltage greater than **10 V**?	Yes	Go to next step.
		No	Repair wiring harness between main fuse and instrument cluster, then go to Step 27.
4	**MEASURE VOLTAGE BETWEEN INSTRUMENT CLUSTER CONNECTOR TERMINAL 1D AND GROUND.** • Is the voltage greater than **10 V**?	Yes	Repair wiring harness between instrument cluster and PCM, then go to Step 27.
		No	Replace print plate in instrument cluster, then go to Step 27.
5	**MEASURE VOLTAGE BETWEEN FREE SOLENOID VALVE CONNECTOR TERMINAL A AND GROUND.** • Disconnect free solenoid valve connector. • Turn engine switch ON. • measure voltage between free solenoid valve connector terminal A and ground. • Is the voltage greater than **10 V**?	Yes	Connect free solenoid valve, then go to next step.
		No	Repair wiring harness between main relay and free solenoid valve connector, then go to Step 27.

STEP	INSPECTION		ACTION
6	**MEASURE VOLTAGE BETWEEN FREE SOLENOID VALVE CONNECTOR TERMINAL B AND GROUND.** • Is the voltage greater than **10 V**?	Yes	Go to next step.
		No	Inspect free solenoid valve, then go to Step 27.
7	**MEASURE VOLTAGE BETWEEN PCM CONNECTOR TERMINAL 254 AND GROUND.** • Is the voltage greater than **10 V**?	Yes	Go to next step.
		No	Repair wiring harness between free solenoid valve and PCM, then go to Step 27.
8	**MEASURE VOLTAGE BETWEEN LOCK SOLENOID VALVE CONNECTOR TERMINAL A AND GROUND.** • Disconnect lock solenoid valve connector. • Turn engine switch ON. • Is the voltage greater than **10 V**?	Yes	Connect lock solenoid valve, then go to next step.
		No	Repair wiring harness between main relay and lock solenoid valve connector, then go to Step 27.
9	**MEASURE VOLTAGE BETWEEN LOCK SOLENOID VALVE CONNECTOR TERMINAL B AND GROUND.** • Is the voltage greater than **10 V**?	Yes	Go to next step.
		No	Repair wiring harness between PCM and ground, then go to Step 27.
10	**MEASURE VOLTAGE BETWEEN PCM CONNECTOR TERMINAL 253 AND GROUND.** • Is the voltage greater than **10 V**?	Yes	Go to next step.
		No	Inspect lock solenoid valve, then go to Step 27.
11	**INSPECT FOR CONTINUITY BETWEEN PCM CONNECTOR TERMINAL 202/204/206 AND GROUND.** • Turn engine switch OFF. • Is there continuity?	Yes	Go to next step.
		No	Repair wiring harness between PCM and ground, then go to Step 27.
12	**INSPECT FOR CONTINUITY BETWEEN PCM CONNECTOR TERMINAL 135 AND GROUND.** • Is there continuity?	Yes	Go to Step 16.
		No	Go to next step.
13	**INSPECT FOR CONTINUITY BETWEEN TRANSFER NEUTRAL SWITCH CONNECTOR TERMINAL A AND GROUND.** • Is there continuity?	Yes	Repair wiring harness between PCM and transfer neutral switch, then go to Step 27.
		No	Go to next step.
14	**INSPECT TRANSFER NEUTRAL SWITCH.** • Is it OK?	Yes	Go to next step.
		No	Replace transfer neutral switch, then go to Step 27.
15	**INSPECT FOR CONTINUITY BETWEEN TRANSFER NEUTRAL SWITCH CONNECTOR TERMINAL B AND GROUND.** • Is there continuity?	Yes	Go to next step.
		No	Repair wiring harness between transfer neutral switch and ground, then go to Step 27.
16	**INSPECT FOR CONTINUITY BETWEEN PCM CONNECTOR TERMINAL 137 AND GROUND.** • Shift select lever to 4x4 indicator position. • Is there continuity?	Yes	Go to Step 20.
		No	Go to next step.
17	**INSPECT FOR CONTINUITY BETWEEN 4X4 INDICATOR SWITCH CONNECTOR TERMINAL A AND GROUND.** • Is there continuity?	Yes	Repair wiring harness between 4x4 indicator switch and PCM, then go to Step 27.
		No	Go to next step.
18	**INSPECT 4X4 INDICATOR SWITCH.** • Is it OK?	Yes	Go to next step.
		No	Replace 4x4 indicator switch, then go to Step 27.
19	**INSPECT FOR CONTINUITY BETWEEN 4X4 INDICATOR SWITCH CONNECTOR TERMINAL B AND GROUND.** • Is there continuity?	Yes	Go to next step.
		No	Repair wiring harness between 4x4 indicator switch and ground, then go to Step 27.
20	**INSPECT FOR CONTINUITY BETWEEN PCM CONNECTOR TERMINAL 185 AND GROUND.** • Shift select lever to 4H position. • Is there continuity?	Yes	Go to Step 24.
		No	Go to next step.
21	**INSPECT FOR CONTINUITY BETWEEN RFW SWITCH CONNECTOR TERMINAL A AND GROUND.** • Is there continuity?	Yes	Repair wiring harness between PCM and RFW switch, then go to Step 27.
		No	Go to next step.

STEP	INSPECTION		ACTION
22	**INSPECT RFW SWITCH.** • Is it OK?	Yes	Go to next step.
		No	Replace RFW switch, then go to Step 27.
23	**INSPECT FOR CONTINUITY BETWEEN RFW SWITCH CONNECTOR TERMINAL B AND GROUND.** • Is there continuity?	Yes	Go to next step.
		No	Repair wiring harness between RFW switch and ground, then go to Step 27.
24	**INSPECT ONE-WAY CHECK VALVE.** • Is it OK?	Yes	Go to next step.
		No	Replace one-way check valve, then go to Step 27.
25	**INSPECT RFW CONTROL BOX.** • Is it OK?	Yes	Go to next step.
		No	Replace RFW control box, then go to Step 27.
26	**INSPECT VACUUM IN VACUUM HOSES.** • Is it OK?	Yes	Go to next step.
		No	Replace vacuum in vacuum hoses, then go to Step 27.
27	**DOES RFW OPERATE FROM FREE TO LOCK?** • Turn engine switch ON. • Shift select lever from 2H to 4H position. • Does RFW operate from free to lock?	Yes	Troubleshooting completed. Explain repairs to customer.
		No	Inspect malfunction symptoms again, then repeat from Step 1 if malfunction occurs again.

NO.2 NO RFW OPERATION FROM LOCK TO FREE (RFW INDICATOR LIGHT DOES NOT GO OFF)

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2	NO RFW OPERATION FROM LOCK TO FREE (RFW INDICATOR LIGHT DOES NOT GO OFF.)
DESCRIPTION	RFW does not change from lock to free.

[TROUBLESHOOTING HINTS]

- RFW main switch malfunction
- Transfer neutral switch malfunction
- 4x4 indicator switch malfunction
- PCM malfunction
- Free solenoid valve malfunction
- Lock solenoid valve malfunction
- RFW control box malfunction
- Main relay malfunction
- RFW actuator malfunction
- RFW switch malfunction
- Air leakage from vacuum reservoir or actuator system
- One-way check valve
- Print plate in instrument cluster malfunction
- Related fuses and/or harnesses malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT FOR CONTINUITY BETWEEN INSTRUMENT CLUSTER TERMINAL 1F AND GROUND.** • Disconnect instrument cluster connector No.1. • Is there continuity?	Yes	Repair wiring harness between PCM and instrument cluster, then go to Step 30.
		No	Inspect for no continuity between instrument cluster terminal 1F and ground
2	**INSPECT MAIN RELAY.** • Inspect main relay. • Is it OK?	Yes	Repair wiring harness between main relay and PCM, then go to Step 29.
		No	Replace the main relay, then go to Step 29.
3	**MEASURE VOLTAGE BETWEEN FREE SOLENOID VALVE CONNECTOR TERMINAL A AND GROUND.** • Disconnect free solenoid valve connector. • Turn engine switch ON. • Is the voltage greater than **10 V**?	Yes	Connect free solenoid valve, then go to next step.
		No	Repair wiring harness between main relay and free solenoid valve connector, then go to Step 29.
4	**MEASURE VOLTAGE BETWEEN FREE SOLENOID VALVE CONNECTOR TERMINAL B AND GROUND.** • Is the voltage greater than **10 V**?	Yes	Go to next step.
		No	Inspect free solenoid valve, then go to Step 29.
5	**MEASURE VOLTAGE BETWEEN PCM CONNECTOR TERMINAL 254 AND GROUND.** • Is the voltage greater than **10 V**?	Yes	Go to next step.
		No	Repair wiring harness between free solenoid valve and PCM, then go to Step 29.

STEP	INSPECTION		ACTION
6	**MEASURE VOLTAGE BETWEEN LOCK SOLENOID VALVE CONNECTOR TERMINAL A AND GROUND.** • Disconnect lock solenoid valve connector. • Turn engine switch ON. • Is the voltage greater than **10 V**?	Yes	Connect lock solenoid valve, then go to next step.
		No	Repair wiring harness between main relay and lock solenoid valve connector, then go to Step 29.
7	**MEASURE VOLTAGE BETWEEN LOCK SOLENOID VALVE CONNECTOR TERMINAL B AND GROUND.** • Is the voltage greater than **10 V**?	Yes	Go to next step.
		No	Inspect lock solenoid valve, then go to Step 29.
8	**MEASURE VOLTAGE BETWEEN PCM CONNECTOR TERMINAL 253 AND GROUND.** • Is the voltage greater than **10 V**?	Yes	Go to next step.
		No	Repair wiring harness between lock solenoid valve and PCM, then go to Step 29.
9	**INSPECT FOR CONTINUITY BETWEEN PCM CONNECTOR TERMINAL 202/204/206 AND GROUND.** • Turn engine switch OFF. • Is there continuity?	Yes	Go to next step.
		No	Repair wiring harness between PCM and ground, then go to Step 29.
10	**INSPECT FOR CONTINUITY BETWEEN PCM CONNECTOR TERMINAL 135 AND GROUND.** • Shift select lever to N position. • Is there continuity?	Yes	Go to Step 14.
		No	Go to next step.
11	**INSPECT FOR CONTINUITY BETWEEN TRANSFER NEUTRAL SWITCH CONNECTOR TERMINAL A AND GROUND.** • Is there continuity?	Yes	Repair wiring harness between PCM and transfer neutral switch, then go to Step 29.
		No	Go to next step.
13	**INSPECT FOR CONTINUITY BETWEEN TRANSFER NEUTRAL SWITCH CONNECTOR TERMINAL B AND GROUND.** • Is there continuity?	Yes	Go to next step.
		No	Repair wiring harness between transfer neutral switch and ground, then go to Step 29.
14	**INSPECT FOR CONTINUITY BETWEEN PCM CONNECTOR TERMINAL 137 AND GROUND.** • Shift select lever to 2 H position. • Is there continuity?	Yes	Go to Step 18.
		No	Go to next step.
15	**INSPECT FOR CONTINUITY BETWEEN 4X4 INDICATOR SWITCH CONNECTOR TERMINAL A AND GROUND.** • Is there continuity?	Yes	Repair wiring harness between PCM and 4x4 indicator switch, then go to Step 29.
		No	Go to next step.
16	**INSPECT 4X4 INDICATOR SWITCH.** • Is it OK?	Yes	Go to next step.
		No	Replace 4x4 indicator switch, then go to Step 29.
17	**INSPECT FOR CONTINUITY BETWEEN 4X4 INDICATOR SWITCH CONNECTOR TERMINAL B AND GROUND.** • Is there continuity?	Yes	Go to next step.
		No	Repair wiring harness between 4x4 indicator switch and ground, then go to Step 30.
18	**INSPECT FOR CONTINUITY BETWEEN PCM CONNECTOR TERMINAL 185 AND GROUND.** • Is there continuity?	Yes	Go to Step 25.
		No	Go to next step.
19	**INSPECT FOR CONTINUITY BETWEEN RFW SWITCH CONNECTOR TERMINAL A AND GROUND.** • Is there continuity?	Yes	Repair wiring harness between RFW switch, then go to Step 29.
		No	Go to next step.
20	**INSPECT RFW SWITCH.** • Is it OK?	Yes	Go to next step.
		No	Replace RFW switch, then go to Step 29.
21	**INSPECT FOR CONTINUITY BETWEEN RFW SWITCH CONNECTOR TERMINAL B AND GROUND.** • Is there continuity?	Yes	Go to next step.
		No	Repair wiring harness between RFW switch and ground, then go to Step 29.
22	**INSPECT FOR CONTINUITY BETWEEN RFW MAIN SWITCH CONNECTOR TERMINAL D AND GROUND.** • Is there continuity?	Yes	Repair wiring harness between RFW main switch and PCM, then go to Step 29.
		No	Go to next step.

STEP	INSPECTION		ACTION
23	**INSPECT RFW MAIN SWITCH.** • Is it OK?	Yes	Go to next step.
		No	Replace RFW main switch.
24	**INSPECT FOR CONTINUITY BETWEEN RFW MAIN SWITCH CONNECTOR TERMINAL B AND GROUND.** • Is there continuity?	Yes	Go to next step.
		No	Repair wiring harness between RFW main switch and ground, then go to Step 29.
25	**INSPECT ONE-WAY CHECK VALVE.** • Is it OK?	Yes	Go to next step.
		No	Replace one-way check valve, then go to Step 29.
26	**INSPECT RFW ACTUATOR.** • Is it OK?	Yes	Go to next step.
		No	Replace RFW actuator, then go to Step 29.
27	**INSPECT VACUUM IN VACUUM HOSES.** • Is it OK?	Yes	Go to next step.
		No	Replace vacuum in vacuum hoses, then go to Step 29.
28	**INSPECT PCM.** • Is it OK?	Yes	Go to next step.
		No	Repair or replace PCM, then go to next step.
29	**DOES RFW OPERATE FROM FREE TO LOCK?** • Turn engine switch ON. • Move selector lever from 2H to 4H position. • Does RFW operate from free to lock?	Yes	Troubleshooting completed. Explain repairs to customer.
		No	Inspect malfunction symptoms again, then repeat from Step 1 if malfunction occurs again.

NO.3 NOISE

dcf030327100w06

3	NOISE
DESCRIPTION	**Noise is heard from front differential.**
[TROUBLESHOOTING HINTS] • Joint shaft bearing abrasion or damage. • RFW hub abrasion • Joint shaft abrasion • Conventional front differential parts malfunction	

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT JOINT SHAFT BEARING.** • Is it OK?	Yes	Go to next step.
		No	Replace joint shaft bearing.
2	**INSPECT RFW HUB** • Is it OK?	Yes	Go to next step.
		No	Replace RFW hub.
3	**INSPECT JOINT SHAFT.** • Is it OK?	Yes	Go to next step.
		No	Replace joint shaft.
4	**INSPECT CONVENTIONAL FRONT DIFFERENTIAL PARTS.** • Are they OK?	Yes	Go to next step.
		No	Replace defective part(s).
5	**VERIFY THERE IS NO NOISE.** • Has front differential noise stopped?	Yes	Troubleshooting completed. Explain repairs to customer.
		No	Inspect malfunction symptoms again, then repeat from Step 1 if malfunction occurs again.

NO.4 OIL LEAKAGE

dcf030327100w07

4	OIL LEAKAGE
DESCRIPTION	The oil leaks from front differential.
[TROUBLESHOOTING HINTS] • Poor installation of the RFW control box. • Malfunction of conventional front differential parts.	

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY CONDITION RFW CONTROL BOX INSTALLATION** • Is RFW control box installed completely?	Yes	Go to next step.
		No	Install RFW control box securely, then go to Step 3.
2	**INSPECT CONVENTIONAL FRONT DIFFERENTIAL PARTS.** • Are they OK?	Yes	Go to next step.
		No	Replace defective part(s).
3	**VERIFY THERE IS NO OIL LEAKAGE FROM FRONT DIFFERENTIAL.** • Is there any oil leakage from front differential?	Yes	Inspect malfunction symptoms again, then repeat from Step 1 if malfunction still occurs.
		No	Troubleshooting completed. Explain repairs to customer.

03-03 SYMPTOM TROUBLESHOOTING [4x4 control module]

4x4 CONTROL SYSTEM WIRING DIAGRAM [4x4 control module] 03-03–1
PRECAUTION [4x4 control module] ... 03-03–2
SYMPTOM TROUBLESHOOTING [4x4 control module] 03-03–2
NO.1 NO RFW OPERATION [4x4 control module] 03-03–3
NO.2 4x4/4L INDICATOR DOSE NOT ILLUMINATE [4x4 control module] ... 03-03–5
NO.3 NO CHANGE FORM 4x2 TO 4x4 [4x4 control module] 03-03–6
NO.4 NO CHANGE FORM 4H TO 4L [4x4 control module] 03-03–7
NO.5 NOISE [4x4 control module] 03-03–9
NO.6 OIL LEAKAGE [4x4 control module] 03-03–10

4x4 CONTROL SYSTEM WIRING DIAGRAM [4x4 control module]

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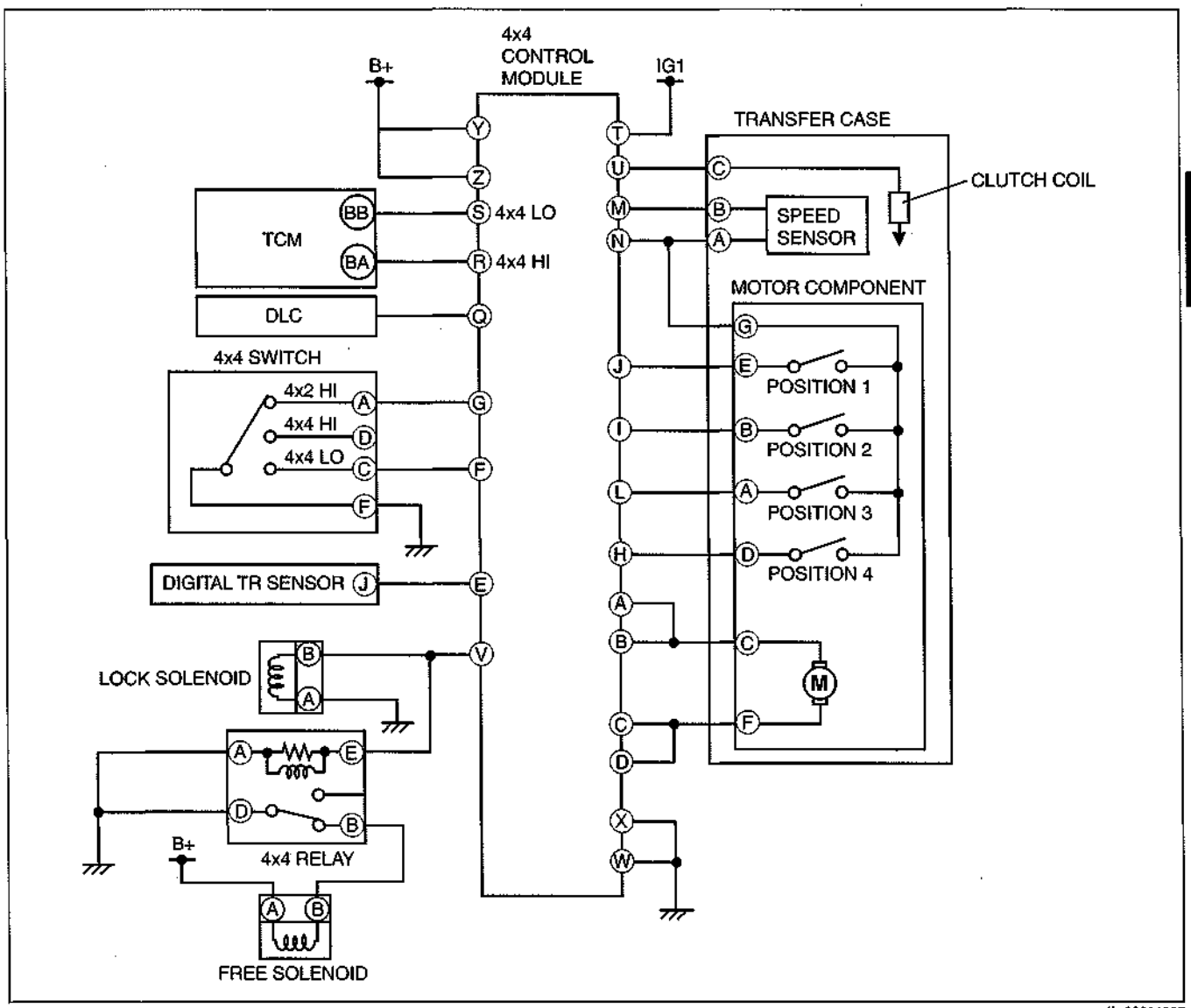

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SYMPTOM TROUBLESHOOTING [4x4 control module]

PRECAUTION [4x4 control module]

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- This section only mentions unique symptoms of the trouble caused by 4x4 system. Inspect and repair if necessary for trouble caused by other sources.
- Inspect the connector and terminal connections when inspecting the wiring harness. (The cause of the malfunction may be a poor connection in the connectors, terminals, or wiring harness.)

Quick Diagnosis Chart

x: Applicable

	Possible factor / Troubleshooting item	Instrument cluster	Motor component (position sensor)	Motor component (shift motor)	Transfer drive chain	TCM	4x4 control module	4x4 switch	Digital TR sensor (neutral signal)	Lock solenoid valve	Free solenoid valve	RFW actuator	RFW control box	One-way check valve	Vacuum hose	Related fuse and/or harnesses	Joint shaft bearing	RFW hub	Joint shaft	Tire pressure	Oil level	Transfer bearing	Transfer gear	Conventional front differential parts	RFW control box	Sealing bolts	Breather	Oil seal	Transfer case
1	No RFW operation		X	X		X	X	X		X	X	X	X	X	X	X													
2	4x4/4L indicator dose not illuminate	X				X	X																						
3	No change from 4x2 to 4x4		X	X	X	X	X	X																					
4	No change from 4H to 4L		X	X		X	X	X	X																				
5	Noise				X												X	X	X	X	X	X	X	X					
6	Oil leakage												X								X			X	X	X	X	X	X

amffw00001938

SYMPTOM TROUBLESHOOTING [4x4 control module]

id030310800300

- Verify the symptoms, and perform troubleshooting according to the appropriate number.

No.	Symptom	Description
1	No RFW operation	• Motor component (position sensor) malfunction • Motor component (shift motor) malfunction • 4x4 control module malfunction • 4x4 switch malfunction • Lock solenoid valve malfunction • Free solenoid valve malfunction • RFW actuator malfunction • RFW control box malfunction • One-way check valve malfunction • Air leakage from vacuum hose • Related fuses and /or harnesses malfunction
2	4x4/4L indicator dose not illuminate	• Instrument cluster malfunction • TCM malfunction • 4x4 control module malfunction
3	No change form 4x2 to 4x4	• Motor component (position sensor) malfunction • Motor component (shift motor) malfunction • TCM malfunction • 4x4 control module malfunction • 4x4 switch malfunction • Drive chain malfunction
4	No change form 4H to 4L	• Motor component (position sensor) malfunction • Motor component (shift motor) malfunction • TCM malfunction • 4x4 control module malfunction • 4x4 switch malfunction • Digital TR sensor malfunction

No.	Symptom	Description
5	Noise	• Joint shaft bearing abrasion or damage • RFW hub abrasion • Joint shaft abrasion • Conventional front differential parts malfunction • Incorrect tire pressure • Improper oil level • Transfer bearing damaged • Transfer gear damaged • Transfer drive chain damaged
6	Oil leakage	• RFW control box malfunction • Conventional front differential parts malfunction • Transfer case malfunction • Improper oil level • Loosened sealing bolts • Breather clogging • Improper oil seal

NO.1 NO RFW OPERATION [4x4 control module]

id030310802000

1	NO RFW OPERATION
DESCRIPTION	RFW dose not change from lock to free or from free to lock.
TROUBLESHOOTING HINTS	• Motor component (position sensor) malfunction • Motor component (shift motor) malfunction • 4x4 control module malfunction • 4x4 switch malfunction • Lock solenoid valve malfunction • Free solenoid valve malfunction • RFW actuator malfunction • RFW control box malfunction • One-way check valve malfunction • Air leakage from vacuum hose • Related fuses and/or harnesses malfunction

03

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**MEASURE VOLTAGE BETWEEN FREE SOLENOID VALVE CONNECTOR TERMINAL A AND GROUND** • Disconnect free solenoid valve connector. • Turn engine switch ON. • Measure voltage between free solenoid valve connector terminal A and ground. • Is the voltage greater than **10 V**?	Yes	Connect free solenoid valve, then go to next step.
		No	Repair wiring harness between main relay and free solenoid valve connector. Then go to Step 14.
2	**MEASURE VOLTAGE BETWEEN FREE SOLENOID VALVE CONNECTOR TERMINAL B AND GROUND** • Is the voltage greater than **10 V**?	Yes	Go to next step.
		No	Inspect free solenoid valve. Then go to Step 14.
3	**MEASURE VOLTAGE BETWEEN 4x4 CONTROL MODULE CONNECTOR TERMINAL V AND GROUND** • Is the voltage greater than **10 V**?	Yes	Go to next step.
		No	Repair wiring harness between free solenoid valve and 4x4 control module. Then go to Step 14.
4	**MEASURE VOLTAGE BETWEEN LOCK SOLENOID VALVE CONNECTOR TERMINAL A AND GROUND** • Disconnect free solenoid valve connector. • Turn engine switch ON. • Measure voltage between free solenoid valve connector terminal A and ground. • Is the voltage greater than **10 V**?	Yes	Connect lock solenoid valve, then go to next step.
		No	Repair wiring harness between main relay and lock solenoid valve connector. Then go to Step 14.
5	**MEASURE VOLTAGE BETWEEN LOCK SOLENOID VALVE CONNECTOR TERMINAL B AND GROUND** • Is the voltage greater than **10 V**?	Yes	Go to next step.
		No	Inspect lock solenoid valve. Then go to Step 14.

STEP	INSPECTION		ACTION
6	**MEASURE VOLTAGE BETWEEN 4x4 CONTROL MODULE CONNECTOR TERMINAL V AND GROUND** • Is the voltage greater than **10 V**?	Yes	Go to next step.
		No	Repair wiring harness between lock solenoid valve and 4x4 control module. Then go to Step 14.
7	**INSPECT FOR CONTINUITY BETWEEN 4x4 CONTROL MODULE CONNECTOR TERMINAL W, X AND GROUND** • Turn engine switch OFF. • Is there continuity?	Yes	Go to next step.
		No	Repair wiring harness between 4x4 control module and ground. Then go to Step 14.
8	**MEASURE VOLTAGE BETWEEN 4x4 CONTROL MODULE CONNECTOR TERMINAL T, Y, Z AND GROUND** • Turn engine switch ON. • Is the voltage greater than **10 V**?	Yes	Go to next step.
		No	Repair related wiring harness and related fuses. Then go to Step 14.
9	**INSPECT 4x4 SWITCH** • Is 4x4 switch OK?	Yes	Go to next step.
		No	Repair or replace 4x4 switch. Then go to step 14.
10	**INSPECT CONTINUITY FOR 4x4 SWITCH** • Between 4x4 switch connector terminal A and 4x4 control module terminal G. • Between 4x4 switch connector terminal C and 4x4 control module terminal F. • Between 4x4 switch connector terminal F and ground. • Is there continuity?	Yes	Go to next step.
		No	Repair wiring harness between 4x4 switch and 4x4 control module. Then go to Step 14.
11	**INSPECT ONE-WAY CHECK VALVE** • Is one-way check valve OK?	Yes	Go to next step.
		No	Replace one-way check valve. Then go to step 14.
12	**INSPECT RFW ACTUATOR** • Is RFW actuator OK?	Yes	Go to next step.
		No	Replace RFW actuator. Then go to step 14.
13	**INSPECT VACUUM HOSE** • Is vacuum hose OK?	Yes	Go to next step.
		No	Repair or Replace vacuum hose. Then go to step 14.
14	• **Verify test results.** — If normal, return to the diagnostic index to service any additional symptoms. — If malfunction remains, inspect the related Service Bulletins and/or On-line Repair Information and perform repair or diagnosis. • If the vehicle is repaired, troubleshooting completed. • If the vehicle is not repaired or additional diagnostic information is not available, replace the 4x4 control module.		

NO.2 4x4/4L INDICATOR DOSE NOT ILLUMINATE [4x4 control module]

id030310802600

2	4x4/4L INDICATOR DOSE NOT ILLUMINATE
DESCRIPTION	4x4/4L indicator dose not illuminate when select 4H or 4L position.
TROUBLESHOOTING HINTS	• Instrument cluster malfunction • TCM malfunction • 4x4 control module malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT CONTINUITY FOR 4x4 CONTROL MODULE AND TCM** • Between 4x4 control module terminal S and TCM terminal BB. • Between 4x4 control module terminal R and TCM terminal BA. • Is there continuity?	Yes	Go to next step.
		No	Repair wiring harness between 4x4 control module terminal and TCM. Then go to Step 5.
2	**INSPECT CONTINUITY FOR TCM AND INSTRUMENT CLUSTER** • Between TCM terminal N and instrument cluster terminal 1D. • Between TCM terminal R and instrument cluster terminal 1F. • Is there continuity?	Yes	Inspect the instrument cluster. Then go to next step.
		No	Repair wiring harness between TCM and instrument cluster. Then go to Step 5.
3	**INSPECT FOR CONTINUITY BETWEEN 4x4 CONTROL MODULE CONNECTOR TERMINAL W, X AND GROUND** • Turn engine switch OFF. • Is there continuity?	Yes	Go to next step.
		No	Repair wiring harness between 4x4 control module and ground. Then go to Step 5.
4	**MEASURE VOLTAGE BETWEEN 4x4 CONTROL MODULE CONNECTOR TERMINAL T, Y, Z AND GROUND** • Turn engine switch ON. • Is the voltage greater than **10 V**?	Yes	Go to next step.
		No	Repair related wiring harness and related fuses. Then go to Step 5.
5	• **Verify test results.** — If normal, return to the diagnostic index to service any additional symptoms. — If malfunction remains, inspect the related Service Bulletins and/or On-line Repair Information and perform repair or diagnosis. • If the vehicle is repaired, troubleshooting completed. • If the vehicle is not repaired or additional diagnostic information is not available, replace the TCM.		

NO.3 NO CHANGE FORM 4x2 TO 4x4 [4x4 control module]

id030310802700

3	NO CHANGE FORM 4x2 TO 4x4
DESCRIPTION	4x4 system dose not operate when select 4H position.
TROUBLESHOOTING HINTS	• Motor component (position sensor) malfunction • Motor component (shift motor) malfunction • TCM malfunction • 4x4 control module malfunction • 4x4 switch malfunction • Drive chain malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT 4x4 SWITCH** • Is 4x4 switch OK?	Yes	Go to next step.
		No	Repair or replace 4x4 switch. Then go to step 10.
2	**INSPECT CONTINUITY FOR 4x4 SWITCH AND 4x4 CONTROL MODULE** • Between 4x4 switch connector terminal A and 4x4 control module terminal G. • Between 4x4 switch connector terminal C and 4x4 control module terminal F. • Between 4x4 switch connector terminal F and ground. • Is there continuity?	Yes	Go to next step.
		No	Repair wiring harness between 4x4 switch and 4x4 control module. Then go to Step 10.
3	**INSPECT CONTINUITY FOR 4x4 CONTROL MODULE AND MOTOR COMPONENT (SHIFT MOTOR)** • Between 4x4 control module connector terminal A, B and transfer case connector terminal C. • Between 4x4 control module connector terminal C, D and transfer case connector terminal F. • Is there continuity?	Yes	Go to next step.
		No	Repair wiring harness between 4x4 control module and transfer case connector. Then go to Step 10.
4	**INSPECT MOTOR COMPONENT (SHIFT MOTOR)** • Is motor component (shift motor) OK?	Yes	Go to next step.
		No	Repair or replace motor component. Then go to Step 10.
5	**INSPECT CONTINUITY FOR 4x4 CONTROL MODULE AND MOTOR COMPONENT (POSITION SENSOR)** • Between 4x4 control module connector terminal J and transfer case connector terminal E. • Between 4x4 control module connector terminal I and transfer case connector terminal B. • Between 4x4 control module connector terminal L and transfer case connector terminal A. • Between 4x4 control module connector terminal H and transfer case connector terminal D. • Is there continuity?	Yes	Go to next step.
		No	Repair wiring harness between 4x4 control module and transfer case connector. Then go to Step 10.
6	**INSPECT MOTOR COMPONENT (POSITION SENSOR)** • Is motor component (position sensor) OK?	Yes	Go to next step.
		No	Repair or replace motor component. Then go to Step 10.
7	**INSPECT FOR CONTINUITY BETWEEN 4x4 CONTROL MODULE CONNECTOR TERMINAL W, X AND GROUND** • Turn engine switch OFF. • Is there continuity?	Yes	Go to next step.
		No	Repair wiring harness between 4x4 control module and ground. Then go to Step 10.

STEP	INSPECTION		ACTION
8	**MEASURE VOLTAGE BETWEEN 4x4 CONTROL MODULE CONNECTOR TERMINAL T, Y, Z AND GROUND** • Turn engine switch ON. • Is the voltage greater than **10 V**?	Yes	Go to next step.
		No	Repair related wiring harness and related fuses. Then go to Step 10.
9	**INSPECT TRANSFER** • Is transfer OK?	Yes	Go to next step.
		No	Overhaul and check for wear and damage. Replace if necessary. Then go to Step 10.
10	• **Verify test results.** — If normal, return to the diagnostic index to service any additional symptoms. — If malfunction remains, inspect the related Service Bulletins and/or On-line Repair Information and perform repair or diagnosis. • If the vehicle is repaired, troubleshooting completed. • If the vehicle is not repaired or additional diagnostic information is not available, replace the 4x4 Control Module.		

NO.4 NO CHANGE FORM 4H TO 4L [4x4 control module]

id030310802900

4	NO CHANGE FORM 4H TO 4L
DESCRIPTION	**No change form 4H to 4L at neutral position.**
TROUBLESHOOTING HINTS	• Motor component (position sensor) malfunction • Motor component (shift motor) malfunction • TCM malfunction • 4x4 control module malfunction • 4x4 switch malfunction • Digital TR sensor malfunction

03

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT 4x4 SWITCH** • Is 4x4 switch OK?	Yes	Go to next step.
		No	Repair or replace 4x4 switch. Then go to step 11.
2	**INSPECT CONTINUITY FOR 4x4 SWITCH AND 4x4 CONTROL MODULE** • Between 4x4 switch connector terminal A and 4x4 control module terminal G. • Between 4x4 switch connector terminal B and 4x4 control module terminal F. • Between 4x4 switch connector terminal F and ground. • Is there continuity?	Yes	Go to next step.
		No	Repair wiring harness between 4x4 switch and 4x4 control module. Then go to Step 11.
3	**INSPECT DIGITAL TR SENSOR** • Is digital TR sensor OK?	Yes	Go to next step.
		No	Repair or replace digital TR sensor. Then go to step 11.
4	**INSPECT CONTINUITY FOR DIGITAL TR SENSOR AND 4x4 CONTROL MODULE** • Between digital TR sensor connector terminal J and 4x4 control module terminal E. • Is there continuity?	Yes	Go to next step.
		No	Repair wiring harness between digital TR sensor and 4x4 control module. Then go to Step 11.
5	**INSPECT CONTINUITY FOR 4x4 CONTROL MODULE AND MOTOR COMPONENT (SHIFT MOTOR)** • Between 4x4 control module connector terminal A, B and transfer case connector terminal C. • Between 4x4 control module connector terminal C, D and transfer case connector terminal F. • Is there continuity?	Yes	Go to next step.
		No	Repair wiring harness between 4x4 control module and transfer case connector. Then go to Step 11.
6	**INSPECT MOTOR COMPONENT (SHIFT MOTOR)** • Is motor component (shift motor) OK?	Yes	Go to next step.
		No	Repair or replace motor component. Then go to Step 11.

STEP	INSPECTION		ACTION
7	**INSPECT CONTINUITY FOR 4x4 CONTROL MODULE AND MOTOR COMPONENT (POSITION SENSOR)** • Between 4x4 control module connector terminal J and transfer case connector terminal E. • Between 4x4 control module connector terminal I and transfer case connector terminal B. • Between 4x4 control module connector terminal L and transfer case connector terminal A. • Between 4x4 control module connector terminal H and transfer case connector terminal D. • Is there continuity?	Yes	Go to next step.
		No	Repair wiring harness between 4x4 control module and transfer case connector. Then go to Step 11.
8	**INSPECT MOTOR COMPONENT (POSITION SENSOR)** • Is motor component (position sensor) OK?	Yes	Go to next step.
		No	Repair or replace motor component. Then go to Step 11.
9	**INSPECT FOR CONTINUITY BETWEEN 4x4 CONTROL MODULE CONNECTOR TERMINAL W, X AND GROUND** • Turn engine switch OFF. • Is there continuity?	Yes	Go to next step.
		No	Repair wiring harness between 4x4 control module and ground. Then go to Step 11.
10	**MEASURE VOLTAGE BETWEEN 4x4 CONTROL MODULE CONNECTOR TERMINAL T, Y, Z AND GROUND** • Turn engine switch ON. • Is the voltage greater than **10 V**?	Yes	Go to next step.
		No	Repair related wiring harness and related fuses. Then go to Step 11.
11	• **Verify test results.** — If normal, return to the diagnostic index to service any additional symptoms. — If malfunction remains, inspect the related Service Bulletins and/or On-line Repair Information and perform repair or diagnosis. • If the vehicle is repaired, troubleshooting completed. • If the vehicle is not repaired or additional diagnostic information is not available, replace the 4x4 Control Module.		

NO.5 NOISE [4x4 control module]

id030310802400

5	NOISE
DESCRIPTION	**Noise is heard from front differential or transfer case.**
TROUBLESHOOTING HINTS	• Joint shaft bearing abrasion or damage • RFW hub abrasion • Joint shaft abrasion • Conventional front differential parts malfunction • Incorrect tire pressure • Improper oil level • Transfer bearing damaged • Transfer gear damaged • Transfer drive chain damaged

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT JOINT SHAFT BEARING** • Is it OK?	Yes	Go to next step.
		No	Replace joint shaft bearing.
2	**INSPECT RFW HUB** • Is it OK?	Yes	Go to next step.
		No	Replace RFW hub.
3	**INSPECT JOINT SHAFT** • Is it OK?	Yes	Go to next step.
		No	Replace joint shaft.
4	**INSPECT CONVENTIONAL FRONT DIFFERENTIAL PARTS** • Are they OK?	Yes	Go to next step.
		No	Replace defective part (s).
5	**INSPECT TIRE PRESSURE** • Are they OK?	Yes	Go to next step.
		No	Adjust the tire pressure.
6	**INSPECT TRANSFER OIL LEVEL** • Is oil level OK?	Yes	Go to next step.
		No	Adjust the oil level.
7	**INSPECT TRANSFER INNER PARTS** • Transfer bearing • Transfer gear • Transfer drive chain • Are they OK?	Yes	Go to next step.
		No	Overhaul and check for wear and damage. Replace if necessary.
8	• **Verify test results.** — If normal, return to the diagnostic index to service any additional symptoms. — If malfunction remains, inspect the related Service Bulletins and/or On-line Repair Information and perform repair or diagnosis. • If the vehicle is repaired, troubleshooting completed. • If the vehicle is not repaired or additional diagnostic information is not available.		

NO.6 OIL LEAKAGE [4x4 control module]

id030310802500

6	OIL LEAKEGE
DESCRIPTION	**The oil leaks from front differential or transfer case.**
TROUBLESHOOTING HINTS	• RFW control box malfunction • Conventional front differential parts malfunction • Transfer case malfunction • Improper oil level • Loosened sealing bolts • Breather clogging • Improper oil seal

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY RFW CONTROL BOX INSTALLATION CONDITION** • Is RFW control box installed completely?	Yes	Go to next step.
		No	Install RFW control box securely, then go to Step.
2	**INSPECT CONVENTIONAL FRONT DIFFERENTIAL PARTS** • Are they OK?	Yes	Go to next step.
		No	Replace defective part (s).
3	**INSPECT TRANSFER CASE** • Is it OK?	Yes	Go to next step.
		No	Replace transfer case.
4	**INSPECT TRANSFER OIL LEVEL** • Is oil level OK?	Yes	Go to next step.
		No	Adjust the oil level.
5	**INSPECT TRANSFER SEALING BOLTS** • Are sealing bolts OK?	Yes	Go to next step.
		No	Re-tighten the sealing bolts.
6	**INSPECT BREATHER NIPPLE FOR CLOGGING** • Is it OK?	Yes	Go to next step.
		No	Clean or replace breather nipple.
7	**INSPECT OIL SEAL** • Is it OK?	Yes	Go to next step.
		No	Replace damaged oil seal.
8	• **Verify test results.** — If normal, return to the diagnostic index to service any additional symptoms. — If malfunction remains, inspect the related Service Bulletins and/or On-line Repair Information and perform repair or diagnosis. • If the vehicle is repaired, troubleshooting completed. • If the vehicle is not repaired or additional diagnostic information is not available.		

03-10 GENERAL PROCEDURES

GENERAL PROCEDURES
(FRONT AND REAR AXLES) 03-10–1

GENERAL PROCEDURES (FRONT AND REAR AXLES)

dcf031000000w01

Wheel And Tire Installation

1. When installing the wheels and tires, tighten the wheel nuts in a criss-cross pattern to the following tightening torque.

Tightening torque
88.2—117.6 N·m {9.0—12.0 kgf·m, 65.0—87.0 ft·lbf}

Connector Disconnection

1. Disconnect the negative battery cable before performing any work that requires handling of connectors.

Suspension Links Removal/Installation

1. For the joint sections with rubber bushings, raise the vehicle using a lift, and then temporarily tighten the installation bolts and nuts. Lower the vehicle to the ground and tighten them completely with the specified torque.

Brake Lines Disconnection/Connection

Caution
- **Brake fluid will damage painted surfaces. If brake fluid does get on a painted surface, wipe it off immediately.**

1. Tighten the brake pipe flare nut using the **SST** (49 0259 770B). Be sure to modify the brake pipe flare nut tightening torque to allow for use of a torque wrench-**SST** combination.
   (See 00-00-16 Torque Formulas.)
2. If any brake line has been disconnected anytime during the procedure, add brake fluid, bleed the brakes, and inspect for leakage after the procedure has been completed.

03-11 FRONT AXLE

FRONT AXLE LOCATION INDEX [4x2 (EXCEPT Hi-Rider)] 03-11–1
FRONT AXLE LOCATION INDEX [Hi-Rider] 03-11–2
FRONT AXLE LOCATION INDEX [4x4] 03-11–2
WHEEL HUB BOLT REPLACEMENT [Hi-Rider, 4x4] 03-11–3
WHEEL HUB, STEERING KNUCKLE INSPECTION [4x2 (EXCEPT Hi-Rider)] 03-11–3
WHEEL HUB, STEERING KNUCKLE INSPECTION [Hi-Rider, 4x4] 03-11–4
WHEEL HUB, STEERING KNUCKLE REMOVAL/INSTALLATION [4x2 (EXCEPT Hi-Rider)] 03-11–4
WHEEL HUB, STEERING KNUCKLE REMOVAL/INSTALLATION [Hi-Rider] 03-11–8
WHEEL HUB, STEERING KNUCKLE REMOVAL/INSTALLATION [4x4] 03-11–14

FRONT AXLE LOCATION INDEX [4x2 (EXCEPT Hi-Rider)]

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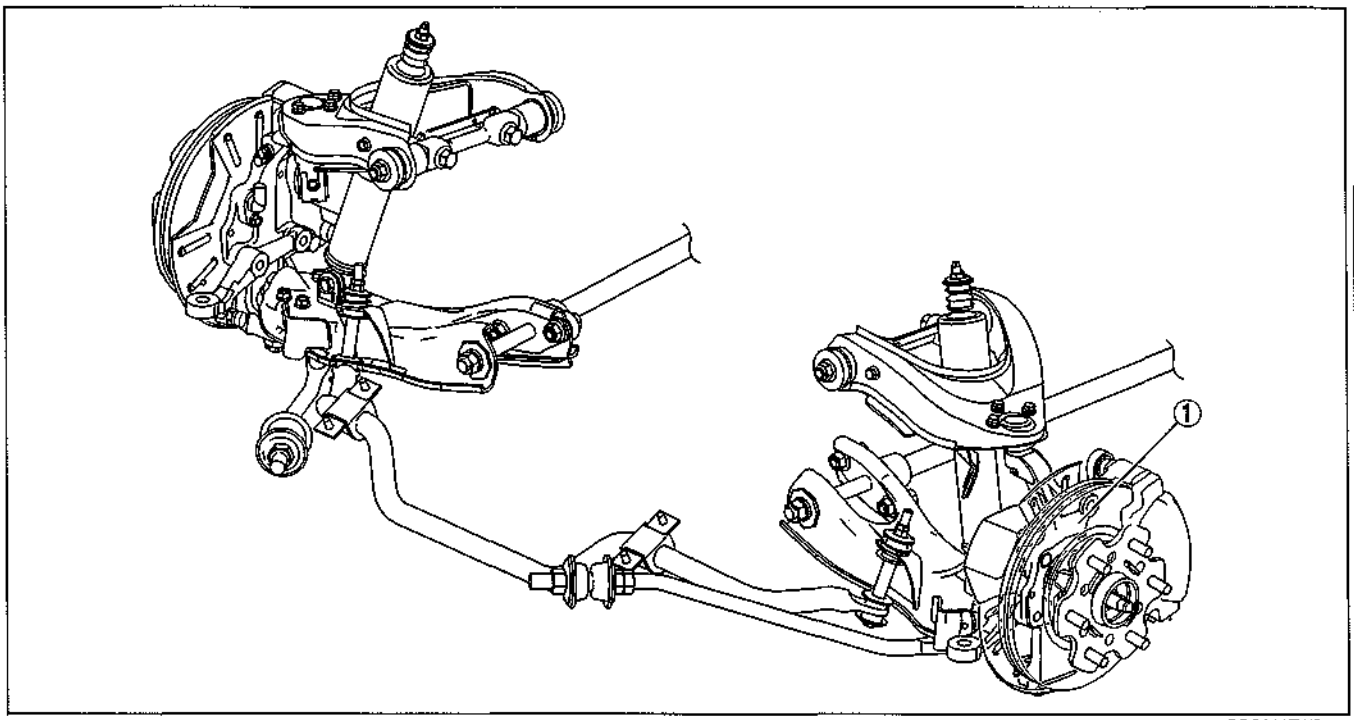
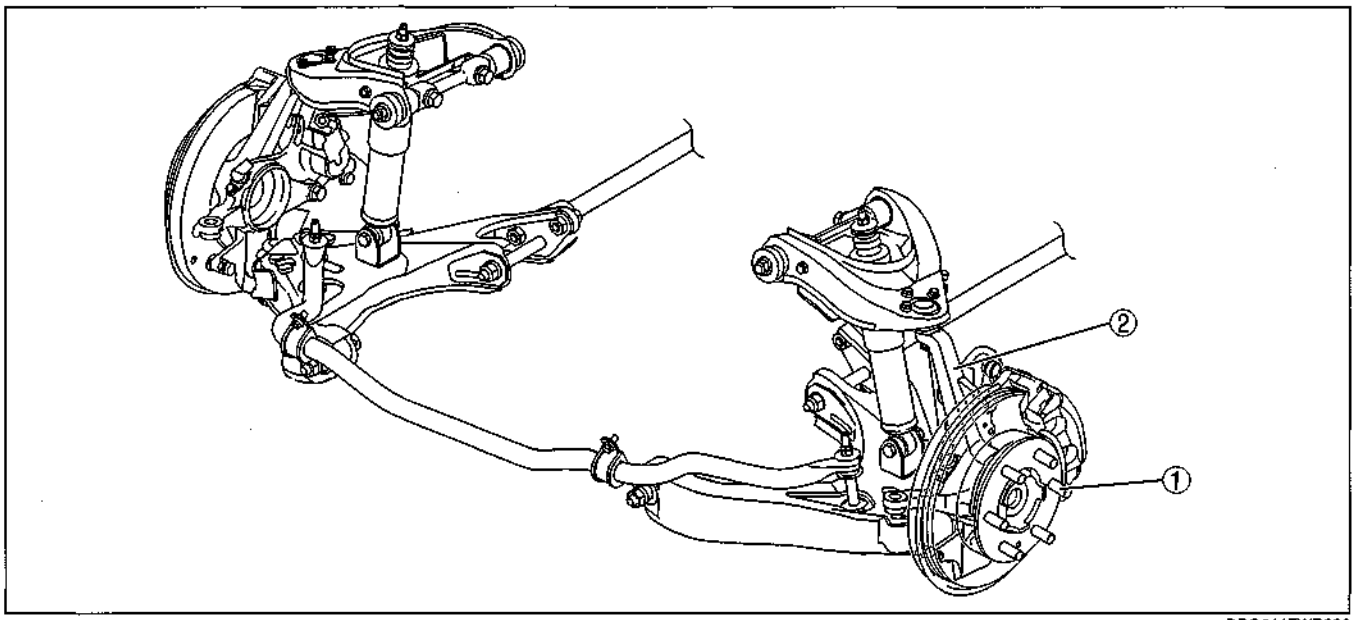


DBG311ZWB001

1	Wheel hub, steering knuckle (See 03-11-3 WHEEL HUB, STEERING KNUCKLE INSPECTION [4x2 (EXCEPT Hi-Rider)].) (See 03-11-4 WHEEL HUB, STEERING KNUCKLE REMOVAL/INSTALLATION [4x2 (EXCEPT Hi-Rider)].)

FRONT AXLE LOCATION INDEX [Hi-Rider]

dcf031104000w02



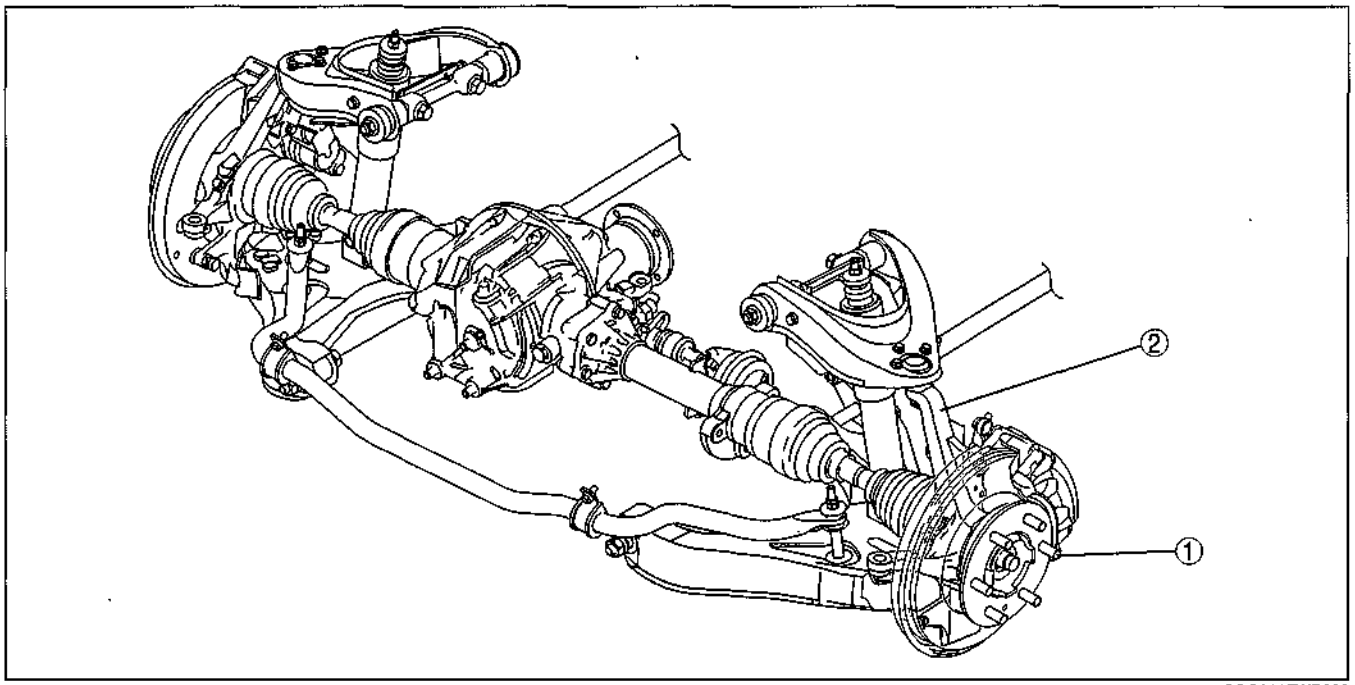
DBG311ZWB003

1	Wheel hub bolt (See 03-11-3 WHEEL HUB BOLT REPLACEMENT [Hi-Rider, 4x4].)

2	Wheel hub, steering knuckle (See 03-11-4 WHEEL HUB, STEERING KNUCKLE INSPECTION [Hi-Rider, 4x4]) (See 03-11-8 WHEEL HUB, STEERING KNUCKLE REMOVAL/INSTALLATION [Hi-Rider])

FRONT AXLE LOCATION INDEX [4x4]

dcf031104000w03



DBG311ZWB002

1	Wheel hub bolt (See 03-11-3 WHEEL HUB BOLT REPLACEMENT [Hi-Rider, 4x4].)

2	Wheel hub, steering knuckle (See 03-11-4 WHEEL HUB, STEERING KNUCKLE INSPECTION [Hi-Rider, 4x4]) (See 03-11-14 WHEEL HUB, STEERING KNUCKLE REMOVAL/INSTALLATION [4x4].)

WHEEL HUB BOLT REPLACEMENT [Hi-Rider, 4x4]

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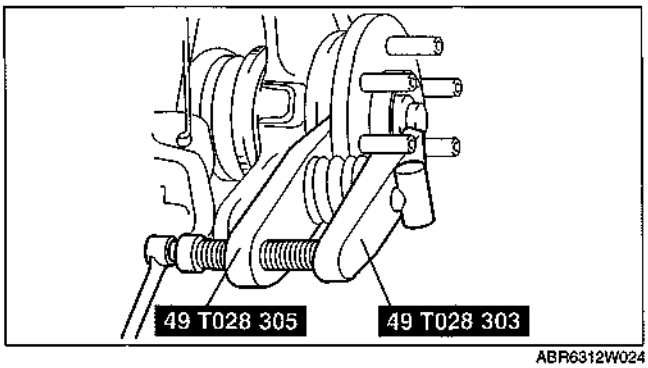
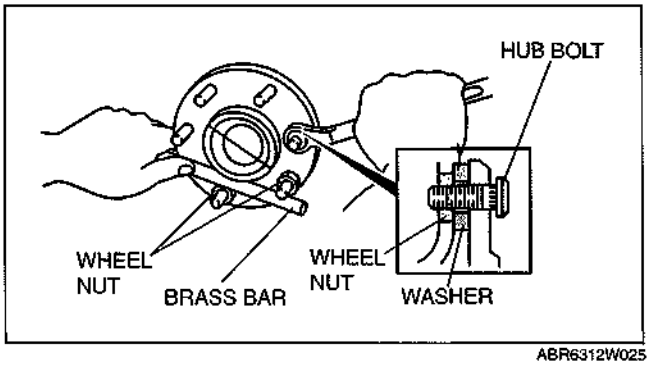
1. Remove the brake caliper component and disc plate.
2. Remove the hub bolt using the **SST**.
3. Place a new wheel hub bolt in the wheel hub.



ABR6312W024

4. Install the wheel hub bolt by placing a proper sized washer on the hub, and tightening the nut as shown in the figure.



ABR6312W025

WHEEL HUB, STEERING KNUCKLE INSPECTION [4x2 (EXCEPT Hi-Rider)]

dcf031104060w01

Wheel Bearing Looseness Inspection

1. After jacking up the vehicle and supporting it at the specified places with safety stands, inspect for noticeable bearing play by holding the top and bottom of the tire.

   Maximum wheel bearing play [4x2 (Except Hi-Rider)]
   0 mm {0 in}

Preload Adjustment

1. Inspect that the tire rotates smoothly when rotated strongly, and there is no rough feeling or no abnormal noise from the bearing.
2. Attach a pull scale to a hub bolt and measure the preload.

   Front wheel axle preload [4x2 (Except Hi-Rider)]
   5.6—11.2 N {0.58—1.14 kgf, 1.26—2.51 lbf}

   - If not an specification, adjust the front wheel bearing preload.

When replacing the bearing

1. Remove the brake caliper component and suspend it by a rope.
2. Remove the hub cap, pull out the cotter pin and remove the set cover.
3. Tighten the wheel hub locknut with **20—30 N·m {2.1—3.0 kgf·m, 15—22 ft·lbf}** to fit the bearing.
4. Loosen the locknut to the extent that it can be turned by hand.
5. Attach a pull scale to a hub bolt and adjust the preload.

   Front wheel axle preload [4x2 (Except Hi-Rider)]
   5.6—11.2 N {0.58—1.14 kgf, 1.26—2.51 lbf}

6. Tighten the locknut until the reading reaches the specified amount.

WHEEL HUB, STEERING KNUCKLE INSPECTION [Hi-Rider, 4x4]

dcf031104060w02

Wheel Bearing Play Inspection

1. After jacking up the vehicle and supporting it at the specified places with safety stands, inspect for noticeable bearing play by holding the top and bottom of the tire.

Maximum front wheel bearing play [Hi-Rider, 4x4]
0.05 mm {0.002 in}

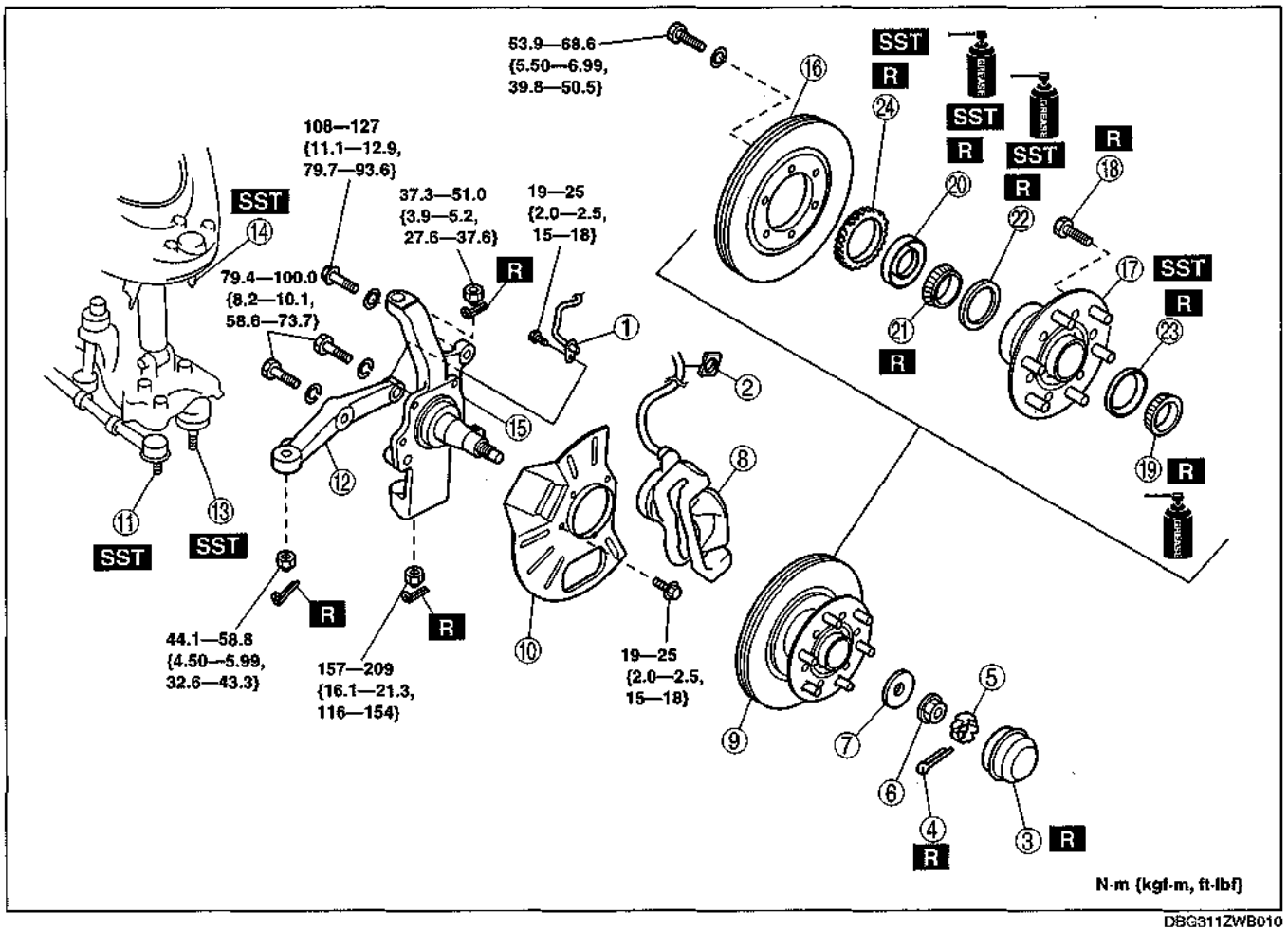
WHEEL HUB, STEERING KNUCKLE REMOVAL/INSTALLATION [4x2 (EXCEPT Hi-Rider)]

dcf031104060w03

Caution

- **Performing the following procedures without first removing the ABS wheel-speed sensor may possibly cause an open circuit in the wiring harness if it is pulled by mistake. Before performing the following procedures, disconnect the ABS wheel-speed sensor harness connector (axle side) and fix it to an appropriate place where the sensor will not be pulled by mistake while servicing the vehicle.**

1. Remove in the order indicated in the table.
2. Install in the reverse order of removal.



DBG311ZWB010

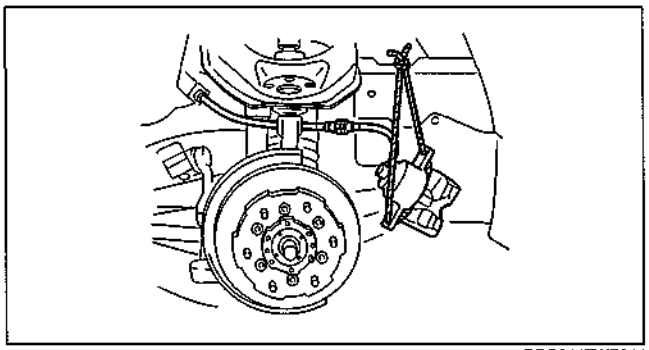
1	ABS wheel-speed sensor (with ABS)
2	Clip
3	Hub cap
4	Cotter pin
5	Set cover
6	Locknut
7	Washer

8	Brake caliper component (See 03-11-5 Brake Caliper Component Removal Note.)
9	Hub and disc plate component (See 03-11-7 Hub And Disc Plate Component Installation Note.)
10	Dust cover
11	Tie-rod end (See 06-14-10 STEERING GEAR AND LINKAGE REMOVAL/INSTALLATION.)

12	Knuckle arm
13	Lower arm ball joint (See 02-13-5 TORSION BAR SPRING AND LOWER ARM REMOVAL/INSTALLATION [4x2 (EXCEPT Hi-Rider)].)
14	Upper arm ball joint (See 02-13-15 Front Upper Arm Ball Joint Removal Note.)
15	Steering knuckle
16	Disc plate (See 03-11-5 Disc Plate, Wheel Hub, Hub Bolt Removal Note.) (See 03-11-7 Hub And Disc Plate Component Installation Note.)
17	Wheel hub (See 03-11-5 Disc Plate, Wheel Hub, Hub Bolt Removal Note.) (See 03-11-7 Hub And Disc Plate Component Installation Note.)
18	Hub bolt (See 03-11-5 Disc Plate, Wheel Hub, Hub Bolt Removal Note.) (See 03-11-7 Hub Bolt Installation Note.)
19	Outer bearing inner race
20	Oil seal (See 03-11-7 Oil Seal Installation Note.)
21	Inner bearing inner race
22	Inner bearing outer race (See 03-11-6 Inner Bearing Outer Race, Outer Bearing Outer Race Removal Note.) (See 03-11-7 Outer Bearing Outer Race, Inner Bearing Outer Race Installation Note.)
23	Outer bearing outer race (See 03-11-6 Inner Bearing Outer Race, Outer Bearing Outer Race Removal Note.) (See 03-11-7 Outer Bearing Outer Race, Inner Bearing Outer Race Installation Note.)
24	ABS sensor rotor (with ABS) (See 03-11-6 ABS Sensor Rotor Removal Note.) (See 03-11-6 ABS Sensor Rotor Installation Note.)

Brake Caliper Component Removal Note

1. Remove the brake caliper component installation bolt, and suspend it with a cable in place out of the way.



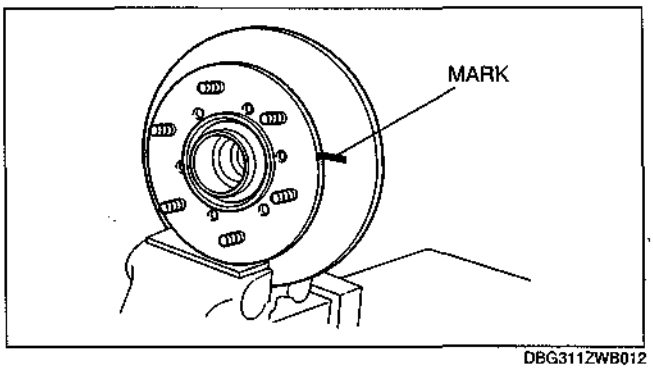
DBG311ZWB011

Disc Plate, Wheel Hub, Hub Bolt Removal Note

Note

- The hub bolt does not need to be removed unless replacing them.

1. After putting markings on the disc plate and the wheel hub, remove the bolt and disassemble the plate and hub.
2. Remove the hub bolt using a press as necessary.

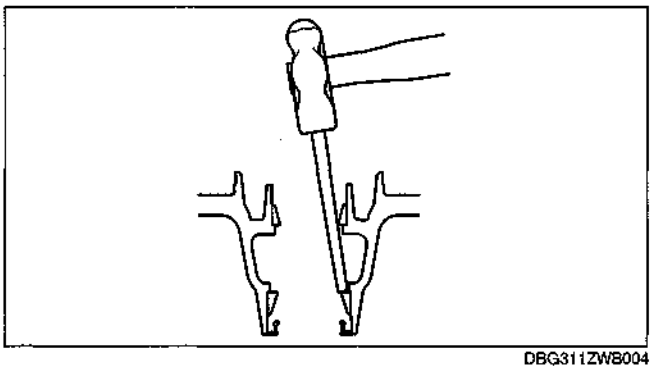


DBG311ZWB012

Inner Bearing Outer Race, Outer Bearing Outer Race Removal Note

Note
- When inner bearing outer race is removed, inner race and oil seal are removed together.

1. Remove the bearing outer race using a suitable round bar and a hammer. For other side, reverse the wheel hub and remove the outer race.

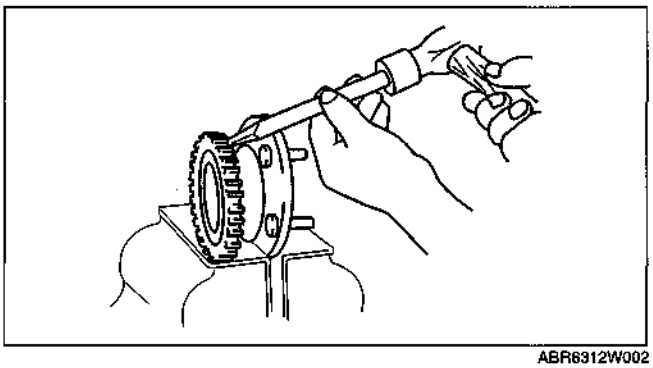


DBG311ZWB004

ABS Sensor Rotor Removal Note

Note
- The sensor rotor does not need to be removed unless it is being replaced.

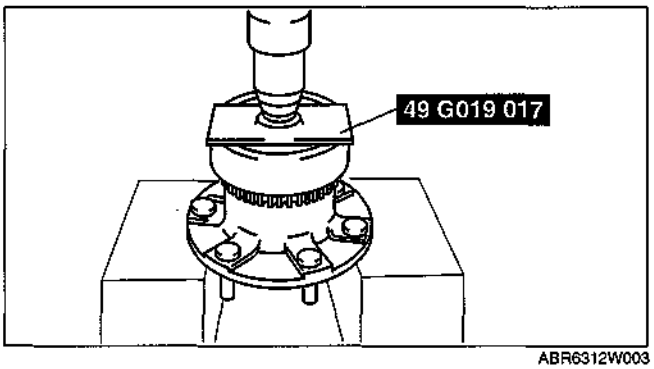
1. Remove the sensor rotor using a chisel.



ABR6312W002

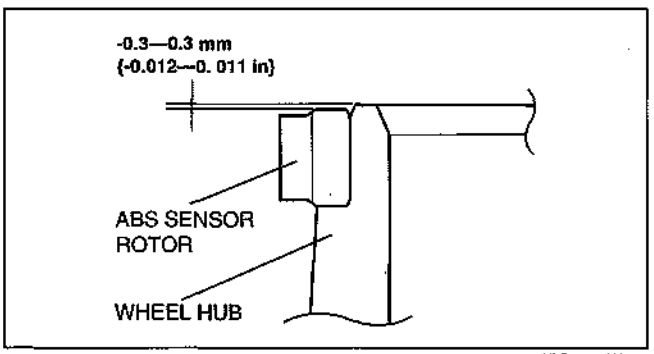
ABS Sensor Rotor Installation Note

1. Set the **SST** shown in the figure.



ABR6312W003

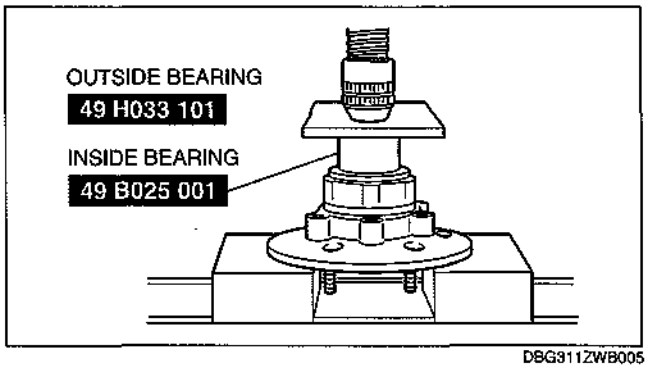
2. Press the new sensor rotor in unit flush with the end of the wheel hub using the **SST** and a press.



ABR6312W023

Outer Bearing Outer Race, Inner Bearing Outer Race Installation Note

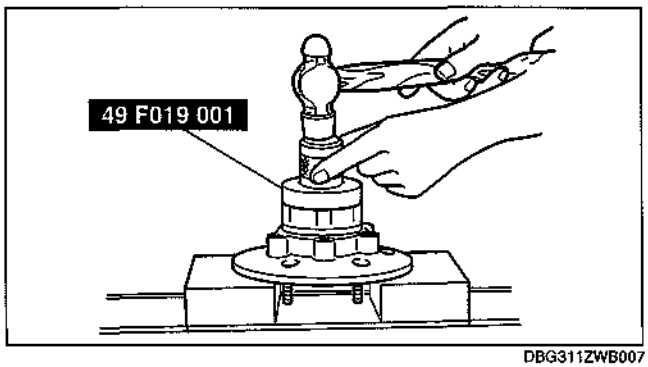
1. Install the bearing outer race using the **SSTs** and a press. For other side, reverse the wheel hub and install the outer race.



DBG311ZWB005

Oil Seal Installation Note

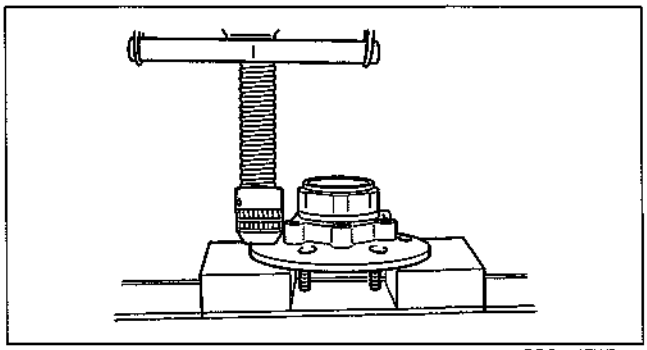
1. After inserting the bearing in the hub, tap in the oil seal until it is flush with the hub end surface using the **SST**.
2. Apply grease to the oil seal lip.



DBG311ZWB007

Hub Bolt Installation Note

1. Press new hub bolts into the wheel hub using a press.

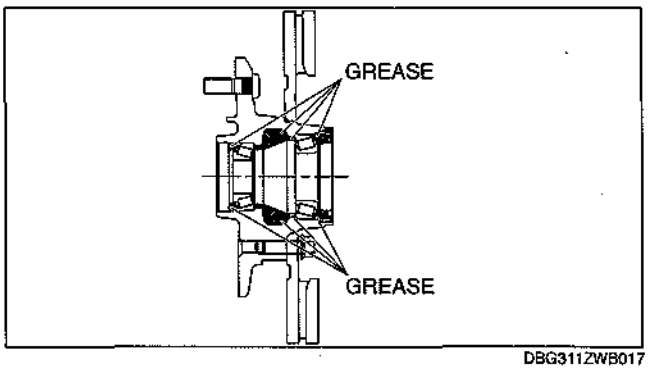

DBG311ZWB006

Hub And Disc Plate Component Installation Note

1. Apply grease to the areas indicated in the figure.

   Grease amount
   68—76 g {2.5—2.6 oz}

2. Install the hub and disc plate component, then adjust the preload. (See 03-11-3 WHEEL HUB, STEERING KNUCKLE INSPECTION [4x2 (EXCEPT Hi-Rider)].)



DBG311ZWB017

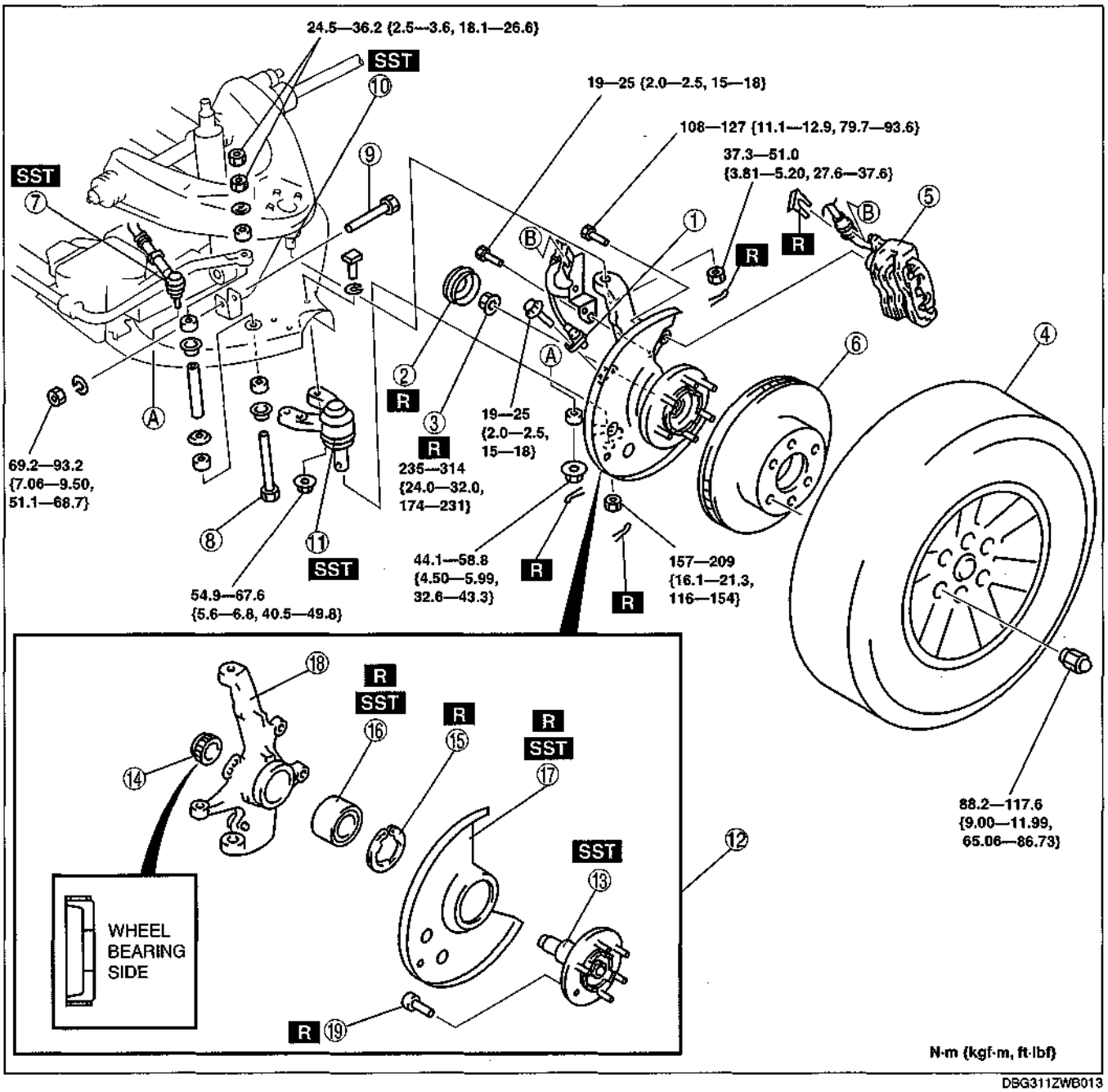
WHEEL HUB, STEERING KNUCKLE REMOVAL/INSTALLATION [Hi-Rider]

dcf031104060w04

Caution

- **Performing the following procedures without first removing the ABS wheel-speed sensor may possibly cause an open circuit in the harness if it is pulled by mistake. Before performing the following procedures, remove the ABS wheel-speed sensor (axle side) and fix it to an appropriate place where the sensor will not be pulled by mistake while the vehicle is being serviced.**

1. Remove in the order indicated in the table.
2. Install in the reverse order of removal.



DBG311ZWB013

1	ABS wheel-speed sensor (with ABS)
2	Hub cap
3	Locknut (See 03-11-9 Locknut Removal Note) (See 03-11-13 Locknut Installation Note)
4	Wheel and tire

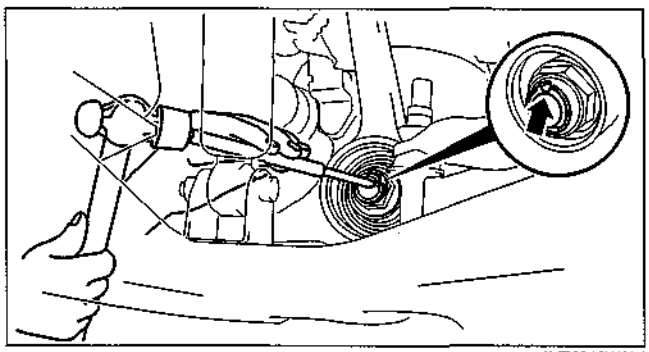
5	Brake caliper component (See 03-11-10 Brake Caliper Component Removal Note)
6	Disc plate
7	Tie-rod end ball joint (See 03-11-10 Tie-rod End Ball Joint Removal Note)

8	Bolt (stabilizer) (See 02-13-17 FRONT STABILIZER REMOVAL/ INSTALLATION [Hi-Rider, 4x4].)
9	Bolt (shock absorber)
10	Upper arm ball joint (See 02-13-15 Front Upper Arm Ball Joint Removal Note.)
11	Lower arm ball joint (See 02-13-9 TORSION BAR SPRING AND LOWER ARM REMOVAL/INSTALLATION [Hi-Rider, 4x4]
12	Wheel hub, steering knuckle, dust cover
13	Wheel hub component (See 03-11-10 Wheel Hub Component Removal Note) (See 03-11-13 Wheel Hub Component Installation Note)
14	ABS sensor rotor (with ABS) or spacer (without ABS)
15	Retaining ring
16	Wheel bearing (See 03-11-11 Wheel Bearing Removal Note) (See 03-11-12 Wheel Bearing Installation Note)
17	Dust cover (See 03-11-11 Dust Cover Removal Note) (See 03-11-12 Dust Cover Installation Note)
18	Steering knuckle
19	Hub bolt (See 03-11-11 Hub Bolt Removal Note) (See 03-11-12 Hub Bolt Installation Note)

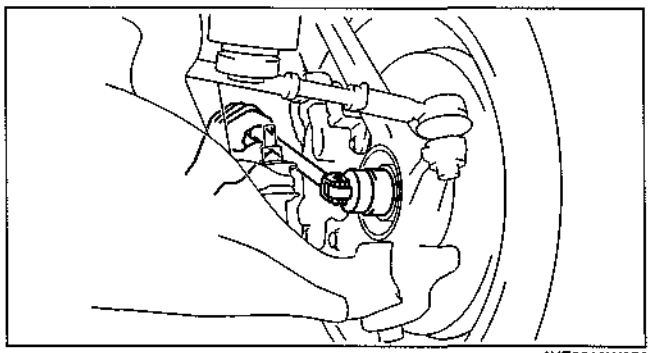
Locknut Removal Note

Note
- Remove the locknut with the vehicle on level ground.

1. Knock the crimped portion of the locknut outward using a small chisel and a hammer.

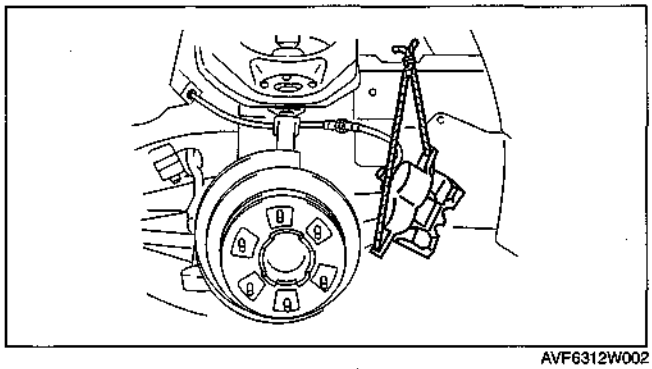

AVF6312W051

2. Remove the locknut.


AVF6312W052

Brake Caliper Component Removal Note

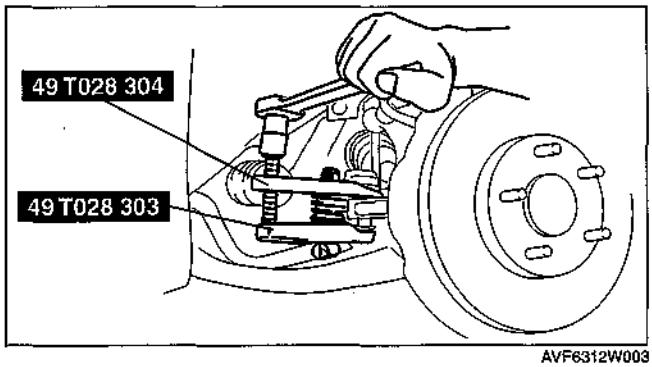
1. Remove the brake caliper component, and suspend it with rope.



AVF6312W002

Tie-rod End Ball Joint Removal Note

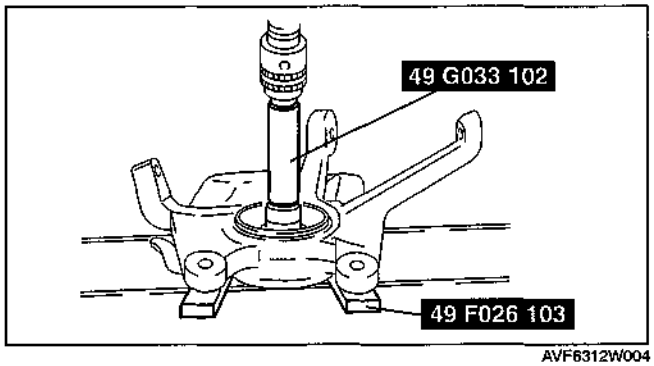
1. Remove the tie rod-nut.
2. Separate the tie-rod end from the steering knuckle using the **SSTs**.



AVF6312W003

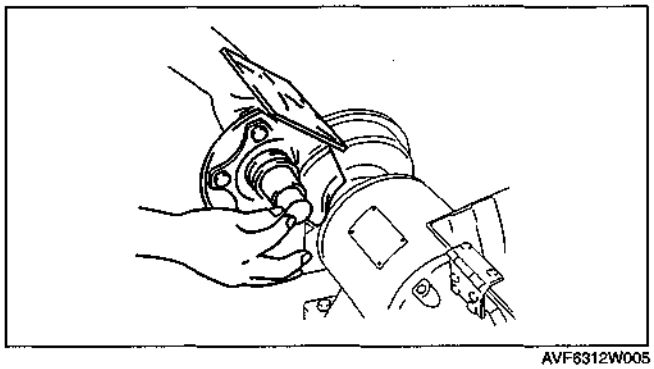
Wheel Hub Component Removal Note

1. Remove the wheel hub component using the **SSTs** and a press.



AVF6312W004

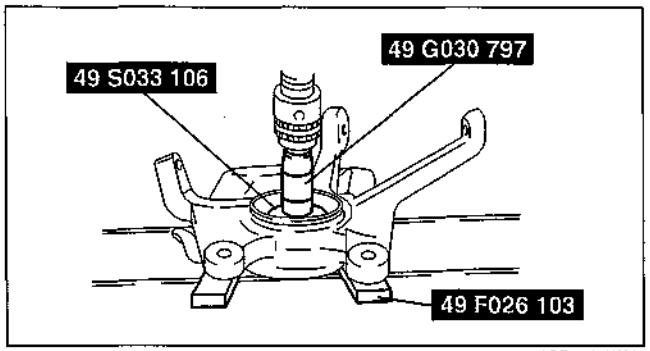
2. If the bearing inner race remains on the front wheel hub component, grind a section of the bearing inner race until **approx. 0.5 mm {0.02 in}** remains. Then remove it using a chisel.



AVF6312W005

Wheel Bearing Removal Note

1. Remove the wheel bearing using the **SSTs** and a press.

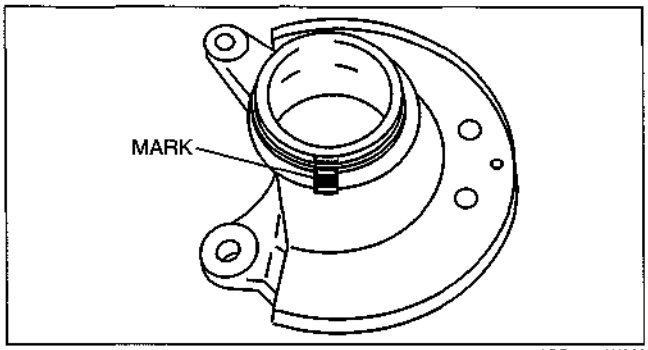


ABR6312W007

Dust Cover Removal Note

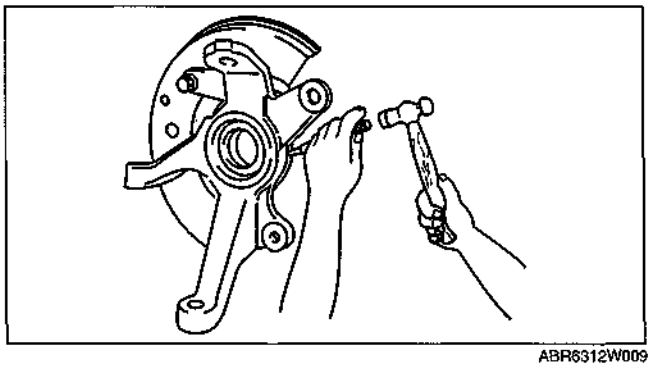
Note
- The dust cover does not need to be removed unless it is being replaced.

1. Mark the dust cover and steering knuckle for proper installation.



ABR6312W008

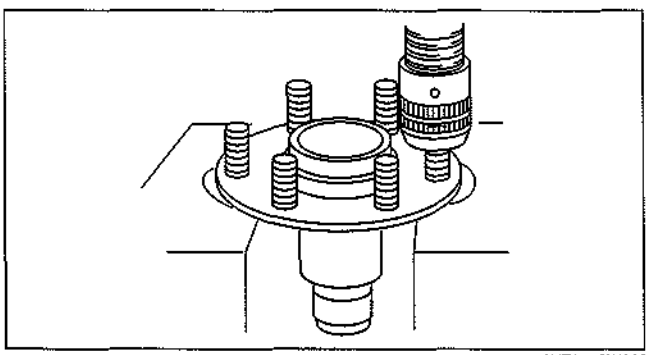
2. Remove the dust cover using a chisel.


ABR6312W009

Hub Bolt Removal Note

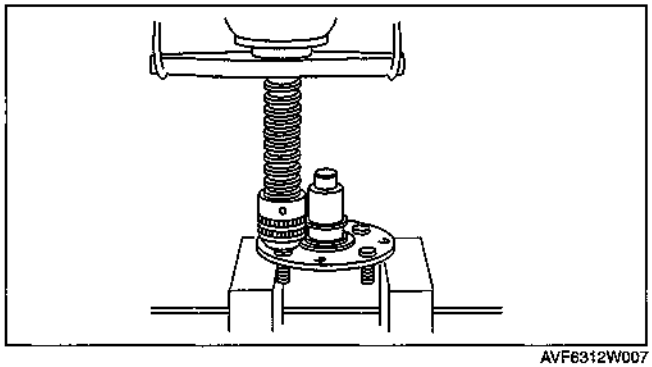
Note
- The hub bolts do not need to be removed unless they are being replaced.

1. Remove the hub bolts using a press.


AVF6312W006

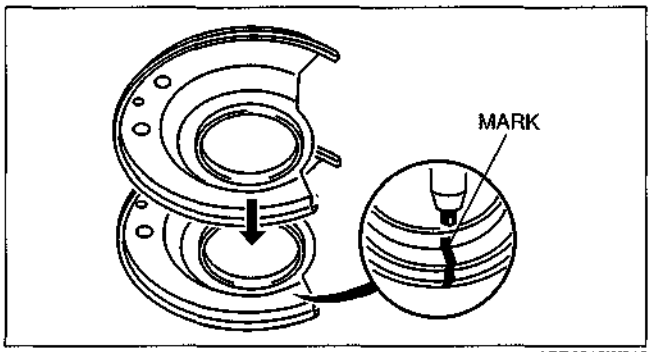
Hub Bolt Installation Note

1. Install the new hub bolts using a press.


AVF6312W007

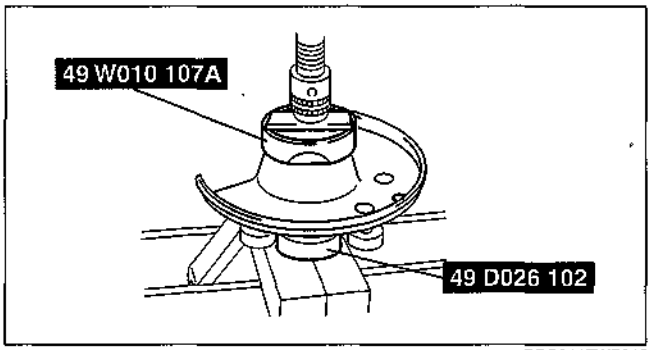
Dust Cover Installation Note

1. Mark the new dust cover in the same way as the removed one.
2. Align the marks of the new dust cover and the knuckle.



ABR6312W010

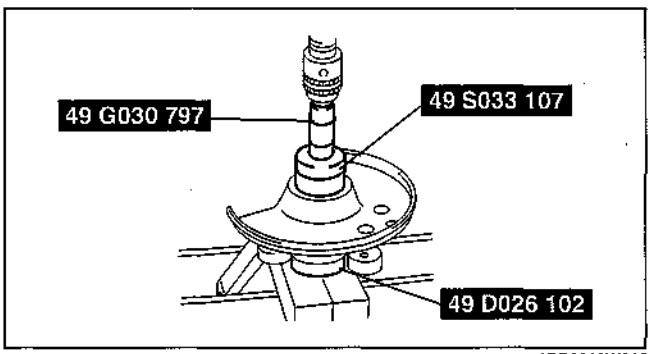
3. Install the new dust cover using the **SSTs** and a press.



DBG311ZWB015

Wheel Bearing Installation Note

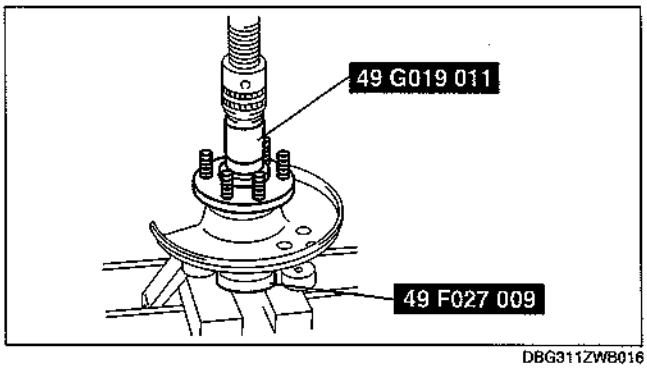
1. Install the new wheel bearing using the **SSTs** and a press.



ABR6312W012

Wheel Hub Component Installation Note

1. Install the wheel hub component using the **SSTs** and a press.



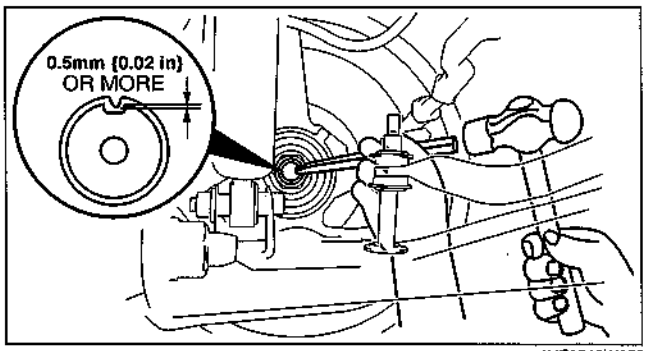
DBG311ZW8016

Locknut Installation Note

Note

- Install the locknut with the vehicle on level ground.

1. Install a new locknut and stake it as shown.



AVF6312W053

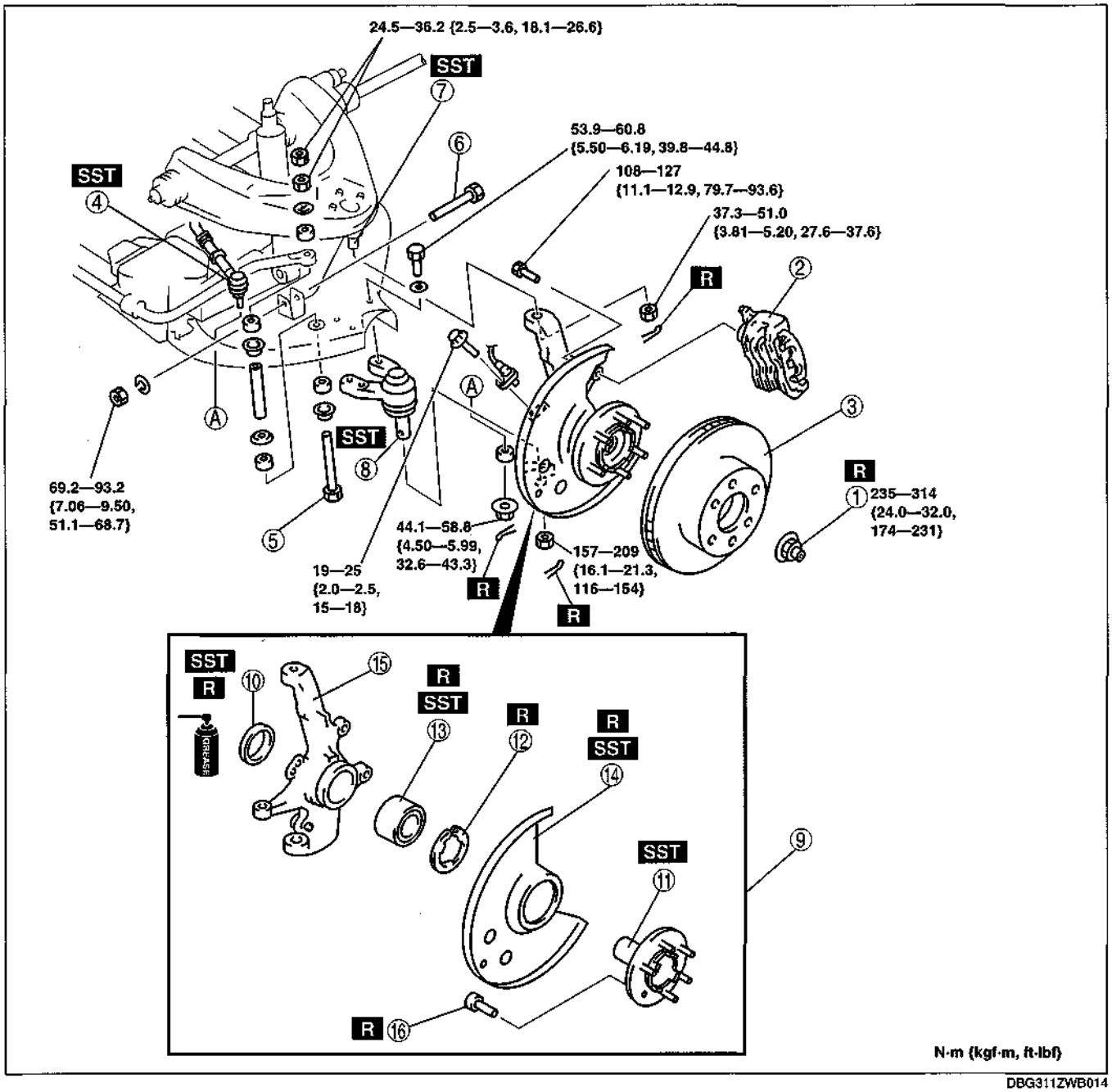
WHEEL HUB, STEERING KNUCKLE REMOVAL/INSTALLATION [4x4]

dcf031104060w05

Caution

- **Performing the following procedures without first removing the ABS wheel-speed sensor may possibly cause an open circuit in the harness if it is pulled by mistake. Before performing the following procedures, remove the ABS wheel-speed sensor (axle side) and fix it to an appropriate place where the sensor will not be pulled by mistake while the vehicle is being serviced.**

1. Remove in the order indicated in the table.
2. Install in the reverse order of removal.



DBG311ZWB014

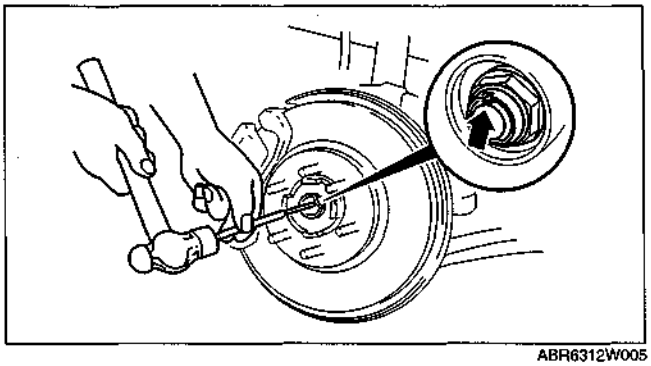
1	Locknut (See 03-11-15 Locknut Removal Note) (See 03-11-19 Locknut Installation Note)
2	Brake caliper component (See 03-11-15 Brake Caliper Component Removal Note)
3	Disc plate

4	Tie-rod end ball joint (See 03-11-15 Tie-rod End Ball Joint Removal Note)
5	Bolt (stabilizer)
6	Bolt (shock absorber)
7	Upper arm ball joint
8	Lower arm ball joint
9	Wheel hub, steering knuckle, dust cover

10	Oil seal (See 03-11-16 Oil Seal Removal Note) (See 03-11-19 Oil Seal Installation Note)
11	Wheel hub component (See 03-11-16 Wheel Hub Component Removal Note) (See 03-11-18 Wheel Hub Component Installation Note)
12	Retaining ring
13	Wheel bearing (See 03-11-16 Wheel Bearing Removal Note) (See 03-11-18 Wheel Bearing Installation Note)
14	Dust cover (See 03-11-17 Dust Cover Removal Note) (See 03-11-18 Dust Cover Installation Note)
15	Steering knuckle
16	Hub bolt (See 03-11-17 Hub Bolt Removal Note) (See 03-11-17 Hub Bolt Installation Note)

Locknut Removal Note

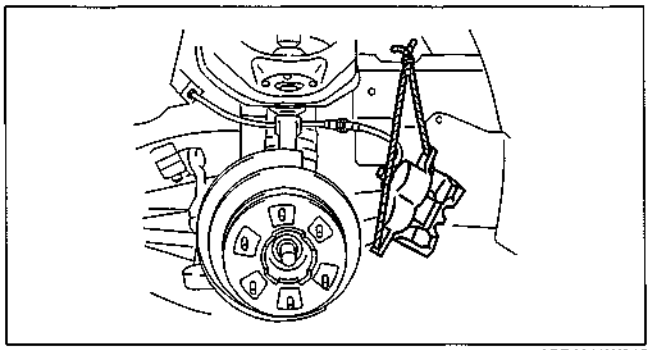
1. Knock the crimped portion of the locknut outward using a small chisel and a hammer.
2. Lock the hub by applying the brakes.
3. Remove the locknut.



ABR6312W005

Brake Caliper Component Removal Note

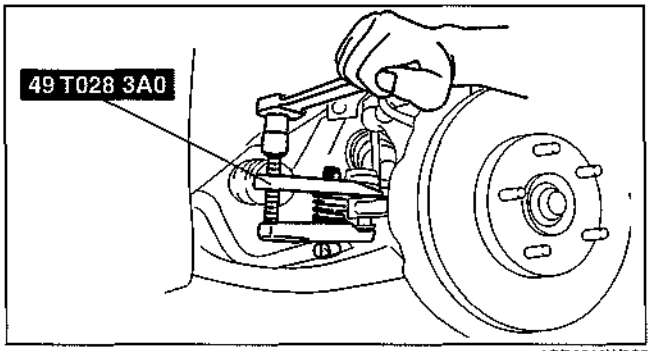
1. Remove the brake caliper component, and suspend it with rope.



ABR6312W015

Tie-rod End Ball Joint Removal Note

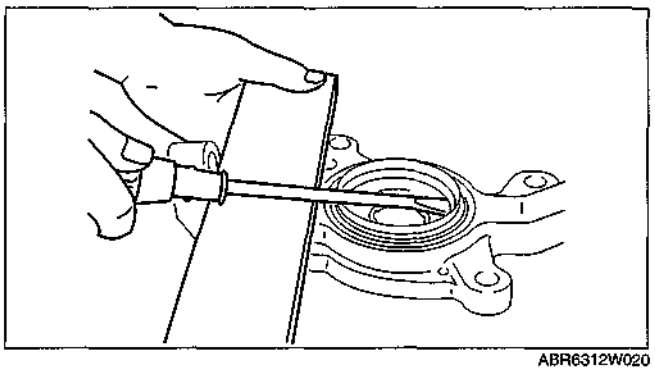
1. Remove the tie rod-nut.
2. Separate the tie-rod end from the steering knuckle using the **SSTs**.



ABR6312W028

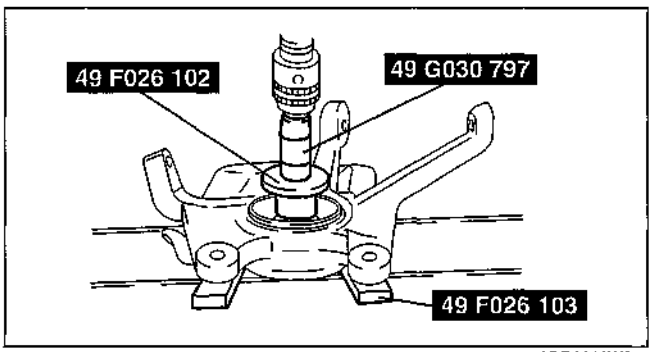
Oil Seal Removal Note

1. Remove the oil seal by using a screwdriver.


ABR6312W020

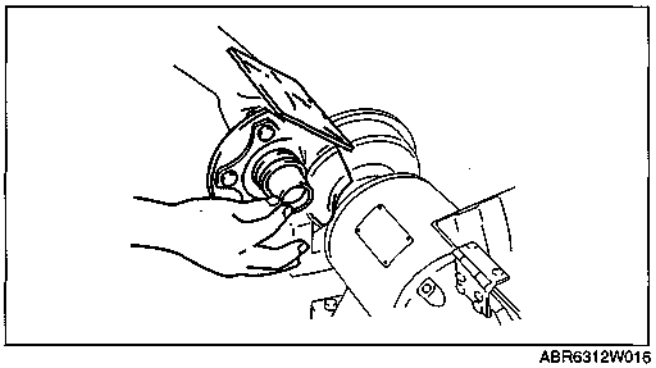
Wheel Hub Component Removal Note

1. Remove the wheel hub component using the **SSTs** and a press.



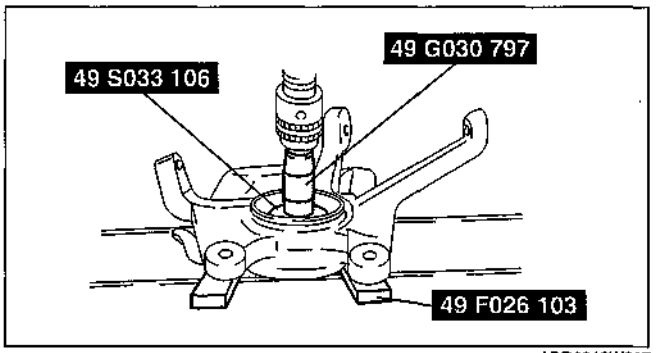
ABR6312W006

2. If the bearing inner race remains on the front wheel hub component, grind a section of the bearing inner race until **approx. 0.5 mm {0.02 In}** remains. Then remove it using a chisel.


ABR6312W016

Wheel Bearing Removal Note

1. Remove the wheel bearing using the **SSTs** and a press.

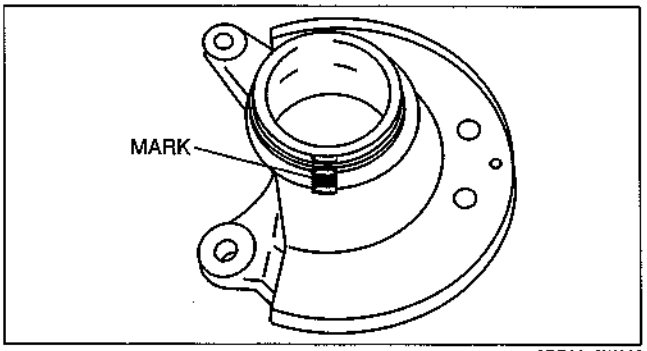


ABR6312W007

Dust Cover Removal Note

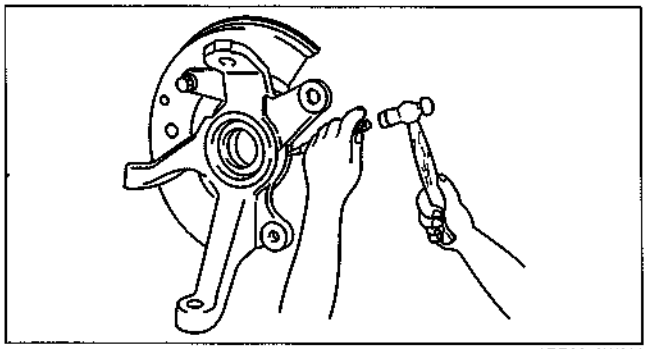
Note
- The dust cover does not need to be removed unless it is being replaced.

1. Mark the dust cover and steering knuckle for proper installation.



ABR6312W008

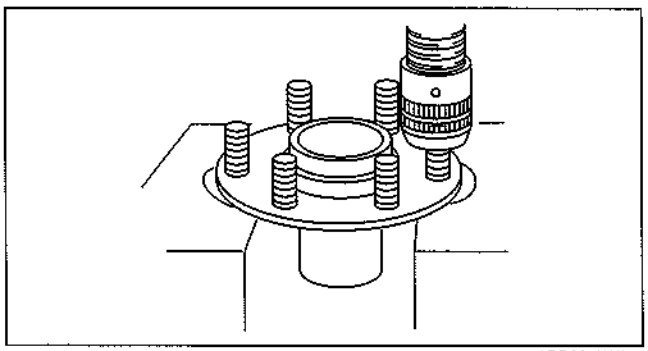
2. Remove the dust cover using a chisel.


ABR6312W009

Hub Bolt Removal Note

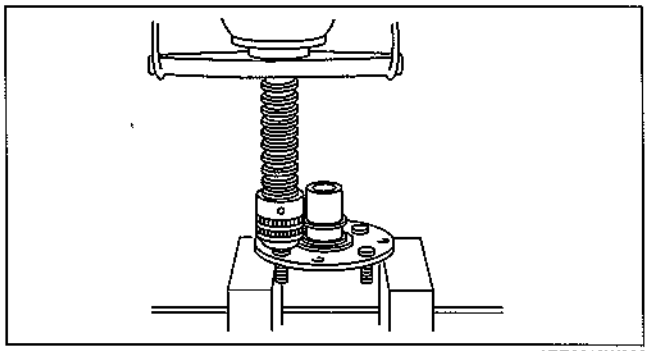
Note
- The hub bolts do not need to be removed unless they are being replaced.

1. Remove the hub bolts using a press.


ABR6312W019

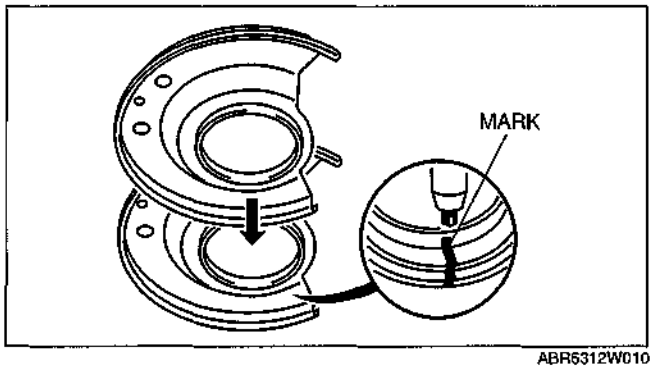
Hub Bolt Installation Note

1. Install the new hub bolts using a press.


ABR6312W022

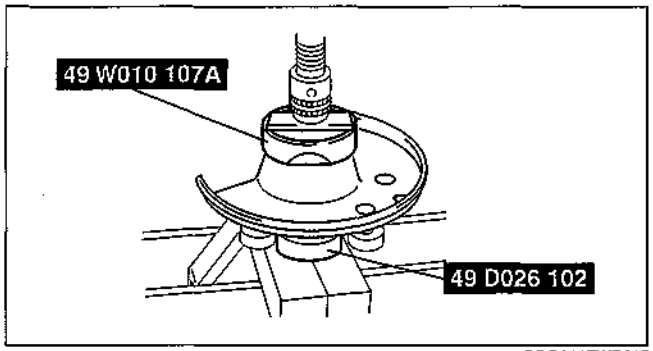
Dust Cover Installation Note

1. Mark the new dust cover in the same way as the removed one.
2. Align the marks of the new dust cover and the knuckle.



ABR5312W010

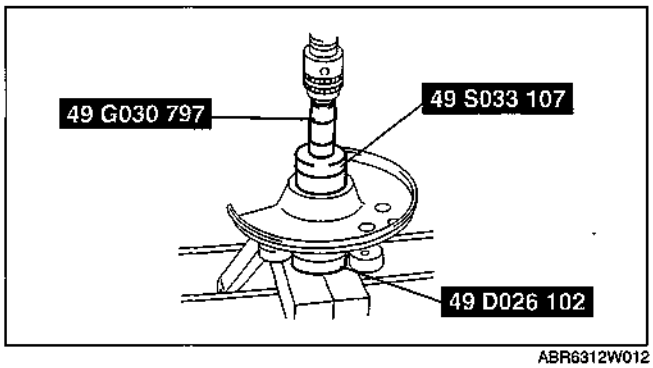
3. Install the new dust cover using the **SSTs** and a press.



DBG311ZWB015

Wheel Bearing Installation Note

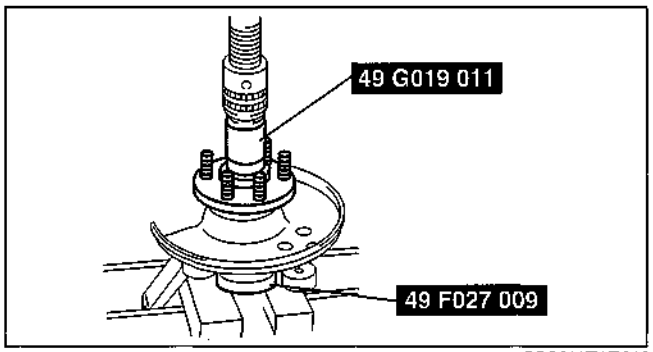
1. Install the new wheel bearing using the **SSTs** and a press.



ABR6312W012

Wheel Hub Component Installation Note

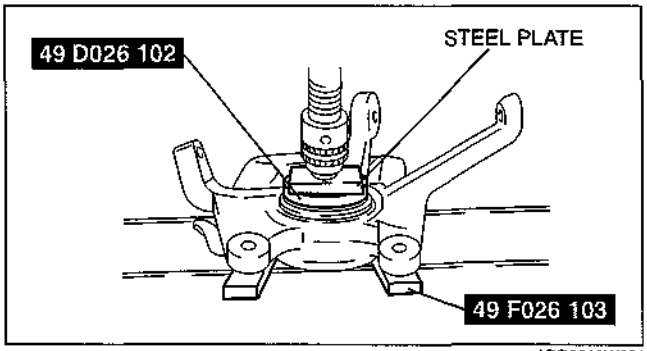
1. Install the wheel hub component using the **SSTs** and a press.



DBG311ZWB016

Oil Seal Installation Note

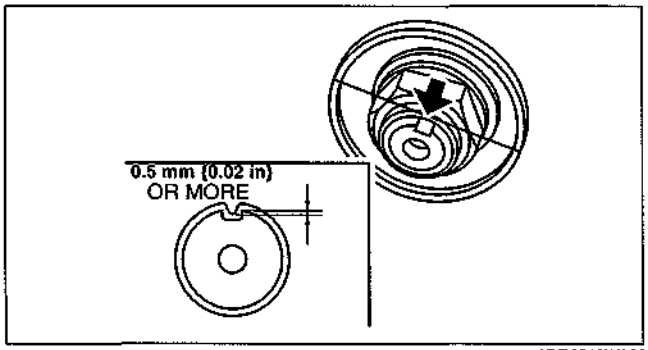
1. Apply grease to the new oil seal lip.
2. Install the new oil seal flush with the knuckle using the **SSTs**.



ABR6312W021

Locknut Installation Note

1. Install a new locknut and stake it as shown.



ABR6312W026

03-12 REAR AXLE

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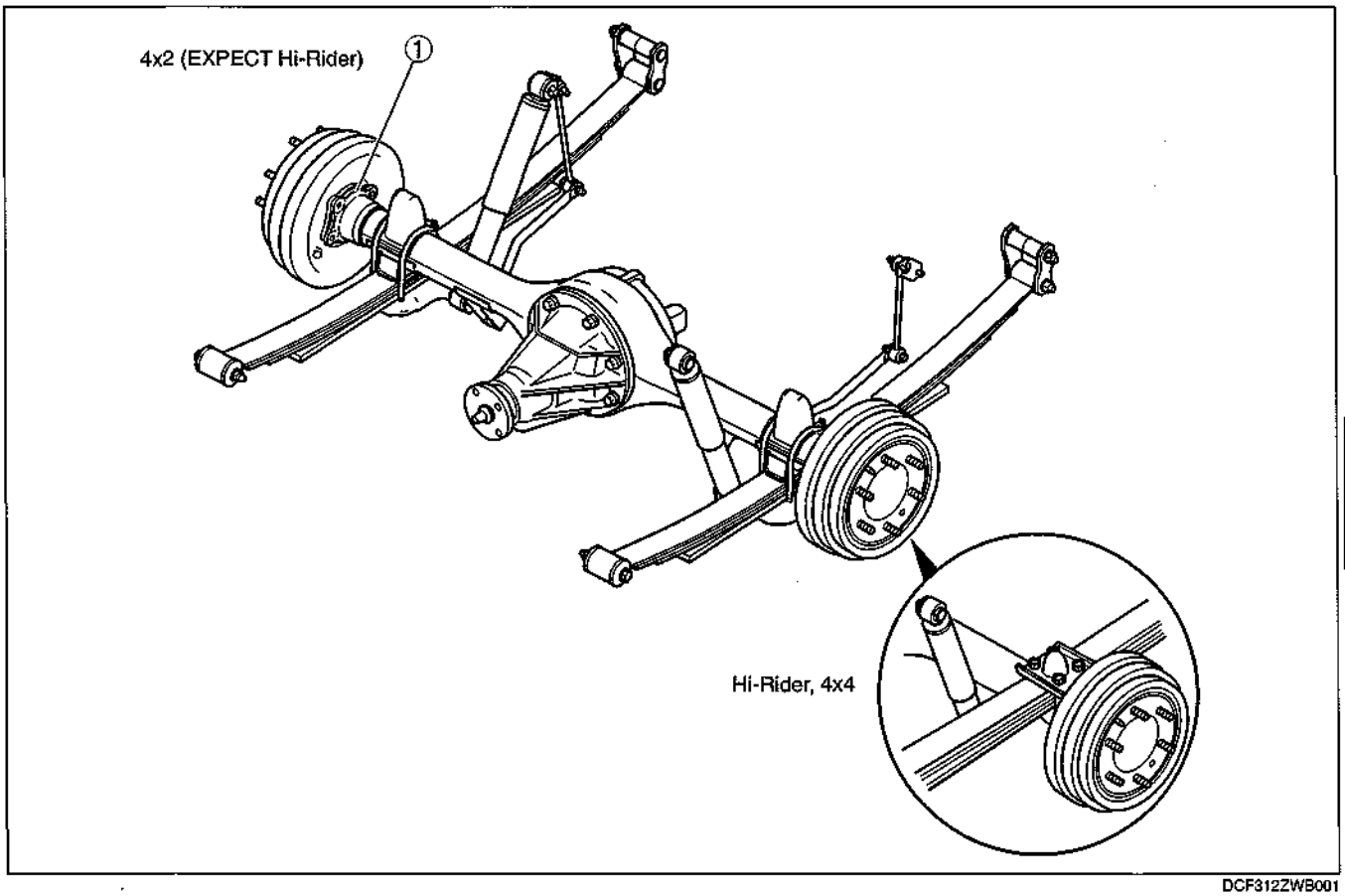
REAR AXLE INSPECTION..... 03-12–1
REAR AXLE ADJUSTMENT..... 03-12–2
AXLE SHAFT
REMOVAL/INSTALLATION 03-12–2

REAR AXLE LOCATION INDEX

dcf031205000w01



DCF312ZWB001

1	Axle shaft (See 03-12-1 REAR AXLE INSPECTION.) (See 03-12-2 REAR AXLE ADJUSTMENT.) (See 03-12-2 AXLE SHAFT REMOVAL/ INSTALLATION.)

REAR AXLE INSPECTION

dcf031226110w01

Wheel Bearing Play Inspection

1. Jack up the rear end and support it with safety stands.
2. Verify that there is no abnormal noise and that the tire rotates smoothly when forcefully rotated by hand.
3. With a hand on top of the tire, inspect the bearing play.

Rear wheel bearing play
0.05—0.25 mm {0.002—0.010 in}

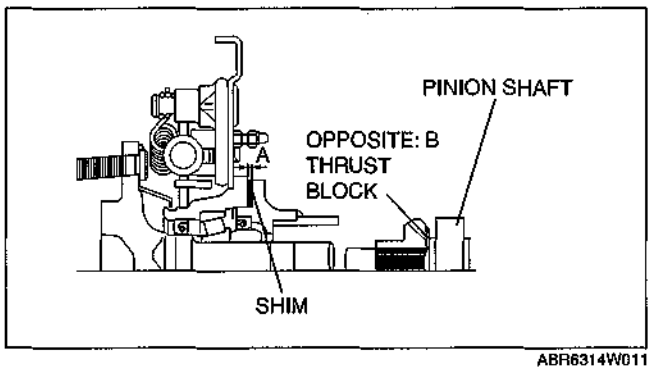
4. If the bearing play exceeds the specification, adjust the bearing play.

REAR AXLE ADJUSTMENT

dcf031226110w02

Wheel Bearing Play Adjustment

1. Adjust the bearing end play in the axial direction using the following procedures. (Only when the bearing is replaced.)
   (1) Press one side of the rear axle shaft components to the thrust bearing on the differential.
   (2) Measure the clearance between the bearing housing and the axle housing (part A in the figure).
   (3) Select a shim that is **0.65—0.95 mm {0.026—0.037 in}** thicker than the clearance measured in Step 2 and install it.
   (4) Measure the clearance of the rear axle shaft component on the opposite side using the same procedure in Steps 1 and 2 above.



ABR6314W011

   (5) Select a shim that is **0.05—0.25 mm {0.002—0.009 in}** thicker than the clearance measured in Step 4 and install it.
   (6) Verify that the rear axle bearing end play is within a range of **0.05—0.25 mm {0.002—0.009 in}**.
      - If it is not within the range, adjust the rear axle bearing end play again.

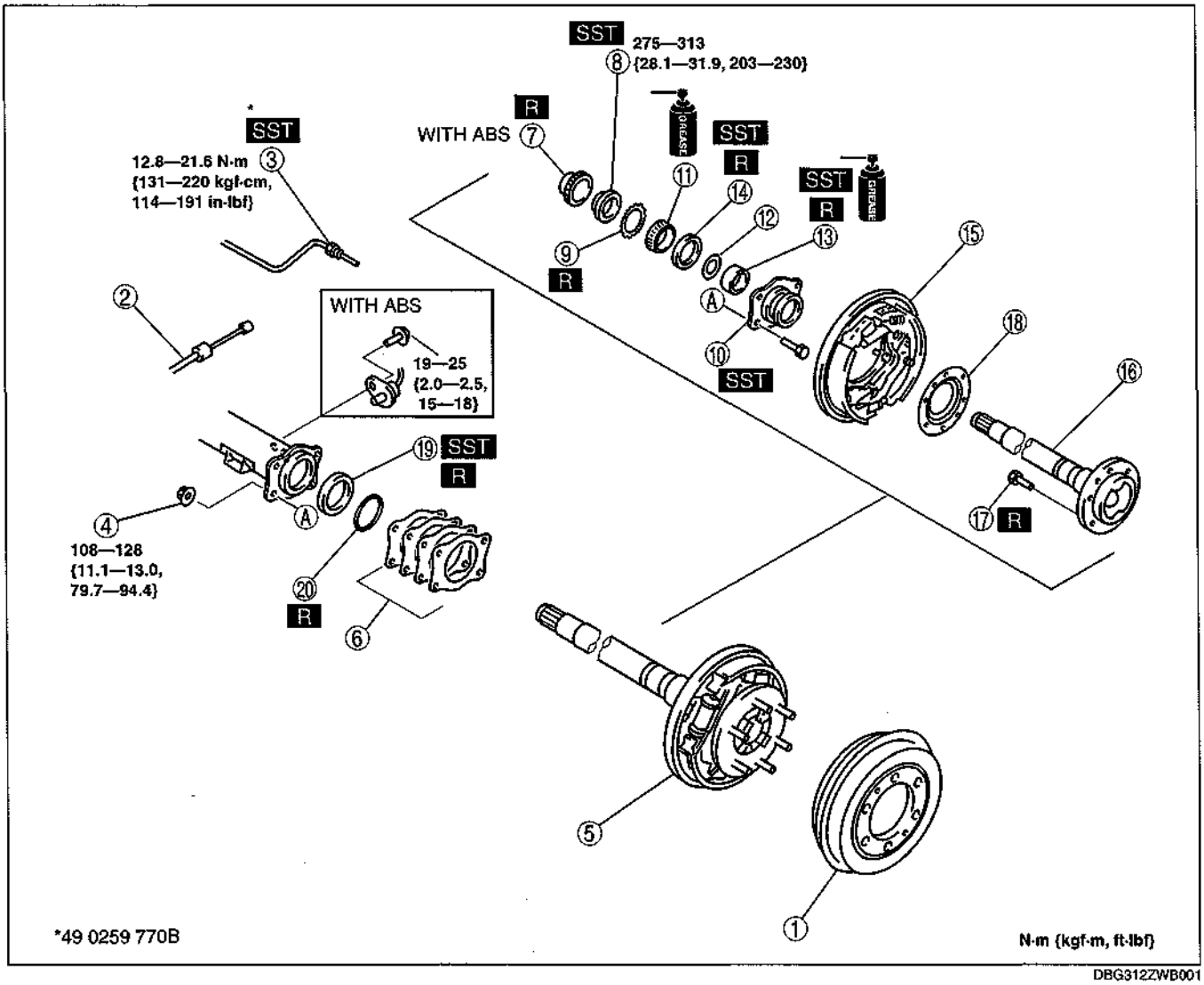
Rear axle bearing play in axial direction
0.05—0.25 mm {0.002—0.009 in}

AXLE SHAFT REMOVAL/INSTALLATION

dcf031226110w03

1. Remove in the order indicated in the table.

2. Install in the reverse order of removal.



DBG312ZWB001

1	Brake drum
2	Parking brake cable connecting pin
3	Brake pipe
4	Nut
5	Axle shaft and back plate component (See 03-12-7 Axle Shaft and Back Plate Component, Shim Installation Note (Bearing play adjustment))
6	Shim (See 03-12-7 Axle Shaft and Back Plate Component, Shim Installation Note (Bearing play adjustment))
7	ABS sensor rotor (with ABS) (See 03-12-4 ABS Sensor Rotor Removal Note) (See 03-12-6 ABS Sensor Rotor Installation Note)
8	Bearing locknut (See 03-12-4 Bearing Locknut Removal Note) (See 03-12-6 Bearing Inner Race, Bearing Locknut Installation Note)
9	Lock washer
10	Bearing housing (See 03-12-4 Bearing Housing Removal Note)

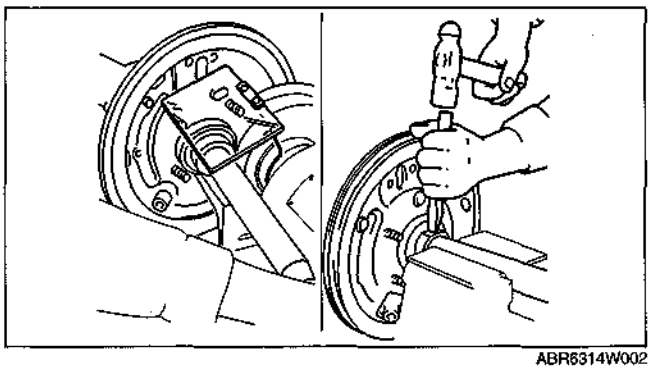
11	Bearing inner race (See 03-12-6 Bearing Inner Race, Bearing Locknut Installation Note)
12	Bearing spacer
13	Oil seal (bearing housing side) (See 03-12-6 Bearing Outer Race, Oil Seal (Bearing Housing Side) Installation Note)
14	Bearing outer race (See 03-12-5 Bearing Outer Race Removal Note) (See 03-12-6 Bearing Outer Race, Oil Seal (Bearing Housing Side) Installation Note)
15	Back plate component
16	Axle shaft
17	Hub bolt
18	Baffle
19	Oil seal (axle casing side) (See 03-12-5 Oil Seal (Axle Casing Side) Removal Note) (See 03-12-5 Oil Seal (Axle Casing Side) Installation Note)
20	O-ring

ABS Sensor Rotor Removal Note

Warning
- **When grinding, be careful of debris coming from the grinder or bearing collar. Always wear eye protectors.**

Caution
- **Because the ABS sensor rotor and rear wheel hub edge are almost flush even if the axle shaft is moved as far as it will go, be careful not to damage the rear wheel hub when grinding.**

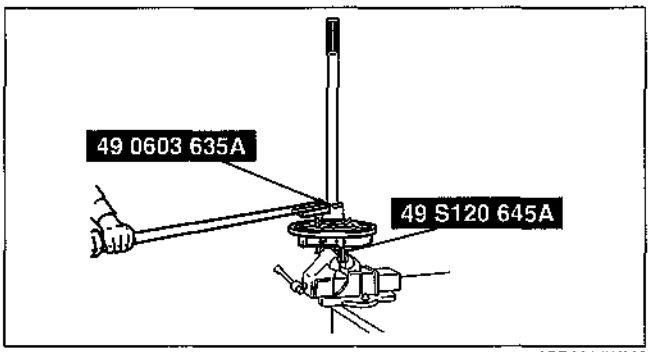
1. Grind a part of the ABS sensor rotor using a grinder until **0.5 mm {0.02 in}** remains, and then brake it using a chisel and remove from the shaft.


ABR6314W002

Bearing Locknut Removal Note

Note
- Be careful when removing or installing the bearing locknuts for the left wheels because they are left threaded (tightened by turning counterclockwise).

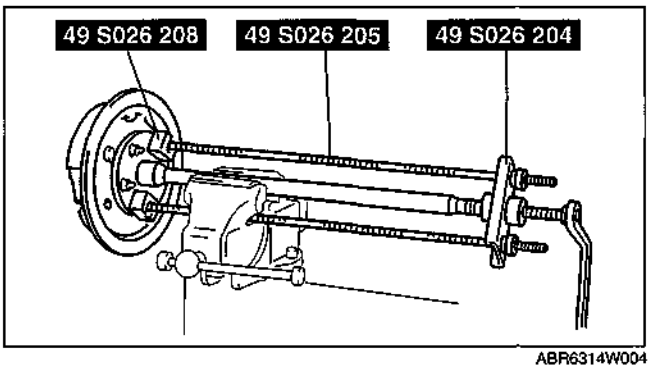
1. Set the **SSTs** as shown in the figure, and remove the bearing locknut from the rear axle shaft.



ABR6314W003

Bearing Housing Removal Note

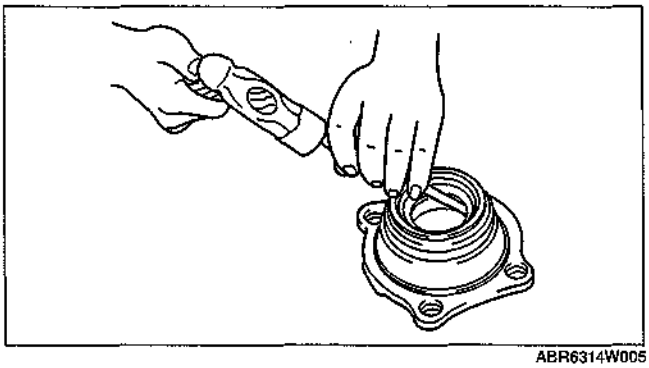
1. Remove the bearing and bearing housing using the **SSTs**.



ABR6314W004

Bearing Outer Race Removal Note

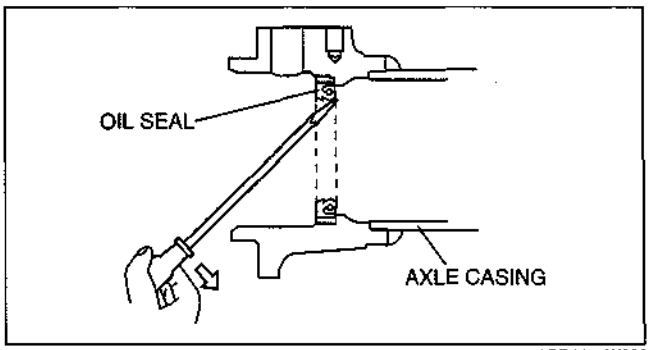
1. After removing the bearing inner race and oil seal from the rear wheel hub, tap lightly using a suitable round bar to force out the outer race.



ABR6314W005

Oil Seal (Axle Casing Side) Removal Note

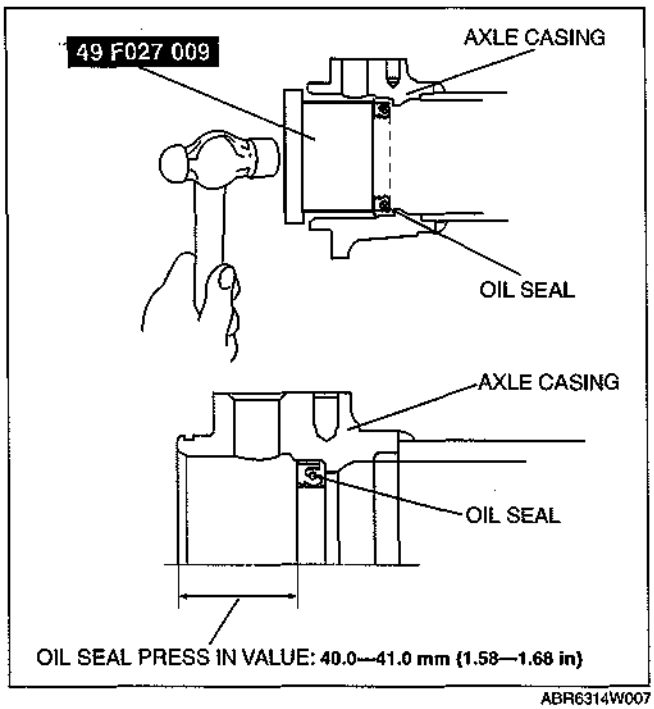
1. remove the oil seal from the axle casing using a screwdriver.



ABR6314W006

Oil Seal (Axle Casing Side) Installation Note

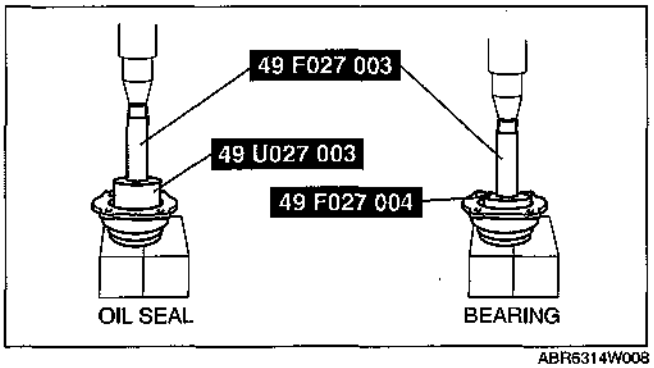
1. Tap the oil seal in until it is flush with the end of the axle casing using the **SST**.
2. After installation, apply grease to the oil seal lip.



ABR6314W007

Bearing Outer Race, Oil Seal (Bearing Housing Side) Installation Note

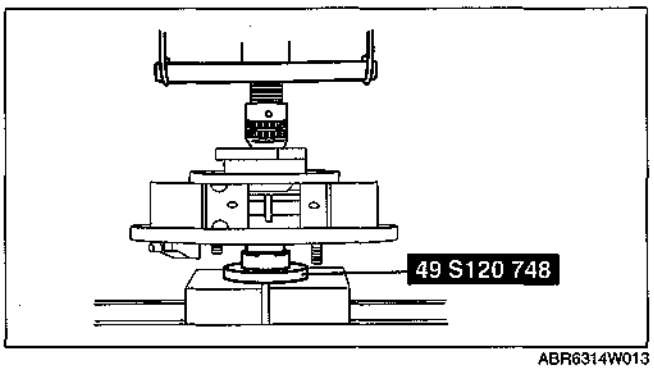
1. Press the bearing outer race and the oil seal using the **SSTs**.



ABR6314W008

Bearing Inner Race, Bearing Locknut Installation Note

1. Set the **SST** and then press the bearing in until 3 to 5 threads of the bearing locknut mounting screw of the axle shaft are visible above the top of the bearing outer race.
2. Remove the **SST**, and then install the bearing locknut to the axle shaft.
3. Tighten the bearing locknut using the **SST (49 0603 635A)** to press in the bearing inner race.
4. Remove the bearing locknut and install the lock washer so that its tab fits into the groove of the axle shaft.
5. Re-install the bearing locknut and tighten it to the specified torque.

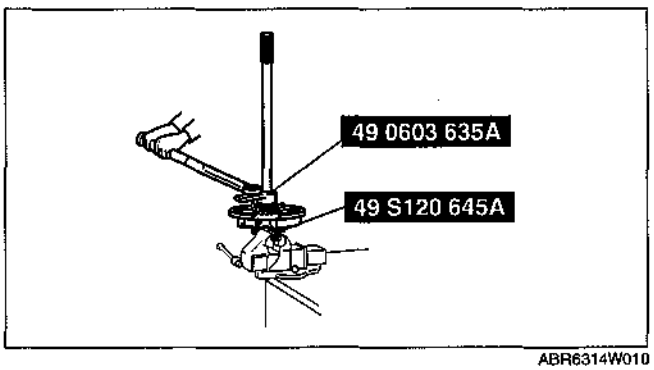


ABR6314W013

Tightening torque
275—313 N·m {28.1—31.9 kgf·m, 203—230 ft·lbf}

6. Bend the lock washer tab securely in the slot in the locknut.

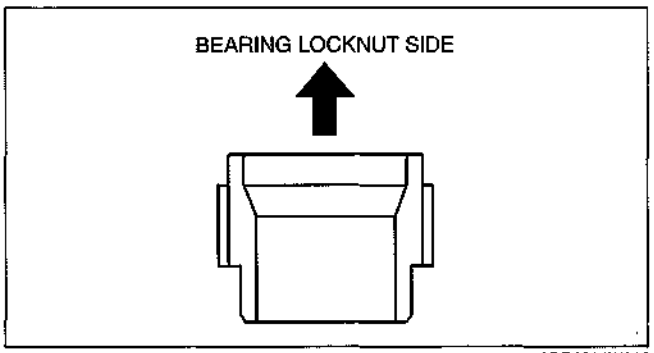
Caution
- **The torque wrench must be attached perpendicular to the SST.**



ABR6314W010

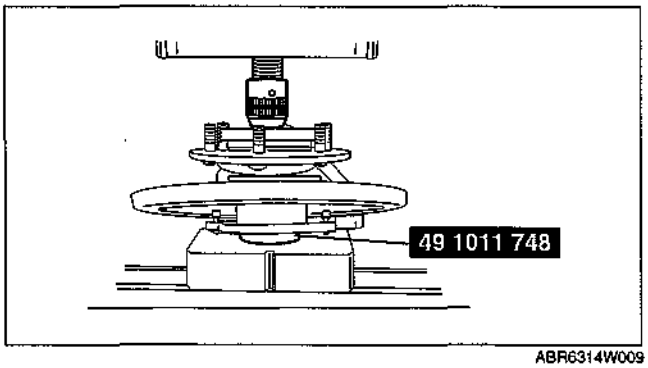
ABS Sensor Rotor Installation Note

Note
- Install the ABS sensor rotor in the direction shown in the figure.



ABR6314W012

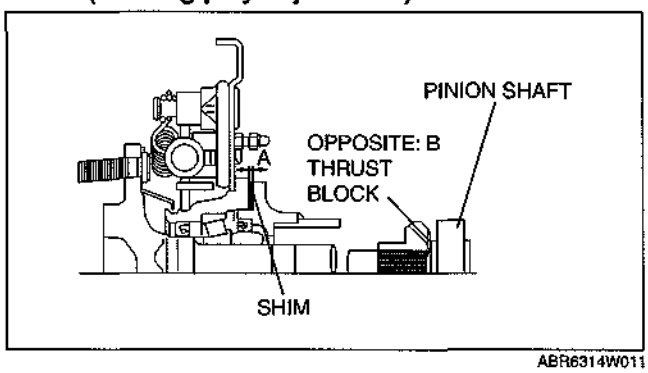
1. Press the ABS sensor rotor in until it is flush with the end of the bearing lock nut using the **SST**.



ABR6314W009

Axle Shaft and Back Plate Component, Shim Installation Note (Bearing play adjustment)

1. Adjust the bearing end play in the axial direction using the following procedures. (Only when the bearing is replaced.)
   (1) Press one side of the rear axle shaft components to the thrust bearing on the differential.
   (2) Measure the clearance between the bearing housing and the axle housing (part A in the figure).
   (3) Select a shim that is **0.65—0.95 mm {0.026—0.037 in}** thicker than the clearance measured in Step 2 and install it.
   (4) Measure the clearance of the rear axle shaft component on the opposite side using the same procedure in Steps 1 and 2 above.



ABR6314W011

   (5) Select a shim that is **0.05—0.25 mm {0.002—0.009 in}** thicker than the clearance measured in Step 4 and install it.
   (6) Verify that the rear axle bearing end play is within a range of **0.05—0.25 mm {0.002—0.009 In}**.
      • If it is not within the range, adjust the rear axle bearing end play again.

Rear axle bearing play in axial direction
0.05 —0.25 mm {0.002—0.009 in}

03-13 DRIVE SHAFT

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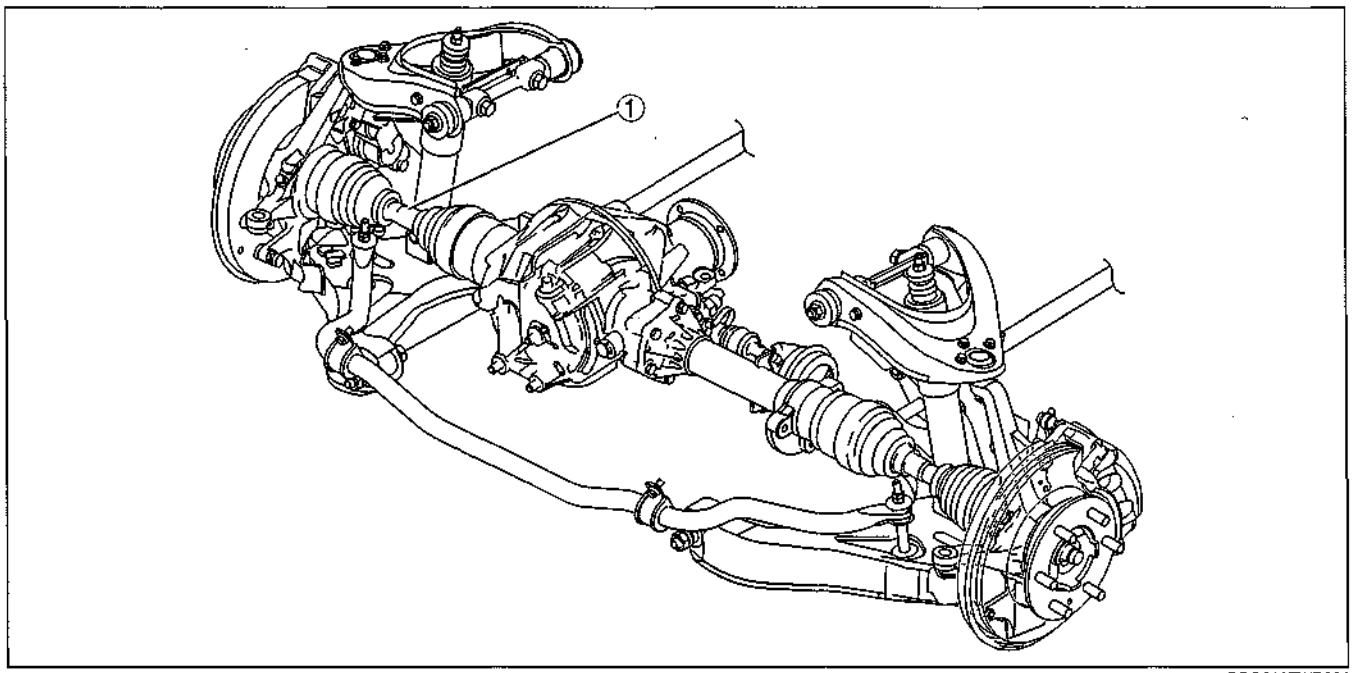
FRONT DRIVE SHAFT
INSPECTION 03-13–1
FRONT DRIVE SHAFT
REMOVAL/INSTALLATION 03-13–2
FRONT DRIVE SHAFT
DISASSEMBLY/ASSEMBLY 03-13–4

DRIVE SHAFT LOCATION INDEX

dcf031325501w01



DBG313ZWB001

1	Front drive shaft (See 03-13-1 FRONT DRIVE SHAFT INSPECTION.) (See 03-13-2 FRONT DRIVE SHAFT REMOVAL/INSTALLATION.) (See 03-13-4 FRONT DRIVE SHAFT DISASSEMBLY/ASSEMBLY.)

FRONT DRIVE SHAFT INSPECTION

dcf031325501w02

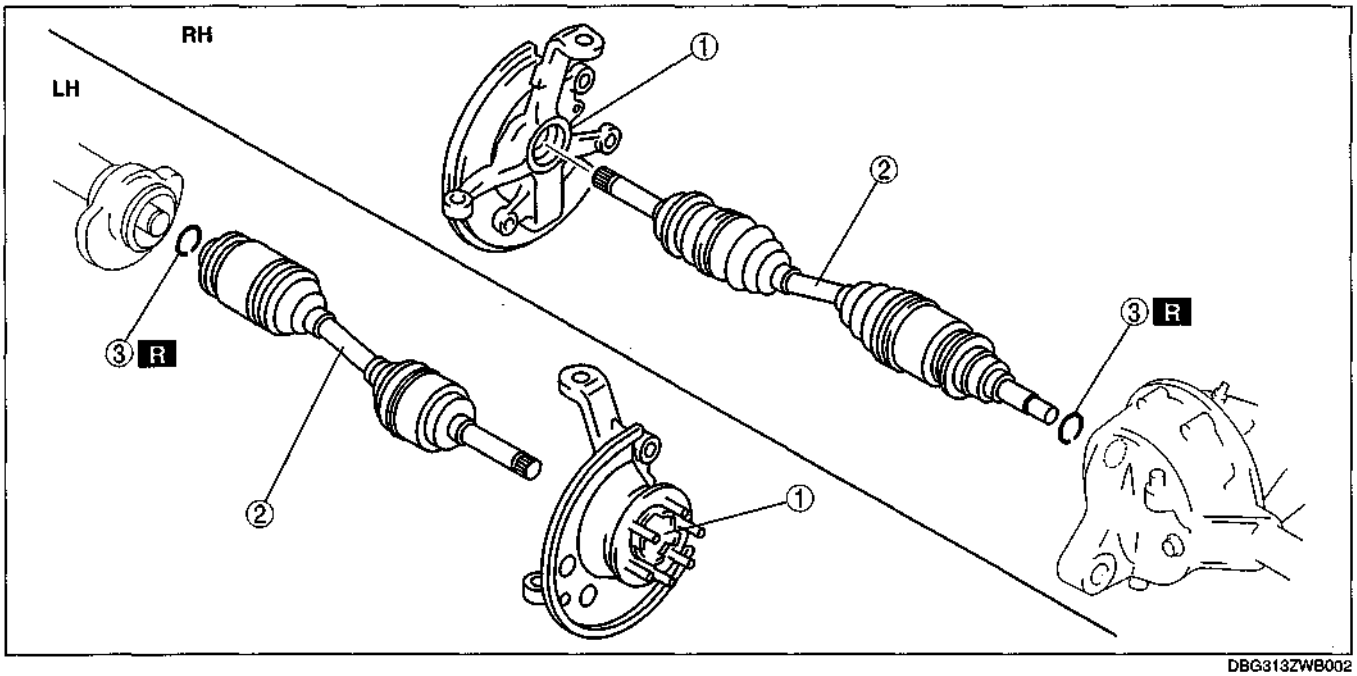
1. Verify that the drive shaft is not twisted or damaged.
   - If there is any malfunction, replace the applicable part.
2. Inspect the dust boot for damage and cracks.
   - If there is any malfunction, replace the applicable part.
3. Move the spline and joint up and down, left and right by hand and verify that there is no roughness.
   - If there is any malfunction, replace the applicable part.

FRONT DRIVE SHAFT REMOVAL/INSTALLATION

dcf031325501w03

Caution
- **Performing the following procedures without first removing the ABS wheel-speed sensor may possibly cause an open circuit in the harness if it is pulled by mistake. Before performing the following procedures, remove the ABS wheel-speed sensor (axle side) and fix it to an appropriate place where the sensor will not be pulled by mistake while servicing the vehicle.**

1. If removing the RH drive shaft, drain the front differential oil.
2. Remove in the order indicated in the table.
3. Install in the reverse order of removal.



DBG313ZWB002

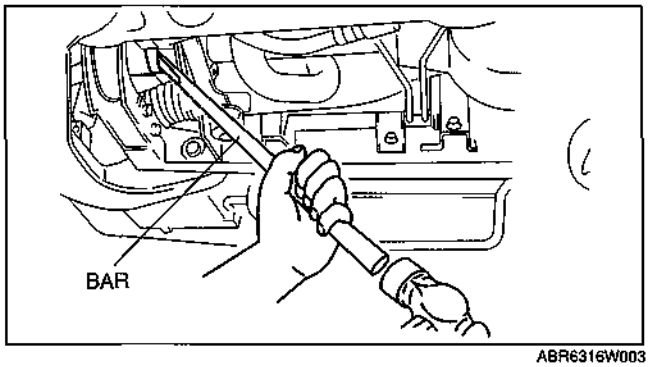
1	Wheel hub, steering knuckle (See 03-11-4 WHEEL HUB, STEERING KNUCKLE REMOVAL/INSTALLATION [4x2 (EXCEPT Hi-Rider)].) (See 03-11-8 WHEEL HUB, STEERING KNUCKLE REMOVAL/INSTALLATION [Hi-Rider].) (See 03-11-14 WHEEL HUB, STEERING KNUCKLE REMOVAL/INSTALLATION [4x4].)

2	Drive shaft (See 03-13-2 Drive Shaft Removal Note) (See 03-13-3 Drive Shaft Installation Note)
3	Clip

Drive Shaft Removal Note

Caution
- **Do not damage the dust cover or the ABS sensor rotor on the drive shaft. These parts cannot be purchased separately. Replace the assembled unit if the dust cover or the ABS sensor rotor is damaged.**
- **The sharp edges of the drive shaft can slice or puncture the oil seal. Be careful when removing the drive shaft from the front differential.**

1. Remove the drive shaft by prying with a bar inserted between the differential casing and the drive shaft, as shown in the figure.



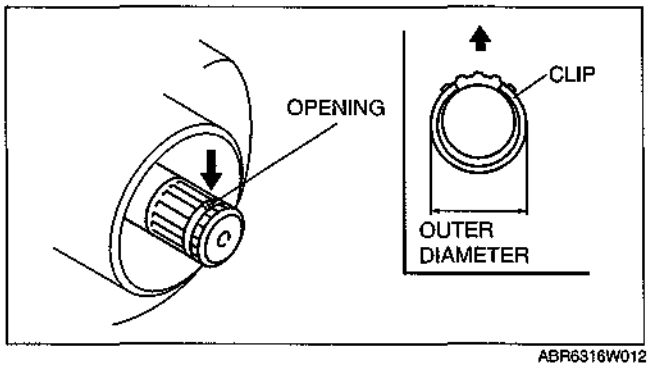
ABR6316W003

Drive Shaft Installation Note

Caution
- **The sharp edges of the drive shaft can slice or puncture the oil seal. Be careful when installing the drive shaft to the front differential.**
- **The oil seals are damaged easily if this procedure is not done correctly.**

(LH)
1. Install a new clip onto the output shaft with the opening facing upward. Ensure that the diameter of the clip does not exceed the specification for installation.
2. After installation, measure the outer diameter.
   - If it exceeds the specification, repeat Steps 1—2 using a new clip.

   Outer diameter specification
   31.2 mm {1.23 in}

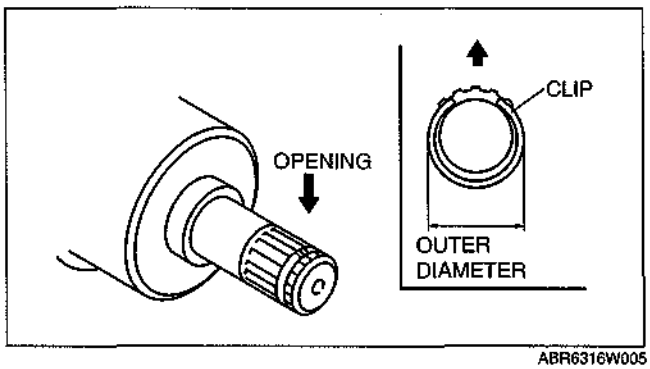


ABR6316W012

3. Apply differential oil to the oil seal lip.
4. Insert the drive shaft into the output shaft.
5. Push the drive shaft into the wheel hub.
6. After installation, pull the output shaft side outer ring forward to confirm that the drive shaft is securely held by the clip.

(RH)
1. Install a new clip onto the drive shaft with the opening of a new clip facing upward.
2. After installation, measure the outer diameter.
   - If it exceeds the specification, repeat Steps 1—2 using a new clip.

   Outer diameter specification
   33.2 mm {1.31 in}



ABR6316W005

3. Install the drive shaft into the front differential.
4. Push the drive shaft into the wheel hub.
5. After installation, pull the front differential side outer ring forward to confirm that the drive shaft is securely held by the clip.

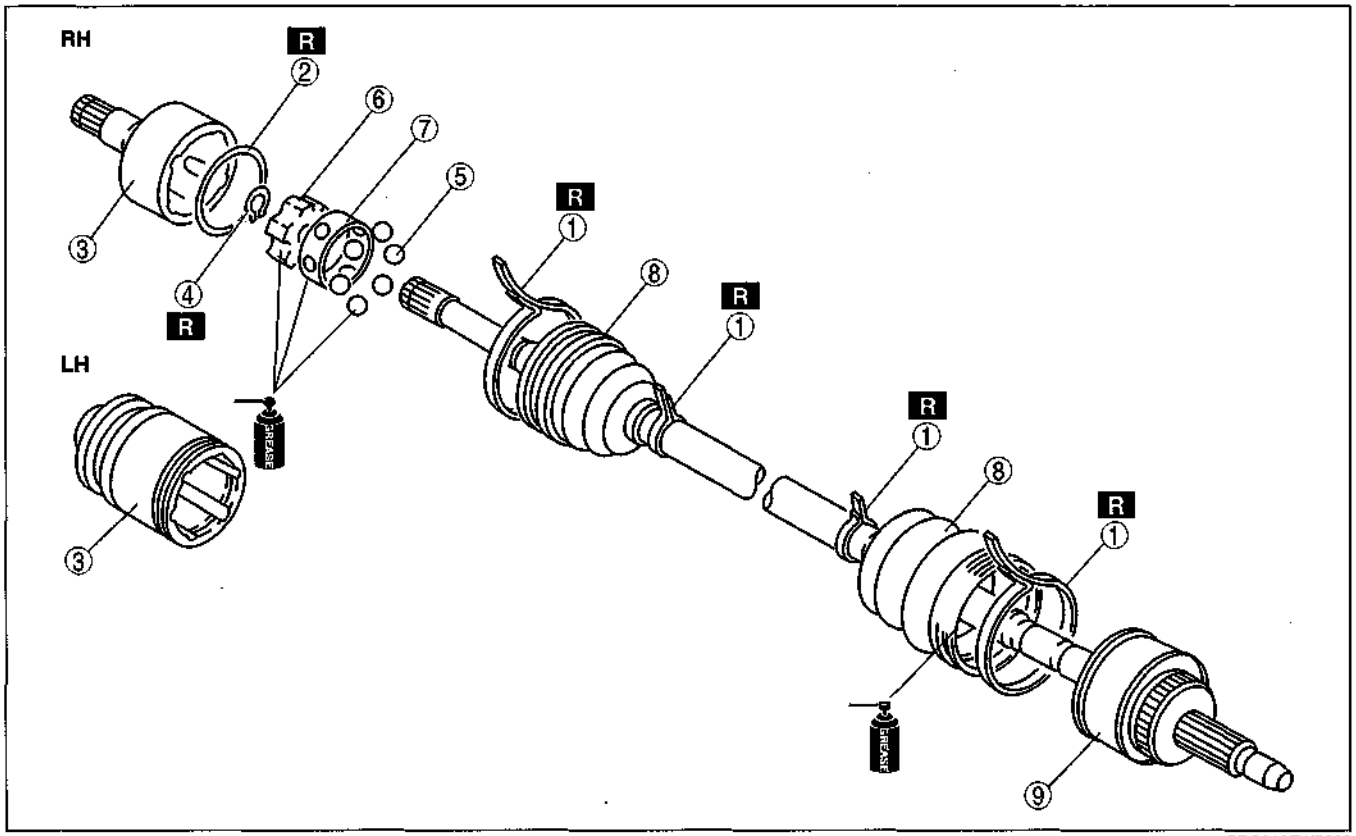
FRONT DRIVE SHAFT DISASSEMBLY/ASSEMBLY

dcf031325501w04

Caution

- **Do not damage and remove the dust cover or the ABS sensor rotor on the drive shaft. These parts cannot be purchased separately. Replace the assembled unit if the dust cover or the ABS sensor rotor is damaged and removed.**

1. Disassemble in the order indicated in the table.
2. Assemble in the reverse order of disassembly.



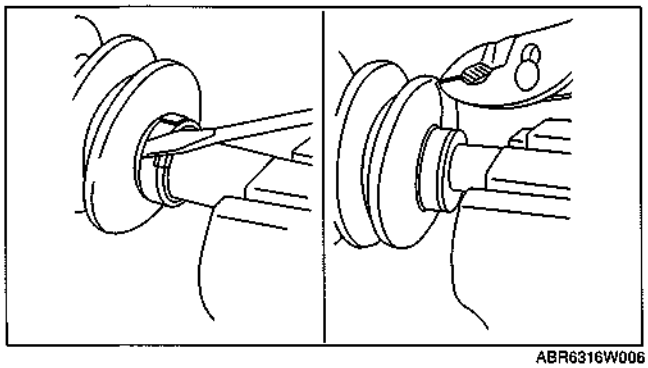
DBG313ZWB003

1	Boot band (See 03-13-5 Boot Band Disassembly Note) (See 03-13-7 Boot Band Assembly Note)
2	Clip
3	Outer ring (See 03-13-5 Outer Ring Disassembly Note) (See 03-13-7 Outer Ring Assembly Note)
4	Snap ring (See 03-13-6 Cage, Inner Ring, Balls, Snap Ring Assembly Note)
5	Balls (See 03-13-5 Balls, Inner Ring, Cage Disassembly Note) (See 03-13-6 Cage, Inner Ring, Balls, Snap Ring Assembly Note)
6	Inner ring (See 03-13-5 Balls, Inner Ring, Cage Disassembly Note) (See 03-13-6 Cage, Inner Ring, Balls, Snap Ring Assembly Note)
7	Cage (See 03-13-5 Balls, Inner Ring, Cage Disassembly Note) (See 03-13-6 Cage, Inner Ring, Balls, Snap Ring Assembly Note)
8	Boot (See 03-13-6 Boot Disassembly Note) (See 03-13-6 Boot Assembly Note)
9	Shaft and bell joint component

Boot Band Disassembly Note

Note
- The wheel side boot band does not need to be removed unless replacing it.

1. Pry up the locking clips using a screwdriver.
2. Remove the band using pliers.
3. Slide the boot along the shaft to expose the joint.

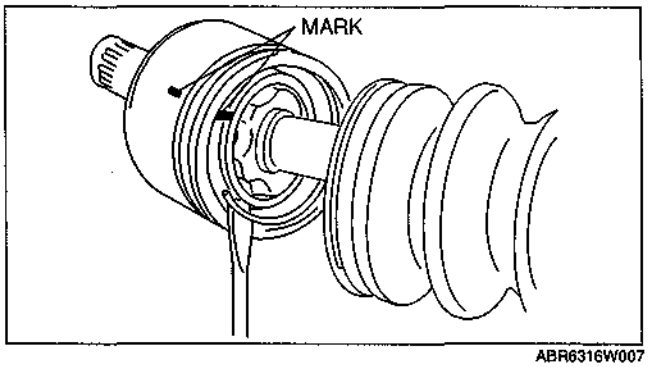

ABR6316W006

Outer Ring Disassembly Note

1. Mark the cage and outer ring for proper assembly.

Caution
- **Mark with paint; do not use a punch.**

2. Remove the clip using a screwdriver.
3. Remove the outer ring from the inner ring and the balls.
4. Clean the grease away.



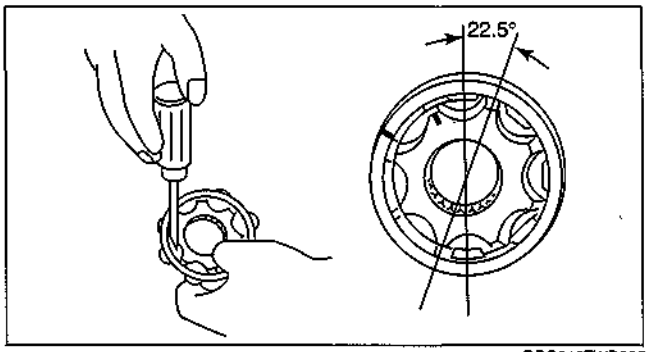
ABR6316W007

Balls, Inner Ring, Cage Disassembly Note

1. Mark the inner ring and cage.

Caution
- **Mark with paint; do not use a punch.**

2. Remove the snap ring using snap-ring pliers.
3. Disassemble the balls, inner ring, cage from the drive shaft as component.
4. Turn the cage **approx. 22.5 degree** and pull the cage and balls away from the inner ring.

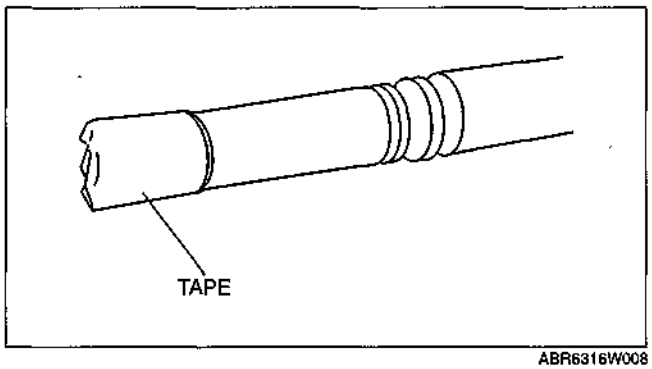


DBG313ZWB005

Boot Disassembly Note

Note
- The wheel side boot does not need to be removed unless replacing it or the bell joint and shaft component.
- Do not strip the tape until the boot is assembled.

1. Wrap the shaft splines with tape.
2. Remove the boot.



ABR6316W008

Boot Assembly Note

1. Fill the boot (wheel side) with the specified grease from a tube, not by hand.

Caution
- **Do not touch the grease with your hand. Apply it from the tube to prevent foreign matter from entering the boot.**

Note
- The wheel side and differential side boots are different.
- Use the specified grease supplied in the boot kit.

Grease amount
110—130 g {3.88—4.58 oz}

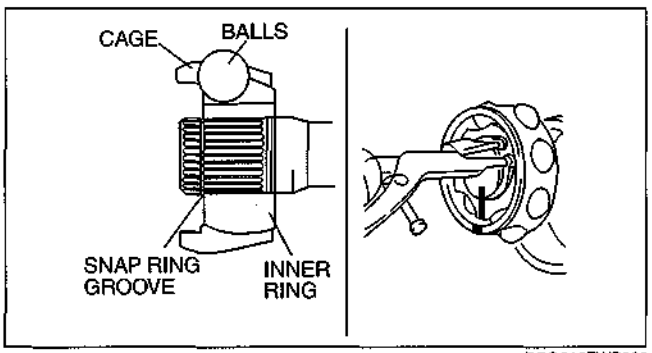
2. With the splines of the shaft still wrapped in tape from disassembly, install the boot.
3. Remove the tape.

Cage, Inner Ring, Balls, Snap Ring Assembly Note

1. Align the marks and install the balls and cage to the inner ring in the direction shown in the figure.

Caution
- **Install the cage with the offset facing the snap ring groove. If incorrectly installed, the drive shaft may become disengaged.**

2. Install a new snap ring.



DBG313ZWB006

Outer Ring Assembly Note

1. Fill the outer ring and boot with the specified grease.

Caution
- **Do not touch the grease with your hand. Apply it from the tube to prevent foreign matter from entering the boot.**

Note
- Use the specified grease supplied in the boot kit.

Grease amount
115—135 g {4.06—4.76 oz}

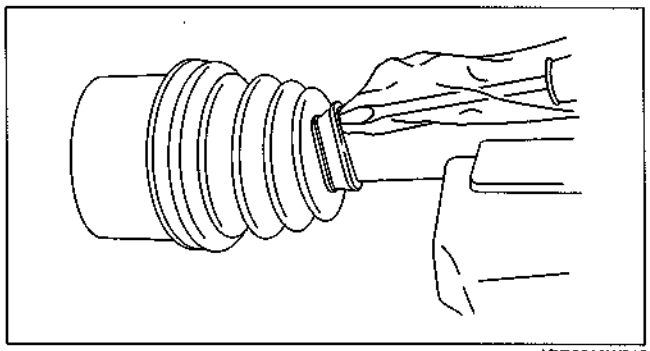
2. Align the marks, and install the outer ring on to the shaft.
3. Install a new clip.
4. Install the boot.
5. Set the drive shaft to the standard length.

Front drive shaft standard length
LH: 507.8—517.8 mm {20.00—20.38 in}
RH: 596.7—606.7 mm {23.50—23.88 in}

6. Release any trapped air from the boots by carefully lifting up the small end of each boot with a cloth wrapped screwdriver.

Caution
- **Be careful not to allow the grease to leak.**
- **Do not damage the boot.**

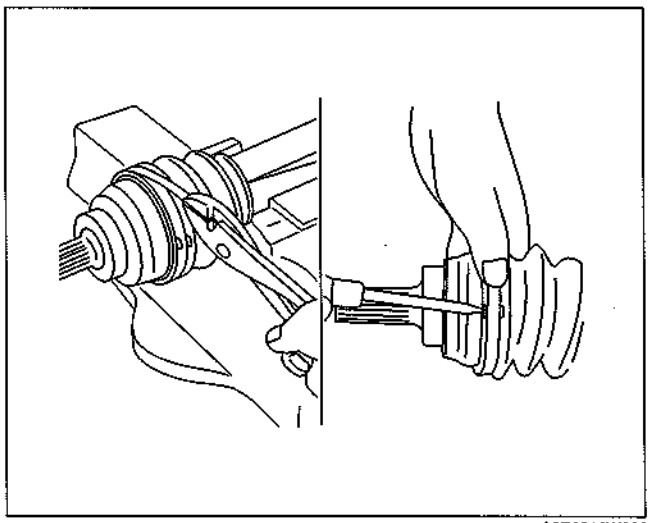
7. Verify that the drive shaft length is within the specification.


ABR6316W010

Boot Band Assembly Note
Differential side

1. Fold the band in the direction opposite to the forward revolving direction of the drive shaft and use pliers to pull it tight.
2. Lock the end of the band by bending the locking clips.

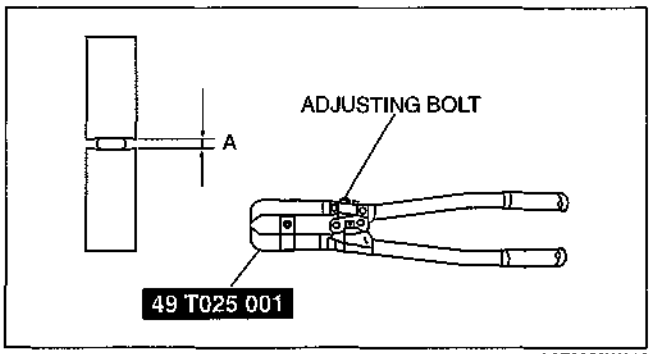
Caution
- **Install the band into the groove securely.**


A6E6316W006

Wheel side

1. Adjust clearance A by turning the adjusting bolt of the **SST**.

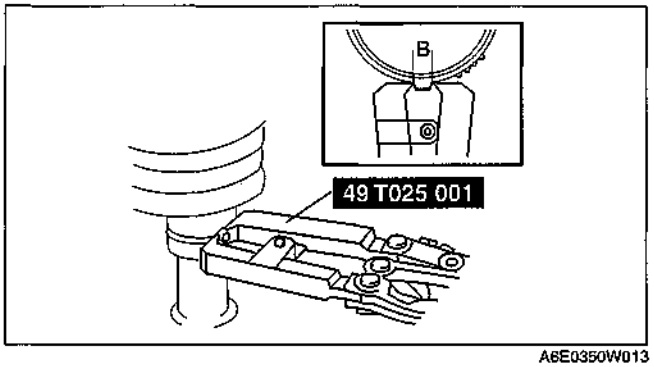
   Clearance A
   2.9 mm {0.11 in}



A6E0350W012

2. Crimp the wheel side small boot band using the **SST**. Verify that clearance B is within the specification.
   - If clearance B is more than the specification, reduce clearance A of the **SST** and crimp the boot again.
   - If clearance B is less than the specification, replace the boot band, increase clearance A of the **SST**, and crimp the new boot.

   Clearance B
   2.4—2.8 mm {0.095—0.110 in}



A6E0350W013

3. Verify that the boot band does not protrude from the boot band installation area.
   - If it does, replace the boot band and repeat Steps 2 and 3.
4. Fill the boot with the repair kit grease.
5. Adjust clearance A by turning the adjusting bolt of the **SST**.

   Clearance A
   3.2 mm {0.13 in}

6. Crimp the wheel side big boot band using the **SST**.
7. Verify that clearance B is within the specification.
   - If clearance B is more than the specification, reduce clearance A of the **SST** and crimp the boot again.
   - If clearance B is less than the specification, replace the boot band, increase clearance A of the **SST** and crimp the new boot.

   Clearance B
   2.4—2.8 mm {0.095—0.110 in}

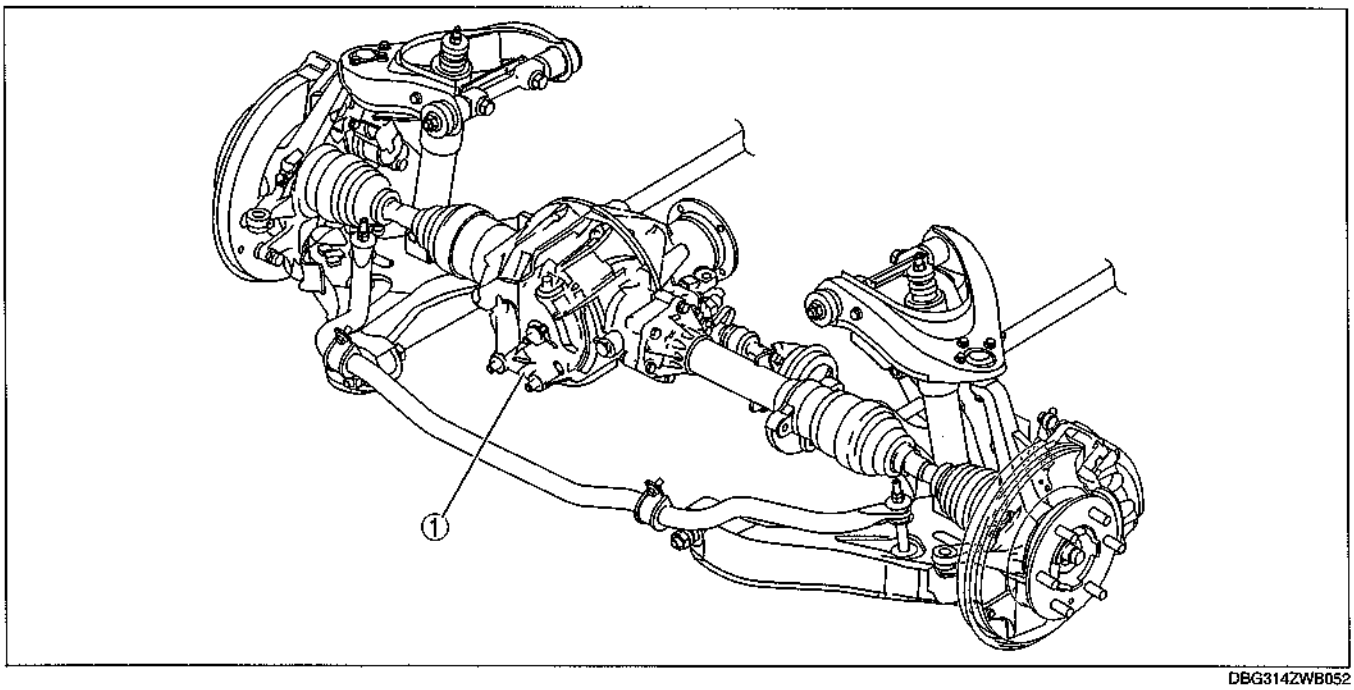
8. Verify that the boot band does not protrude from the boot band installation area.
   - If it does, replace the boot band and repeat Steps 7 and 8.

03-14A DIFFERENTIAL [FRONT]

FRONT DIFFERENTIAL LOCATION INDEX..... 03-14A–1
FRONT DIFFERENTIAL OIL INSPECTION..... 03-14A–1
FRONT DIFFERENTIAL OIL REPLACEMENT 03-14A–2
FRONT DIFFERENTIAL REMOVAL/INSTALLATION 03-14A–2
FRONT DIFFERENTIAL DISASSEMBLY..... 03-14A–4
FRONT DIFFERENTIAL ASSEMBLY ... 03-14A–8

FRONT DIFFERENTIAL LOCATION INDEX

dcf031427100w01



DBG314ZWB052

1	Front differential (See 03-14A-1 FRONT DIFFERENTIAL OIL INSPECTION.) (See 03-14A-2 FRONT DIFFERENTIAL OIL REPLACEMENT.) (See 03-14A-2 FRONT DIFFERENTIAL REMOVAL/INSTALLATION.) (See 03-14A-4 FRONT DIFFERENTIAL DISASSEMBLY.) (See 03-14A-8 FRONT DIFFERENTIAL ASSEMBLY.)

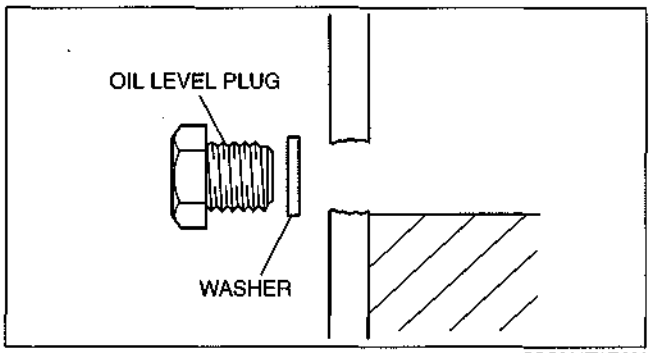
FRONT DIFFERENTIAL OIL INSPECTION

dcf031427000w01

1. Position the vehicle on level ground.
2. Remove the oil-fill plug and the washer.
3. Inspect if the oil level is close to the rim of the oil-fill plug hole.
4. If the oil is not close to the rim of the oil-fill plug hole, add oil.

5. Install the oil-fill plug with a new washer and tighten.

Tightening torque
39.2—53.9 N·m {4.00—5.49 kgf·m, 29.0—39.7 ft·lbf}



DBG314ZWB001

FRONT DIFFERENTIAL OIL REPLACEMENT

dcf031427000w02

1. Position the vehicle on level ground.
2. Remove the oil-fill plug.
3. Remove the drain plug and drain the oil.
4. Install the drain plug with a new washer and tighten.

Tightening torque
39.2—53.9 N·m {4.00—5.49 kgf·m, 29.0—39.7 ft·lbf}

5. Add the specified oil through the oil-fill plug hole.

Front differential oil
Type: API service GL-5
Viscosity (above -18°C): SAE 90
Viscosity (below -18°C): SAE 80
Oil capacity (approx. quantity): 1.8—2.0 L {2.0—2.1US qt, 1.6—1.7 Imp qt}

6. After adding the oil, perform the oil level inspection.
7. Install the oil-fill plug with a new washer and tighten.

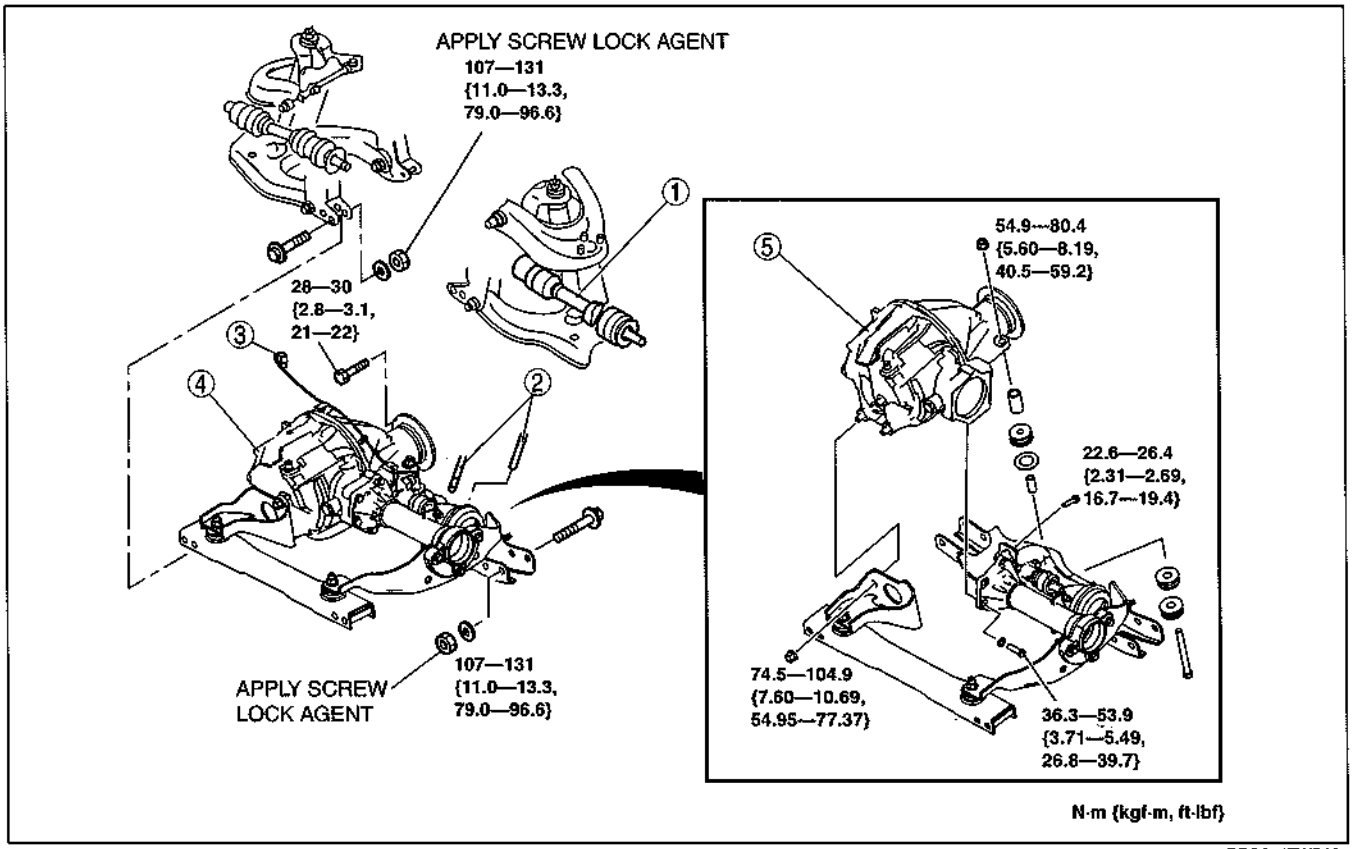
Tightening torque
39.2—53.9 N·m {4.00—5.49 kgf·m, 29.0—39.7 ft·lbf}

FRONT DIFFERENTIAL REMOVAL/INSTALLATION

dcf031427100w02

Caution
- **Performing the following procedures without first removing the ABS wheel-speed sensor may possibly cause an open circuit in the wiring harness if it is pulled by mistake. Before performing the following procedures, remove the ABS wheel-speed sensor (axle side) and fix it to an appropriate place where the sensor will not be pulled by mistake while servicing the vehicle.**

1. Drain the front differential oil. (See 03-14A-2 FRONT DIFFERENTIAL OIL REPLACEMENT.)
2. Remove the front propeller shaft. (See 03-15-2 PROPELLER SHAFT REMOVAL/INSTALLATION.)
3. Remove in the order indicated in the table.
4. Install in the reverse order of removal.
5. Add front differential oil. (See 03-14A-2 FRONT DIFFERENTIAL OIL REPLACEMENT.)



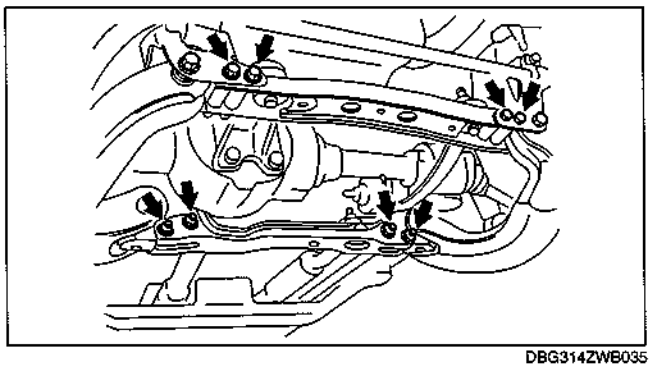
DBG314ZWB034

1	Drive shaft (See 03-13-2 FRONT DRIVE SHAFT REMOVAL/ INSTALLATION.)
2	Vacuum hose
3	RFW switch connector

4	Front differential, joint shaft component (See 03-14A-3 Front Differential, Joint Shaft Component Removal Note.)
5	Front differential

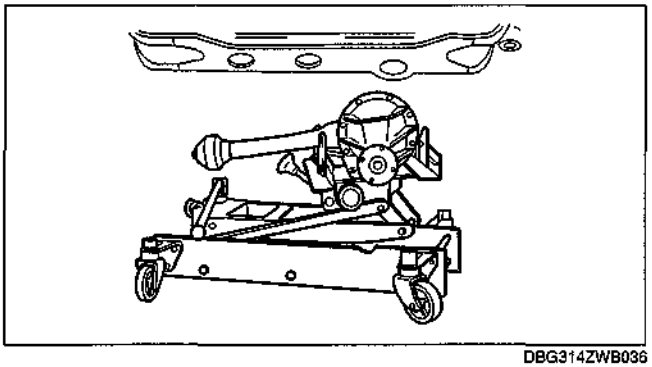
Front Differential, Joint Shaft Component Removal Note

1. Set the transmission jack on the differential.
2. Remove the bolts and nuts indicated in the figure.



DBG314ZWB035

3. Remove the front differential and joint shaft component from the vehicle using the transmission jack.

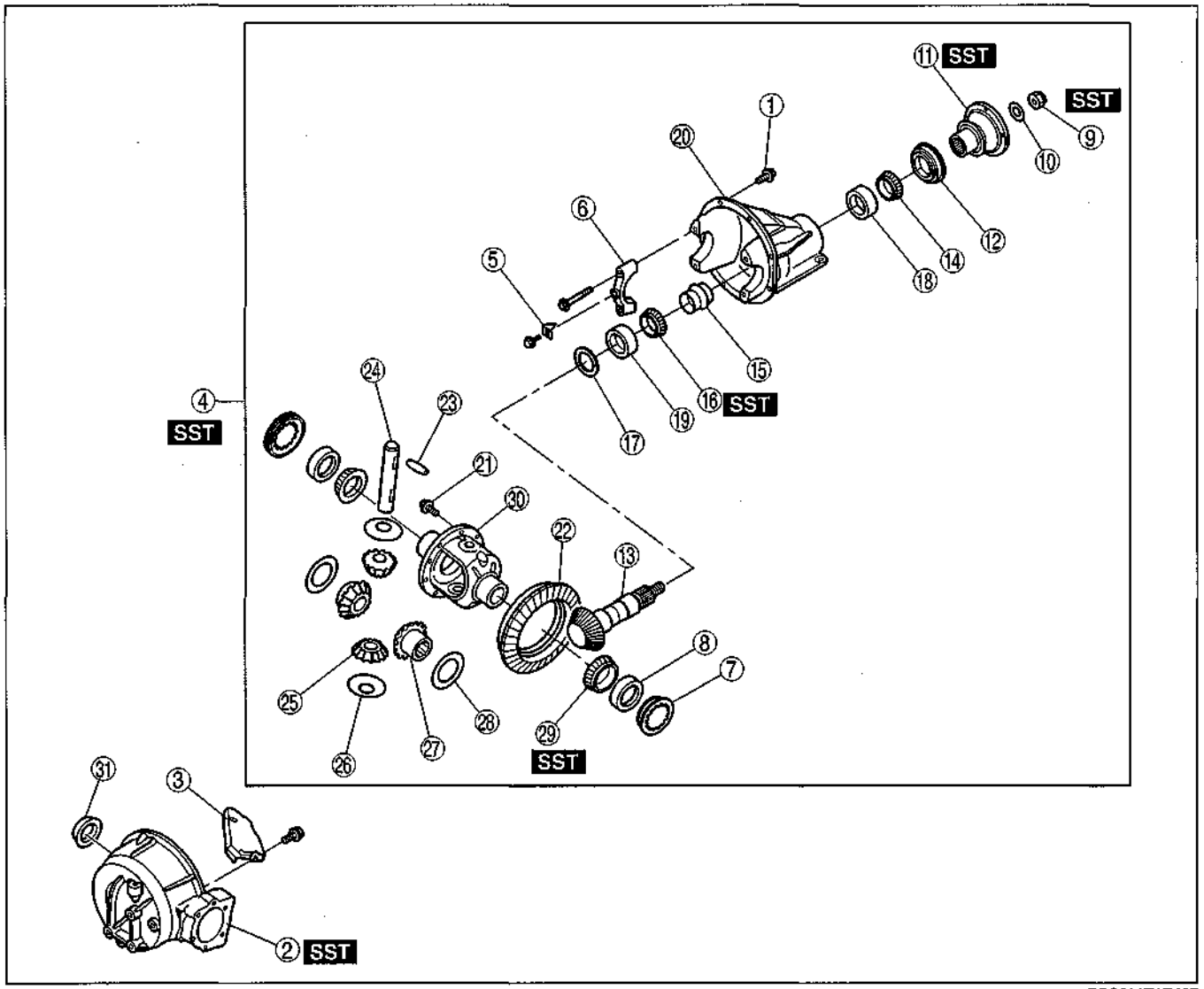


DBG314ZWB036

FRONT DIFFERENTIAL DISASSEMBLY

dcf031427100w03

1. Disassemble in the order indicated in the table.



DBG314ZWB037

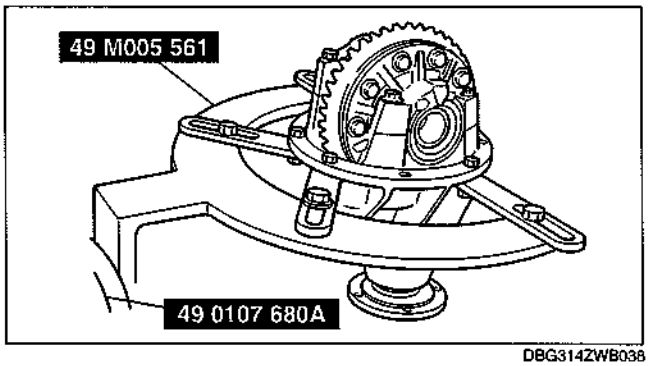
1	Bolt
2	Differential casing
3	Oil baffle
4	Differential component (See 03-14A-5 Differential Component Disassembly Note.)
5	Lock plate
6	Bearing cap (See 03-14A-5 Bearing Cap Disassembly Note.)
7	Adjusting screw

8	Side bearing outer race
9	Locknut (See 03-14A-5 Locknut Disassembly Note.)
10	Washer
11	Companion flange (See 03-14A-6 Companion Flange Disassembly Note.)
12	Oil seal (See 03-14A-6 Oil Seal Disassembly Note.)

13	Drive pinion (See 03-14A-6 Drive Pinion Disassembly Note.)
14	Front bearing inner race
15	Collapsible spacer
16	Rear bearing inner race (See 03-14A-6 Rear Bearing Inner Race Disassembly Note.)
17	Spacer
18	Front bearing outer race (See 03-14A-7 Front Bearing Outer Race, Rear Bearing Outer Race Disassembly Note.)
19	Rear bearing outer race (See 03-14A-7 Front Bearing Outer Race, Rear Bearing Outer Race Disassembly Note.)
20	Differential carrier
21	Bolt
22	Ring gear
23	Knock pin (See 03-14A-7 Knock Pin Disassembly Note.)
24	Pinion shaft
25	Pinion gear
26	Thrust washer
27	Side gear
28	Thrust washer
29	Side bearing inner race (See 03-14A-7 Side Bearing Inner Race Disassembly Note.)
30	Gear case
31	Oil seal

Differential Component Disassembly Note

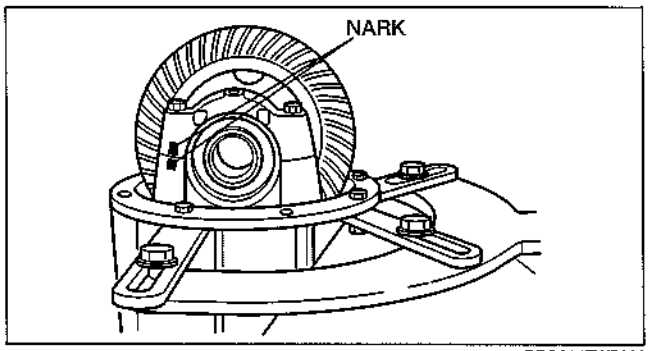
1. Install the differential component to the **SSTs**.



DBG314ZWB038

Bearing Cap Disassembly Note

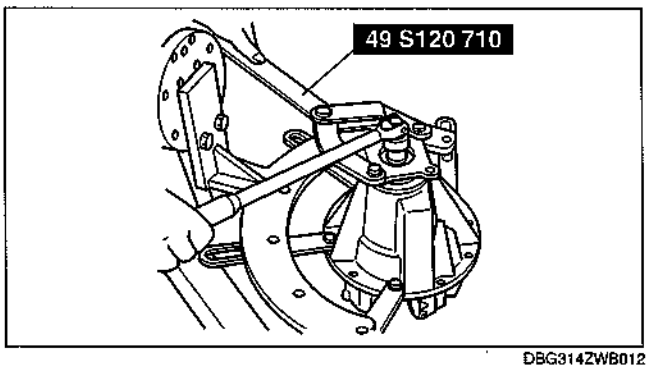
1. Place a mark on one of the bearing caps so that the left and right bearing caps won't get mixed up. Use the mark for matching at the time of assembly.



DBG314ZWB039

Locknut Disassembly Note

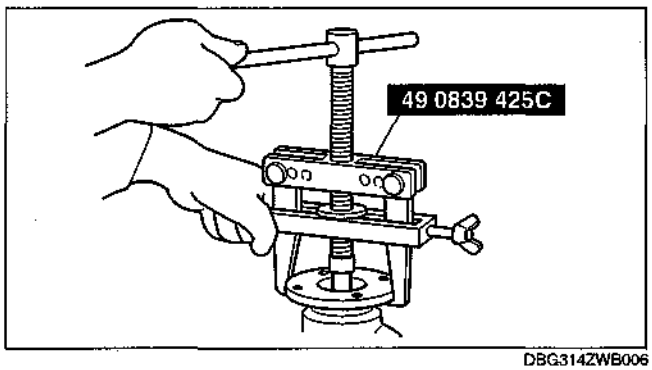
1. Hold the companion flange using the **SST** and remove the locknut.



DBG314ZWB012

Companion Flange Disassembly Note

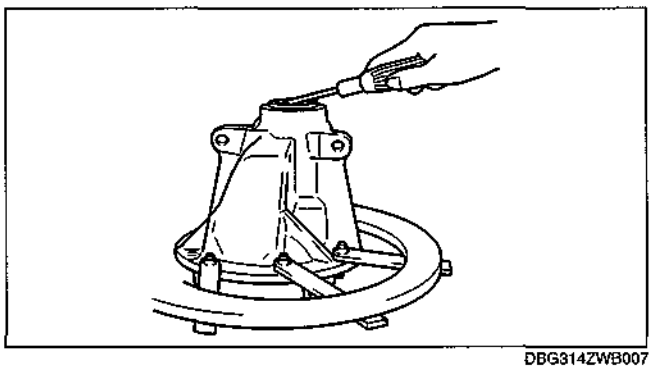
1. Pull the companion flange out using the **SST**.



DBG314ZWB006

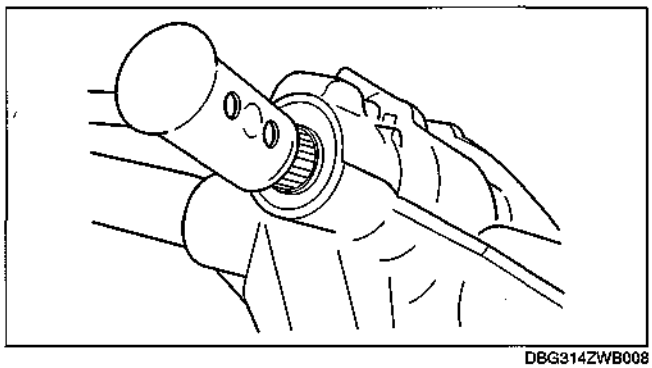
Oil Seal Disassembly Note

1. Remove the oil seal using a screw driver.


DBG314ZWB007

Drive Pinion Disassembly Note

1. Remove the drive pinion by tapping with a plastic hammer.

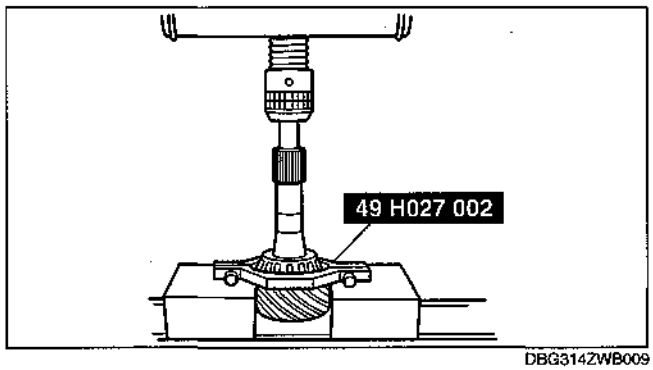

DBG314ZWB008

Rear Bearing Inner Race Disassembly Note

Note

- Mark or otherwise distinguish between the front and rear inner races so that they are not mixed at the time of reassembly.

1. Remove the rear bearing inner race using the **SST**.

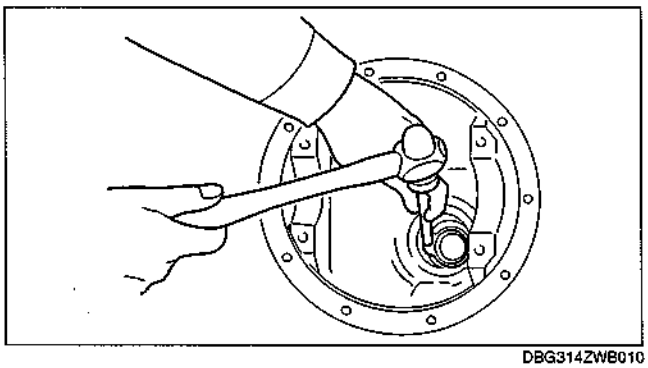


DBG314ZWB009

Front Bearing Outer Race, Rear Bearing Outer Race Disassembly Note

Note
- Mark or otherwise distinguish between the front and rear outer races so that they are not mixed up at the time of reassembly.

1. Remove the bearing outer race by using the two grooves on the carrier and tapping the outer races alternately.

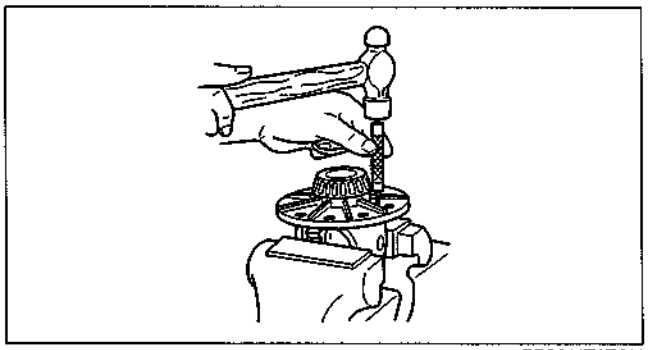


DBG314ZWB010

Knock Pin Disassembly Note

Caution
- **Insert the bar from the knock pin hole at the opposite side from where the ring gear is installed.**

1. Secure the gear case in a vise and remove the knock pin using a **4 mm {0.16 in}** diameter bar

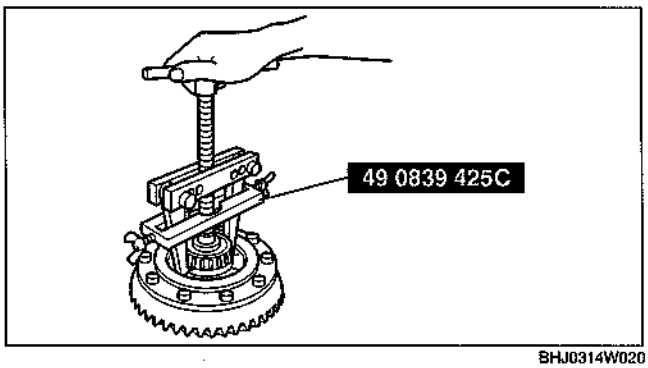


DBG314ZWB011

Side Bearing Inner Race Disassembly Note

Caution
- **Mark the left bearing in order to install in the same position.**

1. Remove the side bearing inner race from the gear case using the **SST**.

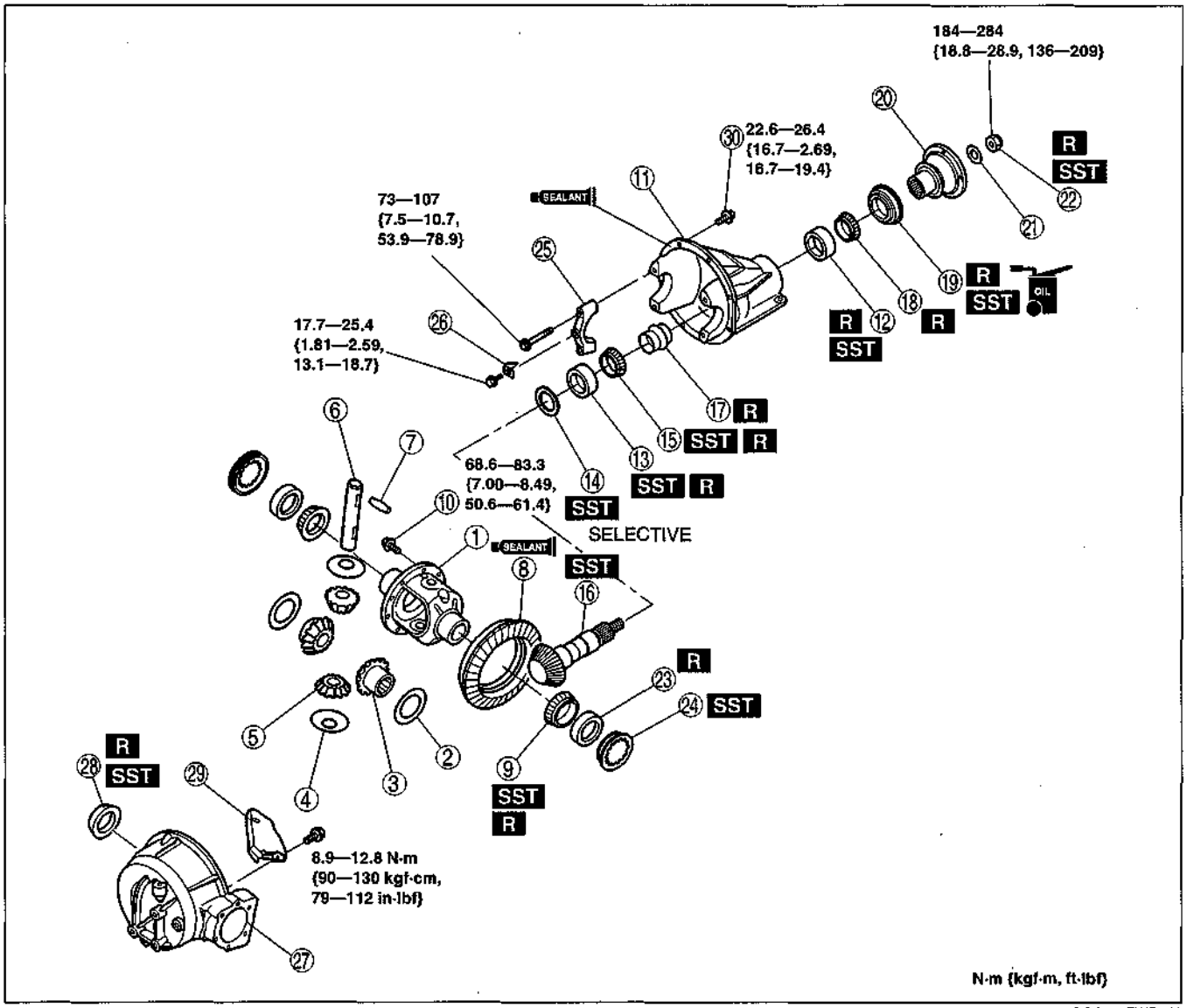


BHJ0314W020

FRONT DIFFERENTIAL ASSEMBLY

dcf031427100w04

1. Assemble in the order indicated in the table.



DBG314ZWB040

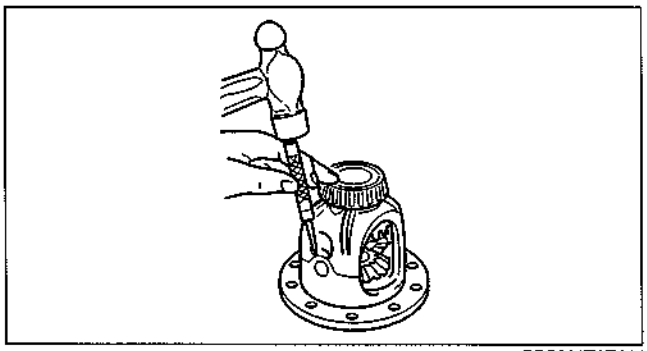
1	Gear case
2	Thrust washer
3	Side gear
4	Thrust washer
5	Pinion gear
6	Pinion shaft
7	Knock pin (See 03-14A-9 Knock Pin Assembly Note.)
8	Ring gear (See 03-14A-9 Ring Gear Assembly Note.)
9	Side bearing inner race (See 03-14A-9 Side Bearing Inner Race Assembly Note.)
10	Bolt
11	Differential carrier
12	Front bearing outer race (See 03-14A-9 Front Bearing Outer Race Assembly Note.)
13	Rear bearing outer race (See 03-14A-10 Rear Bearing Outer Race Assembly Note.)

14	Spacer (See 03-14A-10 Spacer Assembly Note)
15	Rear bearing inner race (See 03-14A-12 Rear Bearing Inner Race Assembly Note.)
16	Drive pinion (See 03-14A-12 Drive Pinion Assembly Note.)
17	Collapsible spacer
18	Front bearing inner race
19	Oil seal (companion flange) (See 03-14A-13 Oil Seal (Companion Flange) Assembly Note.)
20	Companion flange
21	Washer
22	Locknut (See 03-14A-13 Locknut Assembly Note.)
23	Side bearing outer race (See 03-14A-13 Side Bearing Outer Race, Adjusting Screw, Bearing Cap Assembly Note.)

24	Adjusting screw (See 03-14A-13 Side Bearing Outer Race, Adjusting Screw, Bearing Cap Assembly Note.)
25	Bearing cap (See 03-14A-13 Side Bearing Outer Race, Adjusting Screw, Bearing Cap Assembly Note.)
26	Lock plate
27	Differential casing
28	Oil seal (differential casing) (See 03-14A-15 Oil Seal (Differential Casing) Assembly Note.)
29	Oil baffle
30	Bolt

Knock Pin Assembly Note

1. Assemble the side gears, thrust washer, pinion gears, pinion shaft and knock pin. After assembling the knock pin, make a crimp so that the pin will not come out of the gear case.



DBG314ZWB014

Ring Gear Assembly Note

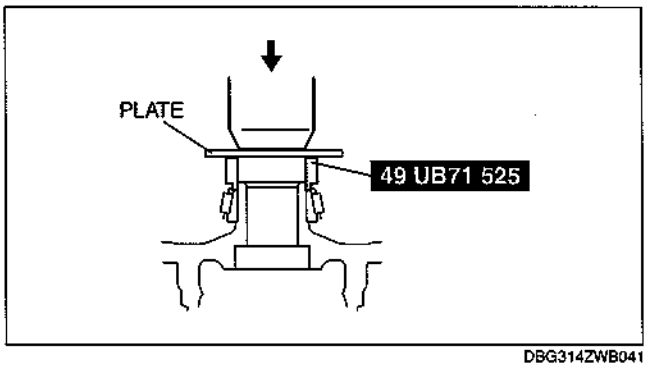
1. Coat the ring gear and gear case facing surfaces with locking agent.
2. Install the ring gear and tighten the bolt to the specified torque.

Tightening torque
68.6—83.3 N·m {7.00—8.49 kgf·m, 50.6—61.4 ft·lbf}

Side Bearing Inner Race Assembly Note

Caution
- **Bearings should be assembled to the original positions.**

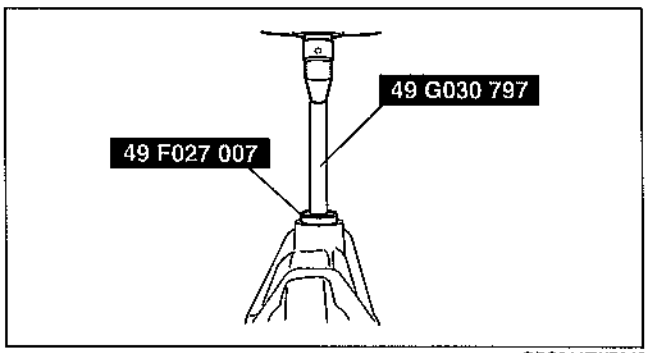
1. Press the side gearings into the gear case using the **SST**.



DBG314ZWB041

Front Bearing Outer Race Assembly Note

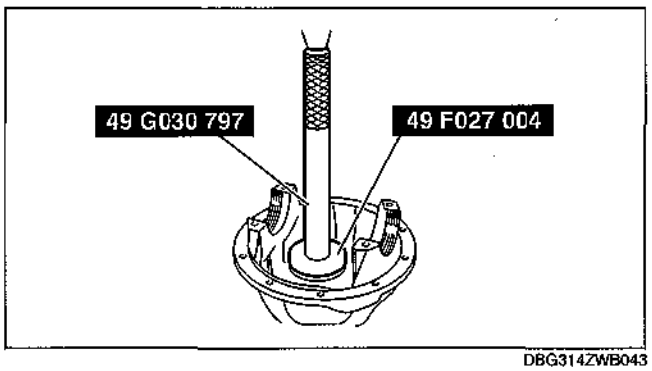
1. Press the front bearing outer race into the carrier using the **SST** and a press.



DBG314ZWB042

Rear Bearing Outer Race Assembly Note

1. Press the rear bearing outer race into the carrier using the **SST** and a press.

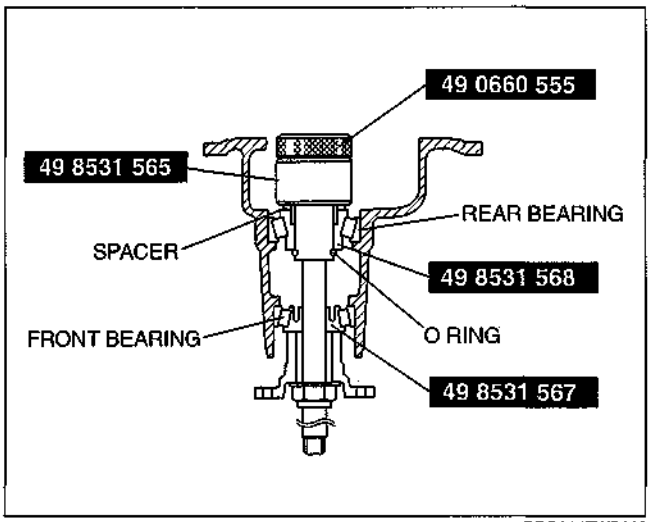


DBG314ZWB043

Spacer Assembly Note
Pinion height adjustment

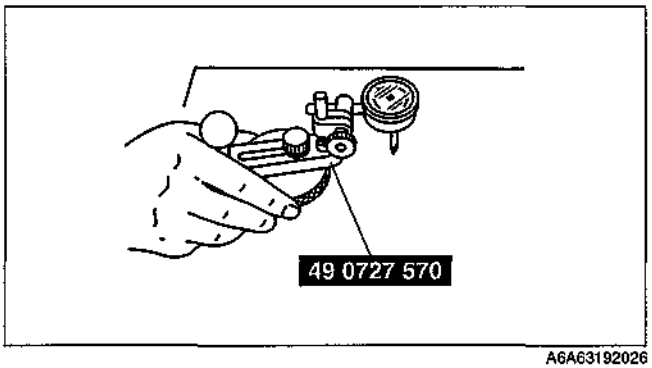
Note
- Use the installed spacer when adjusting.
- Be careful to install **SSTs** in the correct position and facing in the correct direction.

1. Assemble the spacer, rear bearing inner race, and the **SST** (49 8531 568) on to the **SST** (49 8531 565) as shown in the figure.
2. Assemble the front bearing inner race, **SST** (49 8531 567), companion flange, washer and nut to the **SST** (49 8531 565).
3. Tighten the nut to the extent that the **SST** (49 8531 565) can be turned by hand.



DBG314ZWB068

4. Place the **SST** on the surface plate and set the dial gauge to zero.
5. Place the **SST** (49 0660 555) on top of the **SST** (49 8531 565), and then set the **SST** (49 0727 570) on top of the **SST** (49 0660 555).



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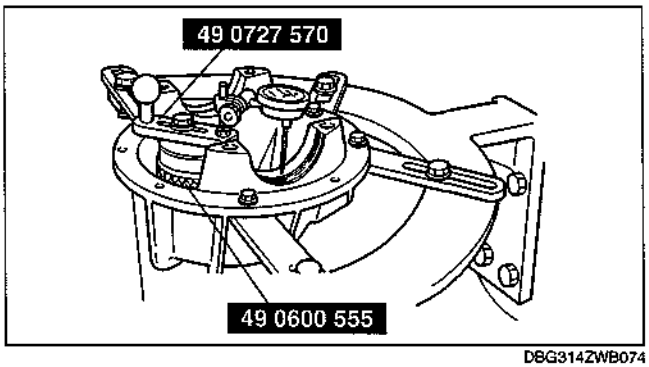
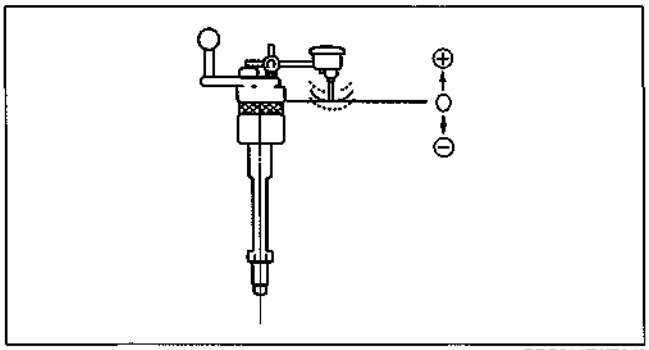
6. Place the measuring probe of the dial gauge at the point where the side bearing is installed in the differential carrier and measure at the lowest position. Measure the left and right sides.



DBG314ZWB074

7. Add the two (left and right) values obtained by the measurements taken in Step 6 and then divide the total by **2**. From this sum, subtract the sum of the number inscribed on the end of the drive pinion divided by **100**. (If there is no figure inscribed, use 0.) This is the pinion height adjustment value.



DBG314ZWB049

Note
- For example, the measured results obtained step 6 are 0.06 mm {0.0024 in} and 0.04 mm {0.0016 in}, the formula is (0.06+0.04)/ 2=0.05.
  Therefore, replace it with a spacer 0.05 mm {0.002 in} thicker than the currently used one.

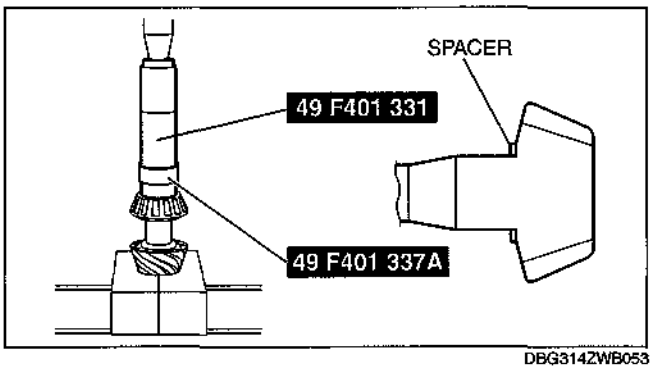
Spacer table

Identification mark	Thickness (mm {in})	Identification mark	Thickness (mm {in})
08	3.080 {0.1213}	29	3.290 {0.1295}
09	3.095 {0.1220}	30	3.305 {0.1301}
11	3.110 {0.1224}	32	3.320 {0.1307}
12	3.125 {0.1230}	33	3.335 {0.1313}
14	3.140 {0.1234}	35	3.350 {0.1319}
15	3.155 {0.1242}	36	3.365 {0.1325}
17	3.170 {0.1248}	38	3.380 {0.1331}
18	3.185 {0.1254}	39	3.395 {0.1337}
20	3.200 {0.1260}	41	3.410 {0.1343}
21	3.215 {0.1266}	42	3.425 {0.1348}
23	3.230 {0.1271}	44	3.440 {0.1354}
24	3.245 {0.1278}	45	3.455 {0.1360}
26	3.260 {0.1283}	47	3.470 {0.1366}
27	3.275 {0.1289}	—	—

Rear Bearing Inner Race Assembly Note

Caution
- **Press in until the force required suddenly increases.**
- **Install the spacer selected for the pinion height adjustment, confirm that the installation direction is correct.**

1. Press the rear bearing inner race in using the **SSTs**.



DBG314ZWB053

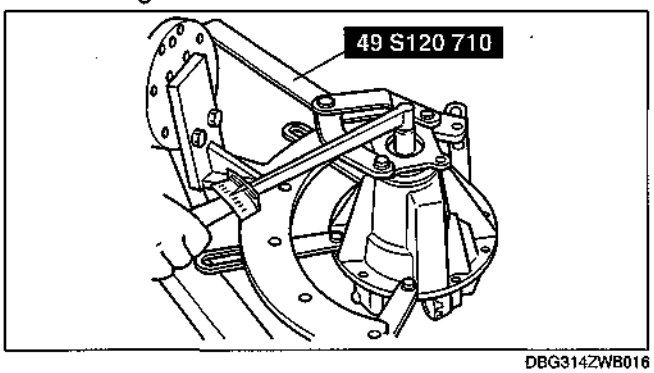
Drive Pinion Assembly Note
Drive pinion preload adjustment

Caution
- **Do not install the oil seal.**

1. Assemble the following parts to the drive pinion.
   - New collapsible spacer
   - Front bearing
   - New spacer
   - Companion flange
   - New washer
   - New locknut
2. Turn the serrated part of the drive pinion by hand to seat the bearing.
3. Tighten the locknut temporarily tightened in Step 1 from the lower limit of the specified tightening torque using the **SST**, and obtain the specified preload. Record the tightening torque at this time.

   Tightening torque
   128—284 N·m {13.1—28.9 kgf·m, 94.5—209 ft·lbf}

   Front differential drive pinion preload
   1.28—1.76 N·m {13.1—17.9 kgf·cm, 11.4—15.5 in·lbf}

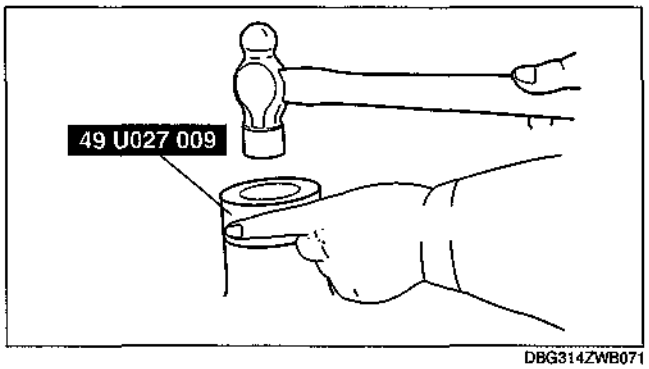


DBG314ZWB016

   - If the specified preload cannot be obtained within the specified tightening torque, replace with a new collapsible spacer and adjust again.
4. Remove the locknut, washer, and companion flange.

Oil Seal (Companion Flange) Assembly Note

1. Apply differential oil to the lip of a new oil seal.
2. Assemble the oil seal using the **SST**.

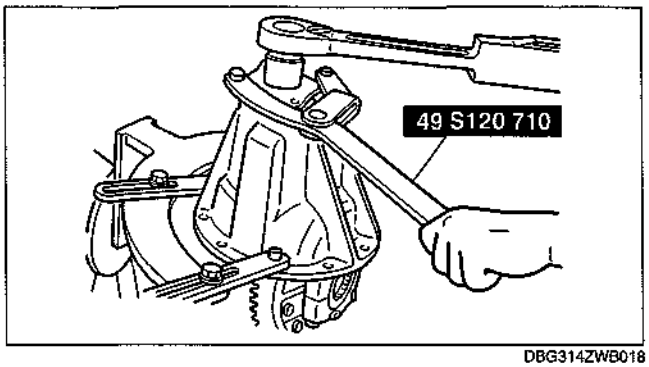


DBG314ZWB071

Locknut Assembly Note

1. Assemble the companion flange and washer.
2. Tighten a new locknut using the **SST**.

Tightening torque
128—284 N·m {13.1—28.9 kgf·m, 94.5—209 ft·lbf}

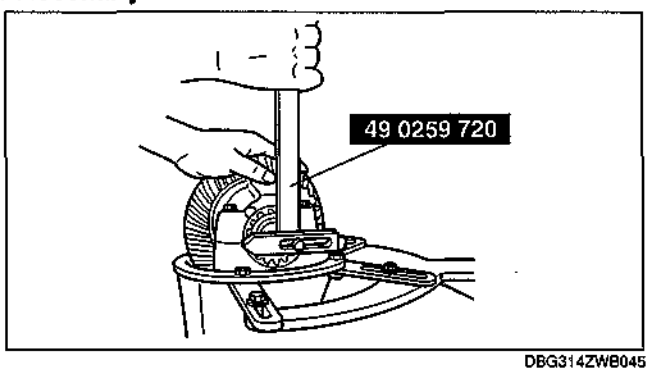


DBG314ZWB018

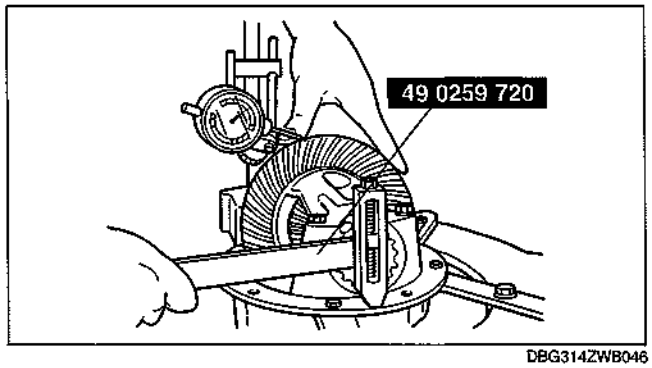
Side Bearing Outer Race, Adjusting Screw, Bearing Cap Assembly Note

1. Install the differential gear component to the carrier. After loosely tightening the bearing outer race and bearing cap mounting bolts, completely tighten the adjustment screw by hand. Then, while turning the ring gear, alternately tighten the left and right adjustment screws using the **SST**.
2. Adjust the drive pinion, ring gear backlash and the side bearing preload as follows:
   (1) Mark the ring gear at four points at **approx. 90°** intervals and mount a dial indicator to the carrier so that the feeler comes in contact at a 90° angle with one of the ring gear teeth.

   (2) Turn both bearing adjusters equally until the backlash becomes **0.09—0.11 mm {0.0035—0.0043 in}** using the **SST**.

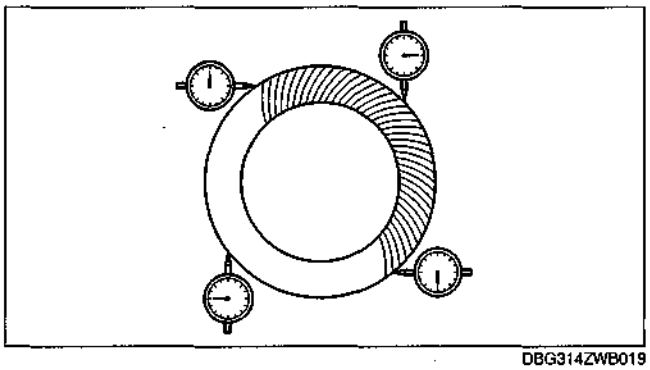


DBG314ZWB045



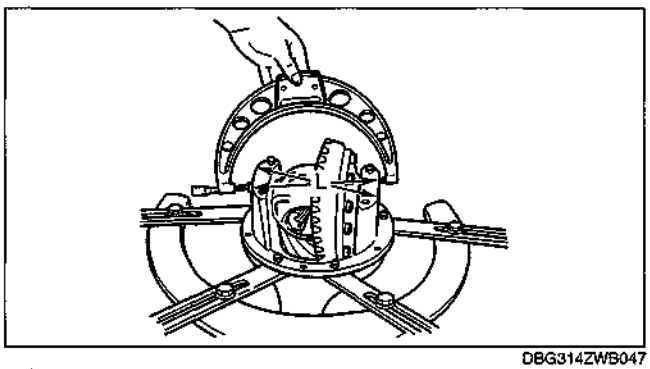
DBG314ZWB046

(3) Inspect for the backlash at the three other marked points and make sure that the minimum backlash is more than **0.05 mm {0.002 in}** and difference of the maximum and minimum backlash value is less than **0.07 mm {0.0028 in}**.

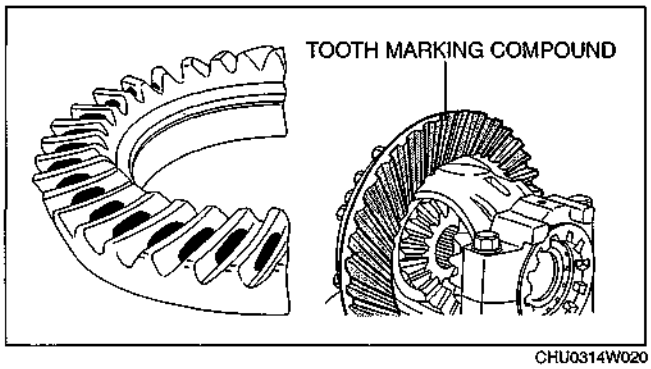

DBG314ZWB019

(4) After adjusting the backlash, tighten the adjustment screws equally until the distance between both pilot sections on the bearing caps (L) become as specified.

Bearing cap bolt tightening torque
73—107 N·m {7.45—10.9 kgf·m, 53.9—78.9 ft·lbf}
Distance L
204.5 mm {8.052 in}

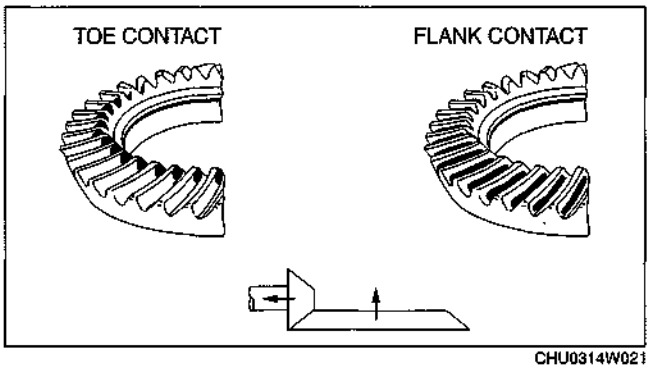

DBG314ZWB047

3. The inspection and adjustment procedure is as follows:
   (1) Coat both surfaces of 6—8 teeth of the ring gear uniformly with a tooth marking compound.
   (2) While moving the ring gear back and forth by hand, rotate the drive pinion several times and inspect the tooth contact.
   (3) If the tooth contact is good, wipe off the red lead coating.
   (4) If it is not good, adjust the pinion height, then adjust the backlash.



CHU0314W020

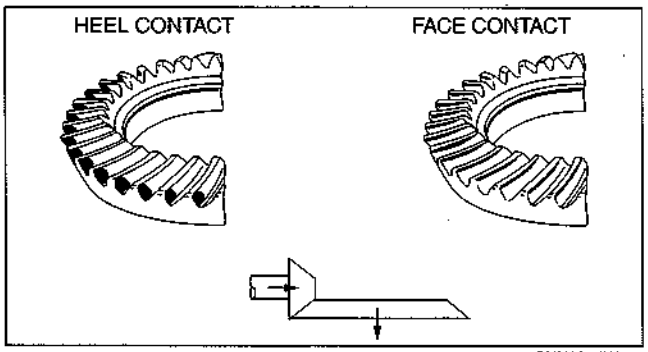
Toe and flank contact
1. Replace the spacer with a thinner one, and move the drive pinion outward.



CHU0314W021

Heel and face contact

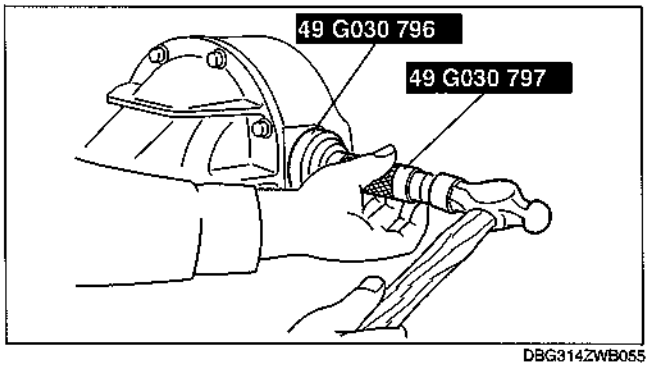
1. Replace the spacer with a thicker one. Bring the drive pinion inward.



CHU0314W022

Oil Seal (Differential Casing) Assembly Note

1. Tap in the new oil seal to the front differential casing using the **SSTs**.



DBG314ZWB055

03-14B DIFFERENTIAL [REAR]

REAR DIFFERENTIAL LOCATION INDEX..... 03-14B–1
REAR DIFFERENTIAL OIL INSPECTION..... 03-14B–2
REAR DIFFERENTIAL OIL REPLACEMENT..... 03-14B–2
REAR DIFFERENTIAL REMOVAL/INSTALLATION..... 03-14B–3
REAR DIFFERENTIAL DISASSEMBLY [STANDARD DIFFERENTIAL]..... 03-14B–4
REAR DIFFERENTIAL ASSEMBLY [STANDARD DIFFERENTIAL]..... 03-14B–7
REAR DIFFERENTIAL DISASSEMBLY [LSD (LIMITED SLIP DIFFERENTIAL)]..... 03-14B–16
REAR DIFFERENTIAL ASSEMBLY [LSD (LIMITED SLIP DIFFERENTIAL)]..... 03-14B–18

REAR DIFFERENTIAL LOCATION INDEX

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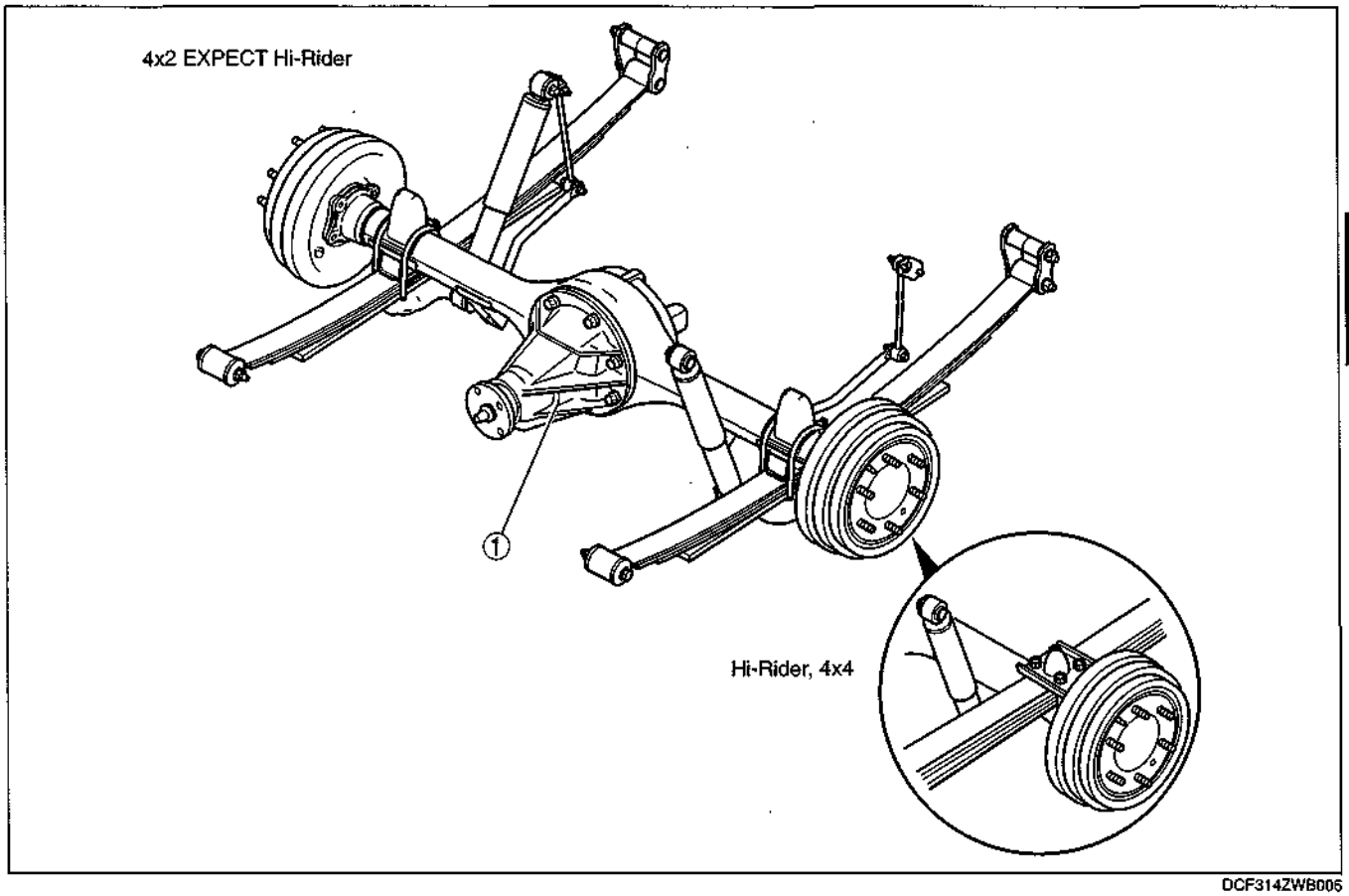


DCF314ZWB005

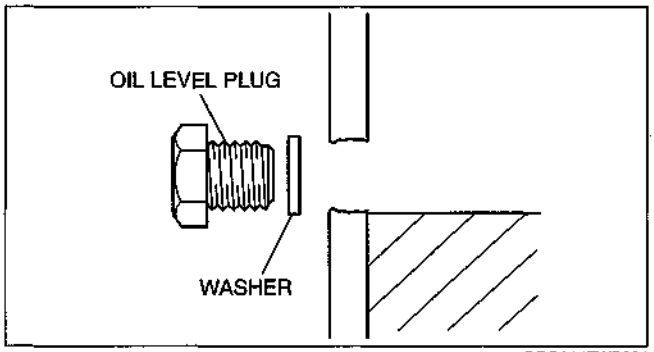
1	Rear differential (See 03-14B-2 REAR DIFFERENTIAL OIL INSPECTION.) (See 03-14B-2 REAR DIFFERENTIAL OIL REPLACEMENT.) (See 03-14B-3 REAR DIFFERENTIAL REMOVAL/ INSTALLATION.) (See 03-14B-4 REAR DIFFERENTIAL DISASSEMBLY [STANDARD DIFFERENTIAL].) (See 03-14B-7 REAR DIFFERENTIAL ASSEMBLY [STANDARD DIFFERENTIAL].) (See 03-14B-16 REAR DIFFERENTIAL DISASSEMBLY [LSD (LIMITED SLIP DIFFERENTIAL)].) (See 03-14B-18 REAR DIFFERENTIAL ASSEMBLY [LSD (LIMITED SLIP DIFFERENTIAL)].)

REAR DIFFERENTIAL OIL INSPECTION

dcf031427000w03

1. Position the vehicle on level ground.
2. Remove the oil-fill plug and the washer.
3. Inspect if the oil level is close to the rim of the oil-fill plug hole.
   - If the oil is not close to the rim of the oil-fill plug hole, add oil.
4. Install the oil-fill plug with a new washer and tighten.

Tightening torque
39.2—53.9 N·m {4.00—5.49 kgf·m, 29.0—39.7 ft·lbf}



DBG314ZWB001

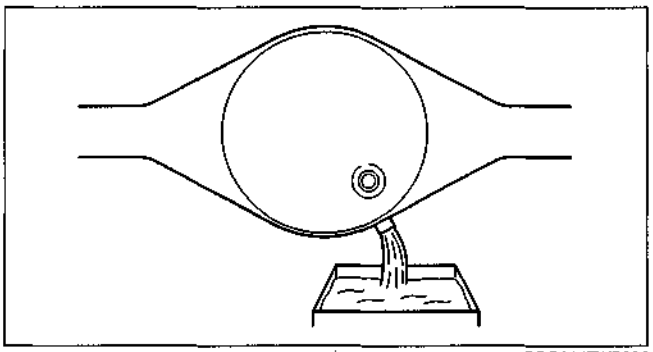
REAR DIFFERENTIAL OIL REPLACEMENT

dcf031427000w04

1. Position the vehicle on level ground.
2. Remove the oil-fill plug.
3. Remove the drain plug and drain the oil.
4. Install the drain plug with a new washer and tighten.

Tightening torque
39.2—53.9 N·m {4.00—5.49 kgf·m, 29.0—39.7 ft·lbf}

5. Add the specified oil through the oil-fill plug hole.


DBG314ZWB002

Rear differential oil [STANDARD DIFFERENTIAL]
Type: API service GL-5
Viscosity: SAE 90
Oil capacity (approx. quantity): 1.3—1.5 L {1.3—1.4 US qt, 1.1—1.2 Imp qt} (WL-3)
Oil capacity (approx. quantity): 2.35—2.55 L {2.23—2.41 US qt, 1.96—2.12 Imp qt} (WL-C)

Rear differential oil [LSD]
Type: API service GL-5
Viscosity: SAE 90
Oil capacity (approx. quantity): 2.25—2.45 L {2.13—2.31 US qt, 1.88—2.03 Imp qt}

6. After adding the oil, perform the oil level inspection.
7. Install the oil-fill plug with a new washer and tighten.

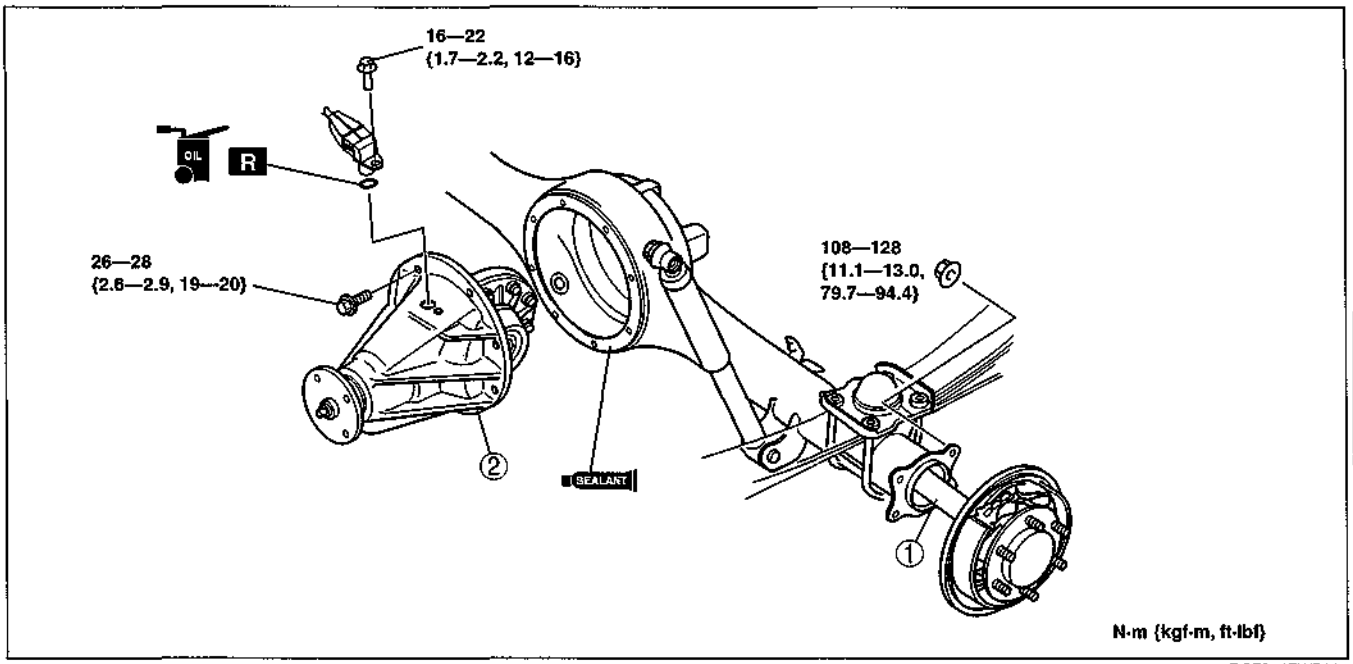
Tightening torque
39.2—53.9 N·m {4.00—5.49 kgf·m, 29.0—39.7 ft·lbf}

REAR DIFFERENTIAL REMOVAL/INSTALLATION

dcf031427100w06

Caution
- **Clean away the ole sealant before applying the new sealant.**
- **Install the differential carrier 10 min. after applying sealant.**
- **Allow the sealant to set at least 30 min. after installation before filling the differential with the specified oil.**

1. Drain the rear differential oil.
2. Remove the propeller shaft. (See 03-15-2 PROPELLER SHAFT REMOVAL/INSTALLATION.)
3. Remove in the order indicated in the table.
4. Install in the reverse order of removal.
5. Add rear differential oil. (See 03-14B-2 REAR DIFFERENTIAL OIL REPLACEMENT.)

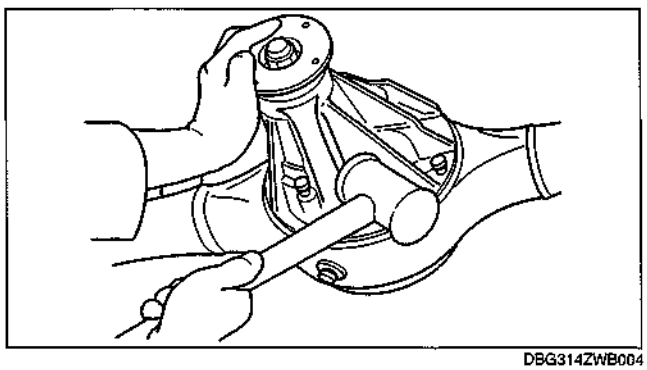


DCF314ZWB003

1	Axle shaft and back plate component (See 03-12-2 AXLE SHAFT REMOVAL/ INSTALLATION.)
2	Rear differential component (See 03-14A-3 Front Differential, Joint Shaft Component Removal Note.)

Rear Differential Component Removal Note

1. To prevent the rear differential from dropping, leave the two bolts loosely tightened, then tap the rear differential carrier using a wooden hammer.



DBG314ZWB004

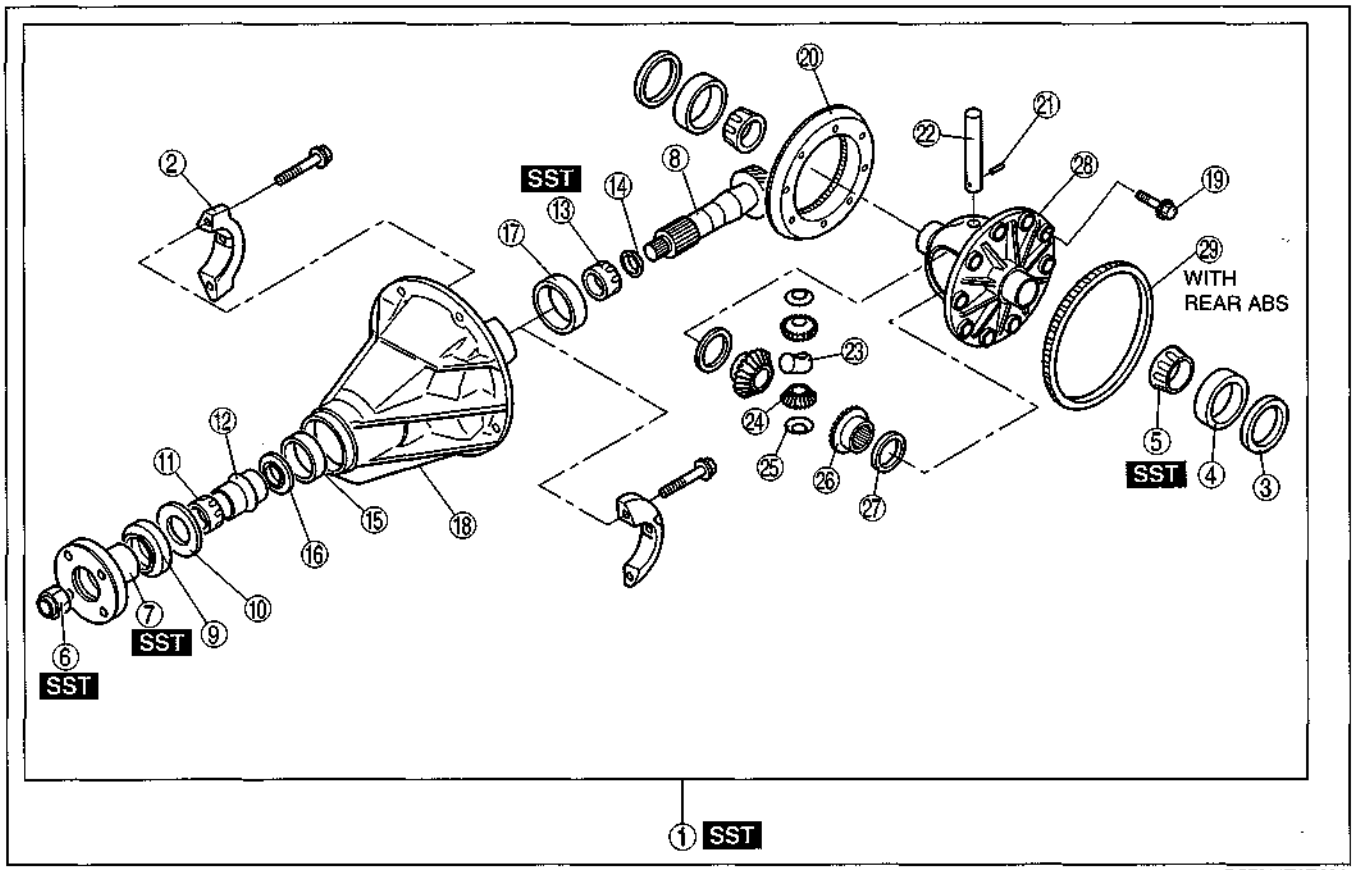
REAR DIFFERENTIAL DISASSEMBLY [STANDARD DIFFERENTIAL]

dcf031427100w07

Warning

- **The engine stand is equipped with a self-lock mechanism, however, if the rear differential is tilted, the self-lock mechanism could become inoperative. If the rear differential unexpectedly rotates, it could cause injury, therefore do not maintain the rear differential tilted. When turning the rear differential, grasp the rotation handle firmly.**

1. Disassemble in the order indicated in the table.



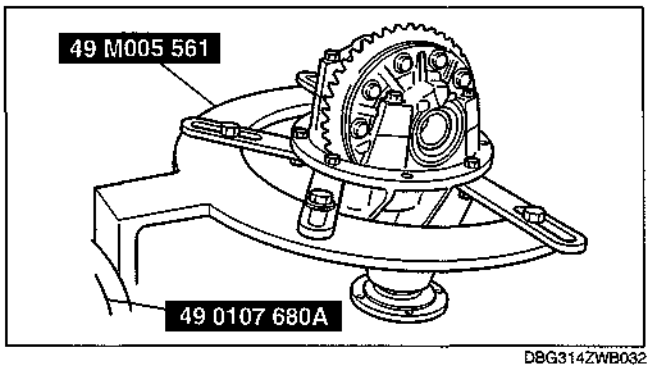
DCF314ZWB004

1	Differential component (See 03-14B-5 Differential Component Disassembly Note.)
2	Bearing cap (See 03-14B-5 Bearing Cap Disassembly Note.)
3	Adjusting shim
4	Side bearing outer race
5	Side bearing inner race (See 03-14B-5 Side Bearing Inner Race Disassembly Note.)
6	Locknut (See 03-14B-5 Locknut Disassembly Note.)
7	Companion flange (See 03-14B-6 Companion Flange Disassembly Note.)
8	Drive pinion (See 03-14B-6 Drive Pinion Disassembly Note.)
9	Oil seal (See 03-14B-6 Oil Seal Disassembly Note.)
10	Thrust washer
11	Front bearing inner race
12	Collapsible spacer
13	Rear bearing inner race (See 03-14B-6 Rear Bearing Inner Race Disassembly Note.)

14	Adjusting shim
15	Front bearing outer race (See 03-14B-7 Front Bearing Outer Race, Rear Bearing Outer Race Disassembly Note.)
16	Oil baffle
17	Rear bearing outer race (See 03-14B-7 Front Bearing Outer Race, Rear Bearing Outer Race Disassembly Note.)
18	Differential carrier
19	Bolt
20	Ring gear
21	Knock pin (See 03-14B-7 Knock Pin Disassembly Note.)
22	Pinion shaft
23	Thrust block
24	Pinion gear
25	Thrust washer
26	Side gear
27	Thrust washer
28	Differential case
29	ABS sensor rotor (with rear ABS)

Differential Component Disassembly Note

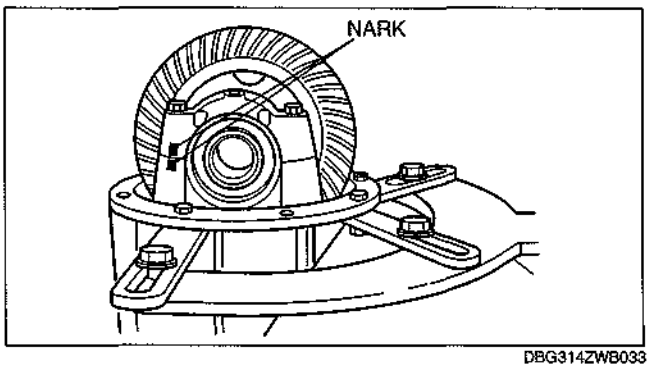
1. Install the differential component to the **SSTs**.



DBG314ZWB032

Bearing Cap Disassembly Note

1. Place a mark on one of the bearing caps so that the left and right bearing caps won't get mixed up. Use the mark for matching at the time if assembly.



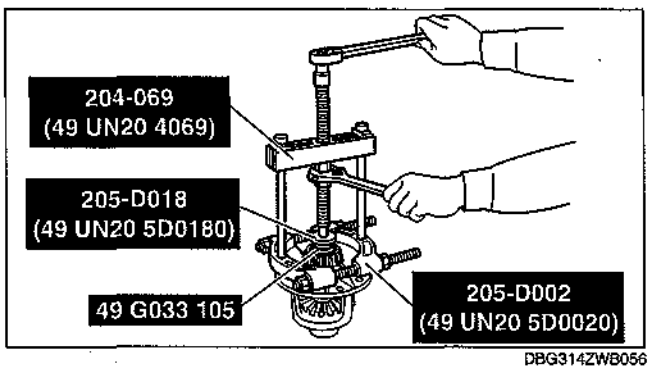
DBG314ZWB033

Side Bearing Inner Race Disassembly Note

Caution

- **Mark the left bearing in order to install in the same position.**

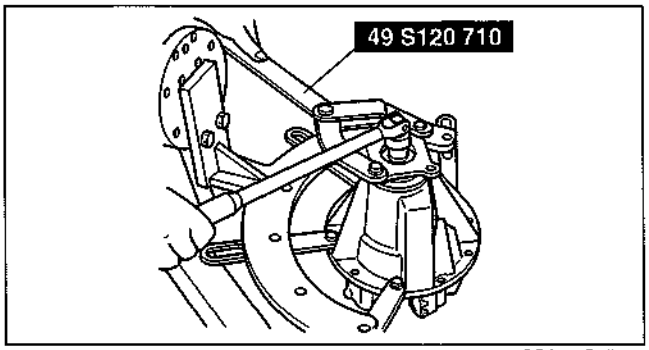
1. Remove the side bearing inner race from the gear case using the **SSTs**.



DBG314ZWB056

Locknut Disassembly Note

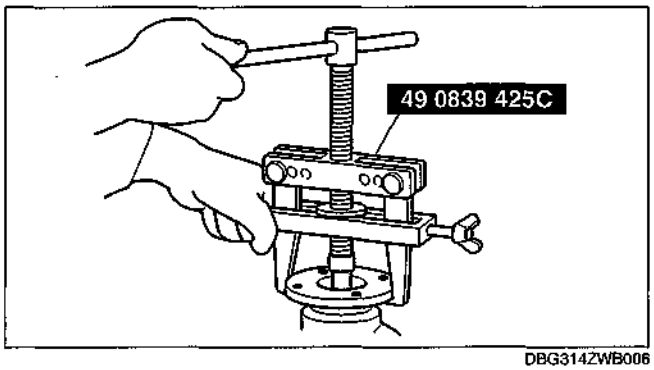
1. Hold the companion flange using the **SST** and remove the locknut.



DBG314ZWB012

Companion Flange Disassembly Note

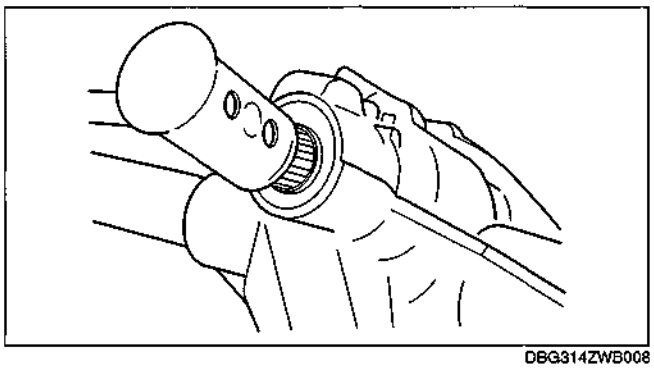
1. Pull the companion flange out using the **SST**.



DBG314ZWB006

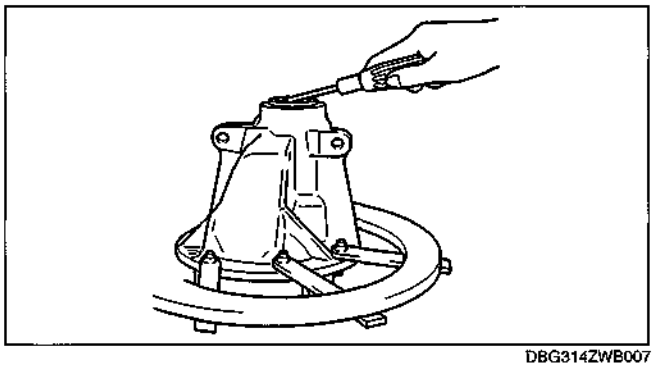
Drive Pinion Disassembly Note

1. Remove the drive pinion by tapping with a plastic hammer.
2. Remove the drive pinion component by tapping the locknut lightly using a plastic hammer.
3. Remove the locknut installed in Step 1.


DBG314ZWB008

Oil Seal Disassembly Note

1. Remove the oil seal using a screw driver.

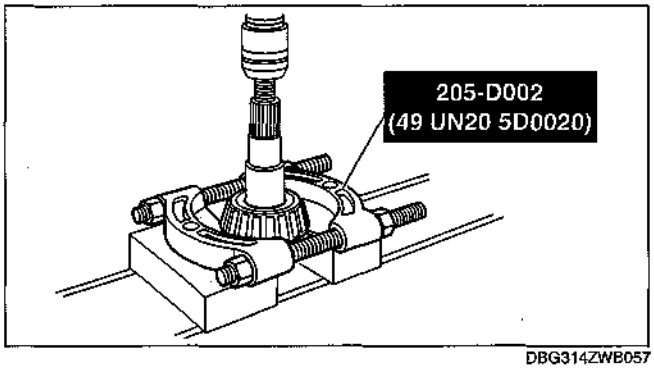

DBG314ZWB007

Rear Bearing Inner Race Disassembly Note

Note

- Mark or otherwise distinguish between the front and rear inner races so that they are not mixed at the time of reassembly.

1. Remove the rear bearing inner race using the **SST**.

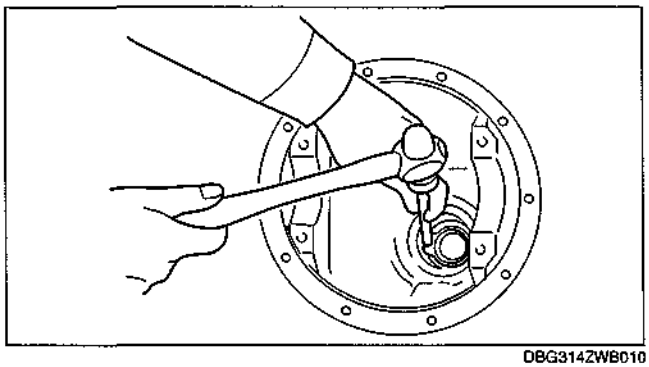


DBG314ZWB057

Front Bearing Outer Race, Rear Bearing Outer Race Disassembly Note

Note
- Mark or otherwise distinguish between the front and rear outer races so that they are not mixed up at the time of reassembly.

1. Remove the bearing outer race by lightly tapping the edge of the bearing outer race using a flathead screwdriver.

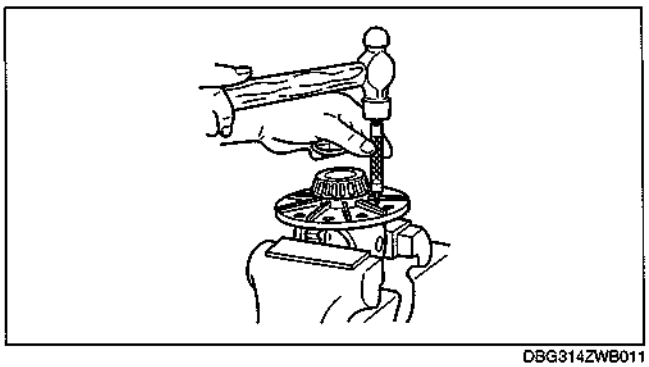


DBG314ZWB010

Knock Pin Disassembly Note

Caution
- **Insert the bar from the knock pin hole at the opposite side from where the ring gear is installed.**

1. Secure the gear case in a vise and remove the knock pin by using a **4 mm {0.16 in}** diameter bar.



DBG314ZWB011

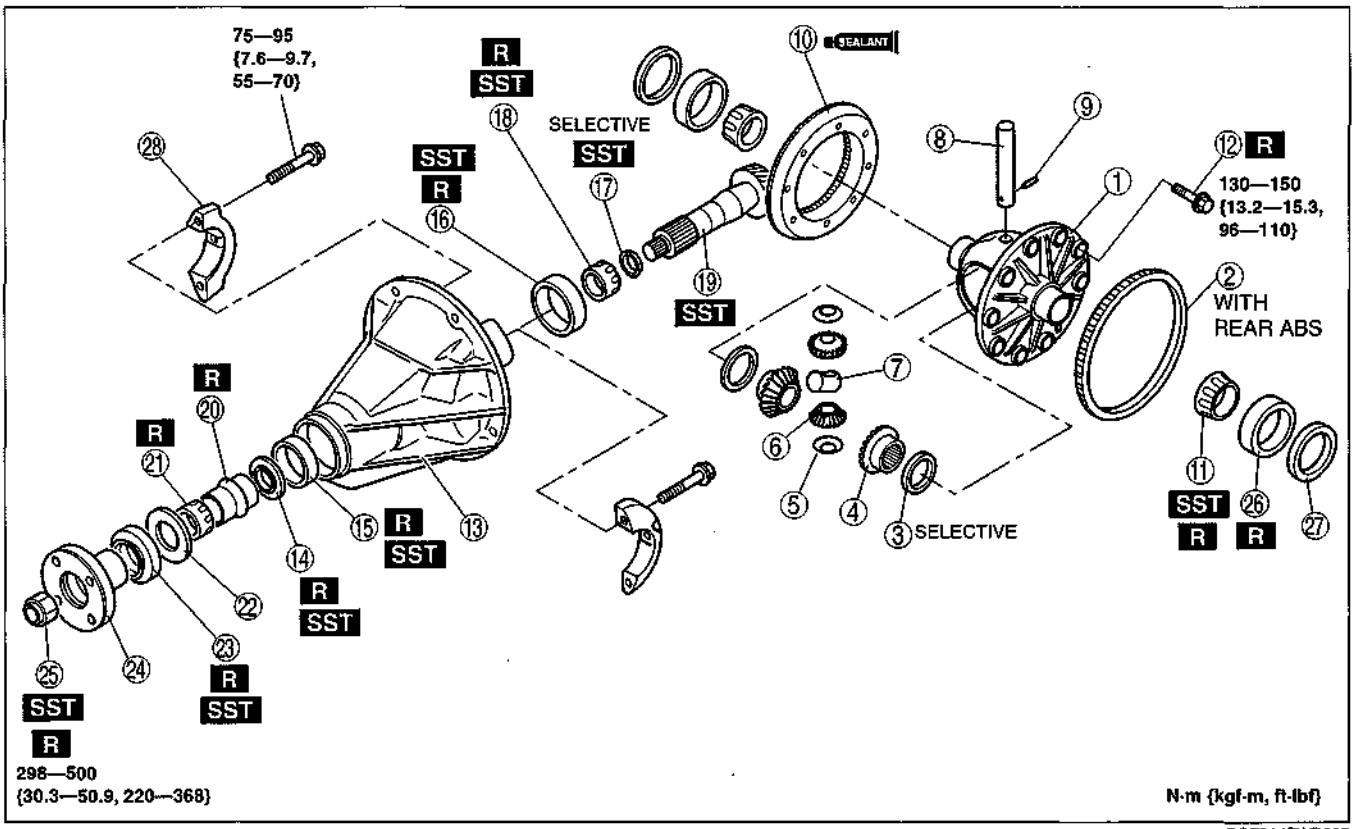
REAR DIFFERENTIAL ASSEMBLY [STANDARD DIFFERENTIAL]

dcf031427100w08

Warning
- **The engine stand is equipped with a self-lock mechanism, however, if the rear differential is tilted, the self-lock mechanism could become inoperative. If the rear differential unexpectedly rotates, it could cause injury, therefore do not maintain the rear differential tilted. When turning the rear differential, grasp the rotation handle firmly.**

Note
- Clean away the old silicone sealant before applying the new silicone sealant.
- Install the rear cover **within 10 min** after applying the silicone sealant.
- Allow the sealant to set **at least 30 min or more** after installation before filling the differential with differential oil.

1. Assemble in the order indicated in the table.



DCF314ZWB005

1	Differential case
2	ABS sensor rotor (with rear ABS)
3	Thrust washer (See 03-14B-9 Thrust Washer Assembly Note.)
4	Side gear
5	Thrust washer
6	Pinion gear
7	Thrust block
8	Pinion shaft
9	Knock pin (See 03-14B-9 Knock Pin Assembly Note.)
10	Ring gear (See 03-14B-9 Ring Gear Assembly Note.)
11	Side bearing inner race (See 03-14B-9 Side Bearing Inner Race Assembly Note.)
12	Bolt
13	Differential carrier
14	Oil baffle (See 03-14B-10 Oil Baffle Assembly Note [WL-C].)
15	Front bearing outer race (See 03-14B-10 Front Bearing Outer Race Assembly Note.)
16	Rear bearing outer race (See 03-14B-10 Rear Bearing Outer Race Assembly Note.)

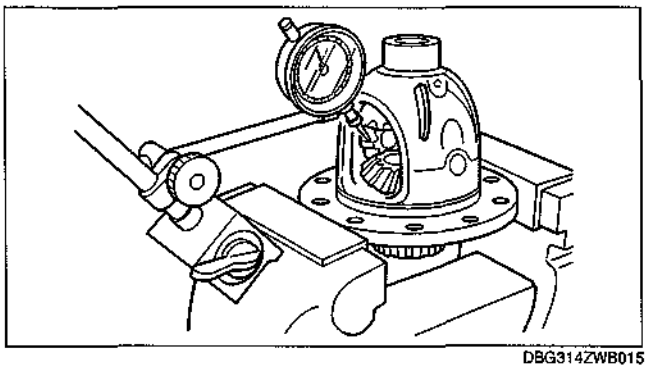
17	Adjusting shim (See 03-14B-11 Adjusting Shim Assembly Note.)
18	Rear bearing inner race (See 03-14B-13 Rear Bearing Inner Race Assembly Note.)
19	Drive pinion (See 03-14B-13 Drive Pinion Assembly Note.)
20	Collapsible spacer
21	Front bearing inner race
22	Thrust washer
23	Oil seal (See 03-14B-14 Oil Seal Assembly Note.)
24	Companion flange
25	Locknut (See 03-14B-14 Locknut Assembly Note.)
26	Side bearing outer race (See 03-14B-14 Side Bearing Outer Race, Adjusting Shim, Bearing Cap Assembly Note.)
27	Adjusting shim (See 03-14B-14 Side Bearing Outer Race, Adjusting Shim, Bearing Cap Assembly Note.)
28	Bearing cap (See 03-14B-14 Side Bearing Outer Race, Adjusting Shim, Bearing Cap Assembly Note.)

Thrust Washer Assembly Note

1. Adjust the backlash of the side gears and pinion gear as follows:
   (1) Set a dial gauge to the pinion gear as shown in the figure.
   (2) Secure one of the side gears.
   (3) Move the pinion gear and measure the backlash at the end of the pinion gear.

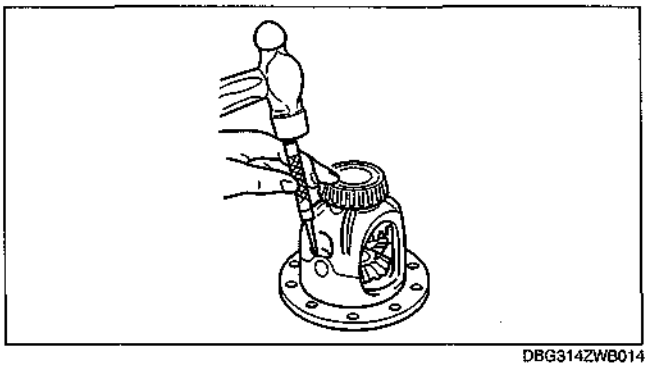
   Backlash of side gear and pinion gear
   0—0.1 mm {0—0.004 in}

   (4) If the backlash exceeds the standard, use the thrust washers to adjust.


DBG314ZWB015

Knock Pin Assembly Note

1. Assemble the side gears, thrust washer, thrust block, pinion gears, pinion shaft and knock pin. After assembling the knock pin, make a crimp so that the pin will not come out of the gear case.


DBG314ZWB014

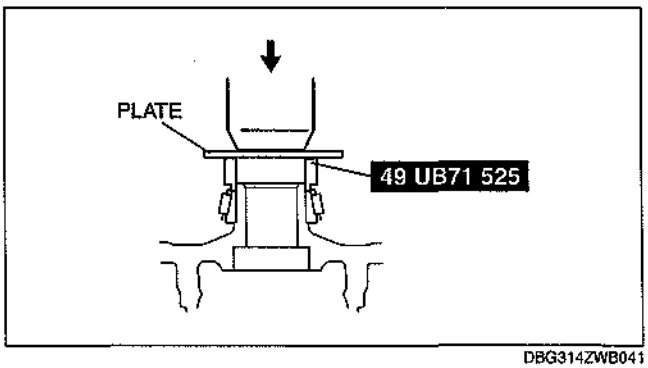
Ring Gear Assembly Note

1. Coat the ring gear and gear case facing surfaces with locking agent.
2. Install the ring gear and tighten the bolt to the specified torque.

Side Bearing Inner Race Assembly Note

Caution
- **Bearings should be assembled to the original positions.**

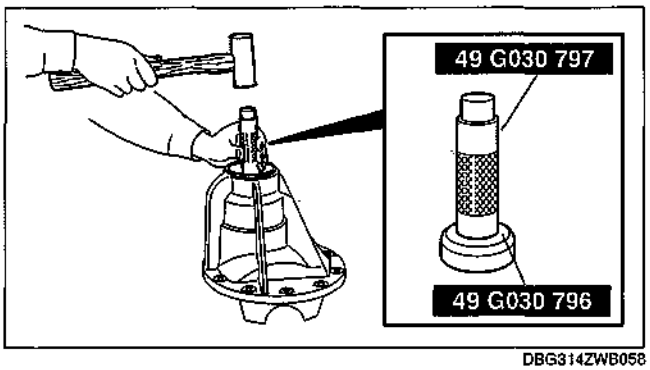
1. Press the side bearings into the gear case using the **SST**.



DBG314ZWB041

Oil Baffle Assembly Note [WL-C]

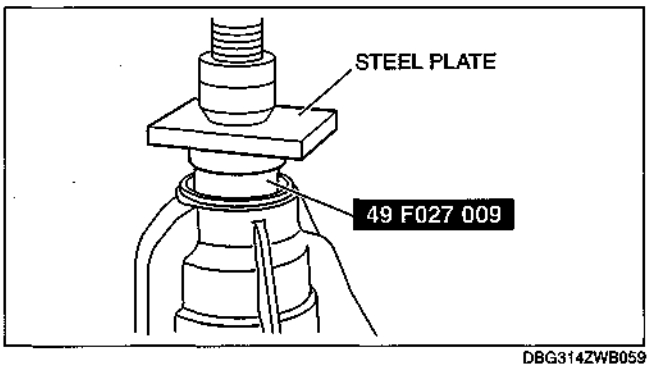
1. Tap the oil baffle into the differential carrier using the **SSTs**.



DBG314ZWB058

Front Bearing Outer Race Assembly Note

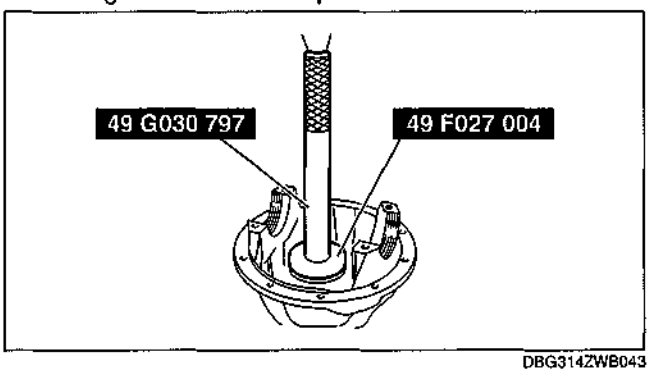
1. Press the front bearing outer race into the carrier using the **SST** and a press.



DBG314ZWB059

Rear Bearing Outer Race Assembly Note
WL-3

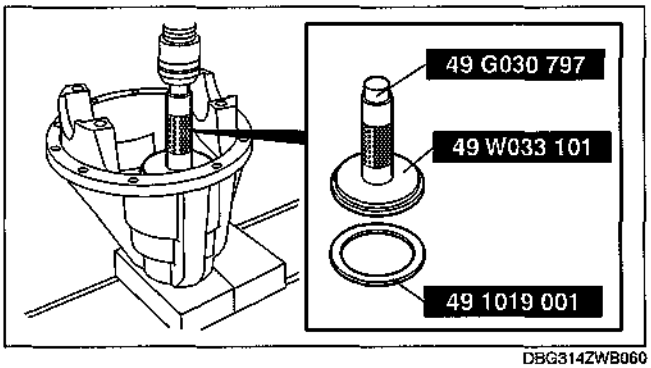
1. Press the rear bearing outer race into the differential carrier using the **SSTs** and a press.



DBG314ZWB043

WL-C

1. Press the rear bearing outer race into the differential carrier using the **SSTs** and a press.

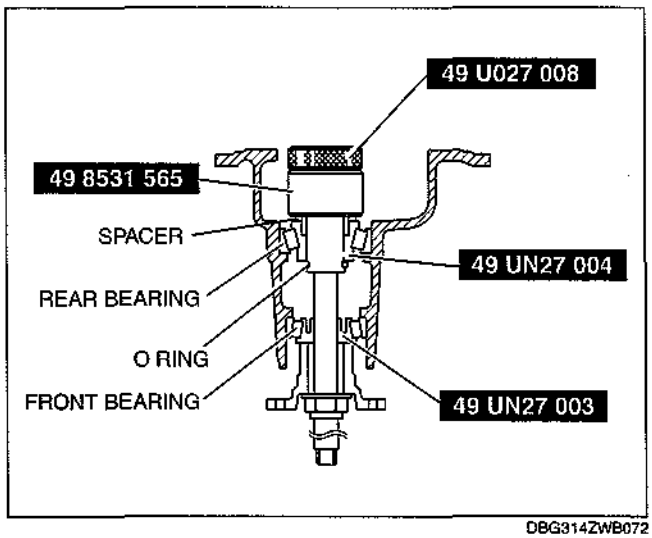


DBG314ZWB060

Adjusting Shim Assembly Note
Pinion height adjustment [WL-3]

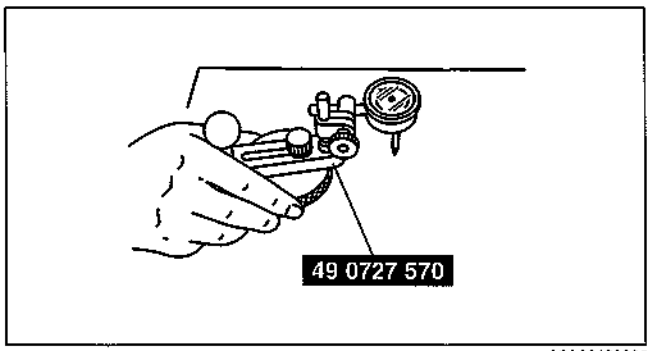
Note
- Use the installed spacer when adjusting.
- Be careful to install **SSTs** in the correct position and facing in the correct direction.

1. Assemble the spacer, rear bearing inner race and **SST** (49 UN27 004) on to the **SST** (49 8531 565). Secure the collar with the O-ring, then install this to the carrier.
2. Assemble the front bearing inner race, **SST** (49 UN27 003), companion flange, washer and nut to the **SST** (49 8531 565).
3. Tighten the nut to the extent that the **SST** (49 8531 565) can be turned by hand.



DBG314ZWB072

4. Place the **SST** on the surface plate and set the dial indicator to zero.
5. Place the **SST** (49 U027 008) on top of the **SST** (49 8531 565), and then set the **SST** (49 0727 570) on top of the **SST** (49 U027 008).



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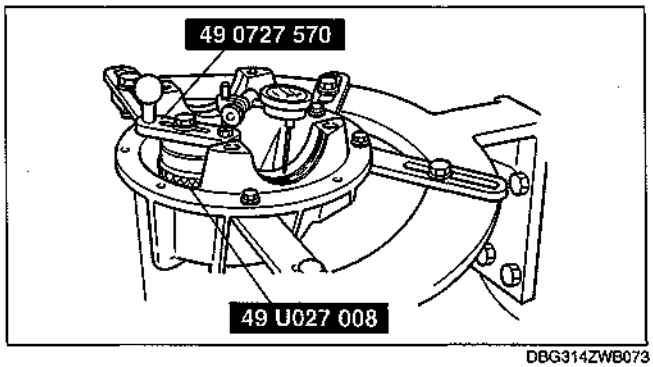
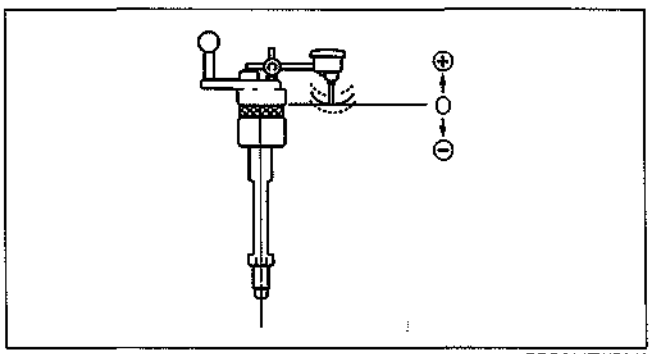
6. Place the measuring probe of the dial indicator so that it contacts the place where the side bearing is installed in the carrier, then measure left and right side of the lower position.



DBG314ZWB073

7. Add the two (left and right) values obtained by the measurements taken in Step 6 and then divide the total by **2**. From this sum, subtract the sum of the number inscribed on the end of the drive pinion divided by **100**. (If there is no figure inscribed, use 0.) This is the pinion height adjustment value.



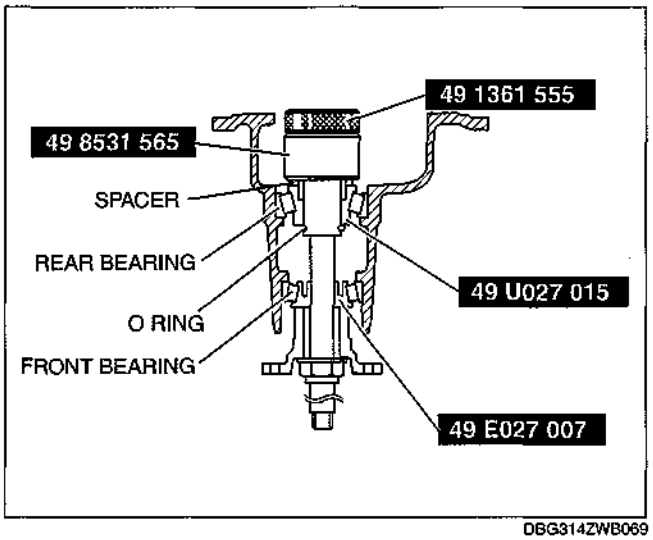
DBG314ZWB049

Note
- When the values obtained by the measurements taken in Step 7 are 0.06 mm {00.003 in}, 0.04 mm {0.002 in} and the tip surface of the drive pinion value is 2, the formula is ((0.06+0.04)/2)-(2/100)=0.03. Therefore, assemble a spacer 0.03 mm {0.001 in} thicker than the currently assembled one.

Pinion height adjustment [WL-C]

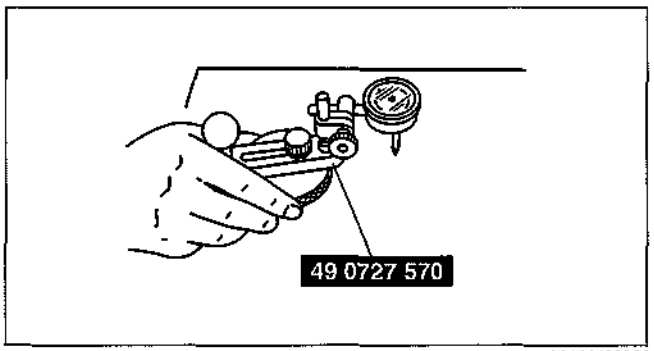
Note
- Use the installed spacer when adjusting.
- Be careful to install **SSTs** in the correct position and facing in the correct direction.

1. Assemble the spacer, rear bearing inner race and **SST** (49 U027 015) on to the **SST** (49 8531 565). Secure the collar with the O-ring, then install this to the carrier.
2. Assemble the front bearing inner race, **SST** (49 E027 007), companion flange, washer and nut to the **SST** (49 8531 565).
3. Tighten the nut to the extent that the **SST** (49 8531 565) can be turned by hand.



DBG314ZWB069

4. Place the **SST** on the surface plate and set the dial indicator to zero.
5. Place the **SST** (49 1361 555) on top of the **SST** (49 8531 565), and then set the **SST** (49 0727 570) on top of the **SST** (49 1361 555).



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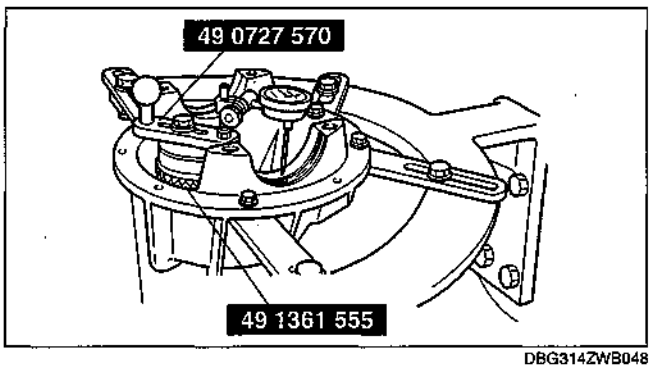
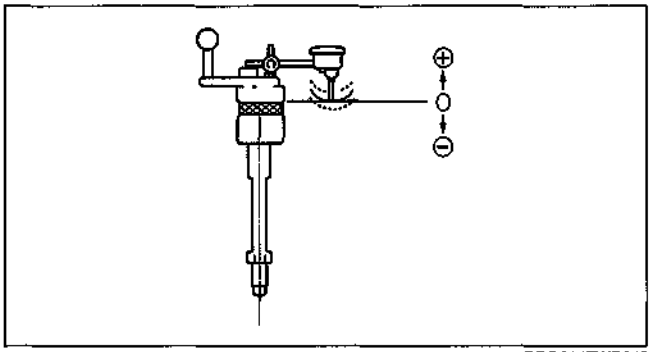
6. Place the measuring probe of the dial indicator so that it contacts the place where the side bearing is installed in the carrier, then measure left and right side of the lower position.
7. Add the two (left and right) values obtained by the measurements taken in Step 6 and then divide the total by **2**. From this sum, subtract the sum of the number inscribed on the end of the drive pinion divided by **100**. (If there is no figure inscribed, use 0.)



DBG314ZWB048

8. Subtract **3** from measurement taken in Step 7. This is the pinion height adjustment value.

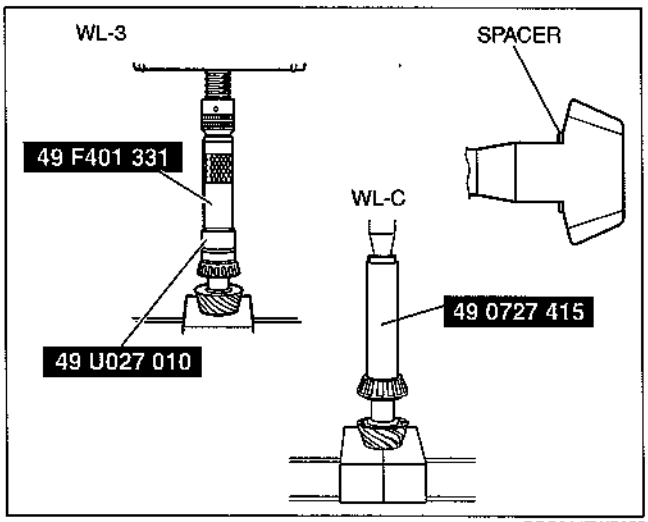
Note
- When the values obtained by the measurements taken in Step 7 and 8 are 3.06 mm {0.1205 in}, 3.04 mm {0.1197 in} and the tip surface of the drive pinion value is 2, the formula is ((3.06+3.04)/2)-(2/100)-3=0.03. Therefore, assemble a spacer 0.03 mm {0.001 in} thicker than the currently assembled one.


DBG314ZWB049

Rear Bearing Inner Race Assembly Note

Caution
- **Press in until the force required suddenly increases.**
- **Install the spacer selected for the pinion height adjustment, confirm that the installation direction is correct.**

1. Press the rear bearing inner race using the **SST**.

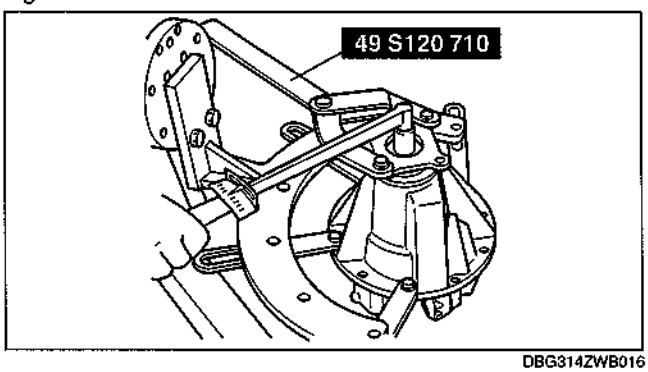


DBG314ZWB075

Drive Pinion Assembly Note
Drive pinion preload adjustment

Caution
- **Do not install the oil seal.**

1. Assemble the following parts to the drive pinion.
   - New collapsible spacer
   - Front bearing
   - New spacer
   - Companion flange
   - New washer
   - New locknut
2. Adjust the preload of the drive pinion bearing as follows:
   (1) Turn the companion flange by hand to seat the bearing.
   (2) Use a torque wrench to tighten the locknut temporarily tightened in step 1, and confirm that the specified preload can be obtained within the specified tightening torque range. The torque applied at this time will be used after the oil seal is installed.



DBG314ZWB016

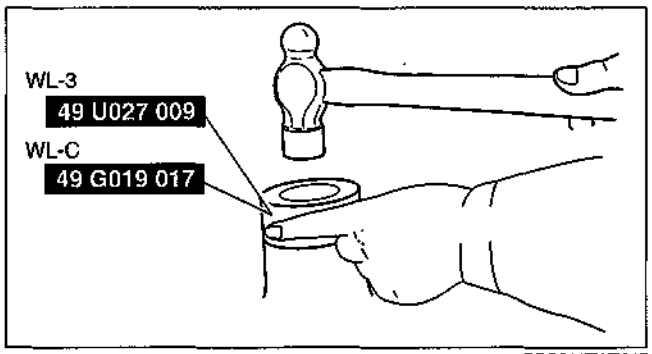
Tightening torque
298—500 N·m {30.4—50.9 kgf·m, 220—368 ft·lbf}

Rear differential drive pinion preload
WL-3: 2.0—3.5 N·m {21—35 kgf·cm, 18—30 in·lbf}
WL-C, WE-C: 2.55—4.00 N·m {26.1—40.7 kgf·cm, 22.6—35.4 in·lbf}

   (3) If the specified preload can't be obtained within the specified tightening torque range, replace the collapsible spacer and inspect again.
   (4) Remove the locknut, washer and companion flange.

Oil Seal Assembly Note

1. Apply differential oil to the lip of a new oil seal.
2. Press the oil seal in until it touches the end of the differential carrier using the **SST**.

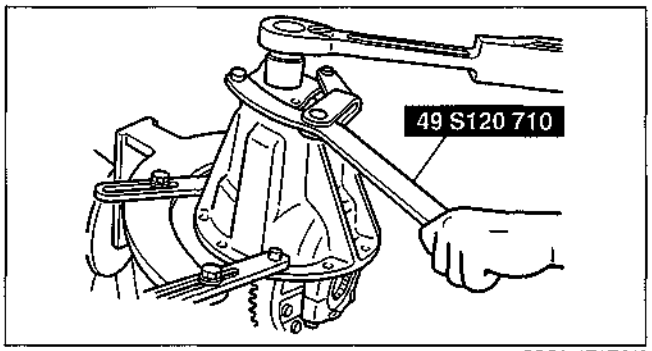


DBG314ZWB017

Locknut Assembly Note

1. Assemble the companion flange and washer.
2. Tighten the new locknut using the **SST**.
3. Verify that the preload is within the specification.

Rear differential drive pinion preload
WL-3: 2.0—3.5 N·m {21—35 kgf·cm, 18—30 In·lbf}
WL-C, WE-C: 2.55—4.00 N·m {26.1—40.7 kgf·cm, 22.6—35.4 in·lbf}

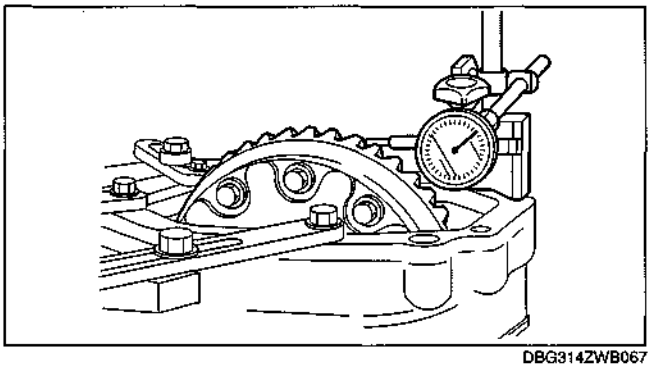


DBG314ZWB018

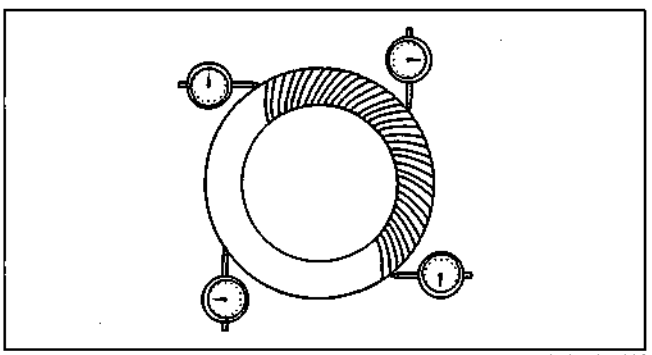
Side Bearing Outer Race, Adjusting Shim, Bearing Cap Assembly Note
Ring gear backlash adjustment

1. Install the gear case component on the differential carrier.
2. Push the gear case component tot he left side of the differential carrier and measure the clearance between the side bearing and differential carrier. This measurement is the left and right total shim thickness.
3. Divide the amount of shim in step 2 appropriately between the right and left side, then install the bearing cap.
4. Adjust the drive pinion, ring gear backlash and the side bearing preload as follows:
   (1) Mark the ring gear at four points at **approx. 90°** intervals and mount a dial indicator to the carrier so that the feeler comes in contact at **90°** angle with one of the ring gear teeth.
5. Inspect the backlash at the three other marked points and make sure that the minimum backlash is more than **0.05 mm {0.002 in}** and difference of the maximum and minimum backlash value is less than **0.03 mm {0.001 in}**.

Ring gear backlash
0.12—0.20 mm {0.005—0.007 in}


DBG314ZWB067

6. If backlash is not as specified, correct the backlash by switching whims from one side of the differential case to the other.
7. Using a torque wrench, inspect the total rotating torque of the pinion three complete revolutions, and then reading the rotating torque. The readings should not exceed **2.4 N·m {24.0 kgf·cm, 20.8 In·lbf}**. If the backlash is within specification but the rotating torque is to high, the preload may be adjusted by removing an equal amount of shims from both sides of the differential.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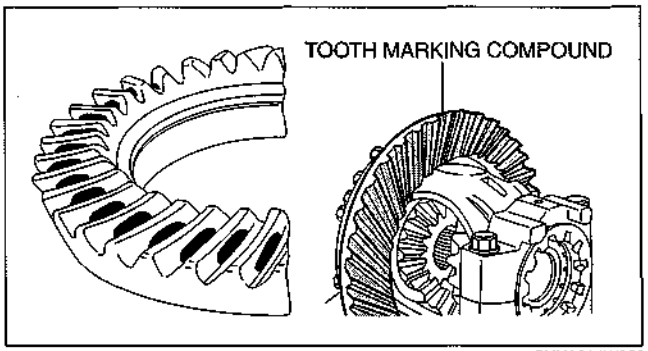
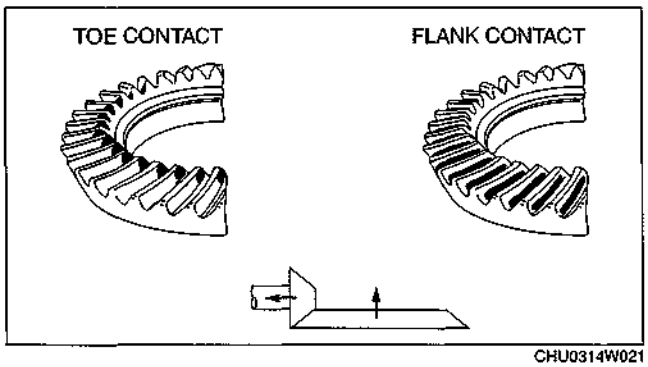
8. The inspection and adjustment procedure is as follows:
   (1) Coat both surfaces of 6—8 teeth of the ring gear uniformly with a tooth marking compound.
   (2) While moving the ring gear back and forth by hand, rotate the drive pinion several times and inspect the tooth contact.
   (3) If the tooth contact is good, wipe off the red lead coating.
   (4) If it is not good, adjust the pinion height, then adjust the backlash.



CHU0314W020

Toe and flank contact

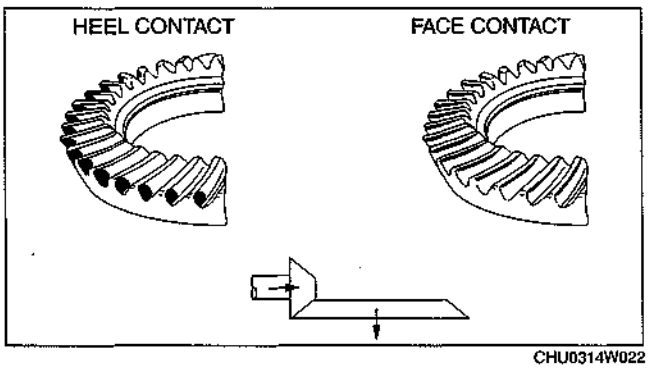
1. Replace the spacer with a thinner one, and move the drive pinion outward.



CHU0314W021

Heel and face contact

1. Replace the spacer with a thicker one. Bring the drive pinon inward.

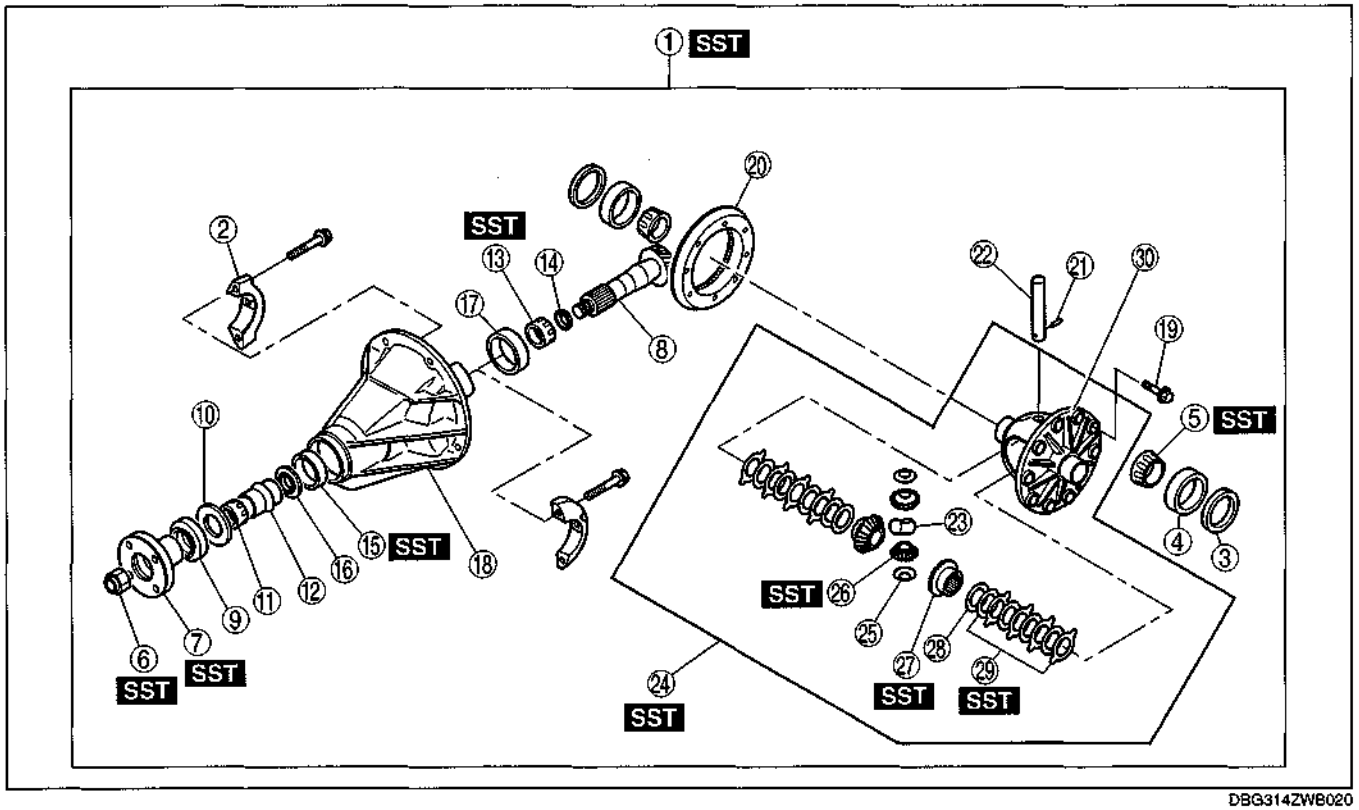


CHU0314W022

REAR DIFFERENTIAL DISASSEMBLY [LSD (LIMITED SLIP DIFFERENTIAL)]

dcf031427101w01

1. Disassemble in the order indicated in the table.



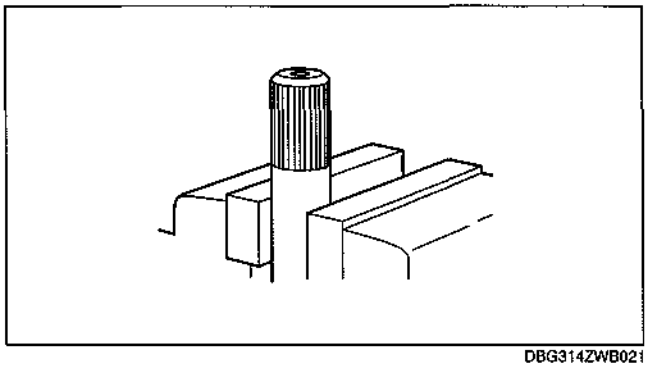
DBG314ZWB020

1	Differential component (See 03-14B-5 Differential Component Disassembly Note.)
2	Bearing cap (See 03-14B-5 Bearing Cap Disassembly Note)
3	Adjusting shim
4	Side bearing outer race
5	Side bearing inner race (See 03-14B-5 Side Bearing Inner Race Disassembly Note)
6	Locknut (See 03-14B-5 Locknut Disassembly Note)
7	Companion flange (See 03-14B-6 Companion Flange Disassembly Note)
8	Drive pinion (See 03-14B-6 Drive Pinion Disassembly Note)
9	Oil seal (See 03-14B-6 Oil Seal Disassembly Note)
10	Thrust washer (See 03-14B-6 Oil Seal Disassembly Note)
11	Front bearing inner race
12	Collapsible spacer
13	Rear bearing inner race (See 03-14B-6 Rear Bearing Inner Race Disassembly Note)

14	Adjusting shim
15	Front bearing outer race (See 03-14B-7 Front Bearing Outer Race, Rear Bearing Outer Race Disassembly Note)
16	Oil baffle
17	Rear bearing outer race
18	Differential carrier
19	Bolt
20	Ring gear
21	Knock pin (See 03-14B-7 Knock Pin Disassembly Note)
22	Pinion shaft
23	Thrust block
24	Limited slip differential component (See 03-14B-17 Limited Slip Differential Component Disassembly Note.)
25	Pinion gear thrust washer
26	Pinion gear
27	Side gear
28	Side gear thrust washer
29	LSD clutches
30	Differential case

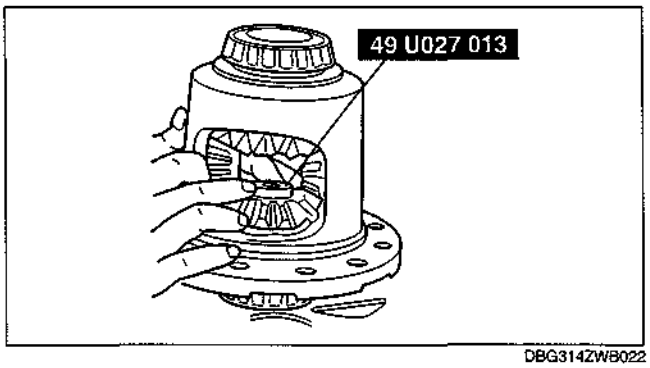
Limited Slip Differential Component Disassembly Note

1. Place one of the axle shafts, which was removed from the component, into a vise, with the splines extending above the jaws of the vise far enough to component. Position the differential case onto the axle shaft as a holding fixture by aligning the splines of the side gear with those of the axle shaft.



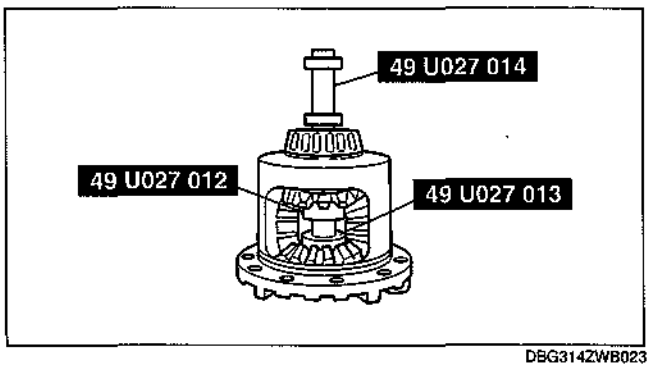
DBG314ZWB021

2. Install the **SST** into the bottom of the side gear, and apply grease to the centering hole of it.



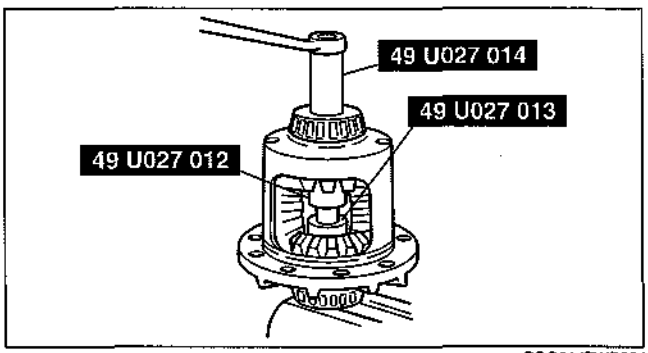
DBG314ZWB022

3. Install the **SSTs** into the differential case.



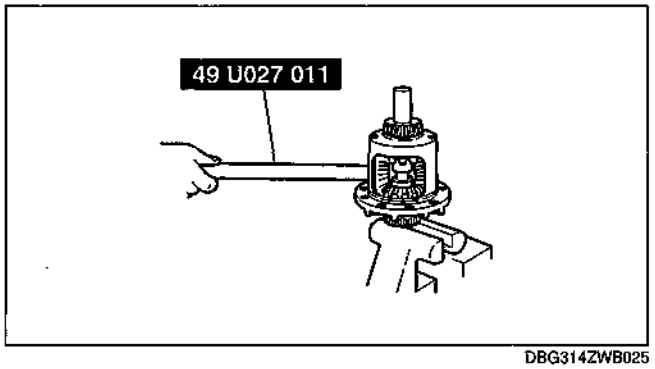
DBG314ZWB023

4. Tighten the **SSTs** to move the side gears away from the pinion gears and relieve the normal loaded condition.
5. Push out the thrust washers located behind the pinion gears.
6. Momentarily loosen the **SST**. Retighten the **SST** until a very slight movement of the pinion gears is seen.



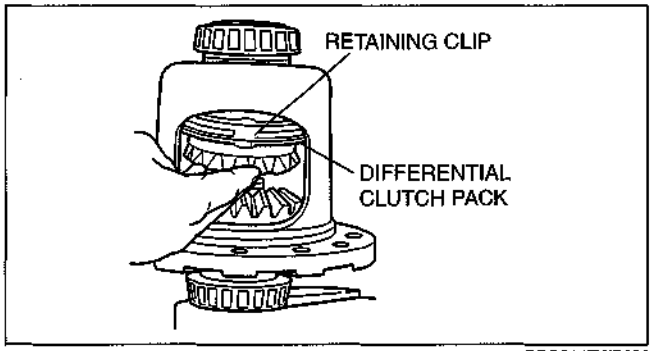
DBG314ZWB024

7. Insert **SST** into the bore of the pinion shaft and rotate the differential case until the pinion gears can be removed through the large openings in the differential case.



DBG314ZWB025

8. Retain the top side gear and clutch pack in the differential case by hand and remove the **SSTs**.
9. Remove the top side gear and clutch pack. Keep the stack of the clutch plates and clutch discs in exact order.
10. Remove the retainer clips from both clutch packs to allow separation of the clutch discs and clutch plates for cleaning and inspection.



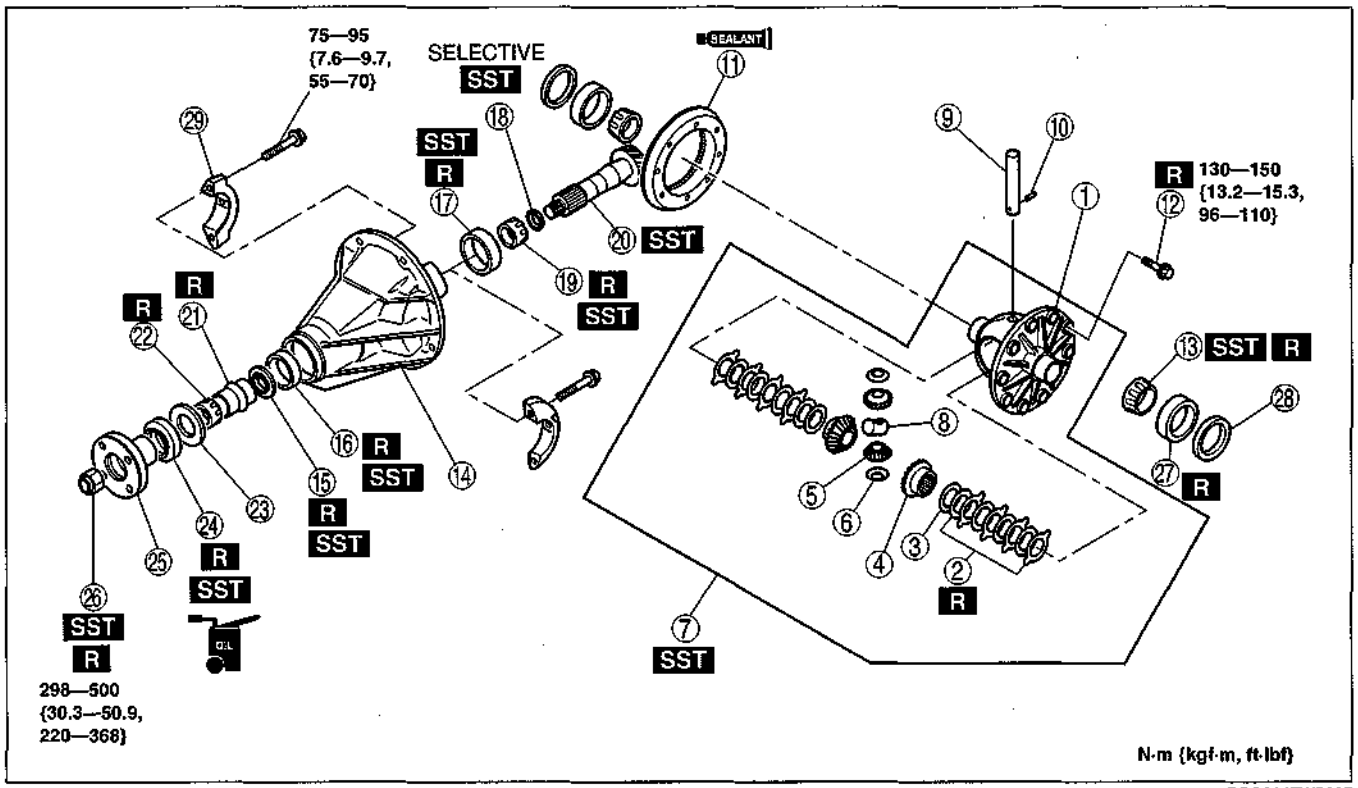
DBG314ZWB026

REAR DIFFERENTIAL ASSEMBLY [LSD (LIMITED SLIP DIFFERENTIAL)]

dcf031427101w02

Note
- Clean away the old sealant before applying the new sealant.
- Install the rear cover within **10 minutes** after applying sealant.
- Allow the sealant to set at least **30 minutes** after installation before filling the differential with the specified oil.

1. Assemble in the order indicated in the table.



DBG314ZWB027

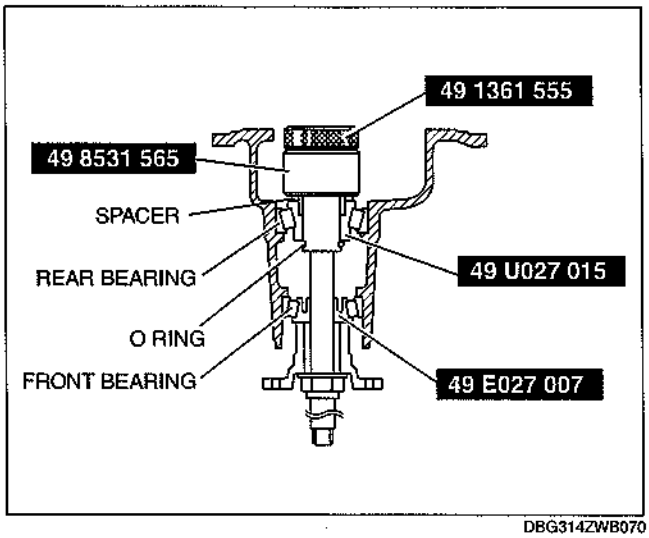
1	Differential case
2	LSD clutches
3	Side gear thrust washer
4	Side gear

5	Pinion gear
6	Pinion gear thrust washer
7	Limited slip differential component (See 03-14B-21 Limited Slip Differential Component Assembly Note.)
8	Thrust block
9	Pinion shaft
10	Knock pin (See 03-14B-9 Knock Pin Assembly Note.)
11	Ring gear (See 03-14B-9 Ring Gear Assembly Note.)
12	Bolt
13	Side bearing inner race (See 03-14B-9 Side Bearing Inner Race Assembly Note.)
14	Differential carrier
15	Oil baffle (See 03-14B-10 Oil Baffle Assembly Note [WL-C].)
16	Front bearing outer race (See 03-14B-10 Front Bearing Outer Race Assembly Note.)
17	Rear bearing outer race (See 03-14B-10 Rear Bearing Outer Race Assembly Note.)
18	Adjusting shim (See 03-14B-19 Adjusting Shim Assembly Note.)
19	Rear bearing inner race (See 03-14B-13 Rear Bearing Inner Race Assembly Note.)
20	Drive pinion (See 03-14B-20 Drive Pinion Assembly Note.)
21	Collapsible spacer
22	Front bearing inner race
23	Thrust washer
24	Oil seal (See 03-14B-10 Oil Baffle Assembly Note [WL-C].)
25	Companion flange
26	Locknut (See 03-14B-14 Locknut Assembly Note.)
27	Side bearing outer race (See 03-14B-14 Side Bearing Outer Race, Adjusting Shim, Bearing Cap Assembly Note.)
28	Adjusting shim (See 03-14B-14 Side Bearing Outer Race, Adjusting Shim, Bearing Cap Assembly Note.)
29	Bearing cap (See 03-14B-14 Side Bearing Outer Race, Adjusting Shim, Bearing Cap Assembly Note.)

Adjusting Shim Assembly Note
Pinion height adjustment

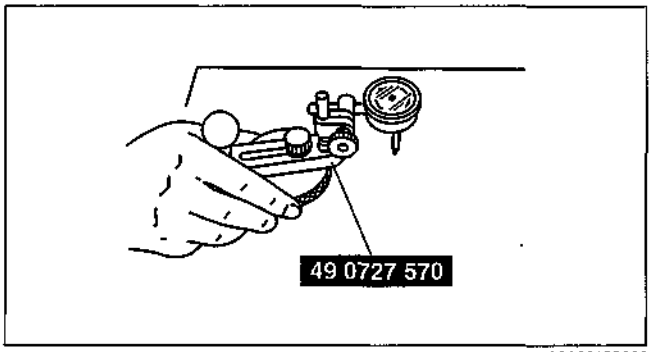
Note
- Use the installed spacer when adjusting.
- Be careful to install **SSTs** in the correct position and facing in the correct direction.

1. Assemble the spacer, rear bearing inner race and **SST** (49 U027 015) on to the **SST** (49 8531 565). Secure the collar with the O-ring, then install this to the carrier.
2. Assemble the front bearing inner race, **SST** (49 E027 007), companion flange, washer and nut to the **SST** (49 8531 565).
3. Tighten the nut to the extent that the **SST** (49 8531 565) can be turned by hand.



DBG314ZWB070

4. Place the **SST** on the surface plate and set the dial indicator to zero.
5. Place the **SST** (49 1361 555) on top of the **SST** (49 8531 565), and then set the **SST** (49 0727 570) on top of the **SST** (49 1361 555).



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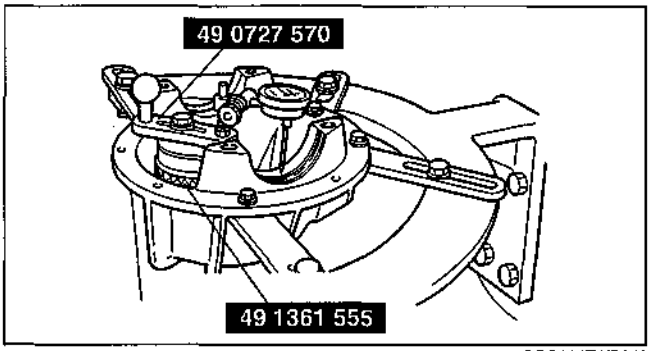
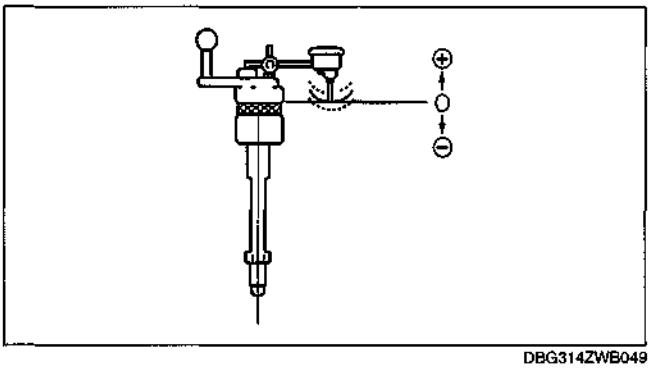
6. Place the measuring probe of the dial indicator so that it contacts the place where the side bearing is installed in the carrier, then measure left and right side of the lower position.
7. Add the two (left and right) values obtained by the measurements taken in Step 6 and then divide the total by **2**. From this sum, subtract the sum of the number inscribed on the end of the drive pinion divided by **100**. (If there is no figure inscribed, use 0.)



DBG314ZWB048

8. Subtract **3** from measurement taken in Step 7. This is the pinion height adjustment value.

Note
- When the values obtained by the measurements taken in Step 7 and 8 are 3.06 mm {0.1205 in}, 3.04 mm {0.1197 in} and the tip surface of the drive pinion value is 2, the formula is ((3.06+3.04)/2)-(2/100)-3=0.03. Therefore, assemble a spacer 0.03 mm {0.001 in} thicker than the currently assembled one.


DBG314ZWB049

Drive Pinion Assembly Note
Drive pinion preload adjustment

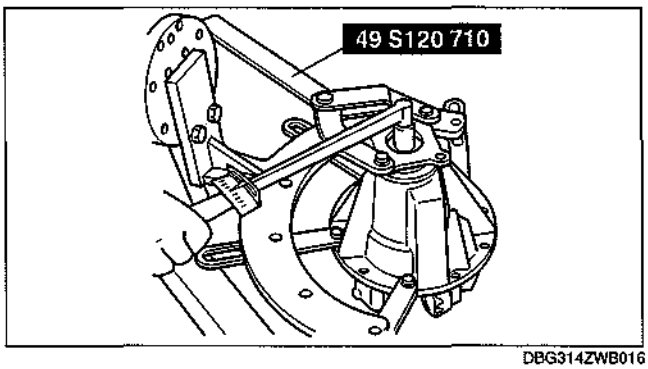
Caution
- **Do not install the oil seal.**

1. Assemble the following parts to the drive pinion.
   - New collapsible spacer
   - Front bearing
   - New spacer
   - Companion flange
   - New washer
   - New locknut
2. Adjust the preload of the drive pinion bearing as follows:
   (1) Turn the companion flange by hand to seat the bearing.

(2) Use a torque wrench to tighten the locknut temporarily tightened in step 1, and confirm that the specified preload can be obtained within the specified tightening torque range. The torque applied at this time will be used after the oil seal is installed.

Tightening torque
298—500 N·m {30.4—50.9 kgf·m, 220—368 ft·lbf}

Rear differential drive pinion preload
2.55—4.00 N·m {26.1—40.7 kgf·cm, 22.6—35.4 in·lbf}



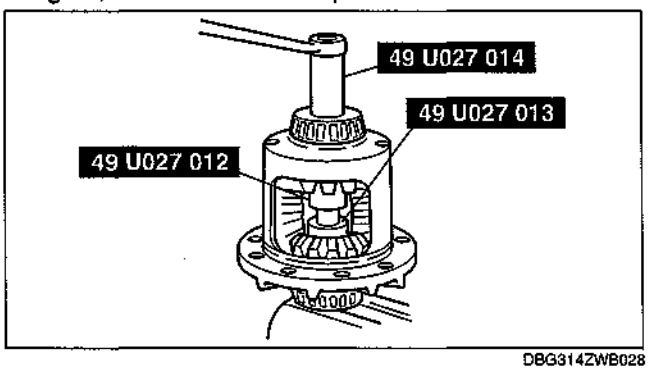
DBG314ZWB016

(3) If the specified preload can't be obtained within the specified tightening torque range, replace the collapsible spacer and inspect again.
(4) Remove the locknut, washer and companion flange.

Limited Slip Differential Component Assembly Note

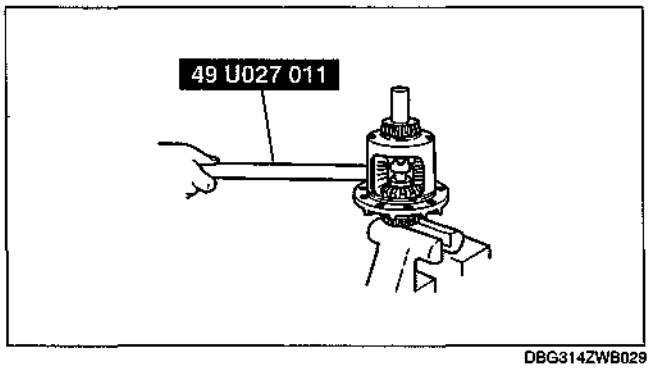
Note
- Always replace the entire disc and plate kits, even if only one component requires it.

1. Assemble the retainer clips to the ears of the clutch plates. Make sure both clips are completely assembled or seated onto the ears of the clutch plates.
2. Place the differential case on a bench. Assemble the clutch pack and side gear into the differential case. Make sure the clutch pack stays assembled to the splines of side gear, and the retainer clips differential case.
3. Install the **SSTs** to the differential case.
4. With tools assembled to the differential case, position the differential case onto the axle shaft by aligning the splines of the differential side gear with those of the axle shaft.
5. Position both pinion gears opposite one another through the openings in the differential case. Align holes of the differential pinion gears with each other. Hold the pinion gears by hand.
6. Tighten the **SST** so the side gears move away condition.



DBG314ZWB028

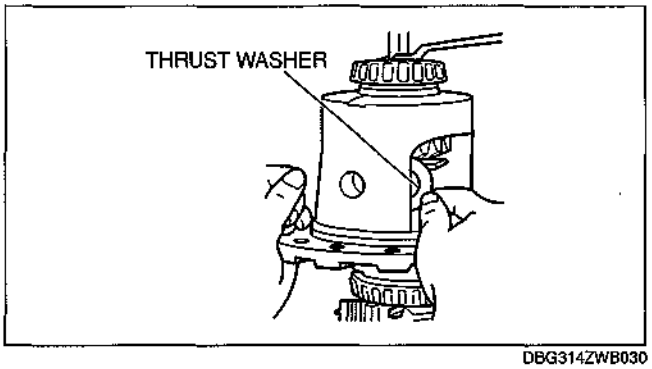
7. While holding the pinion gears in place, insert **SST** into the hole of pinion shaft in the differential case. Pull on the **SST** rotating differential case allowing the differential pinion gears to rotate and enter into the differential case.
8. Adjust the **SST** by very slightly loosening or tightening until the required load is applied to allow the side gears and pinion gears to rotate.
9. Rotate the differential case until the holes of both pinion gears are aligned with those of the differential case.



DBG314ZWB029

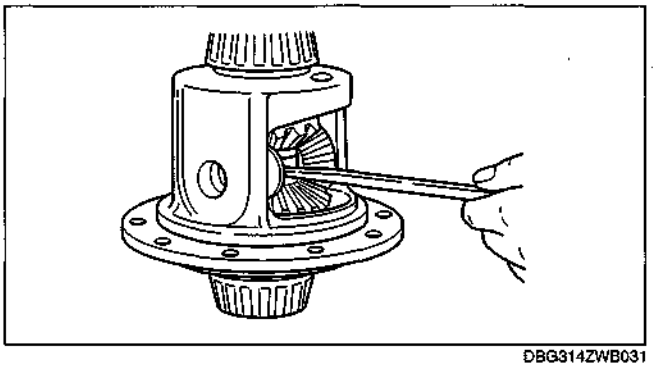
10. Apply torque to the **SST** for clearance to assemble the differential thrust washers.

Note
- During assembly, be sure the holes of the thrust washers and gears are lined up exactly with those of the differential case.



DBG314ZWB030

11. Assemble thrust washers into the differential case. Use a very small screwdriver or shim stock to push the washers into place.


DBG314ZWB031

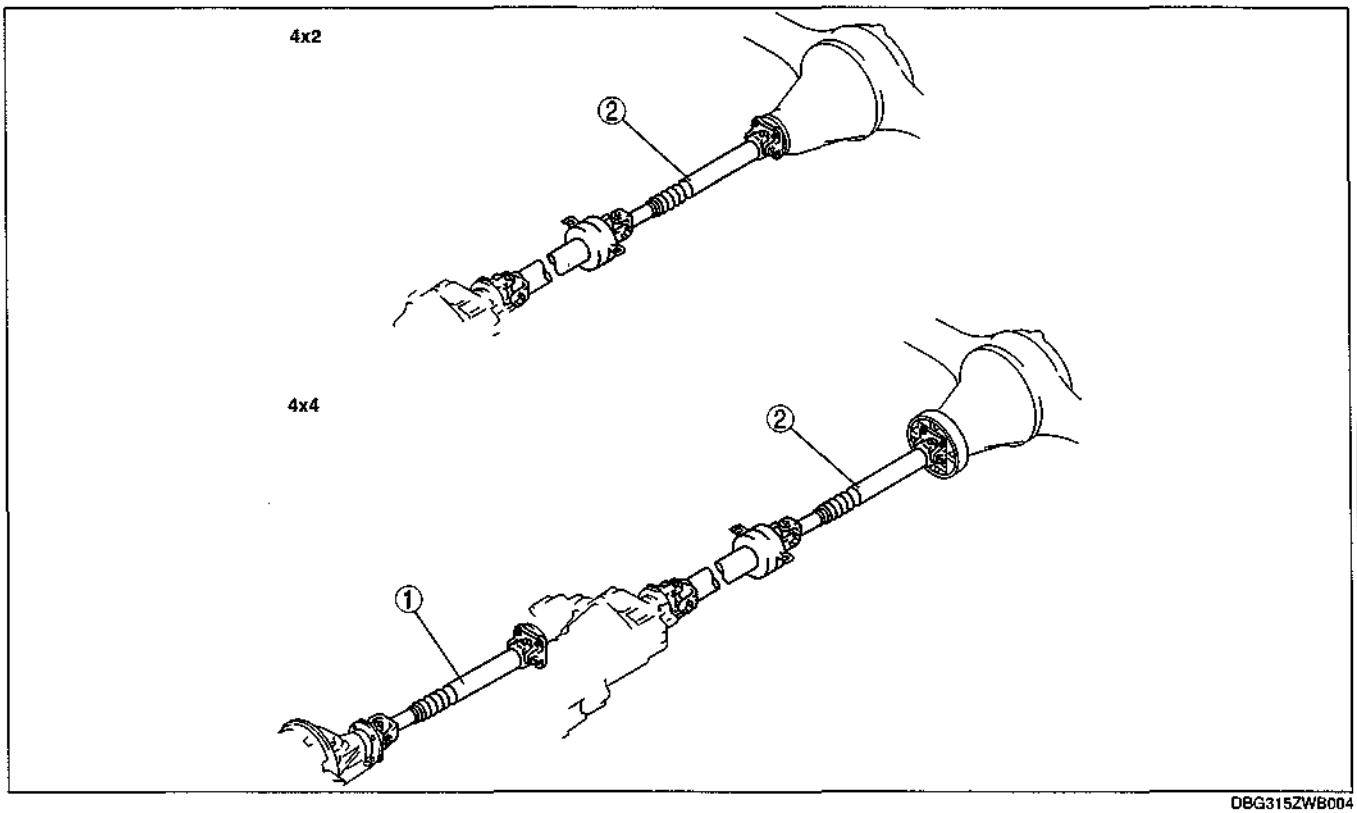
03-15 PROPELLER SHAFT

PROPELLER SHAFT
LOCATION INDEX..... 03-15–1

PROPELLER SHAFT
REMOVAL/INSTALLATION 03-15–2
PROPELLER SHAFT INSPECTION 03-15–4

PROPELLER SHAFT LOCATION INDEX

dcf031525002w01



DBG315ZWB004

1	Front propeller shaft (See 03-15-2 PROPELLER SHAFT REMOVAL/ INSTALLATION.) (See 03-15-4 PROPELLER SHAFT INSPECTION.)

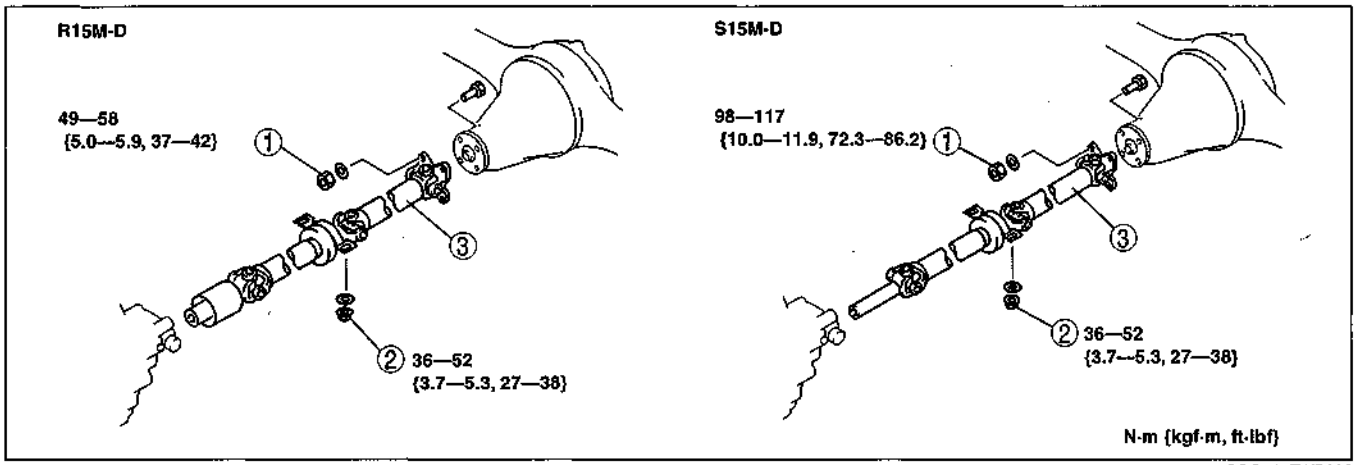
2	Rear propeller shaft (See 03-15-2 PROPELLER SHAFT REMOVAL/ INSTALLATION.) (See 03-15-4 PROPELLER SHAFT INSPECTION.)

PROPELLER SHAFT REMOVAL/INSTALLATION

dcf031525002w02

1. Remove the member.
2. Remove in the order indicated in the table.
3. Install in the reverse order of removal.

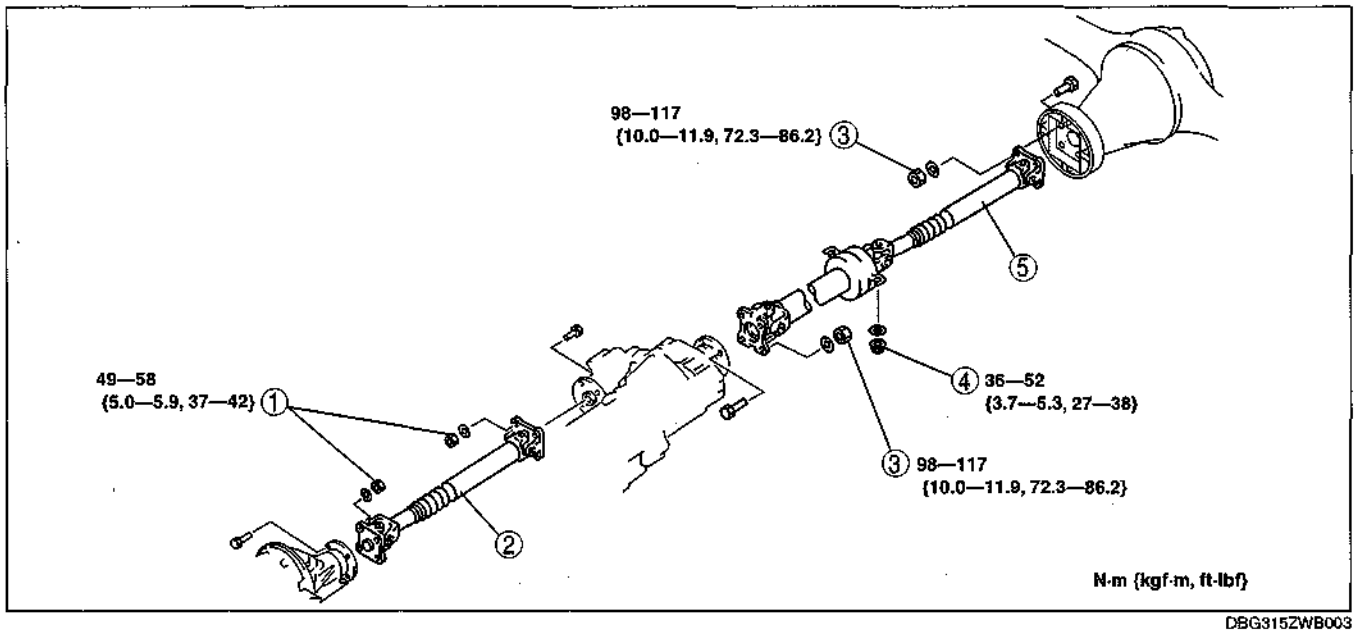
4x2



DBG315ZWB002

1	Nut
2	Nut
3	Propeller shaft (See 03-15-3 Propeller Shaft Removal Note.) (See 03-15-3 Propeller Shaft Installation Note.)

4x4



DBG315ZWB003

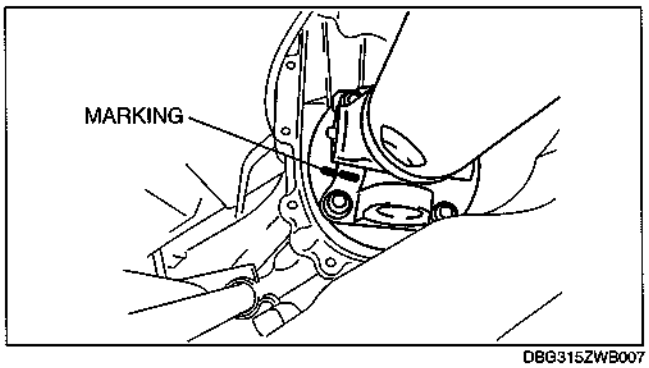
1	Nut
2	Propeller shaft (See 03-15-3 Propeller Shaft Removal Note.) (See 03-15-3 Propeller Shaft Installation Note.)
3	Nut
4	Nut
5	Propeller shaft (See 03-15-3 Propeller Shaft Removal Note.) (See 03-15-3 Propeller Shaft Installation Note.)

Propeller Shaft Removal Note

Caution
- **When replacing with a new propeller shaft, mark the companion flange to match the position of the tag on the propeller shaft.**

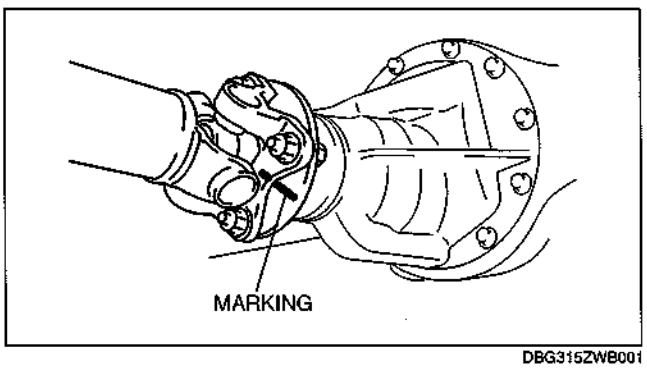
1. Before removing the propeller shaft, make alignment marks on the yoke and differential companion flange.

FRONT PROPELLER SHAFT (4x4)



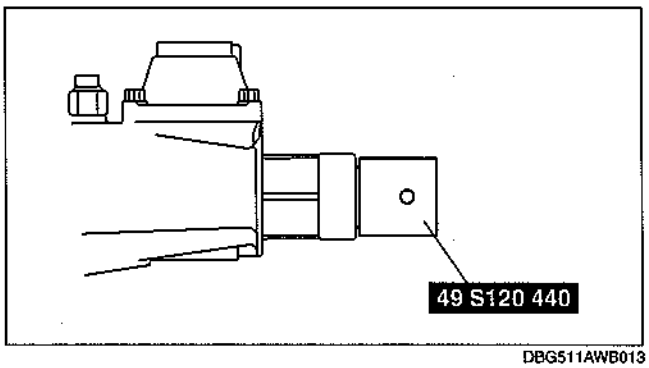
DBG315ZWB007

REAR PROPELLER SHAFT



DBG315ZWB001

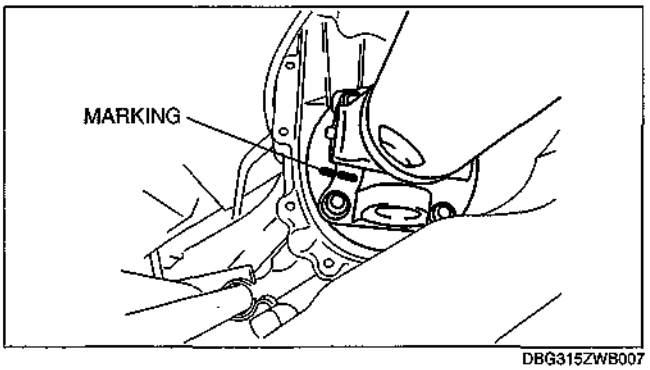
2. Install the **SST** to the extension housing. (R15M-D)



DBG511AWB013

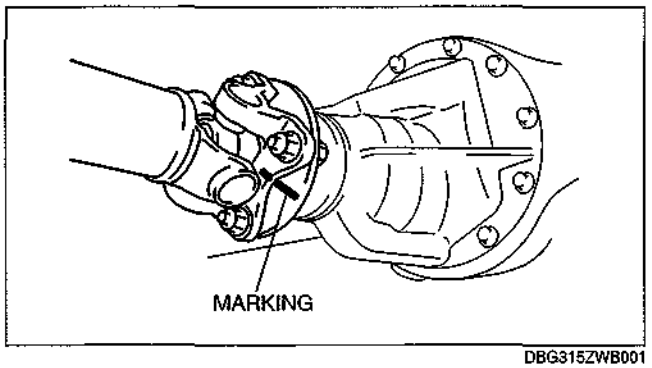
Propeller Shaft Installation Note
1. Align the marks and install the propeller shaft.
2. When installing a new propeller shaft, align the differential companion flange mark with the tag on the propeller shaft and assemble.

FRONT PROPELLER SHAFT (4x4)



DBG315ZWB007

REAR PROPELLER SHAFT



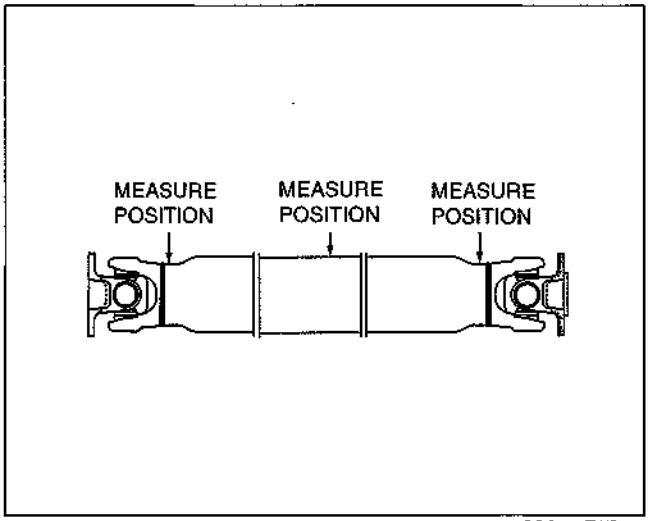
DBG315ZWB001

PROPELLER SHAFT INSPECTION

dcf031525002w03

1. Use a dial gauge to measure the runout of the propeller shaft at each position.
   - If it exceeds the maximum specification, replace the propeller shaft.

   Propeller shaft maximum runout
   0.4 mm {0.016 in}

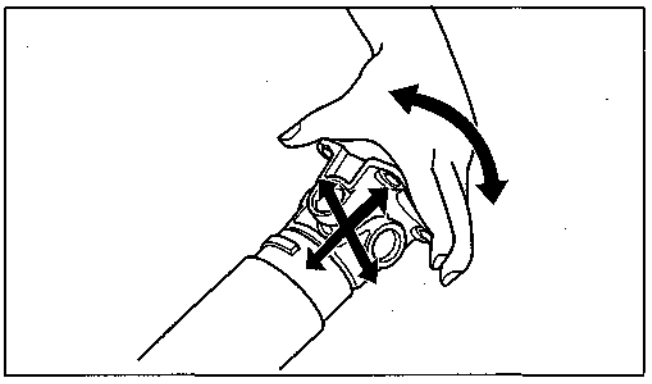


DBG315ZWB005

2. Inspect the play and rotation of the joint by turning the universal joint in the direction shown by the arrow.

   Propeller shaft initial torque (Reference value)
   0.29—1.76 N·m {3.0—17.9 kgf·cm, 2.6—15.5 in·lbf}

   - If there is excessive play or initial torque, replace the propeller shaft.


DBG315ZWB006

03-15 PROPELLER SHAFT [5AT]

PROPELLER SHAFT LOCATION INDEX [5AT] 03-15–1
PROPELLER SHAFT REMOVAL/INSTALLATION [5AT] 03-15–2
PROPELLER SHAFT INSPECTION [5AT].....03-15–6

PROPELLER SHAFT LOCATION INDEX [5AT]

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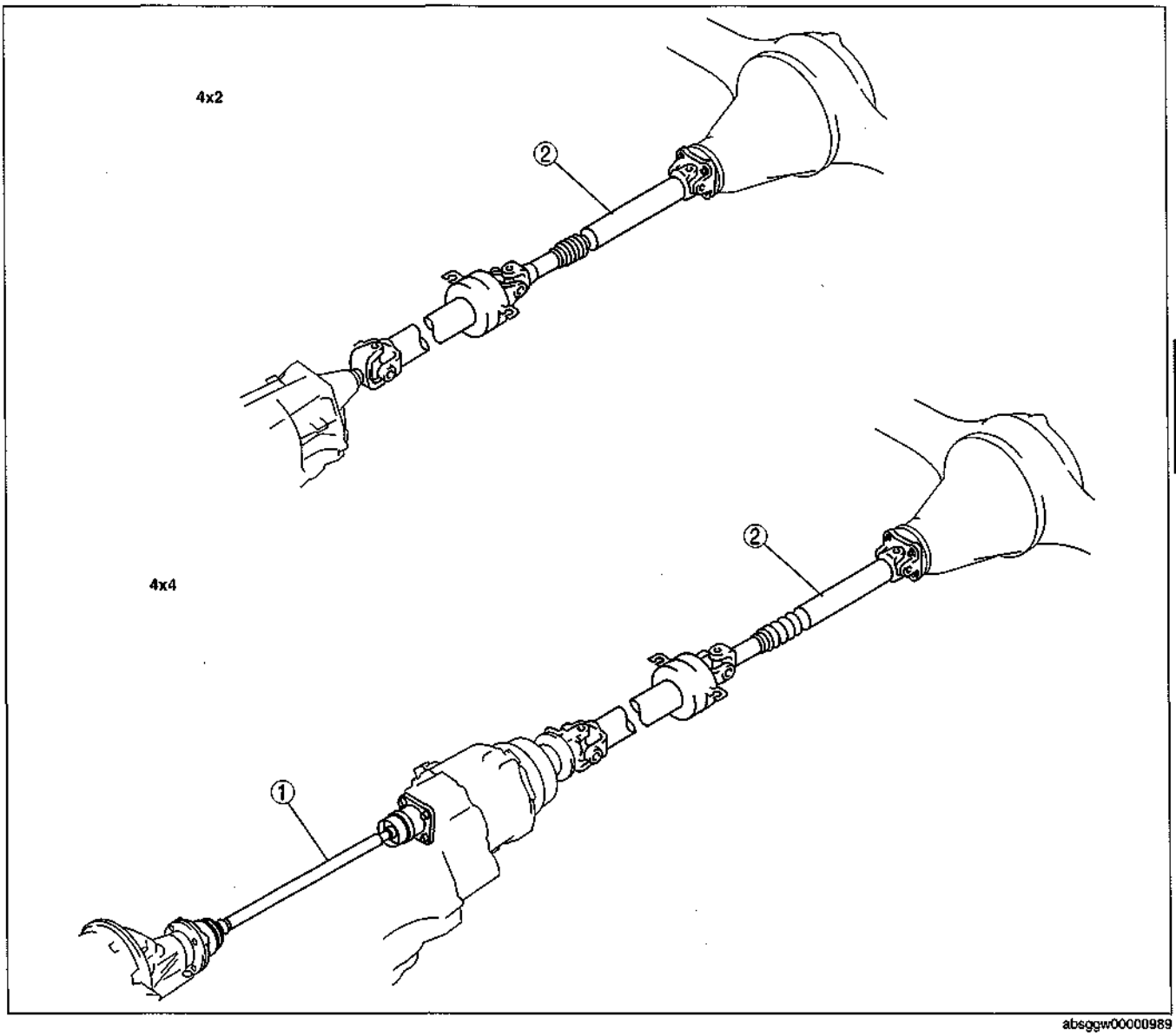


absggw00000989

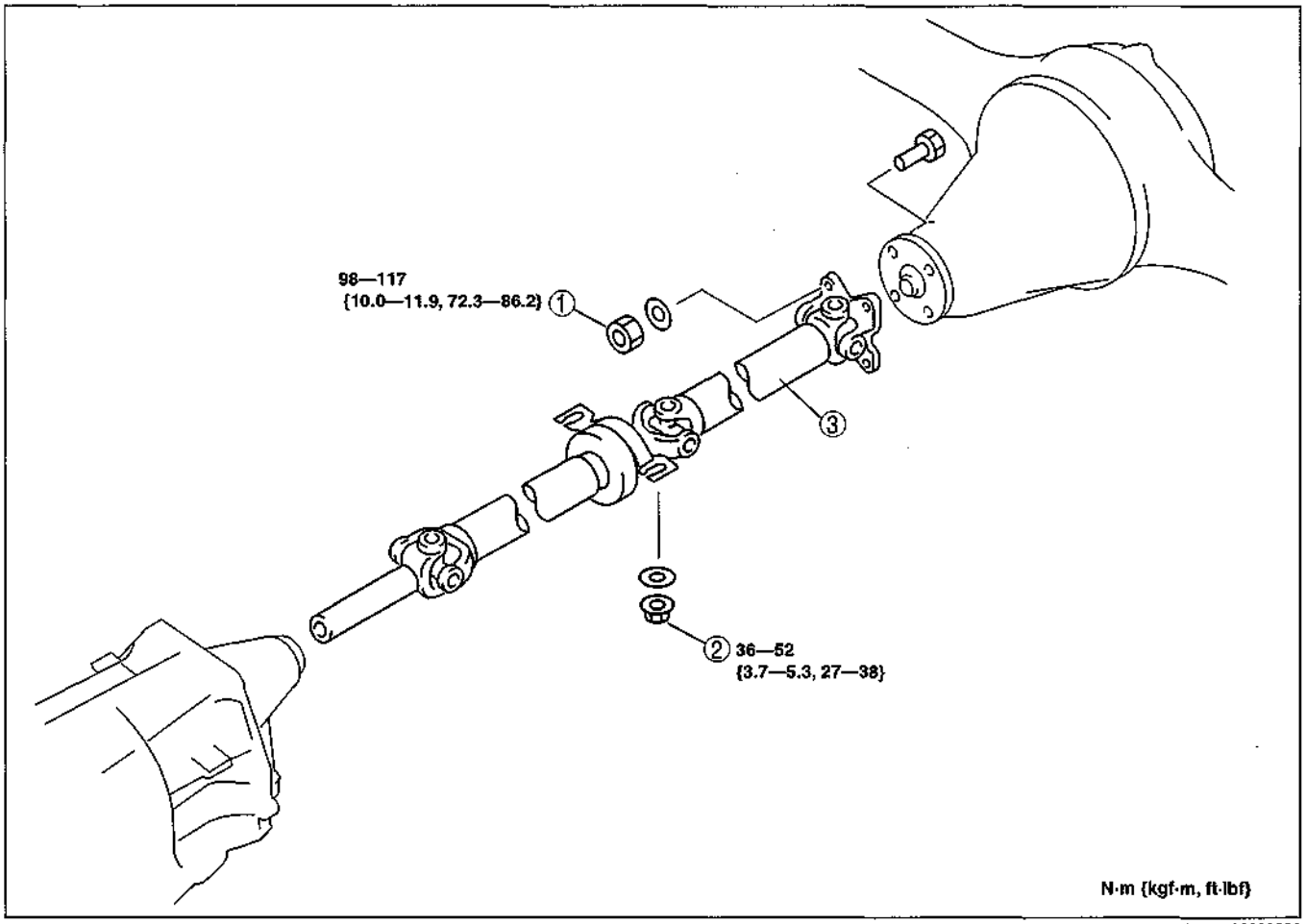
1	Front propeller shaft (See 03-15-2 PROPELLER SHAFT REMOVAL/ INSTALLATION [5AT].) (See 03-15-6 PROPELLER SHAFT INSPECTION [5AT].)
2	Rear propeller shaft (See 03-15-2 PROPELLER SHAFT REMOVAL/ INSTALLATION [5AT].) (See 03-15-6 PROPELLER SHAFT INSPECTION [5AT].)

PROPELLER SHAFT REMOVAL/INSTALLATION [5AT]

id0315b3800300

1. Remove the member.
2. Remove in the order indicated in the table.
3. Install in the reverse order of removal.

4x2

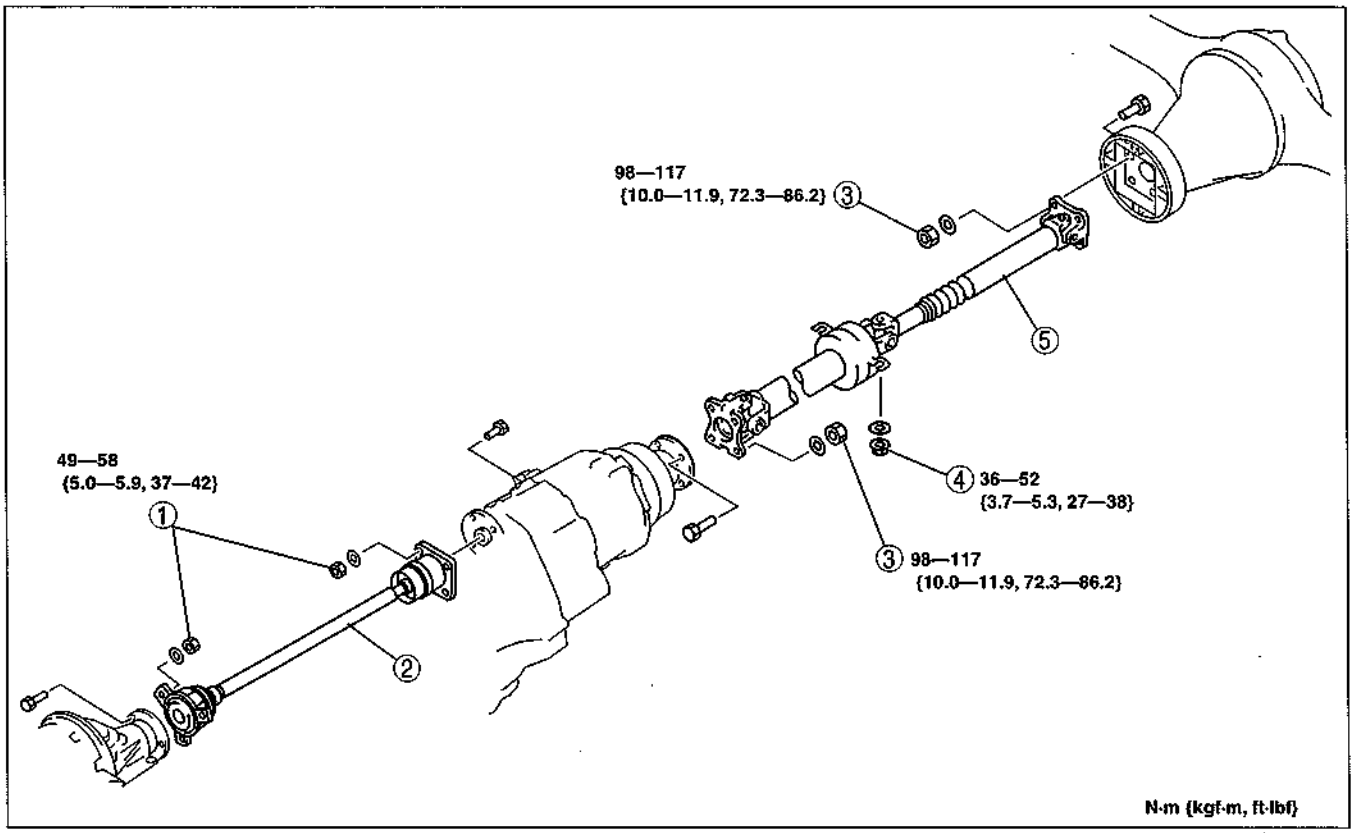


absggw00000990

1	Nut
2	Nut

3	Propeller shaft (See 03-15-4 Propeller Shaft Removal Note.) (See 03-15-5 Propeller Shaft Installation Note.)

4x4



arnfw00001947

1	Nut
2	Front propeller shaft (See 03-15-4 Propeller Shaft Removal Note.) (See 03-15-5 Propeller Shaft Installation Note.)
3	Nut

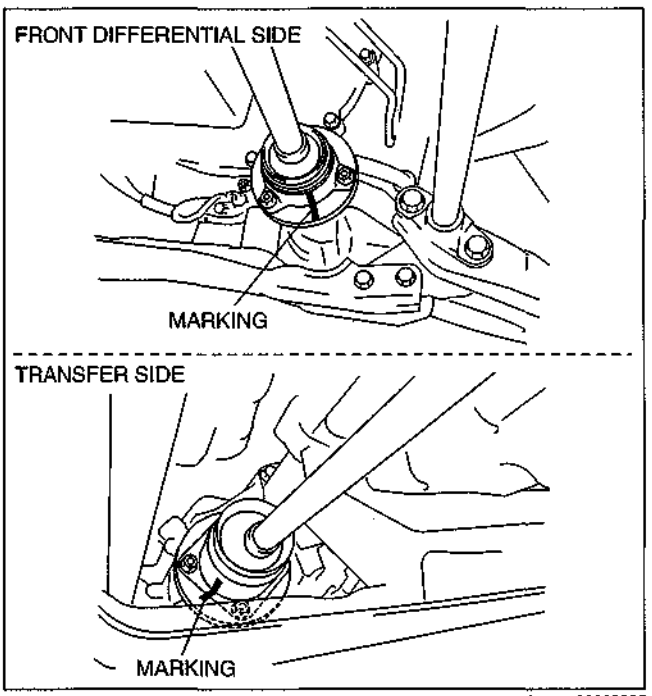
4	Nut
5	Rear propeller shaft (See 03-15-4 Propeller Shaft Removal Note.) (See 03-15-5 Propeller Shaft Installation Note.)

Propeller Shaft Removal Note

Caution
- **When replacing with a new propeller shaft, mark the companion flange to match the position of the tag on the propeller shaft.**

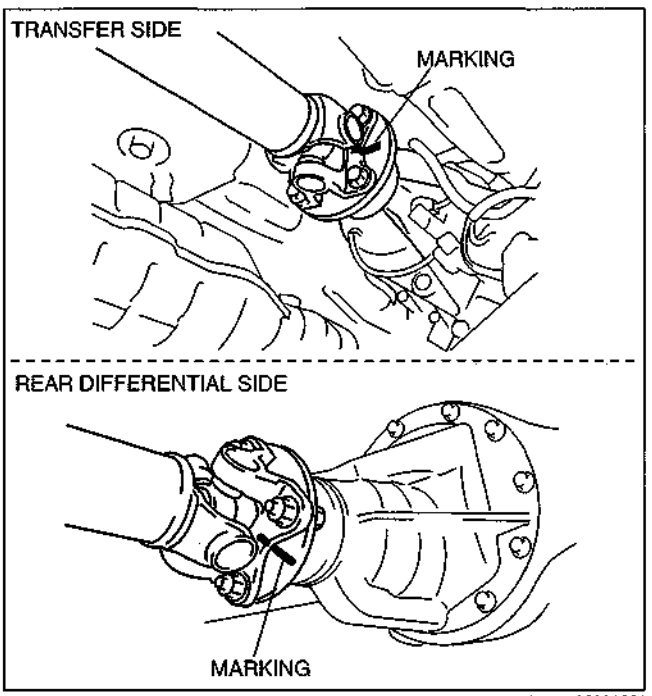
1. Before removing the propeller shaft, make alignment marks on the yoke and differential or transfer companion flange.

Front propeller shaft (4x4)



absggw00000995

Rear propeller shaft

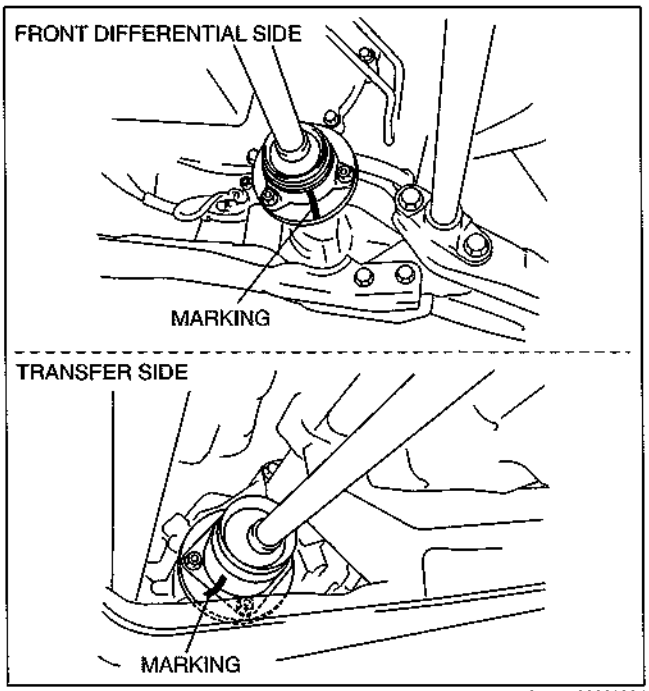


absggw00001021

Propeller Shaft Installation Note

1. Align the marks and install the propeller shaft.
2. When installing a new propeller shaft, align the differential or transfer companion flange mark with the tag on the propeller shaft and assemble.

Front propeller shaft (4x4)



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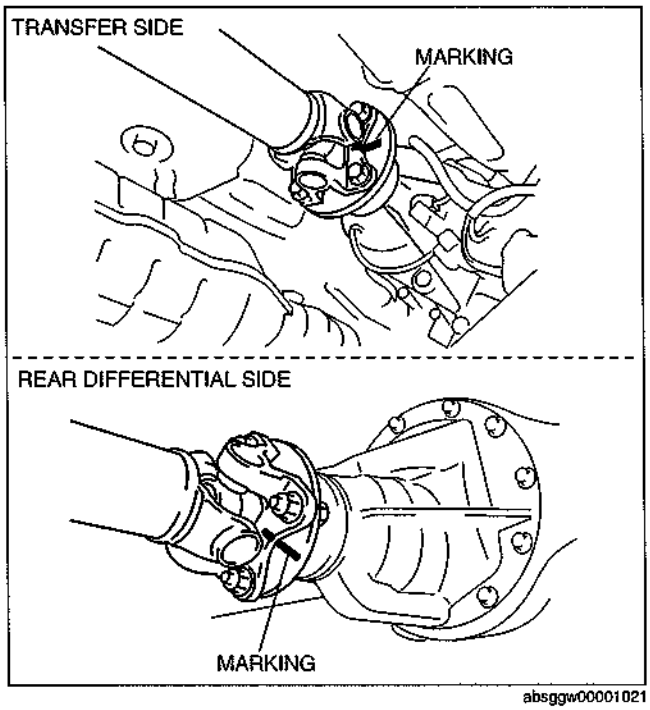
Rear propeller shaft



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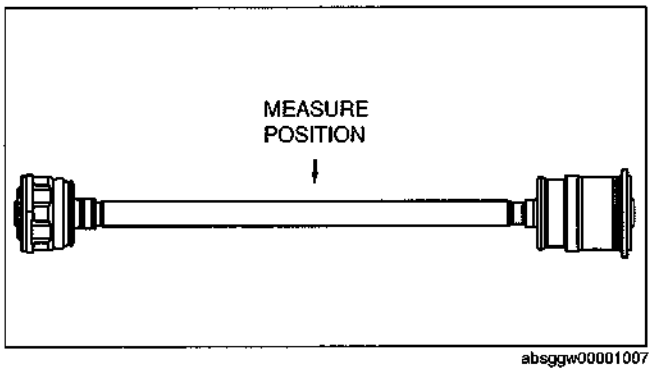
PROPELLER SHAFT INSPECTION [5AT]

id0315b3800500

Front Propeller Shaft (4x4) Inspection

1. Use a dial gauge to measure the runout of the propeller shaft at each position.
   - If it exceeds the maximum specification, replace the propeller shaft.

   Front propeller shaft maximum runout
   0.4 mm {0.016 in}



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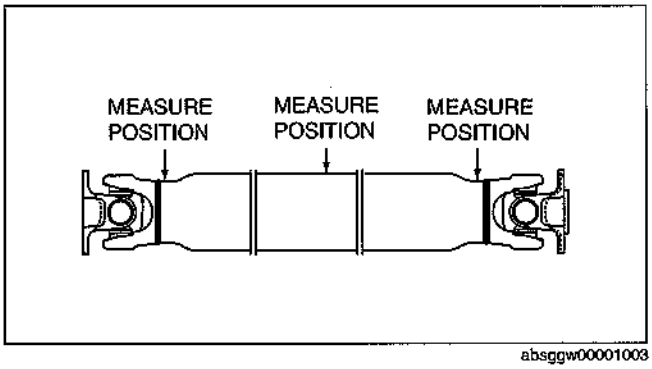
Rear Propeller Shaft (4x2,4x4) Inspection

1. Use a dial gauge to measure the runout of the propeller shaft at each position.
   - If it exceeds the maximum specification, replace the propeller shaft.

   Rear propeller shaft maximum runout
   0.4 mm {0.016 in}



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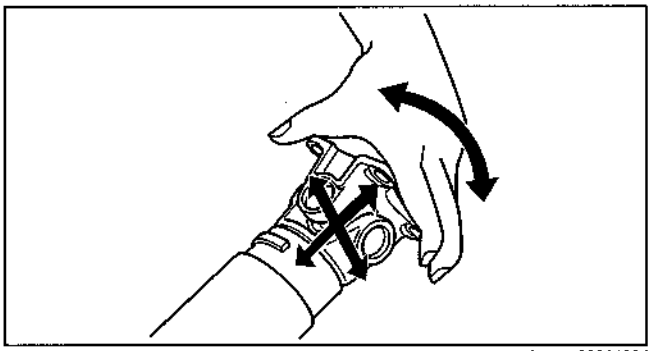
2. Inspect the play and rotation of the joint by turning the universal joint in the direction shown by the arrow.

   Rear propeller shaft initial torque (Reference value)
   0.29—1.76 N·m {3.0—17.9 kgf·cm, 2.6—15.5 in·lbf}

   - If there is excessive play or initial torque, replace the propeller shaft.



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03-16 TRANSFER

TRANSFER LOCATION INDEX 03-16–1
TRANSFER OIL INSPECTION 03-16–1
TRANSFER OIL REPLACEMENT 03-16–2
VEHICLE SPEED SENSOR (VSS) REMOVAL/INSTALLATION [S15MX-D] 03-16–2
VEHICLE SPEED SENSOR (VSS) INSPECTION [S15MX-D] 03-16–2

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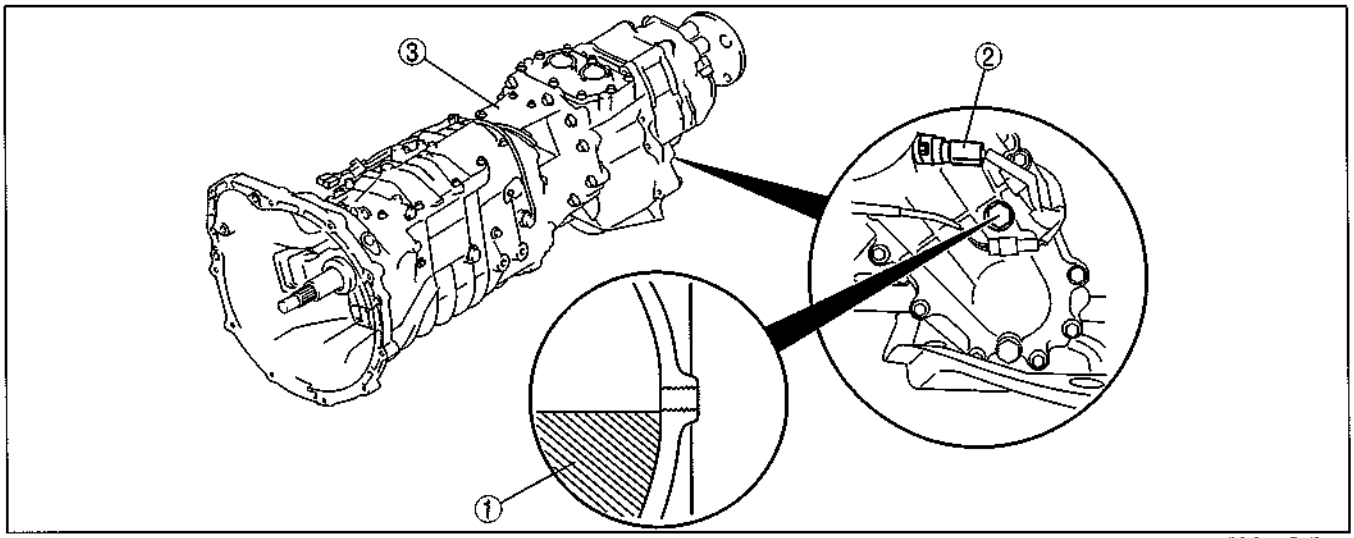


DBG316ZWB003

1	Transfer oil (See03-16-1 TRANSFER OIL INSPECTION.) (See03-16-2 TRANSFER OIL REPLACEMENT.)
2	Vehicle speed sensor (See 03-16-2 VEHICLE SPEED SENSOR (VSS) REMOVAL/INSTALLATION [S15MX-D].) (See 03-16-2 VEHICLE SPEED SENSOR (VSS) INSPECTION [S15MX-D].)
3	Transmission and transfer (See 05-11B-10 TRANSMISSION AND TRANSFER REMOVAL/INSTALLATION [S15MX-D].) (See 05-11B-12 INSPECTION AFTER TRANSMISSION AND TRANSFER INSTALLATION [S15MX-D].)

TRANSFER OIL INSPECTION

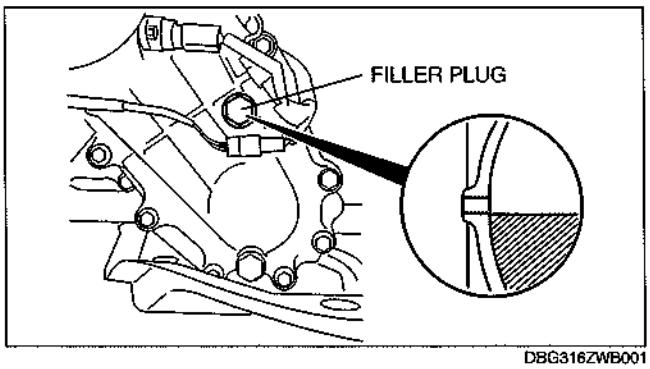
dcf031617001w01

1. Park the vehicle on level ground.
2. Remove the filler plug and with the packing.
3. Verify that the oil is near the brim of the plug port.
   - If the oil level is low, add the specified amount and type of oil through the filler plug hole.

Transfer oil
Type: Mercon® Multi-purpose AFT XT-2-QDX

4. Tighten the filler plug with a new packing.

Tightening torque
39—59 N·m {4.0—6.0 kgf·m, 29—43 ft·lbf}



DBG316ZWB001

TRANSFER OIL REPLACEMENT

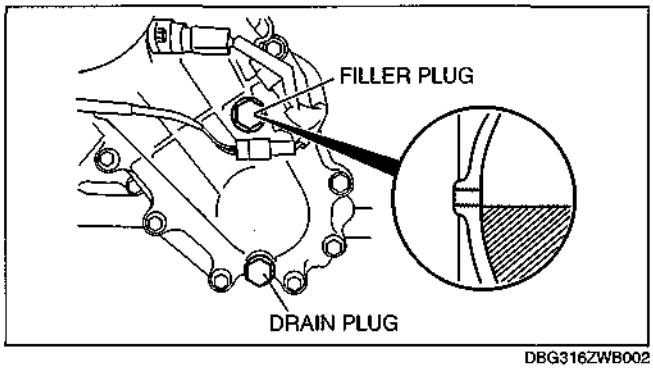
dcf031617001w02

1. Park the vehicle on level ground.
2. Remove the transfer under cover. (See 05-11B-10 TRANSMISSION AND TRANSFER REMOVAL/INSTALLATION [S15MX-D].)
3. Remove the drain plug with the packing.
4. Drain the oil into a suitable container.
5. Tighten the drain plug with a new packing.

   Tightening torque
   39—59 N·m {4.0—6.0 kgf·m, 29—43 ft·lbf}

6. Remove the filler plug with the packing and add the specified amount and type of oil through the filler plug hole until the level reaches the bottom of the filler plug hole.

   Transfer oil
   Type: Mercon® Multi-purpose AFT XT-2-QDX
   Capacity (approximate quantity): 1.85 L {1.95 US qt, 1.63 Imp qt}



DBG316ZWB002

7. Tighten the filler plug with a new packing.

   Tightening torque
   39—59 N·m {4.0—6.0 kgf·m, 29—43 ft·lbf}

8. Install the transfer under cover. (See 05-11B-10 TRANSMISSION AND TRANSFER REMOVAL/INSTALLATION [S15MX-D].)

VEHICLE SPEED SENSOR (VSS) REMOVAL/INSTALLATION [S15MX-D]

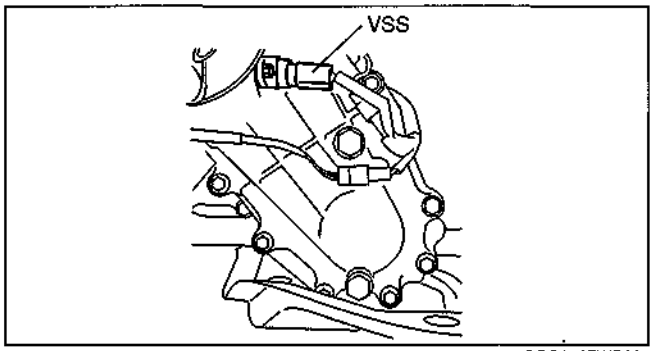
dcf031600000w02

Caution
- **Water or foreign material entering the connector can cause a poor connection or corrosion. Be sure not to drop water or foreign material on the connector when disconnecting it.**

1. Disconnect the negative battery cable.
2. Disconnect the VSS connector.
3. Remove the VSS.
4. Apply the specified oil to a new O-ring and install it on a VSS.
5. Install the VSS.

   Tightening torque
   7.8—11.0 N·m {80—112 kgf·cm, 70—97 In·lbf}

6. Connect the VSS connector.
7. Connect the negative battery cable.



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VEHICLE SPEED SENSOR (VSS) INSPECTION [S15MX-D]

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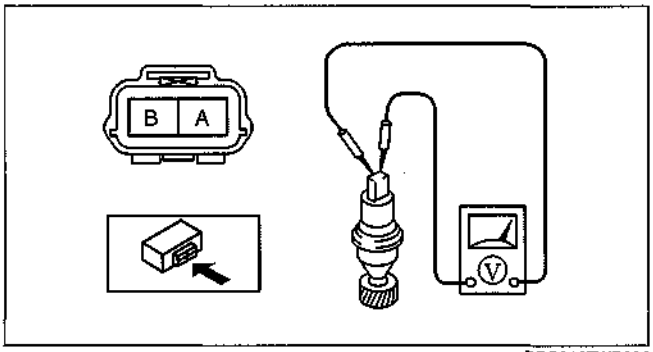
1. Remove the VSS. (See 03-16-2 VEHICLE SPEED SENSOR (VSS) REMOVAL/INSTALLATION [S15MX-D].)
2. Measure voltage between terminals of the VSS while the gear is turning.

   Vehicle speed sensor (VSS) voltage [S15MX-D]
   5 V or less

   - If the voltage is within the specification, the VSS is normal. Repair the related wiring harness.
   - If the voltage is not within the specification (tester needle does not move), replace the VSS.

3. Install the VSS. (See 03-16-2 VEHICLE SPEED SENSOR (VSS) REMOVAL/INSTALLATION [S15MX-D].)



DBG316ZWB006

03-16 TRANSFER [5R55S]

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MOTOR INSPECTION [5R55S] 03-16–4
MOTOR REMOVAL/INSTALLATION [5R55S] 03-16–5
CLUTCH COIL INSPECTION [5R55S] 03-16–6
TRANSFER CASE REMOVAL/INSTALLATION [5R55S] 03-16–7

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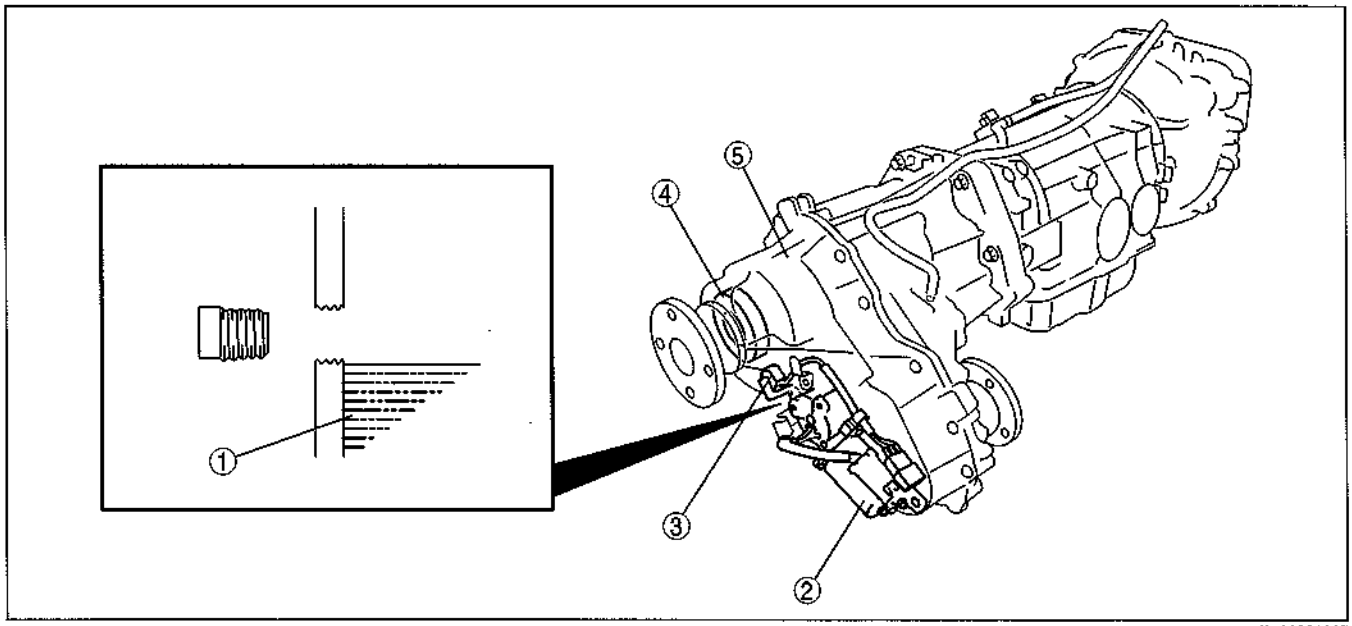

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1	Transfer case oil (See 03-16-2 TRANSFER CASE OIL INSPECTION [5R55S].) (See 03-16-2 TRANSFER CASE OIL REPLACEMENT [5R55S].)
2	Motor (See 03-16-4 MOTOR INSPECTION [5R55S].) (See 03-16-5 MOTOR REMOVAL/INSTALLATION [5R55S].)

3	Speed sensor (See 03-16-3 SPEED SENSOR INSPECTION [5R55S].) (See 03-16-4 SPEED SENSOR REMOVAL/INSTALLATION [5R55S].)
4	Clutch coil (See 03-16-6 CLUTCH COIL INSPECTION [5R55S].)
5	Transfer case (See 03-16-7 TRANSFER CASE REMOVAL/INSTALLATION [5R55S].)

TRANSFER CASE OIL INSPECTION [5R55S]

id0316c1816200

1. Warm up the transfer case.

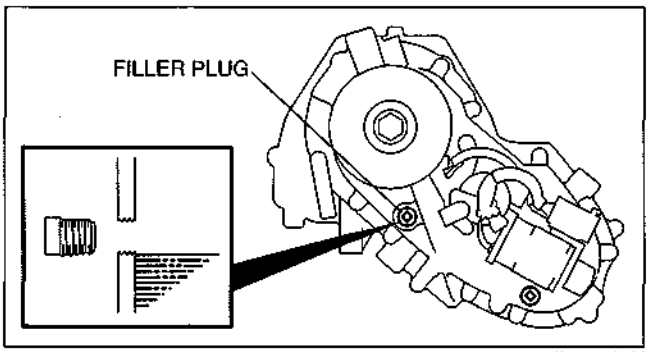
Caution
- **Do not use an impact wrench when removing the filler plug. It may damage the transfer case.**

2. Remove the filler plug from the transfer case.
3. Verify that the oil is near the brim of the plug port.
   - If the oil level is low, add the specified amount and type of oil through the filler plug hole.

Transfer case oil
Type: Mercon® V

4. Tighten the new filler plug.

Tightening torque
19—30 N·m {2.0—3.0 kgf·m, 15—22 ft·lbf}



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TRANSFER CASE OIL REPLACEMENT [5R55S]

id0316c1816300

1. Warm up the transfer case.
2. Remove the transfer case under cover. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION [5R55S].)

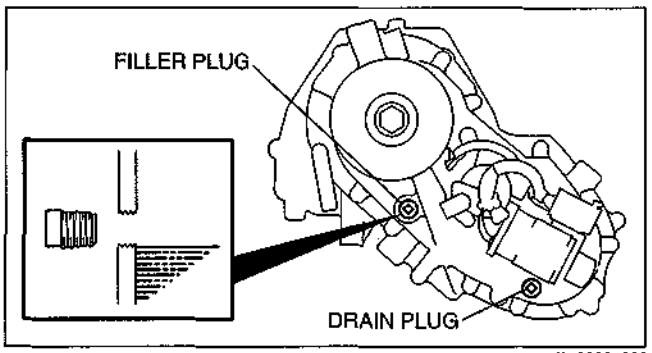
Caution
- **Do not use an impact wrench when removing the filler plug or drain plug. It may damage the transfer case.**

3. Remove the drain plug from the transfer case.
4. Drain the oil into a suitable container.
5. Tighten the new drain plug.

Tightening torque
19—30 N·m {2.0—3.0 kgf·m, 15—22 ft·lbf}

6. Remove the filler plug and add the specified amount and type of oil through the filler plug hole until the level reaches the bottom of the filler plug hole.

Transfer case oil
Type: Mercon® V
Capacity (approx. quantity): 1.2 L {1.3 US qt, 1.1 Imp qt}



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7. Tighten the new filler plug.

Tightening torque
19—30 N·m {2.0—3.0 kgf·m, 15—22 ft·lbf}

8. Install the transfer case under cover. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION [5R55S].)

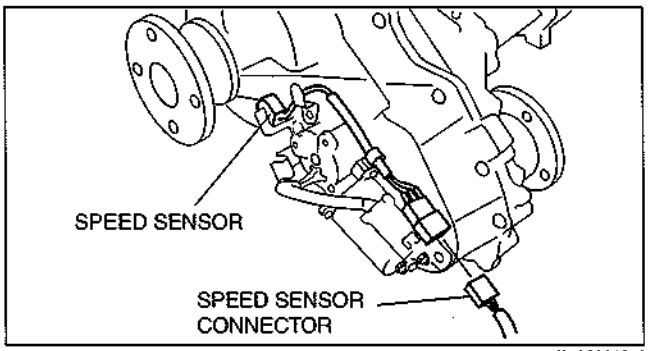
SPEED SENSOR INSPECTION [5R55S]

id0316c1816000

Caution
- **Water or foreign material entering the connector can cause poor connections or corrosion. Be sure that water or foreign material do not enter the connector when disconnecting it.**

1. Disconnect the negative battery cable.
2. Remove the transfer case under cover. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/ INSTALLATION [5R55S].)
3. Disconnect the speed sensor connector.

Caution
- **Do not apply a shock in the speed sensor.**
- **Do not damage the terminals.**



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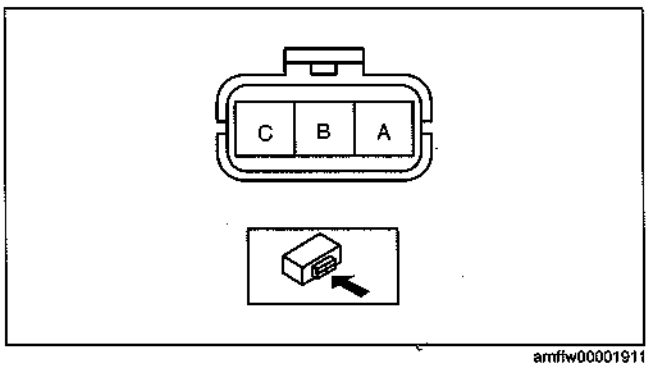
4. Measure the resistance between the speed sensor terminals A and B.
   - If there is any malfunction, replace the speed sensor. (See 05-13-29 TURBINE SHAFT SPEED (TSS) SENSOR REMOVAL/ INSTALLATION [5R55S].)

Transfer case speed sensor resistance
Approx. 300 ohms



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5. Connect the speed sensor connector.
6. Install the transfer case under cover. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/ INSTALLATION [5R55S].)
7. Connect the negative battery cable.

SPEED SENSOR REMOVAL/INSTALLATION [5R55S]

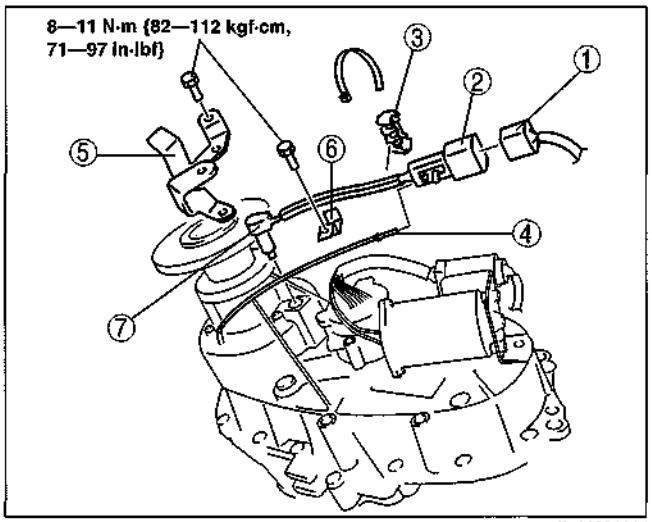
id0316c1815700

Caution
- **Water or foreign material entering the connector can cause poor connections or corrosion. Be sure that water or foreign material do not enter the connector when disconnecting it.**
- **Do not damage the speed sensor.**

1. Disconnect the negative battery cable.
2. Remove the transfer case under cover. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION [5R55S].)
3. Remove in the order indicated in the table.

1	Connector (wiring harness-side)
2	Connector (part side)
3	Connector cover
4	Clutch coil terminal
5	Speed sensor bracket
6	Wiring harness bracket
7	Speed sensor

4. Install in the reverse order of removal.



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MOTOR INSPECTION [5R55S]

id0316c1815900

Motor Operating Inspection

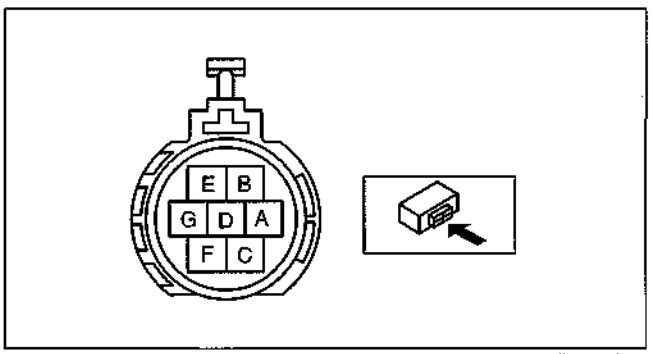
Caution
- **Water or foreign material entering the connector can cause poor connections or corrosion. Be sure that water or foreign material do not enter the connector when disconnecting it.**

1. Disconnect the negative battery cable.
2. Remove the transfer case under cover. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION [5R55S].)
3. Remove the motor. (See 03-16-5 MOTOR REMOVAL/INSTALLATION [5R55S].)

Caution
- **Do not apply a shock to the speed sensor.**
- **Do not damage the terminals.**

4. Connect battery positive voltage to motor terminal F, connect terminal C to ground, and then verify that the motor operates as shown in the table.
5. Connect battery positive voltage to motor terminal C, connect terminal F to ground, and then verify that the motor operates as shown in the table.
   - If the operation condition is not normal, replace the motor. (See 03-16-5 MOTOR REMOVAL/INSTALLATION [5R55S].)

Terminal		Motor position
C	F	
Ground	B+	2H→4H→4L
B+	Ground	4L→4H→2H



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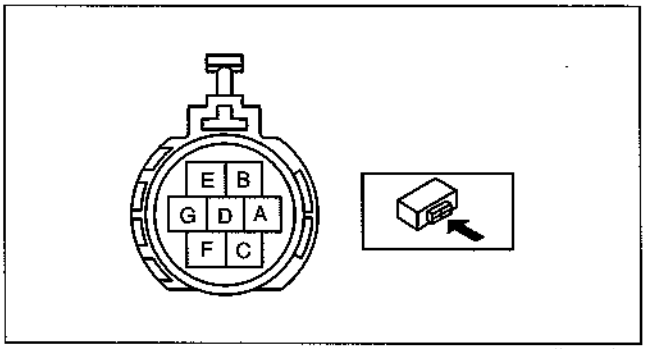
6. Measure the resistance between the motor terminals C and F.
   - If there is any malfunction, replace the motor. (See 03-16-5 MOTOR REMOVAL/INSTALLATION [5R55S].)

Transfer case motor resistance
approx. 117 ohms

7. Install the motor. (See 03-16-5 MOTOR REMOVAL/INSTALLATION [5R55S].)
8. Install the transfer case under cover. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION [5R55S].)
9. Connect the negative battery cable.

Motor Position Inspection

1. Remove the transfer case under cover. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION [5R55S].)
2. Turn the engine switch to the ON position.
3. Measure the resistance between the motor terminals
   - If there is any malfunction, replace the motor. (See 03-16-5 MOTOR REMOVAL/INSTALLATION [5R55S].)



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○—○ : Continuity

Motor position	Terminal				
	A	B	D	E	G
2H		○	○		○
4H		○		○	○
4L	○		○		○

amtfw00001913

4. Install the transfer case under cover. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION [5R55S].)

03

MOTOR REMOVAL/INSTALLATION [5R55S]

id0316c1815800

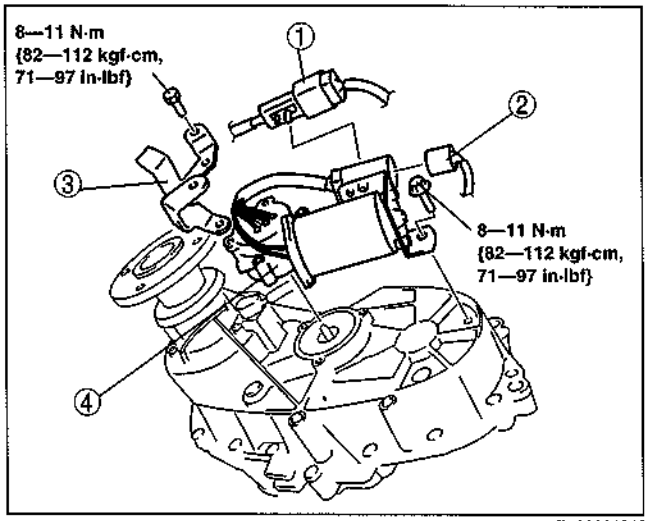
Caution

- **Water or foreign material entering the connector can cause poor connections or corrosion. Be sure that water or foreign material do not enter the connector when disconnecting it.**
- **Do not damage the motor.**

1. Disconnect the negative battery cable.
2. Remove the transfer case under cover. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION [5R55S].)
3. Remove in the order indicated in the table.

1	Speed sensor connector
2	Connector
3	Speed sensor bracket
4	Motor

4. Install in the reverse order of removal.



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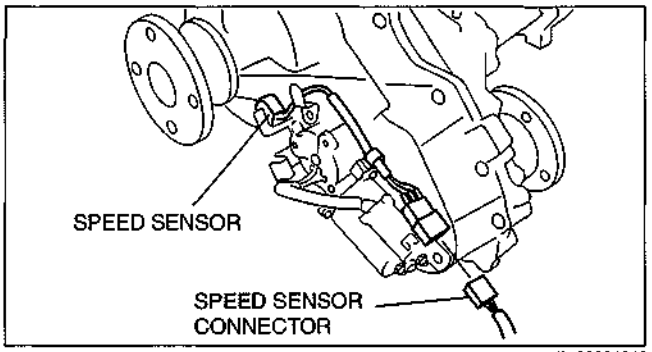
CLUTCH COIL INSPECTION [5R55S]

id0316c1816100

Caution
- **Water or foreign material entering the connector can cause poor connections or corrosion. Be sure that water or foreign material do not enter the connector when disconnecting it.**

1. Disconnect the negative battery cable.
2. Remove the transfer case under cover. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/ INSTALLATION [5R55S].)
3. Disconnect the speed sensor connector.

Caution
- **Do not apply a shock In the speed sensor.**
- **Do not damage the terminals.**



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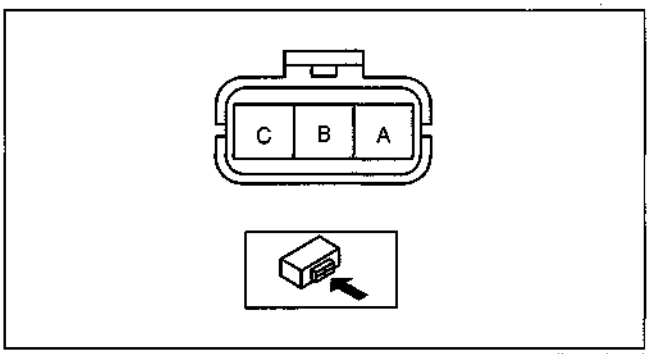
4. Measure the resistance between the speed sensor terminal C and body ground.
   - If there is any malfunction, replace the clutch coil.

Transfer case clutch coil resistance
Approx. 3 ohms



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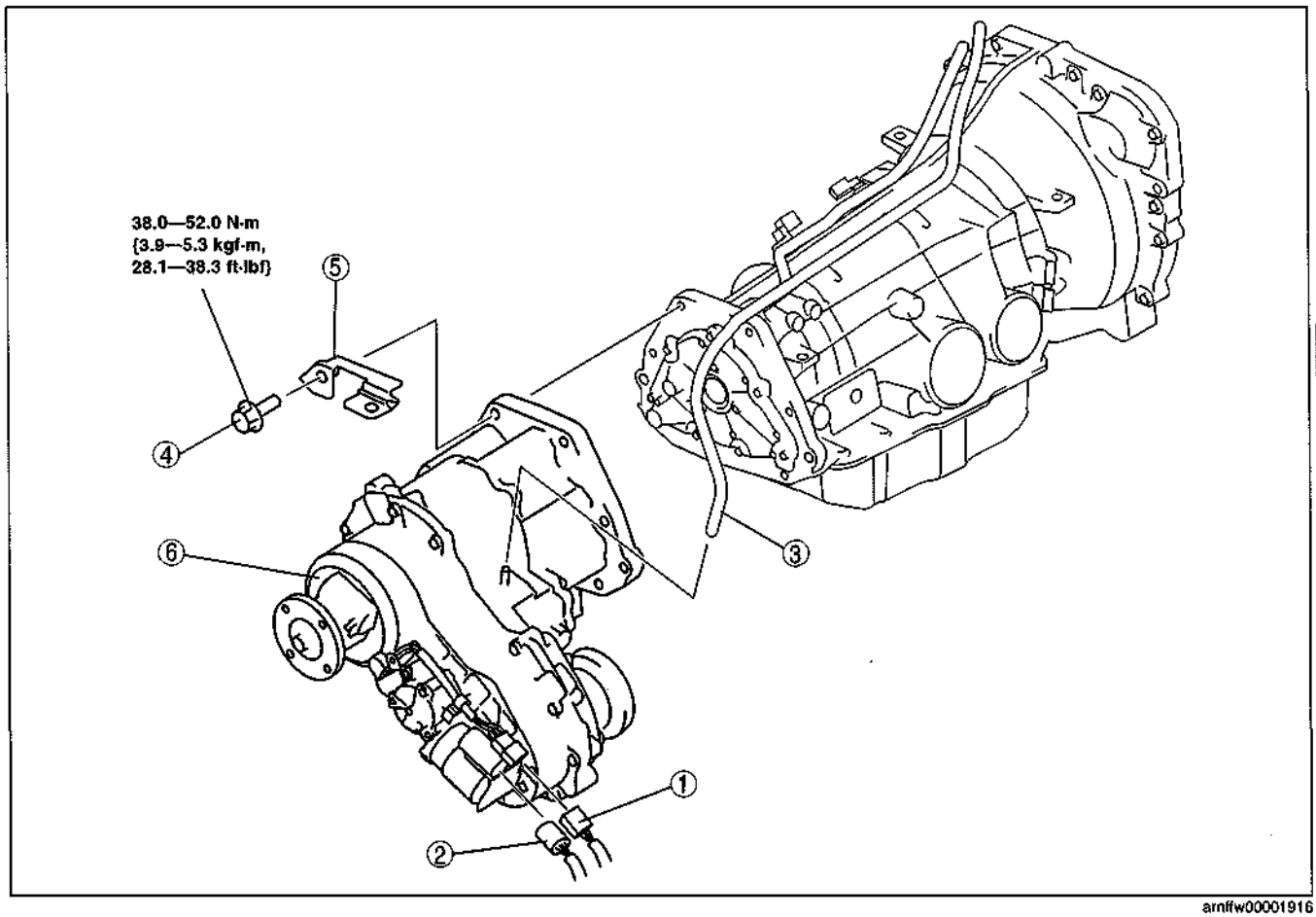
5. Connect the speed sensor connector.
6. Install the transfer case under cover. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/ INSTALLATION [5R55S].)
7. Connect the negative battery cable.

TRANSFER CASE REMOVAL/INSTALLATION [5R55S]

id0316c1816400

1. Disconnect the negative battery cable.
2. Remove the transfer case under cover. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION [5R55S].)
3. Remove the oxidation catalytic converter (See 01-15-1 EXHAUST SYSTEM REMOVAL/INSTALLATION [WL-C, WE-C (RANGER (AT))].)
4. Remove the propeller shaft. (See 03-15-2 PROPELLER SHAFT REMOVAL/INSTALLATION [5AT].)
5. Remove the crossmember and transmission mount rubber. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION [5R55S])
6. Lower the transmission slightly.
7. Remove in the order indicated in the table.
8. Install in the reverse order of removal.



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1	Speed sensor connector	4	Bolt
2	Motor connector	5	Bracket
3	Breather hose	6	Transfer case

03-18 4-WHEEL DRIVE

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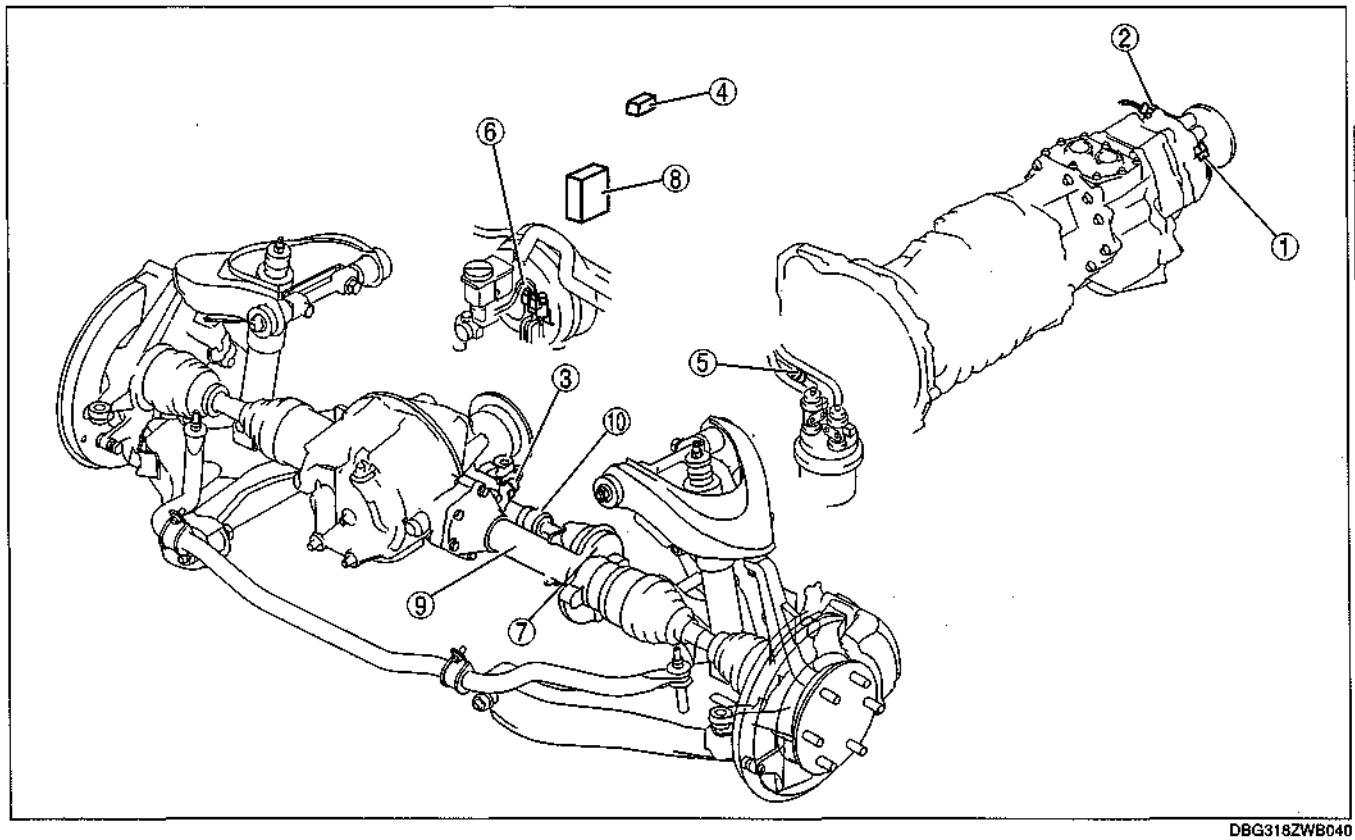
4-WHEEL DRIVE LOCATION INDEX

dcf031827300w01



DBG318ZWB040

1	4x4 indicator switch (See 03-18-2 4x4 INDICATOR SWITCH INSPECTION.)
2	Transfer neutral switch (See 03-18-2 TRANSFER NEUTRAL SWITCH INSPECTION.)
3	RFW switch (See 03-18-3 RFW SWITCH INSPECTION.)
4	RFW main switch (See 03-18-3 RFW MAIN SWITCH REMOVAL/INSTALLATION.) (See 03-18-4 RFW MAIN SWITCH INSPECTION.)
5	One-way check valve (See 03-18-4 ONE-WAY CHECK VALVE INSPECTION.)

6	Lock and free solenoid valve (See 03-18-4 LOCK AND FREE SOLENOID VALVES INSPECTION.)
7	RFW actuator (See 03-18-5 RFW ACTUATOR INSPECTION.)
8	PCM (RFW control) (See 01-40B-10 PCM INSPECTION [WL-C, WE-C].)
9	Joint shaft component (See 03-18-5 JOINT SHAFT COMPONENT REMOVAL/INSTALLATION.) (See 03-18-7 JOINT SHAFT COMPONENT DISASSEMBLY.) (See 03-18-9 JOINT SHAFT COMPONENT ASSEMBLY.)

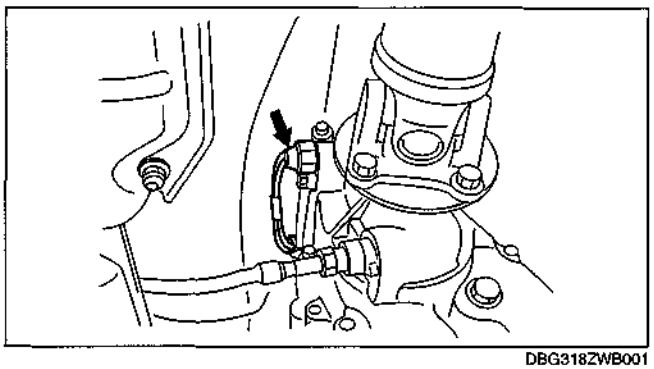
10	Control box (See 03-18-12 CONTROL BOX REMOVAL/ INSTALLATION.) (See 03-18-13 CONTROL BOX DISASSEMBLY/ ASSEMBLY.) (See 03-18-14 SHIFT FORK INSPECTION.)

4x4 INDICATOR SWITCH INSPECTION

dcf031827461w01

1. Jack up the vehicle and support it on safety stands.
2. Remove the 4x4 indicator switch.
3. Inspect for continuity between the terminals as shown using a tester.
   - If not correct, replace the 4x4 indicator switch.

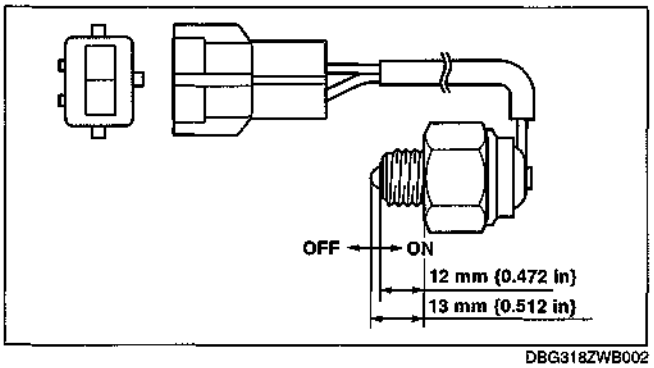
Continuity	Switch
Yes	Depressed (ON)
No	Released (OFF)



DBG318ZWB001

4. Install the 4x4 indicator switch.

Tightening torque
25—34 N·m {2.6—3.4 kgf·m, 19—25 ft·lbf}



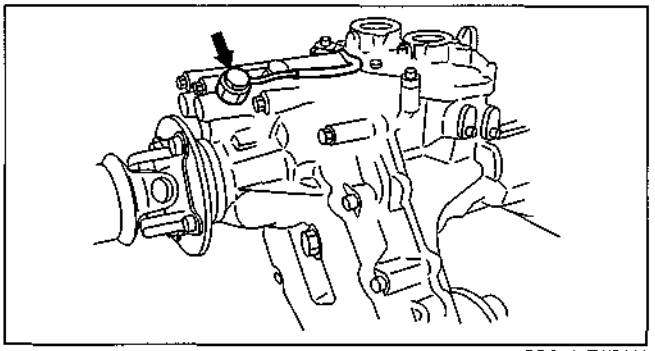
DBG318ZWB002

TRANSFER NEUTRAL SWITCH INSPECTION

dcf031827462w01

1. Jack up the vehicle and support it on safety stands.
2. Remove the transfer neutral switch.
3. Inspect for continuity at the switch using a tester.
   - If not correct, replace the transfer neutral switch.

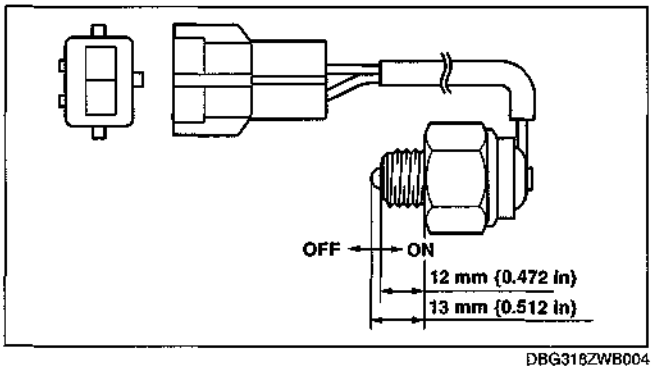
Continuity	Switch
Yes	Depressed (ON)
No	Released (OFF)



DBG318ZWB003

4. Install the transfer neutral switch.

Tightening torque
25—34 N·m {2.6—3.4 kgf·m, 19—25 ft·lbf}



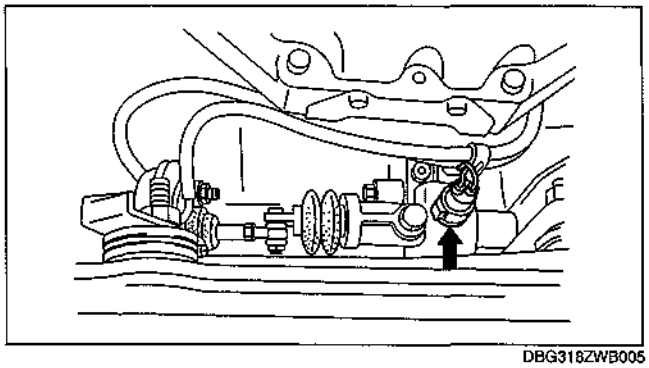
DBG318ZWB004

RFW SWITCH INSPECTION

dcf031827463w01

1. Jack up the vehicle and support it on safety stands.
2. Remove the RFW switch.
3. Inspect for continuity at the switch using a tester.
   - If not correct, replace the RFW switch.

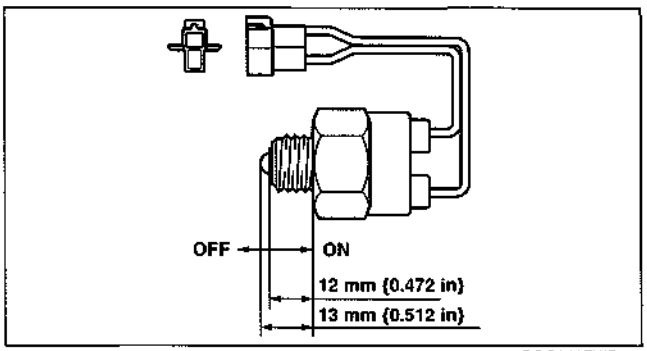
Continuity	Switch
Yes	Depressed (ON)
No	Released (OFF)



DBG318ZWB005

4. Install the RFW switch.

Tightening torque
24.5—34.3 N·m {2.50—3.49 kgf·m, 18.1—25.2 ft·lbf}



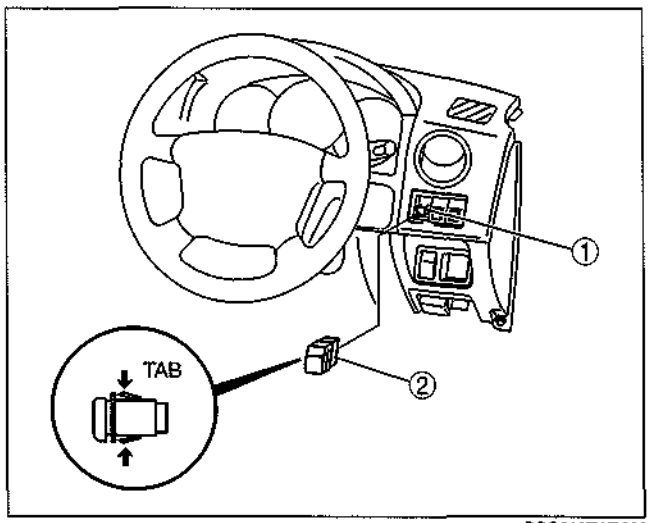
DBG318ZWB006

RFW MAIN SWITCH REMOVAL/INSTALLATION

dcf031827464w01

1. Remove the lower panel. (See 09-17-10 LOWER PANEL REMOVAL/INSTALLATION.)
2. Remove in the order indicated in the table.
3. Install in the reverse order of removal.

1	Connector
2	RFW main switch



DBG318ZWB039

RFW MAIN SWITCH INSPECTION

dcf031827464w02

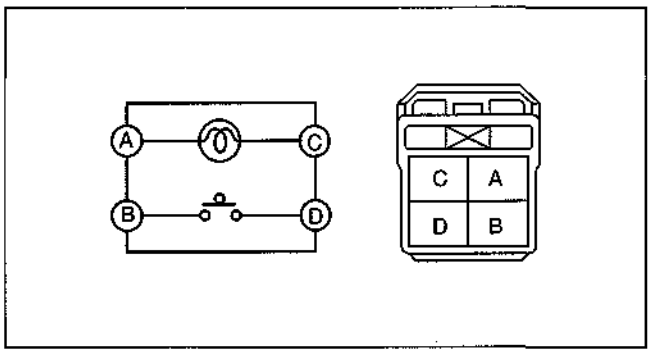
1. Remove the RFW main switch.
2. Inspect for continuity between the terminals as shown using a tester.

○—○ : Continuity

Switch	Terminal			
	A	B	C	D
DEPRESSED	○	○	○	
		○		○
RELEASED	○	○	○	

DBG318ZWB007

- If not correct, replace the switch.

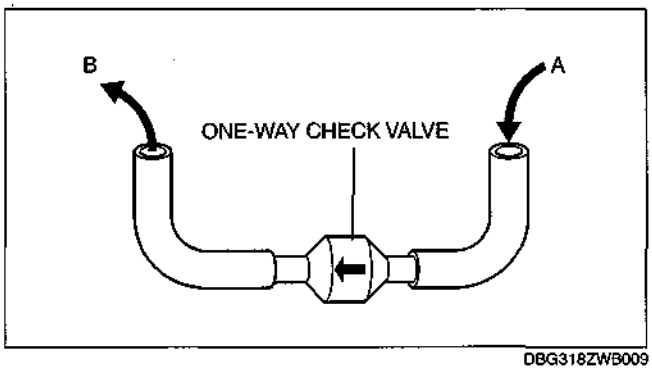


DBG318ZWB008

ONE-WAY CHECK VALVE INSPECTION

dcf031813995w01

1. Remove the one-way check valve.
2. Blow through A and inspect that air flows from B.
3. Blow through B and inspect that air does not flow from A.
   - If not correct, replace the one-way check valve.

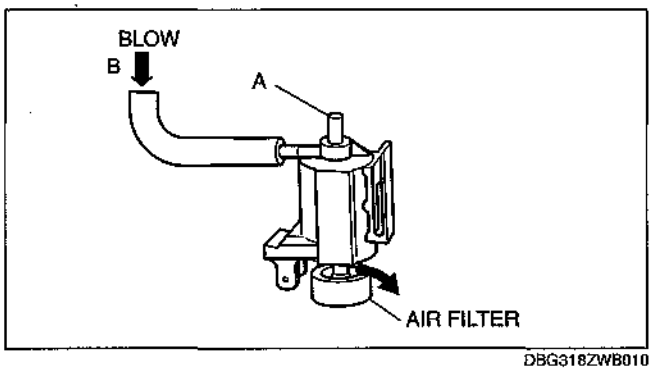


DBG318ZWB009

LOCK AND FREE SOLENOID VALVES INSPECTION

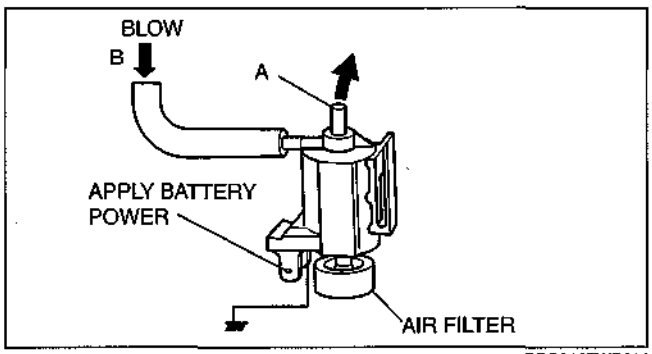
dcf031827740w01

1. Disconnect the vacuum hoses and the connector from each solenoid valve.
2. Blow through each valve from port B.
3. Inspect that air flows from the air filter.
4. Connect **12 V** and a ground to the terminals of each valve.
5. Blow through each valve from port B.



DBG318ZWB010

6. Inspect that air flows from port A.
   - If not correct, replace the lock and free solenoid valve(s).

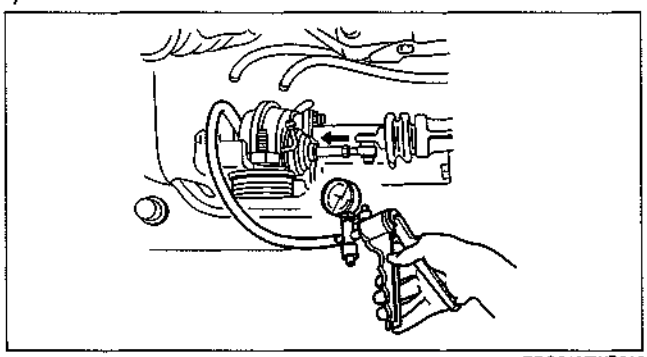


DBG318ZWB011

RFW ACTUATOR INSPECTION

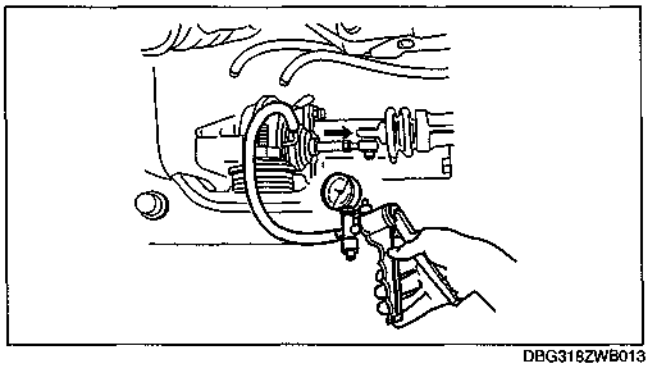
dcf031827310w01

1. Jack up the vehicle and support it on safety stands.
2. Disconnect the vacuum hoses from the actuator.
3. Connect a vacuum pump tester to the actuator (free side) as shown.
4. Apply **26.66 kPa {200 mmHg, 7.87 inHg}** vacuum, and verify that the rod moves toward the left.
5. Disconnect the vacuum pump tester.
6. Connect the vacuum pump tester tot he actuator (lock side) as shown.



DBG318ZWB012

7. Apply **26.66 kPa {200 mmHg, 7.87 inHg}** vacuum, and inspect that the rod moves toward the right.
   - If not correct, replace the RFW actuator.

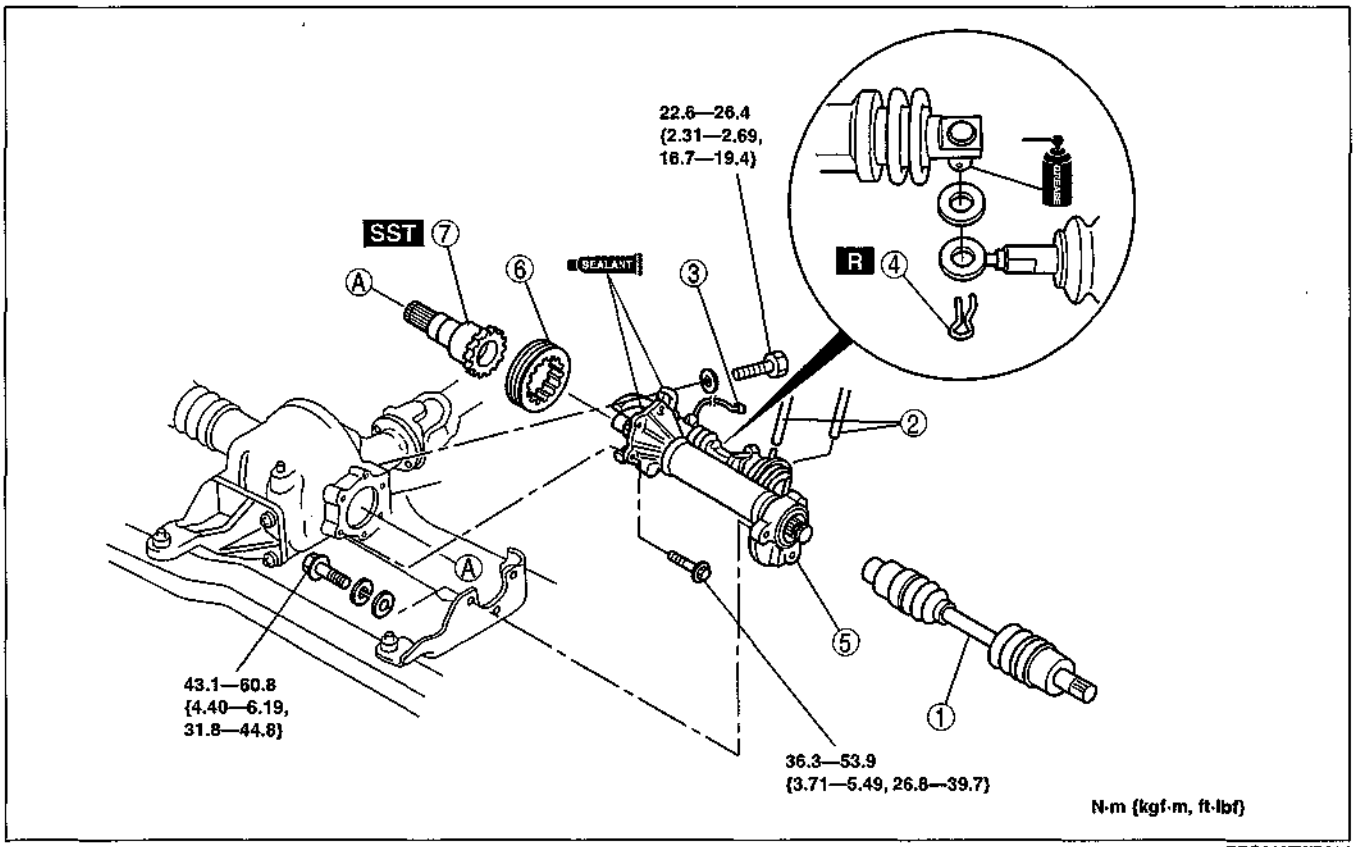


DBG318ZWB013

JOINT SHAFT COMPONENT REMOVAL/INSTALLATION

dcf031827300w02

1. Drain the front differential oil.
2. Remove in the order indicated in the table.
3. Install in the reverse order of removal.
4. Add the front differential oil. (See 03-14A-2 FRONT DIFFERENTIAL OIL REPLACEMENT.)



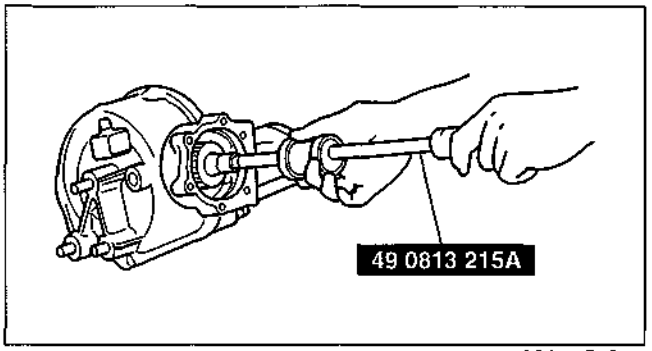
DBG318ZWB014

1	Drive shaft (See 03-13-2 FRONT DRIVE SHAFT REMOVAL/ INSTALLATION.)
2	Vacuum hose
3	RFW switch connector

4	Snap pin
5	Joint shaft component, control box component
6	Gear sleeve
7	Output shaft (See 03-18-6 Output Shaft Removal Note.)

Output Shaft Removal Note

1. Remove the output shaft using the **SST**.

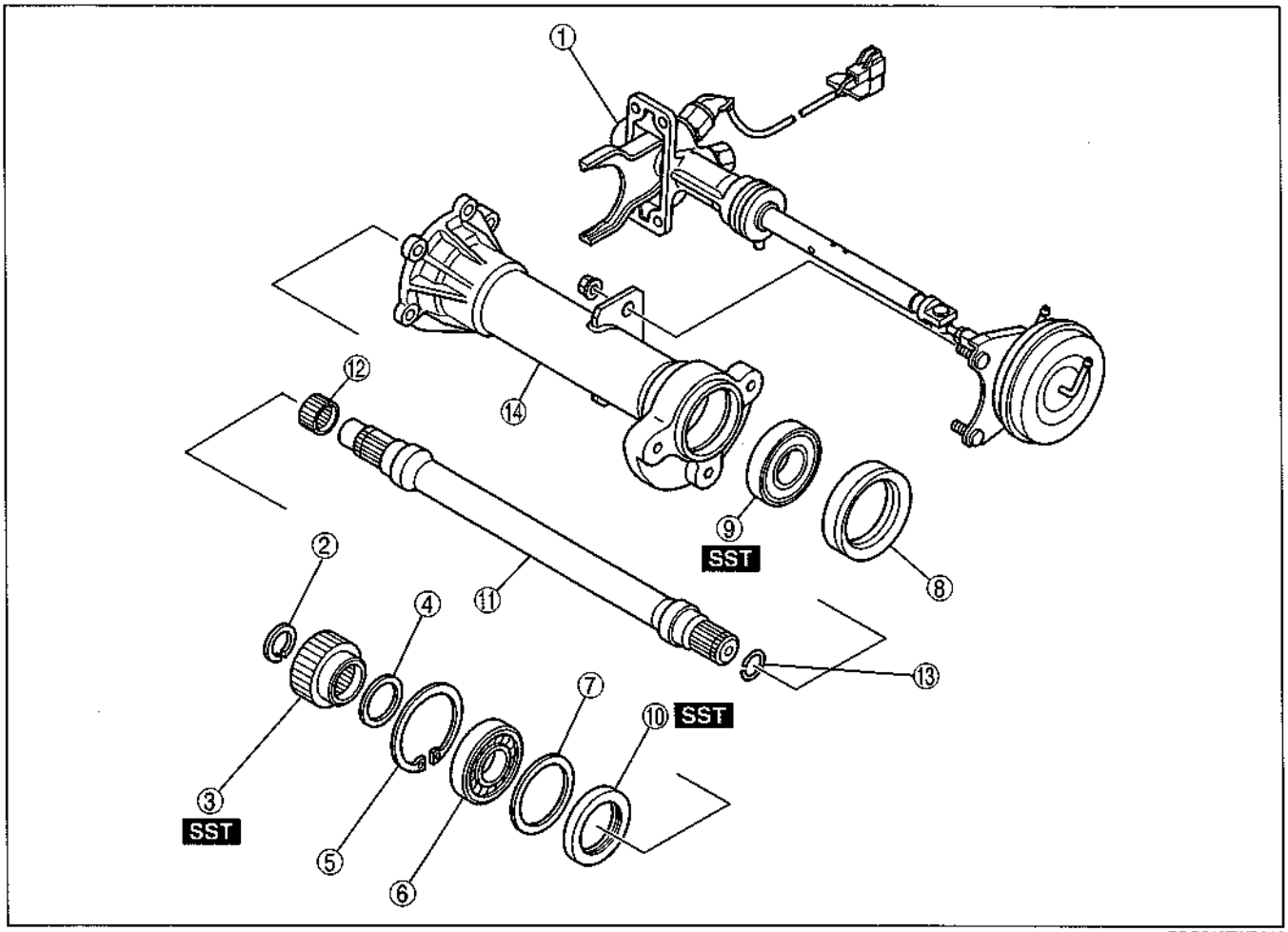


DBG318ZWB015

JOINT SHAFT COMPONENT DISASSEMBLY

dcf031827300w03

1. Disassemble in the order indicated in the table



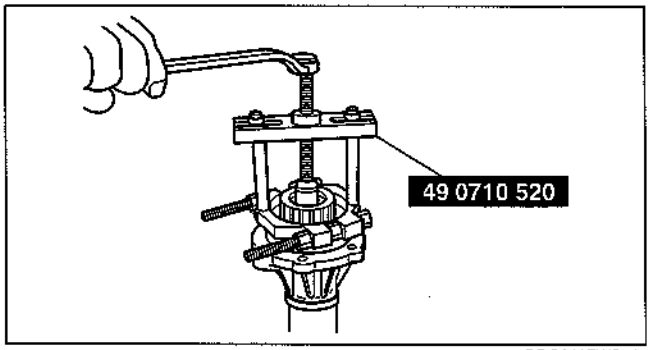
DBG318ZWB016

1	Control box
2	Clip
3	Remote freewheel hub (See03-18-7 Remote Freewheel Hub Disassembly Note.)
4	Spacer
5	Retaining ring
6	Ball bearing (See 03-18-8 Ball Bearing Disassembly Note.)
7	Adjusting shim(s)

8	Dust seal
9	Bearing (See 03-18-8 Bearing Disassembly Note.)
10	Oil seal (See 03-18-8 Oil Seal Disassembly Note.)
11	Joint shaft
12	Needle bearing
13	Clip
14	Casing

Remote Freewheel Hub Disassembly Note

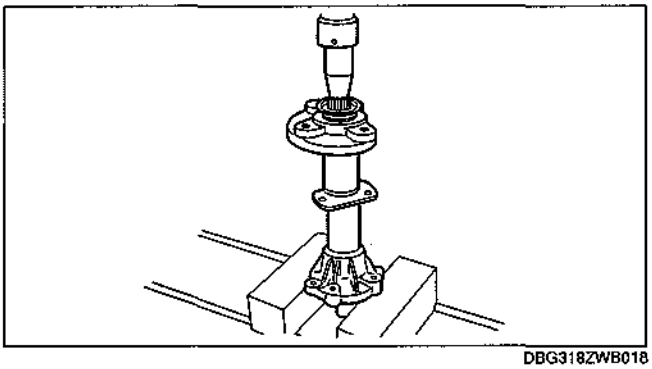
1. Remove the remote freewheel hub using the **SST**.



DBG318ZWB017

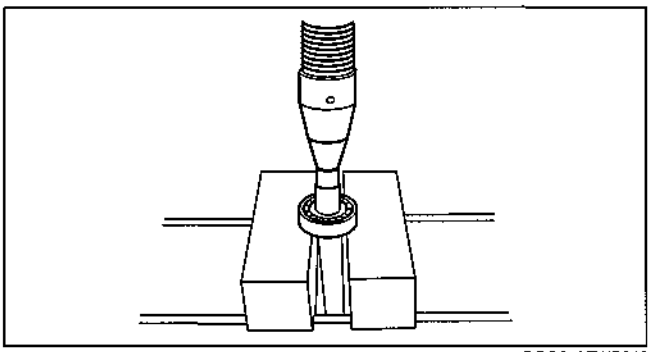
Ball Bearing Disassembly Note

1. Remove the ball bearing and the joint shaft using a press.



DBG318ZWB018

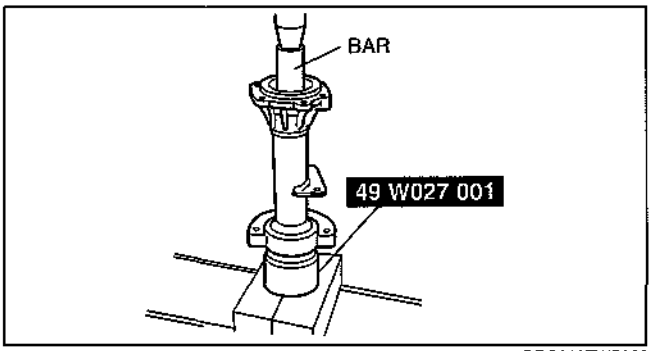
2. Remove the ball bearing using a press.



DBG318ZWB019

Bearing Disassembly Note

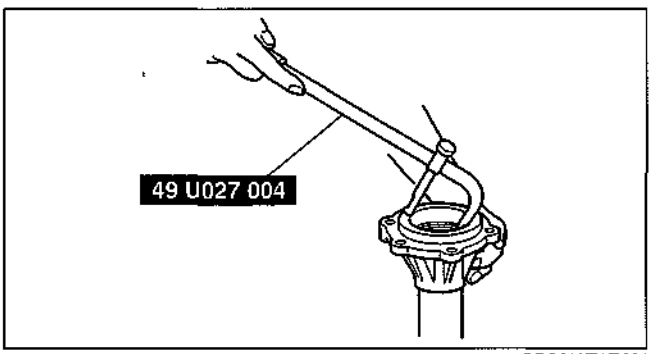
1. Remove the dust seal and bearing using the **SST** and a suitable bar.



DBG318ZWB020

Oil Seal Disassembly Note

1. Remove the oil seal using the **SST**.

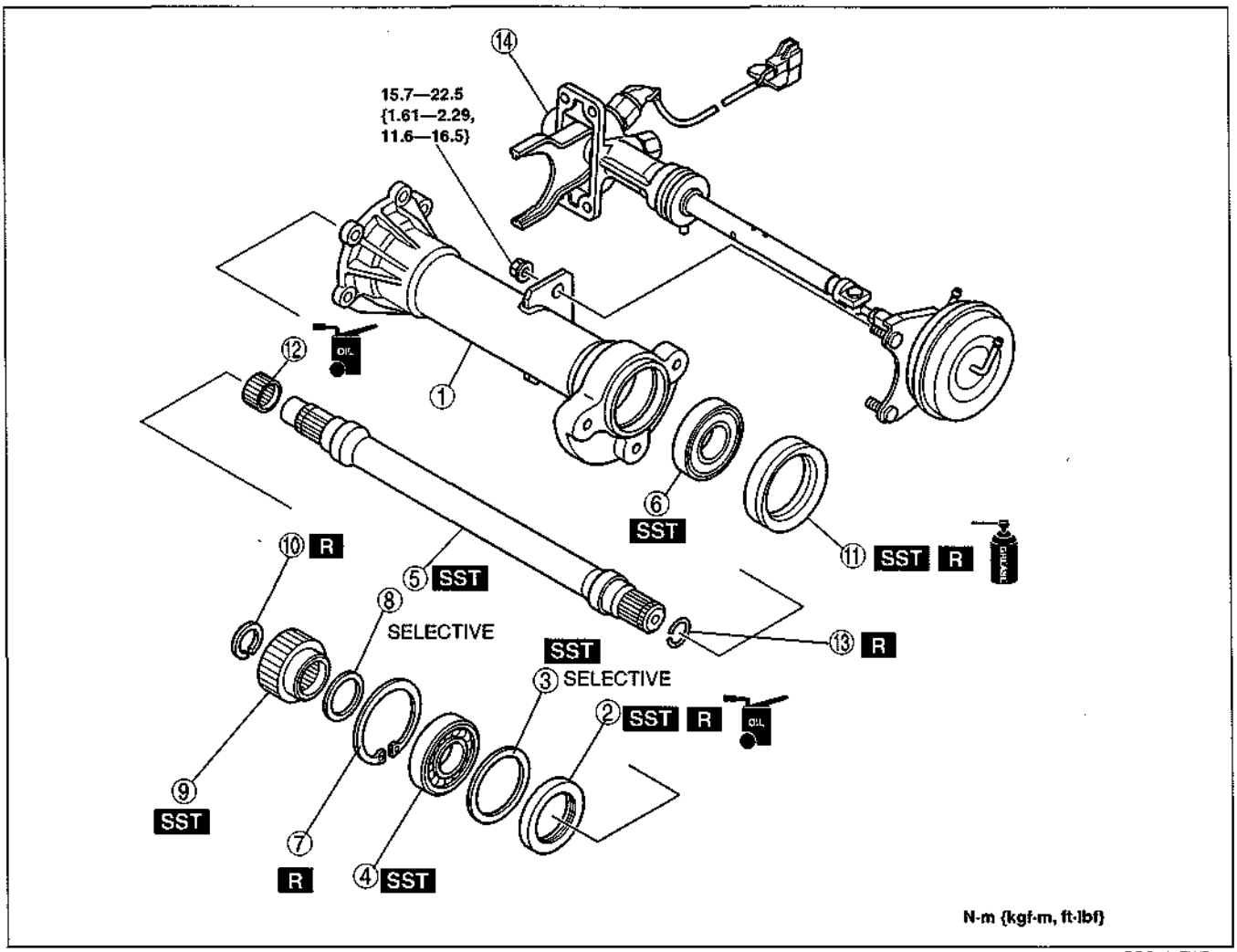


DBG318ZWB021

JOINT SHAFT COMPONENT ASSEMBLY

dcf031827300w04

1. Assemble in the order indicated in the table.



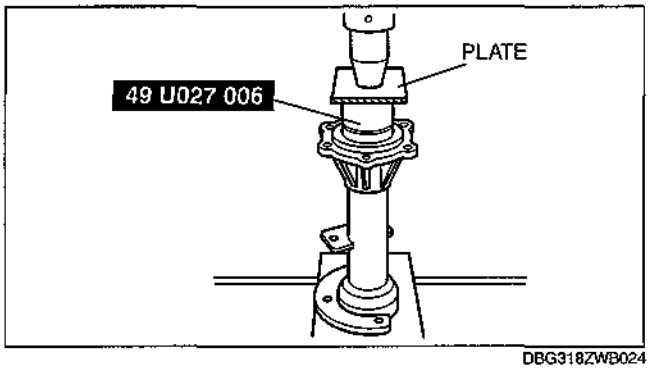
DBG318ZWB023

1	Casing
2	Oil seal (See 03-18-10 Oil Seal Assembly Note.)
3	Adjustment shim(s) (See 03-18-10 Adjustment Shim(s), Ball Bearing Assembly Note.)
4	Ball bearing (See 03-18-10 Adjustment Shim(s), Ball Bearing Assembly Note.)
5	Joint shaft (See 03-18-10 Joint Shaft Assembly Note.)
6	Bearing (See 03-18-11 Bearing Assembly Note.)

7	Retaining ring
8	Spacer (See 03-18-11 Spacer, Remote Freewheel Hub Assembly Note.)
9	Remote freewheel hub (See 03-18-11 Spacer, Remote Freewheel Hub Assembly Note.)
10	Clip
11	Dust seal (See 03-18-11 Dust Seal Assembly Note.)
12	Needle bearing
13	Clip
14	Control box

Oil Seal Assembly Note

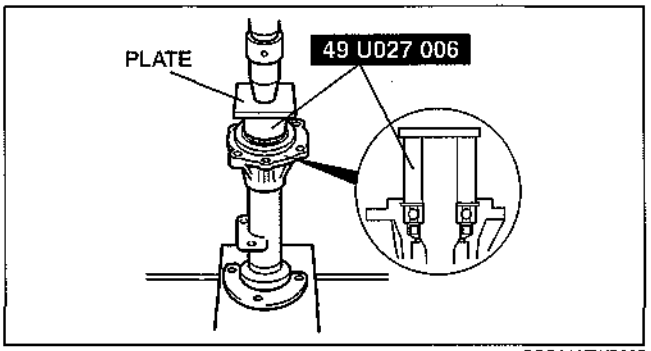
1. Apply differential oil to a new oil seal.
2. Install the new oil seal using the **SST** and a press.



DBG318ZWB024

Adjustment Shim(s), Ball Bearing Assembly Note

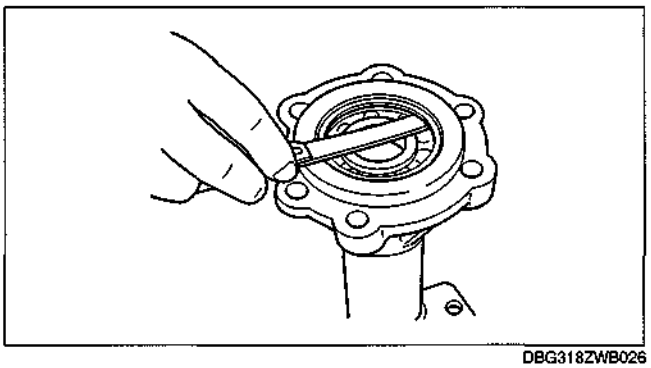
1. Install the removed shim(s) and the ball bearing using the **SST** and a press.
2. Install a new retaining ring.



DBG318ZWB025

3. Measure the clearance between the ball bearing and the retaining ring.
   - If not as specified, adjust by adding or removing shims. Use no more than two shims on either side.

   Maximum clearance
   0.15 mm {0.0059 in}

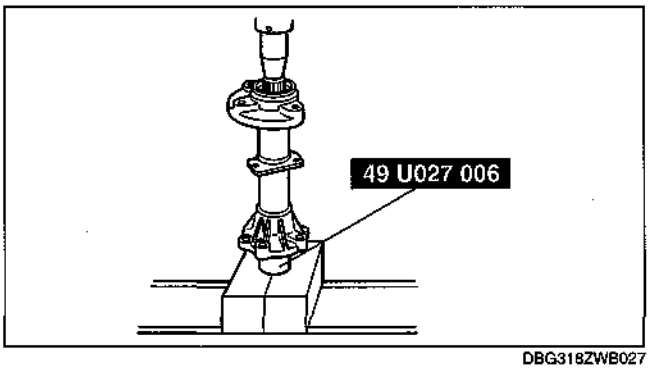

DBG318ZWB026

Available shim thickness
0.15 mm {0.0059 in}
0.30 mm {0.0118 in}
0.35 mm {0.0138 in}
0.40 mm {0.0157 in}
0.50 mm {0.0197 in}

4. Remove the retaining ring.

Joint Shaft Assembly Note

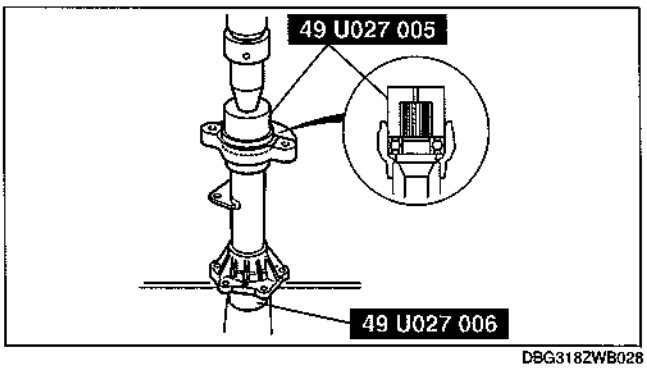
1. Install the joint shaft using the **SST** and a press.



DBG318ZWB027

Bearing Assembly Note

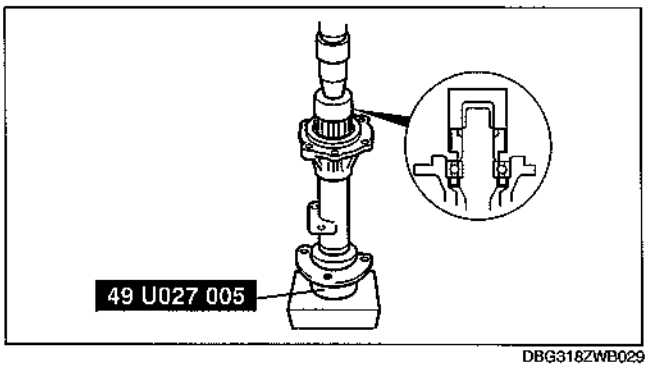
1. Install the bearing using the **SSTs** and a press.



DBG318ZWB028

Spacer, Remote Freewheel Hub Assembly Note

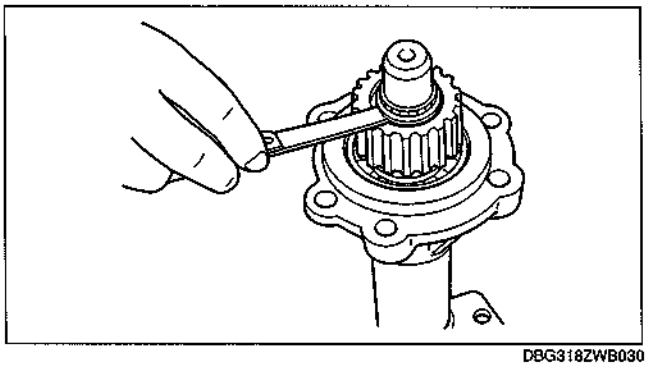
1. Install the removed spacer and the remote freewheel hub using a suitable pipe and the **SST** and a press.
2. Install a new clip.



DBG318ZWB029

3. Measure the clearance between the remote freewheel hub and the clip.
   - If not as specified, adjust by adding or removing spacers. Use no more than two spacers on either side.

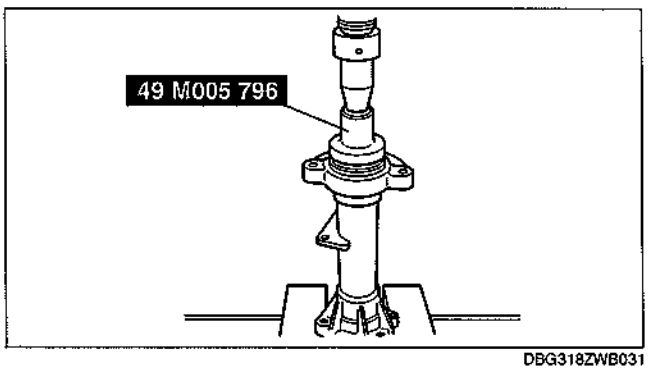
Maximum clearance
0.15 mm {0.0059 in}


DBG318ZWB030

Available shim thickness
0.15 mm {0.0059 in}
0.30 mm {0.0118 in}
0.35 mm {0.0138 in}
0.40 mm {0.0157 in}
0.50 mm {0.0197 in}

Dust Seal Assembly Note

1. Install the new dust seal using the **SST** and a press.



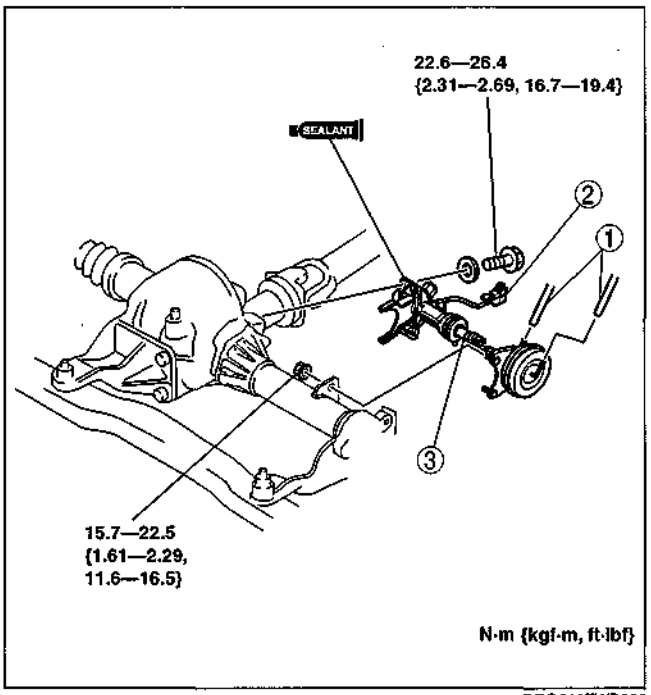
DBG318ZWB031

CONTROL BOX REMOVAL/INSTALLATION

dcf031827750w01

1. Drain the front differential oil into a container.
2. Remove in the order indicated in the table.
3. Install in the reverse order of removal.
4. Add the specified front differential oil.

1	Vacuum hose
2	RFW switch connector
3	Control box

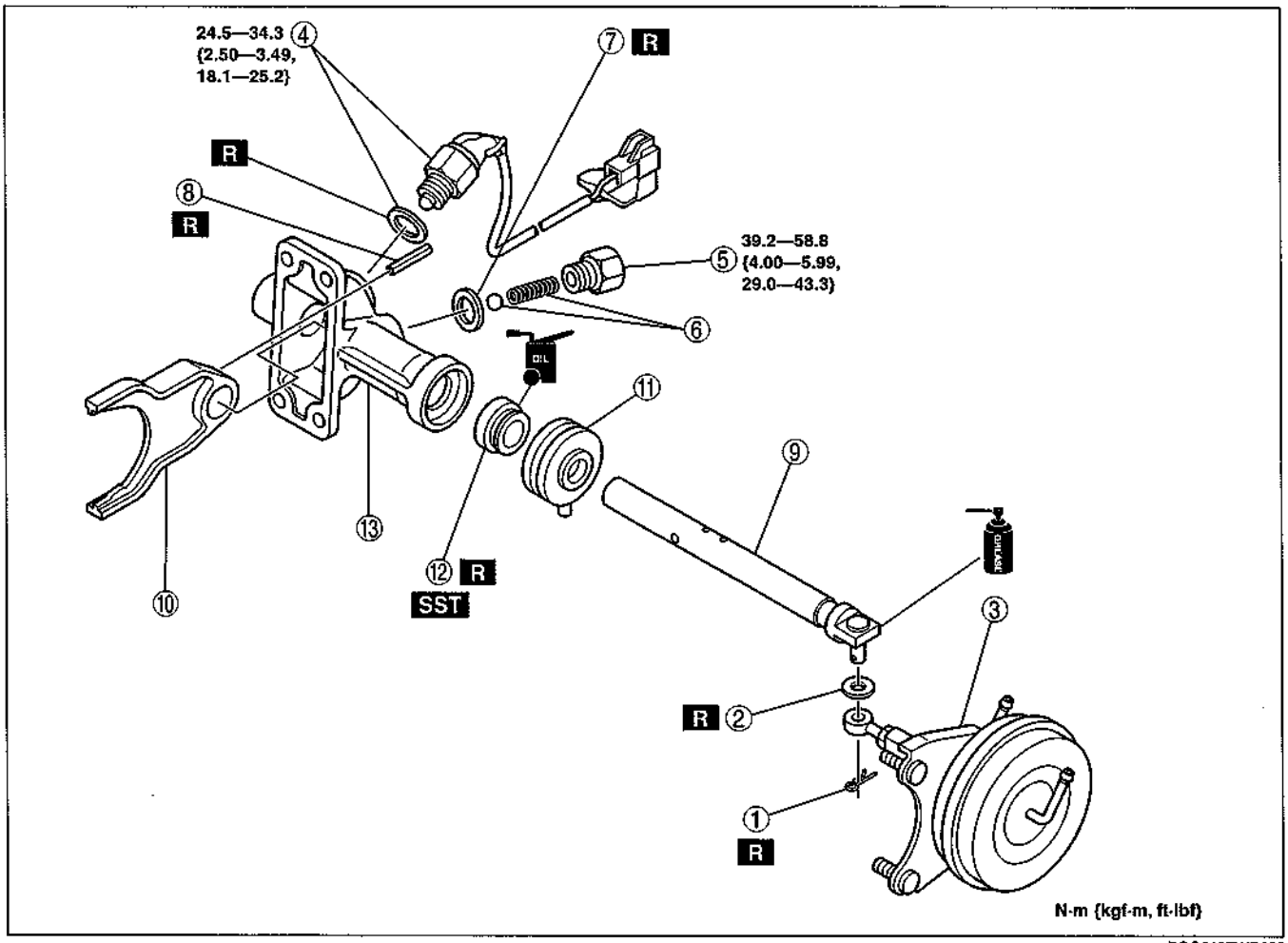


DBG318ZWB032

CONTROL BOX DISASSEMBLY/ASSEMBLY

dcf031827750w02

1. Disassemble in the order indicated in the table.
2. Assemble in the reverse order of disassembly.



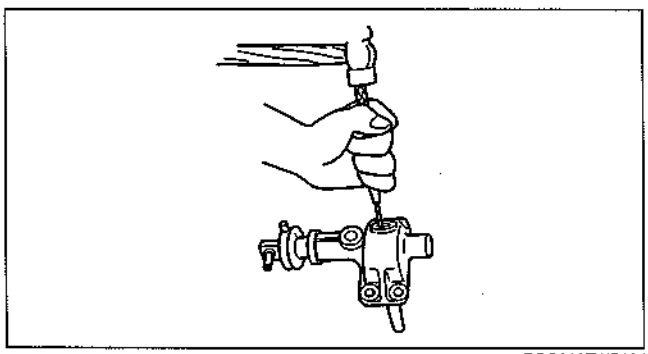
DBG318ZWB033

1	Snap ring
2	Washer
3	RFW actuator
4	RFW switch and washer
5	Spring cap
6	Spring and ball
7	Washer

8	Roll pin (See 03-18-13 Roll Pin Disassembly Note.) (See 03-18-14 Roll Pin Assembly Note.)
9	Change rod
10	Shift fork
11	Boot (See 03-18-14 Boot Assembly Note.)
12	Oil seal (See 03-18-14 Oil Seal Assembly Note.)
13	Control box

Roll Pin Disassembly Note

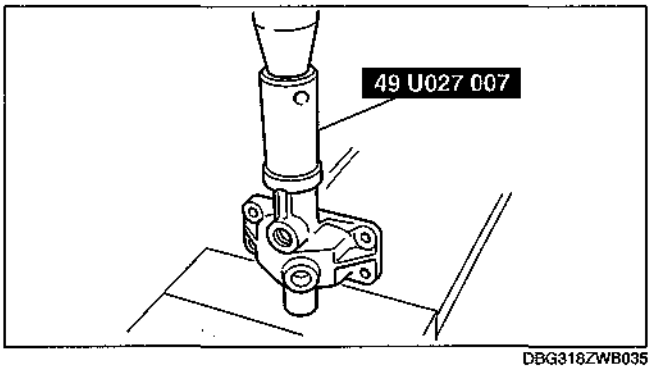
1. Remove the roll pin as shown in the figure.



DBG318ZWB034

Oil Seal Assembly Note

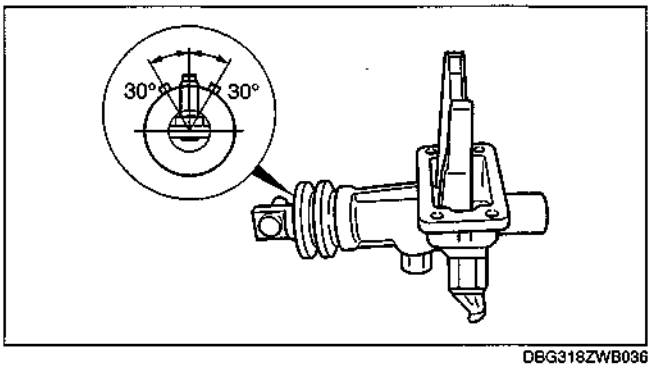
1. Assemble a new oil seal using the **SST** and a press.



DBG318ZWB035

Boot Assembly Note

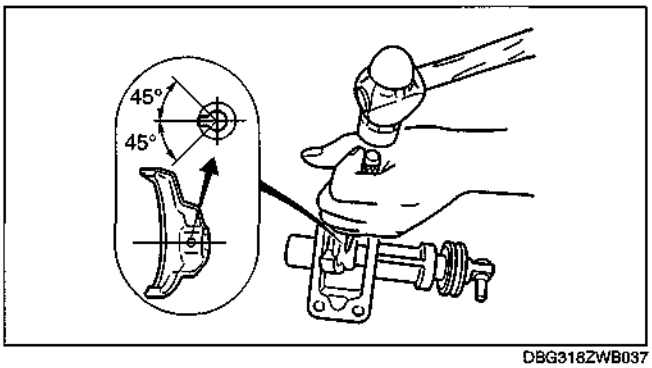
1. Assemble the boot as shown in the figure.



DBG318ZWB036

Roll Pin Assembly Note

1. Install a new roll pin as shown in the figure.



DBG318ZWB037

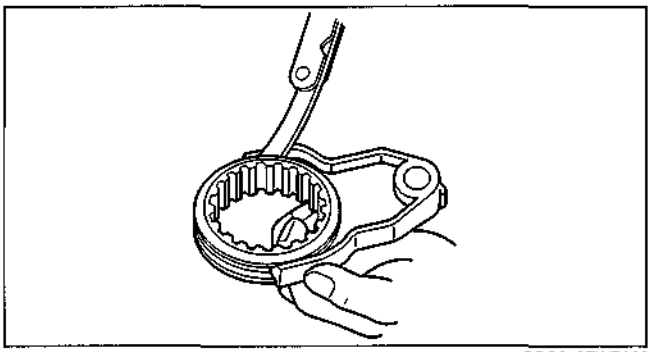
SHIFT FORK INSPECTION

dcf031827300w05

1. Measure the clearance between the gear sleeve and the shift fork.

   Standard clearance
   0.1—0.4 mm {0.0040—0.0157 in}
   Maximum clearance
   0.50 mm {0.0197 in}

2. Inspect the output shaft and gear sleeve of the splines for damage and wear.
   - If not correct, replace the output shaft and gear sleeve as necessary.



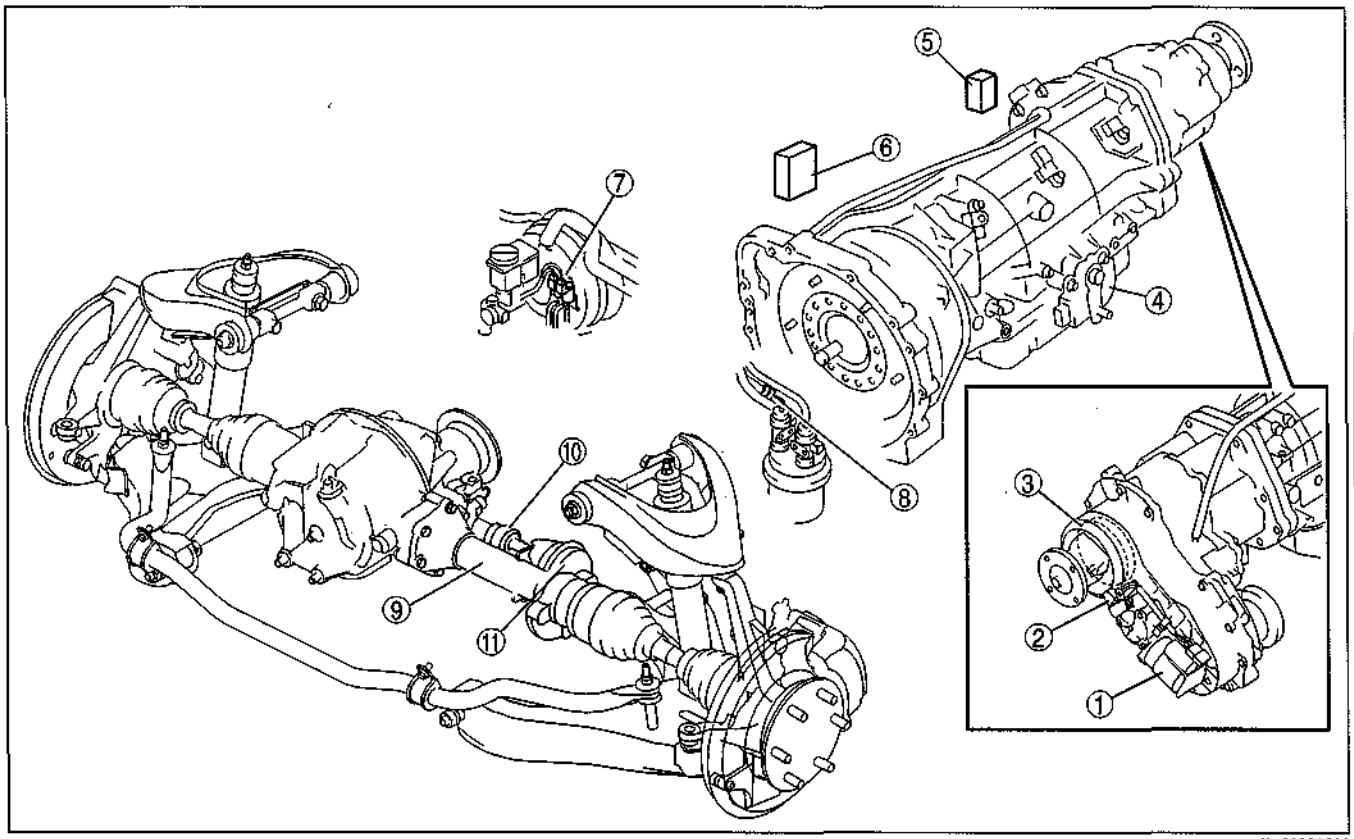
DBG318ZWB038

03-18 4-WHEEL DRIVE

4-WHEEL DRIVE LOCATION INDEX [AT (5R55S)] 03-18–1
4x4 SWITCH INSPECTION [AT (5R55S)] 03-18–2
4x4 SWITCH REMOVAL/INSTALLATION [AT (5R55S)] 03-18–3
4x4 CONTROL MODULE INSPECTION [AT (5R55S)] 03-18–3
4x4 CONTROL MODULE REMOVAL/INSTALLATION [AT (5R55S)] 03-18–5

4-WHEEL DRIVE LOCATION INDEX [AT (5R55S)]

Id0318008005d2



arnffw00001888

1	Motor component (See 03-16-4 MOTOR INSPECTION [5R55S].) (See 03-16-5 MOTOR REMOVAL/INSTALLATION [5R55S].)
2	Speed sensor (See 03-16-3 SPEED SENSOR INSPECTION [5R55S].) (See 03-16-4 SPEED SENSOR REMOVAL/INSTALLATION [5R55S].)
3	Clutch coil (See 03-16-6 CLUTCH COIL INSPECTION [5R55S].)
4	Digital TR sensor (See 05-13-20 DIGITAL TRANSMISSION RANGE (TR) SENSOR INSPECTION [5R55S].) (See 05-13-22 DIGITAL TRANSMISSION RANGE (TR) SENSOR REMOVAL/INSTALLATION [5R55S].)

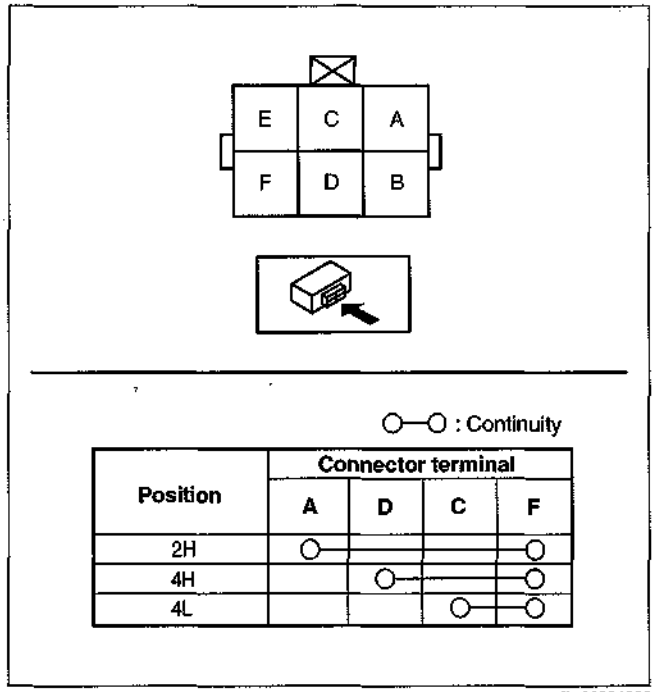
5	4x4 switch (See 03-18-2 4x4 SWITCH INSPECTION [AT (5R55S)].) (See 03-18-3 4x4 SWITCH REMOVAL/INSTALLATION [AT (5R55S)].)
6	4x4 control module (See 03-18-3 4x4 CONTROL MODULE INSPECTION [AT (5R55S)].) (See 03-18-5 4x4 CONTROL MODULE REMOVAL/INSTALLATION [AT (5R55S)].)
7	Lock and free solenoid valve
8	One-way check valve
9	Joint shaft component
10	Control box
11	RFW actuator

4x4 SWITCH INSPECTION [AT (5R55S)]

id0318008050d2

Caution
- **Water or foreign material entering the connector can cause a poor connection or corrosion. Be sure not to drop water or foreign material on the connector when disconnecting it.**

1. Disconnect the negative battery cable.
2. Remove the boot panel.
3. Verify that the continuity is as indicated in the table.

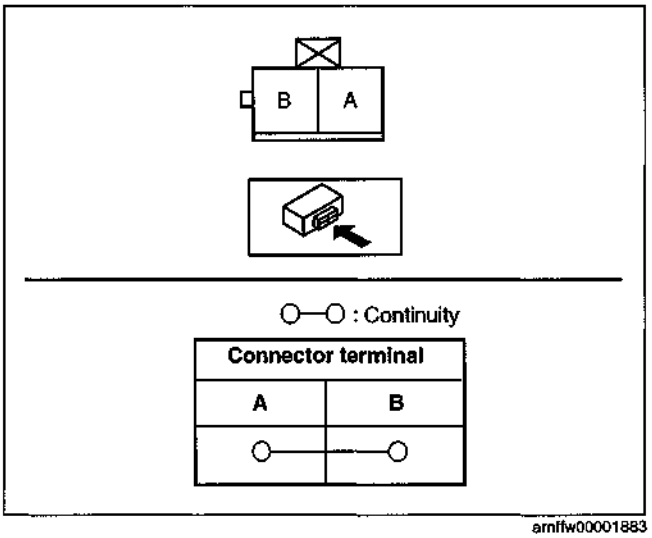


Position	Connector terminal			
	A	D	C	F
2H	○			○
4H		○		○
4L			○	○

amffw00001882

- If there is any malfunction, replace the 4x4 switch. (See 03-18-3 4x4 SWITCH REMOVAL/INSTALLATION [AT (5R55S)].)

4. Install the boot panel.
5. Connect the negative battery cable.



Connector terminal	
A	B
○	○

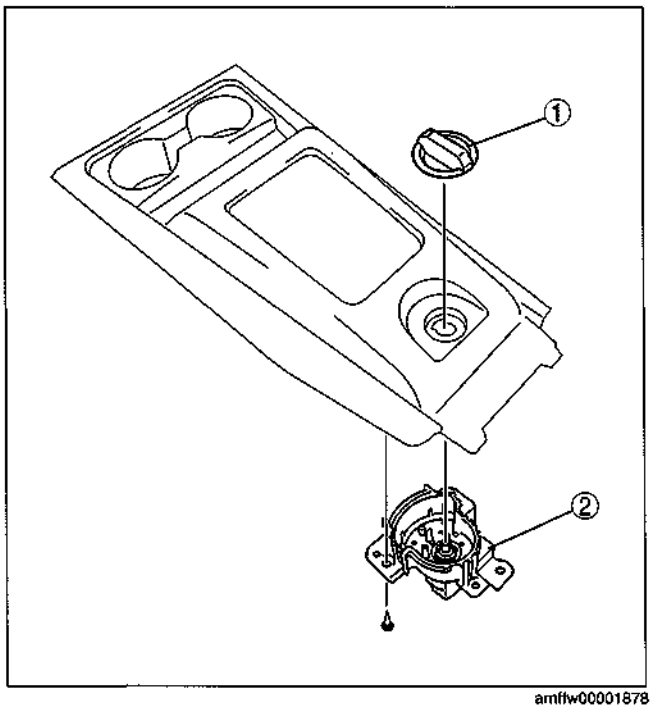
amffw00001883

4x4 SWITCH REMOVAL/INSTALLATION [AT (5R55S)]

id0318006051d2

1. Disconnect the negative battery cable.
2. Remove the boot panel. (See .)
3. Remove in the order indicated in the table.
4. Install in the reverse order of removal.

1	knob
2	4x4 switch



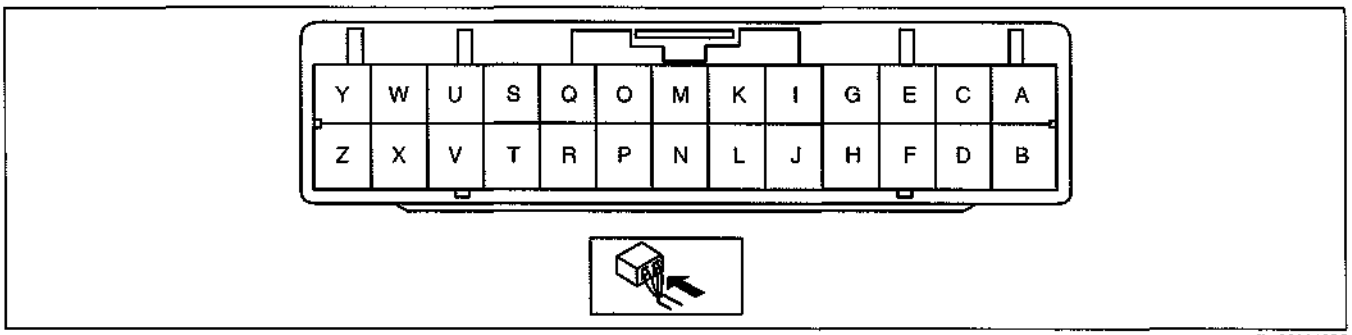
amflw00001878

4x4 CONTROL MODULE INSPECTION [AT (5R55S)]

id0318006049d2

1. Remove the lower panel.
2. Turn the engine switch to the ON position (Engine off).
3. Attach the tester lead to the control module connector and inspect the voltage and continuity according to the Terminal Voltage Table (Reference).

Terminal Voltage Table (Reference)



amflw00001875

Terminal	Signal name	Connected to	condition	Voltage (V)	Inspection Item(s)
A	Motor control (4L-4H-2H)	Motor component (shift motor)	Motor operating	Below 1.0	• Inspect related wiring harness • Motor component (shift motor)
			Motor not operating	B+	
B	Motor control (4L-4H-2H)	Motor component (shift motor)	Motor operating	Below 1.0	• Inspect related wiring harness • Motor component (shift motor)
			Motor not operating	B+	
C	Motor control (2H-4H-4L)	Motor component (shift motor)	Motor operating	Below 1.0	• Inspect related wiring harness • Motor component (shift motor)
			Motor not operating	B+	

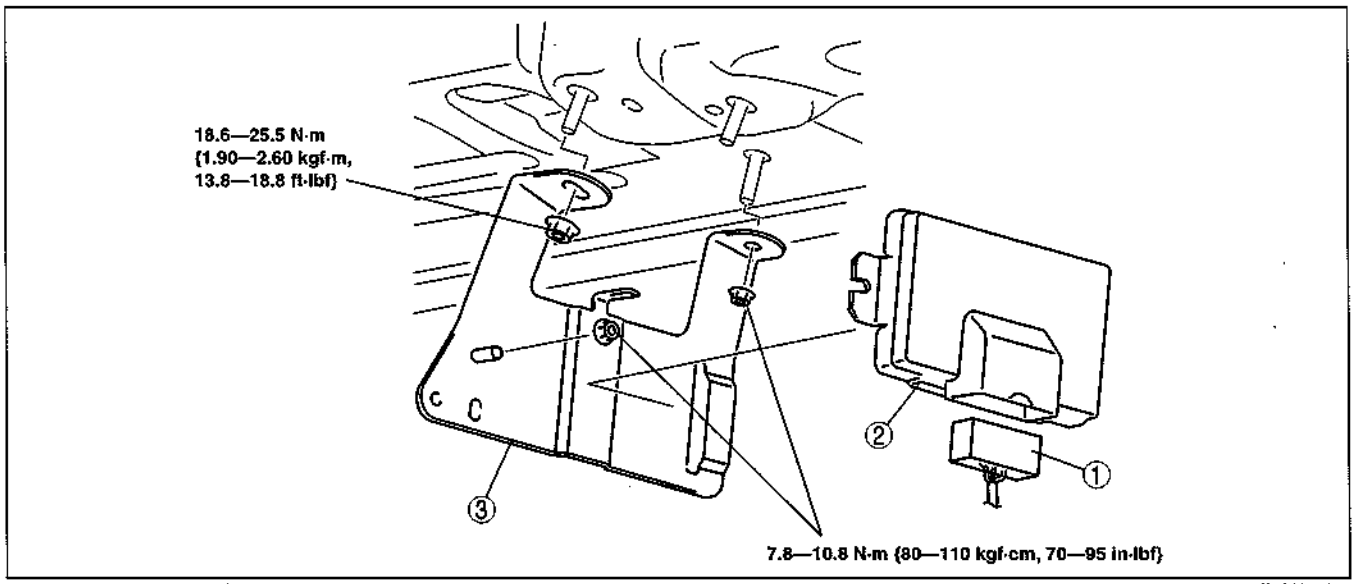
Terminal	Signal name	Connected to	condition	Voltage (V)	Inspection item(s)
D	Motor control (2H-4H-4L)	Motor component (shift motor)	Motor operating	Below 1.0	• Inspect related wiring harness • Motor component (shift motor)
			Motor not operating	B+	
E	Neutral signal	Digital TR sensor	N position	Below 1.0	• Inspect related wiring harness • Digital TR sensor
			Except N position	Approx. 4.3	
F	4H or 4L mode signal	4x4 switch	2H or 4H position	B+	• Inspect related wiring harness • 4x4 switch
			4L position	Below 1.0	
G	2H or 4H mode signal	4x4 switch	2H position	Below 1.0	• Inspect related wiring harness • 4x4 switch
			4H or 4L position	B+	
H	Position 4	Motor component (position sensor)	2H position	Approx. 5.0	• Inspect related wiring harness • Motor component (position sensor)
			4H position	Approx. 5.0	
			4L position	Approx. 4.2	
I	Position 2	Motor component (position sensor)	2H position	Approx. 5.0	• Inspect related wiring harness • Motor component (position sensor)
			4H position	Approx. 5.0	
			4L position	Approx. 4.2	
J	Position 1	Motor component	2H position	Approx. 5.0	• Inspect related wiring harness • Motor component (position sensor)
			4H position	Approx. 5.0	
			4L position	Below 1.0	
K	—	—	—	—	—
L	Position 3	Motor component (position sensor)	2H position	Approx. 5.0	• Inspect related wiring harness • Motor component (position sensor)
			4H position	Approx. 5.0	
			4L position	Approx. 4.2	
M	Vehicle speed	Speed sensor	Engine switch OFF	Below 1.0	• Inspect related wiring harness • Speed sensor
			Engine switch ON	Approx. 5.0	
N	Ground	Speed sensor or motor component	Engine switch OFF	Below 1.0	• Inspect related wiring harness • Speed sensor • Motor component
			Engine switch ON	Approx. 5.0	
O	—	—	—	—	—
P	—	—	—	—	—
Q	DTC output	Data link connector (DLC)	Engine switch OFF	Below 1.0	• Inspect related wiring harness
			Engine switch ON	Approx. 5.0	
R	4x4 indicator light	4x4 indicator light	4x4 indicator light OFF	B+	• Inspect related wiring harness • 4x4 indicator light
			4x4 indicator light ON	Below 1.0	
S	4L indicator light	4L indicator light	4L indicator light OFF	B+	• Inspect related wiring harness • 4L indicator light
			4L indicator light ON	Below 1.0	
T	IG 1	Engine fuse	Engine switch OFF	Below 1.0	• Inspect related wiring harness • Engine fuse
			Engine switch ON	B+	
U	Clutch coil	Clutch coil	Clutch coil operating	B+	• Inspect related wiring harness • Clutch coil
			Clutch coil not operating	Below 1.0	
V	Lock solenoid valve	Lock solenoid valve	Lock solenoid valve operating	Below 1.0	• Inspect related wiring harness • Lock solenoid valve
			Lock solenoid valve not operating	B+	
W	Ground	Body ground	Under any condition	Below 1.0	• Inspect related wiring harness (W—ground)

Terminal	Signal name	Connected to	condition	Voltage (V)	Inspection item(s)
X	Ground	Body ground	Under any condition	Below 1.0	• Inspect related wiring harness (X—ground)
Y	B+	PTC/AT fuse	Engine switch OFF	B+	• Inspect related wiring harness
			Engine switch ON		
Z	B+	PTC/AT fuse	Engine switch OFF	B+	• Inspect related wiring harness
			Engine switch ON		

4x4 CONTROL MODULE REMOVAL/INSTALLATION [AT (5R55S)]

id0318008048d2

1. Disconnect the negative battery cable.
2. Remove the lower panel.
3. Remove in the order indicated in the table.
4. Install in the reverse order of removal.



amffw00001874

1	Connector
2	4x4 CM

3	Bracket

03-50 TECHNICAL DATA

DRIVELINE/AXLE TECHNICAL DATA . . 03-50–1

DRIVELINE/AXLE TECHNICAL DATA

dcf035000000w02

Item	Specification
Maximum wheel bearing play [4x2 (Except Hi-Rider)]	0 mm {0 in}
Front wheel axle preload [4x2 (Except Hi-Rider)]	5.6—11.2 N {0.58—1.14 kgf, 1.26—2.51 lbf}
Maximum front wheel bearing play [Hi-Rider, 4x4]	0.05 mm {0.002 in}
Rear axle bearing play in axial direction	0.05 —0.25 mm {0.002—0.009 in}
Front drive shaft standard length	LH: 507.8—517.8 mm {20.00—20.38 in} RH: 596.7—606.7 mm {23.50—23.88 in}
Front differential oil	Type: API service GL-5 Viscosity (above -18°C): SAE 90 Viscosity (below -18°C): SAE 80 Oil capacity (approx. quantity): 1.8—2.0 L {2.0—2.1US qt, 1.6—1.7 Imp qt}
Front differential drive pinion preload	1.28—1.76 N.m {13.1—17.9 kgf.cm, 11.4—15.5 in.lbf}
Rear differential oil [STANDARD DIFFERENTIAL]	Type: API service GL-5 Viscosity: SAE 90 Oil capacity (approx. quantity): 1.3—1.5 L {1.3—1.4 US qt, 1.1—1.2 Imp qt} (WL-3) Oil capacity (approx. quantity): 2.35—2.55 L {2.23—2.41 US qt, 1.96—2.12 Imp qt} (WL-C)
Rear differential oil [LSD]	Type: API service GL-5 Viscosity: SAE 90 Oil capacity (approx. quantity): 2.25—2.45 L {2.13—2.31 US qt, 1.88—2.03 Imp qt}
Backlash of side gear and pinion gear	0—0.1 mm {0—0.004 in}
Rear differential drive pinion preload	WL-3: 2.0—3.5 N.m {21—35 kgf.cm, 18—30 in.lbf} WL-C: 2.55—4.00 N.m {26.1—40.7 kgf.cm, 22.6—35.4 in.lbf}
Ring gear backlash	0.12—0.20 mm {0.005—0.007 in}
Rear differential drive pinion preload	2.55—4.00 N.m {26.1—40.7 kgf?cm, 22.6—35.4 in?lbf}
Propeller shaft maximum runout	0.4 mm {0.016 in}
Propeller shaft initial torque (Reference value)	0.29—1.76 N.m {3.0—17.9 kgf?cm, 2.6—15.5 in?lbf}
Transfer case oil (MT)	Type: Mercon® Multi-purpose AFT XT-2-QDX Capacity (approximate quantity): 1.85 L {1.95 US qt, 1.63 Imp qt}
Transfer case oil (AT)	Type: Mercon® V Capacity (approx. quantity): 1.2 L {1.3 US qt, 1.1 Imp qt}
Vehicle speed sensor (VSS) voltage [S15MX-D]	5 V or less
Transfer case speed sensor resistance	Approx. 300 ohms
Transfer case motor resistance	Approx. 117 ohms
Transfer case clutch coil resistance	Approx. 3 ohms

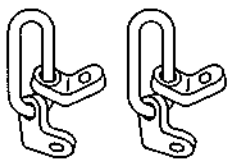
03-60 SERVICE TOOLS

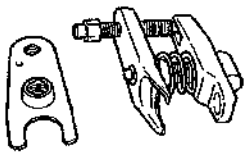
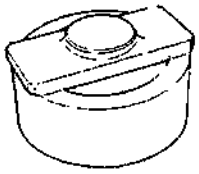
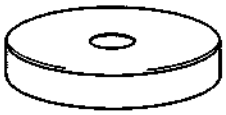
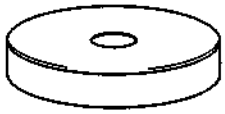
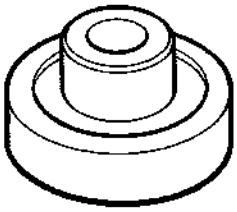
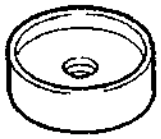
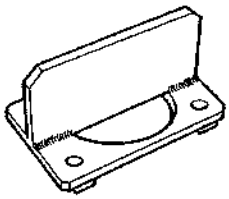
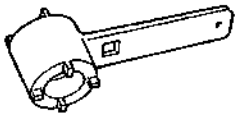
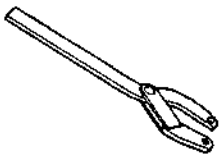
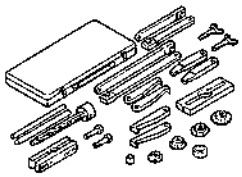
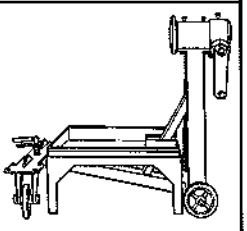
DRIVELINE/AXLE SST 03-60–1

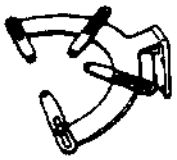
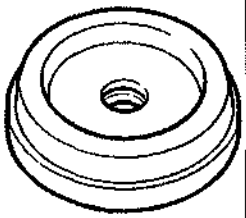
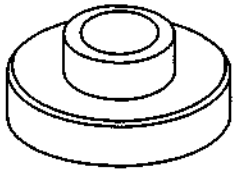
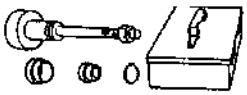
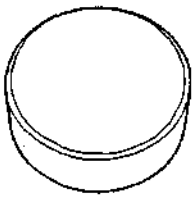
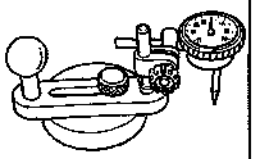
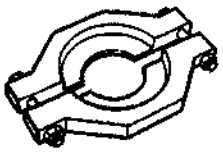
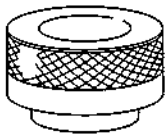
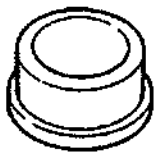
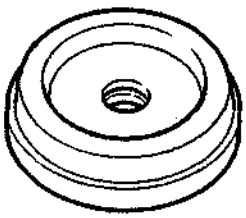
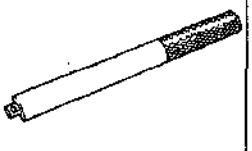
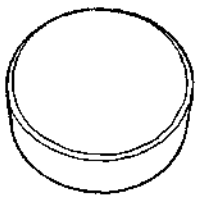
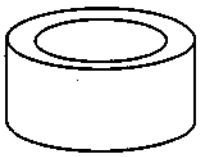
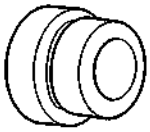
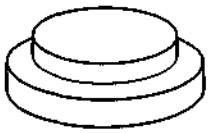
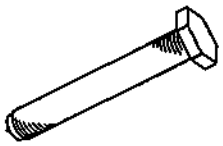
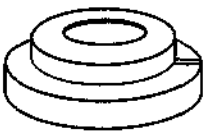
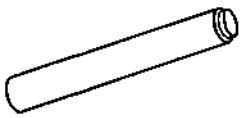
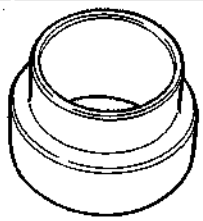
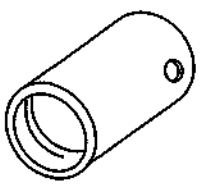
DRIVELINE/AXLE SST

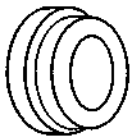
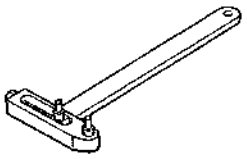
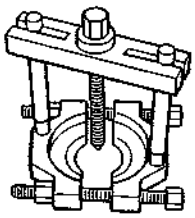
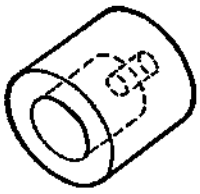
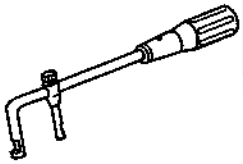
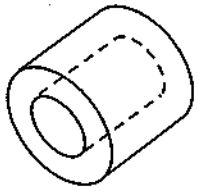
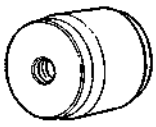
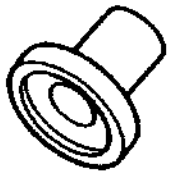
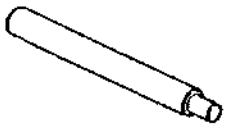
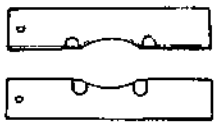
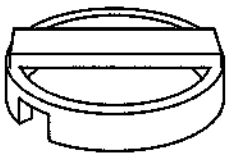
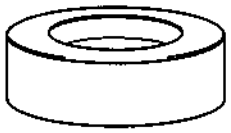
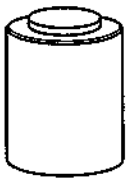
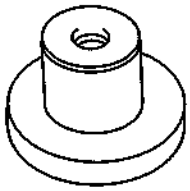
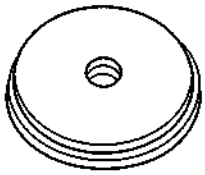
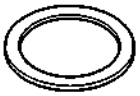
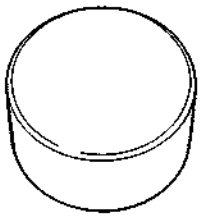
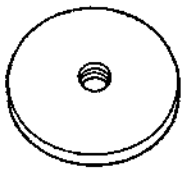
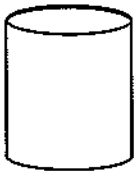
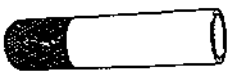
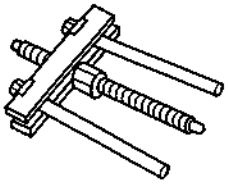
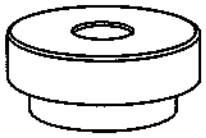
dcf036000000w02

1: Mazda **SST** number
2: Global **SST** number
Example

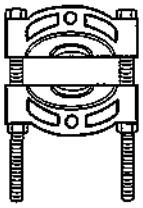
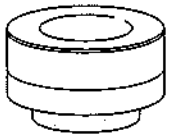
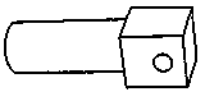
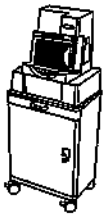
1:49 UN30 3050 2:303-050 Engine lifting brackets	

1:49 T028 3A0 2:– Ball joint puller set 	1:49 G019 017 2:– Oil seal installer 	1:49 G030 797 2:– Handle
1:49 S033 107 2:– Oil seal installer 	1:49 F027 007 2:– Attachment for ø72 	1:49 S033 106 2:– Oil seal installer 
1:49 H033 101 2:– Bearing remover 	1:49 B025 001 2:– Body 	1:49 F019 001 2:– Oil seal installerg 
1:49 S120 645A 2:– Rear shaft holder 	1:49 0603 635A 2:– Rear sahft nut wrench 	1:49 S120 710 2:– Coupling flange holder 
1:49 0839 425C 2:– Bearing puller set 	1:49 S026 2A1 2:– Rear axle shaft bearing puller set 	1:49 0107 680A 2:– Engine stand 

1:49 M005 561 2:– Differential carrier hunger 	1:49 F027 004 2:– Attachment for ø80 	1:49 S120 748 2:– Attachment 
1:49 8531 565 2:– Drive pinion model 	1:49 0660 555 2:– Gauge block 	1:49 0727 570 2:– Pinion height gauge body 
1:49 H027 002 2:– Bearing remover 	1:49 UB71 525 2:– Bearing installer 	1:49 F027 009 2:– Attachment for ø68&77 
1:49 F027 004 2:– Attachment for ø80 	1:49 F027 003 2:– Handle 	1:49 U027 008 2:– Gauge block 
1:49 UN27 004 2:– Collar B 	1:49 UN27 003 2:– Collar A 	1:49 F401 331 2:– Body
1:49 U027 009 2:– Oil seal installer 	1:49 U027 013 2:– Attachment B 	1:49 U027 014 2:– Bolt 
1:49 U027 012 2:– Attachment A 	1:49 U027 011 2:– Shaft 	1:49 G030 796 2:– Oil seal installer
1:49 F401 337A 2:– Attachment C 	1:49 U027 007 2:– Oil seal installer 	1:49 8531 567 2:– Collar A

1:49 8531 568 2:– Collar B 	1:49 0259 720 2:– Side bearing adjustment wrench 	1:49 0710 520 2:– Bearing puller 
1:49 U027 005 2:– Bearing installer 	1:49 U027 004 2:– Oil seal remover 	1:49 U027 006 2:– Bearing installer 
1:49 W027 001 2:– Body 	1:49 M005 796 2:– Body 	1:49 G033 102 2:– Handle 
1:49 F026 103 2:– Wheel hub puller 	1:49 W010 107A 2:– Oil seal installer 	1:49 D026 102 2:– Sensor rotor installer 
1:49 G019 011 2:– Bearing installer 	1:49 F026 102 2:– Bearing installer 	1:49 1011 748 2:– Attachment
1:49 G033 105 2:– Attachment 	1:49 W033 101 2:– Body 	1:49 T019 001 2:– Attachment 
1:49 1361 555 2:– Gauge block 	1:49 J027 002 2:– Collar 	1:49 E027 007 2:– Collar 
1:49 0727 415 2:– Bearing installer 	1:49 UN20 4069 2:204-069 Remover 	1: 49 UN20 5D0180 2:205-D018 Attachment 

SERVICE TOOLS

1: 49 UN20 5D0020 2:205-D002 Remover 	1: 49 F401 331 2:– Body	1: 49 U027 010 2:– Bearing installer 
1:49 S120 440 2:– Mainshaft holder 	WDS 	—

BRAKES

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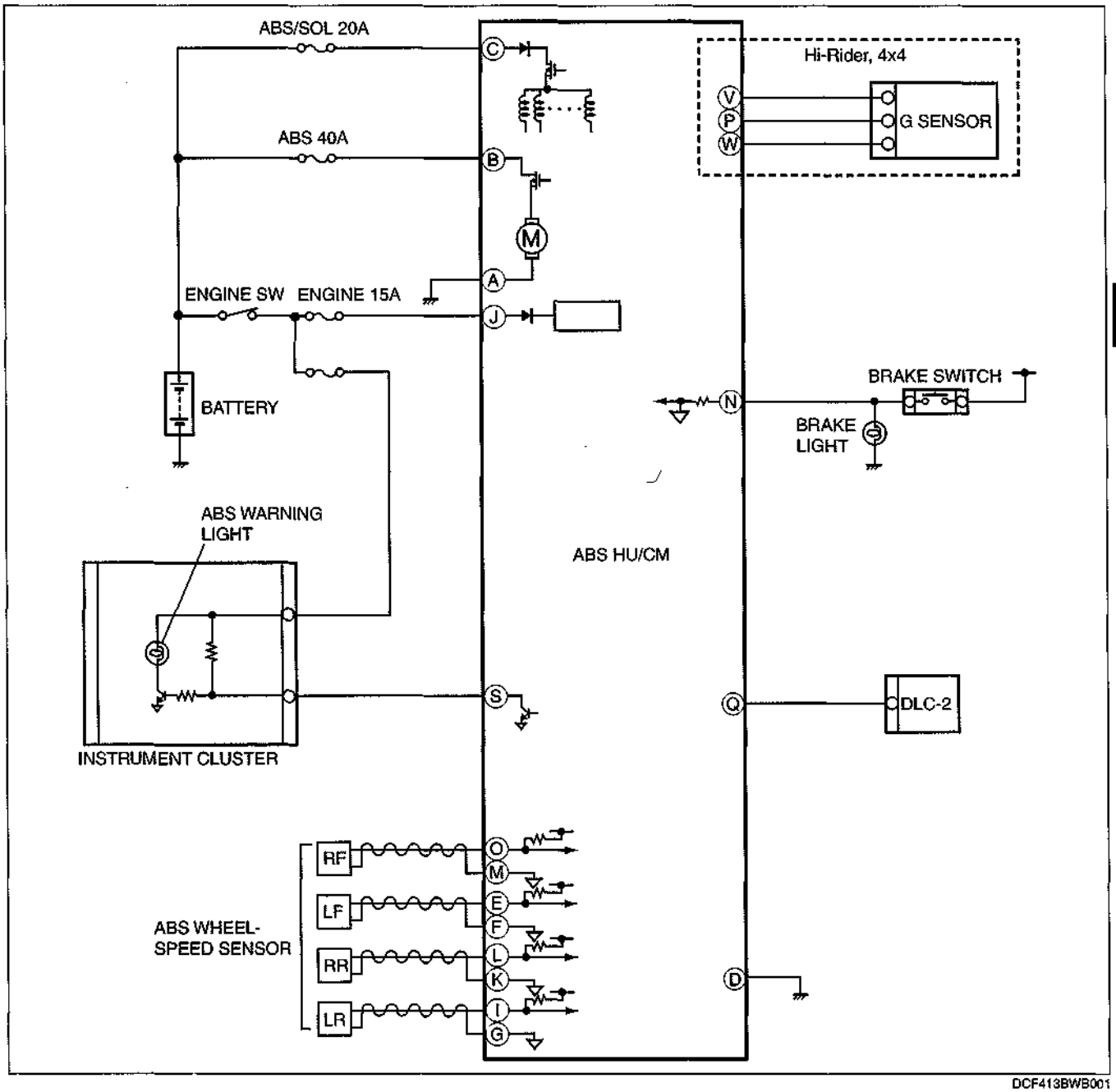
ABS SYSTEM WIRING DIAGRAM [4W-ABS]

dcf040200000w15



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ON-BOARD DIAGNOSIS [4W-ABS]

dcf040200000w16

On-Board Diagnostic (OBD) Test Description

- The OBD test inspects the integrity and function of the ABS and outputs the results when requested by the specific tests.
- On-board diagnostic test also:
  - — Provides a quick inspection of the ABS usually performed at the start of each diagnostic procedure.
  - — Provides verification after repairs to ensure that no other faults occurred during service.
- The OBD test is divided into 3 tests:
  - — Read/clear diagnostic results, PID monitor and record and active command modes.

Read/clear diagnostic results

- This function allows you to read or clear DTCs in the ABS HU/CM memory.

PID/Data monitor and record

- This function allows you to access certain data values, input signals, calculated values, and system status information.

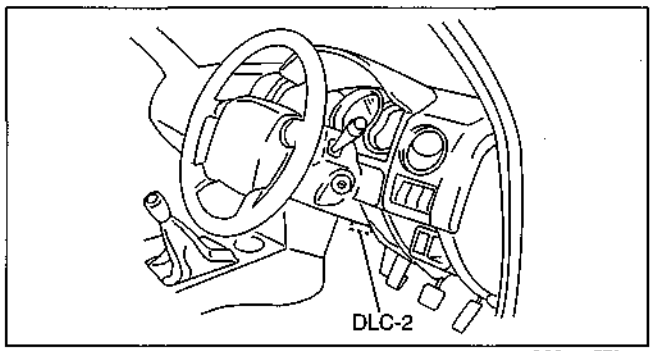
Active command modes

- This function allows you to control devices through the current diagnostic tool.

Reading DTCs Procedure

Using WDS

1. Connect the WDS to the DLC-2 connector.
2. Retrieve DTC using the WDS.



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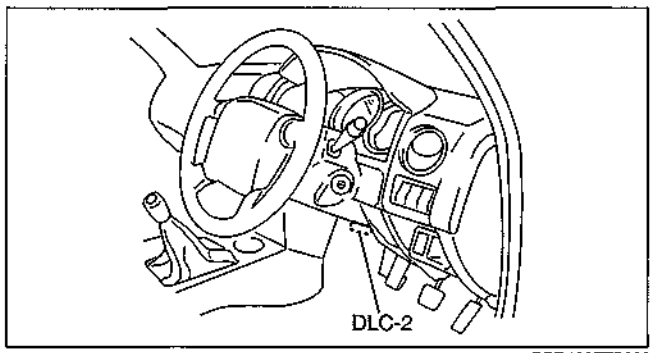
Using IDS/PDS

1. Connect the IDS/PDS to the DLC-2 connector.
2. After the vehicle is identified, select the following items from the initialization screen of the IDS/PDS.
   - When using the IDS (notebook PC)
     1. Select the "Toolbox" tab.
     2. Select "Self Test".
     3. Select "Module".
     4. Select "ABS".
   - When using the PDS (pocket PC)
     1. Select "Module Tests".
     2. Select "ABS".
     3. Select "Self Test".
3. Verify the DTC according to the directions on the screen.
   - If any DTCs are displayed, perform troubleshooting according to the corresponding DTC inspection.
4. After completion of repairs, clear all DTCs stored in the ABS HU/CM. (See 04-02B-2 Clearing DTCs Procedures.)



DBR402ZTB003

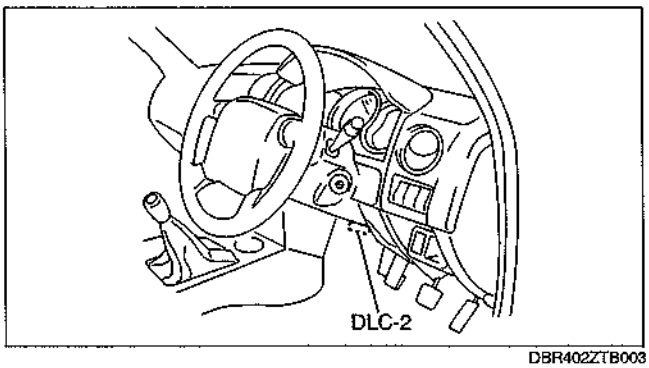
Clearing DTCs Procedures

Using WDS

1. After repairs have been made, perform the **DTCs reading procedure**.
2. Erase DTC using the WDS.
3. Ensure that the customer's concern has been resolved.

Using IDS/PDS

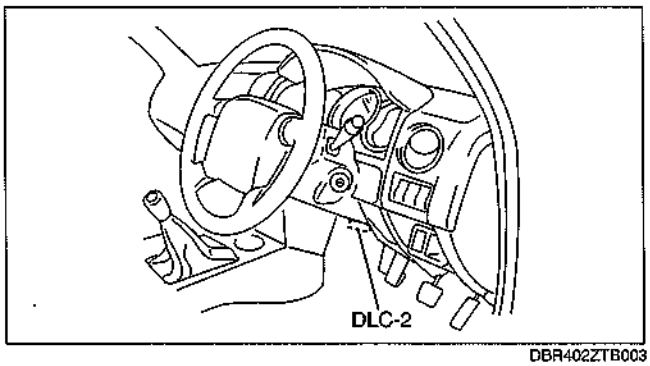
1. Connect the IDS/PDS to the vehicle DLC-2 connector.
2. After the vehicle is identified, select the following items from the initialization screen of the IDS/PDS.
   - When using the IDS (notebook PC)
     1. Select the "Toolbox" tab.
     2. Select "Self Test".
     3. Select "Module".
     4. Select "ABS".
   - When using the PDS (pocket PC)
     1. Select "Module Tests".
     2. Select "ABS".
     3. Select "Self Test".
3. Verify the DTC according to the directions on the screen.
4. Press the clear button on the DTC screen to clear the DTC.
5. Verify that no DTCs are displayed.



DBR402ZTB003

PID/Data Monitor and Record Procedure
Using WDS

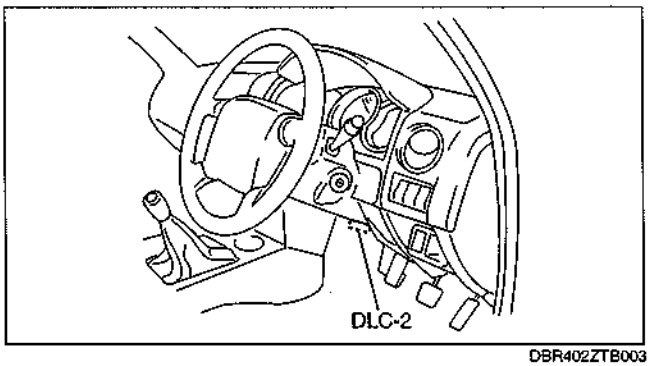
1. Connect the WDS to the vehicle DLC-2 connector.
2. Access and monitor PIDs using the WDS.



DBR402ZTB003

Using IDS/PDS

1. Connect the IDS/PDS to the DLC-2 connector.
2. After the vehicle is identified, select the following items from the initialization screen of the IDS/PDS.
   - When using the IDS (notebook PC)
     1. Select the "Toolbox" tab.
     2. Select "DataLogger".
     3. Select "Module".
     4. Select "ABS".
   - When using the PDS (pocket PC)
     1. Select "Module Tests".
     2. Select "ABS".
     3. Select "DataLogger".
3. Select the applicable PID from the PID table.
4. Verify the PID data according to the directions on the screen.



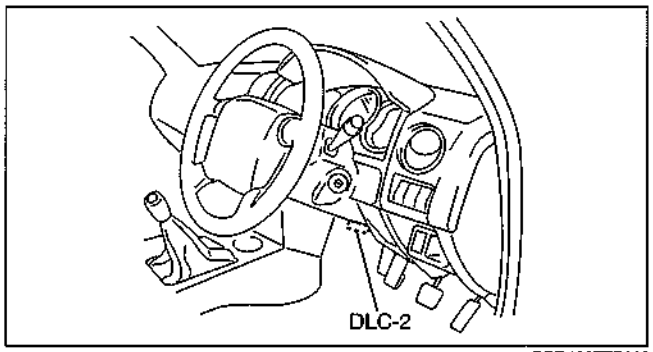
DBR402ZTB003

Note

- The PID data screen function is used for monitoring the calculated value. Therefore, if the monitored value of the output parts is not within the specification, inspection of the monitored value of input parts corresponding to applicable output part control is necessary. In addition, because the system does not display output part malfunction as abnormality in the monitored value, it is necessary to inspect the output part individually using a active command modes function.

Active Command Modes Procedure
Using WDS

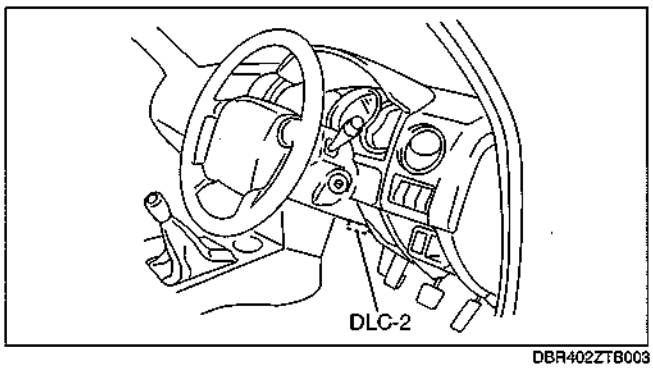
1. Connect the WDS to the vehicle DLC-2 connector.
2. Turn the engine switch to the ON position (engine off) or start the engine.
3. Activate active command modes using the WDS.



DBR402ZTB003

Using IDS/PDS

1. Connect the IDS/PDS to the DLC-2 connector.
2. After the vehicle is identified, select the following items from the initialization screen of the IDS/PDS.
   - When using the IDS (notebook PC)
     1. Select the "Toolbox" tab.
     2. Select "DataLogger".
     3. Select "Module".
     4. Select "ABS".
   - When using the PDS (pocket PC)
     1. Select "Module Tests".
     2. Select "ABS".
     3. Select "DataLogger".
3. Select the active command modes from the PID table.



DBR402ZTB003

4. Perform the active commands modes, inspect the operations for each parts.
   - If there is no operation sound from the relay, motor, and solenoid after the active commands mode inspection is performed, it is possible that there ia an open or short circuit in the wiring harness, relay, motor or solenoid, or sticking and operation malfunction.

DTC Table

DTC	System malfunction location	Page
B1317	Power supply system	(See 04-02B-7 DTC B1317, B1318 [4W-ABS].)
B1318	Power supply system	(See 04-02B-7 DTC B1317, B1318 [4W-ABS].)
B1342	ABS HU/CM system	(See 04-02B-8 DTC B1342 [4W-ABS].)
B1484	Brake switch system	(See 04-02B-8 DTC B1484 [4W-ABS].)
C1095	Pump motor, motor relay system	(See 04-02B-9 DTC C1095, C1096 [4W-ABS].)
C1096	Pump motor, motor relay system	(See 04-02B-9 DTC C1095, C1096 [4W-ABS].)
C1145	RF ABS wheel-speed sensor system	(See 04-02B-11 DTC C1145, C1155, C1165, C1175 [4W-ABS].)
C1155	LF ABS wheel-speed sensor system	(See 04-02B-11 DTC C1145, C1155, C1165, C1175 [4W-ABS].)
C1165	RR ABS wheel-speed sensor system	(See 04-02B-11 DTC C1145, C1155, C1165, C1175 [4W-ABS].)
C1175	LR ABS wheel-speed sensor system	(See 04-02B-11 DTC C1145, C1155, C1165, C1175 [4W-ABS].)
C1186	Fail-safe relay system	(See 04-02B-12 DTC C1186 [4W-ABS].)
C1194	LF outlet solenoid valve system	(See 04-02B-13 DTC C1194, C1198, C1202, C1206, C1210, C1214 [4W-ABS].)
C1198	LF inlet solenoid valve system	(See 04-02B-13 DTC C1194, C1198, C1202, C1206, C1210, C1214 [4W-ABS].)
C1202	Rear outlet solenoid valve system	(See 04-02B-13 DTC C1194, C1198, C1202, C1206, C1210, C1214 [4W-ABS].)
C1206	Rear inlet solenoid valve system	(See 04-02B-13 DTC C1194, C1198, C1202, C1206, C1210, C1214 [4W-ABS].)

DTC	System malfunction location	Page
C1210	RF outlet solenoid valve system	(See 04-02B-13 DTC C1194, C1198, C1202, C1206, C1210, C1214 [4W-ABS].)
C1214	RF inlet solenoid valve system	(See 04-02B-13 DTC C1194, C1198, C1202, C1206, C1210, C1214 [4W-ABS].)
C1222	ABS wheel-speed sensor (slip monitor) system	(See 04-02B-14 DTC C1222 [4W-ABS].)
C1233	LF ABS wheel-speed sensor/ABS sensor rotor system	(See 04-02B-16 DTC C1233, C1234, C1235, C1236 [4W-ABS].)
C1234	RF ABS wheel-speed sensor/ABS sensor rotor system	(See 04-02B-16 DTC C1233, C1234, C1235, C1236 [4W-ABS].)
C1235	RR ABS wheel-speed sensor/ABS sensor rotor system	(See 04-02B-16 DTC C1233, C1234, C1235, C1236 [4W-ABS].)
C1236	LR ABS wheel-speed sensor/ABS sensor rotor system	(See 04-02B-16 DTC C1233, C1234, C1235, C1236 [4W-ABS].)
C1414	Incorrect ABS HU/CM installed	(See 04-02B-17 DTC C1414 [4W-ABS].)
C1730*	G sensor system	(See 04-02B-18 DTC C1730, C1949, C1950 [4W-ABS].)
C1949*	G sensor system	(See 04-02B-18 DTC C1730, C1949, C1950 [4W-ABS].)
C1950*	G sensor system	(See 04-02B-18 DTC C1730, C1949, C1950 [4W-ABS].)

* : Hi-Rider, 4x4

PID/DATA Monitor Table

PID name (definition)	Unit/Condition	Operation condition (reference)	Action	ABS HU/CM terminal
ABS_LAMP (ABS warning light driver output state)	On/Off	• ABS warning light is illuminated: ON • ABS warning light is not illuminated: Off	Inspect the ABS warning light.	S
ABS_VOLT (System battery voltage value)	V	• Engine switch at ON: **Approx. 12.2 V** • Idling: **Approx. 14.1 V**	Inspect the power supply circuit. (See 04-13B-5 ABS HU/CM INSPECTION [4W-ABS].)	J
ACCLMTR* (Forward-G sensor input)	G	• Vehicle is stopped or driving at a constant speed: **0 G** • Cornering to left: Changes between **0 G and 1.5 G** • Cornering to right: Changes between **0 G and -1.5 G**	Inspect the G sensor. (See 04-13B-13 G SENSOR INSPECTION [4W-ABS].)	P
BOO_ABS (Brake pedal switch input)	On/Off	• Brake pedal depressed: On • Brake pedal released: Off	Inspect the brake switch. (See 04-11-6 BRAKE SWITCH INSPECTION.)	N
CCNTABS (Number of continuous codes)	—	• DTCs detected: **1—255** • No DTCs detected: **0**	Perform the DTC inspection.	—
PMP_MOTOR (Pump motor output state)	On/Off	• Pump motor activated: On • Pump motor not activated: Off	Inspect the ABS HU/CM. (See 04-13B-2 ABS HU/CM SYSTEM INSPECTION [4W-ABS].)	—
RLY_PMP (Pump motor relay output state)	On/Off	• Relay activated: On • Relay not activated: Off	Inspect the ABS HU/CM. (See 04-13B-2 ABS HU/CM SYSTEM INSPECTION [4W-ABS].)	—
RLY_VLV (Solenoid valve relay output state)	On/Off	• Solenoid valve relay is activated: On • Solenoid valve relay is deactivated: Off	Inspect ABS HU/CM. (See 04-13B-2 ABS HU/CM SYSTEM INSPECTION [4W-ABS].)	—
V_LF_INL (Left front inlet solenoid valve output state)	On/Off	• Solenoid valve activated: On • Solenoid valve not activated: Off	Inspect the ABS HU/CM. (See 04-13B-2 ABS HU/CM SYSTEM INSPECTION [4W-ABS].)	—

PID name (definition)	Unit/Condition	Operation condition (reference)	Action	ABS HU/CM terminal
V_LF_OTL (Left front outlet solenoid valve output state)	On/Off	• Solenoid valve activated: On • Solenoid valve not activated: Off	Inspect the ABS HU/CM. (See 04-13B-2 ABS HU/CM SYSTEM INSPECTION [4W-ABS].)	—
V_RF_INL (Right front inlet solenoid valve output state)	On/Off	• Solenoid valve activated: On • Solenoid valve not activated: Off	Inspect the ABS HU/CM. (See 04-13B-2 ABS HU/CM SYSTEM INSPECTION [4W-ABS].)	—
V_RF_OTL (Right front outlet solenoid valve output state)	On/Off	• Solenoid valve activated: On • Solenoid valve not activated: Off	Inspect the ABS HU/CM. (See 04-13B-2 ABS HU/CM SYSTEM INSPECTION [4W-ABS].)	—
V_Rear_ INL (Rear inlet solenoid valve output state)	On/Off	• Solenoid valve activated: On • Solenoid valve not activated: Off	Inspect the ABS HU/CM. (See 04-13B-2 ABS HU/CM SYSTEM INSPECTION [4W-ABS].)	—
V_Rear_OTL (Rear outlet solenoid valve output state)	On/Off	• Solenoid valve activated: On • Solenoid valve not activated: Off	Inspect the ABS HU/CM. (See 04-13B-2 ABS HU/CM SYSTEM INSPECTION [4W-ABS].)	—
WSPD_LF (Left front ABS wheel-speed sensor input)	KPH, MPH	• Vehicle stopped: **0 KPH, 0 MPH** • Vehicle running: Vehicle speed	Inspect the ABS wheel-speed sensor.	E, F
WSPD_LR (Left rear ABS wheel-speed sensor input)	KPH, MPH	• Vehicle stopped: **0 KPH, 0 MPH** • Vehicle running: Vehicle speed	Inspect the ABS wheel-speed sensor.	I, G
WSPD_RF (Right front ABS wheel-speed sensor input)	KPH, MPH	• Vehicle stopped: **0 KPH, 0 MPH** • Vehicle running: Vehicle speed	Inspect the ABS wheel-speed sensor.	O, M
WSPD_RR (Right rear ABS wheel-speed sensor input)	KPH, MPH	• Vehicle stopped: **0 KPH, 0 MPH** • Vehicle running: Vehicle speed	Inspect the ABS wheel-speed sensor.	L, K

* : Hi-Rider, 4x4

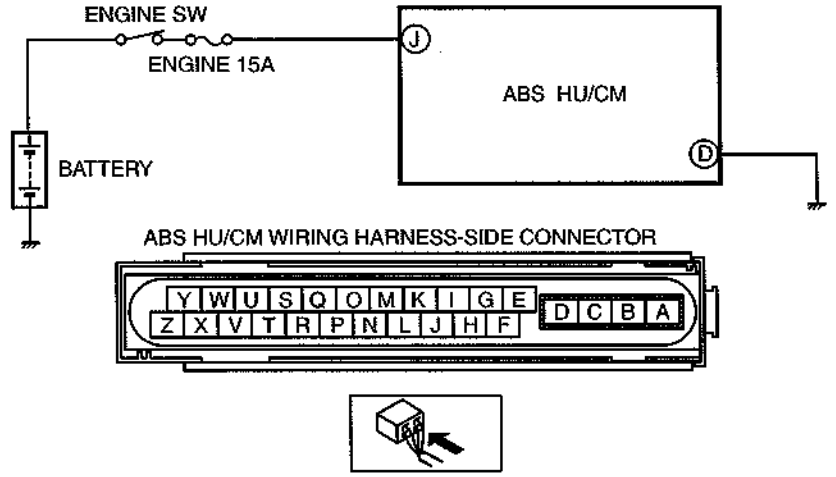
Active Command Modes Table

Command name	Output part	Operation	Operating condition
PMP_MOTOR	Pump motor	On/Off	Engine switch at ON
V_LF_INL	LF inlet solenoid valve		
V_LF_OTL	LF outlet solenoid valve		
V_Rear_INL	Rear inlet solenoid valve		
V_Rear_OTL	Rear outlet solenoid valve		
V_RF_INL	RF inlet solenoid valve		
V_RF_OTL	RF outlet solenoid valve		

DTC B1317, B1318 [4W-ABS]

dcf040200000w17

DTC B1317, B1318	Power supply system
DETECTION CONDITION	• B1317 — The voltage at ABS HU/CM terminal J **16.8 V** or more. • B1318 — The vehicle speed exceeds **6 km/h {3.7 mph}** and the voltage at ABS HU/CM terminal J is less than **9.6 V**.
POSSIBLE CAUSE	• ENGINE 15 A fuse malfunction • Open circuit or short to ground in the wiring harness between the ABS HU/CM terminal J and the battery • Open circuit or faulty ground in the wiring harness between the ABS HU/CM terminal D and the body ground • Battery deterioration • Generator malfunction • Poor connection at connectors (female terminal)



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT BATTERY VOLTAGE** • Is the battery terminal voltage normal?	Yes	Make sure that battery terminal connection is normal. Go to the next step.
		No	Charge or replace the battery, then go to Step 6. (See 01-17-4 BATTERY RECHARGING.) (See 01-17-2 BATTERY REMOVAL/INSTALLATION.)
2	**INSPECT BATTERY GRAVITY** • Is battery specific gravity as specified?	Yes	Go to the next step.
		No	Replace the battery, then go to Step 6. (See 01-17-2 BATTERY REMOVAL/INSTALLATION.)
3	**INSPECT CHARGING SYSTEM** • Are the generator and drive belt tensions normal?	Yes	Go to the next step.
		No	Inspect generator and/or drive belt as necessary, then go to Step 6. (See 01-10A-3 DRIVE BELT INSPECTION [WL-3].) (See 01-10B-3 DRIVE BELT INSPECTION [WL-C, WE-C].) (See 01-17-5 GENERATOR INSPECTION.)
4	**INSPECT ABS HU/CM POWER SUPPLY FOR OPEN CIRCUIT** • Start the engine. • Measure the voltage between ABS HU/CM terminal J and ground. • Is the voltage **approx. 10 V**?	Yes	Go to the next step.
		No	Repair or replace the wiring harness for open circuit between the ABS HU/CM and ground, then go to Step 6.
5	**INSPECT ABS HU/CM GROUND FOR POOR GROUND OR OPEN CIRCUIT** • Turn the engine switch off. • Measure the resistance between ground and ABS HU/CM terminal D. • Is the resistance **within 0—1 ohm**?	Yes	Go to the next step.
		No	If there is no continuity: • Repair or replace the wiring harness for open circuit between the ABS HU/CM and ground, then go to the next step. If the resistance is not **within 0—1 ohm**: • Repair or replace harness for poor ground, then go to the next step.

STEP	INSPECTION		ACTION
6	**VERIFY TROUBLESHOOTING COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear the DTC from the memory. (See 04-02B-2 Clearing DTCs Procedures.) • Start the engine and drive the vehicle at **6 km/h {3.5 mph} or more**. • Is the same DTC present?	Yes	Replace the ABS HU/CM, then go to the next step. (See 04-13B-3 ABS HU/CM REMOVAL/INSTALLATION [4W-ABS].)
		No	Go to the next step.
7	**VERIFY AFTER REPAIR PROCEDURE** • Are any other DTCs present?	Yes	Go to the applicable DTC inspection. (See 04-02B-4 DTC Table.)
		No	DTC troubleshooting completed.

DTC B1342 [4W-ABS]

dcf040200000w18

DTC B1342	ABS HU/CM system
DETECTION CONDITION	• The ABS HU/CM on-board diagnostic function detects control module malfunction.
POSSIBLE CAUSE	• ABS HU/CM internal malfunction

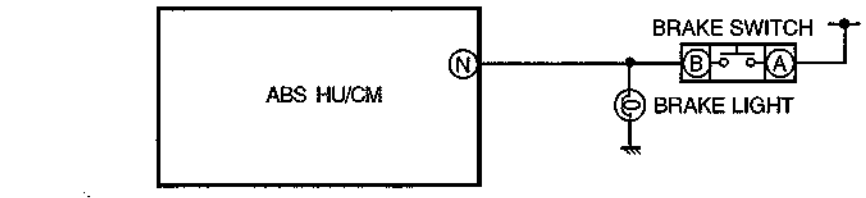
Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY CURRENT STATUS OF MALFUNCTION** • Clear the DTC from the memory. (See 04-02B-2 Clearing DTCs Procedures.) • Is same DTC present?	Yes	Replace the ABS HU/CM, then go to the next step. (See 04-13B-3 ABS HU/CM REMOVAL/INSTALLATION [4W-ABS].)
		No	Go to the next step.
2	**VERIFY AFTER REPAIR PROCEDURE** • Are any other DTCs present?	Yes	Go to the applicable DTC inspection. (See 04-02B-4 DTC Table.)
		No	DTC troubleshooting completed.

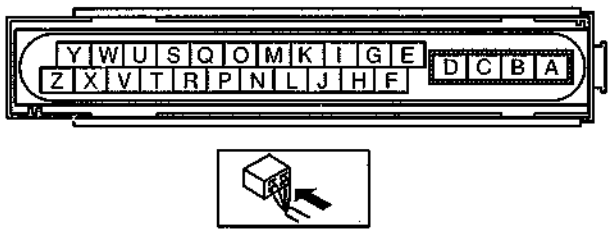
DTC B1484 [4W-ABS]

dcf040200000w19

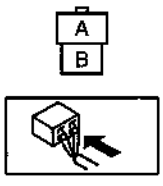
DTC B1484	Brake switch system
DETECTION CONDITION	• Open circuit in the wiring harness between the ABS HU/CM terminal and the brake switch terminal
POSSIBLE CAUSE	• Brake switch malfunction • Open circuit in the wiring harness between the ABS HU/CM terminal N and the brake switch terminal



ABS HU/CM WIRING HARNESS-SIDE CONNECTOR



BRAKE SWITCH WIRING HARNESS-SIDE CONNECTOR



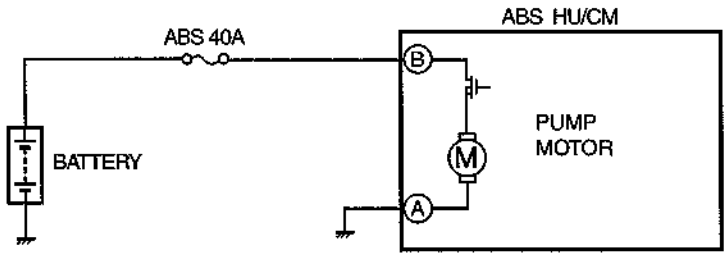
Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT WIRING HARNESS BETWEEN ABS HU/CM AND BRAKE SWITCH FOR CONTINUITY** • Turn the engine switch off. • Disconnect the ABS HU/CM connector. • Is B+ correctly applied to ABS HU/CM connector terminal N when brake pedal depressed?	Yes	Go to Step 3.
		No	Go to the next step.
2	**INSPECT BRAKE SWITCH** • Inspect the brake switch. (See 04-11-6 BRAKE SWITCH INSPECTION.) • Is the brake switch normal?	Yes	Repair or replace the wiring harness for open circuit between ABS HU/CM and brake switch, then go to the next step.
		No	Replace the brake switch, then go to the next step. (See 04-11-5 BRAKE SWITCH REMOVAL/INSTALLATION.)
3	**VERIFY TROUBLESHOOTING COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear the DTC from the memory. (See 04-02B-2 Clearing DTCs Procedures.) • Are the same DTCs present?	Yes	Replace the ABS HU/CM, then go to the next step. (See 04-13B-3 ABS HU/CM REMOVAL/INSTALLATION [4W-ABS].)
		No	Go to the next step.
4	**VERIFY AFTER REPAIR PROCEDURE** • Are any other DTC present?	Yes	Go to the applicable DTC inspection. (See 04-02B-4 DTC Table.)
		No	DTC troubleshooting completed.

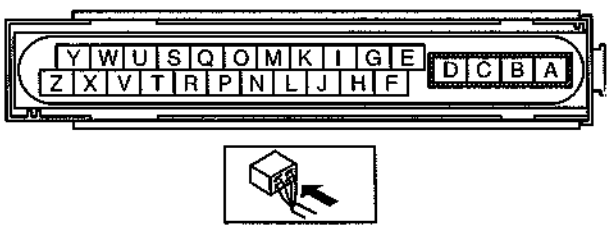
DTC C1095, C1096 [4W-ABS]

dcf040200000w20

DTC C1095, C1096	Pump motor, motor relay system
DETECTION CONDITION	• C1095 — When the pump motor monitor voltage remains at **2.0 V** or more for **1 s**. — ABS motor monitor OFF signal is input within specified time limit when the motor signal is switched from ON to OFF by ABS CM. • C1096 — When the difference between the battery power supply voltage and pump motor power supply voltage remains at **4.0 V** or more for **0.1 s** or more while the pump motor is operating.
POSSIBLE CAUSE	• ABS 40 A fuse malfunction • Open or short to ground circuit in the wiring harness between the battery and the ABS HU/CM terminal B • Open circuit in the wiring harness between the ABS HU/CM terminal A and the body ground • Open or short circuit in the ABS HU/CM internal motor relay, or stuck motor relay • Open or short circuit in the ABS HU/CM internal motor, or frozen motor • Fail-safe relay malfunction • Poor connection at connectors (female terminal)



ABS HU/CM WIRING HARNESS-SIDE CONNECTOR



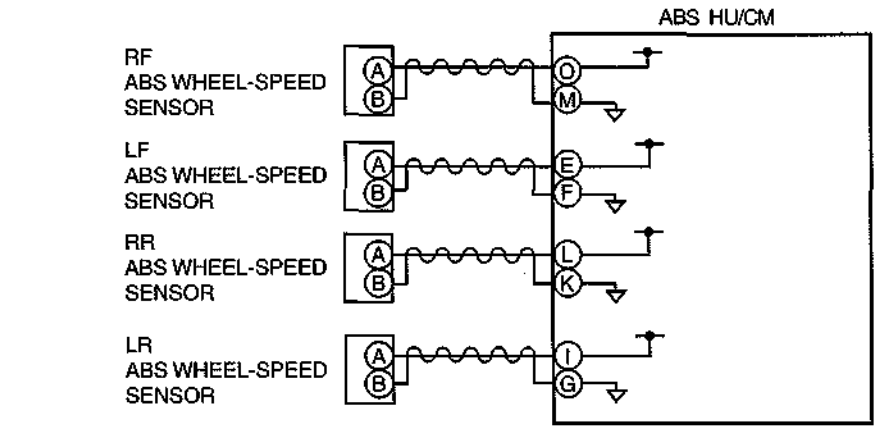
Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT ABS FUSE CONDITION** • Is the ABS 40A fuse normal?	Yes	Go to the next step.
		No	Replace the fuse, then go to Step 5.
2	**INSPECT MOTOR RELAY POWER SUPPLY FOR OPEN CIRCUIT** • Turn the engine switch off. • Disconnect ABS HU/CM connector. • Turn the engine switch to the ON position (engine off). • Measure voltage between ABS HU/CM terminal B (harness-side) and ground. • Is the voltage **B+**?	Yes	Go to the next step.
		No	Repair or replace the wiring harness for open circuit between battery positive terminal and ABS HU/CM terminal B, then go to Step 5.
3	**INSPECT PUMP MOTOR GROUND FOR OPEN CIRCUIT** • Turn the engine switch off. • Inspect for continuity between ABS HU/CM terminal A (harness-side) and ground. • Is there continuity?	Yes	Go to the next step.
		No	Repair or replace the wiring harness for open circuit between ABS HU/CM terminal A and ground, then go to the next step.
4	**VERIFY PUMP MOTOR OPERATION** • Turn the engine switch off. • Connect the current diagnostic tool to the DLC-2. • Turn the engine switch to the ON position (engine off). • Access PMP_MOTOR active command modes using the current diagnostic tool. • Does the pump motor operate?	Yes	Go to the next step.
		No	Replace the ABS HU/CM, then go to the next step. (See 04-13B-3 ABS HU/CM REMOVAL/INSTALLATION [4W-ABS].)
5	**VERIFY TROUBLESHOOTING COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear the DTC from the memory. (See 04-02B-2 Clearing DTCs Procedures.) • Start the engine and drive the vehicle at **12 km/h {7.5 mph} or more.** • Gradually slow down and stop the vehicle. • Is the same DTC present?	Yes	Replace the ABS HU/CM, then go to the next step. (See 04-13B-3 ABS HU/CM REMOVAL/INSTALLATION [4W-ABS].)
		No	Go to the next step.
6	**VERIFY AFTER REPAIR PROCEDURE** • Are any other DTCs present?	Yes	Go to the applicable DTC inspection. (See 04-02B-4 DTC Table.)
		No	DTC troubleshooting completed.

DTC C1145, C1155, C1165, C1175 [4W-ABS]

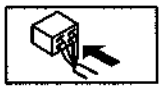
dcf040200000w21

DTC	C1145 C1155 C1165 C1175	**RF ABS wheel-speed sensor system** **LF ABS wheel-speed sensor system** **RR ABS wheel-speed sensor system** **LR ABS wheel-speed sensor system**
DETECTION CONDITION	• Open circuit or short to ground has been detected in the ABS wheel-speed sensor wiring harness on any of the four vehicle wheels.	
POSSIBLE CAUSE	• Open circuit or short to ground in the wiring harness between the following ABS HU/CM terminal and the ABS wheel-speed sensor terminal: — ABS HU/CM terminal O—RF ABS wheel-speed sensor terminal A — ABS HU/CM terminal M—RF ABS wheel-speed sensor terminal B — ABS HU/CM terminal E—LF ABS wheel-speed sensor terminal A — ABS HU/CM terminal F—LF ABS wheel-speed sensor terminal B — ABS HU/CM terminal L—RR ABS wheel-speed sensor terminal A — ABS HU/CM terminal K—RR ABS wheel-speed sensor terminal B — ABS HU/CM terminal I—LR ABS wheel-speed sensor terminal A — ABS HU/CM terminal G—LR ABS wheel-speed sensor terminal B • ABS wheel-speed sensor malfunction • Poor connection at connectors (female terminal)	



ABS WHEEL-SPEED SENSOR WIRING HARNESS-SIDE CONNECTOR

ABS HU/CM WIRING HARNESS-SIDE CONNECTOR



Diagnostic procedure

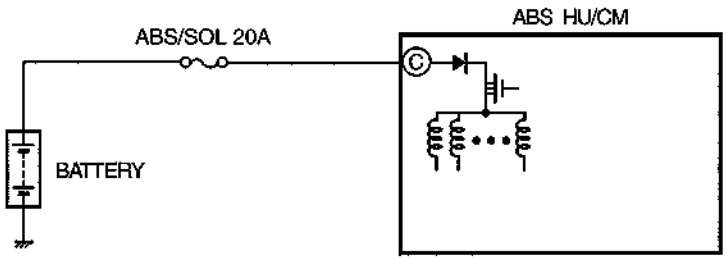
STEP	INSPECTION		ACTION
1	**INSPECT PID TO VERIFY THAT WHEEL SPEED-SIGNALS ARE TRANSMITTED FROM ABS WHEEL- SPEED SENSOR USING CURRENT DIAGNOSTIC TOOL** • Turn the engine switch off. • Connect the current diagnostic tool to the DLC-2. • Select the following PIDs using the current diagnostic tool: WSPD_LF WSPD_LR WSPD_RF WSPD_RR • Drive the vehicle. • Verify that the wheel speed-signals are transmitted from each ABS wheel-speed sensor. • Are the wheel-speed signals transmitted?	Yes	Go to Step 3.
		No	Go to the next step.

STEP	INSPECTION		ACTION
2	**INSPECT FOR OPEN CIRCUIT IN WIRING HARNESS BETWEEN ABS HU/CM AND ABS WHEEL-SPEED SENSOR** • Turn the engine switch off. • Disconnect the ABS HU/CM connector and ABS wheel-speed sensor. • Inspect for continuity in the wiring harness between the following ABS wheel-speed sensor connectors on the vehicle wiring harness-side and ABS HU/CM connectors. — RF ABS wheel-speed sensor (+): O—A — RF ABS wheel-speed sensor (–): M—B — LF ABS wheel-speed sensor (+): E—A — LF ABS wheel-speed sensor (–): F—B — RR ABS wheel-speed sensor (+): L—A — RR ABS wheel-speed sensor (–): K—B — LR ABS wheel-speed sensor (+): I—A — LR ABS wheel-speed sensor (–): G—B • Is there continuity?	Yes	Replace the ABS wheel-speed sensor, then go to the next step. (See 04-13B-7 FRONT ABS WHEEL-SPEED SENSOR REMOVAL/INSTALLATION [4W-ABS (4x2 (EXCEPT Hi-Rider))].) (See 04-13B-8 FRONT ABS WHEEL-SPEED SENSOR REMOVAL/INSTALLATION [4W-ABS (Hi-Rider, 4x4)].) (See 04-13B-10 REAR ABS WHEEL-SPEED SENSOR REMOVAL/INSTALLATION [4W-ABS (4x2 (EXCEPT Hi-Rider))].) (See 04-13B-11 REAR ABS WHEEL-SPEED SENSOR REMOVAL/INSTALLATION [4W-ABS (Hi-Rider, 4x4)].)
		No	Repair or replace the wiring harness, then go to the next step.
3	**VERIFY THAT THE SAME DTC IS NOT PRESENT** • Clear the DTCs from the memory. (See 04-02B-2 Clearing DTCs Procedures.) • Start the engine and drive the vehicle at **12 km/h {7.5 mph} or more**. • Are the same DTCs present?	Yes	Repeat the inspection from Step 1. If the malfunction recurs, replace the ABS HU/CM, then go to the next step. (See 04-13B-3 ABS HU/CM REMOVAL/INSTALLATION [4W-ABS].)
		No	Go to the next step.
4	**VERIFY THAT NO OTHER DTCS ARE PRESENT** • Are any other DTCs output?	Yes	Go to the applicable DTC inspection. (See 04-02B-4 DTC Table.)
		No	DTC troubleshooting completed.

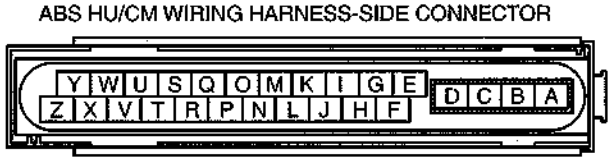
DTC C1186 [4W-ABS]

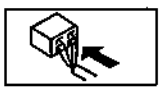
dcf040200000w23

DTC C1186	Fail-safe relay system
DETECTION CONDITION	• ABS HU/CM internal valve relay remains OFF when valve relay ON is commanded. • ABS HU/CM internal valve relay remains ON (stuck) when valve relay OFF is commanded.
POSSIBLE CAUSE	• ABS/SOL 20 A fuse malfunction • Open circuit or short to ground in the wiring harness between the battery and the ABS HU/CM terminal C • Open or short circuit in the ABS HU/CM internal valve relay, or stuck valve relay • Poor connection at connectors (female terminal)



ABS HU/CM WIRING HARNESS-SIDE CONNECTOR





Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT ABS FUSE CONDITION** • Is the ABS/SOL 20 A fuse normal?	Yes	Go to the next step.
		No	Replace the fuse, then go to Step 3.
2	**INSPECT VALVE RELAY POWER SUPPLY FOR OPEN CIRCUIT** • Turn the engine switch off. • Disconnect ABS HU/CM connector. • Turn the engine switch to the ON position (engine off). • Measure voltage between ABS HU/CM terminal C (harness-side) and ground. • Is voltage **B+**?	Yes	Go to the next step.
		No	Repair or replace the wiring harness for open circuit between battery positive terminal and ABS HU/CM terminal C, then go to the next step.
3	**VERIFY TROUBLESHOOTING COMPLETED** • Clear the DTC from the memory. (See 04-02B-2 Clearing DTCs Procedures.) • Is the same DTC present?	Yes	Replace the ABS HU/CM, then go to next step. (See 04-13B-3 ABS HU/CM REMOVAL/INSTALLATION [4W-ABS].)
		No	Go to the next step.
4	**VERIFY AFTER REPAIR PROCEDURE** • Are any other DTCs present?	Yes	Go to the applicable DTC inspection. (See 04-02B-4 DTC Table.)
		No	DTC troubleshooting completed.

DTC C1194, C1198, C1202, C1206, C1210, C1214 [4W-ABS]

dcf040200000w24

DTC	**C 1194**	**LF outlet solenoid valve system**
	C 1198	**LF inlet solenoid valve system**
	C 1202	**Rear outlet solenoid valve system**
	C 1206	**Rear inlet solenoid valve system**
	C 1210	**RF outlet solenoid valve system**
	C 1214	**RF inlet solenoid valve system**
DETECTION CONDITION	• Solenoid valve operation does not correspond to solenoid ON/OFF commands from the ABS HU/CM.	
POSSIBLE CAUSE	• Open or short circuit in the ABS HU/CM internal solenoid valves • Solenoid valve malfunction • Poor connection at connectors (female terminal)	

Diagnostic procedure

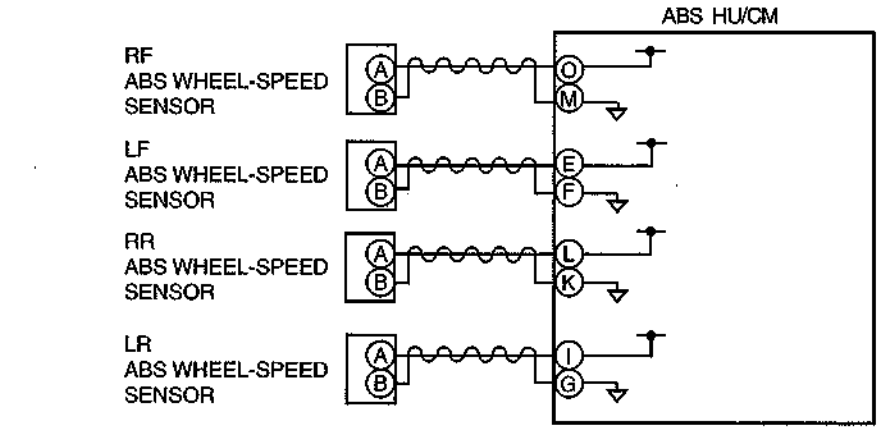
STEP	INSPECTION		ACTION
1	**VERIFY SOLENOID VALVE OPERATION** • Turn the engine switch off. • Connect the current diagnostic tool to the DLC-2. • Turn the engine switch to the ON position (engine off). • Access the active command mode for the solenoid valve using the current diagnostic tool. • Does the solenoid valve operate?	Yes	Go to the next step.
		No	Replace the ABS HU/CM, then go to the next step. (See 04-13B-3 ABS HU/CM REMOVAL/INSTALLATION [4W-ABS].)
2	**VERIFY DTC TROUBLESHOOTING COMPLETED** • Clear the DTC from the memory. (See 04-02B-2 Clearing DTCs Procedures.) • Start the engine and drive the vehicle at **12 km/h {7.5 mph} or more**. • Gradually slow down and stop vehicle. • Are the same DTCs present?	Yes	Repeat the inspection from Step 1. If the malfunction recurs, replace the ABS HU/CM, then go to the next step. (See 04-13B-3 ABS HU/CM REMOVAL/INSTALLATION [4W-ABS].)
		No	Go to the next step.
3	**VERIFY AFTER REPAIR PROCEDURE** • Are any other DTCs present?	Yes	Go to the applicable DTC inspection. (See 04-02B-4 DTC Table.)
		No	DTC troubleshooting completed.

DTC C1222 [4W-ABS]

dcf040200000w25

Note
- DTC C1222 will be detected when a malfunctioning ABS wheel-speed sensor cannot be specified.

DTC C1222	ABS wheel-speed sensor (slip monitor) system
DETECTION CONDITION	• Difference between any vehicle wheel speeds exceeds specification when driving at a constant speed. • ABS control operates for **60 s** or more.
POSSIBLE CAUSE	• ABS wheel-speed sensor malfunction (low output, metal shavings on sensor) • ABS sensor rotor malfunction (chipping of sensor rotor teeth) • Poor installation of ABS wheel-speed sensor and/or sensor rotor (If the sensor rotor is installed at an angle, it may cause output of abnormal wave pattern at high speeds.) • Excessive clearance between the ABS wheel-speed sensor and sensor rotor



ABS WHEEL-SPEED SENSOR WIRING HARNESS-SIDE CONNECTOR

ABS HU/CM WIRING HARNESS-SIDE CONNECTOR

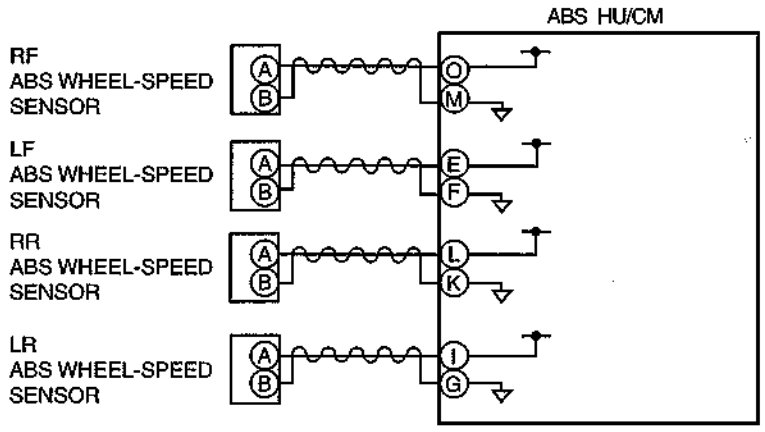
Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT PID FOR ABNORMAL OUTPUT FROM ABS WHEEL-SPEED SENSOR USING CURRENT DIAGNOSTIC TOOL** • Turn the engine switch off. • Connect the current diagnostic tool to the DLC-2. • Select the following PIDs using the current diagnostic tool: WSPD_LF WSPD_LR WSPD_RF WSPD_RR • Start the engine and drive the vehicle. • Verify that the PIDs of the four ABS wheel-speed sensors correspond approximately. • Do the vehicle speeds correspond?	Yes	Go to Step 4.
		No	If there is a difference in speeds of the four wheels, go to the next step.
2	**INSPECT IF MALFUNCTION OCCURRED DUE TO IMPROPER SENSOR CLEARANCE** • Inspect the clearance between the ABS wheel-speed sensor and the ABS sensor rotor. **Clearance** **0.30—1.1 mm {0.012—0.043 in}**	Yes	Go to the next step.
		No	Replace the rear ABS wheel-speed sensor, then go to Step 4. (See 04-13B-7 FRONT ABS WHEEL-SPEED SENSOR REMOVAL/INSTALLATION [4W-ABS (4x2 (EXCEPT Hi-Rider))].) (See 04-13B-8 FRONT ABS WHEEL-SPEED SENSOR REMOVAL/INSTALLATION [4W-ABS (Hi-Rider, 4x4)].) (See 04-13B-10 REAR ABS WHEEL-SPEED SENSOR REMOVAL/INSTALLATION [4W-ABS (4x2 (EXCEPT Hi-Rider))].) (See 04-13B-11 REAR ABS WHEEL-SPEED SENSOR REMOVAL/INSTALLATION [4W-ABS (Hi-Rider, 4x4)].)
3	**VISUALLY INSPECT ABS SENSOR ROTOR FOR FOREIGN MATERIAL ADHERING OR IMPROPER INSTALLATION** • Is the result normal?	Yes	Go to the next step.
		No	Replace the front wheel hub component, front drive shaft or rear axle shaft, then go to the next step. (See 03-11-4 WHEEL HUB, STEERING KNUCKLE REMOVAL/INSTALLATION [4x2 (EXCEPT Hi-Rider)].) (See 03-13-2 FRONT DRIVE SHAFT REMOVAL/INSTALLATION.) (See 03-12-2 AXLE SHAFT REMOVAL/INSTALLATION.)
4	**VERIFY DTC TROUBLESHOOTING COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear the DTC from the memory. (See 04-02B-2 Clearing DTCs Procedures.) • Start the engine and drive the vehicle at **12 km/h {7.5 mph} or more**. • Are the same DTCs present?	Yes	Repeat the inspection from Step **1**. If the malfunction recurs, replace the ABS HU/CM. (See 04-13B-3 ABS HU/CM REMOVAL/INSTALLATION [4W-ABS].)
		No	Go to the next step.
5	**VERIFY AFTER REPAIR PROCEDURE** • Are any other DTCs present?	Yes	Go to the applicable DTC inspection. (See 04-02B-4 DTC Table.)
		No	DTC troubleshooting completed.

DTC C1233, C1234, C1235, C1236 [4W-ABS]

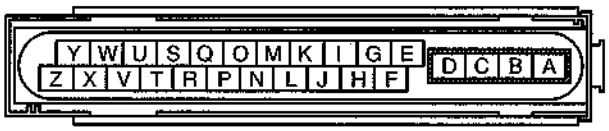
dcf040200000w26

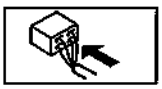
DTC	C1233 C1234 C1235 C1236	**LF ABS wheel-speed sensor (short to ground) system** **RF ABS wheel-speed sensor (short to ground) system** **RR ABS wheel-speed sensor (short to ground) system** **LR ABS wheel-speed sensor (short to ground) system**
DETECTION CONDITION	• The vehicle wheel speed of any of the four vehicle wheels is **2.75 km/h {1.71 mph} or less** when driving at the specified vehicle speed or more.	
POSSIBLE CAUSE	• Short to ground in the wiring harness between the following ABS HU/CM terminal and the ABS wheel-speed sensor terminal: — ABS HU/CM terminal O—RF ABS wheel-speed sensor terminal A — ABS HU/CM terminal M—RF ABS wheel-speed sensor terminal B — ABS HU/CM terminal E—LF ABS wheel-speed sensor terminal A — ABS HU/CM terminal F—LF ABS wheel-speed sensor terminal B — ABS HU/CM terminal L—RR ABS wheel-speed sensor terminal A — ABS HU/CM terminal K—RR ABS wheel-speed sensor terminal B — ABS HU/CM terminal I—LR ABS wheel-speed sensor terminal A — ABS HU/CM terminal G—LR ABS wheel-speed sensor terminal B • ABS wheel-speed sensor malfunction • Poor connection at connectors (female terminal)	



ABS WHEEL-SPEED SENSOR WIRING HARNESS-SIDE CONNECTOR

ABS HU/CM WIRING HARNESS-SIDE CONNECTOR





Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT PID TO VERIFY THAT WHEEL SPEED-SIGNALS ARE TRANSMITTED FROM ABS WHEEL- SPEED SENSOR USING CURRENT DIAGNOSTIC TOOL** • Turn the engine switch off. • Connect the current diagnostic tool to the DLC-2. • Select the following PIDs using the current diagnostic tool: WSPD_LF WSPD_LR WSPD_RF WSPD_RR • Drive the vehicle. • Verify that the wheel speed-signals are transmitted from each ABS wheel-speed sensor. • Are the wheel-speed signals transmitted?	Yes	Go to Step 3.
		No	Go to the next step.

STEP	INSPECTION		ACTION
2	**INSPECT A SHORT TO GROUND IN THE WIRING HARNESS BETWEEN THE ABS HU/CM AND THE ABS WHEEL-SPEED SENSOR** • Turn the engine switch off. • Disconnect the ABS HU/CM connector and the ABS wheel-speed sensor connector. • Inspect for a short to ground in the wiring harness between the following ABS wheel-speed sensor connectors on the vehicle wiring harness-side and ABS HU/CM connectors. — RF ABS wheel-speed sensor (+): O—A — RF ABS wheel-speed sensor (–): M—B — LF ABS wheel-speed sensor (+): E—A — LF ABS wheel-speed sensor (–): F—B — RR ABS wheel-speed sensor (+): L—A — RR ABS wheel-speed sensor (–): K—B — LR ABS wheel-speed sensor (+): I—A — LR ABS wheel-speed sensor (–): G—B • Is there continuity?	Yes	Replace the rear ABS wheel-speed sensor, then go to Step 4. (See 04-13B-7 FRONT ABS WHEEL-SPEED SENSOR REMOVAL/INSTALLATION [4W-ABS (4x2 (EXCEPT Hi-Rider))].) (See 04-13B-8 FRONT ABS WHEEL-SPEED SENSOR REMOVAL/INSTALLATION [4W-ABS (Hi-Rider, 4x4)].) (See 04-13B-10 REAR ABS WHEEL-SPEED SENSOR REMOVAL/INSTALLATION [4W-ABS (4x2 (EXCEPT Hi-Rider))].) (See 04-13B-11 REAR ABS WHEEL-SPEED SENSOR REMOVAL/INSTALLATION [4W-ABS (Hi-Rider, 4x4)].)
		No	Repair or replace the wiring harness, then go to the next step.
3	**VERIFY THAT THE SAME DTC IS NOT PRESENT** • Clear the DTCs from the memory. (See 04-02B-2 Clearing DTCs Procedures.) • Start the engine and drive the vehicle at **12 km/h {7.5 mph} or more.** • Are the same DTCs present?	Yes	Repeat the inspection from Step 1. If the malfunction recurs, replace the ABS HU/CM, then go to the next step. (See 04-13B-3 ABS HU/CM REMOVAL/INSTALLATION [4W-ABS].)
		No	Go to the next step.
4	**VERIFY THAT NO OTHER DTCS ARE PRESENT** • Are any other DTCs output?	Yes	Go to the applicable DTC inspection. (See 04-02B-4 DTC Table.)

04

DTC C1414 [4W-ABS]

dcf040200000w27

DTC C1414	ABS HU/CM unit mismatched installation
DETECTION CONDITION	• When G sensor signal input for **more than 1 s** to 4x2 (except Hi-Rider) vehicle-type ABS HU/CM.
POSSIBLE CAUSE	• Mismatched installation of ABS HU/CM — 4x2 (except Hi-Rider) vehicle type ABS HU/CM is mismatched installed on Hi-Rider and 4x4 vehicle.

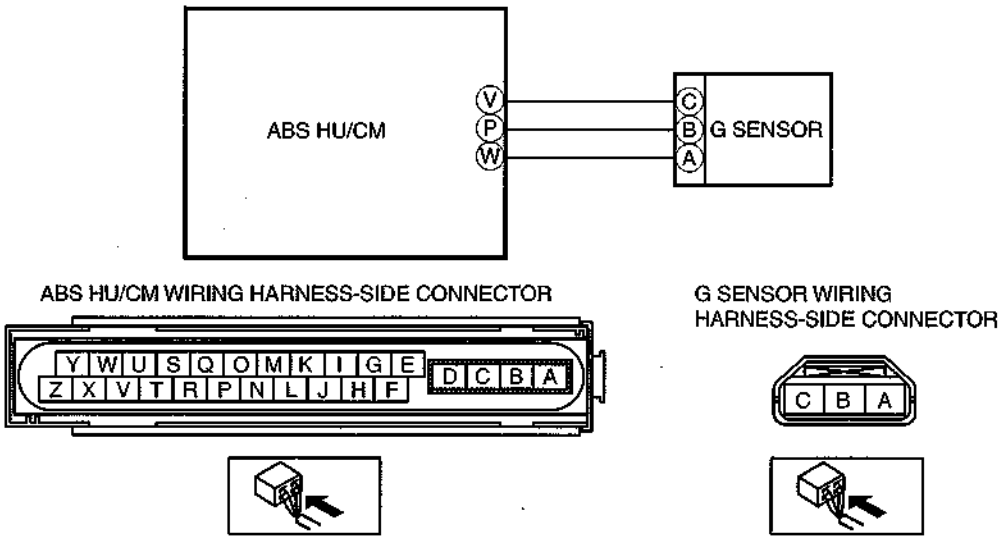
Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT ABS HU/CM FOR MISMATCHED INSTALLATION** • Verify ABS HU/CM part number • Has a ABS HU/CM with the correct part number been installed?	Yes	Go to next step.
		No	Replace with correct ABS HU/CM part number, then go to next step.
2	**VERIFY CURRENT STATUS OF MALFUNCTION** • Clear DTC from memory. (See 04-02B-2 Clearing DTCs Procedures) • Is same DTC present?	Yes	Replace ABS HU/CM. (See 04-13B-3 ABS HU/CM REMOVAL/INSTALLATION [4W-ABS].)
		No	Go to next step.
3	**VERIFY THAT NO OTHER DTCS ARE PRESENT** • Are any other DTCs output?	Yes	Go to the applicable DTC inspection. (See 04-02B-4 DTC Table.)

DTC C1730, C1949, C1950 [4W-ABS]

dcf040200000w28

DTC	C1730, C1949, C1950	G sensor
DETECTION CONDITION	• C1730 — Voltage to G sensor is detected out of range • C1949 — Monitor voltage of G sensor is detected at **4.7 V or more**, or **0.3 V or less** for more than **1 s**. • C1950 — G sensor 0-point correction value is default or more — Output voltage value from G sensor remains absolutely unchanged	
POSSIBLE CAUSE	• Open circuit in harness between ABS HU/CM terminal V and G sensor terminal C • Open, short to power, or short to ground circuit in harness between ABS HU/CM terminal P and G sensor terminal B • Open circuit in harness between ABS HU/CM terminal W and G sensor terminal A • Malfunction of G sensor	



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT G SENSOR POWER SUPPLY CIRCUIT FOR OPEN CIRCUIT** • Turn engine switch to ON (engine OFF). • Measure voltage between G sensor terminal C (harness side) and ground. • Is voltage **B+**?	Yes	Go to the next step.
		No	Repair or replace harness for open circuit between G sensor terminal C and engine switch, then go to Step 7.
2	**INSPECT G SENSOR GROUND CIRCUIT FOR OPEN CIRCUIT** • Turn engine switch to OFF. • Disconnect ABS HU/CM and G sensor connectors. • Inspect continuity between ABS HU/CM terminal W (harness side) and G sensor terminal A (harness side). • Is there continuity?	Yes	Go to the next step.
		No	Repair or replace harness for open circuit between ABS HU/CM terminal W and G sensor terminal A, then go to Step 7.
3	**INSPECT G SENSOR SIGNAL CIRCUIT FOR OPEN CIRCUIT** • Inspect continuity between ABS HU/CM terminal P (harness side) and G sensor terminal B (harness side). • Is there continuity?	Yes	Go to the next step.
		No	Repair or replace harness for open circuit between ABS HU/CM terminal P and G sensor terminal B, then go to Step 7.
4	**INSPECT G SENSOR SIGNAL CIRCUIT FOR SHORT TO POWER** • Turn engine switch to ON (engine OFF). • Measure voltage between ABS HU/CM terminal P (harness side) and ground. • Is voltage **B+**?	Yes	Repair or replace harness for short to power circuit between ABS HU/CM terminal P and G sensor terminal B, then go to Step 7.
		No	Go to the next step.

STEP	INSPECTION		ACTION
5	**INSPECT G SENSOR SIGNAL CIRCUIT FOR SHORT TO GROUND** • Turn engine switch to OFF. • Inspect continuity between ABS HU/CM terminal P (harness side) and ground. • Is there continuity?	Yes	Repair or replace harness for short to ground circuit between ABS HU/CM terminal P and G sensor terminal B, then go to Step 7.
		No	Go to the next step.
6	**INSPECT G SENSOR** • Inspect the G sensor. (See 04-13B-13 G SENSOR INSPECTION [4W-ABS]) • Is it normal?	Yes	Go to the next step.
		No	Replace the G sensor, then go to next step. (See 04-13B-12 G SENSOR REMOVAL/INSTALLATION [4W-ABS].)
7	**VERIFY DTC TROUBLESHOOTING COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear the DTC from the memory. (See 04-02B-2 Clearing DTCs Procedures.) • Are the same DTCs present?	Yes	Replace the ABS HU/CM, then go to next step. (See 04-13B-3 ABS HU/CM REMOVAL/INSTALLATION [4W-ABS].)
		No	Go to the next step.
8	**VERIFY AFTER REPAIR PROCEDURE** • Are any other DTCs present?	Yes	Go to the applicable DTC inspection. (See 04-02B-4 DTC Table.)
		No	DTC troubleshooting completed.

04-03B SYMPTOM TROUBLESHOOTING [4-WHEEL ANTILOCK BRAKE SYSTEM (4W-ABS)]

SYSTEM WIRING DIAGRAM [4W-ABS]..... 04-03B–1
FOREWORD [4W-ABS] 04-03B–2
PRECAUTION [4W-ABS] 04-03B–2
SYMPTOM TROUBLESHOOTING [4W-ABS]..... 04-03B–5
NO.1 ABS WARNING LIGHT ILLUMINATE WHEN THE ENGINE SWITCH IS TURNED TO THE ON POSITION [4W-ABS] 04-03B–6
NO.2 ABS WARNING LIGHT DOES NOT ILLUMINATE WHEN THE ENGINE SWITCH IS TURNED TO THE ON POSITION [4W-ABS]..... 04-03B–7
NO.3 ABS WARNING LIGHT STAYS ON 4 S OR MORE WHEN THE ENGINE SWITCH IS TURNED TO THE ON POSITION [4W-ABS] 04-03B–7
NO.4 THERE IS MALFUNCTION IN THE SYSTEM EVEN THOUGH ABS WARNING LIGHT, DO NOT ILLUMINATE [4W-ABS]..... 04-03B–8

SYSTEM WIRING DIAGRAM [4W-ABS]

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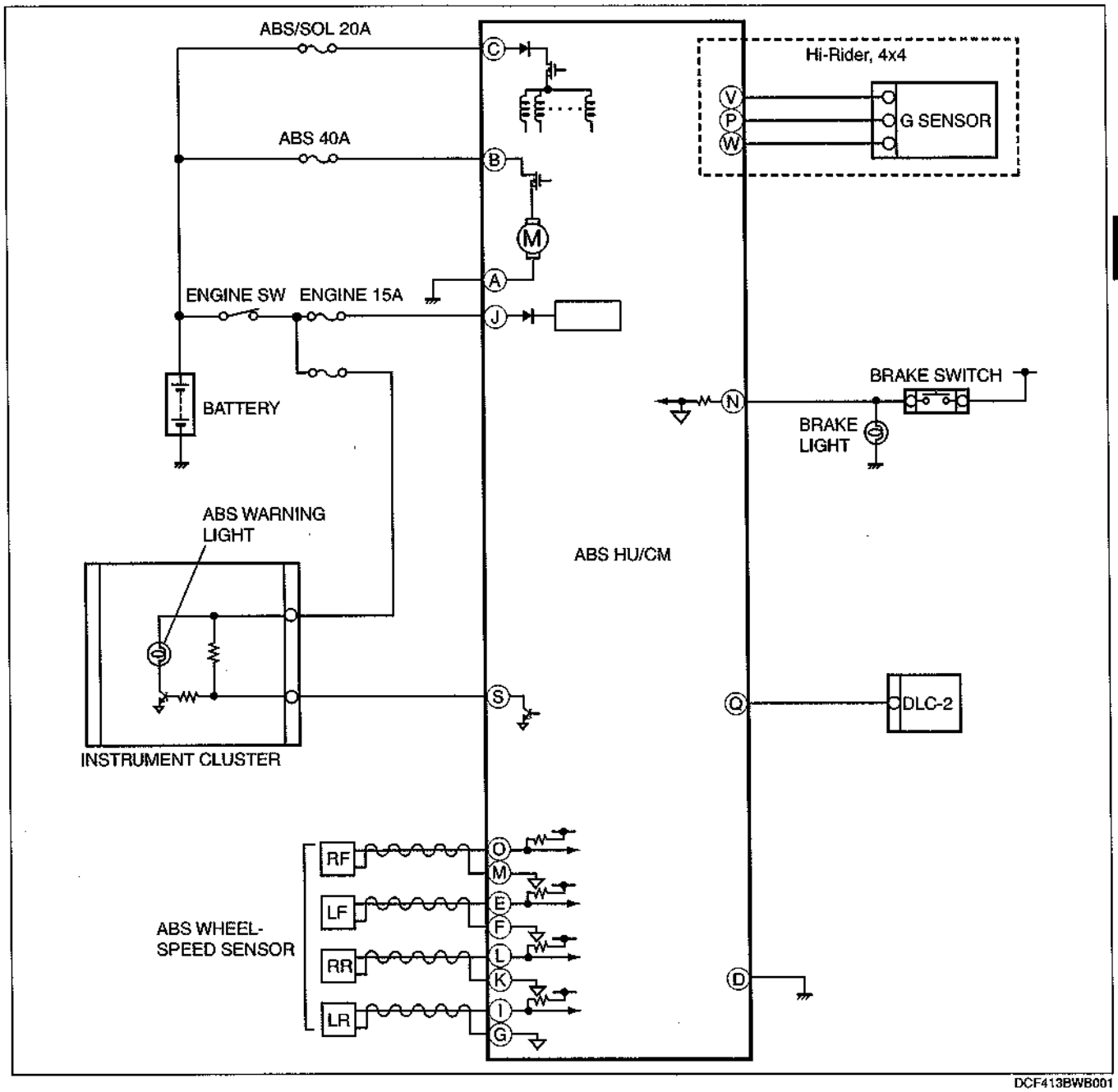

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SYMPTOM TROUBLESHOOTING [4-WHEEL ANTILOCK BRAKE SYSTEM (4W-ABS)]

FOREWORD [4W-ABS]

dcf040300000w23

- Before performing the steps in Symptom Troubleshooting, perform the On-board Diagnostic inspection. To inspect the DTC, follow the DTC Inspection steps. (See 04-02B-4 DTC Table.)

PRECAUTION [4W-ABS]

dcf040300000w24

1. Any one or a combination of the ABS warning illuminates even when the system is normal.

Warning lights that may illuminate and/or flash	Cases in which the light may illuminate	Conditions in which the light will go out	ABS control
• ABS warning light	When the front wheels are jacked up, stuck, or placed on a chassis roller, and only the front wheel ABS wheel-speed sensors are spun.	After turning engine switch off, vehicle is driven at speed **greater than 12 km/h {7.5 mph}** and normal operation is confirmed.	• ABS: Cuts control.
	Parking brake is not fully released while driving.		
	Brake drag.		
	Sudden acceleration/ deceleration.		
	Left/right or front/rear tires are different. (Size, radius, tire pressure, or wear is other than that listed on tire label.)		
	Battery voltage at ABS HU/CM ignition terminal J drops **below approx. 10 V.**(*1)	Battery voltage rises **above approx. 10 V.**	ABS: Cuts control.
	Battery voltage at ABS HU/CM ignition terminal J rises **above approx. 16 V.**(*2)	Battery voltage drops **below approx. 16 V.**	ABS: Cuts control.

*1 : If battery voltage drops **below 10 V** while vehicle speed is **greater than 6 km/h {3.7 mph}** , ABS HU/CM records DTC B1318.

*2 : If battery voltage rises **above 16 V** , ABS HU/CM records DTC B1317.

2. Precautions during servicing of ABS
   The ABS is composed of electrical and mechanical parts. It is necessary to categorize malfunctions as being either electrical or hydraulic when performing troubleshooting.
   (1) Malfunctions in electrical system
   - The ABS hydraulic unit and control module (ABS HU/CM) has an on-board diagnostic function. With this function, the ABS warning light and/or BRAKE system warning light will illuminate when there is a problem in the electrical system. Also, past and present malfunctions are recorded in the ABS HU/CM. This function can find malfunctions that do not occur during periodic inspections. Connect the current diagnostic tool to the DLC-2. The stored malfunctions will be displayed in the order of occurrence. To find out the causes of ABS malfunctions, use these on-board diagnostic results.
   - If a malfunction occurred in the past but is now normal, the cause is likely a temporary poor connection of the wiring harness. The ABS HU/CM usually operates normally. Be careful when searching for the cause of malfunction.
   - After repair, it is necessary to clear the DTC from the ABS HU/CM memory. Also, if the ABS related parts have been replaced, verify that the no DTC has been displayed after repairs.
   - After repairing the ABS wheel-speed sensor or ABS sensor rotor, or after replacing the ABS CM (ABS motor or ABS motor relay or solenoid valve), the ABS warning light may not go out even when the engine switch is turned to the ON position. In this case, drive the vehicle at a speed of **12 km/h {7.5 mph} or more**, make sure that ABS warning light goes out, and then clear the DTC.
   - When repairing, if the ABS related connectors are disconnected and the engine switch is turned to the ON position, the ABS CM will mistakenly detect a fault and record it as a malfunction.
   - To protect the ABS HU/CM, make sure the engine switch is turned off before connecting or disconnecting the ABS CM connector.

   (2) Malfunctions in hydraulic system
   - Symptoms in a hydraulic system malfunction are similar to those in a conventional brake malfunction. However, it is necessary to determine if the malfunction is in an ABS component or the conventional brake system.
   - The ABS hydraulic unit contains delicate mechanical parts. If foreign material enters into the component, the ABS may fail to operate. Also, it will likely become extremely difficult to find the location of the malfunction in the event that the brakes operate but the ABS does not. Make sure foreign material does not enter when servicing the ABS (e.g. brake fluid replacement, pipe removal).

Intermittent Concern Troubleshooting
Vibration method

- If a malfunction occurs or becomes worse while driving on a rough road or when engine is vibrating, perform the following steps.

Note

- There are several reasons why vehicle or engine vibration could cause an electrical malfunction. Inspect the following:
  - — Connectors not fully seated.
  - — Wiring harness not having full play.
  - — Wiring harness laying across brackets or moving parts.
  - — Wiring harness routed too close to hot parts.
- An improperly routed, improperly clamped, or loose wiring harness can cause pinching between parts.
- The connector joints, points of vibration, and places where wiring harness pass through the firewall, body panels, etc. are the major areas to be inspected.

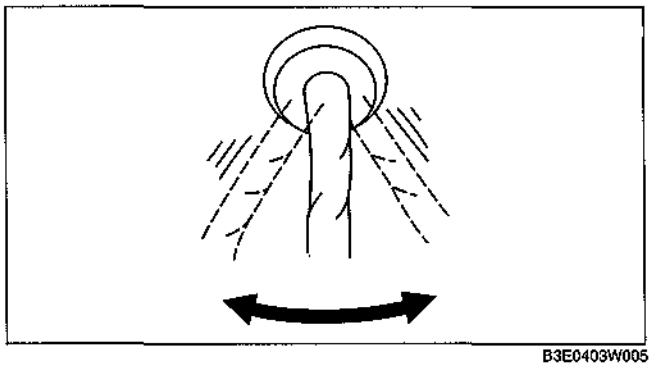
Inspection method for switch connectors or wiring harnesses

1. Connect the current diagnostic tool to the DLC-2.
2. Turn the engine switch to the ON position (Engine OFF).

Note

- If the engine starts and runs, perform the following steps at idle.

3. Access PIDs for the switch you are inspecting.
4. Turn the switch on manually.
5. Slightly shake each connector or wiring harness vertically and horizontally while monitoring the PID.
   - If the PID value is unstable, inspect poor connection.



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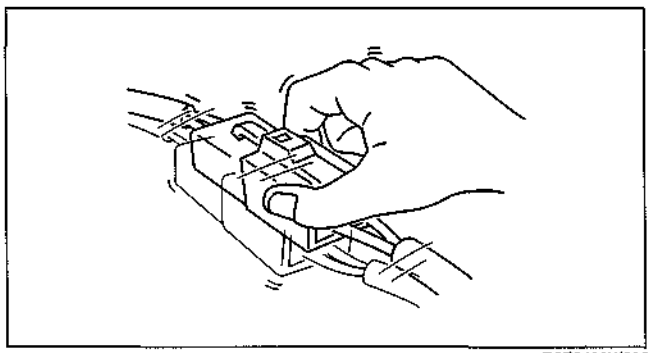
Inspection method for sensor connectors or wiring harnesses

1. Connect the current diagnostic tool to the DLC-2.
2. Turn the engine switch to the ON position (Engine OFF).

Note

- If the engine starts and runs, perform the following steps at idle.

3. Access PIDs for the switch you are inspecting.
4. Slightly shake each connector or wiring harness vertically and horizontally while monitoring the PID.
   - If the PID value is unstable, inspect poor connection.



B3E0403W006

Inspection method for sensors

1. Connect the current diagnostic tool to the DLC-2.
2. Turn the engine switch to the ON position (Engine OFF).

Note

- If the engine starts and runs, perform the following steps at idle.

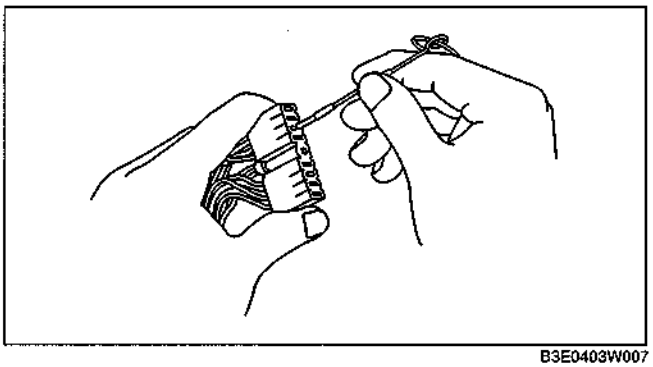
3. Access PIDs for the switch you are inspecting.
4. Vibrate the sensor slightly with your finger.
   - If the PID value is unstable or a malfunction occurs, inspect the sensor for poor connection and/or poor mounting.

Malfunction data monitor method

1. Perform malfunction reappearance test according to malfunction reappearance mode and malfunction data monitor. The malfunction cause is found in the malfunction data.

Connector terminal inspection method

1. Inspect the connection of each female terminal.
2. Insert the male terminal to the female terminal and Inspect the female terminal for looseness.



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SYMPTOM TROUBLESHOOTING [4W-ABS]

dcf040300000w25

- Verify the symptoms, and perform troubleshooting according to the appropriate number.

No.	Symptom
1	ABS warning light illuminate when the engine switch is turned to the ON position.
2	ABS warning light does not illuminate when the engine switch is turned to the ON position.
3	ABS warning light stays on **4 s or more** when the engine switch is turned to the ON position.
4	There is a malfunction in the system even through ABS warning light, do not illuminate.

x: Applicable

Troubleshooting item / Possible factor		ABS HU/CM	Instrument cluster	Charging system	Instrument cluster power supply (terminal 2A)	Instrument cluster GND	Conventional brakes	Brake pipe routing	Open or short circuit in ABS/brake warning light control circuit
1	ABS warning light illuminate when the engine switch is turned to the ON position.	X	X		X	X			
2	ABS warning light does not illuminate when the engine switch is turned to the ON position.		X						X
3	ABS warning light stays on 4 s or more when the engine switch is turned to the ON position.	X	X	X					X
4	There is a malfunction in the system even though ABS warning light, do not illuminate.	X					X	X	

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04

NO.1 ABS WARNING LIGHT ILLUMINATE WHEN THE ENGINE SWITCH IS TURNED TO THE ON POSITION [4W-ABS]

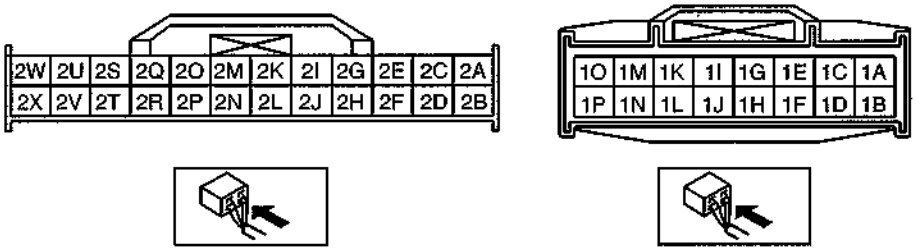
dcf040300000w26

1	ABS warning light illuminate when the engine switch is turned to the ON position.
[TROUBLESHOOTING HINTS] • Instrument cluster or ABS HU/CM malfunction	

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT FOR DTCs IN ABS HU/CM** • Have DTCs been stored in memory?	Yes	Perform the applicable DTC inspection. (See 04-02B-4 DTC Table.)
		No	Inspect the instrument cluster. If the instrument cluster is normal, inspect CAN communication. If instrument cluster has a malfunction, go to the next step.
2	**VERIFY WHETHER MALFUNCTION IS IN WARNING LIGHTS AND INDICATOR LIGHT'S COMMON POWER SUPPLY, OR IN OTHER WARNING LIGHTS AND INDICATOR LIGHTS** • Do other warning and indicator lights illuminate when the engine switch is turned to the ON position?	Yes	Replace the instrument cluster. (open circuit in instrument cluster) (See 09-22-2 INSTRUMENT CLUSTER REMOVAL/ INSTALLATION.)
		No	Go to the next step.
3	**INSPECT INSTRUMENT CLUSTER POWER SUPPLY FUSE** • Is the instrument cluster ignition power supply fuse normal?	Yes	Go to the next step.
		No	Inspect for a short to ground on circuit of blown fuse. Repair or replace if necessary. Install appropriate amperage fuse.
*4	**VERIFY WHETHER MALFUNCTION IS IN WIRING HARNESS (BETWEEN INSTRUMENT CLUSTER POWER SUPPLY AND INSTRUMENT CLUSTER FOR CONTINUITY) OR INSTRUMENT CLUSTER** • Turn the engine switch to the ON position. • Measure voltage at instrument cluster connector terminal 2A. • Is the voltage **approx. 12 V?**	Yes	Replace the instrument cluster (open circuit in instrument cluster). (See 09-22-2 INSTRUMENT CLUSTER REMOVAL/ INSTALLATION.)
		No	Inspect for open circuit in wiring harness between the instrument cluster and ground. Repair or replace if necessary. Replace the ABS HU/CM. (See 04-13B-3 ABS HU/CM REMOVAL/INSTALLATION [4W-ABS].)

INSTRUMENT CLUSTER WIRING HARNESS-SIDE CONNECTOR



- When performing an asterisked (*) troubleshooting inspection, slightly shake the wiring harness and connectors while performing the inspection to discover whether poor contact points are the cause of any intermittent malfunction. If there is a problem, verify that the connectors, terminals and wiring harness are connected correctly and undamaged.

NO.2 ABS WARNING LIGHT DOES NOT ILLUMINATE WHEN THE ENGINE SWITCH IS TURNED TO THE ON POSITION [4W-ABS]

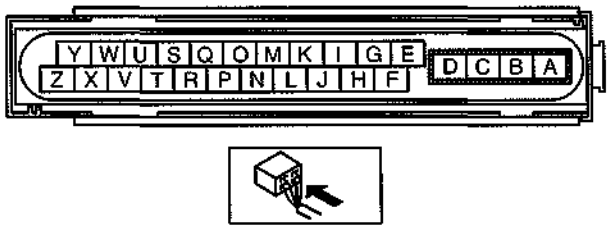
dcf040300000w27

2	ABS warning light does not illuminate when the engine switch is turned to the ON position.
[TROUBLESHOOTING HINTS] • Instrument cluster malfunction • Open circuit between ABS HU/CM and instrument cluster	

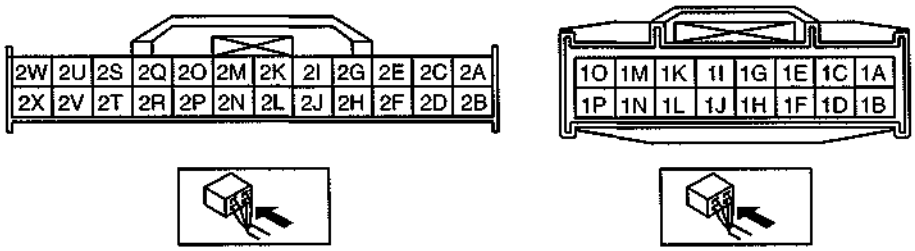
Diagnostic procedure

STEP	INSPECTION		ACTION
1	VERIFY WHETHER MALFUNCTION IS IN WIRING LIGHT OR CONTROL CIRCUIT • Turn the engine switch OFF. • Disconnect ABS HU/CM connector. • Short to ground at ABS HU/CM harness-side connector terminal S using a jumper wire. • Turn the engine switch ON. • Does the ABS warning light illuminate?	Yes	Inspect for open circuit between ABS HU/CM terminal S and instrument cluster terminal 2L.
		No	Replace instrument cluster. (See 09-22-2 INSTRUMENT CLUSTER REMOVAL/ INSTALLATION.)

ABS HU/CM WIRING HARNESS-SIDE CONNECTOR



INSTRUMENT CLUSTER WIRING HARNESS-SIDE CONNECTOR



NO.3 ABS WARNING LIGHT STAYS ON 4 S OR MORE WHEN THE ENGINE SWITCH IS TURNED TO THE ON POSITION [4W-ABS]

dcf040300000w29

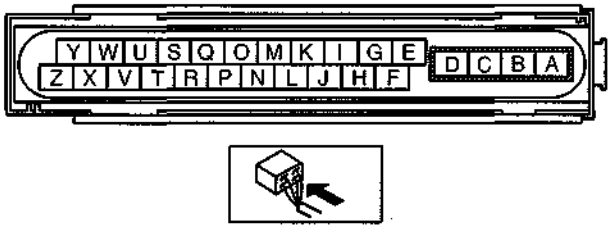
3	ABS warning light stays on 4 s or more when the engine switch is turned to the ON position.
[TROUBLESHOOTING HINTS] • ABS CM detects ABS system malfunction. • Short to ground in ABS warning light control circuit	

Diagnostic procedure

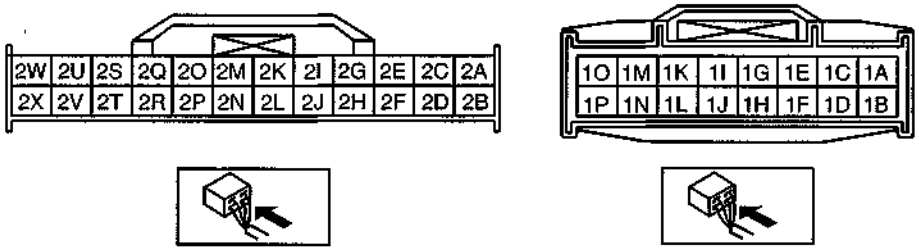
STEP	INSPECTION		ACTION
1	INSPECT FOR DTCs IN ABS HU/CM • Have DTCs been stored in memory?	Yes	Perform the applicable DTC inspection. (See 04-02B-4 DTC Table.)
		No	Inspect the instrument cluster If the instrument cluster is normal, go to the next step. If the instrument cluster has a malfunction, repair the instrument cluster, go to the next step.
2	VERIFY WHETHER MALFUNCTION IS IN WARNING LIGHT OR CONTROL CIRCUIT • Turn the engine switch OFF. • Disconnect the ABS HU/CM connector. • Turn the engine switch to ON. • Does the ABS warning light stay on **4 s or more**?	Yes	Go to the next step.
		No	Replace the ABS HU/CM. (See 04-13B-3 ABS HU/CM REMOVAL/INSTALLATION [4W-ABS].)

STEP	INSPECTION		ACTION
3	**INSPECT ABS WARNING LIGHT CONTROL CIRCUIT FOR SHORT TO GROUND** • Turn the engine switch OFF. • ABS HU/CM connector disconnected. • Disconnect the instrument cluster connector. • Verify continuity between ABS HU/CM harness-side connector terminal S and body ground. • Is there any continuity?	Yes	Repair or replace for short to ground.
		No	Replace instrument cluster. (See 09-22-2 INSTRUMENT CLUSTER REMOVAL/ INSTALLATION.)

ABS HU/CM WIRING HARNESS-SIDE CONNECTOR



INSTRUMENT CLUSTER WIRING HARNESS-SIDE CONNECTOR



NO.4 THERE IS MALFUNCTION IN THE SYSTEM EVEN THOUGH ABS WARNING LIGHT, DO NOT ILLUMINATE [4W-ABS]

dcf040300000w31

4	**There is a malfunction in system even though ABS warning light, do not illuminate.**
[TROUBLESHOOTING HINTS] • **There is a difference in size or air pressure between the front and rear tires.**	

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT FOR DTCs IN ABS HU/CM** Have DTCs been stored in memory?	Yes	Perform the applicable DTC inspection. (See 04-02B-4 DTC Table.)
		No	Go to the next step.
2	**INSPECT ABS HYDRAULIC UNIT** Perform the ABS hydraulic unit system inspection. Is the system normal?	Yes	Inspect the conventional brake system.
		No	**If the wheels do not rotate:** Replace the ABS HU/CM. (See 04-13B-3 ABS HU/CM REMOVAL/INSTALLATION [4W-ABS].) **If the wheels rotate but order in which wheels rotate is incorrect:** Inspect the brake pipe passage to the ABS HU/CM.

04-10 GENERAL PROCEDURES

GENERAL PROCEDURES (BRAKE). . . 04-10–1

GENERAL PROCEDURES (BRAKE)

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Wheel and Tire Installation

1. When installing the wheels and tires, tighten the wheel nuts in a criss-cross pattern to the following tightening torque.

Tightening torque
88.2—117.6 N·m {9.00—11.99 Kgf·m, 65.06—86.73 ft·lbf}

Brake Lines Disconnection

1. If any brake line has been disconnected during the procedures, add brake fluid, bleed the brakes, and inspect for leakage after the procedure has been completed.

Caution
- **Brake fluid will damage painted surfaces. Be careful not to spill any on painted surfaces. If it is spilled, wipe it off immediately.**

Brake Pipe Flare Nut Tightening

1. Tighten the brake pipe flare nut using the **SST** (49 0259 770B).

Connector Disconnection

1. Disconnect the negative battery cable before performing any work that requires handling of connectors. (See 01-17-2 BATTERY REMOVAL/INSTALLATION.)

ABS Related Parts

1. Make sure that there are no DTCs in the ABS memory after working on ABS related parts. If there are any DTCs in the memory, clear them.

04-11 CONVENTIONAL BRAKE SYSTEM

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CONVENTIONAL BRAKE SYSTEM LOCATION INDEX

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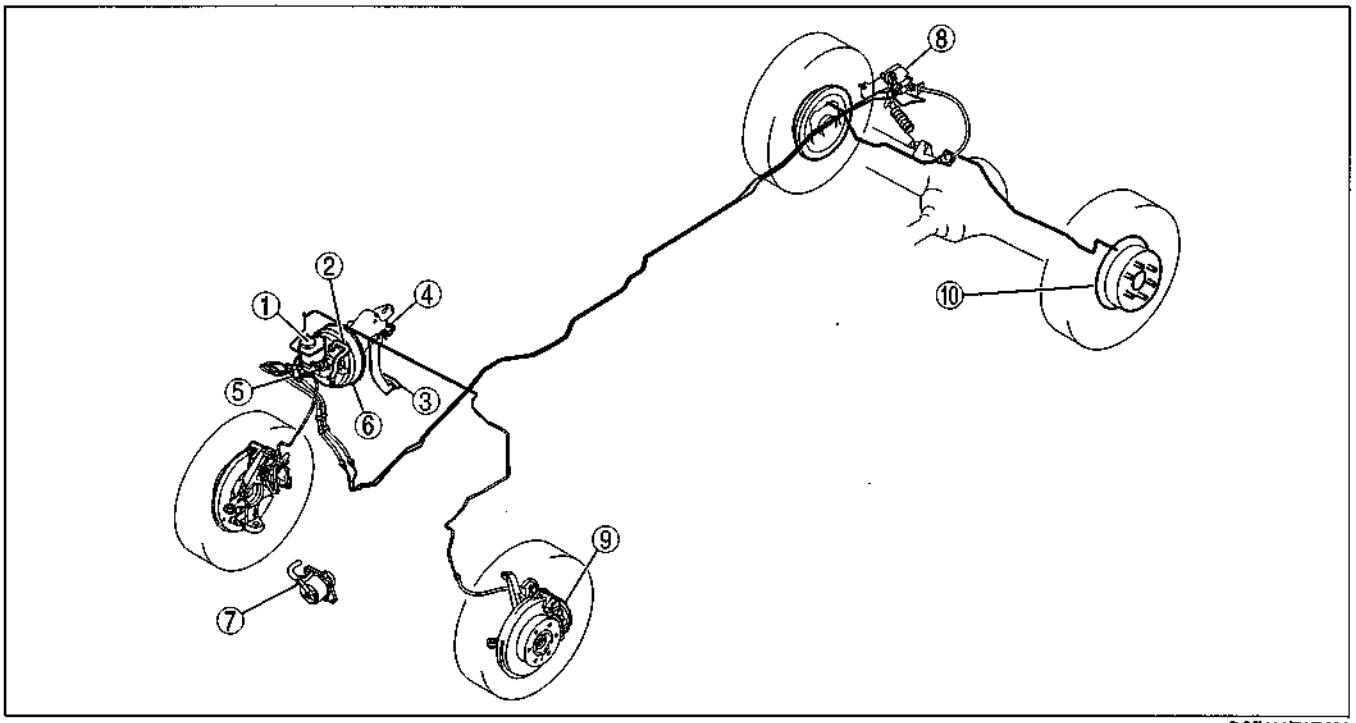

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1	Brake fluid (See 04-11-3 AIR BLEEDING.)
2	Vacuum line (See 04-11-3 VACUUM LINE INSPECTION.)
3	Brake pedal (See 04-11-4 BRAKE PEDAL INSPECTION.) (See 04-11-5 BRAKE PEDAL REMOVAL/ INSTALLATION.)
4	Brake switch (See 04-11-5 BRAKE SWITCH REMOVAL/ INSTALLATION.) (See 04-11-6 BRAKE SWITCH INSPECTION.)
5	Master cylinder (See 04-11-6 MASTER CYLINDER REMOVAL/ INSTALLATION.) (See 04-11-7 BRAKE FLUID LEVEL SENSOR INSPECTION.) (See 04-11-8 MASTER CYLINDER DISASSEMBLY/ ASSEMBLY.)
6	Power brake unit (See 04-11-9 POWER BRAKE UNIT INSPECTION.) (See 04-11-10 POWER BRAKE UNIT REMOVAL/ INSTALLATION.)
7	Vacuum pump (See 04-11-11 VACUUM PUMP INSPECTION.) (See 04-11-11 VACUUM PUMP REMOVAL/ INSTALLATION.)
8	Load sensing proportioning valve (LSPV) (See 04-11-12 LOAD SENSING PROPORTIONING VALVE (LSPV) INSPECTION.) (See 04-11-13 LOAD SENSING PROPORTIONING VALVE (LSPV) ADJUSTMENT.) (See 04-11-14 LOAD SENSING PROPORTIONING VALVE (LSPV) REMOVAL/INSTALLATION.)
9	Front brake (disc) (See 04-11-15 FRONT BRAKE (DISC) INSPECTION.) (See 04-11-16 FRONT BRAKE (DISC) REMOVAL/ INSTALLATION [4x2 (EXCEPT Hi-Rider)].) (See 04-11-17 FRONT BRAKE (DISC) REMOVAL/ INSTALLATION [Hi-Rider, 4x4].) (See 04-11-19 DISC PAD (FRONT) REPLACEMENT [4x2 (EXCEPT Hi-Rider)].) (See 04-11-20 DISC PAD (FRONT) REPLACEMENT [Hi-Rider, 4x4].) (See 04-11-20 CALIPER (FRONT) DISASSEMBLY/ ASSEMBLY [4x2 (EXCEPT Hi-Rider)].) (See 04-11-21 CALIPER (FRONT) DISASSEMBLY/ ASSEMBLY [Hi-Rider, 4x4].)
10	Rear brake (drum) (See 04-11-22 REAR BRAKE (DRUM) INSPECTION.) (See 04-11-23 REAR BRAKE (DRUM) REMOVAL/ INSTALLATION.) (See 04-11-25 WHEEL CYLINDER DISASSEMBLY/ ASSEMBLY.)

AIR BLEEDING

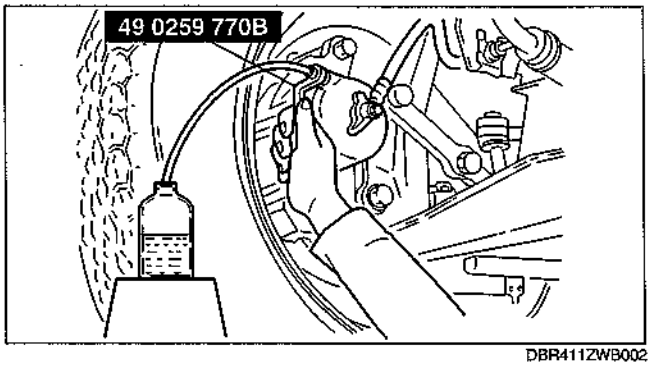
dcf041100000w02

Caution
- **Brake fluid will damage painted surfaces. Be careful not to spill any on painted surfaces. If it is spilled, wipe it off immediately.**

Note
- Keep the fluid level in the reserve tank at 3/4 full or more during the air bleeding.
- Begin air bleeding with the brake caliper that is furthest from the master cylinder.

Brake fluid type
SAE J1703, FMVSS 116 DOT-3

1. Remove the bleeder cap on the brake caliper, and attach a vinyl tube to the bleeder screw.
2. Place the other end of the vinyl tube in a clear container and fill the container with fluid during air bleeding.
3. Working with two people, one should pump the brake pedal several times and depress and hold the pedal down.
4. While the brake pedal is depressed, the other should loosen the bleeder screw using the **SST**, drain out any fluid containing air bubbles, and tighten the bleeder screw.



DBR411ZWB002

Tightening torque
Front (4x2 (except Hi-Rider)): 9—14 N·m {92—142 kgf·cm, 80—123 in·lbf}
Front (Hi-Rider, 4x4): 5.9—8.8 N·m {61—89 kgf·cm, 53—77 in·lbf}
Rear: 5.9—8.8 N·m {61—89 kgf·cm, 53—77 in·lbf}

5. Repeat Steps 3 and 4 until no air bubbles are seen.
6. Perform air bleeding as described in the above procedures for all brake calipers.
7. After air bleeding, inspect the following:
   - Brake operation
   - Fluid leakage
   - Fluid level

04

VACUUM LINE INSPECTION

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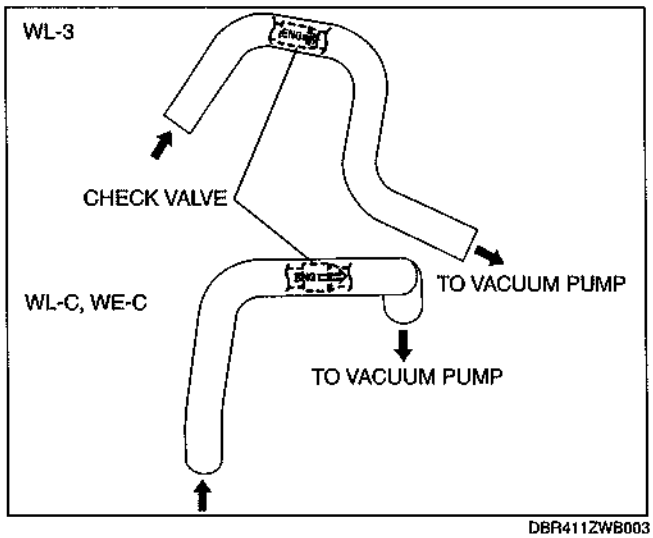
1. Remove the vacuum hose.
2. Verify that air can be blown from the power brake unit side of the vacuum hose towards the vacuum pump side, and that air cannot be blown in the opposite direction.
   - If there is any malfunction of the inner check valve, replace it together with the vacuum hose as a single unit.



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BRAKE PEDAL INSPECTION

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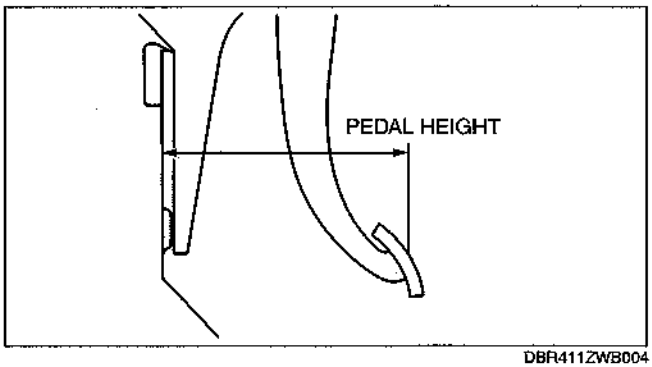
Brake pedal Height Inspection

1. Measure the distance from the center of the upper surface of the pedal pad to the floor panel and verify that it is as specified.
   - If not within the specification, replace the brake pedal.

Brake pedal height
214—219 mm {8.43—8.62 in}



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Brake Pedal Height Adjustment

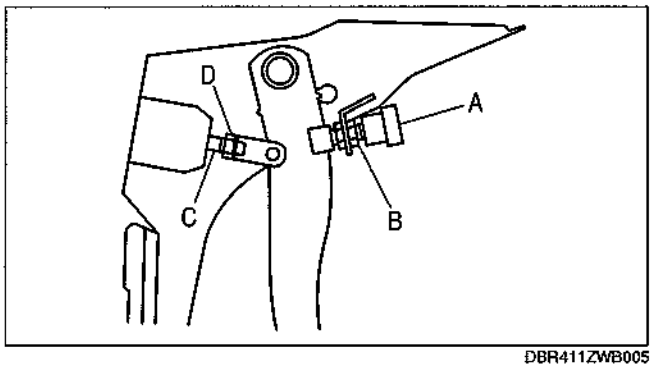
1. Disconnect the brake switch connector.
2. Loosen locknut B and turn switch A until it does not contact the pedal.
3. Loosen locknut D and turn rod C to adjust the height.
4. Tighten the turn rod C with locknut D.

Tightening torque
24—34 N·m {2.5—3.4 kgf·m, 18—25 ft·lbf}

5. Tighten the bolt with locknut B so that clearance between the bolt for brake switch A and pedal stopper is within the specification.

Specification
0.1—1.0 mm {0.004—0.039}
Tightening torque
13.7—17.6 N·m {140—179 kgf·cm, 122—155 in·lbf}

6. Connect the brake switch connector.
7. After adjustment, inspect the pedal play and the brake light operation.



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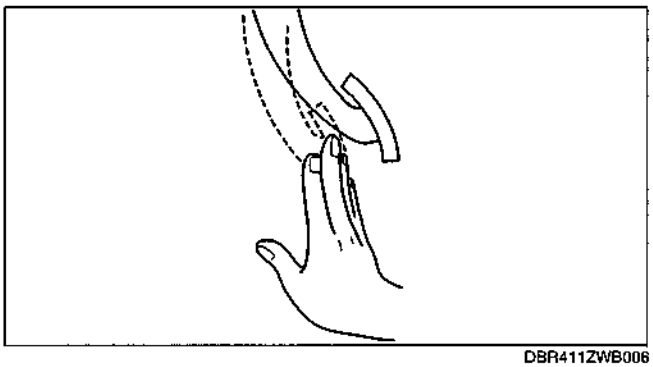
Brake Pedal Play Inspection

1. Pump the pedal several times to release the vacuum in the power brake unit.
2. Remove the snap pin, verify that the holes in the fork and in the pedal are aligned, and reinstall the pin.
3. Gently depress the pedal by hand until resistance is felt (**approx. 20 N {2.0 kgf, 4.5 lbf}**) and measure the pedal play.

Standard pedal play
3.0—8.0 mm {0.12—0.31 in}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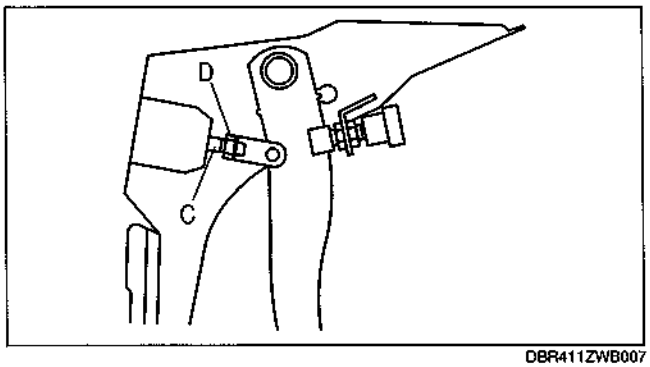
Brake Pedal Play Adjustment

1. Remove the snap pin and clevis pin.
2. Loosen locknut D and turn rod C to align the holes in the fork and in the pedal.
3. Install the clevis pin ant the snap pin.
4. Tighten locknut D.

   Tightening torque
   24—34 N·m {2.5—3.4 kgf·m, 18—25 ft·lbf}

5. After adjustment, inspect the pedal height and the brake light operation.



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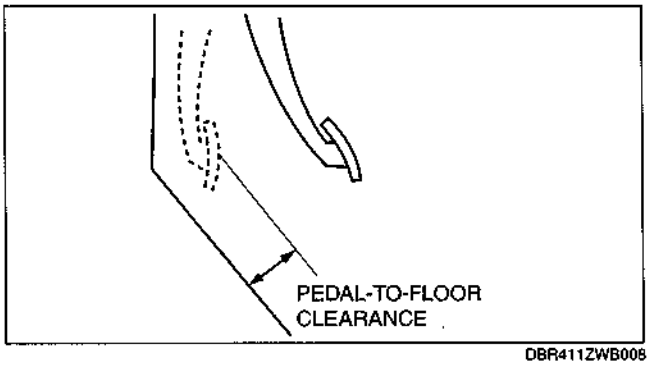
Pedal-to-floor Clearance Inspection

1. Start the engine and depress the brake pedal with a force of **589 N {60 kgf, 132 lbf}**.
2. Measure the distance from the center of the upper surface of the pedal pad to the floor covering and verify that it is as specified.
   - If it is less than the specification, inspect the following:
     — Air in brake system
     — Malfunction of the automatic adjuster
     — Excessive shoe clearance

   Standard pedal-to-floor clearance
   105 mm {4.14 in} or more



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04

BRAKE PEDAL REMOVAL/INSTALLATION

dcf041143300w02

1. The brake pedal is mounted on the bracket integrated with the clutch pedal and accelerator pedal. Refer to section 01, INTAKE AIR SYSTEM, ACCELERATOR PEDAL REMOVAL/INSTALLATION for the brake pedal removal/installation. (See 01-13A-9 ACCELERATOR PEDAL COMPONENT REMOVAL/INSTALLATION [WL-3].) (See 01-13B-11 ACCELERATOR PEDAL COMPONENT REMOVAL/INSTALLATION [WL-C, WE-C].)

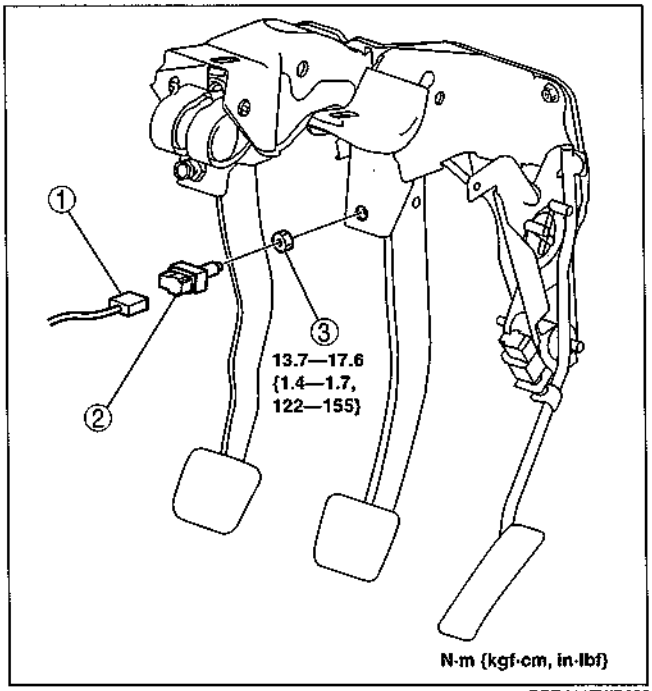
BRAKE SWITCH REMOVAL/INSTALLATION

dcf041166490w01

1. Remove in the order indicated in the table.

1	Brake switch connector
2	Brake switch
3	Nut

2. Install in the reverse order of removal.
3. After installation, inspect the brake pedal. (See 04-11-4 BRAKE PEDAL INSPECTION.)

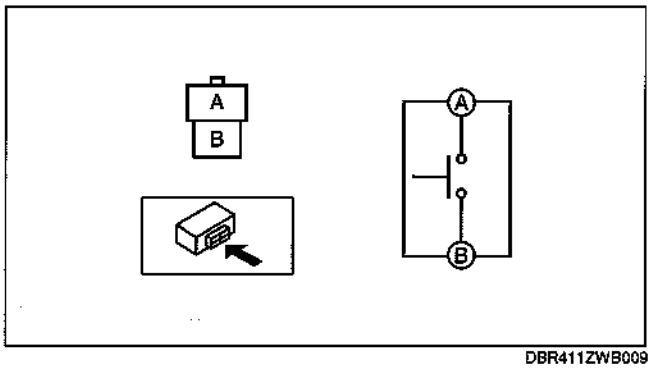


DBR411ZWB053

BRAKE SWITCH INSPECTION

dcf041166490w02

1. Remove the lower panel.
2. Disconnect the brake switch connector.
3. Verify that the continuity is as indicated in the table.
   - If not as indicated in the table, replace the brake switch. (See 04-11-5 BRAKE SWITCH REMOVAL/INSTALLATION.)



DBR411ZWB009

O—O : Continuity

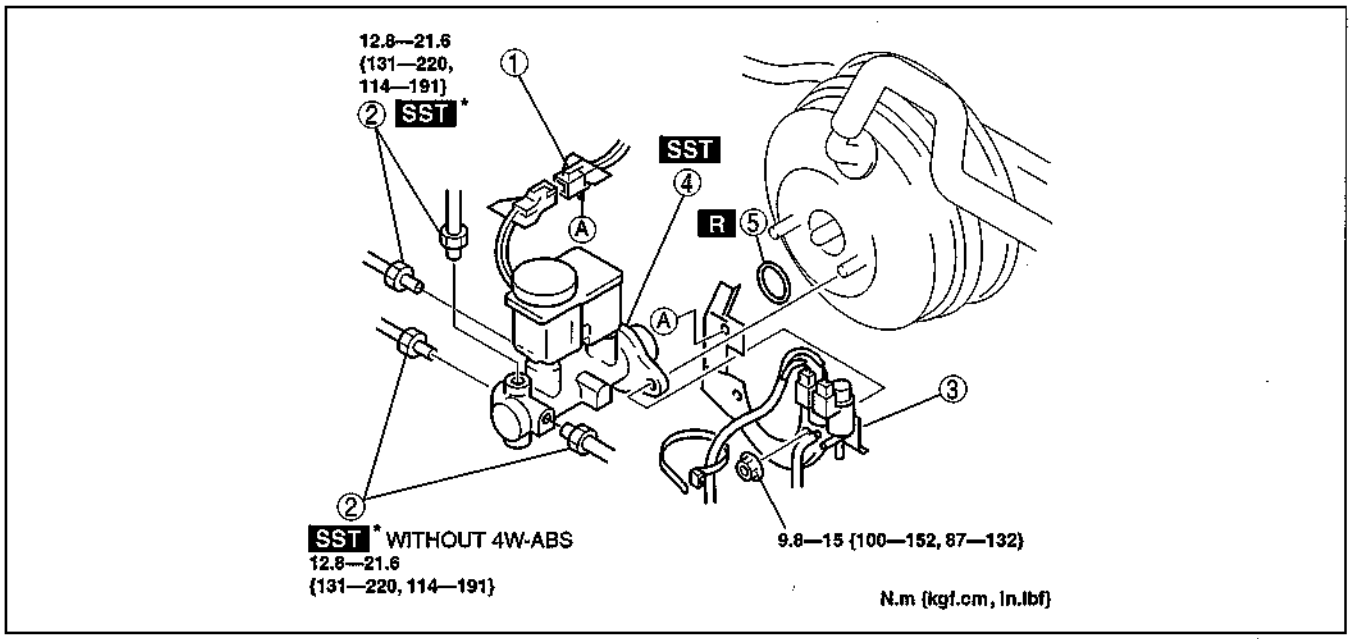
Condition	Terminal	
	A	B
When the brake pedal is depressed	O	O
When the brake pedal is not depressed		

DBR411ZWB052

MASTER CYLINDER REMOVAL/INSTALLATION

dcf041143400w01

1. Remove in the order indicated in the table.
2. Install in the reverse order of removal.



arnffw00001986

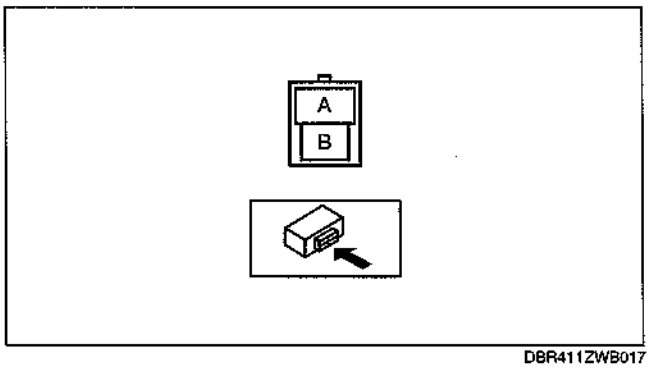
1	Brake fluid level sensor connector
2	Brake pipe
3	Bracket

4	Master cylinder
5	O-ring (AT)

BRAKE FLUID LEVEL SENSOR INSPECTION

dcf041143400w02

1. Disconnect the brake fluid level sensor connector from the master cylinder.
2. Inspect for continuity according to fluid level between the brake fluid level sensor terminals.
   - If not as indicated in the table, replace the brake fluid level sensor. (See 04-11-6 MASTER CYLINDER REMOVAL/ INSTALLATION.)



DBR411ZWB017

O—O: Continuity

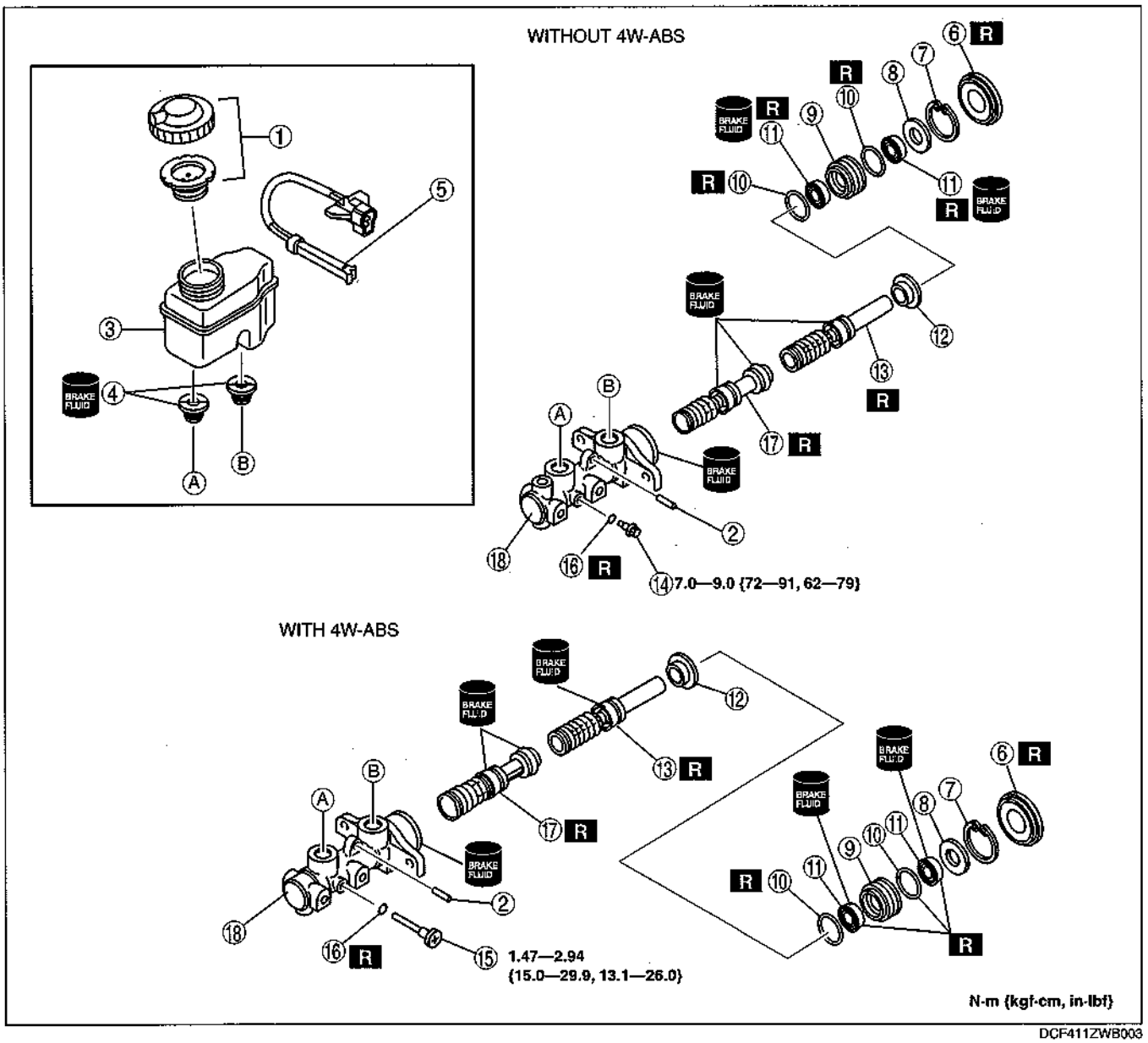
Condition	Terminal	
	A	B
Above MIN		
Below MIN	O	O

CHU0411W017

MASTER CYLINDER DISASSEMBLY/ASSEMBLY

dcf041143400w03

1. After removing the brake fluid, disassemble in the order indicated in the table.
2. Assemble in the reverse order of disassembly.



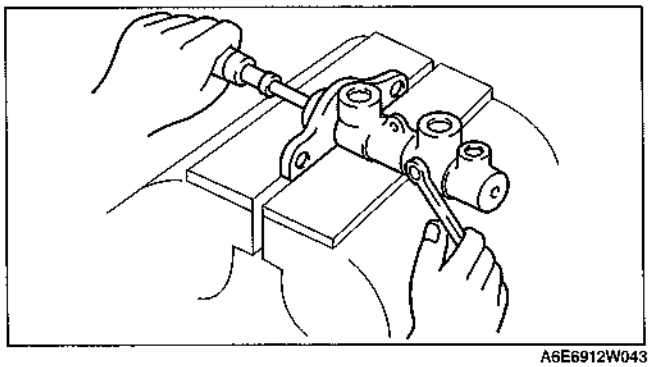
DCF411ZWB003

1	Cap set
2	Pin
3	Reservoir
4	Joint bushing
5	Brake fluid level sensor
6	Seal and plate assembly
7	Snap ring
8	Spacer
9	Piston guide
10	O-ring
11	Cup

12	Primary piston stopper
13	Primary piston
14	Stop screw (without 4W-ABS) (See 04-11-9 Stop Screw (without 4W-ABS) Assembly Note)
15	Stop screw (with 4W-ABS) (See 04-11-9 Stop Screw (with 4W-ABS) Assembly Note.)
16	Gasket
17	Secondary piston
18	Master cylinder body

Stop Screw (with 4W-ABS) Assembly Note

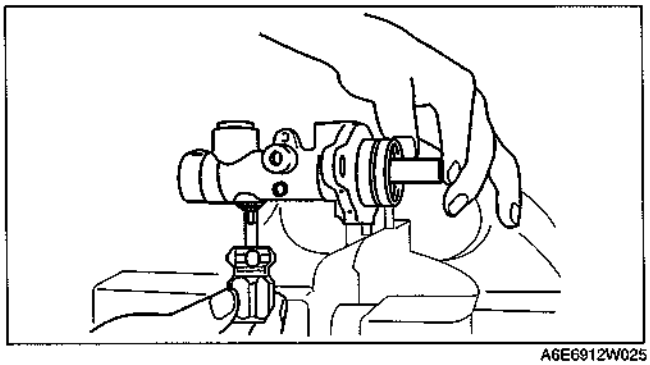
1. Install the secondary piston component with the piston hole facing the stop pin.
2. Install and tighten a new gasket and the stop pin.
3. Push and release the piston to verify that it is held by the stop pin.



A6E6912W043

Stop Screw (without 4W-ABS) Assembly Note

1. Push the primary piston component in fully.
2. Install and tighten a new gasket and the stop screw.
3. Push and release the piston to verify that it is held by the stop screw.



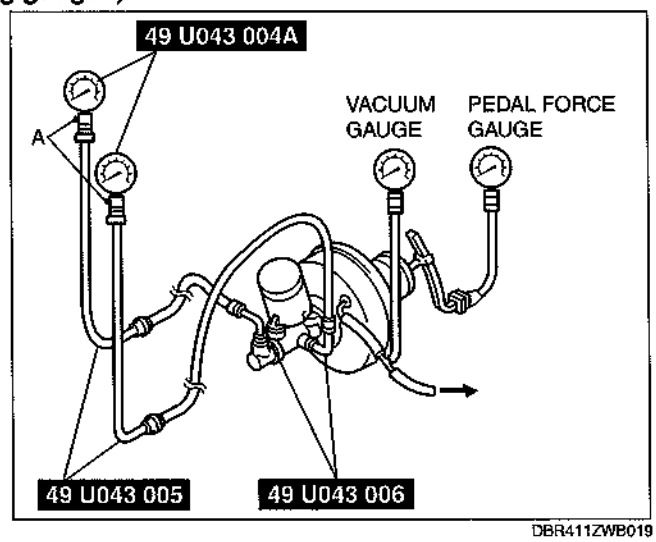
A6E6912W025

POWER BRAKE UNIT INSPECTION

dcf041143800w01

Power Brake Unit Function Inspection (Inspection using gauges)

1. Connect the **SST** gauges, a vacuum gauge, and a pedal depression gauge as shown in the figure. Bleed the air from the **SST** gauges before performing the following tests.



DBR411ZWB019

Checking for vacuum loss (unloaded condition)

1. Start the engine.
2. Stop the engine when the vacuum gauge indicates **67 kPa {500 mmHg, 20 inHg}**.
3. Observe the vacuum gauge for **15 s**.
   - If the gauge indicates **64—66 kPa {476—499 mmHg, 18.8—19.6 inHg}**, the unit is operating.

Checking for vacuum loss (loaded condition)

1. Start the engine.
2. Depress the brake pedal with a force of **200 N {20 kgf, 45 lbf}**.
3. With the brake pedal held depressed, stop the engine when the vacuum gauge indicates **67 kPa {500 mmHg, 20 inHg}**.
4. Observe the vacuum gauge for **15 s**.
   - If the gauge indicates **64—66 kPa {476—499 mmHg, 18.8—19.6 inHg}**, the unit is operating.

Checking for hydraulic pressure

1. If the engine is stopped (vacuum **0 kPa {0 mmHg, 0 inHg}**) and the fluid pressure is within the specification, the unit is operating.

   Power brake unit fluid pressure when pedal depressed at 200 N {20 kgf, 45 lbf}
   At 0 kPa {0 mmHg, 0 inHg}: 593 kPa {6.1 kgf/cm^2, 87 psi} or more

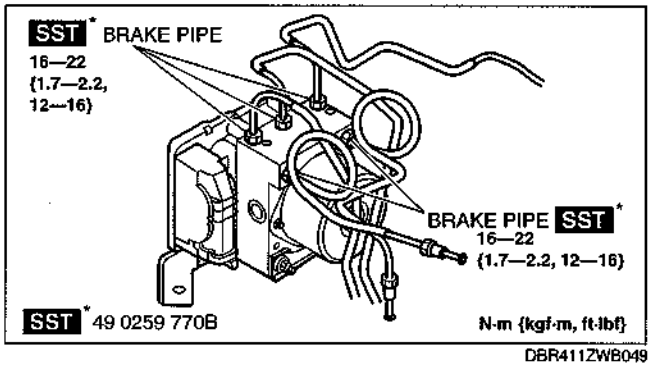
2. Start the engine. Depress the brake pedal when the vacuum reaches **67 kPa {500 mmHg, 20 inHg}**.
   - If the fluid pressure is within the specification, the unit is operating.
   - If the fluid pressure is not as specified, inspect for damage to the check valve or vacuum hose, and fluid leakage of the hydraulic line. Repair as necessary, and inspect again.

   Power brake unit fluid pressure when pedal depressed at 200 N {20 kgf, 45 lbf}
   At 67 kPa {500 mmHg, 20 inHg}: 6,950 kPa {71 kgf/cm^2, 1,008 psi} or more

POWER BRAKE UNIT REMOVAL/INSTALLATION

dcf041143800w02

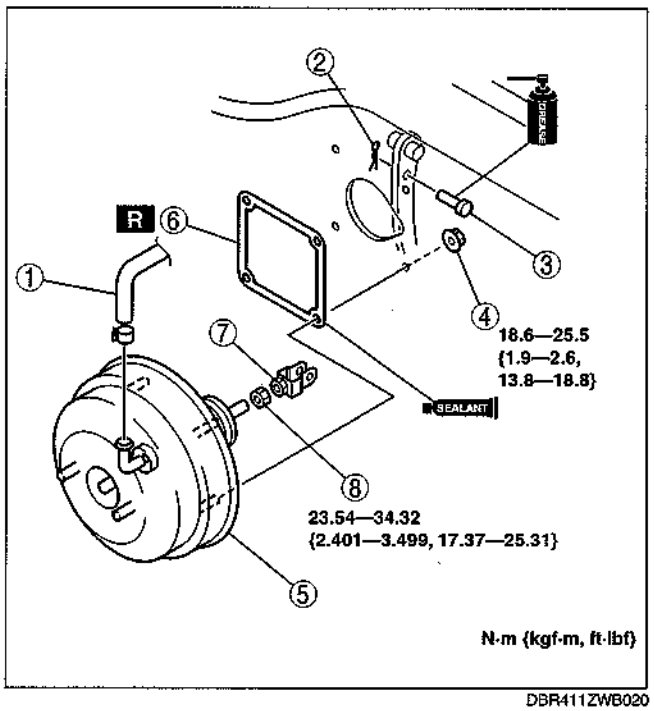
1. Remove the master cylinder. (See 04-11-6 MASTER CYLINDER REMOVAL/INSTALLATION.)
2. For vehicles with 4W-ABS, disconnect all the ABS HU/CM brake pipes shown in the figure. (See 04-13B-3 ABS HU/CM REMOVAL/INSTALLATION [4W-ABS].)
3. Remove the brake pipe (ABS HU/CM—master cylinder).



DBR411ZWB049

4. Remove in the order indicated in the table.

1	Vacuum hose
2	Snap pin
3	Clevis pin
4	Nut
5	Power brake unit
6	Gasket
7	Fork
8	Nut



DBR411ZWB020

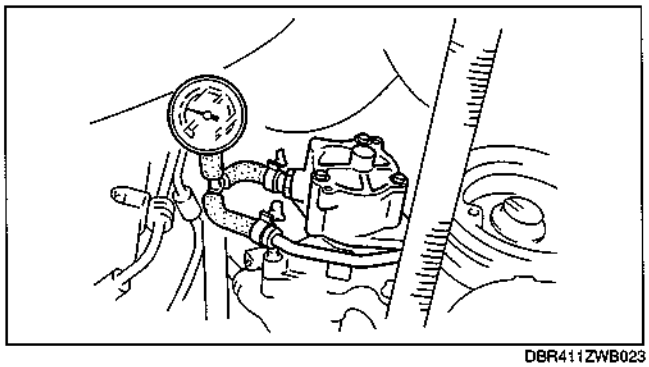
5. Install in the reverse order of removal.

VACUUM PUMP INSPECTION

dcf041118777w01

1. Warn up the engine.
2. Disconnect the vacuum hose from the vacuum pump and connect a vacuum gauge as shown in the figure, then check the vacuum.
   - If the pressure is less than the specification, inspect for the following.
     — Malfunction of the vacuum pump
     — Shortage of the lubrication oil pressure

Vacuum specification (In 20 s)
Engine speed 1,270 rpm: 74 kPa {550 mmHg, 22 inHg} or more
Engine speed 2,450 rpm: 94 kPa {700 mmHg, 28 inHg} or more

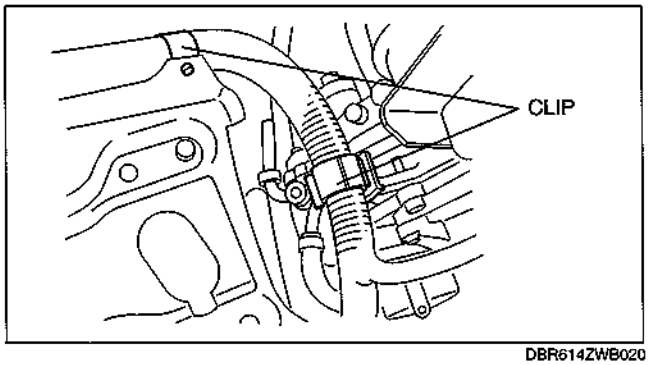


DBR411ZWB023

VACUUM PUMP REMOVAL/INSTALLATION

dcf041118777w02

1. Remove the battery and battery tray. (See 01-17-2 BATTERY REMOVAL/INSTALLATION.)
2. Remove the clip shown in the figure.

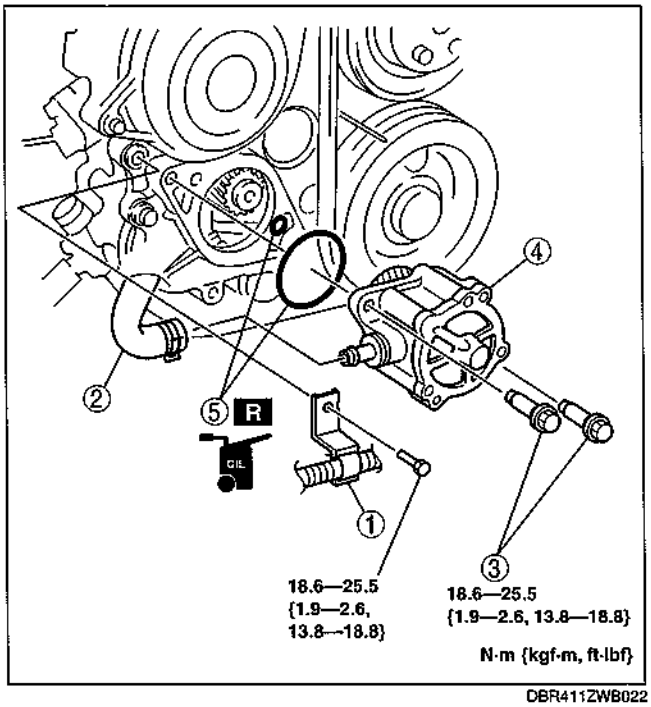


DBR614ZWB020

3. Remove in the order indicated in the table.

1	Bracket (WL-C, WE-C)
2	Vacuum hose
3	Bolt
4	Vacuum pump
5	O-ring

4. Install in the reverse order of removal.

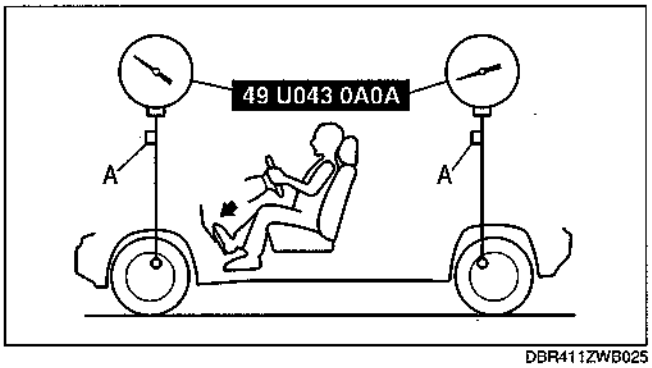


DBR411ZWB022

LOAD SENSING PROPORTIONING VALVE (LSPV) INSPECTION

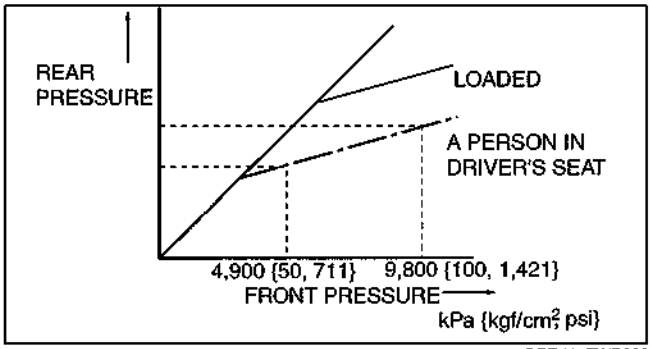
dcf041143903w01

1. Place the vehicle on level ground.
2. Check the tire inflations and set them to the recommended pressure if necessary.
   - If not as specified, replace or adjust.
3. Check the vehicle with a person in the driver's seat; include the standard vehicle tools, the spare wheel and tire, and a full tank of fuel.
4. Install the **SST** to the front wheel cylinder and rear wheel cylinder, then bleed the air in the brake line and LSPV using a air bleed valve A.



DBR411ZWB025

5. Inspect the fluid pressure of rear wheel cylinder while the fluid pressure of front wheel cylinder is **4,900 kPa {50 kgf/cm^2, 711 psi}** and **9,800 kPa {100 kgf/cm^2, 1,421 psi}**.
   - If not as specified, adjust the LSPV.



DBR411ZWB026

Load sensing proportioning valve (LSPV) fluid pressure

Type		Front wheel cylinder fluid pressure (kPa {kgf/cm^2, psi})	Rear wheel cylinder (kPa {kgf/cm^2, psi})
4x2 (except Hi-Rider)	Without 4W-ABS	4,900 {50, 711}	2,250—2,850 {23—29, 327—413}
		9,800 {100, 1,421}	3,130—3,930 {32—40, 454—569}
	With 4W-ABS	4,900 {50, 711}	2,910—3,710 {30—37, 423—538}
		9,800 {100, 1,421}	4,970—6,170 {51—62, 721—894}
Hi-Rider, 4x4	Without 4W-ABS	4,900 {50, 711}	2,250—2,850 {23—29, 327—413}
		9,800 {100, 1,421}	3,130—3,930 {32—40, 454—569}
	With 4W-ABS	4,900 {50, 711}	2,650—3,450 {28—35, 385—500}
		9,800 {100, 1,421}	4,700—5,900 {48—60, 682—855}

Note
- When applying the specified pressure, the brake pedal must not be "double pumped" or released.
- Read the rear pressure. After **approx. 2 s** elapse from setting the front wheel cylinder fluid pressure.

LOAD SENSING PROPORTIONING VALVE (LSPV) ADJUSTMENT

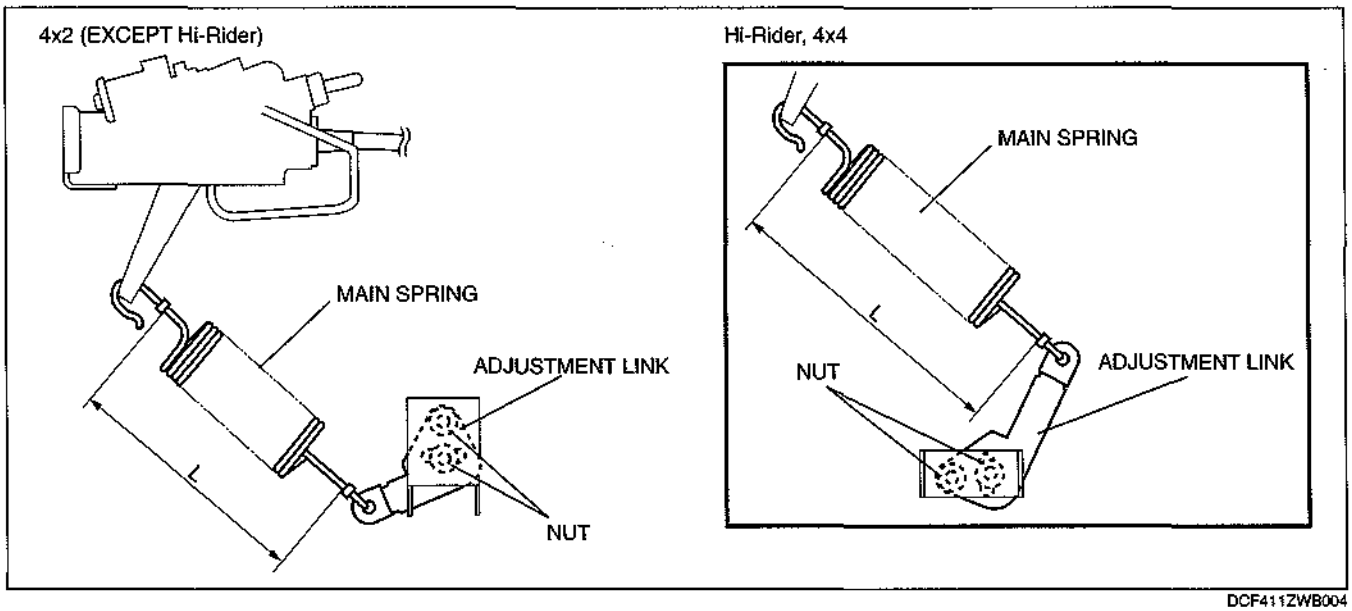
dcf041143903w02

1. Place the unloaded vehicle on level ground. Unloaded: Fuel tank is full. Engine coolant and tire, jack and tools are in designated position.

Note
- A change of **5 mm {0.20 in}** in dimension L results in a change of the following.

Type		Change (kPa {kgf/cm^2, psi})
4x2 (except Hi-Rider)	without 4W-ABS	850 {8.7, 123}
	with 4W-ABS	1,020 {10, 148}
Hi-Rider, 4x4	without 4W-ABS	1,060 {11, 154}
	with 4W-ABS	1,080 {11, 157}

2. Adjust main spring dimension L between the LSPV and the adjustment link loosening and repositioning the LSPV.



DCF411ZWB004

- Decrease dimension L if the fluid pressure is low.
- Increase dimension L if the fluid pressure is high.

Specification
Dimension L

Type		Dimension L (mm {in})
4x2 (except Hi-Rider)	without 4W-ABS	147.5—154.5 {5.808—6.082}
	with 4W-ABS	
Hi-Rider, 4x4	without 4W-ABS	175.5—182.5 {6.910—7.185}
	with 4W-ABS	

3. Tightening the nut.

Specification
18.6—25.4 N·m {1.90—2.59 kgf·m, 13.8—18.7 ft·lbf}

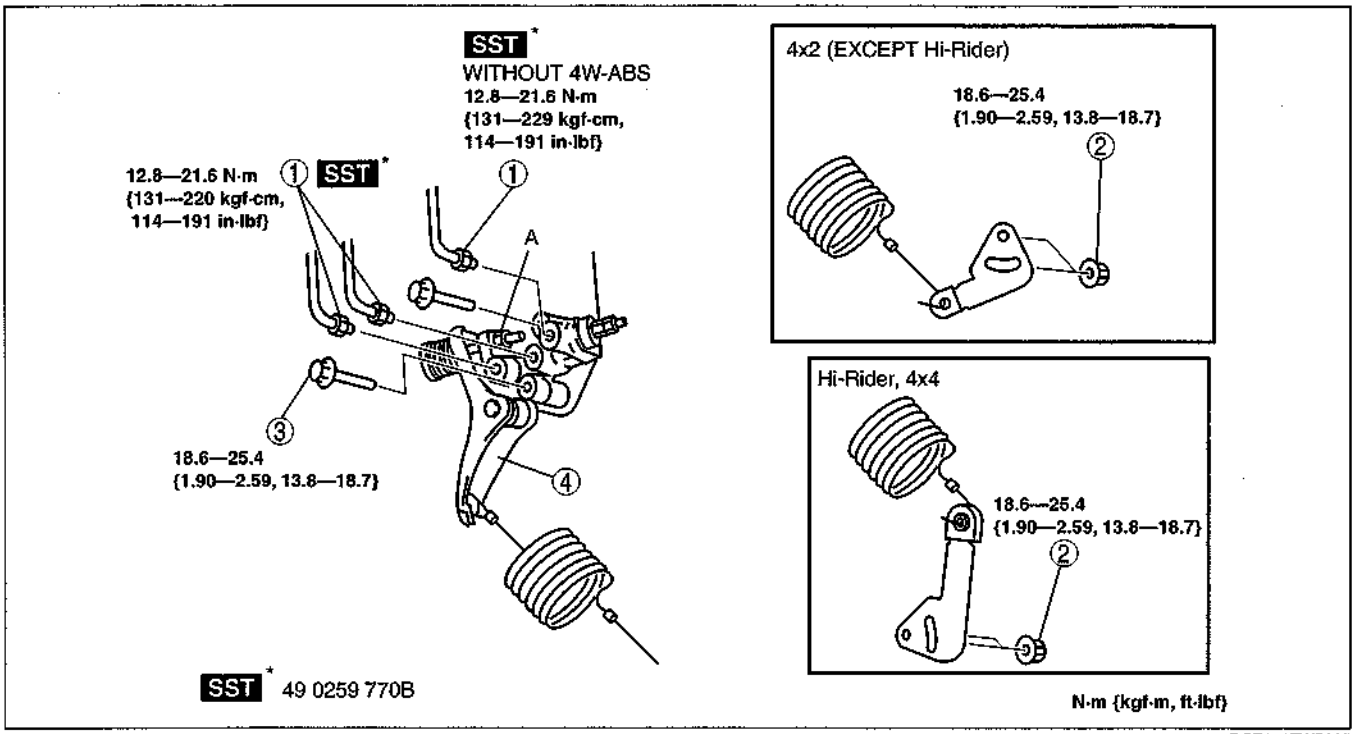
4. After adjustment, recheck the fluid pressure.
   - If not as specified, replace the LSPV as a component.

LOAD SENSING PROPORTIONING VALVE (LSPV) REMOVAL/INSTALLATION

dcf041143903w03

Caution
- **Do not disassemble the load sensing proportioning valve (LSPV) or move nut A, otherwise the LSPV may not function properly.**

1. Remove in the order indicated in the table.
2. Install in the reverse order of removal.
3. After installation, adjust the main spring dimension. (See 04-11-13 LOAD SENSING PROPORTIONING VALVE (LSPV) ADJUSTMENT.)

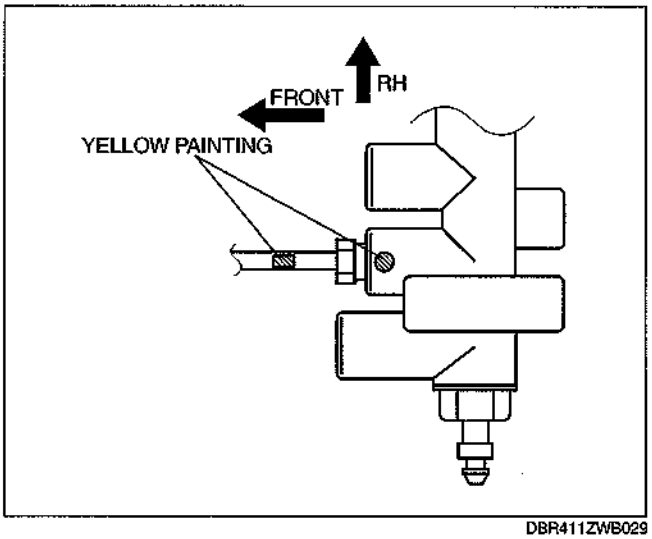


DCF411ZWB005

1	Brake pipe (See 04-11-14 Brake Pipe Installation Note)
2	Nut
3	Bolt
4	Load sensing proportioning valve (LSPV)

Brake Pipe Installation Note

1. Install the brake pipe to the LSPV and align yellow painting on the brake pipe and LSPV.



DBR411ZWB029

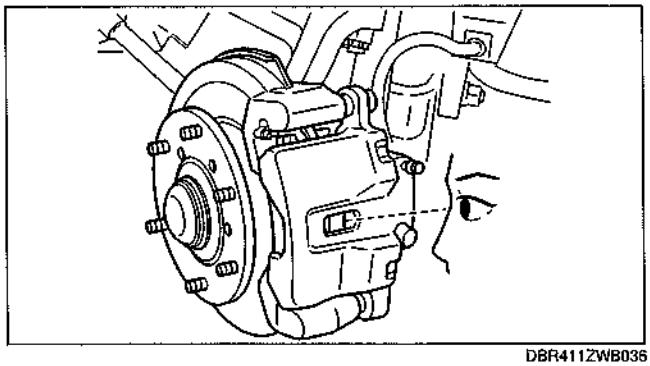
FRONT BRAKE (DISC) INSPECTION

dcf041133980w01

Disc Pad Thickness Inspection

1. Jack up the front of the vehicle on level ground and support it with safety stands.
2. Remove the wheels.
3. Look through the caliper inspection hole and verify the remaining thickness of the pad.

Minimum front disc pad thickness
2.0 mm {0.079 in} min.

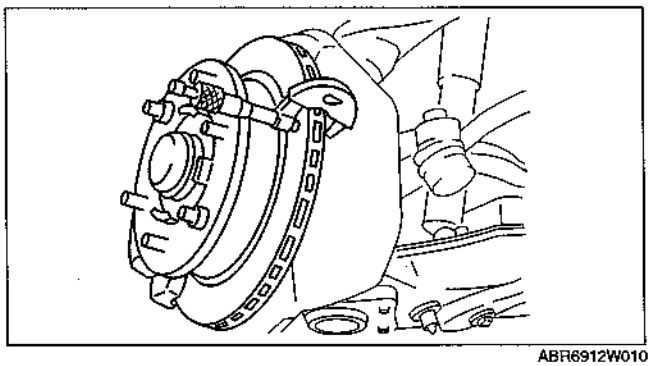


DBR411ZWB036

Disc Plate Thickness Inspection

1. Measure the thickness of the disc plate.
   - If the thickness is not within the specification, replace the disc plate.

Caution
- **When it is necessary to machine the disc plate, make sure the disc plate is not removed from the vehicle when machined, excessive runout may result. Machine the disc plate with it installed on the vehicle.**



ABR6912W010

Standard front disc plate thickness
4x2 (except Hi-Rider): 24.0 mm {0.945 in}
Hi-Rider, 4x4: 28.0 mm {1.11 in}

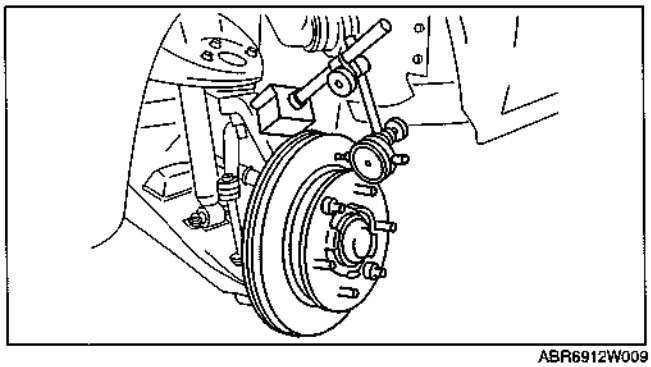
Minimum front disc plate thickness
4x2 (except Hi-Rider): 22.0 mm {0.867 in}
Hi-Rider, 4x4: 26.0 mm {1.03 in}

Minimum front disc plate thickness after machining using a brake lathe on-vehicle
4x2 (except Hi-Rider): 22.8 mm {0.898 in}
Hi-Rider, 4x4: 26.8 mm {1.06 in}

Disc Plate Runout Inspection

1. Tighten the disc plate to the wheel hub using two wheel nuts. When measuring runout, measure at the outer edge of the disc plate surface.

Front disc plate runout limit
0.05 mm {0.002 in} max.



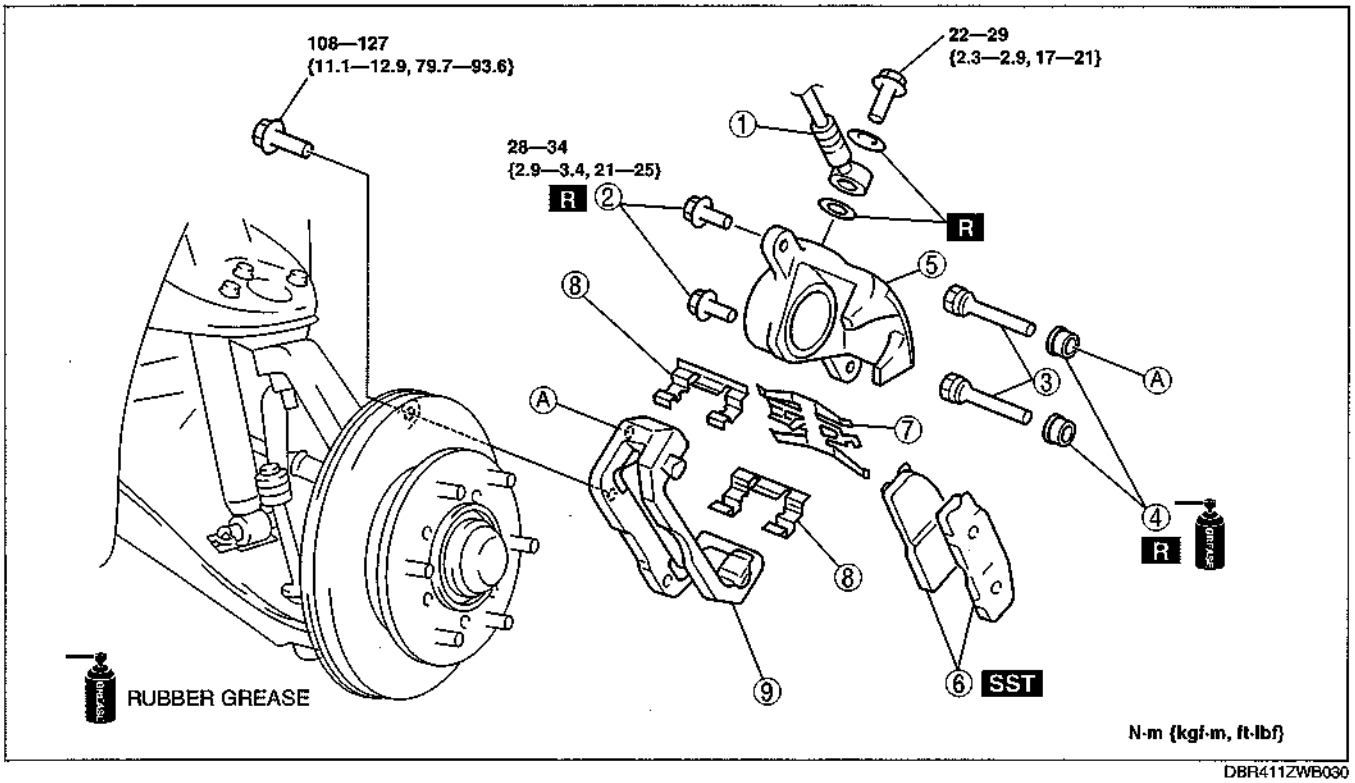
ABR6912W009

FRONT BRAKE (DISC) REMOVAL/INSTALLATION [4x2 (EXCEPT Hi-Rider)]

dcf041133980w02

Note
- Because the disc plate is installed to the front wheel hub, refer to WHEEL HUB, STEERING KNUCKLE REMOVAL/INSTALLATION to remove it. (See 03-11-4 WHEEL HUB, STEERING KNUCKLE REMOVAL/INSTALLATION [4x2 (EXCEPT Hi-Rider)].)

1. Remove in the order indicated in the table.
2. Install in the reverse order of removal.
3. After installation, depress the pedal a few times, rotate the wheel by hand, and verify that the brake does not drag.

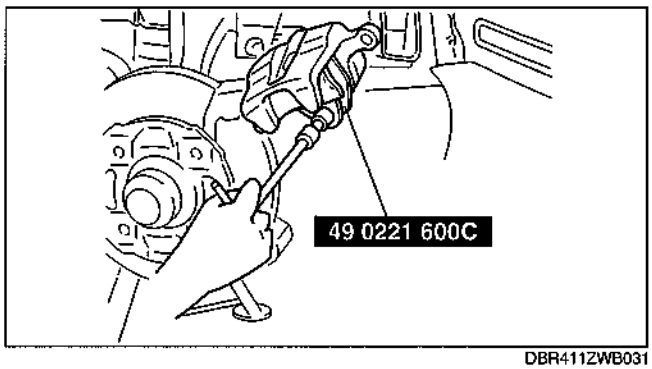


DBR411ZWB030

1	Brake hose
2	Bolt
3	Guide pin
4	Dust boot
5	Caliper

6	Disc pad (See 04-11-16 Disc Pad Installation Note)
7	Plate
8	Guide plate
9	Mounting support

Disc Pad Installation Note
1. Push the piston fully inward using the **SST**.
2. Install the disc pad.



DBR411ZWB031

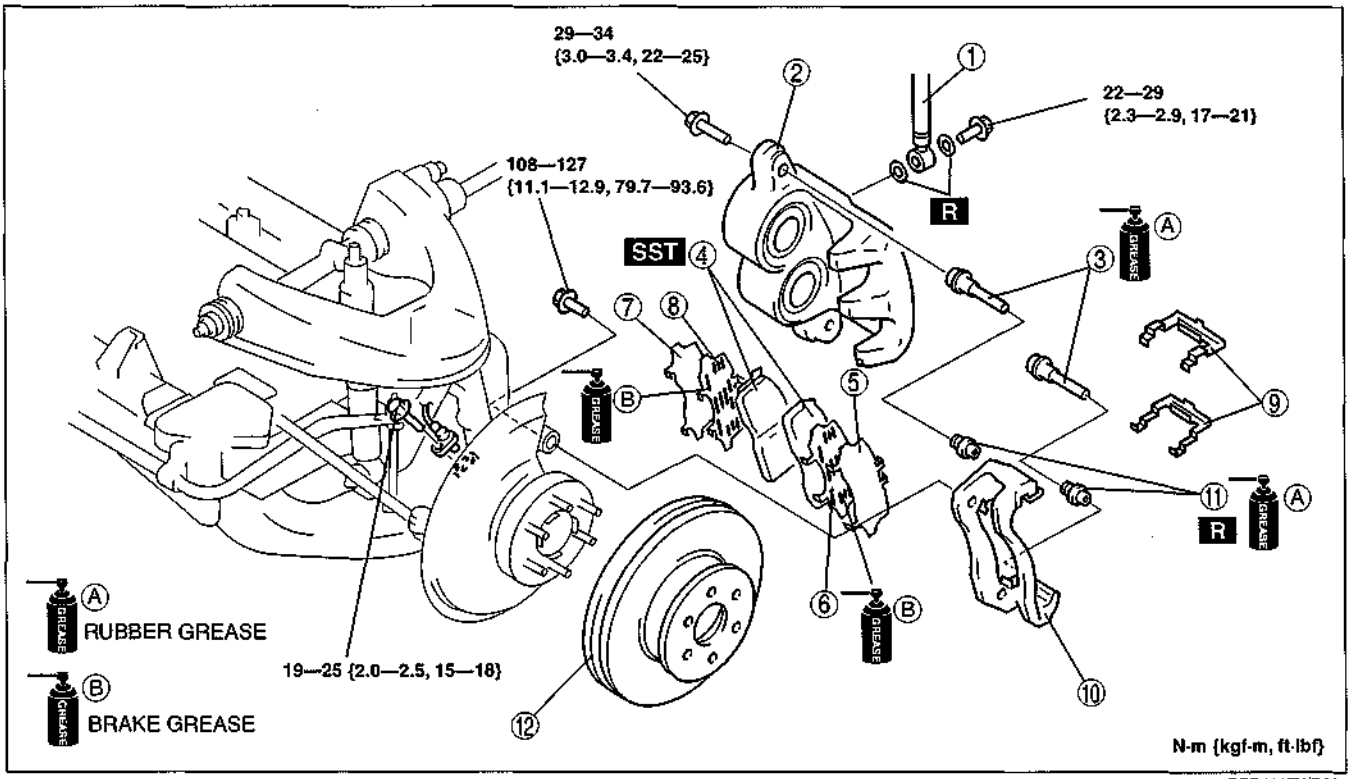
FRONT BRAKE (DISC) REMOVAL/INSTALLATION [Hi-Rider, 4x4]

dcf041133980w03

Caution

- **Performing the following procedures without first removing the ABS wheel-speed sensor may possibly cause an open circuit in the harness if it is pulled by mistake. Before performing the following procedures, remove the ABS wheel-speed sensor (axle side) and fix it to an appropriate place where the sensor will not be pulled by mistake while the vehicle is being serviced.**

1. Remove in the order indicated in the table.
2. Install in the reverse order of removal.
3. After installation, depress the pedal a few times, rotate the wheel by hand, and verify that the brake does not drag.



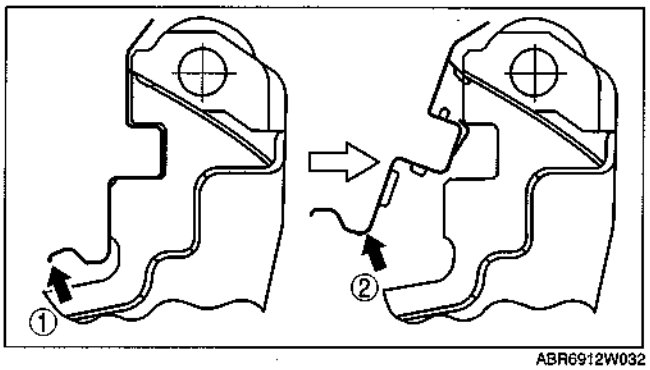
DBR411ZWB035

1	Brake hose
2	Caliper
3	Guide pin
4	Disc pad (See 04-11-19 Disc Pad Installation Note)
5	Outer shim (cover shim) (See 04-11-18 Outer Shim, Inner shim Installation Note)
6	Outer shim (rubber coated shim) (See 04-11-18 Outer Shim, Inner shim Installation Note)

7	Inner shim (cover shim) (See 04-11-18 Outer Shim, Inner shim Installation Note)
8	Inner shim (rubber coated shim) (See 04-11-18 Outer Shim, Inner shim Installation Note)
9	Guide plate (See 04-11-18 Guide Plate Removal Note)
10	Mounting support
11	Dust boot
12	Disc plate (See 04-11-18 Disc Plate Removal Note) (See 04-11-18 Disc Plate Installation Note)

Guide Plate Removal Note

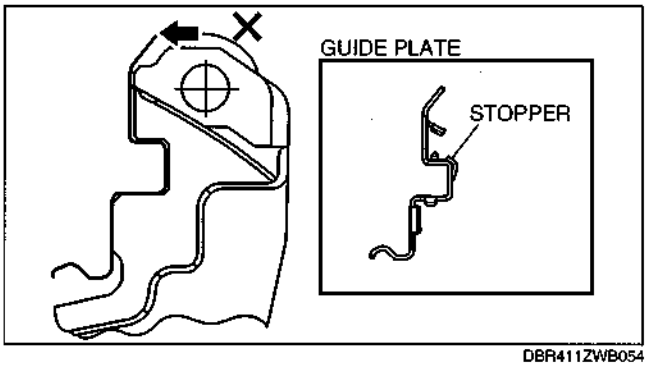
1. Pull up and at a slant on the supporting part of the guide plate in the direction indicated by the arrow (1) and (2) as shown in the figure, to remove the guide plate from the mounting support.



ABR6912W032

Caution

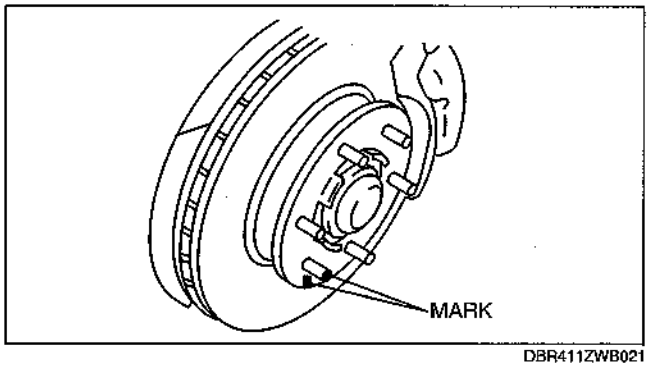
- **If the guide plate is removed by pulling in the direction indicated by the arrow as shown in the figure, the stopper may be deformed and not able to be reused. Do not remove in this manner.**



DBR411ZWB054

Disc Plate Removal Note

1. Mark the wheel hub bolt and disc plate before removal for reference during installation.



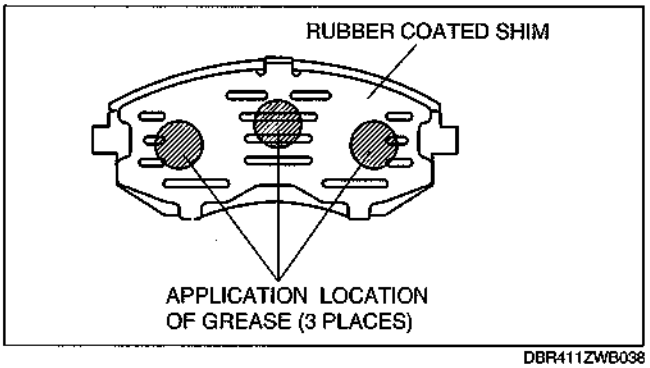
DBR411ZWB021

Disc Plate Installation Note

1. Remove any rust or grime on the contact face of the disc plate and wheel hub.
2. Install the disc plate and align the marks made before removal.

Outer Shim, Inner shim Installation Note

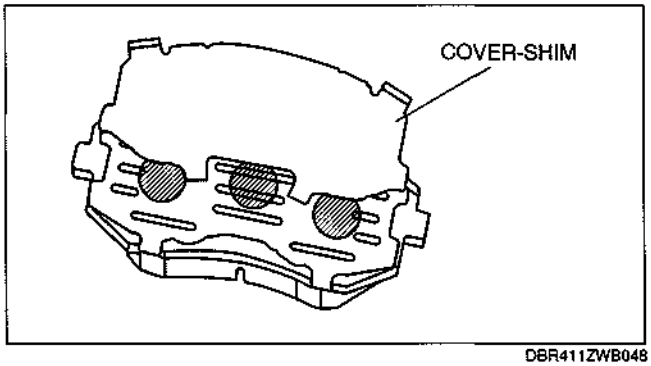
1. Assemble the rubber coated shim to the back plate of the disc pad.
2. Apply brake grease to the rubber coated shim as shown in the figure.



DBR411ZWB038

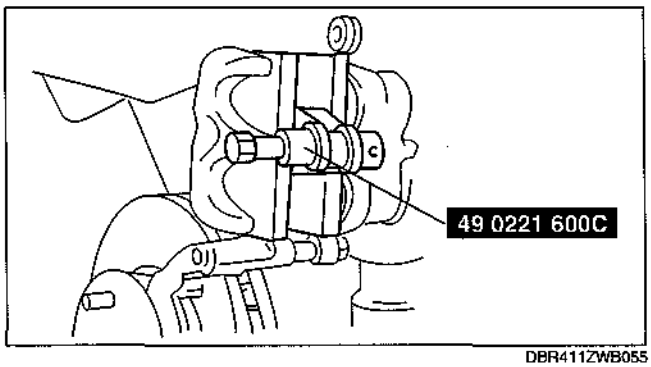
3. Assemble the cover-shim to the grease-applied rubber coated shim.

Caution
- **Be careful not to get any grease on the pad lining surface.**



DBR411ZWB048

Disc Pad Installation Note
1. Push the piston fully inward using the **SST**.
2. Install the disc pad.



DBR411ZWB055

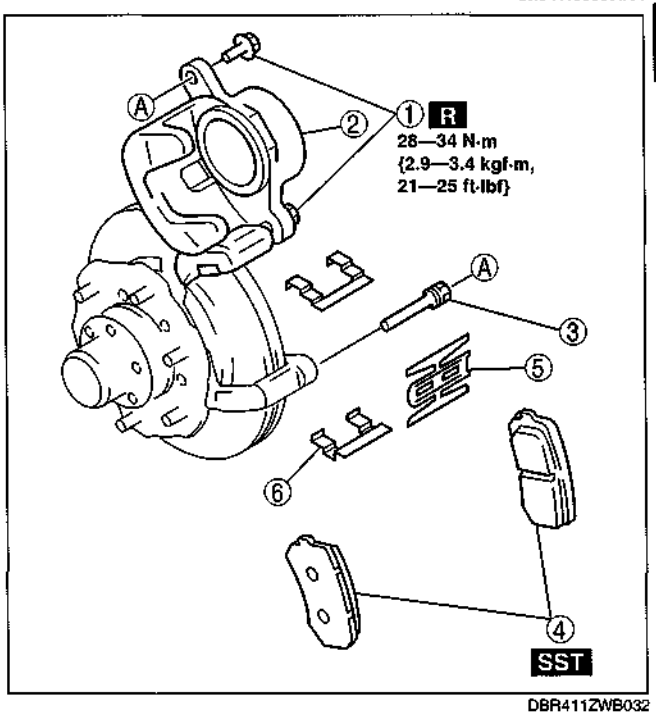
DISC PAD (FRONT) REPLACEMENT [4x2 (EXCEPT Hi-Rider)]

dcf041133630w01

1. Remove in the order indicated in the table.

1	Bolt
2	Caliper
3	Guide pin
4	Disc pad (See 04-11-16 Disc Pad Installation Note.)
5	Plate
6	Guide plate

2. Install in the reverse order of removal.



DBR411ZWB032

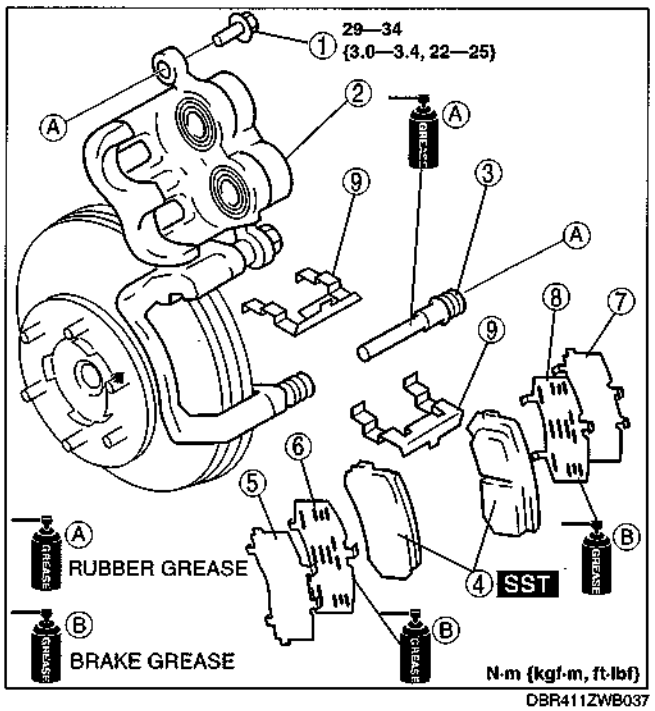
DISC PAD (FRONT) REPLACEMENT [Hi-Rider, 4x4]

1. Remove in the order indicated in the table.

1	Bolt
2	Caliper
3	Guide pin
4	Disc pad (See 04-11-19 Disc Pad Installation Note)
5	Outer shim (cover shim) (See 04-11-19 Disc Pad Installation Note)
6	Outer shim (rubber coated shim) (See 04-11-19 Disc Pad Installation Note)
7	Inner shim (cover shim) (See 04-11-19 Disc Pad Installation Note)
8	Inner shim (rubber coated shim) (See 04-11-19 Disc Pad Installation Note)
9	Guide plate (See 04-11-18 Guide Plate Removal Note)

2. Install in the reverse order of removal.

dcf041133630w02



DBR411ZWB037

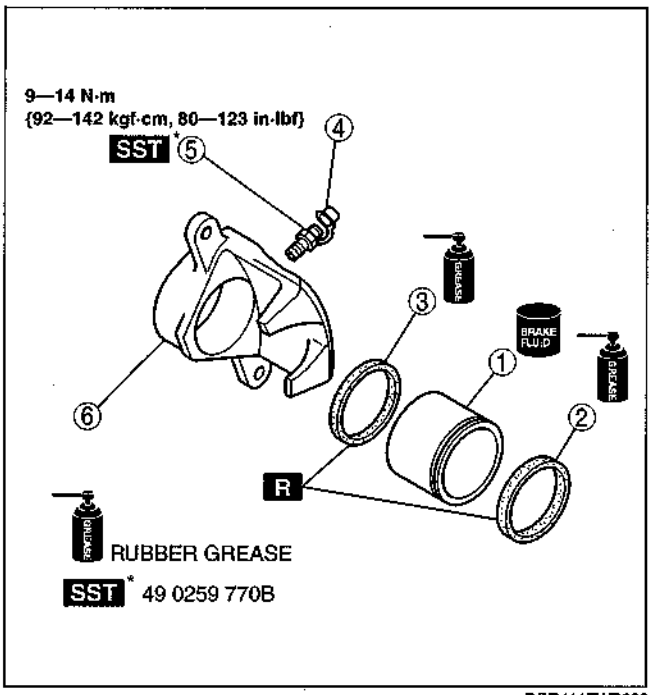
CALIPER (FRONT) DISASSEMBLY/ASSEMBLY [4x2 (EXCEPT Hi-Rider)]

1. Disassemble in the order indicated in the table.

1	Piston (See 04-11-21 Piston Disassembly Note)
2	Dust seal
3	Piston seal
4	Bleeder cap
5	Bleeder screw
6	Caliper

2. Assemble in the reverse order of removal.

dcf041133990w01

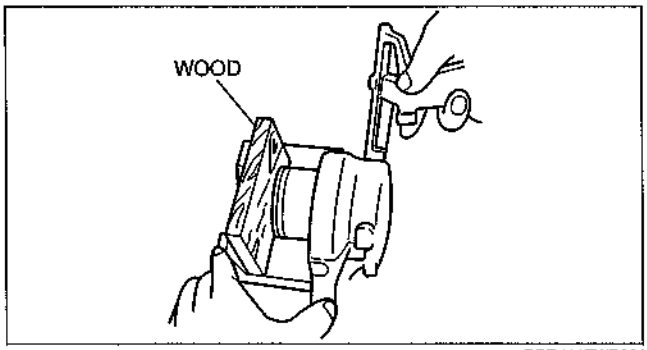


DBR411ZWB033

Piston Disassembly Note

Caution
- **The piston could be damaged if blown out with great force. Blow the compressed air slowly to prevent the piston from suddenly popping out.**

1. Place the piece of wood in the caliper, then blow compressed air through the hole to force the piston out of the caliper.



DBR411ZWB034

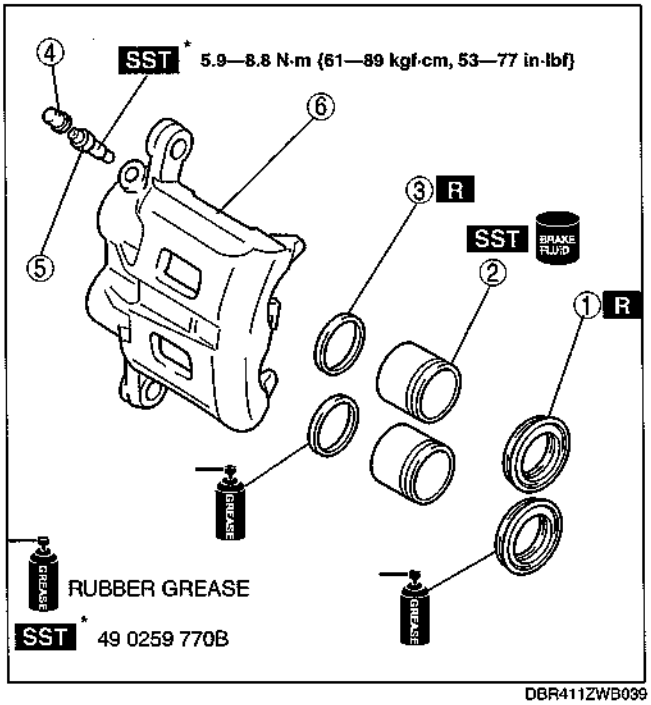
CALIPER (FRONT) DISASSEMBLY/ASSEMBLY [Hi-Rider, 4x4]

dcf041133990w02

1. Disassemble in the order indicated in the table.

1	Dust seal
2	Piston (See 04-11-21 Piston Disassembly Note)
3	Piston seal
4	Bleeder cap
5	Bleeder screw
6	Caliper

2. Assemble in the reverse order of removal.

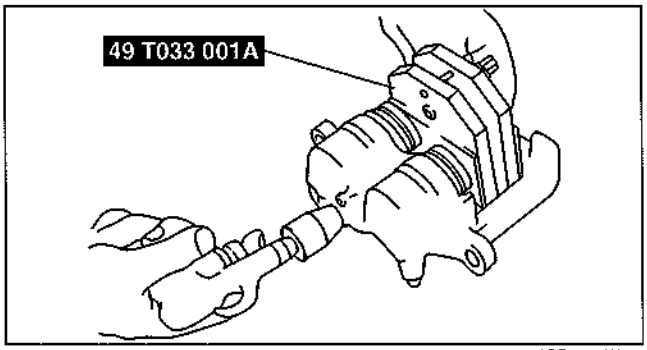


DBR411ZWB039

Piston Disassembly Note

Caution
- **The piston could be damaged if blown out with great force. Blow the compressed air slowly to prevent the piston from suddenly popping out.**

1. Place the **SST** in the caliper, then blow compressed air through the hole to force the piston out of the caliper.



ABR6912W006

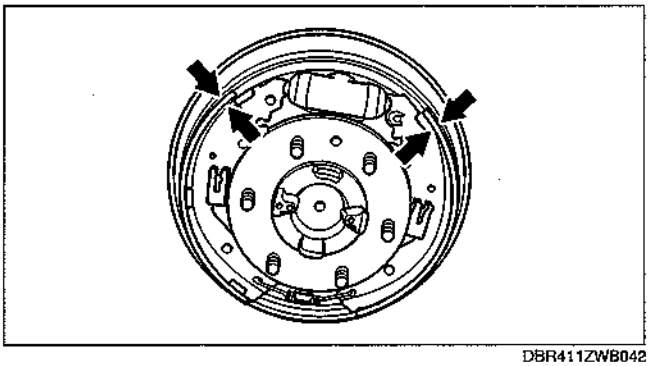
REAR BRAKE (DRUM) INSPECTION

dcf04112625Ow01

Brake Lining Thickness Inspection

1. Remove the brake drum. (See 04-11-23 REAR BRAKE (DRUM) REMOVAL/INSTALLATION.)
2. Inspect the brake lining thickness.
   - If it less than the minimum specification, replace the brake shoe. (See 04-11-23 REAR BRAKE (DRUM) REMOVAL/INSTALLATION.)

Minimum rear brake lining thickness
1.0 mm {0.04 in}

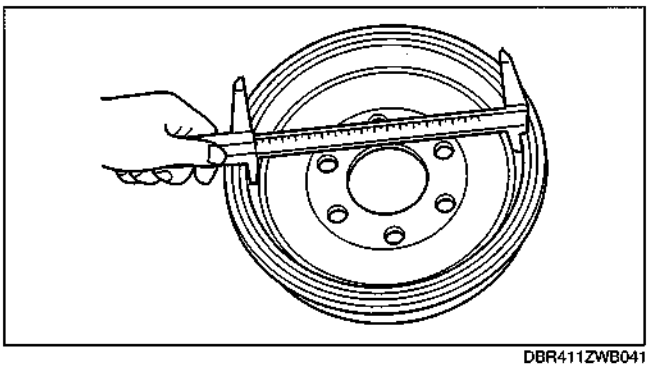


DBR411ZWB042

Brake Drum Inspection

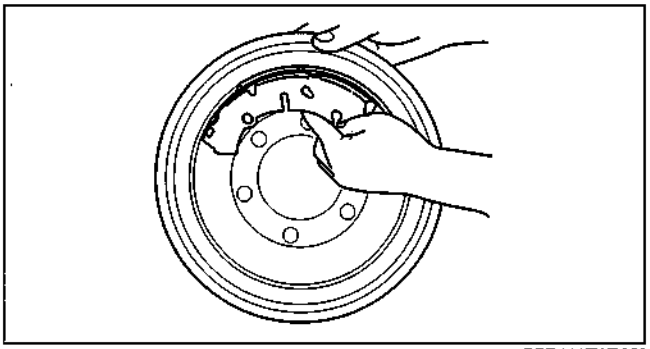
1. Remove the brake drum. (See 04-11-23 REAR BRAKE (DRUM) REMOVAL/INSTALLATION.)
2. Inspect the inner diameter of the brake drum.
   - If t exceeds the maximum specification, replace the brake drum. (See 04-11-23 REAR BRAKE (DRUM) REMOVAL/INSTALLATION.)

Maximum rear brake drum diameter
4x2 (except Hi-Rider): 271.5 mm {10.68 in}
Hi-Rider, 4x4: 296.5 mm {11.67 in}



DBR411ZWB041

3. Apply chalk to the inside of the brake drum, rub it against the brake shoe, and then inspect for scratches and uneven or abnormal wear inside the drum.
   - If there is significant uneven wear of the brake drum, repair it within the maximum brake drum inner diameter or replace. (See 04-11-23 REAR BRAKE (DRUM) REMOVAL/ INSTALLATION.)
4. After inspection, wipe the chalk off.



DBR411ZWB050

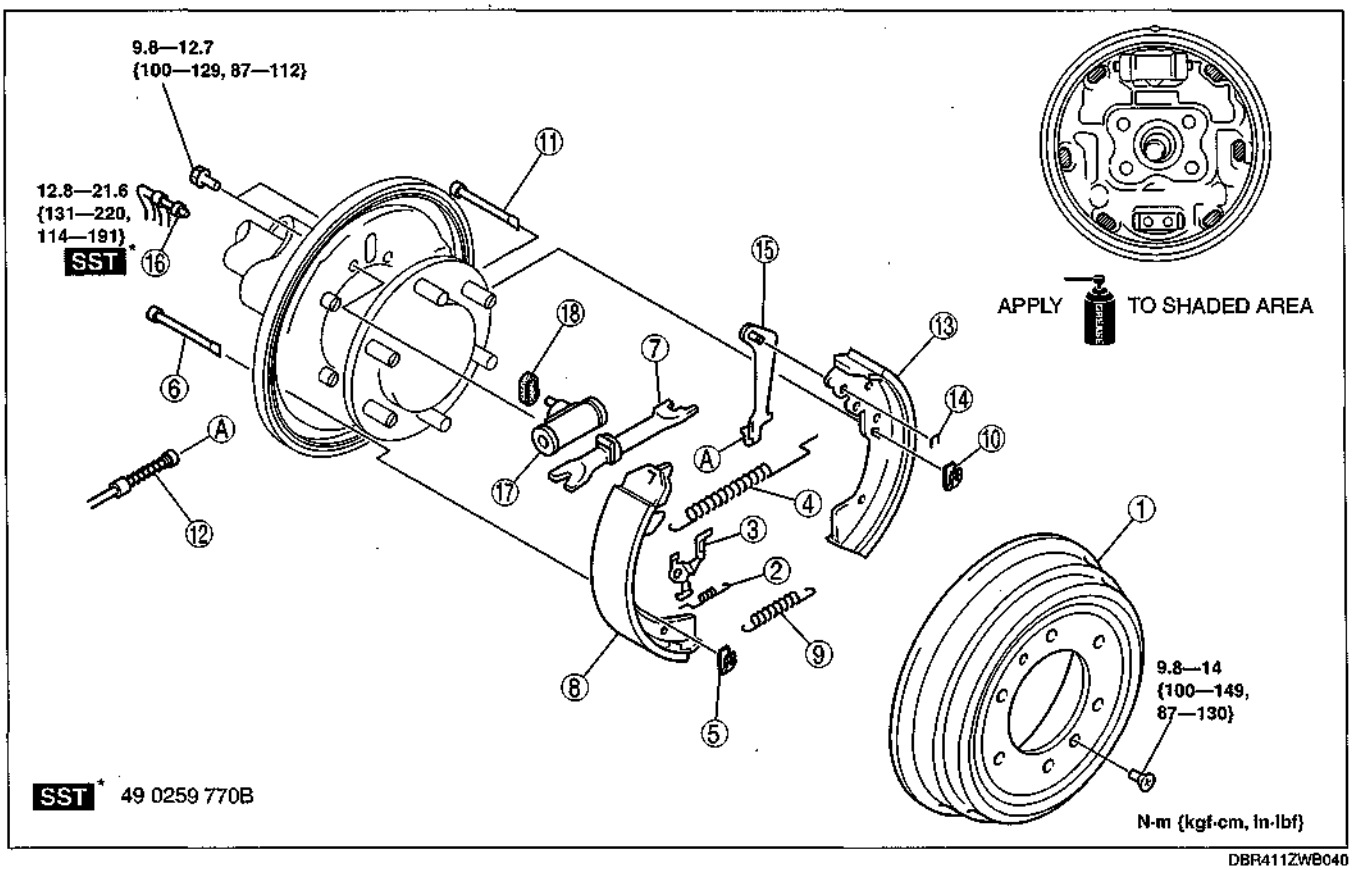
REAR BRAKE (DRUM) REMOVAL/INSTALLATION

dcf041126250w02

Warning

- **When removing/installing the brake drum component parts, the spring could fly off and cause injury. Remove/install the spring being careful not to allow the spring to fly off. Wear protective equipment such as safety glasses if necessary.**

1. Remove in the order indicated in the table.
2. Install in the reverse order of removal.
3. After installation, pump the brake pedal a few times and inspect the following:
   — Parking brake lever stroke
   — Brake drag



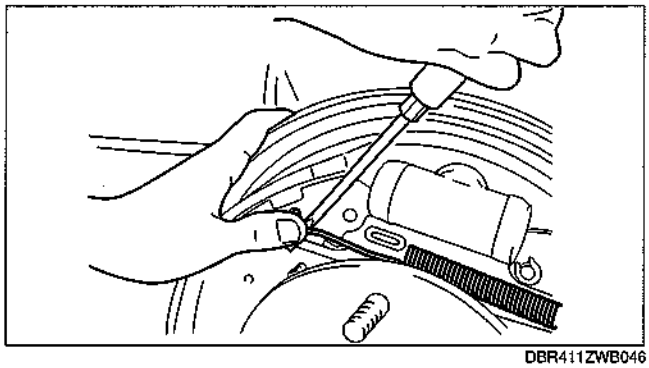
DBR411ZWB040

1	Brake drum (See 04-11-24 Brake Drum Installation Note.)
2	Pawl spring
3	Pawl lever
4	Upper return spring (See 04-11-24 Upper Return Spring Removal Note.) (See 04-11-24 Upper Return Spring Installation Note.)
5	Hold spring (leading shoe side)
6	Hold pin (leading shoe side)
7	Adjust strut
8	Brake shoe (leading shoe)

9	Lower return spring
10	Hold spring (trailing shoe side)
11	Hold pin (trailing shoe side)
12	Parking brake cable
13	Brake shoe (trailing shoe)
14	U-ring
15	Operating lever
16	Brake pipe
17	Wheel cylinder
18	Gasket

Upper Return Spring Removal Note

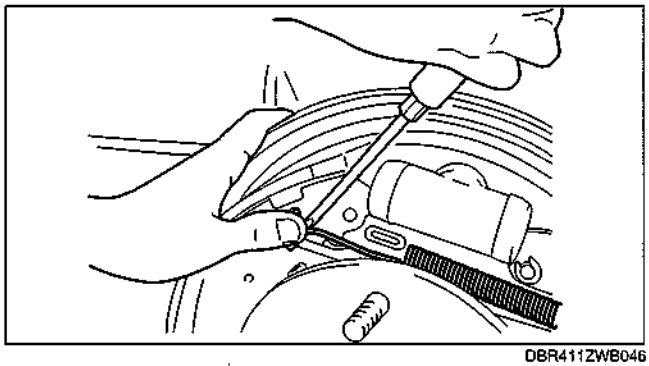
1. Remove the return spring using a flathead screwdriver while supporting it with the hand, as shown in the figure, to prevent it from flying off.



DBR411ZWB046

Upper Return Spring Installation Note

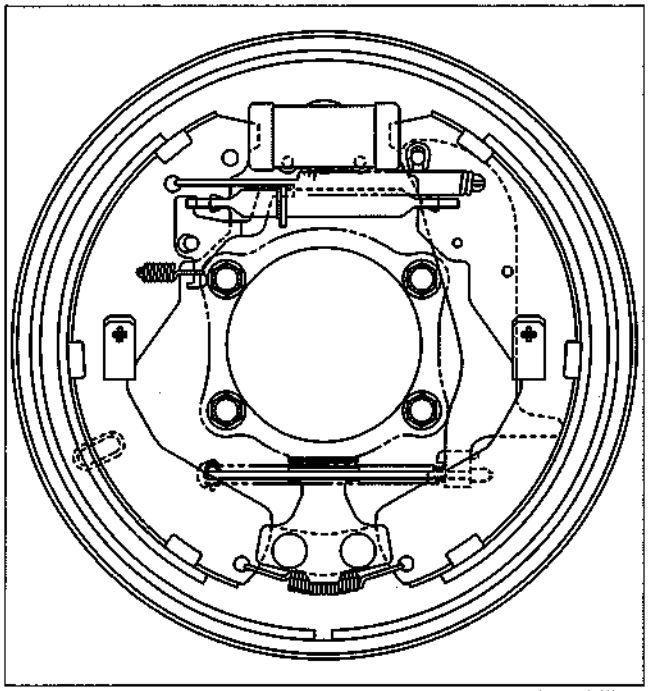
1. Install the return spring using a flathead screwdriver while supporting it with the hand, as shown in the figure, to prevent it from flying off.



DBR411ZWB046

Brake Drum Installation Note

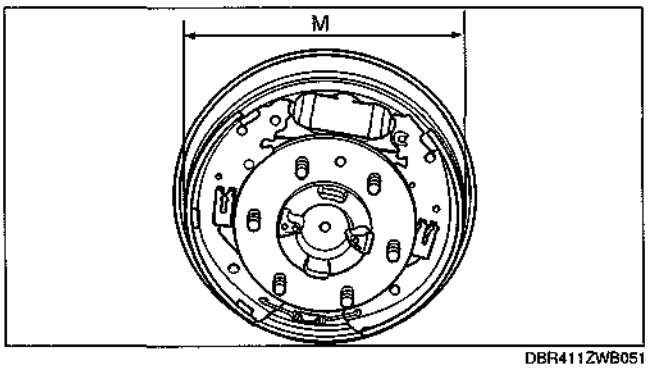
1. Verify that each component part of the rear brake (drum) is properly installed as shown in the figure.



DBR411ZWB056

2. Turn the adjuster on the adjustment strut to adjust the brake shoe until the outer diameter (M) of the brake shoe is as specified below.

   Brake shoe adjustment value
   - **4x2 (except Hi-Rider): 269.3—269.7 mm {10.603—10.618 in}**
   - **Hi-Rider, 4x4: 294.3—294.7 mm {11.59—10.60 in}**



DBR411ZWB051

3. Install the brake drum.
4. Depress the brake pedal five times and operate the auto adjuster.
5. Verify there is no brake drag.
   - If there is any brake drag, readjust the brake adjustment

WHEEL CYLINDER DISASSEMBLY/ASSEMBLY

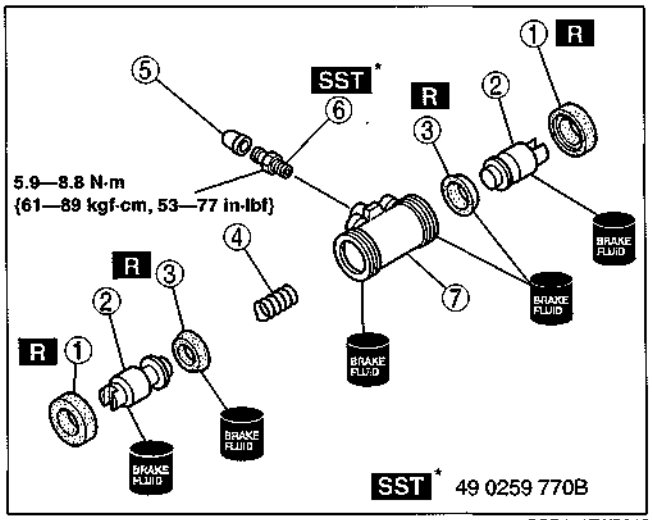
dcf041126610w01

Caution
- **Replace the wheel cylinder component if a problem is found.**

1. Disassemble in the order indicated in the table.

1	Dust boot
2	Wheel cylinder piston
3	Piston cup
4	Wheel cylinder spring
5	Bleeder cap
6	Bleeder screw
7	Wheel cylinder body

2. Assemble in the reverse order of disassembly.



DBR411ZWB045

04-12 PARKING BRAKE SYSTEM

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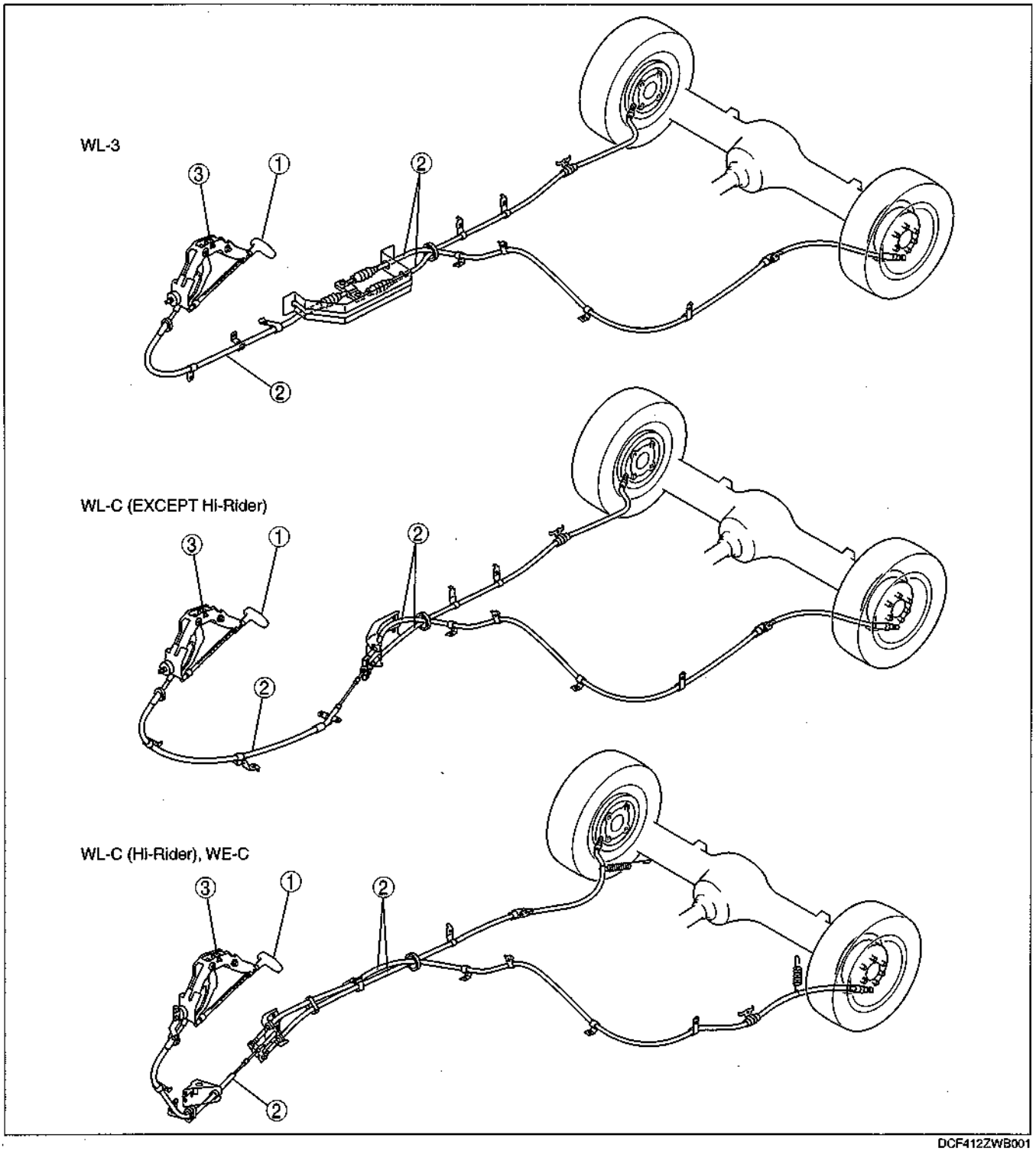
PARKING BRAKE LEVER INSPECTION 04-12–3
PARKING BRAKE LEVER ADJUSTMENT 04-12–3
PARKING BRAKE LEVER REMOVAL/ INSTALLATION 04-12–4
PARKING BRAKE CABLE REMOVAL/ INSTALLATION [WL-3] 04-12–5
PARKING BRAKE CABLE REMOVAL/ INSTALLATION [WL-C (EXCEPT Hi-Rider)] 04-12–6
PARKING BRAKE CABLE REMOVAL/ INSTALLATION [WL-C (Hi-Rider), WE-C] 04-12–7
PARKING BRAKE SWITCH INSPECTION 04-12–8

PARKING BRAKE SYSTEM LOCATION INDEX

dcf041200000w01



DCF412ZWB001

1	Parking brake lever (See 04-12-3 PARKING BRAKE LEVER INSPECTION.) (See 04-12-3 PARKING BRAKE LEVER ADJUSTMENT.) (See 04-12-4 PARKING BRAKE LEVER REMOVAL/INSTALLATION.)

2	Parking brake cable (See 04-12-5 PARKING BRAKE CABLE REMOVAL/INSTALLATION [WL-3].) (See 04-12-6 PARKING BRAKE CABLE REMOVAL/INSTALLATION [WL-C (EXCEPT Hi-Rider)].) (See 04-12-7 PARKING BRAKE CABLE REMOVAL/INSTALLATION [WL-C (Hi-Rider), WE-C].)
3	Parking brake switch (See 04-12-8 PARKING BRAKE SWITCH INSPECTION.)

PARKING BRAKE LEVER INSPECTION

dcf041244300w01

Parking Brake Lever Stroke Inspection

1. Pump the brake pedal a few times.
2. Pull the parking brake lever two to three times.
3. Verify that the stroke is within the specification when the parking brake lever is pulled with a force of **98 N {10 kgf, 22 lbf}**.
   - If not within the specification, adjust the parking brake lever. (See 04-12-3 PARKING BRAKE LEVER ADJUSTMENT.)

Parking brake lever stroke when pulled at 98 N {10 kgf, 22 lbf}
1—7 notches

PARKING BRAKE LEVER ADJUSTMENT

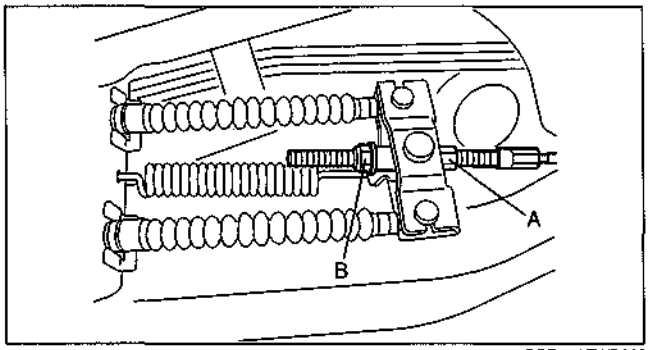
dcf041244300w02

Parking Brake Lever Stroke Adjustment

1. Before adjustment, depress the brake pedal several times while the vehicle is moving in reverse.
2. Loosen the locknut A and turn the adjustment nut B so that the stroke is within the above range.
3. After adjustment, tighten the locknut A.

Tightening torque
6.9—9.8 N·m {71—99 kgf·cm, 62—86 in·lbf}

4. After adjustment, pull the parking brake lever one notch and verify that the parking brake warning light illuminates.
5. Verify that the rear brakes do not drag.

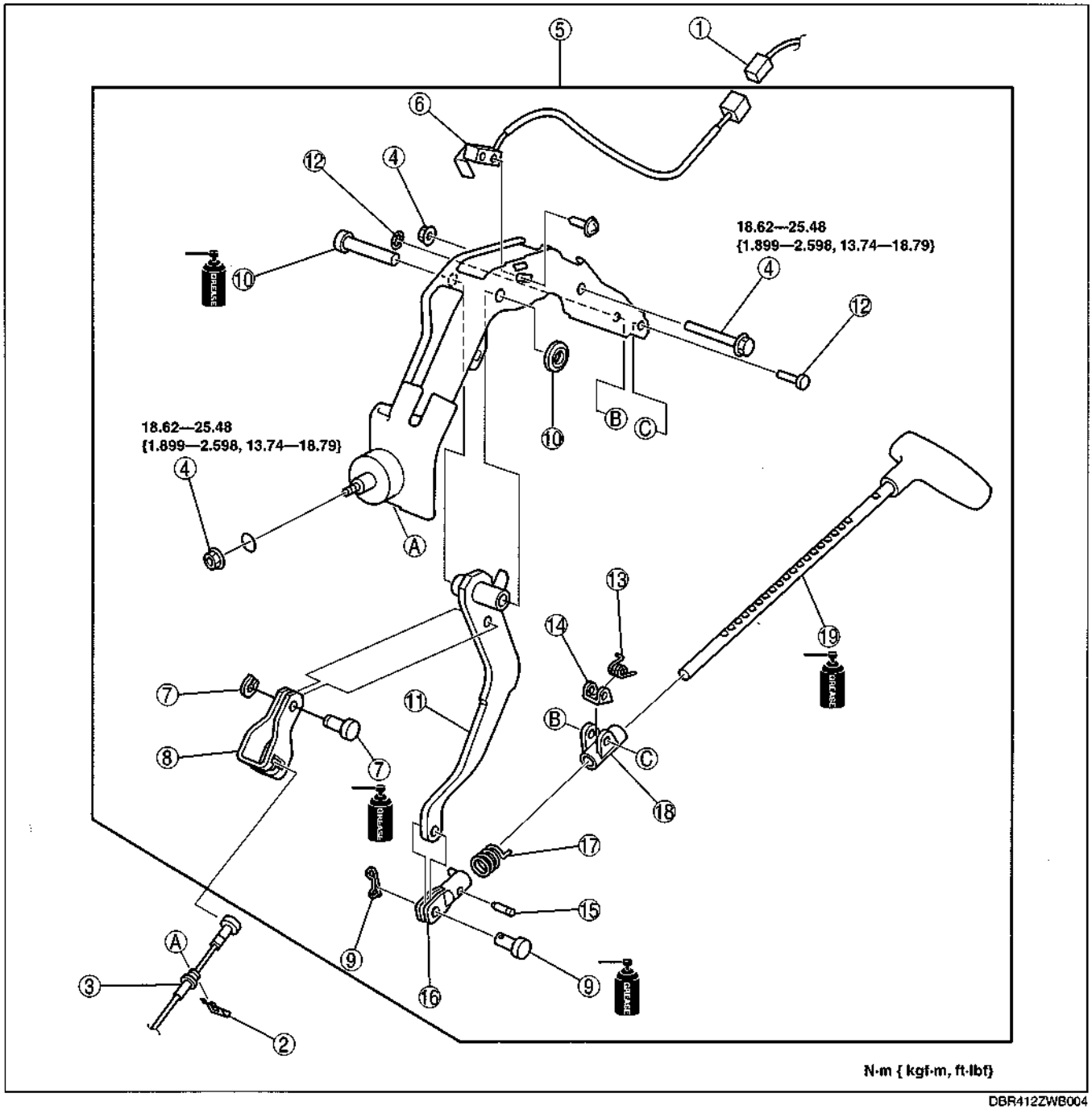


DBR412ZWB002

PARKING BRAKE LEVER REMOVAL/INSTALLATION

dcf041244300w03

1. Remove the lower panel. (See 09-17-10 LOWER PANEL REMOVAL/INSTALLATION.)
2. Remove in the order indicated in the table.
3. Install in the reverse order of removal.
4. After installation, inspect the parking brake lever stroke. (See 04-12-3 PARKING BRAKE LEVER INSPECTION.)



DBR412ZWB004

1	Parking brake switch connector
2	Clip
3	Front parking brake cable (See 04-12-5 PARKING BRAKE CABLE REMOVAL/INSTALLATION [WL-3].) (See 04-12-6 PARKING BRAKE CABLE REMOVAL/INSTALLATION [WL-C (EXCEPT Hi-Rider)].) (See 04-12-7 PARKING BRAKE CABLE REMOVAL/INSTALLATION [WL-C (Hi-Rider), WE-C].)
4	Bolt and nut
5	Parking brake lever component

6	Parking brake switch
7	Clip and joint pin
8	Cable connector
9	Clip and joint pin
10	Clip and joint pin
11	Lever
12	Clip and joint pin
13	Spring
14	Ratchet pawl

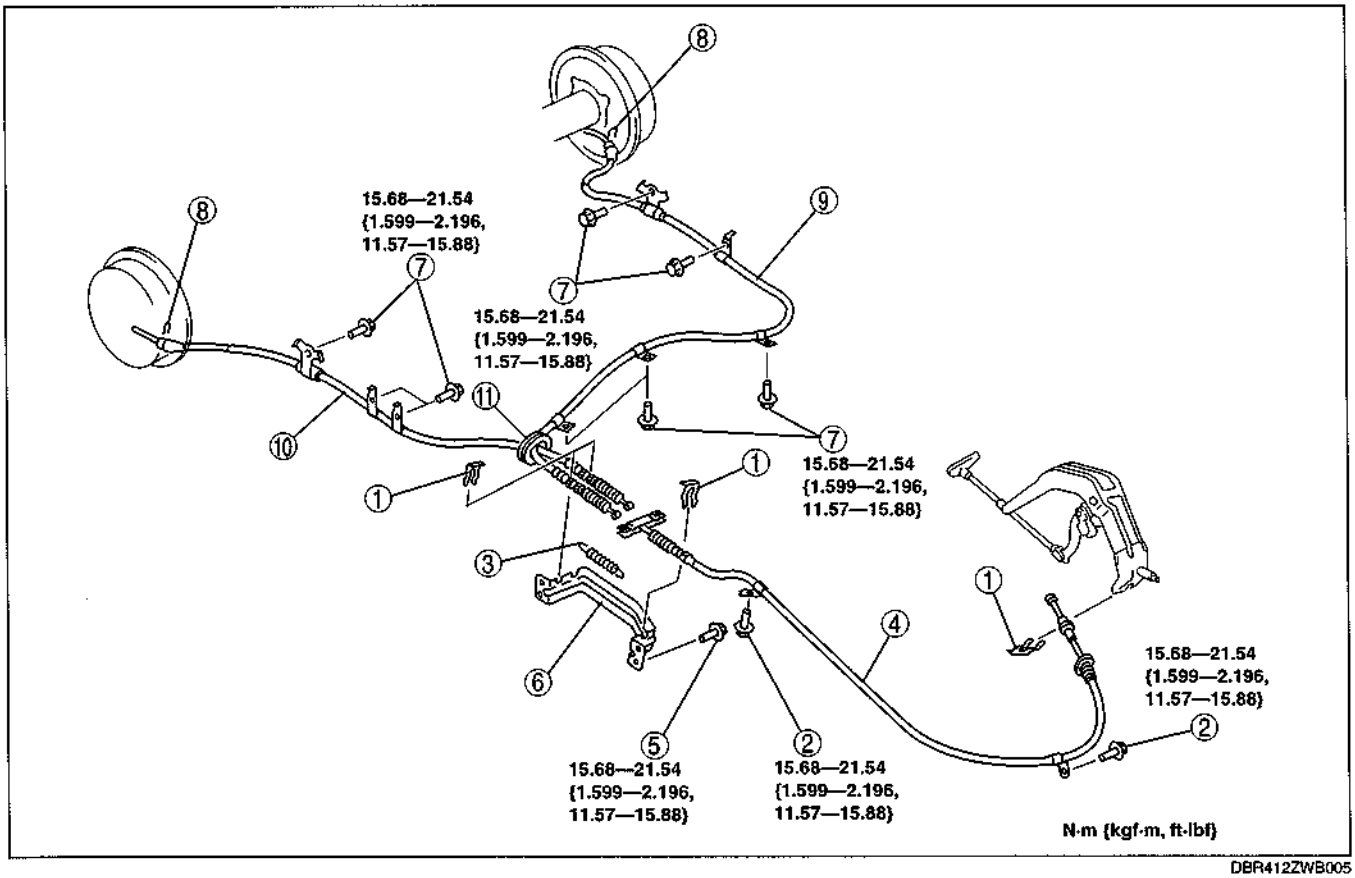
15	Stopper
16	Fork joint
17	Spring

18	Guide
19	Rod

PARKING BRAKE CABLE REMOVAL/INSTALLATION [WL-3]

dcf041244410w01

1. Remove the fuel tank cover. (See 01-14A-5 FUEL TANK REMOVAL/INSTALLATION [WL-3].)
2. Remove the brake shoe (trailing shoe). (See 04-11-23 REAR BRAKE (DRUM) REMOVAL/INSTALLATION.)
3. Remove in the order indicated in the table.
4. Install in the reverse order of removal.
5. After installation, inspect the parking brake lever stroke. (See 04-12-3 PARKING BRAKE LEVER INSPECTION.)



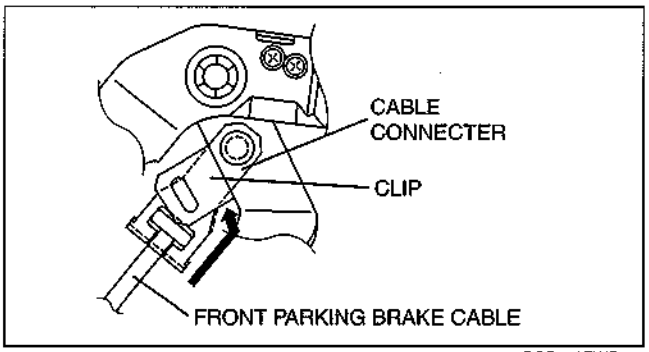
DBR412ZWB005

1	Clip
2	Bolt
3	Spring
4	Front parking brake cable (See 04-12-6 Front Parking Brake Cable Removal Note.)
5	Bolt

6	Bracket
7	Bolt
8	Clip
9	Rear parking brake cable (left)
10	Rear parking brake cable (right)
11	Grommet

Front Parking Brake Cable Removal Note

1. Slide the clip installed to the cable connector in the direction shown by the arrow.
2. Remove the end of the front parking brake cable from the cable connector.

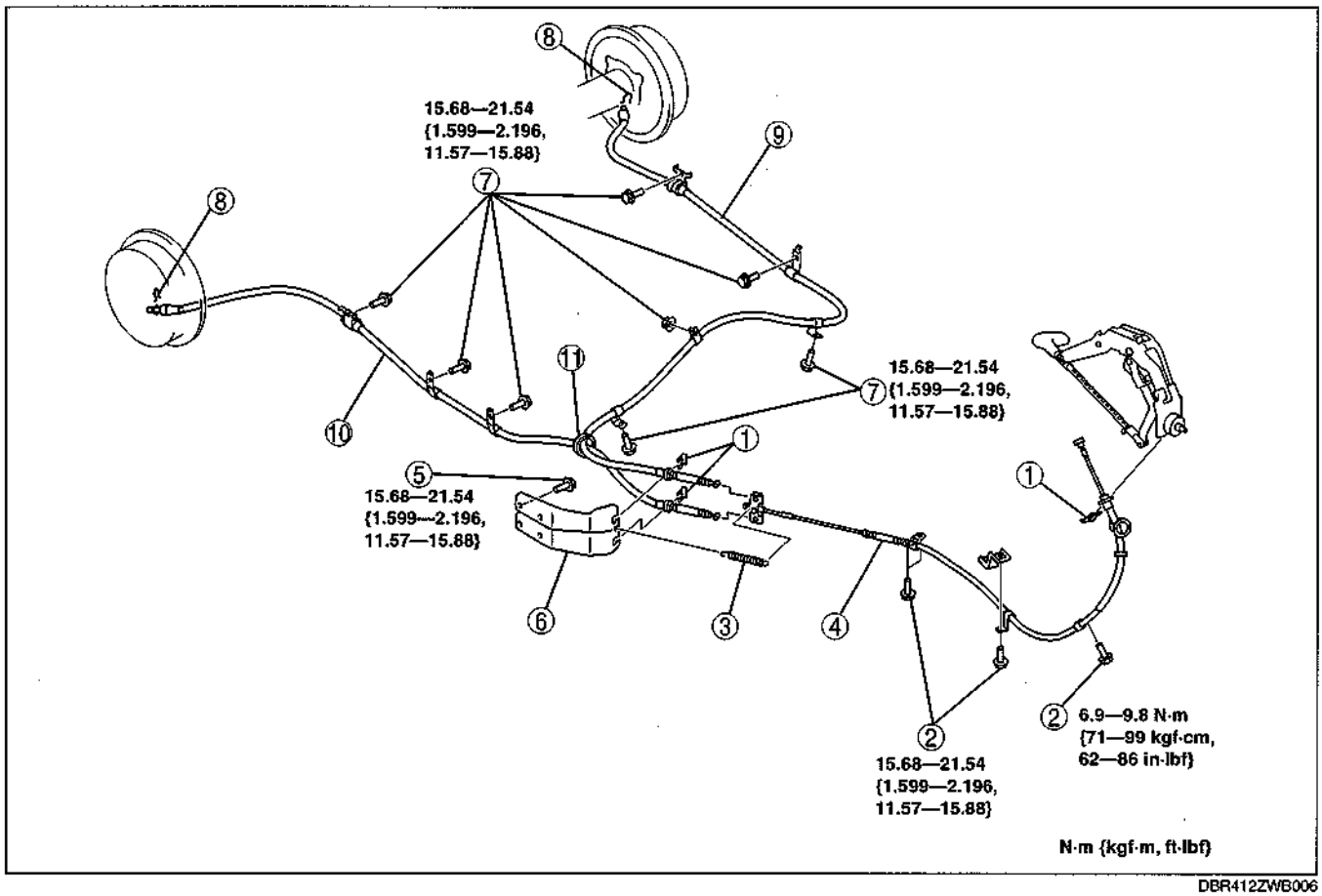


DBR412ZWB008

PARKING BRAKE CABLE REMOVAL/INSTALLATION [WL-C 4x2 (EXCEPT Hi-Rider)]

dcf041244410w02

1. Remove the fuel tank cover. (See 01-14B-4 FUEL TANK REMOVAL/INSTALLATION [WL-C, WE-C].)
2. Remove the brake shoe (trailing shoe). (See 04-11-23 REAR BRAKE (DRUM) REMOVAL/INSTALLATION.)
3. Remove in the order indicated in the table.
4. Install in the reverse order of removal.
5. After installation, inspect the parking brake lever stroke. (See 04-12-3 PARKING BRAKE LEVER INSPECTION.)



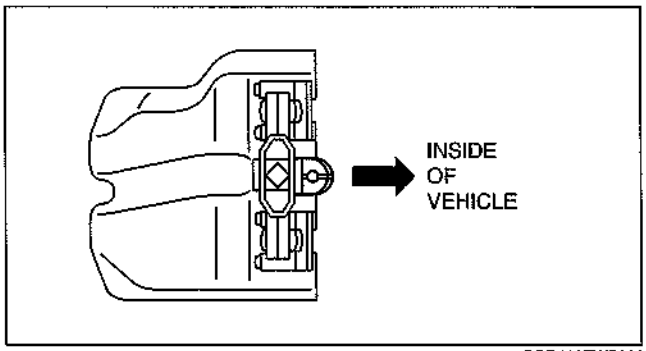
DBR412ZWB006

1	Nut
2	Bolt
3	Spring
4	Front parking brake cable (See 04-12-6 Front Parking Brake Cable Removal Note.) (See 04-12-7 Front Parking Brake Cable Installation Note.)
5	Bolt
6	Bracket

7	Bolt, nut
8	Clip
9	Rear parking brake cable (left)
10	Rear parking brake cable (right)
11	Grommet

Front Parking Brake Cable Installation Note

1. Install the front parking brake cable with the spring installation area of the equalizer pointed towards the inside of the vehicle.

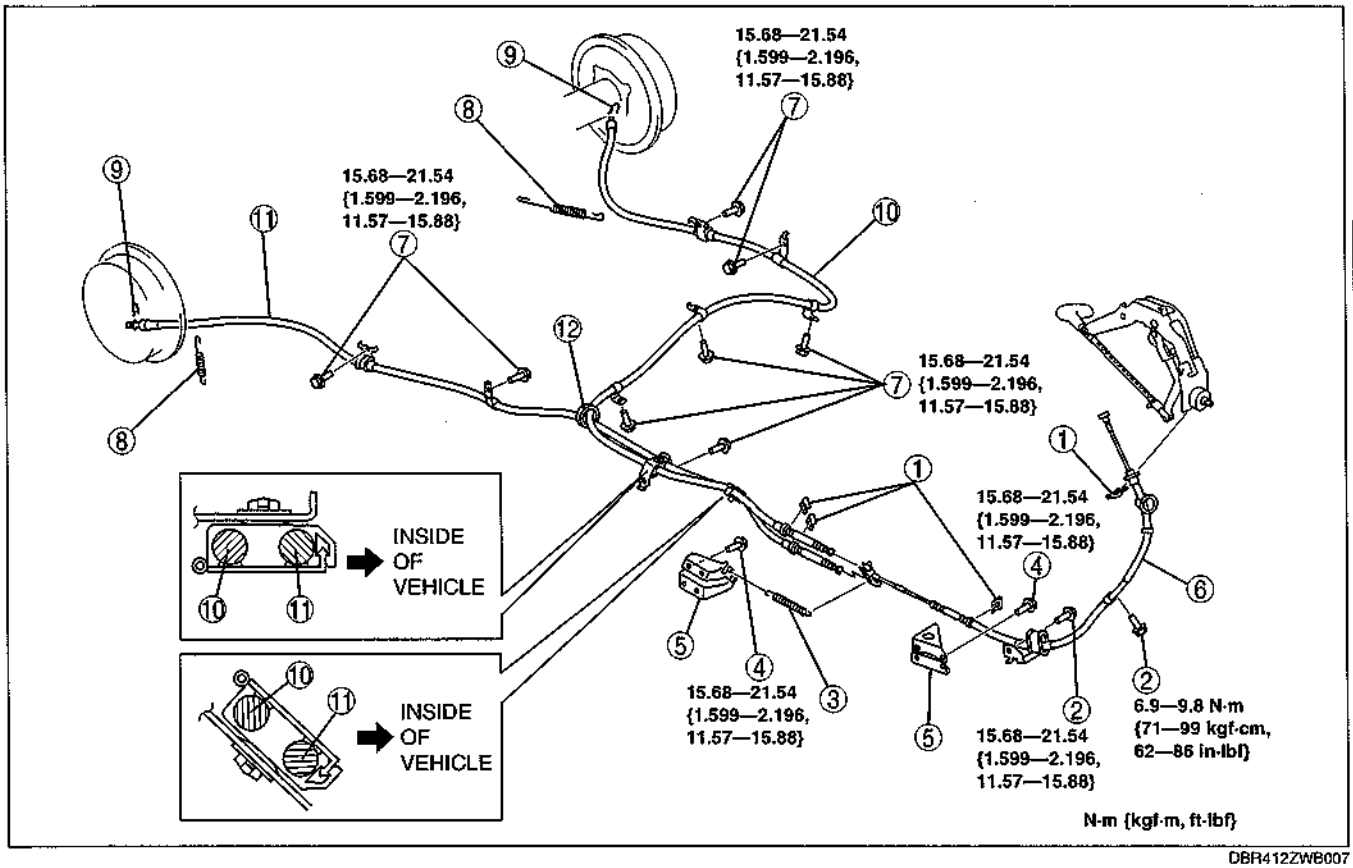


DBR412ZWB009

PARKING BRAKE CABLE REMOVAL/INSTALLATION [WL-C (Hi-Rider, 4x4), WE-C]

dcf041244410w03

1. Remove the fuel tank cover. (See 01-14B-4 FUEL TANK REMOVAL/INSTALLATION [WL-C, WE-C].)
2. Remove the brake shoe (trailing shoe). (See 04-11-23 REAR BRAKE (DRUM) REMOVAL/INSTALLATION.)
3. Remove in the order indicated in the table.
4. Install in the reverse order of removal.
5. After installation, inspect the parking brake lever stroke. (See 04-12-3 PARKING BRAKE LEVER INSPECTION.)



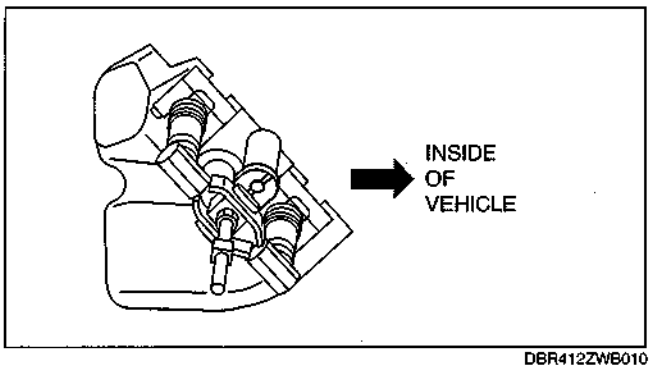
DBR412ZWB007

1	Clip
2	Bolt
3	Spring
4	Bolt
5	Bracket
6	Front parking brake cable (See 04-12-6 Front Parking Brake Cable Removal Note.) (See 04-12-8 Front Parking Brake Cable Installation Note.)

7	Bolt
8	Spring
9	Clip
10	Rear parking brake cable (left)
11	Rear parking brake cable (right)
12	Grommet

Front Parking Brake Cable Installation Note

1. Install the front parking brake cable with the spring installation area of the equalizer pointed towards the inside of the vehicle.

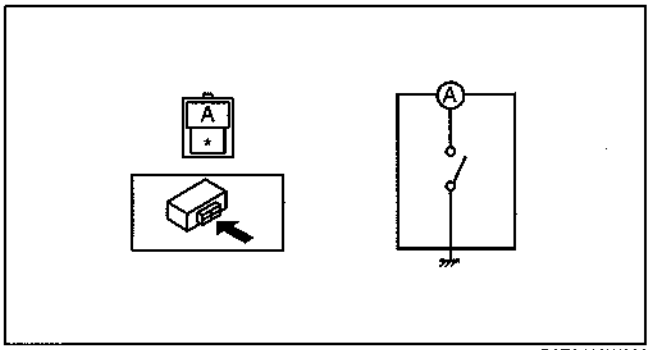


DBR412ZWB010

PARKING BRAKE SWITCH INSPECTION

dcf041266450w01

1. Disconnect the parking brake switch connector.
2. Verify that the continuity is as indicated in the table.
   - If not as indicated in the table, replace the parking brake switch.



B3E0412W006

O—O: Continuity

Condition	Terminal	
	A	Body ground
Parking brake lever pulled	O	O
Parking brake lever released		

CHU0412W003

04-13B ANTILOCK BRAKE SYSTEM [4-WHEEL ANTILOCK BRAKE SYSTEM (4W-ABS)]

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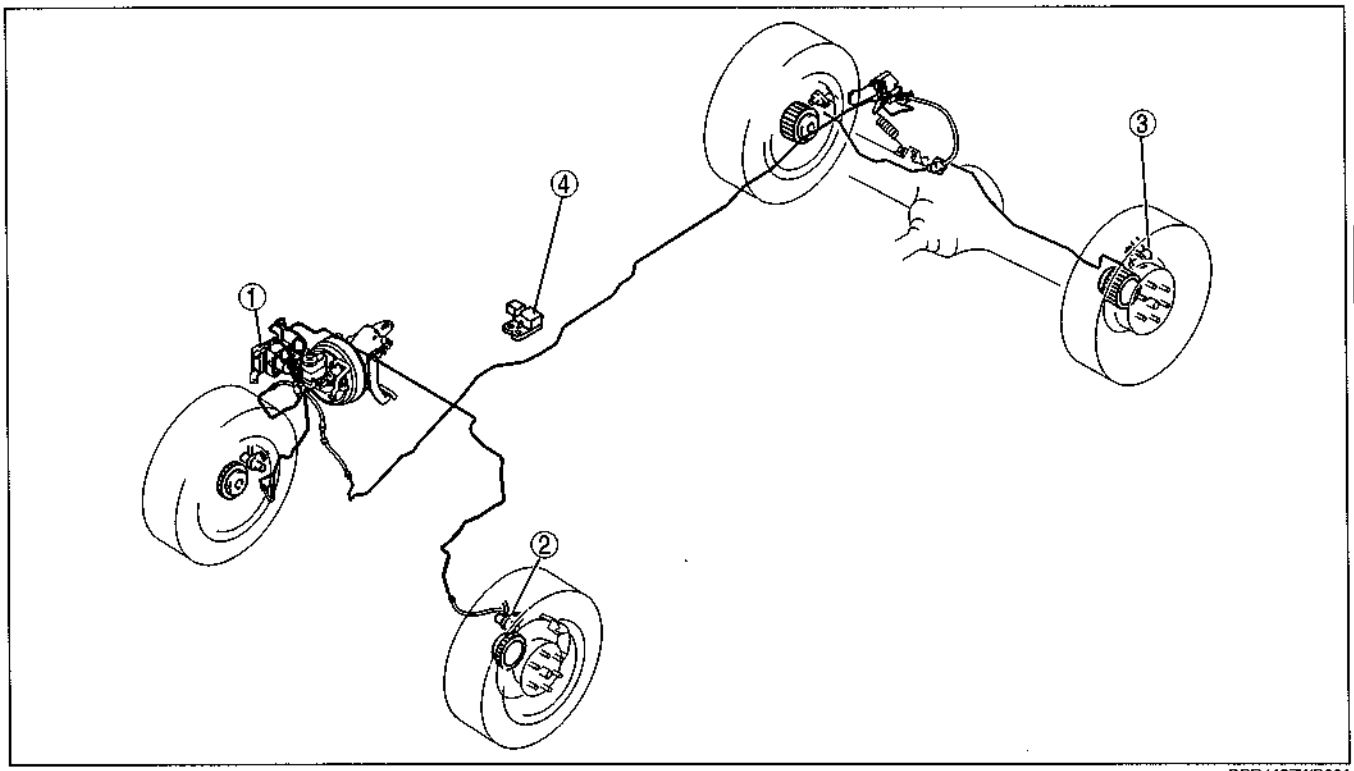
dcf041300000w02



DBR413ZWB001

1	ABS HU/CM (See 04-13B-2 ABS HU/CM SYSTEM INSPECTION [4W-ABS]) (See 04-13B-3 ABS HU/CM REMOVAL/INSTALLATION [4W-ABS]) (See 04-13B-5 ABS HU/CM INSPECTION [4W-ABS])
2	Front ABS wheel-speed sensor (See 04-13B-7 FRONT ABS WHEEL-SPEED SENSOR REMOVAL/INSTALLATION [4W-ABS (4x2 (EXCEPT Hi-Rider))]) (See 04-13B-8 FRONT ABS WHEEL-SPEED SENSOR REMOVAL/INSTALLATION [4W-ABS (Hi-Rider, 4x4)]) (See 04-13B-9 FRONT ABS WHEEL-SPEED SENSOR INSPECTION)
3	Rear ABS wheel-speed sensor (See 04-13B-10 REAR ABS WHEEL-SPEED SENSOR REMOVAL/INSTALLATION [4W-ABS (4x2 (EXCEPT Hi-Rider))]) (See 04-13B-11 REAR ABS WHEEL-SPEED SENSOR REMOVAL/INSTALLATION [4W-ABS (Hi-Rider, 4x4)]) (See 04-13B-11 REAR ABS WHEEL-SPEED SENSOR INSPECTION [4W-ABS])
4	G sensor (Hi-Rider, 4x4) (See 04-13B-12 G SENSOR REMOVAL/INSTALLATION [4W-ABS]) (See 04-13B-13 G SENSOR INSPECTION [4W-ABS])

ABS HU/CM SYSTEM INSPECTION [4W-ABS]

dcf041300000w03

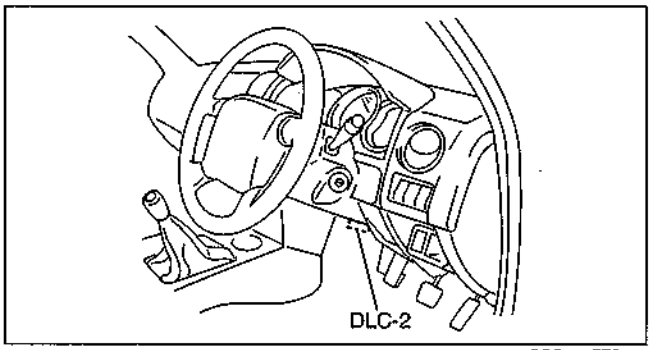
ABS Hydraulic Unit On-vehicle Inspection

Preparation

1. Verify that the battery is fully charged.
2. Turn the ignition switch to the ON position and verify that the ABS warning light goes out after **approx. 3.0 s.**
3. Turn the ignition switch off.
4. Jack up the vehicle and support it evenly on safety stands.
5. Shift to neutral.
6. Release the parking brake.
7. Verify that all four wheels rotate.
8. Rotate the inspected wheels by hand and verify there is no brake drag.
   - If there is any brake drag, perform regular brake inspection.
   - If there is no brake drag, perform ABS HU/CM operation inspection.

Operation inspection

1. Perform "Preparation".
2. Connect the current diagnostic tool to the DLC-2 connector.
3. Set up an active command mode inspection according to the combination of commands below.



DBR402ZTB003

Operation condition	Command name			Command transmission type
	PMP_MOTOR	V_RF_OTL	V_RF_INL	
Brake pressure retention	OFF	OFF	ON	Manual
Brake pressure reduction	ON	ON	ON	

The chart above shows an example of a right front wheel inspection.

Caution

- **When operating the solenoid valve and pump motor using the active command mode, make sure to keep the operation time within 10 s to prevent damaging the ABS HU/CM.**

Note

- When working with two people, one should press on the brake pedal, the other should attempt to rotate the wheel being inspected.

4. Send the command while depressing on the brake pedal and attempting to rotate the wheel being inspected.
5. Performing the inspection above determines the following:
   - The ABS HU/CM brake lines are normal.
   - The ABS HU/CM hydraulic system is not significantly abnormal (including inside ABS HU/CM).
   - The ABS HU/CM internal electrical parts (solenoid, motor and other parts) are normal.
   - The ABS HU/CM output system wiring harnesses (solenoid valve, relay system) are normal.
     — However, the following items cannot be verified.
     - Malfunction of ABS HU/CM input system wiring harnesses and parts
     - Extremely small leakage in the ABS HU/CM internal hydraulic system
     - Intermittent malfunction of the above items

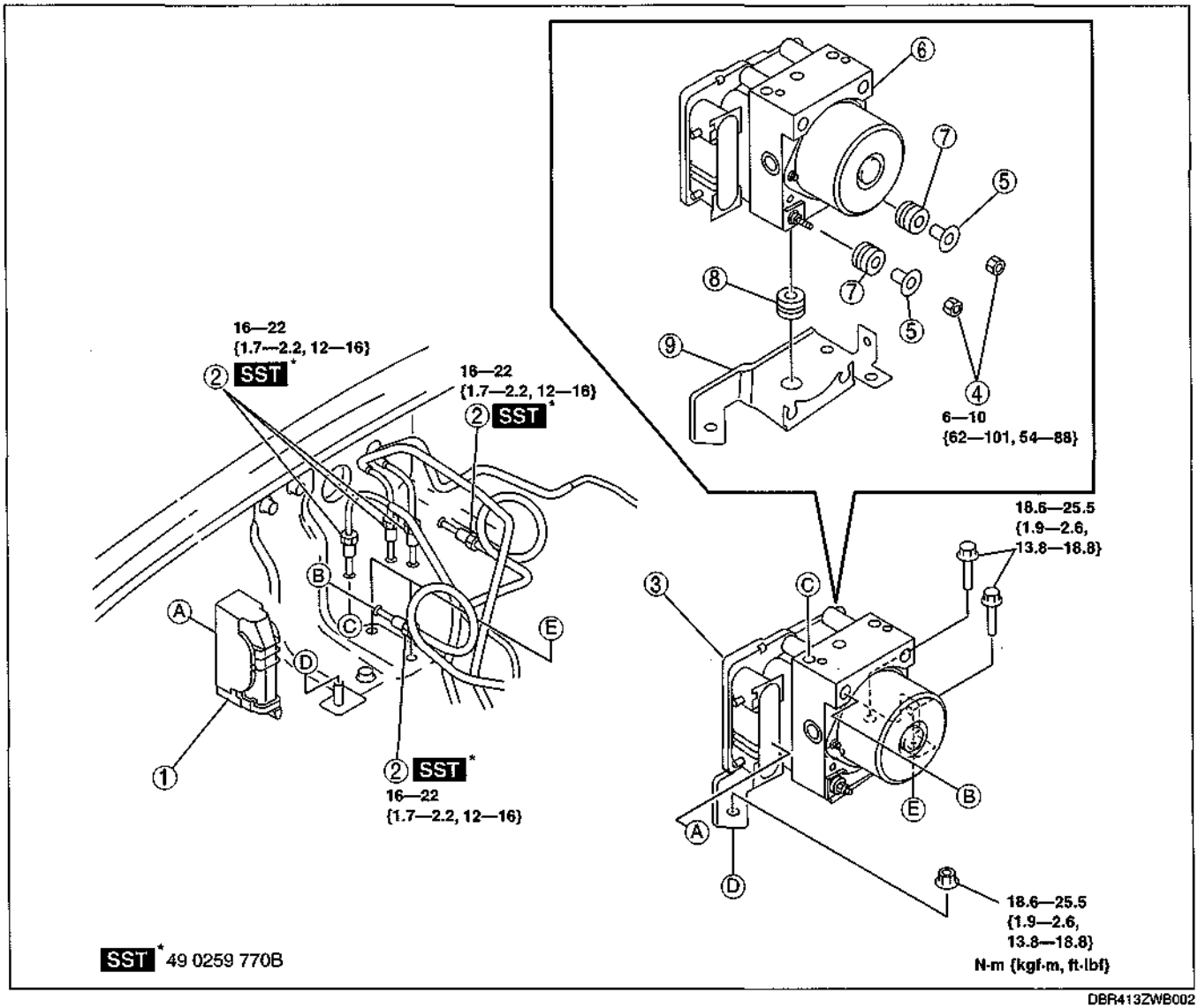
ABS HU/CM REMOVAL/INSTALLATION [4W-ABS]

dcf041343750w05

Caution

- **The internal parts of the ABS HU/CM could be damaged if dropped. Be careful not to drop the ABS HU/CM. Replace the ABS HU/CM if it is subjected to an impact.**

1. Remove in the order indicated in the table.
2. Install in the reverse order of removal.



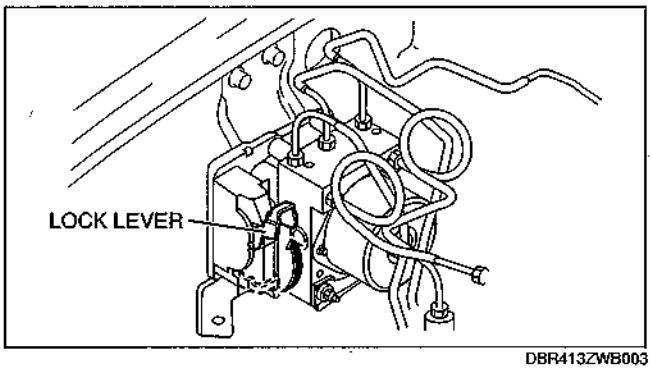
DBR413ZWB002

1	Connector (See 04-13B-4 Connector Removal Note.) (See 04-13B-4 Connector Installation Note.)
2	Brake pipe (See 04-13B-4 Brake Pipe Removal Note.) (See 04-13B-4 Brake Pipe Installation Note)
3	ABS HU/CM component

4	Nut
5	washer
6	ABS HU/CM
7	Bushing (ABS HU/CM side)
8	Bushing (bracket side)
9	Bracket

Connector Removal Note

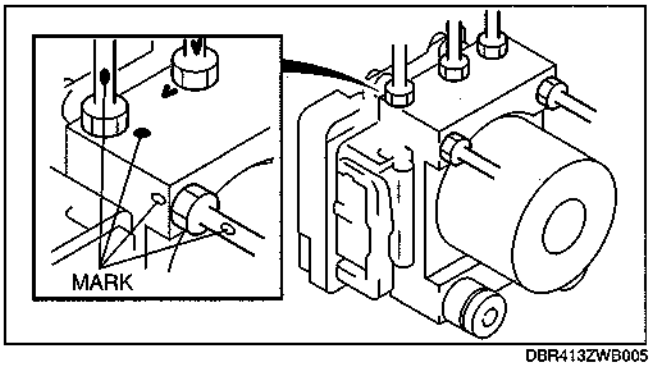
1. Rotate the lock lever in the direction of the arrow, and remove the ABS HU/CM connector.



DBR413ZWB003

Brake Pipe Removal Note

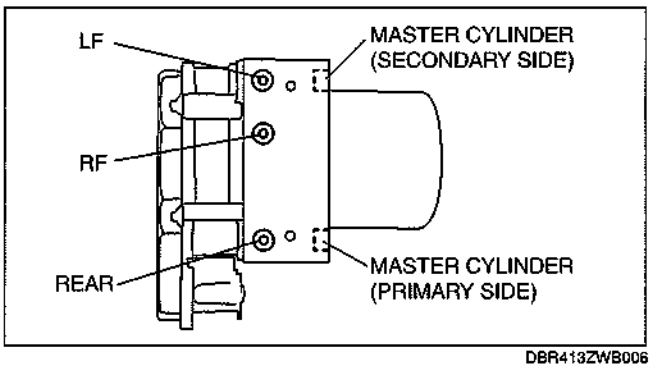
1. Place an alignment mark on the brake pipe and ABS HU/CM.
2. Apply protective tape to the connector to prevent brake fluid from entering.
3. Remove the brake pipe.



DBR413ZWB005

Brake Pipe Installation Note

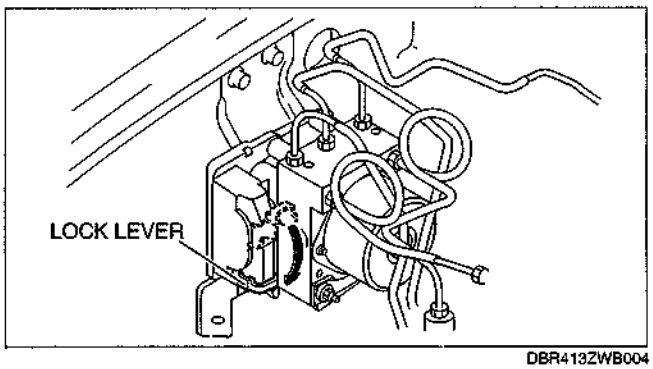
1. When install the brake pipe, align the marks made before removal with the ABS HU/CM as shown in the figure.
2. Tighten the brake pipe to the specified torque using the **SST** (49 0259 770B).



DBR413ZWB006

Connector Installation Note

1. After connecting the connector, rotate the lock lever in the direction of the arrow to install the ABS HU/CM connector.



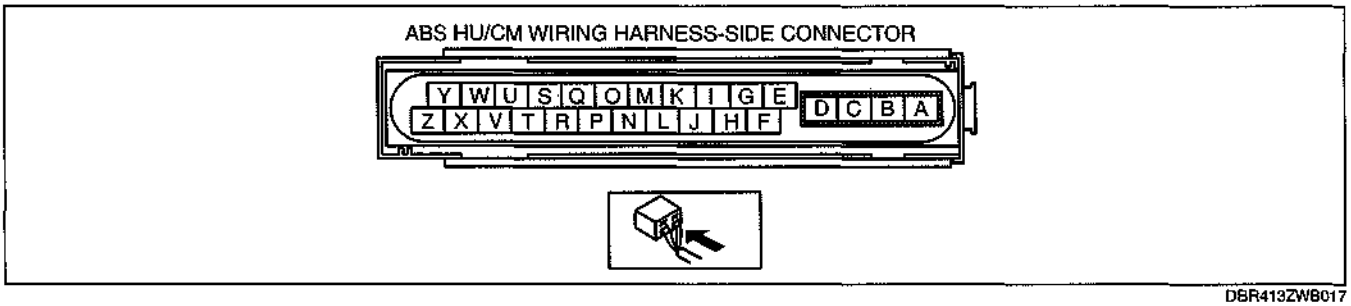
DBR413ZWB004

ABS HU/CM INSPECTION [4W-ABS]

dcf041343750w06

1. Disconnect the ABS HU/CM connector.
2. Connect the negative battery cable.
3. Attach the tester lead to the ABS HU/CM harness side connector, then inspect voltage, continuity or resistance according to the standard (reference value) on the table.

Standard (Reference Value)



DBR413ZW8017

Terminal	Signal name	Connected to	Measured item	Measured terminal (measured condition)	Standard	Inspection item(s)
A	Ground (ABS motor)	Ground point	Continuity	A—ground point	Continuity detected	• Wiring harness (A—ground point)
B	Power supply (ABS motor operation)	Battery	Voltage	Under any condition	B+	• Wiring harness (B—battery)
C	Power supply (solenoid)	Battery	Voltage	Under any condition	B+	• Wiring harness (C—battery)
D	Ground (ABS system)	Ground point	Continuity	D—ground point	Continuity detected	• Wiring harness (D—ground point)
E	LF wheel-speed sensor (single)	LF ABS wheel-speed sensor	Continuity	E—LF ABS wheel-speed sensor connector terminal A	Continuity detected	• Wiring harness (E—LF ABS wheel-speed sensor connector terminal A)
F	LF wheel-speed sensor (ground)	LF ABS wheel-speed sensor	Continuity	F—LF ABS wheel-speed sensor connector terminal B	Continuity detected	• Wiring harness (F—LF ABS wheel-speed sensor connector terminal B)
G	LR wheel-speed sensor (ground)	LR ABS wheel-speed sensor	Continuity	G—LR ABS wheel-speed sensor connector terminal B	Continuity detected	• Wiring harness (G—LR ABS wheel-speed sensor connector terminal B)
H	—	—	—	—	—	—
I	LR wheel-speed sensor (signal)	LR ABS wheel-speed sensor	Continuity	I—LR ABS wheel-speed sensor connector terminal A	Continuity detected	• Wiring harness (I—LR ABS wheel-speed sensor connector terminal A)
J	Power supply (system)	Ignition switch	Voltage	Ignition switch at ON	B+	• Wiring harness (J—ignition switch)
				Ignition switch is off.	1 V or less	—
K	RR wheel-speed sensor (ground)	RR ABS wheel-speed sensor	Continuity	K—RR ABS wheel-speed sensor connector terminal B	Continuity detected	• Wiring harness (K—RR ABS wheel-speed sensor connector terminal B)
L	RR wheel-speed sensor (signal)	RR ABS wheel-speed sensor	Continuity	L—RR ABS wheel-speed sensor connector terminal A	Continuity detected	• Wiring harness (L—RR ABS wheel-speed sensor connector terminal A)
M	RF wheel-speed sensor (ground)	RF ABS wheel-speed sensor	Continuity	M—RF ABS wheel-speed sensor connector terminal B	Continuity detected	• Wiring harness (M—RF ABS wheel-speed sensor connector terminal B)

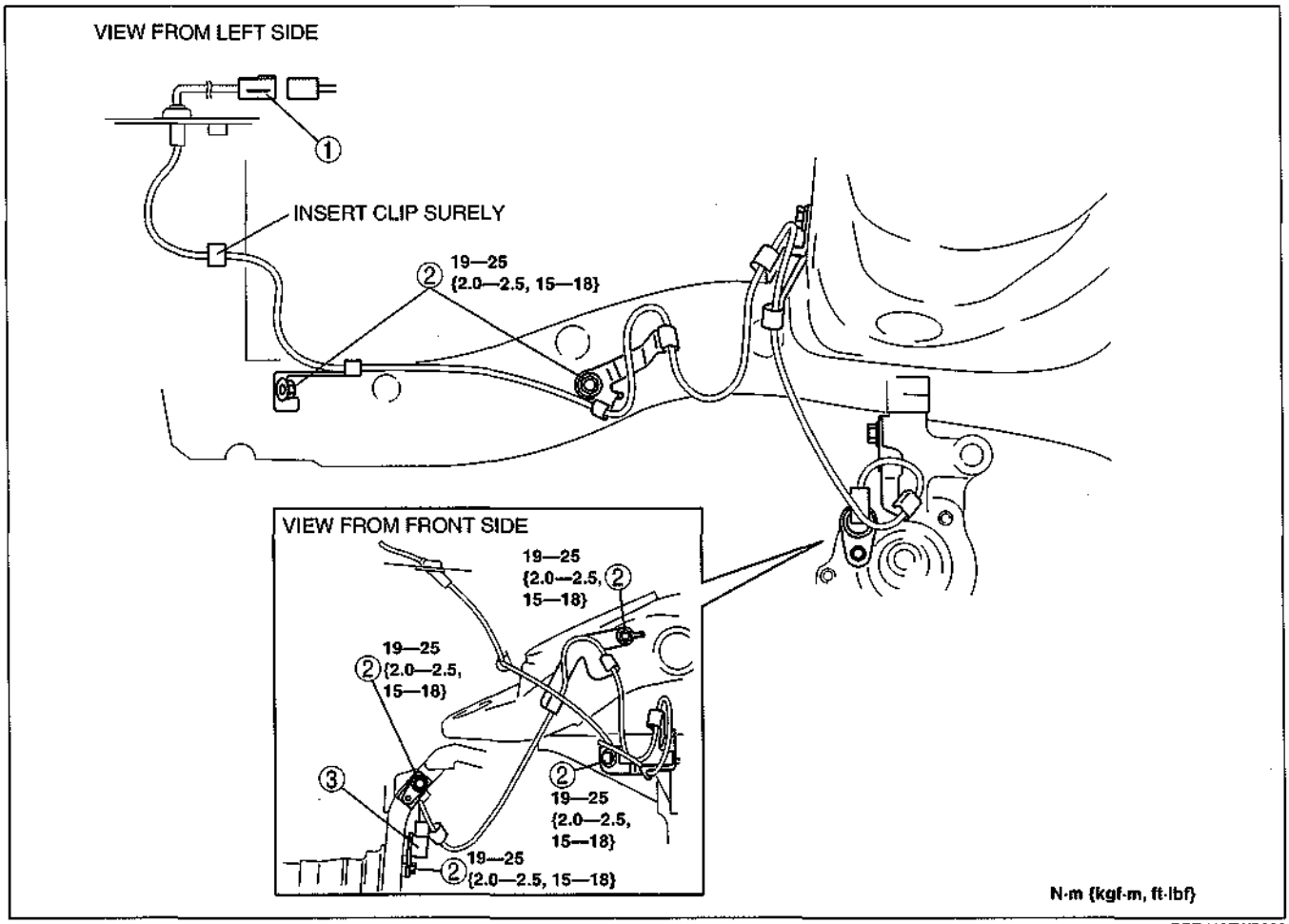
Terminal	Signal name	Connected to	Measured item	Measured terminal (measured condition)	Standard	Inspection item(s)
N	Brake switch	Brake switch	Voltage	N—brake switch (Brake pedal depressed)	B+	• Wiring harness (N—brake switch) • Brake switch
				Y—brake switch (Brake pedal not depressed)	1 V or less	
O	RF wheel-speed sensor (signal)	RF ABS wheel-speed sensor	Continuity	O—RF ABS wheel-speed sensor connector terminal A	Continuity detected	• Wiring harness (O—RF ABS wheel-speed sensor connector terminal A)
P*	G sensor (signal)	G sensor	Continuity	P—G sensor connector terminal B	Continuity detected	• Wiring harness (P—G sensor connector terminal B)
Q	On-board diagnostic	KLN terminal of DLC-2	Continuity	Q—DLC-2 connector terminal KLN	Continuity detected	• Wiring harness (Q—DLC-2 connector terminal KLN)
R	—	—	—	—	—	—
S	—	—	—	—	—	—
T	—	—	—	—	—	—
U	—	—	—	—	—	—
V*	G sensor (power supply	G sensor	Continuity	V—G sensor connector terminal A	Continuity detected	• Wiring harness (V—G sensor connector terminal A)
W*	G sensor (ground)	G sensor	Continuity	W—G sensor connector terminal C	—	• Wiring harness (W—G sensor connector terminal C)
X	—	—	—	—	—	—
Y	—	—	—	—	—	—
Z	—	—	—	—	—	—

* : Hi-Rider, 4x4

FRONT ABS WHEEL-SPEED SENSOR REMOVAL/INSTALLATION [4W-ABS (4x2 (EXCEPT Hi-Rider))]

dcf041343720w01

1. When removing the ABS wheel-speed sensor on the right side, remove the washer tank installation bolts and the connector, then move the washer tank to a place out of the way. (See 09-19-5 WINDSHIELD WASHER TANK REMOVAL/INSTALLATION.)
2. Remove in the order indicated in the table.
3. Install in the reverse order of removal.



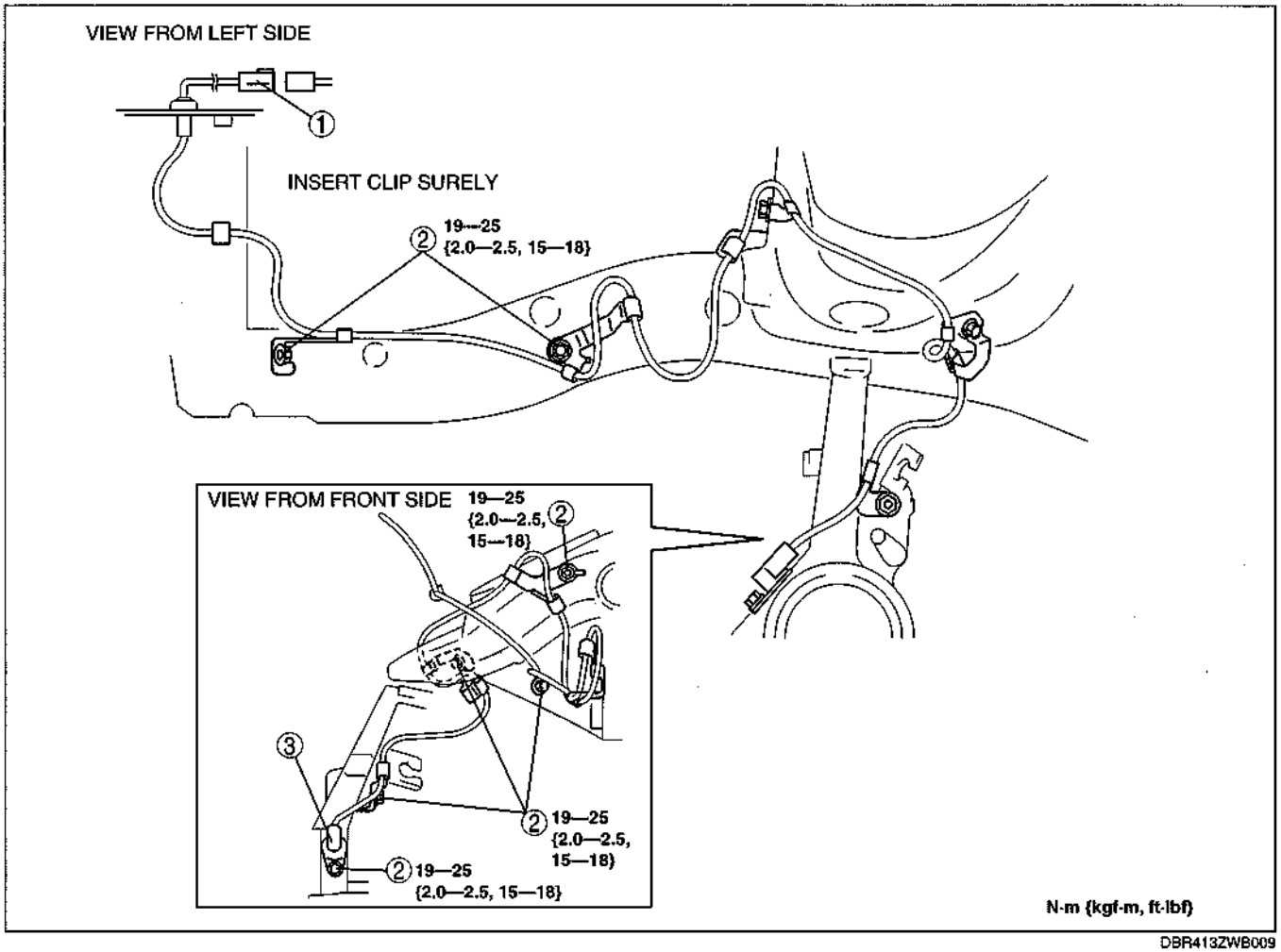
DBR413ZWB008

1	Connector
2	Bolt
3	Front ABS wheel-speed sensor

FRONT ABS WHEEL-SPEED SENSOR REMOVAL/INSTALLATION [4W-ABS (Hi-Rider, 4x4)]

dcf041343720w02

1. When removing the ABS wheel-speed sensor on the right side, remove the washer tank installation bolts and the connector, then move the washer tank to a place out of the way. (See 09-19-5 WINDSHIELD WASHER TANK REMOVAL/INSTALLATION.)
2. Remove in the order indicated in the table.
3. Install in the reverse order of removal.



DBR413ZWB009

1	Connector
2	Bolt

3	Front ABS wheel-speed sensor

FRONT ABS WHEEL-SPEED SENSOR INSPECTION

dcf041343720w03

Visual Inspection

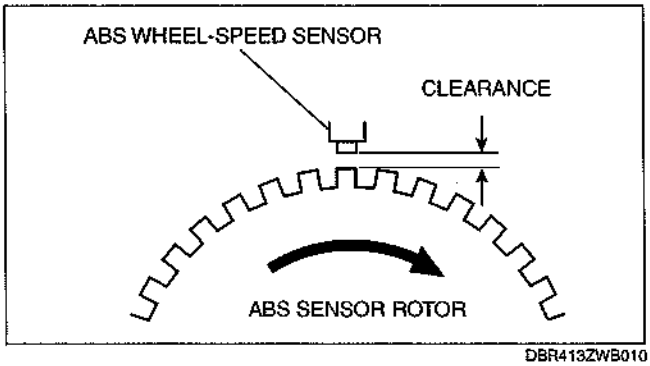
1. Remove the wheel and tire, and inspect the sensor for looseness and damage. Replace the sensor if necessary.

Clearance Inspection

1. Inspect the clearance between the wheel-speed sensor and the sensor rotor.

Clearance
0.3—1.1 mm {0.012—0.043 in}

- If not as specified, replace the defective part(s). (ABS wheel-speed sensor, ABS sensor rotor and steering knuckle etc.)



DBR413ZWB010

Resistance Inspection

1. Disconnect the ABS wheel-speed sensor connector.
2. Inspect the resistance at the ABS wheel-speed sensor.
   - If not as specified, replace the ABS wheel-speed sensor.

Resistance
1.2—1.6 kilohm

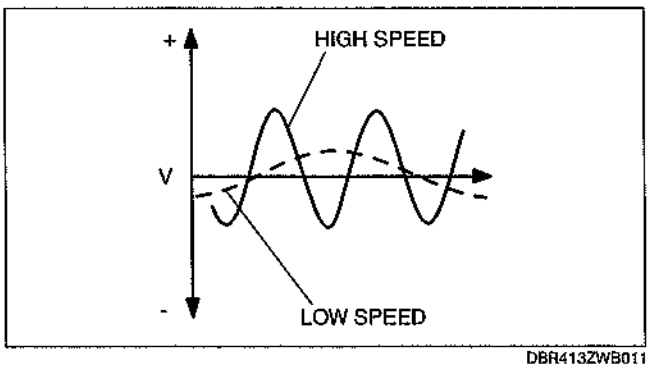
Voltage Inspection

1. Jack up the vehicle on level ground and support it evenly on safety stands.
2. Disconnect the ABS wheel-speed sensor connector.
3. Inspect each sensor by rotating each wheel one revolution per second.
   - If not as specified, replace the ABS wheel-speed sensor.

Voltage
0.15—1.2 V (AC)

Voltage Pattern Inspection

1. Jack up the vehicle on level ground and support it evenly on safety stands.
2. Disconnect the ABS wheel-speed sensor connector.
3. Using an oscilloscope, inspect voltage pattern for distortion and noise by rotating each wheel.
   - If there is distortion or noise, inspect the ABS sensor rotor.

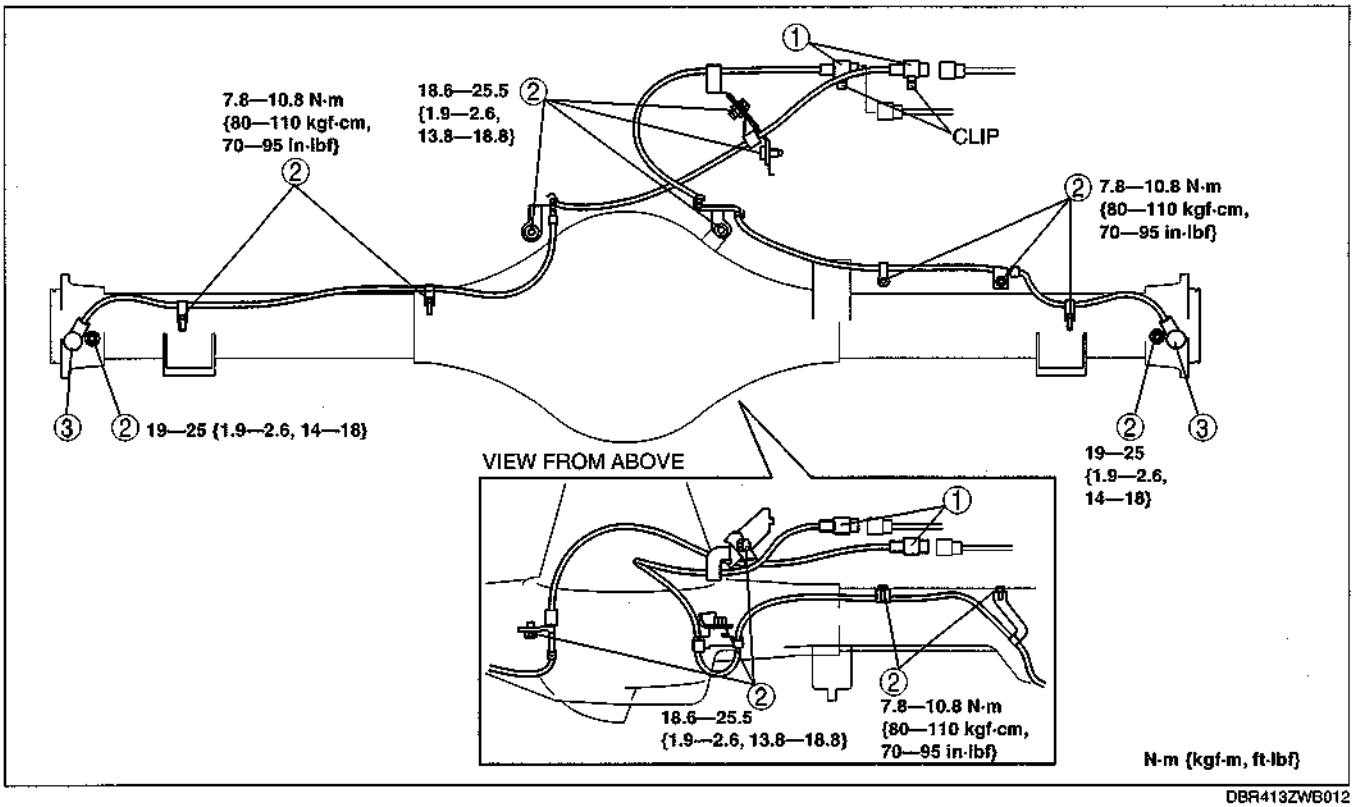


DBR413ZWB011

REAR ABS WHEEL-SPEED SENSOR REMOVAL/INSTALLATION [4W-ABS (4x2 (EXCEPT Hi-Rider))]

dcf041343710w03

1. Remove in the order indicated in the table.
2. Install in the reverse order of removal.



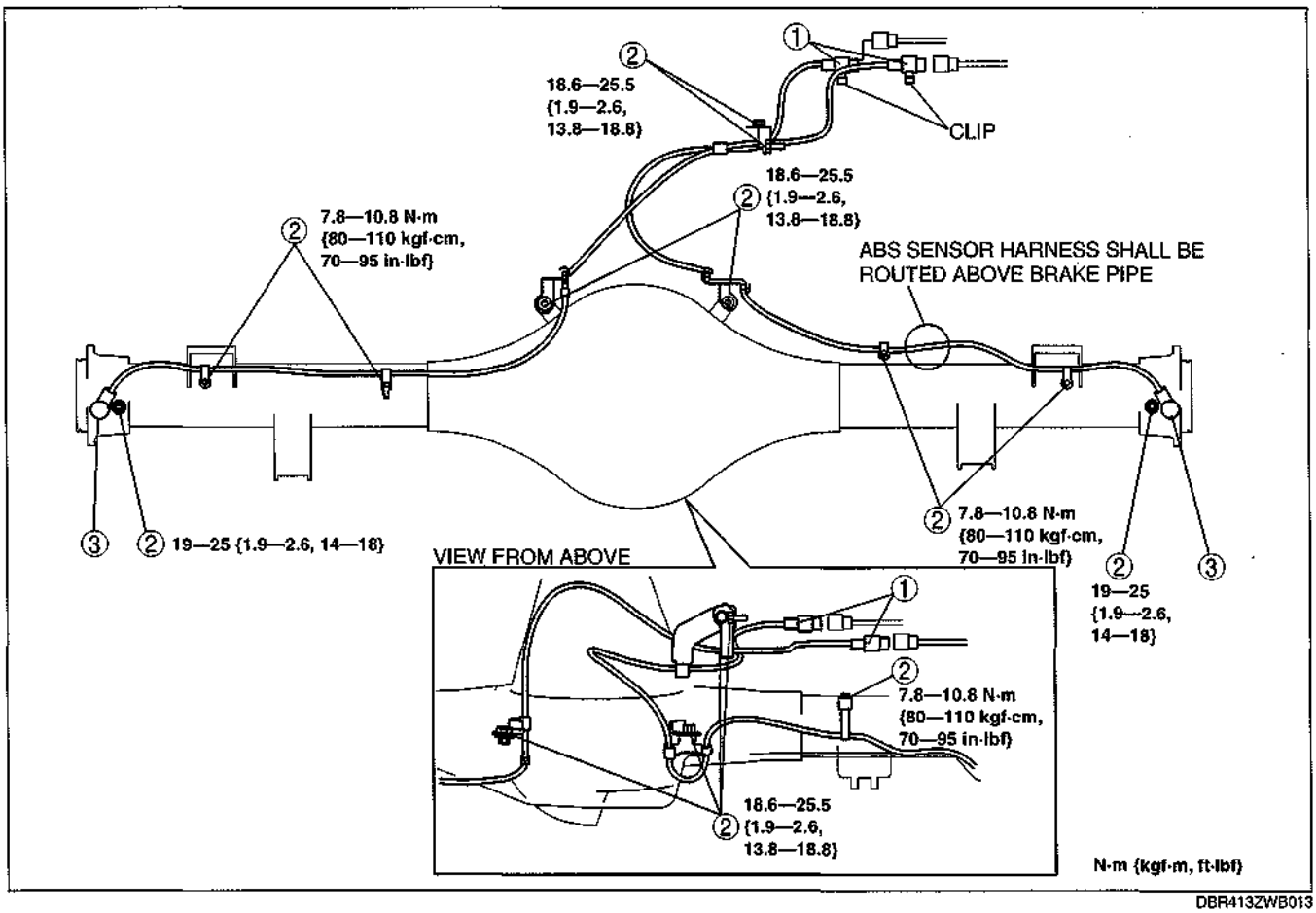
DBR413ZWB012

1	Connector
2	Bolt
3	Rear ABS wheel-speed sensor

REAR ABS WHEEL-SPEED SENSOR REMOVAL/INSTALLATION [4W-ABS (HI-Rider, 4x4)]

dcf041343710w04

1. Remove in the order indicated in the table.
2. Install in the reverse order of removal.



DBR413ZWB013

1	Connector
2	Bolt
3	Rear ABS wheel-speed sensor

REAR ABS WHEEL-SPEED SENSOR INSPECTION [4W-ABS]

dcf041343710w05

Visual Inspection

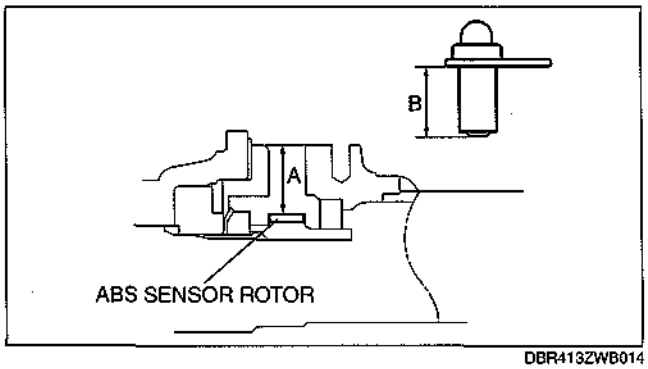
1. Inspect the sensor for looseness and damage. Replace the sensor if necessary.

Clearance Inspection

1. Remove the ABS wheel-speed sensor.
2. Measure the length A and B shown in the figure using vernier calipers.
3. Subtract B from A then verify the clearance between the wheel-speed sensor and the sensor rotor.

Clearance
0.3—1.1 mm {0.012—0.043 in}

- If not as specified, replace the defective part(s). (ABS wheel-speed sensor, ABS sensor rotor, rear axle shaft and rear axle housing etc.)



DBR413ZWB014

Resistance Inspection

1. Disconnect the ABS wheel-speed sensor connector.
2. Inspect the resistance at the ABS wheel-speed sensor.
   - If not as specified, replace the ABS wheel-speed sensor.

Resistance
1.2—1.6 kilohm

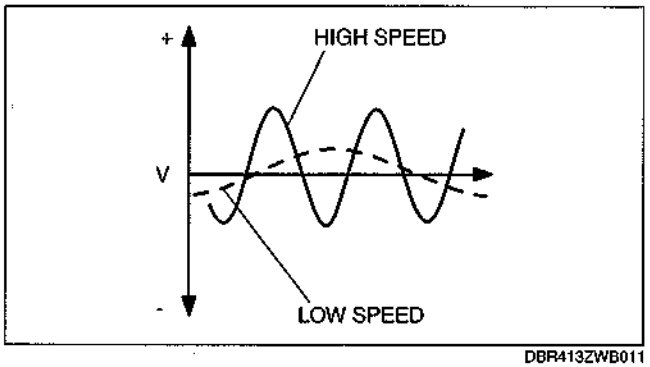
Voltage Inspection

1. On level ground, jack up the vehicle and support it evenly on safety stands.
2. Disconnect the ABS wheel-speed sensor connector.
3. Inspect each sensor by rotating each wheel one revolution per second.
   - If not as specified, replace the ABS wheel-speed sensor.

Voltage
0.15—1.2 V (AC)

Voltage Pattern Inspection

1. Jack up the vehicle on level ground and support it evenly on safety stands.
2. Disconnect the ABS wheel-speed sensor connector.
3. Using an oscilloscope, inspect voltage pattern for distortion and noise by rotating each wheel.
   - If there is distortion or noise, inspect the ABS sensor rotor.



DBR413ZWB011

G SENSOR REMOVAL/INSTALLATION [4W-ABS]

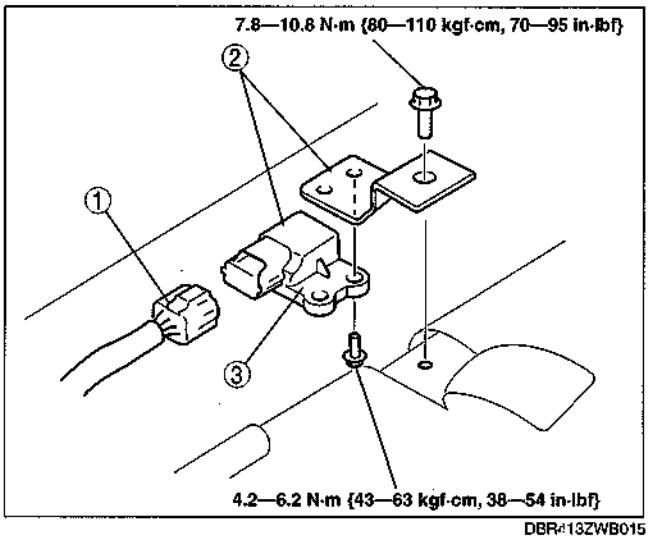
dcf041343770w01

Caution
- **Be careful and do not allow the combined sensor to fall. If by chance it is subjected to strong impact, replace it.**

1. Slide the RH front seat fully backward.
2. Remove in the order indicated in the table.

1	Connector
2	G sensor and bracket
3	G sensor

3. Install in the reverse order of removal.



DBR413ZWB015

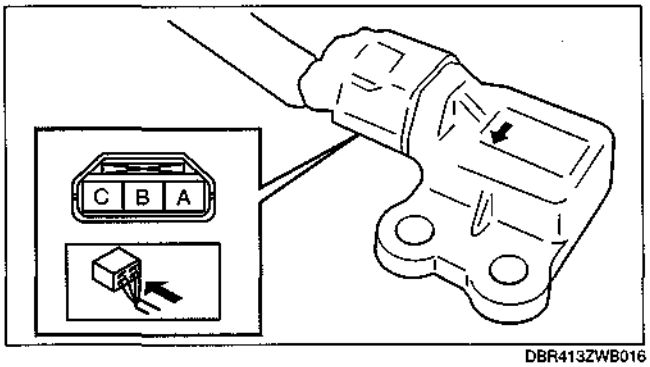
G SENSOR INSPECTION [4W-ABS]

dcf041343770w02

1. Connect the connector.
2. Turn ignition switch (engine switch) on, and verify the voltage between terminals A and B under the following conditions.
   - If not within the specification, replace the G sensor.

(1) Horizontal

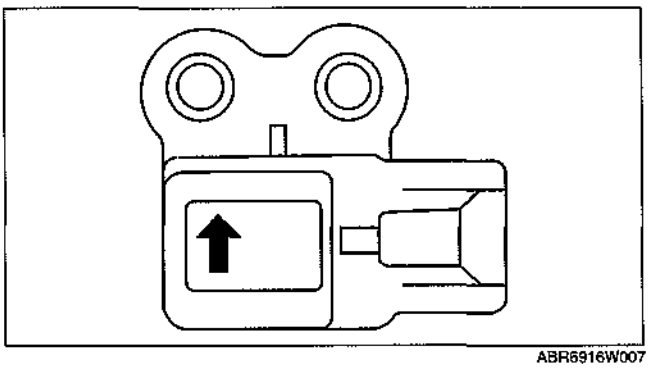
Voltage
2.4—2.6 V



DBR413ZWB016

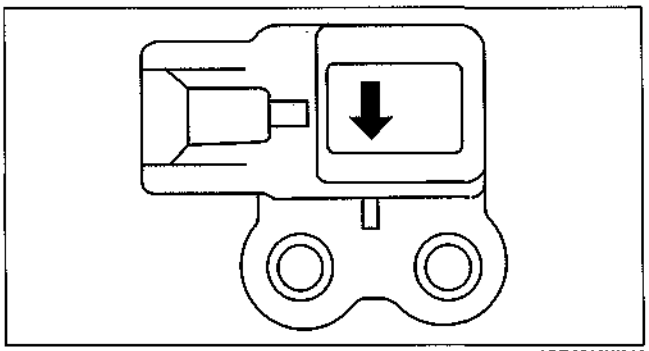
(2) Facing up (inclined **90°** from horizontal)

Voltage
1.3—1.7 V


ABR6916W007

(3) Facing down (declined **90°** from horizontal)

Voltage
3.3—3.7 V


ABR6916W010

04-50 TECHNICAL DATA

BRAKE TECHNICAL DATA 04-50-1

BRAKE TECHNICAL DATA

dcf045000000w01

Item	Specification
Brake fluid type	SAE J1703, FMVSS 116 DOT-3
Brake pedal height	214—219 mm {8.43—8.62 in}
Standard pedal play	3.0—8.0 mm {0.12—0.31 in}
Standard pedal-to-floor clearance	105 mm {4.14 in} or more
Power brake unit fluid pressure when pedal depressed at 200 N {20 kgf, 45 lbf}	At 0 kPa {0 mmHg, 0 inHg}: 593 kPa {6.1 kgf/cm^2, 87 psi} or more
Power brake unit fluid pressure when pedal depressed at 200 N {20 kgf, 45 lbf}	At 67 kPa {500 mmHg, 20 inHg}: 6,950 kPa {71 kgf/cm^2, 1,008 psi} or more
Minimum front disc pad thickness	2.0 mm {0.079 in} min.
Minimum front disc plate thickness	4x2 (except Hi-Rider): 22.0 mm {0.867 in} Hi-Rider, 4x4: 26.0 mm {1.03 in}
Minimum front disc plate thickness after machining using a brake lathe on-vehicle	4x2 (except Hi-Rider): 22.8 mm {0.898 in} Hi-Rider, 4x4: 26.8 mm {1.06 in}
Front disc plate runout limit	0.05 mm {0.002 in} max.
Minimum rear brake lining thickness	1.0 mm {0.04 in}
Maximum rear brake drum diameter	4x2 (except Hi-Rider): 271.5 mm {10.68 in} Hi-Rider, 4x4: 296.5 mm {11.67 in}
Parking brake lever stroke when pulled at 98 N {10 kgf, 22 lbf}	1—7 notches

Load sensing proportioning valve (LSPV) fluid pressure

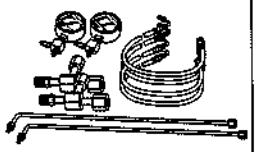
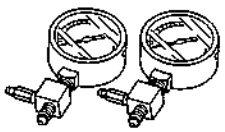
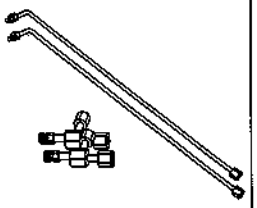
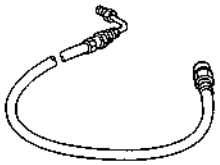
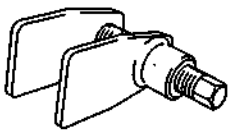
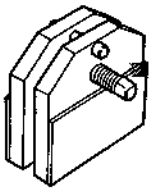
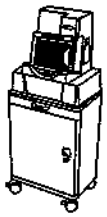
Type		Front wheel cylinder fluid pressure (kPa {kgf/cm^2, psi})	Rear wheel cylinder (kPa {kgf/cm^2, psi})
4x2 (except Hi-Rider)	Without 4W-ABS	4,900 {50, 711}	2,250—2,850 {23—29, 327—413}
		9,800 {100, 1,421}	3,130—3,930 {32—40, 454—569}
	With 4W-ABS	4,900 {50, 711}	2,910—3,710 {30—37, 423—538}
		9,800 {100, 1,421}	4,970—6,170 {51—62, 721—894}
Hi-Rider, 4x4	Without 4W-ABS	4,900 {50, 711}	2,250—2,850 {23—29, 327—413}
		9,800 {100, 1,421}	3,130—3,930 {32—40, 454—569}
	With 4W-ABS	4,900 {50, 711}	2,650—3,450 {28—35, 385—500}
		9,800 {100, 1,421}	4,700—5,900 {48—60, 682—855}

04-60 SERVICE TOOLS

BRAKES SST **04-60–1**

BRAKES SST

dcf046000000w01

49 0259 770B Flare nut wrench	49 U043 0A0A Oil pressure gauge set 	49 U043 004A Oil pressure gauge (Part of 49 U043 0A0A) 
49 U043 005 Joint (Part of 49 U043 0A0A) 	49 U043 006 Hose (Part of 49 U043 0A0A) 	49 0221 600C Disc brake expand tool 
49 T033 001A Disc brake piston stopper 	WDS 	—

04

TRANSMISSION/TRANSAXLE

05 SECTION

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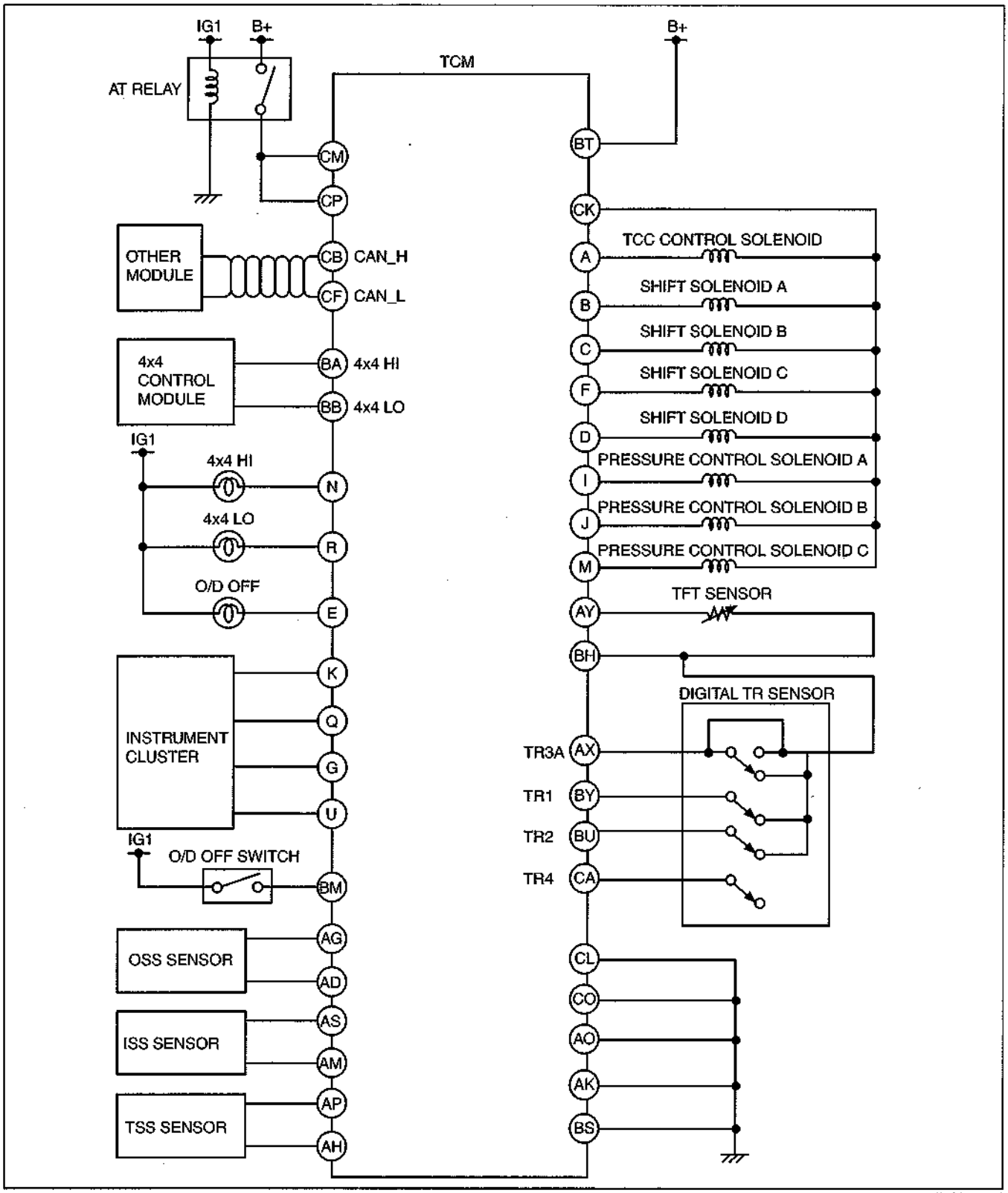
AUTOMATIC TRANSMISSION CONTROL SYSTEM WIRING DIAGRAM [5R55S]

id0502c1811000

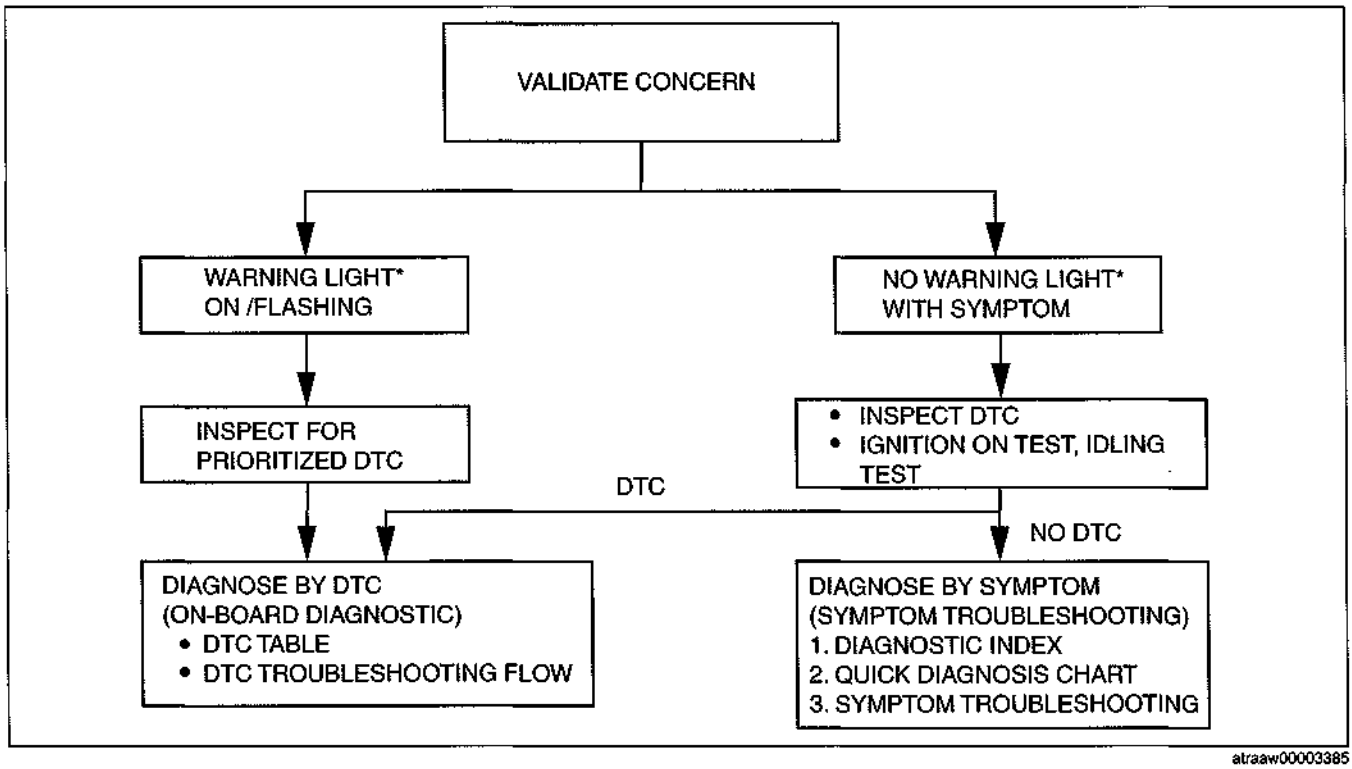


arnffw00001941

FOREWORD [5R55S]

id0502c1800200

- When the customer reports a vehicle malfunction, inspect the malfunction indicator lamp (MIL) indication, O/D OFF indicator light flashing, and TCM memory for diagnostic trouble code (DTC), then diagnose the malfunction according to following flowchart.
  - — If the DTC exists, diagnose the applicable DTC. (See 05-02-5 DTC TABLE [5R55S].)
  - — If the DTC does not exist and the MIL does not illuminate, and the O/D OFF indicator light flashes, diagnose the applicable symptom troubleshooting. (See05-03-5 SYMPTOM TROUBLESHOOTING ITEM TABLE [5R55S].)



atraaw00003385

*: Malfunction Indicator Lamp (MIL), O/D OFF indicator light

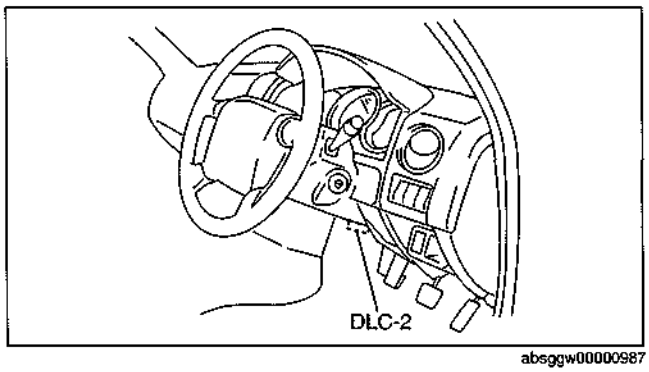
05

AUTOMATIC TRANSMISSION ON-BOARD DIAGNOSTIC FUNCTION [5R55S]

id0502c1811100

DTC Reading Procedure

1. Perform necessary vehicle preparation and visual inspection.
2. Connect the IDS/PDS to the DLC-2.
3. After the vehicle is identified, select the following items from the initial screen of the IDS/PDS.
   - When using the IDS (laptop PC)
     1. Select the "Toolbox" tab.
     2. Select "Self Test".
     3. Select "Modules".
     4. Select "TCM".
   - When using the PDS (Pocket PC)
     1. Select "Module Tests".
     2. Select "TCM".
     3. Select "Self Test".



absggw00000987

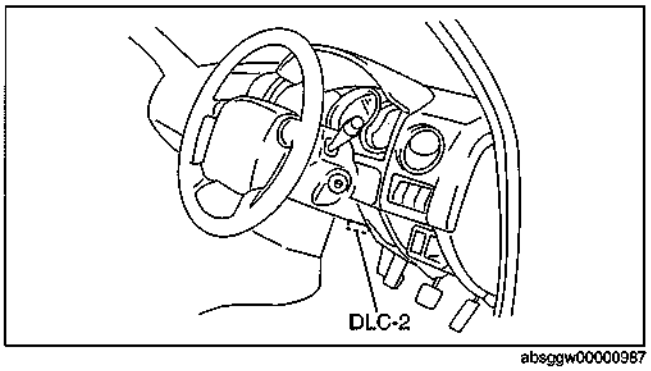
4. Verify the DTC according to the directions on the screen.
   - If any DTCs are displayed, perform troubleshooting according to the corresponding DTC inspection.
5. After completion of repairs, clear all DTCs stored in the TCM. (See 05-02-4 AFTER REPAIR PROCEDURE [5R55S].)

AFTER REPAIR PROCEDURE [5R55S]

id0502c1800400

Caution
- **After repairing a malfunction, perform this procedure to verify that the malfunction has been corrected.**
- **When this procedure is carried out, be sure to drive the vehicle at lawful speed and pay attention to other vehicles.**

1. Connect the IDS/PDS to the DLC-2.
2. After the vehicle is identified, select the following items from the initial screen of the IDS/PDS.
- When using the IDS (laptop PC)
  1. Select the "Toolbox" tab.
  2. Select "SelfTest".
  3. Select "Modules".
  4. Select "TCM".
- When using the PDS (Pocket PC)
  1. Select "Module Tests".
  2. Select "TCM".
  3. Select "SelfTest".
3. Verify the DTC according to the directions on the IDS/PDS screen.
4. Press the clear button on the DTC screen to clear the DTC.
5. Verify that no DTCs are displayed.
6. Verify that the ATF level is normal.
7. Turn the O/D OFF switch on (O/D OFF indicator illuminates) and gradually accelerate vehicle speed to **64 km/h {40 mph}**.
   - Verify that the transmission shifts to 4GR, and maintain the vehicle speed and acceleration pedal opening angle for **15 s or more**.
8. Turn the O/D OFF switch off (O/D OFF indicator turns off) and accelerate the vehicle speed to **80 km/h {50 mph}**.
   - Verify that the transmission shifts to 5GR, and maintain the vehicle speed and acceleration pedal opening angle for **15 s or more**.
9. Decelerate using light brake pedal force (Brake light illuminates). Maintain this condition for **5 s or more**.
10. Stop the vehicle for **approx. 20 s**.
11. Repeat Steps 7—10 five times.
12. Gradually slow down and stop the vehicle.
13. Make sure that the repaired DTC does not recur.



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DTC TABLE [5R55S]

id0502c1800500

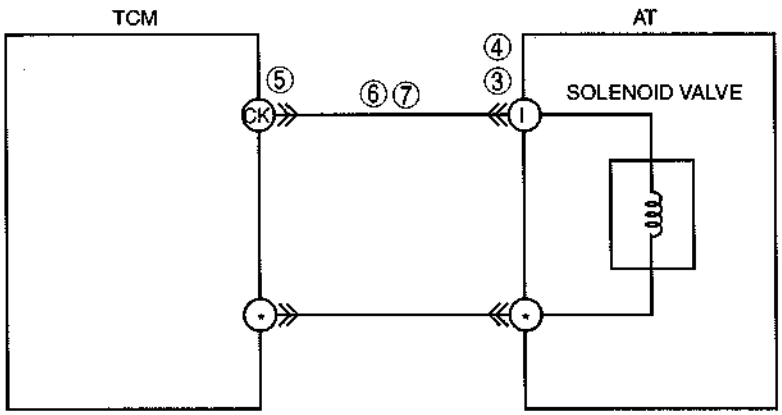
DTC No.	Condition	Page
P0657	Solenoid valve power supply circuit open	(See 05-02-7 DTC P0657, P0658 [5R55S].)
P0658	Solenoid valve power supply circuit voltage low	(See 05-02-7 DTC P0657, P0658 [5R55S].)
P0705	Digital transmission range (TR) sensor circuit malfunction (invalid bit pattern)	(See 05-02-9 DTC P0705, P0708, P1702, P1704, P1705 [5R55S].)
P0708	Digital transmission range (TR) sensor circuit malfunction (TR3A circuit open)	(See 05-02-9 DTC P0705, P0708, P1702, P1704, P1705 [5R55S].)
P0711	Transmission fluid temperature (TFT) sensor malfunction (ATF temperature no change)	(See 05-02-13 DTC P0711, P0712, P0713 [5R55S].)
P0712	Transmission fluid temperature (TFT) sensor circuit malfunction (short to ground)	(See 05-02-13 DTC P0711, P0712, P0713 [5R55S].)
P0713	Transmission fluid temperature (TFT) sensor circuit malfunction (open circuit)	(See 05-02-13 DTC P0711, P0712, P0713 [5R55S].)
P0715	Turbine shaft speed (TSS) sensor malfunction	(See 05-02-15 DTC P0715, P0717, P0718 [5R55S].)
P0717	Turbine shaft speed (TSS) sensor signal is not input	(See 05-02-15 DTC P0715, P0717, P0718 [5R55S].)
P0718	Turbine shaft speed (TSS) sensor signal noise	(See 05-02-15 DTC P0715, P0717, P0718 [5R55S].)
P0720	Output shaft speed (OSS) sensor malfunction	(See 05-02-17 DTC P0720, P0721, P0722 [5R55S].)
P0721	Output shaft speed (OSS) sensor signal noise	(See 05-02-17 DTC P0720, P0721, P0722 [5R55S].)
P0722	Output shaft speed (OSS) sensor signal is not input	(See 05-02-17 DTC P0720, P0721, P0722 [5R55S].)
P0731	Gear 1 incorrect	(See 05-02-19 DTC P0731, P0732, P0733, P0734, P0735 [5R55S].)
P0732	Gear 2 incorrect	(See 05-02-19 DTC P0731, P0732, P0733, P0734, P0735 [5R55S].)
P0733	Gear 3 incorrect	(See 05-02-19 DTC P0731, P0732, P0733, P0734, P0735 [5R55S].)
P0734	Gear 4 incorrect	(See 05-02-19 DTC P0731, P0732, P0733, P0734, P0735 [5R55S].)
P0735	Gear 5 incorrect	(See 05-02-19 DTC P0731, P0732, P0733, P0734, P0735 [5R55S].)
P0740	Torque converter clutch (TCC) control solenoid circuit malfunction (open circuit)	(See 05-02-20 DTC P0740, P0741, P0742, P0743, P0744 [5R55S].)
P0741	Torque converter clutch (TCC) control solenoid circuit malfunction (stuck off)	(See 05-02-20 DTC P0740, P0741, P0742, P0743, P0744 [5R55S].)
P0742	Torque converter clutch (TCC) control solenoid circuit malfunction (stuck on)	(See 05-02-20 DTC P0740, P0741, P0742, P0743, P0744 [5R55S].)
P0743	Torque converter clutch (TCC) control solenoid circuit malfunction (open or short circuit)	(See 05-02-20 DTC P0740, P0741, P0742, P0743, P0744 [5R55S].)
P0744	Torque converter clutch (TCC) control solenoid circuit malfunction (short to power)	(See 05-02-20 DTC P0740, P0741, P0742, P0743, P0744 [5R55S].)
P0745	Pressure control solenoid A malfunction (low pressure)	(See 05-02-22 DTC P0745, P0748, P0960, P0962, P0963 [5R55S].)
P0748	Pressure control solenoid A circuit malfunction (non-operation)	(See 05-02-22 DTC P0745, P0748, P0960, P0962, P0963 [5R55S].)
P0750	Shift solenoid A circuit malfunction (open or short circuit)	(See 05-02-24 DTC P0750, P0753 [5R55S].)
P0753	Shift solenoid A circuit malfunction (open or short circuit)	(See 05-02-24 DTC P0750, P0753 [5R55S].)
P0755	Shift solenoid B circuit malfunction (open or short circuit)	(See 05-02-26 DTC P0755, P0757, P0758 [5R55S].)
P0757	Shift solenoid B malfunction (stuck on)	(See 05-02-26 DTC P0755, P0757, P0758 [5R55S].)
P0758	Shift solenoid B circuit malfunction (open or short circuit)	(See 05-02-26 DTC P0755, P0757, P0758 [5R55S].)
P0760	Shift solenoid C circuit malfunction (open or short circuit)	(See 05-02-28 DTC P0760, P0762, P0763 [5R55S].)
P0762	Shift solenoid C malfunction (stuck on)	(See 05-02-28 DTC P0760, P0762, P0763 [5R55S].)
P0763	Shift solenoid C circuit malfunction (open or short circuit)	(See 05-02-28 DTC P0760, P0762, P0763 [5R55S].)
P0765	Shift solenoid D circuit malfunction (open or short circuit)	(See 05-02-30 DTC P0765, P0768 [5R55S].)
P0768	Shift solenoid D circuit malfunction (open or short circuit)	(See 05-02-30 DTC P0765, P0768 [5R55S].)
P0775	Pressure control solenoid B malfunction (low pressure)	(See 05-02-32 DTC P0775, P0778, P0964, P0966, P0967 [5R55S].)
P0778	Pressure control solenoid B circuit malfunction (non-operation)	(See 05-02-32 DTC P0775, P0778, P0964, P0966, P0967 [5R55S].)
P0791	Intermediate shaft speed (ISS) sensor malfunction	(See 05-02-34 DTC P0791, P0794 [5R55S].)

DTC No.	Condition	Page
P0794	Intermediate shaft speed (ISS) sensor signal noise	(See 05-02-34 DTC P0791, P0794 [5R55S].)
P0795	Pressure control solenoid C malfunction (low pressure)	(See 05-02-36 DTC P0795, P0798, P0968, P0970, P0971 [5R55S].)
P0798	Pressure control solenoid C circuit malfunction (non-operation)	(See 05-02-36 DTC P0795, P0798, P0968, P0970, P0971 [5R55S].)
P0960	Pressure control solenoid A circuit malfunction (open circuit)	(See 05-02-22 DTC P0745, P0748, P0960, P0962, P0963 [5R55S].)
P0962	Pressure control solenoid A circuit malfunction (short to ground)	(See 05-02-22 DTC P0745, P0748, P0960, P0962, P0963 [5R55S].)
P0963	Pressure control solenoid A circuit malfunction (short to power supply)	(See 05-02-22 DTC P0745, P0748, P0960, P0962, P0963 [5R55S].)
P0964	Pressure control solenoid B circuit malfunction (open circuit)	(See 05-02-32 DTC P0775, P0778, P0964, P0966, P0967 [5R55S].)
P0966	Pressure control solenoid B circuit malfunction (short to ground)	(See 05-02-32 DTC P0775, P0778, P0964, P0966, P0967 [5R55S].)
P0967	Pressure control solenoid B circuit malfunction (short to power supply)	(See 05-02-32 DTC P0775, P0778, P0964, P0966, P0967 [5R55S].)
P0968	Pressure control solenoid C circuit malfunction (open circuit)	(See 05-02-36 DTC P0795, P0798, P0968, P0970, P0971 [5R55S].)
P0970	Pressure control solenoid C circuit malfunction (short to ground)	(See 05-02-36 DTC P0795, P0798, P0968, P0970, P0971 [5R55S].)
P0971	Pressure control solenoid C circuit malfunction (short to power supply)	(See 05-02-36 DTC P0795, P0798, P0968, P0970, P0971 [5R55S].)
P1635	Tire/axle ratio out of acceptable range	(See 05-02-38 DTC P1635 [5R55S].)
P1700	Transmission indeterminate malfunction	(See 05-02-38 DTC P1700 [5R55S].)
P1702	Digital transmission range (TR) sensor circuit intermittent	(See 05-02-9 DTC P0705, P0708, P1702, P1704, P1705 [5R55S].)
P1704	Digital transmission range (TR) sensor circuit not indicating P or N position during on-board diagnostic	(See 05-02-9 DTC P0705, P0708, P1702, P1704, P1705 [5R55S].)
P1705	Digital transmission range (TR) sensor circuit not indicating P or N position during on-board diagnostic	(See 05-02-9 DTC P0705, P0708, P1702, P1704, P1705 [5R55S].)
P1711	ATF temperature out of on-board diagnostic range	(See 05-02-39 DTC P1711 [5R55S].)
P1780	O/D OFF switch circuit malfunction (open or short circuit)	(See 05-02-40 DTC P1780 [5R55S].)
P1783	ATF overheating	(See 05-02-42 DTC P1783 [5R55S].)
U0100	Communication error to PCM	(See 05-02-43 DTC U0100, U0297 [5R55S].)
U0294	Communication error to PCM	(See 05-02-43 DTC U0100, U0297 [5R55S].)

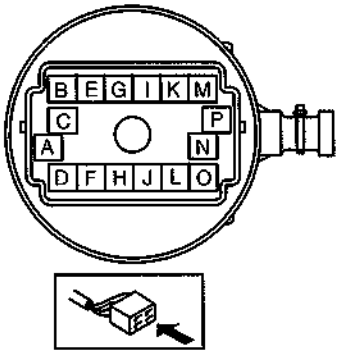
DTC P0657, P0658 [5R55S]

Id0502c1814400

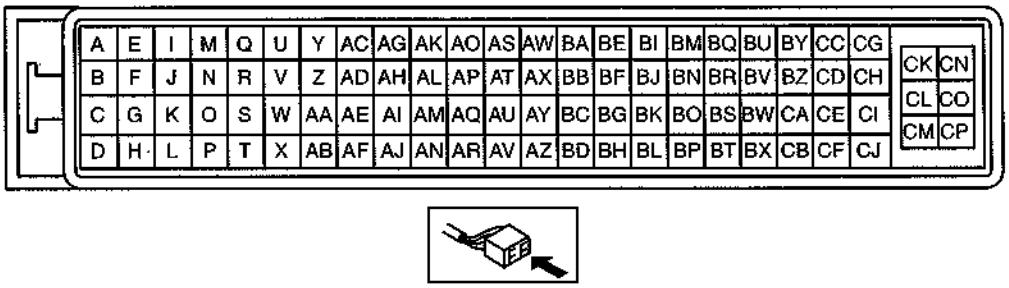
DTC P0657	**Solenoid valve power supply circuit open**
DTC P0658	**Solenoid valve power supply circuit voltage low**
DETECTION CONDITION	• P0657: Open circuit in circuit between solenoid valve and TCM • P0658: Short circuit in circuit between solenoid valve and TCM
POSSIBLE CAUSE	• Short to ground in wiring harness between AT connector terminal I (wiring harness-side) and TCM terminal CK (wiring harness-side). • Open circuit in wiring harness between AT connector terminal I (wiring harness-side) and TCM terminal CK (wiring harness-side). • Damaged connector between shift AT connector and TCM. • TCM malfunction.



AT CONNECTOR WIRING HARNESS-SIDE CONNECTOR



TCM WIRING HARNESS-SIDE CONNECTOR



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has the FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** • Verify related Service Information availability. • Is any related Service Information available?	Yes	Perform repair or diagnosis according to the available Service Information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**INSPECT AT CONNECTOR FOR POOR CONNECTION** • Turn the engine switch to the LOCK position. • Inspect AT connector connection. • Disconnect the AT connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is the connection normal?	Yes	Go to the next step.
		No	Repair or replace the connector and/or terminals, then go to Step 8.
4	**INSPECT POWER SUPPLY CIRCUIT** • Turn the engine switch to the ON position (engine off). • Inspect voltage at AT connector terminal H (wiring harness-side). • Is the voltage **approx. 12 V**?	Yes	Go to Step 8.
		No	Go to the next step.
5	**INSPECT TCM CONNECTOR FOR POOR CONNECTION** • Turn the engine switch to the LOCK position. • Disconnect the TCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is the connection normal?	Yes	Go to the next step.
		No	Repair or replace connector and/or terminals, then go to Step 8.
6	**INSPECT SOLENOID POWER SUPPLY CIRCUIT FOR OPEN CIRCUIT** • Inspect for continuity between the TCM terminal CK (wiring harness-side) and the AT connector terminal I (wiring harness-side). • Is there continuity between terminals?	Yes	Go to the next step.
		No	Repair or replace the wiring harness, then go to Step 8.
7	**INSPECT SOLENOID POWER SUPPLY CIRCUIT FOR SHORT TO GROUND** • Inspect continuity between AT connector terminal H (wiring harness-side) and body ground. • Is there continuity?	Yes	Repair or replace the wiring harness, then go to the Step 8.
		No	Go to the next step.
8	**VERIFY TROUBLESHOOTING OF DTC P0657 OR P0658 COMPLETED** • Make sure to reconnect all the disconnected connectors. • Clear the DTC from memory using the IDS/ PDS. • Perform the "After Repair Procedure". (See 05-02-4 AFTER REPAIR PROCEDURE [5R55S].) • Are any DTCs present?	Yes	Replace the TCM, then go to the next step. (See 05-13-44 TCM REMOVAL/INSTALLATION [5R55S].)
		No	Go to the next step.
9	**VERIFY DTCS** • Are DTCs except for P0657 and P0658 output?	Yes	Go to the applicable DTC inspection. (See 05-02-5 DTC TABLE [5R55S].)
		No	DTC troubleshooting completed.

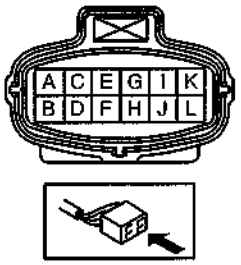
DTC P0705, P0708, P1702, P1704, P1705 [5R55S]

Id0502c1814500

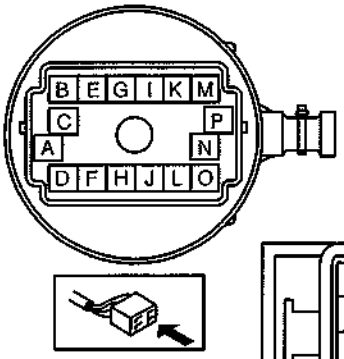
DTC P0705	**Digital transmission range (TR) sensor circuit malfunction (invalid bit pattern)**
DTC P0708	**Digital transmission range (TR) sensor circuit malfunction (TR3A circuit open)**
DTC P1702	**Digital transmission range (TR) sensor circuit intermittent**
DTC P1704	**Digital transmission range (TR) sensor circuit not indicating P or N position during on-board diagnostic**
DTC P1705	**Digital transmission range (TR) sensor circuit not indicating P or N position during on-board diagnostic**
DETECTION CONDITION	• P0705: Open circuit or short to ground in wiring harness between digital TR sensor terminal and TCM terminal or in digital TR sensor internal circuit (invalid bit pattern) • P0708: Open circuit in wiring harness between digital TR sensor and TCM terminal or in digital TR sensor internal circuit (TR3 circuit) • P1702: TCM cannot detect a signal from digital TR sensor • P1704: PID TR_D not indicating P or N position, digital TR sensor or selector cable misalignment • P1705: On-board diagnostic not performed in P or N position
POSSIBLE CAUSE	• Digital TR sensor malfunction • Digital TR sensor or selector cable misadjustment • Short to ground in wiring harness between digital TR sensor terminal G and TCM terminal AX • Short to ground in wiring harness between digital TR sensor terminal E and TCM terminal BY • Short to ground in wiring harness between digital TR sensor terminal C and TCM terminal BU • Short to ground in wiring harness between digital TR sensor terminal A and TCM terminal CA • Short to ground in wiring harness between digital TR sensor terminal I and TCM terminal BH • Open circuit in wiring harness between digital TR sensor terminal G and TCM terminal AX • Open circuit in wiring harness between digital TR sensor terminal E and TCM terminal BY • Open circuit in wiring harness between digital TR sensor terminal C and TCM terminal BU • Open circuit in wiring harness between digital TR sensor terminal A and TCM terminal CA • Open circuit in wiring harness between digital TR sensor terminal I and TCM terminal BH • Short to power supply in wiring harness between digital TR sensor terminal G and TCM terminal AX • Short to power supply in wiring harness between digital TR sensor terminal E and TCM terminal BY • Short to power supply in wiring harness between digital TR sensor terminal C and TCM terminal BU • Short to power supply in wiring harness between digital TR sensor terminal A and TCM terminal CA • Short to power supply in wiring harness between digital TR sensor terminal I and TCM terminal BH • Damaged connectors between digital TR sensor and TCM • TCM malfunction

DTC P0705	Digital transmission range (TR) sensor circuit malfunction (invalid bit pattern)
DTC P0708	Digital transmission range (TR) sensor circuit malfunction (TR3A circuit open)
DTC P1702	Digital transmission range (TR) sensor circuit intermittent
DTC P1704	Digital transmission range (TR) sensor circuit not indicating P or N position during on-board diagnostic
DTC P1705	Digital transmission range (TR) sensor circuit not indicating P or N position during on-board diagnostic

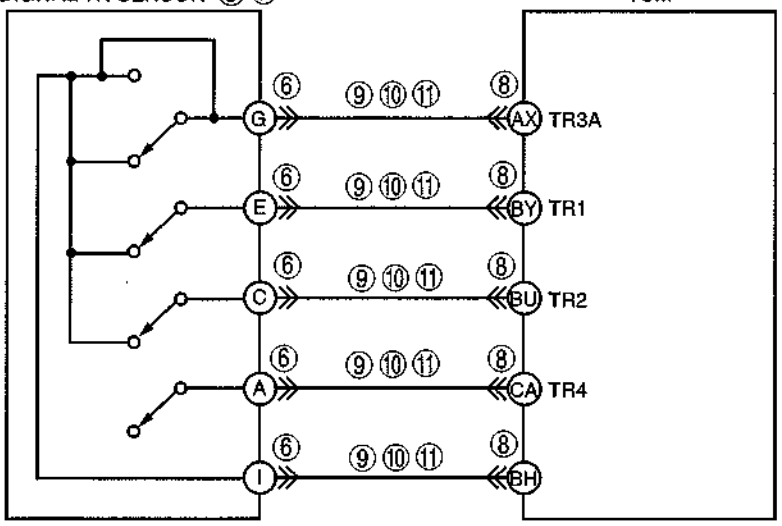
DIGITAL TR SENSOR WIRING HARNESS-SIDE CONNECTOR



AT CONNECTOR WIRING HARNESS-SIDE CONNECTOR



DIGITAL TR SENSOR ③⑦



TCM WIRING HARNESS-SIDE CONNECTOR

A	E	I	M	Q	U	Y	AC	AG	AK	AO	AS	AW	BA	BE	BI	BM	BQ	BU	BY	CC	CG	CK CN
B	F	J	N	R	V	Z	AD	AH	AL	AP	AT	AX	BB	BF	BJ	BN	BR	BV	BZ	CD	CH	CL CO
C	G	K	O	S	W	AA	AE	AI	AM	AQ	AU	AY	BC	BG	BK	BO	BS	BW	CA	CE	CI	CM CP
D	H	L	P	T	X	AB	AF	AJ	AN	AR	AV	AZ	BD	BH	BL	BP	BT	BX	CB	CF	CJ	

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has the FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** • Verify related Service Information availability. • Is any related Service Information available?	Yes	Perform repair or diagnosis according to the available Service Information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY DIGITAL TR SENSOR ALIGNMENT** • Select the N position. • Turn the engine switch to the LOCK position. • Disconnect the selector cable from the manual lever. • Verify that the **SST** (307-351 (49 UN30 7351)) fits in the appropriate slots of digital TR sensor. • Is the digital TR sensor correctly adjusted?	Yes	Connect the selector cable to the manual lever, then go to the next step.
		No	Adjust the digital TR sensor, then go to Step 12. (See 05-13-24 DIGITAL TRANSMISSION RANGE (TR) SENSOR ADJUSTMENT [5R55S].)
4	**VERIFY SELECTOR CABLE ADJUSTMENT** • Turn the engine switch to the ON position. • Verify that the selector cable is correctly adjusted. (See 05-14-2 SELECTOR CABLE ADJUSTMENT.) • Is the selector cable is correctly adjusted?	Yes	Go to the next step.
		No	Adjust the selector cable, then go to Step 12. (See 05-14-2 SELECTOR CABLE ADJUSTMENT.)
5	**INSPECT ELECTRICAL SYSTEM OPERATION** • Connect the IDS/PDS to DLC-2. • Access TR_D and TR_V PIDs. • Move the selector lever into each range and position (P, R, N, D, 3, 2, 1). • Observe the PIDs, TR D and TR V (vehicle-dependent) while wiggling wiring harness, tapping on sensor or driving the vehicle. — Use PIDs TR_D for DTCs P0705, P1704 and P1705. — Use PIDs TR_V for DTC P0708. • Are the PIDs within the specification?	Yes	Go to Step 12.
		No	Go to the next step.
6	**INSPECT DIGITAL TR SENSOR CONNECTOR FOR POOR CONNECTION** • Turn the engine switch to the LOCK position. • Disconnect the digital TR sensor connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion) • Is the connection normal?	Yes	Go to the next step.
		No	Repair or replace connector and/or terminal, then go to Step 12.
7	**INSPECT DIGITAL TR SENSOR** • Inspect the digital TR sensor. (See 05-13-20 DIGITAL TRANSMISSION RANGE (TR) SENSOR INSPECTION [5R55S].) • Is digital TR sensor normal?	Yes	Go to the next step.
		No	Replace the digital TR sensor, then go to Step 12. (See 05-13-22 DIGITAL TRANSMISSION RANGE (TR) SENSOR REMOVAL/INSTALLATION [5R55S].)
8	**INSPECT TCM CONNECTOR FOR POOR CONNECTION** • Disconnect the TCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is the connection normal?	Yes	Go to the next step.
		No	Repair or replace the connector and/or terminals, then go to Step 12.
9	**INSPECT DIGITAL TR SENSOR CIRCUIT FOR SHORT TO GROUND** • Inspect continuity between digital TR sensor terminals (wiring harness-side) and body ground. — G and body ground — E and body ground — C and body ground — A and body ground — I and body ground • Is there continuity?	Yes	Repair or replace the wiring harness, then go to Step 12.
		No	Go to the next step.

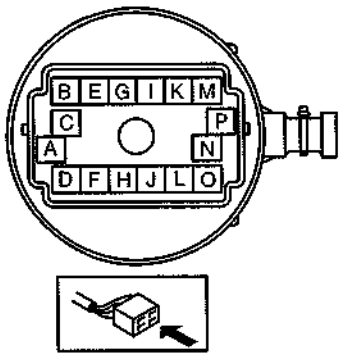
STEP	INSPECTION		ACTION
10	**INSPECT DIGITAL TR SENSOR CIRCUIT FOR SHORT TO POWER SUPPLY** • Turn the engine switch to the ON position (engine off). • Inspect the voltage at digital TR sensor terminals G, E, C, A and I (wiring harness-side). • Is the voltage **0 V**?	Yes	Go to the next step.
		No	Repair or replace the wiring harness, then go to Step 12.
11	**INSPECT DIGITAL TR SENSOR CIRCUIT FOR OPEN CIRCUIT** • Inspect the following digital TR sensor terminals (wiring harness-side) and TCM terminals (wiring harness-side): — G and AX — E and BY — C and BU — A and CA — I and BH • Is there continuity?	Yes	Go to the next step.
		No	Repair or replace the wiring harness, then go to the next step.
12	**VERIFY TROUBLESHOOTING OF DTC P0705, P0708, P1702, P1704 OR P1705 COMPLETED** • Make sure to reconnect all the disconnected connectors. • Clear the DTC from the memory using the IDS/PDS. • Perform the "After Repair Procedure". (See 05-02-4 AFTER REPAIR PROCEDURE [5R55S].) • Is the same DTC present?	Yes	Replace the TCM, then go to the next step. (See 05-13-44 TCM REMOVAL/INSTALLATION [5R55S].)
		No	Go to the next step.
13	**VERIFY DTCS** • Are DTCs except for P0705, P0708, P1702, P1704 and P1705 output?	Yes	Go to the applicable DTC inspection. (See 05-02-5 DTC TABLE [5R55S].)
		No	DTC troubleshooting completed.

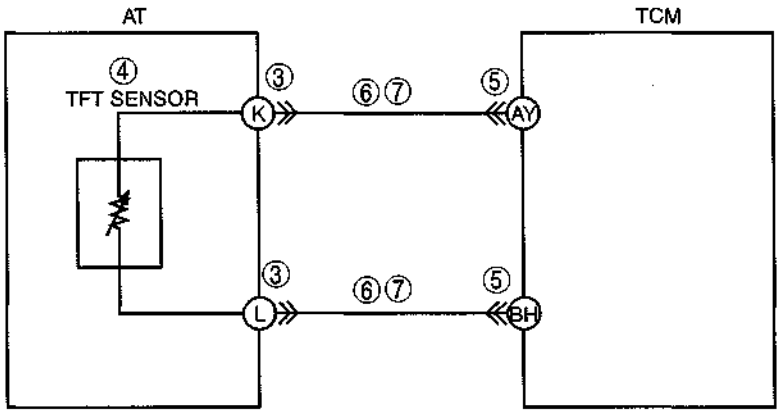
DTC P0711, P0712, P0713 [5R55S]

id0502c1814600

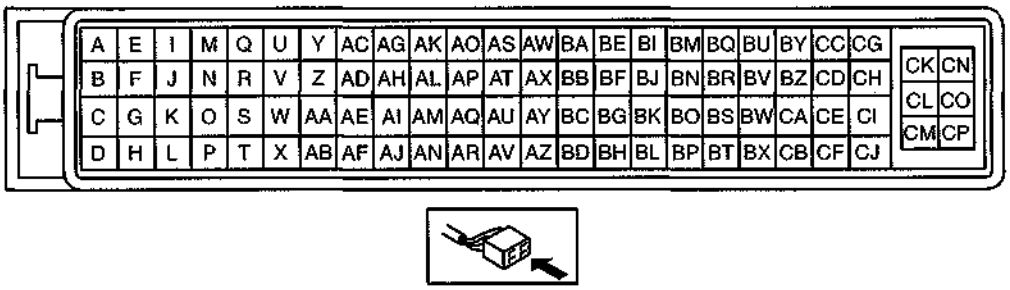
DTC P0711	**Transmission fluid temperature (TFT) sensor malfunction (ATF temperature no change)**
DTC P0712	**Transmission fluid temperature (TFT) sensor circuit malfunction (short to ground)**
DTC P0713	**Transmission fluid temperature (TFT) sensor circuit malfunction (open circuit)**
DETECTION CONDITION	• P0711: ATF temperature signal continually reading cold or hot • P0712: TCM detects that ATF signal output from ATF sensor is **157° C {315° F} or more** • P0713: TCM detects ATF signal from ATF sensor is **–40° C {–40° F} or less**
POSSIBLE CAUSE	• TFT sensor malfunction • Short to ground in wiring harness between AT connector terminal K and TCM terminal AY • Short to ground in wiring harness between AT connector terminal L and TCM terminal BH • Open circuit supply in wiring harness between AT connector terminal K and TCM terminal AY • Open circuit supply in wiring harness between AT connector terminal L and TCM terminal BH • Damaged connectors between AT connector and TCM • TCM malfunction

AT CONNECTOR WIRING HARNESS-SIDE CONNECTOR





TCM WIRING HARNESS-SIDE CONNECTOR



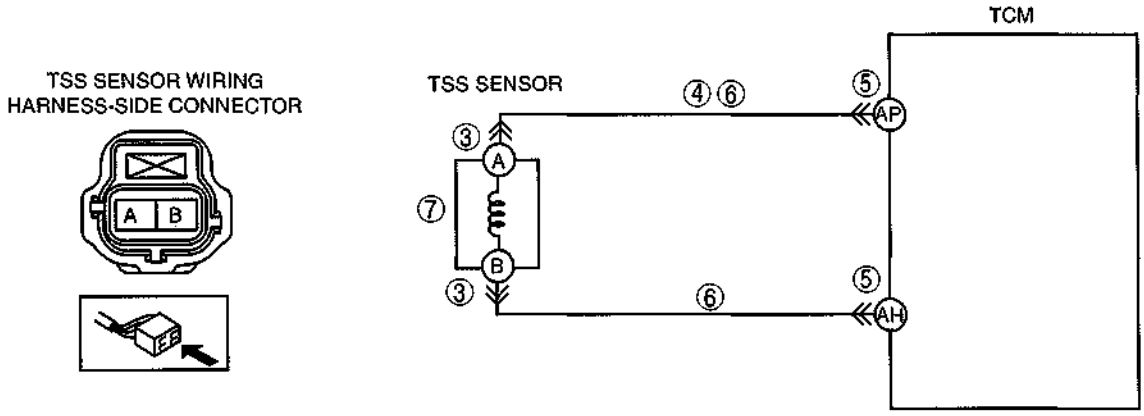
Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has the FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** • Verify related Service Information availability. • Is any related Service Information available?	Yes	Perform repair or diagnosis according to the available Service Information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**INSPECT AT CONNECTOR FOR POOR CONNECTION** • Turn the engine switch to the LOCK position. • Inspect the AT connector connection. • Disconnect the AT connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is the connection normal?	Yes	Go to the next step.
		No	Repair or replace the connector and/or terminals, then go to Step 8.
4	**INSPECT TFT SENSOR** • Inspect the TFT sensor. (See 05-13-26 TRANSMISSION FLUID TEMPERATURE (TFT) SENSOR INSPECTION [5R55S]) • Is the digital TR sensor normal?	Yes	Go to the next step.
		No	Replace the TFT sensor, then go to Step 8.
5	**INSPECT TCM CONNECTOR FOR POOR CONNECTION** • Disconnect the TCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is the connection normal?	Yes	Go to the next step.
		No	Repair or replace the connector and/or terminals, then go to Step 8.
6	**INSPECT TFT SENSOR CIRCUIT FOR SHORT TO GROUND** • Inspect for continuity between the AT terminals (wiring harness-side) and body ground. — K and body ground — L and body ground • Is there continuity?	Yes	Repair or replace the wiring harness, then go to Step 8.
		No	Go to the next step.
7	**INSPECT TFT SENSOR CIRCUIT FOR OPEN CIRCUIT** • Inspect the following AT terminals (wiring harness-side) and TCM terminals (wiring harness-side): — K and AY — L and BH • Is there continuity?	Yes	Go to the next step.
		No	Repair or replace the wiring harness, then go to Step 8.
8	**VERIFY TROUBLESHOOTING OF DTC P0711, P0712 OR P0713 COMPLETED** • Make sure to reconnect all the disconnected connectors. • Clear the DTC from the memory using the IDS/ PDS. • Perform the "After Repair Procedure". (See 05-02-4 AFTER REPAIR PROCEDURE [5R55S].) • Is the same DTC present?	Yes	Replace the TCM, then go to the next step. (See 05-13-44 TCM REMOVAL/INSTALLATION [5R55S].)
		No	Go to the next step.
9	**VERIFY DTCS** • Are DTCs except for P0711, P0712 and P0713 output?	Yes	Go to the applicable DTC inspection. (See 05-02-5 DTC TABLE [5R55S].)
		No	DTC troubleshooting completed.

DTC P0715, P0717, P0718 [5R55S]

id0502c1806200

DTC P0715	**Turbine shaft speed (TSS) sensor malfunction**
DTC P0717	**Turbine shaft speed (TSS) sensor signal is not input.**
DTC P0718	**Turbine shaft speed (TSS) sensor signal noise**
DETECTION CONDITION	• P0715: TCM detects insufficient TSS sensor signal while driving • P0717: TCM detects that TSS sensor is not input while driving • P0718: TCM detects intermittent TSS sensor signal input while driving
POSSIBLE CAUSE	• TSS sensor malfunction. • Short to ground in wiring harness between TSS sensor terminal A (wiring harness-side) and TCM terminal AP (wiring harness-side). • Open circuit in wiring harness between TSS sensor terminal A (wiring harness-side) and TCM terminal AP (wiring harness-side). • Open circuit in wiring harness between TSS sensor terminal B (wiring harness-side) and TCM terminal AH (wiring harness-side). • Damaged connectors between TSS sensor and TCM. • TCM malfunction.



TCM WIRING HARNESS-SIDE CONNECTOR

A	E	I	M	Q	U	Y	AC	AG	AK	AO	AS	AW	BA	BE	BI	BM	BQ	BU	BY	CC	CG	CK CN
B	F	J	N	R	V	Z	AD	AH	AL	AP	AT	AX	BB	BF	BJ	BN	BR	BV	BZ	CD	CH	CL CO
C	G	K	O	S	W	AA	AE	AI	AM	AQ	AU	AY	BC	BG	BK	BO	BS	BW	CA	CE	CI	CM CP
D	H	L	P	T	X	AB	AF	AJ	AN	AR	AV	AZ	BD	BH	BL	BP	BT	BX	CB	CF	CJ	

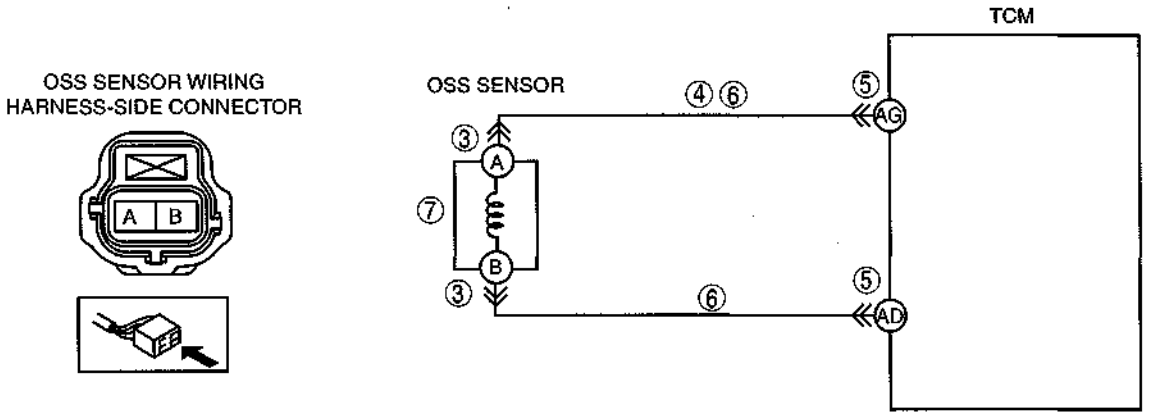
Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has the FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** • Verify related Service Information availability. • Is any related Service Information available?	Yes	Perform repair or diagnosis according to the available Service Information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**INSPECT TSS SENSOR CONNECTOR FOR POOR CONNECTION** • Turn the engine switch to the LOCK position. • Disconnect the TSS sensor connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion) • Is the connection normal?	Yes	Go to the next step.
		No	Repair or replace connector and/or terminal, then go to Step 8.
4	**INSPECT TSS SENSOR CIRCUIT FOR SHORT TO GROUND** • Inspect for continuity between TSS sensor connector A (wiring harness-side) and body ground. • Is there continuity?	Yes	Repair or replace the wiring harness, then go to Step 8.
		No	Go to the next step.
5	**INSPECT TCM CONNECTOR FOR POOR CONNECTION** • Disconnect the TCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is the connection normal?	Yes	Go to the next step.
		No	Repair or replace the connector and/or terminals, then go to Step 8.
6	**INSPECT TSS SENSOR CIRCUIT FOR OPEN CIRCUIT** • Inspect the following TSS sensor terminals (wiring harness-side) and TCM terminals (wiring harness-side): — A and AP — B and AH • Is there continuity?	Yes	Go to the next step.
		No	Repair or replace the wiring harness, then go to Step 8.
7	**INSPECT TSS SENSOR** • Inspect the TSS sensor. (See 05-13-28 TURBINE SHAFT SPEED (TSS) SENSOR INSPECTION [5R55S]) • Is TSS sensor normal?	Yes	Go to the next step.
		No	Replace the TSS sensor, then go to the next step. (See 05-13-29 TURBINE SHAFT SPEED (TSS) SENSOR REMOVAL/INSTALLATION [5R55S].)
8	**VERIFY TROUBLESHOOTING OF DTC P0715, P0717 OR P0718 COMPLETED** • Make sure to reconnect all the disconnected connectors. • Clear the DTC from memory using the IDS/ PDS. • Perform the "After Repair Procedure". (See 05-02-4 AFTER REPAIR PROCEDURE [5R55S].) • Are any DTCs present?	Yes	Replace the TCM, then go to the next step. (See 05-13-44 TCM REMOVAL/INSTALLATION [5R55S].)
		No	Go to the next step.
9	**VERIFY DTCS** • Are DTCs except for P0715, P0717 and P0718 output?	Yes	Go to the applicable DTC inspection. (See 05-02-5 DTC TABLE [5R55S].)
		No	DTC troubleshooting completed.

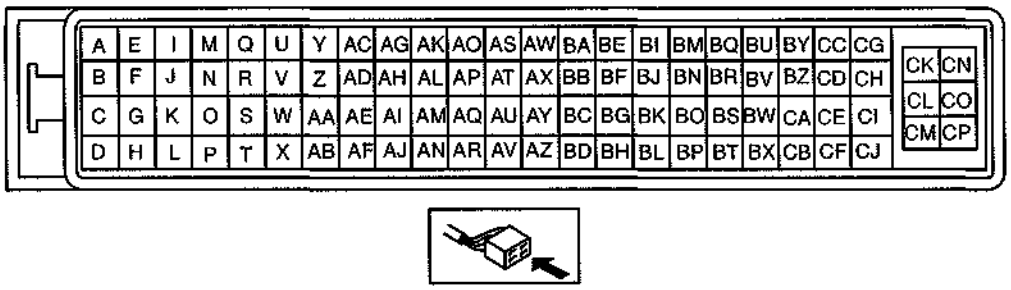
DTC P0720, P0721, P0722 [5R55S]

id0502c1806300

DTC P0720	**Output shaft speed (OSS) sensor malfunction**
DTC P0721	**Output shaft speed (OSS) sensor signal noise**
DTC P0722	**Output shaft speed (OSS) sensor signal is not input.**
DETECTION CONDITION	• P0720: TCM detects insufficient OSS sensor signal while driving • P0721: TCM detects intermittent OSS sensor signal input while driving • P0722: TCM detects that OSS sensor is not input while driving
POSSIBLE CAUSE	• OSS sensor malfunction. • Short to ground in wiring harness between OSS sensor terminal A (wiring harness-side) and TCM terminal AG (wiring harness-side). • Open circuit in wiring harness between OSS sensor terminal A (wiring harness-side) and TCM terminal AG (wiring harness-side). • Open circuit in wiring harness between OSS sensor terminal B (wiring harness-side) and TCM terminal AD (wiring harness-side). • Damaged connectors between OSS sensor and TCM. • TCM malfunction.



TCM WIRING HARNESS-SIDE CONNECTOR



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has the FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** • Verify related Service Information availability. • Is any related Service Information available?	Yes	Perform repair or diagnosis according to the available Service Information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**INSPECT OSS SENSOR CONNECTOR FOR POOR CONNECTION** • Turn the engine switch to the LOCK position. • Disconnect the OSS sensor connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion) • Is the connection normal?	Yes	Go to the next step.
		No	Repair or replace connector and/or terminal, then go to Step 9.
4	**INSPECT OSS SENSOR CIRCUIT FOR SHORT TO GROUND** • Inspect for continuity between OSS sensor connector A (wiring harness-side) and body ground. • Is there continuity?	Yes	Repair or replace the wiring harness, then go to Step 9.
		No	Go to the next step.
5	**INSPECT TCM CONNECTOR FOR POOR CONNECTION** • Disconnect the TCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is the connection normal?	Yes	Go to the next step.
		No	Repair or replace the connector and/or terminals, then go to Step 9.
6	**INSPECT OSS SENSOR CIRCUIT FOR OPEN CIRCUIT** • Inspect the following OSS sensor terminals (wiring harness-side) and TCM terminals (wiring harness-side): — A and AG — B and AD • Is there continuity?	Yes	Go to the next step.
		No	Repair or replace the wiring harness, then go to Step 9.
7	**INSPECT OSS SENSOR** • Inspect the OSS sensor. (See 05-13-32 OUTPUT SHAFT SPEED (OSS) SENSOR INSPECTION [5R55S]) • Is OSS sensor normal?	Yes	Go to the next step.
		No	Replace the OSS sensor, then go to the next step. (See 05-13-33 OUTPUT SHAFT SPEED (OSS) SENSOR REMOVAL/INSTALLATION [5R55S].)
8	**VERIFY TROUBLESHOOTING OF DTC P0720, P0721 OR P0722 COMPLETED** • Make sure to reconnect all the disconnected connectors. • Clear the DTC from memory using the IDS/ PDS. • Perform the "After Repair Procedure". (See 05-02-4 AFTER REPAIR PROCEDURE [5R55S].) • Are any DTCs present?	Yes	Replace the TCM, then go to the next step. (See 05-13-44 TCM REMOVAL/INSTALLATION [5R55S].)
		No	Go to the next step.
9	**VERIFY DTCS** • Are DTCs except for P0720, P0721 and P0722 output?	Yes	Go to the applicable DTC inspection. (See 05-02-5 DTC TABLE [5R55S].)
		No	DTC troubleshooting completed.

DTC P0731, P0732, P0733, P0734, P0735 [5R55S]

Id0502c1814700

DTC P0731	**Gear 1 incorrect**
DTC P0732	**Gear 2 incorrect**
DTC P0733	**Gear 3 incorrect**
DTC P0734	**Gear 4 incorrect**
DTC P0735	**Gear 5 incorrect**
DETECTION CONDITION	• P0731: Does not shift to 1st gear while driving • P0732: Does not shift to 2nd gear while driving • P0733: Does not shift to 3rd gear while driving • P0734: Does not shift to 4th gear while driving • P0735: Does not shift to 5th gear while driving
POSSIBLE CAUSE	• Shift solenoid A malfunction • Shift solenoid B malfunction • Shift solenoid C malfunction • Shift solenoid D malfunction • Transmission internal malfunction • TCM malfunction

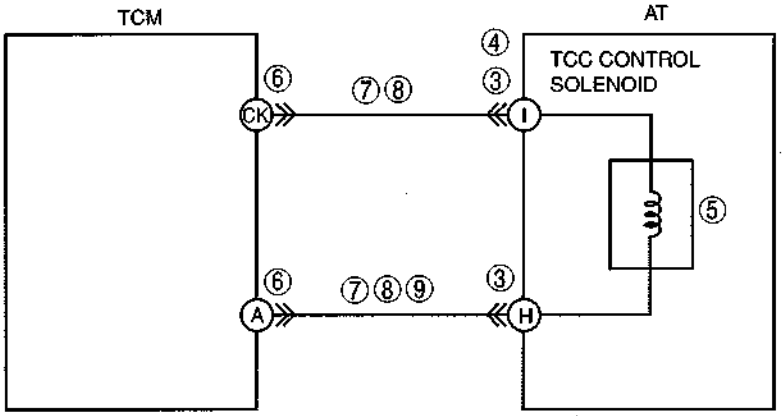
Diagnostic procedure

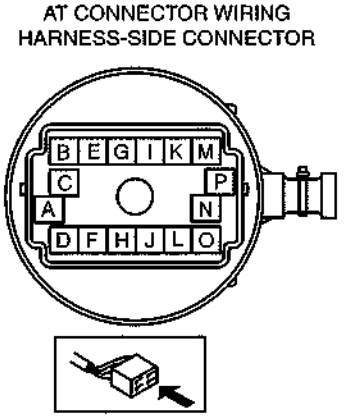
STEP	INSPECTION		ACTION
1	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** • Verify related Service Information availability. • Is any related Service Information available?	Yes	Perform repair or diagnosis according to the available Service Information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
2	**VERIFY DTCS** • Turn the engine switch to the LOCK position, then to the ON position. • Verify the DTCs in the TCM memory. • Are DTCs except for P0731, P0732, P0733, P0734 and P0735 output?	Yes	Go to the applicable DTC inspection. (See 05-02-5 DTC TABLE [5R55S].)
		No	Go to the next step.
3	**SHIFT SOLENOID OPERATION INSPECTION** • Drive in D range. • Connect the IDS/PDS to the DLC-2 and select the following PIDs. — SSA — SSB — SSC — SSD • Using the IDS/PDS, verify the operation status of shift solenoid A, B, C and D while driving. — 1GR: SSA on, SSB off, SSC off, SSD on — 2GR: SSA on, SSB off, SSC on, SSD on — 3GR: SSA on, SSB on, SSC off, SSD on — 4GR: SSA off, SSB off, SSC off, SSD on — 5GR: SSA off, SSB off, SSC on, SSD on • Is the shift solenoid operation normal?	Yes	Go to the next step.
		No	Replace the solenoid body component, then go to Step 5. (See 05-13-35 SOLENOID BODY REMOVAL/INSTALLATION [5R55S].)
4	**INSPECT ROAD TEST** • Road-test the vehicle to verify the respective shift points. (See 05-13-8 ROAD TEST [5R55S].) • Are the shift points normal?	Yes	Go to the next step.
		No	Inspect the symptom troubleshooting, then go to the next step. (See 05-03-5 SYMPTOM TROUBLESHOOTING ITEM TABLE [5R55S].)
5	**VERIFY TROUBLESHOOTING OF DTC P0731, P0732, P0733, P0734 OR P0735 COMPLETED** • Make sure to reconnect all the disconnected connectors. • Clear the DTC using the IDS/PDS. • Start the engine. • Perform the "After Repair Procedure". (See 05-02-4 AFTER REPAIR PROCEDURE [5R55S].) • Are any DTCs present?	Yes	Replace the TCM, then go to the next step. (See 05-13-44 TCM REMOVAL/INSTALLATION [5R55S].)
		No	Go to the next step.
6	**VERIFY DTCS** • Are DTCs except for P0731, P0732, P0733, P0734 and P0735 output?	Yes	Go to the applicable DTC inspection. (See 05-02-5 DTC TABLE [5R55S].)
		No	DTC troubleshooting completed.

DTC P0740, P0741, P0742, P0743, P0744 [5R55S]

id0502c1814800

DTC P0740	**Torque converter clutch (TCC) control solenoid circuit malfunction (open circuit)**
DTC P0741	**Torque converter clutch (TCC) control solenoid circuit malfunction (stuck off)**
DTC P0742	**Torque converter clutch (TCC) control solenoid circuit malfunction (stuck on)**
DTC P0743	**Torque converter clutch (TCC) control solenoid circuit malfunction (open or short circuit)**
DTC P0744	**Torque converter clutch (TCC) control solenoid circuit malfunction (short to power)**
DETECTION CONDITION	• P0740: Open circuit in circuit between TCC control solenoid and TCM, or in TCC control solenoid internal circuit. • P0741: Torque converter clutch slipping indicating a mechanical or hydraulic concern. • P0742: Short to ground in circuit between TCC control solenoid and TCM, or in TCC control solenoid internal circuit. • P0743: Open or short circuit in circuit between TCC control solenoid and TCM, or in TCC control solenoid internal circuit. • P0744: Short to power supply in circuit between TCC control solenoid and TCM, or in TCC control solenoid internal circuit.
POSSIBLE CAUSE	• TCC control solenoid malfunction. • Short to ground in wiring harness between AT connector terminal I (wiring harness-side) and TCM terminal CK (wiring harness-side). • Short to ground in wiring harness between AT connector terminal H (wiring harness-side) and TCM terminal A (wiring harness-side). • Short to power supply in wiring harness between AT connector terminal H (wiring harness-side) and TCM terminal A (wiring harness-side). • Open circuit in wiring harness between AT connector terminal I (wiring harness-side) and TCM terminal CK (wiring harness-side). • Open circuit in wiring harness between AT connector terminal H (wiring harness-side) and TCM terminal A (wiring harness-side). • Damaged connector between AT connector and TCM. • TCM malfunction.





TCM WIRING HARNESS-SIDE CONNECTOR

A	E	I	M	Q	U	Y	AC	AG	AK	AO	AS	AW	BA	BE	BI	BM	BQ	BU	BY	CC	CG	
B	F	J	N	R	V	Z	AD	AH	AL	AP	AT	AX	BB	BF	BJ	BN	BR	BV	BZ	CD	CH	CK CN
C	G	K	O	S	W	AA	AE	AI	AM	AQ	AU	AY	BC	BG	BK	BO	BS	BW	CA	CE	CI	CL CO
D	H	L	P	T	X	AB	AF	AJ	AN	AR	AV	AZ	BD	BH	BL	BP	BT	BX	CB	CF	CJ	CM CP

Diagnostic procedure

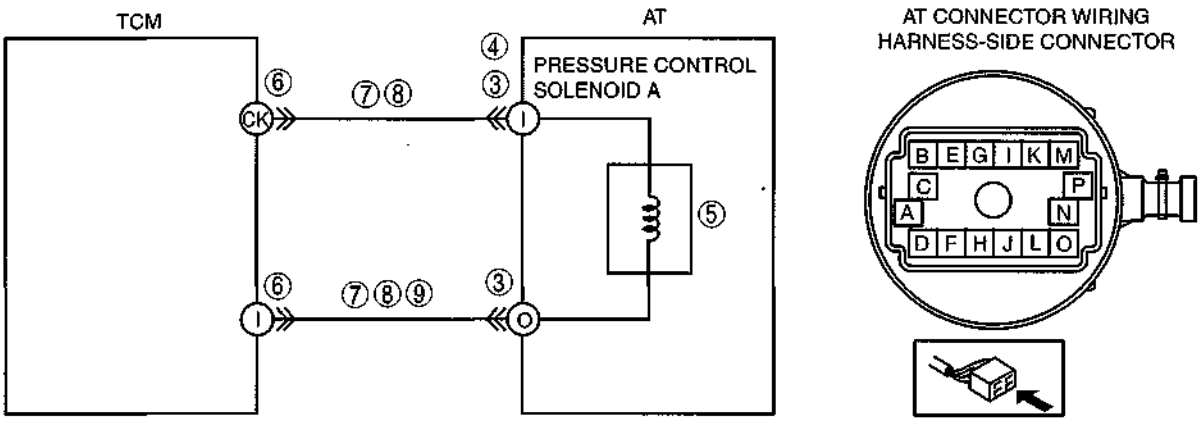
STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has the FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.

STEP	INSPECTION		ACTION
2	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** • Verify related Service Information availability. • Is any related Service Information available?	Yes	Perform repair or diagnosis according to the available Service Information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**INSPECT AT CONNECTOR FOR POOR CONNECTION** • Turn the engine switch to the LOCK position. • Inspect the AT connector connection. • Disconnect the AT connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is the connection normal?	Yes	Go to the next step.
		No	Repair or replace the connector and/or terminals, then go to Step 10.
4	**INSPECT POWER SUPPLY CIRCUIT** • Turn the engine switch to the ON position (engine off). • Inspect voltage at AT connector terminal I (wiring harness-side). • Is the voltage **approx. 12 V**?	Yes	Go to the next step.
		No	Go to Step 6.
5	**INSPECT RESISTANCE** • Turn the engine switch to the LOCK position. • Inspect resistance between AT terminal I and H (transmission case side). • Is resistance **within 9—16 ohms**? (See 05-13-34 SOLENOID VALVE INSPECTION [5R55S].)	Yes	Go to the next step.
		No	Replace the TCC control solenoid, then go to Step 10.
6	**INSPECT TCM CONNECTOR FOR POOR CONNECTION** • Disconnect the TCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is the connection normal?	Yes	Go to the next step.
		No	Repair or replace connector and/or terminals, then go to Step 10.
7	**INSPECT TCC CONTROL SOLENOID CIRCUIT FOR OPEN CIRCUIT** • Inspect for continuity between the TCM terminal (wiring harness-side) and the AT connector terminal (wiring harness-side). — CK and I — A and H • Is there continuity between terminals?	Yes	Go to the next step.
		No	Repair or replace the wiring harness, then go to Step 10.
8	**INSPECT TCC CONTROL SOLENOID CIRCUIT FOR SHORT TO GROUND** • Inspect for continuity between AT connector terminal (wiring harness-side) and body ground. — I and body ground — H and body ground • Is there continuity?	Yes	Repair or replace the wiring harness, then go to the Step 10.
		No	Go to the next step.
9	**INSPECT TCC CONTROL SOLENOID CIRCUIT FOR SHORT TO POWER SUPPLY** • Turn the engine switch to the ON position (engine off). • Inspect voltage at AT connector terminal H (wiring harness-side). • Is the voltage **0 V**?	Yes	Go to the next step.
		No	Repair or replace the wiring harness, then go to the next step.
10	**VERIFY TROUBLESHOOTING OF DTC P0740, P0741, P0742, P0743 OR P0744 COMPLETED** • Make sure to reconnect all the disconnected connectors. • Clear the DTC from memory using the IDS/ PDS. • Perform the "After Repair Procedure". (See 05-02-4 AFTER REPAIR PROCEDURE [5R55S].) • Are any DTCs present?	Yes	Replace the TCM, then go to the next step. (See 05-13-44 TCM REMOVAL/INSTALLATION [5R55S].)
		No	Go to the next step.
11	**VERIFY DTCS** • Are DTCs except for P0740, P0741, P0742, P0743 and P0744 output?	Yes	Go to the applicable DTC inspection. (See 05-02-5 DTC TABLE [5R55S].)
		No	DTC troubleshooting completed.

DTC P0745, P0748, P0960, P0962, P0963 [5R55S]

id0502c1815300

DTC P0745	**Pressure control solenoid A malfunction (low pressure)**
DTC P0748	**Pressure control solenoid A circuit malfunction (not operation)**
DTC P0960	**Pressure control solenoid A circuit malfunction (open circuit)**
DTC P0962	**Pressure control solenoid A circuit malfunction (short to ground)**
DTC P0963	**Pressure control solenoid A circuit malfunction (short to power supply)**
DETECTION CONDITION	• P0745: Incorrect shift pattern indicating mechanical or hydraulic failure in the transmission. • P0748: Possible slip in gear and/or 3GR ratio. • P0960: Open circuit in circuit between pressure control solenoid O and TCM, or in pressure control solenoid A internal circuit. • P0962: Short to ground in circuit between pressure control solenoid A and TCM, or in pressure control solenoid A internal circuit. • P0963: Short to power supply in circuit between pressure control solenoid A and TCM, or in pressure control solenoid A internal circuit.
POSSIBLE CAUSE	• Pressure control solenoid A malfunction. • Short to ground in wiring harness between AT connector terminal I (wiring harness-side) and TCM terminal CK (wiring harness-side). • Short to ground in wiring harness between AT connector terminal O (wiring harness-side) and TCM terminal I (wiring harness-side). • Short to power supply in wiring harness between AT connector terminal O (wiring harness-side) and TCM terminal I (wiring harness-side). • Open circuit in wiring harness between AT connector terminal I (wiring harness-side) and TCM terminal CK (wiring harness-side). • Open circuit in wiring harness between AT connector terminal O (wiring harness-side) and TCM terminal I (wiring harness-side). • Damaged connector between AT connector and TCM. • TCM malfunction.



TCM WIRING HARNESS-SIDE CONNECTOR

A	E	I	M	Q	U	Y	AC	AG	AK	AO	AS	AW	BA	BE	BI	BM	BQ	BU	BY	CC	CG	CK CN
B	F	J	N	R	V	Z	AD	AH	AL	AP	AT	AX	BB	BF	BJ	BN	BR	BV	BZ	CD	CH	CL CO
C	G	K	O	S	W	AA	AE	AI	AM	AQ	AU	AY	BC	BG	BK	BO	BS	BW	CA	CE	CI	CM CP
D	H	L	P	T	X	AB	AF	AJ	AN	AR	AV	AZ	BD	BH	BL	BP	BT	BX	CB	CF	CJ	

Diagnostic procedure

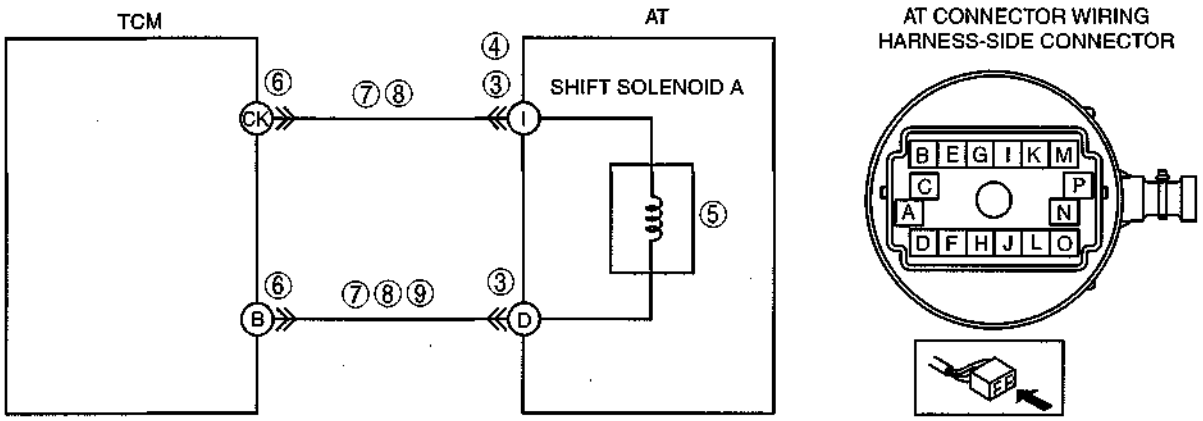
STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has the FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.

STEP	INSPECTION		ACTION
2	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** • Verify related Service Information availability. • Is any related Service Information available?	Yes	Perform repair or diagnosis according to the available Service Information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**INSPECT AT CONNECTOR FOR POOR CONNECTION** • Turn the engine switch to the LOCK position. • Inspect AT connector connection. • Disconnect the AT connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is the connection normal?	Yes	Go to the next step.
		No	Repair or replace the connector and/or terminals, then go to Step 10.
4	**INSPECT POWER SUPPLY CIRCUIT** • Turn the engine switch to the ON position (engine off). • Inspect voltage at AT connector terminal I (wiring harness-side). • Is the voltage **approx. 12 V**?	Yes	Go to the next step.
		No	Go to Step 6.
5	**INSPECT RESISTANCE** • Turn the engine switch to the LOCK position. • Inspect resistance between AT terminal I and O (transmission case side). • Is resistance **within 3.3—7.5 ohms**? (See 05-13-34 SOLENOID VALVE INSPECTION [5R55S].)	Yes	Go to the next step.
		No	Replace the pressure control solenoid A, then go to Step 10.
6	**INSPECT TCM CONNECTOR FOR POOR CONNECTION** • Disconnect the TCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is the connection normal?	Yes	Go to the next step.
		No	Repair or replace connector and/or terminals, then go to Step 10.
7	**INSPECT PRESSURE CONTROL SOLENOID A CIRCUIT FOR OPEN CIRCUIT** • Inspect for continuity between the TCM terminal (wiring harness-side) and the AT connector terminal (wiring harness-side). — CK and I — I and O • Is there continuity between terminals?	Yes	Go to the next step.
		No	Repair or replace the wiring harness, then go to Step 10.
8	**INSPECT PRESSURE CONTROL SOLENOID A CIRCUIT FOR SHORT TO GROUND** • Inspect continuity between AT connector terminal (wiring harness-side) and body ground. — I and body ground — O and body ground • Is there continuity?	Yes	Repair or replace the wiring harness, then go to the Step 10.
		No	Go to the next step.
9	**INSPECT PRESSURE CONTROL SOLENOID A CIRCUIT FOR SHORT TO POWER SUPPLY** • Turn the engine switch to the ON position (engine off). • Inspect voltage at AT connector terminal O (wiring harness-side). • Is the voltage **0 V**?	Yes	Go to the next step.
		No	Repair or replace the wiring harness, then go to the next step.
10	**VERIFY TROUBLESHOOTING OF DTC P0745, P0748, P0960, P0962 OR P0963 COMPLETED** • Make sure to reconnect all the disconnected connectors. • Clear the DTC from memory using the IDS/ PDS. • Perform the "After Repair Procedure". (See 05-02-4 AFTER REPAIR PROCEDURE [5R55S].) • Are any DTCs present?	Yes	Replace the TCM, then go to the next step. (See 05-13-44 TCM REMOVAL/INSTALLATION [5R55S].)
		No	Go to the next step.
11	**VERIFY DTCS** • Are DTCs except for P0745, P0748, P0960, P0962 and P0963 output?	Yes	Go to the applicable DTC inspection. (See 05-02-5 DTC TABLE [5R55S].)
		No	DTC troubleshooting completed.

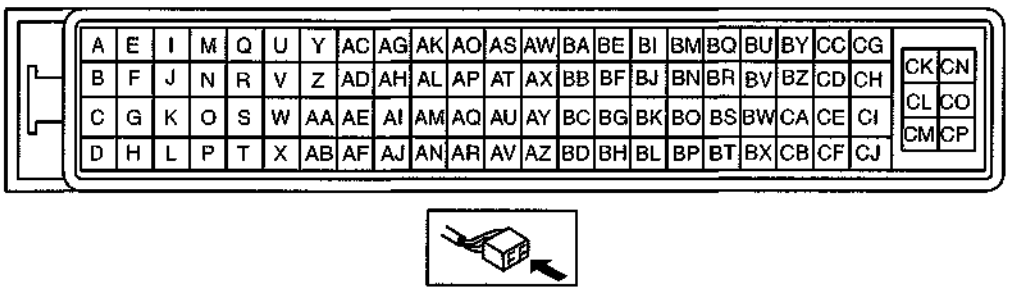
DTC P0750, P0753 [5R55S]

id0502c1814900

DTC P0750	**Shift solenoid A circuit malfunction (open or short circuit)**
DTC P0753	**Shift solenoid A circuit malfunction (open or short circuit)**
DETECTION CONDITION	• P0750: Open or short circuit in circuit between shift solenoid A and TCM, or in shift solenoid A internal circuit. • P0753: Open or short circuit in circuit between shift solenoid A and TCM, or in shift solenoid A internal circuit.
POSSIBLE CAUSE	• Shift solenoid A malfunction. • Short to ground in wiring harness between AT connector terminal I (wiring harness-side) and TCM terminal CK (wiring harness-side). • Short to ground in wiring harness between AT connector terminal D (wiring harness-side) and TCM terminal B (wiring harness-side). • Short to power supply in wiring harness between AT connector terminal D (wiring harness-side) and TCM terminal B (wiring harness-side). • Open circuit in wiring harness between AT connector terminal I (wiring harness-side) and TCM terminal CK (wiring harness-side). • Open circuit in wiring harness between AT connector terminal D (wiring harness-side) and TCM terminal B (wiring harness-side). • Damaged connector between AT connector and TCM. • TCM malfunction.



TCM WIRING HARNESS-SIDE CONNECTOR



Diagnostic procedure

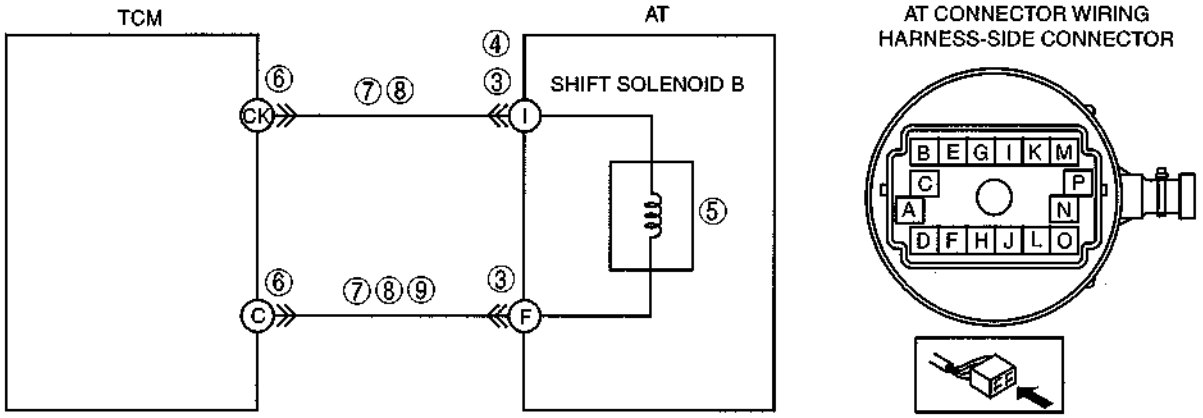
STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has the FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** • Verify related Service Information availability. • Is any related Service Information available?	Yes	Perform repair or diagnosis according to the available Service Information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.

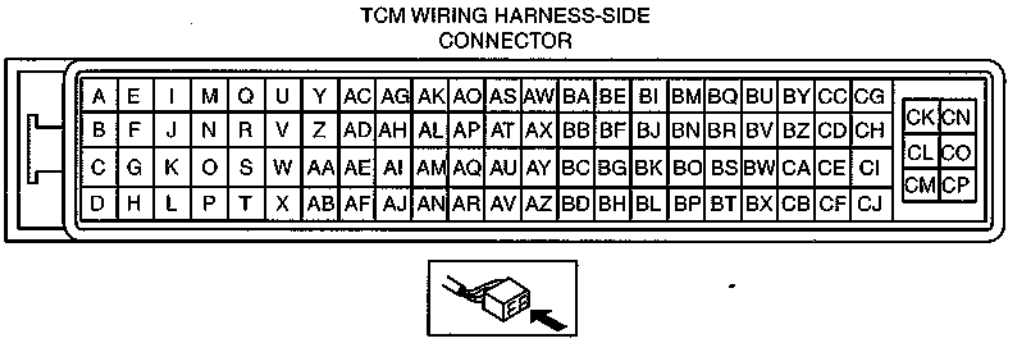
STEP	INSPECTION		ACTION
3	**INSPECT AT CONNECTOR FOR POOR CONNECTION** • Turn the engine switch to the LOCK position. • Inspect the AT connector connection. • Disconnect the AT connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is the connection normal?	Yes	Go to the next step.
		No	Repair or replace the connector and/or terminals, then go to Step 10.
4	**INSPECT POWER SUPPLY CIRCUIT** • Turn the engine switch to the ON position (engine off). • Inspect the voltage at AT connector terminal I (wiring harness-side). • Is the voltage **approx. 12 V**?	Yes	Go to the next step.
		No	Go to Step 6.
5	**INSPECT RESISTANCE** • Turn the engine switch to the LOCK position. • Inspect resistance between AT terminal I and D (transmission case side). • Is resistance **within 16—45 ohms**? (See 05-13-34 SOLENOID VALVE INSPECTION [5R55S].)	Yes	Go to the next step.
		No	Replace the shift solenoid A, then go to Step 10.
6	**INSPECT TCM CONNECTOR FOR POOR CONNECTION** • Disconnect the TCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is the connection normal?	Yes	Go to the next step.
		No	Repair or replace connector and/or terminals, then go to Step 10.
7	**INSPECT SHIFT SOLENOID A CIRCUIT FOR OPEN CIRCUIT** • Inspect for continuity between the TCM terminal (wiring harness-side) and the AT connector terminal (wiring harness-side). — CK and I — B and D • Is there continuity between terminals?	Yes	Go to the next step.
		No	Repair or replace the wiring harness, then go to Step 10.
8	**INSPECT SHIFT SOLENOID A CIRCUIT FOR SHORT TO GROUND** • Inspect for continuity between AT connector terminal (wiring harness-side) and body ground. — I and body ground — D and body ground • Is there continuity?	Yes	Repair or replace the wiring harness, then go to the Step 10.
		No	Go to the next step.
9	**INSPECT SHIFT SOLENOID A CIRCUIT FOR SHORT TO POWER SUPPLY** • Turn the engine switch to the ON position (engine off). • Inspect voltage at AT connector terminal D (wiring harness-side). • Is the voltage **0 V**?	Yes	Go to the next step.
		No	Repair or replace the wiring harness, then go to the next step.
10	**VERIFY TROUBLESHOOTING OF DTC P0750 OR P0753 COMPLETED** • Make sure to reconnect all the disconnected connectors. • Clear the DTC from memory using the IDS/ PDS. • Perform the "After Repair Procedure". (See 05-02-4 AFTER REPAIR PROCEDURE [5R55S].) • Are any DTCs present?	Yes	Replace the TCM, then go to the next step. (See 05-13-44 TCM REMOVAL/INSTALLATION [5R55S].)
		No	Go to the next step.
11	**VERIFY DTCS** • Are DTCs except for P0750 and P0753 output?	Yes	Go to the applicable DTC inspection. (See 05-02-5 DTC TABLE [5R55S].)
		No	DTC troubleshooting completed.

DTC P0755, P0757, P0758 [5R55S]

id0502c1815000

DTC P0755	**Shift solenoid B circuit malfunction (open or short circuit)**
DTC P0757	**Shift solenoid B malfunction (stuck on)**
DTC P0758	**Shift solenoid B circuit malfunction (open or short circuit)**
DETECTION CONDITION	• P0755: Open or short circuit in circuit between shift solenoid B and TCM, or in shift solenoid B internal circuit. • P0757: Shift solenoid B mechanically stuck on. • P0758: Open or short circuit in circuit between shift solenoid B and TCM, or in shift solenoid B internal circuit.
POSSIBLE CAUSE	• Shift solenoid B malfunction. • Short to ground in wiring harness between AT connector terminal I (wiring harness-side) and TCM terminal CK (wiring harness-side). • Short to ground in wiring harness between AT connector terminal F (wiring harness-side) and TCM terminal C (wiring harness-side). • Short to power supply in wiring harness between AT connector terminal F (wiring harness-side) and TCM terminal C (wiring harness-side). • Open circuit in wiring harness between AT connector terminal I (wiring harness-side) and TCM terminal CK (wiring harness-side). • Open circuit in wiring harness between AT connector terminal F (wiring harness-side) and TCM terminal C (wiring harness-side). • Damaged connector between AT connector and TCM. • TCM malfunction.





Diagnostic procedure

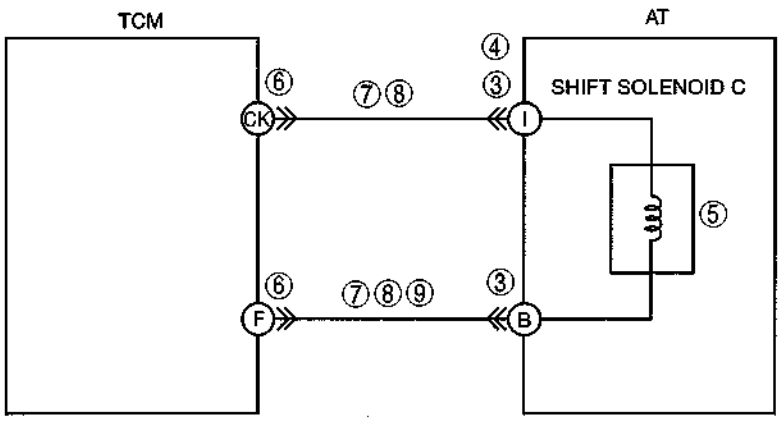
STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has the FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** • Verify related Service Information availability. • Is any related Service Information available?	Yes	Perform repair or diagnosis according to the available Service Information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.

STEP	INSPECTION		ACTION
3	**INSPECT AT CONNECTOR FOR POOR CONNECTION** • Turn the engine switch to the LOCK position. • Inspect AT connector connection. • Disconnect the AT connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is the connection normal?	Yes	Go to the next step.
		No	Repair or replace the connector and/or terminals, then go to Step 10.
4	**INSPECT POWER SUPPLY CIRCUIT** • Turn the engine switch to the ON position (engine off). • Inspect voltage at AT connector terminal I (wiring harness-side). • Is the voltage **approx. 12 V**?	Yes	Go to the next step.
		No	Go to Step 6.
5	**INSPECT RESISTANCE** • Turn the engine switch to the LOCK position. • Inspect resistance between AT terminal I and F (transmission case side). • Is resistance **within 16—45 ohms**? (See 05-13-34 SOLENOID VALVE INSPECTION [5R55S].)	Yes	Go to the next step.
		No	Replace the shift solenoid B, then go to Step 10.
6	**INSPECT TCM CONNECTOR FOR POOR CONNECTION** • Disconnect the TCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is the connection normal?	Yes	Go to the next step.
		No	Repair or replace connector and/or terminals, then go to Step 10.
7	**INSPECT SHIFT SOLENOID B CIRCUIT FOR OPEN CIRCUIT** • Inspect for continuity between the TCM terminal (wiring harness-side) and the AT connector terminal (wiring harness-side). — CK and I — C and F • Is there continuity between terminals?	Yes	Go to the next step.
		No	Repair or replace the wiring harness, then go to Step 10.
8	**INSPECT SHIFT SOLENOID B CIRCUIT FOR SHORT TO GROUND** • Inspect continuity between AT connector terminal (wiring harness-side) and body ground. — I and body ground — F and body ground • Is there continuity?	Yes	Repair or replace the wiring harness, then go to the Step 10.
		No	Go to the next step.
9	**INSPECT SHIFT SOLENOID B CIRCUIT FOR SHORT TO POWER SUPPLY** • Turn the engine switch to the ON position (engine off). • Inspect voltage at AT connector terminal F (wiring harness-side). • Is the voltage **0 V**?	Yes	Go to the next step.
		No	Repair or replace the wiring harness, then go to the next step.
10	**VERIFY TROUBLESHOOTING OF DTC P0755, P0757 OR P0758 COMPLETED** • Make sure to reconnect all the disconnected connectors. • Clear the DTC from memory using the IDS/ PDS. • Perform the "After Repair Procedure". (See 05-02-4 AFTER REPAIR PROCEDURE [5R55S].) • Are any DTCs present?	Yes	Replace the TCM, then go to the next step. (See 05-13-44 TCM REMOVAL/INSTALLATION [5R55S].)
		No	Go to the next step.
11	**VERIFY DTCS** • Are DTCs except for P0755, P0757 and P0758 output?	Yes	Go to the applicable DTC inspection. (See 05-02-5 DTC TABLE [5R55S].)
		No	DTC troubleshooting completed.

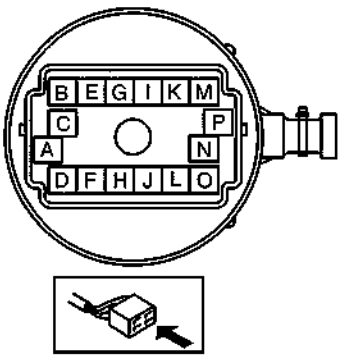
DTC P0760, P0762, P0763 [5R55S]

id0502c1815100

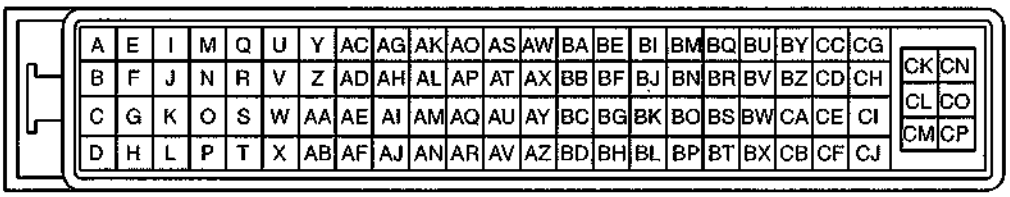
DTC P0760	**Shift solenoid C circuit malfunction (open or short circuit)**
DTC P0762	**Shift solenoid C malfunction (stuck on)**
DTC P0763	**Shift solenoid C circuit malfunction (open or short circuit)**
DETECTION CONDITION	• P0760: Open or short circuit in circuit between shift solenoid C and TCM, or in shift solenoid C internal circuit. • P0762: Shift solenoid C mechanically stuck on. • P0763: Open or short circuit in circuit between shift solenoid C and TCM, or in shift solenoid C internal circuit.
POSSIBLE CAUSE	• Shift solenoid C malfunction. • Short to ground in wiring harness between AT connector terminal I (wiring harness-side) and TCM terminal CK (wiring harness-side). • Short to ground in wiring harness between AT connector terminal B (wiring harness-side) and TCM terminal F (wiring harness-side). • Short to power supply in wiring harness between AT connector terminal B (wiring harness-side) and TCM terminal F (wiring harness-side). • Open circuit in wiring harness between AT connector terminal I (wiring harness-side) and TCM terminal CK (wiring harness-side). • Open circuit in wiring harness between AT connector terminal B (wiring harness-side) and TCM terminal F (wiring harness-side). • Damaged connector between AT connector and TCM. • TCM malfunction.



AT CONNECTOR WIRING HARNESS-SIDE CONNECTOR



TCM WIRING HARNESS-SIDE CONNECTOR



Diagnostic procedure

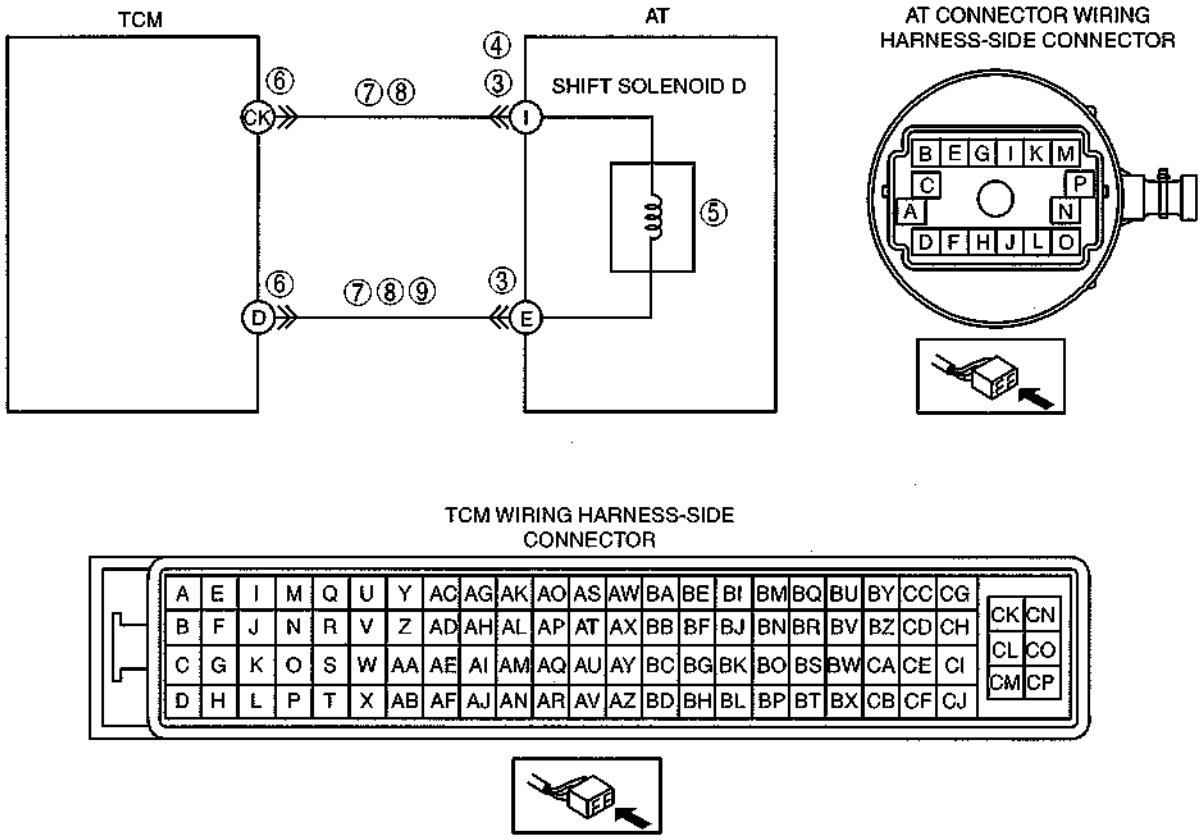
STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has the FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** • Verify related Service Information availability. • Is any related Service Information available?	Yes	Perform repair or diagnosis according to the available Service Information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.

STEP	INSPECTION		ACTION
3	**INSPECT AT CONNECTOR FOR POOR CONNECTION** • Turn the engine switch to the LOCK position. • Inspect the AT connector connection. • Disconnect the AT connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is the connection normal?	Yes	Go to the next step.
		No	Repair or replace the connector and/or terminals, then go to Step 10.
4	**INSPECT POWER SUPPLY CIRCUIT** • Turn the engine switch to the ON position (engine off). • Inspect the voltage at AT connector terminal I (wiring harness-side). • Is the voltage **approx. 12 V**?	Yes	Go to the next step.
		No	Go to Step 6.
5	**INSPECT RESISTANCE** • Turn the engine switch to the LOCK position. • Inspect the resistance between AT terminal I and B (transmission case side). • Is resistance **within 16—45 ohms**? (See 05-13-34 SOLENOID VALVE INSPECTION [5R55S].)	Yes	Go to the next step.
		No	Replace the shift solenoid C, then go to Step 10.
6	**INSPECT TCM CONNECTOR FOR POOR CONNECTION** • Disconnect the TCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is the connection normal?	Yes	Go to the next step.
		No	Repair or replace connector and/or terminals, then go to Step 10.
7	**INSPECT SHIFT SOLENOID C CIRCUIT FOR OPEN CIRCUIT** • Inspect for continuity between the TCM terminal (wiring harness-side) and the AT connector terminal (wiring harness-side). — CK and I — F and B • Is there continuity between terminals?	Yes	Go to the next step.
		No	Repair or replace the wiring harness, then go to Step 10.
8	**INSPECT SHIFT SOLENOID C CIRCUIT FOR SHORT TO GROUND** • Inspect for continuity between AT connector terminal (wiring harness-side) and body ground. — I and body ground — B and body ground • Is there continuity?	Yes	Repair or replace the wiring harness, then go to the Step 10.
		No	Go to the next step.
9	**INSPECT SHIFT SOLENOID C CIRCUIT FOR SHORT TO POWER SUPPLY** • Turn the engine switch to the ON position (engine off). • Inspect the voltage at AT connector terminal B (wiring harness-side). • Is the voltage **0 V**?	Yes	Go to the next step.
		No	Repair or replace the wiring harness, then go to the next step.
10	**VERIFY TROUBLESHOOTING OF DTC P0760, P0762 OR P0763 COMPLETED** • Make sure to reconnect all the disconnected connectors. • Clear the DTC from memory using the IDS/ PDS. • Perform the "After Repair Procedure". (See 05-02-4 AFTER REPAIR PROCEDURE [5R55S].) • Are any DTCs present?	Yes	Replace the TCM, then go to the next step. (See 05-13-44 TCM REMOVAL/INSTALLATION [5R55S].)
		No	Go to the next step.
11	**VERIFY DTCS** • Are DTCs except for P0760, P0762 and P0763 output?	Yes	Go to the applicable DTC inspection. (See 05-02-5 DTC TABLE [5R55S].)
		No	DTC troubleshooting completed.

DTC P0765, P0768 [5R55S]

id0502c1815200

DTC P0765	**Shift solenoid D circuit malfunction (open or short circuit)**
DTC P0768	**Shift solenoid D circuit malfunction (open or short circuit)**
DETECTION CONDITION	• P0765: Open or short circuit in circuit between shift solenoid D and TCM, or in shift solenoid D internal circuit. • P0768: Open or short circuit in circuit between shift solenoid D and TCM, or in shift solenoid D internal circuit.
POSSIBLE CAUSE	• Shift solenoid D malfunction. • Short to ground in wiring harness between AT connector terminal I (wiring harness-side) and TCM terminal CK (wiring harness-side). • Short to ground in wiring harness between AT connector terminal E (wiring harness-side) and TCM terminal D (wiring harness-side). • Short to power supply in wiring harness between AT connector terminal E (wiring harness-side) and TCM terminal D (wiring harness-side). • Open circuit in wiring harness between AT connector terminal I (wiring harness-side) and TCM terminal CK (wiring harness-side). • Open circuit in wiring harness between AT connector terminal E (wiring harness-side) and TCM terminal D (wiring harness-side). • Damaged connector between AT connector and TCM. • TCM malfunction.



Diagnostic procedure

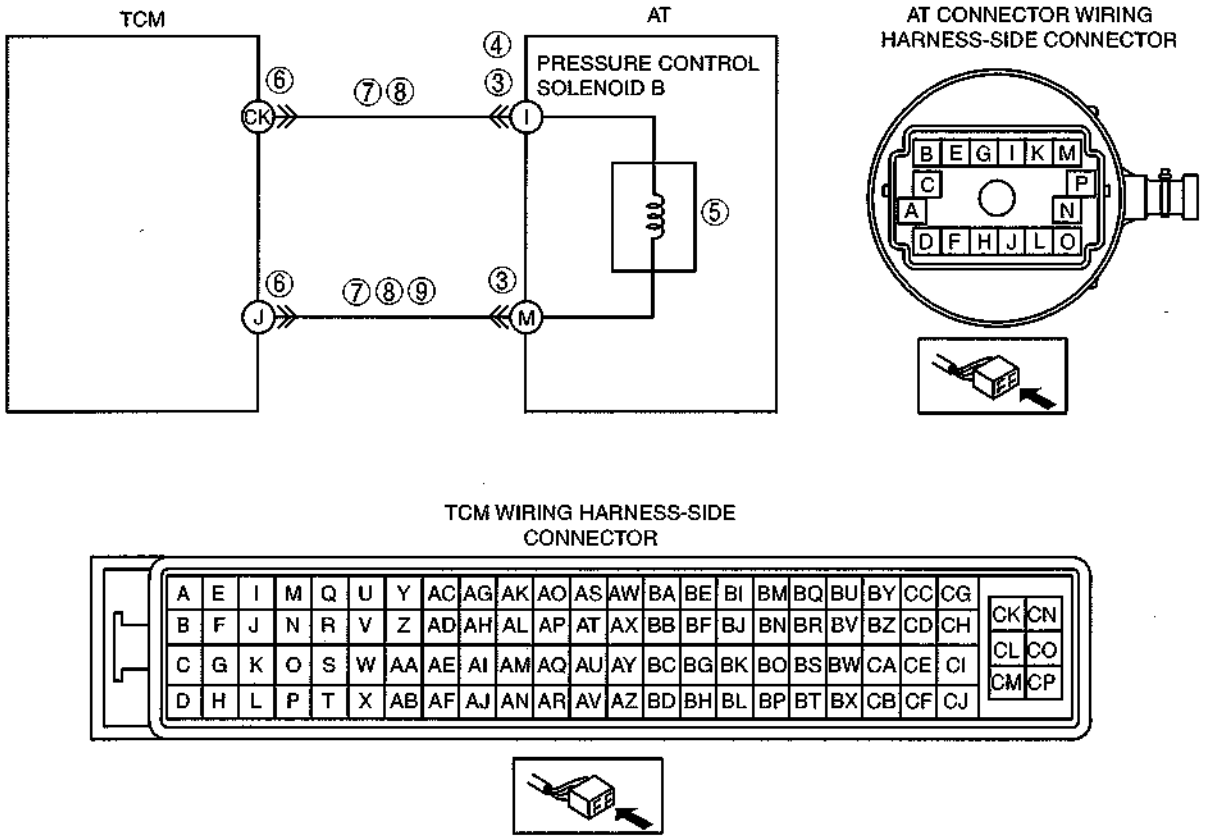
STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has the FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** • Verify related Service Information availability. • Is any related Service Information available?	Yes	Perform repair or diagnosis according to the available Service Information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.

STEP	INSPECTION		ACTION
3	**INSPECT AT CONNECTOR FOR POOR CONNECTION** • Turn the engine switch to the LOCK position. • Inspect the AT connector connection. • Disconnect the AT connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is the connection normal?	Yes	Go to the next step.
		No	Repair or replace the connector and/or terminals, then go to Step 10.
4	**INSPECT POWER SUPPLY CIRCUIT** • Turn the engine switch to the ON position (engine off). • Inspect the voltage at AT connector terminal I (wiring harness-side). • Is the voltage **approx. 12 V**?	Yes	Go to the next step.
		No	Go to Step 6.
5	**INSPECT RESISTANCE** • Turn the engine switch to the LOCK position. • Inspect resistance between AT terminal I and E (transmission case side). • Is resistance **within 16—45 ohms**? (See 05-13-34 SOLENOID VALVE INSPECTION [5R55S].)	Yes	Go to the next step.
		No	Replace the shift solenoid D, then go to Step 10.
6	**INSPECT TCM CONNECTOR FOR POOR CONNECTION** • Disconnect the TCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is the connection normal?	Yes	Go to the next step.
		No	Repair or replace connector and/or terminals, then go to Step 10.
7	**INSPECT SHIFT SOLENOID D CIRCUIT FOR OPEN CIRCUIT** • Inspect for continuity between the TCM terminal (wiring harness-side) and the AT connector terminal (wiring harness-side). — CK and I — D and E • Is there continuity between terminals?	Yes	Go to the next step.
		No	Repair or replace the wiring harness, then go to Step 10.
8	**INSPECT SHIFT SOLENOID D CIRCUIT FOR SHORT TO GROUND** • Inspect for continuity between AT connector terminal (wiring harness-side) and body ground. — I and body ground — E and body ground • Is there continuity?	Yes	Repair or replace the wiring harness, then go to the Step 10.
		No	Go to the next step.
9	**INSPECT SHIFT SOLENOID D CIRCUIT FOR SHORT TO POWER SUPPLY** • Turn the engine switch to the ON position (engine off). • Inspect the voltage at AT connector terminal E (wiring harness-side). • Is the voltage **0 V**?	Yes	Go to the next step.
		No	Repair or replace the wiring harness, then go to the next step.
10	**VERIFY TROUBLESHOOTING OF DTC P0765 OR P0768 COMPLETED** • Make sure to reconnect all the disconnected connectors. • Clear the DTC from memory using the IDS/ PDS. • Perform the "After Repair Procedure". (See 05-02-4 AFTER REPAIR PROCEDURE [5R55S].) • Are any DTCs present?	Yes	Replace the TCM, then go to the next step. (See 05-13-44 TCM REMOVAL/INSTALLATION [5R55S].)
		No	Go to the next step.
11	**VERIFY DTCS** • Are DTCs except for P0765 and P0768 output?	Yes	Go to the applicable DTC inspection. (See 05-02-5 DTC TABLE [5R55S].)
		No	DTC troubleshooting completed.

DTC P0775, P0778, P0964, P0966, P0967 [5R55S]

id0502c1815400

DTC P0775	**Pressure control solenoid B malfunction (low pressure)**
DTC P0778	**Pressure control solenoid B circuit malfunction (not operation)**
DTC P0964	**Pressure control solenoid B circuit malfunction (open circuit)**
DTC P0966	**Pressure control solenoid B circuit malfunction (short to ground)**
DTC P0967	**Pressure control solenoid B circuit malfunction (short to power supply)**
DETECTION CONDITION	• P0775: Incorrect shift pattern indicating mechanical or hydraulic failure in the transmission. • P0778: Incorrect gear ratio in 2GR and 5GR. • P0964: Open circuit in circuit between pressure control solenoid B and TCM, or in pressure control solenoid B internal circuit. • P0966: Short to ground in circuit between pressure control solenoid B and TCM, or in pressure control solenoid B internal circuit. • P0967: Short to power supply in circuit between pressure control solenoid B and TCM, or in pressure control solenoid B internal circuit.
POSSIBLE CAUSE	• Pressure control solenoid B malfunction. • Short to ground in wiring harness between AT connector terminal I (wiring harness-side) and TCM terminal CK (wiring harness-side). • Short to ground in wiring harness between AT connector terminal M (wiring harness-side) and TCM terminal J (wiring harness-side). • Short to power supply in wiring harness between AT connector terminal M (wiring harness-side) and TCM terminal J (wiring harness-side). • Open circuit in wiring harness between AT connector terminal I (wiring harness-side) and TCM terminal CK (wiring harness-side). • Open circuit in wiring harness between AT connector terminal M (wiring harness-side) and TCM terminal J (wiring harness-side). • Damaged connector between AT connector and TCM. • TCM malfunction.



Diagnostic procedure

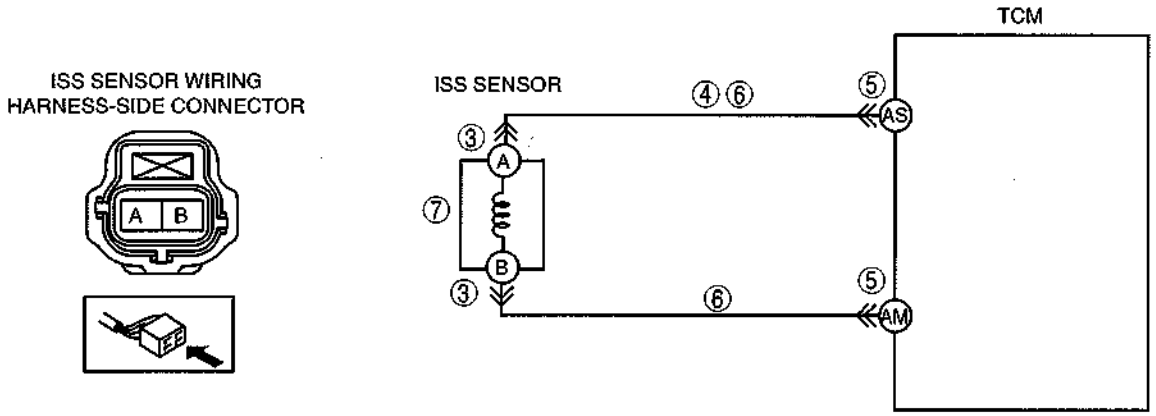
STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has the FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.

STEP	INSPECTION		ACTION
2	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** • Verify related Service Information availability. • Is any related Service Information available?	Yes	Perform repair or diagnosis according to the available Service Information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**INSPECT AT CONNECTOR FOR POOR CONNECTION** • Turn the engine switch to the LOCK position. • Inspect the AT connector connection. • Disconnect the AT connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is the connection normal?	Yes	Go to the next step.
		No	Repair or replace the connector and/or terminals, then go to Step 10.
4	**INSPECT POWER SUPPLY CIRCUIT** • Turn the engine switch to the ON position (engine off). • Inspect voltage at AT connector terminal I (wiring harness-side). • Is the voltage **approx. 12 V**?	Yes	Go to the next step.
		No	Go to Step 6.
5	**INSPECT RESISTANCE** • Turn the engine switch to the LOCK position. • Inspect resistance between AT terminal I and M (transmission case side). • Is resistance **within 3.3—7.5 ohms**? (See 05-13-34 SOLENOID VALVE INSPECTION [5R55S].)	Yes	Go to the next step.
		No	Replace the pressure control solenoid B, then go to Step 10.
6	**INSPECT TCM CONNECTOR FOR POOR CONNECTION** • Disconnect the TCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is the connection normal?	Yes	Go to the next step.
		No	Repair or replace connector and/or terminals, then go to Step 10.
7	**INSPECT PRESSURE CONTROL SOLENOID B CIRCUIT FOR OPEN CIRCUIT** • Inspect for continuity between the TCM terminal (wiring harness-side) and the AT connector terminal (wiring harness-side). — CK and I — J and M • Is there continuity between terminals?	Yes	Go to the next step.
		No	Repair or replace the wiring harness, then go to Step 10.
8	**INSPECT PRESSURE CONTROL SOLENOID B CIRCUIT FOR SHORT TO GROUND** • Inspect for continuity between AT connector terminal (wiring harness-side) and body ground. — I and body ground — M and body ground • Is there continuity?	Yes	Repair or replace the wiring harness, then go to the Step 10.
		No	Go to the next step.
9	**INSPECT PRESSURE CONTROL SOLENOID B CIRCUIT FOR SHORT TO POWER SUPPLY** • Turn the engine switch to the ON position (engine off). • Inspect the voltage at AT connector terminal M (wiring harness-side). • Is the voltage **0 V**?	Yes	Go to the next step.
		No	Repair or replace the wiring harness, then go to the next step.
10	**VERIFY TROUBLESHOOTING OF DTC P0775, P0778, P0964, P0966 OR P0967 COMPLETED** • Make sure to reconnect all the disconnected connectors. • Clear the DTC from memory using the IDS/ PDS. • Perform the "After Repair Procedure". (See 05-02-4 AFTER REPAIR PROCEDURE [5R55S].) • Are any DTCs present?	Yes	Replace the TCM, then go to the next step. (See 05-13-44 TCM REMOVAL/INSTALLATION [5R55S].)
		No	Go to the next step.
11	**VERIFY DTCS** • Are DTCs except for P0775, P0778, P0964, P0966 and P0967 output?	Yes	Go to the applicable DTC inspection. (See 05-02-5 DTC TABLE [5R55S].)
		No	DTC troubleshooting completed.

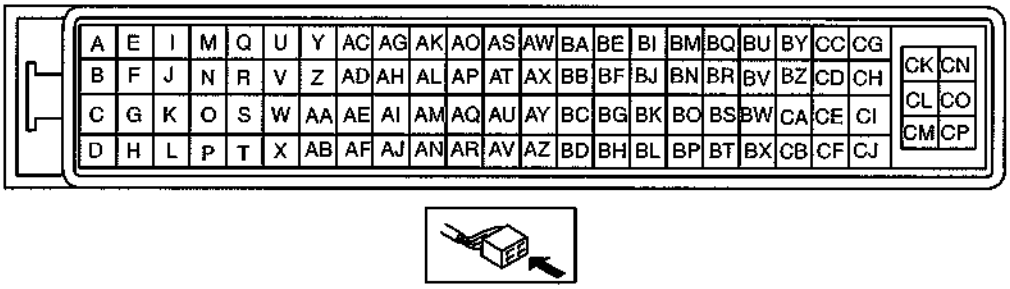
DTC P0791, P0794 [5R55S]

id0502c1814100

DTC P0791	**Intermediate shaft speed (ISS) sensor malfunction**
DTC P0794	**Intermediate shaft speed (ISS) sensor signal noise**
DETECTION CONDITION	• P0791: TCM detects insufficient ISS sensor signal while driving • P0794: TCM detects intermittent ISS sensor signal input while driving
POSSIBLE CAUSE	• ISS sensor malfunction. • Short to ground in wiring harness between ISS sensor terminal A (wiring harness-side) and TCM terminal AS (wiring harness-side). • Open circuit in wiring harness between ISS sensor terminal A (wiring harness-side) and TCM terminal AS (wiring harness-side). • Open circuit in wiring harness between ISS sensor terminal B (wiring harness-side) and TCM terminal AM (wiring harness-side). • Damaged connectors between ISS sensor and TCM. • TCM malfunction.



TCM WIRING HARNESS-SIDE CONNECTOR



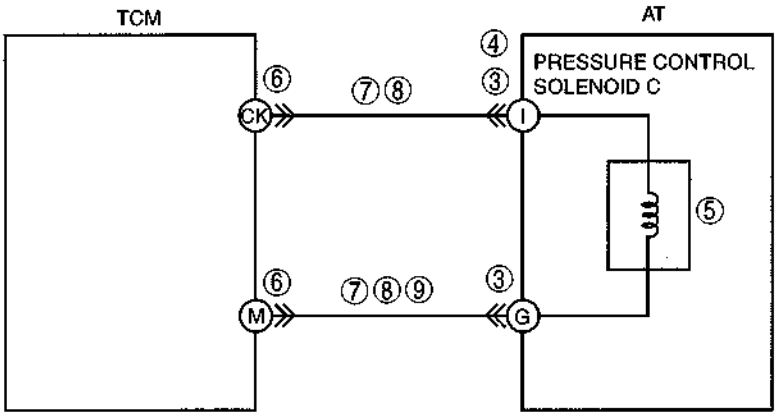
Diagnostic procedure

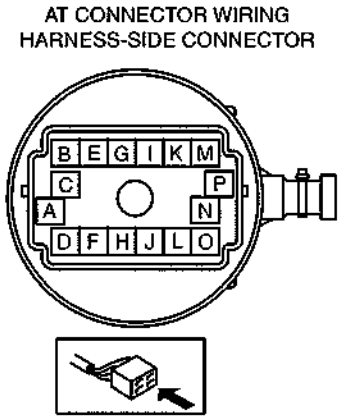
STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has the FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** • Verify related Service Information availability. • Is any related Service Information available?	Yes	Perform repair or diagnosis according to the available Service Information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**INSPECT ISS SENSOR CONNECTOR FOR POOR CONNECTION** • Turn the engine switch to the LOCK position. • Disconnect the ISS sensor connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion) • Is the connection normal?	Yes	Go to the next step.
		No	Repair or replace connector and/or terminal, then go to Step 8.
4	**INSPECT ISS SENSOR CIRCUIT FOR SHORT TO GROUND** • Inspect for continuity between ISS sensor connector A (wiring harness-side) and body ground. • Is there continuity?	Yes	Repair or replace the wiring harness, then go to Step 8.
		No	Go to the next step.
5	**INSPECT TCM CONNECTOR FOR POOR CONNECTION** • Disconnect the TCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is the connection normal?	Yes	Go to the next step.
		No	Repair or replace the connector and/or terminals, then go to Step 8.
6	**INSPECT ISS SENSOR CIRCUIT FOR OPEN CIRCUIT** • Inspect the following ISS sensor terminals (wiring harness-side) and TCM terminals (wiring harness-side): — A and AS — B and AM • Is there continuity?	Yes	Go to the next step.
		No	Repair or replace the wiring harness, then go to Step 8.
7	**INSPECT ISS SENSOR** • Inspect the ISS sensor. (See 05-13-30 INTERMEDIATE SHAFT SPEED (ISS) SENSOR INSPECTION [5R55S]) • Is ISS sensor normal?	Yes	Go to the next step.
		No	Replace the ISS sensor, then go to the next step. (See 05-13-31 INTERMEDIATE SHAFT SPEED (ISS) SENSOR REMOVAL/INSTALLATION [5R55S].)
8	**VERIFY TROUBLESHOOTING OF DTC P0791 OR P0794 COMPLETED** • Make sure to reconnect all the disconnected connectors. • Clear the DTC from memory using the IDS/ PDS. • Perform the "After Repair Procedure". (See 05-02-4 AFTER REPAIR PROCEDURE [5R55S].) • Are any DTCs present?	Yes	Replace the TCM, then go to the next step. (See 05-13-44 TCM REMOVAL/INSTALLATION [5R55S].)
		No	Go to the next step.
9	**VERIFY DTCS** • Are DTCs except for P0791 and P0794 output?	Yes	Go to the applicable DTC inspection. (See 05-02-5 DTC TABLE [5R55S].)
		No	DTC troubleshooting completed.

DTC P0795, P0798, P0968, P0970, P0971 [5R55S]

id0502c1815500

DTC P0795	**Pressure control solenoid C malfunction (low pressure)**
DTC P0798	**Pressure control solenoid C circuit malfunction (not operation)**
DTC P0968	**Pressure control solenoid C circuit malfunction (open circuit)**
DTC P0970	**Pressure control solenoid C circuit malfunction (short to ground)**
DTC P0971	**Pressure control solenoid C circuit malfunction (short to power supply)**
DETECTION CONDITION	• P0795: Incorrect shift pattern indicating mechanical or hydraulic failure in the transmission. • P0798: Incorrect gear ratio in 4GR and 5GR. • P0968: Open circuit in circuit between pressure control solenoid C and TCM, or in pressure control solenoid C internal circuit. • P0970: Short to ground in circuit between pressure control solenoid C and TCM, or in pressure control solenoid C internal circuit. • P0971: Short to power supply in circuit between pressure control solenoid C and TCM, or in pressure control solenoid C internal circuit.
POSSIBLE CAUSE	• Pressure control solenoid C malfunction. • Short to ground in wiring harness between AT connector terminal I (wiring harness-side) and TCM terminal CK (wiring harness-side). • Short to ground in wiring harness between AT connector terminal G (wiring harness-side) and TCM terminal M (wiring harness-side). • Short to power supply in wiring harness between AT connector terminal G (wiring harness-side) and TCM terminal M (wiring harness-side). • Open circuit in wiring harness between AT connector terminal I (wiring harness-side) and TCM terminal CK (wiring harness-side). • Open circuit in wiring harness between AT connector terminal G (wiring harness-side) and TCM terminal M (wiring harness-side). • Damaged connector between AT connector and TCM. • TCM malfunction.





TCM WIRING HARNESS-SIDE CONNECTOR

A	E	I	M	Q	U	Y	AC	AG	AK	AO	AS	AW	BA	BE	BI	BM	BQ	BU	BY	CC	CG	
B	F	J	N	R	V	Z	AD	AH	AL	AP	AT	AX	BB	BF	BJ	BN	BR	BV	BZ	CD	CH	CK CN
C	G	K	O	S	W	AA	AE	AI	AM	AQ	AU	AY	BC	BG	BK	BO	BS	BW	CA	CE	CI	CL CO
D	H	L	P	T	X	AB	AF	AJ	AN	AR	AV	AZ	BD	BH	BL	BP	BT	BX	CB	CF	CJ	CM CP

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has the FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.

STEP	INSPECTION		ACTION
2	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** • Verify related Service Information availability. • Is any related Service Information available?	Yes	Perform repair or diagnosis according to the available Service Information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**INSPECT AT CONNECTOR FOR POOR CONNECTION** • Turn the engine switch to the LOCK position. • Inspect the AT connector connection. • Disconnect the AT connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is the connection normal?	Yes	Go to the next step.
		No	Repair or replace the connector and/or terminals, then go to Step 10.
4	**INSPECT POWER SUPPLY CIRCUIT** • Turn the engine switch to the ON position (engine off). • Inspect voltage at AT connector terminal I (wiring harness-side). • Is the voltage **approx. 12 V**?	Yes	Go to the next step.
		No	Go to Step 6.
5	**INSPECT RESISTANCE** • Turn the engine switch to the LOCK position. • Inspect resistance between AT terminal I and G (transmission case side). • Is resistance **within 3.3—7.5 ohms**? (See 05-13-34 SOLENOID VALVE INSPECTION [5R55S].)	Yes	Go to the next step.
		No	Replace the pressure control solenoid C, then go to Step 10.
6	**INSPECT TCM CONNECTOR FOR POOR CONNECTION** • Disconnect the TCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is the connection normal?	Yes	Go to the next step.
		No	Repair or replace connector and/or terminals, then go to Step 10.
7	**INSPECT PRESSURE CONTROL SOLENOID C CIRCUIT FOR OPEN CIRCUIT** • Inspect for continuity between the TCM terminal (wiring harness-side) and the AT connector terminal (wiring harness-side). — CK and I — M and G • Is there continuity between terminals?	Yes	Go to the next step.
		No	Repair or replace the wiring harness, then go to Step 10.
8	**INSPECT PRESSURE CONTROL SOLENOID C CIRCUIT FOR SHORT TO GROUND** • Inspect for continuity between AT connector terminal (wiring harness-side) and body ground. — I and body ground — G and body ground • Is there continuity?	Yes	Repair or replace the wiring harness, then go to the Step 10.
		No	Go to the next step.
9	**INSPECT PRESSURE CONTROL SOLENOID C CIRCUIT FOR SHORT TO POWER SUPPLY** • Turn the engine switch to the ON position (engine off). • Inspect the voltage at AT connector terminal G (wiring harness-side). • Is the voltage **0 V**?	Yes	Go to the next step.
		No	Repair or replace the wiring harness, then go to the next step.
10	**VERIFY TROUBLESHOOTING OF DTC P0795, P0798, P0968, P0970 OR P0971 COMPLETED** • Make sure to reconnect all the disconnected connectors. • Clear the DTC from memory using the IDS/ PDS. • Perform the "After Repair Procedure". (See 05-02-4 AFTER REPAIR PROCEDURE [5R55S].) • Are any DTCs present?	Yes	Replace the TCM, then go to the next step. (See 05-13-44 TCM REMOVAL/INSTALLATION [5R55S].)
		No	Go to the next step.
11	**VERIFY DTCS** • Are DTCs except for P0795, P0798, P0968, P0970 and P0971 output?	Yes	Go to the applicable DTC inspection. (See 05-02-5 DTC TABLE [5R55S].)
		No	DTC troubleshooting completed.

DTC P1635 [5R55S]

id0502c1813800

DTC P1635	Tire/axle ratio out of acceptable range
DETECTION CONDITION	• Tire size or axle ratio message from the PCM corrupt or invalid.
POSSIBLE CAUSE	• CAN malfunction • PCM malfunction • TCM malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** • Verify related Service Information availability. • Is any related Service Information available?	Yes	Perform repair or diagnosis according to the available Service Information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
2	**VERIFY STORED DTC IN PCM AND ABS HU/CM** • Turn the engine switch to the LOCK position, then to the ON position. • Verify stored DTCs in PCM and ABS HU/CM. • Are DTCs stored?	Yes	Go to the applicable DTC inspection. (See 04-02-2 ON-BOARD DIAGNOSIS [4W-ABS (EVEREST)].)
		No	Go to the next step.
3	**VERIFY DTCS** • Turn the engine switch to the LOCK position, then to the ON position. • Verify the DTCs in the TCM memory. • Are DTCs except for P1635 output?	Yes	Go to the applicable DTC inspection. (See 05-02-5 DTC TABLE [5R55S].)
		No	Go to the next step.
4	**ROAD TEST INSPECTION** • Road-test the vehicle to verify the respective shift points. (See 05-13-8 ROAD TEST [5R55S].) • Are the shift points normal?	Yes	Go to the next step.
		No	Inspect the symptom troubleshooting, then go to the next step. (See 05-03-5 SYMPTOM TROUBLESHOOTING ITEM TABLE [5R55S].)
5	**VERIFY TROUBLESHOOTING OF DTC P1635 COMPLETED** • Make sure to reconnect all the disconnected connectors. • Clear the DTC using the IDS/PDS. • Start the engine. • Perform the "After Repair Procedure". (See 05-02-4 AFTER REPAIR PROCEDURE [5R55S].) • Are any DTCs present?	Yes	Replace the TCM, then go to the next step. (See 05-13-44 TCM REMOVAL/INSTALLATION [5R55S].)
		No	Go to the next step.
6	**VERIFY DTCS** • Are DTCs except for P1635 output?	Yes	Go to the applicable DTC inspection. (See 05-02-5 DTC TABLE [5R55S].)
		No	DTC troubleshooting completed.

DTC P1700 [5R55S]

id0502c1805000

DTC P1700	Transmission indeterminate malfunction
DETECTION CONDITION	• Direct one-way clutch malfunction. **Note** • Engine rpm limited to **4,000 rpm**. Failed a NEUTRAL condition in 1GR, 3GR or 4GR in automatic mode. Only 2GR and 5GR available. • Other DTCs that may set: P1700: P0745, P0750, P0755
POSSIBLE CAUSE	• Direct one-way clutch malfunction • Shift solenoid A malfunction • Shift solenoid B malfunction • Pressure control solenoid A malfunction • Transmission internal malfunction • TCM malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** • Verify related Service Information availability. • Is any related Service Information available?	Yes	Perform repair or diagnosis according to the available Service Information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
2	**VERIFY DTCS** • Turn the engine switch to the LOCK position, then to the ON position. • Verify the DTCs in the TCM memory. • Are DTCs except for P1700 output?	Yes	Go to the applicable DTC inspection. (See 05-02-5 DTC TABLE [5R55S].)
		No	Go to the next step.
3	**VERIFY DTC P1700 OUTPUT** • Drive in D range. • Verify the DTC in the TCM memory. • Are DTC P1700 output?	Yes	Inspect the direct one-way clutch, then go to the next step.
		No	Go to the next step.
4	**VERIFY TROUBLESHOOTING OF DTC P1700 COMPLETED** • Make sure to reconnect all the disconnected connectors. • Clear the DTC using the IDS/PDS. • Start the engine. • Perform the "After Repair Procedure". (See 05-02-4 AFTER REPAIR PROCEDURE [5R55S].) • Are any DTCs present?	Yes	Replace the TCM, then go to the next step. (See 05-13-44 TCM REMOVAL/INSTALLATION [5R55S].)
		No	Go to the next step.
5	**VERIFY DTCS** • Are DTCs except for P1700 output?	Yes	Go to the applicable DTC inspection. (See 05-02-5 DTC TABLE [5R55S].)
		No	DTC troubleshooting completed.

DTC P1711 [5R55S]

id0502c1814200

DTC P1711	ATF temperature out of on-board diagnostic range
DETECTION CONDITION	• ATF temperature range too high or too low during on-board diagnostic.
POSSIBLE CAUSE	• TFT sensor malfunction. • TCM malfunction.

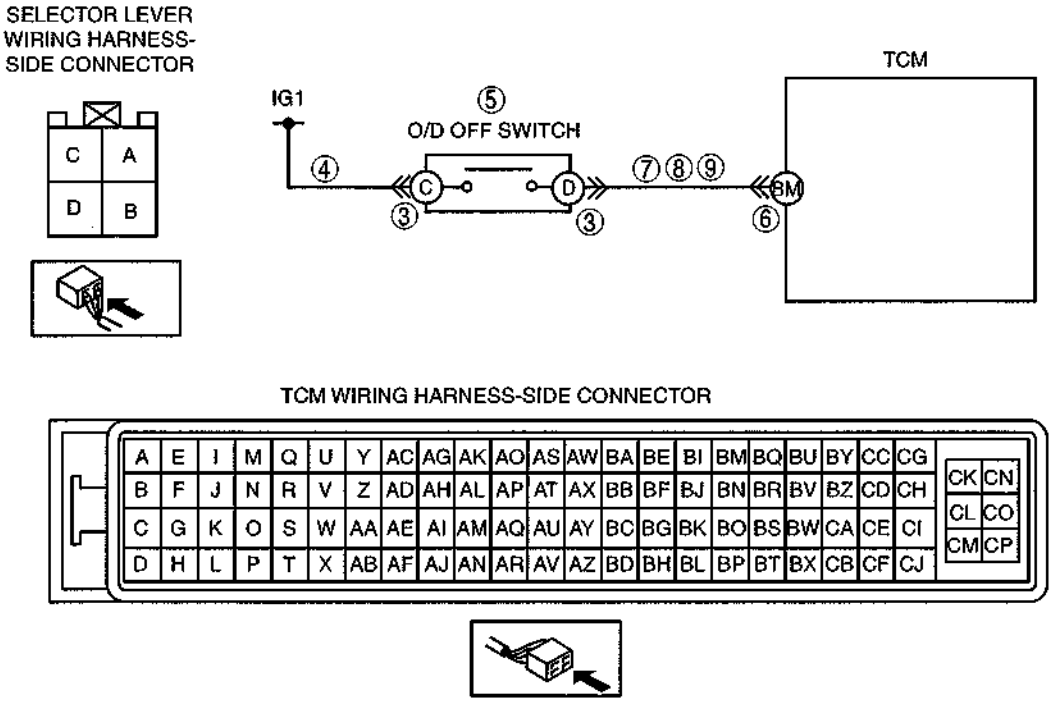
Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has the FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** • Verify related Service Information availability. • Is any related Service Information available?	Yes	Perform repair or diagnosis according to the available Service Information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY DTCS** • Turn the engine switch to the LOCK position, then to the ON position. • Verify the DTCs in the TCM memory. • Are DTCs except for P1711 output?	Yes	Go to the applicable DTC inspection. (See 05-02-5 DTC TABLE [5R55S].)
		No	Warm or cool vehicle to normal operating temperature, then go to the next step.
4	**VERIFY TROUBLESHOOTING OF DTC P1711 COMPLETED** • Make sure to reconnect all the disconnected connectors. • Clear the DTC from the memory using the IDS/PDS. • Perforrn the "After Repair Procedure". (See 05-02-4 AFTER REPAIR PROCEDURE [5R55S].) • Are any DTCs present?	Yes	Replace the TCM, then go to the next step. (See 05-13-44 TCM REMOVAL/INSTALLATION [5R55S].)
		No	Go to the next step.
5	**VERIFY DTCS** • Are DTCs except for P1711 output?	Yes	Go to the applicable DTC inspection. (See 05-02-5 DTC TABLE [5R55S].)
		No	DTC troubleshooting completed.

DTC P1780 [5R55S]

id0502c1807600

DTC P1780	O/D OFF switch circuit malfunction (open or short circuit)
DETECTION CONDITION	• Open or short circuit in circuit between O/D OFF switch and TCM, or in O/D OFF switch internal circuit
POSSIBLE CAUSE	• O/D OFF switch malfunction. • Short to ground in wiring harness between engine switch and O/D OFF switch terminal C (wiring harness-side). • Open circuit in wiring harness between engine switch and O/D OFF switch terminal C (wiring harness-side). • Short to ground in wiring harness between O/D OFF switch terminal D (wiring harness-side) and TCM terminal BM (wiring harness-side). • Open circuit in wiring harness between O/D OFF switch terminal D (wiring harness-side) and TCM terminal BM (wiring harness-side). • Short to power supply in wiring harness between O/D OFF switch terminal D (wiring harness-side) and TCM terminal BM (wiring harness-side). • Damaged connector between O/D OFF switch and TCM. • TCM malfunction.



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has the FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** • Verify related Service Information availability. • Is any related Service Information available?	Yes	Perform repair or diagnosis according to the available Service Information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**INSPECT SELECTOR LEVER CONNECTOR FOR POOR CONNECTION** • Turn the engine switch to the LOCK position. • Inspect the selector lever connector connection. • Disconnect the selector lever connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is the connection normal?	Yes	Go to the next step.
		No	Repair or replace the connector and/or terminals, then go to Step 10.

STEP	INSPECTION		ACTION
4	**INSPECT POWER SUPPLY CIRCUIT** • Turn the engine switch to the ON position (engine off). • Inspect the voltage at O/D OFF switch terminal C (wiring harness-side). • Is the voltage **approx. 12 V**?	Yes	Go to the next step.
		No	Inspect the engine switch and wiring harness, then go to Step 10.
5	**INSPECT O/D OFF SWITCH** • Turn the engine switch to the LOCK position. • Inspect the O/D OFF switch. (See 05-13-19 O/D OFF SWITCH INSPECTION [5R55S].) • Is the O/D OFF switch normal?	Yes	Go to the next step.
		No	Replace the selector lever, then go to Step 10. (See 05-14-4 SELECTOR LEVER REMOVAL/ INSTALLATION.)
6	**INSPECT TCM CONNECTOR FOR POOR CONNECTION** • Disconnect the TCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is the connection normal?	Yes	Go to the next step.
		No	Repair or replace connector and/or terminals, then go to Step 10.
7	**INSPECT O/D OFF SWITCH CIRCUIT FOR OPEN CIRCUIT** • Inspect for continuity between the TCM terminal BM (wiring harness-side) and O/D OFF switch terminal D (wiring harness-side). • Is there continuity between terminals?	Yes	Go to the next step.
		No	Repair or replace the wiring harness, then go to Step 10.
8	**INSPECT O/D OFF SWITCH CIRCUIT FOR SHORT TO GROUND** • Turn the engine switch to the LOCK position. • Inspect for continuity between O/D OFF switch terminal D (wiring harness-side) and body ground. • Is there continuity?	Yes	Repair or replace the wiring harness, then go to the Step 10.
		No	Go to the next step.
9	**INSPECT O/D OFF SWITCH CIRCUIT FOR SHORT TO POWER SUPPLY** • Turn the engine switch to the ON position (engine off). • Inspect the voltage at O/D OFF switch terminal D (wiring harness-side). • Is the voltage **0 V**?	Yes	Go to the next step.
		No	Repair or replace the wiring harness, then go to the next step.
10	**VERIFY TROUBLESHOOTING OF DTC P1780 COMPLETED** • Make sure to reconnect all the disconnected connectors. • Clear the DTC from memory using the IDS/ PDS. • Perform the "After Repair Procedure". (See 05-02-4 AFTER REPAIR PROCEDURE [5R55S].) • Are any DTCs present?	Yes	Replace the TCM, then go to the next step. (See 05-13-44 TCM REMOVAL/INSTALLATION [5R55S].)
		No	Go to the next step.
11	**VERIFY DTCS** • Are DTCs except for P1780 output?	Yes	Go to the applicable DTC inspection. (See 05-02-5 DTC TABLE [5R55S].)
		No	DTC troubleshooting completed.

DTC P1783 [5R55S]

id0502c1807700

DTC P1783	ATF overheating
DETECTION CONDITION	• ATF temperature signal is **127° C {270 °F} or more**
POSSIBLE CAUSE	• ATF level low • Deteriorated ATF • TFT sensor malfunction. • TCM malfunction.

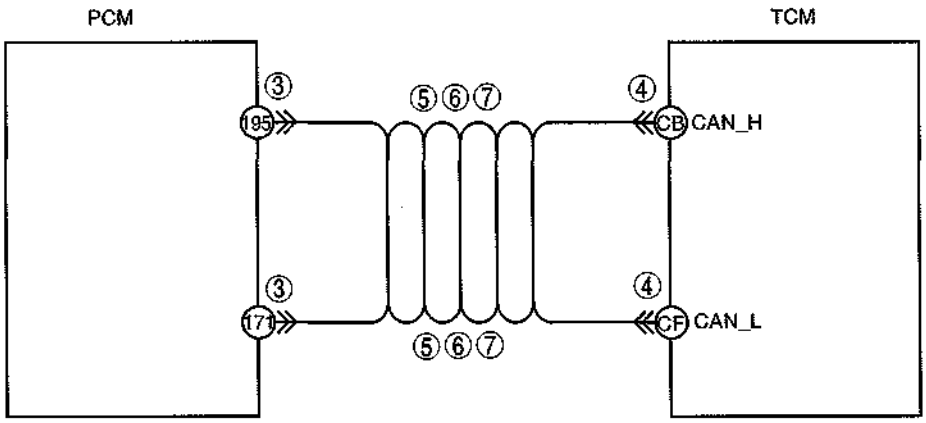
Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has the FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** • Verify related Service Information availability. • Is any related Service Information available?	Yes	Perform repair or diagnosis according to the available Service Information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**VERIFY DTCS** • Turn the engine switch to the LOCK position, then to the ON position. • Verify the DTCs in the TCM memory. • Are DTCs except for P1783 output?	Yes	Go to the applicable DTC inspection. (See 05-02-5 DTC TABLE [5R55S].)
		No	Go to SYMPTOM TROUBLESHOOTING, "NO.22 TRANSMISSION OVERHEATS", then go to the next step. (See 05-03-24 NO.22 TRANSMISSION OVERHEATS [5R55S].)
4	**INSPECT ATF CONDITION** • Inspect the ATF condition. (See 05-13-13 AUTOMATIC TRANSMISSION FLUID (ATF) INSPECTION [5R55S].) • Is it normal?	Yes	Go to the next step.
		No	Replace the ATF, then go to Step 6. (See 05-13-13 AUTOMATIC TRANSMISSION FLUID (ATF) INSPECTION [5R55S].)
5	**NSPECT ATF LEVELVE** • Start the engine. • Warm up the AT. • Is the ATF level within the specification? (See 05-13-13 AUTOMATIC TRANSMISSION FLUID (ATF) INSPECTION [5R55S].)	Yes	Go to the next step.
		No	Add ATF to the specified level, then go to the next step. (See 05-13-16 AUTOMATIC TRANSMISSION FLUID (ATF) REPLACEMENT [5R55S].)
6	**VERIFY TROUBLESHOOTING OF DTC P1783 COMPLETED** • Make sure to reconnect all the disconnected connectors. • Clear the DTC from the memory using the IDS/PDS. • Perform the "After Repair Procedure". (See 05-02-4 AFTER REPAIR PROCEDURE [5R55S].) • Are any DTCs present?	Yes	Replace the TCM, then go to the next step. (See 05-13-44 TCM REMOVAL/INSTALLATION [5R55S].)
		No	Go to the next step.
7	**VERIFY DTCS** • Are DTCs except for P1783 output?	Yes	Go to the applicable DTC inspection. (See 05-02-5 DTC TABLE [5R55S].)
		No	DTC troubleshooting completed.

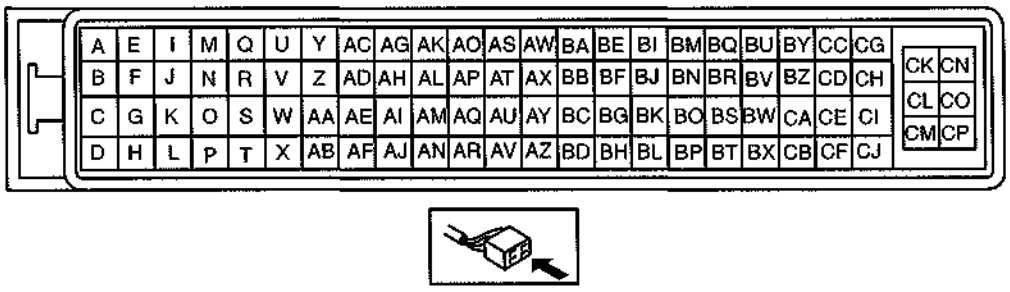
DTC U0100, U0297 [5R55S]

id0502c1815600

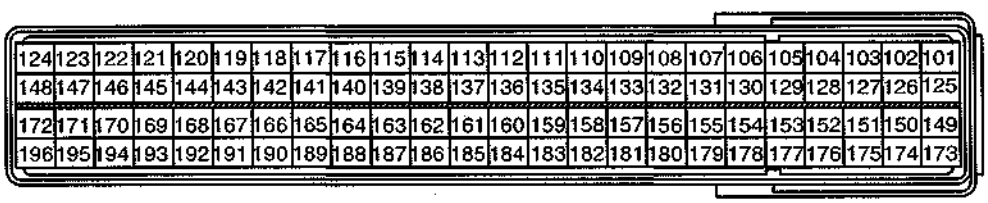
DTC U0100	**Communication error to PCM**
DTC U0297	**Communication error to PCM**
DETECTION CONDITION	• TCM cannot receive any signals from PCM.
POSSIBLE CAUSE	• Short to ground in wiring harness between PCM terminal 195 (wiring harness-side) and TCM terminal CB (wiring harness-side). • Short to ground in wiring harness between PCM terminal 171 (wiring harness-side) and TCM terminal CF (wiring harness-side). • Short to power supply in wiring harness between PCM terminal 195 (wiring harness-side) and TCM terminal CB (wiring harness-side). • Short to power supply in wiring harness between PCM terminal 171 (wiring harness-side) and TCM terminal CF (wiring harness-side). • Open circuit in wiring harness between PCM terminal 195 (wiring harness-side) and TCM terminal CB (wiring harness-side). • Open circuit in wiring harness between PCM terminal 171 (wiring harness-side) and TCM terminal CF (wiring harness-side). • Damaged connector between PCM and TCM. • PCM malfunction. • TCM malfunction.

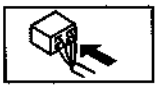


TCM WIRING HARNESS-SIDE CONNECTOR



PCM WIRING HARNESS-SIDE CONNECTOR





Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has the FREEZE FRAME DATA been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA on the repair order, then go to the next step.
2	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** • Verify related Service Information availability. • Is any related Service Information available?	Yes	Perform repair or diagnosis according to the available Service Information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**INSPECT PCM FOR POOR CONNECTION** • Turn the engine switch to the LOCK position. • Inspect the PCM connection. • Disconnect the PCM. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is the connection normal?	Yes	Go to the next step.
		No	Repair or replace the connector and/or terminals, then go to Step 8.
4	**INSPECT TCM CONNECTOR FOR POOR CONNECTION** • Disconnect the TCM connector. • Inspect for poor connection (such as damaged/ pulled-out pins, corrosion). • Is the connection normal?	Yes	Go to the next step.
		No	Repair or replace connector and/or terminals, then go to Step 8.
5	**INSPECT CAN CIRCUIT FOR OPEN CIRCUIT** • Inspect for continuity between the TCM terminal (wiring harness-side) and the PCM terminal (wiring harness-side). — CB and 195 — CF and 171 • Is there continuity between terminals?	Yes	Go to the next step.
		No	Repair or replace the wiring harness, then go to Step 8.
6	**INSPECT CAN CIRCUIT FOR SHORT TO GROUND** • Inspect for continuity between TCM terminal (wiring harness-side) and body ground. — CB and body ground — CF and body ground • Is there continuity?	Yes	Repair or replace the wiring harness, then go to the Step 8.
		No	Go to the next step.
7	**INSPECT CAN CIRCUIT FOR SHORT TO POWER SUPPLY** • Turn the engine switch to the ON position (engine off). • Inspect the voltage at TCM terminal CB and CF (wiring harness-side). • Is the voltage **0 V**?	Yes	Go to the next step.
		No	Repair or replace the wiring harness, then go to the next step.
8	**VERIFY TROUBLESHOOTING OF DTC U0100 OR U0297 COMPLETED** • Make sure to reconnect all the disconnected connectors. • Clear the DTC from memory using the IDS/ PDS. • Perform the "After Repair Procedure". (See 05-02-4 AFTER REPAIR PROCEDURE [5R55S].) • Are any DTCs present?	Yes	Replace the TCM, then go to the next step. (See 05-13-44 TCM REMOVAL/INSTALLATION [5R55S].)
		No	Go to the next step.
9	**VERIFY DTCS** • Are DTCs except for U0100 and U0297 output?	Yes	Go to the applicable DTC inspection. (See 05-02-5 DTC TABLE [5R55S].)
		No	DTC troubleshooting completed.

PID/DATA MONITOR INSPECTION [5R55S]

1. Connect the IDS/PDS to the DLC-2.
2. After the vehicle is identified, select the following items from the initial screen of the IDS/PDS.
   - When using the IDS (laptop PC)
     1. Select the "Toolbox" tab.
     2. Select "DataLogger".
     3. Select "Modules".
     4. Select "TCM".
   - When using the PDS (Pocket PC)
     1. Select "Module Tests".
     2. Select "TCM".
     3. Select "DataLogger".
3. Select the PID from the PID table
4. Verify the PID data according to the directions on the IDS/PDS screen.

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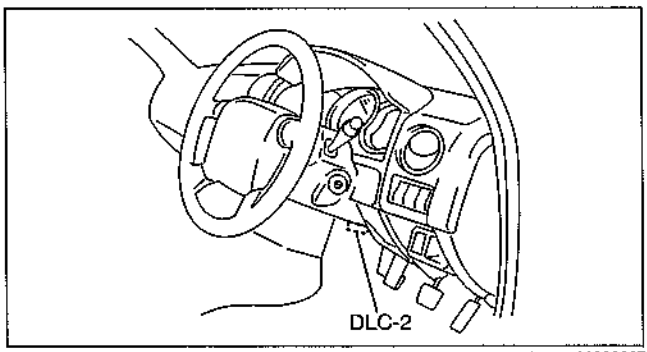

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Note

- Perform part inspection for the output device after TCM inspection.
- The PID/DATA MONITOR function monitors the calculated value of the input/output signals in the TCM. Therefore, if a monitored value of an output device is out of specification, it is necessary to inspect the monitored value of the input device related to the output device control. Since an output device malfunction is not directly indicated as a malfunction of the monitored value for the output device, it is necessary to inspect the output device individually using the simulation function.

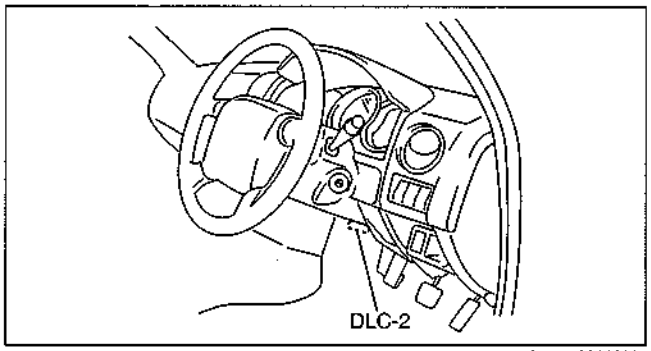
PID/DATA MONITOR AND RECORD function table

Monitor item	Definition	Unit/ Condition	Condition/Specification	TCM terminal
BPP	Brake switch	on/off	• Brake pedal depressed: on • Other: off	N/A
FIRM_ST	Firm shaft control (FSC) status requested	0/1	• FSC not commanded by IDS/PDS PID output (off): 0 • FSC commanded by IDS/PDS PID output (on): 1	N/A
GEAR	Calculated gear range in TCM	1/2/3/4/5	• 1GR: 1 • 2GR: 2 • 3GR: 3 • 4GR: 4 • 5GR: 5	N/A
GEAR_OSC	PID used to command gear changes during Simulation Function	1/2/3/4/5	• 1GR: 1 • 2GR: 2 • 3GR: 3 • 4GR: 4 • 5GR: 5	N/A
ISS	ISS sensor	rpm	Indicates intermediate shaft speed	AM, AS
OSS	OSS sensor	rpm	Indicates output shaft speed	AD, AG
PCA	Pressure control solenoid A	pis	Indicates pressure control solenoid A commanded pressure	I, CK
PCB	Pressure control solenoid B	pis	Indicates pressure control solenoid B commanded pressure	J, CK
PCC	Pressure control solenoid C	pis	Indicates pressure control solenoid C commanded pressure	M, CK
RPM	Engine speed	rpm	Indicates engine speed	N/A
SSA	Shift solenoid A	on/off	• Shift solenoid A operation: on • Shift solenoid A not operation: off	B, CK
SSB	Shift solenoid B	on/off	• Shift solenoid B operation: on • Shift solenoid B not operation: off	C, CK
SSC	Shift solenoid C	on/off	• Shift solenoid C operation: on • Shift solenoid C not operation: off	F, CK
SSD	Shift solenoid D	on/off	• Shift solenoid D operation: on • Shift solenoid D not operation: off	D, CK
TCC	TCC control solenoid	%	Indicates TCC control solenoid operation	A, CK
TCCRAT	Torque converter speed ratio	ratio	Indicates torque converter speed ratio (engine speed compared with turbine shaft speed)	N/A

Monitor item	Definition	Unit/ Condition	Condition/Specification	TCM terminal
TFT	ATF temperature	°C, °F	Indicates ATF temperature	AY, BH
TR_D	Digital TR sensor signal		Indicates digital TR sensor signal	AX, BU, BY, CA
TR_V	Digital TR sensor signal voltage	V	Indicates digital TR sensor signal voltage	AX, BU, BY, CA
TR1	TR1 switch	0/1	• TR1 switch open: 1 • TR1 switch close: 0	BY
TR2	TR2 switch	0/1	• TR2 switch open: 1 • TR2 switch close: 0	BU
TR3A	TR3 switch	0/1	• TR3 switch open: 1 • TR3 switch close: 0	AX
TR4	TR4 switch	0/1	• TR4 switch open: 1 • TR4 switch close: 0	CA
TSS	TSS sensor	rpm	Indicates turbine shaft speed	AH, AP
VSS	Vehicle speed	mph	Indicates vehicle speed	AD, AG

Simulation Function Procedure

1. Connect the IDS/PDS to the DLC-2.
2. After the vehicle is identified, select the following items from the initial screen of the IDS/PDS.
   - When using the IDS (laptop PC)
     1. Select the "Toolbox" tab.
     2. Select "DataLogger".
     3. Select "Modules".
     4. Select "TCM".
   - When using the PDS (Pocket PC)
     1. Select "Module Tests".
     2. Select "TCM".
     3. Select "DataLogger".
3. Select the simulation items from the PID table.
4. Perform the simulation function, inspect the operations for each parts.
   - If there is no operation sound from the solenoid after the simulation function inspection is performed, it is possible that there is an open or short circuit in the wiring harness, or solenoid, or sticking and operation malfunction.



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Simulation Item table

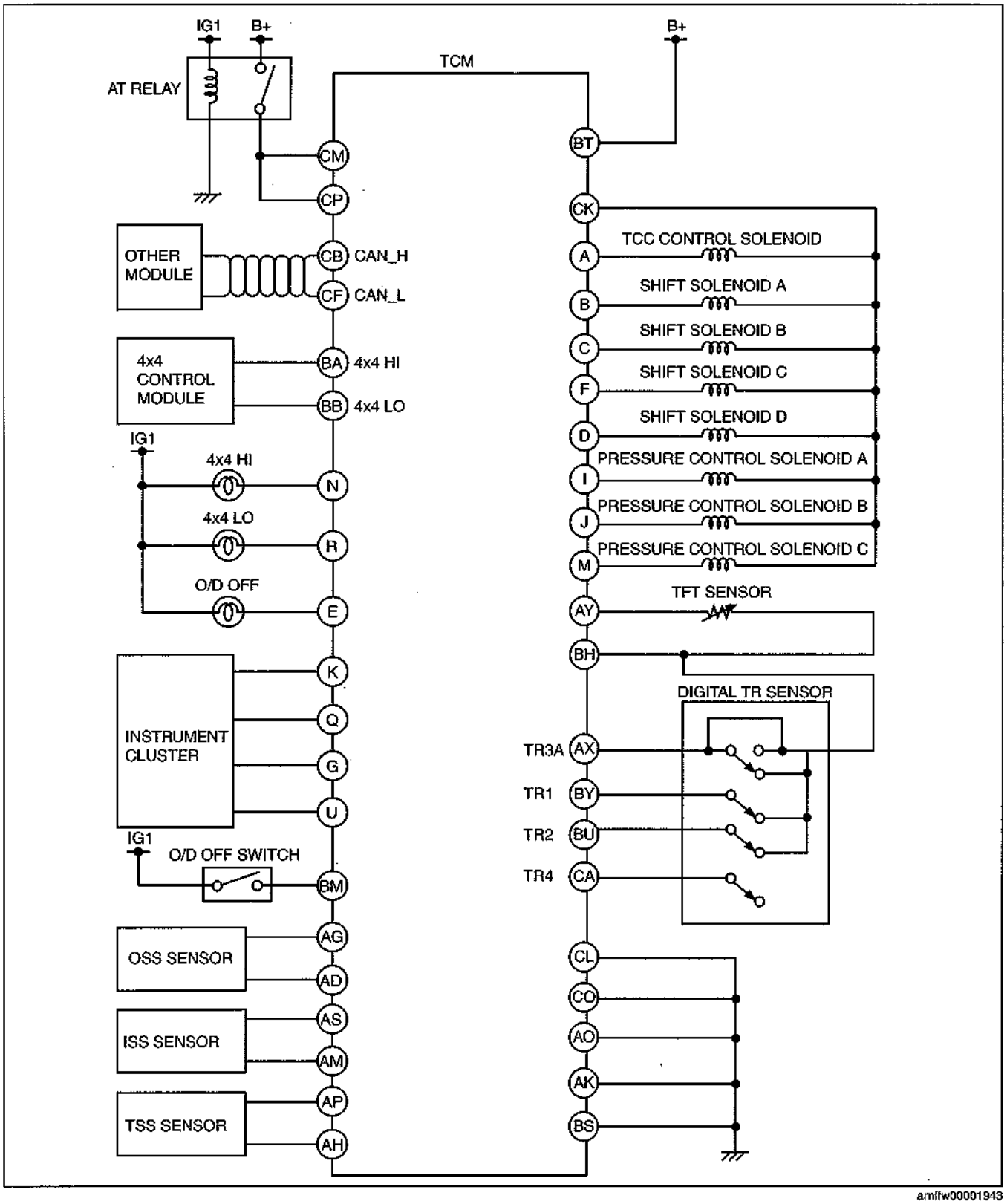
Simulation item	Applicable component	Unit	TCM terminal
PCA	Pressure control solenoid A	pis	I, CK
PCB	Pressure control solenoid B	pis	J, CK
PCC	Pressure control solenoid C	pis	M, CK
SSA	Shift solenoid A	on/off	B, CK
SSB	Shift solenoid B	on/off	C, CK
SSC	Shift solenoid C	on/off	F, CK
SSD	Shift solenoid D	on/off	D, CK
TCC	TCC control solenoid	%	A, CK

05-03 SYMPTOM TROUBLESHOOTING [5R55S]

AUTOMATIC TRANSMISSION CONTROL SYSTEM WIRING DIAGRAM [5R55S] 05-03-2
FOREWORD [5R55S] 05-03-3
BASIC INSPECTION [5R55S] 05-03-4
SYMPTOM TROUBLESHOOTING ITEM TABLE [5R55S] 05-03-5
QUICK DIAGNOSIS CHART [5R55S] 05-03-7
NO.1 VEHICLE DOES NOT MOVE IN D RANGE, OR IN R POSITION [5R55S] 05-03-9
NO.2 VEHICLE MOVES IN N POSITION [5R55S] 05-03-10
NO.3 VEHICLE MOVES IN P POSITION, OR PARKING GEAR DOES NOT DISENGAGE WHEN P IS DISENGAGED [5R55S] 05-03-10
NO.4 EXCESSIVE CREEP [5R55S] 05-03-11
NO.5 NO CREEP AT ALL [5R55S] 05-03-11
NO.6 LOW MAXIMUM SPEED AND POOR ACCELERATION [5R55S] 05-03-12
NO.7 NO SHIFTING [5R55S] 05-03-13
NO.8 NO 2ND AND 5TH GEARS (MANUAL 2ND IS OK) [5R55S] 05-03-14
NO.9 ABNORMAL SHIFTING [5R55S] 05-03-14
NO.10 FREQUENT SHIFTING [5R55S] 05-03-15
NO.11 SHIFT POINT IS HIGH OR LOW [5R55S] 05-03-15
NO.12 TORQUE CONVERTER CLUTCH (TCC) NON-OPERATION [5R55S] 05-03-16
NO.13 NO KICKDOWN [5R55S] 05-03-17
NO.14 ENGINE FLARES UP OR SLIPS WHEN UPSHIFTING OR DOWNSHIFTING [5R55S] 05-03-17
NO.15 ENGINE FLARES UP OR SLIPS WHEN ACCELERATING VEHICLE [5R55S] 05-03-18
NO.16 JUDDER UPON TORQUE CONVERTER CLUTCH (TCC) OPERATION [5R55S] 05-03-18
NO.17 EXCESSIVE SHIFT SHOCK FROM N TO D OR N TO R POSITION/RANGE [5R55S] 05-03-19
NO.18 EXCESSIVE SHIFT SHOCK IS FELT WHEN UPSHIFTING AND DOWNSHIFTING [5R55S] 05-03-20
NO.19 EXCESSIVE SHIFT SHOCK ON TORQUE CONVERTER CLUTCH (TCC) [5R55S] 05-03-21
NO.20 NOISE/VIBRATION FORWARD OR REVERSE [5R55S] 05-03-22
NO.21 NO ENGINE BRAKING IN 1GR POSITION OF MANUAL 1 RANGE [5R55S] 05-03-23
NO.22 TRANSMISSION OVERHEATS [5R55S] 05-03-24
NO.23 ENGINE STALLS WHEN SHIFTED TO D RANGE, OR IN R POSITION [5R55S] 05-03-25
NO.24 ENGINE STALLS WHEN DRIVING AT SLOW SPEEDS OR STOPPING [5R55S] 05-03-25
NO.25 STARTER DOES NOT WORK [5R55S] 05-03-25

AUTOMATIC TRANSMISSION CONTROL SYSTEM WIRING DIAGRAM [5R55S]

id0503c1809500

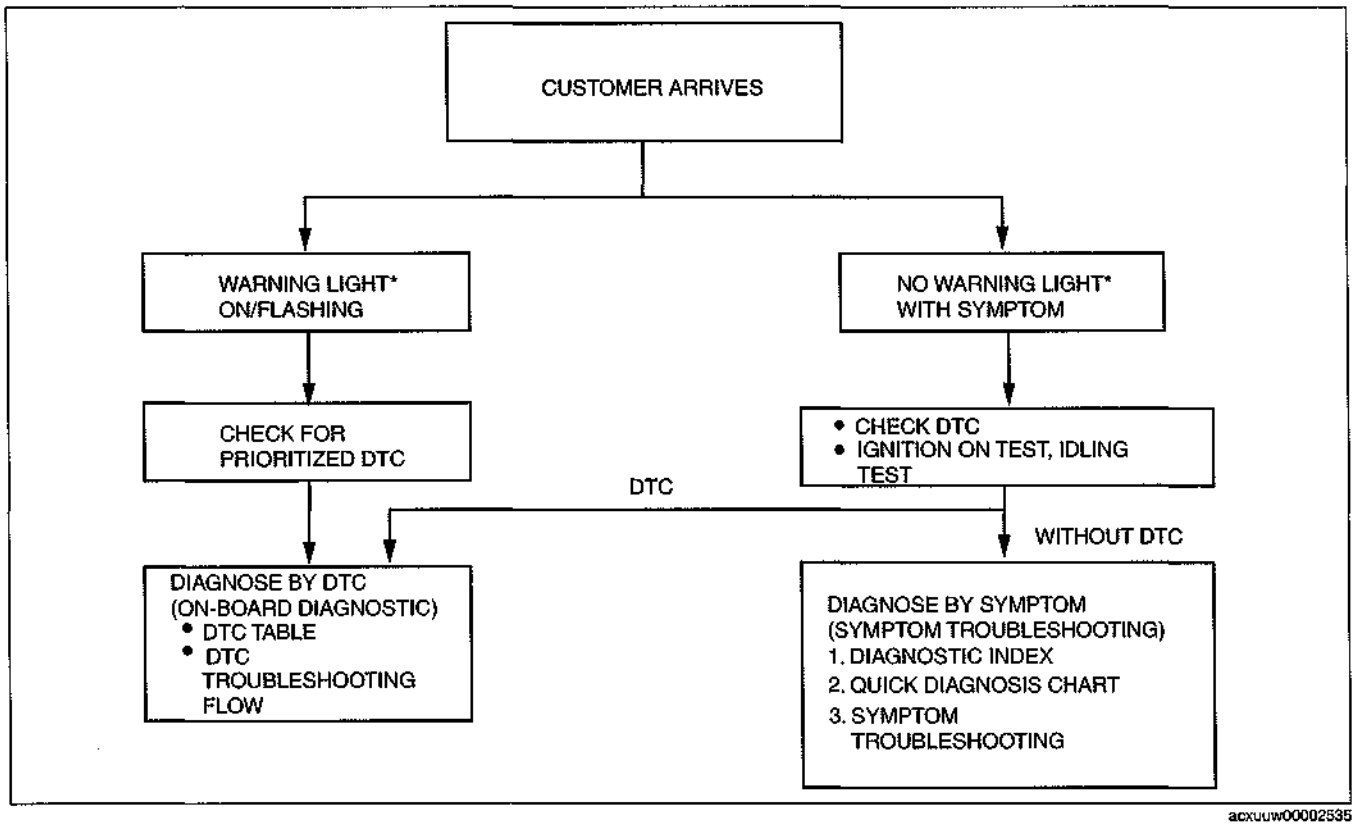


arnlfw00001943

FOREWORD [5R55S]

id0503c1800200

- When the customer reports a vehicle malfunction, inspect the malfunction indicator lamp (MIL) indication, O/D OFF indicator light flash, and diagnostic trouble code (DTC), then diagnose the malfunction according to the following flowchart.
  - — If a DTC exists, diagnose the applicable DTC inspection. (See 05-02-5 DTC TABLE [5R55S].)
  - — If a DTC does not exist, the MIL does not illuminate and O/D OFF indicator light flash, diagnose the applicable symptom troubleshooting. (See 05-03-5 SYMPTOM TROUBLESHOOTING ITEM TABLE [5R55S].)



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*: Malfunction Indicator Lamp (MIL), O/D OFF indicator light.

BASIC INSPECTION [5R55S]

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STEP	INSPECTION		ACTION
1	Perform the mechanical system test. (See 05-13-4 MECHANICAL SYSTEM TEST [5R55S].) Is the mechanical system normal?	Yes	Go to the next step.
		No	Repair or replace any malfunctioning parts according to the inspection result.
2	Turn the engine switch to the ON position. When the selector lever is moved, does the selector illumination indicate a synchronized position to the lever location? Also, when other ranges are selected from N or P during idling, does the vehicle move **within 1—2 s**?	Yes	Go to the next step.
		No	Inspect the selector lever and digital TR sensor. Repair or replace malfunctioning areas. If the selector lever and digital TR sensor are normal, go to the next step.
3	Inspect the ATF color, condition and level. (See 05-13-13 AUTOMATIC TRANSMISSION FLUID (ATF) INSPECTION [5R55S].) Are the ATF color, odor and level normal?	Yes	Go to the next step.
		No	Repair or replace any malfunctioning parts according to the inspection result. Flush the AT and cooler line if necessary.
4	Perform the line pressure test. (See 05-13-4 MECHANICAL SYSTEM TEST [5R55S].) Is the line pressure normal?	Yes	Go to the next step.
		No	Adjust the accelerator cable if necessary. Repair or replace any malfunctioning parts according to the inspection result.
5	Perform the stall test. (See 05-13-4 MECHANICAL SYSTEM TEST [5R55S].) Is the stall speed normal?	Yes	Go to the next step.
		No	Repair or replace any normal parts according to the inspection result.
6	Inspect the value at the following PCM and TCM PIDs using the IDS/PDS. (See 05-02-45 PID/DATA MONITOR INSPECTION [5R55S].) **PCM PIDs:** • APP1 • APP2 • ECT • RPM • VPWR **TCM PIDs:** • TFT • TR_D • TR_V • TSS • ISS • OSS Is the PID value normal?	Yes	Perform the symptom troubleshooting and the follow procedures.
		No	Repair or replace any malfunctioning parts according to the inspection result.

SYMPTOM TROUBLESHOOTING ITEM TABLE [5R55S]

id0503c1800400

- Use the chart below to verify the trouble symptoms to diagnose the appropriate area.

No.	TROUBLESHOOTING ITEM	DESCRIPTION	PAGE
1	Vehicle does not move in D range, or in R position	Vehicle does not move when AP is depressed.	(See 05-03-9 NO.1 VEHICLE DOES NOT MOVE IN D RANGE, OR IN R POSITION [5R55S].)
2	Vehicle moves in N position	Vehicle creeps in N position. Vehicle creeps if brake pedal is not depressed in N position.	(See 05-03-10 NO.2 VEHICLE MOVES IN N POSITION [5R55S].)
3	Vehicle moves in P position, or parking gear does not disengage when P position is disengaged	Vehicle rolls when on a downward slope and tires do not lock in P position. Tires locked when P position is disengaged, vehicle does not move in D range, and R position when AP is depressed, and engine remains in stall condition.	(See 05-03-10 NO.3 VEHICLE MOVES IN P POSITION, OR PARKING GEAR DOES NOT DISENGAGE WHEN P IS DISENGAGED [5R55S].)
4	Excessive creep	Vehicle accelerates in D range, and R position without depressing accelerator pedal.	(See 05-03-11 NO.4 EXCESSIVE CREEP [5R55S].)
5	No creep at all	Vehicle does not move in D range, or R position when idling on flat, paved road.	(See 05-03-11 NO.5 NO CREEP AT ALL [5R55S].)
6	Low maximum speed and poor acceleration	Vehicle acceleration poor at start. Delayed acceleration when accelerator pedal depressed while driving.	(See 05-03-12 NO.6 LOW MAXIMUM SPEED AND POOR ACCELERATION [5R55S].)
7	No shifting	Single shift range only. Sometimes shifts correctly.	(See 05-03-13 NO.7 NO SHIFTING [5R55S].)
8	No 2nd and 5th gears (Manual 2nd is OK)	Vehicle dose not shift to 2nd or 5th gear.	(See 05-03-14 NO.8 NO 2ND AND 5TH GEARS (MANUAL 2ND IS OK) [5R55S].)
9	Abnormal shifting	Shifts incorrectly (incorrect shift pattern).	(See 05-03-14 NO.9 ABNORMAL SHIFTING [5R55S].)
10	Frequent shifting	Downshifting occurs immediately even when the accelerator pedal is depressed slightly in D range.	(See 05-03-15 NO.10 FREQUENT SHIFTING [5R55S].)
11	Shifts point is high or low	Shift point is considerably different from automatic shift diagram. Shift delays when accelerating. Shift occurs quickly when accelerating and engine speed does not increase.	(See 05-03-15 NO.11 SHIFT POINT IS HIGH OR LOW [5R55S].)
12	Torque converter clutch (TCC) non-operation	TCC does not operate when vehicle reaches TCC operation range.	(See 05-03-16 NO.12 TORQUE CONVERTER CLUTCH (TCC) NON-OPERATION [5R55S].)
13	No kickdown	Does not downshift when accelerator pedal is fully depressed within kickdown range.	(See 05-03-17 NO.13 NO KICKDOWN [5R55S].)
14	Engine flares up or slips when upshifting or downshifting	When accelerator pedal is depressed, engine speed increases but vehicle speed increases slowly. When accelerator pedal is depressed while driving, engine speed increases but vehicle speed does not.	(See 05-03-17 NO.14 ENGINE FLARES UP OR SLIPS WHEN UPSHIFTING OR DOWNSHIFTING [5R55S].)
15	Engine flares up or slips when accelerating vehicle	Engine flares up when accelerator pedal is depressed for upshifting. Engine flares up suddenly when accelerator pedal is depressed for downshifting.	(See 05-03-18 NO.15 ENGINE FLARES UP OR SLIPS WHEN ACCELERATING VEHICLE [5R55S].)
16	Judder upon torque converter clutch (TCC) operation	Vehicle jolts when TCC is engaged.	(See 05-03-18 NO.16 JUDDER UPON TORQUE CONVERTER CLUTCH (TCC) OPERATION [5R55S].)
17	Excessive shift shock from N to D or N to R position/range	Strong shock is felt when shifting from N to D or N to R position/range at idle.	(See 05-03-19 NO.17 EXCESSIVE SHIFT SHOCK FROM N TO D OR N TO R POSITION/RANGE [5R55S].)

No.	TROUBLESHOOTING ITEM	DESCRIPTION	PAGE
18	Excessive shift shock is felt when upshifting and downshifting	Excessive shift shock is felt when depressing accelerator pedal to accelerate at upshifting. During cruising, excessive shift shock is felt when depressing accelerator pedal at downshifting.	(See 05-03-20 NO.18 EXCESSIVE SHIFT SHOCK IS FELT WHEN UPSHIFTING AND DOWNSHIFTING [5R55S].)
19	Excessive shift shock on torque converter clutch (TCC)	Strong shock is felt when TCC is engaged.	(See 05-03-21 NO.19 EXCESSIVE SHIFT SHOCK ON TORQUE CONVERTER CLUTCH (TCC) [5R55S].)
20	Noise/vibration forward or reverse	Transmission noisy in all positions and ranges.	(See 05-03-22 NO.20 NOISE/ VIBRATION FORWARD OR REVERSE [5R55S].)
21	No engine braking in 1GR position of manual 1 range	Engine speed drops to idle but vehicle coasts when accelerator pedal is released when in 1GR position of manual 1 range at low vehicle speed.	(See 05-03-23 NO.21 NO ENGINE BRAKING IN 1GR POSITION OF MANUAL 1 RANGE [5R55S].)
22	Transmission overheats	Burnt smell emitted from transmission. Smoke is emitted from transmission.	(See 05-03-24 NO.22 TRANSMISSION OVERHEATS [5R55S].)
23	Engine stalls when shifted to D range, or in R position	Engine stalls when shifting from N or P position to D range or R position at idle.	(See 05-03-25 NO.23 ENGINE STALLS WHEN SHIFTED TO D RANGE, OR IN R POSITION [5R55S].)
24	Engine stalls when driving at slow speeds or stopping	Engine stalls when brake pedal is depressed while driving at low speed or stopping.	(See 05-03-25 NO.24 ENGINE STALLS WHEN DRIVING AT SLOW SPEEDS OR STOPPING [5R55S].)
25	Starter does not work	Starter does not work even when P or N position is selected.	(See 05-03-25 NO.25 STARTER DOES NOT WORK [5R55S].)

QUICK DIAGNOSIS CHART [5R55S]

id0503c1800500

X: Applied

	Symptom item / Cause of trouble	Selector lever is misadjusted	Parking mechanism malfunction	Not within line pressure specification	Not within idle speed specification	Excessive amount of ATF	Electrical system components: APP sensor: No signal input	APP sensor: Abnormal signal input	TSS sensor: Signal is not inputted	TSS sensor: Malfunction signal is inputted	ISS sensor: Signal is not inputted	ISS sensor: Malfunction signal is inputted	OSS sensor: Signal is not inputted	OSS sensor: Malfunction signal is inputted	ECT sensor: Signal is not inputted	ECT sensor: Malfunction signal is inputted	Digital TR sensor: Misadjusted	Digital TR sensor: Not operating properly	Brake switch: Always ON
1	Vehicle does not move in D range, or in R position	X		X		X													
2	Vehicle moves in N position	X																	
3	Vehicle moves in P position, or parking gear does not disengage when P is disengaged	X																	
4	Excessive creep		X		X	X													
5	No creep at all			X		X		X	X	X	X	X	X	X					
6	Low maximum speed and poor acceleration		X	X			X	X	X	X	X	X	X	X			X	X	
7	No shifting			X			X	X			X	X	X	X					
8	No 2nd and 5th gears (Manual 2nd is OK)	X		X			X	X	X	X	X	X	X	X	X	X	X	X	
9	Abnormal shifting	X		X		X	X	X			X	X	X	X			X	X	
10	Frequent shifting			X			X	X	X	X	X	X	X	X					
11	Shifts point is high or low					X	X	X	X	X	X	X	X	X	X	X			
12	Torque converter clutch (TCC) non-operation					X	X	X			X	X			X	X	X	X	X
13	No kickdown						X	X											
14	Engine flares up or slips when upshifting or downshifting	X		X			X	X			X	X	X	X					
15	Engine flares up or slip when accelerating vehicle	X		X			X	X	X	X	X	X	X	X			X	X	
16	Judder upon torque converter clutch (TCC) operation			X							X	X							
17	Excessive shift shock from N to D or N to R position/range	X		X	X		X	X			X	X					X	X	
18	Excessive shift shock is felt when upshifting and downshifting			X			X	X	X	X	X	X					X	X	
19	Excessive shift shock on torque converter clutch (TCC)			X					X	X	X	X	X	X					
20	Noise/vibration forward or reverse																		
21	No engine braking in 1GR position of manual 1 range			X					X	X	X	X	X	X					
22	Transmission overheats			X		X													
23	Engine stalls when shifted to D range, or in R position				X					X		X	X						
24	Engine stalls when driving at slow speeds or stopping				X														
25	Starter does not work																X	X	

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X: Applied

	Symptom item / Cause of trouble	Poor GND	Signal is not inputted (TFT sensor)	Malfunction signal is inputted (TFT sensor)	Shift solenoid D malfunction	Shift solenoid A malfunction	Shift solenoid B malfunction	Shift solenoid C malfunction	Pressure control solenoid B malfunction	Pressure control solenoid A malfunction	Pressure control solenoid C malfunction	TCC control solenoid malfunction	Control valve is not operating properly	Forward clutch is not operating properly	Reverce servo is not operating properly	Oil cooler is not operating properly	Slipping (Brake, clutch)	Burnt (Brake, clutch)	Torque converter is not operating properly	TCC burnt Inspection method	Fluid pump is not operating properly
		Electrical system components											Hydraulic system components				Powertrain system				
		AT outer parts																			
1	Vehicle does not move in D range, or in R position	X					X		X		X		X				X	X	X		X
2	Vehicle moves in N position												X					X			
3	Vehicle moves in P position, or parking gear does not disengage when P is disengaged																				
4	Excessive creep																				
5	No creep at all	X		X	X	X	X	X		X			X				X	X	X		
6	Low maximum speed and poor acceleration	X	X	X	X	X	X	X		X	X		X				X	X	X	X	
7	No shifting	X				X	X	X		X	X		X				X	X			
8	No 2nd and 5th gears (Manual 2nd is OK)	X	X	X		X	X		X				X				X	X			
9	Abnormal shifting	X			X	X	X	X			X		X	X	X		X	X	X		
10	Frequent shifting	X															X	X			
11	Shifts point is high or low	X	X	X													X				
12	Torque converter clutch (TCC) non-operation	X		X								X	X						X	X	X
13	No kickdown	X			X	X	X	X					X				X	X			
14	Engine flares up or slips when upshifting or downshifting	X							X	X	X	X	X				X	X			
15	Engine flares up or slip when accelerating vehicle	X		X	X	X		X		X			X				X	X			
16	Judder upon torque converter clutch (TCC) operation	X				X						X	X						X	X	
17	Excessive shift shock from N to D or N to R position/range	X				X			X	X	X		X	X	X			X			
18	Excessive shift shock is felt when upshifting and downshifting	X	X	X	X	X	X	X	X	X	X		X	X	X		X	X			
19	Excessive shift shock on torque converter clutch (TCC)	X		X		X				X			X						X	X	
20	Noise/vibration forward or reverse																				
21	No engine braking in 1GR position of manual 1 range	X			X	X		X	X	X			X				X	X			
22	Transmission overheats			X					X	X	X		X			X			X	X	
23	Engine stalls when shifted to D range, or in R position												X						X	X	
24	Engine stalls when driving at slow speeds or stopping												X						X	X	
25	Starter does not work																				

amftw00001949

NO.1 VEHICLE DOES NOT MOVE IN D RANGE, OR IN R POSITION [5R55S]

id0503c1800600

1	Vehicle does not move in D range, or in R position
DESCRIPTION	• Vehicle does not move when AP is depressed.
POSSIBLE CAUSE	• If the vehicle does not move in D range or R position, basically, the malfunction is in the AT. (Vehicle will move even with a malfunction in the TCM.) Since a malfunction is in the sensor circuit or output circuit is the cause of the malfunction in the AT, inspect the sensors, output circuit, and the related wiring harnesses. 1. Clutch slipped, worn (D range-Forward clutch, R position-Direct clutch, Coast clutch, Reverse band) • Fluid pump malfunction • Shift solenoid B malfunction • Pressure control solenoid B malfunction • Pressure control solenoid C malfunction • Body ground malfunction • Control valve body malfunction 2. Selector lever malfunction 3. Parking mechanism not operating properly 4. Torque converter malfunction **Note** • Before the following the troubleshooting steps, make sure that the Automatic Transmission On-Board Diagnostic and Automatic Transmission Basic Inspections are conducted. (See 05-03-4 BASIC INSPECTION [5R55S].)

Diagnostic procedure

STEP	INSPECTION		ACTION
1	When the vehicle is stopped on a flat, level road and the engine is off, does the vehicle move when it is pushed? (In D range or N, R positions and brake released)	Yes	Go to the next step.
		No	Check the parking mechanism.
2	Disconnect the TCM connector. Is the resistance between TCM ground terminal CO and body ground, and between TCM ground terminal CL and body ground **less than 5.0 ohms**?	Yes	Go to the next step.
		No	Repair the open ground circuit.
3	Inspect the pressure control solenoid B and C. (See 05-13-34 SOLENOID VALVE INSPECTION [5R55S].) Is it normal?	Yes	Clean and inspect main control, if parts are damaged replace main control. If the problem remains, overhaul the transmission and repair or replace any malfunctioning parts.
		No	Repair or replace any malfunctioning parts.
4	• Verify test results. — If normal, return to the diagnostic index to service any additional symptoms. — If the malfunction remains, inspect the related Service Information and perform repair or diagnosis. • If the vehicle repaired, the troubleshooting is completed. • If the vehicle the not repaired or additional diagnostic information is not available, replace the TCM.		

NO.2 VEHICLE MOVES IN N POSITION [5R55S]

id0503c1800700

2	Vehicle moves in N position
DESCRIPTION	• Vehicle creeps in N position. • Vehicle creeps if brake pedal is not depressed in N position.
POSSIBLE CAUSE	• If the vehicle moves in N position, basically, the malfunction is in the AT. Since a malfunction in the sensor circuit or output circuit is the cause of the malfunction in the AT, inspect the sensors, output circuit, and the related wiring harnesses. 1. Clutch is burned (Forward clutch) • Control valve body malfunction 2. Selector lever position disparity. Although the selector indicator shows N position, the hydraulic circuit shows D range or R position. • Incorrect fluid level • Fluid pump malfunction • Shift control cables • Main control • Case and clutches **Note** • Before the following the troubleshooting steps, make sure that the Automatic Transmission On-Board Diagnostic and Automatic Transmission Basic Inspections are conducted. (See 05-03-4 BASIC INSPECTION [5R55S].)

Diagnostic procedure

STEP	INSPECTION		ACTION
1	Does the vehicle creep when the selector lever is moved slightly in the N position?	Yes	Go to the next step.
		No	Adjust the selector lever. (See 05-14-2 SELECTOR CABLE ADJUSTMENT.)
2	Disconnect the TCM connector. Is the resistance between TCM ground terminal CO and body ground, and between TCM ground terminal CL and body ground **less than 5.0 ohms**?	Yes	Go to the next step.
		No	Repair the open ground circuit. Reconnect the TCM.
3	Inspect following items. • Fluid level • Fluid pump operation • Shift control cables • Main control • Case and clutches Are they normal?	Yes	Clean and inspect main control, if parts are damaged replace main control. If the problem remains, overhaul the transmission and repair or replace any malfunctioning parts.
		No	Repair or replace any malfunctioning parts.
4	• Verify test results. — If normal, return to the diagnostic index to service any additional symptoms. — If the malfunction remains, inspect the related Service Information and perform repair or diagnosis. • If the vehicle repaired, the troubleshooting is completed. • If the vehicle the not repaired or additional diagnostic information is not available, replace the TCM.		

NO.3 VEHICLE MOVES IN P POSITION, OR PARKING GEAR DOES NOT DISENGAGE WHEN P IS DISENGAGED [5R55S]

id0503c1800800

3	Vehicle moves in P position, or parking gear does not disengage when P is disengaged
DESCRIPTION	• Vehicle rolls on a downward slope in P position. • Tires are locked when P is disengaged. Vehicle does not move in D range, and R position when accelerator pedal is depressed, and engine remains in stall condition.
POSSIBLE CAUSE	1. Improper adjustment of selector lever 2. Transmission case damaged 3. Parking mechanism malfunction (May have effect on noise or shock from transmission) 4. If vehicle moves in N position, perform No.2 "VEHICLE MOVES IN N POSITION"

NO.4 EXCESSIVE CREEP [5R55S]

id0503c1800900

4	Excessive creep
DESCRIPTION	• Vehicle accelerates in D range, and R position without depressing accelerator pedal.
POSSIBLE CAUSE	1. Engine idle speed high (transmission system is not cause of problem) 2. Go to No.9 "FAST IDLE/RUNS ON"

NO.5 NO CREEP AT ALL [5R55S]

id0503c1801000

5	No creep at all
DESCRIPTION	• Vehicle does not move in D range and R position when idling on flat, paved road.
POSSIBLE CAUSE	• Either transmission is stuck in 4GR or clutch slippage due to a stuck 3–4 clutch. 1. Clutch is burned • Line pressure low • Shift solenoid D malfunction • Shift solenoid A malfunction • Shift solenoid B malfunction • Shift solenoid C malfunction • Pressure control solenoid A malfunction • Body ground malfunction • Control valve body malfunction 2. Transmission fixed in 4GR (Operation of fail-safe function) • Short or open circuit in wiring harness • Poor connection of connector • Electronic parts of output and input system have malfunction 3. No engine torque • Low engine RPM • Torque converter malfunction **Note** • Before the following the troubleshooting steps, make sure that the Automatic Transmission On-Board Diagnostic and Automatic Transmission Basic Inspections are conducted. (See 05-03-4 BASIC INSPECTION [5R55S].)

Diagnostic procedure

STEP	INSPECTION		ACTION
1	Does the vehicle creep in any range/position?	Yes	Go to the next step.
		No	Inspect or adjust the selector lever. (See 05-14-2 SELECTOR LEVER INSPECTION.) (See 05-14-2 SELECTOR CABLE ADJUSTMENT.)
2	Check the value at the following PCM PIDs using the IDS/PDS. • APP1 • APP2 • RPM Are PID values normal?	Yes	Go to the next step.
		No	Repair or replace any malfunctioning parts.
3	Disconnect the TCM connector. Is the resistance between TCM ground terminal CO and body ground, and between TCM ground terminal CL and body ground **less than 5.0 ohms?**	Yes	Go to the next step.
		No	Repair the open ground circuit.
4	Inspect the pressure control solenoid A. (See 05-13-34 SOLENOID VALVE INSPECTION [5R55S].) Is it normal?	Yes	Clean and inspect main control, if parts are damaged replace main control. If the problem remains, overhaul the transmission and repair or replace any malfunctioning parts.
		No	Repair or replace any malfunctioning parts.
5	• Verify test results. — If normal, return to the diagnostic index to service any additional symptoms. — If the malfunction remains, inspect the related Service Information and perform repair or diagnosis. • If the vehicle repaired, the troubleshooting is completed. • If the vehicle the not repaired or additional diagnostic information is not available, replace the TCM.		

NO.6 LOW MAXIMUM SPEED AND POOR ACCELERATION [5R55S]

id0503c1801100

6	Low maximum speed and poor acceleration
DESCRIPTION	• Vehicle acceleration is poor at start. • Delayed acceleration when accelerator pedal is depressed while driving.
POSSIBLE CAUSE	• If the clutch is stuck or does not stay in 4GR, the malfunction is in the engine control system. 1. Clutch slippage, burned • Line pressure low • Shift solenoid D malfunction • Shift solenoid A malfunction • Shift solenoid B malfunction • Shift solenoid C malfunction • Pressure control solenoid A, B and C malfunction • Body ground malfunction • Control valve body malfunction 2. Signal malfunction • OSS sensor malfunction • Sensor ground malfunction • Accelerator pedal position sensor malfunction • TSS sensor malfunction 3. Transmission fixed in 4GR (Operation of fail-safe function) • Short or open circuit in wiring • Poor connection of connector • Electronic parts of output and input system have malfunction 4. Insufficient starting torque (Suspected when in-gear condition, shift control and engine circuit are normal) • Torque converter have malfunction (Poor operation, stuck) • TFT sensor malfunction (Short or open circuit) 5. Digital TR sensor adjustment incorrect **Note** • Before the following the troubleshooting steps, make sure that the Automatic Transmission On-Board Diagnostic and Automatic Transmission Basic Inspections are conducted. (See 05-03-4 BASIC INSPECTION [5R55S].)

Diagnostic procedure

STEP	INSPECTION		ACTION
1	Go to No.12 "LACK/LOSS OF POWER-ACCELERATION/CRUISE". Is the CIS system normal?	Yes	Go to the next step.
		No	Repair or replace any malfunctioning parts.
2	Disconnect the AT connector. Does the vehicle operate as follows? **D range: 4GR (fixed)** **R position: Reverse**	Yes	Go to the next step.
		No	Clean and inspect main control, if parts are damaged replace main control. If the problem remains, overhaul the transmission and repair or replace any malfunctioning parts.
3	Drive the vehicle in D range. Does the vehicle start from stop in first gear? Check the value at the following TCM PIDs using the IDS/PDS. • GR_CM • GEAR	Yes	Go to the next step.
		No	Check the value at the following. (See 05-02-45 PID/DATA MONITOR INSPECTION [5R55S].) **PCM PIDs (using IDS/PDS):** • APP1 • APP2 • VSS **TCM PIDs (using IDS/PDS):** • TSS • ISS • OSS • TR_D Repair or replace any malfunctioning parts.

STEP	INSPECTION		ACTION
4	Inspect the value at the following TCM PIDs using the IDS/PDS. • SSA • SSB • SSC • SSD Are the PID values normal?	Yes	Inspect the shift solenoids for sticking. • If the shift solenoids are normal, go to the next step.
		No	Check the value at the following. **PCM PIDs (using IDS/PDS):** • APP **TCM PIDs (using IDS/PDS):** • OSS • ISS • TSS • TR_D
5	Is the line pressure normal? (See 05-13-4 MECHANICAL SYSTEM TEST [5R55S].)	Yes	Go to the next step.
		No	Repair or replace any malfunctioning parts according to the inspection results.
6	Perform the stall test. (See 05-13-4 MECHANICAL SYSTEM TEST [5R55S].) Is the stall speed normal?	Yes	Reverify symptoms of malfunctioning.
		No	Overhaul the transmission and repair or replace any malfunctioning parts.
7	• Verify test results. — If normal, return to the diagnostic index to service any additional symptoms. — If the malfunction remains, inspect the related Service Information and perform repair or diagnosis. • If the vehicle repaired, the troubleshooting is completed. • If the vehicle the not repaired or additional diagnostic information is not available, replace the TCM.		

NO.7 NO SHIFTING [5R55S]

id0503c1801200

7	No shifting
DESCRIPTION	• Single shift range only. • Sometimes it shifts correctly.
POSSIBLE CAUSE	• When the gear position is fixed in 4GR due to the fail-safe operation, the malfunction is in the AT. • Perform malfunction diagnosis according to No.6 "LOW MAXIMUM SPEED AND POOR ACCELERATION". 1. Clutch slippage, burned • Line pressure low • Shift solenoid A malfunction • Shift solenoid B malfunction • Shift solenoid C malfunction • Pressure control solenoid A, B and C malfunction • Body ground malfunction • Control valve body malfunction 2. Signal malfunction • OSS sensor malfunction • Sensor ground malfunction • Accelerator pedal position sensor malfunction • IAT sensor malfunction • VSS signal malfunction 3. Transmission fixed in 4GR (Operation in fail-safe function) • Short or open circuit in wiring harness • Poor connection of connector • Disconnected shift solenoid connector • Poor ground of shift solenoid • Fluid pump malfunction • Overdrive planetary malfunction • Center support malfunction • Direct clutch malfunction • Overdrive servo/band malfunction

NO.8 NO 2ND AND 5TH GEARS (MANUAL 2ND IS OK) [5R55S]

id0503c1814500

8	No 2nd and 5th gears (Manual 2nd is OK)
DESCRIPTION	• Vehicle dose not shift to 2nd or 5th gear.
POSSIBLE CAUSE	• Pressure control solenoid B malfunction • Pressure control solenoid C malfunction • TCM malfunction • Main control malfunction **Note** • Before following the troubleshooting steps, make sure that the Automatic Transmission On-Board Diagnostic and Automatic Transmission Basic Inspection are conducted. (See 05-03-4 BASIC INSPECTION [5R55S].)

Diagnostic procedure

STEP	INSPECTION		ACTION
1	Verify that Manual 2nd is present and functions correctly. Is manual 2nd operating correctly?	Yes	Go to the next step.
		No	Go to symptom troubleshooting NO.8 "ABNORMAL SHIFTING".
2	Inspect the following solenoids. • Pressure control solenoid B • Pressure control solenoid C (See 05-13-34 SOLENOID VALVE INSPECTION [5R55S].) Are they normal?	Yes	Clean and inspect main control, if parts are damaged replace main control. If the problem remains, overhaul the transmission and repair or replace any malfunction parts.
		No	Repair or replace any malfunction parts.
3	• Verify test results. — If normal, return to the diagnostic index to service any additional symptoms. — If the malfunction remains, inspect the related Service Information and perform repair or diagnosis. • If the vehicle repaired, the troubleshooting is completed. • If the vehicle the not repaired or additional diagnostic information is not available, replace the TCM.		

NO.9 ABNORMAL SHIFTING [5R55S]

id0503c1801400

9	Abnormal shifting
DESCRIPTION	• Shifts incorrectly (incorrect shift pattern).
POSSIBLE CAUSE	• There is a malfunction in the signal circuit which controls shifting (accelerator pedal position sensor, TSS sensor, OSS sensor), the control valve is stuck, the accumulator (forward or servo apply) is stuck, or the clutch circuit is stuck. 1. Clutch slippage, burned • Fluid level low • Line pressure low • Control valve body malfunction • Shift solenoid D malfunction • Shift solenoid A malfunction • Shift solenoid B malfunction • Shift solenoid C malfunction • Pressure control solenoid A, B and C malfunction • Body ground malfunction 2. Signal malfunction • OSS sensor malfunction • Sensor ground malfunction • Accelerator pedal position sensor malfunction • IAT sensor malfunction 3. Digital TR sensor malfunction • Selector lever adjustment incorrect • Digital TR sensor adjustment incorrect **Note** • Before the following the troubleshooting steps, make sure that the Automatic Transmission On-Board Diagnostic and Automatic Transmission Basic Inspections are conducted. (See 05-03-4 BASIC INSPECTION [5R55S].)

Diagnostic procedure

STEP	INSPECTION		ACTION
1	Disconnect the TCM connector. Is the resistance between TCM ground terminal CO and body ground, and between TCM ground terminal CL and body ground **less than 5.0 ohms**?	Yes	Go to the next step.
		No	Repair the open ground circuit. Reconnect the TCM connector.
2	Check the value at the following. (See 05-02-45 PID/DATA MONITOR INSPECTION [5R55S].) **PCM PIDs (using IDS/PDS):** • APP **TCM PIDs (using IDS/PDS):** • TSS • OSS • VSS Are they normal?	Yes	Clean and inspect main control, if parts are damaged replace main control. If the problem remains, overhaul the transmission and repair or replace any malfunctioning parts.
		No	Repair or replace any malfunctioning parts.
3	• Verify test results. — If normal, return to the diagnostic index to service any additional symptoms. — If the malfunction remains, inspect the related Service Information and perform repair or diagnosis. • If the vehicle repaired, the troubleshooting is completed. • If the vehicle the not repaired or additional diagnostic information is not available, replace the TCM.		

NO.10 FREQUENT SHIFTING [5R55S]

Id0503c1801500

10	Frequent shifting
DESCRIPTION	• Downshifting occurs immediately even when the accelerator pedal is depressed slightly in D range.
POSSIBLE CAUSE	• The circuit which is the cause is basically the same as No.9 "ABNORMAL SHIFTING". However, a malfunction of the input signal to the accelerator pedal is position sensor, OSS sensor (including the sensor ground, sensor harness and connector), or clutch slippage (clutch stuck, low pressure in line) may also be the cause.

NO.11 SHIFT POINT IS HIGH OR LOW [5R55S]

Id0503c1801600

11	Shift point is high or low
DESCRIPTION	• Shift point is considerably different from automatic shift diagram. • Shift delays when accelerating. • Shift occurs quickly when accelerating and engine speed does not increase.
POSSIBLE CAUSE	• If the transmission does not shift abnormally, there is a malfunction of the input signal to the accelerator pedal position sensor, TSS sensor, or OSS sensor (including sensor ground). • If the engine speed is high or low, regardless of normal shifting, inspect the tachometer. • Verify that the output signal of the accelerator pedal position sensor change linearly. • Verify fluid level and conditions. • Verify main control operation.

NO.12 TORQUE CONVERTER CLUTCH (TCC) NON-OPERATION [5R55S]

Id0503c1801700

12	Torque converter clutch (TCC) non-operation
DESCRIPTION	• TCC does not operate when vehicle reaches TCC operation range.
POSSIBLE CAUSE	• Basically, the TCC does not operate when the fail-safe is operating. Verify the DTC first. **Caution** • **If the TCC is stuck, inspect it. In addition, inspect the oil cooler for foreign particles which may have mixed in with the ATF.** 1. TCC is burned (1) Input sensor system malfunction • ECT sensor • TFT sensor • Sensor ground (2) Output solenoid valve system malfunction (Sticking) • TCC control solenoid malfunction (3) Main control malfunction (Poor operation, stuck) • TCC hydraulic pressure system • Improper pressures • Fluid pump malfunction • Converter malfunction 2. Accelerator pedal position sensor malfunction (Not operating linearly) 3. Brake switch malfunction (Always ON) 4. TCM malfunction **Note** • Before the following the troubleshooting steps, make sure that the Automatic Transmission On-Board Diagnostic and Automatic Transmission Basic Inspections are conducted. (See 05-03-4 BASIC INSPECTION [5R55S].)

Diagnostic procedure

STEP	INSPECTION		ACTION
1	Check the value at the following. (See 05-02-45 PID/DATA MONITOR INSPECTION [5R55S].) **PCM PIDs (using IDS/PDS):** • APP • VSS **TCM PIDs (using IDS/PDS):** • TFT Are they normal?	Yes	Go to the next step.
		No	Repair or replace any malfunctioning parts.
2	Disconnect the TCM connector. Is the resistance between TCM ground terminal CO and body ground, and between TCM ground terminal CL and body ground **less than 5.0 ohms**?	Yes	Go to the next step.
		No	Repair the wiring harness.
3	Measure the resistance between TCM terminal A and AT connector terminal H, and between TCM terminal CK and AT connector terminal F. Are the resistances **less than 5.0 ohms**?	Yes	Go to the next step.
		No	Repair the TCC control solenoid circuit. Reconnect the TCM connector.
4	Inspect the TCC control solenoid. (See 05-13-34 SOLENOID VALVE INSPECTION [5R55S].) Are the TCC control solenoids operating properly?	Yes	Replace TCM.
		No	Replace TCC control solenoid. If the problem remains, overhaul the transmission and repair or replace any malfunctioning parts.
5	• Verify test results. — If normal, return to the diagnostic index to service any additional symptoms. — If the malfunction remains, inspect the related Service Information and perform repair or diagnosis. • If the vehicle repaired, the troubleshooting is completed. • If the vehicle the not repaired or additional diagnostic information is not available, replace the TCM.		

NO.13 NO KICKDOWN [5R55S]

id0503c1801800

13	No kickdown
DESCRIPTION	• Does not downshift when accelerator pedal is fully depressed within kickdown range.
POSSIBLE CAUSE	• If the transmission does not downshift though shifting is normal, the malfunction is in accelerator pedal position sensor circuit (including sensor ground, sensor harness and connector).

NO.14 ENGINE FLARES UP OR SLIPS WHEN UPSHIFTING OR DOWNSHIFTING [5R55S]

id0503c1801900

14	Engine flares up or slips when upshifting or downshifting
DESCRIPTION	• When accelerator pedal is depressed for driving, engine speed increases but vehicle speed increases slowly. • When accelerator pedal is depressed while driving, engine speed increases but vehicle speed does not.
POSSIBLE CAUSE	• The clutch is slipping because it is stuck or it line pressure is low. 1. Clutch stuck, slippage (forward clutch, 3–4 clutch, 2–4 brake band, one-way clutch) • Line pressure low • Incorrect fluid level • Pressure control solenoid A, B and C malfunction • Body ground malfunction • Control valve body malfunction 2. Signal malfunction • OSS sensor malfunction • Sensor ground malfunction • Accelerator pedal position sensor malfunction • IAT sensor malfunction 3. Poor operation of mechanical pressure **Note** • Before the following the troubleshooting steps, make sure that the Automatic Transmission On-Board Diagnostic and Automatic Transmission Basic Inspections are conducted. (See 05-03-4 BASIC INSPECTION [5R55S].)

Diagnostic procedure

STEP	INSPECTION		ACTION
1	Is the shift point normal?	Yes	Go to the next step.
		No	Go to symptom troubleshooting No.9 "ABNORMAL SHIFTING".
2	Check the value at the following PCM PIDs using the IDS/PDS. • APP • ACT Are the PID values normal?	Yes	Go to the next step.
		No	Repair or replace any malfunctioning parts.
3	Disconnect the TCM connector. Is the resistance between TCM ground terminal CO and body ground, and between TCM ground terminal CL and body ground **less than 5.0 ohms?**	Yes	Go to the next step.
		No	Repair the wiring harness. Reconnect the TCM connector.
4	Inspect PCA, PCB and PCC PIDs value. (See 05-02-45 PID/DATA MONITOR INSPECTION [5R55S].) Are the PCA, PCB and PCC PID values normal?	Yes	Clean and inspect main control, if parts are damaged replace main control. If the problem remains, overhaul the transmission and repair or replace any malfunctioning parts.
		No	Repair or replace any malfunctioning parts.
5	• Verify test results. — If normal, return to the diagnostic index to service any additional symptoms. — If the malfunction remains, inspect the related Service Information and perform repair or diagnosis. • If the vehicle repaired, the troubleshooting is completed. • If the vehicle the not repaired or additional diagnostic information is not available, replace the TCM.		

NO.15 ENGINE FLARES UP OR SLIPS WHEN ACCELERATING VEHICLE [5R55S]

id0503c1802000

15	Engine flares up or slips when accelerating vehicle
DESCRIPTION	• Engine flares up when accelerator pedal is depressed for upshifting. • Engine flares up suddenly when accelerator pedal is depressed for downshifting.
POSSIBLE CAUSE	• The malfunction is basically the same as for No.14 "ENGINE FLARES UP OR SLIPS WHEN UPSHIFTING OR DOWNSHIFTING". If conditions for No.14 worsen, the malfunction will develop to No.15.

NO.16 JUDDER UPON TORQUE CONVERTER CLUTCH (TCC) OPERATION [5R55S]

Id0503c1802100

16	Judder upon torque converter clutch (TCC) operation
DESCRIPTION	• Vehicle jolts when TCC is engaged.
POSSIBLE CAUSE	• Poor TCC engagement due to either slippage because the TCC is stuck or the line pressure is low **Caution** **• If the TCC is stuck, inspect it. In addition, inspect the oil cooler for foreign particles which may have mixed in with the ATF.** 1. Torque converter clutch piston slipped, burned • Line pressure high • TCC control solenoid malfunction • Control valve body malfunction • Body ground malfunction 2. Signal malfunction • Sensor ground malfunction 3. Torque converter malfunction **Note** • Before the following the troubleshooting steps, make sure that the Automatic Transmission On-Board Diagnostic and Automatic Transmission Basic Inspections are conducted. (See 05-03-4 BASIC INSPECTION [5R55S].)

Diagnostic procedure

STEP	INSPECTION		ACTION
1	Disconnect TCM. Is the resistance between TCM ground terminal CO and body ground, and between TCM ground terminal CL and body ground **less than 5.0 ohms**?	Yes	Go to the next step.
		No	Repair the wiring harness.
2	Measure the resistance between the following TCM and AT connector terminals. • TCM terminal A and AT connector terminal F • TCM terminal CK and AT connector terminal H Is the resistance **less than 5.0 ohms**?	Yes	Go to the next step.
		No	Repair the TCC control solenoid circuit.
3	Inspect the TCC control solenoid. (See 05-13-34 SOLENOID VALVE INSPECTION [5R55S].) Is the solenoid valve operating properly?	Yes	Go to the next step.
		No	Replace TCC control solenoid. If the problem remains, overhaul the transmission and repair or replace any malfunctioning parts.
4	Inspect the PCA, PCB and PCC PID values. (See 05-02-45 PID/DATA MONITOR INSPECTION [5R55S].) Are the PCA, PCB and PCC PID values normal?	Yes	Clean and inspect main control, if parts are damaged replace main control. If the problem remains, overhaul the transmission and repair or replace any malfunctioning parts.
		No	Replace the TCM.
5	• Verify test results. — If normal, return to the diagnostic index to service any additional symptoms. — If the malfunction remains, inspect the related Service Information and perform repair or diagnosis. • If the vehicle repaired, the troubleshooting is completed. • If the vehicle the not repaired or additional diagnostic information is not available, replace the TCM.		

NO.17 EXCESSIVE SHIFT SHOCK FROM N TO D OR N TO R POSITION/RANGE [5R55S]

id0503c1802200

17	Excessive shift shock from N to D or N to R position/range
DESCRIPTION	• Strong shock felt when shifting from N to D or N to R position/range.
POSSIBLE CAUSE	• Shift shock may worsen when the fail-safe is operating. If no DTC is output, the shift shock may worsen due to poor operation of the control valve body or sticking of the clutch. 1. Clutch burned (N→D: Forward clutch, N→R: Reverse servo or Direct clutch) • Line pressure low, high • Incorrect fluid level • Accelerator pedal position sensor malfunction • TFT sensor malfunction • Pressure control solenoid A malfunction (N→D only) • Pressure control solenoid C malfunction (N→R only) • Main control malfunction • Sensor ground malfunction • Body ground malfunction • Digital TR sensor misadjustment or malfunction 2. Poor hydraulic operation (Malfunction in range change) • Forward clutch malfunction • Reverse servo malfunction 3. Idle speed high 4. Poor tightening torque of engine mount, exhaust mount **Note** • Before the following the troubleshooting steps, make sure that the Automatic Transmission On-Board Diagnostic and Automatic Transmission Basic Inspections are conducted. (See 05-03-4 BASIC INSPECTION [5R55S].)

Diagnostic procedure

STEP	INSPECTION		ACTION
1	Does the shift shock occur only when the engine is cold?	Yes	Go to the next step.
		No	Go to Step 3.
2	Disconnect the TCM connector. Is the resistance between the TCM ground terminal CO and body ground, and between TCM ground terminal CL and body ground **less than 5.0 ohms**?	Yes	Check the value at the following. (See 05-02-45 PID/DATA MONITOR INSPECTION [5R55S].) **PCM PIDs (using IDS/PDS):** • APP **TCM PIDs (using IDS/PDS):** • TFT Repair or replace any malfunctioning parts.
		No	Repair the wiring harness. Reconnect the TCM connector.
3	Is the pressure normal? (See 05-13-4 MECHANICAL SYSTEM TEST [5R55S].)	Yes	Go to the next step.
		No	Repair or replace any malfunctioning parts according to the inspection results.
4	Perform the stall test. (See 05-13-4 MECHANICAL SYSTEM TEST [5R55S].) Is stall speed normal?	Yes	Go to the next step.
		No	Go to Step 5.
5	Inspect the voltage at the following TCM PID using the IDS/PDS. (See05-02-45 PID/DATA MONITOR INSPECTION [5R55S].) • TR_D Is the PID value normal?	Yes	Clean and inspect main control, if parts are damaged replace main control. If the problem remains, overhaul the transmission and repair or replace any malfunctioning parts.
		No	Repair or replace any malfunctioning parts.
6	Check the value at the following PCM PIDs using the IDS/PDS. • APP Are the PID values normal?	Yes	Go to the next step.
		No	Repair or replace any malfunctioning parts.
7	Disconnect the TCM connector. Is the resistance between TCM ground terminal CO and body ground, and between TCM ground terminal CL and body ground **less than 5.0 ohms**?	Yes	Go to the next step.
		No	Repair the wiring harness. Reconnect the TCM connector.

STEP	INSPECTION		ACTION
8	Inspect the PCA and PCC PID values. (See 05-02-45 PID/DATA MONITOR INSPECTION [5R55S].) Are the PCA and PCC PID values normal?	Yes	Clean and inspect main control, if parts are damaged replace main control. If the problem remains, overhaul the transmission and repair or replace any malfunctioning parts.
		No	Repair or replace any malfunctioning parts.
9	• Verify test results. — If normal, return to the diagnostic index to service any additional symptoms. — If the malfunction remains, inspect the related Service Information and perform repair or diagnosis. • If the vehicle repaired, the troubleshooting is completed. • If the vehicle the not repaired or additional diagnostic information is not available, replace the TCM.		

NO.18 EXCESSIVE SHIFT SHOCK IS FELT WHEN UPSHIFTING AND DOWNSHIFTING [5R55S]

Id0503c1804600

18	**Excessive shift shock is felt when upshifting and downshifting**
DESCRIPTION	• Excessive shift shock felt when depressing accelerator pedal to accelerate at upshifting. During cruising, excessive shift shock is felt when depressing accelerator pedal at downshifting.
POSSIBLE CAUSE	• Shift shock may worsen when fail-safe is operating. The shift shock may worsen if the signal from the accelerator pedal position sensor, TSS sensor, or OSS sensor has a malfunction. 1. Clutch slipped, burned • Line pressure low, high • Shift solenoid D malfunction • Shift solenoid A malfunction • Shift solenoid B malfunction • Shift solenoid C malfunction • Pressure control solenoid B malfunction • Pressure control solenoid A malfunction • Pressure control solenoid C malfunction • Accelerator pedal position sensor misadjustment • Control valve body malfunction • Body ground malfunction 2. Signal malfunction • TFT sensor malfunction • ISS sensor malfunction • Sensor ground malfunction • Accelerator pedal position sensor malfunction • VSS signal malfunction • IAT sendor malfunction • Digital TR sensor malfunction 3. Poor hydraulic operation (Malfunction in range change) • Low fluid pressure 4. Engine mounts installation • Loose attaching bolts • Worn parts **Note** • Before the following the troubleshooting steps, make sure that the Automatic Transmission On-Board Diagnostic and Automatic Transmission Basic Inspections are conducted. (See 05-03-4 BASIC INSPECTION [5R55S].)

Diagnostic procedure

STEP	INSPECTION		ACTION
1	Inspect the engine mounts for loose tightening bolts or worn parts. Are all engine mounts normal?	Yes	Go to the next step.
		No	Readjust, tighten or replace engine mounts.
2	Perform the stall test. (See 05-13-4 MECHANICAL SYSTEM TEST [5R55S].) Is stall speed normal?	Yes	Go to the next step.
		No	Repair or replace any malfunctioning parts.
3	Check the value at the following PCM PIDs using the IDS/PDS. • APP Are the PID values normal?	Yes	Go to the next step.
		No	Repair or replace any malfunctioning parts.
4	Disconnect the TCM connector. Is the resistance between TCM ground terminal CO and body ground, and between TCM ground terminal CL and body ground **less than 5.0 ohms**?	Yes	Go to the next step.
		No	Repair the wiring harness. Reconnect the TCM connector.
5	Inspect the PCA, PCB and PCC PID values. (See 05-02-45 PID/DATA MONITOR INSPECTION [5R55S].) Are the PCA, PCB and PCC PID values normal?	Yes	Clean and inspect main control, if parts are damaged replace main control. If the problem remains, overhaul the transmission and repair or replace any malfunctioning parts.
		No	Repair or replace any malfunctioning parts.
6	• Verify test results. — If normal, return to the diagnostic index to service any additional symptoms. — If the malfunction remains, inspect the related Service Information and perform repair or diagnosis. • If the vehicle repaired, the troubleshooting is completed. • If the vehicle the not repaired or additional diagnostic information is not available, replace the TCM.		

NO.19 EXCESSIVE SHIFT SHOCK ON TORQUE CONVERTER CLUTCH (TCC) [5R55S]

id0503c1802400

19	Excessive shift shock on torque converter clutch (TCC)
DESCRIPTION	• Strong shock is felt when TCC is engaged.
POSSIBLE CAUSE	• The troubleshooting flow is the same as No.16 "JUDDER UPON TORQUE CONVERTER CLUTCH (TCC) OPERATION".

NO.20 NOISE/VIBRATION FORWARD OR REVERSE [5R55S]

id0503c1814600

20	Noise/vibration forward or reverse
DESCRIPTION	• Transmission noisy in all positions and ranges.
POSSIBLE CAUSE	• Improper fluid level • Transmission shift cable and bracket damaged or misadjusted. • Digital transmission range (TR) sensor damaged • Line pressure high/low • One-way clutch • Transmission oil cooler • Gear • Torque converter **Note** • Before following the troubleshooting steps, make sure that the Automatic Transmission On-Board Diagnostic and Automatic Transmission Basic Inspection are conducted. (See 05-03-4 BASIC INSPECTION [5R55S].)

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**FLUID** • Does the following problem exist? • Improper level.	Yes	Adjust to proper level.
		No	Go to Step 2.
2	**SHIFT LINKAGES (INTERNAL/ EXTERNAL)** • Does the following problem exist? • Transmission shift cable and bracket damaged or misadjusted. Digital transmission range (TR) sensor damaged.	Yes	Inspect for damage. Readjust as required. Repair all damaged components. After repairing linkages, readjust the digital TR sensor. (See 05-13-22 DIGITAL TRANSMISSION RANGE (TR) SENSOR REMOVAL/INSTALLATION [5R55S].)
		No	Go to Step 3.
3	**IMPROPER PRESSURES** • Does the following problem exist? • Improper band/clutch application pressures, line pressure high/low.	Yes	Perform line pressure and stall speed tests. If pressure is high/low, check the pump assembly.
		No	Go to Step 4.
4	**PUMP ASSEMBLY** • Do any of the following problems exist? • Internal leakage, cavitations. • Screws out of torque specification.	Yes	Inspect and repair as required. Tighten screws to specification.
		No	Go to Step 5.
5	**OVERDRIVE ONE-WAY CLUTCH ASSEMBLY** • Does the following problem exist? • One-way clutch damaged, worn, misassembled.	Yes	Repair one-way clutch.
		No	Go to step 6.
6	**REAR ONE-WAY CLUTCH ASSEMBLY** • Does the following problem exist? • One-way clutch damaged, worn, misassembled.	Yes	Repair one-way clutch.
		No	Go to Step 7.
7	**OTHER** • Does the following problem exist? • Transmission oil cooler lines fill tube grounding.	Yes	Relocate transmission oil cooler lines or fill tube properly.
		No	Go to Step 8.
8	**GEAR** • Does the following problem exist? • Gear noise.	Yes	Repair planetary gear assemblies.
		No	Go to Step 9.
9	**TORQUE CONVERTER CLUTCH ASSEMBLY** • Does the following problem exist? • Torque converter internal malfunction preventing lockup piston application.	Yes	Go to symptom troubleshooting NO.16 "JUDDER UPON TORQUE CONVERTER CLUTCH (TCC) OPERATION".
		No	Go to symptom troubleshooting "SYMPTOM TROUBLESHOOTING ITEM TABLE".
10	• Verify test results. — If normal, return to the diagnostic index to service any additional symptoms. — If the malfunction remains, inspect the related Service Information and perform repair or diagnosis. • If the vehicle repaired, the troubleshooting is completed. • If the vehicle the not repaired or additional diagnostic information is not available, replace the TCM.		

NO.21 NO ENGINE BRAKING IN 1GR POSITION OF MANUAL 1 RANGE [5R55S]

id0503c1814000

21	No engine braking in 1GR position of manual 1 range
DESCRIPTION	• Engine speed drops to idle but vehicle coasts when accelerator pedal is released when in 1GR of manual 1 range at low vehicle speed.
POSSIBLE CAUSE	1. Clutch slippage, burned • Line pressure low • Incorrect fluid level • Pressure control solenoid A and B malfunction • Shift solenoid A malfunction • Shift solenoid C malfunction • Shift solenoid D malfunction • Control valve body malfunction • Reverse servo malfunction • Reverse band malfunction • Body ground malfunction 2. Signal malfunction • Accelerator pedal position sensor malfunction • Sensor ground malfunction **Note** • Before the following the troubleshooting steps, make sure that the Automatic Transmission On-Board Diagnostic and Automatic Transmission Basic Inspections are conducted. (See 05-03-4 BASIC INSPECTION [5R55S].)

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Do the following symptoms concurrently occur? — Engine flares up or slips during acceleration. — Engine flares up or slips when shifting.	Yes	Go to symptom troubleshooting NO.14 "ENGINE FLARES UP OR SLIPS WHEN UPSHIFTING OR DOWNSHIFTING" or NO.15 "ENGINE FLARES UP OR SLIPS WHEN ACCELERATING VEHICLE".
		No	Repeat the basic inspection and repair or replace any malfunctioning parts according to the inspection result. (See 05-03-4 BASIC INSPECTION [5R55S].)
2	• Verify test results. — If normal, return to the diagnostic index to service any additional symptoms. — If the malfunction remains, inspect the related Service Information and perform repair or diagnosis. • If the vehicle repaired, the troubleshooting is completed. • If the vehicle the not repaired or additional diagnostic information is not available, replace the TCM.		

NO.22 TRANSMISSION OVERHEATS [5R55S]

id0503c1814100

22	Transmission overheats
DESCRIPTION	• Burnt smell emitted from transmission. • Smoke emitted from transmission.
POSSIBLE CAUSE	• The malfunction maybe restriction in the cooling system. The technician needs to diagnose the complete cooling system. Include coolers, line, and hoses. In addition, overheating of the transmission may be caused by a malfunction of the TFT sensor. 1. Burning (TCC) • Line pressure • Improper fluid level • Control valve body malfunction 2. Oil cooler malfunction (Foreign material mixed ATF) 3. Excessive amount of ATF 4. Torque converter malfunction • TCC control solenoid malfunction • Pressure control solenoid A malfunction • Pressure control solenoid B malfunction • Pressure control solenoid C malfunction • Excessive tow load • Vehicle over load • Engine concern **Note** • Before the following the troubleshooting steps, make sure that the Automatic Transmission On-Board Diagnostic and Automatic Transmission Basic Inspections are conducted. (See 05-03-4 BASIC INSPECTION [5R55S].)

Diagnostic procedure

STEP	INSPECTION		ACTION
1	Inspect oil cooler pipes for bending, damage, corrosion or kinks. Are the oil cooler pipes normal?	Yes	Go to the next step.
		No	Replace any malfunctioning parts.
2	Is the line pressure normal. (See 05-13-4 MECHANICAL SYSTEM TEST [5R55S].)	Yes	Go to the next step.
		No	Repair or replace any malfunctioning parts according to the inspection results.
3	Perform the stall test. (See 05-13-4 MECHANICAL SYSTEM TEST [5R55S].) Is the stall speed normal?	Yes	Go to the next step.
		No	Repair or replace any malfunctioning parts.
4	Check the value at the following PCM PIDs using the IDS/PDS. • TFT • TCC • PCA • PCB • PCC Are the PID values normal?	Yes	Go to the next step.
		No	Repair or replace any malfunctioning parts.
5	Disconnect the TCM connector. Is the resistance between TCM ground terminal CO and body ground, and between TCM ground terminal CL and body ground **less than 5.0 ohms?**	Yes	Go to the next step.
		No	Repair the wiring harness. Reconnect the TCM connector.
6	Inspect pressure control solenoid A, B and C. (See 05-13-34 SOLENOID VALVE INSPECTION [5R55S].) Is it normal?	Yes	Clean and inspect main control and the thermo static bypass valve. If parts are damaged, replace main control. If the problem remains, overhaul the transmission and repair or replace any malfunctioning parts.
		No	Repair or replace any malfunctioning parts.
7	• Verify test results. — If normal, return to the diagnostic index to service any additional symptoms. — If the malfunction remains, inspect the related Service Information and perform repair or diagnosis. • If the vehicle repaired, the troubleshooting is completed. • If the vehicle the not repaired or additional diagnostic information is not available, replace the TCM.		

NO.23 ENGINE STALLS WHEN SHIFTED TO D RANGE, OR IN R POSITION [5R55S]

id0503c1814200

23	Engine stalls when shifted to D range, or in R position
DESCRIPTION	• Engine stalls when shifting from N or P position to D range or R position at idle.
POSSIBLE CAUSE	• The malfunction is on the engine control side (i.e. Electronic throttle control system). Otherwise, the malfunction is in the TSS sensor (engine sometimes starts).

Diagnostic procedure

STEP	INSPECTION		ACTION
1	Go to symptom troubleshooting No.10 "LOW IDLE/STALLS DURING DECELERATION". Is the engine control system normal?	Yes	Repeat basic inspection and repair or replace any malfunctioning parts according to the inspection result. (See 05-03-4 BASIC INSPECTION [5R55S].)
		No	Repair or replace any malfunctioning parts according to the inspection results.
2	• Verify test results. — If normal, return to the diagnostic index to service any additional symptoms. — If the malfunction remains, inspect the related Service Information and perform repair or diagnosis. • If the vehicle repaired, the troubleshooting is completed. • If the vehicle the not repaired or additional diagnostic information is not available, replace the TCM.		

NO.24 ENGINE STALLS WHEN DRIVING AT SLOW SPEEDS OR STOPPING [5R55S]

id0503c1814300

24	Engine stalls when driving at slow speeds or stopping
DESCRIPTION	• Engine stalls when brake pedal is depressed while driving at low speed or stopping.
POSSIBLE CAUSE	• The malfunction on engine control side (e.g. Fuel injection control, Electronic throttle control system) Otherwise, the malfunction is in the control valve body, TCC control solenoid or TCC and one-way clutch.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	Go to symptom troubleshooting No.10 "LOW IDLE/STALLS DURING DECELERATION". Is the engine control system normal?	Yes	Go to the next step.
		No	Repair or replace any malfunctioning parts according to inspection results.
2	Go to symptom troubleshooting No.5 "ENGINE STALLS-AFTER START/AT IDLE". Is the engine control system normal?	Yes	Repeat the basic inspection and repair or replace any malfunctioning parts according to the inspection result. (See 05-03-4 BASIC INSPECTION [5R55S].)
		No	Repair or replace any malfunctioning parts according to the inspection results.
3	• Verify test results. — If normal, return to the diagnostic index to service any additional symptoms. — If the malfunction remains, inspect the related Service Information and perform repair or diagnosis. • If the vehicle repaired, the troubleshooting is completed. • If the vehicle the not repaired or additional diagnostic information is not available, replace the TCM.		

NO.25 STARTER DOES NOT WORK [5R55S]

id0503c1814400

25	Starter does not work
DESCRIPTION	• Starter does not work even when in P or N position.
POSSIBLE CAUSE	• Selector lever misadjustment • Digital TR sensor misadjustment • Open or short circuit in digital TR sensor • TCM malfunction • Vehicle harnesses • Shift cable misadjustment • Fluid pump • Torque converter

TRANSMISSION/TRANSAXLE

05 SECTION

CLUTCH 05-10
MANUAL TRANSMISSION [R15M-D] 05-11A
MANUAL TRANSMISSION [S15M-D, S15MX-D] 05-11B
TECHNICAL DATA 05-50
SERVICE TOOLS 05-60

05-10 CLUTCH

CLUTCH LOCATION INDEX 05-10–2
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CLUTCH FLUID INSPECTION 05-10–3
CLUTCH FLUID AIR BLEEDING/REPLACEMENT 05-10–3
CLUTCH PEDAL ADJUSTMENT 05-10–4
CLUTCH PEDAL REMOVAL/INSTALLATION 05-10–5
CLUTCH PEDAL DISASSEMBLY/ASSEMBLY 05-10–6
CLUTCH MASTER CYLINDER REMOVAL/INSTALLATION 05-10–6
CLUTCH MASTER CYLINDER DISASSEMBLY/ASSEMBLY 05-10–8
CLUTCH RELEASE CYLINDER REMOVAL/INSTALLATION 05-10–10
CLUTCH RELEASE CYLINDER DISASSEMBLY/ASSEMBLY 05-10–11
CLUTCH UNIT REMOVAL/INSTALLATION 05-10–12
CLUTCH COVER INSPECTION 05-10–16
CLUTCH DISC INSPECTION 05-10–17
CLUTCH RELEASE COLLAR INSPECTION 05-10–17
PILOT BEARING INSPECTION 05-10–18
FLYWHEEL INSPECTION [R15M-D] 05-10–18
DUAL-MASS FLYWHEEL INSPECTION [S15M-D, S15MX-D] 05-10–19

CLUTCH LOCATION INDEX

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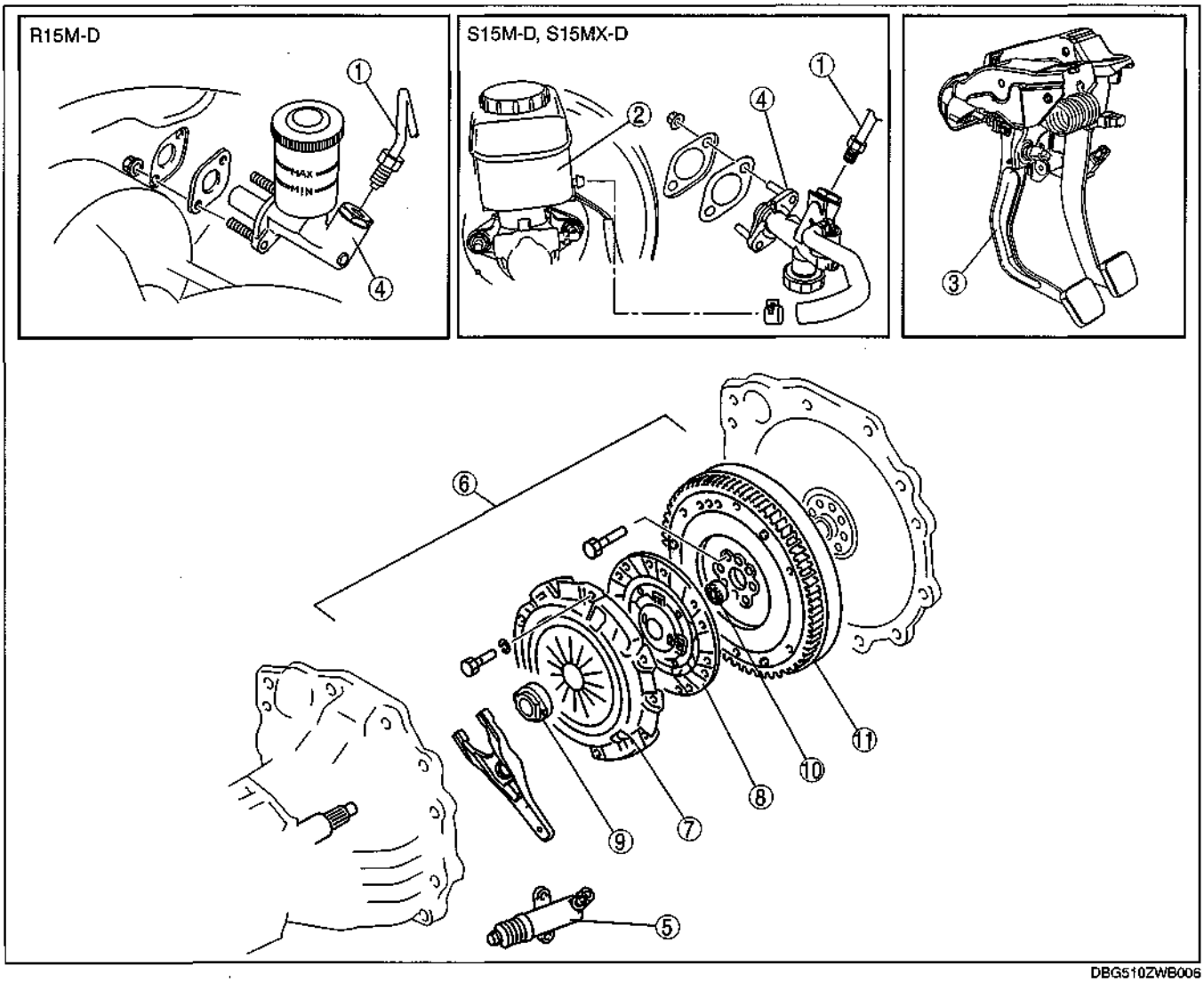


DBG510ZWB006

1	Clutch pipe (See 05-10-3 GENERAL PROCEDURES (CLUTCH).)
2	Brake fluid reservoir tank (See 05-10-3 CLUTCH FLUID INSPECTION.) (See 05-10-3 CLUTCH FLUID AIR BLEEDING/ REPLACEMENT.)
3	Clutch pedal (See 05-10-4 CLUTCH PEDAL ADJUSTMENT.) (See 05-10-5 CLUTCH PEDAL REMOVAL/ INSTALLATION.)
4	Clutch master cylinder (See 05-10-6 CLUTCH MASTER CYLINDER REMOVAL/INSTALLATION.) (See 05-10-8 CLUTCH MASTER CYLINDER DISASSEMBLY/ASSEMBLY.)
5	Clutch release cylinder (See 05-10-10 CLUTCH RELEASE CYLINDER REMOVAL/INSTALLATION.) (See 05-10-11 CLUTCH RELEASE CYLINDER DISASSEMBLY/ASSEMBLY.)

6	Clutch unit (See 05-10-12 CLUTCH UNIT REMOVAL/ INSTALLATION.)
7	Clutch cover (See 05-10-16 CLUTCH COVER INSPECTION.)
8	Clutch disc (See 05-10-17 CLUTCH DISC INSPECTION.)
9	Clutch release collar (See 05-10-17 CLUTCH RELEASE COLLAR INSPECTION.)
10	Pilot bearing (See 05-10-18 PILOT BEARING INSPECTION.)
11	Flywheel [R15M-D] or dual-mass flywheel [S15M-D, S15MX-D] (See 05-10-18 FLYWHEEL INSPECTION [R15M-D].) (See 05-10-19 DUAL-MASS FLYWHEEL INSPECTION [S15M-D, S15MX-D].)

GENERAL PROCEDURES (CLUTCH)

dcf051016003w02

Caution
- **Fluid will damage painted surfaces. Be careful not to spill any fluid on painted surfaces. If fluid does get on painted surfaces, wipe it off immediately.**

Note
- If any hydraulic related parts of the clutch system are removed during the procedure, add clutch fluid (brake fluid), bleed air from the system and inspect for leakage after the procedure has been completed.

1. Remove the clutch pipe using the **SST** (49 0259 770B).
2. Install the clutch pipe using a torque wrench and the **SST** (49 0259 770B).

CLUTCH FLUID INSPECTION

dcf051016010w01

1. Inspect whether the fluid level in the clutch fluid (brake fluid) reservoir tank is between MIN and MAX.

CLUTCH FLUID AIR BLEEDING/REPLACEMENT

dcf051016010w02

Caution
- **Fluid will damage painted surfaces. Be careful not to spill any on painted surfaces. If fluid does get on painted surfaces, wipe it off immediately.**
- **Keep the fluid level in the reserve tank at 3/4 full or more during air bleeding.**

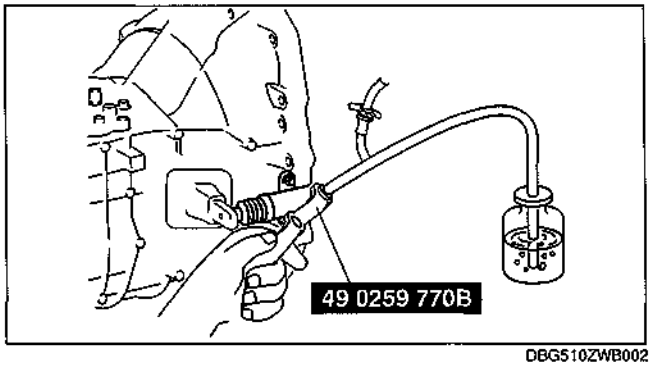
Note
- When replacing the fluid, drain the old fluid, fill the reserve tank with new fluid and then perform Steps 1—7 below.

Specified fluid
SAE J1703, FMVSS 116 DOT-3

1. Remove the bleeder cap from the clutch release cylinder, and connect a vinyl hose to the bleeder plug.
2. Place the other end of the vinyl tube in a clear container, and fill fluid in the container during air bleeding.
3. Working with two people, one should depress the clutch pedal a few times and then depress and hold the pedal down.
4. While the clutch pedal is being held down, the other person should loosen the bleeder screw using the **SST**, and bleed any fluid containing air bubbles. Once completed, tighten the bleeder screw.
5. Continue to perform Steps 3 and 4 until no air comes from the vinyl hose.
6. Tighten the bleeder screw using the **SST**.

Tightening torque
5.9—8.8 N·m {61—89 kgf·cm, 53—77 in·lbf}

7. Fill the reserve tank to MAX with the recommended fluid.
8. Perform the following inspections:
   - Clutch operation
   - Fluid leakage
   - Fluid level



DBG510ZWB002

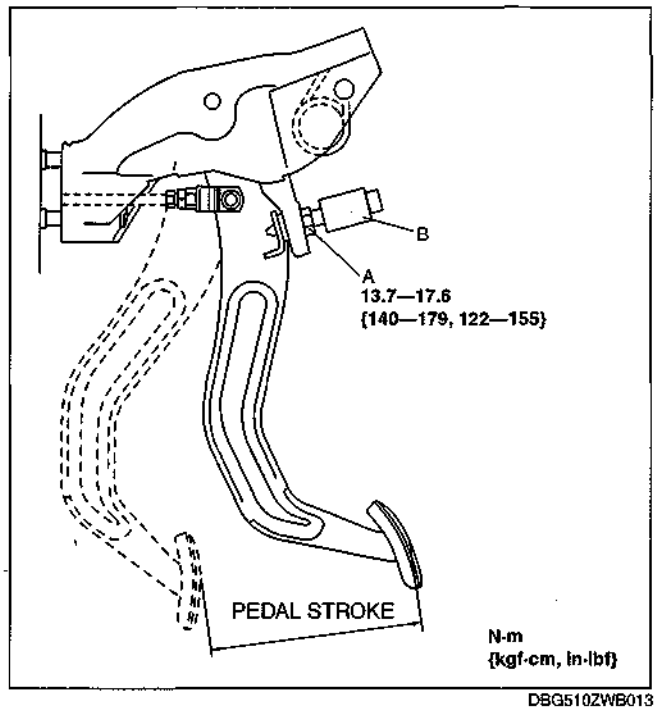
CLUTCH PEDAL ADJUSTMENT

dcf051041030w01

Clutch Pedal Stroke Inspection/Adjustment

1. Measure the clutch pedal stroke.
   - If there is any malfunction, loosen locknut A and adjust the pedal stroke by clutch switch B. Tighten locknut A after adjustment.

Clutch pedal stroke
152 mm {5.98 in}



DBG510ZWB013

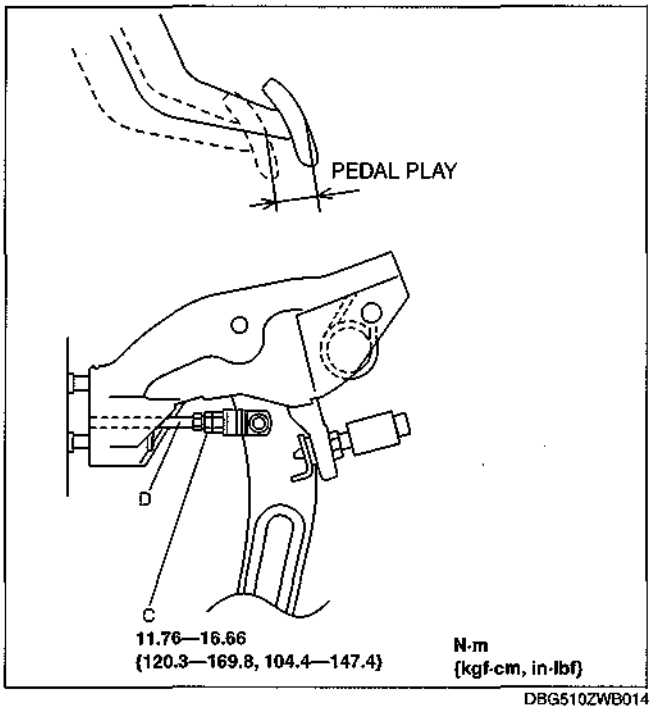
Clutch Pedal Play Inspection/Adjustment

1. Lightly depress the clutch pedal by hand until clutch resistance is felt and then measure the pedal play.

Clutch pedal play
5—15 mm {0.20—0.59 in}

Clutch pedal push rod play (Reference value)
0.1—0.5 mm {0.004—0.020 in}

2. If it is not within the specification, loosen locknut C and turn push rod D to adjust the pedal play.
3. Remeasure the pedal play and, if it is within the specification, tighten locknut C.



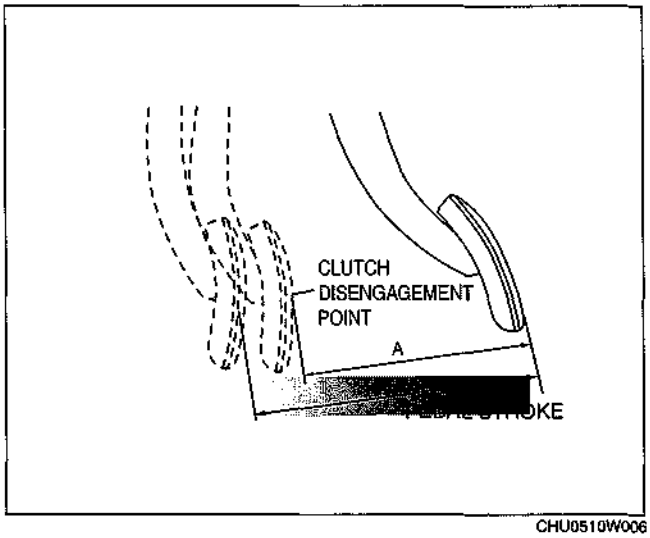
DBG510ZWB014

Clutch Disengagement Point Inspection

1. Start the engine.
2. Without depressing the clutch pedal, move the shift lever slowly to the reverse position until gear noise is heard and hold the lever in that position.
3. Slowly depress the clutch pedal and hold at the point where the gear noise stops (clutch disengagement point).
4. Measure distance A (from pedal not depressed to clutch disengagement point) and verify that it is within the specification.

Clutch disengagement stroke (Reference value) [R15M-D]
A: 100—130 mm {3.94—5.11 in}

Clutch disengagement stroke (Reference value) [S15M-D, S15MX-D]
A: 110—125 mm {4.34—4.92 in}



CHU0510W006

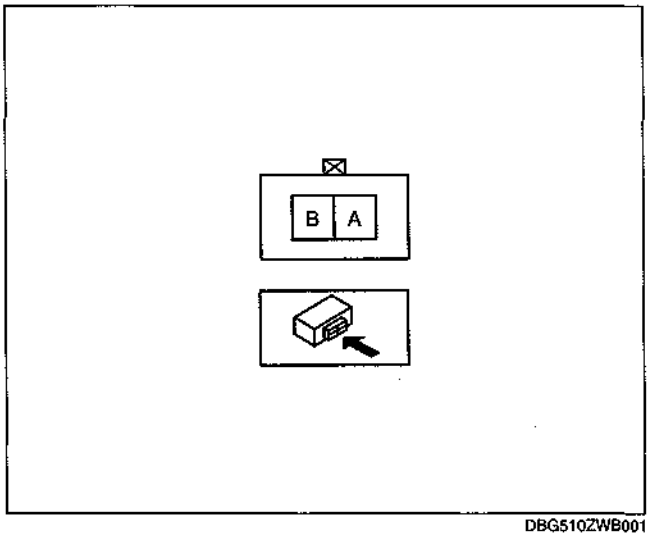
Clutch Switch Inspection

1. Disconnect the negative battery cable.
2. Disconnect the clutch switch connector.
3. Verify continuity as indicated in the table.

○—○ : Continuity

Condition	Terminal	
	A	B
Clutch pedal depressed	○	○
Clutch pedal released		

CHU0510W007



DBG510ZWB001

- If there is any malfunction, replace the clutch switch.

CLUTCH PEDAL REMOVAL/INSTALLATION

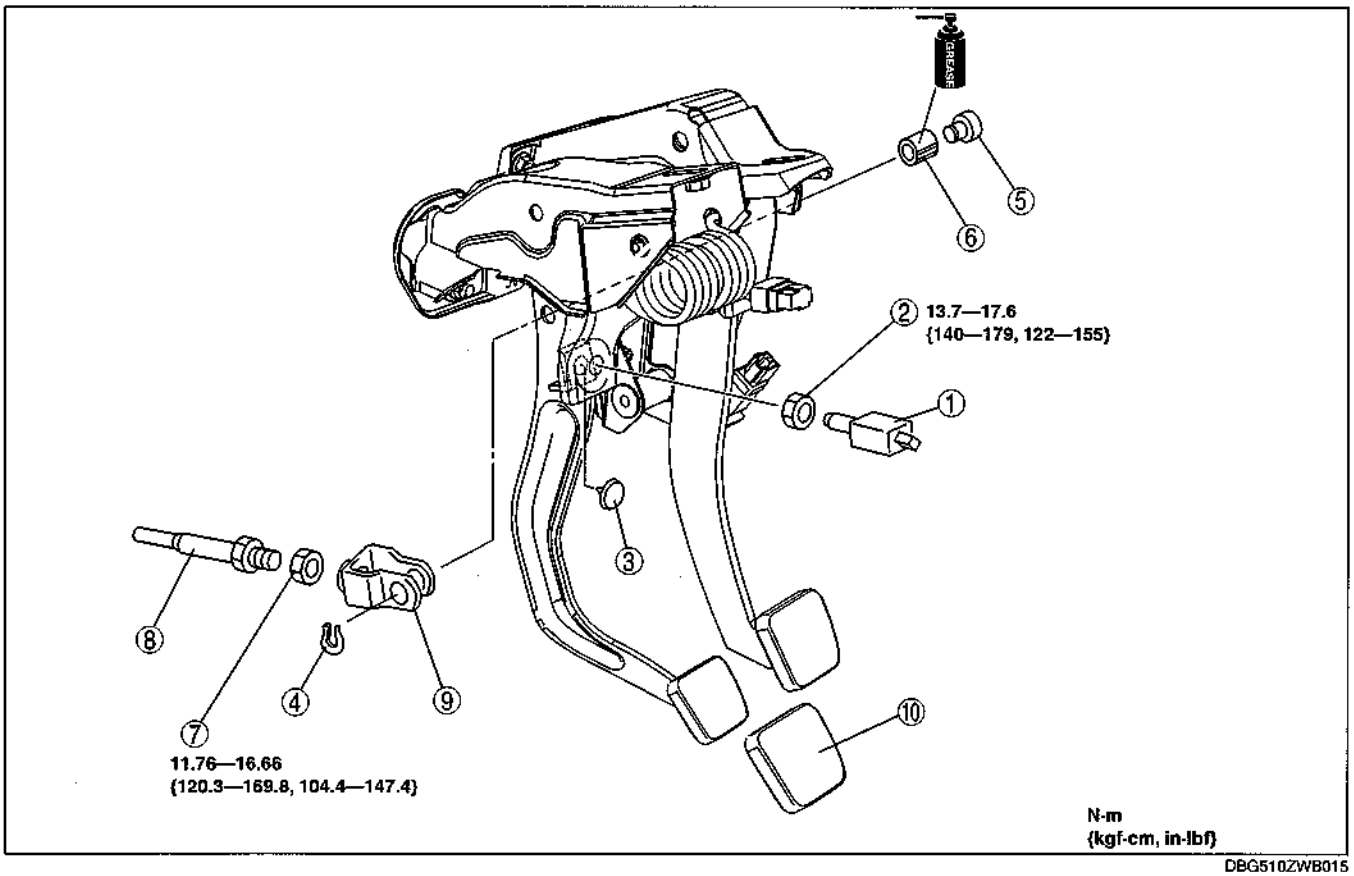
dcf051041030w02

1. The clutch pedal is mounted on the bracket integrated with the brake pedal and accelerator pedal. Refer to section 01, INTAKE AIR SYSTEM, ACCELERATOR PEDAL REMOVAL/INSTALLATION for the brake pedal removal/installation. (See 01-13A-9 ACCELERATOR PEDAL COMPONENT REMOVAL/INSTALLATION [WL-3].) (See 01-13B-11 ACCELERATOR PEDAL COMPONENT REMOVAL/INSTALLATION [WL-C, WE-C].)

CLUTCH PEDAL DISASSEMBLY/ASSEMBLY

dcf051041030w03

1. Remove the accelerator pedal component. (See 01-13A-9 ACCELERATOR PEDAL COMPONENT REMOVAL/INSTALLATION [WL-3].) (See 01-13B-11 ACCELERATOR PEDAL COMPONENT REMOVAL/INSTALLATION [WL-C, WE-C].)
2. Remove in the order indicated in the table.
3. Install in the reverse order of removal.
4. Inspect and adjust the clutch pedal. (See 05-10-4 CLUTCH PEDAL ADJUSTMENT.)



DBG510ZWB015

1	Clutch switch
2	Nut
3	Stopper rubber
4	Retaining ring
5	Pin

6	Bush
7	Nut
8	Push rod
9	Fork
10	Pedal pad

CLUTCH MASTER CYLINDER REMOVAL/INSTALLATION

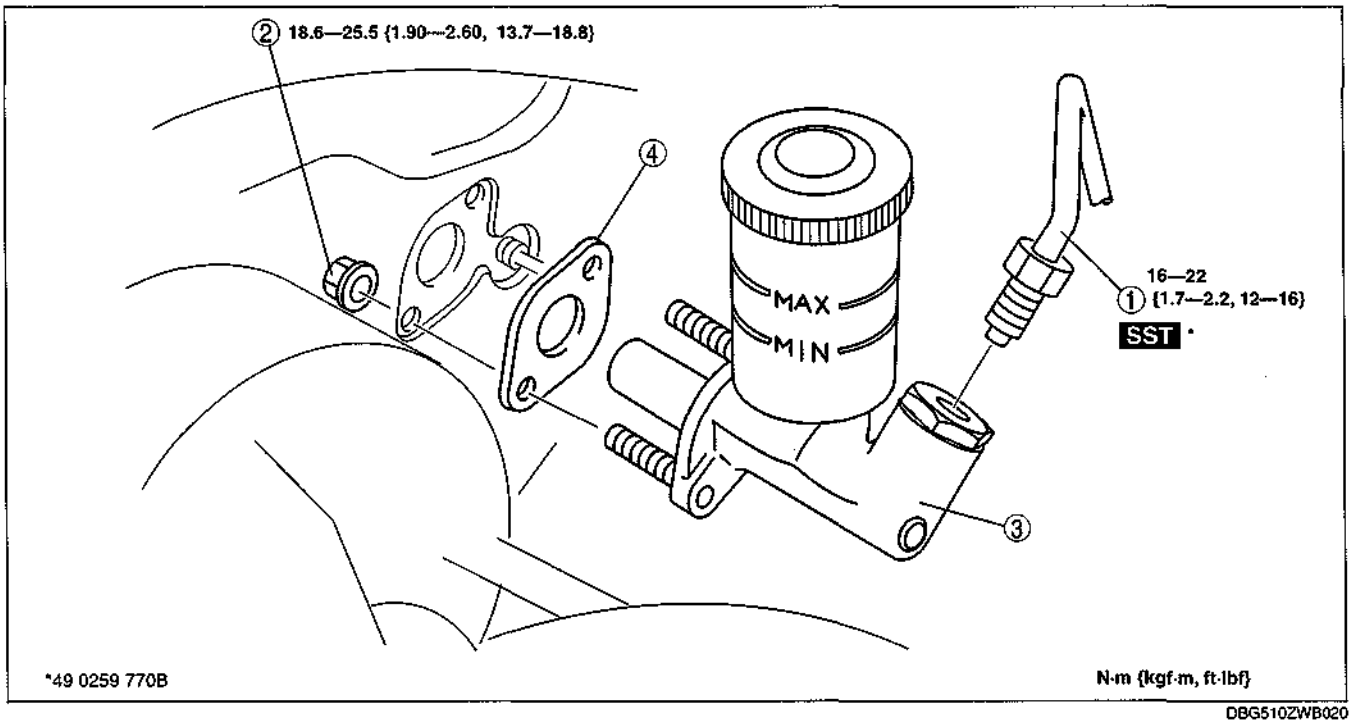
dcf051041990w01

Caution

- **Fluid will damage painted surfaces. Be careful not to spill any fluid on painted surfaces. If it is spilled, wipe it off immediately.**

1. Remove in the order indicated in the table.
2. Install in the reverse order of removal.
3. Bleed the air from the system.
   (See 05-10-3 CLUTCH FLUID AIR BLEEDING/REPLACEMENT.)
4. Inspect and adjust the clutch pedal.
   (See 05-10-4 CLUTCH PEDAL ADJUSTMENT.)

R15M-D

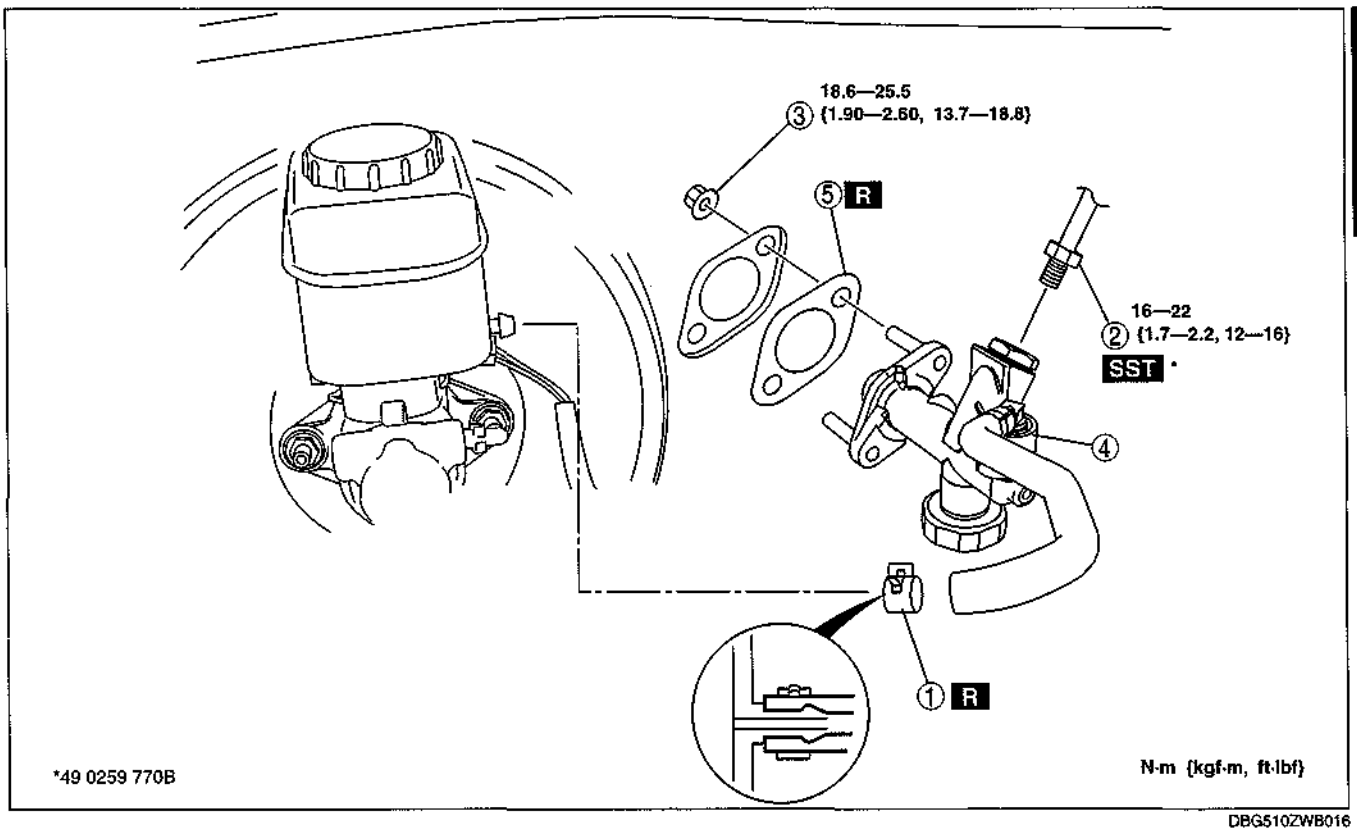


DBG510ZWB020

1	Clutch pipe
2	Nut

3	Clutch master cylinder
4	Packing

S15M-D, S15MX-D



DBG510ZWB016

1	Hose clip
2	Clutch pipe
3	Nut

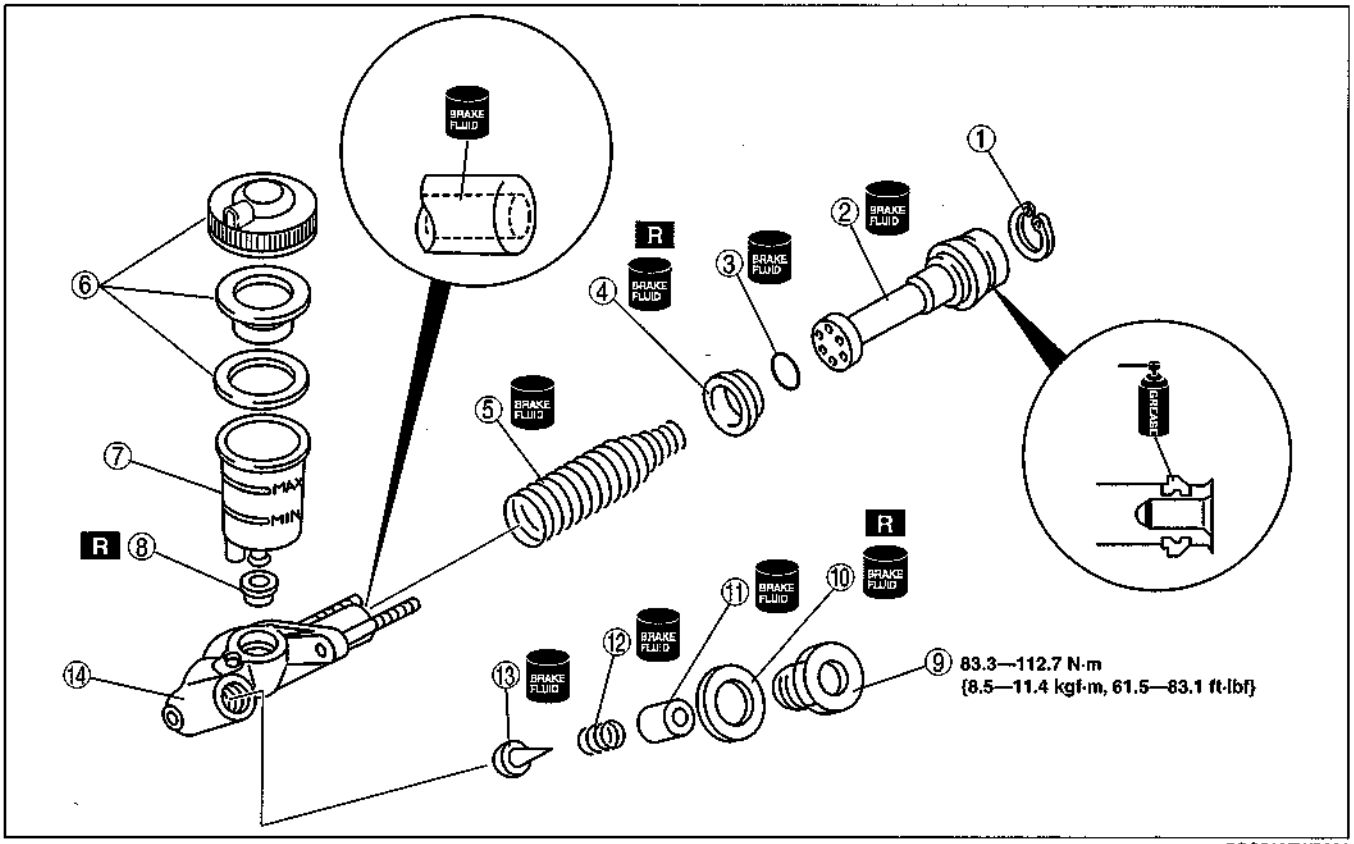
4	Clutch master cylinder
5	Packing

CLUTCH MASTER CYLINDER DISASSEMBLY/ASSEMBLY

dcf051041990w02

1. Disassemble in the order indicated in the table.
2. Assemble in the reverse order of disassembly.

R15M-D

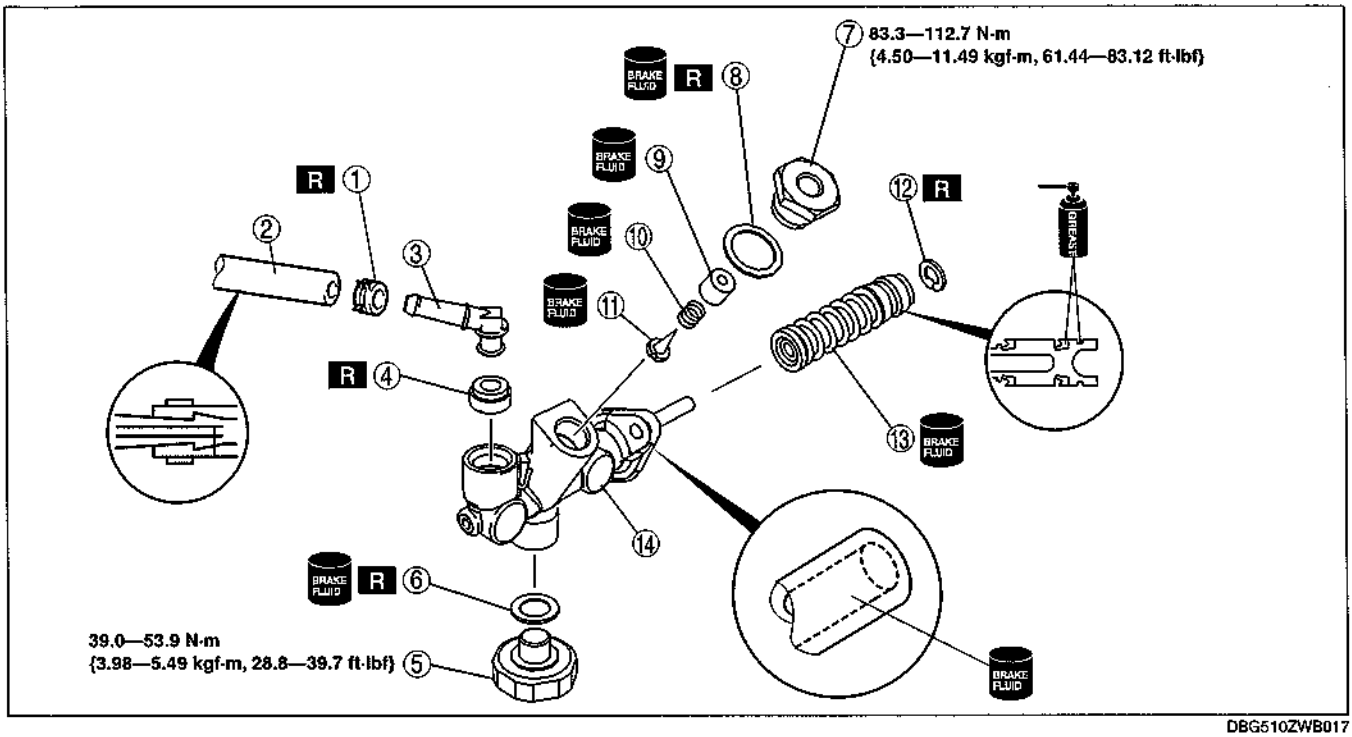


DBG510ZWB021

1	Snap ring (See 05-10-9 Snap Ring Disassembly/Assembly Note.)
2	Piston
3	Spacer
4	Primary cup
5	Return spring
6	Tank cap

7	Reservoir
8	Bushing
9	Joint bolt
10	Packing
11	One-way valve piston
12	Return spring
13	One-way valve pin
14	Clutch master cylinder body

S15M-D, S15MX-D



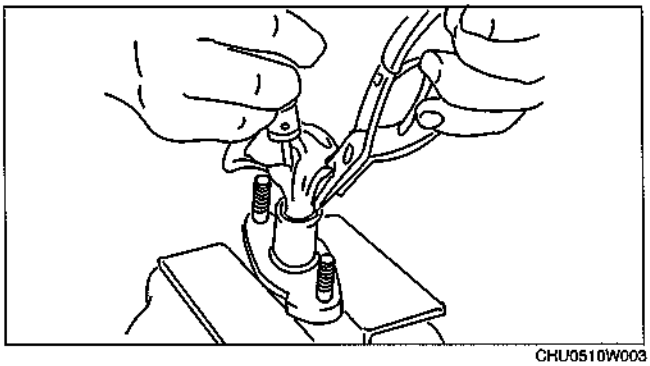
DBG510ZWB017

1	Hose clip
2	Reserve tank hose
3	Joint
4	Bushing
5	Clutch damper
6	Packing
7	Joint bolt
8	Packing

9	One-way valve piston
10	Return spring
11	One-way valve pin
12	Snap ring (See 05-10-9 Snap Ring Disassembly/Assembly Note.)
13	Piston component
14	Clutch master cylinder body

Snap Ring Disassembly/Assembly Note

1. While pressing the piston in with a cloth-wrapped pin punch to protect the push rod contacting surface, remove/install the snap ring.



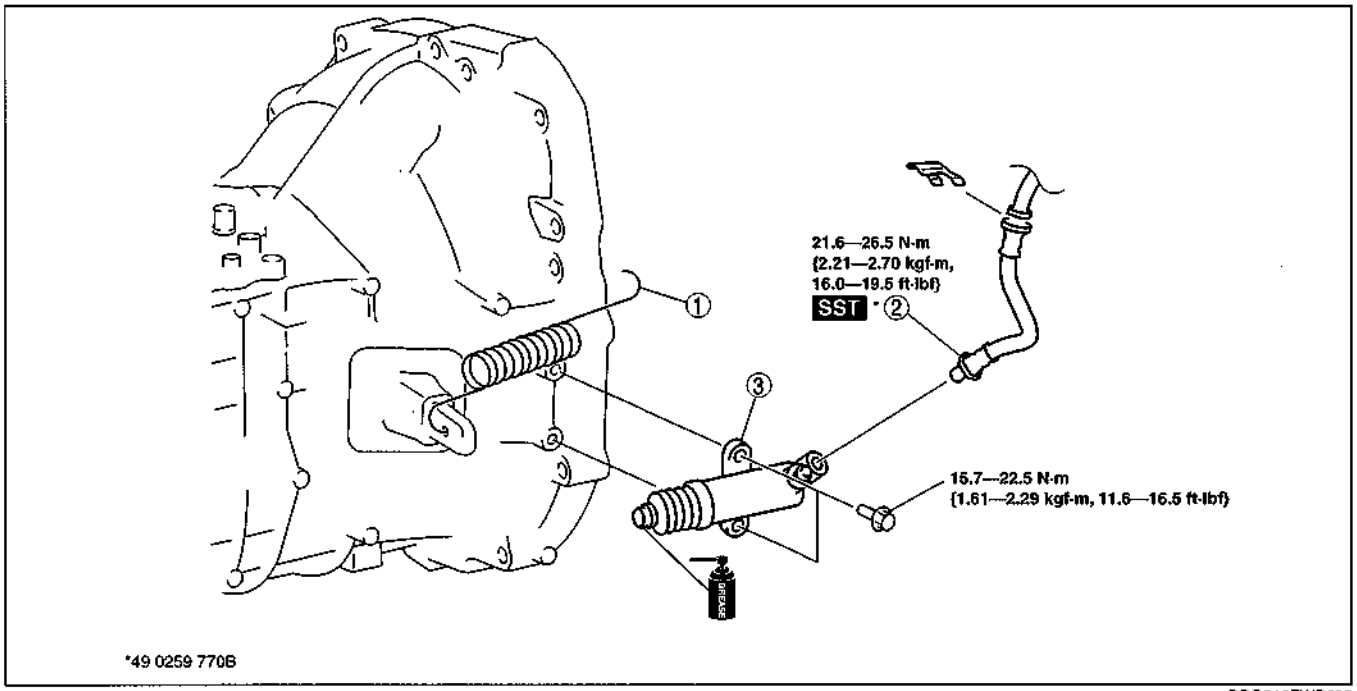
CRU0510W003

CLUTCH RELEASE CYLINDER REMOVAL/INSTALLATION

dcf051041920w01

Caution
- **Fluid will damage painted surfaces. Be careful not to spill any fluid on painted surfaces. If fluid does get on painted surfaces, wipe it off immediately.**

1. Remove in the order indicated in the table.
2. Install in the reverse order of removal.
3. Bleed the air from the system.
   (See 05-10-3 CLUTCH FLUID AIR BLEEDING/REPLACEMENT.)
4. Inspect and adjust the clutch pedal.
   (See 05-10-4 CLUTCH PEDAL ADJUSTMENT.)



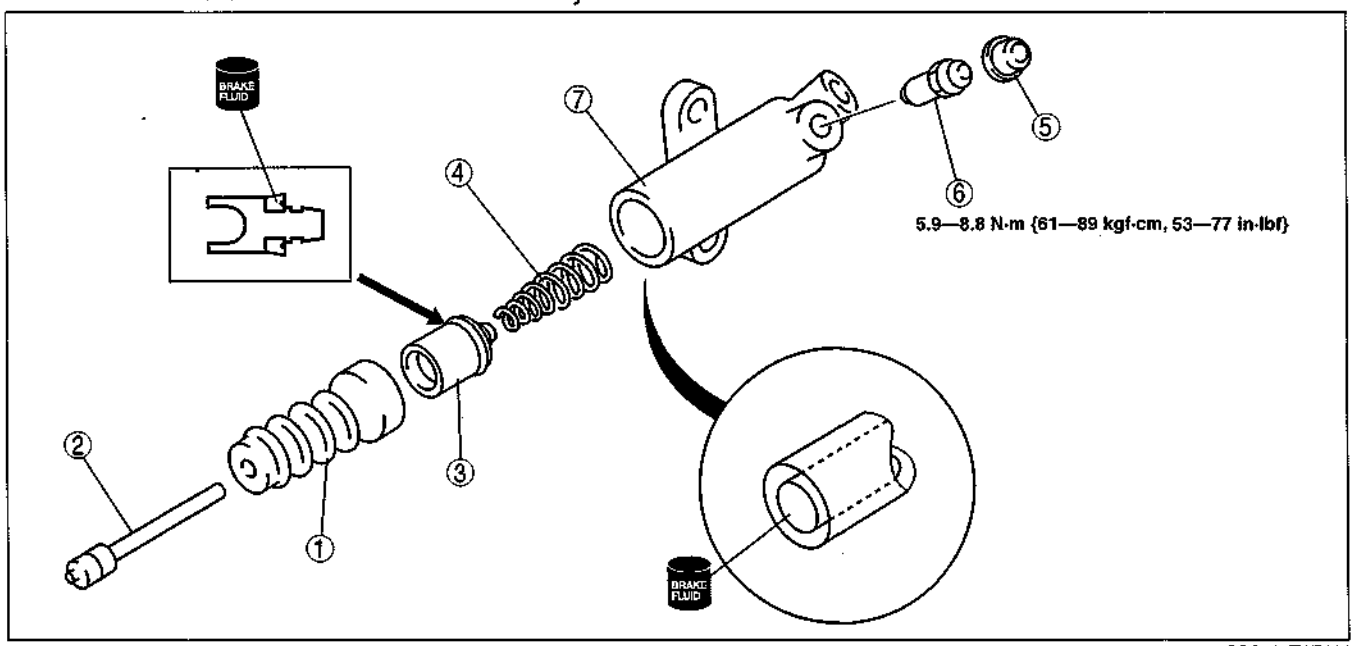
DBG510ZWB003

1	Return spring (S15M-D, S15MX-D)
2	Clutch hose
3	Clutch release cylinder

CLUTCH RELEASE CYLINDER DISASSEMBLY/ASSEMBLY

dcf051041920w02

1. Disassemble in the order indicated in the table.
2. Assemble in the reverse order of disassembly.



DBG510ZWB004

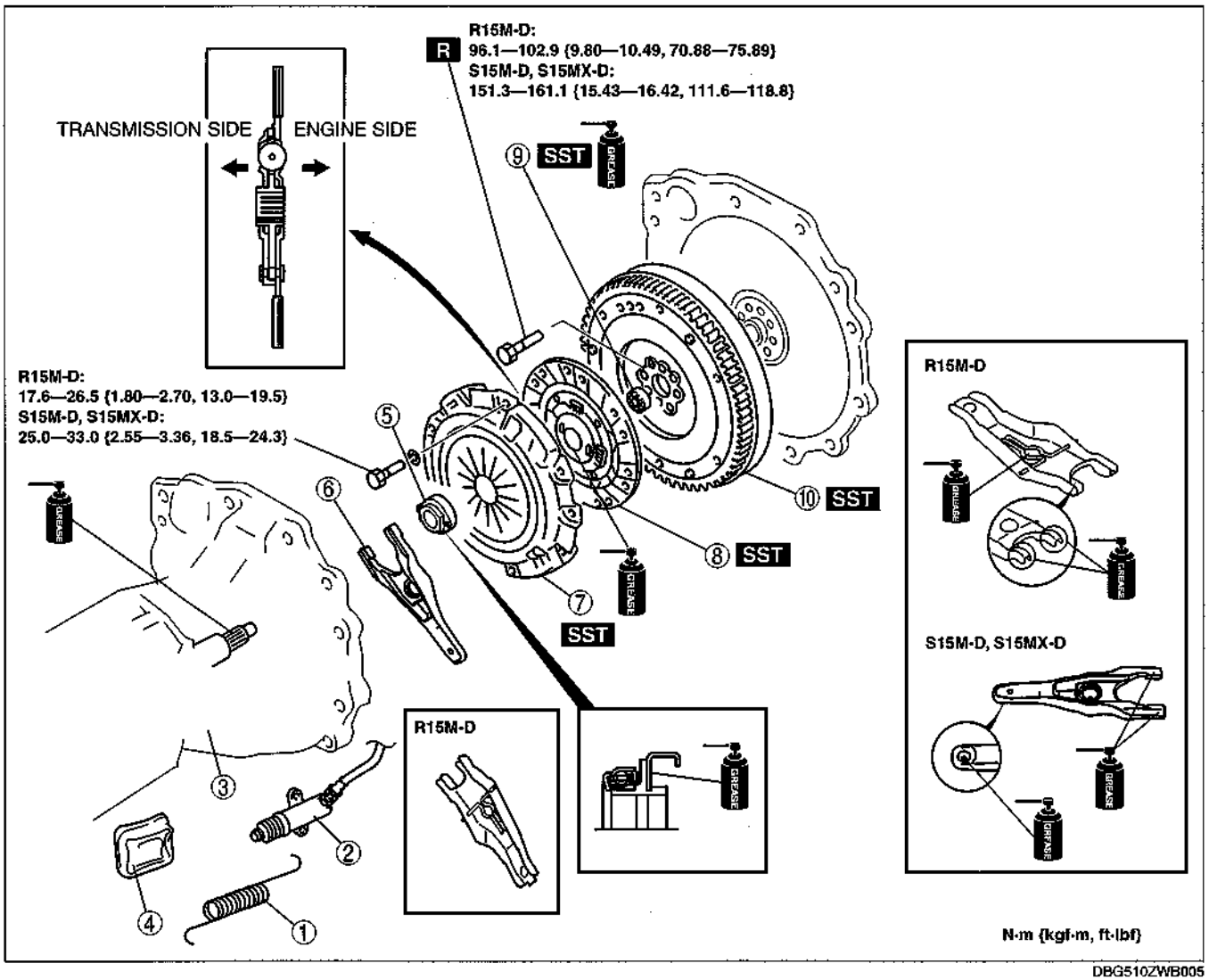
1	Boot
2	Push rod
3	Piston, piston cup component
4	Return spring

5	Bleeder cap
6	Bleeder screw
7	Clutch release cylinder body

CLUTCH UNIT REMOVAL/INSTALLATION

dcf051016000w01

1. Remove in the order indicated in the table.
2. Install in the reverse order of removal.



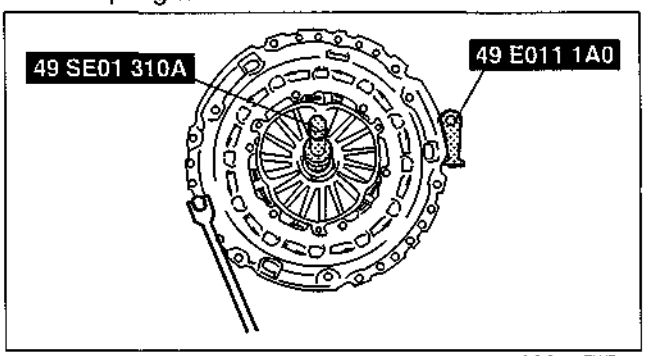
DBG510ZWB005

1	Return spring (S15M-D, S15MX-D)
2	Clutch release cylinder (See 05-10-10 CLUTCH RELEASE CYLINDER REMOVAL/INSTALLATION.)
3	Manual transmission (See 05-11A-5 TRANSMISSION REMOVAL/INSTALLATION [R15M-D].) (See 05-11B-5 TRANSMISSION REMOVAL/INSTALLATION [S15M-D].) (See 05-11B-10 TRANSMISSION AND TRANSFER REMOVAL/INSTALLATION [S15MX-D].)
4	Boot
5	Clutch release collar (See 05-10-17 CLUTCH RELEASE COLLAR INSPECTION.)
6	Clutch release fork
7	Clutch cover (See 05-10-13 Clutch Cover and Disc Removal Note.) (See 05-10-15 Clutch Cover Installation Note.)
8	Clutch disc (See 05-10-13 Clutch Cover and Disc Removal Note.) (See 05-10-15 Clutch Disc Installation Note.)
9	Pilot bearing [R15M-D] (See 05-10-13 Pilot Bearing Removal Note [R15M-D].) (See 05-10-14 Pilot Bearing Installation Note [R15M-D].)
10	Flywheel [R15M-D] or dual-mass flywheel [S15M-D, S15MX-D] (See 05-10-14 Flywheel [R15M-D] or Dual-Mass Flywheel [S15M-D, S15MX-D] Removal Note.) (See 05-10-15 Flywheel [R15M-D] or Dual-Mass Flywheel [S15M-D, S15MX-D] Installation Note.)

Clutch Cover and Disc Removal Note

Caution
- **When replacing components, always replace as a complete set. [S15M-D, S15MX-D]**
- **Due to the automatic adjustment function of clutch cover, if the old cover assembly is reused, it must be reinstalled together with its original clutch disc. [S15M-D, S15MX-D]**

1. Install the **SSTs**.
2. Loosen each bolt one turn at a time in a crisscross pattern until spring tension is released.
3. Remove the clutch cover and disc.

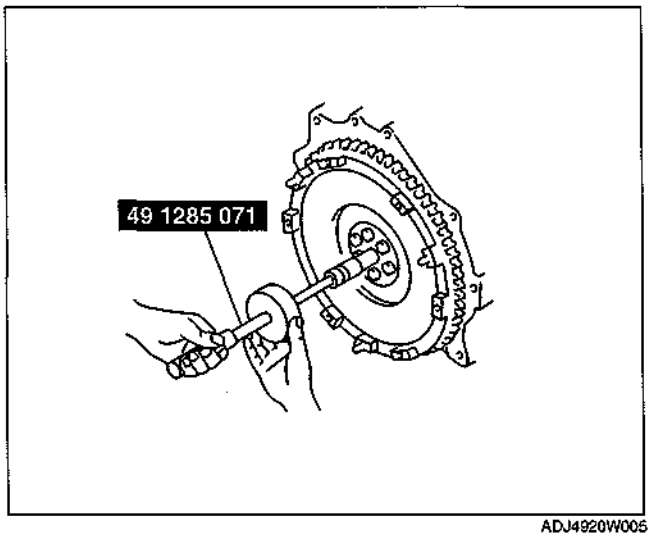


DBG510ZWB008

Pilot Bearing Removal Note [R15M-D]

Note
- The pilot bearing does not need to be removed unless you are replacing it.

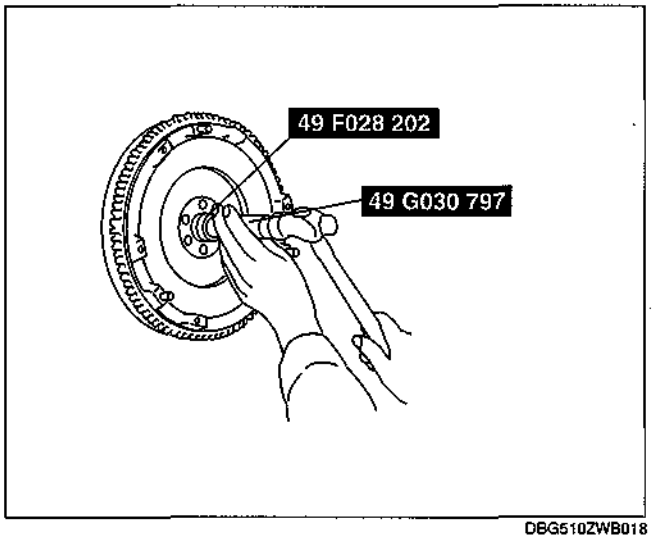
1. Use the **SST** to remove the pilot bearing.



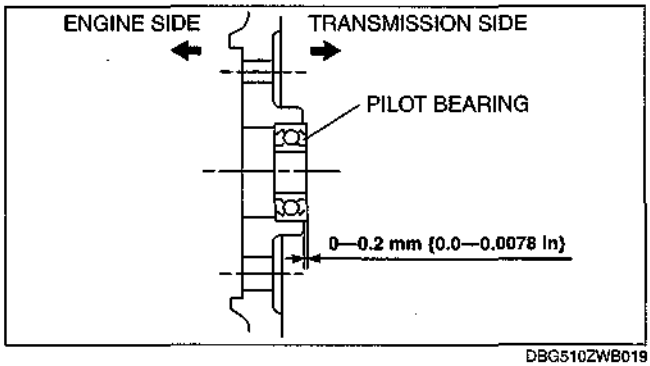
ADJ4920W005

Pilot Bearing Installation Note [R15M-D]

1. Use the **SSTs** to install the pilot bearing.



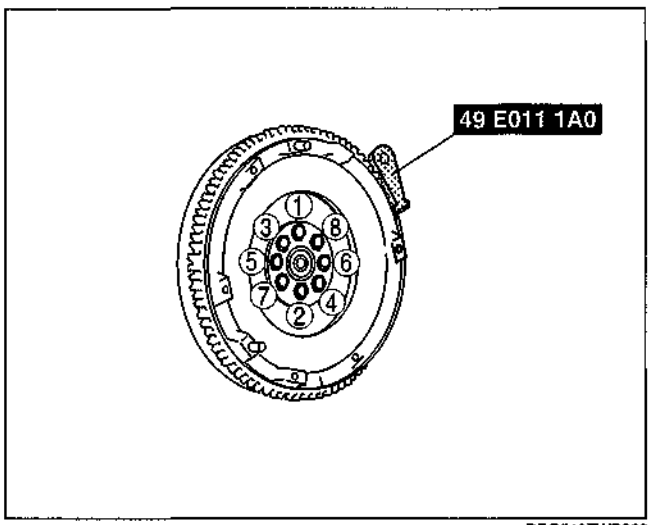
DBG510ZWB018



DBG510ZWB019

Flywheel [R15M-D] or Dual-Mass Flywheel [S15M-D, S15MX-D] Removal Note

1. Hold the flywheel or dual-mass flywheel using the **SST**.
2. Remove the bolts evenly and gradually in a crisscross pattern.
3. Remove the flywheel or dual-mass flywheel.
4. Inspect for oil leakage from the crankshaft rear oil seal.
   - If there is any malfunction, replace the crankshaft rear oil seal.
     (See 01-10A-17 REAR OIL SEAL REPLACEMENT [WL-3].)
     (See 01-10B-18 REAR OIL SEAL REPLACEMENT [WL-C, WE-C].)

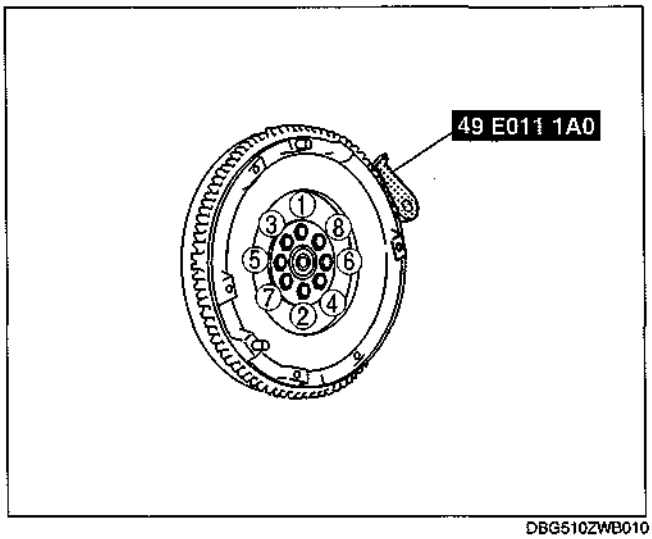


DBG510ZWB009

Flywheel [R15M-D] or Dual-Mass Flywheel [S15M-D, S15MX-D] Installation Note

1. Clean the crankshaft thread holes.
2. Install the flywheel or dual-mass flywheel to the crankshaft.
3. Hand-tighten the flywheel lock bolts or dual-mass flywheel lock bolts.
4. Install the **SST** to the flywheel or dual-mass flywheel.
5. Gradually tighten the flywheel lock bolts or dual-mass flywheel lock bolts in a crisscross pattern.

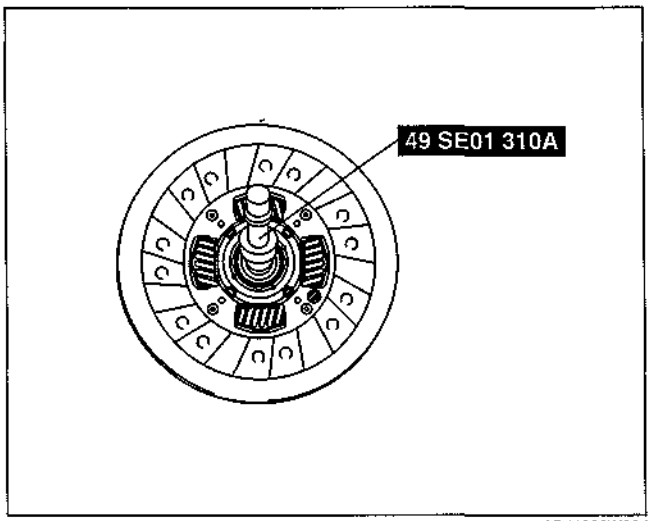
Tightening torque
R15M-D: 96.1—102.9 N·m {9.80—10.49 kgf·m, 70.88—75.89 ft·lbf}
S15M-D, S15MX-D: 151.3—161.1 N·m {15.43—16.42 kgf·m, 111.6—118.8 ft·lbf}



DBG510ZWB010

Clutch Disc Installation Note

1. Hold the clutch disc position using the **SST**.

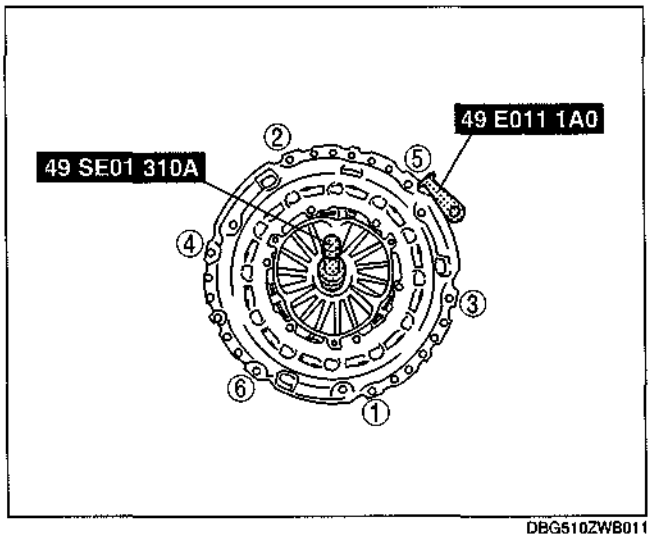


ADJ4920W004

Clutch Cover Installation Note

1. Install the **SSTs**.
2. Tighten the bolts evenly and gradually in a crisscross pattern.

Tightening torque
R15M-D: 17.6—26.5 N·m {1.80—2.70 kgf·m, 13.0—19.5 ft·lbf}
S15M-D, S15MX-D: 25.0—33.0 N·m {2.55—3.36 kgf·m, 18.5—24.3 ft·lbf}



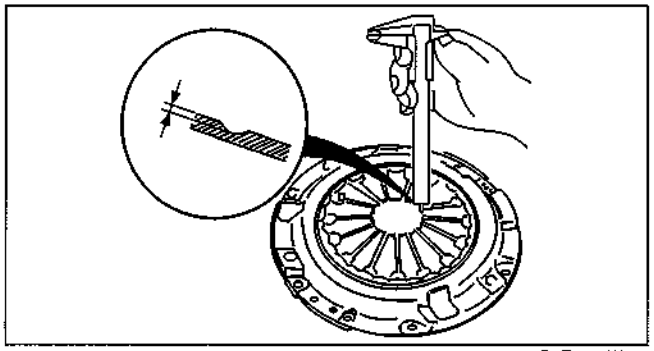
DBG510ZWB011

CLUTCH COVER INSPECTION

dcf051016410w01

1. Measure the wear of the diaphragm spring fingers.
   - If it exceeds the maximum specification, replace the clutch cover.

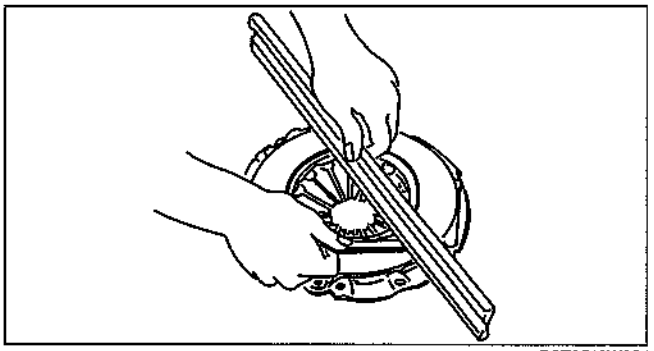
   Clutch disc maximum depth
   0.6 mm {0.024 in}



B3E0510W023

2. Measure the flatness of the pressure plate with a straight edge and a feeler gauge.
   - If it exceeds the maximum specification, replace the clutch cover.

   Clutch cover maximum clearance
   0.3 mm {0.012 in}

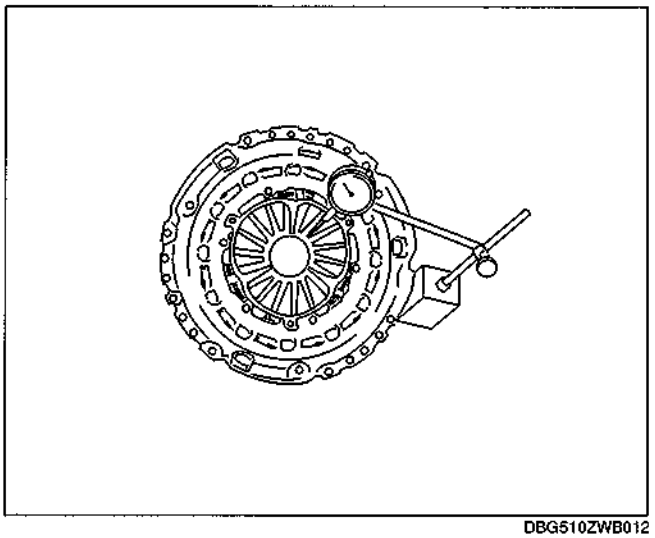


B3E0510W024

3. When checking the diaphragm spring fingers, mount a dial indicator on the cylinder block.

4. Rotate the flywheel or dual-mass flywheel and check for misaligned diaphragm spring fingers.
   - If it exceeds the maximum specification, replace the clutch cover.

   Clutch cover maximum height difference
   1.0 mm {0.039 in}



DBG510ZWB012

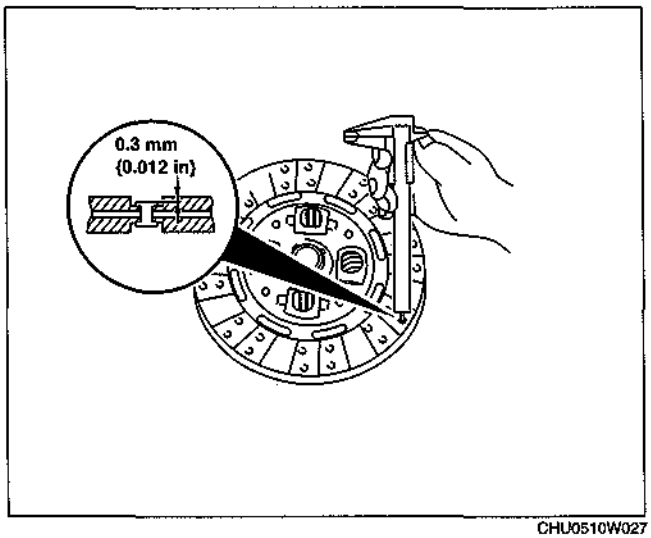
CLUTCH DISC INSPECTION

dcf051016460w01

1. Remove the clutch disc.
2. Inspect the lining surface for discoloration and grease/oil contamination.
3. Inspect the torsion spring for weakness and the rivet for looseness.
4. Using a vernier caliper, measure the depth between the lining surface and the rivet head.

   Clutch disc minimum depth
   0.3 mm {0.012 in}

   - If it is less than the minimum specification, replace the clutch disc.

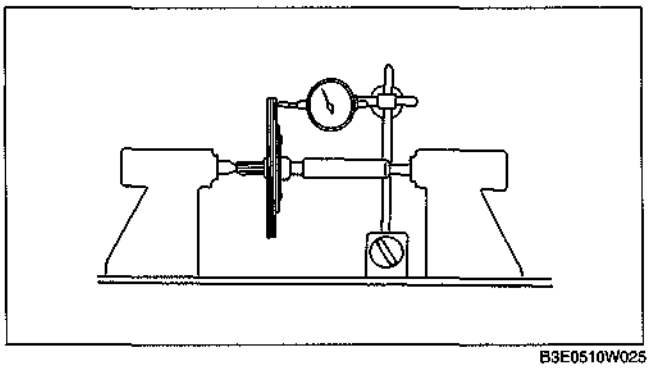


CHU0510W027

5. Measure the clutch disc runout using a dial gauge.

   Clutch disc maximum runout
   0.7 mm {0.028 in}

   - If it exceeds the maximum specification, replace the clutch disc.
6. Install the clutch disc.



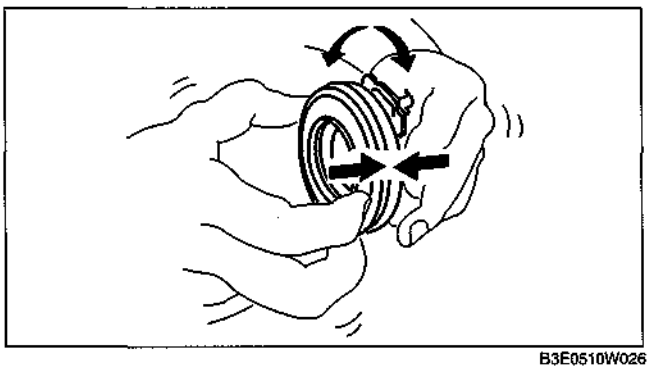
B3E0510W025

CLUTCH RELEASE COLLAR INSPECTION

dcf051016510w01

Caution
- **Do not clean the clutch release collar with cleaning fluids or a steam cleaner because it is filled with grease.**

1. Remove the clutch release collar.
2. Turn the collar while applying force in the axial direction, and inspect for sticking, excessive resistance, and an abnormal noise.
   - If there is any malfunction, replace the clutch release collar.
3. Install the clutch release collar.

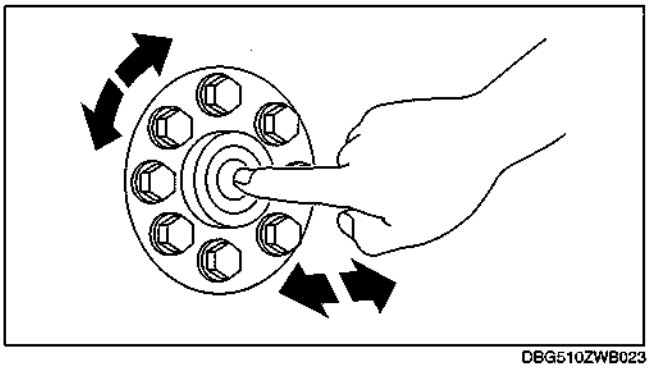


B3E0510W026

PILOT BEARING INSPECTION

dcf051011501w01

1. Without removing the pilot bearing, turn the bearing while applying force in the axial direction.
   - If there is any malfunction, replace the pilot bearing.



DBG510ZWB023

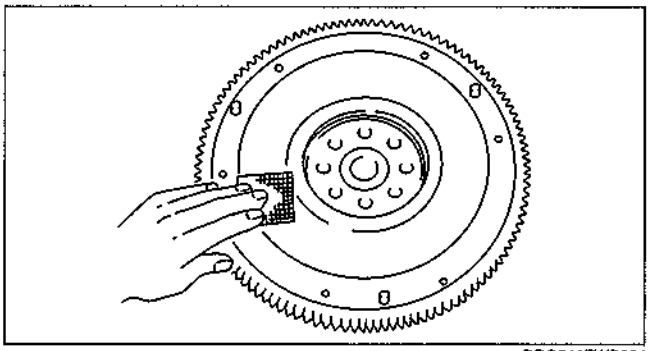
FLYWHEEL INSPECTION [R15M-D]

dcf051011500w01

1. Remove the flywheel.

Note
- Correct slight scratches and discoloration using sandpaper.
- Inspect the runout of the surface that contacts the clutch disc with the flywheel installed to the crankshaft.

2. Inspect the surface that contacts the clutch disc for scratches, nicks, and discoloration.
3. Inspect the ring gear teeth for damage and wear.
4. Install the flywheel.

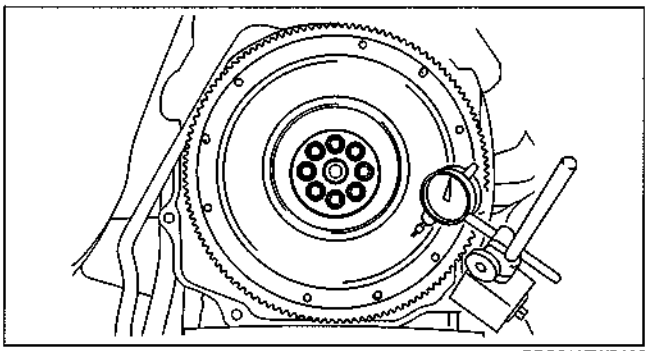


DBG510ZWB024

5. Measure the runout of the surface that contacts the clutch disc using a dial gauge.

Flywheel maximum runout [R15M-D]
0.1 mm {0.004 in}

- If it exceeds the maximum specification, replace the flywheel.



DBG510ZWB025

DUAL-MASS FLYWHEEL INSPECTION [S15M-D, S15MX-D]

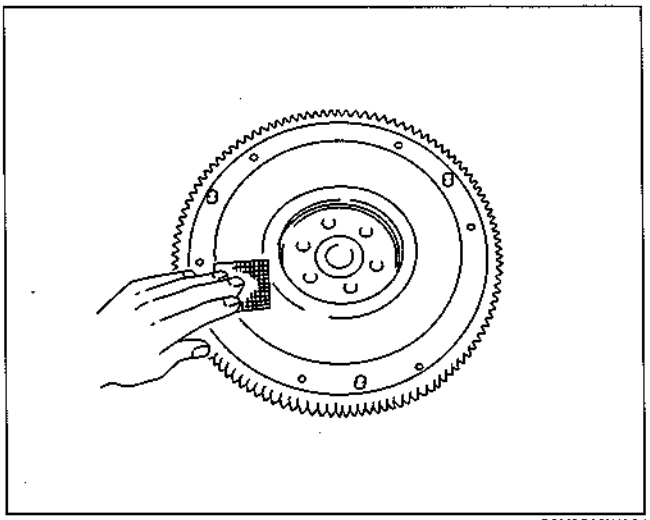
dcl051011500w02

Caution
- **Do not rework the dual-mass flywheel if it is distorted.**
- **Do not clean the dual-mass flywheel with any kind of fluid. Clean the dual-mass flywheel with a dry cloth only.**
- **Do not clean the gap between the primary and secondary mass. Only clean the bolt connection surface and the clutch surface.**

1. Remove the dual-mass flywheel.

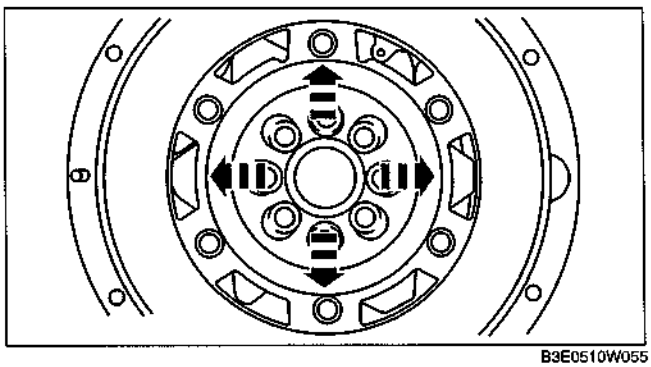
Note
- Correct slight scratches and discoloration using sandpaper.
- Inspect the runout of the surface that contacts the clutch disc with the dual-mass flywheel installed to the crankshaft.

2. Inspect the dual-mass flywheel.
   — Cracks
   — Worn ring gear teeth
   — Chipped or cracked ring gear teeth
   — Surface that contacts the clutch disc for scratches, nicks, and discoloration.
   - If there is any malfunction, replace the dual-mass flywheel.



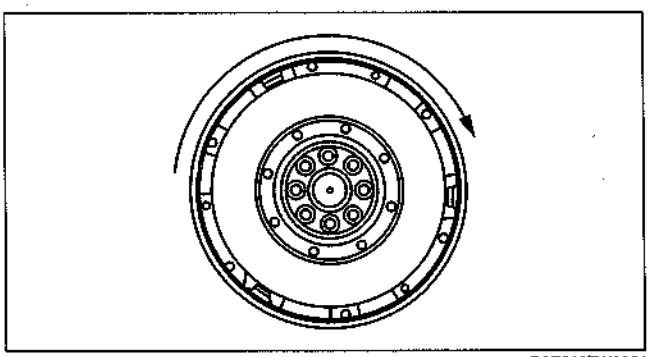
C3U0510W004

3. Verify that the center of the dual-mass flywheel does not move.
   (1) Rotate the dual-mass flywheel or attempt to move it up and down, and left and right to verify that the center of the dual-mass flywheel does not move.
      - If there is any movement as indicated by the arrows in the figure, replace the dual-mass flywheel with a new one.



B3E0510W055

4. Verify that the secondary mass rotates by 15 teeth or more.
   - If it rotates by 15 teeth or more, replace the dual-mass flywheel.

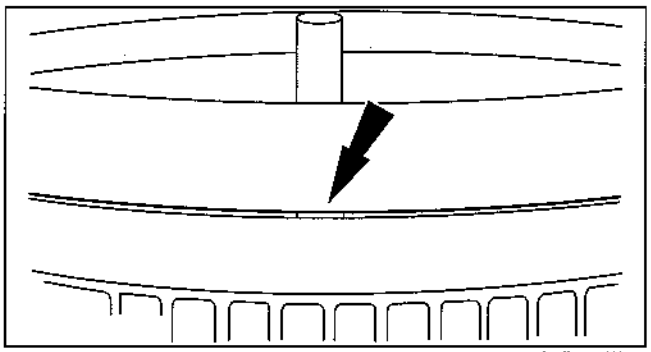


D3E510ZW8001

5. Inspect for locating dowels touching the primary mass of the dual-mass flywheel.

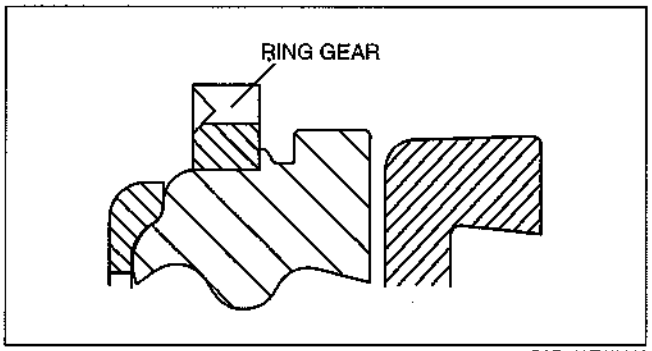
   Caution
   - **Make sure that the three locating dowels are installed.**

   - If the locating dowels are touching the primary mass of the dual-mass flywheel, replace the dual-mass flywheel with a new one.



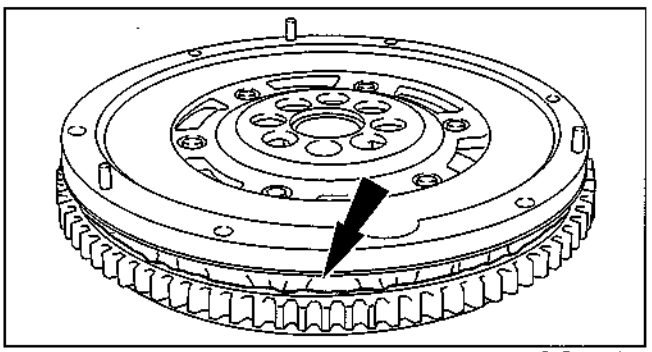
B3E0510W056

6. Visually inspect the secondary mass.
   - If there is any damage, replace the dual-mass flywheel.
7. Visually inspect the ring gear on the dual-mass flywheel.
   - If there is any damage, replace the dual-mass flywheel.



D3E510ZW8002

8. Inspect the welded area of the dual-mass flywheel for grease leakage.
   - If there is grease leakage, replace the dual-mass flywheel.

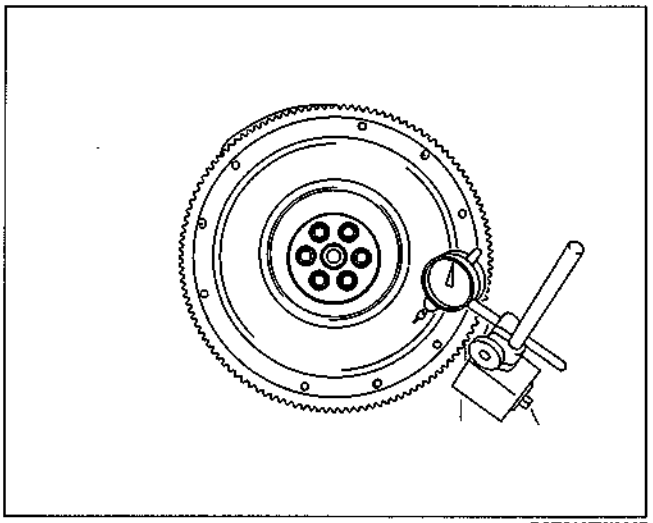


B3E0510W057

9. Inspect the dual-mass flywheel runout.

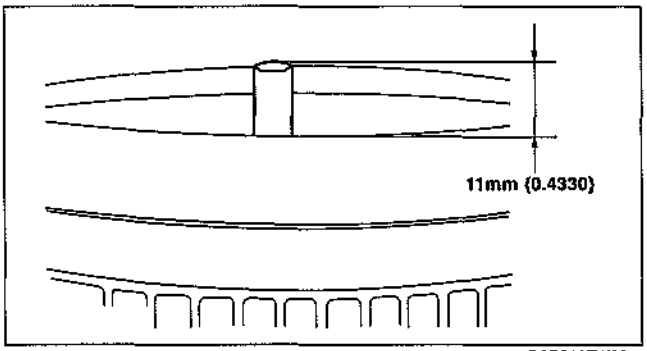
   Dual-mass flywheel maximum runout [S15M-D, S15MX-D]
   1.5 mm {0.059 in}

   - If it is more than the maximum specification, replace the dual-mass flywheel.



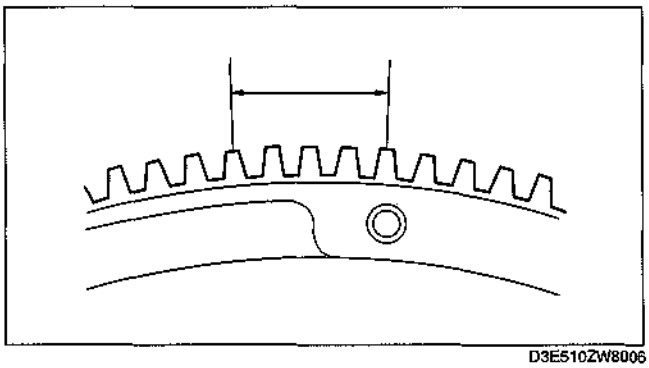
D3E510ZW8007

10. Inspect the dual-mass flywheel for the amount of guide pin projection.
    - If not within the specification, replace the dual-mass flywheel.



D3E510ZW8005

11. Rotate the secondary mass left and right and verify that it rotates within a range of five teeth without resistance.
    - If there is any malfunction, replace the dual-mass flywheel.
12. Inspect the dual-mass flywheel for cracks.
    - If there are cracks, replace the dual-mass flywheel.


D3E510ZW8006

05-11B MANUAL TRANSMISSION [S15M-D, S15MX-D]

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TRANSMISSION OIL REPLACEMENT [S15M-D, S15MX-D] 05-11B–4
OIL SEAL (EXTENSION HOUSING) REPLACEMENT [S15M-D] 05-11B–4
VEHICLE SPEED SENSOR (VSS) REMOVAL/INSTALLATION [S15M-D] 05-11B–5
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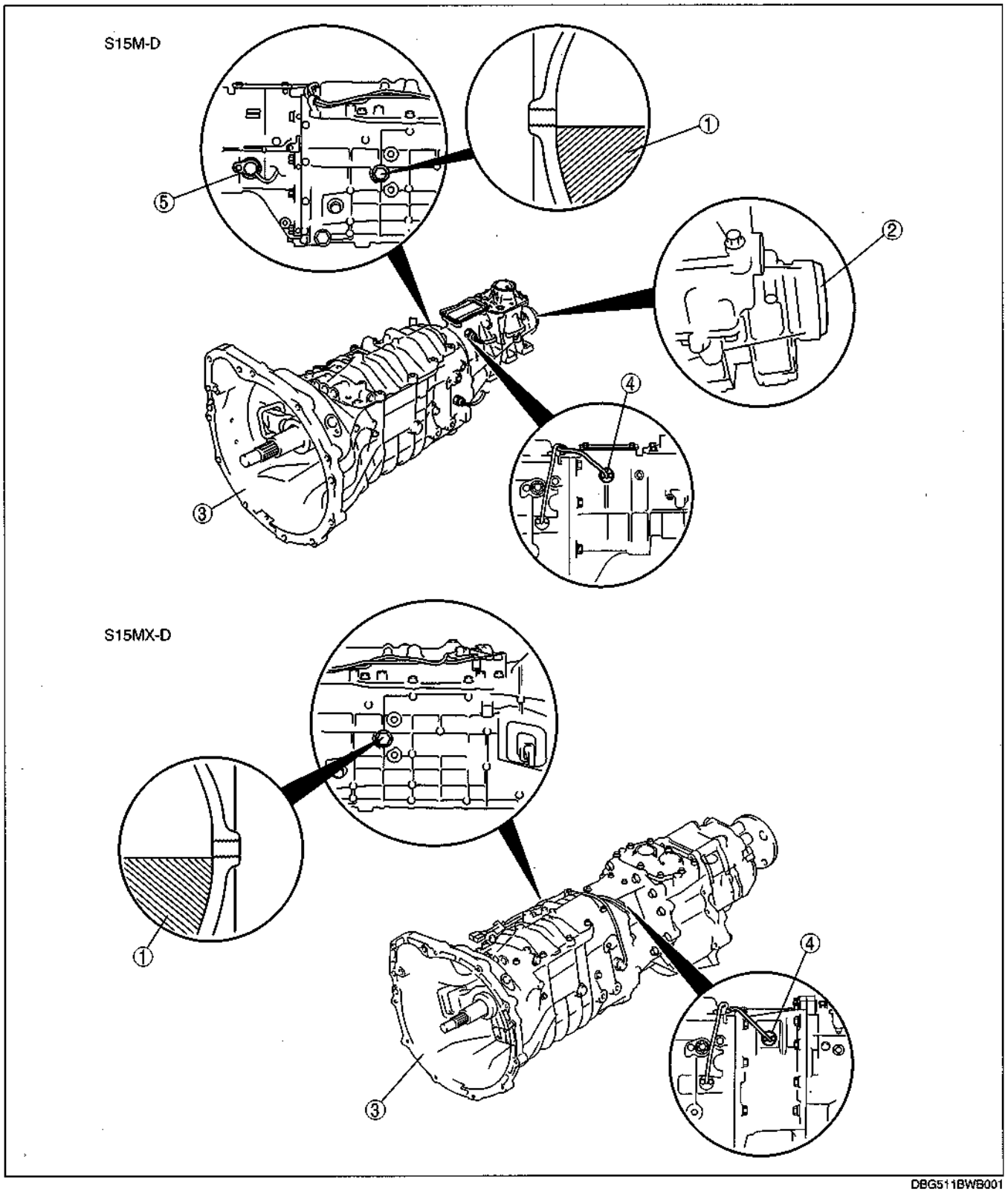
INSPECTION AFTER TRANSMISSION AND TRANSFER INSTALLATION [S15MX-D] 05-11B–12

MANUAL TRANSMISSION LOCATION INDEX [S15M-D, S15MX-D]

dcf051100000w05



DBG511BWB001

1	Transmission oil (See 05-11B-3 TRANSMISSION OIL INSPECTION [S15M-D, S15MX-D].) (See 05-11B-4 TRANSMISSION OIL REPLACEMENT [S15M-D, S15MX-D].)

2	Oil seal (extension housing) (See 05-11B-4 OIL SEAL (EXTENSION HOUSING) REPLACEMENT [S15M-D].)

3	Transmission (See 05-11B-5 TRANSMISSION REMOVAL/ INSTALLATION [S15M-D].) (See 05-11B-10 TRANSMISSION AND TRANSFER REMOVAL/INSTALLATION [S15MX-D].) (See 05-11B-12 INSPECTION AFTER TRANSMISSION INSTALLATION [S15M-D].) (See 05-11B-12 INSPECTION AFTER TRANSMISSION AND TRANSFER INSTALLATION [S15MX-D].)

4	Neutral switch (See 05-11B-3 NEUTRAL SWITCH REMOVAL/ INSTALLATION [S15M-D, S15MX-D].)
5	Vehicle speed sensor (See 05-11B-5 VEHICLE SPEED SENSOR (VSS) REMOVAL/INSTALLATION [S15M-D].) (See 05-11B-5 VEHICLE SPEED SENSOR (VSS) INSPECTION [S15M-D].)

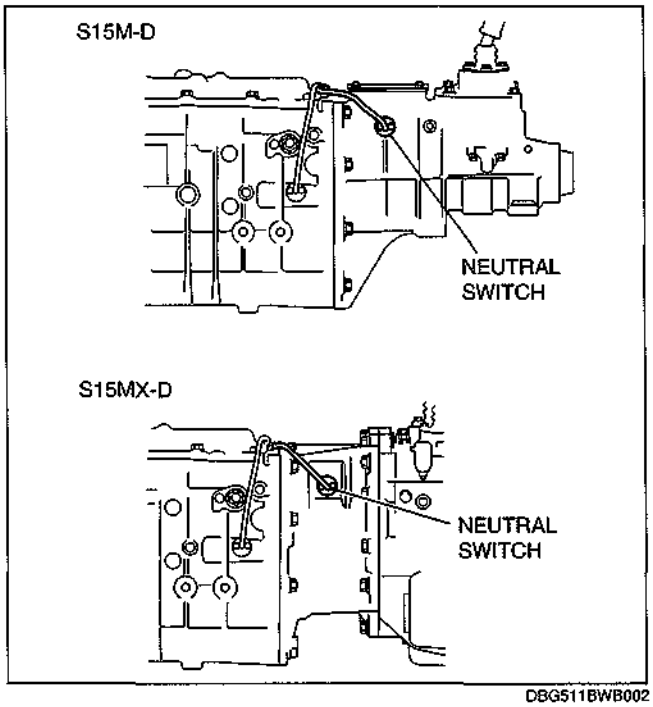
NEUTRAL SWITCH REMOVAL/INSTALLATION [S15M-D, S15MX-D]

dcf051100000w06

1. Disconnect the negative battery cable.
2. Disconnect the neutral switch connector.
3. Remove the neutral switch.
4. Install the new neutral switch and a new packing to the transmission case.

Tightening torque
25—34 N·m {2.6—3.4 kgf·m, 19—25 ft·lbf}

5. Connect the neutral switch connector.
6. Connect the negative battery cable.



DBG511BWB002

TRANSMISSION OIL INSPECTION [S15M-D, S15MX-D]

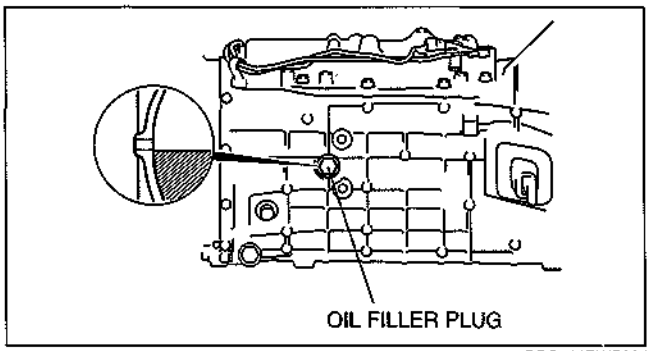
dcf051127001w03

1. Position the vehicle on level ground.
2. Remove oil filler plug.
3. Verify that the oil is near the brim of the plug port.
   - If the oil is not near the brim of the plug port, add the specified amount and type of oil.

Transmission case oil [S15M-D, S15MX-D]
Type: Mercon® Multi-purpose AFT XT-2-QDX

4. Install oil filler plug and a new washer.

Tightening torque
40—59 N·m {4.1—6.0 kgf·m, 30—43 ft·lbf}



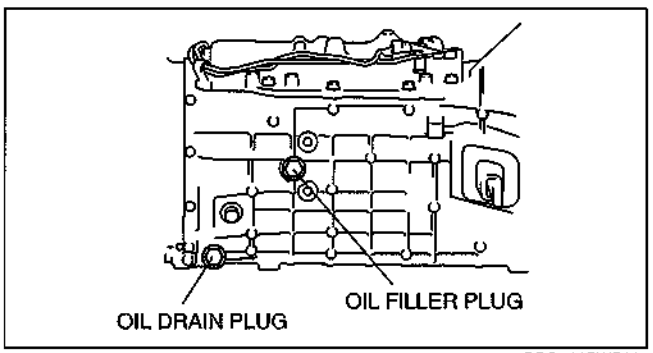
DBG511BWB004

TRANSMISSION OIL REPLACEMENT [S15M-D, S15MX-D]

dcf051127001w04

1. Position the vehicle on level ground.
2. Remove oil filler plug and drain plug, and then drain the oil.
3. Clean drain plug.
4. Install drain plug and a new washer.

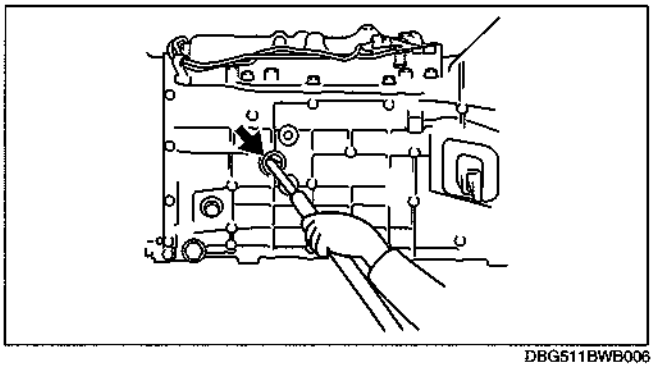
Tightening torque
40—59 N·m {4.1—6.0 kgf·m, 30—43 ft·lbf}



DBG511BWB005

5. Add the specified amount and type of oil through the plug port for oil filler plug to near the brim of the port.

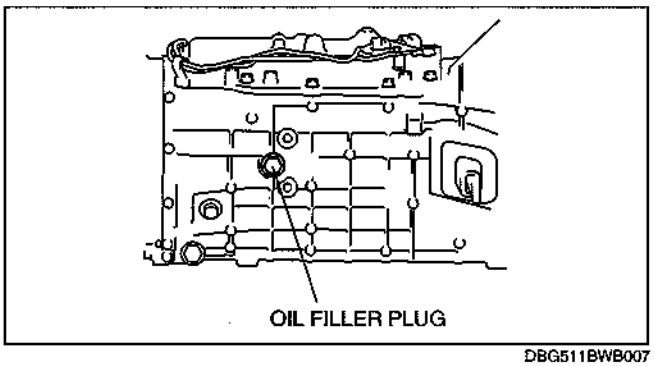
Transmission case oil [S15M-D, S15MX-D]
Type: Mercon® Multi-purpose AFT XT-2-QDX
Capacity (approx. quantity): 3.55 L {3.75 US qt, 3.12 Imp qt}



DBG511BWB006

6. Install oil filler plug and a new washer.

Tightening torque
40—59 N·m {4.1—6.0 kgf·m, 30—43 ft·lbf}

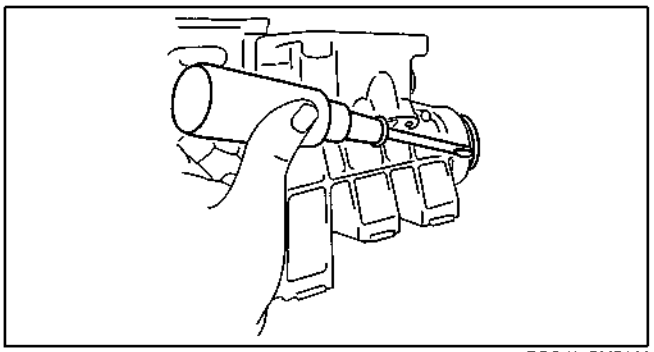


DBG511BWB007

OIL SEAL (EXTENSION HOUSING) REPLACEMENT [S15M-D]

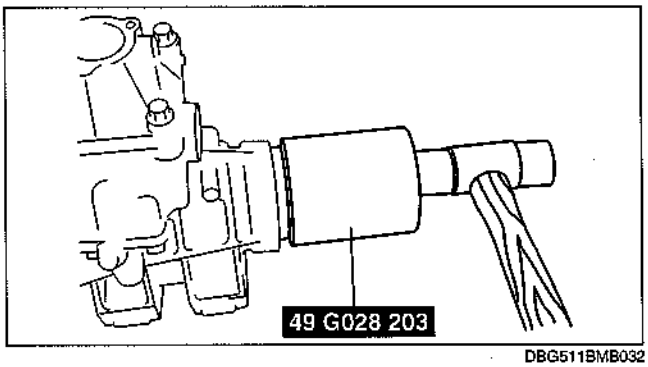
dcf051117335w02

1. Position the vehicle on level ground.
2. Drain the transmission oil.
   (See 05-11B-4 TRANSMISSION OIL REPLACEMENT [S15M-D, S15MX-D].)
3. Remove the propeller shaft.
   (See 03-15-2 PROPELLER SHAFT REMOVAL/INSTALLATION.)
4. Remove the oil seal using a flathead screwdriver.
5. Apply specified grease to the lip of a new oil seal.



DBG511BMB003

6. Tap a new oil seal into the case using the **SST**.
7. Install in the reverse order of removal.
8. Add transmission oil.
   (See 05-11B-4 TRANSMISSION OIL REPLACEMENT [S15M-D, S15MX-D].)



DBG511BMB032

VEHICLE SPEED SENSOR (VSS) REMOVAL/INSTALLATION [S15M-D]

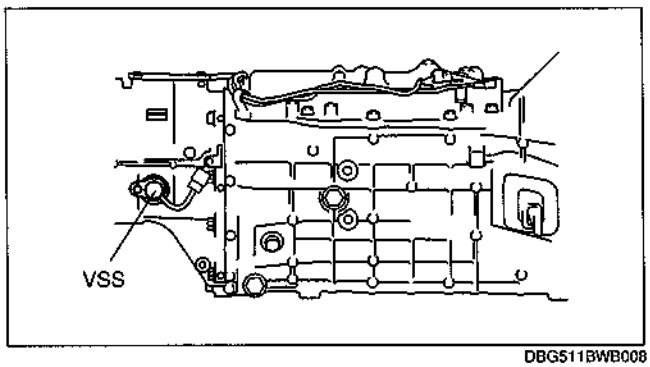
dcf051117400w03

Caution
- **Water or foreign material entering the connector can cause a poor connection or corrosion. Be sure not to drop water or foreign material on the connector when disconnecting it.**

1. Disconnect the negative battery cable.
2. Disconnect the VSS connector.
3. Remove the VSS.
4. Apply the specified oil to a new O-ring and install it on a VSS.
5. Install the VSS.

Tightening torque
7.8—11.0 N·m {80—112 kgf-cm, 70—97 in-lbf}

6. Connect the VSS connector.
7. Connect the negative battery cable.



DBG511BWB008

VEHICLE SPEED SENSOR (VSS) INSPECTION [S15M-D]

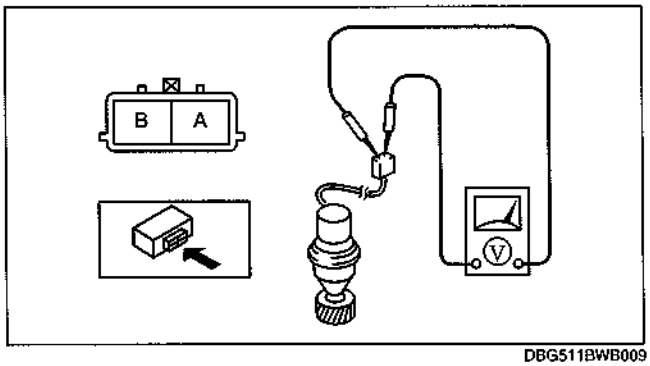
dcf051117400w04

1. Remove the VSS. (See 05-11B-5 VEHICLE SPEED SENSOR (VSS) REMOVAL/INSTALLATION [S15M-D].)
2. Measure voltage between terminals of the VSS while the gear is turning.

Vehicle speed sensor (VSS) voltage [S15M-D]
5 V or less

- If the voltage is within the specification, the VSS is normal. Repair the related wiring harness.
- If the voltage is not within the specification (tester needle does not move), replace the VSS.

3. Install the VSS. (See 05-11B-5 VEHICLE SPEED SENSOR (VSS) REMOVAL/INSTALLATION [S15M-D].)



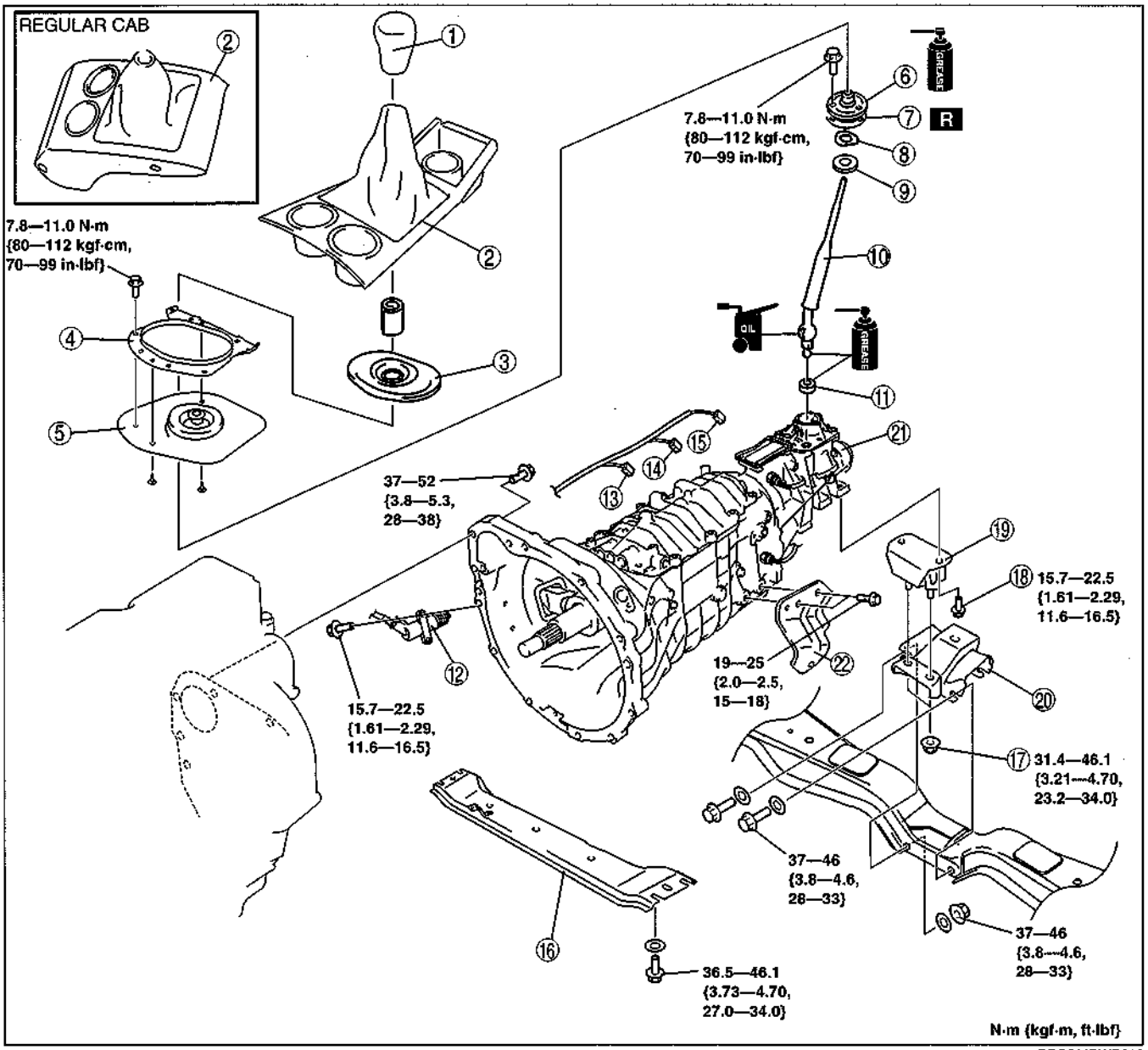
DBG511BWB009

TRANSMISSION REMOVAL/INSTALLATION [S15M-D]

dcf051100000w07

1. Disconnect the negative battery cable.
2. Remove the propeller shaft. (See 03-15-2 PROPELLER SHAFT REMOVAL/INSTALLATION.)
3. Remove the front pipe and oxidation catalytic converter. (See 01-15B-2 EXHAUST SYSTEM REMOVAL/INSTALLATION [WL-C, WE-C].)
4. Remove in the order indicated in the table.
5. Install in the reverse order of removal.
6. Perform the 'INSPECTION AFTER TRANSMISSION INSTALLATION', and verify that there is no abnormality. (See 05-11B-12 INSPECTION AFTER TRANSMISSION INSTALLATION [S15M-D].)

Except Hi-Rider

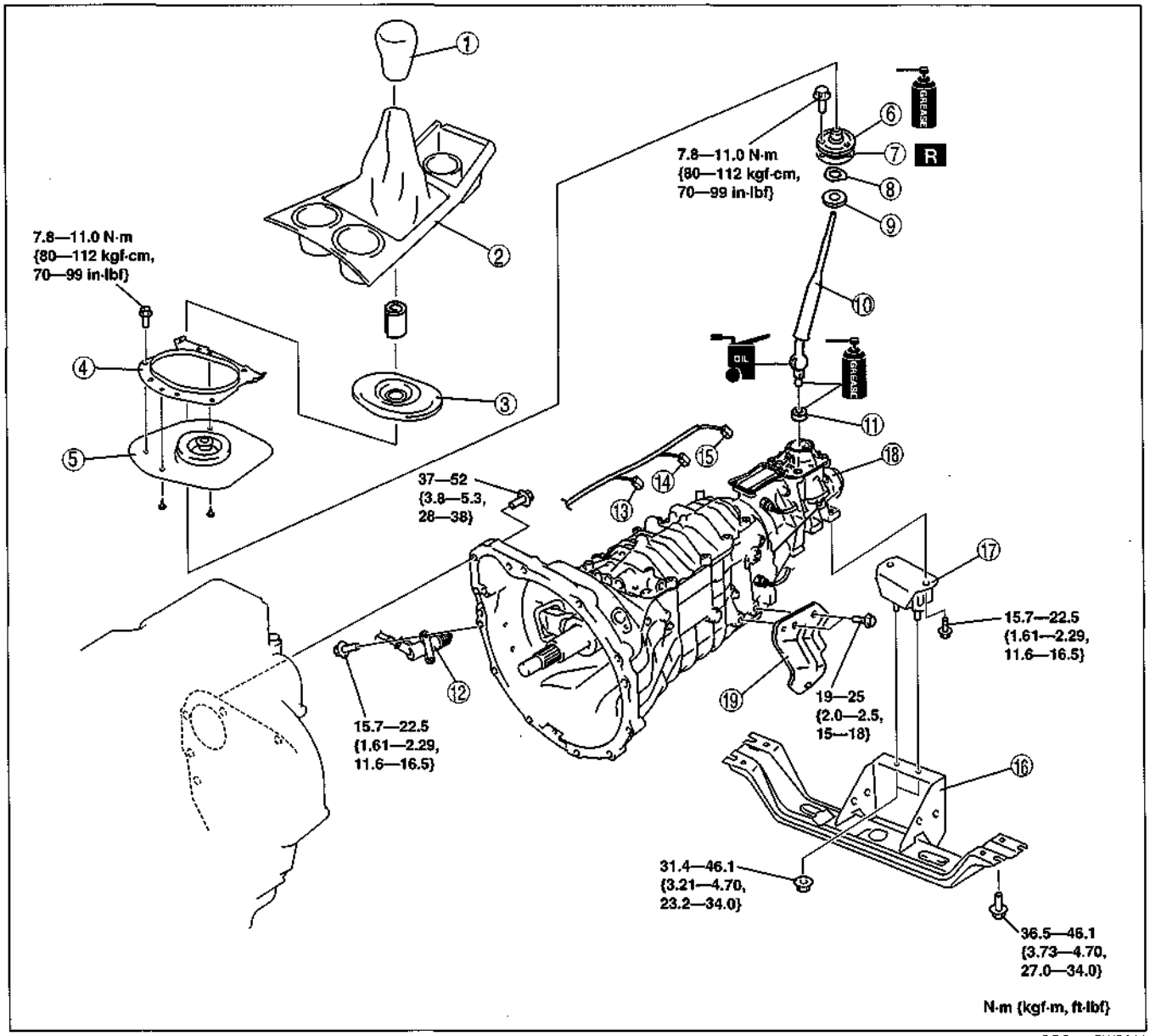


DBG511BWB010

1	Shift lever knob
2	Console (regular cab) or boot panel (except regular cab) (See 09-17-12 CONSOLE REMOVAL/ INSTALLATION.)
3	Dust boot
4	Change boot upper plate
5	Boot
6	Dust boot
7	Gasket
8	Wave washer
9	Change bush
10	Shift lever
11	Change seat
12	Clutch release cylinder
13	Neutral switch connector

14	Back-up light switch connector
15	Vehicle speed sensor connector
16	Crossmember (See 05-11B-8 Crossmember Removal Note [Except Hi-Rider].)
17	Bolt
18	Bolt
19	Transmission mount rubber (See 05-11B-8 Transmission Removal/installation Note.)
20	Transmission mount bracket (See 05-11B-8 Transmission Removal/installation Note.)
21	Transmission (See 05-11B-8 Transmission Removal/installation Note.)
22	Front pipe bracket

Hi-Rider



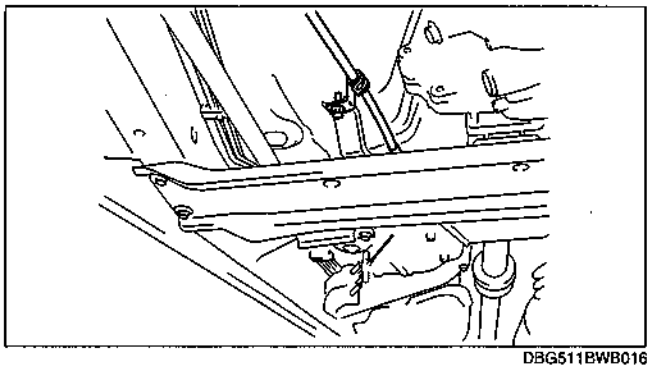
DBG511BW8011

1	Shift lever knob
2	Boot panel (See 09-17-12 CONSOLE REMOVAL/ INSTALLATION.)
3	Dust boot
4	Change boot upper plate
5	Boot
6	Dust boot
7	Gasket
8	Wave washer
9	Change bush
10	Shift lever
11	Change seat

12	Clutch release cylinder
13	Neutral switch connector
14	Back-up light switch connector
15	Vehicle speed sensor connector
16	Crossmember (See 05-11B-8 Transmission Removal/installation Note.)
17	Transmission mount rubber (See 05-11B-8 Transmission Removal/installation Note.)
18	Transmission (See 05-11B-8 Transmission Removal/installation Note.)
19	Front pipe bracket

Crossmember Removal Note [Except Hi-Rider]

1. Remove the front parking brake cable as shown in the figure. (See 04-12-6 PARKING BRAKE CABLE REMOVAL/INSTALLATION [WL-C (EXCEPT Hi-Rider)].)
2. Remove the crossmember.



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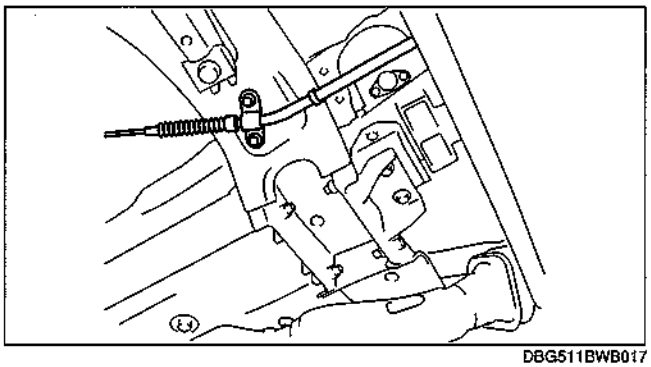

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Transmission Removal/installation Note

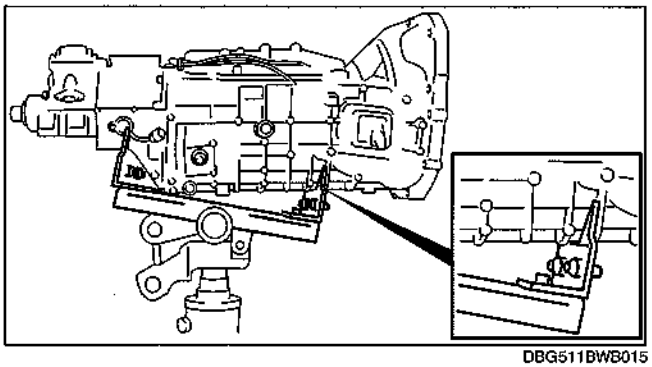
Warning

- **Remove the transmission carefully, holding it steady. If the transmission falls it could be damaged or cause injury.**

Caution

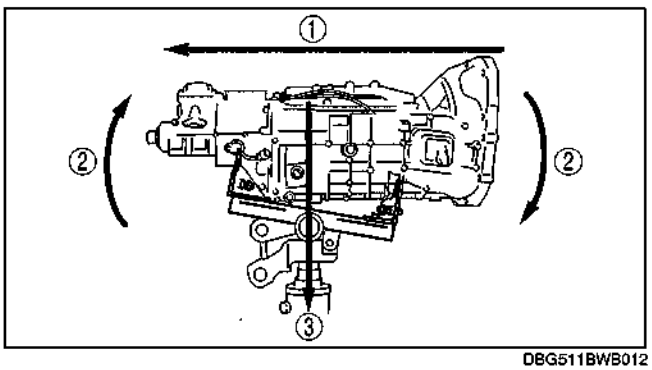
- **When removing/installing the transmission, do not move it more than necessary so as to prevent part interference with the body.**

1. Support the transmission securely using a transmission jack.
2. Set the transmission jack attachment into the concavity of the transmission to prevent the transmission from falling when it is tilted.
3. Remove the following parts:
   - — Crossmember. (Hi-Rider)
   - — Transmission mount rubber.
   - — Transmission mount bracket. (except Hi-Rider)
4. Remove the transmission installation bolt.



DBG511BWB015

5. Remove the transmission.
   (1) Move the transmission to the rear.
   (2) Change the inclination of the transmission jack to raise the extension housing side.
   (3) Lower the transmission jack until the transmission does not interfere with the member.
   (4) Repeat Steps (1) to (3) (After Step (3) is completed, a space will be available between the extension housing and member).
   (5) Wind a rope around the transmission after it has tilted enough.



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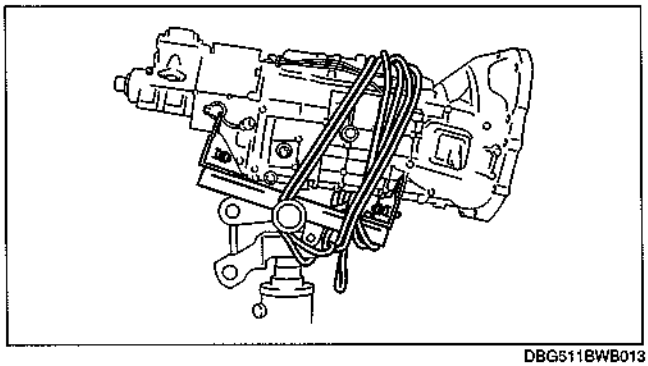
Warning
- **Secure the transmission and transmission jack properly using a rope, otherwise the transmission could fall off, causing damage or injury.**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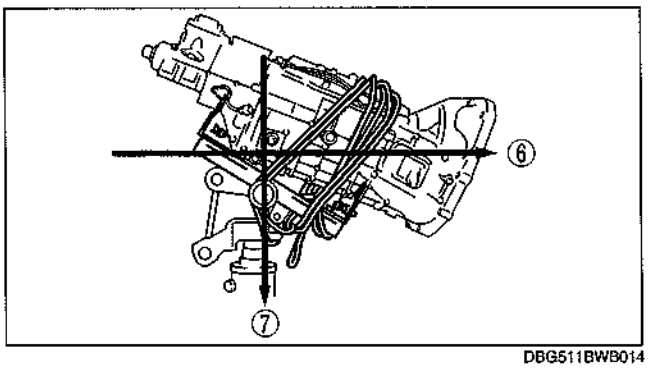
(6) Move the transmission towards the engine (After the inclination reaches a certain point, the transmission can be moved towards engine).
(7) Lower the transmission jack when the extension housing moves to the position where it does not interfere with the member.

6. Install in the reverse order of removal.



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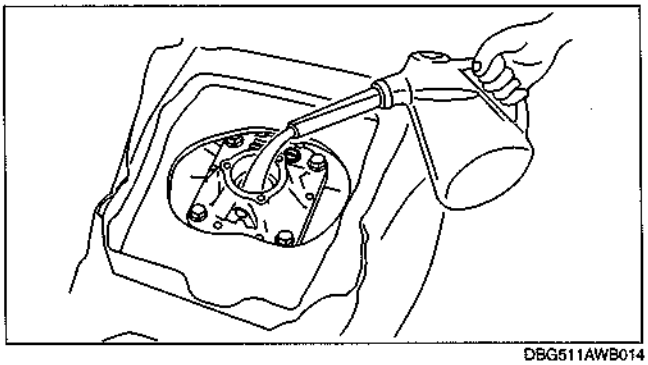
Shift Lever Component Installation Note

Note
- If the extension housing has been removed or the transmission has been disassembled and inspected, always add the specified type and amount of transmission oil.

1. Add the specified type and amount of oil to the shift control case.

Shift control case oil [S15M-D]
Type: Mercon® Multi-purpose AFT XT-2-QDX
Capacity (approx. quantity): 220—260 ml {220—260 cc, 13.42—15.86 cu in}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TRANSMISSION AND TRANSFER REMOVAL/INSTALLATION [S15MX-D]

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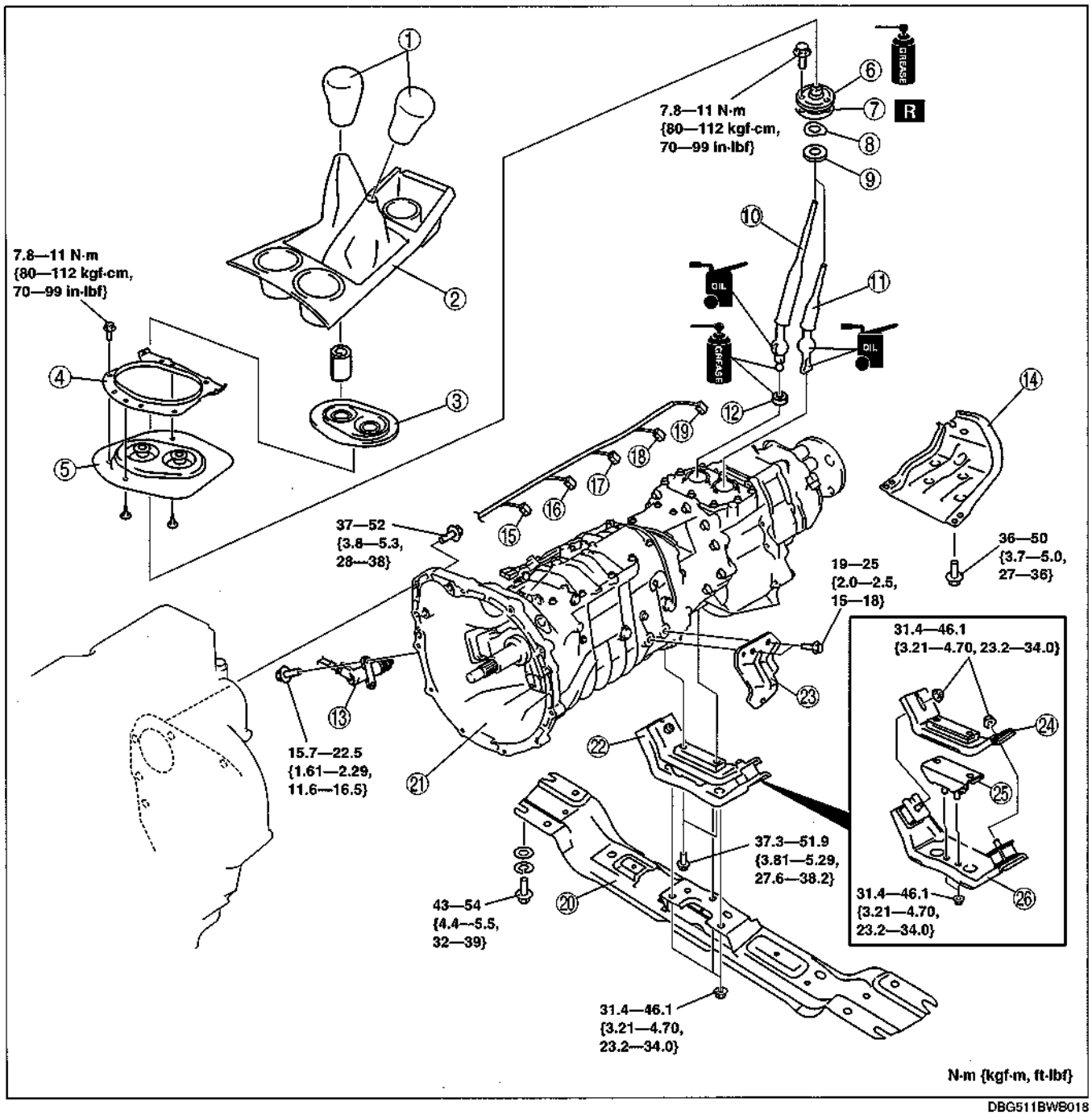
1. Disconnect the negative battery cable.
2. Remove the front propeller shaft and rear propeller shaft. (See 03-15-2 PROPELLER SHAFT REMOVAL/ INSTALLATION.)
3. Remove the front pipe and oxidation catalytic converter. (See 01-15B-2 EXHAUST SYSTEM REMOVAL/ INSTALLATION [WL-C, WE-C].)
4. Remove in the order indicated in the table.
5. Install in the reverse order of removal.
6. Perform the 'INSPECTION AFTER TRANSMISSION INSTALLATION', and verify that there is no abnormality. (See 05-11B-12 INSPECTION AFTER TRANSMISSION AND TRANSFER INSTALLATION [S15MX-D].)



DBG511BWB018

1	Shift lever knob
2	Boot panel (See 09-17-12 CONSOLE REMOVAL/ INSTALLATION.)
3	Dust boot
4	Change boot upper plate

5	Boot
6	Dust boot
7	Gasket
8	Wave washer
9	Change bush
10	Shift lever

11	Transfer shift lever
12	Change seat
13	Clutch release cylinder (See 05-10-10 CLUTCH RELEASE CYLINDER REMOVAL/INSTALLATION.)
14	Transfer under cover
15	Neutral switch connector
16	Back-up light switch connector
17	4x4 indicator switch connector
18	Transfer neutral switch connector
19	Vehicle speed sensor connector

20	Crossmember (See 05-11B-11 Transmission Removal/installation Note.)
21	Transmission (See 05-11B-11 Transmission Removal/installation Note.)
22	Transmission mount component
23	Front pipe bracket
24	Transmission mount upper
25	Transmission rubber
26	Transmission mount lower

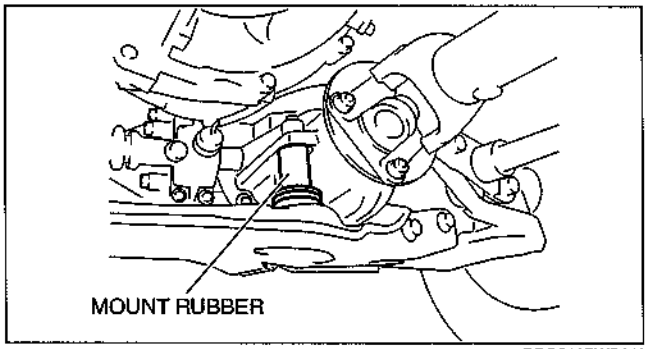
Transmission Removal/Installation Note

Warning
- **Remove the transmission carefully, holding it steady. If the transmission falls it could be damaged or cause injury.**

Caution
- **When removing/installing the transmission, do not move it more than necessary so as to prevent part interference with the body.**

Note
- Two transmission jacks are necessary for the transmission removal/installation.

1. Remove the front differential mount rubber. (See 03-14A-2 FRONT DIFFERENTIAL REMOVAL/INSTALLATION.)



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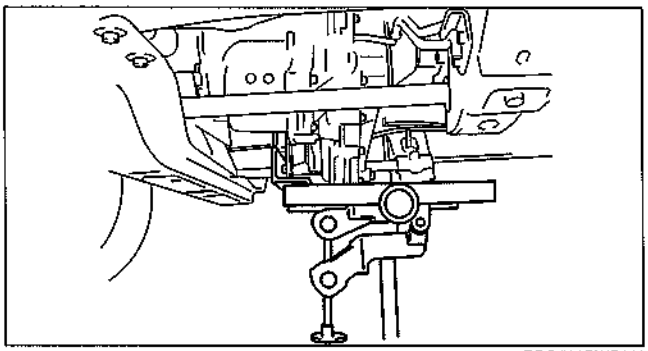
2. Support the transfer side securely using one transmission jack.
3. Remove the crossmember.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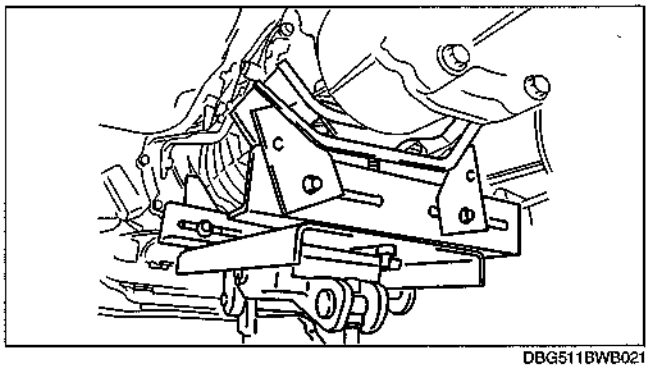
4. Support the transmission securely using the other transmission jack.
5. When removing/installing the transmission, secure the transmission using the transmission jack attachment to prevent it from tilting to the left or right.

Caution
- **Do not allow the transmission jack to interfere with the transmission mount bracket bolts, otherwise the bolts could be damaged.**



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6. Remove the first transmission jack.
7. Remove the transmission installation bolts.
8. Remove the transmission.
9. Install in the reverse order of removal.

INSPECTION AFTER TRANSMISSION INSTALLATION [S15M-D]

dcf051100000w09

Note
- Perform the following inspection only when the transmission has been overhauled.

1. Perform a road test and inspect the following items:
   (1) No abnormal noise in each shift position.
   (2) Smooth shift operation when shifting gears.
   (3) No gear slipout after shifting gears.
   (4) Back-up light switch operates correctly.

INSPECTION AFTER TRANSMISSION AND TRANSFER INSTALLATION [S15MX-D]

dcf051100000w10

Note
- Perform the following inspection only when the transmission or transfer has been overhauled.

1. Perform a road test and inspect the following items:
   (1) No abnormal noise in each shift position.
   (2) Smooth shift operation when shifting gears.
   (3) No gear slipout after shifting gears.
   (4) Back-up light switch operates correctly.

05-13 AUTOMATIC TRANSMISSION [5R55S]

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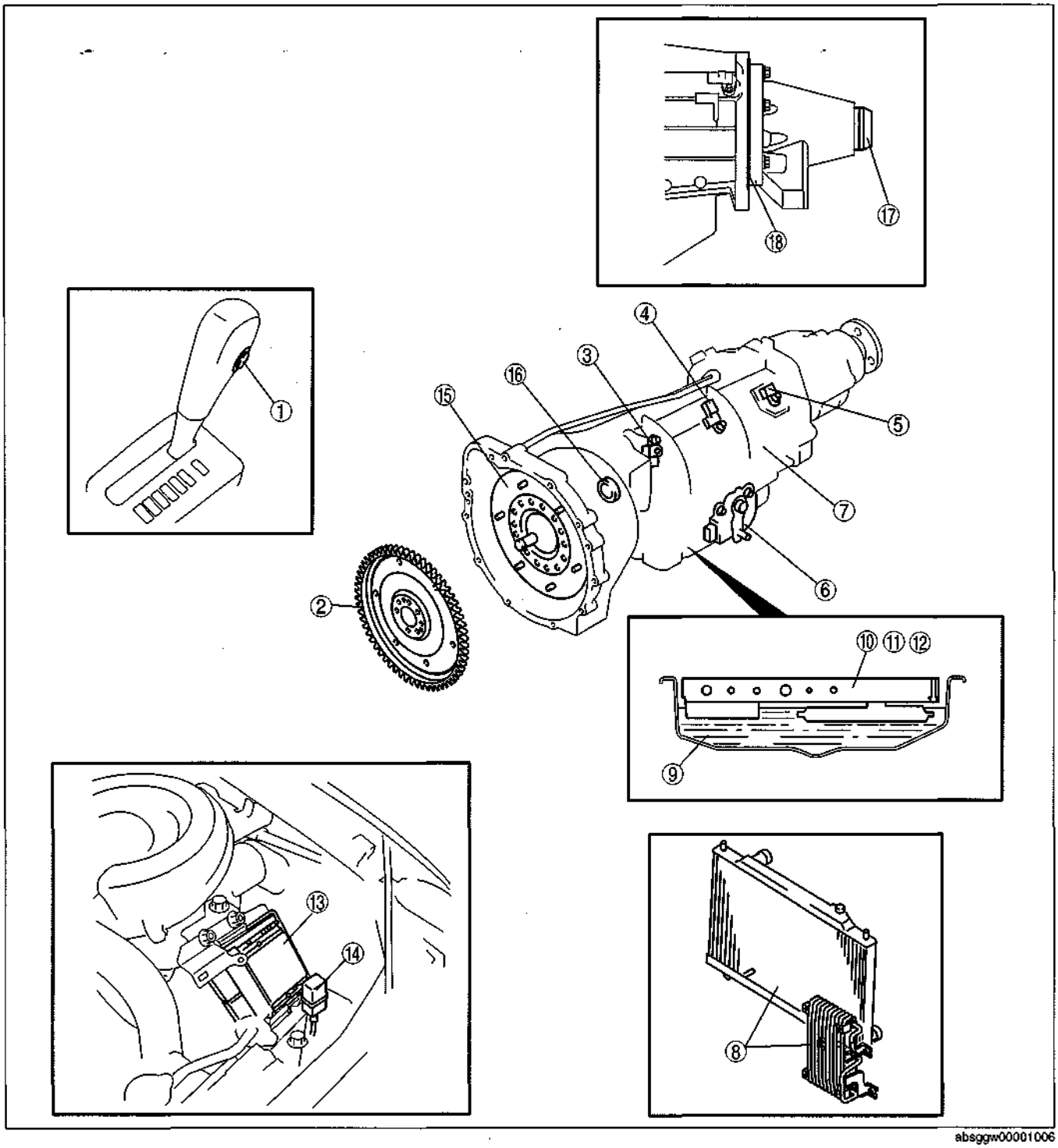

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1	O/D OFF switch (See 05-13-19 O/D OFF SWITCH INSPECTION [5R55S].)
2	Drive plate (See 05-13-71 DRIVE PLATE REMOVAL/INSTALLATION [5R55S].)
3	Turbine shaft speed (TSS) sensor (See 05-13-28 TURBINE SHAFT SPEED (TSS) SENSOR INSPECTION [5R55S].) (See 05-13-29 TURBINE SHAFT SPEED (TSS) SENSOR REMOVAL/INSTALLATION [5R55S].)
4	Intermediate shaft speed (ISS) sensor (See 05-13-30 INTERMEDIATE SHAFT SPEED (ISS) SENSOR INSPECTION [5R55S].) (See 05-13-31 INTERMEDIATE SHAFT SPEED (ISS) SENSOR REMOVAL/INSTALLATION [5R55S].)
5	Output shaft speed (OSS) sensor (See 05-13-32 OUTPUT SHAFT SPEED (OSS) SENSOR INSPECTION [5R55S].) (See 05-13-33 OUTPUT SHAFT SPEED (OSS) SENSOR REMOVAL/INSTALLATION [5R55S].)
6	Digital transmission range (TR) sensor (See 05-13-20 DIGITAL TRANSMISSION RANGE (TR) SENSOR INSPECTION [5R55S].) (See 05-13-22 DIGITAL TRANSMISSION RANGE (TR) SENSOR REMOVAL/INSTALLATION [5R55S].) (See 05-13-24 DIGITAL TRANSMISSION RANGE (TR) SENSOR ADJUSTMENT [5R55S].)
7	Automatic transmission (See 05-13-4 MECHANICAL SYSTEM TEST [5R55S].) (See 05-13-8 ROAD TEST [5R55S].) (See 05-13-11 LEAKAGE INSPECTION [5R55S].) (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION [5R55S].)
8	Oil cooler (See 05-13-67 OIL COOLER FLUSHING [5R55S].) (See 05-13-68 OIL COOLER REMOVAL/INSTALLATION [5R55S].)
9	Automatic transmission fluid (See 05-13-13 AUTOMATIC TRANSMISSION FLUID (ATF) INSPECTION [5R55S].) (See 05-13-16 AUTOMATIC TRANSMISSION FLUID (ATF) REPLACEMENT [5R55S].)
10	Transmission fluid temperature (TFT) sensor (See 05-13-26 TRANSMISSION FLUID TEMPERATURE (TFT) SENSOR INSPECTION [5R55S].)
11	Solenoid valve (See 05-13-34 SOLENOID VALVE INSPECTION [5R55S].) (See 05-13-35 SOLENOID BODY REMOVAL/INSTALLATION [5R55S].)
12	Control valve body (See 05-13-10 AIR PRESSURE TEST [5R55S].) (See 05-13-61 CONTROL VALVE BODY REMOVAL [5R55S].) (See 05-13-63 CONTROL VALVE BODY INSTALLATION [5R55S].)
13	TCM (See 05-13-39 TCM INSPECTION [5R55S].) (See 05-13-44 TCM REMOVAL/INSTALLATION [5R55S].)
14	AT relay (See 05-13-38 AT RELAY LOCATION [5R55S].) (See 05-13-38 AT RELAY INSPECTION [5R55S].)
15	Torque converter (See 05-13-54 TORQUE CONVERTER INSPECTION [5R55S].) (See 05-13-55 TORQUE CONVERTER REMOVAL/INSTALLATION [5R55S].)
16	Oil seal (fluid pump) (See 05-13-56 OIL SEAL (FLUID PUMP) REPLACEMENT [5R55S].)
17	Oil seal (extension housing) (See 05-13-57 OIL SEAL (EXTENSION HOUSING) REPLACEMENT [5R55S].)
18	Extension housing gasket (See 05-13-58 EXTENSION HOUSING GASKET REPLACEMENT [5R55S].)

MECHANICAL SYSTEM TEST [5R55S]

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Mechanical System Test Preparation

1. Engage the parking brake and use wheel chocks at the front and rear of the wheels.
2. Inspect the engine coolant level.
3. Inspect the engine oil level.
4. Inspect the ATF level. (See 05-13-13 AUTOMATIC TRANSMISSION FLUID (ATF) INSPECTION [5R55S].)
5. Inspect the idle speed.

Line Pressure Test (Pressure Control A, Pressure Control B)

Warning

- **Removing the plug when the ATF is hot is dangerous. Hot ATF can discharge from the opening and cause severe burns. Before removing the line pressure tap, allow the AT and ATF to cool.**

Caution

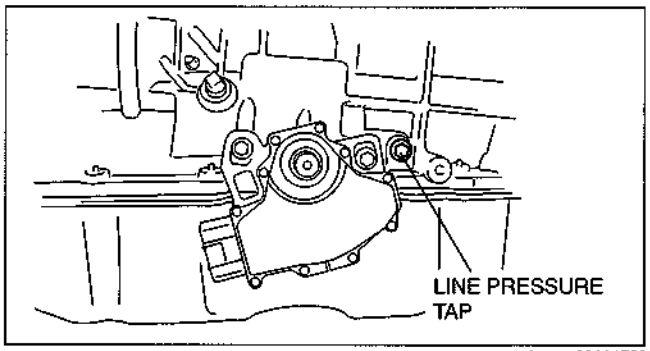
- **Perform the line pressure test before performing the stall test. If the line pressure is low at stall speed, do not perform the stall test or further transmission damage will occur.**
- **Do not maintain WOT in any gear position for more than 5 s.**

Note

- Certain sensor failures may cause high pressure control, Failure Mode Effect Management (FMEM) actions. Be sure that the self-test and electrical repairs have been carried out or test results may be incorrect.
- The line pressure tap is used to verify output pressure from pressure control A or pressure control B. Use PC PIDs and take note which solenoid, pressure control A or pressure control B, is commanded higher. Use the higher commanded PC x value when referencing the Line Pressure Charts A and B. The second pressure tap is used to verify the output from the pressure control solenoid C.

Pressure control A, pressure control B

1. Remove the line pressure tap.
2. Connect the pressure gauge (**SST**: 307-004) to the line pressure tap.
3. Connect the diagnostic scan tool and monitor the PC A and PC B PIDs. Note which PID is commanded higher. Use the higher commanded PC x value when referencing the Line Pressure Charts A and B.
4. Start the engine and check the line pressure reading from the gauge installed in Step 1. Refer to the Line Pressure Chart for the correct shift lever position.
   - If the line pressure is not within ranges given in Line Charts A and B, refer to Line Pressure Diagnosis Chart in this section for line pressure concern causes.



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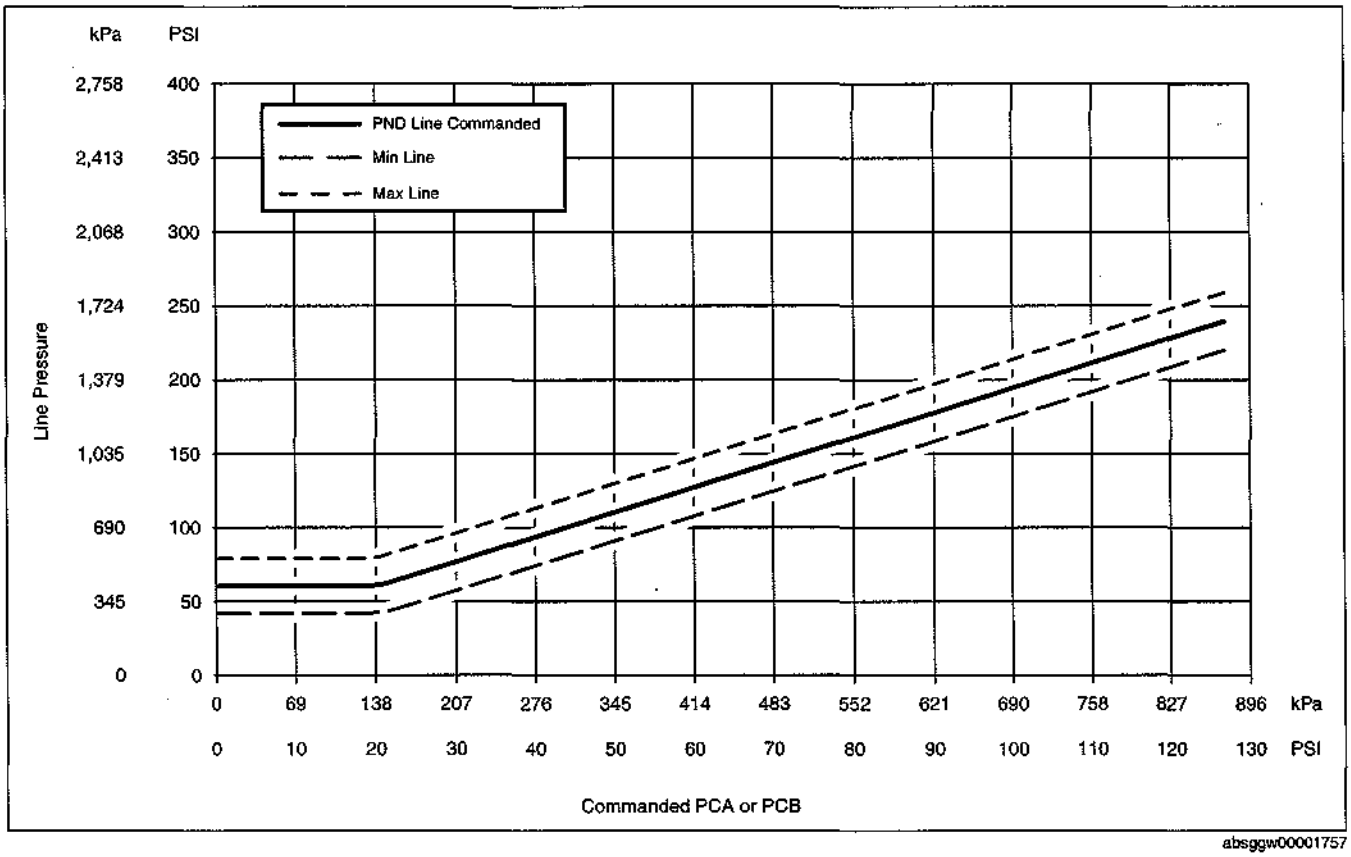
Line pressure (pressure control A, pressure control B)

Position/range	Line pressure (kPa {kgf/cm^2, psi})	
	Idle	Stall
P/N	793 {8.09, 115}	793 {8.09, 115}
R	793 {8.09, 115}	2,138 {21.80, 310}
D, 3, 2, 1	793 {8.09, 115}	1,520 {15.47, 220}



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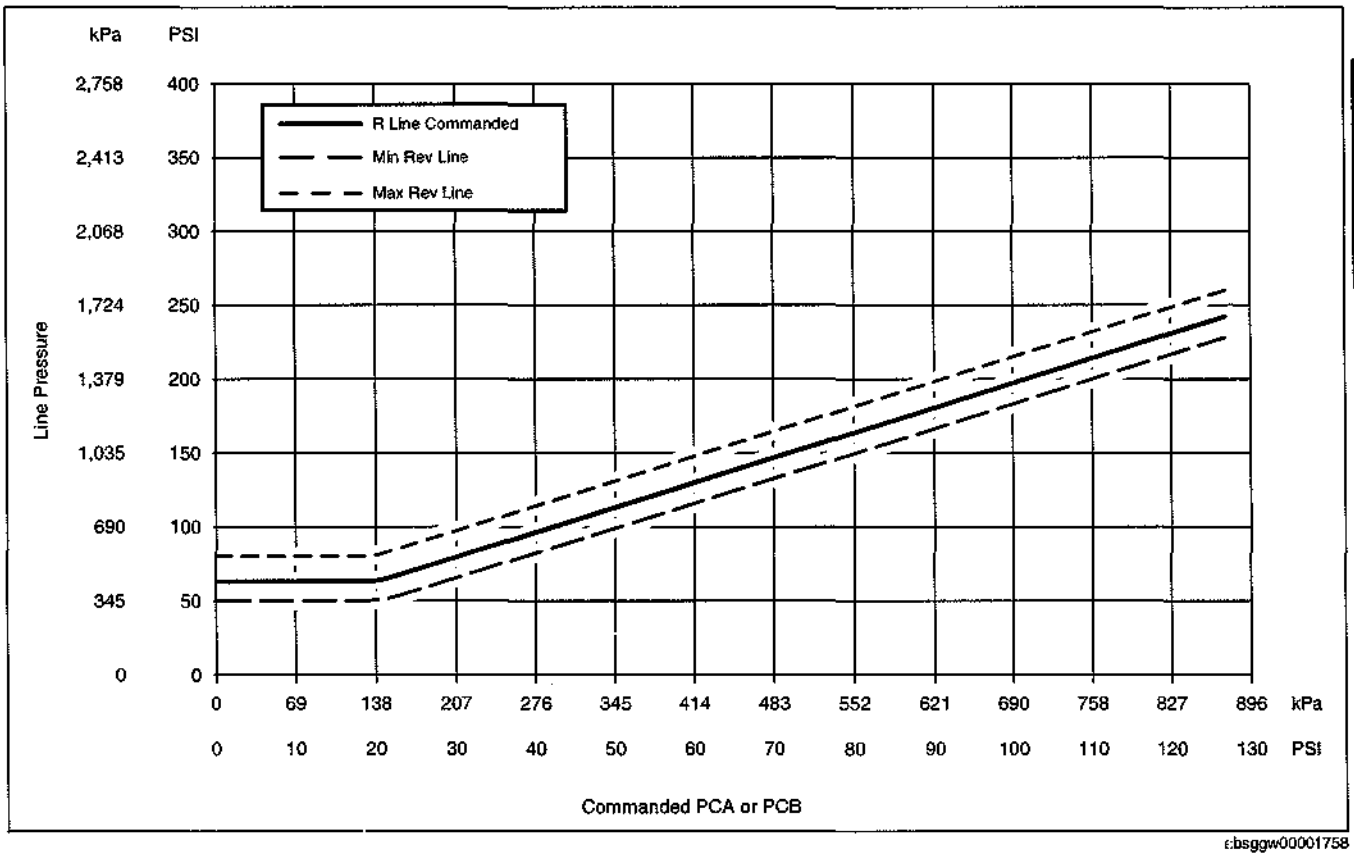

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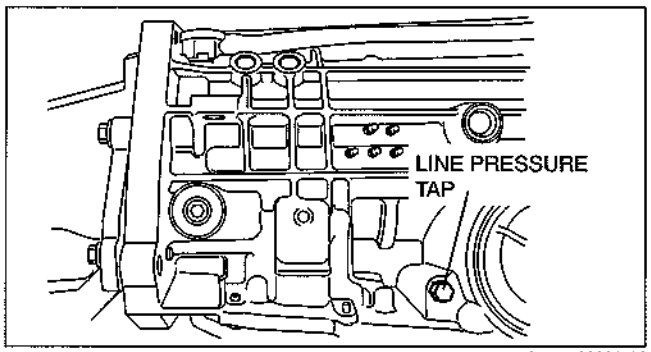
5. Install the line pressure tap.

Tightening torque
10—15 N·m {102—152 kgf·cm, 89—132 in·lbf}

6. Go to the Pressure Control C Pressure Test in this section.

Pressure Control C

1. If not previously connected, install the scan tool.
2. Remove the line pressure tap.
3. Connect the pressure gauge (**SST**: 307-004) to the line pressure tap.
4. Using the diagnostic scan tool, monitor the PC C PID and note the commanded pressure.
5. Start the engine and check the PC C pressure.
   - If the gauge reading does not match within ± **103 kPa {1.05 kgf/cm^2, 15 psi}** of the PID value displayed for the PC C, inspect the pressure control solenoid C. (See 05-13-34 SOLENOID VALVE INSPECTION [5R55S].)
   - If pressure control solenoid C operation is normal, refer to the Line Pressure Diagnosis Chart in this section for line pressure concern causes.



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Line pressure (pressure control C)

Position/range	Line pressure (kPa {kgf/cm^2, psi})	
	Idle	Stall
P/N	27 {0.28, 4}	0 {0, 0}
R	793 {8.09, 115}	793 {8.09, 115}
D, 3, 2, 1	27 {0.28, 4}	0 {0, 0}

6. Install the line pressure tap.

Tightening torque
10—15 N·m {102—152 kgf·cm, 89—132 in·lbf}

Line pressure diagnosis chart

Test Results	Possible Source
High at Idle—All Ranges	• Wiring harnesses • PC C boost valve • Pressure control solenoid C • Main regulator valve
Low at Idle—All Ranges	• Low fluid level • Fluid inlet filter/seal • Control valve body • Cross leaks • Gaskets • Pump • Separator plate
Low—All Forward Ranges	• Forward Clutch • Main Control • Overdrive brake servo • Intermediate brake servo
Low in P position Only	• Control valve body
Low in R position Only	• Separator plate • Reverse servo piston, cover seal • Reverse clutch • Overdrive brake servo • Intermediate brake servo • Control valve body • Forward clutch
Low in N position Only	• Control valve body • Overdrive brake servo • Intermediate brake servo
Low in D range	• Forward clutch • Overdrive brake servo • Intermediate brake servo • Control valve body
Low in D range Only (O/D OFF mode)	• Forward clutch • Overdrive brake servo • Intermediate brake servo • Control valve body

Test Results	Possible Source
Low in 1 range	• Forward clutch • Control valve body
Low in 2 range	• Intermediate brake servo • Overdrive brake servo • Forward clutch
Low in 3 range	• Intermediate brake servo • Overdrive brake servo • Forward clutch

Stall Speed Test

Warning
- **Apply the parking brake firmly while performing each stall test. Failure to set the brakes can result in death or severe injury.**

Caution
- **Perform the line pressure test before performing the stall test. If the line pressure is low at stall speed, do not perform the stall test or further transmission damage will occur.**
- **The stall test should only be performed with the engine and transmission at normal operating temperature.**

Note
- The stall speed test inspects the operation of the following:
  - — Torque converter clutch
  - — Forward clutch
  - — Low/reverse one-way clutch
  - — Low one-way clutch component
  - — Engine driveability concerns
  - — Overdrive one-way clutch component

1. Connect a tachometer to the engine.

Caution
- **Do not maintain WOT in any shift position for more than 5 s.**
- **If the engine rpm recorded by the tachometer exceeds the maximum specified rpm, release the accelerator pedal immediately. Otherwise, clutch or band slippage could occur.**

Note
- Prolonged use of this procedure may set DTC P0712 or P1783. After carrying out the Stall Speed Test, run the OBD Test and clear DTCs from the memory.

2. Depress the accelerator pedal to the floor (WOT) in each shift position. Record the rpm reached in each shift position.

Engine stall speed

Engine type	rpm
WL-C	2,700
WE-C	2,900

3. After testing the D, 3, 2, 1 range and R position, shift the selector lever to the N position and run the engine at **1,000 rpm** for **15 s** to allow the torque converter to cool before testing the next gear position.
   - If the stall speed is too high, refer to the stall speed diagnosis chart.

Stall speed diagnosis chart

Position/range	Stall speeds high	Stall speeds low
D, D (O/D OFF mode) and 1	• Overdrive one-way clutch • Rear one-way clutch	—
D (O/D OFF mode), 2 and 1	• Forward clutch • Overdrive one-way clutch	—
D	• Forward clutch • Overdrive one-way clutch	—
D, D (O/D OFF mode), 2, 1 and R	• General pressure concerns • Forward clutch • Overdrive one-way clutch	• Converter one-way clutch or engine driveability concerns
R	• High/reverse • High clutch • Low/reverse band/servo	—
2	• Intermediate band/servo	—
1	• Intermediate band/servo	—

4. If the stall speed is too low, inspect the idle speed.
   - If the idle speed is normal, remove the torque converter and inspect the torque converter one-way clutch for slippage.

ROAD TEST [5R55S]

id0513c1248900

Warning
- **When performing a road test, be aware of other vehicles, people, and impediments to avoid an accident.**

Note
- Always drive the vehicle in a safe manner according to driving conditions and obey all traffic laws.
- When the legal speed limit must be exceeded, use a chassis dynamometer instead of performing a road test.

Road Test Preparation

1. Inspect the engine coolant level.
2. Inspect the engine oil level.
3. Inspect the ATF level. (See 05-13-13 AUTOMATIC TRANSMISSION FLUID (ATF) INSPECTION [5R55S].)
4. Inspect the idle speed.

Shift Point Road Test

Note
- This test verifies that the shift control system is operating correctly.

1. Bring up the engine and transmission to normal operating temperature.
2. Shift the selector lever to the D range.
3. Apply minimum throttle and observe speeds at which up-shift occurs and the torque converter engages.

Caution
- **Do not exceed posted speed limits when performing this test.**

Shift speed (Reference) WL-C

Throttle position	Gear position	Vehicle speed (km/h {mph})
Closed	5—4	33—35 {20—22}
	4—1	17—19 {10—12}
Minimum monitor PID minimum TP volt 1.25	1—2	17—19 {10—12}
	2—3	21—24 {13—15}
	3—4	28—30 {17—19}
	4—5	38—40 {23—25}
Wide open	1—2	42—45 {26—28}
	2—3	60—62 {37—39}
	3—4	80—83 {49—52}
	4—5	115—122 {71—76}

Shift speed (Reference) WE-C

Throttle position	Gear position	Vehicle speed (km/h {mph})
Closed	5—4	44—46 {27—29}
	4—1	17—19 {10—12}
Minimum monitor PID minimum TP volt 1.25	1—2	17—19 {10—12}
	2—3	26—29 {16—18}
	3—4	31—33 {19—21}
	4—5	52—54 {32—34}
Wide open	1—2	42—45 {26—28}
	2—3	61—66 {38—41}
	3—4	84—91 {52—57}
	4—5	107—119 {66—74}

4. Stop the vehicle.
5. Depress O/D OFF switch to activate D range and repeat Step 3.
6. The transmission will make all upshifts except 4-5, and the torque converter clutch application should occur above **46 km/h {29 mph}**.
7. Press the accelerator pedal to the floor, wide open throttle (WOT). The transmission should shift from 3GR to 2GR or 3GR to 1GR depending on vehicle speed, and the torque converter clutch should release.
8. With the vehicle speed above **48 km/h {30 mph}**, move the transmission range selector lever from D range to 1 range and release the accelerator pedal. The transmission should immediately downshift to 3GR. When the vehicle speed drops below **32 km/h {20 mph}**, the transmission should downshift into 1st gear.
9. If the transmission fails to up-shift/down-shift or the torque converter does not apply and release, inspect according to "SYMPTOM TROUBLESHOOTING". (See 05-03-5 SYMPTOM TROUBLESHOOTING ITEM TABLE [5R55S].)

AIR PRESSURE TEST [5R55S]

id0513c1249500

Note
- A no-drive or erratic shift condition may be due to inoperative bands and clutches. To diagnose these conditions a series of checks can be made by substituting air pressure for fluid to determine the location of the damaged or obstructed component.
- Follow the procedure to determine the location of the inoperative clutch or band by substituting air pressure into the various test plate passages.
- Use only dry, regulated air pressure, **276 kPa {2.8 kgf/cm^2, 40 psi}** maximum.

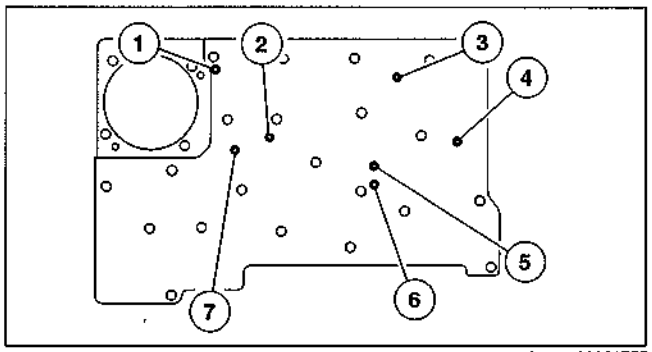
1. Remove the control valve body. (See 05-13-61 CONTROL VALVE BODY REMOVAL [5R55S].)
2. Install the transmission test plate and gasket (**SST**: 307-433-01, 307-433-02, 307-433-03).

Tightening torque
10 N·m {102 kgf·m, 111.6—89 ft·lbf}

Note
- Do not apply air to the test plate vent hole.

3. Apply air to the appropriate clutch or servo port. Refer to the Air Pressure Test Diagnostic Chart for conditions, possible causes and actions.

1	Reverse servo
2	Intermediate servo
3	Overdrive servo
4	Coast clutch
5	Forward clutch
6	Direct clutch
7	Reverse servo modulator



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4. After the testing is completed, remove the air test plate and gasket (**SST**: 307-433-01, 307-433-02, 307-433-03) and proceed with any repairs that are needed.
5. After the repairs are completed, install the control valve body. (See 05-13-63 CONTROL VALVE BODY INSTALLATION [5R55S].)

Air pressure test diagnostic chart

Condition	Possible causes	Actions
Dull thud heard or movement felt when air is applied and released	Clutches, bands and fluid passages are normal.	Concerns may not be in the transmission. Check the powertrain TCM, wiring harness and non-transmission related components.
No drive	Clutches and bands inoperative.	Disassemble the transmission, clean and inspect to locate area of concern.
Erratic shifts	Clutches and bands inoperative due to incorrect pressures.	Disassemble the transmission, clean and inspect to locate area of concern.
No dull thud heard	Clutches, bands and fluid passages may be damaged or obstructed.	Disassemble the transmission, clean and inspect to locate area of concern.
No movement felt	Clutches, bands and fluid passages may be damaged or obstructed.	Disassemble the transmission, clean and inspect to locate area of concern.
Hissing sound heard	Clutch seals or check ball may be damaged or leaking.	Disassemble the transmission, clean and inspect to locate area of concern.
Servos do not operate	Seals and pistons may be damaged. Supply and release ports may be obstructed. Spring may be broken.	Disassemble the transmission, clean and inspect to locate area of concern.
Multiple clutches are applied	Fluid passages in center support or clutch cylinders may be obstructed.	Disassemble the transmission, clean and inspect to locate area of concern.Check fluid passages in the center support for obstructions.

LEAKAGE INSPECTION [5R55S]

id0513c1249600

Leak Check Test with a Black Light

Note
- Automatic Transmission/Power Steering Dye (specifically formulated for ATF) is used to detect a transmission fluid leak.

1. Add Automatic Transmission/Power Steering Dye to the transmission fluid. Use one **30.0 mL {30.0 cc, 1 ft oz}** of dye solution for every **3.8 L {4.0 US qt, 3.3 Imp qt}** of transmission fluid.
2. Start and run the engine until the transmission reaches its normal operating temperature.
3. Observe the back of the cylinder block and top of the torque converter housing for evidence of fluid leakage.
4. Raise the vehicle on a hoist.
5. Run the engine at fast idle, then at engine idle, occasionally shifting to the D range and R position to increase pressure within the transmission.
6. Observe the front of the flexplate, back of the cylinder block (in as far as possible), inside the torque converter housing and the entire case until fluid leakage is evident and the probable source of leakage can be detemined.

Caution
- **Do not try to stop a fluid leak by increasing the torque beyond specifications. This may cause damage to the transmission case threads.**

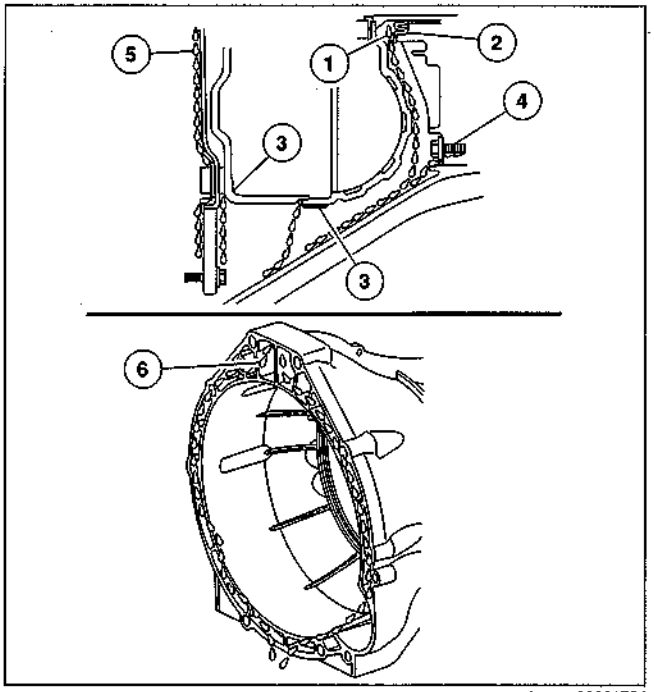
External fluid leaks

Leak path	Possible source
Leaks at the fluid pan-to-case	• Pan bolts not tightened to specification. • Case pan rail damaged. • Pan gasket damaged.
Fluid cooler lines or fittings leaking	• Cooler line(s), cooler line fitting(s) damaged. • Cooler line fittings-to-case union damaged. • Case damage at case fitting. • Fittings not tightened to specifications.
Fluid cooler line nut-to-case fittings leaking	• Damaged or missing O-rings. • Fittings not tightened to specifications.
Leaks at the fluid cooler	• Fluid cooler damage. • Fitting(s) damaged or not tightened to specifications.
Leaks at the external sensors	• Damaged or missing O-rings. • Screw not tightened to specifications.
Leaks at the manual control lever seal	• Damaged or missing lever seal.
Leaks at the solenoid body harness connector	• Install a new solenoid body wiring harness connector O-ring seal. Either on the wiring harness end or the solenoid body.
Fluid leakage in the torque converter area	• For possible sources refer to Fluid Leakage In Torque Converter Area Chart.

Fluid Leakage in Torque Converter Area

- In diagnosing and correcting fluid leaks in the front pump support and gear and torque converter area, use the following procedures to locate the exact cause of the leakage.
- Leakage at the front of the transmission, as evidenced by fluid around the torque converter housing, may have several sources.
- By careful observation it is possible, in many instances, to pinpoint the source of leak before removing the transmission from the vehicle.
- The paths which the fluid takes to reach the bottom of the torque converter housing are shown in the illustration.

Leak path	Symptom	Possible source
1, 2 and 4	Leak at front of transmission	Pump lip seal
1, 2 and 4	Leak at front of transmission	Converter hub weld
1, 2 and 4	Leak at front of transmission	External pump seal (large)
1, 2 and 4	Leak at front of transmission	Pump-to-case screws
1, 2 and 4	Leak at front of transmission	Pump gasket
3	Leak at front of transmission	Torque converter seal weld
3	Leak at front of transmission	Torque converter stud
5	Leak at front of transmission	Engine oil leak—rear main seal
5	Leak at front of transmission	Engine valve cover
5	Leak at front of transmission	Oil galley
5	Leak at front of transmission	Engine oil pressure sensor
6	Leak between engine and transmission case	Venting



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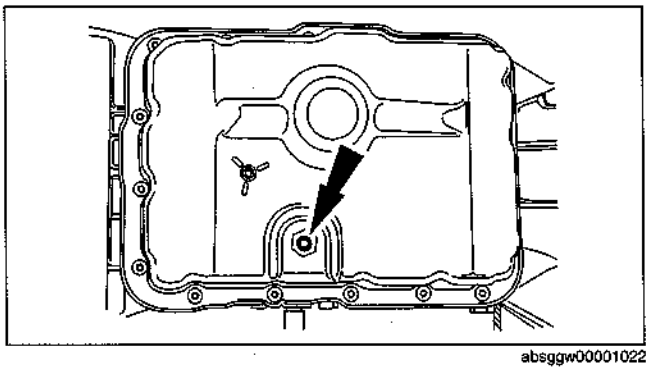
AUTOMATIC TRANSMISSION FLUID (ATF) INSPECTION [5R55S]

id0513c1251100

Automatic Transmission Fluid (ATF) Condition Inspection

1. Hold the larger drain plug with a wrench and remove the small (center) fluid level indicating plug.
2. Check the ATF level.
3. Observe the color and the odor of the ATF.
   - Under normal circumstances the color should be dark reddish, not brown or black.
4. Allow the ATF to drip onto a facial tissue and examine the stain.
   - If evidence of solid material is found, the fluid pan should be removed for further inspection.
   - If ATF contamination or transmission failure is confirmed by the sediment in the bottom of the fluid pan, the transmission must be disassembled and completely cleaned.
5. Install the small (center) fluid level indicating plug.



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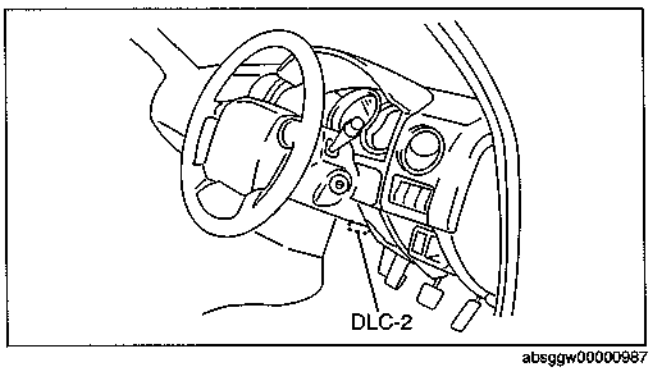
Tightening torque
10 N·m {102 kgf·cm, 89 in·lbf}

Automatic Transmission Fluid (ATF) Level Inspection

1. Connect the M-MDS to the vehicle DLC-2 16-pin connector.
2. Verify the ATF temperature using the PID/data monitor "TFT".
3. Warm up the automatic transmission until the ATF temperature is **27—49 °C {80—120 °F}**.
4. Move the range selector lever slowly through each gear, stopping in each position and allowing the transmission to engage.
5. Place the selector lever in the P position.



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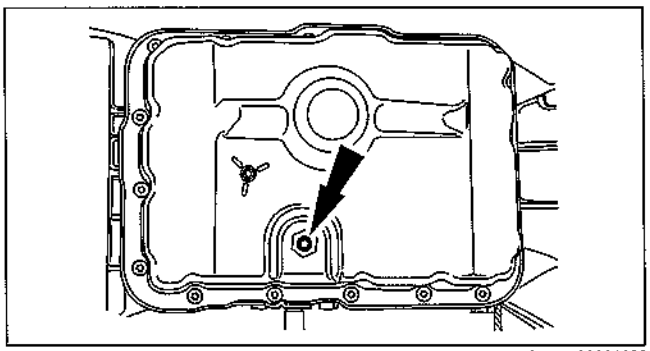
6. Hold the larger drain plug with a wrench and remove the small (center) fluid level indicating plug.



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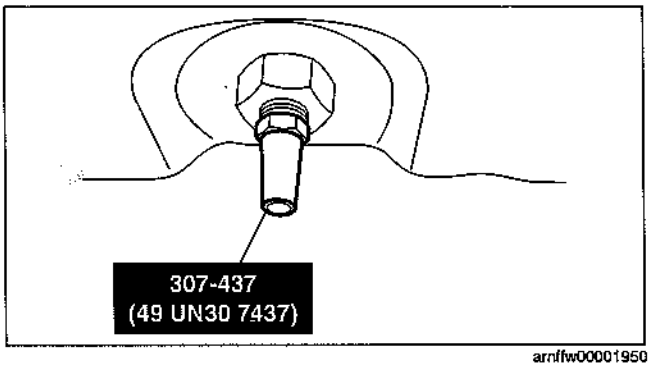
7. Install the **SST** into the pan.

Note
- Prior to filling the **SST** with clean ATF, make sure that the canister is clean.



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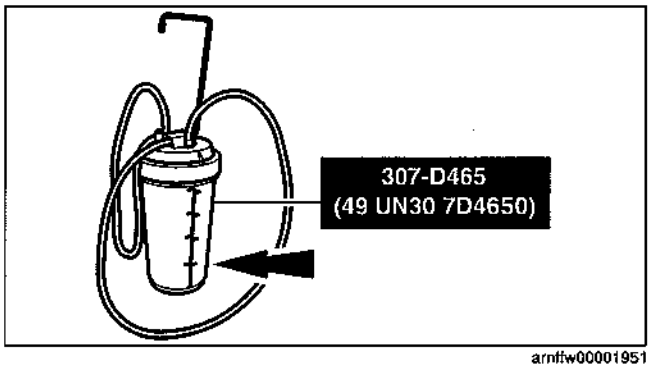
8. Fill the **SST** with clean ATF.



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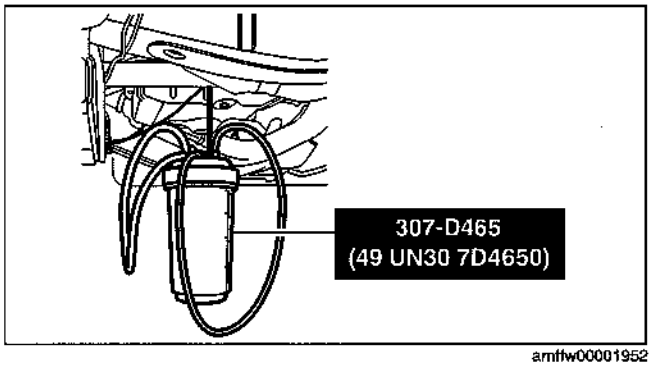
9. Hang the **SST** under the vehicle. Position it upright and close to the transmission.



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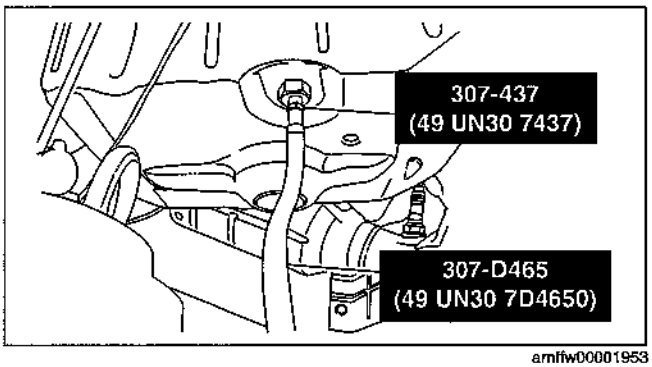
10. Connect the **SST**.
    - Connect the open end of the fluid hose from the **SST** (307-D465) to the **SST** (307-437) at the bottom of the fluid pan.



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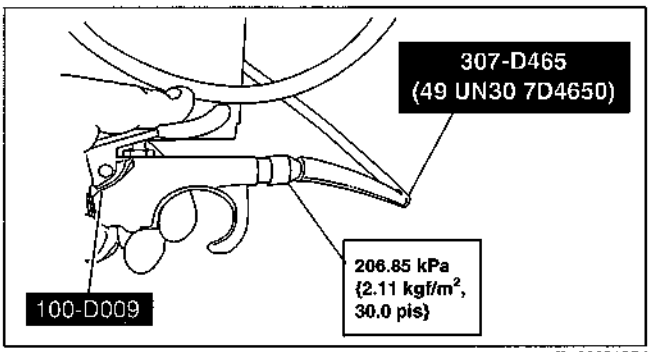
11. Apply a maximum of **206.85 kPa {2.11 kgf/cm^2, 30.0 pis}** to the open end of the vacuum/pressure hose from the rubber tip air nozzle. Fluid will immediately start flowing out of the **SST** into the fluid pan.
12. Add **0.5 L {0.5 US qt, 0.4 Imp qt}** of ATF into the fluid pan. Stop the process by releasing the air pressure and removing the air nozzle from the end of the hose.
13. Inspect the ATF level in the **SST**.
    - If the fluid drains back into the canister, the transmission is full.
    - If no fluid drains back, more fluid will need to be added. Repeat Steps 11 and 12.



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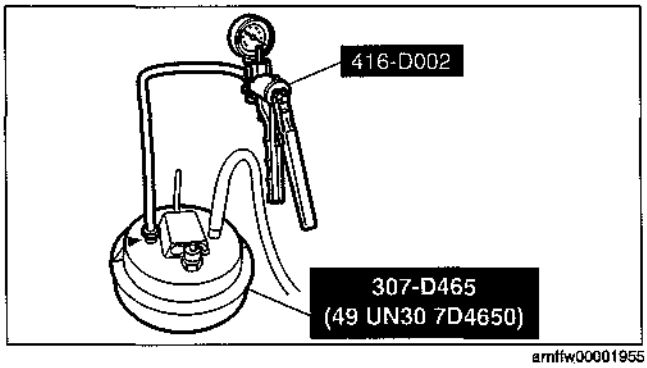
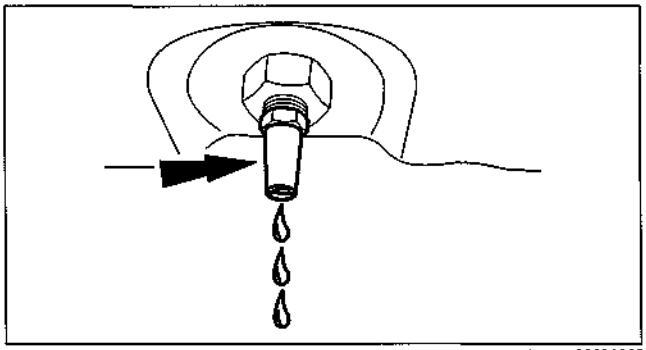
14. Once the transmission is full, place a hand vacuum pump on the open end of the vacuum/ pressure hose on the **SST** and apply vacuum to the system. This will pull out any extra fluid trapped in the system and direct it into the container.
15. Make sure that the ATF temperature is between **27—49 °C {80—120 °F}**.



arnlfw00001955

16. Allow the ATF to drain.
    - When the ATF comes out as a thin stream or drip, the ATF is at the correct level.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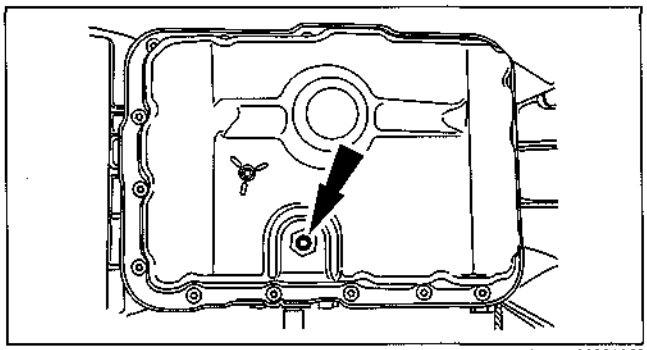
17. Install the small (center) fluid level indicating plug.

    Tightening torque
    10 N·m {102 kgf·cm, 89 in·lbf}

18. Check the operation of the transmission by moving the selector lever slowly through each gear, stopping in each position and allowing the transmission to engage.

    ATF
    Type: Mercon® V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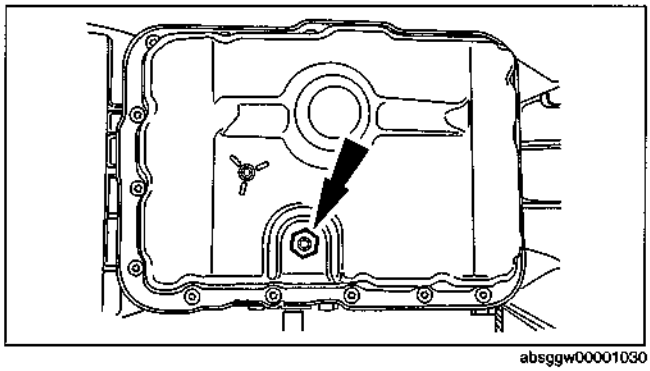
AUTOMATIC TRANSMISSION FLUID (ATF) REPLACEMENT [5R55S]

id0513c1251200

Draining

1. Place the selector lever in the P position.
2. Remove the drain plug (large plug) and allow the ATF to drain.



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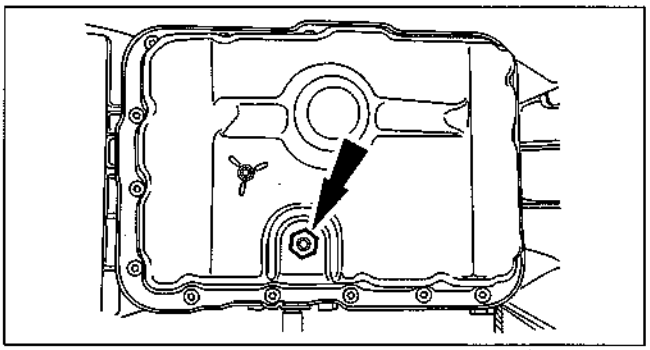
Refill

1. Install the drain plug (large plug).

   Tightening torque
   24—28 N·m {2.5—2.8 kgf·m, 18—20 ft·lbf}



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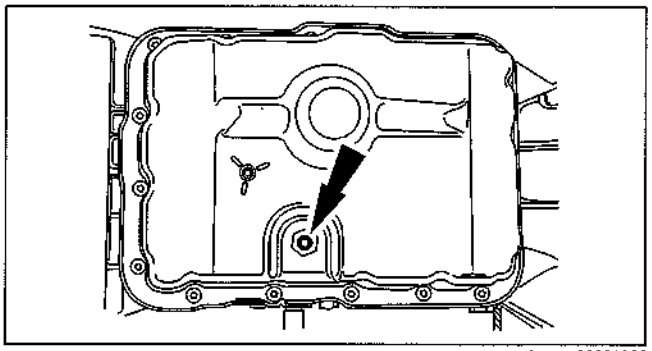
2. Hold the larger drain plug with a wrench and remove the small (center) fluid level indicating plug.



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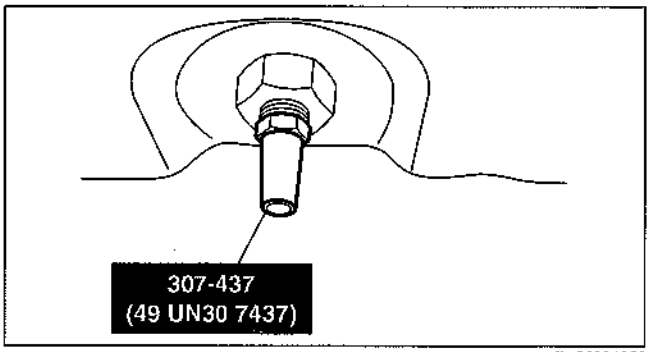
3. Install the **SST** into the pan.

   Note
   - Prior to filling the **SST** with clean ATF, make sure that the canister is clean.



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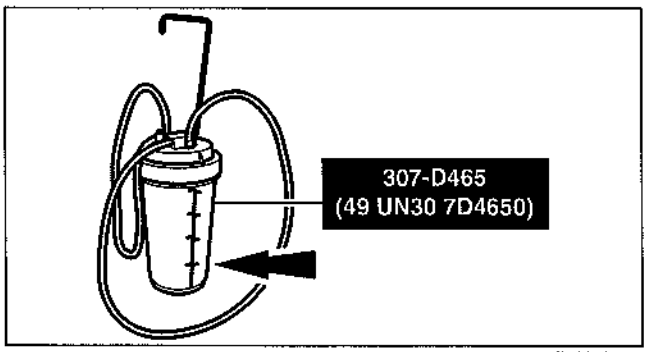
4. Fill the **SST** with clean ATF.



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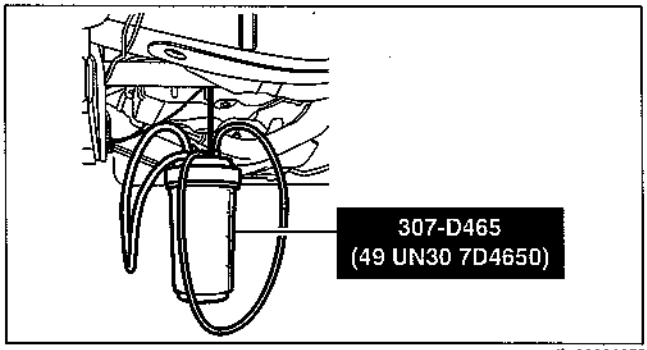
5. Hang the **SST** under the vehicle. Position it upright and close to the transmission.



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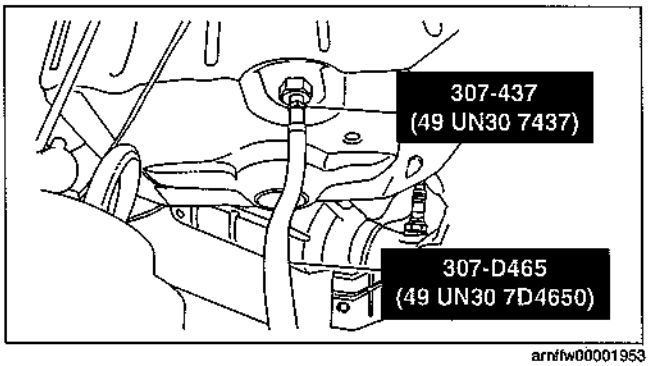
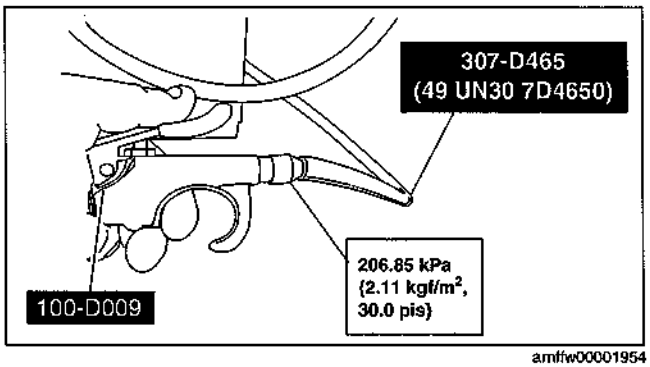
6. Connect the **SST**.
   - Connect the open end of the fluid hose from the **SST** (307-D465) to the **SST** (307-437) at the bottom of the fluid pan.



arnffw00001953

7. Apply a maximum of **206.85 kPa {2.11 kgf/cm^2, 30.0 pis}** to the open end of the vacuum/pressure hose from the rubber tip air nozzle. Fluid will immediately start flowing out of the **SST** into the fluid pan.
8. Add **1.89—2.83 L {2.00—2.99 US qt, 1.67—2.49 imp qt}** of ATF into the fluid pan. Stop the process by releasing the air pressure and removing the air nozzle from the end of the hose.



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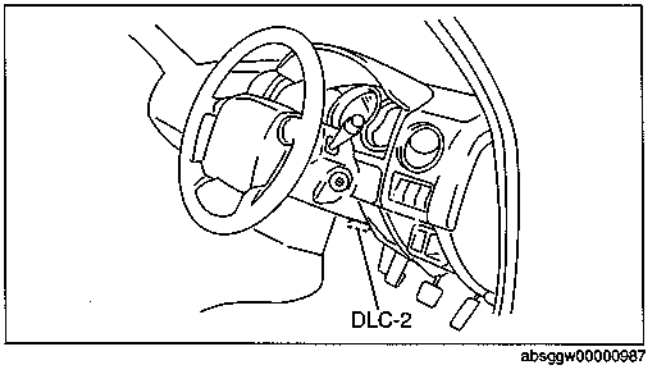
9. Connect the M-MDS to the vehicle DLC-2 16-pin connector.
10. Verify the ATF temperature using the PID/data monitor "TFT".
11. Warm up the automatic transmission until the ATF temperature is **27—49 °C {80—120 °F}**.
12. Inspect the ATF level in the **SST**.
    - If the fluid drains back into the canister, the transmission is full.
    - If no fluid drains back, more fluid will need to be added. Repeat Steps 7 and 8.



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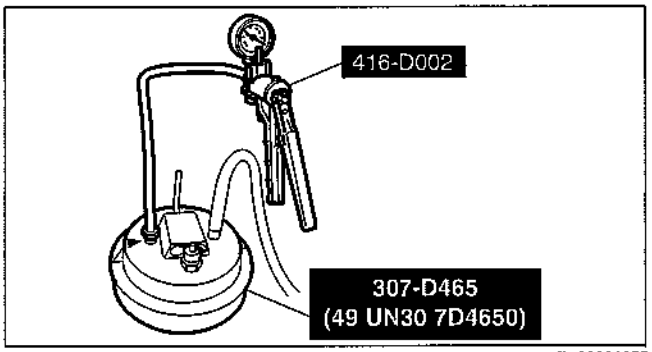
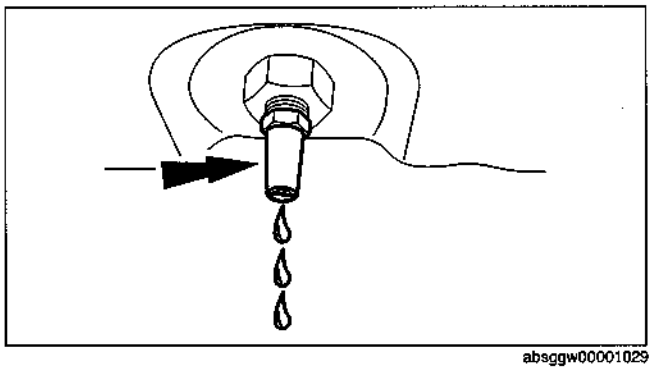
13. Once the transmission is full, place a hand vacuum pump on the open end of the vacuum/ pressure hose on the **SST** and apply vacuum to the system. This will pull out any extra fluid trapped in the system and direct it into the container.



arnffw00001955

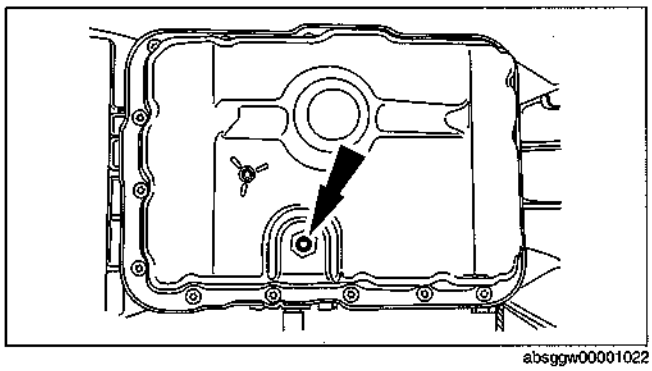
14. Allow the ATF to drain.
    - When the ATF comes out as a thin stream or drip, the ATF is at the correct level.


absggw00001029

15. Install the small (center) fluid level indicating plug.

    Tightening torque
    10 N·m {102 kgf·cm, 89 in·lbf}

    ATF
    Type: Mercon® V
    Capacity (approx. quantity): 9.93 L {10.49 US qt, 8.74 Imp qt}


absggw00001022

O/D OFF SWITCH INSPECTION [5R55S]

id0513c1254200

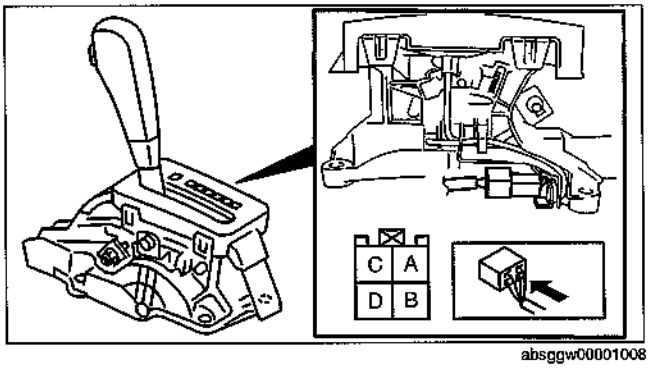
Operation Inspection

1. Turn the engine switch to the ON position.
2. Verify that the O/D OFF indicator light is not illuminated. Press the O/D OFF switch and verify that the O/D OFF indicator light illuminates.
   - If there is any malfunction, inspect the terminal voltage of the O/D OFF switch. (See 05-13-19 Voltage Inspection.)

Voltage Inspection

1. Turn the engine switch to the ON position.
2. Measure the voltage at the O/D OFF switch connector.
   - If there is any malfunction, inspect for continuity at the O/D OFF switch. (See 05-13-19 Continuity Inspection.)

Position		Connector terminal	
		C	D
OFF (Normal)	(V)	B+	0
ON (Depressed)	(V)	0	0



absggw00001008

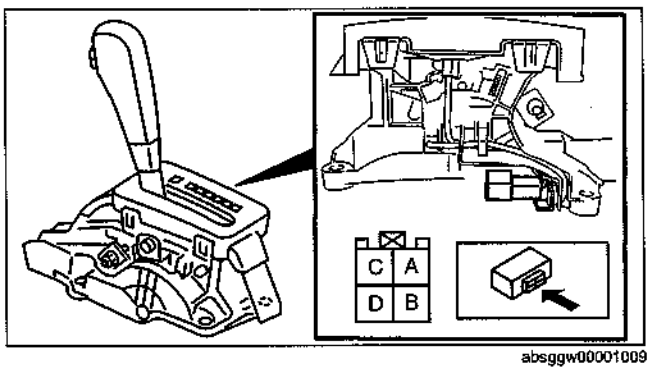
Continuity Inspection

1. Disconnect the O/D OFF switch connector.
2. Verify that the continuity is as indicated in the table.
   - If the switch is normal, inspect the wiring harness. (O/D OFF switch—TCM, O/D OFF switch—Body ground)
   - If there is any malfunction, replace the selector lever component. (See 05-14-4 SELECTOR LEVER REMOVAL/ INSTALLATION.)

○—○ : Continuity

Switch	Terminal	
	C	D
ON (Normal)		
OFF (Depressed)	○	○

absggw00001858



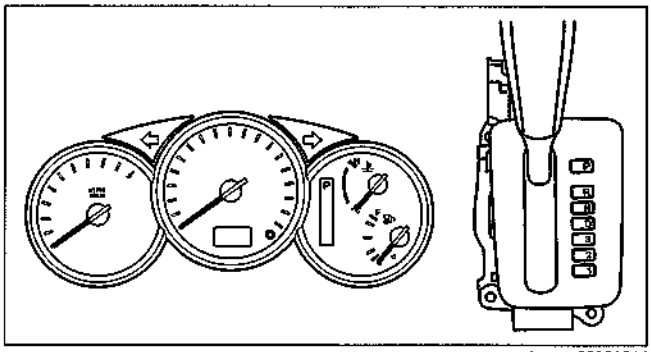
absggw00001009

DIGITAL TRANSMISSION RANGE (TR) SENSOR INSPECTION [5R55S]

id0513c1254700

Operating Inspection

1. Verify that the starter operates only when the engine switch is turned to the START position with the selector lever in the P or N position.
   - If there is any malfunction, adjust the digital TR sensor. (See 05-13-24 DIGITAL TRANSMISSION RANGE (TR) SENSOR ADJUSTMENT [5R55S].)
2. Verify that the back-up lights illuminate when shifted to the R position with the engine switch at the ON position.
   - If there is any malfunction, adjust the digital TR sensor. (See 05-13-24 DIGITAL TRANSMISSION RANGE (TR) SENSOR ADJUSTMENT [5R55S].)
3. Verify that the positions of the selector lever and the indicator are aligned.
   - If there is any malfunction, adjust the digital TR sensor. (See 05-13-24 DIGITAL TRANSMISSION RANGE (TR) SENSOR ADJUSTMENT [5R55S].)



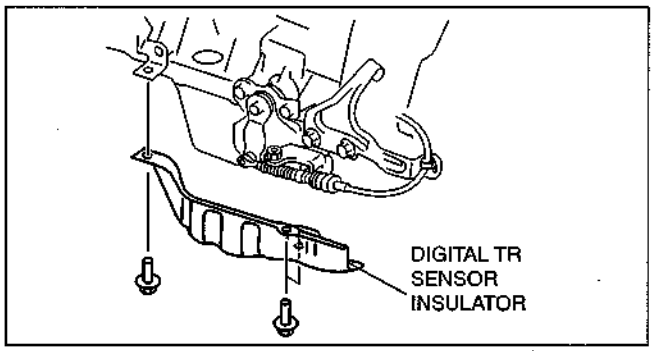
absggw00001014

Continuity Inspection

Caution

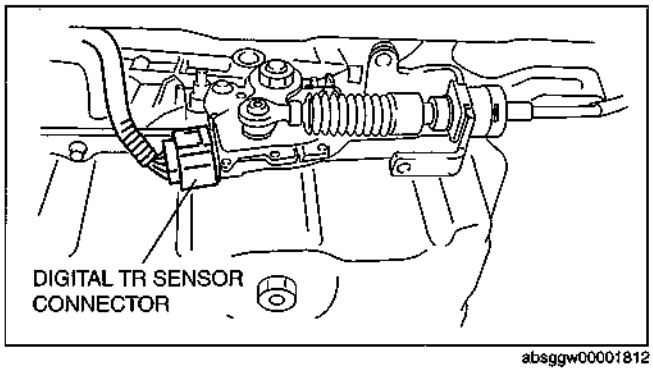
- **Water or foreign material entering the connector can cause poor connections or corrosion. Be sure that water or foreign material do not enter the connector when disconnecting it.**

1. Disconnect the negative battery cable.
2. Remove the digital TR sensor insulator.



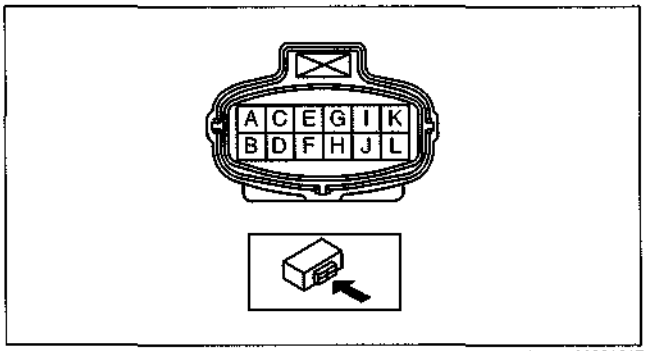
absggw00001811

3. Disconnect the digital TR sensor connector.



absggw00001812

4. Verify that the continuity is as indicated in the table.
   - If there is any malfunction, adjust the digital TR sensor. (See 05-13-24 DIGITAL TRANSMISSION RANGE (TR) SENSOR ADJUSTMENT [5R55S].)



absggw00001017

○—○ : Continuity

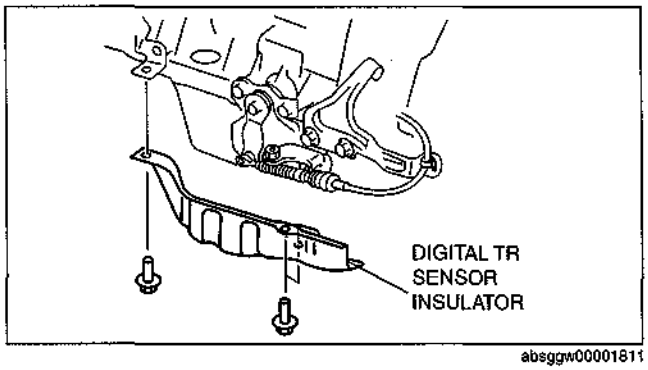
Selector position	Terminal										
	A	B	C	D	E	F	G	H	I	J	L
P	○		○		○		○		○		
		○				○					
R			○		○				○		
				○				○			
N	○				○				○		
		○				○				○	○
D											
3					○		○			○	
2			○				○			○	
1	○						○			○	

absggw00001018

5. Reinspect for continuity at digital TR sensor.
   - If there is any malfunction, replace the digital TR sensor. (See 05-13-22 DIGITAL TRANSMISSION RANGE (TR) SENSOR REMOVAL/INSTALLATION [5R55S].)
6. Connect the digital TR sensor connector.
7. Install the digital TR sensor insulator.

   Tightening torque
   7.8—10.7 N·m {80—108 kgf·cm, 69.1—94.7 in·lbf}

8. Connect the negative battery cable.



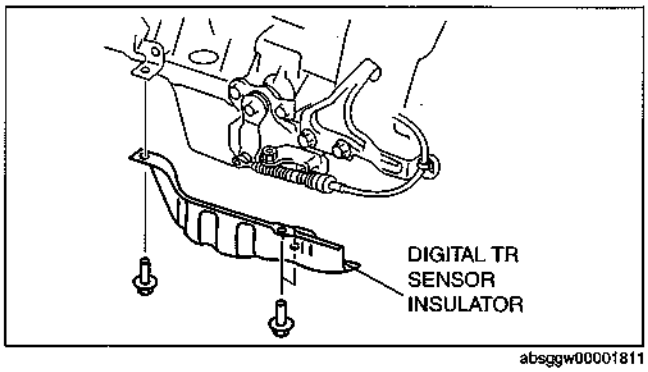
absggw00001811

DIGITAL TRANSMISSION RANGE (TR) SENSOR REMOVAL/INSTALLATION [5R55S]

id0513c1254800

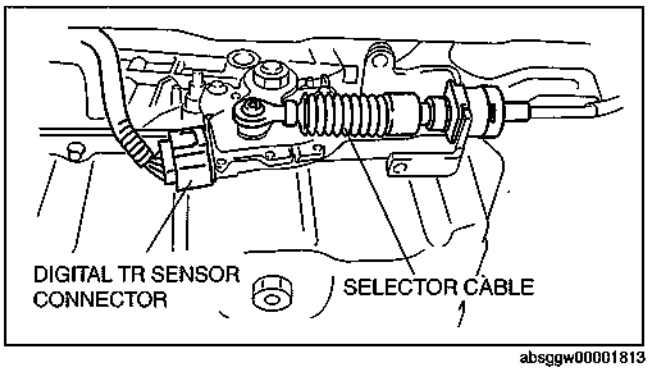
Caution
- **Water or foreign material entering the connector can cause poor connections or corrosion. Be sure that water or foreign material do not enter the connector when disconnecting it.**

1. Disconnect the negative battery cable.
2. Remove the digital TR sensor insulator.



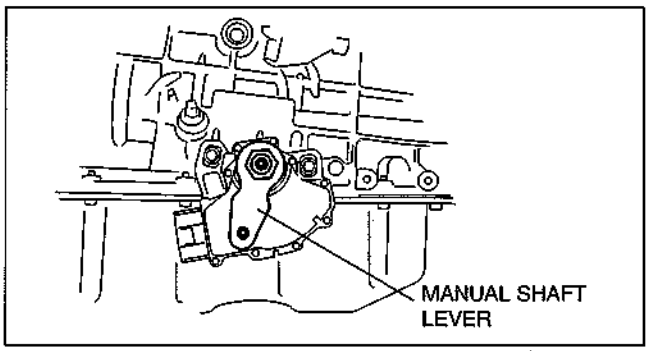
absggw00001811

3. Disconnect the digital TR sensor connector.
4. Remove the selector cable.



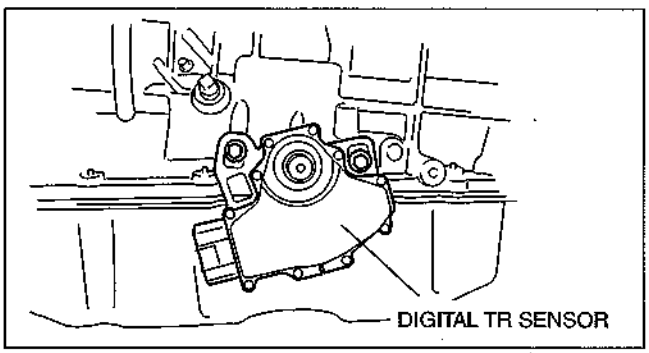
absggw00001813

5. Set the adjustable wrench as shown in the figure to hold the manual shaft lever.
6. Remove the manual shaft nut.
7. Remove the manual shaft lever.



absggw00001032

8. Remove the digital TR sensor.

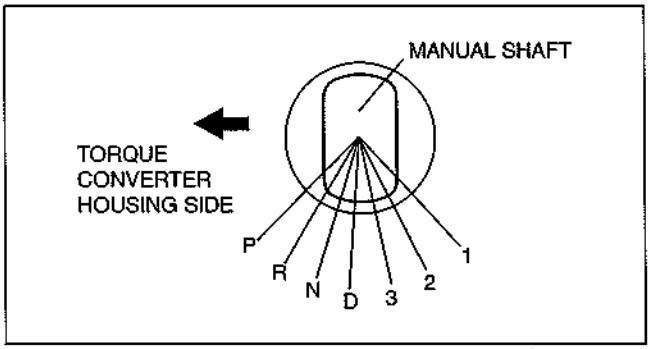


absggw00001814

9. Rotate the manual shaft to the torque converter housing side fully and return two notches to set the N position.
10. Install the digital TR sensor and loosely install the screws.

Caution
- **Tightening one screw before tightening the other may cause the digital TR sensor to bind or become damaged.**

Note
- The manual lever must be in the N position.

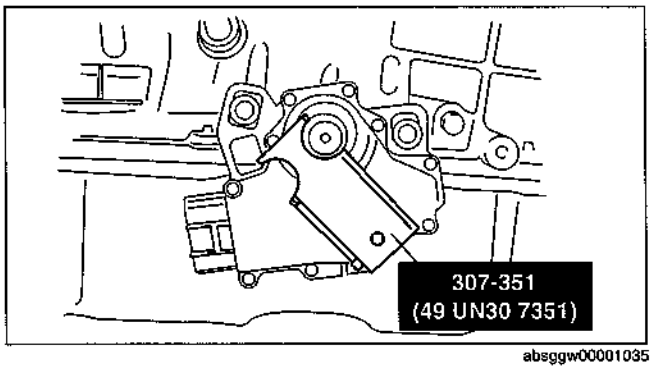


absggw00001034

11. Using the **SST**, align the digital TR sensor and tighten the screws in an alternating sequence.

Tightening torque
6.5—9.5 N·m {67— 96 kgf·cm, 58—84 in·lbf}

Caution
- **Do not use an impact wrench. Hold the manual shaft lever when tightening the manual shaft nut, otherwise the transmission may be damaged.**

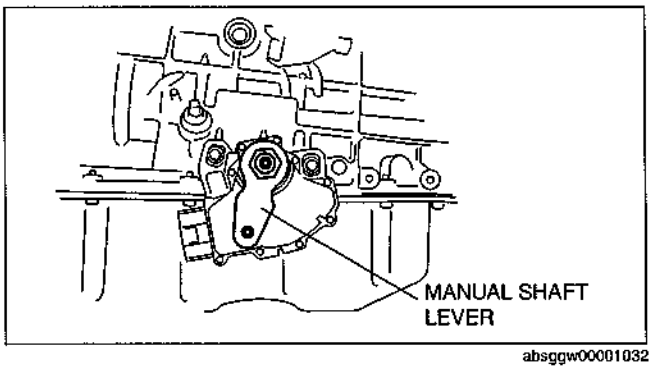


absggw00001035

12. Install the manual shaft lever.

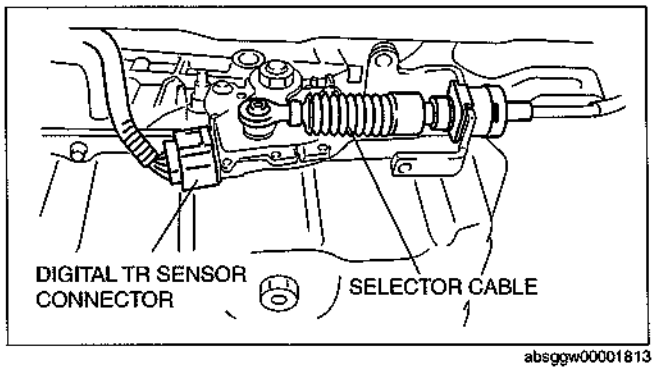
Tightening torque
61—74 N·m {6.3— 7.5 kgf·m, 45—54 ft·lbf}

13. Shift the selector lever to P position.
14. Turn the manual shaft lever to P position.



absggw00001032

15. Install the selector cable.
16. Connect the digital TR sensor connector.

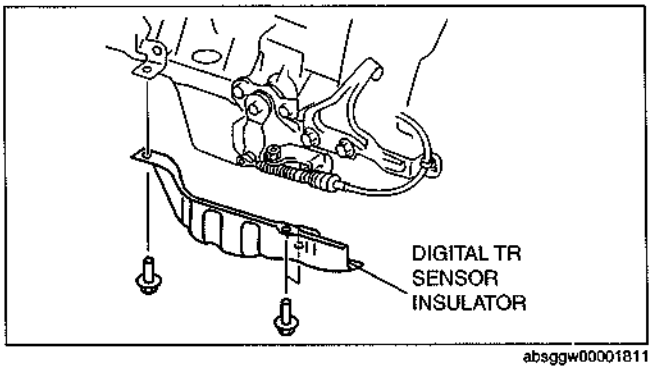


absggw00001813

17. Install the digital TR sensor insulator.

Tightening torque
7.8—10.7 N·m {80—108 kgf·cm, 69.1—94.7 in·lbf}

18. Connect the negative battery cable.
19. Inspect digital TR sensor operation. (See 05-13-20 DIGITAL TRANSMISSION RANGE (TR) SENSOR INSPECTION [5R55S].)



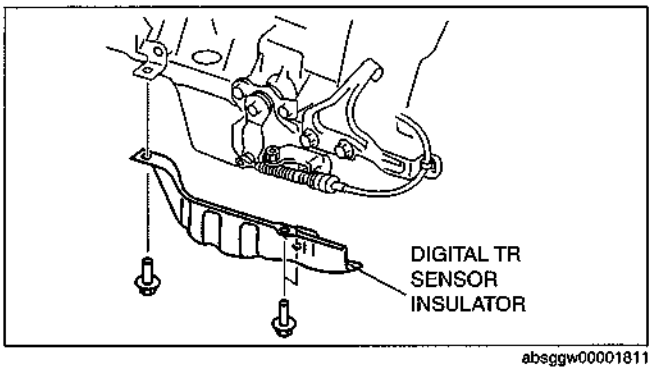
absggw00001811

DIGITAL TRANSMISSION RANGE (TR) SENSOR ADJUSTMENT [5R55S]

id0513c1254900

Caution
- **Water or foreign material entering the connector can cause poor connections or corrosion. Be sure that water or foreign material do not enter the connector when disconnecting it.**

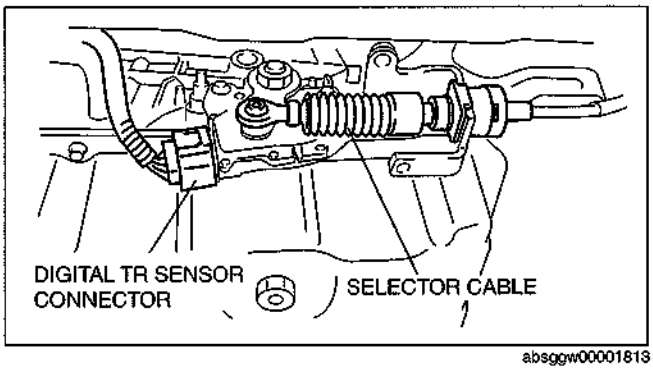
1. Disconnect the negative battery cable.
2. Remove the digital TR sensor insulator.



absggw00001811

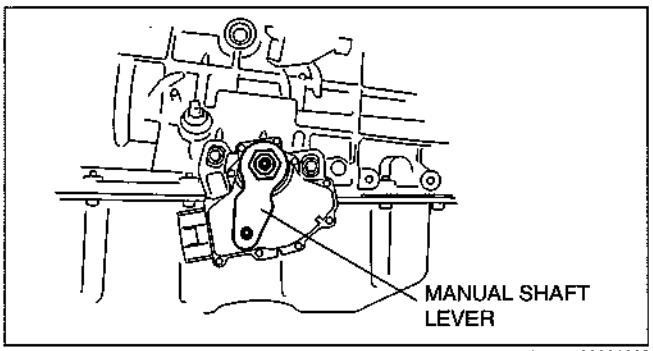
3. Disconnect the digital TR sensor connector.
4. Remove the selector cable.
5. Rotate the manual shaft to the N position.

Caution
- **Do not use an Impact wrench. Hold the manual shaft lever when removing the manual shaft nut, otherwise the transmission may be damaged.**



absggw00001813

6. Set the adjustable wrench as shown in the figure to hold the manual shaft lever.
7. Remove the manual shaft nut.
8. Remove the manual shaft lever.

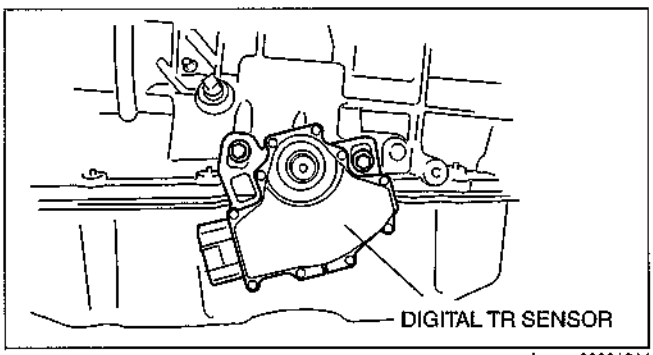


absggw00001032

9. Loosen the digital TR sensor mounting bolts.

Caution
- **Tightening one screw before tightening the other may cause the digital TR sensor to bind or become damaged.**

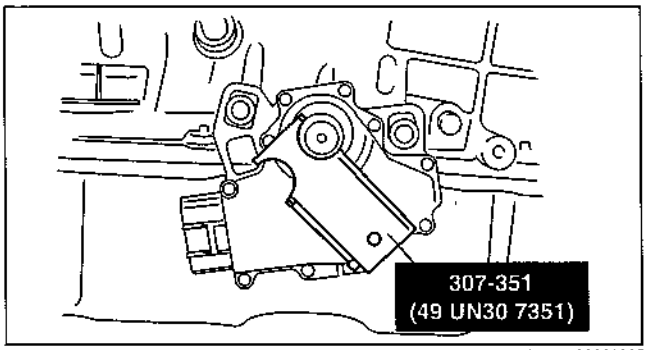
Note
- The manual lever must be in the N position.



absggw00001814

10. Using the **SST**, align the digital TR sensor and tighten the screws in an alternating sequence.

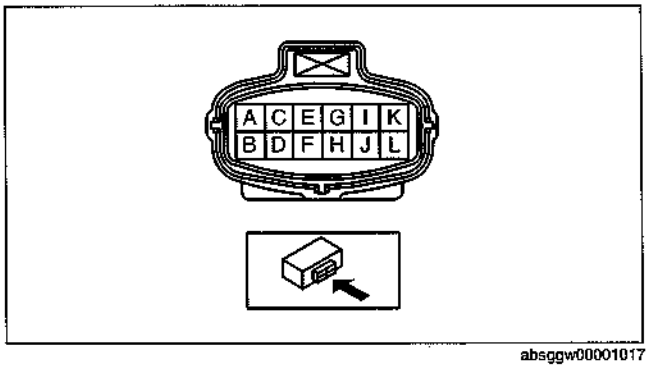
    Tightening torque
    6.5—9.5 N·m {67— 96 kgf·cm, 58—84 in·lbf}



absggw00001035

11. Inspect for continuity between digital TR sensor terminals A, E and I.

    Caution
    - **Do not use an impact wrench. Hold the manual shaft lever when tightening the manual shaft nut, otherwise the transmission may be damaged.**



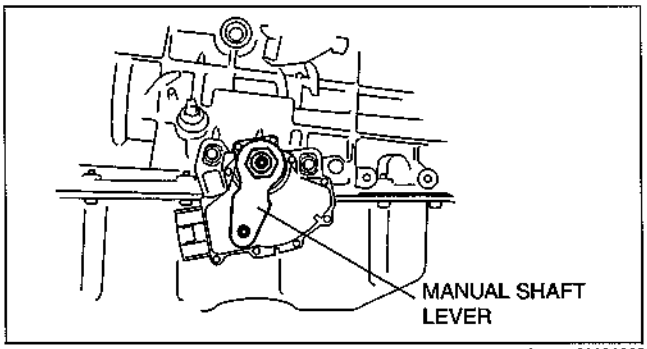
absggw00001017

12. Install the manual shaft lever.

    Tightening torque
    61—74 N·m {6.3— 7.5 kgf·m, 45—54 ft·lbf}

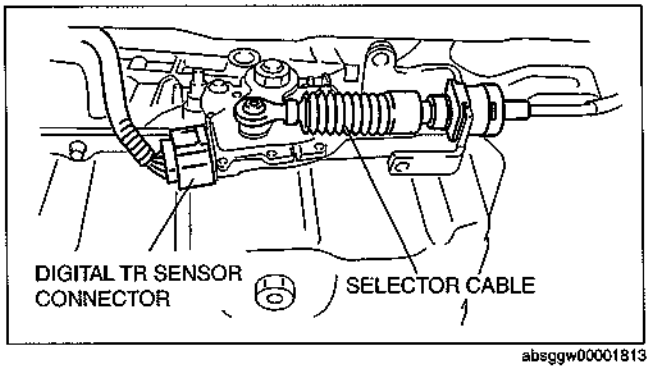
13. Set the adjustable wrench as shown in the figure to hold the manual shaft lever.
14. Tighten the manual shaft nut using a torque wrench.

    Tightening torque
    14—18 N·m {1.5—1.8 kgf·m, 11—13 ft·lbf}



absggw00001032

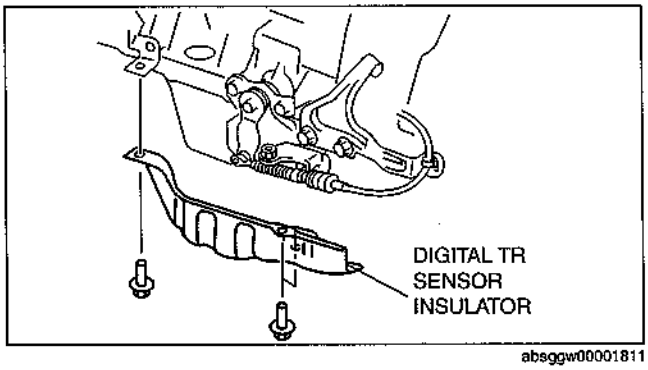
15. Shift the selector lever to P position.
16. Turn the manual shaft lever to P position.
17. Install the selector cable.
18. Connect the digital TR sensor connector.



absggw00001813

19. Install the digital TR sensor insulator.

    Tightening torque
    7.8—10.7 N·m {80—108 kgf·cm, 69.1—94.7 in·lbf}



absggw00001811

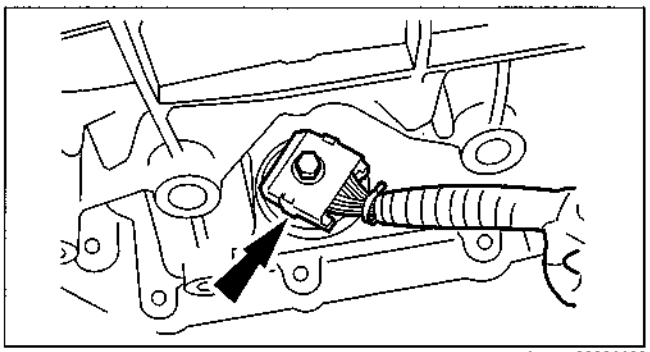
20. Connect the negative battery cable.
21. Inspect digital TR sensor operation. (See 05-13-20 DIGITAL TRANSMISSION RANGE (TR) SENSOR INSPECTION [5R55S].)

TRANSMISSION FLUID TEMPERATURE (TFT) SENSOR INSPECTION [5R55S]

id0513c1710300

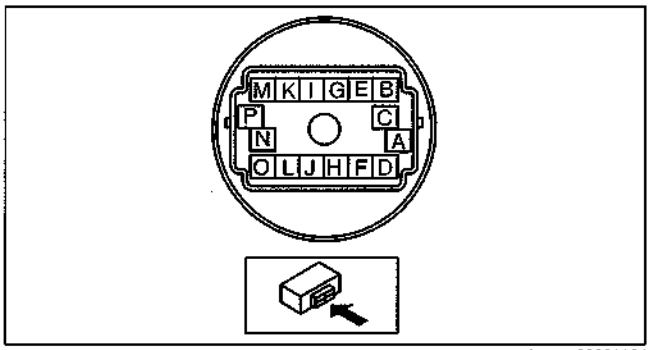
Caution
- **Water or foreign material entering the connector can cause poor connections or corrosion. Be sure that water or foreign material do not enter the connector when disconnecting it.**

On-Vehicle Inspection
1. Disconnect the negative battery cable.
2. Remove the digital TR sensor insulator.
3. Remove the CKP sensor insulator.
4. Remove the insulator bracket.
5. Disconnect the AT connector.



absggw00001183

6. Measure resistance between the AT terminals K and L.
   - If there is any malfunction, perform the off-vehicle inspection for TFT sensor. (See 05-13-27 Off-Vehicle Inspection.)



absggw00001184

Transmission fluid temperature (TFT) sensor

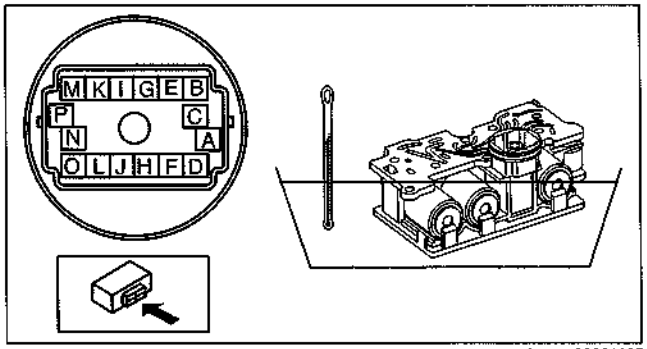
ATF temperature (°C {°F})	Resistance (kilohm)
-40—-20 {-40—-4}	284—967
-19—1 {-3—30}	100—284
0—20 {32—68}	37—100
21—40 {70—104}	16—37
41—70 {106—158}	5—16
71—90 {160—194}	2.7—5
91—110 {196—230}	1.5—2.7
111—130 {232—266}	0.8—1.5
131—150 {268—302}	0.54—0.8

7. Connect the AT connector.
8. Remove the insulator bracket. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION [5R55S].)
9. Remove the CKP sensor insulator. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION [5R55S].)
10. Remove the digital TR sensor insulator. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION [5R55S].)
11. Connect the negative battery cable.

Off-Vehicle Inspection

Warning
- **A hot the transmission and ATF can cause severe burns. Turn off the engine and wait until they are cool before replacing ATF.**

1. Remove the solenoid body. (See 05-13-35 SOLENOID BODY REMOVAL/INSTALLATION [5R55S].)
2. Place the solenoid body and a thermometer in ATF as shown in the figure, and heat the ATF gradually.
3. Measure the resistance between the solenoid body terminals K and L.
   - If there is any malfunction, replace the solenoid body. (See 05-13-35 SOLENOID BODY REMOVAL/INSTALLATION [5R55S].)



absggw00001185

Transmission fluid temperature (TFT) sensor

ATF temperature (°C {°F})	Resistance (kilohm)
-40—-20 {-40—-4}	284—967
-19—-1 {-3—30}	100—284
0—20 {32—68}	37—100
21—40 {70—104}	16—37
41—70 {106—158}	5—16
71—90 {160—194}	2.7—5
91—110 {196—230}	1.5—2.7
111—130 {232—266}	0.8—1.5
131—150 {268—302}	0.54—0.8

4. Install the solenoid body. (See 05-13-35 SOLENOID BODY REMOVAL/INSTALLATION [5R55S].)

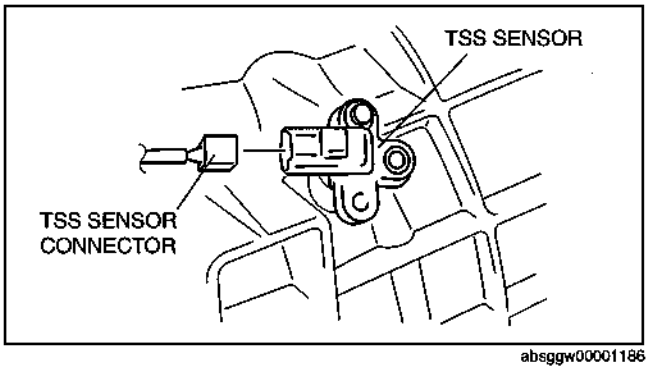
TURBINE SHAFT SPEED (TSS) SENSOR INSPECTION [5R55S]

id0513c1252900

Caution
- **Water or foreign material entering the connector can cause poor connections or corrosion. Be sure that water or foreign material do not enter the connector when disconnecting it.**

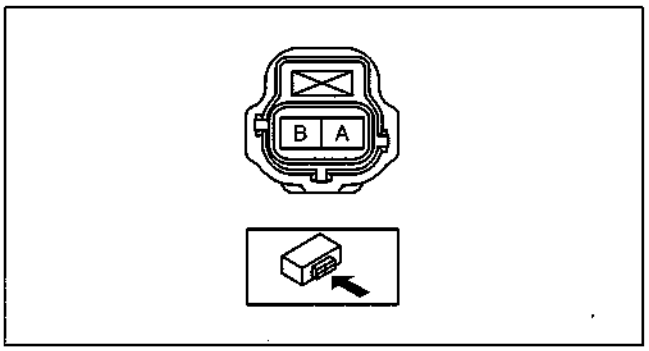
1. Disconnect the negative battery cable.
2. Remove the oxidation catalytic converter.
3. Remove the propeller shaft. (See 03-15-2 PROPELLER SHAFT REMOVAL/INSTALLATION [5AT].)
4. Remove the crossmember and transmission mount rubber. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION [5R55S])
5. Lower the transmission slightly.
6. Disconnect the TSS sensor connector.

Caution
- **Do not apply a shock in the TSS sensor.**
- **Do not damage the terminals.**



absggw00001186

7. Measure the resistance between the TSS sensor terminals.
   - If there is any malfunction, replace the TSS sensor. (See 05-13-29 TURBINE SHAFT SPEED (TSS) SENSOR REMOVAL/INSTALLATION [5R55S].)



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TSS sensor resistance

Resistance (ohm)	Temperature (°C {°F})
226—390	-20 {4}
325—485	21 {70}
492—738	150 {302}

8. Connect the TSS sensor connector.
9. Install the crossmember and transmission mount rubber. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION [5R55S])
10. Install the propeller shaft. (See 03-15-2 PROPELLER SHAFT REMOVAL/INSTALLATION [5AT].)
11. Install the oxidation catalytic converter.
12. Connect the negative battery cable.

TURBINE SHAFT SPEED (TSS) SENSOR REMOVAL/INSTALLATION [5R55S]

id0513c1253000

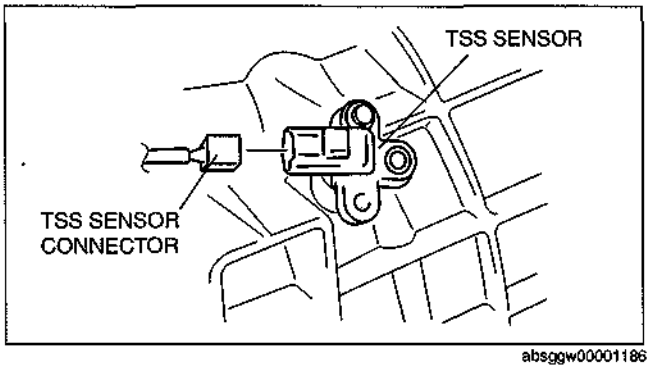
Caution
- **Water or foreign material entering the connector can cause poor connections or corrosion. Be sure that water or foreign material do not enter the connector when disconnecting it.**
- **Do not damage the TSS sensor.**

1. Disconnect the negative battery cable.
2. Remove the oxidation catalytic converter.
3. Remove the propeller shaft. (See 03-15-2 PROPELLER SHAFT REMOVAL/INSTALLATION [5AT].)
4. Remove the crossmember and transmission mount rubber. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION [5R55S])
5. Lower the transmission slightly.
6. Disconnect the TSS sensor connector.
7. Remove the TSS sensor.

Note
- Inspect O-ring for damage. Install new O-ring if damaged. Lubricate the O-ring with petroleum jelly to prevent damage to the O-ring.

8. Install the TSS sensor.

Tightening torque
8—12 N·m {82—122 kgf·cm, 71—106 in·lbf}



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9. Connect the TSS sensor connector.
10. Install the crossmember and transmission mount rubber. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION [5R55S])
11. Install the propeller shaft. (See 03-15-2 PROPELLER SHAFT REMOVAL/INSTALLATION [5AT].)
12. Install the oxidation catalytic converter.
13. Connect the negative battery cable.

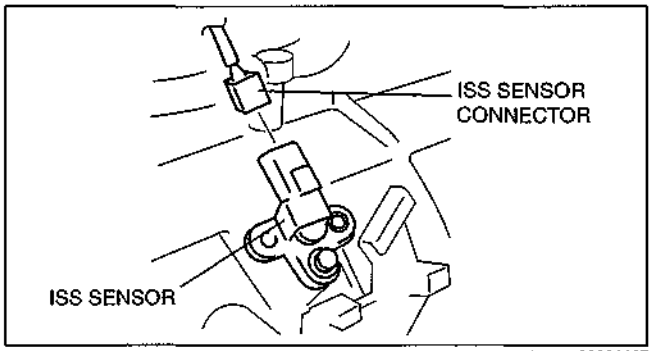
INTERMEDIATE SHAFT SPEED (ISS) SENSOR INSPECTION [5R55S]

id0513c1253400

Caution
- **Water or foreign material entering the connector can cause poor connections or corrosion. Be sure that water or foreign material do not enter the connector when disconnecting it.**

1. Disconnect the negative battery cable.
2. Remove the oxidation catalytic converter.
3. Remove the propeller shaft. (See 03-15-2 PROPELLER SHAFT REMOVAL/INSTALLATION [5AT].)
4. Remove the crossmember and transmission mount rubber. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION [5R55S].)
5. Lower the transmission slightly.
6. Disconnect the ISS sensor connector.

Caution
- **Do not apply a shock in the ISS sensor.**
- **Do not damage the terminals.**



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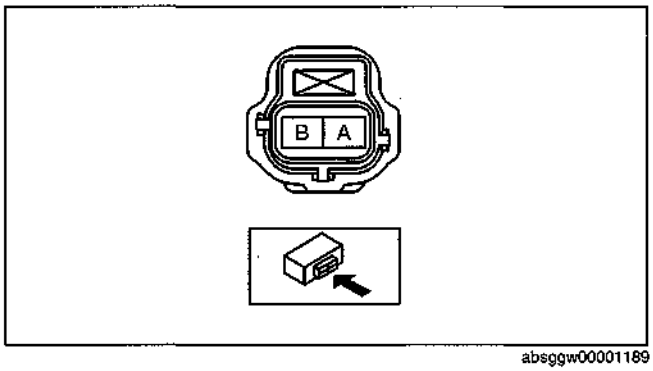
7. Measure the resistance between the ISS sensor terminals.
   - If there is any malfunction, replace the ISS sensor. (See 05-13-31 INTERMEDIATE SHAFT SPEED (ISS) SENSOR REMOVAL/INSTALLATION [5R55S].)



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ISS sensor resistance

Resistance (ohm)	Temperature (°C {°F})
226—390	-20 {4}
325—485	21 {70}
492—738	150 {302}

8. Connect the ISS sensor connector.
9. Install the crossmember and transmission mount rubber. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION [5R55S].)
10. Install the propeller shaft. (See 03-15-2 PROPELLER SHAFT REMOVAL/INSTALLATION [5AT].)
11. Install the oxidation catalytic converter.
12. Connect the negative battery cable.

INTERMEDIATE SHAFT SPEED (ISS) SENSOR REMOVAL/INSTALLATION [5R55S]

id0513c1253500

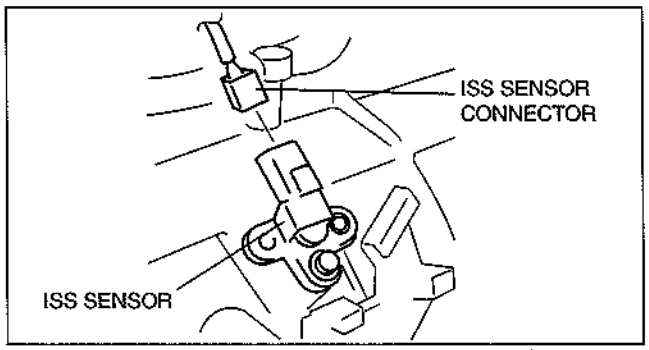
Caution
- **Water or foreign material entering the connector can cause poor connections or corrosion. Be sure that water or foreign material do not enter the connector when disconnecting it.**
- **Do not damage the ISS sensor.**

1. Disconnect the negative battery cable.
2. Remove the oxidation catalytic converter.
3. Remove the propeller shaft. (See 03-15-2 PROPELLER SHAFT REMOVAL/INSTALLATION [5AT].)
4. Remove the crossmember and transmission mount rubber. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION [5R55S].)
5. Lower the transmission slightly.
6. Disconnect the ISS sensor connector.
7. Remove the ISS sensor.

Note
- Inspect O-ring for damage. Install new O-ring if damaged. Lubricate the O-ring with petroleum jelly to prevent damage to the O-ring.

8. Install the ISS sensor.

Tightening torque
8—12 N·m {82—122 kgf·cm, 71—106 in·lbf}



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9. Connect the ISS sensor connector.
10. Install the crossmember and transmission mount rubber. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION [5R55S].)
11. Install the propeller shaft. (See 03-15-2 PROPELLER SHAFT REMOVAL/INSTALLATION [5AT].)
12. Install the oxidation catalytic converter.
13. Connect the negative battery cable.

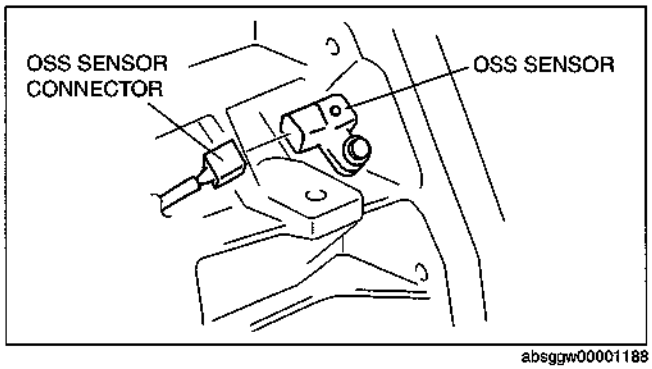
OUTPUT SHAFT SPEED (OSS) SENSOR INSPECTION [5R55S]

id0513c1254000

Caution
- **Water or foreign material entering the connector can cause poor connections or corrosion. Be sure that water or foreign material do not enter the connector when disconnecting it.**

1. Disconnect the negative battery cable.
2. Remove the oxidation catalytic converter.
3. Remove the propeller shaft. (See 03-15-2 PROPELLER SHAFT REMOVAL/INSTALLATION [5AT].)
4. Remove the crossmember and transmission mount rubber. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION [5R55S].)
5. Lower the transmission slightly.
6. Disconnect the OSS sensor connector.

Caution
- **Do not apply a shock to the OSS sensor.**
- **Do not damage the terminals.**



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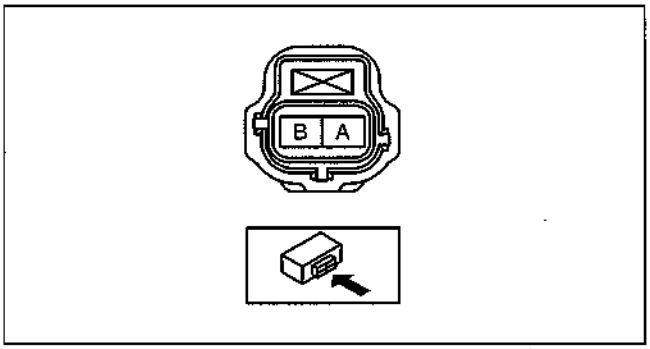
7. Measure the resistance between the OSS sensor terminals.
   - If there is any malfunction, replace the OSS sensor. (See 05-13-33 OUTPUT SHAFT SPEED (OSS) SENSOR REMOVAL/INSTALLATION [5R55S].)



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OSS sensor resistance

Resistance (ohm)	Temperature (°C {°F})
226—390	-20 {4}
325—485	21 {70}
492—738	150 {302}

8. Connect the OSS sensor connector.
9. Install the crossmember and transmission mount rubber. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION [5R55S].)
10. Install the propeller shaft. (See 03-15-2 PROPELLER SHAFT REMOVAL/INSTALLATION [5AT].)
11. Install the oxidation catalytic converter.
12. Connect the negative battery cable.

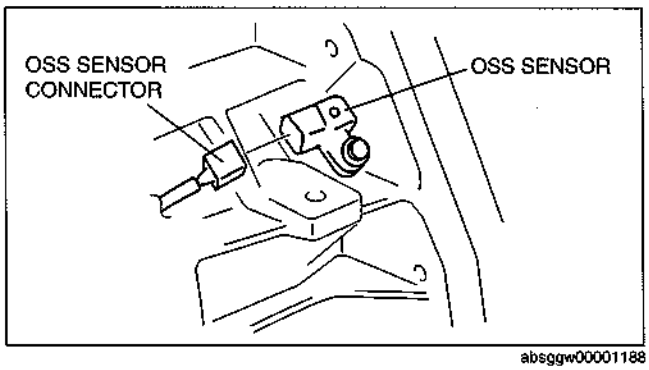
OUTPUT SHAFT SPEED (OSS) SENSOR REMOVAL/INSTALLATION [5R55S]

id0513c1254100

Caution
- **Water or foreign material entering the connector can cause poor connections or corrosion. Be sure that water or foreign material do not enter the connector when disconnecting it.**
- **Do not damage the OSS sensor.**

1. Disconnect the negative battery cable.
2. Remove the oxidation catalytic converter.
3. Remove the propeller shaft. (See 03-15-2 PROPELLER SHAFT REMOVAL/INSTALLATION [5AT].)
4. Remove the crossmember and transmission mount rubber. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION [5R55S].)
5. Lower the transmission slightly.
6. Disconnect the OSS sensor connector.
7. Remove the OSS sensor.

Note
- Inspect O-ring for damage. Install new O-ring if damaged. Lubricate the O-ring with petroleum jelly to prevent damage to the O-ring.



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8. Install the OSS sensor.

Tightening torque
12—16 N·m {123—163 kgf·cm, 107—141 in·lbf}

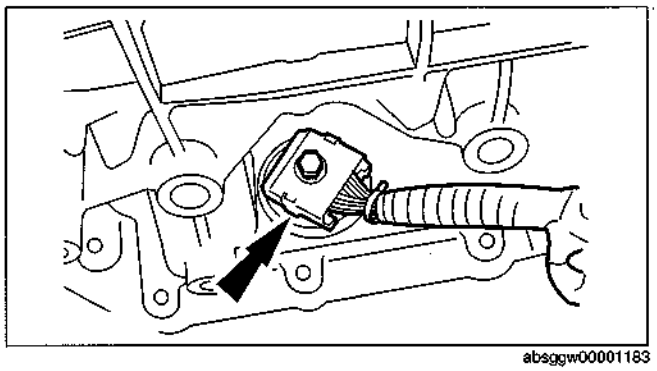
9. Connect the OSS sensor connector.
10. Install the crossmember and transmission mount rubber. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION [5R55S].)
11. Install the propeller shaft. (See 03-15-2 PROPELLER SHAFT REMOVAL/INSTALLATION [5AT].)
12. Install the oxidation catalytic converter.
13. Connect the negative battery cable.

SOLENOID VALVE INSPECTION [5R55S]

id0513c1253200

Caution
- **Water or foreign material entering the connector can cause poor connections or corrosion. Be sure that water or foreign material do not enter the connector when disconnecting it.**
- **Do not damage the terminals.**

1. Disconnect the negative battery cable.
2. Remove the digital TR sensor insulator.
3. Remove the CKP sensor insulator.
4. Remove the insulator bracket.
5. Disconnect the AT connector.



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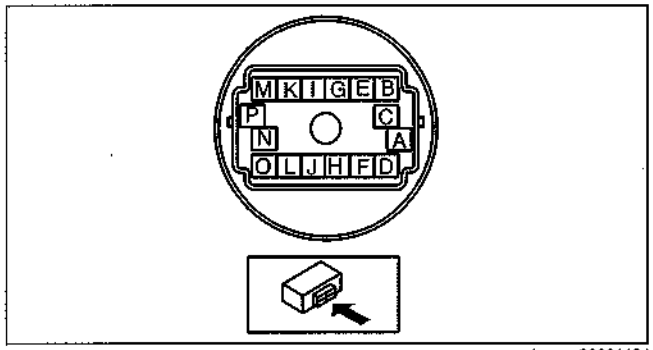
6. Measure the resistance between the following terminals.
   - If there is any malfunction, inspect the coupler component.
   - If the coupler component is normal, replace the solenoid body. (See 05-13-35 SOLENOID BODY REMOVAL/INSTALLATION [5R55S].)



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Solenoid valve resistance)

Terminals	Solenoid valve	Resistance (ohm)
D—I	Shift solenoid A	16—45
F—I	Shift solenoid B	16—45
B—I	Shift solenoid C	16—45
E—I	Shift solenoid D	16—45
O—I	Pressure control solenoid A	3.3—7.5
M—I	Pressure control solenoid B	3.3—7.5
G—I	Pressure control solenoid C	3.3—7.5
H—I	TCC control solenoid	9—16

7. Connect the AT connector.
8. Remove the insulator bracket. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION [5R55S].)
9. Remove the CKP sensor insulator. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION [5R55S].)
10. Remove the digital TR sensor insulator. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION [5R55S].)
11. Connect the negative battery cable.

SOLENOID BODY REMOVAL/INSTALLATION [5R55S]

id0513c1254400

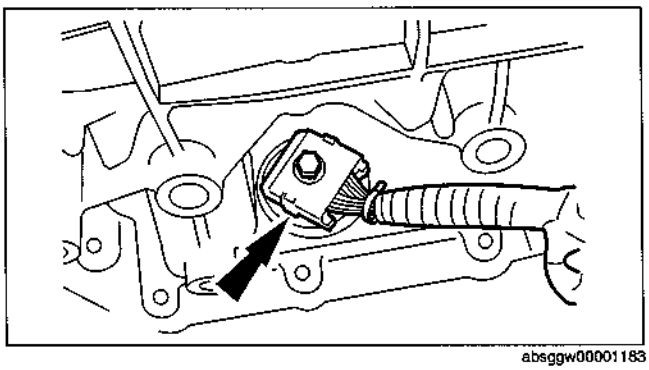
On-Vehicle Removal

Warning
- **A hot transmission and ATF can cause severe burns. Turn off the engine and wait until they are cool before replacing ATF.**
- **Using compressed air can cause dirt and other particles to fly out, causing injury to the eyes. Wear protective eye wear whenever using compressed air.**

Caution
- **Clean the transmission exterior thoroughly with a stream cleaner or cleaning solvents before removal.**

1. Disconnect the negative battery cable.
2. Drain the ATF. (See 05-13-16 AUTOMATIC TRANSMISSION FLUID (ATF) REPLACEMENT [5R55S].)
3. Remove the digital TR sensor insulator.
4. Remove the CKP sensor insulator.
5. Remove the insulator bracket.
6. Disconnect the AT connector.

Note
- The transmission fluid pan gasket is reusable. Clean and inspect the gasket for damage. If not damaged, the gasket should be reused.



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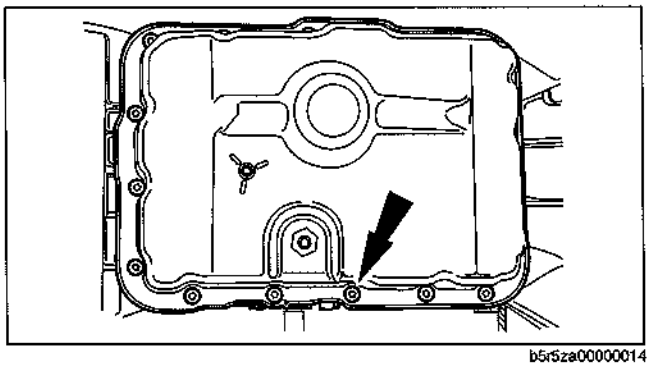
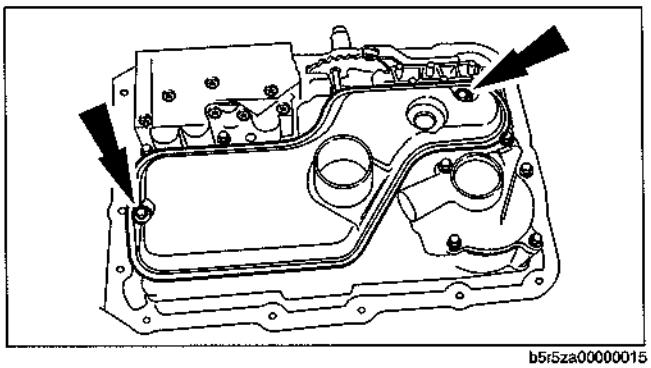
7. Remove the screws, transmission fluid pan and gasket.



b5r5za00000014

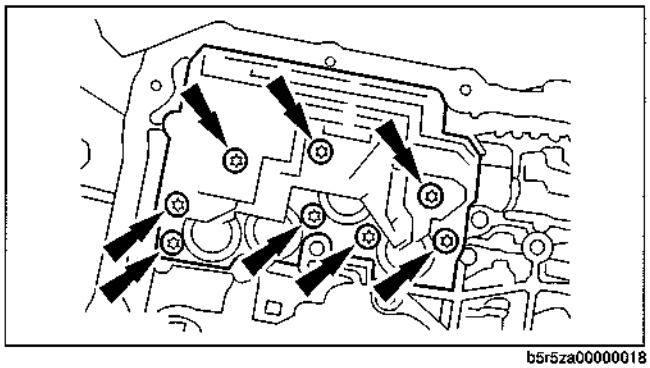
8. Remove the transmission fluid filter and seal component and discard.

Caution
- **Do not damage solenoid body connector pins.**



b5r5za00000015

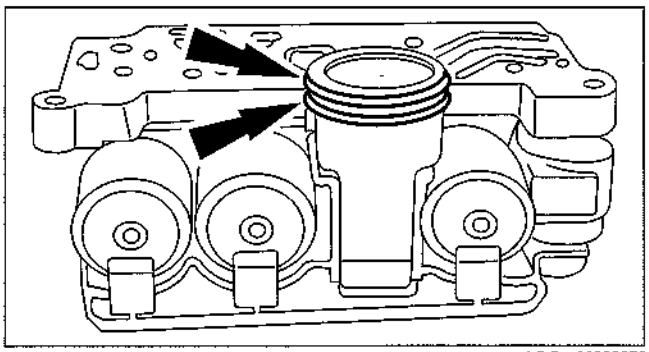
9. Remove the solenoid body component by lifting on the body and pushing the connector from the other side of the case.


b5r5za00000018

On-Vehicle Installation

1. Install new O-rings on the solenoid body connector. Lubricate the O-rings with clean ATF.

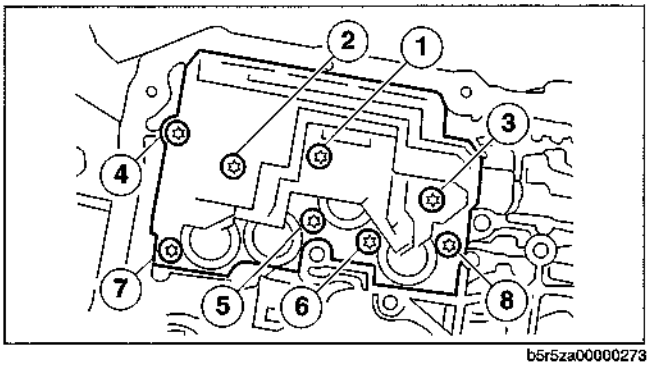
Caution
- **Inspect the transmission case bore to make sure it is free of foreign material and not damaged. If damaged, transmission leak may occur.**


b5r5za00000272

2. Install the solenoid body. Tighten bolts in the sequence shown.

Tightening torque
7—9 N·m {72—91 kgf·cm, 62—79 in·lbf}

Caution
- **Lubricate the transmission fluid filter seals with clean ATF or they may be damaged.**

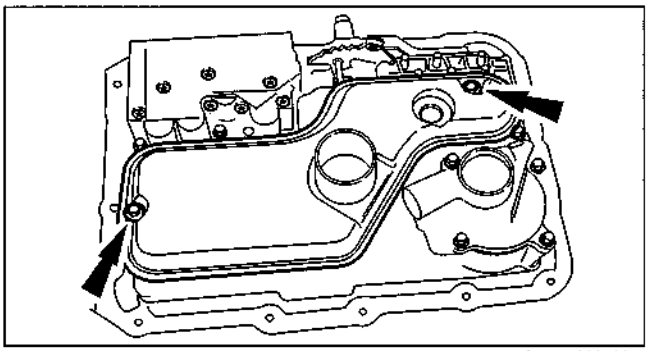


b5r5za00000273

3. Lubricate the seals and install the transmission fluid filter.

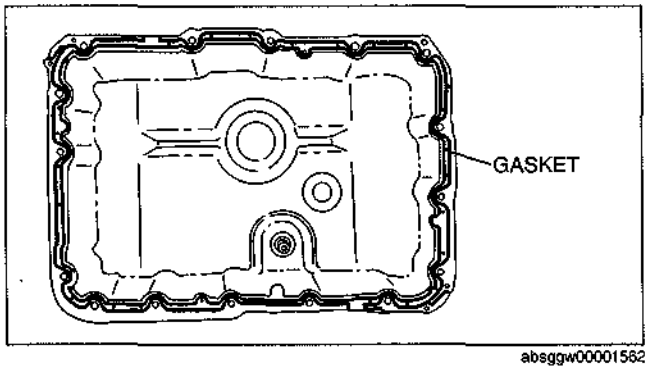
Tightening torque
9—11 N·m {92—112 kgf·cm, 80—97 in·lbf}

Note
- Make sure that the transmission fluid filter seals are correctly seated on the filter.


b5r5za00000275

4. Install the transmission fluid pan gasket on the pan.

Note
- The transmission fluid pan gasket is reusable, clean and inspect for damage. If not damaged, the gasket should be reused.



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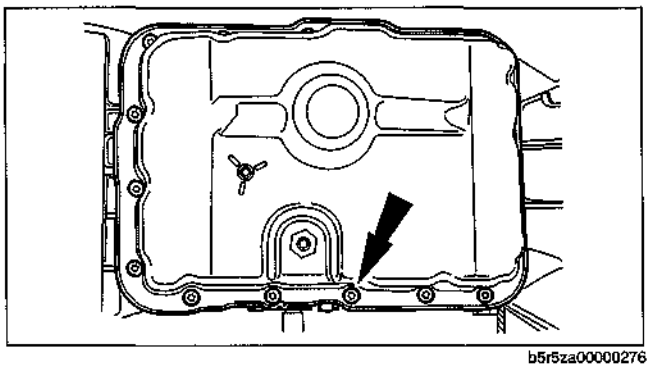
5. Install the transmission fluid pump and gasket, magnet and loosely install the bolts.
6. Tighten the bolts in a crisscross sequence.

Tightening torque
9.5—11.5 N·m {97—117 kgf·cm, 85—101 in·lbf}

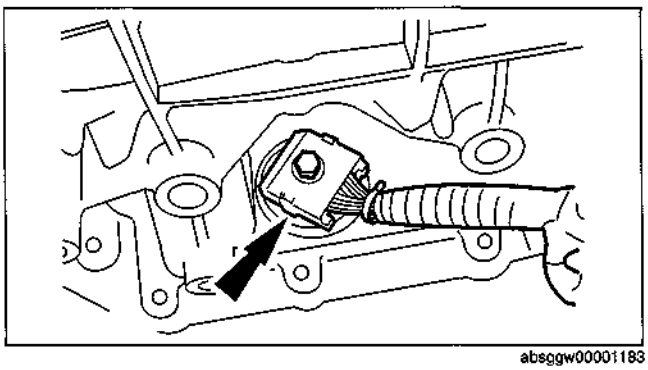
Caution
- **Damage will occur to the solenoid body component if the screw is tightened above specification.**


b5r5za00000276

7. Install and lubricate new O-rings on the AT connector and connect the connector.

Tightening torque
5 N·m {51 kgf·cm, 44 in·lbf}

Note
- Clean the area around connector to prevent contamination of the AT connector.
- Use petroleum jelly to lubricate the O-rings to aid in the installation process.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8. Remove the insulator bracket. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/ INSTALLATION [5R55S].)
9. Remove the CKP sensor insulator. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION [5R55S].)
10. Remove the digital TR sensor insulator. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/ INSTALLATION [5R55S].)
11. Connect the negative battery cable.
12. Add ATF and, with the engine idling, inspect the ATF level and for leakage. (See 05-13-13 AUTOMATIC TRANSMISSION FLUID (ATF) INSPECTION [5R55S].)
13. Perform the mechanical system test. (See 05-13-4 MECHANICAL SYSTEM TEST [5R55S].)
14. Perform the road test. (See 05-13-8 ROAD TEST [5R55S].)

AT RELAY LOCATION [5R55S]

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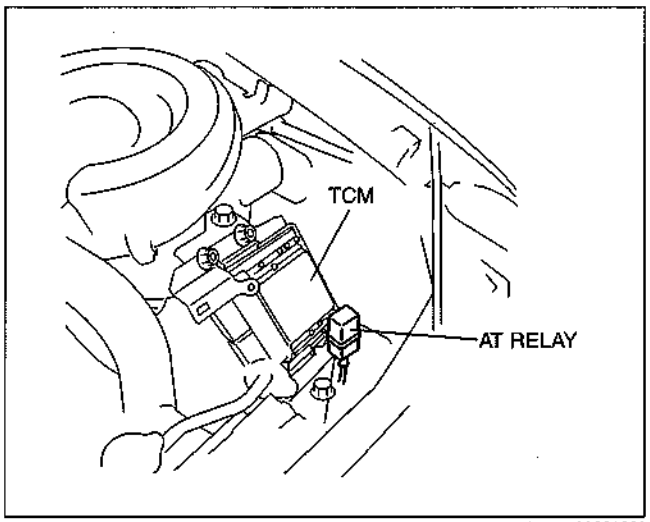

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AT RELAY INSPECTION [5R55S]

id0513c1254600

1. Disconnect the negative battery cable.
2. Remove the AT relay.
3. Verify the continuity between the relay terminals.
   - If not as indicated in the table, replace the relay.

○—○: Continuity

Step	Terminal			
	A	E	C	D
1	○	○		
2	B+	GND	○	○

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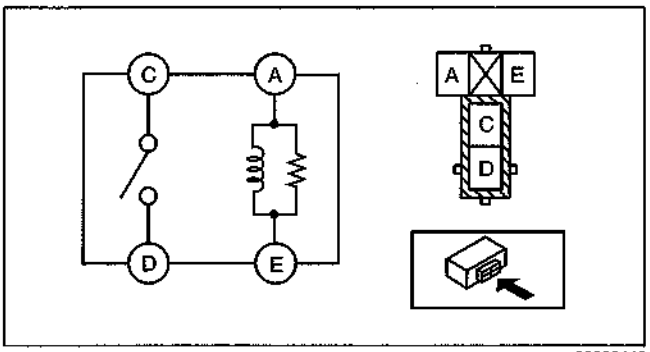

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TCM INSPECTION [5R55S]

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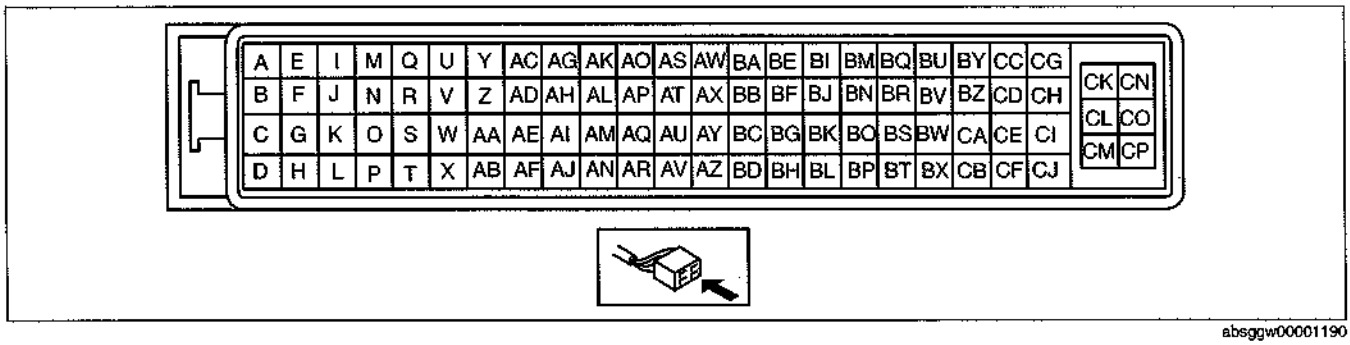
Terminal Voltage/Resistance Table (Reference)



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Terminal	Signal	Connected to	Test Condition	Voltage/ Resistance	Action
A	TCC control solenoid control	TCC control solenoid	Inspect resistance between TCM terminals A and CK (wiring harness-side).	9—16 ohm	• Inspect the TCC control solenoid (See 05-13-34 SOLENOID VALVE INSPECTION [5R55S]) • Inspect the related wiring harness
B	Shift solenoid A control	Shift solenoid A	Inspect resistance between TCM terminals B and CK (wiring harness-side).	16—45 ohm	• Inspect the shift solenoid A (See 05-13-34 SOLENOID VALVE INSPECTION [5R55S]) • Inspect the related wiring harness
C	Shift solenoid B control	Shift solenoid B	Inspect resistance between TCM terminals C and CK (wiring harness-side).	16—45 ohm	• Inspect the shift solenoid B (See 05-13-34 SOLENOID VALVE INSPECTION [5R55S]) • Inspect the related wiring harness
D	Shift solenoid D control	Shift solenoid D	Inspect resistance between TCM terminals D and CK (wiring harness-side).	16—45 ohm	• Inspect the shift solenoid D (See 05-13-34 SOLENOID VALVE INSPECTION [5R55S]) • Inspect the related wiring harness
E	O/D OFF indicator output	Instrument cluster	Engine switch ON	B+	• Inspect the instrument cluster • Inspect the related wiring harness
			Engine switch OFF	Below 1.0 V	
F	Shift solenoid C control	Shift solenoid C	Inspect resistance between TCM terminals F and CK (wiring harness-side).	16—45 ohm	• Inspect the shift solenoid C (See 05-13-34 SOLENOID VALVE INSPECTION [5R55S]) • Inspect the related wiring harness
G	Selector position indicator signal 3	Instrument cluster	Inspect continuity between TCM and instrument cluster (wiring harness-side).	Continuity	• Inspect the related wiring harness
H	—	—	—	—	—

Terminal	Signal	Connected to	Test Condition	Voltage/ Resistance	Action
I	Pressure control solenoid A control	Pressure control solenoid A	Inspect resistance between TCM terminals I and CK (wiring harness-side).	3.3—7.5 ohm	• Inspect the pressure control solenoid A (See 05-13-34 SOLENOID VALVE INSPECTION [5R55S]) • Inspect the related wiring harness
J	Pressure control solenoid B control	Pressure control solenoid B	Inspect resistance between TCM terminals J and CK (wiring harness-side).	3.3—7.5 ohm	• Inspect the pressure control solenoid B (See 05-13-34 SOLENOID VALVE INSPECTION [5R55S]) • Inspect the related wiring harness
K	Selector position indicator signal 1	Instrument cluster	Inspect continuity between TCM and instrument cluster (wiring harness-side).	Continuity	• Inspect the related wiring harness
L	—	—	—	—	—
M	Pressure control solenoid C control	Pressure control solenoid C	Inspect resistance between TCM terminals M and CK (wiring harness-side).	3.3—7.5 ohm	• Inspect the pressure control solenoid C (See 05-13-34 SOLENOID VALVE INSPECTION [5R55S]) • Inspect the related wiring harness
N	4x4 HI indicator output	Instrument cluster	Engine switch ON	B+	• Inspect the instrument cluster • Inspect the related wiring harness
			Engine switch OFF	Below 1.0 V	
O	—	—	—	—	—
P	—	—	—	—	—
Q	Selector position indicator signal 2	Instrument cluster	Inspect continuity between TCM and instrument cluster (wiring harness-side).	Continuity	• Inspect the related wiring harness
R	4x4 LO indicator output	Instrument cluster	Engine switch ON	B+	• Inspect the instrument cluster • Inspect the related wiring harness
			Engine switch OFF	Below 1.0 V	
S	—	—	—	—	—
T	—	—	—	—	—
U	Vehicle speed output	Instrument cluster	Inspect continuity between TCM and instrument cluster (wiring harness-side).	Continuity	• Inspect the related wiring harness
V	—	—	—	—	—
W	—	—	—	—	—
X	—	—	—	—	—
Y	—	—	—	—	—
Z	—	—	—	—	—
AA	—	—	—	—	—
AB	—	—	—	—	—
AC	—	—	—	—	—
AD	Output shaft speed (+)	OSS sensor	Inspect resistance between TCM terminals AD and AG (wiring harness-side).	325—485 ohm	• Inspect the OSS sensor (See 05-13-32 OUTPUT SHAFT SPEED (OSS) SENSOR INSPECTION [5R55S]) • Inspect the related wiring harness
AE	—	—	—	—	—
AF	—	—	—	—	—

Terminal	Signal	Connected to	Test Condition		Voltage/ Resistance	Action
AG	Output shaft speed (-)	OSS sensor	Inspect resistance between TCM terminals AD and AG (wiring harness-side).		325—485 ohm	• Inspect the OSS sensor (See 05-13-32 OUTPUT SHAFT SPEED (OSS) SENSOR INSPECTION [5R55S]) • Inspect the related wiring harness
AH	Turbine shaft speed (-)	TSS sensor	Inspect resistance between TCM terminals AH and AP (wiring harness-side).		325—485 ohm	• Inspect the TSS sensor (See 05-13-28 TURBINE SHAFT SPEED (TSS) SENSOR INSPECTION [5R55S]) • Inspect the related wiring harness
AI	—	—	—		—	—
AJ	—	—	—		—	—
AK	System GND	GND	Under any condition		Continuity	• Inspect the related wiring harness
AL	—	—	—		—	—
AM	Intermediate shaft speed (-)	ISS sensor	Inspect resistance between TCM terminals AM and AS (wiring harness-side).		325—485 ohm	• Inspect the ISS sensor (See 05-13-30 INTERMEDIATE SHAFT SPEED (ISS) SENSOR INSPECTION [5R55S]) • Inspect the related wiring harness
AN	—	—	—		—	—
AO	System GND	GND	Under any condition		Continuity	• Inspect the related wiring harness
AP	Turbine shaft speed (+)	TSS sensor	Inspect resistance between TCM terminals AH and AP (wiring harness-side).		325—485 ohm	• Inspect the TSS sensor (See 05-13-28 TURBINE SHAFT SPEED (TSS) SENSOR INSPECTION [5R55S]) • Inspect the related wiring harness
AQ	—	—	—		—	—
AR	—	—	—		—	—
AS	Intermediate shaft speed (+)	ISS sensor	Inspect resistance between TCM terminals AM and AS (wiring harness-side).		325—485 ohm	• Inspect the ISS sensor (See 05-13-30 INTERMEDIATE SHAFT SPEED (ISS) SENSOR INSPECTION [5R55S]) • Inspect the related wiring harness
AT	—	—	—		—	—
AU	—	—	—		—	—
AV	—	—	—		—	—
AW	—	—	—		—	—
AX	TR3A signal	Digital TR sensor	Inspect continuity between TCM terminals AX and BH (wiring harness-side).	P position, 1,2 and 3 range	Continuity	• Inspect the Digital TR sensor (See 05-13-20 DIGITAL TRANSMISSION RANGE (TR) SENSOR INSPECTION [5R55S]) • Inspect the related wiring harness
				Other	Not continuity	

Terminal	Signal	Connected to	Test Condition		Voltage/ Resistance	Action
AY	ATF temperature	TFT sensor	Inspect resistance between TCM terminals AY and BH (wiring harness-side).	ATF temperature -40—-20 °C {-40—-4 °F}	284—967 kilohm	• Inspect the TFT sensor (See 05-13-26 TRANSMISSION FLUID TEMPERATURE (TFT) SENSOR INSPECTION [5R55S]) • Inspect the related wiring harness
				ATF temperature -19—-1 °C {-3—30 °F}	100—284 kilohm	
				ATF temperature 0—20 °C {32—68 °F}	37—100 kilohm	
				ATF temperature 21—40 °C {70—104 °F}	16—37 kilohm	
				ATF temperature 41—70 °C {106—158 °F}	5—16 kilohm	
				ATF temperature 71—90 °C {160—194 °F}	2.7—5 kilohm	
				ATF temperature 91—110 °C {196—230 °F}	1.5—2.7 kilohm	
				ATF temperature 111—130 °C {232—266 °F}	0.8—1.5 kilohm	
				ATF temperature 131—150 °C {268—302 °F}	0.54—0.8 kilohm	
AZ	—	—	—		—	—
BA	4x4 HI mode input	4x4 control module	Inspect continuity between TCM and 4x4 control module (wiring harness-side).		Continuity	• Inspect the 4x4 control module • Inspect the related wiring harness
BB	4x4 LO mode input	4x4 control module	Inspect continuity between TCM and 4x4 control module (wiring harness-side).		Continuity	• Inspect the 4x4 control module • Inspect the related wiring harness
BC	—	—	—		—	—
BD	—	—	—		—	—
BE	—	—	—		—	—
BF	—	—	—		—	—
BG	—	—	—		—	—
BH	Sensor GND	• TFT sensor • Digital TR sensor	Inspect the TCM terminals AX, AY, BU, BY and CA.(wiring harness-side)			• Inspect the related wiring harness
BI	—	—	—		—	—
BJ	—	—	—		—	—
BK	—	—	—		—	—
BL	—	—	—		—	—

Terminal	Signal	Connected to	Test Condition		Voltage/ Resistance	Action
BM	O/D OFF switch	O/D OFF switch	Engine switch ON	O/D OFF switch button depressed	B+	• Inspect the O/D OFF switch (See 05-13-19 O/D OFF SWITCH INSPECTION [5R55S]) • Inspect the related wiring harness
				O/D OFF switch button not depressed	Below 1.0 V	
BN	—	—	—		—	—
BO	—	—	—		—	—
BP	—	—	—		—	—
BQ	—	—	—		—	—
BR	—	—	—		—	—
BS	System GND	GND	Under any condition		Continuity	• Inspect the related wiring harness
BT	—	—	—		—	—
BU	TR2 signal	Digital TR sensor	Inspect continuity between TCM terminals BU and BH (wiring harness-side).	P, R position and 2 range	Continuity	• Inspect the Digital TR sensor (See 05-13-20 DIGITAL TRANSMISSION RANGE (TR) SENSOR INSPECTION [5R55S]) • Inspect the related wiring harness
				Other	Not continuity	
BV	—	—	—		—	—
BW	—	—	—		—	—
BX	—	—	—		—	—
BY	TR1 signal	Digital TR sensor	Inspect continuity between TCM terminals BY and BH (wiring harness-side).	P, R position and 3 range	Continuity	• Inspect the Digital TR sensor (See 05-13-20 DIGITAL TRANSMISSION RANGE (TR) SENSOR INSPECTION [5R55S]) • Inspect the related wiring harness
				Other	Not continuity	
BZ	—	—	—		—	—
CA	TR4 signal	Digital TR sensor	Inspect continuity between TCM terminals CA and BH (wiring harness-side).	P, N position and 1 range	Continuity	• Inspect the Digital TR sensor (See 05-13-20 DIGITAL TRANSMISSION RANGE (TR) SENSOR INSPECTION [5R55S]) • Inspect the related wiring harness
				Other	Not continuity	
CB	CAN_H	PCM	Because this terminal is for serial communication, good/no good judgment by terminal voltage is not possible. Carry out inspection according to DTCs.		—	• Inspect the related wiring harness
CC	—	—	—		—	—
CD	—	—	—		—	—
CE	—	—	—		—	—
CF	CAN_L	PCM	Because this terminal is for serial communication, good/no good judgment by terminal voltage is not possible. Carry out inspection according to DTCs.		—	• Inspect the related wiring harness
CG	—	—	—		—	—
CH	—	—	—		—	—
CI	—	—	—		—	—
CJ	—	—	—		—	—

Terminal	Signal	Connected to	Test Condition	Voltage/ Resistance	Action
CK	Solenoid valve power supply	Solenoid valve	Inspect the TCM terminals A, B, C, D, F, I, J and M. (wiring harness-side)		• Inspect the solenoid valve (See 05-13-34 SOLENOID VALVE INSPECTION [5R55S]) • Inspect the related wiring harness
CL	System GND	GND	Under any condition	Continuity	• Inspect the related wiring harness
CM	IG	AT relay	Engine switch ON	B+	• Inspect the AT relay (See 05-13-38 AT RELAY INSPECTION [5R55S]) • Inspect the related wiring harness
			Engine switch OFF	Below 1.0 V	
CN	—	—	—	—	—
CO	System GND	GND	Under any condition	Continuity	• Inspect the related wiring harness
CP	IG	AT relay	Engine switch ON	B+	• Inspect the AT relay (See 05-13-38 AT RELAY INSPECTION [5R55S]) • Inspect the related wiring harness
			Engine switch OFF	Below 1.0 V	

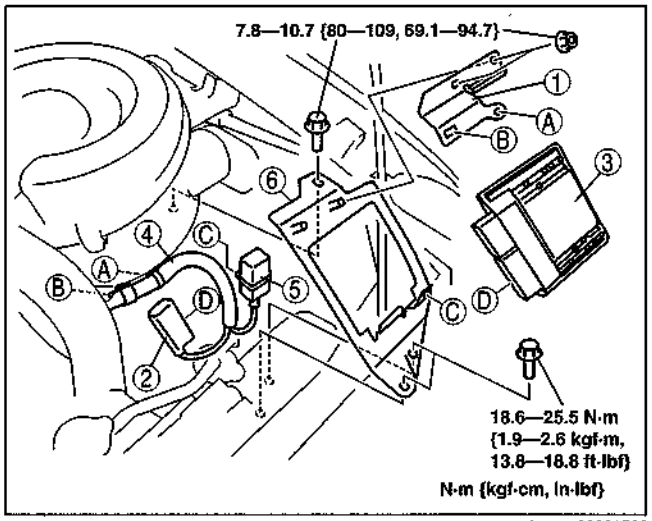
TCM REMOVAL/INSTALLATION [5R55S]

id0513c1250800

1. Disconnect the negative battery cable.
2. Remove in the order indicated in the table.

1	Bracket
2	TCM connector
3	TCM
4	Wiring harness
5	AT relay
6	Bracket

3. Install in the reverse order of removal.



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AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION [5R55S]

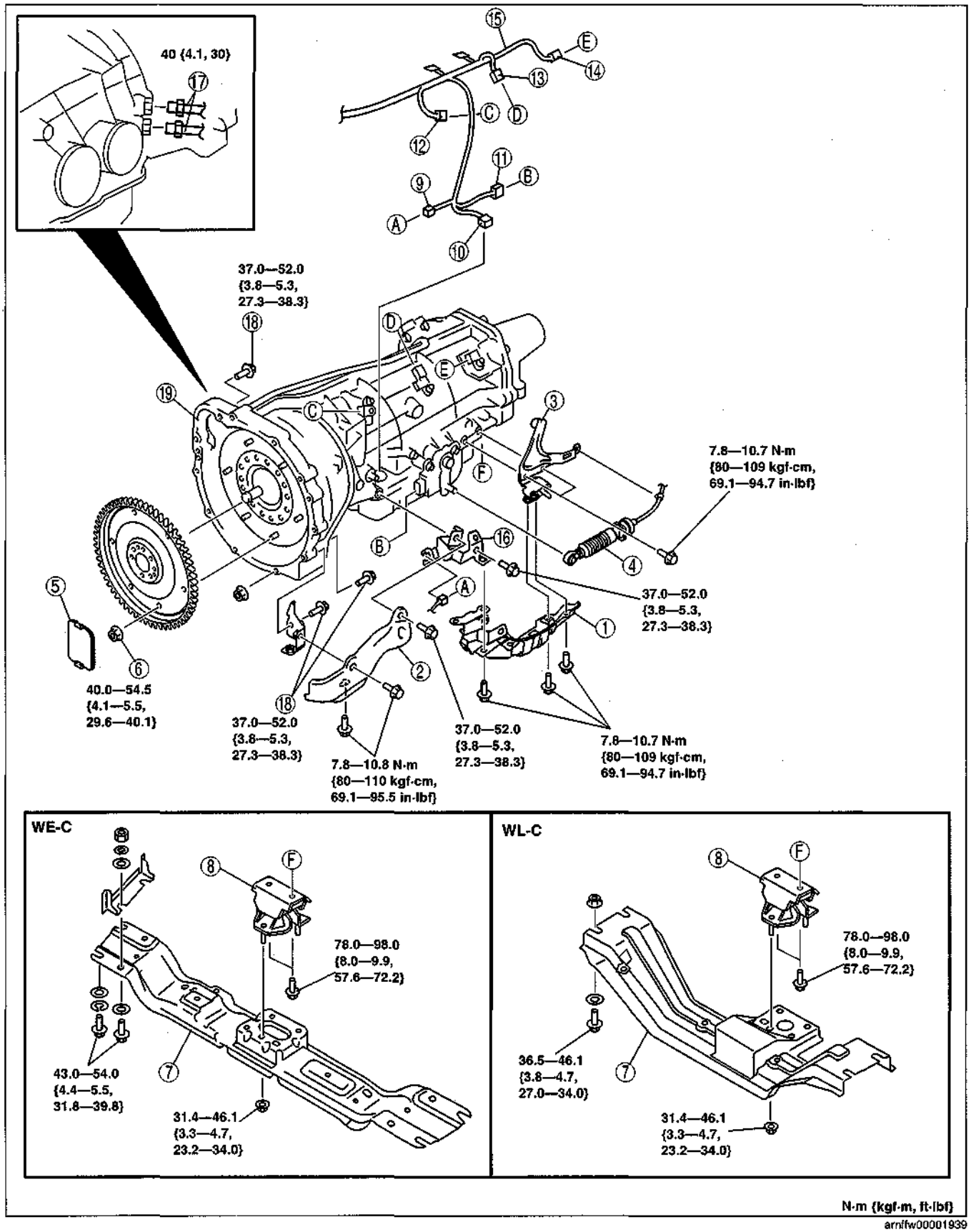
id0513c1249200

1. Disconnect the negative battery cable.
2. Drain the ATF. (See 05-13-16 AUTOMATIC TRANSMISSION FLUID (ATF) REPLACEMENT [5R55S].)
3. Remove the following parts.
   (1) Under cover
   (2) Front propeller shaft (4x4) (See 03-15-2 PROPELLER SHAFT REMOVAL/INSTALLATION [5AT].)
   (3) Rear propeller shaft (See 03-15-2 PROPELLER SHAFT REMOVAL/INSTALLATION [5AT].)
   (4) Oxidation catalytic converter.
   (5) Front pipe
4. Remove in the order indicated in the table.
5. Install in the reverse order of removal.
6. Add ATF and, with the engine idling, inspect the ATF level and inspect for leakage. (See 05-13-16 AUTOMATIC TRANSMISSION FLUID (ATF) REPLACEMENT [5R55S].) (See 05-13-13 AUTOMATIC TRANSMISSION FLUID (ATF) INSPECTION [5R55S].)
7. Inspect selector lever operation. (See 05-14-2 SELECTOR LEVER INSPECTION.)
8. Inspect for leakage of ATF from all connecting points.
9. Perform the mechanical system test. (See 05-13-4 MECHANICAL SYSTEM TEST [5R55S].)

Service item	Test item	
	Line pressure test	Stall speed test
Automatic transmission replacement	×	
Automatic transmission overhaul	×	×
Control valve body replacement	×	×
Torque converter replacement	×	×
Fluid pump replacement	×	
Clutch system replacement	×	

10. Perform the road test. (See 05-13-8 ROAD TEST [5R55S].)

4x2



N·m {kgf·m, ft·lbf}

arnifw00001939

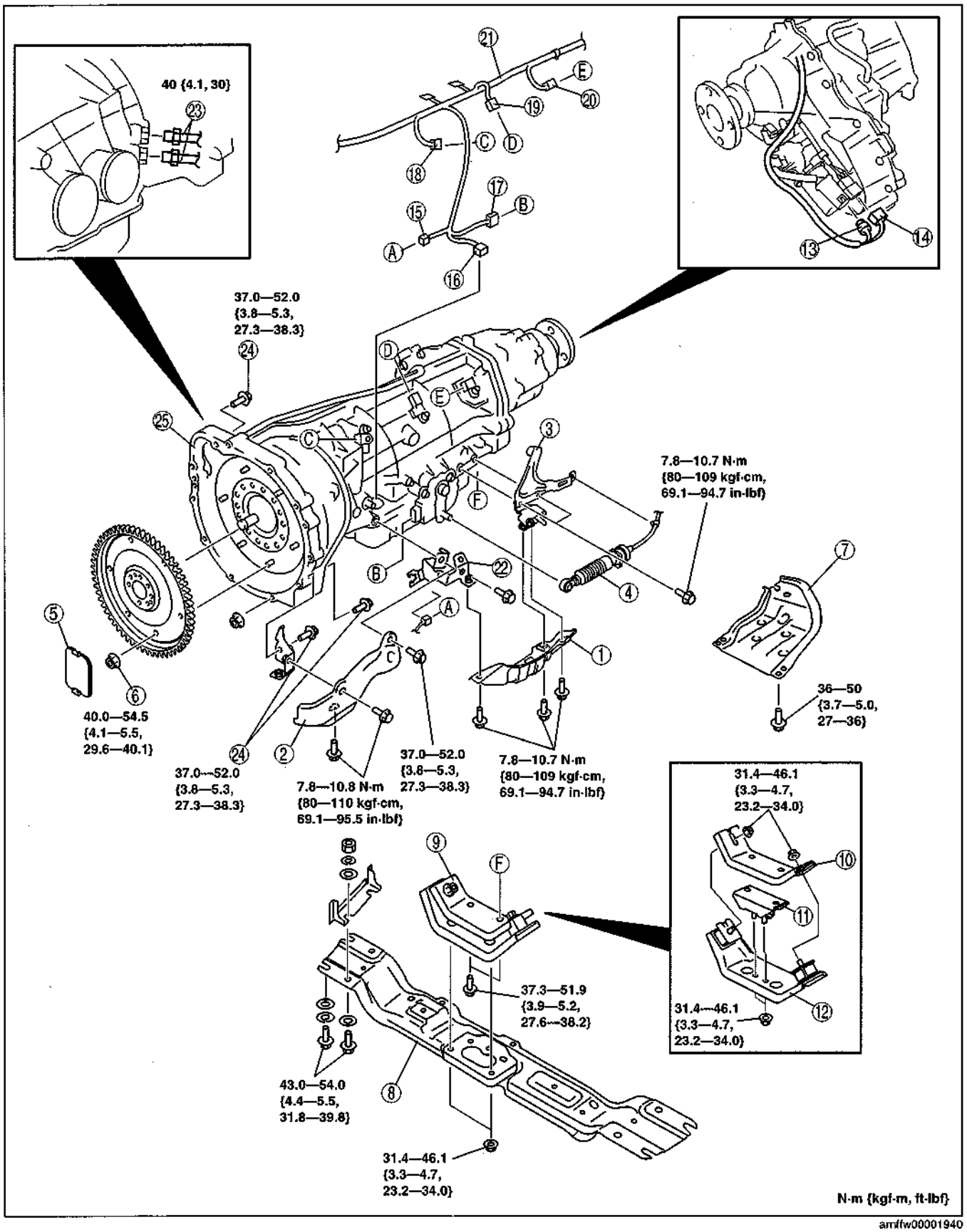
1	Insulator
2	Insulator
3	Selector cable bracket
4	Selector cable
5	Cover

6	Torque converter installation nuts (See 05-13-50 Torque Converter Installation Nuts Removal Note.) (See 05-13-54 Torque Converter Installation Nuts Installation Note.)

7	Crossmember (See 05-13-51 Transmission Removal Note.)
8	Transmission mount rubber
9	CKP sensor connector
10	AT connector
11	Digital TR sensor connector
12	TSS sensor connector
13	ISS sensor connector
14	OSS sensor connector

15	Wiring harness
16	Insulator bracket
17	Oil pipe (See 05-13-50 Oil Pipe Removal Note.) (See 05-13-53 Oil Pipe Installation Note.)
18	Transmission installation bolt and nut
19	Transmission (See 05-13-51 Transmission Removal Note.) (See 05-13-52 Transmission Installation Note.)

4x4



amfw00001940

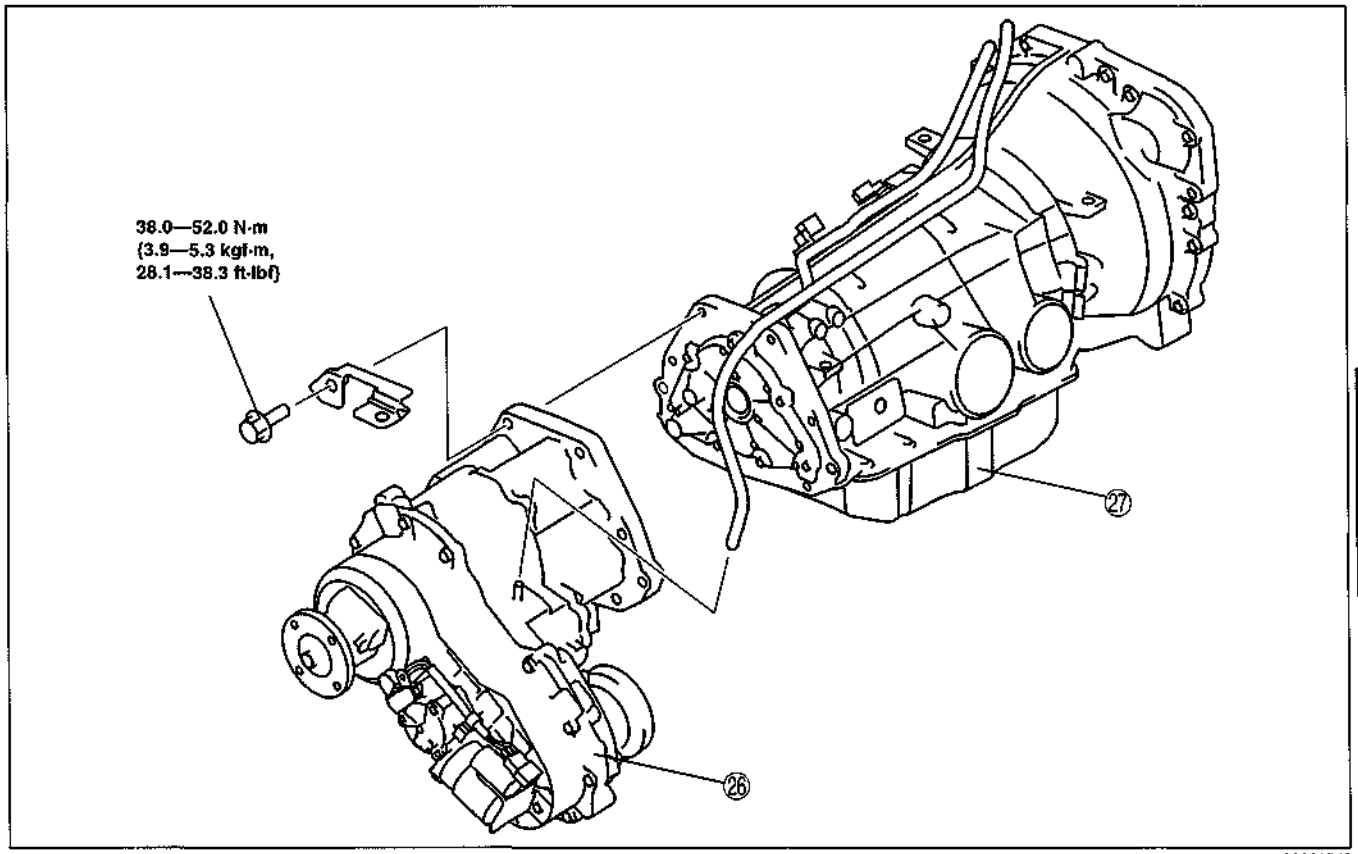
1	Insulator
2	Insulator
3	Selector cable bracket

4	Selector cable
5	Cover

6	Torque converter installation nuts (See 05-13-50 Torque Converter Installation Nuts Removal Note.) (See 05-13-54 Torque Converter Installation Nuts Installation Note.)
7	Transfer case under cover
8	Crossmember (See 05-13-51 Transmission Removal Note.)
9	Transmission mount component
10	Transmission mount upper
11	Transmission rubber
12	Transmission mount lower
13	Transfer case motor connector
14	Transfer case speed sensor connector
15	CKP sensor connector

16	AT connector
17	Digital TR sensor connector
18	TSS sensor connector
19	ISS sensor connector
20	OSS sensor connector
21	Wiring harness
22	Insulator bracket
23	Oil pipe (See 05-13-50 Oil Pipe Removal Note.) (See 05-13-53 Oil Pipe Installation Note.)
24	Transmission installation bolt and nut
25	Transmission and transfer case (See 05-13-51 Transmission Removal Note.) (See 05-13-52 Transmission Installation Note.)

4x4



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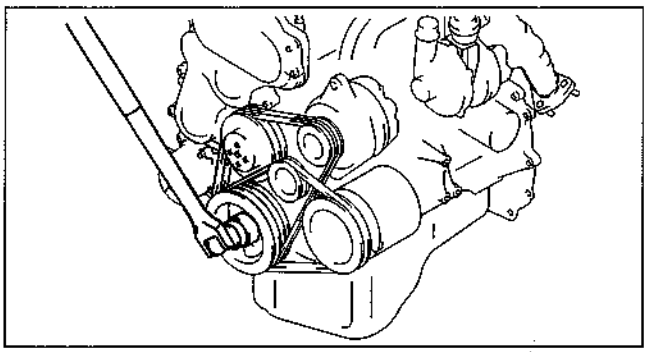
26	Transfer case

27	Transmission

Torque Converter Installation Nuts Removal Note

1. Remove the cooling fan.
2. Hold the crankshaft pulley to prevent the drive plate from rotating.



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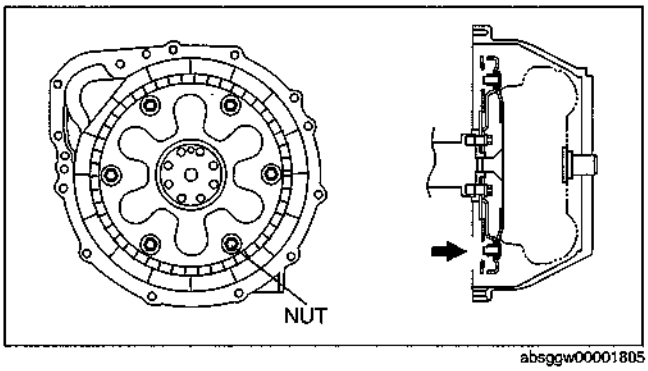
3. Remove the torque converter nuts.



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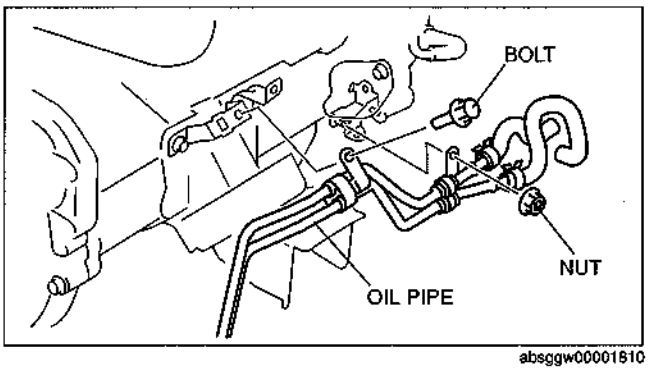
Oil Pipe Removal Note

1. Remove the oil pipe installation bolt and nut.



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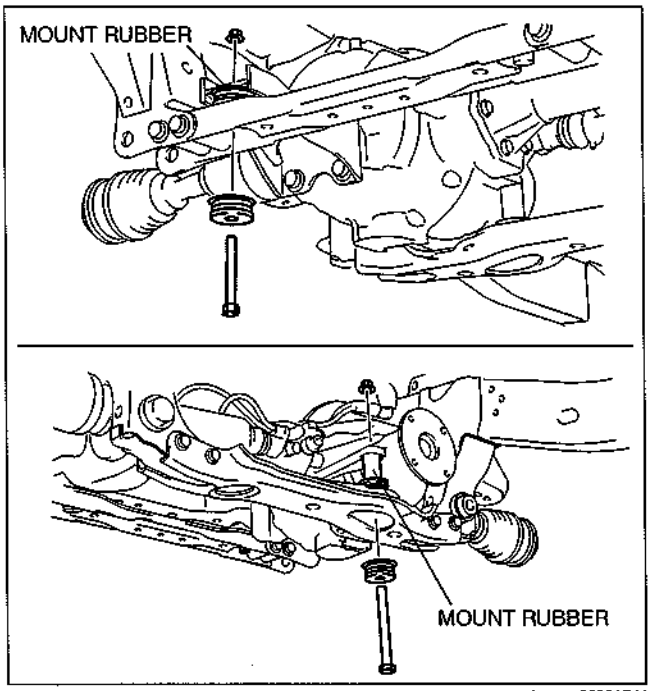
Transmission Removal Note

Warning
- **Verify that the transmission is securely supported by the jack. If the transmission falls, serious injury or death and damage to the vehicle could result. Before removing the transmission make sure that the jack is securely supporting the transmission.**

Caution
- **To prevent the torque converter and transmission from separating, remove the transmission without tilting it toward the torque converter.**

1. Remove the front differential mount rubber.



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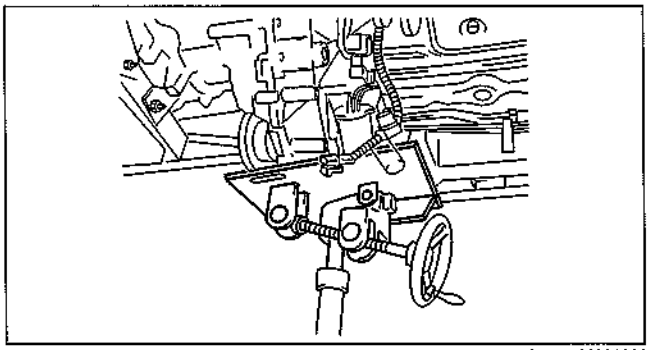
2. Support the transfer case side securely using one transmission jack.
3. Remove the crossmember.

Caution
- **Do not allow the transmission jack to interfere with the transmission mount bracket bolts, otherwise the bolts could be damaged.**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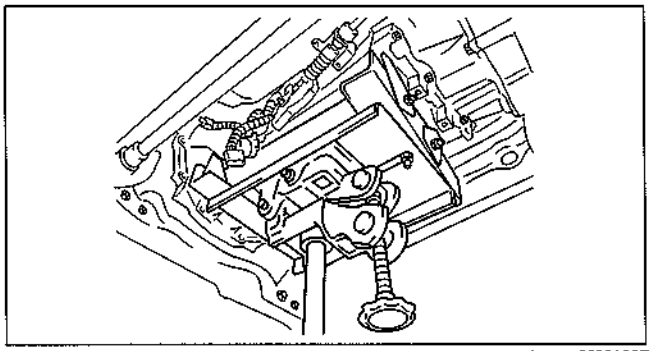
4. Support the transmission securely using a transmission jack.
5. Support the front side of engine securely using a transmission jack.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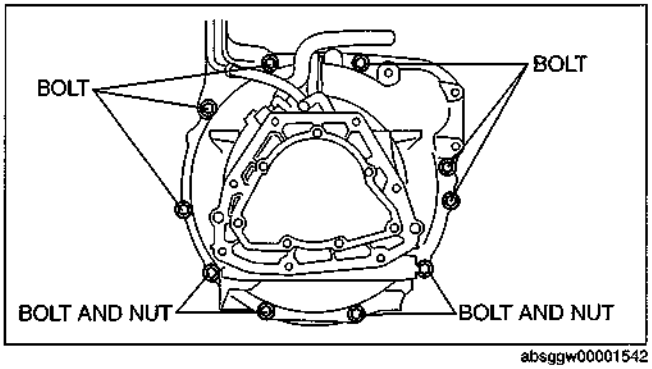
6. Remove the transmission installation bolt.



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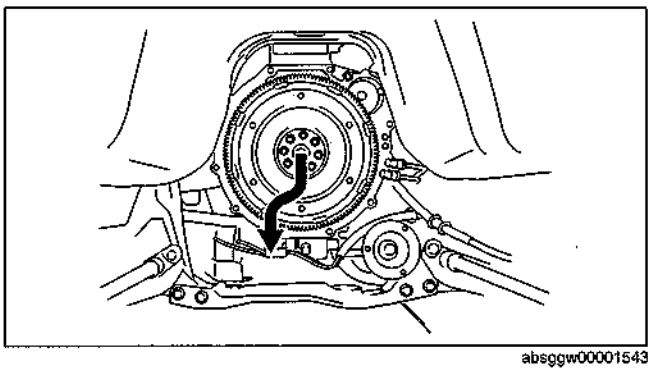
7. Remove the transmission while setting it out of the way so that it does not contact the differential.



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Transmission Installation Note

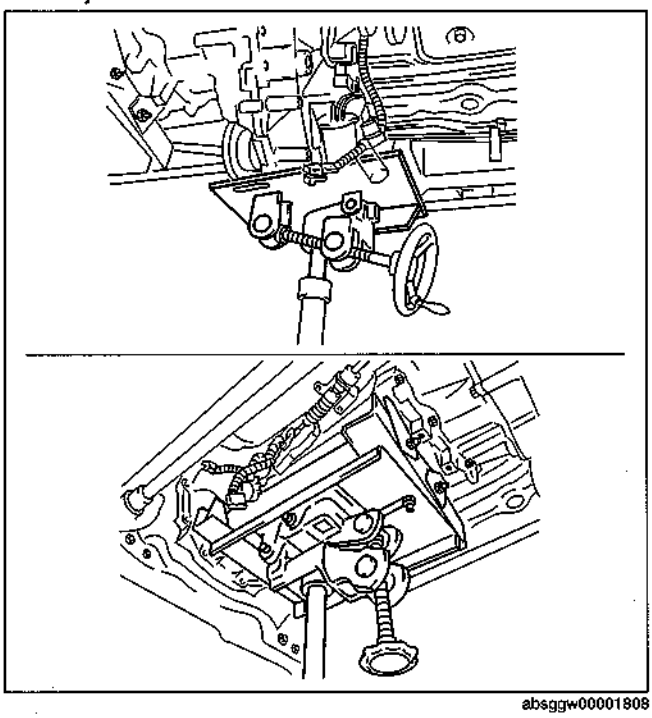
Warning

- **Verify that the transmission is securely supported by the jack. If the transmission falls, serious injury or death and damage to the vehicle could result. Before removing the transmission make sure that the jack is securely supporting the transmission.**

Caution

- **To prevent the torque converter and transmission from separating, remove the transmission without tilting it toward the torque converter**

1. Support the front side of engine securely using a transmission jack.
2. Support the transmission and transfer case securely using a transmission jack.



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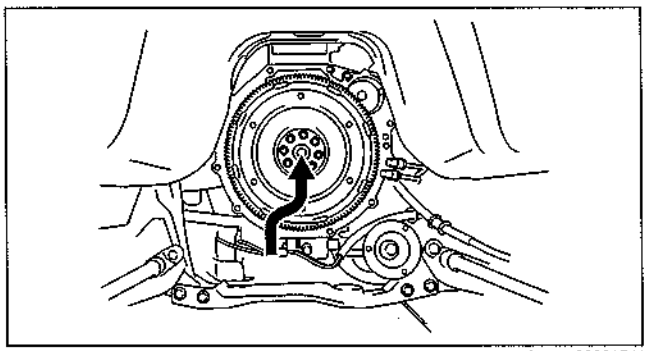
3. Install the transmission while setting it out of the way so that it does not contact the differential.



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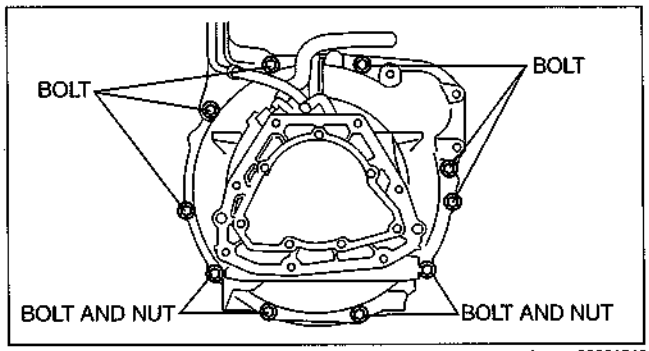
4. Tighten the transmission installation bolts and nuts.

Tightening torque
37—52 N·m {3.8—5.3 kgf·m, 28—38 ft·lbf}



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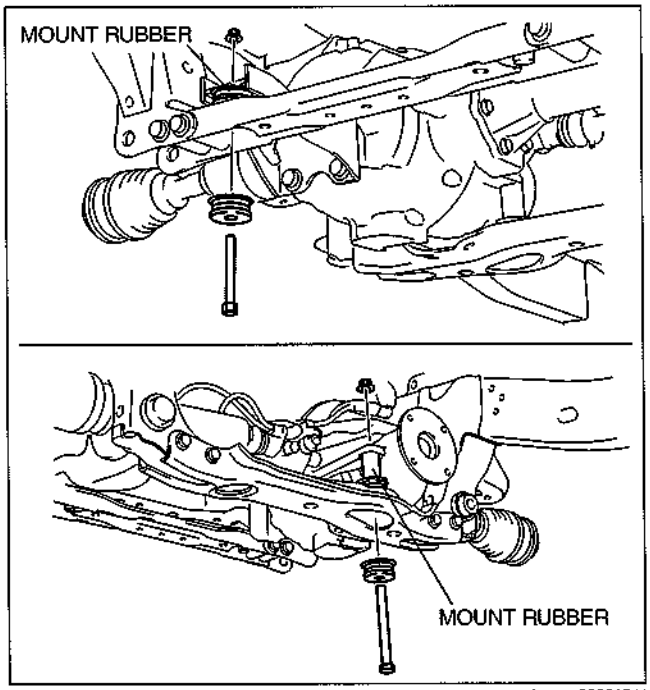
5. Install the front differential mount rubber.

Tightening torque
54.9—80.4 N·m {5.6—8.1 kgf·m, 41—59 ft·lbf}



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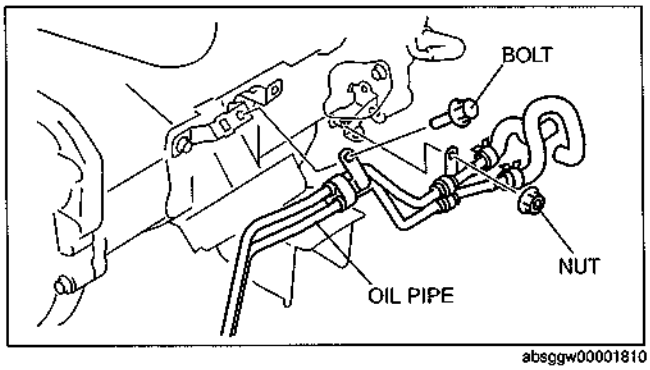
Oil Pipe Installation Note

1. Install the oil pipe installation bolt and nut.

Tightening torque
7.8—10.7 N·m {80—109 kgf·cm, 69.1—94.7 in·lbf}



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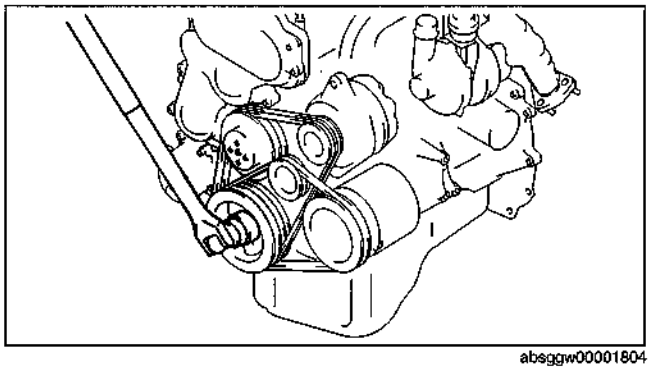
Torque Converter Installation Nuts Installation Note

1. Hold the crankshaft pulley to prevent the drive plate from rotating.



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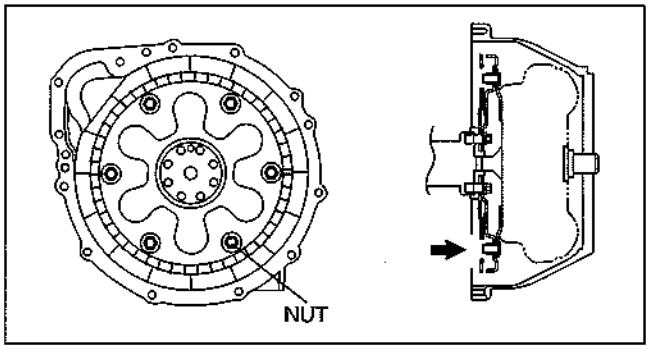
Caution
- **Loosely and equally tighten the torque converter nuts, then further tighten them to the specified tightening torque.**

2. Tighten the new torque converter installation nuts.

Tightening torque
40.0—54.5 N·m {4.1—5.5 kgf·m, 29.6—40.1 ft·lbf}



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TORQUE CONVERTER INSPECTION [5R55S]

id0513c1711900

Caution
- **Do not use water-based cleaners or mineral spirits to clean or flush the torque converter or transmission damage will occur. Use only clean ATF designated for the transmission and converter being serviced.**
- **The torque converter drain plug and seal are not reusable. If equipped, discard the drain plug and seal, then install a new drain plug component.**

- If a new or remanufactured torque converter is not being installed, the following steps must be completed.

1. With the torque converter on a bench, pour a small ATF from the torque converter onto an absorbent white tissue or through a paper filter and examine the ATF.
2. Observe the color and odor of the ATF. The ATF should be red, not brown or black. Odor may indicate an overheating condition such as clutch disc or band failure.
3. Examine the stain on the tissue for evidence of particles (spec of any kind). Examine the fluid level indicator for signs of antifreeze (gum or varnish).
   - If particles are present in the fluid or there is evidence of engine coolant or water, a new torque converter must be installed.
   - If there are no particles or contamination present, drain the remainder of the ATF from the torque converter.
4. Add **1.9 L {2.0 US qt, 1.7 Imp qt}** of clean ATF into the converter and agitate by hand.
5. Thoroughly drain the fluid.

TORQUE CONVERTER REMOVAL/INSTALLATION [5R55S]

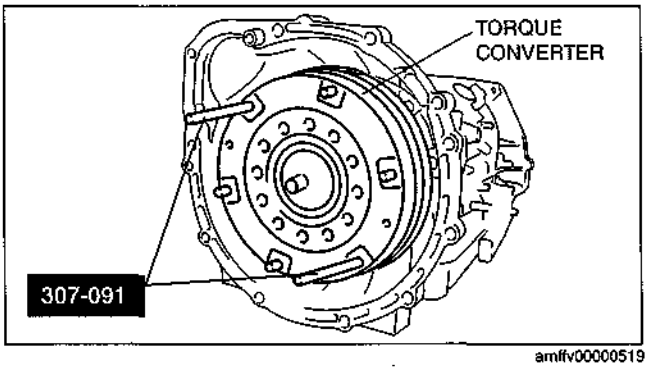
id0513c1710100

Removal

1. Remove the transmission. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION [5R55S].)

Caution
- **The oil seal is easily damaged by the sharp edges of the torque converter splines. Do not let the splines contact the oil seal.**
- **Do not drop the torque converter.**
- **Do not pinch fingers.**

2. Using the **SSTs**, remove the torque converter.



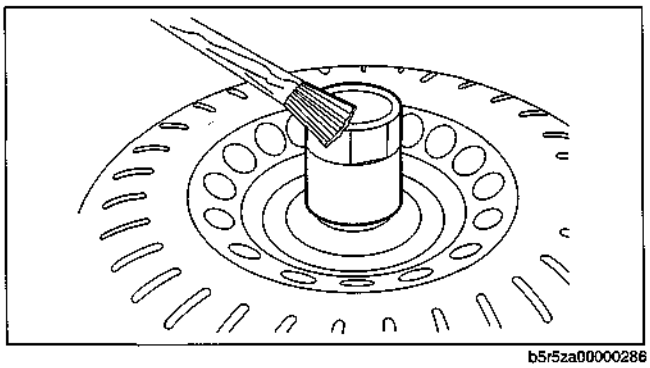
amfv00000519

Installation

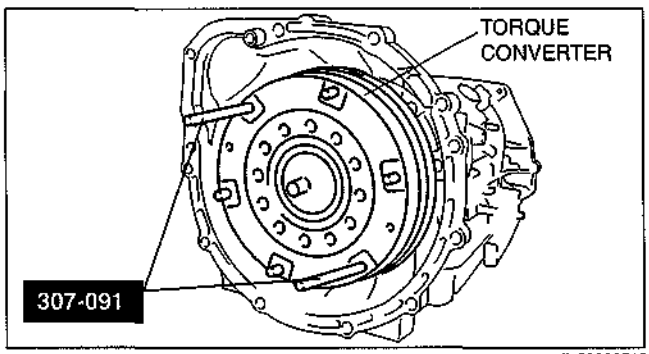
Caution
- **Do not damage the fluid pump gear O-ring when installing torque converter.**
- **Make sure the converter hub is fully engaged in the pump support and gear and rotates freely. Do not damage the hub seal.**
- **If the torque converter slides out, the hub seal may be damaged.**

1. Lubricate the converter hub with clean ATF.

Warning
- **The torque converter can fall out if the transmission is tipped. Failure to follow these instructions may cause personal injury.**


b5r5za00000286

2. Using the **SST**, install the torque converter by pushing and rotating.
3. Install the automatic transmission. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION [5R55S].)
4. Perform the mechanical system test. (See 05-13-4 MECHANICAL SYSTEM TEST [5R55S].)



amfv00000519

OIL SEAL (FLUID PUMP) REPLACEMENT [5R55S]

ld0513c1712000

Removal

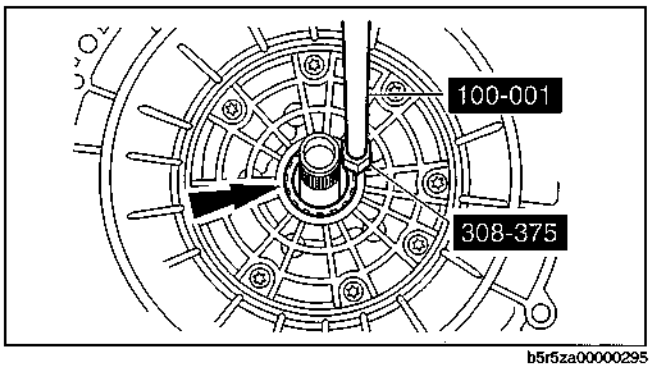
1. Remove the transmission. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION [5R55S].)

Caution
- **The oil seal is easily damaged by the sharp edges of the torque converter splines. Do not let the splines contact the oil seal.**
- **Do not drop the torque converter.**
- **Do not pinch fingers.**

2. Remove the torque converter. (See 05-13-55 TORQUE CONVERTER REMOVAL/INSTALLATION [5R55S].)

Caution
- **Do not to damage the bushing on the fluid pump body.**

3. Using the **SST**, remove the fluid pump seal.

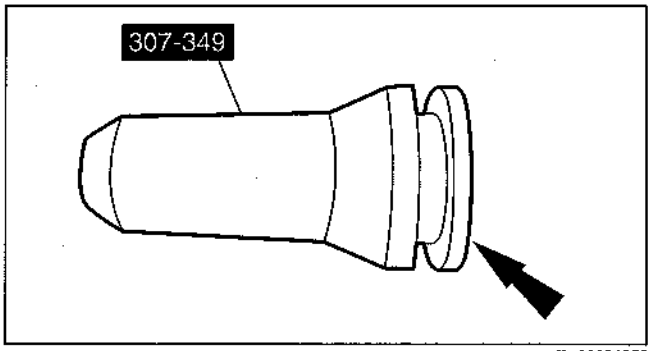


b5r5za00000295

Installation

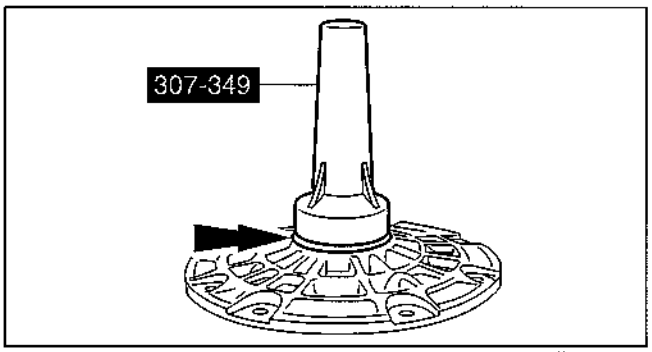
1. Install a new seal onto the **SST**.

Note
- Check and make sure that the garter spring in the seal has not popped off of the converter hub seal.



arnflw00001959

2. Using the **SST**, install the converter hub seal.
3. Install the torque converter. (See 05-13-55 TORQUE CONVERTER REMOVAL/INSTALLATION [5R55S].)
4. Install the automatic transmission. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION [5R55S].)
5. Perform the mechanical system test. (See 05-13-4 MECHANICAL SYSTEM TEST [5R55S].)



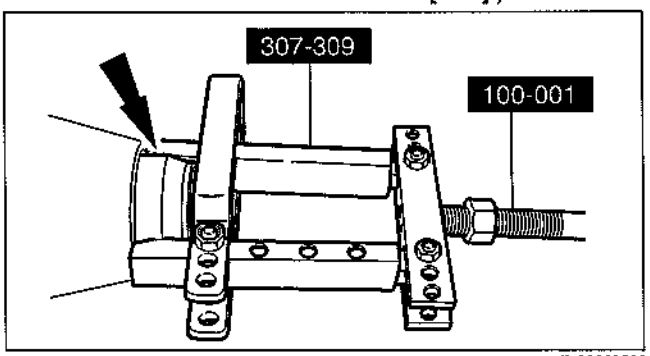
arnflw00001960

OIL SEAL (EXTENSION HOUSING) REPLACEMENT [5R55S]

id0513c1710000

Removal (4x2)

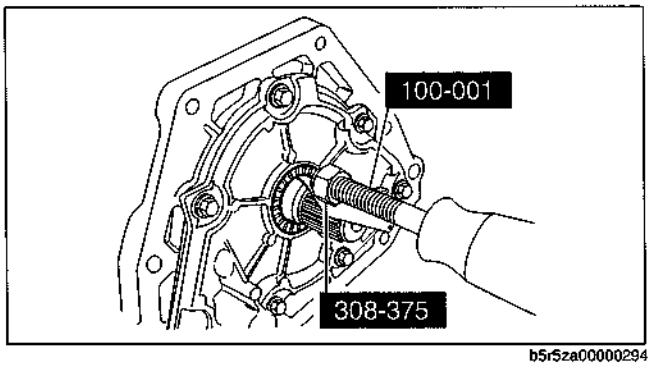
1. Remove the propeller shaft. (See 03-15-2 PROPELLER SHAFT REMOVAL/INSTALLATION [5AT].)
2. Using the **SST**, remove the extension housing seal.



amffv00000522

Removal (4x4)

1. Remove the transfer case. (See 03-16-7 TRANSFER CASE REMOVAL/INSTALLATION [5R55S].)
2. Using the **SSTs**, remove the extension housing seal.



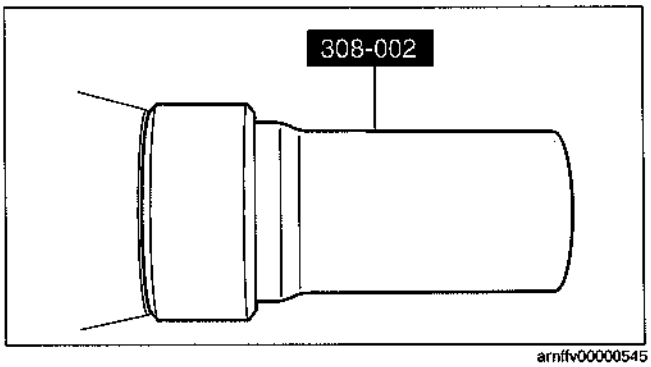
b5r5za00000294

Installation (4x2)

1. Using the **SST**, install the extension housing seal.

   Note
   - Make sure the extension housing seal is correctly installed onto the SST and the garter spring is in the correct position.

2. Install the propeller shaft. (See 03-15-2 PROPELLER SHAFT REMOVAL/INSTALLATION [5AT].)
3. Inspect the ATF level for leakage. (See 05-13-13 AUTOMATIC TRANSMISSION FLUID (ATF) INSPECTION [5R55S].)



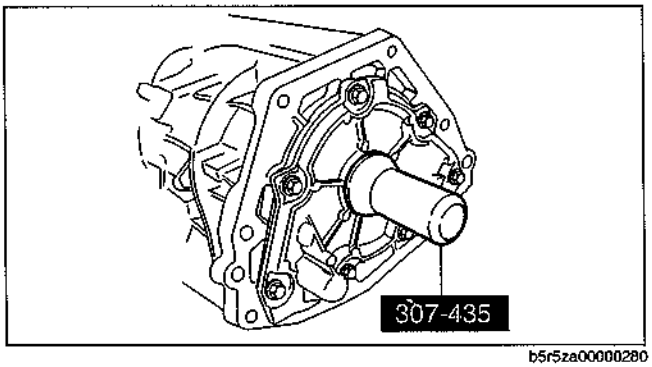
arnffv00000545

Installation (4x4)

1. Using the **SST**, install the extension housing seal.

   Note
   - Make sure the extension housing seal is correctly installed onto the SST and the garter spring is in the correct position.

2. Install the transfer case. (See 03-16-7 TRANSFER CASE REMOVAL/INSTALLATION [5R55S].)
3. Inspect the ATF level for leakage. (See 05-13-13 AUTOMATIC TRANSMISSION FLUID (ATF) INSPECTION [5R55S].)



b5r5za00000280

EXTENSION HOUSING GASKET REPLACEMENT [5R55S]

id0513c1254300

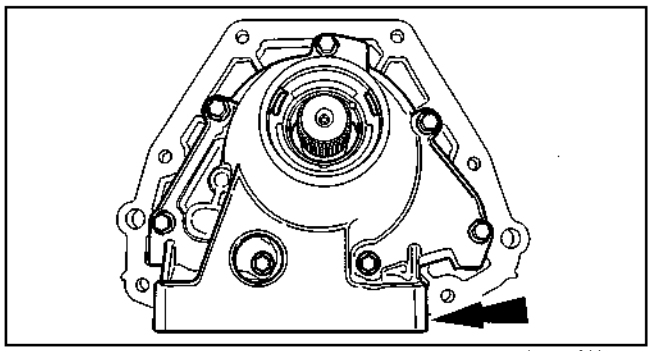
Removal (4x2)

1. Remove the oxidation catalytic converter.
2. Remove the propeller shaft. (See 03-15-2 PROPELLER SHAFT REMOVAL/INSTALLATION [5AT].)
3. Remove the crossmember and transmission mount rubber. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION [5R55S])
4. Lower the transmission.

Caution

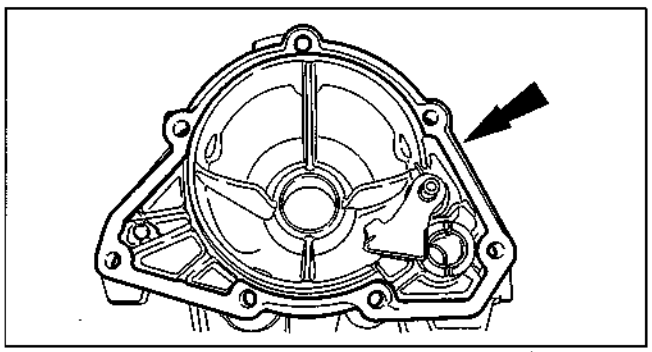
- **The parking pawl, parking pawl return spring and parking pawl shaft could fall out during removal of the extension housing.**

5. Remove the extension housing.



b5r5za00000011

6. Remove and discard the extension housing gasket.



absggw00001629

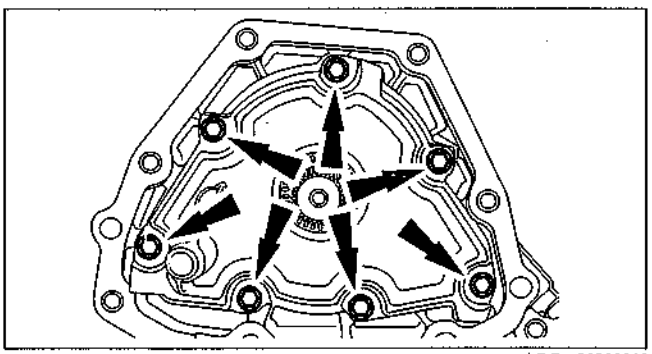
Removal (4x4)

1. Remove the oxidation catalytic converter.
2. Remove the propeller shaft. (See 03-15-2 PROPELLER SHAFT REMOVAL/INSTALLATION [5AT].)
3. Remove the crossmember and Transmission mount component. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION [5R55S])
4. Remove the transfer case. (See 03-16-7 TRANSFER CASE REMOVAL/INSTALLATION [5R55S].)

Caution

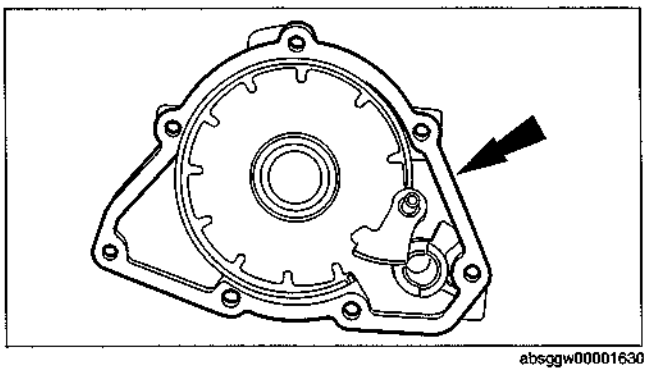
- **The parking pawl, parking pawl return spring and parking pawl shaft could fall out during removal of the extension housing.**

5. Remove the extension housing.



b5r5za00000012

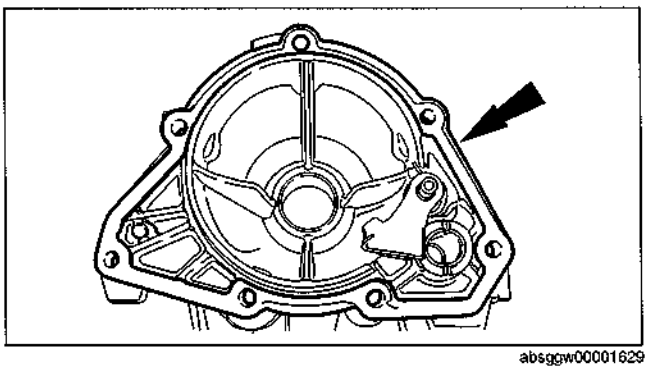
6. Remove and discard the extension housing gasket.


absggw00001630

Installation (4x2)

1. Clean the extension housing and install new extension housing gasket.
2. Make sure that the park pawl is installed correctly.

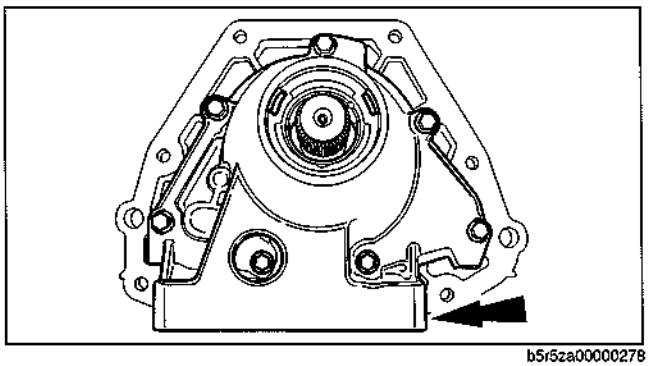
Caution
- **Make sure the parking lever actuating rod is correctly seated into the case parking rod guide cup.**


absggw00001629

3. Install the extension housing.

Tightening torque
28—32 N·m {2.9—3.2 kgf·m, 21—23 ft·lbf}

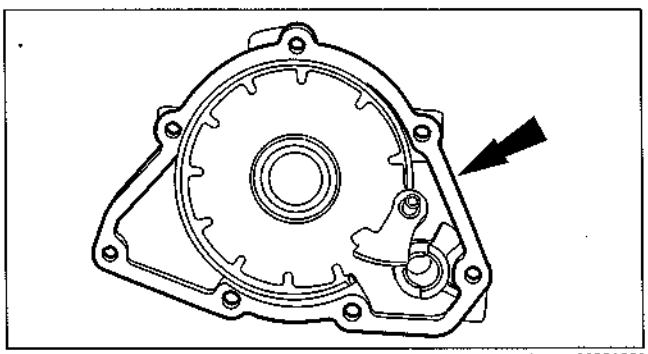
4. Install the crossmember and transmission mount rubber. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION [5R55S])
5. Install the propeller shaft. (See 03-15-2 PROPELLER SHAFT REMOVAL/INSTALLATION [5AT].)
6. Install the oxidation catalytic converter.
7. Inspect the ATF level for leakage. (See 05-13-13 AUTOMATIC TRANSMISSION FLUID (ATF) INSPECTION [5R55S].)


b5r5za00000278

Installation (4x4)

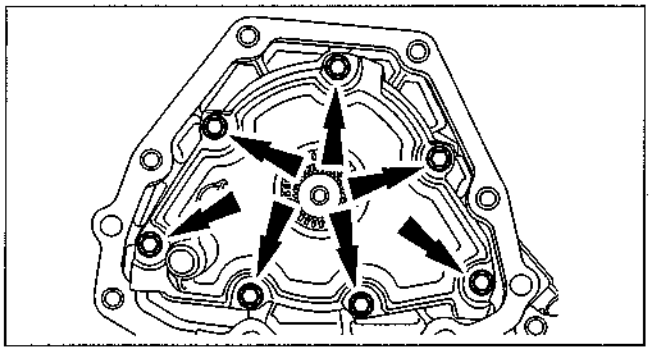
1. Clean the extension housing and install new extension housing gasket.
2. Make sure that the park pawl is installed correctly.

Caution
- **Make sure the parking lever actuating rod is correctly seated into the case parking rod guide cup.**


absggw00001630

3. Install the extension housing.

   Tightening torque
   28—32 N·m {2.9—3.2 kgf·m, 21—23 ft·lbf}


b5r5za00000012

4. Install the transfer case. (See 03-16-7 TRANSFER CASE REMOVAL/INSTALLATION [5R55S].)
5. Install the crossmember and Transmission mount component. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION [5R55S])
6. Install the propeller shaft. (See 03-15-2 PROPELLER SHAFT REMOVAL/INSTALLATION [5AT].)
7. Install the oxidation catalytic converter.
8. Inspect the ATF level for leakage. (See 05-13-13 AUTOMATIC TRANSMISSION FLUID (ATF) INSPECTION [5R55S].)

CONTROL VALVE BODY REMOVAL [5R55S]

id0513c1710600

On-Vehicle Removal

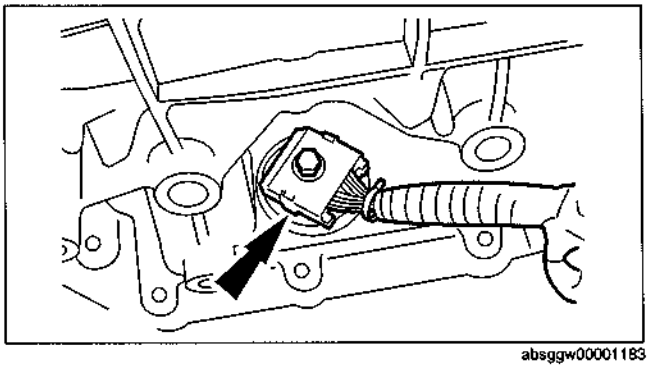
Warning

- **A hot transmission and ATF can cause severe burns. Turn off the engine and wait until they are cool before replacing ATF.**
- **Using compressed air can cause dirt and other particles to fly out, causing injury to the eyes. Wear protective eye wear whenever using compressed air.**

Caution

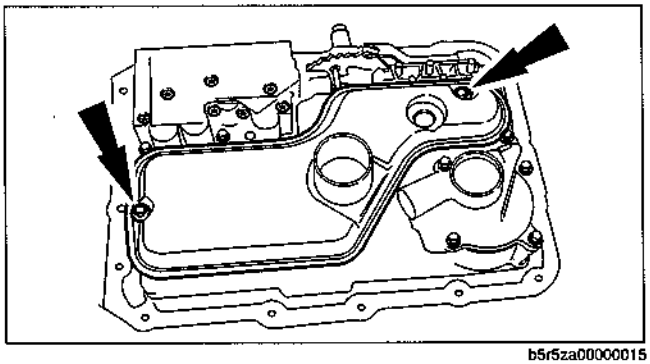
- **Clean the transmission exterior thoroughly with a stream cleaner or cleaning solvents before removal.**

1. Disconnect the negative battery cable.
2. Drain the ATF. (See 05-13-16 AUTOMATIC TRANSMISSION FLUID (ATF) REPLACEMENT [5R55S].)
3. Remove the digital TR sensor insulator.
4. Remove the CKP sensor insulator.
5. Remove the insulator bracket.
6. Disconnect the AT connector.



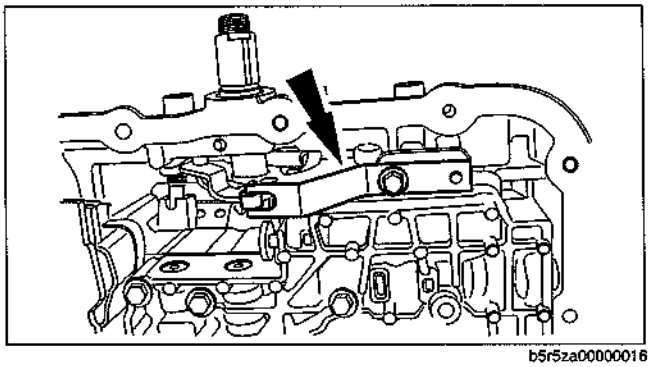
absggw00001183

7. Remove the transmission fluid filter and seal component and discard.



b5r5za00000015

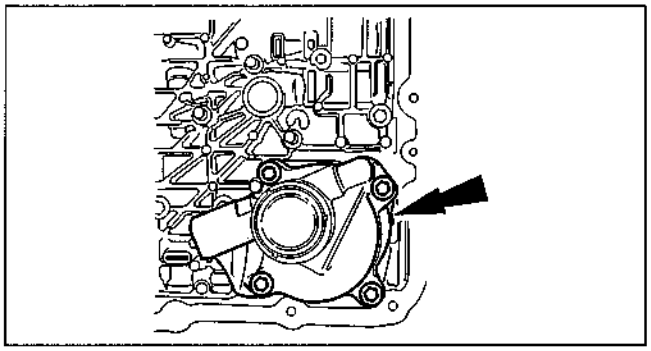
8. Remove the detent spring.



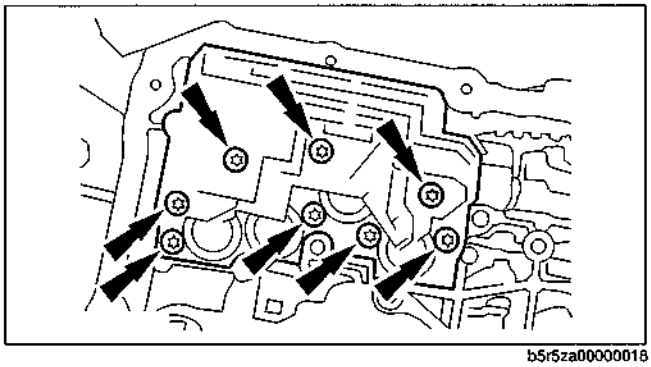
b5r5za00000016

9. Remove the low/reverse brake servo component.

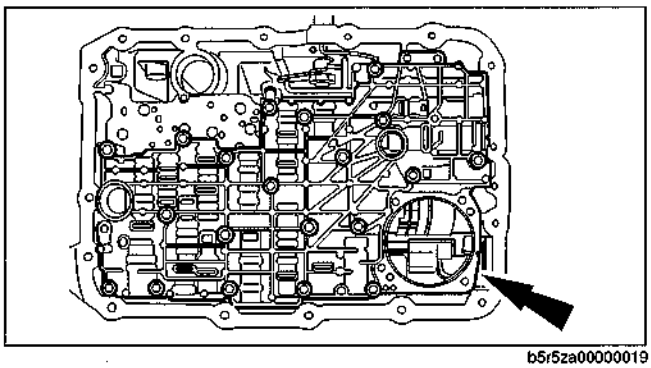
Caution
- **Do not damage solenoid body connector pins.**


b5r5za00000017

10. Remove the solenoid body component by lifting on the body and pushing the connector from the other side of the case.


b5r5za00000018

11. Remove the control valve body.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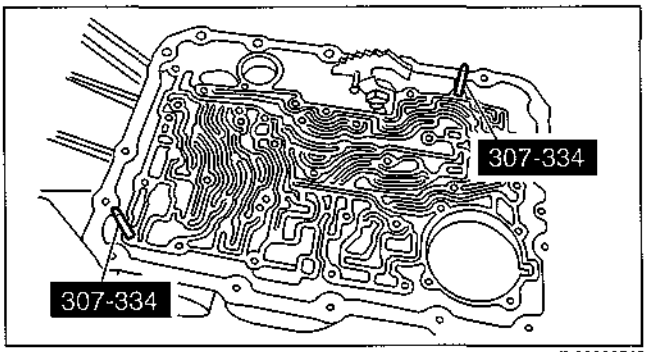
CONTROL VALVE BODY INSTALLATION [5R55S]

id0513c1710700

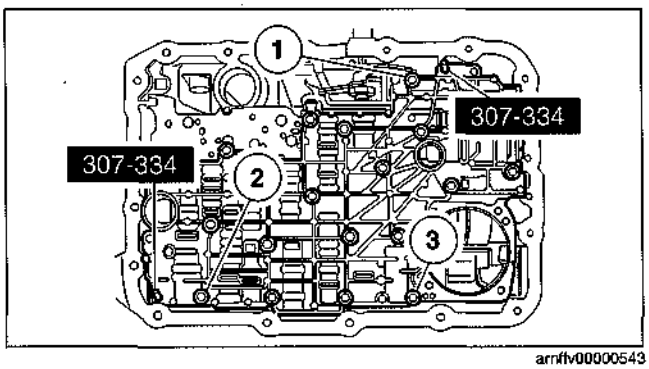
On-Vehicle Installation

1. Install the **SSTs** into the transmission case.



arnffv00000542

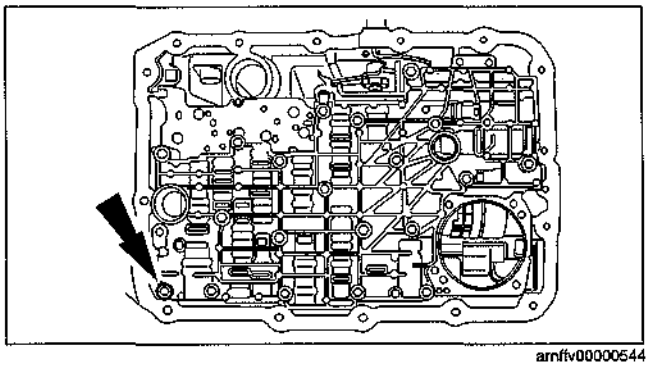
2. Using the **SSTs**, Install the control valve body and loosely install the bolts.
   (1) Install the short bolt.
   (2) Install the bolt with the larger head.
   (3) Install the remaining bolts.



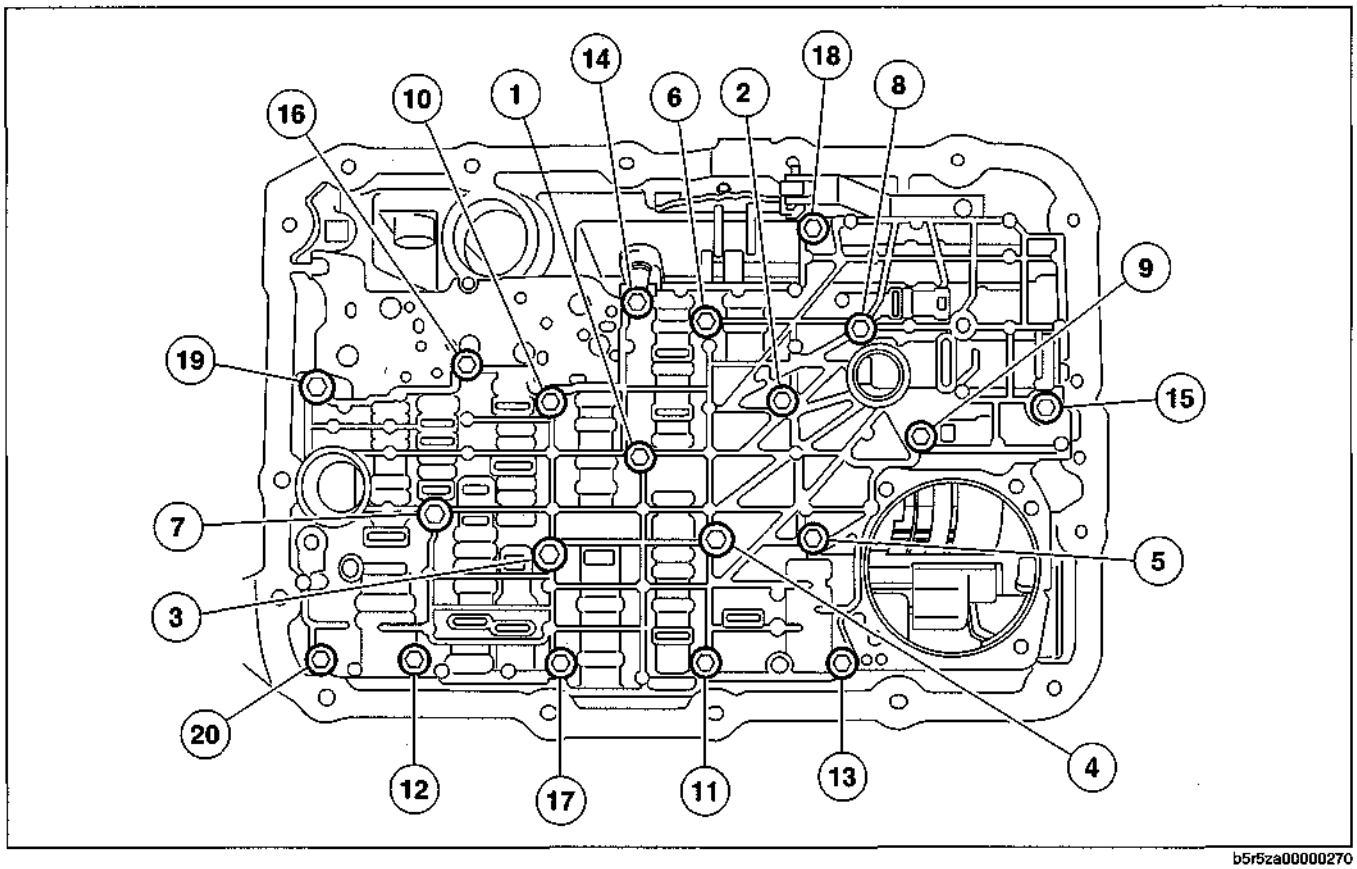
arnffv00000543

3. Remove the **SSTs** and loosely install the screw.
4. Tighten the bolts in the sequence shown.

Tightening torque
9—11 N·m {92—112 kgf·cm, 80—97 in·lbf}



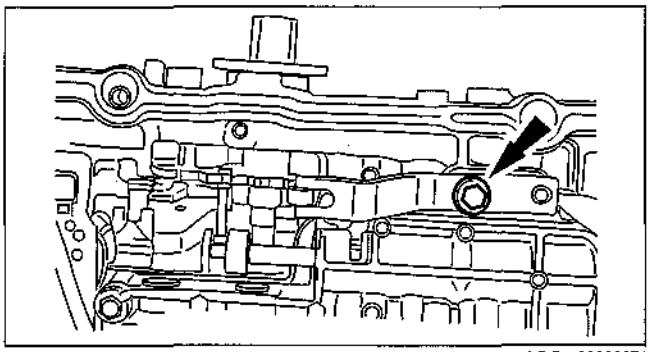
arnffv00000544



b5r5za00000270

5. Install the detent spring.

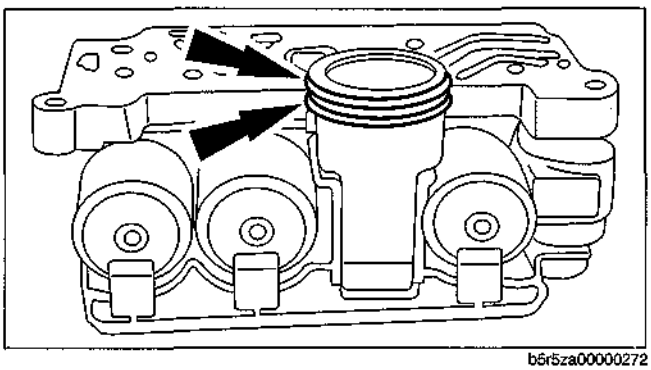
Tightening torque
9—11 N·m {92—112 kgf·cm, 80—97 in·lbf}



b5r5za00000271

6. Install new O-rings on the solenoid body connector. Lubricate the O-rings with clean ATF.

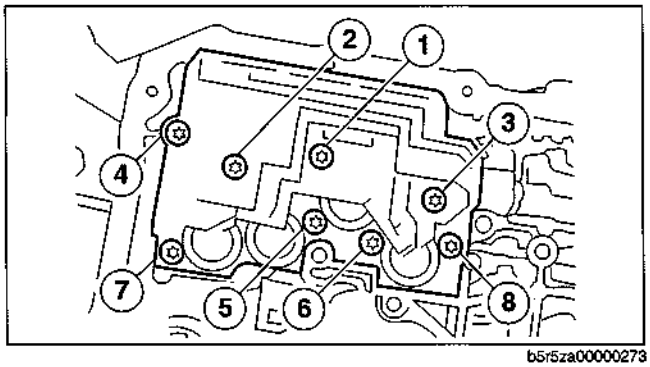
Caution
- **Inspect the transmission case bore to make sure it is free of foreign material and not damaged. If damaged, a transmission leak may occur.**



b5r5za00000272

7. Install the solenoid body. Tighten bolts in the sequence shown.

Tightening torque
7—9 N·m {72—91 kgf·cm, 62—79 in·lbf}

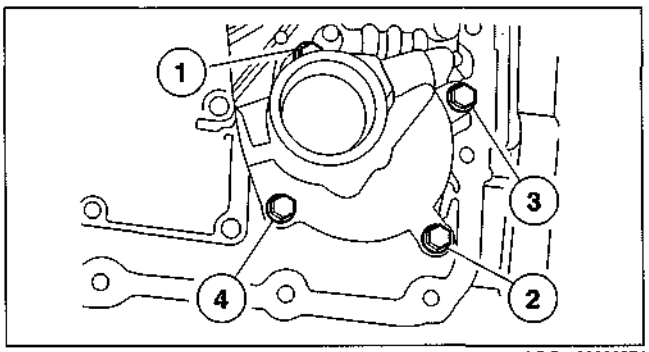


b5r5za00000273

8. Install the reverse servo. Tighten the bolts in the sequence shown in 2 stages.

Tightening torque
Stage 1: 5 N·m {51 kgf·cm, 44 in·lbf}
Stage 2: 10—12 N·m {102—122 kgf·cm, 89—106 in·lbf}

Caution
- **Lubricate the transmission fluid filter seals with clean ATF or they may be damaged.**

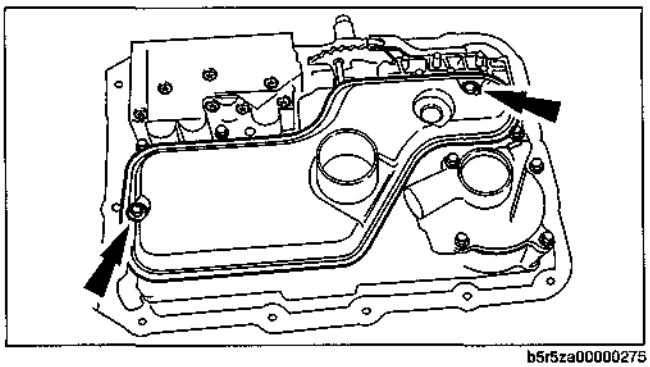


b5r5za00000274

9. Lubricate the seals and install the transmission fluid filter.

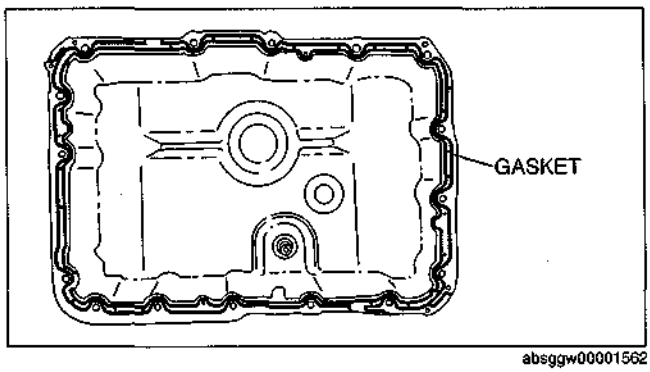
Tightening torque
9—11 N·m {92—112 kgf·cm, 80—97 in·lbf}

Note
- Make sure that the transmission fluid filter seals are correctly seated on the filter.


b5r5za00000275

10. Install the transmission fluid pan gasket on the pan.

Note
- The transmission fluid pan gasket is reusable, clean and inspect for damage. If not damaged, the gasket should be reused.

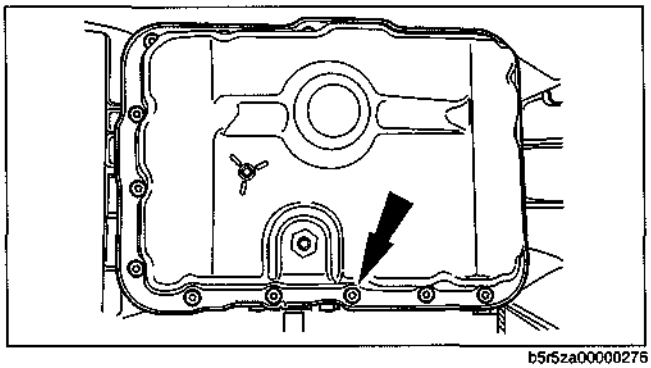


absggw00001562

11. Install the transmission fluid pump and gasket, magnet and loosely install the bolts.
12. Tighten the bolts in a crisscross sequence.

Tightening torque
9.5—11.5 N·m {97—117 kgf·cm, 85—101 in·lbf}

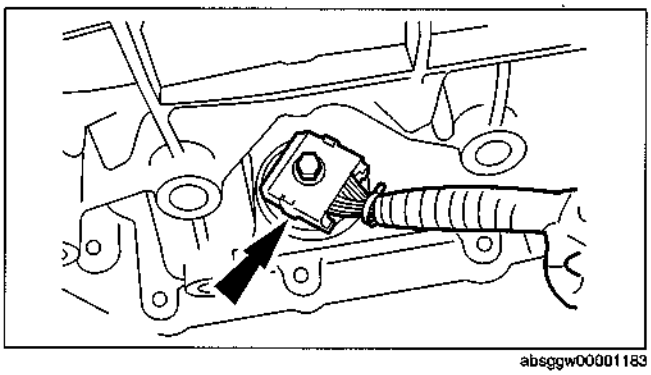
Caution
- **Damage will occur to the solenoid body component if the screw is tightened above specification.**


b5r5za00000276

13. Install and lubricate new O-rings on the AT connector and connect the connector.

    Tightening torque
    5 N·m {51 kgf·cm, 44 in·lbf}

    Note
    - Clean the area around connector to prevent contamination of the AT connector.
    - Use petroleum jelly to lubricate the O-rings to aid in the installation process.



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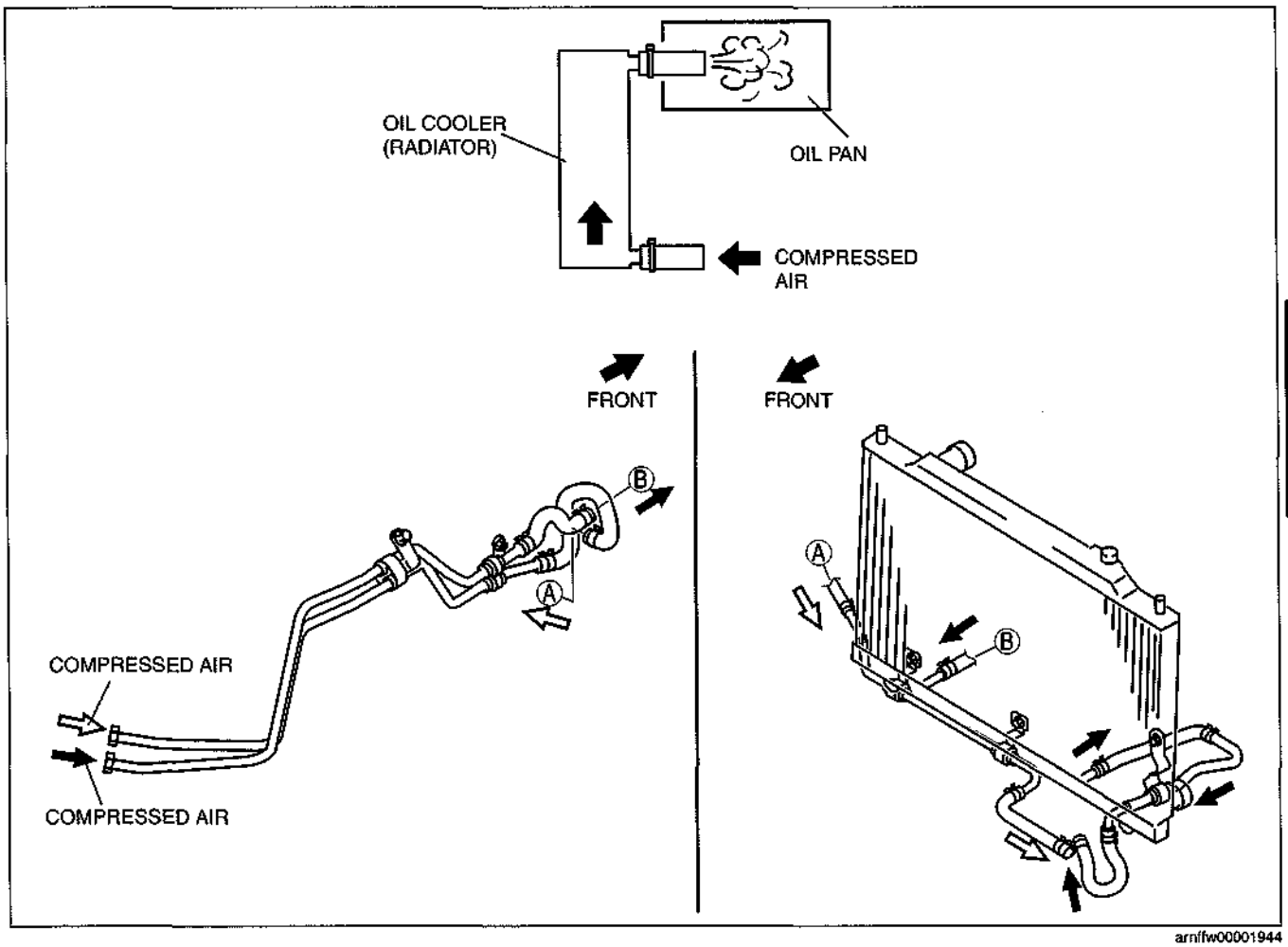
14. Remove the insulator bracket. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/ INSTALLATION [5R55S].)
15. Remove the CKP sensor insulator. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION [5R55S].)
16. Remove the digital TR sensor insulator. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/ INSTALLATION [5R55S].)
17. Connect the negative battery cable.
18. Add ATF and, with the engine idling, inspect the ATF level and for leakage. (See 05-13-13 AUTOMATIC TRANSMISSION FLUID (ATF) INSPECTION [5R55S].)
19. Perform the mechanical system test. (See 05-13-4 MECHANICAL SYSTEM TEST [5R55S].)
20. Perform the road test. (See 05-13-8 ROAD TEST [5R55S].)

OIL COOLER FLUSHING [5R55S]

id0513c1710900

Note
- If the automatic transaxle is replaced, flush and inspect the oil cooler.
- When replacing the automatic transaxle, inspect the oil cooler together with flushing it using the following procedure, and with the oil cooler hose removed.

1. Remove the oil cooler. (See 05-13-68 OIL COOLER REMOVAL/INSTALLATION [5R55S].)
2. Disconnect the oil cooler hose.
3. Set a clean fluid pan up to the oil cooler hose inlet.
4. Blow **491—882 kPa {5—9 kgf/cm^2, 72—127 psi}** of compressed air from the oil cooler hose outlet to drain remaining oil.
5. Add new ATF from the oil cooler hose outlet and blow **491—882 kPa {5—9 kgf/cm^2, 72—127 psi}** of compressed air to flush. (Repeat 2 or 3 times)
6. Verify that none of the following foreign material is mixed in with the drained ATF:
   - Large metal fragments of ϕ 0.5 mm {0.02 mm} or more that cannot pass through the oil strainer
   - Fibrous clutch facing
7. Repeat the procedures from Step 3 to 4 and flush the inside of the oil cooler.
8. If foreign material such as metal fragments or clutch facing remains even after the oil cooler is flushed repeatedly, replace the oil cooler (radiator).



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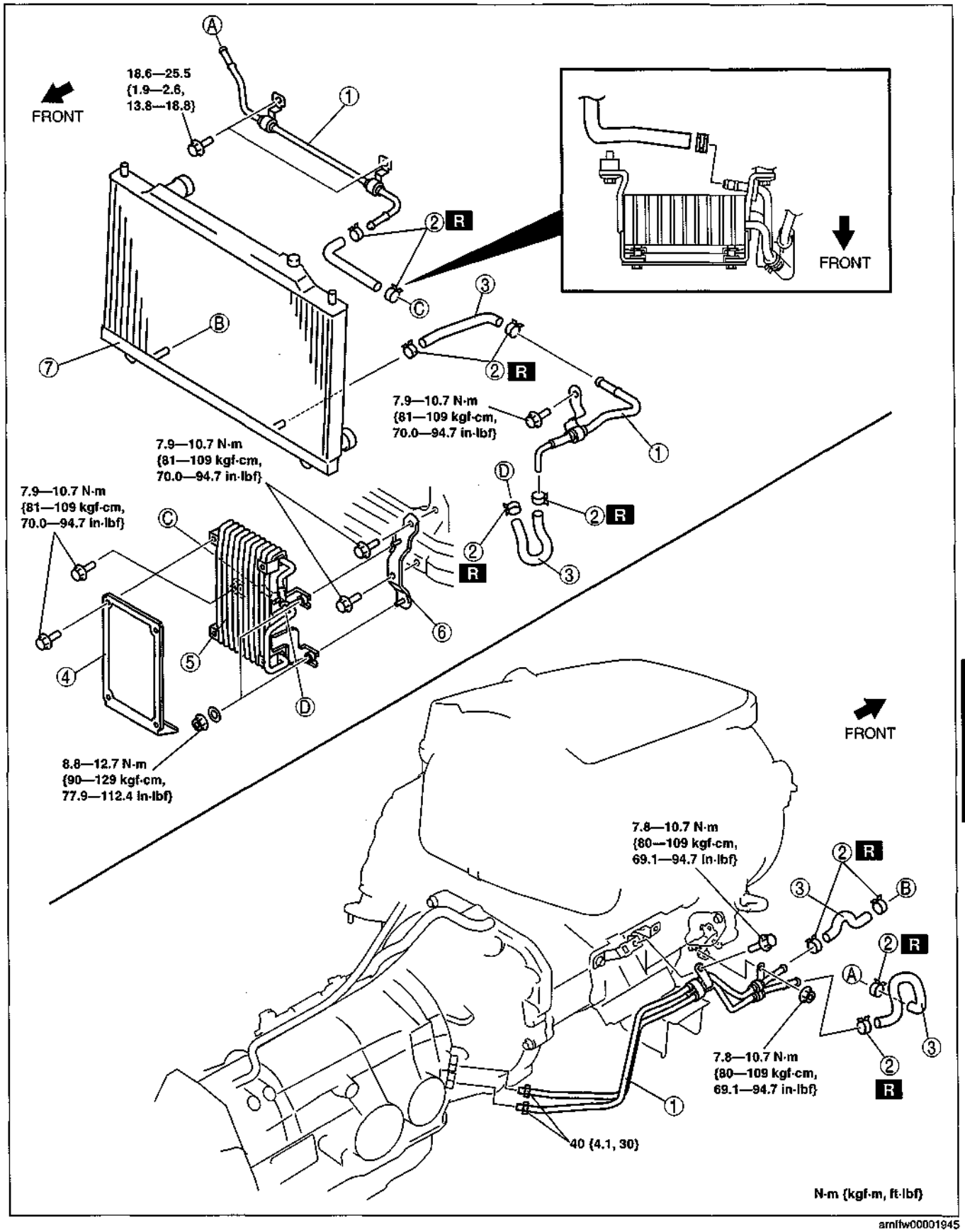
OIL COOLER REMOVAL/INSTALLATION [5R55S]

id0513c1248700

1. Disconnect the negative battery cable.
2. Drain the ATF. (See 05-13-16 AUTOMATIC TRANSMISSION FLUID (ATF) REPLACEMENT [5R55S].)
3. Drain the engine coolant.
4. Remove the following parts.
   (1) Splash shield
   (2) Under cover
   (3) Front bumper
5. Remove in the order indicated in the table.
6. Install in the reverse order of removal.
7. Add the engine coolant.
8. Add ATF to the specified level. (See 05-13-16 AUTOMATIC TRANSMISSION FLUID (ATF) REPLACEMENT [5R55S].)
9. Inspect for oil leakage from the oil pipes and oil hoses.
10. Inspect for coolant from the hoses.
11. Inspect for engine coolant leakage.
12. Inspect the ATF level and condition. (See 05-13-13 AUTOMATIC TRANSMISSION FLUID (ATF) INSPECTION [5R55S].)



amlfw00001945

1	Oil pipe (See 05-13-70 Oil Pipe, Hose clamp, Oil hose Installation Note.)
2	Hose clamp (See 05-13-70 Oil Pipe, Hose clamp, Oil hose Installation Note.)

3	Oil hose (See 05-13-70 Oil Pipe, Hose clamp, Oil hose Installation Note.)
4	Cover
5	Oil cooler
6	Braket
7	Radiator (in tank oil cooler) (See 05-13-70 Radiator (In Tank Oil Cooler) Installation Note.)

Radiator (In Tank Oil Cooler) Installation Note

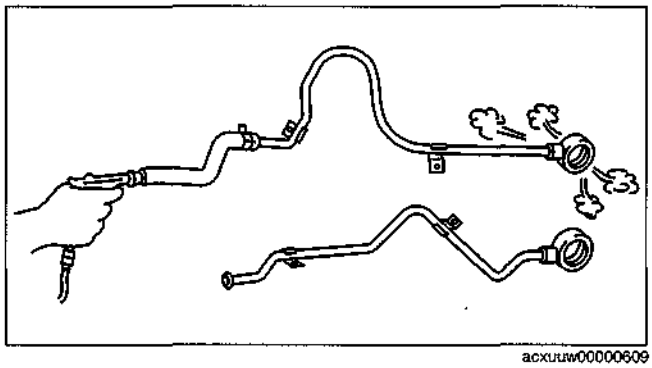
1. The automatic transmission oil cooler flushing must be performed whenever a transmission is removed for service because the existing fluid may be contaminated, and to prevent contamination of new fluid.

Note
- Flushing must be performed after installation of the overhauled or replaced transmission.

2. Follow the instructions in the manufacturer's publication for flushing operation.

Oil Pipe, Hose clamp, Oil hose Installation Note

1. Apply compressed air to cooler-side opening, and blow any remaining grime and foreign material from the cooler pipes. Compressed air should be applied for **more than 1 min.**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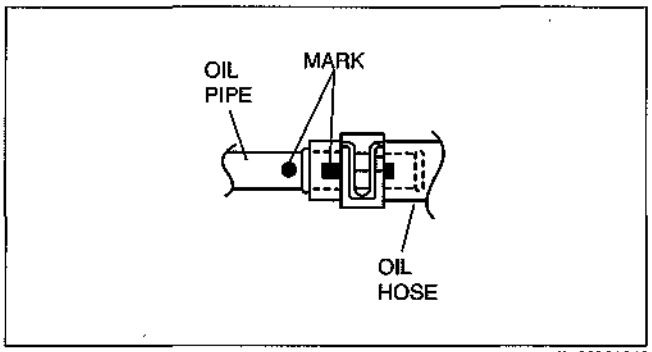
2. Align the marks, and slide the oil hose onto the oil pipe until it is fully seated as shown.
3. Install the hose clamp onto the hose.



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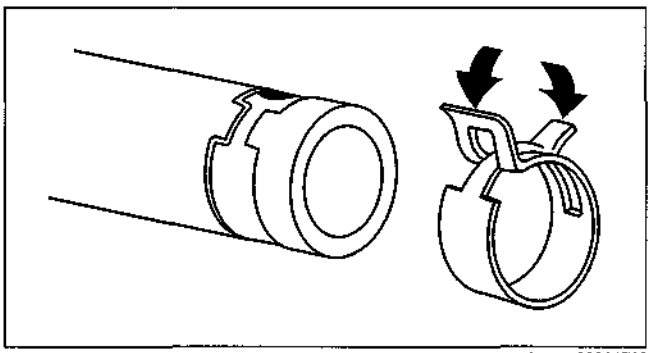
Note
- If reusing the hose, install the new hose clamp exactly on the mark left by the previous hose clamp. Then apply force to the hose clamp in the direction of the arrow in order to fit the clamp in place.

4. Verify that the hose clamp does not interfere with any other components.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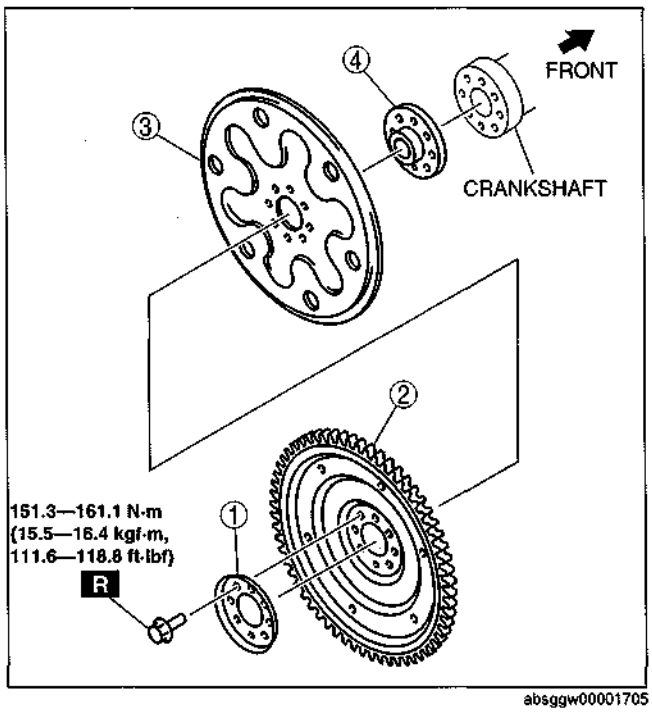
DRIVE PLATE REMOVAL/INSTALLATION [5R55S]

id0513c1250200

1. Remove the transmission. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION [5R55S].)
2. Remove in the order indicated in the table.
3. Install in the reverse order of removal.

1	Backing plate
2	Drive plate (See 05-13-71 Drive Plate Removal Note.) (See 05-13-71 Drive Plate Installation Note.)
3	Plate
4	Spacer



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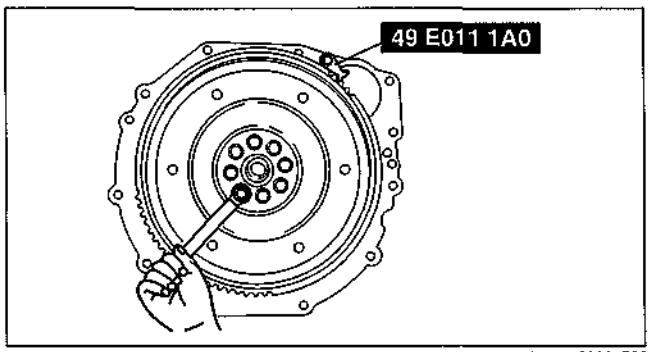
Drive Plate Removal Note

1. Set the **SST** or equivalent against the drive plate.
2. Remove the bolts and the drive plate.



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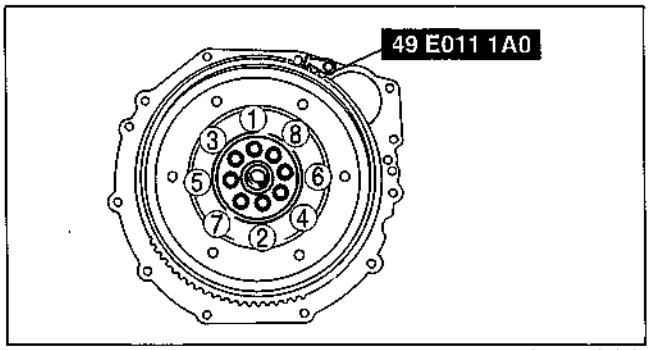
Drive Plate Installation Note

1. Remove the sealant from the bolt holes in the crankshaft.
2. Install the drive plate.
3. Install the backing plate.
4. Set the **SST** or equivalent against the drive plate.
5. Tighten the drive plate mounting bolts in two or three steps in the order as shown in the figure.

   Tightening torque
   151.3—161.1 N·m
   {15.5—16.4 kgf·m, 111.6—118.8 ft·lbf}

6. Install the transmission. (See 05-13-45 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION [5R55S].)



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05-14 AUTOMATIC TRANSMISSION SHIFT MECHANISM

AUTOMATIC TRANSMISSION SHIFT MECHANISM LOCATION INDEX..... 05-14–1
SELECTOR LEVER INSPECTION 05-14–2
SELECTOR CABLE ADJUSTMENT 05-14–2
SELECTOR CABLE REMOVAL/INSTALLATION 05-14–3
SELECTOR LEVER REMOVAL/INSTALLATION 05-14–4

AUTOMATIC TRANSMISSION SHIFT MECHANISM LOCATION INDEX

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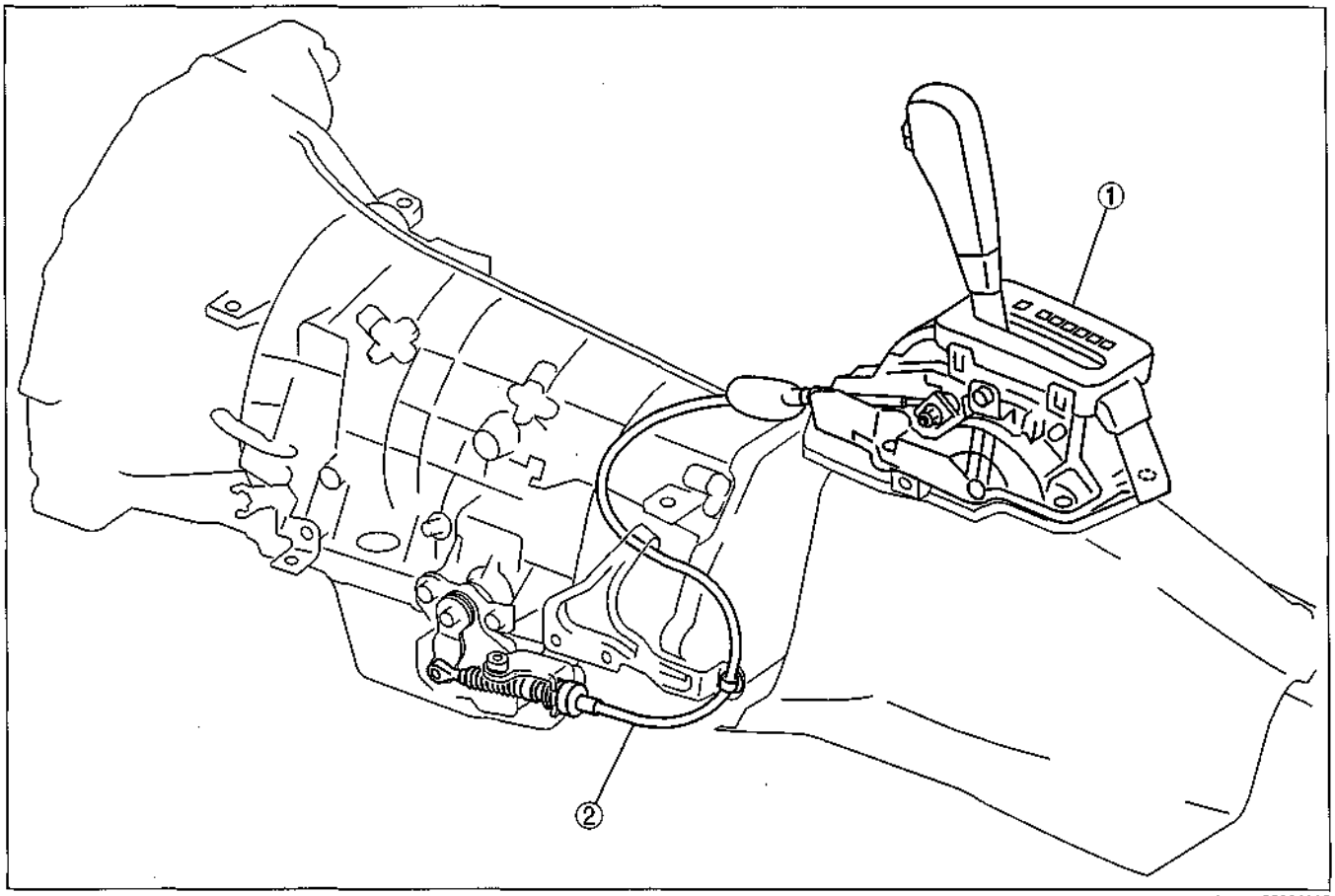

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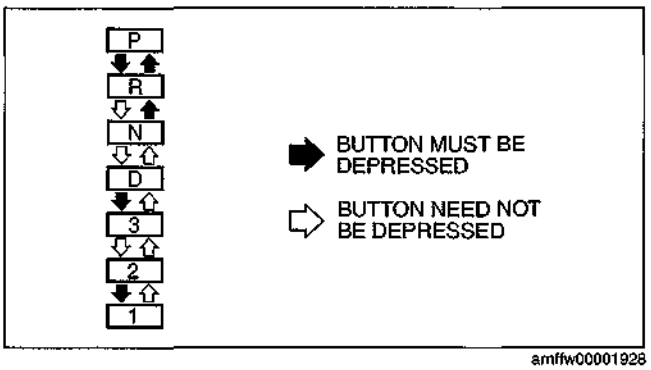
1	Selector lever (See 05-14-2 SELECTOR LEVER INSPECTION.) (See 05-14-4 SELECTOR LEVER REMOVAL/INSTALLATION.)

2	Selector cable (See 05-14-2 SELECTOR CABLE ADJUSTMENT.) (See 05-14-3 SELECTOR CABLE REMOVAL/INSTALLATION.)

SELECTOR LEVER INSPECTION

id051400255500

1. Turn the engine switch to the ON position (engine off).
2. With the brake pedal depressed, verify that there is a "click" at each range when shifted.
3. Verify that the selector lever can be shifted.
4. Verify that there is a "click" at each position when shifted from the P position to the 1 range.



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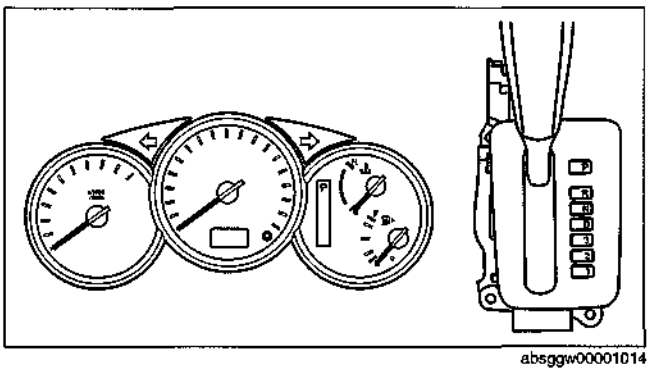
5. Verify that the positions of the selector lever and the indicator are aligned.
   - If there is any malfunction, adjust the digital TR sensor. (See 05-13-24 DIGITAL TRANSMISSION RANGE (TR) SENSOR ADJUSTMENT [5R55S].)
6. Verify that the vehicle operates in each selected range.



absggw00001014

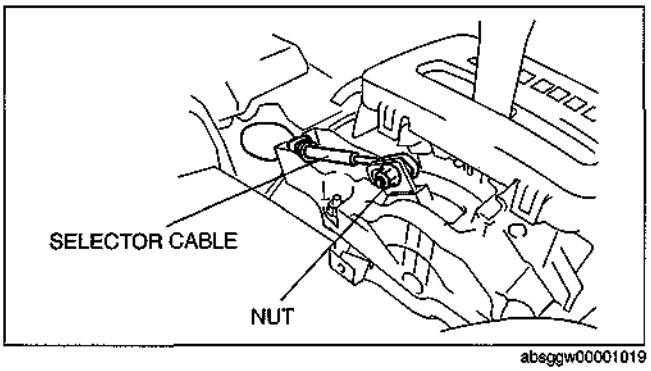
SELECTOR CABLE ADJUSTMENT

id051400256100

1. Remove the console.
2. Shift the selector lever to the N position.
3. Loosen the nut at **approx. 90°**.
4. Adjustment the end of the selector cable position.
5. Tighten the nut.

   Tightening torque
   9.8—18.2 N·m {100—185 kgf·cm, 87—161 in·lbf}

6. Install the console.



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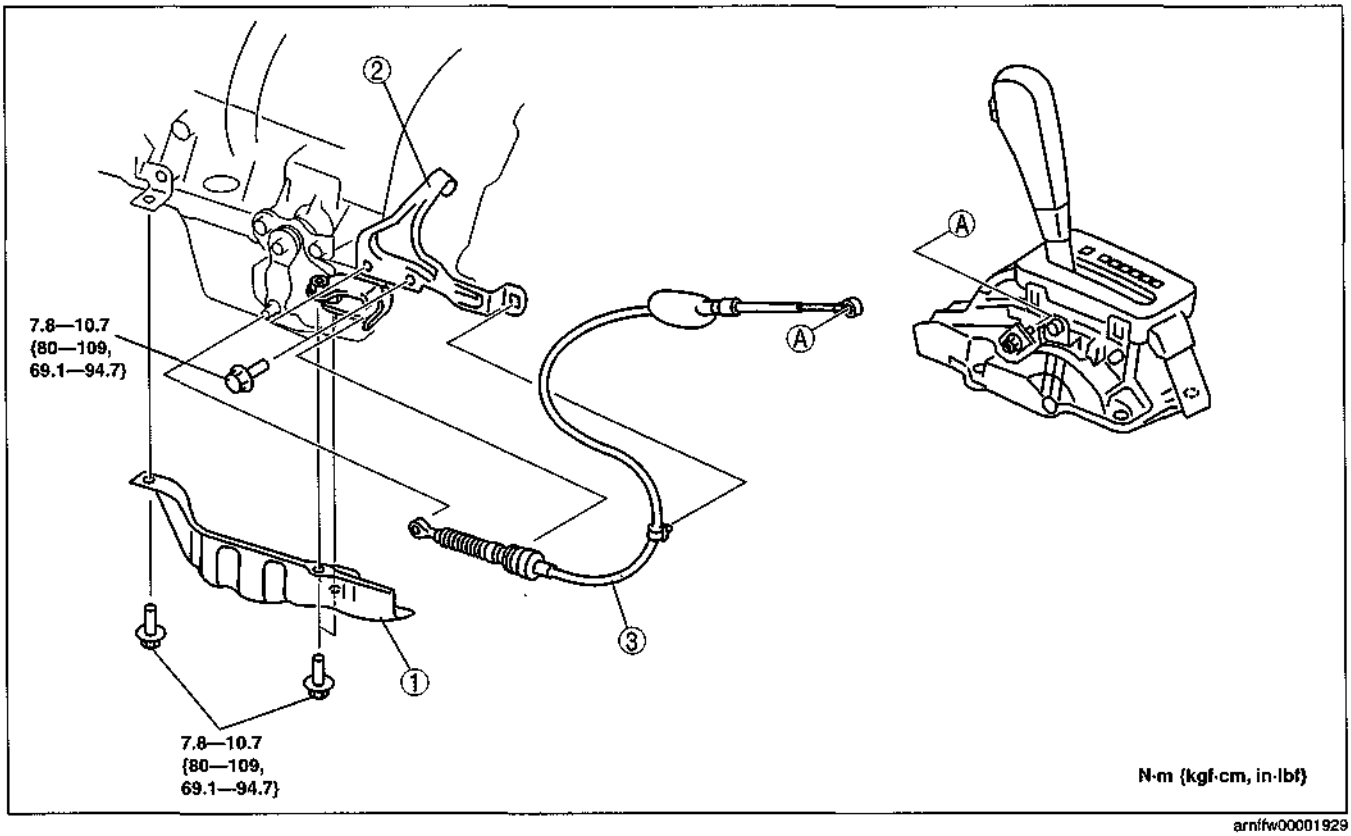
SELECTOR CABLE REMOVAL/INSTALLATION

id051400256200

1. Disconnect the negative battery cable.
2. Remove the console.
3. Shift the selector lever to the P position.
4. Remove in the order indicated in the table.
5. Install in the reverse order of removal.



arnifw00001929

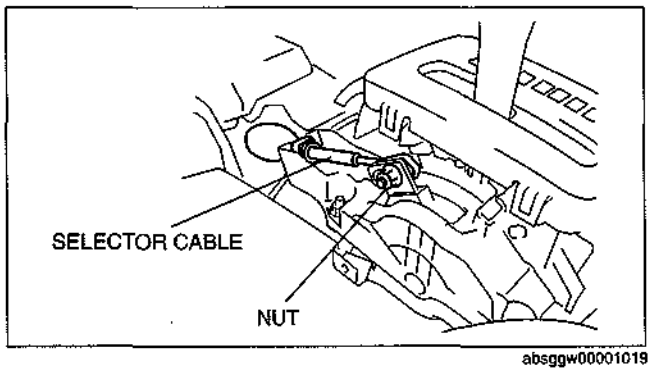
1	Digital TR sensor insulator
2	Selector cable bracket

3	Selector cable (See 05-14-3 Selector Cable Installation Note.)

Selector Cable Installation Note

1. Shift the selector lever to the N position.
2. Loosen the nut at **approx. 90°**.
3. Adjustment the end of the selector cable position.
4. Tighten the nut.

Tightening torque
9.8—18.2 N·m {100—185 kgf·cm, 87—161 in·lbf}



absggw00001019

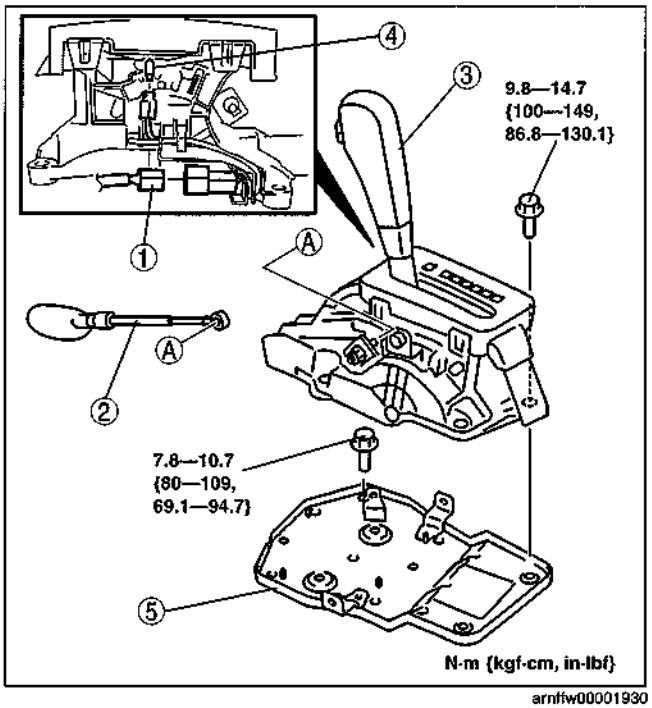
SELECTOR LEVER REMOVAL/INSTALLATION

id051400255700

1. Disconnect the negative battery cable.
2. Remove the console.
3. Shift the selector lever to the P position.
4. Remove in the order indicated in the table.

1	Connector
2	Selector cable (See 05-14-4 Selector Cable Installation Note.)
3	Selector lever
4	Bulb
5	Selector lever bracket

5. Install in the reverse order of removal.



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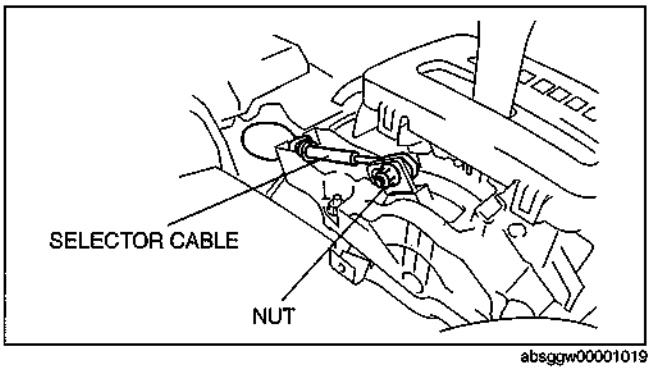
Selector Cable Installation Note

1. Shift the selector lever to the N position.
2. Loosen the nut at **approx. 90°**.
3. Adjustment the end of the selector cable position.
4. Tighten the nut.

Tightening torque
9.8—18.2 N·m {100—185 kgf·cm, 87—161 in·lbf}



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05-50 TECHNICAL DATA

TRANSMISSION/TRANSAXLE
..... 05-50–1

TRANSMISSION/TRANSAXLE [5R55S]

Id0550h1800400

Item	Specification
ATF	Type: Mercon® V Capacity (approx. quantity): 9.93 L {10.49 US qt, 8.74 Imp qt}

Line pressure (pressure control A, pressure control B)

Position/range	Line pressure (kPa {kgf/cm^2, psi})	
	Idle	Stall
P/N	793 {8.09, 115}	793 {8.09, 115}
R	793 {8.09, 115}	2,138 {21.80, 310}
D, 3, 2, 1	793 {8.09, 115}	1,520 {15.47, 220}

Line pressure (pressure control C)

Position/range	Line pressure (kPa {kgf/cm^2, psi})	
	Idle	Stall
P/N	27 {0.28, 4}	0 {0, 0}
R	793 {8.09, 115}	793 {8.09, 115}
D, 3, 2, 1	27 {0.28, 4}	0 {0, 0}

Engine stall speed

Engine type	rpm
WL-C	2,700
WE-C	2,900

Transmission fluid temperature (TFT) sensor

ATF temperature (°C {°F})	Resistance (kilohm)
-40—-20 {-40—-4}	284—967
-19—1 {-3—30}	100—284
0—20 {32—68}	37—100
21—40 {70—104}	16—37
41—70 {106—158}	5—16
71—90 {160—194}	2.7—5
91—110 {196—230}	1.5—2.7
111—130 {232—266}	0.8—1.5
131—150 {268—302}	0.54—0.8

TSS sensor resistance

Resistance (ohm)	Temperature (°C {°F})
226—390	-20 {4}
325—485	21 {70}
492—738	150 {302}

ISS sensor resistance

Resistance (ohm)	Temperature (°C {°F})
226—390	-20 {4}
325—485	21 {70}
492—738	150 {302}

OSS sensor resistance

Resistance (ohm)	Temperature (°C {°F})
226—390	-20 {4}
325—485	21 {70}
492—738	150 {302}

Solenoid valve resistance)

Terminals	Solenoid valve	Resistance (ohm)
D—I	Shift solenoid A	16—45
F—I	Shift solenoid B	16—45
B—I	Shift solenoid C	16—45
E—I	Shift solenoid D	16—45
O—I	Pressure control solenoid A	3.3—7.5
M—I	Pressure control solenoid B	3.3—7.5
G—I	Pressure control solenoid C	3.3—7.5
H—I	TCC control solenoid	9—16

Clutch

Item	Specification
Specified fluid	SAE J1703, FMVSS 116 DOT-3
Clutch pedal stroke	152 mm {5.98 in}
Clutch pedal play	5—15 mm {0.20—0.59 in}
Clutch pedal push rod play (Reference value)	0.1—0.5 mm {0.004—0.020 in}
Clutch disengagement stroke (Reference value) [R15M-D]	A: 100—130 mm {3.94—5.11 in}
Clutch disengagement stroke (Reference value) [S15M-D, S15MX-D]	A: 110—125 mm {4.34—4.92 in}
Clutch disc maximum depth	0.6 mm {0.024 in}
Clutch cover maximum clearance	0.3 mm {0.012 in}
Clutch cover maximum height difference	1.0 mm {0.039 in}
Clutch disc minimum depth	0.3 mm {0.012 in}
Clutch disc maximum runout	0.7 mm {0.028 in}
Flywheel maximum runout [R15M-D]	0.1 mm {0.004 in}
Dual-mass flywheel maximum runout [S15M-D, S15MX-D]	1.5 mm {0.059 in}

Manual Transmission [S15M-D, S15MX-D]

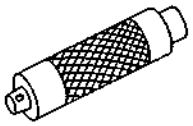
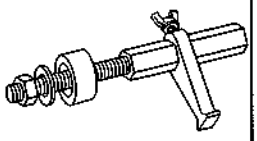
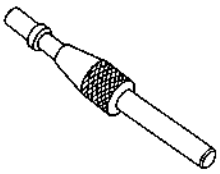
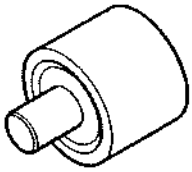
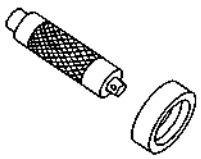
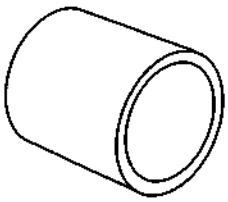
Item	Specification
Transmission case oil [S15M-D, S15MX-D]	Type: Mercon® Multi-purpose AFT XT-2-QDX Capacity (approx. quantity): 3.55 L {3.75 US qt, 3.12 Imp qt}
Vehicle speed sensor (VSS) voltage [S15M-D]	5 V or less
Shift control case oil [S15M-D]	Type: Mercon® Multi-purpose AFT XT-2-QDX Capacity (approx. quantity): 220—260 ml {220—260 cc, 13.42—15.86 cu in}

05-60 SERVICE TOOLS

TRANSMISSION SST 05-60–1

TRANSMISSION SST

dcf056000000w01

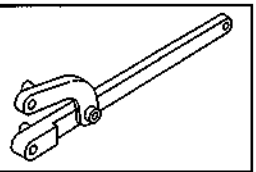
49 S120 440 Mainshaft holder	49 G030 797 Handle 	49 E011 1A0 Ring gear brake set 
49 0259 770B Flare nut wrench	49 SE01 310A Clutch disc centering tool 	49 1285 071 Bearing puller
49 F028 202 Bush Installer 	49 G030 795 Oil seal Installer 	49 G028 203 Support 

05

TRANSMISSION SST [5R55S]

id0560h1500200

1: Mazda **SST** number
2: Global **SST** number
Example

1:49 UN20 5072 2:205-072 Holding Tool	

1:– 2:100-001 Slide Hammer	1:– 2:100-D009 Rubber Tip Air Nozzle	1:– 2:307-004 Pressure Gauge, Transmission Fluid
1:– 2:307-091 Handle, Torque Converter	1:– 2:307-309 Remover, Torque Converter Fluid Seal	1:– 2:307-334 Aligner, Valve Body (2 required)
1:– 2:307-349 Installer, Torque Converter Fluid Seal	1:49 UN30 7351 2:307-351 Alignment Gauge, TR Sensor	1:– 2:307-433-01, 307-433-02, 307-433-03 Transmission Test Plate and Gasket
1:– 2:307-435 Installer, Transmission Extension Housing Fluid Seal	1:49 UN30 7437 2:307-437 Adapter, Fluid Level and Fill Plug	1:49 UN30 7D4650 2:307-D465 Fluid Transporter/ Evacuator/ Injector
1:– 2:308-002 Installer, Transmission Extension Housing Oil Seal	1:– 2:308-375 Remover, Input Shaft Oil Seal	1:– 2:416-D002 Vacuum Pump Kit
1:49 E011 1A0 2:– Brake Set, Ring Gear	—	—

STEERING

06
SECTION

GENERAL PROCEDURES . . . 06-10
POWER STEERING. 06-14
TECHNICAL DATA 06-50
SERVICE TOOLS 06-60

06-10 GENERAL PROCEDURES

GENERAL PRECAUTION
(STEERING) 06-10–1

GENERAL PRECAUTION (STEERING)

dcf061000000w01

Wheels and Tire Installation

1. When installing the wheels and tires, tighten the wheel nuts in a criss-cross pattern to the following tightening torque.

   Tightening torque
   88.2—117.6 N·m {9.00—11.99 kgf·m, 65.06—86.73 ft·lbf}

Connector Disconnection

1. Disconnect the negative battery cable before performing any work that requires handling of connectors. (See 01-17-2 BATTERY REMOVAL/INSTALLATION.)

Power Steering Components Removal/Installation

1. If any power steering fluid line has been disconnected anytime during the procedure, add ATF M-III or equivalent (e.g. Dexron®II), bleed the fluid lines, and inspect for leakage after the procedure has been completed.

06-14 POWER STEERING

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POWER STEERING OIL PUMP DISASSEMBLY/ASSEMBLY 06-14–15

STEERING LOCATION INDEX

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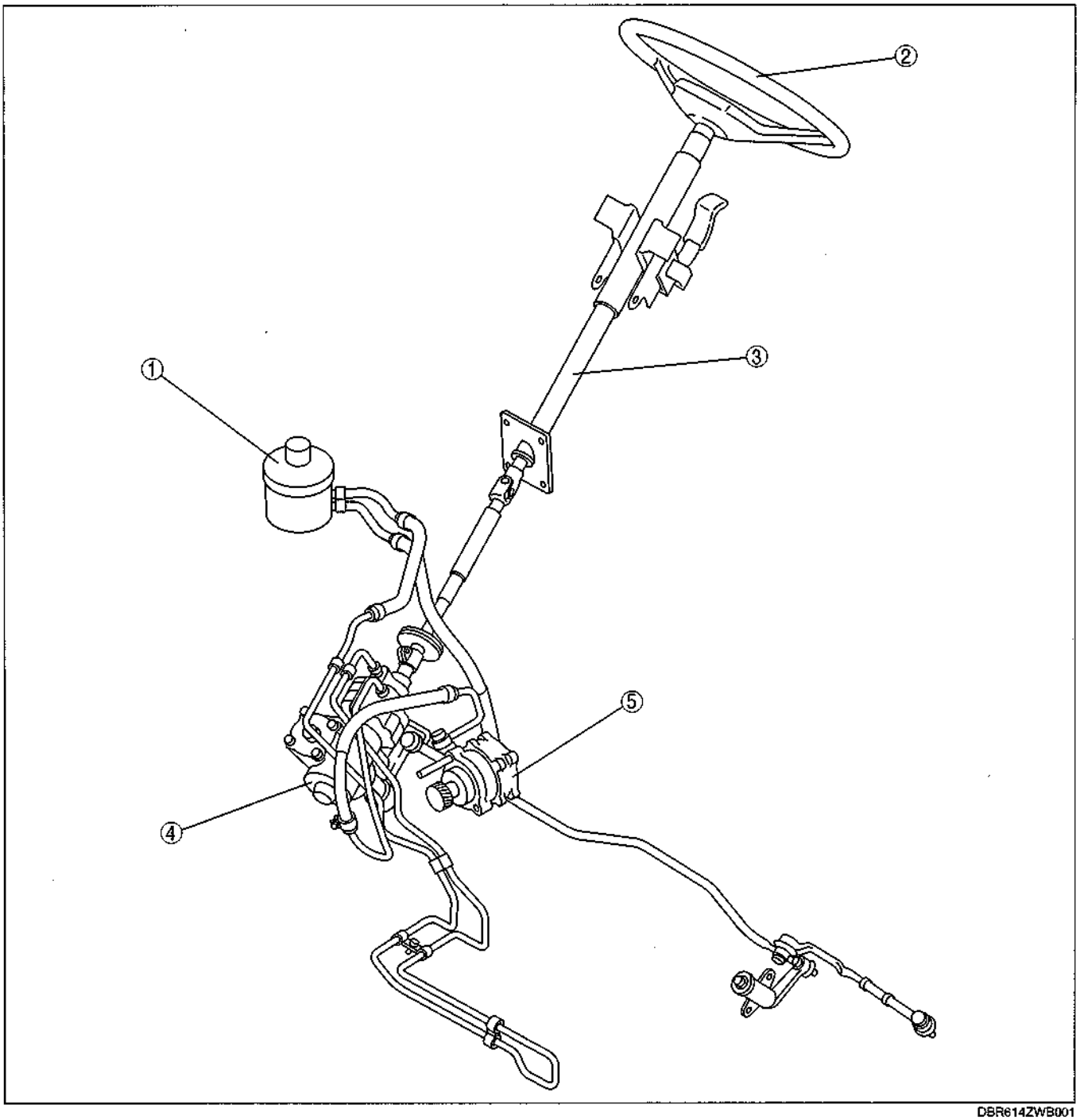

DBR614ZWB001

1	Power steering fluid tank (See 06-14-3 AIR BLEEDING.) (See 06-14-3 POWER STEERING FLUID INSPECTION.)
2	Steering wheel and column (See 06-14-5 STEERING WHEEL AND COLUMN INSPECTION.) (See 06-14-6 STEERING WHEEL AND COLUMN REMOVAL/INSTALLATION.)
3	Steering shaft (See 06-14-9 STEERING SHAFT INSPECTION.)
4	Steering gear and linkage (See 06-14-10 STEERING GEAR AND LINKAGE REMOVAL/INSTALLATION.) (See 06-14-11 STEERING GEAR AND LINKAGE DISASSEMBLY/ASSEMBLY.) (See 06-14-13 STEERING GEAR AND LINKAGE INSPECTION.)
5	Power steering oil pump (See 06-14-14 POWER STEERING OIL PUMP REMOVAL/INSTALLATION.) (See 06-14-15 POWER STEERING OIL PUMP DISASSEMBLY/ASSEMBLY.)

AIR BLEEDING

dcf061400000w02

Caution
- **Do not turn the steering wheel during the fluid level inspection, otherwise the fluid level changes and cannot be inspected correctly.**

1. Inspect the fluid level. (See06-14-3 POWER STEERING FLUID INSPECTION.)
2. Jack up the front of the vehicle and support it on safety stands.
3. Turn the steering wheel fully to the left and right several times with the engine not running.
4. Reinspect the fluid level.
   - If it has dropped, add fluid.
5. Repeat Steps 3 and 4 until the fluid level stabilizes.
6. Lower the vehicle.
7. Start the engine and let it idle.
8. Turn the steering wheel fully to the left and right several times.
9. Verify that the fluid is not foamy and that the fluid level has not dropped.
   - If the fluid level has dropped, add fluid as necessary and repeat Steps 8 and 9.

POWER STEERING FLUID INSPECTION

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Fluid Level Inspection

1. Inspect the power steering fluid level.
   - Add fluid to the specified level as necessary.

Power steering fluid type
ATF M-III or equivalent (e.g. Dexron®II)

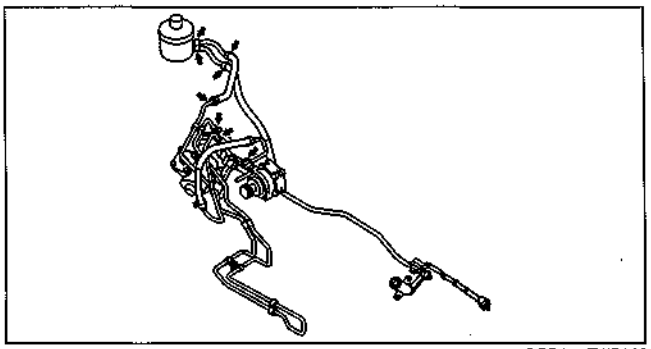
Power steering fluid capacity (approx. quantity)
1.1 L {1.2 US qt, 1.0 Imp qt}

Fluid Leakage Inspection

1. Start the engine and let it idle.
2. Turn the steering wheel fully to the left and right to apply fluid pressure.

Caution
- **If the steering wheel is kept in the fully turned position for more than 5 seconds, the fluid temperature will rise excessively and adversely affect the oil pump.**

3. Inspect for fluid leakage at the points indicated in the figure.
   - If fluid leakage is found, replace related parts.

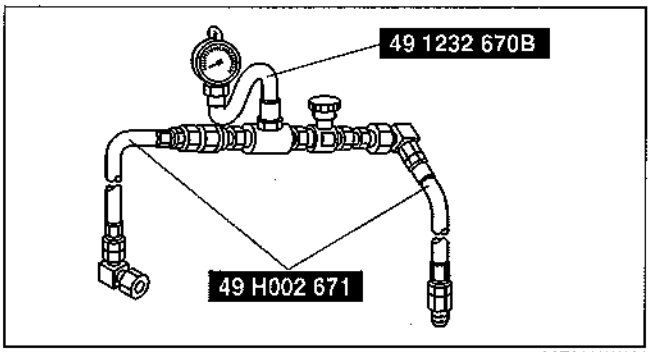


DBR614ZWB999

Fluid Pressure Inspection

1. Assemble the **SSTs** as shown in the figure.
2. Mark both hose connections to ensure that the hose is reinstalled in its original position.
3. Disconnect the pressure pipe from the oil pump, and connect the **SSTs**.

Tightening torque
29.4—44.1 N·m {3.00—4.49 kgf·m, 21.7—32.5 ft·lbf}



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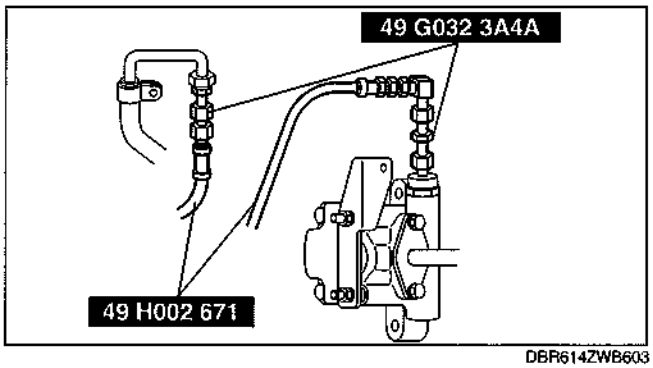
4. Connect the **SSTs** (49 1232 670B and 49 H002 671) to the **SST** (49 G032 3A4A)
5. Bleed the air from the system. (See 06-14-3 AIR BLEEDING.)
6. Open the gauge valve fully.
7. Start the engine and turn the steering wheel fully left and right to raise the fluid temperature to **50—60 °C {122—140 °F}**.

Caution
- **If the valve is left closed for more than 5 s, the fluid temperature will increase excessively and adversely affect the oil pump.**

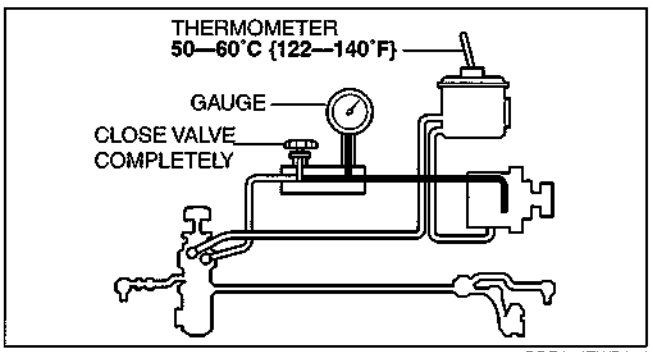


DBR614ZWB603

8. Close the gauge valve completely. Increase the engine speed to 1,000—1,500 rpm and measure the fluid pressure generated by the oil pump. If the pressure is not within the specification, repair or replace the oil pump component.

Oil pump fluid pressure
9.3—9.8 MPa {94.8—99.9 kgf/cm^2, 1348—1421 psi}

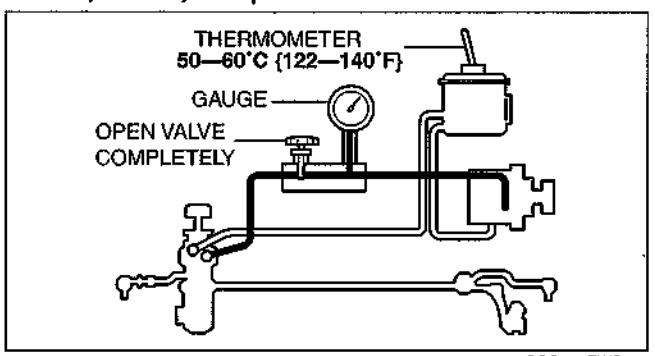
Caution
- **If the steering wheel is kept in the fully turned position for more than 5 s, the fluid temperature will rise excessively and adversely affect the oil pump.**



DBR614ZWB614

9. Open the gauge valve fully and increase the engine speed to **1,000—1,500 rpm**
10. Turn the steering wheel fully to left and right and measure the fluid pressure generated at the gear housing. If the pressure is not within the specification, repair or replace the steering gear component.

Gear housing fluid pressure
9.30—9.79 MPa {94.8—99.8 kgf/cm^2, 1348—1419psi}



DBR614ZWB604

11. Remove the **SSTs**. Install and tighten the pressure pipe to the specified torque.

Tightening torque
31.4—47.0 N·m {3.21—4.79 kgf·m, 23.2—34. ft·lbf}

12. Bleed the air from the system.

STEERING WHEEL AND COLUMN INSPECTION

dcf061432010w01

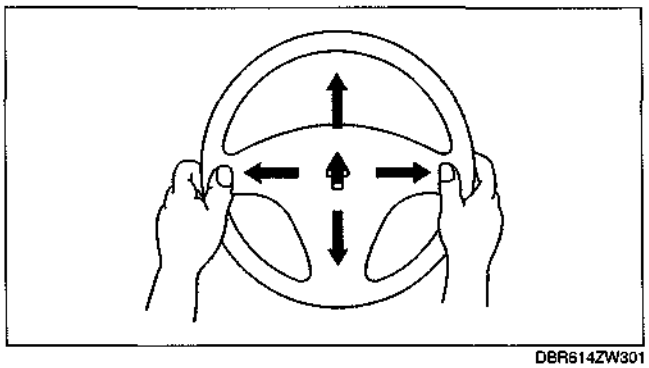
Steering Wheel Play Inspection

1. With the wheels in the straight-ahead position, gently turn the steering wheel to the left and right and verify that the play is within the specification.
   - If the play exceeds the specification, either the steering joints are worn or the backlash of the steering gear is excessive. Correct as necessary.

Steering wheel play
0—30 mm {0—1.18 in}

Steering Wheel Looseness Inspection

1. Move the steering wheel as shown in the figure to inspect for column bearing wear, steering shaft joint play, steering wheel looseness, and column looseness.
   - Repair or replace as necessary.



DBR614ZW301

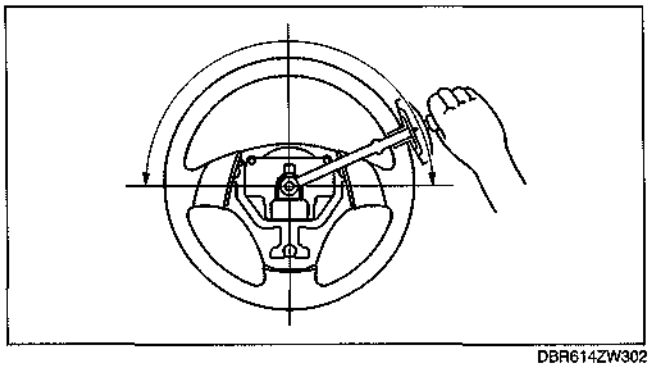
Steering Wheel Effort Inspection

1. Inspect the following points:
   - Tire size and tire pressure
   - Fluid level
2. With the vehicle on a hard, level surface, put the wheels in the straight-ahead position.
3. Remove the air bag module.

Warning
- **Handling the air bag module improperly can accidentally deploy the air bag module, which may seriously injure you. Read AIR BAG SYSTEM WARNINGS before handling the air bag module. (See 08-10-2 SERVICE WARNINGS.) (See 08-10-3 SERVICE CAUTIONS.)**

4. Start the engine and warm the power steering fluid to **50—60 °C {122—140 °F}**.
5. Measure the steering wheel effort using a torque wrench.
   - If not within the specification, verify the following:
     — No air in steering system
     — No fluid leakage at hose or connectors
     — Function of oil pump and steering gear

Steering wheel effort
7.8 N·m {80 kgf·cm, 58 in·lbf} max.



DBR614ZW302

Note
- To determine whether the steering effort is satisfactory or not, perform the inspection on another vehicle of the same model and under the same conditions, and compare the results.
- The steering wheel effort varies with conditions as shown below.
  — Road conditions, such as dry or wet, and asphalt or concrete.
  — Tire conditions, such as brand, wear, and tire pressure.

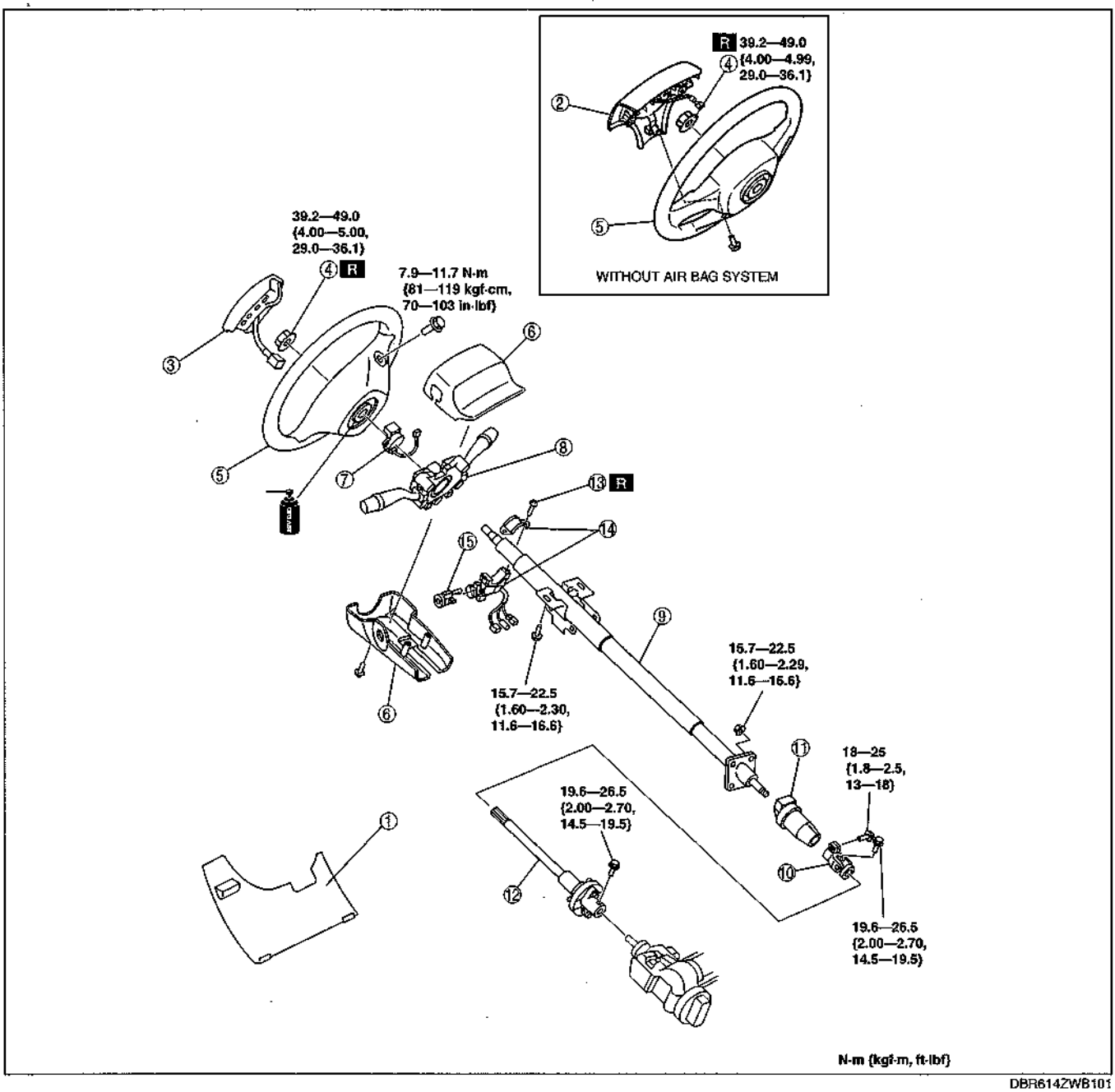
STEERING WHEEL AND COLUMN REMOVAL/INSTALLATION

dcf061432010w02

Warning

- **Handling the air bag module improperly can accidentally deploy the air bag module, which may seriously injure you. Read AIR BAG SYSTEM WARNINGS before handling the air bag module. (See 08-10-2 SERVICE WARNINGS.) (See 08-10-3 SERVICE CAUTIONS.)**

1. Remove in the order indicated in the table.
2. Install in the reverse order of removal.



DBR614ZWB101

1	Lower panel (See 09-17-10 LOWER PANEL REMOVAL/INSTALLATION.)
2	Horn cap
3	Air bag module (See 08-10-4 DRIVER-SIDE AIR BAG MODULE REMOVAL/INSTALLATION.)
4	Locknut

5	Steering wheel (See 06-14-7 Steering Wheel Removal Note.) (See 06-14-8 Steering Wheel Installation Note.)
6	Column cover (See 09-17-8 COLUMN COVER REMOVAL/INSTALLATION.)
7	Clock spring (See 08-10-7 CLOCK SPRING REMOVAL/INSTALLATION.)

8	Combination switch (See 09-18-9 COMBINATION SWITCH REMOVAL/ INSTALLATION.)
9	Steering shaft (See 06-14-8 Steering Shaft Installation Note.)
10	Universal joint
11	Boot
12	Intermediate shaft

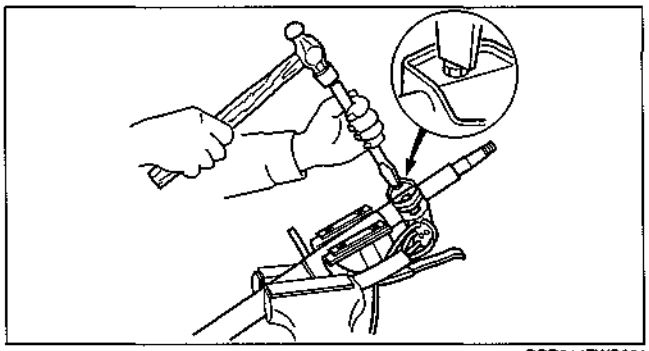
13	Steering lock mounting bolts (See 06-14-7 Steering Lock Mounting Bolts Removal Note.) (See 06-14-8 Steering Lock Mounting Bolts Installation Note.)
14	Steering lock component
15	Outer cylinder (See 06-14-7 Outer Cylinder Removal Note.)

Steering Wheel Removal Note

Caution
- **Do not try to remove the steering wheel by hitting the shaft with a hammer. The column will collapse.**

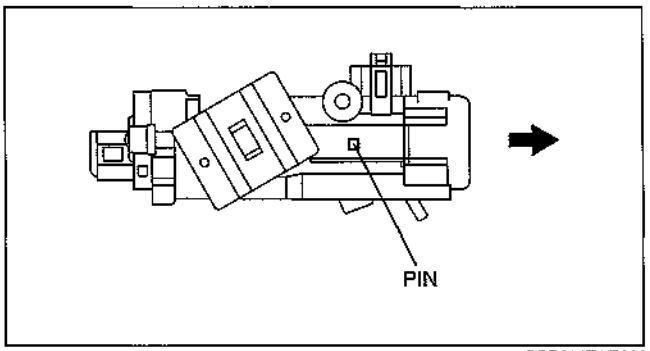
1. Set the vehicle in the straight-ahead position.
2. Remove the steering wheel using a suitable puller.

Steering Lock Mounting Bolts Removal Note
1. Make a groove in the heads of the steering lock mounting bolts using a chisel and a hammer.
2. Remove the bolts using a flathead screwdriver.
3. Disassemble the steering lock component.



DBR614ZWB601

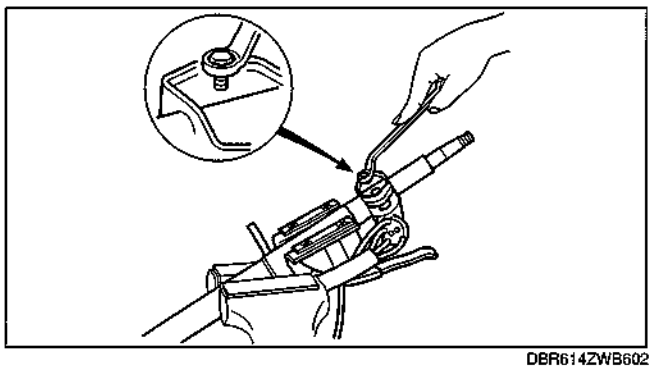
Outer Cylinder Removal Note
1. Turn the key to the ACC position.
2. Push the pin and remove the outer cylinder.



DBR614ZWB606

Steering Lock Mounting Bolts Installation Note

1. Assemble the steering lock component to the steering shaft.
2. Verify that the lock operates correctly.
3. Install new steering lock mounting bolts.
4. Tighten the bolts until the heads break off.



DBR614ZWB602

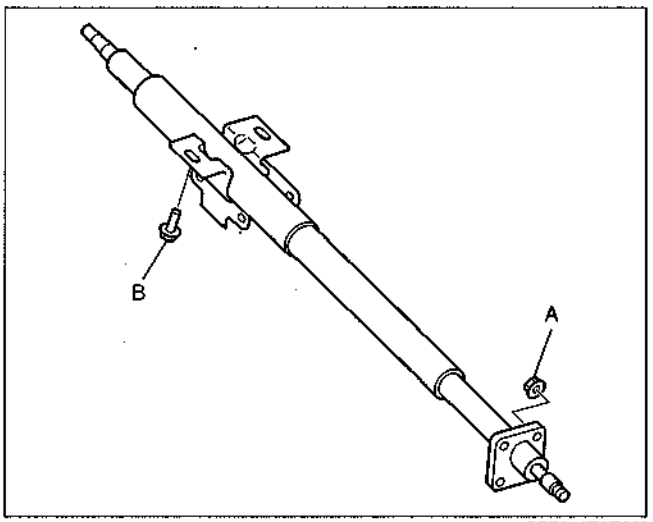
Steering Shaft Installation Note

Caution

- **Do not apply a shock in the axial direction of the shaft.**

1. Lock the tilt lever. (Equiped with tilt mechanism)
2. Tighten nut A.
3. Tighten bolt B.

Tightening torque
15.7—22.5 N·m {1.60—2.29 kgf·m, 11.6—16.5 ft·lbf}



DBR614ZWB002

Steering Wheel Installation Note

1. Make sure the wheels in the straight-ahead position, and install the steering wheel.

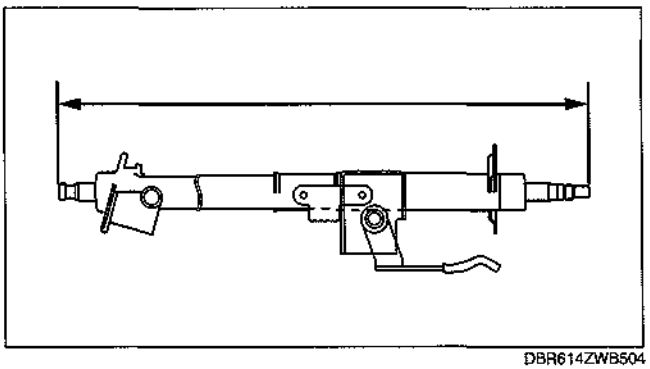
STEERING SHAFT INSPECTION

dcf061432100w01

1. Inspect the following.
   (1) Column bearing for damage
   (2) Steering shaft length

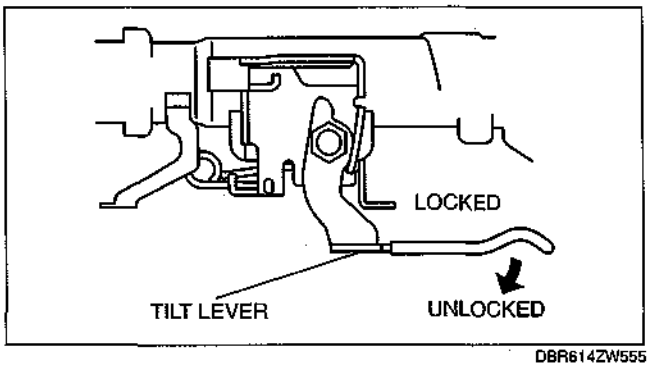
   Steering shaft length
   789.9—792.9 mm {31.10—31.22 In}

   (3) Dust boot damage
   - Replace the steering shaft component as necessary.



DBR614ZWB504

2. Inspect the tilt operation. (Equiped with tilt mechanism)
   (1) Verify that the tilt lever moves smoothly from unlock position to lock position.
   (2) Verify that the steering shaft is fixed firmly when the tilt lever is locked.
   - Replace the steering shaft component as necessary.



DBR614ZW555

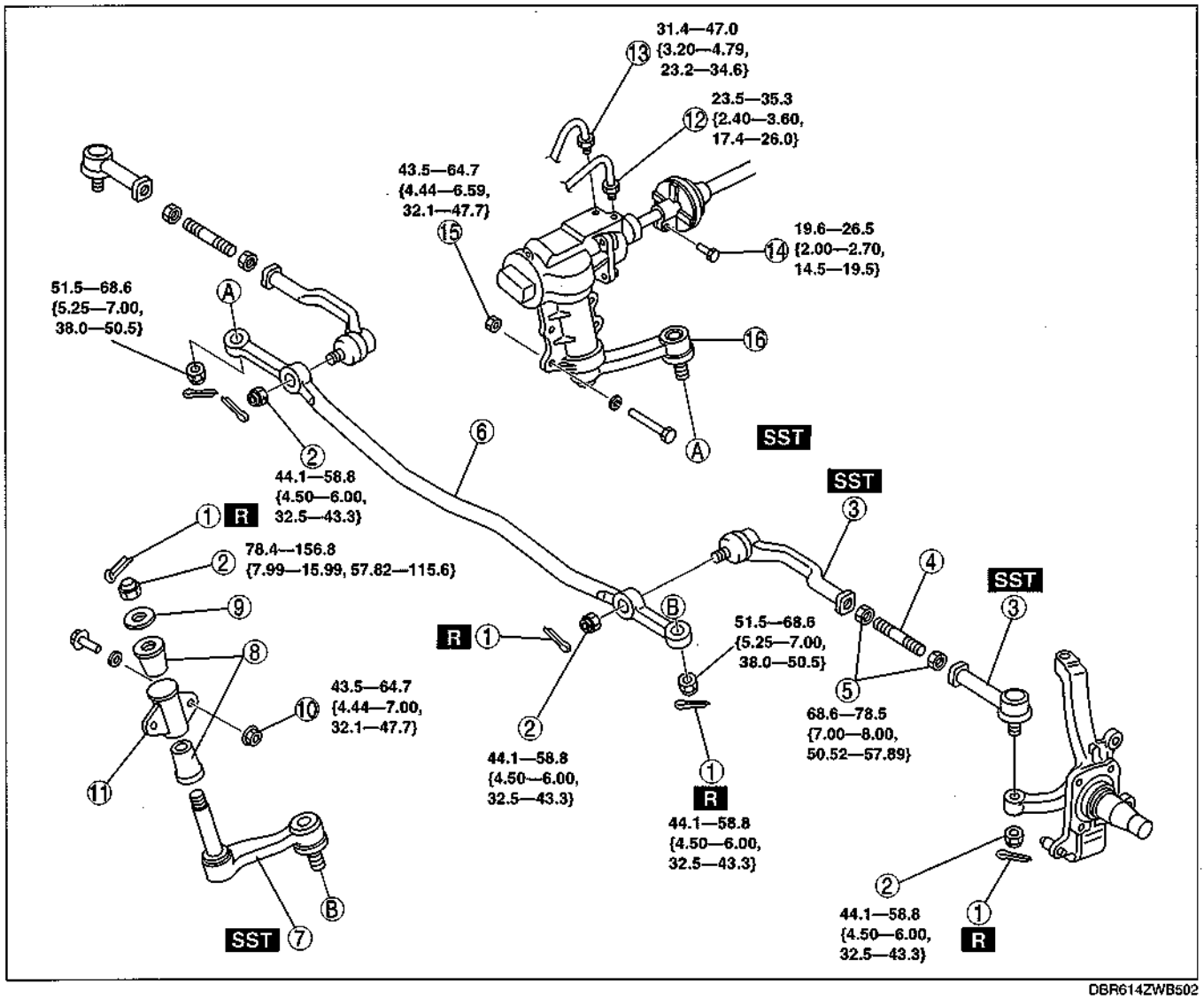
STEERING GEAR AND LINKAGE REMOVAL/INSTALLATION

dcf061432960w01

Caution

- **Performing the following procedures without first removing the ABS wheel-speed sensor may possibly cause an open circuit in the harness if it is pulled by mistake. Before performing the following procedures, remove the ABS wheel-speed sensor (axle side) and fix it to an appropriate place where the sensor will not be pulled by mistake while servicing the vehicle.**

1. Remove the front ABS wheel-speed sensor. (with 4W-ABS) (See 04-13B-7 FRONT ABS WHEEL-SPEED SENSOR REMOVAL/INSTALLATION [4W-ABS (4x2 (EXCEPT Hi-Rider))].) (See 04-13B-8 FRONT ABS WHEEL-SPEED SENSOR REMOVAL/INSTALLATION [4W-ABS (Hi-Rider, 4x4)].)
2. Remove in the order indicated in the table.
3. Install in the reverse order of removal.
4. After installation, adjust the total toe-in. (See 02-11-3 FRONT WHEEL ALIGNMENT [4x2].) (See 02-11-5 FRONT WHEEL ALIGNMENT [4x4].)



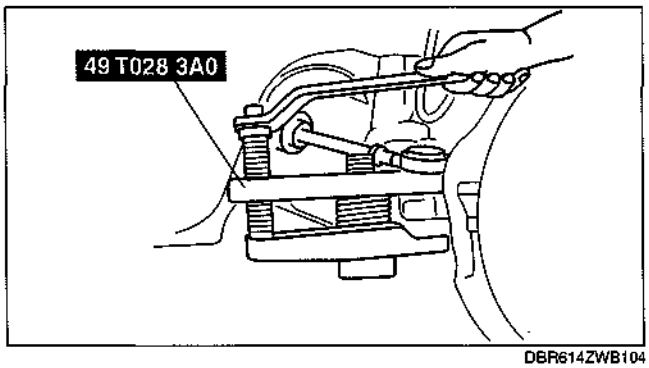
DBR614ZWB502

1	Cotter pin
2	Locknut
3	Ball joint (See 06-14-11 Ball Joint, Idler Arm, Steering Gear and Pitman Arm Removal Note.)
4	Tie rod
5	Locknut
6	Center link
7	Idler arm (See 06-14-11 Ball Joint, Idler Arm, Steering Gear and Pitman Arm Removal Note.)

8	Bushing
9	Washer
10	Bolt, Nut, washer
11	Idler arm bracket
12	Pressure pipe
13	Return pipe
14	Bolt
15	Bolt, Nut, Washer
16	Steering gear and pitman arm (See 06-14-11 Ball Joint, Idler Arm, Steering Gear and Pitman Arm Removal Note.)

Ball Joint, Idler Arm, Steering Gear and Pitman Arm Removal Note

1. Remove the ball joint from the knuckle and center link, the idler arm from the center link, and steering gear and pitman arm from the center link using the **SST**.

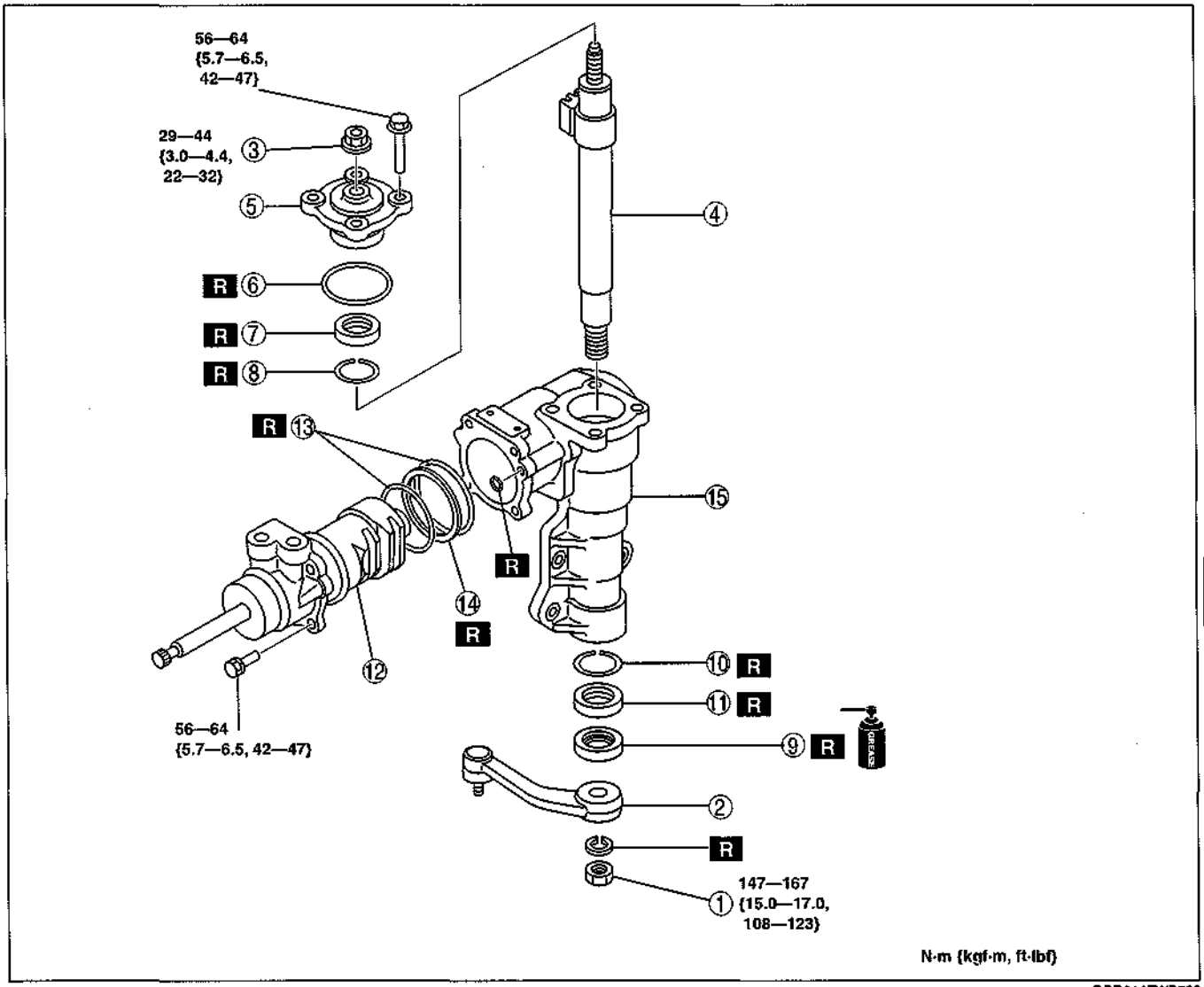


DBR614ZWB104

STEERING GEAR AND LINKAGE DISASSEMBLY/ASSEMBLY

dcf061432960w02

1. Disassemble in the order indicated in the table.
2. Assemble in the reverse order of disassembly.
3. After assembly, adjust the steering gear backlash. (See 06-14-13 Steering Gear Backlash Adjustment.)



DBR614ZWB503

1	Nut
2	Pitman arm (See 06-14-12 Pitman Arm Disassembly Note.)
3	Locknut (See 06-14-12 Locknut, Sector Shaft Disassembly Note.)

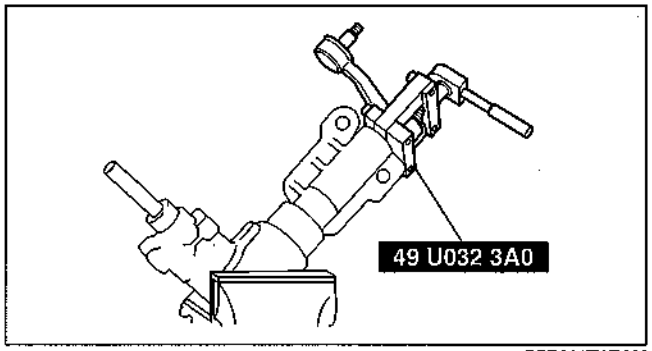
4	Sector shaft (See 06-14-12 Locknut, Sector Shaft Disassembly Note.)
5	Side cover
6	O-ring
7	Back up ring
8	Y packing

9	Oil seal
10	Y packing
11	Back up ring
12	Valve and piston component (See 06-14-12 Valve and Piston Component Assembly Note.)

13	O-ring
14	Seal ring
15	Gear housing

Pitman Arm Disassembly Note

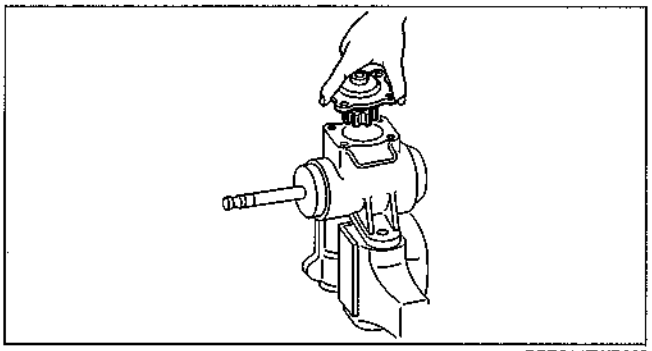
1. Separate the pitman arm from the steering gear using the **SST**.



DBR614ZWB008

Locknut, Sector Shaft Disassembly Note

1. Loosen the locknut.
2. Remove the side cover attaching bolts.
3. Set the sector shaft in the middle position.
4. Tap the sector shaft lower end using a plastic hammer to loosen the sector shaft.
5. Lift and remove the sector shaft with the locknut and the side cover from the gear housing.



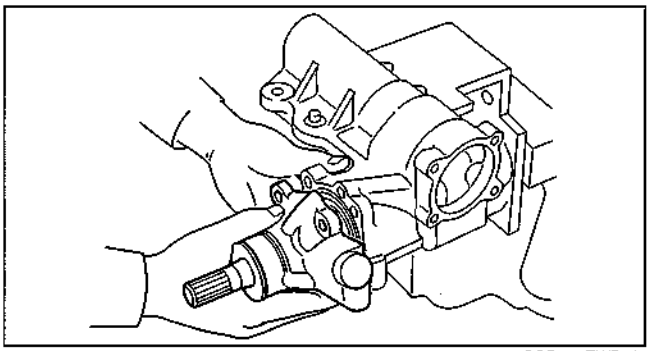
DBR614ZWB009

Valve and Piston Component Assembly Note

Caution

- **Do not scratch the seal ring and O-ring on the piston against the entrance to the housing**
- **Insert the piston by slightly turning to the left and right so as not to create flection at the O-ring and seal ring.**

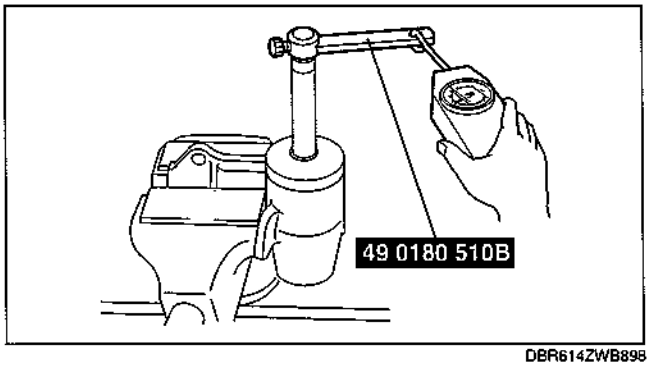
1. Insert the valve and piston component to the gear housing.



DBR614ZWB019

2. Inspect the worm shaft preload using the **SST**.

Steering gear worm shaft preload
0.64—1.23 N·m {6.6—12.5 kgf·cm, 5.7—10.8 in·lbf}
[Pull scale reading: 6.4—12.3 N {0.66—1.25 kgf, 1.44—2.76 lbf}]



DBR614ZWB898

- If not within specification, replace the valve and piston component.

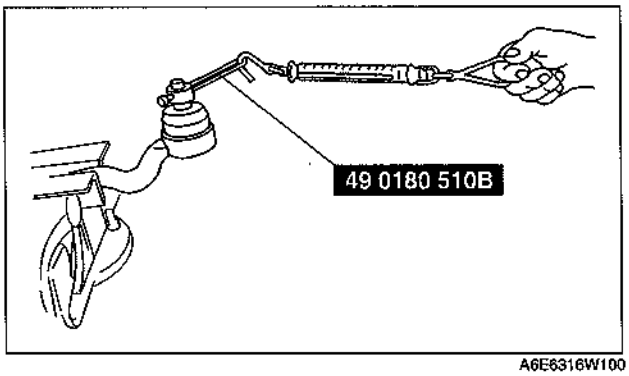
STEERING GEAR AND LINKAGE INSPECTION

dcf061432960w03

Tie-rod End Inspection

1. Inspect the tie-rod end for damage and excessive play.
   - If there are any cracks, replace the tie-rod end.
2. Inspect the boot for cracks.
   - If there is any malfunction, replace the tie-rod end boot.
3. Rotate the ball joint **5 times**.
   - If there is any malfunction, replace the tie-rod end boot.
4. Measure the rotational torque of the tie-rod end using the **SST** and a pull scale.
   - If not within the specification, replace the tie-rod end.

Tie-rod end rotational torque
0.49—1.18 N·m {5—12 kgf·cm, 4.4—10.4 in·lbf}
[Pull scale reading: 4.9—11.8 N·m {0.5—1.2 kgf, 1.11—2.65 lbf}]



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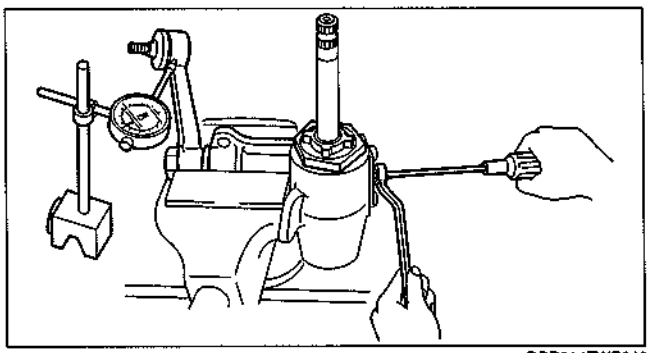
Steering Gear Backlash Adjustment

Caution
- **Adjust the backlash while keeping the steering gear in the center position. Otherwise, the backlash becomes excessively small and gears may be damaged.**

1. Turn the adjusting screw to adjust steering gear backlash.

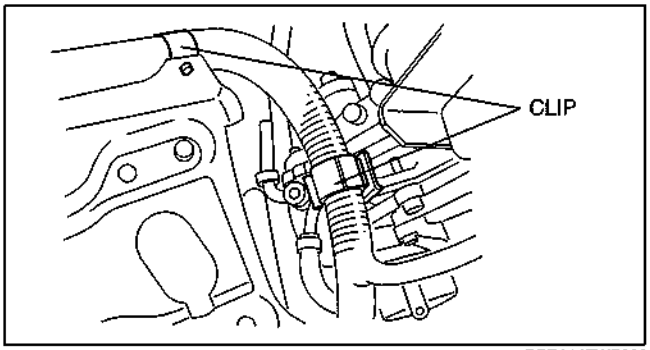
Steering gear backlash
0 mm {0 in}


DBR614ZWB016

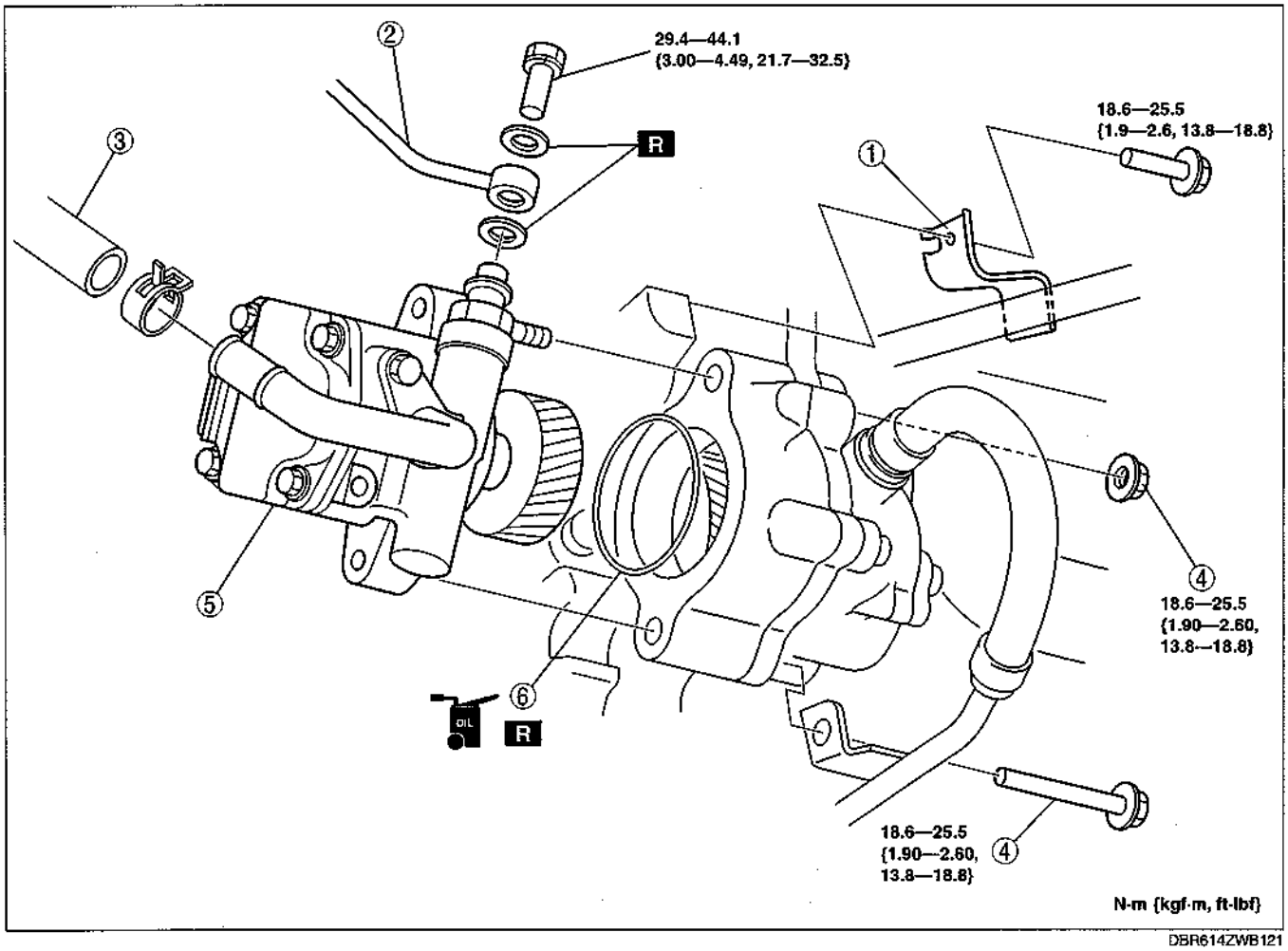
POWER STEERING OIL PUMP REMOVAL/INSTALLATION

dcf061432650w01

1. Remove the battery and battery tray. (See 01-17-2 BATTERY REMOVAL/INSTALLATION.)
2. Remove the clip shown in the figure.
3. Remove in the order indicated in the table.
4. Install in the reverse order of removal.



DBR614ZWB020



DBR614ZWB121

1	Bracket (except WL-3)
2	Pressure pipe
3	Return hose

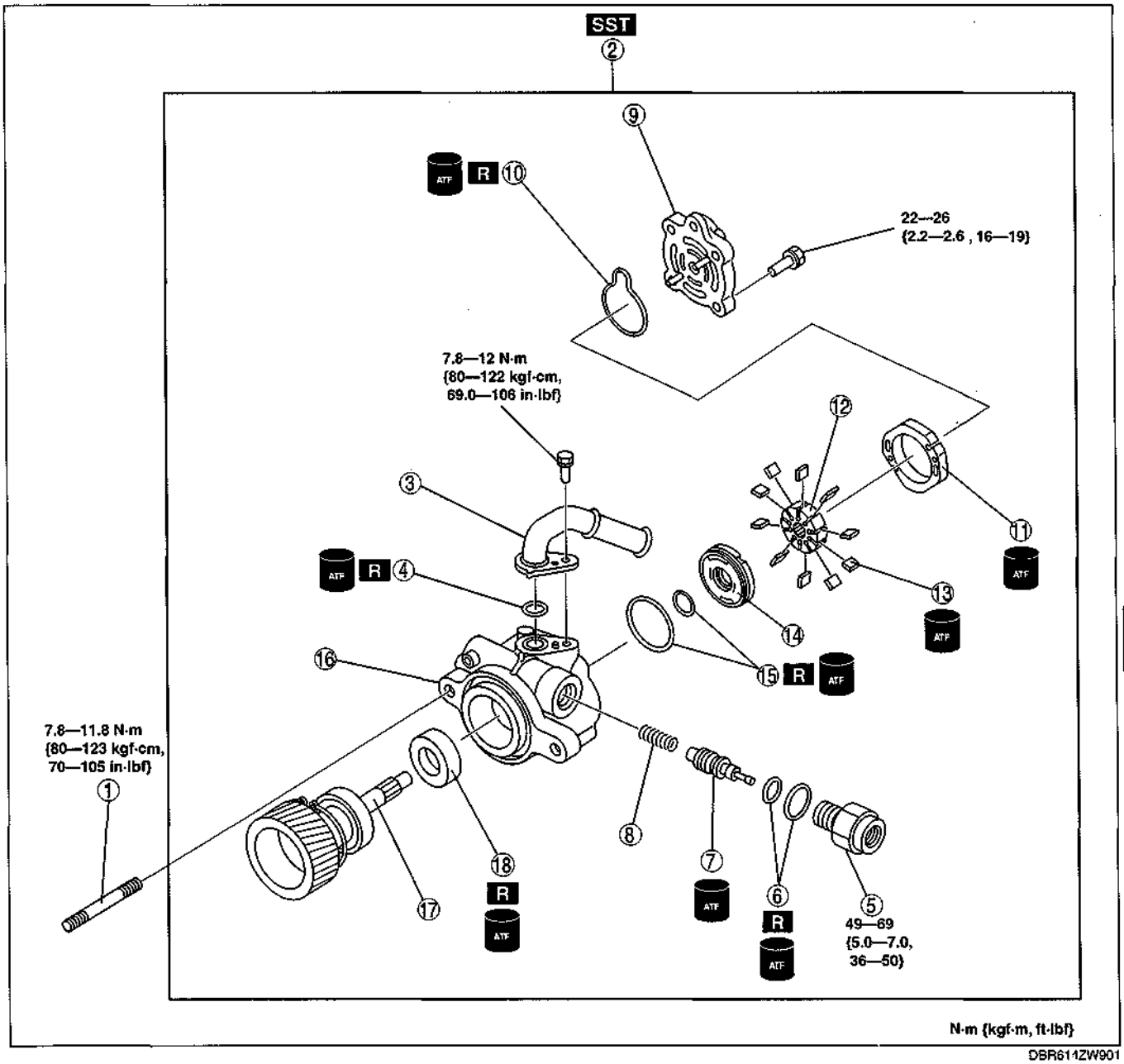
4	Bolt and nut
5	Power steering oil pump
6	O-ring

POWER STEERING OIL PUMP DISASSEMBLY/ASSEMBLY

dcf061432650w02

Note
- The following procedure is for replacement of the O-ring and oil seal only. Replace the pump component if other repairs are necessary.

1. Disassemble in the order indicated in the table.
2. Assemble in the reverse order of disassembly.
3. After installing the P/S pump. flush the power steering system according to the following procedures.
   (1) Add ATF until it reaches the MAX level of the P/S fluid tank.
   (2) Start the engine and turn the steering wheel fully to the left and right several times to circulate the ATF.
      - If the fluid level is dropped. add ATF
   (3) Drain the ATF.
   (4) Add the new ATF to the MAX level of the P/S fluid tank, and repeat Step (1) and (2) a few times.



DBR611ZW901

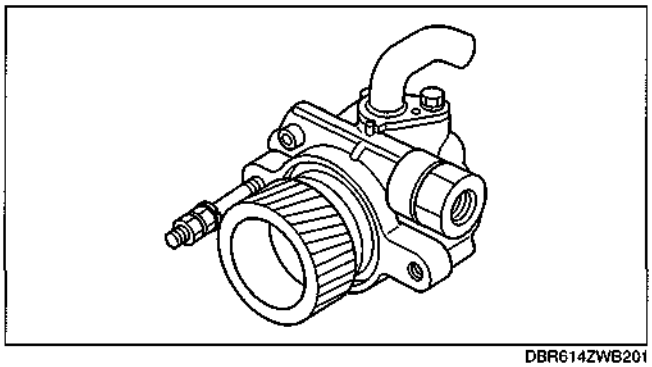
1	Stud (See 06-14-16 Stud Disassembly Note.) (See 06-14-19 Stud Assembly Note.)
2	Power steering oil pump component (See 06-14-16 Power Steering Oil Pump Component Disassembly Note.)

3	Suction pipe
4	O-ring
5	Connector
6	O-ring
7	Control valve

8	Spring
9	Rear pump body (See 06-14-18 Rear Pump Body Assembly Note.)
10	O-ring
11	Cam ring (See 06-14-18 Rotor, Cam Ring, Vane, Assembly Note.)
12	Rotor (See 06-14-18 Rotor, Cam Ring, Vane, Assembly Note.)
13	Vane (See 06-14-18 Rotor, Cam Ring, Vane, Assembly Note.)
14	Side plate (See 06-14-18 Side Plate Assembly Note.)
15	O-rings
16	Front pump body
17	Gear shaft component (See 06-14-16 Gear Shaft Component Disassembly Note.) (See 06-14-17 Gear Shaft Component Assembly Note.)
18	Oil seal (See 06-14-17 Oil Seal Disassembly Note.) (See 06-14-17 Oil Seal Assembly Note.)

Stud Disassembly Note

1. Tighten 2 nuts against each other on the stud, and then remove it.



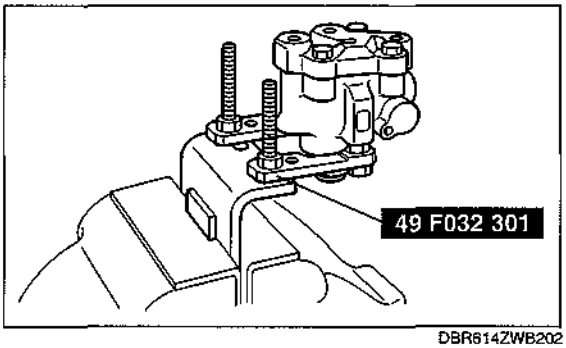
DBR614ZWB201

Power Steering Oil Pump Component Disassembly Note

1. Secure the power steering oil pump using the **SST**.

Caution

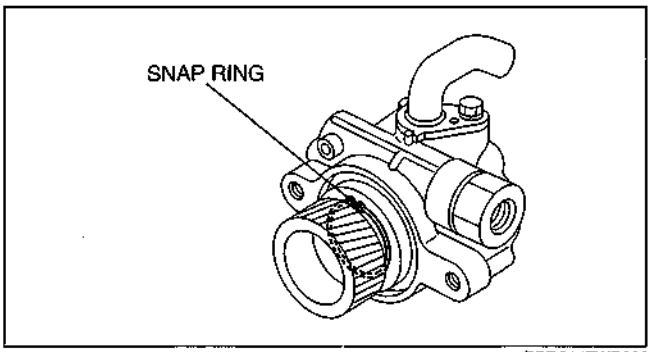
- **Use the SST to prevent damage to the pump when securing it in a vise.**



DBR614ZWB202

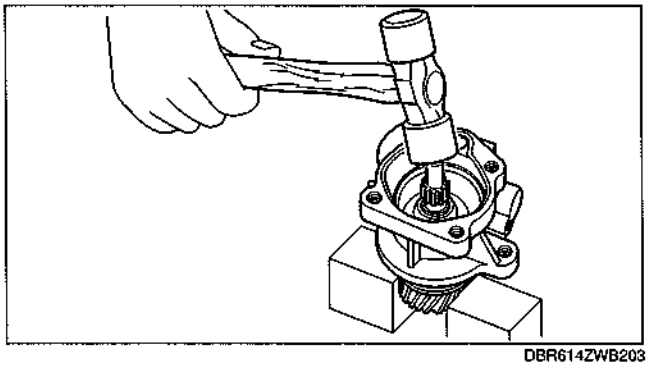
Gear Shaft Component Disassembly Note

1. Remove the snap ring to front body shown in the figure.



DBR614ZWB888

2. Tap the gear shaft from the shaft side using a plastic hammer to remove it.



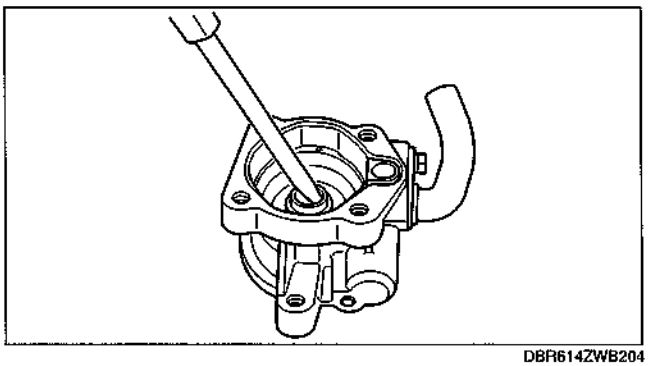
DBR614ZWB203

Oil Seal Disassembly Note

1. Tap the oil seal out using a flathead screwdriver.

Caution

- **To prevent damaging the power steering oil pump body when tapping it out, wrap a clean rag on the end of the flathead screwdriver. If the power steering oil pump body is damaged, replace it together with the power steering oil pump component.**



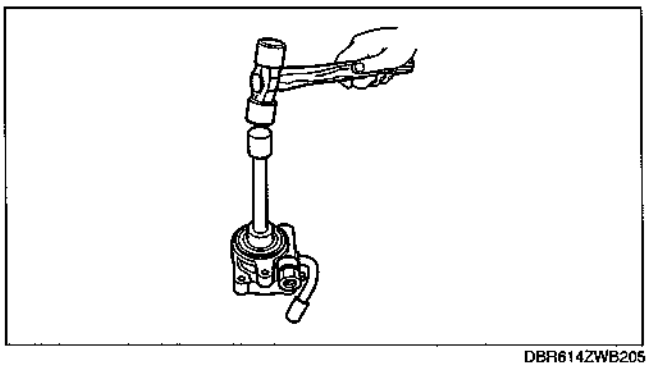
DBR614ZWB204

Oil Seal Assembly Note

1. Press fit the oil seal using a proper pipe.

Caution

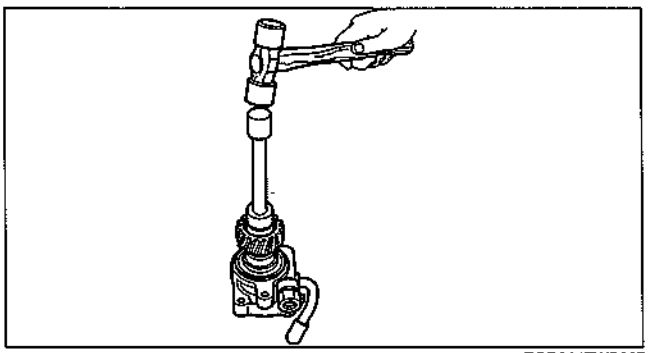
- **Install it so that the side with narrow groove points outwards.**



DBR614ZWB205

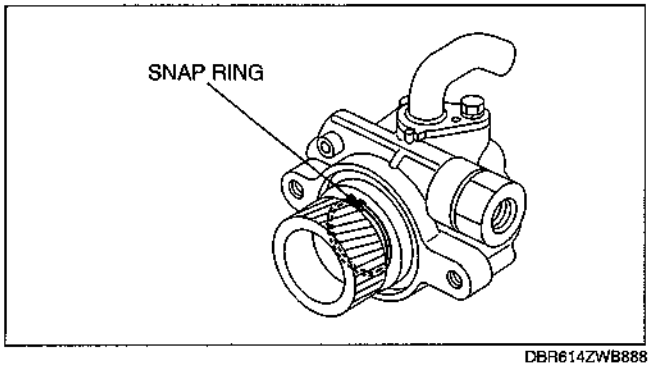
Gear Shaft Component Assembly Note

1. Set a proper pipe into the gear depression and press fit the gear shaft.



DBR614ZWB207

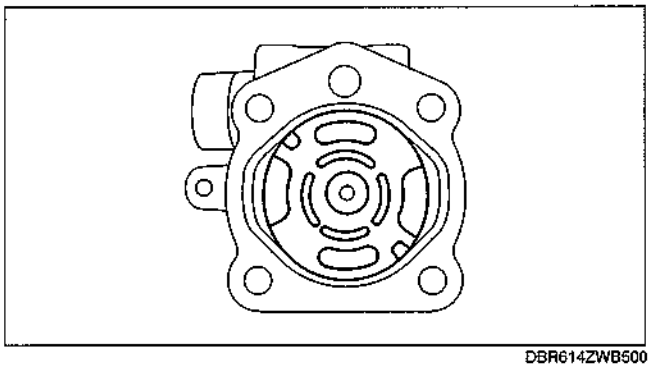
2. Install the snap ring to front body shown in the figure.



DBR614ZWB888

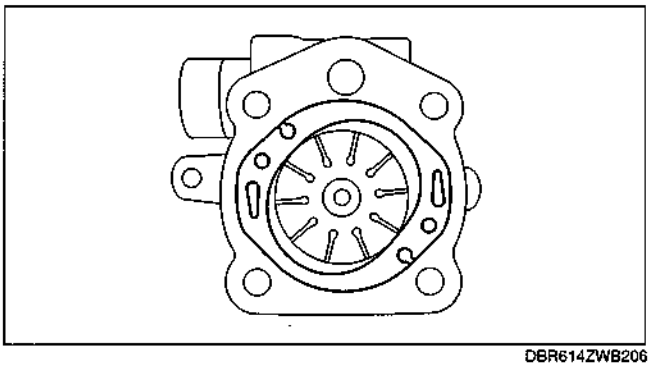
Side Plate Assembly Note

1. Install the side plate in the front pump body shown in the figure


DBR614ZWB500

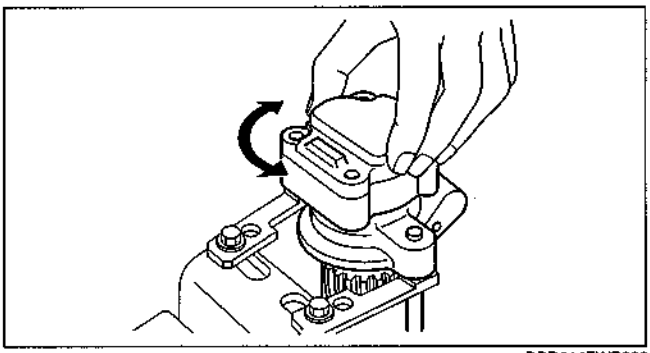
Rotor, Cam Ring, Vane, Assembly Note

1. Install the rotor in the front pump body shown in the figure.
2. Install the cam ring in the front pump body shown in the figure.
3. Install the vane in the rotor.


DBR614ZWB206

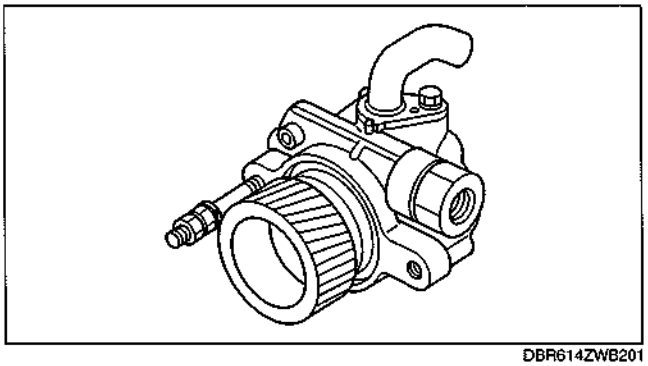
Rear Pump Body Assembly Note

1. Install a new O-ring and the side plate to the front body.
2. Position the side plate using the rear pump body.
3. Install the rear body to the rear pump body.


DBR614ZWB208

Stud Assembly Note

1. Tighten 2 nuts against each other on the stud, and then install it so that the stud projection is within the following specification.



DBR614ZWB201

06-50 TECHNICAL DATA

STEERING TECHNICAL DATA. 06-50–1

STEERING TECHNICAL DATA

dcf065000000w01

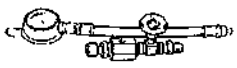
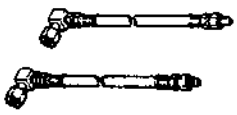
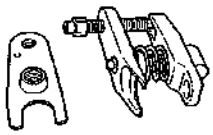
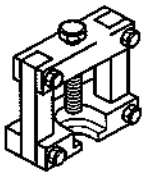
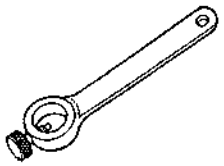
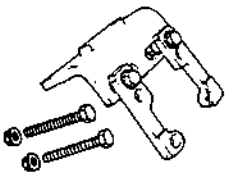
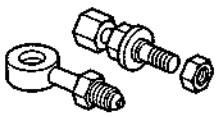
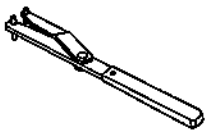
Item	Specification
Steering wheel play	0—30 mm {0—1.18 in}
Steering wheel effort	7.8 N·m {80 kgf·cm, 58 in·lbf} max.
Steering shaft length	789.9—792.9 mm {31.10—31.22 in}
Steering gear worm shaft preload	0.64—1.23 N·m {6.6—12.5 kgf·cm, 5.7—10.8 in·lbf} [Pull scale reading: 6.4—12.3 N {0.66—1.25 kgf, 1.44—2.76 lbt}]
Tie-rod end rotational torque	0.49—1.18 N·m {5—12 kgf·cm, 4.4—10.4 in·lbt} [Pull scale reading: 4.9—11.8 N·m {0.5—1.2 kgf, 1.11—2.65 lbt}]
Steering gear backlash	0 mm
Power steering fluid type	ATF M-III or equivalent (e.g. Dexron®II)
Power steering fluid capacity (approx. quantity)	1.1 L {1.2 US qt, 1.0 Imp qt}
Oil pump fluid pressure	9.3—9.8 MPa {94.8—99.9 kgf/cm^2, 1348—1421 psi}
Gear housing fluid pressure	9.30—9.79 MPa {94.8—99.8 kgf/cm^2, 1348—1419psi}

06-60 SERVICE TOOLS

STEERING SST..... 06-60–1

STEERING SST

dcf066000000w01

49 1232 670B Power steering gauge set 	49 H002 671 Adapter 	49 G032 3A4A Power steering gauge adapter set
49 T028 3A0 Ball joint puller set 	49 U032 3A0 Pitman arm 	49 0180 510B Preload measuring attachment 
49 F032 301 Power Steering Pump Hanger 	49 B032 304 Adapter 	49 G032 354 Adjusting Wrench 

HEATER, VENTILATION & AIR CONDITIONING (HVAC)

07 SECTION

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REFRIGERANT SYSTEM 07-10
BASIC SYSTEM..... 07-11
CONTROL SYSTEM.....07-40
TECHNICAL DATA 07-50
SERVICE TOOLS 07-60

07-03 SYMPTOM TROUBLESHOOTING

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TROUBLESHOOTING INDEX..... 07-03–1
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NO.2 AMOUNT OF AIR BLOWN FROM VENTS DOES NOT CHANGE..... 07-03–2
NO.3 NO TEMPERATURE CONTROL WITH CLIMATE CONTROL UNIT 07-03–3
NO.4 AIR FROM VENTS COLD ENOUGH 07-03–4
NO.5 NO COOL AIR.....07-03–6
NO.6 NOISE WHILE OPERATING A/C SYSTEM 07-03–8

FOREWORD

dcf070300000w01

- The areas for inspection (steps) are given according to various circuit malfunctions. Use the following chart to verify the symptoms of the trouble in order to diagnose the appropriate area.

TROUBLESHOOTING INDEX

dcf070300000w02

No.	TROUBLESHOOTING ITEM	DESCRIPTION
1	Insufficient air (or no air) blown from vents.	• Problem with each vent and/or duct.
2	Amount of air blown from vents does not change.	• Malfunction in blower system.
3	No temperature control with climate control unit.	• Malfunction in air outlet duct and/or climate control unit air mix system.
4	Air from vents not cold enough.	• Magnetic clutch operates but A/C system malfunctions.
5	No cool air.	• Magnetic clutch does not operate.
6	Noise while operating A/C system.	• Noise from magnetic clutch, A/C compressor, hose or refrigerant line.

NO.1 INSUFFICIENT AIR (OR NO AIR) BLOWN FROM VENTS

dcf070300000w03

1	Insufficient air (or no air) blown from vents.
DESCRIPTION	• Problem with each vent and/or duct.
POSSIBLE CAUSE	• Malfunction in VENT mode system (Steps 1—4) • Malfunction in HEAT mode system (Step 5) • Malfunction in DEFROSTER mode system (Steps 6—8)

Diagnostic procedure

Step	Inspection		Inspection item (s)
1	INSPECT TO SEE WHETHER MALFUNCTION IS IN VENT MODE OR OTHER MODES • Does air blow out when in VENT mode?	Yes	Go to Step 4.
		No	Go to next step.
2	INSPECT VENT • Is vent clogged?	Yes	Remove obstruction, then go to Step 8.
		No	Go to the next step.
3	VERIFY THAT DUCT IN DASHBOARD IS INSTALLED • Is duct in dashboard properly installed?	Yes	Inspect duct for clogging, deformity and air leakage, then go to Step 8.
		No	Install duct securely in the proper position, then go to Step 8.

Step	Inspection		Inspection item (s)
4	**INSPECT TO SEE WHETHER MALFUNCTION IS IN HEAT MODE OR DEFROSTER MODE** • Does air blow out when in HEAT mode?	Yes	Go to the next step.
		No	Inspect vent for clogging, then go to Step 8.
5	**INSPECT DEFROSTER MODE** • Does air blow out when in DEFROSTER mode?	Yes	Operation is normal. Recheck malfunction symptoms.
		No	Go to the next step.
6	**INSPECT VENT** • Is vent clogged?	Yes	Remove obstruction, then go to Step 8.
		No	Go to the next step.
7	**VERIFY THAT DEFROSTER DUCT IS INSTALLED** • Is defroster duct properly installed?	Yes	Inspect duct for clogging, deformity, and air leakage, then go to the next step.
		No	Install duct securely in proper position, then go to the next step.
8	**CONFIRM THAT MALFUNCTION SYMPTOMS DO NOT RECUR AFTER REPAIR** • Does air blow out?	Yes	Troubleshooting completed. Explain repairs to customer.
		No	Recheck malfunction symptoms, then repeat from Step 1 if malfunction recurs.

NO.2 AMOUNT OF AIR BLOWN FROM VENTS DOES NOT CHANGE

dcf070300000w04

2	**Amount of air blown from vents does not change.**
DESCRIPTION	• Malfunction in blower system.
POSSIBLE CAUSE	• Blower relay, blower motor, resistor, fan switch malfunction (Step 1) • Blower unit malfunction (Steps 2—4)

Diagnostic procedure

Step	Inspection		Inspection item (s)
1	**INSPECT BLOWER SYSTEM** • Inspect the following systems and electrical parts. — Blower relay — Blower motor — Resistor — Fan switch — Related wiring harnesses • Are they normal?	Yes	Go to the next step.
		No	Repair or replace malfunctioning part, then go to Step 5.
2	**CHECK TO SEE WHETHER MALFUNCTION IS IN BLOWER UNIT OR ELSEWHERE** • Turn engine switch to ON position. • Turn fan switch on. • Recirculate air inside vehicle. • Does fan in blower unit rotate smoothly?	Yes	Go to Step 4.
		No	Go to the next step.
3	**INSPECT BLOWER UNIT** • Inspect fan in blower unit. — Is fan free of interference from blower unit case? — Is fan free of foreign material and obstructions? • Is fan normal?	Yes	Go to the next step.
		No	Remove obstruction, repair or replace fan and blower unit case, then go to Step 5.
4	**INSPECT BLOWER UNIT INTAKE VENT** • Is blower unit intake vent clogged?	Yes	Remove obstruction, then go to the next step.
		No	Inspect if there are any obstructions in passage between blower unit and air outlet duct, then go to the next step.
5	**VERIFY THAT MALFUNCTION SYMPTOM OCCURS AFTER REPAIR** • Does air blow out?	Yes	Troubleshooting completed. Explain repairs to customer.
		No	Recheck malfunction symptoms, then repeat from Step 1 if malfunction recurs.

NO.3 NO TEMPERATURE CONTROL WITH CLIMATE CONTROL UNIT

dcf070300000w05

3	**No temperature control with climate control unit.**
DESCRIPTION	• Malfunction in air outlet duct and/or climate control unit air mix system.
POSSIBLE CAUSE	• Air outlet duct air mix link, air mix crank, air mix rod, air mix wire, wire clamp malfunction (Steps 2, 3) • Climate control unit rack-and-pinion, air mix wire malfunction (Step 4) • Air outlet duct air mix door malfunction (Steps 5, 6) • Heater piping malfunction (Step 7)

Diagnostic procedure

Step	Inspection		Inspection item (s)
1	**INSPECT COOLANT TEMPERATURE** • Is coolant sufficiently warmed up?	Yes	Go to the next step.
		No	Warm engine up, then go to Step 8.
2	**INSPECT AIR OUTLET DUCT AIR MIX SYSTEM** • Inspect air outlet duct air mix links, air mix cranks, air mix rods or wire clamp. — Is there grease on links and cranks? — Are links, cranks, and rods securely installed in their proper positions? — Is wire clamp free of deformation? • Are above items normal?	Yes	Go to the next step.
		No	Apply grease or install links, cranks, and rods securely in their proper positions, repair or replace wire clamp, then go to Step 8.
3	**VERIFY THAT AIR MIX WIRE FROM AIR OUTLET DUCT IS POSITIONED SECURELY AND CORRECTLY (IF AVAILABLE)** • Is air mix wire securely installed in the correct position in relation to air outlet duct air mix links?	Yes	Go to the next step.
		No	Adjust air mix wire or install securely in correct position, then go to Step 8.
4	**INSPECT CLIMATE CONTROL UNIT** • Inspect climate control unit as follows. — Is bevel gear set properly engaged? — Is air mix wire properly installed in correct position in relation to bevel gear? — Is wire clamp free of deformation? • Are above items okay?	Yes	Go to the next step.
		No	Properly engage bevel gear or install air mix wire in correct position, repair or replace wire clamp, then go to Step 8.
5	**INSPECT AIR OUTLET DUCT** • Is there any foreign material or obstruction in air outlet duct air mix doors?	Yes	Remove obstruction, then go to Step 8.
		No	Go to the next step.
6	**INSPECT AIR OUTLET DUCT AIR MIX DOORS** • Is air outlet duct air mix door securely and properly installed?	Yes	Inspect air mix door for cracks or damage, then go to the next step.
		No	Install air mix door securely in proper position, then go to the next step.
7	**INSPECT HEATER LINES** • Inspect heater lines. — Is heater piping free of damage and cracks? — Are heater piping connections free of engine coolant leakage? — Are heater piping connections securely tightened? — Are heater piping installation points on air outlet duct free of engine coolant leakage? • Are above items normal?	Yes	Operation is normal. Recheck malfunction symptoms.
		No	If heater piping connections is loosed, tighten connections with specified torque. Repair or replace heater piping, then go to the next step.
8	**VERIFY THAT MALFUNCTION SYMPTOM OCCURS AFTER REPAIR** • Does unit operate in every temperature setting?	Yes	Troubleshooting completed. Explain repairs to customer.
		No	Recheck malfunction symptoms, then repeat from Step 1 if malfunction recurs.

NO.4 AIR FROM VENTS COLD ENOUGH

dcl070300000w08

4	Air from vents not cold enough.
DESCRIPTION	• Magnetic clutch operates but A/C system malfunctions.
POSSIBLE CAUSE	• Drive belt malfunction (Step 2) • Malfunction in blower unit or condenser (Steps 4, 5) • Malfunction in receiver/drier or expansion valve (valve closes too much) (Steps 8, 9) • Malfunction in refrigerant lines (Steps 10, 11) • A/C compressor system malfunction, insufficient compressor oil (Steps 15, 16) • Over filling of compressor oil, malfunction in expansion valve or air outlet duct air mix link system (Steps 17—19)

Diagnostic procedure

Step	Inspection		Inspection item (s)
1	**INSPECT DRIVE BELT** • Inspect drive belt. (See 01-10A-3 DRIVE BELT INSPECTION [WL-3].) (See 01-10B-3 DRIVE BELT INSPECTION [WL-C, WE-C].) • Is it normal?	Yes	Go to the next step.
		No	Adjust or replace drive belt, then go to Step 20.
2	**INSPECT REFRIGERANT SYSTEM PERFORMANCE** • Perform refrigerant system performance test. (See 07-10-2 REFRIGERANT SYSTEM PERFORMANCE TEST.) • Is operation normal?	Yes	Operation is normal. (Recheck malfunction symptoms.)
		No	Go to the next step.
3	**CHECK TO SEE WHETHER MALFUNCTION IS IN BLOWER UNIT INTAKE AND CONDENSER OR ELSEWHERE** • Are refrigerant high-pressure and low-pressure values both high?	Yes	Go to the next step.
		No	Go to Step 6.
4	**INSPECT BLOWER UNIT INTAKE** • Is blower unit intake clogged?	Yes	Remove obstruction, then go to Step 20. (If air does not reach evaporator within cooling unit, heat exchange does not occur and refrigerant pressure becomes high. Therefore, removal of obstruction is necessary.)
		No	Go to the next step.
5	**INSPECT CONDENSER** • Inspect condenser. (See 07-11-8 CONDENSER INSPECTION.) • Is it normal?	Yes	Adjust refrigerant to specified amount, then go to Step 20. (Excessive amount of refrigerant.)
		No	Replace condenser, or repair and clean condenser fins, then go to Step 20.
6	**CHECK TO SEE WHETHER MALFUNCTION IS IN EXPANSION VALVE, RECEIVER/DRIER AND REFRIGERANT LINES OR ELSEWHERE** • Are refrigerant high-pressure and low-pressure values low?	Yes	Go to the next step.
		No	Go to Step 14.
7	**CHECK TO SEE WHETHER MALFUNCTION IS IN EXPANSION VALVE AND RECEIVER/ DRIER OR ELSEWHERE** • Immediately after A/C compressor operates, does refrigerant high-pressure value momentarily rise to correct value, then fall and stay below it? (Is there negative pressure on low-pressure side?)	Yes	Go to the next step.
		No	Go to Step 10.
8	**CHECK TO SEE WHETHER MALFUNCTION IS IN EXPANSION VALVE OR RECEIVER/ DRIER** • Turn A/C switch off and let air conditioner stop for **10 min.** • Start engine. • Turn both A/C switch and fan switch on. • Does malfunction occur after A/C compressor turns on?	Yes	Go to the next step.
		No	Replace condenser and vacuum refrigerant line **30 min or more** by vacuum pump, add refrigerant to specified level, then go to Step 20. (Since water has intermixed in receiver/ drier and it is saturated, replacement is necessary.)

Step	Inspection		Inspection item (s)
9	**VERIFY THAT EXPANSION VALVE HEAT-SENSING TUBE WITHIN COOLING UNIT IS POSITIONED SECURELY AND CORRECTLY** • Is expansion valve heat-sensing tube within cooling unit securely installed in proper position?	Yes	Replace expansion valve, then go to Step 20. (Since valve closes too much, replacement is necessary.)
		No	Install heat-sensing tube securely in proper position, then go to Step 20.
10	**INSPECT REFRIGERANT LINES** • Inspect refrigerant lines. — Is piping free of damage and cracks? — Are piping connections free of oil grime? (Visual inspection) — Are piping connections free of gas leakage? — Are piping installation points on condenser free of gas leakage? — Are piping installation points on receiver/drier free of gas leakage? — Are piping installation points on A/C compressor free of gas leakage? — Are piping installation points on cooling unit free of gas leakage? — Perform gas leak inspection using gas leak tester. • Are above items normal?	Yes	Go to the next step.
		No	If piping or A/C component (s) are damaged or cracked, replace them. Then go to Step 20. If there is no damage, go to Step 13.
11	**INSPECT EVAPORATOR PIPING CONNECTIONS IN COOLING UNIT FOR GAS LEAKAGE** • Are piping connections for evaporator in cooling unit free of gas leakage?	Yes	If the vane makes a noise, add **10 ml {10 cc, 0.34 fl oz}** of compressor oil to the A/C compressor. Verify that the noise is no longer heard. Adjust refrigerant to specified amount, then go to Step 20.
		No	If piping is damaged or cracked, replace it. Then go to Step 20. If there is no damage, go to the next step.
12	**INSPECT EVAPORATOR PIPING CONNECTIONS IN COOLING UNIT FOR LOOSE** • Are piping connections for evaporator in cooling unit loose?	Yes	Tighten connections with specified torque, adjust both compressor oil and refrigerant to specified amount, then go to Step 20.
		No	If the vane makes a noise, add **10 ml {10 cc, 0.34 fl oz}** of compressor oil to the A/C compressor. Verify that the noise is no longer heard. Replace O-ring on piping, adjust refrigerant to specified amount, then go to Step 20.
13	**INSPECT PIPING CONNECTIONS FOR LOOSE** • Are piping connections loose?	Yes	Tighten connections with specified torque, adjust both compressor oil and refrigerant to specified amount, then go to Step 20.
		No	If the vane makes a noise, add **10 ml {10 cc, 0.34 fl oz}** of compressor oil to the A/C compressor. Verify that the noise is no longer heard. Replace O-ring on piping, adjust refrigerant to specified amount, then go to Step 20.
14	**CHECK TO SEE WHETHER MALFUNCTION IS IN EXPANSION VALVE, AIR MIX ACTUATOR AND COMPRESSOR OIL OR ELSEWHERE** • Does refrigerant high-pressure value hardly increase?	Yes	Go to the next step. (Pressure hardly increases.)
		No	Go to Step 17.
15	**CHECK TO SEE WHETHER MALFUNCTION IS IN COMPRESSOR OIL AMOUNT AND A/C COMPRESSOR OR ELSEWHERE** • When engine is racing, does high-pressure value increase?	Yes	Return to Step 3.
		No	Go to the next step.
16	**CHECK TO SEE WHETHER MALFUNCTION IS IN COMPRESSOR OIL AMOUNT OR A/C COMPRESSOR** • After compressor oil is replenished each **10 ml {10 cc, 0.34 fl oz}**, does high-pressure value increase?	Yes	Troubleshooting completed. (Explain to customer that cause was insufficient compressor oil.)
		No	Replace A/C compressor, then go to Step 20. (Cause is defective A/C compressor.)
17	**CHECK TO SEE WHETHER MALFUNCTION IS IN EXPANSION VALVE OR ELSEWHERE** • Is only refrigerant low-pressure value high?	Yes	Go to Step 19.
		No	Go to the next step.

Step	Inspection		Inspection item (s)
18	**VERIFY THAT AIR MIX IS INSTALLED SECURELY AND PROPERLY** • Are air outlet duct air mix links, air mix cranks, and air mix rods securely and properly installed?	Yes	Set fan switch to 4th position. Turn A/C switch on. Set FRESH mode. Set temperature control to MAX COLD. Set VENT mode. (1)Start and run the engine at **1,500 rpm** for **10 min.** (2)Run the engine at idle for **1 min.** (3)Within **12 s**, idle → **4,000 rpm** → idle. Perform cycle **5 times.** (4) Run the engine at idle for **30 s.** (5)Drain the compressor oil completely from the A/C compressor and verify the amount. • If there is **approx. 90 ml {90 cc, 3.0 fl oz}** of compressor oil, go to Step 20. • If there is **more than 90 ml {90 cc, 3.0 fl oz}** of compressor oil, remove surplus oil and fill A/C compressor with **90 ml {90 cc, 3.0 fl oz}** of compressor oil. Repeat Steps (1) to (5). (Cause is excessive amount of compressor oil.)
		No	Repair or install links, cranks and rods securely in proper position, then go to Step 20.
19	**VERIFY THAT EXPANSION VALVE HEAT-SENSING TUBE WITHIN COOLING UNIT IS POSITIONED SECURELY AND CORRECTLY** • Is expansion valve heat-sensing tube within cooling unit securely installed in proper position?	Yes	Replace expansion valve, then go to the next step. (Since valve opens too much, replacement is necessary.)
		No	Install heat-sensing tube securely in proper position, then go to the next step.
20	**VERIFY THAT MALFUNCTION SYMPTOM OCCURS AFTER REPAIR** • Does cool air blow out? (Are results of refrigerant system performance test normal?)	Yes	Troubleshooting completed. Explain repairs to customer.
		No	Recheck malfunction symptoms, then repeat from Step 1 if malfunction recurs.

NO.5 NO COOL AIR

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5	No cool air
DESCRIPTION	• Magnetic clutch does not operate.
POSSIBLE CAUSE	• Malfunction in PCM A/C cut control system (Step 3) • Malfunction in climate control unit (Step 4) • Malfunction in refrigerant pressure switch (Steps 5, 7—9) • Malfunction in PCM (A/C signal) (Step 6) • Malfunction in PCM (IG1 signal) (Steps 10, 11) • Malfunction in A/C compressor (Step 12) • Malfunction in A/C relay (Steps 13—15) • Malfunction in evaporator temperature sensor (Step 16)

- When performing an asterisked (*) troubleshooting inspection, shake the wiring harness and connectors while performing the inspection to discover whether poor contact points are the cause of any intermittent malfunctions. If there is a problem, check to make sure connectors, terminals and wiring harnesses are connected correctly and undamaged.

Diagnostic procedure

Step	Inspection		Inspection item (s)
1	**INSPECT AIR BLOW OUT** • Does air blow out?	Yes	Go to the next step.
		No	Go to Step 1 of troubleshooting index No.1.
2	**INSPECT A/C COMPRESSOR OPERATION** • Start engine. • Turn A/C switch and fan switch on. • Does A/C compressor operate?	Yes	Go to Step 1 of troubleshooting index No.4.
		No	Go to the next step.
3	**INSPECT FOR DTC IN PCM** • Inspect for DTCs related to the PCM on-board diagnostic system. • Are any DTCs displayed?	Yes	Go to appropriate inspection procedure.
		No	Go to the next step.

Step	Inspection		Inspection Item (s)
4	**INSPECT TO SEE WHETHER MALFUNCTION IS IN CLIMATE CONTROL UNIT OR ELSEWHERE** • Does cool air blow out when terminal 3B of climate control unit connector (3-pin, A/C signal) is grounded?	Yes	Replace climate control unit, then go to Step 17.
		No	Release short, then go to the next step.
5*	**INSPECT TO SEE WHETHER MALFUNCTION IS IN A/C SIGNAL CIRCUIT (BETWEEN REFRIGERANT PRESSURE SWITCH AND PCM) OR ELSEWHERE** • Test voltage at following terminal of refrigerant pressure switch. — Terminal B (A/C signal) • Is voltage **approx. 12 V**?	Yes	Go to Step 7.
		No	Go to the next step.
6*	**INSPECT TO SEE WHETHER MALFUNCTION (LACK OF CONTINUITY) IS IN WIRING HARNESS (BETWEEN REFRIGERANT PRESSURE SWITCH AND PCM) OR PCM** • Test voltage at A/C signal terminal of PCM. • Is voltage **approx. 12 V**?	Yes	Repair wiring harness between PCM and refrigerant pressure switch, then go to Step 17.
		No	Inspect PCM, then go to Step 17.
7	**INSPECT TO SEE WHETHER MALFUNCTION IS IN REFRIGERANT PRESSURE SWITCH, REFRIGERANT AMOUNT, OR ELSEWHERE** • Does cool air blow out when terminals A and B of refrigerant pressure switch connector are shorted?	Yes	Go to Step 9.
		No	Go to the next step.
8*	**INSPECT TO SEE WHETHER MALFUNCTION IS IN WIRING HARNESS (BETWEEN REFRIGERANT PRESSURE SWITCH AND CLIMATE CONTROL UNIT) OR ELSEWHERE** • Test voltage at following terminal of climate control unit. (3-pin) — Terminal 3B (3-pin, A/C signal) • Is voltage **approx. 12 V**?	Yes	Go to Step 10.
		No	Repair wiring harness between refrigerant pressure switch and climate control unit, then go to Step 17.
9	**INSPECT TO SEE WHETHER MALFUNCTION IS IN REFRIGERANT PRESSURE SWITCH OR REFRIGERANT AMOUNT** • Inspect refrigerant pressure switch. • Is it normal?	Yes	If refrigerant amount is empty, replace condenser, vacuum refrigerant line **30 min or more** by vacuum pump, and add refrigerant to specified level, then go to Step 17.
		No	Replace refrigerant pressure switch, then go to Step 17.
10	**INSPECT TO SEE WHETHER MALFUNCTION (LACK OF CONTINUITY) IS IN A/C CONTROL SIGNAL CIRCUIT (BETWEEN A/C RELAY AND PCM) OR ELSEWHERE** • Does cool air blow out when terminal E of A/C relay connector (A/C control signal) is grounded?	Yes	Release short, then go to the next step.
		No	Go to Step 12.
11*	**INSPECT TO SEE WHETHER MALFUNCTION (LACK OF CONTINUITY) IS IN PCM OR WIRING HARNESS (BETWEEN A/C RELAY AND PCM)** • Test voltage at the A/C relay control signal terminal of PCM. • Is voltage **approx. 12 V**?	Yes	Inspect PCM, then go to Step 17.
		No	Repair wiring harness between A/C relay and PCM, then go to Step 17.
12*	**INSPECT TO SEE WHETHER MALFUNCTION IS IN MAGNETIC CLUTCH OR ELSEWHERE** • Test voltage at the following terminal of magnetic clutch. — Terminal A (magnetic clutch operation signal) • Is voltage **approx. 12 V**?	Yes	Inspect magnetic clutch, then go to Step 17.
		No	Go to the next step.
13	**INSPECT FUSE** • Are A/C relay power supply fuses normal?	Yes	Go to the next step.
		No	Replace fuse, then go to Step 17. If fuse burns out immediately, go to the next step.

Step	Inspection		Inspection item (s)
14	**INSPECT WIRING HARNESS BETWEEN FUSE BLOCK AND A/C RELAY FOR LACK OF CONTINUITY** • Test voltages at following terminals of A/C relay. — Terminal A (A/C relay control signal) — Terminal C (A/C control signal) • Are voltages **approx. 12 V**?	Yes	Go to the next step.
		No	Repair wiring harness between fuse block and A/C relay, then go to Step 17.
15	**INSPECT TO SEE WHETHER MALFUNCTION IS IN A/C RELAY OR WIRING HARNESS (BETWEEN A/C RELAY AND MAGNETIC CLUTCH) AND EVAPORATOR TEMPERATURE SENSOR** • Test voltage at the following terminal of A/C relay. — Terminal D (magnetic clutch operation signal) • Is voltage **approx. 12 V**?	Yes	Inspect wiring harness between A/C relay and magnetic clutch. • If above wiring harness is normal, go to the next step. • If above wiring harness malfunctions, repair wiring harness, then go to Step 17.
		No	Replace A/C relay, then go to Step 17.
16	**INSPECT EVAPORATOR TEMPERATURE SENSOR** • Inspect evaporator temperature sensor. • Is it normal?	Yes	Go to the next step.
		No	Replace evaporator temperature sensor, then go to the next step.
17	**CONFIRM THAT MALFUNCTION SYMPTOMS DO NOT RECUR AFTER REPAIR** • Does cool air blow out? (Are the results of refrigerant system performance test normal?)	Yes	Troubleshooting completed. Explain repairs to customer.
		No	Recheck malfunction symptoms, then repeat from Step 1 if malfunction recurs.

NO.7 NO COOL AIR.[5R55S]

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7	No cool air
DESCRIPTION	? Magnetic clutch does not operate.
POSSIBLE CAUSE	? A/C compressor system malfunction (Step 2) ? Incorrect amount of refrigerant (Step 3) ? A/C switch indicator light malfunction (Steps 4—6) ? PCM A/C cut-off control system (WL, WLT-1, WLT-2: Step 18) (G6: Step 7) ? PCM (IG1 signal) system malfunction (WL, WLT-1, WLT-2: Steps 8, 9) (G6: Step 20) ? Themoswitch, A/C switch malfunction (WL,WLT-1, WLT-2: Steps 11, 12, 14, 15) (G6: Step 10—14) ? PCM (A/C signal) system malfunction (WL, WLT-1, WLT-2: Steps 17) (G6: Step 16, 17) ? Refrigerant pressure switch malfunction (WL, WLT-1, WLT-2: Step 26) (G6: Step19) ? A/C relay malfunction (WL, WLT-1, WLT-2: Steps 22—25) (G6: Step 22—24)

? When performing an asterisked (*) troubleshooting inspection, shake the wiring harness and connectors while doing the inspection to discover whether poor contact points are the cause of any intermittent malfunctions. If there is a problem, check to make sure connectors, terminals and wiring harnesses are connected correctly and undamaged.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT AIR BLOW OUT** ? Does air blow out?	Yes	Go to next step.
		No	Go to Step 1 of troubleshooting indexes No.1, 2.
2	**INSPECT A/C COMPRESOR OPERATION** ? Start engine. ? Turn both A/C switch and front fan switch on. ? Does A/C compressor operate?	Yes	Go to Step 1 of troubleshooting index No. 6.
		No	Go to next step.
3	**INSPECT REFRIGERANT AMOUNT** ? Inspect refrigerant amount. ? Is it okay?	Yes	Go to next step.
		No	Add or subtract refrigerant to specified level, then go to Step 27.
4	**INSPECT A/C SWITCH INDICATOR LIGHT** ? Does A/C switch indicator light illuminate?	Yes	WL or WL-T1, WLT-2: Go to Step 8. G6: Go to Step 7.
		No	Go to next step.
*5	**INSPECT WIRING HARNESS BETWEEN FUSE BLOCK AND FRONT CLIMATE CONTROL UNIT FOR CONTINUITY** ? Turn ignition switch to ON position. ? Turn both A/C switch and front fan switch on. ? Remove airflow mode wire and air mix wire and pull out front climate control unit. ? Test voltage at front climate control unit terminal C (IG2 signal). ? Is voltage **approximately 12 V**?	Yes	Go to next step.
		No	Repair wiring harness between fuse block and A/C switch, then go to Step 27.
*6	**INSPECT A/C SWITCH** ? Inspect A/C switch. ? Is it okay?	Yes	Inspect wiring harness between A/C switch and resistor, then go to Step 27.
		No	Replace A/C switch, then go to Step 27.
7	**CHECK FOR DTCS IN PCM** ? Check the DTC for the ON-BOARD DIAGNOSTIC (ENGINE CONTROL). ? Are the following DTCs displayed? — DTC 0120	Yes	Go to appropriate inspection procedure. (The throttle position sensor (DTC 0120), which sends the PCM's A/C cut off control input signal, may be the cause of the trouble.)
		No	Go to Step 10.
*8	**VERIFY WHETHER MALFUNCTION IS IN MAGNETIC CLUTCH SYSTEM OR ELSEWHERE** ? Turn ignition switch to ON position. ? Does magnetic clutch operate when A/C relay connector terminal B (IG2 signal) is grounded?	Yes	Go to next step.
		No	Go to Step 21.
*9	**VERIFY WHETHER MALFUNCTION IS IN A/C RELAY SYSTEM (COIL-SIDE) OR ELSEWHERE** ? Turn A/C switch off. ? Test voltage at PCM connector terminal L(IG1 signal). ? Is voltage **approximately 12 V**?	Yes	Go to Step 11.
		No	Repair wiring harness between A/C relay and PCM, then go to Step 27.

STEP	INSPECTION		ACTION
*10	**VERIFY WHETHER MALFUNCTION IS IN THEMOSWITCH SYSTEM OR ELSEWHERE** ? Turn ignition switch to LOCK position. ? Remove radiator grille. ? Disconnect refrigerant pressure switch connector. ? Turn ignition switch to ON position. ? Set front fan switch at first speed. ? Test voltage at the following refrigerant pressure switch connector terminal B (A/C signal) on wiring harness side. ? Is voltage **approximately 12 V** when A/C switch is off and **0 V** when it is on?	Yes	Go to Step 16.
		No	Reconnect refrigerant pressure switch connector, then go to next step.
*11	**VERIFY WHETHER MALFUNCTION IS IN EVAPORATOR TEMPERATURE SENSOR AND WIRING HARNESS (BETWEEN FUSE BLOCK AND EVAPORATOR TEMPERATURE SENSOR FOR CONTINUITY) OR ELSEWHERE** ? Turn ignition switch to LOCK position. ? Remove glove compartment. ? Disconnect evaporator temperature sensor connector. ? Start engine. ? Turn both A/C switch and front fan switch on. ? When evaporator temperature sensor connector terminals B and C (on wiring harness side) are shorted, does cool air blow out?	Yes	Undo short, then go to next step.
		No	WL or WL-T1, WLT-2: Undo short, then go to Step 14. G6: Undo short, then go to Step 13.
*12	**VERIFY WHETHER MALFUNCTION IS IN EVAPORATOR TEMPERATURE SENSOR OR WIRING HARNESS (BETWEEN FUSE BLOCK AND THEMOSWITCH FOR CONTINUITY)** ? Turn ignition switch to ON position. ? Test voltage at evaporator temperature sensor connector terminal A (IG2 signal). ? Is voltage **approximately 12 V**?	Yes	Inspect evaporator temperature sensor, then go to Step 27.
		No	Repair wiring harness between fuse block and evaporator temperature sensor, then go to Step 27.
*13	**INSPECT WIRING HARNESS BETWEEN EVAPORATOR TEMPERATURE SENSOR AND REFRIGERANT PRESSURE SWITCH FOR CONTINUITY** ? Turn ignition switch to LOCK position. ? Inspect for continuity between evaporator temperature sensor connector terminal B (A/C signal) and refrigerant pressure switch connector terminal B. ? Is there continuity?	Yes	Go to next step.
		No	Repair wiring harness between refrigerant pressure switch and evaporator temperature sensor, then go to Step 27.
*14	**VERIFY WHETHER MALFUNCTION IS IN EVAPORATOR TEMPERATURE SENSOR AND WIRING HARNESS (BETWEEN EVAPORATOR TEMPERATURE SENSOR AND A/C SWITCH FOR CONTINUITY) OR ELSEWHERE** ? Turn ignition switch to ON position. ? Turn A/C switch ON. ? Turn fan switch ON. ? Test voltage at A/C switch connector terminal A (A/C signal). ? Is voltage **approximately 12 V**?	Yes	WL or WL-T1, WLT-2: Go to next step. G6: Inspect wiring harness between evaporator temperature sensor and A/C switch, then go to Step 27.
		No	Inspect A/C switch, then go to Step 27.

STEP	INSPECTION		ACTION
*15	**VERIFY WHETHER MALFUNCTION IS IN EVAPORATOR TEMPERATURE SENSOR AND WIRING HARNESS (BETWEEN EVAPORATOR TEMPERATURE SENSOR AND A/C SWITCH FOR CONTINUITY) OR ELSEWHERE** ? Test voltage at evaporator temperature sensor connector terminal C (A/C signal). ? Is voltage **approximately 12 V**?	Yes	Go to Step 17.
		No	Repair wiring harness between evaporator temperature sensor and A/C switch, then go to Step 27.
*16	**VERIFY WHETHER MALFUNCTION IS IN PCM AND WIRING HARNESS (BETWEEN PCM AND REFRIGERANT PRESSURE SWITCH FOR CONTINUITY) OR ELSEWHERE** ? Test voltage at refrigerant pressure switch connector (on wiring harness side) terminal A (A/C signal). ? Is voltage **approximately 12 V**?	Yes	Go to Step 19.
		No	Go to next step.
*17	**VERIFY WHETHER MALFUNCTION IS IN PCM OR WIRING HARNESS (BETWEEN PCM AND REFRIGERANT PRESSURE SWITCH FOR CONTINUITY)** ? Test voltage at the following PCM connector terminals (A/C signal). — Terminal G (WL or WL-T1, WLT-2) — Terminal Q (G6) ? Is voltage **approximately 12 V**?	Yes	WL or WL-T1, WLT-2: Go to next step. G6: Inspect wiring harness between PCM and refrigerant pressure switch, then go to Step 27.
		No	Inspect PCM, then go to Step 27.
*18	**VERIFY WHETHER MALFUNCTION IS IN PCM AND WIRING HARNESS (BETWEEN PCM AND EVAPORATOR TEMPERATURE SENSOR FOR CONTINUITY) OR ELSEWHERE** ? Inspect the following input signal components: — Engine coolant temperature sensor, including PCM wiring harness (A/C cut-off control) ? Are they okay?	Yes	Repair wiring harness between PCM and evaporator temperature sensor, then go to Step 27.
		No	Replace input signal components, then go to Step 27.
*19	**VERIFY WHETHER MALFUNCTION IS IN REFRIGERANT PRESSURE SWITCH OR ELSEWHERE** ? When the following refrigerant pressure switch connector terminal A and B (on wiring harness side) are shorted, does cool air blow out?	Yes	Inspect refrigerant pressure switch, then go to Step 27.
		No	Undo short, reconnect refrigerant pressure switch, then go to next step.
*20	**INSPECT TO SEE WHETHER MALFUNCTION IS IN A/C RELAY OR ELSEWHERE** ? Does magnetic clutch operate when terminal B (IG2 signal) of A/C relay connector is grounded?	Yes	Inspect wiring harness between A/C relay and PCM, then go to Step 27.
		No	Go to next step.
*21	**VERIFY WHETHER MALFUNCTION IS IN MAGNETIC CLUTCH OR WIRING HARNESS (BETWEEN A/C RELAY AND MAGNETIC CLUTCH FOR CONTINUITY)** ? Test voltage at magnetic clutch connector terminal A (A/C control signal). ? Is voltage **approximately 12 V**?	Yes	Inspect magnetic clutch, then go to Step 27.
		No	Go to next step.
22	**INSPECT A/C RELAY (SWITCH-SIDE) POWER SUPPLY FUSE** ? Are A/C relay power supply fuses okay?	Yes	Go to next step.
		No	Inspect for a short to ground on blown fues's circuit. Repair or replace as necessary. Install appropriate amperage fuse.

STEP	INSPECTION		ACTION
*23	**INSPECT WIRING HARNESS BETWEEN FUSE BLOCK AND A/C RELAY (SWITCH-SIDE) FOR CONTINUITY** ? Turn ignition switch to ON position. ? Test voltage at the following A/C relay connector terminals: — Terminal A (IG2 signal) — Terminal C (A/C control signal) ? Is voltage **approximately 12 V**?	Yes	Go to next step.
		No	Repair wiring harness between fuse block and A/C relay, then go to Step 27.
*24	**VERIFY WHETHER MALFUNCTION IS IN MAGNETIC CLUTCH OR WIRING HARNESS (BETWEEN A/C RELAY AND MAGNETIC CLUTCH FOR CONTINUITY)** ? Test voltage at A/C relay connector terminal D (A/C control signal). ? Is voltage **approximately 12 V**?	Yes	WL or WL-T1, WLT-2: Go to next step. G6: Repair wiring harness between A/C relay and magnetic clutch, then go to Step 27.
		No	Inspect A/C relay, then go to Step 27.
*25	**INSPECT WIRING HARNESS BETWEEN FUSE BLOCK AND A/C RELAY (SWITCH-SIDE) FOR CONTINUITY** ? Turn ignition switch to ON position. ? Test voltage at refrigerant pressure switch connector (on wiring harness side) terminal A (A/C control signal) ? Is voltage **approximately 12 V**?	Yes	Go to next step.
		No	Repair wiring harness between A/C relay and refrigerant pressure switch, then go to Step 27.
*26	**VERIFY WHETHER MALFUNCTION IS IN REFRIGERANT PRESSURE SWITCH OR ELSEWHERE** ? When refrigerant pressure switch connector terminal A and B (on wiring harness side) are shorted, does cool air blow out?	Yes	Inspect refrigerant pressure switch, then go to next step.
		No	Repair wiring harness between refrigerant pressure switch and magnetic clutch, then go to next step.
27	**VERIFY THAT MALFUNCTION SYMPTOM OCCURS AFTER REPAIR** ? Does cool air blow out? (Is refrigerant system performance test result correct?)	Yes	Troubleshooting completed. Explain repairs to customer.
		No	Recheck malfunction symptoms, then repeat from Step 1 if malfunction recurs.

NO.6 NOISE WHILE OPERATING A/C SYSTEM

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6	Noise while operating A/C system.
DESCRIPTION	• Noise from magnetic clutch, A/C compressor, hose or refrigerant line.
POSSIBLE CAUSE	• Magnetic clutch operation noise (Step 4) • A/C compressor vane noise (Steps 5—13) • A/C compressor slippage noise (Steps 14—17) • Hose or refrigerant line interference noise (Step 18)

Diagnostic procedure

Step	Inspection		Inspection item (s)
1	**CHECK A/C COMPRESSOR VANE NOISE** • Is there a jingling, popping, beeping, or buzzing sound (A/C compressor vane noise)?	Yes	Go to Step 5.
		No	Go to the next step.
2	**INSPECT A/C COMPRESSOR SLIPPAGE NOISE** • Is there a squeaking or whirling sound (A/C compressor slippage noise)?	Yes	Go to Step 14.
		No	Go to the next step.
3	**INSPECT A/C COMPRESSOR INTERFERENCE NOISE** • Is there a rattling or vibrating sound (interference noise)?	Yes	Go to Step 18.
		No	Go to the next step.
4	**INSPECT MAGNETIC CLUTCH OPERATION NOISE** • Is there a clicking sound (magnetic clutch operation noise)?	Yes	Adjust clearance between pressure plate of magnetic clutch and A/C compressor pulley, then go to Step 19. (See 07-40-4 MAGNETIC CLUTCH ADJUSTMENT.)
		No	Condition is normal. (Recheck malfunction symptoms.)
5	**INSPECT A/C COMPRESSOR NOISE TIME** • Is noise heard continuously for **3 s or more** after A/C compressor comes on?	Yes	Go to the next step.
		No	Condition is normal. (Noise occurs for **2—3 s** immediately after A/C compressor turns on.)
6	**INSPECT IDLE SPEED** • Inspect idle speed. (See 01-10A-20 ENGINE TUNE-UP [WL-3].) (See 01-10B-21 ENGINE TUNE-UP [WL-C, WE-C].) • Is it normal?	Yes	Go to the next step.
		No	Follow the repair instruction described in section F, then go to Step 19.

Step	Inspection		Inspection item (s)
7	**INSPECT REFRIGERANT AMOUNT** • Inspect refrigerant amount. • Is it normal?	Yes	Go to Step 10.
		No	Go to the next step.
8	**INSPECT REFRIGERANT LINES** • Inspect refrigerant lines. — Is piping free of damage and cracks? — Are piping connections free of oil grime? (Visual inspection) — Are piping connections free of gas leakage? — Are piping installation points on condenser free of gas leakage? — Are piping installation points on receiver/drier free of gas leakage? — Are piping installation points on A/C compressor free of gas leakage? — Are piping installation points on cooling unit free of gas leakage — Perform gas leak inspection using gas leak tester. • Are above items normal?	Yes	Go to the next step.
		No	If piping or A/C component (s) is damaged or cracked, replace then go to Step 19. If there is gas leakage, repair or replace connection and replace condenser*, then go to Step 19.
9	**INSPECT EVAPORATOR PIPING CONNECTIONS IN COOLING UNIT FOR GAS LEAKAGE** • Are piping connections for evaporator in cooling unit free of gas leakage?	Yes	Adjust refrigerant amount to specified level, then go to Step 19.
		No	If piping is damaged or cracked, replace then go to Step 19. If there is gas leakage, repair or replace connection and replace condenser*, then go to Step 19.
10	**CHECK TO SEE WHETHER MALFUNCTION IS IN COMPRESSOR OIL OR ELSEWHERE** • Add **20 ml {20 cc, 0.8 fl oz}** of compressor oil. • Is noise heard when racing engine?	Yes	Go to the next step.
		No	Troubleshooting completed. Explain repair to customer.
11	**CHECK TO SEE WHETHER MALFUNCTION IS IN A/C COMPRESSOR OR ELSEWHERE** • Drain compressor oil. • Is it contaminated with metal particles?	Yes	Go to the next step.
		No	Replace A/C compressor, then go to Step 19.
12	**CHECK TO SEE WHETHER MALFUNCTION IS SOMEWHERE IN A/C SYSTEM OR ELSEWHERE** • Is compressor oil whitish and mixed with water?	Yes	Replace entire A/C system (excluding heater), then go to Step 19.
		No	Go to the next step.
13	**INSPECT A/C COMPRESSOR OIL** • Is compressor oil darker than normal and contaminated with aluminum chips?	Yes	Replace A/C compressor and condenser, then go to Step 19. (Since A/C compressor may be worn and receiver/drier may be clogged, replacement of receiver/drier is necessary.)
		No	Condition is normal. Recheck malfunction symptoms.
14	**CHECK TO SEE WHETHER MALFUNCTION IS IN A/C COMPRESSOR OR ELSEWHERE** • Is noise heard immediately after A/C compressor is stopped?	Yes	Replace A/C compressor, then go to Step 19. (A/C compressor discharge valve left open)
		No	Go to the next step.
15	**INSPECT DRIVE BELT** • Inspect drive belt. (See 01-10A-3 DRIVE BELT INSPECTION [WL-3].) (See 01-10B-3 DRIVE BELT INSPECTION [WL-C, WE-C].) • Is it normal?	Yes	Go to the next step.
		No	Adjust or replace drive belt, then go to Step 19.
16	**INSPECT DRIVE BELT CONDITION** • Is drive belt worn? • Does it have foreign material imbedded in it, or have oil on it?	Yes	Remove obstruction, remove oil, or replace drive belt, then go to Step 19.
		No	Go to the next step.
17	**INSPECT MAGNETIC CLUTCH** • Inspect magnetic clutch. (See 07-40-5 MAGNETIC CLUTCH INSPECTION.) • Is it normal?	Yes	Replace A/C compressor (excluding pressure plate, A/C compressor pulley, and stator), then go to Step 19.
		No	Replace magnetic clutch, then go to Step 19.

Step	Inspection		Inspection item (s)
18	**CHECK TO SEE WHETHER MALFUNCTION IS IN A/C COMPRESSOR OR REFRIGERANT LINES** • Is noise emitted from A/C compressor?	Yes	Visually inspect A/C compressor, replace appropriate parts if necessary, then go to the next step.
		No	If noise is due to refrigerant lines, repair detached or missing clips, tighten loose bolts, then go to the next step.
19	**VERIFY THAT MALFUNCTION SYMPTOM OCCURS AFTER REPAIR** • Has A/C compressor noise stopped?	Yes	Troubleshooting completed. Explain repairs to customer.
		No	Recheck malfunction symptoms, then repeat from Step 1 if malfunction recurs.

* : If there is gas leakage, air enters into the A/C system. The desiccant within the receiver/drier absorbs the moisture from the air and becomes saturated. If the A/C system is used in this condition, the inside of the A/C compressor will begin to rust due to this moisture, which may cause lock up or noise to occur. Therefore, replacement of the receiver/drier is necessary.

07-10 REFRIGERANT SYSTEM

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REFRIGERANT SYSTEM SERVICE CAUTIONS 07-10–1
REFRIGERANT SYSTEM GENERAL PROCEDURES 07-10–2
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REFRIGERANT PRESSURE CHECK 07-10–3
RECOVERY 07-10–3
REFRIGERANT CHARGING 07-10–3

REFRIGERANT SYSTEM SERVICE WARNINGS

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Handling Refrigerant

- Avoid breathing air conditioning refrigerant or lubricant vapor. Exposure may irritate eyes, nose and throat. Also, due to environmental concerns, the use of recovery/recycling/recharging equipment is mandatory when draining R-134a from the air conditioning system. If accidental system discharge occurs, ventilate work area before resuming service.
- Do not perform pressure test or leak test for R-134a service equipment and/or vehicle air conditioning system using compressed air. Some mixtures of air and R-134a have been shown to be combustible at elevated pressures. These mixtures, if ignited, may cause injury or property damage. Additional health and safety information may be obtained from refrigerant manufacturers.
- Do not allow the refrigerant to leak near fire or any kind of heat. A poisonous gas may be generated if the refrigerant gas contacts fire or heat such as from cigarettes and heaters. When carrying out any operation that can cause refrigerant leakage, extinguish or remove the above-mentioned heat sources and maintain adequate ventilation.
- Handling liquid refrigerant is dangerous. A drop of it on the skin can result in localized frostbite. When handling the refrigerant, wear gloves and safety goggles. If refrigerant splashes into the eyes, immediately wash them with clean water and consult a doctor.

Storing Refrigerant

- The refrigerant container is highly pressurized. If it is subjected to high heat, it could explode, scattering metal fragments and liquid refrigerant that can seriously injure you. Store the refrigerant at temperatures below 40 °C {104 °F}.

REFRIGERANT SYSTEM SERVICE CAUTIONS

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Handling Insufficient Refrigerant Level

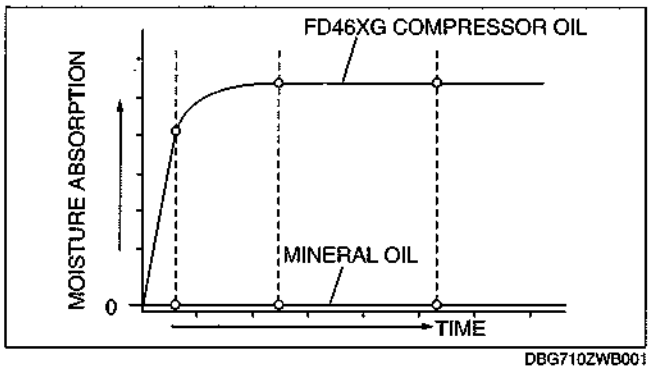
- If an insufficient refrigerant level is detected at troubleshooting, do not charge (add) the refrigerant. Because an accurate amount of refrigerant cannot be determined from the pressure indicated on the manifold gauge, never charge the refrigerant. If there is too much or too little refrigerant from the refilling, there may be secondary problems such as damage to the refrigerant cycle parts, or a decrease of cooling performance. Therefore, if it is determined that the refrigerant level is insufficient, completely remove refrigerant from the refrigerant cycle and refill with refrigerant to the specified amount.

Handling A/C Related Parts

- There will be no effect on either performance or quality of A/C-related parts, including but not limited to the piping, etc., provided that said parts are serviced/repaired in accordance with standard procedure.
- When serviced/repaired A/C units in locations where there is a considerable risk of contamination from dirt or dust, plug up the openings on the parts to prevent dust/dirt from entering.
- When using adhesive material to cover openings on A/C parts, make sure that the adhesive side of the material does not come in contact with the connectors on the parts.
- When the system is opened to atmosphere, there is no need to replace the condenser, or the receiver dryer when it is housed within the condenser, provided that the unit is plugged accordingly.

Handling Compressor Oil

- **Use only FD46XG compressor oil for this vehicle. Using a PAG oil other than FD46XG compressor oil can damage the A/C compressor.**
- **Do not spill FD46XG compressor oil on the vehicle. A drop of compressor oil on the vehicle surface can eat away at the paint. If oil gets on the vehicle, wipe it off immediately.**
- **FD46XG compressor oil (PAG oil) has a higher moisture absorption efficiency than the previously used mineral oil. If moisture mixes with the compressor oil, the refrigerant system could be damaged. Therefore, install caps immediately after using the compressor oil or removing refrigerant system parts to prevent moisture absorption.**



DBG710ZWB001

REFRIGERANT SYSTEM GENERAL PROCEDURES

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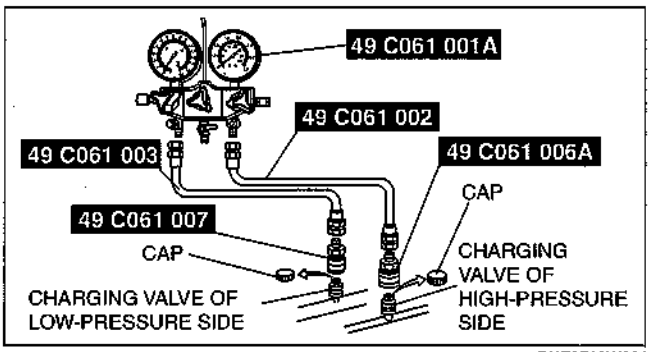
1. Fully close the valves of the **SST** (49 C061 001A).
2. Connect the **SSTs** (49 C061 002, 49 C061 003) to the high- and low-pressure side joints of the **SST** (49 C061 001A).
3. Connect the **SSTs** (49 C061 006A, 49 C061 007) to the ends of the **SSTs** (49 C061 002, 49 C061 003).
4. Connect the **SSTs** (49 C061 006A, 49 C061 007) to the charging valves.



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REFRIGERANT SYSTEM PERFORMANCE TEST

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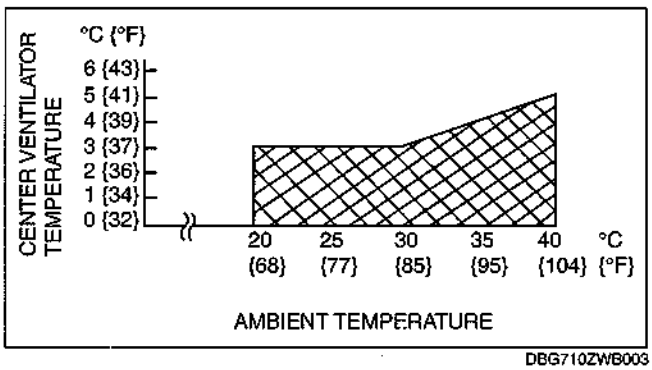
1. Inspect the refrigerant pressure. (See 07-10-3 REFRIGERANT PRESSURE CHECK.)
2. Place a dry-bulb thermometer in the driver-side center ventilator outlet.
3. Start the engine and after it is warmed up, run it at a constant **1,500 rpm**.
4. Set the fan speed to MAX HI.
5. Turn the A/C switch on.
6. Set to RECIRCULATE mode.
7. Set the temperature control to MAX COLD.
8. Set to VENT mode.
9. Close all the doors and windows.
10. Wait until the air conditioner output temperature stabilizes.
    Stabilized condition
    - The A/C compressor repeatedly turns on and off at regular intervals.
11. After the blower air is stabilized, read the dry-bulb thermometer.
12. Verify the ambient temperature.
13. Verify that the temperature reading is in the shaded zone.
    - If the there is any malfunction, inspect the refrigerant system according to the troubleshooting chart.



DBG710ZWB003

REFRIGERANT PRESSURE CHECK

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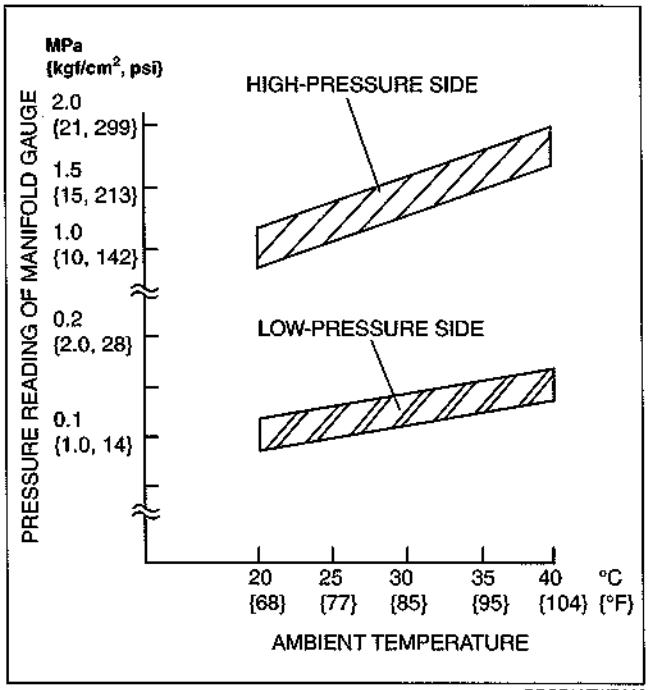
1. Install the **SSTs** (49 C061 0A0B).
2. Start the engine and after it is warmed up, run it at a constant **1,500 rpm**.
3. Set the fan speed MAX HI.
4. Turn the A/C switch on.
5. Set to RECIRCULATE mode.
6. Set the temperature control to MAX COLD.
7. Set to VENT mode.
8. Close all the doors and all the windows.
9. Measure the ambient temperature and high- and low- pressure side reading of the **SST** (49 C061 001A).
10. Verify that the intersection of the pressure reading of the **SST** (49 C061 001A) and ambient temperature is in the shaded zone.
    - If there is any malfunction, inspect the refrigerant system according to the troubleshooting chart.



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RECOVERY

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1. Connect an R-134a recovery/recycling/recharging device to the vehicle and follow the device manufacturer's instructions.

REFRIGERANT CHARGING

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Caution

- **Do not exceed the specification when charging the system with refrigerant. Doing so will decrease the efficiency of the air conditioner or damage the refrigeration cycle parts.**

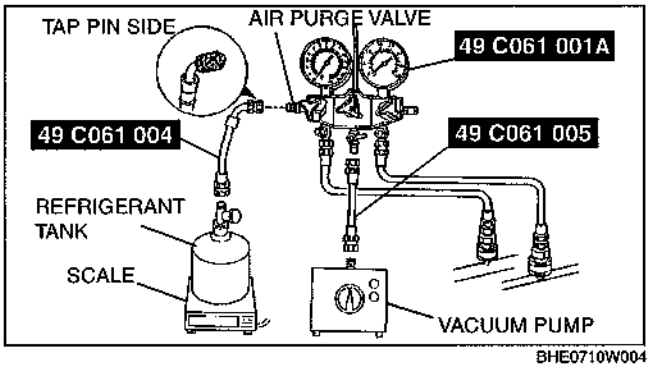
Charging Recycled R-134a Refrigerant

1. Connect an R-134a recovery/recycling/recharging device to the vehicle and follow the device manufacturer's instructions.

Charging Preparation

1. Install the **SSTs** (49 C061 0A0B).
2. Connect the tap pin side of the **SST** (49 C061 004) to the air purge valve of the **SST** (49C061 001).
3. Connect the **SST** (49 C061 005) to the center joint of the **SST** (49 C061 001A).
4. Connect the **SST** (49 C061 005) to the vacuum pump.
5. Connect the **SST** (49 C061 004) to the refrigerant tank.
6. Place the refrigerant tank on the scale.

Regular amount of refrigerant (approx. quantity)
475 g {16.8 oz}



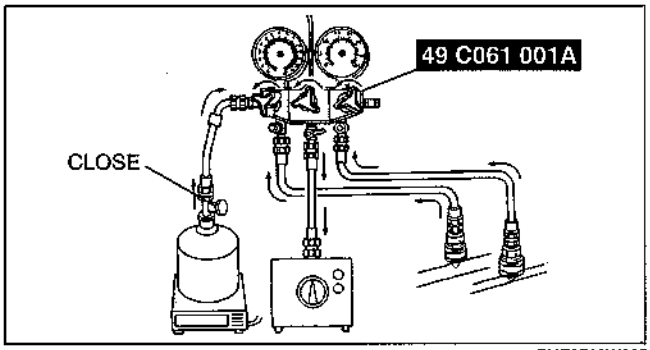
BHE0710W004

Evacuation

1. Open all the valves of the **SST** (49 C061 001A).

Caution
- **Close the SST (49 C061 001A) valve immediately after stopping the vacuum pump. If the valve is left open, the vacuum pump oil will flow back into the refrigeration cycle and cause a decrease in the efficiency of the air conditioner.**

2. Start the vacuum pump and let it operate for **15 min.**



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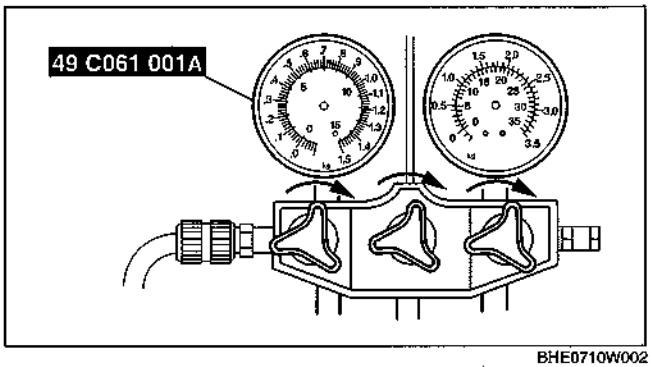
3. Verify that high- and low-pressure side readings of the **SST** (49 C061 001A) are at **–101 kPa {–760 mmHg, –29.9 inHg}**. Close each valve of the **SST** (49 C061 001A).



BHE0710W002

Airtightness Check

1. Stop the vacuum pump and wait for **5 min.**
2. Check the high- and low-pressure side readings of the **SST** (49 C061 001A).
   - If the reading has changed, inspect for leakage and go to Evacuation. (See 07-10-4 Evacuation.)
   - If the reading has not changed, go to Charging New R-134a Refrigerant. (See 07-10-5 Charging New R-134a Refrigerant.)

Charging New R-134a Refrigerant

1. Open the valve of the refrigerant tank.
2. Weigh the refrigerant tank to charge the suitable amount of refrigerant.

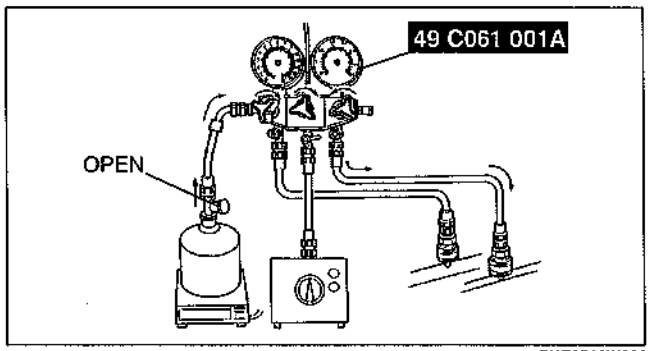
Warning

- **If the refrigerant system is charged with a large amount of refrigerant when inspecting for gas leakage, and if any leakage should occur, the refrigerant will be released into the atmosphere. In order to prevent the accidental release of refrigerant which can destroy the ozone layer in the stratosphere, follow the proper procedures and charge with only a small amount of refrigerant when inspecting for gas leakage.**
- **If charging the system with refrigerant using service cans, running the engine with the high-pressure side valve open is dangerous. Pressure within the service cans will increase and the cans could explode, scattering metal fragments and liquid refrigerant that can seriously injure you. Therefore, do not open the high-pressure side valve while the engine is running.**

Caution

- **Always being charging of refrigerant from the high-pressure side. If changing is begun from the low-pressure side, the vanes of the A/C compressor will not be released and abnormal noise may result.**

3. Open the low-pressure side valve of the **SST** (49 C061 001A).



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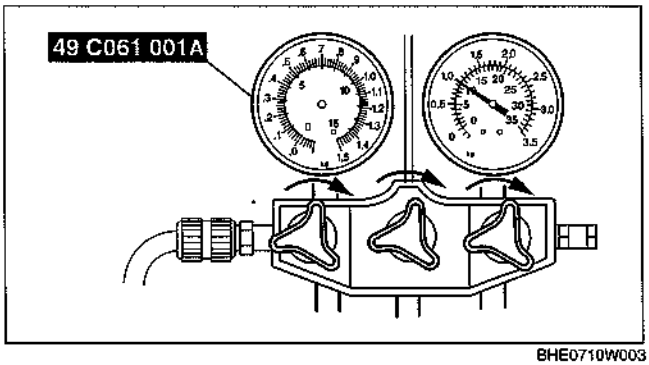
4. When the high-pressure side reading increases to **0.098 MPa {1.0 kgf/cm^2, 14 psi}**, close the low-pressure side valve of the **SST** (49 C061 001A).
5. Inspect for leakage from the cooler pipe/hose connections using the **SST** (49 C061 013).
   - If there is no leakage, go to Step 7.
   - If leakage is found at a loose joint, tighten the joint, then go to next step.
6. Inspect for leakage again.
   - If there is no leakage after tightening the joint, go to next step.
   - If there is still a leakage at the same joint, discharge the refrigerant and then repair the joint. Repeat the charging procedure from evacuation.

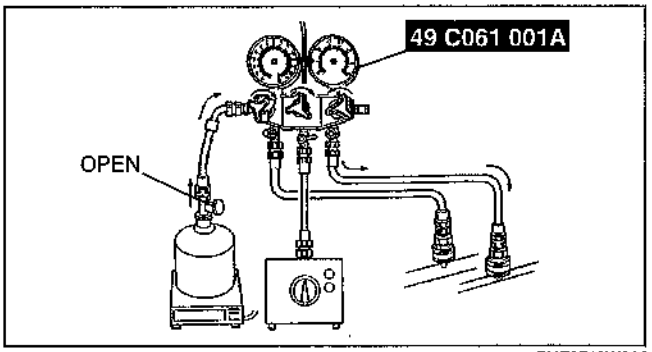


BHE0710W003

Warning

- **If charging the system with refrigerant using service cans, running the engine with the high-pressure side valve open is dangerous. Pressure within the service cans will increase and the cans could explode, scattering metal fragments and liquid refrigerant that can seriously injure you. Therefore, do not open the high-pressure side valve while the engine is running.**

7. Open the low-pressure side valve of the **SST** (49 C061 001A) and charge with refrigerant until the weight of refrigerant tank has decreased **250 g {8.83 oz}** from the amount in Step 2.



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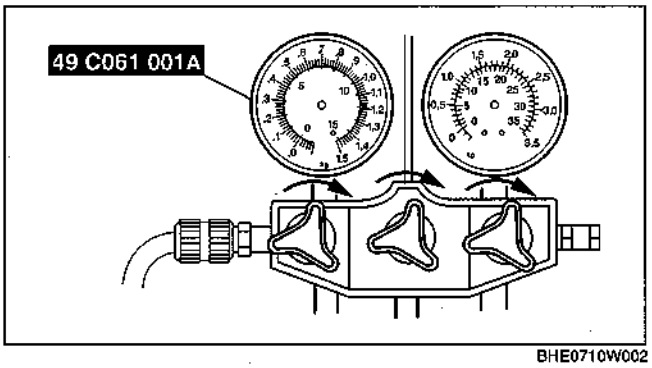
8. Close the low-pressure side valve of the **SST** (49 C061 001A).

Warning
- **If charging the system with refrigerant using service cans, running the engine with the high-pressure side valve open is dangerous. Pressure within the service cans will increase and the cans could explode, scattering metal fragments and liquid refrigerant that can seriously injure you. Therefore, do not open the high-pressure side valve while the engine is running.**



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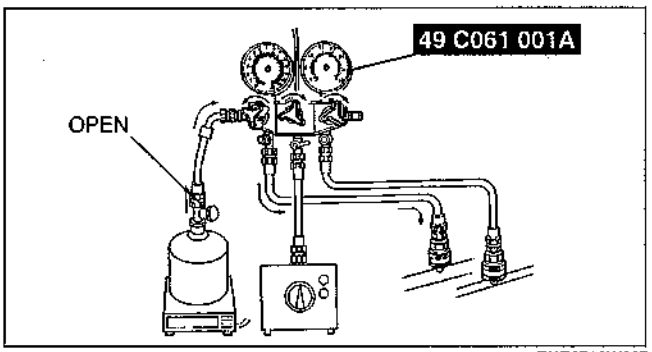
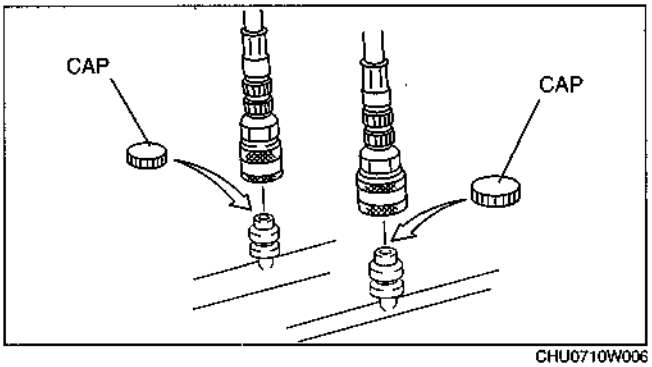
9. Start the engine and actuate the A/C compressor.
10. Open the low-pressure side valve of the **SST** (49 C061 001A) and charge with refrigerant until the weight of the refrigerant tank has decreased regular amount from the amount in Step 2.
11. Close the low-pressure side valve of the **SST** (49 C061 001A) and the valve of the refrigerant tank.
12. Stop the engine and A/C compressor.



BHE0710W007

Leak Test
1. Inspect for leakage using the **SST** (49 C061 013).
   - If there is no leakage, go to Step 3.
   - If leakage is found at a loose joint, tighten the joint, then go to next step.
2. Inspect for leakage again.
   - If there is no leakage after tightening the joint, go to next step.
   - If there is still leakage at the same joint, discharge the refrigerant and then repair the joint. Repeat the charging procedure from evacuation.
3. Disconnect the **SSTs** (49 C061 006A, 49 C061 007) from the charging valves.
4. Install the caps to the charging valves.



CHU0710W006

07-11 BASIC SYSTEM

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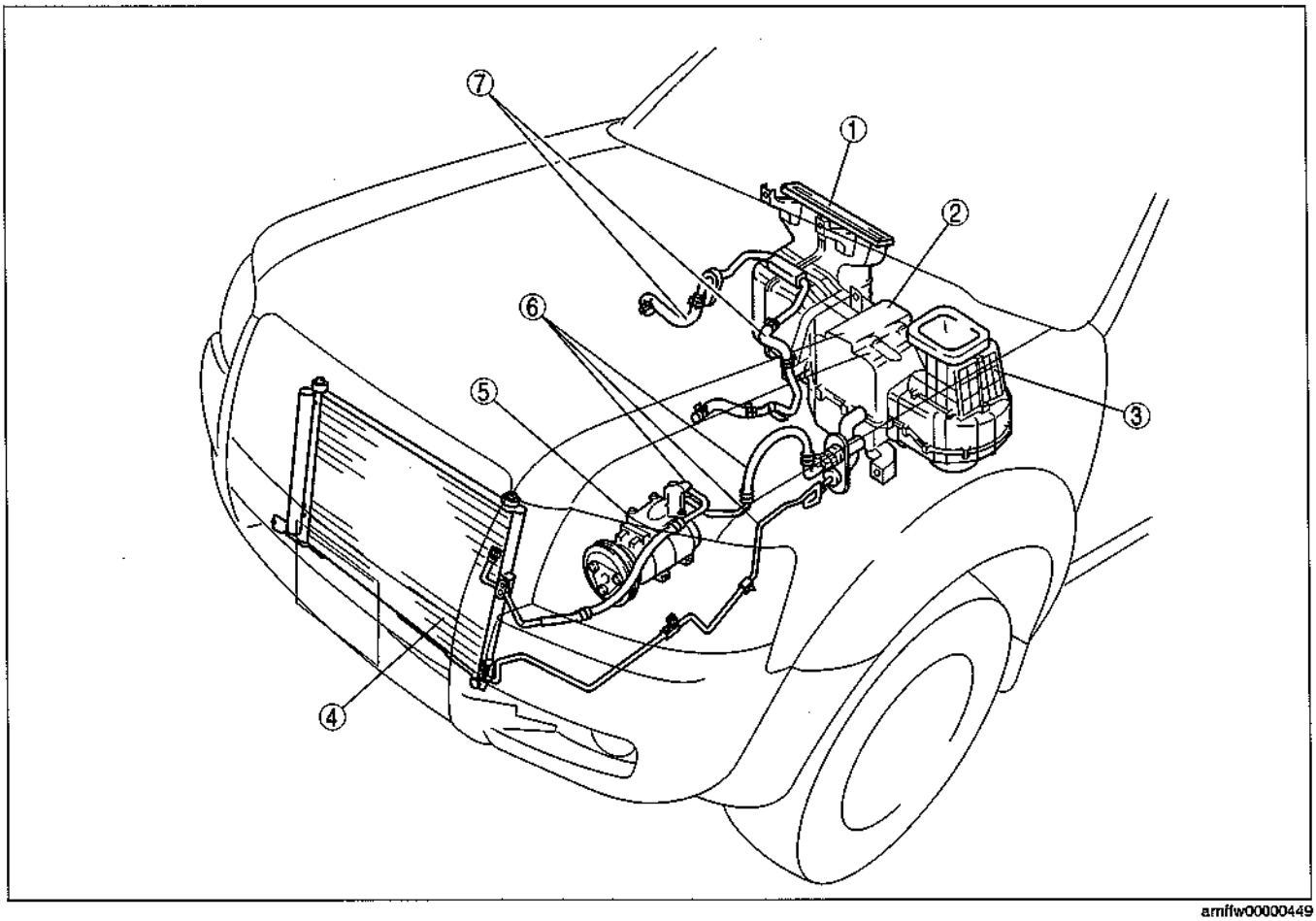
HVAC BASIC SYSTEM LOCATION INDEX



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1	Heater unit
2	Cooling unit (See 07-11-2 COOLING UNIT REMOVAL/INSTALLATION.) (See 07-11-4 COOLING UNIT DISASSEMBLY/ASSEMBLY.)
3	Blower unit (See 07-11-5 BLOWER UNIT DISASSEMBLY/ASSEMBLY.)
4	Condenser

5	A/C compressor (See 07-11-6 A/C COMPRESSOR REMOVAL/INSTALLATION.)
6	Refrigerant line (See 07-11-8 REFRIGERANT LINES REMOVAL/INSTALLATION.)
7	Heater hose

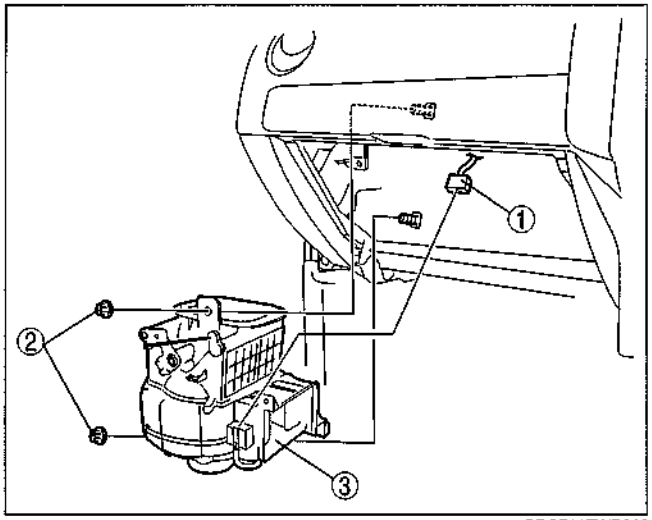
BLOWER UNIT REMOVAL/INSTALLATION

dcf071161140w01

1. Disconnect the negative battery cable.
2. Remove the glove compartment. (See 09-17-9 GLOVE COMPARTMENT REMOVAL/INSTALLATION.)
3. Remove the cooling unit. (See 07-11-3 COOLING UNIT REMOVAL/INSTALLATION.)
4. Remove in the order indicated in the table.

1	Connector
2	Nut
3	Blower unit

5. Install in the reverse order of removal.



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BLOWER UNIT DISASSEMBLY/ASSEMBLY

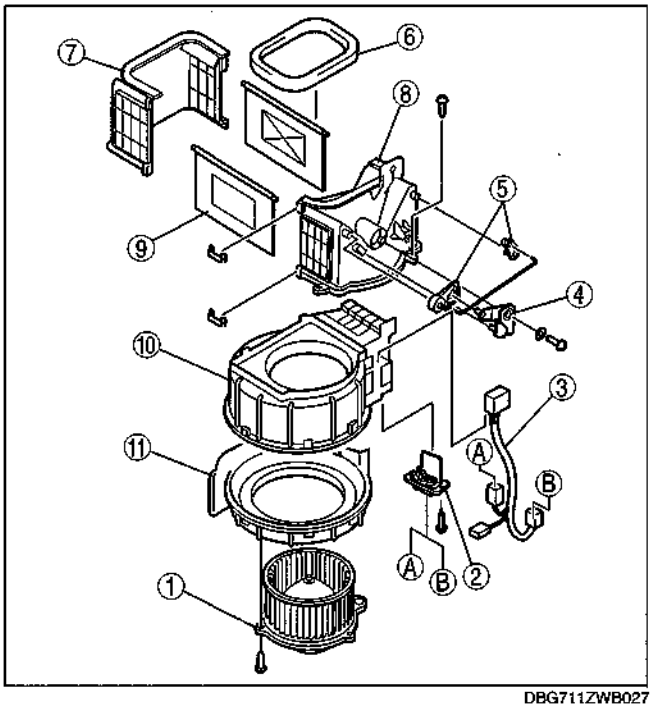
dcf071161140w02

1. Disassemble in the order indicated in the table.

Caution
- **Apply only the specified grease to the link. Otherwise abnormal noise or improper operation may result.**

1	Blower motor
2	Resistor
3	Blower wiring harness
4	Air intake link
5	Air intake crank
6	Polyurethane protector
7	Blower case (1)
8	Blower case (2)
9	Air interke door
10	Blower case (3)
11	Blower case (4)

2. Assemble in the reverse order of disassembly.



DBG711ZWB027

COOLING UNIT REMOVAL/INSTALLATION

dcf071161520w01

1. Disconnect the negative battery cable.
2. Discharge the refrigerant from the system. (See 07-10-3 REFRIGERANT CHARGING.)
3. Remove the glove compartment. (See 09-17-9 GLOVE COMPARTMENT REMOVAL/INSTALLATION.)
4. Disconnect the air intake wire from the blower unit. (See 07-40-8 CLIMATE CONTROL UNIT WIRE ADJUSTMENT.)

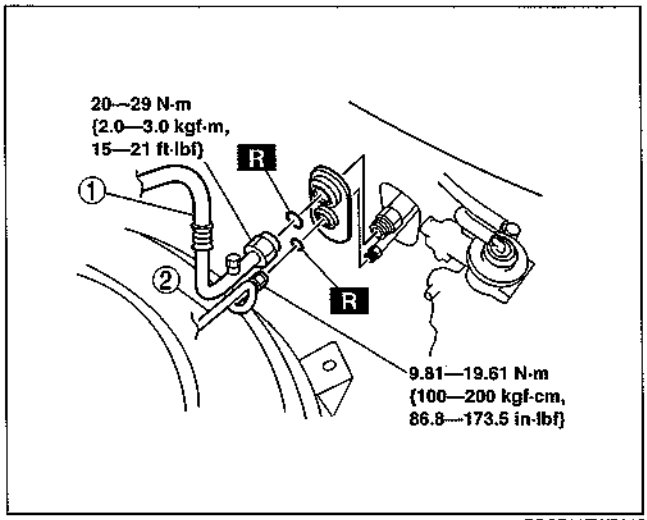
Caution

- **If moisture or foreign material enters the refrigeration cycle, cooling ability will be lowered and abnormal noise will occur. Always immediately plug all open fittings after removing any refrigeration cycle parts to keep moisture or foreign material out of the cycle.**

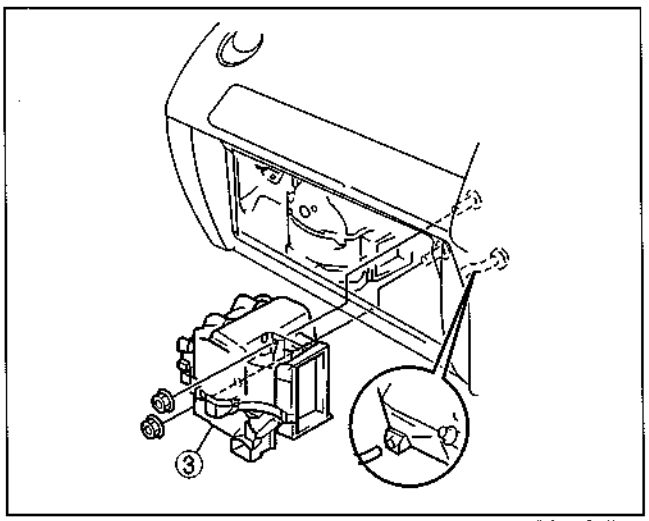
5. Remove in the order indicated in the table. Do not allow compressor oil to spill.

1	Cooler hose (LO) (See 07-11-9 Refrigerant Line Removal Note.) (See 07-11-9 Refrigerant Line Installation Note.)
2	Cooler pipe (See 07-11-9 Refrigerant Line Removal Note.) (See 07-11-9 Refrigerant Line Installation Note.)
3	Cooling unit (See 07-11-3 Cooling Unit Installation Note.)

6. Install in the reverse order of removal.
7. Perform the refrigerant system performance test. (See 07-10-2 REFRIGERANT SYSTEM PERFORMANCE TEST.)



DBG711ZWB018



DBG711ZWB025

Cooling Unit Installation Note

1. When installing a new cooling unit (evaporator), add FD46XG compressor oil into the refrigerant cycle.

Supplemental amount (approx. quantity)
40 ml {40 cc, 1.4 fl oz}

07

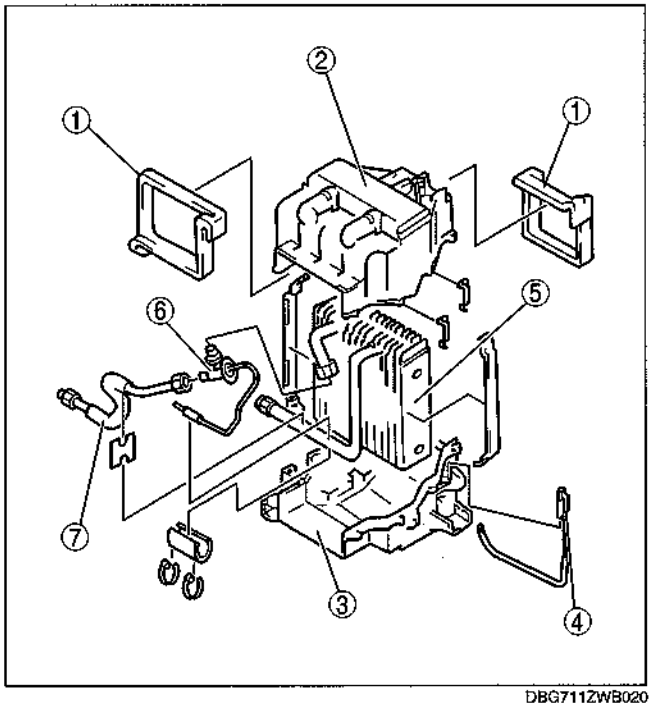
COOLING UNIT DISASSEMBLY/ASSEMBLY

dcf071161520w02

Caution
- **If moisture or foreign material enters the refrigeration cycle, cooling ability will be lowered and abnormal noise will occur. Always immediately plug all open fittings after removing any refrigeration cycle parts to keep moisture or foreign material out of the cycle.**

1. Disassemble in the order indicated in the table.
2. Assemble in the reverse order of disassembly.

1	Polyurethane protector
2	Cooler case (1)
3	Cooler case (2)
4	Thermistor (See 07-11-5 Thermistor Assembly Note.)
5	Evaporator
6	Expansion valve (See 07-11-4 Expansion Valve assembly Note.)
7	High pressure pipe



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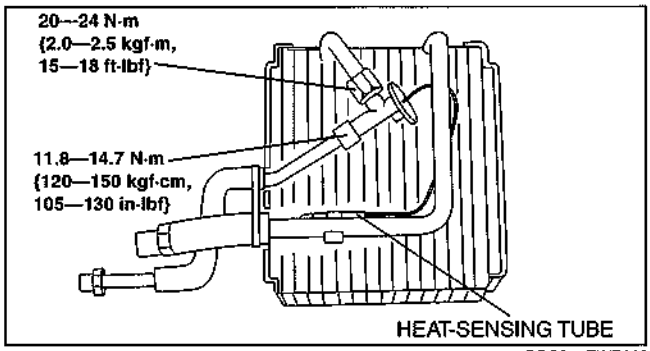
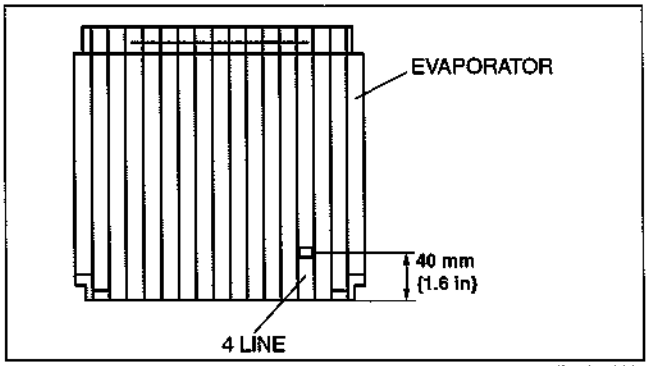
Expansion Valve assembly Note
- Replace the O-rings at the expansion valve joints and apply compressor oil to the O-rings and connect the joints.
- Tighten the joint to the specified torque using two open-end wrenches.
- Assemble the heat-sensing tube as shown in the figure.



DBG711ZWB009

Thermistor Assembly Note

1. Assemble the thermistor as shown in the figure.



arnffw00000020

EVAPORATOR INSPECTION

dcf071161610w01

1. Remove the cooling unit. (See 07-11-3 COOLING UNIT REMOVAL/INSTALLATION.)
2. Remove the evaporator from the cooling unit.
3. Check for cracks, damage, and oil leakage. If an problems found, replace the evaporator.
4. Check for bent fins. in they are bent, use a flat-head screwdriver to straighten them.

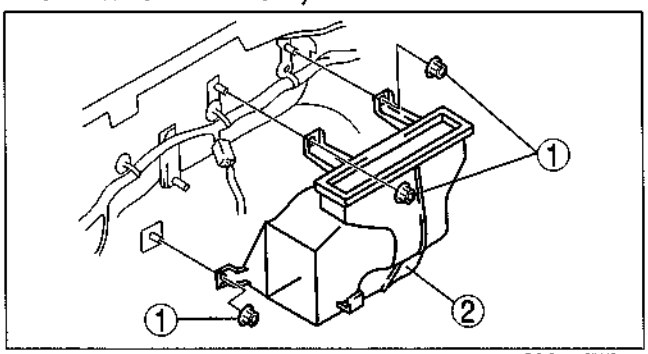
AIR OUTLET DUCT REMOVAL/INSTALLATION

dcf071160120w01

1. Disconnect the negative battery cable.
2. Remove the dashboard. (See 09-17-4 DASHBOARD REMOVAL/INSTALLATION.)
3. Remove as indicated in the table.

1	Nut
2	Air outlet duct

4. Install in the reverse order of removal.



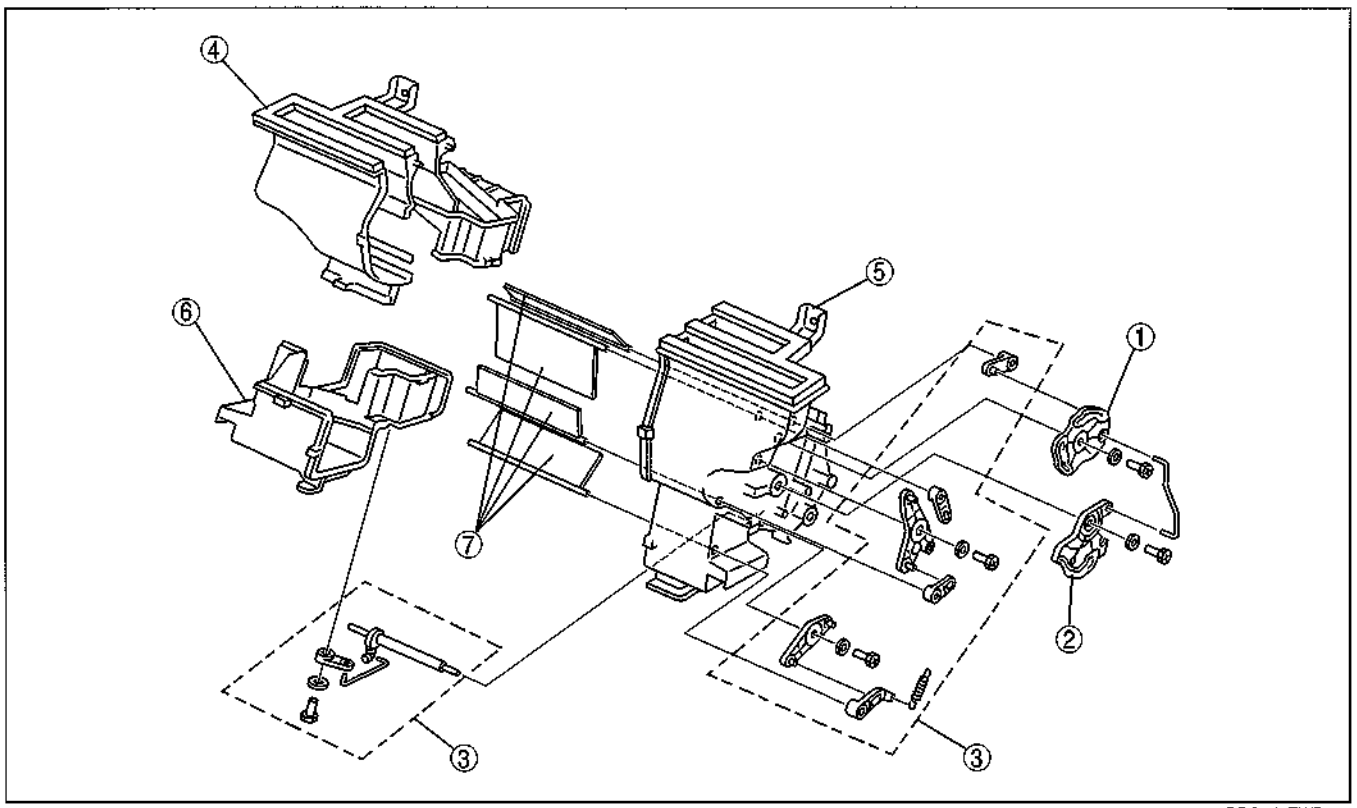
DBG711ZWB012

07

AIR OUTLET DUCT DISASSEMBLY/ASSEMBLY

dcf071160120w02

1. Disassemble in the order indicated in the table.



DBG740ZWB033

1	Airflow mode main link
2	Airflow mode link
3	Airflow mode link set
4	Case (1)

5	Case (2)
6	Case (3)
7	Airflow mode door

2. Assemble in the reverse order of disassembly.

A/C COMPRESSOR REMOVAL/INSTALLATION

dcf071161450w01

1. Disconnect the negative battery cable.
2. Discharge the refrigerant from the system. (See 07-10-3 REFRIGERANT CHARGING.)
3. Remove the drive belt.
4. Loosen the A/C compressor bolts, then slide the A/C compressor.

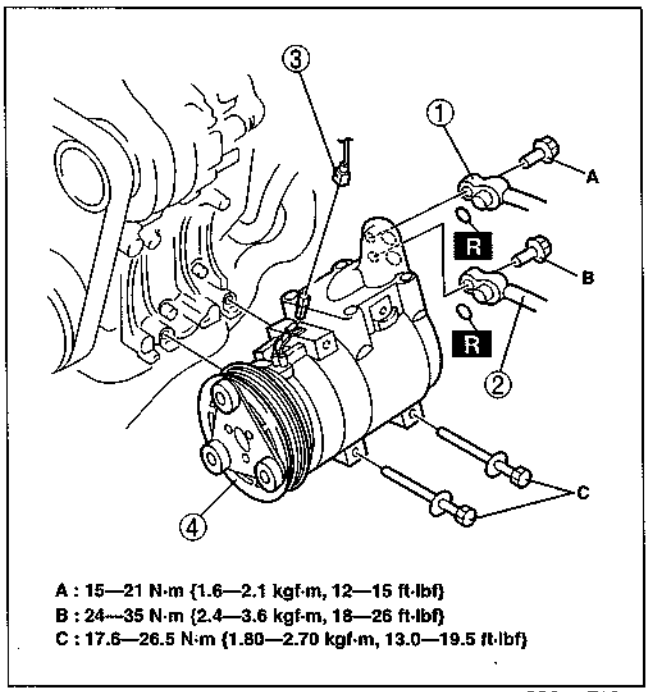
Caution

- **If moisture or foreign material enters the refrigeration cycle, cooling ability will be lowered and abnormal noise will occur. Always immediately plug all open fittings after removing any refrigeration cycle parts to keep moisture or foreign material out of the cycle.**

5. Remove in the order indicated in the table. Do not allow compressor oil to spill.

1	Cooler hose (HI)
2	Cooler hose (LO)
3	Magnetic connector
4	A/C compressor (See 07-11-7 A/C Compressor Installation Note.)

6. Install in the reverse order of removal.
7. Adjust the drive belt. (See 01-10A-4 DRIVE BELT ADJUSTMENT [WL-3].) (See 01-10B-4 DRIVE BELT ADJUSTMENT [WL-C, WE-C].)
8. Perform the refrigerant system performance test. (See 07-10-2 REFRIGERANT SYSTEM PERFORMANCE TEST.)



DBG711ZWB024

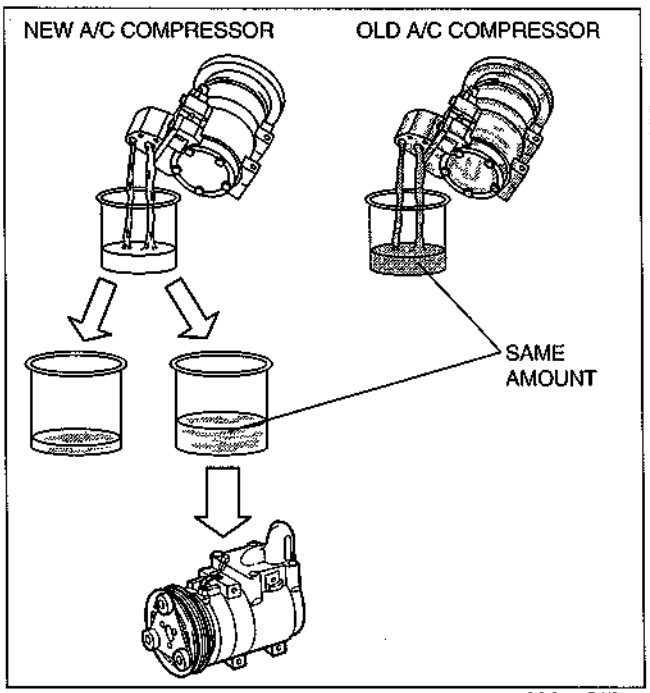
A/C Compressor Installation Note

Caution
- **Due to the high moisture-absorption characteristics of the compressor oil, it may absorb moisture if left over a long period of time thereby negatively affecting A/C operation. Drain the compressor oil and refill within 10 min. of each other.**

1. Rotate new A/C compressor shaft six to eight revolutions while collecting refrigerant oil in a clean measuring device. Use this refrigerant oil to refill new compressor. Do not allow refrigerant oil to become contaminated.
2. Rotate old A/C compressor shaft six to eight revolutions while collecting refrigerant oil in a separate, clean measuring device.
3. Compare those oil amounts. The amount of the oil drained from the new A/C compressor should be greater than the old one.
4. Pour the same amount oil of drained from the old A/C compressor back into the new A/C compressor.

A/C compressor oil type
- **FD46XG**

A/C compressor oil sealed volume (approx. quantity)
- **180 ml {180 cc, 6.08 fl oz}**



DBG711ZWB016

07

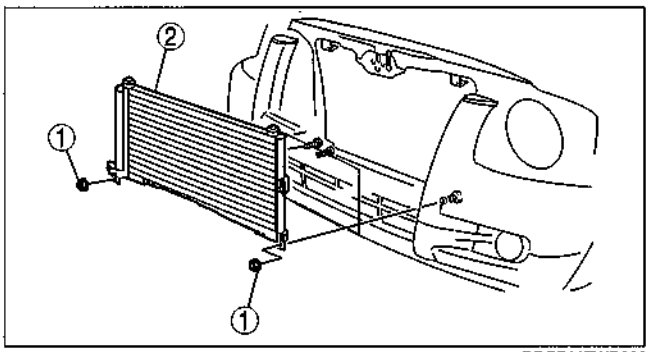
CONDENSER REMOVAL/INSTALLATION

dcf071161480w01

1. Disconnect the negative battery cable.
2. Discharge the refrigerant from the system. (See 07-10-3 REFRIGERANT CHARGING.)
3. Remove the radiator grill. (See 09-16-3 RADIATOR GRILLE REMOVAL/INSTALLATION.)
4. Remove the charge air cooler. (See 01-13A-2 INTAKE-AIR SYSTEM REMOVAL/INSTALLATION [WL-3].) (See 01-13B-3 INTAKE-AIR SYSTEM REMOVAL/INSTALLATION [WL-C, WE-C].)
5. Disconnect the cooler hose (HI) and cooler pipe. Do not allow remaining compressor oil in the refrigerant line to spill.
6. Remove in the order indicated in the table.

Caution
- **If moisture or foreign material enters the refrigeration cycle, cooling ability will be lowered and abnormal noise or other malfunction could occur. Always plug open fittings immediately after removing any refrigeration cycle parts.**

1	Nut
2	Condenser (See 07-11-8 Condenser Installation Note.)



DBG711ZWB029

7. Install in the reverse order of removal.
8. Perform the refrigerant system performance test. (See 07-10-2 REFRIGERANT SYSTEM PERFORMANCE TEST.)

Condenser Installation Note

1. After replacing the condenser, add compressor oil to the refrigeration cycle.

Supplemental oil amount (approx. quantity)
20 ml {20 cc, 0.7 fl oz}

CONDENSER INSPECTION

dcf071161480w02

1. Inspect the condenser for cracks, damage, and oil leakage.
   - If there is any malfunction, replace the condenser.
2. Visually inspect the fins for clogging of foreign material.
   - If any fins are clogged, remove the foreign material.
3. Visually inspect the fins for bending.
   - If there is any bending, use the end of a flathead screwdriver to straighten fins.

REFRIGERANT LINES REMOVAL/INSTALLATION

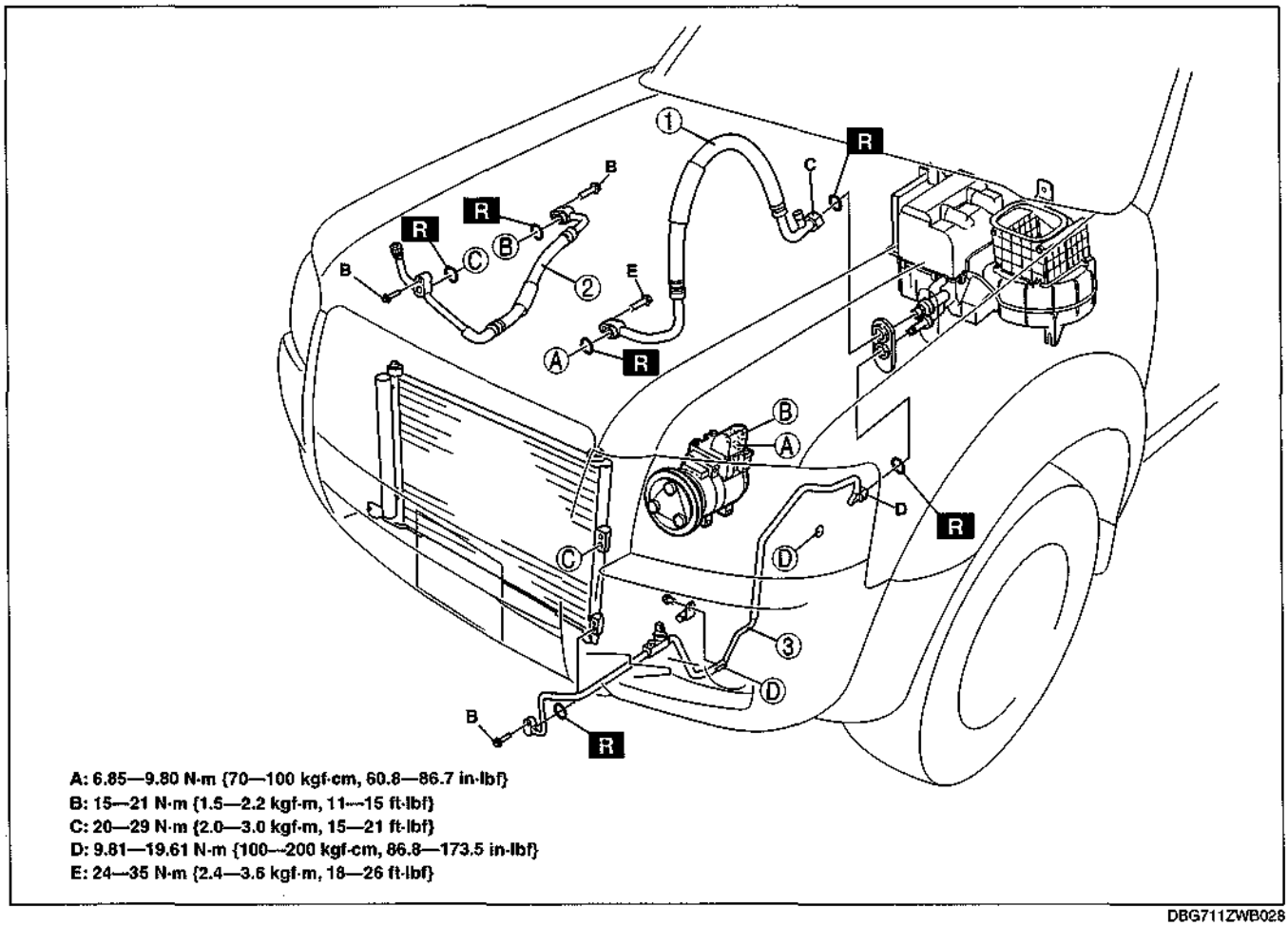
dcf071161460w01

1. Disconnect the negative battery cable.
2. Discharge the refrigerant from the system. (See 07-10-3 RECOVERY.) (See 07-10-3 REFRIGERANT CHARGING.)

Caution
- **If moisture or foreign material enters the refrigeration cycle, cooling ability will be lowered and abnormal noise will occur. Always immediately plug all open fittings after removing any refrigeration cycle parts to keep moisture or foreign material out of the cycle.**

3. Remove the radiator grille. (See 09-16-3 RADIATOR GRILLE REMOVAL/INSTALLATION.)

4. Remove in the order indicated in the table. Do not allow compressor oil to spill.



1	Cooler hose (LO) (See 07-11-9 Cooler Hose Removal Note.) (See 07-11-9 Refrigerant Line Removal Note.) (See 07-11-9 Refrigerant Line Installation Note.)
2	Cooler hose (HI) (See 07-11-9 Cooler Hose Removal Note.) (See 07-11-9 Refrigerant Line Removal Note.) (See 07-11-9 Refrigerant Line Installation Note.)
3	Cooler pipe (See 07-11-9 Refrigerant Line Removal Note.) (See 07-11-9 Refrigerant Line Installation Note.)

5. Install in the reverse order of removal.
6. Perform the refrigerant system performance test. (See 07-10-2 REFRIGERANT SYSTEM PERFORMANCE TEST.)

Cooler Hose Removal Note

WL-3 only

- Loosen the A/C compressor bolts, then slide the A/C compressor, and remove the cooler hose bolt from the A/C compressor.

Refrigerant Line Removal Note

- Loosen the nut by using two spanners, then remove the cooler pipe or hose.

Refrigerant Line Installation Note

1. When installing a new cooler pipe or hose, add FD46XG compressor oil into the refrigeration cycle.

   Supplemental amount
   - **Cooler hose (LO): 8 ml {8 cc, 0.3 fl oz}**
   - **Cooler hose (HI): 5 ml {5 cc, 0.2 fl oz}**
   - **Cooler pipe: 3 ml {3 cc, 0.1 fl oz}**

2. Apply compressor oil to the O-rings and connect the joints.
3. Tighten the joints.
   (1) Tighten the nut or bolt of the joint by hand.
   (2) Tighten the joint to the specified torque. If it is a nut joint, tighten the nut using a spanner and torque wrench.

07-40 CONTROL SYSTEM

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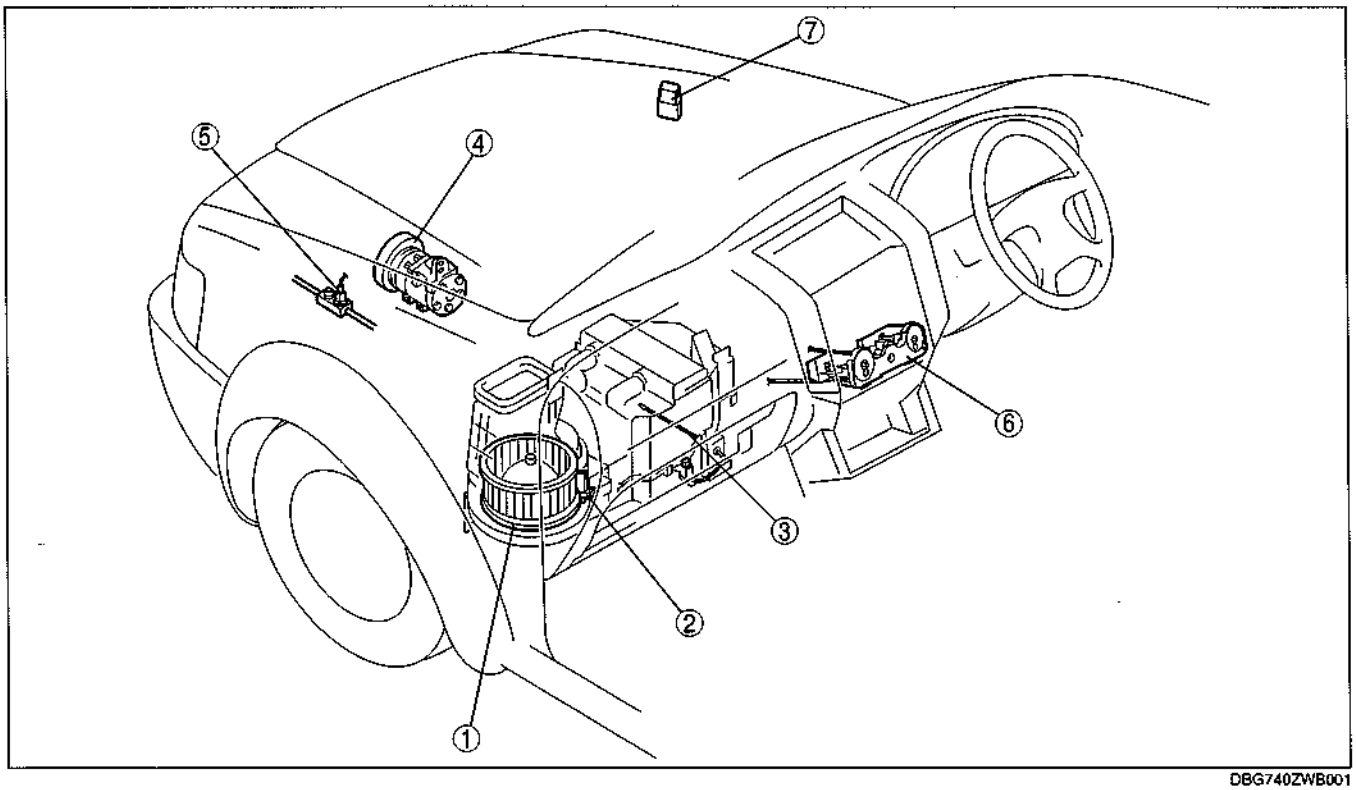


DBG740ZWB001

1	Blower motor (See 07-40-2 BLOWER MOTOR REMOVAL/INSTALLATION.) (See 07-40-2 BLOWER MOTOR INSPECTION.)
2	Resistor (See 07-40-3 RESISTOR REMOVAL/INSTALLATION.) (See 07-40-3 RESISTOR INSPECTION.)
3	Thermistor (See 07-40-5 THERMISTOR REMOVAL/INSTALLATION.) (See 07-40-5 THERMISTOR INSPECTION.)

4	Magnetic clutch (See 07-40-3 MAGNETIC CLUTCH DISASSEMBLY/ASSEMBLY.) (See 07-40-4 MAGNETIC CLUTCH ADJUSTMENT.) (See 07-40-5 MAGNETIC CLUTCH INSPECTION.)
5	Refrigerant pressure switch (See 07-40-6 REFRIGERANT PRESSURE SWITCH REMOVAL/INSTALLATION.) (See 07-40-6 REFRIGERANT PRESSURE SWITCH INSPECTION.)

6	Climate control unit (See 07-40-7 CLIMATE CONTROL UNIT REMOVAL.) (See 07-40-7 CLIMATE CONTROL UNIT INSTALLATION.) (See 07-40-8 CLIMATE CONTROL UNIT DISASSEMBLY/ASSEMBLY.) (See 07-40-8 CLIMATE CONTROL UNIT WIRE ADJUSTMENT.)

7	A/C relay

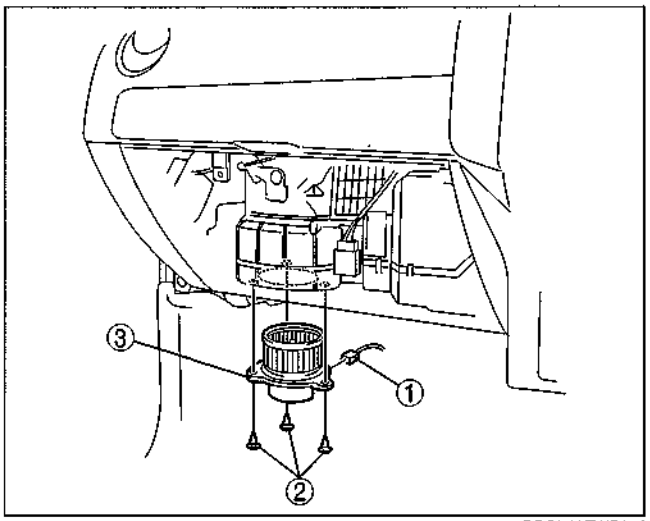
BLOWER MOTOR REMOVAL/INSTALLATION

dcf074061020w01

1. Disconnect negative battery cable.
2. Remove in the order indicated in the table.

1	Blower motor connector
2	Screw
3	Blower motor

3. Install in the reverse order of removal.



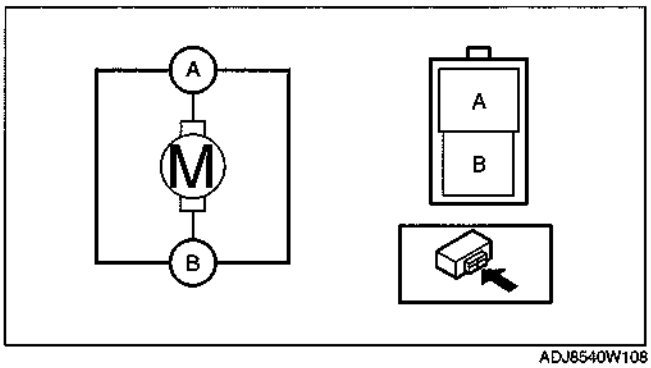
DBG740ZWB016

BLOWER MOTOR INSPECTION

dcf074061020w02

Connect battery positive voltage to blower motor terminal A, connect terminal B to ground, and then verify its operation.

- If there is any malfunction, replace the blower motor.



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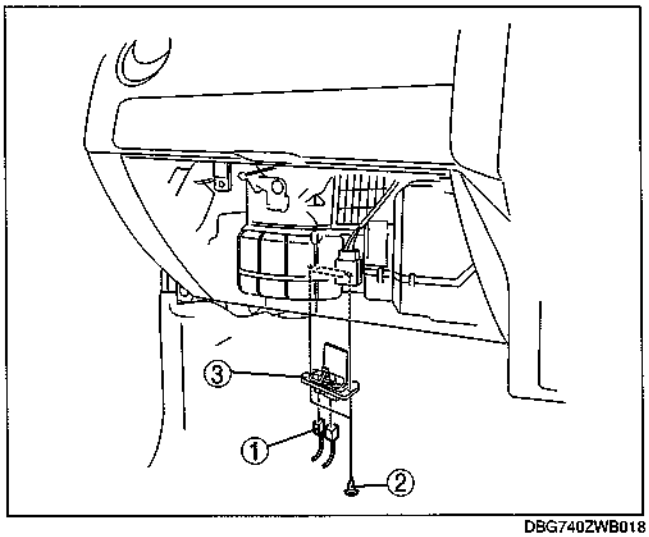
RESISTOR REMOVAL/INSTALLATION

dcf074061015w01

1. Disconnect the negative battery cable.
2. Remove in the order indicated in the table.

1	Resistor connector
2	Screw
3	Resistor

3. Install in the reverse order of removal.



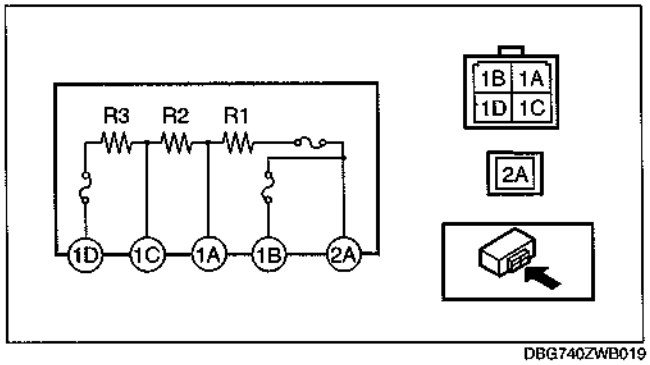
DBG740ZWB018

RESISTOR INSPECTION

dcf074061015w02

1. Verify that the resistance between the resistor terminals is as shown in the table.
   - If there is any malfunction, replace the resistor.

Terminal	Resistance (ohm)
1A—1B (2A)	R1: 0.43—0.47
1A—1C	R2: 1.04—1.16
1C—1D	R3: 1.47—1.63



DBG740ZWB019

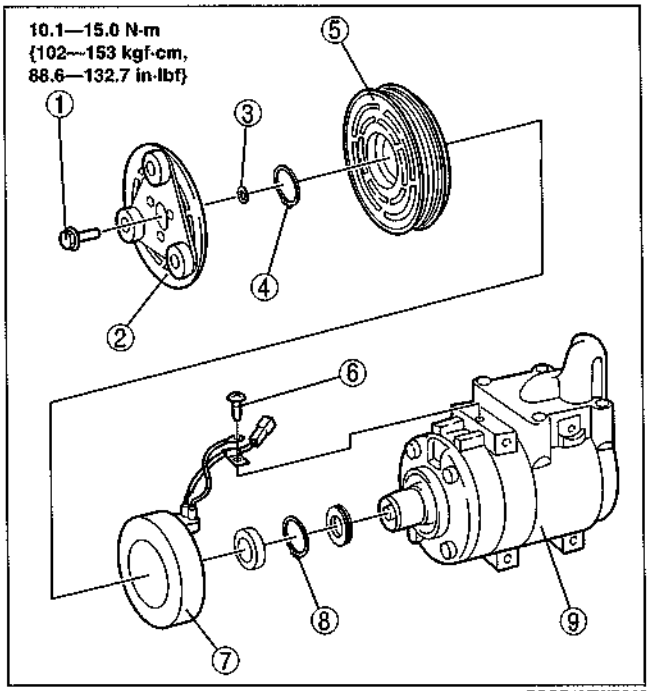
MAGNETIC CLUTCH DISASSEMBLY/ASSEMBLY

dcf074061010w01

1. Disassemble in the order indicated in the table.

1	Bolt (See 07-40-4 Bolt Removal/Installation Note.)
2	Pressure plate (See 07-40-4 Pressure Plate Installation Note.)
3	Shim
4	Snap ring
5	A/C compressor pulley
6	Screw
7	Stator (See 07-40-4 Stator Removal Note.) (See 07-40-4 Stator Installation Note.)
8	Snap ring
9	A/C compressor body

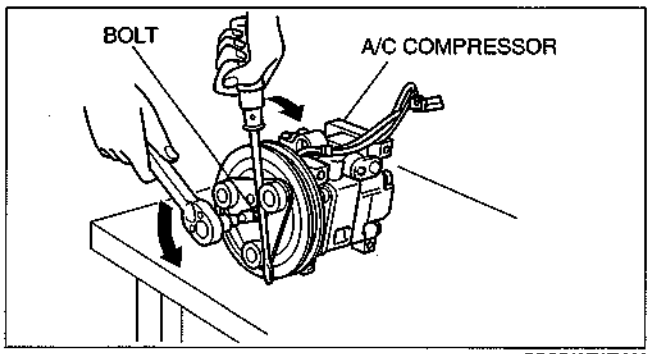
2. Assemble in the reverse order of disassembly.
3. Adjust the magnetic clutch clearance. (See 07-40-4 MAGNETIC CLUTCH ADJUSTMENT.)



DBG740ZWB002

Bolt Removal/Installation Note

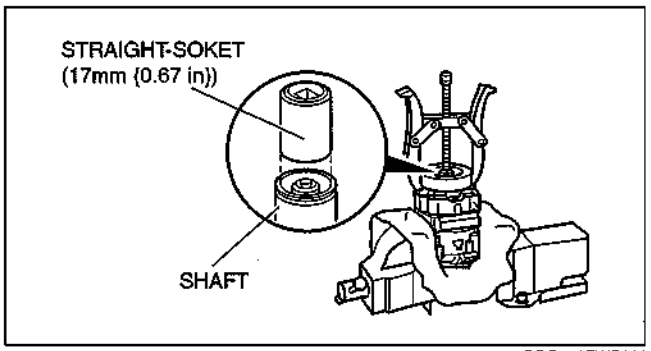
1. When removing or installing the bolt, hold the pressure plate in place as shown in the figure.
2. When installing a new A/C compressor body, replace the recommended bolt.



DBG740ZWB006

Stator Removal Note

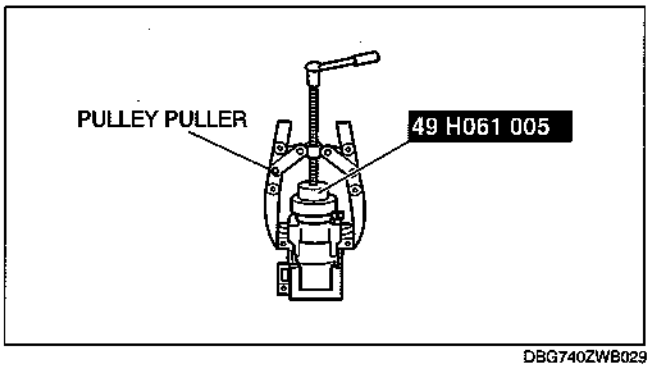
1. Set a straight-socket **(17 mm {0.67 in})** on the shaft of the A/C compressor to protect it.
2. Remove the stator using a pulley puller as shown in the figure.



DBG740ZWB028

Stator Installation Note

1. Install the stator perpendicularly using the **SST (49 H061 005)** and a pulley puller as shown in the figure.



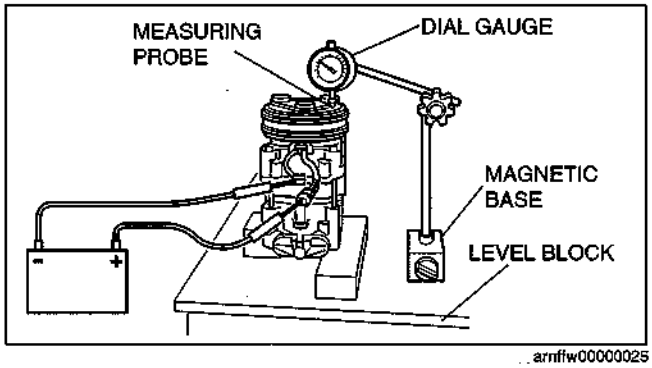
DBG740ZWB029

Pressure Plate Installation Note

1. When installing the pressure plate, carry out magnetic clutch clearance adjustment.

MAGNETIC CLUTCH ADJUSTMENT

1. Set the A/C compressor on a level block.
2. Turn on the magnetic clutch by connecting the battery voltage to the magnetic clutch connector terminal and the ground to the A/C compressor body.
3. Fix a dial gauge on a magnetic base and set the measuring probe onto point A on the pressure plate surface.
4. Turn off the magnetic clutch by disconnecting the ground from the A/C compressor body, then measure the dial gauge readings.



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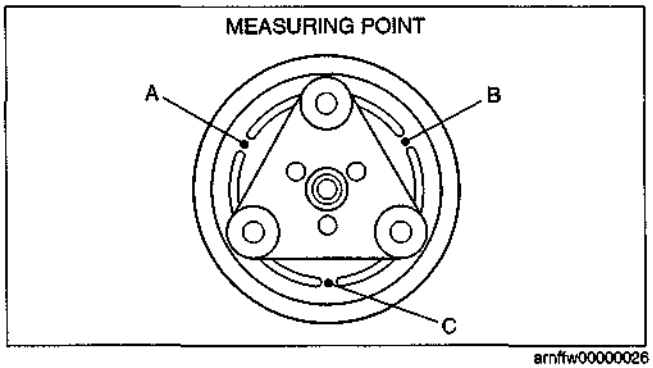
5. Measure the clearance for point B and C on the pressure plate surface by repeating the above steps 2 through 4.

   Clearance
   0.35—0.75 mm {0.014—0.029 in}



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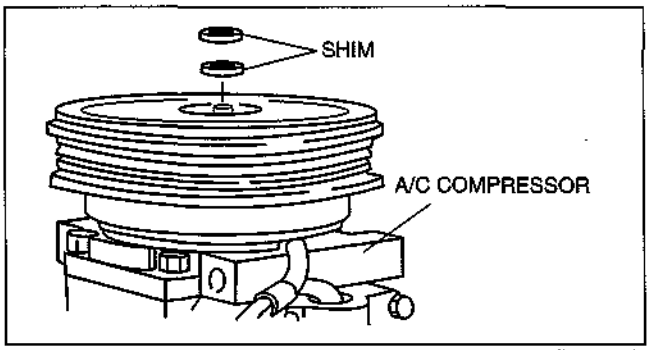
6. If the clearance is not as specified, adjust it by changing the shim.

   Note
   - **The seven shim sizes from 0.7 mm {0.028 in} to 1.3 mm {0.051 in} differ in 0.1 mm {0.004 in} increments.**



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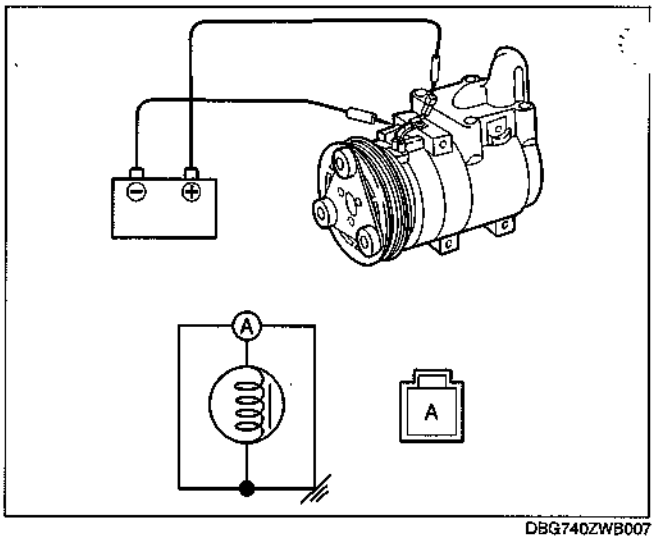
MAGNETIC CLUTCH INSPECTION

dcf074061010w03

1. Connect battery positive voltage to terminal A of magnetic clutch and the ground to A/C compressor body.
2. Verify that the magnetic clutch operates.
   - If there is any malfunction, replace the stator.



DBG740ZWB007

THERMISTOR REMOVAL/INSTALLATION

dcf074061022w01

1. Remove the thermistor from the cooling unit. (See 07-11-4 COOLING UNIT DISASSEMBLY/ASSEMBLY.)

THERMISTOR INSPECTION

dcf074061022w02

1. Disconnect the negative battery cable.
2. Remove the cooling unit. (See 07-11-3 COOLING UNIT REMOVAL/INSTALLATION.)
3. Remove the thermistor. (See 07-11-4 COOLING UNIT DISASSEMBLY/ASSEMBLY.)
4. Connect the negative battery cable.
5. Connect the thermistor connector to the wiring harness connector.
6. Turn the ignition switch to on position.
7. Turn the A/C switch on.
8. Turn the fan switch on.
9. Immerse the sensor part of thermistor in a container of ice water.
10. Verify that magnetic clutch operate as shown below.
    - If not as specified, replace the thermistor.

Water temperature	Differential	Magnetic clutch
0—3°C {32—37°F}	3—5°C {38—41°F}	OFF
13—17°C {34—62°F}	2—6°C {36—42°F}	OFF

REFRIGERANT PRESSURE SWITCH REMOVAL/INSTALLATION

dcf074061503w01

1. Disconnect the negative battery cable.
2. Discharge the refrigerant from the system. (See 07-10-3 RECOVERY.) (See 07-10-3 REFRIGERANT CHARGING.)

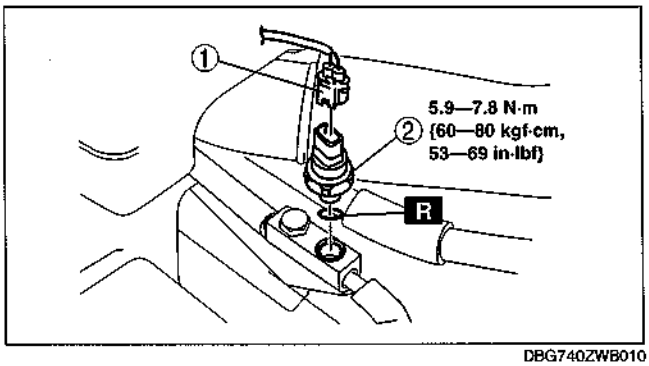
Caution

- **If moisture or foreign material enters the refrigeration cycle, cooling ability will be lowered and abnormal noise will occur. Always immediately plug all open fittings after removing any refrigeration cycle parts to keep moisture or foreign material out of the cycle.**

3. Remove in the order indicated in the table.

1	Refrigerant pressure switch connector
2	Refrigerant pressure switch

4. Install in the reverse order of removal.
5. Perform the refrigerant system performance test. (See 07-10-2 REFRIGERANT SYSTEM PERFORMANCE TEST.)



DBG740ZWB010

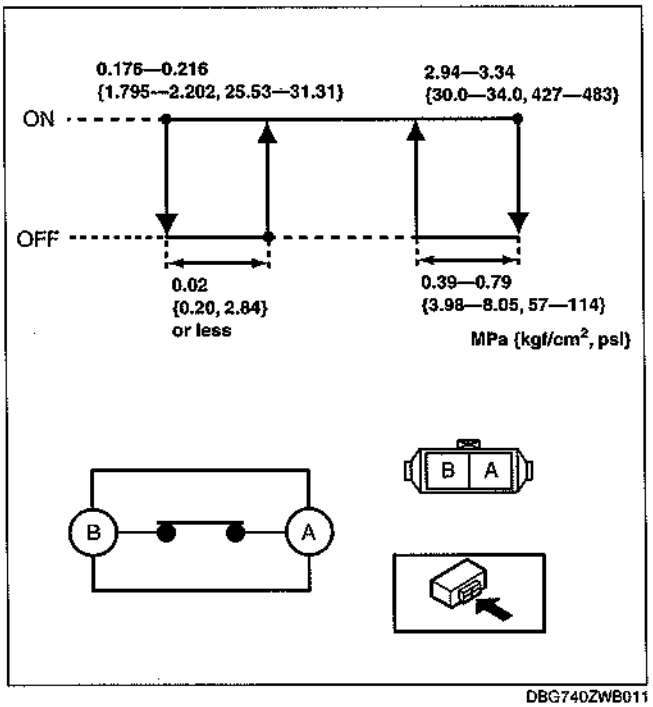
Refrigerant Pressure Switch Installation Note

1. Apply compressor oil to O-ring and connect the joint.

REFRIGERANT PRESSURE SWITCH INSPECTION

dcf074061503w02

1. Install the **SST** (gas charging set).
2. Disconnect the refrigerant pressure switch connector.
3. Verify the high-pressure side reading of the SST (manifold gauge) and continuity between the refrigerant pressure switch terminals.
   - If there is any malfunction, replace the refrigerant pressure switch.



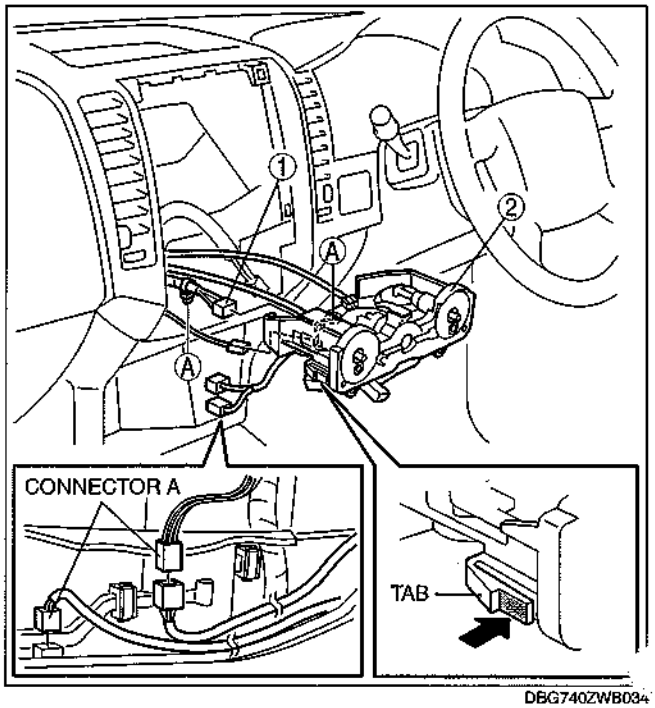
DBG740ZWB011

CLIMATE CONTROL UNIT REMOVAL

dcf074061190w01

1. Disconnect the negative battery cable.
2. Remove the glove compartment. (See 09-17-9 GLOVE COMPARTMENT REMOVAL/INSTALLATION.)
3. Remove the center panel module or audio unit. (See 09-20-3 CENTER PANEL UNIT REMOVAL/INSTALLATION [TYPE A].) (See 09-20-5 AUDIO UNIT REMOVAL/INSTALLATION [TYPE B].)
4. Disconnect the connector A.
5. Disconnect the air intake wire from the blower unit.
6. Disconnect the airflow mode wire from the air outlet duct.
7. Release the left and right tabs and remove in the order indicated in the table.

1	Connector B
2	Climate control unit

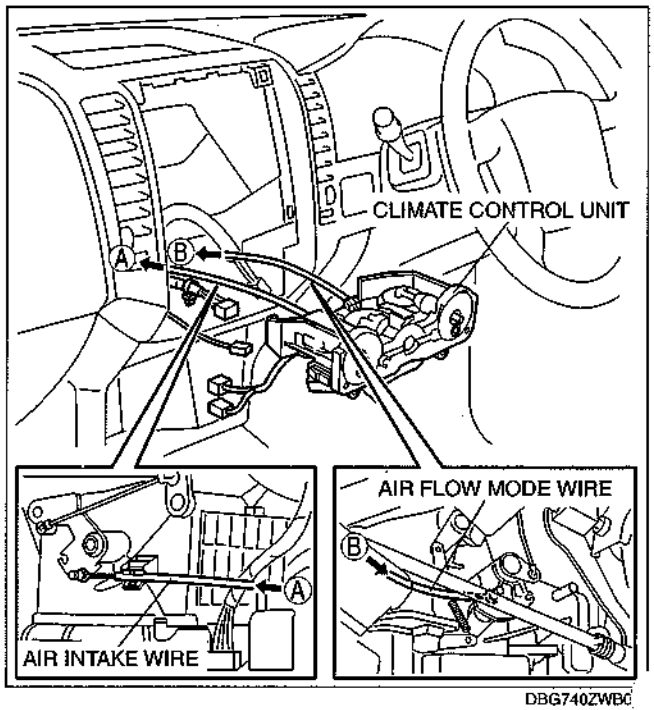


DBG740ZWB034

CLIMATE CONTROL UNIT INSTALLATION

dcf074061190w02

1. Connect the climate control unit connectors.
2. Insert the climate control unit until each clip clicks.
3. Adjust the climate control unit wire. (See 07-40-8 CLIMATE CONTROL UNIT WIRE ADJUSTMENT.)
4. Install the center panel module or audio unit. (See 09-20-3 CENTER PANEL UNIT REMOVAL/INSTALLATION [TYPE A].) (See 09-20-5 AUDIO UNIT REMOVAL/INSTALLATION [TYPE B].)
5. Install the glove compartment. (See 09-17-9 GLOVE COMPARTMENT REMOVAL/INSTALLATION.)
6. Connect the negative battery cable.



DBG740ZWB0

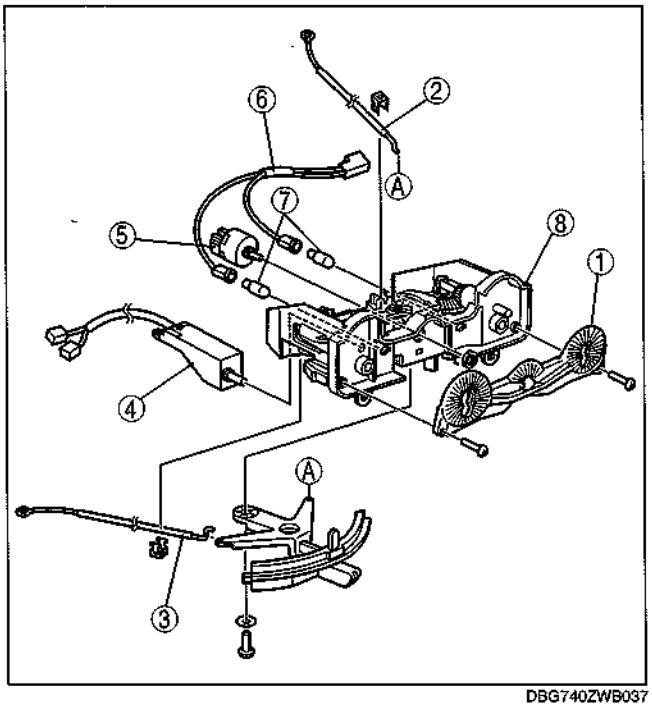
CLIMATE CONTROL UNIT DISASSEMBLY/ASSEMBLY

dcf074061190w03

1. Disassemble in the order indicated in the table.

1	Panel
2	Airflow mode wire
3	Air intake wire
4	A/C amplifier
5	Fan switch
6	Climate control unit harness
7	Illumination bulb
8	Body

2. Assemble in the reverse order of disassembly.



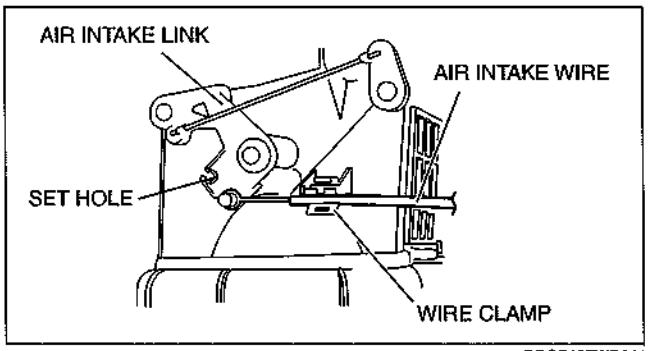
DBG740ZWB037

CLIMATE CONTROL UNIT WIRE ADJUSTMENT

dcf074061190w04

Air Intake Wire

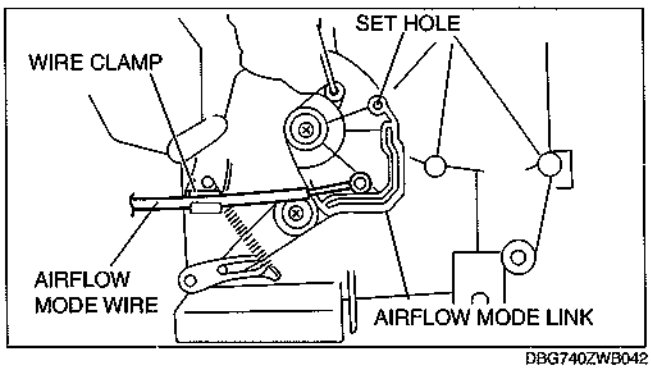
1. Set the REC/FRESH lever at REC.
2. Set the air intake link to REC in the direction of the arrow and insert a screwdriver into the set hole.
3. Connect the air intake wire to the air intake link.
4. Clamp the air intake wire to wire clamp.
5. Verify that the REC/FRESH lever moves its full stroke.



DBG740ZWB041

Airflow Mode Wire

1. Set the airflow mode control dial at DEFROSTER.
2. Set the airflow mode link to DEFROSTER in the direction of the arrow and insert a screwdriver into the set hole.
3. Connect the airflow mode wire to the airflow mode link.
4. Clamp the airflow mode wire to wire clamp.
5. Verify that the airflow mode control dial moves its full stroke.



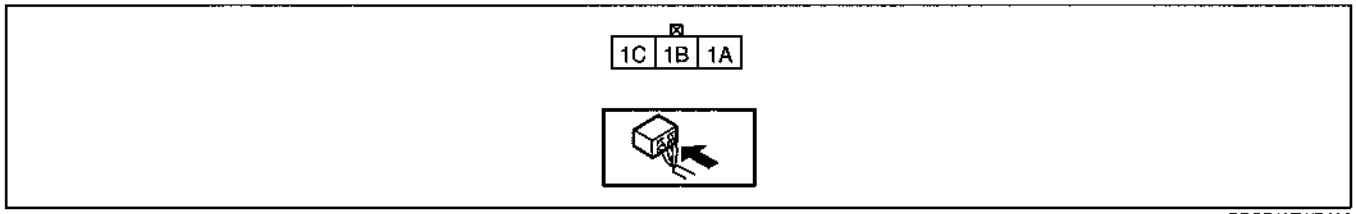
DBG740ZWB042

A/C AMPLIFIER INSPECTION

dcf074061190w05

1. Connect the A/C amplifier connector.
2. Turn the engine switch to the ON position.
3. Connect the negative (-) lead of the tester to body ground.
4. By inserting the positive (+) lead of the tester into each A/C amplifier terminal, measure the voltage according to the terminal voltage table.
   - If there is any malfunction, inspect the parts under "Inspection item (s)".
     — If the parts under "Inspection item (s)", replace the A/C amplifier.

Terminal Voltage Table

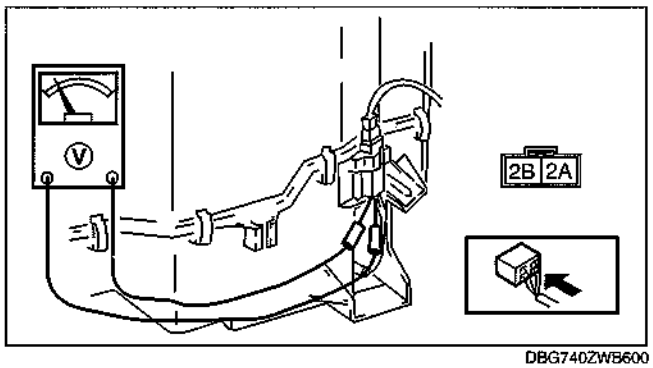


DBG740ZWB699

Terminal	Signal name	Connected to	Measurement condition	Voltage (V)	Inspection item (s)
1A	IG2	A/C2 10 A fuse	Engine switch at ON position	B+	• Inspect for continuity or short circuit (A/C amplifier—A/C2 10 A fuse:1A—A/C2 10 A fuse • Inspect A/C2 10 A fuse
			Engine switch at LOCK position	Below 1.0	• Inspect short circuit (A/C amplifier—A/C2 10 A fuse:1A—A/C2 10 A fuse)
1B	A/C	A/C relay	A/C switch OFF	B+	• Inspect or continuity or short circuit (A/C amplifier—A/C relay:1B—Inspect A/C relay
			A/C switch ON	Below 1.0	• Inspect terminal voltage of A/C amplifier (1A)
1C	GND	Ground	Under any condition	Below 1.0	• Inspect for continuity (A/C amplifier—ground:1C—GND)

Thermistor Side

1. Connect the thermistor connector.
2. Turn the engine switch to the ON position.
3. Turn the fan switch ON.
4. Turn the A/C switch ON.
5. Connect the positive (+) and negative (-) probes of the voltmeter to terminal 2A and terminal 2B of the thermistor respectively. (The wiring harness connector must be connected to the thermistor connector.)
6. If there is any malfunction, replace the A/C amplifier.

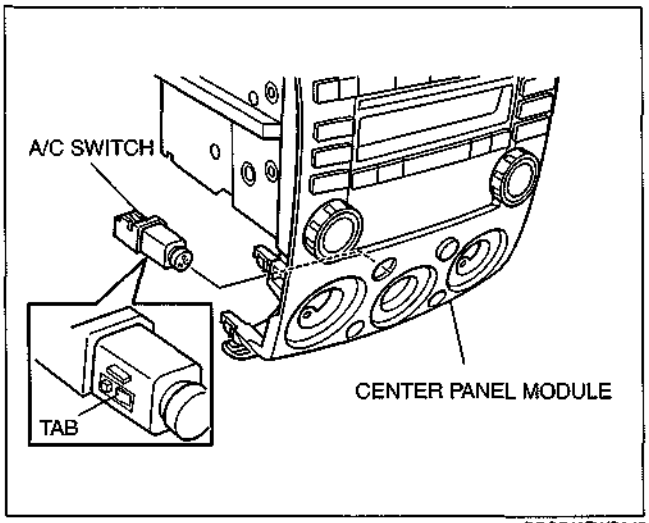


DBG740ZWB600

A/C SWITCH REMOVAL/INSTALLATION

dcf074061190w06

1. Disconnect the negative battery cable.
2. Remove the center panel module or audio unit. (See 09-20-3 CENTER PANEL UNIT REMOVAL/INSTALLATION [TYPE A].) (See 09-20-5 AUDIO UNIT REMOVAL/INSTALLATION [TYPE B].)
3. Disconnect the A/C switch connector.
4. Release the left and right tabs and remove the A/C switch as shown in the figure.
5. Install in the reverse order of removal.



DBG740ZWB045

A/C SWITCH INSPECTION

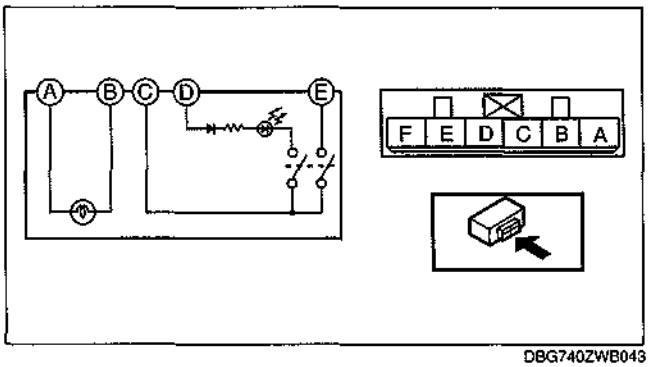
dcf074061190w07

1. Inspect for continuity between the A/C switch terminals using a tester.

: Bulb : Continuity

Switch position	Terminal				
	A	B	C	D	E
OFF	○	●	○		
ON	○	●	○	○	○

DBG740ZWB044



DBG740ZWB043

2. Connect battery positive voltage to terminal D and ground to the terminal C.
3. Turn the A/C switch on.
4. Verify that the LED illuminates.
   - If there is any malfunction, replace the A/C switch.

FAN SWITCH INSPECTION

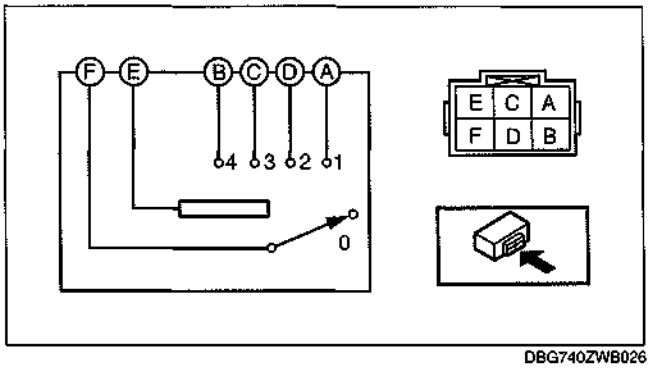
dcf074061050w01

1. Remove the climate control unit. (See 07-40-7 CLIMATE CONTROL UNIT REMOVAL.) (See 07-40-7 CLIMATE CONTROL UNIT INSTALLATION.)
2. Verify that the continuity between the fan switch terminals is as indicated in the table.
   - If there is any malfunction, replace the fan switch.

: Continuity

Switch position	Terminal					
	A	B	C	D	E	F
0						
1	○					○
2				○		○
3			○		○	○
4		○			○	○

DBG740ZWB025



DBG740ZWB026

07-50 TECHNICAL DATA

HVAC TECHNICAL DATA 07-50–1

HVAC TECHNICAL DATA

dcf075000000w01

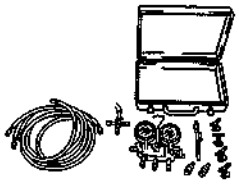
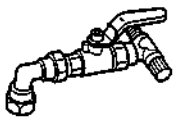
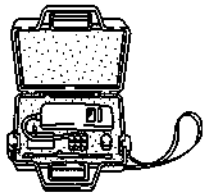
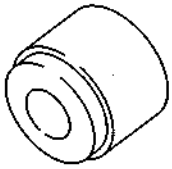
Item			Specification
REFRIGERANT SYSTEM			
Refrigerant	Type		R-134a
	Regular amount (approx. quantity) (g {oz})		550 {19.4}
BASIC SYSTEM			
A/C compressor	Lubrication oil	Type	FD46XG
		Sealed volume (approx. quantity) (ml {cc, fl oz})	180 {180, 6.08}
CONTROL SYSTEM			
A/C compressor	Magnetic clutch clearance (mm {in})		0.35—0.75 {0.014—0.029}

07-60 SERVICE TOOLS

HEATER, VENTILATION &
AIR CONDITIONING (HVAC) SST 07-60–1

HEATER, VENTILATION & AIR CONDITIONING (HVAC) SST

dcf076000000w01

49 C061 0A0B Gas Charge Set 	49 C061 012 Anti-back flow valve 	49 C061 013 Gas Leak Tester 
49 H061 005 Attachment 	—	—

07

RESTRAINTS

08 SECTION

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TROUBLESHOOTING. 08-03
AIR BAG SYSTEM 08-10
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SERVICE TOOLS 08-60

08-02 ON-BOARD DIAGNOSTIC

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FOREWORD

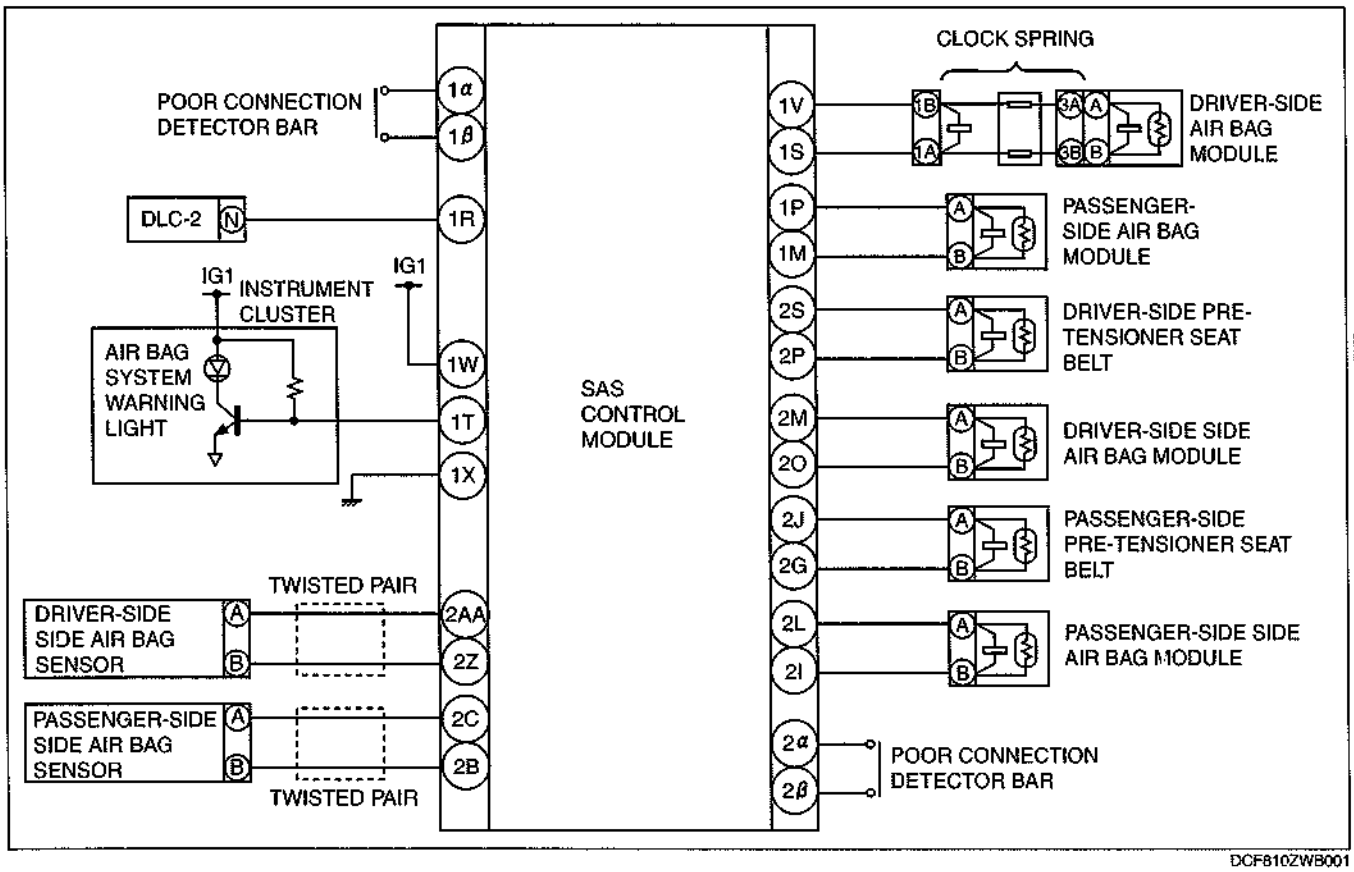
dcf080200000w01

Outline

- The OBD (on-board diagnostic) system has the following functions:
  - — Malfunction detection function: Detects malfunctions in the air bag system and outputs DTCs.
  - — Data monitor function: Reads out specific input/output signals and the system status.
- Diagnostic DTCs can be read/cleared using the current diagnostic tool.

AIR BAG SYSTEM WIRING DIAGRAM (ON-BOARD DIAGNOSTIC)

dcf080200000w02



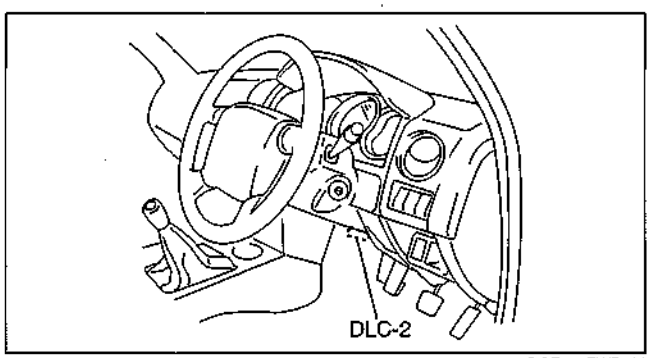
DCF810ZWB001

DTC DISPLAY

dcf080200000w03

Using WDS

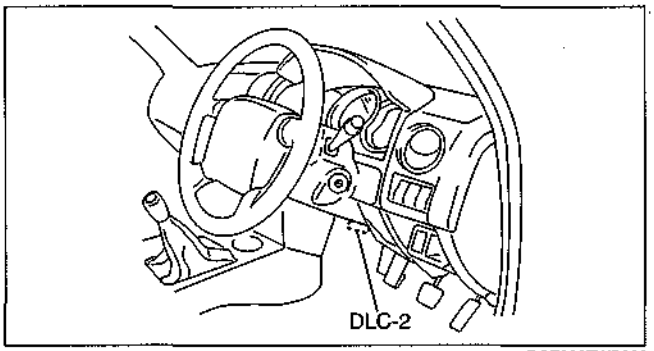
1. Connect the WDS to the DLC-2 connector.
2. Retrieve DTC using the WDS.



DCF802ZWB003

Using IDS/PDS

1. Connect the IDS/PDS to the DLC-2 connector.
2. After the vehicle is identified, select the following items from the initialization screen of the IDS/PDS.
   - When using the IDS (notebook PC)
     1. Select the "Toolbox" tab.
     2. Select "Self Test".
     3. Select "Module".
     4. Select "RCM".
   - When using the PDS (pocket PC)
     1. Select "Module Tests".
     2. Select "RCM".
     3. Select "Self Test".



DCF802ZWB003

3. Verify the DTC according to the directions on the screen.
   - If any DTCs are displayed, perform troubleshooting according to the corresponding DTC inspection.
4. After completion of repairs, clear all DTCs stored in the SAS control module. (See 08-02-2 CLEARING DTC.)

CLEARING DTC

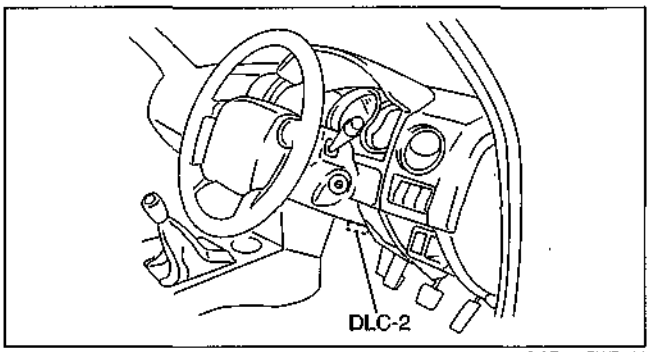
dcf080200000w04

Using WDS

1. After repairs have been made, perform the **DTCs reading procedure.**
2. Erase DTC using the WDS.
3. Ensure that the customer's concern has been resolved.

Using IDS/PDS

1. Connect the IDS/PDS to the DLC-2 connector.
2. After the vehicle is identified, select the following items from the initialization screen of the IDS/PDS.
   - When using the IDS (notebook PC)
     1. Select the "Toolbox" tab.
     2. Select "Self Test".
     3. Select "Module".
     4. Select "RCM".
   - When using the PDS (pocket PC)
     1. Select "Module Tests".
     2. Select "RCM".
     3. Select "Self Test".



DCF802ZWB003

3. Verify the DTC according to the directions on the screen.
4. Press the clear button on the DTC screen to clear the DTC.
5. Verify that no DTCs are displayed.

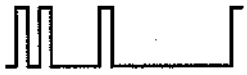
DTC TABLE

dcf080200000w05

- DTCs are common for present and past malfunction diagnosis.

Note
- When DTCs not shown in the DTC table are displayed, replace the SAS control module.
- If the air bag system warning light does not illuminate or remains illuminated when the engine switch is turned to the ON position, inspect and repair the air bag system warning light circuit, and then confirm that the air bag system warning light is operational.
- The air bag system warning light flashes the DTC pattern for five cycles, and then remains illuminated until the engine switch is turned to the LOCK position.

DTC				System malfunction location	Page
Current diagnostic tool display	Air bag system warning light				
	Flashing pattern		Priority ranking		
B1231	13		3	SAS control module activation (deployment) control freeze	(See 08-02-8 DTC B1231.)
B1317	—	Air bag system warning light is illuminated all the time	—	The SAS control module power supply voltage increases (16.1 V or more)	(See 08-02-8 DTC B1317, B1318.)
B1318	—	Air bag system warning light is illuminated all the time	—	The SAS control module power supply voltage decreases (less than 9 V)	(See 08-02-8 DTC B1317, B1318.)
B1342	12		2	SAS control module	(See 08-02-9 DTC B1342.)
	—	Air bag system warning light is illuminated all the time	1	SAS control module (air bag system warning light DTC 12 is displayed)	
B1869	—	Air bag system warning light is illuminated all the time	1	Air bag system warning light system circuit open	(See 08-02-10 DTC B1869, B1870.)
	—	Air bag system warning light dose not illuminate	—	Air bag system warning light system circuit short to ground	
B1870	—	Air bag system warning light is illuminated all the time	1	Air bag system warning light system circuit short to power supply	
B1877	33		10	Driver-side pre-tensioner seat belt circuit resistance high	(See 08-02-12 DTC B1877, B1878, B1879, B1885.)
B1878				Driver-side pre-tensioner seat belt circuit short to power supply	
B1879				Driver-side pre-tensioner seat belt circuit short to ground	
B1881	34		9	Passenger-side pre-tensioner seat belt circuit resistance high	(See 08-02-14 DTC B1881, B1882, B1883, B1886.)
B1882				Passenger-side pre-tensioner seat belt circuit short to power supply	
B1883				Passenger-side pre-tensioner seat belt circuit short to ground	
B1885	33		10	Driver-side pre-tensioner seat belt circuit resistance low	(See 08-02-12 DTC B1877, B1878, B1879, B1885.)

DTC				System malfunction location	Page
Current diagnostic tool display	Air bag system warning light				
	Flashing pattern		Priority ranking		
B1886	34		9	Passenger-side pre-tensioner seat belt circuit resistance low	(See 08-02-14 DTC B1881, B1882, B1883, B1886.)
B1913	19		8	Driver-side air bag module circuit short to body ground	(See 08-02-16 DTC B1913, B1916, B1932, B1934.)
	21		7	Passenger-side air bag module circuit short to body ground	(See 08-02-18 DTC B1913, B1925, B1933, B1935.)
B1916	19		8	Driver-side air bag module circuit short to power supply	(See 08-02-16 DTC B1913, B1916, B1932, B1934.)
B1925	21		7	Passenger-side air bag module circuit short to power supply	(See 08-02-18 DTC B1913, B1925, B1933, B1935.)
B1932	19		8	Driver-side air bag module circuit resistance high	(See 08-02-16 DTC B1913, B1916, B1932, B1934.)
B1933	21		7	Passenger-side air bag module circuit resistance high	(See 08-02-18 DTC B1913, B1925, B1933, B1935.)
B1934	19		8	Driver-side air bag module circuit resistance low	(See 08-02-16 DTC B1913, B1916, B1932, B1934.)
B1935	21		7	Passenger-side air bag module circuit resistance low	(See 08-02-18 DTC B1913, B1925, B1933, B1935.)
B1992	22		12	Driver-side side air bag module circuit short to power supply	(See 08-02-20 DTC B1992, B1993, B1994, B1995.)
B1993				Driver-side side air bag module circuit short to ground	
B1994				Driver-side side air bag module circuit resistance high	
B1995				Driver-side side air bag module circuit resistance low	
B1996	23		11	Passenger-side side air bag module circuit short to power supply	(See 08-02-22 DTC B1996, B1997, B1998, B1999.)
B1997				Passenger-side side air bag module circuit short to ground	
B1998				Passenger-side side air bag module circuit resistance high	
B1999				Passenger-side side air bag module circuit resistance low	
B2444	43		6	Driver-side side air bag sensor system (internal circuit disabled)	(See 08-02-24 DTC B2444, U2017.)

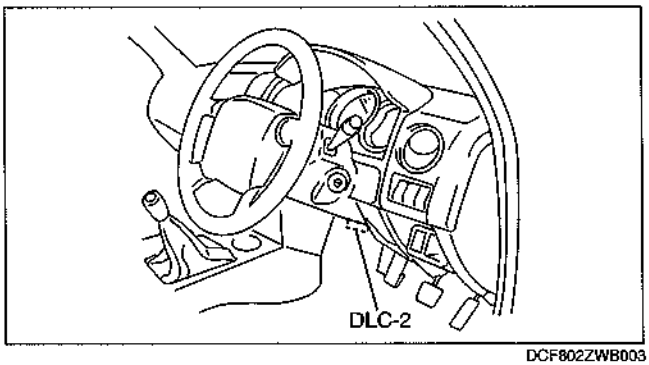
DTC				System malfunction location	Page
Current diagnostic tool display	Air bag system warning light				
	Flashing pattern		Priority ranking		
B2445	44		5	Passenger-side side air bag sensor system (internal circuit disabled)	(See 08-02-25 DTC B2445, U2018.)
B2867	31		4	Poor connection of any SAS control module connectors	(See 08-02-27 DTC B2867.)
U2017	43		6	Driver-side side air bag sensor (communication error)	(See 08-02-24 DTC B2444, U2017.)
U2018	44		5	Passenger-side side air bag sensor (communication error)	(See 08-02-25 DTC B2445, U2018.)

PID/DATA MONITOR DISPLAY

dcf080200000w06

Using WDS

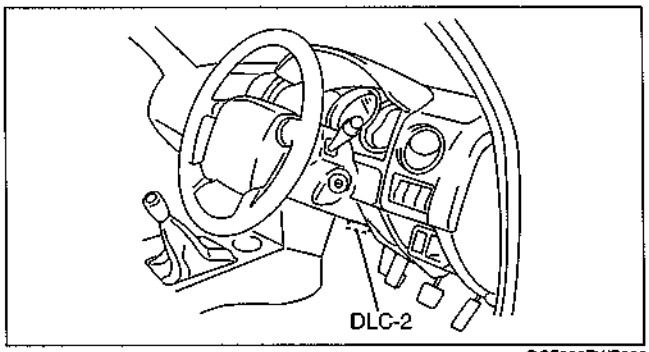
1. Connect the WDS to the DLC-2 connector.
2. Access and monitor PIDs using the WDS.



DCF802ZWB003

Using IDS/PDS

1. Connect the IDS/PDS to the DLC-2 connector.
2. After the vehicle is identified, select the following items from the initialization screen of the IDS/PDS.
   - When using the IDS (notebook PC)
     1. Select the "Toolbox" tab.
     2. Select "DataLogger".
     3. Select "Module".
     4. Select "RCM".
   - When using the PDS (pocket PC)
     1. Select "Module Tests".
     2. Select "RCM".
     3. Select "DataLogger".
3. Select the applicable PID from the PID table.
4. Verify the PID data according to the directions on the screen.



DCF802ZWB003

Note

- The PID data screen function is used for monitoring the calculated value. Therefore, if the monitored value of the output parts is not within the specification, inspection of the monitored value of input parts corresponding to applicable output part control is necessary.In addition, because the system does not display output part malfunction as abnormality in the monitored value, it is necessary to inspect the output part individually.

PID/DATA MONITOR TABLE

dcf080200000w07

PID name (definition)	Unit/condition	Condition/specification	terminal
CONT_RCM (Number of continuous DTC)	—	• DTC is detected: 1—255 • DTC is not detected: 0	—
CRSH_ST_D1 (Driver-side air bag sensor communication state)	OK/ FAULT	• Sensor normal: OK • Sensor communication error: FAULT	2Z, 2AA
CRSH_ST_D2 (Driver-side air bag sensor circuit state)	OK/ FAULT	• Sensor normal: OK • Sensor internal circuit error: FAULT	2Z, 2AA
CRSH_ST_P1 (Passenger-side air bag sensor communication state)	OK/ FAULT	• Sensor normal: OK • Sensor communication error: FAULT	2B, 2C
CRSH_ST_P2 (Passenger-side air bag sensor circuit state)	OK/ FAULT	• Sensor normal: OK • Sensor internal circuit error: FAULT	2B, 2C
D_PTENSFLT (Driver-side pre-tensioner seat belt circuit state)	SQ_LOWRES OPEN SHRT_B+ SHRT_GND Normal	• Air bag module circuit resistance low: SQ_LOWRES • Related wiring harness circuit resistance high: OPEN • Related wiring harness short to power supply: SHRT_B+ • Related wiring harness short to ground: SHRT_GND • Related wiring harness normal: Normal	2P, 2S
DABAGR (Driver-side air bag module resistance)	ohm	Under any condition: 1.5—3.7 ohms	1S, 1V
DR_PTENS (Driver-side pre-tensioner seat belt resistance)	ohm	Under any condition: 1.5—3.1 ohms	2P, 2S
DS_AB (Driver-side side air bag module resistance)	ohm	Under any condition: 1.4—3.2 ohms	2M, 2O
DS_AB_ST (Driver-side side air bag module circuit state)	SHRT_B+ SHRT_GND OPEN SQ_LOWRES Normal	• Related wiring harness short to power supply: SHRT_B+ • Related wiring harness short to ground: SHRT_GND • Related wiring harness circuit resistance high: OPEN • Air bag module circuit resistance low: SQ_LOWRES • Related wiring harness normal: Normal	2M, 2O
DS1_STAT (Driver-side air bag module circuit state)	SHRT_GND SHRT_B+ OPEN SQ_LOWRES Normal	• Related wiring harness short to ground: SHRT GND • Related wiring harness short to power supply: SHRT B+ • Related wiring harness circuit resistance high: OPEN • Air bag module circuit resistance low: SQ_LOWRES • Related wiring harness normal: Normal	1S, 1V
DSB_P_ST (On demand driver-side pre-tensioner seat belt circuit state)	SQ_LOWRES OPEN SHRT_B+ SHRT_GND Normal	• Air bag module circuit resistance low: SQ_LOWRES • Related wiring harness circuit resistance high: OPEN • Related wiring harness short to power supply: SHRT_B+ • Related wiring harness short to ground: SHRT_GND • Related wiring harness normal: Normal	2P, 2S
IG_V_2 (System IG1 voltage value)	V	Engine switch to ON position: B+	1W
OD_CRST_D1 (On demand driver-side side air bag sensor communication state)	OK/ FAULT	• Sensor normal: OK • Sensor communication error: FAULT	2Z, 2AA
OD_CRST_D2 (On demand driver-side side air bag sensor circuit state)	OK/ FAULT	• Sensor normal: OK • Sensor internal circuit error: FAULT	2Z, 2AA
OD_CRST_P1 (On demand passenger-side side air bag sensor communication state)	OK/ FAULT	• Sensor normal: OK • Sensor communication error: FAULT	2B, 2C
OD_CRST_P2 (On demand passenger-side side air bag sensor circuit state)	OK/ FAULT	• Sensor normal: OK • Sensor internal circuit error: FAULT	2B, 2C

PID name (definition)	Unit/condition	Condition/specification	terminal
OD_DAB1_ST (On demand driver-side air bag module circuit state)	SHRT_GND SHRT_B+ OPEN SQ_LOWRES Normal	• Related wiring harness short to ground: SHRT_GND • Related wiring harness short to power supply: SHRT_B+ • Related wiring harness circuit resistance high: OPEN • Air bag module circuit resistance low: SQ_LOWRES • Related wiring harness normal: Normal	1S, 1V
OD_DSAB_ST (On demand driver-side side air bag circuit state)	SHRT_B+ SHRT_GND OPEN SQ_LOWRES Normal	• Related wiring harness short to power supply: SHRT_B+ • Related wiring harness short to ground: SHRT_GND • Related wiring harness circuit resistance high: OPEN • Air bag module circuit resistance low: SQ_LOWRES • Related wiring harness normal: Normal	2M, 2O
OD_PAB1_ST (On demand passenger-side air bag module circuit state)	SHRT_GND SHRT_B+ OPEN SQ_LOWRES Normal	• Related wiring harness short to ground: SHRT_GND • Related wiring harness short to power supply: SHRT_B+ • Related wiring harness circuit resistance high: OPEN • Air bag module circuit resistance low: SQ_LOWRES • Related wiring harness normal: Normal	1M, 1P
OD_PSAB_ST (On demand passenger-side side air bag sensor circuit state)	SHRT_B+ SHRT_GND OPEN SQ_LOWRES Normal	• Related wiring harness short to power supply: SHRT_B+ • Related wiring harness short to ground: SHRT_GND • Related wiring harness circuit resistance high: OPEN • Air bag module circuit resistance low: SQ_LOWRES • Related wiring harness normal: Normal	2I, 2L
P_PTENSFLT (Passenger-side pre-tensioner seat belt circuit state)	SQ_LOWRES OPEN SHRT_B+ SHRT_GND Normal	• Air bag module circuit resistance low: SQ_LOWRES • Related wiring harness circuit resistance high: OPEN • Related wiring harness short to power supply: SHRT_B+ • Related wiring harness short to ground: SHRT_GND • Related wiring harness normal: Normal	2G, 2J
PABAGR (Passenger-side air bag module resistance)	ohm	Under any condition: 1.4—2.9 ohms	1M, 1P
PS_AB (Passenger-side side air bag module resistance)	ohm	Under any condition: 1.4—3.2 ohms	2I, 2L
PS_AB_ST (Passenger-side side air bag sensor circuit state)	SHRT_B+ SHRT_GND OPEN SQ_LOWRES Normal	• Related wiring harness short to power supply: SHRT_B+ • Related wiring harness short to ground: SHRT_GND • Related wiring harness circuit resistance high: OPEN • Air bag module circuit resistance low: SQ_LOWRES • Related wiring harness normal: Normal	2I, 2L
PS_PTENS (Passenger-side pre-tensioner seat belt resistance)	ohm	Under any condition: 1.5—3.1 ohms	2G, 2J
PS1_STAT (Passenger-side air bag module circuit state)	SHRT_GND SHRT_B+ OPEN SQ_LOWRES Normal	• Related wiring harness short to ground: SHRT_GND • Related wiring harness short to power supply: SHRT_B+ • Related wiring harness circuit resistance high: OPEN • Air bag module circuit resistance low: SQ_LOWRES • Related wiring harness normal: Normal	1M, 1P
PSB_P_ST (On demand passenger-side pre-tensioner seat belt circuit state)	SQ_LOWRES OPEN SHRT_B+ SHRT_GND Normal	• Air bag module circuit resistance low: SQ_LOWRES • Related wiring harness circuit resistance high: OPEN • Related wiring harness short to power supply: SHRT_B+ • Related wiring harness short to ground: SHRT_GND • Related wiring harness normal: Normal	2G, 2J

DTC B1231

dcf080200000w08

DTC B1231	SAS control module activation (deployment) control freeze
DETECTION CONDITION	**Warning** • **Detection conditions are for understanding the DTC outline before performing an inspection. Performing an inspection with only detection conditions may cause injury due to an operating error, or damage the system. When performing an inspection, always follow the inspection procedure.** • SAS control module determined collision

Diagnostic procedure

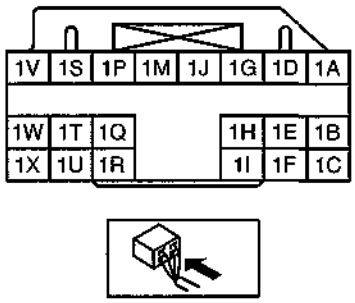
ACTION
Replace the SAS control module. (See 08-10-6 SAS CONTROL MODULE REMOVAL/INSTALLATION.)

DTC B1317, B1318

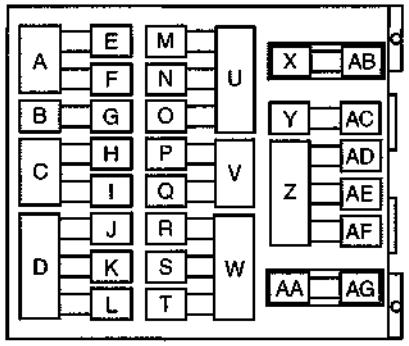
dcf080200000w09

DTC	B1317	SAS control module power supply voltage increases (16.1 V or more)
	B1318	SAS control module power supply voltage decreases (less than 9 V)
DETECTION CONDITION		**Warning** • **Detection conditions are for understanding the DTC outline before performing an inspection. Performing an inspection with only detection conditions may cause injury due to an operating error, or damage the system. When performing an inspection, always follow the inspection procedure.** • When the SAS control module power supply voltage is not **within 9—16 V**.
POSSIBLE CAUSE		• Open or short circuit in wiring harness between battery and SAS control module • ENGINE 15 A fuse malfunction • Battery malfunction • SAS control module malfunction

SAS CONTROL MODULE WIRING HARNESS-SIDE CONNECTOR



FUSE BLOCK



Diagnostic procedure

Step	Inspection		Action
1	**INSPECT FUSE** • Remove the ENGINE 15 A fuse. • Is the fuse normal?	Yes	Go to the next step.
		No	Replace the fuse.
2	**INSPECT BATTERY** • Measure the battery positive voltage. • Is the voltage **9 V—16 V**?	Yes	Go to the next step.
		No	The battery has a malfunction. Inspect the charge/discharge system.
3	**INSPECT WIRING HARNESS BETWEEN BATTERY AND FUSE BLOCK** • Turn the engine switch to the ON position. • Measure the fuse block terminal W voltage. • Is the voltage **9 V—16 V**?	Yes	Install the fuse, then go to the next step.
		No	Repair the wiring harness between the fuse block and engine switch.

Step	Inspection		Action
4	**INSPECT FUSE BLOCK** **Warning** • **Handling the air bag system components improperly can accidentally deploy the air bag modules and pre-tensioner seat belts, which may seriously injure you. Read the service warnings and cautions before handling the air bag system components.** **(See 08-10-2 SERVICE WARNINGS.)** **(See 08-10-3 SERVICE CAUTIONS.)** • Turn the engine switch to the LOCK position. • Disconnect the negative battery cable and wait for **1 min or more**. • Remove the column cover. • Disconnect the clock spring connector. • Remove the glove compartment. (Vehicles with passenger-side air bag) • Disconnect the passenger-side air bag module connector. (Vehicles with passenger-side air bag) • Disconnect the driver and passenger-side seat connectors. (Vehicles with side air bag) • Disconnect the driver and passenger-side pre-tensioner seat belt connectors. (Vehicle with pre-tensioner seat belt) • Remove the console. • Disconnect the all SAS control module connectors. • Turn the engine switch to the ON position. • Measure the SAS control module terminal 1W voltage. • Is the voltage **9 V—16 V**?	Yes	Replace the SAS control module. (See 08-10-6 SAS CONTROL MODULE REMOVAL/INSTALLATION.)
		No	Repair the wiring harness between the fuse block and SAS control module.

DTC B1342

dcf080200000w10

DTC B1342	SAS control module
DETECTION CONDITION	**Warning** • **Detection conditions are for understanding the DTC outline before performing an inspection. Performing an inspection with only detection conditions may cause injury due to an operating error, or damage the system. When performing an inspection, always follow the inspection procedure.** • Malfunction in the SAS control module internal circuit
POSSIBLE CAUSE	• SAS control module malfunction

Diagnostic procedure

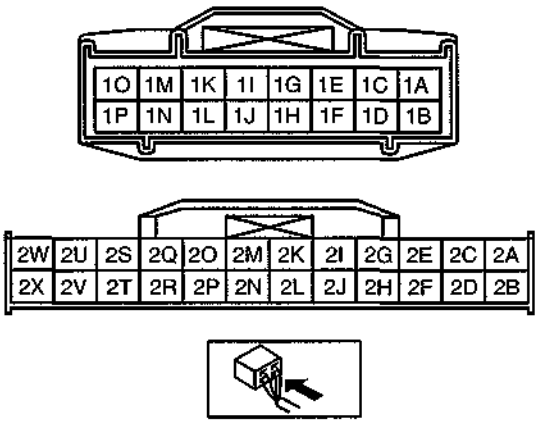
ACTION
Replace the SAS control module. (See 08-10-6 SAS CONTROL MODULE REMOVAL/INSTALLATION.)

DTC B1869, B1870

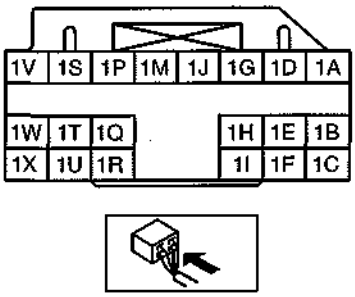
dcf080200000w11

DTC	B1869	**Air bag system warning light system circuit open or short to ground**
	B1870	**Air bag system warning light system circuit short to power supply**
DETECTION CONDITION		**Warning** • **Detection conditions are for understanding the DTC outline before performing an inspection. Performing an inspection with only detection conditions may cause injury due to an operating error, or damage the system. When performing an inspection, always follow the inspection procedure.** • Malfunction in air bag system warning light circuit
POSSIBLE CAUSE		• METER 15 A fuse malfunction • Instrument cluster malfunction • Malfunction of connectors between instrument cluster and SAS control module • Open or short circuit in wiring harness between METER 15 A fuse and instrument cluster • Open or short circuit in wiring harness between instrument cluster and SAS control module • SAS control module malfunction

INSTRUMENT CLUSTER HARNESS-SIDE CONNECTOR



SAS CONTROL MODULE HARNESS-SIDE CONNECTOR



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT METER 15 A FUSE** • Turn engine switch to LOCK position. • Disconnect the negative battery cable. • Remove the METER 15 A fuse. • Is fuse normal?	Yes	Reinstall the METER 15 A fuse, then go to the next step.
		No	Replace the METER 15 A fuse.
2	**INSPECT FOR CONTINUITY BETWEEN METER 15 A FUSE AND INSTRUMENT CLUSTER** • Connect the negative battery cable. • Turn engine switch to ON position. • Measure voltage at instrument cluster connector terminal 2C. • Is voltage **9 V or more**?	Yes	Go to the next step.
		No	Repair the wiring harness.

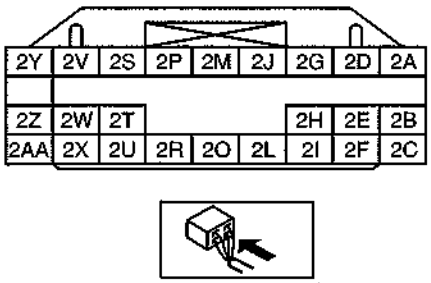
STEP	INSPECTION		ACTION
3	**INSPECT WIRING HARNESS BETWEEN INSTRUMENT CLUSTER AND SAS CONTROL MODULE** **Warning** • **Handling the air bag system components improperly can accidentally deploy the air bag modules and pre-tensioner seat belts, which may seriously injure you. Read the service warnings and cautions before handling the air bag system components.** **(See 08-10-2 SERVICE WARNINGS.)** **(See 08-10-3 SERVICE CAUTIONS.)** • Turn the engine switch to LOCK position. • Disconnect the negative battery cable and wait for **1 min or more**. • Remove the column cover. • Disconnect the clock spring connector. • Remove the glove compartment. (Vehicles with passenger-side air bag) • Disconnect the passenger-side air bag module connector. (Vehicles with passenger-side air bag) • Disconnect the driver and passenger-side seat connectors. (Vehicles with side air bag) • Disconnect the driver and passenger-side pre-tensioner seat belt connectors. (Vehicle with pre-tensioner seat belt) • Remove the console. • Disconnect the all SAS control module connectors. • Disconnect the instrument cluster. • Inspect following wiring harness between SAS control module and instrument cluster terminals for short to ground, short to power supply, and open circuit: — 1T—1H • Is wiring harness normal?	Yes	Go to the next step.
		No	Replace the air bag wiring harness.
4	**INSPECT AIR BAG SYSTEM WARNING LIGHT** • Connect instrument cluster. • Turn the engine switch to ON position. • Is air bag system warning light illuminated?	Yes	Go to the next step.
		No	Replace the instrument cluster. (See 09-22-2 INSTRUMENT CLUSTER REMOVAL/ INSTALLATION.)
5	**INSPECT AIR BAG SYSTEM WARNING LIGHT** • Using a jumper wire, cause a short circuit between instrument cluster terminal 1H and ground. • Does air bag system warning light go out?	Yes	Go to the next step.
		No	Replace the instrument cluster. (See 09-22-2 INSTRUMENT CLUSTER REMOVAL/ INSTALLATION.)
6	**INSPECT AIR BAG SYSTEM WARNING LIGHT** • Turn the engine switch to LOCK position. • Disconnect the negative battery cable and wait for **1 min or more**. • Connect the all SAS control module connectors. • Connect the driver and passenger-side pre-tensioner seat belt connectors. (Vehicle with pre-tensioner seat belt) • Connect the driver and passenger-side seat connectors. (Vehicles with side air bag) • Connect the passenger-side air bag module connector. (Vehicles with passenger-side air bag) • Connect the clock spring connector. • Turn the engine switch to ON position. • Verify that the air bag system warning light turns off **approx. 2 s** after illuminating for **approx. 6 s**. • Is the result normal?	Yes	The system is normal at present. (Clear the malfunction from the memory.)
		No	Replace the SAS control module. (See 08-10-6 SAS CONTROL MODULE REMOVAL/ INSTALLATION.)

DTC B1877, B1878, B1879, B1885

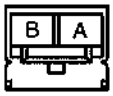
dcf080200000w12

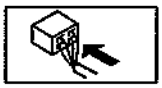
DTC	B1877	Driver-side pre-tensioner seat belt system resistance high
	B1878	Driver-side pre-tensioner seat belt system circuit short to power supply
	B1879	Driver-side pre-tensioner seat belt system circuit short to ground
	B1885	Driver-side pre-tensioner seat belt system resistance low
DETECTION CONDITION		**Warning** • **Detection conditions are for understanding the DTC outline before performing an inspection. Performing an inspection with only detection conditions may cause injury due to an operating error, or damage the system. When performing an inspection, always follow the inspection procedure.** • Resistance other than **1.5—3.1 ohms** detected in driver-side pre-tensioner seat belt circuit • Malfunction in the wiring harness between driver-side pre-tensioner seat belt and SAS control module
POSSIBLE CAUSE		• Open or short circuit in wiring harness between driver-side pre-tensioner seat belt and SAS control module • Driver-side pre-tensioner seat belt malfunction • SAS control module malfunction

SAS CONTROL MODULE WIRING HARNESS-SIDE CONNECTOR



DRIVER-SIDE PRE-TENSIONER SEAT BELT WIRING HARNESS-SIDE CONNECTOR





Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT DRIVER-SIDE PRE-TENSIONER SEAT BELT** • Using the current diagnostic tool, verify the following PID/DATA monitor. (See 08-02-6 PID/DATA MONITOR TABLE.) — DR_PTENS • Is the resistance of the driver-side pre-tensioner seat belt normal? — Resistance: **1.5—3.1 ohms**	Yes	Replace the SAS control module. (See 08-10-6 SAS CONTROL MODULE REMOVAL/ INSTALLATION.)
		No	Go to the next step.
2	**INSPECT DRIVER-SIDE PRE-TENSIONER SEAT BELT CONNECTOR** **Warning** • **Handling the air bag system components improperly can accidentally deploy the air bag modules and pre-tensioner seat belts, which may seriously injure you. Read the service warnings and cautions before handling the air bag system components. (See 08-10-2 SERVICE WARNINGS.) (See 08-10-3 SERVICE CAUTIONS.)** • Turn the engine switch to LOCK position. • Disconnect the negative battery cable and wait for **1 min or more**. • Disconnect the driver-side pre-tensioner seat belt connector. • Is there any malfunction of the driver-side pre-tensioner seat belt connector?	Yes	Replace the air bag wiring harness.
		No	Go to the next step.

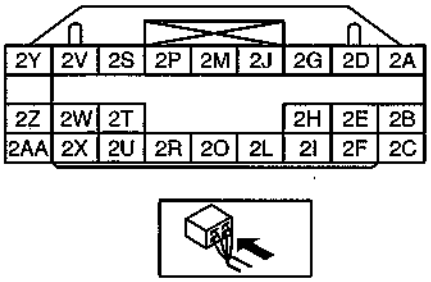
STEP	INSPECTION		ACTION
3	**VERIFY WHETHER MALFUNCTION IS IN DRIVER-SIDE PRE-TENSIONER SEAT BELT OR RELATED WIRING HARNESS** • Connect leads of **SST** (Fuel and thermometer checker) or apply **2-ohm** resistor to driver-side pre-tensioner seat belt connector terminal A and B. • Set resistance of **SST** (Fuel and thermometer checker) to the **2-ohm** position. • Connect the negative battery cable. • Turn the engine switch to ON position. • Are DTCs B1877, B1878, B1879, and/or B1885 indicated?	Yes	Go to the next step.
		No	Replace the driver-side pre-tensioner seat belt. (See 08-10-5 SIDE AIR BAG MODULE REMOVAL/ INSTALLATION.)
4	**INSPECT WIRING HARNESS BETWEEN DRIVER-SIDE PRE-TENSIONER SEAT BELT MODULE AND SAS CONTROL MODULE** • Turn the engine switch to the LOCK position. • Disconnect the negative battery cable and wait for **1 min or more.** • Disconnect the driver-side pre-tensioner seat belt connector. • Remove the console. • Disconnect the SAS control module connectors. • Inspect the wiring harness between SAS control module terminal 2S and driver-side pre-tensioner seat belt terminal A, SAS control module terminal 2P and driver-side pre-tensioner seat belt terminal B for the following: — Short to ground — Short to power supply — Open circuit • Is the wiring harness normal?	Yes	Go to the next step.
		No	Replace the air bag wiring harness.
5	**INSPECT AIR BAG SYSTEM WARNING LIGHT** • Connect the all SAS control module connectors. • Connect the driver and passenger-side pre-tensioner seat belt connectors. • Connect the negative battery cable. • Turn the engine switch to ON position. • Are DTCs B1877, B1878, B1879, and/or B1885 indicated?	Yes	Replace the SAS control module. (See 08-10-6 SAS CONTROL MODULE REMOVAL/ INSTALLATION.)
		No	The system is normal at present. (Clear the malfunction from the memory.)

DTC B1881, B1882, B1883, B1886

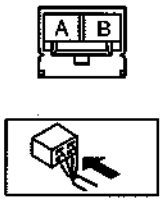
dcf080200000w13

DTC	B1881	**Passenger-side pre-tensioner seat belt circuit resistance high**
	B1882	**Passenger-side pre-tensioner seat belt circuit short to power supply**
	B1883	**Passenger-side pre-tensioner seat belt circuit short to body ground**
	B1886	**Passenger-side pre-tensioner seat belt circuit resistance low**
DETECTION CONDITION		**Warning** • **Detection conditions are for understanding the DTC outline before performing an inspection. Performing an inspection according to only the detection conditions may cause injury due to an operating error, or damage the system. When performing an inspection, always follow the inspection procedure.** • Resistance other than **1.5—3.1 ohms** detected in passenger-side pre-tensioner seat belt circuit • Malfunction in wiring harness between passenger-side pre-tensioner seat belt and SAS control module
POSSIBLE CAUSE		• Open or short circuit in wiring harness between passenger-side pre-tensioner seat belt and SAS control module • Passenger-side pre-tensioner seat belt malfunction • SAS control module malfunction

SAS CONTROL MODULE WIRING HARNESS-SIDE CONNECTOR



PASSENGER-SIDE PRE-TENSIONER SEAT BELT WIRING HARNESS-SIDE CONNECTOR



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT PASSENGER-SIDE PRE-TENSIONER SEAT BELT** • Using the current diagnostic tool, verify the following PID/DATA monitor. (See 08-02-6 PID/DATA MONITOR TABLE.) — PS_PTENS • Is the resistance of the passenger-side pre-tensioner seat belt normal? — Resistance: **1.5—3.1 ohms**	Yes	Replace the SAS control module. (See 08-10-6 SAS CONTROL MODULE REMOVAL/ INSTALLATION.)
		No	Go to the next step.
2	**INSPECT PASSENGER-SIDE PRE-TENSIONER SEAT BELT CONNECTOR** **Warning** • **Handling the air bag system components improperly can accidentally deploy the air bag modules and pre-tensioner seat belts, which may seriously injure you. Read the service warnings and cautions before handling the air bag system components. (See 08-10-2 SERVICE WARNINGS.) (See 08-10-3 SERVICE CAUTIONS.)** • Turn the engine switch to the LOCK position. • Disconnect the negative battery cable and wait for **1 min or more**. • Disconnect the passenger-side pre-tensioner seat belt connector. • Is there any malfunction of the passenger-side pre-tensioner seat belt connector?	Yes	Replace the air bag wiring harness.
		No	Go to the next step.

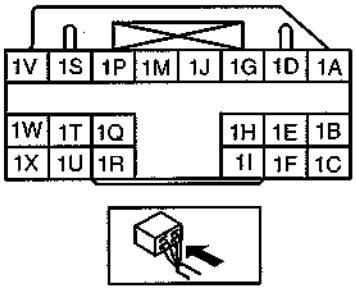
STEP	INSPECTION		ACTION
3	**VERIFY WHETHER MALFUNCTION IS IN PASSENGER-SIDE PRE-TENSIONER SEAT BELT OR RELATED WIRING HARNESS** • Connect the leads of the **SST** (Fuel and thermometer checker) or apply **2-ohm** resistance to passenger-side pre-tensioner seat belt connector terminals A and B. • Set the resistance of the **SST** (Fuel and thermometer checker) to the **2-ohm** position. • Connect the negative battery cable. • Turn the engine switch to the ON position. • Are DTCs B1881, B1882, B1883, and/or B1886 indicated?	Yes	Go to the next step.
		No	Replace the passenger-side pre-tensioner seat belt. (See 08-10-5 SIDE AIR BAG MODULE REMOVAL/ INSTALLATION.)
4	**INSPECT WIRING HARNESS BETWEEN PASSENGER-SIDE PRE-TENSIONER SEAT BELT MODULE AND SAS CONTROL MODULE** • Turn the engine switch to the LOCK position. • Disconnect the negative battery cable and wait for **1 min or more**. • Disconnect the driver-side pre-tensioner seat connector. • Remove the console. • Disconnect the SAS control module connectors. • Inspect the wiring harness between SAS control module terminal 2J and passenger-side pre-tensioner seat belt terminal A, SAS control module terminal 2G and passenger-side pre-tensioner seat belt terminal B for the following: — Short to ground — Short to power supply — Open circuit • Is the wiring harness normal?	Yes	Go to the next step.
		No	Replace the air bag wiring harness.
5	**INSPECT AIR BAG SYSTEM WARNING LIGHT** • Connect the all SAS control module connectors. • Connect the driver and passenger-side pre-tensioner seat belt connectors. • Connect the negative battery cable. • Turn the engine switch to ON position. • Are DTCs B1881, B1882, B1883, and/or B1886 indicated?	Yes	Replace the SAS control module. (See 08-10-6 SAS CONTROL MODULE REMOVAL/ INSTALLATION.)
		No	The system is normal at present. (Clear the malfunction from the memory.)

DTC B1913, B1916, B1932, B1934

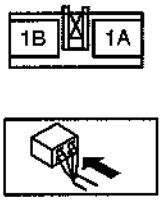
dcf080200000w14

DTC	B1913	**Driver-side air bag module system circuit short to ground**
	B1916	**Driver-side air bag module system circuit short to power supply**
	B1932	**Driver-side air bag module system resistance high**
	B1934	**Driver-side air bag module system resistance low**
DETECTION CONDITION		**Warning** • **Detection conditions are for understanding the DTC outline before performing an inspection. Performing an inspection with only detection conditions may cause injury due to an operating error, or damage the system. When performing an inspection, always follow the inspection procedure.** • resistance other than **1.5—3.7 ohms** detected in driver-side air bag module circuit • Malfunction in wiring harness between driver-side air bag module and SAS control module
POSSIBLE CAUSE		• Open or short circuit in wiring harness between clock spring and SAS control module • Clock spring malfunction • Driver-side air bag module malfunction • SAS control module malfunction

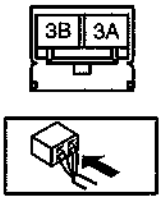
SAS CONTROL MODULE WIRING HARNESS-SIDE CONNECTOR



CLOCK SPRING WIRING HARNESS-SIDE CONNECTOR



DRIVER-SIDE AIR BAG MODULE WIRING HARNESS-SIDE CONNECTOR (CLOCK SPRING)



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT DRIVER-SIDE AIR BAG MODULE** • Using the current diagnostic tool, verify the following PID/DATA monitor. (See 08-02-6 PID/DATA MONITOR TABLE.) — DABAGR • Is the resistance of the driver-side air bag module normal? — Resistance: **1.5—3.7 ohms**	Yes	Replace the SAS control module. (See 08-10-6 SAS CONTROL MODULE REMOVAL/ INSTALLATION.)
		No	Go to the next step.
2	**INSPECT DRIVER-SIDE AIR BAG MODULE CONNECTOR (CLOCK SPRING)** **Warning** • **Handling the air bag system components improperly can accidentally deploy the air bag modules and pre-tensioner seat belts, which may seriously injure you. Read the service warnings and cautions before handling the air bag system components. (See 08-10-2 SERVICE WARNINGS.) (See 08-10-3 SERVICE CAUTIONS.)** • Turn the engine switch to LOCK position. • Disconnect the negative battery cable and wait for **1 min or more**. • Remove the driver-side air bag module. • Is there any malfunction of the driver-side air bag module connector?	Yes	Replace the air bag wiring harness and/or clock spring.
		No	Go to the next step.

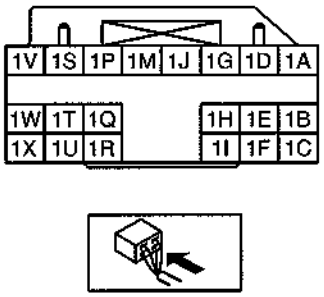
STEP	INSPECTION		ACTION
3	**VERIFY WHETHER MALFUNCTION IS IN DRIVER-SIDE AIR BAG MODULE OR RELATED WIRING HARNESS** • Connect the leads of **SST** (Fuel and thermometer checker) or apply **2-ohm** resistance to driver-side air bag module connector terminals 3A and 3B. • Set the resistance of **SST** (Fuel and thermometer checker) to **2-ohm** position. • Connect the negative battery cable. • Turn the engine switch to ON position. • Are DTCs B1913, B1916, B1932 and/or B1934?	Yes	Go to the next step.
		No	Replace the driver-side air bag module. (See 08-10-4 DRIVER-SIDE AIR BAG MODULE REMOVAL/INSTALLATION.)
4	**INSPECT CLOCK SPRING** • Inspect the clock spring. (See 08-10-8 CLOCK SPRING INSPECTION.) • Is the clock spring normal?	Yes	Go to the next step.
		No	Replace the clock spring. (See 08-10-7 CLOCK SPRING REMOVAL/INSTALLATION.)
5	**INSPECT WIRING HARNESS BETWEEN CLOCK SPRING AND SAS CONTROL MODULE** • Turn the engine switch to LOCK position. • Disconnect the negative battery cable and wait for **1 min or more.** • Remove the column cover. • Disconnect the clock spring connector. • Remove the glove compartment. • Disconnect the passenger-side air bag module connector. (Vehicles with passenger-side air bag) • Disconnect the driver and passenger-side seat connectors. (Vehicles with side air bag) • Disconnect the driver and passenger-side pre-tensioner seat belt connectors. (Vehicle with pre-tensioner seat belt) • Remove the console. • Disconnect the all SAS control module connectors. • Inspect the wiring harness between SAS control module terminal 1S and clock spring terminal 1A, SAS control module terminal 1V and clock spring terminal 1B for the following: — Short to ground — Short to power supply — Open circuit • Is the wiring harness normal?	Yes	Go to the next step.
		No	Replace the air bag wiring harness.
6	**INSPECT AIR BAG SYSTEM WARNING LIGHT** • Connect the all SAS control module connectors. • Connect the driver and passenger-side pre-tensioner seat belt connectors. (Vehicle with pre-tensioner seat belt) • Connect the driver and passenger-side seat connectors. (Vehicles with side air bag) • Connect the passenger-side air bag module connector. (Vehicles with passenger-side air bag) • Connect the clock spring connector. • Connect the negative battery cable. • Turn the engine switch to ON position. • Are DTCs B1913, B1916, B1932 and/or B1934?	Yes	Replace the SAS control module. (See 08-10-6 SAS CONTROL MODULE REMOVAL/INSTALLATION.)
		No	The system is normal at present. (Clear the malfunction from the memory.)

DTC B1913, B1925, B1933, B1935

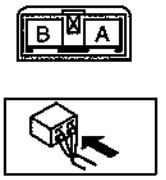
dcf080200000w15

DTC	B1913	Passenger-side air bag module circuit short to ground
	B1925	Passenger-side air bag module circuit short to power supply
	B1933	Passenger-side air bag module circuit resistance high
	B1935	Passenger-side air bag module circuit resistance low
DETECTION CONDITION		**Warning** • **Detection conditions are for understanding the DTC outline before performing an inspection. Performing an inspection according to only the detection conditions may cause injury due to an operating error, or damage the system. When performing an inspection, always follow the inspection procedure.** • Resistance other than **1.4—2.9 ohms** detected in passenger-side air bag module circuit • Malfunction in wiring harness between passenger-side air bag module and SAS control module
POSSIBLE CAUSE		• Open or short circuit in wiring harness between passenger-side air bag module and SAS control module • Passenger-side air bag module malfunction • SAS control module malfunction

SAS CONTROL MODULE WIRING HARNESS-SIDE CONNECTOR



PASSENGER-SIDE AIR BAG MODULE WIRING HARNESS-SIDE CONNECTOR



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT PASSENGER-SIDE AIR BAG MODULE** • Using the current diagnostic tool, verify the following PID/DATA monitor. (See 08-02-6 PID/DATA MONITOR TABLE.) — PABAGR • Is the resistance of the passenger-side air bag module normal? — Resistance: **1.4—2.9 ohms**	Yes	Replace the SAS control module. (See 08-10-6 SAS CONTROL MODULE REMOVAL/ INSTALLATION.)
		No	Go to the next step.
2	**INSPECT PASSENGER-SIDE AIR BAG MODULE CONNECTOR** **Warning** • **Handling the air bag system components improperly can accidentally deploy the air bag modules and pre-tensioner seat belts, which may seriously injure you. Read the service warnings and cautions before handling the air bag system components. (See 08-10-2 SERVICE WARNINGS.) (See 08-10-3 SERVICE CAUTIONS.)** • Turn the engine switch to the LOCK position. • Disconnect the negative battery cable and wait for **1 min or more**. • Remove the glove compartment. • Disconnect the passenger-side air bag module connector. • Is there any malfunction of the passenger-side air bag module connector?	Yes	Replace the air bag wiring harness.
		No	Go to the next step.

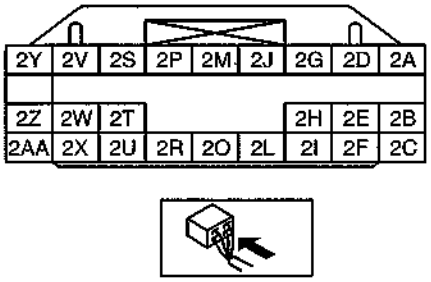
STEP	INSPECTION		ACTION
3	**VERIFY WHETHER MALFUNCTION IS IN PASSENGER-SIDE AIR BAG MODULE OR RELATED WIRING HARNESS** • Connect the leads of the **SST** (Fuel and thermometer checker) or apply **2-ohm** resistance to passenger-side air bag module connector terminals A and B. • Set the resistance of the **SST** (Fuel and thermometer checker) to the **2-ohm** position. • Connect the negative battery cable. • Turn the engine switch to the ON position. • Are DTCs B1913, B1925, B1933 and/or B1935 indicated?	Yes	Go to the next step.
		No	Replace the passenger-side air bag module. (See 08-10-5 PASSENGER-SIDE AIR BAG MODULE REMOVAL/INSTALLATION.)
4	**INSPECT WIRING HARNESS BETWEEN PASSENGER-SIDE AIR BAG MODULE AND SAS CONTROL MODULE** • Turn the engine switch to the LOCK position. • Disconnect the negative battery cable and wait for **1 min or more.** • Disconnect the passenger-side air bag module connector. • Remove the console. • Disconnect the SAS control module connectors. • Inspect the wiring harness between SAS control module terminal 1P and passenger-side air bag module terminal A, SAS control module terminal 1M and passenger-side air bag module terminal B for the following: — Short to ground — Short to power supply — Open circuit • Is the wiring harness normal?	Yes	Go to the next step.
		No	Replace the air bag wiring harness.
5	**INSPECT AIR BAG SYSTEM WARNING LIGHT** • Connect the all SAS control module connectors. • Connect the passenger-side air bag module connector. • Connect the negative battery cable. • Turn the engine switch to ON position. • Are DTCs B1913, B1925, B1933 and/or B1935 indicated?	Yes	Replace the SAS control module. (See 08-10-6 SAS CONTROL MODULE REMOVAL/INSTALLATION.)
		No	The system is normal at present. (Clear the malfunction from the memory.)

DTC B1992, B1993, B1994, B1995

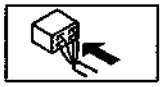
dcf080200000w16

DTC	B1992	**Driver-side side air bag module circuit short to power supply**
	B1993	**Driver-side side air bag module circuit short to ground**
	B1994	**Driver-side side air bag module circuit resistance high**
	B1995	**Driver-side side air bag module circuit resistance low**
DETECTION CONDITION		**Warning** • **Detection conditions are for understanding the DTC outline before performing an inspection. Performing an inspection according to only the detection conditions may cause injury due to an operating error, or damage the system. When performing an inspection, always follow the inspection procedure.** • Resistance other than **1.4—3.2 ohms** detected in driver-side side air bag module circuit • Malfunction in wiring harness between driver-side side air bag module and SAS control module
POSSIBLE CAUSE		• Open or short circuit in wiring harness between driver-side side air bag module and SAS control module • Driver-side side air bag module malfunction • SAS control module malfunction

SAS CONTROL MODULE WIRING HARNESS-SIDE CONNECTOR



DRIVER-SIDE SIDE AIR BAG MODULE WIRING HARNESS-SIDE CONNECTOR



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT DRIVER-SIDE SIDE AIR BAG MODULE** • Using the current diagnostic tool, verify the following PID/DATA monitor. (See 08-02-6 PID/DATA MONITOR TABLE.) — DS_AB • Is the resistance of the driver-side side air bag module normal? — Resistance: **1.4—3.2 ohms**	Yes	Replace the SAS control module. (See 08-10-6 SAS CONTROL MODULE REMOVAL/ INSTALLATION.)
		No	Go to the next step.
2	**INSPECT DRIVER-SIDE SIDE AIR BAG MODULE CONNECTOR** **Warning** • **Handling the air bag system components improperly can accidentally deploy the air bag modules and pre-tensioner seat belts, which may seriously injure you. Read the service warnings and cautions before handling the air bag system components. (See 08-10-2 SERVICE WARNINGS.) (See 08-10-3 SERVICE CAUTIONS.)** • Turn the engine switch to the LOCK position. • Disconnect the negative battery cable and wait for **1 min or more**. • Remove the driver-side side air bag module. • Disconnect the driver-side side air bag module connector. • Is there any malfunction of the driver-side side air bag module connector?	Yes	Replace the air bag wiring harness.
		No	Go to the next step.

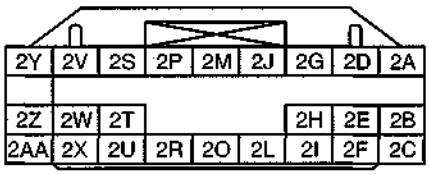
STEP	INSPECTION		ACTION
3	**VERIFY WHETHER MALFUNCTION IS IN DRIVER-SIDE SIDE AIR BAG MODULE OR RELATED WIRING HARNESS** • Connect the leads of the **SST** (Fuel and thermometer checker) or apply **2-ohm** resistance to driver-side side air bag module connector terminals A and B. • Set the resistance of the **SST** (Fuel and thermometer checker) to the **2-ohm** position. • Connect the negative battery cable. • Turn the engine switch to the ON position. • Are DTCs B1992, B1993, B1994, and/or B1995 indicated?	Yes	Go to the next step.
		No	Replace the driver-side side air bag module. (See 08-10-5 SIDE AIR BAG MODULE REMOVAL/ INSTALLATION.)
4	**INSPECT WIRING HARNESS BETWEEN DRIVER-SIDE SIDE AIR BAG MODULE AND SAS CONTROL MODULE** • Turn the engine switch to the LOCK position. • Disconnect the negative battery cable and wait for **1 min or more.** • Disconnect the driver-side side air bag module connector. • Remove the console. • Disconnect the SAS control module connectors. • Inspect the wiring harness between SAS control module terminal 2M and driver-side side air bag module terminal A, SAS control module terminal 2O and driver-side side air bag module terminal B for the following: — Short to ground — Short to power supply — Open circuit • Is the wiring harness normal?	Yes	Go to the next step.
		No	Replace the air bag wiring harness.
5	**INSPECT AIR BAG SYSTEM WARNING LIGHT** • Connect the all SAS control module connectors. • Connect the driver-side side air bag module connector. • Connect the negative battery cable. • Turn the engine switch to ON position. • Are DTCs B1992, B1993, B1994, and/or B1995 indicated?	Yes	Replace the SAS control module. (See 08-10-6 SAS CONTROL MODULE REMOVAL/ INSTALLATION.)
		No	The system is normal at present. (Clear the malfunction from the memory.)

DTC B1996, B1997, B1998, B1999

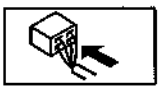
dcf080200000w17

DTC	B1996	**Passenger-side side air bag module circuit short to power supply**
	B1997	**Passenger-side side air bag module circuit short to ground**
	B1998	**Passenger-side side air bag module circuit resistance high**
	B1999	**Passenger-side side air bag module circuit resistance low**
DETECTION CONDITION		**Warning** • **Detection conditions are for understanding the DTC outline before performing an inspection. Performing an inspection according to only the detection conditions may cause injury due to an operating error, or damage the system. When performing an inspection, always follow the inspection procedure.** • Resistance other than **1.4—3.2 ohms** detected in passenger-side side air bag module circuit • Malfunction in wiring harness between passenger-side side air bag module and SAS control module
POSSIBLE CAUSE		• Open or short circuit in wiring harness between passenger-side side air bag module and SAS control module • Passenger-side side air bag module malfunction • SAS control module malfunction

SAS CONTROL MODULE WIRING HARNESS-SIDE CONNECTOR



PASSENGER-SIDE SIDE AIR BAG MODULE WIRING HARNESS-SIDE CONNECTOR



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT PASSENGER-SIDE SIDE AIR BAG MODULE** • Using the current diagnostic tool, verify the following PID/DATA monitor. (See 08-02-6 PID/DATA MONITOR TABLE.) — PS_AB • Is the resistance of the passenger-side side air bag module normal? — Resistance: **1.4—3.2 ohms**	Yes	Replace the SAS control module. (See 08-10-6 SAS CONTROL MODULE REMOVAL/ INSTALLATION.)
		No	Go to the next step.
2	**INSPECT PASSENGER-SIDE SIDE AIR BAG MODULE CONNECTOR** **Warning** • **Handling the air bag system components improperly can accidentally deploy the air bag modules and pre-tensioner seat belts, which may seriously injure you. Read the service warnings and cautions before handling the air bag system components. (See 08-10-2 SERVICE WARNINGS.) (See 08-10-3 SERVICE CAUTIONS.)** • Turn the engine switch to the LOCK position. • Disconnect the negative battery cable and wait for **1 min or more**. • Remove the passenger-side side air bag module. • Disconnect the passenger-side side air bag module connector. • Is there any malfunction of the passenger-side side air bag module connector?	Yes	Replace the air bag wiring harness.
		No	Go to the next step.

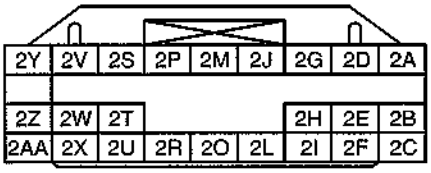
STEP	INSPECTION		ACTION
3	**VERIFY WHETHER MALFUNCTION IS IN PASSENGER-SIDE SIDE AIR BAG MODULE OR RELATED WIRING HARNESS** • Connect the leads of the **SST** (Fuel and thermometer checker) or apply **2-ohm** resistance to passenger-side side air bag module connector terminals A and B. • Set the resistance of the **SST** (Fuel and thermometer checker) to the **2-ohm** position. • Connect the negative battery cable. • Turn the engine switch to the ON position. • Are DTCs B1996, B1997, B1998 and/or B1999 indicated?	Yes	Go to the next step.
		No	Replace the passenger-side side air bag module. (See 08-10-5 SIDE AIR BAG MODULE REMOVAL/ INSTALLATION.)
4	**INSPECT WIRING HARNESS BETWEEN PASSENGER-SIDE SIDE AIR BAG MODULE AND SAS CONTROL MODULE** • Turn the engine switch to the LOCK position. • Disconnect the negative battery cable and wait for **1 min or more**. • Disconnect the passenger-side side air bag module connector. • Remove the console. • Disconnect the SAS control module connectors. • Inspect the wiring harness between SAS control module terminal 2L and passenger-side side air bag module terminal A, SAS control module terminal 2I and passenger-side side air bag module terminal B for the following: — Short to ground — Short to power supply — Open circuit • Is the wiring harness normal?	Yes	Go to the next step.
		No	Replace the air bag wiring harness.
5	**INSPECT AIR BAG SYSTEM WARNING LIGHT** • Connect the all SAS control module connectors. • Connect the passenger-side side air bag module connector. • Connect the negative battery cable. • Turn the engine switch to ON position. • Are DTCs B1996, B1997, B1998 and/or B1999 indicated?	Yes	Replace the SAS control module. (See 08-10-6 SAS CONTROL MODULE REMOVAL/ INSTALLATION.)
		No	The system is normal at present. (Clear the malfunction from the memory.)

DTC B2444, U2017

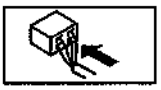
dcf080200000w18

DTC	B2444	**Driver-side side air bag sensor system internal circuit disabled**
	U2017	**Driver-side side air bag sensor system communication error**
DETECTION CONDITION		**Warning** • **Detection conditions are for understanding the DTC outline before performing an inspection. Performing an inspection according to only the detection conditions may cause injury due to an operating error, or damage the system. When performing an inspection, always follow the inspection procedure.** • Malfunction in wiring harness between driver-side side air bag sensor and SAS control module • Malfunction in driver-side side air bag sensor circuit
POSSIBLE CAUSE		• Open or short circuit in wiring harness between driver-side side air bag sensor and SAS control module • Driver-side side air bag sensor malfunction • SAS control module malfunction

SAS CONTROL MODULE WIRING HARNESS-SIDE CONNECTOR



DRIVER-SIDE SIDE AIR BAG SENSOR WIRING HARNESS-SIDE CONNECTOR



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT DRIVER-SIDE SIDE AIR BAG SENSOR CONNECTOR** **Warning** • **Handling the air bag system components improperly can accidentally deploy the air bag modules and pre-tensioner seat belts, which may seriously injure you. Read the service warnings and cautions before handling the air bag system components.** **(See 08-10-2 SERVICE WARNINGS.)** **(See 08-10-3 SERVICE CAUTIONS.)** • Turn the engine switch to the LOCK position. • Disconnect the negative battery cable and wait for **1 min or more**. • Disconnect the driver-side side air bag sensor connector. • Is there any malfunction of the driver-side side air bag sensor connector?	Yes	Replace the air bag wiring harness.
		No	Go to the next step.

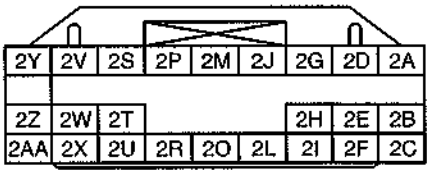
STEP	INSPECTION		ACTION
2	**INSPECT WIRING HARNESS BETWEEN DRIVER-SIDE SIDE AIR BAG SENSOR AND SAS CONTROL MODULE** • Turn the engine switch to the LOCK position. • Disconnect the negative battery cable and wait for **1 min or more**. • Remove the console. • Disconnect the SAS control module connector. • Disconnect the driver-side side air bag sensor connector. • Inspect the wiring harnesses between SAS control module terminal 2AA and driver-side side air bag sensor terminal A, SAS control module terminal 2Z and driver-side side air bag sensor terminal B for the following: — Short to ground — Short to power supply — Open circuit • Is the wiring harness normal?	Yes	Replace the driver-side side air bag sensor, then go to the next step. (See 08-10-6 SIDE AIR BAG SENSOR REMOVAL/ INSTALLATION.)
		No	Replace the air bag wiring harness.
3	**INSPECT SAS CONTROL MODULE** • Connect the SAS control module connector. • Connect the driver-side side air bag sensor connector. • Connect the negative battery cable. • Turn the engine switch to the ON position. • Are DTCs B2444, U2017 indicated?	Yes	Replace the SAS control module. (See 08-10-6 SAS CONTROL MODULE REMOVAL/ INSTALLATION.)
		No	DTC troubleshooting completed.

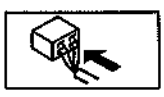
DTC B2445, U2018

dcf080200000w19

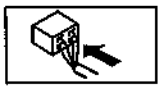
DTC		
	B2445	**Passenger-side side air bag sensor system internal circuit disabled**
	U2018	**Passenger-side side air bag sensor system communication error**
DETECTION CONDITION	**Warning** • **Detection conditions are for understanding the DTC outline before performing an inspection. Performing an inspection according to only the detection conditions may cause injury due to an operating error, or damage the system. When performing an inspection, always follow the inspection procedure.** • Malfunction in wiring harness between passenger-side side air bag sensor and SAS control module • Malfunction in passenger-side side air bag sensor circuit	
POSSIBLE CAUSE	• Open or short circuit in wiring harness between passenger-side side air bag sensor and SAS control module • Passenger-side side air bag sensor malfunction • SAS control module malfunction	

SAS CONTROL MODULE WIRING HARNESS-SIDE CONNECTOR





PASSENGER-SIDE SIDE AIR BAG SENSOR WIRING HARNESS-SIDE CONNECTOR



Diagnostic procedure

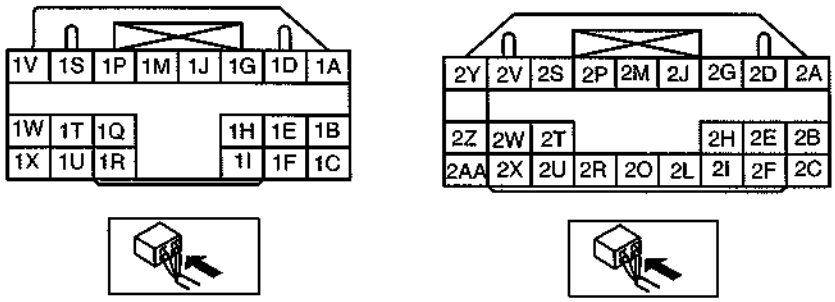
STEP	INSPECTION		ACTION
1	**INSPECT PASSENGER-SIDE SIDE AIR BAG SENSOR CONNECTOR** **Warning** • **Handling the air bag system components improperly can accidentally deploy the air bag modules and pre-tensioner seat belts, which may seriously injure you. Read the service warnings and cautions before handling the air bag system components. (See 08-10-2 SERVICE WARNINGS.) (See 08-10-3 SERVICE CAUTIONS.)** • Turn the engine switch to the LOCK position. • Disconnect the negative battery cable and wait for **1 min or more**. • Disconnect the passenger-side side air bag sensor connector. • Is there any malfunction of the passenger-side side air bag sensor connector?	Yes	Replace the air bag wiring harness.
		No	Go to the next step.
2	**INSPECT WIRING HARNESS BETWEEN PASSENGER-SIDE SIDE AIR BAG SENSOR AND SAS CONTROL MODULE** • Turn the engine switch to the LOCK position. • Disconnect the negative battery cable and wait for **1 min or more**. • Remove the console. • Disconnect the SAS control module connector. • Disconnect the passenger-side side air bag sensor connector. • Inspect the wiring harnesses between SAS control module terminal 2C and passenger-side side air bag sensor terminal A, SAS control module terminal 2B and passenger-side side air bag sensor terminal B for the following: — Short to ground — Short to power supply — Open circuit • Is the wiring harness normal?	Yes	Replace the passenger-side side air bag sensor, then go to the next step. (See 08-10-6 SIDE AIR BAG SENSOR REMOVAL/ INSTALLATION.)
		No	Replace the air bag wiring harness.
3	**INSPECT SAS CONTROL MODULE** • Connect the SAS control module connector. • Connect the passenger-side side air bag sensor connector. • Connect the negative battery cable. • Turn the engine switch to the ON position. • Are DTCs B2445, U2018 indicated?	Yes	Replace the SAS control module. (See 08-10-6 SAS CONTROL MODULE REMOVAL/ INSTALLATION.)
		No	DTC troubleshooting completed.

DTC B2867

dcf080200000w20

DTC B2867	SAS control module connector poor connection
DETECTION CONDITION	**Warning** • **Detection conditions are for understanding the DTC outline before performing an inspection. Performing an inspection with only detection conditions may cause injury due to an operating error, or damage the system. When performing an inspection, always follow the inspection procedure.** • There is no continuity between poor connection detector bar terminals of SAS control module.
POSSIBLE CAUSE	• Poor connection of any SAS control module connectors • Malfunction of any SAS control module connectors • SAS control module malfunction

SAS CONTROL MODULE WIRING HARNESS-SIDE CONNECTOR



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY THAT ALL SAS CONTROL MODULE CONNECTORS ARE CONNECTED WITH SAS CONTROL MODULE** **Warning** • **Handling the air bag system components improperly can accidentally deploy the air bag modules and pre-tensioner seat belts, which may seriously injure you. Read the service warnings and cautions before handling the air bag system components.** **(See 08-10-2 SERVICE WARNINGS.)** **(See 08-10-3 SERVICE CAUTIONS.)** • Turn engine switch to LOCK position. • Disconnect the negative battery cable and wait for **1 min or more**. • Remove the console. • Are all SAS control module connectors securely connected?	Yes	Go to the next step.
		No	Reconnect connector properly.

STEP	INSPECTION		ACTION
2	**INSPECT ALL SAS CONTROL MODULE CONNECTORS** • Remove the column cover. • Disconnect the clock spring connector. • Remove the glove compartment. • Disconnect the passenger-side air bag module connector. • Disconnect the driver and passenger-side side air bag module connectors. (Vehicles with side air bag) • Disconnect the driver and passenger-side seat connectors. (Vehicles with side air bag) • Disconnect the driver and passenger-side pre-tensioner seat belt connectors. (Vehicle with pre-tensioner seat belt) • Remove the console. • Disconnect the all SAS control module connectors. • Are poor connection detector bars of all SAS control module connectors normal?	Yes	Replace the SAS control module. (See 08-10-6 SAS CONTROL MODULE REMOVAL/ INSTALLATION.)
		No	Replace wiring harnesses.

08-03 SYMPTOM TROUBLESHOOTING

AIR BAG SYSTEM 08-03–1
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AIR BAG SYSTEM

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Troubleshooting Index

- Use the chart below verify the symptoms of the trouble in order to diagnose the appropriate area.

No.	Troubleshooting item	Description	Page
1	Air bag system warning light does not illuminate.	Malfunction in air bag system warning light circuit (short to ground).	(See 08-03-1 NO.1 AIR BAG SYSTEM WARNING LIGHT DOES NOT ILLUMINATE)
2	Air bag system warning light is illuminated constantly.	Malfunction in air bag system warning light circuit (open circuit or short to power supply).	(See 08-03-3 NO.2 AIR BAG SYSTEM WARNING LIGHT ILLUMINATES CONSTANTLY)

AIR BAG SYSTEM WIRING DIAGRAM (SYMPTOM TROUBLESHOOTING)

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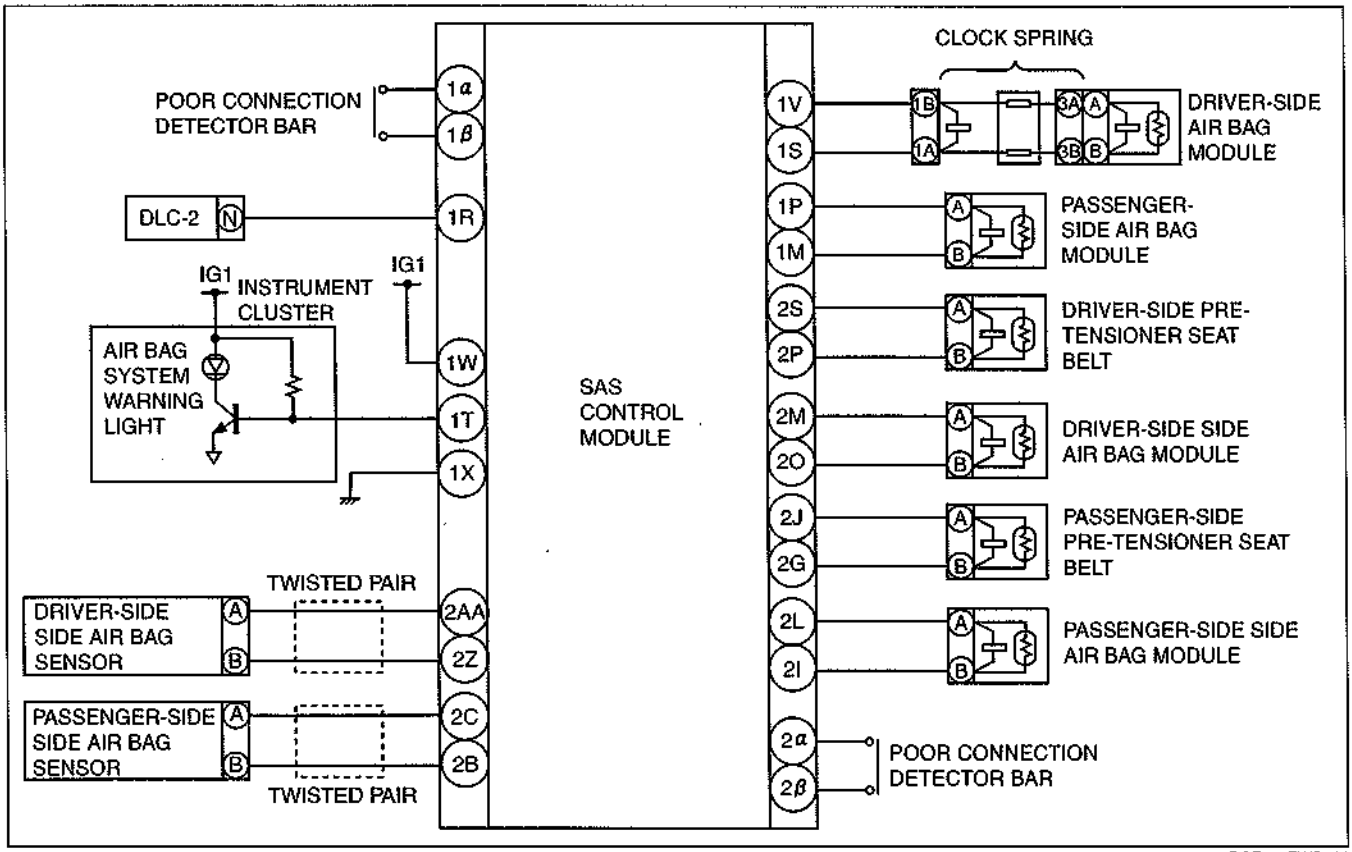

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NO.1 AIR BAG SYSTEM WARNING LIGHT DOES NOT ILLUMINATE

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1	**Air bag system warning light does not illuminate.**
DETECTION CONDITION	Malfunction in air bag system warning light circuit (short to ground)
POSSIBLE CAUSE	• SAS control module malfunction • Instrument cluster (circuit board) malfunction • Short to ground circuit in wiring harness between instrument cluster and SAS control module

Diagnostic Procedure

- When performing an asterisked (*) troubleshooting inspection, slightly shake the wiring harness and connectors while performing the inspection to discover whether poor contact points are the cause of any intermittent malfunction. If there is a problem, verify that connectors, terminals and wiring harness are connected correctly and undamaged.

STEP	INSPECTION		ACTION
1	**INSPECT OTHER WARNING AND INDICATOR LIGHTS CIRCUIT IN INSTRUMENT CLUSTER** • Turn the engine switch to the ON position. • Do other warning and indicator lights illuminate?	Yes	Turn the engine switch to the LOCK position, then go to the next step.
		No	Inspect instrument cluster power supply system and ground system the, then go to Step 4.
2	**INSPECT SAS CONTROL MODULE** **Warning** • **Handling the air bag system components improperly can accidentally deploy the air bag modules and pre-tensioner seat belts, which may seriously injure you. Read the air bag system service warnings and cautions before handling the air bag system components. (See 08-10-2 SERVICE WARNINGS.) (See 08-10-3 SERVICE CAUTIONS.)** • Turn the engine switch to LOCK position. • Disconnect the negative battery cable and wait for **1 min or more**. • Remove the column cover. • Disconnect the clock spring connector. • Remove the glove compartment. • Disconnect the passenger-side air bag module connector. • Disconnect the driver and passenger-side seat connectors. • Disconnect the driver- and passenger-side pre-tensioner seat belt connectors. • Remove the console. • Disconnect all SAS control module connectors. • Connect the negative battery cable. • Turn the engine switch to ON position. • Does the air bag system warning light illuminate?	Yes	Replace the SAS control module, then go to Step 4. (See 08-10-6 SAS CONTROL MODULE REMOVAL/ INSTALLATION.)
		No	Go to the next step.
*3	**INSPECT WIRING HARNESS BETWEEN SAS CONTROL MODULE AND INSTRUMENT CLUSTER FOR SHORT TO GROUND** • Turn the engine switch to LOCK position. • Disconnect the negative battery cable. • Disconnect the instrument cluster connector. • Is there continuity between terminal 1H of the instrument cluster connector and ground?	Yes	Replace the wiring harness, then go to Step 4.
		No	Replace the instrument cluster, then go to the next step. (See 09-22-2 INSTRUMENT CLUSTER REMOVAL/ INSTALLATION.)
4	**CONFIRM THAT MALFUNCTION SYMPTOMS DO NOT RECUR AFTER REPAIR** • Turn the engine switch to LOCK position. • Disconnect the negative battery cable and wait for **1 min or more**. • Connect all SAS control module connectors. • Connect the driver and passenger-side pre-tensioner seat belt connectors. • Connect the driver and passenger-side seat connectors. • Connect the passenger-side air bag module connector. • Connect the clock spring connector. • Connect the negative battery cable. • Turn the engine switch to ON position. • Does the air bag system warning light operate properly?	Yes	Complete troubleshooting, then explain repairs to customer.
		No	Recheck malfunction symptoms, then repeat from Step 1 if malfunction recurs.

NO.2 AIR BAG SYSTEM WARNING LIGHT ILLUMINATES CONSTANTLY

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2	**Air bag system warning light is illuminated constantly.**
DETECTION CONDITION	Malfunction in air bag system warning light circuit (open circuit or short to power supply).
POSSIBLE CAUSE	• Weak battery • SAS control module malfunction • Instrument cluster (circuit board) malfunction • No connection in SAS control module connector • Poor contact in instrument cluster connector (16-pin) • Open or short to power supply circuit in wiring harness between instrument cluster and SAS control module • Poor contact at terminals 1X and/or 1W of SAS control module connector • Poor contact in wiring harness between terminal 1X of SAS control module connector and ground • Poor contact in wiring harness between battery and terminal 1W of SAS control module

Diagnostic Procedure

- When performing an asterisked (*) troubleshooting inspection, slightly shake the wiring harness and connectors while performing the inspection to discover whether poor contact points are the cause of any intermittent malfunction. If there is a problem, verify that connectors, terminals and wiring harness are connected correctly and undamaged.

STEP	INSPECTION		ACTION
1	**INSPECT BATTERY** • Measure the voltage of battery. • Is the voltage **9 V or more**?	Yes	Go to the next step.
		No	Battery is weak. Inspect charge/discharge system, then go to Step 9. (See 01-17-2 BATTERY INSPECTION.)
2	**VERIFY THAT SAS CONTROL MODULE CONNECTOR IS CONNECTED** **Warning** • **Handling the air bag system components improperly can accidentally deploy the air bag modules and pre-tensioner seat belts, which may seriously injure you. Read the air bag system service warnings and cautions before handling the air bag system components. (See 08-10-2 SERVICE WARNINGS.) (See 08-10-3 SERVICE CAUTIONS.)** • Turn the engine switch to LOCK position. • Disconnect the negative battery cable and wait for **1 min or more**. • Remove the console. • Are all SAS control module connectors securely connected?	Yes	Go to the next step.
		No	Reconnect the connector properly, then go to Step 9.
* 3	**INSPECT WIRING HARNESS BETWEEN SAS CONTROL MODULE AND INSTRUMENT CLUSTER FOR CONTINUITY** • Remove the column cover. • Disconnect the clock spring connector. • Remove the glove compartment. • Disconnect the passenger-side air bag module connector. • Disconnect the driver and passenger-side seat connectors. • Disconnect the driver- and passenger-side pre-tensioner seat belt connectors. • Remove the console. • Disconnect all SAS control module connectors. • Disconnect the instrument cluster connector. • Is there continuity between SAS control module connector (20-pin) terminal 1T and instrument cluster connector terminal 1H?	Yes	Go to the next step.
		No	Replace the wiring harness, then go to Step 9.

STEP	INSPECTION		ACTION
* 4	**INSPECT WIRING HARNESS BETWEEN SAS CONTROL MODULE AND INSTRUMENT CLUSTER FOR SHORT TO POWER SUPPLY** • Connect the negative battery cable. • Turn the engine switch to ON position. • Measure the voltage at instrument cluster connector terminal 1H. • Is the voltage **9 V or more**?	Yes	Replace the wiring harness, then go to Step 9.
		No	Go to the next step.
5	**CHECK TO SEE WHETHER MALFUNCTION IS IN AIR BAG SYSTEM WARNING LIGHT IN INSTRUMENT CLUSTER** • Connect instrument cluster connector terminal 1H to ground, then reconnect the connector • Does the air bag system warning light illuminate with engine switch ON?	Yes	Replace the instrument cluster, then go to Step 9. (See 09-22-2 INSTRUMENT CLUSTER REMOVAL/ INSTALLATION.)
		No	Go to the next step.
6	**INSPECT POWER SUPPLY CIRCUIT OF SAS CONTROL MODULE (TERMINAL (20-pin) 1W)** • Turn the engine switch to LOCK position. • Disconnect the negative battery cable and wait for **1 min or more**. • Connect all SAS control module connectors. • Connect the driver and passenger-side pre-tensioner seat belt connectors. • Connect the driver and passenger-side seat connectors. • Connect the passenger-side air bag module connector. • Connect the clock spring connector. • Inspect the voltage for PID/DATA monitor "IG_V_2" item using current diagnostic tool. • Is the voltage of at least one terminal **9 V or more**?	Yes	Go to the Step 8.
		No	Go to the next step.
7	**INSPECT WIRING HARNESS BETWEEN BATTERY AND FUSE BLOCK** • Connect the negative battery cable. • Turn the engine switch to ON position. • Measure the voltage at instrument cluster connector terminal 2A. • Is the voltage **9 V or more**?	Yes	Go to the next step.
		No	Repair the wiring harnesses, then go to Step 9.
8	**VERIFY THAT SAS CONTROL MODULE CONNECTOR TERMINAL 1X IS GROUND** • Turn the engine switch to LOCK position. • Disconnect the negative battery cable and wait for **1 min or more**. • Remove the column cover. • Disconnect the clock spring connector. • Remove the glove compartment. • Disconnect the passenger-side air bag module connector. • Disconnect the driver and passenger-side side air bag module connectors. • Disconnect the driver and passenger-side pre-tensioner seat belt connectors. • Remove the console. • Disconnect all SAS control module control model connectors. • Inspect the wiring harness between SAS control module connector (20-pin) terminal 1X and ground for the following: — Short to power supply — Open circuit • Is the wiring harness normal?	Yes	Replace the SAS control module, then go to the next step. (See 08-10-6 SAS CONTROL MODULE REMOVAL/ INSTALLATION.)
		No	Replace the wiring harnesses, then go to the next step.

STEP	INSPECTION		ACTION
9	**CONFIRM THAT MALFUNCTION SYMPTOMS DO NOT RECUR AFTER REPAIR** • Turn the engine switch to LOCK position. • Disconnect the negative battery cable and wait for **1 min or more**. • Connect all SAS control module connectors. • Connect the driver and passenger-side pre-tensioner seat belt connectors. • Connect the driver and passenger-side seat connectors. • Connect the passenger-side air bag module connector. • Connect the clock spring connector. • Connect the instrument cluster connector. • Connect the negative battery cable. • Turn the engine switch to ON position. • Does the air bag system warning light operate properly?	Yes	Complete troubleshooting, then explain repairs to customer.
		No	Recheck malfunction symptoms, then repeat from Step 1 if malfunction recurs.

08-10 AIR BAG SYSTEM

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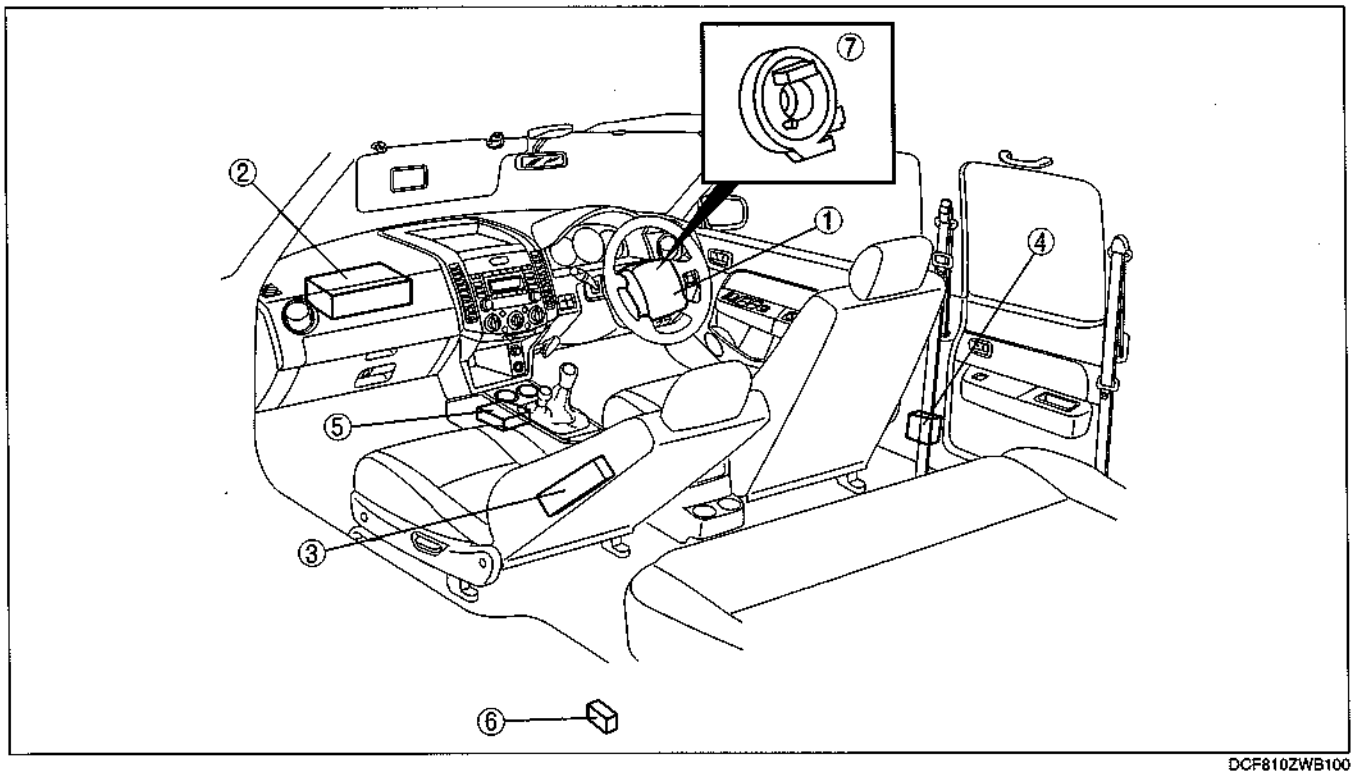

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1	Driver-side air bag module (See 08-10-4 DRIVER-SIDE AIR BAG MODULE REMOVAL/INSTALLATION.) (See 08-10-9 AIR BAG MODULE AND PRE-TENSIONER SEAT BELT DEPLOYMENT PROCEDURES.)
2	Passenger-side air bag module (See 08-10-5 PASSENGER-SIDE AIR BAG MODULE REMOVAL/INSTALLATION.) (See 08-10-9 AIR BAG MODULE AND PRE-TENSIONER SEAT BELT DEPLOYMENT PROCEDURES.)
3	Side air bag module (See 08-10-5 SIDE AIR BAG MODULE REMOVAL/ INSTALLATION.) (See 08-10-9 AIR BAG MODULE AND PRE-TENSIONER SEAT BELT DEPLOYMENT PROCEDURES.)
4	Pre-tensioner seat belt (See 08-10-9 AIR BAG MODULE AND PRE-TENSIONER SEAT BELT DEPLOYMENT PROCEDURES.)
5	SAS control module (See 08-10-6 SAS CONTROL MODULE REMOVAL/INSTALLATION.)
6	Side air bag sensor (See 08-10-6 SIDE AIR BAG SENSOR REMOVAL/ INSTALLATION.)
7	Clock spring (See 08-10-7 CLOCK SPRING REMOVAL/ INSTALLATION.) (See 08-10-8 CLOCK SPRING INSPECTION.) (See 08-10-7 CLOCK SPRING ADJUSTMENT.)

SERVICE WARNINGS

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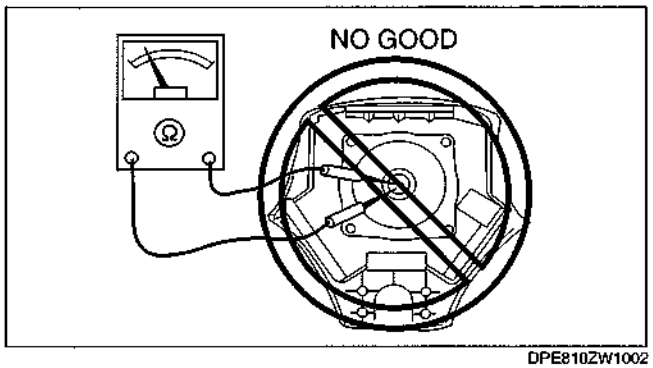
Air Bag Module Inspection

- **Inspecting an air bag module using a tester can operate (deploy) the air bag module, which may cause serious injury. Do not use a tester to inspect an air bag module. Always use the on-board diagnostic function to diagnose the air bag module for malfunctions.**



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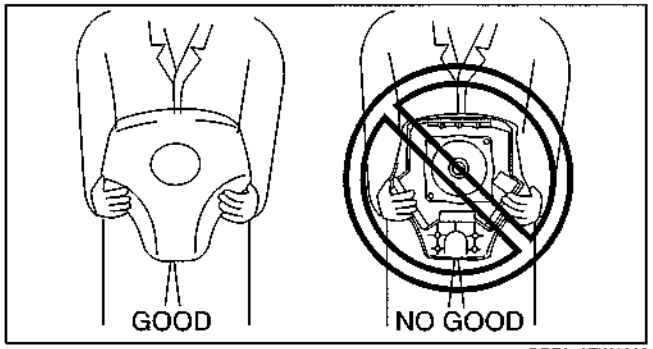
Air Bag Module Handling

- **Before removing the air bag module or disconnecting the air bag module connector, always turn the ignition switch to the LOCK position, disconnect the negative battery cable, and then wait for 1 min or more to allow the backup power supply of the SAS control module to deplete its stored power.**
- **Handling a live (undeployed) air bag module that is pointed toward your body could result in serious injury if the air bag module were to accidentally operate (deploy). When carrying a live (undeployed) air bag module, point the deployment surface away from your body to lessen the chance of injury in case it operates (deploys).**



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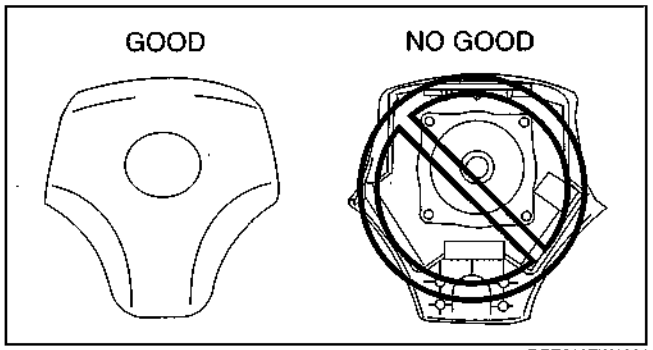
- **A live (undeployed) air bag module placed with its deployment surface to ground is dangerous. If the air bag module were to accidentally operate (deploy), it could cause serious injury. Always place a live (undeployed) air bag module with its deployment surface up.**



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Side Air Bag Module Handling

- **When a side air bag module operates (deploys) due to a collision, the interior of the seat back (pad, frame, trim) may become damaged. If a side air bag does not operate (deploy) normally from a seat back that has been reused, a serious accident may result. After a side air bag has operated (deployed), always replace both the side air bag module and the seat back (pad, frame, trim) with new parts. After servicing, verify that the seat operates normally and that the wiring harness is not caught.**

SAS control module Handling

- **Removing the SAS control module or disconnecting the SAS control module connector with the ignition switch at the ON position can activate the sensor in the SAS control module and operate (deploy) the air bags and pre-tensioner seat belts, which may cause serious injury. Before removing the SAS control module or disconnecting the SAS control module connector, always turn the ignition switch to the LOCK position, disconnect the negative battery cable, and then wait for 1 min or more to allow the backup power supply of the SAS control module to deplete its stored power.**
- **Connecting the SAS control module connector with the SAS control module not securely fixed to the vehicle is dangerous. The sensor in the SAS control module could send an electrical signal to the air bag modules and pre-tensioner seat belts. This will operate (deploy) the air bags and pre-tensioner seat belts, which may result in serious injury. Therefore, before connecting the connector, securely fix the SAS control module to the vehicle.**

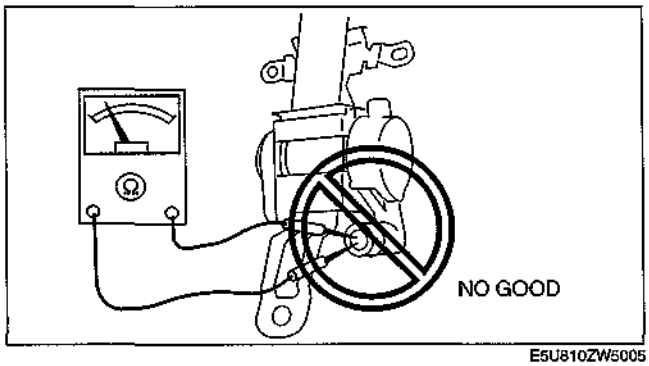
- **Because a sensor is built into the SAS control module, once the air bags and pre-tensioner seat belts have operated (deployed) due to a collision or other causes, the SAS control module must be replaced with a new one even if the used one does not have any visible external damage or deformation. The used SAS control module may have been damaged internally which may cause improper operation. If the SAS control module is reused, the air bags and pre-tensioner seat belts may not operate (deploy) normally, which could result in a serious accident. Always replace the SAS control module with a new one. The SAS control module cannot be bench-checked or self-checked.**

Side Air Bag Sensor Handling

- **Removing the side air bag sensor or disconnecting the side air bag sensor connector with the ignition switch at the ON position can activate the side air bag sensor and operate (deploy) the side air bag, which may cause serious injury. Before removing the side air bag sensor or disconnecting the side air bag sensor connector, always turn the ignition switch to the LOCK position, disconnect the negative battery cable, and then wait for 1 min or more to allow the backup power supply of the SAS control module to deplete its stored power.**
- **If the side air bag sensor is subjected to shock or the sensor is disassembled, the side air bag may accidentally operate (deploy) and cause injury, or the system may fail to operate normally and cause a serious accident. Do not subject the side air bag sensor to shock or disassemble the sensor.**
- **Because a sensor is built into the side air bag sensor, once the air bag has operated (deployed) due to a collision or other causes, the side air bag sensor must be replaced with a new one even if the used one does not have any visible external damage or deformation. If the side air bag sensor is reused, the side air bag may not operate (deploy) normally, which could result in a serious accident. Always replace the side air bag sensor with a new one. The side air bag sensor cannot be bench-checked or self-checked.**

Pre-tensioner Seat Belt Inspection

- **Inspecting a pre-tensioner seat belt using a tester can operate (deploy) the pre-tensioner seat belt, which may cause serious injury. Do not use a tester to inspect a pre-tensioner seat belt. Always use the on-board diagnostic function to diagnose the pre-tensioner seat belt for malfunctions.**



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SERVICE CAUTIONS

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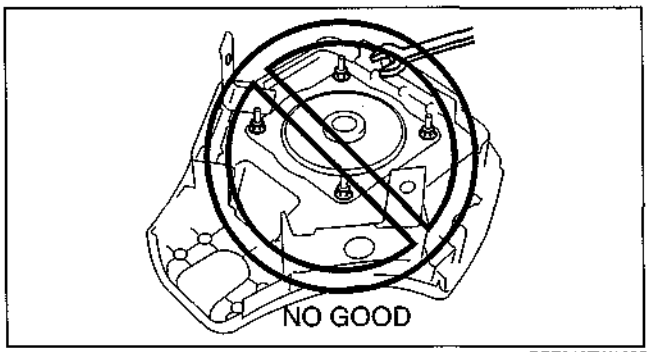
Air Bag System Component Disassembly

- **Disassembling the air bag system components could cause it to not operate (deploy) normally. Never disassemble any air bag system components.**



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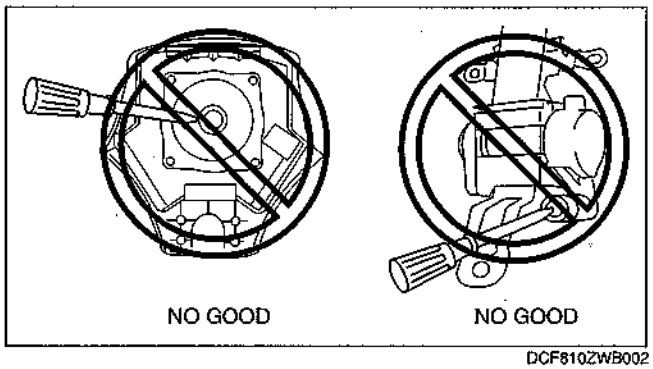
Air Bag Module, Pre-tensioner Seat Belt Handling

- **Oil, grease, or water on the air bag modules may cause the air bags and pre-tensioner seat belts to fail to operate (deploy) in an accident. Never allow oil, grease, or water to get on the air bag modules or pre-tensioner seat belts.**
- **Inserting a screwdriver or similar object into the connector of an air bag module or a pre-tensioner seat belt may damage the connector and cause the air bag module or the pre-tensioner seat belt to operate (deploy) improperly, which may cause serious injury. Never insert any foreign objects into the air bag module or seat belt connectors.**



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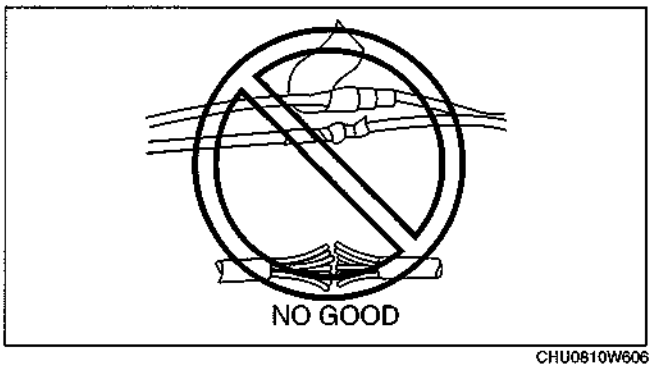
Air Bag Module, Pre-tensioner Seat Belt Reuse

- **Even if an air bag module or a pre-tensioner seat belt does not operate (deploy) in a collision and does not have any external signs of damage, it may have been damaged internally, which may cause improper operation. Before reusing a live (undeployed) air bag module and the pre-tensioner seat belts, always use the on-board diagnostic to diagnose the air bag module and the pre-tensioner seat belts to verify that they have no malfunction.**

Air Bag Wiring Harness Repair

- **Incorrectly repairing an air bag wiring harness can accidentally operate (deploy) the air bag module and pre-tensioner seat belts. If a problem is found in the air bag wiring harness, always replace the wiring harness with a new one.**



CHU0810W606

DRIVER-SIDE AIR BAG MODULE REMOVAL/INSTALLATION

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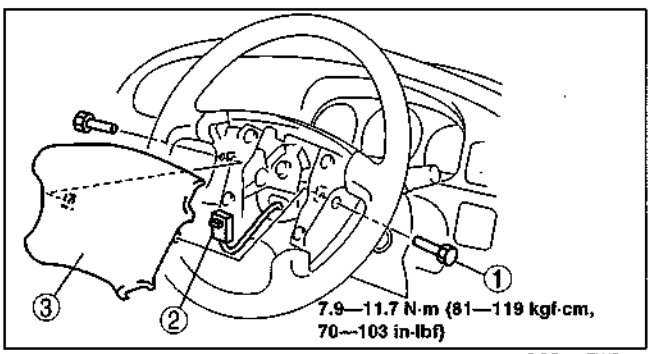
Warning

- **Handling the air bag module improperly can accidentally deploy the air bag module, which may seriously injure you. Read the service warnings and cautions before handling the air bag module. (See 08-10-2 SERVICE WARNINGS.) (See 08-10-3 SERVICE CAUTIONS.)**

1. Turn the engine switch to the LOCK position.
2. Disconnect the negative battery cable and wait for **1 min or more.** (See 01-17-2 BATTERY REMOVAL/INSTALLATION.)
3. Remove in the order indicated in the table.

1	Bolt
2	Connector (See 08-10-5 Connector Removal Note.)
3	Driver-side air bag module



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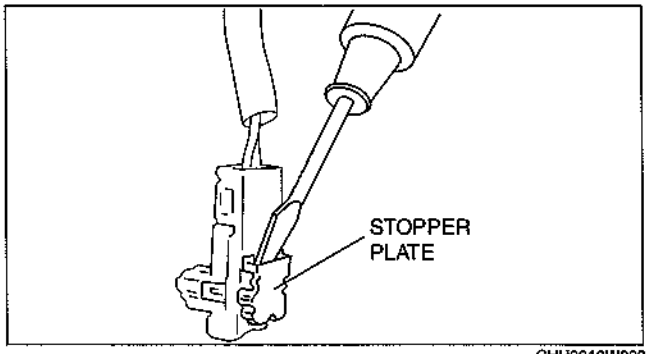
4. Install in the reverse order of removal.
5. Turn the engine switch to the ON position.
6. Verify that the air bag system warning light illuminates for **approx. 6 s** and goes out.
   - If the air bag system warning light does not operate, refer to the on-board diagnostic system (air bag system) and perform inspection of the system.

Connector Removal Note

1. Using a flathead screwdriver, pry out the connector stopper plate.
2. Disconnect the connector.



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PASSENGER-SIDE AIR BAG MODULE REMOVAL/INSTALLATION

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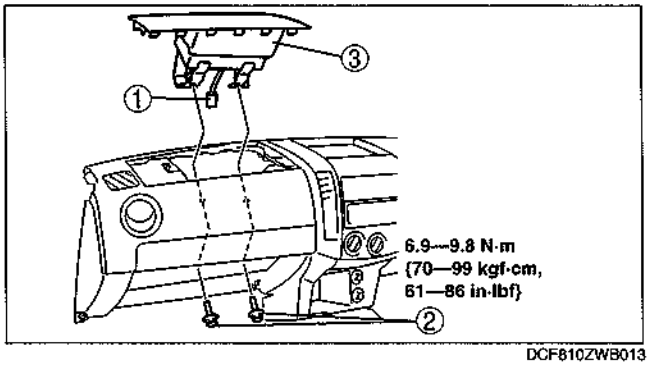
Warning

- **Handling the air bag module improperly can accidentally deploy the air bag module, which may seriously injure you. Read the service warnings and cautions before handling the air bag module. (See 08-10-2 SERVICE WARNINGS.) (See 08-10-3 SERVICE CAUTIONS.)**

1. Turn the engine switch to the LOCK position.
2. Disconnect the negative battery cable and wait for **1 min or more.** (See 01-17-2 BATTERY REMOVAL/INSTALLATION.)
3. Remove the glove compartment. (See 09-17-9 GLOVE COMPARTMENT REMOVAL/INSTALLATION.)
4. Remove in the order indicated in the table.

1	Connector
2	Bolt
3	Passenger-side air bag module



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5. Install in the reserve order of removal.
6. Turn the engine switch to the ON position.
7. Verify that the air bag system warning light illuminates for **approx. 6 s** and goes out.
   - If the air bag system warning light does not operate, refer to the on-board diagnostic system (air bag system) and perform inspection of the system.

SIDE AIR BAG MODULE REMOVAL/INSTALLATION

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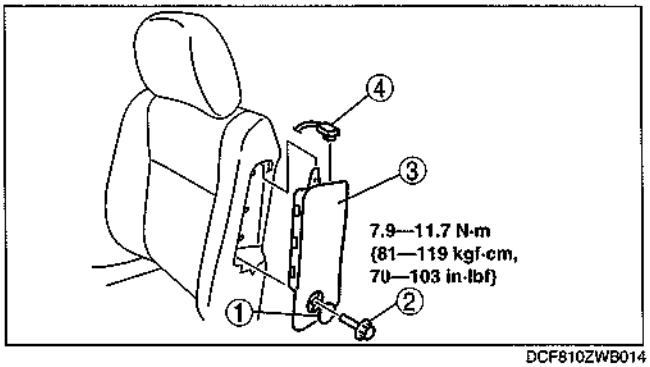
Warning

- **Handling the air bag module improperly can accidentally operate (deploy) the air bag module, which may seriously injure you. Read the service warnings and cautions before handling the air bag module. (See 08-10-2 SERVICE WARNINGS.) (See 08-10-3 SERVICE CAUTIONS.)**
- **If the side air bag module is installed with debris in the seat back, the foreign material may be scattered when the side air bag module operates (deploys), causing injury. Verify that there is no foreign material in the seat back before installing the side air bag module.**

1. Turn the engine switch to the LOCK position.
2. Disconnect the negative battery cable and wait for **1 min or more.** (See 01-17-2 BATTERY REMOVAL/INSTALLATION.)
3. Remove in the order indicated in the table.

1	Cup
2	Bolt
3	Side air bag module
4	Connector



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4. Install in the reverse order of removal.
5. Turn the engine switch to the ON position.
6. Verify that the air bag system warning light illuminates for **approx. 6 s** and goes out.
   - If the air bag system warning light does not operate, refer to the on-board diagnostic system (air bag system) and perform inspection of the system.

SAS CONTROL MODULE REMOVAL/INSTALLATION

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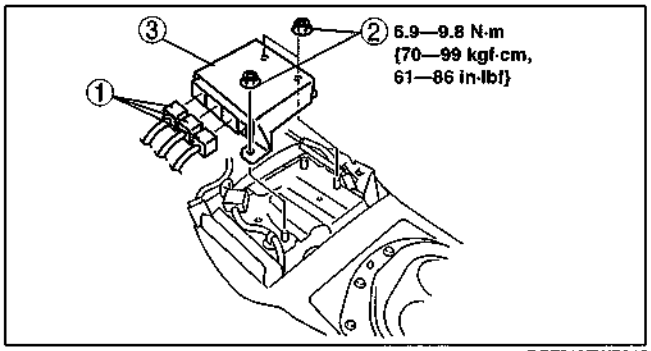
Warning

- **Handling the SAS control module improperly can accidentally deploy the air bag modules and pretensioner seat belt, which may seriously injure you. Read the service warnings and cautions before handling the air bag module. (See 08-10-2 SERVICE WARNINGS.) (See 08-10-3 SERVICE CAUTIONS.)**

1. Turn the engine switch to the LOCK position.
2. Disconnect the negative battery cable and wait for **1 min or more.** (See 01-17-2 BATTERY REMOVAL/INSTALLATION.)
3. Remove the console. (See 09-17-12 CONSOLE REMOVAL/INSTALLATION.)
4. Remove in the order indicated in the table.

1	Connector
2	Bolt
3	SAS control module



DCF810ZWB015

5. Install in the reverse order of removal.
6. Turn the engine switch to the ON position.
7. Verify that the air bag system warning light illuminates for **approx. 6 s** and goes out.
   - If the air bag system warning light does not operate, refer to the on-board diagnostic system (air bag system) and perform inspection of the system.

SIDE AIR BAG SENSOR REMOVAL/INSTALLATION

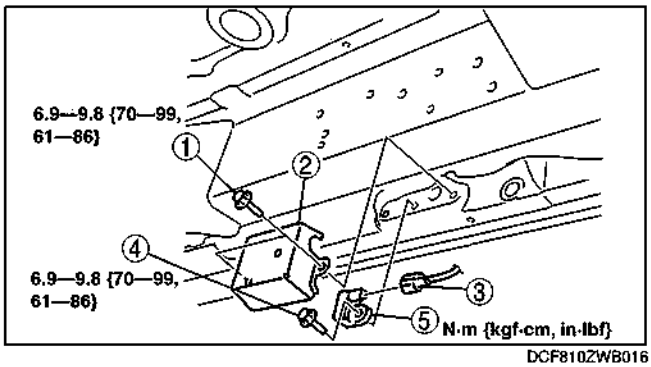
dcf081000146w01

Warning

- **Handling the side air bag sensor improperly can accidentally operate (deploy) the air bag module, which may seriously injure you. Read the service warnings and cautions before handling the side air bag sensor. (See 08-10-2 SERVICE WARNINGS.) (See 08-10-3 SERVICE CAUTIONS.)**

1. Turn the engine switch to the LOCK position.
2. Disconnect the negative battery cable and wait for **1 min or more.** (See 01-17-2 BATTERY REMOVAL/INSTALLATION.)
3. Remove in the order indicated in the table.

1	Bolt A
2	Cover
3	Connector
4	Bolt B
5	Side air bag sensor



DCF810ZWB016

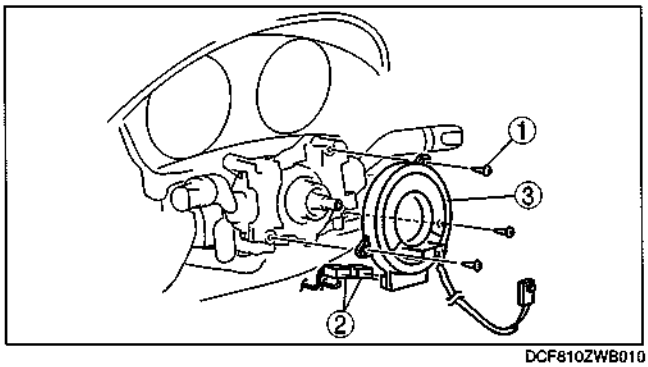
4. Install in the reverse order of removal.
5. Turn the engine switch to the ON position and hold for **5 s or more.**
6. Verify that the air bag system warning light illuminates for **approx. 6 s** and goes out.
   - If the air bag system warning light does not operate, refer to the on-board diagnostic system (air bag system) and perform inspection of the system.

CLOCK SPRING REMOVAL/INSTALLATION

dcf081066123w01

1. Disconnect the negative battery cable and wait for **1 min or more**. (See 01-17-2 BATTERY REMOVAL/INSTALLATION.)
2. Remove the driver-side air bag module. (See 08-10-4 DRIVER-SIDE AIR BAG MODULE REMOVAL/INSTALLATION.)
3. Remove the steering wheel. (See 06-14-6 STEERING WHEEL AND COLUMN REMOVAL/INSTALLATION.)
4. Remove the column cover. (See 09-17-8 COLUMN COVER REMOVAL/INSTALLATION.)
5. Remove in the order indicated in the table.

1	Screw
2	Connector
3	Clock spring (See 08-10-7 Clock Spring Installation Note.)



DCF810ZWB010

6. Install in the reverse order of removal.
7. Turn the ignition switch to the ON position.
8. Verify that the air bag system warning light illuminates for **approx. 6 s** and goes out.
   - If the air bag system warning light does not operate, refer to the on-board diagnostic system (air bag system) and perform inspection of the system.

Clock Spring Installation Note

Caution
- **If the clock spring is not adjusted, the spring wire in the clock spring could over-wind and break when the steering wheel is turned. Always adjust the clock spring after installing it.**

1. Adjust the clock spring after installing it. (See 08-10-7 CLOCK SPRING ADJUSTMENT.)

CLOCK SPRING ADJUSTMENT

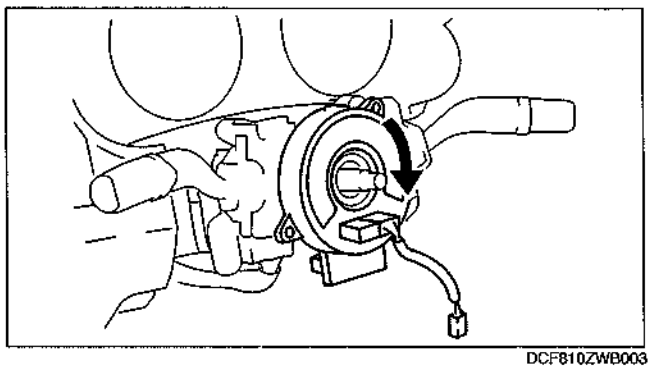
dcf081066123w02

Note
- The adjustment procedure is also specified on the caution label of the clock spring.

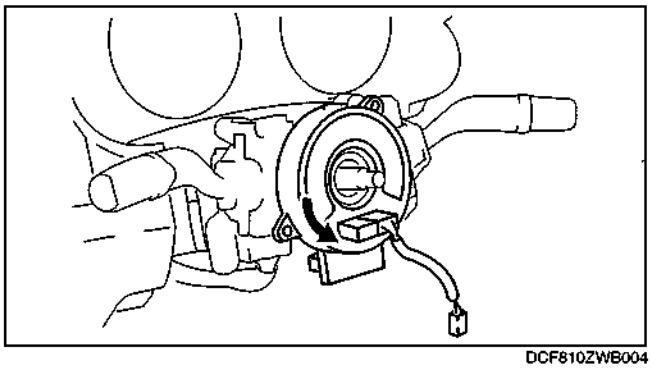
1. Set the front tires straight-ahead.

Caution
- **The clock spring will break if over-wound. Do not forcibly turn the clock spring.**

2. Turn the clock spring clockwise until it stops.

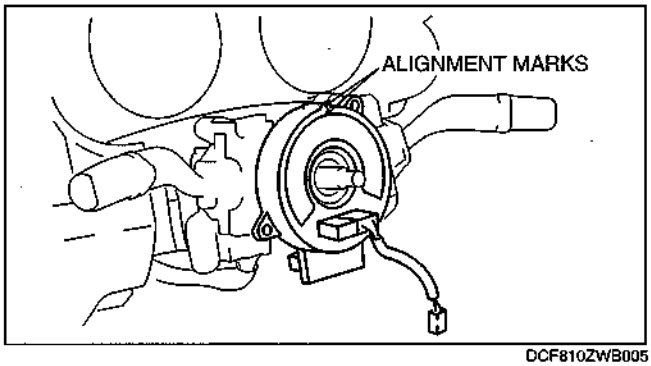

DCF810ZWB003

3. From the stopped position, turn the clock spring counterclockwise **2 3/4 turns.**



DCF810ZWB004

4. Align the mark on the clock spring with the mark on the outer housing.



DCF810ZWB005

CLOCK SPRING INSPECTION

dcf081066123w03

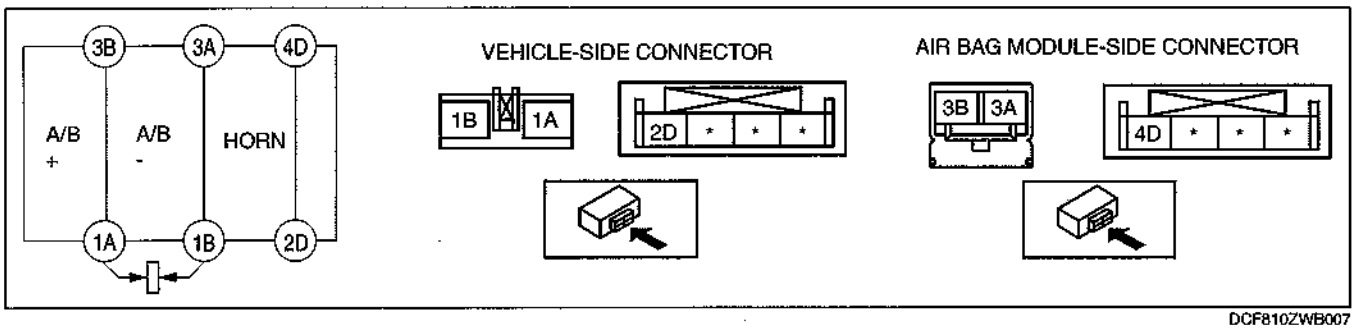
1. Verify that the continuity is as indicated in the table.
   - If not as indicated in the table, replace the clock spring.

Note
- When the vehicle-side connector for the clock spring is disconnected, terminals 1A and 1B are shorted to prevent unexpected operation (deployment) of the air bag module.

○—○ : Continuity

Test condition	Terminal					
	1A	1B	2D	3A	3B	4D
Under any condition	○				○	
		○		○		
			○			○

DCF810ZWB006



DCF810ZWB007

AIR BAG MODULE AND PRE-TENSIONER SEAT BELT DEPLOYMENT PROCEDURES

dcf081057000w01

Warning

- **A live (undeployed) air bag module or pre-tensioner seat belt may accidentally operate (deploy) when it is disposed of and cause serious injury. Do not dispose of a live (undeployed) air bag module and pre-tensioner seat belt. If the SSTs (Deployment tool and Adapter harness) are not available, consult the nearest Mazda representative for assistance.**

Caution

- **Deploying the air bag modules and pre-tensioner seat belts inside the vehicle may cause damage to the vehicle interior. When the vehicle is not to be scrapped, always deploy the air bag modules and pre-tensioner seat belts outside the vehicle.**

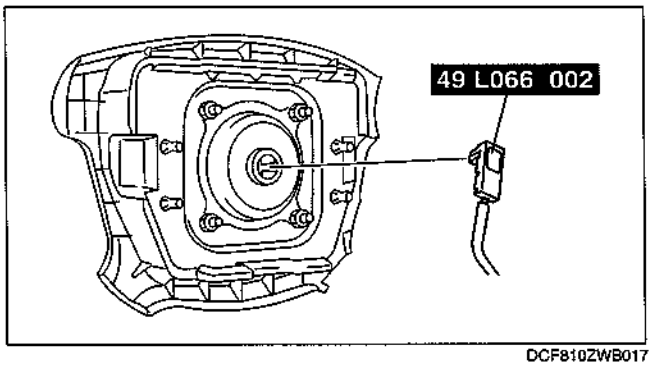
- If the vehicle is to be scrapped, or when disposing of any air bag modules or pre-tensioner seat belts, operate (deploy) them inside the vehicle by following the deployment procedure below and using the **SST** (Deployment tool).
- When disposing of an operated (deployed) air bag module and pre-tensioner seat belt, refer to "AIR BAG MODULE AND PRE-TENSIONER SEAT BELT DISPOSAL PROCEDURES".

Deployment Procedure for Inside of Vehicle

1. Inspect the **SST** (Deployment tool). (See 08-10-19 INSPECTION OF SST (DEPLOYMENT TOOL).)
2. Move the vehicle to an open space, away from strong winds, and close all of the vehicle doors and windows.
3. Turn the engine switch to the LOCK position.
4. Disconnect the negative battery cable and wait for **1 min or more.** (See 01-17-2 BATTERY REMOVAL/INSTALLATION.)
5. Follow the procedure below for operating (deploying) the applicable air bag module or pre-tensioner seat belt.

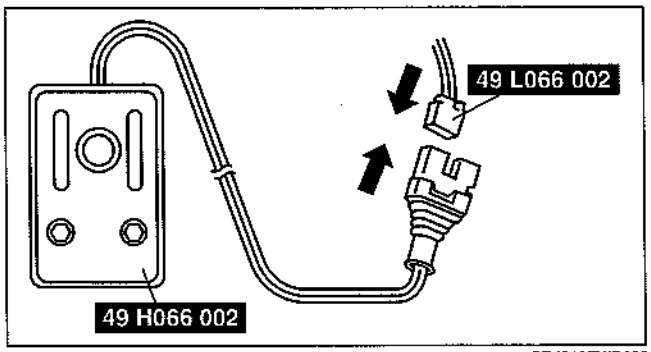
Driver-side Air Bag Module

1. Remove the driver-side air bag module. (See 08-10-4 DRIVER-SIDE AIR BAG MODULE REMOVAL/INSTALLATION.)
2. Connect the **SST** (Adapter harness) to the driver-side air bag module as shown in the figure.
3. Install the driver-side air bag module. (See 08-10-4 DRIVER-SIDE AIR BAG MODULE REMOVAL/INSTALLATION.)



DCF810ZWB017

4. Connect the **SST** (Deployment tool) to the **SST** (Adapter harness).
5. Connect both **SST** (Deployment tool) to the battery. Connect the power supply red clip to the positive battery terminal, and the black clip to the negative battery terminal.
6. Verify that the red lamp on both **SST** (Deployment tool) is illuminated.
7. Verify that all persons are standing **at least 6 m {20 ft}** away from the vehicle.

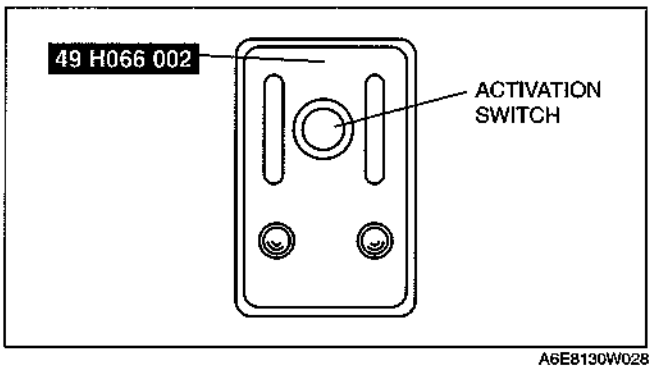


CPJ810ZWB032

8. Press the activation switch on the **SST** (Deployment tool) to operate (deploy) the driver-side air bag module.

   Warning
   - **The air bag module is very hot immediately after it is operated (deployed). You can get burned. Do not touch the air bag module for at least 15 min after deployment.**

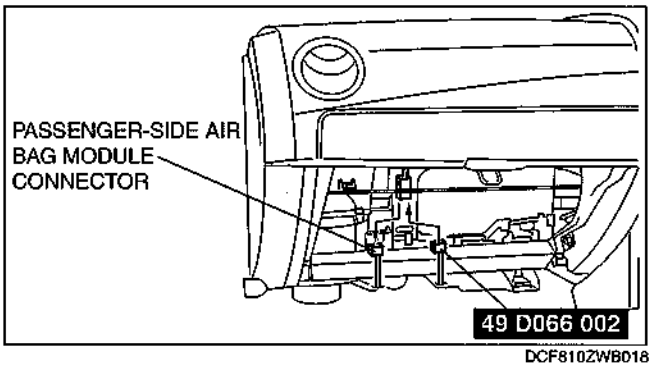
9. Disconnect the **SST** (Deployment tool) from the **SST** (Adapter harness).



A6E8130W028

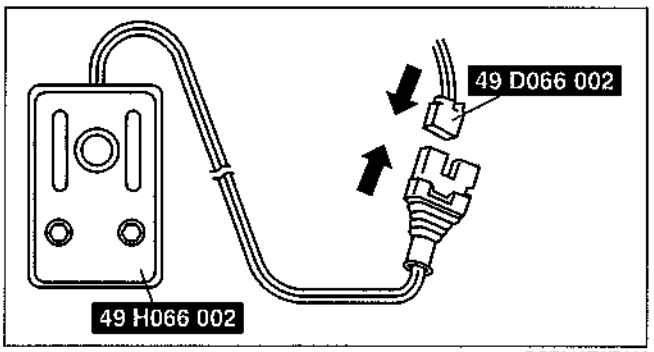
Passenger-side Air Bag Module

1. Remove the glove compartment. (See 09-17-9 GLOVE COMPARTMENT REMOVAL/INSTALLATION.)
2. Disconnect the passenger-side air bag module connector.
3. Connect the **SST** (Adapter harness) to the passenger-side air bag module as shown in the figure.



DCF810ZWB018

4. Connect the **SST** (Deployment tool) to the **SST** (Adapter harness).
5. Connect the **SST** (Deployment tool) to the battery. Connect the power supply red clip to the positive battery terminal, and the black clip to the negative battery terminal.
6. Verify that the red lamp on both **SST** (Deployment tool) is illuminated.
7. Verify that all persons are standing **at least 6 m {20 ft}** away from the vehicle.

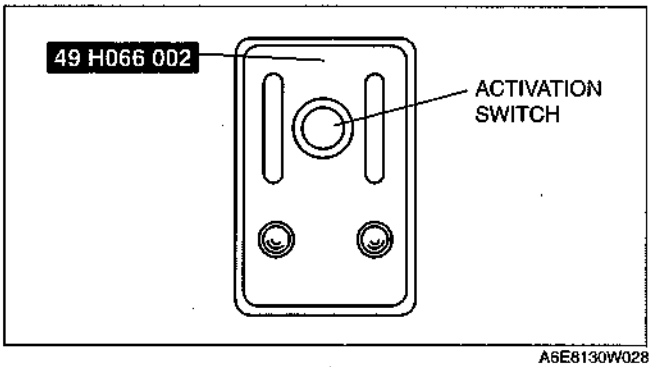


DCF810ZWB008

8. Press the activation switch on the **SST** (Deployment tool) to operate (deploy) the passenger-side air bag module.

   Warning
   - **The air bag module is very hot immediately after it is operated (deployed). You can be burned. Do not touch the air bag module for at least 15 min after deployment.**

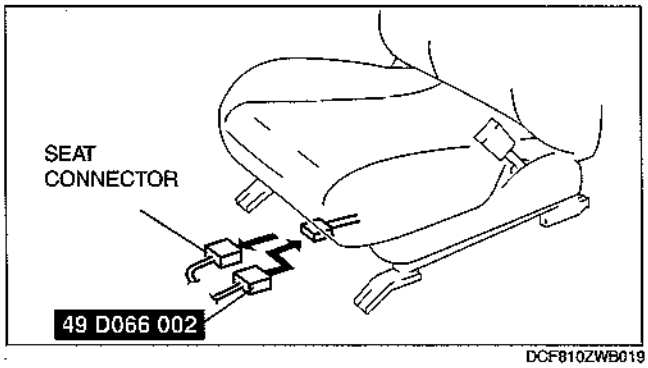
9. Disconnect the **SST** (Deployment tool) from the **SST** (Adapter harness).



A6E8130W028

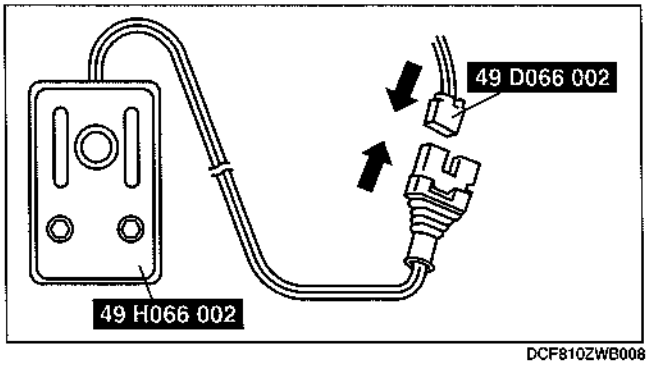
Side Air Bag Module

1. Disconnect the seat connector.
2. Connect the **SST** (Adapter harness) to the side air bag module as shown in the figure.



DCF810ZWB019

3. Connect the **SST** (Deployment tool) to the **SST** (Adapter harness).
4. Connect the **SST** (Deployment tool) to the battery. Connect the power supply red clip to the positive battery terminal, and the black clip to the negative battery terminal.
5. Verify that the red lamp on the **SST** (Deployment tool) is illuminated.
6. Verify that all persons are standing **at least 6 m {20 ft}** away from the vehicle.

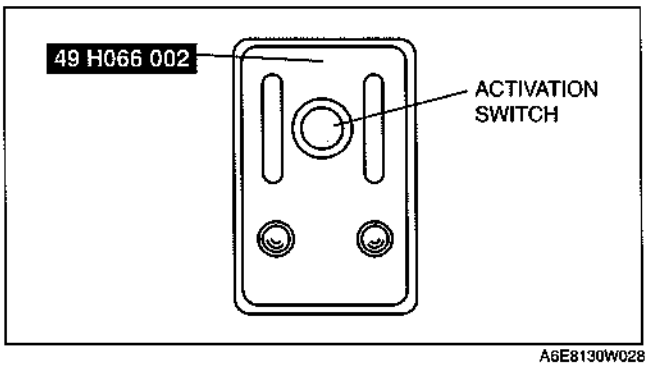


DCF810ZWB008

7. Press the activation switch on the **SST** (Deployment tool) to operate (deploy) the side air bag module.

   Warning
   - **The air bag module is very hot immediately after it is operated (deployed). You can be burned. Do not touch the air bag module for at least 15 min after deployment.**

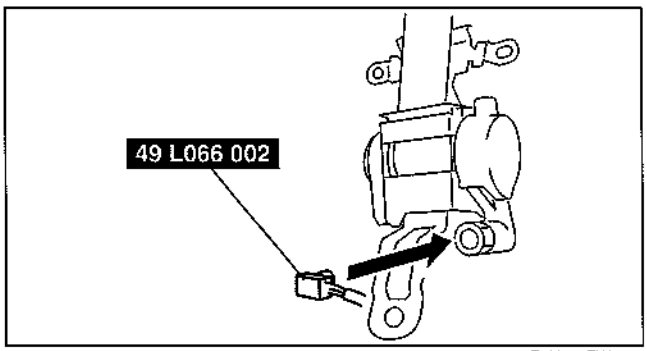
8. Disconnect the **SST** (Deployment tool) from the **SST** (Adapter harness).



A6E8130W028

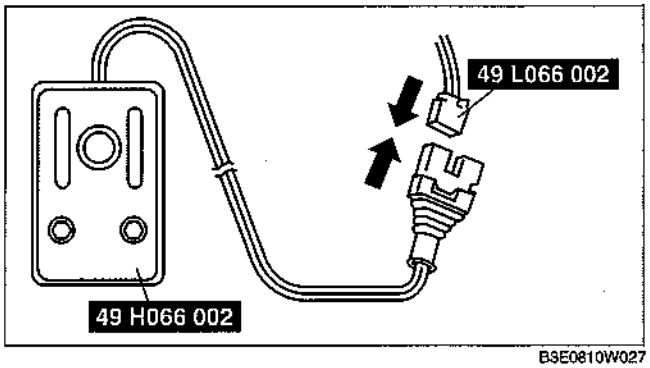
Pre-tensioner Seat Belt

1. Remove the pre-tensioner seat belt and connect the **SST** (Adapter harness) as shown in the figure. (See 08-11-1 SEAT BELT REMOVAL/ INSTALLATION.)
2. Install the pre-tensioner seat belt.



E5U810ZW5026

3. Connect the **SST** (Deployment tool) to the **SST** (Adapter harness).
4. Connect the **SST** (Deployment tool) to the battery. Connect the power supply red clip to the positive battery terminal, and the black clip to the negative battery terminal.
5. Verify that the red lamp on the **SST** (Deployment tool) is illuminated.
6. Verify that all persons are standing **at least 6 m {20 ft}** away from the vehicle.

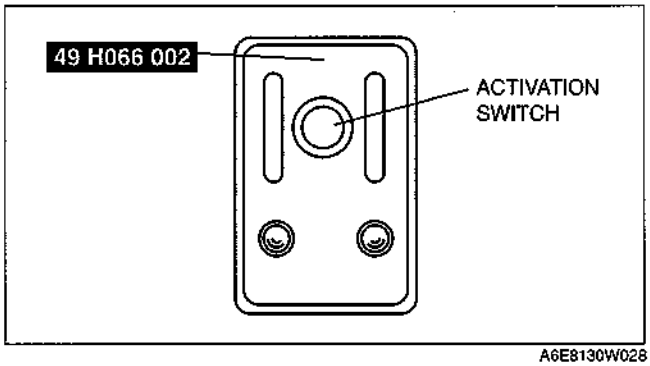


B3E0810W027

7. Press the activation switch on the **SST** (Deployment tool) to operate (deploy) the pre-tensioner seat belt.

Warning
- **The air bag module is very hot immediately after it is operated (deployed). You can be burned. Do not touch the air bag module for at least 15 min after deployment.**

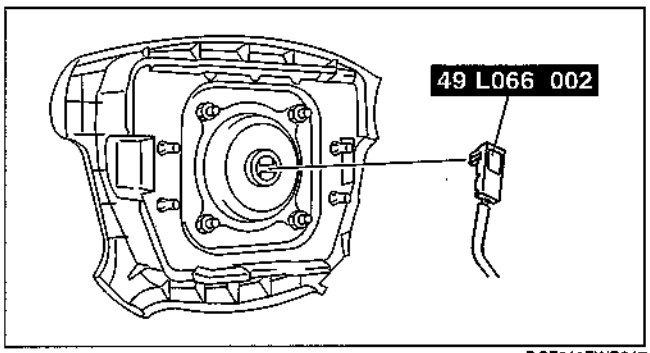
8. Disconnect the **SST** (Deployment tool) from the **SST** (Adapter harness).



A6E8130W028

Deployment Procedure for Outside of Vehicle
1. Inspect the **SST** (Deployment tool). (See 08-10-19 INSPECTION OF SST (DEPLOYMENT TOOL).)
2. Turn the engine switch to the LOCK position.
3. Disconnect the negative battery cable and wait for **1 min or more.** (See 01-17-2 BATTERY REMOVAL/ INSTALLATION.)
4. Follow the procedure below for operating (deploying) the applicable air bag module or pre-tensioner seat belt.

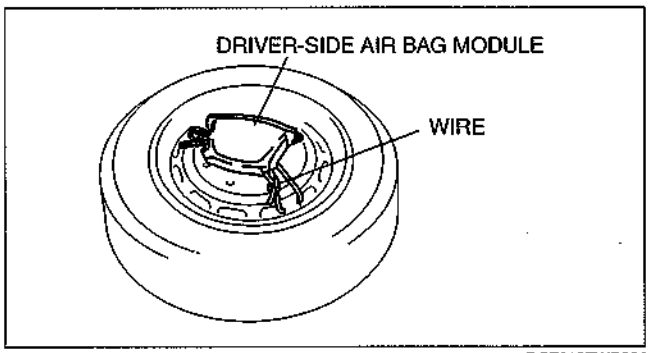
Driver-side Air Bag Module
1. Remove the driver-side air bag module. (See 08-10-4 DRIVER-SIDE AIR BAG MODULE REMOVAL/ INSTALLATION.)
2. Connect the **SST** (Adapter harness) to the driver-side air bag module as shown in the figure.



DCF810ZWB017

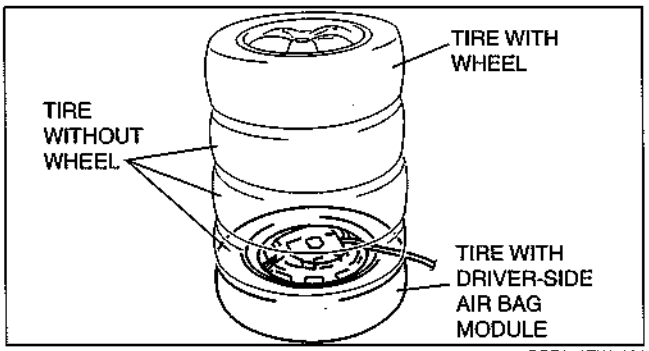
3. Place the driver-side air bag module on the center of the tire wheel with the padded surface facing up. To secure the air bag module to the tire wheel, wrap a wire (cross section **1.25 mm^2 {0.002 in^2} or more**) through the wheel and the bolt installation holes of the air bag module **at least 4 times.**

Warning
- **If the air bag module is not properly installed to the tire wheel, serious injury may occur when the module is operated (deployed). When installing the air bag module to the tire wheel, make sure the padded surface is facing up.**



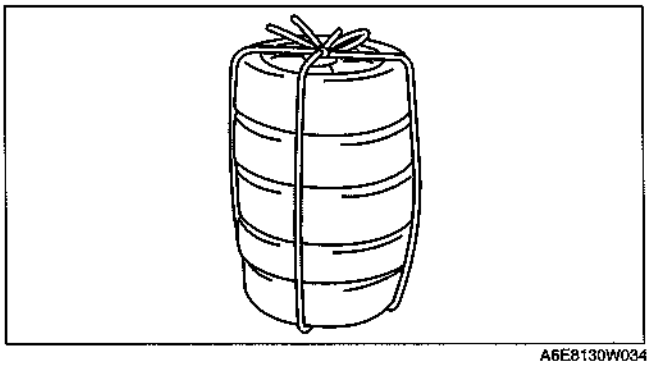
DCF810ZWB020

4. Stack three tires without wheels on top of the tire with the driver-side air bag module, and then stack another tire with a wheel on the very top.

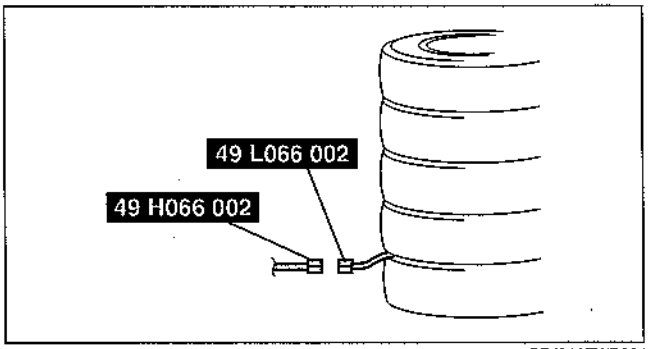


DPE810ZW1036

5. Secure the tires with wire.


A6E8130W034

6. Connect the **SST** (Deployment tool) to the **SST** (Adapter harness).
7. Connect both **SST** (Deployment tool) to the battery. Connect the power supply red clip to the positive battery terminal, and the black clip to the negative battery terminal.
8. Verify that the red lamp on both **SST** (Deployment tool) is illuminated.
9. Verify that all persons are standing **at least 6 m {20 ft}** away from the vehicle.

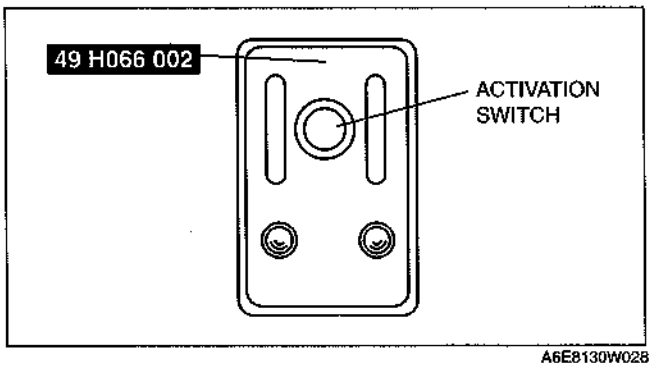


CPJ810ZWB034

10. Press the activation switch on the **SST** (Deployment tool) to operate (deploy) the driver-side air bag module.

Warning
- **The air bag module is very hot immediately after it is operated (deployed). You can be burned. Do not touch the air bag module for at least 15 min after deployment.**

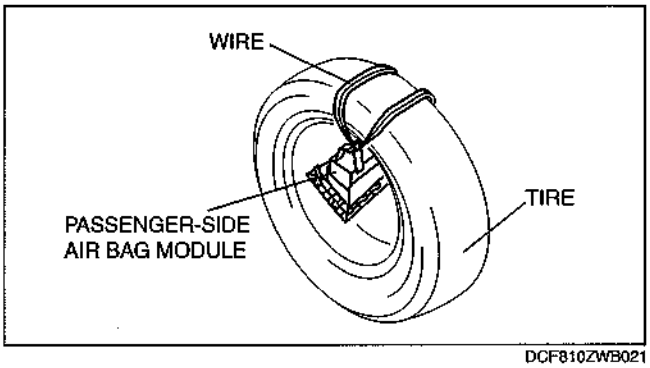
11. Disconnect the **SST** (Deployment tool) from the **SST** (Adapter harness).



A6E8130W028

Passenger-side Air Bag Module

1. Remove the passenger-side air bag module. (See 08-10-5 PASSENGER-SIDE AIR BAG MODULE REMOVAL/INSTALLATION.)
2. Place the padded surface of the passenger-side air bag module facing the center of the tire as shown in the figure. To secure the air bag module to the tire wheel, wrap a wire (cross section **1.25 mm^2 {0.002 in^2} or more**) through the tire and the bolt installation holes of the air bag module **at least 4 times**.

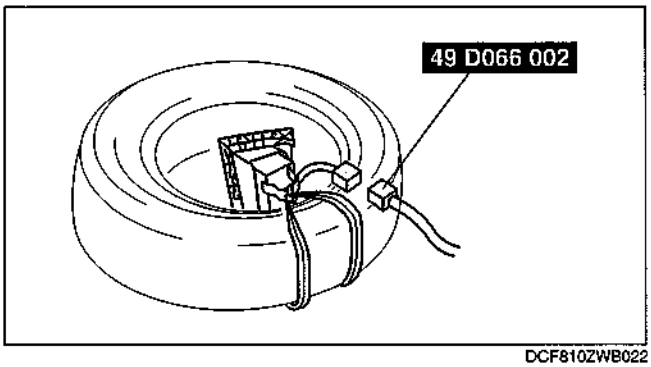


DCF810ZWB021

Warning

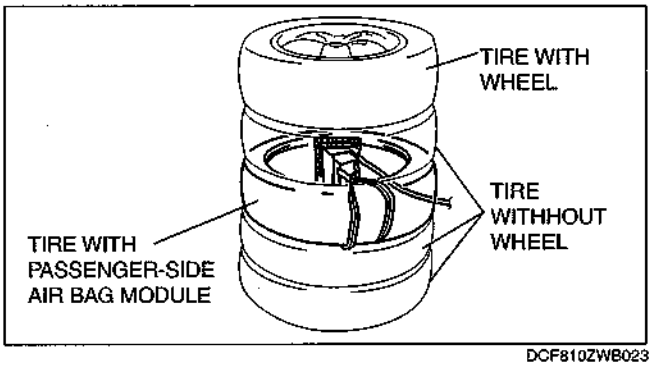
- **If the air bag module is not properly secured to the tire, the tires may fall over by the impact of operation (deployment) and cause serious injury. To prevent this, secure the air bag module properly with the padded surface facing the center of the tire.**

3. Connect the **SST** (Adapter harness) to the passenger-side air bag module as shown in the figure.



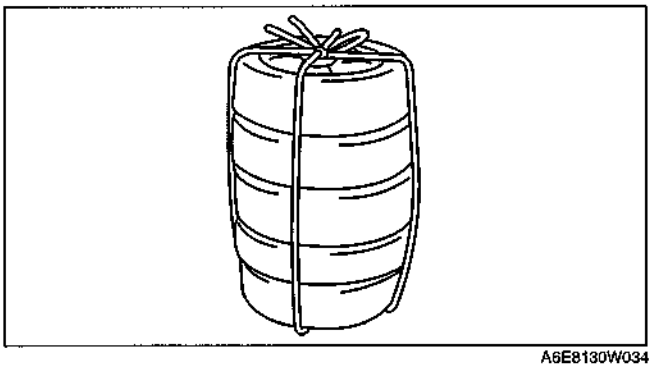
DCF810ZWB022

4. Stack the tire with the passenger-side air bag module on top of two tires without wheels. Stack a tire without a wheel on top of the tire with the passenger-side air bag module, and then stack another tire with a wheel on the very top.

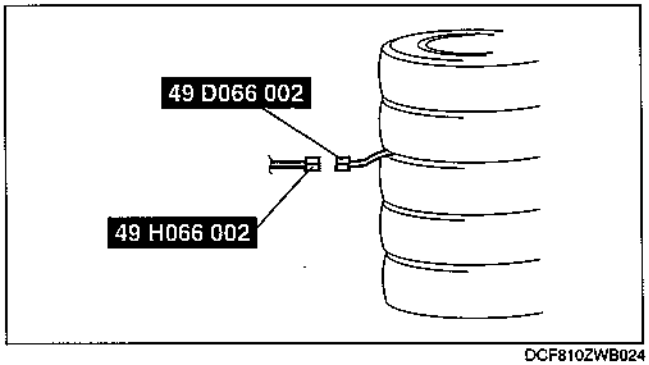


DCF810ZWB023

5. Secure the tires with wire.


A6E8130W034

6. Connect the **SST** (Deployment tool) to the **SST** (Adapter harness).
7. Connect both **SST** (Deployment tool) to the battery. Connect the power supply red clip to the positive battery terminal, and the black clip to the negative battery terminal.
8. Verify that the red lamp on both **SST** (Deployment tool) is illuminated.
9. Verify that all persons are standing **at least 6 m {20 ft}** away from the vehicle.

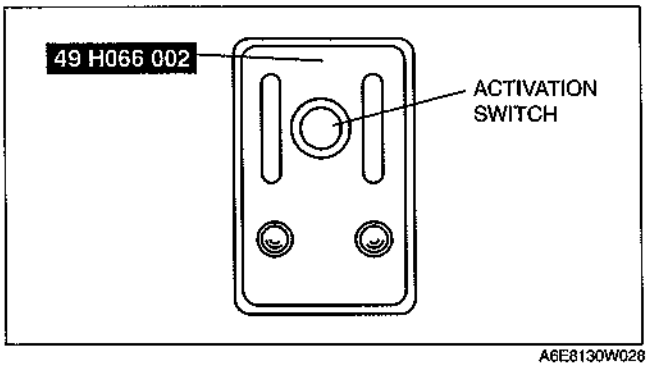


DCF810ZWB024

10. Press the activation switch on the **SST** (Deployment tool) to operate (deploy) the passenger-side air bag module.

Warning
- **The air bag module is very hot immediately after it is operated (deployed). You can be burned. Do not touch the air bag module for at least 15 min after deployment.**

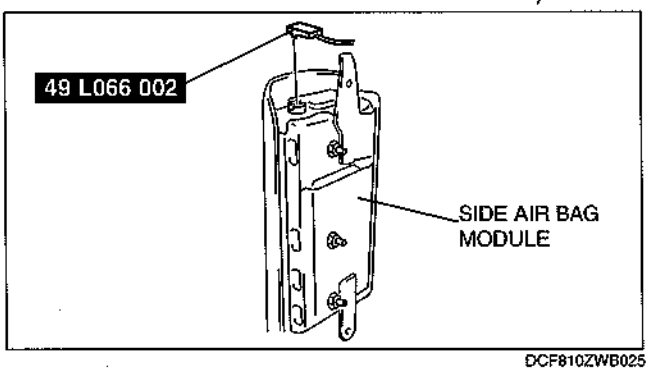
11. Disconnect the **SST** (Deployment tool) from the **SST** (Adapter harness).



A6E8130W028

Side Air Bag Module

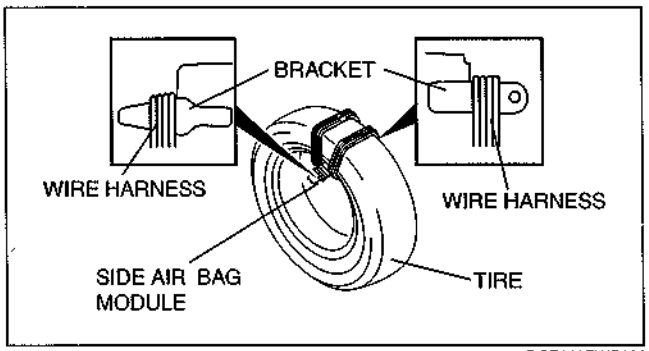
1. Remove the side air bag module. (See 08-10-5 SIDE AIR BAG MODULE REMOVAL/INSTALLATION.)
2. Connect the **SST** (Adapter harness) to the side air bag module as shown in the figure.



DCF810ZWB025

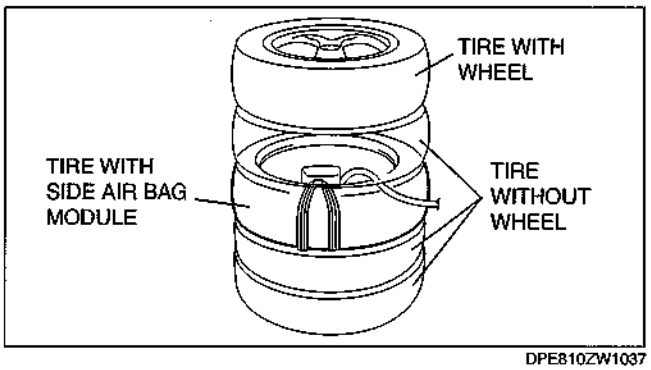
3. Place the padded surface of the side air bag module facing the center of the tire as shown in the figure. To secure the air bag module to the tire wheel, wrap a wire (cross section **1.25 mm^2 {0.002 in^2} or more**) through the tire and around the bracket **at least 4 times**.

Warning
- **If the air bag module is not properly secured to the tire, the tires may fall over by the impact of operation (deployment) and cause serious injury. To prevent this, secure the air bag module properly with the padded surface facing the center of the tire.**



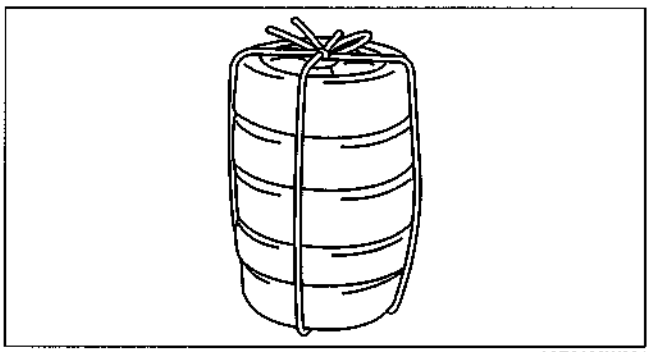
DCF810ZWB026

4. Stack the tire with the side air bag module on top of two tires without wheels. Stack a tire without a wheel on top of the tire with the side air bag module, and then stack another tire with a wheel on the very top.

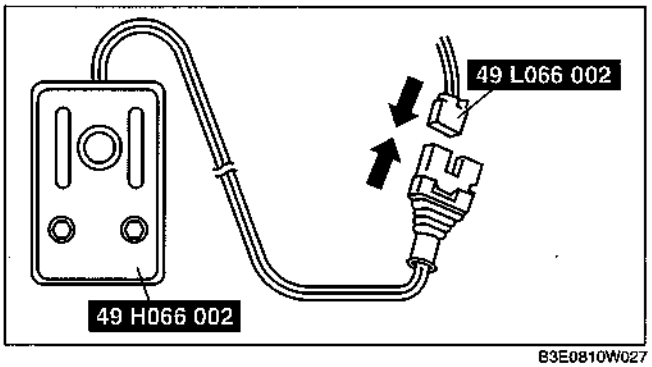


DPE810ZW1037

5. Secure the tires with wire.


A6E8130W034

6. Connect the **SST** (Deployment tool) to the **SST** (Adapter harness).
7. Connect the **SST** (Deployment tool) to the battery. Connect the power supply red clip to the positive battery terminal, and the black clip to the negative battery terminal.
8. Verify that the red lamp on the **SST** (Deployment tool) is illuminated.
9. Verify that all persons are standing **at least 6 m {20 ft}** away from the vehicle.

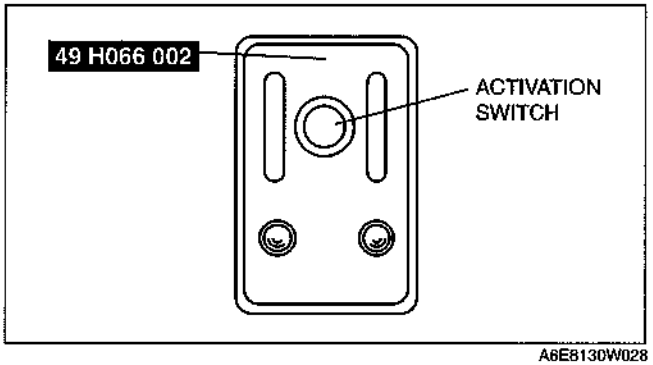


B3E0810W027

10. Press the activation switch on the **SST** (Deployment tool) to operate (deploy) the side air bag module.

    Warning
    - **The air bag module is very hot immediately after it is operated (deployed). You can be burned. Do not touch the air bag module for at least 15 min after deployment.**

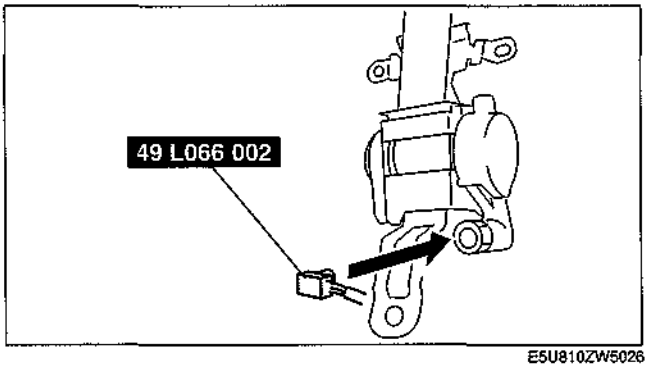
11. Disconnect the **SST** (Deployment tool) from the **SST** (Adapter harness).



A6E8130W028

Pre-tensioner Seat Belt

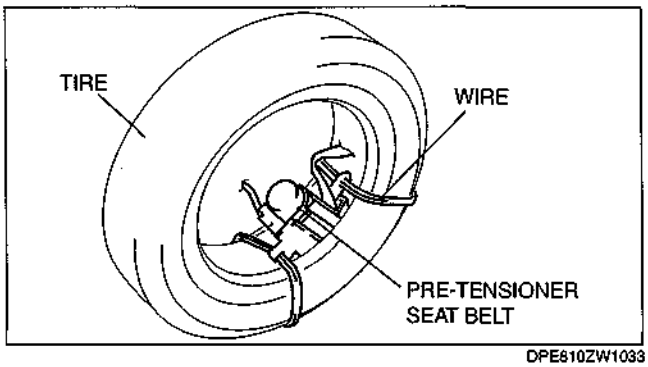
1. Remove the pre-tensioner seat belt. (See 08-11-1 SEAT BELT REMOVAL/INSTALLATION.)
2. Connect the **SST** (Adapter harness) to the pre-tensioner seat belt as shown in the figure.



E5U810ZW5026

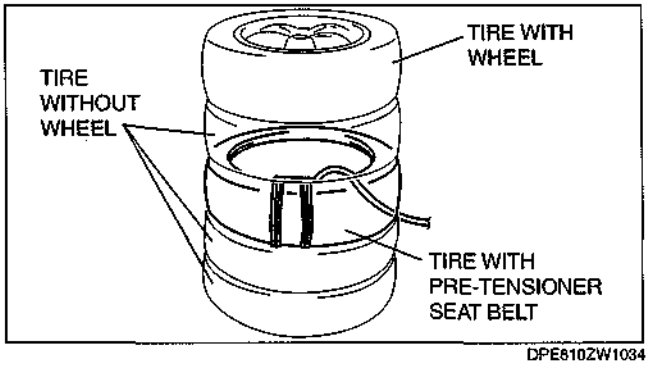
3. Put the pre-tensioner seat belt inside the tire and secure it to the tire by wrapping a wire (cross section of **1.25 mm^2 {0.002 in^2} or more**) through the tire and the bolt installation holes **at least 4 times**.

   Warning
   - **If the pre-tensioner seat belt is not properly secured to the tire, serious injury may occur when the pre-tensioner part is deployed. When installing the pre-tensioner seat belt to the tire, make sure the pre-tensioner part is inside the tire.**



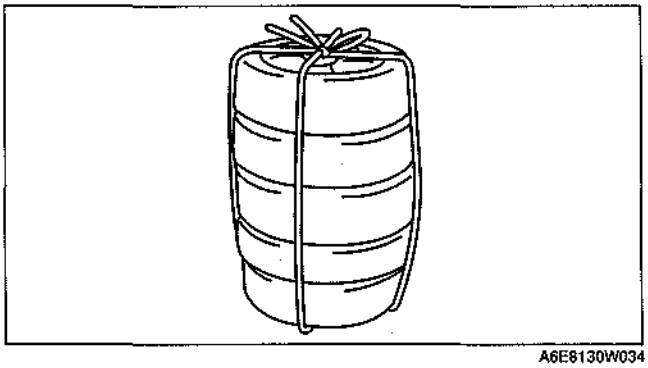
DPE810ZW1033

4. Stack the tire with the pre-tensioner seat belt on top of two tires without wheels. Stack a tire without a wheel on top of the tire with the pre-tensioner seat belt, and then stack another tire with a wheel on the very top.

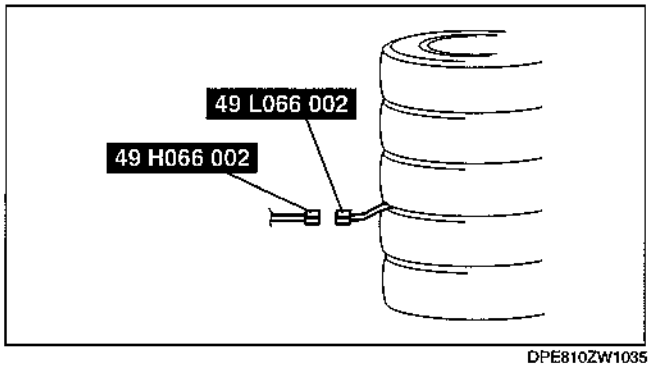


DPE810ZW1034

5. Secure the tires with wire.


A6E8130W034

6. Connect the **SST** (Deployment tool) to the **SST** (Adapter harness).
7. Connect the **SST** (Deployment tool) to the battery. Connect the power supply red clip to the positive battery terminal, and the black clip to the negative battery terminal.
8. Verify that the red lamp on the **SST** (Deployment tool) is illuminated.
9. Verify that all persons are standing **at least 6 m {20 ft}** away from the vehicle.

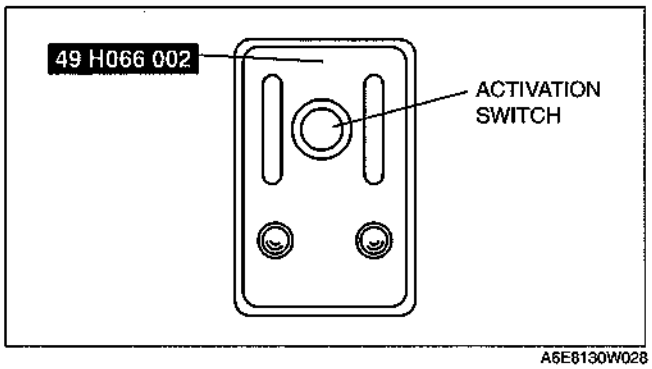


DPE810ZW1035

10. Press the activation switch on the **SST** (Deployment tool) to operate (deploy) the pre-tensioner seat belt.

Warning
- **The air bag module is very hot immediately after it is operated (deployed). You can be burned. Do not touch the air bag module for at least 15 min after deployment.**

11. Disconnect the **SST** (Deployment tool) from the **SST** (Adapter harness).



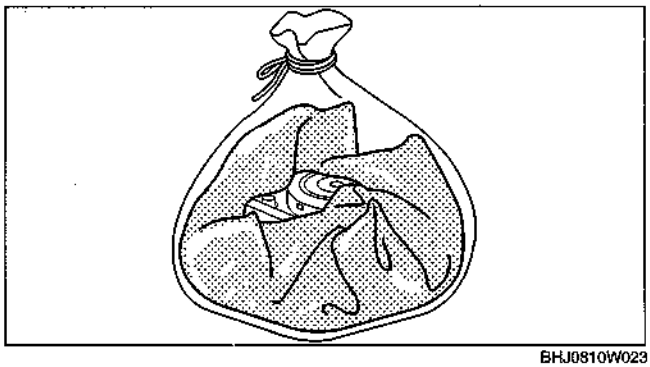
A6E8130W028

AIR BAG MODULE AND PRE-TENSIONER SEAT BELT DISPOSAL PROCEDURES

dcl081057000w02

Warning
- **A live (undeployed) air bag module or pre-tensioner seat belt may accidentally operate (deploy) when it is disposed of and cause serious injury. Always refer to the "AIR BAG MODULE AND PRE-TENSIONER SEAT BELT DEPLOYMENT PROCEDURES" and dispose of air bag modules and pre-tensioner seat belts in a deployed condition.**
- **The air bag modules and the pre-tensioner seat belts are very hot immediately after they are deployed. You can be burned. Do not touch an air bag module and pre-tensioner seat belt for at least 15 min after deployment.**
- **Pouring water on the deployed air bag module and pre-tensioner seat belt is dangerous. The water will mix with the residual gases to form a gas that can make breathing difficult. Do not pour water on the deployed air bag module and pre-tensioner seat belt.**
- **The deployed air bag module or pre-tensioner seat belt may contain deposits of sodium hydroxide, a caustic byproduct of the gas-generated combustion. If this substance gets into your eyes or on your hands, it can cause irritation and itching. When handling the deployed air bag module and pre-tensioner seat belt, wear gloves and safety glasses.**

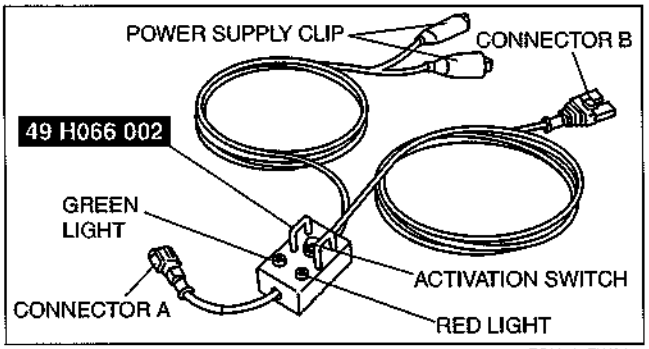
1. Remove the deployed air bag module or pre-tensioner seat belt.
2. Put the air bag module or pre-tensioner seat belt in a plastic bag, seal the bag, and then dispose of it.


BHJ0810W023

INSPECTION OF SST (DEPLOYMENT TOOL)

dcf081001078w01

1. Before using the **SST** (49 H066 002), inspect its operation.



EPU810ZW3011

Inspection Procedure

1. Follow the steps below to inspect the **SST** (49 H066 002).
   - If not as indicated in the table, replace the **SST** (49 H066 002) because it has a malfunction.

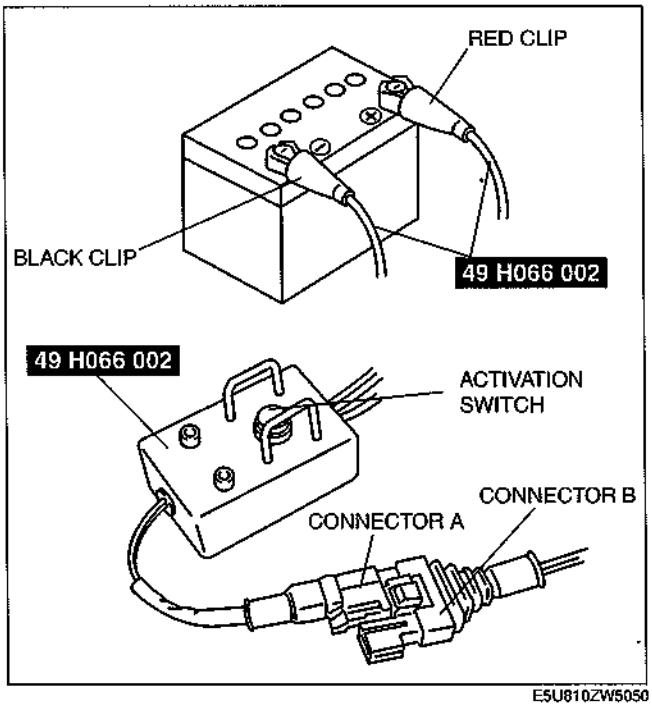
Warning

- **Do not use a malfunctioning SST (49 H066 002), otherwise it could cause the air bag module or pre-tensioner seat belt to accidentally operate (deploy).**

Caution

- **Because the permissible voltage for the SST (49 H066 002) is 12 V, do not connect a 24 V power source because it will damage the SST. Always connect only a 12 V power source.**

Step	Inspection procedure	Light condition	
		Green	Red
1	Connect the power supply red clip to the positive battery terminal, and the black clip to the negative battery terminal.	On	Off
2	Connect connectors A and B.	Off	On
3	Press the activation switch.	On	Off



E5U810ZW5050

08

08-11 SEAT BELT

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REMOVAL/INSTALLATION..... 08-11–1
ADJUSTER ANCHOR
REMOVAL/INSTALLATION 08-11–5
SEAT BELT INSPECTION 08-11–6
BUCKLE REMOVAL/INSTALLATION ...08-11–7

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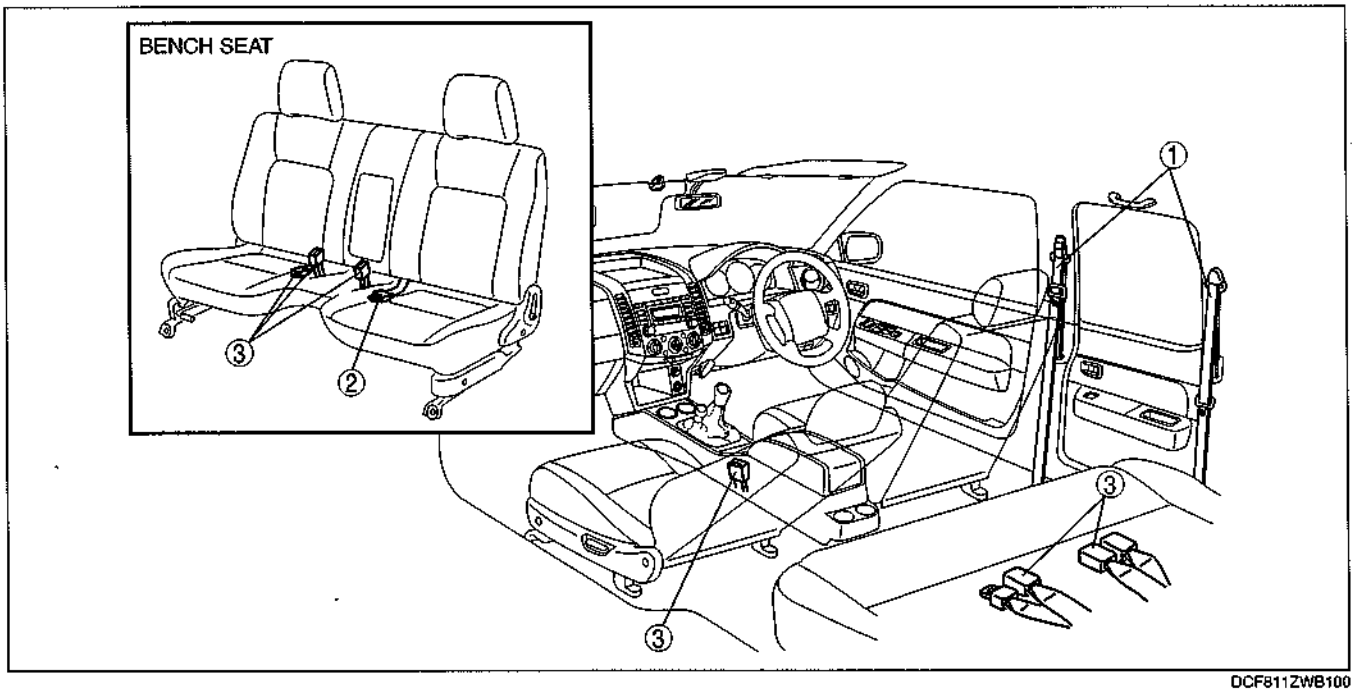
dcf061157000w01



DCF811ZWB100

1	Seat belt (See 08-11-1 SEAT BELT REMOVAL/ INSTALLATION.) (See 08-11-5 ADJUSTER ANCHOR REMOVAL/ INSTALLATION.) (See 08-11-6 SEAT BELT INSPECTION.)

2	Center seat belt (See 08-11-1 SEAT BELT REMOVAL/ INSTALLATION.)
3	Buckle (See 08-11-7 BUCKLE REMOVAL/INSTALLATION.)

SEAT BELT REMOVAL/INSTALLATION

dcf081157630w01

Warning

- **Handling the seat belt (pre-tensioner seat belt) improperly can accidentally deploy the pre-tensioner seat belt, which may seriously injure you. Read the service warnings and cautions before handling the seat belt (pre-tensioner seat belt). (See 08-10-2 SERVICE WARNINGS.) (See 08-10-3 SERVICE CAUTIONS.)**

Caution

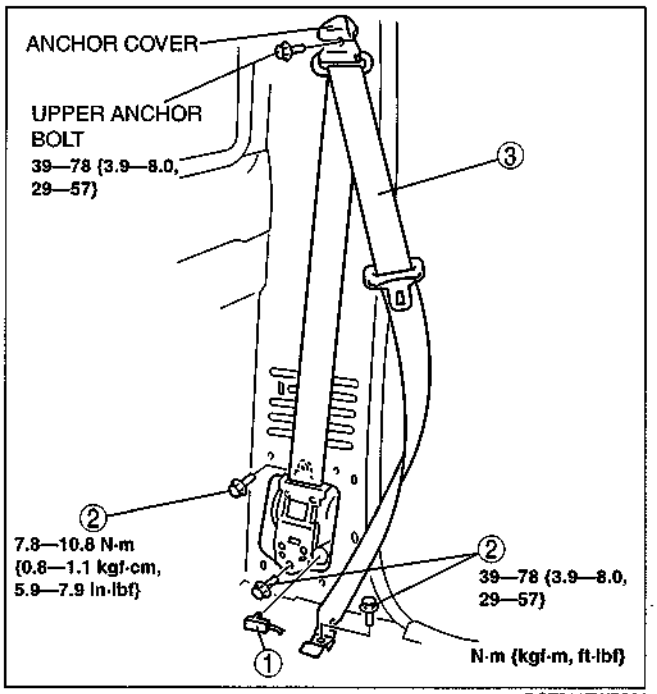
- **The ELR (emergency locking retractor) has a spring that will unwind if the retractor cover is removed. The spring cannot be rewound by hand. If this occurs, the ELR will not work properly. Therefore, do not disassemble the retractor.**

Regular Cab (Driver-side and passenger-side)

1. Turn the engine switch to the LOCK position. (vehicle with pre-tensioner seat belt)
2. Disconnect the negative battery cable and wait for **1 min or more**. (vehicle with pre-tensioner seat belt) (See 01-17-2 BATTERY REMOVAL/INSTALLATION.)
3. Remove the anchor cover.

1	Connector (vehicle with pre-tensioner seat belt) (See 08-11-2 Connector removal note.)
2	Bolt
3	Seat belt

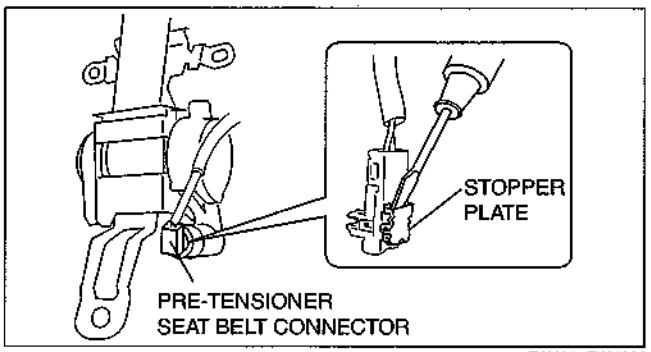
4. Remove the upper anchor bolt.
5. Remove the B-pillar trim. (See 09-17-15 B-PILLAR TRIM REMOVAL/INSTALLATION.)
6. Remove in the order indicated in the table.
7. Install in the reverse order of removal.
8. Turn the engine switch to the ON position. (vehicle with pre-tensioner seat belt)
9. Verify that the air bag system warning light illuminates for **approx. 6 s** and goes out. (vehicle with pre-tensioner seat belt)
   - If the air bag system warning light does not operate, refer to the on-board diagnostic system (air bag system) and perform inspection of the system.



DCF811ZWB001

Connector removal note

1. Using a screwdriver, pry out the pre-tensioner seat belt connector stopper plate.



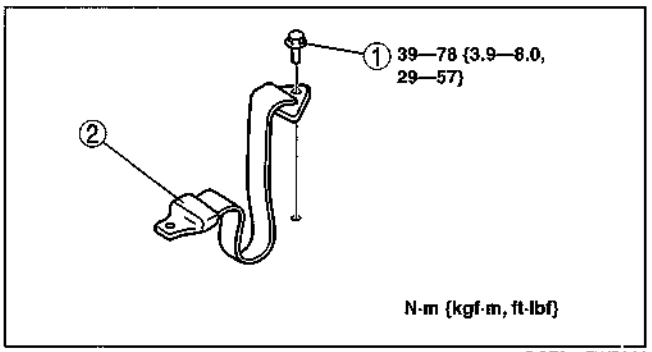
E5U811ZW5003

Regular Cab (center)

1. Remove in the order indicated in the table.

1	Bolt
2	Center seat belt

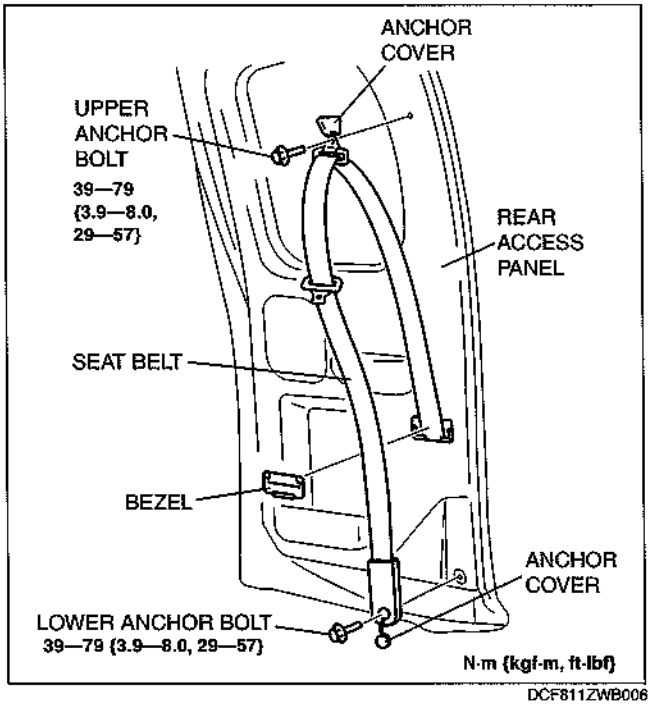
2. Install in the reverse order of removal.



DCF811ZWB002

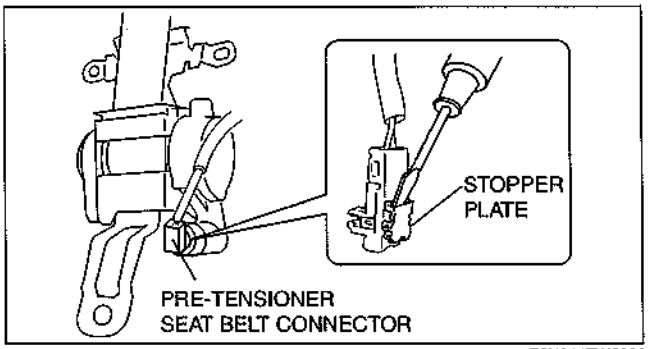
Stretch Cab (with rear access system)

1. Turn the engine switch to the LOCK position. (vehicle with pre-tensioner seat belt)
2. Disconnect the negative battery cable and wait for **1 min or more.** (vehicle with pre-tensioner seat belt) (See 01-17-2 BATTERY REMOVAL/INSTALLATION.)
3. Remove the bezel.
4. Remove the anchor cover.
5. Remove the upper anchor bolt and lower anchor bolt.
6. Remove the Rear access panel trim. (See 09-17-18 REAR ACCESS PANEL TRIM REMOVAL/INSTALLATION.)
7. Remove the seat belt through the seat belt hole.



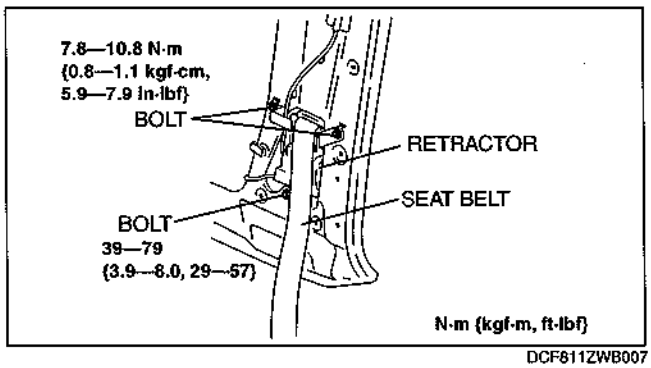
DCF811ZWB006

8. Using a screwdriver, pry out the pre-tensioner seat belt connector stopper plate. (vehicle with pre-tensioner seat belt)
9. Remove the bolts from the retractor.



E5U811ZW5003

10. Remove the retractor.
11. Install in the reverse order of removal.



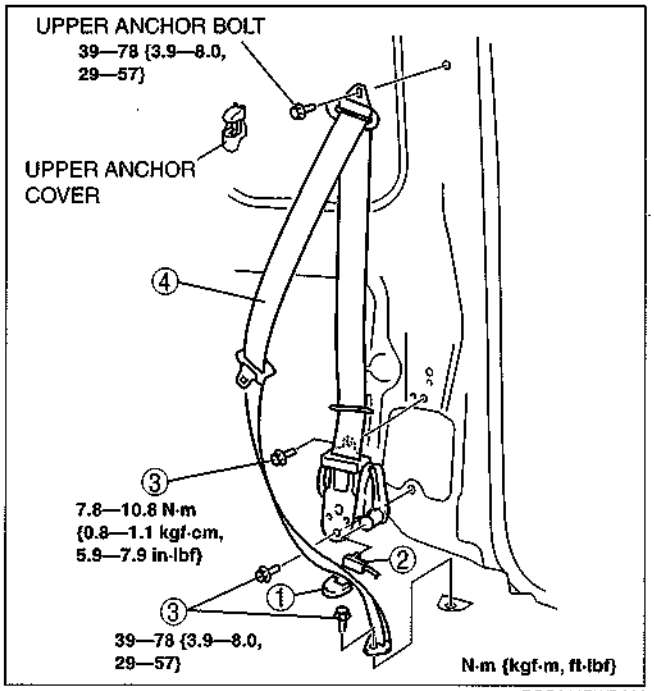
DCF811ZWB007

Double Cab
Front

1. Turn the engine switch to the LOCK position. (vehicle with pre-tensioner seat belt)
2. Disconnect the negative battery cable and wait for **1 min or more**. (vehicle with pre-tensioner seat belt) (See 01-17-2 BATTERY REMOVAL/INSTALLATION.)
3. Remove the following parts:
   (1) Rear scuff plate (See 09-17-21 REAR SCUFF PLATE REMOVAL/INSTALLATION.)
   (2) Rear seat back (See 09-13-5 REAR SEAT REMOVAL/INSTALLATION.)
   (3) Rear seat belt upper anchor installation bolt (See 08-11-5 Rear)
   (4) Remove the C-pillar trim (See 09-17-17 C-PILLAR TRIM REMOVAL/INSTALLATION.)
   (5) Front scuff plate (See 09-17-20 FRONT SCUFF PLATE REMOVAL/INSTALLATION.)
   (6) Remove the B-pillar lower trim (See 09-17-16 B-PILLAR LOWER TRIM REMOVAL/INSTALLATION.)
   (7) Front seat belt upper anchor cover
   (8) Front seat belt upper anchor installation bolt
   (9) Remove the B-pillar upper trim (See 09-17-16 B-PILLAR UPPER TRIM REMOVAL/INSTALLATION.)
4. Remove in the order indicated in the table.

1	Lower anchor cover
2	Connector (vehicle with pre-tensioner seat belt) (See 08-11-2 Connector removal note.)
3	Bolt
4	Seat belt

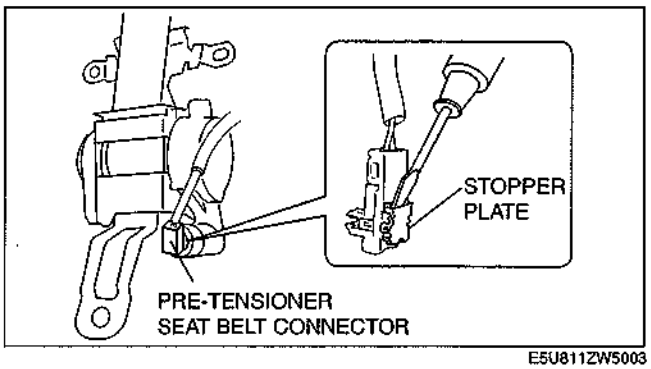
5. Install in the reverse order of removal.
6. Turn the engine switch to the ON position. (vehicle with pre-tensioner seat belt)
7. Verify that the air bag system warning light illuminates for **approx. 6 s** and goes out. (vehicle with pre-tensioner seat belt)
   - If the air bag system warning light does not operate, refer to the on-board diagnostic system (air bag system) and perform inspection of the system.



DBG811ZWBA02

Connector removal note

1. Using a screwdriver, pry out the pre-tensioner seat belt connector stopper plate.



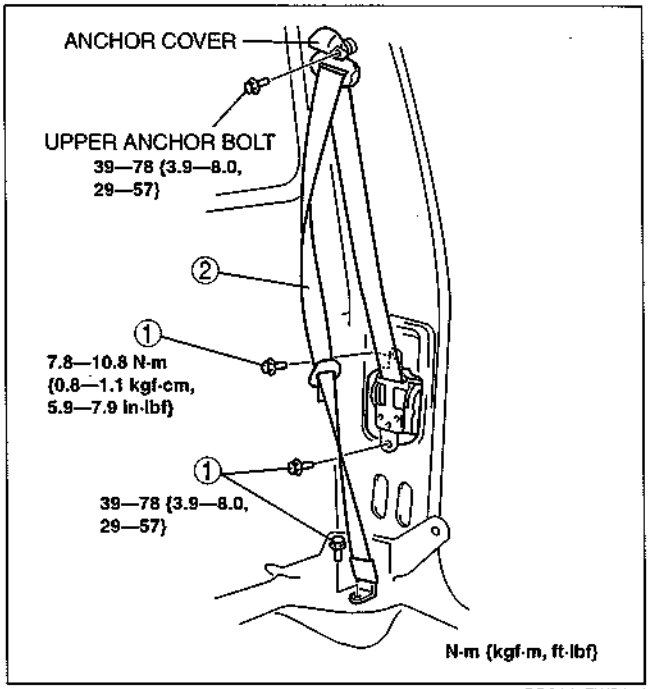
E5U811ZW5003

Rear

1. Remove the following parts:
   (1) Rear scuff plate (See 09-17-21 REAR SCUFF PLATE REMOVAL/INSTALLATION.)
   (2) Rear seat back (See 09-13-5 REAR SEAT REMOVAL/INSTALLATION.)
   (3) Rear seat belt upper anchor cover
   (4) Rear seat belt upper anchor installation bolt
   (5) Remove the C-pillar trim (See 09-17-17 C-PILLAR TRIM REMOVAL/INSTALLATION.)
2. Remove in the order indicated in the table.

1	Bolt
2	Seat belt

3. Install in the reverse order of removal.



DBG811ZWBA01

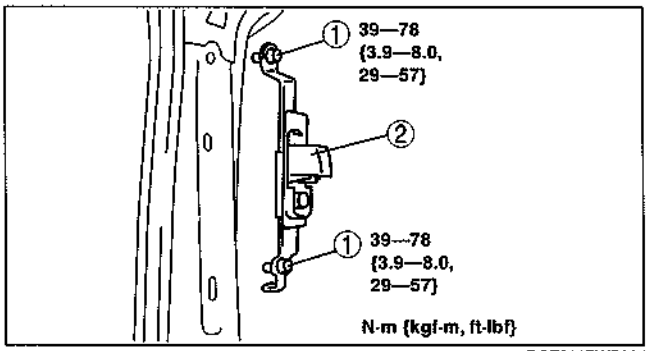
ADJUSTER ANCHOR REMOVAL/INSTALLATION

dcf081157630w02

1. Remove the following parts:
   (1) Rear scuff plate (See 09-17-21 REAR SCUFF PLATE REMOVAL/INSTALLATION.)
   (2) Rear seat back (See 09-13-5 REAR SEAT REMOVAL/INSTALLATION.)
   (3) Rear seat belt upper anchor installation bolt (See 08-11-5 Rear)
   (4) Remove the C-pillar trim (See 09-17-17 C-PILLAR TRIM REMOVAL/INSTALLATION.)
   (5) Front scuff plate (See 09-17-20 FRONT SCUFF PLATE REMOVAL/INSTALLATION.)
   (6) Remove the B-pillar lower trim (See 09-17-16 B-PILLAR LOWER TRIM REMOVAL/INSTALLATION.)
   (7) Front seat belt upper anchor installation bolt (See 08-11-4 Front)
   (8) Remove the B-pillar upper trim (See 09-17-16 B-PILLAR UPPER TRIM REMOVAL/INSTALLATION.)
2. Remove in the order indicated in the table.

1	Bolt
2	Adjuster anchor

3. Install in the reverse order of removal.



DCF811ZWB004

SEAT BELT INSPECTION

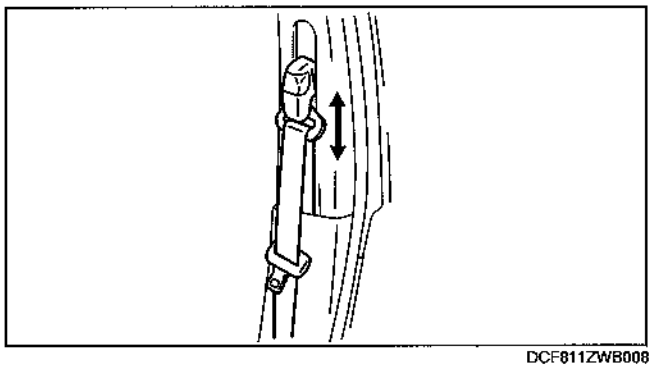
dcf081157000w02

Belt

1. Verify that the belt is installed properly with no twists or kinks.
2. Verify that there is no damage to the seat belt and no deformation of the metal fittings.
   - If there is any malfunction, replace the seat belt.

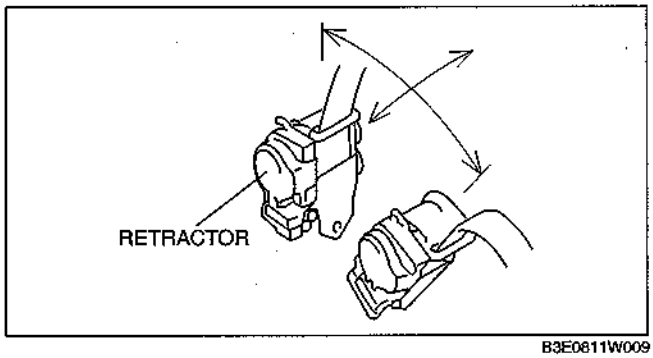
ELR

1. Verify that the belt can be pulled out smoothly, and that it retracts smoothly.
   - If there is any malfunction, replace the seat belt.
2. Verify that the retractor locks when the belt is pulled quickly.
   - If there is any malfunction, replace the seat belt.
3. Remove the retractor.



DCF811ZWB008

4. While pulling the seat belt out, make sure that the seat belt does not lock when the retractor is tilted slowly **up to 15°** from the mounted position and locks when the retractor is tilted **40° or more.**
   - If there is any malfunction, replace the seat belt.



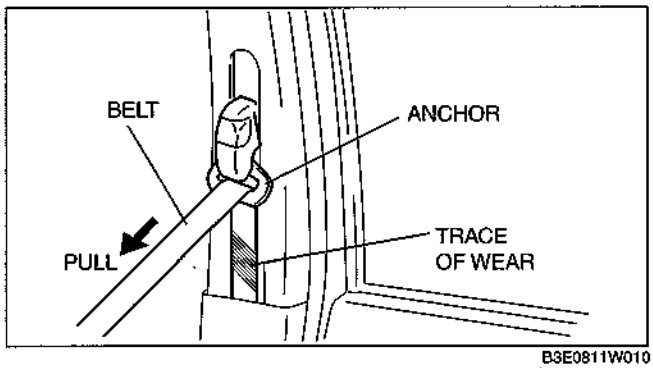
B3E0811W009

Load Limiter Retractor

Warning

- **When the load limiter operates, the belt and anchor rub against each other strongly leaving wear tracks. If the seat belt is used in this state, the seat belt will not function at its full capability and there is the possibility of serious injury to passengers. Be sure to replace the seat belt once the load limiter operates.**

1. If the vehicle has been subjected to a shock in an accident, pull the belt from the retractor and confirm that there are no wear tracks (the load limiter has not operated) by visually inspecting and feeling the belt.
   - If there is any malfunction, replace the seat belt.



B3E0811W010

BUCKLE REMOVAL/INSTALLATION

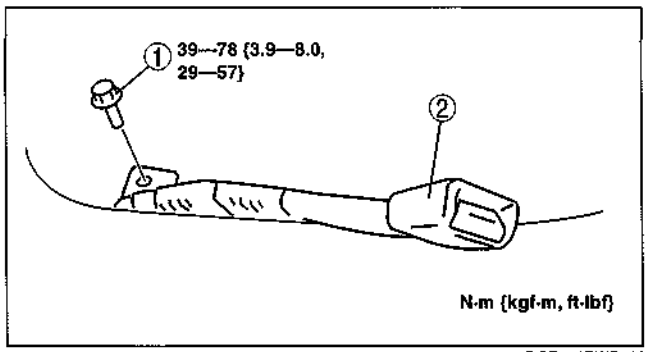
dcf081157620w01

Bench Seat (Driver-side and Passenger-side)

1. Remove in the order indicated in the table.

1	Bolt
2	Buckle

2. Install in the reverse order of removal.



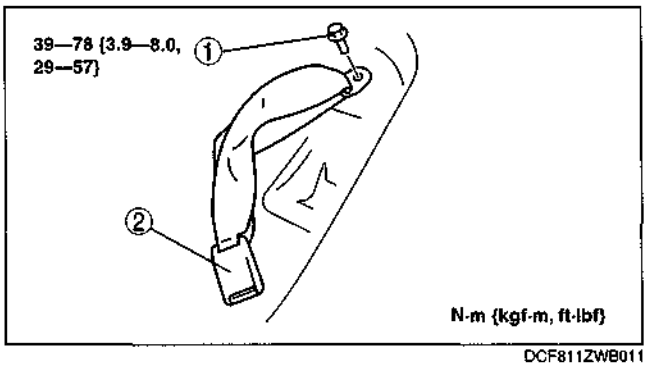
DCF811ZWB010

Bench Seat (Center)

1. Remove the seat. (See 09-13-2 SEAT REMOVAL/INSTALLATION.)
2. Remove in the order indicated in the table.

1	Bolt
2	Buckle

3. Install in the reverse order of removal.



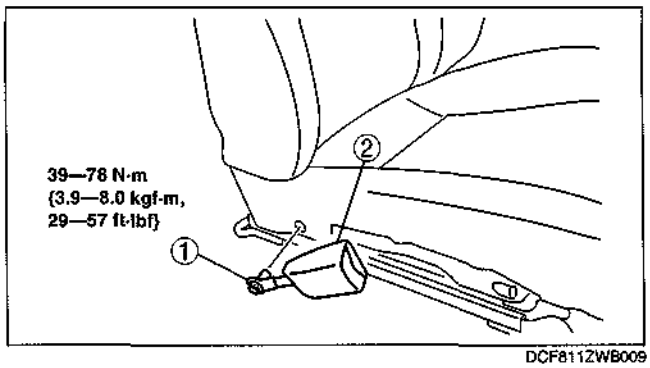
DCF811ZWB011

Separate Seat

1. Remove the seat or front seat. (See 09-13-2 SEAT REMOVAL/INSTALLATION.) (See 09-13-4 FRONT SEAT REMOVAL/INSTALLATION.)
2. Remove the side cover. (See 09-13-3 SEAT DISASSEMBLY/ASSEMBLY.) (See 09-13-4 FRONT SEAT DISASSEMBLY/ASSEMBLY.)
3. Remove in the order indicated in the table.

1	Bolt
2	Buckle

4. Install in the reverse order of removal.



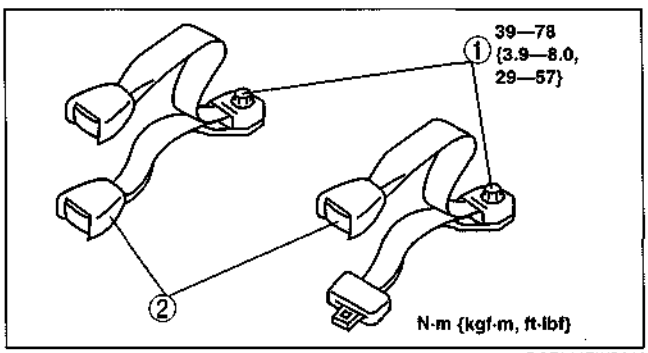
DCF811ZWB009

Double Cab
Rear

1. Remove in the order indicated in the table.

1	Bolt
2	Buckle

2. Install in the reverse order of removal.



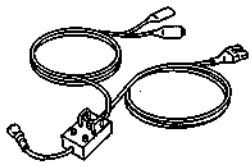
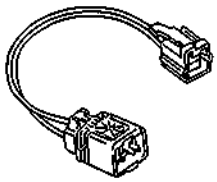
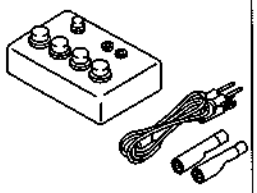
DCF811ZWB012

08-60 SERVICE TOOLS

RESTRAINTS SST 08-60–1

RESTRAINTS SST

dcf086000000w01

49 H066 002 Deployment tool 	49 D066 002 Adapter harness 	49 L066 002 Adapter harness
49 N088 0A0 Fuel and Thermometer checker 	—	—

BODY & ACCESSORIES

09 SECTION

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ON-BOARD DIAGNOSTIC [AUDIO] 09-02B
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SYMPTOM TROUBLESHOOTING [KEYLESS ENTRY SYSTEM] 09-03B
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09-02A ON-BOARD DIAGNOSTIC [IMMOBILIZER SYSTEM]

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DTC 03 . . . . . 09-02A–3
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DTC 21 . . . . . 09-02A–4
DTC 24 . . . . . 09-02A–5
DTC 30 . . . . . 09-02A–5

FOREWORD [IMMOBILIZER SYSTEM]

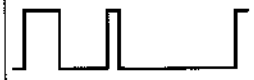
dcf090267000w01

Caution
- **When the engine does not start or stalls and the following DTCs are not indicated, go to engine symptom troubleshooting.**

Note
- When the immobilizer system is defective, the engine cannot be started.
- If engine condition is normal but light stays on, inspect for short circuit between security light and immobilizer unit connector terminal M. Repair or replace the wiring harness if necessary.
- The DDS1 is installed to the FIP with set bolts and cannot be removed. if there is a possibility that the DDS1 is faulty, be sure to ask your distributor to repair it.

1. Turn the ignition switch to ON position.
2. Verify the security light condition and read the DTC if indicated.
3. If the DTC is indicated, go to troubleshooting referring to the DTC table.

DTC TABLE [IMMOBILIZER SYSTEM]

DTC	Output pattern	Description	Page
01		ID number unregistered in immobilizer unit is input after engine switch is turned to ON position or cranking engine.	(See 09-02A-3 DTC 01[IMMOBILIZER SYSTEM])
02		ID number format error (voltage range, frequency)	(See 09-02A-3 DTC 02[IMMOBILIZER SYSTEM])
03		ID number is not input into immobilizer unit after engine switch is turned to ON position or cranking engine.	(See 09-02A-4 DTC 03[IMMOBILIZER SYSTEM])
11		Coil or wiring harness between immobilizer unit and coil is open circuit.	(See 09-02A-5 DTC 11[IMMOBILIZER SYSTEM])
21		Code word/ID number stored in immobilizer unit EEPROM cannot be read.	(See 09-02A-5 DTC 21[IMMOBILIZER SYSTEM])
24		Open or short circuit in wiring harness between immobilizer unit and DDS1.	(See 09-02A-6 DTC 24[IMMOBILIZER SYSTEM])
25		IG circuit of immobilizer unit is open circuit or IG circuit of DDS1 is for short to B+ circuit.	
30		DDS1 is defective. (Malfunction of communication line inside DDS1)	(See 09-02A-8 DTC 30[IMMOBILIZER SYSTEM])
41		Immobilizer unit or DDS1 is defective. (Code words of immobilizer unit and DDS1 do not match)	
42		DDS1 is defective. (Communication error between immobilizer unit and DDS1)	
44		DDS1 is defective. (Malfunction of DDS1, except for malfunctions related to DTC 30, 41, or 42	

Note
- If DTC 25 and the other DTC are indicated, go to DTC 25 first and then go to the other DTC.

Note
- Perform the following if the security light stays on:
  - — If engine stalls, go to symptom troubleshooting "NO.4 ENGINE STALLS-AFTER START/AT IDLE".
  - — If engine will not start, go to symptom troubleshooting "NO.5 CRANKS NORMALLY BUT WILL NOT START." (See 01-03A-13 NO.5 CRANKS NORMALLY BUT WILL NOT START [WL-3])
  - — If engine condition is normal but light stays on, inspect for continuity between the following wiring harness and body ground: security light and immobilizer unit connector terminal M. Repair or replace the wiring harness.

DTC 01

dcf090267000w03

DTC 01	**ID number unregistered in immobilizer unit is input after engine switch is turned to ON position or engine cranking.**
POSSIBLE CAUSE	• ID number is unregistered in immobilizer unit.

Diagnostic procedure

STEP	INSPECTION		ACTION
—	—	—	Go to ID number input procedure. (See 09-14-24 Key Replacement or Addition)

DTC 02

dcf090267000w04

DTC 02	ID number format error (voltage range, frequency)
POSSIBLE CAUSE	• Defective transponder in the key

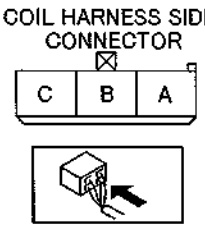
Diagnostic procedure

STEP	INSPECTION		ACTION
—	—	—	Dispose of defective key. Duplicate key if necessary. (See 09-14-24 Key Replacement or Addition)

DTC 03

dcf090267000w05

DTC 03	ID number is not input into immobilizer unit after engine switch is turned to ON position or cranking engine.
POSSIBLE CAUSE	• No transponder in the key • Defective transponder in the key (ID number is not output.) • Defective coil at steering lock • Defective wiring harness between coil and immobilizer unit



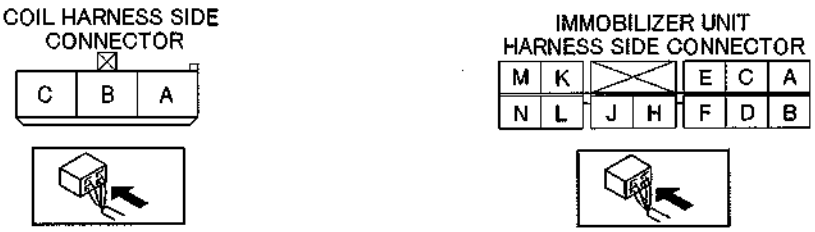
Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Does security light indicate DTC 11?	Yes	Go to DTC 11.
		No	Go to next step.
2	• Does security light indicate DTC 30?	Yes	Go to DTC 30.
		No	Go to next step.
3	**INSPECT FOR OTHER PROPER KEYS** • Does engine start with other proper keys?	Yes	Dispose of defective key. Duplicate key if necessary. (See 09-14-24 Key Replacement or Addition .)
		No	Go to next step.
4	**INSPECT COIL CIRCUIT FOR SHORT TO GND OR COIL CIRCUIT FOR CONTINUITY** • Disconnect the coil connector. • Inspect for short circuits between coil connector terminals A and C and ground, and also between coil connector terminals A and C. • Is there a short?	Yes	Repair the wiring harness connected to terminals A and/or C.
		No	Troubleshooting is completed.

DTC 11

dcf090267000w06

DTC 11	Coil or wiring harness between immobilizer unit and coil is open circuit.
POSSIBLE CAUSE	• Open circuit in coil • Poor connection of coil connector • Poor connection of immobilizer unit • Defective wiring harness between immobilizer unit and coil



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT CONNECTOR CONNECTION** • Is connector of coil or immobilizer unit connected securely?	Yes	Go to next step.
		No	Connect connector securely.
2	**INSPECT COIL CIRCUIT FOR CONTINUITY** • Is there continuity between coil terminals A and C?	Yes	Go to next step.
		No	Replace coil.
3	**INSPECT COIL CIRCUIT FOR CONTINUITY** • Disconnect coil connector and immobilizer unit connector. • Inspect if either of the following wiring harnesses has continuity. — Immobilizer unit D to coil C, and immobilizer unit F to coil A — Immobilizer unit D to coil A, and immobilizer unit F to coil C **Note** • Vehicle harness which is connected to immobilizer unit terminals D and F, uses a twisted pair wire. Because twisted pair wire does not have polarity, immobilizer unit connector terminal D may be connected to coil connector terminal A or C. Likewise, immobilizer unit connector terminal F may be connected to coil connector terminal A or C.	Yes	Replace immobilizer unit and reprogram immobilizer system. (See 09-14-28 Immobilizer Unit Replacement)
		No	Repair wiring harness between coil and immobilizer unit.

DTC 21

dcf090267000w07

DTC 21	Code word/ID number stored in immobilizer unit EEPROM cannot be read.
POSSIBLE CAUSE	• Defective immobilizer unit

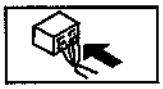
Diagnostic procedure

STEP	INSPECTION		ACTION
—	**INSPECT IMMOBILIZER UNIT** • Turn engine switch from LOCK position to START position **for 2 seconds.** • Does security light indicate DTC 21 again?	Yes	Replace immobilizer unit and reprogram immobilizer system. (See 09-14-28 Immobilizer Unit Replacement)
		No	Immobilizer system is okay.

DTC 24

DTC 24	Open or short circuit in wiring harness between immobilizer unit and DDS1
POSSIBLE CAUSE	• Defective immobilizer unit • Defective DDS1 • Poor connection of connector • Defective wiring harness

IMMOBILIZER UNIT HARNESS SIDE CONNECTOR



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT CONNECTOR CONNECTION** • Are both immobilizer unit and FIP connectors connected properly?	Yes	Go to next step.
		No	Connect connectors properly.
2	**INSPECT COMMUNICATION CIRCUIT FOR CONTINUITY** • Disconnect FIP connector. • Turn engine switch to ON position. • Measure voltage at FIP connector terminal H. • Is voltage **more than 10 V**?	Yes	Go to Step 5.
		No	Go to next step.
3	**INSPECT COMMUNICATION CIRCUIT FOR CONTINUITY** • Disconnect immobilizer unit and FIP connectors. • Is there continuity between immobilizer unit connector terminal A and FIP connector terminal H?	Yes	Go to next step.
		No	Repair wiring harness between DDS1 and immobilizer unit.
4	**INSPECT IMMOBILIZER UNIT FOR SHORT TO GND** • Is there continuity between immobilizer unit connector terminal A and ground?	Yes	Repair for short circuit in wiring harness between DDS1 and immobilizer unit.
		No	Go to next step.
5	**INSPECT POWER CIRCUIT FOR OPEN CIRCUIT TO DDS1** • Turn engine switch to ON position. • Measure voltage at FIP connector terminal G. • Is voltage **more than 10 V**?	Yes	Go to next step.
		No	Repair wiring harness between ENGINE 15 A fuse and DDS1.
6	**INSPECT DDS1 FOR SHORT TO GND** • Turn engine switch to LOCK position. • Disconnect FIP connector. • Is there continuity between FIP connector terminal F and ground?	Yes	Go to next step.
		No	Repair wiring harness between DDS1 and ground.
7	**INSPECT INNER CIRCUIT OF IMMOBILIZER UNIT** • Replace immobilizer unit and reprogram immobilizer system. (See 09-14-5 IMMOBILIZER SYSTEM REPROGRAM PROCEDURE.) • Dose engine start?	Yes	Immobilizer unit was defective.
		No	Replace DDS1 and reprogram immobilizer system. (See 09-14-5 IMMOBILIZER SYSTEM REPROGRAM PROCEDURE.)

DTC 30[IMMOBILIZER SYSTEM]

id0902e4904800

DTC 30	DDS1 is defective (Malfunction of communication line inside DDS1)
POSSIBLE CAUSE	• Defective DDS1

Diagnostic procedure

STEP	INSPECTION		ACTION
—	—	—	Replace DDS1 and reprogram immobilizer system. (See 09-14-5 IMMOBILIZER SYSTEM REPROGRAM PROCEDURE.)

09-02B ON-BOARD DIAGNOSTIC [AUDIO]

STARTING PROCEDURE FOR ON-BOARD DIAGNOSTIC TEST MODE 09-02B–1
SUPPLIER IDENTIFICATION PROCEDURE 09-02B–1
MEMORY CLEARING PROCEDURE 09-02B–2
DTC TABLE [AUDIO SYSTEM] 09-02B–2
DIAGNOSTIC ASSIST FUNCTION 09-02B–4

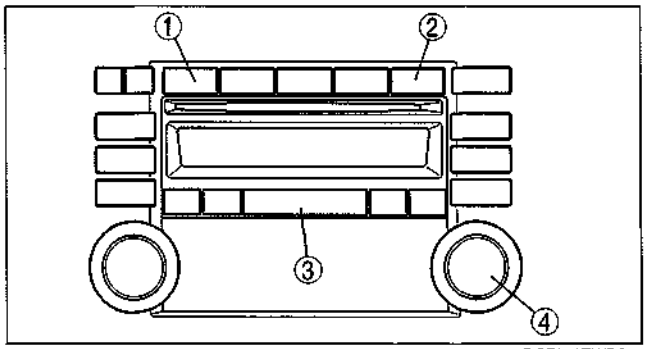
STARTING PROCEDURE FOR ON-BOARD DIAGNOSTIC TEST MODE

dcf090266900w01

Note
- All DTCs displayed in the on-board diagnostic test mode should be entered in the Audio Repair Order Form.

1. Turn the engine switch to the ACC or ON position.
2. Turn the POWER button off.
3. While pressing the POWER button, simultaneously press the FM 1 button and the MEDIA button for **2 s or more**.

1	FM 1 button
2	MEDIA button
3	SEEK switch
4	POWER button



DCF902ZWBS01

Note
- If several DTCs are in the memory, they can be displayed using the SEEK switch (up or down).

4. To stop the on-board diagnostic test mode, turn the engine switch off.

SUPPLIER IDENTIFICATION PROCEDURE

dcf090266900w02

Note
- The supplier can vary with the module. When asking the supplier (service center) for repair or replacement, identify the supplier and fill in the Audio Repair Order Form with the following procedures.

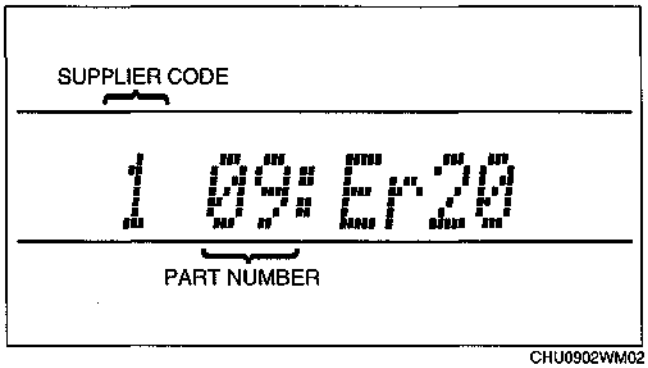
Identification Using the Label or Inscribed Lettering

1. Remove the audio unit.
2. Verify the supplier by referring to the label attached to each unit.

Identification Using the On-board Diagnostic Test Mode.

1. Start the on-board diagnostic test mode.
2. Identify the device and supplier codes by referring to the information display.

Note
- If no DTC is stored, no codes will be displayed.



CHU0902WM02

Supplier code	Supplier name
1	SANYO Automedia
2	Panasonic
3	Clarion
4	Pioneer

Part number	Part name
03	CD player
05	CD changer (external)

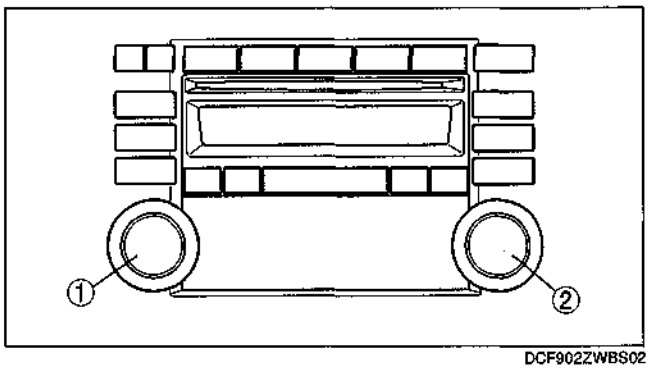
Part number	Part name
06	CD changer (upper module)
07	MD player (lower module)
09	Base unit
10	MP3 applicable CD player system
21	Center panel
22	MP3 applicable CD changer (upper module)

MEMORY CLEARING PROCEDURE

dcf090266900w03

1. Start the on-board diagnostic test mode.
2. While pressing the POWER button, simultaneously press the AUDIO CONT button for **2 s or more.**

1	AUDIO CONT button
2	POWER button



DCF902ZWBS02

Caution
- **Before clearing the memory, be sure to enter all of the DTCs displayed in the on-board diagnostic test mode in the Audio Repair Order Form.**

3. To stop the on-board diagnostic test mode, turn the engine switch off.

DTC TABLE [AUDIO SYSTEM]

dcf090266900w04

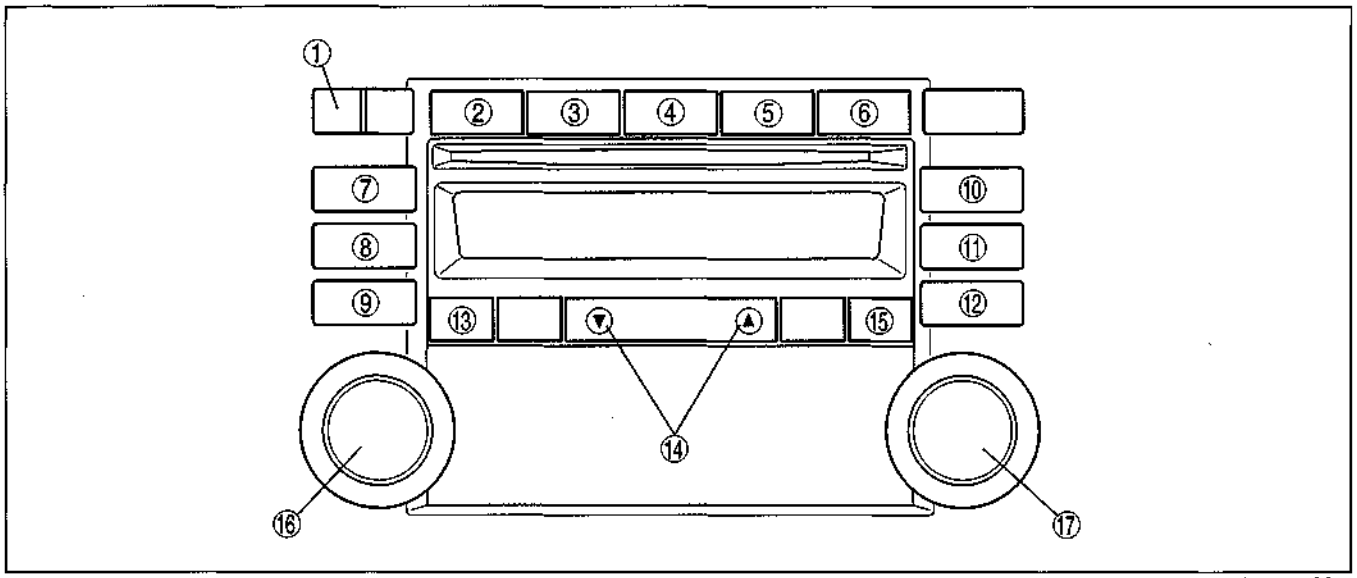
Screen display DTC (When starting on-board diagnostic test function)	Detection condition	Possible cause/inspection
03: Er01	CD player cannot implement insert and eject commands.	CD player malfunction
03: Er02	Cannot change tracks.	CD player malfunction
03: Er07	CD reading error.	• Defective CD (scratches or dirt) • CD player malfunction
03: Er10	CD player does not operate.	• Malfunction of connectors between base unit and CD player • CD player malfunction
05: Er01	CD changer (external) cannot implement insert, eject, and disc change commands.	• Defective CD (curved, broken or foreign material stuck/attached, etc.) • CD changer (external) malfunction
05: Er07	CD reading error.	• Defective CD (curved, broken or foreign material stuck/attached, etc.) • CD changer (external) malfunction
05: Er10	CD changer (external) does not operate.	• Defective CD (curved, broken or foreign material stuck/attached, etc.) • CD changer (external) malfunction
06: Er01	CD changer cannot implement insert, eject, and disc change commands.	• Defective CD (curved, broken or foreign material stuck/attached, etc.) • CD changer malfunction
06: Er02	Cannot change tracks.	• Defective CD (curved, broken or foreign material stuck/attached, etc.) • CD changer malfunction
06: Er07	CD reading error.	• Defective CD (curved, broken or foreign material stuck/attached, etc.) • CD changer malfunction
06: Er10	CD changer does not operate.	• Malfunction of connectors between base unit and CD changer • CD changer malfunction

Screen display DTC (When starting on-board diagnostic test function)	Detection condition	Possible cause/inspection
07: Er01	MD player cannot implement insert and eject commands.	MD player malfunction
07: Er02	Cannot change tracks.	MD player malfunction
07: Er07	MD reading error.	Defective MD
07: Er08	Blank unrecorded MD is inserted.	Defective MD
07: Er10	MD player does not operate.	• Malfunction of connectors between base unit and MD player • MD player malfunction
09: Er20	Audio system does not operate.	Voltage at base unit is low.
09: Er21	Broken sound/No sound	Inspect the audio system operation according to vehicle condition.
09: Er22	No radio reception	Inspect the radio operation according to vehicle condition.
10: Er01	MP3 applicable CD player cannot implement insert and eject commands.	MP3 applicable CD player malfunction
10: Er02	Cannot change tracks.	MP3 applicable CD player malfunction
10: Er07	MP3 CD reading error.	Incorrect format CD
10: Er09	MP3 CD data is unreadable.	• CD data error • No playback data on the CD
10: Er10	MP3 applicable CD player does not operate.	• Malfunction of connectors between base unit and MP3 applicable CD player • MP3 applicable CD player malfunction
21: Er17	Incorrect combination (base unit and center panel)	Install the correct base unit or the center panel.
21: Er18		
21: Er19	Communication error between base unit and center panel	Malfunction of connectors between base unit and center panel
22: Er01	MP3 applicable CD changer cannot implement insert, eject, and disc change commands.	• Defective CD (curved, broken or foreign material stuck/attached, etc.) • MP3 applicable CD changer malfunction
22: Er02	Cannot change tracks.	• Defective CD (curved, broken or foreign material stuck/attached, etc.) • MP3 applicable CD changer malfunction
22: Er07	CD reading error.	• Defective CD (curved, broken or foreign material stuck/attached, etc.) • MP3 applicable CD changer malfunction
22: Er09	MP3 CD data is unreadable.	• CD data error • No playback data on the CD
22: Er10	MP3 applicable CD changer does not operate.	• Malfunction of connectors between base unit and MP3 applicable CD changer • MP3 applicable CD changer malfunction
no Err	No DTCs stored	No DTCs stored

DIAGNOSTIC ASSIST FUNCTION

dcf090266900w05

Structural View
Buttons



DCF902ZWBS03

1	CLOCK button
2	FM 1 button
3	FM 2 button
4	AM button
5	CD button
6	MEDIA button
7	Preset button 1
8	Preset button 2
9	Preset button 3

10	Preset button 4
11	Preset button 5
12	Preset button 6
13	DISP/AUTO-M button
14	SEEK/APC/TRACK switch
15	Traffic information button
16	AUDIO CONT/TUNE/TEXT button
17	POWER/VOLUME button

Information Display Inspection

1. With the audio power on, press the POWER button and simultaneously press the SEEK switch (up or down) for **approx. 1s.**
2. Inspect according to the following table:

INSPECTION	DISPLAY	ACTION	
Start the information display inspection mode.		The characters displayed on the information display are not truncated or faint.	The information display is normal.
		Except above	Replace the base unit. (See 09-20-4 AUDIO UNIT DISASSEMBLY/ ASSEMBLY [TYPE A].)

3. Turn the audio off or the ignition switch to the LOCK position to stop the diagnostic assist function.

Speaker Inspection

1. With the audio power on, press the POWER button and simultaneously press the AUTO-M button for **approx. 1s.**
2. Inspect according to the following table:

INSPECTION	DISPLAY	ACTION	
• Start the speaker inspection mode. • Does each speaker output sound in the following order? 1. Front speaker and tweeter (LH) 2. Front speaker and tweeter (RH) 3. Rear speaker (RH)*1 4. Rear speaker (LH)*1	—	Yes	Speakers, and wiring harness between the base unit and speakers are normal.
		No	• Inspect the following parts. — Malfunctioning speaker — Wiring harness between base unit and malfunctioning speaker

3. Turn the audio off or the ignition switch to the LOCK position to stop the diagnostic assist function.

*1 : May or may not be equipped, depending on the vehicle.

Radio Reception Condition Inspection

1. With the audio power on and at radio mode, press the POWER button and simultaneously press the Preset 2 button for **approx. 1 s.**
2. Inspect according to the following table:

Caution

- **Even if the system is normal, radio reception may be difficult depending on where the system is inspected (indoors/outdoors, or conditions at the location). Before inspecting the system, verify that radio reception is adequate.**
- **When inspecting, select a frequency band (radio station) with the best reception.**

INSPECTION	DISPLAY	ACTION
Start the radio reception condition inspection mode.	NORMAL CONDITION S-METER 5 | S-METER 9	Antenna, antenna feeder and base unit are normal
	S-METER 3 | S-METER 4	Change the frequency (radio station) and inspect again.
	MALFUNCTION PRESENT S-METER 0 | S-METER 2	Inspect the antenna and antenna feeder. • If either the antenna or the antenna feeder is not normal, replace the malfunctioning part. • If the antenna and antenna feeder are normal, replace the base unit.

3. Turn the audio off or the ignition switch to the LOCK position to stop the diagnostic assist function.

Antenna control condition inspection

1. With the audio power on and at radio mode, press the POWER button and simultaneously press the FM 2 button for **approx. 1 s**.
2. Inspect the antenna control conditon according to the following table:

Inspection	Display	Action	
Start antenna control condition inspection mode.	ANT-ON	Sound quality is good.	System is okay.
		Sound quality is poor.	Inspect the roof antenna.
	ANT-OFF	Replace base unit.	

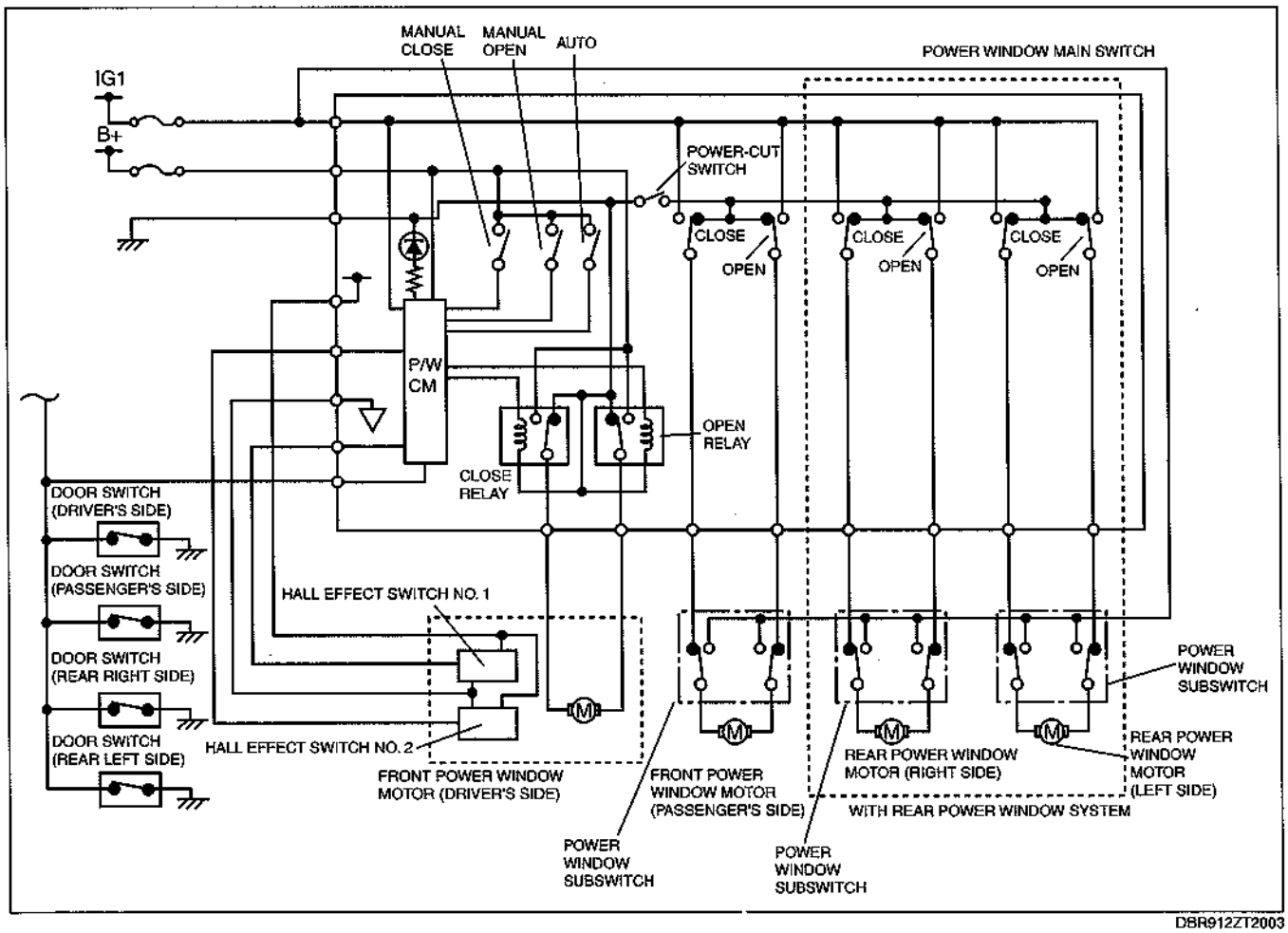
3. Turn the audio off or the ignition switch to the LOCK position to stop the diagnostic assist function.

09-03A SYMPTOM TROUBLESHOOTING [POWER WINDOW SYSTEMS (WITH AUTO-OPEN/CLOSE FUNCTION FOR DRIVER-SIDE)]

POWER WINDOW SYSTEM WIRING DIAGRAM 09-03A–1
FOREWORD 09-03A–2
POWER WINDOW SYSTEM TROUBLESHOOTING QUESTIONNAIRE 09-03A–3
SYMPTOM TROUBLESHOOTING CHART 09-03A–4
BASIC POWER WINDOW SYSTEM INSPECTION 09-03A–4
NO. 1 THE AUTO OPEN/CLOSE FUNCTION ON THE DRIVER'S SIDE POWER WINDOW IS INOPERATIVE [WITH AUTOMATIC DOOR GLASS RETURN FUNCTION] 09-03A–7
NO. 2 THE DRIVER'S SIDE POWER WINDOW INOPERATIVE 09-03A–7
NO. 3 POWER WINDOWS OTHER THAN DRIVER'S SIDE DO NOT OPERATE BY SUBSWITCH 09-03A–9
NO. 4 POWER WINDOWS OTHER THAN DRIVER'S SIDE DO NOT OPERATE BY MAIN SWITCH 09-03A–9
NO. 5 POWER WINDOWS OTHER THAN DRIVER'S SIDE DO NOT OPERATE BY MAIN SWITCH AND SUBSWITCH. 09-03A–9
NO. 6 THE DRIVER'S SIDE POWER WINDOW AUTOMATICALLY OPENS IN THE CLOSING OPERATION 09-03A–11
NO. 7 ABNORMAL NOISE DURING THE POWER WINDOW OPERATION. 09-03A–13

POWER WINDOW SYSTEM WIRING DIAGRAM

dcf090358000w13



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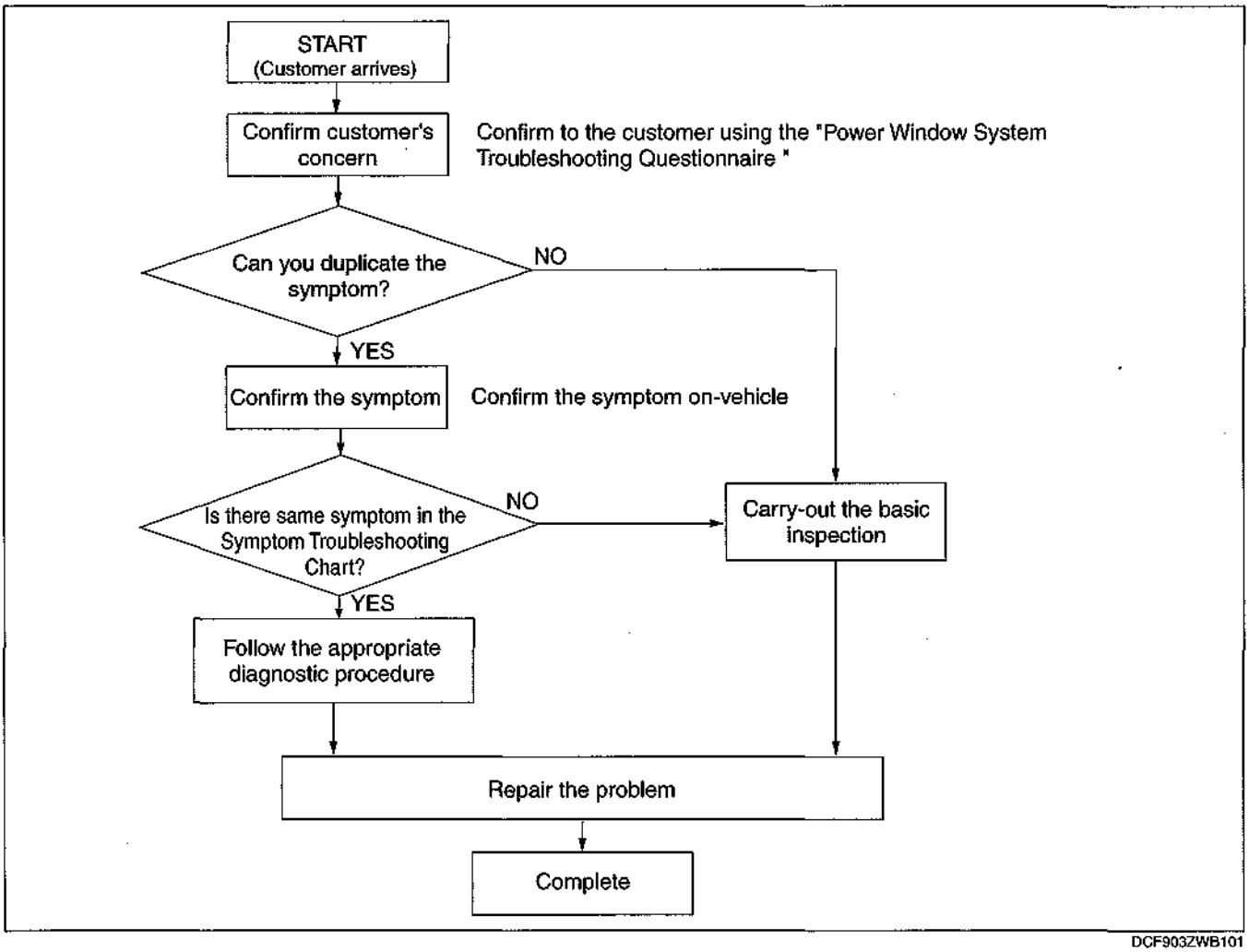
SYMPTOM TROUBLESHOOTING [POWER WINDOW SYSTEMS (WITH AUTO-OPEN/CLOSE FUNCTION FOR DRIVER-SIDE)]

FOREWORD

dcf090358000w14

Troubleshooting Procedure



DCF903ZWB101

Caution

- **The power window system initialization is required after performing below operations. Because of both the automatic operation and tow-step down return function are reset by the operations.**
  - **— Disconnect the negative battery cable from the battery terminal.**
  - **— Disconnect the power window main switch connector.**
  - **— Remove the fuse for the power window system.**
- **Power window system initialization procedures:**
  1. **Start the engine.**
  2. **Fully open the driver side front door glass by operating the driver side front window switch.**
  3. **Fully close the driver side front door glass using the driver side front window switch and hold the switch for two seconds.**
- **Slightly shake the wiring harness and connectors while performing the inspection to discover whether poor contact points are the cause of any intermittent malfunctions.**

SYMPTOM TROUBLESHOOTING [POWER WINDOW SYSTEMS (WITH AUTO-OPEN/CLOSE FUNCTION FOR DRIVER-SIDE)]

POWER WINDOW SYSTEM TROUBLESHOOTING QUESTIONNAIRE

dcf090358000w15

Date :

When the malfunction is occurred.				
Weather condition	☐Fair weather ☐Cloudy ☐ Rain ☐ Snow ☐ Other ( )		Outside temperature	Approx. F
Driving condition	☐ Driving ☐Stop (Engine is : ☐Running ☐ Stoped)			
Duplicate symptom	☐YES ☐ NO	Frequency	☐ Always ☐ Sometimes (times/month)	
Road conditions	☐ City ☐Outer city ☐ Freeway ☐Other ( ) / ☐ Pavage ☐ Dirt track			

*Follow the appropriate diagnostic procedures shown below or perform the basic flow of Troublesho.

☐ (No.1) The auto open/close function on the driver's side power window inoperative.

☐ (No.2) The driver's side power window inoperative.

☐ (No.3) Power windows other than driver's side do not operate by sub-switch.

☐ (No.4) Power windows other than driver's side do not operate by main switch.

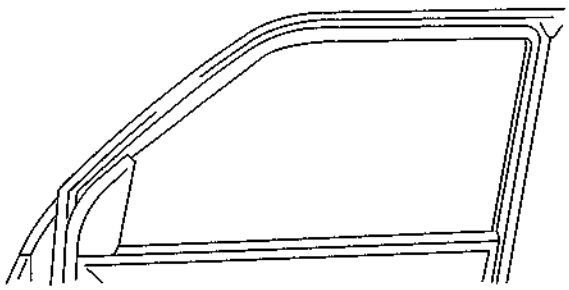
☐ (No.5) Power windows other than driver's side do not operate by main switch and sub-switch.

☐ (No.6) The driver's side power window automatically opens in the closing operation.

Please clarify the position that the driver side front door glass opens automatically. ☐ Completely closed position
☐Approx. ( )mm lower than completely position ☐Approx. ( )mm upper than the completely position.

☐ (No.7) Abnormal noise during the power window operation

☐Other (Describe the symptom below if there is no symptom in the above list.)



Please describe any condition when the malfunction occurs.
(Example) : Operate outside door mirror operation, etc

Please describe any condition that the system returns to normal operation after malfunctioning.
(Example) : Turn the ignition switch to ON position after inserting the ignition key into the key cylinder, etc

Installed Accessory Part availability
(Example) : Side visor, Immobilizer, Rader, ect(regardless genuine parts or sfter-market parts)

DCF903ZWB102

SYMPTOM TROUBLESHOOTING [POWER WINDOW SYSTEMS (WITH AUTO-OPEN/CLOSE FUNCTION FOR DRIVER-SIDE)]

SYMPTOM TROUBLESHOOTING CHART

dcf090358000w16

No.	Malfunction symptom
1	09-03A-7 NO. 1 THE AUTO OPEN/CLOSE FUNCTION ON THE DRIVER'S SIDE POWER WINDOW IS INOPERATIVE [WITH AUTOMATIC DOOR GLASS RETURN FUNCTION]
2	09-03A-7 NO. 2 THE DRIVER'S SIDE POWER WINDOW INOPERATIVE
3	09-03A-9 NO. 3 POWER WINDOWS OTHER THAN DRIVER'S SIDE DO NOT OPERATE BY SUBSWITCH
4	09-03A-9 NO. 4 POWER WINDOWS OTHER THAN DRIVER'S SIDE DO NOT OPERATE BY MAIN SWITCH
5	09-03A-9 NO. 5 POWER WINDOWS OTHER THAN DRIVER'S SIDE DO NOT OPERATE BY MAIN SWITCH AND SUBSWITCH.
6	09-03A-11 NO. 6 THE DRIVER'S SIDE POWER WINDOW AUTOMATICALLY OPENS IN THE CLOSING OPERATION
7	09-03A-13 NO. 7 ABNORMAL NOISE DURING THE POWER WINDOW OPERATION.

BASIC POWER WINDOW SYSTEM INSPECTION

dcf090358000w17

Manual Mode Function Inspection

STEP	INSPECTION		ACTION
1	• Turn the ignition switch to the ON position. • Operate the power window using the manual open/close function on the power window main switch. • Does the power window operate properly?	Yes	Go to the next step.
		No	• Inspect the power window main switch and the wiring harness. • Repair or replace malfunctioning part.
2	• Set the power cut switch to the UNLOCK position. • Operate the power window using the power window subswitch. • Does the power window operate properly?	Yes	Go to the next step.
		No	• Inspect for the power window subswitch and the wiring harness. • Repair or replace malfunctioning parts.
3	• Set the power cut switch to the LOCK position. • Operate all power windows other than the driver side. • Does the power window operate ?	Yes	• Inspect the power cut switch and the wiring harness. • Replace the power window main switch.
		No	• Manual mode function is normal. • Perform the automatic mode function inspection.

Automatic Mode function Inspection

Note

- Automatic mode function is equipped with automatic door glass return function adapted model.

STEP	INSPECTION		ACTION
1	• Turn the ignition switch to the ON position. • Operate the power window using the auto open / close function on the power window main switch. • Does the power window operate properly?	Yes	Go to the next step.
		No	**If the power window automatically opens in the closing operation:** • Go to 09-03A-11 NO. 6 THE DRIVER'S SIDE POWER WINDOW AUTOMATICALLY OPENS IN THE CLOSING OPERATION **Others:** • Go to 09-03A-7 NO. 1 THE AUTO OPEN/CLOSE FUNCTION ON THE DRIVER'S SIDE POWER WINDOW IS INOPERATIVE [WITH AUTOMATIC DOOR GLASS RETURN FUNCTION]
2	• Operate the power window main switch to the close position while the power window is in opening operation. • Is the power window operation stopped?	Yes	Go to the next step.
		No	• Replace the power window main switch. (power window control unit is malfunctioning.)
3	• Operate the power window main switch to open position while the power window is in closing operation. • Is the power window operation stopped?	Yes	• Automatic mode function is normal. • Perform the IG-OFF timer function inspection.
		No	• Replace the power window main switch. (power window control unit is malfunctioning.)

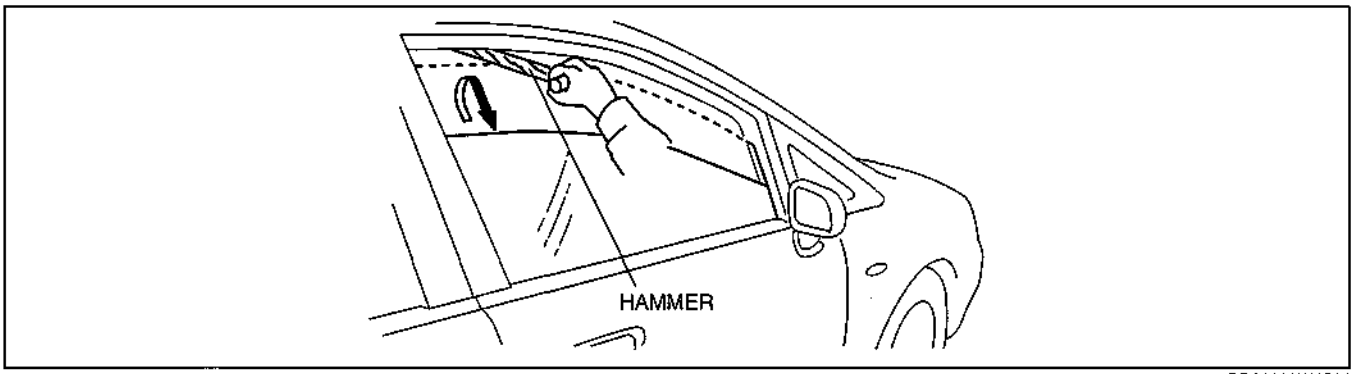
IG-OFF Timer Function Inspection

Note
- IG-OFF timer function is equipped with automatic door glass return function adapted model.

STEP	INSPECTION		ACTION
1	• Close all doors. • Turn the ignition switch to the ON position.. • In automatic mode, push down the power window main switch for the driver-side front door glass. The door glass should move down within **approx. 43s** after ignition switch off. • In manual mode (finger continuously depressing the power window main switch), the door glass should move down within **approx. 43s** after ignition switch off. • Does the driver-side front door glass move down?	Yes	• Go to the next step.
		No	• If it does not move up and down upon reinspection, inspect the following: — Wiring harness for the door open/close signal system . — Latch switch. • Repair or replace the malfunctioning part, and reinspect. — If operation is not normal, replace the power window main switch, and then go to the next step.
2	• Turn the ignition switch to the **ON** position • In automatic mode, pull up the power window main switch for the driver-side front door glass. The door glass does not move up within **approx. 43s** after ignition switch off. • Verify that driver-side front door glass does not operate • Does the driver-side front door glass move up?	Yes	• If operation is not normal, replace the power window main switch, then go to the next step.
		No	• Go to the next step.
3	• Open any doors. • Turn the ignition switch to the ON position. • Push/pull the power window main switch for the door glass within **approx. 43s** after ignition switch off. • Verify that the door glass does not move up or down. • Does the door glass move up or down?	Yes	• Inspect the door switch and related wiring harness. • If above parts are normal, replace the power window main switch, then go to the next step. • If the above parts have any malfunction, repair or replace the malfunction part, then go to the next step.
		No	• Go to the next step.
4	• Close all doors. • Turn the ignition switch to the ON position. • Push/pull the power window main switch for door glass after **approx. 60 s** after ignition switch off. • Verify that the door glass does not move up or down. • Does the door glass move up or down?	Yes	• If operation is not normal, replace the power window main switch, then go to the automatic door glass return function inspection.
		No	• The IG OFF timer function is normal. • Go to the automatic door glass return function inspection.

Auto Reverse Pinch Protection Function Inspection

STEP	INSPECTION		ACTION
1	• Turn the ignition switch to the ON position. • Fully open the driver's side power window. • Set the hammer (thickness: 10 mm or more) as shown below. Then, close the power window using auto close function. • Inspect that the power window opens by 200 mm after contacting the hammer and stops the operation. • Does automatic door glass return function operate properly?	Yes	• Automatic door glass return function is normal. • Perform the two-step down function inspection.
		No	Go to the next step.
2	• Does power window open before contacting the hammer?	Yes	• Go to 09-03A-11 NO. 6 THE DRIVER'S SIDE POWER WINDOW AUTOMATICALLY OPENS IN THE CLOSING OPERATION
		No	• Initialize the power window main switch. **Note** • Before initializing the power window main switch, cut off the power supply to the power window main switch for **60 seconds**. Then, reconnect or install it again after **60 seconds**: <Power supply cut-off method> — Disconnect the negative battery cable from the battery terminal. — Disconnect the power window main switch connector. — Remove the fuse for the power window system.



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SYMPTOM TROUBLESHOOTING [POWER WINDOW SYSTEMS (WITH AUTO-OPEN/CLOSE FUNCTION FOR DRIVER-SIDE)]

NO. 1 THE AUTO OPEN/CLOSE FUNCTION ON THE DRIVER'S SIDE POWER WINDOW IS INOPERATIVE [WITH AUTOMATIC DOOR GLASS RETURN FUNCTION]

dcf090358000w18

1	The auto open/close function on the driver's side power window is inoperative
POSSIBLE CAUSE	• No power supply to power window main switch • Power window main switch malfunction (power window control unit malfunction, auto switch malfunction) • Power window motor malfunction (Sensor inside motor malfunction) • Wiring harness between power window motor (sensor) and power window main switch malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Turn the ignition switch to the ON position. • Inspect the manual mode function. • Dose the manual mode function operate properly?	Yes	Replace the power window main switch.
		No	Go to the next step.
2	• Does the sensor built inside the power window motor send the pulse signals during operating the power window motor? • Is voltage between the terminals of power window mortor connecter (4-pin) and ground approx.6V? — Terminal1A (sensor 1 signal). — Terminal1C (sensor 2 signal).	Yes	Go to the next step.
		No	Replace the power window motor.
3	• Does the power window main switch receive the pulse signals during operating the power window motor? • Is voltage between the terminals of power window main switch connecter (4-pin) and ground approx.6V? — Terminal2D (sensor 1 signal). — Terminal2B (sensor 2 signal).	Yes	Replace the power window main switch.
		No	Inspect open or short circuit in the wiring harness between power window motor (sensor) and power window main switch.Inspect the connection of the power window motor and power window main switch connectors. (such as damaged/pulled-out pins, corrosion).Repair or replace the suspect part if necessary.

NO. 2 THE DRIVER'S SIDE POWER WINDOW INOPERATIVE

dcf090358000w19

2	The driver's side power window inoperative
POSSIBLE CAUSE	• Power supply circuit or ground circuit malfunction — Burnt fuse (B+) — Open or short circuit in wiring harness between fuse (B+) and power window main switch — Open or short circuit in wiring harness between power window main switch and power window motor — Open circuit in wiring harness between power window main switch and ground • Power window main switch malfunction (Internal circuit malfunction, relay malfunction) • Power window motor malfunction (motor malfunction, window regulator guide malfunction)

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Turn the ignition switch to the ON position. • Does the LED on the power window main switch illuminate?	Yes	Go to Step 6.
		No	Go to the next step.
2	• Operate all power windows other than driver's side window using the power window main switch. • Does the power window operate properly?	Yes	Go to the next step.
		No	Inspect open or short circuit and connection in the following wiring harnesses/connections **Automatic door glass return function is equipped:** • P.WIND 30 A fuse—Power window main switch connector terminal 1F • Power window main switch connector terminal 1H—body ground. **Automatic door glass return function is not equipped:** • P.WIND 30A fuse—Power window main switch terminal F • Power window main switch terminal H—ground. Repair or replace the suspect part if necessary.

09

SYMPTOM TROUBLESHOOTING [POWER WINDOW SYSTEMS (WITH AUTO-OPEN/CLOSE FUNCTION FOR DRIVER-SIDE)]

STEP	INSPECTION		ACTION
3	• Is the P.WIND 30 A fuse normal?	Yes	Automatic door glass return function is equipped: Go to Step 5. Automatic door glass return function is not equipped: • Replace the power window main switch. (See 09-12-8 POWER WINDOW MAIN SWITCH REMOVAL/INSTALLATION.)
		No	Inspect the followings: • Short circuit in **B+** power supply wiring harness • Short circuit in power window motor Repair or replace the suspect part if necessary.Replace with the appropriate standard fuse. Then, go to the next step.
4	• Initialize the power window system. • Operate the power window systemoperation. • Does power window operate properly?	Yes	Troubleshooting is completed.
		No	Re-confirm the symptom and go to Step 1 in this procedure.
5	• Measure the voltage at power window main switch (battery power supply terminal 1I) . • Is the voltage **B+**?	Yes	Replace the power window main switch.
		No	Inspect open or short circuit in the power window main switch wiring harness (battery power supply). Inspect the connection of the power window main switch connector. (such as damaged/pulled-out pins, corrosion). Repair or replace the suspect part if necessary.
6	• Measure the voltage at the power window main switch (power window motor output terminal) during operating the power window using the power window main switch. • Is the voltage **B+**? (Open: terminal 1K*11/I*2 Close: terminal 1M*11/K*2)	Yes	Go to the next step.
		No	Replace the power window main switch.
7	• Measure the voltage at power window motor (2-pin)(battery power supply terminal) during operating the power window using the power window main switch. • Is the voltage **B+**? (Open: terminal 1B/ close: terminal 1A)	Yes	Go to the next step.
		No	Inspect open or short circuit in the wiring harness between power window main switch and power window motor. Inspect the connection of the power window main switch and power window motor connectors. (such as damaged/pulled-out pins, corrosion). Repair or replace the suspect part if necessary.
8	• Operate the driver's side power window using the power window main switch. • Does power window motor operate (rotate)? **Note** • The power window motor does not operate during the power window motor internal temperature is too high. Leave the motor for 3 minutes and inspect the power window motor operation again after cooling down the motor temperature.	Yes	Go to the next step.
		No	Replace the power window motor.
9	• Remove the door glass from the carrier plate. • Make sure that the door glass moving smoothly by hand. • Is the door glass move smoothly?	Yes	Replace the regulator guide.
		No	Inspect for bent regulator guide or other possible facts. If there is normal, replace the door glass run-channel.

*1 : With automatic door glass return function
*2 : Without automatic dooe glass return function

NO. 3 POWER WINDOWS OTHER THAN DRIVER'S SIDE DO NOT OPERATE BY SUBSWITCH

dcf090358000w20

3	Power windows other than driver's side do not operate by subswitch
POSSIBLE CAUSE	• Open or short circuit in power window subswitch wiring harness (battery power supply circuit) • Power window subswitch malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Turn the ignition switch to ON position. • Set power cut-switch on power window main switch to UNLOCK position. • Measure the voltage at power window sub-switch (terminal C). • Is the voltage **B+**?	Yes	Replace the power window subswitch.
		No	Inspect open or short circuit in the wiring harness between power window main switch and power window subswitch.Inspect the connection of the power window subswitch connector. (such as damaged/pulled-out pins, corrosion).Repair or replace the suspect part if necessary.

NO. 4 POWER WINDOWS OTHER THAN DRIVER'S SIDE DO NOT OPERATE BY MAIN SWITCH

dcf090358000w21

4	power windows other than driver's side do not operate by main switch
POSSIBLE CAUSE	• Open or short circuit in wiring harness between ignition switch (IG1) and power window main switch (IG1) • Power window main switch malfunction

Diagnostic procedures

STEP	INSPECTION		ACTION
1	• Turn the ignition switch to ON position. • Set power cut-switch on power window main switch to UNLOCK position. • Operate all power windows other than driver's side using the power window main switch. • Does power window operate properly?	Yes	Replace the power window main switch.
		No	Inspect open or short circuit in the power window main switch wiring harness (battery power supply).Inspect the connection of the power window main switch connector. (such as damaged/pulled-out pins, corrosion). Repair or replace the suspect part if necessary.

NO. 5 POWER WINDOWS OTHER THAN DRIVER'S SIDE DO NOT OPERATE BY MAIN SWITCH AND SUBSWITCH.

dcf090358000w22

5	All power windows are inoperative
POSSIBLE CAUSE	• Power supply circuit or ground circuit malfunction — Burnt fuse (IG1) — Open or short circuit in wiring harness between ignition switch (IG1) and power window main switch — Open or short circuit in wiring harness between power window main switch and power window subswitch — Open or short circuit in wiring harness between power window main switch and power window motor — Open circuit in wiring harness between power window main switch and ground • Power window main switch malfunction (power cut-off switch malfunction, switch malfunction) • Power window subswitch malfunction • Power window motor malfunction(motor malfunction, window regulator guide malfunction)

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Turn the ignition switch to ON position. • Set the power cut-off switch on power window main switch to UNLOCK position. • Inspect the power window system operation again. • Does the system operate properly?	Yes	System is now normal. (power cut-off switch dose not set properly.)
		No	Go to the next step.
2	• Operate all power windows other than driver's side window using power window main switch. • Does any power window operate?	Yes	Go to Step 6.
		No	Go to the next step.

STEP	INSPECTION		ACTION
3	• Operate driver's side power window using the power window main switch. • Does power window operate?	Yes	Go to the next step.
		No	Inspect open circuit in the wiring harness between power window main switch and body ground. Inspect the connection of the power window main switch connector. (such as damaged/pulled-out pins, corrosion). Repair or replace the suspect part if necessary.
4	• Is the P.WIND 30 A fuse normal?	Yes	Automatic door glass return function is equipped: Go to the next step. Automatic door glass return function is not equipped: Replace power window main switch.(See 09-12-8 POWER WINDOW MAIN SWITCH REMOVAL/ INSTALLATION)
		No	• Replace with the appropriate standard fuse. — If the fuse is melted, inspect the wiring harness for short to ground.Repair or replace the wiring harness, then replace the fuse.
5	• Measure the voltage at power window main switch (battery power supply terminal 1I) • Is the voltage **B+**?	Yes	Replace power window main switch.
		No	Inspect open or short circuit in the power window main switch wiring harness (battery power supply). Inspect the connection of the power window main switch connector. (such as damaged/pulled-out pins, corrosion). Repair or replace the suspect part if necessary.
6	• Identify the inoperative power window. • Measure the voltage at suspect power window motor (battery power supply) during operating the power window motor using the suspect power window sub-switch. • Is the voltage **B+**? (Open: terminal B/ close: terminal A)	Yes	Go to the next step.
		No	Go to Step 9.
7	• Operate power window using the power window sub-switch. • Does power window motor operate (rotate)? **Note** • The power window motor does not operate during the power window motor internal temperature is too high. Leave the motor for 3 minutes and inspect the power window motor operation again after cooling down the motor temperature.	Yes	Go to the next step.
		No	Replace power window motor.
8	• Remove the door glass from the carrier plate. • Make sure that the door glass moving smoothly byhand. • Is the door glass move smoothly?	Yes	Replace regulator guide.
		No	Inspect for bent regulator guide or other possible facts. If there is normal, replace the door glass run-channel.
9	• Measure the voltage at power window sub-switch (power window motor output) during operating the power window sub-switch. • Is the voltage **B+**? (open:terminal F/close:terminal B)	Yes	Inspect open or short circuit in the wiring harness between power window sub-switch and power window motor. Inspect the connection of the power window sub- switch and power window motor connectors. (such as damaged/pulled-out pins, corrosion). Repair or replace the suspect part if necessary.
		No	Go to the next step.
10	• Disconnect power window sub-switch connector. • Inspect the continuity between power window sub-switch terminal B and ground. • Is there a continuity?	Yes	Go to the next step.
		No	Inspect open or short circuit in the power window sub-switch wiring harness. Inspect the connection of the power window sub- switch connector. (such as damaged/pulled-out pins, corrosion). Repair or replace the suspect part if necessary Then, go to STEP 12.
11	• Inspect the continuity between power window sub-switch terminal F and ground. • Is there continuity?	Yes	Replace power window subswitch.
		No	Inspect open or short circuit in the power window sub-switch wiring harness. Inspect the connection of the power window sub-switch connector. (such as damaged/pulled-out pins, corrosion). Repair or replace the suspect part if necessary Then, go to STEP 12.

STEP	INSPECTION		ACTION
12	**Note** • Do not operate the power window main switch during the following inspection. • Inspect the continuity between power window main switch terminals (1A, 1B, 1J)*1/ (A, B, J)*2 and ground. • Is there continuity?	Yes	Go to the next step.
		No	Replace the power window main switch.
13	**Note** • Do not operate the power window main switch during the following inspection. • Inspect the continuity between power window main switch terminal (1C, 1D, 1L)*1/ (C, D, L)*2 and ground. • Is there a continuity?	Yes	Inspect open or short circuit in the wiring harness between power window main switch and power window sub-switch. Inspect the connection of the power window main switch and sub-switch connectors. (such as damaged/pulled-out pins, corrosion). Repair or replace the suspect part if necessary.
		No	Replace power window main switch.

*1 : With automatic door glass return function
*2 : Without automatic door glass return function

NO. 6 THE DRIVER'S SIDE POWER WINDOW AUTOMATICALLY OPENS IN THE CLOSING OPERATION

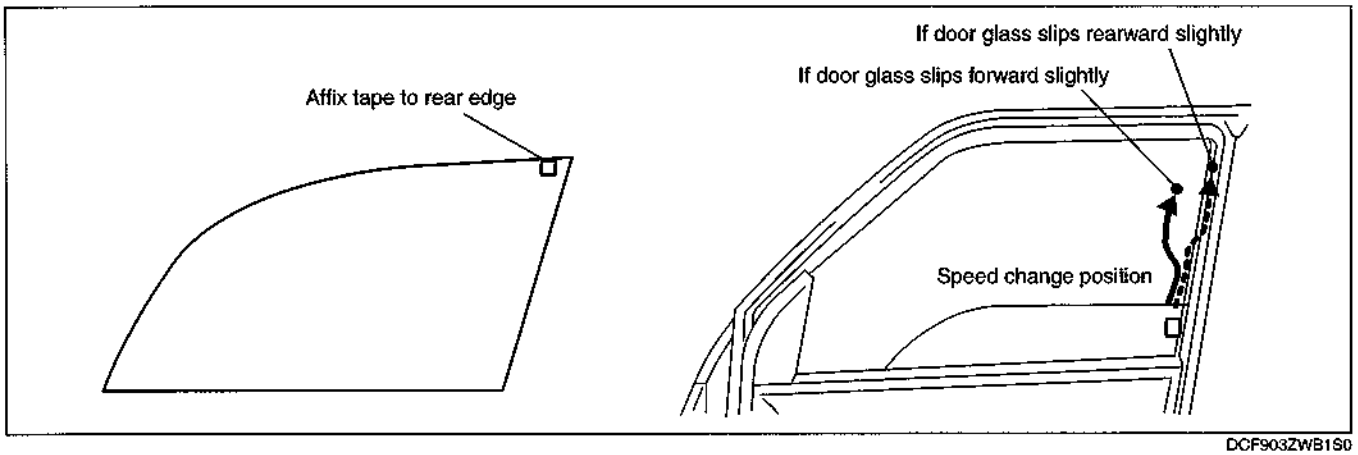
dcf090358000w23

6	The driver's side power window automatically opens in the closing operation.
POSSIBLE CAUSE	• Increase sliding resistance of door glass while raising the glass. — Improper installation of side visor — Regulator motor malfunction — Pinch any foreign material between door glass and door glass run channel — Inadequate installation of carrier plate and door glass — Door glass run channel malfunction — Door glass guide malfunction **Note** • When the switch detects to pinch something, auto reverse pinch protection function operates to open the door glass automatically. • If the sliding resistance of door glass is increased and door glass raising speed is slow down, the auto reverse pinch protection function sometime operates. • If the door glass raising speed is slow down, inspect the following parts: — If door glass rotates forward slightly: inspect the vehicle front side of door glass guide and/or door glass run channel. — If door glass rotates backward slightly: inspect the vehicle rear side of door glass guide and/or door glass run channel.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Confirm the symptom. • Does the symptom occur under the following condition? — Bumping road. — Opening/closing door.	Yes	System is normal. (Explain to customer that this is normal operation on this system.)
		No	Go to the next step.
2	• Inspect the side visor installation condition. • Is the side visor normal?	Yes	Go to the next step.
		No	Install the side visor properly, then go to the next step.
3	• Put any tape on the back side of the door glass. • Run the engine at idle. • Inspect the door glass operating speed. • Is there any speed change? (e.g., slow down)	Yes	Put the mark the speed change position on either door shell or door glass run channel. Go to STEP 5.
		No	Go to the next step.
4	• Inspect the door glass operating speed again • Is the speed change frequently (e.g., 5-6 times)?	Yes	Replace the regulator motor. Then go to STEP 8.
		No	Go to Step 8.

STEP	INSPECTION		ACTION
5	• Is there any foreign material between door glass run channel and door glass? • Is there any rough surface on the sliding surface?	Yes	**If there is any foreign material:** • Remove the foreign material. **If there is any rough surface on the sliding surface:** • Replace the door glass run channel. Confirm the symptom again. If there is a same symptom, return to STEP 3.
		No	Go to the next step.
6	• Inspect the installation condition of carrier plate and door glass. • Are both parts installed securely?	Yes	Go to the next step.
		No	Install them securely. Confirm the symptom again. If there is a same symptom, return to STEP 3.
7	• Inspect the door glass run channel and door glass guide. • Are both parts normal?	Yes	Go to the next step.
		No	Install door glass run channel and door glass guide properly. Confirm the symptom again. If there is a same symptom, return to STEP 3.
8	• Inspect the door glass operating speed. • Is there any speed change?	Yes	Perform STEP 3 in this procedure again.
		No	Troubleshooting is completed.



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NO. 7 ABNORMAL NOISE DURING THE POWER WINDOW OPERATION.

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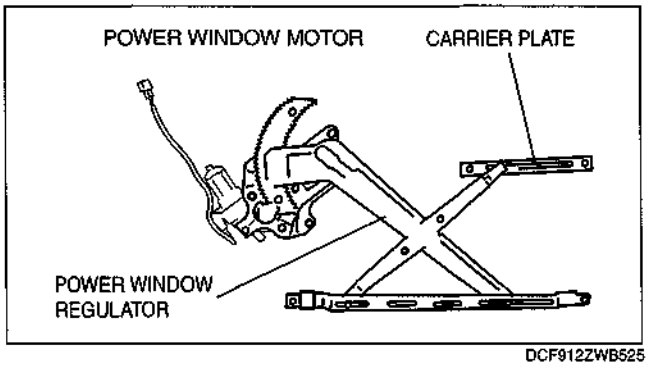
7	**Abnormal noise during the power window operation.**
POSSIBLE CAUSE	• Loosen bolt for installing the door glass to the carrier plate. • Deform resin part on the regulator. — Wear mark on the resin part caused by cable. — Deform gear inside regulator motor. **Note** • Identify the noise generating place using the stethoscope or any equivalent.

Diagnostic procedure

Abnormal noise	Occurrence timing	Possible route cause	Noise generating place	Action
Clicking noise	Beginning of door glass operation	Loosen bolt for installing the door glass to carrier plate.	Between carrier plate and lower side of door glass.	Re-tighten bolt.
Groaning noise	While operating door glass	Noise is created due to the wear mark on the resin part of the regulator guide caused by cable. **Note** • There is no groaning noise on the vehicle equipped with roller type regulator guide..	Regulator guide.	Replace regulator guide
Booming noise		Deform gear inside regulator motor	Gear inside regulator motor	Replace the regulator motor
Chattering noise				



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09

09-03B SYMPTOM TROUBLESHOOTING [KEYLESS ENTRY SYSTEM]

KEYLESS ENTRY SYSTEM WIRING DIAGRAM 09-03B–1
FOREWORD 09-03B–1
KEYLESS ENTRY SYSTEM CHECK SHEET 09-03B–2
KEYLESS ENTRY SYSTEM PRELIMINARY INSPECTION 09-03B–3
ON-BOARD DIAGNOSTIC FUNCTION 09-03B–4
TROUBLESHOOTING INDEX 09-03B–4
NO. 1 ON-BOARD DIAGNOSTIC FUNCTION INOPERATIVE 09-03B–5
NO. 2 TRANSMITTER ID CODE CANNOT BE REPROGRAMMED 09-03B–7

KEYLESS ENTRY SYSTEM WIRING DIAGRAM

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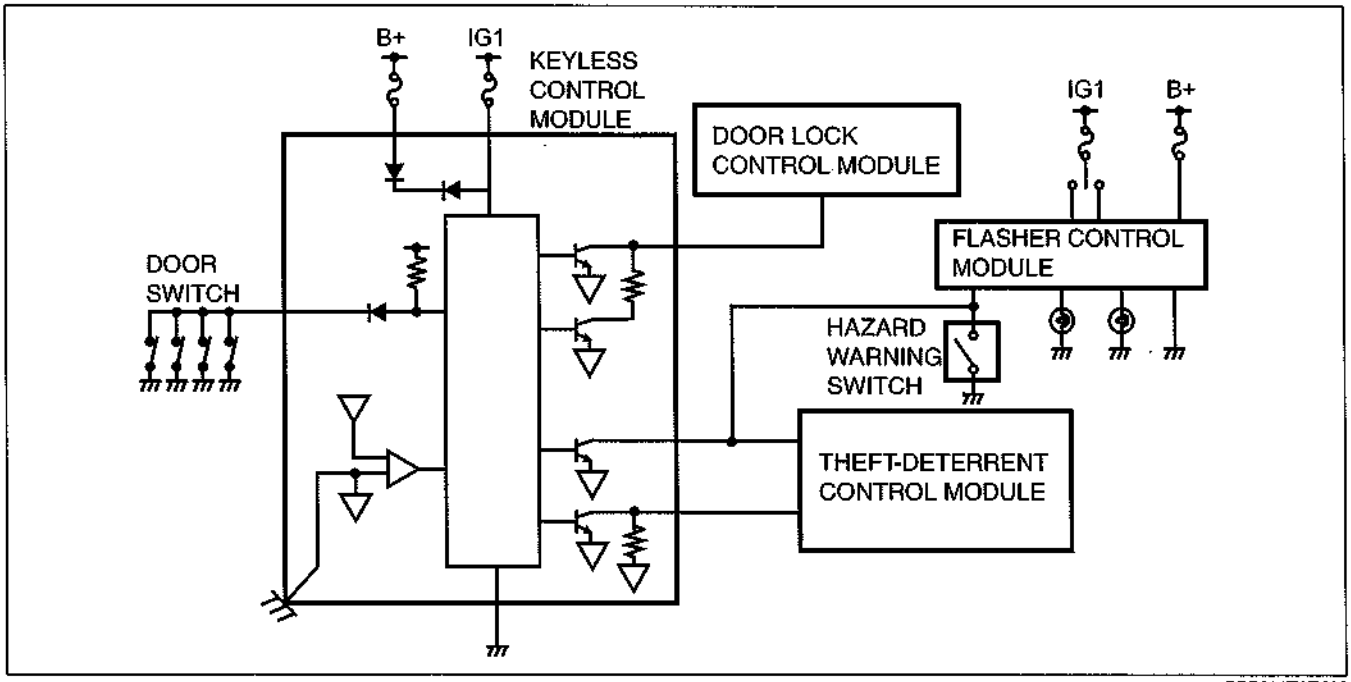

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FOREWORD

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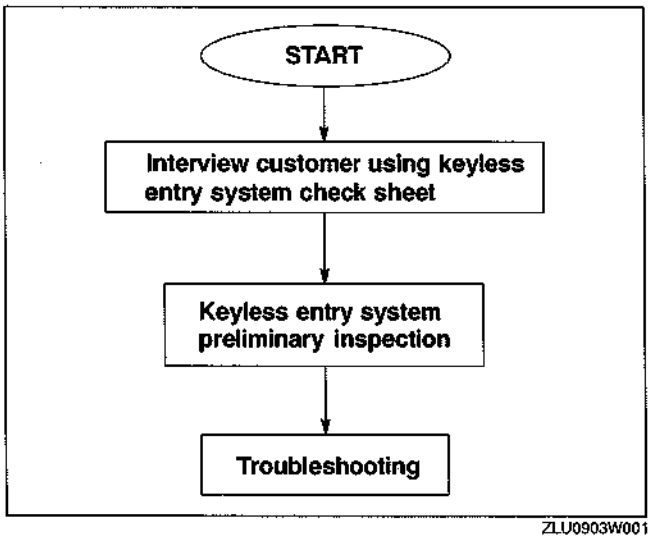
- Go to troubleshooting after identifying the specific malfunction by performing a keyless entry system preliminary inspection.

Flowchart



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KEYLESS ENTRY SYSTEM CHECK SHEET

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- Use the sheet below as a customer interview sheet when accepting a vehicle for service.
- If the symptom is "Power door lock system does not operate with transmitter at all," find out how the customer uses the keyless entry system by following the check sheet below.

Perform the following inspection with customer:

Q1. What's the customer's complaint?
- ☐ Power door lock system does not operate with transmitter (door does not lock/unlock).
- ☐ Other_____

Q2. Is system factory-installed or after-market?
- ☐ Factory-installed system
- → Go to Q3.

- ☐ After-market system
- → Perform troubleshooting according to after-market keyless entry system manual.

Q3. Operate transmitter with customer from 2.5 m {8.2 ft} away from center of vehicle. (Make sure the ignition key is either in the LOCK position or removed.)
Does keyless entry system work?
- ☐ Yes
- → Explain the following to the customer:
  - Keyless entry system does not work when ignition switch is in ON position.
  - Keyless entry system does not work from excessive distances (more than 2.5 m {8.2 ft} away from center of vehicle).
- ☐ No
- → Go to Q4.

Q4. Check location where customer uses keyless entry system.
Does a particular area, such as being near TV towers, power plants, power lines, or factories, have an effect on malfunction?
- ☐ Yes Place_____
- →Area of operation is bad. Explain effect of outside interference on transmitter to customer.
- ☐ No
- → Go to Q5.

Q5. Make sure there are no after-market electrical parts installed on vehicle.
Are there any of the following present?
- Cellular phone
- Radio-wave equipment
- Remote engine starter
- TV, etc.

- ☐ Yes Parts_____
- ☐ No

Perform the keyless entry system preliminary inspection.

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KEYLESS ENTRY SYSTEM PRELIMINARY INSPECTION

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- Perform the following preliminary inspection before troubleshooting.

STEP	INSPECTION		ACTION
1	• Is system an after-market one?	Yes	Perform troubleshooting according to after-market keyless entry system manual.
		No	Go to next step.
2	• Did customer activate keyless entry system when ignition switch was in LOCK position?	Yes	Go to next step.
		No	• Explain to customer that system does not work when ignition is in ON position. • Turn ignition switch to LOCK position, then go to next step.
3	• Did customer use keyless entry system in particular area, such as being near TV towers, power plants, power lines, or factories?	Yes	Attempt to lock/unlock doors with transmitter in non-interference area. **If system operates:** • Area of operation is bad. Explain effect of outside interference on transmitter to customer. **If system does not operate:** • Go to next step.
		No	Go to next step.
4	• Are any of the following after-market electrical parts on the vehicle? — Cellular phone — Radio-wave equipment — Remote engine starter — TV, etc.	Yes	Disconnect after-market electrical part connectors and attempt to lock/unlock doors with transmitter. **If system operates:** • After-market electrical parts are interfering with keyless entry system. **If system does not operate:** • Go to next step.
		No	Go to next step.
5	• Perform on-board diagnostic function. (See 09-03B-4 ON-BOARD DIAGNOSTIC FUNCTION.) • Does on-board diagnostic function work?	Yes	Go to next step.
		No	Go to Step 1 of NO. 1 ON-BOARD DIAGNOSTIC FUNCTION INOPERATIVE.
6	• Attempt to reprogram transmitter ID code. • Can transmitter ID code be reprogrammed?	Yes	System is normal now.
		No	Go to Step 1 of troubleshooting NO. 2 TRANSMITTER ID CODE CANNOT BE REPROGRAMMED.

ON-BOARD DIAGNOSTIC FUNCTION

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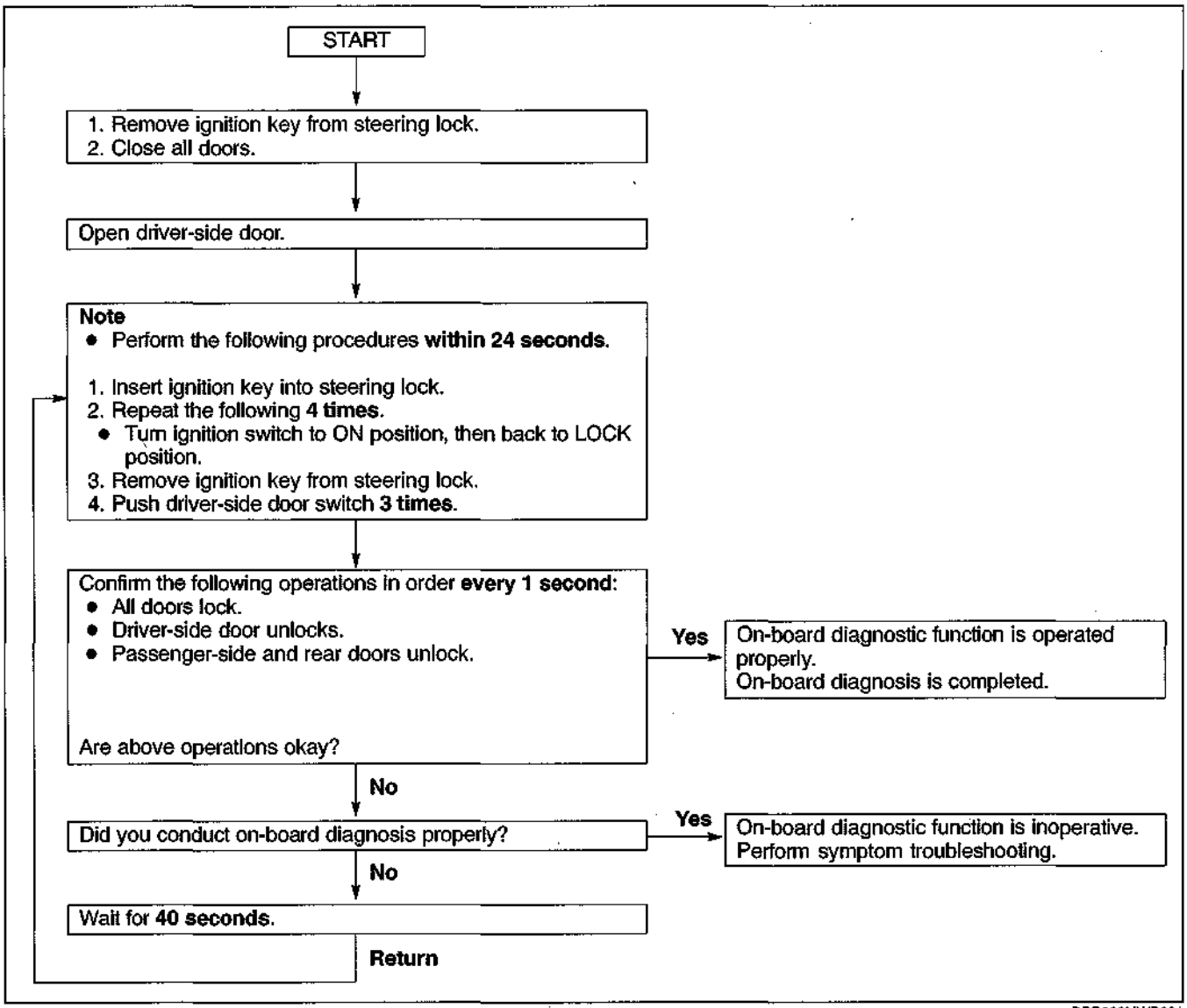

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TROUBLESHOOTING INDEX

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No.	TROUBLESHOOTING ITEM	DESCRIPTION	PAGE
1	On-board diagnostic function inoperative	Theft-deterrent control module's on-board diagnostic function does not operate.	(See 09-03B-5 NO. 1 ON-BOARD DIAGNOSTIC FUNCTION INOPERATIVE.)
2	Transmitter ID code cannot be reprogrammed	Theft-deterrent control module's transmitter ID code reprogram function does not work.	(See 09-03B-7 NO. 2 TRANSMITTER ID CODE CANNOT BE REPROGRAMMED.)

NO. 1 ON-BOARD DIAGNOSTIC FUNCTION INOPERATIVE

dcf090369000w07

- When performing an asterisked (*) troubleshooting inspection, shake the wiring harness and connectors while performing the inspection to discover whether poor contact points are the cause of any intermittent malfunctions. If there is a problem, check to make sure connectors, terminals and wiring harness are connected correctly and undamaged.

1	On-board diagnostic function inoperative
DESCRIPTION	Theft-deterrent control module's on-board diagnostic function does not operate.
POSSIBLE CAUSE	• Malfunction in door lock control module system • Malfunction in door lock linkage • Malfunction in power door lock system • Malfunction in theft-deterrent control module • Malfunction in theft-deterrent control module power supply circuit • Malfunction in theft-deterrent control module ground circuit • Malfunction in IG1, B+ signal circuit of keyless control module — keyless control module power supply fuse malfunction — Malfunction in wiring harness between keyless control module power supply fuse(s) and keyless control module itself • Malfunction in keyless control module's door open/closed signal circuit — Door switch, keyless control module malfunction • Malfunction in keyless control module GND signal circuit — Malfunction in wiring harness between keyless control module and ground — Malfunction in wiring harness between keyless control module and door switch(es) • Malfunction in keyless control module door lock/unlock signal circuit — keyless control module malfunction — Malfunction in wiring harness between keyless control module and theft-deterrent control module

Diagnostic Procedure

STEP	INSPECTION		ACTION
1	**INSPECT ON-BOARD DIAGNOSTIC FUNCTION OPERATION** • Did any of the following items work during on-board diagnostic function operation? — All doors locked — Driver's side door unlocked — All doors unlocked	Yes	Go to next step.
		No	Go to Step 7.
2	**INSPECT DOOR LOCK LINKAGE SYSTEM** • Operate inner door lock knob and make sure door locks and unlocks manually. • Do all door's lock systems work?	Yes	Go to next step.
		No	Troubleshoot the door lock linkage.
3	**CHECK TO SEE WHETHER MALFUNCTION IS IN DOOR LOCK CONTROL MODULE, DOOR LOCK ACTUATOR, A KEY CYLINDER SWITCH AND RELATED WIRING HARNESS, OR ELSEWHERE** • Do all of the following items work when inserting ignition key into driver's door key cylinder and operating ignition key? — All doors locked — All doors unlocked	Yes	Go to next step.
		No	Inspect power door lock system, then go to step 15.
4	**INSPECT POWER DOOR LOCK SYSTEM** • Turn ignition switch to LOCK. • Disconnect keyless control module connector. • Measure voltage at following keyless control module connector terminals. — Terminal O — Terminal K • Is voltage **approximately 5 V**?	Yes	Replace keyless control module and reprogram transmitter ID code, then go to Step 15.
		No	Inspect theft-deterrent control module and wiring harness (between keyless control module terminal O, terminal K and theft-deterrent control module terminal Q)
5	**INSPECT THEFT-DETERRENT CONTROL MODULE** • Turn ignition switch to LOCK position. • Disconnect theft-deterrent control module connector (24-pin) • Measure voltage at theft-deterrent control module connector (24-pin) terminal V. • Is resistance **approximately 1.3 kilohm**?	Yes	Go to next step.
		No	Replace theft-deterrent control module, then go to Step 15.

STEP	INSPECTION		ACTION
6*	**INSPECT WIRING HARNESS BETWEEN KEYLESS CONTROL MODULE AND THEFT-DETERRENT CONTROL MODULE FOR CONTINUITY AND SHORT** • Disconnect keyless control module connector. • Inspect wiring harness between keyless control module connector terminal J and theft-deterrent control module connector (24-pin) terminal V. • Is there open circuit and/or short circuit at above wiring harness?	Yes	Repair wiring harness between keyless control module and theft-deterrent control module, then go to Step 15.
		No	Replace keyless control module and reprogram transmitter ID code, then go to Step 15.
7	**INSPECT KEYLESS CONTROL MODULE AND THEFT-DETERRENT CONTROL MODULE POWER SUPPLY FUSES** • Are keyless control module and theft-deterrent control module power supply fuses okay?	Yes	Go to next step.
		No	Check for a short to ground on blown fuse's circuit. Repair or replace if necessary. Install appropriate amperage fuse.
8	**INSPECT DOOR SWITCHES** • Are door switches installed securely?	Yes	Go to next step.
		No	Install door switch(es) securely, then go back to Step 2 of keyless entry system preliminary inspection.
9	**INSPECT THEFT-DETERRENT CONTROL MODULE INSTALLATION** • Is theft-deterrent control module installed to joint box securely?	Yes	Go to next step.
		No	Install theft-deterrent control module securely, then go to Step 15.
10*	**INSPECT WIRING HARNESS BETWEEN KEYLESS CONTROL MODULE POWER SUPPLIES AND KEYLESS CONTROL MODULE FOR CONTINUITY** • Turn ignition switch to ON position. • Measure voltage at following keyless control module terminals: — IG1 signal (Terminal A) — B+ signal (Terminal B) • Is voltage **approximately 12 V**?	Yes	Go to next step.
		No	Repair wiring harness between fuse block and keyless control module, then go to Step 15.
11*	**INSPECT WIRING HARNESS BETWEEN KEYLESS CONTROL MODULE POWER SUPPLY, KEYLESS CONTROL MODULE AND GROUND FOR SHORT TO B+** • Disconnect keyless control module connector. • Measure voltage at following keyless control module connector terminal A. • Is voltage **approximately 12 V**?	Yes	Repair malfunctioning wiring harness, then go to Step 15.
		No	Go to next step.
12*	**INSPECT WIRING HARNESS BETWEEN KEYLESS CONTROL MODULE AND GROUND FOR CONTINUITY** • Is there continuity between keyless control module connector terminal L and ground?	Yes	Go to next step.
		No	Repair wiring harness between keyless control module and ground, then go to Step 15.
13*	**INSPECT WIRING HARNESS BETWEEN KEYLESS CONTROL MODULE AND DOOR SWITCH FOR CONTINUITY AND SHORT** • Turn ignition switch to LOCK position. • Disconnect keyless control module connector. • Inspect wiring harness between keyless control module connector terminal C and door switch connector terminal. • Is there open circuit and/or short circuit at above wiring harness?	Yes	Repair wiring harness between keyless control module and door switch or replace malfunction door switch, then go to Step 15.
		No	Go to next step.

STEP	INSPECTION		ACTION
14*	**INSPECT THEFT-DETERRENT CONTROL MODULE POWER SUPPLY SYSTEM FOR CONTINUITY AND SHORT** • Turn ignition switch to LOCK position. • Remove theft-deterrent control module from joint box. • Turn ignition switch to ON position. • Measure voltage at following theft-deterrent control module (16-pin) terminals. — Terminal C • Is voltage **approximately 12 V**?	Yes	Go to next step.
		No	Replace keyless control module and reprogram transmitter ID code, then go to next step.
15	**CONFIRM THAT MALFUNCTION SYMPTOMS DO NOT RECUR AFTER REPAIR** • Does keyless entry system operate properly?	Yes	Troubleshooting completed. Explain repairs to customer.
		No	Recheck malfunction symptoms, then repeat from Step 1 if malfunction recurs.

NO. 2 TRANSMITTER ID CODE CANNOT BE REPROGRAMMED

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2	**Transmitter ID code cannot be reprogrammed.**
DESCRIPTION	Theft-deterrent control module's transmitter ID code reprogram function does not work.
POSSIBLE CAUSE	• Malfunction in transmission circuit — Transmitter battery, transmitter, keyless control module bracket, keyless control module bracket ground screw or keyless control module malfunction

Diagnostic Procedure

STEP	INSPECTION		ACTION
1	**INSPECT TRANSMITTER BATTERY INSTALLATION AND TYPE** • Visually inspect transmitter battery. • Are below items okay? — Transmitter battery installation (correct polarity) — Battery type (CR2025)	Yes	Go to next step.
		No	Set transmitter battery properly or replace with specified transmitter battery (CR2025), then go to Step 8.
2	**INSPECT TRANSMITTER BATTERY TERMINALS FOR RUST AND POOR CONNECTION** • Visually inspect transmitter. — Is there rust on transmitter battery terminals (positive or negative pole)? — Is there poor connection between terminals and battery ?	Yes	Replace transmitter battery or repair transmitter battery terminal, then go to Step 8.
		No	Go to next step.
3	**INSPECT TRANSMITTER BATTERY** • Inspect transmitter battery. • Is battery voltage normal?	Yes	Go to next step.
		No	Replace transmitter battery, then go to Step 8.
4	**INSPECT KEYLESS CONTROL MODULE BRACKET INSTALLATION** • Is keyless control module bracket installed securely?	Yes	Go to next step.
		No	Install bracket securely, then go back to Step 6 of keyless entry system preliminary inspection.
5	**INSPECT GROUND SCREW INSTALLATION BETWEEN KEYLESS CONTROL MODULE AND KEYLESS CONTROL MODULE BRACKET** • Are keyless control module and keyless control module bracket connected securely to ground screw?	Yes	Go to next step.
		No	Install screw securely, then go back to Step 6 of keyless entry system preliminary inspection.
6	**CHECK TO SEE WHETHER MALFUNCTION IS IN TRANSMITTER BATTERY OR ELSEWHERE** • Replace with a known good transmitter battery. • Does keyless entry system operate properly?	Yes	Replace transmitter battery, then go to Step 8.
		No	Go to next step.

STEP	INSPECTION		ACTION
7	**CHECK TO SEE WHETHER MALFUNCTION IS IN TRANSMITTER OR KEYLESS CONTROL MODULE** • Reprogram transmitter ID codes by using another known good transmitter. • Does keyless entry system operate okay ?	Yes	Replace transmitter and reprogram transmitter ID code, then go to next step.
		No	Replace keyless control module and reprogram transmitter ID code, then go to next step.
8	**CONFIRM THAT MALFUNCTION SYMPTOMS DO NOT RECUR AFTER REPAIR** • Does keyless entry system operate properly?	Yes	Troubleshooting completed. Explain repairs to customer.
		No	Recheck malfunction symptoms, then repeat from Step 1 if malfunction recurs.

09-03C SYMPTOM TROUBLESHOOTING [IMMOBILIZER SYSTEM]

SYMPTOM TROUBLESHOOTING CHART [IMMOBILIZER SYSTEM] 09-03C–1
No.1 SECURITY LIGHT DISPLAY IS NOT NORMAL 09-03C–1

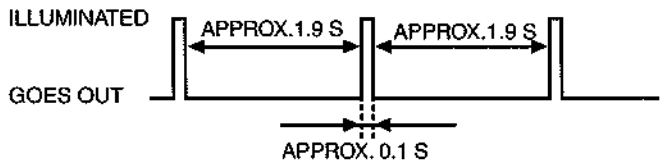
SYMPTOM TROUBLESHOOTING CHART [IMMOBILIZER SYSTEM]

dcf090367000w01

No.	TROUBLESHOOTING ITEM	DESCRIPTION
1	The security light display is not normal.	• The security light remains illuminated **2 min or more** after the ignition switch is turned to the ON position • The security light does not illuminate when the ignition switch is turned to the ON position. • The security light remains illuminated while the ignition switch is at the LOCK position. • The security light does not flash or the flashing interval is abnormal while the ignition switch is at the LOCK position.

No.1 SECURITY LIGHT DISPLAY IS NOT NORMAL

dcf090367000w02

1	**The security light display is not normal.**
DESCRIPTION	• The security light remains illuminated **2 min or more** after the ignition switch is turned to the ON position • The security light does not illuminate when the ignition switch is turned to the ON position. • The security light remains illuminated while the ignition switch is at the LOCK position. • The security light does not flash or the flashing interval is abnormal while the ignition switch is at the LOCK position.
POSSIBLE CAUSE	• Keyless unit malfunction • Instrument cluster malfunction • Open or short circuit in the wiring harness between the instrument cluster and immobilizer unit **Note** • If the security light remains illuminated for **approx. 1 min** after the ignition switch is turned to the ON position and then displays a DTC, perform immobilizer system malfunction diagnosis according to that DTC. (See 09-02A-2 DTC TABLE [IMMOBILIZER SYSTEM].) • While performing immobilizer system security access using the WDS, the security light does not illuminate even if the ignition switch is turned to the ON position. Verify the illumination condition of the security light by disconnecting the DLC-2 to release security access. NOTE: SECURITY LIGHT FLASHING SEQUENCE WHEN IGNITION SWITCH IS TURNED TO LOCK POSITION (IMMOBILIZER SYSTEM IS NORMAL) 

Diagnostic Procedure

STEP	INSPECTION		ACTION
1	• Turn the ignition switch to the ON position. • Do other warning lights in the instrument cluster illuminate normally?	Yes	Go to the next step.
		No	Inspect the instrument cluster. (See 09-22-2 INSTRUMENT CLUSTER INSPECTION.)
2	• Turn the ignition switch to the LOCK position. • Disconnect the negative battery cable. • Disconnect the instrument cluster connector (24-pin). • Connect the negative battery cable. • Does the security light illuminate?	Yes	Replace the instrument cluster. (See 09-22-2 INSTRUMENT CLUSTER REMOVAL/ INSTALLATION.)
		No	Go to the next step.
3	• Disconnect the negative battery cable. • Connect the instrument cluster connector. • Disconnect the immobilizer unit connector • Connect the negative battery cable. • Does the security light illuminate?	Yes	Go to the next step.
		No	Repair or replace the wiring harness for short to GND between the immobilizer unit connector terminal M and the instrument cluster terminal 1J.
4	• Disconnect the negative battery cable. • Ground instrument cluster terminal 1J using a jumper wire. • Connect the negative battery cable. • Does the security light illuminate?	Yes	Go to the next step.
		No	Replace the instrument cluster. (See 09-22-2 INSTRUMENT CLUSTER REMOVAL/ INSTALLATION.)
5	• Disconnect the negative battery cable. • Connect the instrument cluster connector. • Disconnect the immobilizer unit connector • Ground immobilizer unit connector terminal M using a jumper wire. • Connect the negative battery cable. • Does the security light illuminate?	Yes	Replace the immobilizer unit. (See 09-14-22 IMMOBILIZER UNIT REMOVAL/ INSTALLATION.)
		No	Repair or replace the wiring harness for short to GND between the immobilizer unit connector terminal M and the instrument cluster terminal 1J.

09-03D SYMPTOM TROUBLESHOOTING [AUDIO]

FOREWORD [ENTIRE AUDIO SYSTEM] 09-03D–1
CONFIRMATION STEP 1: AUDIO PANEL SWITCH CONFIRMATION 09-03D–3
NO.1 AF NOISE OR POP NOISE ON ALL SOURCES (RADIO, CD) 09-03D–3
NO.2 NO POWER ON THE ENTIRE AUDIO SYSTEM 09-03D–4
NO.3 NO SOUND FROM ALL THE SPEAKERS 09-03D–5
NO.4 NO SOUND FROM SOME SPEAKERS 09-03D–6
NO.5 BROKEN SOUND OR POOR SOUND QUALITY 09-03D–7
NO.6 SOUND BECOMES LOUDLY OR WEAKLY WHILE DRIVING THE VEHICLE 09-03D–7
NO.7 ALC FUNCTION IS INOPERATIVE 09-03D–8
NO.8 AUDIO SYSTEM ILLUMINATION DOES NOT ILLUMINATE AT ALL 09-03D–8
NO.9 LCD DOES NOT DISPLAY AT ALL 09-03D–9
FOREWORD [RADIO] 09-03D–9
CONFIRMATION STEP 1: RECEPTION CONDITION SYMPTOM (EXAMPLE) 09-03D–10
CONFIRMATION STEP 2: ANTENNA SYSTEM SYMPTOM (EXAMPLE) 09-03D–11
CONFIRMATION STEP 3: ANTENNA SYSTEM SIMPLE INSPECTION 09-03D–11
NO.1 NO RADIO RECEPTION (AM/FM)/NO OR LOW VOLUME 09-03D–11
NO.2 NOISE FROM RADIO (AM ONLY) 09-03D–13
NO.3 NOISE FROM RADIO (FM ONLY) 09-03D–14
NO.4 CANNOT TUNE (SEEK DOES NOT STOP) 09-03D–16
NO.5 CANNOT PRESET (PRESET FUNCTION DOES NOT OPERATE) 09-03D–16
NO.6 RECEPTION FREQUENCY OF RADIO SLIPS 09-03D–17
FOREWORD [CD PLAYER/CHANGER] 09-03D–17
NO.1 CD PLAYER/CHANGER DOES NOT LOAD THE CD OR EJECTS THE CD IMMEDIATELY 09-03D–19
NO.2 CD PLAYER/CHANGER DOES NOT EJECT THE CD 09-03D–19
NO.3 CD PLAYER/CHANGER DOES NOT PLAY THE CD/NO SOUND 09-03D–20
NO.4 SOUND JUMPS 09-03D–20
NO.5 CD PLAYER/CHANGER SCRATCHES ON THE CD 09-03D–21
NO.6 DISC CHANGER IS INOPERATIVE 09-03D–21
NO.7 CD PLAYER DOES NOT PLAY THE MP3-FORMATTED FILE 09-03D–22
NO.8 MP3-FORMATTED FILE FOLDER SELECTION IS INOPERATIVE/TRACK SEARCH IS INOPERATIVE 09-03D–23
NO.9 CD PLAYER DOES NOT INDICATE THE MP3 TITLE TEXT 09-03D–24
NO.10 CD PLAYER DOES NOT PLAY THE AUDIO DATA (CDDA) 09-03D–24
NO.11 TRACK CHANGE IS INOPERATIVE 09-03D–25
RADIO [REFERENCE] 09-03D–25
AUDIO CD [REFERENCE] 09-03D–27

FOREWORD [ENTIRE AUDIO SYSTEM]

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Note

- Record all radio programs set by customer prior to the repairs. Set all radio programs and adjust the time after repairs.

Troubleshooting Index

No.	Symptom	Possible DTC
1	AF noise or POP noise on all sources (Radio, CD)	09:Er20, 09:Er21
2	No power on the entire audio system	09:Er20
3	No sound from all the speakers	00:Er10, 03:Er07, 03:Er10, 09:Er20, 09:Er21
4	No sound from some speakers	—
5	Broken sound or poor sound quality	09:Er21
6	Sound becomes loudly or weakly while driving the vehicle	—
7	ALC function is inoperative	—
8	Audio system illumination does not illuminate at all	09:Er20, 21:Er19
9	LCD does not display at all	09:Er20, 21:Er19

Quick Diagnostic Chart (Entire Audio System)

X: Applicable

Possible factor \ Troubleshooting item	1 AF noise or POP noise on all sources (Radio, CD)	2 No power on the entire audio system	3 No sound at all	4 No sound from some speaker	5 Broken sound or poor sound quality	6 Sound becomes loudly or weakly while driving the vehicle	7 ALC function is inoperative	8 Audio system illumination does not illuminate at all	9 LCD does not display at all
Low vehicle battery voltage	X								
Jammed radio signals from after market equipment	X								
Speaker malfunction (e. g., any foreign material, broken)	X		X	X	X				
Improper speaker installation	X				X				
Poor connection of audio unit connector, terminal damage	X	X		X				X	
Antenna malfunction (e.g., poor ground)	X								
Audio unit malfunction		X	X	X	X	X	X	X	X
Burnt fuse (B+)		X							
Burnt fuse (ACC)		X							
Open or short circuit in power supply (B+) wiring harness		X							
Open or short circuit in power supply (ACC) wiring harness		X							
Short circuit in wiring harness between audio unit and speaker			X	X					
Open circuit in wiring harness between audio unit and speaker				X					
Short circuit inside speaker			X	X					
Vibration of door trim and/or package trim					X				
CAN signal wiring harness malfunction							X		
Open or short circuit in vehicle speed signal wiring harness (e.g., instrument cluster)							X		
Burnt fuse (TNS signal)								X	
Open or short circuit in TNS signal wiring harness								X	
Center panel malfunction								X	
Information display malfunction									X

DBG903AWBS01

CONFIRMATION STEP 1: AUDIO PANEL SWITCH CONFIRMATION

dcf090366900w02

- Make sure the customer complain and identify either the center panel malfunction or audio unit malfunction.

How to activate audio panel switch confirmation mode

1. Turn the audio system to ON.
2. Press both POWER SW and CLOCK buttons for a second at the same time.
3. The audio panel switch confirmation mode is now activated.

STEP	INSPECTION		ACTION
1	• Press each button on the center panel. • Does buzzer sound when pressing each button?	Yes	Make sure the customer complain and then go to the appropriate symptom troubleshooting procedure.
		No	Go to the next step.
2	• Disassemble and reassemble the center panel and audio unit. • Activate the audio panel switch confirmation mode. • Does buzzer sound when pressing each button?	Yes	Go to the next step.
		No	Replace the center panel.
3	• Does the audio system operate properly?	Yes	The system is normal.
		No	Make sure the customer complain and then go to the appropriate symptom troubleshooting procedure.

NO.1 AF NOISE OR POP NOISE ON ALL SOURCES (RADIO, CD)

dcf090366900w03

1	AF noise or POP noise on all sources (Radio, CD)/Possible DTC: 09:Er20, 09:Er21

Troubleshooting hints

- Low vehicle battery voltage
- Jammed radio signals from after market equipment
- Speaker malfunction (e.g., any foreign material, broken)
- Improper speaker installation
- Audio unit malfunction
- Poor connection of audio unit connector, terminal damage
- Antenna malfunction (e.g., poor ground)

Note

- AF noise is "Petit Petit" noise that generally occurs with switch ON/OFF operations of electrical equipment other than the audio unit, or "Gee" continual noise that occurs when electrical equipment is operated.This is caused by noise entrance to the power supply wiring, signal wiring, speaker cable or head of cassette deck etc. Therefore noise can be heard regardless of radio wave condition or audio volume position. The noise will start after one click from the minimum position of volume button but normally does not change even when volume is turned to higher position.
- POP noise is "Putsun", "Poco" or "Putsun" noise that occurs with switch ON/OFF operation of the audio unit, or with switching Radio to CD. Even normal audio unit sometimes emit small noise depending on conditions.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Inspect the vehicle battery voltage. • Is the vehicle battery voltage normal? **Specification:** **Ignition switch ON: 11.5 V or more** **Idle: 12.5 V or more**	Yes	Go to the next step.
		No	Charge the battery, then go to the next step.
2	• Turn the audio system to ON. • Is there any noise?	Yes	Go to the next step.
		No	The system is normal. Explain to the customer that the vehicle battery voltage was low.
3	• Is any of the following after-market equipment installed? (Inspect especially near the antenna.) — Radar — Remote engine starter — Anti-theft device — Other	Yes	Go to the next step.
		No	Go to the Step 5.
4	• Remove the after-market equipment. • Turn the audio system to ON. • Is there any noise?	Yes	Go to the next step.
		No	The system is normal. The after-market electrical devices might make a noise.

STEP	INSPECTION		ACTION
5	• Is there the noise from all speakers?	Yes	Go to the Step 7.
		No	Go to the next step.
6	• Inspect the suspect speaker. • Is the speaker normal?	Yes	Go to the next step.
		No	**If there is any foreign material on the speaker:** • Remove the foreign material from the speaker. **If the speaker is malfunctioning:** • Replace the speaker. **If the speaker is not installed properly:** • Install the speaker properly.
7	• Attempt to duplicate the symptom on the other vehicle. • Is the noise better than the customer's vehicle?	Yes	Go to the next step.
		No	The system is normal. Explain the noise generation mechanism to the customer. **Note** • The noise may be heard depends on the operating speed of audio power and/or mode switch.
8	• Turn the ignition switch to the LOCK position. • Remove the audio unit. • Inspect the connection of the audio unit connector (24-pin) (for sound signal line). • Is the connector connected securely?	Yes	Go to the next step.
		No	**If poor connection of audio unit connector:** • Securely connect the audio unit connector. **If the audio unit side connector is wrong:** • Replace the audio unit. **If the wiring harness-side connector is wrong:** • Repair or replace the pins and/or the connector. After treating either the above-mentioned, then go to the next step.
9	• Is there any noise?	Yes	Go to the next step.
		No	The system is normal.
10	• Inspect the ground condition of the antenna. • Is the ground condition normal?	Yes	Replace the audio unit.
		No	Repair or replace the ground. Go to the next step.
11	• Is there any noise?	Yes	Replace the audio unit.
		No	The system is normal.

NO.2 NO POWER ON THE ENTIRE AUDIO SYSTEM

dcf090366800w04

2	No power on the entire audio system/Possible DTC: 09:Er20

Troubleshooting hints

- Poor connection of audio unit connector, terminal damage
- Audio unit malfunction
- Burnt fuse (B+)
- Burnt fuse (ACC)
- Open or short circuit in power supply (B+) wiring harness
- Open or short circuit in power supply (ACC) wiring harness

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Turn the ignition switch to the LOCK position. • Inspect the following fuses: — RADIO — ROOM • Are the fuse normal?	Yes	Go to the next step.
		No	Replace with the appropriate standard fuse. • If the fuse is melted, inspect the wiring harness for short to ground. Repair or replace the wiring harness, then replace the fuse.
2	• Remove the audio unit. • Inspect the connection of the audio unit connector (24-pin). • Disconnect the audio unit connector and inspect both the audio unit and wiring harness-side connectors for poor connection. (such as damaged/pulled-out pins, corrosion). — Terminal B (B+) — Terminal R (ACC) — Terminal W GND) • Are all the pins normal?	Yes	Go to the next step.
		No	**If poor connection of audio unit connector:** • Securely connect the audio unit connector. **If the audio unit side connector is wrong:** • Replace the audio unit. **If the wiring harness-side connector is wrong:** • Repair or replace the pins and/or the connector.

STEP	INSPECTION		ACTION
3	• Connect the audio unit connector. • Inspect the voltage for the power supply line (B+, ACC). **Specification:** **Ignition switch ON: 11.5 V or more** **Idle: 12.5 V or more** • Is the voltage normal?	Yes	Go to the next step.
		No	Repair or replace the suspect wiring harness.
4	• Turn the ignition switch to the LOCK position. • Remove the audio unit connector (24-pin). • Inspect the continuity between the audio unit wiring harness-side connector terminal W and the ground. • Is there the continuity?	Yes	Replace the audio unit.
		No	Repair or replace the wiring harness.

NO.3 NO SOUND FROM ALL THE SPEAKERS

dcf090366900w05

3	**No sound from all the speakers/Possible DTC: 00:Er10, 03:Er07, 03:Er10, 09:Er20, 09:Er21**

Troubleshooting hints

- Speaker malfunction (e.g., any foreign material, broken)
- Audio unit malfunction
- Short circuit in wiring harness between audio unit and speaker
- Short circuit inside speaker

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Press AUDIO CONT button more than 1 second. • Play the CD or Radio. • Adjust the volume between "10" to "15". • Is there the sound?	Yes	The system is normal.
		No	Go to the next step.
2	• Turn the ignition switch to the LOCK position. • Remove the audio unit. • Disconnect the audio connector (24-pin). • Inspect the continuity between the audio unit wiring harness-side connector terminal and ground: **For front speaker** — Terminal A (L+) — GND — Terminal C (L-) — GND — Terminal D (R+) — GND — Terminal F (R-) — GND **For rear speaker** — Terminal S (L+) — GND — Terminal U (L-) — GND — Terminal V (R+) — GND — Terminal X (R-) — GND — Is there a continuity?	Yes	Repair or replace the suspect wiring harness or speaker unit. **Note** • If there is a short circuit between the speaker harness or speaker lead wire and ground, the protector circuit inside the audio unit operates to cut the sound.
		No	Go to the next step.
3	• Remove the speaker. • Disconnect the speaker connector (2-pin). • Inspect the continuity between the speaker wiring harness-side connector (2-pin) terminal and ground: **For each speaker** — Terminal A — GND — Terminal B — GND • Is there the continuity?	Yes	Replace the speaker.
		No	Replace the audio unit.

NO.4 NO SOUND FROM SOME SPEAKERS

dcf090366900w06

4	No sound from some speakers/Possible DTC: —

Troubleshooting hints

- Speaker malfunction (e.g., any foreign material, broken)
- Audio unit malfunction
- Short circuit inside speaker
- Open or short circuit in wiring harness between audio unit and speaker

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Turn the audio unit to ON. • Press AUDIO CONT button more than one second (BAL/FAD cancel mode). • Press both POWER and AUTO-M buttons more than 1 second at the same time. **Note** • The sounded speaker now changes in the order of left — front speaker, right — front speaker, right — rear speaker and left — rear speaker. • Is there any speaker with no sound?	Yes	**If no sound from some speaker:** • Go to the next step. **If no sound at all:** • Go to the troubleshooting of "No.3 No sound from all speakers".
		No	The troubleshooting is completed.
2	• Turn the ignition switch to the LOCK position. • Disconnect the audio unit connector (24-pin). • Inspect the continuity between the audio unit wiring harness-side connector (24-pin) terminal and ground. • Is there the continuity?	Yes	Repair or replace the suspect wiring harness or speaker unit. **Note** • If there is a short circuit between the speaker harness or speaker lead wire and ground, the protector circuit inside the audio unit operates to cut the sound.
		No	Go to the next step.
3	• Remove the suspect speaker. • Disconnect the speaker connector (2-pin) and inspect the resistance of speaker. • Is the resistance normal? **Specification** **Speaker resistance + wiring harness resistance**	Yes	Replace the audio unit.
		No	Go to the next step.
4	• Inspect the wiring harness between the audio unit and the suspect speaker. • Is there the continuity?	Yes	Go to the next step.
		No	Repair or replace the suspect wiring harness.
5	• Inspect the suspect speaker. • Is the speaker normal? **Note** • If the speaker lead wire contacts to either ground or vehicle frame, replace the speaker.	Yes	Replace the audio unit.
		No	Go to the next step.

NO.5 BROKEN SOUND OR POOR SOUND QUALITY

dcf090366900w07

5	Broken sound or poor sound quality/Possible DTC: 09:Er21

Troubleshooting hints

- Speaker malfunction (e.g., any foreign material, broken)
- Improper speaker installation
- Audio unit malfunction
- Vibration of door trim and/or package trim

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Are there a broken sound or poor sound quality from all speakers?	Yes	Go to the next step.
		No	Go to the Step 5.
2	• Inspect the sound while adjusting the sound volume. • Is there a broken sound or poor sound quality between "15" and "20"?	Yes	Go to the next step.
		No	The system is normal.
3	• Inspect the BASS/TREB. • Is there a poor sound quality at "-3 — +3" of "BASS/TREB"? **Note** • When press the AUDIO CONT button for a few seconds, BASS/TREB is set at "0".	Yes	Go to the next step.
		No	If there is a broken sound at "+6— -6" of BASS/TREB with the maximum volume, the system is normal.
4	• Attempt to duplicate the symptom on the other vehicle. • Is the sound better than the customer's vehicle?	Yes	Replace the audio unit.
		No	The system is normal.
5	• Identify the speaker with a broken sound by adjusting BAL/FADE. • Is the suspect speaker installed upward?	Yes	Go to the Step 7.
		No	Go to the next step.
6	• Inspect the speaker installation condition. • Is the speaker installed properly?	Yes	Go to the next step.
		No	Install the speaker properly.
7	• Remove the speaker. • Is there any foreign material or damage on the speaker?	Yes	Repair or replace the suspect speaker.
		No	Go to the next step.
8	• Inspect the sound again. • Is there broken sound?	Yes	Go to the next step.
		No	Inspect the vibration from the door trim and/or package trim. Repair or replace the suspect trim as necessary.
9	• Replace with the speaker known to be good. (e.g., swap right and left speakers) • Does the broken sound appear at the same location?	Yes	Replace the audio unit.
		No	Replace the speaker.

NO.6 SOUND BECOMES LOUDLY OR WEAKLY WHILE DRIVING THE VEHICLE

dcf090366900w08

6	Sound becomes loudly or weakly while driving the vehicle/Possible DTC: —

Troubleshooting hints

- Audio unit malfunction

Note

- Inspect the ALC function while driving the vehicle with playing the CD, etc.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Does the ALC function turn to ON?	Yes	Go to the next step.
		No	Replace the audio unit.
2	• Turn the ALC function to OFF. • Does the sound change while driving the vehicle?	Yes	Replace the audio unit.
		No	The system is normal. Explains the ALC function to the customer.

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NO.7 ALC FUNCTION IS INOPERATIVE

dcf090366900w09

7	ALC function is inoperative/Possible DTC: —

Troubleshooting hints

- Audio unit malfunction
- CAN signal wiring harness malfunction
- Open or short circuit in vehicle speed signal wiring harness (e. g., instrument cluster)

Note

- Inspect the ALC function while driving the vehicle with playing the CD, etc.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Turn the ALC function to ON. • Inspect the ALC function operation when driving the vehicle. • Does the ALC system operate properly?	Yes	The system is normal. Explains the ALC function to the customer.
		No	Go to the next step.
2	• Retrieve the DTCs from all vehicle modules using the WDS or equivalent. • Is there the following DTC displayed? — Vehicle speed signal wiring harness — CAN signal wiring harness	Yes	Go to the appropriate DTC inspection.
		No	Replace the audio unit.

NO.8 AUDIO SYSTEM ILLUMINATION DOES NOT ILLUMINATE AT ALL

dcf090366900w10

8	Audio system illumination does not illuminate at all/Possible DTC: 09:Er20, 21:Er19

Troubleshooting hints

- Poor connection of audio unit connector, terminal damage
- Audio unit malfunction
- Burnt fuse (TNS signal)
- Open or short circuit in TNS signal wiring harness
- Center panel malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Are all illumination on the audio unit turned OFF?	Yes	Go to the next step.
		No	Replace the center panel.
2	• Turn the ignition switch to the LOCK position. • Inspect the fuse (ILLUMI). • Is the fuse normal?	Yes	Go to the Step 4.
		No	Go to the next step.
3	• Turn the ignition switch to the LOCK position. • Disconnect the audio unit connector (24-pin) and inspect the continuity between the audio unit wiring harness-side connector terminal E (TNS) and the ground. • Is there continuity?	Yes	Repair or replace the short circuit in the suspect wiring harness. After repair the harness, replace with the appropriate standard fuse.
		No	Go to the next step.
4	• Inspect the connection of the audio unit connector (24-pin). • Inspect both the audio unit and wiring harness-side connector terminal E for poor connection (such as damaged/pulled-out pins, corrosion). • Are all the pins normal?	Yes	Go to the next step.
		No	**If poor connection of audio unit connector:** • Securely connect the audio unit connector. **If the audio unit side connector is wrong:** • Replace the audio unit. **If the wiring harness-side connector is wrong:** • Repair or replace the pins and/or the connector.
5	• Connect the audio unit connector (24-pin). • Turn the ignition switch to the ACC position. • Inspect the voltage at the audio unit connector terminal E (TNS). • Is the voltage **B+** when the light switch is turned to the TNS position?	Yes	Replace the audio unit.
		No	Repair or replace the suspect wiring harness (TNS signal).

NO.9 LCD DOES NOT DISPLAY AT ALL

dcf090366900w11

9	LCD does not display at all/Possible DTC: 09:Er20, 21:Er19

Troubleshooting hints
- Audio unit malfunction
- Information display malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Turn the audio unit to ON. • Press both POWER ON/OFF and SEEK UP buttons for **0.2 seconds** at the same time. • Does the LCD display properly?	Yes	Go to the next step.
		No	Replace the information display.
2	• Press either CLC or SET/INFO button on the information display. • Does the beep sound?	Yes	Replace the audio unit.
		No	Replace both audio unit and information display. (CAN communication malfunction)

FOREWORD [RADIO]

dcf090366900w12

Note
- In case location, time, and broadcasting station etc. can be specified through interview to customer, possibility that signal environment causes problem is high.
- Perform confirmation of symptom and evaluation under conditions that customer reported (location, time, broadcasting station etc.). If not possible, perform it under equivalent conditions.
- Before inspection or repair, record the broadcasting stations that customer preset and reset them accordingly after the inspection or repair. Adjust the clock too.

Troubleshooting Index

No.	Symptom	Possible DTC
1	No radio reception (AM/FM)/No or low volume	09:Er20, 09:Er22
2	Noise from radio (AM only)	09:Er22
3	Noise from radio (FM only)	09:Er22
4	Cannot tune (SEEK does not stop)	09:Er20, 09:Er22
5	Cannot preset (preset function does not operate)	21:Er19
6	Reception frequency of radio slips	09:Er22

Quick Diagnostic Chart (Radio)

X: Applicable

Possible factor \ Troubleshooting item	1 No radio reception (AM/FM)/No or low volume	2 Noise from radio (AM only)	3 Noise from radio (FM only)	4 Cannot tune (SEEK does not stop)	5 Cannot preset (preset function does not operate)	6 Reception frequency of radio slips
Jamming from aftermarket electronic equipment (two-way radio, navigation system, mobile phone, etc)	X	X	X			
Audio unit	X	X	X	X	X	X
Antenna plug poor connection	X	X	X	X		
Antenna feeder	X	X	X	X		
Electronic jamming from outside, or inferior condition of broadcasting station radio wave	X	X	X	X		X
Antenna rod not installed	X	X	X	X		
Noise from electrical system on vehicle (e.g. fuel pump)		X	X			
Battery		X	X			
Charging system		X	X			
Antenna installation loosened		X	X			
Center panel				X	X	

DPE903EW1O03

CONFIRMATION STEP 1: RECEPTION CONDITION SYMPTOM (EXAMPLE)

dcf090366900w13

Symptom	Antenna signal condition	Source
Only a buzzing sound from the speakers	• There is no broadcasting wave. • Signals from antenna to audio unit are not transmitted.	• Electric noise caused by the operation of internal circuit from audio unit itself • Atmosphere noise
A buzzing or crunching sound and normal sound produced at the same time from the speakers	• Though signals are transmitted from antenna to audio unit, electric noise from other sources is larger.	• Electrical noise caused by operation of electrical component on vehicle • Electrical noise from high tension wire, transformer substation (factory), electrical feeder line (street car), or motorcycle.
A thumping sound and normal sound produced at the same time from the speakers (FM only)	• Noise occurs due to radio wave environment at specific places (e.g. in valleys between buildings). Noise varies when own vehicle or surrounding vehicles moves. (FM only)	• Interference between direct and reflected waves of FM signals causes noise (Multipass noise).

CONFIRMATION STEP 2: ANTENNA SYSTEM SYMPTOM (EXAMPLE)

dcf090366900w14

Possible cause	AM reception condition	FM reception condition
• Antenna feeder axis, open circuit • Antenna feeder plug not attached	NG: No reception	YES: Reception possible. (Sensitivity decreases, but reception is possible under strong electric field.)
• Antenna feeder axis (+) to ground (-), open circuit	NG: No reception	NG: No reception
• Antenna feeder and antenna, poor ground	YES: Reception possible (Noise may occur)	YES: Reception possible (Sensitivity decreases, but reception is possible under strong electric field.)
• Antenna feeder, jack and plug poor connection	NG: No reception (Depending on connection conditions)	YES: Reception possible (Depending on connection conditions)

CONFIRMATION STEP 3: ANTENNA SYSTEM SIMPLE INSPECTION

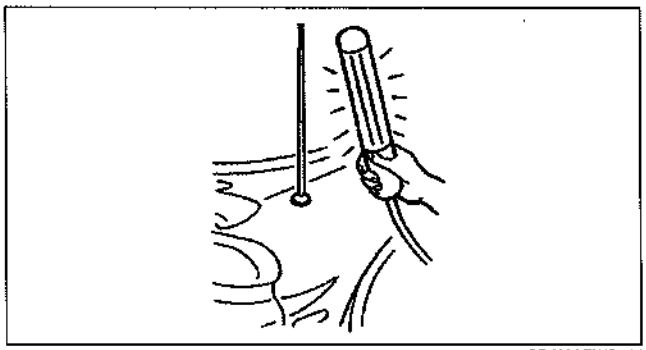
dcf090366900w15

Note

- Because the antenna system is equipped with a capacitor, the continuity cannot be checked. Therefore proceed the following simple inspection.
  1. Turn the AM radio on.
  2. Tune to the frequency that there is no broadcast and you will hear a buzzing sound.
  3. Turn a work light on and shake it around the antenna rod (around 10—20 mm)
  4. If a whirring sound from the speaker synchronized to the work light movement is confirmed, the antenna system is normal.

Note

- Use a fluorescent light type for the inspection. Accurate diagnostic cannot be done with an incandescent light.



CPJ902EWB011

NO.1 NO RADIO RECEPTION (AM/FM)/NO OR LOW VOLUME

dcf090366900w16

1	No radio reception (AM/FM)/no or low volume/Possible DTC: 09:Er20, 09:Er22
POSSIBLE CAUSE	• Jamming from aftermarket electronic equipment (two-way radio, navigation system, mobile phone, etc.) • Audio unit malfunction • Antenna plug poor connection • Antenna feeder malfunction • Electronic jamming from outside, or inferior condition of broadcasting station radio wave • Antenna rod is not installed

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Turn the audio unit ON. • Is the LCD indicated correctly?	Yes	Go to the Step 3.
		No	Go to the next step.
2	• Measure voltage at B+ and ACC terminals. • Is voltage okay? **Specification** **With ignition switch ON: 11.5 V or more** **At idling: 12.5 V or more**	Yes	Go to the next step.
		No	Follow diagnostic procedure for symptom No. 2 (Entire audio system).
3	• Set volume to 10 to 15. • Is buzzing sound or voice confirmed?	Yes	Go to the next step.
		No	Follow diagnostic procedure for symptom No. 3 (Entire audio system) or No. 4 (Entire audio system).

STEP	INSPECTION		ACTION
4	• Tune to local broadcasting station and check reception condition. • Is reception okay?	Yes	Go to the next step.
		No	Go to the Step 6.
5	• Push PRESET buttons and check preset conditions. • Has preset been stored?	Yes	The system is normal.
		No	Preset broadcasting stations.
6	• Is aftermarket electronic equipment (two-way radio, navigation system, mobile phone, etc.) installed? **Note** • TV antenna located closely to audio antenna can be cause of noise. Relocate TV antenna.	Yes	Go to the next step.
		No	Go to the Step 8.
7	• Remove aftermarket electronic equipment. • Turn audio unit ON and check reception condition. • Is reception improved?	Yes	The system is normal. (Explain to customers that aftermarket electronic equipment is cause of noise)
		No	Go to the next step.
8	• Refer to confirmation step 3, and inspect antenna system. • Is a whirring sound present?	Yes	Replace audio unit.
		No	Go to the next step.
9	• Inspect antenna plug connection condition. • Is connection okay?	Yes	Go to the next step.
		No	Insert antenna plug securely.
10	• Turn ignition switch to LOCK position. • Measure continuity between antenna feeder axis and ground. • Is there any continuity?	Yes	Replace antenna feeder.
		No	Go to the next step.
11	• Compare reception with other audio unit on same model (model/unit) under same problem conditions. • Is reception equivalent between customer's unit and compared unit? **Note** • Due to following differences, you may feel difference in reception efficiency. **(Vehicle side factor)** — Antenna installation location, height, feeder wiring routing, optional electrical equipment **(Audio unit factor)** — Volume concern type: It decreases change of volume when signals become weak. (Noise is easy to be conspicuous) — Noise decrease type: It decreases volume when signals become weak, so that noise is not conspicuous.	Yes	The system is normal. (It is caused by electronic jamming from outside, or inferior broadcasting station signal condition.)
		No	Replace audio unit.

NO.2 NOISE FROM RADIO (AM ONLY)

dcf090366900w17

2	Noise from radio (am only)/Possible DTC: 09:Er22
POSSIBLE CAUSE	• Antenna rod not installed • Jamming from aftermarket electronic equipment (two-way radio, navigation system, mobile phone, etc.) • Noise from electrical system on vehicle (e.g. fuel pump) • Battery malfunction • Charging system malfunction • Audio unit malfunction • Antenna plug poor connection • Antenna feeder malfunction • Electronic jamming from outside, or inferior condition of broadcasting station radio wave • Antenna installation loosened

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Tune to local broadcasting station and check reception condition. • Is reception okay?	Yes	Tune to correct frequency of broadcasting station. If not preset, preset it.
		No	Go to the next step.
2	• Inspect antenna rod condition. • Is antenna rod installed?	Yes	Go to the next step.
		No	Advise customer to install antenna rod when radio is used.
3	• Is aftermarket electronic equipment (two-way radio, navigation system, mobile phone, etc.) installed? **Note** • TV antenna located closely to audio antenna can be cause of noise. Relocate TV antenna.	Yes	Go to the next step.
		No	Go to the Step 5.
4	• Remove aftermarket electronic equipment. • Turn audio unit ON and check reception condition. • Is reception improved?	Yes	The system is normal. (Explain to customers that aftermarket electronic equipment is cause of noise)
		No	Go to the next step.
5	• Measure battery voltage. • Is battery voltage okay? **Standard** **With ignition switch ON: 11.5 V or more** **At idling: 12.5 V or more** **Note** • Inspect that battery cables are connected to terminals securely.	Yes	Go to the next step.
		No	Charge battery. Inspect charging system, and repair or replace if necessary.
6	• Is noise occurring only when vehicle electrical system (e.g. fuel pump) operates? **Note** • Identify subject electrical component by disconnecting fuse, turning switch ON & OFF, or disconnecting & connecting connector. • It will be easy when simulation function on WDS is used.	Yes	Go to the next step.
		No	Go to the Step 8.
7	• Inspect power supply, ground condition, and noise prevention capacitor for electrical component. • Is noise present after inspection? **Note** • Inspect following: — Power supply to electrical component for voltage drop (compare with battery voltage) — Resistance between ground of electrical component and body. (Should be close to 0 ohm) — Installation condition of noise prevention capacitor for fuel pump etc.	Yes	Go to the next step.
		No	Troubleshooting completed. **Note** • The audio unit supplies 12 V battery power to the antenna amplifier for the AM radio reception in the radio mode. The audio unit cannot receive the AM signals without the 12 V battery power to the antenna amplifier. If the AM signals become strong, the audio unit may receive the signal with noises.

STEP	INSPECTION		ACTION
8	• Inspect antenna plug connection condition. • Is connection okay?	Yes	Go to the next step.
		No	Insert antenna plug securely.
9	• Turn ignition switch to LOCK position. • Measure continuity between antenna feeder axis and ground. • Is there any continuity?	Yes	Replace antenna feeder.
		No	Go to the next step.
10	Compare reception with other audio unit on same model (model/unit) under same problem conditions. • Is reception equivalent between customer's unit and compared unit? **Note** • Due to following differences, you may feel difference in reception efficiency. **(Vehicle side factor)** — Antenna installation location, height, feeder wiring routing, optional electrical equipment **(Audio unit factor)** — Volume concern type: It decreases change of volume when signals become weak. (Noise is easy to be conspicuous) — Noise decrease type: It decreases volume when signals become weak, so that noise is not conspicuous.	Yes	The system is normal (It is caused by electronic jamming from outside, or inferior broadcasting station signal condition).
		No	Go to the next step.
11	• Retighten ground fixation for antenna installation part and antenna amplifier. Retighten antenna rod. • Is noise present, after retightening?	Yes	Replace audio unit.
		No	Troubleshooting completed.

NO.3 NOISE FROM RADIO (FM ONLY)

dcf090366900w18

3	Noise from radio (FM only)/Possible DTC: 09:Er22
POSSIBLE CAUSE	• Antenna rod not installed • Jamming from aftermarket electronic equipment (two-way radio, navigation system, mobile phone, etc.) • Noise from electrical system on vehicle (e.g. fuel pump) • Battery malfunction • Charging system malfunction • Audio unit malfunction • Antenna plug poor connection • Antenna feeder malfunction • Electronic jamming from outside, or inferior condition of broadcasting station radio wave • Antenna installation loosened **Note** • FM broadcast has feature "sound quality is good" and "resistant to noise", but FM broadcast has particular noises. Though audio unit is designed to reduce noise, there are times noise occurs due to conditions.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Tune to local broadcasting station and check reception condition. • Is reception okay?	Yes	Tune to correct frequency of broadcasting station. If not preset, preset it.
		No	Go to the next step.
2	• Inspect antenna rod condition. • Is antenna rod installed?	Yes	Go to the next step.
		No	Advise customer to install antenna rod when radio is used.
3	• Is aftermarket electronic equipment (two-way radio, navigation system, mobile phone, etc.) installed?	Yes	Go to the next step.
		No	Go to the Step 5.

STEP	INSPECTION		ACTION
4	• Remove aftermarket electronic equipment. • Turn audio unit ON and check reception condition. • Is reception improved?	Yes	The system is normal. (Explain to customers that aftermarket electronic equipment is cause of noise)
		No	Go to the next step.
5	• Measure battery voltage. • Is battery voltage okay? **Standard** **With ignition switch ON: 11.5 V or more** **At idling: 12.5 V or more** **Note** • Inspect that battery cables are connected to terminals securely.	Yes	Go to the next step.
		No	Charge battery. Inspect charging system, and repair or replace if necessary.
6	• Is noise occurring only when vehicle electrical system (e.g. fuel pump) operates? **Note** • Identify subject electrical component by disconnecting fuse, turning switch ON & OFF, or disconnecting & connecting connector. • It will be easy when simulation function on WDS is used.	Yes	Go to the next step.
		No	Go to the Step 8.
7	• Inspect power supply, ground condition, and noise prevention capacitor for electrical component. • Is noise present after inspection? **Note** • Inspect following: — Power supply to electrical component for voltage drop (compare with battery voltage) — Resistance between ground of electrical component and body. (Should be close to 0 ohm) — Installation condition of noise prevention capacitor for fuel pump etc.	Yes	Go to the next step.
		No	Troubleshooting completed.
8	• Inspect antenna plug connection condition. • Is connection okay?	Yes	Go to the next step.
		No	Insert antenna plug securely.
9	• Turn ignition switch to LOCK position. • Measure continuity between antenna feeder axis and ground. • Is there any continuity?	Yes	Replace antenna feeder.
		No	Go to the next step.
10	• Compare reception with other audio unit on same model (model/unit) under same problem conditions. • Is reception equivalent between customer's unit and compared unit?	Yes	The system is normal (It is caused by electronic jamming from outside, or inferior broadcasting station signal condition).
		No	Go to the next step.
11	• Retighten ground fixation for antenna installation part and antenna amplifier. Retighten antenna rod. • Is noise present, after retightening? **Note** • When antenna is not grounded perfectly, FM particular noise is likely to be conspicuous.	Yes	Replace audio unit.
		No	Troubleshooting completed.

NO.4 CANNOT TUNE (SEEK DOES NOT STOP)

dcf090366900w19

4	Cannot tune (seek does not stop)/Possible DTC: 09:Er20, 09:Er22
POSSIBLE CAUSE	• Center panel malfunction • Antenna plug poor connection • Antenna feeder malfunction • Audio unit malfunction • Electronic jamming from outside, or inferior condition of broadcasting station radio wave • Antenna rod not installed

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Inspect if feel of SEEK button is normal when button is pushed and released. • Is it okay?	Yes	Go to the next step.
		No	Perform confirmation step 1: audio panel switch confirmation. Replace center panel if necessary.
2	• Inspect indication of LCD. • Is frequency indication increased or decreased when SEEK button is pushed?	Yes	Go to the next step.
		No	Perform confirmation step 1: audio panel switch confirmation. Replace center panel if necessary.
3	• Manually tune to local broadcasting station and check reception condition. • Is reception okay?	Yes	Go to the Step 6.
		No	Go to the next step.
4	• Inspect antenna plug connection condition. • Is connection okay?	Yes	Go to the next step.
		No	Insert antenna plug securely.
5	• Turn ignition switch to LOCK position. • Measure continuity between antenna feeder axis and ground. • Is there any continuity?	Yes	Replace antenna feeder.
		No	Go to the next step.
6	• Check if number of broadcasting stations changes depending on time and place. • Does it change?	Yes	The system is normal. (Explain to customer that SEEK sometimes does not stop depending on signal reception condition.) **Note** • Signals tend to reach longer distances in the night. It is conspicuous in AM signals, several audio functions may stop due to foreign broadcasting station or noise. Though the audio system restrains sensitivity of SEEK and SCAN functions in the night, the audio system may select other than desired broadcasting station when signals are considerably strong.This function is linked to the parking light. When the parking light or headlight is turned on, SEEK and SCAN may not function for weak signals.
		No	Replace audio unit.

NO.5 CANNOT PRESET (PRESET FUNCTION DOES NOT OPERATE)

dcf090366900w20

5	Cannot preset (preset function does not operate)/Possible DTC: 21:Er19
POSSIBLE CAUSE	• Audio unit malfunction • Center panel malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Tune to desired station and push channel preset button 1 for about 2 seconds to store it. • Repeat above for other stations using channel preset buttons 2 to 5. • Push channel preset button 1 to 6 one by one. • Are stored stations present?	Yes	Go to the next step.
		No	Go to the Step 3.
2	• Turn ignition switch to LOCK and then to ACC. • Check if preset stations are stored by pushing preset buttons. • Are stations stored?	Yes	The system is normal. (Explain preset procedure to customer using Owner's Manual)
		No	Replace audio unit.

STEP	INSPECTION		ACTION
3	• Remove center panel from audio unit, and reinstall center panel to audio unit. • Turn audio power switch ON. • Push POWER SW button and MEDIA button at same time for approximately 1 second to enter system to switch check mode. • Push all buttons and check if buzzer sounds. • Is all buttons okay?	Yes	Replace audio unit.
		No	Replace center panel.

NO.6 RECEPTION FREQUENCY OF RADIO SLIPS

dcf090366900w21

6	Reception frequency of radio slip/Possible DTC: 09:Er22
POSSIBLE CAUSE	• Audio unit malfunction • Electronic jamming from outside, or inferior condition of broadcasting station radio wave

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Push SEEK button and check if desired broadcasting station is tuned. • Is it okay?	Yes	Go to the Step 3.
		No	Go to the next step.
2	• Check if other broadcasting station is received at certain place when indication of reception frequency stays. • Is other station received? **Note** • When you receive weak signal from one broadcasting station and come close to broadcasting antenna which emits strong signal, broadcasting with strong signal is sometimes received.	Yes	Go to the next step.
		No	Replace audio unit.
3	• Compare reception with other audio unit on same model (model/unit) under same problem conditions. • Is reception equivalent between customer's unit and compared unit?	Yes	Troubleshooting completed (Audio unit is normal).
		No	Replace audio unit.

FOREWORD [CD PLAYER/CHANGER]

dcf090366900w22

Troubleshooting Index

No.	Items	Symptom	Possible DTC
1	CD player/changer	CD player/changer does not load the CD or ejects the CD immediately	03:Er01, 03:Er10
2		CD player/changer does not eject the CD	03:Er01
3		CD player/changer does not play the CD/No sound	03:Er07, 03:Er10
4		Sound jumps	03:Er02
5		CD player/changer scratches on the CD	03:Er02
6	CD changer	Disc changer is inoperative	—
7	MP3 applicable CD player	CD player does not play the MP3-formatted file	10:Er09, 22:Er09
8		MP3-formatted file folder selection is inoperative/Track search is inoperative	10:Er09, 22:Er09
9		CD player does not indicate the MP3 title text	—
10		CD player does not play the audio data (CDDA)	—
11	CD player/changer	Track change is inoperative	03:Er02

X: Applicable

Troubleshooting Item / Possible factor	CD player/changer					CD player	MP3 applicable CD player				CD player/changer
	1	2	3	4	5	6	7	8	9	10	11
	CD player/changer dose not load the CD or ejects the CD immediately	CD player/changer dose not eject the CD	CD player/changer dose not play the CD/No sound	Sound jumps	CD player/changer scratches on the CD	Disc change is inoperative	CD player dose not play the MP3-formatted file	MP3-formatted file folder selection is inoperative/ Track search is inoperative	CD player dose not indicate the MP3 title text	CD player dose not play the audio data (CODA)	Track change is inoperative
CD is inserted upside down	X		X								
Audio unit is malfunctioning	X	X	X	X	X	X					X
Defective CD (egg., cracked, badly bent, rough edges, scratch, dirty CD, condensation)	X	X	X	X							X
Non-conventional discs (e.g., 8 cm (3 in) CD, 8 cm (3 in) disc adapter, heart-shaped disc, octagonal disc)	X	X	X								X
Poor connection of audio unit connector or terminal (e.g., damaged, bent, pull-out pin, corrosion)	X	X									
Improper center panel installation		X				X					
Improper CD cover installation		X									
Improper audio unit installation (e.g., rattle, loose)				X							
Inadequate tire pressure				X							
Deformed disc is used (e.g., out of specification (thickness), bent disc)	X	X			X						
Multiple CDs are inserted into the CD player at the same time		X			X						
Center panel is malfunctioning						X					X
CD-R/RW written format is out of specification							X			X	
MP3 and other format data are in the CD-R/RW							X				
File extension for MP3-formatted file is incorrect (Correct: ".mp3", Incorrect: e.g., RIFF)							X				
Defective CD-R/RW (e.g., dirty, scratch)							X	X	X	X	
CD-R/RW (MP3 files are all written to RIFF format)							X				
Conflict of ID tag version for CD-R/RW								X	X		
Improper folder and/or music title in CD-R/RW								X			
The number of characters of folder/music file name in CD-R/RW exceeds the maximum number of characters								X	X		
Improper encode in CD-R/RW								X	X		
MP3 applicable CD player is malfunctioning							X	X	X	X	X
No title input in CD-R/RW									X		
Input title text by 2-bytes characters									X		
Data other than the audio data is in CD-R/RW										X	

EPU903EW3O02

NO.1 CD PLAYER/CHANGER DOES NOT LOAD THE CD OR EJECTS THE CD IMMEDIATELY

dcf090366900w23

1	**CD player/changer does not load the CD or ejects the CD immediately** **Possible DTC: 03:Er01, 03:Er10**

Troubleshooting hints

- CD is inserted upside down
- Audio units is malfunctioning
- Defective CD (e.g., cracked, badly bent, rough edges, scratch, dirty CD, condensation)
- Non-conventional discs (e.g., 8 cm (3 in) CD, 8 cm (3 in) disc adapter, heart-shaped disc, octagonal disc)
- Poor connection of audio unit connector or terminal (e.g., damaged, bent, pulled-out pin, corrosion)
- Deformed disc is used (e.g., out of specification (thickness), bent disc)

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Is CD inserted properly, label-side up?	Yes	Go to the next step.
		No	Explain to the customer that CD should be inserted into the slot, label-side up.
2	• Replace with a CD known to be good. • Does the CD player/changer load the CD?	Yes	Go to the next step.
		No	Replace the audio unit.
3	Visually inspect the CD. — Is there any dirt, scratch or deformation on the CD? — Is the CD a non-conventional disc?	Yes	Explain to the customer that the defective CD or non-conventional disc cannot be use.
		No	Go to the next step.
4	• Turn the ignition switch to the LOCK position. • Inspect the connection of the audio unit connector (24-pin). • Inspect both audio unit connector and wiring harness-side connector for poor connection. (such as damaged/bent/pulled-out pins, corrosion) • All the pins and connector normal?	Yes	Replace the audio unit.
		No	**If the audio unit connector/pin is wrong:** • Replace the audio unit. **If the wiring harness-side connector/pin is wrong:** • Repair or replace the pins and/or the connector.

NO.2 CD PLAYER/CHANGER DOES NOT EJECT THE CD

dcf090366900w24

2	**CD player/changer does not eject the CD** **Possible DTC: 03:Er01**

Troubleshooting hints

- Audio units is malfunctioning
- Defective CD (e.g., cracked, badly bent, rough edges, scratch, dirty CD, condensation)
- Non-conventional discs (e.g., 8 cm (3 in) CD, 8 cm (3 in) disc adapter, heart-shaped disc, octagonal disc)
- Poor connection of audio unit connector or terminal (e.g., damaged, bent, pulled-out pin, corrosion)
- Improper center panel installation
- Improper CD cover installation
- Deformed disc is used (e.g., out of specification (thickness), bent disc)
- Multiple CDs are inserted into the CD player at the same time

Note

- The CD may be malfunctioning if the CD player/changer does not eject the certain CD only. Inspect the CD player/changer operation using the CD known to be good.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Inspect the operation of the audio system other than CD player/changer (e.g. Radio). • Does other audio system operate?	Yes	Go to Step 3.
		No	Go to the next step.
2	• Turn the ignition switch to the LOCK position. • Inspect the connection of the audio unit connector (24-pin). • Inspect both audio unit connector and wiring harness-side connector for poor connection. (such as damaged/bent/pulled-out pins, corrosion) • All the pins and connector normal?	Yes	Go to the next step.
		No	**If the audio unit connector/pin is wrong:** • Replace the audio unit. **If the wiring harness-side connector/pin is wrong:** • Repair or replace the pins and/or the connector.

STEP	INSPECTION		ACTION
3	• Eject the CD. • Is the CD ejected from the CD player/ changer?	Yes	Go to the next step.
		No	Inspect the center panel and CD cover installation. Securely install the center panel and/or CD cover as necessary.
4	• Insert the CD into the CD player/changer. • Does the CD insert into the CD player/ changer smoothly?	Yes	Replace the audio unit.
		No	Install the center panel and/or CD cover properly, then go to the next step.
5	• Is the CD ejected from the CD player/ changer?	Yes	Troubleshooting completed. Explain repairs to the customers.
		No	Replace the audio unit.

NO.3 CD PLAYER/CHANGER DOES NOT PLAY THE CD/NO SOUND

dcf090386900w25

3	**CD player/changer does not play the CD/No sound** **Possible DTC: 03:Er07, 03:Er10**

Troubleshooting hints

- CD is inserted upside down
- Audio units is malfunctioning
- Defective CD (e.g., cracked, badly bent, rough edges, scratch, dirty CD, condensation)
- Non-conventional discs (e.g., 8 cm (3 in) CD, 8 cm (3 in) disc adapter, heart-shaped disc, octagonal disc)

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Turn the radio ON and inspect that there is a sound. • Is there a sound? **Note** • Check for the volume dial position.	Yes	Go to the next step.
		No	Go to the symptom troubleshooting No.3 (Audio system).
2	• Was CD inserted properly, label-side up?	Yes	Go to the next step.
		No	Explain to the customer that CD should be inserted into the slot, label-side up.
3	• Replace the CD known to be good. • Does the CD player/changer load the CD?	Yes	Go to the next step.
		No	Replace the audio unit.
4	• Visually inspect the CD. — Is there any dirt, scratch or deformation on the CD? — Is the CD a non-conventional disc? — Is there a CD in MP3 recording?	Yes	Explain to the customer that the defective CD or non-conventional disc cannot be use.
		No	Replace the audio unit.

NO.4 SOUND JUMPS

dcf090386900w26

4	**Sound jumps** **Possible DTC: 03:Er02**

Troubleshooting hints

- Audio unit is malfunctioning
- Defective CD (e.g., cracked, badly bent, rough edges, scratch, dirty CD, condensation)
- Improper audio unit installation (e.g., rattle, loose)
- Inadequate tire pressure

Note

- The CD may be malfunctioning if the sound jumps on the certain CD only. Inspect the CD player/changer operation using the CD known to be good.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Does the sound jump when the vehicle is stopped?	Yes	Go to the Step 6.
		No	Go to the next step.
2	• Drive the vehicle. • Does the sound jump when driving over uneven surfaces?	Yes	Go to the next step.
		No	Go to the Step 6.

STEP	INSPECTION		ACTION
3	• Is the audio unit installed securely?	Yes	Go to the next step.
		No	Install the audio unit securely.
4	• Inspect the tire pressure. • Is the tire pressure normal?	Yes	Replace the audio unit.
		No	Go to the next step.
5	• Adjust the tire pressure within specification. • Does the sound jump when driving the vehicle?	Yes	Replace the audio unit.
		No	Audio system is normal. Explain repairs to the customers.
6	• Replace the CD known to be good. • Does the sound jump when driving the vehicle?	Yes	Replace the audio unit.
		No	Audio system is normal. Explain to the customer that the CD is malfunctioning.

NO.5 CD PLAYER/CHANGER SCRATCHES ON THE CD

dcf090366900w27

5	**CD player/changer scratches on the CD** **Possible DTC: 03:Er02**

Troubleshooting hints

- Audio unit is malfunctioning
- Deformed disc is used (e.g., out of specification (thickness), bent disc)
- Multiple CDs are inserted into the CD player at the same time

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Were the multiple CDs inserted into the CD player at the same time?	Yes	Explain to the customer to insert a CD one by one.
		No	Go to the next step.
2	• Visually inspect the CD. • Is the CD a deformed disc (e.g., out of specification (thickness), bent disc)?	Yes	Audio system is normal. Explain to the customer that the CD is malfunctioning.
		No	Replace the audio unit.

NO.6 DISC CHANGER IS INOPERATIVE

dcf090366900w28

6	**Disc changer is inoperative** **Possible DTC: —**

Troubleshooting hints

- Audio unit is malfunctioning
- Improper center panel installation
- Center panel is malfunctioning

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Inspect the CD changer operation. • Does the CD changer operate properly?	Yes	Go to the next step.
		No	Go to the symptom troubleshooting "No.3 CD player/ changer does not play the CD/No sound".
2	• Inspect the followings: — Is the display shown properly when operating the disc change button? — Does the radio band selection operate properly?	Yes	Replace the audio unit.
		No	Go to the next step.
3	• Inspect the center panel installation. • Does the CD changer change the disc properly after re-installing the center panel?	Yes	Install the center panel securely and properly.
		No	Go to the "No.1 Audio panel switch inspection" in this section. Replace the center panel as necessary.

NO.7 CD PLAYER DOES NOT PLAY THE MP3-FORMATTED FILE

dcf090366900w29

7	**CD player does not play the MP3-formatted file** **Possible DTC: 10:Er09, 22:Er09**

Troubleshooting hints

- CD-R/RW written format is out of specification
- MP3 and other format data are in the CD-R/RW
- File extension for MP3-formatted file is incorrect (Correct. ".mp3", incorrect: e.g., MP3 pro)
- Defective CD-R/RW (e.g. dirty CD, scratch)
- MP3 applicable CD player is malfunctioning

Note

- The free-software for the MP3-formatted file in the field may cause the deterioration of sound quality, noise, or defective play, so that the CD player won't play the customer made MP-3-formatted file.
- The CD player may not play the CD-R/RW properly due to the disc condition.
- If there are MP-3-formatted file and other file in the same disc, the CD player may not play the disc.
- If there are MP-3-formatted file and audio data in the same disc, the CD player loads and plays the first session of the data only.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Inspect the written format of the recorded data on the CD-R/RW. • Is the written format correct?	Yes	Go to the next step.
		No	Write the CD-R/RW with the correct specification.
2	• Inspect the recorded data in the CD-R/RW. • Is there MP3 and other format data in the CD-R/RW.	Yes	Replace with the CD-R/RW known to be good (MP3-formatted file data only), then inspect the CD player operation. **If the CD player plays the MP3-formatted file:** • Audio system is normal. Explain to the customer that the CD player does not operate properly if the MP3 and other format data are in the CD-R/RW. **If the CD player does not play the MP3-formatted file:** • Replace the audio unit.
		No	Go to the next step.
3	• Inspect the CD-R/RW written format. • Is the written format within the specification (".mp3" is the correct file extension)?	Yes	Replace with the CD-R/RW using the ".mp3" file extension, then inspect the CD player operation. **If the CD player plays the MP3-formatted file:** • Audio system is normal. Explain to the customer that the CD player does not operate properly if the correct file extension is not used. **If the CD player does not play the MP3-formatted file:** • Replace the audio unit.
		No	Go to the next step.
4	• Visually inspect the CD-R/RW. • Is there any dirt or scratch on the CD-R/RW?	Yes	Clean the disc or replace with the CD-R/RW known to be good.
		No	Replace the audio unit.

NO.8 MP3-FORMATTED FILE FOLDER SELECTION IS INOPERATIVE/TRACK SEARCH IS INOPERATIVE

dcf090366900w30

8	**MP3-formatted file folder selection is inoperative/Track search is inoperative** **Possible DTC: 10:Er09, 22:Er09**

Troubleshooting hints

- Defective CD-R/RW (e.g. dirty CD, scratch)
- Conflict of ID tag version for CD-R/RW
- Improper folder and/or music title in CD-R/RW
- The number of characters of folder/audio file name in CD-R/RW exceeds the maximum number of characters
- Improper encode in CD-R/RW
- MP3 applicable CD player is malfunctioning

Note

- ID3 is a tagging format for MP3-formatted file. ID3 allows metadata (e.g., title, artist, track number, etc.) to be added to the MP3-formatted file.
- There are two versions in the ID tag.
  - — ID3v1: This is the most widespread standard tag formats and most software is compatible with this version. There is a limitation on the maximum number of characters for the text data.
  - — ID3v2: There are a variety of version in V2, but there is no interchangeability among the versions.

Limitation on the maximum number of characters for the text data (ID3v1)

Item	Maximum number of characters	Description
Title	30	Music title
Artist	30	Artist name
Album	30	Album title
Year	4	Album produced year/CD wholesale year
Genre	—	Music category selection
Comment	30	Free comment
Track	3	Track number

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Visually inspect the CD-R/RW. • Is there any dirt or scratch on the CD/R/RW?	Yes	Clean the disc or replace with the CD-R/RW known to be good.
		No	Go to the next step.
2	• Inspect the ID tag version. • Is ID tag correct?	Yes	Go to the next step.
		No	Write the CD-R/RW with the correct ID tag version.
3	• Inspect folder and audio file name. • Are all file name input correctly?	Yes	Go to the next step.
		No	Use the CD-R/RW that a folder and audio file name is input correctly.
4	• Inspect the encode for the folder and audio file name in the CD-R/RW. • Is the encode correct? **Note** • Unreadable characters may be displayed if incorrect encode is used.	Yes	Go to the next step.
		No	Use the correct encode.
5	• Inspect the number of characters for the folder and audio file name. • Is the number of characters within the maximum number of characters?	Yes	Replace the audio unit.
		No	Input the folder and audio file name within the maximum number of characters.

NO.9 CD PLAYER DOES NOT INDICATE THE MP3 TITLE TEXT

dcf090366900w31

9	CD player does not indicate the MP3 title text Possible DTC: —

Troubleshooting hints

- Defective CD-R/RW (e.g. dirty CD, scratch)
- Conflict of ID tag version for CD-R/RW
- The number of characters of folder/audio file name in CD-R/RW exceeds the maximum number of characters
- Improper encode in CD-R/RW
- MP3 applicable CD player is malfunctioning
- No title input in CD-R/RW
- Input title text by 2-bytes characters

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Visually inspect the CD-R/RW. • Is there any dirt or scratch on the CD/R/RW?	Yes	Clean the disc or replace with the CD-R/RW known to be good.
		No	Go to the next step.
2	• Inspect the display the LCD. • Is the CD (other than MP3 compatible) displayed on the LCD?	Yes	Go to the next step.
		No	Go to the symptom troubleshooting No.9 (Entire audio system).
3	• Inspect the ID tag version. • Is the ID tag correct?	Yes	Go to the next step.
		No	Write the CD-R/RW with the correct ID tag version.
4	• Is the title text input into the CD-R/RW?	Yes	Go to the next step.
		No	Input the title text. **Note** • Do not input the title text by two-bytes character.
5	• Inspect the encode for the folder and audio file name in the CD-R/RW. • Is the encode correct?	Yes	Go to the next step.
		No	Use the correct encode.
6	• Inspect the number of characters for the folder and audio file name. • Is the number of characters within the maximum number of characters?	Yes	Replace the audio unit.
		No	Input the folder and audio file name within the maximum number of characters.

NO.10 CD PLAYER DOES NOT PLAY THE AUDIO DATA (CDDA)

dcf090366900w32

10	CD player does not play the audio data (CDDA) Possible DTC: —

Troubleshooting hints

- CD-R/RW written format is out of specification
- Defective CD-R/RW (e.g., dirty CD, scratch)
- MP3 applicable CD player is malfunctioning
- Data other than the audio data is in CD-R/RW

Note

- The CD player may not play the CD-R/RW properly due to the disc condition.
- If there are MP-3-formatted file and audio data in the same disc, the CD player loads and plays the first session of the data only.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Replace with the audio-CD known to be good. • Does the CD player play the audio-CD properly?	Yes	Go to the next step.
		No	Replace the audio unit.
2	• Inspect the written format of the recorded data on the CD-R/RW. • Is the written format correct?	Yes	Go to the next step.
		No	Write the CD-R/RW with the correct specification.

STEP	INSPECTION		ACTION
3	• Inspect the recorded data in the CD-R/RW. • Is any data other than the audio data recorded in the CD-R/RW?	Yes	Replace with the CD-R/RW known to be good (record audio data only), then inspect the CD player operation. **If the CD-R/RW plays:** • Audio system is normal. Explain to the customer that the CD player does not operate properly if the audio data and other data are recorded in the CD-R/RW. **If the CD-R/RW does not play:** • Replace the audio unit.
		No	Go to the next step.
4	• Visually inspect the CD-R/RW. • Is there any dirt or scratch on the CD-R/RW?	Yes	Clean the disc or replace with the CD-R/RW known to be good.
		No	Replace the audio unit.

NO.11 TRACK CHANGE IS INOPERATIVE

dcf090366900w33

11	**Track change is inoperative** **Possible DTC: 03:Er02**

Troubleshooting hints

- Audio unit is malfunctioning
- Defective CD (e.g., cracked, badly bent, rough edges, scratch, dirty CD, condensation)
- Non-conventional discs (e.g., 8 cm (3 in) CD, 8 cm (3 in) disc adapter, heart-shaped disc, octagonal disc)
- Center panel is malfunctioning
- MP3 applicable CD player is malfunctioning

Diagnostic procedure

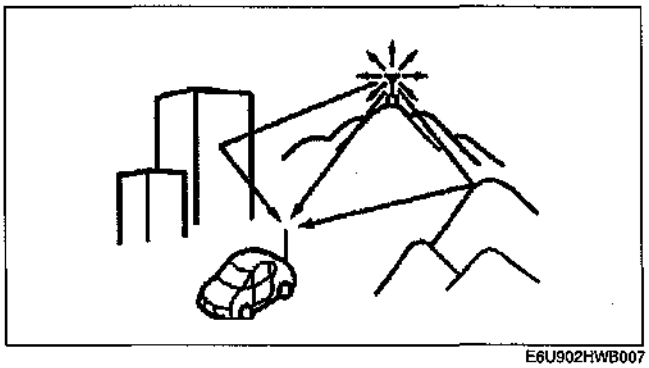
STEP	INSPECTION		ACTION
1	• Replace the CD known to be good. • Does the CD player change the track?	Yes	Explain to the customer that the defective CD or non-conventional disc cannot be used.
		No	Go to the next step.
2	• Inspect the center panel installation. • Does the CD player change the track number on the display when pressing the track up or down button?	Yes	Replace the audio unit.
		No	Go to the "No.1 Audio panel switch inspection" in this section.Replace the center panel as necessary.

RADIO [REFERENCE]

dcf090366900w34

1. Multipath Noise

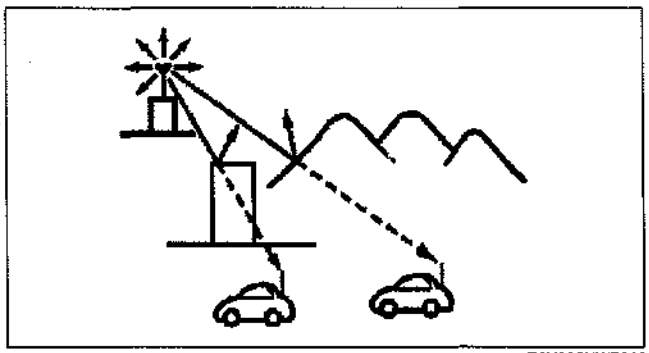
- Signals from an FM transmitter are a high frequency and similar to beams of light because they do not bend around corners, but they do reflect. Since FM signals can be reflected by obstructions, it is possible to receive both the direct signal and the reflected signal at the same time. This causes a slight delay in reception and may be heard as a broken sound or a distortion.



E6U902HWB007

2. Flutter/Skip Noise

- Signals become weak in valleys between mountains, tall building, and other obstacles. When the vehicle passes through such an area, the reception conditions may change suddenly, resulting in annoying noise.



E6U902HWB008

3. Stereo and Monaural Receptions

- As signals become weak, noise may appear more in stereo reception. Comparing to stereo reception, noise in monaural receptions is relatively less striking.

Measures in Audio System

Separation control

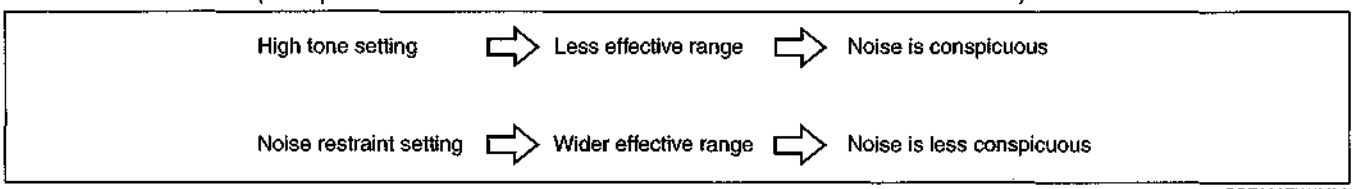
- Utilizing the characteristic of monaural reception that noise is relatively less striking than stereo reception, the audio system automatically changes the reception from stereo to monaural and lessens annoying noise when signals become weak or a multipath phenomenon occurs.

High tone control

- When signals become weak or a multipath phenomenon occurs, the audio system restrains volume level in high frequency band and lessens annoying noise.

Effect Setting of Separation Control and High Tone Control

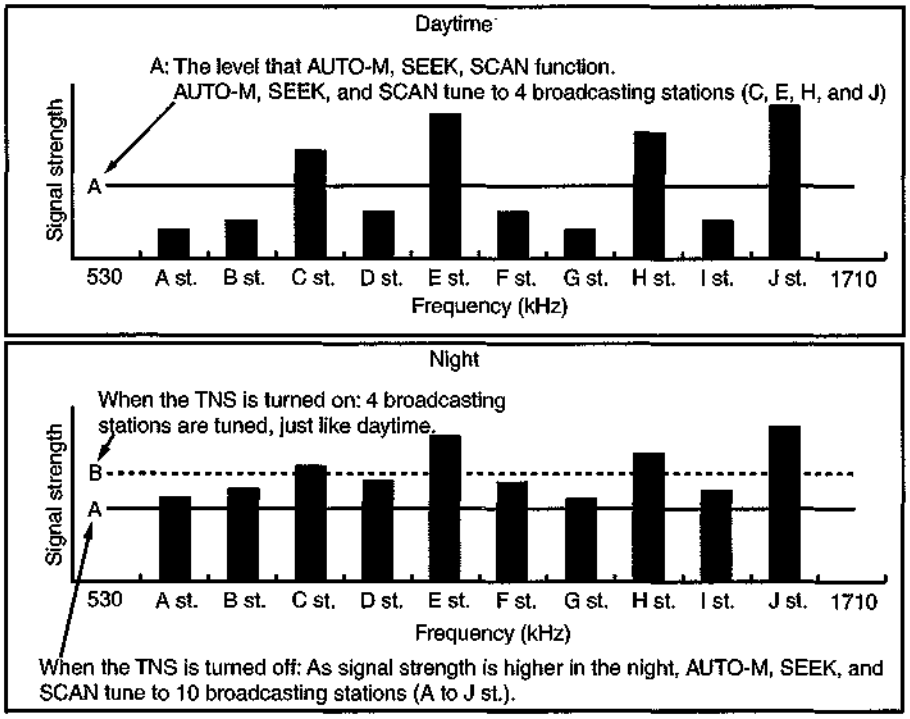
- The separation and high tone controls influence sound quality, Therefore they are specifically tuned for individual model. (Comparison of characteristic must be done on the same models)



DPE903EW1V0A

Remarks

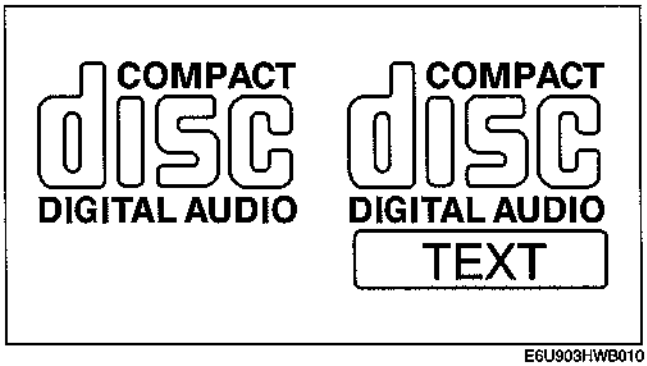
- Signals tend to reach longer distances in the night. It is conspicuous in AM signals, several audio functions may stop due to foreign broadcasting station or noise. though the audio system restrains sensitivity of SEEK and SCAN functions in the night, the audio system may select other than desired broadcasting station when signals are considerably strong. This function is liked to the parking light. When the parking light or headlight is turned on, SEEK and SCAN may not function for weak signals.



EPU903EW3O03

AUDIO CD [REFERENCE]

dcf090366900w35

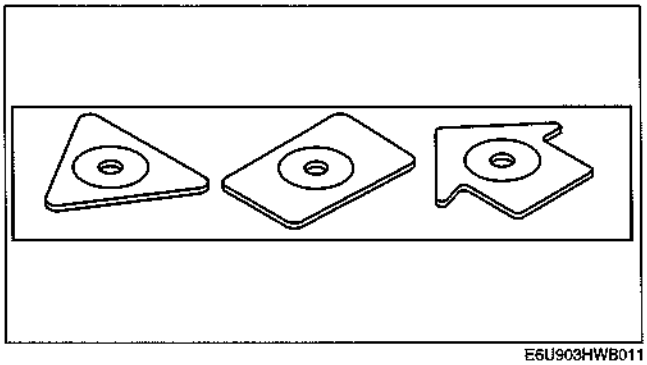


E6U903HWB010

- The CD player/changer has been designed to play CDs bearing the identification logo, COMPACT DISC DIGITAL AUDIO, as shown. No other discs can be played on the CD player/changer other than MP3 applicable one.
- The CD player/changer may not play the following CD:
  - — Defective CD (e.g., cracked, badly bent, rough edges, scratch, dirty CD condensation, transparent)
  - — 8 cm (3 in) CDs accessories (e.g., 8 cm (3 in) disc adapter, sticker, label)
  - — Nonstandard CD (e.g., Diameter/thickness is out of specification)
    Specification: 119.7—120.3 mm (4.668—4.692 in) of diameter, 12+0.3 or -0.1 mm (0.047+0.012 or 0.004 in) of thickness
- Do not use non-conventional discs. The CD player/changer could be damaged.

Examples:

- Although the same physical size as the compact disc, SACD uses a different kind of digital audio signal, Direct Stream Digital.
- The CD player/changer may not play the CD-R/RW properly due to the disc condition (excluding the MP3).



E6U903HWB011

MP3-Formatted File
Outline of CD-R and CD-RW

- Definition
  - — CD-R: The CD-R is a non-rewritable version. Once a section of a CD-R is written, it cannot be erased or rewritten.
  - — CD-RW: The CD-RW is a re-writable version of CD-ROM and can be written the data an unlimited number of times.
  - — Since a reflected laser beam amount of the CD-R/RW is less than the reflected laser beam amount of the conventional CD media, the CD player/changer may not play the CD-R/RW or have the sound jumped.
  - — Since the recording quality of the CD-R/RW vary widely, some CD-R/RW may not be played.

Recording method

- There are two methods for recording.
- Classification by recorder
  - — Record the audio data in the audio-CD by audio recorder
    - The price of the audio recorder and original audio-CD includes the copyright fee.
  - — Recorded the audio data in the conventional data-CD by the personal computer
    - The data-CD is cheaper than the audio-CD. But, there is a CD with the low quality.
- Classification by audio data uncompression/compression
  - — Uncompressed audio data
    - The CD-R/RW player can play the uncompressed audio data.
  - — Compressed audio data
    - It is possible to record the large quantity of music in a disc. The sound quality varies depends on the audio data compression format. The compressed audio data can be played on the applicable player only.
  - — Type of compression format:
    - MP3: MPEG Audio Layer 3 — Mazda genie MP3 applicable CD player is available.
    - WMA: Windows Media Audio
    - ATRAG: Adaptive TRansform Acoustic Coding

MP3

- The following condition should be met in order to record the MP3-formatted data on the MP3 applicable CD player:

Media	Applicable to the CD-R/RW
Logical format	ISO 9660 level 1&2 / Joliet / Romeo
Number of directly	8 directly
Number of files	Maximum 255 as a total number of file and folder Maximum 155 for folder
ID3 TAG	Applicable to Ver1.1, 2.3 and 2.4
File extension	MP3
Packet writing	Not applicable
Bit rate	8kbps—320kbps/VBR
Sampling rate	11.025kHz—48kHz

09-03E SYMPTOM TROUBLESHOOTING [INSTRUMENT CLUSTER]

NO. 4 MIL ILLUMINATES [INSTRUMENT CLUSTER] 09-03E–1

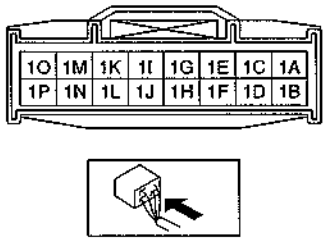
NO. 8 TACHOMETER INDICATION IS DEFECTIVE [INSTRUMENT CLUSTER] 09-03E–2

NO. 4 MIL ILLUMINATES[INSTRUMENT CLUSTER]

id0903d7807700

4	MIL illuminates
POSSIBLE CAUSE	• PCM malfunction • DTC is stored in PCM. • Instrument cluster malfunction • Connector or pin malfunction • Short to GND circuit between instrument cluster and PCM.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Start the engine. • Does the MIL turn off?	Yes	Troubleshooting completed.
		No	Go to the next step.
2	• Connect the current diagnostic tool to DLC-2. • Perform KOEO and KOER self-test and retrieve continuous memory DTC for PCM. • Is there any DTC displayed?	Yes	Perform the appropriate DTC troubleshooting procedure.
		No	Go to the next step.
3	• Turn the engine switch off. • Inspect the instrument cluster connector terminals for poor connection (such as damaged/pulled-out pins, and corrosion). • Are the terminals normal?	Yes	Go to the next step.
		No	Repair or replace the terminal.
4	• Turn the engine switch to LOCK position. • Connect the instrument cluster connector. • Disconnect the PCM connector. • Short to GND at PCM terminal 256 (WLT-1, WLT-2, WL-C, WE-C), 1E (G6, F2) using the jumper wire. • Turn the engine switch to ON position. • Does the auto leveling warning light illuminate?	Yes	Replace the PCM.
		No	Go to the next step.
5	• Turn the engine switch to LOCK position. • Disconnect the instrument cluster connector (with PCM connector disconnected). • Verify continuity between instrument cluster terminal 1I and GND. • Is there continuity? 	Yes	Repair or replace for short to GND.
		No	Replace the instrument cluster.

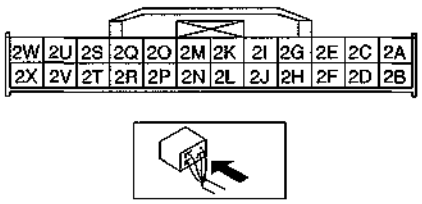
09

NO. 8 TACHOMETER INDICATION IS DEFECTIVE[INSTRUMENT CLUSTER]

id0903d7808100

8	Tachometer indication is defective
POSSIBLE CAUSE	• PCM malfunction • Instrument cluster malfunction • Connector or pin malfunction • Open or short circuit in wiring between instrument cluster and PCM

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Start the engine. — Does the tachometer needle move smoothly? — Does the tachometer needle indicate correct engine speed?	Yes	Troubleshooting completed.
		No	Go to the next step.
2	• Start the instrument cluster input/output check mode. • Inspect the tachometer using the check code 13. • Is the tachometer normal?	Yes	Go to the next step.
		No	Replace the instrument cluster.
3	• Turn the engine switch off. • Inspect the instrument cluster connector terminals for poor connection (such as damaged/pulled-out pins, and corrosion). • Are the terminals normal?	Yes	Go to the next step.
		No	Repair or replace the terminal.
4	• Turn the engine switch to LOCK position. • Remove the instrument cluster. • Disconnect the instrument cluster connector. • Inspect for continuity between instrument cluster terminal 2S and GND. • Is there continuity?  	Yes	Repair or replace the wiring harness between the instrument cluster and GND.
		No	Go to the next step.
5	• Turn the engine switch to LOCK position. • Inspect the PCM terminal for poor connection (such as damaged/pulled-out pins, and corrosion). • Are the terminals normal?	Yes	Go to the next step.
		No	Repair or replace the terminal.
6	• Turn the engine switch to LOCK position. • Disconnect the PCM sensor connector (with the instrument cluster connector disconnected). • Inspect for continuity between instrument cluster terminal 2S and following: — PCM terminal 218 (WLT-1, WLT-2, WL-C, WE-C) — Igniter (F2) — PCM terminal 2Z (G6) • Is there continuity?	Yes	Inspect the CKP sensor and related wiring harness.
		No	Repair or replace the wiring harness between the instrument cluster and PCM.

09-10 BODY PANELS

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REAR ACCESS PANEL
DISASSEMBLY/ASSEMBLY 09-10–11

BODY PANEL LOCATION INDEX

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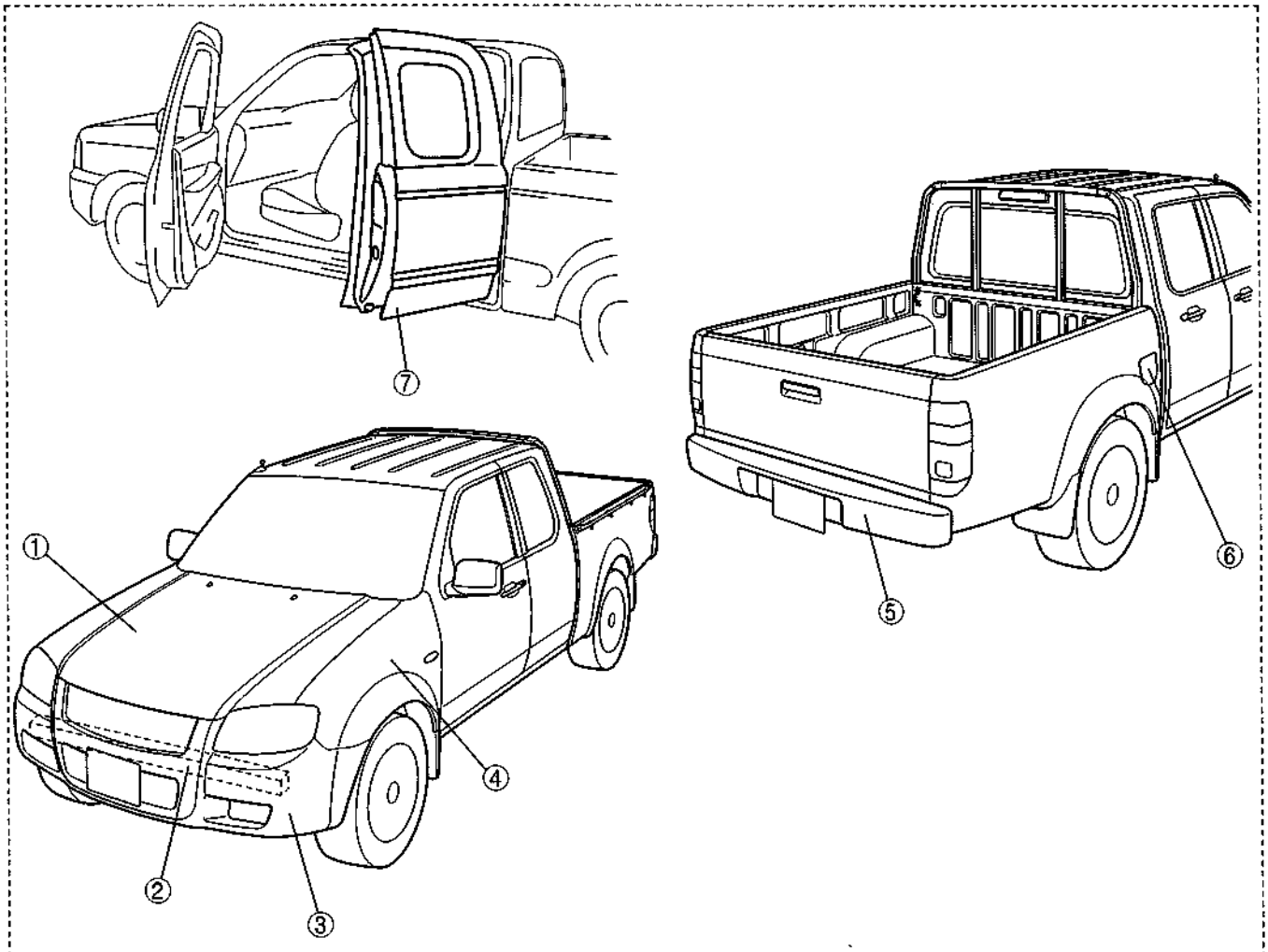


DCF910ZWB001

1	Bonnet (See 09-10-2 BONNET REMOVAL/INSTALLATION.) (See 09-10-3 BONNET ADJUSTMENT.)
2	Front bumper reinforcement (See 09-10-9 FRONT BUMPER REINFORCEMENT REMOVAL/INSTALLATION.)
3	Front bumper (See 09-10-6 FRONT BUMPER REMOVAL/INSTALLATION.) (See 09-10-7 FRONT BUMPER DISASSEMBLY/ASSEMBLY.)
4	Front fender panel (See 09-10-9 FRONT FENDER PANEL REMOVAL/INSTALLATION.)
5	Rear bumper (See 09-10-8 REAR BUMPER REMOVAL/INSTALLATION.) (See 09-10-8 REAR BUMPER DISASSEMBLY/ASSEMBLY.)

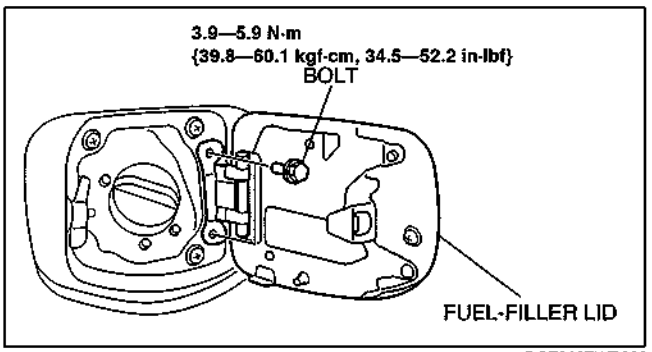
6	Fuel-filler lid (See 09-10-2 FUEL-FILLER LID REMOVAL/INSTALLATION.) (See 09-10-2 FUEL-FILLER LID ADJUSTMENT.)

7	Rear access panel (See 09-10-10 REAR ACCESS PANEL REMOVAL/INSTALLATION.)

FUEL-FILLER LID REMOVAL/INSTALLATION

dcf091042400w01

1. Remove the bolt.
2. Remove the fuel-filler lid.
3. Install in the reverse order of removal.
4. Adjust the fuel-filler lid. (See 09-10-2 FUEL-FILLER LID ADJUSTMENT.)



DCF910ZWB002

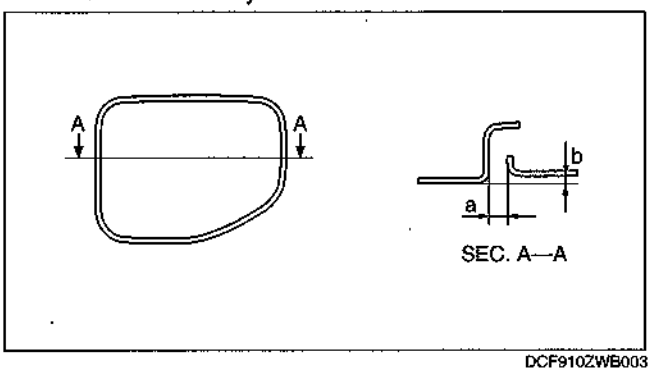
FUEL-FILLER LID ADJUSTMENT

dcf091042400w02

1. Measure the gap and height difference between the fuel-filler lid and the body.
2. Loosen the fuel-filler lid installation bolts and adjust the fuel-filler lid.

   Standard clearance
   a: 3.5—5.5 mm {0.14—0.21 in}
   b: -0.5—2.0 mm {0.01—-0.07 in}

3. Tighten the bolts.



DCF910ZWB003

BONNET REMOVAL/INSTALLATION

dcf091056601w01

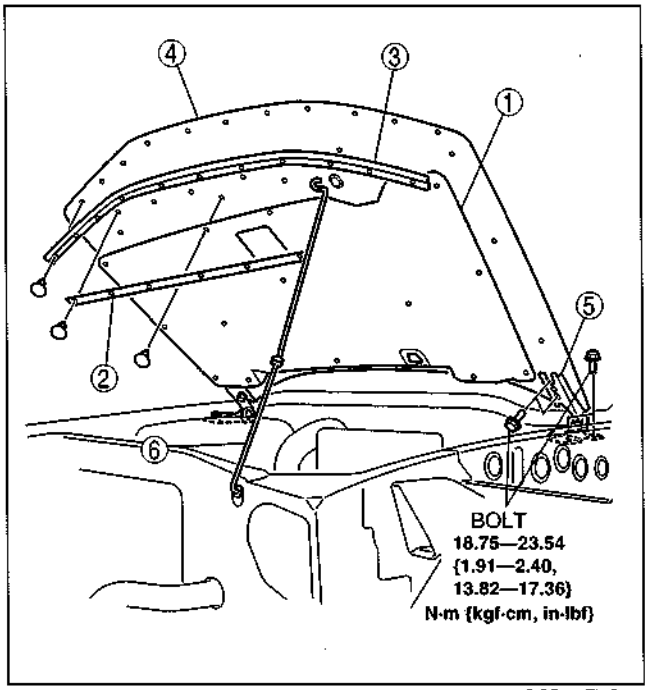
Warning
- **Removing the bonnet without supporting it could cause the bonnet to fall and cause serious injury. Always perform the procedure with at least another person to prevent the bonnet from falling.**

1. Disconnect the negative battery cable.
2. To remove the bonnet hinges, remove the following parts:
   (1) Radiator grille (See 09-16-3 RADIATOR GRILLE REMOVAL/INSTALLATION.)
   (2) Front bumper (See 09-10-6 FRONT BUMPER REMOVAL/INSTALLATION.)
   (3) Front combination lights (See 09-18-3 FRONT COMBINATION LIGHT REMOVAL/INSTALLATION.)
   (4) Front side turn light (See 09-18-6 FRONT SIDE TURN LIGHT REMOVAL/INSTALLATION.)
   (5) Front over fender (vehicles with front over fender) (See 09-16-4 OVER FENDER REMOVAL/INSTALLATION.)
   (6) Front fender panel (See 09-10-9 FRONT FENDER PANEL REMOVAL/INSTALLATION.)
3. Disconnect the windshield washer hose.

4. Remove in the order indicated in the table.

1	Bonnet insulator
2	Shroud seal weatherstrip
3	Parting seal weatherstrip
4	Bonnet
5	Bonnet hinge
6	Bonnet stay

5. Install in the reverse order of removal.
6. Adjust the bonnet. (See 09-10-3 BONNET ADJUSTMENT.)



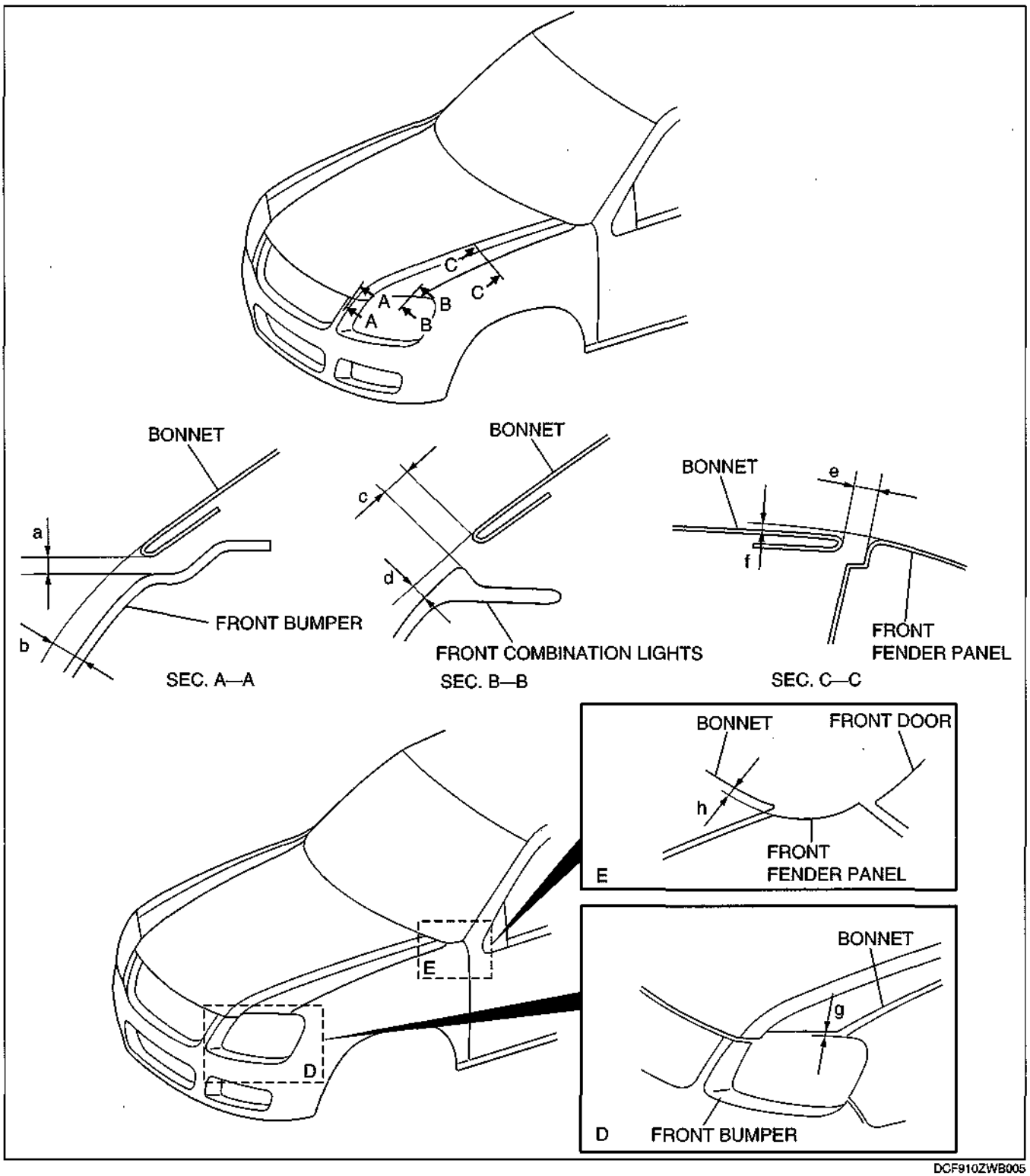
DCF910ZWB004

BONNET ADJUSTMENT

dcf091056601w02

1. Measure the gap and height between the bonnet and the body.

clearance
a: 4.7—7.4 mm {0.16—0.29 in}
b: -1.2—4.2 mm {-0.05—0.16 in}
c: 2.3—6.7 mm {0.09—0.26 in}
d: -1.6—1.6 mm {-0.06—0.06 in}
e: 2.7—5.3 mm {0.11—0.20 in}
f: -0.5—2.1 mm {-0.02—0.08 in}
g: -0.9—2.1 mm {0.04—0.08 in}
h: 0.0—1.5 mm {0.00—0.06 in}

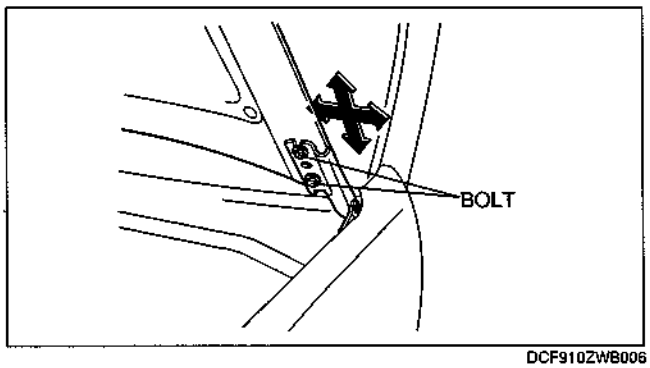


DCF910ZWB005

2. If not as specified, adjust the gap and height.

Gap Adjustment

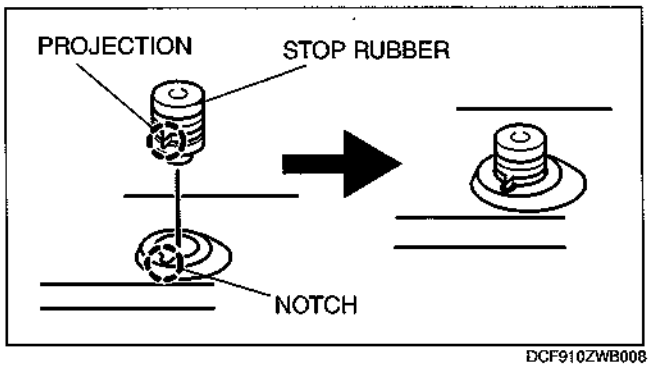
1. Loosen the bonnet installation bolts and reposition the bonnet.
2. Tighten the bonnet installation bolts.



DCF910ZWB006

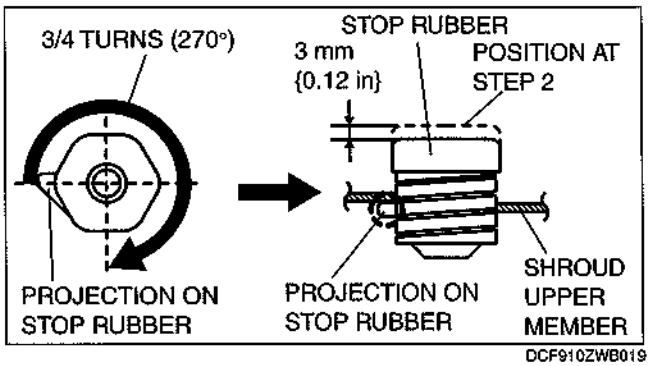
Height Difference Adjustment

1. Remove the Radiator grille. (See 09-16-3 RADIATOR GRILLE REMOVAL/INSTALLATION.)
2. Rotate the stop rubber until the projection is caught in the notch as shown in the figure.



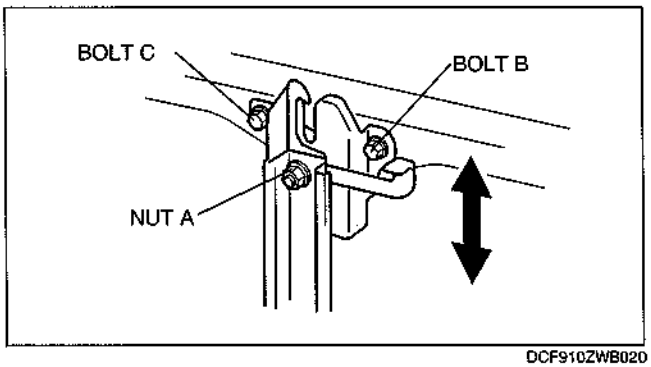
DCF910ZWB008

3. Rotate the stop rubber further to the position shown in the figure.



DCF910ZWB019

4. Loosen the bonnet lock installation bolts and nut and press the bonnet lock up to the highest position.
5. Tighten the bonnet lock installation bolts.
6. Close the bonnet and loosen the bonnet lock installation bolts.
7. Slightly pull the bonnet lock down by hand to lower and tighten the bonnet lock installation bolts and nut with no excessive play between the bonnet lock and striker.
   (1) Tighten the bolts and nut in order to nut A, bolt B and bolt C.
8. Verify that there is no gap between the bonnet and stop rubber.
9. Open the bonnet.

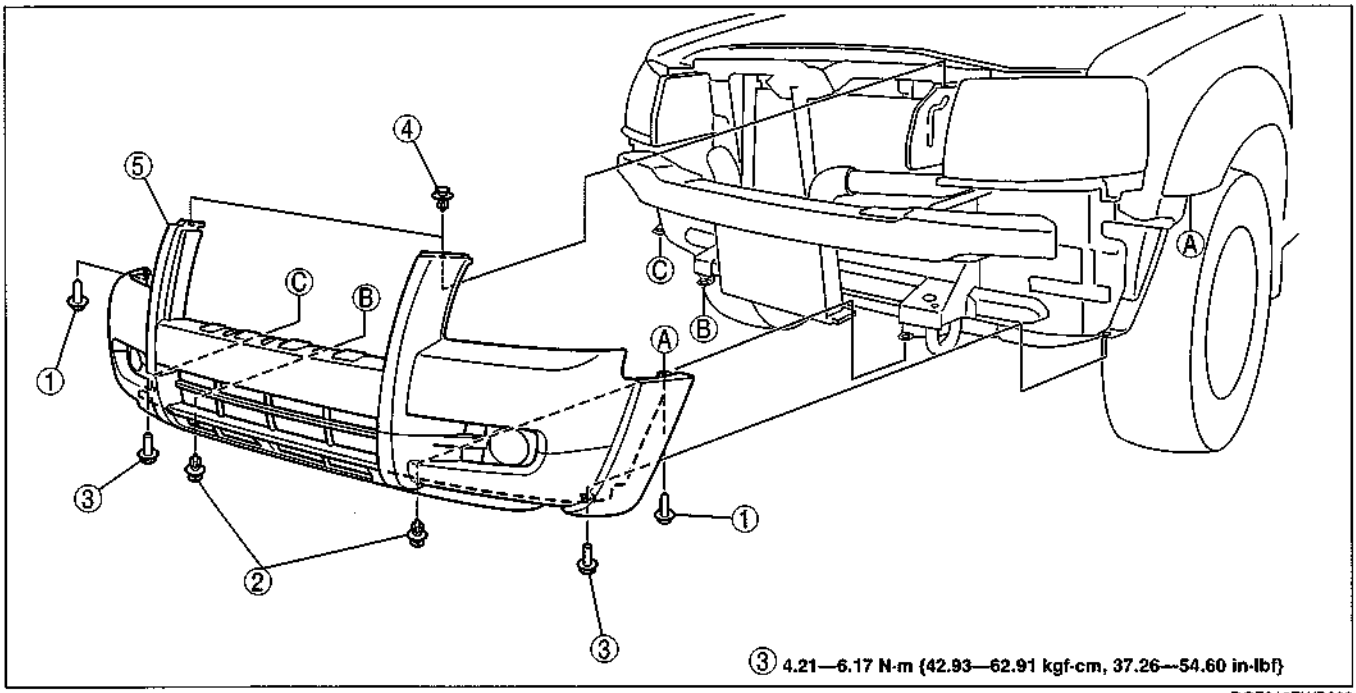


DCF910ZWB020

FRONT BUMPER REMOVAL/INSTALLATION

dcf091050000w01

1. Disconnect the negative battery cable.
2. Remove the radiator grille. (See 09-16-3 RADIATOR GRILLE REMOVAL/INSTALLATION.)
3. Remove in the order indicated in the table.



DCF910ZWB009

1	Screw
2	Fastener A
3	Bolt

4	Fastener B
5	Front bumper (See 09-10-6 Front Bumper Removal Note.) (See 09-10-6 Front Bumper Installation Note.)

4. Disconnect the front fog light connector.
5. Install in the reverse order of removal.
6. Adjust the front fog light aiming for vehicles with front fog lights. (See 09-18-5 FRONT FOG LIGHT AIMING.)

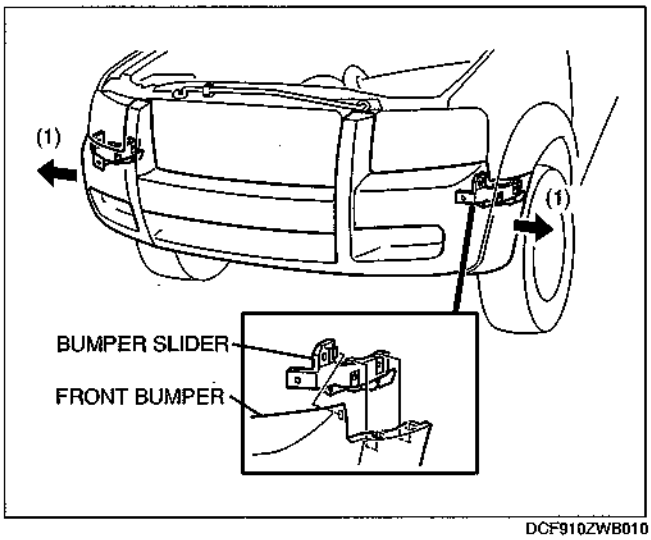
Front Bumper Removal Note

1. Pull the front bumper ends (wheel arch) outward (1) to detach from the bumper slider.

Caution

- **When disengaging the front bumper from the bumper slider, the front bumper could fall and be damaged. Secure the front bumper so that it does not fall.**

2. Remove the front bumper from the body.



DCF910ZWB010

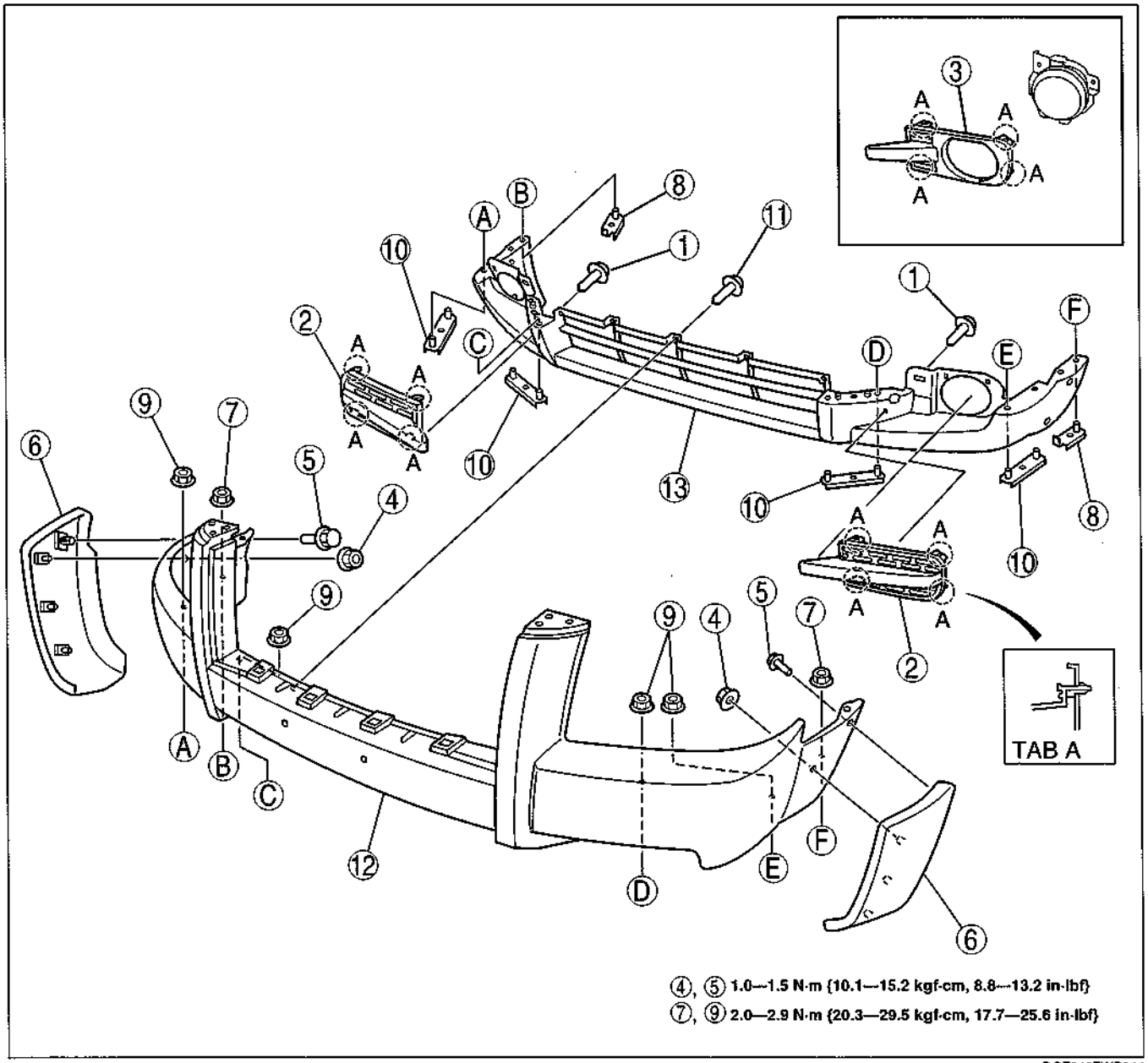
Front Bumper Installation Note

1. Spread the front bumper ends apart.
2. Assemble the front bumper to the body.
3. Press the front bumper connecting area into the body to engage with the bumper slider.

FRONT BUMPER DISASSEMBLY/ASSEMBLY

dcf091050000w02

1. Remove the front fog light. (Vehicles with front fog lights) (See 09-18-5 FRONT FOG LIGHT REMOVAL/INSTALLATION.)
2. Remove the radiator grille. (See 09-16-3 RADIATOR GRILLE REMOVAL/INSTALLATION.)
3. Disassemble in the order indicated in the table.



DCF910ZWB011

1	Screw A
2	Front hole cover (Vehicles without front fog lights)
3	Front fog light cover (Vehicles with front fog lights)
4	Nut A
5	Bolt
6	Over fender lower
7	Nut B

8	Set plate A
9	Nut C
10	Set plate B
11	Screw B
12	Front bumper fascia upper
13	Front bumper fascia lower

4. Assemble in the reverse order of disassembly.

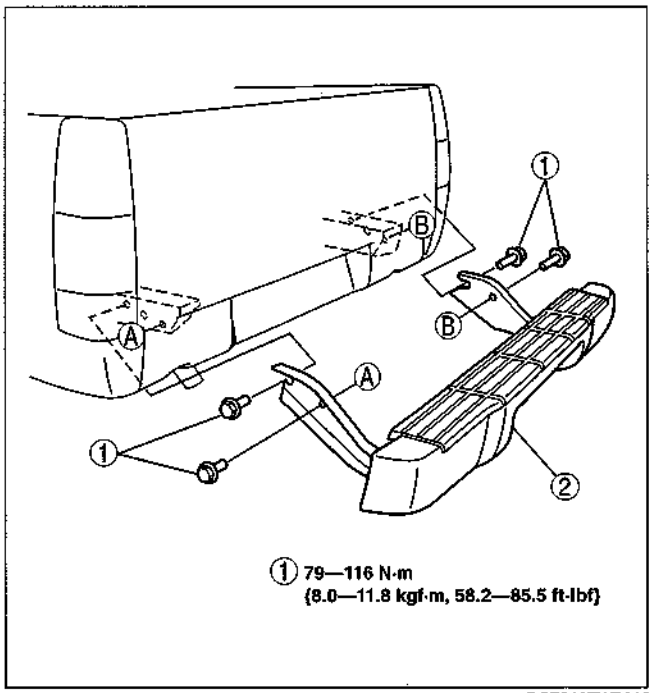
REAR BUMPER REMOVAL/INSTALLATION

dcf091050000w03

1. Disconnect the negative battery cable.
2. Remove the license plate light. (See 09-18-8 LICENSE PLATE LIGHT REMOVAL/INSTALLATION.)
3. Remove in the order indicated in the table.

1	Bolt
2	Rear bumper

4. Install in the reverse order of removal.



DCF910ZWB012

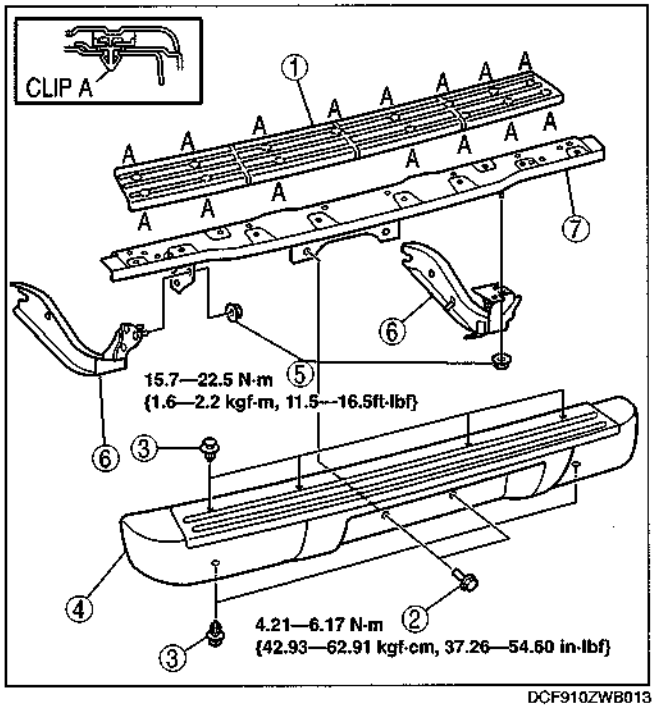
REAR BUMPER DISASSEMBLY/ASSEMBLY

dcf091050000w04

1. Disassemble in the order indicated in the table.

1	Rear bumper step
2	Bolt
3	Fastener
4	Rear bumper fascia
5	Nut
6	Rear bumper stay
7	Rear bumper reinforcement

2. Assemble in the reverse order of disassembly.

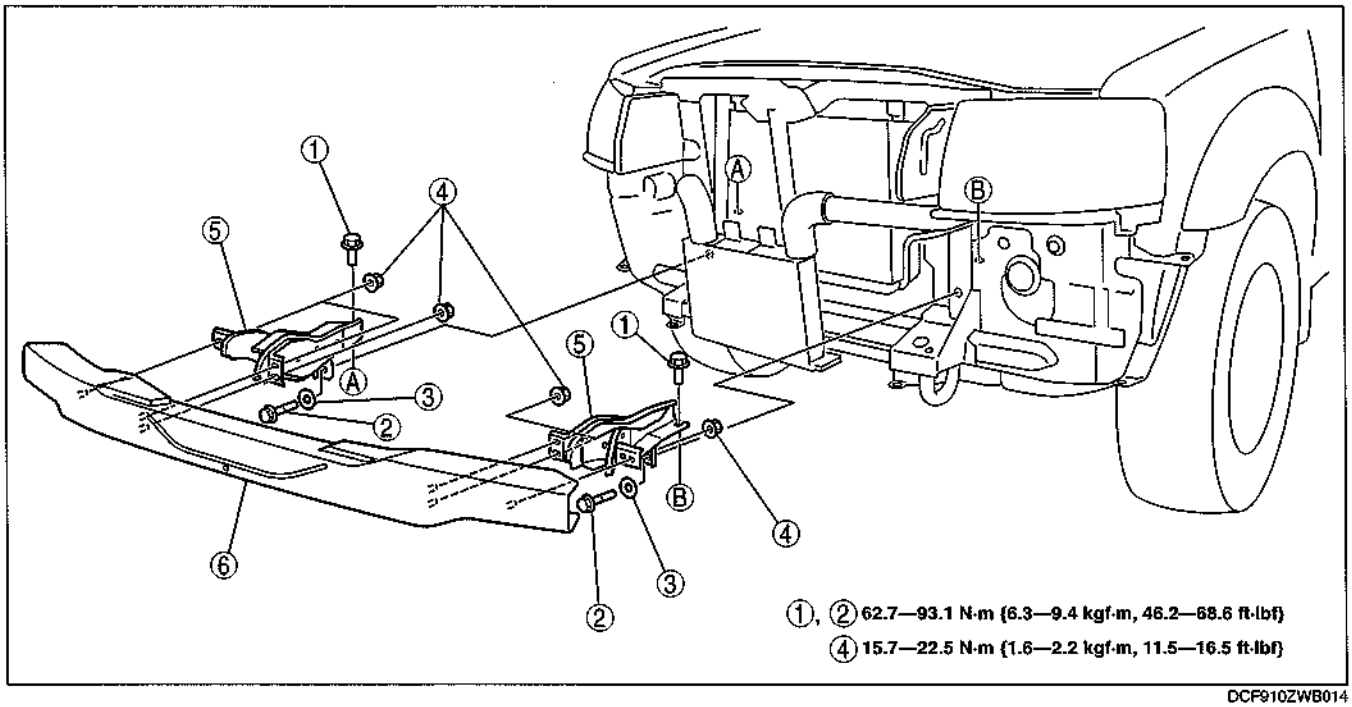


DCF910ZWB013

FRONT BUMPER REINFORCEMENT REMOVAL/INSTALLATION

dcf091050000w05

1. Disconnect the negative battery cable.
2. Remove the radiator grille. (See 09-16-3 RADIATOR GRILLE REMOVAL/INSTALLATION.)
3. Remove the front bumper. (See 09-10-6 FRONT BUMPER REMOVAL/INSTALLATION.)
4. Remove in the order indicated in the table.



DCF910ZWB014

1	Bolt A
2	Bolt B
3	Washer

4	Nut
5	Front bumper stay
6	Rear bumper reinforcement

5. Install in the reverse order of removal.

FRONT FENDER PANEL REMOVAL/INSTALLATION

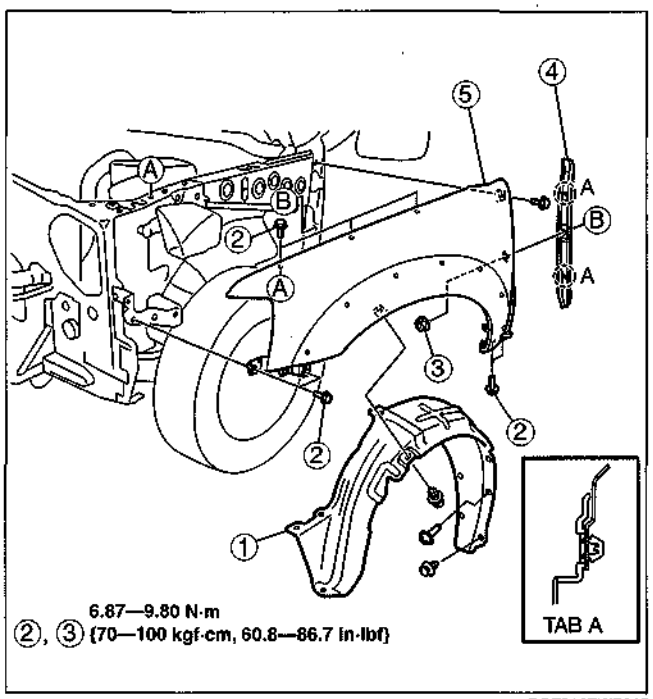
dcf091052010w01

1. Disconnect the negative battery cable.
2. To remove the bonnet hinges, remove the following parts:
   (1) Radiator grille (See 09-16-3 RADIATOR GRILLE REMOVAL/INSTALLATION.)
   (2) Front bumper (See 09-10-6 FRONT BUMPER REMOVAL/INSTALLATION.)
   (3) Front combination lights (See 09-18-3 FRONT COMBINATION LIGHT REMOVAL/INSTALLATION.)
   (4) Front side turn lights (See 09-18-6 FRONT SIDE TURN LIGHT REMOVAL/INSTALLATION.)
   (5) Front over fender (vehicles with front over fender) (See 09-16-4 OVER FENDER REMOVAL/INSTALLATION.)

3. Remove in the order indicated in the table.

1	Mad guard
2	Bolt
3	Nut
4	Seal plate
5	Front fender panel

4. Install in the reverse order of removal.



DCF910ZWB015

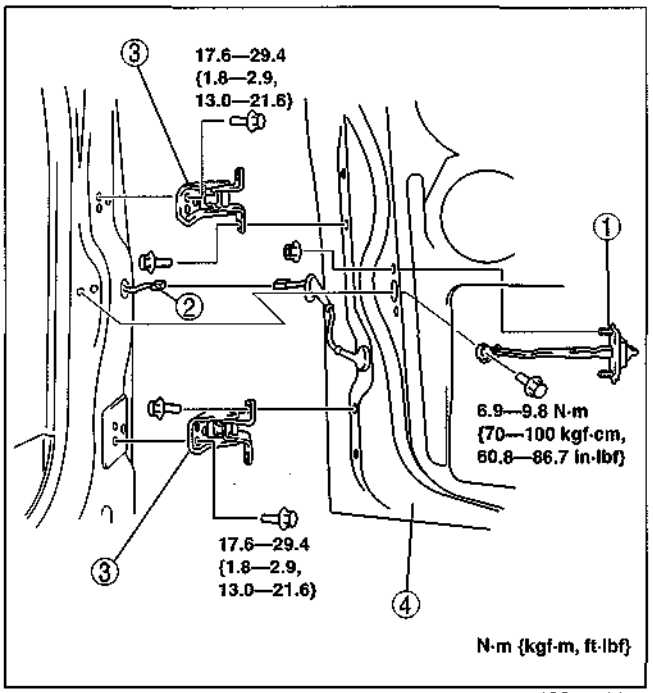
dcf091056100w03

REAR ACCESS PANEL REMOVAL/INSTALLATION

1. Disconnect the negative battery cable.
2. Remove in the order indicated in the table.

1	Checker
2	Connector
3	Rear access panel hinge
4	Rear access panel

3. Install in the reverse order of removal.

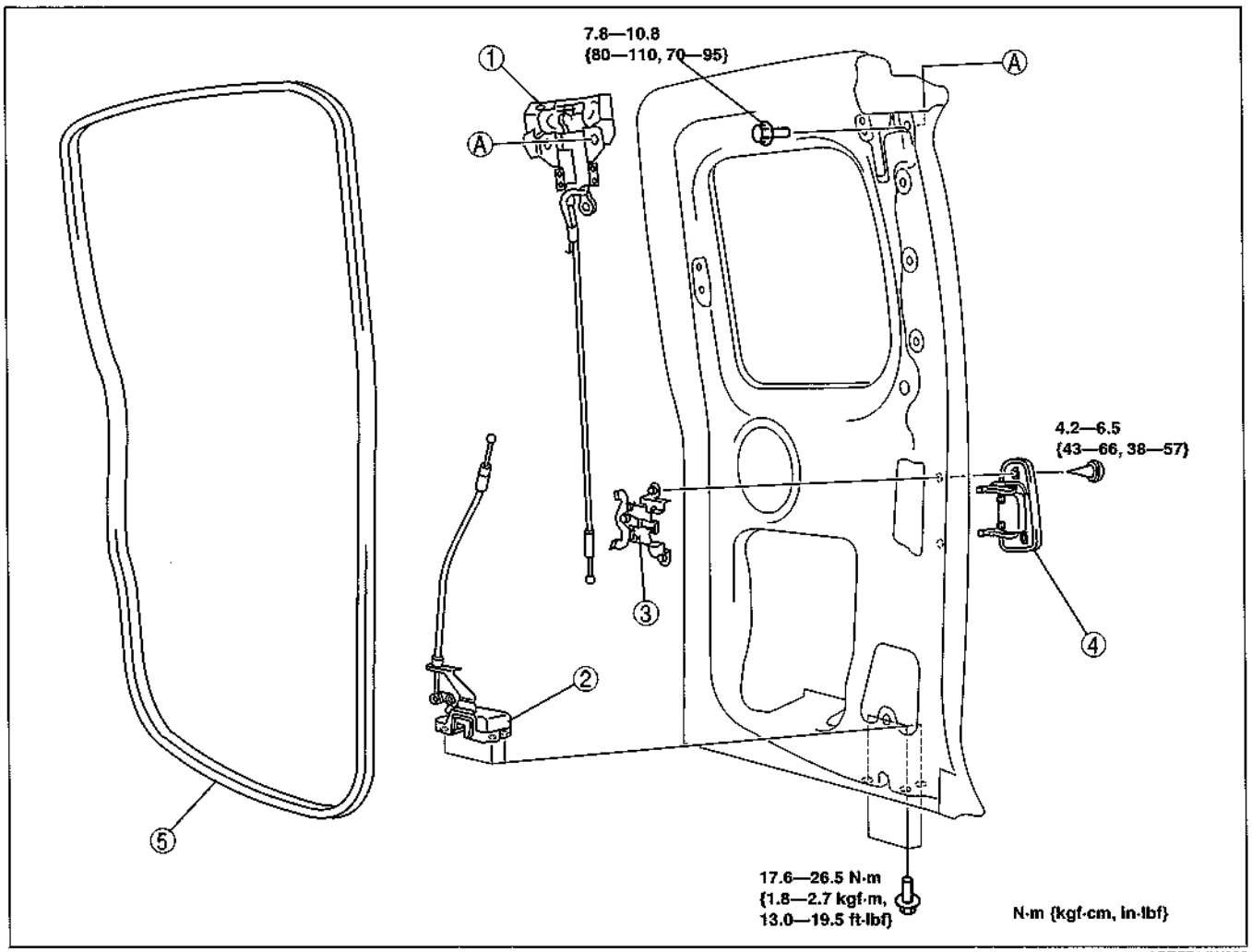


ABR7714W004

REAR ACCESS PANEL DISASSEMBLY/ASSEMBLY

dcl091056100w06

1. Remove the rear access panel. (See 09-10-10 REAR ACCESS PANEL REMOVAL/INSTALLATION.)
2. Disassemble in the order indicated in the table.



ABR7714W005

1	Upper latch
2	Lower latch
3	Rear access panel remote controller

4	Outer handle
5	Weatherstrip

3. Assemble in the reverse order of disassembly.

09-11 DOORS AND LIFTGATE

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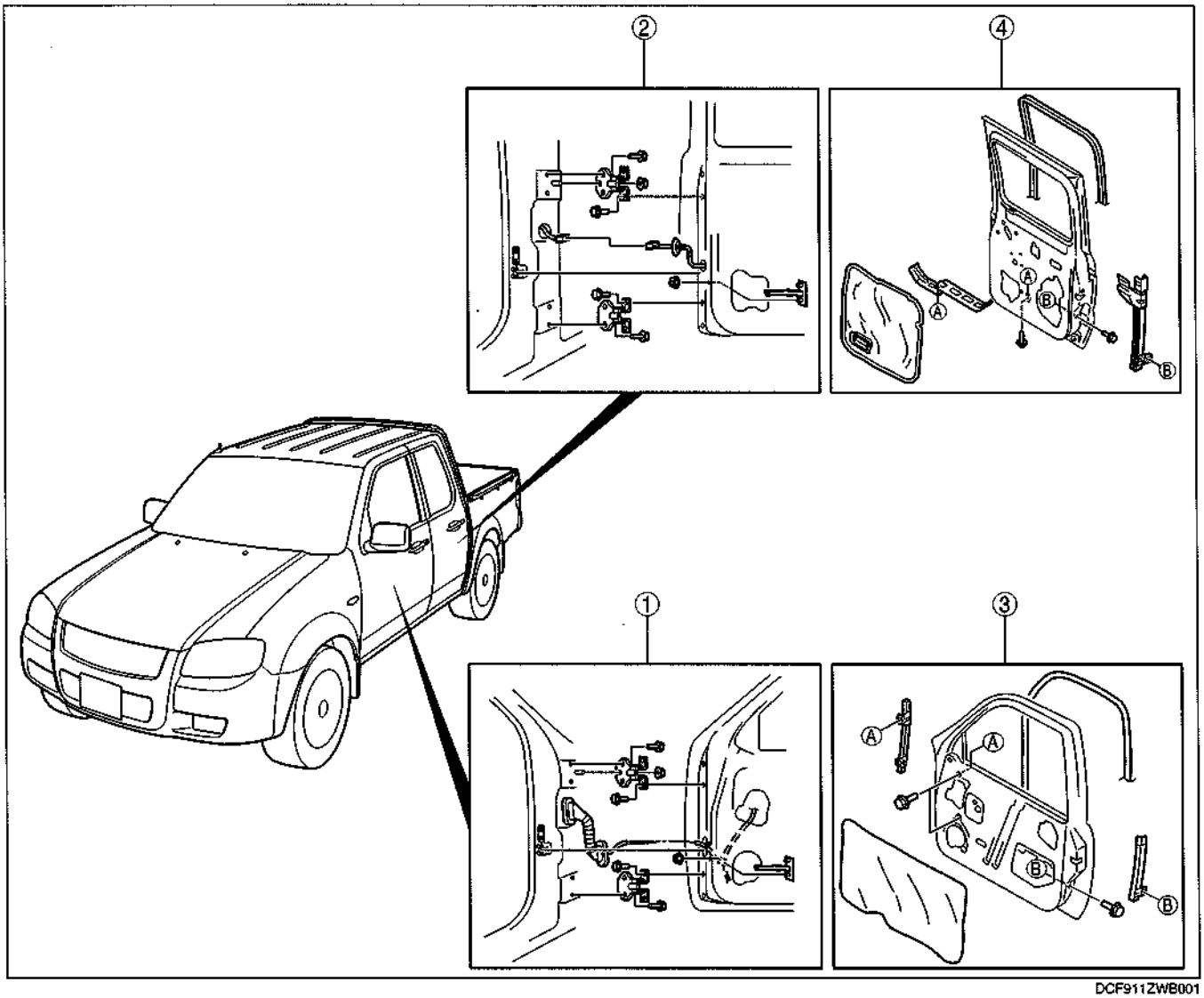
dcf091100000w01



DCF911ZWB001

1	Front door (See 09-11-2 FRONT DOOR REMOVAL/ INSTALLATION.) (See 09-11-2 DOOR ADJUSTMENT.)
2	Rear door (See 09-11-2 REAR DOOR REMOVAL/ INSTALLATION.) (See 09-11-2 DOOR ADJUSTMENT.)

4	Front door unit (See 09-11-4 FRONT DOOR UNIT REMOVAL/ INSTALLATION.)
5	Rear door unit (See 09-11-4 REAR DOOR UNIT REMOVAL/ INSTALLATION.)

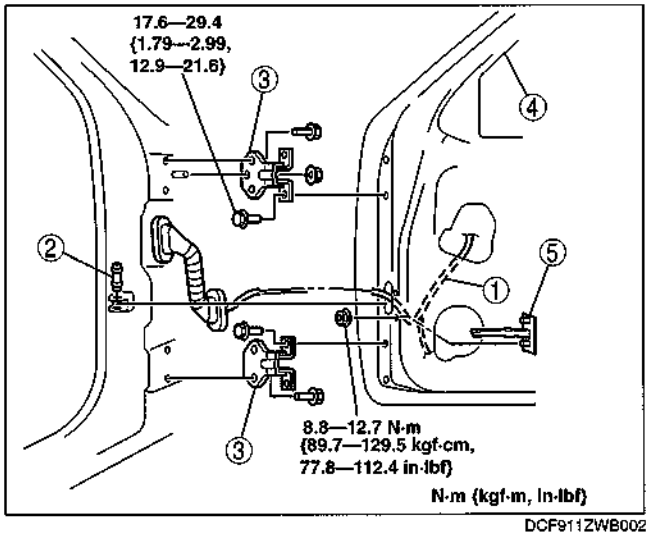
FRONT DOOR REMOVAL/INSTALLATION

dcf091158010w01

1. Disconnect the negative battery cable.
2. Remove the door screen. (See09-11-4 FRONT DOOR UNIT REMOVAL/INSTALLATION.)
3. To remove the front door hinge, remove the front fender panel. (See09-10-9 FRONT FENDER PANEL REMOVAL/INSTALLATION.)
4. To remove the checker, remove the door speaker. (See09-20-5 FRONT SPEAKER REMOVAL/INSTALLATION.)
5. Remove in the order indicated in the table.

1	Front door harness
2	Checker pin
3	Front door hinge
4	Front door
5	Checker

6. Install in the reverse order of removal.
7. Adjust the front door. (See 09-11-2 DOOR ADJUSTMENT.)



DCF911ZWB002

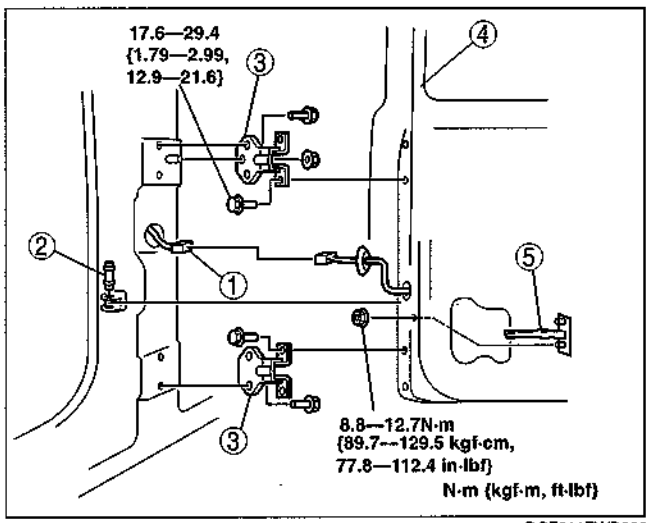
REAR DOOR REMOVAL/INSTALLATION

dcf091158010w02

1. Disconnect the negative battery cable.
2. Remove the door screen. (See09-11-4 REAR DOOR UNIT REMOVAL/INSTALLATION.)
3. To remove the checker, remove the ashtray bracket. (See 09-11-4 REAR DOOR UNIT REMOVAL/INSTALLATION.)
4. Remove in the order indicated in the table.

1	Connector
2	Checker pin
3	Rear door hinge
4	Rear door
5	Checker

5. Install in the reverse order of removal.
6. Adjust the rear door. (See 09-11-2 DOOR ADJUSTMENT.)



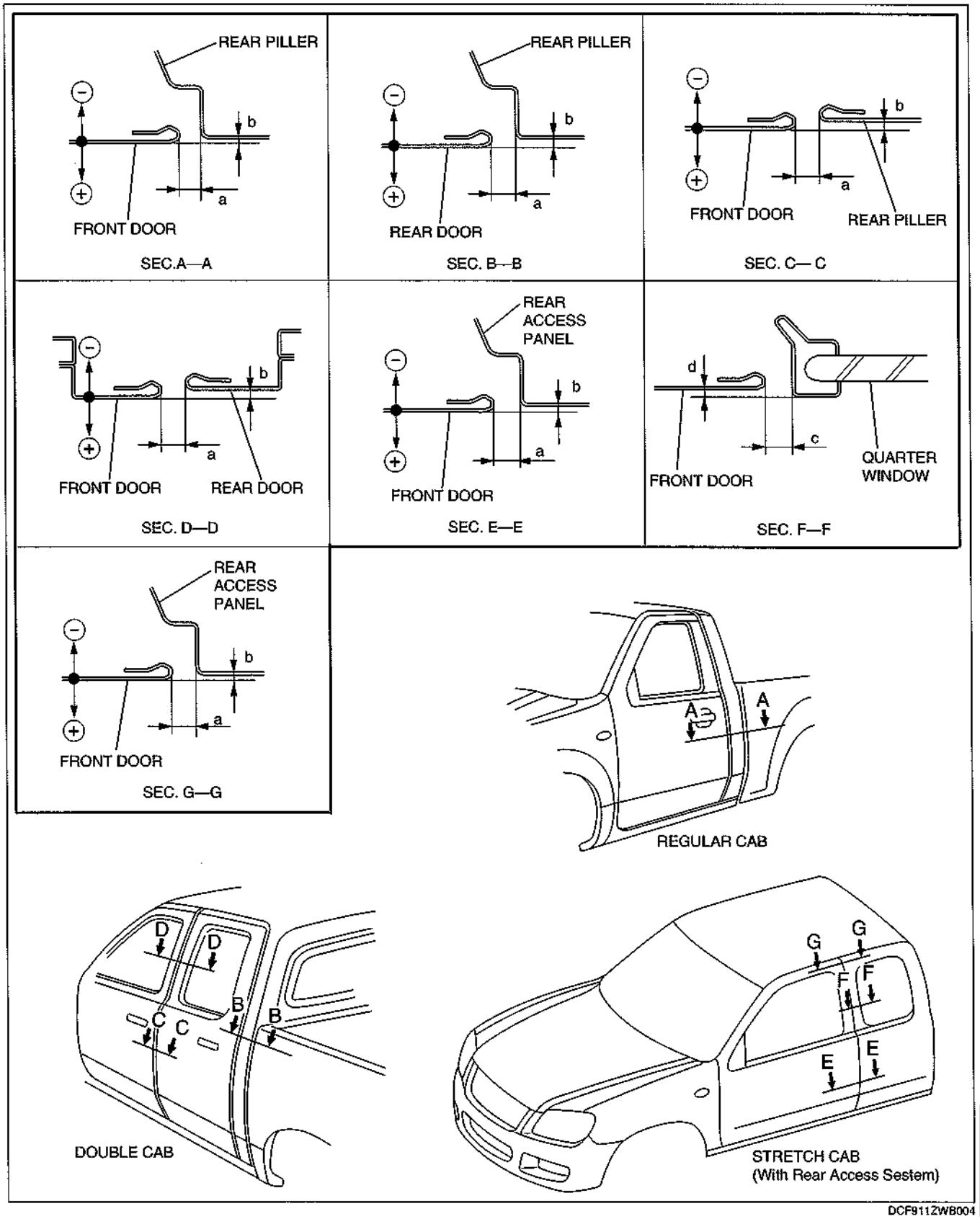
DCF911ZWB003

DOOR ADJUSTMENT

dcf091158010w03

1. Measure the gap and height between the front or rear door and the body.
2. If there is any malfunction, loosen the front or rear door hinge installation bolts or the door lock striker installation screws, and reposition the door.

Clearance
a: 3.5—6.5 mm {0.14—0.25 in}
b: -1.0—1.5 mm {-0.04—0.06 in}
c: 5.0 mm {0.19 in}
d: 0.0—2.5 mm {0.00—0.09 in}



DCF911ZWB004

3. Tighten the bolts or screws.

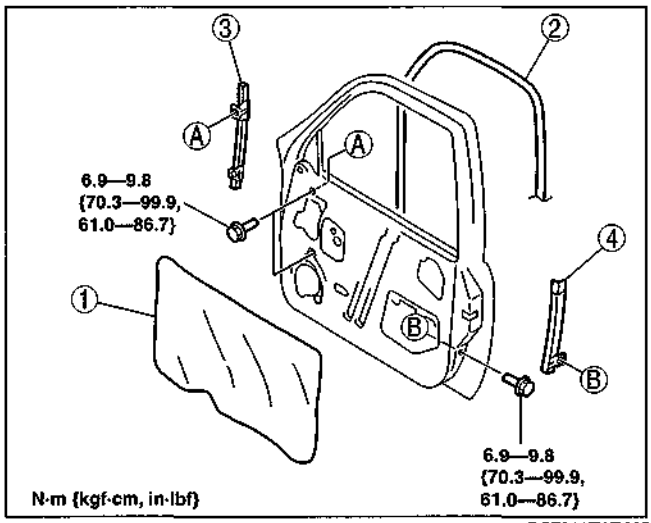
FRONT DOOR UNIT REMOVAL/INSTALLATION

dcf091159970w01

1. Raise the rear edge of the front door glass 80 mm {3.1 in} from the fully lowered position.
2. Disconnect the negative battery cable.
3. Remove the front door trim. (See 09-17-17 FRONT DOOR TRIM REMOVAL/INSTALLATION.)
4. Remove the front door grass. (See 09-12-3 FRONT DOOR GLASS REMOVAL/INSTALLATION.)
5. Remove the inner handle. (See 09-14-6 FRONT DOOR INNER HANDLE REMOVAL/INSTALLATION.)
6. Disassemble in the order indicated in the table.

1	Door screen
2	Glass run channel
3	Front glass guide
4	Rear glass guide

7. Assemble in the reverse order of disassembly.



DCF911ZWB005

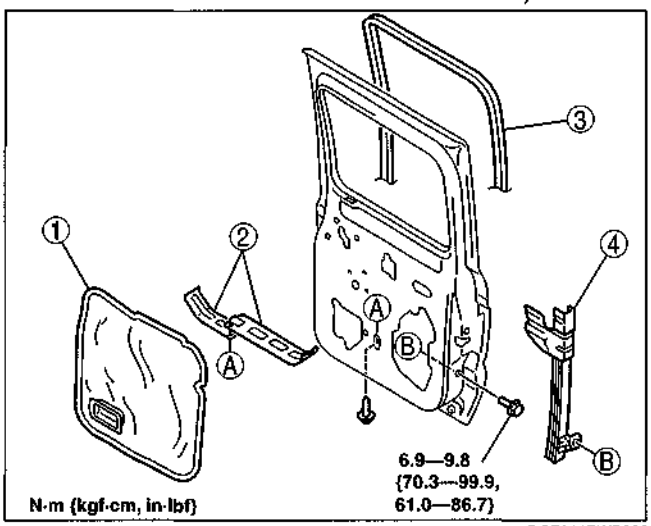
REAR DOOR UNIT REMOVAL/INSTALLATION

dcf091159970w02

1. Close the rear door glass completely.
2. Disconnect the negative battery cable.
3. Remove the rear door trim. (See 09-17-18 REAR DOOR TRIM REMOVAL/INSTALLATION.)
4. Remove the rear door grass. (See 09-12-4 REAR DOOR GLASS AND REAR WINDOW REGULATOR REMOVAL/INSTALLATION.)
5. Remove the inner handle. (See 09-14-7 REAR DOOR INNER HANDLE REMOVAL/INSTALLATION.)
6. Disassemble in the order indicated in the table.

1	Door screen
2	Glass hole lid
3	Glass run channel
4	Glass guide

7. Assemble in the reverse order of disassembly.



DCF911ZWB006

09-12 GLASS/WINDOWS/MIRRORS

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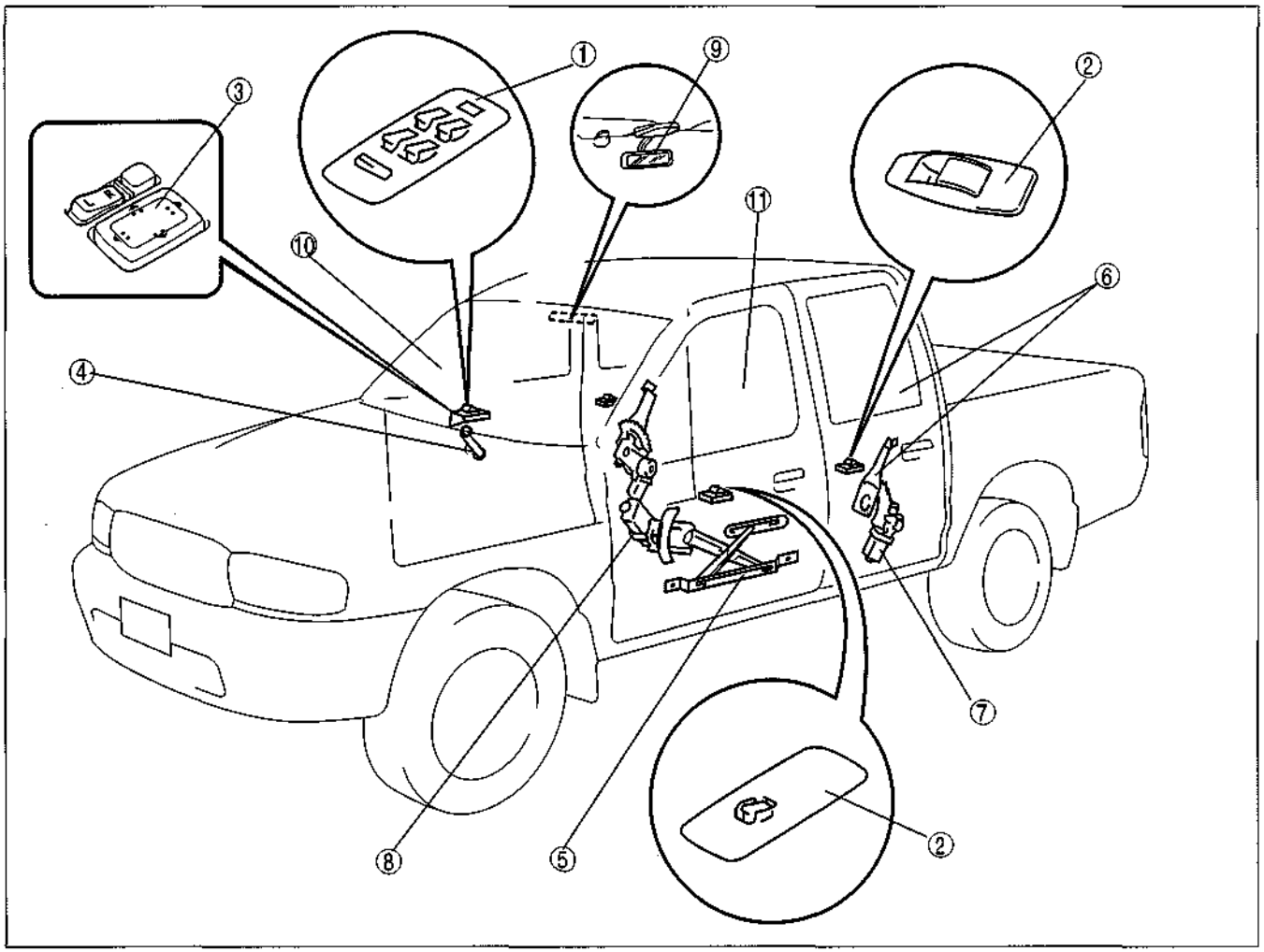
dcf091200001w01

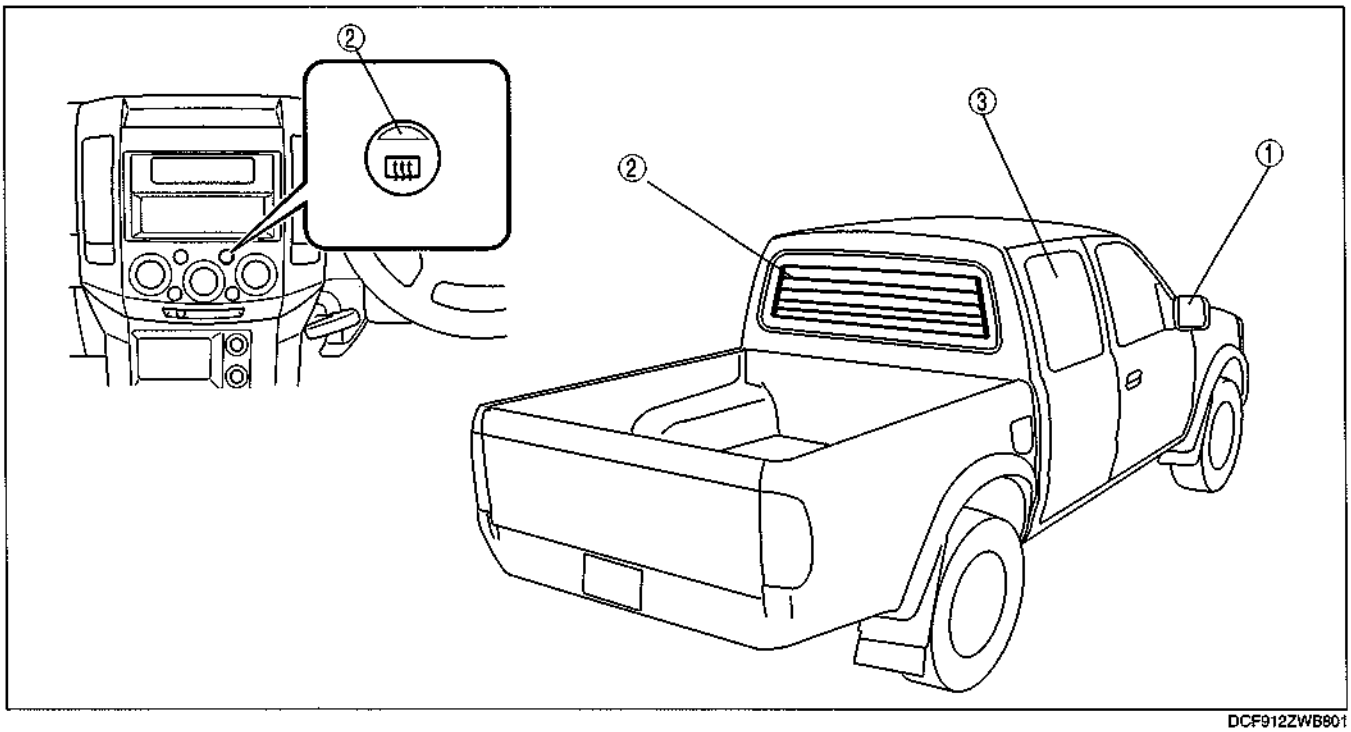
Front view



DCF912ZWB800

1	Power window main switch (See 09-12-8 POWER WINDOW MAIN SWITCH REMOVAL/INSTALLATION.) (See 09-12-8 POWER WINDOW MAIN SWITCH INSPECTION.)
2	Power window subswitch (See 09-12-11 POWER WINDOW SUBSWITCH REMOVAL/INSTALLATION.) (See 09-12-11 POWER WINDOW SUBSWITCH INSPECTION.)
3	Power outer mirror switch (See 09-12-20 POWER OUTER MIRROR SWITCH REMOVAL/INSTALLATION.) (See 09-12-21 POWER OUTER MIRROR SWITCH INSPECTION.)
4	Regulator handle (See 09-12-6 REGULATOR HANDLE REMOVAL.) (See 09-12-6 REGULATOR HANDLE INSTALLATION.)
5	Front power window regulator (See 09-12-5 FRONT POWER WINDOW REGULATOR REMOVAL/INSTALLATION.) (See 09-12-6 FRONT MANUAL WINDOW REGULATOR REMOVAL/INSTALLATION.)
6	Rear door glass and rear window regulator (See 09-12-4 REAR DOOR GLASS AND REAR WINDOW REGULATOR REMOVAL/INSTALLATION.)
7	Rear power window motor (See 09-12-7 REAR POWER WINDOW MOTOR REMOVAL/INSTALLATION.) (See 09-12-7 POWER WINDOW MOTOR INSPECTION.)
8	Front power window motor (See 09-12-7 FRONT POWER WINDOW MOTOR REMOVAL/INSTALLATION.) (See 09-12-7 POWER WINDOW MOTOR INSPECTION.)
9	Rearview mirror (See 09-12-21 REARVIEW MIRROR REMOVAL/INSTALLATION.)
10	Windshield (See 09-12-12 WINDSHIELD REMOVAL.) (See 09-12-14 WINDSHIELD INSTALLATION.)
11	Front door glass (See 09-12-3 FRONT DOOR GLASS REMOVAL/INSTALLATION.)

Rear view



DCF912ZWB801

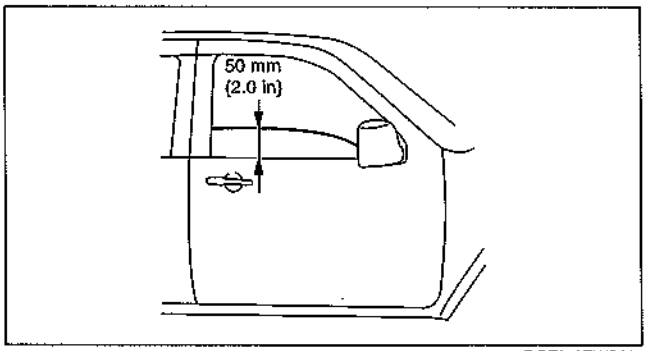
1	Outer mirror (See 09-12-19 OUTER MIRROR REMOVAL/ INSTALLATION.) (See 09-12-19 OUTER MIRROR GLASS REMOVAL/ INSTALLATION.) (See 09-12-20 POWER OUTER MIRROR INSPECTION.)

2	Rear window glass (See 09-12-16 REAR WINDOW GLASS REMOVAL.) (See 09-12-17 REAR WINDOW GLASS INSTALLATION.) (See 09-12-18 FILAMENT SWITCH REMOVAL/ INSTALLATION.) (See 09-12-18 FILAMENT INSPECTION.) (See 09-12-18 FILAMENT REPAIR.)
3	Rear quarter window glass (See 09-12-5 REAR QUARTER WINDOW GLASS REMOVAL/INSTALLATION.)

FRONT DOOR GLASS REMOVAL/INSTALLATION

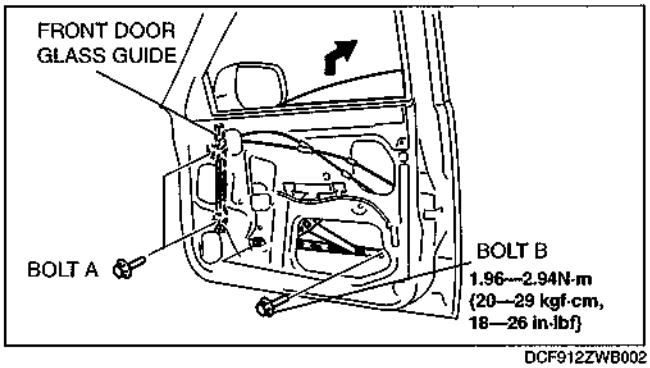
1. Adjust the door glass position as shown in the figure.
2. Disconnect the negative battery cable.(Vehicles with the power window system)
3. Remove the inner garnish. (See 09-17-11 INNER GARNISH REMOVAL/INSTALLATION.)
4. Remove the regulator handle.(Vehicles with manual window system)(See 09-12-6 REGULATOR HANDLE REMOVAL.)
5. Remove the front door trim. (See 09-17-17 FRONT DOOR TRIM REMOVAL/ INSTALLATION.)
6. Remove the screen.

dcf091259500w01



DCF912ZWB001

7. Remove the bolts and the front door glass guide out of the way.
8. Remove the bolts.
9. Lift the front door glass up and remove it in the direction of the arrow.
10. Install in the reverse order of removal.

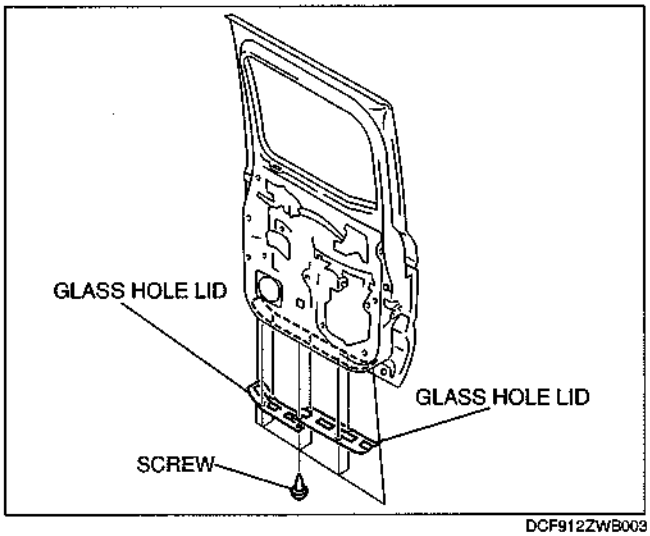


DCF912ZWB002

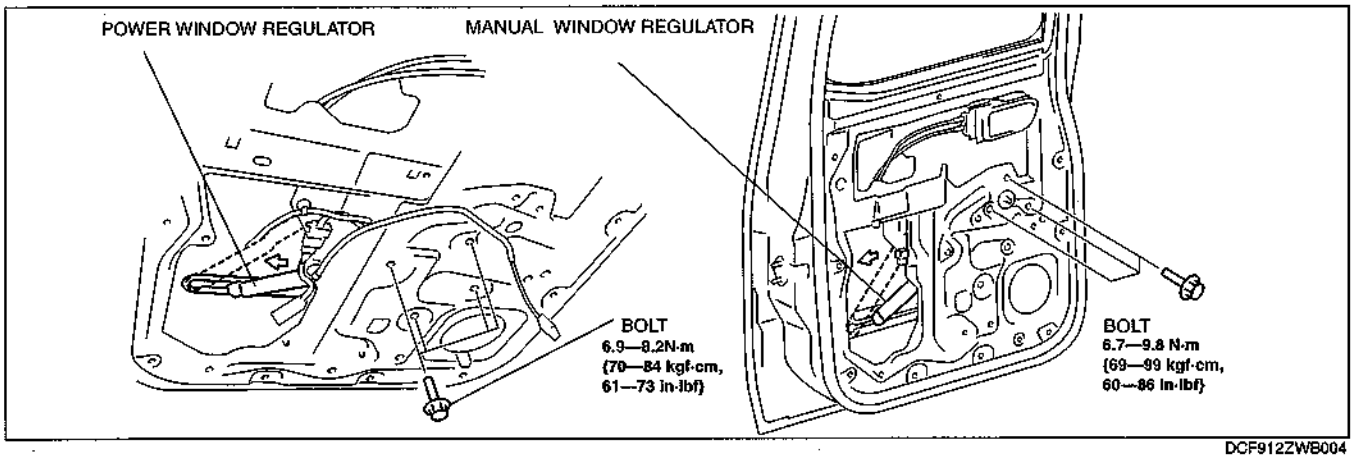
REAR DOOR GLASS AND REAR WINDOW REGULATOR REMOVAL/INSTALLATION

dcf091259500w02

1. Disconnect the negative battery cable.(Vehicles with the power window system)
2. Remove the regulator handle.(Vehicles with manual window system)(See 09-12-6 REGULATOR HANDLE REMOVAL.)
3. Remove the rear door trim. (See 09-17-18 REAR DOOR TRIM REMOVAL/INSTALLATION.)
4. Remove the screws.
5. Remove the glass hole lid.
6. Lift the rear door glass and remove the bolts.

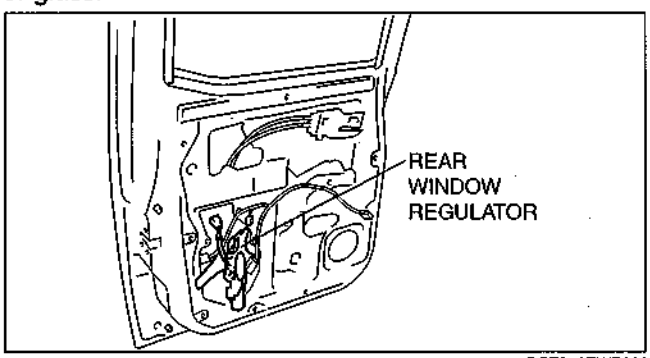


DCF912ZWB003



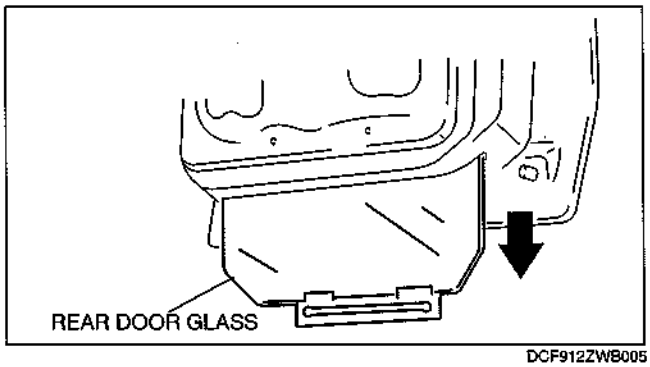
DCF912ZWB004

7. Slide the window regulator link to the rear of the rear door glass.
8. Remove the rear window regulator through the service hole.



DCF912ZWB200

9. Draw out the rear door glass through the glass hole.
10. Install in the reverse order of removal.

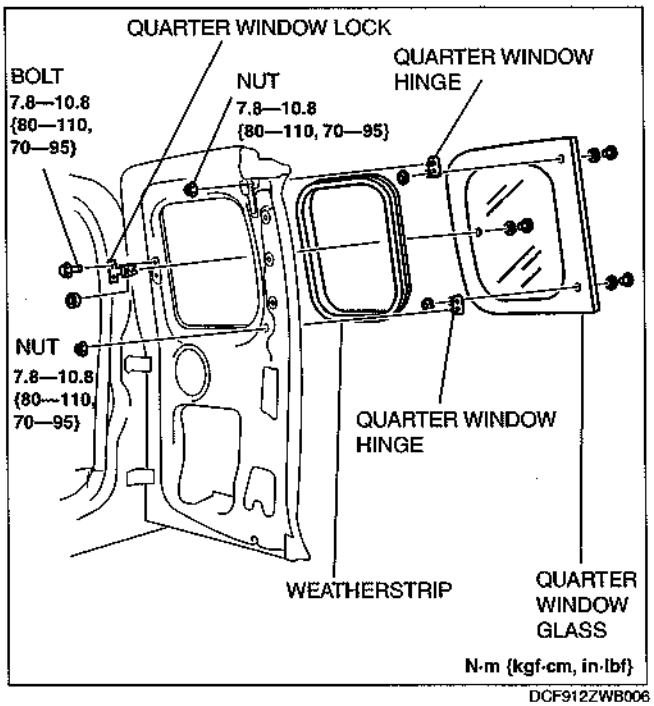


DCF912ZWB005

REAR QUARTER WINDOW GLASS REMOVAL/INSTALLATION

dcf091259500w03

1. Remove the rear access panel trim. (See 09-17-18 REAR ACCESS PANEL TRIM REMOVAL/INSTALLATION.)
2. Remove the upper latch. (See 09-10-11 REAR ACCESS PANEL DISASSEMBLY/ASSEMBLY.)
3. Remove the quarter window hinge.
4. Remove the quarter window lock.
5. Remove the window glass.
6. Install in the reverse order of the removal.

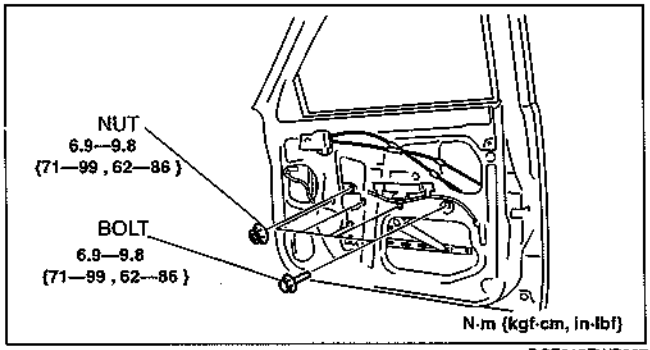


DCF912ZWB006

FRONT POWER WINDOW REGULATOR REMOVAL/INSTALLATION

dcf091258560w01

1. Disconnect the negative battery cable.
2. Remove the following parts:
   (1) Inner garnish (See 09-17-11 INNER GARNISH REMOVAL/INSTALLATION.)
   (2) Front door trim (See 09-17-17 FRONT DOOR TRIM REMOVAL/INSTALLATION.)
   (3) Door screen .
   (4) Front door glass (See 09-12-3 FRONT DOOR GLASS REMOVAL/INSTALLATION.)
3. Remove the nuts and bolts.
4. Remove the front power window regulator through the service hole.
5. Install in the reverse order of removal.

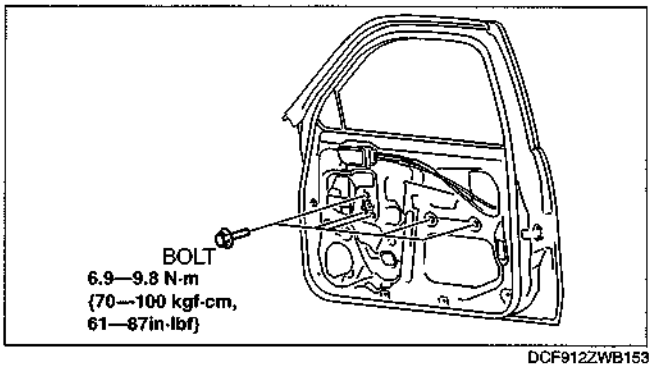


DCF912ZWB007

FRONT MANUAL WINDOW REGULATOR REMOVAL/INSTALLATION

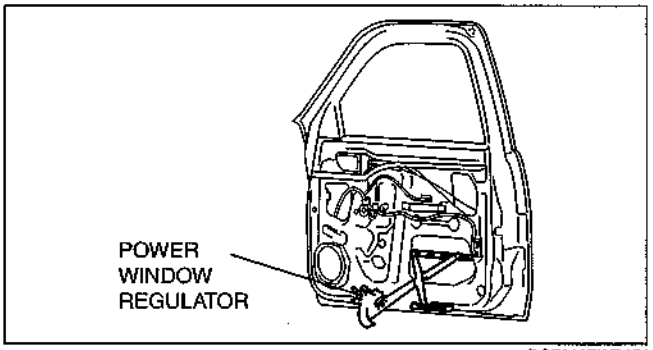
dcf091258560w05

1. Remove the following parts:
   (1) Inner garnish (See 09-17-11 INNER GARNISH REMOVAL/INSTALLATION.)
   (2) Regulator handle (See 09-12-6 REGULATOR HANDLE REMOVAL.)
   (3) Front door trim (See 09-17-17 FRONT DOOR TRIM REMOVAL/INSTALLATION.)
   (4) Front door glass (See 09-12-3 FRONT DOOR GLASS REMOVAL/INSTALLATION.)
2. Remove the nuts and the bolts.



DCF912ZWB153

3. Remove the front manual window regulator through the speaker installation hole.
4. Install in the reverse order of removal.

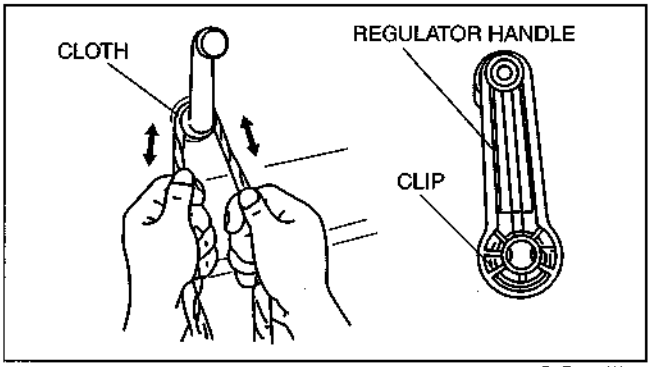


DCF912ZWB154

REGULATOR HANDLE REMOVAL

dcf091258560w03

1. Using a cloth, remove the regulator handle installation clip and remove the regulator handle.

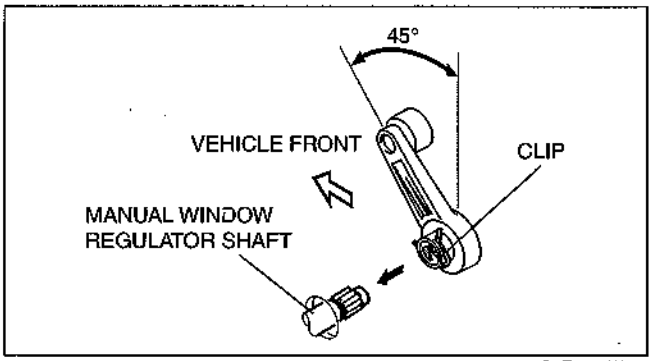


B3E0912W221

REGULATOR HANDLE INSTALLATION

dcf091258560w04

1. Fully raise the door glass.
2. Install the clip to the regulator handle.
3. Install the regulator handle while tilting it as shown in the figure and press it onto the shaft.

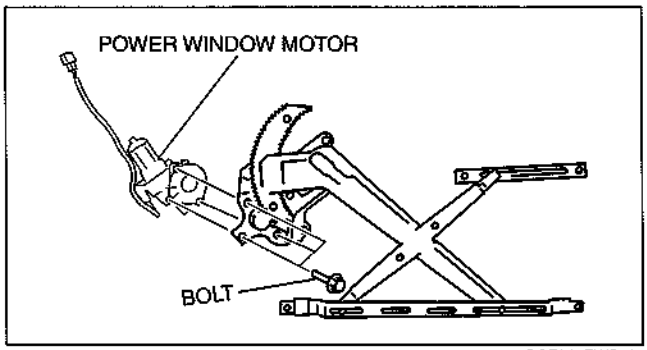


B3E0912W330

FRONT POWER WINDOW MOTOR REMOVAL/INSTALLATION

dcf091259560w01

1. Disconnect the negative battery cable.
2. Remove the following parts:
   (1) Inner garnish (See 09-17-11 INNER GARNISH REMOVAL/INSTALLATION.)
   (2) Front door trim (See 09-17-17 FRONT DOOR TRIM REMOVAL/INSTALLATION.)
   (3) Door screen.
   (4) Front door glass (See 09-12-3 FRONT DOOR GLASS REMOVAL/INSTALLATION.)
   (5) Front power window regulator (See 09-12-5 FRONT POWER WINDOW REGULATOR REMOVAL/INSTALLATION.)
3. Disconnect the power window motor connector.
4. Remove the bolts.
5. Remove the power window motor from the power window regulator.
6. Install in the reverse order of removal.

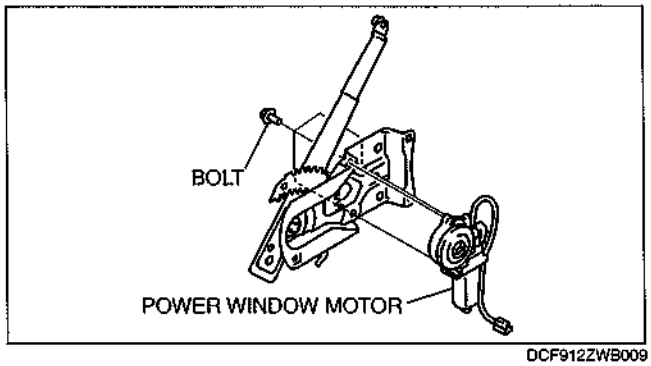


DCF912ZWB008

REAR POWER WINDOW MOTOR REMOVAL/INSTALLATION

dcf091259560w02

1. Disconnect the negative battery cable.
2. Remove the following parts:
   (1) Rear door trim (See 09-17-18 REAR DOOR TRIM REMOVAL/INSTALLATION.)
   (2) Door screen.
   (3) REAR DOOR GLASS AND REAR WINDOW REGULATOR REMOVAL/INSTALLATION(See 09-12-4 REAR DOOR GLASS AND REAR WINDOW REGULATOR REMOVAL/INSTALLATION.)
   (4) Rear window regulator (See 09-12-4 REAR DOOR GLASS AND REAR WINDOW REGULATOR REMOVAL/INSTALLATION.)
3. Disconnect the power window motor connector.
4. Remove the bolts.
5. Remove the power window motor from the power window regulator.
6. Install in the reverse order of removal.



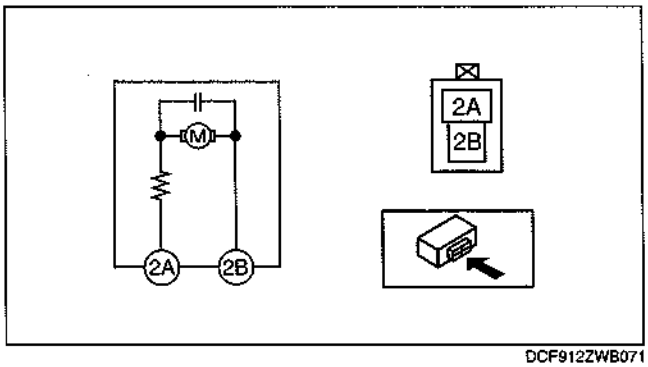
DCF912ZWB009

POWER WINDOW MOTOR INSPECTION

dcf091259560w03

1. Apply battery positive voltage and connect the ground to the power window motor terminals, and then inspect the power window motor operation.
   - If the power window motor does not operate as indicated in the table, replace it.

   Caution
   - **If the power window motor temperature is high, the motor may not rotate due to the motor internal bimetal function. Leave it untouched for about 3 min to cool it down, then reinspect.**



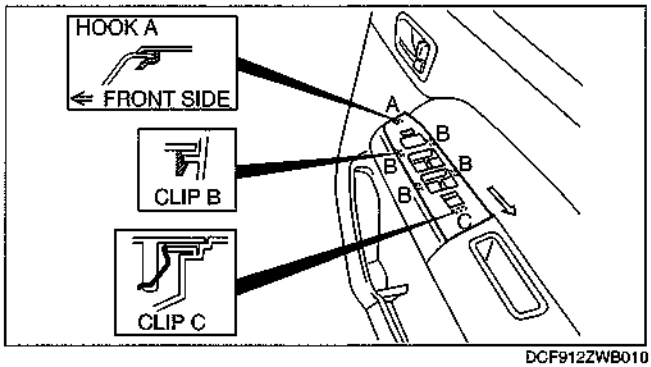
DCF912ZWB071

Operation	Terminal	
	2A	2B
Close	B+	Ground
Open	Ground	B+

POWER WINDOW MAIN SWITCH REMOVAL/INSTALLATION

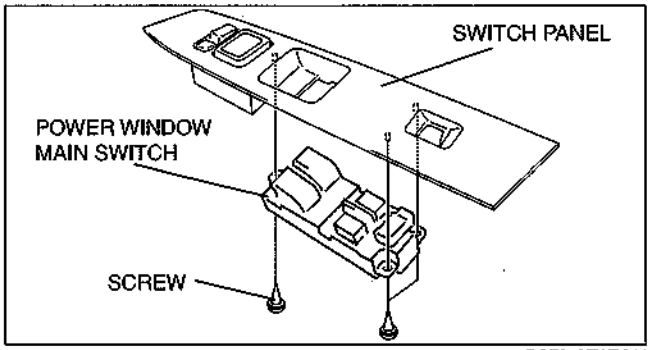
dcf091266330w01

1. Disconnect the negative battery cable.
2. Detach clip C using a tape-wrapped flathead screwdriver.
3. Detach clip B and clip C by pulling it in the direction of the arrow, and remove the switch panel from the front door trim.
4. Disconnect the power window main switch connector and the power outer mirror switch connector.



DCF912ZWB010

5. Remove the screws, then remove the power window main switch.
6. Install in the reverse order of removal.



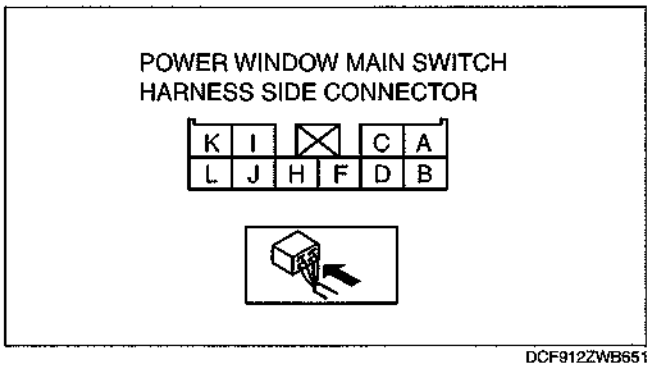
DCF912ZWB011

POWER WINDOW MAIN SWITCH INSPECTION

dcf091266330w06

Driver's Side

1. Measure the voltage at each terminal (other than terminal 1H).
   - If the voltage is not as specified in the Terminal Voltage Table, inspect the parts under "Inspection item (s)" and related wiring harnesses.
2. Disconnect the negative battery cable.
3. Inspect the power window main switch connector for continuity at terminal 1H.
4. If the system does not work properly even though the inspection items or related wiring harnesses do not have any malfunction, replace the power window main switch.



DCF912ZWB651

Terminal	Signal	Connected to	Test condition	Voltage (V)/ Continuity	Action
F	IG1	P. WIND 30 A fuse	Ignition switch is at ON position	B+	• Inspect P. WIND 30 A fuse • Inspect related harness
			Ignition switch is at LOCK position	Below 1.0	
H	Ground	GND	Under any condition: inspect for continuity to ground	Yes	• Inspect GND
K	Open output	Power window motor	While door glass is opening	B+	• Power window motor • Inspect related harness
			While door glass is closing	Below 1.0	
C	Open output	Power window motor	While door glass is opening	B+	• Power window motor • Inspect related harness
			While door glass is closing	Below 1.0	

Terminal	Signal	Connected to	Test condition	Voltage (V)/ Continuity	Action
L	Open output	Power window motor	While door glass is opening	B+	• Power window motor • Inspect related harness
			While door glass is closing	Below 1.0	
D	Open output	Power window motor	While door glass is opening	B+	• Power window motor • Inspect related harness
			While door glass is closing	Below 1.0	
M	Close output	Power window motor	While door glass is opening	Below 1.0	• Power window motor • Inspect related harness
			While door glass is closing	B+	
A	Close output	Power window motor	While door glass is opening	Below 1.0	• Power window motor • Inspect related harness
			While door glass is closing	B+	
J	Close output	Power window motor	While door glass is opening	Below 1.0	• Power window motor • Inspect related harness
			While door glass is closing	B+	
B	Close output	Power window motor	While door glass is opening	Below 1.0	• Power window motor • Inspect related harness
			While door glass is closing	B+	

Except Driver's Side

1. When inspecting the passenger-side and rear power windows, turn the power-cut switch to UNLOCK.
2. Inspect for continuity between the power window main switch terminals.
   - If not as specified, replace the power window main switch.
3. Connect battery positive voltage to terminal 1B and ground to terminal 1M. Verify that there is continuity.
   - If not as specified, replace the power window main switch.

Passenger's side ○—○ : Continuity

Switch position	Terminal			
	F	H	A	C
CLOSED	○		○	
		○		○
OFF		○	○	○
OPEN	○			○
		○	○	

Rear right ○—○ : Continuity

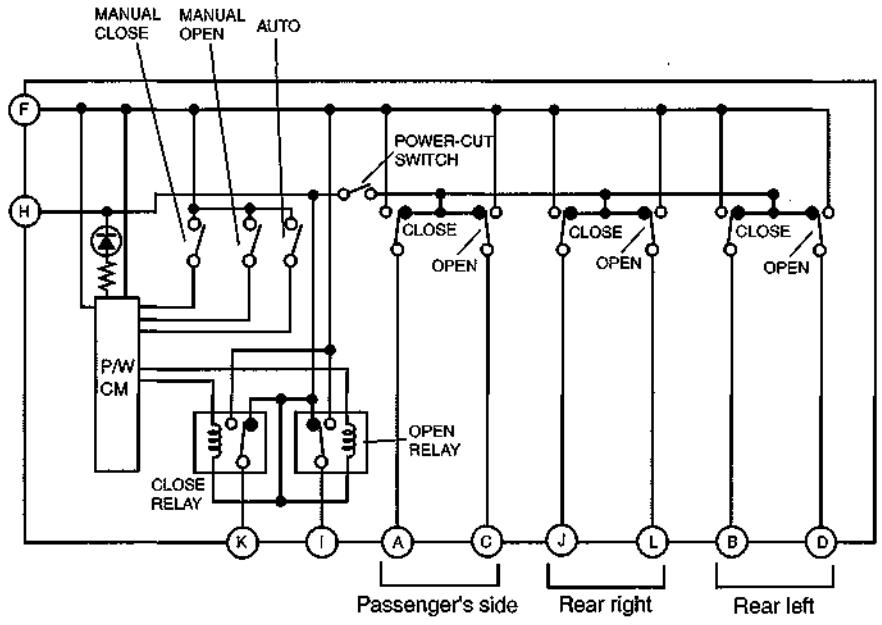
Switch position	Terminal			
	F	H	J	L
CLOSED	○		○	
		○		○
OFF		○	○	○
OPEN	○			○
		○	○	

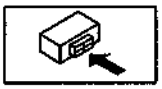
Rear left ○—○ : Continuity

Switch position	Terminal			
	F	H	B	D
CLOSED	○		○	
		○		○
OFF		○	○	○
OPEN	○			○
		○	○	

Power-cut switch ○—○ : Continuity

Switch position	Terminal								
	H	K	I	A	C	J	L	B	D
UNLOCK	○	○	○	○	○	○	○	○	○
LOCK	○	○	○	○	○	○	○	○	○





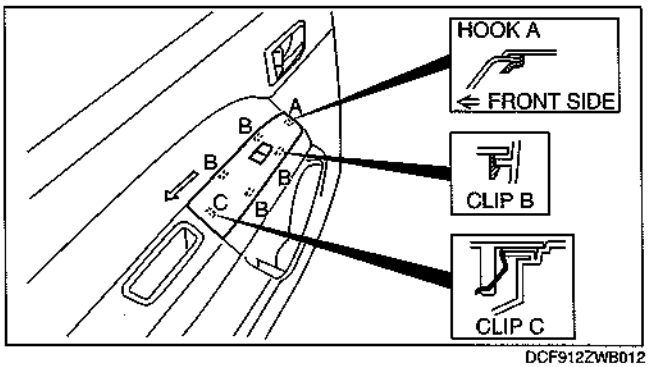
DBG912ZWB900

POWER WINDOW SUBSWITCH REMOVAL/INSTALLATION

dcf091266330w03

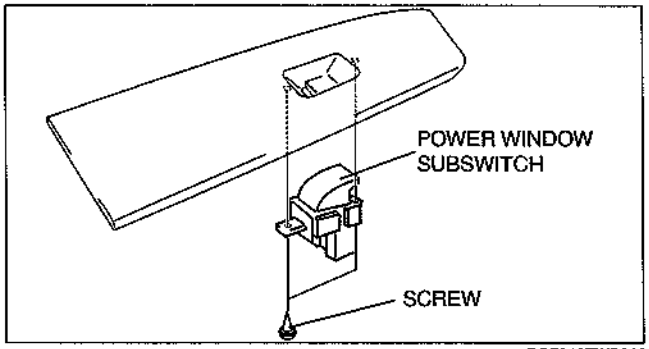
Passenger's Side and Rear

1. Disconnect the negative battery cable.
2. Detach clip C using a tape-wrapped flathead screwdriver.
3. Detach clip B and clip C by pulling it in the direction of the arrow, and remove the switch panel from the door trim.
4. Disconnect the power window subswitch connector.



DCF912ZWB012

5. Remove the screws, then remove the power window subswitch.
6. Install in the reverse order of removal.

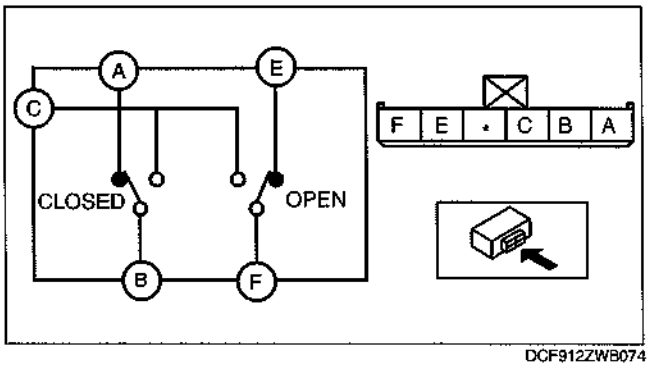


DCF912ZWB013

POWER WINDOW SUBSWITCH INSPECTION

dcf091266330w04

1. Verify continuity as indicated in the table.
   - If not as indicated in the table, replace the power window subswitch.



DCF912ZWB074

O—O: Continuity

Switch position	Terminal				
	C	B	A	E	F
CLOSED	O—O			O—O	
OFF		O—O		O—O	
OPEN	O	O—O			O

DCF912ZWB075

POWER WINDOW SYSTEM INITIAL SETTING

dcf091266330w05

Note

- Initial setting must be performed for the switch of each seat.
- If the following operations have been performed, initial setting is reset, and auto up/down are disabled. Therefore, performing initial setting is necessary.
  - — Negative battery cable disconnected or power window system power supply fuse removed (perform initial setting for the switches of all seats.)
  - — Power window switch connector disconnected (Perform initial setting for the switch connected with the connector.)
  - — Prolonged open/close operation of the power window main or sub switches causes the circuit breaker to activate and automatic operation is disabled.

1. Turn the ignition switch to the ON position.
2. Press the switch of each seat and fully open the door glass.
3. Pull the switch of each seat to the manual-up position to fully close the door glass, and keep holding the switch up at the position for **approx. 2 s.**

WINDSHIELD REMOVAL

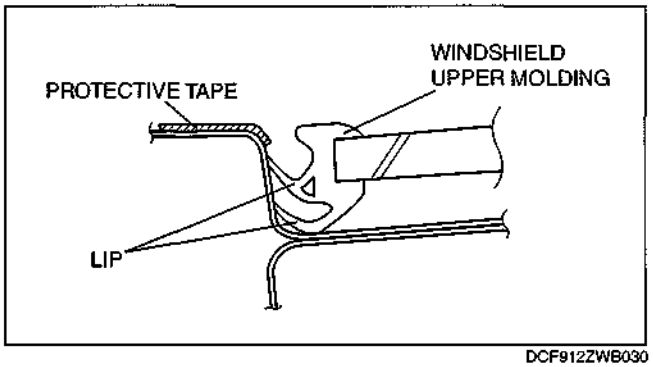
dcf091263900w01

1. Disconnect the negative battery cable.
2. Remove the following parts:
   (1) Windshield wiper arm and blade (See 09-19-3 WINDSHIELD WIPER ARM AND BLADE REMOVAL/INSTALLATION.)
   (2) Cowl grille (See 09-16-2 COWL GRILLE REMOVAL/INSTALLATION.)
   (3) Rearview mirror (See 09-12-21 REARVIEW MIRROR REMOVAL/INSTALLATION.)
   (4) Sunvisor (See 09-17-21 HEADLINER REMOVAL/INSTALLATION.)
   (5) Interior light(See 09-18-13 INTERIOR LIGHT REMOVAL/INSTALLATION.)
   (6) A-pillar trim (See 09-17-14 A-PILLAR TRIM REMOVAL/INSTALLATION.)
3. Set the headliner out of the way.
4. Apply protective tape along the edge of the body.

Note
- Overlap and adhere the protective tape to the corners to prevent damage.

5. Remove the windshield molding by pulling it outward.

Note
- If the windshield molding is difficult to remove, warm the windshield molding using a hot air blower.
- The windshield molding is a replacement part.

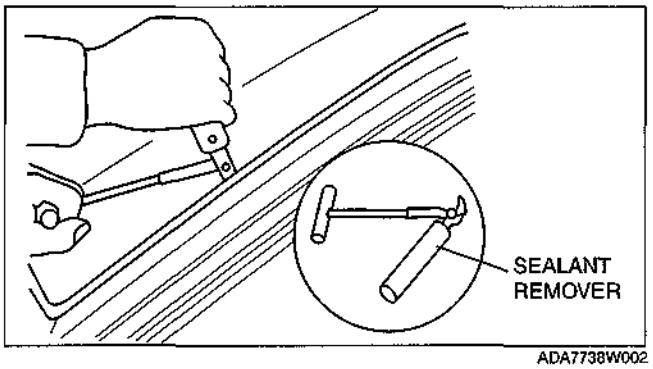


DCF912ZWB030

Not Reusing Windshield

Note
- For the areas of the sealant that are difficult to cut, use the **SST** (piano wire) and follow the procedure under "Reusing Windshield".

1. Cut out the sealant all around the glass using a sealant remover.
2. Remove the windshield.



ADA7738W002

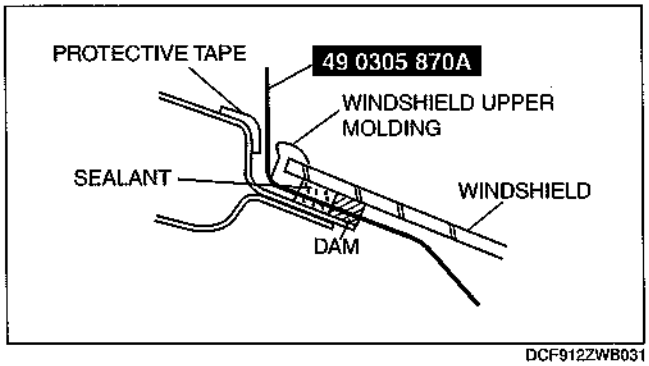
Reusing Windshield

Warning
- **Using the SST (piano wire) with bare hands can cause injury. Always wear gloves when using the SST (piano wire).**

Note
- Before removing the windshield from the body, mark the position of the windshield by affixing tape to the windshield and body panel.

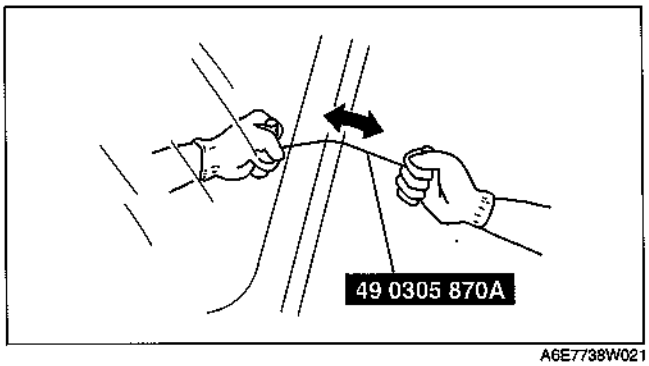
1. On the inside of the vehicle, insert the **SST** (piano wire) which has been cut to sufficient length.
2. Wind each end of the **SST** (piano wire) around a bar.

Note
- Use a long sawing action to spread the work over the whole length of the **SST** (piano wire) to prevent it from breaking due to localized heating.



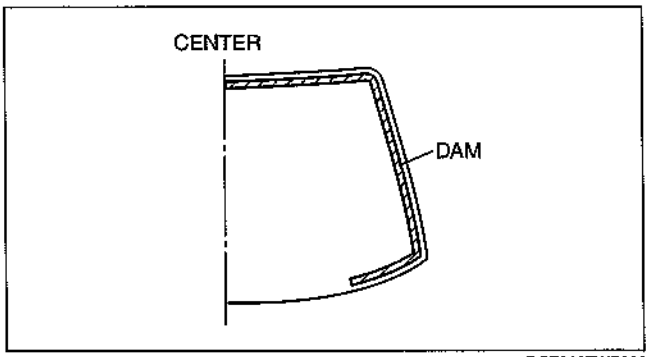
DCF912ZWB031

3. Secure one end of the **SST** (piano wire), and while pulling the other end, cut the sealant around the windshield.
4. Pinch the pin from the inside of the vehicle and detach it.
5. Remove the windshield.



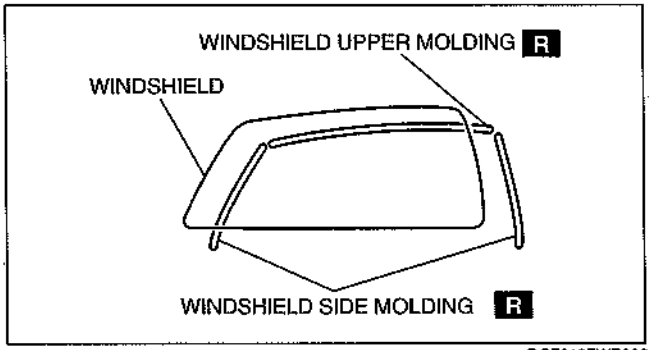
A6E7738W021

6. Remove the dam from the glass.



DCF912ZWB032

7. Remove the windshield upper molding and the windshield side molding from the windshield.



DCF912ZWB033

WINDSHIELD INSTALLATION

dcf091263900w02

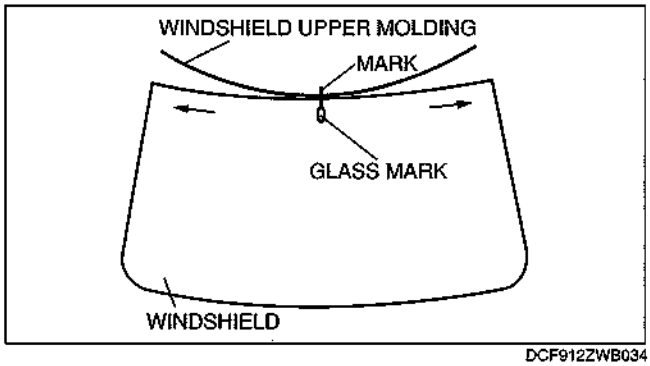
Warning
- **Using a razor with bare hands can cause injury. Always wear gloves when using a razor.**

Caution
- **If a door is opened or closed when all the window glass is closed, the resulting change in air pressure could cause the sealant to crack preventing the proper installation of the glass. Keep the door glass opened until the windshield installation is completed.**

1. Remove the sealant along the perimeter of the glass using a cutting a razor. (When reusing the glass)
2. Clean and degrease an **approximately 50 mm {1.97 in}** wide strip along the perimeter of the windshield.
3. Inspect the glass for cracks. If it is cracked, chamfer it using sandpaper.
4. Install the windshield upper molding from the center toward both sides.
5. Align the upper edge of the windshield side molding with the glass mark.

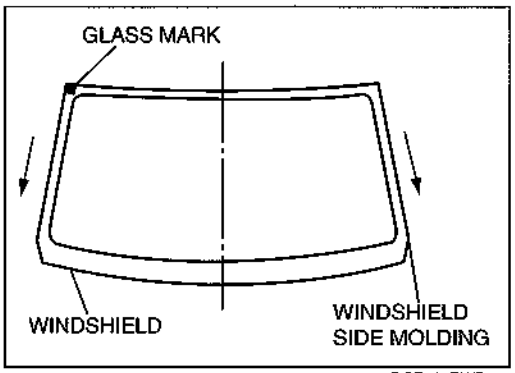
Caution
- **To prevent weakening of the primer adhesion, keep the bonding surface free of dirt, moisture, and grease. Do not touch the surface with your hand.**

Note
- Make sure to apply primer to the hollowed marks in the ceramic coating.



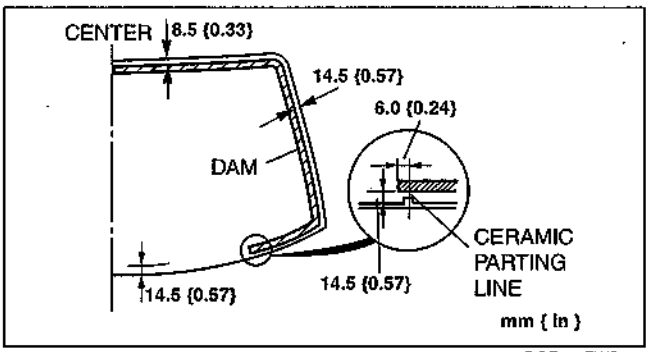
DCF912ZWB034

6. Install the windshield side molding from the upper part towards the lower part.



DCF912ZWB035

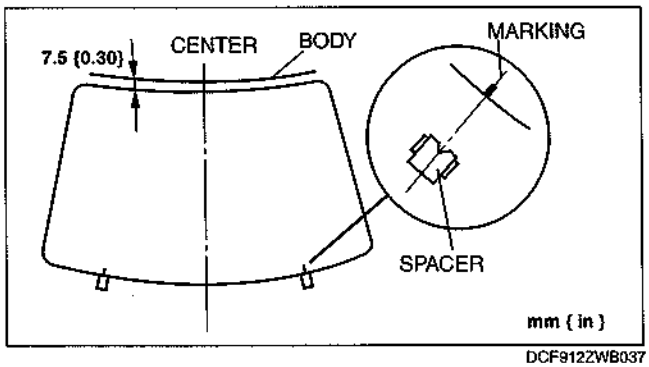
7. Securely bond a dam along the circumference of the glass **8.5 mm {0.33 in}** from the upper edge and 14.5 mm {0.57 in} from the lower and side edge.
8. Temporarily install the glass onto the body and adjust the glass to body clearance.
9. Make a mark on the glass directly above the V-notch of spacers.



DCF912ZWB036

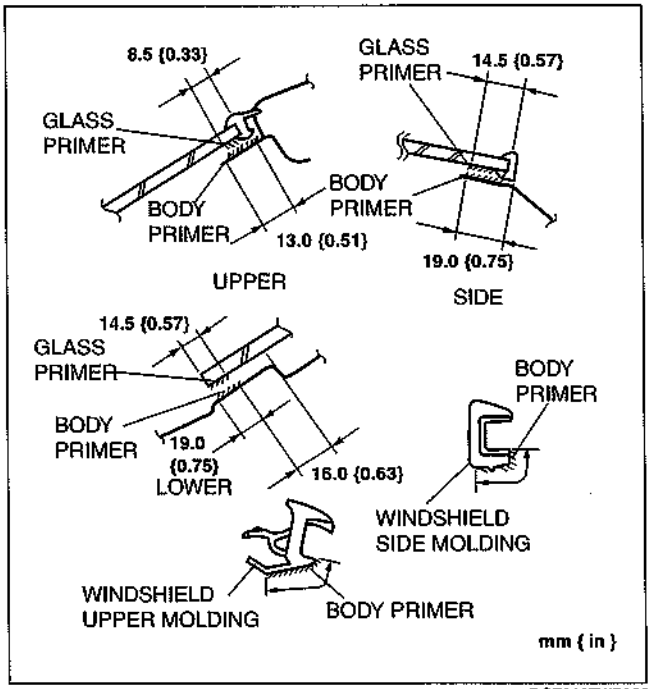
10. Verify that the gap along the upper edge is **7.5 mm {0.30 in}**.
11. Remove the windshield.

Caution
- **To prevent weakening of the primer adhesion, keep the bonding surface free of dirt, moisture, and grease. Do not touch the surface with your hand.**



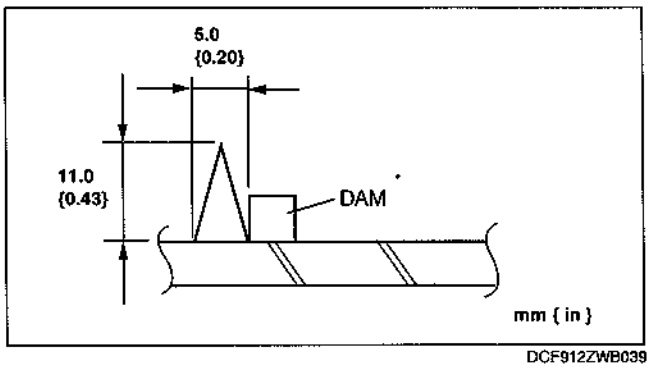
DCF912ZWB037

12. Use a brush to apply primer to the bonding area of the glass and body within the region shown. Use only glass primer on the glass and body primer on the body and molding. Allow it to dry for **approximately 30 minutes.**



DCF912ZWB038

13. Once the primer is dry, apply a 11.0 mm {0.43 in} high, 5.0 mm {0.20 in} wide bead of sealant along the dam around the entire circumference to fill the gap between the dam and the edge of the windshield.
14. Align the glass marks with the V-notches in spacers and install the glass onto the body.
15. Press firmly inward on the glass to compress the sealant .
16. Verify that the gap along the upper and side edge is **7.5 mm {0.30 in}**.

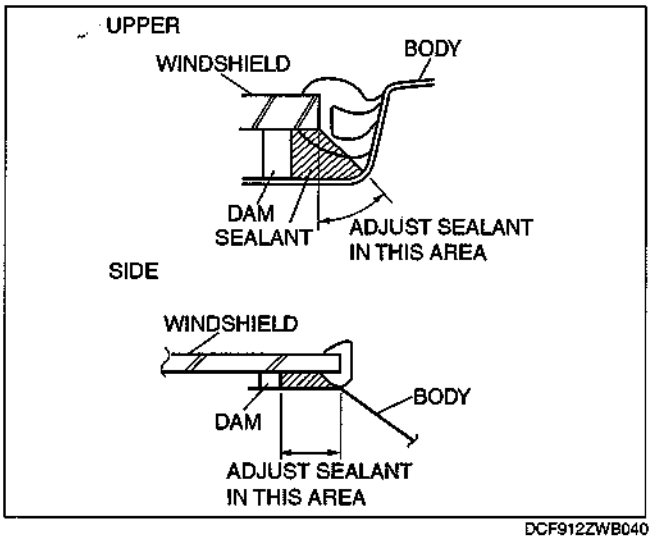


DCF912ZWB039

17. Adjust the sealant as indicated in the figure.

Hardening time of sealant

Temperature	Surface hardening time	Time required until car can be put into service
5 °C {41 °F}	Approx. 1.5 h	Approx. 12 h
20 °C {68 °F}	Approx. 1 h	Approx. 4 h
35 °C {95 °F}	Approx. 10 min	Approx. 2 h



DCF912ZWB040

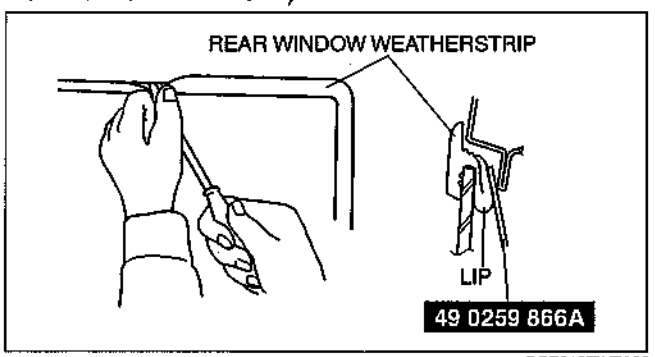
18. Use white gasoline to remove any sealant that oozes out.
19. Install the following parts:
    (1) A-pillar trim (See 09-17-14 A-PILLAR TRIM REMOVAL/INSTALLATION.)
    (2) Interior light (See 09-18-13 INTERIOR LIGHT REMOVAL/INSTALLATION.)
    (3) Sunvisor (See 09-17-21 HEADLINER REMOVAL/INSTALLATION.)
    (4) Rearview mirror (See 09-12-21 REARVIEW MIRROR REMOVAL/INSTALLATION.)
    (5) Cowl grille (See 09-16-2 COWL GRILLE REMOVAL/INSTALLATION.)
    (6) Windshield wiper arm and blade (See 09-19-3 WINDSHIELD WIPER ARM AND BLADE REMOVAL/INSTALLATION.)
20. Allow the sealant to harden completely.

    Sealant hardening time: 24 h

REAR WINDOW GLASS REMOVAL

dcf091263900w03

1. Disconnect the negative battery cable.
2. Remove the front seat belt upper anchor installation bolt . (Regular cab) (See 08-11-1 SEAT BELT REMOVAL/INSTALLATION.)
3. Remove the back upper trim. (Stretch cab(with Rear Access System),Regular cab) (See 09-17-19 BACK UPPER TRIM REMOVAL/INSTALLATION.)
4. Remove the B-pillar trim. (See 09-17-15 B-PILLAR TRIM REMOVAL/INSTALLATION.)
5. Disconnect the filament connector.
6. Remove the headliner. (See 09-17-21 HEADLINER REMOVAL/INSTALLATION.)
7. While another person presses the rear window glass, use flat head screwdriver to push the lip of the rear window weatherstrip from the inside.
8. After the top of the rear window weatherstrip is removed, push the rear window glass outside and remove it with the rear window weatherstrip attached.
9. Remove the rear window weatherstrip from the rear window glass.
10. Remove the rear window glass.

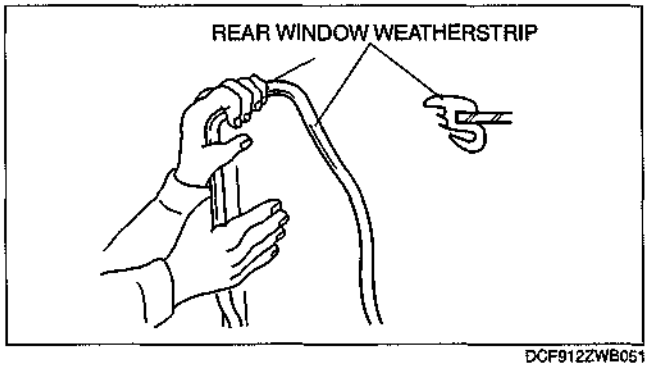


DCF912ZWB050

REAR WINDOW GLASS INSTALLATION

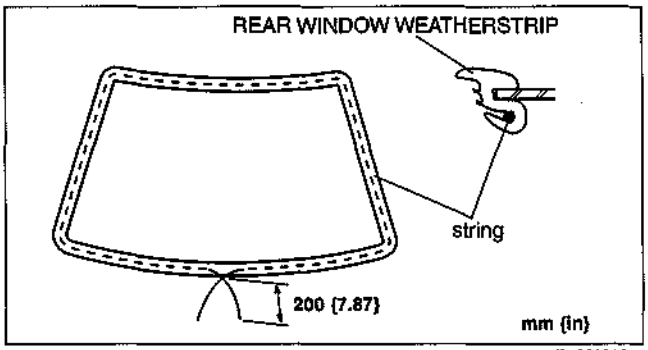
dcf091263900w04

1. Clean and degrease the body and rear window glass.
2. Install the rear window weatherstrip to the rear window glass.



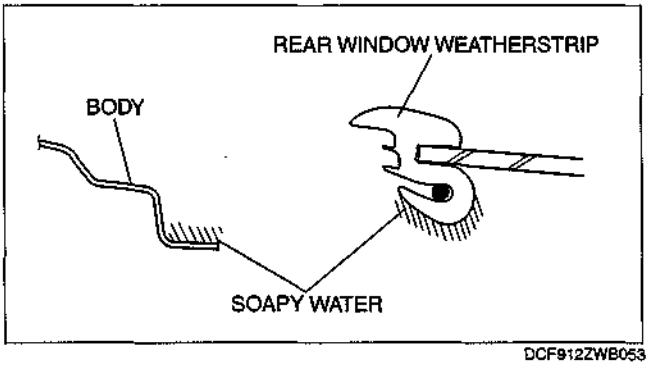
DCF912ZWB051

3. Fit string **ϕ4.5mm {0.17 in}** into the rear window weatherstrip and cross the ends as shown, leave **200 mm {7.87 in}**.



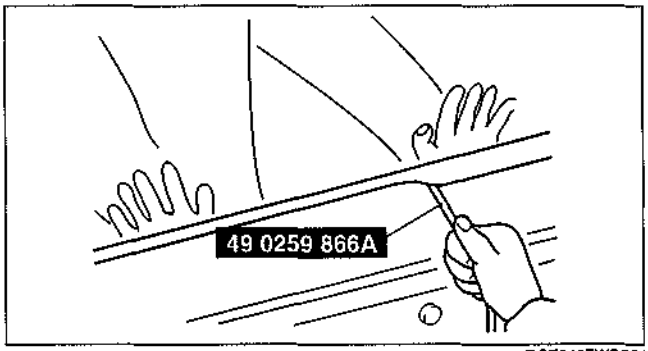
arnffw00001637

4. Apply soapy water as shown.
5. Align the rear window glass with the rear window weatherstrip and body.



DCF912ZWB053

6. While another person lightly taps the outside of the rear window glass near the rear window weatherstrip all around its circumference, pull one end of the **string** and install the rear window glass.
7. Install the rear window filament connector if equipped.
8. Install B-pillar trim. (See 09-17-15 B-PILLAR TRIM REMOVAL/INSTALLATION.)
9. Install the back upper trim. (Stretch cab(with Rear Access System),Regular cab) (See 09-17-19 BACK UPPER TRIM REMOVAL/INSTALLATION.)
10. Install the front seat belt upper anchor installation bolt . (Regular cab) (See 08-11-1 SEAT BELT REMOVAL/INSTALLATION.)



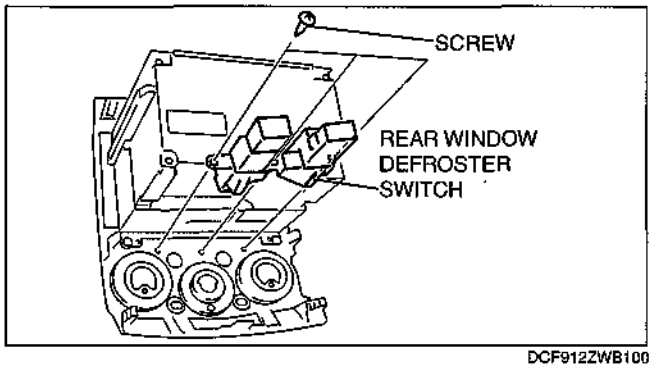
DCF912ZWB054

11. Install the rear window glass.
12. Install the headliner. (See 09-17-21 HEADLINER REMOVAL/INSTALLATION.)
13. Connect the filament connector.
14. Install the B-pillar trim. (See 09-17-15 B-PILLAR TRIM REMOVAL/INSTALLATION.)
15. Install the back upper trim. (Stretch cab (with Rear Access System),Regular cab)(See 09-17-19 BACK UPPER TRIM REMOVAL/INSTALLATION.)
16. Install the front seat belt upper anchor installation bolt .(Regular cab) (See 08-11-1 SEAT BELT REMOVAL/INSTALLATION.)
17. Connect the negative battery cable.

FILAMENT SWITCH REMOVAL/INSTALLATION

dcf091263000w05

1. Disconnect the negative battery cable.
2. Remove the center pane unit. (vehicles with audio unit) (See 09-20-3 CENTER PANEL UNIT REMOVAL/INSTALLATION [TYPE A].)
3. Disconnect the defroster switch connector.
4. Disconnect the hazard warning switch connector.
5. Remove the screw.
6. Remove the defroster switch.
7. Install in the reverse order of removal.

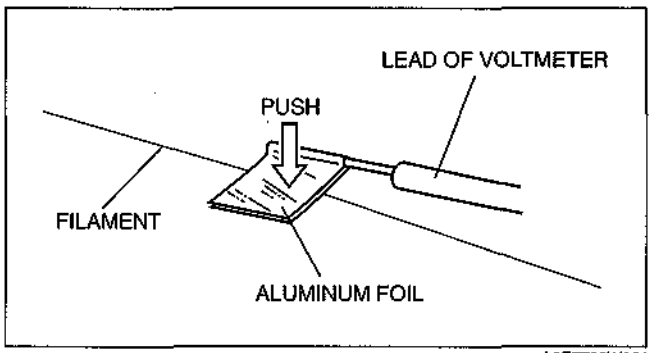


DCF912ZWB100

FILAMENT INSPECTION

dcf091263000w01

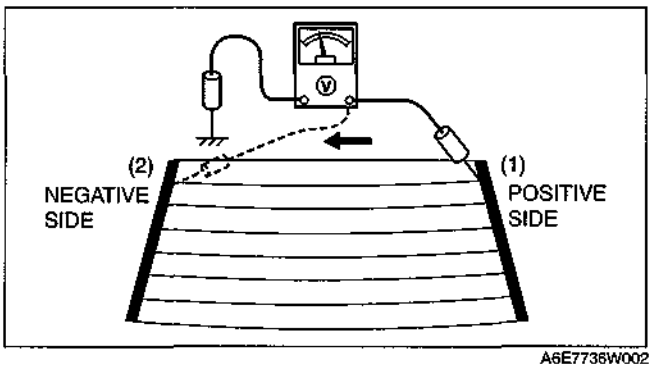
1. Turn the ignition switch to the ON position.
2. Turn the rear window defroster switch on.
   Caution
   - **Directly touching the rear window defroster filament with the lead of the tester could damage it. Wrap aluminum foil around the end of the lead and inspect the filament by touching it with the foil.**
3. Connect the positive lead of the tester to the positive side of each filament and the negative lead to ground.



A6E7736W001

4. Gradually slide the positive lead from the positive side to the negative side and verify that the voltage decreases accordingly.
   - If the voltage changes rapidly, the filament has a malfunction. Repair the filament.

Measured part	Voltage (Reference)
(1) to (2)	Approx. 11 V to 0 V

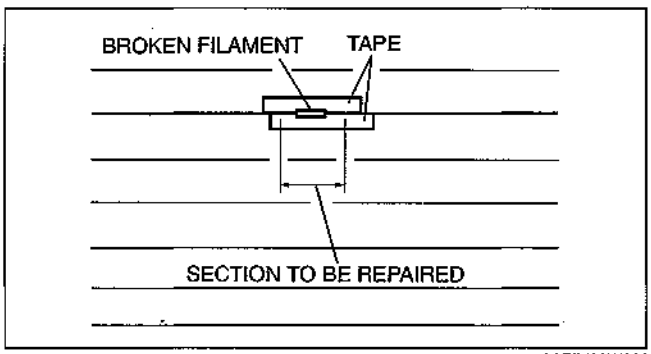


A6E7736W002

FILAMENT REPAIR

dcf091263000w02

1. Clean the filament using isopropyl alcohol.
2. Attach tape to both sides of the filament.
3. Using a small brush or marking pen, apply silver paint.
4. After **2—3 min**, carefully remove the tape without damaging the applied area.
   Caution
   - **Do not operate the rear window defroster until the paint is completely dry. It may cause other malfunctions if it is used before the paint is dry.**
5. Dry the repaired part according to the following procedure.
   - When the room temperature is **25 °C {77 °F}**, leave it as it is for **24 h**.
   - When a hot air blower is used, dry with the **150 °C {302 °F}** air for **30 min**.

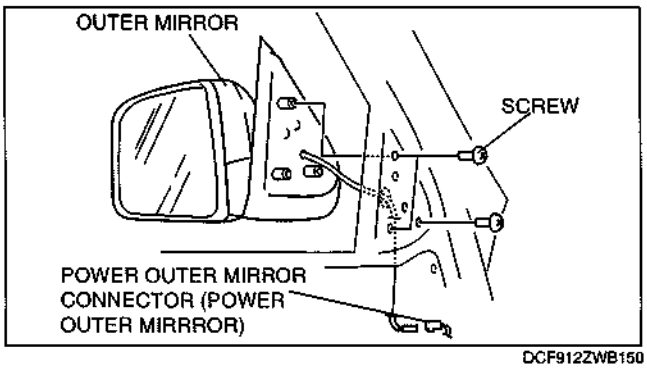


A6E7736W003

OUTER MIRROR REMOVAL/INSTALLATION

dcf091269100w01

1. Disconnect the negative battery cable. (Power outer mirror)
2. Remove the inner garnish. (See 09-17-11 INNER GARNISH REMOVAL/INSTALLATION.)
3. Remove the front door trim. (See 09-17-17 FRONT DOOR TRIM REMOVAL/INSTALLATION.)
4. Disconnect the power outer mirror connector.(Power outer mirror)
5. Remove the screws.
6. Remove the outer mirror.
7. Install in the reverse order of removal.



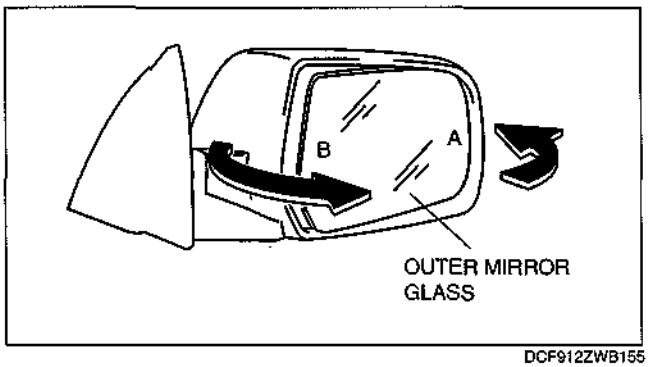
DCF912ZWB150

OUTER MIRROR GLASS REMOVAL/INSTALLATION

dcf091269100w07

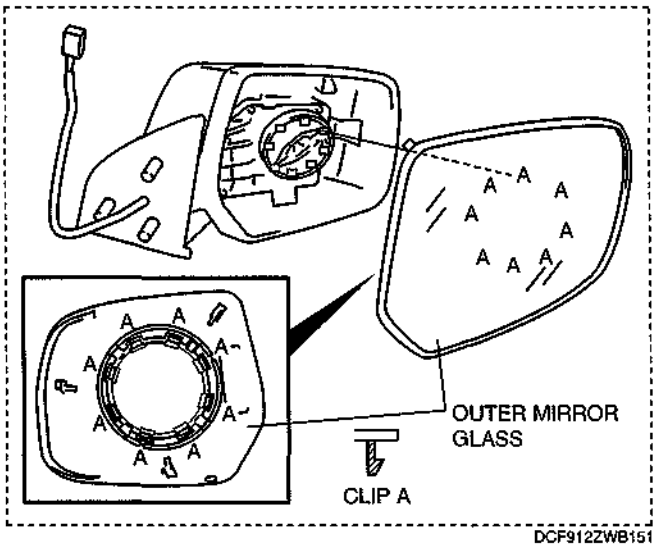
Outer mirror glass removal

1. Press area A of the mirror glass so that area B moves outward.
2. Pull the mirror glass holder.



DCF912ZWB155

3. Detach clip A while lifting up the inside of the mirror glass.



DCF912ZWB151

Outer mirror glass installation

1. Press part A on the outer mirror glass.

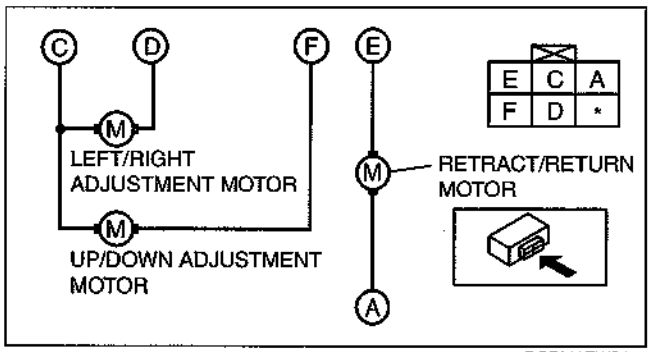
09

POWER OUTER MIRROR INSPECTION

dcf091269100w06

1. Apply battery positive voltage to the power outer mirror terminals and inspect the operation of the power outer mirror.
   - If not as specified, replace the power outer mirror.

Mirror operation	terminal	
	B+	GND
Up	F	C
Down	C	F
Left	D	C
Return	A	E
Retract	E	A

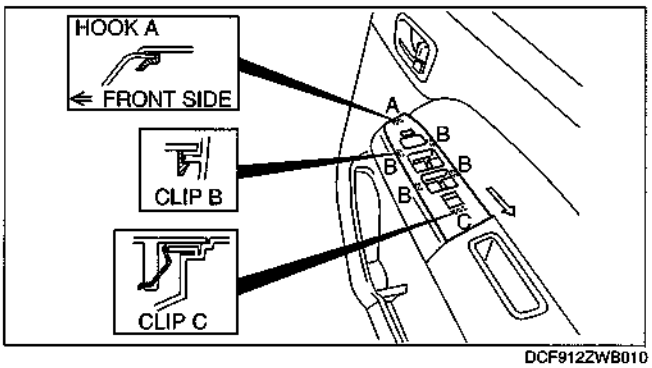


DCF912ZWB076

POWER OUTER MIRROR SWITCH REMOVAL/INSTALLATION

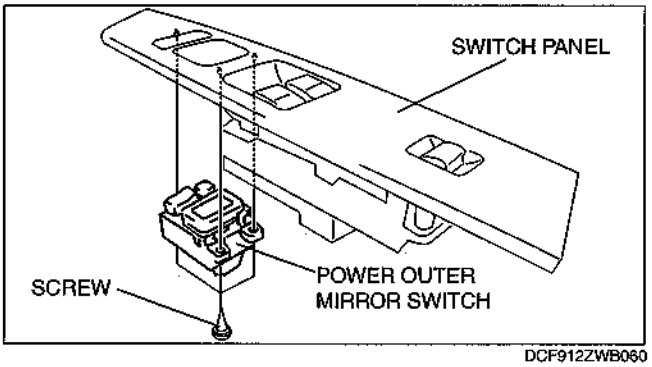
dcf091266600w01

1. Disconnect the negative battery cable.
2. Detach clip C using a tape-wrapped flathead screwdriver.
3. Detach clip B and clip C by pulling it in the direction of the arrow, and remove the switch panel from the front door trim.
4. Disconnect the power outer mirror switch connector.



DCF912ZWB010

5. Remove the screws, then remove the power outer mirror switch.
6. Install in the reverse order of removal.



DCF912ZWB060

POWER OUTER MIRROR SWITCH INSPECTION

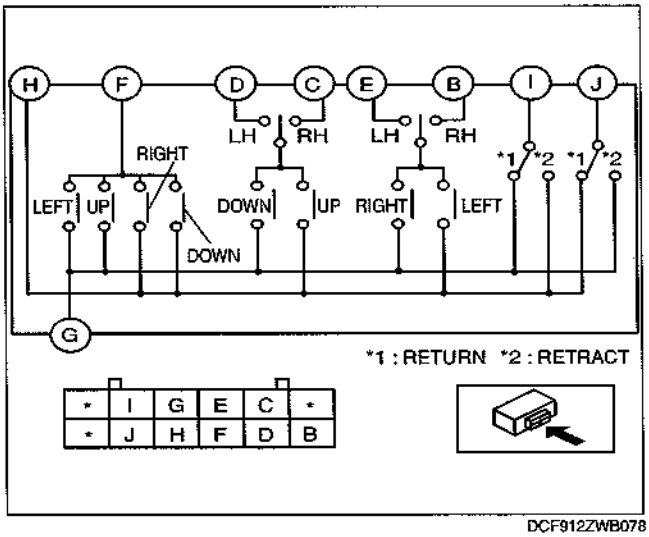
dcf091266600w02

1. Inspect for continuity between the power outer mirror switch terminals using an ohmmeter.
   - If not as indicated in the table, replace the power outer mirror switch.

○—○ : Continuity

Operation		D	C	E	B	H	G	F	J	I
LH	Up	○				○		○		
	Down	○					○	○		
	Left			○		○		○		
	Right			○			○	○		
RH	Up		○			○		○		
	Down		○				○	○		
	Left				○	○		○		
	Right				○		○	○		
RETURN/ RETRACT SWITCH	RETURACT					○		○		○
	RETURN					○		○		○

DCF912ZWB077

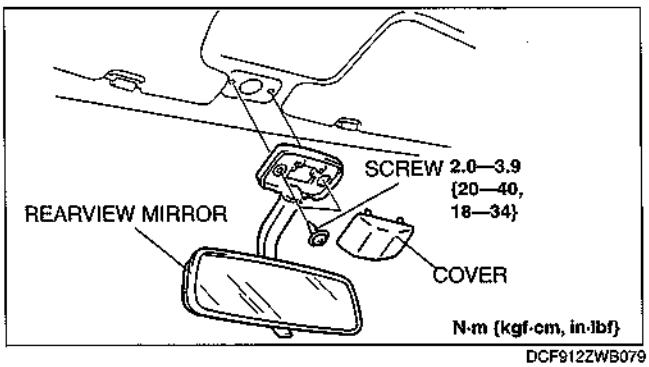


DCF912ZWB078

REARVIEW MIRROR REMOVAL/INSTALLATION

dcf091269220w01

1. Disconnect the negative battery cable.
2. Remove the covers and screw.
3. Remove the rearview mirror.
4. Install in the reverse order of removal.



DCF912ZWB079

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PJ Ranger
Wiring Diagrams Manual

(Part No. WD380)

WARNING

Servicing a vehicle can be dangerous. If you have not received service-related training, the risks of injury, property damage, and failure of servicing increase. The recommended servicing procedures for the vehicle in this workshop manual were developed with Ford-trained technicians in mind. This manual may be useful to non-Ford trained technicians, but a technician with our service-related training and experience will be at less risk when performing service operations. However, all users of this manual are expected to at least know general safety procedures.

This manual contains "Warnings" and "Cautions" applicable to risks not normally encountered in a general technician's experience. They should be followed to reduce the risk of injury and the risk that improper service or repair may damage the vehicle or render it unsafe. It is also important to understand that the "Warnings" and "Cautions" are not exhaustive. It is impossible to warn of all the hazardous consequences that might result from failure to follow the procedures.

The procedures recommended and described in this manual are effective methods of performing service and repair. Some require tools specifically designed for a specific purpose. Persons using procedures and tools which are not recommended by Ford Motor Company must satisfy themselves thoroughly that neither personal safety nor safety of the vehicle will be jeopardized.

The contents of this manual, including drawings and specifications, are the latest available at the time of printing, and Ford Motor Company reserves the right to change the vehicle designs and alter the contents of this manual without notice and without incurring obligation.

Parts should be replaced with genuine Ford replacement parts or with parts which match the quality of genuine Ford replacement parts. Persons using replacement parts of lesser quality than that of genuine Ford replacement parts must satisfy themselves thoroughly that neither personal safety nor safety of the vehicle will be jeopardized.

Ford Motor Company is not responsible for any problems which may arise from the use of this manual. The cause of such problems includes but is not limited to insufficient service-related training, use of improper tools, use of replacement parts of lesser quality than that of genuine Ford replacement parts, or not being aware of any revision of this manual.

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WIRING DIAGRAMS

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FOREWORD

This wiring diagram incorporates the wiring schematics of the RANGER and available optional equipment. Actual vehicle wiring may vary slightly depending on optional equipment or local specifications, or both.

For proper repair and maintenance, a thorough familiarization with this manual is important, and it should always be kept in a handy place for quick and easy reference.

All the contents of this manual, including drawings and specifications, are the latest available at the time of printing.
As modifications affecting repair or maintenance occur, relevant information supplementary to this volume will be made available at Ford dealers. This manual should be kept up-to-date.

Ford Motor Company reserves the right to alter the specifications and contents of this manual without obligation or advance notice.

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Ford Motor Company

APPLICATION:
This manual is applicable to vehicles beginning with the Vehicle Identification Numbers (VIN) shown on the following page.

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PRINTED IN THAILAND, DEC. 2005
F198-30-05L

VEHICLE IDENTIFICATION NUMBERS (VIN)
(CHASSIS NUMBERS)

Australian specs.

MNA BS1D90*W
MNA BS1E90*W
MNA BS2D90*W
MNA BS2E90*W
MNA BSAD10*W
MNA BSAD90*W
MNA BSAE10*W
MNA BSAE90*W
MNA BSBD10*W
MNA BSBD90*W
MNA BSBE10*W
MNA BSBE90*W
MNA BSED90*W
MNA BSEE90*W
MNA BSFD90*W
MNA BSFE90*W
MNA DS1D90*W
MNA DS1E90*W
MNA DS2D90*W
MNA DS2E90*W
MNA DSAD10*W
MNA DSAD90*W
MNA DSAE10*W
MNA DSAE90*W
MNA DSBD10*W
MNA DSBD90*W
MNA DSBE10*W
MNA DSBE90*W
MNA DSED90*W
MNA DSEE90*W
MNA DSFD90*W
MNA DSFE90*W
MNA LS1D90*W
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MNA LS2D90*W
MNA LS2E90*W
MNA LSAD10*W
MNA LSAD90*W
MNA LSAE10*W
MNA LSAE90*W
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MNA LSBE10*W
MNA LSBE90*W
MNA LSED90*W
MNA LSEE90*W
MNA LSFD90*W
MNA LSFE90*W
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MNA US1E90*W
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MNA US2E90*W
MNA USAD10*W
MNA USAD90*W
MNA USAE10*W
MNA USAE90*W
MNA USBD10*W
MNA USBD90*W
MNA USBE10*W
MNA USBE90*W
MNA USED90*W
MNA USEE90*W
MNA USFD90*W
MNA USFE90*W

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Two digits (section ID) indicated in front of each title are commonly used with the Workshop Manual.

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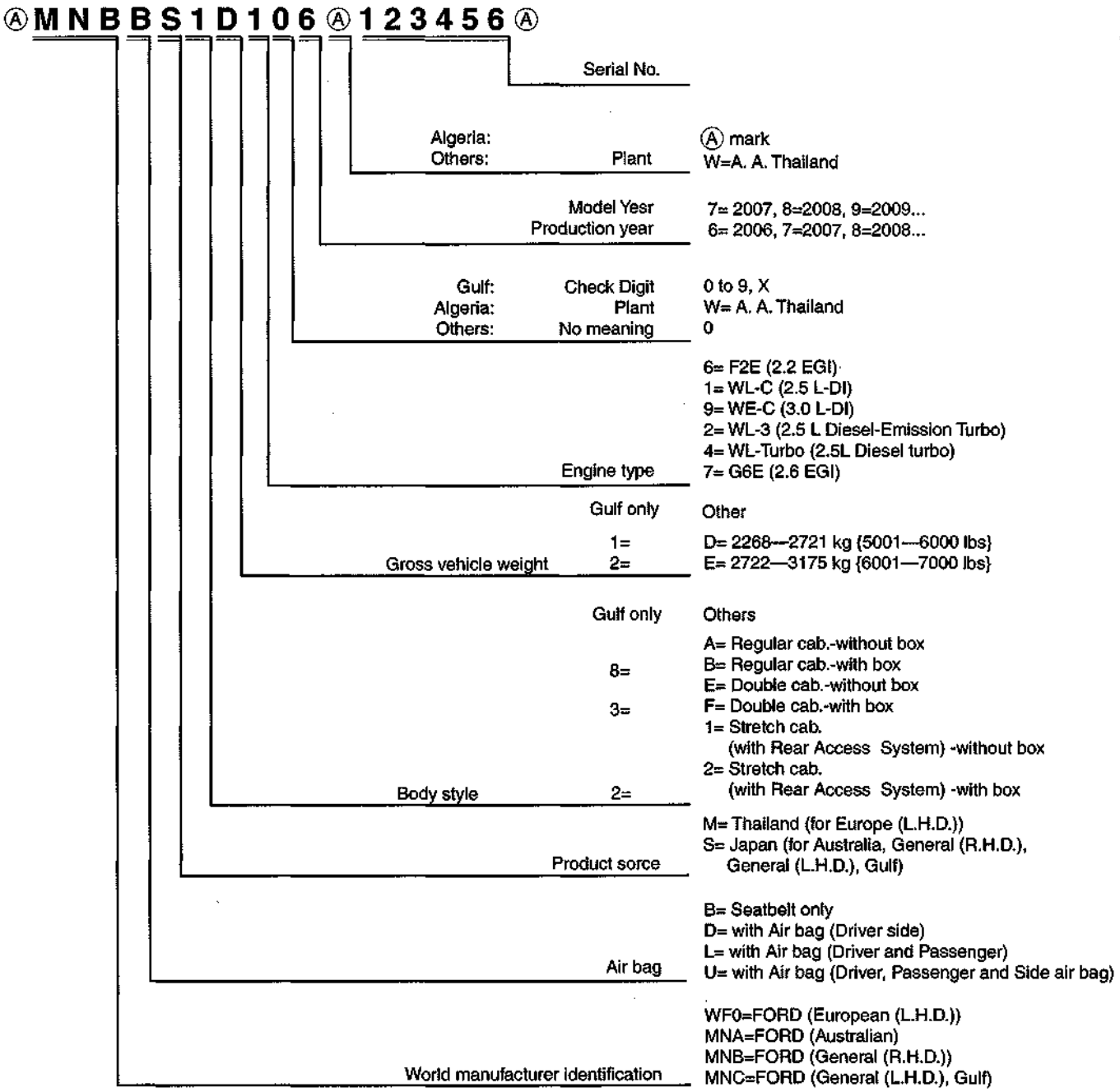

Ⓐ : This mark is used only for Algerian model, in order to identify the manufacturer.

VEHICLE IDENTIFICATION NUMBERS (VIN)

Australian specs.

MNA BS1D90*W
MNA BS1E90*W
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MNA BSBD10*W
MNA BSBD90*W
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MNA USAE10*W
MNA USAE90*W
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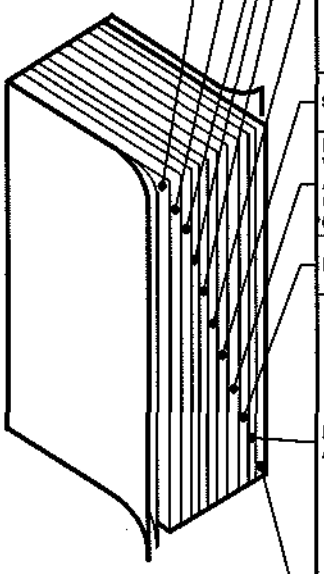
- This manual comprises the sections shown below.



NEW					PREVIOUS	
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		J	Joint box/Junction box complete wiring system		JB	Joint box complete wiring system
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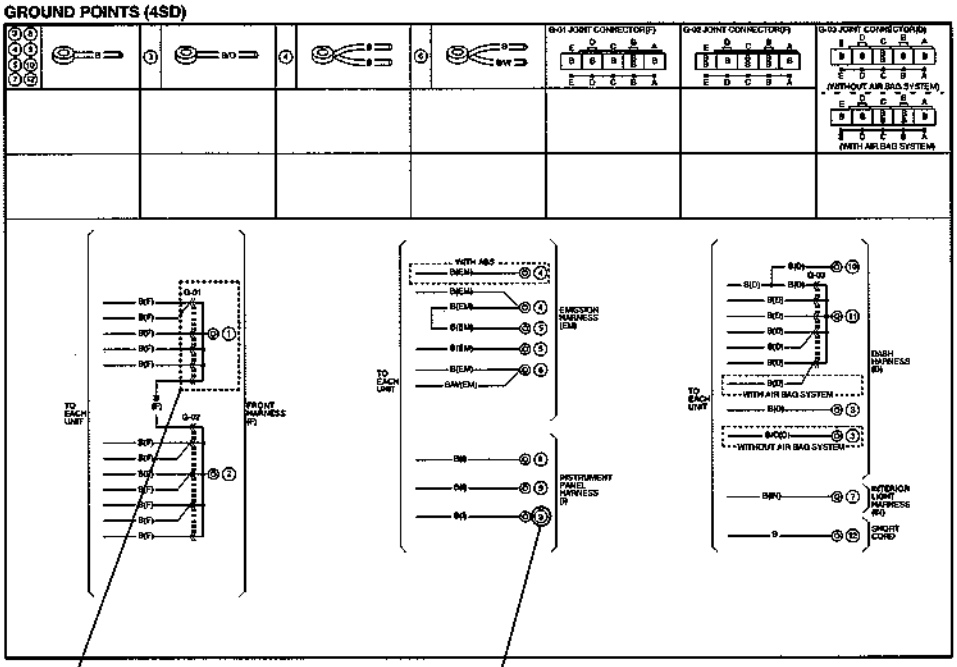
		14	Fuel system		B	Engine control system
		17	Charging system		C	Gauge control system
		18	Ignition system		D	Wiper system
		19	Starting system		E	Lighting system
		20	Cruise control system		F	Signal system
		40	Control system			
SUSPENSION	02	12	Wheel and tires		G	Air-conditioning system
DRIVELINE/AXLE	03	18	4-Wheel drive			
BRAKES	04	13	Antilock brake system		H	Transmission control/Key interlock/Shift-lock system
		14	Traction control system			
		15	Dynamic stability control		I	Interior light system
TRANSMISSION/ TRANSAXLE	05	13	Automatic transmission		J	Audio/Radio system
		14	Automatic transmission shift mechanism			
		17	Automatic transaxle			
		18	Automatic transaxle shift mechanism		K	Power window/Power door lock system
STEERING	06	13	Electric power steering (EPS)			
		14	Power steering			
HEATER, VENTILATION & AIR CONDITIONING (HVAC)	07	40	Control system		L	Remote control mirror system
RESTRAINTS	08	10	Air bag system			
		11	Seat belt		M	Sliding sunroof system
BODY & ACCESSORIES	09	12	Glass/Windows/Mirrors		O	Anti-lock brake system
		13	Seats			
		14	Security and locks		N	Electric power steering (EPS)
		15	Sunroof			
		18	Lighting systems		P	Power seat/Seat warmer system
		19	Wiper/Washer system			
		20	Entertainment		Q	Auto cruise control system
		21	Power systems			
		22	Instrumentation/Driver info.		S	Air bag system
		40	Control system		T	Others
AI			Alphabetical Index	Gives page number of circuit diagram for each component	AI	Alphabetical Index

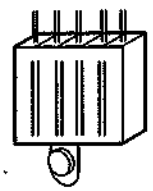
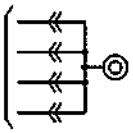
Depending on the vehicle model, the actual sections may be different.

GROUND POINTS

- This shows ground points of the harness.

GROUND POINTS (4SD)

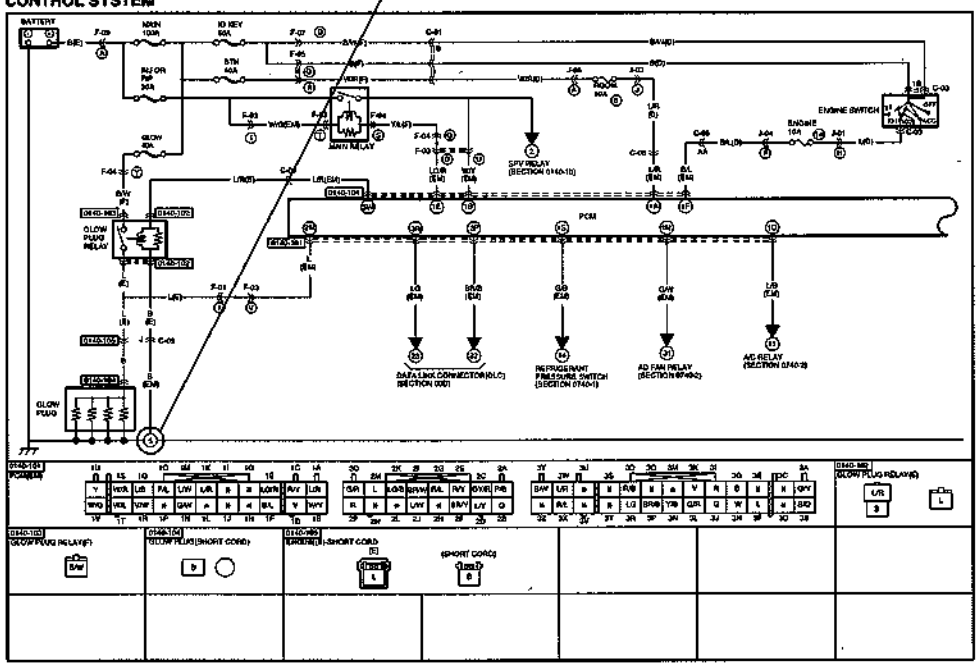


Ground indication	
On vehide	Indication
	To circuit 

On circuit diagrams and ground points

The ground connection numbers in system circuit diagrams correspond to those in the ground point diagram.

CONTROL SYSTEM

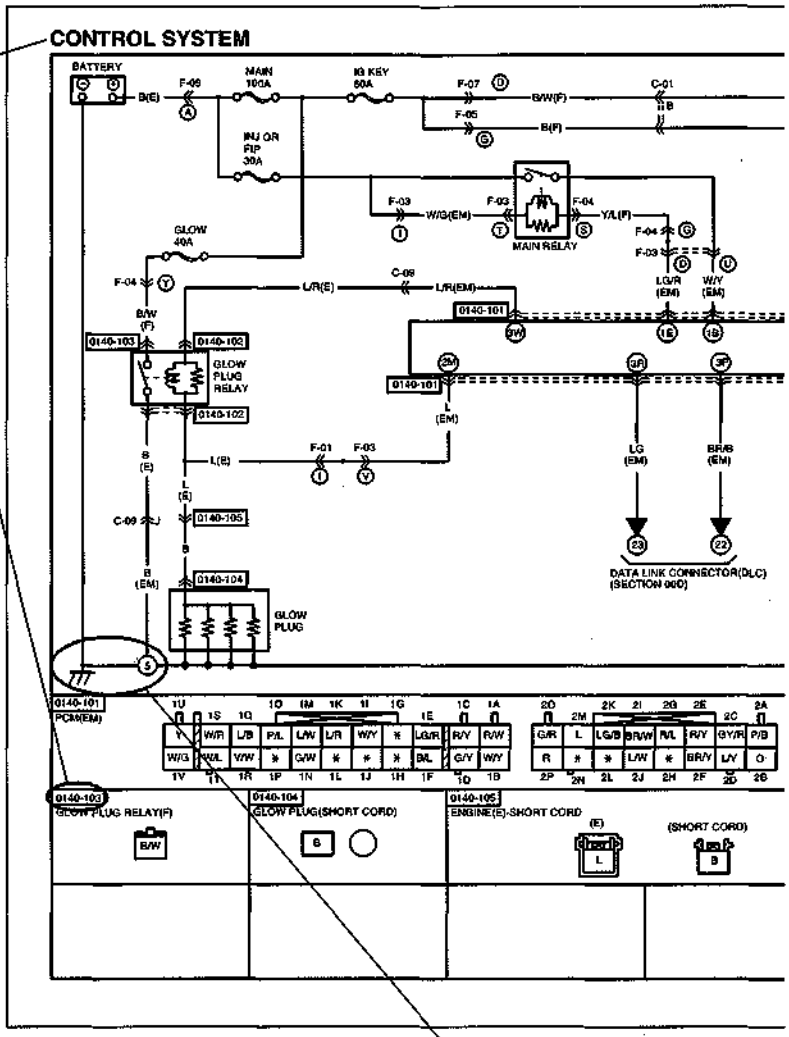


SYSTEM CIRCUIT DIAGRAM/CONNECTOR DIAGRAM

- These diagrams show the circuits for each system, from the power supply to the ground. The power supply side is on the upper part of the page, the ground side on the lower part. The diagrams describe circuits with the ignition switch off.

  Below is an explanation of the various points in the diagram.

System name



Connector code

The prefix letter indicates the system in which the connector is used.

- **F**: Fuse box connectors
- **J**: Joint box/Junction box connectors
- **C**: Common connectors
- **G**: Ground point connectors
- **D**: Data link connector

0112: Cooling system connectors
0114: Fuel system connectors
0117: Charging system connectors
0118: Ignition system connectors
0119: Starting system connectors
0120: Cruise control system connectors
0140: Engine control system connectors
0212: Wheel and tires connectors
0318: 4-Wheel drive connectors
0413: Antilock brake system connectors
0414: Traction control system connectors
0415: Dynamic stability control connectors
0513: Automatic transmission connectors
0514: Automatic transmission shift mechanism connectors
0517: Automatic transaxle connectors
0518: Automatic transaxle shift mechanism connectors
0613: Electric power steering (EPS) connectors
0614: Power steering connectors
0740: Heater, ventilation & air conditioning (HVAC) control system connectors
0810: Air bag system connectors
0811: Seat belt connectors
0912: Glass/Windows/Mirrors connectors
0913: Seats connectors
0914: Security and locks connectors
0915: Sunroof connectors
0918: Lighting systems connectors
0919: Wiper/Washer system connectors
0920: Entertainment connectors
0921: Power systems
0922: Instrumentation/Driver info. Connectors
0940: Control system

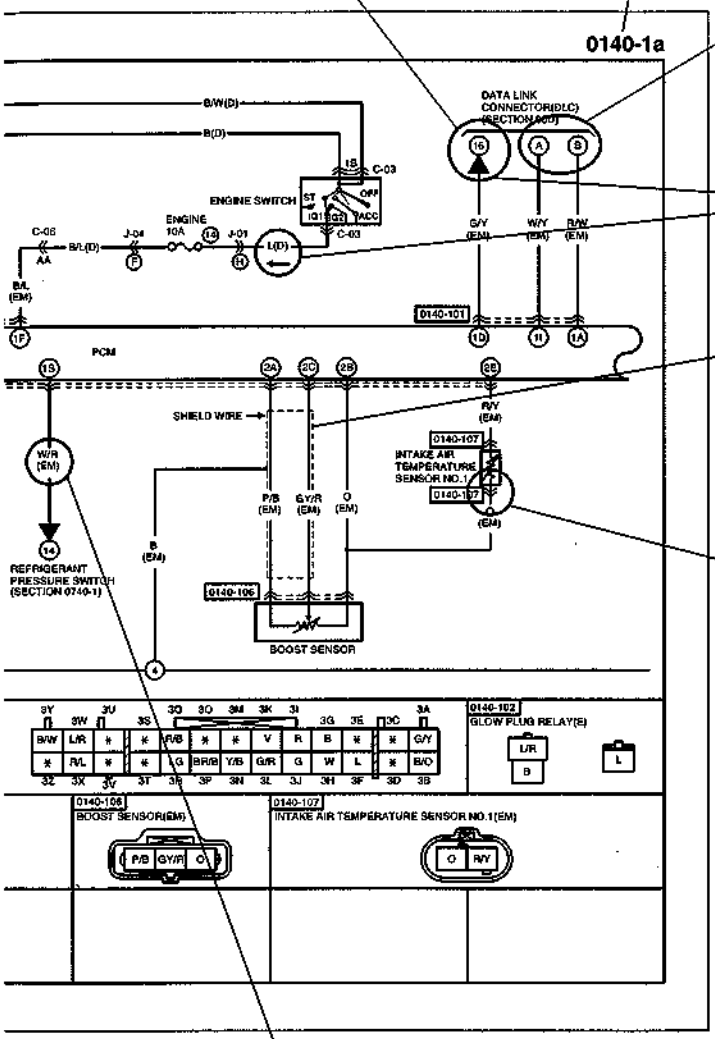
Ground numbers

A harness ground is represented differently than a unit ground.

Types of grounds	Symbol
Harness	
Unit	

The number indicates that the circuit continues to the related system diagram.

System code



Multiplex communication

Indicates communication with connected parts. Signals are transmitted back and forth between connected parts.

Current symbol

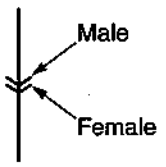
Current flows in the direction of the arrow.

Indicates shielded wire.*

* Shielded wire :
Prevents signal disturbances from electrical interference.
Wire is covered by a metal meshing for grounding.

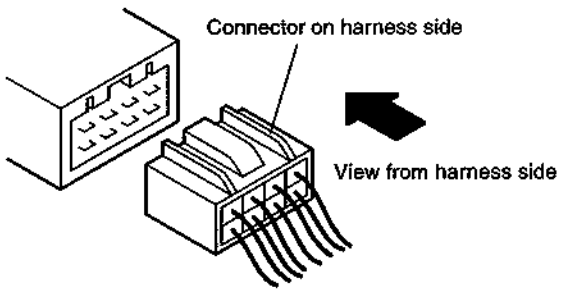
Connector symbols

- Male and female connectors are represented as follows in the circuit and connector diagrams.

		Circuit diagram symbol	Connector diagram symbol
Male			
Female			

- Like connectors are linked by dashed lines between the connector symbols.
- Connector diagrams show connectors on the harness side. The terminal indicates the view from the harness side.

(Example)

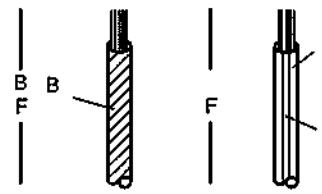


- Colors for connectors except white are given in locations.
- Unused terminals are indicated by *.

Wire color code (harness symbol)

- Two-color wires are indicated by a two-letter symbol.The first indicates the base color of the wire, the second the color of the stripe.
  For example:
  W/R is a white wire with a red strip
  BR/Y is a brown wire with a yellow strip

Symbol
(Example)



- The harness symbol is in ( ) following the harness symbols (refer to P-9.).

ROUTING DIAGRAM

- The routing diagram shows where electrical components are on the system circuit diagram by call out line and connector symbols.

Connector symbol

Shows the system that uses the connector.

(Example)

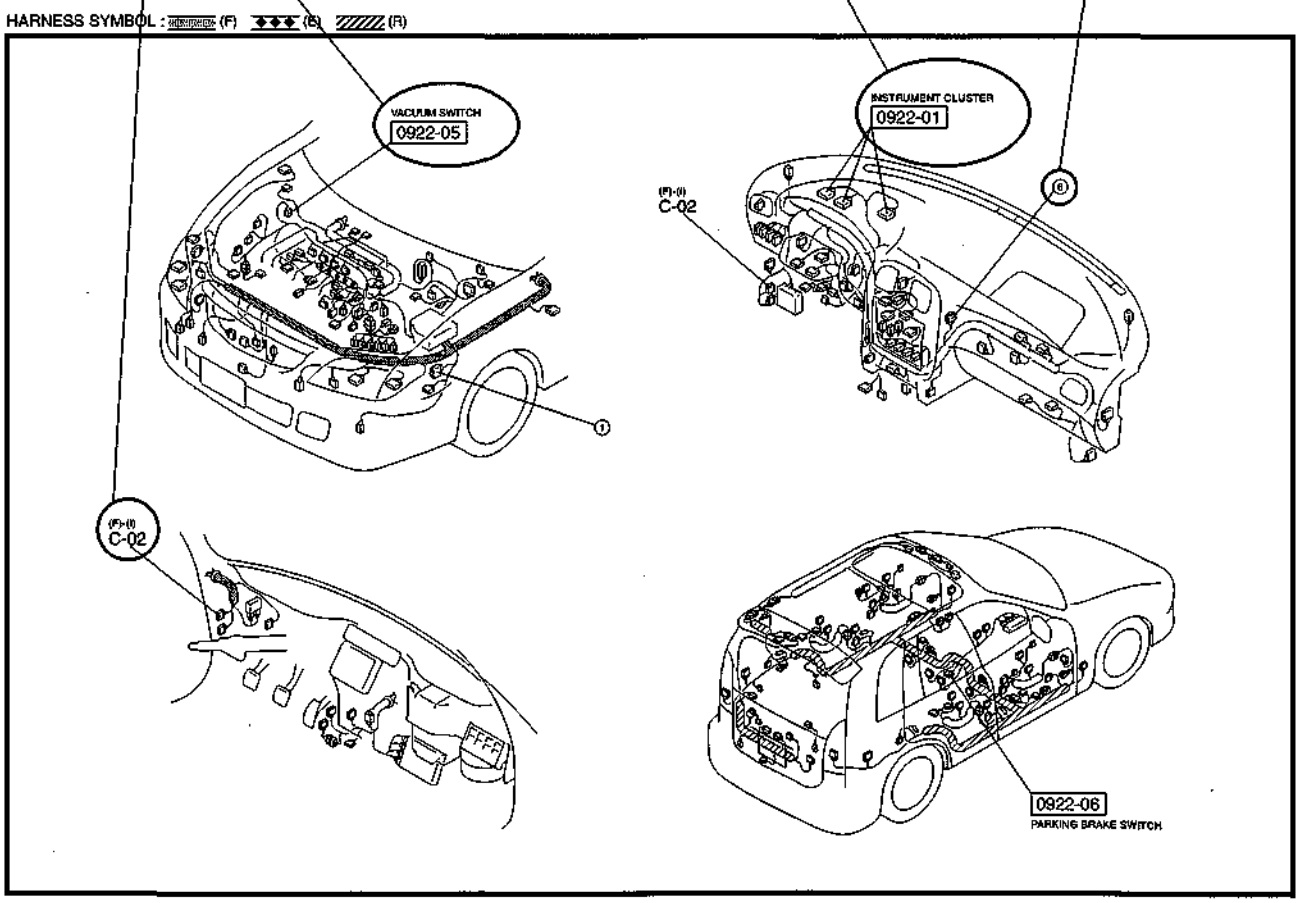
Connector	Symbol
Common connectors	C-02
System connectors	0922-05

Component name

Shows the names of components in routing diagrams.

Ground symbol

Shows the ground in system diagrams.



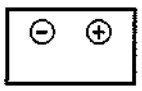
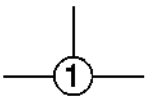
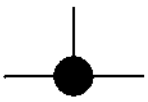
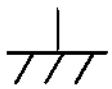
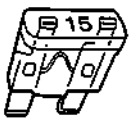
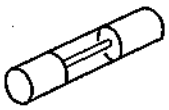
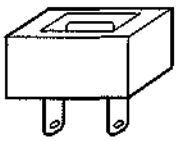
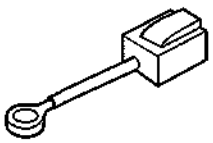
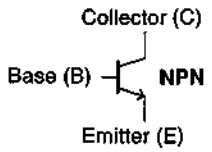
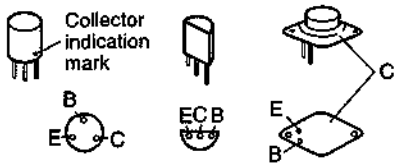
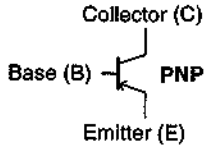
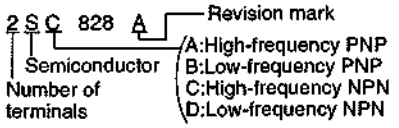
HARNESS SYMBOLS

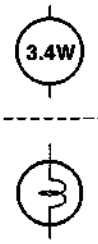
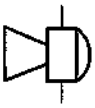
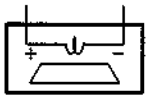
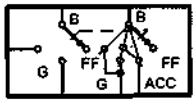
DESCRIPTION OF HARNESS	SYMBOL		DESCRIPTION OF HARNESS	SYMBOL	
FRONT HARNESS	(F)		DOOR No. 1 HARNESS	(DR1)	—
FRONT No. 2 HARNESS	(F2)		DOOR No. 2 HARNESS	(DR2)	
ENGINE HARNESS	(E)		DOOR No. 3 HARNESS	(DR3)	
DASH HARNESS	(D)		DOOR No. 4 HARNESS	(DR4)	
REAR HARNESS	(R)		FLOOR HARNESS	(FR)	—
REAR No. 2 HARNESS	(R2)		INTERIOR LIGHT HARNESS	(IN)	—
REAR No. 3 HARNESS	(R3)		A/C HARNESS	(AC)	—
INSTRUMENT PANEL HARNESS	(I)	—	INJECTION HARNESS	(INJ)	—
EMISSION HARNESS	(EM)		HAND BRAKE HARNESS	(HB)	—
EMISSION No. 2 HARNESS	(EM2)	—			
EMISSION No. 3 HARNESS	(EM3)				

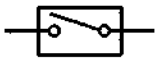
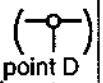
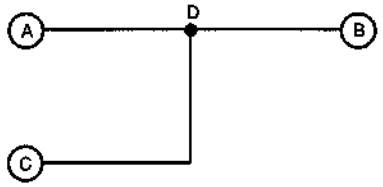
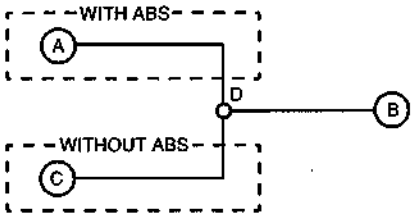
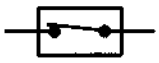
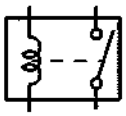
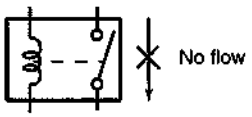
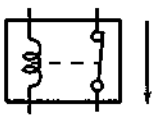
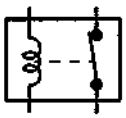
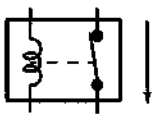
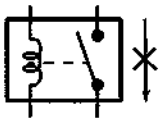
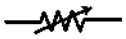
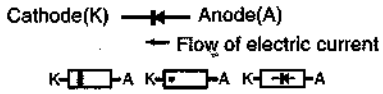
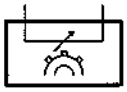
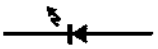
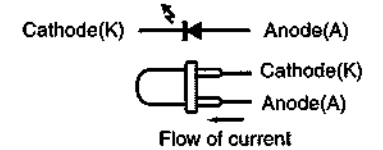
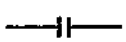
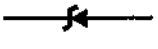
WIRING COLOR CODE

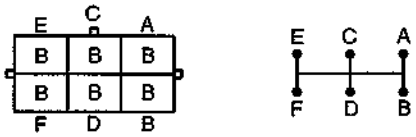
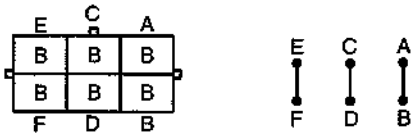
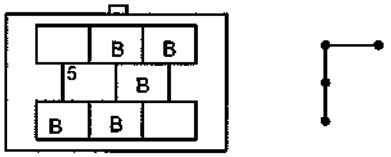
COLOR	CODE	COLOR	CODE
BLACK	B	ORANGE	O
BLUE	L	PINK	P
BROWN	BR	RED	R
DARK BLUE	DL	SKY BLUE	SB
DARK GREEN	DG	TAN	T
GRAY	GY	VIOLET	V
GREEN	G	WHITE	W
LIGHT BLUE	LB	YELLOW	Y
LIGHT GREEN	LG		

SYMBOLS

Symbol	Meaning
Battery 	• Generates electricity through chemical reaction. • Supplies direct current to circuits.
Ground (1) 	• Connecting point to vehicle body or other ground wire where current flows from positive to negative terminal of battery. • Ground (1) indicates a ground point to body through wire harness. • Ground (2) indicates point where component is grounded directly to body. Remarks • Current will not flow through a circuit if ground is faulty.
Ground (2) 	
Ground (3) 	
Fuse	• Melts when current flow exceeds that specified for circuit, interrupts current flow. Precautions • Do not replace with fuses exceeding specified capacity. <Blade type>  <Tube type> 
Fuse (For high current fuse)/ Fusible link	<Cartridge type>  <Fusible link> 
Transistor (1) 	• Electrical switching component. • Turns on when voltage is applied to the base (B). 
Transistor (2) 	• Reading code. 

Symbol	Meaning
Light 	• Emits light and generates heat when current flows through filament.
Resistance	• A resistor with a constant value. • Mainly used to protect electrical components in circuits by maintaining rated voltage.
Motor	• Converts electrical energy into mechanical energy.
Pump	• Pulls in and discharges gases and liquids.
Cigarette lighter	• Electrical coil that generates heat.
Accessory socket	• Interior power supply.
Horn 	• Generates sound when current flows.
Speaker 	
Heater	• Generates heat when current flows.
Ignition switch 	• Turning ignition key switches circuit to operate various component. (NOTE) Ignition switch is called engine switch on diesel vehicles.

Symbol	Meaning	Symbol	Meaning
Switch (1)  Normally open	• Allows or breaks current flow by opening and closing curcuits.	Harness **Connection** When circuit C-D is connected to circuit A-B, the connection D is indicated by a black dot. **Selection**  Diversion point D for the different circuits according to the vehicle's specification is indicated by a white dot.	 For vehicles with ABS, use the A-B circuit.  For vehicles without ABS, use the C-B circuit.
Switch (2)  Normally closed			
Autostop switch 	• Automatically shuts off circuit when certain conditions are met.		
Relay (1)  Normally open	• Current flowing through coil produces electromagnetic force causing contact to open or close. No current to coil  Current to coil 		
Relay (2)  Normally closed	• Current flowing through coil produces electromagnetic force causing contact to close. No current to coil  Current to coil 		
Sensor (1) 	• Detects characteristics such as intake manifold vacuum and airflow amount according to resistance variation.	Solenoid 	• Current flowing through coil generates electromagnetic force to operate plungers.
Sensor (2) 	• Detects resistance variation according to operation of other parts.	Diode 	• Known as a semiconductor rectifier, the diode allows current flow in one direction only. 
Sensor (3) 	• A resistor whose resistance variation according to temperature variation. • When temperature increases, resistance decreases.		
Sensor (4) 	• Detects pulse signals from rotating object.	Light-emitting diode (LED) 	• A diode that lights when current flows. • Unlike ordinary bulbs, the diode does not generate heat when lit. 
Sensor (5) 	• Generates potential difference when tension or pressure is applied.		
Capacitor 	• Component that temporarily stores electrical charge.	Reference diode (Zener diode) 	• Allows current to flow in one direction up to a certain voltage; allows current to flow in the other direction once that voltage is exceeded.

Symbol	Meaning
Extent of the change in the wiring position (1) 	• The wiring position can be exchanged freely within the connector.
Extent of the change in the wiring position (2) 	• The wiring position can be exchanged according to the following combinations only. Between A and B, Between C and D, Between E and F
Extent of the change in the wiring position (3) 	• The wiring position can be exchanged according to the following combinations only. Between 1, 2, 4 and 7. • The wiring positions may be indicated by numbers for some connectors.

ABBREVIATIONS USED IN THIS MANUAL

3GR	THIRD GEAR
4GR	FOURTH GEAR
A	AMPERE
A/C	AIR CONDITIONING
A/F	AIR FUEL
AAS	AUTO ADJUSTING SUSPENSION
ABS	ANTI-LOCK BRAKING SYSTEM
ACC	ACCESSORIES
ACV	AIR CONTROL VALVE
ADD	ADDITIONAL
AIS	AIR INJECTION SYSTEM
ALL	AUTOMATIC LOAD LEVELING
AM	AMPLITUDE MODULATION
AMP	AMPLIFIER
ANT	ANTENNA
ASV	AIR SUPPLY VALVE
AT	AUTOMATIC TRANSMISSION
ATX	AUTOMATIC TRANSAXLE
B+	BATTERY POSITIVE VOLTAGE
BAC	BYPASS AIR CONTROL
CAN	CONTROLLER AREA NETWORK
CIGAR	CIGARETTE
CIS	CONTINUOUS FUEL INJECTION SYSTEM
CKP	CRANKSHAFT POSITION SENSOR
CM	CONTROL MODULE
CMP	CAMSHAFT POSITION SENSOR

COMBI	COMBINATION
CON	CONDITIONER
CONT	CONTROL
CPU	CENTRAL PROCESSING UNIT
DEF	DEFROSTER
DI	DISTRIBUTOR IGNITION
DLC	DATA LINK CONNECTOR
DLI	DISTRIBUTORLESS IGNITION
DOHC	DOUBLE-OVERHEAD CAMSHAFT
DRL	DAYTIME RUNNING LIGHT
DTC	DIAGNOSTIC TROUBLE CODE(S)
DTM	DIAGNOSTIC TEST MODE
ECPS	ELECTRONICALLY CONTROLLED POWER STEERING
ECT	ENGINE CONTROL TEMPERATURE
EGR	EXHAUST GAS RECIRCULATION
EHPAS	ELECTRO HYDRAULIC POWER ASSIST STEERING
EI	ELECTRONIC IGNITION
ELEC	ELECTRIC
ELR	EMERGENCY LOCKING RETRACTOR
ET	ELECTRONIC THROTTLE
EPS	ELECTRIC POWER STEERING
EVAP	EVAPORATIVE EMISSION
F	FRONT
F/I	FUEL INJECTOR
FICB	FAST-IDLE CAM BREAKER

FM	FREQUENCY MODULATION
FP	FUEL PUMP
FPR	FUEL PUMP RELAY
GEN	GENERATOR
GND	GROUND
H/D	HEATER/DEFROSTER
HEAT	HEATER
HI	HIGH
HO2S	HEATED OXYGEN SENSOR
HS	HIGH SPEED
HU	HYDRAULIC UNIT
IAC	IDLE AIR CONTROL
IAT	INTAKE AIR TEMPERATURE
IG	IGNITION
ILLUMI	ILLUMINATION
INT	INTERMITTENT
JB	JOINT BOX
KS	KNOCK SENSOR
LCD	LIQUID CRYSTAL DISPLAY
LF	LEFT FRONT
LH	LEFT HAND
LO	LOW
LR	LEFT REAR
M	MOTOR
MAF	MASS AIR FLOW
MAP	MANIFOLD ABSOLUTE PRESSURE
MFI	MULTIPORT FUEL INJECTION
MID	MIDDLE
MIL	MALFUNCTION INDICATOR LAMP
MIN	MINUTE
MIX	MIXTURE
MPX	MULTIPLEX
MS	MIDDLE SPEED
MT	MANUAL TRANSMISSION
MTX	MANUAL TRANSAXLE
N	NEUTRAL
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
O_2S	OXYGEN SENSOR
OBD	ON-BOARD DIAGNOSTIC
O/D	OVER DRIVE
OFF	SWITCH OFF
ON	SWITCH ON
OSC	OSCILLATOR
P	POWER
P/S	POWER STEERING
PCM	POWERTRAIN CONTROL MODULE
PJB	PASSENGER JUNCTION BOX

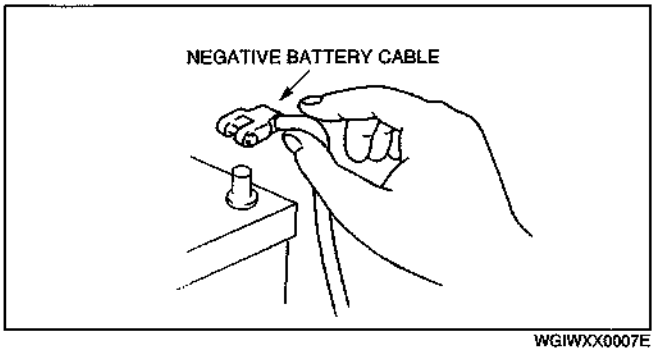
PNP	PARK/NEUTRAL POSITION
PRC	PRESSURE REGULATOR CONTROL
PRG	PURGE SOLENOID VALVE
PSP	POWER STEERING PRESSURE
PTC	POSITIVE TEMPERATURE COEFFICIENT HEATER
PWM	PULSE WIDTH MODULATION
QSS	QUICK-START SYSTEM
R	REAR
REC	RECIRCULATION
RF	RIGHT FRONT
RH	RIGHT HAND
RPM	REVOLUTIONS PER MINUTE
RR	RIGHT REAR
SAS	SOPHISTICATED AIR BAG SENSOR
SFI	SEQUENTIAL MULTIPOINT FUEL INJECTION
SOL	SOLENOID
SPV	SPILL VALVE
ST	START
SW	SWITCH
TC	TURBOCHARGER
TCC	TORQUE CONVERTER CLUTCH
TCM	TRANSMISSION(TRANSAXLE) CONTROL MODULE
TCS	TRACTION CONTROL SYSTEM
TEMP	TEMPERATURE
TFT	TRANSAXLE FLUID TEMPERATURE
TICS	TRIPLE INDUCTION CONTROL SYSTEM
TNS	TAIL NUMBER SIDE LIGHTS
TP	THROTTLE POSITION SENSOR
TR	TRANSMISSION(TRANSAXLE) RANGE
TWS	TOTAL WIRING SYSTEM
V	VOLT
VAF	VOLUME AIR FLOW SENSOR
VENT	VENTILATION
VICS	VARIABLE INERTIA CHARGING SYSTEM
VOL	VOLUME
VR	VOLTAGE REGULATOR
VRIS	VARIABLE RESONANCE INDUCTION SYSTEM
VSS	VEHICLE SPEED SENSOR
VTCS	VARIABLE TUMBLE CONTROL SYSTEM
W	WATT(S)
WOT	WIDE OPEN THROTTLE

ELECTRICAL PARTS

B6U000000006W03

Battery Cable

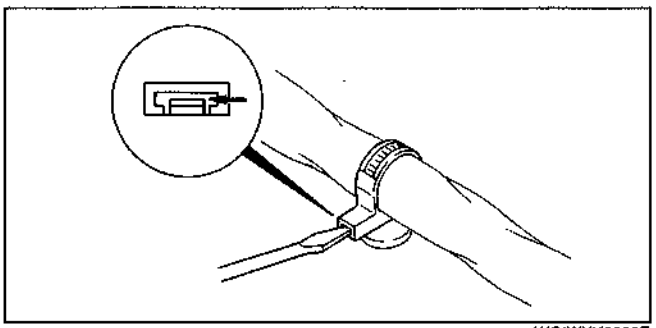
- Before disconnecting connectors or removing electrical parts, disconnect the negative battery cable.



WGIWXX0007E

Wiring Harness

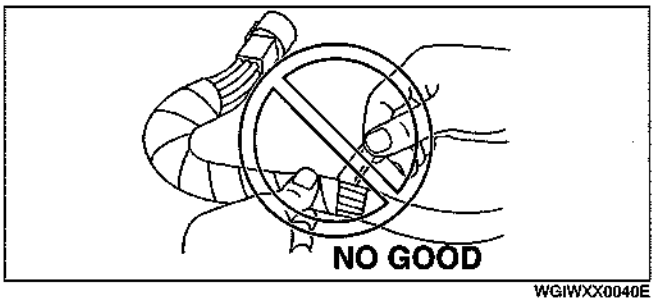
- To remove the wiring harness from the clip in the engine room, pry up the hook of the clip using a flathead screwdriver.



WGIWXX0039E

Caution

- **Do not remove the Harness protective tape. Otherwise, the wires could rub against the body, which could result in water penetration and electrical shorting.**



WGIWXX0040E

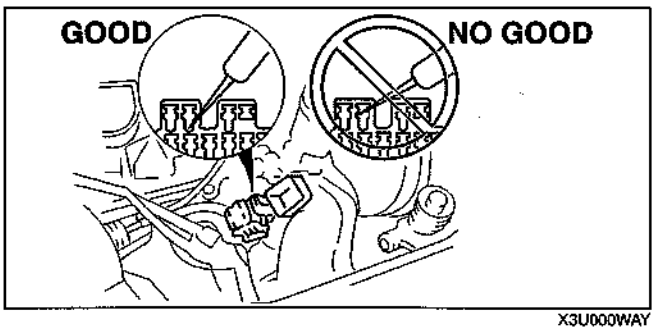
CONNECTORS

Data Link Connector

- Insert the probe into the terminal when connecting a jumper wire to the data link connector.

Caution

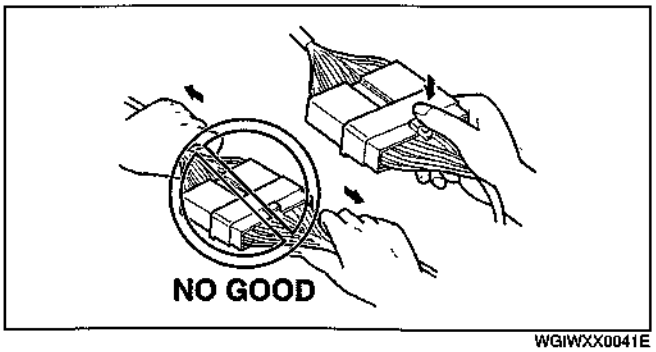
- **Inserting a jumper wire probe into the data link connector terminal may damage the terminal.**



X3U000WAY

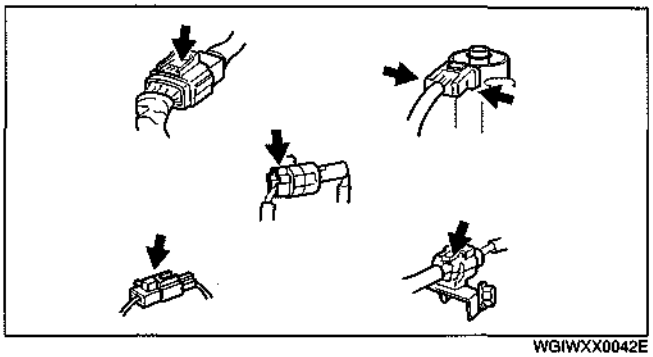
Disconnecting Connectors

- When disconnecting connector, grasp the connectors, not the wires.



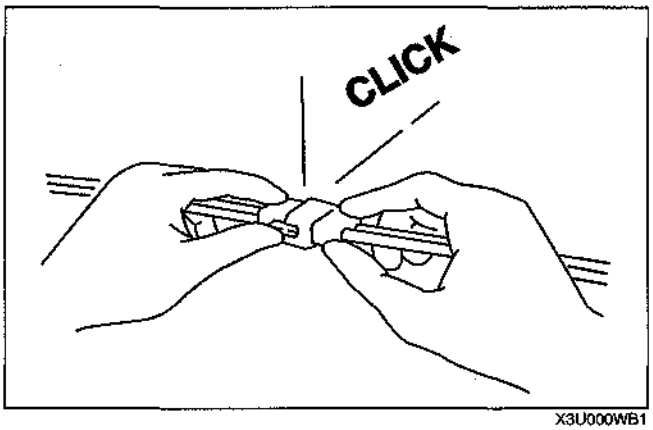
WGIWXX0041E

- Connectors can be disconnected by pressing or pulling the lock lever as shown.


WGIWXX0042E

Locking Connector

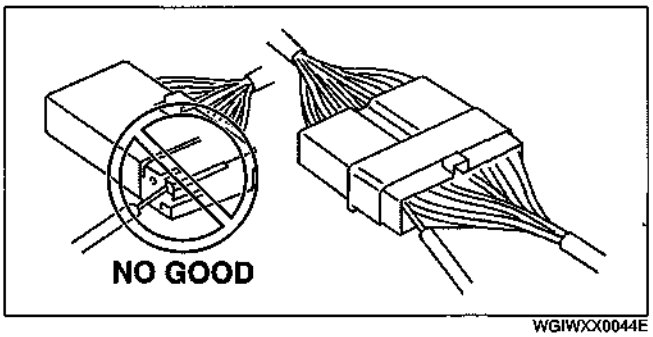
- When locking connectors, listen for a click indicating they are securely locked.



X3U000WB1

Inspection

- When a tester is used to inspect for continuity or measuring voltage, insert the tester probe from the wiring harness side.

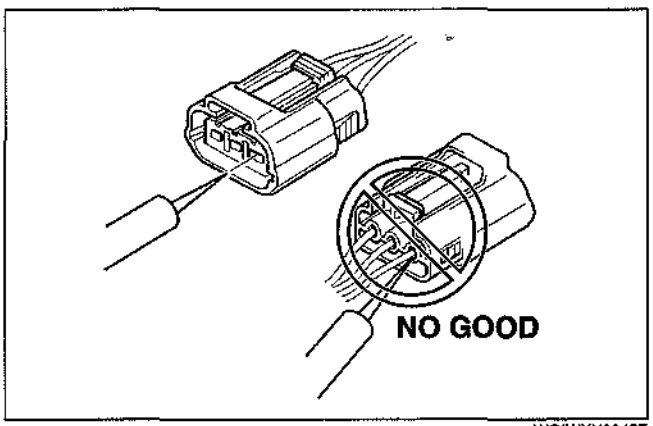


WGIWXX0044E

- Inspect the terminals of waterproof connectors from the connector side since they cannot be accessed from the wiring harness side.

Caution

- **To prevent damage to the terminal, wrap a thin wire around the tester probe before inserting into terminal.**

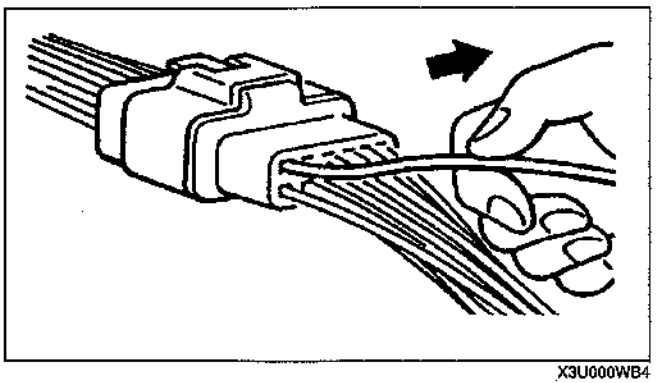


WGIWXX0045E

Terminals

Inspection

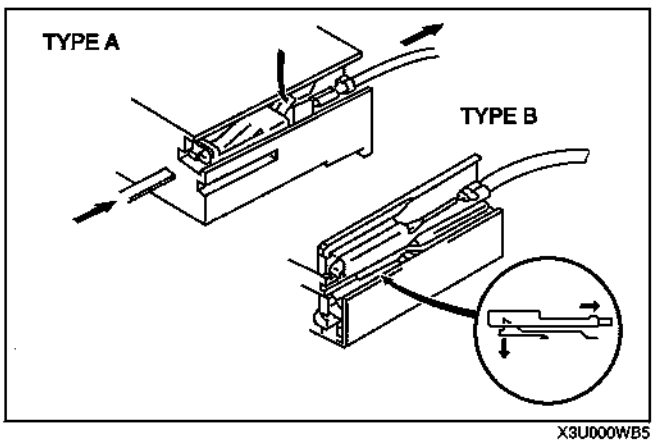
- Pull lightly on individual wires to verify that they are secured in the terminal.



X3U000WB4

Replacement

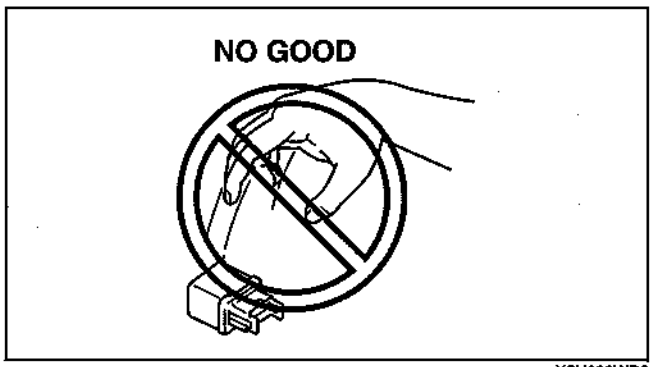
- Use the appropriate tools to remove a terminal as shown. When installing a terminal, be sure to insert it until it locks securely.
- Insert a thin piece of metal from the terminal side of the connector and with the terminal locking tab pressed down, pull the terminal out from the connector.



X3U000WB5

Sensors, Switches, And Relays

- Handle sensors, switches, and relays carefully. Do not drop them or strike them against other objects.

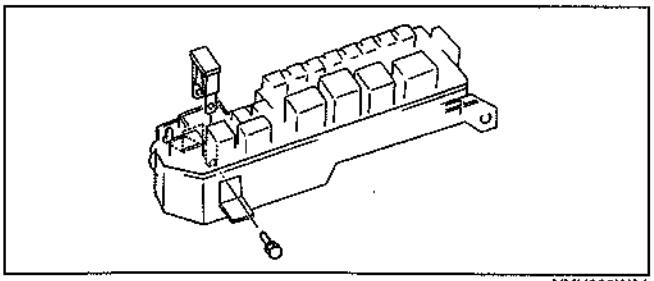


X3U000WB6

Fuse

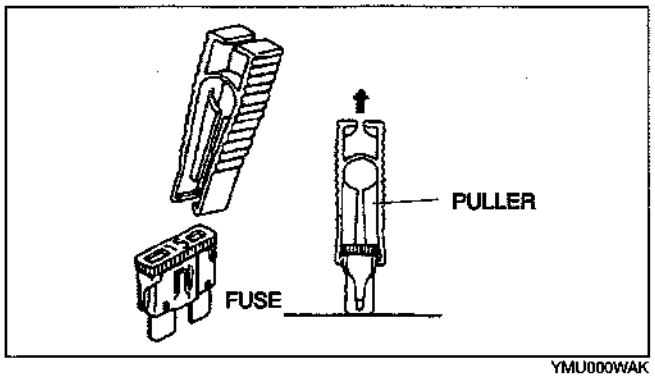
Replacement

- When replacing a fuse, be sure to replace it with one of the same capacity. If a fuse fails again, the circuit probably has a short and the wiring should be inspected.
- Be sure the negative battery terminal is disconnected before replacing a main fuse.



YMU000WA1

- When replacing a pullout fuse, use the fuse puller.



YMU000WAK

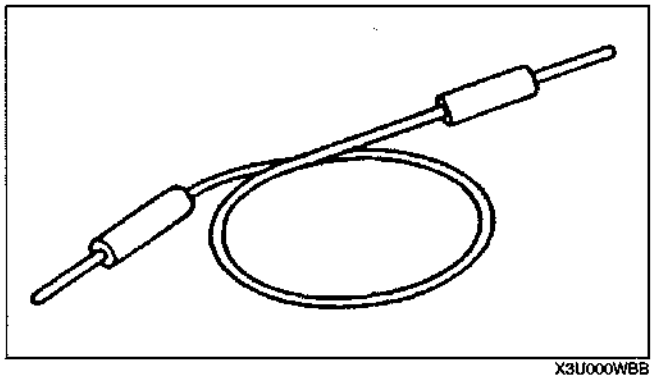
ELECTRICAL TROUBLESHOOTING TOOLS

Jumper Wire

- A jumper wire is used to create a temporary circuit. Connect the jumper wire between the terminals of a circuit to bypass a switch.

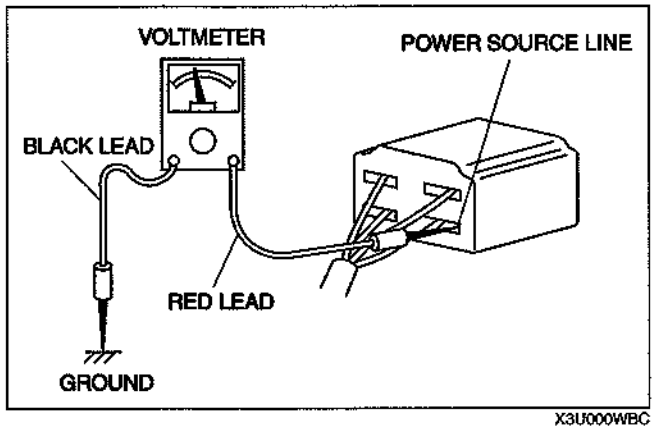
Caution

- **Do not connect a jumper wire from the power source line to a body ground. This may cause burning or other damage to wiring harnesses or electronic components.**


X3U000WBB

Voltmeter

- The DC voltmeter is used to measure circuit voltage. A voltmeter with a range of **15 V or more** is used by connecting the positive (+) probe (red lead wire) to the point where voltage will be measured and the negative (-) probe (black lead wire) to a body ground.



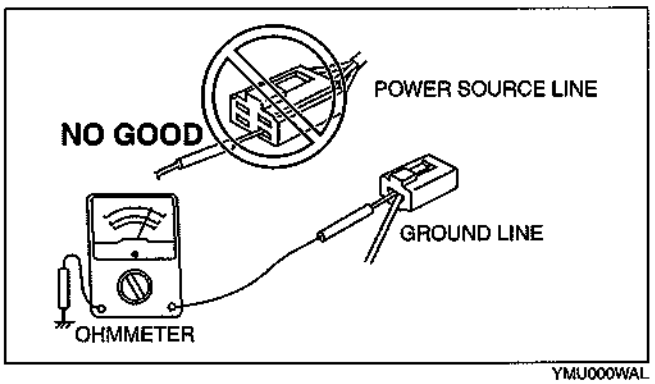
X3U000WBC

Ohmmeter

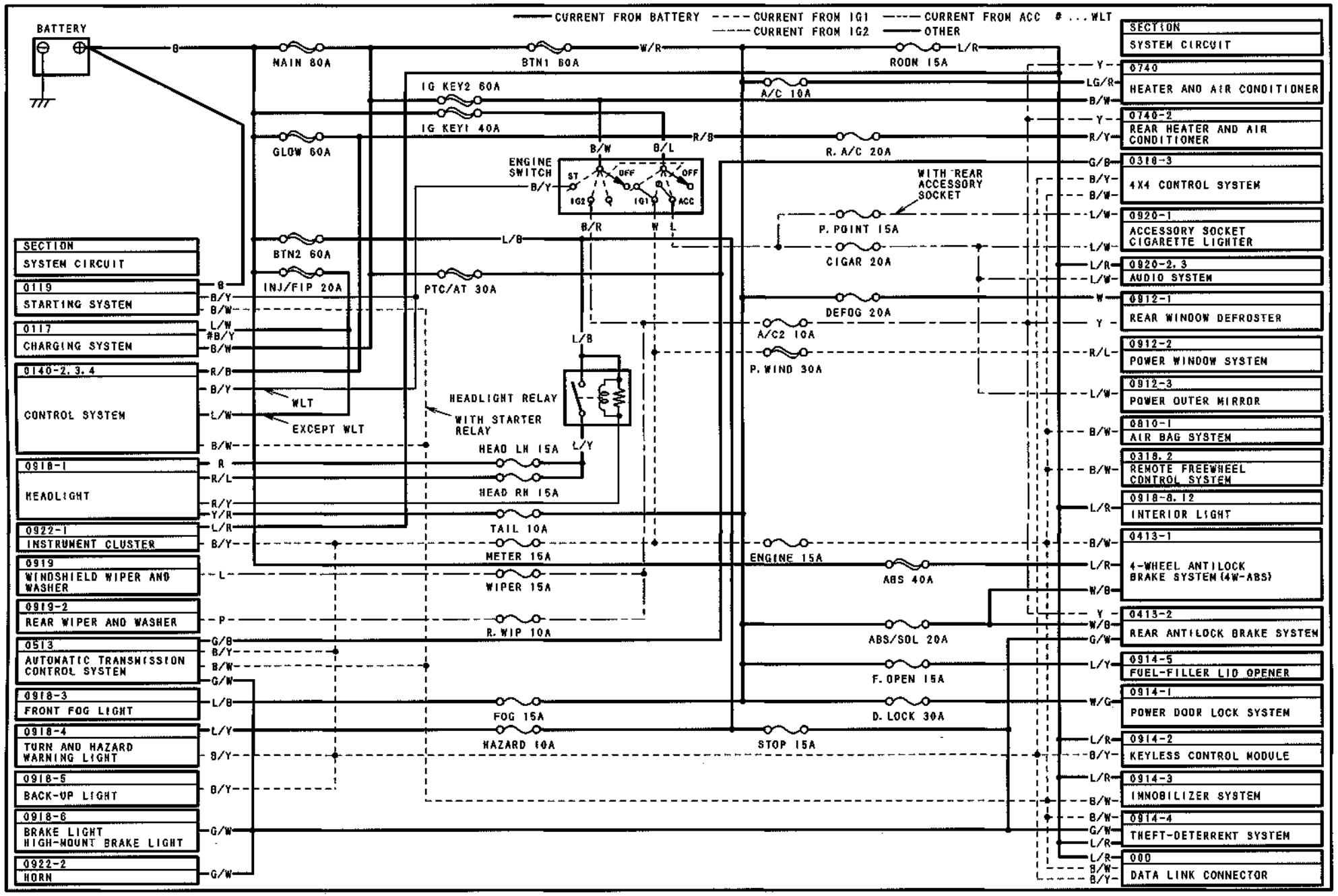
- The ohmmeter is used to measure the resistance between two points in a circuit and to inspect for continuity and short circuits.

Caution

- **Do not connect the ohmmeter to any circuit where voltage is applied. This will damage the ohmmeter.**



YMU000WAL


CURRENT FROM BATTERY
CURRENT FROM IG1
CURRENT FROM ACC
CURRENT FROM IG2
OTHER
... WLT
BATTERY
MAIN 80A
BTN1 80A
ROOM 15A
IG KEY2 60A
A/C 10A
IG KEY1 40A
GLOW 60A
R. A/C 20A
ENGINE SWITCH
WITH REAR ACCESSORY SOCKET
P. POINT 15A
CIGAR 20A
BTN2 60A
INJ/FIP 20A
PTC/AT 30A
DEFOG 20A
A/C2 10A
P. WIND 30A
HEADLIGHT RELAY
WITH STARTER RELAY
WLT
EXCEPT WLT
HEAD LH 15A
HEAD RH 15A
TAIL 10A
METER 15A
ENGINE 15A
WIPER 15A
ABS 40A
R. WIP 10A
ABS/SOL 20A
F. OPEN 15A
D. LOCK 30A
FOG 15A
HAZARD 10A
STOP 15A
SECTION
SYSTEM CIRCUIT
0119 STARTING SYSTEM
0117 CHARGING SYSTEM
0140-2, 3, 4 CONTROL SYSTEM
0918-1 HEADLIGHT
0922-1 INSTRUMENT CLUSTER
0919 WINDSHIELD WIPER AND WASHER
0919-2 REAR WIPER AND WASHER
0513 AUTOMATIC TRANSMISSION CONTROL SYSTEN
0918-3 FRONT FOG LIGHT
0918-4 TURN AND HAZARD WARNING LIGHT
0918-5 BACK-UP LIGHT
0918-6 BRAKE LIGHT HIGH-MOUNT BRAKE LIGHT
0922-2 HORN
0740 HEATER AND AIR CONDITIONER
0740-2 REAR HEATER AND AIR CONDITIONER
0310-3 4X4 CONTROL SYSTEM
0920-1 ACCESSORY SOCKET CIGARETTE LIGHTER
0920-2, 3 AUDIO SYSTEM
0912-1 REAR WINDOW DEFROSTER
0912-2 POWER WINDOW SYSTEM
0912-3 POWER OUTER MIRROR
0810-1 AIR BAG SYSTEM
0318-2 REMOTE FREEWHEEL CONTROL SYSTEM
0918-8, 12 INTERIOR LIGHT
0413-1 4-WHEEL ANTILOCK BRAKE SYSTEM (4W-ABS)
0413-2 REAR ANTILOCK BRAKE SYSTEM
0914-5 FUEL-FILLER LID OPENER
0914-1 POWER DOOR LOCK SYSTEM
0914-2 KEYLESS CONTROL MODULE
0914-3 IMMOBILIZER SYSTEM
0914-4 THEFT-DETERRENT SYSTEM
000 DATA LINK CONNECTOR

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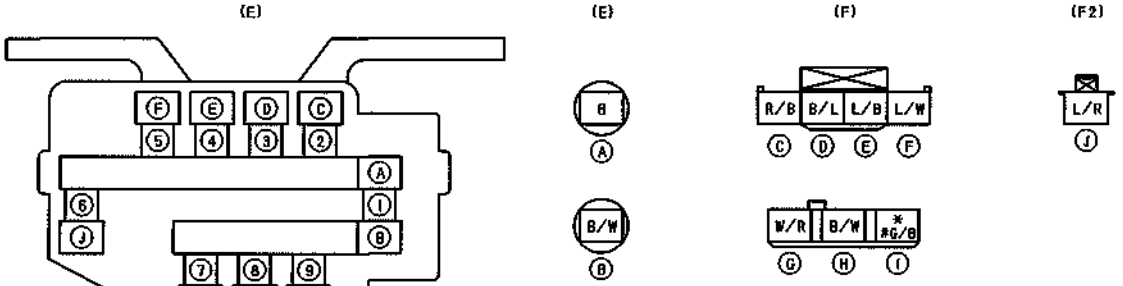
F-01 MAIN FUSE BLOCK

* . . . VACANT
\# . . . AT



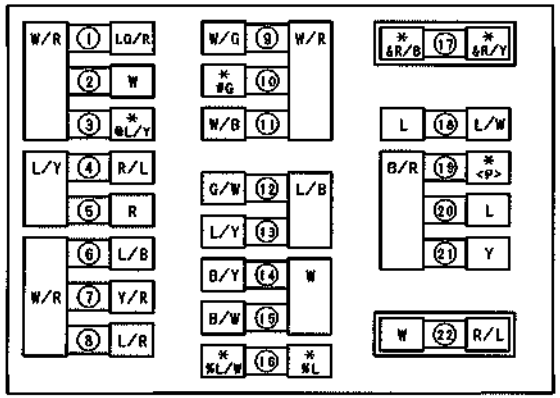
NOTE:SEEN FROM TERMINAL SIDE

NO.	FUSE NAME	FUSE	NO.	FUSE NAME	FUSE
1	MAIN	80A	6	(ABS)	40A
2	(GLOW)	60A	7	BTN1	60A
3	IG KEY1	40A	8	IG KEY2	60A
4	BTN2	60A	9	(PTC/AT)	30A
5	(INJ/FIP)	20A			

( ) IF EQUIPPED

F-02 FUSE BLOCK (F)

* . . . VACANT
\# . . . NOT USED
@ . . . WITH FUEL-FILLER LID OPENER
% . . . WITH REAR ACCESSORY SOCKET
& . . . WITH REAR A/C
< > . . . WITH REAR WIPER AND WASHER



NOTE:SEEN FROM TERMINAL SIDE

NO.	FUSE NAME	FUSE	NO.	FUSE NAME	FUSE
1	(A/C)	10A	12	STOP	15A
2	(DEFOG)	20A	13	HAZARD	10A
3	(F. OPEN)	15A	14	METER	15A
4	HEAD RH	15A	15	ENGINE	15A
5	HEAD LH	15A	16	(P. POINT)	15A
6	(FOG)	15A	17	(R. A/C)	20A
7	TAIL	10A	18	CIGAR	20A
8	ROOM	15A	19	(R. WIP)	10A
9	(D. LOCK)	30A	20	WIPER	15A
10	(P. WIND)	30A	21	(A/C2)	10A
11	(ABS/SOL)	20A	22	(P. WIND)	30A

( ) IF EQUIPPED

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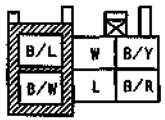
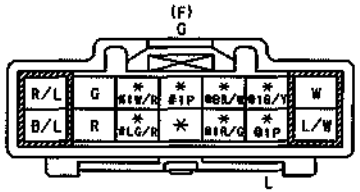
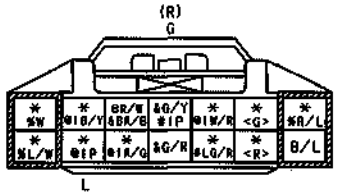
COMMON CONNECTOR LIST

C-01 ENGINE SWITCH (F)



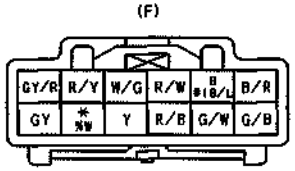
C-02 FRONT (F) -REAR (R)

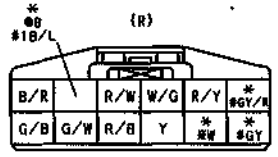




* ... VACANT
# ... WITH THEFT-DETERRENT SYSTEM
@ ... WITH BUCKLE SWITCH
< >... WITH REAR POWER DOOR LOCK SYSTEM
% ... WITH REAR POWER WINDOW SYSTEN
& ... NOT USED
@1... AT
#1... WITH REAR WIPER AND WASHER
%1... 4X4 AT

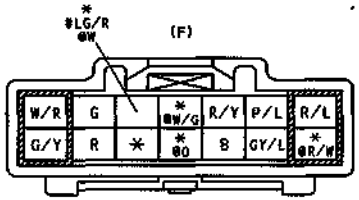
C-03 FRONT (F) -REAR (R)



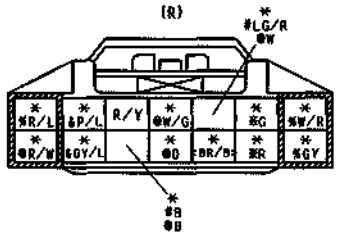


* ... VACANT
# ... WITH REAR SPEAKER
@ ... WITH HIGH-MOUNT BRAKE LIGHT
% ... 4X4 AT
& ... 4X4
#1... WITH FUEL FILLER LID OPENER

C-04 FRONT (F) -REAR (R)

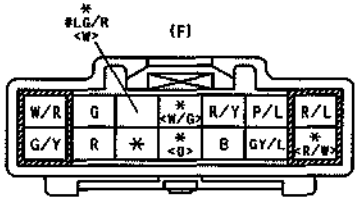


WITH AIR BAG SYSTEN

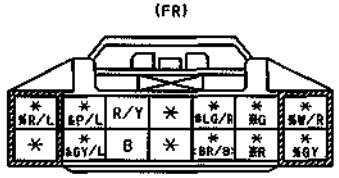


* ... VACANT
# ... WITH THEFT-DETERRENT SYSTEN
@ ... WITH REAR ABS
< >... NOT USED
% ... WITH REAR POWER WINDOW SYSTEM
& ... WITH REAR SPEAKER
※ ... WITH REAR POWER DOOR LOCK SYSTEM

C-04 FRONT (F) -FLOOR (FR)



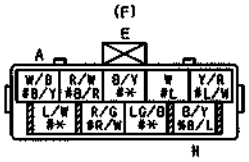
WITHOUT AIR BAG SYSTEN

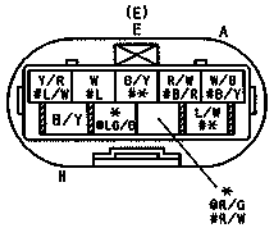


* ... VACANT
# ... WITH THEFT-DETERRENT SYSTEN
< >... NOT USED
% ... WITH REAR POWER WINDOW SYSTEN
& ... WITH REAR SPEAKER
※ ... WITH REAR POWER DOOR LOCK SYSTEM

COMMON CONNECTOR LIST

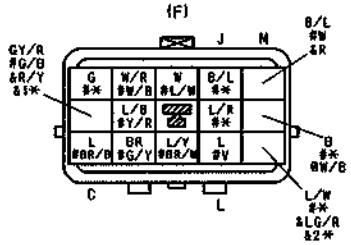
C-05 FRONT (F) -ENGINE (E)

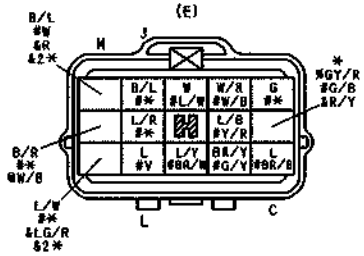




* . . . VACANT
# . . . WLT
@ . . . WL-C, WE-C WITH RFW CONTROL SYSTEM
& . . . WITH STARTER RELAY

C-06 FRONT (F) -ENGINE (E)





* . . . VACANT
# . . . WL-3
% . . . WITH RFW CONTROL SYSTEM
& . . . 4X4 AT
&1 . . . 4X2
@ . . . AT
&2 . . . 4X2 AT

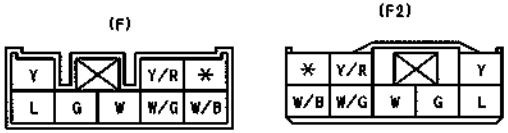
C-07 FRONT (F) -INTERIOR LIGHT (IN)

C-08 FRONT (F) -FRONT No. 2 (F2)

* . . . VACANT
# . . . NOT USED

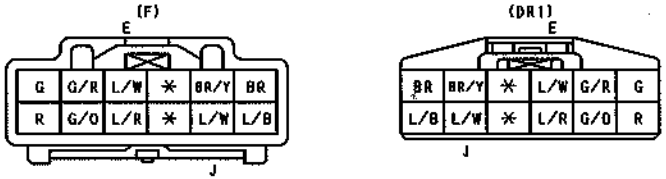
C-09 FRONT (F) -FRONT No. 2 (F2)

* . . . VACANT



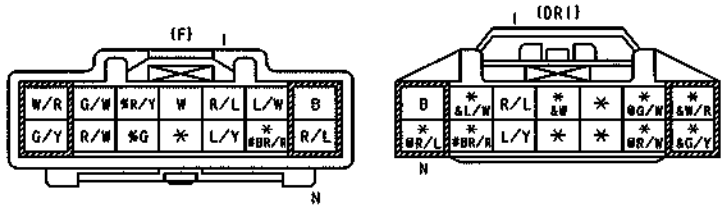
C-10 FRONT (F) -DOOR No. 1 (DR1)

* . . . VACANT



C-11 FRONT (F) -DOOR No. 1 (DR1)

* . . . VACANT
# . . . WITH THEFT-DETERRENT SYSTEM
@ . . . WITH POWER WINDOW SYSTEM
& . . . WITH REAR POWER WINDOW SYSTEM
% . . . NOT USED



COMMON CONNECTOR LIST

C-12 FRONT (F) -DOOR No. 2 (DR2)

* ... VACANT
# ... WITH THEFT-DETERRENT SYSTEM
@ ... WITH POWER WINDOW SYSTEM

C-13 REAR (R) -REAR No. 2 (R2)

* ... VACANT
# ... WITH REAR ABS
@ ... WITH 4WABS
% ... BARE WIRE
< >... DOUBLE CAB WITH REAR ABS
※ ... NOT USED

C-14 REAR (R) -FRONT No. 2 (F2)

* ... VACANT

C-15 REAR (R) -DOOR No. 3 (DR3)

C-16 REAR (R) -DOOR No. 3 (DR3)

C-17 REAR (R) -DOOR No. 4 (DR4)

WITH AIR BAG SYSTEM

C-17 FLOOR (FR) -DOOR No. 4 (DR4)

... NOT USED

WITHOUT AIR BAG SYSTEM

COMMON CONNECTOR LIST

C-18 REAR (R) -DOOR No. 4 (DR4)

C-19 REAR (R) -DOOR No. 3 (DR3)

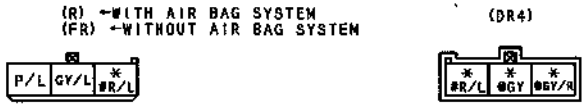
* ... VACANT
# ... WITH REAR POWER WINDOW SYSTEM
@ ... WITH REAR SPEAKER

C-20 REAR (R) -DOOR No. 3 (DR3)

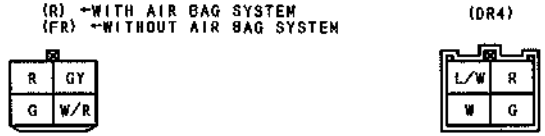
C-21 REAR (R) -DOOR No. 3 (DR3)

C-22 REAR (R) -DOOR No. 4 (DR4) ←WITH AIR BAG SYSTEM
FLOOR (FR) -DOOR No. 4 (DR4) ←WITHOUT AIR BAG SYSTEM

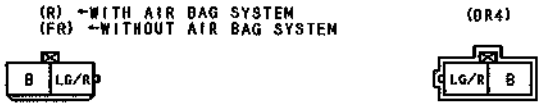
* ... VACANT
# ... WITH REAR POWER WINDOW SYSTEM
@ ... WITH REAR SPEAKER



C-23 REAR (R) -DOOR No. 4 (DR4) ←WITH AIR BAG SYSTEM
FLOOR (FR) -DOOR No. 4 (DR4) ←WITHOUT AIR BAG SYSTEM

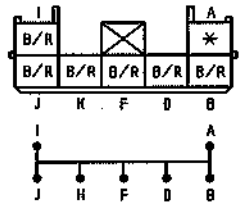


C-24 REAR (R) -DOOR No. 4 (DR4) ←WITH AIR BAG SYSTEM
FLOOR (FR) -DOOR No. 4 (DR4) ←WITHOUT AIR BAG SYSTEM



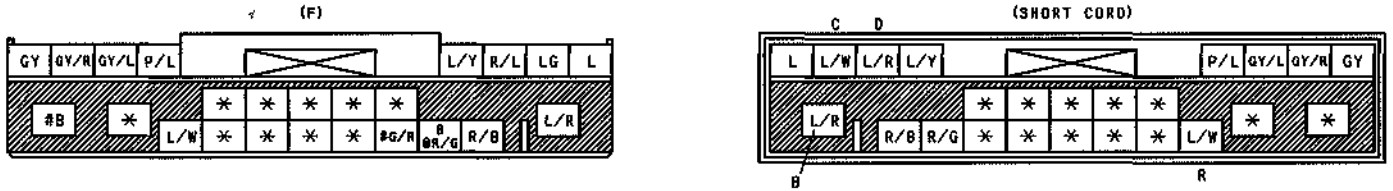
C-25 JOINT CONNECTOR (F)

* ... VACANT



C-26 FRONT (F) -SHORT CORD

* ... VACANT
# ... NOT USED
@ ... WITH PANEL LIGHT CONTROL SYSTEM

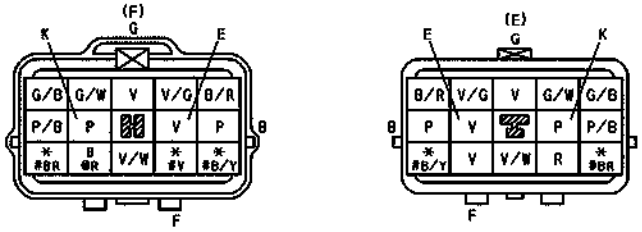


COMMON CONNECTOR LIST

C-28 FRONT (F) -REAR (R)

C-29 FRONT (F) -ENGINE (E)

C-30 FRONT (F) -ENGINE (E)



* ... VACANT
# ... 4X4 AT
⊛ ... WITH STARTER CUT SYSTEM

C-31 FRONT (F) -ENGINE (E)

C-32 REAR (R) -REAR No. 4 (R4)

* ... VACANT
# ... WITH THEFT-DETERRENT SYSTEM

C-33 REAR (R) -REAR No. 4 (R4)

* ... VACANT

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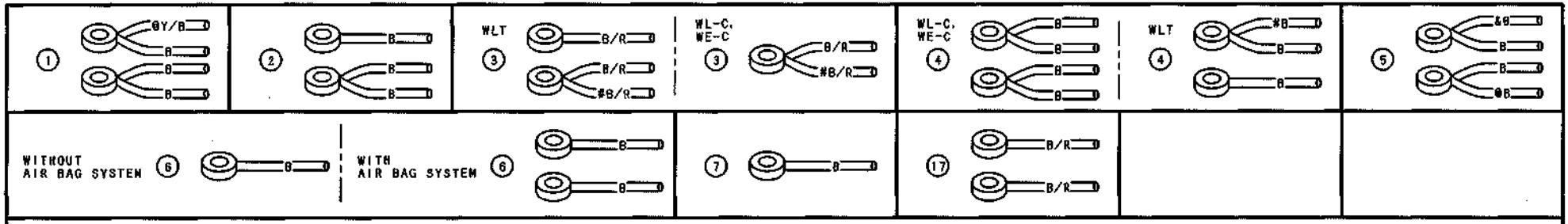
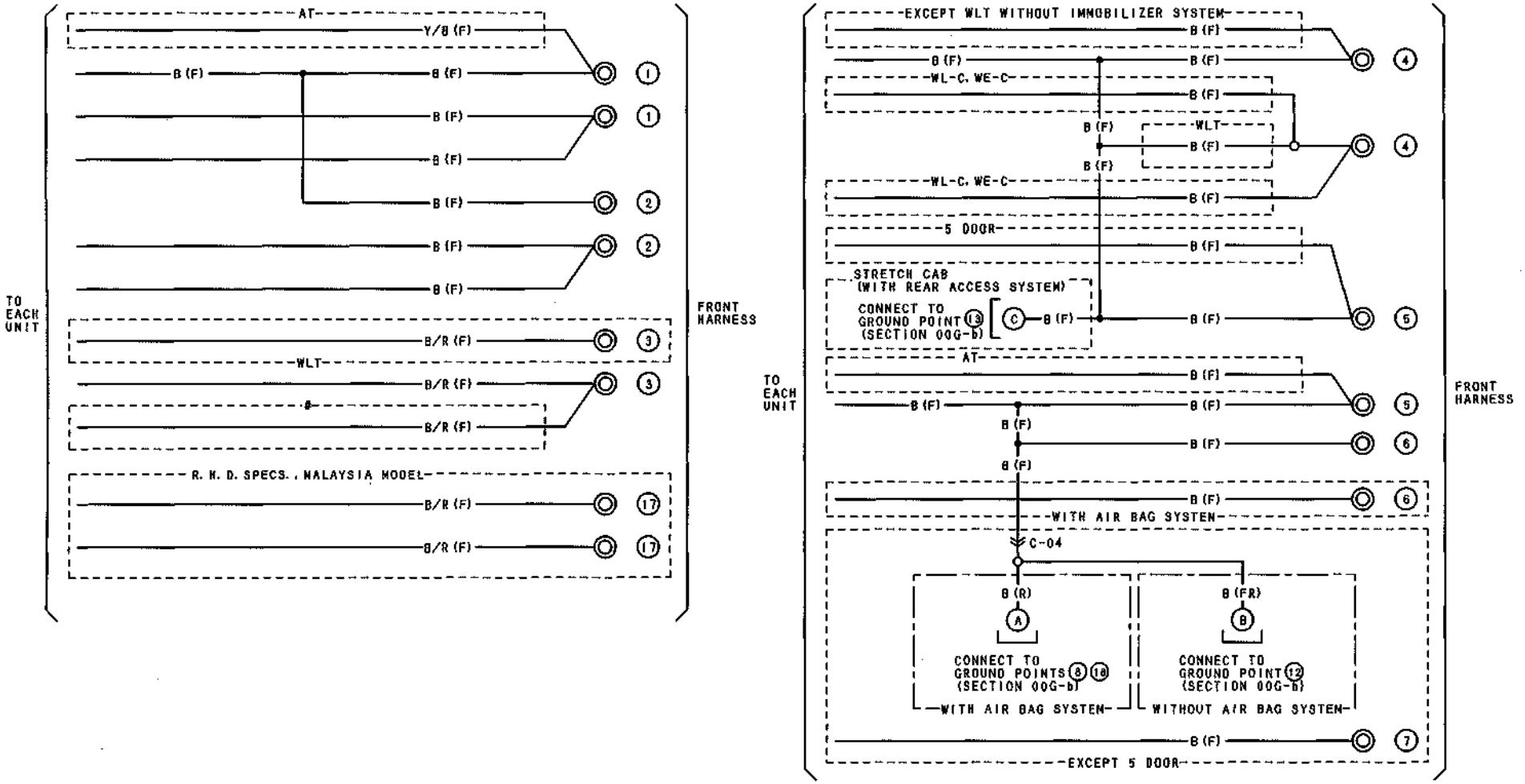
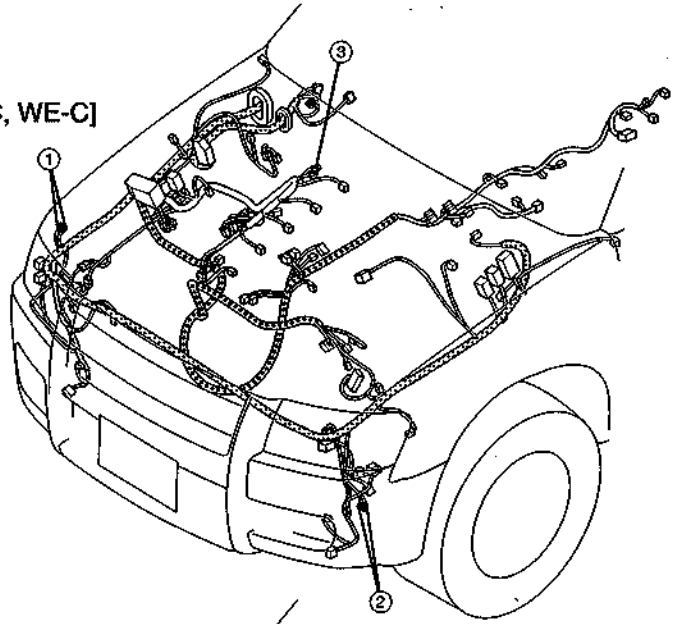
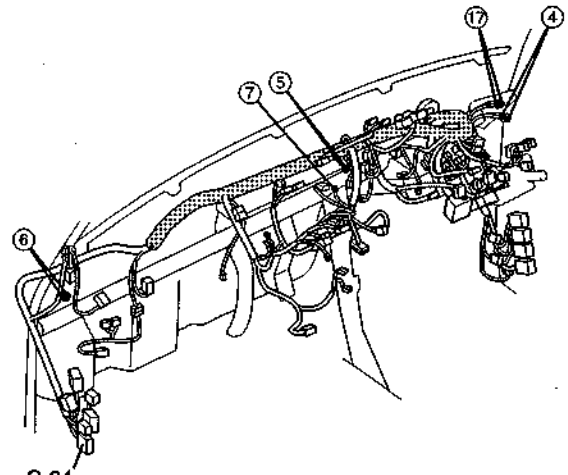
GROUND POINT





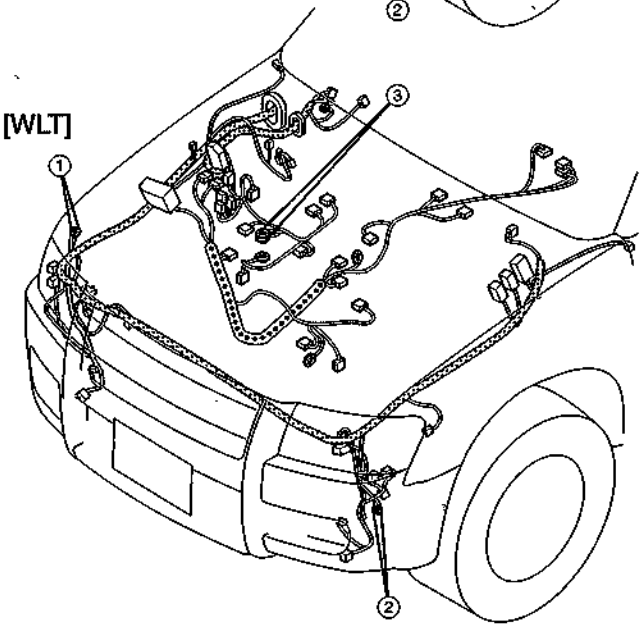
[WL-C, WE-C]

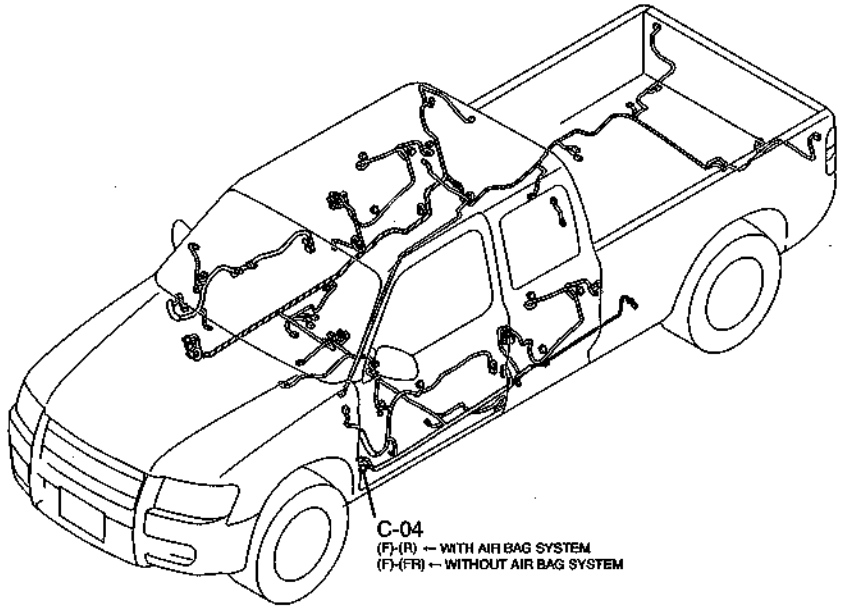




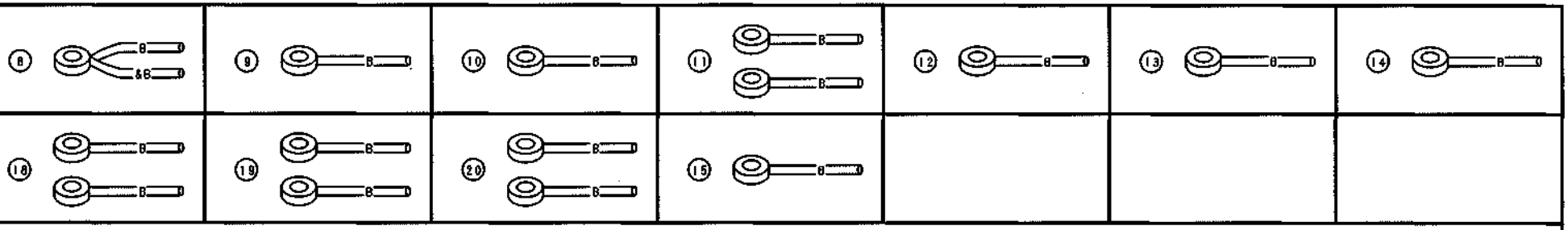
C-04
WITH AIR BAG SYSTEM → (F)-(R)
WITHOUT AIR BAG SYSTEM → (F)-(FR)

[WLT]





C-04
(F)-(R) ← WITH AIR BAG SYSTEM
(F)-(FR) ← WITHOUT AIR BAG SYSTEM



& ... 5 DOOR, REGULAR CAB WITH SEAT WARMER

WITH AIR BAG SYSTEM

EXCEPT 5 DOOR

CONNECT TO GROUND POINTS (5)(6) (SECTION 00G-a)

A

B (R)

B (R) — B (R) — 8

5 DOOR, REGULAR CAB WITH SEAT WARMER

B (R) — B (R)

REAR HARNESS

TO EACH UNIT

B (R2) — B (R2) — B (R2) — 9

B (R2) — 10

REAR No. 2 HARNESS

TO EACH UNIT

5 DOOR

B (R2) — C-13 — B (R)

B (R) — B (R) — B (R) — 18

B (R) — 16

B (R) — 19

B (R) — 19

REAR HARNESS

C-33

B (R) — B (R4) — 20

B (R4) — 20

REAR No. 4 HARNESS

B (F2) — 11

B (F2) — 11

FRONT No. 2 HARNESS

WITHOUT AIR BAG SYSTEM

CONNECT TO GROUND POINTS (5)(6) (SECTION 00G-a)

B

WITH THEFT-DETERRENT SYSTEM

B (FR)

B (FR) — B (FR) — 12

FLOOR HARNESS

STRETCH CAB (WITH REAR ACCESS SYSTEM)

B (R)

CONNECT TO GROUND POINTS (4)(5) (SECTION 00G-a)

C — B (F) — C-03 — B (R) — B (R) — C-15 — B (DR3) — 13

DOOR No. 3 HARNESS

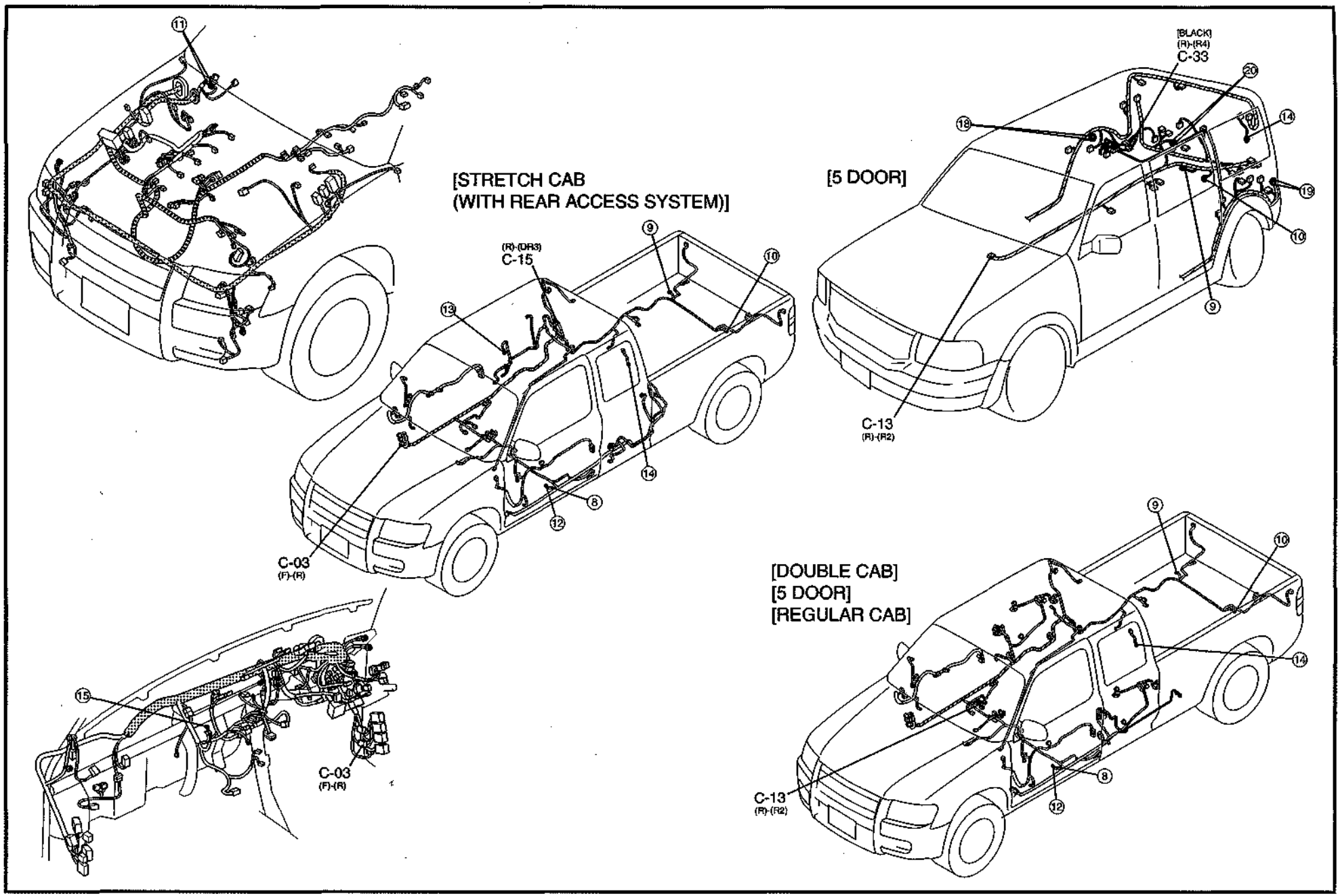
B — 14

REAR WINDOW DEFROSTER GROUND

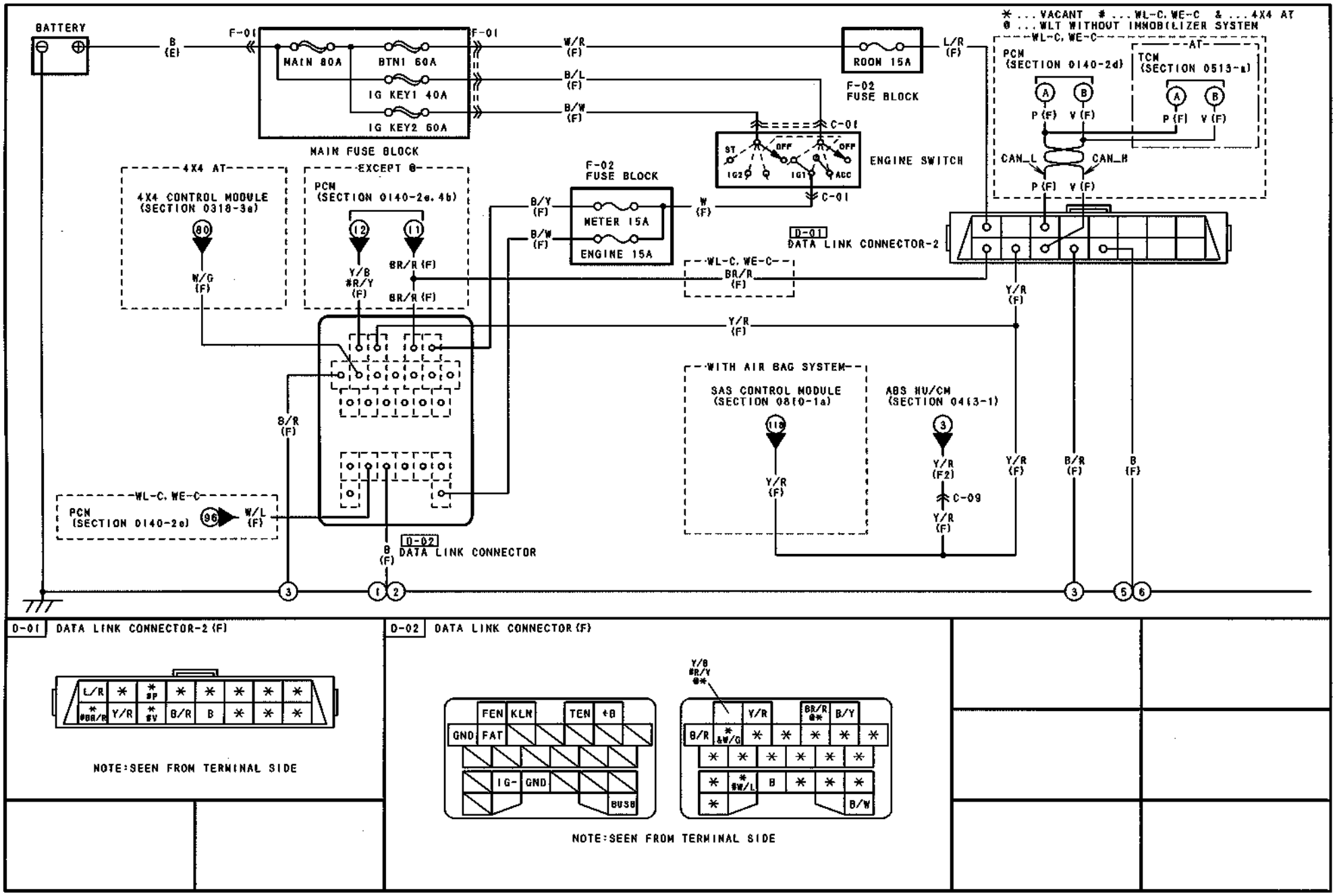
5 DOOR

B — 15

AUDIO GROUND


[STRETCH CAB
(WITH REAR ACCESS SYSTEM)]
[5 DOOR]
[DOUBLE CAB]
[5 DOOR]
[REGULAR CAB]
[BLACK]
(R)-(R4)
C-33
(R)-(DR3)
C-15
C-03
(F)-(R)
C-13
(R)-(R2)

DATA LINK CONNECTOR

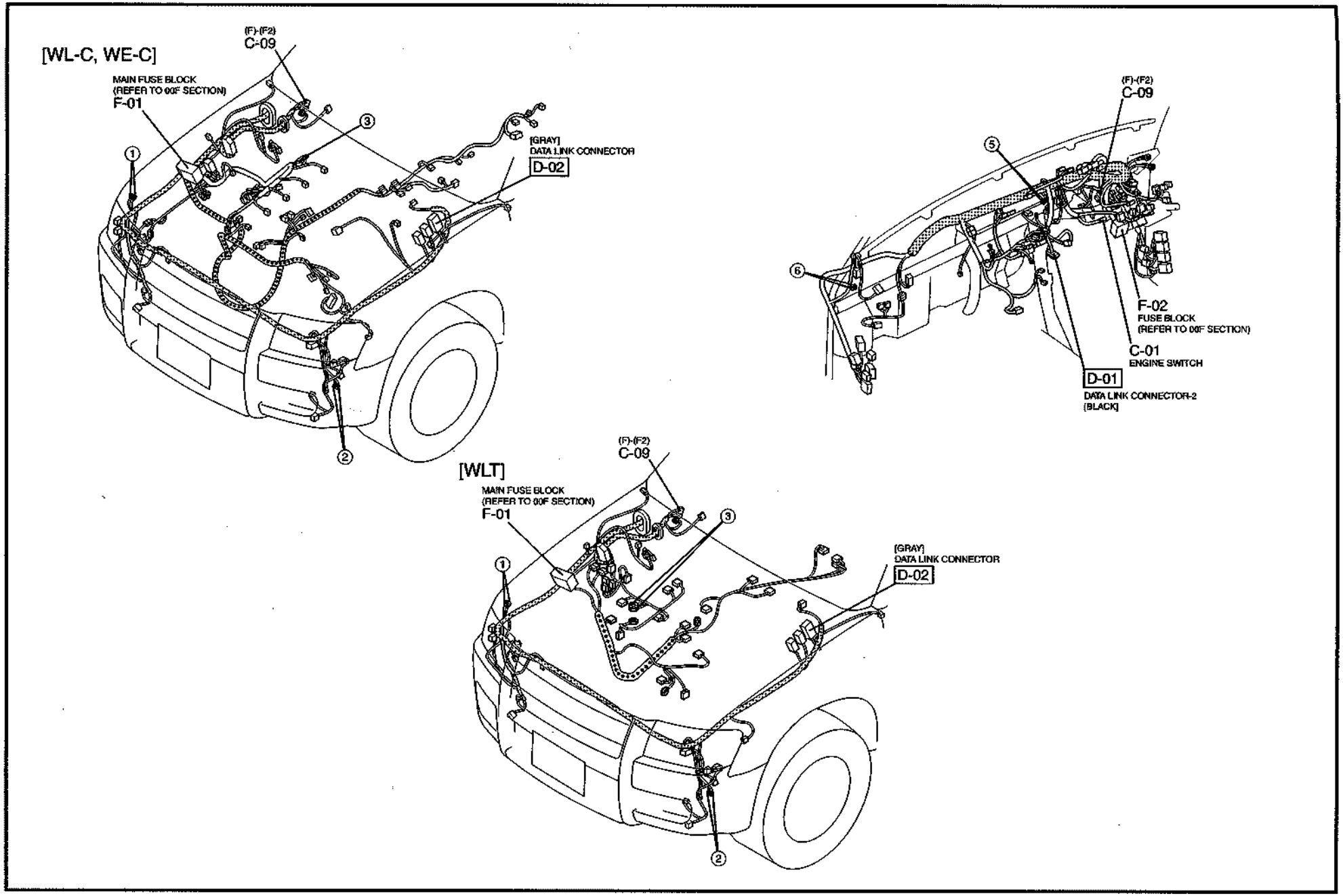


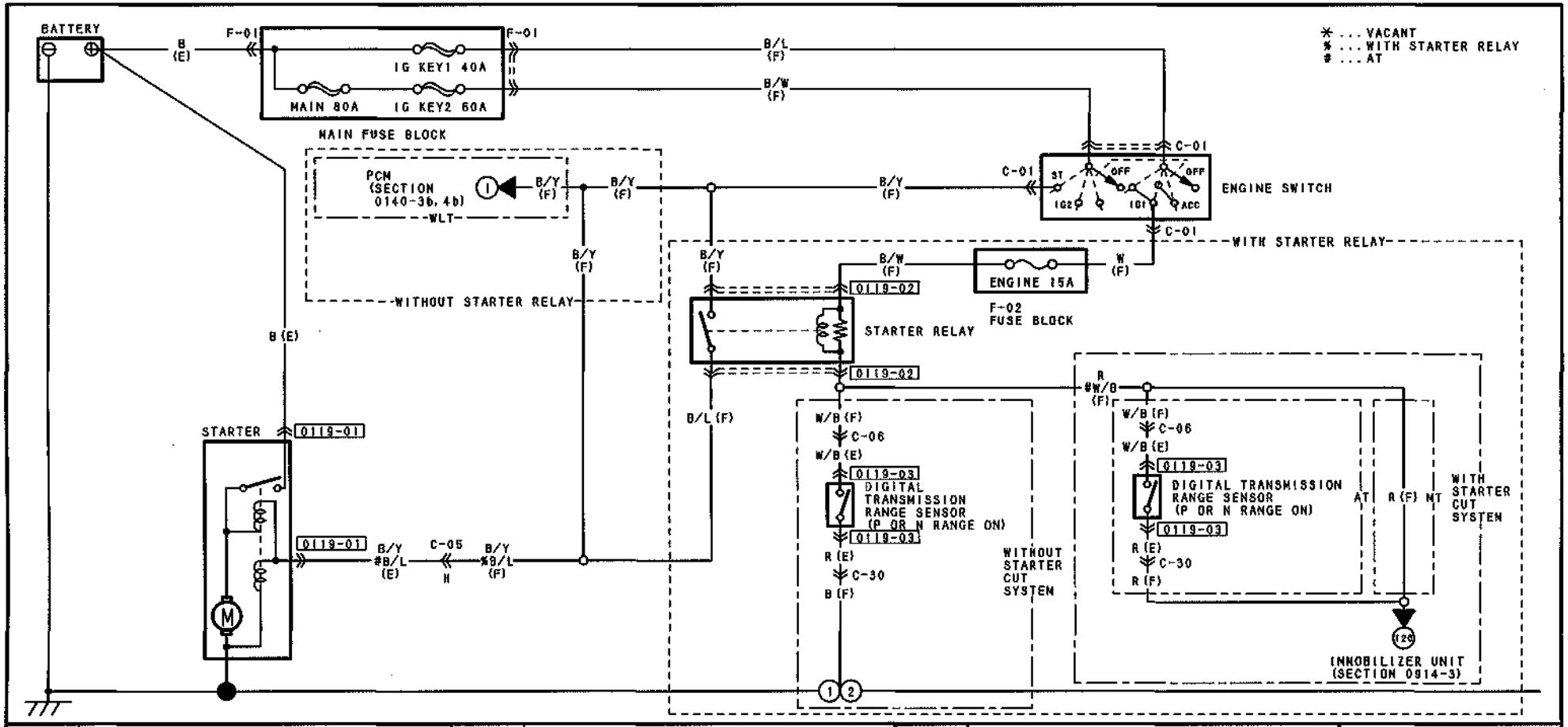
D-01 DATA LINK CONNECTOR-2 (F)

NOTE: SEEN FROM TERMINAL SIDE

D-02 DATA LINK CONNECTOR (F)

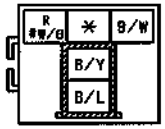
NOTE: SEEN FROM TERMINAL SIDE


[WL-C, WE-C]
(F)-(F2)
C-09
MAIN FUSE BLOCK
(REFER TO 00F SECTION)
F-01
[GRAY]
DATA LINK CONNECTOR
D-02
(F)-(F2)
C-09
F-02
FUSE BLOCK
(REFER TO 00F SECTION)
C-01
ENGINE SWITCH
D-01
DATA LINK CONNECTOR-2
[BLACK]
[WLT]
(F)-(F2)
C-09
MAIN FUSE BLOCK
(REFER TO 00F SECTION)
F-01
[GRAY]
DATA LINK CONNECTOR
D-02

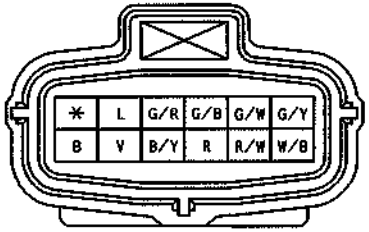


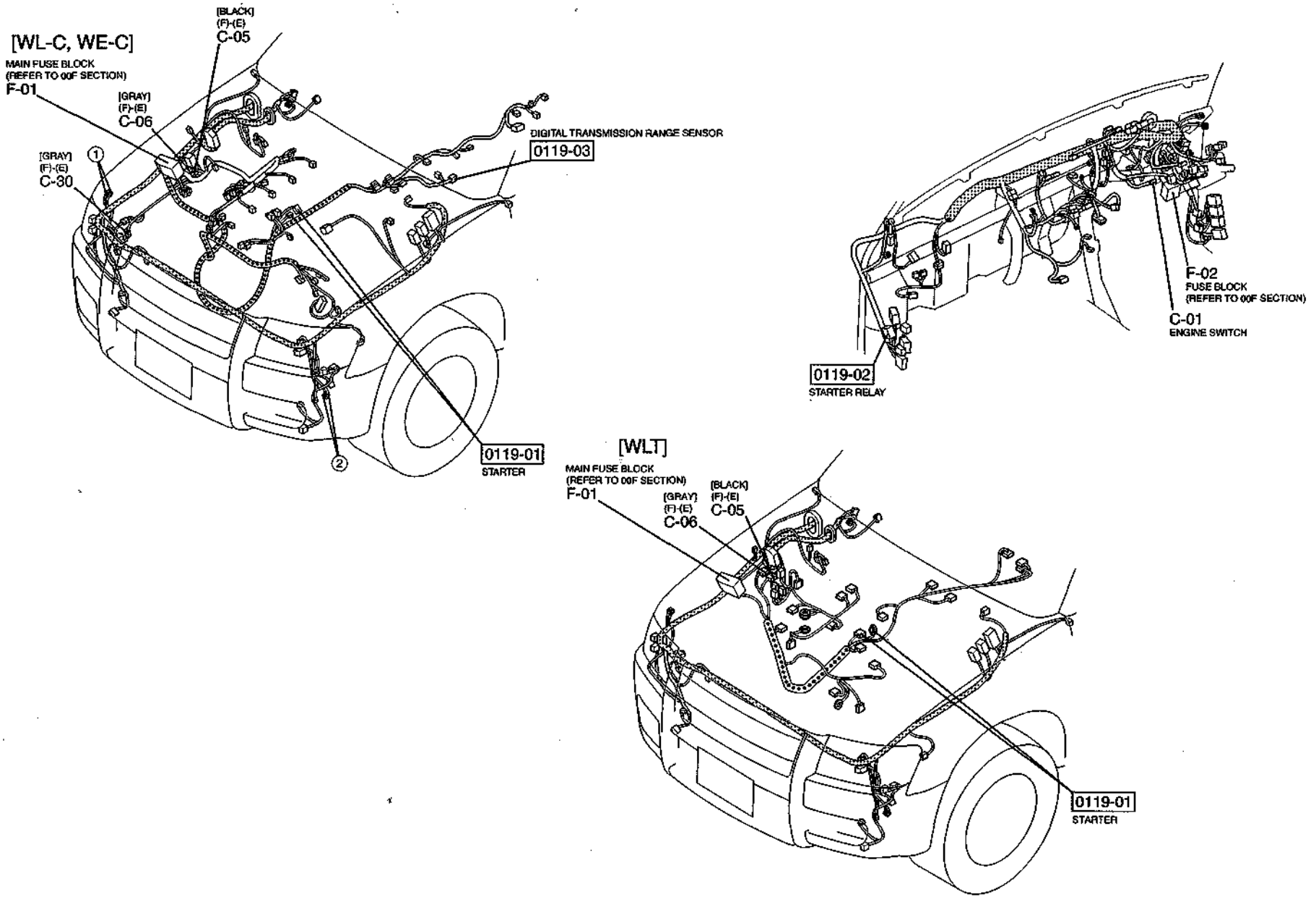
0119-01 STARTER (E)

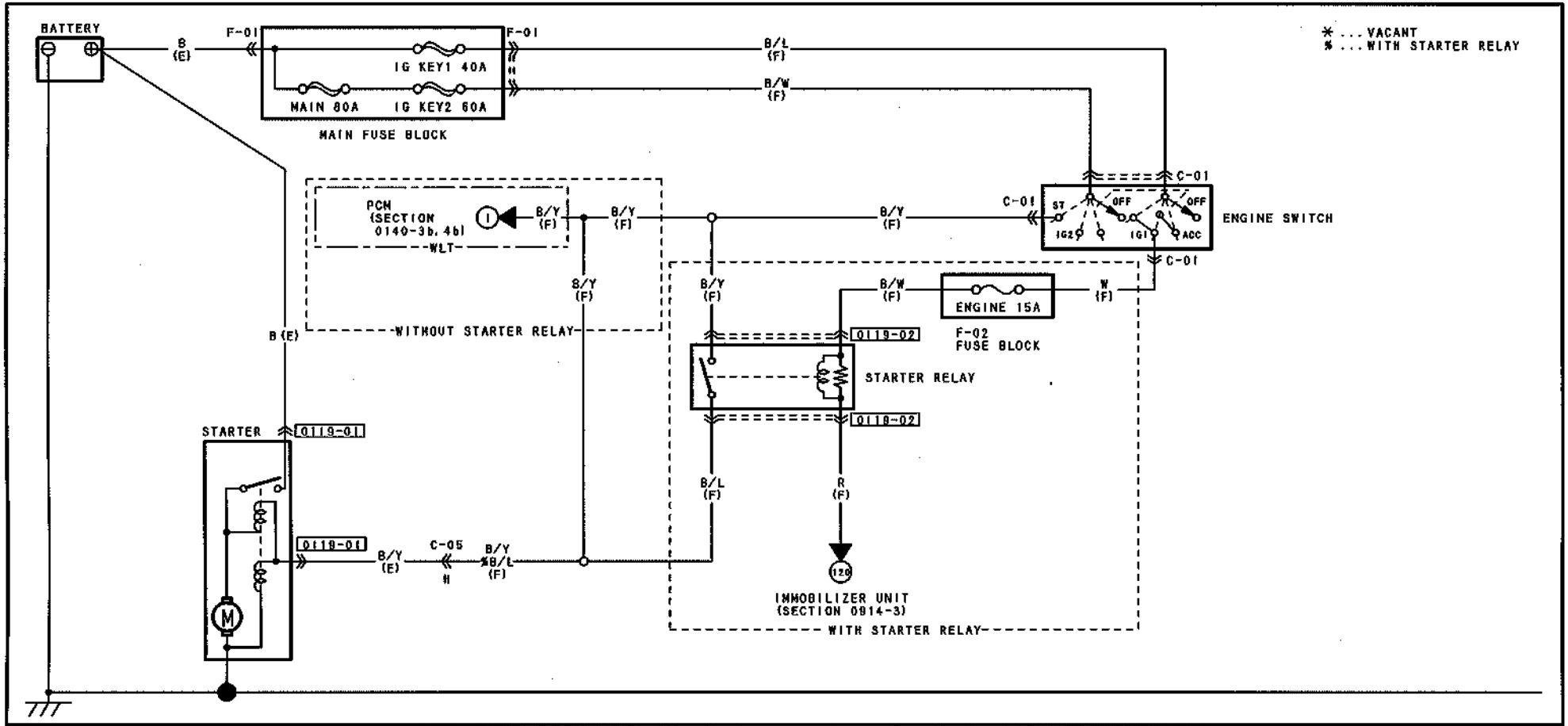
0119-02 STARTER RELAY (F)



0119-03 DIGITAL TRANSMISSION RANGE SENSOR (E)

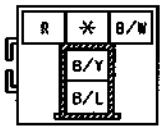


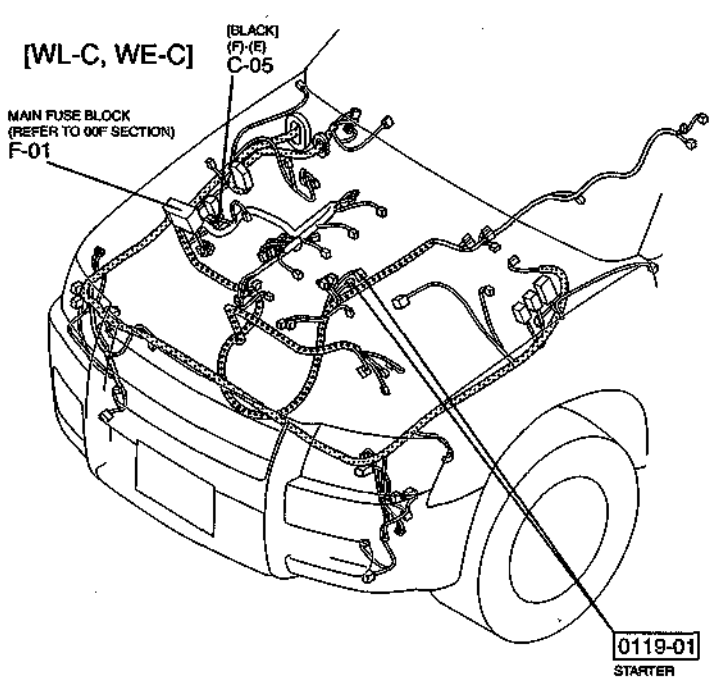

[WL-C, WE-C]
MAIN FUSE BLOCK
(REFER TO 00F SECTION)
F-01
[BLACK]
(F)-(E)
C-05
[GRAY]
(F)-(E)
C-06
[GRAY]
(F)-(E)
C-30
DIGITAL TRANSMISSION RANGE SENSOR
0119-03
0119-01
STARTER
F-02
FUSE BLOCK
(REFER TO 00F SECTION)
C-01
ENGINE SWITCH
0119-02
STARTER RELAY
[WLT]
MAIN FUSE BLOCK
(REFER TO 00F SECTION)
F-01
[GRAY]
(F)-(E)
C-06
[BLACK]
(F)-(E)
C-05
0119-01
STARTER

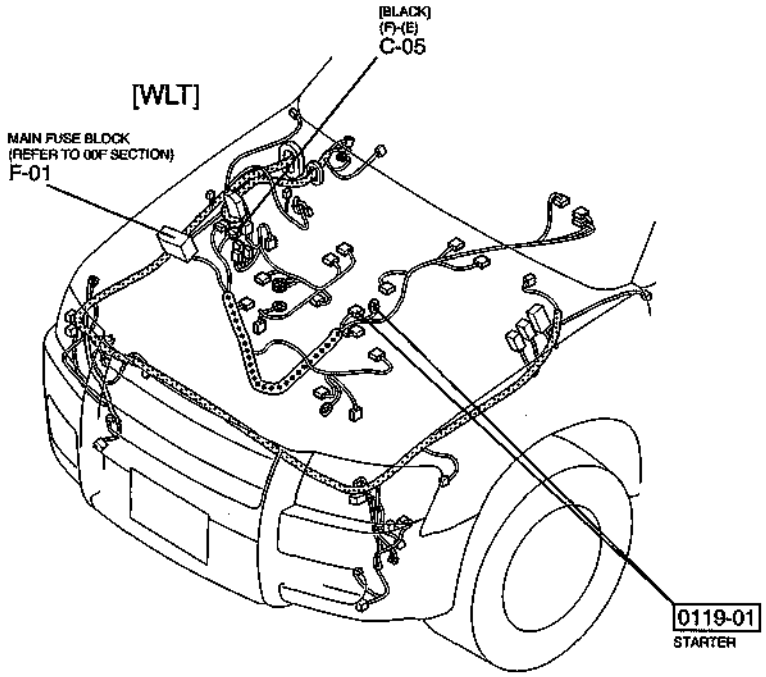


0119-01 STARTER (E)

0119-02 STARTER RELAY (F)




[WL-C, WE-C]
[BLACK]
(F)-(E)
C-05
MAIN FUSE BLOCK
(REFER TO 00F SECTION)
F-01
0119-01
STARTER


[WLT]
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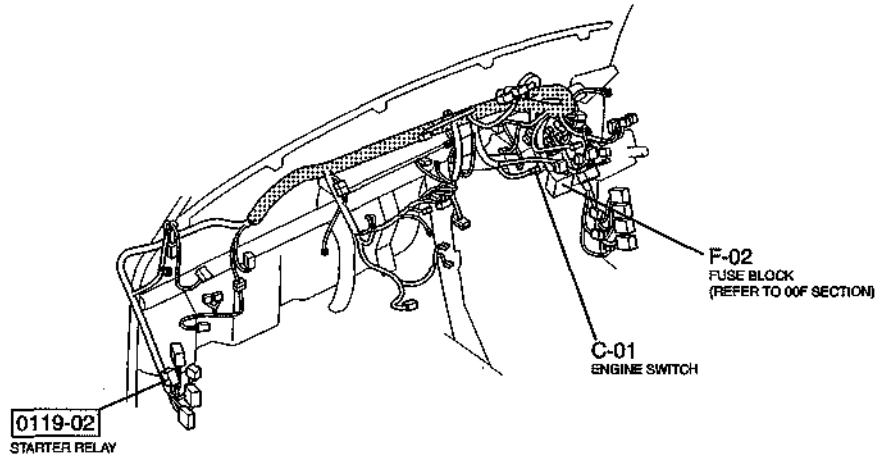
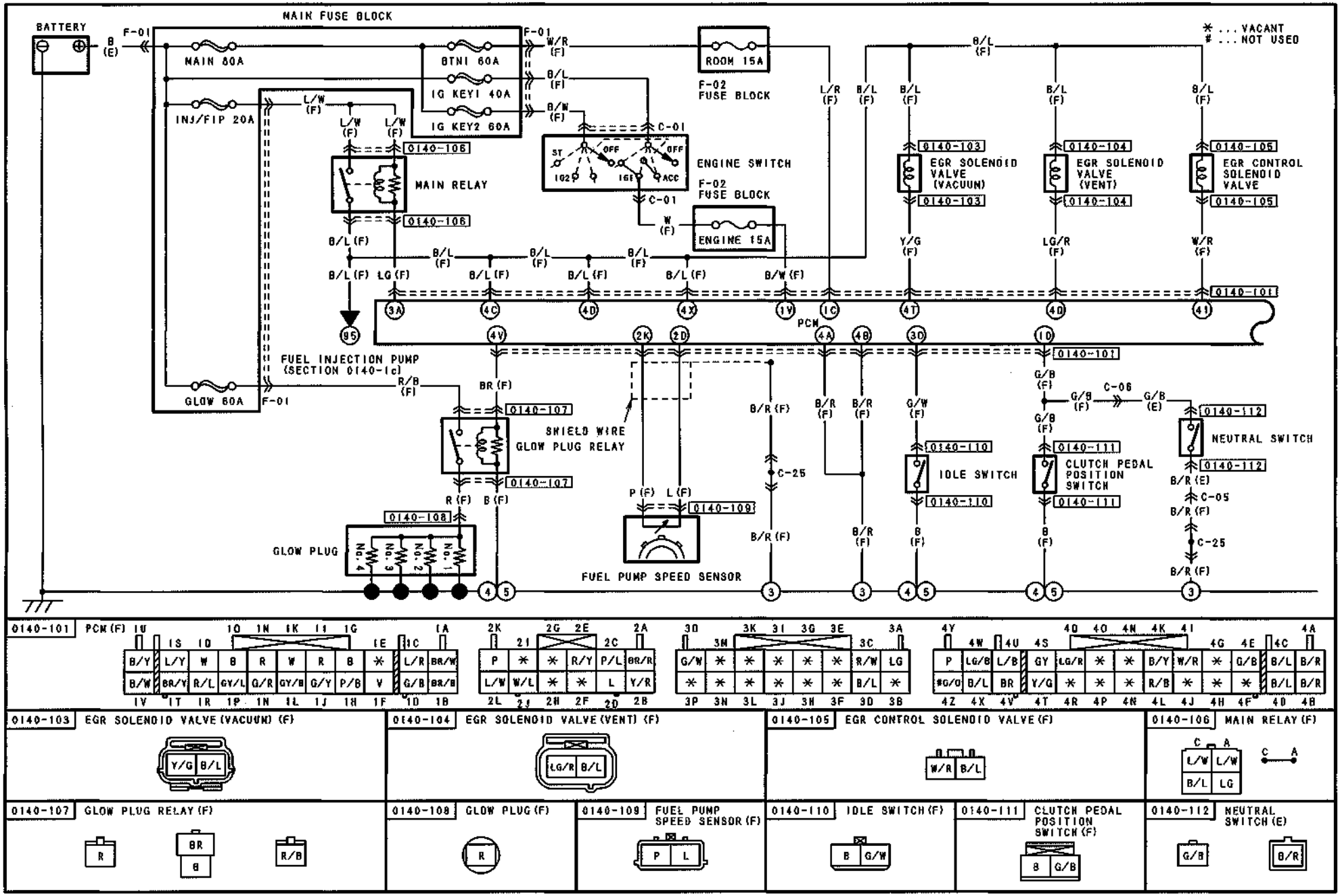
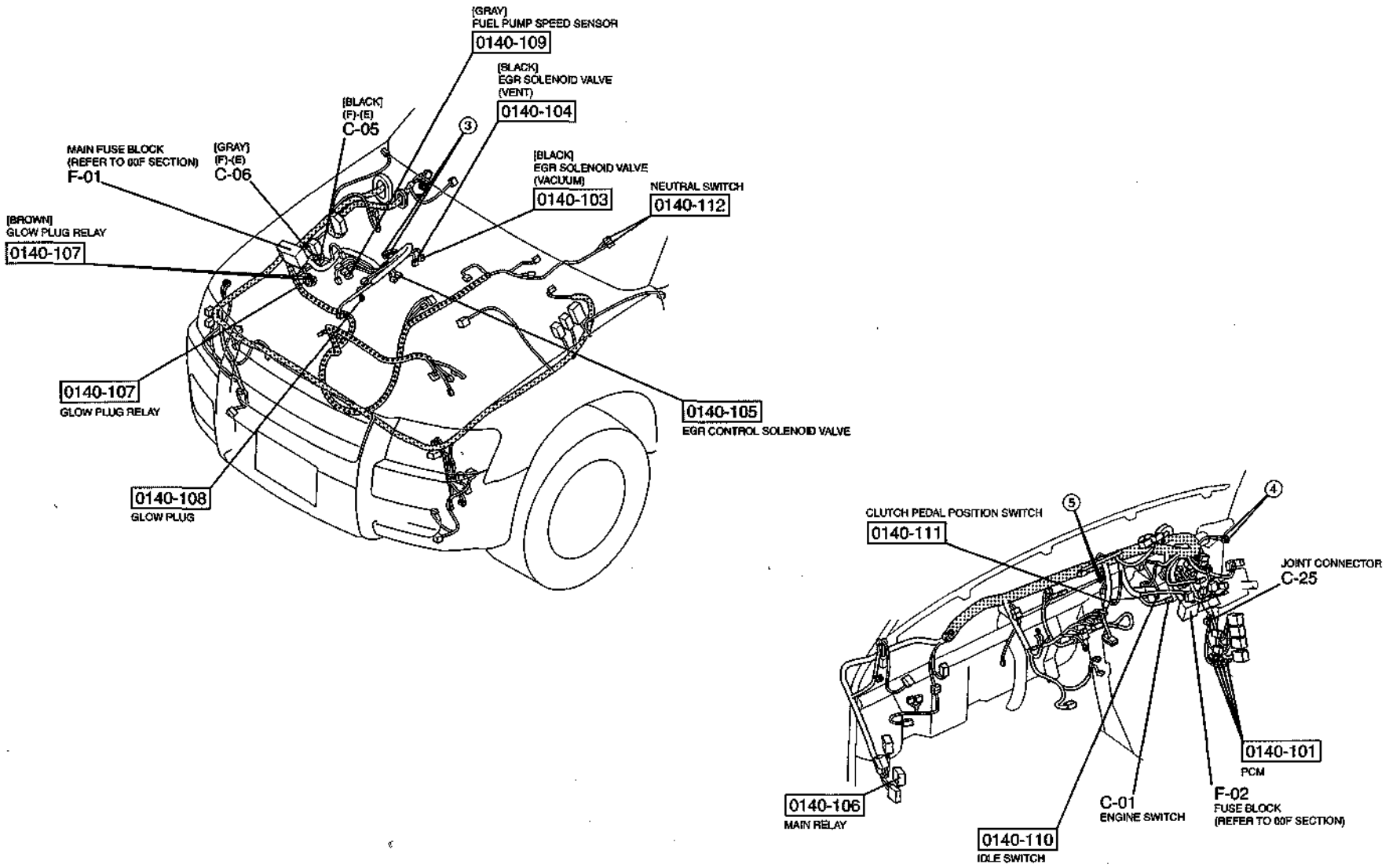
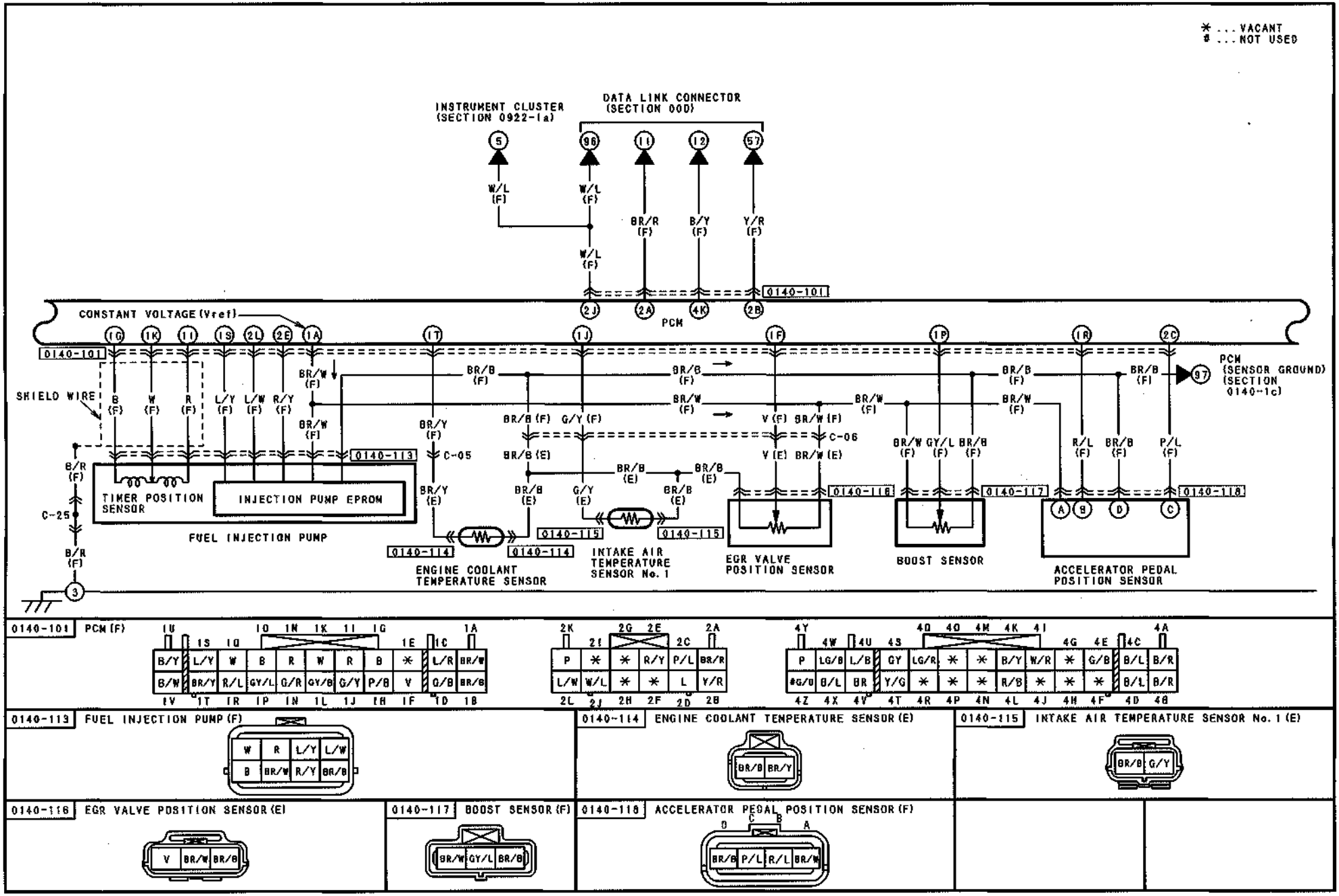
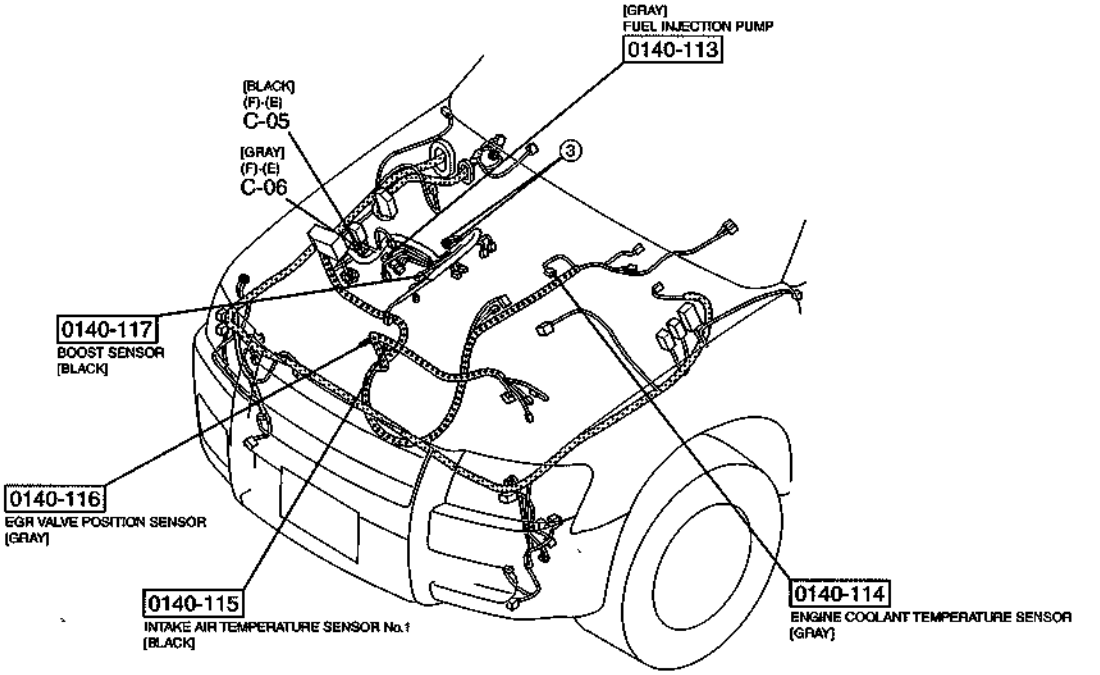
(F)-(E)
C-05
MAIN FUSE BLOCK
(REFER TO 00F SECTION)
F-01
0119-01
STARTER

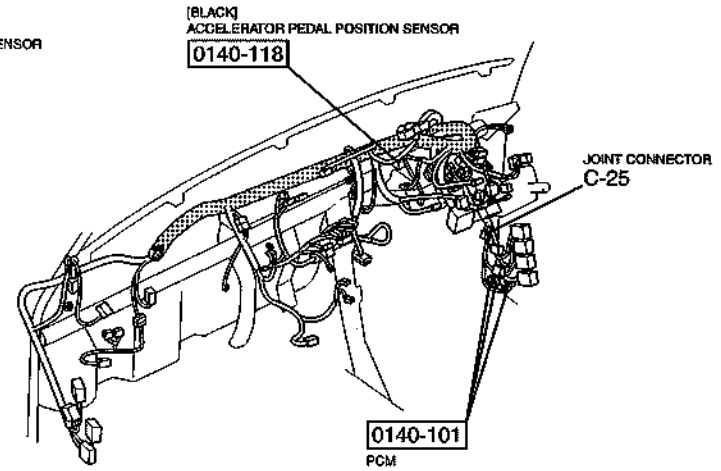

F-02
FUSE BLOCK
(REFER TO 00F SECTION)
C-01
ENGINE SWITCH
0119-02
STARTER RELAY

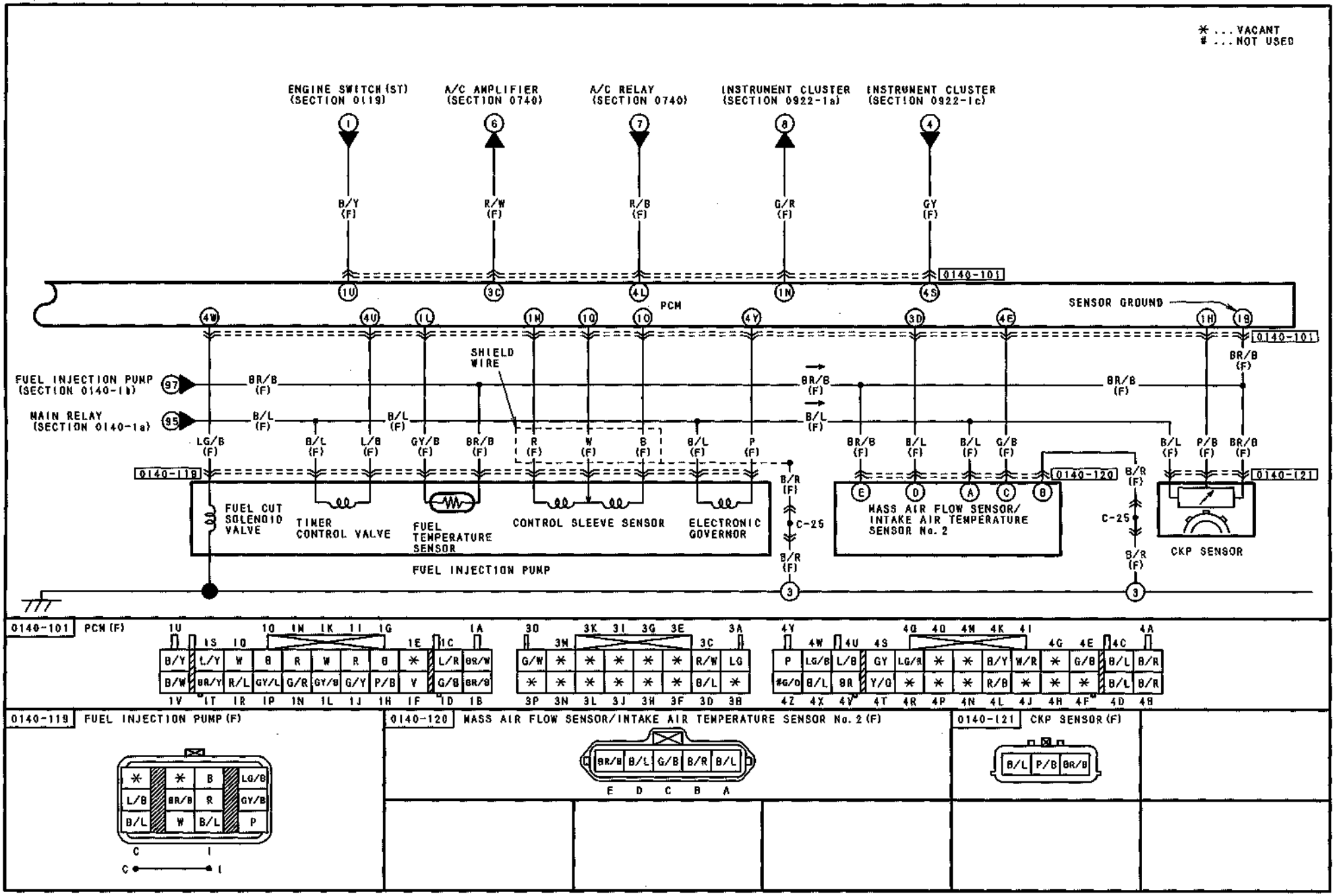

BATTERY
MAIN FUSE BLOCK
MAIN 60A
BTN1 60A
IG KEY1 40A
IG KEY2 60A
INJ/FIP 20A
GLOW 60A
FUEL INJECTION PUMP (SECTION 0140-1c)
MAIN RELAY
ENGINE SWITCH
F-02 FUSE BLOCK
ROOM 15A
ENGINE 15A
EGR SOLENOID VALVE (VACUUM)
EGR SOLENOID VALVE (VENT)
EGR CONTROL SOLENOID VALVE
PCM
SHIELD WIRE
GLOW PLUG RELAY
GLOW PLUG
FUEL PUMP SPEED SENSOR
IDLE SWITCH
CLUTCH PEDAL POSITION SWITCH
NEUTRAL SWITCH
* : VACANT
# : NOT USED
0140-101 PCM (F)
0140-103 EGR SOLENOID VALVE (VACUUM) (F)
0140-104 EGR SOLENOID VALVE (VENT) (F)
0140-105 EGR CONTROL SOLENOID VALVE (F)
0140-106 MAIN RELAY (F)
0140-107 GLOW PLUG RELAY (F)
0140-108 GLOW PLUG (F)
0140-109 FUEL PUMP SPEED SENSOR (F)
0140-110 IDLE SWITCH (F)
0140-111 CLUTCH PEDAL POSITION SWITCH (F)
0140-112 NEUTRAL SWITCH (E)

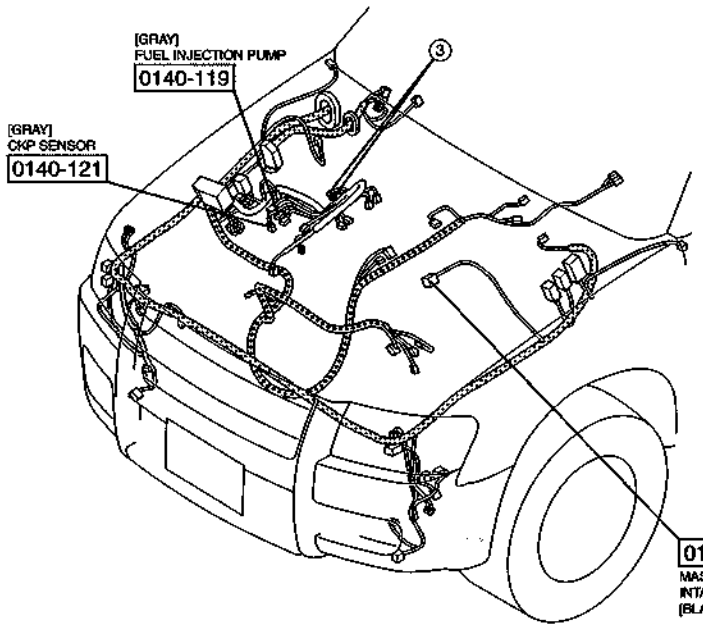

[GRAY]
FUEL PUMP SPEED SENSOR
0140-109
[BLACK]
EGR SOLENOID VALVE
(VENT)
0140-104
[BLACK]
(F)-(E)
C-05
MAIN FUSE BLOCK
(REFER TO 00F SECTION)
F-01
[GRAY]
(F)-(E)
C-06
[BLACK]
EGR SOLENOID VALVE
(VACUUM)
0140-103
NEUTRAL SWITCH
0140-112
[BROWN]
GLOW PLUG RELAY
0140-107
0140-107
GLOW PLUG RELAY
0140-105
EGR CONTROL SOLENOID VALVE
0140-108
GLOW PLUG
CLUTCH PEDAL POSITION SWITCH
0140-111
JOINT CONNECTOR
C-25
0140-101
PCM
0140-106
MAIN RELAY
C-01
ENGINE SWITCH
F-02
FUSE BLOCK
(REFER TO 00F SECTION)
0140-110
IDLE SWITCH

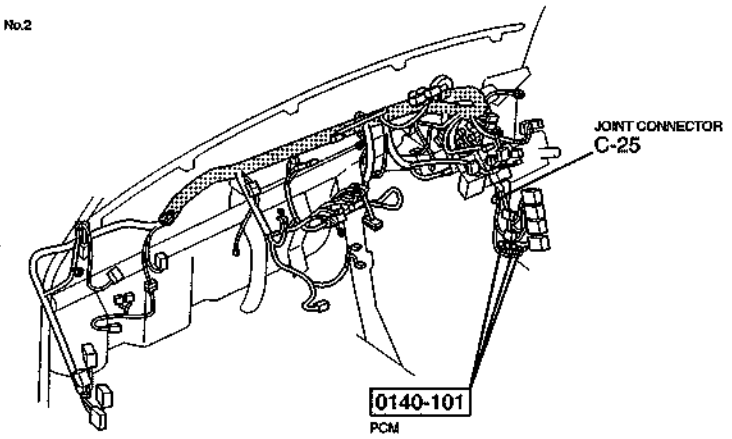

* ... VACANT
# ... NOT USED
INSTRUMENT CLUSTER (SECTION 0922-1a)
DATA LINK CONNECTOR (SECTION 00D)
PCM
CONSTANT VOLTAGE (Vref)
SHIELD WIRE
TIMER POSITION SENSOR
INJECTION PUMP EPROM
FUEL INJECTION PUMP
ENGINE COOLANT TEMPERATURE SENSOR
INTAKE AIR TEMPERATURE SENSOR No. 1
EGR VALVE POSITION SENSOR
BOOST SENSOR
ACCELERATOR PEDAL POSITION SENSOR
PCM (SENSOR GROUND) (SECTION 0140-1c)
0140-101 PCM (F)
0140-113 FUEL INJECTION PUMP (F)
0140-114 ENGINE COOLANT TEMPERATURE SENSOR (E)
0140-115 INTAKE AIR TEMPERATURE SENSOR No. 1 (E)
0140-116 EGR VALVE POSITION SENSOR (E)
0140-117 BOOST SENSOR (F)
0140-118 ACCELERATOR PEDAL POSITION SENSOR (F)

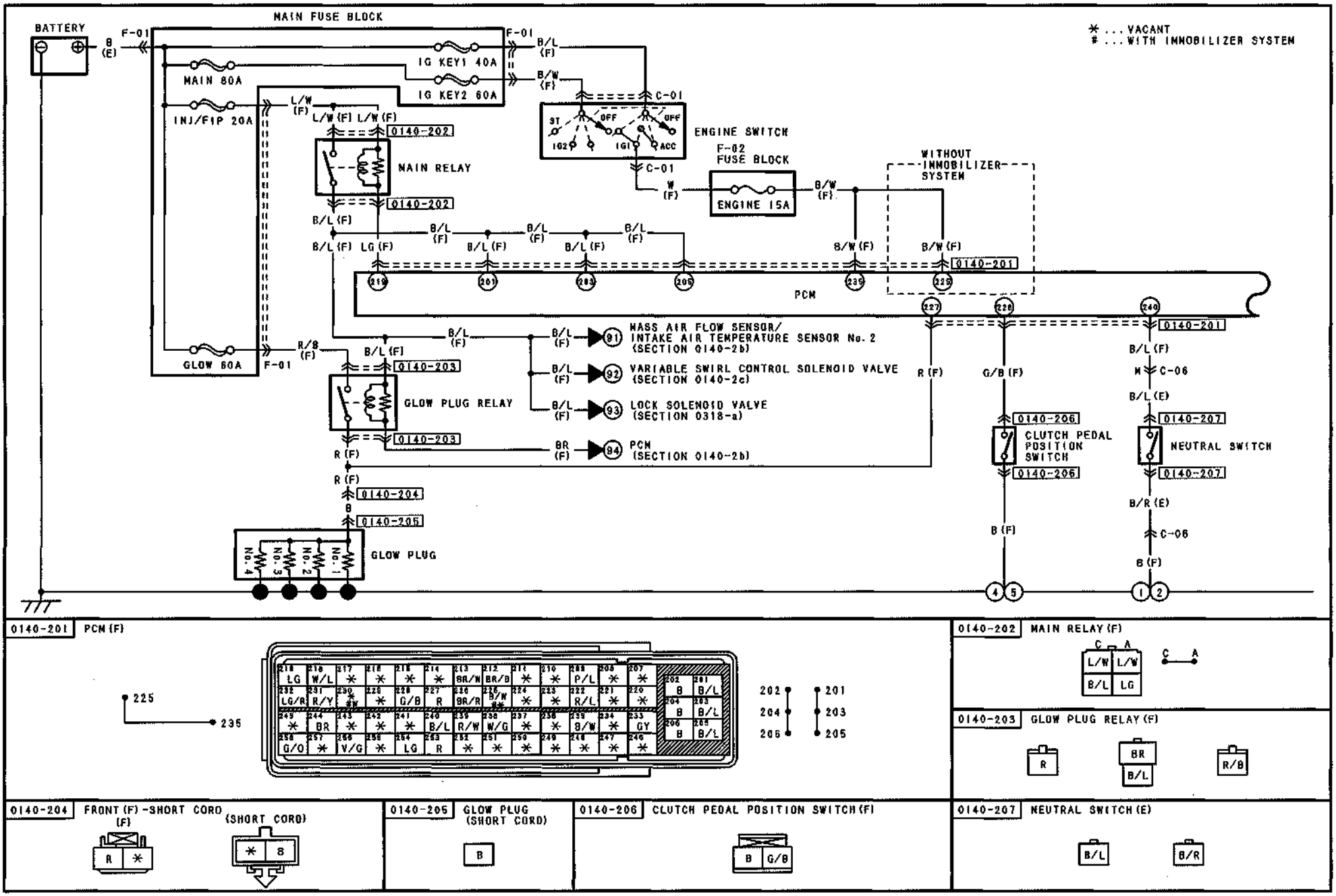

[GRAY]
FUEL INJECTION PUMP
0140-113
[BLACK]
(F)-(E)
C-05
[GRAY]
(F)-(E)
C-06
③
0140-117
BOOST SENSOR
[BLACK]
0140-116
EGR VALVE POSITION SENSOR
[GRAY]
0140-115
INTAKE AIR TEMPERATURE SENSOR No.1
[BLACK]
0140-114
ENGINE COOLANT TEMPERATURE SENSOR
[GRAY]

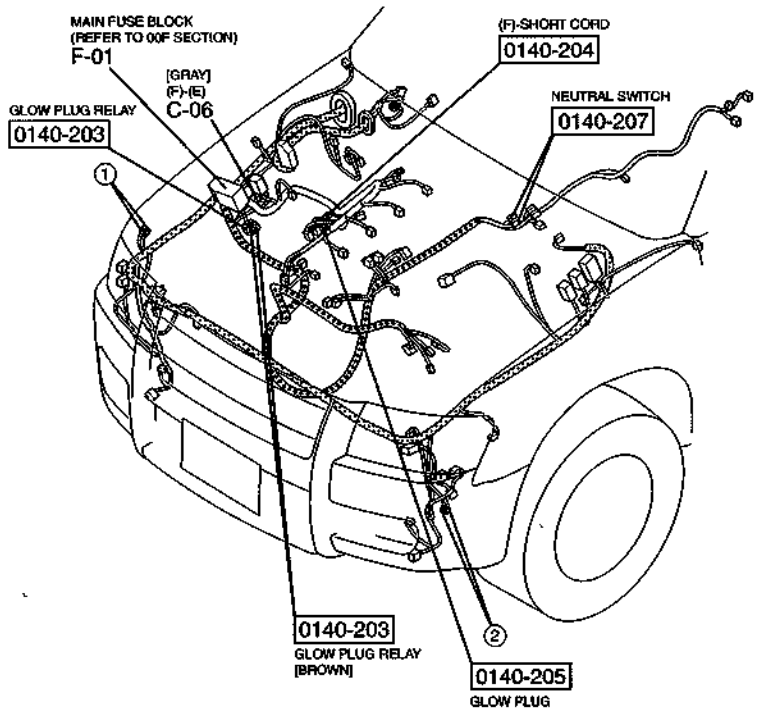

[BLACK]
ACCELERATOR PEDAL POSITION SENSOR
0140-118
JOINT CONNECTOR
C-25
0140-101
PCM

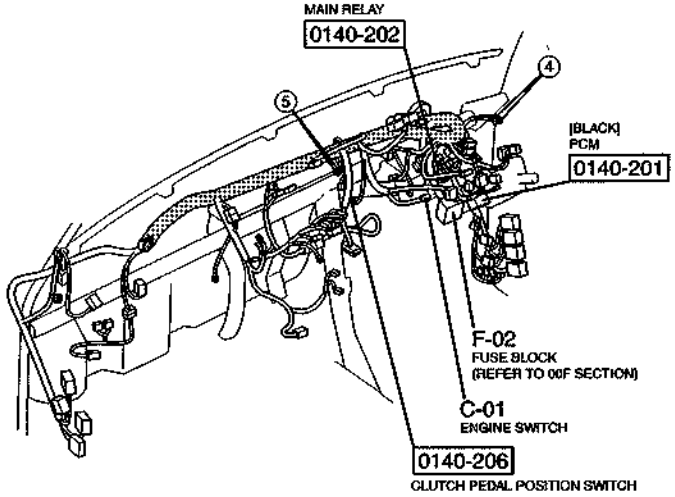

* . . . VACANT
# . . . NOT USED
ENGINE SWITCH (ST) (SECTION 0119)
A/C AMPLIFIER (SECTION 0740)
A/C RELAY (SECTION 0740)
INSTRUMENT CLUSTER (SECTION 0922-1a)
INSTRUMENT CLUSTER (SECTION 0922-1c)
B/Y (F)
R/W (F)
R/B (F)
G/R (F)
GY (F)
0140-101
PCM
SENSOR GROUND
SHIELD WIRE
FUEL INJECTION PUMP (SECTION 0140-1b)
MAIN RELAY (SECTION 0140-1a)
BR/B (F)
B/L (F)
LG/B (F)
L/B (F)
GY/B (F)
R (F)
W (F)
B (F)
P (F)
P/B (F)
G/B (F)
0140-119
0140-120
0140-121
FUEL CUT SOLENOID VALVE
TIMER CONTROL VALVE
FUEL TEMPERATURE SENSOR
CONTROL SLEEVE SENSOR
ELECTRONIC GOVERNOR
FUEL INJECTION PUMP
C-25
MASS AIR FLOW SENSOR/ INTAKE AIR TEMPERATURE SENSOR No. 2
CKP SENSOR
0140-101 PCM (F)
0140-119 FUEL INJECTION PUMP (F)
0140-120 MASS AIR FLOW SENSOR/INTAKE AIR TEMPERATURE SENSOR No. 2 (F)
0140-121 CKP SENSOR (F)


[GRAY]
FUEL INJECTION PUMP
0140-119
③
[GRAY]
CKP SENSOR
0140-121
0140-120
MASS AIR FLOW SENSOR/
INTAKE AIR TEMPERATURE SENSOR No.2
(BLACK)

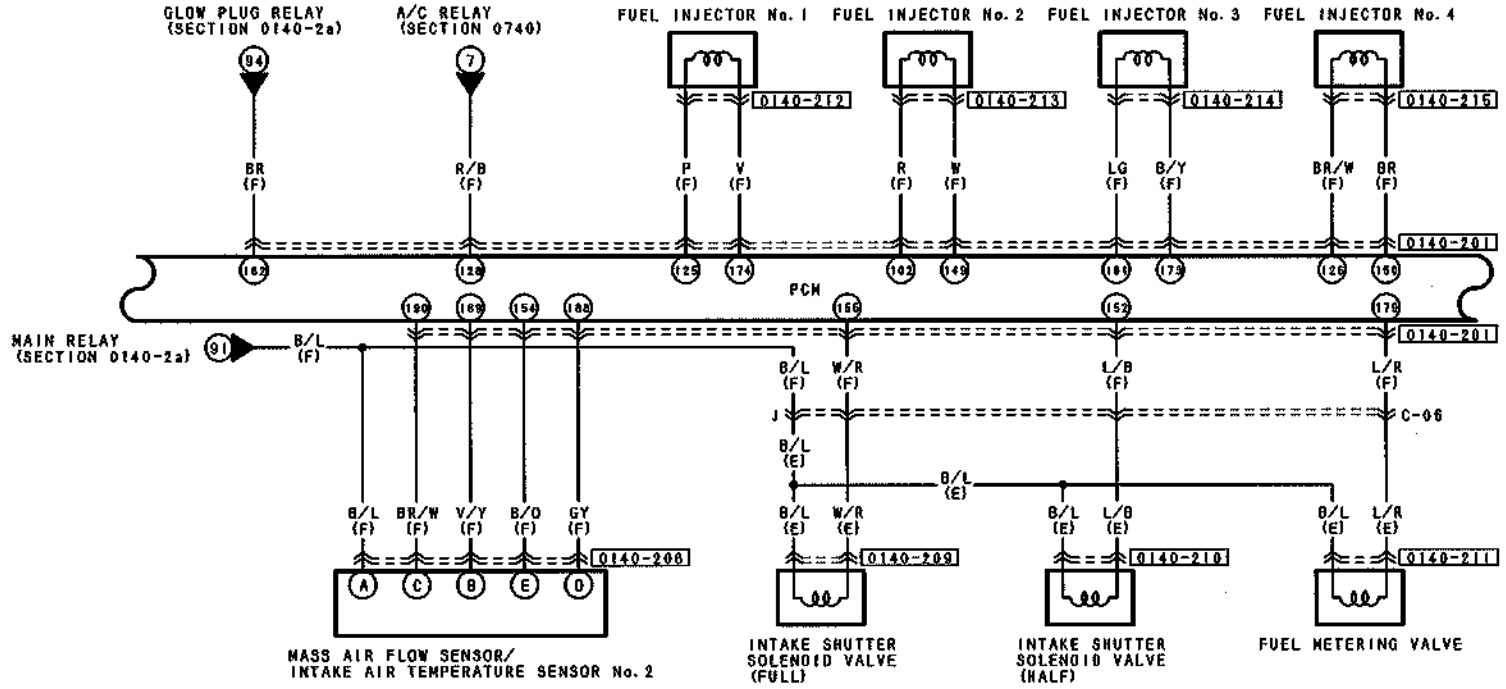

JOINT CONNECTOR
C-25
0140-101
PCM


* . . . VACANT
# . . . WITH IMMOBILIZER SYSTEM
BATTERY
MAIN FUSE BLOCK
F-01
B (E)
IG KEY1 40A
MAIN 80A
IG KEY2 60A
INJ/FIP 20A
GLOW 60A
B/L (F)
B/W (F)
L/W (F)
R/B (F)
C-01
ENGINE SWITCH
ST
OFF
IG2
IG1
ACC
F-02
FUSE BLOCK
ENGINE 15A
W (F)
WITHOUT IMMOBILIZER SYSTEM
0140-202
MAIN RELAY
0140-203
GLOW PLUG RELAY
0140-204
0140-205
GLOW PLUG
No. 1
No. 2
No. 3
No. 4
0140-201
PCM
LG (F)
R (F)
G/B (F)
B (F)
B/L (E)
B/R (E)
C-06
0140-206
CLUTCH PEDAL POSITION SWITCH
0140-207
NEUTRAL SWITCH
91 MASS AIR FLOW SENSOR/ INTAKE AIR TEMPERATURE SENSOR No. 2 (SECTION 0140-2b)
92 VARIABLE SWIRL CONTROL SOLENOID VALVE (SECTION 0140-2c)
93 LOCK SOLENOID VALVE (SECTION 0318-a)
84 PCM (SECTION 0140-2b)
0140-201 PCM (F)
225
235
202
204
206
201
203
205
0140-202 MAIN RELAY (F)
0140-203 GLOW PLUG RELAY (F)
0140-204 FRONT (F) -SHORT CORD (F)
(SHORT CORD)
0140-205 GLOW PLUG (SHORT CORD)
0140-206 CLUTCH PEDAL POSITION SWITCH (F)
0140-207 NEUTRAL SWITCH (E)

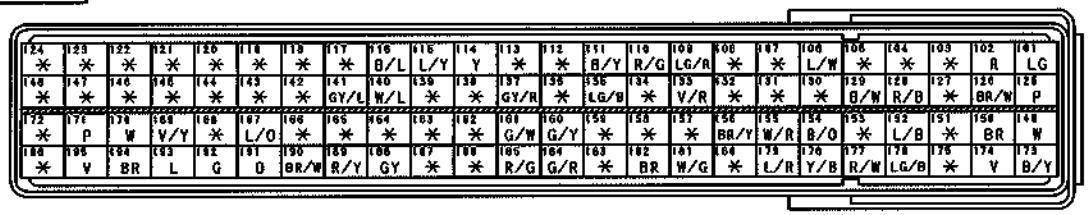

MAIN FUSE BLOCK
(REFER TO 00F SECTION)
F-01
[GRAY]
(F)-(E)
C-06
GLOW PLUG RELAY
0140-203
(F)-SHORT CORD
0140-204
NEUTRAL SWITCH
0140-207
1
2
0140-203
GLOW PLUG RELAY
[BROWN]
0140-205
GLOW PLUG


MAIN RELAY
0140-202
4
5
[BLACK]
PCM
0140-201
F-02
FUSE BLOCK
(REFER TO 00F SECTION)
C-01
ENGINE SWITCH
0140-206
CLUTCH PEDAL POSITION SWITCH

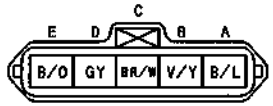
* . . . VACANT



0140-201 PCM (F)



0140-208 MASS AIR FLOW SENSOR/INTAKE AIR TEMPERATURE SENSOR No. 2 (F)



0140-209 INTAKE SHUTTER SOLENOID VALVE (FULL) (E)

0140-210 INTAKE SHUTTER SOLENOID VALVE (HALF) (E)

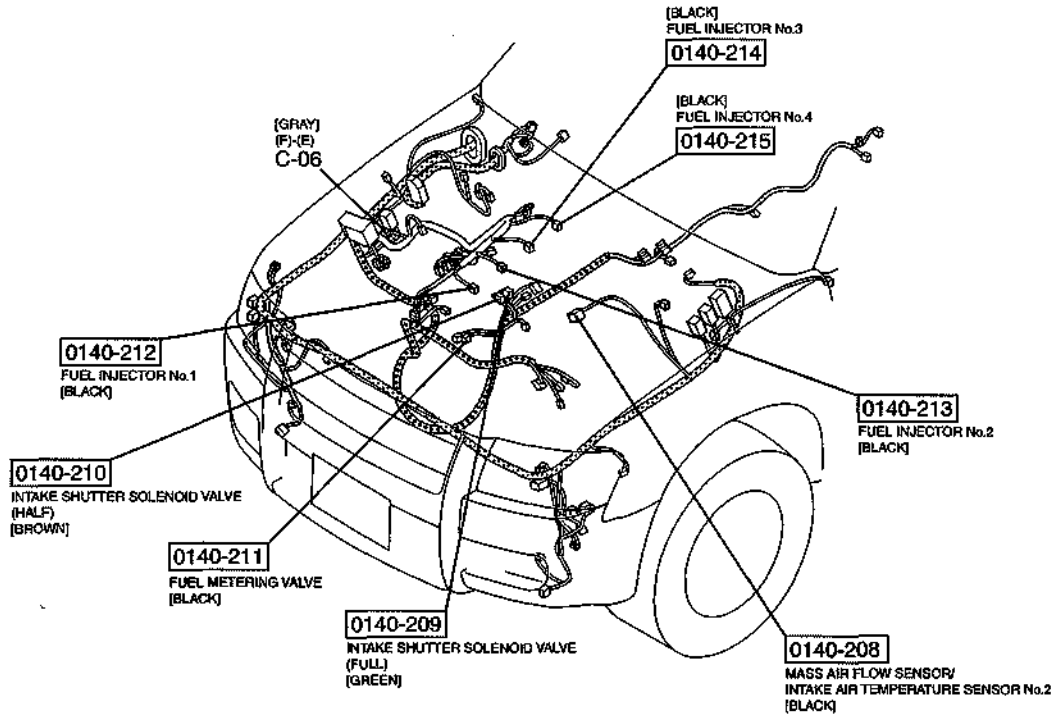
0140-211 FUEL METERING VALVE (E)

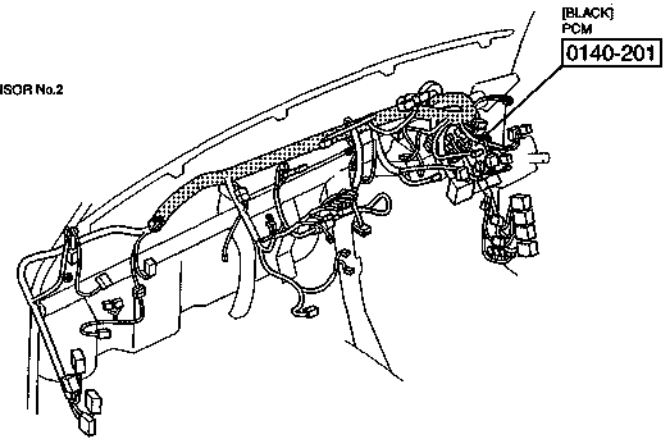
0140-212 FUEL INJECTOR No. 1 (F)

0140-213 FUEL INJECTOR No. 2 (F)

0140-214 FUEL INJECTOR No. 3 (F)

0140-215 FUEL INJECTOR No. 4 (F)


[BLACK]
FUEL INJECTOR No.3
0140-214
[BLACK]
FUEL INJECTOR No.4
0140-215
[GRAY]
(F)-(E)
C-06
0140-212
FUEL INJECTOR No.1
[BLACK]
0140-213
FUEL INJECTOR No.2
[BLACK]
0140-210
INTAKE SHUTTER SOLENOID VALVE
(HALF)
[BROWN]
0140-211
FUEL METERING VALVE
[BLACK]
0140-209
INTAKE SHUTTER SOLENOID VALVE
(FULL)
[GREEN]
0140-208
MASS AIR FLOW SENSOR/
INTAKE AIR TEMPERATURE SENSOR No.2
[BLACK]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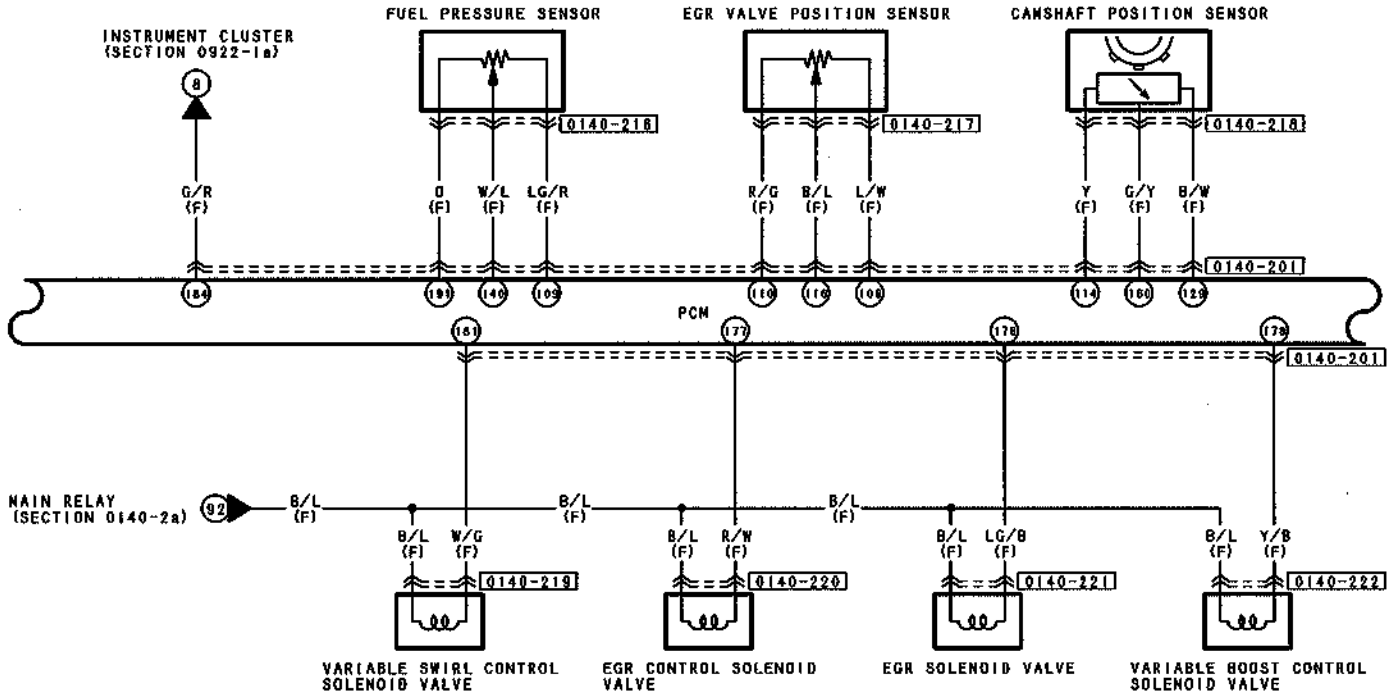
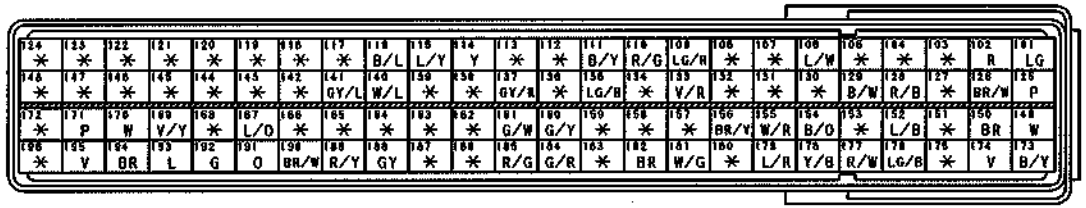
PCM
0140-201

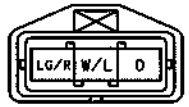
* . . . VACANT



0140-201 PCM (F)



0140-216 FUEL PRESSURE SENSOR (F)



0140-217 EGR VALVE POSITION SENSOR (F)

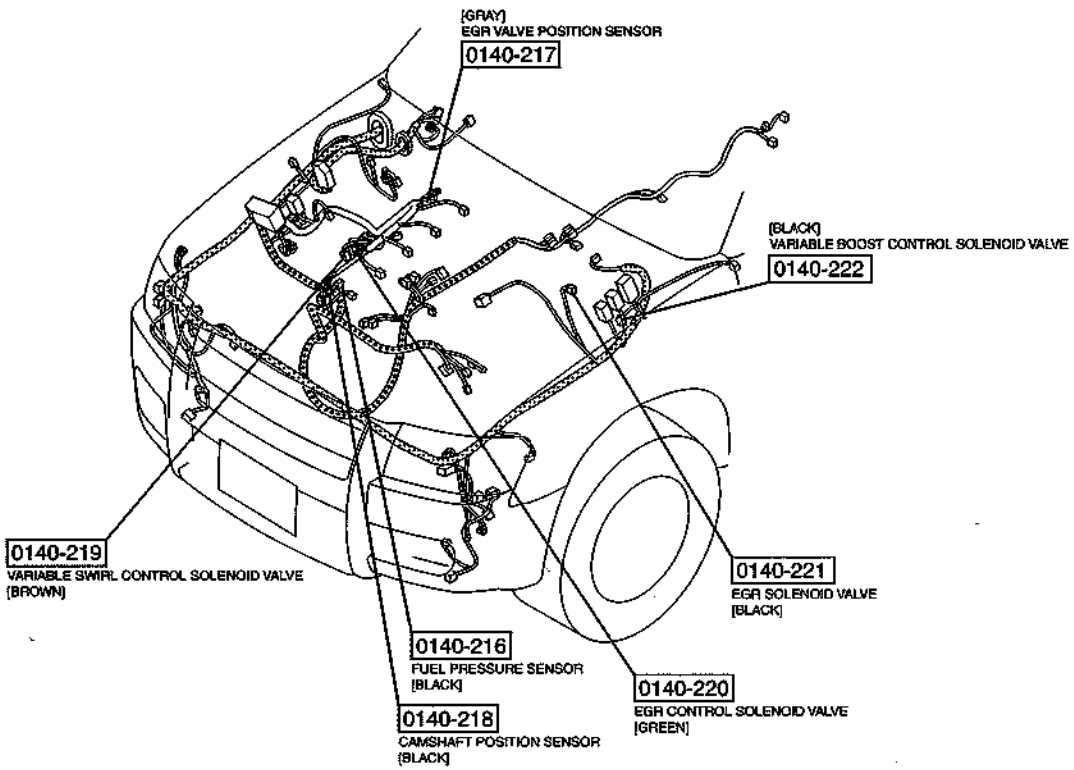
0140-218 CAMSHAFT POSITION SENSOR (F)

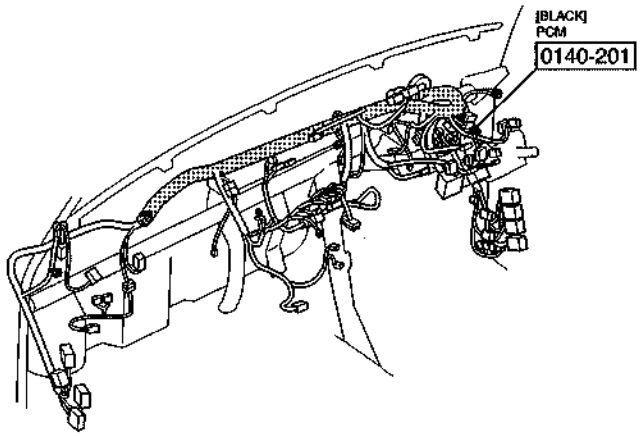
0140-219 VARIABLE SWIRL CONTROL SOLENOID VALVE (F)

0140-220 EGR CONTROL SOLENOID VALVE (F)

0140-221 EGR SOLENOID VALVE (F)

0140-222 VARIABLE BOOST CONTROL SOLENOID VALVE (F)


[GRAY]
EGR VALVE POSITION SENSOR
0140-217
[BLACK]
VARIABLE BOOST CONTROL SOLENOID VALVE
0140-222
0140-219
VARIABLE SWIRL CONTROL SOLENOID VALVE
[BROWN]
0140-221
EGR SOLENOID VALVE
[BLACK]
0140-216
FUEL PRESSURE SENSOR
[BLACK]
0140-220
EGR CONTROL SOLENOID VALVE
[GREEN]
0140-218
CAMSHAFT POSITION SENSOR
[BLACK]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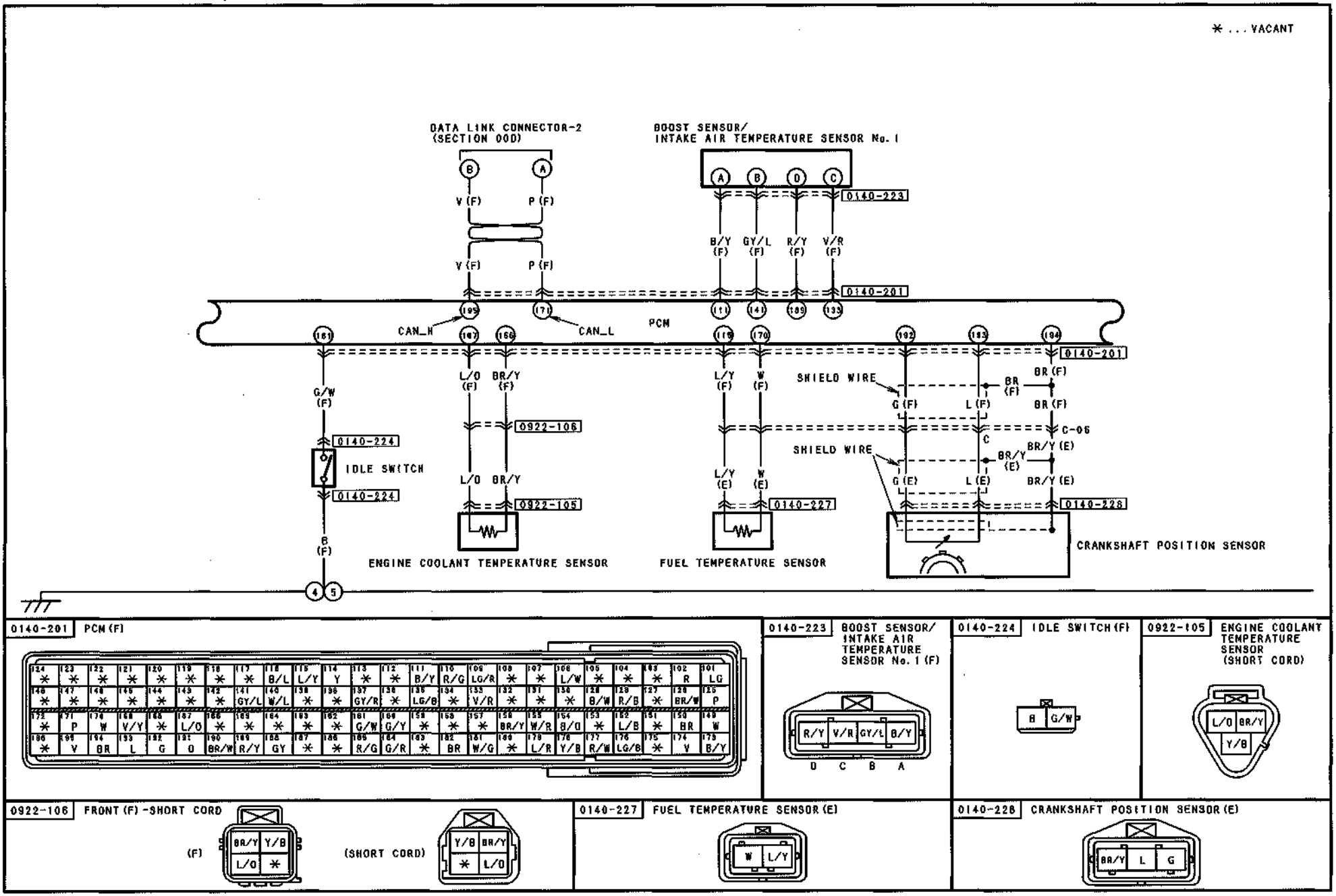
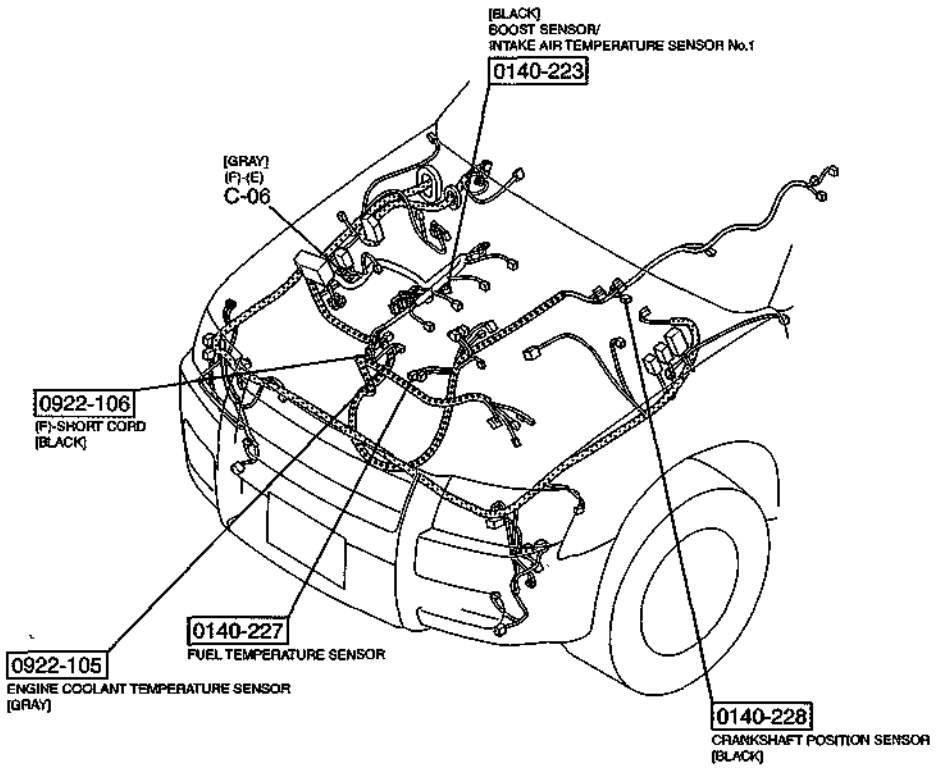
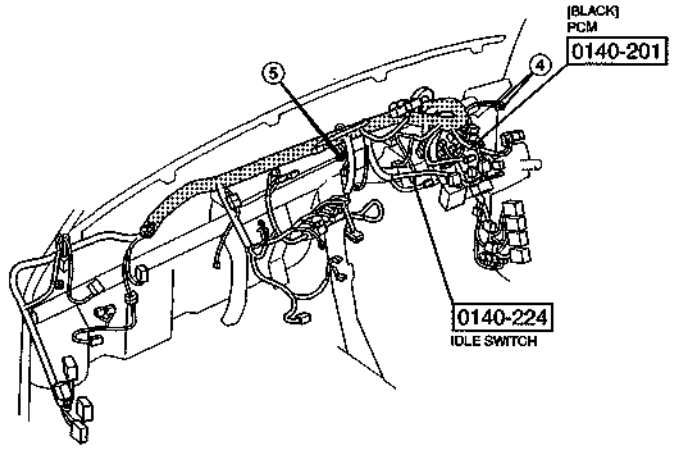
PCM
0140-201


* . . . VACANT
DATA LINK CONNECTOR-2
(SECTION 00D)
BOOST SENSOR/
INTAKE AIR TEMPERATURE SENSOR No. 1
0140-223
0140-201
PCM
CAN_H
CAN_L
SHIELD WIRE
0140-224
IDLE SWITCH
0922-106
0922-105
0140-227
0140-228
C-06
ENGINE COOLANT TEMPERATURE SENSOR
FUEL TEMPERATURE SENSOR
CRANKSHAFT POSITION SENSOR
0140-201 PCM (F)
0140-223 BOOST SENSOR/ INTAKE AIR TEMPERATURE SENSOR No. 1 (F)
0140-224 IDLE SWITCH (F)
0922-105 ENGINE COOLANT TEMPERATURE SENSOR (SHORT CORD)
0922-106 FRONT (F) -SHORT CORD
(F)
(SHORT CORD)
0140-227 FUEL TEMPERATURE SENSOR (E)
0140-228 CRANKSHAFT POSITION SENSOR (E)


[BLACK]
BOOST SENSOR/
INTAKE AIR TEMPERATURE SENSOR No.1
0140-223
[GRAY]
(F)-(E)
C-06
0922-106
(F)-SHORT CORD
[BLACK]
0140-227
FUEL TEMPERATURE SENSOR
0922-105
ENGINE COOLANT TEMPERATURE SENSOR
[GRAY]
0140-228
CRANKSHAFT POSITION SENSOR
[BLACK]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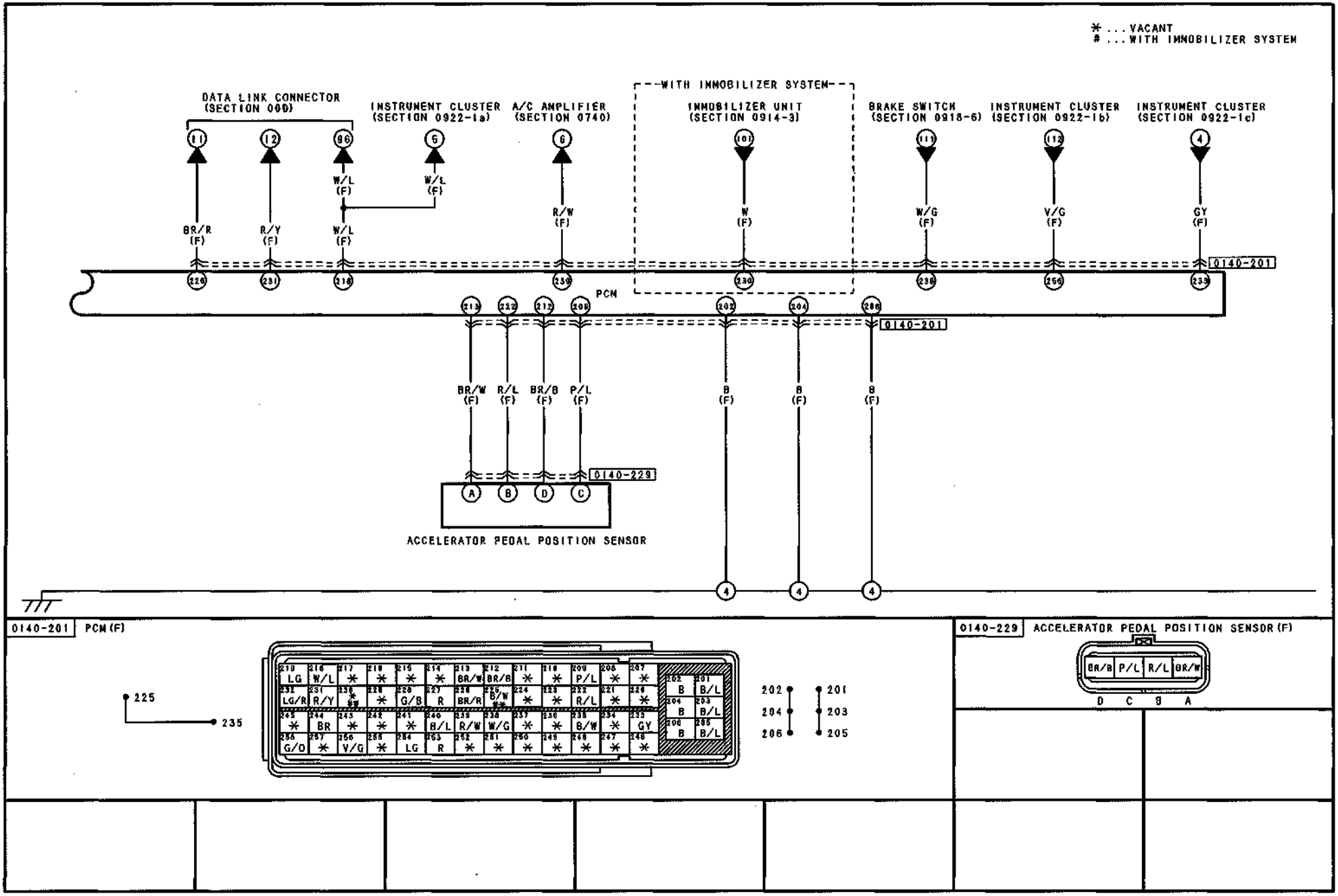
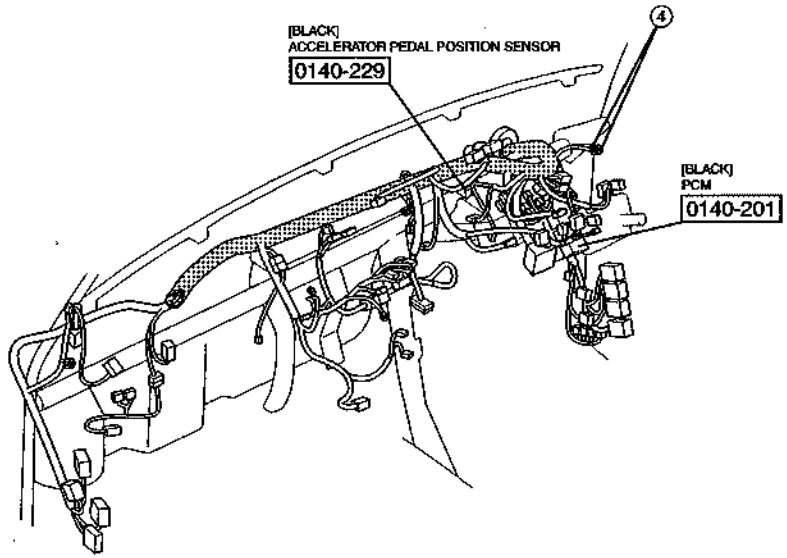
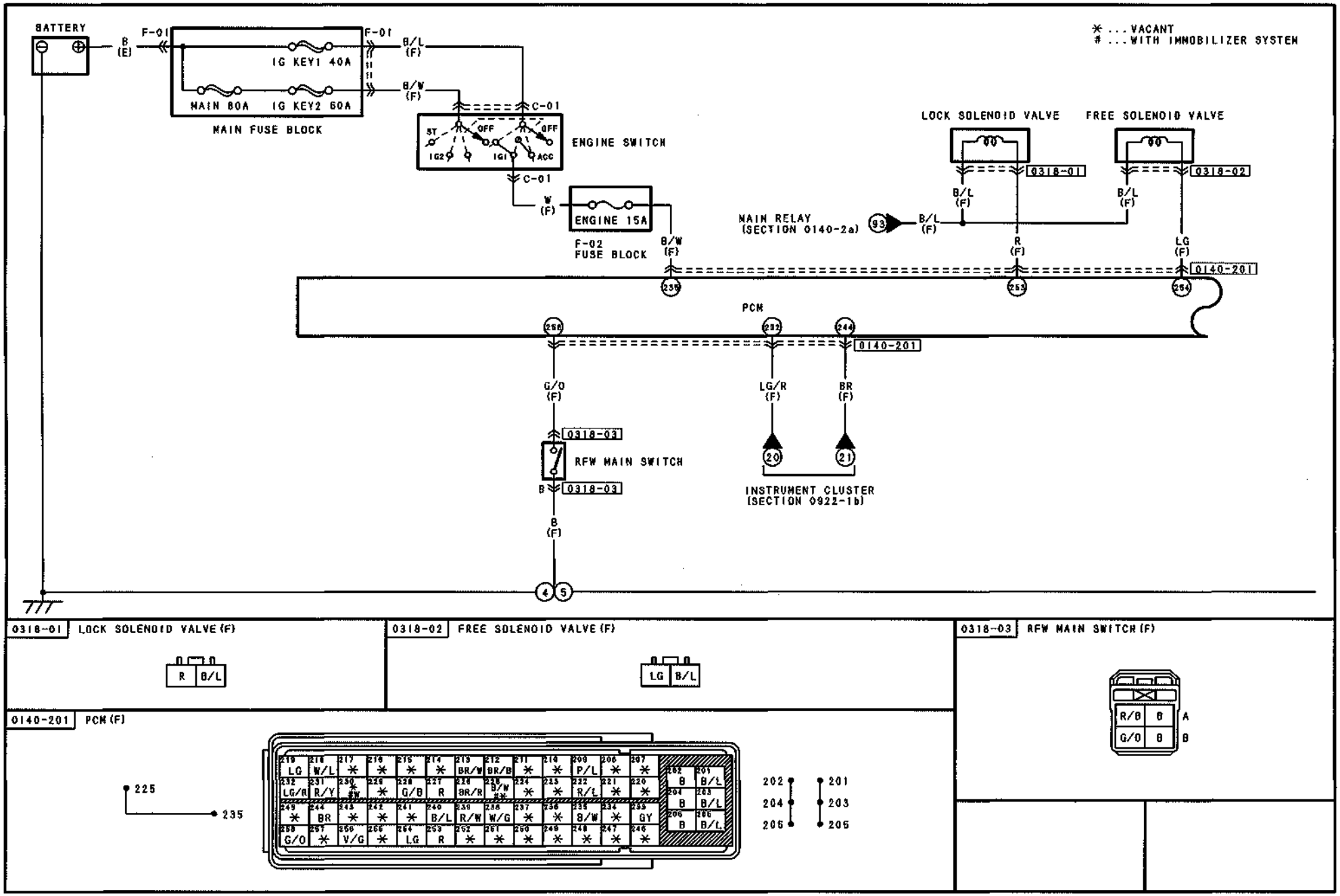
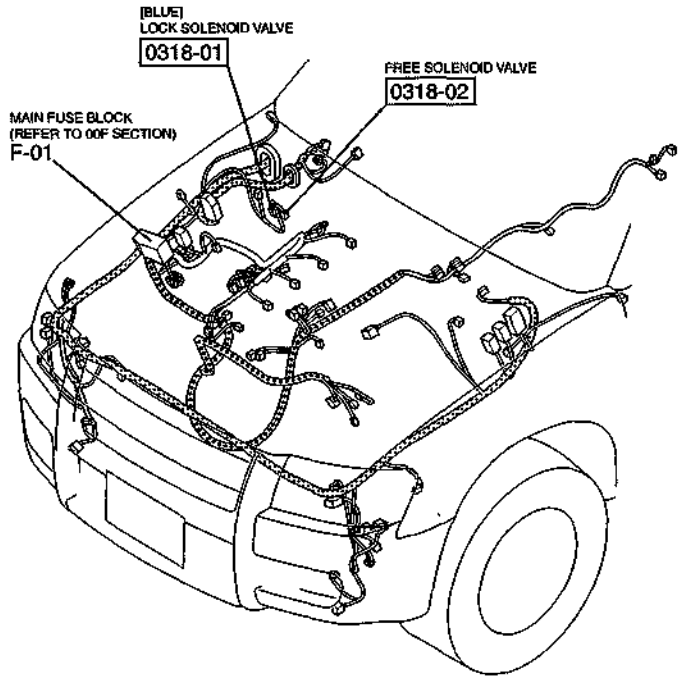
PCM
0140-201
5
4
0140-224
IDLE SWITCH

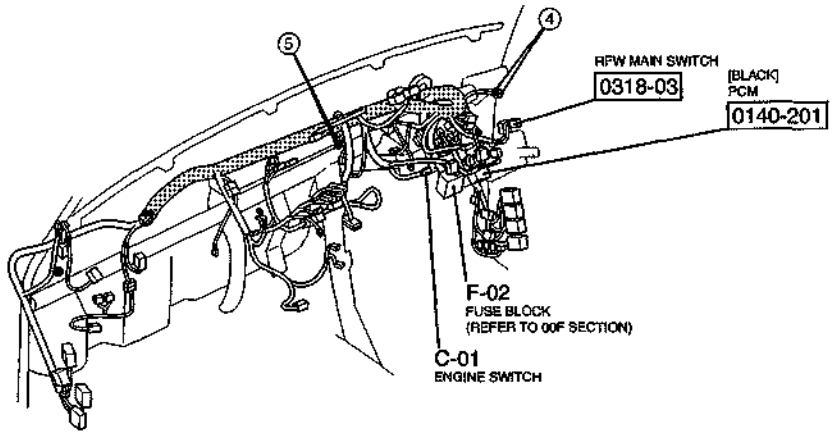

* . . . VACANT
# . . . WITH IMMOBILIZER SYSTEM
DATA LINK CONNECTOR (SECTION 000)
INSTRUMENT CLUSTER (SECTION 0922-1a)
A/C AMPLIFIER (SECTION 0740)
WITH IMMOBILIZER SYSTEM
IMMOBILIZER UNIT (SECTION 0914-3)
BRAKE SWITCH (SECTION 0918-6)
INSTRUMENT CLUSTER (SECTION 0922-1b)
INSTRUMENT CLUSTER (SECTION 0922-1c)
PCM
0140-201
0140-229
ACCELERATOR PEDAL POSITION SENSOR
0140-201 PCM (F)
0140-229 ACCELERATOR PEDAL POSITION SENSOR (F)
BR/B
P/L
R/L
BR/W
D C B A


[BLACK]
ACCELERATOR PEDAL POSITION SENSOR
0140-229
4
[BLACK]
PCM
0140-201

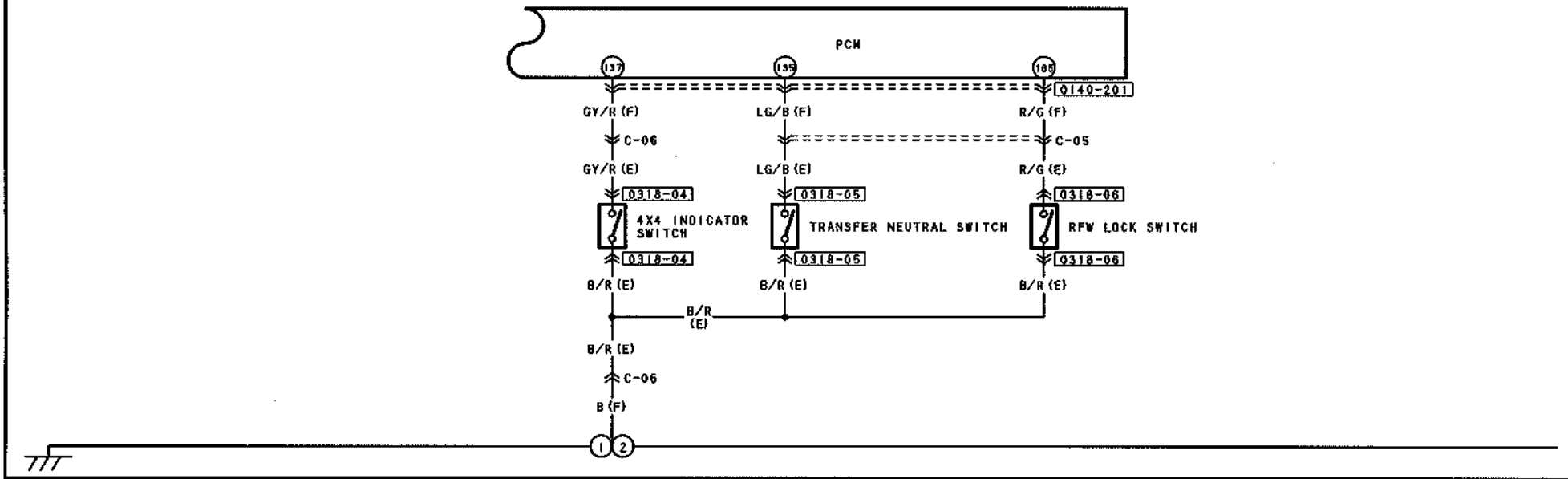
REMOTE FREEWHEEL CONTROL SYSTEM




[BLUE]
LOCK SOLENOID VALVE
0318-01
FREE SOLENOID VALVE
0318-02
MAIN FUSE BLOCK
(REFER TO 00F SECTION)
F-01


5
4
RFW MAIN SWITCH
0318-03
[BLACK]
PCM
0140-201
F-02
FUSE BLOCK
(REFER TO 00F SECTION)
C-01
ENGINE SWITCH

* . . . VACANT



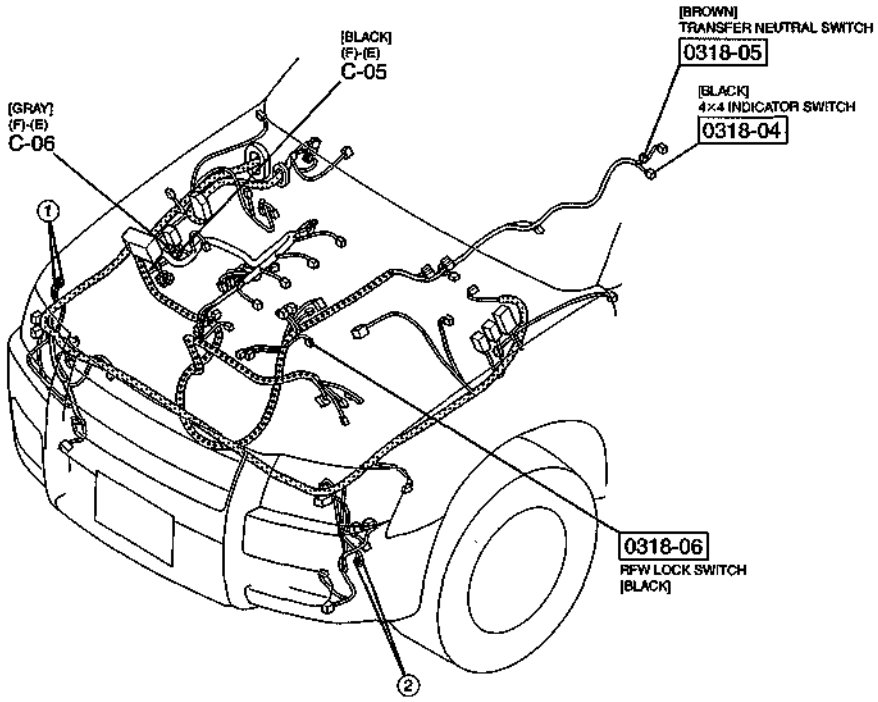
0318-04 4X4 INDICATOR SWITCH (E)

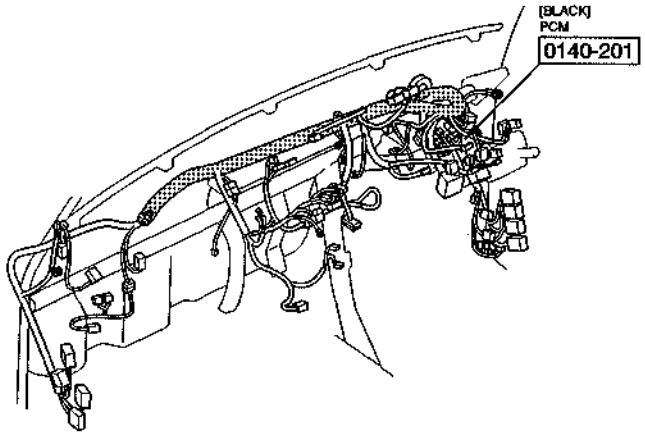
0318-05 TRANSFER NEUTRAL SWITCH (E)

0318-06 RFW LOCK SWITCH (E)

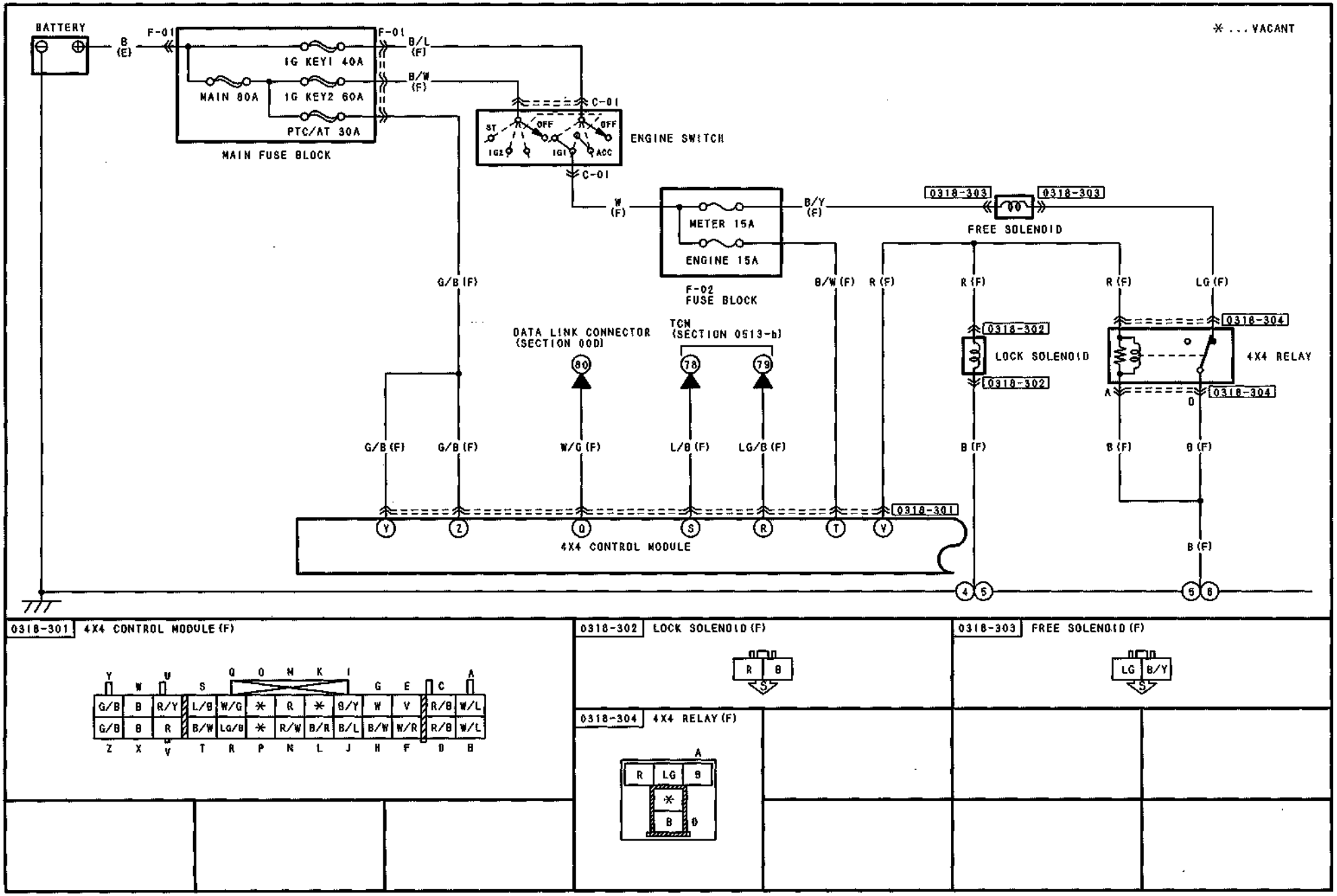
0140-201 PCN (F)

134 *	135 *	136 *	137 *	138 *	139 *	140 *	141 *	142 B/L	143 L/Y	144 Y	145 *	146 *	147 B/Y	148 R/G	149 LG/R	150 *	151 *	152 L/W	153 *	154 *	155 *	156 R	157 LG
158 *	159 *	160 *	161 *	162 *	163 *	164 GY/L	165 W/L	166 *	167 *	168 GY/R	169 *	170 LG/B	171 *	172 V/R	173 *	174 *	175 BR/Y	176 W/R	177 B/O	178 B/W	179 R/B	180 BR/W	181 P
182 *	183 P	184 W	185 V/Y	186 *	187 L/O	188 *	189 *	190 *	191 *	192 G/W	193 G/Y	194 *	195 *	196 BR/Y	197 W/R	198 B/O	199 *	200 L/B	201 *	202 BR	203 *	204 *	205 *
206 *	207 V	208 BR	209 L	210 G	211 O	212 BR/W	213 R/Y	214 GY	215 *	216 *	217 R/G	218 G/R	219 *	220 BR	221 W/G	222 *	223 L/R	224 Y/B	225 R/W	226 LG/B	227 *	228 V	229 B/Y


[BROWN]
TRANSFER NEUTRAL SWITCH
0318-05
[BLACK]
(F)-(E)
C-05
[BLACK]
4×4 INDICATOR SWITCH
0318-04
[GRAY]
(F)-(E)
C-06
1
0318-06
RFW LOCK SWITCH
[BLACK]
2


[BLACK]
PCM
0140-201

4X4 CONTROL SYSTEM



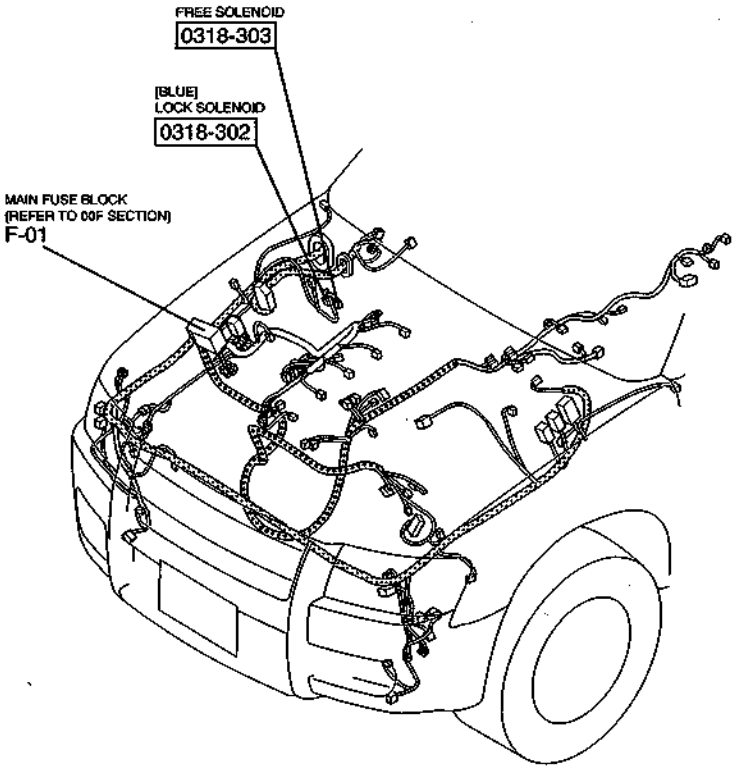
0318-301 4X4 CONTROL MODULE (F)

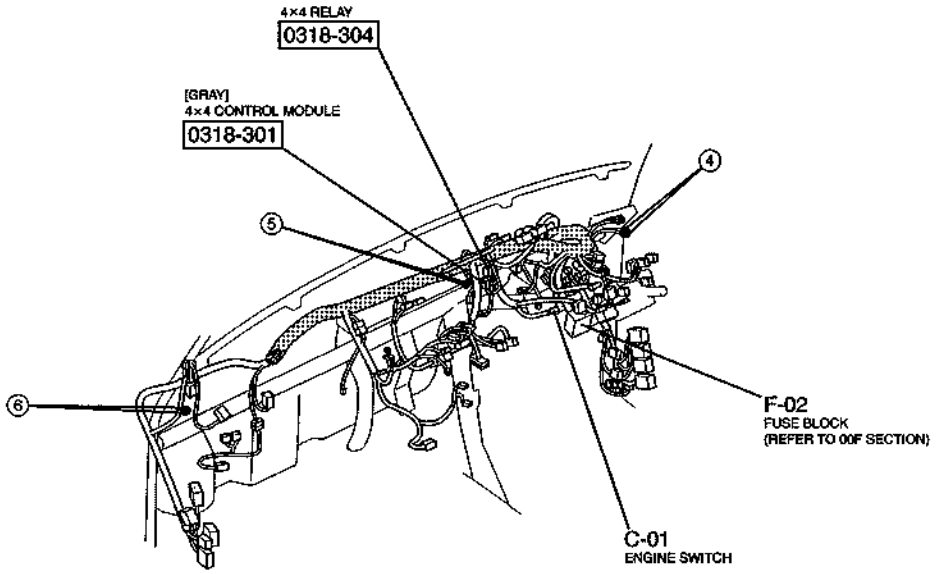
Y	W	U	S	Q	O	N	K	I	G	E	C	A
G/B	B	R/Y	L/B	W/G	*	R	*	B/Y	W	V	R/B	W/L
G/B	B	R	B/W	LG/B	*	R/W	B/R	B/L	B/W	W/R	R/B	W/L
Z	X	V	T	R	P	N	L	J	H	F	D	B

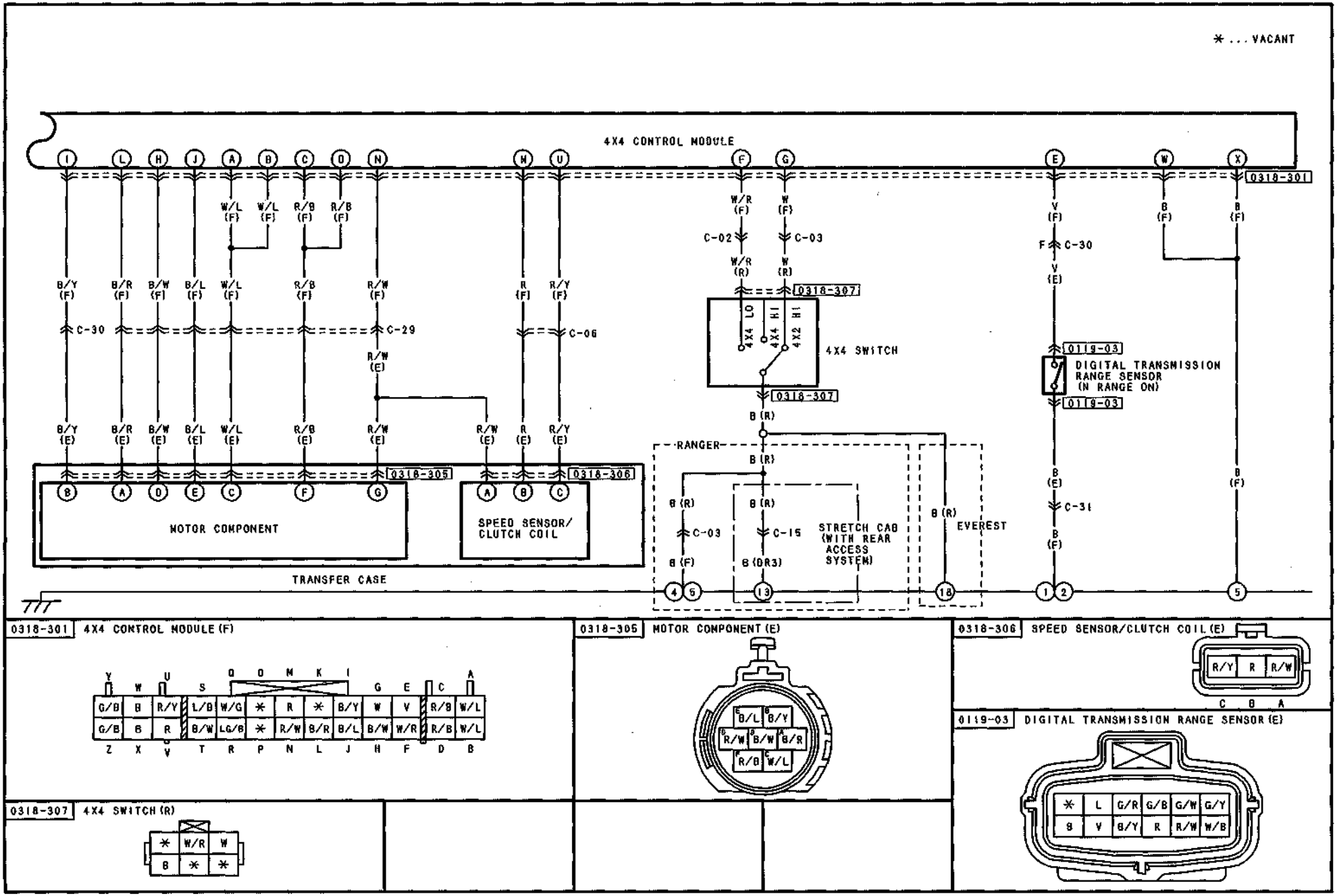
0318-302 LOCK SOLENOID (F)

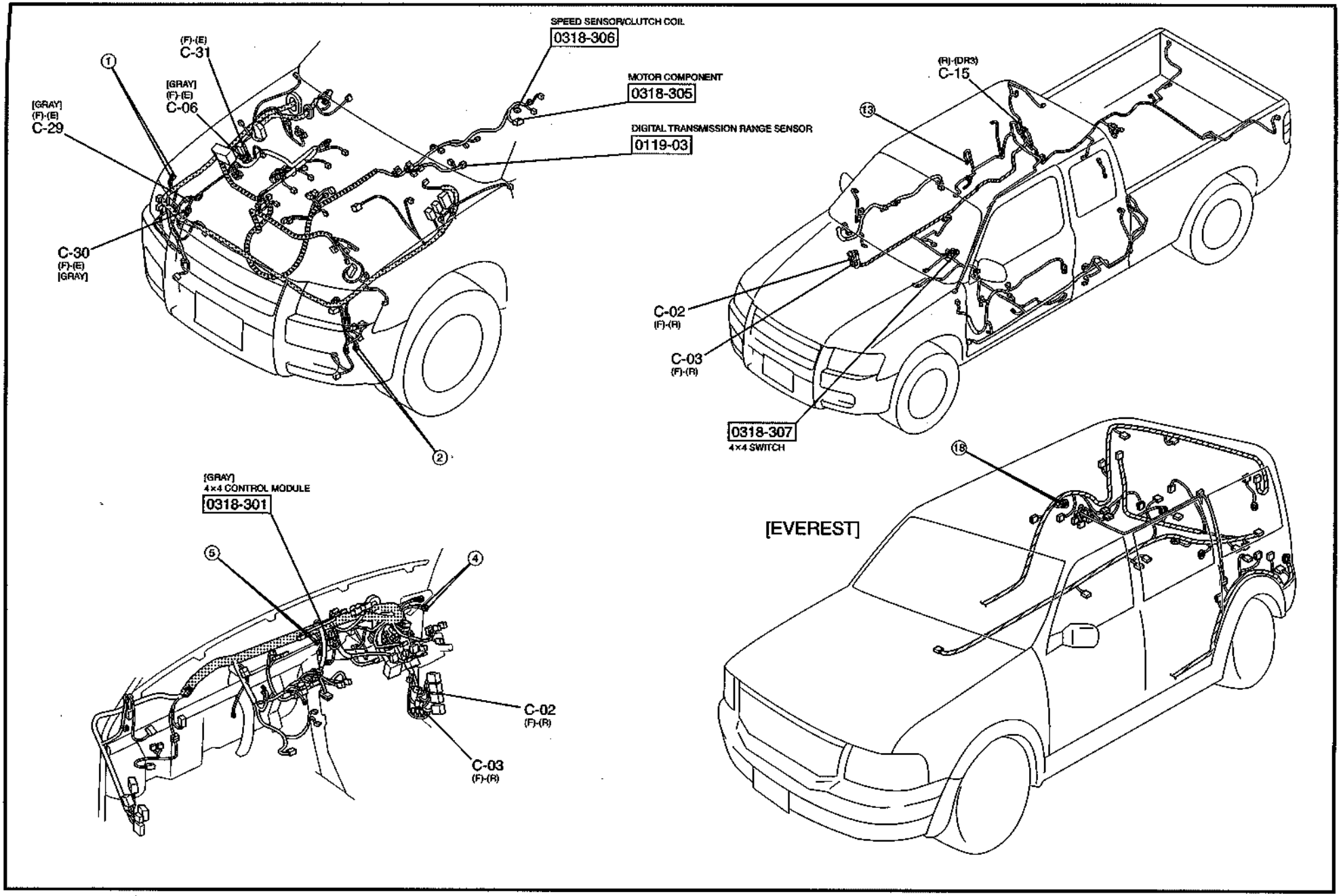
0318-303 FREE SOLENOID (F)

0318-304 4X4 RELAY (F)

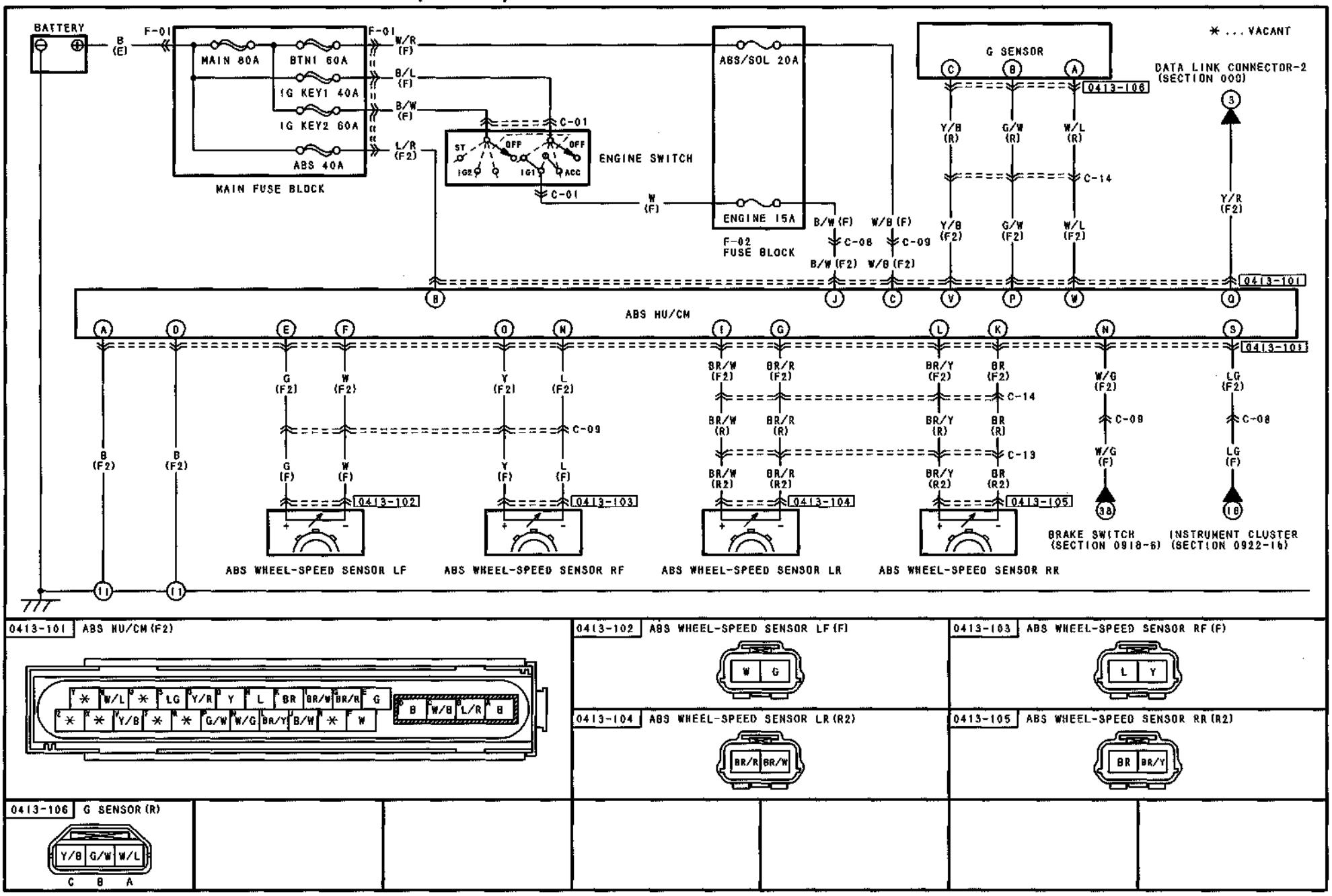

FREE SOLENOID
0318-303
[BLUE]
LOCK SOLENOID
0318-302
MAIN FUSE BLOCK
(REFER TO 00F SECTION)
F-01

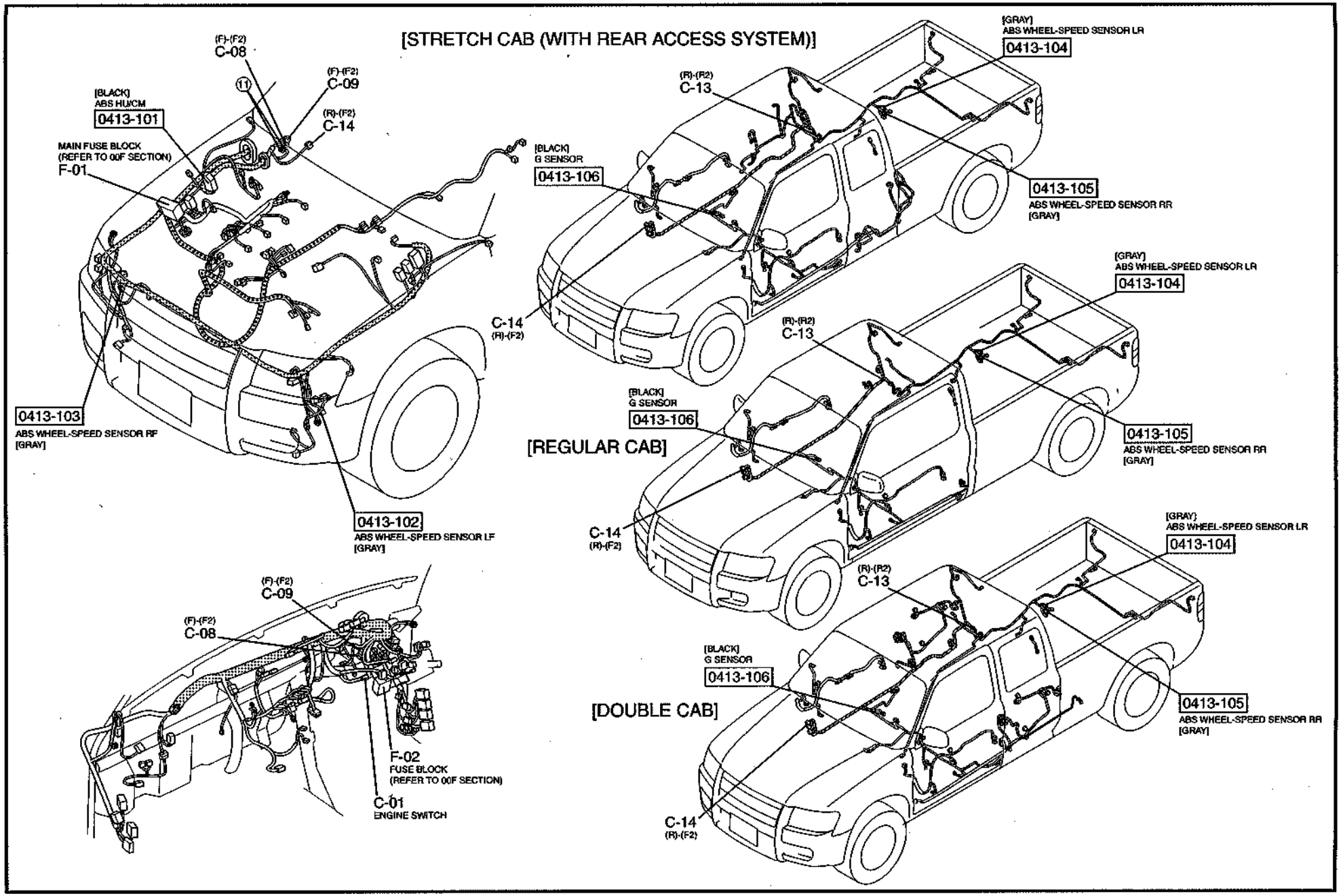

4×4 RELAY
0318-304
[GRAY]
4×4 CONTROL MODULE
0318-301
4
5
6
F-02
FUSE BLOCK
(REFER TO 00F SECTION)
C-01
ENGINE SWITCH


* . . . VACANT
4X4 CONTROL MODULE
0318-301
W/L (F)
W/L (F)
R/B (F)
R/B (F)
W/R (F)
W (F)
V (F)
B (F)
B (F)
C-02
C-03
F C-30
W/R (R)
W (R)
0318-307
4X4 LO
4X4 HI
4X2 HI
4X4 SWITCH
B/Y (F)
B/R (F)
B/W (F)
B/L (F)
W/L (F)
R/B (F)
R/W (F)
R (F)
R/Y (F)
C-30
C-29
C-06
R/W (E)
V (E)
0119-03
DIGITAL TRANSMISSION RANGE SENSOR (N RANGE ON)
0119-03
B/Y (E)
B/R (E)
B/W (E)
B/L (E)
W/L (E)
R/B (E)
R/W (E)
R/W (E)
R (E)
R/Y (E)
0318-305
0318-306
MOTOR COMPONENT
SPEED SENSOR/ CLUTCH COIL
RANGER
B (R)
B (R)
B (R)
C-03
C-15
B (F)
B (DR3)
STRETCH CAB (WITH REAR ACCESS SYSTEM)
EVEREST
B (E)
C-31
B (F)
TRANSFER CASE
0318-301 4X4 CONTROL MODULE (F)
0318-305 MOTOR COMPONENT (E)
0318-306 SPEED SENSOR/CLUTCH COIL (E)
R/Y R R/W
0119-03 DIGITAL TRANSMISSION RANGE SENSOR (E)
0318-307 4X4 SWITCH (R)
* W/R W
B * *
* L G/R G/B G/W G/Y
B V B/Y R R/W W/B

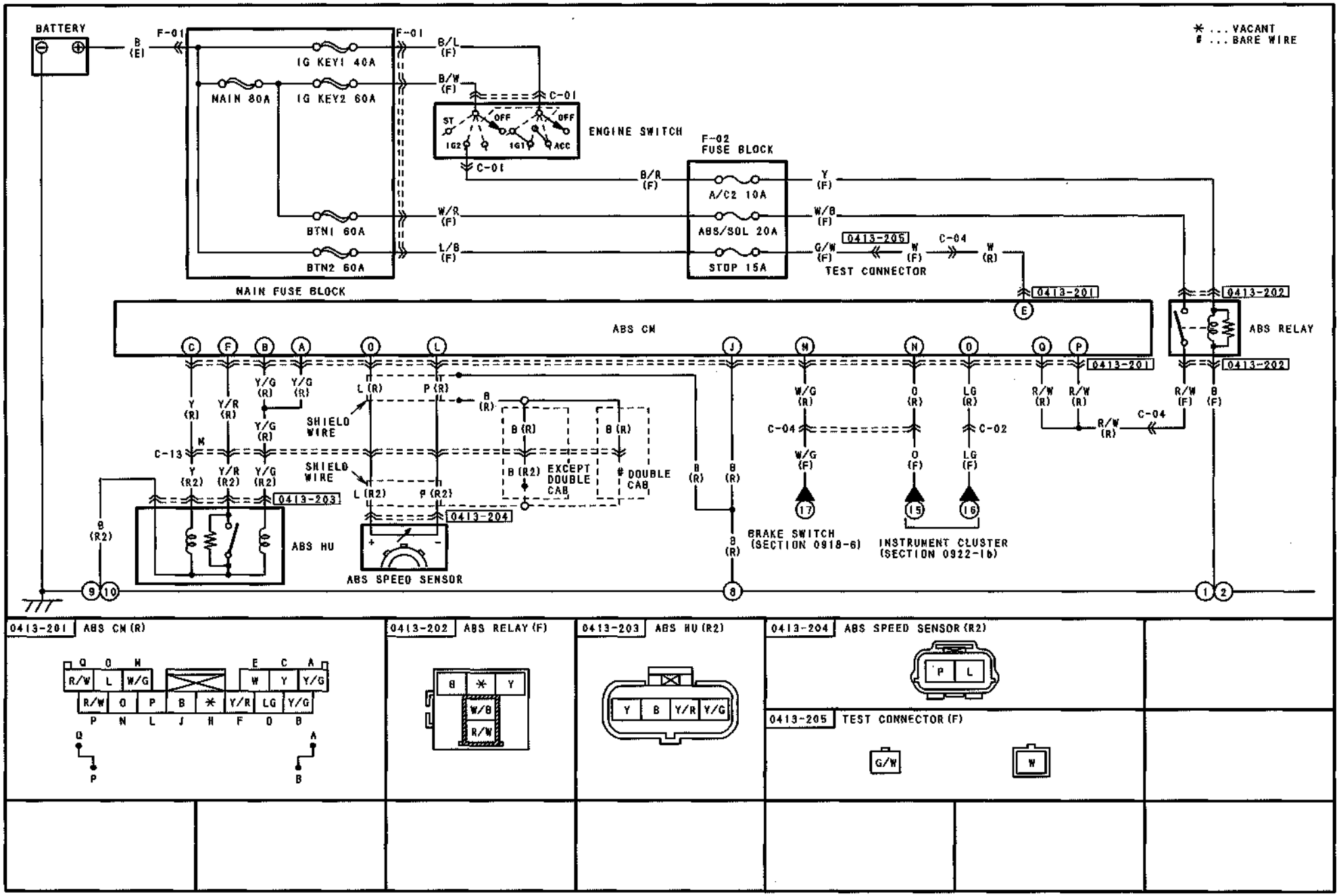

SPEED SENSOR/CLUTCH COIL
0318-306
MOTOR COMPONENT
0318-305
DIGITAL TRANSMISSION RANGE SENSOR
0119-03
(F)-(E)
C-31
[GRAY]
(F)-(E)
C-06
[GRAY]
(F)-(E)
C-29
C-30
(F)-(E)
[GRAY]
(R)-(DR3)
C-15
C-02
(F)-(R)
C-03
(F)-(R)
0318-307
4×4 SWITCH
[GRAY]
4×4 CONTROL MODULE
0318-301
C-02
(F)-(R)
C-03
(F)-(R)
[EVEREST]

4 WHEEL ANTILOCK BRAKE SYSTEM (4WABS)




[STRETCH CAB (WITH REAR ACCESS SYSTEM)]
(F)-(F2)
C-08
(F)-(F2)
C-09
(R)-(F2)
C-14
[BLACK]
ABS HU/CM
0413-101
MAIN FUSE BLOCK
(REFER TO 00F SECTION)
F-01
0413-103
ABS WHEEL-SPEED SENSOR RF
[GRAY]
0413-102
ABS WHEEL-SPEED SENSOR LF
[GRAY]
[BLACK]
G SENSOR
0413-106
C-14
(R)-(F2)
(R)-(F2)
C-13
[GRAY]
ABS WHEEL-SPEED SENSOR LR
0413-104
0413-105
ABS WHEEL-SPEED SENSOR RR
[GRAY]
[REGULAR CAB]
[DOUBLE CAB]
F-02
FUSE BLOCK
(REFER TO 00F SECTION)
C-01
ENGINE SWITCH

REAR ANTILOCK BRAKE SYSTEM



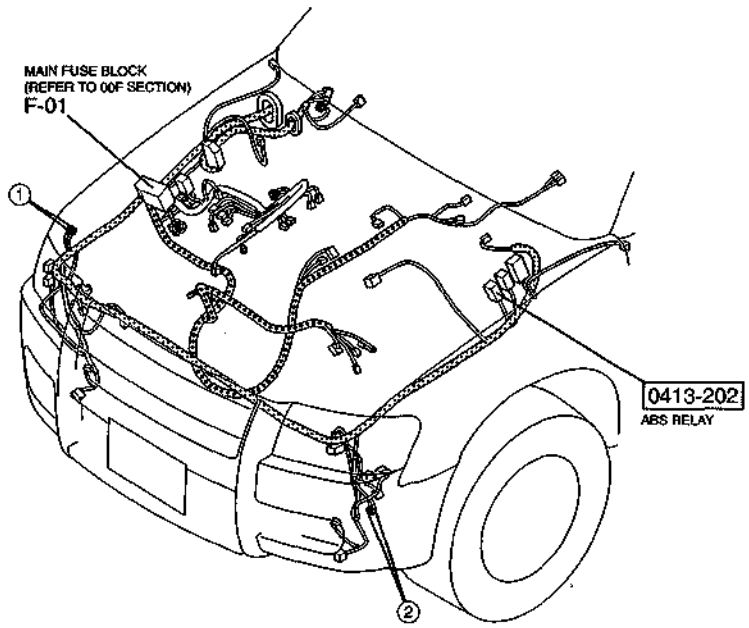
0413-201 ABS CM (R)

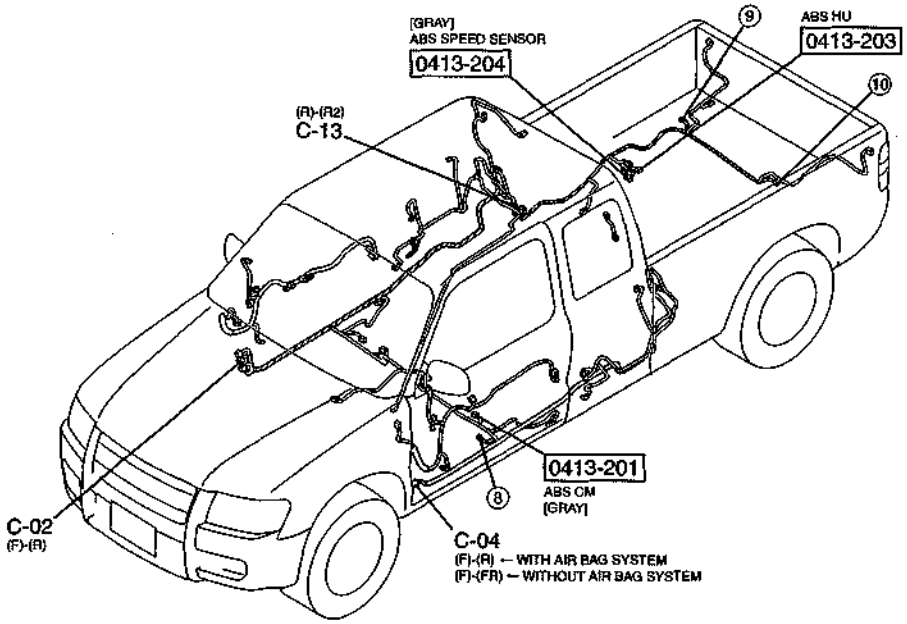
0413-202 ABS RELAY (F)

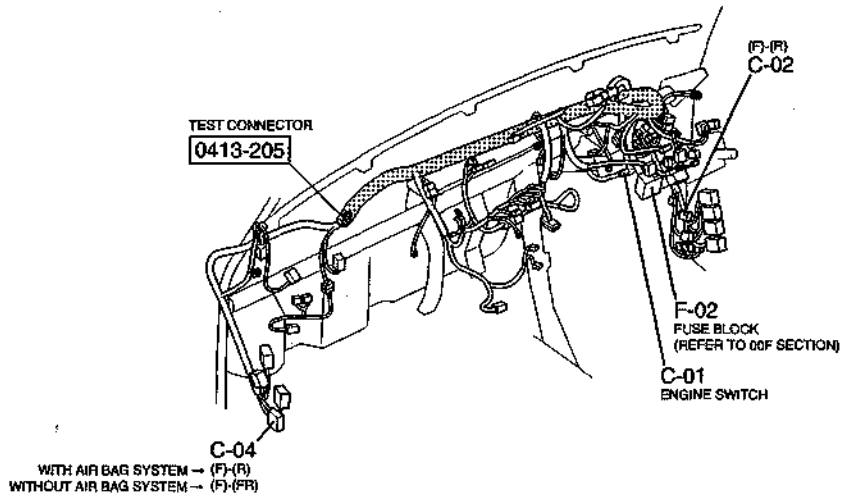
0413-203 ABS HU (R2)

0413-204 ABS SPEED SENSOR (R2)

0413-205 TEST CONNECTOR (F)

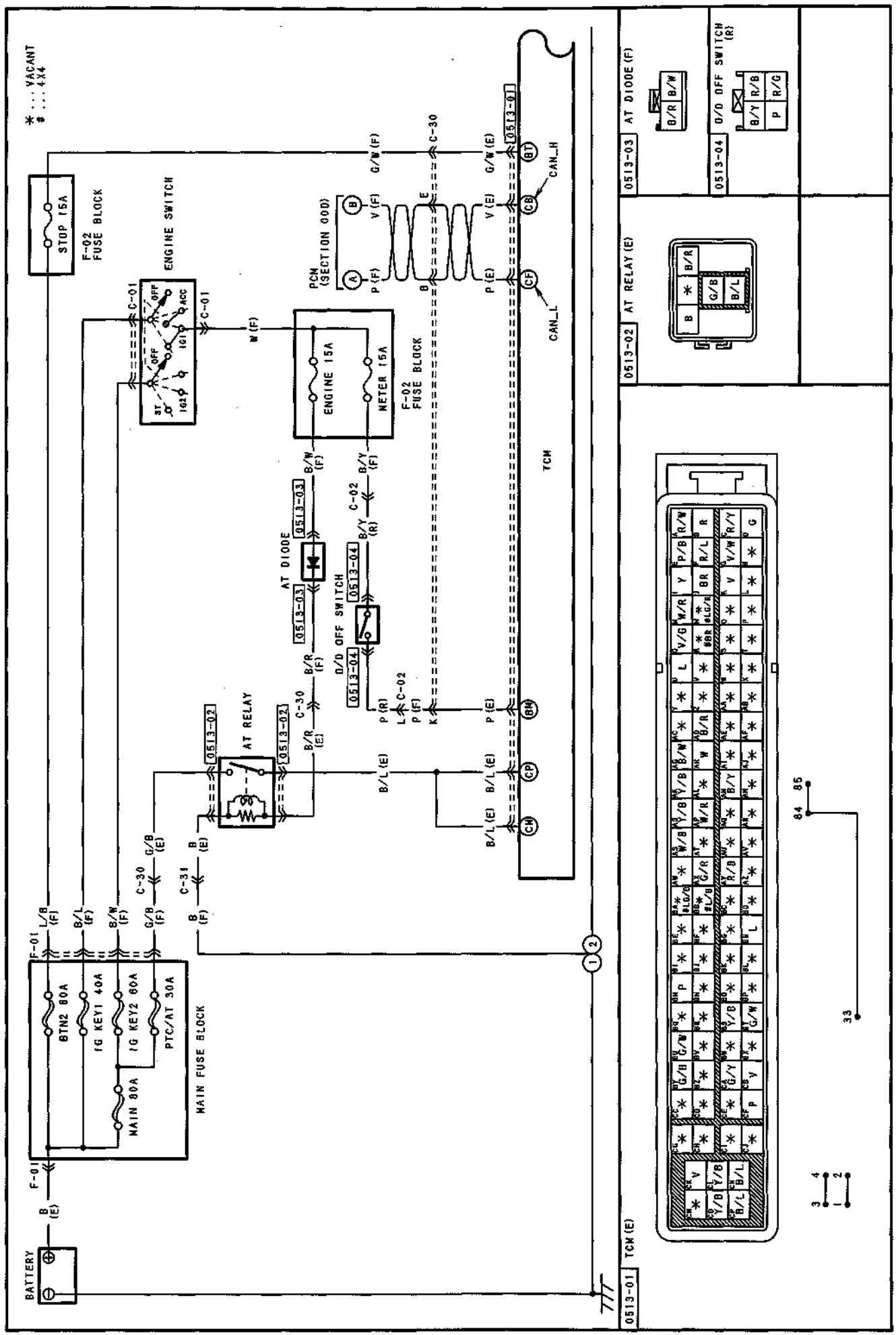

MAIN FUSE BLOCK
(REFER TO 00F SECTION)
F-01
0413-202
ABS RELAY


[GRAY]
ABS SPEED SENSOR
0413-204
ABS HU
0413-203
(R)-(R2)
C-13
0413-201
ABS CM
[GRAY]
C-02
(F)-(R)
C-04
(F)-(R) ← WITH AIR BAG SYSTEM
(F)-(FR) ← WITHOUT AIR BAG SYSTEM

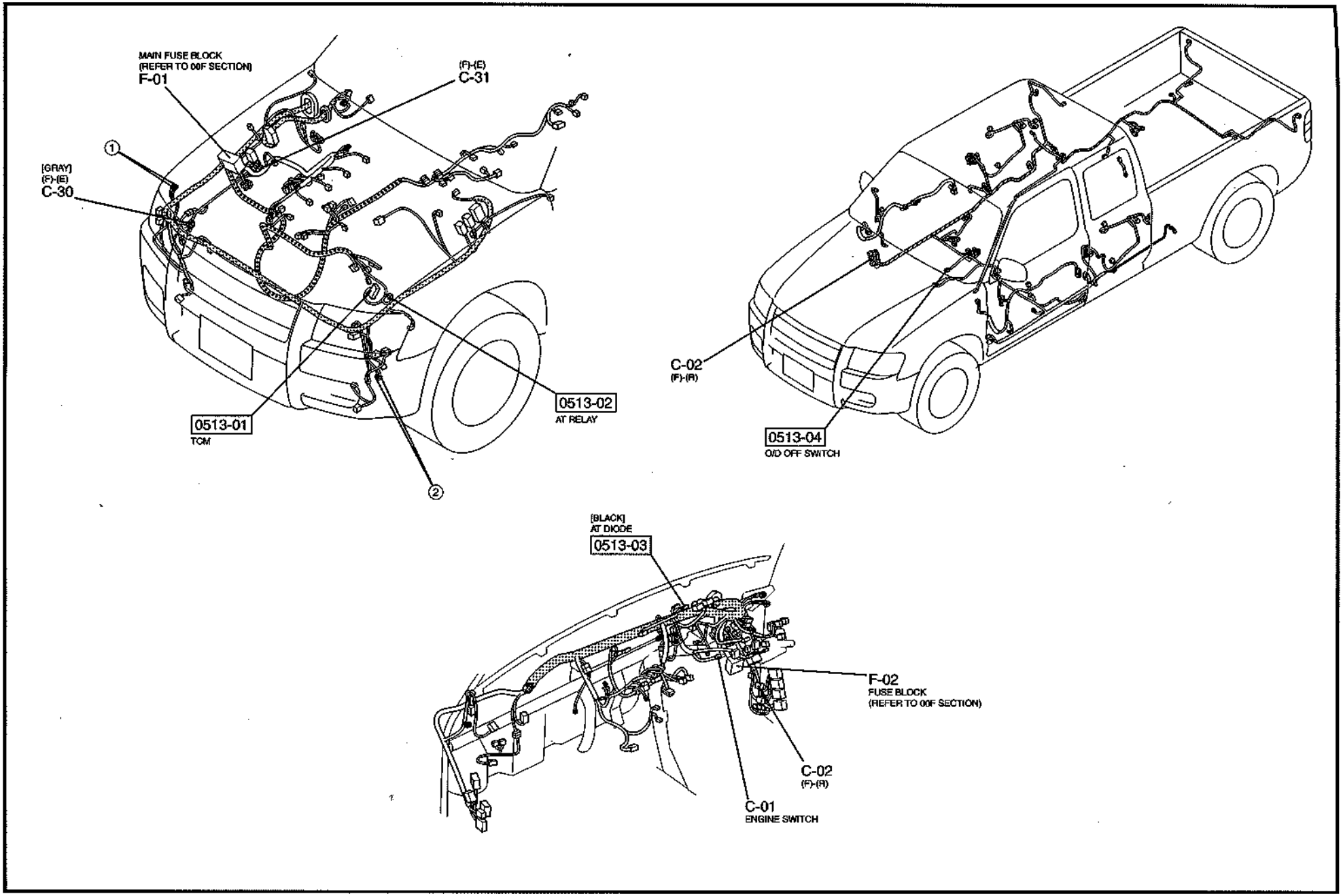

TEST CONNECTOR
0413-205
(F)-(R)
C-02
F-02
FUSE BLOCK
(REFER TO 00F SECTION)
C-01
ENGINE SWITCH
C-04
WITH AIR BAG SYSTEM → (F)-(R)
WITHOUT AIR BAG SYSTEM → (F)-(FR)

0513-a

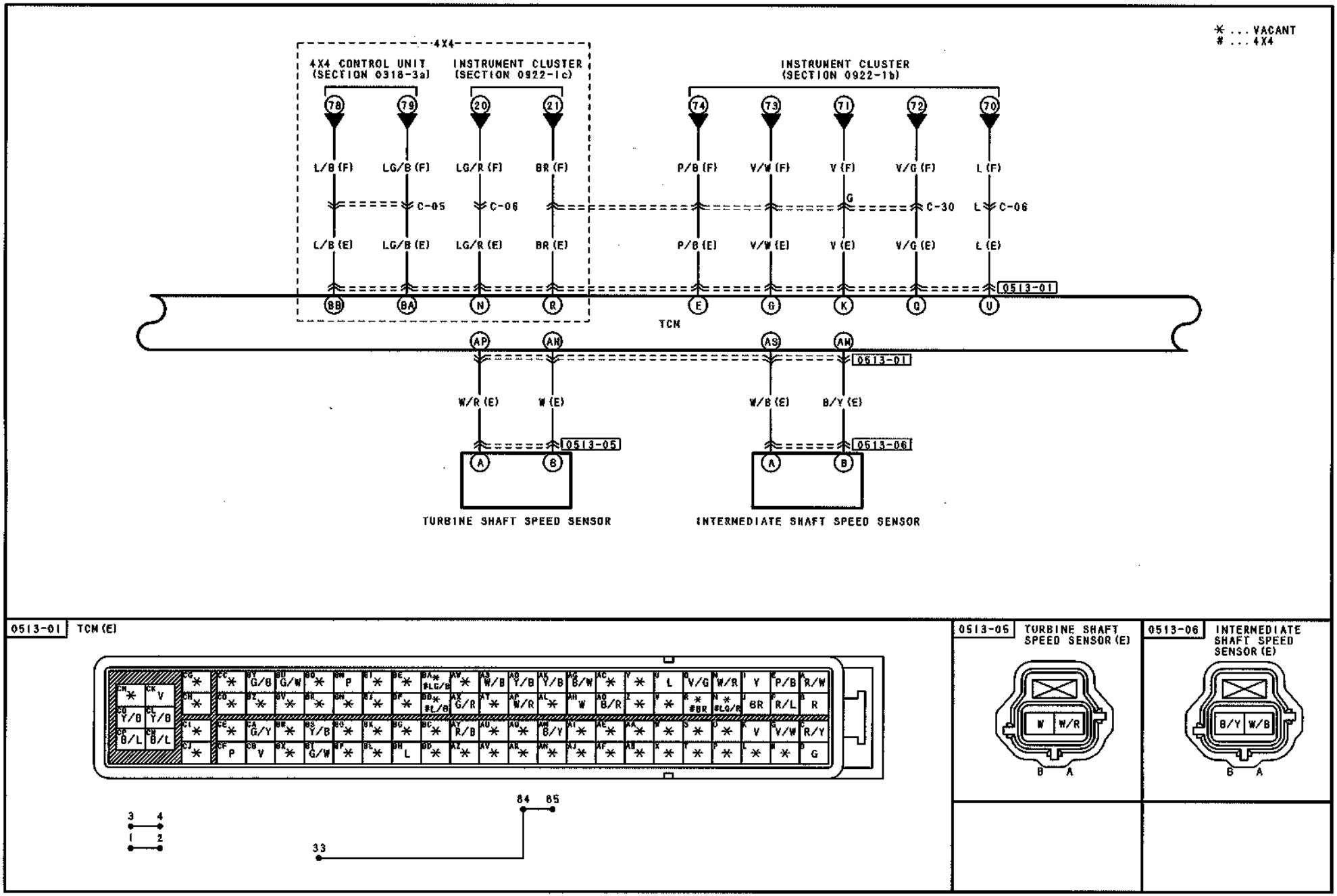
AUTOMATIC TRANSMISSION CONTROL SYSTEM



HARNESS SYMBOL: (F) (E) (R)



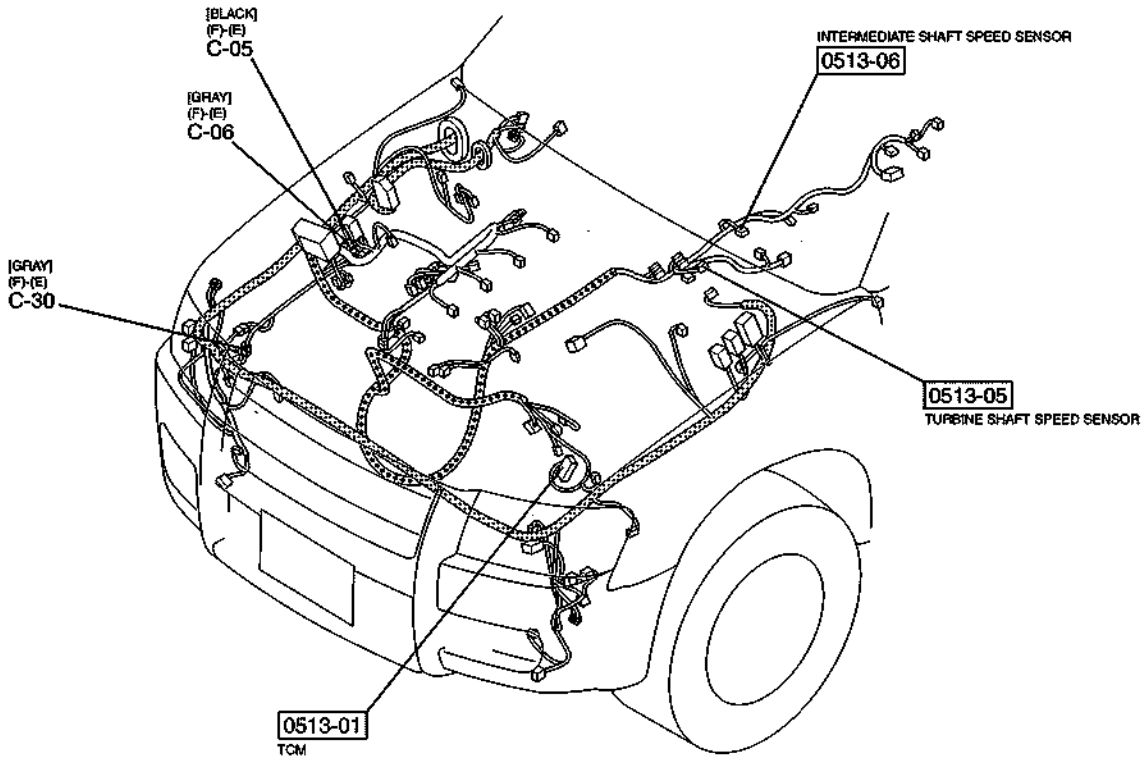
59B



0513-01 TCM (E)

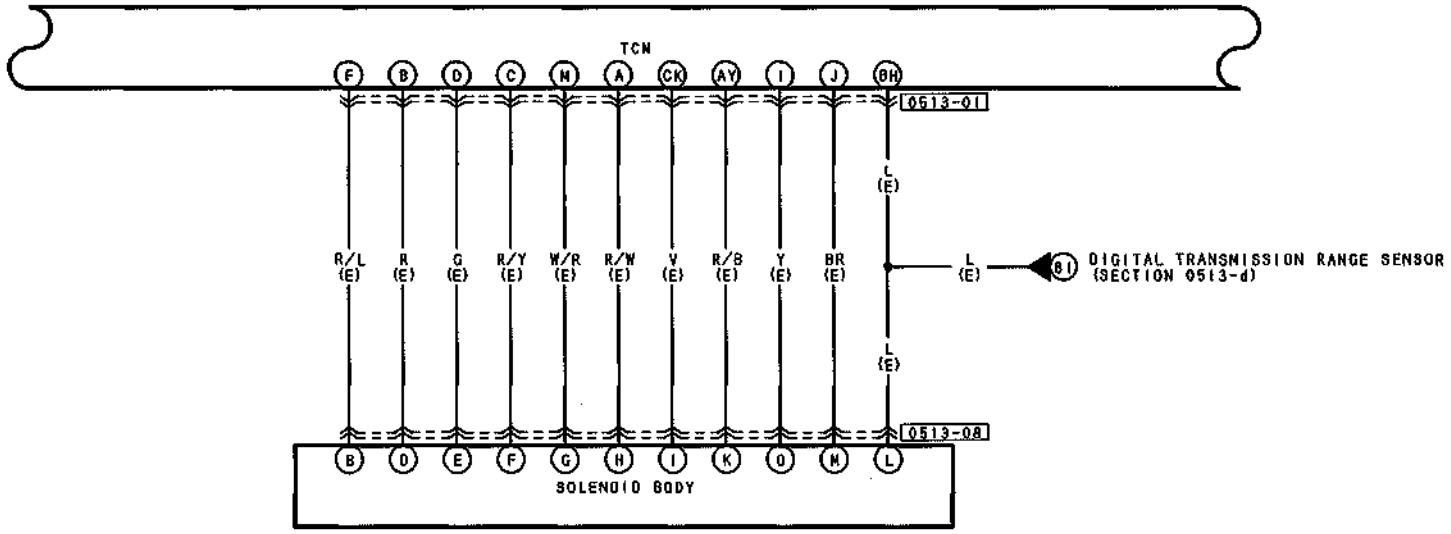
0513-05 TURBINE SHAFT SPEED SENSOR (E)

0513-06 INTERMEDIATE SHAFT SPEED SENSOR (E)

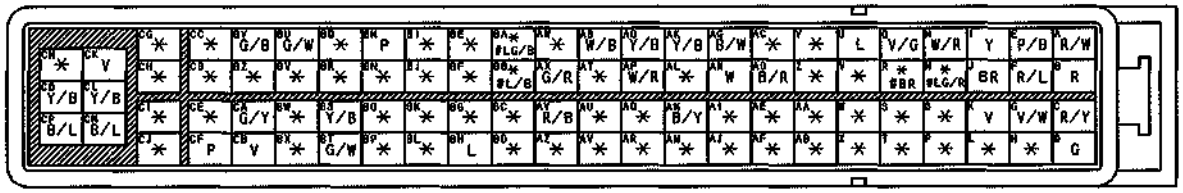

[BLACK]
(F)-(E)
C-05
[GRAY]
(F)-(E)
C-06
[GRAY]
(F)-(E)
C-30
INTERMEDIATE SHAFT SPEED SENSOR
0513-06
0513-05
TURBINE SHAFT SPEED SENSOR
0513-01
TCM

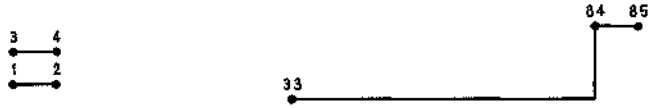
59D

* . . . VACANT
# . . . 4X4

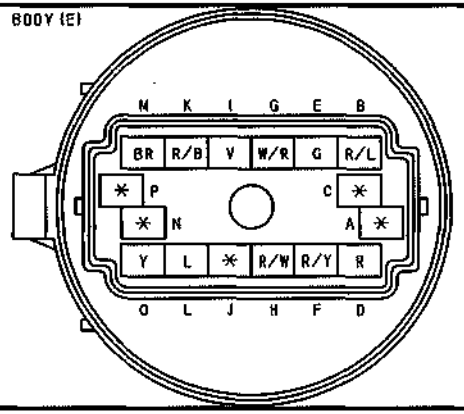


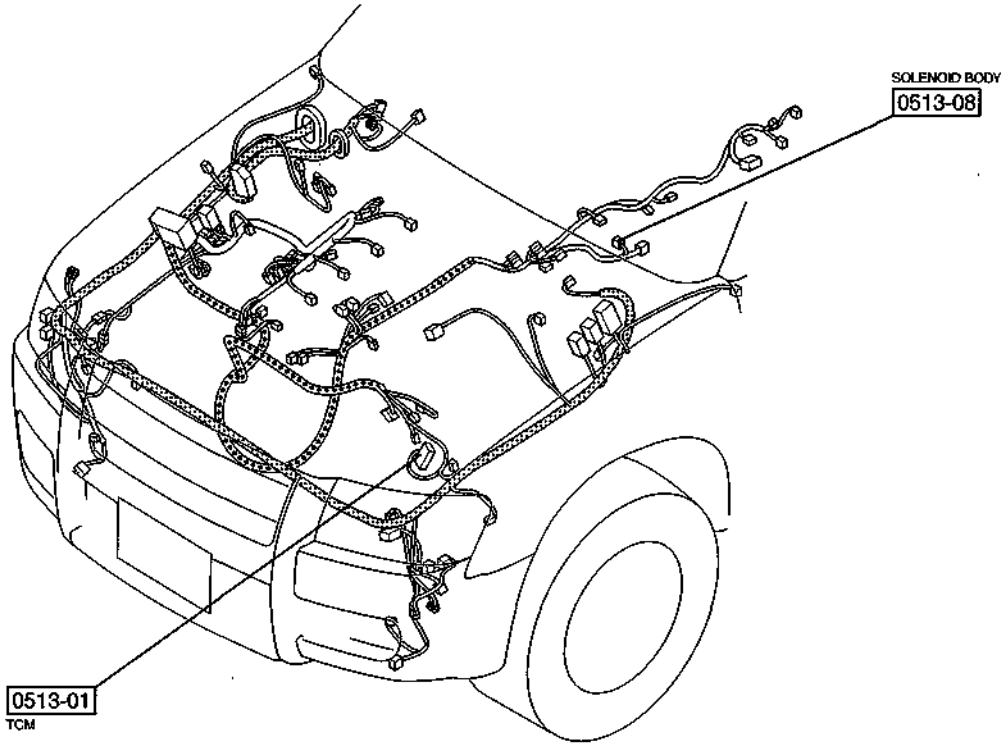
0513-01 TCM (E)

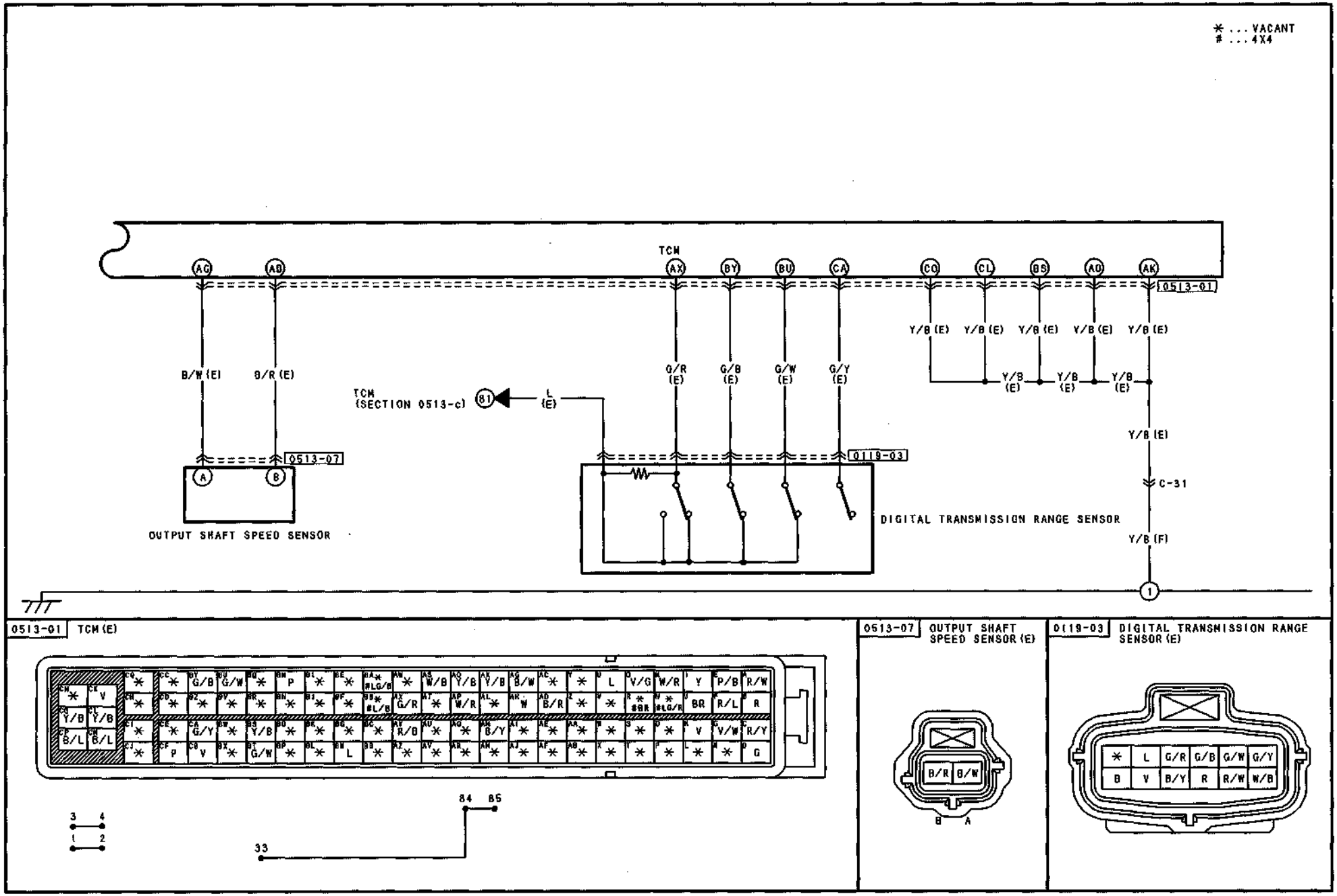


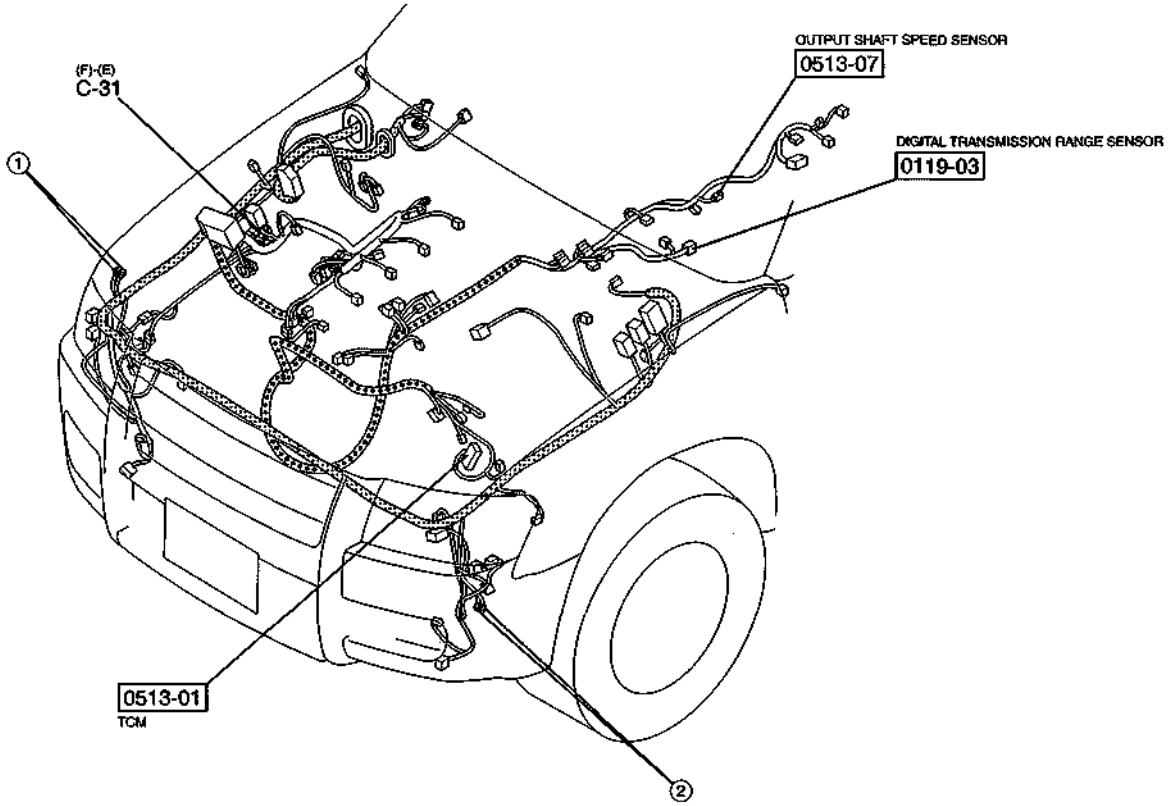


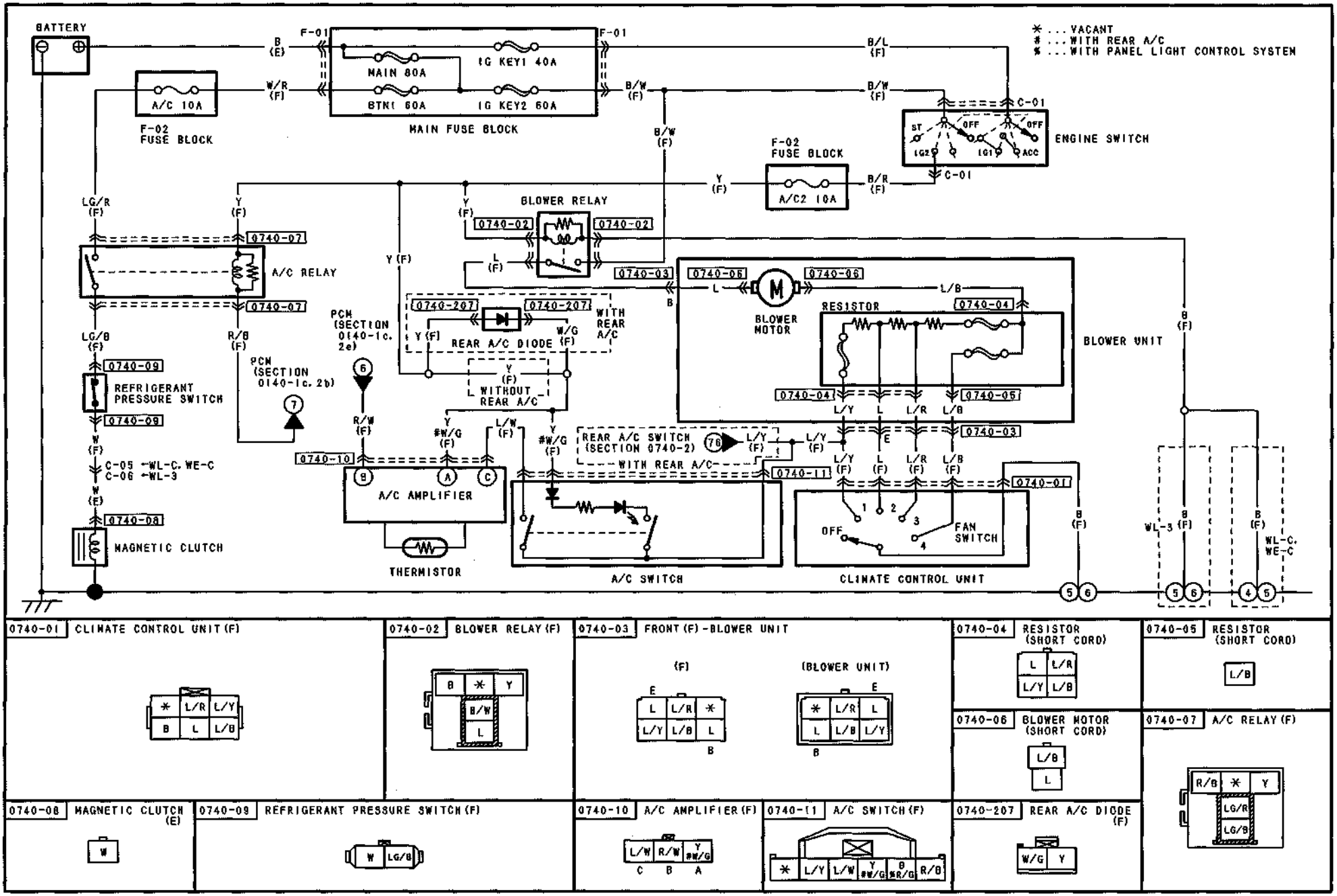
0513-08 SOLENOID BODY (E)



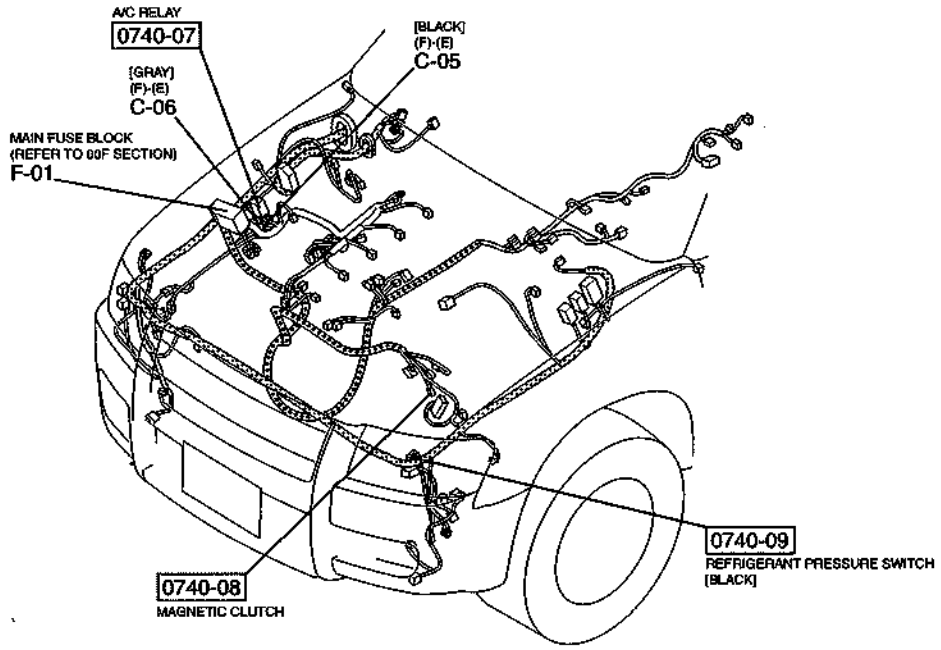

SOLENOID BODY
0513-08
0513-01
TCM

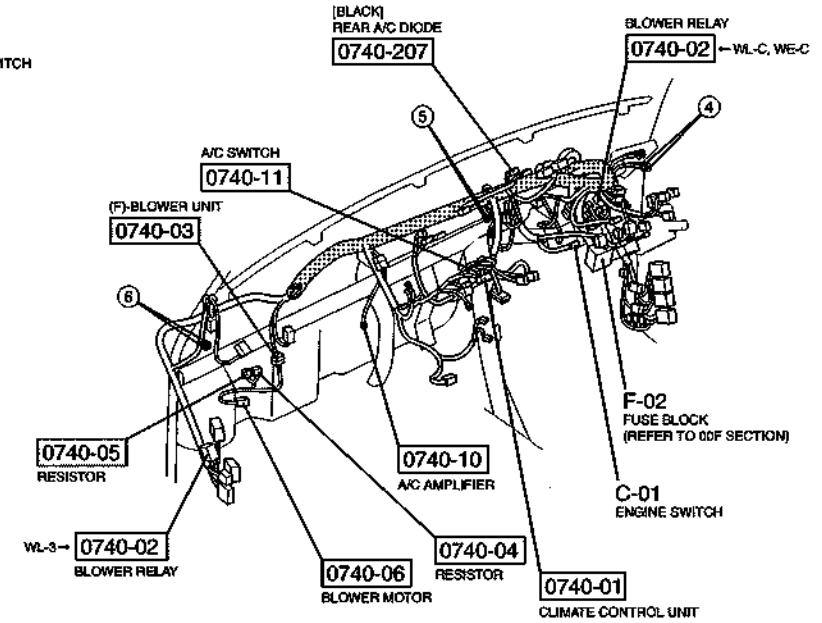

* ... VACANT
# ... 4X4
TCM
AG
AB
AX
BY
BU
CA
CQ
CL
BS
AO
AK
0513-01
B/W (E)
B/R (E)
G/R (E)
G/B (E)
G/W (E)
G/Y (E)
Y/B (E)
Y/B (E)
Y/B (E)
Y/B (E)
Y/B (E)
Y/B (E)
Y/B (E)
Y/B (E)
TCM (SECTION 0513-c)
81
L (E)
0513-07
0119-03
A
B
OUTPUT SHAFT SPEED SENSOR
DIGITAL TRANSMISSION RANGE SENSOR
C-31
Y/B (F)
1
0513-01 TCM (E)
3 4
1 2
84 85
33
0513-07 OUTPUT SHAFT SPEED SENSOR (E)
B/R B/W
B A
0119-03 DIGITAL TRANSMISSION RANGE SENSOR (E)
* L G/R G/B G/W G/Y
B V B/Y R R/W W/B


OUTPUT SHAFT SPEED SENSOR
0513-07
(F)-(E)
C-31
DIGITAL TRANSMISSION RANGE SENSOR
0119-03
1
0513-01
TCM
2



0740-01 CLIMATE CONTROL UNIT (F)	0740-02 BLOWER RELAY (F)	0740-03 FRONT (F) - BLOWER UNIT		0740-04 RESISTOR (SHORT CORD)	0740-05 RESISTOR (SHORT CORD)
		(F)	(BLOWER UNIT)		
0740-06 BLOWER MOTOR (SHORT CORD)	0740-07 A/C RELAY (F)				
0740-08 MAGNETIC CLUTCH (E)	0740-09 REFRIGERANT PRESSURE SWITCH (F)	0740-10 A/C AMPLIFIER (F)	0740-11 A/C SWITCH (F)	0740-207 REAR A/C DIODE (F)	


A/C RELAY
0740-07
[BLACK]
(F)-(E)
C-05
[GRAY]
(F)-(E)
C-06
MAIN FUSE BLOCK
(REFER TO 00F SECTION)
F-01
0740-09
REFRIGERANT PRESSURE SWITCH
[BLACK]
0740-08
MAGNETIC CLUTCH


[BLACK]
REAR A/C DIODE
0740-207
BLOWER RELAY
0740-02
WL-C, WE-C
A/C SWITCH
0740-11
(F)-BLOWER UNIT
0740-03
F-02
FUSE BLOCK
(REFER TO 00F SECTION)
0740-05
RESISTOR
0740-10
A/C AMPLIFIER
C-01
ENGINE SWITCH
WL-3
0740-02
BLOWER RELAY
0740-06
BLOWER MOTOR
0740-04
RESISTOR
0740-01
CLIMATE CONTROL UNIT

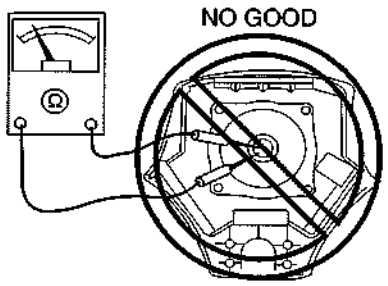
AIR BAG SYSTEM

SERVICE WARNINGS

DBG081000000W02

Air Bag Module Inspection

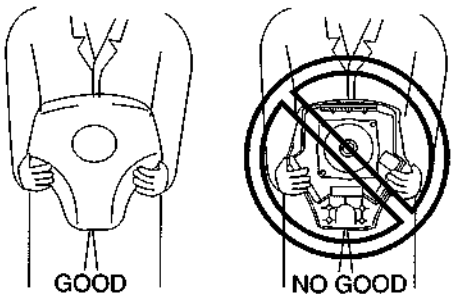
- **Inspecting an air bag module using a tester can operate (deploy) the air bag module, which may cause serious injury. Do not use a tester to inspect an air bag module. Always use the on-board diagnostic function to diagnose the air bag module for malfunctions.**



DPE810ZW1002

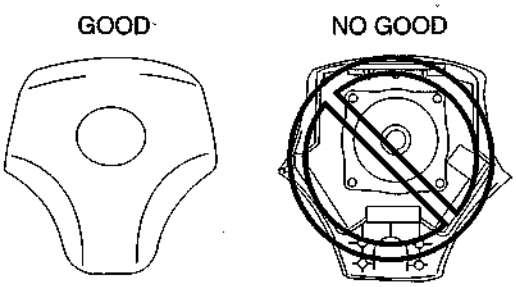
Air Bag Module Handling

- **Before removing the air bag module or disconnecting the air bag module connector, always turn the ignition switch to the LOCK position, disconnect the negative battery cable, and then wait for 1 min or more to allow the backup power supply of the SAS control module to deplete its stored power.**
- **Handling a live (undeployed) air bag module that is pointed toward your body could result in serious injury if the air bag module were to accidentally operate (deploy). When carrying a live (undeployed) air bag module, point the deployment surface away from your body to lessen the chance of injury in case it operates (deploys).**



DPE810ZW1003

- **A live (undeployed) air bag module placed with its deployment surface to ground is dangerous. If the air bag module were to accidentally operate (deploy), it could cause serious injury. Always place a live (undeployed) air bag module with its deployment surface up.**



DPE810ZW1004

Side Air Bag Module Handling

- **When a side air bag module operates (deploys) due to a collision, the interior of the seat back (pad, frame, trim) may become damaged. If a side air bag does not operate (deploy) normally from a seat back that has been reused, a serious accident may result. After a side air bag has operated (deployed), always replace both the side air bag module and the seat back (pad, frame, trim) with new parts. After servicing, verify that the seat operates normally and that the wiring harness is not caught.**

SAS control module Handling

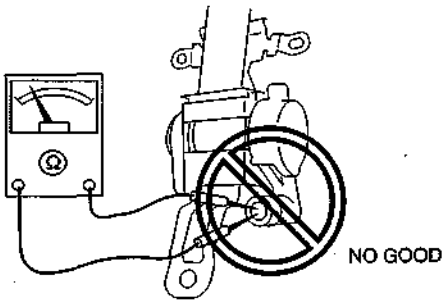
- **Removing the SAS control module or disconnecting the SAS control module connector with the ignition switch at the ON position can activate the sensor in the SAS control module and operate (deploy) the air bags and pre-tensioner seat belts, which may cause serious injury. Before removing the SAS control module or disconnecting the SAS control module connector, always turn the ignition switch to the LOCK position, disconnect the negative battery cable, and then wait for 1 min or more to allow the backup power supply of the SAS control module to deplete its stored power.**
- **Connecting the SAS control module connector with the SAS control module not securely fixed to the vehicle is dangerous. The sensor in the SAS control module could send an electrical signal to the air bag modules and pre-tensioner seat belts. This will operate (deploy) the air bags and pre-tensioner seat belts, which may result in serious injury. Therefore, before connecting the connector, securely fix the SAS control module to the vehicle.**
- **Because a sensor is built into the SAS control module, once the air bags and pre-tensioner seat belts have operated (deployed) due to a collision or other causes, the SAS control module must be replaced with a new one even if the used one does not have any visible external damage or deformation. The used SAS control module may have been damaged internally which may cause improper operation. If the SAS control module is reused, the air bags and pre-tensioner seat belts may not operate (deploy) normally, which could result in a serious accident. Always replace the SAS control module with a new one. The SAS control module cannot be bench-checked or self-checked.**

Side Air Bag Sensor Handling

- **Removing the side air bag sensor or disconnecting the side air bag sensor connector with the ignition switch at the ON position can activate the side air bag sensor and operate (deploy) the side air bag, which may cause serious injury. Before removing the side air bag sensor or disconnecting the side air bag sensor connector, always turn the ignition switch to the LOCK position, disconnect the negative battery cable, and then wait for 1 min or more to allow the backup power supply of the SAS control module to deplete its stored power.**
- **If the side air bag sensor is subjected to shock or the sensor is disassembled, the side air bag may accidentally operate (deploy) and cause injury, or the system may fail to operate normally and cause a serious accident. Do not subject the side air bag sensor to shock or disassemble the sensor.**
- **Because a sensor is built into the side air bag sensor, once the air bag has operated (deployed) due to a collision or other causes, the side air bag sensor must be replaced with a new one even if the used one does not have any visible external damage or deformation. If the side air bag sensor is reused, the side air bag may not operate (deploy) normally, which could result in a serious accident. Always replace the side air bag sensor with a new one. The side air bag sensor cannot be bench-checked or self-checked.**

Pre-tensioner Seat Belt Inspection

- **Inspecting a pre-tensioner seat belt using a tester can operate (deploy) the pre-tensioner seat belt, which may cause serious injury. Do not use a tester to inspect a pre-tensioner seat belt. Always use the on-board diagnostic function to diagnose the pre-tensioner seat belt for malfunctions.**



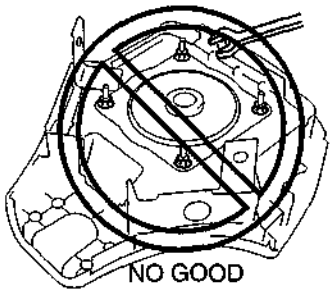
E5U810ZW5005

SERVICE CAUTIONS

DBG081000000W03

Air Bag System Component Disassembly

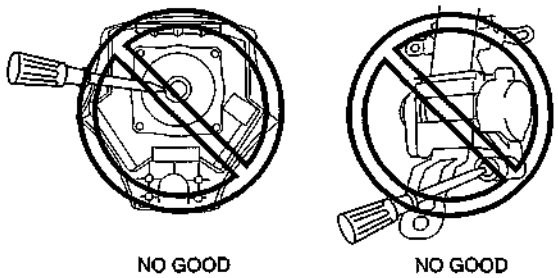
- **Disassembling the air bag system components could cause it to not operate (deploy) normally. Never disassemble any air bag system components.**



DPE810ZW1005

Air Bag Module, Pre-tensioner Seat Belt Handling

- **Oil, grease, or water on the air bag modules may cause the air bags and pre-tensioner seat belts to fail to operate (deploy) in an accident. Never allow oil, grease, or water to get on the air bag modules or pre-tensioner seat belts.**
- **Inserting a screwdriver or similar object into the connector of an air bag module or a pre-tensioner seat belt may damage the connector and cause the air bag module or the pre-tensioner seat belt to operate (deploy) improperly, which may cause serious injury. Never insert any foreign objects into the air bag module or seat belt connectors.**



DCF810ZWB002

Air Bag Module, Pre-tensioner Seat Belt Reuse

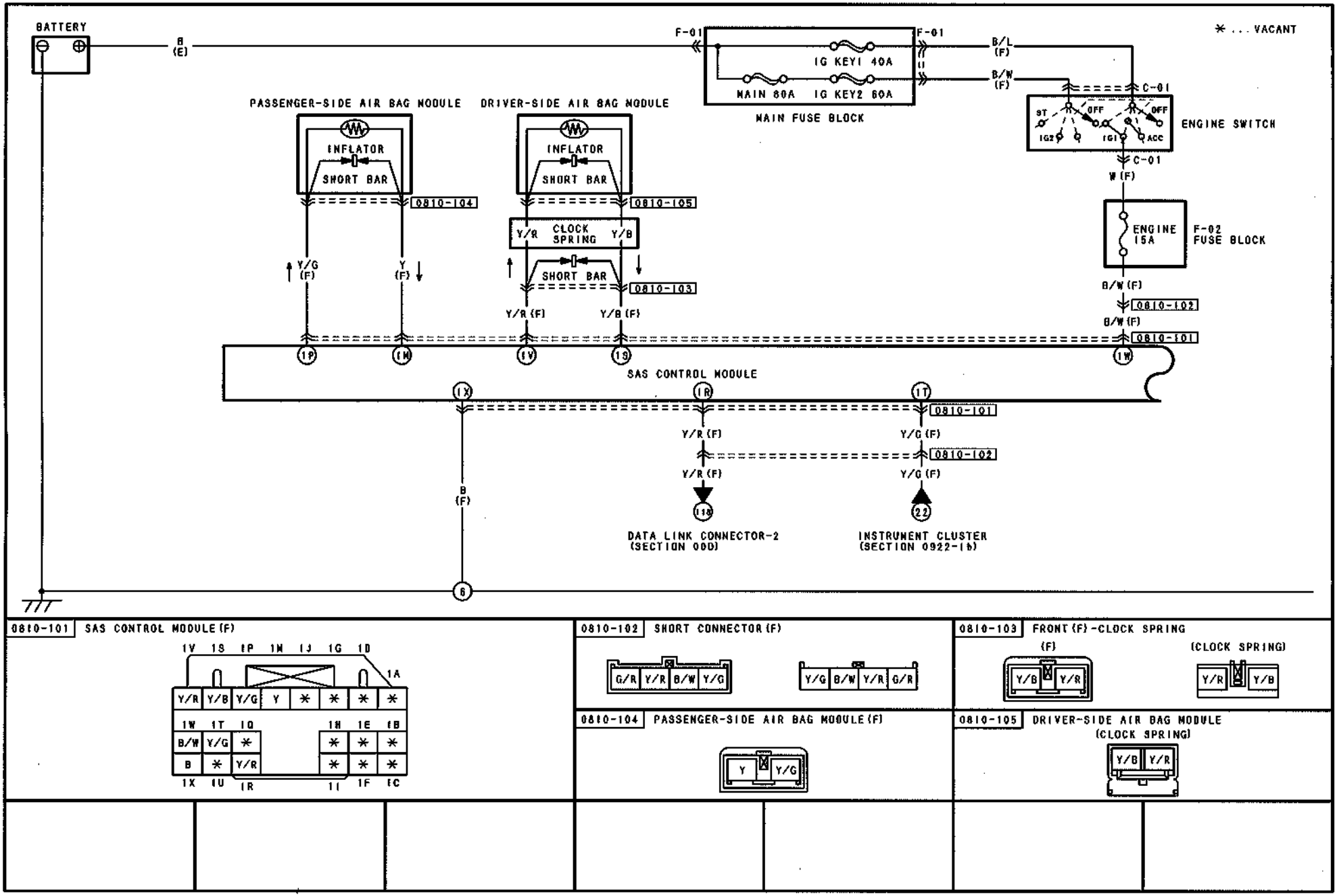
- **Even if an air bag module or a pre-tensioner seat belt does not operate (deploy) in a collision and does not have any external signs of damage, it may have been damaged internally, which may cause improper operation. Before reusing a live (undeployed) air bag module and the pre-tensioner seat belts, always use the on-board diagnostic to diagnose the air bag module and the pre-tensioner seat belts to verify that they have no malfunction.**

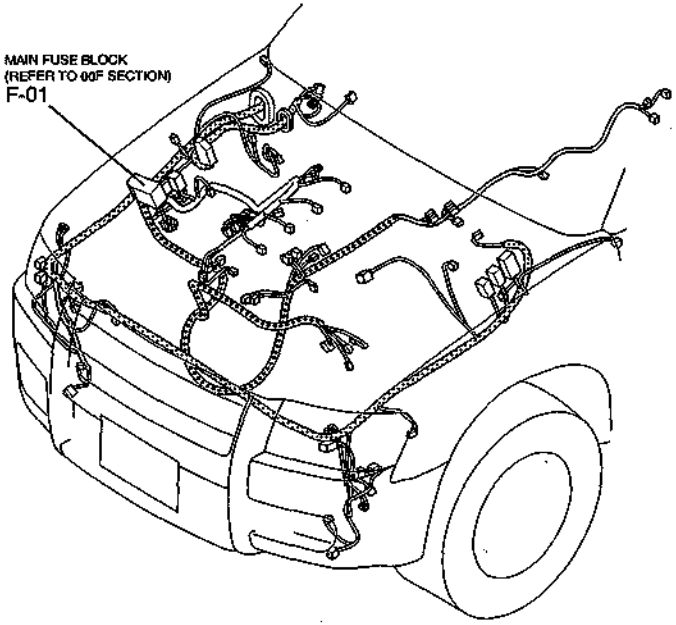
Air Bag Wiring Harness Repair

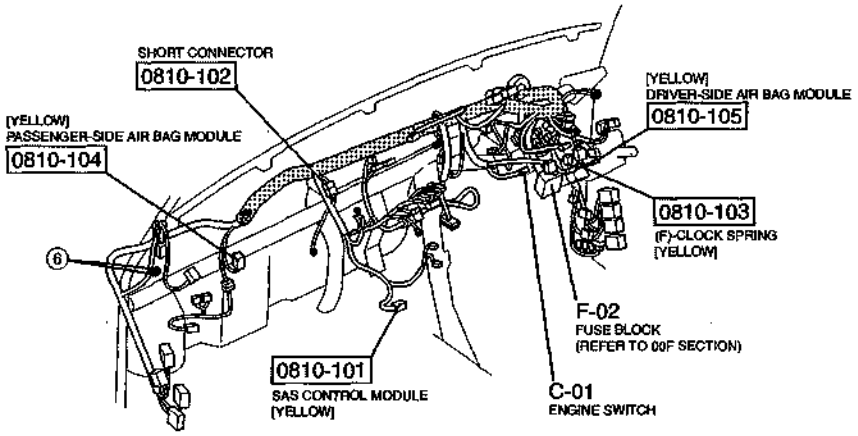
- **Incorrectly repairing an air bag wiring harness can accidentally operate (deploy) the air bag module and pre-tensioner seat belts. If a problem is found in the air bag wiring harness, always replace the wiring harness with a new one.**

CHU0810W606

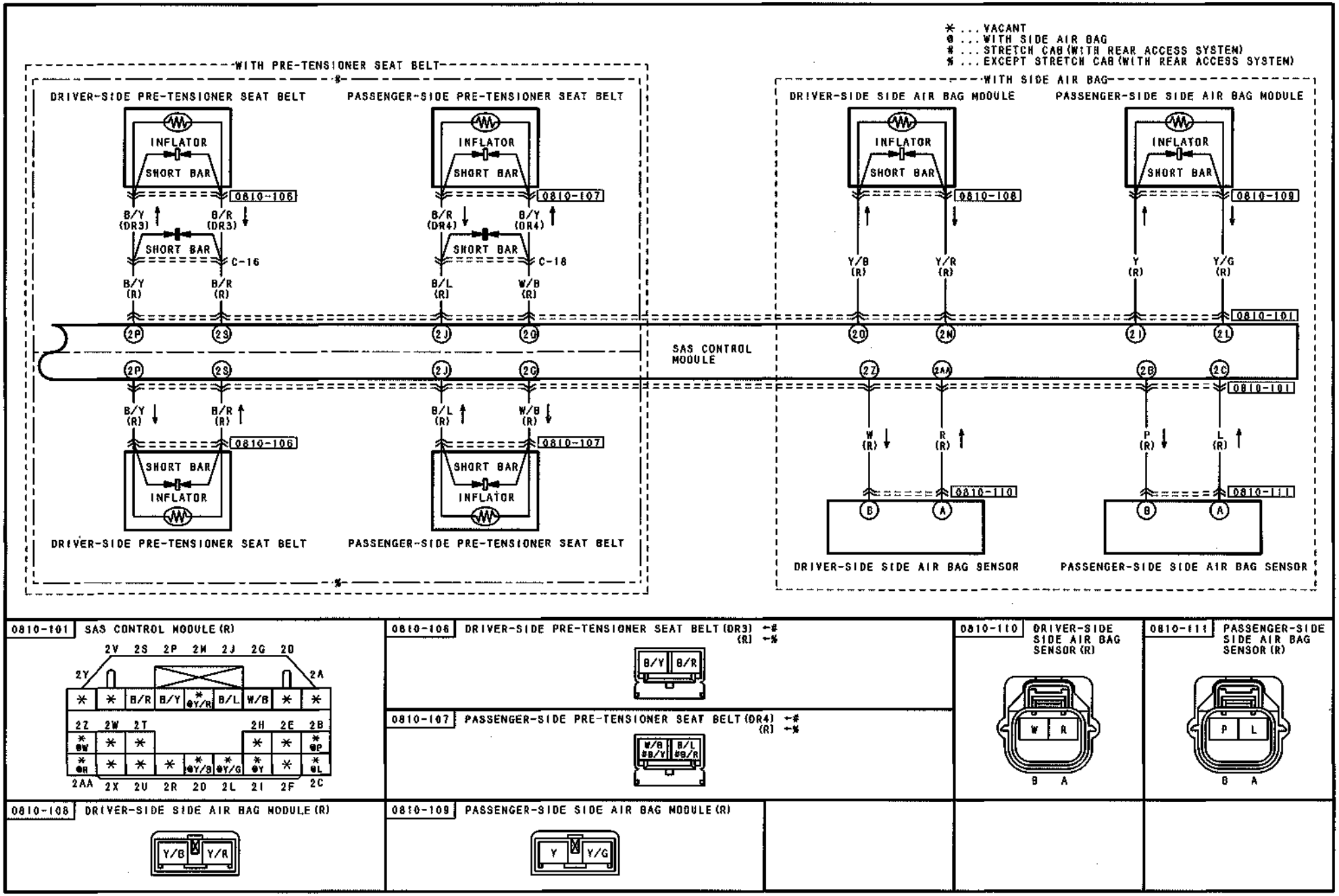
AIR BAG SYSTEM (INCLUDES PRE-TENSIONER SEAT BELT INFORMATION)




MAIN FUSE BLOCK
(REFER TO 00F SECTION)
F-01


SHORT CONNECTOR
0810-102
[YELLOW]
PASSENGER-SIDE AIR BAG MODULE
0810-104
[YELLOW]
DRIVER-SIDE AIR BAG MODULE
0810-105
0810-103
(F)-CLOCK SPRING
[YELLOW]
6
F-02
FUSE BLOCK
(REFER TO 00F SECTION)
0810-101
SAS CONTROL MODULE
[YELLOW]
C-01
ENGINE SWITCH

AIR BAG SYSTEM (INCLUDES PRE-TENSIONER SEAT BELT INFORMATION)



0810-101 SAS CONTROL MODULE (R)

0810-106 DRIVER-SIDE PRE-TENSIONER SEAT BELT (DR3) ←#
(R) ←%

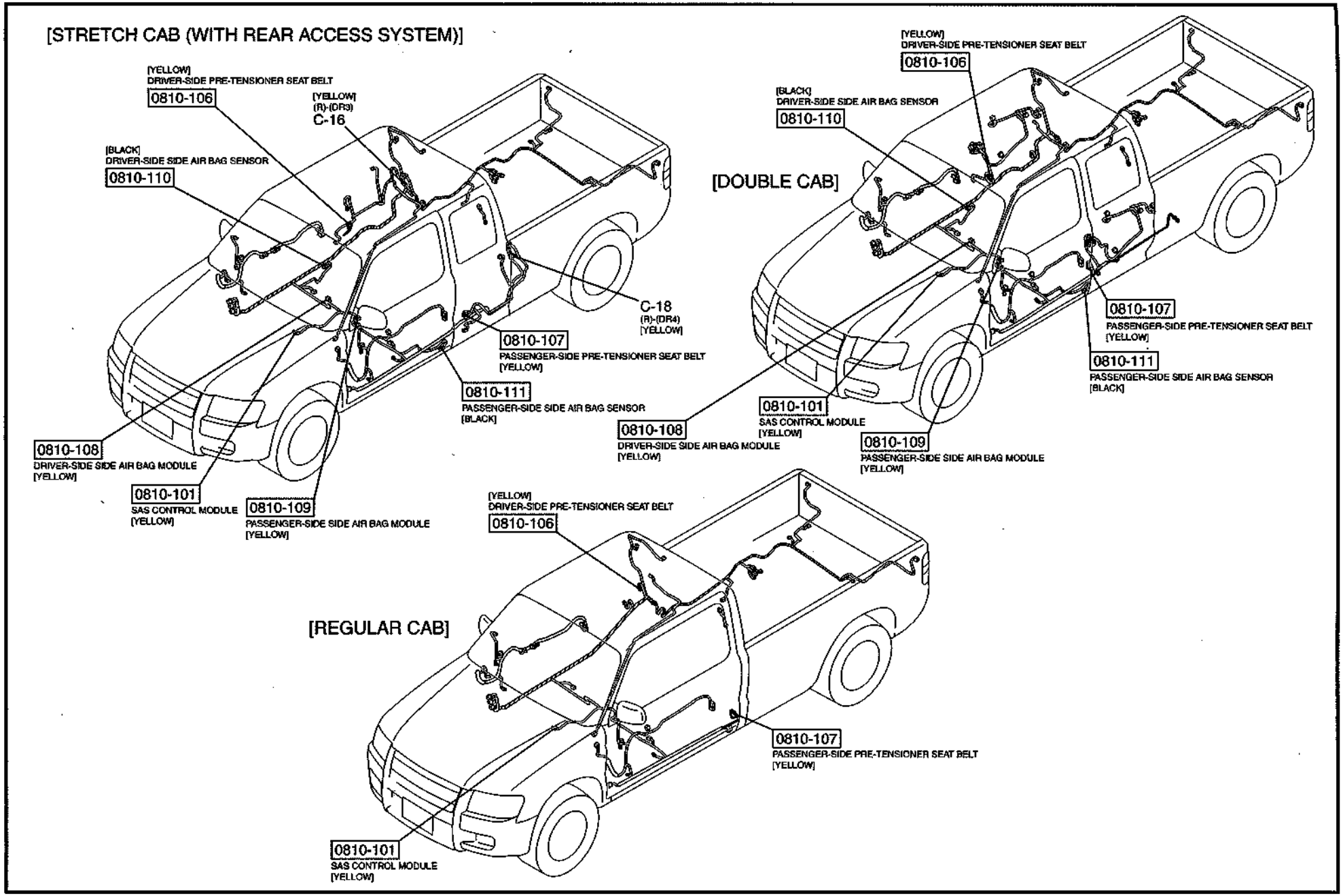
0810-107 PASSENGER-SIDE PRE-TENSIONER SEAT BELT (DR4) ←#
(R) ←%

0810-110 DRIVER-SIDE SIDE AIR BAG SENSOR (R)

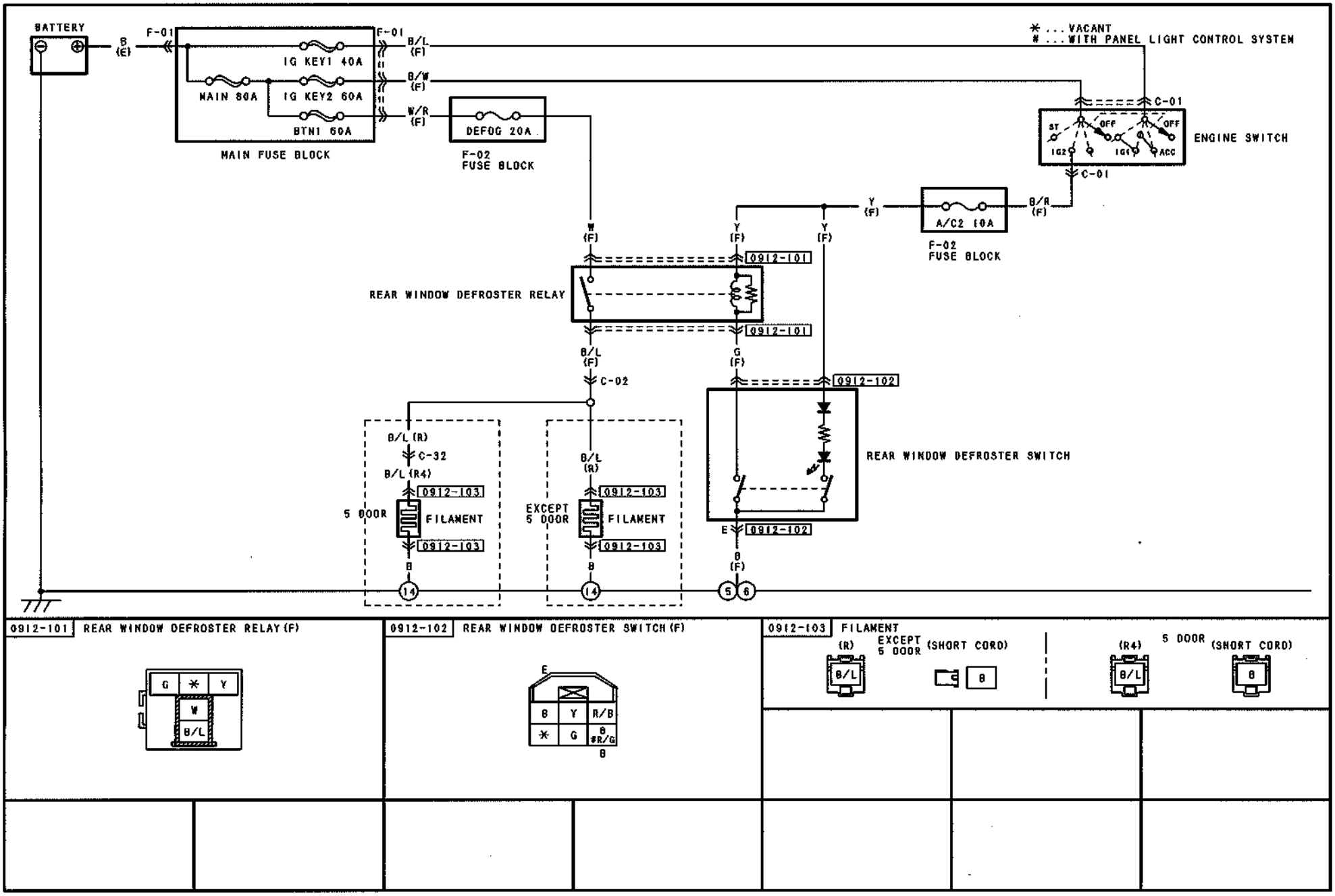
0810-111 PASSENGER-SIDE SIDE AIR BAG SENSOR (R)

0810-108 DRIVER-SIDE SIDE AIR BAG MODULE (R)

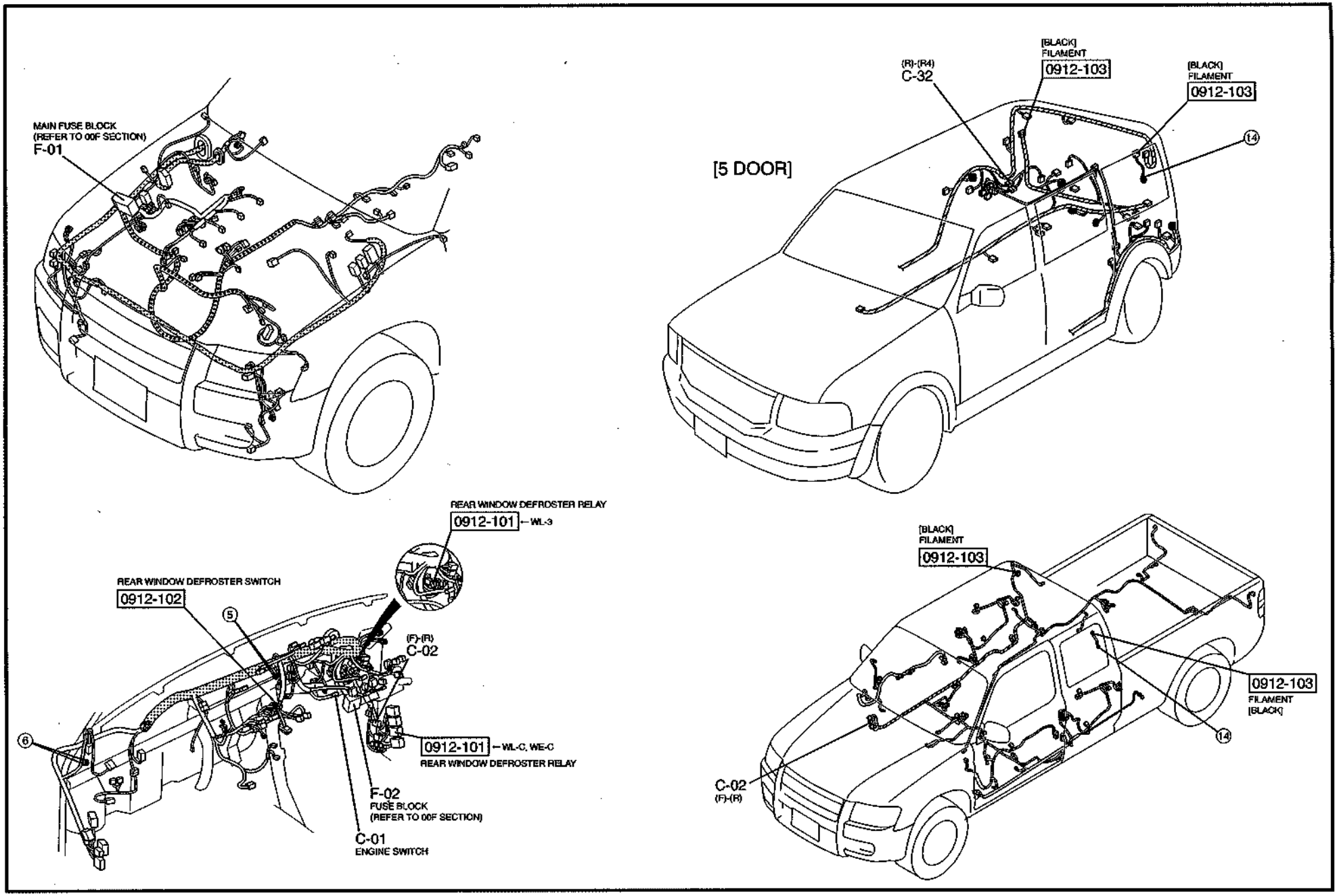
0810-109 PASSENGER-SIDE SIDE AIR BAG MODULE (R)

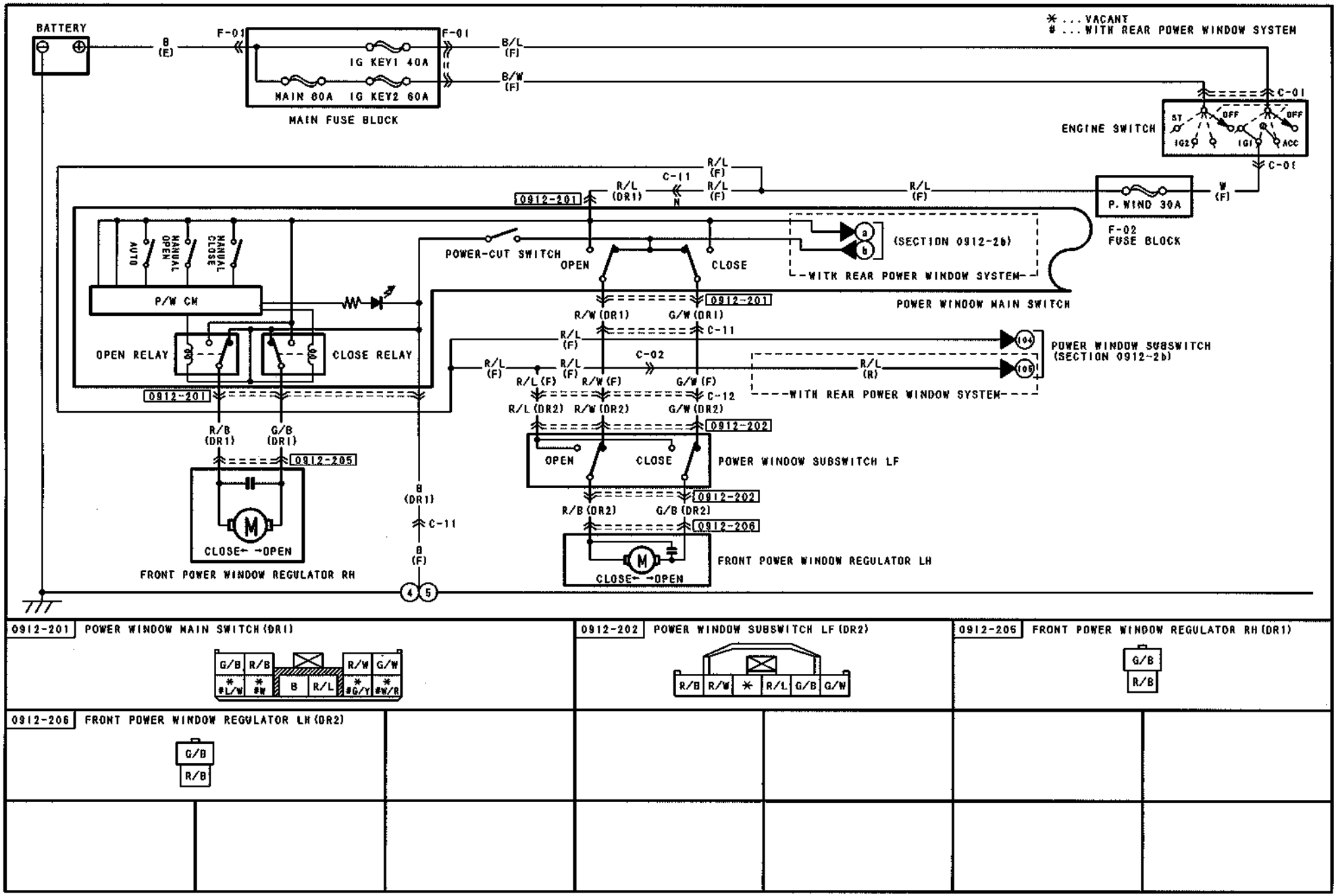

[STRETCH CAB (WITH REAR ACCESS SYSTEM)]
[YELLOW]
DRIVER-SIDE PRE-TENSIONER SEAT BELT
0810-106
[YELLOW]
(R)-(DR3)
C-16
[BLACK]
DRIVER-SIDE SIDE AIR BAG SENSOR
0810-110
C-18
(R)-(DR4)
[YELLOW]
0810-107
PASSENGER-SIDE PRE-TENSIONER SEAT BELT
[YELLOW]
0810-111
PASSENGER-SIDE SIDE AIR BAG SENSOR
[BLACK]
0810-108
DRIVER-SIDE SIDE AIR BAG MODULE
[YELLOW]
0810-101
SAS CONTROL MODULE
[YELLOW]
0810-109
PASSENGER-SIDE SIDE AIR BAG MODULE
[YELLOW]
[DOUBLE CAB]
[YELLOW]
DRIVER-SIDE PRE-TENSIONER SEAT BELT
0810-106
[BLACK]
DRIVER-SIDE SIDE AIR BAG SENSOR
0810-110
0810-107
PASSENGER-SIDE PRE-TENSIONER SEAT BELT
[YELLOW]
0810-111
PASSENGER-SIDE SIDE AIR BAG SENSOR
[BLACK]
0810-101
SAS CONTROL MODULE
[YELLOW]
0810-108
DRIVER-SIDE SIDE AIR BAG MODULE
[YELLOW]
0810-109
PASSENGER-SIDE SIDE AIR BAG MODULE
[YELLOW]
[REGULAR CAB]
[YELLOW]
DRIVER-SIDE PRE-TENSIONER SEAT BELT
0810-106
0810-107
PASSENGER-SIDE PRE-TENSIONER SEAT BELT
[YELLOW]
0810-101
SAS CONTROL MODULE
[YELLOW]

REAR WINDOW DEFROSTER

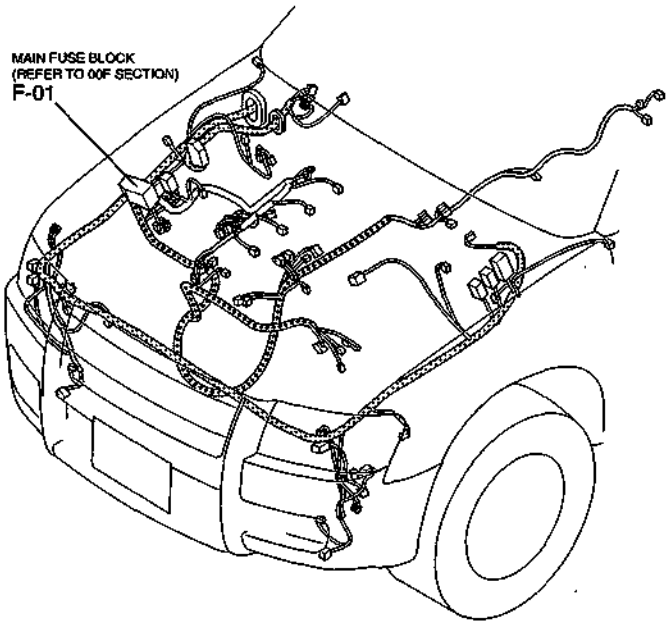


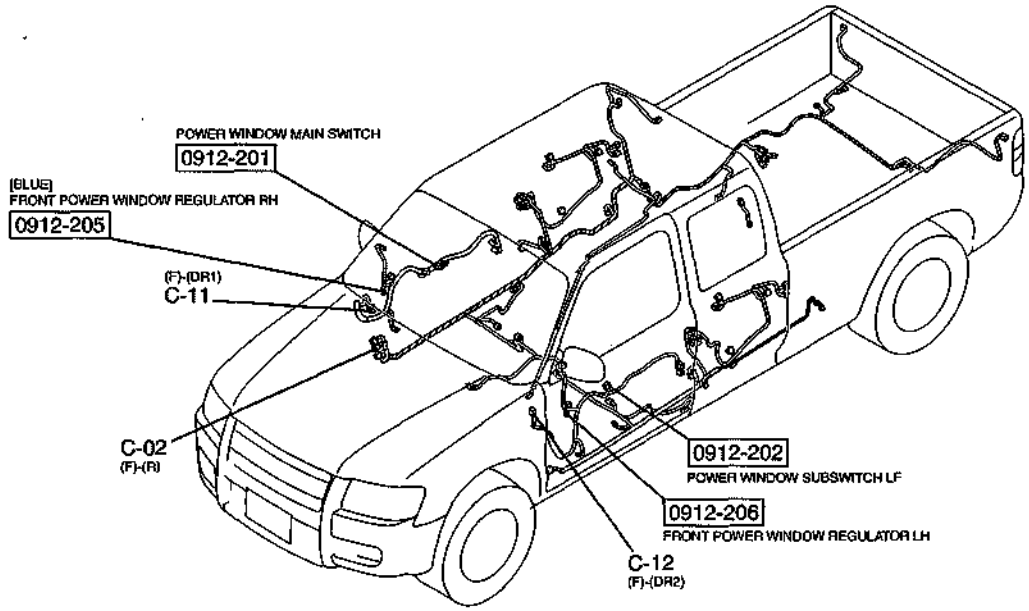
0912-101 REAR WINDOW DEFROSTER RELAY (F)	0912-102 REAR WINDOW DEFROSTER SWITCH (F)	0912-103 FILAMENT

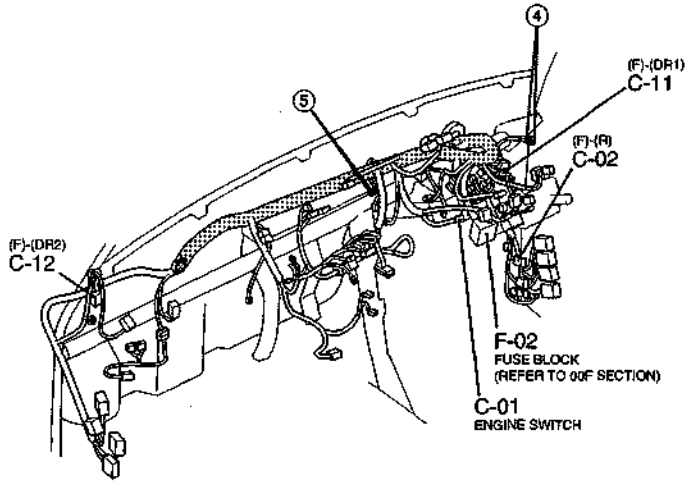

MAIN FUSE BLOCK
(REFER TO 00F SECTION)
F-01
[5 DOOR]
(R)-(R4)
C-32
[BLACK]
FILAMENT
0912-103
[BLACK]
FILAMENT
0912-103
14
REAR WINDOW DEFROSTER RELAY
0912-101
← WL-3
REAR WINDOW DEFROSTER SWITCH
0912-102
5
(F)-(R)
C-02
6
0912-101
← WL-C, WE-C
REAR WINDOW DEFROSTER RELAY
F-02
FUSE BLOCK
(REFER TO 00F SECTION)
C-01
ENGINE SWITCH
[BLACK]
FILAMENT
0912-103
0912-103
FILAMENT
[BLACK]
14
C-02
(F)-(R)

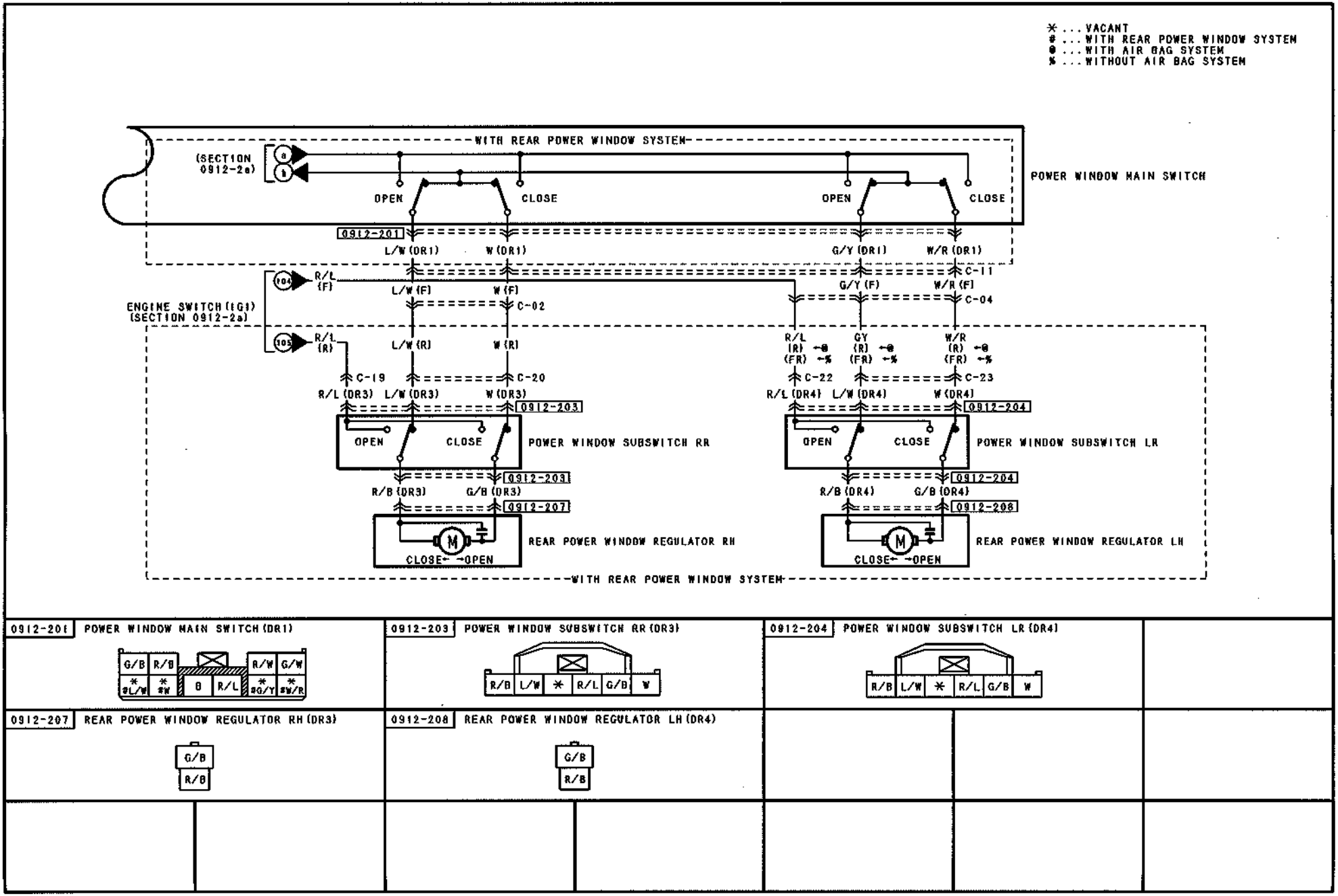

* ... VACANT
# ... WITH REAR POWER WINDOW SYSTEM
BATTERY
B (E)
F-01
IG KEY1 40A
MAIN 80A
IG KEY2 60A
MAIN FUSE BLOCK
B/L (F)
B/W (F)
C-01
ENGINE SWITCH
ST
IG2
OFF
IG1
ACC
C-05
R/L (F)
C-11
R/L (DR1)
0912-201
P. WIND 30A
W (F)
F-02
FUSE BLOCK
AUTO
MANUAL OPEN
MANUAL CLOSE
POWER-CUT SWITCH
OPEN
CLOSE
(SECTION 0912-26)
WITH REAR POWER WINDOW SYSTEM
P/W CM
POWER WINDOW MAIN SWITCH
R/W (DR1)
G/W (DR1)
OPEN RELAY
CLOSE RELAY
C-02
C-12
R/W (F)
G/W (F)
R/L (R)
POWER WINDOW SUBSWITCH (SECTION 0912-2b)
WITH REAR POWER WINDOW SYSTEM
R/L (DR2)
R/W (DR2)
G/W (DR2)
0912-202
OPEN
CLOSE
POWER WINDOW SUBSWITCH LF
R/B (DR1)
G/B (DR1)
0912-205
CLOSE← →OPEN
FRONT POWER WINDOW REGULATOR RH
B (DR1)
B (F)
R/B (DR2)
G/B (DR2)
0912-206
FRONT POWER WINDOW REGULATOR LH
4
5

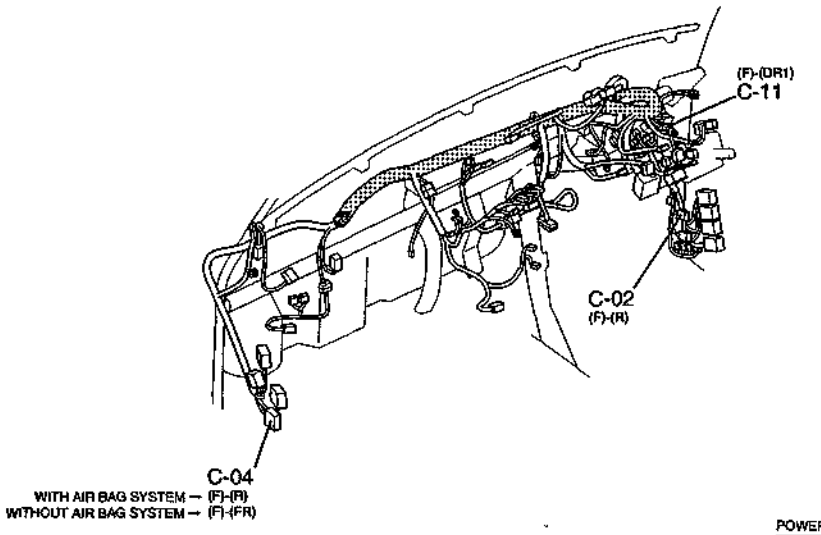
0912-201 POWER WINDOW MAIN SWITCH (DR1)
G/B R/B
*L/W *W B R/L *G/Y *W/R R/W G/W
0912-202 POWER WINDOW SUBSWITCH LF (DR2)
R/B R/W * R/L G/B G/W
0912-205 FRONT POWER WINDOW REGULATOR RH (DR1)
G/B
R/B
0912-206 FRONT POWER WINDOW REGULATOR LH (DR2)
G/B
R/B

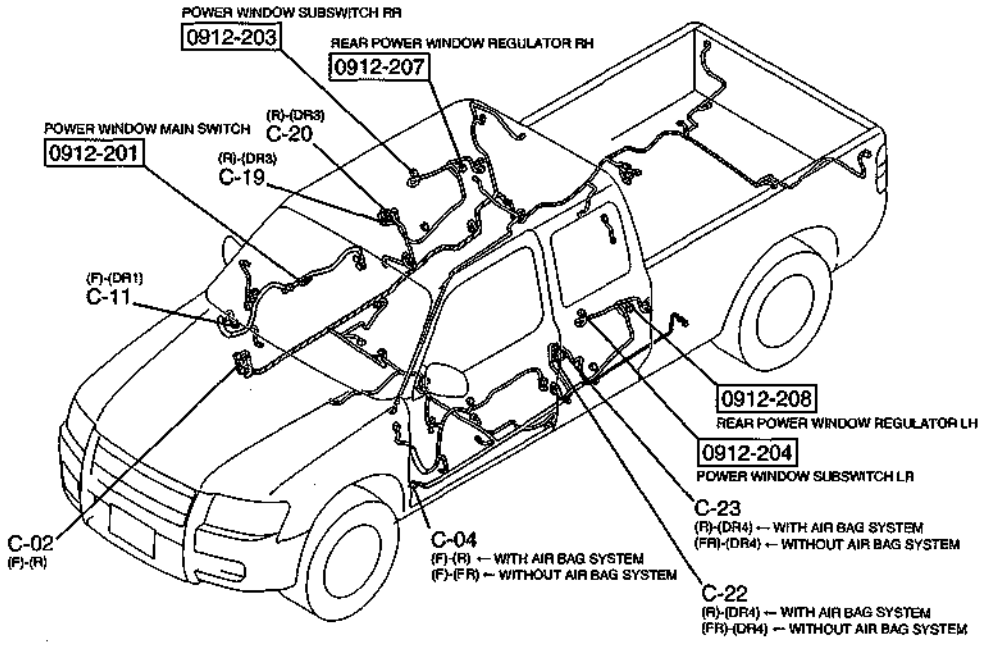

MAIN FUSE BLOCK
(REFER TO 00F SECTION)
F-01

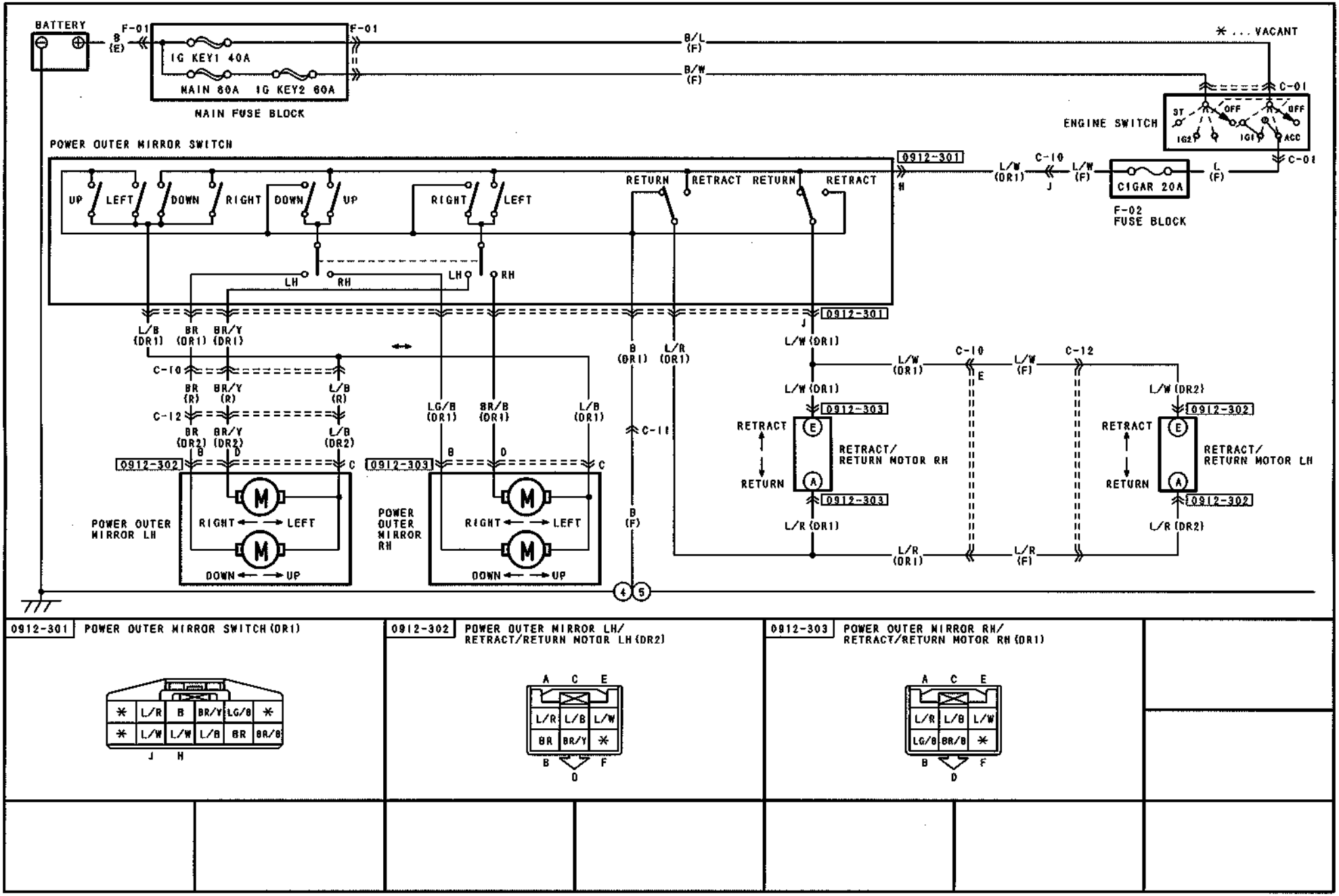

POWER WINDOW MAIN SWITCH
0912-201
[BLUE]
FRONT POWER WINDOW REGULATOR RH
0912-205
(F)-(DR1)
C-11
C-02
(F)-(R)
0912-202
POWER WINDOW SUBSWITCH LF
0912-206
FRONT POWER WINDOW REGULATOR LH
C-12
(F)-(DR2)


4
5
(F)-(DR1)
C-11
(F)-(R)
C-02
(F)-(DR2)
C-12
F-02
FUSE BLOCK
(REFER TO 00F SECTION)
C-01
ENGINE SWITCH

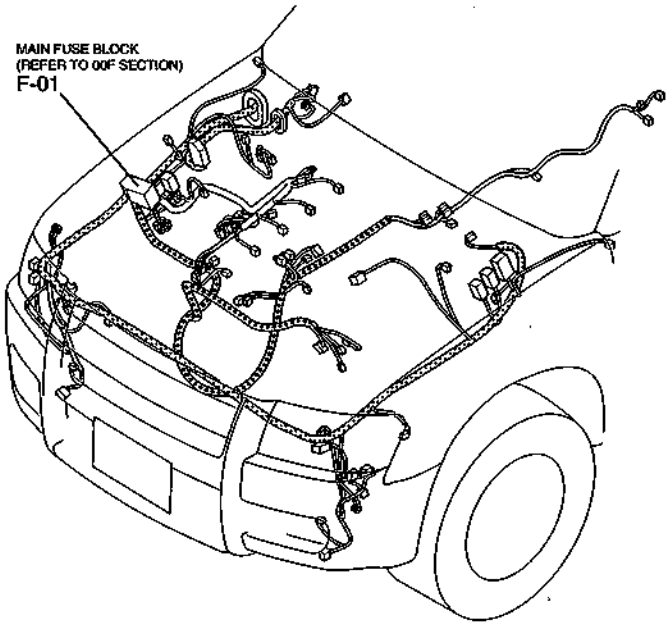

* . . . VACANT
# . . . WITH REAR POWER WINDOW SYSTEM
@ . . . WITH AIR BAG SYSTEM
% . . . WITHOUT AIR BAG SYSTEM
WITH REAR POWER WINDOW SYSTEM
(SECTION 0912-2a)
POWER WINDOW MAIN SWITCH
OPEN
CLOSE
OPEN
CLOSE
0912-201
L/W (DR1)
W (DR1)
G/Y (DR1)
W/R (DR1)
C-11
R/L (F)
L/W (F)
W (F)
G/Y (F)
W/R (F)
C-02
C-04
ENGINE SWITCH (IG1) (SECTION 0912-2a)
R/L (R)
L/W (R)
W (R)
R/L (R) *@ (FR) *%
GY (R) *@ (FR) *%
W/R (R) *@ (FR) *%
C-19
C-20
C-22
C-23
R/L (DR3)
L/W (DR3)
W (DR3)
R/L (DR4)
L/W (DR4)
W (DR4)
0912-203
0912-204
OPEN
CLOSE
POWER WINDOW SUBSWITCH RR
OPEN
CLOSE
POWER WINDOW SUBSWITCH LR
0912-203
0912-204
R/B (DR3)
G/B (DR3)
R/B (DR4)
G/B (DR4)
0912-207
0912-208
M
CLOSE
OPEN
REAR POWER WINDOW REGULATOR RH
M
CLOSE
OPEN
REAR POWER WINDOW REGULATOR LH
WITH REAR POWER WINDOW SYSTEM
0912-201 POWER WINDOW MAIN SWITCH (DR1)
G/B
R/B
R/W
G/W
*#L/W
*#W
B
R/L
*#G/Y
*#W/R
0912-203 POWER WINDOW SUBSWITCH RR (DR3)
R/B
L/W
*
R/L
G/B
W
0912-204 POWER WINDOW SUBSWITCH LR (DR4)
R/B
L/W
*
R/L
G/B
W
0912-207 REAR POWER WINDOW REGULATOR RH (DR3)
G/B
R/B
0912-208 REAR POWER WINDOW REGULATOR LH (DR4)
G/B
R/B

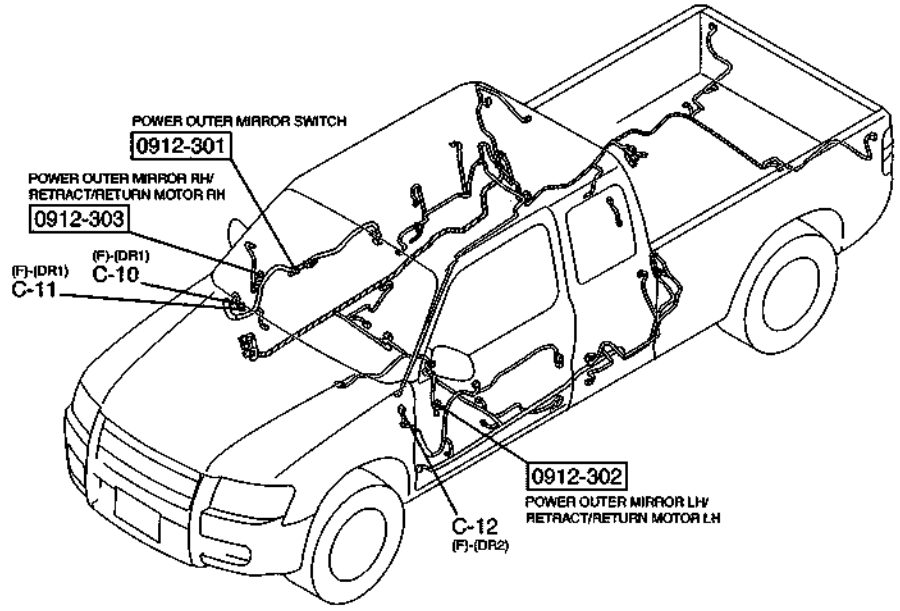

(F)-(DR1)
C-11
C-02
(F)-(R)
C-04
WITH AIR BAG SYSTEM ← (F)-(R)
WITHOUT AIR BAG SYSTEM ← (F)-(FR)

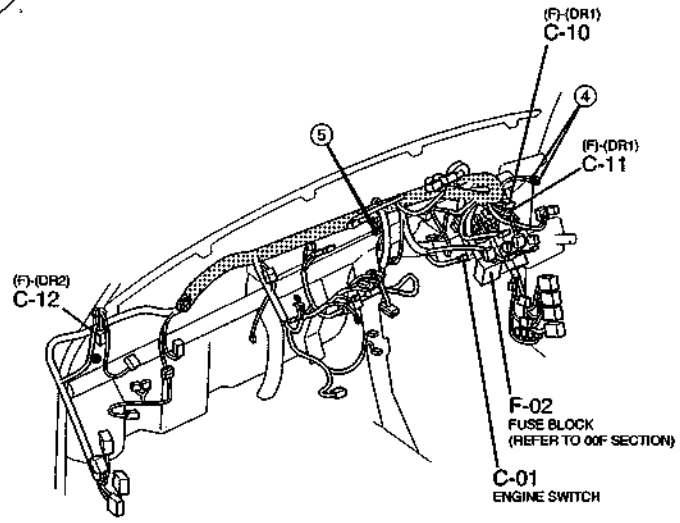

POWER WINDOW SUBSWITCH RR
0912-203
REAR POWER WINDOW REGULATOR RH
0912-207
POWER WINDOW MAIN SWITCH
0912-201
(R)-(DR3)
C-20
(R)-(DR3)
C-19
(F)-(DR1)
C-11
0912-208
REAR POWER WINDOW REGULATOR LH
0912-204
POWER WINDOW SUBSWITCH LR
C-23
(R)-(DR4) ← WITH AIR BAG SYSTEM
(FR)-(DR4) ← WITHOUT AIR BAG SYSTEM
C-02
(F)-(R)
C-04
(F)-(R) ← WITH AIR BAG SYSTEM
(F)-(FR) ← WITHOUT AIR BAG SYSTEM
C-22
(R)-(DR4) ← WITH AIR BAG SYSTEM
(FR)-(DR4) ← WITHOUT AIR BAG SYSTEM



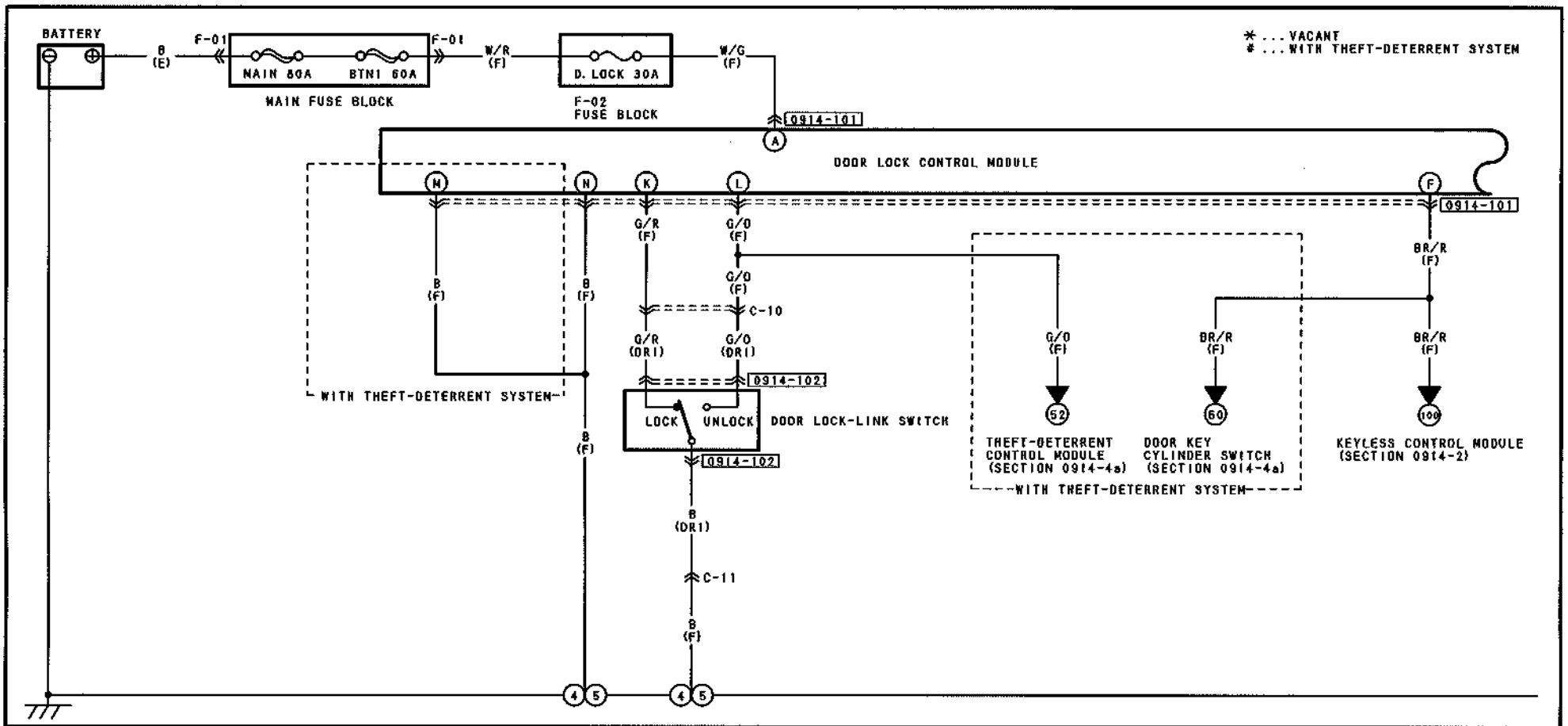
0912-301 POWER OUTER MIRROR SWITCH (DR1)	0912-302 POWER OUTER MIRROR LH/ RETRACT/RETURN MOTOR LH (DR2)	0912-303 POWER OUTER MIRROR RH/ RETRACT/RETURN MOTOR RH (DR1)


MAIN FUSE BLOCK
(REFER TO 00F SECTION)
F-01

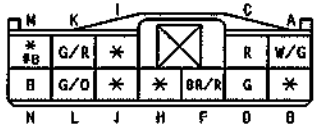

POWER OUTER MIRROR SWITCH
0912-301
POWER OUTER MIRROR RH/
RETRACT/RETURN MOTOR RH
0912-303
(F)-(DR1)
C-10
(F)-(DR1)
C-11
0912-302
POWER OUTER MIRROR LH/
RETRACT/RETURN MOTOR LH
C-12
(F)-(DR2)


(F)-(DR1)
C-10
4
5
(F)-(DR1)
C-11
(F)-(DR2)
C-12
F-02
FUSE BLOCK
(REFER TO 00F SECTION)
C-01
ENGINE SWITCH

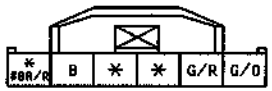
POWER DOOR LOCK SYSTEM

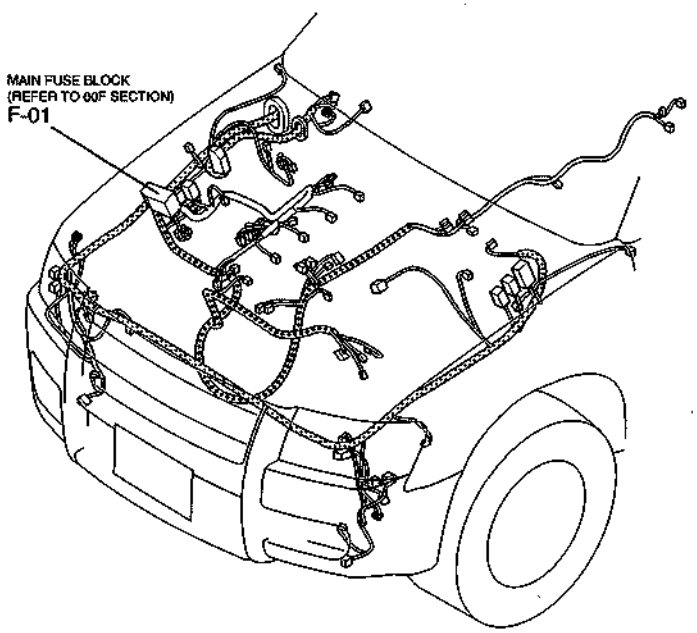


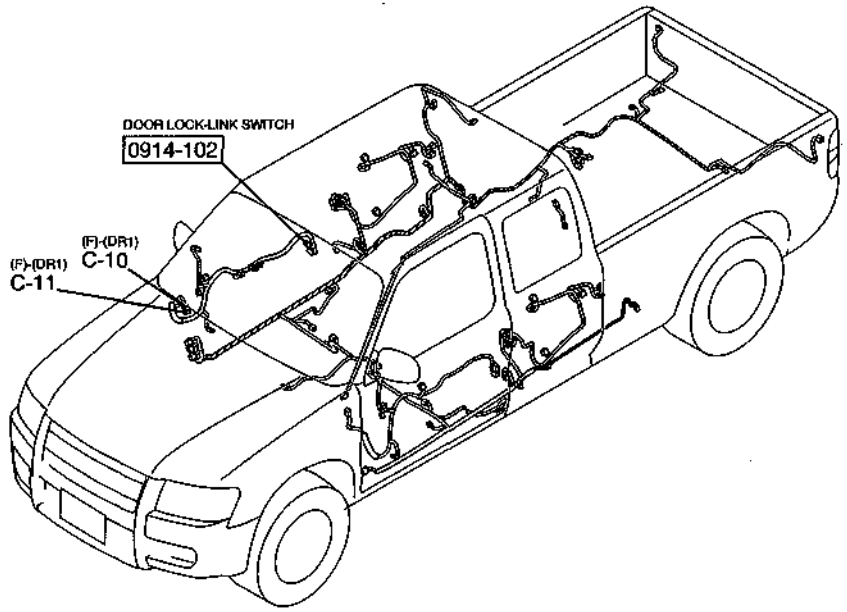
0914-101 DOOR LOCK CONTROL MODULE (F)

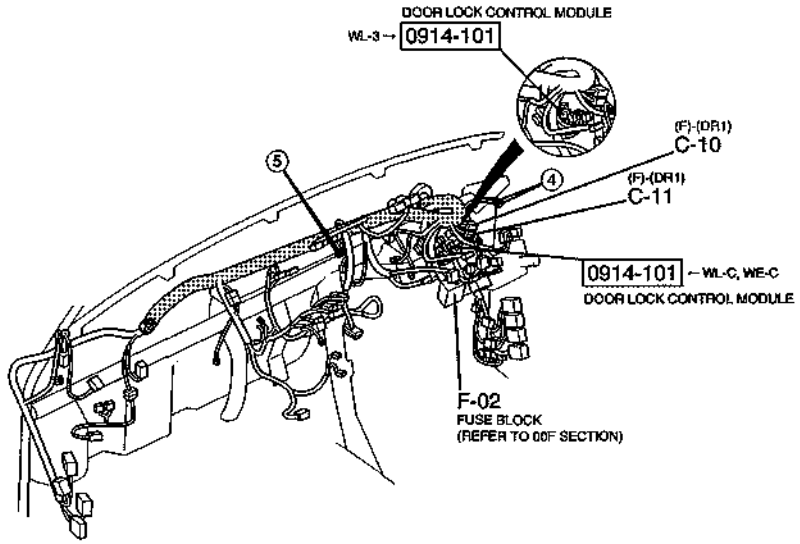


0914-102 DOOR LOCK-LINK SWITCH (DR1)

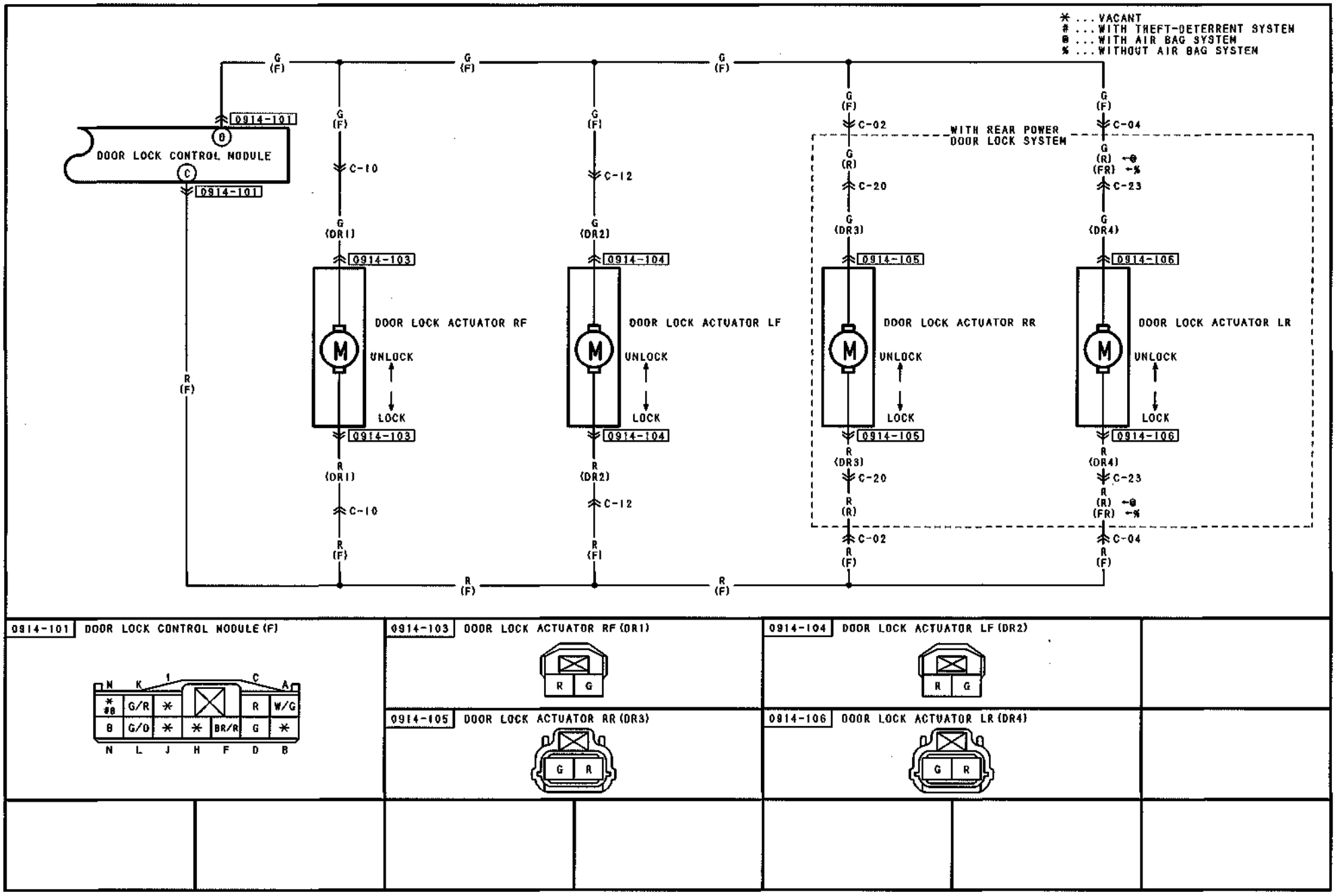


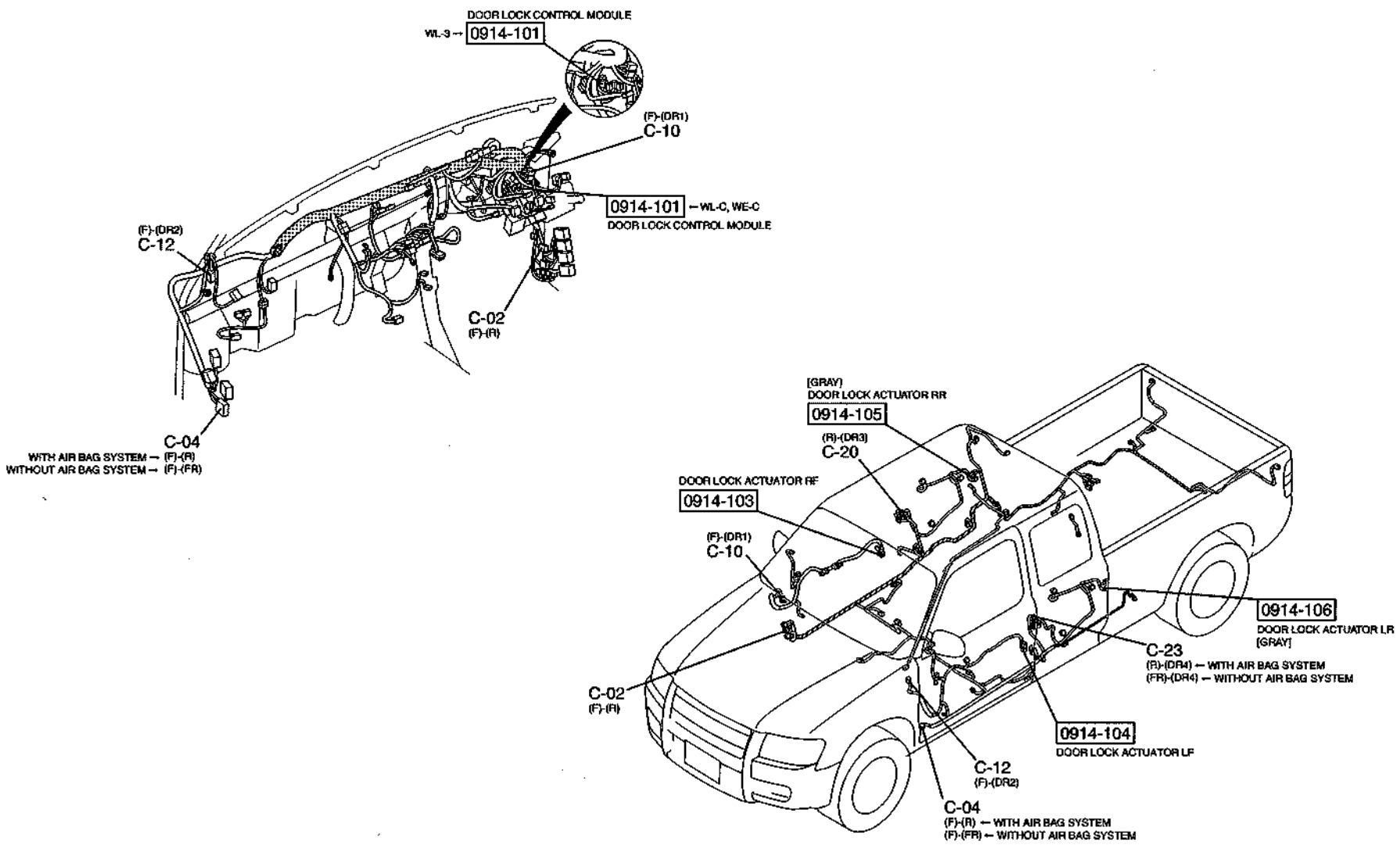

MAIN FUSE BLOCK
(REFER TO 00F SECTION)
F-01


DOOR LOCK-LINK SWITCH
0914-102
(F)-(DR1)
C-10
(F)-(DR1)
C-11

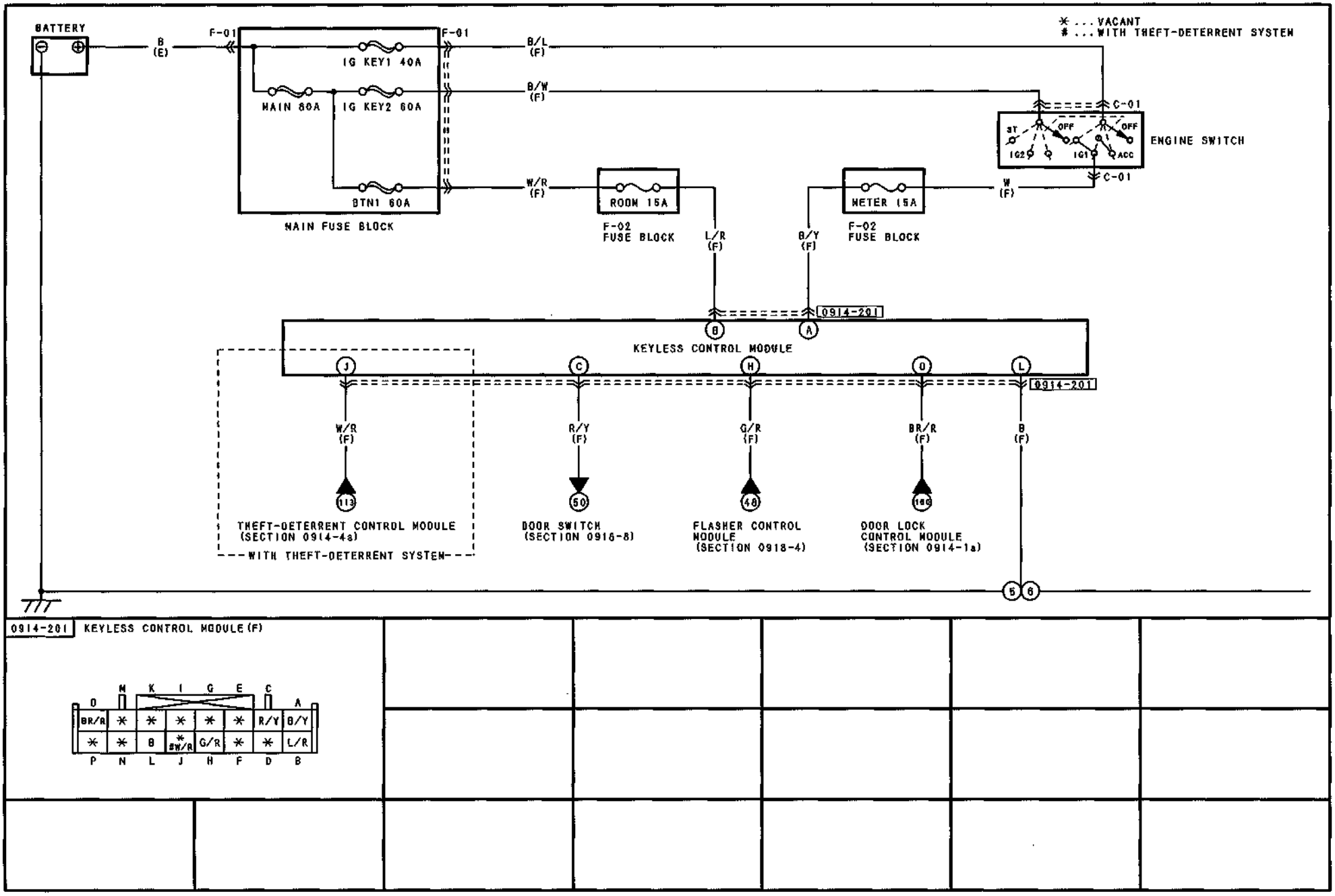

DOOR LOCK CONTROL MODULE
WL-3
0914-101
(F)-(DR1)
C-10
(F)-(DR1)
C-11
5
4
0914-101
WL-C, WE-C
DOOR LOCK CONTROL MODULE
F-02
FUSE BLOCK
(REFER TO 00F SECTION)

77

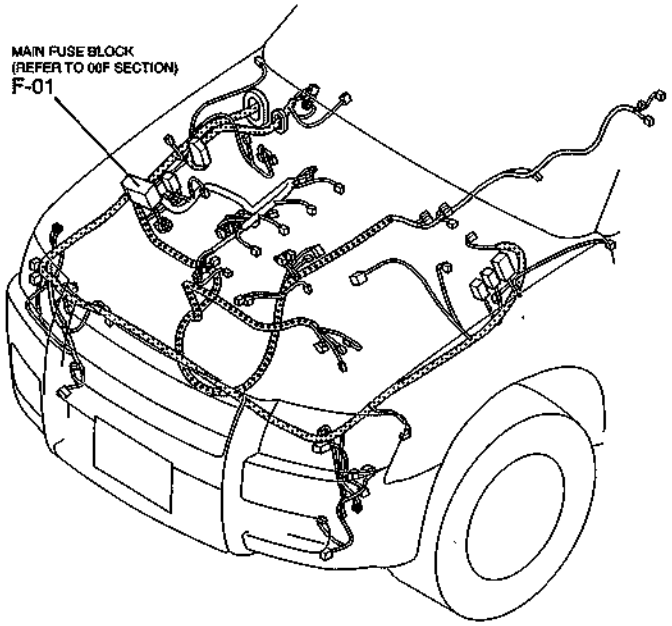

* ... VACANT
# ... WITH THEFT-DETERRENT SYSTEM
@ ... WITH AIR BAG SYSTEM
% ... WITHOUT AIR BAG SYSTEM
DOOR LOCK CONTROL MODULE
0914-101
WITH REAR POWER DOOR LOCK SYSTEM
DOOR LOCK ACTUATOR RF
DOOR LOCK ACTUATOR LF
DOOR LOCK ACTUATOR RR
DOOR LOCK ACTUATOR LR
UNLOCK
LOCK
C-10
C-12
C-02
C-04
C-20
C-23
0914-103
0914-104
0914-105
0914-106
0914-101 DOOR LOCK CONTROL MODULE (F)
0914-103 DOOR LOCK ACTUATOR RF (DR1)
0914-104 DOOR LOCK ACTUATOR LF (DR2)
0914-105 DOOR LOCK ACTUATOR RR (DR3)
0914-106 DOOR LOCK ACTUATOR LR (DR4)

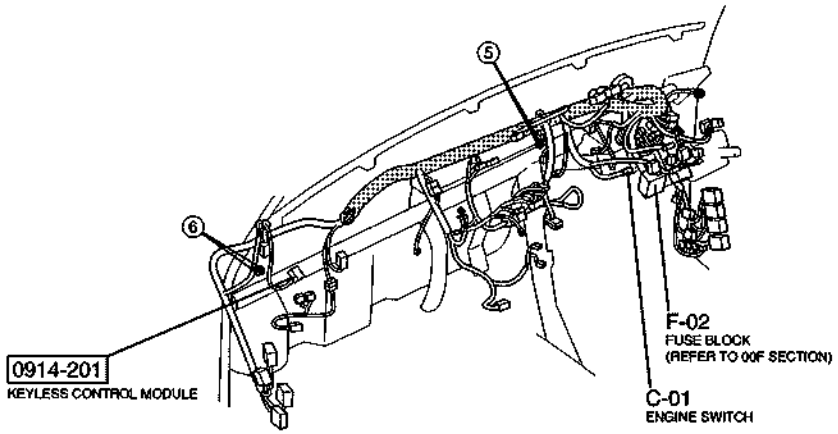

DOOR LOCK CONTROL MODULE
WL-3 → 0914-101
(F)-(DR1)
C-10
0914-101 ← WL-C, WE-C
DOOR LOCK CONTROL MODULE
(F)-(DR2)
C-12
C-02
(F)-(R)
C-04
WITH AIR BAG SYSTEM ← (F)-(R)
WITHOUT AIR BAG SYSTEM ← (F)-(FR)
[GRAY]
DOOR LOCK ACTUATOR RR
0914-105
(R)-(DR3)
C-20
DOOR LOCK ACTUATOR RF
0914-103
(F)-(DR1)
C-10
0914-106
DOOR LOCK ACTUATOR LR
[GRAY]
C-23
(R)-(DR4) ← WITH AIR BAG SYSTEM
(FR)-(DR4) ← WITHOUT AIR BAG SYSTEM
C-02
(F)-(R)
0914-104
DOOR LOCK ACTUATOR LF
C-12
(F)-(DR2)
C-04
(F)-(R) ← WITH AIR BAG SYSTEM
(F)-(FR) ← WITHOUT AIR BAG SYSTEM

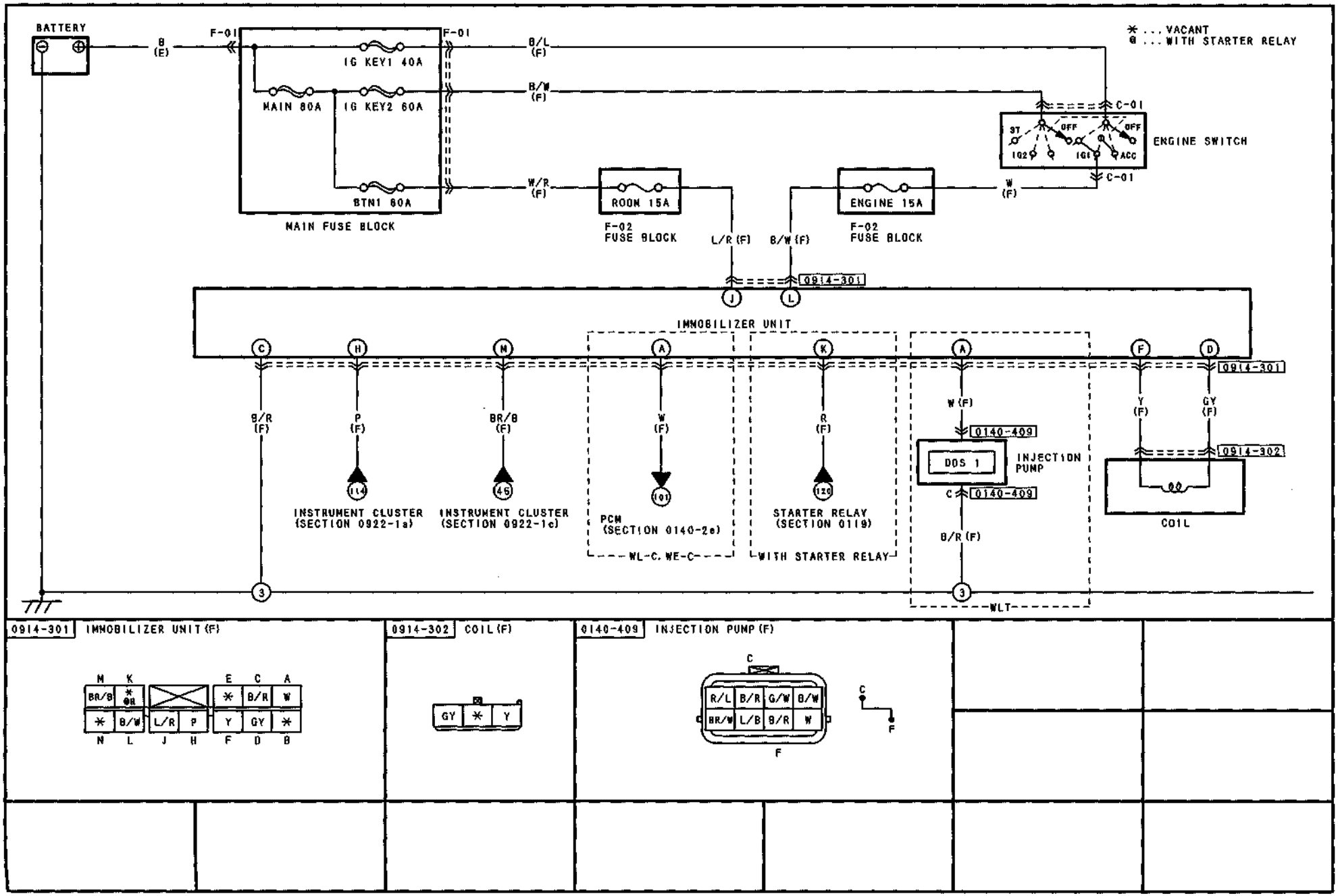
KEYLESS CONTROL MODULE



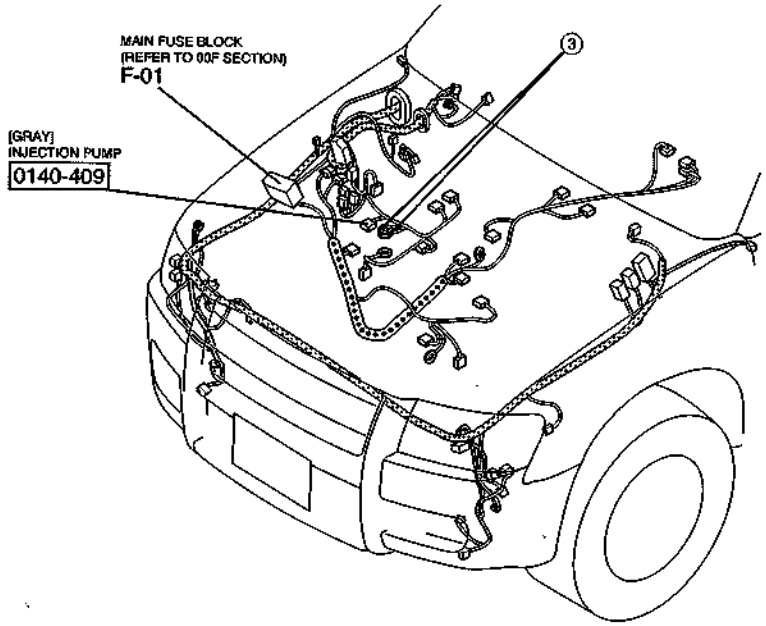
0914-201 KEYLESS CONTROL MODULE (F)

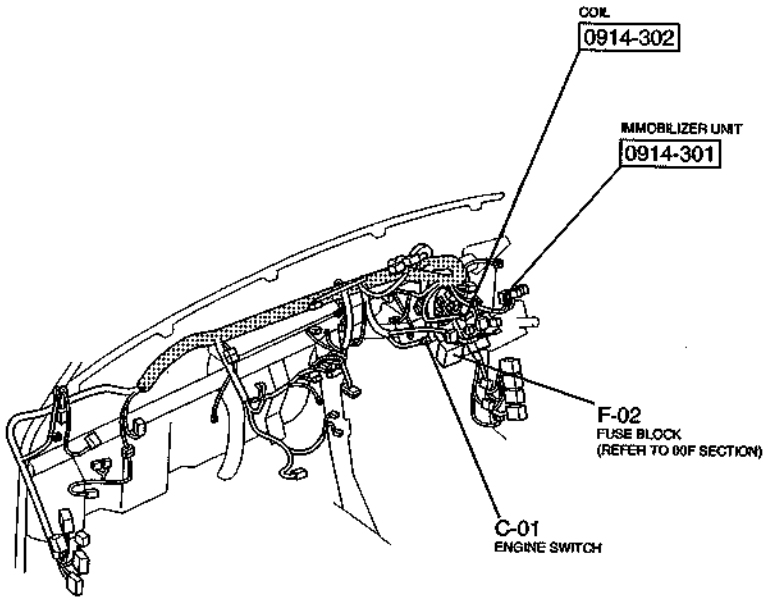

MAIN FUSE BLOCK
(REFER TO 00F SECTION)
F-01

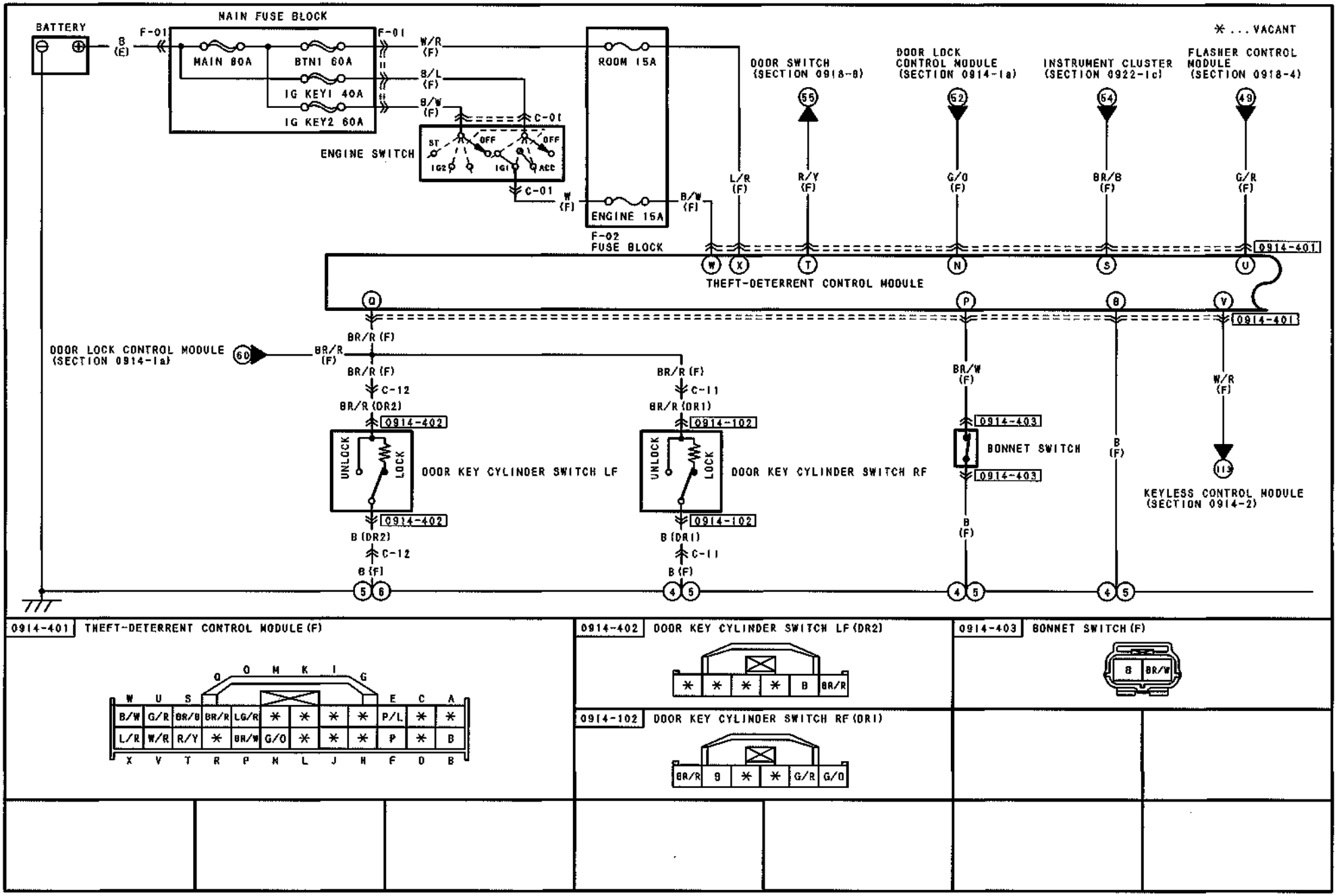

5
6
0914-201
KEYLESS CONTROL MODULE
F-02
FUSE BLOCK
(REFER TO 00F SECTION)
C-01
ENGINE SWITCH


BATTERY
B (E)
F-01
IG KEY1 40A
MAIN 80A
IG KEY2 60A
BTN1 60A
MAIN FUSE BLOCK
B/L (F)
B/W (F)
W/R (F)
ROOM 15A
F-02 FUSE BLOCK
ENGINE 15A
F-02 FUSE BLOCK
W (F)
C-01
ST
OFF
IG2
IG1
ACC
ENGINE SWITCH
* ... VACANT
@ ... WITH STARTER RELAY
L/R (F)
B/W (F)
0914-301
IMMOBILIZER UNIT
B/R (F)
P (F)
BR/B (F)
W (F)
R (F)
W (F)
0140-409
DOS 1
INJECTION PUMP
C 0140-409
B/R (F)
Y (F)
GY (F)
0914-302
COIL
INSTRUMENT CLUSTER (SECTION 0922-1a)
INSTRUMENT CLUSTER (SECTION 0922-1c)
PCM (SECTION 0140-2e)
WL-C, WE-C
STARTER RELAY (SECTION 0119)
WITH STARTER RELAY
WLT

0914-301 IMMOBILIZER UNIT (F)
M K E C A
BR/B * * B/R W
* B/W L/R P Y GY *
N L J H F D B
0914-302 COIL (F)
GY * Y
0140-409 INJECTION PUMP (F)
C
R/L B/R G/W B/W
BR/W L/B B/R W
F
C
F


MAIN FUSE BLOCK
(REFER TO 00F SECTION)
F-01
③
[GRAY]
INJECTION PUMP
0140-409


COIL
0914-302
IMMOBILIZER UNIT
0914-301
F-02
FUSE BLOCK
(REFER TO 00F SECTION)
C-01
ENGINE SWITCH

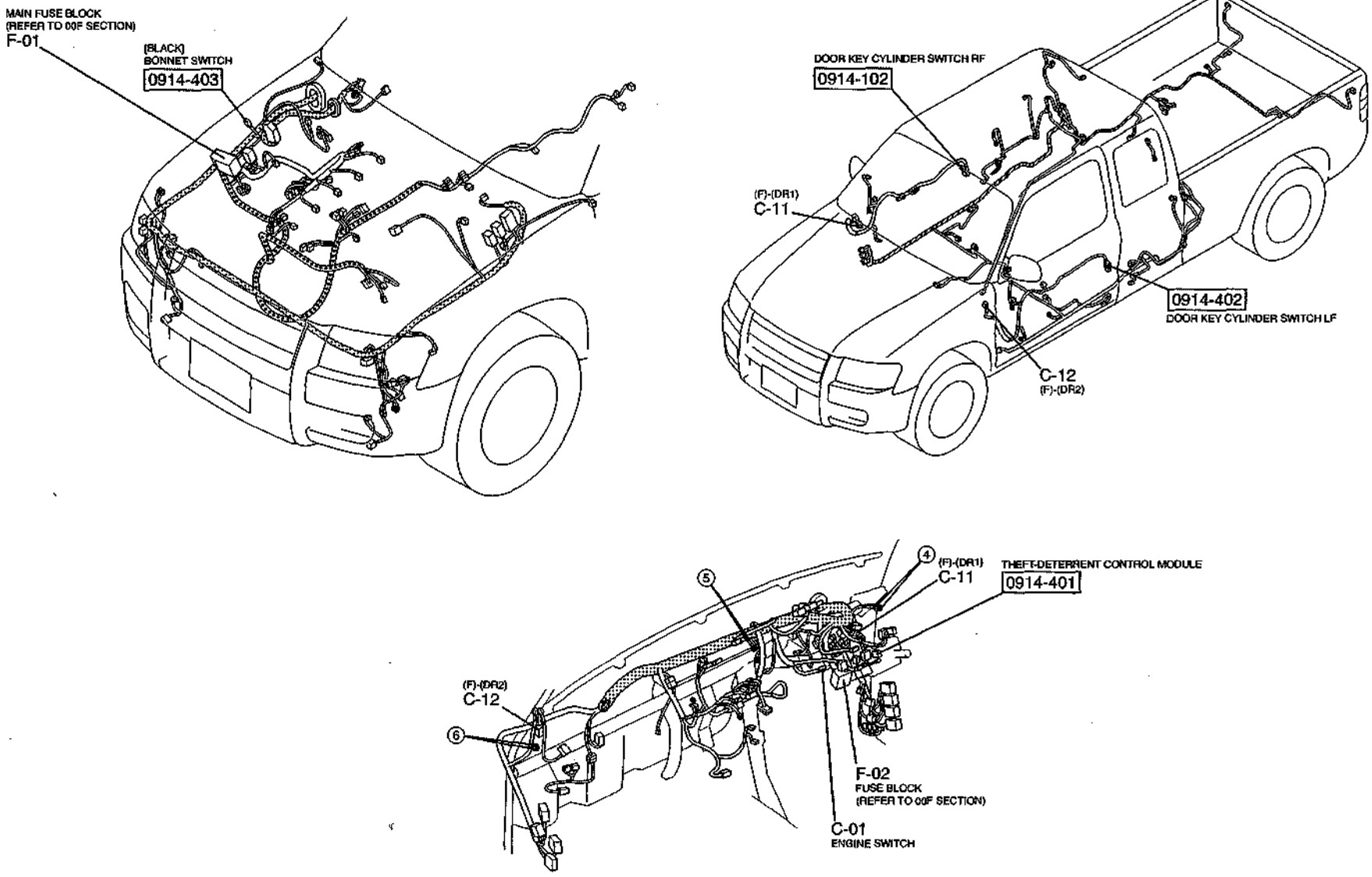


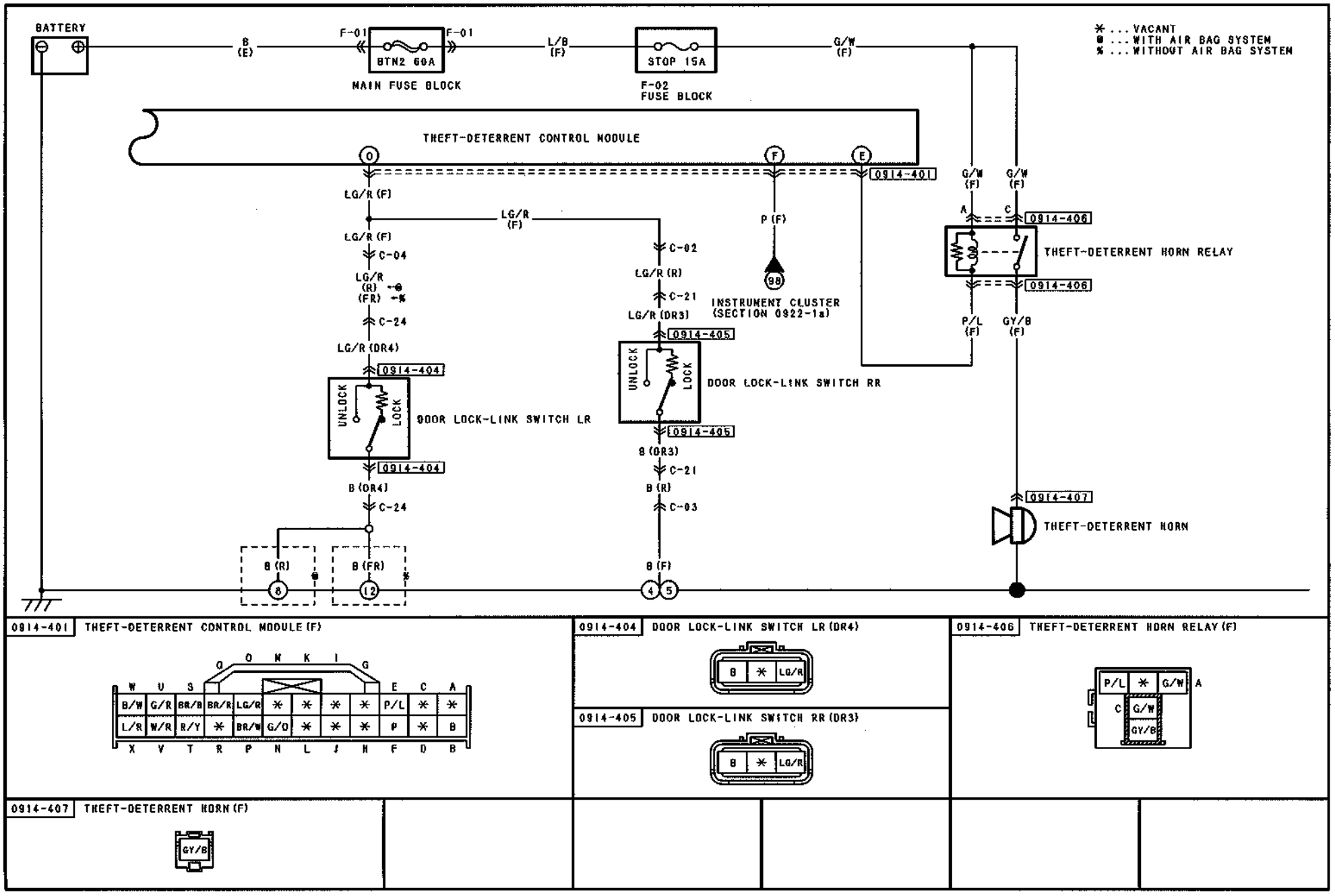
0914-401 THEFT-DETERRENT CONTROL MODULE (F)

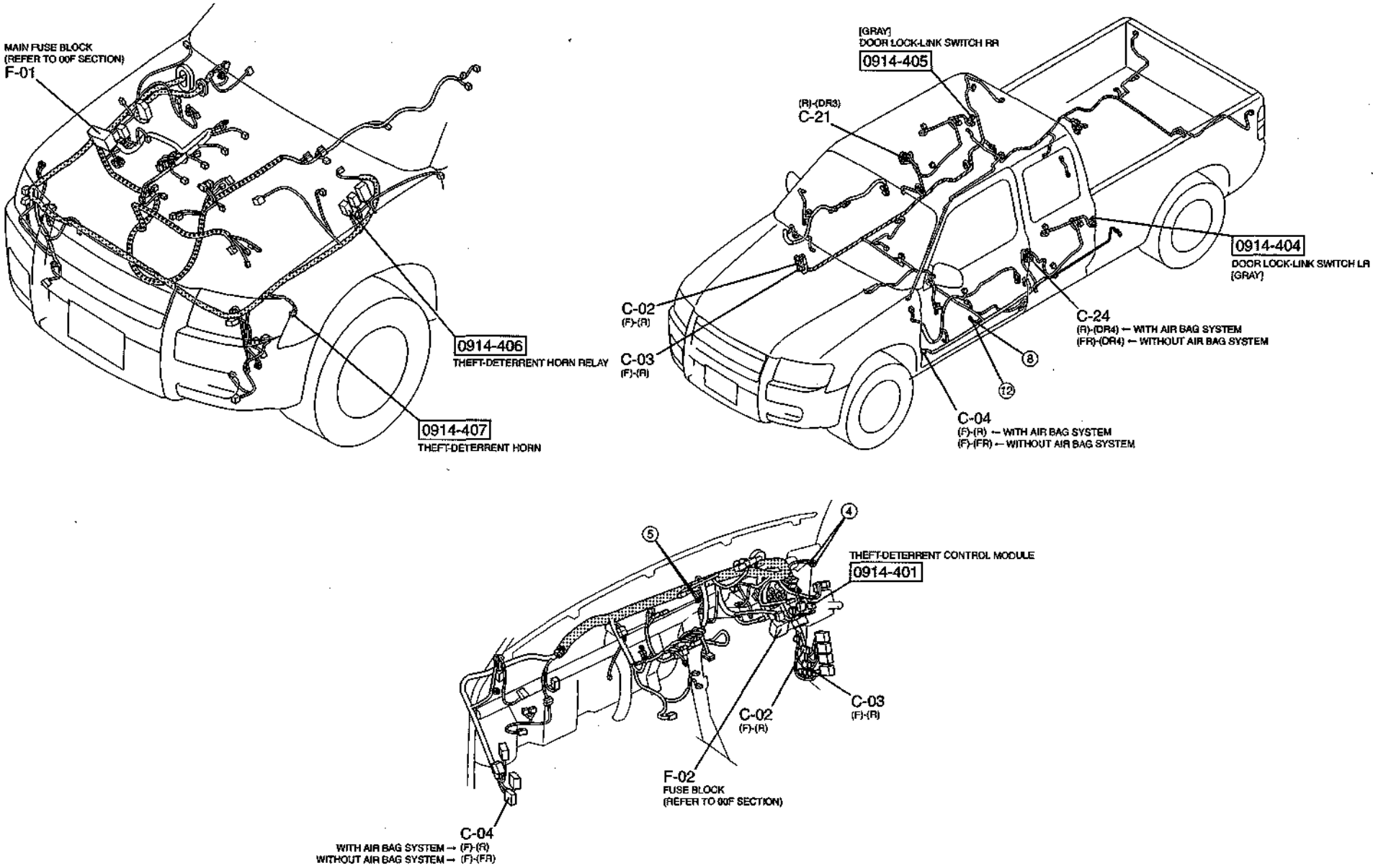
0914-402 DOOR KEY CYLINDER SWITCH LF (DR2)

0914-403 BONNET SWITCH (F)

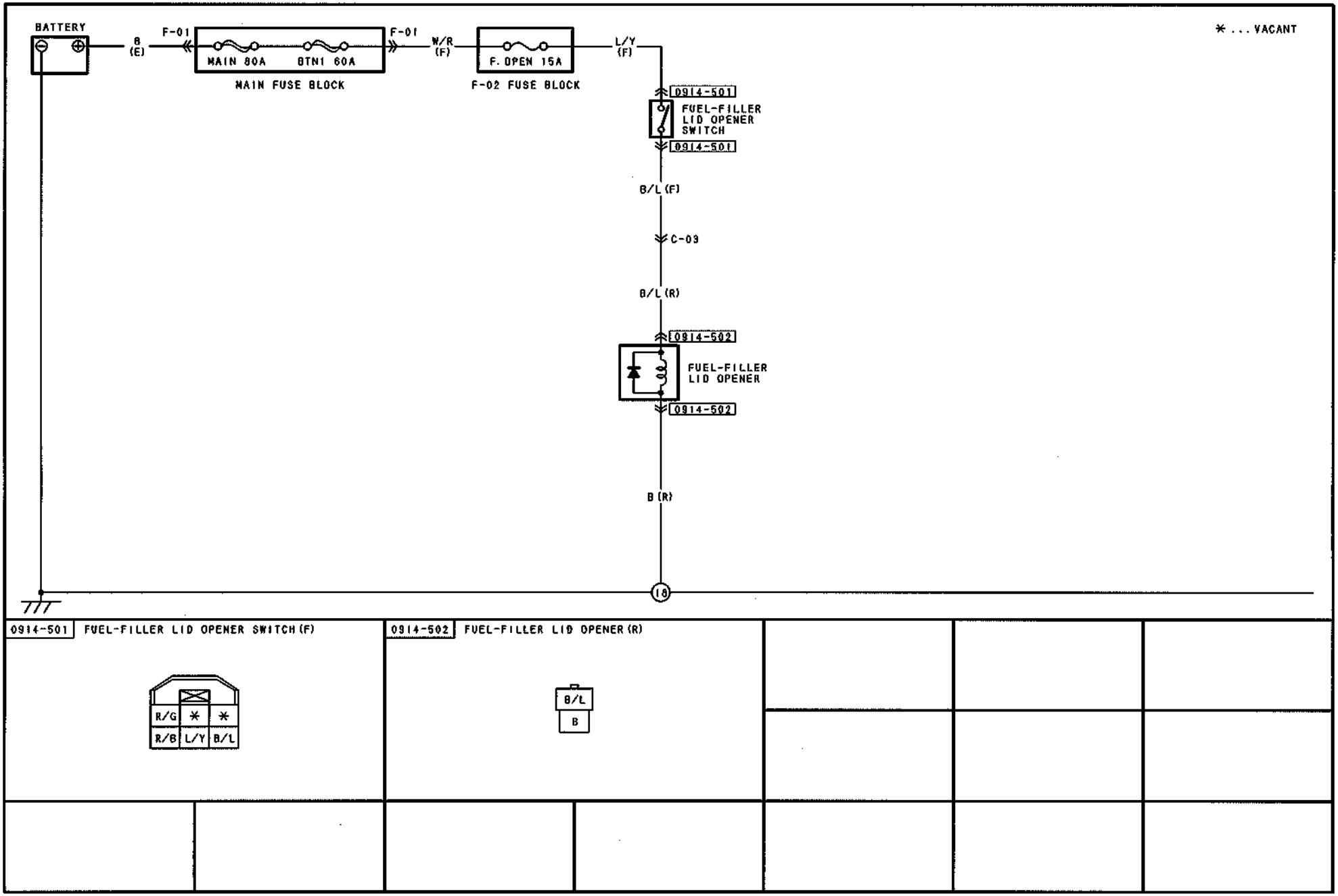
0914-102 DOOR KEY CYLINDER SWITCH RF (DR1)

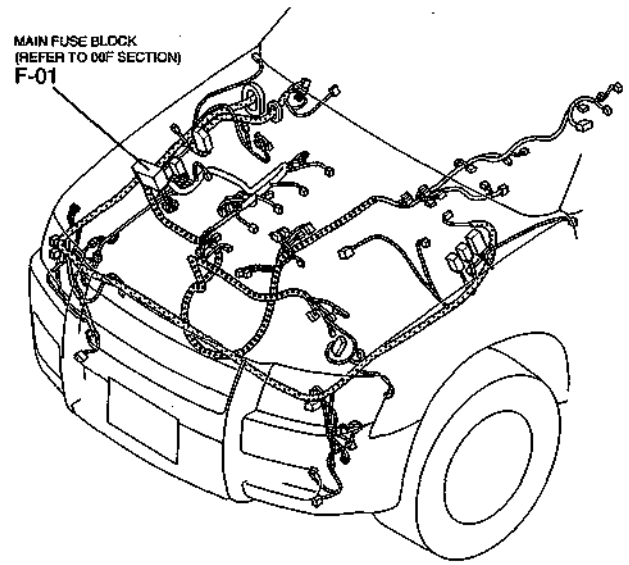

MAIN FUSE BLOCK
(REFER TO 00F SECTION)
F-01
(BLACK)
BONNET SWITCH
0914-403
DOOR KEY CYLINDER SWITCH RF
0914-102
(F)-(DR1)
C-11
0914-402
DOOR KEY CYLINDER SWITCH LF
C-12
(F)-(DR2)
(F)-(DR2)
C-12
(F)-(DR1)
C-11
THEFT-DETERRENT CONTROL MODULE
0914-401
F-02
FUSE BLOCK
(REFER TO 00F SECTION)
C-01
ENGINE SWITCH

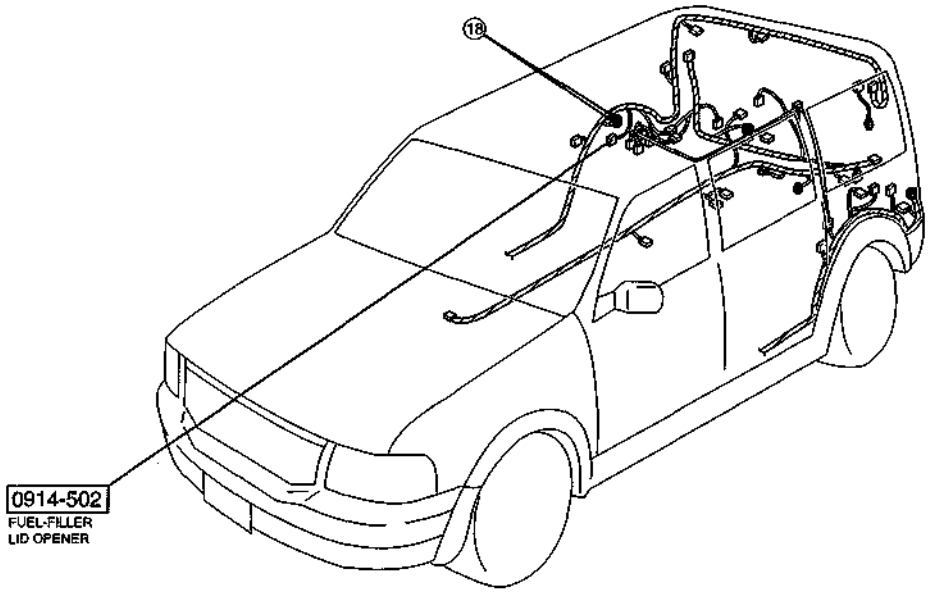

BATTERY
B (E)
F-01
BTN2 60A
F-01
MAIN FUSE BLOCK
L/B (F)
STOP 15A
F-02
FUSE BLOCK
G/W (F)
* ... VACANT
@ ... WITH AIR BAG SYSTEM
% ... WITHOUT AIR BAG SYSTEM
THEFT-DETERRENT CONTROL MODULE
O
F
E
0914-401
LG/R (F)
LG/R (F)
C-04
LG/R (R) (FR) @ %
C-24
LG/R (DR4)
0914-404
UNLOCK
LOCK
DOOR LOCK-LINK SWITCH LR
0914-404
B (DR4)
C-24
B (R)
8
B (FR)
12
LG/R (F)
C-02
LG/R (R)
C-21
LG/R (DR3)
0914-405
UNLOCK
LOCK
DOOR LOCK-LINK SWITCH RR
0914-405
B (DR3)
C-21
B (R)
C-03
B (F)
4
5
P (F)
98
INSTRUMENT CLUSTER (SECTION 0922-1a)
G/W (F)
G/W (F)
A
C
0914-406
THEFT-DETERRENT HORN RELAY
0914-406
P/L (F)
GY/B (F)
0914-407
THEFT-DETERRENT HORN
0914-401 THEFT-DETERRENT CONTROL MODULE (F)
Q O M K I G
W U S E C A
B/W G/R BR/B BR/R LG/R * * * * P/L * *
L/R W/R R/Y * BR/W G/O * * * P * B
X V T R P N L J H F D B
0914-404 DOOR LOCK-LINK SWITCH LR (DR4)
B * LG/R
0914-405 DOOR LOCK-LINK SWITCH RR (DR3)
B * LG/R
0914-406 THEFT-DETERRENT HORN RELAY (F)
P/L * G/W A
C G/W
GY/B
0914-407 THEFT-DETERRENT HORN (F)
GY/B

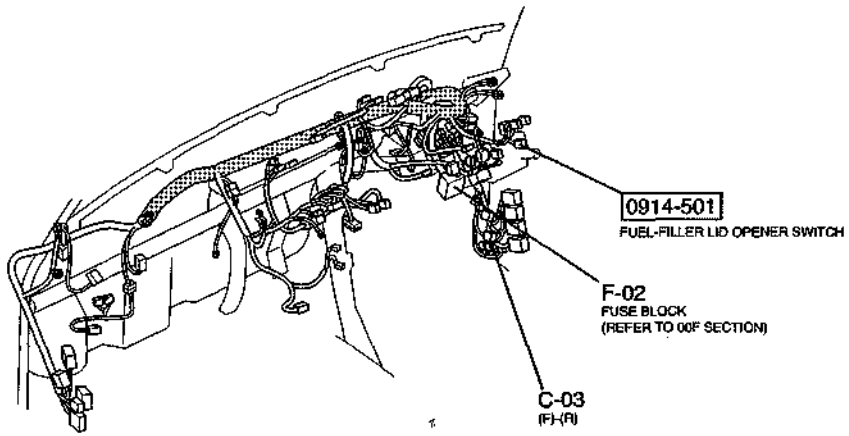

MAIN FUSE BLOCK
(REFER TO 00F SECTION)
F-01
0914-406
THEFT-DETERRENT HORN RELAY
0914-407
THEFT-DETERRENT HORN
[GRAY]
DOOR LOCK-LINK SWITCH RR
0914-405
(R)-(DR3)
C-21
0914-404
DOOR LOCK-LINK SWITCH LR
[GRAY]
C-02
(F)-(R)
C-03
(F)-(R)
C-24
(R)-(DR4) ← WITH AIR BAG SYSTEM
(FR)-(DR4) ← WITHOUT AIR BAG SYSTEM
C-04
(F)-(R) ← WITH AIR BAG SYSTEM
(F)-(FR) ← WITHOUT AIR BAG SYSTEM
THEFT-DETERRENT CONTROL MODULE
0914-401
C-02
(F)-(R)
C-03
(F)-(R)
F-02
FUSE BLOCK
(REFER TO 00F SECTION)
C-04
WITH AIR BAG SYSTEM → (F)-(R)
WITHOUT AIR BAG SYSTEM → (F)-(FR)

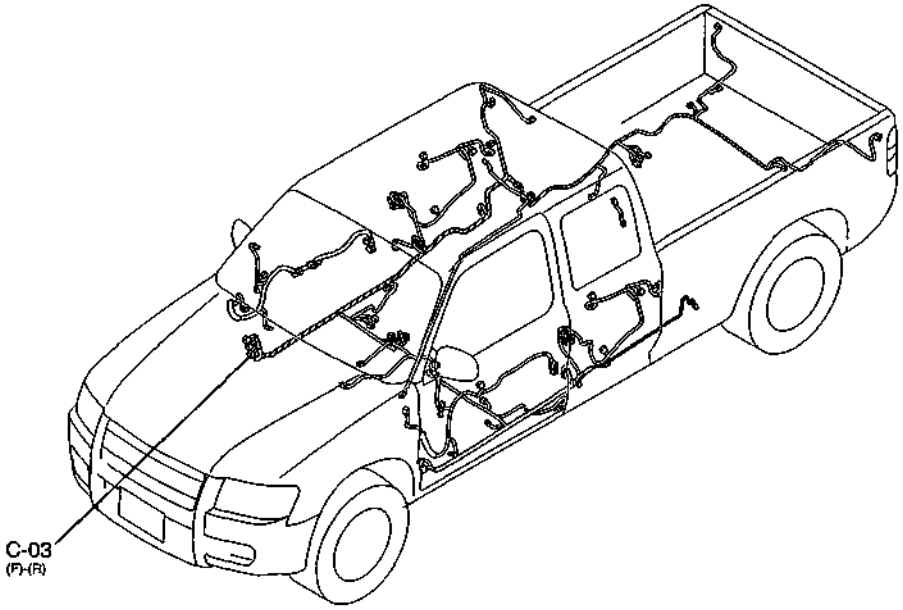
FUEL-FILLER LID OPENER

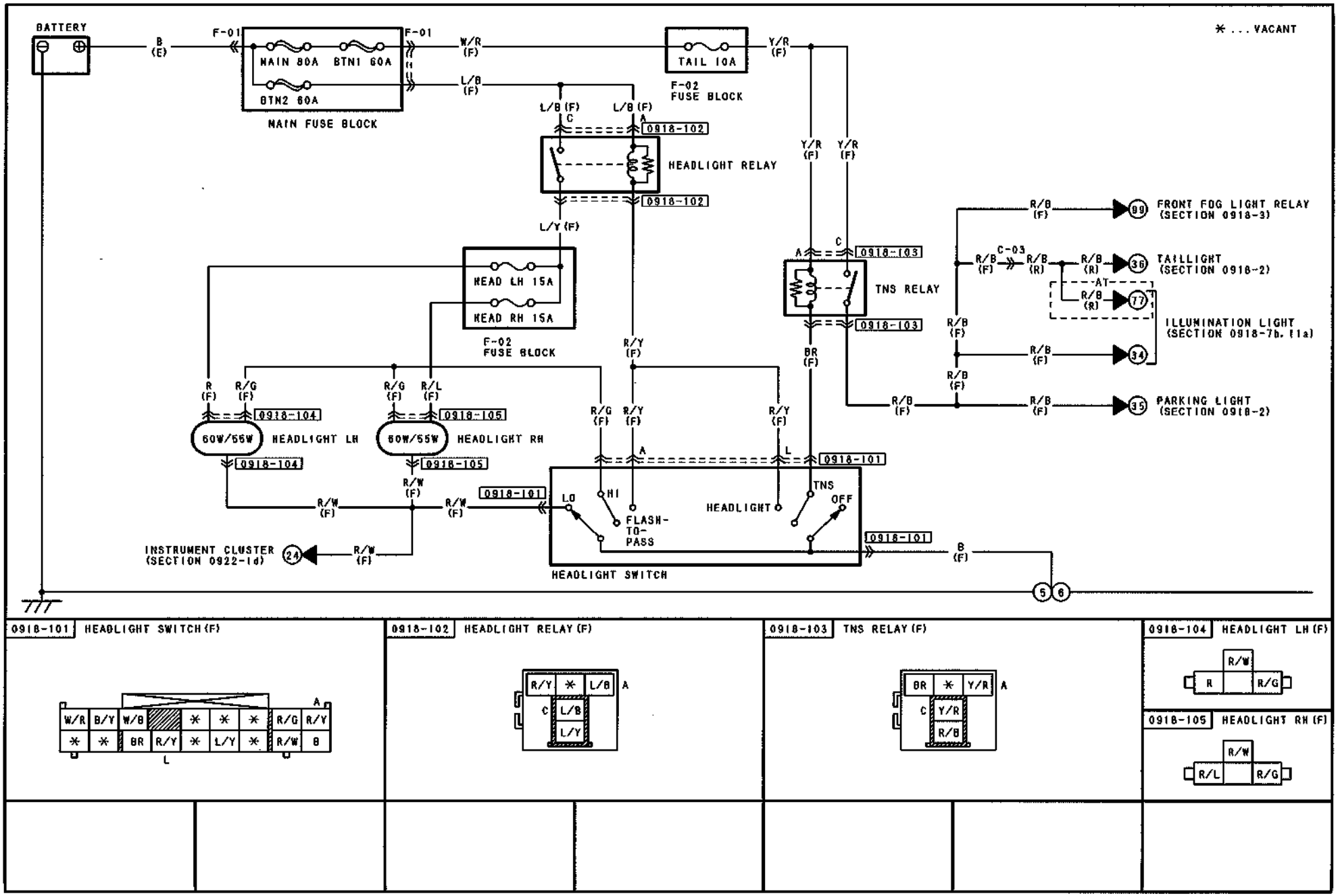


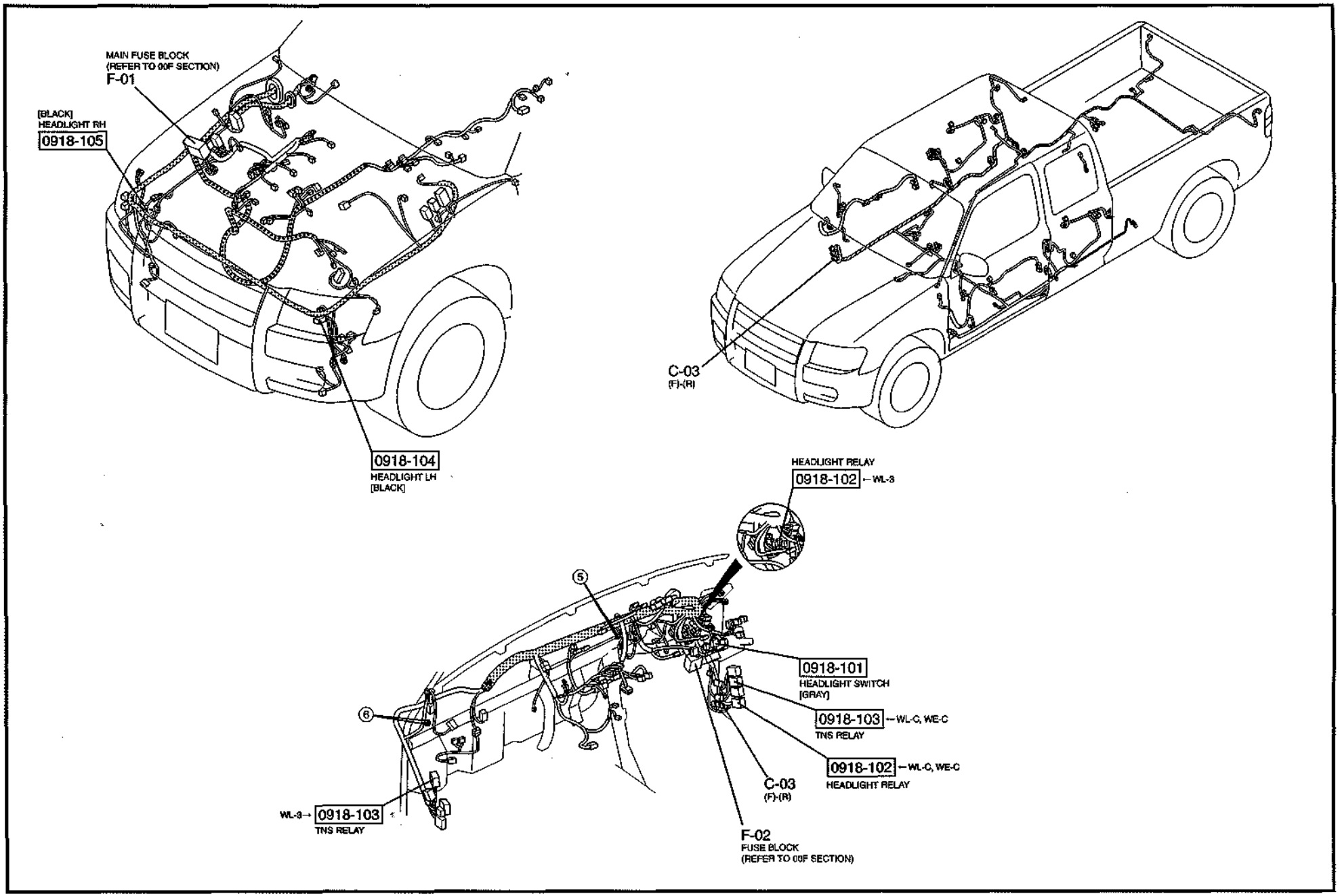

MAIN FUSE BLOCK
(REFER TO 00F SECTION)
F-01

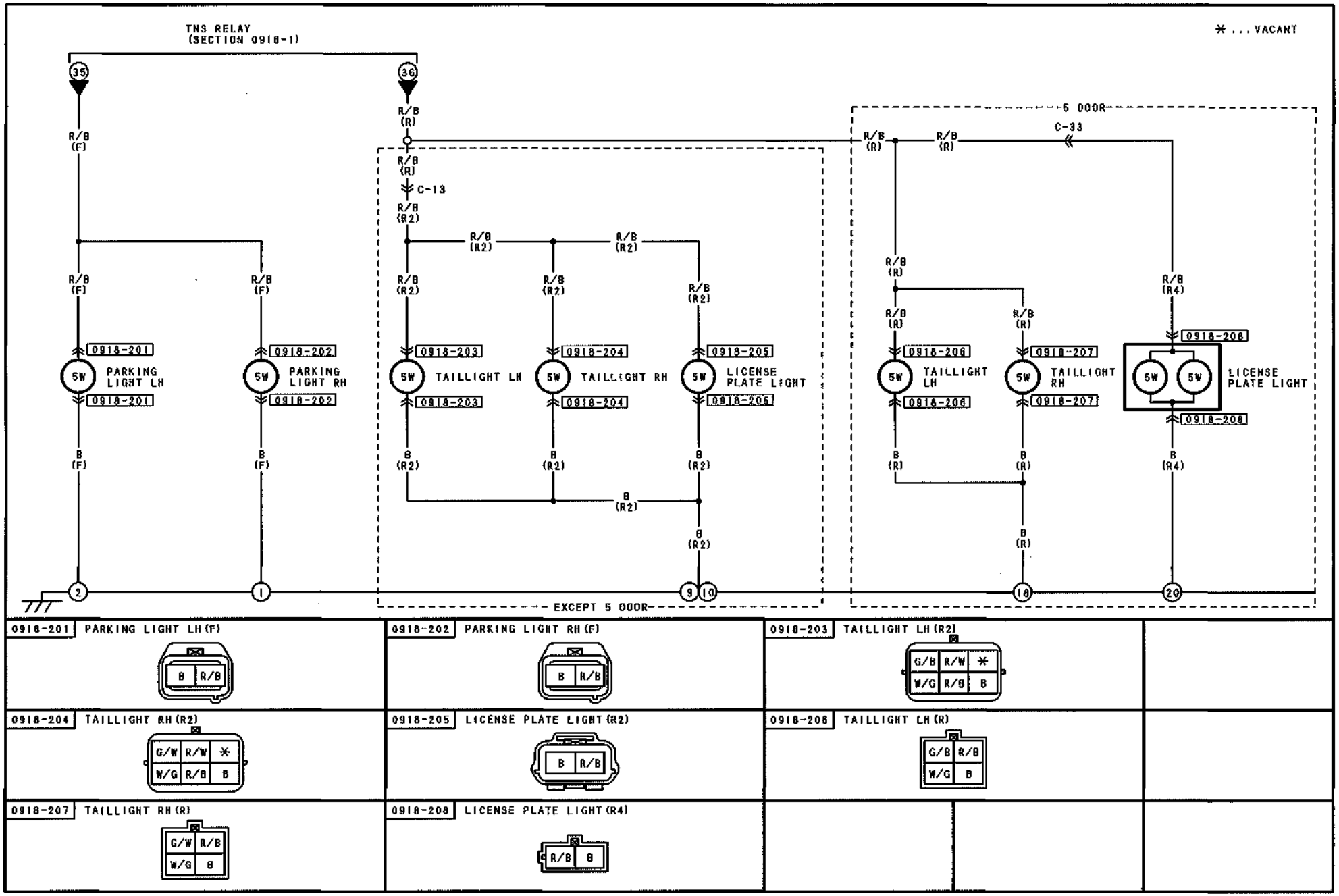

18
0914-502
FUEL-FILLER
LID OPENER


0914-501
FUEL-FILLER LID OPENER SWITCH
F-02
FUSE BLOCK
(REFER TO 00F SECTION)
C-03
(F)-(R)


C-03
(F)-(R)


* . . . VACANT
BATTERY
B (E)
F-01
MAIN 80A
BTN1 60A
BTN2 60A
MAIN FUSE BLOCK
W/R (F)
L/B (F)
TAIL 10A
Y/R (F)
F-02 FUSE BLOCK
0918-102
HEADLIGHT RELAY
L/Y (F)
HEAD LH 15A
HEAD RH 15A
F-02 FUSE BLOCK
0918-103
TNS RELAY
BR (F)
R/B (F)
R/B (R)
C-03
FRONT FOG LIGHT RELAY (SECTION 0918-3)
TAILLIGHT (SECTION 0918-2)
AT
ILLUMINATION LIGHT (SECTION 0918-7b, 11a)
PARKING LIGHT (SECTION 0918-2)
R (F)
R/G (F)
R/L (F)
R/Y (F)
0918-104
0918-105
60W/55W
HEADLIGHT LH
HEADLIGHT RH
R/W (F)
0918-101
LO
HI
FLASH-TO-PASS
HEADLIGHT
TNS
OFF
HEADLIGHT SWITCH
INSTRUMENT CLUSTER (SECTION 0922-1d)
0918-101 HEADLIGHT SWITCH (F)
0918-102 HEADLIGHT RELAY (F)
0918-103 TNS RELAY (F)
0918-104 HEADLIGHT LH (F)
0918-105 HEADLIGHT RH (F)


MAIN FUSE BLOCK
(REFER TO 00F SECTION)
F-01
[BLACK]
HEADLIGHT RH
0918-105
0918-104
HEADLIGHT LH
[BLACK]
C-03
(F)-(R)
HEADLIGHT RELAY
0918-102
WL-3
5
6
0918-101
HEADLIGHT SWITCH
[GRAY]
0918-103
WL-C, WE-C
TNS RELAY
0918-102
WL-C, WE-C
HEADLIGHT RELAY
C-03
(F)-(R)
WL-3
0918-103
TNS RELAY
F-02
FUSE BLOCK
(REFER TO 00F SECTION)



0918-201 PARKING LIGHT LH (F)

0918-202 PARKING LIGHT RH (F)

0918-203 TAILLIGHT LH (R2)

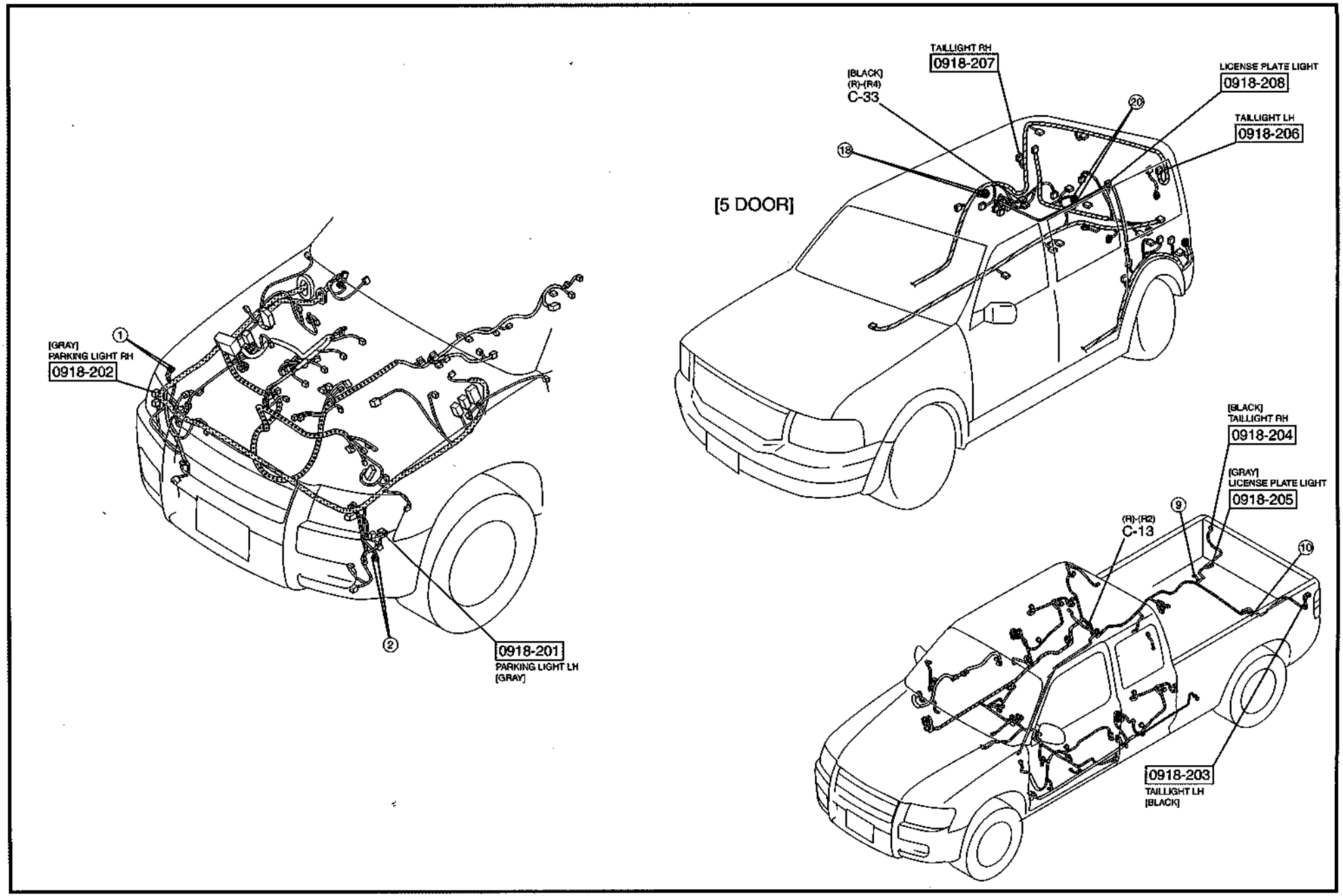
0918-204 TAILLIGHT RH (R2)

0918-205 LICENSE PLATE LIGHT (R2)

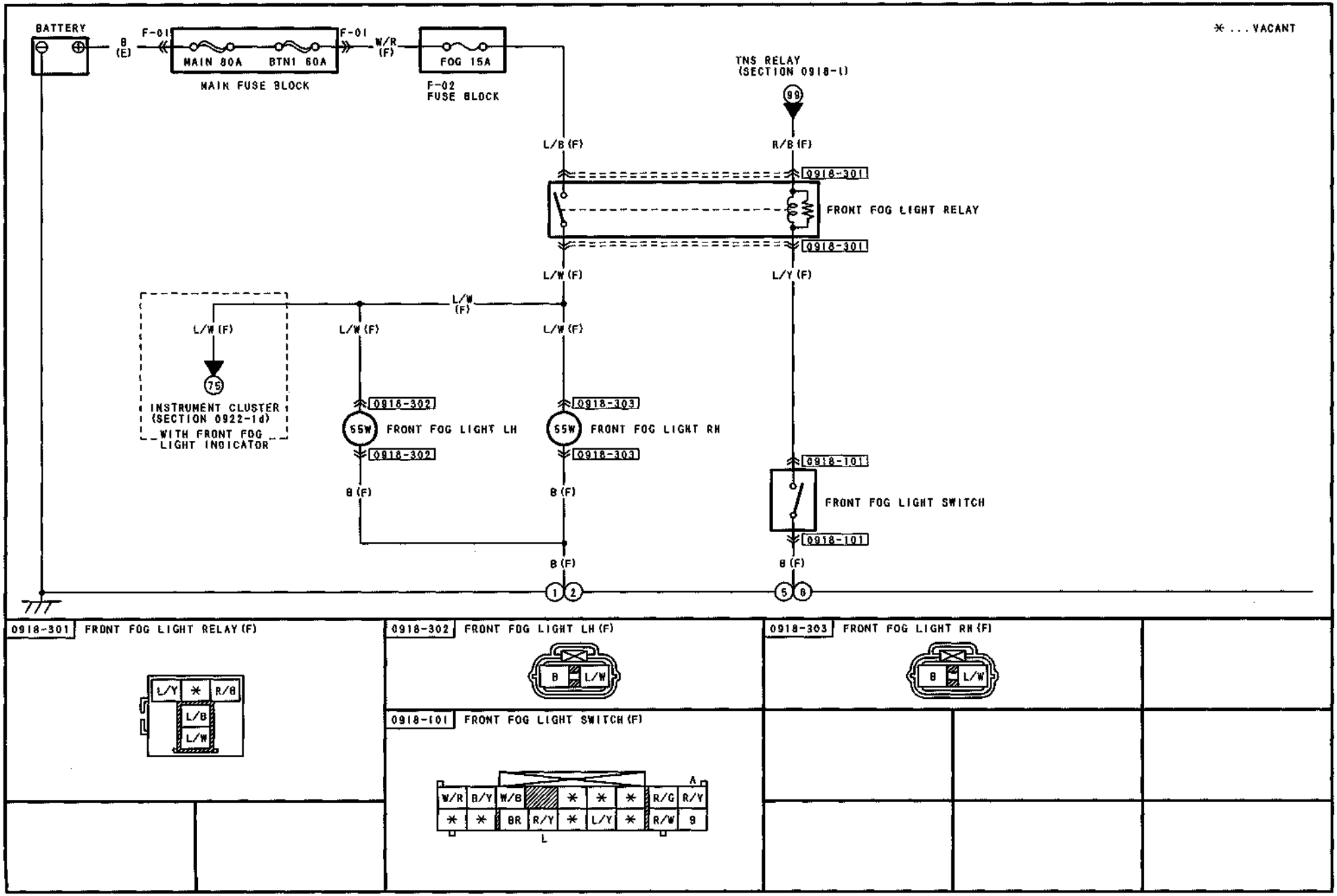
0918-206 TAILLIGHT LH (R)

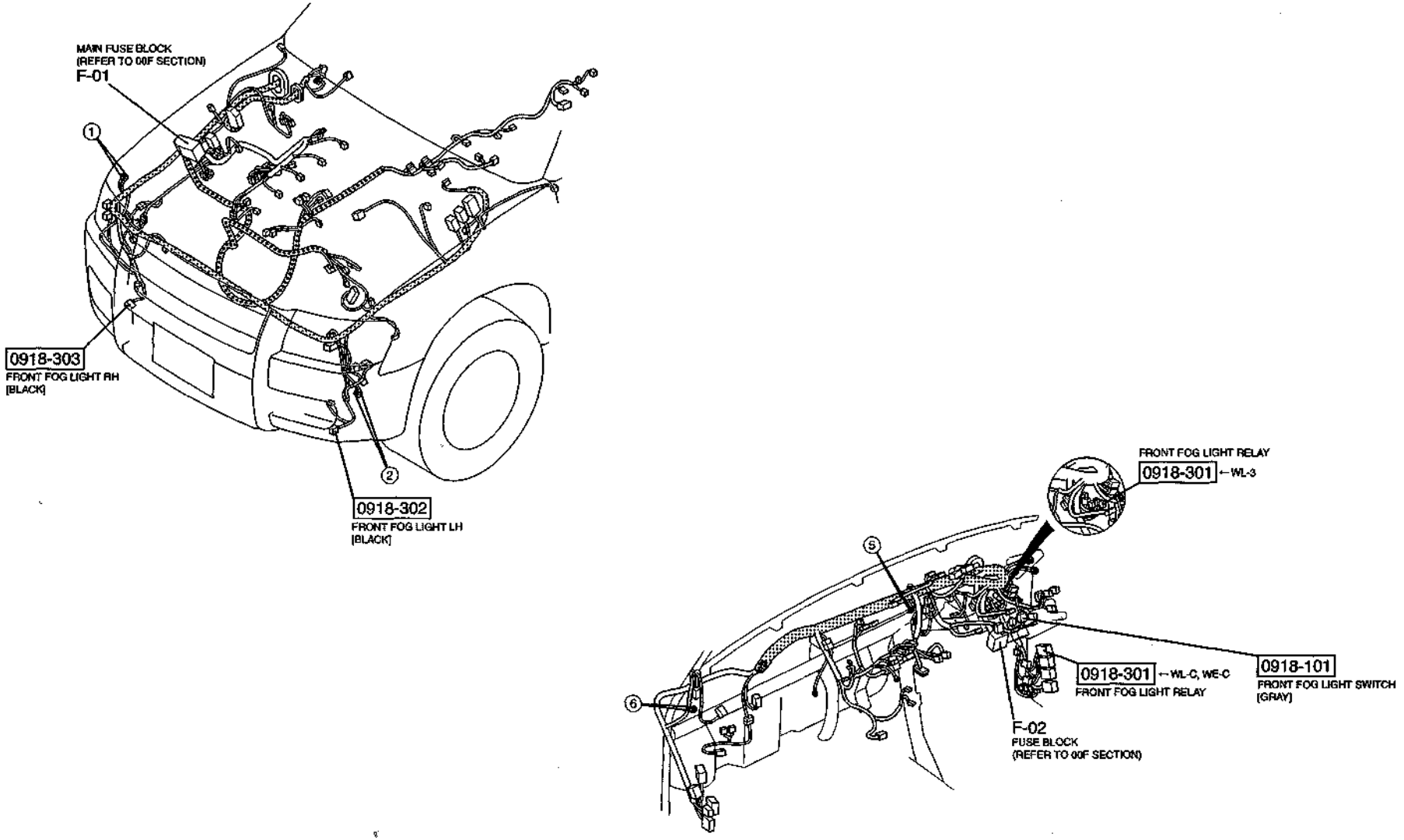
0918-207 TAILLIGHT RH (R)

0918-208 LICENSE PLATE LIGHT (R4)

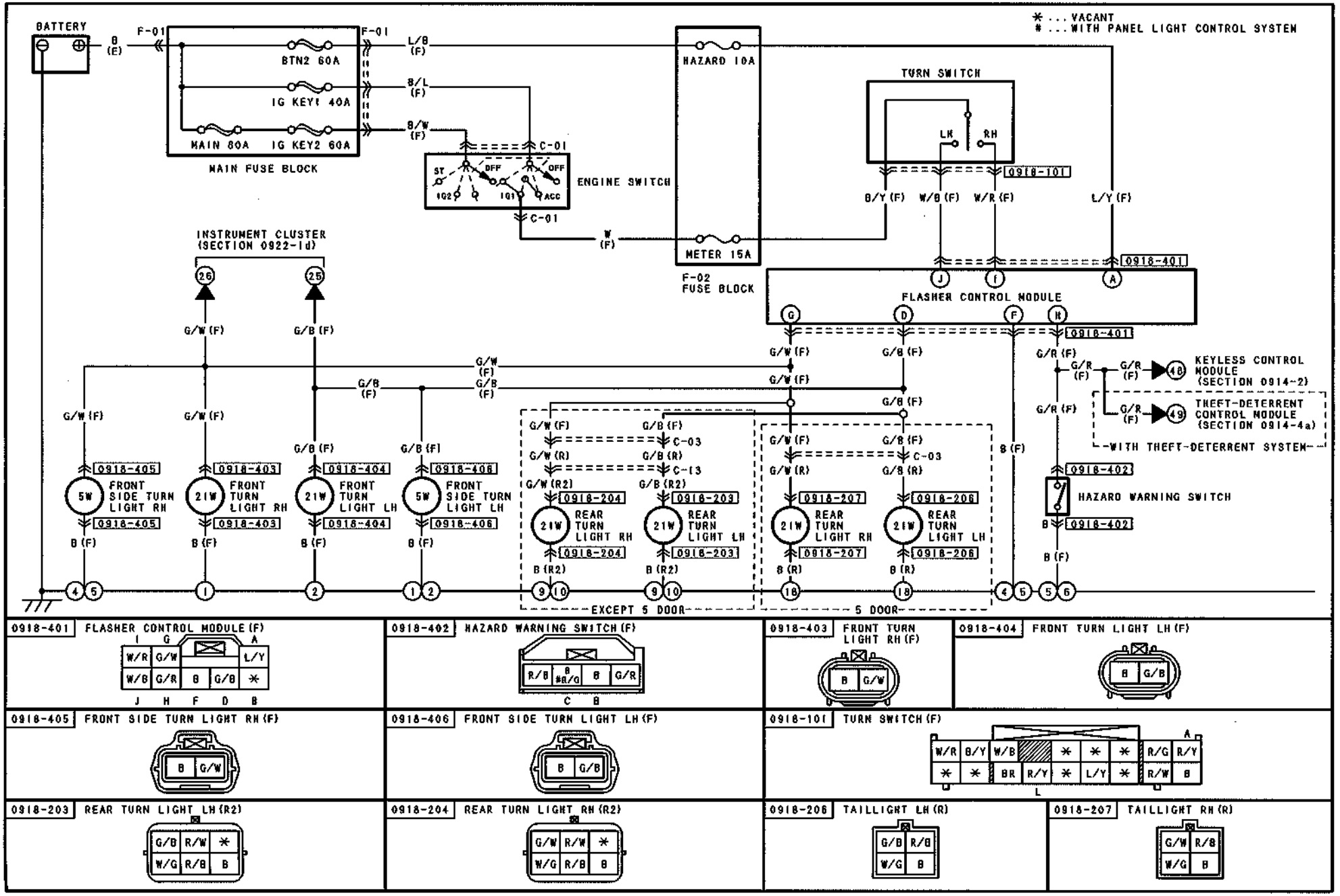

[GRAY]
PARKING LIGHT RH
0918-202
0918-201
PARKING LIGHT LH
[GRAY]
[5 DOOR]
TAILLIGHT RH
0918-207
[BLACK]
(R)-(R4)
C-33
LICENSE PLATE LIGHT
0918-208
TAILLIGHT LH
0918-206
[BLACK]
TAILLIGHT RH
0918-204
[GRAY]
LICENSE PLATE LIGHT
0918-205
(R)-(R2)
C-13
0918-203
TAILLIGHT LH
[BLACK]

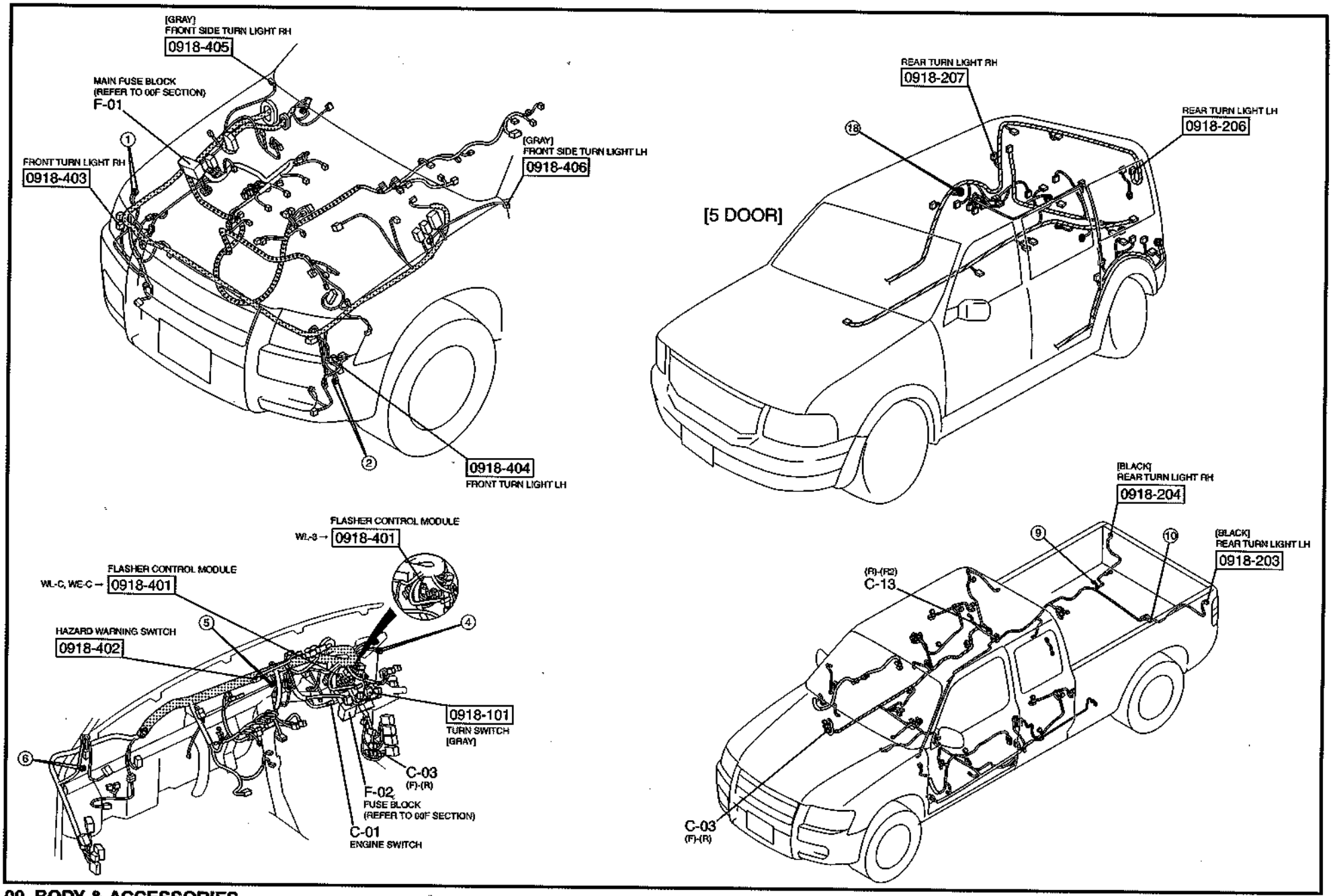
FRONT FOG LIGHT

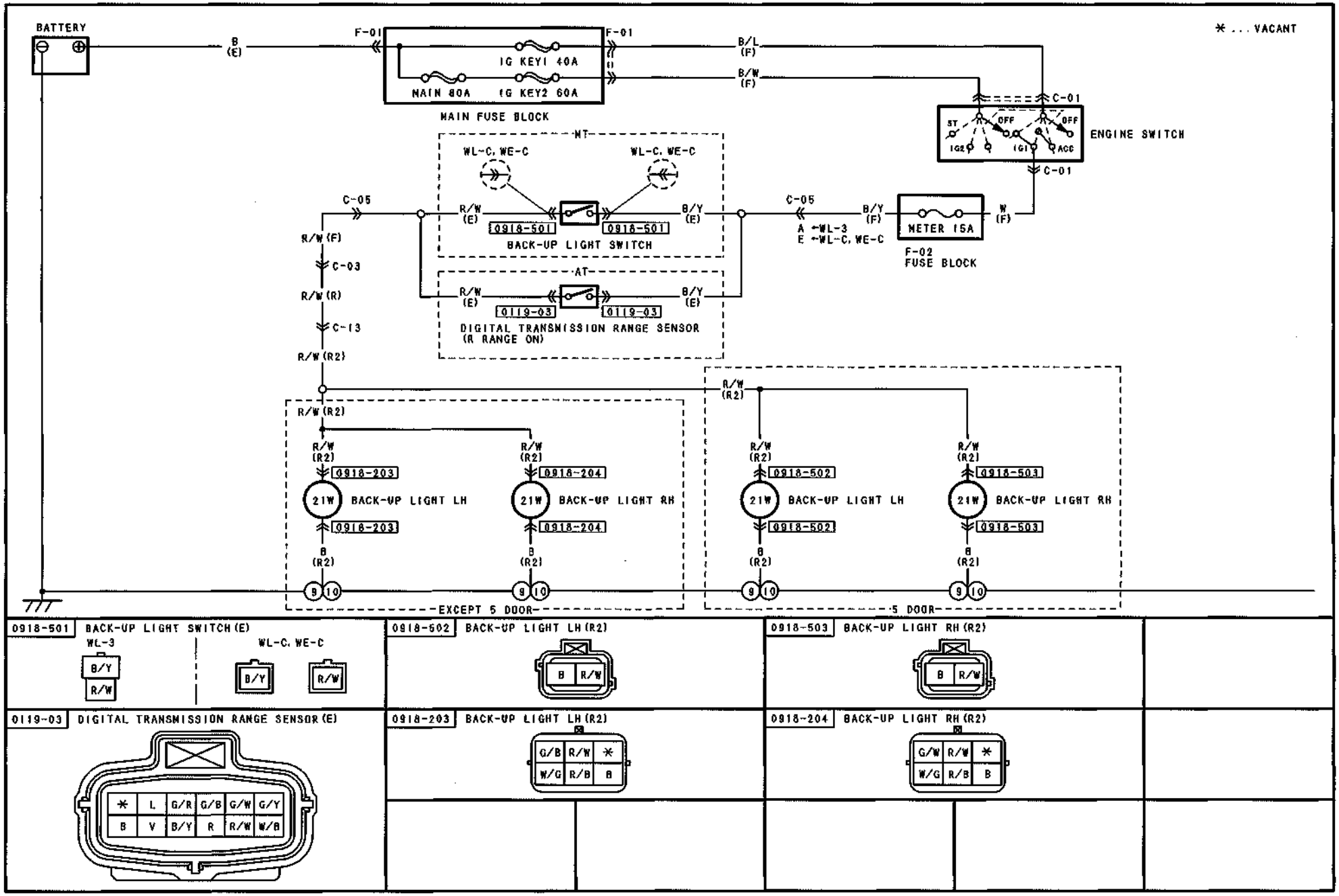


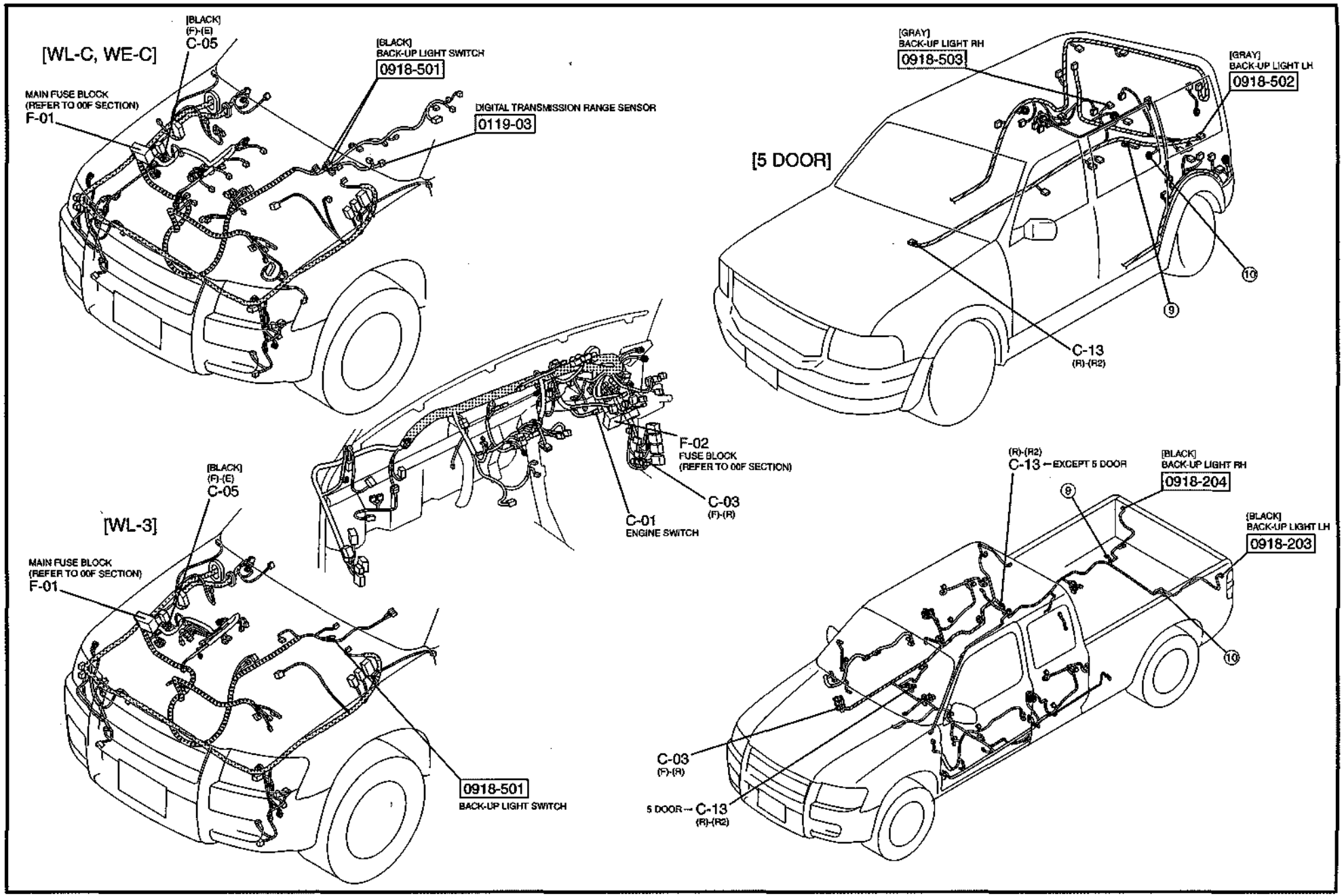

MAIN FUSE BLOCK
(REFER TO 00F SECTION)
F-01
1
0918-303
FRONT FOG LIGHT RH
[BLACK]
2
0918-302
FRONT FOG LIGHT LH
[BLACK]
FRONT FOG LIGHT RELAY
0918-301 ← WL-3
5
6
0918-301 ← WL-C, WE-C
FRONT FOG LIGHT RELAY
0918-101
FRONT FOG LIGHT SWITCH
(GRAY)
F-02
FUSE BLOCK
(REFER TO 00F SECTION)

TURN AND HAZARD WARNING LIGHT

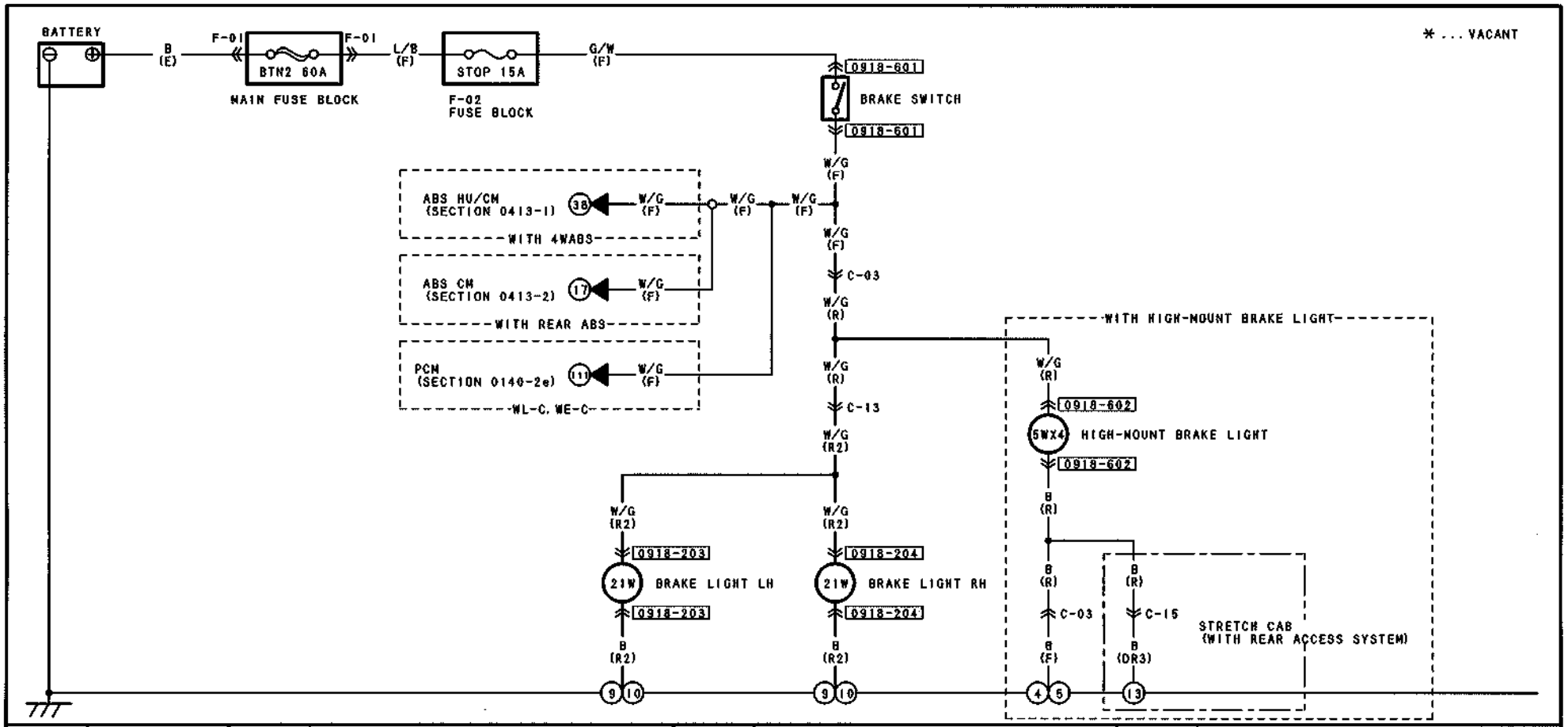



[GRAY]
FRONT SIDE TURN LIGHT RH
0918-405
MAIN FUSE BLOCK
(REFER TO 00F SECTION)
F-01
FRONT TURN LIGHT RH
0918-403
[GRAY]
FRONT SIDE TURN LIGHT LH
0918-406
0918-404
FRONT TURN LIGHT LH
REAR TURN LIGHT RH
0918-207
REAR TURN LIGHT LH
0918-206
[5 DOOR]
FLASHER CONTROL MODULE
WL-3 → 0918-401
FLASHER CONTROL MODULE
WL-C, WE-C → 0918-401
HAZARD WARNING SWITCH
0918-402
0918-101
TURN SWITCH
[GRAY]
C-03
(F)-(R)
F-02
FUSE BLOCK
(REFER TO 00F SECTION)
C-01
ENGINE SWITCH
[BLACK]
REAR TURN LIGHT RH
0918-204
[BLACK]
REAR TURN LIGHT LH
0918-203
(R)-(R2)
C-13
C-03
(F)-(R)

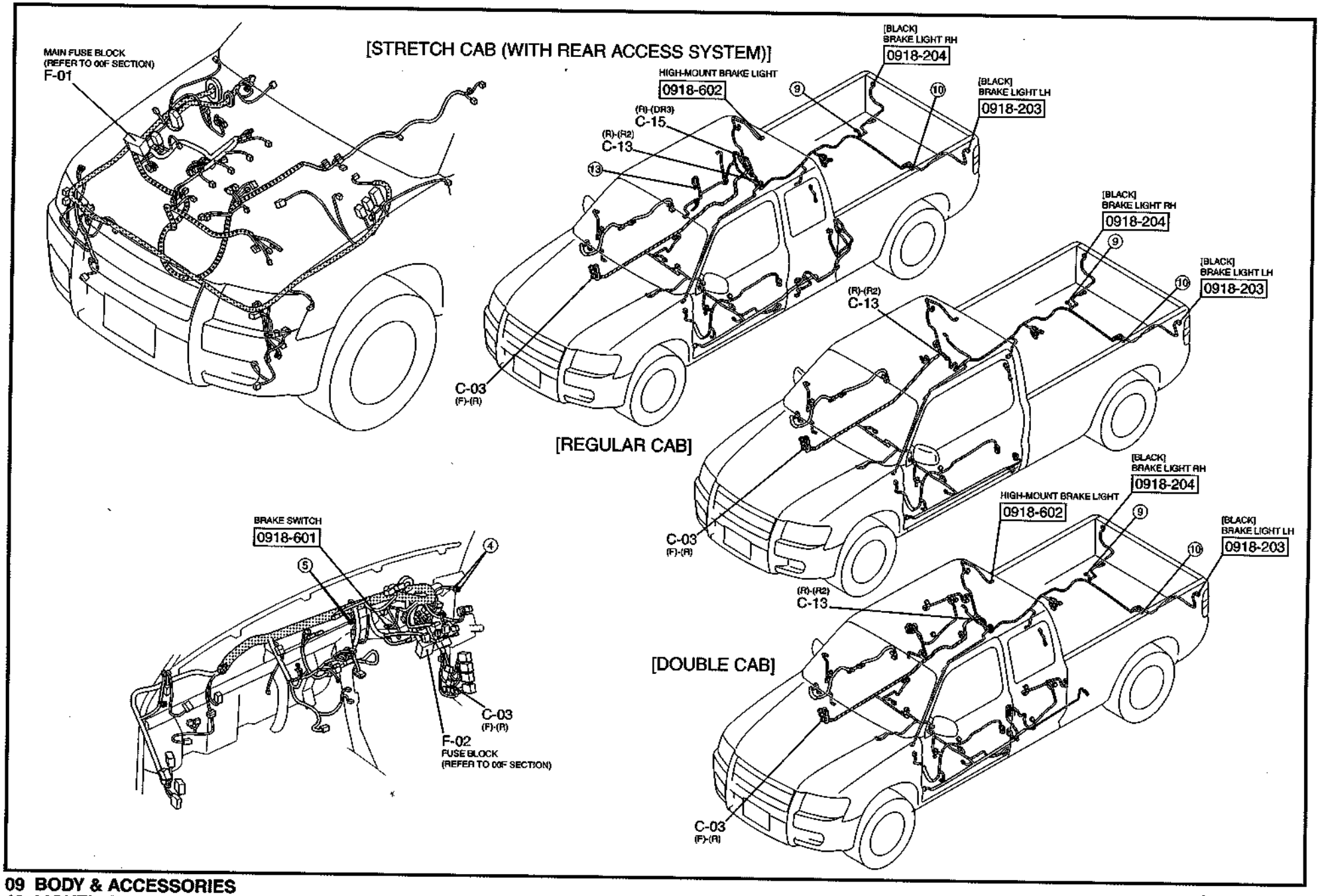

BATTERY
B (E)
F-01
IG KEY1 40A
MAIN 80A
IG KEY2 60A
MAIN FUSE BLOCK
B/L (F)
B/W (F)
C-01
ST
OFF
IG2
IG1
ACC
ENGINE SWITCH
* . . . VACANT
MT
WL-C, WE-C
WL-C, WE-C
C-05
R/W (E)
0918-501
0918-501
B/Y (E)
BACK-UP LIGHT SWITCH
C-05
B/Y (F)
A ←WL-3
E ←WL-C, WE-C
METER 15A
W (F)
F-02
FUSE BLOCK
R/W (F)
C-03
R/W (R)
C-13
R/W (R2)
AT
R/W (E)
0119-03
0119-03
B/Y (E)
DIGITAL TRANSMISSION RANGE SENSOR
(R RANGE ON)
R/W (R2)
R/W (R2)
0918-203
21W
BACK-UP LIGHT LH
0918-203
R/W (R2)
0918-204
21W
BACK-UP LIGHT RH
0918-204
B (R2)
B (R2)
9
10
9
10
EXCEPT 5 DOOR
R/W (R2)
R/W (R2)
0918-502
21W
BACK-UP LIGHT LH
0918-502
R/W (R2)
0918-503
21W
BACK-UP LIGHT RH
0918-503
B (R2)
B (R2)
9
10
9
10
5 DOOR
0918-501 BACK-UP LIGHT SWITCH (E)
WL-3
B/Y
R/W
WL-C, WE-C
B/Y
R/W
0918-502 BACK-UP LIGHT LH (R2)
B
R/W
0918-503 BACK-UP LIGHT RH (R2)
B
R/W
0119-03 DIGITAL TRANSMISSION RANGE SENSOR (E)
*
L
G/R
G/B
G/W
G/Y
B
V
B/Y
R
R/W
W/B
0918-203 BACK-UP LIGHT LH (R2)
G/B
R/W
*
W/G
R/B
B
0918-204 BACK-UP LIGHT RH (R2)
G/W
R/W
*
W/G
R/B
B

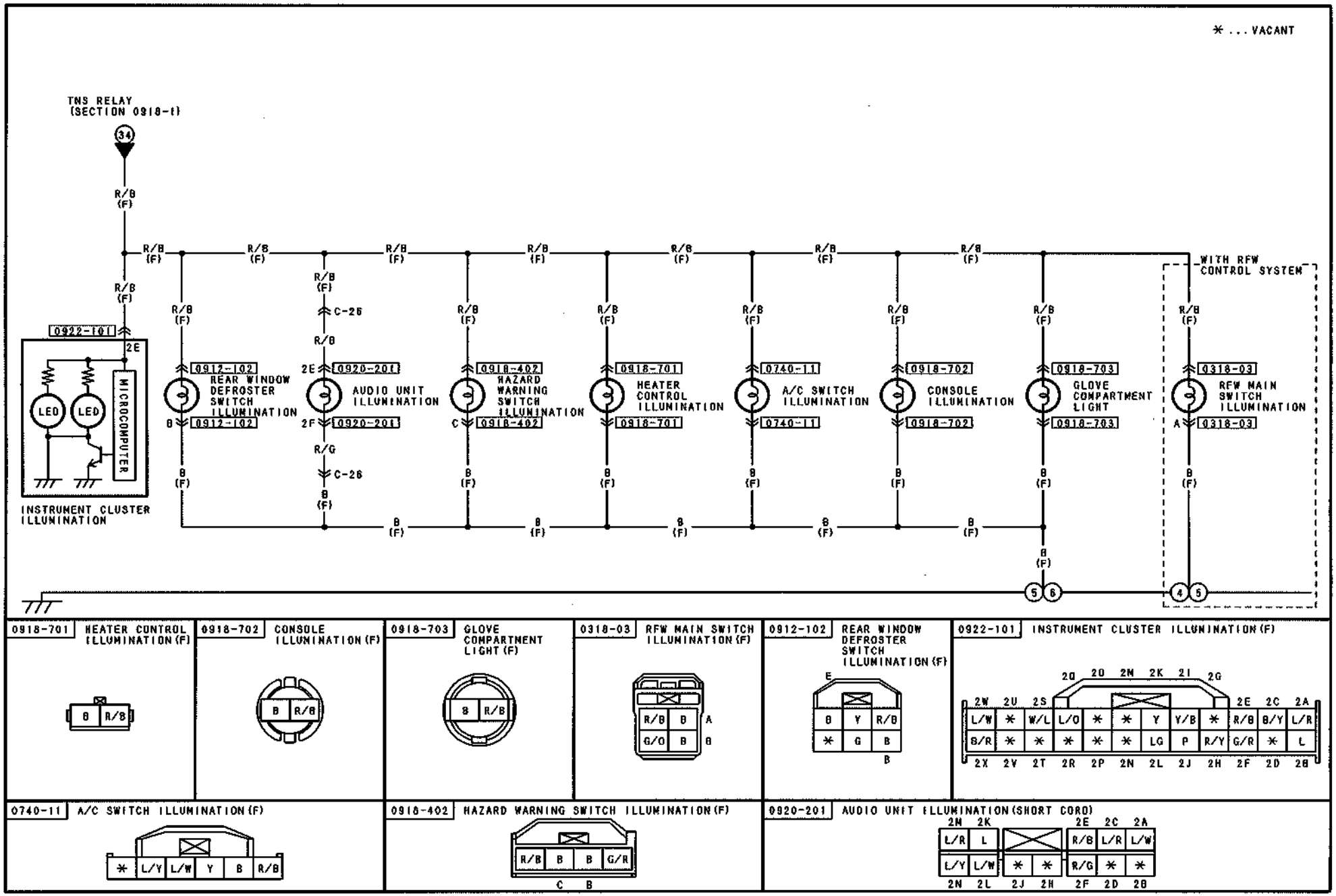

[WL-C, WE-C]
[BLACK]
(F)-(E)
C-05
[BLACK]
BACK-UP LIGHT SWITCH
0918-501
MAIN FUSE BLOCK
(REFER TO 00F SECTION)
F-01
DIGITAL TRANSMISSION RANGE SENSOR
0119-03
[GRAY]
BACK-UP LIGHT RH
0918-503
[GRAY]
BACK-UP LIGHT LH
0918-502
[5 DOOR]
C-13
(R)-(R2)
F-02
FUSE BLOCK
(REFER TO 00F SECTION)
C-03
(F)-(R)
C-01
ENGINE SWITCH
[WL-3]
[BLACK]
(F)-(E)
C-05
MAIN FUSE BLOCK
(REFER TO 00F SECTION)
F-01
0918-501
BACK-UP LIGHT SWITCH
(R)-(R2)
C-13 – EXCEPT 5 DOOR
[BLACK]
BACK-UP LIGHT RH
0918-204
[BLACK]
BACK-UP LIGHT LH
0918-203
C-03
(F)-(R)
5 DOOR – C-13
(R)-(R2)

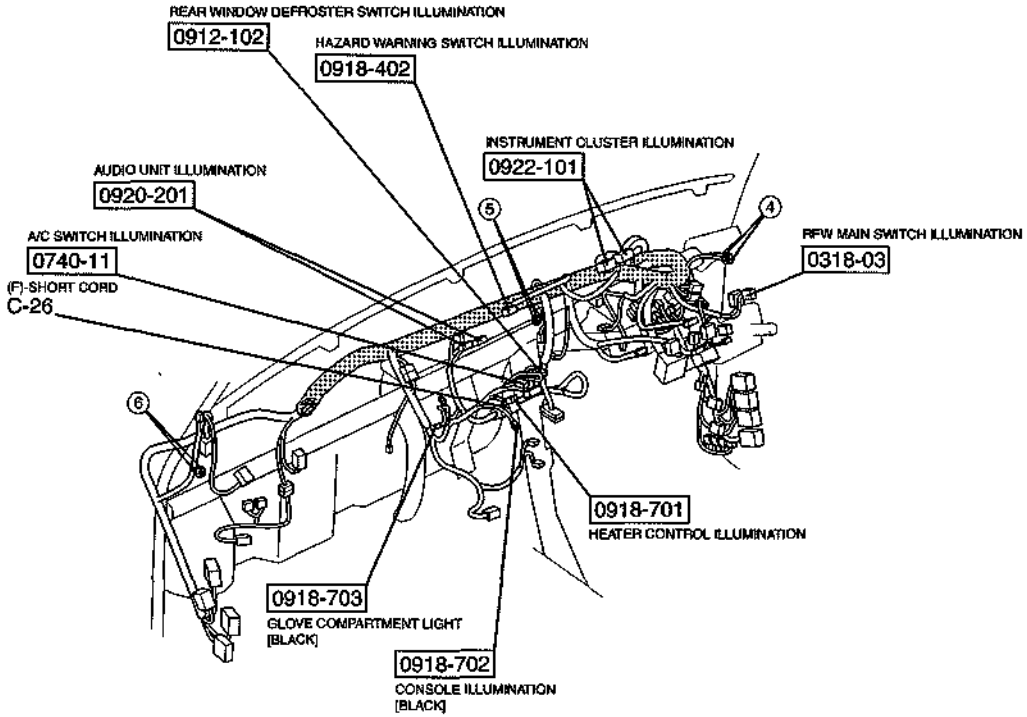
BRAKE LIGHT / HIGH-MOUNT BRAKE LIGHT

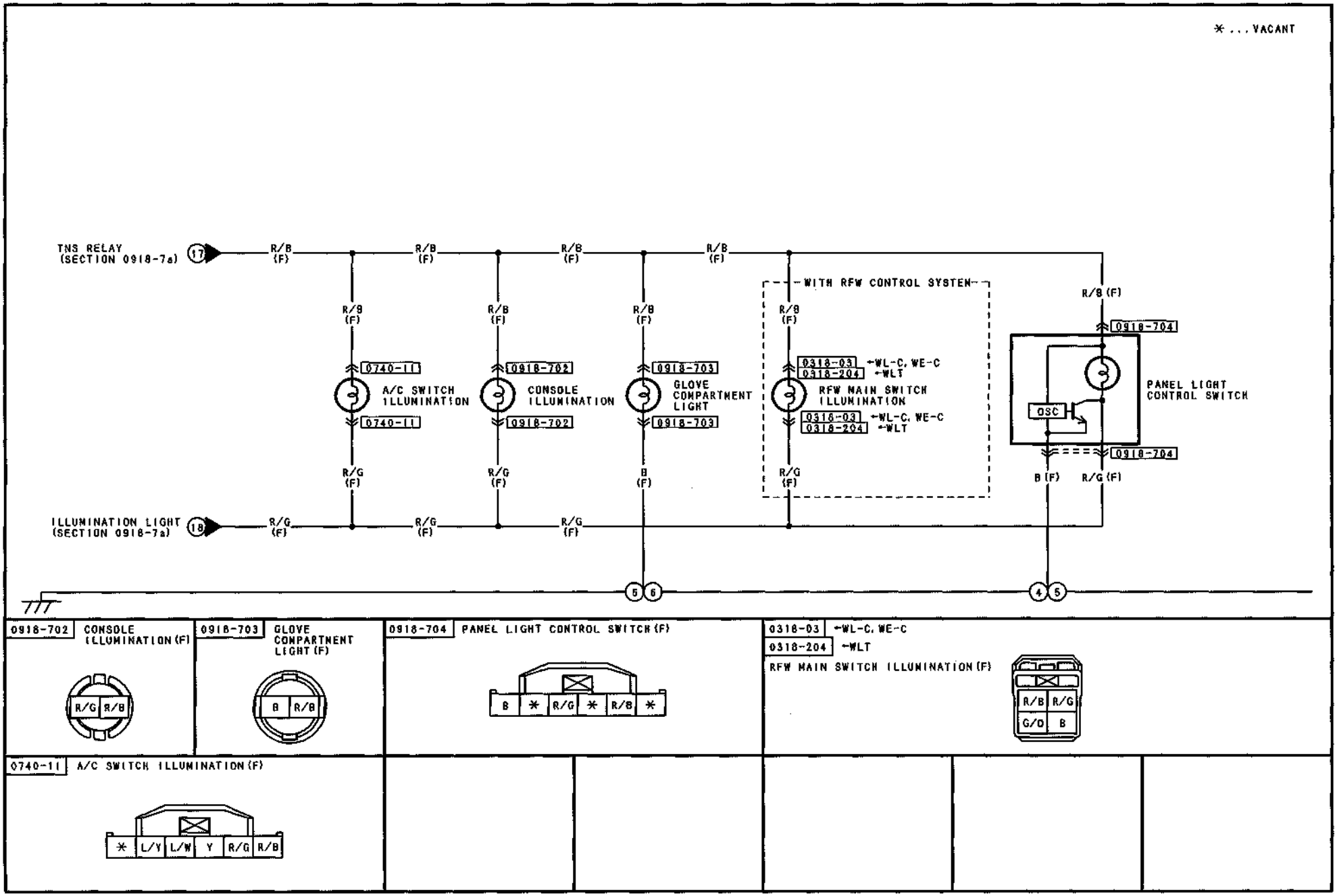


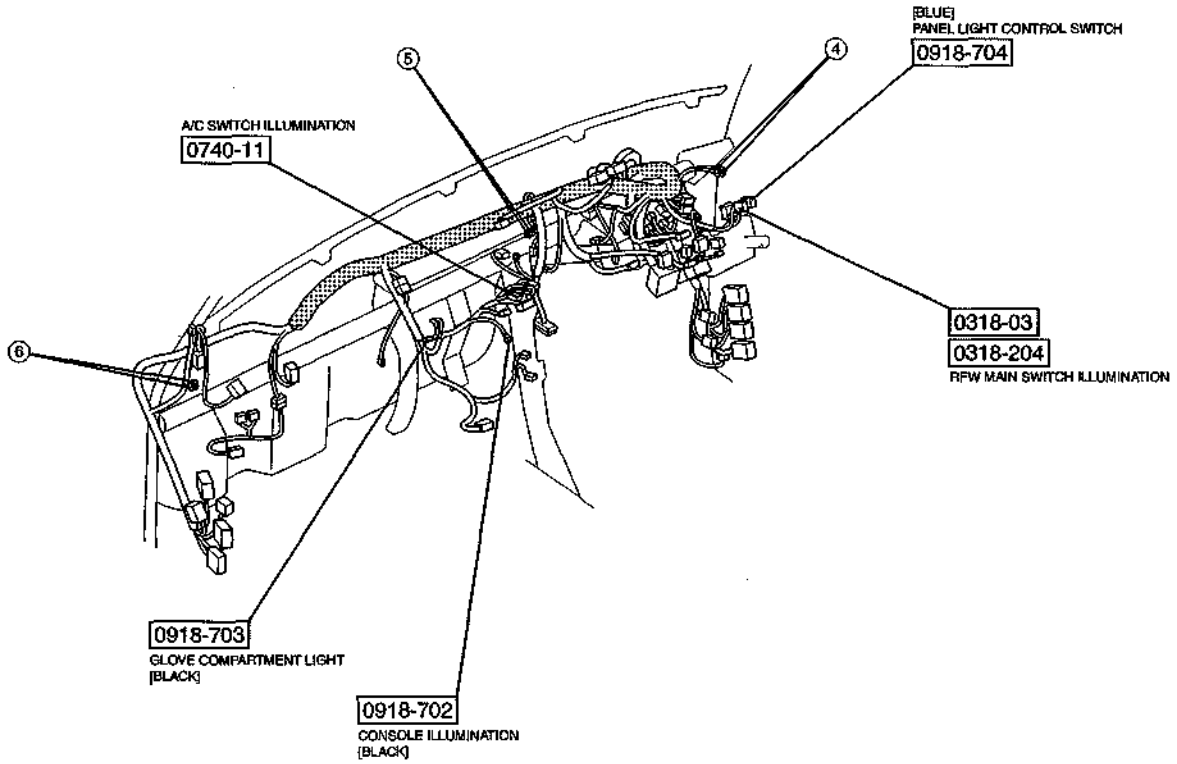
0918-601 BRAKE SWITCH (F)	0918-602 HIGH-MOUNT BRAKE LIGHT (R)	0918-203 BRAKE LIGHT LH (R2)	0918-204 BRAKE LIGHT RH (R2)
G/W W/G	B | W/G	G/B | R/W | * W/G | R/B | B	G/W | R/W | * W/G | R/B | B


MAIN FUSE BLOCK
(REFER TO 00F SECTION)
F-01
[STRETCH CAB (WITH REAR ACCESS SYSTEM)]
[BLACK]
BRAKE LIGHT RH
0918-204
HIGH-MOUNT BRAKE LIGHT
0918-602
[BLACK]
BRAKE LIGHT LH
0918-203
(R)-(DR3)
C-15
(R)-(R2)
C-13
9
10
13
C-03
(F)-(R)
[REGULAR CAB]
[BLACK]
BRAKE LIGHT RH
0918-204
[BLACK]
BRAKE LIGHT LH
0918-203
(R)-(R2)
C-13
C-03
(F)-(R)
BRAKE SWITCH
0918-601
4
5
C-03
(F)-(R)
F-02
FUSE BLOCK
(REFER TO 00F SECTION)
[DOUBLE CAB]
[BLACK]
BRAKE LIGHT RH
0918-204
HIGH-MOUNT BRAKE LIGHT
0918-602
[BLACK]
BRAKE LIGHT LH
0918-203
(R)-(R2)
C-13
C-03
(F)-(R)

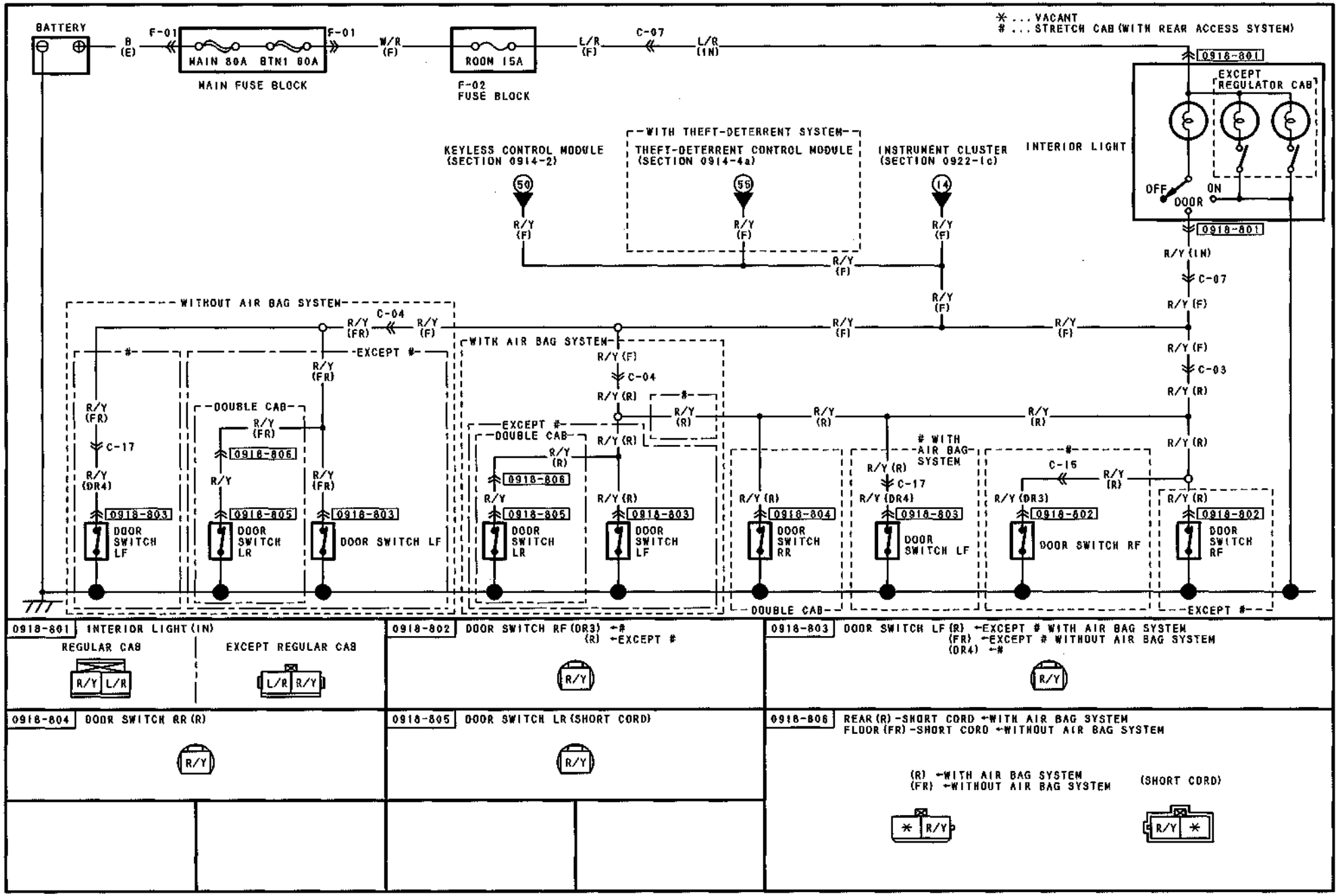

* . . . VACANT
TNS RELAY (SECTION 0918-E)
34
R/B (F)
C-25
C-26
R/G
0922-101
2E
LED
LED
MICROCOMPUTER
INSTRUMENT CLUSTER ILLUMINATION
0912-102
REAR WINDOW DEFROSTER SWITCH ILLUMINATION
0920-201
AUDIO UNIT ILLUMINATION
0918-402
HAZARD WARNING SWITCH ILLUMINATION
0918-701
HEATER CONTROL ILLUMINATION
0740-11
A/C SWITCH ILLUMINATION
0918-702
CONSOLE ILLUMINATION
0918-703
GLOVE COMPARTMENT LIGHT
WITH RFW CONTROL SYSTEM
0318-03
RFW MAIN SWITCH ILLUMINATION
B (F)
5
6
4
5
0918-701 HEATER CONTROL ILLUMINATION (F)
B R/B
0918-702 CONSOLE ILLUMINATION (F)
B R/B
0918-703 GLOVE COMPARTMENT LIGHT (F)
B R/B
0318-03 RFW MAIN SWITCH ILLUMINATION (F)
R/B B A
G/O B B
0912-102 REAR WINDOW DEFROSTER SWITCH ILLUMINATION (F)
E
B Y R/B
* G B
B
0922-101 INSTRUMENT CLUSTER ILLUMINATION (F)
2Q 2O 2M 2K 2I 2G
2W 2U 2S 2E 2C 2A
L/W * W/L L/O * * Y Y/B * R/B B/Y L/R
B/R * * * * * LG P R/Y G/R * L
2X 2V 2T 2R 2P 2N 2L 2J 2H 2F 2D 2B
0740-11 A/C SWITCH ILLUMINATION (F)
* L/Y L/W Y B R/B
0918-402 HAZARD WARNING SWITCH ILLUMINATION (F)
R/B B B G/R
C B
0920-201 AUDIO UNIT ILLUMINATION (SHORT CORD)
2M 2K 2E 2C 2A
L/R L R/B L/R L/W
L/Y L/W * * R/G * *
2N 2L 2J 2H 2F 2D 2B

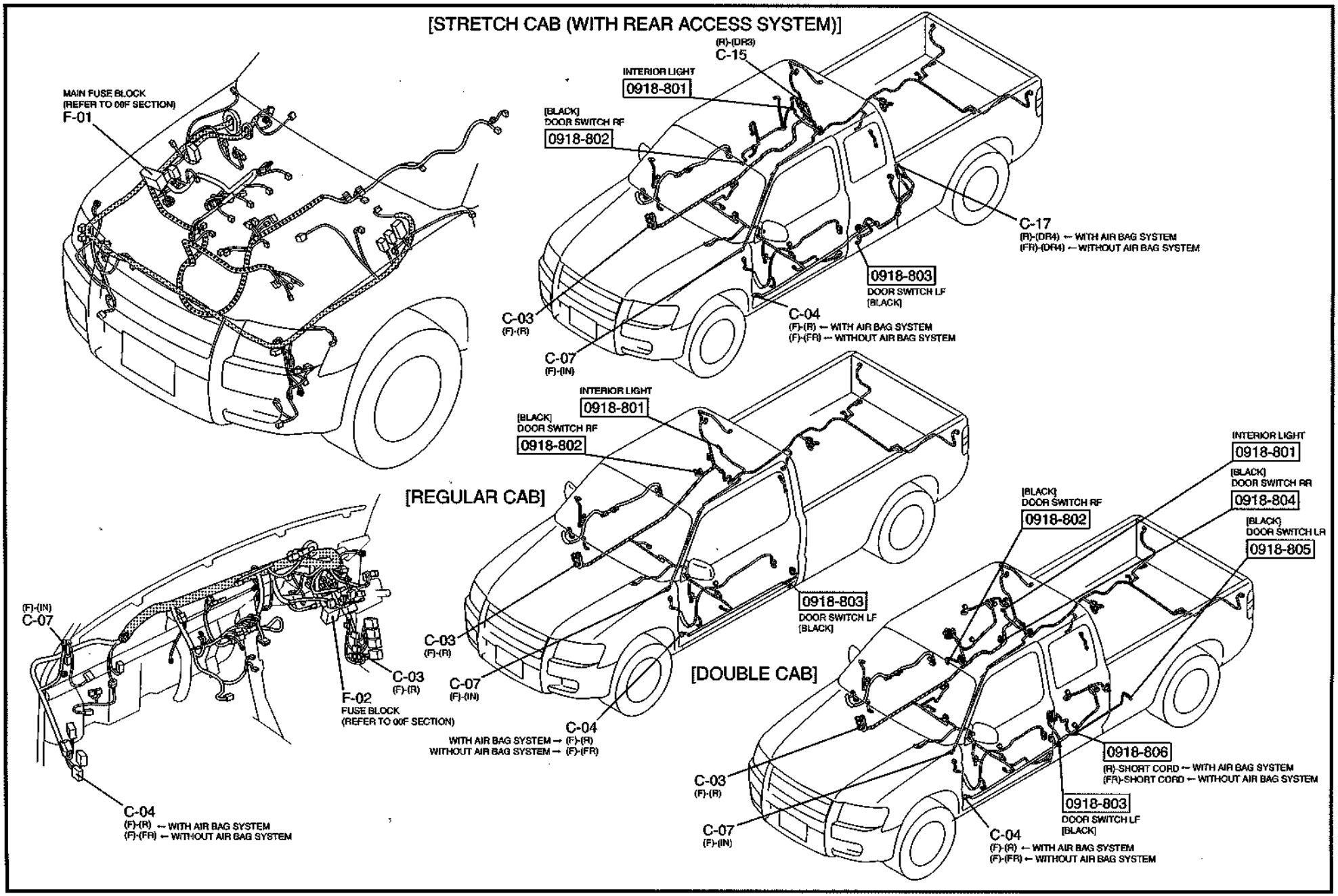

REAR WINDOW DEFROSTER SWITCH ILLUMINATION
0912-102
HAZARD WARNING SWITCH ILLUMINATION
0918-402
INSTRUMENT CLUSTER ILLUMINATION
0922-101
AUDIO UNIT ILLUMINATION
0920-201
A/C SWITCH ILLUMINATION
0740-11
(F)-SHORT CORD
C-26
RFW MAIN SWITCH ILLUMINATION
0318-03
5
4
6
0918-701
HEATER CONTROL ILLUMINATION
0918-703
GLOVE COMPARTMENT LIGHT
[BLACK]
0918-702
CONSOLE ILLUMINATION
[BLACK]


* . . . VACANT
TNS RELAY (SECTION 0918-7a)
17
ILLUMINATION LIGHT (SECTION 0918-7a)
18
R/B (F)
R/G (F)
B (F)
WITH RFW CONTROL SYSTEM
0740-11
A/C SWITCH ILLUMINATION
0918-702
CONSOLE ILLUMINATION
0918-703
GLOVE COMPARTMENT LIGHT
0318-03
0318-204
←WL-C, WE-C
←WLT
RFW MAIN SWITCH ILLUMINATION
0918-704
PANEL LIGHT CONTROL SWITCH
OSC
5
6
4
5
0918-702 CONSOLE ILLUMINATION (F)
R/G R/B
0918-703 GLOVE COMPARTMENT LIGHT (F)
B R/B
0918-704 PANEL LIGHT CONTROL SWITCH (F)
B * R/G * R/B *
0318-03 ←WL-C, WE-C
0318-204 ←WLT
RFW MAIN SWITCH ILLUMINATION (F)
R/B R/G
G/O B
0740-11 A/C SWITCH ILLUMINATION (F)
* L/Y L/W Y R/G R/B

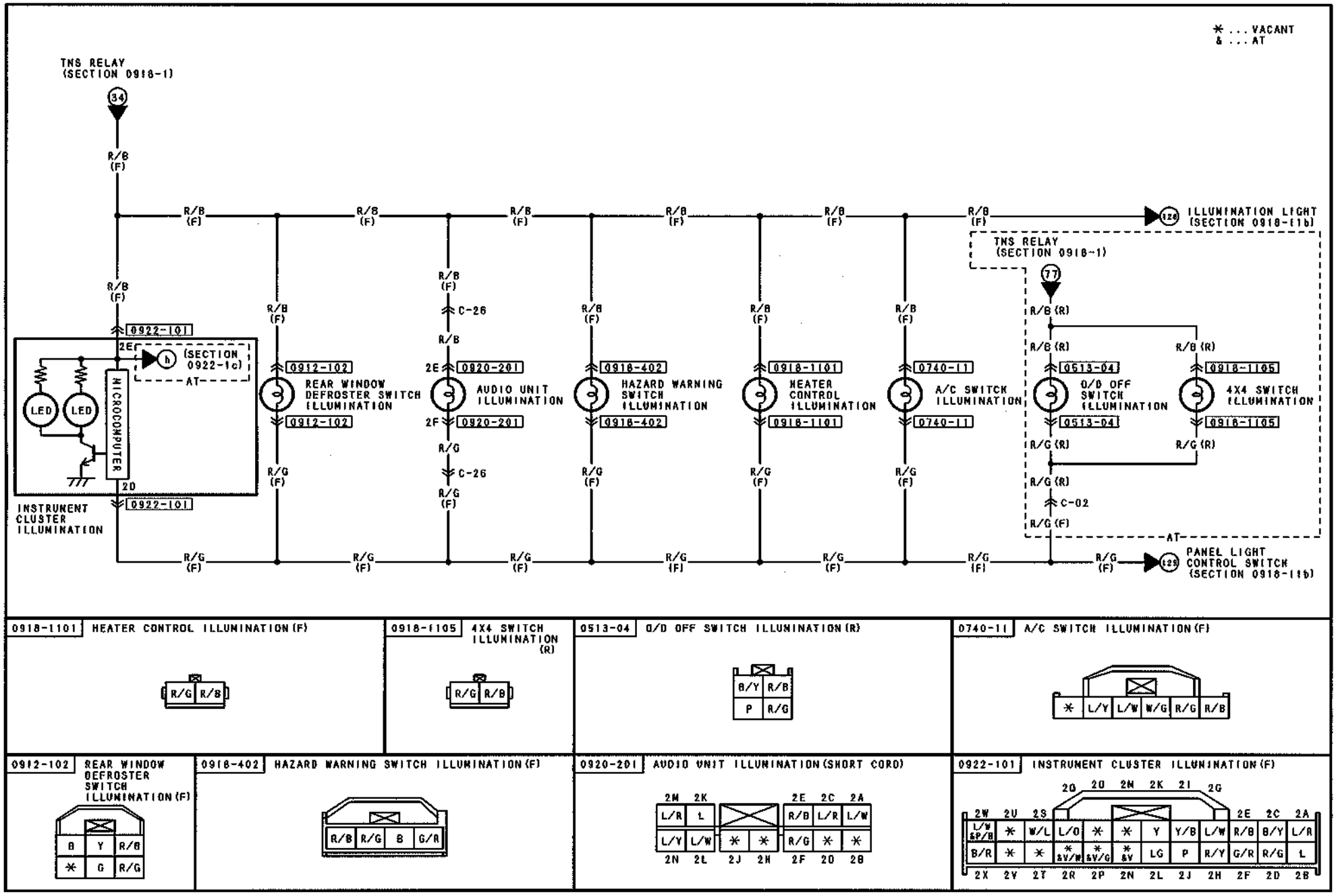

[BLUE]
PANEL LIGHT CONTROL SWITCH
0918-704
A/C SWITCH ILLUMINATION
0740-11
0318-03
0318-204
RFW MAIN SWITCH ILLUMINATION
0918-703
GLOVE COMPARTMENT LIGHT
[BLACK]
0918-702
CONSOLE ILLUMINATION
[BLACK]

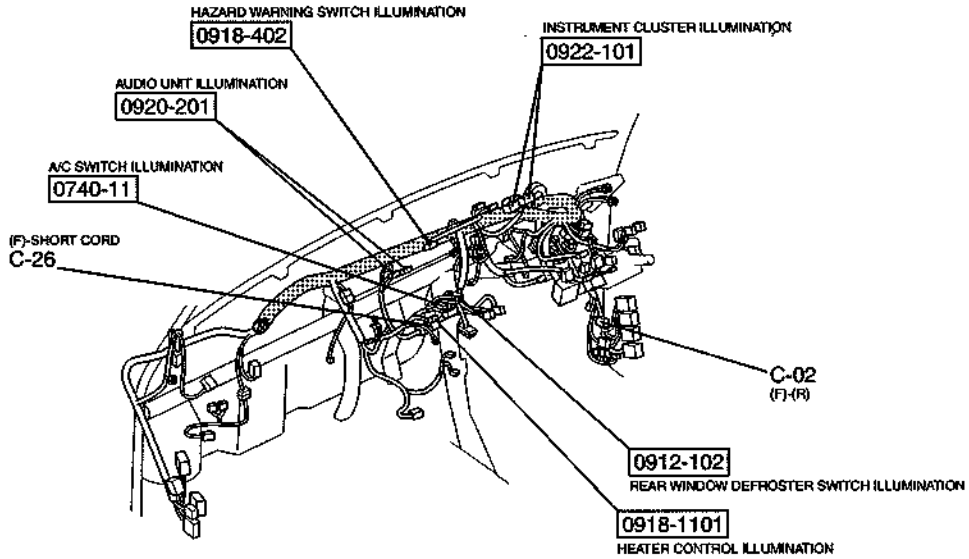
101b

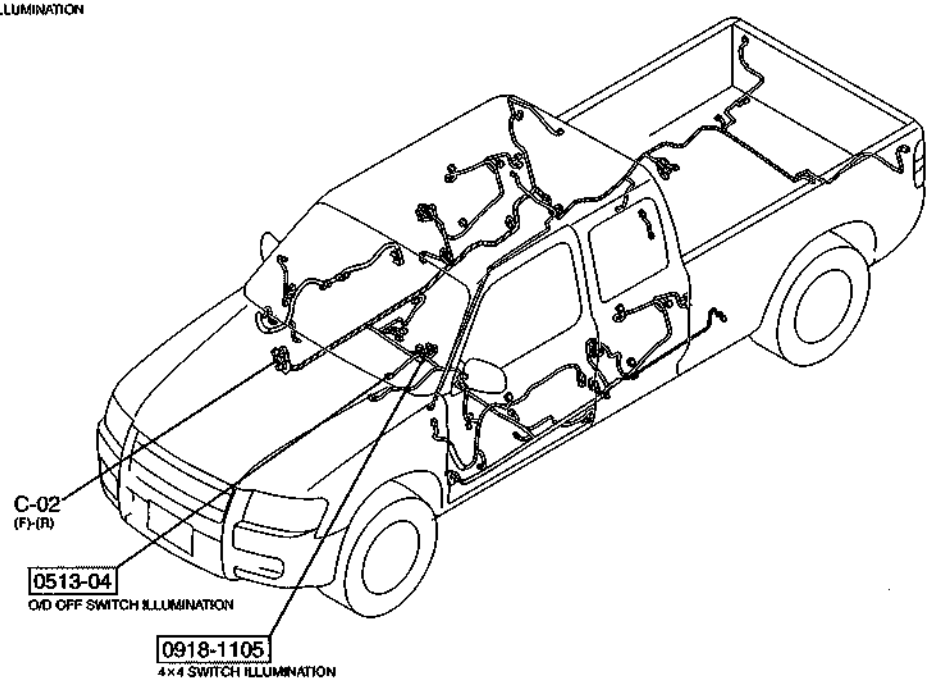

* . . . VACANT
# . . . STRETCH CAB (WITH REAR ACCESS SYSTEM)
BATTERY
B (E)
F-01
MAIN 80A
BTN1 60A
MAIN FUSE BLOCK
W/R (F)
ROOM 15A
F-02 FUSE BLOCK
L/R (F)
C-07
L/R (1N)
0918-801
EXCEPT REGULATOR CAB
INTERIOR LIGHT
OFF
ON
DOOR
WITH THEFT-DETERRENT SYSTEM
KEYLESS CONTROL MODULE (SECTION 0914-2)
THEFT-DETERRENT CONTROL MODULE (SECTION 0914-4a)
INSTRUMENT CLUSTER (SECTION 0922-(c))
50
55
14
R/Y (F)
R/Y (1N)
C-07
C-04
C-03
WITHOUT AIR BAG SYSTEM
WITH AIR BAG SYSTEM
EXCEPT #
DOUBLE CAB
WITH AIR BAG SYSTEM
R/Y (FR)
R/Y (DR4)
R/Y (DR3)
R/Y (R)
C-17
C-15
0918-803
0918-805
0918-806
0918-804
0918-802
DOOR SWITCH LF
DOOR SWITCH LR
DOOR SWITCH RR
DOOR SWITCH RF
0918-801 INTERIOR LIGHT (IN)
REGULAR CAB
EXCEPT REGULAR CAB
R/Y
L/R
0918-802 DOOR SWITCH RF (DR3) ←#
(R) ←EXCEPT #
0918-803 DOOR SWITCH LF (R) ←EXCEPT # WITH AIR BAG SYSTEM
(FR) ←EXCEPT # WITHOUT AIR BAG SYSTEM
(DR4) ←#
0918-804 DOOR SWITCH RR (R)
0918-805 DOOR SWITCH LR (SHORT CORD)
0918-806 REAR (R) -SHORT CORD ←WITH AIR BAG SYSTEM
FLOOR (FR) -SHORT CORD ←WITHOUT AIR BAG SYSTEM
(R) ←WITH AIR BAG SYSTEM
(FR) ←WITHOUT AIR BAG SYSTEM
(SHORT CORD)
*


[STRETCH CAB (WITH REAR ACCESS SYSTEM)]
MAIN FUSE BLOCK
(REFER TO 00F SECTION)
F-01
(R)-(DR3)
C-15
INTERIOR LIGHT
0918-801
[BLACK]
DOOR SWITCH RF
0918-802
C-17
(R)-(DR4) ← WITH AIR BAG SYSTEM
(FR)-(DR4) ← WITHOUT AIR BAG SYSTEM
0918-803
DOOR SWITCH LF
[BLACK]
C-03
(F)-(R)
C-04
(F)-(R) ← WITH AIR BAG SYSTEM
(F)-(FR) ← WITHOUT AIR BAG SYSTEM
C-07
(F)-(IN)
[REGULAR CAB]
INTERIOR LIGHT
0918-801
[BLACK]
DOOR SWITCH RF
0918-802
0918-803
DOOR SWITCH LF
[BLACK]
C-03
(F)-(R)
C-07
(F)-(IN)
C-04
WITH AIR BAG SYSTEM → (F)-(R)
WITHOUT AIR BAG SYSTEM → (F)-(FR)
(F)-(IN)
C-07
C-03
(F)-(R)
F-02
FUSE BLOCK
(REFER TO 00F SECTION)
C-04
(F)-(R) ← WITH AIR BAG SYSTEM
(F)-(FR) ← WITHOUT AIR BAG SYSTEM
[DOUBLE CAB]
INTERIOR LIGHT
0918-801
[BLACK]
DOOR SWITCH RR
0918-804
[BLACK]
DOOR SWITCH RF
0918-802
[BLACK]
DOOR SWITCH LR
0918-805
0918-806
(R)-SHORT CORD ← WITH AIR BAG SYSTEM
(FR)-SHORT CORD ← WITHOUT AIR BAG SYSTEM
0918-803
DOOR SWITCH LF
[BLACK]
C-03
(F)-(R)
C-07
(F)-(IN)
C-04
(F)-(R) ← WITH AIR BAG SYSTEM
(F)-(FR) ← WITHOUT AIR BAG SYSTEM

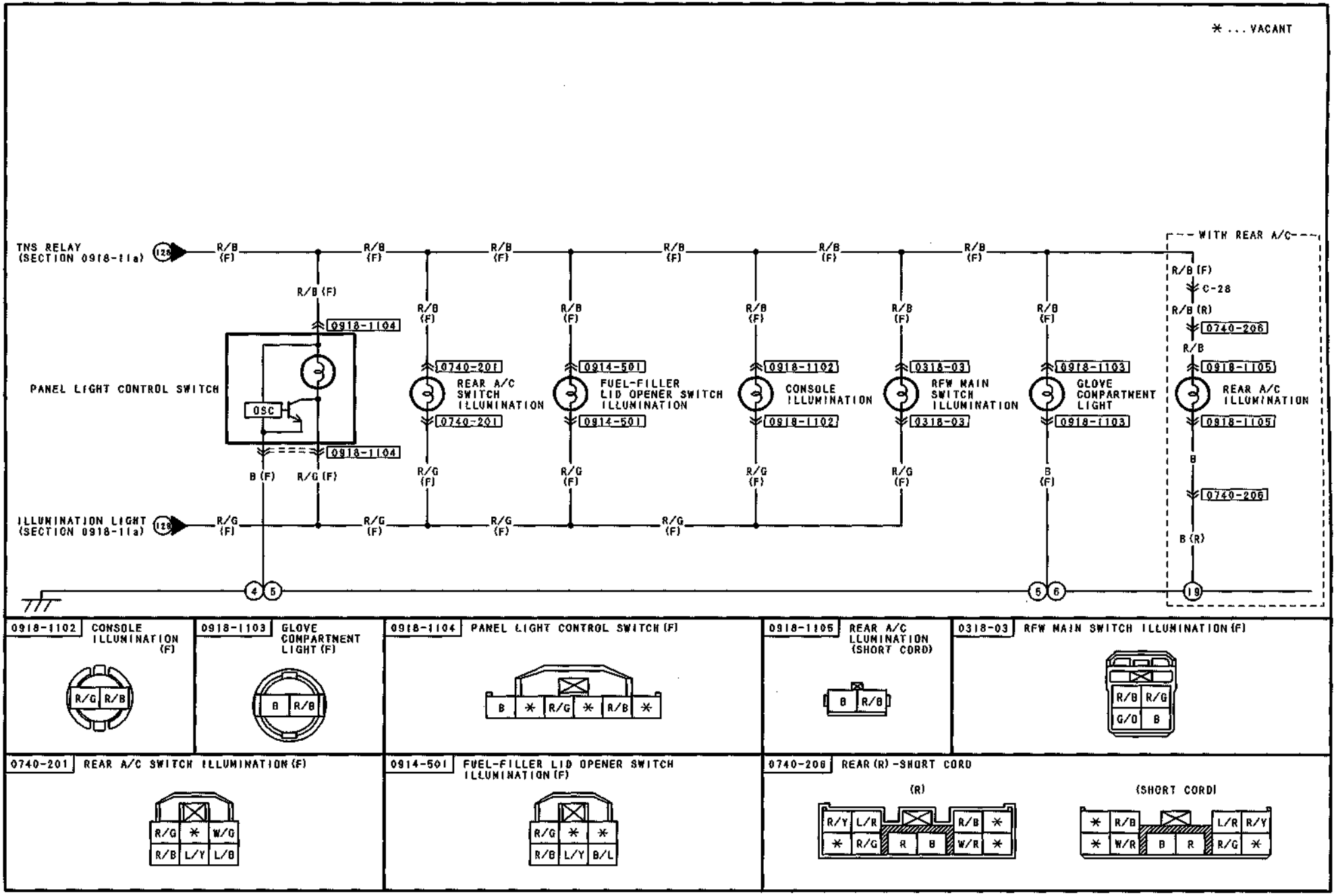
ILLUMINATION LIGHT (WITH PANEL LIGHT CONTROL SYSTEM)

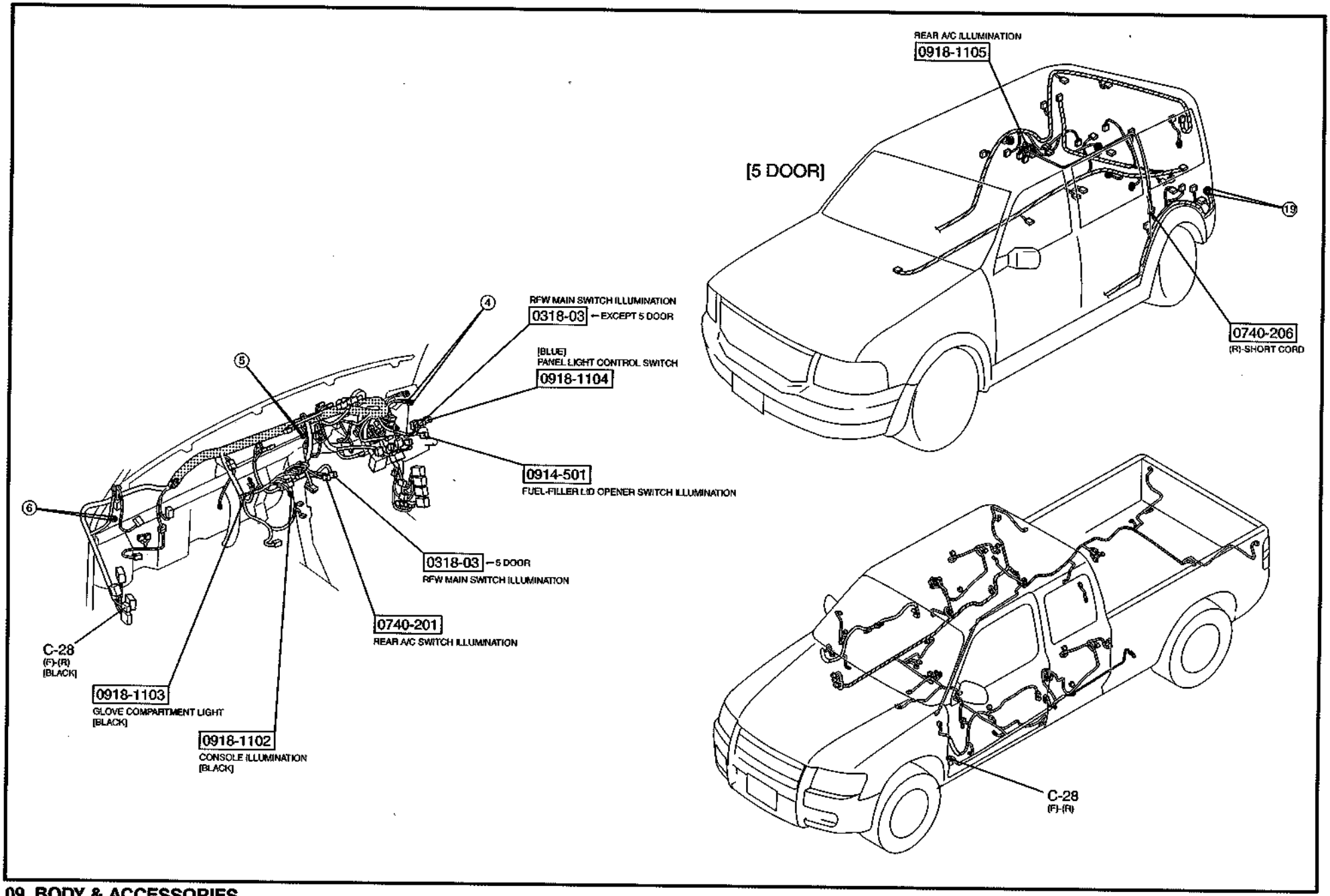


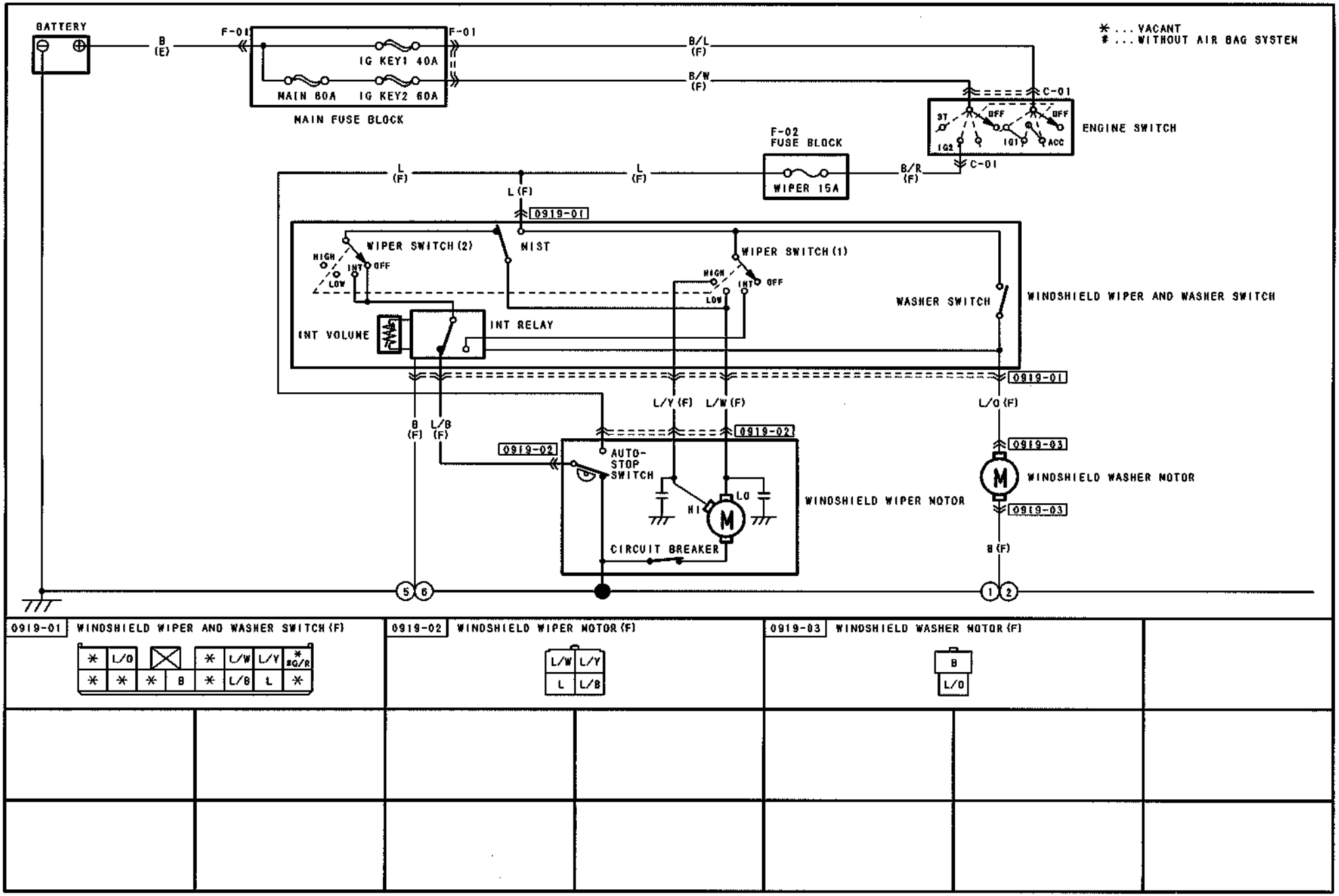

HAZARD WARNING SWITCH ILLUMINATION
0918-402
INSTRUMENT CLUSTER ILLUMINATION
0922-101
AUDIO UNIT ILLUMINATION
0920-201
A/C SWITCH ILLUMINATION
0740-11
(F)-SHORT CORD
C-26
C-02
(F)-(R)
0912-102
REAR WINDOW DEFROSTER SWITCH ILLUMINATION
0918-1101
HEATER CONTROL ILLUMINATION


C-02
(F)-(R)
0513-04
O/D OFF SWITCH ILLUMINATION
0918-1105
4×4 SWITCH ILLUMINATION

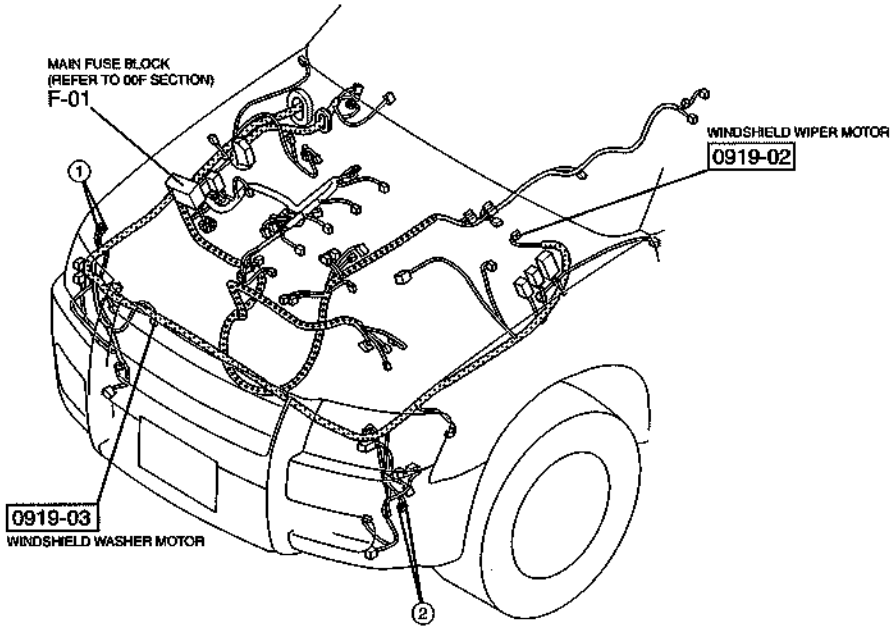
ILLUMINATION LIGHT (WITH PANEL LIGHT CONTROL SYSTEM)

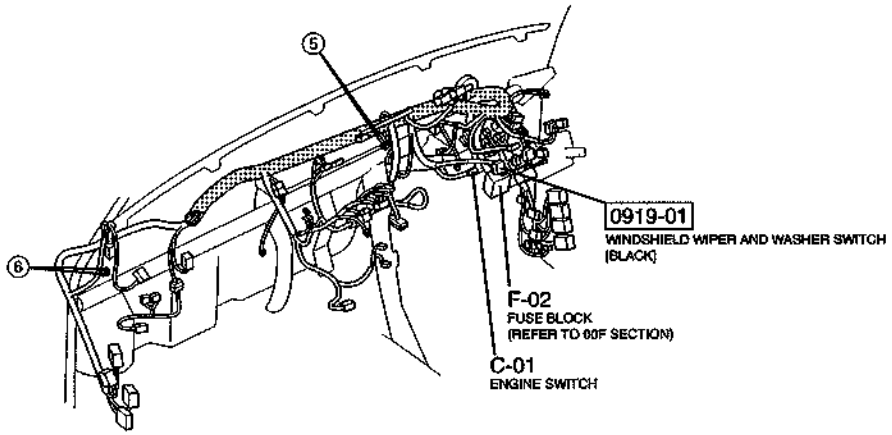



REAR A/C ILLUMINATION
0918-1105
[5 DOOR]
19
0740-206
(R)-SHORT CORD
4
RFW MAIN SWITCH ILLUMINATION
0318-03 — EXCEPT 5 DOOR
[BLUE]
PANEL LIGHT CONTROL SWITCH
0918-1104
5
0914-501
FUEL-FILLER LID OPENER SWITCH ILLUMINATION
6
0318-03 — 5 DOOR
RFW MAIN SWITCH ILLUMINATION
0740-201
REAR A/C SWITCH ILLUMINATION
C-28
(F)-(R)
[BLACK]
0918-1103
GLOVE COMPARTMENT LIGHT
[BLACK]
0918-1102
CONSOLE ILLUMINATION
[BLACK]
C-28
(F)-(R)

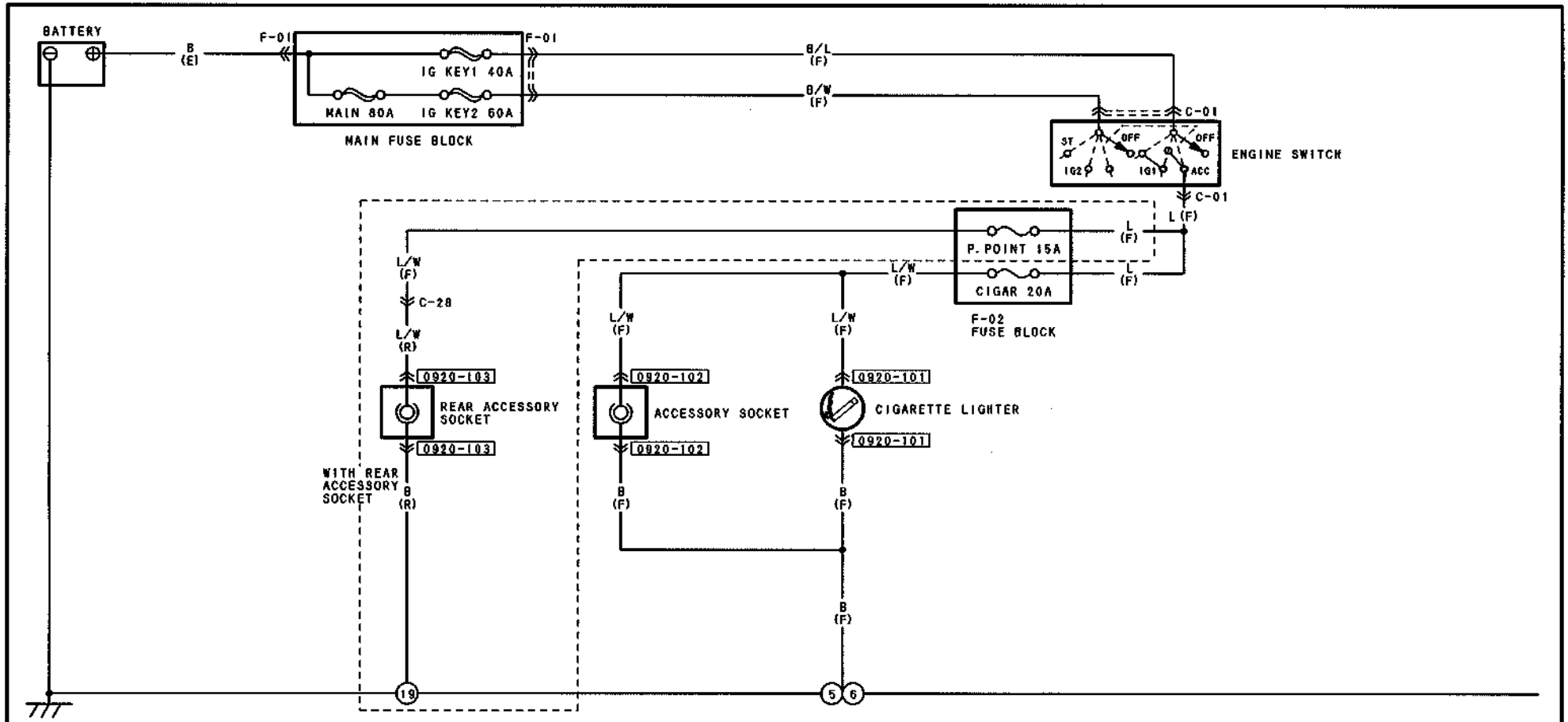


0919-01 WINDSHIELD WIPER AND WASHER SWITCH (F)	0919-02 WINDSHIELD WIPER MOTOR (F)	0919-03 WINDSHIELD WASHER MOTOR (F)
* L/O / * * B * L/B L *	L/W L/Y / L L/B	B / L/O

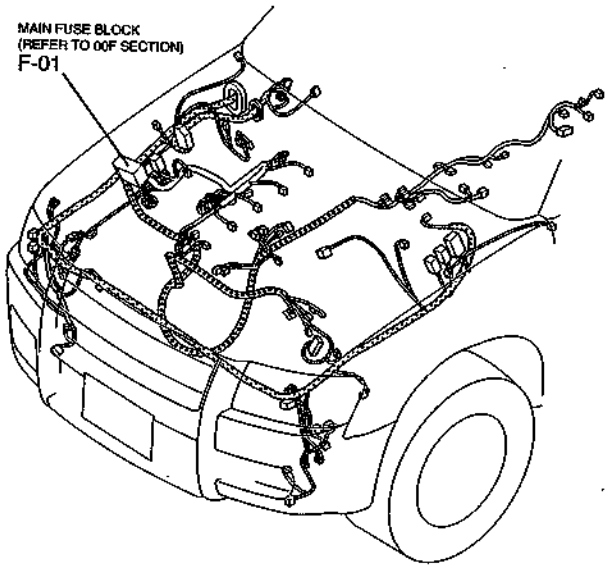

MAIN FUSE BLOCK
(REFER TO 00F SECTION)
F-01
WINDSHIELD WIPER MOTOR
0919-02
1
0919-03
WINDSHIELD WASHER MOTOR
2


5
6
0919-01
WINDSHIELD WIPER AND WASHER SWITCH
(BLACK)
F-02
FUSE BLOCK
(REFER TO 00F SECTION)
C-01
ENGINE SWITCH

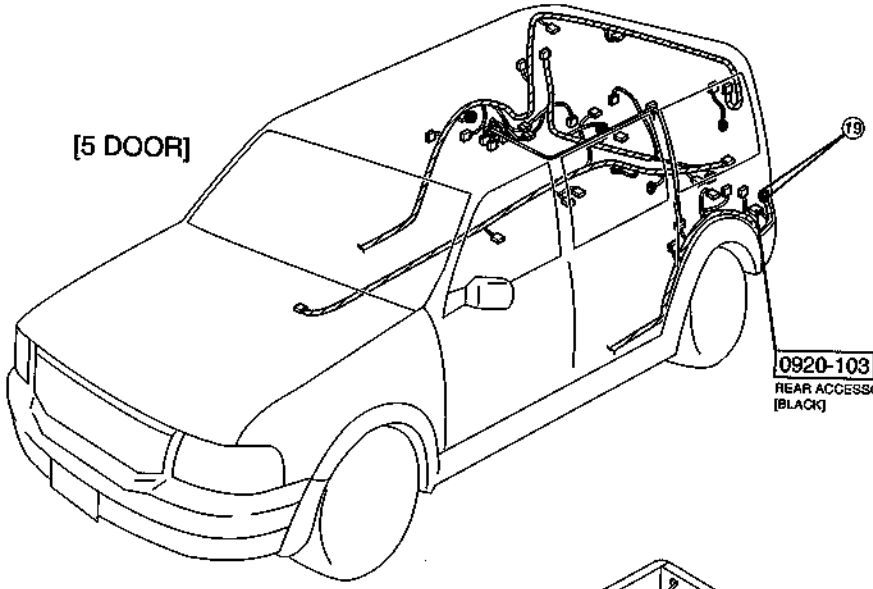
ACCESSORY SOCKET / CIGARETTE LIGHTER



0920-101 CIGARETTE LIGHTER (F)	0920-102 ACCESSORY SOCKET (F)	0920-103 REAR ACCESSORY SOCKET (R)	
L/W / B	L/W / B	L/W / * / B	


MAIN FUSE BLOCK
(REFER TO 00F SECTION)
F-01

[5 DOOR]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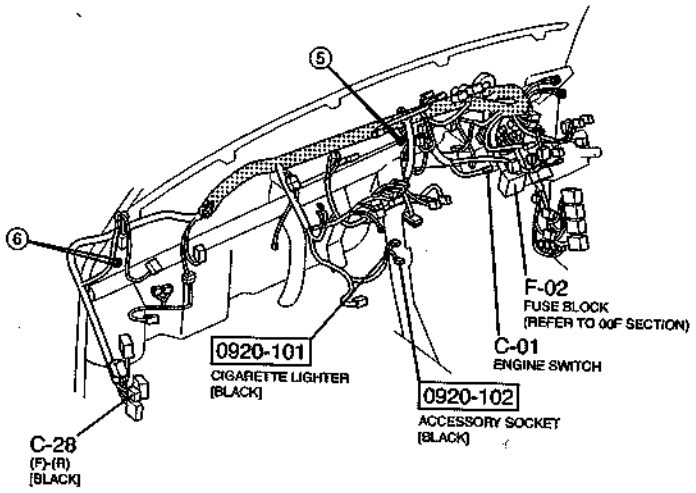
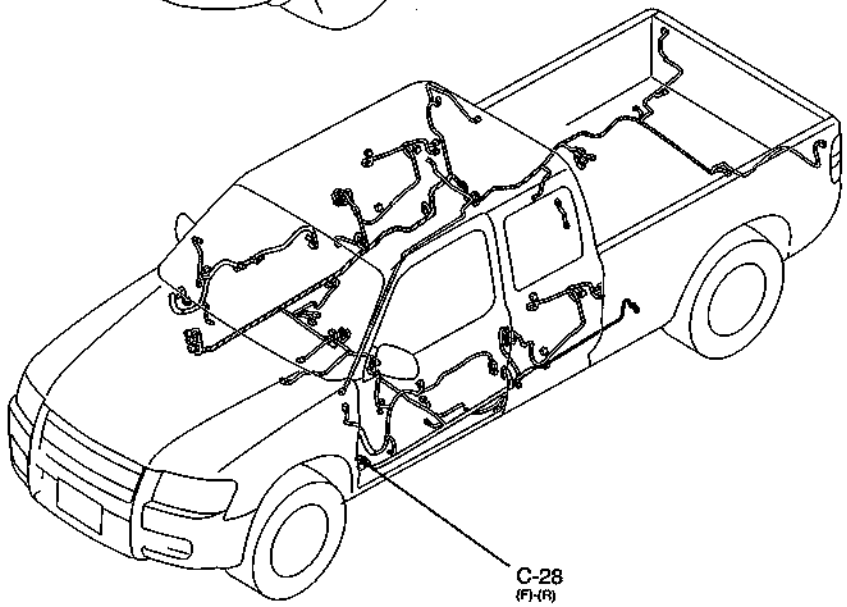
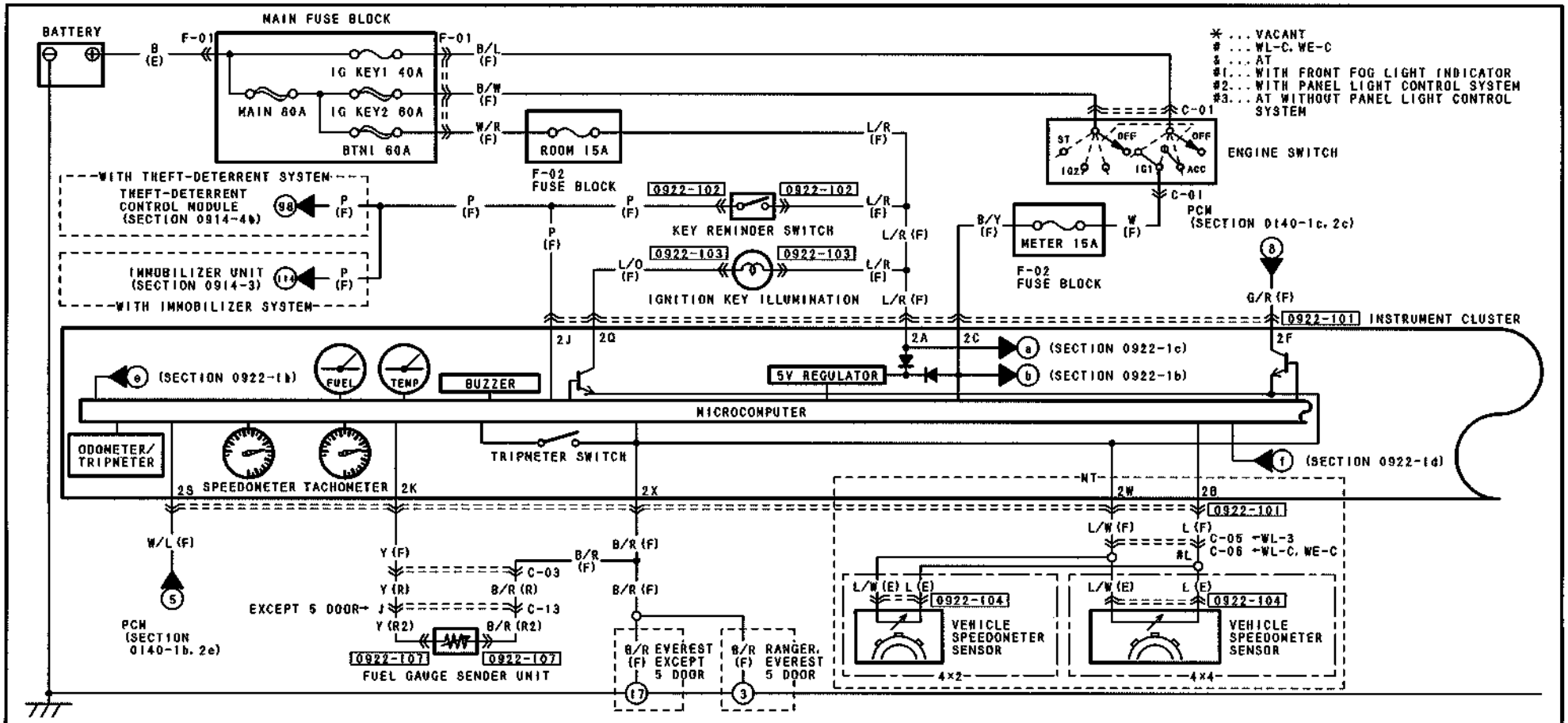
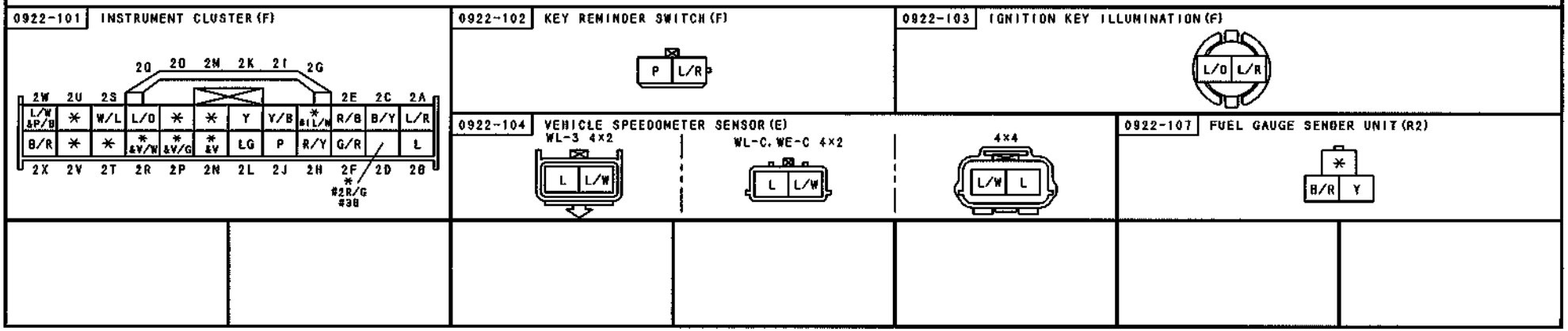
0920-103
REAR ACCESSORY SOCKET
[BLACK]

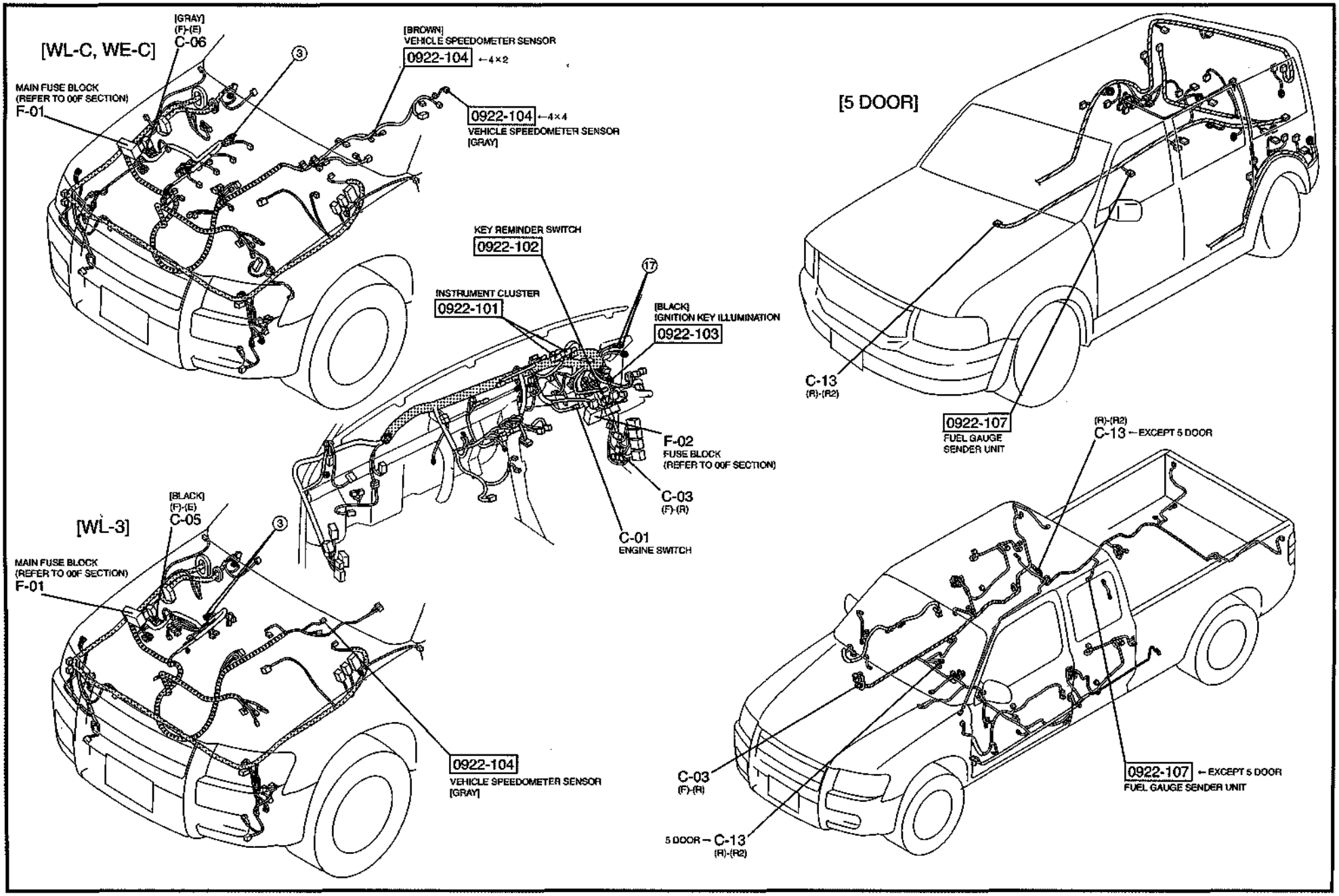

5
6
F-02
FUSE BLOCK
(REFER TO 00F SECTION)
C-01
ENGINE SWITCH
0920-101
CIGARETTE LIGHTER
[BLACK]
0920-102
ACCESSORY SOCKET
[BLACK]
C-28
(F)-(R)
[BLACK]

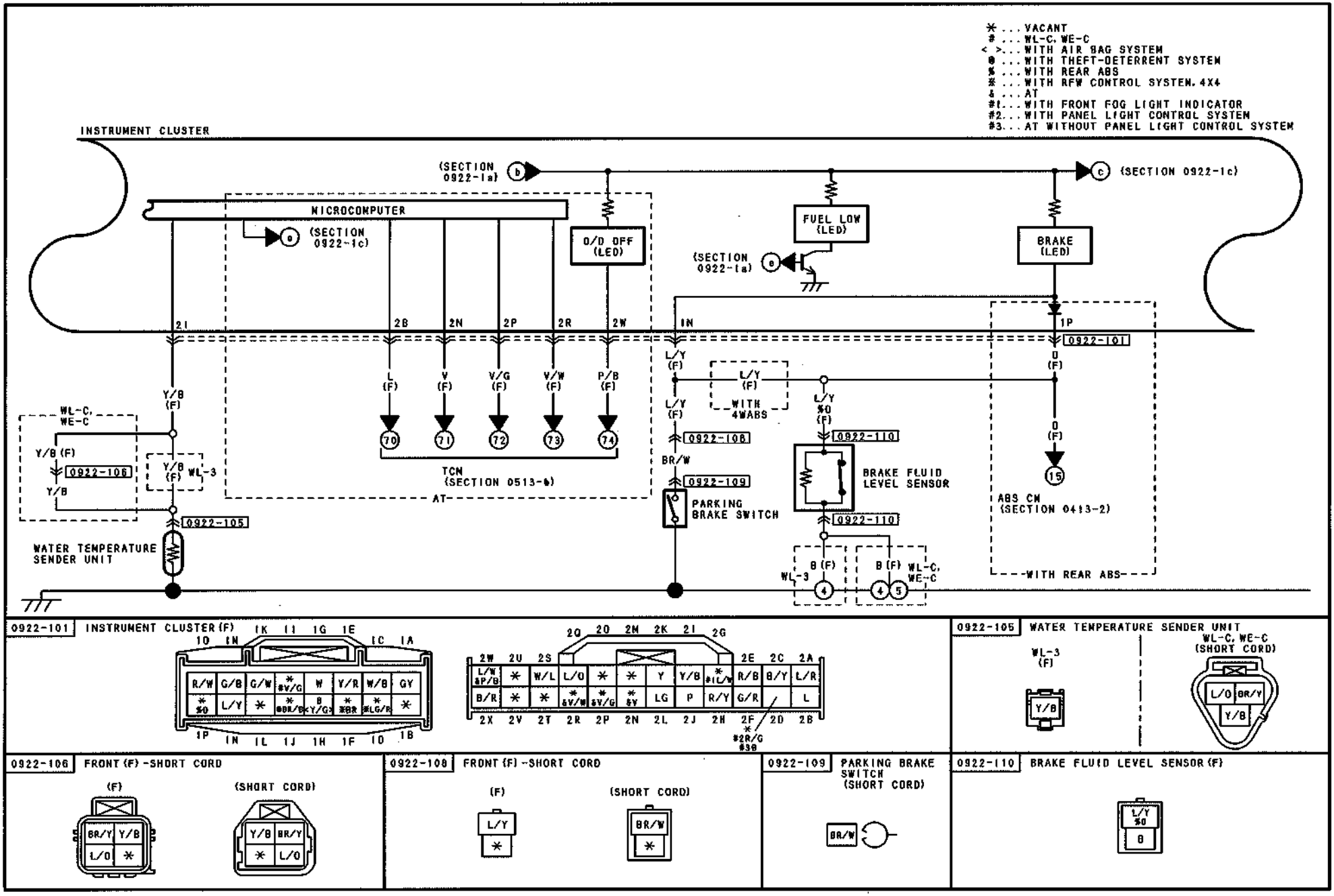

C-28
(F)-(R)

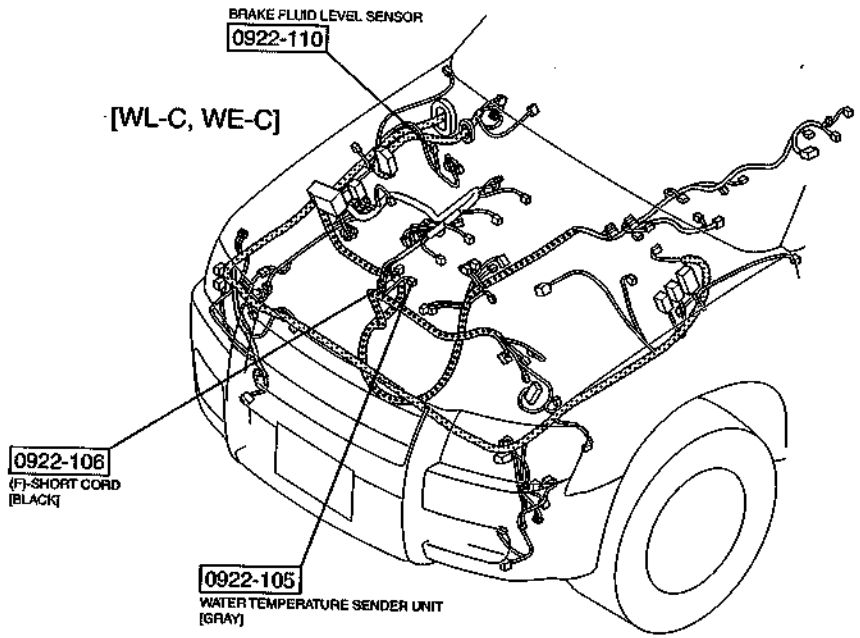
INSTRUMENT CLUSTER

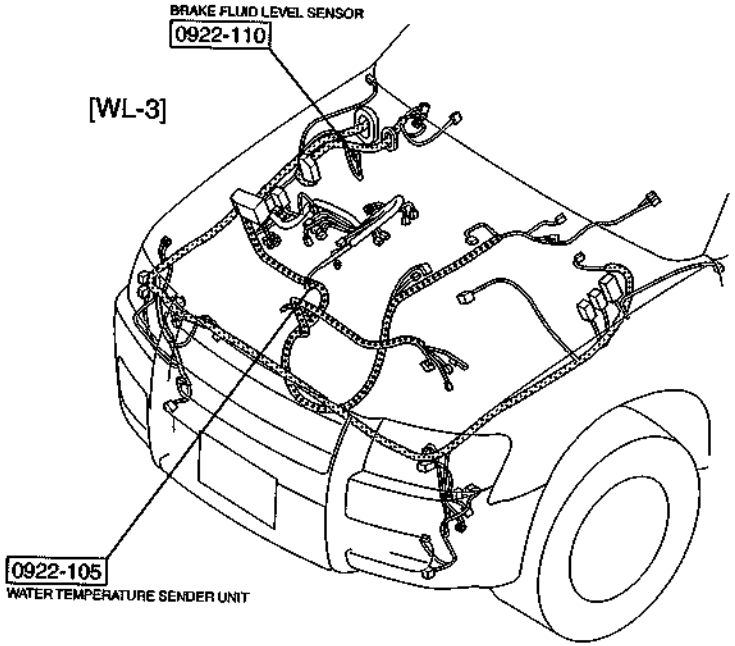


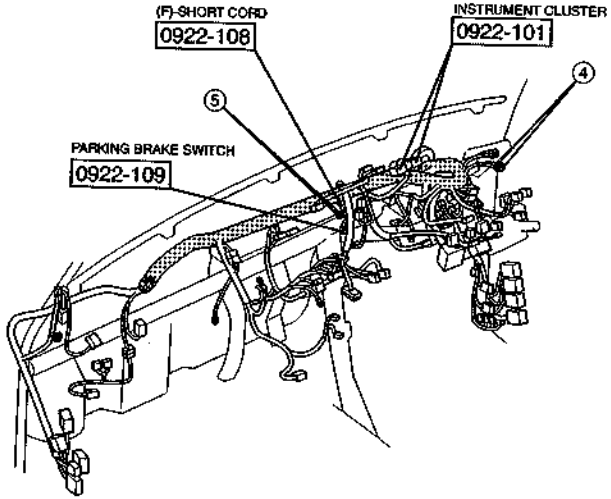


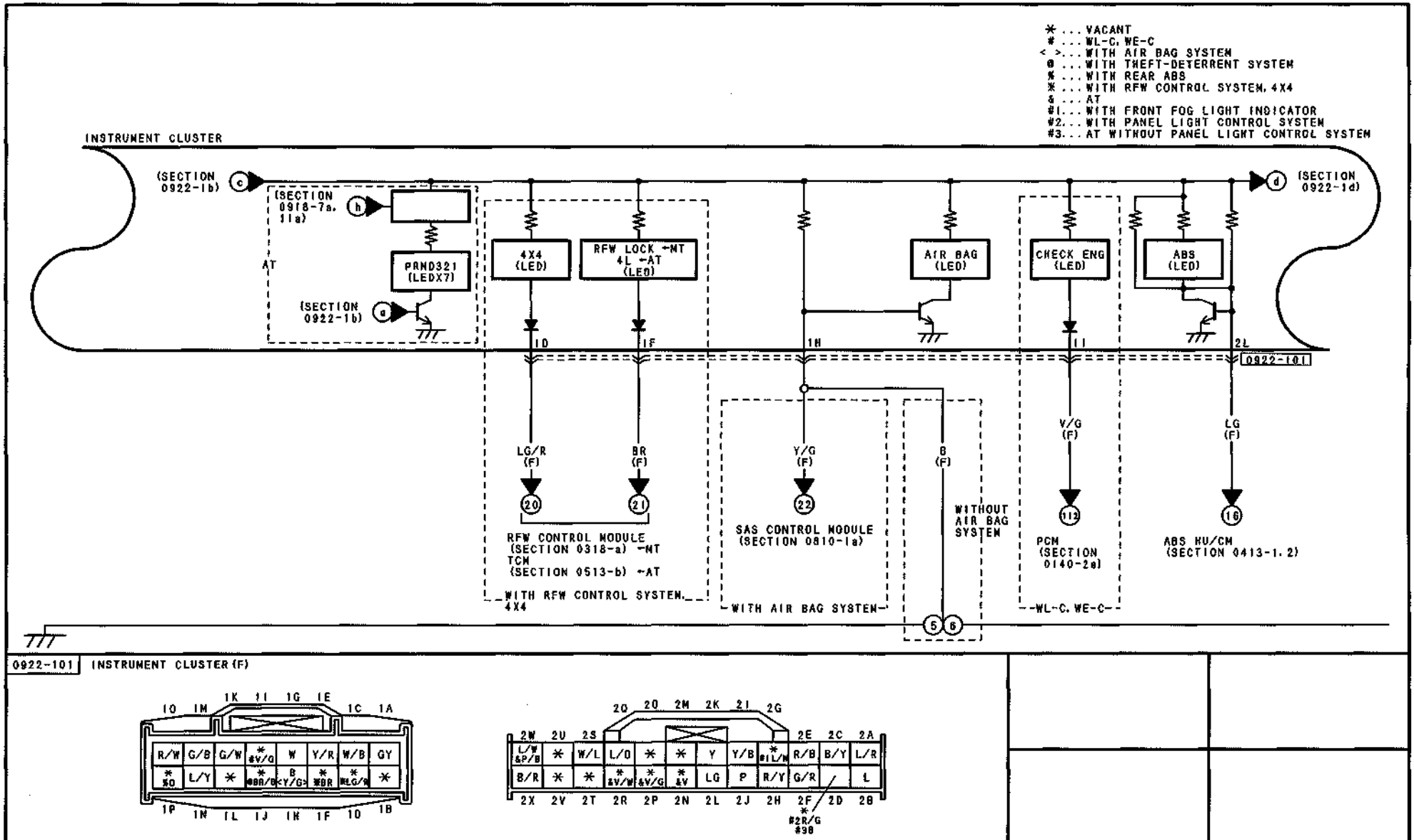

[WL-C, WE-C]
[GRAY]
(F)-(E)
C-06
③
MAIN FUSE BLOCK
(REFER TO 00F SECTION)
F-01
[BROWN]
VEHICLE SPEEDOMETER SENSOR
0922-104 ←4×2
0922-104 ←4×4
VEHICLE SPEEDOMETER SENSOR
[GRAY]
KEY REMINDER SWITCH
0922-102
⑰
INSTRUMENT CLUSTER
0922-101
[BLACK]
IGNITION KEY ILLUMINATION
0922-103
F-02
FUSE BLOCK
(REFER TO 00F SECTION)
C-03
(F)-(R)
C-01
ENGINE SWITCH
[WL-3]
[BLACK]
(F)-(E)
C-05
③
MAIN FUSE BLOCK
(REFER TO 00F SECTION)
F-01
0922-104
VEHICLE SPEEDOMETER SENSOR
[GRAY]
[5 DOOR]
C-13
(R)-(R2)
0922-107
FUEL GAUGE
SENDER UNIT
(R)-(R2)
C-13 ←EXCEPT 5 DOOR
C-03
(F)-(R)
5 DOOR – C-13
(R)-(R2)
0922-107 ←EXCEPT 5 DOOR
FUEL GAUGE SENDER UNIT

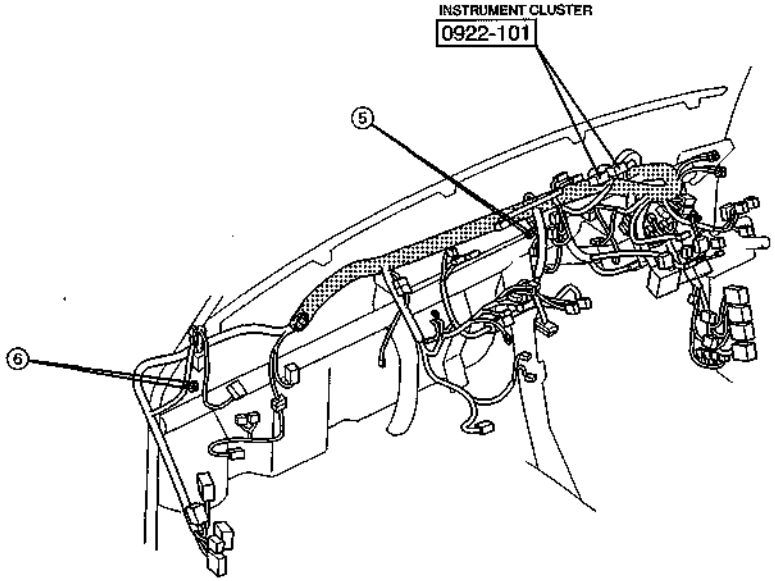

* . . . VACANT
# . . . WL-C, WE-C
< >. . . WITH AIR BAG SYSTEM
@ . . . WITH THEFT-DETERRENT SYSTEM
$ . . . WITH REAR ABS
※ . . . WITH RFW CONTROL SYSTEM, 4X4
& . . . AT
#1. . . WITH FRONT FOG LIGHT INDICATOR
#2. . . WITH PANEL LIGHT CONTROL SYSTEM
#3. . . AT WITHOUT PANEL LIGHT CONTROL SYSTEM
INSTRUMENT CLUSTER
(SECTION 0922-1a)
(SECTION 0922-1c)
MICROCOMPUTER
O/D OFF (LED)
FUEL LOW (LED)
BRAKE (LED)
2I
2B
2N
2P
2R
2W
1N
1P
0922-101
L (F)
V (F)
V/G (F)
V/W (F)
P/B (F)
L/Y (F)
WITH 4WABS
L/Y $0 (F)
0 (F)
Y/B (F)
WL-C, WE-C
Y/B (F) 0922-106 Y/B
Y/B (F) WL-3
0922-105
WATER TEMPERATURE SENDER UNIT
70
71
72
73
74
TCN (SECTION 0513-6)
AT
0922-106
BR/W
0922-109
PARKING BRAKE SWITCH
0922-110
BRAKE FLUID LEVEL SENSOR
15
ABS CM (SECTION 0413-2)
WITH REAR ABS
B (F) WL-3
B (F) WL-C, WE-C
4
4 5
0922-101 INSTRUMENT CLUSTER (F)
1K 1I 1G 1E 1C 1A
1O 1N
R/W G/B G/W *#V/G W Y/R W/B GY
*$0 L/Y * *@BR/B &Y/G *$BR *#LG/R *
1P 1N 1L 1J 1H 1F 1D 1B
2Q 2O 2M 2K 2I 2G
2W 2U 2S 2E 2C 2A
L/W &P/B * W/L L/O * * Y Y/B *#L/W R/B B/Y L/R
B/R * * *&V/W &V/G *&Y LG P R/Y G/R L
2X 2V 2T 2R 2P 2N 2L 2J 2H 2F 2D 2B
*#2R/G #3@
0922-105 WATER TEMPERATURE SENDER UNIT
WL-3 (F)
Y/B
WL-C, WE-C (SHORT CORD)
L/O BR/Y Y/B
0922-106 FRONT (F) -SHORT CORD
(F)
BR/Y Y/B L/O *
(SHORT CORD)
Y/B BR/Y * L/O
0922-108 FRONT (F) -SHORT CORD
(F)
L/Y *
(SHORT CORD)
BR/W *
0922-109 PARKING BRAKE SWITCH (SHORT CORD)
BR/W
0922-110 BRAKE FLUID LEVEL SENSOR (F)
L/Y $0
B

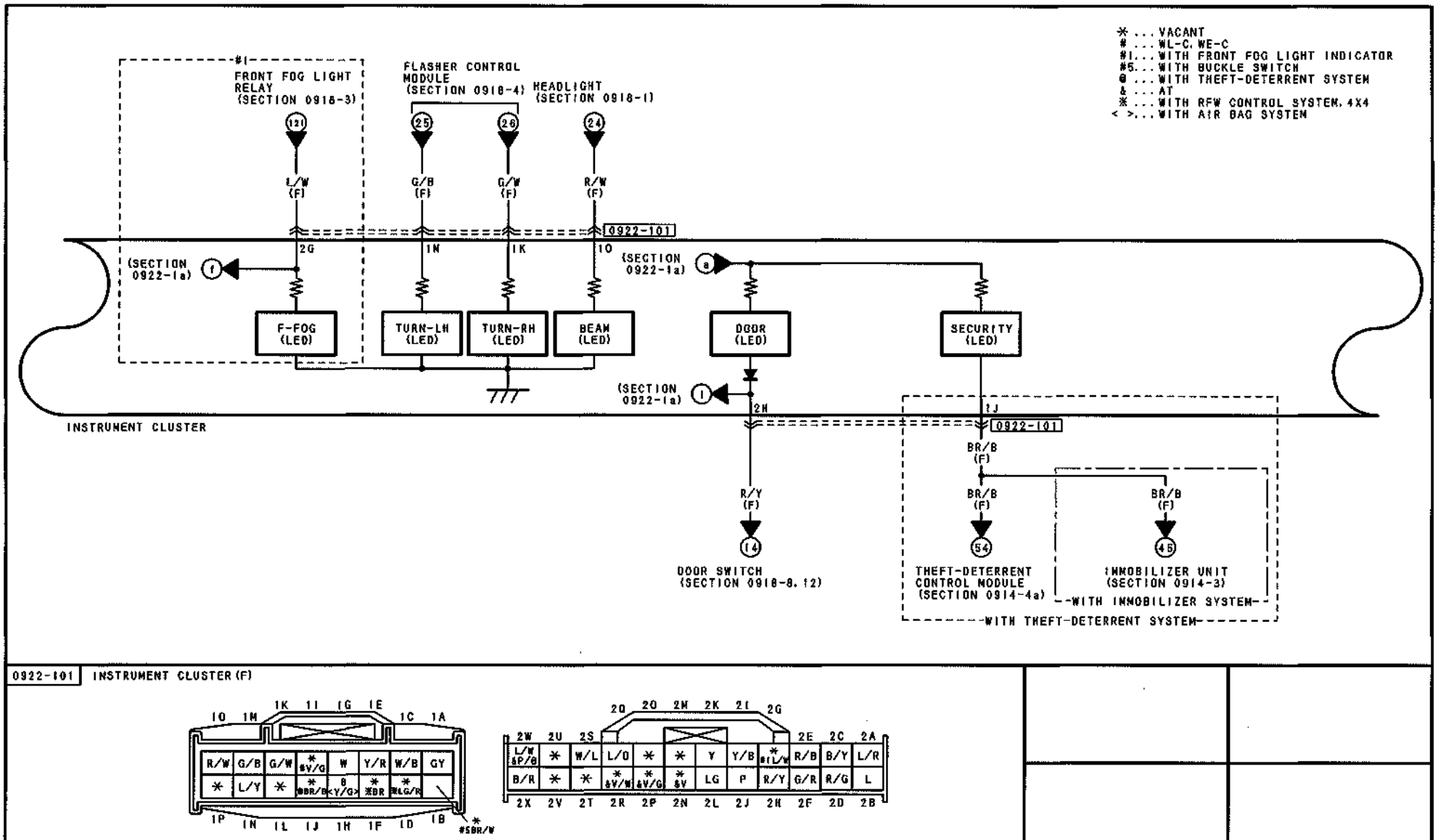

BRAKE FLUID LEVEL SENSOR
0922-110
[WL-C, WE-C]
0922-106
(F)-SHORT CORD
[BLACK]
0922-105
WATER TEMPERATURE SENDER UNIT
[GRAY]


BRAKE FLUID LEVEL SENSOR
0922-110
[WL-3]
0922-105
WATER TEMPERATURE SENDER UNIT


(F)-SHORT CORD
0922-108
INSTRUMENT CLUSTER
0922-101
5
4
PARKING BRAKE SWITCH
0922-109


* . . . VACANT
# . . . WL-C, WE-C
< > . . . WITH AIR BAG SYSTEM
@ . . . WITH THEFT-DETERRENT SYSTEM
% . . . WITH REAR ABS
※ . . . WITH RFW CONTROL SYSTEM, 4X4
& . . . AT
#1. . . WITH FRONT FOG LIGHT INDICATOR
#2. . . WITH PANEL LIGHT CONTROL SYSTEM
#3. . . AT WITHOUT PANEL LIGHT CONTROL SYSTEM
INSTRUMENT CLUSTER
(SECTION 0922-1b)
(SECTION 0918-7a, 11a)
AT
PRND321 (LEDX7)
(SECTION 0922-1b)
4X4 (LED)
RFW LOCK -MT 4L -AT (LED)
AIR BAG (LED)
CHECK ENG (LED)
ABS (LED)
(SECTION 0922-1d)
1D
1F
1H
1I
2L
0922-101
LG/R (F)
BR (F)
Y/G (F)
B (F)
V/G (F)
LG (F)
20
21
22
5
6
112
16
RFW CONTROL MODULE (SECTION 0318-a) -MT
TCM (SECTION 0513-b) -AT
WITH RFW CONTROL SYSTEN, 4X4
SAS CONTROL MODULE (SECTION 0810-1a)
WITH AIR BAG SYSTEN
WITHOUT AIR BAG SYSTEM
PCM (SECTION 0140-2a)
WL-C, WE-C
ABS HU/CM (SECTION 0413-1, 2)
0922-101
INSTRUMENT CLUSTER (F)
1O 1M 1K 1I 1G 1E 1C 1A
R/W G/B G/W *&V/Q W Y/R W/B GY
*&O L/Y * *@BR/B B<Y/G> *@BR *#LG/R *
1P 1N 1L 1J 1H 1F 1D 1B
2W 2U 2S 2Q 2O 2M 2K 2I 2G 2E 2C 2A
L/W&P/B * W/L L/O * * Y Y/B *#1L/W R/B B/Y L/R
B/R * * *&V/W *&V/G *&V LG P R/Y G/R L
2X 2V 2T 2R 2P 2N 2L 2J 2H 2F 2D 2B
*#2R/G #98


INSTRUMENT CLUSTER
0922-101
5
6


* ... VACANT
# ... WL-C, WE-C
#1 ... WITH FRONT FOG LIGHT INDICATOR
#5 ... WITH BUCKLE SWITCH
@ ... WITH THEFT-DETERRENT SYSTEM
& ... AT
※ ... WITH RFW CONTROL SYSTEM, 4X4
< > ... WITH AIR BAG SYSTEM
#1
FRONT FOG LIGHT RELAY (SECTION 0918-3)
FLASHER CONTROL MODULE (SECTION 0918-4)
HEADLIGHT (SECTION 0918-1)
12
25
26
24
L/W (F)
G/B (F)
G/W (F)
R/W (F)
0922-101
2G
1N
1K
1O
(SECTION 0922-1a)
f
a
F-FOG (LED)
TURN-LH (LED)
TURN-RH (LED)
BEAM (LED)
DOOR (LED)
SECURITY (LED)
(SECTION 0922-1a)
1
2H
1J
INSTRUMENT CLUSTER
0922-101
BR/B (F)
R/Y (F)
BR/B (F)
BR/B (F)
14
54
46
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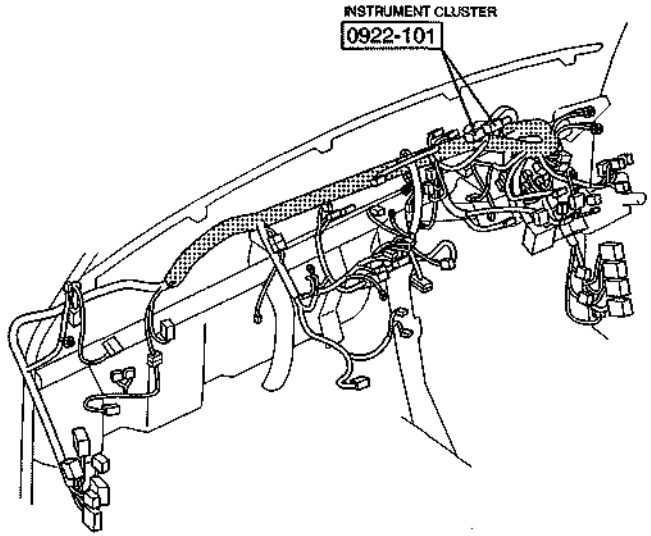
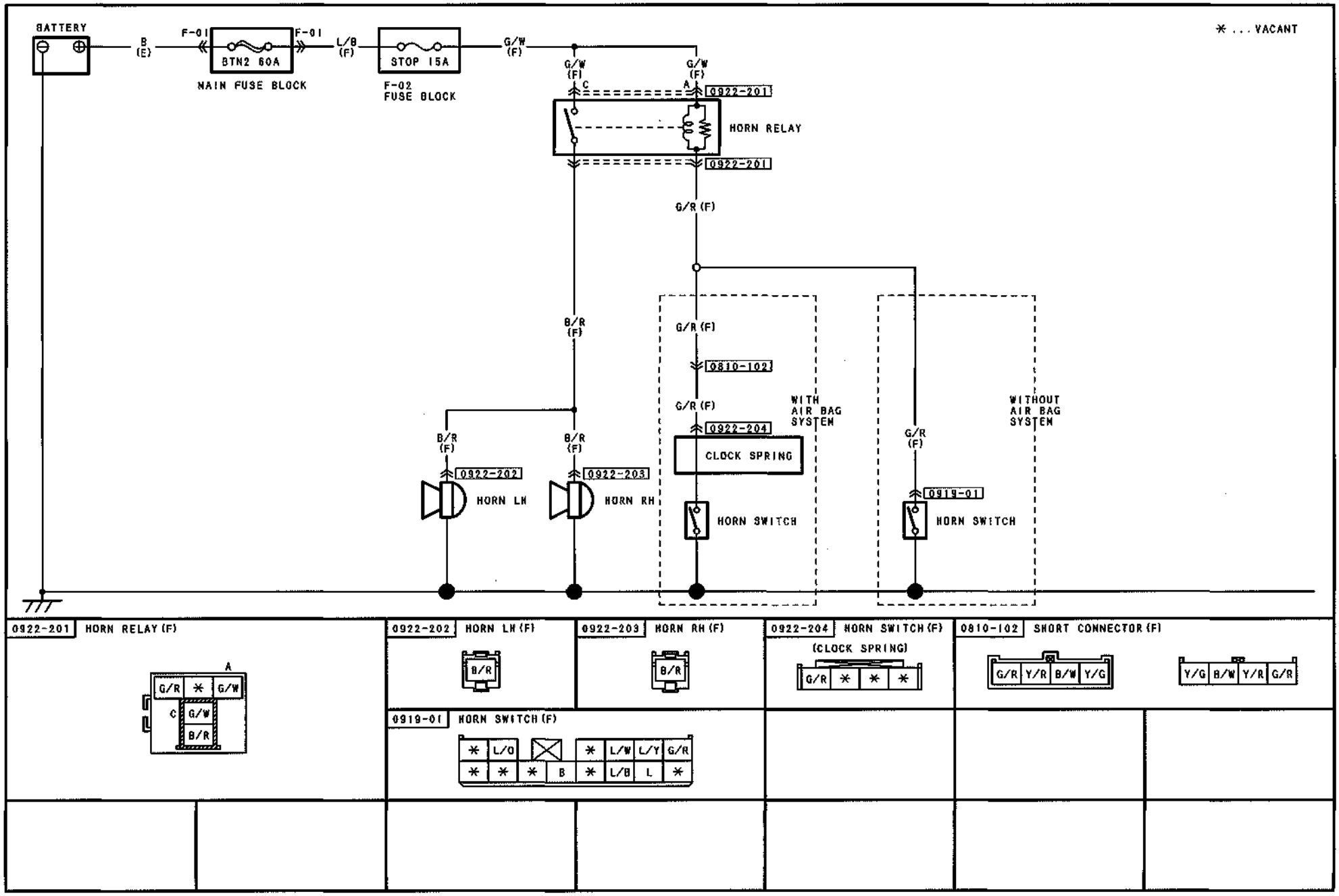
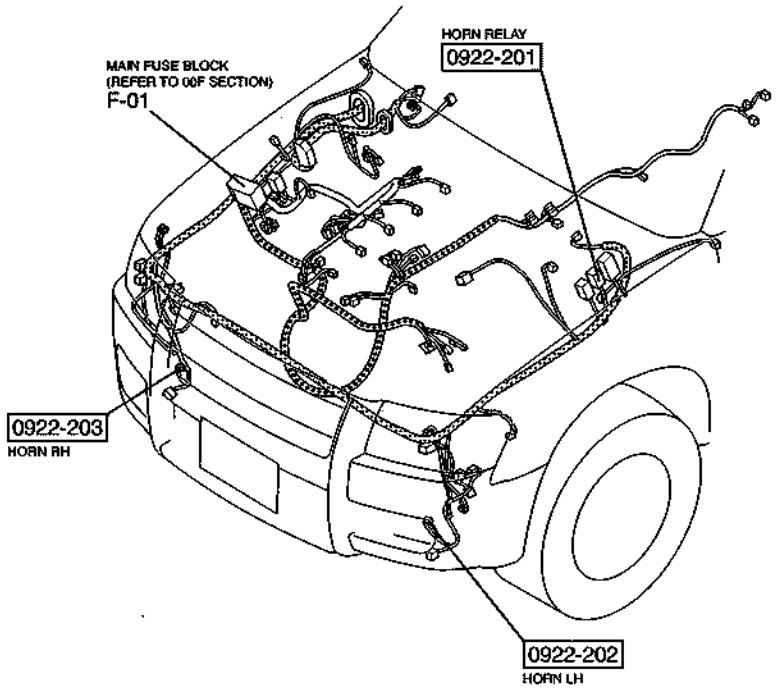
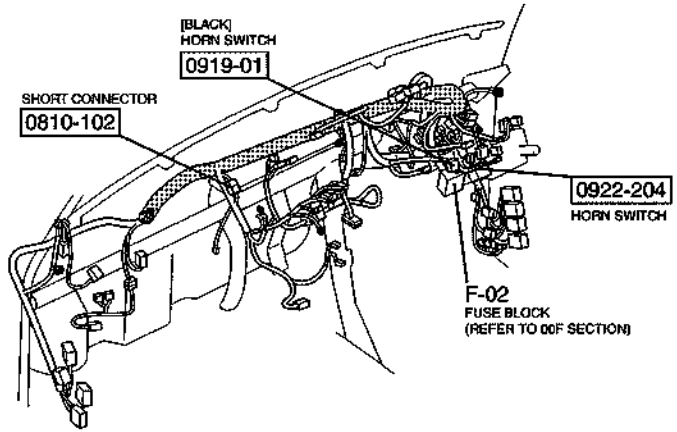
THEFT-DETERRENT CONTROL MODULE (SECTION 0914-4a)
IMMOBILIZER UNIT (SECTION 0914-3)
-WITH IMMOBILIZER SYSTEM-
-WITH THEFT-DETERRENT SYSTEM-
0922-101 INSTRUMENT CLUSTER (F)
1O 1M 1K 1I 1G 1E 1C 1A
R/W G/B G/W *&V/G W Y/R W/B GY
* L/Y * *@BR/B @<Y/G> *@R *@LG/R
1P 1N 1L 1J 1H 1F 1D 1B
*#5BR/W
2Q 2O 2M 2K 2I 2G
2W 2U 2S 2E 2C 2A
L/W &P/@ * W/L L/O * * Y Y/B *@L/W R/B B/Y L/R
B/R * * *&V/W *&V/G *&V LG P R/Y G/R R/G L
2X 2V 2T 2R 2P 2N 2L 2J 2H 2F 2D 2B


INSTRUMENT CLUSTER
0922-101


* . . . VACANT
BATTERY
B (E)
F-01
BTN2 60A
F-01
MAIN FUSE BLOCK
L/B (F)
STOP 15A
F-02
FUSE BLOCK
G/W (F)
G/W (F)
C
A
0922-201
HORN RELAY
0922-201
G/R (F)
B/R (F)
G/R (F)
0810-102
G/R (F)
WITH AIR BAG SYSTEM
0922-204
CLOCK SPRING
HORN SWITCH
WITHOUT AIR BAG SYSTEM
G/R (F)
0919-01
HORN SWITCH
B/R (F)
0922-202
HORN LH
B/R (F)
0922-203
HORN RH
0922-201 HORN RELAY (F)
A
G/R
*
G/W
C
G/W
B/R
0922-202 HORN LH (F)
B/R
0922-203 HORN RH (F)
B/R
0922-204 HORN SWITCH (F)
(CLOCK SPRING)
G/R
*
*
*
0810-102 SHORT CONNECTOR (F)
G/R
Y/R
B/W
Y/G
Y/G
B/W
Y/R
G/R
0919-01 HORN SWITCH (F)
*
L/O
*
L/W
L/Y
G/R
*
*
*
B
*
L/B
L
*


HORN RELAY
0922-201
MAIN FUSE BLOCK
(REFER TO 00F SECTION)
F-01
0922-203
HORN RH
0922-202
HORN LH


[BLACK]
HORN SWITCH
0919-01
SHORT CONNECTOR
0810-102
0922-204
HORN SWITCH
F-02
FUSE BLOCK
(REFER TO 00F SECTION)

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