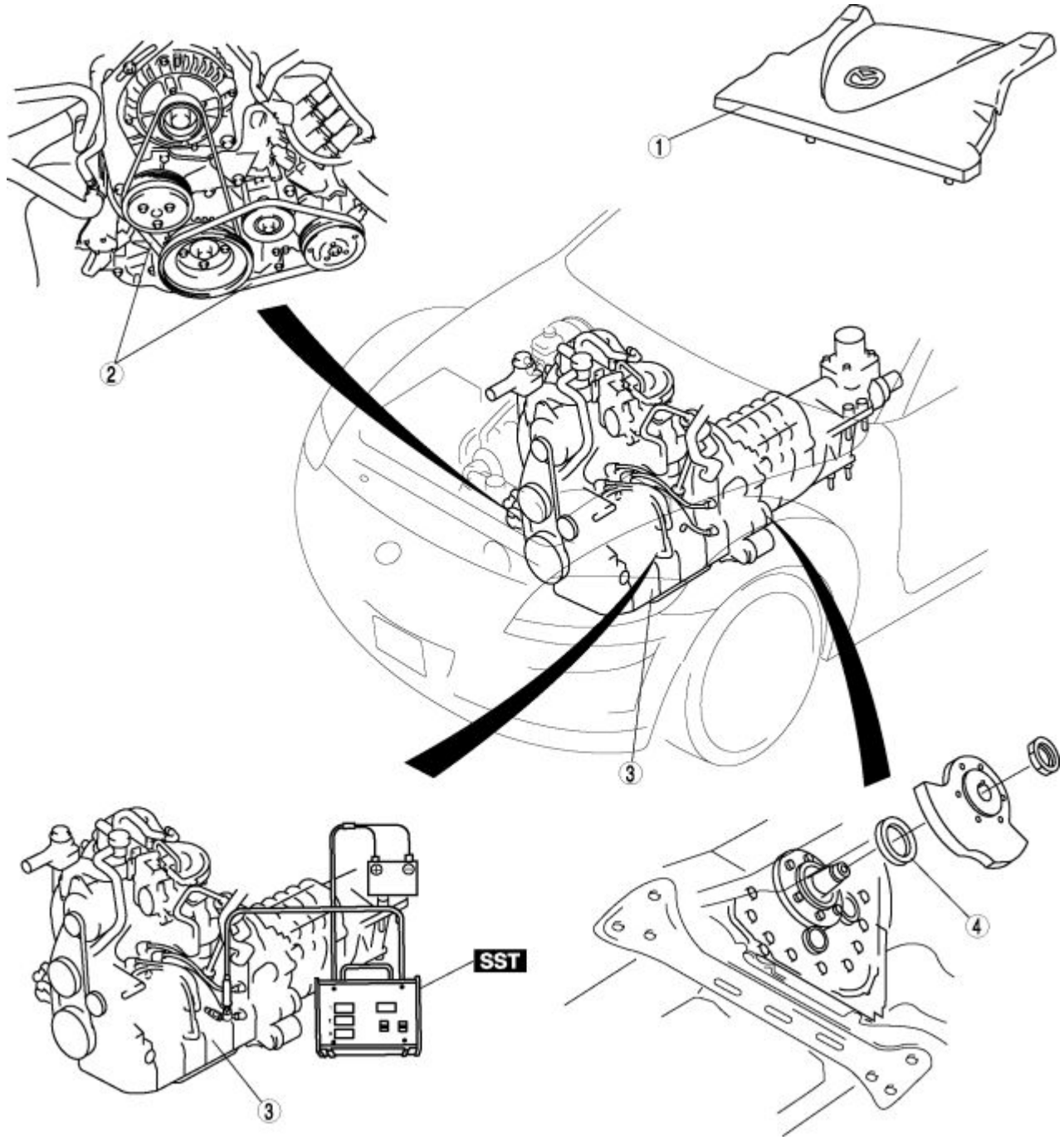
ENGINE SPECIFICATIONS

MECHANICAL (w)

LOCATION INDEX

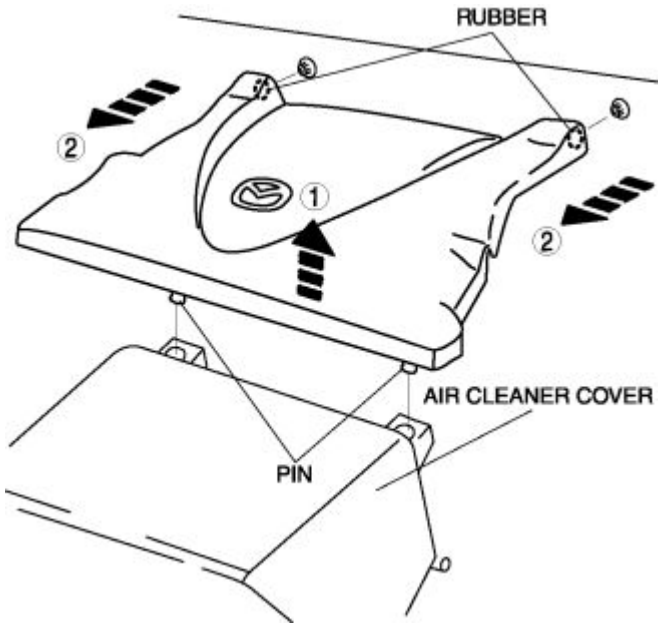


1	Engine cover (See ENGINE COVER REMOVAL/INSTALLATION .)
2	Drive belt

	(See DRIVE BELT DEFLECTION/TENSION INSPECTION .) (See DRIVE BELT ADJUSTMENT .) (See DRIVE BELT REPLACEMENT .)
3	Engine (See COMPRESSION INSPECTION .) (See ENGINE REMOVAL/INSTALLATION .) (See ENGINE DISASSEMBLY/ASSEMBLY .)
4	Rear oil seal (See REAR OIL SEAL REPLACEMENT .)

ENGINE COVER REMOVAL/INSTALLATION

1. Remove in the order shown in the figure.



2. Install in the reverse order of removal.

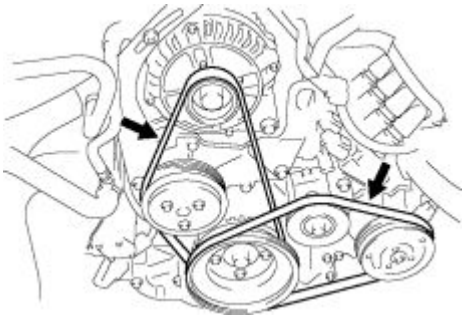
DRIVE BELT

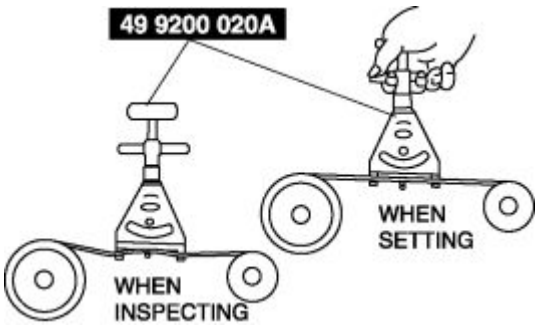
DRIVE BELT DEFLECTION/TENSION INSPECTION

CAUTION:

- The drive belt deflection can be inspected only between specified pulleys.
- Perform the drive belt deflection/tension inspection when the engine is cold, or at least 30 min after the engine has stopped.
- If the drive belt that is being used exceeds the deflection/tension limit, adjust it to the deflection/tension used when adjusting.
- After replacing with a new drive belt, assemble with the deflection/tension for the new drive belt. Operate the generator drive belt for 1 min or more and the A/C drive belt for 5 min or more while idling the engine. Then adjust it to the deflection/tension used when adjusting.

1. Remove the engine cover. (See ENGINE COVER REMOVAL/INSTALLATION .)
2. Apply a pressure of **98 N {10 kgf, 22 lbf}** to the back of the drive belt in the middle of the pulleys shown in the figure and inspect the deflection. Otherwise, inspect the tension using the **SST** .





NOTE:

- The drive belt tension can be inspected anywhere between the pulleys. The drive belt deflection can be inspected only between specified pulleys.
- If the drive belt deflection is at the deflection limit or more, or the drive belt tension is at the tension limit or less, adjust the drive belt tension.

Drive belt deflection (with pressure of 98 N {10 kgf, 22lbf})

Item	New (mm {in})	When adjusting (mm {in})	Deflection

			limit (mm {in})
Generator	4.0—4.5 {0.16—0.17}	4.5—5.0 {0.18—0.19}	6.0 {0.24} or more
A/C	3.0—3.8 {0.11—0.14}	3.3—4.0 {0.13—0.15}	5.5 {0.21} or more

Drive belt tension (when using the SST)

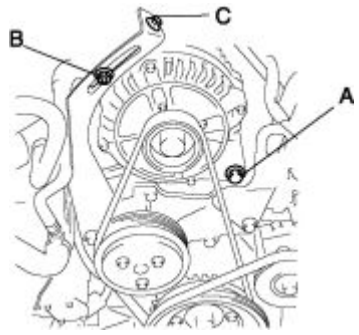
Item	New (N {kgf, lbf})	When adjusting (N {kgf, lbf})	Tension limit (N {kgf, lbf})
Generator	620—767 {63.3—78.2, 140—172}	519—666 {53.0—67.9, 117—149}	344 {35.1, 77.3} or less
A/C	559—706 {57.1—71.9, 126—158}	519—617 {53.0—62.9, 117—138}	265 {27.1, 59.6} or less

3. Install the engine cover. (See ENGINE COVER REMOVAL/INSTALLATION .)

DRIVE BELT ADJUSTMENT

Generator Drive Belt

1. Remove the engine cover. (See ENGINE COVER REMOVAL/INSTALLATION .)
2. Loosen generator installation bolt A and locknut B.



3. Adjust the drive belt deflection and tension by turning adjusting bolt C to the specification.

   Drive belt deflection (with pressure of 98 N {10 kgf, 22 lbf})

   - 4.5—5.0 mm {0.18—0.19 in}

   Drive belt tension (when using the SST)

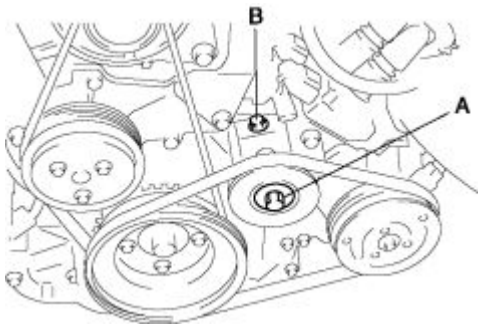
   - 519—666 N {53.0—67.9 kgf, 117—149 lbf}
4. Tighten generator installation bolt A and locknut B to the specified torque.

   Tightening torque

   - A: 38—51 N·m {3.9—5.2 kgf·m, 29—37 ft·lbf}
   - B: 20—30 N·m {2.1—3.0 kgf·m, 15—22 ft·lbf}
5. Crank the engine and measure the deflection and tension again. If not within the specification, repeat from Step 2 again.
6. Install the engine cover. (See ENGINE COVER REMOVAL/INSTALLATION .)

A/C Drive Belt

1. Remove the engine cover. (See ENGINE COVER REMOVAL/INSTALLATION .)
2. Loosen idle pulley locknut A.



3. Adjust the drive belt deflection and tension by turning adjusting bolt B to the specification.

Drive belt deflection (with pressure of 98 N {10 kgf, 22 lbf})

- 3.3—4.0 mm {0.13—0.15 in}

Drive belt tension (when using the SST)

- 519—617 N {53.0—62.9 kgf, 117—138 lbf}

4. Tighten idle pulley locknut A to the specified torque.

Tightening torque

- 37.2—51.9 N·m {3.80—5.29 kgf·m, 27.5—38.2 ft·lbf}

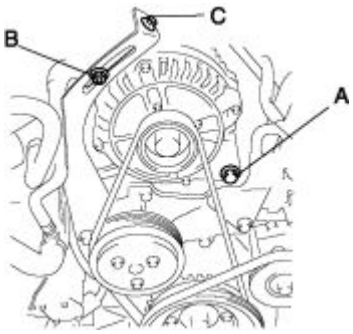
5. Crank the engine and measure the deflection and tension again. If not within the specification, repeat from Step 2 again.
6. Install the engine cover. (See ENGINE COVER REMOVAL/INSTALLATION .)

Notes:

DRIVE BELT REPLACEMENT

Generator Drive Belt

1. Remove the engine cover. (See ENGINE COVER REMOVAL/INSTALLATION .)
2. Remove the A/C drive belt.
3. Loosen generator installation bolt A and locknut B.



4. Loosen adjusting bolt C and remove the drive belt.
5. Install the drive belt and adjust the drive belt deflection by tightening adjusting bolt C to the specification.

CAUTION:

- After replacing with a the new drive belt, assemble with the deflection/tension for new drive belt and operate the drive belt for 1 min or more while idling the engine. Then adjust it to the deflection/tension used when adjusting.

Drive belt deflection (with pressure of 98 N {10 kgf, 22 lbf})

New (mm {in})	When adjusting (mm {in})
4.0—4.5 {0.16—0.17}	4.5—5.0 {0.18—0.19}

Drive belt tension (when using the SST)

New (N {kgf, lbf})	When adjusting (N {kgf, lbf})
620—767 {63.3—78.2, 140—172}	519—666 {53.0—67.9, 117—149}

6. Tighten generator installation bolt A and locknut B to the specified torque.

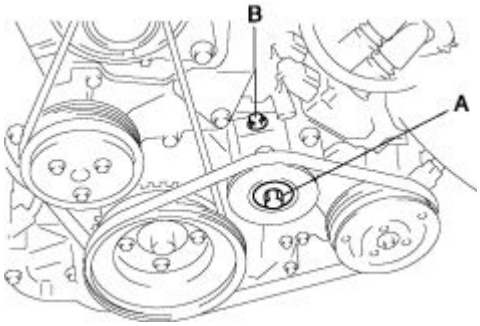
Tightening torque

- A: 38—51 N·m {3.9—5.2 kgf·m, 29—37 ft·lbf}
- B: 20—30 N·m {2.1—3.0 kgf·m, 15—22 ft·lbf}

7. Crank the engine and measure the deflection and tension again. If not within the specification, repeat from Step 3 again.
8. Install the A/C drive belt.
9. Install the engine cover. (See ENGINE COVER REMOVAL/INSTALLATION .)

A/C Drive Belt

1. Remove the engine cover. (See ENGINE COVER REMOVAL/INSTALLATION .)
2. Loosen idle pulley locknut A.



3. Loosen adjusting bolt B and remove the belt.
4. Install the drive belt and adjust the drive belt deflection by tightening adjusting bolt B to the specification.

CAUTION:

- After replacing with a the new drive belt, assemble with the deflection/tension for new drive belt and operate the drive belt for 5 min or more while idling the engine. Then adjust it to the deflection/tension used when adjusting.

Drive belt deflection (with pressure of 98 N {10 kgf, 22 lbf})

New (mm {in})	When adjusting (mm {in})
3.0—3.8 {0.11—0.14}	3.3—4.0 {0.13—0.15}

Drive belt tension (when using the SST)

New (N {kgf, lbf})	When adjusting (N {kgf,lbf})
559—706 {57.1—71.9, 126—158}	519—617 {53.0—62.9, 117—138}

5. Tighten idle pulley locknut A to the specified torque.

Tightening torque

- 37.2—51.9 N·m

{3.80—5.29 kgf·m, 27.5—38.2 ft·lbf}

6. Crank the engine and measure the deflection and tension again. If not within the specification, repeat from Step 2 again.
7. Install the engine cover. (See ENGINE COVER REMOVAL/INSTALLATION .)

Notes:

MECHANICAL

COMPRESSION INSPECTION

WARNING:

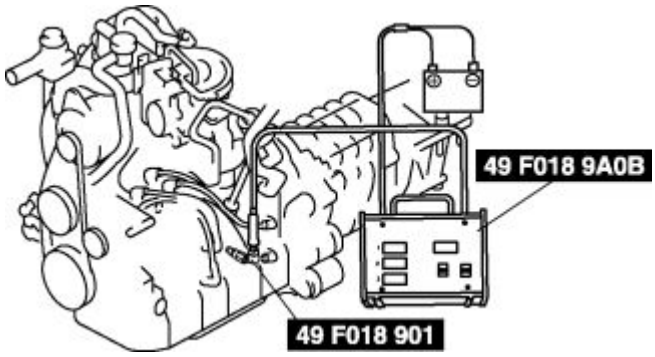
- Hot engines can cause severe burns. Be careful not to burn yourself during removal/installation of each component.

- Fuel vapor is hazardous. It can very easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.

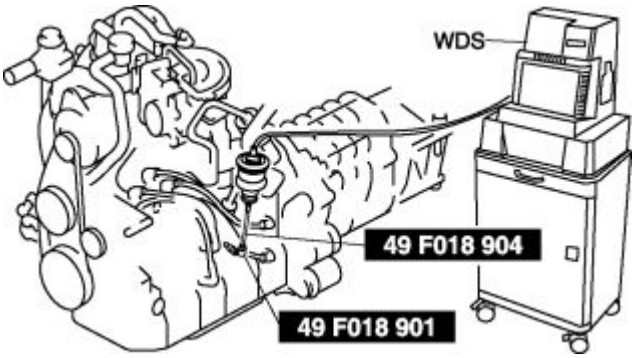
1. Remove the engine cover. (See ENGINE COVER REMOVAL/INSTALLATION .)
2. Verify that the battery is fully charged. (See BATTERY INSPECTION .)
3. Warm up the engine.
4. To decrease the exhaust system temperature, stop the engine and leave it as it is for **approx. 10 min** .
5. Remove the trailing or leading side spark plug of the front and rear rotors. (See SPARK PLUG REMOVAL/INSTALLATION .)
6. Disconnect the eccentric shaft position sensor connector. (See ECCENTRIC SHAFT POSITION SENSOR REMOVAL/INSTALLATION .)

   ### CAUTION:

   - To cut the fuel injection and ignition, make sure the eccentric shaft position sensor connector is disconnected.
7. Measure the compression pressure using one of the following procedures:
   a. Install the **SST (49 F018 901)** to the trailing or leading side plug hole of the rotor housing.



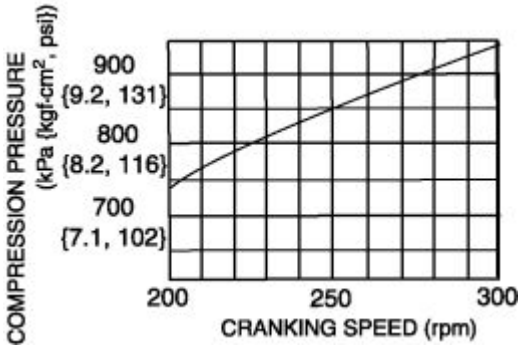
   b. Set the **SST (49 F018 9A0B)** as shown in the figure.
      - When using the WDS or equivalent, set the WDS or equivalent to the **SST (49 F018 901, 49 F018 904)** as shown in the figure.



c. Depress the accelerator pedal fully and crank for **5—10 s** .
d. Read the compression and engine speed.
    - Compression pressure
        - Standard: 830 kPa {8.5 kgf·cm^2 , 120 psi} [250 rpm]
        - Minimum: 680 kPa {6.9 kgf·cm^2 , 98.6 psi} [250 rpm]
        - Standard difference in chambers: Within 150 kPa {1.5 kgf·cm^2 , 21.8psi}
        - Standard difference in rotors: Within 100 kPa {1.0 kgf·cm^2 , 14.5 psi}
e. Perform the same procedure for the other rotor housing.
f. If the compression is at the minimum or less, or the difference in the chambers and difference in the rotors exceed the specifications, replace or overhaul.

CAUTION:

- If the engine speed when measuring compression differs from the standard, adjust according to the graph.

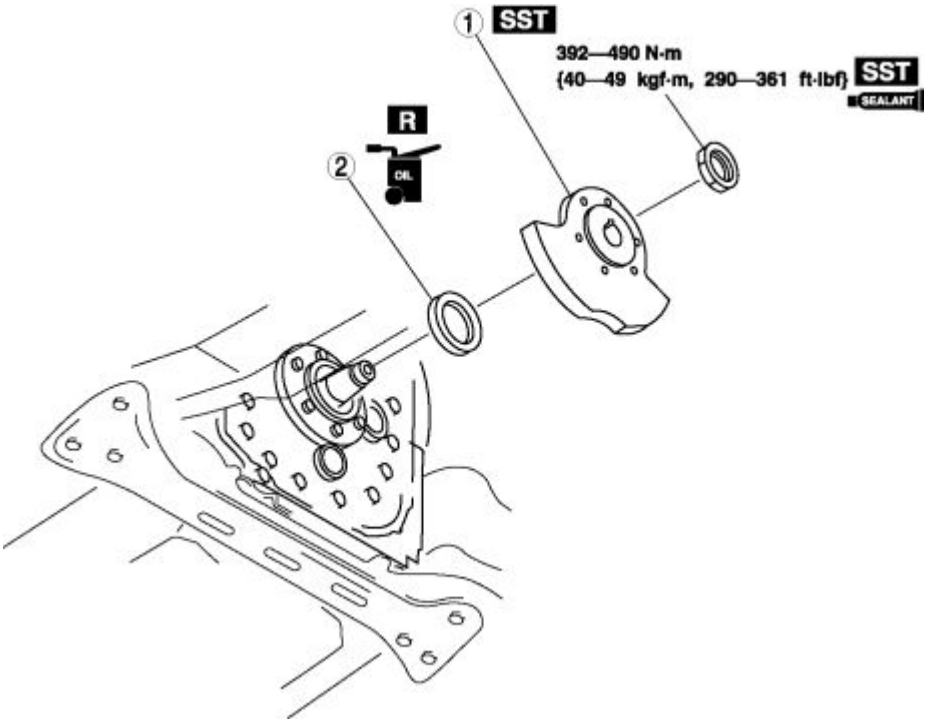


8. Install the spark plugs. (See SPARK PLUG REMOVAL/INSTALLATION .)
9. Connect the eccentric shaft position sensor connector. (See ECCENTRIC SHAFT POSITION SENSOR REMOVAL/INSTALLATION .)
10. Install the engine cover. (See ENGINE COVER REMOVAL/INSTALLATION .)

REAR OIL SEAL

REAR OIL SEAL REPLACEMENT

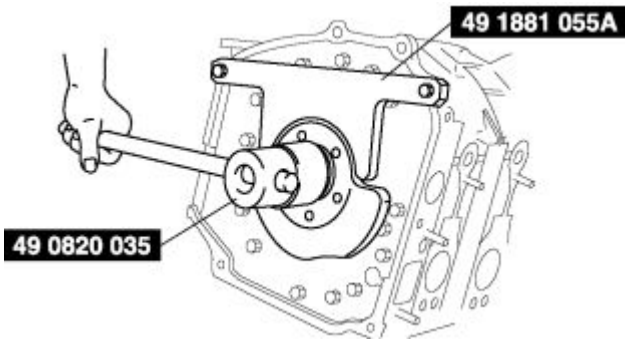
1. Remove the transmission. (See TRANSMISSION REMOVAL/INSTALLATION .) (See AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION .)
2. Remove the flywheel. (MT) (See CLUTCH UNIT REMOVAL/INSTALLATION .)
3. Remove the drive plate. (AT) (See DRIVE PLATE REMOVAL/INSTALLATION .)
4. Remove in the order indicated in the table.
5. Install in the reverse order of removal.



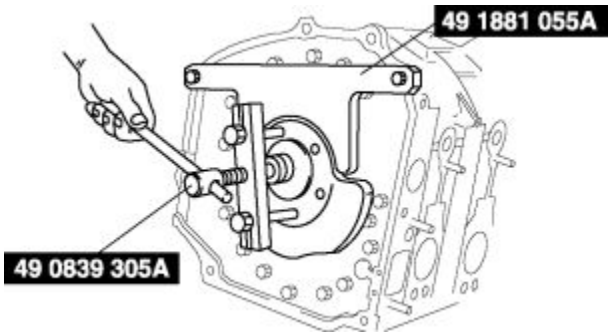
1	Counterweight (AT) (See Counterweight Removal Note .) (See Counterweight Installation Note .)
2	Rear oil seal (See Rear Oil Seal Removal Note .) (See Rear Oil Seal Installation Note .)

Counterweight Removal Note

1. Remove the locknut by locking the counterweight against rotation using the **SST** .



2. Remove the counterweight using the **SST** .



3. Remove the **SST** .

Rear Oil Seal Removal Note

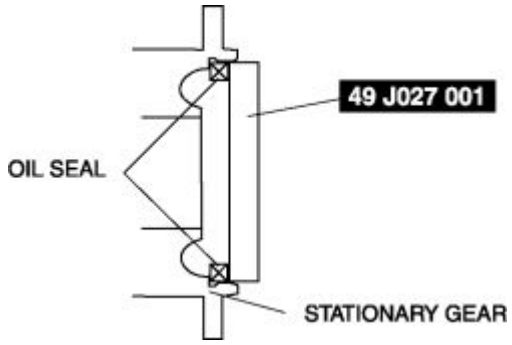
1. Protect the eccentric shaft with cloth and remove the oil seal using the **SST** .

CAUTION:

- Do not damage the contact area of the rear oil seal at the stationary gear and eccentric shaft.

Rear Oil Seal Installation Note

1. Apply engine oil to the lip of a new rear oil seal.
2. Tap the rear oil seal evenly in the stationary gear using the **SST** .

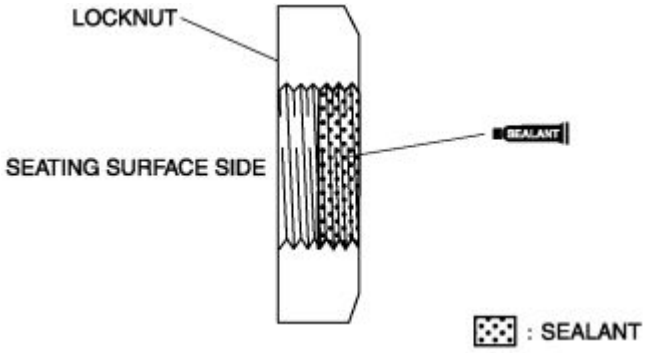


CAUTION:

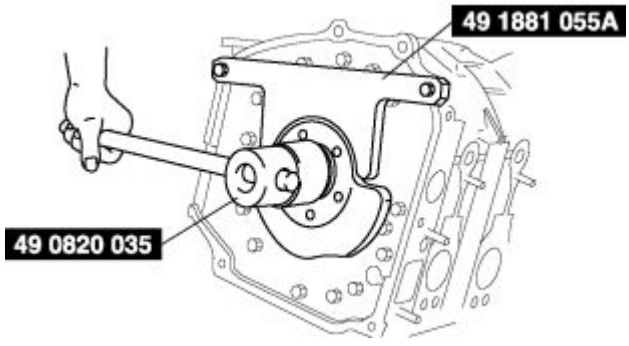
- Insert until it is attached to the seating face.
- Do not damage the oil seal lip by catching it on the eccentric shaft and the key.

Counterweight Installation Note

1. Install the key to the eccentric shaft.
2. Install the counterweight to the eccentric shaft.
3. Apply sealant to the seating face.



4. Install the locknut to the eccentric shaft and temporarily tighten.
5. Lock the counterweight against rotation using the **SST** , and tighten it to the specified torque.



Tightening torque

- 392—490 N·m {40—49 kgf·m, 290—361 ft·lbf}

MECHANICAL

ENGINE REMOVAL/INSTALLATION

WARNING:

- Fuel vapor is hazardous. It can very easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.
- Fuel line spills and leakage from the pressurized fuel system 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 the "Fuel Line Safety Procedure" when servicing the fuel system. (See BEFORE REPAIR PROCEDURE .)
- After disconnecting the steering shaft joint, always set the EPS system to the neutral position to prevent system malfunction. (See EPS SYSTEM NEUTRAL POSITION SETTING .)

NOTE:

- Remove the engine, transmission, and crossmember component as a single unit from under the vehicle.

1. Remove the following parts:
    a. The front wheel and tires (See GENERAL PROCEDURES (SUSPENSION)
    b. The engine cover (See ENGINE COVER REMOVAL/INSTALLATION .)
    c. The front suspension tower bar (See FRONT SUSPENSION TOWER BAR REMOVAL/INSTALLATION .)
    d. The battery cover, battery, battery box and battery tray (See BATTERY REMOVAL/INSTALLATION .)
    e. The air cleaner, intake-air duct and air cleaner insulator (See INTAKE-AIR SYSTEM REMOVAL/INSTALLATION .)
    f. The PCM (See PCM REMOVAL/INSTALLATION .)
    g. The AIR pump. (See SECONDARY AIR INJECTION (AIR) PUMP REMOVAL/INSTALLATION .)
2. Drain the engine coolant. (See ENGINE COOLANT REPLACEMENT .)
3. Disconnect the brake vacuum hose.
4. Disconnect the quick release connector going to the charcoal canister from the engine room side. (See QUICK RELEASE CONNECTOR REMOVAL/INSTALLATION .)
5. Disconnect the plastic fuel hose. (See BEFORE REPAIR PROCEDURE .) (See FUEL INJECTOR REMOVAL/INSTALLATION .)
6. Remove the ignition coil. (See IGNITION COIL REMOVAL/INSTALLATION .)
7. Remove the A/C belt. (See DRIVE BELT REPLACEMENT .)
8. Remove the A/C compressor with the pipes connected and secure the A/C compressor using wire or rope so that it is out of the way.
9. Disconnect the engine wiring harness from the main fuse block side.
10. Remove the engine under cover.
11. Disconnect front ABS wheel speed sensor connector. (See FRONT ABS WHEEL-SPEED SENSOR REMOVAL/INSTALLATION .)
12. Disconnect the radiator hose, the heater hose and coolant reserve tank hose.
13. AT
    - Disconnect the selector link. (See AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION .)

MT

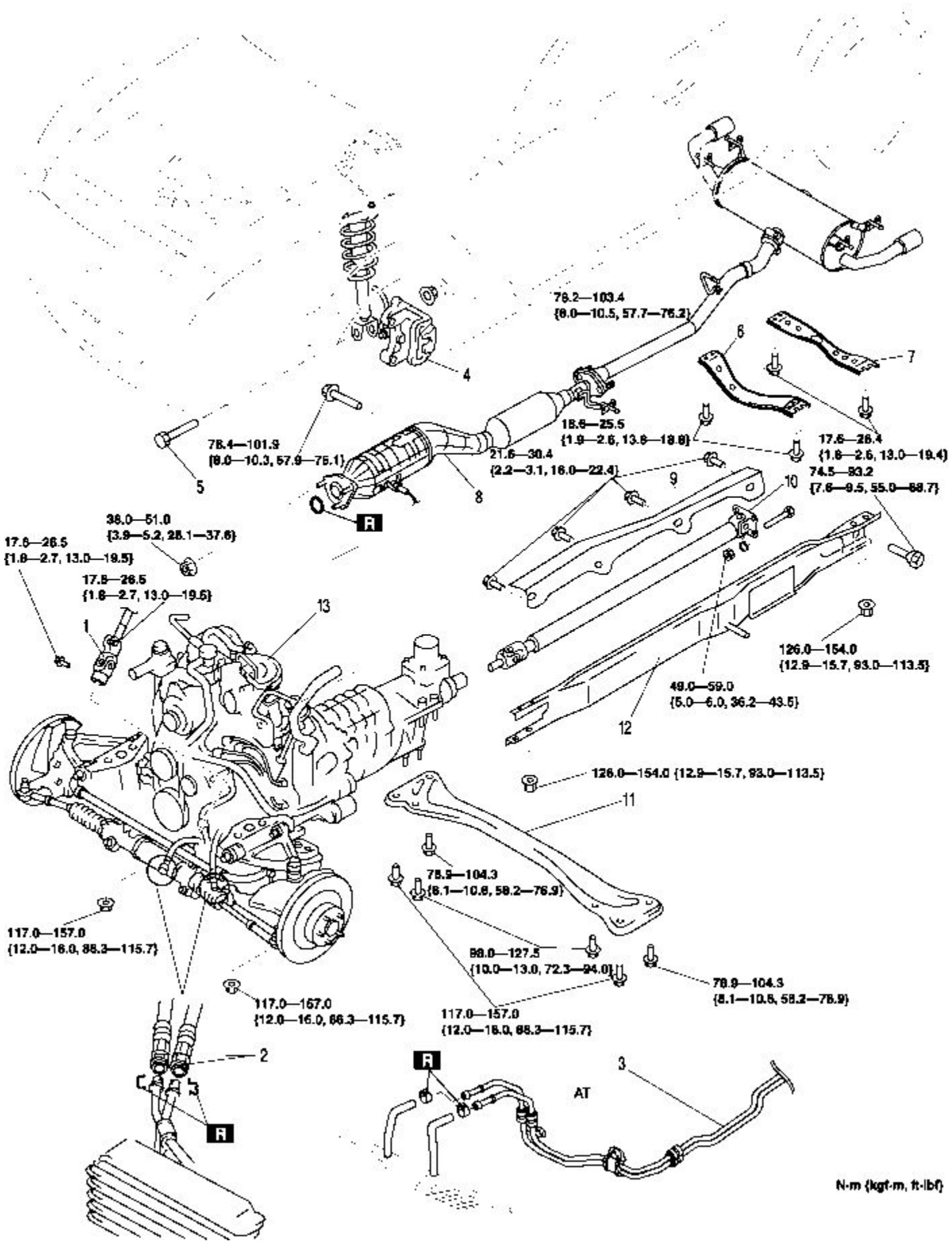
- Remove the clutch release cylinder with the pipes connected and secure the clutch release cylinder using wire or rope so that it is out of the way. (See CLUTCH RELEASE CYLINDER REMOVAL/INSTALLATION .)
- Remove the shift lever component . (See TRANSMISSION REMOVAL/INSTALLATION .)

14. Remove the engine, transmission, and crossmember component using an engine lifter in the order indicated in the table.

WARNING:

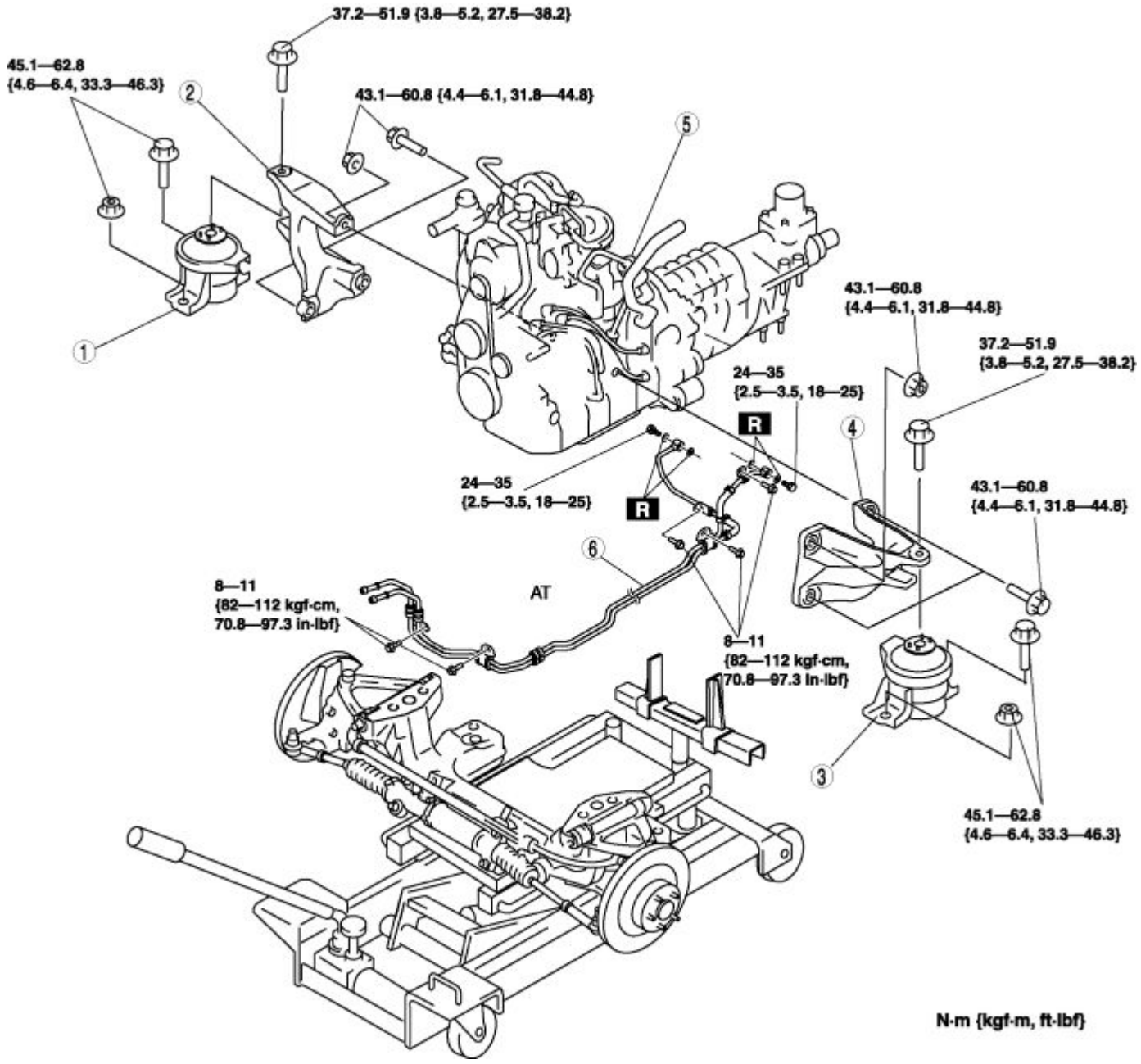
- Remove the engine, transmission and crossmember carefully, holding it steady. If the transmission falls it could be damaged or cause injury.

Notes:


78.2—103.4
{8.0—10.5, 57.7—76.2}
78.4—101.9
{8.0—10.3, 57.9—75.1}
21.6—30.4
{2.2—3.1, 16.0—22.4}
18.6—25.5
{1.9—2.6, 13.8—18.8}
17.6—26.4
{1.8—2.6, 13.0—19.4}
74.5—93.2
{7.6—9.5, 55.0—68.7}
38.0—51.0
{3.9—5.2, 28.1—37.6}
17.6—26.5
{1.8—2.7, 13.0—19.5}
17.6—26.5
{1.8—2.7, 13.0—19.5}
126.0—154.0
{12.9—15.7, 93.0—113.5}
49.0—59.0
{5.0—6.0, 36.2—43.5}
126.0—154.0 {12.9—15.7, 93.0—113.5}
78.9—104.3
{8.1—10.6, 58.2—76.9}
88.0—127.5
{10.0—13.0, 72.3—94.0}
78.9—104.3
{8.1—10.6, 58.2—76.9}
117.0—157.0
{12.0—16.0, 86.3—115.7}
117.0—157.0
{12.0—16.0, 86.3—115.7}
117.0—157.0
{12.0—16.0, 86.3—115.7}
AT
N·m {kgf·m, ft·lbf}

1	Universal joint (See STEERING GEAR AND LINKAGE REMOVAL/INSTALLATION .) (See EPS SYSTEM NEUTRAL POSITION SETTING .)
2	Oil hose (See Oil Hose Removal Note .) (See Oil Hose Installation Note .)
3	AT oil cooler hose (AT)
4	Caliper component
5	Front strut lower bolt
6	Front tunnel member
7	Rear tunnel member
8	Catalytic converter, middle pipe, main silencer (See EXHAUST SYSTEM REMOVAL/INSTALLATION .)
9	Heat insulator
10	Propeller shaft (See PROPELLER SHAFT REMOVAL/INSTALLATION .)
11	Transverse member
12	Power plant frame (See Power Plant Frame, Crossmember Bolt Removal/Installation Note .) (See Power Plant Frame Installation Note .)
13	Engine, transmission, crossmember component (See Power Plant Frame, Crossmember Bolt Removal/Installation Note)

15. Remove the engine and transmission from the crossmember component lifter in the order indicated in the table by suspending them with a crane.



1	Engine mount rubber (RH)
2	Engine mount bracket (RH)
3	Engine mount rubber (LH)
4	Engine mount bracket (LH)
5	Engine, transaxle
6	AT oil cooler pipe

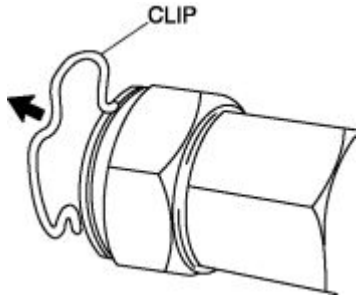
16. Install in the reverse order of removal.
17. Start the engine and inspect and adjust the following:
    - Pulley and belt for runout, tension, and contact
    - Leakage of engine oil, engine coolant, ATF, MT oil, and fuel
    - Ignition timing, idle speed, and idle mixture (CO and HC) (See ENGINE TUNE-UP .)
    - Front wheel alignment (See FRONT WHEEL ALIGNMENT .)

- Engine-driven accessories operation

18. Perform the on-road test and verify that there is no vibration or noise.

Oil Hose Removal Note

1. Remove the clip as shown in the figure and disconnect the oil pipe.

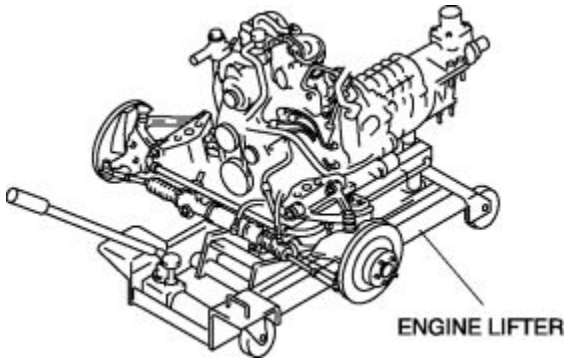


CAUTION:

- Catch the remaining engine oil in the oil cooler using a plate pipe to prevent spillage.

Power Plant Frame, Crossmember Bolt Removal/Installation Note

1. Secure the engine, transmission, and crossmember component using an engine lifter.

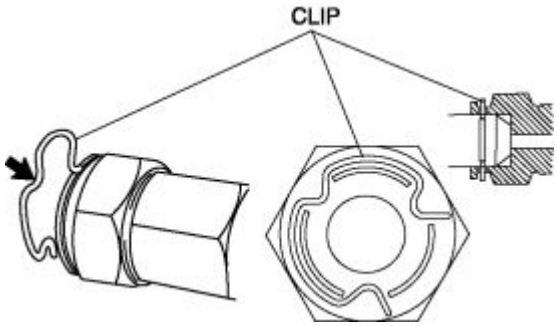


NOTE:

- When installing the power plant frame, tighten the tightening bolts and nuts temporarily at this time, and after installing all parts, adjust the transmission installation positions referring to 'Power Plant Frame Installation Note' and then tighten them completely. (See Power Plant Frame Installation Note)

Oil Hose Installation Note

1. Connect a new clip as shown in the figure and connect the oil hose.

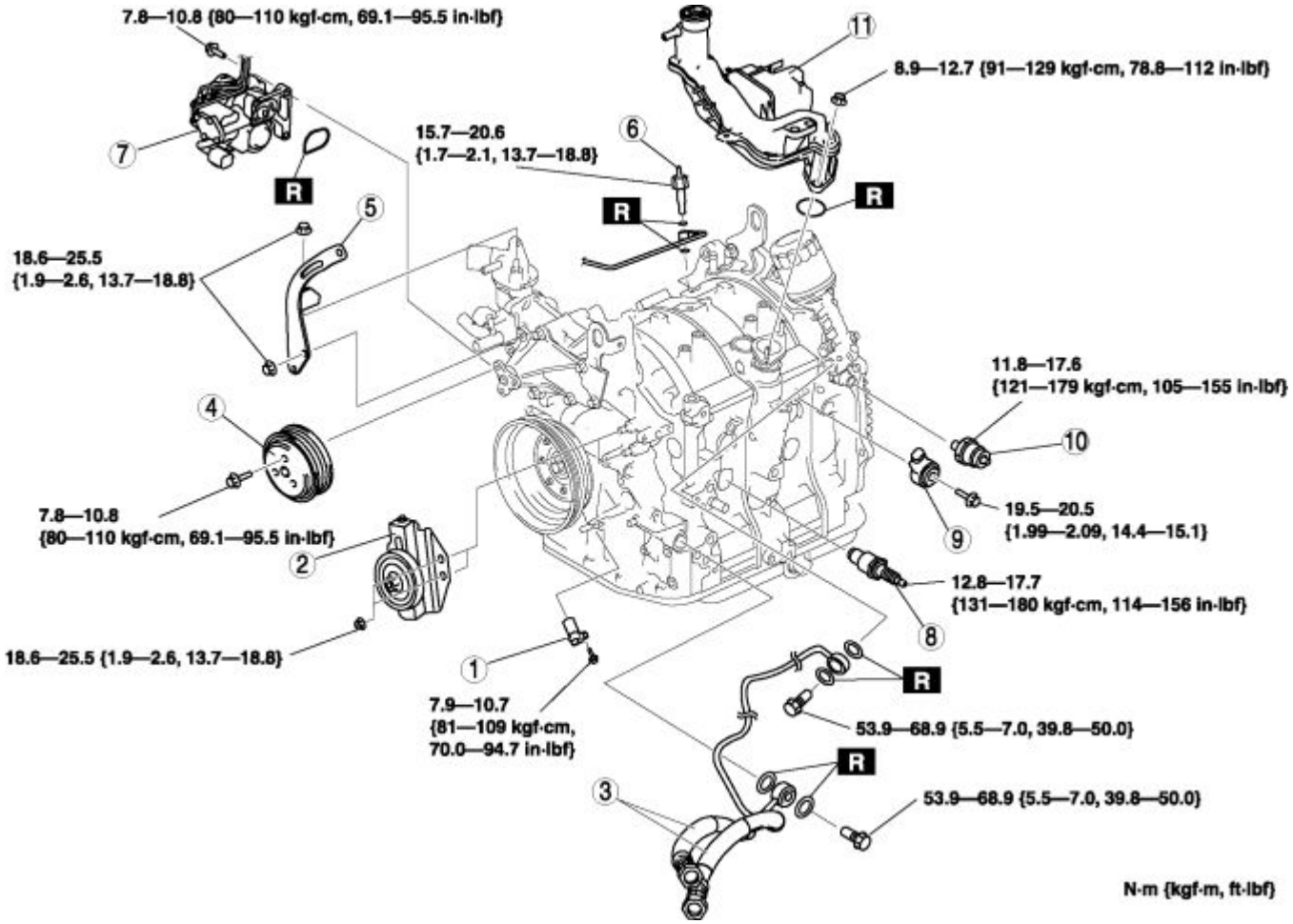


CAUTION:

- Always install the oil hose with the three holes on the oil hose grooves and the three clip projections aligned.

ENGINE DISASSEMBLY/ASSEMBLY

1. Remove the engine from the transmission. (See TRANSMISSION REMOVAL/INSTALLATION .) (See AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION .)
2. Remove the following parts:
    a. The clutch unit (MT) (See CLUTCH UNIT REMOVAL/INSTALLATION .)
    b. The drive plate (AT) (See DRIVE PLATE REMOVAL/INSTALLATION .)
    c. The intake-air system (See INTAKE-AIR SYSTEM REMOVAL/INSTALLATION .)
    d. The exhaust system (See EXHAUST SYSTEM REMOVAL/INSTALLATION .)
    e. The primary fuel injector and wiring harness (See FUEL INJECTOR REMOVAL/INSTALLATION .)
3. Remove in the order indicated in the table.
4. Install in the reverse order of removal.

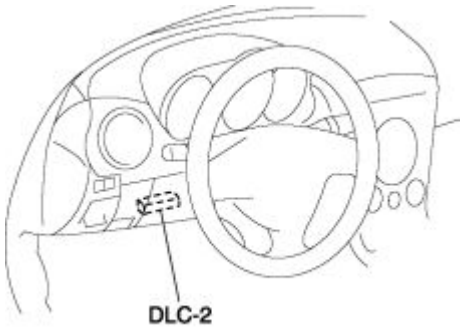


1	Eccentric shaft position sensor (See ECCENTRIC SHAFT POSITION SENSOR REMOVAL/INSTALLATION .)
2	A/C drive belt tensioner
3	Oil hose
4	Water pump pulley
5	Generator strap
6	Oil nozzle
7	Metering oil pump (See METERING OIL PUMP REMOVAL/INSTALLATION .)
8	Spark plug (See SPARK PLUG REMOVAL/INSTALLATION .)
9	Knock sensor (See KNOCK SENSOR (KS) REMOVAL/INSTALLATION .)
10	Oil pressure switch (See OIL PRESSURE INSPECTION .)
11	Oil filler pipe

ENGINE TUNE-UP

Engine Tune-up Preparation

1. Verify the following:
   - AT: Selector lever is in P or N position.
   - MT: Shift lever is in neutral position.
2. Turn off all electrical loads (A/C).
3. Warm up the engine.
   a. Increase the engine speed to **2,500—3,000 rpm** until cooling fans start running.
   b. When the cooling fans start running, release the accelerator pedal and wait until the cooling fans stop running.
4. Connect the WDS or equivalent to the DLC-2.



5. Verify that the idling speed (WDS: RPM PID) is within the specification using the WDS or equivalent function.

   Standard

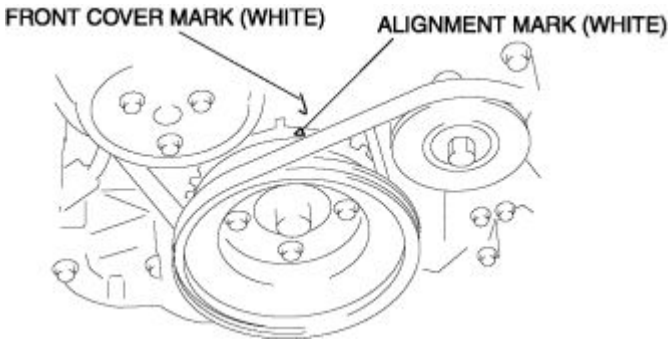
   - AT: 760—860 rpm
   - MT: 750—850 rpm

Ignition Timing Inspection

NOTE:

- The ignition timing cannot be adjusted.
- The WDS or equivalent is required to verify the ignition timing.

1. Complete the engine tune-up preparation. (See Engine Tune-up Preparation .)
2. Connect the timing light to the front rotor housing on the leading side.
3. Turn the test mode on using the test simulation function.
4. Verify that the eccentric shaft position plate alignment mark (white) and the front cover mark (white) is aligned.



NOTE:

- When using the WDS or equivalent, verify that the ignition (WDS: SPARK-L) is **–5°** .
- If there is malfunction, refer to "ENGINE SYMPTOM TROUBLESHOOTING". (See ENGINE SYMPTOM TROUBLESHOOTING .)

5. Turn the test mode off using the test simulation function.

Idle Speed Inspection

NOTE:

- The idling speed cannot be adjusted.
- The WDS or equivalent is required to verify the idling speed.

1. Complete the engine tune-up preparation. (See Engine Tune-up Preparation .)
2. Turn the test mode on using the "test" simulation function.
3. Verify that the engine speed using the RPM DATA MONITOR function is as follows.
   - If there is malfunction, refer to "ENGINE SYMPTOM TROUBLESHOOTING". (See ENGINE SYMPTOM TROUBLESHOOTING .)

Standard

Load status	Idling speed (rpm) N, D, R position (AT), Neutral position (MT)			
	AT			MT
	N range	D range	R range	
No load	760—860	740—840	730—830	750—850
Electrical loads on[*1]	780—880	760—860	730—830	750—850
A/C on (standard)	780—880	760—860	730—830	760—860
A/C on (standard)+ electrical loads on[*1]	780—880	760—860	730—830	790—890
A/C on (heavy load)	800—900	780—880	780—880	790—890

*1

The headlight, rear window defroster, blower fan (2-step or more) are on.

Idle Mixture Inspection

1. Verify that idle speed and ignition timing are within the specification.

   (See Idle Speed Inspection .)

   (See Ignition Timing Inspection .)

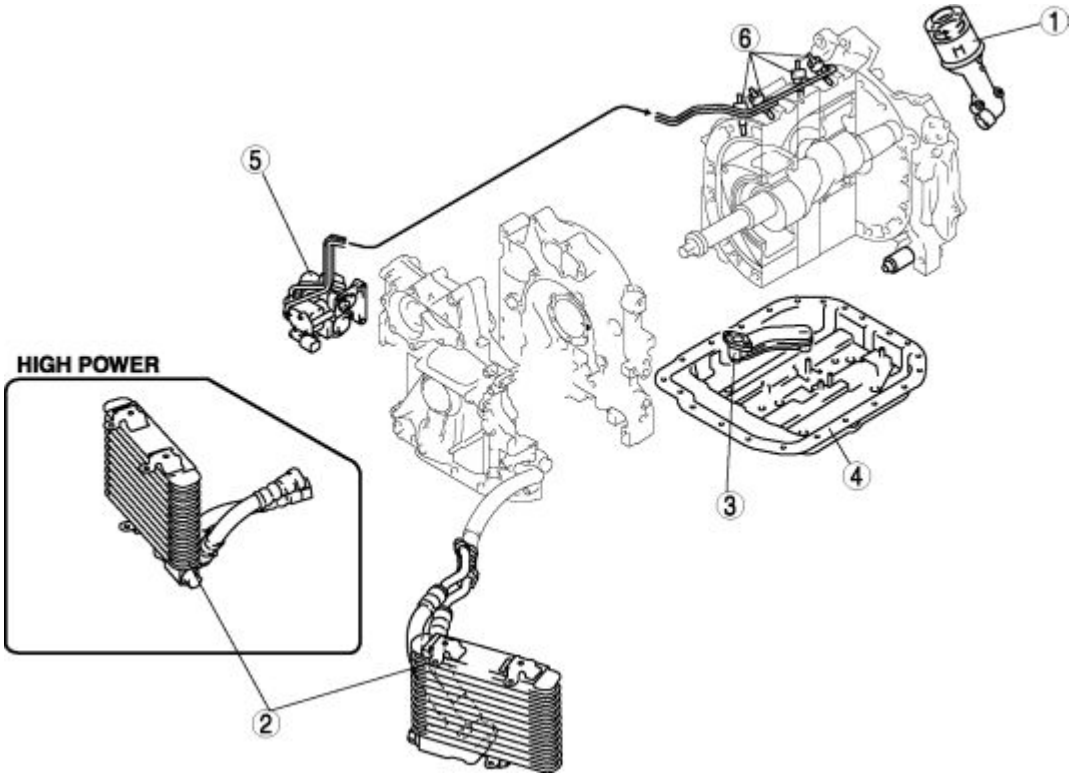
2. Insert an exhaust gas analyzer into the tailpipe.
3. Verify that the CO and HC concentration are within the regulation.
   - If there is malfunction, refer to "ENGINE SYMPTOM TROUBLESHOOTING". (See ENGINE SYMPTOM TROUBLESHOOTING .)

Notes:

LUBRICATION

LUBRICATION SYSTEM

LUBRICATION SYSTEM LOCATION INDEX



1	Oil filter (See OIL FILTER REPLACEMENT .)
2	Oil cooler (See OIL COOLER REMOVAL/INSTALLATION .)
3	Oil strainer (See OIL PAN REMOVAL/INSTALLATION .)
4	Oil pan (See OIL PAN REMOVAL/INSTALLATION .)
5	Metering oil pump (See METERING OIL PUMP REMOVAL/INSTALLATION .) (See METERING OIL PUMP INSPECTION .)
6	Oil nozzle

	(See OIL NOZZLE REMOVAL/INSTALLATION .) (See METERING OIL PUMP INSPECTION .)

Notes:

OIL PRESSURE

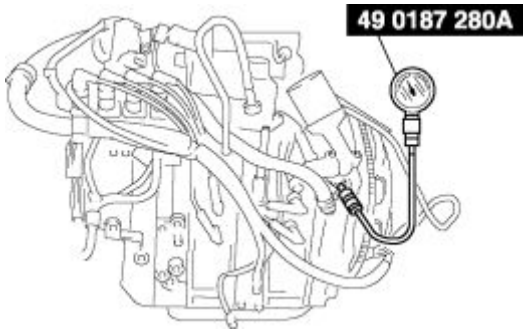
OIL PRESSURE INSPECTION

WARNING:

- Remove and install all parts when the engine is cold, otherwise they can cause severe burns or serious injury.
- Continuous exposure to USED engine oil has caused skin cancer in laboratory mice. Protect your skin by washing with soap and water immediately after working with engine oil.

1. Disconnect the connector, and remove the oil pressure switch.

2. Connect the **SST** to the oil pressure switch installation hole from underneath the vehicle.



3. Warm up the engine to normal operating temperature.

4. Run the engine at the specified speed, and note the gauge readings.
   - If not within the specification, inspect for the cause and repair or replace if necessary.

   NOTE:

   - The oil pressure can vary with oil viscosity and temperature.

     Oil pressure (reference value)

     - 350 kPa {3.57 kgf/cm^2 , 50.8 psi} [3,000 rpm, Oil temperature: 100 °C {212 °F}]

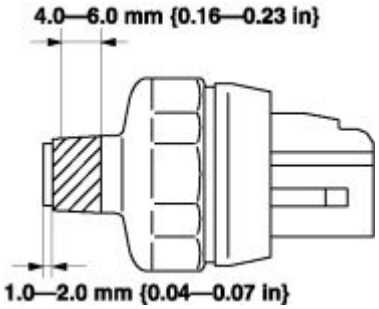
5. Stop the engine and wait until it is cool.

6. Remove the **SST** .

CAUTION:

- Be sure there is no sealant between 1.0—2.0 mm {0.04—0.07 in} from the end of the oil pressure switch to prevent a possible operation malfunction.

7. Apply silicone sealant to the oil pressure switch threads.



8. Install the oil pressure switch.

   Tightening torque

   - 11.8—17.6 N·m {121—179 kgf·cm, 105—155 in·lbf}

9. Connect the connector.

10. Start the engine and confirm that there is no oil leakage.
    - If there is any oil leakage, find the cause and repair or replace the applicable part.

ENGINE OIL

ENGINE OIL LEVEL INSPECTION

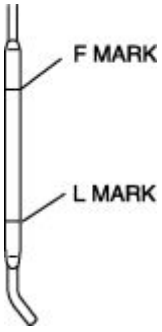
1. Position the vehicle on level ground.

2. Warm up the engine.

3. Stop the engine and allow **approx. 5 min** before continuing.

4. Remove the engine cover. (See ENGINE COVER REMOVAL/INSTALLATION .)

5. Remove the dipstick and verify that the oil level is between the F and L marks on the dipstick.
   - If the oil level is below the L mark, add oil.

6. 

7. Install the dipstick.

8. Install the engine cover. (See ENGINE COVER REMOVAL/INSTALLATION)

ENGINE OIL REPLACEMENT

WARNING:

- Perform engine oil replacement when the engine is cold, otherwise it can cause severe burns or serious injury.
- 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 to USED engine oil has caused skin cancer in laboratory mice. Protect your skin by washing with soap and water immediately after working with engine oil.

CAUTION:

- In case you spill the engine oil on the exhaust system, wipe it off completely. If you fail to wipe the spilled engine oil, it will produce fumes because of the heat.

1. Position the vehicle on level ground.

2. Remove the engine cover.

3. Remove the oil filler cap.

4. Remove the oil pan drain plug, and drain the engine oil.

5. Install the oil pan drain plug with a new washer.

   Oil pan drain plug tightening torque

   - 29.4—39.2 N·m {3.00—3.99 kgf·m, 21.7—28.9 ft·lbf}

   NOTE:

   - The amount of residual oil in the engine can vary according to the replacement method, oil temperature, etc. Verify the oil level after engine oil replacement.

6. Refill the engine with the type and amount of engine oil specified in the table.Recommended oil

Item	Recommended oil

API service	SL
SAE viscosity	5W−20
ILSAC	GF−3

Oil capacity (Approx. quantity)

L {US qt, lmp qt}

Item	Oil capacity (Approx. quantity)
Oil replacement	3.3 {3.5, 2.9}
Oil and oil filter replacement	3.5 {3.7, 3.1}
Engine overhaul	4.7 {5.0, 4.1}
Total (dry engine)	Standard power: 5.8 {6.1, 5.1} High power: 6.7 {7.1, 5.9}

7. Install the oil filler cap.

8. Start the engine and confirm that there is no oil leakage.
    - If there is any oil leakage, find the cause and repair or replace the applicable part.

9. Inspect the oil level. (See ENGINE OIL LEVEL INSPECTION .)

10. Install the engine cover.

OIL FILTER

OIL FILTER REPLACEMENT

WARNING:

- Remove and install all parts when the engine is cold, otherwise they can cause severe burns or serious injury.
- Continuous exposure to USED engine oil has caused skin cancer in laboratory mice. Protect your skin by washing with soap and water immediately after working with engine oil.

CAUTION:

- When removing the oil filter, cover up the surrounding area with cloth to prevent oil in the filter from spilling on other parts.

- In case you spill the engine oil on the exhaust system, wipe it off completely. If you fail to wipe the spilled engine oil, it will produce fumes because of the heat.

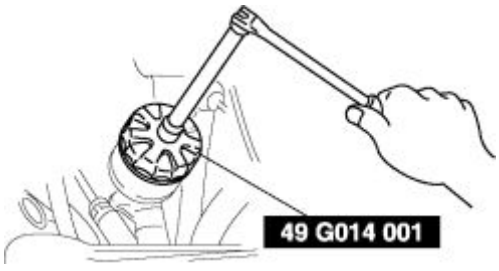
NOTE:

- Since two types of the oil filters have been adopted, make sure to choose the appropriate procedure according to the oil filter manufacturer (Tokyo Roki or Denso) indicated on the label of the filter.

Tokyo Roki

1. Remove the engine cover. (See ENGINE COVER REMOVAL/INSTALLATION .)

2. Remove the oil filter using the **SST.**



3. Clean the installation surface of the oil filter.

4. Apply engine oil to the O-ring of the new oil filter.

5. When the O-ring contacts the oil filter installation surface, turn the filter another one rotation by hand.

6. Fill with the specified amount of engine oil. (See ENGINE OIL REPLACEMENT .)

7. Start the engine and confirm that there is no oil leakage.
    - If there is any oil leakage, find the cause and repair or replace the applicable part.

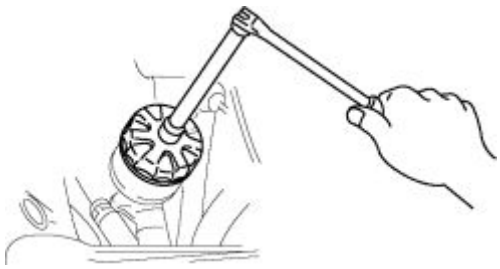
8. Inspect the oil level. (See ENGINE OIL LEVEL INSPECTION .)

9. Install the engine cover. (See ENGINE COVER REMOVAL/INSTALLATION .)

Denso

1. Remove the engine cover. (See ENGINE COVER REMOVAL/INSTALLATION .)

2. Remove the oil filter using a commercially available, cap-type oil filter wrench (diameter- **64 mm {2.5 in}, 14 sided**).



3. Clean the installation surface of the oil filter.

4. Apply engine oil to the O-ring of the new oil filter.

5. When the O-ring contacts the oil filter installation surface, turn the filter another three-quarter rotation by hand.

6. Fill with the specified amount of engine oil. (See ENGINE OIL REPLACEMENT .)

7. Start the engine and confirm that there is no oil leakage.
   - If there is any oil leakage, find the cause and repair or replace the applicable part.

8. Inspect the oil level. (See ENGINE OIL LEVEL INSPECTION .)

9. Install the engine cover. (See ENGINE COVER REMOVAL/INSTALLATION .)

Notes:

OIL COOLER

OIL COOLER REMOVAL/INSTALLATION

WARNING:

- Remove and install all parts when the engine is cold, otherwise they can cause severe burns or serious injury.

1. Remove the engine cover. (See ENGINE COVER REMOVAL/INSTALLATION .)

2. Remove the battery cover.

3. Disconnect the negative battery cable. (See BATTERY REMOVAL/INSTALLATION .)

4. Remove the following.

    a. Front tire (LH)

    b. Front tire (RH) (with twin oil cooler)

    c. Splash shield

    d. Under cover

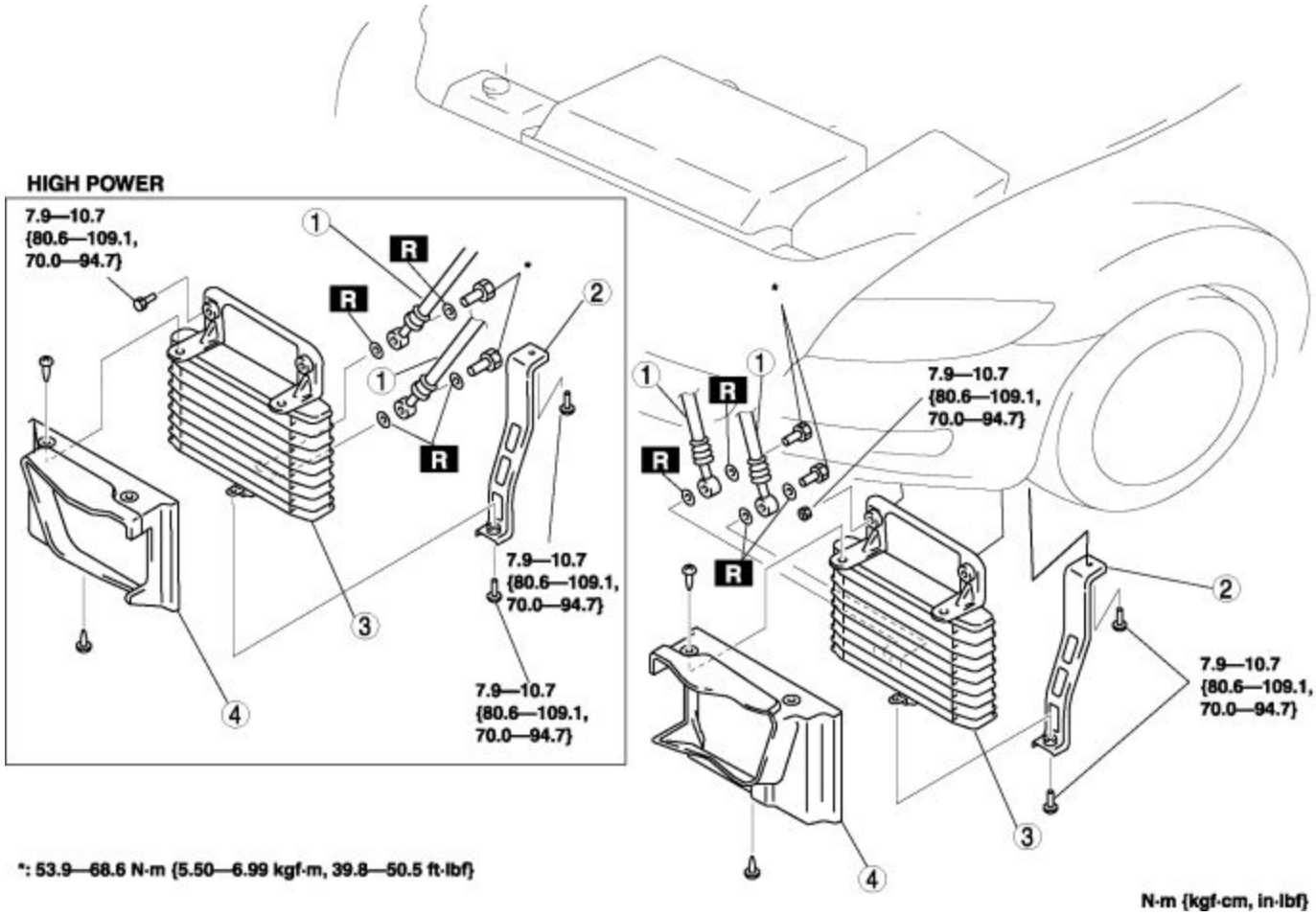
5. Remove in the order indicated in the table.

6. Install in the reverse order of removal.

7. Add engine oil. (See ENGINE OIL REPLACEMENT .)

8. Start the engine and confirm that there is no oil leakage from areas worked on.
   - If there is any oil leakage, find the cause and repair or replace the applicable part.

9. Inspect the oil level. (See ENGINE OIL LEVEL INSPECTION .)



1	Oil cooler hose (See Oil Cooler Hose Removal Note)
2	Oil cooler bracket
3	Oil cooler
4	Oil cooler duct

Oil Cooler Hose Removal Note

NOTE:

- Use a drain pan to catch the oil when the oil hoses are disconnected.

Notes:

OIL PAN

OIL PAN REMOVAL/INSTALLATION

WARNING:

- Remove and install all parts when the engine is cold, otherwise they can cause severe burns or serious injury.

1. Remove the engine cover. (See ENGINE COVER REMOVAL/INSTALLATION .)

2. Remove the battery cover.

3. Disconnect the negative battery cable. (See BATTERY REMOVAL/INSTALLATION .)

4. Drain the engine oil. (See ENGINE OIL REPLACEMENT .)

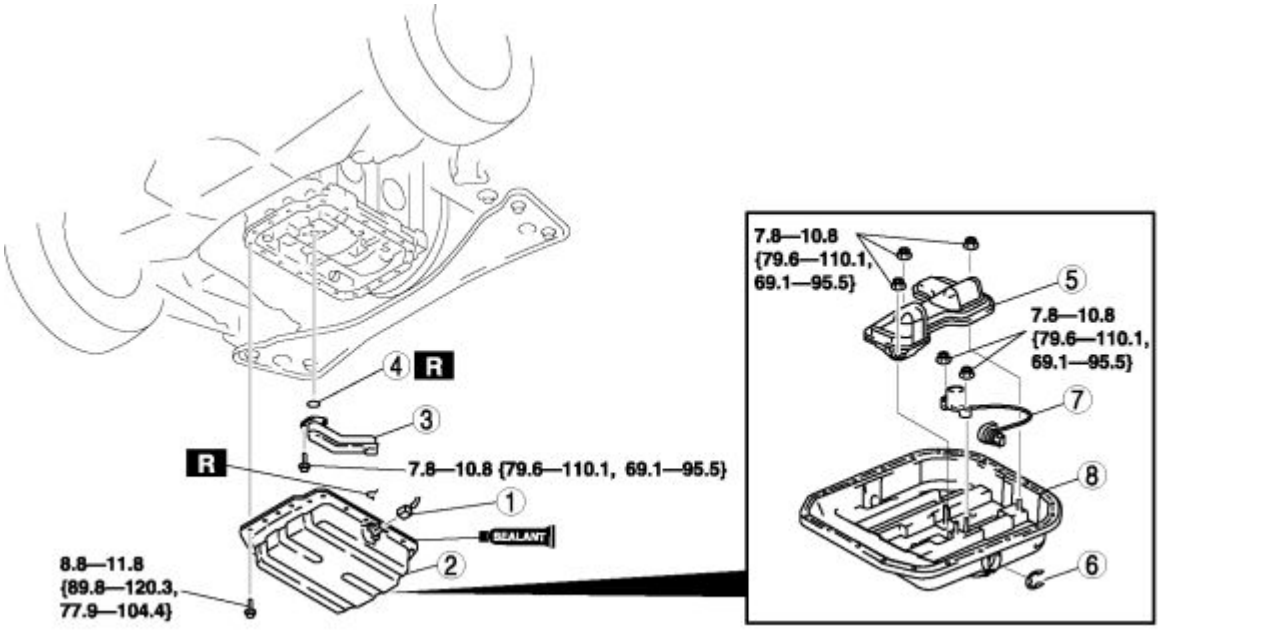
5. Remove in the order indicated in the table.

6. Install in the reverse order of removal.

7. Add engine oil. (See ENGINE OIL REPLACEMENT .)

8. Start the engine and confirm that there is no oil leakage from areas worked on.
    - If there is any oil leakage, find the cause and repair or replace the applicable part.

9. Inspect the oil level. (See ENGINE OIL LEVEL INSPECTION .)

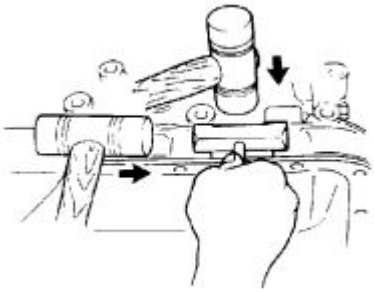


N·m {kgf·cm, in·lbf}

1	Connector
2	Oil pan component (See Oil Pan Component Removal Note .) (See Oil Pan Component Installation Note .)
3	Oil strainer
4	O-ring
5	Oil baffle plate
6	Clip
7	Oil-level switch
8	Oil pan

Oil Pan Component Removal Note

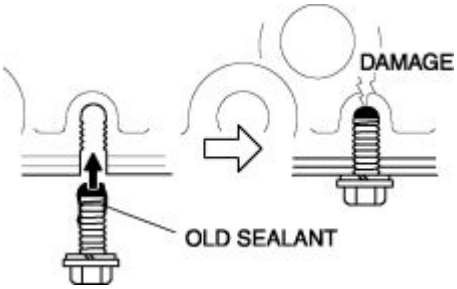
1. Remove the oil pan using the separator tool.



Oil Pan Component Installation Note

CAUTION:

- Apply the silicon sealant in a single, unbroken line around the whole perimeter.
- Install the oil pan within 5 min after applying the silicone sealant.
- Using bolts with the seal adhering could cause cracks in the housing.

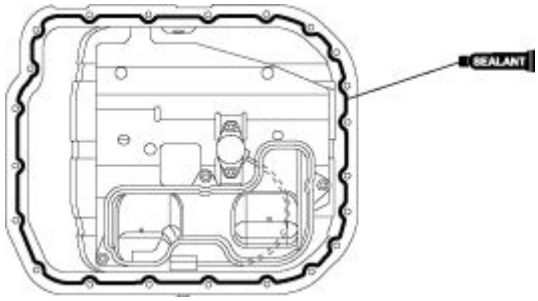


1. Completely clean and remove any oil, dirt, sealant or other foreign material that may be adhering to the housing and oil pan.

2. When reusing oil pan installation bolts, clean any old sealant from the bolts.

3. Apply silicone sealant to the areas shown in the figure.
   - Bead thickness

     2.5—6.5 mm {0.10—0.26 in}

5. 

6. Tighten the oil pan installation bolt.
    - Tightening torque

      8.8—11.8 N·m {89.8—120.3 kgf·cm, 77.9—104.4 in·lbf}

METERING OIL PUMP

METERING OIL PUMP REMOVAL/INSTALLATION

WARNING:

- Remove and install all parts when the engine is cold, otherwise they can cause severe burns or serious injury.

1. Remove the engine cover. (See ENGINE COVER REMOVAL/INSTALLATION .)

2. Remove the battery cover.

3. Disconnect the negative battery cable. (See BATTERY REMOVAL/INSTALLATION .)

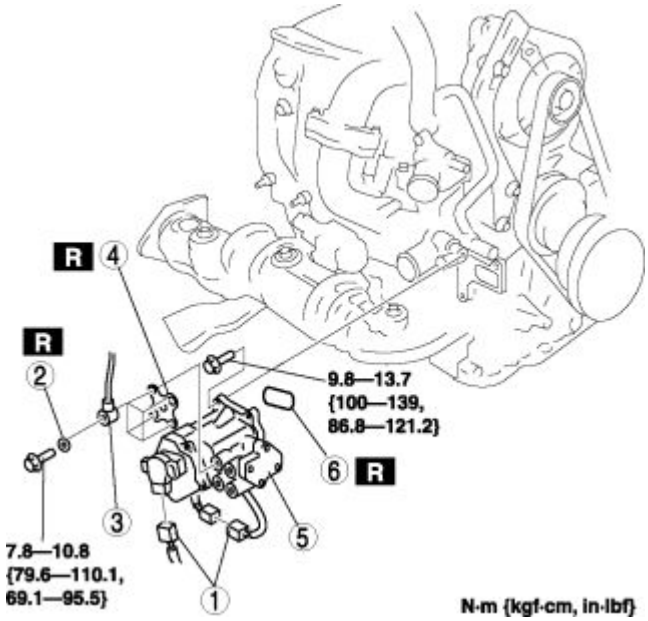
4. Remove the battery, battery box, and battery tray. (See BATTERY REMOVAL/INSTALLATION .)

5. Remove in the order indicated in the table.

6. Install in the reverse order of removal.

7. Start the engine and confirm that there is no oil leakage from areas worked on.
    - If there is any oil leakage, find the cause and repair or replace the applicable part.

8. Inspect the oil level. (See ENGINE OIL LEVEL INSPECTION .)



1	Connectors
2	Washer
3	Oil pipe (metering oil pump side)
4	Gasket
5	Metering oil pump
6	O-ring

OIL NOZZLE REMOVAL/INSTALLATION

WARNING:

- Remove and install all parts when the engine is cold, otherwise they can cause severe burns or serious injury.

1. Remove the engine cover. (See ENGINE COVER REMOVAL/INSTALLATION .)

2. Remove the battery cover.

3. Disconnect the negative battery cable. (See BATTERY REMOVAL/INSTALLATION .)

4. Remove the battery, battery box, and battery tray. (See BATTERY REMOVAL/INSTALLATION .)

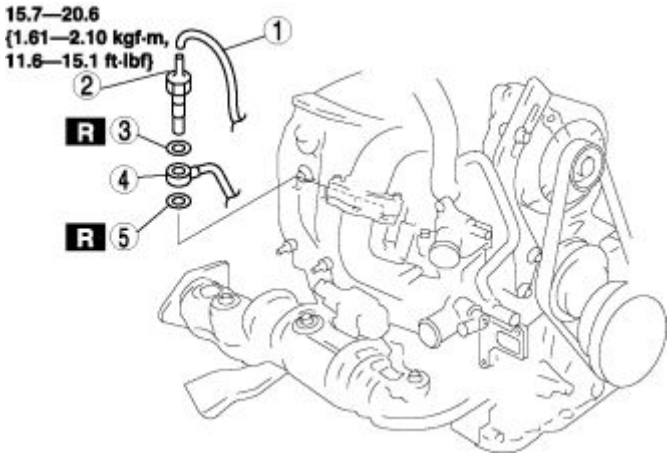
5. Remove extension manifold. (upper, lower) (See INTAKE-AIR SYSTEM REMOVAL/INSTALLATION .)

6. Remove in the order indicated in the table.

7. Install in the reverse order of removal.

8. Start the engine and confirm that there is no oil leakage from areas worked on.
    - If there is any oil leakage, find the cause and repair or replace the applicable part.

9. Inspect the oil level. (See ENGINE OIL LEVEL INSPECTION .)



1	Air hose
2	Oil nozzle
3	Washer
4	Oil pipe (housing side)
5	Washer

METERING OIL PUMP INSPECTION

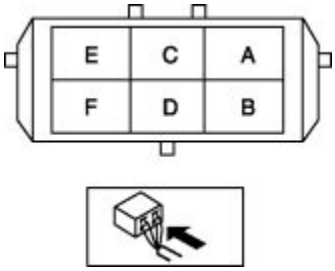
Metering Oil Pump Voltage Inspection

1. Disconnect the metering oil pump connector (6-pin).

2. Measure the voltage at terminals C and D.
   - If not within the specification, repair or replace the related harnesses.

- Voltage

  Battery voltage [IG-ON, 20°C {68 °F}]



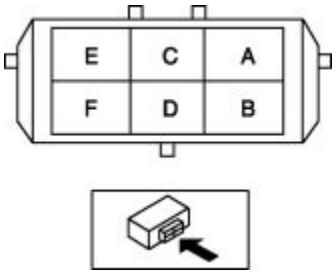
Metering Oil Pump Resistance Inspection

1. Disconnect the metering oil pump connector (6-pin).

2. Measure the resistance between terminals D—B, D—F, C—A, and C—E using a tester.
   - If not within the specification, replace the metering oil pump.

- Resistance

  30.6—35.6 ohms [20°C {68 °F}]



Positioning Switch Resistance Inspection

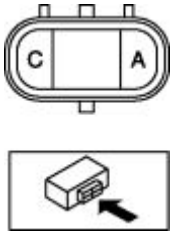
1. Idle the engine.

2. Stop the engine.

3. Disconnect the metering oil pump connector (3-pin).

4. Measure the coil resistance between A-C terminals using a tester.
   - If not within the specification, replace the metering oil pump.
   - Resistance

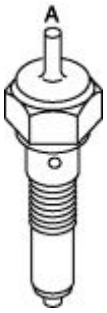
     400 ohms or less [20°C {68 °F}]

5. 

Oil Nozzle Inspection

1. Remove the oil nozzle.

2. Use a vacuum pump to apply a vacuum of **66.5 kPa {0.68 kgm/cm^2 , 9.65 psi} or more** on A of the oil nozzle and verify that vacuum holds:
   - If the vacuum drops **2.66 kpa {0.027 kgm/cm^2 , 0.39 psi} or more in 1 min,** replace the oil nozzle.



Oil Leakage Inspection

1. Idle the engine and keep it.

2. Inspect for oil leakage along the mating surfaces of the metering oil pump and the front cover and where the oil pipe is connected.
    - If there is any malfunction, repair or replace.

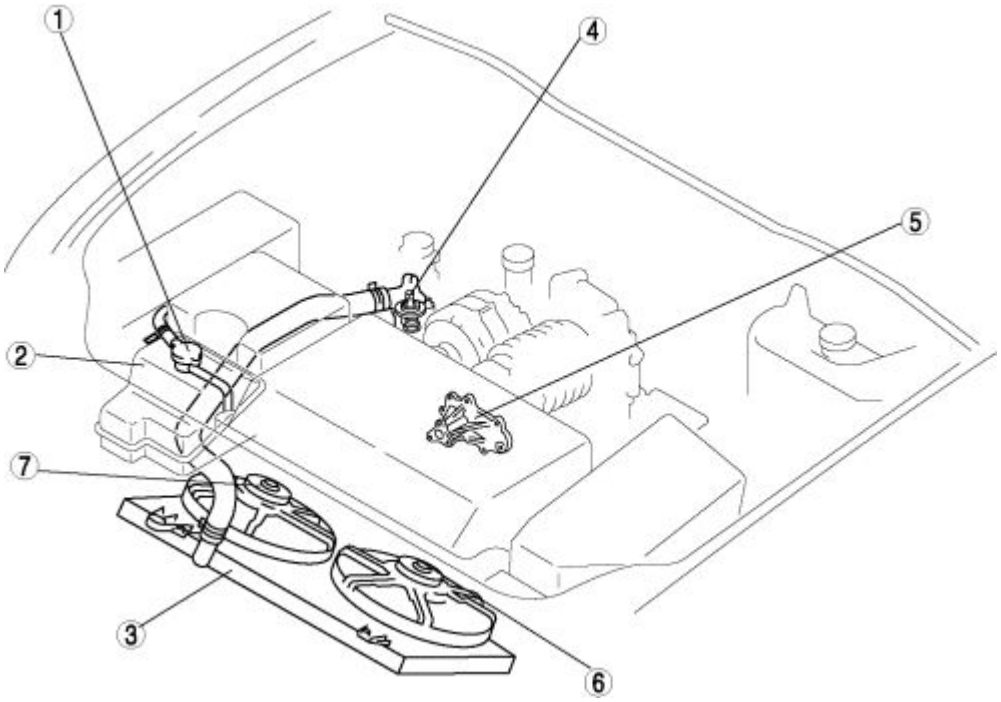
Clogging Inspection

1. Verify that there is no oil clogging in the following parts.
    - If there is any clogging, repair or replace.
        - Oil pipes
        - Oil nozzles
        - Metering oil pump connector bolts (connecting oil pipes and metering oil pump)

Notes:

COOLING SYSTEM

COOLING SYSTEM LOCATION INDEX



1	Cooling system cap (See COOLING SYSTEM CAP INSPECTION .)
2	Coolant reserve tank (See COOLANT RESERVE TANK REMOVAL/INSTALLATION .)
3	Radiator (See RADIATOR REMOVAL/INSTALLATION .)
4	Thermostat (See THERMOSTAT REMOVAL/INSTALLATION .) (See THERMOSTAT INSPECTION .)
5	Water pump (See WATER PUMP REMOVAL/INSTALLATION .)
6	Cooling fan motor No.1

	(See FAN MOTOR REMOVAL/INSTALLATION .) (See FAN MOTOR INSPECTION .)
7	Cooling fan motor No.2 (See FAN MOTOR REMOVAL/INSTALLATION .) (See FAN MOTOR INSPECTION .)

ENGINE COOLANT

COOLING SYSTEM SERVICE WARNINGS

WARNING:

- Remove and install all parts when the engine is cold, otherwise they can cause severe burns or serious injury.
- 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

WARNING:

- Remove and install all parts when the engine is cold, otherwise they can cause severe burns or serious injury.
- 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.

1. Verify that the engine coolant level in the coolant reserve tank installed on the shroud panel is between the L and F marks.

2. If the engine coolant level is below L, add engine coolant.

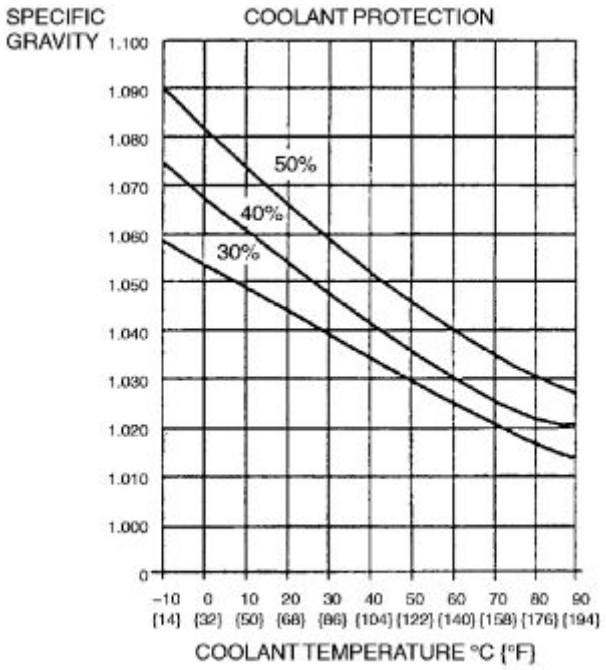
ENGINE COOLANT PROTECTION INSPECTION

1. Measure the coolant temperature and specific gravity with a thermometer and a hydrometer.

   ### CAUTION:

   - The engine has aluminum parts that can be damaged by alcohol or methanol antifreeze. Do not use alcohol or methanol in the cooling system. Use only ethylene-glycol-based coolant.
   - Use only soft (demineralized) water in the coolant mixture. Water that contains minerals will reduce the coolant's effectiveness.

2. Determine the coolant protection by referring to the graph shown.
   - If the coolant protection is not proper, add water or coolant.



ENGINE COOLANT REPLACEMENT

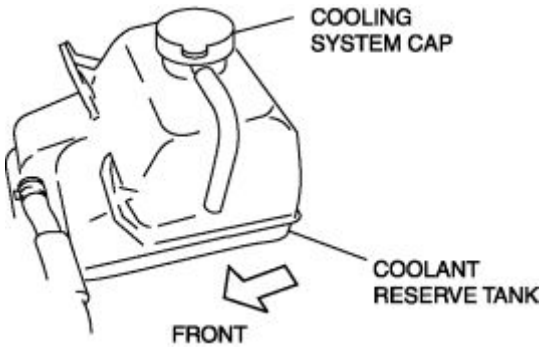
WARNING:

- Remove and install all parts when the engine is cold, otherwise they can cause severe burns or serious injury.
- 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.

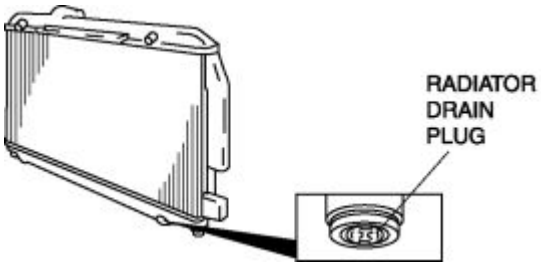
CAUTION:

- 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 that can be damaged by alcohol or methanol antifreeze. Do not use alcohol or methanol in the cooling system. Use only ethylene-glycol-based coolant.
- Use only soft (demineralized) water in the coolant mixture. Water that contains minerals will reduce the coolant's effectiveness.
- Engine coolant damages paint. If engine coolant does get on a painted surface, rinse it off quickly.

1. Remove the cooling system cap.

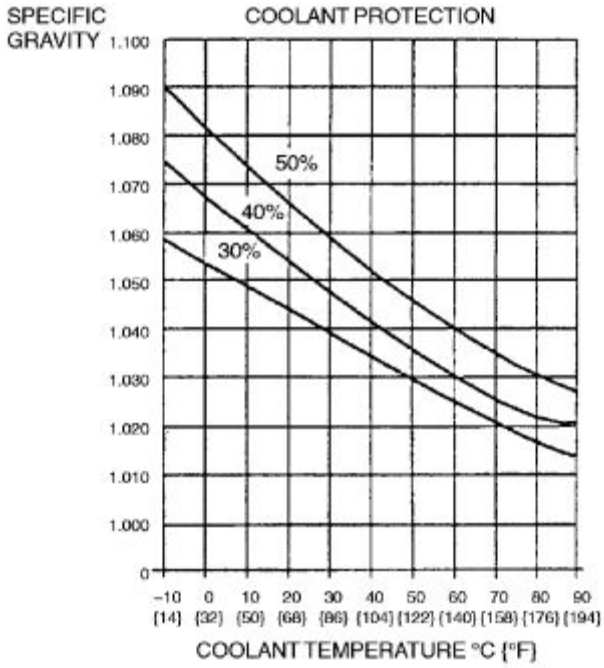


2. Loosen the radiator drain plug and drain the engine coolant.



3. After completely draining the engine coolant, tighten the radiator drain plug.

4. Add engine coolant into the coolant reserve tank up to the F mark.



5. Install the cooling system cap.

6. Start the engine and warm it up by idling.

   CAUTION:

   - If the water temperature gauge rises too high, stop the engine and decrease the water temperature to prevent overheating.

7. After the engine warms up, perform the following steps.

   a. Run the engine at **approx. 2,500 rpm** for **5 min** .

   b. Run the engine at **approx. 3,000 rpm** for **5 min** , then return to idling. Repeat this procedure several times.

8. Stop the engine, wait until it is cool, and check the engine coolant level. If the engine coolant decreases, repeat Steps **4—8** .

9. Inspect each area for engine coolant leakage.

ENGINE COOLANT LEAKAGE INSPECTION

WARNING:

- Remove and install all parts when the engine is cold, otherwise they can cause severe burns or serious injury.
- 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.

1. Inspect the engine coolant level.

2. Remove the cooling system cap.

3. Clean the installation parts of the cooling system cap and the upper radiator hose.

4. Install the **SST** and a radiator cap tester to the coolant reserve tank filler port.

5. Apply pressure using the radiator cap tester.

   ### CAUTION:

   - Applying more than 127 kPa {1.3 kgf/cm^2 , 18 psi} can damage the hoses, fittings, and other components, and cause leaks.

     Pressure

     - 127 kPa {1.3 kgf/cm^2 , 18 psi} [1 min]

6. When pressurizing the radiator, verify that the pressure is maintained.
   - If the gauge needle drops, it may indicate water leakage, therefore perform leakage inspection.
     - If engine coolant leaks from the upper hose installation part, replace the upper hose and the clamp.

- If the engine coolant leaks from the main body of the radiator (caulked part), replace the radiator.

Notes:

COOLING SYSTEM CAP

COOLING SYSTEM CAP INSPECTION

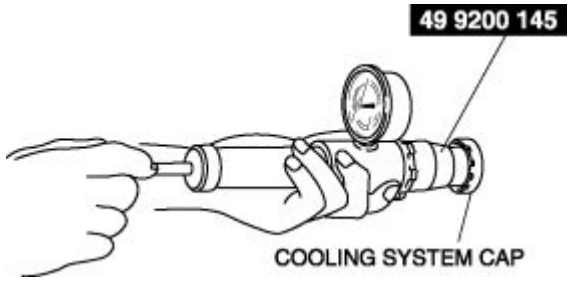
WARNING:

- 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're sure all the pressure is gone, press down on the cap using the cloth, turn it, and remove it.

1. Clean the cooling system cap and the sealed part.

2. Inspect the crack or turn over on the sealed part of the cooling system cap.
    - If there is malfunction, replace the cooling system cap.

3. Attach the cooling system cap to the radiator cap tester.



4. Hold the cooling system cap downward and apply pressure gradually. Verify that the pressure holds for **10 s** .
    - If the pressure is not held stable within the specification, replace the cooling system cap.

      Pressure

    - 73.3—103.3 kPa

      {0.748—1.053 kgf/cm^2 , 10.63—14.98 psi}

COOLANT RESERVE TANK

COOLANT RESERVE TANK REMOVAL/INSTALLATION

WARNING:

- Remove and install all parts when the engine is cold, otherwise they can cause severe burns or serious injury.

1. Remove the engine cover. (See ENGINE COVER REMOVAL/INSTALLATION .)

2. Remove the battery cover.

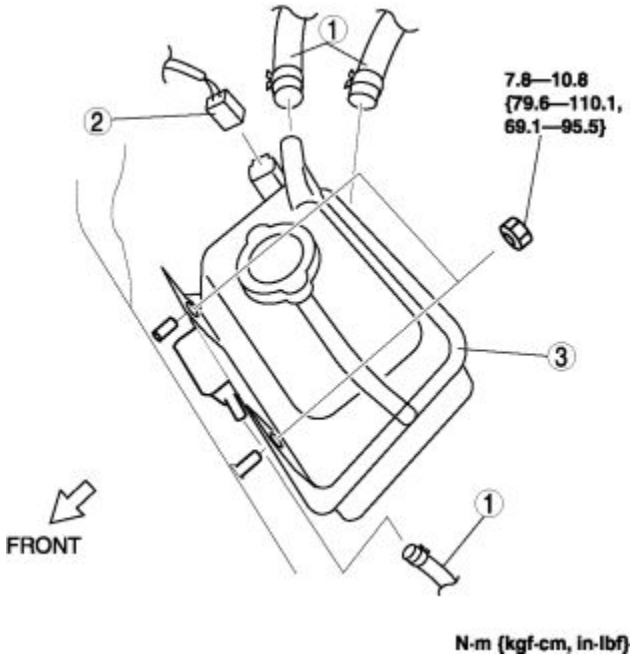
3. Disconnect the negative battery cable. (See BATTERY REMOVAL/INSTALLATION .)

4. Remove the battery, battery box. (See BATTERY REMOVAL/INSTALLATION .)

5. Remove the air cleaner component, air cleaner insulator. (See INTAKE-AIR SYSTEM REMOVAL/INSTALLATION .)

6. Drain the engine coolant until the coolant reserve tank becomes empty. (See ENGINE COOLANT REPLACEMENT .)

7. Remove in the order indicated in the table.



1	Hose
2	Connector
3	Coolant reserve tank

8. Install in the reverse order of removal.

9. Add the engine coolant. (See ENGINE COOLANT REPLACEMENT .)

10. Inspect for the engine coolant leakage. (See ENGINE COOLANT LEAKAGE INSPECTION .)

RADIATOR

RADIATOR REMOVAL/INSTALLATION

WARNING:

- Remove and install all parts when the engine is cold, otherwise they can cause severe burns or serious injury.

1. Remove the engine cover. (See ENGINE COVER REMOVAL/INSTALLATION .)

2. Remove the battery cover.

3. Disconnect the negative battery cable. (See BATTERY REMOVAL/INSTALLATION .)

4. Drain the engine coolant. (See ENGINE COOLANT REPLACEMENT .)

5. Remove the following.

    a. Splash shield

    b. Under cover

    c. Battery, battery box (See BATTERY REMOVAL/INSTALLATION .)

    d. Air cleaner component, air cleaner insulator (See INTAKE-AIR SYSTEM REMOVAL/INSTALLATION .)

    e. PCM duct

6. Position the coolant reserve tank out of the way. (See COOLANT RESERVE TANK REMOVAL/INSTALLATION .)

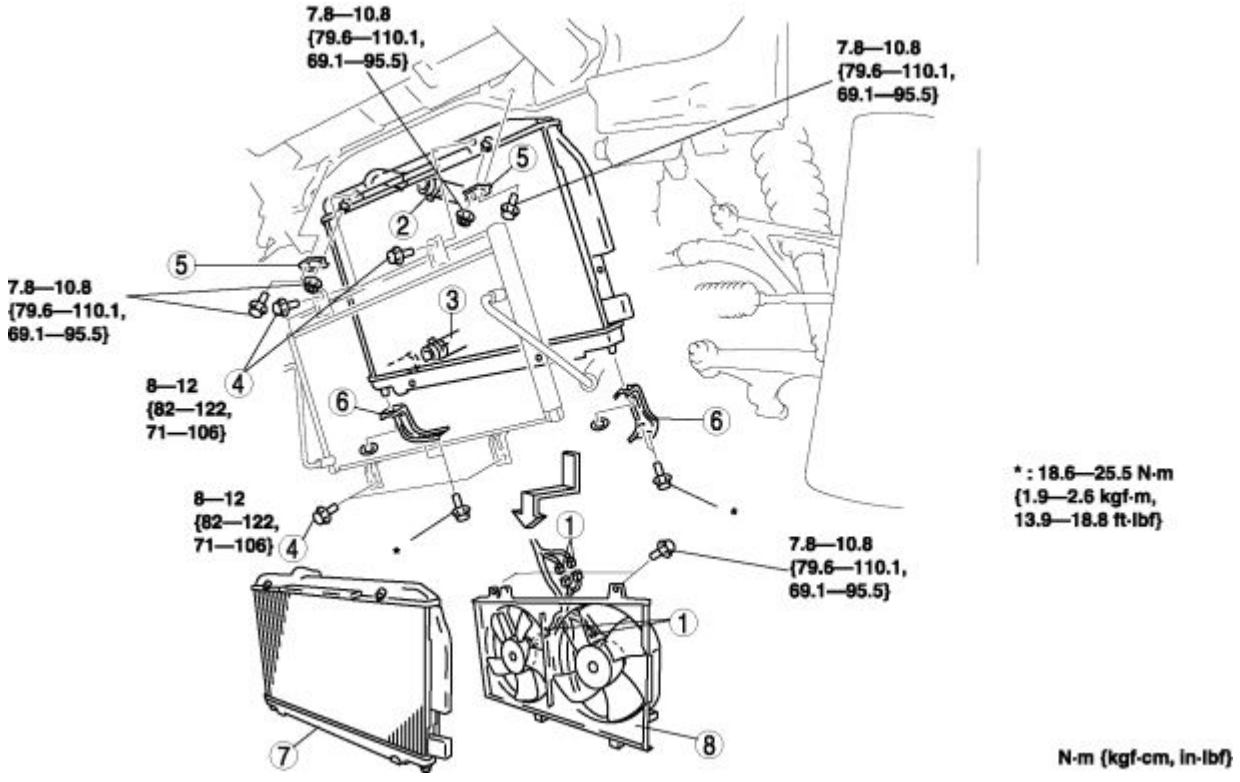
7. Disconnect the ATF oil cooler hose. (AT)

8. Remove in the order indicated in the table.

9. Install in the reverse order of removal.

10. Add engine coolant. (See ENGINE COOLANT REPLACEMENT .)

11. Inspect for engine coolant leakage. (See ENGINE COOLANT LEAKAGE INSPECTION .)



1	Connector
2	Upper radiator hose

3	Lower radiator hose
4	Condenser installation bolts
5	Bracket
6	Radiator bracket
7	Radiator
8	Cooling fan component

Notes:

THERMOSTAT

THERMOSTAT REMOVAL/INSTALLATION

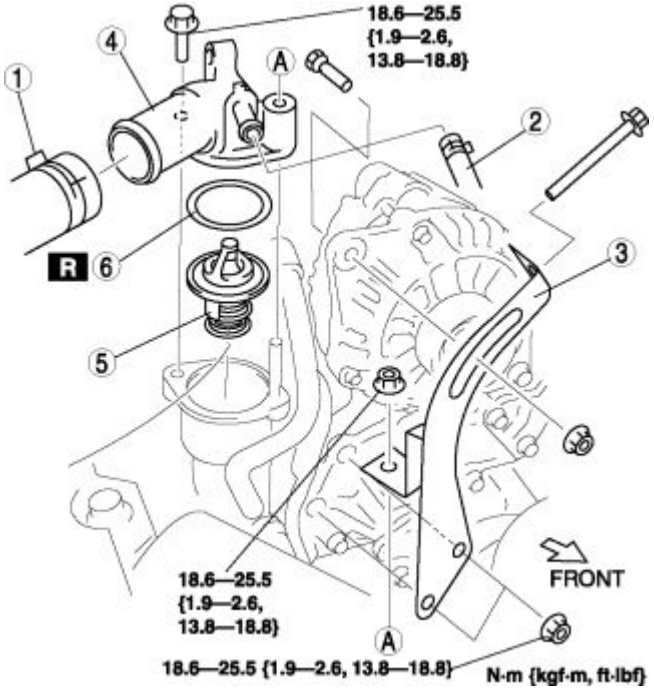
WARNING:

- Remove and install all parts when the engine is cold, otherwise they can cause severe burns or serious injury.

1. Remove the engine cover. (See ENGINE COVER REMOVAL/INSTALLATION .)
2. Remove the battery cover.
3. Disconnect the negative battery cable. (See BATTERY REMOVAL/INSTALLATION .)
4. Drain the engine coolant. (See ENGINE COOLANT REPLACEMENT .)
5. Remove the battery, battery box. (See BATTERY REMOVAL/INSTALLATION .)
6. Remove the secondary air control valve. (See SECONDARY AIR INJECTION (AIR) CONTROL VALVE REMOVAL/INSTALLATION .)
7. Before positioning the drive belt out of the way, loosen the water pump pulley installation bolt.
8. Position the drive belt out of the way. (See DRIVE BELT REPLACEMENT .)
9. Remove the water pump pulley. (See WATER PUMP REMOVAL/INSTALLATION .)
10. Remove in the order indicated in the table.
11. Install in the reverse order of removal.

12. Add engine coolant. (See ENGINE COOLANT REPLACEMENT .)

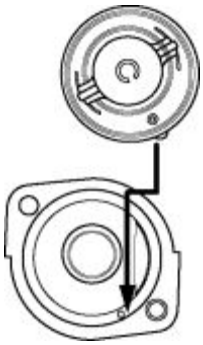
13. Inspect for engine coolant leakage. (See ENGINE COOLANT LEAKAGE INSPECTION .)



1	Upper radiator hose
2	Hose
3	Generator strap
4	Thermostat cover
5	Thermostat (See Thermostat Installation Note .)
6	O-ring

Thermostat Installation Note

1. Install the thermostat by fitting the projection on the thermostat to the recess of the thermostat case.



2. Install the thermostat.

THERMOSTAT INSPECTION

1. Inspect the thermostat for the following.

   WARNING:

   - During inspection, the thermostat and water are extremely hot and they can cause burns. Do not touch the thermostat and water.
   - The valve shall not open under normal temperature.
   - Opening temperature and valve lift
     - If there is any malfunction, replace the thermostat.

Item		Specification
Initial-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

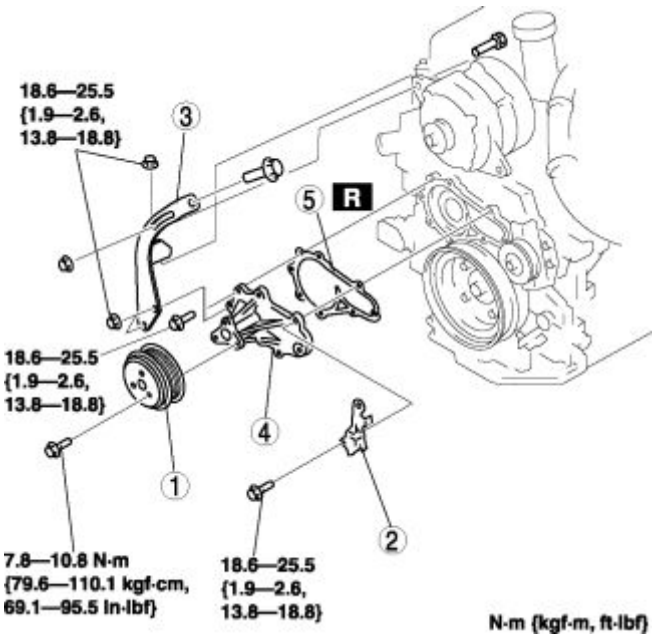
WATER PUMP

WATER PUMP REMOVAL/INSTALLATION

WARNING:

- Remove and install all parts when the engine is cold, otherwise they can cause severe burns or serious injury.

1. Remove the engine cover. (See ENGINE COVER REMOVAL/INSTALLATION .)
2. Remove the battery cover.
3. Disconnect the negative battery cable. (See BATTERY REMOVAL/INSTALLATION .)
4. Drain the engine coolant. (See ENGINE COOLANT REPLACEMENT .)
5. Remove the battery, battery box, battery tray. (See BATTERY REMOVAL/INSTALLATION .)
6. Before positioning the drive belt out of the way, loosen the water pump pulley installation bolt.
7. Position the drive belt out of the way. (See DRIVE BELT REPLACEMENT .)
8. Remove in the order indicated in the table.
9. Install in the reverse order of removal.
10. Add engine coolant. (See ENGINE COOLANT REPLACEMENT .)
11. Inspect for engine coolant leakage. (See ENGINE COOLANT LEAKAGE INSPECTION .)



1	Water pump pulley
2	Engine hanger (engine front side)
3	Generator strap
4	Water pump body
5	Gasket

COOLING FAN

FAN MOTOR REMOVAL/INSTALLATION

1. Remove the engine cover. (See ENGINE COVER REMOVAL/INSTALLATION .)

2. Remove the battery cover.

3. Disconnect the negative battery cable. (See BATTERY REMOVAL/INSTALLATION .)

4. Drain the engine coolant. (See ENGINE COOLANT REPLACEMENT .)

5. Remove the following.

    a. Splash shield

    b. Under cover

    c. Battery, battery box (See BATTERY REMOVAL/INSTALLATION .)

    d. Air cleaner component, air cleaner insulator (See INTAKE-AIR SYSTEM REMOVAL/INSTALLATION .)

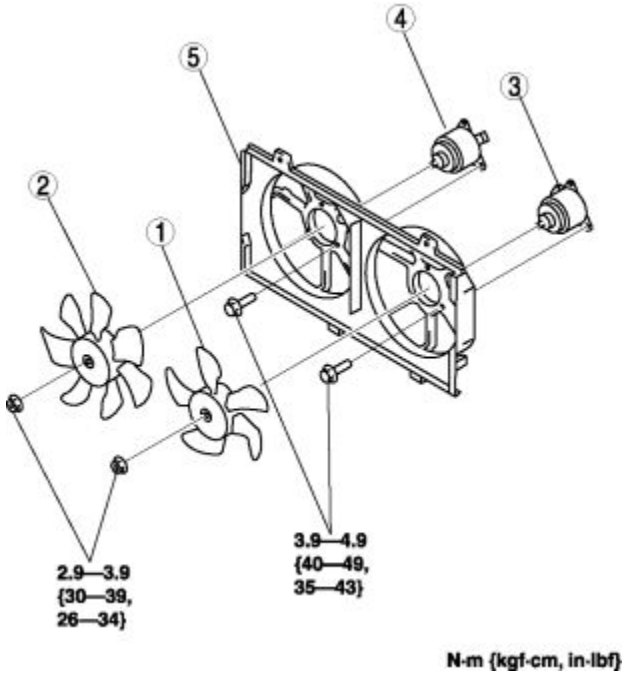
    e. PCM duct

6. Position the coolant reserve tank out of the way. (See COOLANT RESERVE TANK REMOVAL/INSTALLATION .)

7. Disconnect the ATF oil cooler hose. (AT)

8. Remove the radiator and cooling fan component. (See RADIATOR REMOVAL/INSTALLATION .)

9. Remove in the order indicated in the table.



1	Cooling fan No.1
2	Cooling fan No.2
3	Cooling fan motor No.1
4	Cooling fan motor No.2
5	Radiator cowling

10. Install in the reverse order of removal.

11. Add engine coolant. (See ENGINE COOLANT REPLACEMENT .)

12. Inspect for engine coolant leakage. (See ENGINE COOLANT LEAKAGE INSPECTION .)

FAN MOTOR INSPECTION

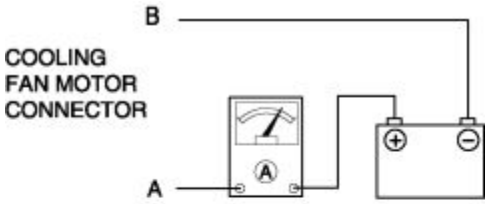
Part inspection

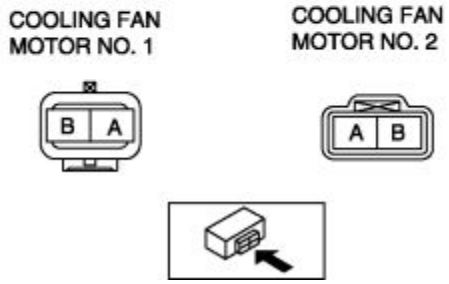
1. Verify that the battery voltage is **12 V** .

2. Install a tester and battery to the cooling fan motor connector as shown in the figure.

3. Verify that each fan motor operates smoothly at the standard current.
   - If there is any malfunction, replace the applicable part.

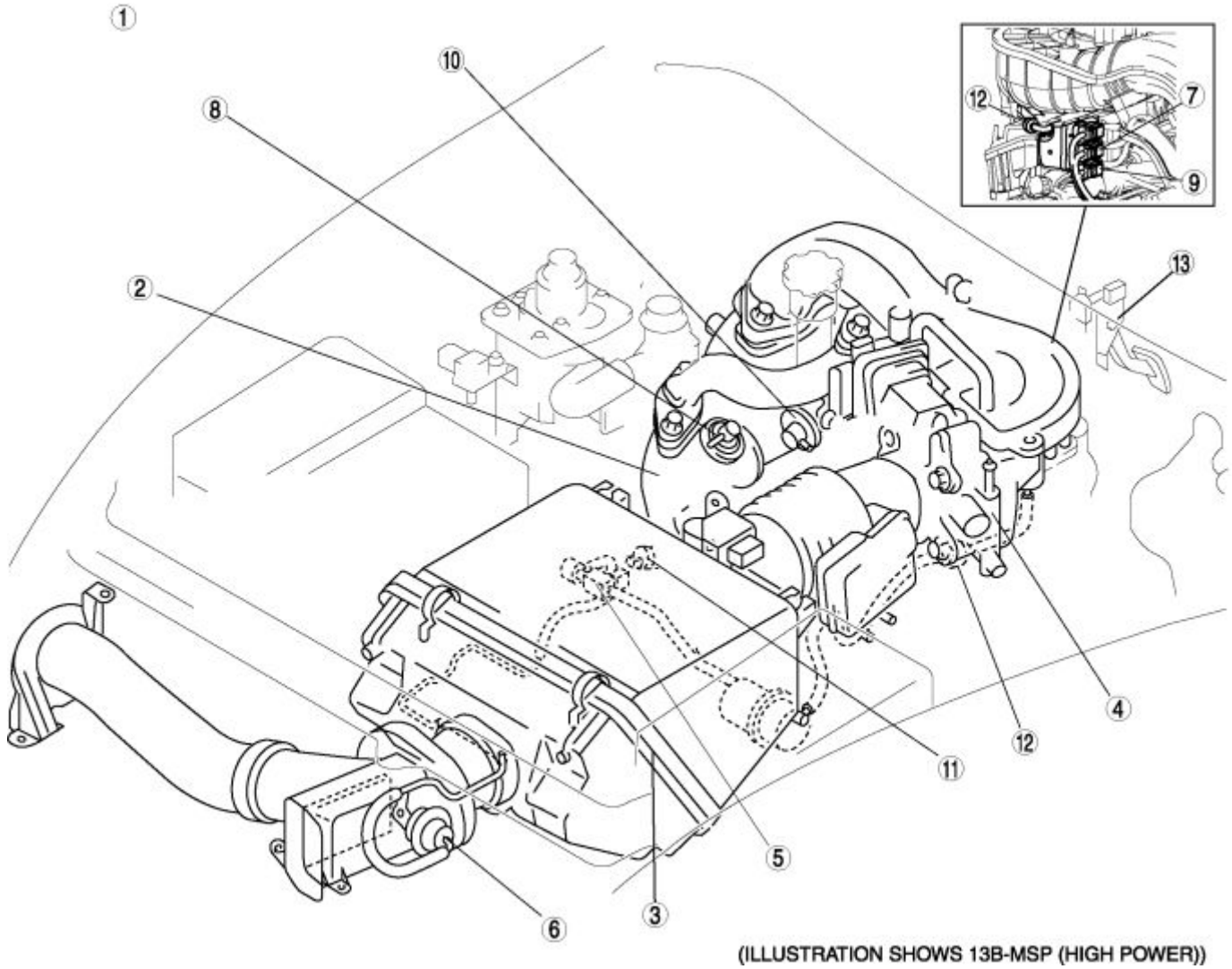
Item	Current (A)
Cooling fan No.1	8.9—11.9
Cooling fan No.2	4.0—7.0





INTAKE-AIR SYSTEM

INTAKE-AIR SYSTEM LOCATION INDEX

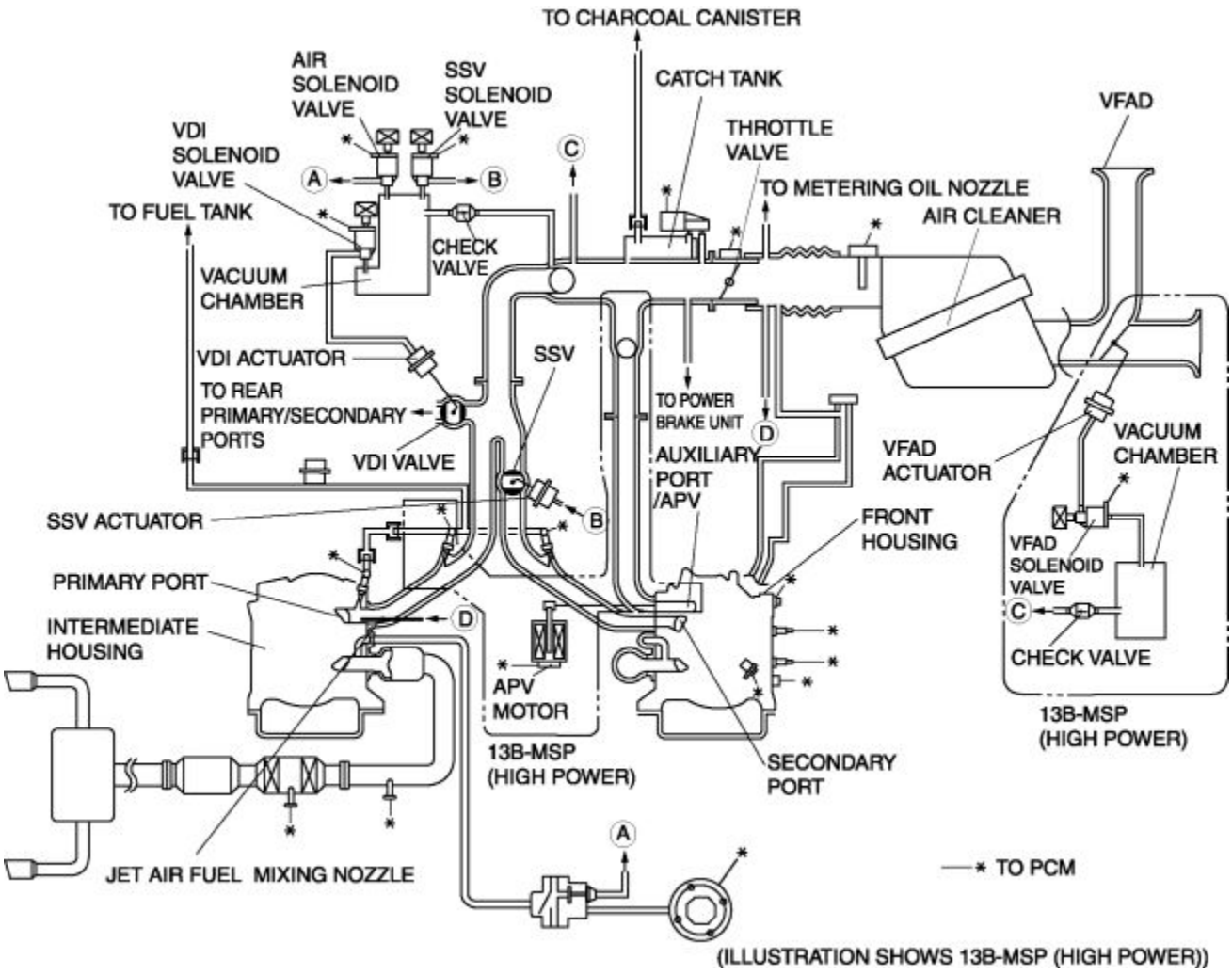


(ILLUSTRATION SHOWS 13B-MSP (HIGH POWER))

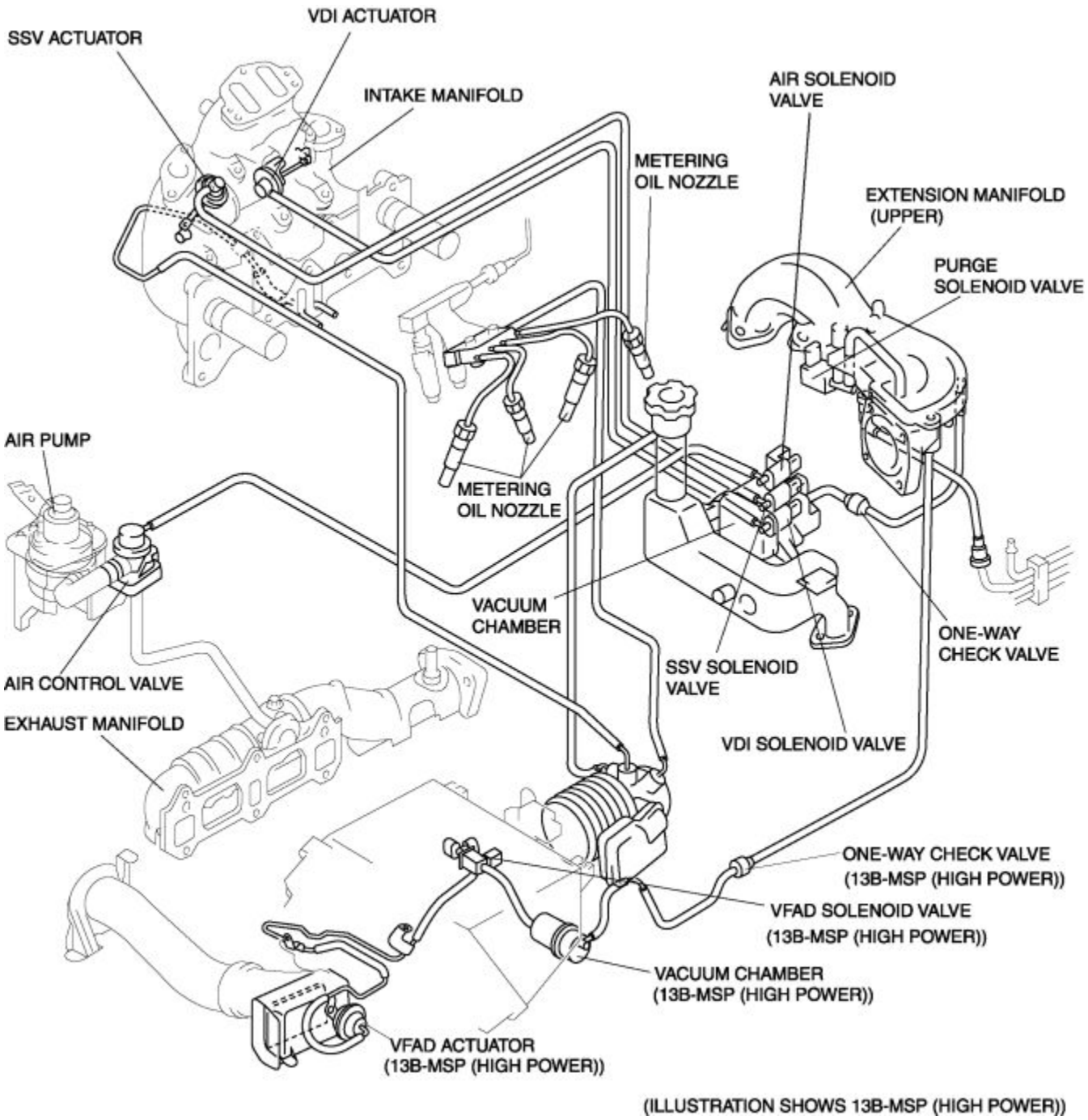
1	Intake-air system (See INTAKE-AIR SYSTEM MANIFOLD VACUUM INSPECTION .) (See INTAKE-AIR SYSTEM REMOVAL/INSTALLATION .) (See INTAKE-AIR SYSTEM INSPECTION .)
2	Intake manifold (See INTAKE MANIFOLD REMOVAL/INSTALLATION .)

	(See INTAKE MANIFOLD DISASSEMBLY/ASSEMBLY .)
3	Air cleaner element (See AIR CLEANER ELEMENT INSPECTION .)
4	Throttle body (See THROTTLE BODY INSPECTION .)
5	VFAD solenoid valve (13B-MSP (high power)) (See VARIABLE FRESH AIR DUCT (VFAD) SOLENOID VALVE INSPECTION (13B-MSP (HIGH POWER)) .)
6	VFAD actuator (13B-MSP (high power)) (See VARIABLE FRESH AIR DUCT (VFAD) ACTUATOR INSPECTION (13B-MSP (HIGH POWER)) .)
7	SSV solenoid valve (See SECONDARY SHUTTER VALVE (SSV) SOLENOID VALVE INSPECTION .)
8	SSV actuator (See SECONDARY SHUTTER VALVE (SSV) ACTUATOR INSPECTION .)
9	VDI solenoid valve (See VARIABLE DYNAMIC EFFECT INTAKE-AIR (VDI) SOLENOID VALVE INSPECTION .)
10	VDI actuator (See VARIABLE DYNAMIC EFFECT INTAKE-AIR (VDI) ACTUATOR INSPECTION .)
11	APV motor (13B-MSP (high power)) (See AUXILIARY PORT VALVE (APV) MOTOR INSPECTION (13B-MSP (HIGH POWER)) .)
12	Check valve (See CHECK VALVE (ONE-WAY) INSPECTION .)
13	Accelerator pedal (See ACCELERATOR PEDAL REMOVAL/INSTALLATION .)

INTAKE-AIR SYSTEM DIAGRAM



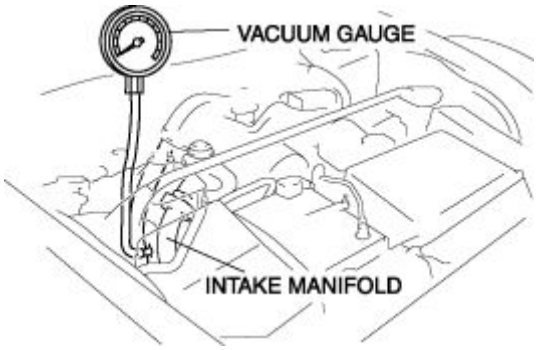
INTAKE-AIR SYSTEM HOSE ROUTING DIAGRAM



INTAKE-AIR SYSTEM MANIFOLD VACUUM INSPECTION

1. Verify that the intake-air system related parts and hoses are securely installed.

2. Remove the intake manifold blind cap and install the vacuum gauge.



3. Warm up the engine.

4. Measure intake manifold vacuum while no load and Idling.

Intake manifold vacuum

- MT: −66.7——56.0 kPa {−500.2——420.1 mmHg, −19.6——16.6 inHg
- AT: −67.3——53.4 kPa {−504.7——400.6 mmHg, −19.8——15.8 inHg
- If not within the specification, perform the following inspection:
  - Compression pressure (See COMPRESSION INSPECTION .)
  - Air intake
    - Each hose installation part
    - Throttle body installation part
    - Fuel injector installation parts
    - Extension manifold (upper, lower) installation part
    - Purge solenoid valve installation part
    - Intake manifold installation part

INTAKE-AIR SYSTEM REMOVAL/INSTALLATION

WARNING:

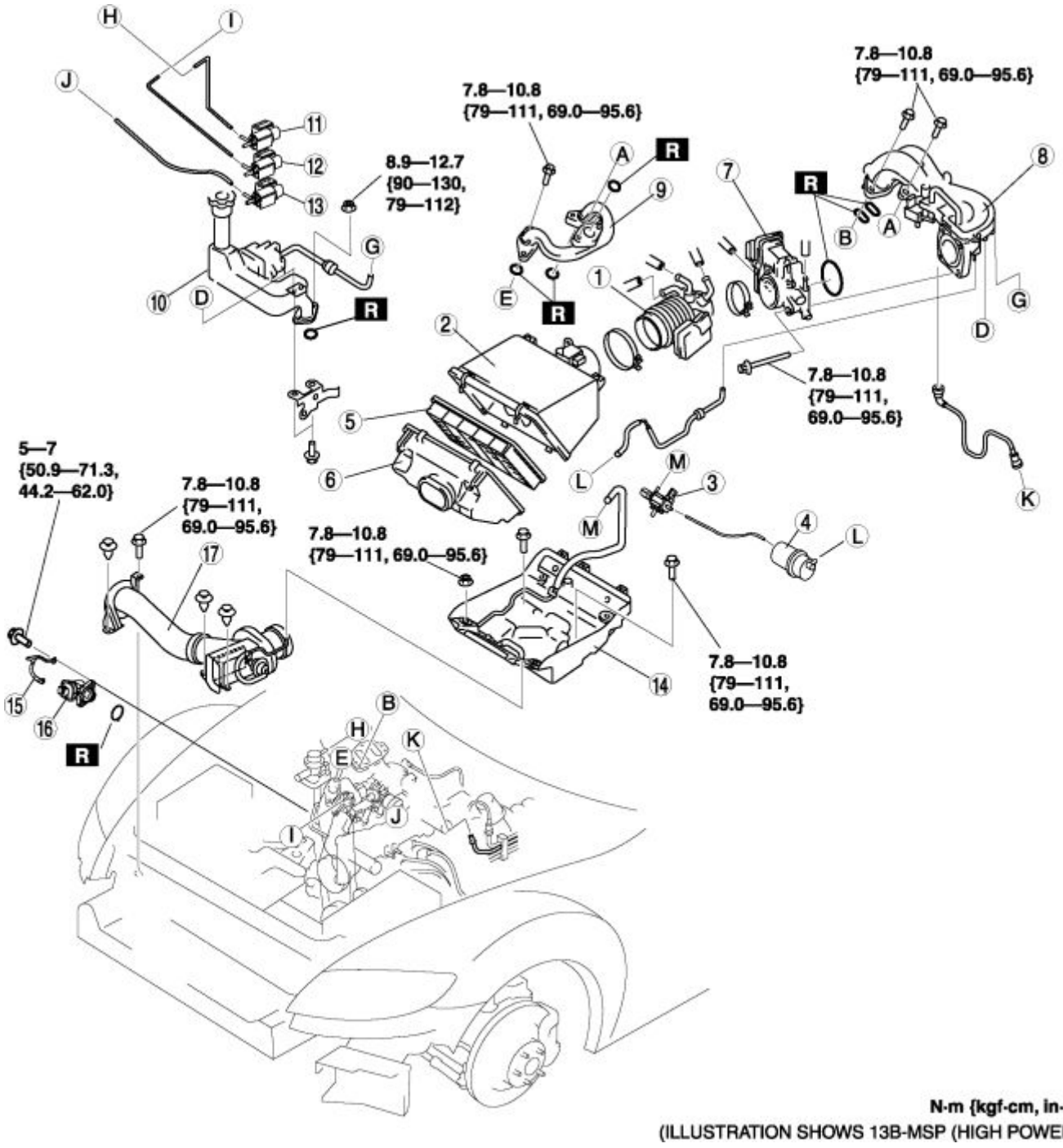
- A hot engine and intake-air system can cause severe burns. Turn off the engine and wait until they are cool before removing the intake-air system.
- Fuel line spills and leakage from the pressurized fuel system are dangerous. Fuel can ignite and cause serious injury or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete the "Fuel Line Safety Procedure", while referring to the "BEFORE SERVICE PRECAUTIONS".

1. Drain the engine coolant. (See ENGINE COOLANT REPLACEMENT .)

2. Remove in the order indicated in the table.

3. Install in the reverse order of removal.

Notes:



1	Air hose (See Air Hose Installation Note .)
2	Air cleaner cover
3	VFAD solenoid valve (13B-MSP (High power))
4	Vacuum chamber (13B-MSP (High power))
5	Air cleaner element
6	Air cleaner case

7	Throttle body
8	Extension manifold (upper)
9	Extension manifold (lower) (13B-MSP (High power))
10	Oil filler pipe
11	AIR solenoid valve
12	SSV solenoid valve
13	VDI solenoid valve
14	Air cleaner insulator (See Air Cleaner Insulator Installation Note .)
15	Bracket (13B-MSP (High power))
16	APV motor (13B-MSP (High power))
17	Fresh-air duct (See Fresh-air Duct Removal Note .) (See Fresh-air Duct Installation Note .)

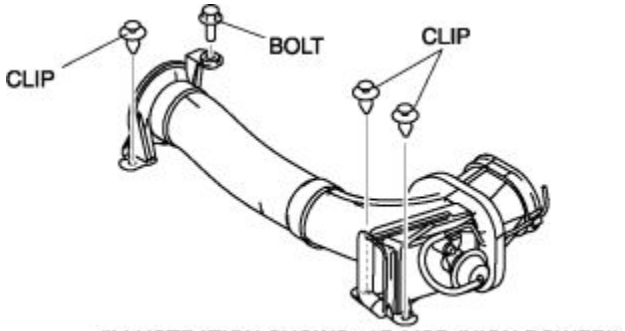
Fresh-air Duct Removal Note

1. Remove the front bumper. (See FRONT BUMPER REMOVAL/INSTALLATION .)

Fresh-air Duct Installation Note

1. Install the clips.

2. Tighten the bolt to the specified torque.



(ILLUSTRATION SHOWS 13B-MSP (HIGH POWER))

Tightening torque

- 7.8—10.8 N·m {79—111 kgf·cm, 69.0—95.6 in·lbf}

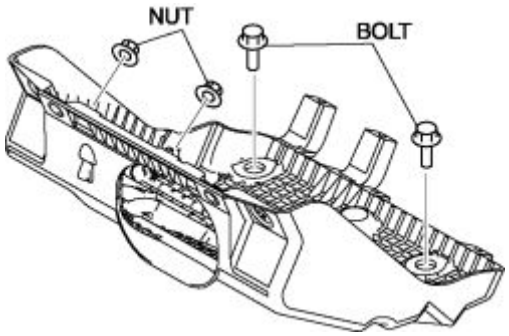
Air Cleaner Insulator Installation Note

1. Temporarily tighten nuts.

2. Temporarily tighten bolts.

3. Tighten the nuts to the specified torque.

4. Tighten the bolts to the specified torque.

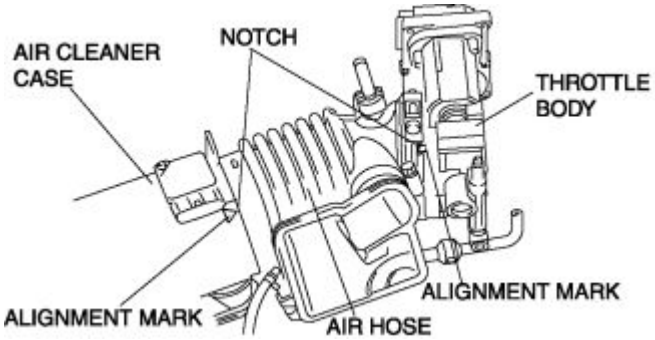


Tightening torque

- 7.8—10.8 N·m {79—111 kgf·cm, 69.0—95.6 in·lbf}

Air Hose Installation Note

1. Align the alignment marks with the air hose notches.



INTAKE-AIR SYSTEM INSPECTION

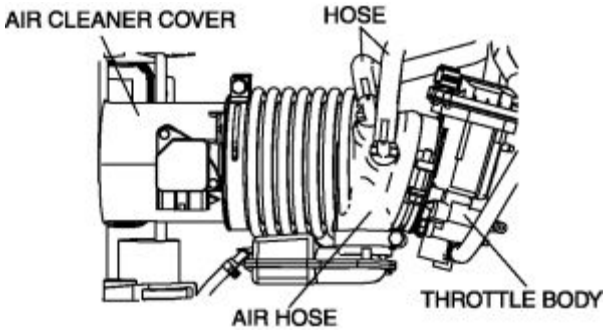
1. Perform the following intake-air system part inspections.

   NOTE:

   - If there is improper installation or a malfunction of an intake-air system part, it could cause poor emission, low engine output, or rough idling.

Air Hose Inspection

1. Visually inspect the following items:
   - If there is any abnormality, reinstall or replace the air hose.
     - Is there any looseness or disconnection of air hose and air cleaner cover connecting parts?
     - Is there any looseness or disconnection of air hose and throttle body connecting parts?
     - Is the hose correctly installed?
     - Are there any cracks or splits in the air hose?



Hose Inspection

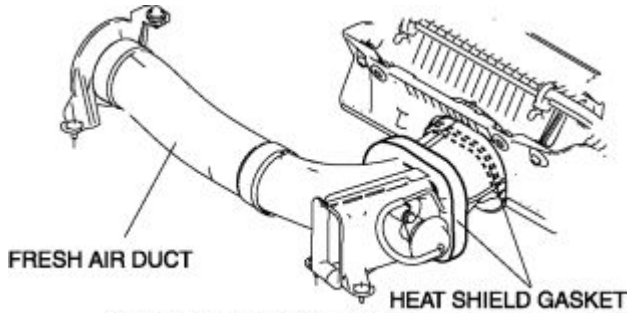
1. Refer to the intake-air system hose routing diagram and verify that the hoses are installed in the correct positions. (See INTAKE-AIR SYSTEM HOSE ROUTING DIAGRAM .)
   - If there is any abnormality, install in the correct position.

2. Verify that there is no crushing, cracks, or splits on the intake air hose.
   - If there is any abnormality, repair or replace the intake air hose.

Fresh-air Duct Inspection

1. Remove the fresh air duct. (See INTAKE-AIR SYSTEM REMOVAL/INSTALLATION .)

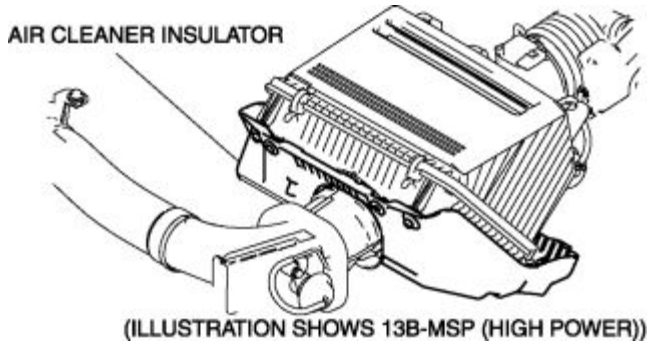
2. Verify that there is no damage or peeling on the heat shield gasket for the fresh air duct.
    - If there is any abnormality, repair or replace the fresh air duct.



(ILLUSTRATION SHOWS 13B-MSP (HIGH POWER))

Air Cleaner Insulator Inspection

1. Verify that the air cleaner insulator has been installed.
    - If it has not been installed, install an air cleaner insulator.



(ILLUSTRATION SHOWS 13B-MSP (HIGH POWER))

AIR CLEANER

AIR CLEANER ELEMENT INSPECTION

1. Remove the air hose. (See INTAKE-AIR SYSTEM REMOVAL/INSTALLATION .)

2. Unclip the air cleaner cover. (See INTAKE-AIR SYSTEM REMOVAL/INSTALLATION .)

3. Remove the air cleaner element. (See INTAKE-AIR SYSTEM REMOVAL/INSTALLATION .)

4. Inspect the following items:
    - If there is any abnormality, clean or replace the air cleaner element.
        - Has the replacement interval come?
        - 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?

THROTTLE BODY

THROTTLE BODY INSPECTION

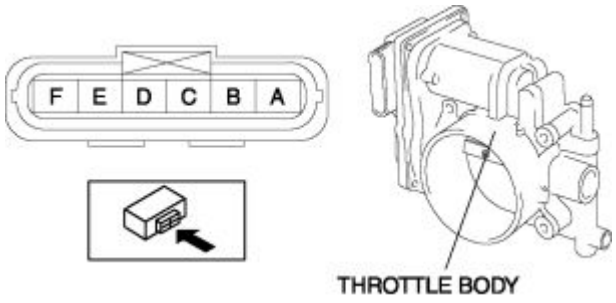
NOTE:

- Perform the following inspection only when directed.

Resistance Inspection

1. Remove the throttle body. (See INTAKE-AIR SYSTEM REMOVAL/INSTALLATION .)

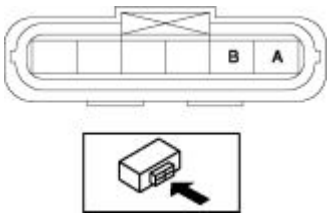
2. Verify that there is no continuity between the throttle body and throttle body each terminal using an ohmmeter.
   - If not as specified, replace the throttle body. (See INTAKE-AIR SYSTEM REMOVAL/INSTALLATION .)



3. Measure the resistance between the throttle actuator terminals using an ohmmeter.
   - If not as specified, replace the throttle body. (See INTAKE-AIR SYSTEM REMOVAL/INSTALLATION .)
   - If as specified, carry out the "Circuit Open/Short Inspection".

   Throttle actuator resistance

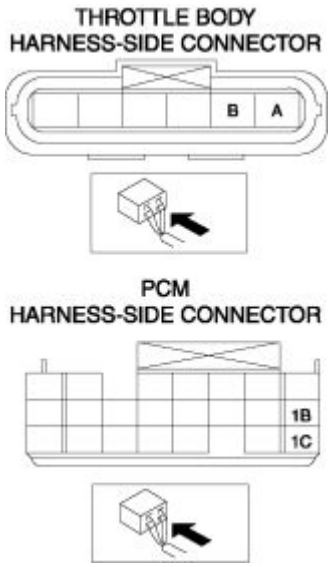
Ambient temperature (°C {°F})	Resistance (ohm)
Approx. 20 {68}	0.3—100



Circuit Open/Short Inspection

1. Disconnect the PCM connector. (See PCM REMOVAL/INSTALLATION .)

2. Inspect the following wiring harnesses for open or short (continuity check).



Open circuit

- If there is no continuity, the circuit is open. Repair or replace the wiring harness.
  - Throttle body terminal A (wiring harness-side) and PCM terminal 1B
  - Throttle body terminal B (wiring harness-side) and PCM terminal 1C

Short circuit

- If there is continuity, the circuit is shorted. Repair or replace the wiring harness.
  - Throttle body terminal A (wiring harness-side) and power supply
  - Throttle body terminal A (wiring harness-side) and GND
  - Throttle body terminal B (wiring harness-side) and power supply
  - Throttle body terminal B (wiring harness-side) and GND

Throttle Valve Inspection

1. Remove the throttle body. (See INTAKE-AIR SYSTEM REMOVAL/INSTALLATION .)

2. Open the throttle valve from the closed position to open the fully position by hand.

3. Verify that the throttle valve moves smoothly.
   - If cannot be verified, replace the throttle body.

4. Release hand from the throttle valve when at the fully open position.

5. Verify that the throttle valve returns to the closed position smoothly by spring force.
    - If cannot be verified, replace the throttle body.

6. Press the throttle valve from the closed position to the fully closed position by hand.

7. Verify that the throttle valve move approx. 5°.
    - If cannot be verified, replace the throttle body.

Notes:

INTAKE MANIFOLD

INTAKE MANIFOLD REMOVAL/INSTALLATION

WARNING:

- Fuel vapor is hazardous. It can very easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.
- Fuel line spills and leakage from the pressurized fuel system 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 the "Fuel Line Safety Procedure" when servicing the fuel system. (See BEFORE REPAIR PROCEDURE .)
- Remove the engine, transmission and crossmember carefully, holding it steady. If the transmission falls it could be damaged or cause injury.
- After disconnecting the steering shaft joint, always set the EPS system to the neutral position to prevent system malfunction. (See EPS SYSTEM NEUTRAL POSITION SETTING .)

NOTE:

- The engine must be removed to remove the intake manifold.
- Remove the engine, transmission, and crossmember component as a single unit downward of the vehicle.

1. Remove the following parts:

    a. The front wheel and tires (See GENERAL PROCEDURES (SUSPENSION)

    b. The engine cover (See ENGINE COVER REMOVAL/INSTALLATION .)

    c. The front suspension tower bar (See FRONT SUSPENSION TOWER BAR REMOVAL/INSTALLATION .)

    d. The battery cover, battery, battery box and battery tray (See BATTERY REMOVAL/INSTALLATION .)

    e. The air cleaner, intake-air duct and air cleaner insulator (See INTAKE-AIR SYSTEM REMOVAL/INSTALLATION .)

    f. The PCM (See PCM REMOVAL/INSTALLATION .)

g. The AIR pump. (See SECONDARY AIR INJECTION (AIR) PUMP REMOVAL/INSTALLATION .)

2. Drain the engine coolant. (See ENGINE COOLANT REPLACEMENT .)

3. Disconnect the brake vacuum hose.

4. Disconnect the quick release connector going to the charcoal canister from the engine room side. (See QUICK RELEASE CONNECTOR REMOVAL/INSTALLATION .)

5. Disconnect the plastic fuel hose. (See BEFORE REPAIR PROCEDURE .) (See FUEL INJECTOR REMOVAL/INSTALLATION .)

6. Remove the ignition coil. (See IGNITION COIL REMOVAL/INSTALLATION .)

7. Remove the A/C belt. (See DRIVE BELT REPLACEMENT .)

8. Remove the A/C compressor with the pipes connected and secure the A/C compressor using wire or rope so that it is out of the way.

9. Disconnect the engine wiring harness from the main fuse block side.

10. Remove the engine under cover.

11. Disconnect front ABS wheel speed sensor connector. (See FRONT ABS WHEEL-SPEED SENSOR REMOVAL/INSTALLATION .)

12. Disconnect the radiator hose, the heater hose and coolant reserve tank hose.

13. AT
    - Disconnect the selector link. (See AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION .)

    MT

    - Remove the clutch release cylinder with the pipes connected and secure the clutch release cylinder using wire or rope so that it is out of the way. (See CLUTCH RELEASE CYLINDER REMOVAL/INSTALLATION .)
    - Remove the shift lever component. (See TRANSMISSION REMOVAL/INSTALLATION .)

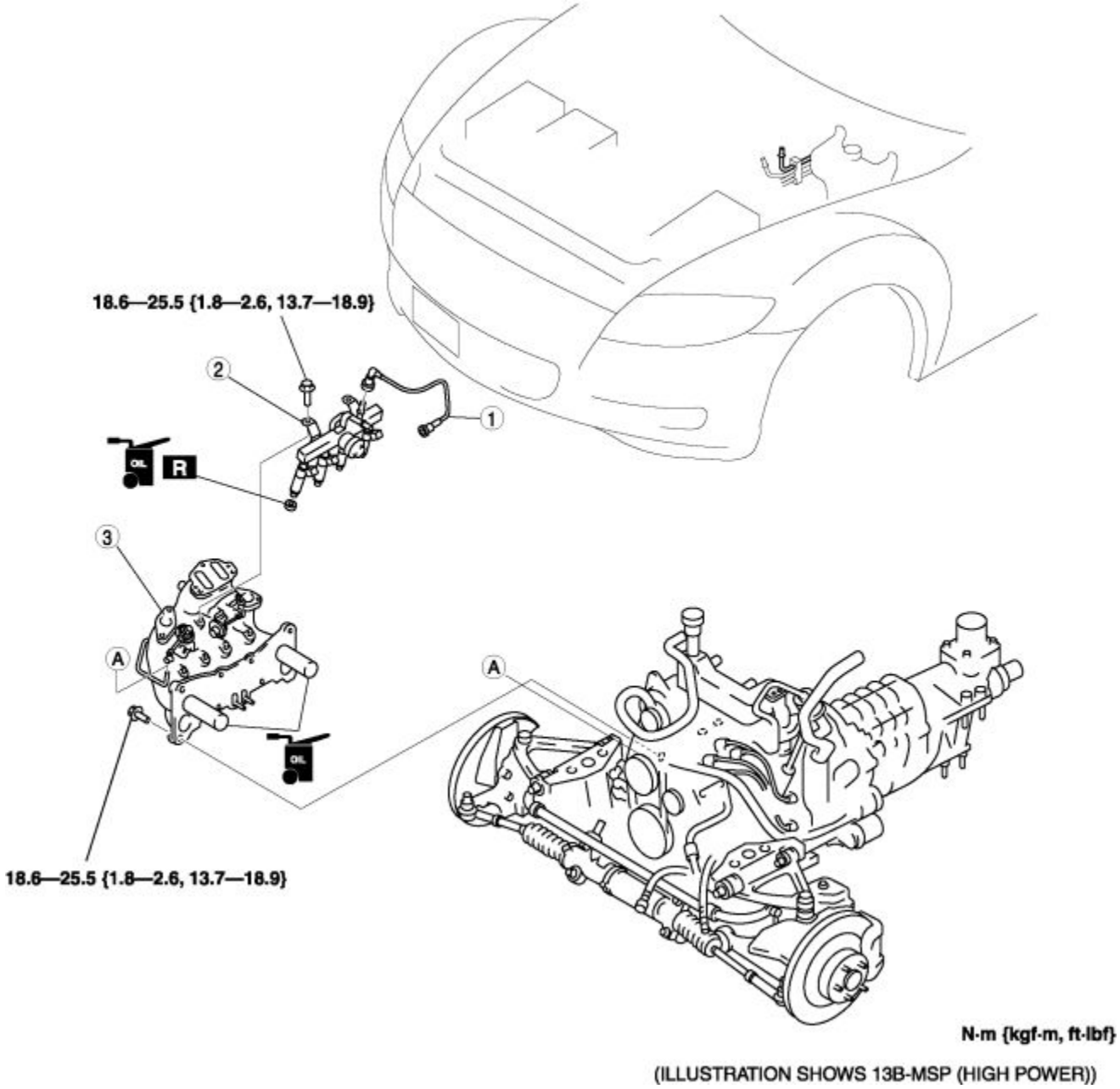
14. Remove the engine, transmission, and crossmember component. (See ENGINE REMOVAL/INSTALLATION .)

15. Remove the extension manifold (upper and lower). (See INTAKE-AIR SYSTEM REMOVAL/INSTALLATION .)

16. Remove the AIR control valve. (See SECONDARY AIR INJECTION (AIR) CONTROL VALVE REMOVAL/INSTALLATION .)

17. Remove in the order indicated in the table.

18. Install in the reverse order of removal.

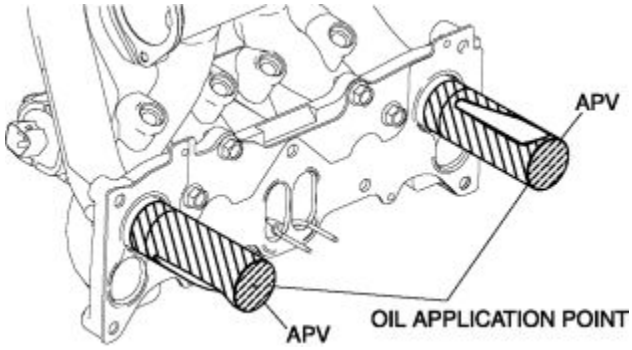


(ILLUSTRATION SHOWS 13B-MSP (HIGH POWER))

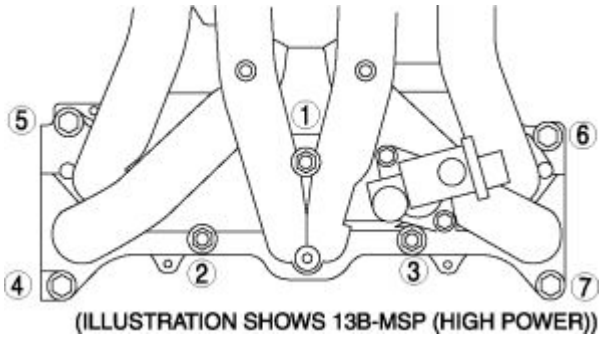
1	Fuel hose (See QUICK RELEASE CONNECTOR REMOVAL/INSTALLATION .)
2	Fuel distributor (primary 2, secondary)
3	Intake manifold (See Intake Manifold Installation Note .)

Intake Manifold Installation Note

1. Apply oil thoroughly to the APVs (13B−MSP (HIGH POWER)) as shown in the figure.



2. Tighten the bolts in the order shown in the figure



(ILLUSTRATION SHOWS 13B-MSP (HIGH POWER))

3. Retighten the No.1 bolt after tighten the all bolts.

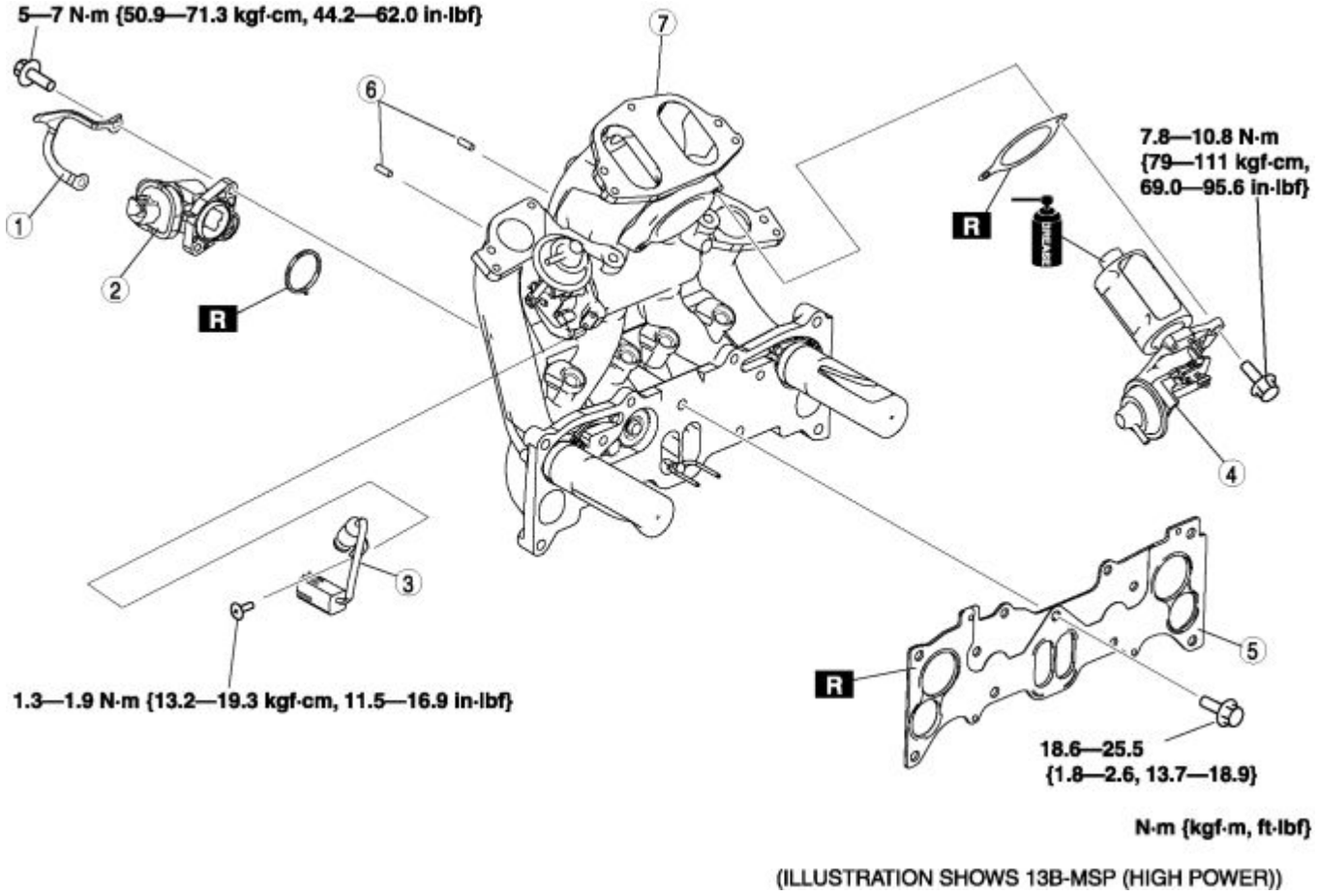
Tightening torque

- 18.6—25.5 N·m {1.8—2.6 kgf·m, 13.7—18.9 ft·lbf}

INTAKE MANIFOLD DISASSEMBLY/ASSEMBLY

1. Remove in the order indicated in the table.

2. Install in the reverse order of removal.

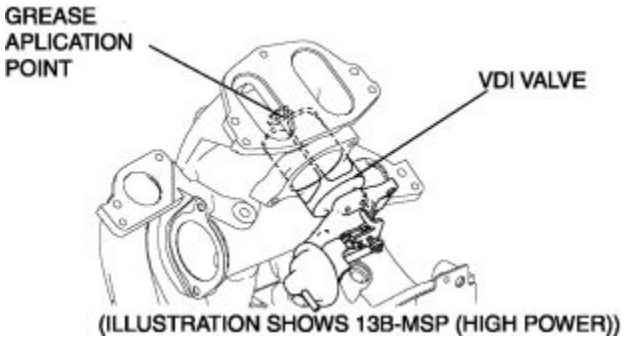


(ILLUSTRATION SHOWS 13B-MSP (HIGH POWER))

1	Bracket (13B-MSP (HIGH POWER))
2	APV motor (13B-MSP (HIGH POWER))
3	SSV switch
4	VDI valve (See VDI Valve Assembly Note .)
5	Gasket
6	Blind cap
7	Intake manifold

VDI Valve Assembly Note

1. Apply grease to the VDI valve end as shown in the figure.



(ILLUSTRATION SHOWS 13B-MSP (HIGH POWER))

Notes:

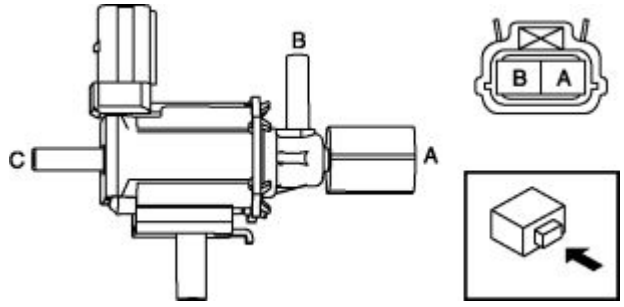
VARIABLE FRESH AIR DUCT SOLENOID VALVE

VARIABLE FRESH AIR DUCT (VFAD) SOLENOID VALVE INSPECTION (13B-MSP (HIGH POWER))

1. Disconnect the negative battery cable.

2. Remove the VFAD solenoid valve. (See INTAKE-AIR SYSTEM REMOVAL/INSTALLATION .)

3. Inspect for airflow with the steps in the table below.



- If it is normal, inspect related wiring harnesses.
- If there is any malfunction, replace the VFAD solenoid valve. (See INTAKE-AIR SYSTEM REMOVAL/INSTALLATION .)

: Resistance : Airflow

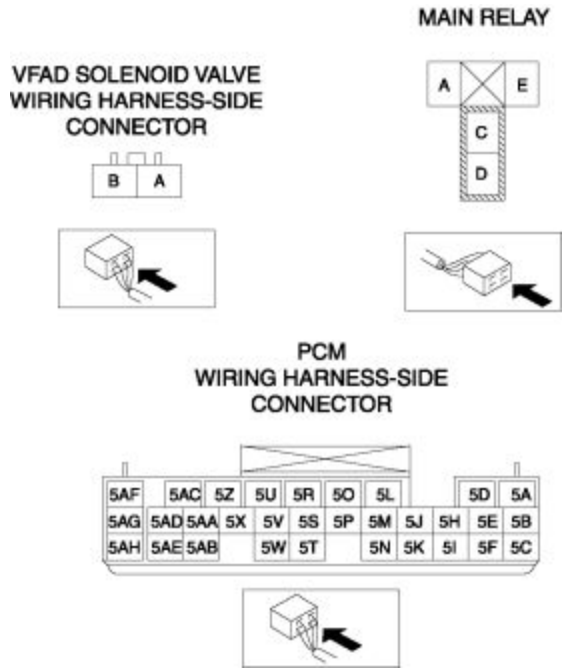
Step	Terminal		Port		
	A	B	A	B	C
1	R				
2	B+	GND			

R: Approx. 28 ohms (20°C {68°F})

Circuit Open/Short Inspection

1. Disconnect the PCM connector. (See PCM REMOVAL/INSTALLATION .)

2. Inspect the following wiring harness for open or short (continuity check).



Open circuit

- If there is no continuity, the circuit is open. Repair or replace the harness.
  - VFAD solenoid valve terminal B (harness-side) and PCM terminal 5Z
  - VFAD solenoid valve terminal A (harness-side) and main relay terminal C (harness-side)

Short circuit

- If there is continuity, the circuit is shorted. Repair or replace the harness.
  - VFAD solenoid valve terminal B (harness-side) and body GND
  - VFAD solenoid valve terminal A (harness-side) and power supply

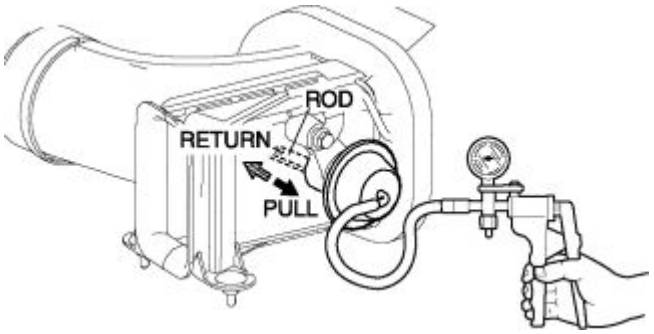
VARIABLE FRESH AIR DUCT ACTUATOR

VARIABLE FRESH AIR DUCT (VFAD) ACTUATOR INSPECTION (13B-MSP (HIGH POWER))

1. Remove the front bumper. (See FRONT BUMPER REMOVAL/INSTALLATION .)

2. Disconnect the vacuum hose of the VFAD actuator.

3. Install the vacuum pump to the VFAD actuator.



4. Verify that the rod moves as indicated in the table below when gradually applying a vacuum to the VFAD actuator.
   - If it cannot be verified, replace the fresh-air duct. (See INTAKE-AIR SYSTEM REMOVAL/INSTALLATION .)

   Rod movement

Vacuum (kPa {mmHg, inHg})	Rod movement
–13 {–97.5, –3.8} or more	Starts to move
–40 {–300.0, –11.8} or less	Fully pulled
–8.7 {–65.3, –2.6} or more	Fully returned

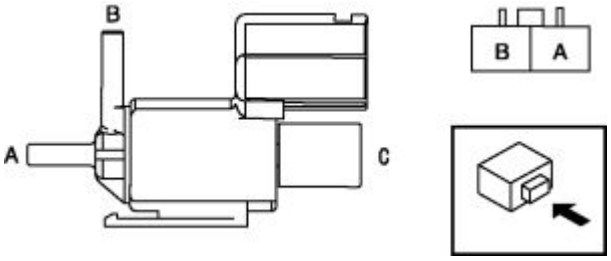
SECONDARY SHUTTER VALVE SOLENOID VALVE

SECONDARY SHUTTER VALVE (SSV) SOLENOID VALVE INSPECTION

1. Disconnect the negative battery cable.

2. Remove the SSV solenoid valve. (See INTAKE-AIR SYSTEM REMOVAL/INSTALLATION .)

3. Inspect for airflow using the steps in the table below.



- If it is normal, inspect related wiring harnesses.
- If there is any malfunction, replace the SSV solenoid valve.

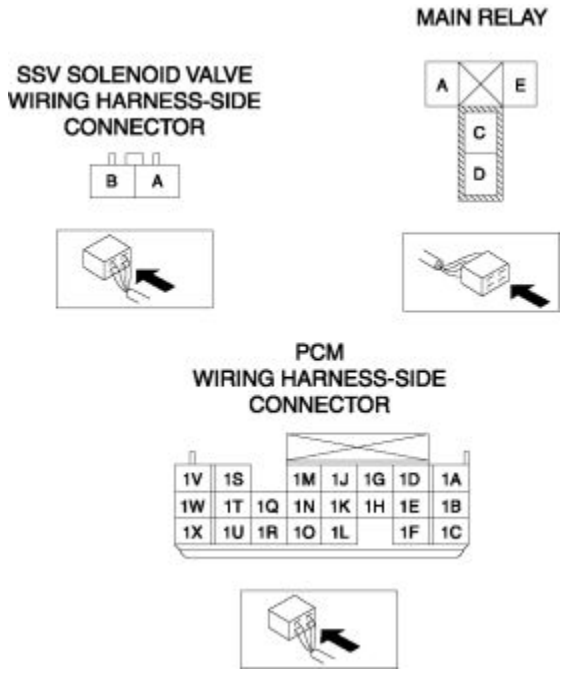
: Continuity : Airflow

Step	Terminal		Port		
	A	B	A	B	C
1	○—○			○═○	
2	B+	GND	○═○		

Circuit Open/Short Inspection

1. Disconnect the PCM connector. (See PCM REMOVAL/INSTALLATION .)

2. Inspect the following wiring harness for open or short (continuity check).



Open circuit

- If there is no continuity, the circuit is open. Repair or replace the harness.
  - SSV solenoid valve terminal B (harness-side) and PCM terminal 1L
  - SSV solenoid valve terminal A (harness-side) and main relay terminal C (harness-side)

Short circuit

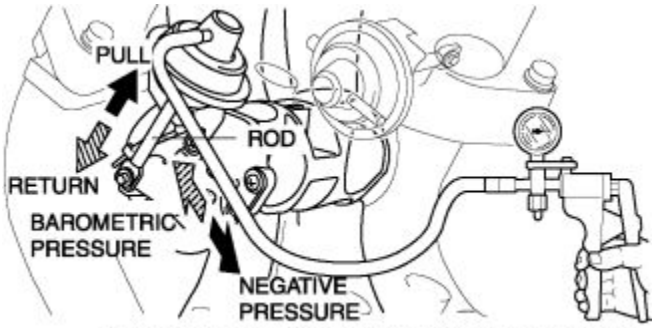
- If there is continuity, the circuit is shorted. Repair or replace the harness.
  - SSV solenoid valve terminal B (harness-side) and body GND
  - SSV solenoid valve terminal A (harness-side) and power supply

SECONDARY SHUTTER VALVE ACTUATOR

SECONDARY SHUTTER VALVE (SSV) ACTUATOR INSPECTION

1. Disconnect the vacuum hose of the SSV actuator.

2. Install the vacuum pump to the SSV actuator.



(ILLUSTRATION SHOWS 13B-MSP (HIGH POWER))

3. Verify that the rod moves as indicated in the table below when gradually applying a vacuum to the SSV actuator.
   - If there is any malfunction, replace the intake manifold. (See INTAKE MANIFOLD REMOVAL/INSTALLATION .)

   Rod movement

Vacuum (kPa {mmHg, inHg})	Rod movement
–3.6 {–27.0, –1.1} or more	Starts to move
–27.9 {–209.2, –8.2} or less	Fully pulled
1.2 {9.0, 0.4} or more	Fully returned

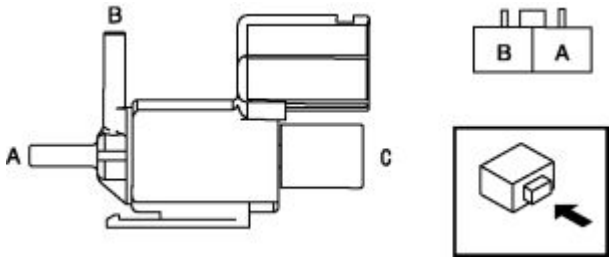
VARIABLE DYNAMIC EFFECT INTAKE-AIR SOLENOID VALVE

VARIABLE DYNAMIC EFFECT INTAKE-AIR (VDI) SOLENOID VALVE INSPECTION

1. Disconnect the negative battery cable.

2. Remove the VDI solenoid valve. (See INTAKE-AIR SYSTEM REMOVAL/INSTALLATION .)

3. Inspect for airflow with the steps in the table below.



- If it is normal, inspect related wiring harnesses.
- If there is any malfunction, replace the VDI solenoid valve. (See INTAKE-AIR SYSTEM REMOVAL/INSTALLATION .)

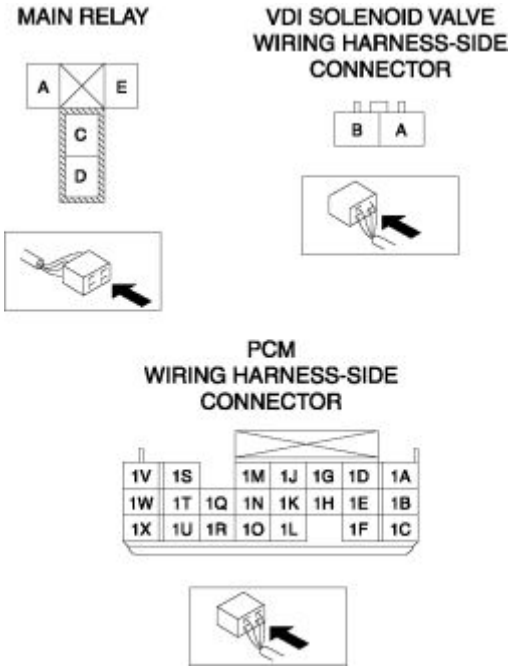
: Continuity : Airflow

Step	Terminal		Port		
	A	B	A	B	C
1	○—○			○=○	
2	B+	GND	○=○		

Circuit Open/Short Inspection

1. Disconnect the PCM connector. (See PCM REMOVAL/INSTALLATION .)

2. Inspect the following wiring harness for open or short (continuity check).



Open circuit

- If there is no continuity, the circuit is open. Repair or replace the harness.
  - VDI solenoid valve terminal B (harness-side) and PCM terminal 1W
  - VDI solenoid valve terminal A (harness-side) and main relay terminal C (harness-side)

Short circuit

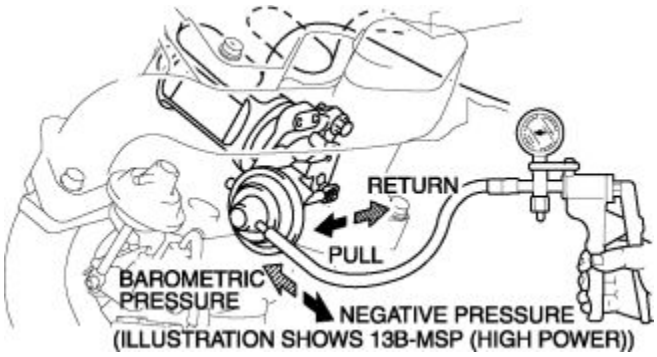
- If there is continuity, the circuit is shorted. Repair or replace the harness.
  - VDI solenoid valve terminal B (harness-side) and body GND
  - VDI solenoid valve terminal A (harness-side) and power supply

VARIABLE DYNAMIC EFFECT INTAKE-AIR ACTUATOR

VARIABLE DYNAMIC EFFECT INTAKE-AIR (VDI) ACTUATOR INSPECTION

1. Disconnect the VDI actuator vacuum hose.

2. Install the vacuum pump to the VDI actuator.



3. Verify that the rod moves as indicated in the table below when gradually applying a vacuum to the VDI actuator.
   - If it fails, replace the VDI actuator. (See INTAKE MANIFOLD REMOVAL/INSTALLATION .)

   Rod movement

Vacuum (kPa {mmHg, inHg})	Rod movement
–3.6 {–27.0, –1.1} or more	Starts to move
–27.9 {–209.2, –8.2} or less	Fully pulled
1.2 {9.0, 0.4} or more	Fully returned

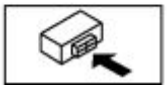
AUXILIARY PORT VALVE MOTOR

AUXILIARY PORT VALVE (APV) MOTOR INSPECTION (13B-MSP (HIGH POWER))

Resistance Inspection

1. Remove the APV motor. (See INTAKE-AIR SYSTEM REMOVAL/INSTALLATION .)

2. Measure the resistance between the APV motor terminals using an ohmmeter.



- If not as specified, replace the APV motor. (See INTAKE-AIR SYSTEM REMOVAL/INSTALLATION .)
- If as specified, carry out the "Circuit Open/Short Inspection".
  - APV motor resistance

    8—50 ohms

Operation Inspection

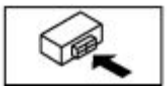
CAUTION:

- Applying voltage to the APV motor terminals for more than 3 s may damage the APV motor.

1. Disconnect the negative battery cable.

2. Remove the APV motor.

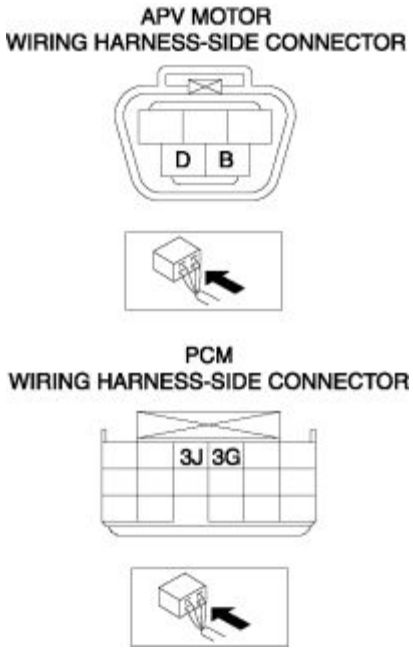
3. Apply **12 V** with a current of **0.9—1.9 A** to terminal B or D and verify that the gear moves.



- If there is no malfunction, carry out the "Circuit Open/Short Inspection".
- If there is any malfunction, replace the APV motor. (See INTAKE-AIR SYSTEM REMOVAL/INSTALLATION .)

Terminal		Gear rotation direction
B	D	
B+	GND	Clockwise
GND	B+	Counterclockwise

Circuit Open/Short Inspection



1. Inspect the following wiring harnesses for an open or short circuit. (Continuity check)

Open circuit

- If there is no continuity, the circuit is open. Repair or replace the wiring harness.
  - APV motor terminal B and PCM terminal 3J
  - APV motor terminal D and PCM terminal 3G

Short circuit

- If there is continuity, the circuit is shorted. Repair or replace the wiring harness.
  - APV motor terminal B and power supply
  - APV motor terminal B and body GND
  - APV motor terminal D and power supply
  - APV motor terminal D and body GND

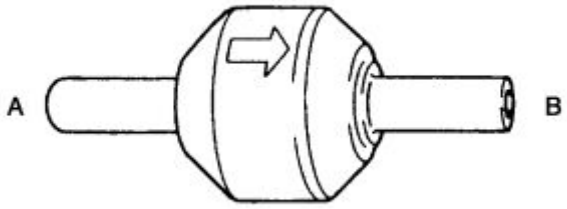
Notes:

CHECK VALVE

CHECK VALVE (ONE-WAY) INSPECTION

1. Remove the check valve.

2. Verify that there is airflow at port B when blowing air by mouth from port A.

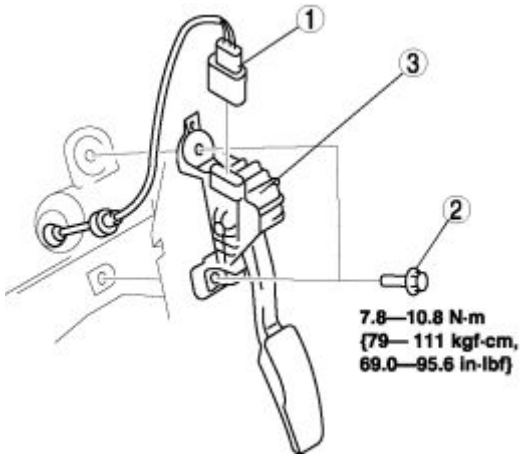


3. Verify that there is no airflow at port A when blowing air by mouth from port B.
   - If it cannot be verified, replace the check valve.

ACCELERATOR PEDAL

ACCELERATOR PEDAL REMOVAL/INSTALLATION

1. Remove in the order indicated in the table.



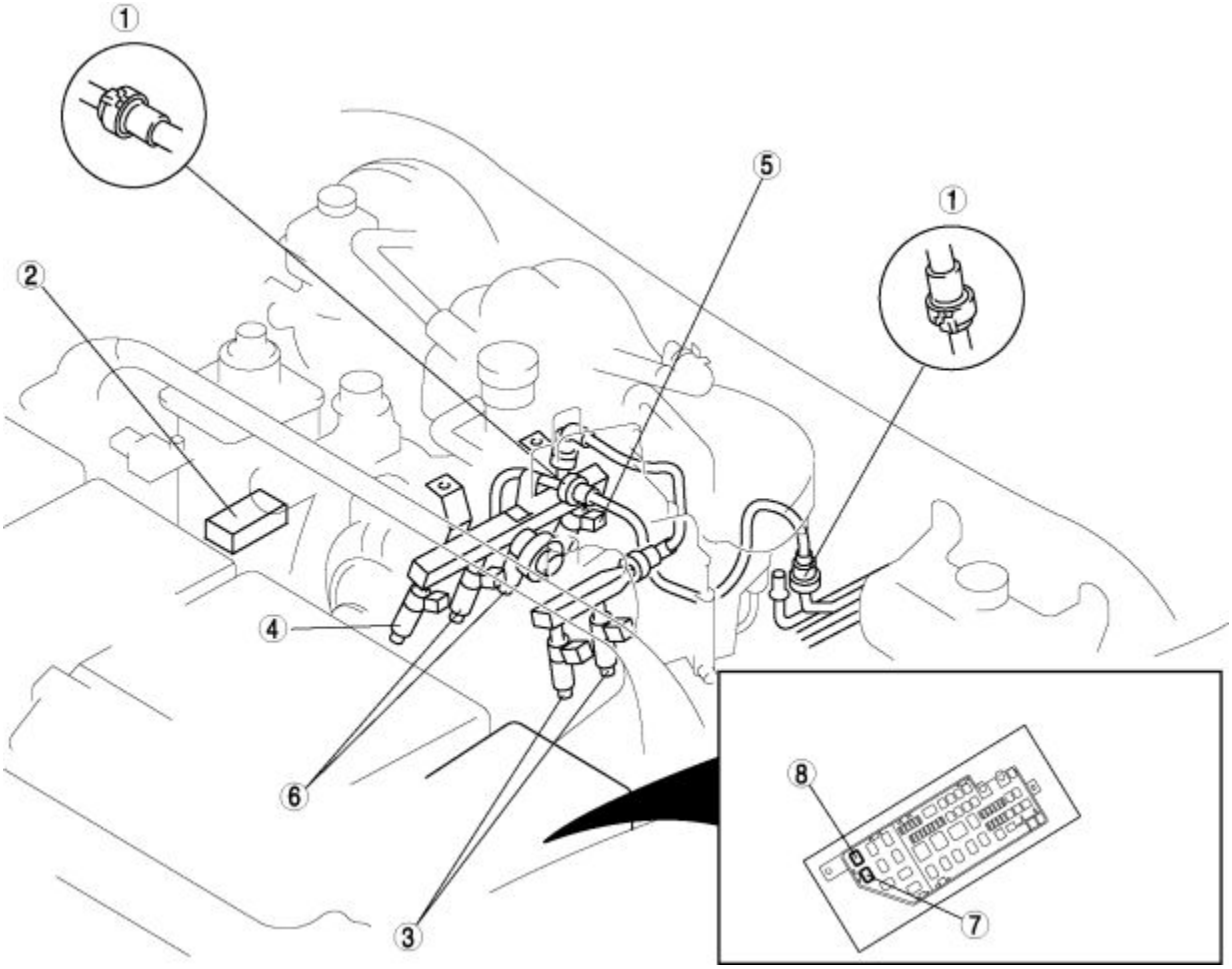
1	Connector
2	Bolt
3	Accelerator pedal

2. Install in the reverse order of removal.

FUEL SYSTEM

FUEL SYSTEM LOCATION INDEX

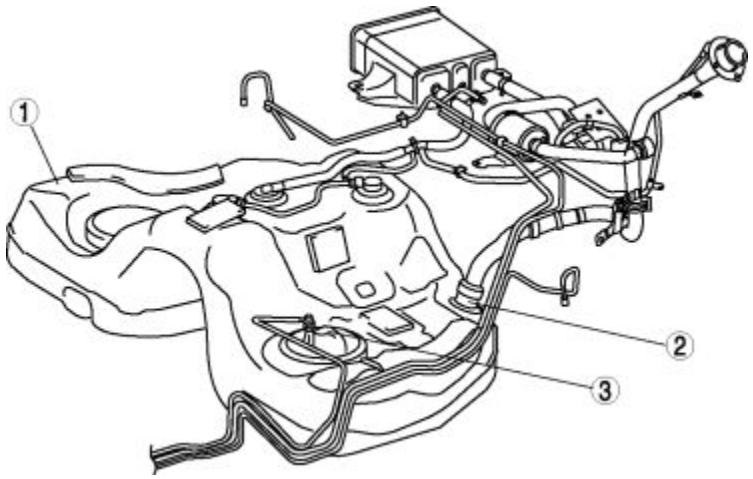
Engine compartment side



1	Quick release connector (See QUICK RELEASE CONNECTOR REMOVAL/INSTALLATION .)
2	Fuel pump resistor (See FUEL PUMP RESISTOR REMOVAL/INSTALLATION .) (See FUEL PUMP RESISTOR INSPECTION .)
3	Fuel injector (FP1, RP1) (See FUEL INJECTOR REMOVAL/INSTALLATION .) (See FUEL INJECTOR INSPECTION .)
4	Fuel injector (FS, RS)

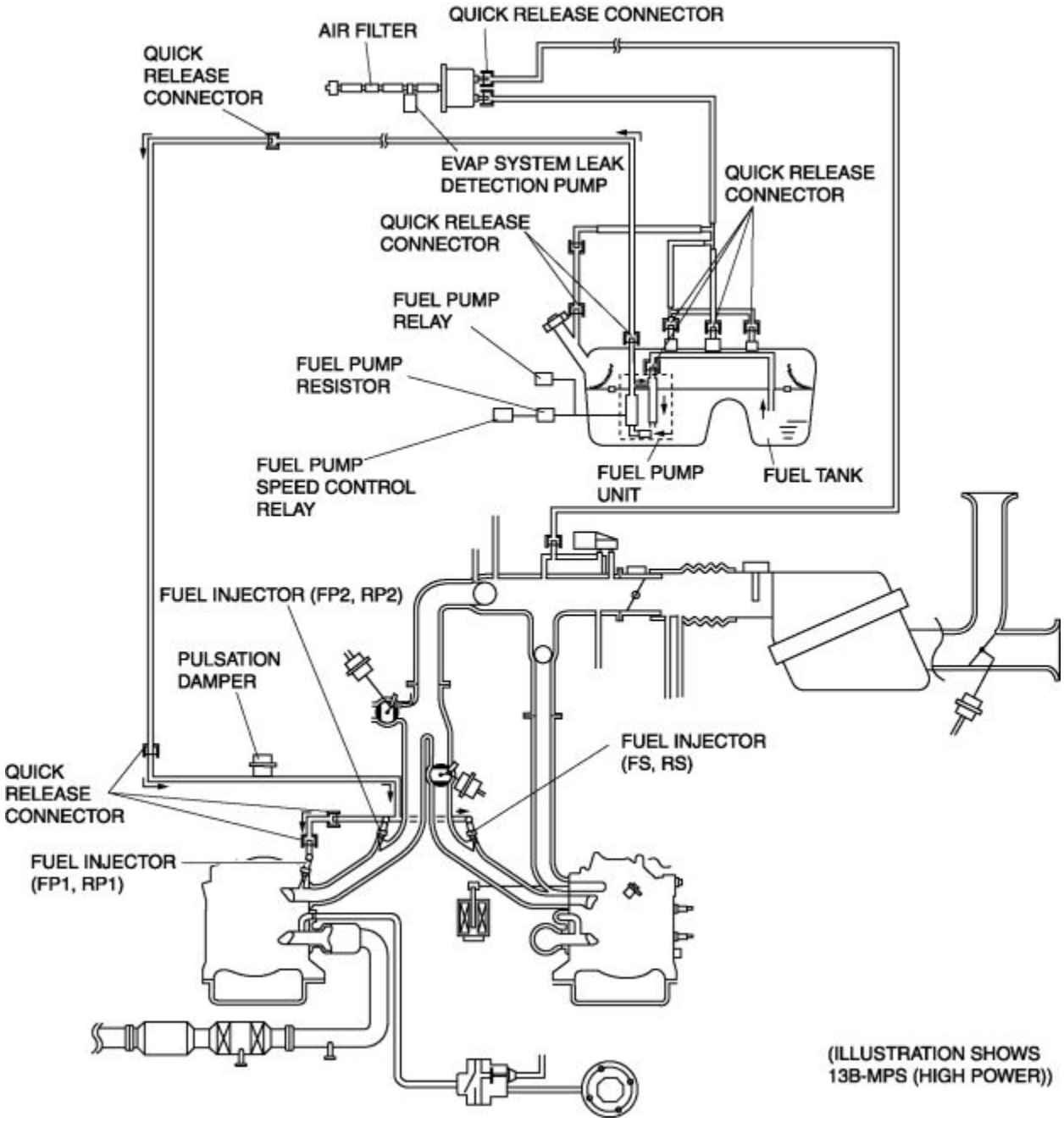
	(See FUEL INJECTOR REMOVAL/INSTALLATION .) (See FUEL INJECTOR INSPECTION .)
5	Fuel injector (FS, RS) (See FUEL INJECTOR REMOVAL/INSTALLATION .) (See FUEL INJECTOR INSPECTION .)
6	Fuel injector (FP2, RP2) (13B-MSP (High Power)) (See FUEL INJECTOR REMOVAL/INSTALLATION .) (See FUEL INJECTOR INSPECTION .)
7	Fuel pump relay
8	Fuel pump speed control relay

Fuel tank side



1	Fuel tank (See FUEL TANK REMOVAL/INSTALLATION .) (See FUEL INJECTOR INSPECTION .)
2	Nonreturn valve (See NONRETURN VALVE INSPECTION .)
3	Fuel pump unit (See FUEL PUMP UNIT REMOVAL/INSTALLATION .) (See FUEL PUMP UNIT INSPECTION .)

FUEL SYSTEM DIAGRAM



BEFORE REPAIR PROCEDURE

WARNING:

- Fuel is extremely flammable. Always keep sparks and flame away from fuel. Ignition may cause death or serious injury, or damage to equipment.
- Fuel line spills and leakage from the pressurized fuel system 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 the "Fuel Line Safety Procedure".

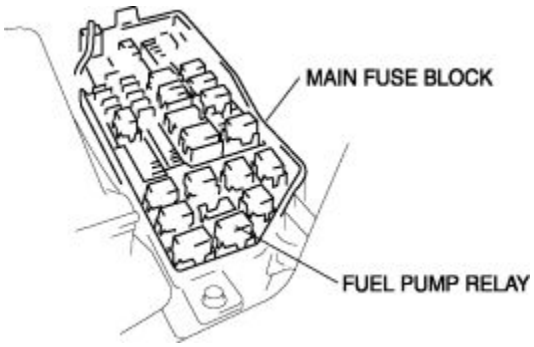
CAUTION:

- If there is foreign material on the connecting area of the quick release connector, it might damage the connector or fuel pipe. To prevent this, when the quick release connector has been disconnected, clean the connecting area before reconnecting it.

Fuel Line Safety Procedure

1. Remove the fuel-filler cap to release the pressure inside the fuel tank.

2. Remove the fuel pump relay.



3. Start the engine.

4. After the engine stalls, crank the engine **several times** .

5. Turn the ignition switch to the LOCK position.

6. Install the fuel pump relay.

AFTER REPAIR PROCEDURE

Fuel Leakage Inspection

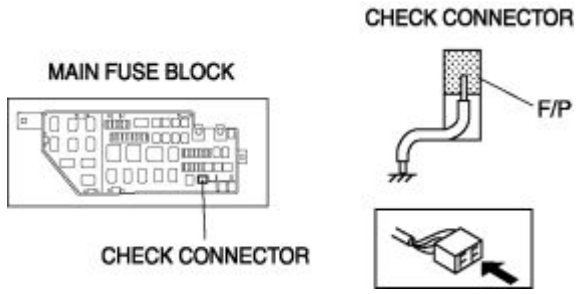
WARNING:

- Fuel vapor is hazardous. It can very easily ignite, causing serious injury and damage. Fuel can also irritate skin and eyes. To prevent this, always complete the "Fuel Line Inspection".

CAUTION:

- Shorting the wrong terminal of the check connector may cause malfunctions. Make sure to short only the specified terminal.

1. Ground the check connector terminal F/P to the body using a jumper wire.



2. Turn the ignition switch to the ON position and operate the fuel pump.

3. Verify that there is no fuel leakage from the pressurized parts.
   - If there is leakage, replace the fuel hoses.
   - If there is damage to the seal on the fuel pipe side, replace the fuel pipe.

     Fuel Leakage

     - There shall be no leakage after 5 min.

4. After reinstallation, repeat Step 1—3 of the fuel leakage inspection.

FUEL LINE PRESSURE INSPECTION

WARNING:

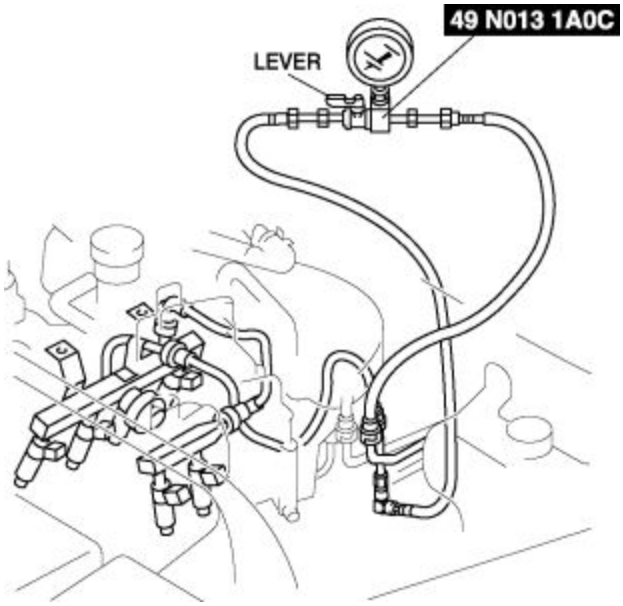
- Fuel line spills and leakage from the pressurized fuel system are dangerous. Fuel can ignite and cause serious injury or death and damage.To prevent this, complete the following inspection with the engine stopped.

1. Follow the before repair procedure and perform the fuel line safety procedure. (See BEFORE REPAIR PROCEDURE .)

2. Disconnect the negative battery cable. (See BATTERY REMOVAL/INSTALLATION .)

3. Disconnect the engine compartment side quick release connector. (See QUICK RELEASE CONNECTOR REMOVAL/INSTALLATION .)

4. Turn the lever of the **SST** parallel to the hose as shown in the figure.



5. Reconnect the quick release connector of the **SST** to the fuel pipe until a click is heard.

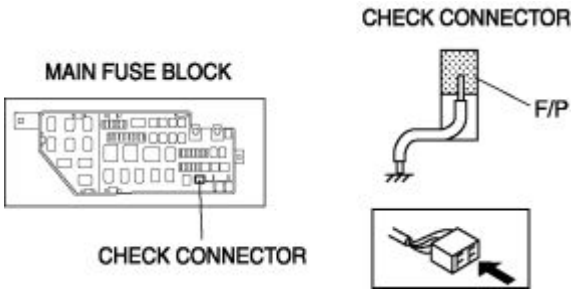
6. Verify that the quick release connector is firmly connected by pulling it by hand.

7. Connect the negative battery cable.

CAUTION:

- Shorting the wrong terminal of the check connector may cause malfunctions. Make sure to short only the specified terminal.

8. Ground the check connector terminal F/P using the jumper wire.



9. Turn the ignition switch to the ON position and operate the fuel pump.

10. Measure the fuel line pressure.
    - If not within the specification, inspect or replace the following parts:

      If it is less than the specification

      - Fuel pump unit
      - Fuel line leakage

      If it is more than the specification

      - Fuel pump unit
      - Fuel line clogging

      Fuel line pressure

      - 375—450 kPa {3.83—4.58 kgf/cm^2 , 54.4—65.2 psi}

11. Disconnect the jumper wire and stop the fuel pump.

12. Wait **5 min** and measure the fuel hold pressure.
    - If it is within the specification, inspect the following.
      - Fuel line for clogging or leakage

      Fuel hold pressure

      - 200 kPa {2.0 kgf/cm^2 , 29 psi}

13. Disconnect the **SST** .

14. Connect the quick release connector. (See QUICK RELEASE CONNECTOR REMOVAL/INSTALLATION .)

15. Inspect all parts by performing the "AFTER REPAIR PROCEDURE". (See AFTER REPAIR PROCEDURE .)

Notes:

FUEL TANK

FUEL TANK REMOVAL/INSTALLATION

WARNING:

- Repairing a fuel tank containing fuel is dangerous. Explosion or fire may cause death or serious injury. Always properly steam clean a fuel tank before repairing it.

1. Park the vehicle on a level surface.

2. Perform the fuel line safety procedure referring to the before repair procedure. (See BEFORE REPAIR PROCEDURE .)

3. Remove the rear seat. (See REAR SEAT REMOVAL/INSTALLATION .)

4. Drain fuel from the fuel tank.

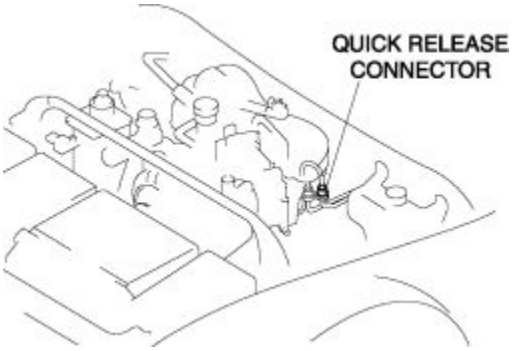
   ### WARNING:

   - 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 a vehicle.

   ### CAUTION:

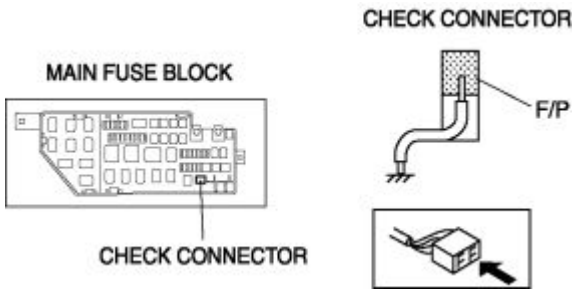
   - When the fuel gauge indicates 3/4 or more, the fuel level is higher than the installation surface of the fuel pump and the fuel suction pipe bracket. Due to this condition, fuel may spill or leak out when performing this procedure. Before performing this procedure, always drain out fuel so that the fuel tank is half full or less (according to the fuel gauge needle).

   c. Disconnect the quick release connector (engine compartment side). (See QUICK RELEASE CONNECTOR REMOVAL/INSTALLATION .)



d. Attach a long hose to the disconnected fuel pipe and drain the fuel into a proper receptacle.

e. Ground check connector terminal F/P to the body using a jumper wire.



CAUTION:

- Shorting the wrong terminal of the check connector may cause malfunctions. Make sure to short only the specified terminal.

f. Turn the ignition switch to the ON position and operate the fuel pump for **approx. 20 min** .

CAUTION:

- The fuel pump may malfunction if it is operated without any fuel in the fuel tank (fuel pump idling). Constantly monitor the amount of fuel being discharged and immediately stop operation of the pump when essentially no fuel is being discharged.

g. When essentially no fuel is being discharged from the hose, turn the ignition switch to the LOCK position.

NOTE:

- When operating the fuel pump with a full fuel tank, fuel discharge will become erratic after **approx. 10 min** but will continue for **approx. 10 min** more and then essentially no fuel will be discharged. At this time the fuel gauge needle will be at the halfway position.

h. Disconnect the jumper wire.

i. Disconnect the negative battery cable.

5. Remove the following parts:

    . Fuel pump unit. (See FUEL PUMP UNIT REMOVAL/INSTALLATION .)

    a. Main silencer and middle pipe. (See EXHAUST SYSTEM REMOVAL/INSTALLATION .)

    b. Power plant frame. (See TRANSMISSION REMOVAL/INSTALLATION .) (See AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION .)

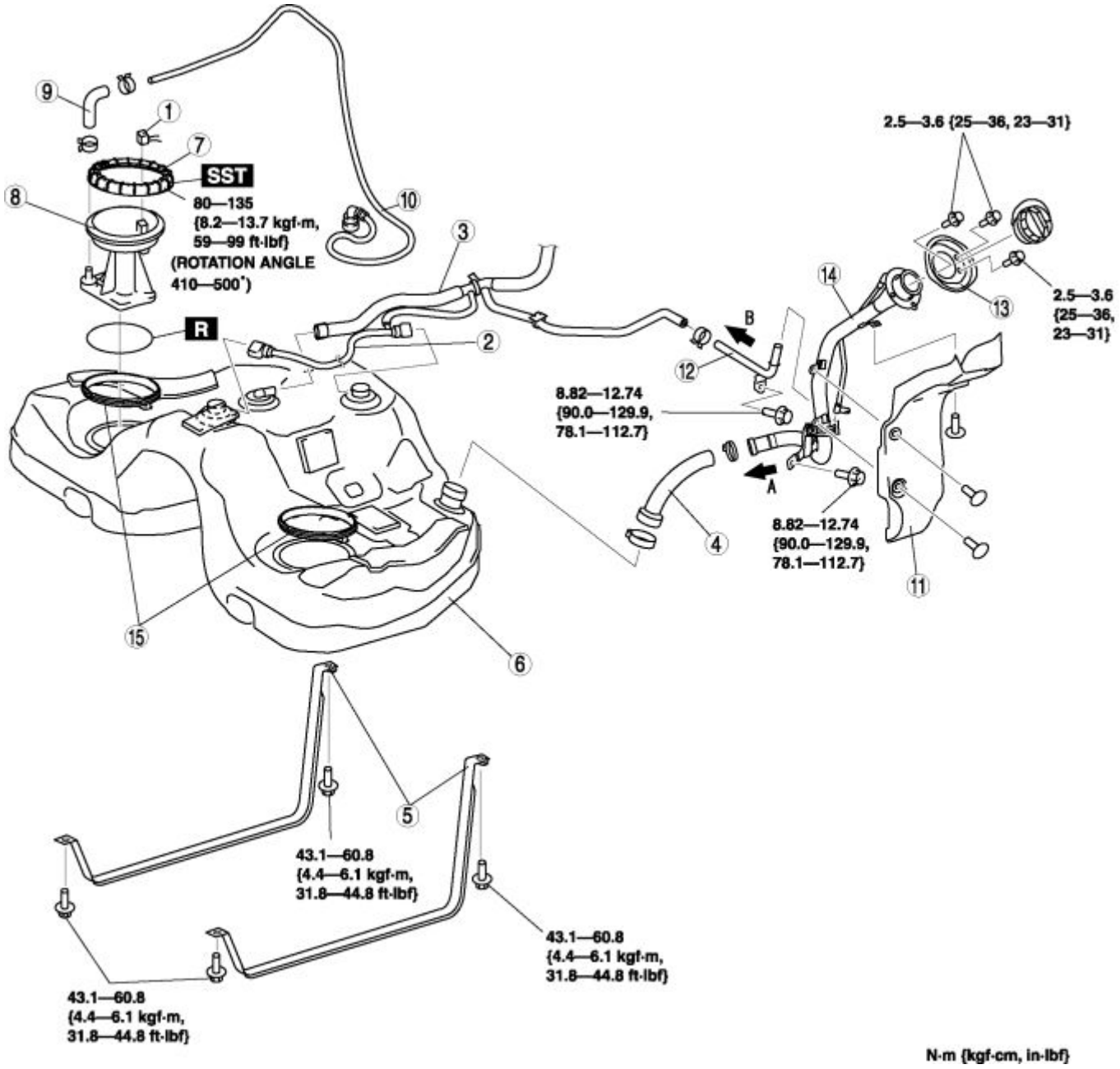
    c. Propeller shaft. (See PROPELLER SHAFT REMOVAL/INSTALLATION .)

6. Position the parking brake cable out of the way. (See PARKING BRAKE LEVER REMOVAL/INSTALLATION .)

7. Remove in the order indicated in the table.

8. Install in the reverse order of removal.

9. Inspect all parts by performing the "AFTER REPAIR PROCEDURE". (See AFTER REPAIR PROCEDURE .)



1	Connector
2	Evaporative hose (See Rollover Valve .)
3	Breather hose (See Fuel Shut-off Valve .)
4	Joint hose (See Joint Hose Installation Note .)
5	Strap

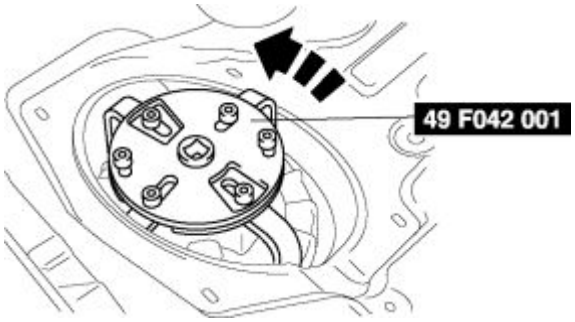
6	Fuel tank
7	Cap (See Cap Removal Note .) (See Cap Installation Note .)
8	Fuel suction pipe bracket
9	Fuel suction hose
10	Fuel suction pipe
11	Protector
12	Joint pipe (See Fuel Tank Side (Except for Fuel Shut-off/Rollover Valve) .)
13	Dust cover
14	Fuel-filler pipe (See Fuel-filler Pipe Removal Note .)
15	Retainer

Cap Removal Note

CAUTION:

- The cap could be damaged if the SST is used with any play between the cap and the SST. Securely attach the SST so that there is no gap between the SST tabs and the side of the cap.

1. Remove the cap using the **SST** .



Fuel-filler Pipe Removal Note

1. Remove the rear ABS wheel-speed sensor. (See REAR ABS WHEEL-SPEED SENSOR REMOVAL/INSTALLATION .)

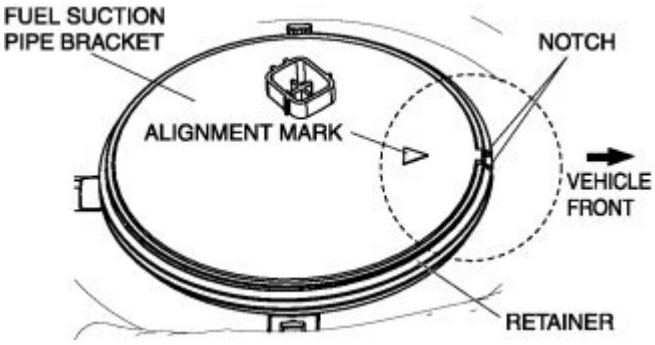
2. Remove the rear shock absorber lower bolt. (See REAR SHOCK ABSORBER AND COIL SPRING REMOVAL/INSTALLATION .)

3. Loosen the rear crossmember installation nut (6 locations), and lower the rear crossmember. (See REAR CROSSMEMBER REMOVAL/INSTALLATION .)

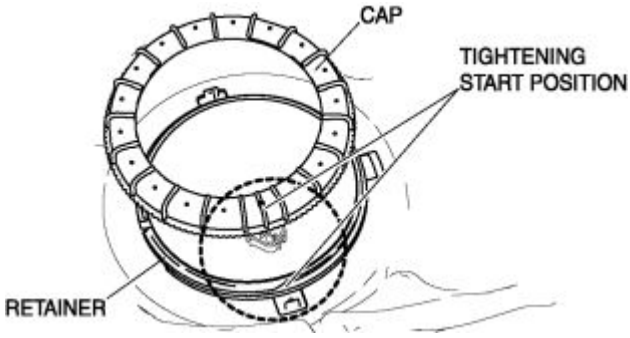
4. Remove the fuel-filler pipe.

Cap Installation Note

1. Align the alignment mark of the fuel suction pipe bracket and the retainer notch as shown in the figure.



2. Align the positions of the cap and retainer as shown in the figure, and tighten them **one full rotation** by hand.



- If the retainer and cap cannot be tighten by hand, remove the cap, verify that there is no damage or misalignment on the retainer and cap, and then tighten again.

CAUTION:

- The cap could be damaged if the SST is used with any play between the cap and the SST. Securely attach the SST so that there is no gap between the SST tabs and the side of the cap.

3. While keeping the alignment mark and the retainer notch aligned, tighten the cap to the rotation angle and specified torque using the **SST** .
    - If the specified torque cannot be obtained even when the cap is rotated to the specified rotation angle, replace with a new cap and retainer and repeat Step 3.

      Rotation angle

    - 50—140°

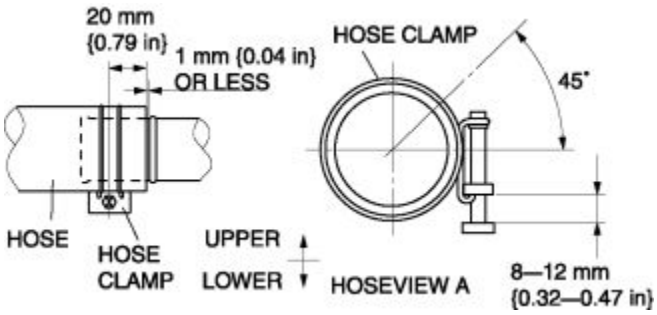
      (Total angle for Step 2 and Step 3 is 410—500°.)

      Cap tightening torque

    - 80—135 N·m {8.2—13.7 kgf·m, 59—99 ft·lbf}

Joint Hose Installation Note

1. Install the joint hose and clamps as shown in the figure.



FUEL TANK INSPECTION

NOTE:

- The two rollover valves built into the fuel tank are inspected in this inspection.

1. Follow the before repair procedure and perform the fuel line safety procedure. (See BEFORE REPAIR PROCEDURE .)

2. Disconnect the negative battery cable. (See BATTERY REMOVAL/INSTALLATION .)

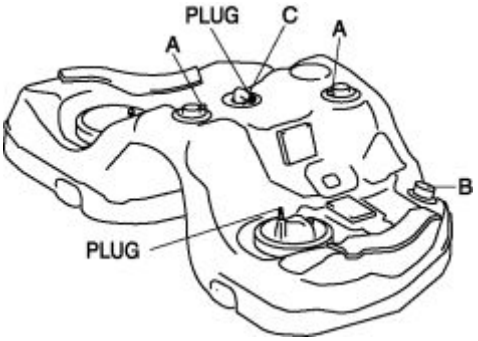
3. Remove the connector and the fuel hose from the fuel pump unit. (See QUICK RELEASE CONNECTOR REMOVAL/INSTALLATION .)

4. Remove the fuel tank with the fuel pump unit and fuel suction pipe bracket still installed. (See FUEL TANK REMOVAL/INSTALLATION .)

5. Plug the fuel pump unit pipe and the port C.

6. Set the fuel tank on a level surface.

7. Verify that there is air flow through the port A when pressurizing port B.

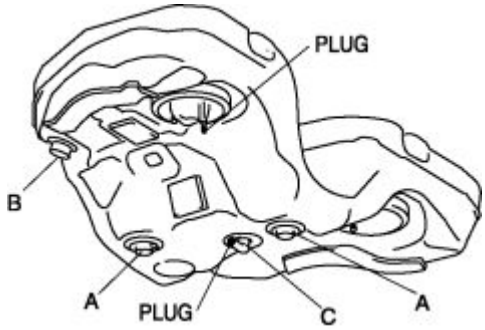


   - If there is no air flow, replace the fuel tank.

8. Verify that there is air flow through port B when pressurizing the port A.
   - If there is no air flow, replace the fuel tank.

- If there is air flow, place the fuel tank upside down.

9. Verify that there is no air flow through port A when pressurizing the port B.



- If there is air flow, replace the fuel tank.

Notes:

NONRETURN VALVE

NONRETURN VALVE INSPECTION

1. Remove the fuel pump. (See FUEL PUMP UNIT REMOVAL/INSTALLATION .)

   NOTE:

   - The nonreturn valve cannot be removed as it is built into the fuel tank.
   - The nonreturn valve is normally closed due to spring force.

2. Verify that the nonreturn valve opens/closes through the fuel pump installation hole.
   - If it does not open/close or return to the normal position, replace the fuel tank.

Notes:

FUEL PUMP

FUEL PUMP UNIT REMOVAL/INSTALLATION

WARNING:

- Fuel is extremely flammable. Always keep sparks and flame away from fuel. Ignition may cause death or serious injury, or damage to equipment.
- Fuel line spills and leakage from the pressurized fuel system 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 the "Fuel Line Safety Procedure".
- Also, before performing the fuel pump unit removal/installation, always complete the "Fuel Leak Inspection After Fuel Pump Unit Installation".

1. Perform the fuel line safety procedure referring to the before repair procedure. (See BEFORE REPAIR PROCEDURE .)

2. Disconnect the negative battery cable. (See BATTERY REMOVAL/INSTALLATION .)

3. Remove the rear seat. (See REAR SEAT REMOVAL/INSTALLATION .)

4. Remove the service hole cover. (See Service Hole Cover Installation Note .)

5. Drain fuel from the fuel tank.

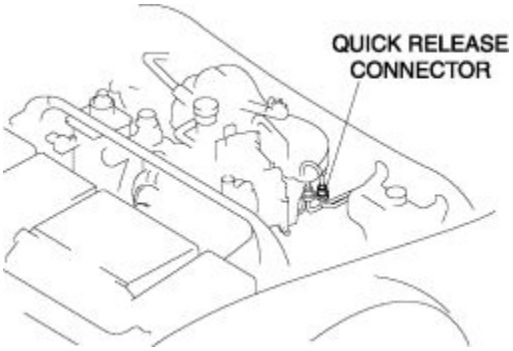
   WARNING:

   - 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 a vehicle.

   CAUTION:

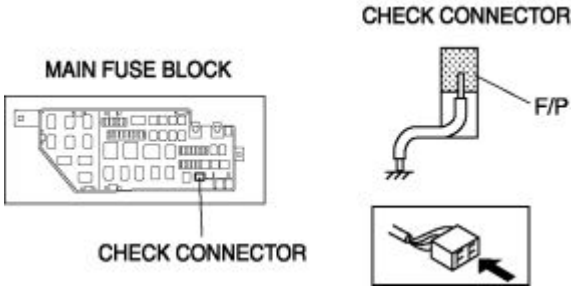
   - When the fuel gauge indicates 3/4 or more, the fuel level is higher than the installation surface of the fuel pump and the fuel suction pipe bracket. Due to this condition, fuel may spill or leak out when performing this procedure. Before performing this procedure, always drain out fuel so that the fuel tank is half full or less (according to the fuel gauge needle).

   c. Disconnect the quick release connector (engine compartment side). (See QUICK RELEASE CONNECTOR REMOVAL/INSTALLATION .)



d. Attach a long hose to the disconnected fuel pipe and drain the fuel into a proper receptacle.

e. Ground check connector terminal F/P to the body using a jumper wire.



CAUTION:

- Shorting the wrong terminal of the check connector may cause malfunctions. Make sure to short only the specified terminal.

f. Turn the ignition switch to the ON position and operate the fuel pump for **approx. 20 min** .

CAUTION:

- The fuel pump may malfunction if it is operated without any fuel in the fuel tank (fuel pump idling). Constantly monitor the amount of fuel being discharged and immediately stop operation of the pump when essentially no fuel is being discharged.

g. When essentially no fuel is being discharged from the hose, turn the ignition switch to the LOCK position.

NOTE:

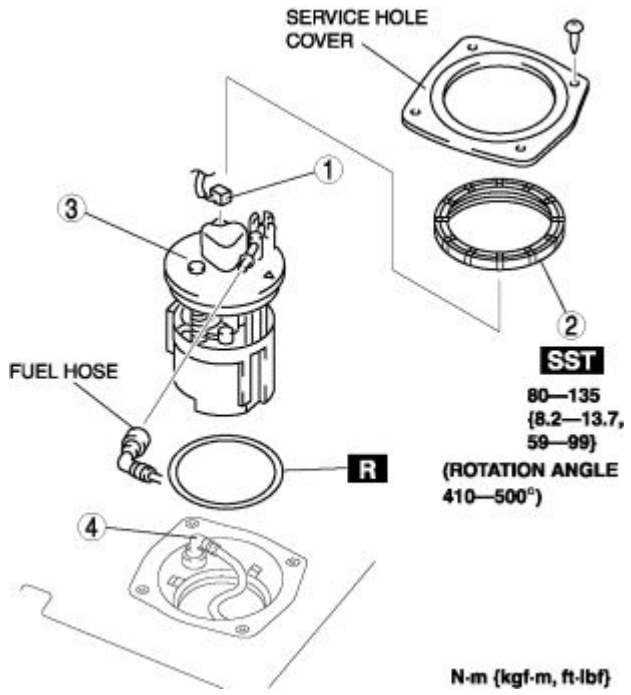
- When operating the fuel pump with a full fuel tank, fuel discharge will become erratic after **approx. 10 min** but will continue for **approx. 10 min** more and then essentially no fuel will be discharged. At this time the fuel gauge needle will be at the halfway position.

h. Disconnect the jumper wire.

i. Disconnect the negative battery cable.

6. Remove in the order indicated in the table.

7. Install in the reverse order of removal.



1	Connector
2	Fuel pump cap (See Fuel Pump Cap Removal Note .) (See Fuel Pump Cap Installation Note .)
3	Fuel pump unit

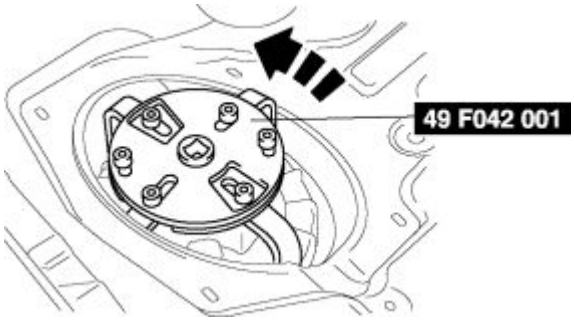
	(See Fuel Pump Unit Removal Note .) (See Fuel Leak Inspection After Pump Unit Installation .)
4	Fuel suction pipe (See QUICK RELEASE CONNECTOR REMOVAL/INSTALLATION .)

Fuel Pump Cap Removal Note

CAUTION:

- The cap could be damaged if the SST is used with any play between the cap and the SST. Securely attach the SST so that there is no gap between the SST tabs and the side of the cap.

1. Remove the fuel pump cap using the **SST** .



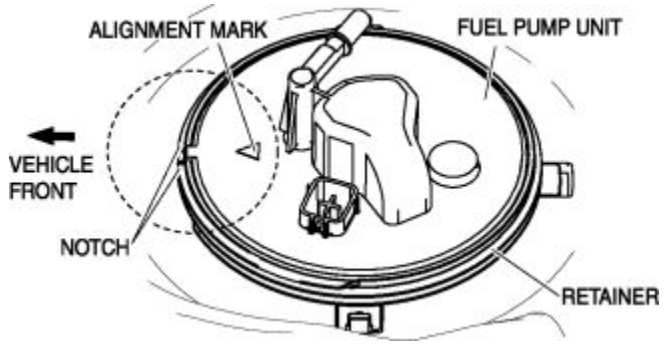
Fuel Pump Unit Removal Note

CAUTION:

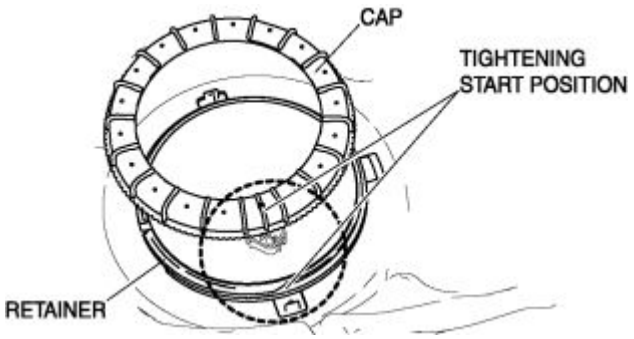
- The fuel suction pipe might be damaged, if the fuel pump unit is lifted too much. Make sure to lift the pump only a small amount.

Fuel Pump Cap Installation Note

1. Align the fuel pump unit alignment marks and the retainer notch as shown in the figure.



2. Align the positions of the cap and retainer as shown in the figure, and tighten them **one full rotation** by hand.



- If the retainer and cap cannot be tighten by hand, remove the cap, verify that there is no damage or misalignment on the retainer and cap, and then tighten again.

CAUTION:

- The cap could be damaged if the SST is used with any play between the cap and the SST. Securely attach the SST so that there is no gap between the SST tabs and the side of the cap.

3. While keeping the alignment mark and the retainer notch aligned, tighten the cap to the rotation angle and specified torque using the **SST** .
   - If the specified torque cannot be obtained even when the cap is rotated to the specified rotation angle, replace with a new cap and repeat Step 3.

     Rotation angle

     - 50—140°

     (Total angle for Step 2 and Step 3 is 410—500°.)

     Cap tightening torque

     - 80—135 N· m {8.2—13.7 kgf·m, 59—99 ft·lbf}

Fuel Leak Inspection After Pump Unit Installation

1. Start driving the vehicle from a standstill or brake suddenly **5—6 times** at a low speed.

2. Stop the vehicle and verify from inside the vehicle that there is no fuel leakage around the fuel pump unit.

Service Hole Cover Installation Note

1. Inspect all parts by performing the "AFTER REPAIR PROCEDURE". (See AFTER REPAIR PROCEDURE .)

2. Install the service hole cover.

Notes:

FUEL PUMP UNIT INSPECTION

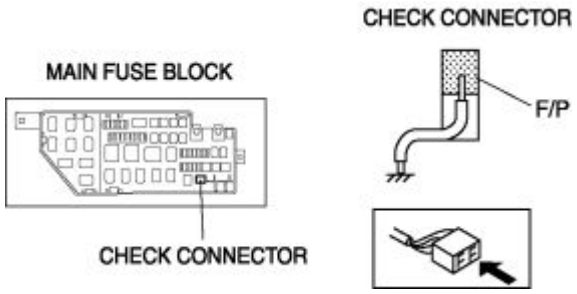
Fuel Pump Operation Inspection

Without Using WDS or equivalent

CAUTION:

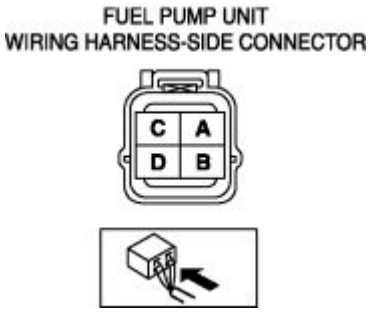
- Shorting the wrong terminal of the check connector may cause malfunctions. Make sure to short only the specified terminal.

1. Ground the check connector terminal F/P using the jumper wire.



2. Remove the fuel filler cap.

3. Turn the ignition switch to the ON position and verify that the fuel pump can be heard operating.
    - If it cannot be verified, inspect for a voltage of **3.76—5.28 V** on the fuel pump wiring harness-side connector terminal B.



        - If it is within the specification, inspect the following.
            - Fuel pump continuity inspection
            - Wiring harness between fuel pump terminal D and GND
        - If not within the specification, inspect the following.
            - Fuel pump relay
            - Wiring harnesses, connectors between main relay, fuel pump relay, and check connector
            - Wiring harnesses, connectors between fuel pump relay, fuel pump resistor, and fuel pump

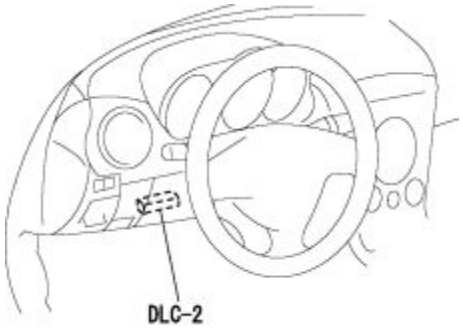
Voltage

- 3.76—5.28 V

4. Disconnect the jumper wire.

Using WDS or equivalent

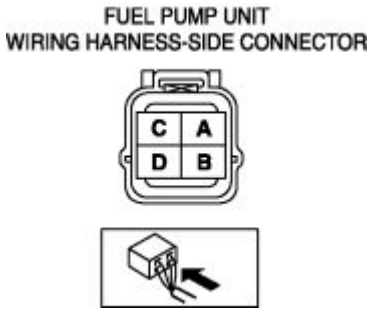
1. Connect the WDS or equivalent to the DLC-2.



2. Remove the fuel filler cap.

3. Turn the ignition switch to the ON position.

4. Verify that the fuel pump can be heard operating when FP is changed from off to on position using simulation function FP.
   - If it cannot be verified, inspect for a voltage of **3.76—5.28 V** on the fuel pump wiring harness-side connector terminal B.



     - If it is within the specification, inspect the following.
       - Fuel pump continuity inspection
       - Wiring harness between fuel pump terminal D and GND

- If not within the specification, inspect the following.
  - Fuel pump relay
  - Wiring harnesses, connectors between fuel pump relay, fuel pump resistor, and fuel pump
  - Wiring harnesses, connectors between main relay, fuel pump relay, and PCM

Voltage

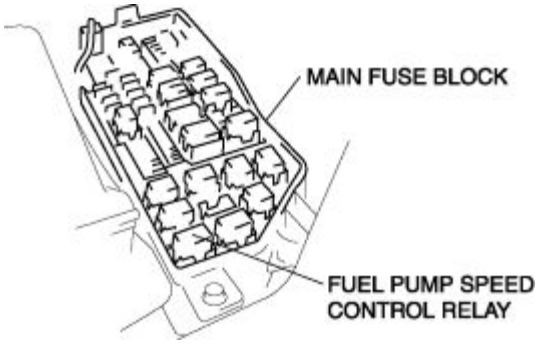
- 3.76—5.28 V

Fuel Pump Controlling System Inspection

Without Using WDS or equivalent

1. Practice the fuel pump operation inspection.

2. Verify that there is an operation sound from the fuel pump speed control relay when the engine cranks.
   - If the operation sound cannot be verified, inspect the following and repair or replace the malfunctioning part.



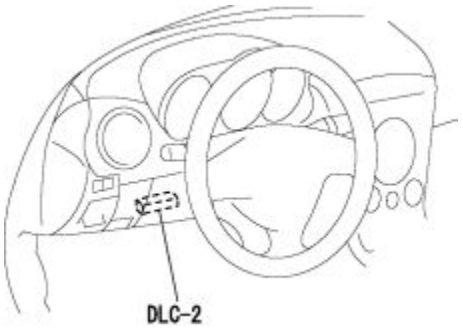
     - Stuck fuel pump speed control relay
     - Wiring harnesses, connectors between the fuel pump speed control relay and PCM terminal 4M

3. Verify that the rotation sound of the fuel pump is higher (higher frequency) than when idling when idling while the engine cranking.
   - If it cannot be verified, inspect the following inspections and repair or replace the malfunctioning part.
     - Stuck fuel pump speed control relay
     - Fuel pump resistor
     - Wiring harnesses open circuit between fuel pump speed control relay and fuel pump
     - Wiring harnesses, connectors between fuel pump speed control relay and PCM

Using WDS or equivalent

1. Perform the fuel pump operation inspection.

2. Connect the WDS or equivalent to the DLC-2.



3. Start the engine and idle it.

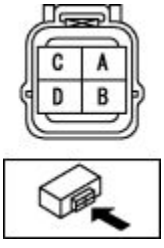
4. Verify that the rotation sound of the fuel pump (higher frequency wave) goes higher when turning fuel pump speed control relay from off to on using the simulation function FPC.
    - If it cannot be verified, inspect the following and repair or replace the malfunctioning part.
        - Stuck fuel pump speed control relay
        - Wiring harnesses, connectors between fuel pump speed control relay and PCM
        - Fuel pump resistor
        - Wiring harnesses open circuit between fuel pump speed control relay and fuel pump

Continuity Inspection

1. Disconnect the negative battery cable. (See BATTERY REMOVAL/INSTALLATION .)

2. Disconnect the fuel pump unit connector.

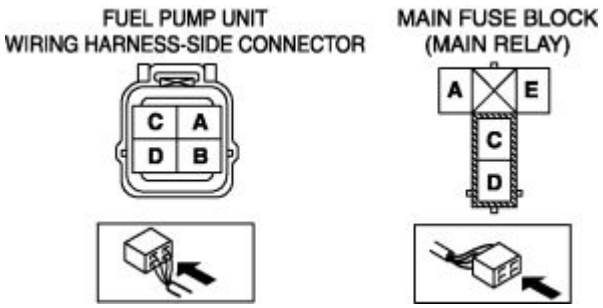
3. Inspect for continuity between fuel pump unit connector terminals B and D.



- If there is continuity, perform the "Circuit Open/Short Inspection".
- If there is no continuity, replace the fuel pump.

Circuit Open/Short Inspection

1. Inspect the following wiring harnesses for open or short circuit (continuity check).



Open circuit

- If there is no continuity, the circuit is open. Repair or replace the harness.
  - Fuel pump unit terminal D and body GND.
  - Fuel pump relay terminal C and fuel pump unit terminal B.

Short circuit

- If there is continuity, the circuit is short. Repair or replace the harness.
  - Fuel pump unit terminal D and power supply.
  - Fuel pump unit terminal B and body GND.

Hold Pressure Inspection

WARNING:

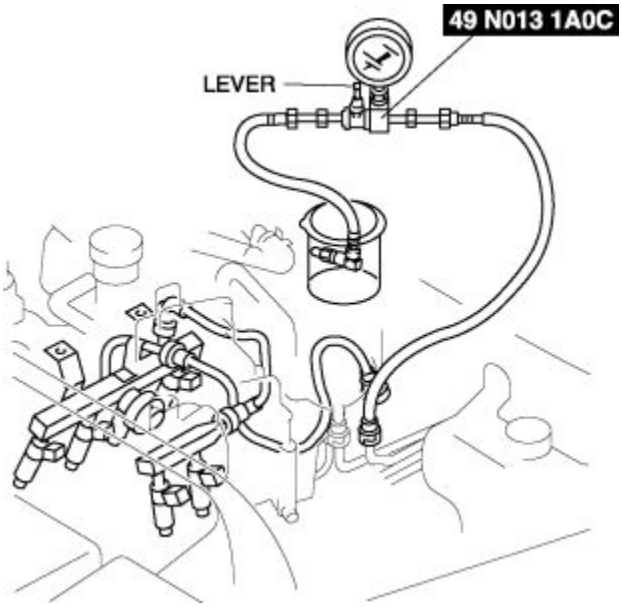
- Fuel line spills and leakage from the pressurized fuel system are dangerous. Fuel can ignite and cause serious injury or death and damage. To prevent this, complete the following inspection with the engine stopped.

1. Follow the before repair procedure and perform the fuel line safety procedure. (See BEFORE REPAIR PROCEDURE .)

2. Disconnect the negative battery cable. (See BATTERY REMOVAL/INSTALLATION .)

3. Disconnect the engine compartment-side quick release connector. (See QUICK RELEASE CONNECTOR REMOVAL/INSTALLATION .)

4. Turn the **SST** lever so that it is **90°** to the hose and then plug the outlet of the **SST** .



5. Reconnect the quick release connector of the **SST** to the fuel pipe until a click is heard.

6. Verify that the quick release connector is firmly connected by pulling it by hand.

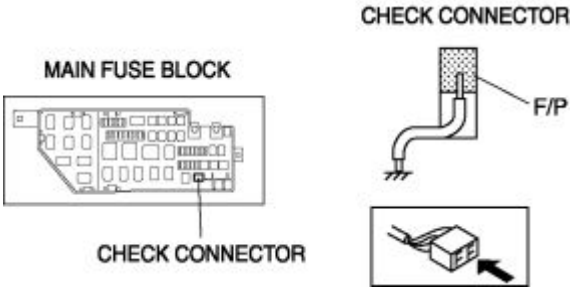
7. Prevent the fuel spillage by placing the fuel hose outlet (rubber hose) of the **SST** into a container

8. Connect the negative battery cable.

   CAUTION:

   - Shorting the wrong terminal of the check connector may cause malfunctions. Make sure to short only the specified terminal.

9. Ground the check connector terminal F/P using the jumper wire.



10. Turn the ignition switch to the ON position for **10 min** and then operate the fuel pump.

11. Measure the fuel pressure **5 min** after turning the ignition switch to the LOCK position.
    - If not within the specification, inspect the following:
        - Fuel filter clogging (low-pressure side and high-pressure side)
        - Fuel line clogging or leakage

      Standard

      - 200 kPa {2.0 kgf/cm^2 , 29 psi} or more

12. Disconnect the jumper wire.

13. Follow the before repair procedure and practice the fuel line safety procedure. (See BEFORE REPAIR PROCEDURE .)

14. Disconnect the **SST** .

15. Connect the quick release connector. (See QUICK RELEASE CONNECTOR REMOVAL/INSTALLATION .)

16. Inspect all parts by performing the "AFTER REPAIR PROCEDURE". (See AFTER REPAIR PROCEDURE .)

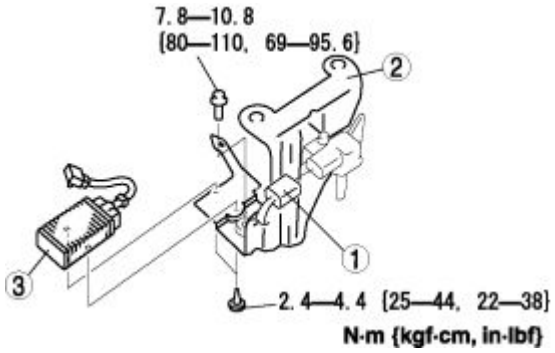
FUEL PUMP RESISTOR REMOVAL/INSTALLATION

1. Disconnect the negative battery cable. (See BATTERY REMOVAL/INSTALLATION .)

2. Remove the secondary air injection (AIR) pump. (See SECONDARY AIR INJECTION (AIR) PUMP REMOVAL/INSTALLATION .)

3. Remove in the order indicated in the table.

4. Install in the reverse order of removal.



1	Connector
2	Bracket
3	Fuel pump resistor

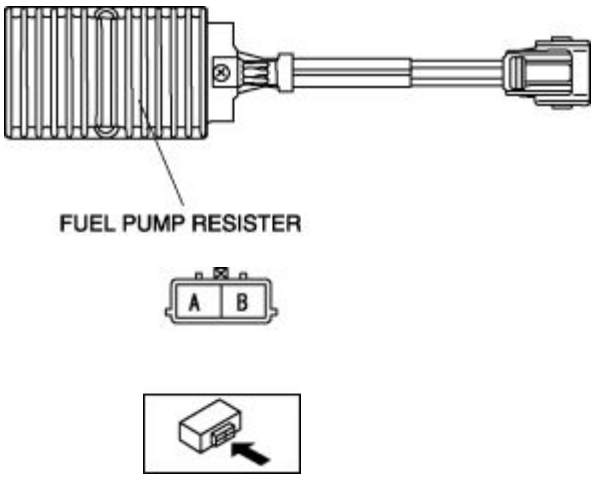
FUEL PUMP RESISTOR INSPECTION

Resistance Inspection

1. Disconnect the negative battery cable. (See BATTERY REMOVAL/INSTALLATION .)

2. Remove the fuel pump resister. (See FUEL PUMP RESISTOR REMOVAL/INSTALLATION .)

3. Verify that the continuity between the fuel pump resister terminal A and B is within the specification.



- If not within the specification, replace the fuel resistor.

  Fuel pump resistor continuity

  - 0.304—0.336 ohms (20 °C {68 °F})

FUEL INJECTOR

FUEL INJECTOR REMOVAL/INSTALLATION

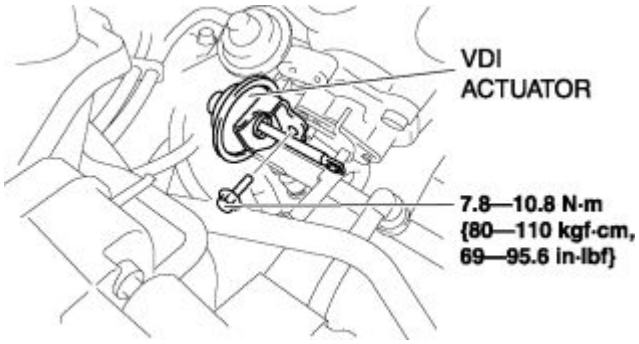
1. Follow the before repair procedure and perform fuel line safety procedure. (See BEFORE REPAIR PROCEDURE .)

2. Disconnect the negative battery cable. (See BATTERY REMOVAL/INSTALLATION .)

3. Remove the extension manifold (upper). (See INTAKE-AIR SYSTEM REMOVAL/INSTALLATION .)

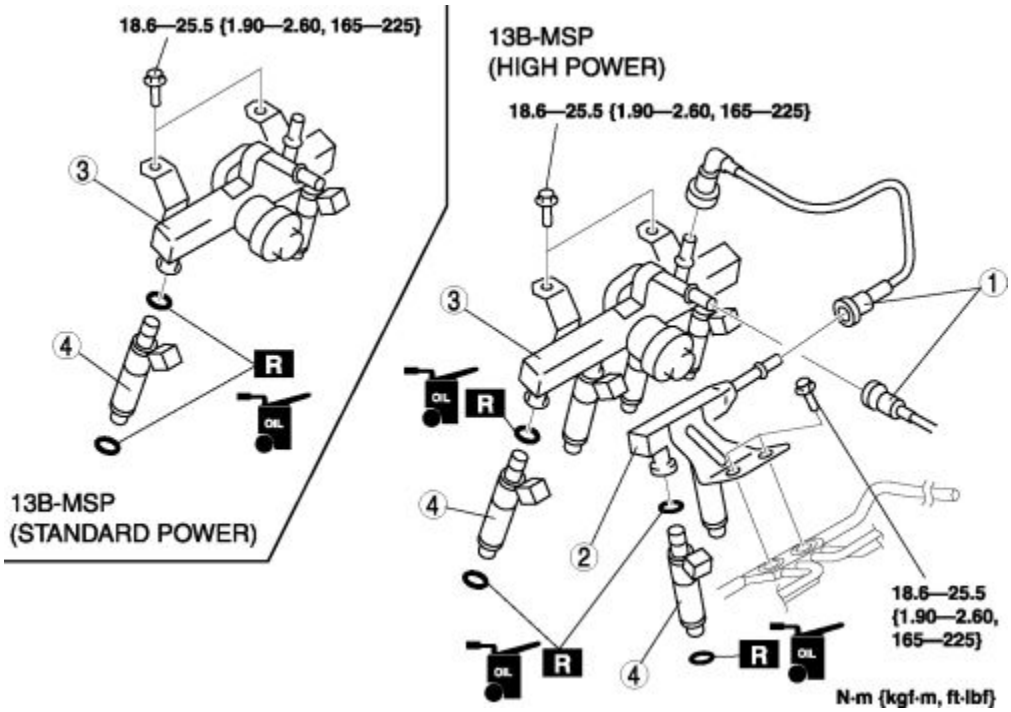
4. Remove the extension manifold (lower). (See INTAKE-AIR SYSTEM REMOVAL/INSTALLATION .)

5. Remove the VDI actuator bracket installation bolt and the position the VDI actuator out of the way.



6. Disconnect the fuel injector connector.

7. Remove in the order indicated in the table.



1	Quick release connector (See Inside the Engine Compartment .)
2	Fuel distributor (housing side)
3	Fuel distributor (intake manifold side)
4	Fuel injector

8. Install in the reverse order of removal.

9. Inspect the variable dynamic effect intake (VDI) actuator. (See VARIABLE DYNAMIC EFFECT INTAKE-AIR (VDI) ACTUATOR INSPECTION .)

10. Inspect all parts by performing the "AFTER REPAIR PROCEDURE". (See AFTER REPAIR PROCEDURE .)

FUEL INJECTOR INSPECTION

WARNING:

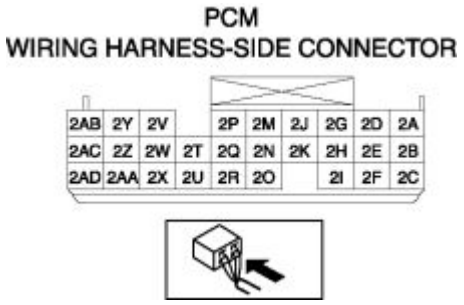
- Fuel can ignite and cause serious injury or death, and damage. To prevent this, always make sure to follow the warnings and cautions for each procedure when repairing or inspecting.

Fuel Injector Operation Inspection

Fuel injector (FP1, RP1) operation inspection

1. Warm up the engine and idle it.

2. Inspect the following PCM output wave pattern. (See PCM INSPECTION .)

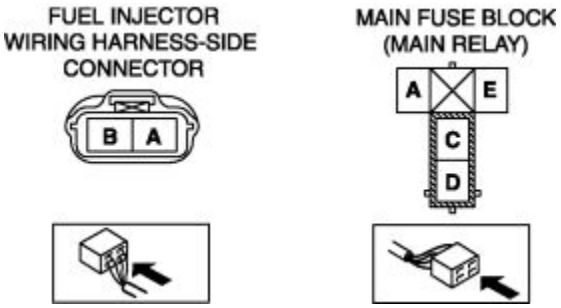


- PCM terminal 2M (FP1)
- PCM terminal 2J (RP1)

3. If a normal condition of the PCM wave pattern cannot be verified, inspect the following and repair or replace the malfunctioning part.

Fuel injector (FP1)

- Short circuit of the wiring harness, connector between fuel injector (FP1) terminal A and main relay terminal C



- Short circuit of the wiring harness between PCM terminal 2M and fuel injector (FP1) terminal B
- Short circuit of the fuel injector (FP1) internal circuit

Fuel injector (RP1)

- Short circuit of the wiring harness, connector between fuel injector (RP1) terminal A and main relay terminal C
- PCM terminal 2J—fuel injector (RP1) terminal B
- Short circuit of the fuel injector (RP1) internal circuit

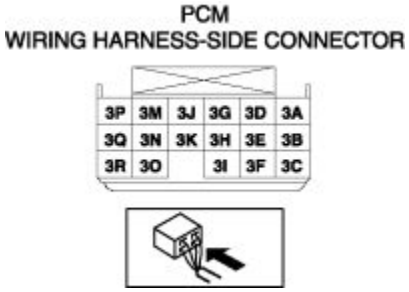
Fuel injector (FP2, RP2) operation inspection

1. Connect the WDS or equivalent to the DLC-2.

2. Warm up the engine and idle it.

3. Monitor the following PID.
   - Engine speed signal (RPM)

4. Verify that there is no output of the fuel injector (FP2, RP2) control signal wave pattern from the following PCM terminals. (See PCM INSPECTION .)

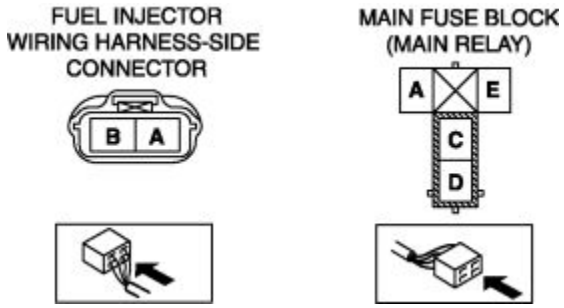


   - PCM terminal 3A (FP2)
   - PCM terminal 3D (RP2)
     - If the signal wave pattern can be verified, inspect the following and repair or replace the malfunctioning part.
       - Mass air flow sensor
       - Throttle position sensor
       - Intake air temperature sensor

5. Verify that there is output of the fuel injector (FP2, RP2) control signal wave pattern from the following PCM terminals when the PID RPM is **6,250 rpm or more** .
   - PCM terminal 3A (FP2)
   - PCM terminal 3D (RP2)
     - If the signal wave pattern cannot be verified, perform the following inspections and repair or replace the malfunctioning location.

Fuel injector (FP2)

- Open or short circuit in the wiring harness between PCM terminal 3A and fuel injector (FP2) terminal B



- Open circuit in the wiring harness between fuel injector (FP2) terminal A and main relay terminal C
- Fuel injector short circuit (FP2)

Fuel injector (RP2)

- Open or short circuit between the PCM terminal 3D—fuel injector (RP2) terminal B
- Open circuit in the wiring harness between fuel injector (RP2) terminal A and main relay terminal C
- Open circuit in the fuel injector (RP2) internal circuit

Fuel injector (FS, RS) operation inspection

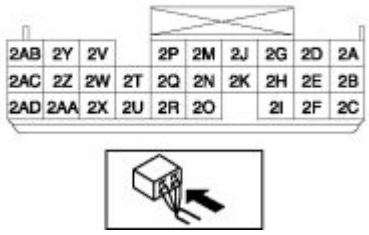
1. Connect the WDS or equivalent to the DLC-2.

2. Warm up the engine and idle it.

3. Monitor the following PID.
   - Engine speed signal (RPM)

4. Verify that there is no output of the fuel injector (FS, RS) control signal wave pattern from the following PCM terminal when idling. (See PCM INSPECTION .)

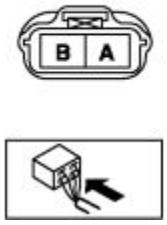
PCM
WIRING HARNESS-SIDE CONNECTOR



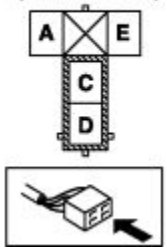
- PCM terminal 2G (FS)
- PCM terminal 2D (RS)
    - If the signal wave pattern cannot be verified, perform the following inspections and repair or replace the malfunctioning part.
        - Mass air flow sensor
        - Throttle position sensor
        - Intake air temperature sensor

5. Verify that there is output of fuel injector (FP2, RP2) control signal wave pattern from the following PCM terminals when the PID RPM is **5,000 rpm or more** .

FUEL INJECTOR
WIRING HARNESS-SIDE
CONNECTOR



MAIN FUSE BLOCK
(MAIN RELAY)



- PCM terminal 2G (FS)
- PCM terminal 2D (RS)
    - If the signal wave pattern can be verified, perform the following inspections and repair or replace the malfunctioning part.

Fuel injector (FS)

- Open or short circuit of the wiring harness between PCM terminal 2G and fuel injector (FS) terminal B
- Open circuit in the wiring harness between fuel injector (FS) terminal A and main relay terminal
- Open circuit in the fuel injector (FS) internal circuit

Fuel injector (RS)

- Open or short circuit in the wiring harness between PCM terminal 2D and fuel injector (RS) terminal B
- Open circuit in the wiring harness between fuel injector (RS) terminal A and main relay
- Open circuit in the fuel injector (RS) internal circuit

Resistance Inspection

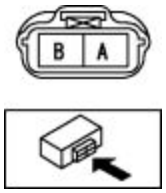
1. Turn the ignition switch to the LOCK position.

2. Disconnect the negative battery cable. (See BATTERY REMOVAL/INSTALLATION .)

3. Remove the extension manifold. (See INTAKE-AIR SYSTEM REMOVAL/INSTALLATION .)

4. Disconnect the fuel injector connector.

5. Measure the resistance between terminals A and B of the fuel injector using a tester.



- If within the specification, perform out the "Circuit Open/Short Inspection".
- If not within the specification, replace the fuel injector.

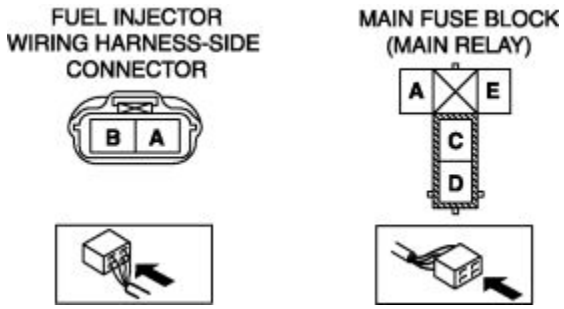
Resistance

- Approx. 13.8 ohms [20 °C {68 °F}]

Circuit Open/Short Inspection

1. Disconnect the PCM connector. (See PCM REMOVAL/INSTALLATION .)

2. Inspect the following wiring harness for open or short (continuity check).



Open circuit

- If there is no continuity, the circuit is open. Repair or replace the harness.
  - Fuel injector (FP1) terminal B and PCM terminal 2M.
  - Fuel injector (RP1) terminal B and PCM terminal 2J.
  - Fuel injector (FP2) terminal B and PCM terminal 3A.
  - Fuel injector (RP2) terminal B and PCM terminal 3D.
  - Fuel injector (FS) terminal B and PCM terminal 2G.
  - Fuel injector (RS) terminal B and PCM terminal 2D.
  - Fuel injector (FP1) terminal A and main relay terminal C through common connector.
  - Fuel injector (RP1) terminal A and main relay terminal C through common connector.
  - Fuel injector (FP2) terminal A and main relay terminal C through common connector.
  - Fuel injector (RP2) terminal A and main relay terminal C through common connector.
  - Fuel injector (FS) terminal A and main relay terminal C through common connector.
  - Fuel injector (RS) terminal A and main relay terminal C through common connector.

Short circuit

- If there is continuity, the circuit is short. Repair or replace the harness.
  - Fuel injector (FP1) terminal B and body GND.
  - Fuel injector (RP1) terminal B and body GND.
  - Fuel injector (FP2) terminal B and body GND.
  - Fuel injector (RP2) terminal B and body GND.
  - Fuel injector (FS) terminal B and body GND.
  - Fuel injector (RS) terminal B and body GND.

Leakage Inspection

WARNING:

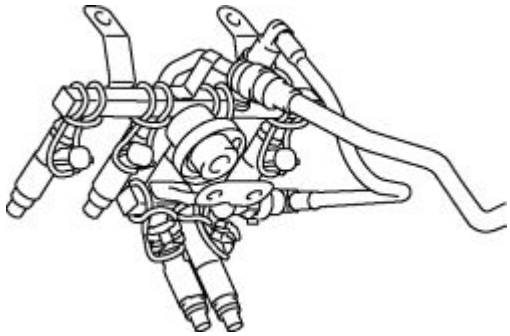
- Fuel line spills and leakage from the pressurized fuel system are dangerous. Fuel can ignite and cause serious injury or death and damage. To prevent this, complete the following inspection with the engine stopped.

1. Follow the before repair procedure and perform the fuel line safety procedure. (See BEFORE REPAIR PROCEDURE .)

2. Disconnect the negative battery cable. (See BATTERY REMOVAL/INSTALLATION .)

3. Remove the fuel injector and fuel distributor as a single unit. (See FUEL INJECTOR REMOVAL/INSTALLATION .)

4. Fix the fuel injector to the fuel distributor with a wire or the equivalent.



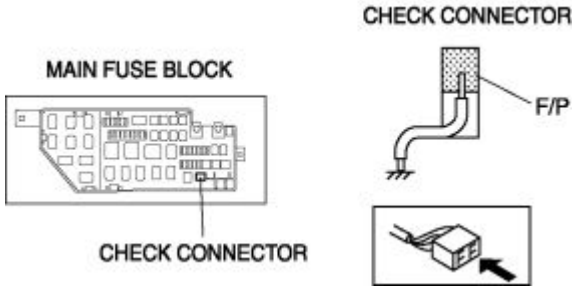
5. Connect the fuel hose.

6. Connect the negative battery cable.

CAUTION:

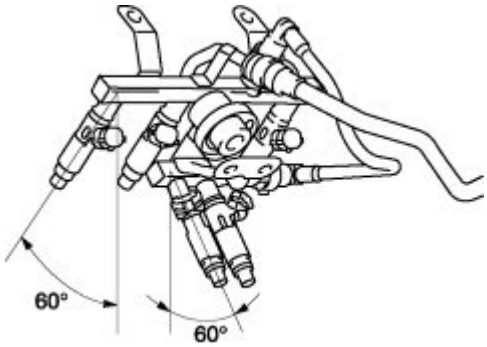
- Shorting the wrong terminal of the check connector may cause malfunctions. Make sure to short only the specified terminal.

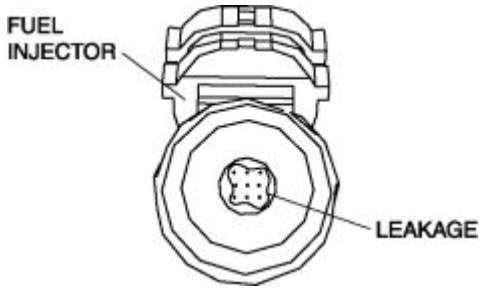
7. Ground the check connector terminal F/P using the jumper wire.



8. Turn the ignition switch to the ON position and operate the fuel pump.

9. Tilt the fuel injector at an angle of **60°** to inspect for leakage.





- If not within the specification, replace the fuel injector.

  Test condition

- Fuel pressure: 392 kPa {4.00 kgf/cm^2 , 56.9 psi}
- Atmosphere temperature: Normal temperature

Leakage amount

Engine	Fuel injector		Leakage amount (approx.) (1 drop)
	Position	Color	
13B-MSP (Standard Power)	FP1, RP1	Red	110 min. or more
	FS, RS	Blue	30 min. or more
13B-MSP (High Power)	FP1, RP1	Red	110 min. or more
	FP2, RP2, FS, RS	Yellow	70 min. or more

10. Turn the ignition switch to the LOCK position and disconnect the jumper wire.

11. Inspect all parts by performing the "AFTER REPAIR PROCEDURE". (See AFTER REPAIR PROCEDURE .)

Injection volume Inspection

WARNING:

- Fuel line spills and leakage from the pressurized fuel system are dangerous. Fuel can ignite and cause serious injury or death and damage. To prevent this, complete the following inspection with the engine stopped.

1. Follow the before repair procedure and perform the fuel line safety procedure. (See BEFORE REPAIR PROCEDURE .)

2. Disconnect the negative battery cable. (See BATTERY REMOVAL/INSTALLATION .)

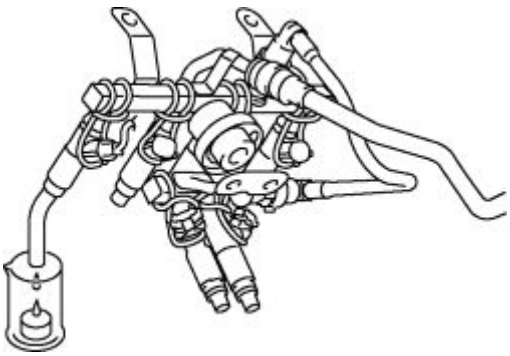
3. Remove the PCM.(See PCM REMOVAL/INSTALLATION .)

4. Connect the PCM connector.

5. Remove the fuel injector and fuel distributor as a single unit. (See FUEL INJECTOR REMOVAL/INSTALLATION .)

6. Fix the fuel injector to the fuel distributor with a wire or the equivalent.

7. Connect the appropriate fuel injector connector.

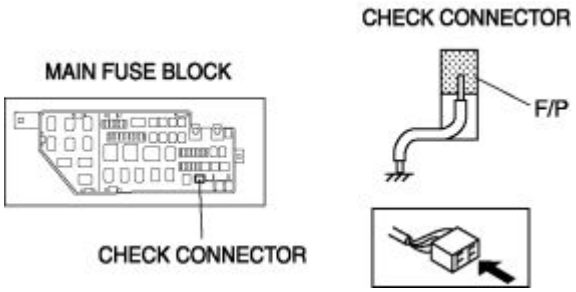


8. Connect the negative battery cable.

CAUTION:

- Shorting the wrong terminal of the check connector may cause malfunctions. Make sure to short only the specified terminal.

9. Ground the check connector terminal F/P using the jumper wire.

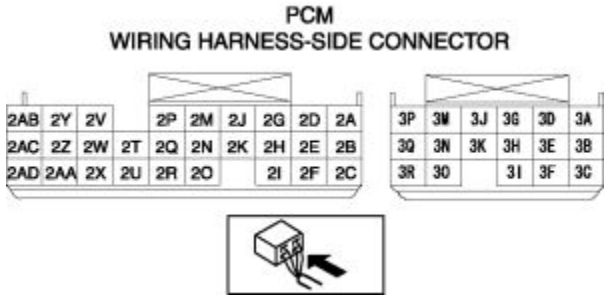


10. Turn the ignition switch to the ON position and operate the fuel pump.

CAUTION:

- Shorting the wrong terminal of the PCM may cause malfunctions. Make sure to short only the specified terminal.

11. Ground the following PCM terminal using the jumper wire, and then measure the injection volume of each fuel injector.



- If not within the specification, replace the fuel injector.

Injection volume

Engine	Fuel injector		Injection volume (approx.)
	Position	Color	(cm^3 {cc, fl oz}/15s)
13B-MSP	FP1, RP1	Red	69—78 {69—78, 2.4—2.6}

(Standard Power)	FS, RS	Blue	118—133 {118—133, 4.00—4.50}
13B-MSP (High Power)	FP1, RP1	Red	69—78 {69—78, 2.4—2.6}
	FP2, RP2, FS, RS	Yellow	89—101 {89—101, 3.01—3.42}

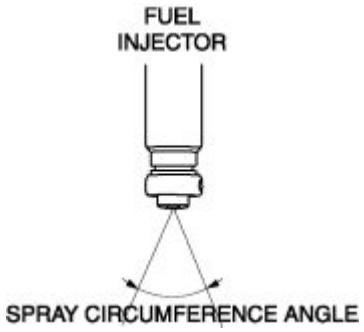
Fuel injector	PCM terminal
Fuel injector (FP1)	2M
Fuel injector (RP1)	2J
Fuel injector (FS)	2G
Fuel injector (RS)	2D
Fuel injector (FP2)	3A
Fuel injector (RP2)	3D

12. Turn the ignition switch to the LOCK position and disconnect the jumper wire.

13. Inspect all parts by performing the "AFTER REPAIR PROCEDURE". (See AFTER REPAIR PROCEDURE .)

Atomization Inspection

1. Inspect the atomization status.



- If the spray circumference angle is incorrect or the spray density is uneven, replace the fuel injector.

Spray circumference angle

Engine	Fuel injector		Spray circumference angle (approx.)
	Position	Color	
13B-MSP (Standard Power)	FP1, RP1	Red	26°—34°
	FS, RS	Blue	13°—25°
13B-MSP (High Power)	FP1, RP1	Red	26°—34°
	FP2, RP2, FS, RS	Yellow	13°—25°

Notes:

QUICK CONNECTOR

QUICK RELEASE CONNECTOR REMOVAL/INSTALLATION

WARNING:

- Fuel vapor is hazardous. It can very easily ignite, causing serious injury and damage. Fuel can also irritate skin and eyes. To prevent this, always complete the "Fuel Line Safety Procedure", while referring to the "BEFORE SERVICE PRECAUTIONS".

Inside the Engine Compartment

Removal

1. Follow the before repair procedure and perform the fuel line safety procedure. (See BEFORE REPAIR PROCEDURE .)

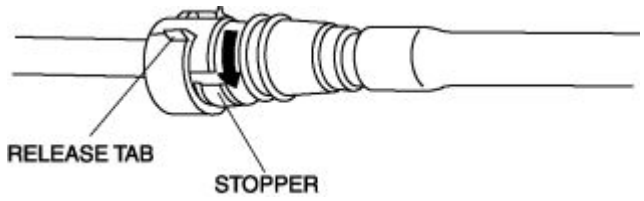
   CAUTION:

   - The quick release connector may be damaged if the release tab is bent excessively. Do not expand the release tab over the stopper.

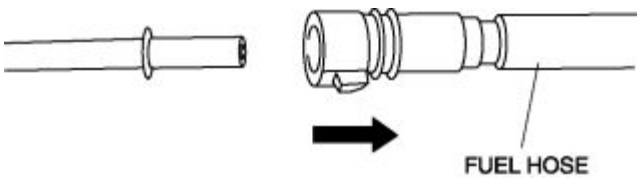
   NOTE:

   - The hose can be removed by pushing it to the pipe side to release the lock.

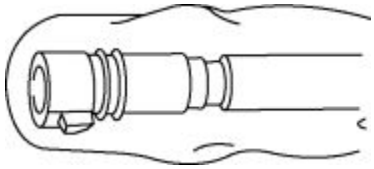
2. Rotate the quick release connector release tab to the stopper position.



3. Pull out the fuel hose straight from the fuel pipe and disconnect it.



4. Cover the disconnected quick release connector and fuel pipe with vinyl sheeting or a similar material to prevent it from being scratched or contaminated with foreign material.



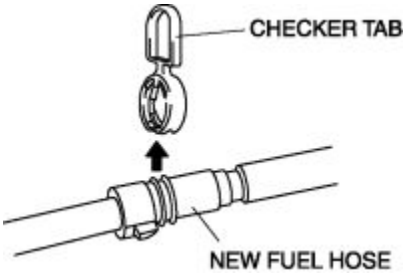
NOTE:

- Take care not to damage or soil the fuel hose.

Installation

NOTE:

- If the quick release connector O-ring is damaged or has slipped, replace the fuel hose.
- A checker tab is integrated with the quick release connector for all of the new fuel hoses and evaporater hoses except for the fuel suction pipe. The checker tab will be released from the quick release connector after it is completely engaged with the fuel pipe.



1. Inspect the fuel hose and fuel pipe sealing surface for damage and deformation.
   - If there is any malfunction, replace a new part.

2. Apply a small amount of clean engine oil to the sealing surface of the fuel pipe.

3. Reconnect the fuel hose straight to the fuel pipe until a click is heard.

   NOTE:

   - If the quick release connector does not move at all, disconnect it and verify that the O-ring is not damaged or has not slipped, then reconnect the quick release connector.

4. Lightly pull and push the quick release connector a few times by hand and verify that it can move **(2—3 mm {0.08—0.12 in})** and it is connected securely.

5. Inspect all parts by performing the "AFTER REPAIR PROCEDURE". (See AFTER REPAIR PROCEDURE .)

Fuel Tank Side (Except for Fuel Shut-off/Rollover Valve)

Removal

1. Follow the before repair procedure and perform the fuel line safety procedure. (See BEFORE REPAIR PROCEDURE .)

   CAUTION:

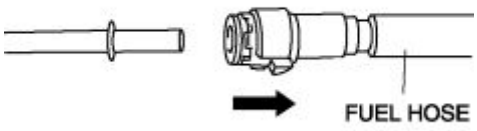
   - The quick release connector may be damaged if the release tab is bent excessively. Do not expand the release tab over the stopper.

   NOTE:

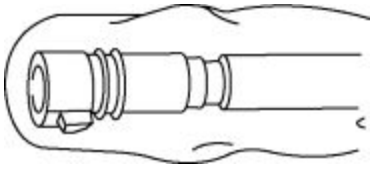
   - The fuel hose may be removed easily by rotating the release tab while the fuel hose is slightly pressed to fuel pipe side.

2. Rotate the quick release connector release tab to the stopper position.

3. Pull out the fuel hose straight from the fuel pipe and disconnect it.



4. Cover the disconnected quick release connector and fuel pipe with vinyl sheeting or a similar material to prevent it from being scratched or contaminated with foreign material.



NOTE:

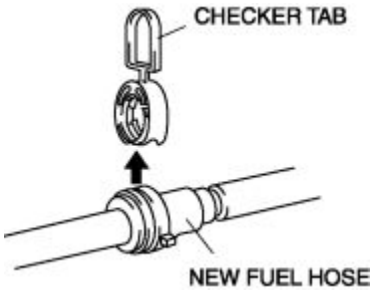
- Take care not to damage or soil the fuel hose.

Installation

NOTE:

- If the quick release connector O-ring is damaged or has slipped, replace a new fuel hose.
- A checker tab is integrated with the quick release connector for all of the new fuel hoses and evaporater hoses except for the fuel suction pipe. The checker tab will be released from the quick release connector after it is completely engaged with the fuel pipe.

Fuel pump pressure hose



1. Inspect the fuel hose and fuel pipe sealing surface for damage and deformation.
   - If there is any malfunction, replace it with a new part.

2. Apply a small amount of clean engine oil to the sealing surface of the fuel pipe.

3. Reconnect the fuel hose straight to the fuel pipe until a click is heard.

   NOTE:

   - If the quick release connector does not move at all, disconnect it and verify that the O-ring is not damaged or has not slipped, then reconnect the quick release connector.

4. Lightly pull and push the quick release connector a few times by hand and verify that it can move **(2—3 mm {0.08—0.12 in})** and it is connected securely.

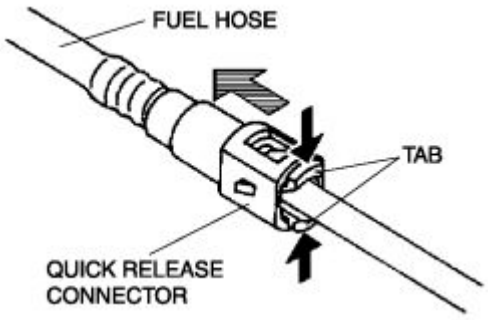
5. Inspect all parts by performing the "AFTER REPAIR PROCEDURE". (See AFTER REPAIR PROCEDURE .)

Fuel Shut-off Valve

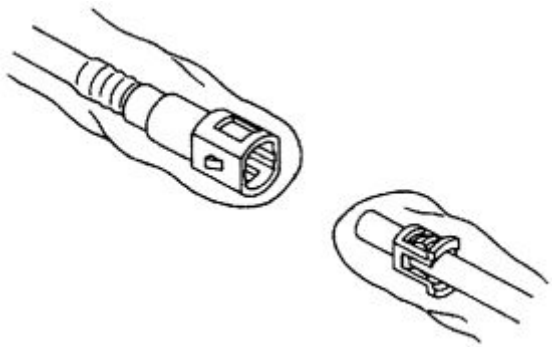
Removal

1. Inspect that the quick release connector joint area is free of foreign materials. Clean as necessary.

2. Squeeze the tabs of the retainer and disconnect the quick release connector.



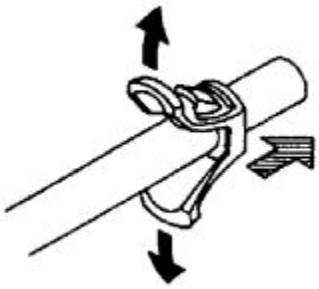
3. Cover the disconnected quick release connector and fuel pipe to prevent it from being scratched or contaminated with foreign materials.



CAUTION:

- Removing the retainer from the disconnected fuel pipe will reduce the effectiveness of the retainer. The retainer must be replaced when any of the following applies.
    1. Retainer has been removed.
    2. Scratches or damage is observed on the retainer.
    3. Plastic fuel hose has been replaced.
    4. Fuel filter (high-pressure) has been replaced.

4. If removal of the retainer is required, remove it in the following procedure.



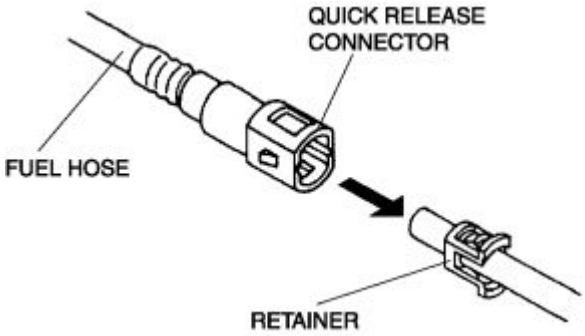
CAUTION:

- Removing the retainer by using a tool can damage the fuel pipe and cause fuel leakage. Remove the retainer by opening the tabs outward by hand.

2. Open the tabs of the retainer outward.
3. Remove and discard the retainer.

Installation

1. When the retainer is not removed, perform the following procedure.
    1. Inspect the plastic fuel hose for kinks. Replace if necessary.
    2. Inspect that the inside of the fuel pipe and the quick release connector is free of foreign materials and damage. Clean as necessary, taking care not to damage the sealing surfaces.
    3. Align the fuel pipe and quick release connector so that the tabs of the retainer are correctly fitted into the quick release connector. Push the quick release connector into the retainer until a click is heard.



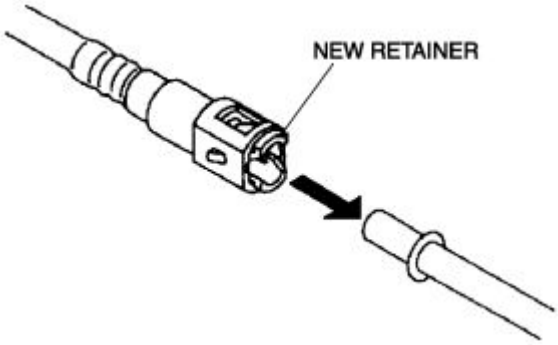
    4. Pull the quick release connector by hand and verify that it is installed securely. Visually inspect that the tabs of the retainer are securely fitted into the quick release connector.

2. When the retainer is removed, perform the following procedure.

NOTE:

- Use the designated genuine retainer only.

2. Install a new retainer onto the quick release connector. Visually inspect that the tabs of the retainer are securely fitted into the quick release connector.
3. Inspect that the inside of the fuel pipe and the quick release connector is free of foreign materials and damage. Clean as necessary, taking care not to damage the sealing surfaces.
4. Push the quick release connector into the fuel pipe until a click is heard.

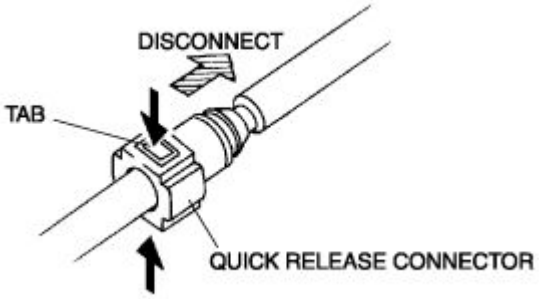


5. Pull the quick release connector by hand and verify that it is installed securely.

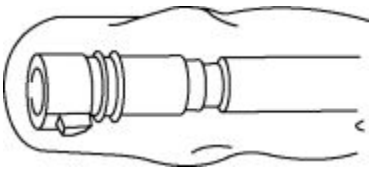
Rollover Valve

Removal

1. Squeeze the tabs on the quick release connector and disconnect the fuel hose from the fuel pipe.



2. Cover the disconnected quick release connector and fuel pipe with vinyl sheeting or a similar material to prevent it from being scratched or contaminated with foreign material.



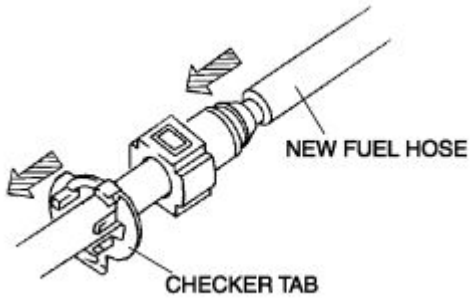
NOTE:

- Take care not to damage or soil the fuel hose.

Installation

NOTE:

- A checker tab is integrated with the quick release connector for new fuel hoses.
- The checker tab will be released from the quick release connector after it is completely engaged with the fuel pipe.



1. Inspect the fuel hose and fuel pipe sealing surface for damage and deformation, and replace as necessary.
    - If the quick release connector O-ring is damaged or has slipped, replace a new fuel hose.

2. Push the quick release connector into the fuel pipe until a click is heard.

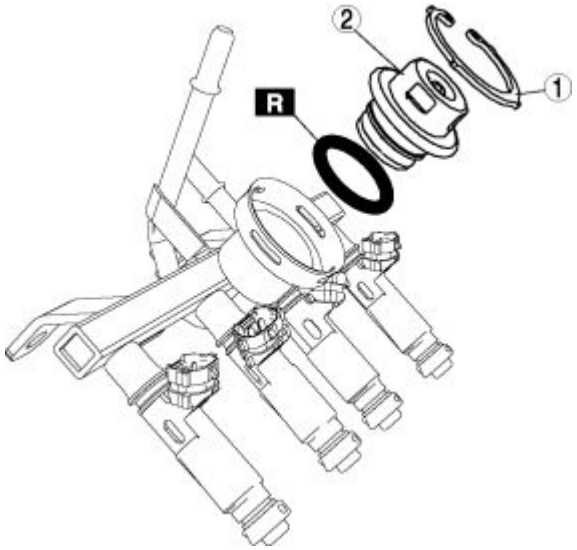
3. Pull the quick release connector by hand and verify that it is installed securely.

PULSATION DAMPER

PULSATION DAMPER REMOVAL/INSTALLATION

1. Remove the fuel distributor. (See FUEL INJECTOR REMOVAL/INSTALLATION .)

2. Remove in the order indicated in the table.



1	Clip
2	Pulsation damper

3. Install in the reverse order of removal.

4. Inspect all parts by performing the "AFTER REPAIR PROCEDURE". (See AFTER REPAIR PROCEDURE .)

PULSATION DAMPER INSPECTION

1. Remove the pulsation damper. (See PULSATION DAMPER REMOVAL/INSTALLATION .)

2. Visually inspect the pulsation damper for damage, cracking, or excess deterioration that would cause fuel leakage.
    - If there is any malfunction, replace the pulsation damper.

Notes:

PRESSURE REGULATOR

PRESSURE REGULATOR INSPECTION

NOTE:

- The pressure regulator cannot be disassembled and inspected as it is built into the fuel pump unit.

1. Perform the fuel line pressure inspection. (See FUEL LINE PRESSURE INSPECTION .)

EXHAUST SYSTEM

EXHAUST SYSTEM INSPECTION

1. Start the engine and inspect each exhaust system component for exhaust gas leakage.
    - If there is leakage, repair or replace the appropriate component.

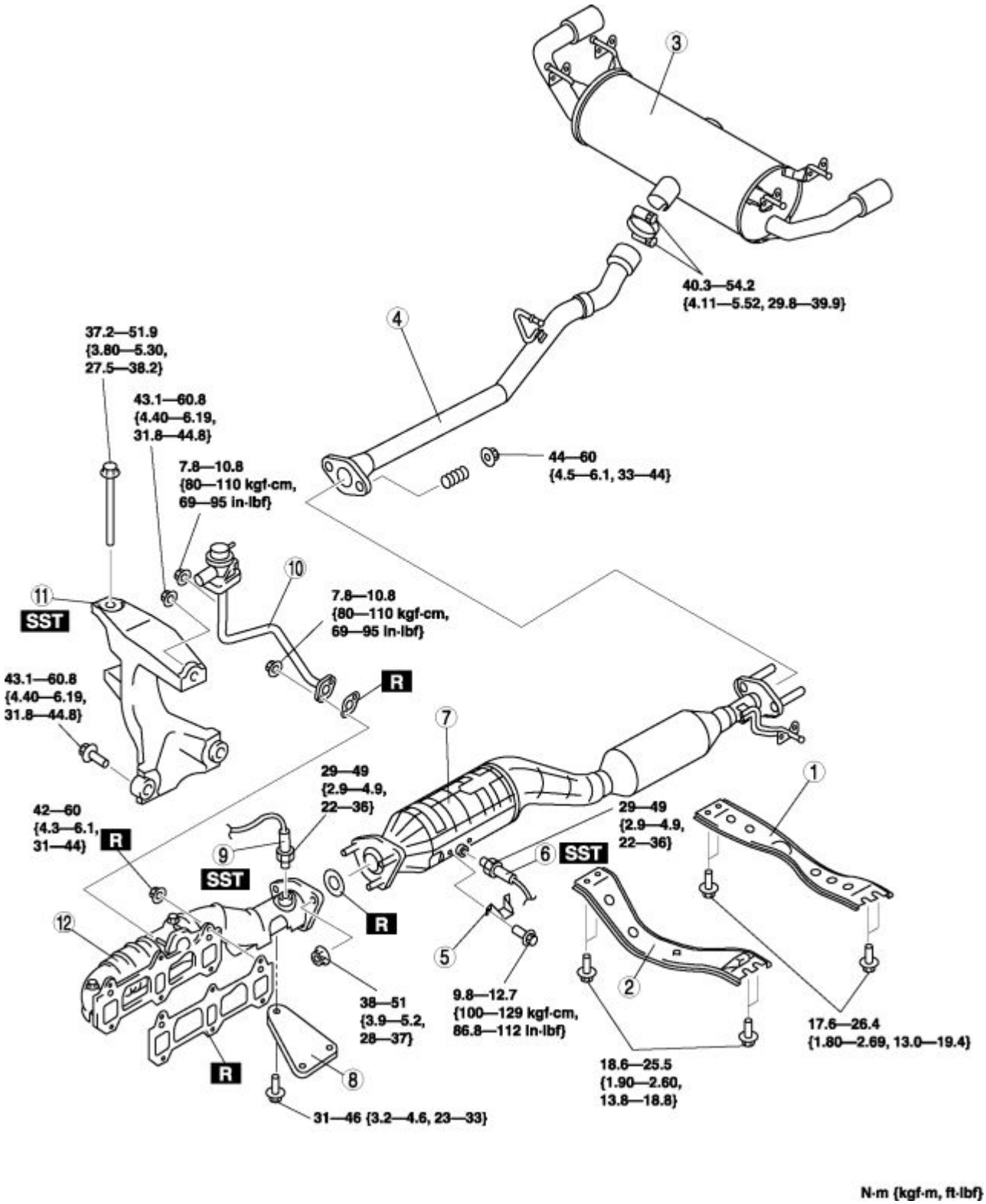
EXHAUST SYSTEM REMOVAL/INSTALLATION

WARNING:

- A hot engine and exhaust system can cause severe burns. Turn off the engine and wait until they are cool before servicing the exhaust system.

1. Remove in the order indicated in the table.

2. Install in the reverse order of removal.

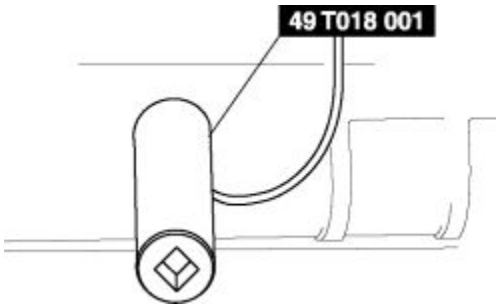


1	Rear tunnel member
2	Front tunnel member
3	Main silencer (See Main Silencer Installation Note .)

4	Middle pipe
5	Protector
6	Rear heated oxygen sensor (See Heated Oxygen Sensor Removal Note .)
7	Catalytic converter
8	Bracket
9	Front heated oxygen sensor (See Heated Oxygen Sensor Removal Note .)
10	AIR pipe
11	Engine mount bracket (RH) (See Engine Mount Bracket (RH) Removal Note .)
12	Exhaust manifold (See Exhaust Manifold Installation Note .)

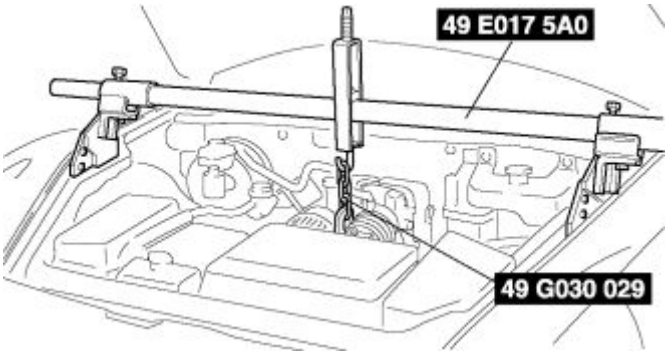
Heated Oxygen Sensor Removal Note

1. Remove the heated oxygen sensor using the **SST** .



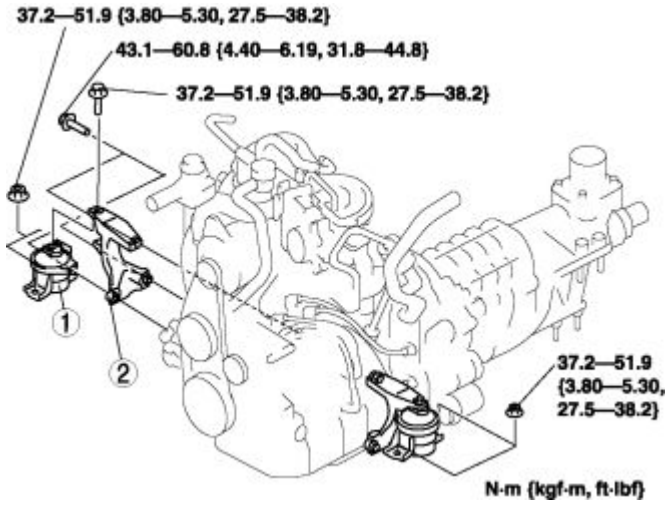
Engine Mount Bracket (RH) Removal Note

1. Attach the **SST** and support the engine.



2. Remove the engine mount rubber (LH) installation nut.

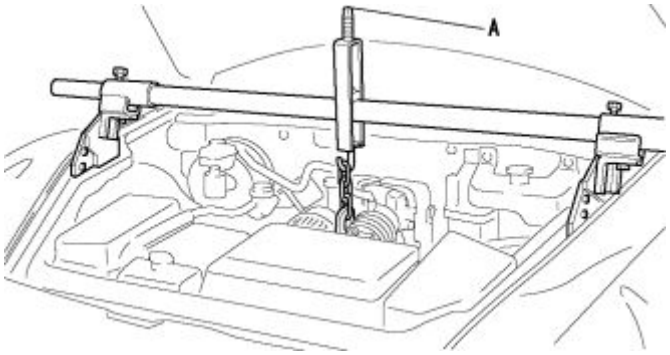
3. Remove in the order indicated in the table.



1	Engine mount rubber (RH) (See Engine Mount Rubber (RH) Removal Note .)
2	Engine mount bracket (RH)

Engine Mount Rubber (RH) Removal Note

1. Tighten the A part indicated in the figure, and then pull up the engine to remove the engine mount rubber (RH).

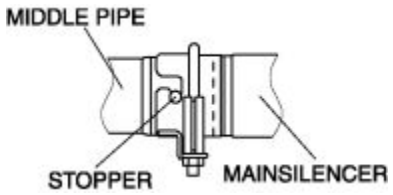


Main Silencer Installation Note

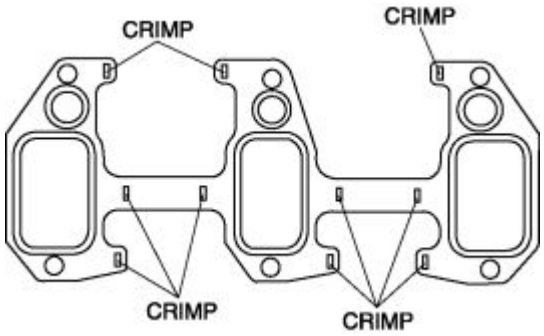
CAUTION:

- If the main silencer and middle pipe are reused after being separated once, exhaust gas leakage will occur. When replacing the main silencer or middle pipe, always replace the main silencer and middle pipe at the same time.

1. Install the main silencer so that the stopper is at the position shown in the figure.



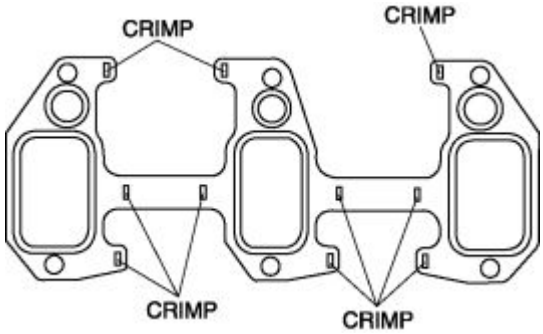
Exhaust Manifold Installation Note



CAUTION:

- Do not reuse the gasket and self-lock nuts on the joint area between the engine and exhaust manifold.
- If a gasket with detached crimps is used on the joint area between the engine and exhaust manifold, exhaust gas will leak. Be careful not to allow the crimps to detach from the gasket. Do not use a gasket if any crimps are detached.

EXHAUST MANIFOLD INSPECTION



CAUTION:

- Do not reuse the gasket and self-lock nuts on the joint area between the engine and exhaust manifold.
- If a gasket with detached crimps is used on the joint area between the engine and exhaust manifold, exhaust gas will leak. Be careful not to allow the crimps to detach from the gasket. Do not use a gasket if any crimps are detached.

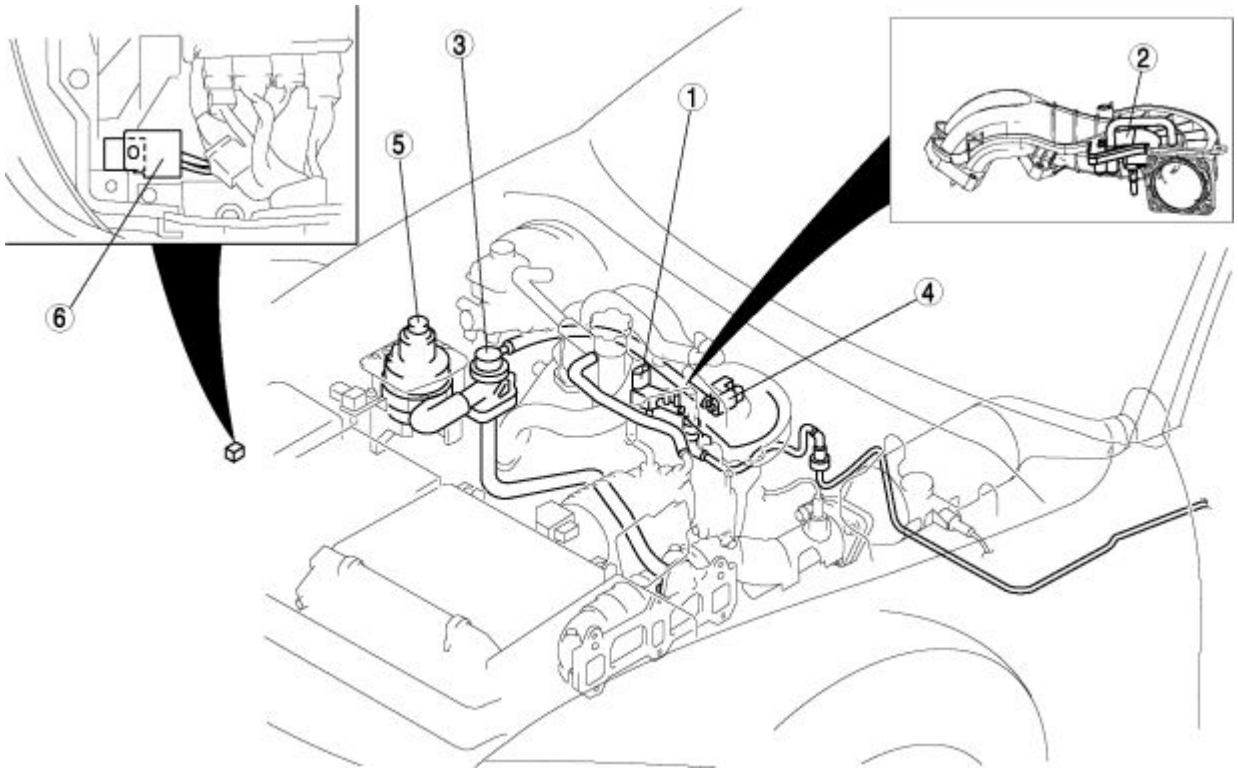
1. Remove the exhaust manifold. (See EXHAUST SYSTEM REMOVAL/INSTALLATION .)

2. Verify that there is no deformation, damage, cracks, or breakage.
    - If there is any malfunction, replace the exhaust manifold.

EMISSION SYSTEM

EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM LOCATION INDEX

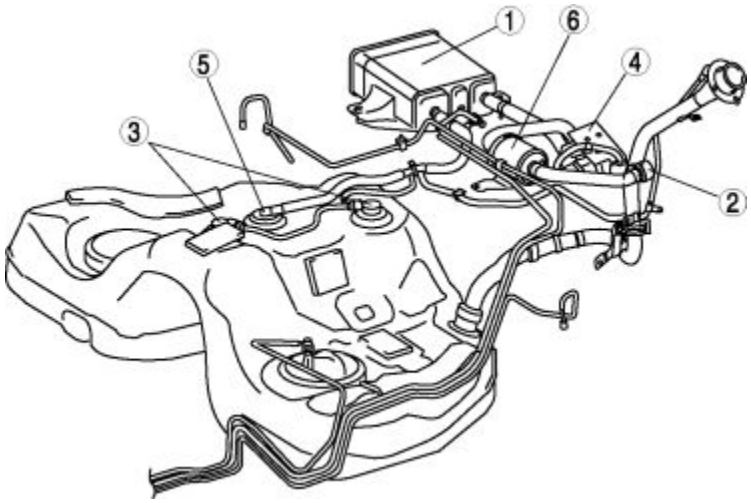
Engine Compartment Side



1	Purge solenoid valve (See PURGE SOLENOID VALVE INSPECTION .)
2	Catch tank (See CATCH TANK INSPECTION .)
3	AIR control valve (See SECONDARY AIR INJECTION (AIR) CONTROL VALVE REMOVAL/INSTALLATION .) (See SECONDARY AIR INJECTION (AIR) CONTROL VALVE INSPECTION .)
4	AIR solenoid valve (See SECONDARY AIR INJECTION (AIR) SOLENOID VALVE REMOVAL/INSTALLATION .) (See SECONDARY AIR INJECTION (AIR) SOLENOID VALVE INSPECTION .
5	AIR pump

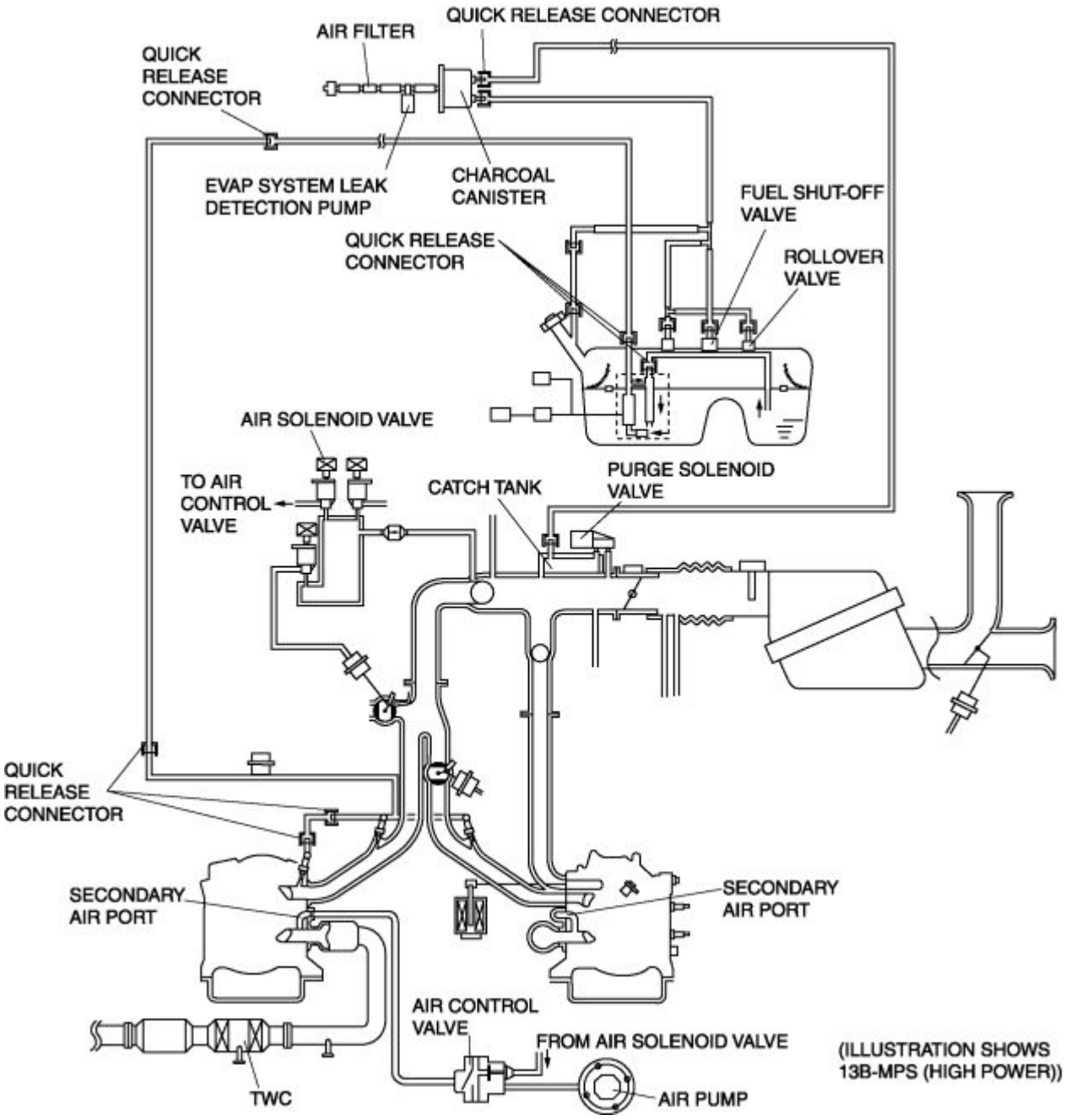
	(See SECONDARY AIR INJECTION (AIR) PUMP REMOVAL/INSTALLATION .) (See SECONDARY AIR INJECTION (AIR) PUMP INSPECTION .)
6	AIR pump relay (See RELAY INSPECTION .)

Fuel Tank Side



1	Charcoal canister (See EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM REMOVAL/INSTALLATION .) (See CHARCOAL CANISTER INSPECTION .)
2	Evaporative chamber (See EVAPORATIVE CHAMBER INSPECTION .)
3	Rollover valve (See FUEL SHUT-OFF/ROLLOVER VALVE INSPECTION .)
4	Evaporative emission (EVAP) system leak detection pump (See EVAPORATIVE EMISSION (EVAP) SYSTEM LEAK DETECTION PUMP INSPECTION .)
5	Fuel shut-off valve (See FUEL SHUT-OFF/ROLLOVER VALVE INSPECTION .)
6	Air filter (See AIR FILTER INSPECTION .)

EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM DIAGRAM

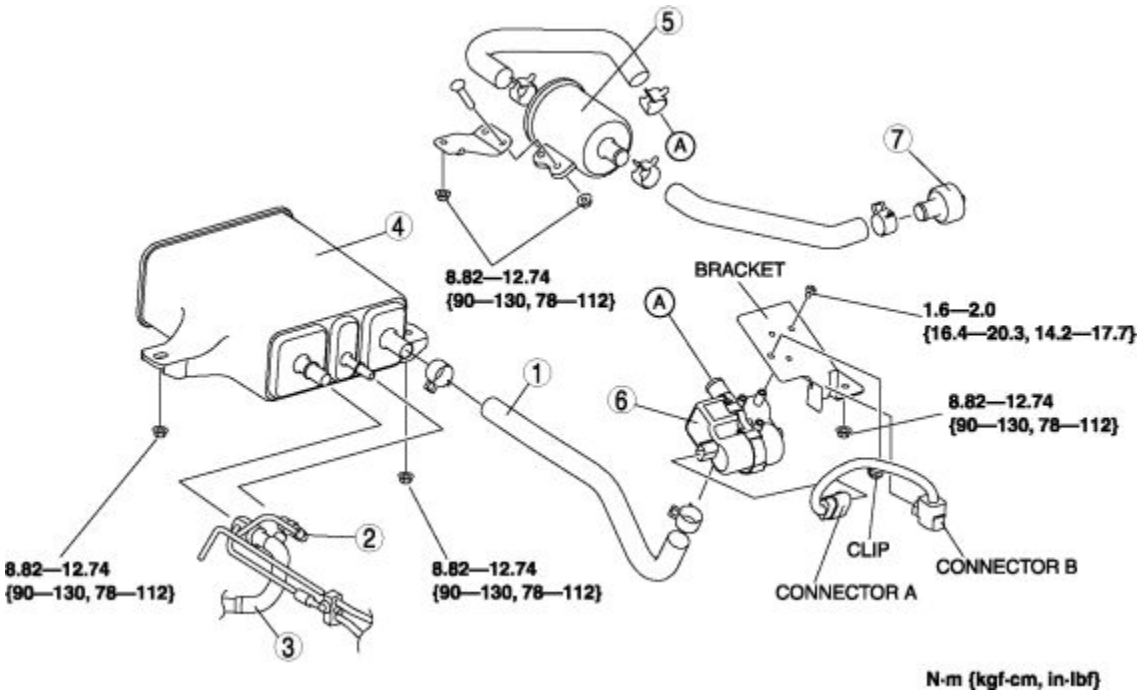


EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM REMOVAL/INSTALLATION

1. Remove the rear differential. (See REAR DIFFERENTIAL REMOVAL/INSTALLATION .)

2. Remove in the order indicated in the table.

3. Install in the reverse order of removal.



1	Evaporative hose (to EVAP system leak detection pump)
2	Evaporative hose (to purge solenoid valve) (See Fuel Tank Side (Except for Fuel Shut-off/Rollover Valve) .)
3	Evaporative hose (to fuel shut-off/rollover valve) (See Fuel Tank Side (Except for Fuel Shut-off/Rollover Valve) .)
4	Charcoal canister
5	Air filter
6	EVAP system leak detection pump (See EVAP System Leak Detection Pump Installation Note .)
7	Evaporative chamber (See Evaporative Chamber Installation Note .)

Evaporative Chamber Installation Note

1. Install the evaporative chamber to the hose.

2. Insert the evaporative chamber into crossmember No.5.

EVAP System Leak Detection Pump Installation Note

1. Install the bracket on the EVAP system leak detection pump.

2. Install the connector A.

3. Install the connector B.

4. Install the clip.

PURGE SOLENOID VALVE

PURGE SOLENOID VALVE INSPECTION

Purge Control Inspection

Without Using WDS or equivalent

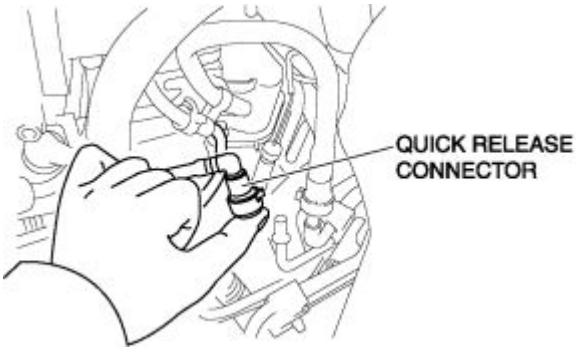
1. Warm up the engine and idle it.

2. Turn the ignition switch off.

3. Disconnect the quick release connector going to the charcoal canister from the engine room side. (See QUICK RELEASE CONNECTOR REMOVAL/INSTALLATION .)

4. Start the engine and idle it.

5. After warming up the engine, verify that the vacuum is not present by placing a finger on the quick release connector for **approx. 30 s** as shown in the figure.



- If the vacuum is not present, inspect the following:
  - PCM terminal voltage
    - Evaporative purge control
  - Purge solenoid valve

6. Verify that the vacuum is not present after **approx. 30 s** from the engine starting.
   - If the vacuum is not present, inspect the following.
     - PCM terminal voltage
       - Intake air temperature
       - Evaporative purge control
       - Throttle opening angle

        - Load/No load identifying signal
    - Purge solenoid valve

Using WDS or equivalent

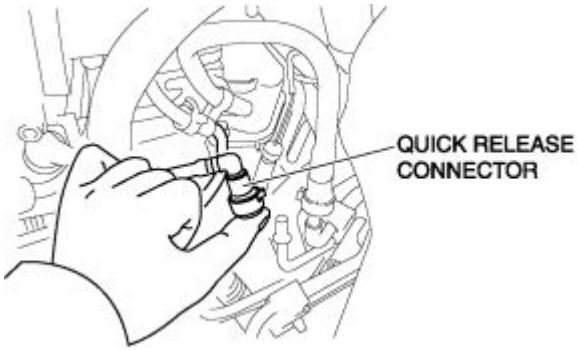
1. Warm up the engine and idle it.

2. Turn the ignition switch off.

3. Disconnect the quick release connector going to the charcoal canister from the engine room side. (See QUICK RELEASE CONNECTOR REMOVAL/INSTALLATION .)

4. Start the engine and idle it.

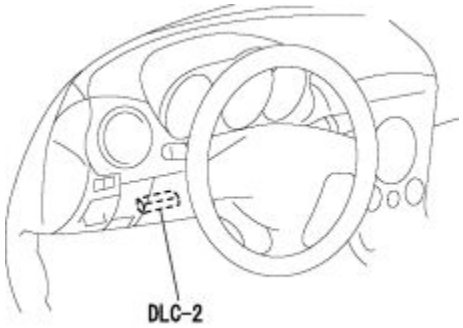
5. After warming up the engine, verify that the negative pressure is not operating by placing a finger on the quick release connector for **approx. 30 s** as shown in the figure.



    - If the vacuum is not present, inspect the following:
        - PCM terminal voltage
            - Evaporative purge control
        - Purge solenoid valve

6. Connect the quick release connector. (See QUICK RELEASE CONNECTOR REMOVAL/INSTALLATION .)

7. Connect the WDS or equivalent to the DLC-2.



8. When operating the purge solenoid valve of DUTY **0 %** at DUTY **100 %** using simulation function EVAPCP, verify that the engine idles roughly or stops.
    - If the idling condition does not change, inspect the following.

    b. Turn the ignition switch to the ON position.

    c. When operating the purge solenoid valve of DUTY **0 %** at DUTY **50 %** using simulation function EVAPCP, verify that purge solenoid valve can be heard operating.
        - If there is no sound of operation, inspect the following.
            - Vacuum hose: disconnection, damage (extension manifold (upper)—purge solenoid valve—charcoal canister)
            - Wiring harnesses, connectors: open circuit (main relay D terminal—purge solenoid valve—PCM 2P terminal)
        - If there is no sound of operation, inspect the following.
            - Purge solenoid valve

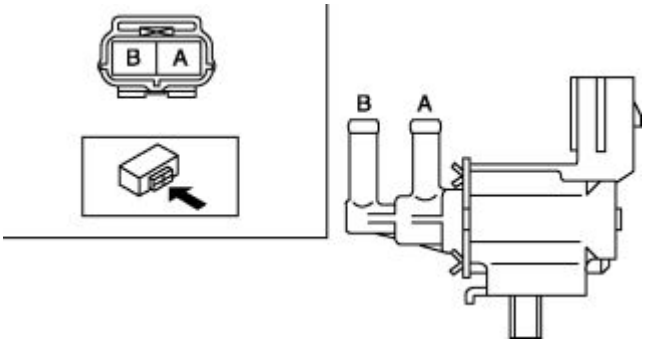
Air flow Inspection

1. Disconnect the negative battery cable. (See BATTERY REMOVAL/INSTALLATION .)

2. Remove the extension manifold. (See INTAKE-AIR SYSTEM REMOVAL/INSTALLATION .)

3. Remove the purge solenoid valve.

4. Inspect air flow between the ports under the following conditions:



- If there is air flow, inspect the related wiring harnesses.
- If there is no air flow, replace the purge solenoid valve.

○—○ : Continuity ○═○ : Air flow

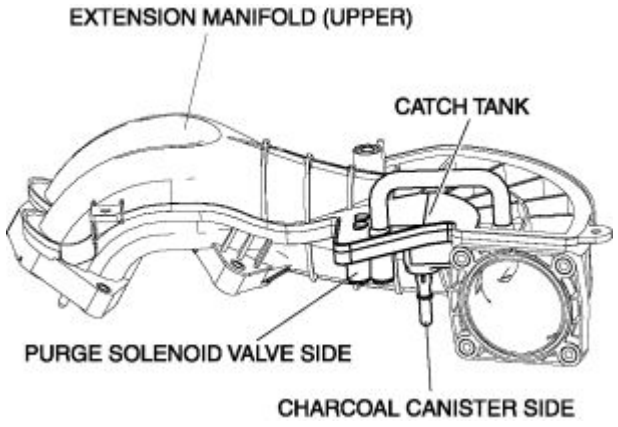
Step	Terminal		Port	
	A	B	A	B
1	○—○			
2	B+	Ground	○═○	

CATCH TANK

CATCH TANK INSPECTION

1. Remove the extension manifold (upper). (See INTAKE-AIR SYSTEM REMOVAL/INSTALLATION .)

2. Seal the catch tank on the purge solenoid valve side.



3. Inspect for air leakage when blowing air using your mouth from the charcoal canister side.
   - If air leaks, replace the extension manifold. (See INTAKE-AIR SYSTEM REMOVAL/INSTALLATION .)

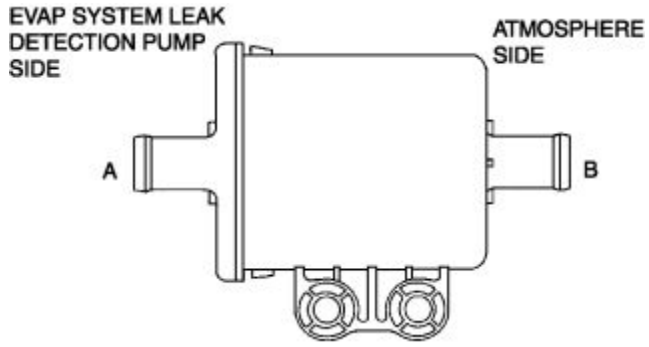
AIR FILTER (EMISSION SYSTEM)

AIR FILTER INSPECTION

1. Remove the air filter. (See EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM REMOVAL/INSTALLATION .)

2. Blow from port A and verify that there is airflow from port B.
   - If not as specified, replace the air filter.

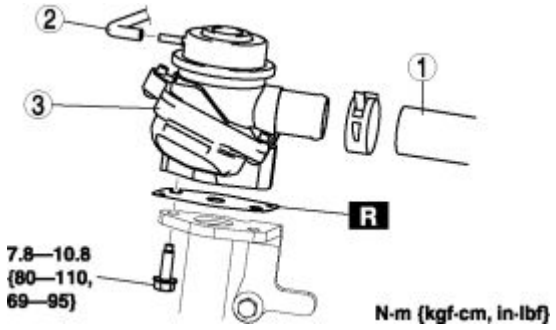
3. Blow from port B and verify that there is airflow from port A.
   - If not as specified, replace the air filter.



SECONDARY AIR INJECTION CONTROL VALVE

SECONDARY AIR INJECTION (AIR) CONTROL VALVE REMOVAL/INSTALLATION

1. Remove in the order indicated in the table.



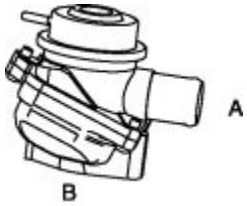
1	Air hose
2	Vacuum hose
3	AIR control valve

2. Install in the reverse order of removal.

SECONDARY AIR INJECTION (AIR) CONTROL VALVE INSPECTION

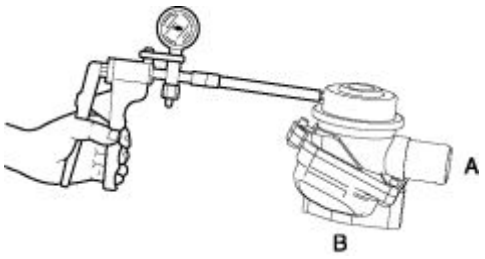
1. Remove the secondary air injection control valve. (See SECONDARY AIR INJECTION (AIR) CONTROL VALVE REMOVAL/INSTALLATION .)

2. Verify that there is no air flow between A and B of the AIR control valve port.



   - If there is air flow, replace the AIR control valve. (See SECONDARY AIR INJECTION (AIR) CONTROL VALVE REMOVAL/INSTALLATION .)

3. Install the vacuum pump to the AIR control valve.



4. Pressurize the actuator valve of the AIR control with a negative pressure of **approx. 60 kPa {0.61 kgf/cm^2 , 8.7 psi}** .

   CAUTION:

   - Since the valve actuator of the AIR control could be damaged, do not pressurize positive pressure or negative pressure more than 100 kPa {1.02 kgf/cm^2 , 14.5 psi}.

5. Blow air through port A, then verify that there is air flow.
   - If there is no air flow, replace the AIR control valve.

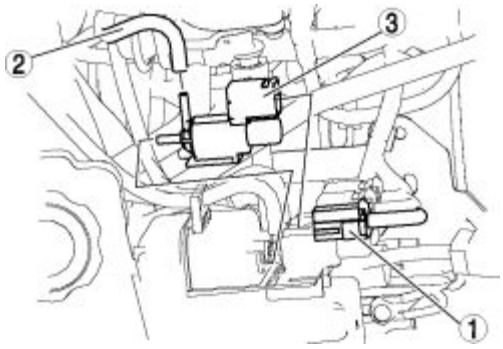
6. Blow air from through port B, then verify that there is no air flow.
   - If there is air flow, replace the AIR control valve. (See SECONDARY AIR INJECTION (AIR) CONTROL VALVE REMOVAL/INSTALLATION .)

SECONDARY AIR INJECTION SOLENOID VALVE

SECONDARY AIR INJECTION (AIR) SOLENOID VALVE REMOVAL/INSTALLATION

1. Remove the extension manifold (upper). (See INTAKE-AIR SYSTEM REMOVAL/INSTALLATION .)

2. Remove in the order indicated in the table.



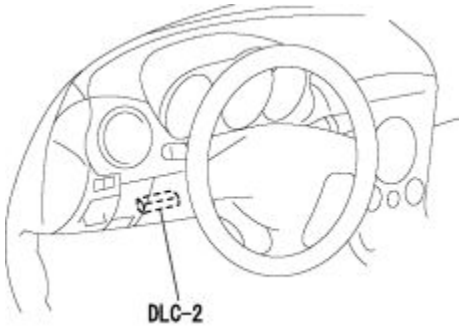
1	Connector
2	Vacuum hose
3	AIR solenoid valve

3. Install in the reverse order of removal.

SECONDARY AIR INJECTION (AIR) SOLENOID VALVE INSPECTION

AIR System Operation Inspection

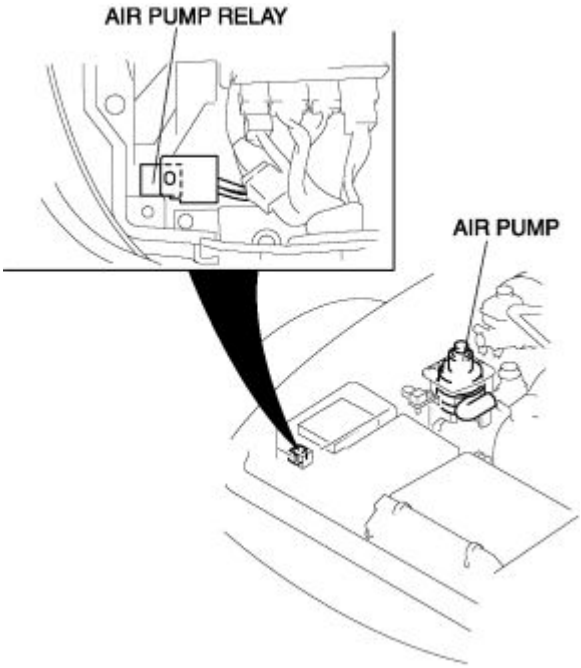
1. Connect the WDS or equivalent to the DLC-2.



2. Warm up the engine to normal operating temperature.

3. Verify that AIR pump is not operating when idling.
   - If the AIR pump is operating, inspect the following items and repair or replace the malfunctioning location.
     - AIR pump relay stuck closed
     - Short circuit of the wiring harness to ground system (PCM terminal 4O—AIR pump relay terminal A)

4. When AIP RLY is turned from off to on, verify that the AIR pump relay and secondary injection pump can be heard operating.



- If there is no sound of operation from the AIR pump relay, inspect the following items and repair or replace the malfunction part.
  - AIR pump relay stuck open
  - Wiring harness, connectors: open circuit (PCM terminal 4O—AIR pump)
  - Wiring harness, connector: open circuit (main relay terminal D—AIR pump relay terminal A)
- If there is no sound of operation from the AIR pump, inspect the following items and repair or replace the malfunction part.
  - Wiring harness, connectors: open or short circuit (Battery—AIR pump relay—AIR pump terminal A)
  - Wiring harness, connectors: open or short circuit (AIR pump terminal B—ground)

5. Inspect the discharging pressure of the AIR pump. (See Discharging Pressure Inspection .)
   - If the discharging pressure is not as specified, replace the AIR pump.

6. Remove the vacuum hose connected to the AIR control valve.

7. Verify that vacuum hose removed when idling is not pressurized with negative pressure.

- If the negative pressure can be verified, perform the following inspections and repair or replace the malfunction part.
    - AIR solenoid valve stuck open
    - Wiring harness, connectors to ground: short circuit (PCM terminal 1O—AIR solenoid valve terminal B)

8. Verify that there is negative pressure when the AIR solenoid valve is turned on from off using the simulation function PACTNV.
    - If the negative pressure cannot be verified, perform the following inspections and repair or replace the malfunction part.
        - AIR solenoid valve stuck closed
        - Wiring harness, connectors: open circuit (PCM terminal 1O—AIR solenoid valve terminal B)
        - Vacuum hose between intake manifold, vacuum tank, AIR solenoid valve, and AIR control valve (clog, leakage, damage, poor connection)

9. Monitor the following PIDs using the monitor function.
    - Heated oxygen sensor (front) (WDS PID: O2S11)
    - AIR pump relay (WDS PID: AIP_RLY)

10. Warm up the engine.

11. Connect the vacuum pump to the AIR control valve.

12. Operate the AIR pump using the simulation function AIP_RLY.

    CAUTION:

    - Do not operate the AIR pump for more than 1 min to avoid damaging the pump.
    - Allow 1 h after energization for the AIR pump to cool down before operating it again.
    - Inspect the following immediately to prevent the catalyst from becoming overheated.

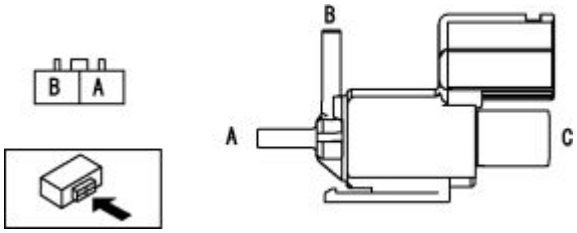
13. Verify that the PID O2S11 shows a lean value when pressurizing the AIR pump using a vacuum pump while idling.
    - If a lean value for the PID O2S11 cannot be confirmed, inspect the following items and repair or replace the applicable part.
        - AIR control valve operation malfunction. (See SECONDARY AIR INJECTION (AIR) CONTROL VALVE INSPECTION .)
        - Channel between AIR pump and exhaust manifold (clog, leakage)

Air flow Inspection

1. Disconnect the negative battery cable. (See BATTERY REMOVAL/INSTALLATION .)

2. Remove the AIR solenoid valve. (See SECONDARY AIR INJECTION (AIR) SOLENOID VALVE REMOVAL/INSTALLATION .)

3. Inspect air flow between the ports under the following conditions:



- If there is no malfunction, inspect the related wiring harnesses.
- If there is any malfunction, replace the AIR solenoid valve. (See SECONDARY AIR INJECTION (AIR) SOLENOID VALVE REMOVAL/INSTALLATION .)

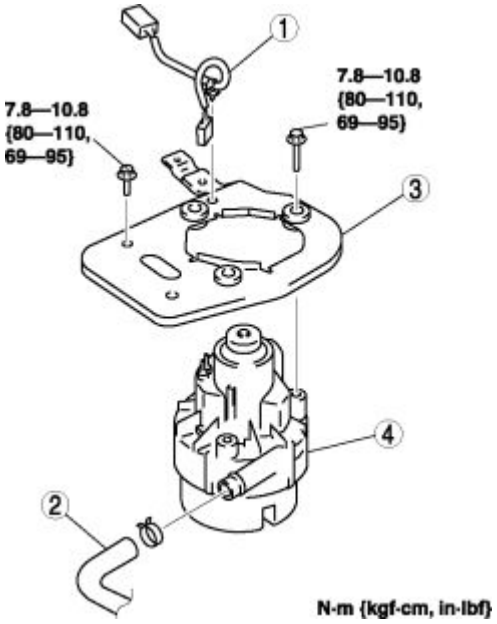
O—O : Continuity O=O : Air flow

Step	Terminal		Port		
	A	B	A	B	C
1	O—O			O=O	
2	B+	Ground	O=O		

SECONDARY AIR INJECTION PUMP

SECONDARY AIR INJECTION (AIR) PUMP REMOVAL/INSTALLATION

1. Remove in the order indicated in the table.



1	Connector
2	Air hose
3	AIR pump bracket
4	AIR pump

2. Install in the reverse order of removal.

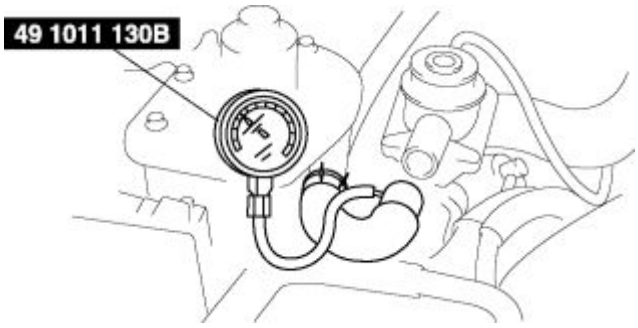
SECONDARY AIR INJECTION (AIR) PUMP INSPECTION

Discharging Pressure Inspection

Without using WDS or equivalent

1. Remove the air hose between the AIR pump and AIR control valve at the AIR control valve side.

2. Install the **SST** on the AIR control side using tape to prevent air leakage.



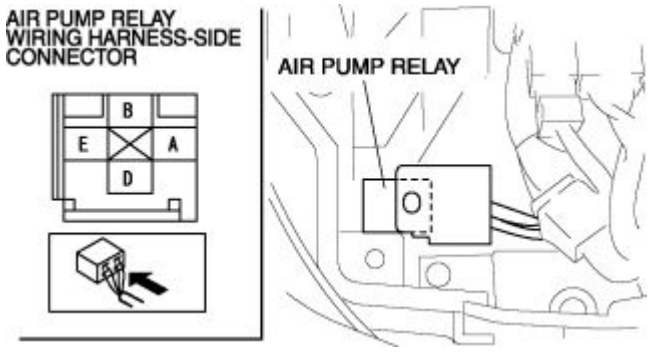
3. Start the engine, turn all electrical loads off, and idle the engine after completely warming it up.

4. Connect the AIR pump relay terminal A to the ground, and operate the AIR pump.

   CAUTION:

   - When connecting the secondary air injection pump relay to the body ground, short the specified terminal, because shorting the wrong terminal may cause malfunctions.
   - Do not operate the secondary air injection pump for more than 1 min to avoid damaging the pump.
   - Stop the engine and wait for 1 hour or more after energization of the secondary air injection pump to allow it to cool down before operating it again.

5. Verify that the discharging pressure of the AIR pump is within the specification.

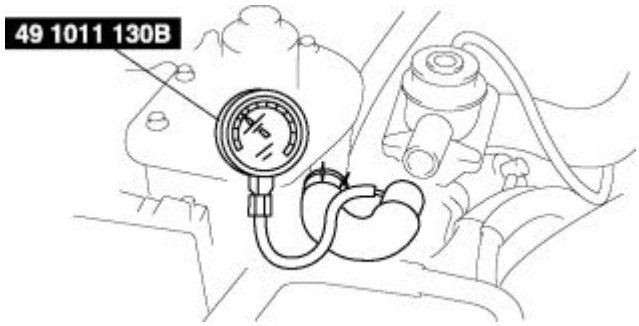


- If not within the specification of the discharge pressure, inspect the following:
  - PCM terminal 4O voltage
  - AIR pump relay
    - If it is within the specification, inspect continuity for the AIR pump.
- Discharging pressure
  - 13.7 kPa {0.14 kgf/cm^2 , 1.99 psi} or more

Using WDS or equivalent

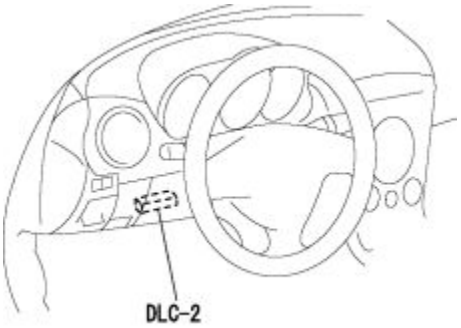
1. Remove the air hose between the AIR pump and AIR control valve at the AIR control valve side.

2. Install the **SST** on the AIR control side using tape to prevent air leakage.



3. Start the engine, turn all electrical loads off, and idle the engine after completely warming it up.

4. Connect the WDS or equivalent to the DLC-2.



5. Turn the PID AIP RLY from off to on position using the simulation function.

CAUTION:

- When connecting the secondary air injection pump relay to the body ground, short the specified terminal, because shorting the wrong terminal may cause malfunctions.
- Do not operate the secondary air injection pump for more than 1 min to avoid damaging the pump.
- Stop the engine and wait for 1 hour or more after energization of the secondary air injection pump to allow it to cool down before operating it again.

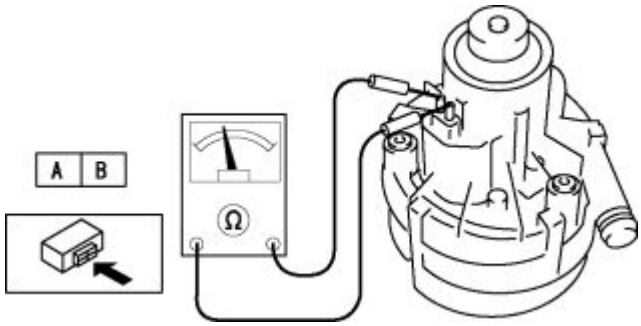
6. Verify that the discharging pressure of the AIR pump is within the specification.
    - If not within the specification, inspect the following:
        - PCM terminal 4O voltage
        - AIR pump relay
            - If it is within the specification, inspect the continuity for the AIR pump.
    - Discharging pressure
        - 13.7 kPa {0.14 kgf/cm^2 , 1.99 psi} or more

Continuity Inspection

1. Disconnect the negative battery cable. (See BATTERY REMOVAL/INSTALLATION .)

2. Disconnect the AIR pump connector.

3. Inspect for continuity between the AIR pump terminals A and B.



- If there is continuity, inspect the related wiring harnesses.
- If there is no continuity, replace the AIR pump. (See SECONDARY AIR INJECTION (AIR) PUMP REMOVAL/INSTALLATION .)

CHARCOAL CANISTER

CHARCOAL CANISTER INSPECTION

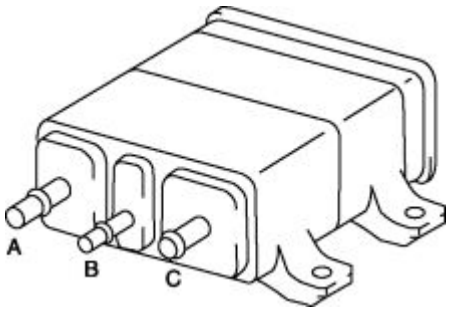
1. Remove the charcoal canister. (See EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM REMOVAL/INSTALLATION .)

2. Plug ports A and C, then blow air into port B.

   CAUTION:

   - Do not apply the pressure more than 20 kPa {0.2 kgf/cm^2 , 2.8 psi} to the charcoal canister. Doing so will damage the charcoal canister.

3. Verify that there is no air leakage from the case.
   - If not as specified, replace the charcoal canister.



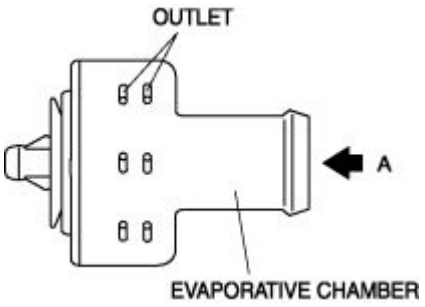
EVAPORATIVE CHAMBER

EVAPORATIVE CHAMBER INSPECTION

1. Remove the rear differential. (See REAR DIFFERENTIAL REMOVAL/INSTALLATION .)

2. Remove the evaporative chamber installed on outside air side of the charcoal canister hose.

3. Blow air from port A using your mouth and verify that there is air flow.
   - If there is no air flow, replace the evaporative chamber.



4. Verify that there is no deformation or cracking of the evaporative chamber.
   - If the exterior is not normal, replace the evaporative chamber.

EVAP SYSTEM LEAK DETECTION PUMP

EVAPORATIVE EMISSION (EVAP) SYSTEM LEAK DETECTION PUMP INSPECTION

Airflow Inspection

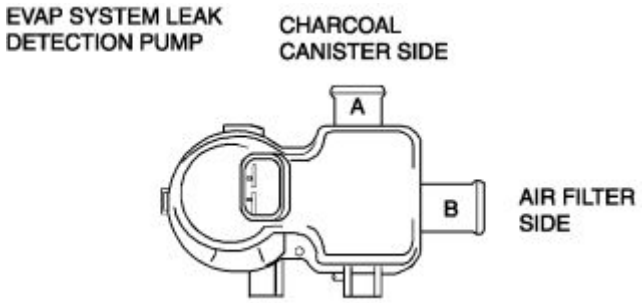
NOTE:

- Perform the following test only when directed.

1. Disconnect the negative battery cable.

2. Remove the EVAP system leak detection pump. (See EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM REMOVAL/INSTALLATION .)

3. Blow air into port A and verify that there is airflow from port B.
    - If not as specified, replace the EVAP system leak detection pump.



4. Blow air into port B and verify that there is airflow from port A.
    - If not as specified, replace the EVAP system leak detection pump.
    - If as specified, perform the following "Resistance Inspection".

Resistance Inspection

NOTE:

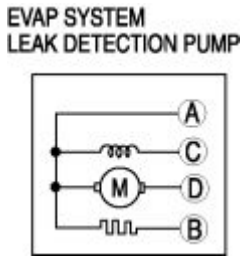
- Perform the following procedure only when directed.

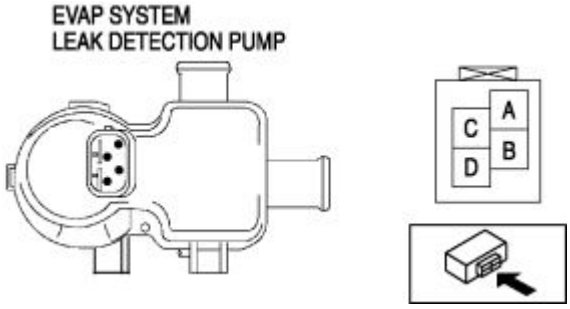
1. Disconnect the negative battery cable.

2. Inspect resistance of the EVAP system leak detection pump.

- If not as specified, replace the EVAP system leak detection pump.
- If as specified, carry out the "Circuit Open/Short Inspection".

Terminals	Resistance (ohm)
A—B	20—50
A—C	26.6—32.4
A—D	118 or less

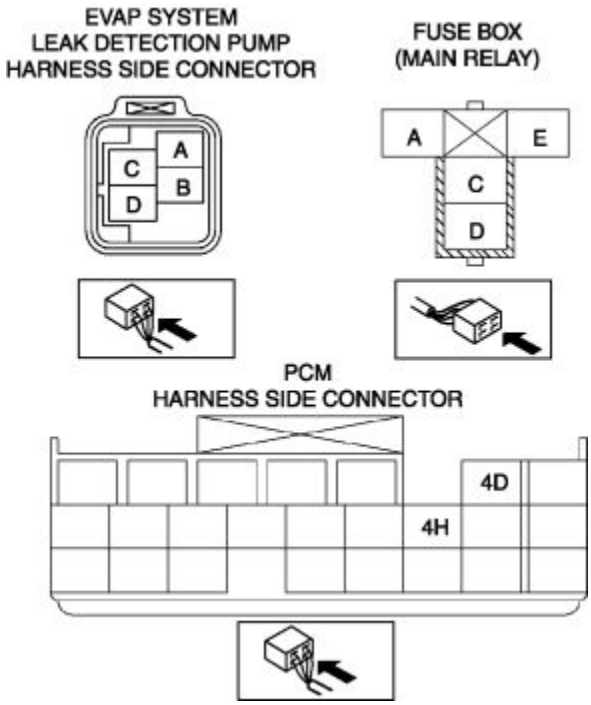




Circuit Open/Short Inspection

1. Disconnect the PCM connector. (See PCM REMOVAL/INSTALLATION .)

2. Inspect the following wiring harness for open or short (continuity check).



Open circuit

- If there is no continuity, the circuit is open. Repair or replace the harness.
  - EVAP system leak detection pump terminal C and PCM terminal 3V
  - EVAP system leak detection pump terminal D and PCM terminal 3Y
  - EVAP system leak detection pump terminal A and main relay terminal C
  - EVAP system leak detection pump terminal B and the body GND

Short circuit

- If there is continuity, the circuit is shorted. Repair or replace the harness.
  - EVAP system leak detection pump terminal C and power supply
  - EVAP system leak detection pump terminal D and power supply
  - EVAP system leak detection pump terminal A and the body GND
  - EVAP system leak detection pump terminal B and power supply

ROLLOVER VALVE

FUEL SHUT-OFF/ROLLOVER VALVE INSPECTION

NOTE:

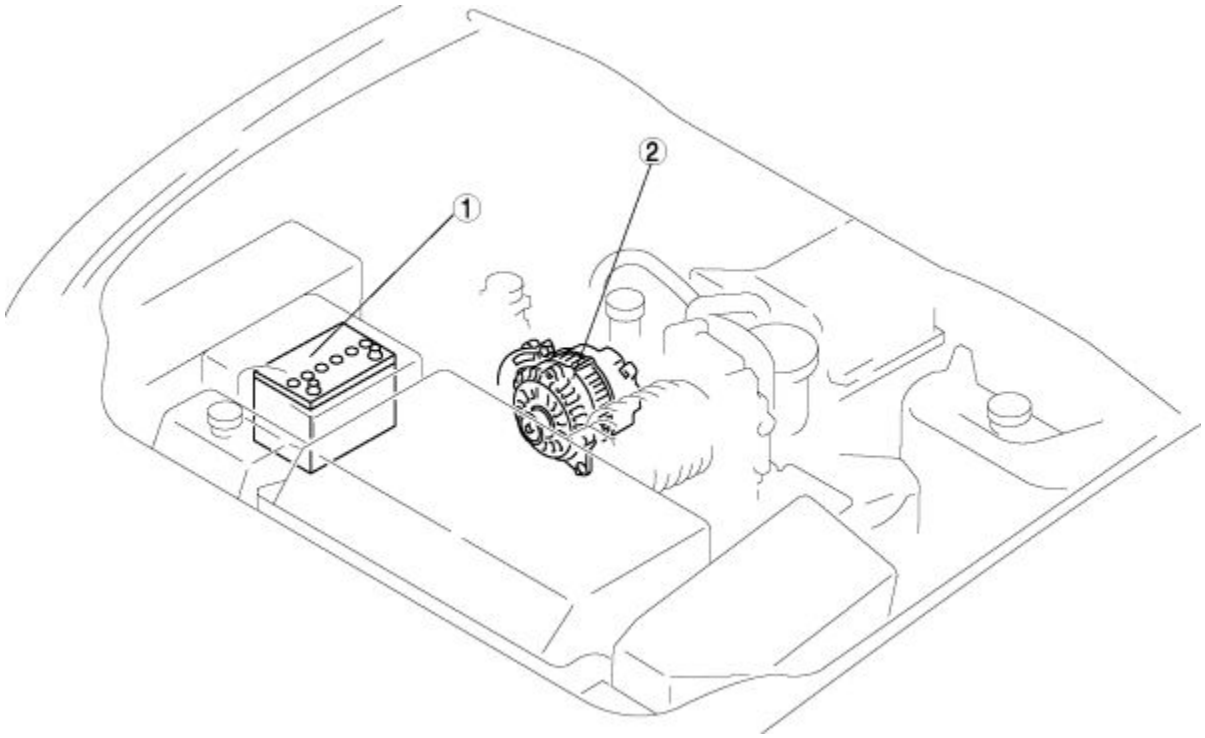
- The fuel shut-off valve and rollover valve cannot be disassembled and inspected because it is built into the fuel tank.

1. Perform the fuel tank inspection. (See FUEL TANK INSPECTION

Notes:

CHARGING SYSTEM

CHARGING SYSTEM LOCATION INDEX



1	Battery (See BATTERY REMOVAL/INSTALLATION .) (See BATTERY INSPECTION .) (See BATTERY RECHARGING .)
2	Generator (See GENERATOR REMOVAL/INSTALLATION .) (See GENERATOR INSPECTION .) (See GENERATOR DISASSEMBLY/ASSEMBLY .)

BATTERY

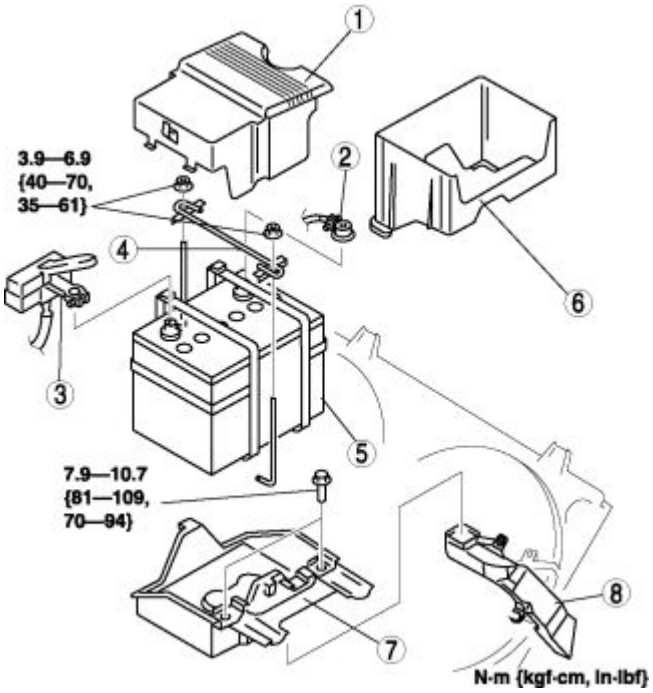
BATTERY REMOVAL/INSTALLATION

WARNING:

- For vehicles with DSC, if the negative battery cable is disconnected, the stored initial position of the steering angle sensor will be cleared and the DSC will not operate properly, making the vehicle unsafe to drive. Perform the steering angle sensor initialization procedure after connecting the negative battery cable.

1. Remove the engine cover. (See ENGINE COVER REMOVAL/INSTALLATION .)

2. Remove in the order indicated in the table.



1	Battery cover (See Battery Cover Removal Note .)
2	Negative battery cable
3	Positive battery cable
4	Battery clamp
5	Battery (See Battery Installation Note .)
6	Battery box

7	Battery tray
8	Battery duct

3. Install in the reverse order of removal.

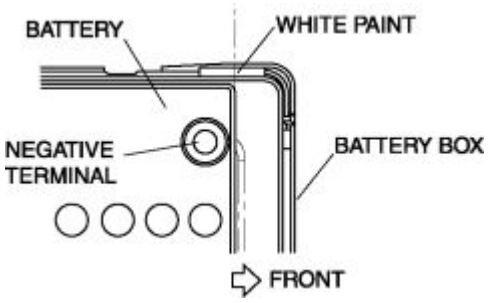
4. Perform the steering angle sensor initializtion procedure. (See STEERING ANGLE SENSOR INITIALIZATION PROCEDURE .)

Battery Cover Removal Note

1. Pull up the two tabs on the rear, remove the tab on the front, and then remove the battery cover.

Battery Installation Note

1. Install the 50D20L and 55D23L battery within the area of the white paint mark on the battery box.



BATTERY INSPECTION

Inspection and Verification

1. Verify that the customer concern by operating the system.

2. Visually inspect for obvious signs of mechanical or electrical damage.Visual Inspection Chart

Mechanical	Electrical
• Battery • Battery mounting	• Battery cables • Battery posts

3. If an obvious cause for a concern is found, correct the cause before proceeding to the next step.

4. If the fault is not visually evident, proceed to the pin point test.

Battery Condition Test

NOTE:

- Failure to fully charge the battery before retesting may cause false readings.

Pin point test

1. Verify the battery condition using the Battery Analyzer.
   - If the meter read, GOOD BATTERY, inspect the generator. (See GENERATOR INSPECTION .)
   - If the meter read, GOOD-RECHARGE, charge the battery and inspect the generator. (See GENERATOR INSPECTION .)
   - If the meter read, CHARGE & RETEST, fully charge the battery and retest.
   - If the meter read, REPLACE BATTERY, install a new battery.
   - If the meter read, BAD CELL-REPLACE, install a new battery.

Battery

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.

3	Using the battery load tester, apply load current (See BATTERY RECHARGING .) **Standard electrolyte gravity** ○ 1.27—1.29 [20 °C {68 °F}] **Back-up current** 2. Verify that the ignition switch is off and that the key has been removed. 3. Disconnect the negative battery cable. 4. Measure the back-up current between the negative battery terminal and the negative battery cable. • 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. **CAUTION:** • Operating electrical loads while the back-up current is being measured can damage the tester. **Standard current** ○ 20 mA max. 5. Inspect and repair wiring harnesses and connectors of the fuse where the current decreased.

BATTERY RECHARGING

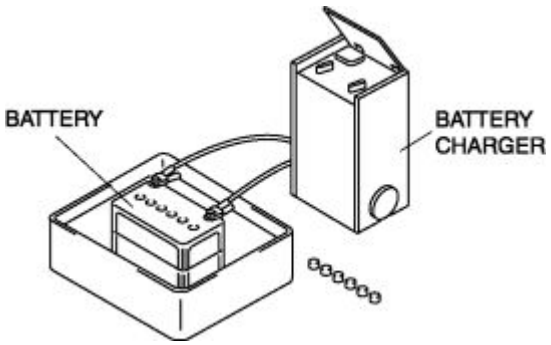
WARNING:

- 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 over 30 min. It will damage the battery.

1. Remove the battery and then place it in a pan of water.



2. Connect a battery charger to the battery and adjust the charging current as follows.Standard specification

Battery type (5-h rate)	Recharge current (A)	Quick charge (A/30 min)
50D20L (40)	4.0—5.0	25
55D23L (48)	4.5—5.5	30
75D26L (52)	5.0—6.0	35

3. 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 stopped.
    - If not within the specification, replace the battery.

      Standard voltage

      - 12.4 V or more

GENERATOR

GENERATOR REMOVAL/INSTALLATION

WARNING:

- When the battery cables are connected, touching the vehicle body with generator terminal B generates sparks. This can cause personal injury, fire, and damage to the electrical components. When removing the generator, always disconnect the negative battery cable.

1. Remove the engine cover. (See ENGINE COVER REMOVAL/INSTALLATION .)

2. Remove the battery cover.

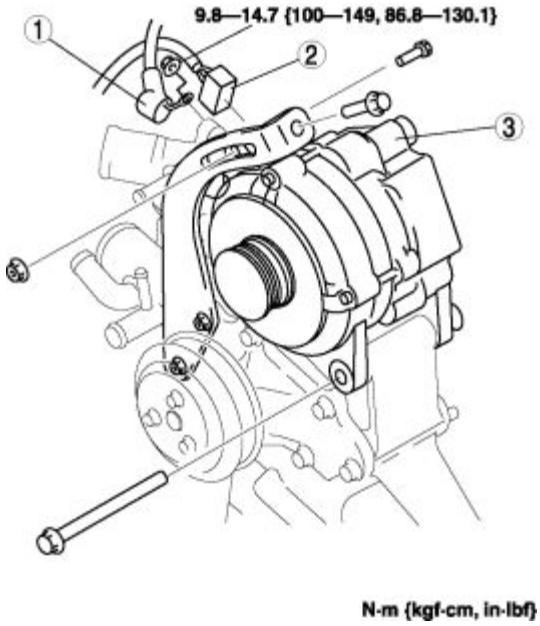
3. Disconnect the negative battery cable. (See BATTERY REMOVAL/INSTALLATION .)

4. Remove the front suspension tower bar. (See FRONT SUSPENSION TOWER BAR REMOVAL/INSTALLATION .)

5. Remove the fresh air duct. (See INTAKE-AIR SYSTEM REMOVAL/INSTALLATION .)

6. Position the drive belt out of the way. (See DRIVE BELT REPLACEMENT .)

7. Remove in the order indicated in the table.



1	Terminal B cable
2	Connector
3	Generator

8. Install in the reverse order of removal.

GENERATOR INSPECTION

CAUTION:

- Do not apply direct battery positive voltage to the generator terminal D, otherwise it could cause damage to the internal parts (power transistor) of the generator.

Generator warning light

1. Verify that the battery is fully charged.

2. Verify that the drive belt deflection/tension is within the specification. (See DRIVE BELT DEFLECTION/TENSION INSPECTION .)

3. With the ignition switch at ON, verify that the generator warning light illuminates.
   - If it does not illuminate, inspect the generator warning light and the wiring harness.

- If the generator warning light and the wiring harness are normal, inspect the PCM.

4. Verify that the generator warning light turns off after the engine is started.
   - If it does not turn off, check if any one of the following DTCs in the on-board diagnostic system are displayed: P0112, P0113, P2502, P2503, P2504. (See DTC TABLE .)

Generator

Voltage

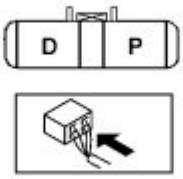
1. Verify that the battery is fully charged.

2. Verify that the drive belt deflection/tension is within the specification. (See DRIVE BELT DEFLECTION/TENSION INSPECTION .)

3. Turn off all electrical loads.

4. 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.



Standard specification

Terminal	IG-ON (V)	Idle (V) [20°C {68 °F}]
B	B+	13.0—15.0
P	Approx. 1.0 or less	Approx. 3.0—8.0
D	Approx. 0	*

*

Turn the following electrical loads on and verify that the voltage reading increases.

- Headlights
- Blower motor
- Rear window defroster

Current

1. Verify that the battery is fully charged.

2. Verify that the drive belt deflection/tension is within the specification. (See DRIVE BELT DEFLECTION/TENSION INSPECTION .)

3. Disconnect the negative battery cable.

4. Connect a tester capable of reading **120 A or above** between generator terminal B and the wiring harness.

5. Connect the negative battery cable.

6. Turn off all electrical loads.

7. Start the engine.

8. Increase engine speed from **2,000—2,500 rpm** .

9. Turn the following electrical loads on and verify that the current reading increases.
   - Headlights
   - Blower motor
   - Rear window defroster

   NOTE:

- Current required for generating power varies with electrical loads applied.

Reference value

- **Current possible for power generation (differs according to load)**
- **[Conditions] ambient temperature 20°C {68 °F}, voltage 13.0—15.0 V, engine warm**

Engine speed (rpm)	Terminal B current (A)
1,000	0* — 70
2,000	0* — 97

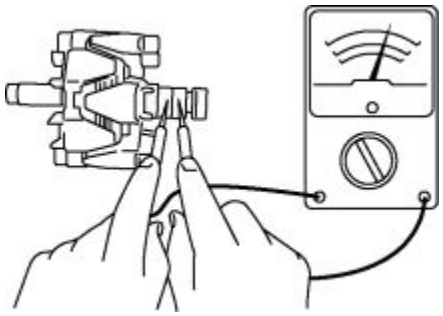
*

The lower limit must be more than 0 A.

Generator Inner Parts

Rotor

1. Measure the resistance between the slip rings using an ohmmeter.

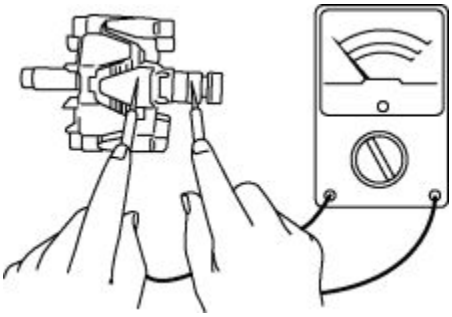


- If not as specified, replace the rotor.

  Resistance [20 °C {68 °F}]

  - 1.6—2.0 ohms

2. Verify that there is no continuity between the slip ring and core using an ohmmeter.

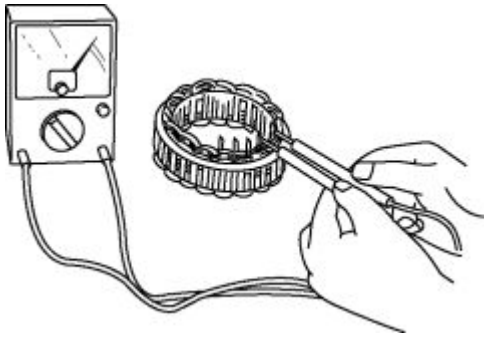


- If there is continuity, replace the rotor.

3. Inspect the slip ring surface condition.
   - If the slip ring surface is rough, use a lathe or fine sandpaper to repair it.

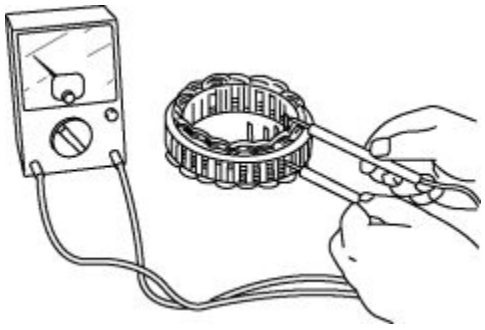
Stator coil

1. Inspect for continuity between the stator coil leads using an ohmmeter.



- If there is no continuity, replace the stator.

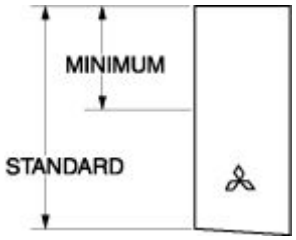
2. Verify that there is no continuity between the stator coil leads and the core using an ohmmeter.



- If there is continuity, replace the stator coil.

Brush

1. Inspect brushes for wear.



- If any brush is worn almost to or beyond the limit, replace all of the brushes.

  Standard brush length

  - 18.5 mm {0.73 in}

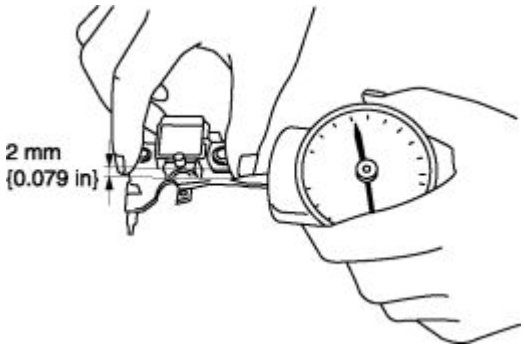
  Minimum brush length

  - 5.0 mm {0.2 in}

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.

  Standard spring force

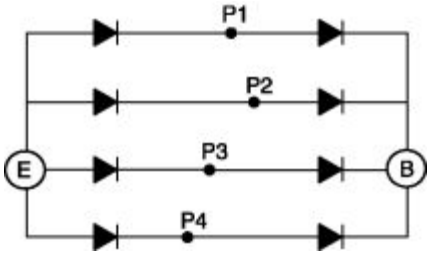
  - 4.8—6.0 N {0.49—0.61 kgf, 1.08—1.34 lbf}

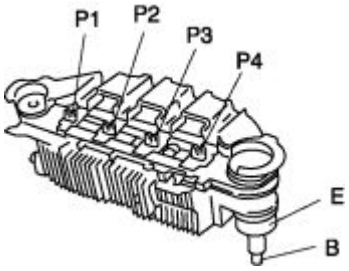
  Minimum spring force

  - 2.16 N {0.22 kgf, 0.49 lbf}

Rectifier

1. Inspect for continuity of the diodes using an ohmmeter.





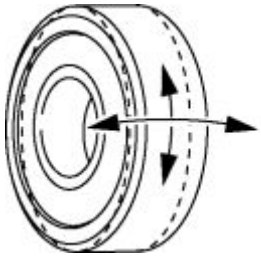
- If not as specified, replace the rectifier.

Specification

Tester		Continuity
Negative	Positive	
E	P1, P2, P3, P4	Yes
B		No
P1, P2, P3, P4	E	No
	B	Yes

Bearing

1. Inspect for abnormal noise, looseness, and sticking.

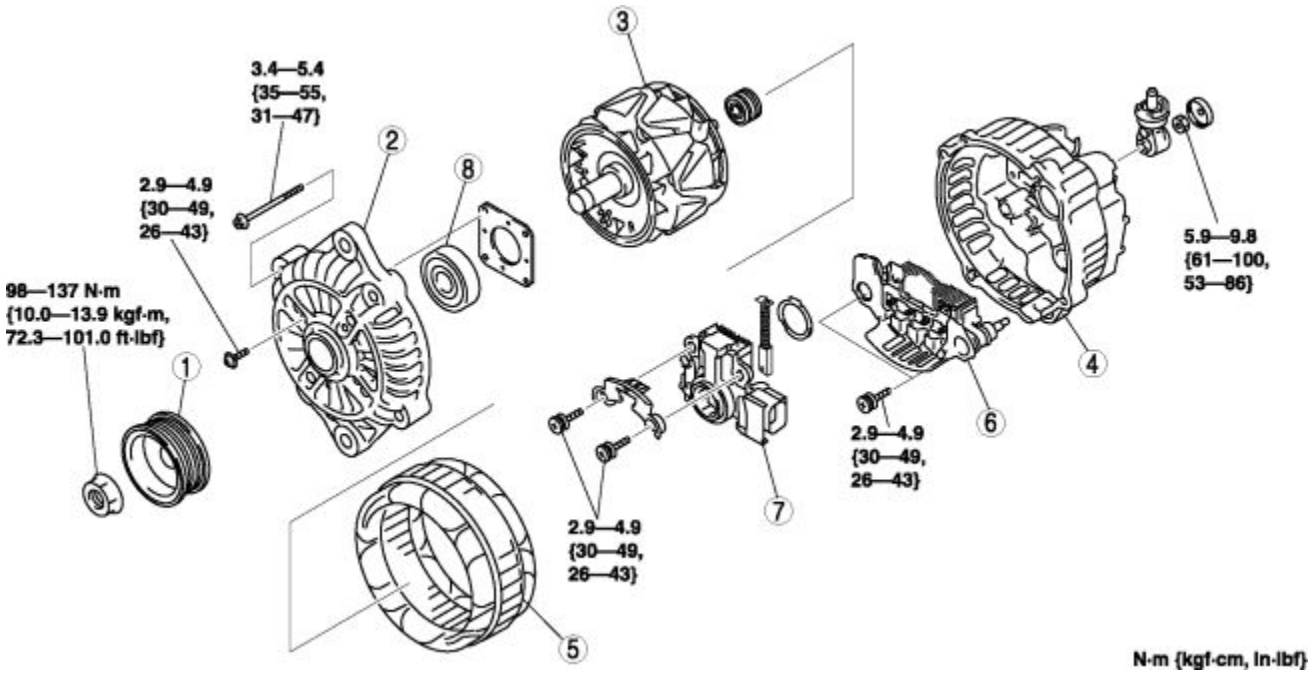


- Replace the bearing if necessary.

GENERATOR DISASSEMBLY/ASSEMBLY

1. Disassemble in the order indicated in the table.

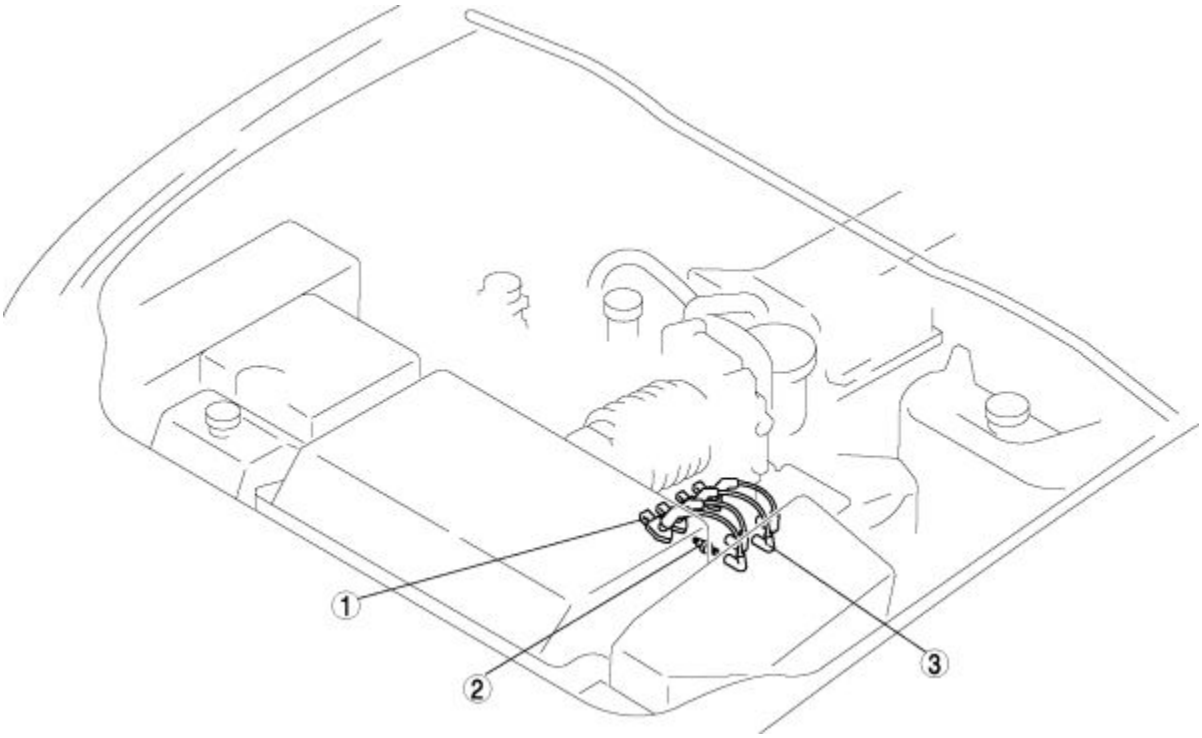
2. Assemble in the reverse order of disassembly.



1	Pulley
2	Front cover
3	Rotor
4	Rear bracket
5	Stator coil
6	Rectifier
7	Brush holder
8	Bearing

IGNITION SYSTEM

IGNITION SYSTEM LOCATION INDEX



1	Ignition coil (See IGNITION COIL REMOVAL/INSTALLATION .) (See IGNITION COIL INSPECTION .)
2	Spark plug (See SPARK PLUG REMOVAL/INSTALLATION .) (See SPARK PLUG INSPECTION .)
3	High-tension lead (See HIGH-TENSION LEAD REMOVAL/INSTALLATION .) (See HIGH-TENSION LEAD INSPECTION .)

IGNITION COIL

IGNITION COIL REMOVAL/INSTALLATION

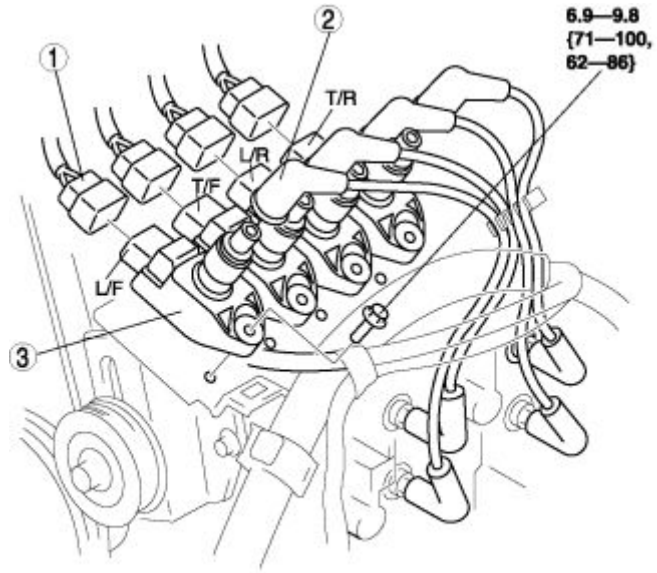
1. Remove the engine cover. (See ENGINE COVER REMOVAL/INSTALLATION .)

2. Remove the battery cover.

3. Remove the negative battery cable. (See BATTERY REMOVAL/INSTALLATION .)

4. Remove the air cleaner duct. (See INTAKE-AIR SYSTEM REMOVAL/INSTALLATION .)

5. Remove in the order indicated in the table.



N·m {kgf·cm, in·lbf}

1	Connector
2	High-tension lead (See HIGH-TENSION LEAD REMOVAL/INSTALLATION .)
3	Ignition coil

6. Install in the reverse order of removal.

IGNITION COIL INSPECTION

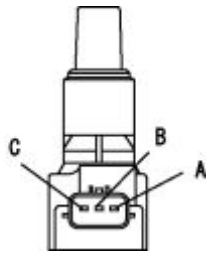
Ignition Coil With Built-in Power Switch Inspection

1. Disconnect the ignition coil connector.

2. Measure the resistance between each terminal on the ignition coil connector.

3.
   - If the measurement corresponds to the table, replace the ignition coil.

Item	Tester Connection Position		Condition
	Positive	Negative	
Terminal	A	B	∞ or 0 ohm is abnormal
	C	B	
	C	A	0 to several kilohm (continuity) is abnormal



SPARK PLUG

SPARK PLUG REMOVAL/INSTALLATION

CAUTION:

- If a spark plug that is not as specified is installed, sealing performance will be deteriorated. Install only the specified spark plug when replacing.

1. Remove the engine cover. (See ENGINE COVER REMOVAL/INSTALLATION .)

2. Remove the battery cover.

3. Disconnect the negative battery cable. (See BATTERY REMOVAL/INSTALLATION .)

4. Position the high-tension lead out of the way. (spark plug side) (See HIGH-TENSION LEAD REMOVAL/INSTALLATION .)

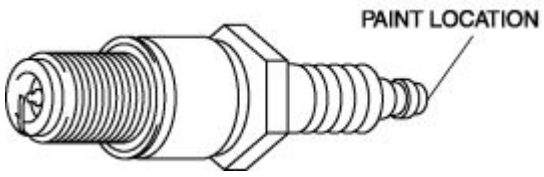
5. Remove the spark plugs using a plug-wrench.

   ### CAUTION:

   - Install spark plugs marked with white paint on the leading side and spark plugs with blue paint on the trailing side.

   ### NOTE:

   - It is easier to remove some spark plugs from beneath the vehicle.



6. Install in the reverse order of removal.
   - Tightening torque

     12.8—17.7 N·m {131—180 kgf·cm, 114—156 in·lbf}

7.

SPARK PLUG INSPECTION

Specification

Item			Specification
Type	NGK	Leading side	RE7A-L[*1] (RE6A-L)[*2]
		Trailing side	RE9B-T[*1]

*1 Standard equipment

*2 Hot type plug: Available only for customers who often drive their car at very low speed which causes the plugs to foul easily.

Plug Gap Inspection

CAUTION:

- To avoid possible damage to the tip, do not adjust the plug gap.
- To prevent damaging the tip, use wire type plug gap gauge when inspecting the plug gap.

1. Measure the spark plug gap using wire type plug gap gauge.
   - If it is more than the maximum specification, replace the spark plug.
   - Standard plug gap

     1.15—1.25 mm {0.046—0.049 in}

   - Maximum plug gap

     Leading side: 1.5 mm {0.059 in}

     Trailing side: 1.4 mm {0.055 in}
2.

Cleaning

CAUTION:

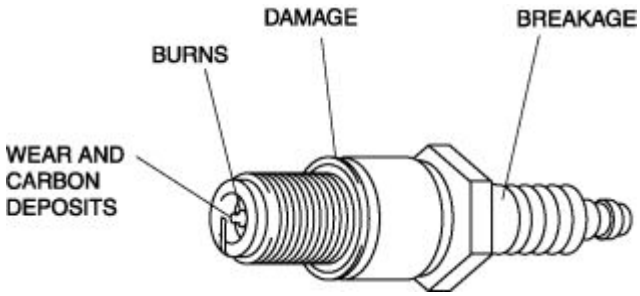
- To avoid possible damage to the tip, do not use a wire brush to clean the plug.

NOTE:

- To avoid possible damage to the tip, use gasoline to clean the spark plugs after removing dirt.

Visual inspection

1. Inspect the following items:



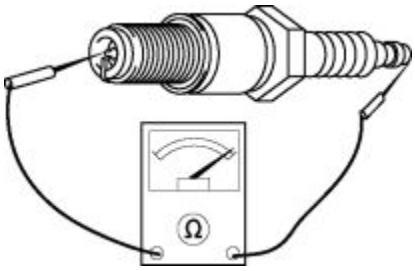
- If there is any malfunction, replace the spark plug.
  - Insulator breakage
  - Worn electrode
  - Damaged gasket
  - Badly burned insulator (sparking side)

Resistance Inspection

1. Measure the resistance of the spark plug using a tester as shown in the figure.
   - If not within the specification, replace the spark plug.

     Resistance

     - 3.0—7.5 kilohms [25°C {77 °F}]



HIGH-TENSION LEAD

HIGH-TENSION LEAD REMOVAL/INSTALLATION

CAUTION:

- Improper installation of the high-tension lead could result in a harmful electrical influence of other electrical parts, or in a ground fault due to damage to the lead. Be sure to install the lead in the same position and routing as when it is removed.

1. Remove the engine cover. (See ENGINE COVER REMOVAL/INSTALLATION .)

2. Remove the battery cover.

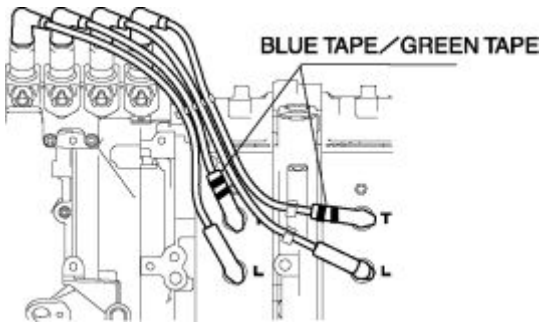
3. Disconnect the negative battery cable. (See BATTERY REMOVAL/INSTALLATION .)

4. Remove the air hose. (See INTAKE-AIR SYSTEM REMOVAL/INSTALLATION .)

5. Remove the high-tension lead from the ignition coil and the spark plug.

   ### CAUTION:

   - Install the high-tension lead with blue and green tape on the trailing side.



6. Install in the reverse order of removal.

HIGH-TENSION LEAD INSPECTION

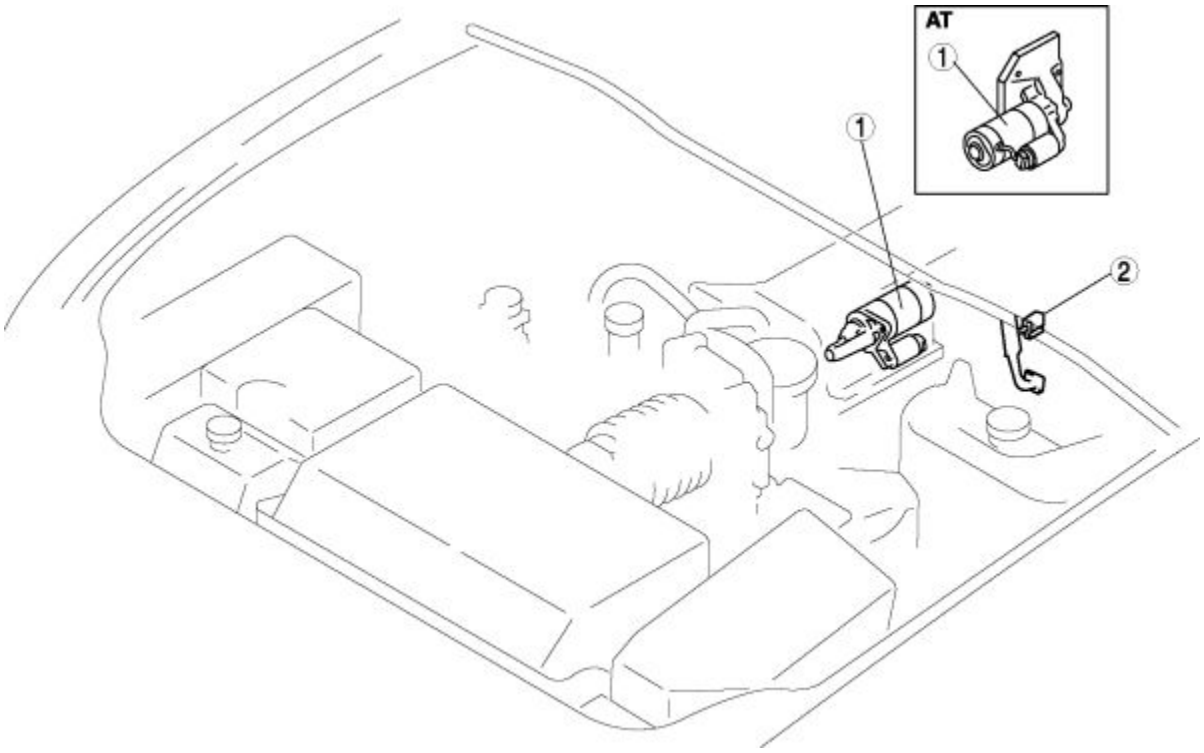
1. Remove the high-tension lead. (See HIGH-TENSION LEAD REMOVAL/INSTALLATION .)

2. Measure the resistance using a tester.
    - If not within the specification, replace the high-tension lead.
    - Resistance

      1.0—4.0 kilohms [20 °C {68 °F}]

STARTING SYSTEM

STARTING SYSTEM LOCATION INDEX



1	Starter (See STARTER REMOVAL/INSTALLATION .) (See STARTER INSPECTION .)
2	Starter interlock switch (MT) (See STARTER INTERLOCK SWITCH (MT) INSPECTION .) (See STARTER DISASSEMBLY/ASSEMBLY .)

STARTER

STARTER REMOVAL/INSTALLATION

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. (See ENGINE COVER REMOVAL/INSTALLATION .)

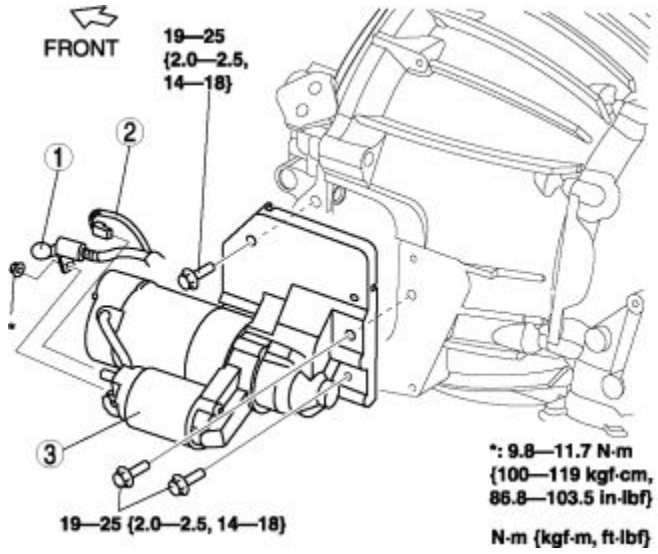
2. Remove the battery cover.

3. Disconnect the negative battery cable. (See BATTERY REMOVAL/INSTALLATION .)

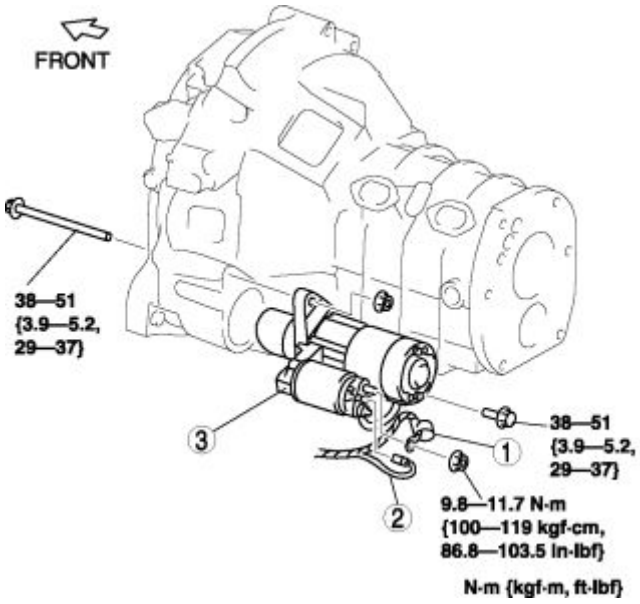
4. Remove in the order indicated in the table.

5. Install in the reverse order of removal.

AT



MT



1	Terminal B cable
2	Terminal S connector
3	Starter

STARTER INSPECTION

On-vehicle Inspection

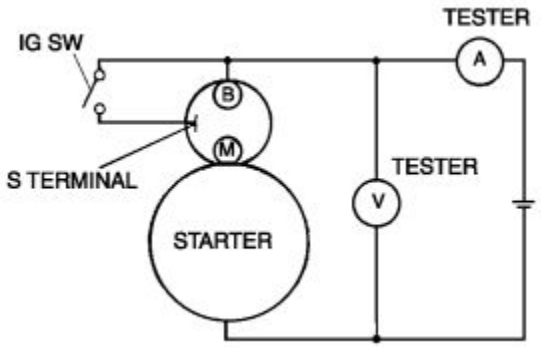
1. Verify that the battery is fully charged.

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, the ignition switch, and the transmission range switch (AT).

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.

   Standard specification

Item

Voltage (V)	Current (A)
11	AT: 105 or less MT: 90 or less

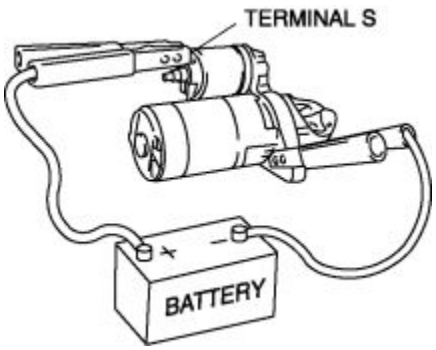
Magnetic Switch Operation Inspection

Pull-out test

NOTE:

- In case the battery is being charged, the pinion may turn during a protruded state. This is normal because the current flows to the motor through the pull-in coil and the motor turns.

1. Verify that the drive pinion is pulled out with battery positive voltage connected to terminal S and the starter body grounded.

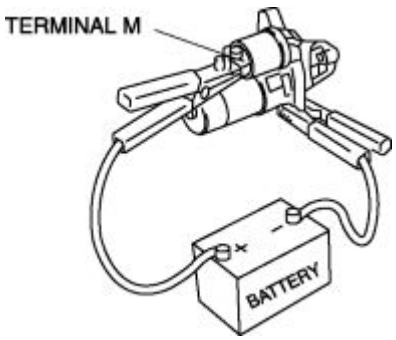


   - If not pulled out, repair or replace the starter.

Return test

1. Disconnect the motor wire from terminal M.

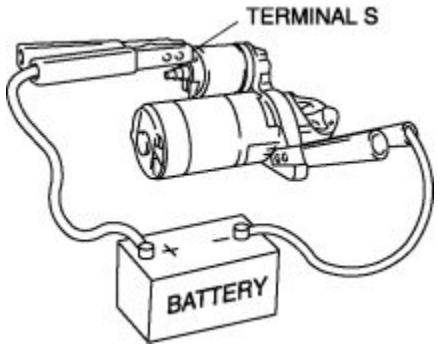
2. Connect battery positive voltage to terminal M and ground the starter body.



3. Pull out the drive pinion with a screwdriver. Verify that it returns to its original position when released.
    - If does not return, repair or replace the starter.

Pinion Gap Inspection

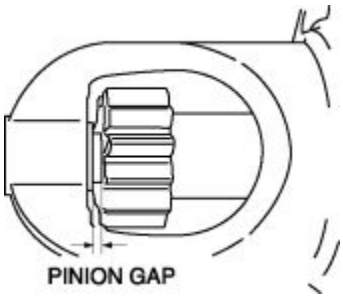
1. Pull out the drive pinion with battery positive voltage connected to terminal S and the starter body grounded.



CAUTION:

- Applying power for more than 10 s can damage the starter. Do not apply power for more than the aforementioned time.

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).

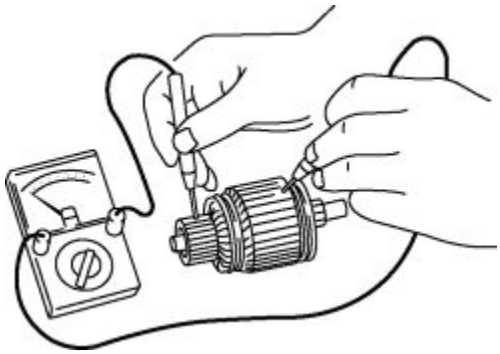
  Pinion gap

  - AT: 0 mm {0 in}
  - MT: 0.5—2.0 mm {0.02—0.07 in}

Starter Inner Parts Inspection

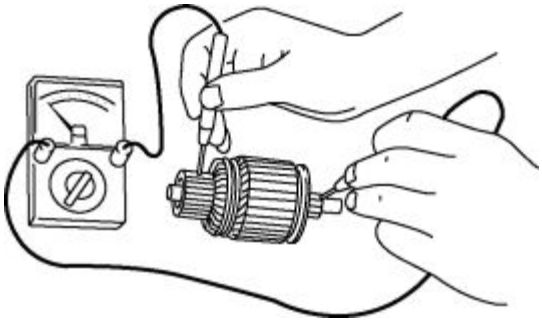
Armature

1. Verify that there is no continuity between the commutator and the core at each segment using an ohmmeter.



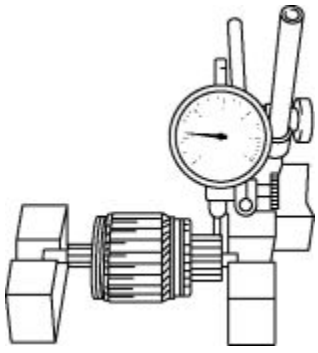
- If there is continuity, replace the armature.

2. Verify that there is no continuity between the commutator and the shaft using an ohmmeter.



- If there is continuity, replace the armature.

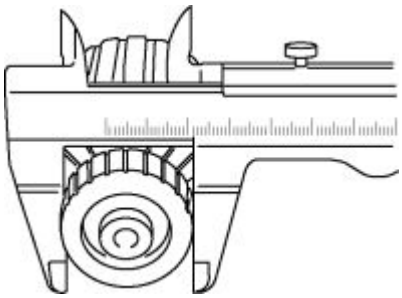
3. Place the armature on V-blocks, and measure the runout using a dial indicator.



Runout

- 0.05 mm {0.002 in} max.

4. Measure the commutator diameter.



- If not within the minimum specification, replace the armature.

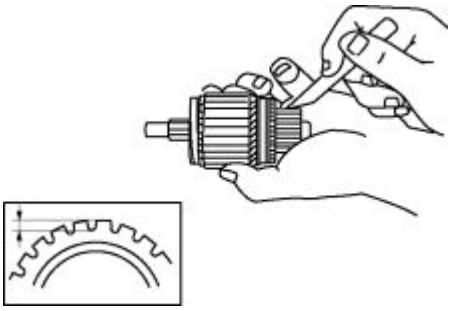
  Standard commutator diameter

  - 29.4 mm {1.16 in}

  Minimum commutator diameter

  - 28.8 mm {1.13 in}

5. Measure the segment groove depth of commutator.



- If not within the minimum specification, undercut the grooves to the standard depth.

  Standard depth

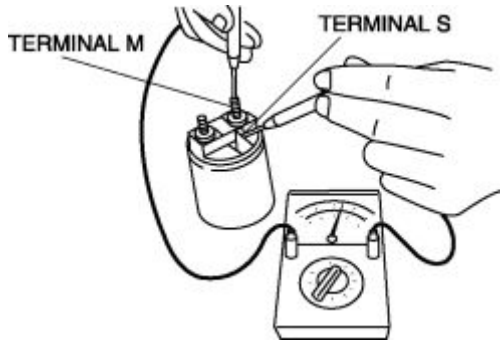
  - 0.4—0.6 mm {0.016—0.023 in}

  Minimum depth

  - 0.2 mm {0.008 in}

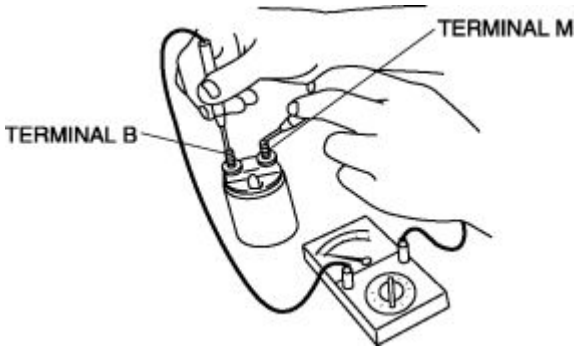
Magnetic switch

1. Inspect for continuity between terminals S and M using an ohmmeter.
   - If there is no continuity, replace the magnetic switch.



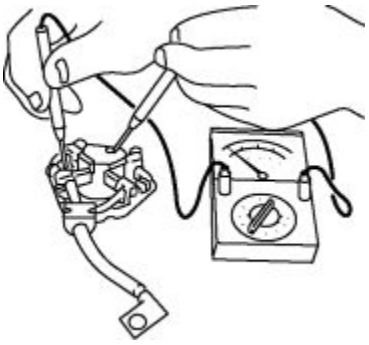
2. Inspect for continuity between terminal S and the body using an ohmmeter.
    - If there is no continuity, replace the magnetic switch.

3. Verify that there is no continuity between terminals M and B using an ohmmeter.
    - If there is continuity, replace the magnetic switch.



Brush and brush holder

1. Verify that there is no continuity between each insulated brush and plate using an ohmmeter.
    - If there is continuity, replace the brush holder.



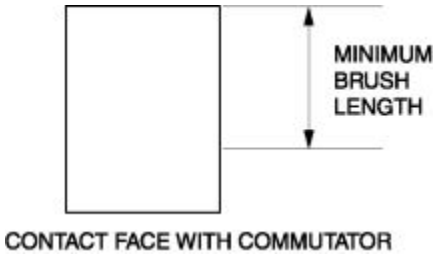
2. Measure the brush length.
    - If any brush is worn almost to or beyond the minimum specification, replace all the brushes.

      Standard brush length

    - AT: 17.5 mm {0.69 in}
    - MT: 12.3 mm {0.48 in}

      Minimum brush length

    - AT: 12.0 mm {0.47 in}
    - MT: 7.0 mm {0.28 in}



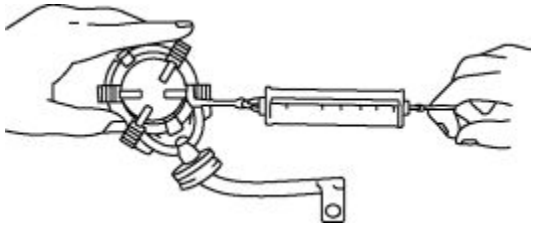
3. Measure the brush spring force using a spring balance.
    - If not within the minimum specification, replace the brush spring.

      Standard spring force

    - AT: 23.3—31.7 N {2.38—3.23 kgf, 5.24—7.12 lbf}
    - MT: 18.3—24.9 N {1.87—2.53 kgf, 4.12—5.59 lbf}

      Minimum spring force

    - AT: 10.0 N {1.02 kgf, 2.25 lbf}
    - MT: 5.9 N {0.6 kgf, 1.3 lbf}

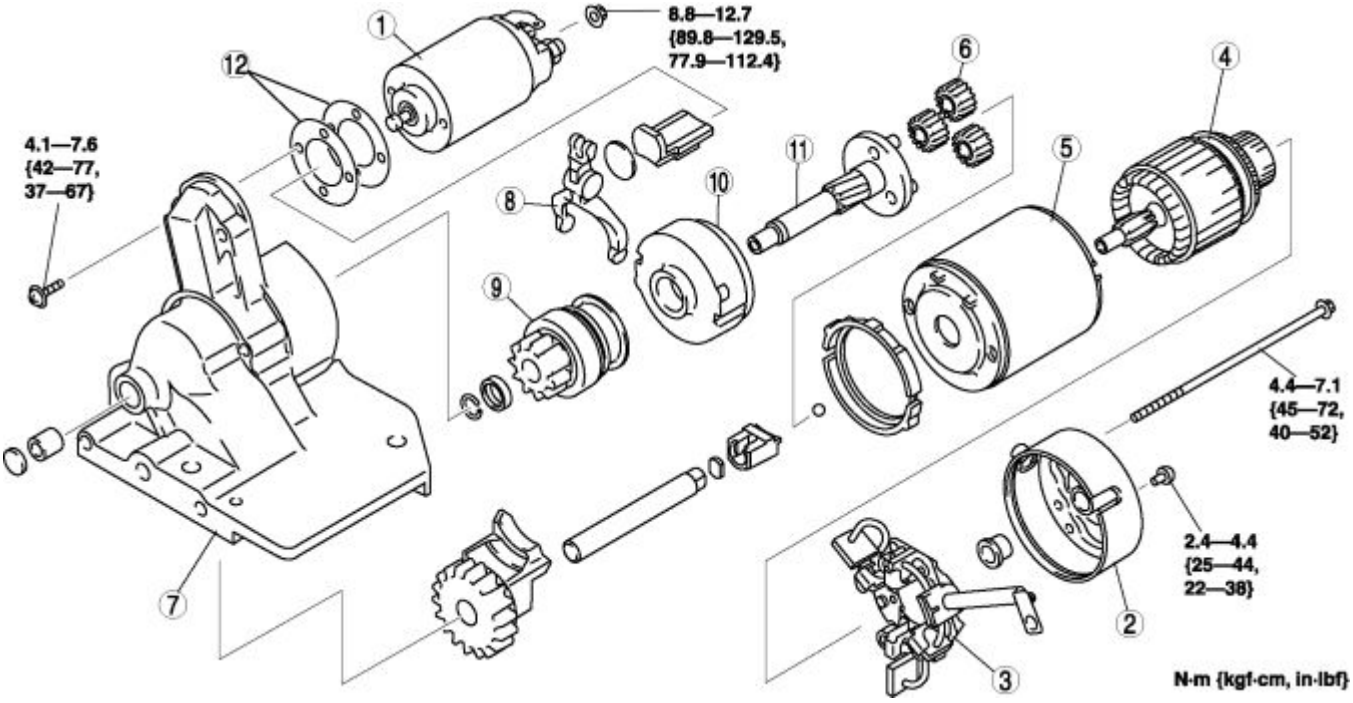


STARTER DISASSEMBLY/ASSEMBLY

1. Disassemble in the order indicated in the table.

2. Assemble in the reverse order of disassembly.

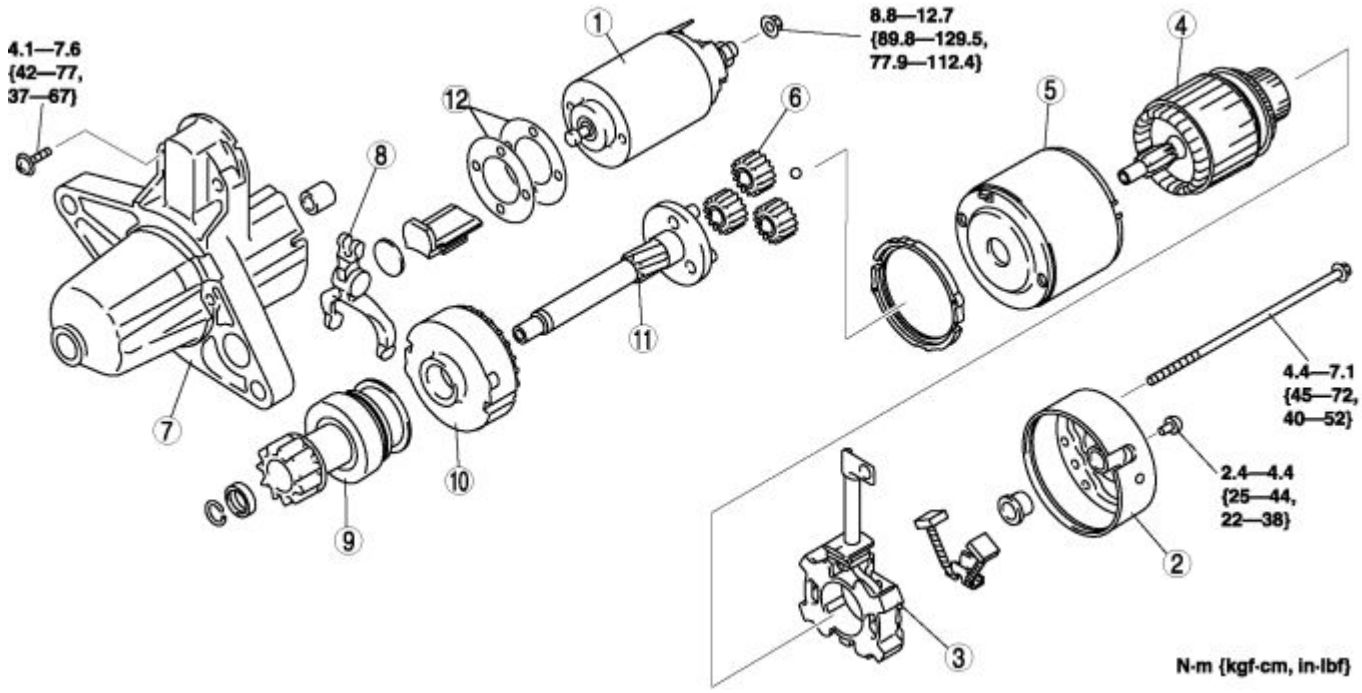
AT



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
12	Adjustment washer

MT



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
12	Adjustment washer

STARTER INTERLOCK SWITCH

STARTER INTERLOCK SWITCH (MT) INSPECTION

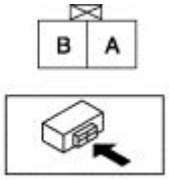
1. Disconnect the negative battery cable.

2. Disconnect the starter interlock switch connector.

3. Verify that the resistance is as indicated in the table using the tester.
   - If the continuity is not as indicated in the table, replace the starter interlock switch.

○—○ : CONTINUITY

MEASURED CONDITION	TERMINAL	
	A	B
CLUTCH PEDAL DEPRESSED	○	○
EXCEPT ABOVE		



Notes:

CRUISE CONTROL SYSTEM

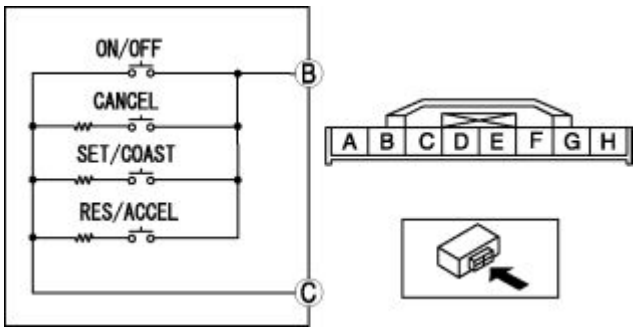
CRUISE CONTROL INSPECTION

1. Disconnect the negative battery cable.

2. Remove the driver-side air bag module. (See DRIVER-SIDE AIR BAG MODULE REMOVAL/INSTALLATION .)

3. Disconnect the audio control switch connector. (See AUDIO CONTROL SWITCH REMOVAL/INSTALLATION .)

4. Inspect for resistance and continuity between cruise control switch terminals B—C using a tester.

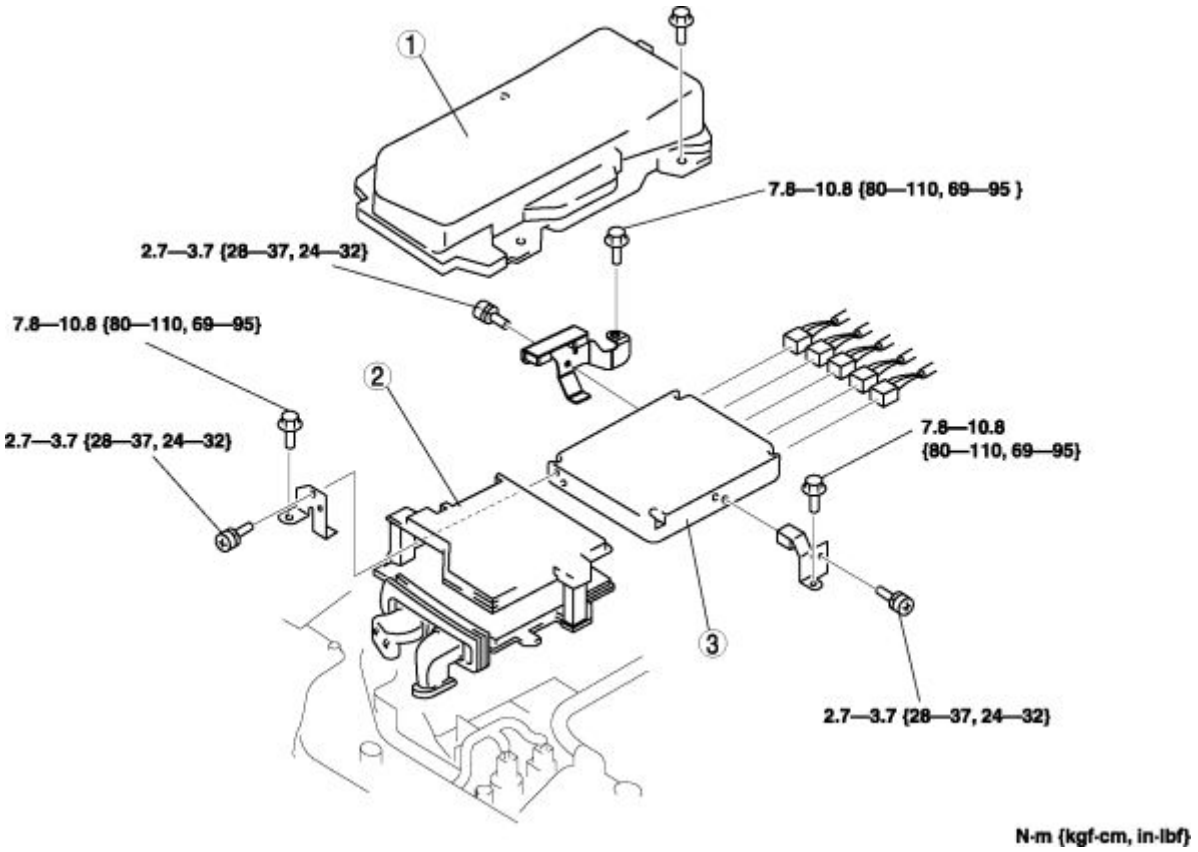


- If not as specified, replace the cruise control switch. (See AUDIO CONTROL SWITCH REMOVAL/INSTALLATION .)

Switch condition	Resistance (ohm)
ON/OFF button pressed	Continuity
CANCEL button pressed	117—123
SET/COAST button pressed	666—694
RES/ACCEL button pressed	2,156—2,244
No button pressed	No continuity

PCM REMOVAL/INSTALLATION

1. When replacing the PCM, perform the following:
    - PCM configuration (See PCM CONFIGURATION .)
2. Remove the battery cover. (See BATTERY REMOVAL/INSTALLATION .)
3. Remove in the order indicated in the table.
4. When replacing the PCM on the vehicles with the immobilizer system, perform the following:
    - Immobilizer system component replacement/key addition and clearing (See IMMOBILIZER SYSTEM COMPONENT REPLACEMENT/KEY ADDITION AND CLEARING .)
5. Install in the reverse order of removal.



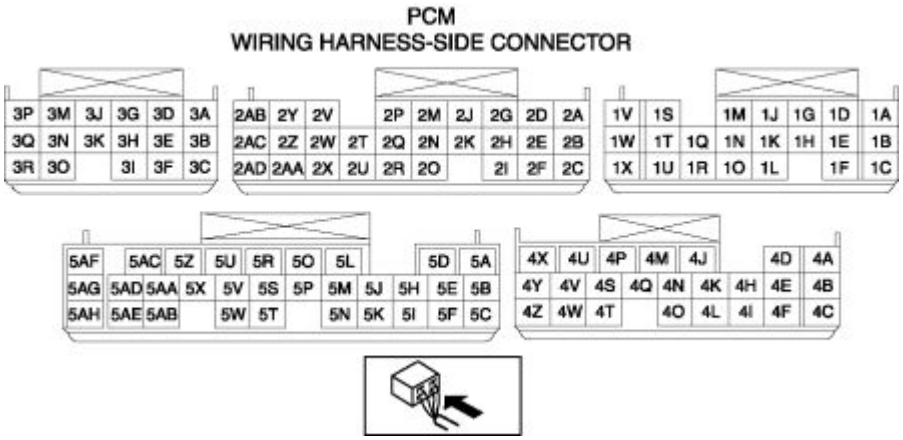
1	PCM cover
2	PCM cooler
3	PCM

Not Using the WDS or Equivalent

NOTE:

- The PCM terminal voltage can vary with conditions when measuring and changes due to age deterioration on the vehicle, causing false diagnosis. Therefore a comprehensive inspection of the input and output systems, and the PCM is necessary to determine where the malfunction occurs.

PCM terminal voltage table (Reference)



Terminal	Signal name	Connected to	Measurement condition		Voltage (V)	Inspection item(s)
1A	—	—	—		—	—
1B	Throttle control (+)	Throttle body (Throttle valve actuator)	(See Inspection Using An Oscilloscope (Reference) .)			• Throttle valve actuator • Related wiring harnesses
1C	Throttle control (−)	Throttle body (Throttle valve actuator)	(See Inspection Using An Oscilloscope (Reference) .)			• Throttle valve actuator • Related wiring harnesses
1D	SSV switch	SSV switch	Idling after warm-up	The SSV actuator rod is completely pulled out.	1.0 or less	

				The SSV actuator rod is pulled in.	B+	• SSV switch • Related wiring harnesses
1E	—	—	—		—	—
1F	Knock sensor (−)	Knock sensor	Under any condition		1.0 or less	• Knock sensor • Related wiring harnesses
1G	Shield	—	—		—	—
1H	—	—	—		—	—
1I	—	—	—		—	—
1J	Throttle valve opening angle No. 1	Throttle body (TP sensor)	Ignition switch at ON	When the accelerator pedal is depressed.	3.825—4.095	• TP sensor • Related wiring harnesses
				When the accelerator pedal is released.	0.4—0.8	
1K	—	—	—		—	—
1L	SSV control	SSV solenoid valve	High engine speed and high load after warm-up		1.0 or less	• SSV solenoid valve • Related wiring harnesses
			Idling		B+	
1M	Throttle valve opening angle No. 2	Throttle body (TP sensor)	Ignition switch at ON	When the accelerator pedal is depressed.	4.033—4.303	• TP sensor • Related wiring harnesses
				When the accelerator pedal is released.	1.18—1.78	
1N	—	—	—		—	—
1O	AIR control	AIR solenoid valve	During the specified period after cold start		1.0 or less	

			Idling after warm-up	B+	• AIR solenoid valve • Related wiring harnesses
1P	—	—	—	—	—
1Q	TP sensor power supply	Throttle body (TP sensor)	Under any condition	Approx. 5.0	• TP sensor • Related wiring harnesses
1R	—	—	—	—	—
1S	APV position sensor power supply *3	APV motor (APV position sensor)	Under any condition	Approx. 5.0	• APV position sensor • Related wiring harnesses
	—*4	—	—	—	—
1T	Knock sensor (+)	Knock sensor	Idling after warm-up	Approx. 2.45	• Knock sensor • Related wiring harnesses
1U	Sensor GND	ECT sensor, rear HO2S, metering oil pump switch, APV position sensor	Under any condition	1.0 or less	• Related wiring harnesses
1V	Front HO2S heater control	Front HO2S heater	(See Inspection Using An Oscilloscope (Reference) .)		• Front HO2S • Related wiring harnesses

1W	VDI control	VDI solenoid valve	High engine speed after warm-up	1.0 or less	• VDI solenoid valve • Related wiring harnesses
			Idling	B+	
1X	—	—	—	—	—
1Y	—	—	—	—	—
1Z	—	—	—	—	—
2A	Rear HO2S heater control	Rear HO2S heater	Idling after warm-up	1.0 or less	• Rear HO2S • Related wiring harnesses
			High load	B+	
2B	Front HO2S	Front HO2S	Idling after warm-up	Approx. 2.8	• Front HO2S • Related wiring harnesses
2C	Front HO2S	Front HO2S	Idling after warm-up	Approx. 2.4	• Front HO2S • Related wiring harnesses
2D	Fuel injector (RS) control	Fuel injector (RS)	(See Inspection Using An Oscilloscope (Reference) .)		• Fuel injector • Related wiring harnesses
2E	Oil pressure switch	Oil pressure switch	Idling	The engine oil pressure is at the specified or more.	B+	• Oil pressure switch • Related wiring harnesses
				The engine oil pressure is less than the specified.	1.0 or less	

2F	TP sensor GND	Throttle body (TP sensor)	Under any condition		1.0 or less	• TP sensor • Related wiring harnesses
2G	Fuel injector (FS) control	Fuel injector (FS)	(See Inspection Using An Oscilloscope (Reference) .)			• Fuel injector • Related wiring harnesses
2H	Shield	—	—		—	—
2I	Field coil control	Generator (D terminal)	(See Inspection Using An Oscilloscope (Reference) .)			• Generator • Related wiring harnesses
2J	Fuel injector (RP1) control	Fuel injector (RP1)	(See Inspection Using An Oscilloscope (Reference) .)			• Fuel injector • Related wiring harnesses
2K	ECT sensor	ECT sensor	Ignition switch at ON	ECT 0 °C {32 °F}	Approx. 4.0	• ECT sensor • Related wiring harnesses
				ECT 20 °C {68 °F}	Approx. 3.1	
				ECT 40 °C {104 °F}	Approx. 2.1	
				ECT 60 °C {140 °F}	Approx. 1.4	
				ECT 80 °C {176 °F}	Approx. 0.9	
				ECT 100 °C {212 °F}	Approx. 0.5	
2L	—	—	—		—	—
2M	Fuel injector (FP1) control	Fuel injector (FP1)	(See Inspection Using An Oscilloscope (Reference) .)			• Fuel injector • Related wiring harnesses

2N	Metering oil pump switch	Metering oil pump (Metering oil pump switch)	Idling	Only when the metering oil pump is commanded to maximum position	B+	• Metering oil pump switch • Related wiring harnesses
				Except above	1.0 or less	
2O	Neutral switch*1	Neutral switch	Idling	Neutral	1.0 or less	• Neutral switch • Related wiring harnesses
				Except above	B+	
	—*2	—	—		—	—
2P	Purge solenoid valve control	Purge solenoid valve	(See Inspection Using An Oscilloscope (Reference) .)			• Purge solenoid valve • Related wiring harnesses
2Q	Rear HO2S	Rear HO2S	Idling after warm-up		0.5—1.0	• Rear HO2S • Related wiring harnesses
2R	Oil-level switch	Oil-level switch	Ignition switch at ON	The engine oil amount is more than the L mark on the dipstick.	1.0 or less	• Oil-level switch • Related wiring harnesses
				The engine oil amount is low.	B+	
2S	—	—	—		—	—
2T	Generator output voltage	Generator (Terminal P)	(See Inspection Using An Oscilloscope (Reference) .)			• Generator • Related wiring harnesses

2U	Eccentric shaft position sensor (+)	Eccentric shaft position sensor	(See Inspection Using An Oscilloscope (Reference) .)		• Eccentric shaft position sensor • Related wiring harnesses
2V	Metering oil pump control 3	Metering oil pump	(See Inspection Using An Oscilloscope (Reference) .)		• Metering oil pump • Related wiring harnesses
2W	Metering oil pump control 1	Metering oil pump	(See Inspection Using An Oscilloscope (Reference) .)		• Metering oil pump • Related wiring harnesses
2X	Eccentric shaft position sensor (−)	Eccentric shaft position sensor	Under any condition	1.0 or less	• Eccentric shaft position sensor • Related wiring harnesses
2Y	Metering oil pump control 4	Metering oil pump	(See Inspection Using An Oscilloscope (Reference) .)		• Metering oil pump • Related wiring harnesses
2Z	Ignition coil (L/R) control	Ignition coil	(See Inspection Using An Oscilloscope (Reference) .)		• Ignition coil • Related wiring

					harnesses
2AA	Ignition coil (L/F) control	Ignition coil	(See Inspection Using An Oscilloscope (Reference) .)		• Ignition coil • Related wiring harnesses
2AB	Metering oil pump control 2	Metering oil pump	(See Inspection Using An Oscilloscope (Reference) .)		• Metering oil pump • Related wiring harnesses
2AC	Ignition coil (T/R) control	Ignition coil	(See Inspection Using An Oscilloscope (Reference) .)		• Ignition coil • Related wiring harnesses
2AD	Ignition coil (T/F) control	Ignition coil	(See Inspection Using An Oscilloscope (Reference) .)		• Ignition coil • Related wiring harnesses
3A	Fuel injector (FP2) control*3	Fuel injector (FP2)	(See Inspection Using An Oscilloscope (Reference) .)		• Fuel injector • Related wiring harnesses
	—*4	—	—	—	—
3B	APV opening angle*3	APV motor (APV position sensor)	High engine speed	1.5 or less	• APV position sensor • Related wiring harnesses
			Idling	1.5 or more	

	—*4	—	—	—	—
3C	—	—	—	—	—
3D	Fuel injector (RP2) control *3	Fuel injector (RP2)	(See Inspection Using An Oscilloscope (Reference) .)		• Fuel injector • Related wiring harnesses
	—*4	—	—	—	—
3E	—	—	—	—	—
3F	—	—	—	—	—
3G	APV motor control (+)*3	APV motor	(See Inspection Using An Oscilloscope (Reference) .)		• APV motor • Related wiring harnesses
	—*4	—	—	—	—
3H	—	—	—	—	—
3I	—	—	—	—	—
3J	APV motor control (−)*3	APV motor	(See Inspection Using An Oscilloscope (Reference) .)		• APV motor • Related wiring harnesses
	—*4	—	—	—	—
3K	—	—	—	—	—
3L	—	—	—	—	—
3M	—	—	—	—	—
3N	—	—	—	—	—
3O	—	—	—	—	—
3P	—	—	—	—	—
3Q	—	—	—	—	—
3R	—	—	—	—	—
3S	—	—	—	—	—
3T	—	—	—	—	—
3U	—	—	—	—	—
3 V	—	—	—	—	—

3W	—	—	—		—	—
3X	—	—	—		—	—
3Y	—	—	—		—	—
3Z	—	—	—		—	—
4A	GND	GND	Under any condition		1.0 or less	• Related wiring harnesses
4B	—	—	—		—	—
4C	Drive-by-wire relay control	Drive-by-wire relay	Ignition switch at ON	When the drive-by-wire system has a malfunction.	1.0 or less	• Drive-by-wire relay • Related wiring harnesses
				Except above	B+	
4D	EVAP leak detection pump (solenoid)	EVAP leak detection pump	Ignition switch at ON		B+	• EVAP leak detection pump • Related wiring harnesses
			Idling		B+	
4E	Main relay control	Main relay	Ignition switch at ON	No malfunction	1.0 or less	• Main relay • Related wiring harnesses
				Malfunctioning	B+	
4F	Clutch switch*1	Clutch switch	Ignition switch at ON	The clutch pedal is depressed.	1.0 or less	• Clutch switch • Related wiring harnesses
				Except above	B+	
	—*2	—	—		—	—
4G	—	—	—		—	—
4H			Ignition switch at ON		B+	

	EVAP leak detection pump (pump)	EVAP leak detection pump	Idling	B+	• EVAP leak detection pump • Related wiring harnesses
4I	—	—	—	—	—
4J	GND	GND	Under any condition	1.0 or less	• Related wiring harnesses
4K	BARO sensor power supply	BARO sensor	Under any condition	Approx. 5.0	• BARO sensor • Related wiring harnesses
4L	—	—	—	—	—
4M	Fuel pump speed control	Fuel pump speed control relay	High engine speed and high load	1.0 or less	• Fuel pump speed control relay • Related wiring harnesses
			Idling	B+	
4N	—	—	—	—	—
4O	AIR pump control	AIR pump relay	During the specified period after sold start	1.0 or less	• AIR pump relay • Related wiring harnesses
			Idling after warm-up	B+	
4P	Brake switch*7	Brake switch	When the brake pedal is depressed.	B+	

			Except above		1.0 or less	• Brake switch • Related wiring harnesses
	—[*8]	—	—		—	—
4Q	IG1	Ignition relay	Ignition switch at ON		B+	• Ignition relay • Related wiring harnesses
			Except above		1.0 or less	
4R	—	—	—		—	—
4S	CAN_L	—	Because this terminal is for communication, good/no good judgment by terminal voltage is not possible.		—	• Related wiring harnesses
4T	Coolant level switch	Coolant level switch	Ignition switch at ON	Engine coolant level in the coolant reserve tank is more than the L mark.	B+	• Coolant level switch • Related wiring harnesses
				Engine coolant level in the coolant reserve tank is at the L mark or less.	1.0 or less	
4U	Sensor GND	MAF sensor, BARO sensor	Under any condition		1.0 or less	• Related wiring harnesses
4V	CAN_H	—	Because this terminal is for communication, good/no good judgment by terminal voltage is not possible.		—	• Related wiring harnesses
4W	A/C control		Idling	A/C switch off	B+	

		Refrigerant pressure switch (high pressure and low pressure)		A/C switch and fan switch on	1.0 or less	• Refrigerant pressure switch • Related wiring harnesses
4X	APP sensor 2 power supply	APP sensor	Under any condition		Approx. 5.0	• APP sensor • Related wiring harnesses
4Y	APP sensor 1 power supply	APP sensor	Under any condition		Approx. 5.0	• APP sensor • Related wiring harnesses
4Z	A/C load	Refrigerant pressure switch (medium pressure)	Idling	Refrigerant pressure is 1.11 MPa {11.3 kgf/cm^2 , 161 psi} or less.	B+	• Refrigerant pressure switch • Related wiring harnesses
				Refrigerant pressure is 1.60 MPa {16.3 kgf/cm^2 , 232 psi} or more.	1.0 or less	
5A	Starter relay	Starter relay	Ignition switch is turned to START using key registered in immobilizer system		1.0 or less	• Starter relay • Related wiring harnesses
			Ignition switch is turned to START using key not registered in immobilizer system		B+	
5B	—	—	—		—	—
5C	APP sensor 2	APP sensor	Ignition switch at ON	When the accelerator pedal is depressed.	3.23—3.38	• APP sensor • Related wiring harnesses
				When the accelerator pedal is released.	1.005—1.105	
5D	GND	GND	Under any condition		1.0 or less	• Related

						wiring harnesses
5E	—	—	—		—	—
5F	APP sensor 1	APP sensor	Ignition switch at ON	When the accelerator pedal is depressed.	3.78—3.93	• APP sensor • Related wiring harnesses
				When the accelerator pedal is released.	1.555—1.655	
5G	—	—	—		—	—
5H	Drive-by-wire relay control	Drive-by-wire relay	Ignition switch at ON	There is a malfunction in the drive-by-wire system.	1.0 or less	• Drive-by-wire relay • Related wiring harnesses
				Except above	B+	
5I	—	—	—		—	—
5J	Backup power supply (KAM)	Battery	Under any condition		B+	• Battery • Related wiring harnesses
5K	IAT sensor	MAF/IAT sensor	Ignition switch at ON	IAT 0 °C {32 °F}	Approx. 3.4	• IAT sensor • Related wiring harnesses
				IAT 20 °C {68 °F}	Approx. 2.4	
				IAT 40 °C {104 °F}	Approx. 1.5	
				IAT 60 °C {140 °F}	Approx. 0.9	
				IAT 80 °C {176 °F}	Approx. 0.5	
				IAT 100 °C {212 °F}	Approx. 0.3	
5L	—	—	—		—	—
5M	—	—	—		—	—
5N	MAF sensor	MAF sensor	MT	Idling	1.16—1.23	• MAF sensor • Related wiring harnesses
				2,500 rpm	1.49—1.64	
			AT	Idling	1.21—1.29	
				2,500 rpm	1.54—1.67	

5O	GND	GND	Under any condition		1.0 or less	• Related wiring harnesses
5P	Fuel pump relay control	Fuel pump relay	Engine runs.		1.0 or less	• Fuel pump relay • Related wiring harnesses
			Engine stops.		B+	
5Q	—	—	—		—	—
5R	GND	GND	Under any condition		1.0 or less	• Related wiring harnesses
5S	BARO sensor	BARO sensor	Ignition switch at ON	Altitude:0 m {0 ft})	3.8—4.2*9	• BARO sensor • Related wiring harnesses
				Altitude:305 m {1,000 ft})	3.6—4.0*9	
				Altitude:610 m {2,000 ft})	3.5—3.9*9	
				Altitude:914 m {3,000 ft})	3.4—3.7*9	
				Altitude:1,219 m {4,000 ft})	3.2—3.6*9	
				Altitude:1,524 m {5,000 ft})	3.1—3.5*9	
				Altitude:1,829 m {6,000 ft})	3.0—3.4*9	
				Altitude:2,134 m {7,000 ft})	2.9—3.3*9	
5T	GND	GND	Under any condition		1.0 or less	• Related wiring harnesses
5U	MAF sensor GND	MAF sensor	Under any condition		1.0 or less	• MAF sensor • Related wiring

						harnesses
5V	Cruise control switch*5	Cruise control switch	Ignition switch at ON	CRUISE MAIN switch pressed in	Approx. 0	• Cruise control switch • Related wiring harnesses
				CANCEL switch pressed in	0.25—0.26	
				SET/COAST switch pressed in	1.16—1.20	
				RES/ACCEL switch pressed in	2.47—2.53	
				Except above	Approx. 5	
	—*6	—	—		—	—
5W	ECT (A/C unit)	A/C unit	Ignition switch at ON	ECT 0 °C {32 °F}	Approx. 4.0	• A/C unit • Related wiring harnesses
				ECT 20 °C {68 °F}	Approx. 3.1	
				ECT 40 °C {104 °F}	Approx. 2.1	
				ECT 60 °C {140 °F}	Approx. 1.4	
				ECT 80 °C {176 °F}	Approx. 0.9	
				ECT 100 °C {212 °F}	Approx. 0.5	
5X	Electrical fan control	Cooling fan relay	The cooling fan is operating.		1.0 or less	• Cooling fan relay • Related wiring harnesses
			Except above		B+	
5Y	—	—	—		—	—
5Z	VFAD control*3	VFAD solenoid valve	High engine speed		1.0 or less	• VFAD solenoid valve • Related wiring harnesses
			Idling		B+	
	—*4	—	—		—	—
5AA	A/C relay	A/C relay	Ignition switch at ON	A/C switch on and fan switch at 1st or higher	1.0 or less	• A/C relay • Related wiring harnesses
				Except above	B+	

5AB	APP sensor GND 2	APP sensor	Under any condition	1.0 or less	• APP sensor • Related wiring harnesses
5AC	Power supply	Main relay	Under any condition	B+	• Main relay • Related wiring harnesses
5AD	Electrical fan control	Cooling fan relay	The cooling fan is operating at high speed.	1.0 or less	• Cooling fan relay • Related wiring harnesses
			Except above	B+	
5AE	APP sensor GND 1	APP sensor	Under any condition	1.0 or less	• APP sensor • Related wiring harnesses
5AF	Power supply	Main relay	Under any condition	B+	• Main relay • Related wiring harnesses

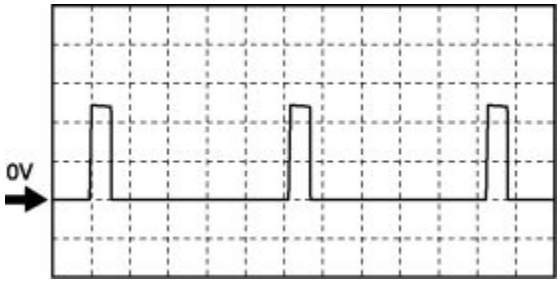
*1 MT
*2 AT
*3 13B-MSP (High Power)
*4 13B-MSP (Standard Power)
*5 With cruise control system
*6 Without cruise control system
*7 With cruise control system and DSC
*8 Without cruise control system and DSC
*9 The voltage may vary excessively depending on the weather or battery conditions.

Inspection Using An Oscilloscope (Reference)

NOTE:

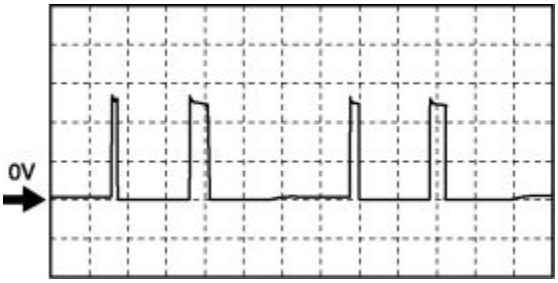
- The duty ratio for the wave pattern can vary with the control conditions. Therefore determine comprehensively where the malfunction occurs among the input systems, output systems, and the PCM.

Throttle control (+)



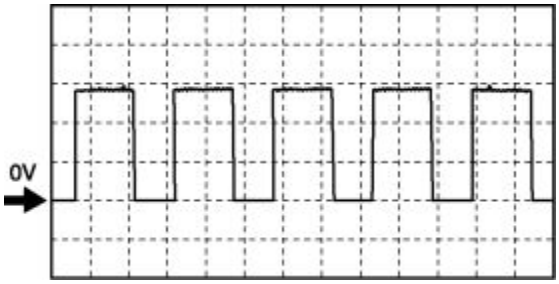
- Terminal connected: 1B (+)—Negative battery terminal
- Oscilloscope setting: 5 V/DIV (Y): 0.4 ms/DIV (X), DC range
- Measurement condition: Ignition switch at ON

Throttle control (–)



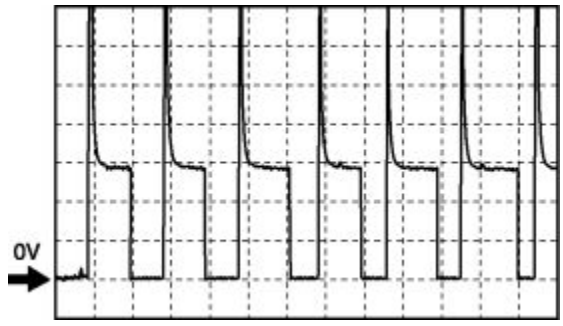
- Terminal connected1C (+)—Negative battery terminal
- Oscilloscope setting: 5 V/DIV (Y): 1 ms/DIV (X), DC range
- Measurement condition: As soon as the accelerator pedal is fully released from the fully depressed position while the ignition switch is at ON (engine off).

Front HO2S heater control



- Terminal connected:1V (+)—Negative battery terminal
- Oscilloscope setting: 5 V/DIV (Y): 50 ms/DIV (X), DC range
- Measurement condition: Idling after warm-up (no load)

Fuel injector (FS, RS) control



- Terminal connected:

  FS: 2G (+)—Negative battery terminal

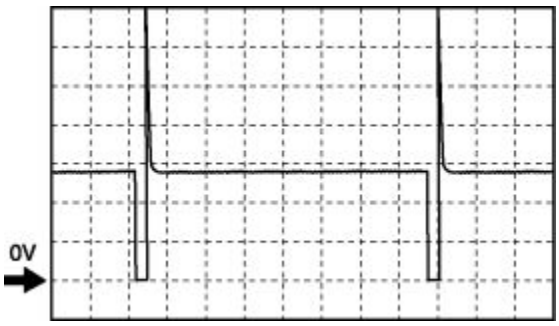
  RS: 2D (+)—Negative battery terminal

- Oscilloscope setting: 5 V/DIV (Y): 5 ms/DIV (X), DC range
- Measurement condition: Racing after warm-up (no load)

Field coil control (Generator)

- Terminal connected: 2I (+)—Negative battery terminal
- Oscilloscope setting: 0.5 V/DIV (Y): 1 ms/DIV (X), DC range
- Measurement condition: Idling after warm-up (no load)

Fuel injector (FP1, RP1) control

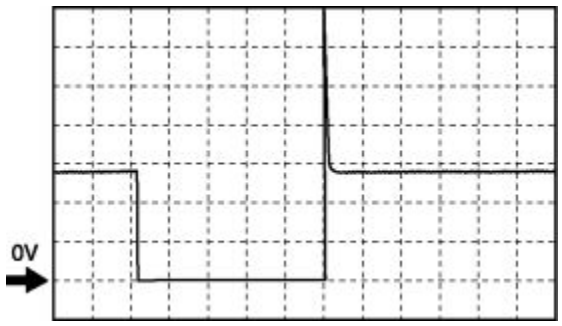


- Terminal connected:

  FP1: 2M (+)—Negative battery terminal

  RP1: 2J (+)—Negative battery terminal

- Oscilloscope setting: 5 V/DIV (Y): 10 ms/DIV (X), DC range
- Measurement condition: Idling after warm-up (no load)



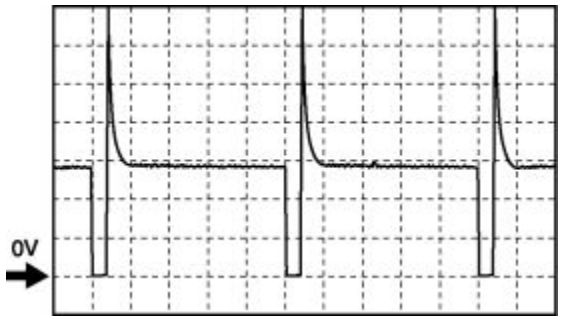
- Terminal connected:

  FP1: 2M (+)—Negative battery terminal

  RP1: 2J (+)—Negative battery terminal

- Oscilloscope setting: 5 V/DIV (Y): 10 ms/DIV (X), DC range
- Measurement condition: Cranking while the engine is cold. (ECT: Approx. 20 °C {68 °F})

Purge control

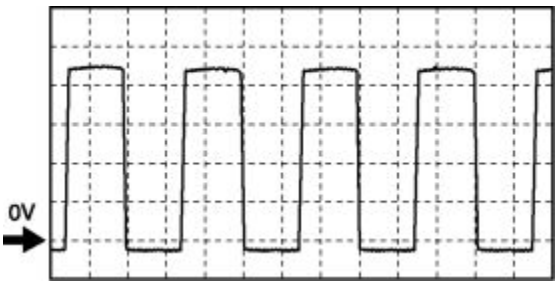


- Terminal connected:2P (+)—Negative battery terminal
- Oscilloscope setting: 5 V/DIV (Y): 20 ms/DIV (X), DC range
- Measurement condition: Idling after warm-up (no load)

NOTE:

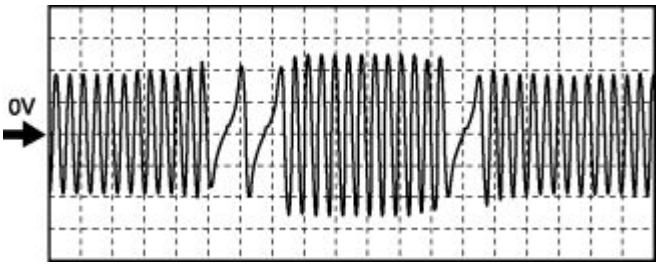
- Purge control might not be activated depending on the engine conditions.

Generator output voltage



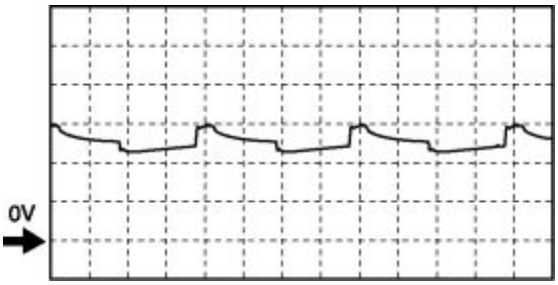
- Terminal connected: 2T (+)—Negative battery terminal
- Oscilloscope setting: 2 V/DIV (Y): 2 ms/DIV (X), DC range
- Measurement condition: Idling after warm-up (no load)

Eccentric shaft position sensor



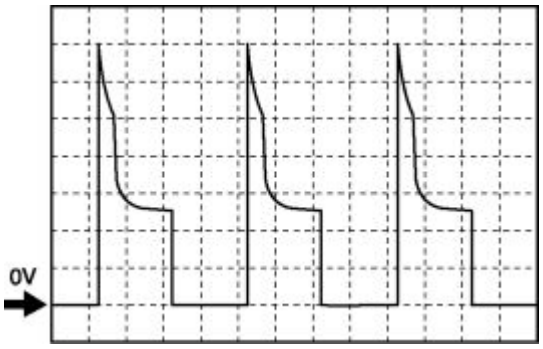
- Terminal connected: 2U (+)—Negative battery terminal
- Oscilloscope setting: 2 V/DIV (Y): 5 ms/DIV (X), DC range
- Measurement condition: Idling after warm-up (no load)

Metering oil pump control 1



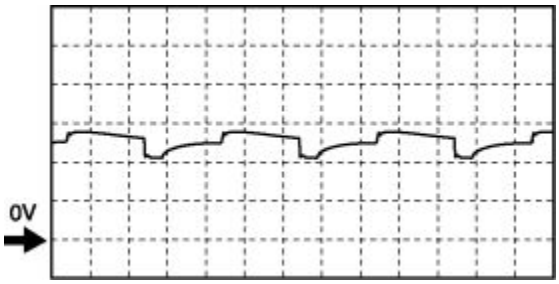
- Terminal connected: 2W (+)—Negative battery terminal
- Oscilloscope setting: 5 V/DIV (Y): 2 ms/DIV (X), DC range
- Measurement condition: Just after the ignition switch is off after warm-up (no load)

Metering oil pump control 2



- Terminal connected: 2AB (+)—Negative battery terminal
- Oscilloscope setting: 5 V/DIV (Y): 2 ms/DIV (X), DC range
- Measurement condition: Just after the ignition switch is off after warm-up (no load)

Metering oil pump control 3

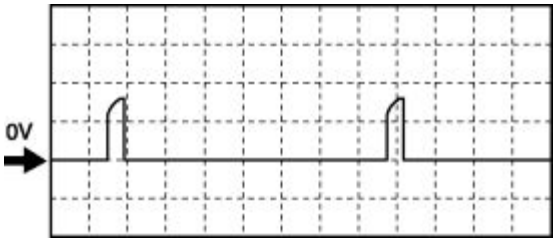


- Terminal connected: 2V (+)—Negative battery terminal
- Oscilloscope setting: 5 V/DIV (Y): 2 ms/DIV (X), DC range
- Measurement condition: Just after the ignition switch is off after warm-up (no load)

Metering oil pump control 4

- Terminal connected: 2Y (+)—Negative battery terminal
- Oscilloscope setting: 5 V/DIV (Y): 2 ms/DIV (X), DC range
- Measurement condition: Just after the ignition switch is off after warm-up (no load)

Ignition coil (L/F, L/R, T/F, T/R)



- Terminal connected:

  L/F: 2AA (+)—Negative battery terminal

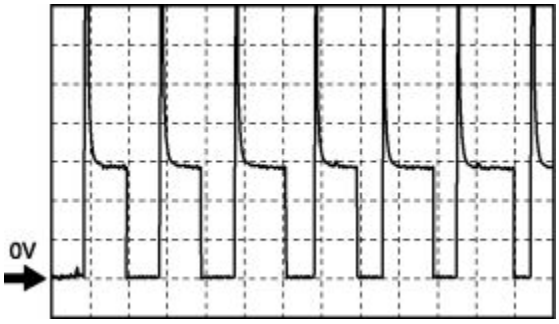
  L/R: 2Z (+)—Negative battery terminal

  T/F: 2AD (+)—Negative battery terminal

  T/R: 2AC (+)—Negative battery terminal

- Oscilloscope setting: 2 V/DIV (Y): 10 ms/DIV (X), DC range
- Measurement condition: Idling after warm-up (no load)

Fuel injector (FP2, RF2) control



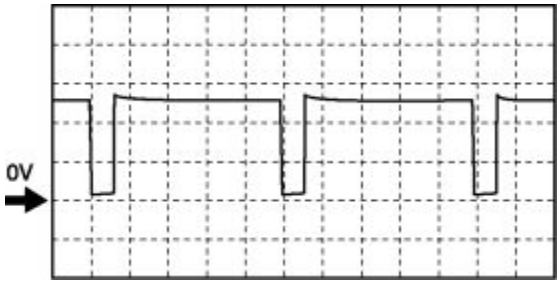
- Terminal connected:

  FP2: 3A (+)—Negative battery terminal

  RP2: 3D (+)—Negative battery terminal

- Oscilloscope setting: 5 V/DIV (Y): 5 ms/DIV (X), DC range
- Measurement condition: Racing after warm-up (no load)

APV motor control (+)



- Terminal connected: 3G (+)—Negative battery terminal
- Oscilloscope setting: 5 V/DIV (Y): 20 ms/DIV (X), DC range
- Measurement condition: Engine speed 6,250 rpm or more after warm-up (approx. 2 s after the APV remains open)

APV motor control (–)

- Terminal connected: 3J (+)—Negative battery terminal
- Oscilloscope setting: 5 V/DIV (Y): 20 ms/DIV (X), DC range
- Measurement condition: Within 20 s from 2 s after the accelerator is released from the engine speed at 6,250 rpm or more after warm-up.

Using the WDS or Equivalent

NOTE:

- PIDs for the following parts are not available on this model. Go to the appropriate part inspection page.
  - Main relay (See RELAY INSPECTION .)

1. Connect the WDS or equivalent to the DLC-2.

2. Turn the ignition switch to ON position.

3. Measure the PID value.
   - If PID value is not within the specification, follow the instructions in Action column.

   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, AIP RLY, ALTF, APV, ARPMDES, DEI, ETC_DSD, EVAPCP, FAN1, FAN2, FP, FPRR, FUELPW, GENVDSD, HTR11, HTR12, IASV, MOP POS, PACNTV, PREDELI, SSV, test

PID/DATA monitor table (reference)

Monitor item (Definition)	Unit/Condition	Condition/Specification (Reference)	Inspection item(s)	PCM terminal
ACCS (A/C relay)	On/Off	• Ignition switch ON: Off • A/C switch ON and fan switch ON at idling: On	• The following PIDs ▪ ACSW, ECT, IVS, PCM_T, RPM, TP, VSS • A/C relay	5AA
ACSW (A/C switch)	On/Off	• A/C switch and fan switch ON at ignition switch ON: On • A/C switch OFF at ignition switch ON: Off	• A/C switch	4W
AIP RLY (AIR pump relay)	On/Off	• During the specified period after cold: On • Idling after warm-up: Off	• The following PIDs ▪ CATT11_DSD, ECT, IAT • AIR pump relay	4O
ALTF (Generator field coil control duty value)	%	• Ignition switch ON: 0% • Just after A/C switch ON and fan switch ON at idling: Duty value rises	• The following PIDs ▪ ALTT V, B+, ECT, IAT, IVS, PCM_T, RPM, VSS	2I
ALTT V (Generator output voltage)	V	• Ignition switch ON: 0 V • Idling: Approx. 14.9 V[*1] (E/L not operating)	Generator.	2T

APP (Accelerator pedal position)	%	• Accelerator pedal released: 0% • Accelerator pedal depressed: 100%	• The following PIDs ▪ APP1, APP2 • APP sensor	—
APP1 (Accelerator pedal position)	%	• Accelerator pedal released: 31.1—33.1% • Accelerator pedal depressed: 75.6—78.6%	APP sensor	5F
	V	• Accelerator pedal released: 1.555—1.655 V • Accelerator pedal depressed: 3.78—3.93 V		
APP2 (Accelerator pedal position)	%	• Accelerator pedal released: 20.1—22.1% • Accelerator pedal depressed: 64.6—67.6%	APP sensor	5C
	V	• Accelerator pedal released: 1.005—1.105 V • Accelerator pedal depressed: 3.23—3.38 V		
APV (APV motor)	Opening/Closing	• High engine speed after warm-up: Opening • Except above:	• The following PIDs ▪ APV_POS, BARO, ECT, IAT, MAF, RPM, TP	3G, 3J

		Closing	• APV motor	
APV_POS (APV position sensor)	V	• High engine speed after warm-up: 1.5 V or less • Except above: 1.5 V or more	• APV position sensor	3B
ARPMDES (Target engine speed)	RPM	**MT** • No load after warm-up: 750—850 rpm **AT** • No load after warm-up: 760—860 rpm	• The following PIDs ▪ ACCS, ALTT V, B+, COLP, ECT, IAT, MAF, RPM, TP	—
B+ (Battery positive voltage)	V	• Ignition switch ON: B+	• Battery	5J
BARO (Barometric pressure)	kPa, Bar, psi	• Ignition switch ON: Indicate the atmospheric pressure	• BARO sensor	5S

	V		• Ignition switch ON ▪ Altitude 0 m {0 ft}): 3.8—4.2 V*4 ▪ Altitude 305 m {1,000 ft}): 3.6—4.0 V*4 ▪ Altitude 610 m {2,000 ft}): 3.5—3.9 V*4 ▪ Altitude 914 m {3,000 ft}): 3.4—3.7 V*4 ▪ Altitude 1,219 m {4,000 ft}): 3.2—3.6 V*4 ▪ Altitude 1,524 m {5,000 ft}): 3.1—3.5 V*4 ▪ Altitude 1,829 m {6,000 ft}): 3.0—3.4 V*4 ▪ Altitude 2,134 m {7,000 ft}): 2.9—3.3 V*4		
BOO (Brake switch)	On/Off		• Brake pedal depressed: On • Brake pedal released: Off	• Brake switch	4P
CATT11_DSD (Estimated catalytic converter temperature)	°C	°F	• Idling after warm-up: Approx. 531 °C {988 °F}	• The following PIDs ▪ ECT, IAT, LOAD, RPM	—
CHRGLP	On/Off				—

(Generator warning light)			• Ignition switch ON: On • Idling: Off	• Generator warning light	
COLP (Refrigerant pressure switch (middle))	ON/OFF		• Refrigerant pressure switch (middle) ON [*2] at idling: ON • Refrigerant pressure switch (middle) OFF [*3] at idling: OFF	• Refrigerant pressure switch	4Z
CPP (Clutch pedal position)	On/Off		• Clutch pedal depressed: On • Clutch pedal released: Off	• CPP switch	4F
CPP/PNP (Shift lever position)	Drive/Neutral		• Neutral position: Neutral • Except above: Drive	• Neutral switch	2O
DEI (VDI solenoid valve)	On/Off		• Idling: Off • High engine speed after warm-up: On	• The following PID ▪ RPM • VDI solenoid valve	1W
DTC_CNT (Number of DTC detected)	—		—	—	—
ECT (Engine coolant temperature)	°C	°F	• Ignition switch at ON position: Indicate the ECT	• ECT sensor	2K

	V		• ECT 20 °C {68 °F}: approx. 3.1 V • ECT 80 °C {176 °F}: approx. 0.9 V		
ECT_DES (Estimated ECT)	°C	°F	• Ignition switch at ON position: Indicate the estimated ECT	• The following PIDs ▪ ECT, IAT, LOAD, MAF, VSS	—
EQ_RAT11 (Front oxygen sensor)	—		• Acceleration: 1 or more • Deceleration: less than 1	• Front HO2S	2B, 2C
ETC_ACT (Electronic throttle control actual)	°		• CTP: Approx. 6.3° • WOT: Approx. 83°	• The following PIDs ▪ TP1, TP2	—
ETC_DSD (Electronic throttle control desired)	°		• CTP: Approx. 6.3° • WOT: Approx. 83°	• The following PIDs ▪ APP, ECT_DES	—
	%		• CTP: Approx. approx. 2.4% • WOT: Approx. 100%		
EVAPCP (Purge solenoid valve duty value)	%		• Ignition switch ON: 0% • Increase the engine speed: Duty value rises	• The following PIDs ▪ BARO, ECT, FUELSYS, IAT, LOAD, MAF, RPM • Purge solenoid valve	2P
FAN1	On/Off				5X

(Cooling fan control)		• The cooling fan is operating: On • Except above: Off	• The following PIDs ▪ ACSW, COLP, ECT, IAT, PCM_T • Cooling fan relay No.1	
FAN2 (Cooling fan control)	On/Off	• The cooling fan is operating at high speed: On • Except above: Off	• The following PIDs ▪ ACSW, COLP, ECT, IAT, PCM_T • Cooling fan relay No.2	5AD
FDPDTC (Pending code caused FFD storage)	—	—	—	—
FLI (Fuel level)	%	• Fuel gauge level F: Approx. 100% • Fuel gauge level E: Approx. 0%	• Fuel tank gauge unit	—
FP (Fuel pump relay)	On/Off	• Ignition switch ON: Off • Idling: On • Cranking: On	• The following PID ▪ RPM • Fuel pump relay	5P
FPRR (Fuel pump speed control relay)	On/Off	• Ignition switch ON: Off • Idling: Off • Cranking: On	• The following PIDs ▪ B+, BARO, ECT, IAT, MAF, O2S11, O2S12, RPM, TP • Fuel pump speed control relay	4M
FUELPW (Fuel injector duration)	ms	• Cranking (before warm-up [ECT: 20 °C {68 °F}): approx. 48 ms • Cranking after warm-up: approx.	• The following PIDs ▪ ACSW, APP, B+, BARO, ECT, IAT, KNOCKR, MAF, O2S11, O2S12, RPM, TP, VSS	2J, 2M

		9.6 ms • Idling after warm-up: 2.9—3.5 ms	• Fuel injector	
FUELSYS (Fuel system status)	OL/CL/ OL Drive/ OL Fault/ CL Fault	• Idling after warm-up: CL	• The following PIDs ▪ ACSW, APP, B+, BARO, ECT, IAT, KNOCKR, MAF, O2S11, O2S12, RPM, TP, VSS	—
GENVDSD (Generator voltage desired)	V	• Ignition switch ON: 0 V • Idling: Approx. 14.9 V[*1] (E/L not operating)	• The following PIDs ▪ ACSW, ALTT V, B+, BOO, ECT, IAT, PCM_T, RPM, VSS	—
HTR11 (Front HO2S heater)	On/Off	• Idling after warm-up: On	• The following PIDs ▪ B+, ECT, IAT, LOAD, MAF • Front HO2S heater	1V
HTR12 (Rear HO2S heater)	On/Off	• Idling after warm-up: On	• The following PIDs ▪ B+, ECT, IAT, LOAD, MAF • Rear HO2S heater	2A
IAC (Idle air control)	%	• Ignition switch ON: Approx. 30% • Idling after warm-up: Approx. 24%	• The following PIDs ▪ ACSW, ALTT V, APP, ARPMDES, COLP, ECT, EVAPCP, RPM, VSS • Throttle valve actuator	1B, 1C
IASV (VFAD solenoid valve)	On/Off	• High engine speed: On	• The following PID ▪ RPM	5Z

			• Idling: Off	• VFAD solenoid valve	
IAT (Intake air temperature)	°C	°F	• Ignition switch at ON position: Indicate the IAT	• IAT sensor	5K
	V		• IAT 20 °C {68 °F}: Approx. 2.4 V • IAT 40 °C {104 °F}: Approx. 1.5 V		
INGEAR (In gear)	On/Off		**MT** • When the following conditions are satisfied: On ▪ Engine runs ▪ Not neutral ▪ Clutch pedal released • Except above: Off **AT** • When the following conditions are satisfied: On ▪ Engine runs ▪ Driving range • Except above: Off	• The following PIDs ▪ CPP, CPP/PNP, RPM	—
IVS (CTP condition)	Idle/ Off Idle		• CTP: Idle • Except above: Off idle	• The following PID ▪ APP	—
KNOCKR (Knocking retard)	°		• Ignition switch ON: 0 ° • Idling: 0 °	• KS	1T

LOAD (Engine load)	%	**MT** • Idling: 18.0—25.0% • Engine speed 2,500 rpm (no load): 13.5—19.5% **AT** • Idling: 20.0—28.0% • Engine speed 2,500 rpm (no load): 15.0—21.0%	• The following PIDs ▪ BARO, IAT, MAF, RPM	—
LONGFT1 (long term fuel trim)	%	• Idling after warm-up: approx.−12.5—12.5 %	• The following PIDs ▪ ECT, LOAD, MAF, RPM, SHRTFT	—
MAF (Mass airflow)	g/s	**MT** • Idling after warm-up: 3.8—4.7 g/s • Engine speed 2,500 rpm (no load): 8.7—11.7 g/s **AT** • Idling after warm-up: 4.4—5.3 g/s • Engine speed 2,500 rpm (no load): 9.5—12.5 g/s	• MAF sensor	5N

	V	**MT** • Idling after warm-up: 1.16—1.23 V • Engine speed 2,500 rpm (no load): 1.49—1.64 V **AT** • Idling after warm-up: 1.21—1.29 V • Engine speed 2,500 rpm (no load): 1.54—1.67 V		
MIL (Malfunction indicator lamp)	On/Off	• Ignition switch ON: On • Idling: Off	• MIL	—
MIL_DIS (Travelled distance since the MIL illuminated)	Indicate the travelled distance since the MIL illuminated			
MOP_POS (Metering oil pump)	—	• When the initial set function is operating: value is increased	• The following PIDs ▪ BARO, ECT, IAT, MOP_SW, RPM • Metering oil pump	2V, 2W, 2Y, 2AB
MOP_SW (Metering oil pump switch)	On/Off	• When the initial set function is operating: On	• Metering oil pump switch	2N
O2S11 (Front oxygen sensor)	mA	• Acceleration: more than 0 mA • Deceleration: 0 mA or less	• Front HO2S	2B
O2S12	V			2Q

(Rear oxygen sensor)		• Idling after warm-up: 0.5 V or more	• Rear HO2S	
PSCNTV (AIR solenoid valve control)	On/Off	• AIR pump operating: On • AIR pump not operating: Off	• The following PIDs ▪ CATT11_DSD, ECT, IAT • AIR solenoid valve	1O
PCM_T (PCM temperature sensor)	V	• Ignition switch at ON position: Indicate the PCM temperature sensor output voltage	• PCM	—
RO2FT1 (Rear oxygen sensor fuel trim)	—	• Idling after warm-up: approx.–0.03—0.03	• The following PID ▪ O2S12	—
RPM (Engine speed)	RPM	• Engine runs: Indicate the engine speed	• Eccentric shaft position sensor	—
PREDELI (Pre-delivery mode)	On/Off	• This PID is for the off-line inspection.		
SC_SET (Cruise set indicator light)	On/Off	• Cruise set indicator light ON: On • Cruise set indicator light OFF: Off	• Cruise indicator light	—
SCCS (Cruise control switch)	V	• Press ON/OFF: approx. 0 V • Press CANCEL: approx. 0.25 V • Press SET/COAST:	• Cruise control switch	5V

		approx. 1.18 V • Press RES/ACCEL: approx. 2.50 V • Others: approx. 5.0 V		
SELTESTDTC (DTC)	Indicate the Number of the DTCs detected by the KOEO/KOER self-test function			
SHRTFT1 (Short term fuel trim (front))	%	• Idling after warm-up: approx.−4—4%	• The following PIDs ▪ ACSW, APP, B+, BARO, ECT, IAT, KNOCKR, LOAD, MAF, O2S11, O2S12, RPM, TP, VSS	—
SHRTFT12 (Short term fuel trim (rear))	%	• Idling after warm-up: approx.−4—4%	• The following PIDs ▪ ACSW, APP, B+, BARO, ECT, IAT, KNOCKR, LOAD, MAF, O2S11, O2S12, RPM, TP, VSS	—
SPARK-L (Ignition timing)	°(BTDC)	• Ignition switch ON: BTDC 0° • Idling after warm-up: BTDC approx. 5°	• The following PIDs ▪ ACSW, APP, ECT, IAT, IVS, KNOCKR, LOAD, MAF, RPM, TP, VSS • Ignition coil (L/F)	2AA
SPARK-T (Ignition timing)	°(BTDC)	• Ignition switch ON: BTDC 20° • Idling after warm-up: BTDC approx. 23°	• The following PIDs ▪ ACSW, APP, ECT, IAT, IVS, KNOCKR, LOAD, MAF, RPM, TP, VSS • Ignition coil (T/F)	2AD

SSV (SSV solenoid valve)	On/Off	• High engine speed and high load after warm-up: On • Idling: Off	• The following PIDs ▪ BARO, ECT, IAT, MAF, RPM, TP • SSV solenoid valve	1L
test	On/Off	• Test mode: On • Except above: Off	—	—
TIRESIZE (Tire revolution per mile)	rev/mile	• Indicate the tire revolution per a mile		
TP (TP)	V	• CTP: Approx. 0.82 V • WOT: Approx. 3.92 V	• The following PIDs ▪ TP1, TP2	—
TP_REL (Relative TP)	%	• CTP: Approx. 16.9% • WOT: Approx. 16.9%	• The following PIDs ▪ TP, TP1, TP2	—
TP1 (TP sensor 1)	%	• CTP: 8.0—16.0% • WOT: 76.5—81.9%	• TP sensor No.1	1J
	V	• CTP: 0.40—0.80 V • WOT: 3.825—4.095 V		
TP2 (TP sensor 2)	%	• CTP: 23.6—35.6% • WOT: 80.66—86.06%	• TP sensor No.2	1M

	V		• CTP: 1.18—1.78 V • WOT: 4.033—4.303 V		
TPCT (TP sensor voltage at CTP)	V		• Ignition switch ON (CTP): 0.01 V	• TP sensor	1J, 1M
VSS (Vehicle speed)	km/h	MPH	• Vehicle running: Indicate the vehicle speed	• ABS HU/CM • DSC HU/CM	—

*1 Calculated value; differs from terminal voltage

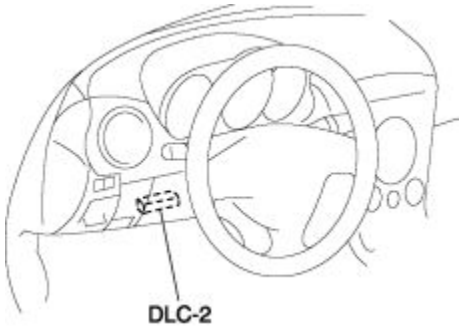
*2 Refrigerant pressure switch (middle) turns off when the refrigerant pressure is 1.11 MPa {11.3 kgf/cm^2 , 161 psi} or less

*3 Refrigerant pressure switch (middle) turns on when the refrigerant pressure is 1.60 MPa {16.3 kgf/cm^2 , 232 psi} or more

*4 The voltage may vary excessively depending on the weather or battery conditions.

PCM CONFIGURATION

1. Connect the WDS or equivalent to the DLC-2.



2. Set up the WDS or equivalent (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 or equivalent screen.

   NOTE:

   - If the PCM is replaced with a new one, the PCM stores DTC P0602 and illuminates the MIL even though no malfunction is detected. This means the PCM has not been configured yet.

6. Retrieve DTCs using the WDS or equivalent and verify that there is no DTC present.
   - If any DTC is present, perform applicable DTC inspection. (See DTC TABLE .)

NEUTRAL SWITCH

NEUTRAL SWITCH INSPECTION

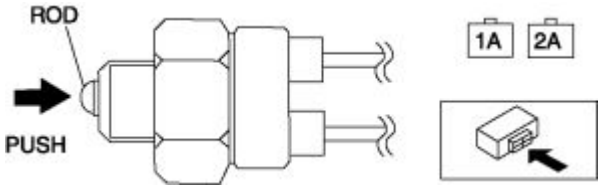
NOTE:

- Before performing the following inspection, make sure to follow the troubleshooting flowchart. (See FOREWORD .)

Continuity Inspection

1. Remove the neutral switch.

2. Verify that the continuity between neutral switch terminals 1A and 2A is as indicated in the table.



- If there is no malfunction, perform the "Circuit Open/Short Inspection".
- If there is any malfunction, replace the neutral switch.

Measurement condition	Continuity
Push the rod.	No continuity
Except above	Continuity detected

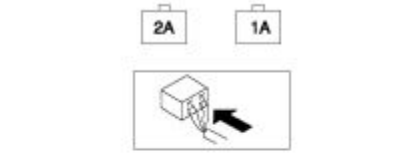
Circuit Open/Short Inspection

1. Disconnect the PCM connector.

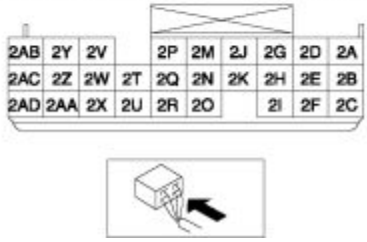
2. Disconnect the neutral switch connectors.

3. Inspect the following wiring harnesses for open or short circuit. (Continuity inspection)

NEUTRAL SWITCH
WIRING HARNESS-SIDE CONNECTOR



PCM
WIRING HARNESS-SIDE CONNECTOR



Open circuit

- If there is no continuity in the following wiring harnesses, there is an open circuit. Repair or replace the wiring harness.
  - Neutral switch terminal 2A and PCM terminal 2O
  - Neutral switch terminal 1A and body ground

Short circuit

- If there is continuity in the following wiring harnesses, there is a short circuit. Repair or replace the wiring harness.
  - Neutral switch terminal 2A and body ground
  - Neutral switch terminal 2A and power supply

CLUTCH SWITCH

CLUTCH PEDAL POSITION (CPP) SWITCH INSPECTION

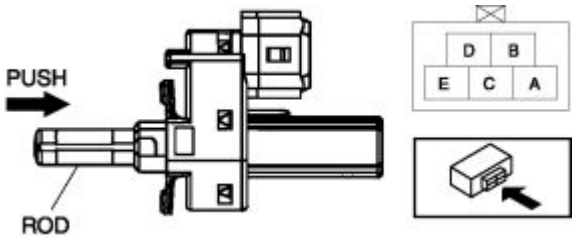
NOTE:

- Before performing the following inspection, make sure to follow the troubleshooting flowchart. (See FOREWORD .)

Continuity Inspection

1. Remove the CPP switch.

2. Verify that the continuity between CPP switch terminals B and D is as indicated in the table.



- If there is no malfunction, perform the "Circuit Open/Short Inspection".
- If there is any malfunction, replace the CPP switch.

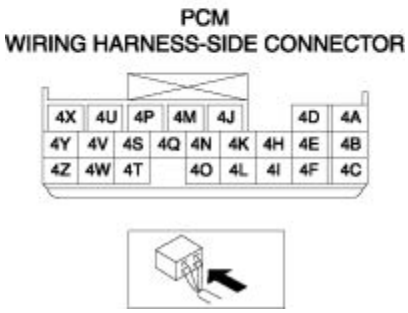
Measurement condition	Continuity
Push the rod.	No continuity
Except above	Continuity detected

Circuit Open/Short Inspection

1. Disconnect the PCM connector.

2. Disconnect the CPP switch connector.

3. Inspect the following wiring harnesses for open or short circuit. (Continuity inspection)



Open circuit

- If there is no continuity in the following wiring harnesses, there is an open circuit. Repair or replace the wiring harness.
  - CPP switch terminal B and PCM terminal 4F
  - CPP switch terminal A and body GND

Short circuit

- If there is continuity in the following wiring harnesses, there is a short circuit. Repair or replace the wiring harness.
  - CPP switch terminal B and body GND
  - CPP switch terminal B and power supply

METERING OIL PUMP

METERING OIL PUMP SWITCH INSPECTION

CAUTION:

- This inspection procedure cannot be completed correctly if the stepping motor which is built into the metering oil pump has a malfunction. Before performing the inspection, verify that any one of the DTCs (P1685, P1686, P1687, P1688) related to the stepping motor is not detected.

NOTE:

- Before performing the following inspection, make sure to follow the troubleshooting flowchart. (See FOREWORD .)

Voltage Inspection

NOTE:

- This inspection procedure is performed using the metering oil pump learning function as one of the PCM learning functions.

1. Make preparations for the PCM terminal voltage measurement. (See PCM INSPECTION .)

2. To clear the metering oil pump control learning value, disconnect the negative battery terminal.

3. Verify that the voltage at PCM terminal 2N is as indicated in the table.
    - If it cannot be verified even though the related wiring harnesses have no malfunction, replace the metering oil pump. (See METERING OIL PUMP REMOVAL/INSTALLATION .)

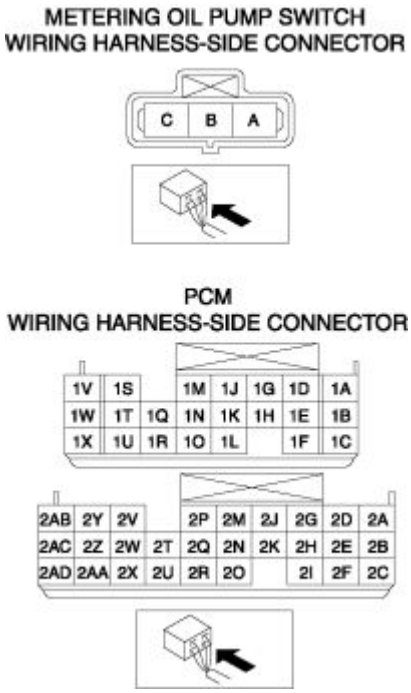
Measurement condition	PCM terminal 2N (V)
Ignition switch ON	0
Just after engine start	B+
Idling after engine start	0

Circuit Open/Short Inspection

1. Disconnect the PCM connectors.

2. Disconnect the metering oil pump switch connector.

3. Inspect the following wiring harnesses for open or short circuit. (Continuity inspection)



Open circuit

- If there is no continuity in the following wiring harnesses, there is an open circuit. Repair or replace the wiring harness.
  - Metering oil pump switch terminal A and PCM terminal 2N
  - Metering oil pump switch terminal C and PCM terminal 1U

Short circuit

- If there is continuity in the following wiring harnesses, there is a short circuit. Repair or replace the wiring harness.
  - Metering oil pump switch terminal A and body ground
  - Metering oil pump switch terminal A and power supply

SECONDARY SUTTER VALVE SWITCH

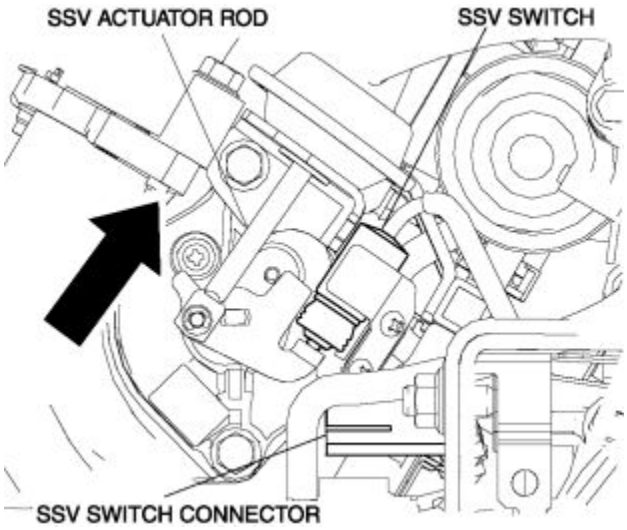
SECONDARY SHUTTER VALVE (SSV) SWITCH INSPECTION

NOTE:

- Before performing the following inspection, make sure to follow the troubleshooting flowchart. (See FOREWORD .)

Continuity Inspection

1. Verify that the continuity between SSV switch terminals A and B is as indicated in the table.



- If there is no malfunction, perform the "Circuit Open/Short Inspection".
- If there is any malfunction, replace the SSV switch. (See SECONDARY SHUTTER VALVE (SSV) SWITCH REMOVAL/INSTALLATION .)

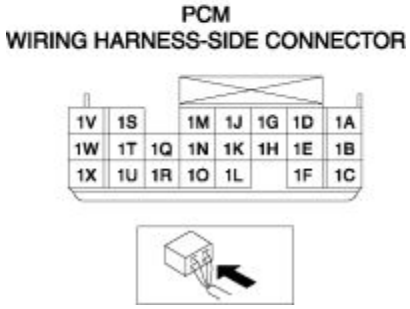
Measurement condition	Continuity
Push the rod.	No continuity
Except above	Continuity detected

Circuit Open/Short Inspection

1. Disconnect the PCM connector.

2. Disconnect the metering oil pump switch connector.

3. Inspect the following wiring harnesses for open or short circuit. (Continuity inspection)



Open circuit

- If there is no continuity in the following wiring harnesses, there is an open circuit. Repair or replace the wiring harness.
  - SSV switch terminal A and PCM terminal 1D
  - SSV switch terminal B and body ground

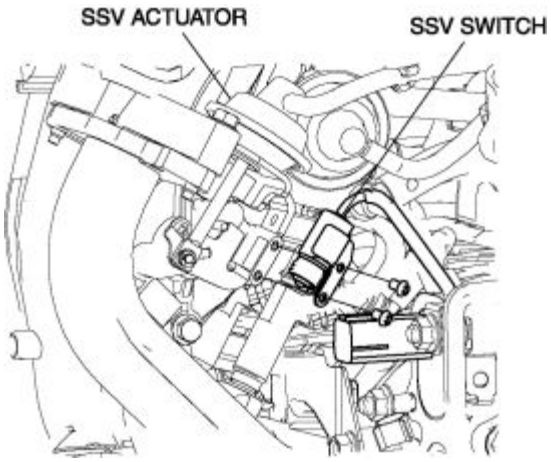
Short circuit

- If there is continuity in the following wiring harnesses, there is a short circuit. Repair or replace the wiring harness.
  - SSV switch terminal A and body ground
  - SSV switch terminal A and power supply

SECONDARY SHUTTER VALVE (SSV) SWITCH REMOVAL/INSTALLATION

1. Disconnect the SSV switch connector.

2. Remove the SSV installation screws and remove the SSV switch.



3. Install in the reverse order of removal.

   SSV switch tightening torque

   - 1.3—1.9 N·m {14—19 kgf·cm, 12—16 in·lbf}

ENGINE COOLANT TEMPERATURE SENSOR

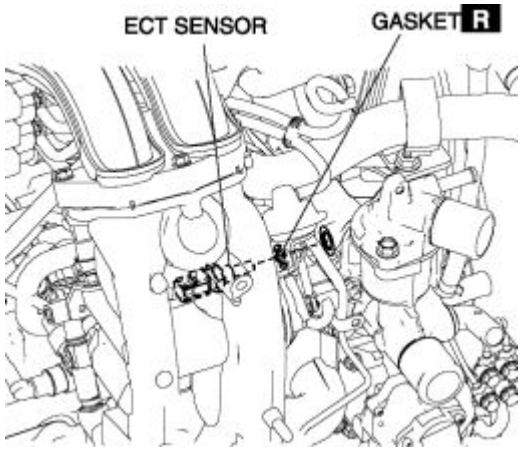
ENGINE COOLANT TEMPERATURE (ECT) SENSOR REMOVAL/INSTALLATION

1. Remove the following part for easier access.
   - Generator (See GENERATOR REMOVAL/INSTALLATION .)

2. Drain the engine coolant. (See ENGINE COOLANT REPLACEMENT .)

3. Disconnect the ECT sensor connector.

4. Remove the ECT sensor.



5. Replace the gasket.

6. Install in the reverse order of removal.

   ECT sensor tightening torque

   - 15.7—23.5 N·m {1.61—2.39 kgf·m, 11.6—17.3 ft·lbf}

ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION

NOTE:

- Before performing the following inspection, make sure to follow the troubleshooting flowchart. (See FOREWORD .)

Resistance Inspection

1. Disconnect the ECT sensor connector.

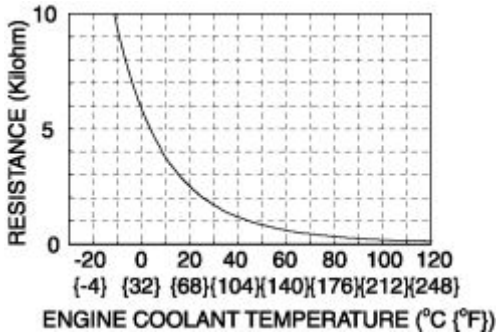
2. Remove the ECT sensor.

3. Place the detection part of the ECT sensor in water and verify that the resistance between ECT sensor terminals A and B is as indicated in the table while gradually increasing water temperature.
   - If the monitor item condition/specification (reference) is not within the specification, even though the resistance is within the specification, perform the "Circuit Open/Short Inspection".
   - If not within the specification, replace the ECT sensor. (See ENGINE COOLANT TEMPERATURE (ECT) SENSOR REMOVAL/INSTALLATION .)

   ECT sensor resistance

Water temperature (°C {°F})	Resistance (ohm)
20 {68}	2,205—2,695
80 {176}	287—349
91 {196}	227—240

ECT sensor characteristics graph (reference)

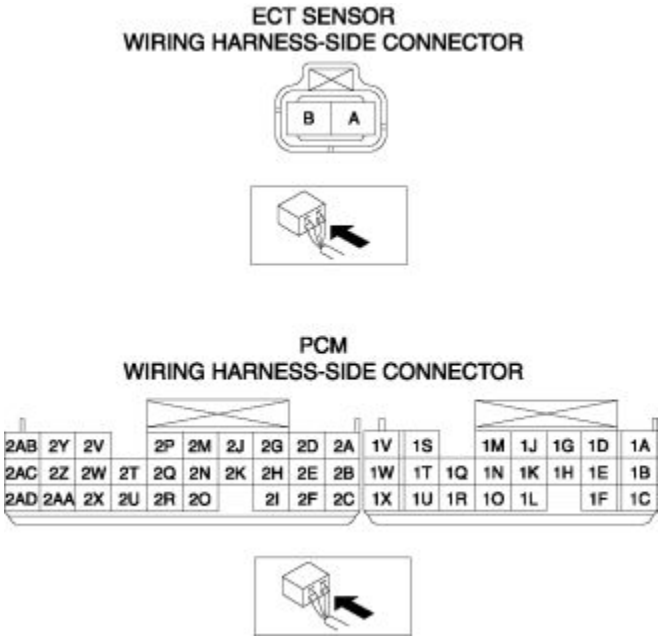


Circuit Open/Short Inspection

1. Disconnect the PCM connector.

2. Disconnect the ECT sensor connector.

3. Inspect the following wiring harnesses for open or short circuit. (Continuity inspection)



Open circuit

- If there is no continuity in the following wiring harnesses, there is an open circuit. Repair or replace the wiring harness.
  - ECT sensor terminal A and PCM terminal 2K
  - ECT sensor terminal B and PCM terminal 1U

Short circuit

- If there is continuity at the following wiring harnesses, there is a short circuit. Repair or replace the wiring harness.
  - ECT sensor terminal A and body ground
  - ECT sensor terminal A and power supply

INTAKE AIR TEMPERATURE SENSOR

INTAKE AIR TEMPERATURE (IAT) SENSOR INSPECTION

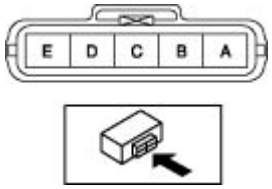
NOTE:

- Before performing the following inspection, make sure to follow the troubleshooting flowchart. (See FOREWORD .)

Resistance Inspection

1. Disconnect the MAF/IAT sensor connector.

2. Verify that the resistance between MAF sensor terminals D and E is as indicated in the table while blowing hot air gradually into the IAT sensor part built into the MAF sensor.

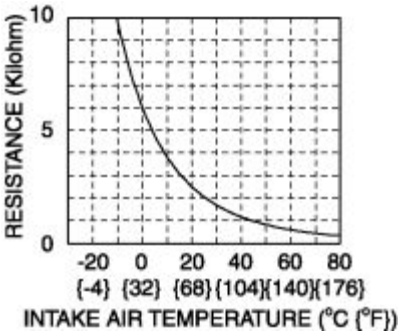


   - If the monitor item condition/specification (reference) is not within the specification, even though the resistance is within the specification, perform the "Circuit Open/Short Inspection".
   - If not within the specification, replace the MAF/IAT sensor. (See MASS AIR FLOW (MAF)/INTAKE AIR TEMPERATURE (IAT) SENSOR REMOVAL/INSTALLATION .)

   IAT sensor resistance

Air temperature (°C {°F})	Resistance (kilohm)
-20 {-4}	13.6—18.4
20 {68}	2.21—2.69
60 {140}	0.493—0.667

IAT sensor characteristics graph (reference)

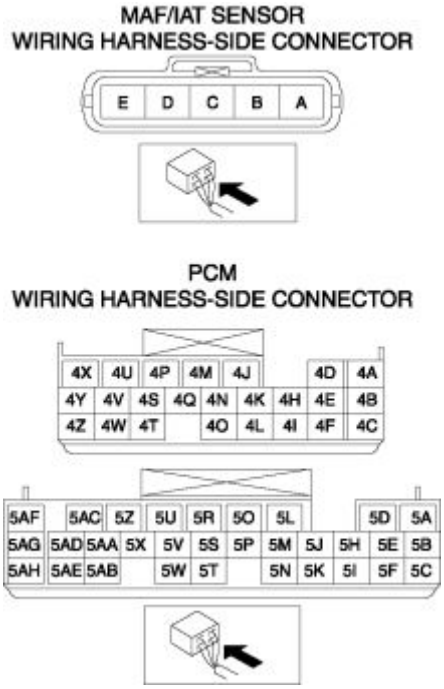


Circuit Open/Short Inspection

1. Disconnect the PCM connectors.

2. Disconnect the MAF/IAT sensor connector.

3. Inspect the following wiring harnesses for open or short circuit. (Continuity inspection)



Open circuit

- If there is no continuity in the following wiring harnesses, there is an open circuit. Repair or replace the wiring harness.
  - MAF/IAT sensor terminal D and PCM terminal 5K
  - MAF/IAT sensor terminal E and PCM terminal 4U

Short circuit

- If there is continuity in the following wiring harnesses, there is a short circuit. Repair or replace the wiring harness.
    - MAF/IAT sensor terminal D and body ground
    - MAF/IAT sensor terminal D and power supply

Notes:

THROTTLE POSITION SENSOR

THROTTLE POSITION (TP) SENSOR INSPECTION

CAUTION:

- This inspection procedure cannot be completed correctly if the accelerator pedal position sensor has a malfunction. Before performing this procedure, verify that any one of the DTCs (P1577, P2122, P2123, P2127, P2128, P2138) related to the accelerator pedal position sensor is not detected.

NOTE:

- Before performing the following inspection, make sure to follow the troubleshooting flowchart. (See FOREWORD .)

Voltage Inspection

1. Turn the ignition switch to the ON position.

2. Verify that the voltage at PCM terminals 1J (WDS PID: TP1) and 1M (WDS PID: TP2) increases while gradually increasing the accelerator pedal opening angle according to the accelerator pedal opening angle.
   - If it can be verified, go to the next step.
   - If it cannot be verified even though the related wiring harnesses have no malfunction, replace the throttle body. (See INTAKE-AIR SYSTEM REMOVAL/INSTALLATION .)

3. Verify that the voltage at PCM terminals 1J (WDS PID: TP1) and 1M (WDS PID: TP2) is as indicated in the table.
   - If it cannot be verified, replace the throttle body. (See INTAKE-AIR SYSTEM REMOVAL/INSTALLATION .)

   TP sensor output voltage

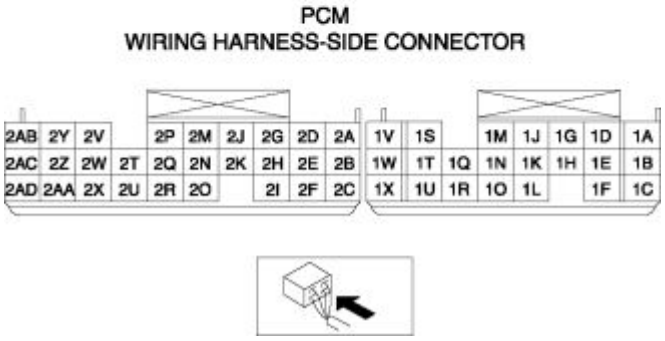
Measurement condition	PCM terminal (WDS PID)	
	1J (TP1)	1M (TP2)
When the accelerator pedal is depressed.	3.825—4.095 V	4.033—4.303 V
When the accelerator pedal is released.	0.4—0.8 V	1.18—1.78 V

Circuit Open/Short Inspection

1. Disconnect the PCM connector.

2. Disconnect the throttle body connector.

3. Inspect the following wiring harnesses for open or short circuit. (Continuity inspection)



Open circuit

- If there is no continuity in the following wiring harnesses, there is an open circuit. Repair or replace the wiring harness.
  - Throttle body terminal C and PCM terminal 2F
  - Throttle body terminal D and PCM terminal 1M
  - Throttle body terminal E and PCM terminal 1Q
  - Throttle body terminal F and PCM terminal 1J

Short circuit

- If there is continuity in the following wiring harnesses, there is a short circuit. Repair or replace the wiring harness.
  - Throttle body terminal E and body ground
  - Throttle body terminal E and power supply
  - Throttle body terminal F and body ground
  - Throttle body terminal F and power supply
  - Throttle body terminal D and body ground
  - Throttle body terminal D and power supply

ACCELERATOR PEDAL POSITION SENSOR

ACCELERATOR PEDAL POSITION (APP) SENSOR INSPECTION

NOTE:

- Before performing the following inspection, make sure to follow the troubleshooting flowchart. (See FOREWORD .)

Voltage Inspection

1. Turn the ignition switch to the ON position.

2. Verify that the voltage at PCM terminals 5F (WDS PID: APP1) and 5C (WDS PID: APP2) increases while gradually increasing the accelerator pedal opening angle according to the accelerator pedal opening angle.
   - If it can be verified, go to the next step.
   - If it cannot be verified even though the related wiring harnesses have no malfunction, replace the accelerator pedal.

3. Verify that the voltage at PCM terminals 5F (WDS PID: APP1) and 5C (WDS PID: APP2) is as indicated in the table.
   - If it cannot be verified, replace the accelerator pedal. (See ACCELERATOR PEDAL REMOVAL/INSTALLATION .)

   APP sensor output voltage

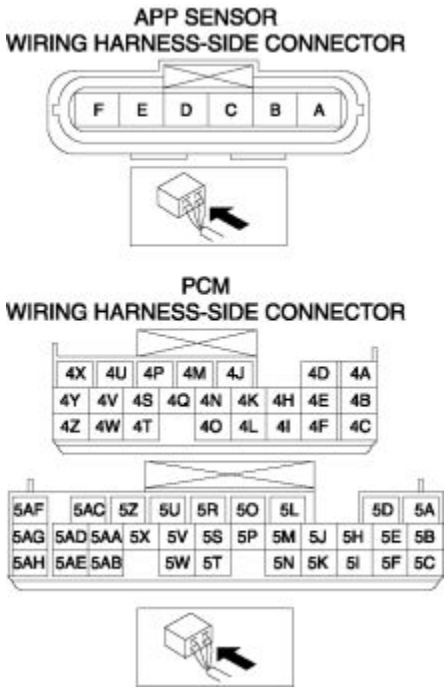
Measurement condition	PCM terminal (WDS PID)	
	5F (APP1)	5C (APP2)
When the accelerator pedal is depressed.	3.78—3.93 V	3.23—3.38 V
When the accelerator pedal is released.	1.555—1.655 V	1.005—1.105 V

Circuit Open/Short Inspection

1. Disconnect the PCM connectors.

2. Disconnect the APP sensor connector.

3. Inspect the following wiring harnesses for open or short circuit. (Continuity inspection)



Open circuit

- If there is no continuity in the following wiring harnesses, there is an open circuit. Repair or replace the wiring harness.
  - APP sensor terminal A and PCM terminal 4X
  - APP sensor terminal B and PCM terminal 5AB
  - APP sensor terminal C and PCM terminal 5C
  - APP sensor terminal D and PCM terminal 4Y
  - APP sensor terminal E and PCM terminal 5AE
  - APP sensor terminal F and PCM terminal 5F

Short circuit

- If there is continuity in the following wiring harnesses, there is a short circuit. Repair or replace the wiring harness.
  - APP sensor terminal D and body ground
  - APP sensor terminal D and power supply
  - APP sensor terminal A and body ground
  - APP sensor terminal A and power supply
  - APP sensor terminal F and body ground
  - APP sensor terminal F and power supply
  - APP sensor terminal C and body ground
  - APP sensor terminal C and power supply

AUXILIARY PORT VALVE POSITION SENSOR

AUXILIARY PORT VALVE (APV) POSITION SENSOR INSPECTION

NOTE:

- To determine if this part has any malfunction, perform the following procedure.

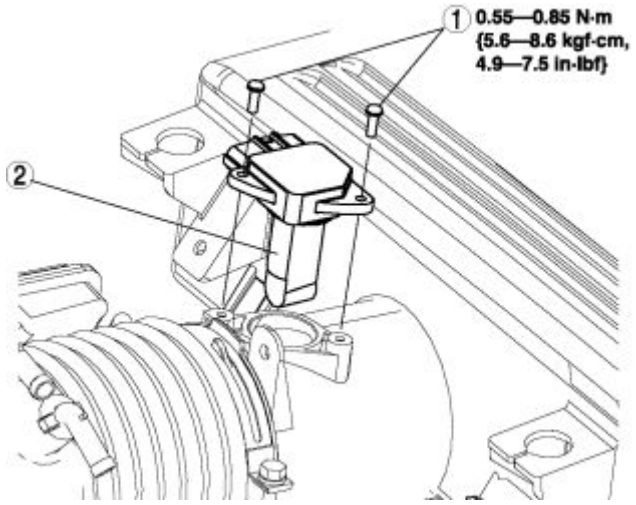
1. Perform the APV motor inspection and replace the APV motor if necessary. (See AUXILIARY PORT VALVE (APV) MOTOR INSPECTION (13B-MSP (HIGH POWER)) .)

MASS AIR FLOW SENSOR

MASS AIR FLOW (MAF)/INTAKE AIR TEMPERATURE (IAT) SENSOR REMOVAL/INSTALLATION

1. Remove the MAF/IAT sensor connector.

2. Remove in the order indicated in the table.

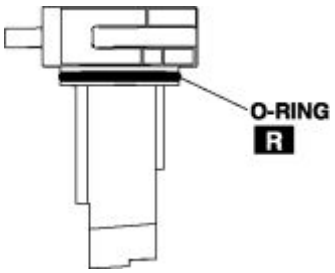


1	Screw (See Screw Installation Note .)
2	MAF/IAT sensor (See MAF/IAT Sensor Installation Note .)

3. Install in the reverse order of removal.

MAF/IAT Sensor Installation Note

1. Before installation of the MAF/IAT sensor, replace the O-ring.



Screw Installation Note

1. After installation of the screws, verify that the MAF/IAT sensor is installed securely.

MASS AIR FLOW (MAF) SENSOR INSPECTION

NOTE:

- Before performing the following inspection, make sure to follow the troubleshooting flowchart. (See FOREWORD .)

Visual Inspection

1. Visually inspect the MAF/IAT sensor for the following:
    - Damage, cracks
    - Rusted sensor terminal
    - Bent sensor terminal
        - If there is any malfunction, replace the MAF/IAT sensor. (See MASS AIR FLOW (MAF)/INTAKE AIR TEMPERATURE (IAT) SENSOR REMOVAL/INSTALLATION .)
        - If the monitor item condition (reference) is not within the specification even though there is no malfunction, perform the "Circuit Open/Short Inspection".

Voltage Inspection

1. Remove the MAF/IAT sensor without disconnect the MAF/IAT sensor connector.

2. Turn the ignition switch to ON position.

3. As the air gradually approaches the MAF detection part of the MAF/IAT sensor, verify that the voltage at PCM terminal 5N (WDS PID: MAF) varies.
    - If it cannot be verified even though the related harnesses have no malfunction, replace the MAF/IAT sensor. (See MASS AIR FLOW (MAF)/INTAKE AIR TEMPERATURE (IAT) SENSOR REMOVAL/INSTALLATION .)

AT

Engine speed	Engine load calculated value (WDS PID: LOAD)	Intake MAF (WDS PID: MAF)
Idle after warm-up (no load)	20—28%	4.4—5.3 g/s
2,500 rpm	15.0—21.0%	9.5—12.5 g/s

MT

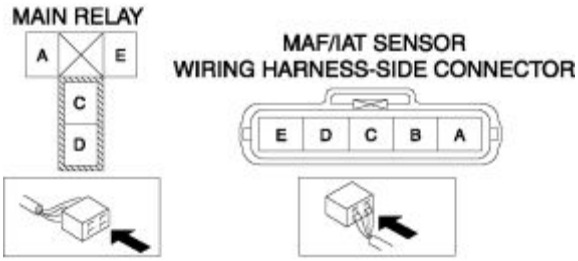
Engine speed	Engine load calculated value (WDS PID: LOAD)	Intake MAF (WDS PID: MAF)
Idle after warm-up (no load)	18.0—25.0%	3.8—4.7 g/s
2,500 rpm	13.5—19.5%	8.7—11.7 g/s

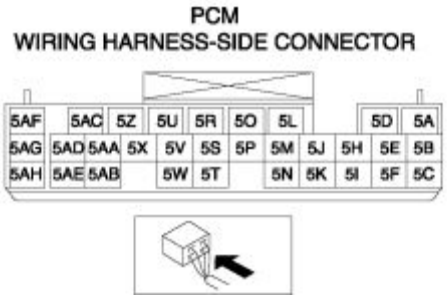
Circuit Open/Short Inspection

1. Disconnect the PCM connector.

2. Disconnect the MAF/IAT sensor connector.

3. Inspect the following wiring harnesses for open or short circuit. (Continuity inspection)





Open circuit

- If there is no continuity in the following wiring harnesses, there is an open circuit. Repair or replace the wiring harness.
  - MAF/IAT sensor terminal A and main relay terminal C
  - MAF/IAT sensor terminal B and PCM terminal 5U
  - MAF/IAT sensor terminal C and PCM terminal 5N

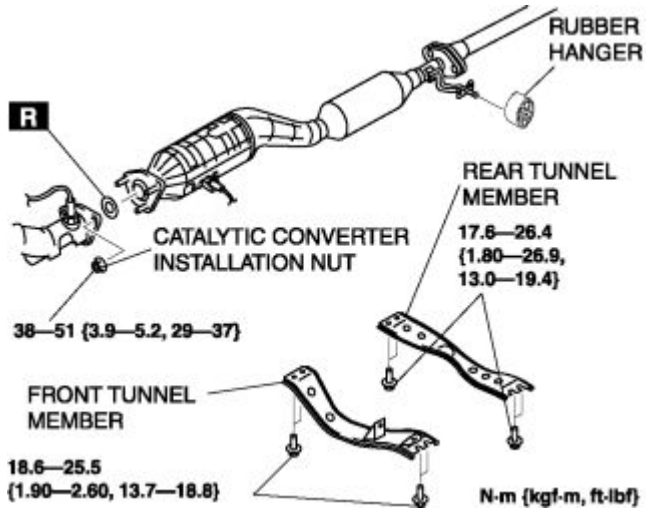
Short circuit

- If there is continuity in the following wiring harnesses, there is a short circuit. Repair or replace the wiring harness.
  - MAF/IAT sensor terminal A and body ground
  - MAF/IAT sensor terminal C and power supply
  - MAF/IAT sensor terminal C and body ground

HEATED OXYGEN SENSOR

FRONT HEATED OXYGEN SENSOR (HO2S) REMOVAL/INSTALLATION

1. For the AT vehicles, perform the following procedure for easier access.



   a. Remove the rubber hanger.

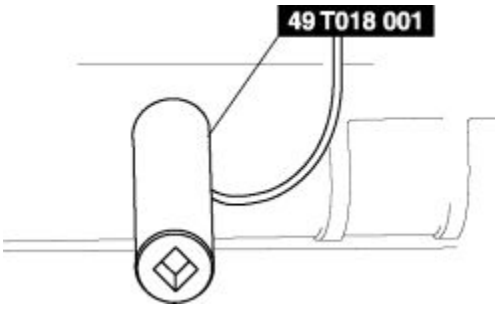
   b. Remove the rear tunnel member.

   c. Remove the front tunnel member.

   d. Remove the catalytic converter installation nuts.

   e. Remove the ATF level gauge pipe. (See AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION .)

2. Remove the front HO2S using the **SST** (49 T018 001).



3. Install in the reverse order of removal.

   Front HO2S tightening torque

   - 29—49 N·m {3.0—4.9 kgf·m, 22—36 ft·lbf}

FRONT HEATED OXYGEN SENSOR (HO2S) INSPECTION

NOTE:

- Before performing the following inspection, make sure to follow the troubleshooting flowchart. (See FOREWORD .)

Front HO2S Current Inspection

1. Warm up the engine to normal operating temperature.

2. Using the WDS or equivalent, verify that the current of the front HO2S (WDS PID: O2S11) is as indicated in the table.
   - If it cannot be verified even though the related harnesses have no malfunction, replace the front HO2S. (See FRONT HEATED OXYGEN SENSOR (HO2S) REMOVAL/INSTALLATION .)

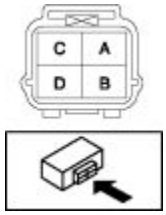
   Front HO2S current

Engine condition	Current (mA)
Accelerated	Positive value
Decelerated	Negative value

Front HO2S Heater Resistance Inspection

1. Disconnect the front HO2S connector.

2. Measure the resistance between front HO2S terminals C and D.



- If not within the specification, replace the front HO2S. (See FRONT HEATED OXYGEN SENSOR (HO2S) REMOVAL/INSTALLATION .)

  Front HO2S heater resistance

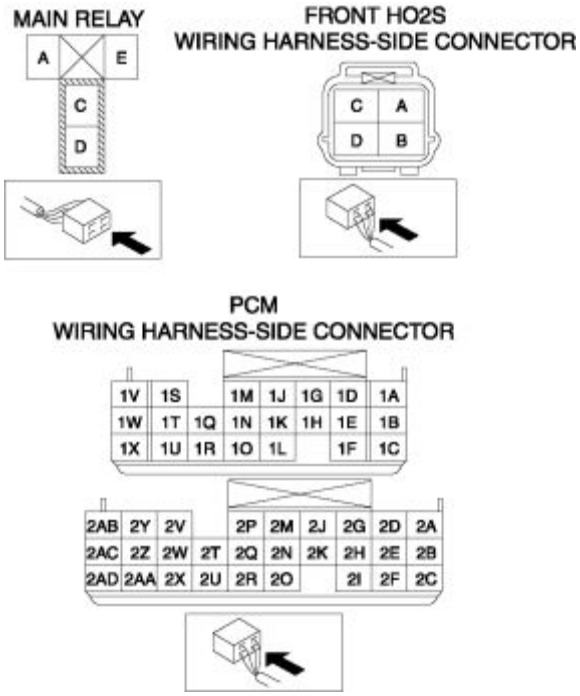
  - 2.16—2.90 ohms [20 °C {68 °F}]

Circuit Open/Short Inspection

1. Disconnect the PCM connector.

2. Disconnect the front HO2S connector.

3. Inspect the following wiring harnesses for open or short circuit. (Continuity inspection)



Open circuit

- If there is no continuity in the following wiring harnesses, there is an open circuit. Repair or replace the wiring harness.
  - Front HO2S terminal A and PCM terminal 2B
  - Front HO2S terminal B and PCM terminal 2C
  - Front HO2S terminal C and main relay terminal C
  - Front HO2S terminal D and PCM terminal 1V

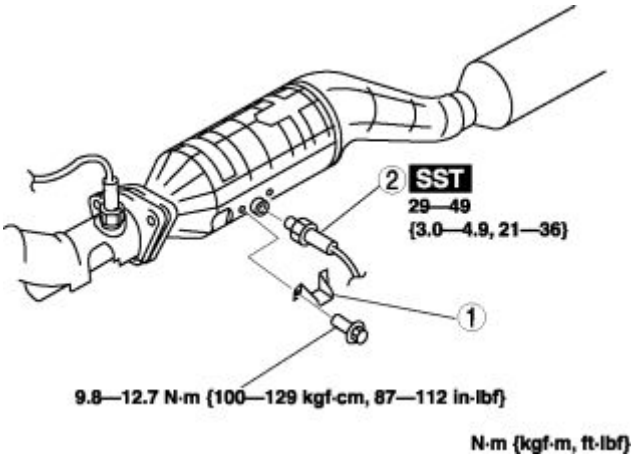
Short circuit

- If there is continuity in the following wiring harnesses, there is a short circuit. Repair or replace the wiring harness.
  - Front HO2S terminal A and body ground
  - Front HO2S terminal A and power supply
  - Front HO2S terminal B and body ground
  - Front HO2S terminal B and power supply
  - Front HO2S terminal D and body ground

REAR HEATED OXYGEN SENSOR (HO2S) REMOVAL/INSTALLATION

1. Remove the rear HO2S connector.

2. Remove in the order indicated in the table.

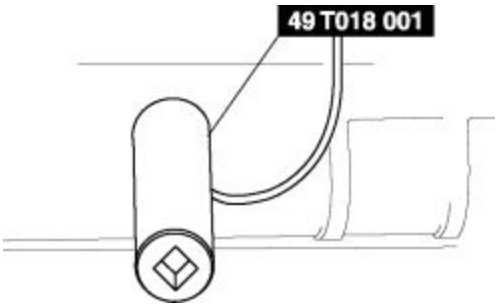


1	Protector
2	Rear HO2S (See Rear HO2S Removal Note .)

3. Install in the reverse order of removal.

Rear HO2S Removal Note

1. Remove the rear HO2S using the **SST** (49 T018 001).



REAR HEATED OXYGEN SENSOR (HO2S) INSPECTION

NOTE:

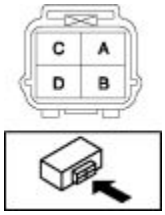
- Before performing the following inspection, make sure to follow the troubleshooting flowchart. (See FOREWORD .)

Rear HO2S Voltage Inspection

1. Warm up the engine to normal operating temperature.

2. Disconnect the rear HO2S connector.

3. Connect the positive probe of the tester (digital type) to rear HO2S sensor terminal A, and the negative probe to rear HO2S sensor terminal B and measure the voltage.



4. Maintain the engine speed at **3,000 rpm** until the voltage indicates **approx. 0.5—0.7 V** .

5. Verify that the voltage is as indicated in the table when the engine is raced repeatedly.
   - If it cannot be verified, replace the rear HO2S. (See REAR HEATED OXYGEN SENSOR (HO2S) REMOVAL/INSTALLATION .)

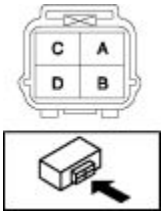
   Rear HO2S Voltage Inspection

Engine condition	Voltage (V)
Accelerated	0.5—1.0
Decelerated	0—0.5

Rear HO2S Heater Resistance Inspection

1. Disconnect the rear HO2S connector.

2. Measure the resistance between rear HO2S terminals C and D.



- If not within the specification, replace the rear HO2S. (See REAR HEATED OXYGEN SENSOR (HO2S) REMOVAL/INSTALLATION .)

  Rear HO2S heater resistance

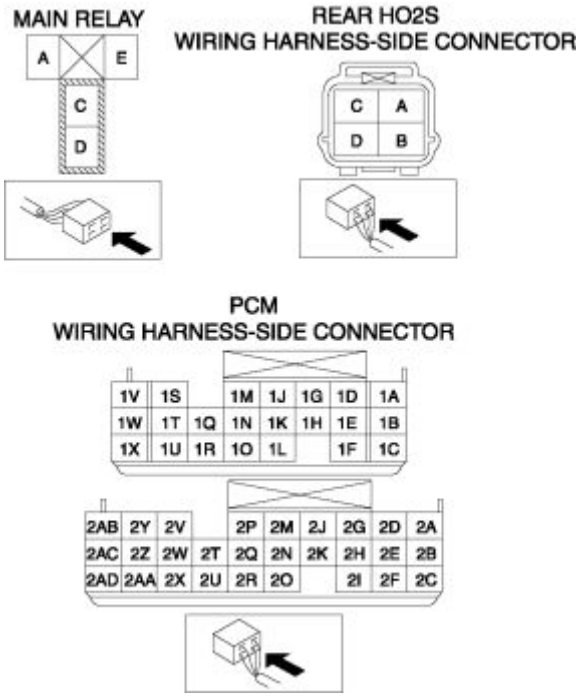
  - 14.1—18.9 ohms [20 °C {68 °F}]

Circuit Open/Short Inspection

1. Disconnect the PCM connector.

2. Disconnect the rear HO2S connector.

3. Inspect the following wiring harnesses for open or short circuit. (Continuity inspection)



Open circuit

- If there is no continuity in the following wiring harnesses, there is an open circuit. Repair or replace the wiring harness.
  - Rear HO2S terminal A and PCM terminal 2Q
  - Rear HO2S terminal B and PCM terminal 1U
  - Rear HO2S terminal C and main relay terminal C
  - Rear HO2S terminal D and PCM terminal 2A

Short circuit

- If there is continuity in the following wiring harnesses, there is a short circuit. Repair or replace the wiring harness.
  - Rear HO2S terminal A and body ground
  - Rear HO2S terminal A and power supply
  - Rear HO2S terminal B and body ground
  - Rear HO2S terminal B and power supply
  - Rear HO2S terminal D and body ground

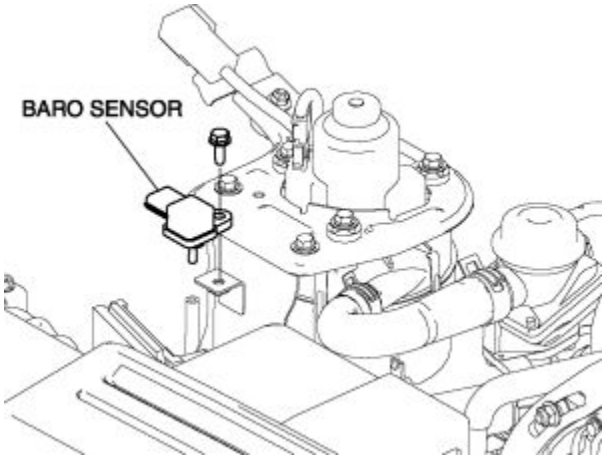
Notes:

BAROMETRIC PRESSURE SENSOR

BAROMETRIC PRESSURE (BARO) SENSOR REMOVAL/INSTALLATION

1. Disconnect the BARO sensor connector.

2. Remove the BARO sensor installation bolt and remove the BARO sensor.



3. Install in the reverse order of removal.

   BARO sensor tightening torque

   - 7.8—10.8 N·m {80—110 kgf·cm, 69—95 in·lbf}

BAROMETRIC PRESSURE (BARO) SENSOR INSPECTION

NOTE:

- Before performing the following inspection, make sure to follow the troubleshooting flowchart. (See FOREWORD .)

Voltage Inspection

1. Remove the BARO sensor with the connector still connected.

2. Remove the BARO sensor hose.

3. Turn the ignition switch to the ON position.

4. Verify that the voltage at PCM terminal 5S (WDS PID: BARO) is within the specification.
   - If not within the specification even though the related wiring harnesses have no malfunction, replace the BARO sensor (See BAROMETRIC PRESSURE (BARO) SENSOR REMOVAL/INSTALLATION .).

     BARO sensor output voltage

     - 2.4—4.7 V

5. Install the vacuum pump.

6. Verify that the change in voltage at PCM terminal 5S (WDS PID: BARO) is within the specification when a vacuum of **30 kPa {0.30 kgf/cm^2 , 4.4 psi}** is applied.
   - If not within the specification, replace the BARO sensor. (See BAROMETRIC PRESSURE (BARO) SENSOR REMOVAL/INSTALLATION .)

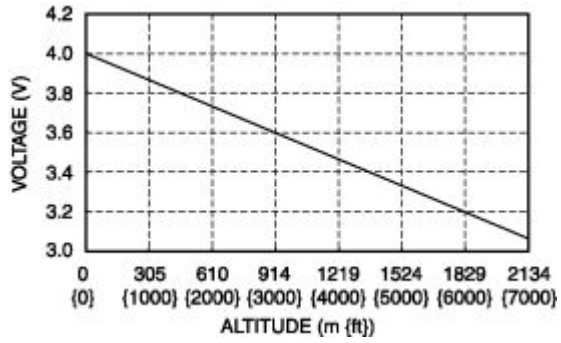
     BARO sensor output voltage variance

     - 1.06—1.30 V

NOTE:

- The voltage shown in the figure may vary excessively depending on the weather or battery conditions.

BARO sensor characteristics graph (reference)

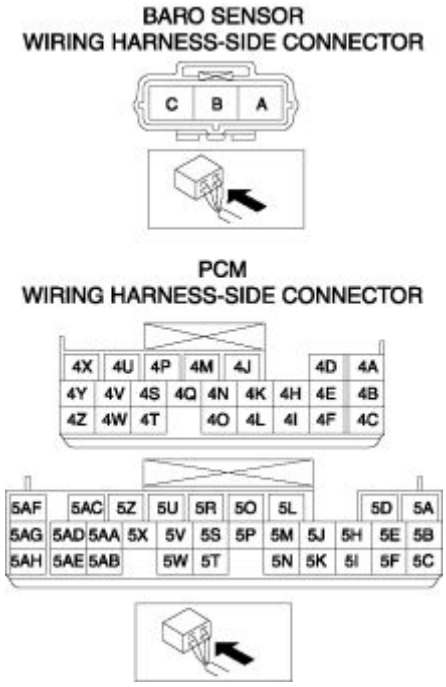


Circuit Open/Short Inspection

1. Disconnect the PCM connectors.

2. Disconnect the BARO sensor connector.

3. Inspect the following wiring harnesses for open or short circuit. (Continuity inspection)



Open circuit

- If there is no continuity in the following wiring harnesses, there is an open circuit. Repair or replace the wiring harness.
  - BARO sensor terminal A and PCM terminal 5S
  - BARO sensor terminal B and PCM terminal 4U
  - BARO sensor terminal C and PCM terminal 4K

Short circuit

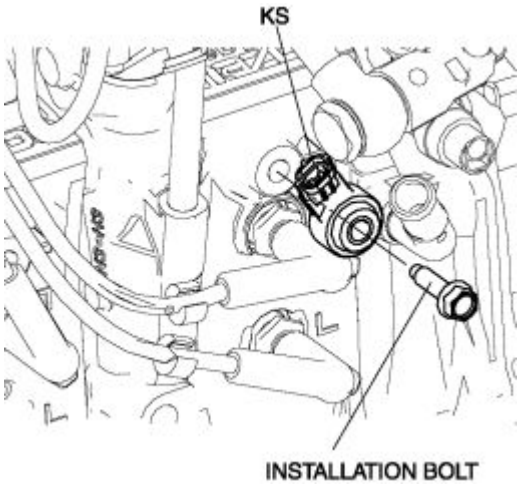
- If there is continuity in the following wiring harnesses, there is a short circuit. Repair or replace the wiring harness.
  - BARO sensor terminal A and body ground
  - BARO sensor terminal A and power supply
  - BARO sensor terminal C and body ground
  - BARO sensor terminal C and power supply

KNOCK SENSOR

KNOCK SENSOR (KS) REMOVAL/INSTALLATION

1. Disconnect the KS connector.

2. Remove the KS installation bolt and remove the KS.



3. Install in the reverse order of removal.

KS tightening torque

- 15—25 N·m {1.6—2.5 kgf·m, 12—18 ft·lbf}

KNOCK SENSOR (KS) INSPECTION

Resistance Inspection

NOTE:

- Before performing the following inspection, make sure to follow the troubleshooting flowchart. (See FOREWORD .)

1. Disconnect the KS connector.

2. Measure the resistance between KS terminals A and B.
   - If not within the specification, replace the KS. (See KNOCK SENSOR (KS) REMOVAL/INSTALLATION .)

- If the monitor item condition/specification (reference) is not within the specification, even though the KS resistance is within the specification, perform the "Circuit Open/Short Inspection".

  KS resistance

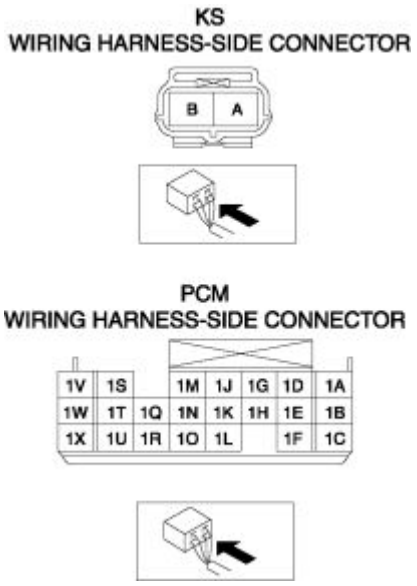
  - 120—280 kilohms

Circuit Open/Short Inspection

1. Disconnect the PCM connector.

2. Disconnect the KS connector.

3. Inspect the following wiring harnesses for open or short. (Continuity inspection)



Open circuit

- If there is no continuity in the following wiring harnesses, there is an open circuit. Repair or replace the wiring harness.
  - KS terminal A and PCM terminal 1T
  - KS terminal B and PCM terminal 1F

Short circuit

- If there is continuity in the following wiring harnesses, there is a short circuit. Repair or replace the wiring harness.

- KS terminal A and body ground
- KS terminal A and power supply
- KS terminal B and body ground
- KS terminal B and power supply

Notes:

ECCENTRIC SHAFT POSITION SENSOR

ECCENTRIC SHAFT POSITION SENSOR INSPECTION

NOTE:

- Before performing the following inspection, make sure to follow the troubleshooting flowchart. (See FOREWORD .)

Visual Inspection

1. Remove the eccentric shaft position sensor.

2. Verify that there are no metal shavings on the sensor.
   - If the monitor item condition (reference) is not within the specification even though there is no malfunction, perform the "Circuit Open/Short Inspection".

Resistance Inspection

1. Disconnect the eccentric shaft position sensor connector.

2. Measure the coil resistance between eccentric shaft position sensor terminals A and B.
   - If not within the specification, replace the eccentric shaft position sensor.
   - If the monitor item condition/specification (reference) is not within the specification, even though the eccentric shaft position sensor resistance is within the specification, perform the "Circuit Open/Short Inspection" and repair or replace the malfunctioning part.

     Eccentric shaft position sensor resistance

     - 950—1,250 ohms (at room temperature)

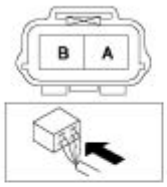
Circuit Open/Short Inspection

1. Disconnect the PCM connector.

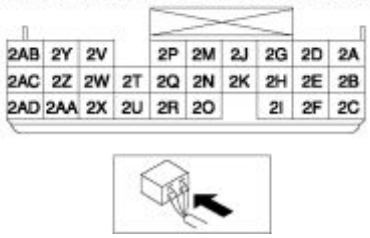
2. Disconnect the eccentric shaft position sensor connector.

3. Inspect the following wiring harnesses for open or short circuit. (Continuity inspection)

ECCENTRIC SHAFT POSITION SENSOR
WIRING HARNESS-SIDE CONNECTOR



PCM
WIRING HARNESS-SIDE CONNECTOR



Open circuit

- If there is no continuity in the following wiring harnesses, there is an open circuit. Repair or replace the wiring harness.
  - Eccentric shaft position sensor terminal A and PCM terminal 2U
  - Eccentric shaft position sensor terminal B and PCM terminal 2X

Short circuit

- If there is continuity in the following wiring harnesses, there is a short circuit. Repair or replace the wiring harness.
  - Eccentric shaft position sensor terminal A and body ground
  - Eccentric shaft position sensor terminal A and power supply
  - Eccentric shaft position sensor terminal B and body ground
  - Eccentric shaft position sensor terminal B and power supply

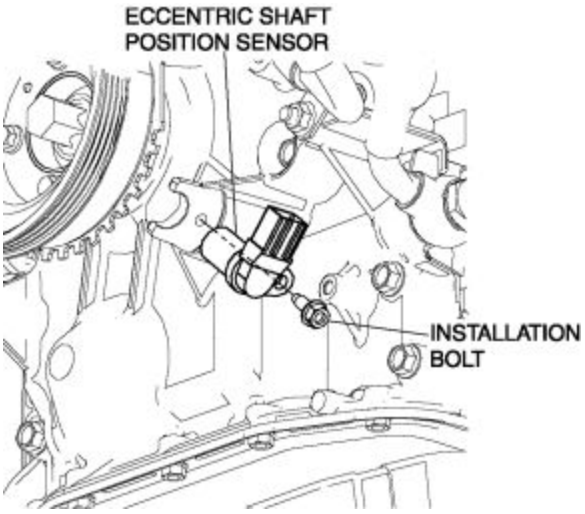
ECCENTRIC SHAFT POSITION SENSOR REMOVAL/INSTALLATION

CAUTION:

- When replacing the eccentric shaft position 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 eccentric shaft position sensor connector.

2. Remove the eccentric shaft position sensor installation bolt and remove the eccentric shaft position sensor.



3. Install in the reverse order of removal.

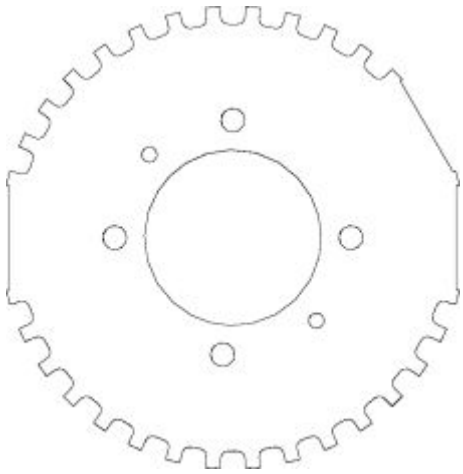
Eccentric shaft position sensor tightening torque

- 7.9—10.7 N·m {80—110 kgf·cm, 69—95 in·lbf}

ECCENTRIC SHAFT POSITION PLATE

ECCENTRIC SHAFT POSITION PLATE INSPECTION

1. Verify that there are no cracks, damage, or corrosion on the projecting parts of the eccentric shaft position plate.

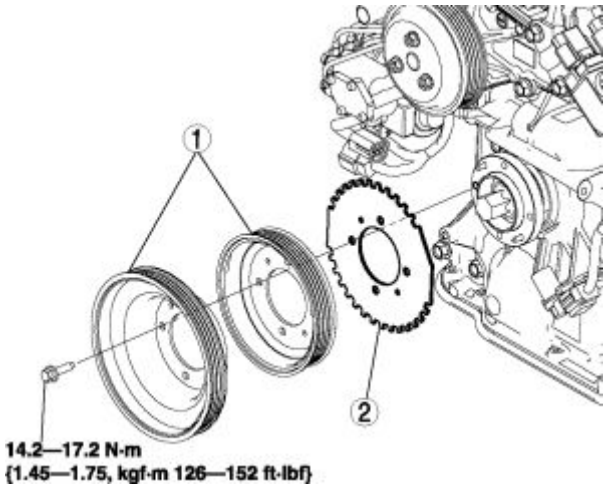


- If there are cracks, damage, or corrosion on the projecting parts, replace the eccentric shaft position plate. (See ECCENTRIC SHAFT POSITION PLATE REMOVAL/INSTALLATION .)

ECCENTRIC SHAFT POSITION PLATE REMOVAL/INSTALLATION

1. Remove the drive belt referring to the drive belt replacement. (See DRIVE BELT REPLACEMENT .)

2. Remove in the order indicated in the table.



1	Drive belt pulley

2	Eccentric shaft position plate

3. Install in the reverse order of removal.

Notes:

TECHNICAL DATA

ENGINE TECHNICAL DATA

Item					13B-MSP (Standard power)	13B-MSP (High power)
MECHANICAL						
Drive belt deflection (with pressure of 98 N {10 kgf, 22 lbf})	(mm {in})	Generator		New	4.0—4.5 {0.16—0.17}	
				When adjusting	4.5—5.0 {0.18—0.19}	
				Deflection limit	6.0 {0.24} or more	
		A/C		New	3.0—3.8 {0.11—0.14}	
				When adjusting	3.3—4.0 {0.13—0.15}	
				Deflection limit	5.5 {0.21} or more	
Drive belt tension (when using the **SST**)	(N {kgf, lbf})	Generator		New	620—767 {63.3—78.2, 140—172}	
				When adjusting	519—666 {53.0—67.9, 117—149}}	
				Deflection limit	344 {35.1, 77.3} or less	
		A/C		New	559—706 {57.1—71.9, 126—158}	
				When adjusting	519—617 {53.0—62.9, 117—138}	
				Tension limit	265 {27.1, 59.6} or less	
Compression pressure	(kPa {kgf/cm^2 ,psi} [rpm])		Standard		830 {8.5, 120} [250 rpm]	
			Minimum		680 {6.9, 98.6} [250 rpm]	
			Standard difference in chambers		Within 150 {1.5, 21.8}	
			Standard difference in rotors		Within 100 {1.0, 14.5}	
Pushing distance of the rear oil seal					Until it is attached to the seating face of stationary gear	
Idle speed		(rpm)		AT	760—860	
				MT	750—850	

Idle-up speed*[1]	(rpm)	Electrical loads on*[1]	AT	N range	780—880	
				D range	760—860	
				R range	730—830	
			MT	Neutral	750—850	
		A/C on (standard)	AT	N range	780—880	
				D range	760—860	
				R range	730—830	
			MT	Neutral	760—860	
		A/C on (standard)+ electrical loads on*[1]	AT	N range	780—880	
				D range	760—860	
				R range	730—830	
			MT	Neutral	790—890	
		A/C on (heavy load)	AT	N range	800—900	
				D range	780—880	
				R range	780—880	
			MT	Neutral	790—890	
LUBRICATION SYSTEM						
Oil pressure (reference value) [oil temperature: 100°C {212°F}]		(kPa {kgf/cm^2 , psi} [rpm])		350 {3.57, 50.8} [3,000]		
Oil capacity (approx. quantity)	Oil replacement	(L {US qt, Imp qt})		3.3 {3.5, 2.9}		
	Oil and oil filter replacement	(L {US qt, Imp qt})		3.5 {3.7, 3.1}		
	Engine overhaul	(L {US qt, Imp qt})		4.7 {5.0, 4.1}		
	Total (dry engine)	(L {US qt, Imp qt})		5.8 {6.1, 5.1}	6.7 {7.1, 5.9}	
Engine oil	API service			SL		
	ILSAC			GF−3		
	SAE viscosity			5W−20		

COOLING SYSTEM			
Coolant capacity		(L {US qt, Imp qt})	8.7 {9.2, 7.7}
Cooling system cap valve opening pressure		(kPa {kgf/cm^2 , psi})	73.3—103.3 {0.748—1.053, 10.63—14.98}
Thermostat	Initial-opening temperature	(°C {°F})	80—84 {176—183}
	Full-opening temperature	(°C {°F})	95 {203}
	Full-open amount	(mm {in})	8.5 {0.33} or more
Cooling fan motor current		[12 V] (A)	Cooling fan No.1: 8.9—11.9 Cooling fan No.2: 4.0—7.0

FUEL SYSTEM					
Fuel line hold pressure			(kPa {kgf/cm^2 , psi})	375—450 {3.83—4.58, 54.4—65.2}	
Fuel injector	Leakage	Position: FP1, RP1		1 drop/110 min. or more	
		Position: FS, RS		1 drop/30 min. or more	1 drop/70 min. or more
		Position: FP2, RP2		—	1 drop/70 min. or more
	Resistance [20°C {68°F}]		(ohm)	13.8	
CHARGING SYSTEM					
Battery	Electrolyte gravity			1.27—1.29 [20°C {68°F}]	
	Back-up current*^{2}		(mA)	Max. 20	
	Test load chart (A)	Battery type (5-hour rate)	50D20L (40)	150	
			55D23L (48)	180	
			75D26L (52)	195	
	Slow charge (A)	Battery type (5-hour rate)	50D20L (40)	4.0—5.0	
			55D23L (48)	4.5—5.5	
			75D26L (52)	5.0—6.0	
	Quick charge (A/30 min.)	Battery type (5-hour rate)	50D20L (40)	25	
			55D23L (48)	30	
			75D26L (52)	35	
Generator	Rotor resistance (Between slip rings)		(ohm)	1.6—2.0	
	Brush length	Standard	(mm {in})	18.5 {0.73}	
		Minimum	(mm {in})	5.0 {0.2}	

	Brush spring force	Standard	(N {kgf, lbf})		4.8—6.0 {0.49—0.61, 1.08—1.34}
		Minimum	(N {kgf, lbf})		2.16 {0.22, 0.49}
	Standard voltage (V)	Ignition switch ON	Terminal	B	B+
				P	Approx. 1.0 or less
				D	Approx. 0
		Idle [20 °C {68 °F}]	Terminal	B	13.0—15.0
				P	Approx. 3.0—8.0
				D	*[6]
	Generated current (reference value) (A)	Terminal B current [Engine speed 1,000 rpm]			0*[3] —70
		Terminal B current [Engine speed 2,000 rpm]			0*[3] —97
IGNITION SYSTEM					
Spark plug	Type	NGK	Leading side		RE7A-L*[4] (RE6A-L)*[5]
			Trailing side		RE9B-T*[4]
	Plug gap	Standard		(mm {in})	1.15—1.25 {0.046—0.049}
		Maximum		(mm {in})	Leading side: 1.5 {0.059} Trailing side: 1.4 {0.055}
	Resistance [25°C {77°F}]			(kilohm)	3.0—7.5
	Tightening torque		(N·m {kgf·cm, in·lbf})		12.8—17.7 {131—180, 114—156}
High-tension lead	Resistance [20°C {68°F}]			(kilohm)	1.0—4.0

STARTING SYSTEM				
Starter	Commutator diameter	Standard	(mm {in})	29.4 {1.16}
		Minimum	(mm {in})	28.8 {1.13}
	Brush length	Standard	(mm {in})	AT: 17.5 {0.69}, MT: 12.3 {0.48}
		Minimum	(mm {in})	AT: 12.0 {0.47}, MT:7.0 {0.28}
	Brush spring force	Standard	(N {kgf, lbf})	AT: 23.3—31.7 {2.38—3.23,5.24—7.12}, MT: 18.3—24.9 {1.87—2.53, 4.12—5.59}
		Minimum	(N {kgf, lbf})	AT: 10.0 {1.02, 2.25} MT: 5.9 {0.6, 1.3}
	Pinion gap		(mm {in})	AT: 0 {0}, MT: 0.5—2.0 {0.02—0.07}
	No load test	Voltage	(V)	11
		Current	(A)	AT: 105 or less, MT: 90 or less

*1 The headlight, rear window defroster, blower fan (2-step or more) are on.

*2 Back-up current is the constant flow of current present (for the audio unit, clock, PCM, etc.) when the ignition switch is off and with the ignition key removed.

*3 The lower limit must be more than 0 A.

*4 Standard equipment

*5 Hot type plug: Available only for customers who often drive their car at very low speed which causes the plugs to foul easily.

*6 Turn the following electrical loads on and verify that the voltage reading increases.

- Headlights
- Blower motor
- Rear window defroster