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# INTAKE AND EXHAUST

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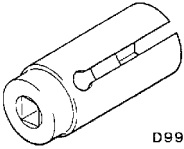
## SERVICE SPECIFICATIONS

15100030128

Items		Standard value	Limit
Waste gate actuator activation pressure kPa		Approx. 83	–
Intake air temperature switch °C	OFF (no continuity)	55 or less	–
	ON (continuity)	57 or more	–
Manifold distortion of the installation surface mm		0.15 or less	0.20

## SPECIAL TOOL

15100060172

Tool	Number	Name	Use
 D998770	MD998770	Oxygen sensor wrench	Removal/Installation of oxygen sensor <6G7>

## ON-VEHICLE SERVICE

15100180236

### INTAKE MANIFOLD VACUUM CHECK <6G7>

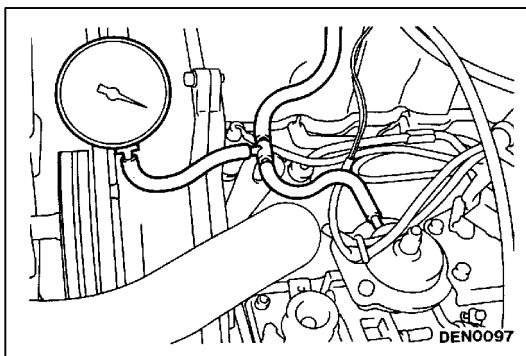
Refer to GROUP 11A – On-vehicle Service

### TURBOCHARGER SUPERCHARGING CHECK <4D5>

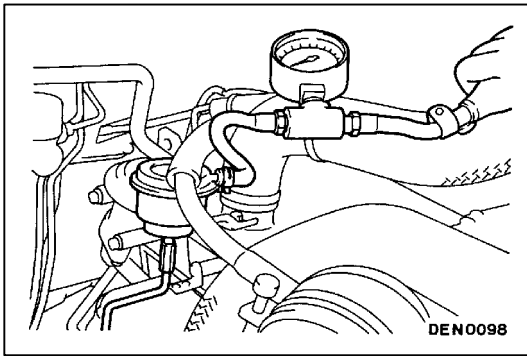
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#### Caution

**Conduct the driving test in a location where driving at full acceleration can be done with safety. Two person should be in the vehicle when the test is conducted; the person in the passenger seat should read the indications shown by the pressure meter.**



1. Remove the boost compensator hose from the fuel injection pump, and install a pressure gauge as shown in the illustration.
2. Drive at full-throttle acceleration in second gear and then measure the supercharging when the engine speed is about 3,000 r/min.
3. When the indicated supercharging does not become positive pressure, check the following items.
  - Malfunction of the waste gate actuator.
  - Leakage of supercharging pressure.
  - Malfunction of the turbocharger.
4. When the indicated supercharging is 84 kPa or more, supercharging control may be faulty, therefore check the followings.
  - Disconnection or cracks of the waste gate actuator rubber hose.
  - Malfunction of the waste gate actuator.
  - Malfunction of the waste gate valve.



**WASTE GATE ACTUATOR CHECK <4D5>**

15100120078

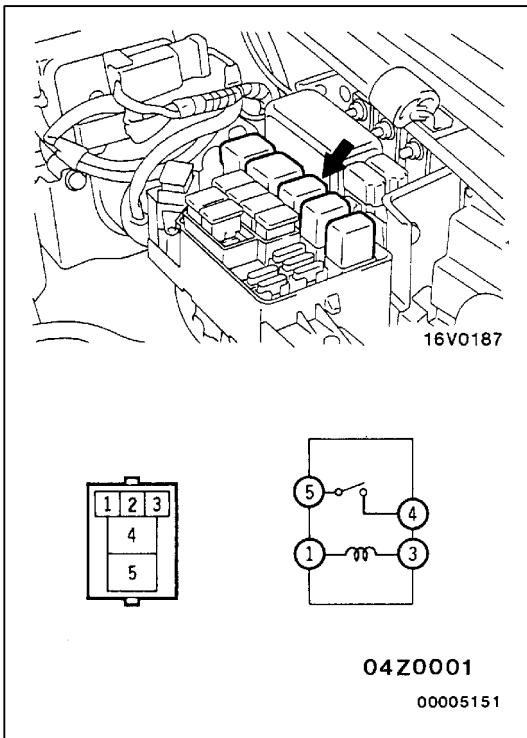
1. Connect a manual pump (pressure-application type) to nipple.
2. While gradually applying pressure, check the pressure that begins to activate (approx. 1 mm stroke) the waste gate actuator rod.

**Standard value: Approx. 83 kPa**

**Caution**

**In order to avoid damage to the diaphragm, do not apply a pressure of 91 kPa or higher.**

3. If there is a significant deviation from the standard value, check the actuator or the waste gate valve: replace if necessary.



**POWER RELAY CHECK**

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**INTERCOOLER FAN MOTOR RELAY CONTINUITY CHECK**

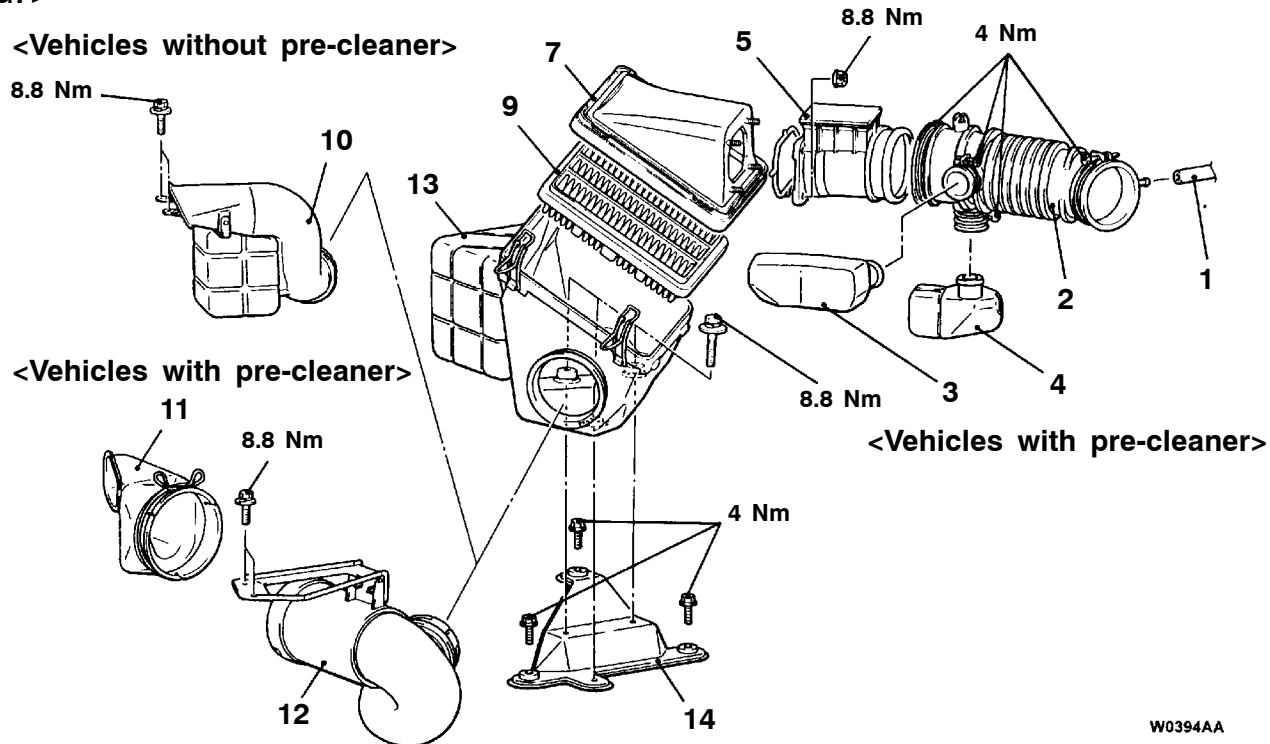
Battery voltage	Terminal No.			
	1	3	4	5
Power is not supplied	○ — ○			
Power is supplied	⊕ — ⊖		○ — ○	

# AIR CLEANER

## REMOVAL AND INSTALLATION

<6G7>

<Vehicles without pre-cleaner>

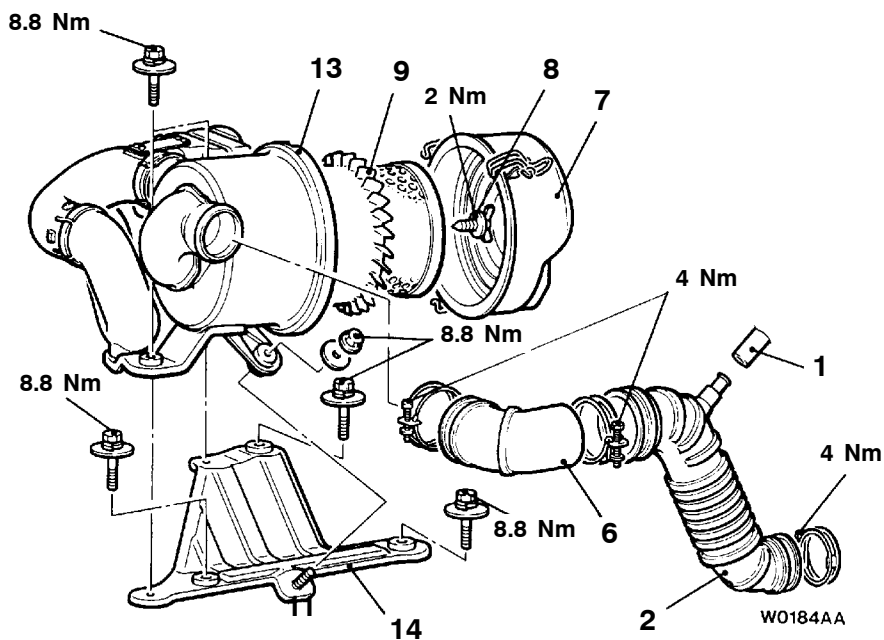


<Vehicles with pre-cleaner>

<Vehicles with pre-cleaner>

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<4D5>



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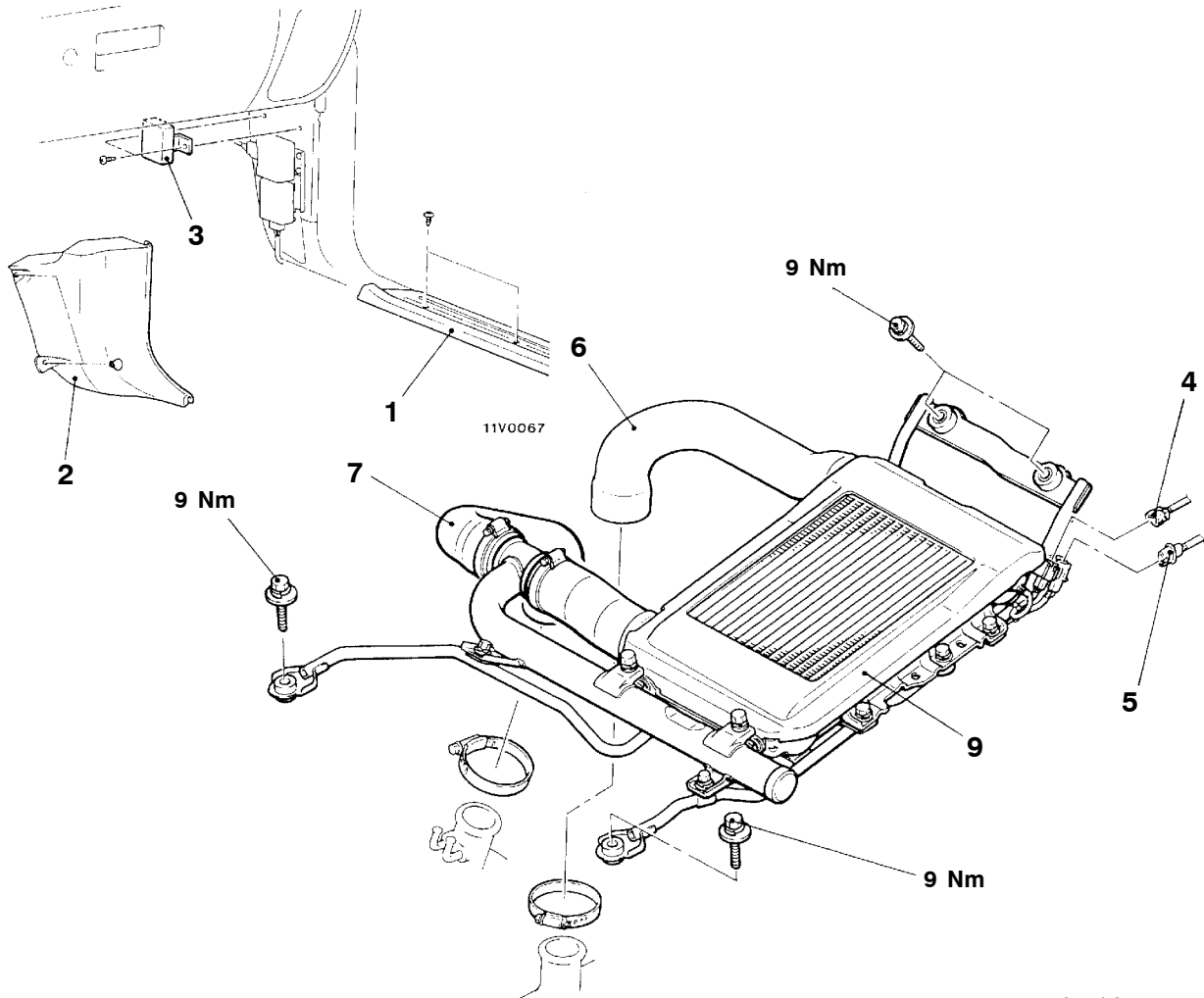
### Removal steps

1. Breather hose connection
2. Air intake hose
3. Resonator  
<6G7-Vehicles with pre-cleaner>
4. Resonator <6G7>
5. Air flow sensor assembly <6G7>
6. Air intake hose <4D56>
7. Air cleaner cover
8. Bolt <4D5>
9. Air cleaner element
10. Air duct  
<6G7-Vehicles without pre-cleaner>
11. Air duct  
<6G7-Vehicles with pre-cleaner>
12. Pre-cleaner assembly  
<6G7-Vehicles with pre-cleaner>
13. Air cleaner body
14. Air cleaner bracket

**INTERCOOLER AND INTERCOOLER FAN-ECU**

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**REMOVAL AND INSTALLATION**



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**Intercooler fan-ECU removal steps**

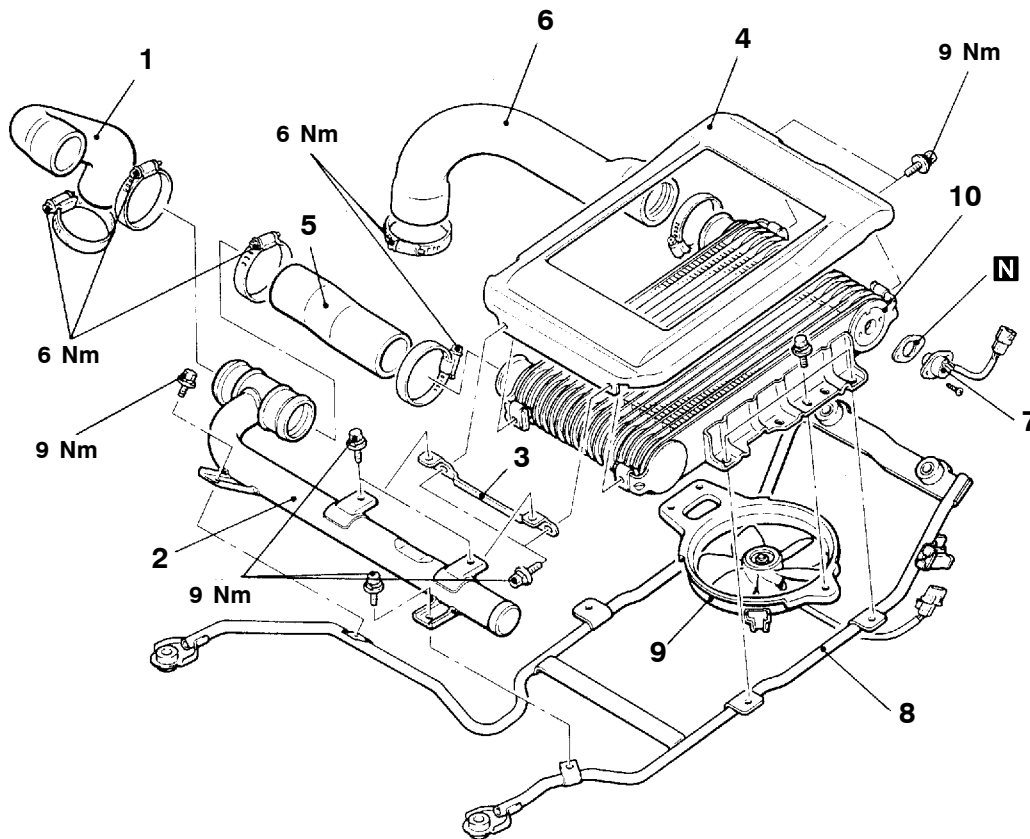
1. Scuff plate
2. Cowl side trim
3. Intercooler fan-ECU

**Intercooler removal steps**

4. Intake air temperature switch connector
5. Intercooler fan motor connector
6. Air hose B connection (Intake manifold side)
7. Air hose A-2 connection (Turbocharger side)
8. Intercooler and bracket assembly

## DISASSEMBLY AND REASSEMBLY

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A05V0044

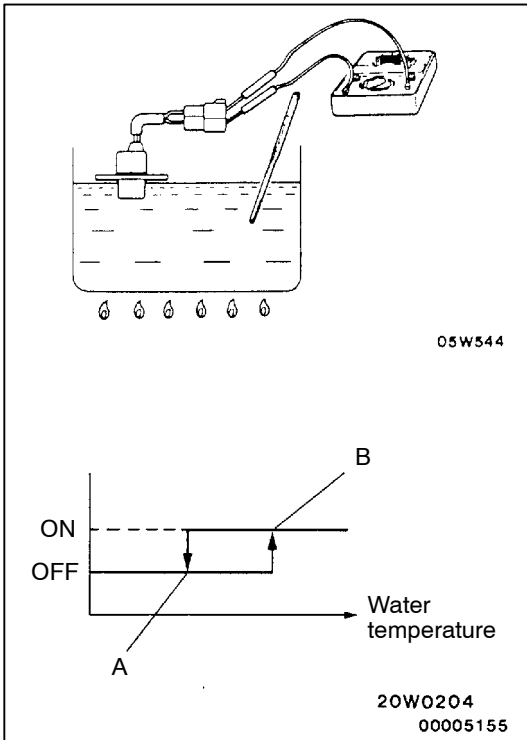
**Disassembly steps**

- |                        |                                  |
|------------------------|----------------------------------|
| 1. Air hose A-2        | 6. Air hose B                    |
| 2. Blanch tube         | 7. Intake air temperature switch |
| 3. Blanch tube bracket | 8. Intercooler bracket           |
| 4. Intercooler cover   | 9. Fan and motor assembly        |
| 5. Air hose A-1        | 10. Intercooler                  |

**INSPECTION**

15100430027

- Check the intercooler fins for bending damage or foreign matter.
- Check the intercooler hoses for cracking, damage or wear.



**INTAKE AIR TEMPERATURE SWITCH CHECK**

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1. Immerse the intake air temperature switch in the hot water shown in the figure.
2. When changing the water temperature, check for continuity between the terminals with the circuit tester.

**Standard value:**

Temperature	Continuity
Less than 55 °C (Temperature at point A)	OFF (No continuity)
More than 57 °C (Temperature at point B)	ON (Continuity)

## INTAKE MANIFOLD &lt;6G7&gt;

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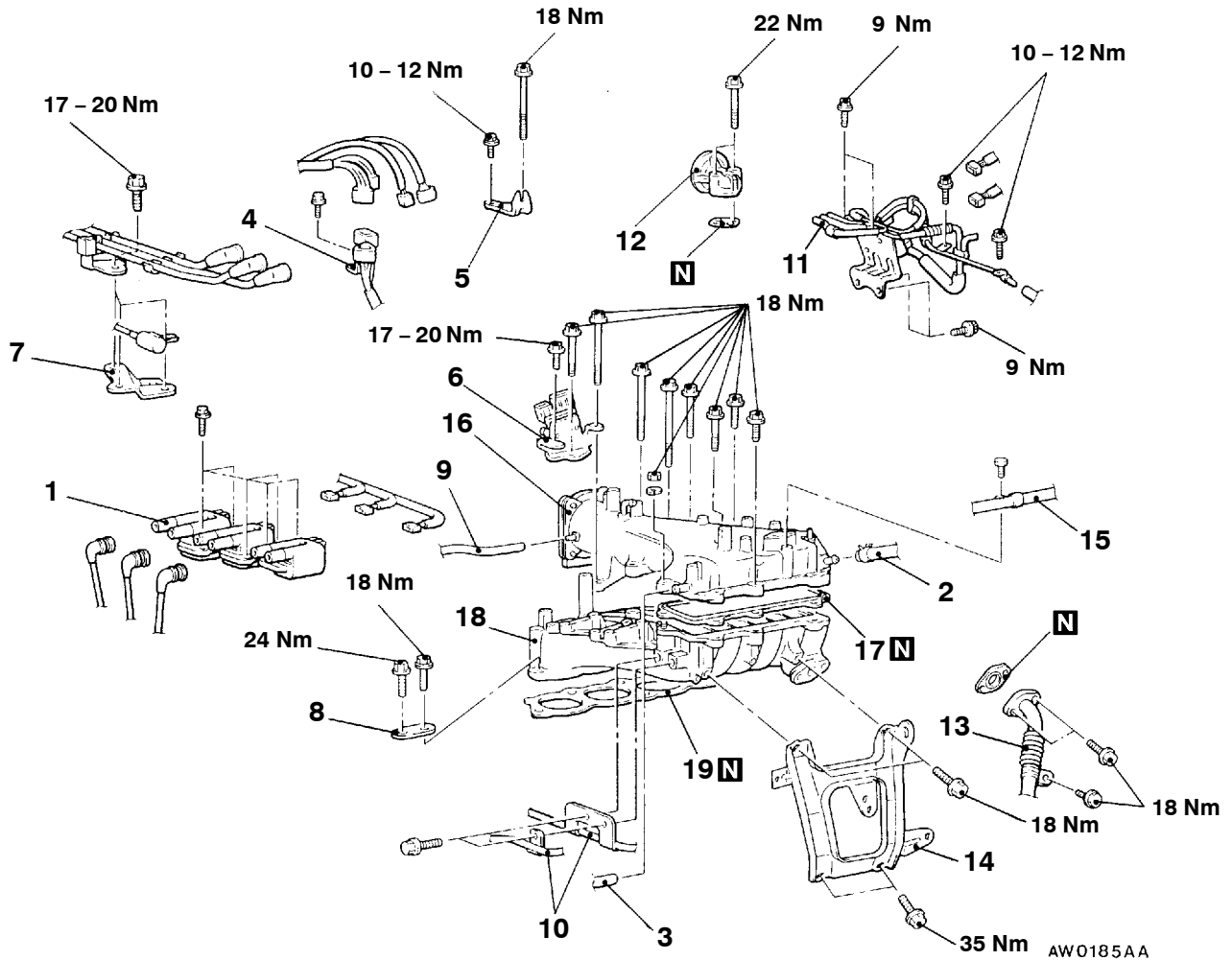
## REMOVAL AND INSTALLATION

**Pre-removal Operation**

- Fuel Discharge Prevention (Refer to GROUP 13A – On-vehicle Service.)
- Throttle Body Removal (Refer to GROUP 13A – Throttle Body.)

**Post-installation Operation**

- Throttle Body installation (Refer to GROUP 13A – Throttle Body.)

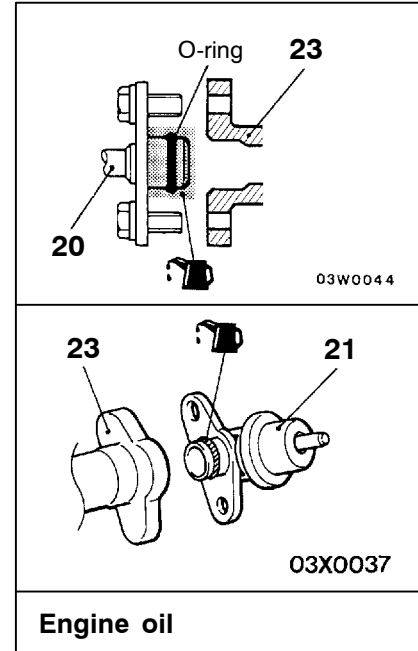
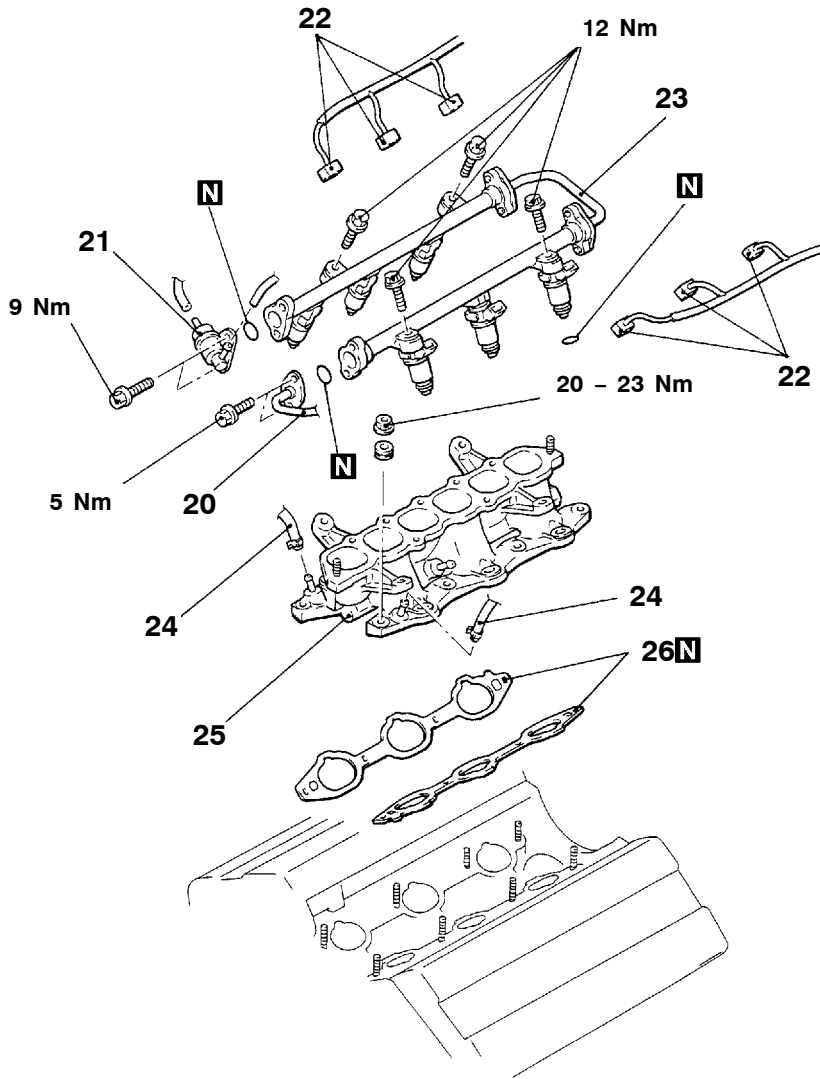
**Removal steps**

1. Ignition coils
2. Brake booster vacuum hose connection
3. PCV hose connection
4. Crankshaft position sensor and cam position sensor connector
5. Accelerator cable bracket
6. Ignition power transistor
7. Water outlet fitting bracket
8. Water pump stay
9. Vacuum hose connection
10. Fuel pipe connection
11. Solenoid valve and vacuum hose assembly
12. EGR valve
13. EGR pipe connection
14. Surge tank stay
15. Throttle cable connection
16. Air intake fitting
17. Air intake fitting gasket
18. Upper intake manifold
19. Surge tank gasket



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- ▶C◀ 20. High-pressure fuel hose
- ▶C◀ 21. Fuel pressure regulator
- ▶C◀ 22. Injector connector
- ◀A▶ 23. Injector and delivery pipe assembly
- ▶B◀ 24. Water hose connection
- ▶B◀ 25. Intake manifold
- ▶A◀ 26. Intake manifold gasket

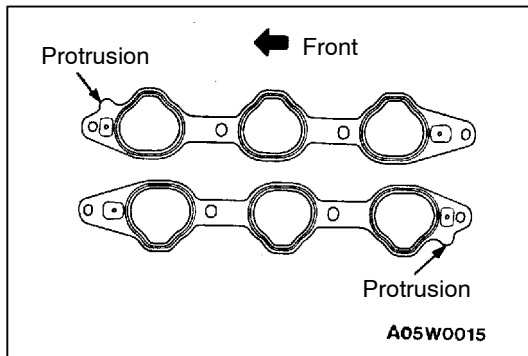
### REMOVAL SERVICE POINT

#### ◀A▶ INJECTOR AND DELIVERY PIPE ASSEMBLY REMOVAL

Remove the fuel rail (with the injectors attached to it.)

#### Caution

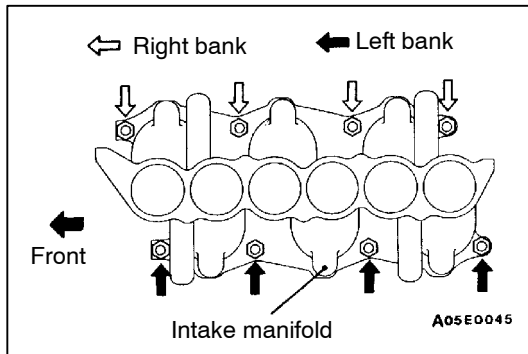
Care must be taken when removing the fuel rail not to drop the injector.



**INSTALLATION SERVICE POINTS**

**▶A◀ INTAKE MANIFOLD GASKET INSTALLATION**

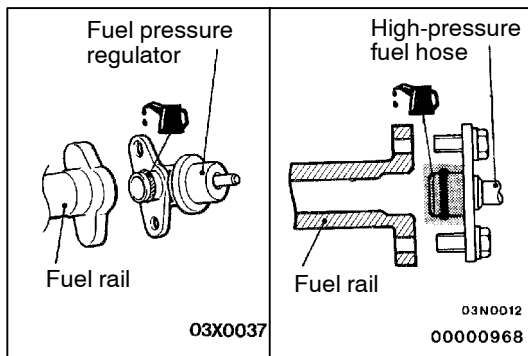
Install the gasket with the protrusions in the position illustrated.



**▶B◀ INTAKE MANIFOLD INSTALLATION**

Tighten the nuts by the following procedure.

Order	Mounting Nuts	Tightening Torque
1	Right-bank nuts	7 Nm
2	Left-bank nuts	20–23 Nm
3	Right-bank nuts	20–23 Nm
4	Left-bank nuts	20–23 Nm
5	Right-bank nuts	20–23 Nm

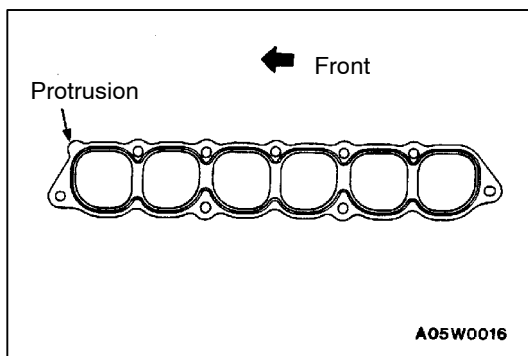


**▶C◀ FUEL PRESSURE REGULATOR/HIGH-PRESSURE FUEL HOSE INSTALLATION**

When connecting the fuel pressure regulator and the high-pressure fuel hose to the fuel rail, apply a small amount of new engine oil to the O-ring. Then insert the high-pressure fuel hose, being careful not to damage the O-ring.

**Caution**

**Be careful not to let any engine oil get into the fuel rail.**



**▶D◀ SURGE TANK GASKET INSTALLATION**

Install the gasket with the protrusion in the position illustrated.

**INSPECTION**

15100370039

Check the following points; replace the part if a problem is found.

**INTAKE MANIFOLD CHECK**

1. Check for damage or cracking of any part.
2. Clogging of the negative pressure (vacuum) outlet port, or clogging of the gas passages.
3. Check deflection of installation surface with straight edge and feeler gauge.

**Standard value: 0.15 mm or less**

**Limit: 0.20 mm**

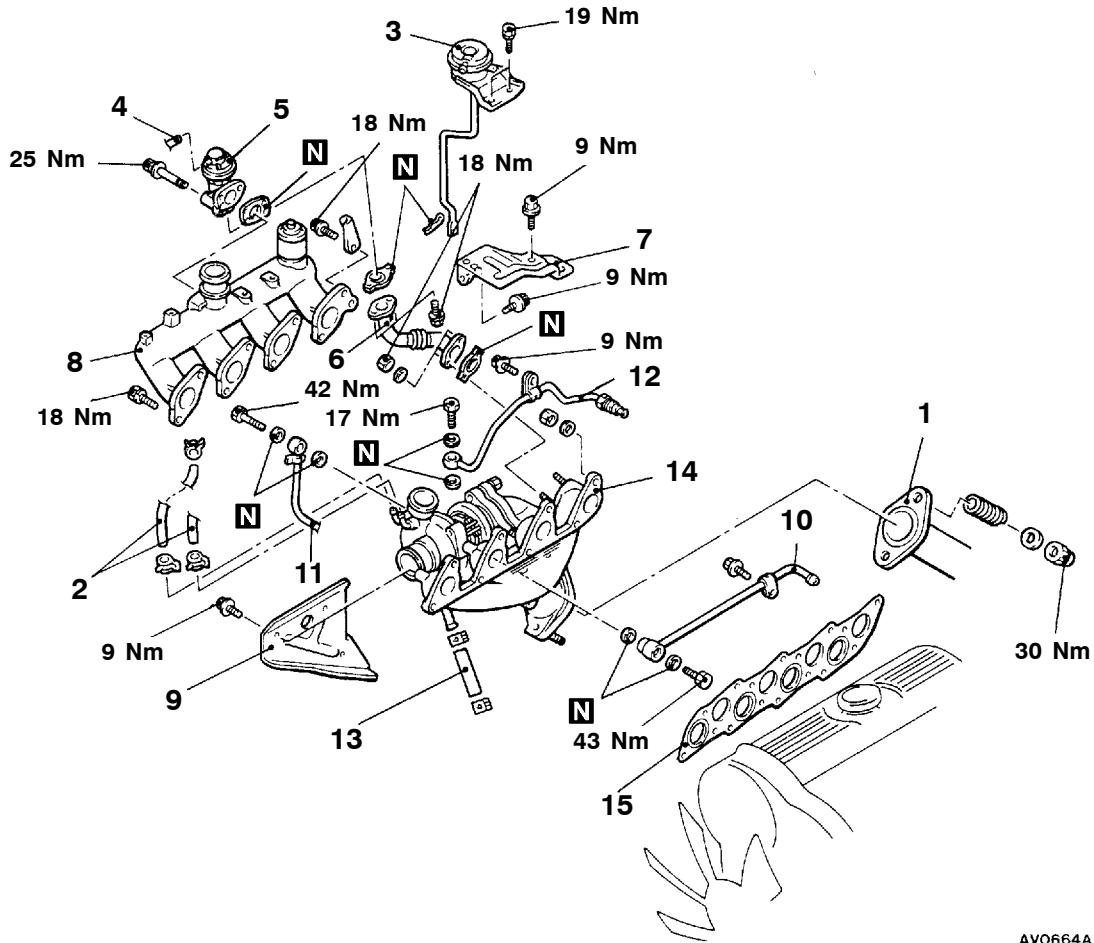
TURBOCHARGER AND EXHAUST MANIFOLD <4D5>

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REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

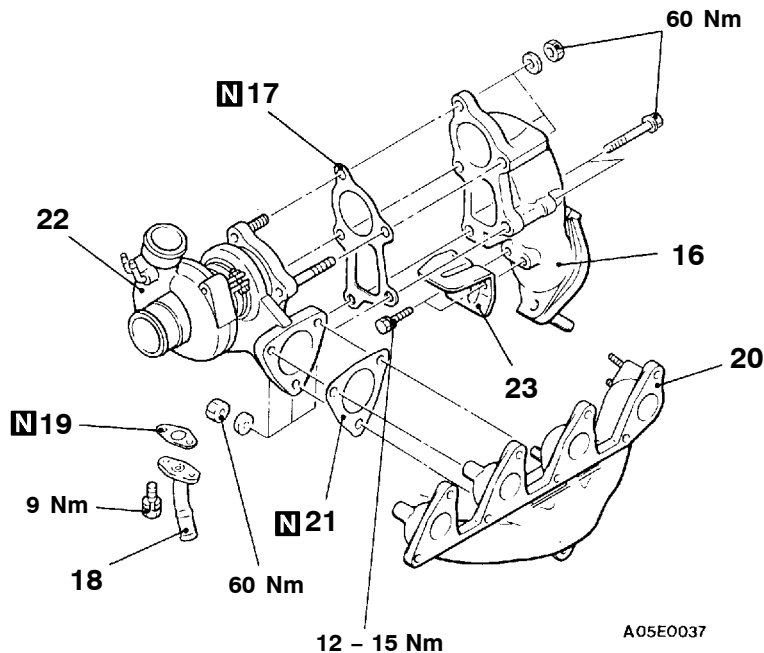
- Engine Coolant Draining and Supplying
- Air Cleaner Cover and Air Intake Hose Removal and Installation (Refer to P. 15-4.)
- Intercooler Removal and Installation (Refer to P. 15-5.)



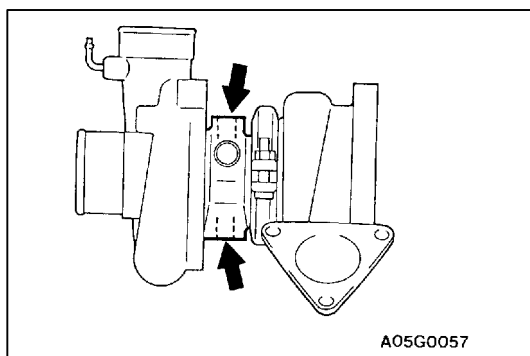
AV0664AA

Removal steps

- |   |   |
|---|---|
| <ol style="list-style-type: none"> <li>1. Front exhaust pipe connection</li> <li>2. Boost hose</li> <li>3. Waste gate actuator</li> <li>4. Vacuum hose</li> <li>5. EGR valve</li> <li>6. EGR pipe</li> <li>7. Heat protector A</li> <li>8. Intake manifold</li> </ol> | <ol style="list-style-type: none"> <li>9. Heat protector</li> <li>10. Water pipe B</li> <li>11. Water pipe A</li> <li>12. Oil pipe</li> <li>13. Oil return hose connection</li> <li>14. Exhaust manifold and turbocharger assembly</li> <li>15. Intake and exhaust manifold gasket</li> </ol> |
|---|---|



- 16. Exhaust fitting
- 17. Exhaust fitting gasket
- 18. Oil-return pipe
- 19. Oil-return pipe gasket
- 20. Exhaust manifold
- 21. Turbocharger gasket
- ▶A◀ 22. Turbocharger assembly
- 23. Heat protector



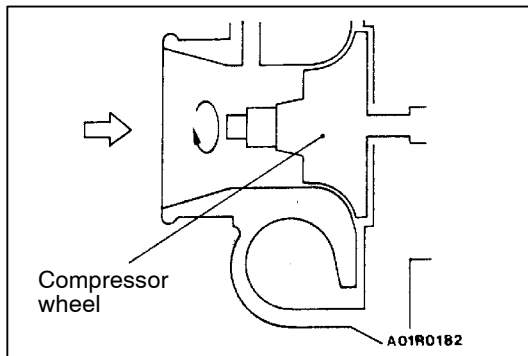
## INSTALLATION SERVICE POINT

### ▶A◀ TURBOCHARGER ASSEMBLY INSTALLATION

1. Clean the alignment surfaces shown in the illustration.
2. Supply clean engine oil from the oil pipe mounting hole of the turbocharger assembly.

#### Caution

**When cleaning, take care that no foreign material gets into the engine coolant or oil passages hole.**

**INSPECTION**

15100640017

**TURBOCHARGER ASSEMBLY CHECK**

- Visually check the turbine wheel and the compressor wheel for cracking or other damage.
  - Check whether the turbine wheel and the compressor wheel can be easily turned by hand.
  - Check for oil leakage from the turbocharger assembly.
  - Check whether or not the waste gate valve remains open.
- If any problem is found, replace the part after disassembly.

**OIL PIPE AND OIL RETURN PIPE CHECK**

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Check the oil pipe and oil return pipe for clogging, bending, or other damage. If there is clogging, clean it.

**EXHAUST MANIFOLD CHECK**

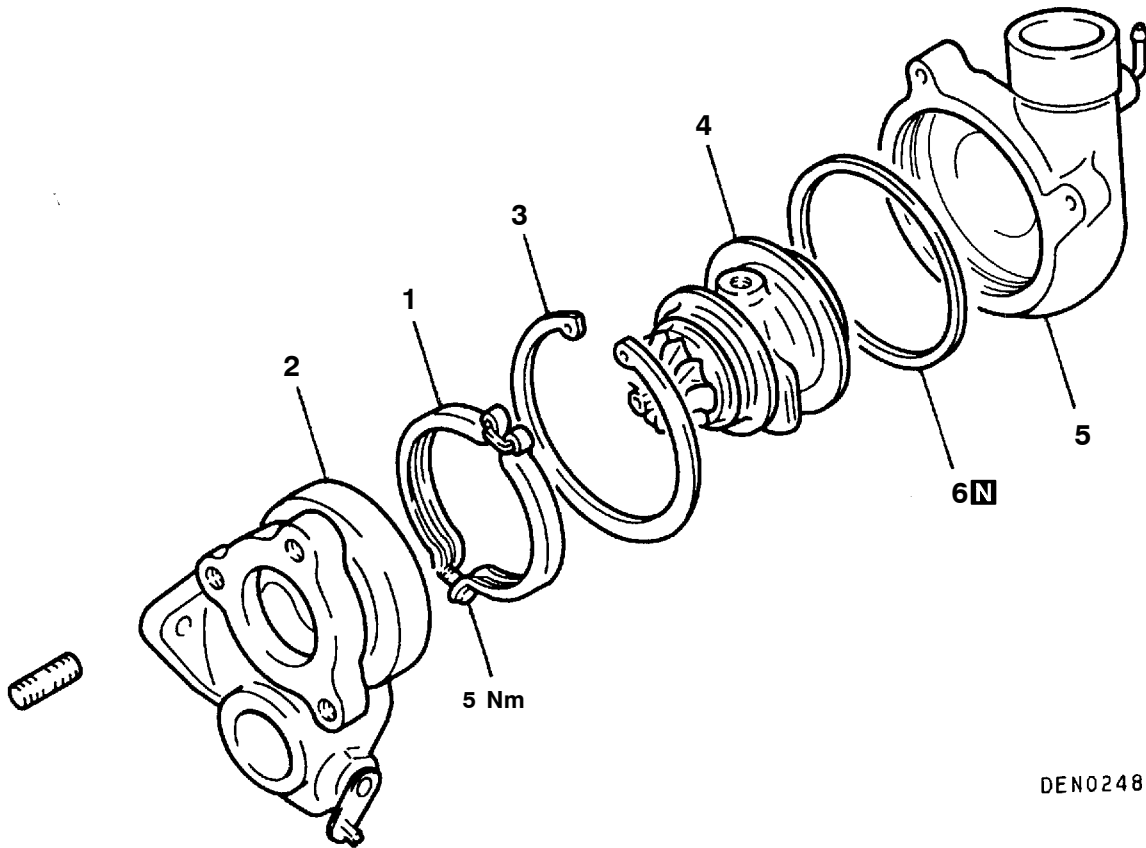
15100340108

Damage or cracking of any part.

**TURBOCHARGER**

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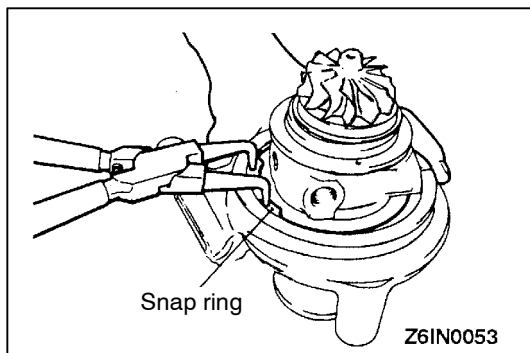
**DISASSEMBLY AND REASSEMBLY**



DEN0248

**Disassembly steps**

- ▶E◀ 1. Coupling
- ▶D◀ 2. Turbine housing
- ◀A▶ ▶C◀ 3. Snap ring
- ◀B▶ ▶B◀ 4. Turbine wheel assembly
- 5. Compressor cover
- ▶A◀ 6. O-ring



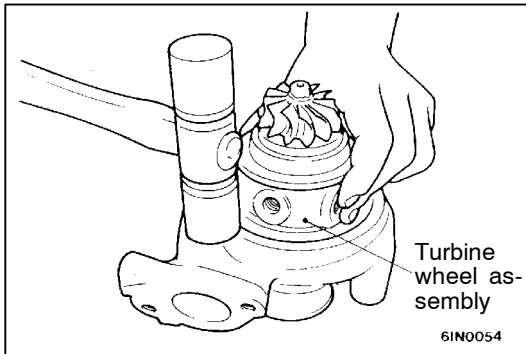
**DISASSEMBLY SERVICE POINTS**

**◀A▶ SNAP RING REMOVAL**

Lay the unit with the compressor cover side facing down and using snap ring pliers, remove the compressor cover attaching snap ring.

**Caution**

**When removing the snap ring, hold it with fingers to prevent it from springing away.**

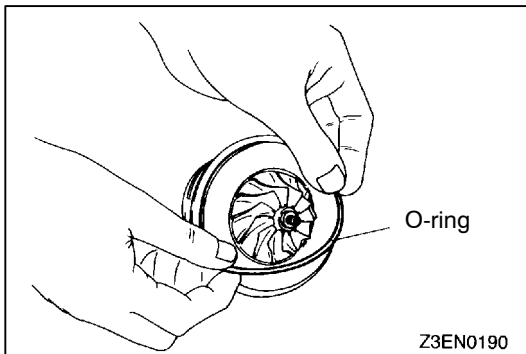


### ◀B▶ TURBINE WHEEL ASSEMBLY REMOVAL

Remove the turbine wheel assembly, striking the circumference of the compressor cover with a plastic hammer. The turbine wheel assembly may be a little hard to remove due to an O-ring put on the outer circumference.

### CLEANING

1. Use a clean cleaning oil commercially available. Do not use corrosive cleaning oils as they could damage to some parts.
2. Use a plastic scraper or hard brush to clean aluminum parts.



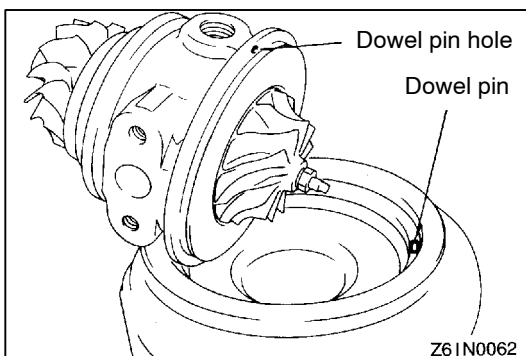
### REASSEMBLY SERVICE POINTS

#### ▶A◀ O-RING INSTALLATION

Apply a light coat of engine oil to a new O-ring and fit in the turbine wheel assembly groove.

#### Caution

**When installing the O-ring, use care not to damage it. A damaged O-ring causes oil leaks.**

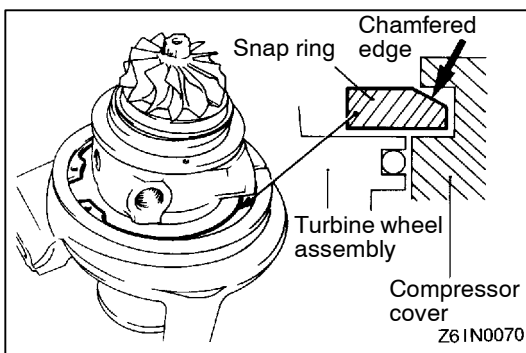


#### ▶B◀ TURBINE WHEEL ASSEMBLY

1. Apply a light coat of engine oil to the periphery of the O-ring.
2. Install the turbine wheel assembly to the compressor cover in relation to the dowel pin.

#### Caution

**Use care not to damage the blades of turbine wheel and compressor wheel.**



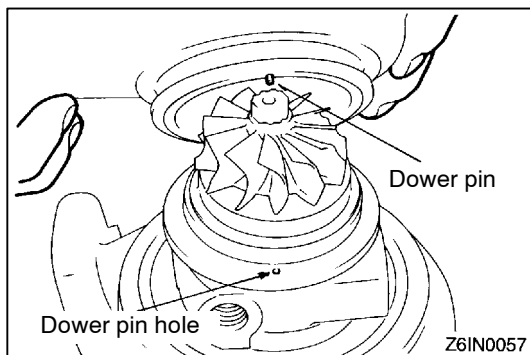
#### ▶C◀ SNAP RING INSTALLATION

Lay the assembly with the compressor cover facing down and fit the snap ring.

#### Caution

**Fit the snap ring with its chamfered side facing up.**



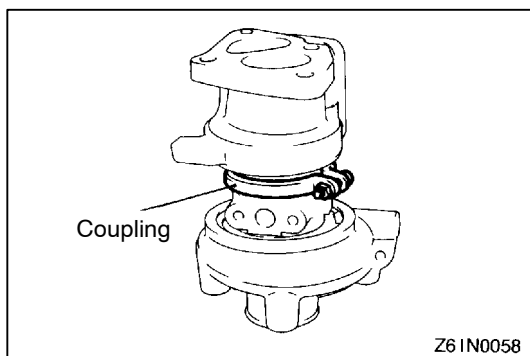


**►D◄ TURBINE HOUSING INSTALLATION**

Install the turbine housing in relation to the dowel pin.

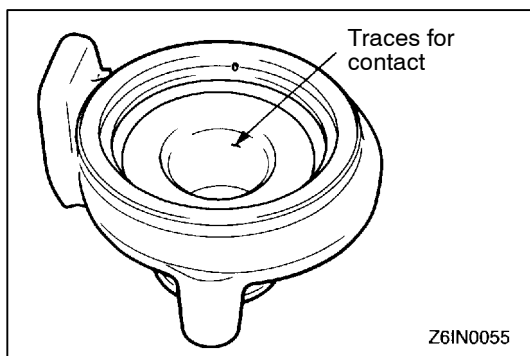
**Caution**

**Use care not to damage the blades of turbine wheel.**



**►E◄ COUPLING INSTALLATION**

Install the coupling and tighten to specified torque.

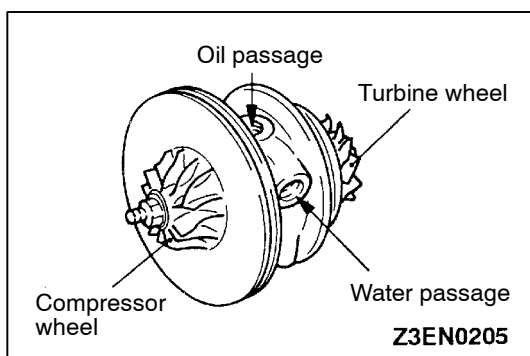


**INSPECTION**

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**TURBINE HOUSING**

1. Check the housing for traces of contact with the turbine wheel, cracks due to overheating, pitching, deformation and other damage. Replace with a new turbine housing if cracked.
2. Operate the waste gate valve lever manually to check that the gate can be operated and closed smoothly.



**COMPRESSOR COVER**

Check the compressor cover for traces of contact with the compressor wheel and other damage.

**TURBINE WHEEL ASSEMBLY**

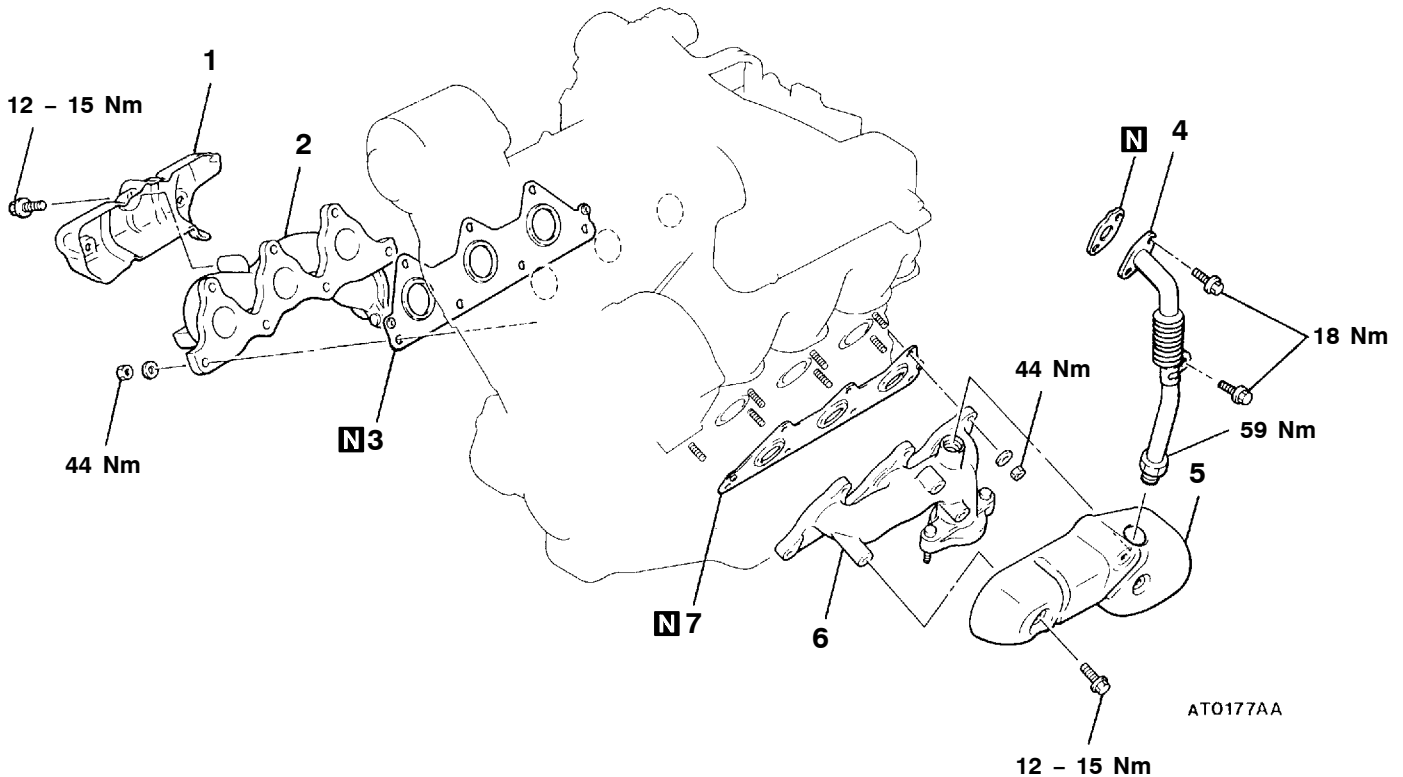
1. Check the turbine and compressor wheel blades for bend, burr, damage, corrosion and traces of contact on the back side and replace if defective.
2. Check the oil passage of the turbine wheel assembly for deposit and clogging.
3. In the case of water cooled type, check also the water passage for deposit and clogging.
4. Check the turbine wheel and compressor wheel for light and smooth turning.

**OIL PIPE/OIL RETURN PIPE**

Correct or replace the oil pipe and oil return pipe if clogged, collapsed, deformed or otherwise damaged.

**EXHAUST MANIFOLD <6G7>****REMOVAL AND INSTALLATION****Pre-removal and Post-installation Operation**

- Front Exhaust Pipe Removal and Installation (Refer to P.15-19.)
- Air Cleaner Removal and Installation (Refer to P.15-4.)
- Battery and Battery Tray Removal and Installation
- Engine Oil Dipstick Guide Removal and Installation

**Removal steps**

- |                                   |                                   |
|-----------------------------------|-----------------------------------|
| 1. Heat protector (R.H.)          | 5. Heat protector (L.H.)          |
| 2. Exhaust manifold (R.H.)        | 6. Exhaust manifold (L.H.)        |
| 3. Exhaust manifold gasket (R.H.) | 7. Exhaust manifold gasket (L.H.) |
| 4. EGR pipe                       |                                   |

**INSPECTION**

15100340160

Check the following points; replace the part if a problem is found.

**EXHAUST MANIFOLD CHECK**

1. Check for damage or cracking of any part.
2. Using a straight edge and a feeler gauge, check for distortion of the cylinder head installation surface.

**Standard value: 0.15 mm or less**

**Limit: 0.20 mm**

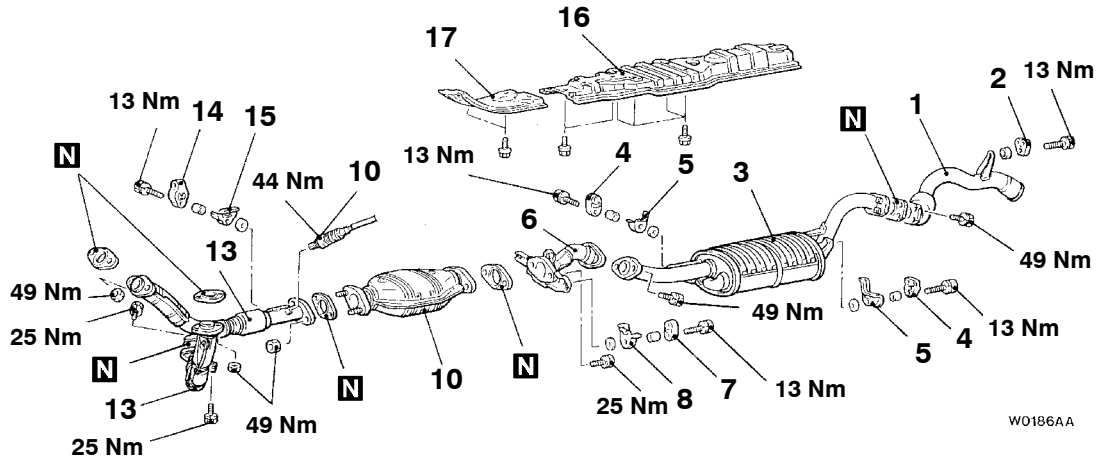
**EXHAUST PIPE AND MAIN MUFFLER**

15100540461

**REMOVAL AND INSTALLATION**

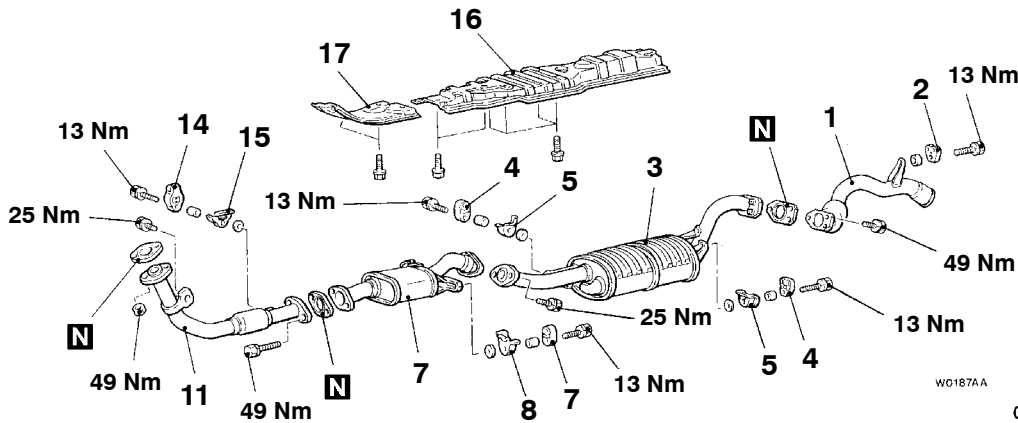
- Pre-removal and Post-installation Operation**
- Front Under Cover Removal and Installation

<6G7>



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**Main muffler removal steps**

1. Tail pipe
2. Hanger
3. Main muffler
4. Hanger
5. Protector

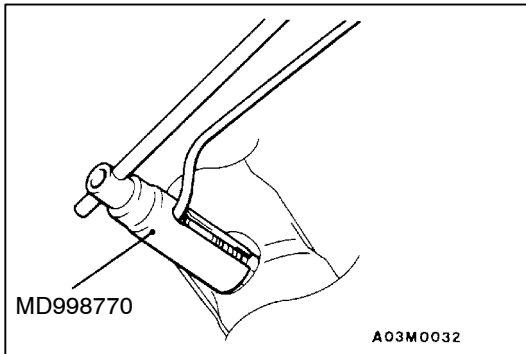
**Center exhaust pipe removal steps**

6. Center exhaust pipe
7. Hanger
8. Protector

9. Catalytic converter <6G7>

**Front exhaust pipe removal steps**

- ◀A▶ ▶A▶
10. Oxygen sensor <6G7>
  11. Front exhaust pipe <4D5>
  12. Front exhaust pipe (R.H.) <6G7>
  13. Front exhaust pipe (L.H.) <6G7>
  14. Hanger
  15. Protector
  16. Front floor heat protector B
  17. Front floor heat protector A

**REMOVAL SERVICE POINT****◀A▶ OXYGEN SENSOR REMOVAL**

Use special tool to remove the oxygen sensor.

**INSTALLATION SERVICE POINT****▶A◀ OXYGEN SENSOR INSTALLATION**

Use special tool to install the oxygen sensor.