
INTAKE AND EXHAUST



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15109000250

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GENERAL INFORMATION

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The intake manifold is made of an aluminium alloy, and the shape provides an increased intake inertia effect and has a good volumetric efficiency.

The exhaust manifold is made of stainless steel. The exhaust pipe is divided into three parts; the front pipe, the centre pipe, and the main muffler.

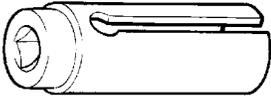
SERVICE SPECIFICATIONS

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Items		Standard value	Limit
Manifold distortion of the installation surface mm		0.15 or less	0.20
Waste gate actuator activation pressure kPa		Approx. 75	-
Air temperature switch _C <Vehicles with intercooler turbocharger>	OFF → ON	57 or more	-
	ON → OFF	45 or less	-

SPECIAL TOOL

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Tool	Number	Name	Use
	MD998770	Oxygen sensor wrench	Removal/Installation of oxygen sensor

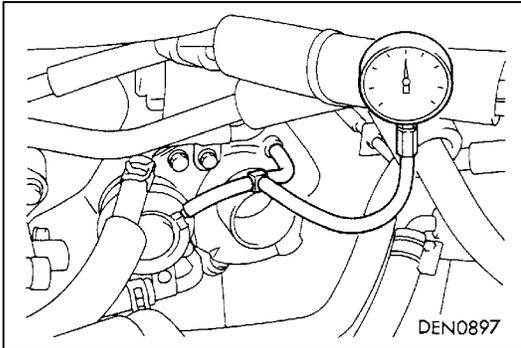
ON-VEHICLE SERVICE

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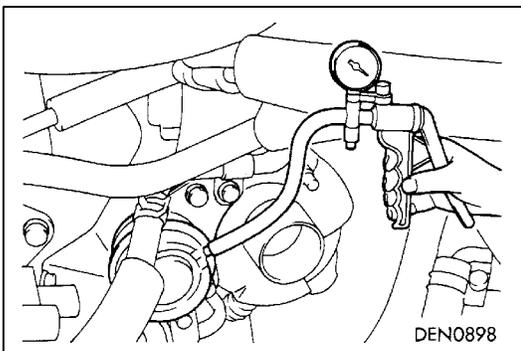
TURBOCHARGER SUPERCHARGING CHECK <4D6>

Caution

Conduct the driving test in a location where driving at full acceleration can be done with safety. Two persons 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. Connect the pressure gauge to the hose between the turbocharger and the waste gate actuator.
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 76 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 <4D6>

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

Standard value: Approx. 75 kPa

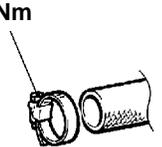
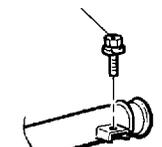
Caution

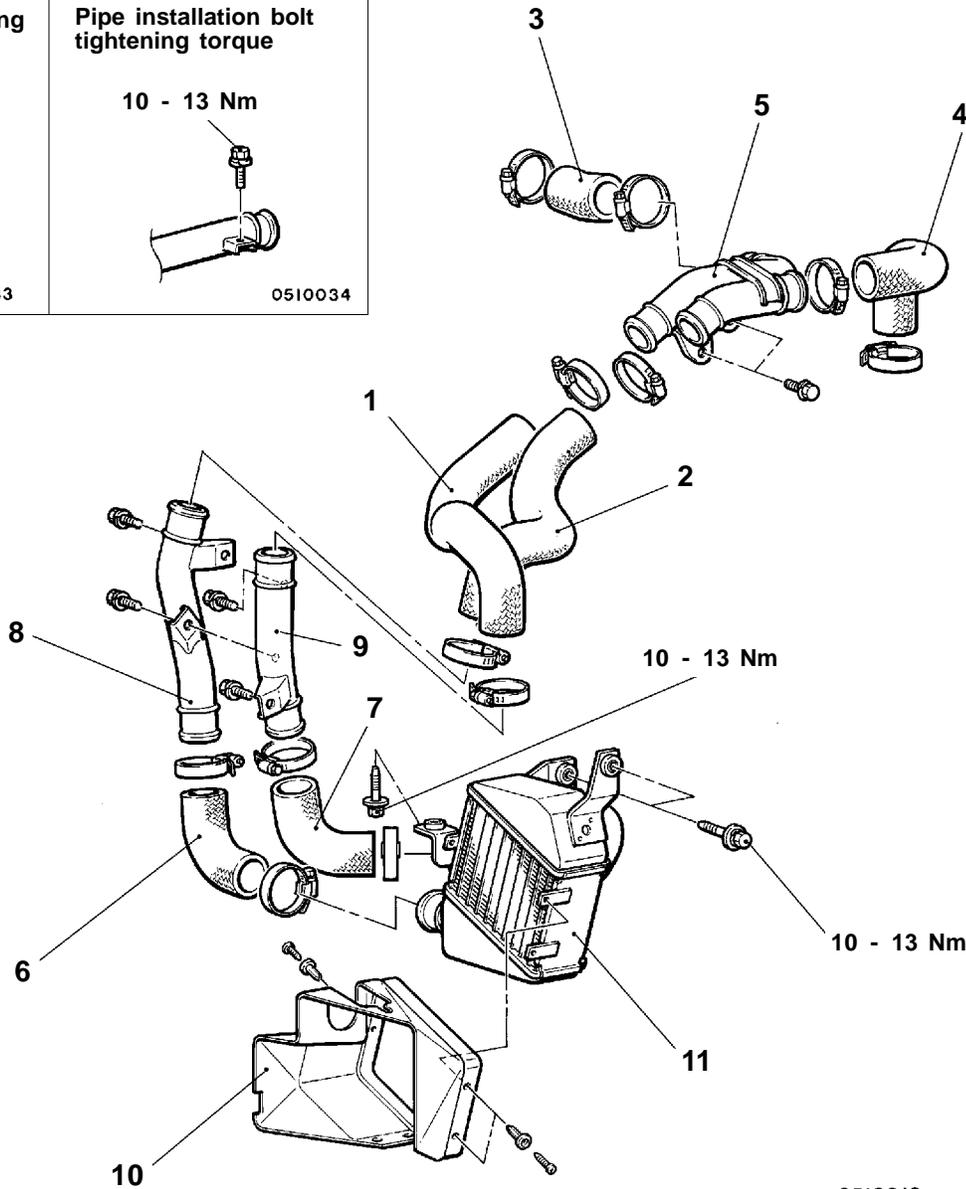
In order to avoid damage to the diaphragm, do not apply a pressure of 109 kPa or higher.

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

INTERCOOLER

REMOVAL AND INSTALLATION

<p>Hose clamp tightening torque</p> <p>6 Nm</p>  <p>0510033</p>	<p>Pipe installation bolt tightening torque</p> <p>10 - 13 Nm</p>  <p>0510034</p>
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Air hose and air pipe removal steps

- ▶▶A◀◀ 1. Air hose E
- ▶▶A◀◀ 2. Air hose B
- ▶▶B◀◀ 3. Air hose F
- ▶▶A◀◀ 4. Air hose A
- ▶▶A◀◀ 5. Air pipe A
- ▶▶A◀◀ 6. Air hose C
- ▶▶A◀◀ 7. Air hose C
- ▶▶A◀◀ 8. Air pipe B
- ▶▶A◀◀ 9. Air pipe C

Intercooler assembly removal steps

- ▶▶A◀◀ 6. Air hose C
- ▶▶A◀◀ 7. Air hose C
- ▶▶A◀◀ 10. Intercooler duct
- ▶▶A◀◀ 11. Intercooler assembly

INSTALLATION SERVICE POINTS**▶A◀ AIR HOSE C/AIR HOSE A/AIR HOSE B/AIR
HOSE E INSTALLATION**

Align the alignment mark (white paint) on each hose with the protrusion on each pipe.

▶B◀ AIR HOSE F INSTALLATION

Install the hose with its marking (white paint) upward.

AIR INTAKE PLENUM

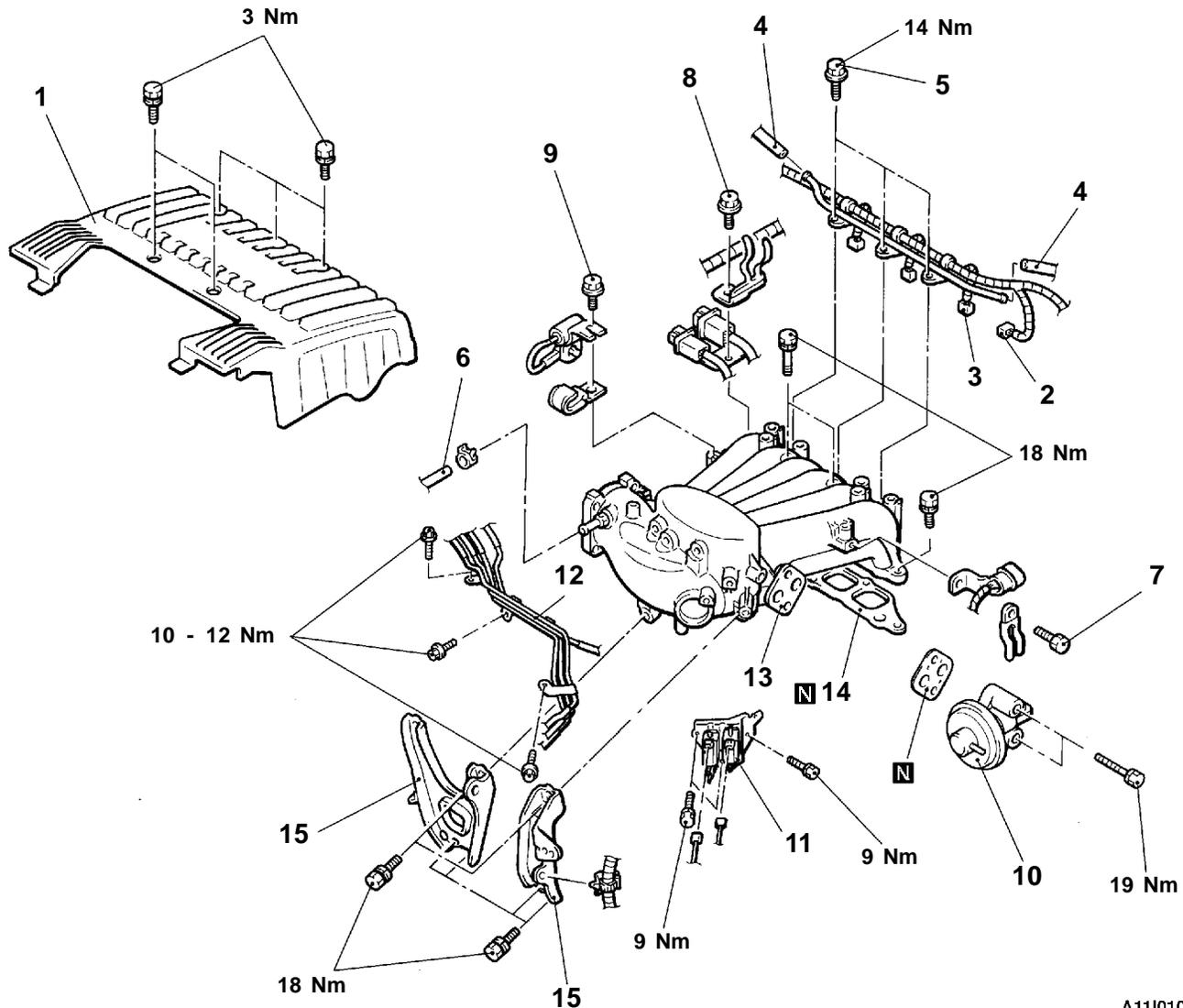
REMOVAL AND INSTALLATION

Pre-removal Operation

- Engine Coolant Draining (Refer to GROUP 14 - On-vehicle Service.)
- Air Cleaner Removal
- Throttle Body Removal (Refer to GROUP 13A.)

Post-installation Operation

- Engine Coolant Supplying (Refer to GROUP 14 - On-vehicle Service.)
- Throttle Body Installation (Refer to GROUP 13A.)
- Air Cleaner Installation
- Accelerator Cable Adjustment (Refer to GROUP 17 - On-vehicle Service.)

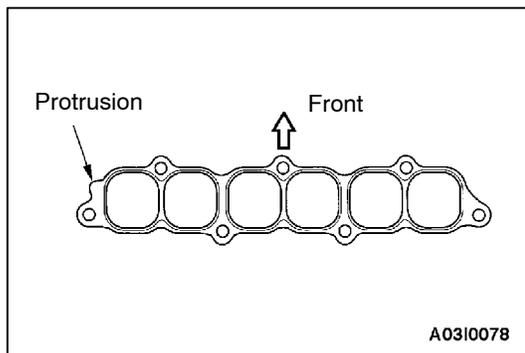


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Removal steps

1. Engine cover
2. Crankshaft position sensor connector
3. Injector connector
4. Vacuum hose connection
5. Air pipe assembly mounting bolt
6. Brake booster vacuum hose connection
7. Connector bracket mounting bolt
8. Connector bracket mounting bolt
9. Noise condenser mounting bolt
10. EGR valve
11. Solenoid valve assembly
12. Vacuum pipe assembly
13. Air intake plenum
14. Air intake plenum gasket
15. Air intake plenum stay





INSTALLATION SERVICE POINT

▶A◀ AIR INTAKE PLENUM GASKET INSTALLATION

Install with gasket protrusions in the position illustrated.

INTAKE MANIFOLD

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REMOVAL AND INSTALLATION

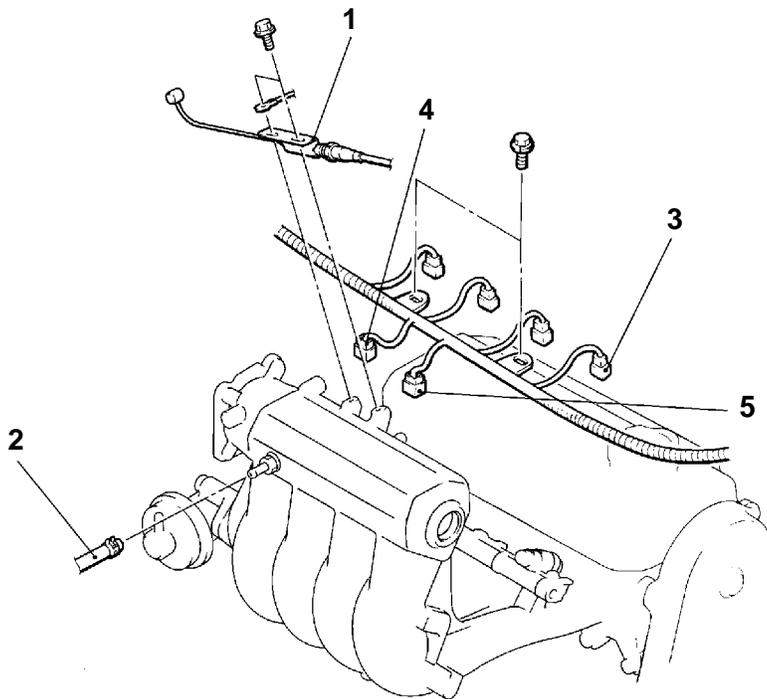
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Pre-removal Operation

- Engine Coolant Draining
(Refer to GROUP 14 - On-vehicle Service.)
- Air Cleaner Removal
- Throttle Body Removal (Refer to GROUP 13A.)

Post-installation Operation

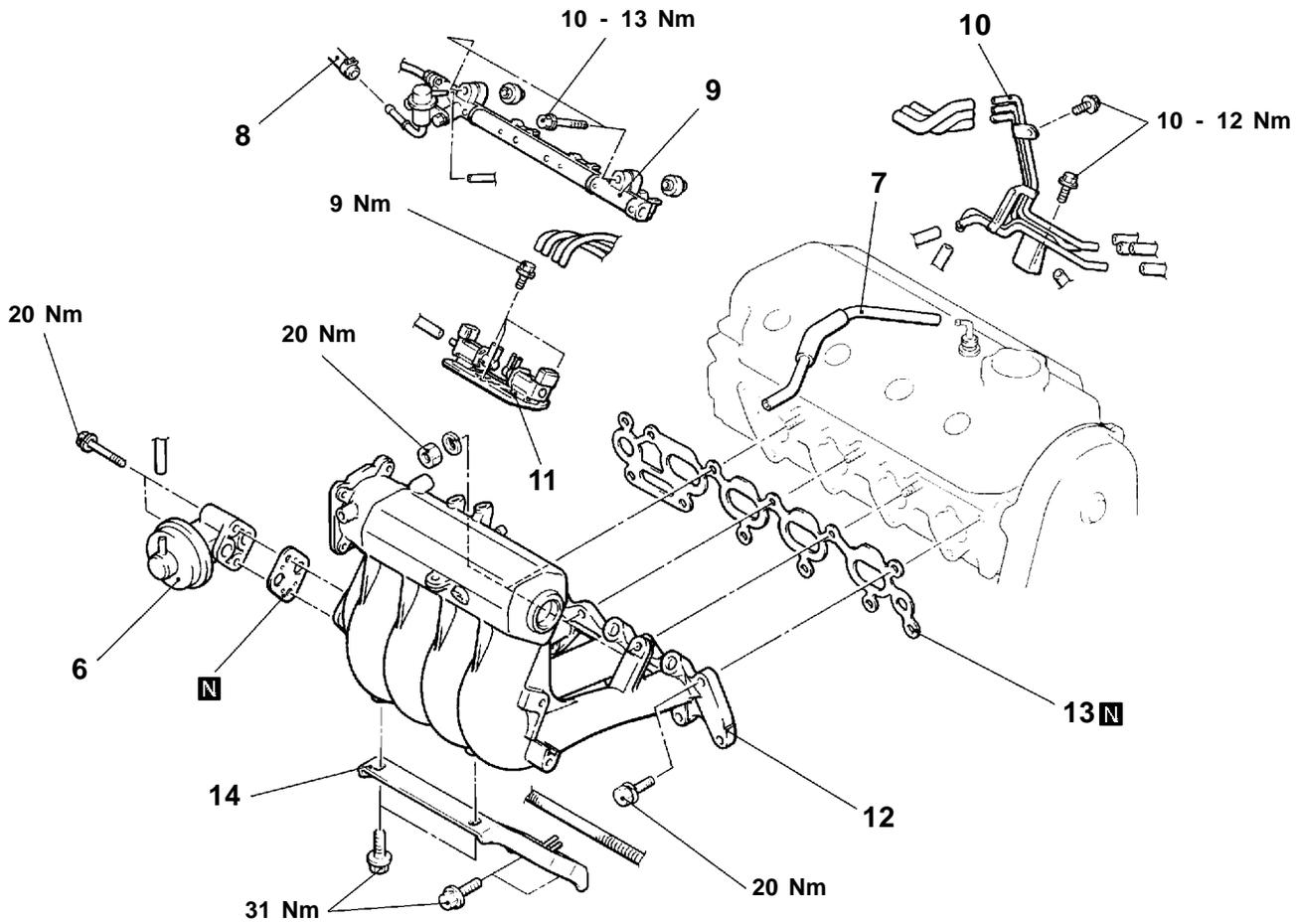
- Throttle Body Installation (Refer to GROUP 13A.)
- Air Cleaner Installation
- Engine Coolant Supplying
(Refer to GROUP 14 - On-vehicle Service.)
- Accelerator Cable Adjustment
(Refer to GROUP 17 - On-vehicle Service.)



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Removal steps

1. Accelerator cable
2. Brake booster vacuum hose connection
3. Injector connector
4. EGR solenoid valve connector
5. Purge control solenoid valve connector



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- 6. EGR valve
- 7. PCV hose
- 8. Fuel return hose connection
- 9. Delivery pipe, injector and pressure regulator

- 10. Vacuum pipe assembly
- 11. Solenoid valve assembly
- 12. Intake manifold
- 13. Intake manifold gasket
- 14. Intake manifold stay



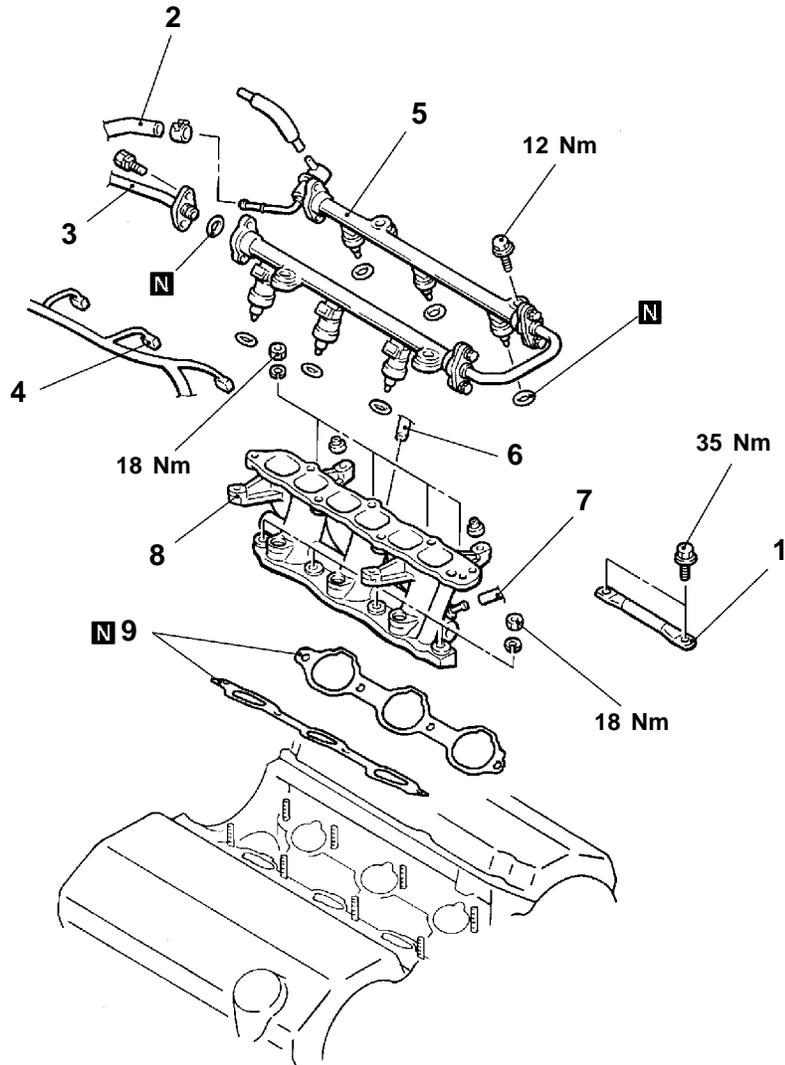
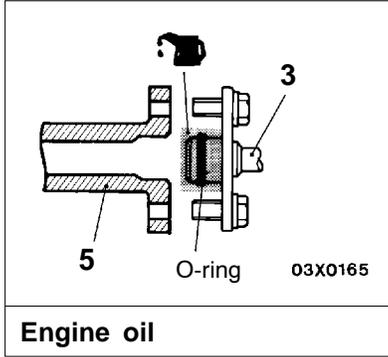
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Pre-removal Operation

- Fuel Discharge Prevention (Refer to GROUP 13A - On-vehicle Service.)
- Engine Coolant Draining (Refer to GROUP 14 - On-vehicle Service.)
- Air Cleaner Removal
- Air Intake Plenum Removal (Refer to P.15-6.)

Post-Installation Operation

- Air Intake Plenum Installation (Refer to P.15-6.)
- Air Cleaner Installation
- Engine Coolant Supplying (Refer to GROUP 14 - On-vehicle Service.)
- Accelerator Cable Adjustment (Refer to GROUP 17 - On-vehicle Service.)



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Removal steps

1. Engine mount stay
2. Fuel return hose connection
3. Fuel high-pressure hose connection
4. Injector connector
5. Delivery pipe, injector and pressure regulator

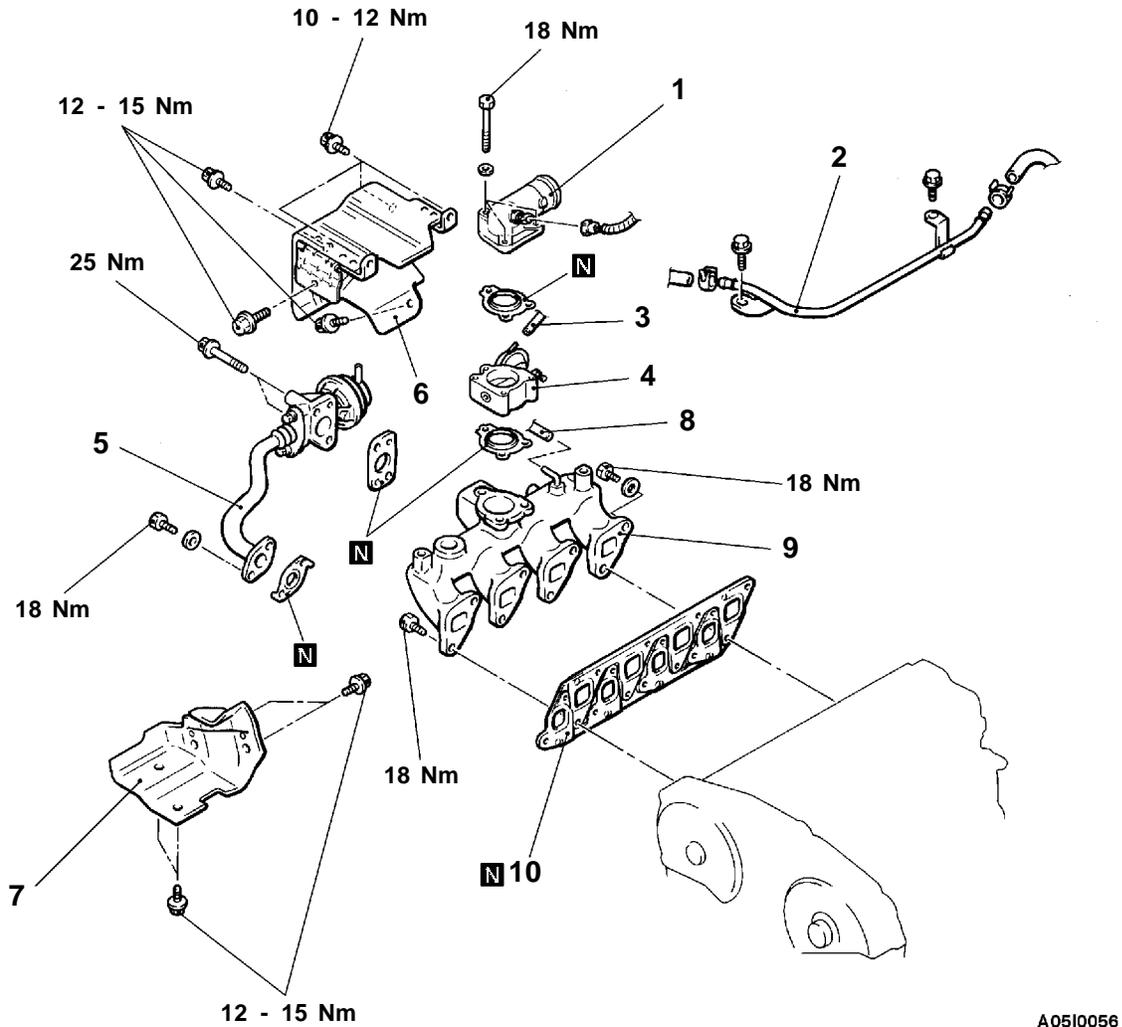
6. PCV hose connection
7. Vacuum hose connection
8. Intake manifold
9. Intake manifold gasket



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Pre-removal and Post-installation Operation

- Air Cleaner Removal and Installation
- Air Pipe A Removal and Installation (Refer to P.15-4.)



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Removal steps

1. Air inlet fitting
2. Brake booster vacuum hose
3. Vacuum hose
4. Throttle body assembly
5. EGR valve and pipe assembly
6. Turbocharger heat protector

7. Rear heat protector
8. Vacuum hose
9. Intake manifold
 - Turbocharger (Refer to P.15-6.)
10. Intake and exhaust manifold gasket

REMOVAL SERVICE POINT**◀A▶ DELIVERY PIPE, INJECTOR AND PRESSURE REGULATOR REMOVAL**

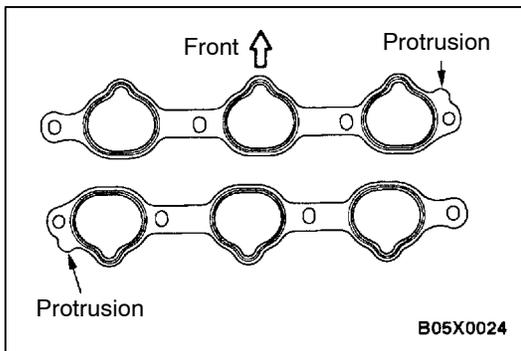
Remove the delivery pipe (with the injectors and pressure regulator attached to it).

Caution

Care must be taken, when removing the delivery pipe, not to drop the injector.

INSTALLATION SERVICE POINTS**▶A◀ INTAKE MANIFOLD GASKET INSTALLATION**

Install gasket with its protrusion in the position illustrated.

**▶B◀ HIGH-PRESSURE FUEL HOSE INSTALLATION**

1. When connecting the high-pressure fuel hose to the delivery pipe, apply a small amount of new engine oil to the O-ring and 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 delivery pipe.

2. While turning the high-pressure fuel hose to the left and right, install it to the delivery pipe.
3. Check to be sure that the injector turns smoothly. If it does not turn smoothly, the O-ring may be trapped, remove the high-pressure fuel hose and then re-insert it into the delivery pipe and check once again.

INSPECTION

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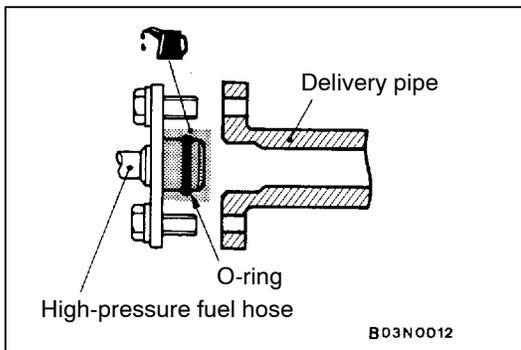
Check the following points; replace the part if a problem is found.

INTAKE MANIFOLD CHECK

1. Check for damage or cracking of any part.
2. Check for obstruction of the negative pressure (vacuum) outlet port, and for obstruction of the water passage or gas passage.
3. Using a straight edge and thickness gauge, check for distortion of the cylinder head installation surface.

Standard value: 0.15 mm or less

Limit: 0.20 mm



EXHAUST MANIFOLD

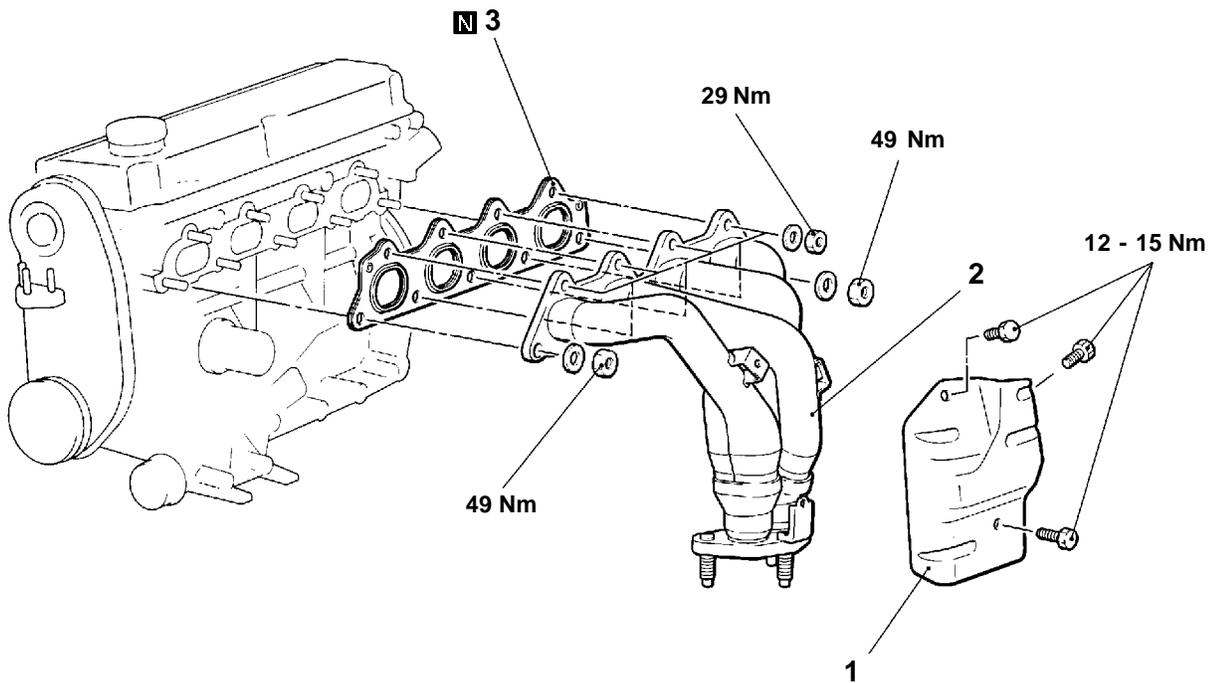
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REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

- Front Exhaust Pipe Removal and Installation
(Refer to P.15-22.)

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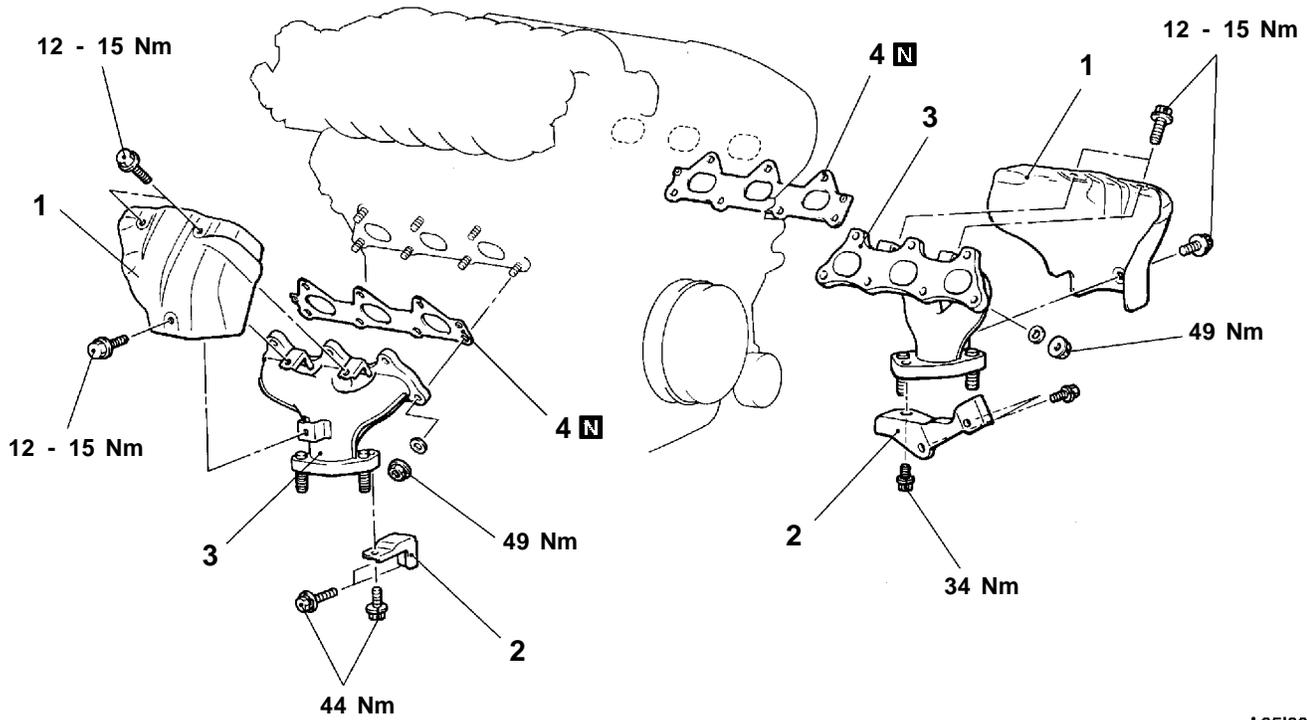


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Removal steps

1. Exhaust manifold cover
2. Exhaust manifold
3. Exhaust manifold gasket

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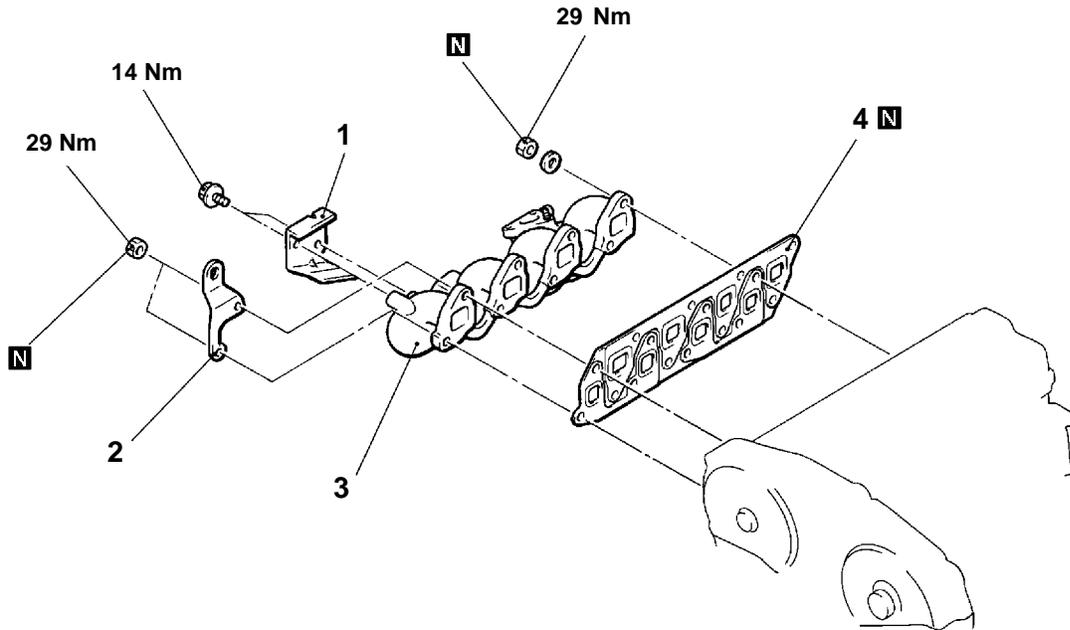


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Removal steps

1. Heat protector
2. Exhaust manifold stay
3. Exhaust manifold
4. Exhaust manifold gasket

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Removal steps

1. Front heat protector
2. Engine hanger
3. Exhaust manifold
- Turbocharger (Refer to P.15-16.)
4. Intake and exhaust manifold gasket

INSPECTION

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EXHAUST MANIFOLD CHECK

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

Standard value: 0.15 mm or less

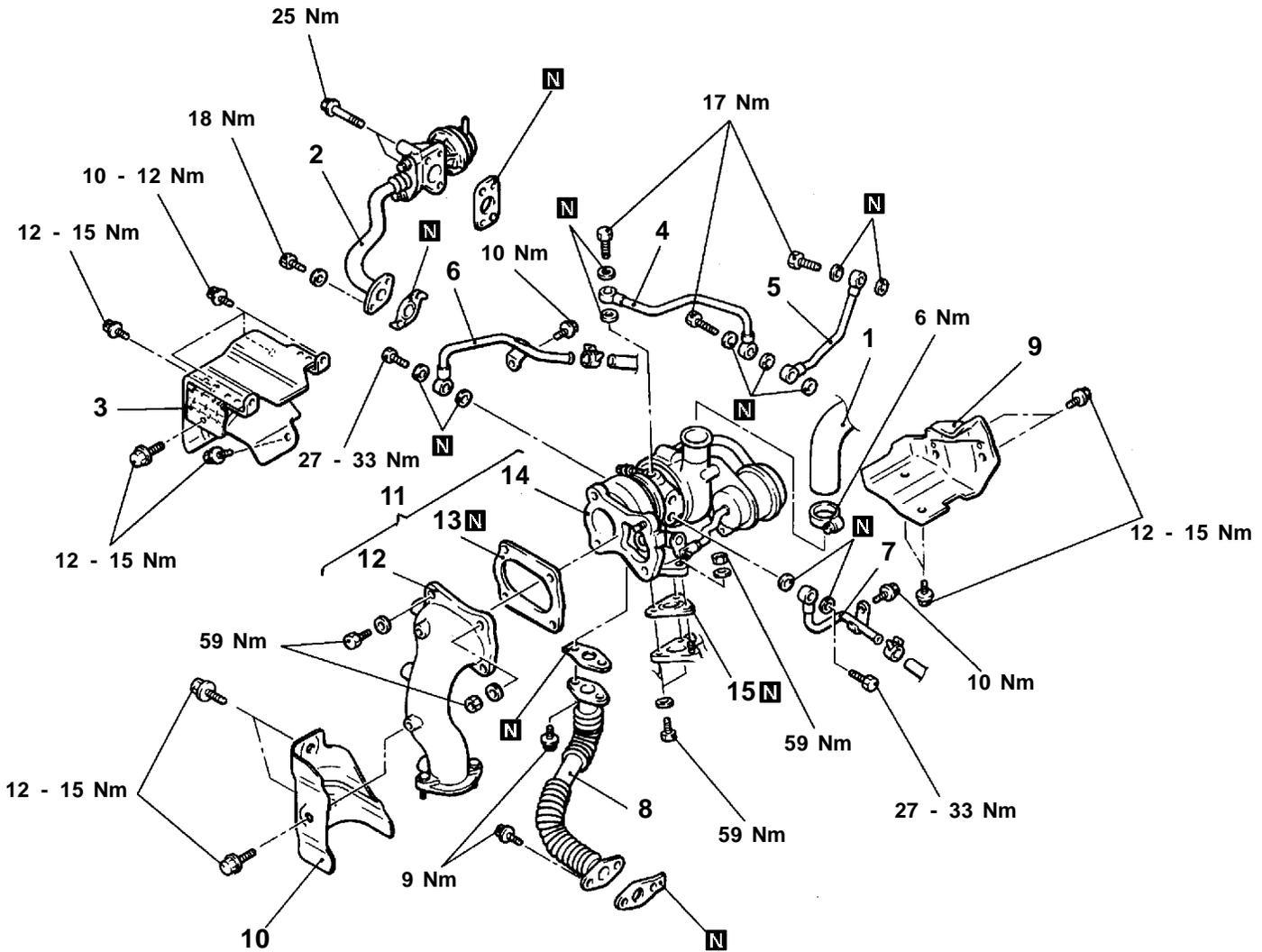
Limit: 0.20 mm

TURBOCHARGER

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

- Engine Coolant Draining and Supplying
- Engine Oil Draining and Supplying
- Air Cleaner Removal and Installation
- Intake Manifold Removal and Installation (Refer to P.15-8.)
- Front Exhaust Pipe and Front Heat Protector Removal and Installation (Refer to P.15-15, 23.)



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Removal steps

- | | |
|---|--|
| <ol style="list-style-type: none"> 1. Air hose A 2. EGR valve and pipe assembly 3. Turbocharger heat protector 4. Oil pipe assembly A 5. Oil pipe assembly B 6. Water pipe assembly A 7. Water pipe assembly B 8. Oil return pipe | <ol style="list-style-type: none"> 9. Rear heat protector 10. Exhaust fitting heat protector 11. Turbocharger assembly 12. Exhaust fitting assembly 13. Exhaust fitting gasket 14. Turbocharger 15. Turbocharger gasket |
|---|--|



REMOVAL SERVICE POINT

**◀A▶ OIL PIPE ASSEMBLY A/OIL PIPE ASSEMBLY
B/OIL RETURN PIPE REMOVAL**

Caution

After disconnecting the oil pipe, take care that foreign material does not enter the oil passage hole of the turbocharger assembly.

INSTALLATION SERVICE POINT

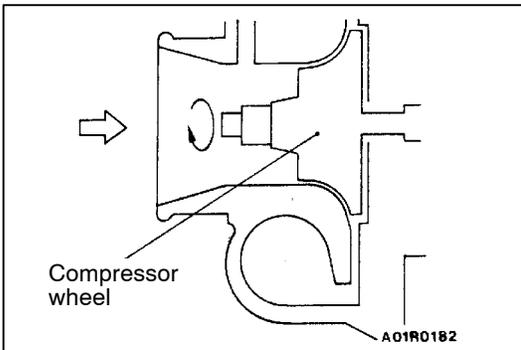
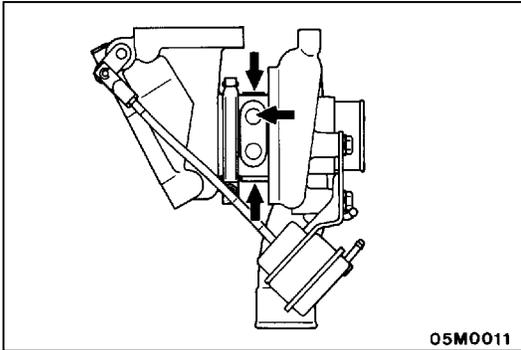
▶A◀ TURBOCHARGER INSTALLATION

1. Clean the alignment surfaces shown in the illustration.

Caution

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

2. Supply clean engine oil through the oil pipe installation hole of the turbocharger.



INSPECTION

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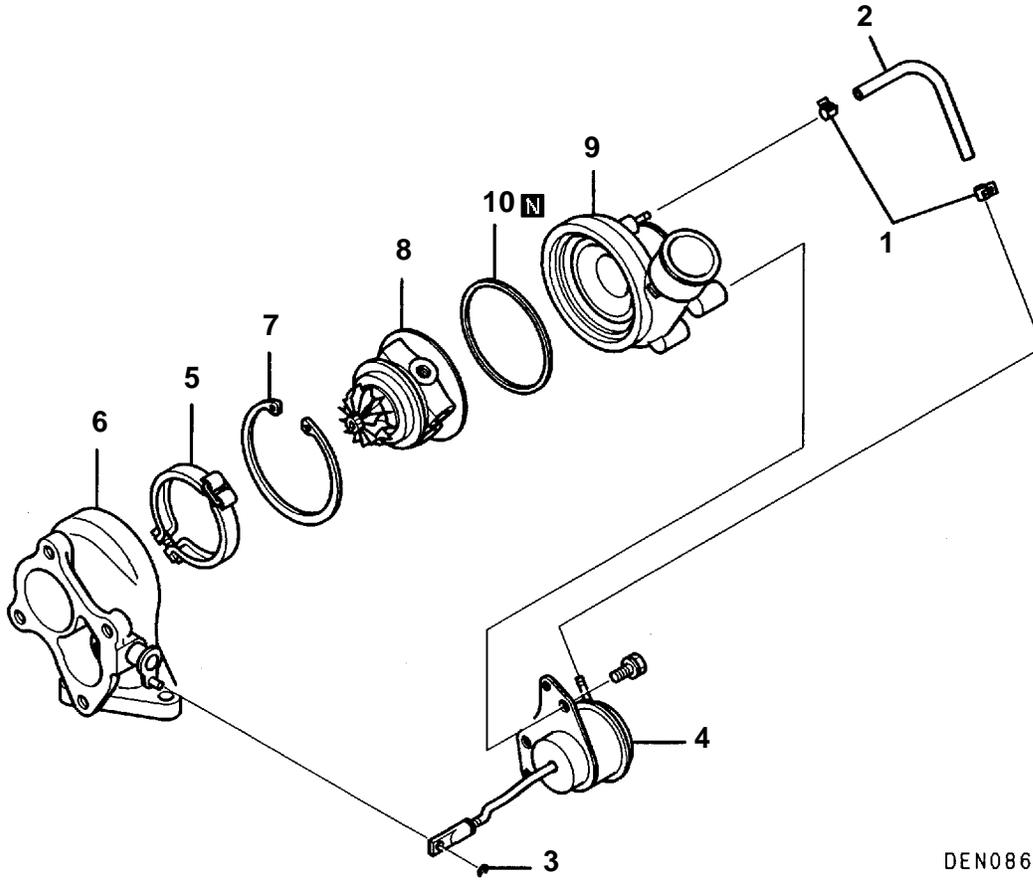
TURBOCHARGER ASSEMBLY CHECK

- 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 ASSEMBLY AND OIL-RETURN PIPE CHECK

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

DISASSEMBLY AND REASSEMBLY

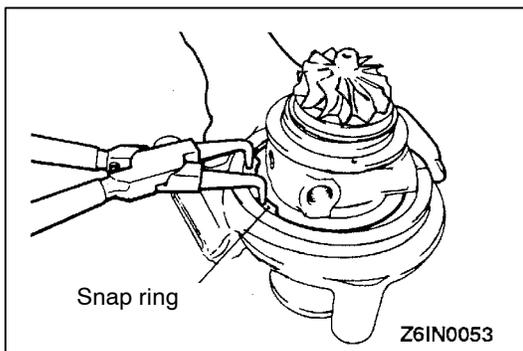


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Disassembly steps

- 1. Hose clip
- 2. Hose
- 3. Snap ring (E-ring)
- 4. Turbocharger waste gate actuator
- 5. Coupling

- 6. Turbine housing
- 7. Snap ring
- 8. Turbine wheel assembly
- 9. Compressor cover
- 10. O-ring



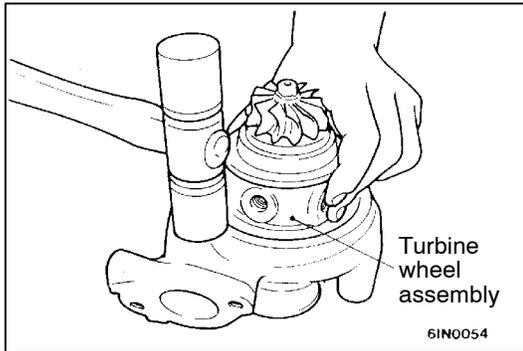
DISASSEMBLY SERVICE POINTS

◀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.

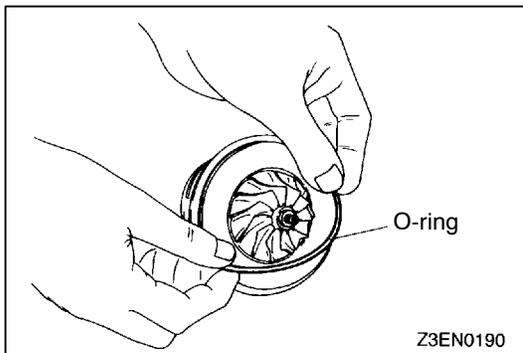


◀B▶ TURBINE WHEEL ASSEMBLY REMOVAL

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.



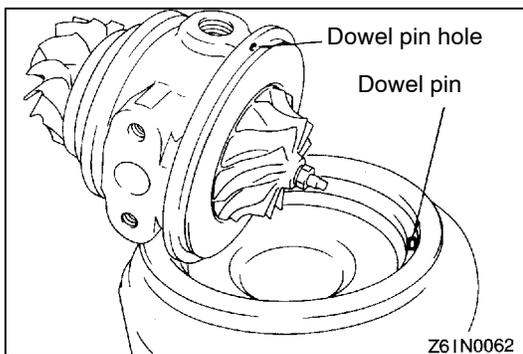
REASSEMBLY SERVICE POINTS

▶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.

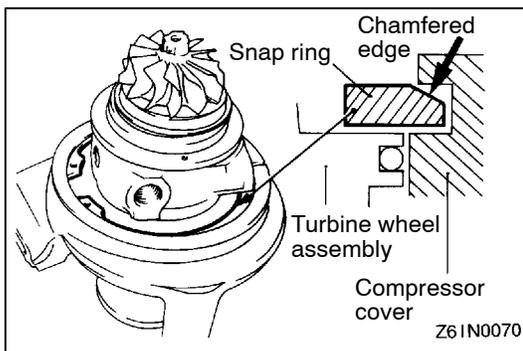


▶B◀ TURBINE WHEEL ASSEMBLY

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 while aligning the dowel pin with the hole.

Caution

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

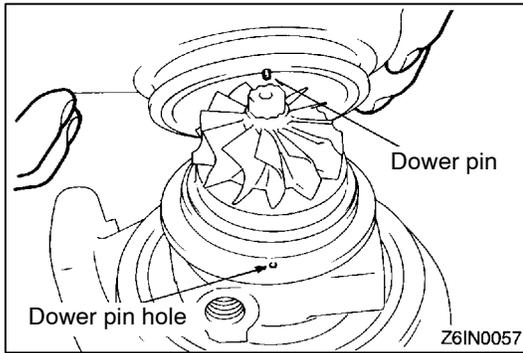


▶C◀ SNAP RING INSTALLATION

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.

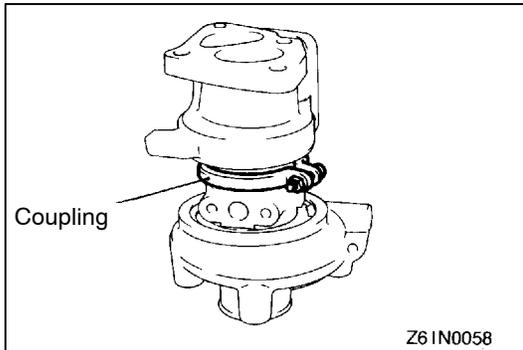


►D◄ TURBINE HOUSING INSTALLATION

Install the turbine housing while aligning the dowel pin with the hole.

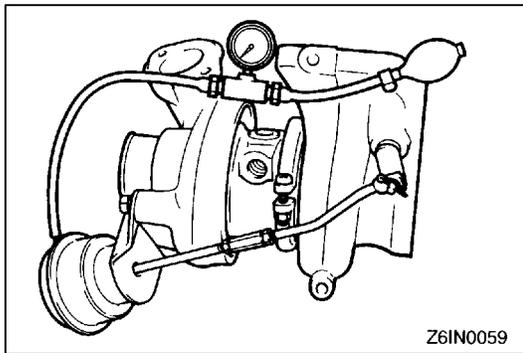
Caution

Use care not to damage the blades of turbine wheel.



►E◄ COUPLING INSTALLATION

Install the coupling and tighten to the specified torque.



►F◄ TURBOCHARGER WASTE GATE ACTUATOR OPERATION INSPECTION

Using a tester, apply pressure to the actuator and check the pressure when the rod starts moving (moves approx. 1 mm).

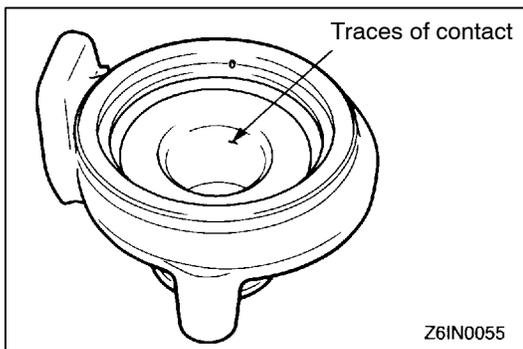
Standard value: Approx. 75 kPa

Caution

Do not apply a pressure of more than 109 kPa to the actuator.

Otherwise, diaphragm may be damaged.

Never attempt to adjust the turbocharger waste gate valve.

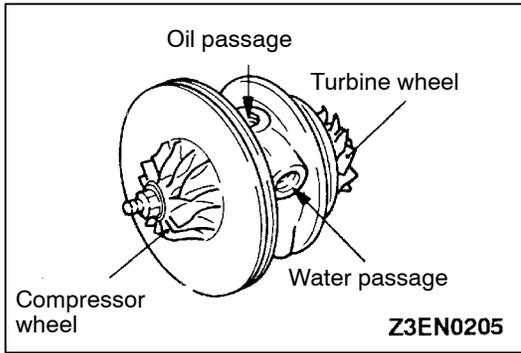


INSPECTION

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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. 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.

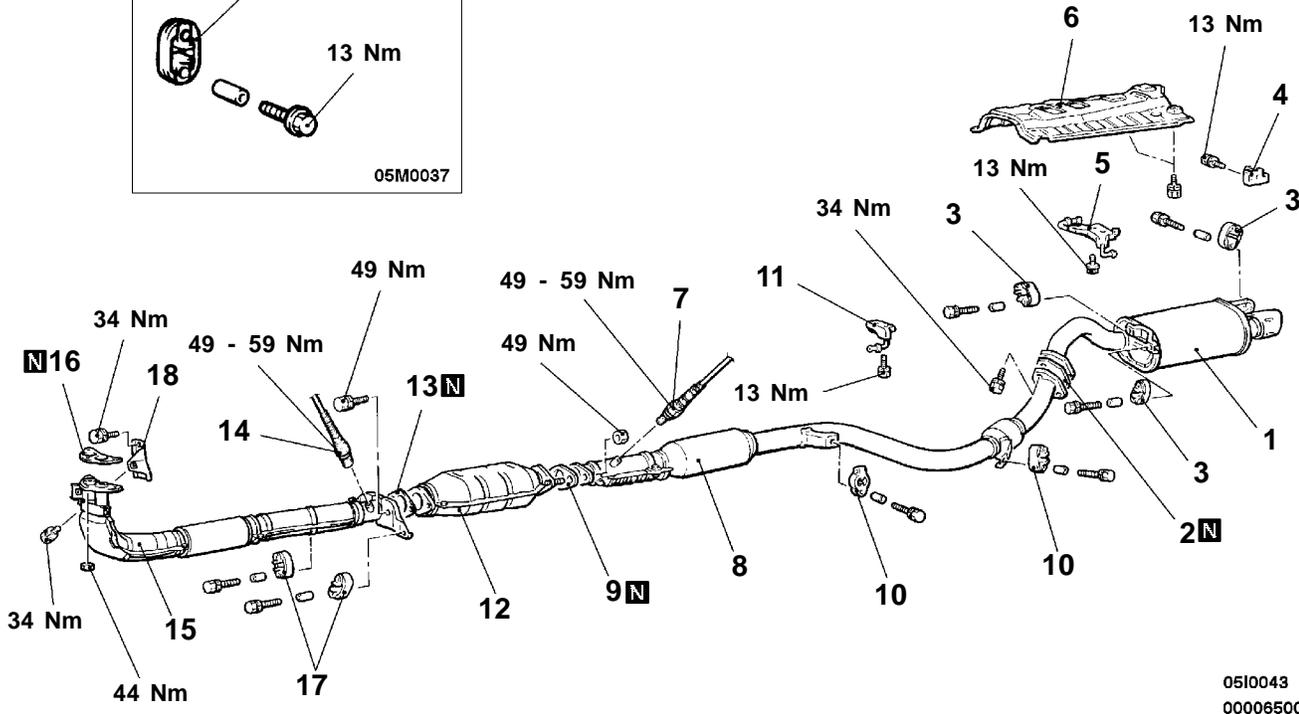
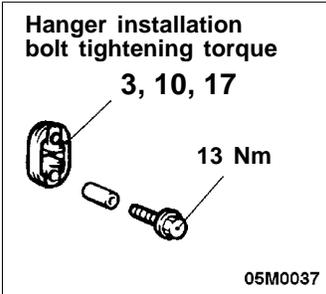
EXHAUST PIPE AND MAIN MUFFLER

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

- Under Cover Removal and Installation

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Main muffler removal steps

1. Main muffler assembly
2. Gasket
3. Hanger
4. Tail hanger
5. Rear hanger
6. Rear floor heat protector panel

Catalytic converter removal steps

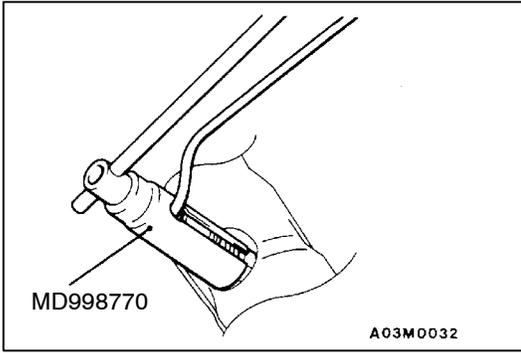
12. Catalytic converter
13. Gasket

Front exhaust pipe removal steps

14. Oxygen sensor
15. Front exhaust pipe
16. Gasket
17. Hanger
18. Front exhaust pipe bracket

Center exhaust pipe removal steps

- ◀A▶ ▶A▶
7. Oxygen sensor
 8. Center exhaust pipe
 9. Gasket
 10. Hanger
 11. Center hanger

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