

---

# INTAKE AND EXHAUST

# INTAKE AND EXHAUST

## CONTENTS

15109000168

<b>SERVICE SPECIFICATIONS</b> .....	<b>2</b>	<b>INTAKE MANIFOLD &lt;4G6&gt;</b> .....	<b>9</b>
<b>SEALANT</b> .....	<b>2</b>	<b>INTAKE AND EXHAUST &lt;4D56-2WD&gt;</b> .....	<b>11</b>
<b>ON-VEHICLE SERVICE</b> .....	<b>2</b>	<b>TURBOCHARGER AND EXHAUST MANIFOLD &lt;4D56-4WD&gt;</b> .....	<b>12</b>
Intake Manifold Vacuum Check .....	2	<b>TURBOCHARGER</b> .....	<b>15</b>
Turbocharger Supercharging Check .....	2	<b>EXHAUST MANIFOLD &lt;4G6&gt;</b> .....	<b>18</b>
Waste Gate Actuator Check .....	3	<b>EXHAUST PIPE AND MAIN MUFFLER</b> .....	<b>19</b>
Power Relay Check .....	3		
<b>AIR CLEANER</b> .....	<b>4</b>		
<b>INTERCOOLER AND INTERCOOLER FAN-ECU</b> .....	<b>6</b>		

## 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

## SEALANT

15100050025

Item	Specified sealant	Remark
Water outlet fitting <4G6>	MITSUBISHI GENUINE PART MD970389 or equivalent	Semi-drying sealant

## ON-VEHICLE SERVICE

15100180137

## INTAKE MANIFOLD VACUUM CHECK &lt;4G6&gt;

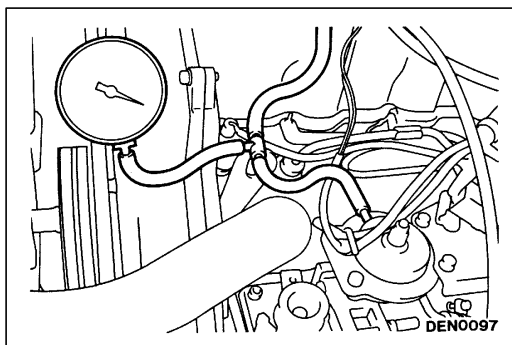
Refer to GROUP 11A – On-vehicle Service

TURBOCHARGER SUPERCHARGING CHECK  
<4D56 with turbocharger>

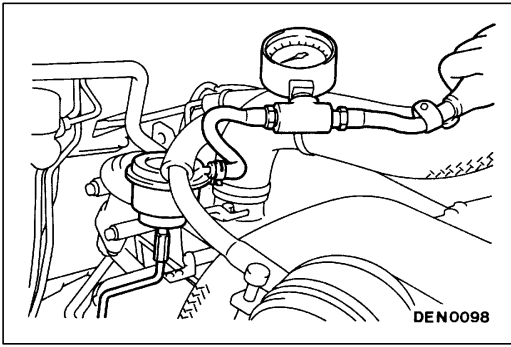
15100100041

## 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 <4D56-with turbocharger>**

15100120023

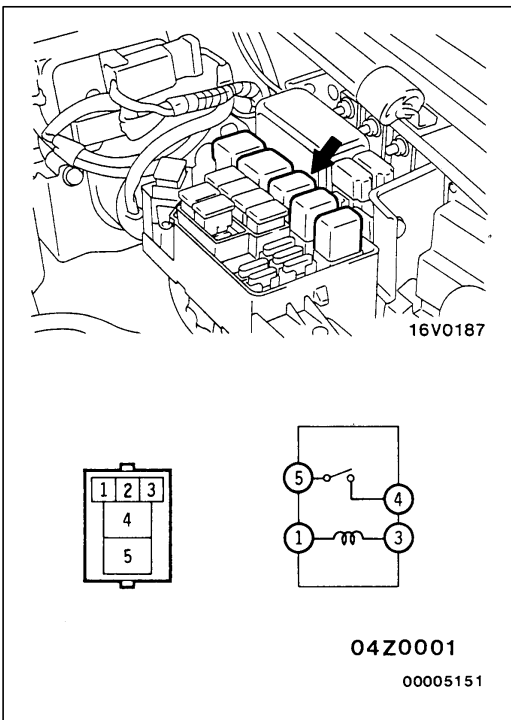
1. Connect a manual pump (pressure-application type) to nipple.
2. While gradually applying pressure, check the pressure that begins to activate (approx. 1 mm stroke) the waste gate actuator rod.

**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**

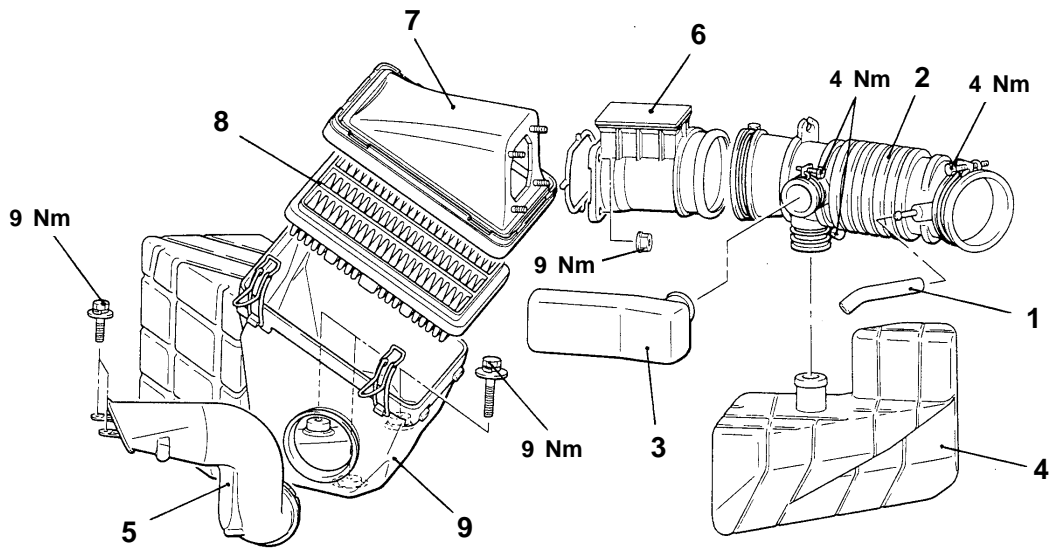
15100620011

**INTERCOOLER FAN MOTOR RELAY CONTINUITY CHECK**

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

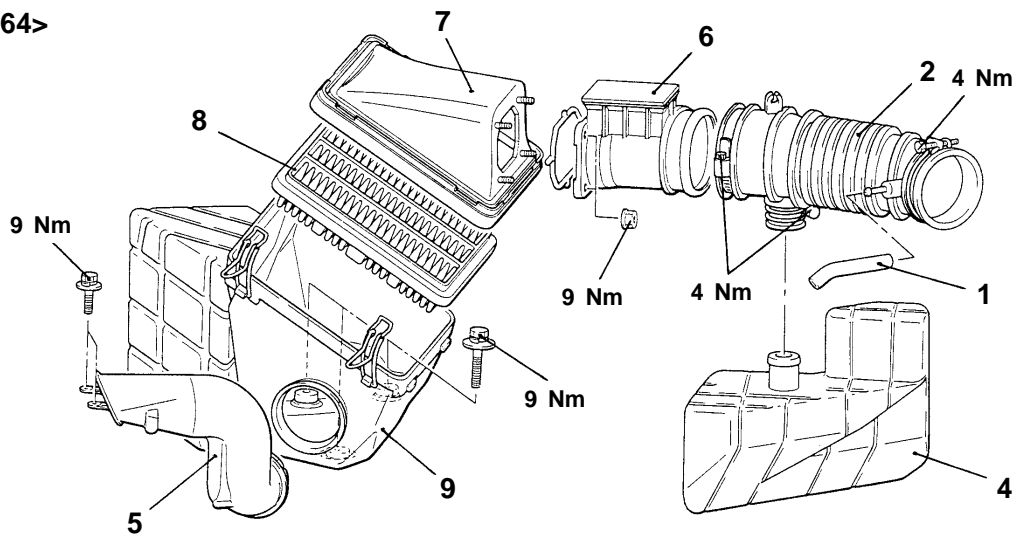
**AIR CLEANER****REMOVAL AND INSTALLATION**

&lt;4G63&gt;



05V0012

&lt;4G64&gt;



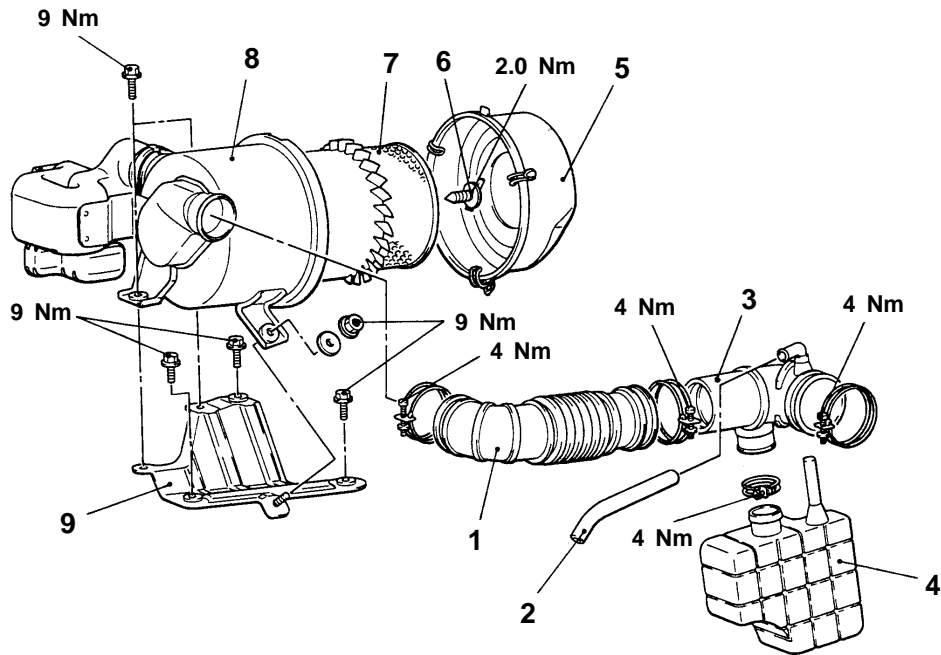
05V0013

00005152

**Removal steps**

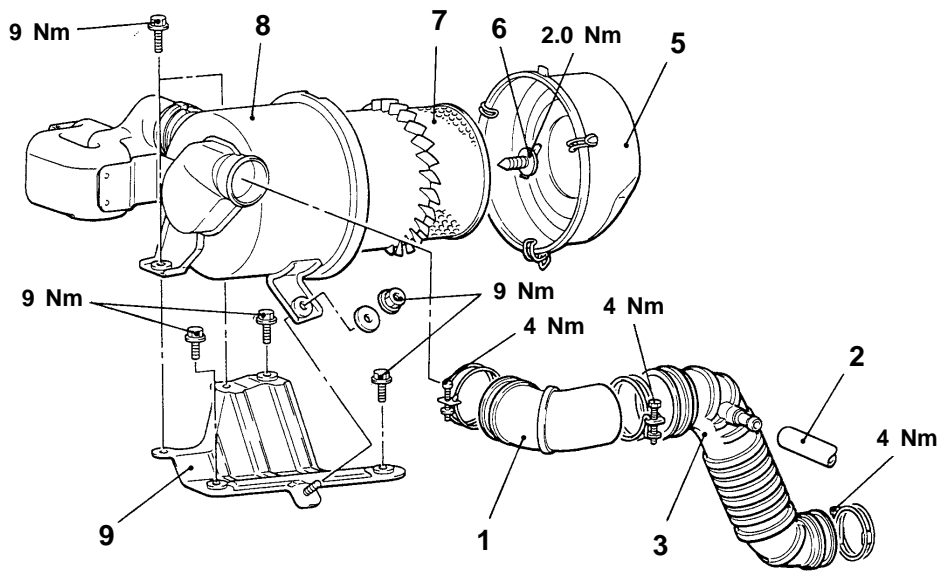
- |                             |                             |
|-----------------------------|-----------------------------|
| 1. Breather hose connection | 6. Air flow sensor assembly |
| 2. Air intake hose          | 7. Air cleaner cover        |
| 3. Resonator <4G63>         | 8. Air cleaner element      |
| 4. Resonator                | 9. Air cleaner body         |
| 5. Air duct                 |                             |

<4D56-2WD>



05V0001

<4D56-4WD>



05V0016

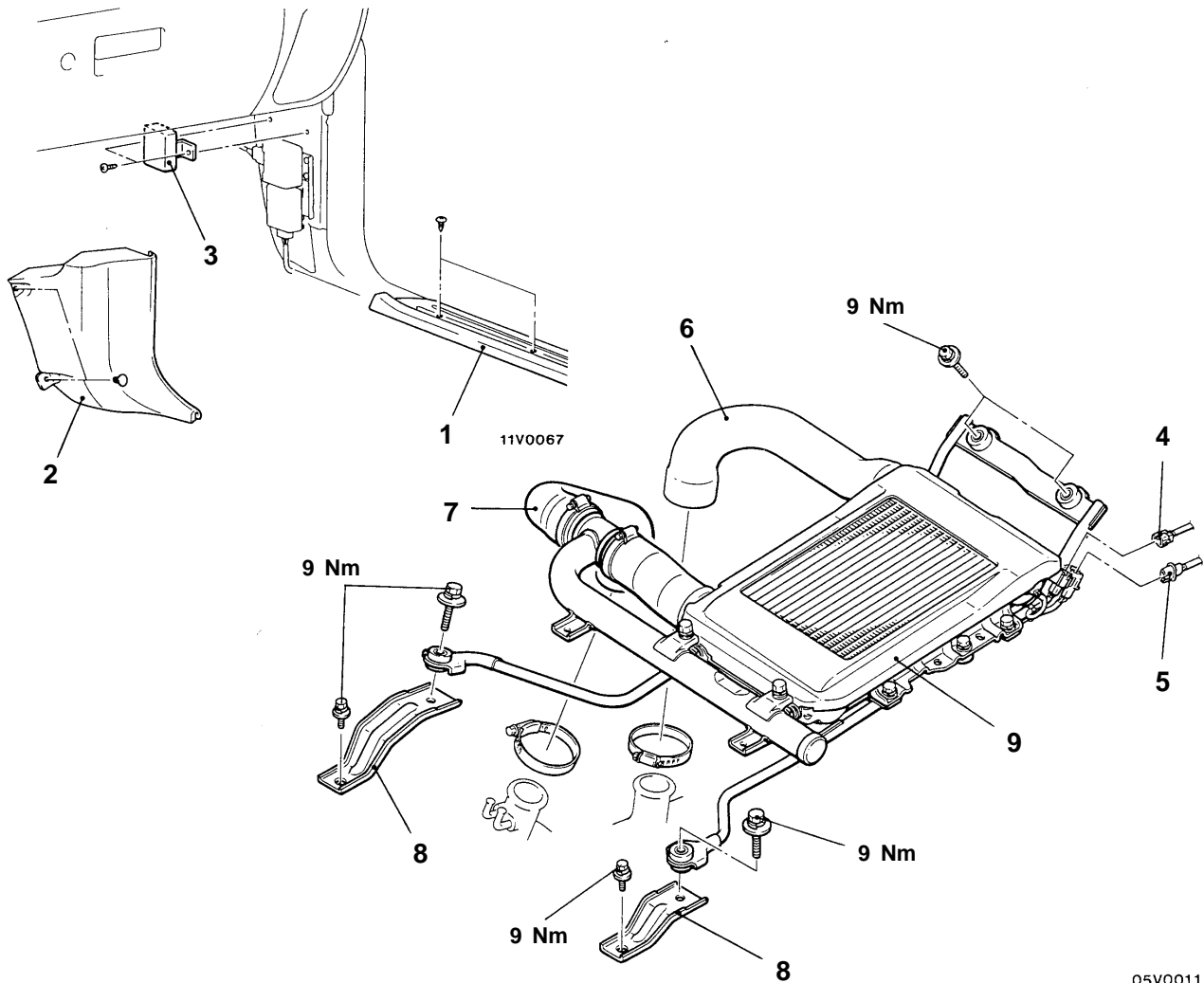
00005153

**Removal steps**

- |                             |                        |
|-----------------------------|------------------------|
| 1. Air intake hose A        | 6. Bolt                |
| 2. Breather hose connection | 7. Air cleaner element |
| 3. Air intake hose B        | 8. Air cleaner body    |
| 4. Resonator <2WD>          | 9. Air cleaner bracket |
| 5. Air cleaner cover        |                        |

## INTERCOOLER AND INTERCOOLER FAN-ECU

### REMOVAL AND INSTALLATION



05V0011  
00005154

#### Intercooler fan-ECU removal steps

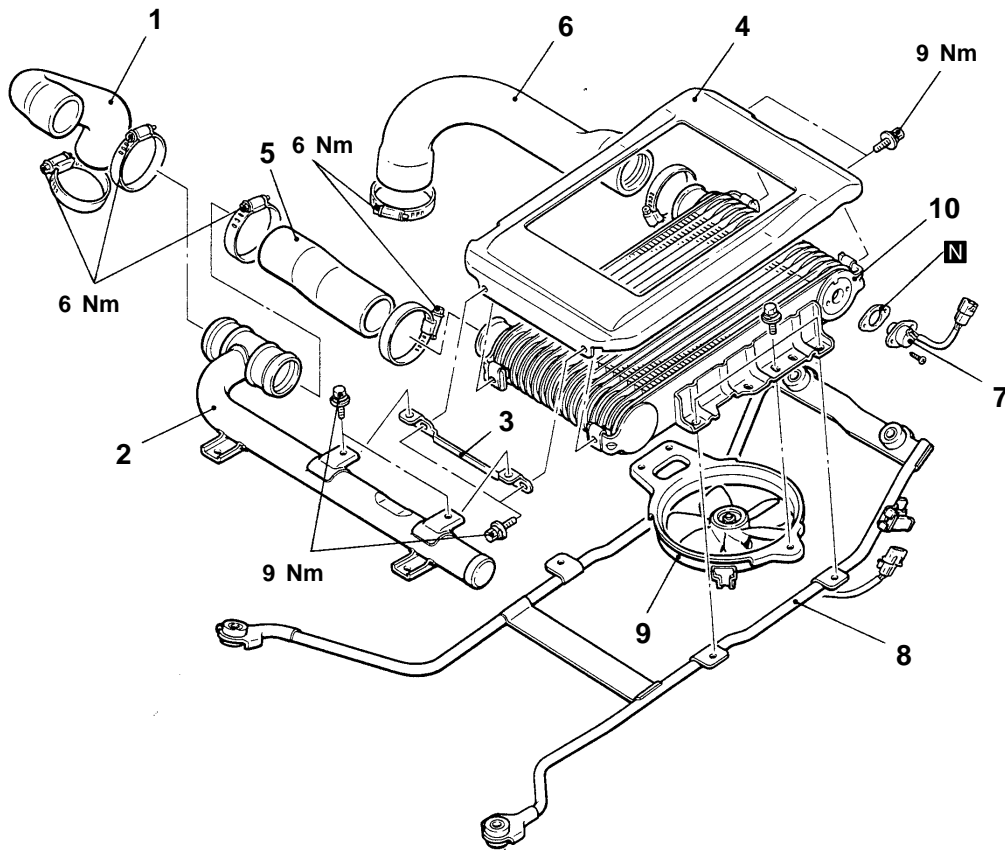
1. Scuff plate
2. Cowl side trim
3. Intercooler fan-ECU

#### 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. Front bracket
9. Intercooler and bracket assembly

DISASSEMBLY AND REASSEMBLY

15100660013



A05V0010

**Disassembly steps**

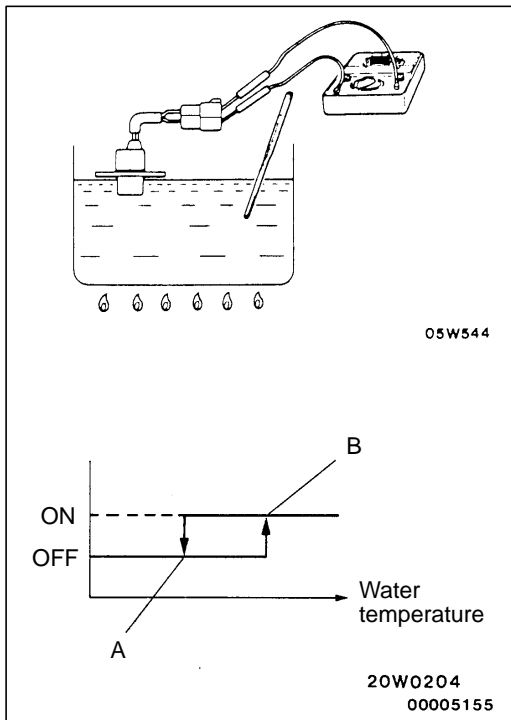
- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>1. Air hose A-2</li> <li>2. Blanch tube</li> <li>3. Blanch tube bracket</li> <li>4. Intercooler cover</li> <li>5. Air hose A-1</li> </ul> | <ul style="list-style-type: none"> <li>6. Air hose B</li> <li>7. Intake air temperature switch</li> <li>8. Intercooler bracket</li> <li>9. Fan and motor assembly</li> <li>10. Intercooler</li> </ul> |
|--|---|

**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

15100630014

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 <4G6>**

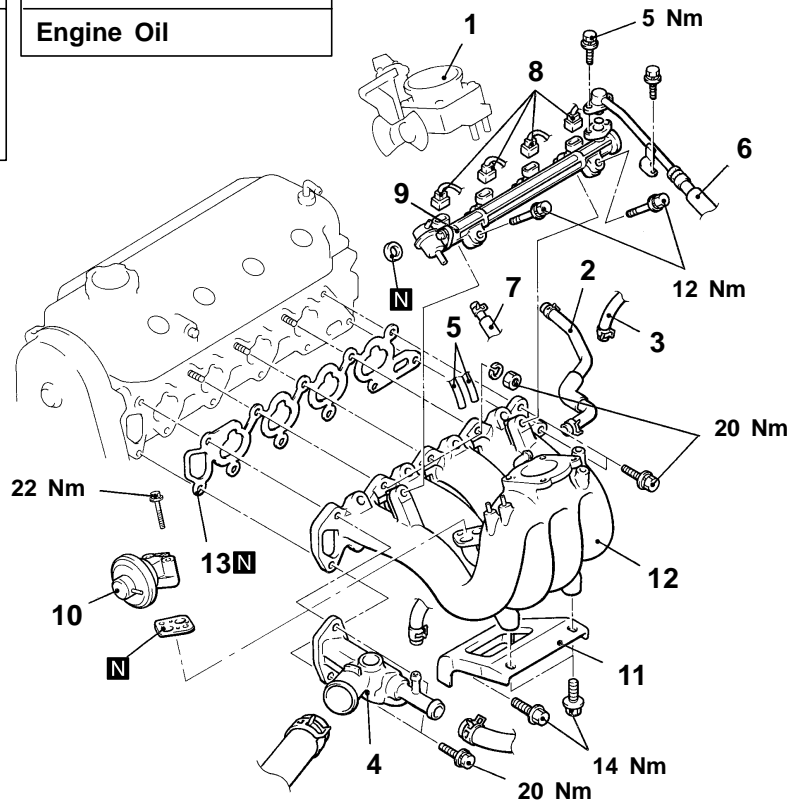
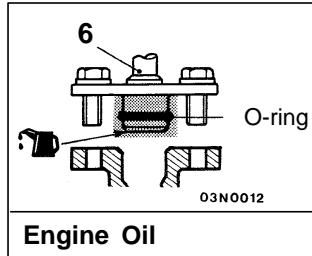
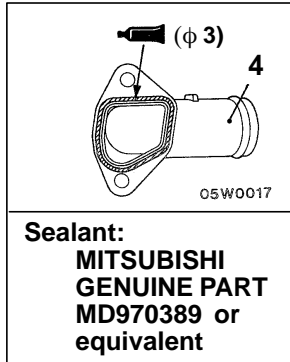
**REMOVAL AND INSTALLATION**

**Pre-removal Operation**

- Fuel Discharge Prevention (Refer to GROUP 13A – On-vehicle Service)
- Engine Coolant Draining
- Air Cleaner Removal (Refer to P. 15-4.)
- Battery and Battery Tray Removal

**Post -installation Operation**

- Engine Coolant Supplying
- Battery and Battery Tray Installation
- Air Cleaner Installation (Refer to P.15-4.)



05W0041

00000966

**Removal steps**

1. Throttle body (Refer to GROUP 13A – Throttle Body.)
2. PCV hose
3. Brake booster vacuum hose connection
4. Water outlet fitting
5. Vacuum hose connection
6. High-pressure fuel hose connection



7. Fuel return hose connection
8. Injector connector
9. Injector and delivery pipe assembly
10. EGR valve
11. Intake manifold stay
12. Intake manifold
13. Intake manifold gasket

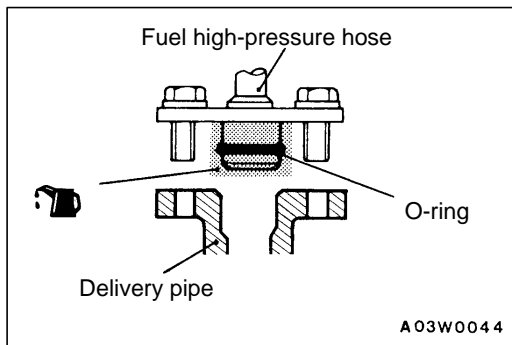


**REMOVAL SERVICE POINT****◀A▶ DELIVERY PIPE AND INJECTOR REMOVAL**

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 POINT****▶A◀ 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.

**INSPECTION**

15100310161

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**

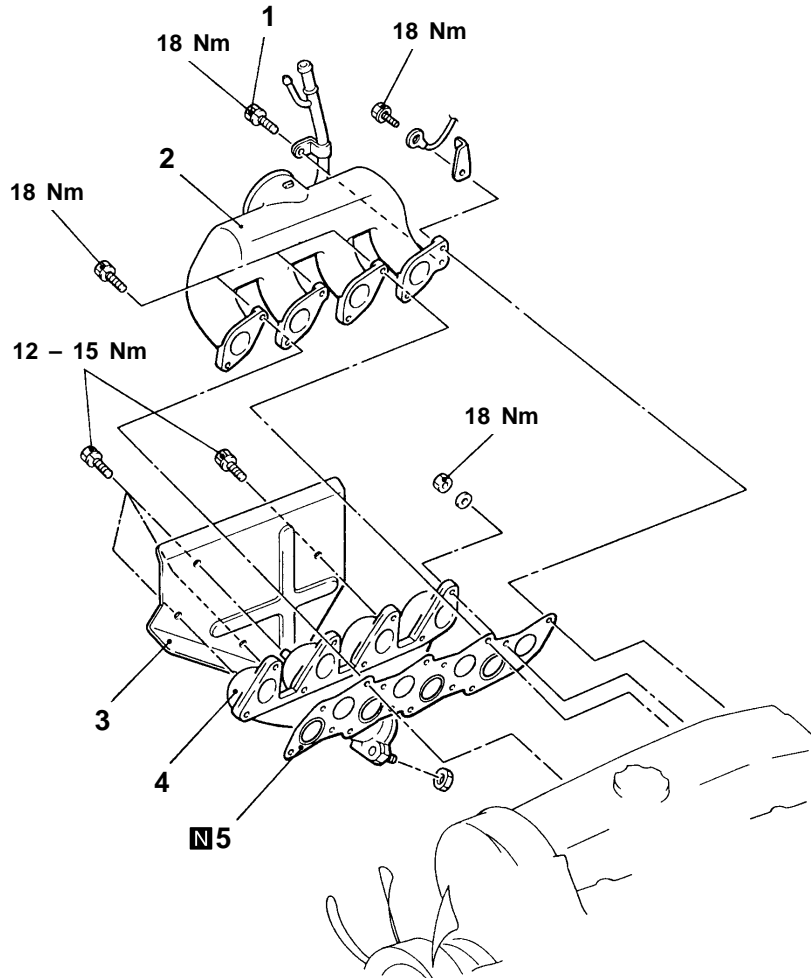
**INTAKE AND EXHAUST MANIFOLD <4D56-2WD>**

15100360029

**REMOVAL AND INSTALLATION**

**Pre-removal and Post-installation Operation**

- Front Exhaust Pipe Removal and Installation  
 (Refer to P.15-19.)



A05V0003

**Removal steps**

1. Vacuum pipe attaching bolt
2. Intake manifold
3. Heat protector
4. Exhaust manifold
5. Intake and exhaust manifold gasket

**INSPECTION**

15100370022

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

**INTAKE AND EXHAUST MANIFOLD CHECK**

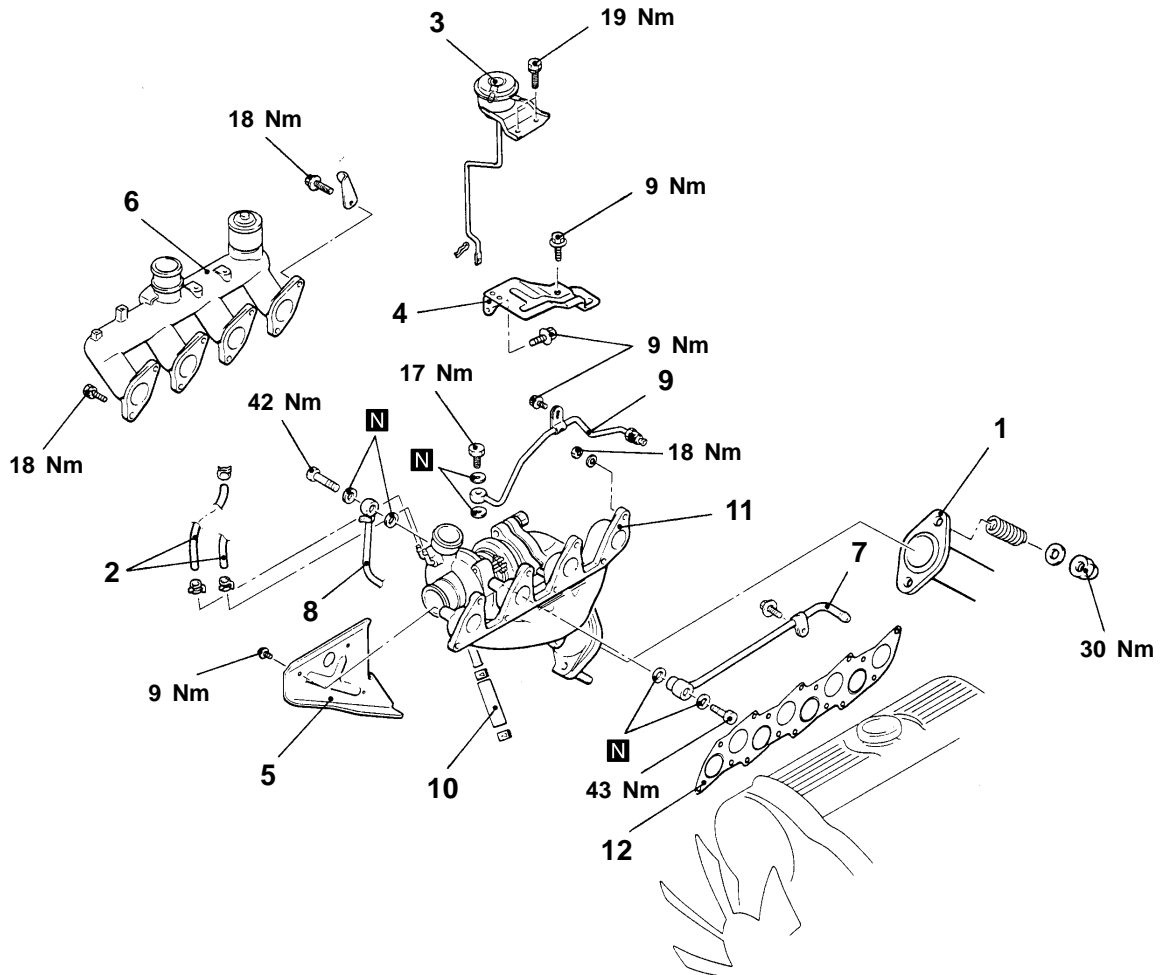
1. Check for damage or cracking of any part.
2. Using a straight edge and thickness gauge, check for distortion of the cylinder head installation gauge surface.

**Standard valve: 0.15 mm or less**

**Limit: 0.20 mm**

**TURBOCHARGER AND EXHAUST MANIFOLD <4D56-4WD>****REMOVAL AND INSTALLATION****Pre-removal and Post-installation Operation**

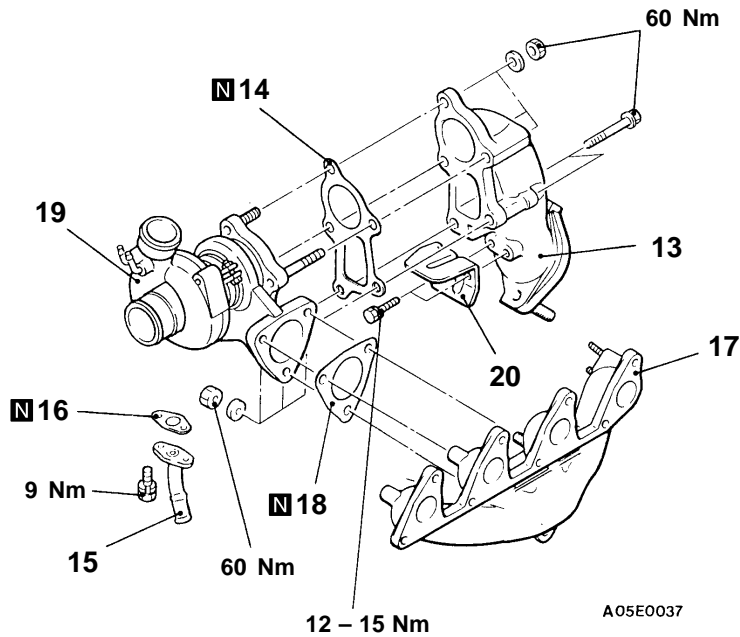
- Engine Coolant Draining and Supplying
- Air Cleaner Cover and Air Intake Hose Removal and Installation (Refer to P. 15-4.)
- Intercooler Removal and Installation (Refer to P. 15-6.)
- Brake Master Cylinder Heat Protector Removal and Installation



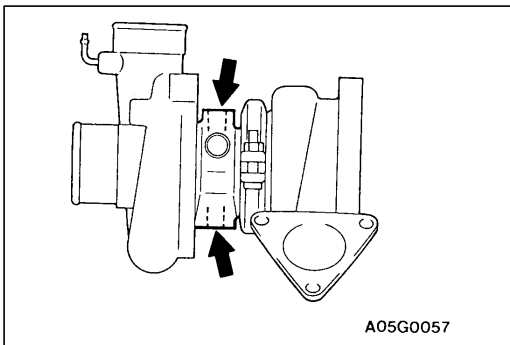
A05V0025

**Removal steps**

1. Front exhaust pipe connection
2. Boost hose
3. Waste gate actuator
4. Heat protector A
5. Heat protector
6. Intake manifold
7. Water pipe B
8. Water pipe A
9. Oil pipe
10. Oil return hose connection
11. Exhaust manifold and turbocharger assembly
12. Intake and exhaust manifold gasket



- 13. Exhaust fitting
- 14. Exhaust fitting gasket
- 15. Oil-return pipe
- 16. Oil-return pipe gasket
- 17. Exhaust manifold
- 18. Turbocharger gasket
- ▶A◀ 19. Turbocharger assembly
- 20. Heat protector



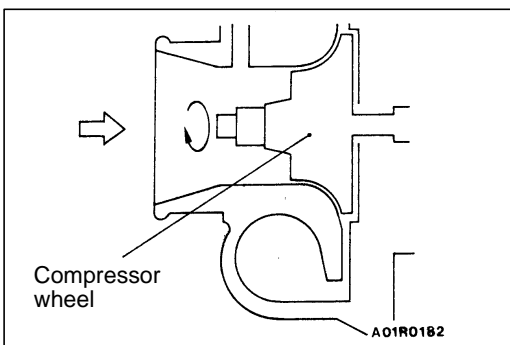
### INSTALLATION SERVICE POINT

#### ▶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** 15100650010

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

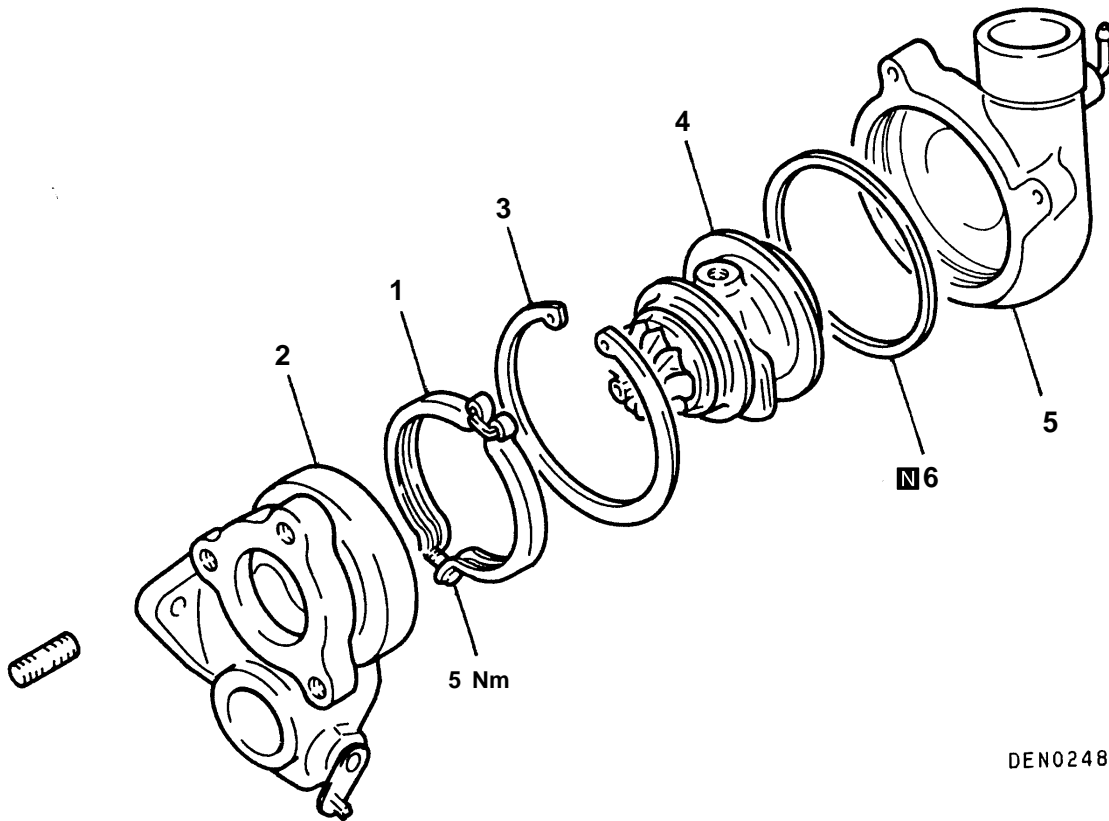
**EXHAUST MANIFOLD CHECK** 15100340108

Damage or cracking of any part.

**TURBOCHARGER**

15100600015

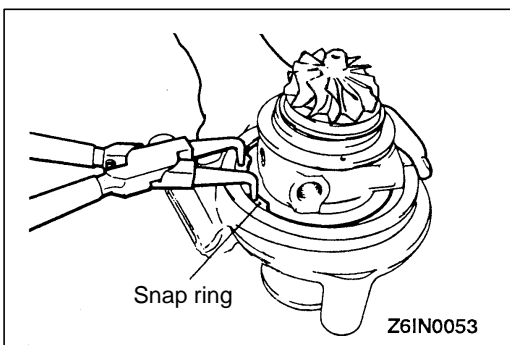
**DISASSEMBLY AND REASSEMBLY**



DEN0248

**Disassembly steps**

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



**DISASSEMBLY SERVICE POINTS**

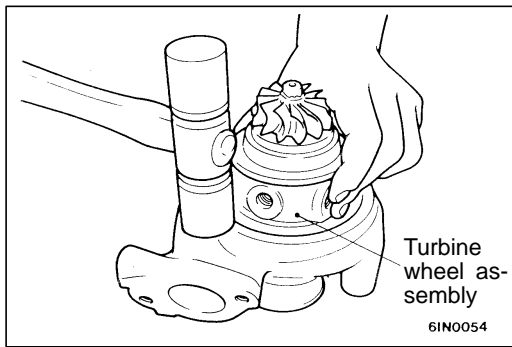
◀A▶ **SNAP RING REMOVAL**

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.**



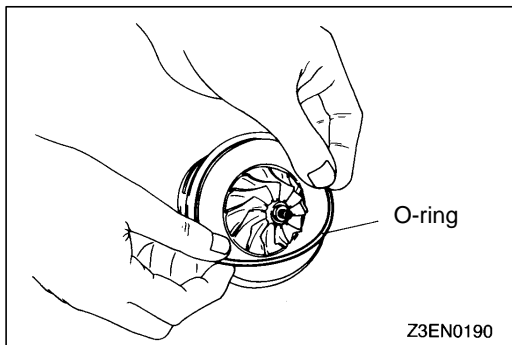


### ◀B▶ TURBINE WHEEL ASSEMBLY REMOVAL

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.



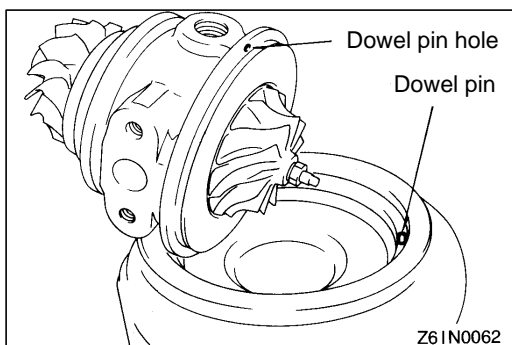
### REASSEMBLY SERVICE POINTS

#### ▶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.**

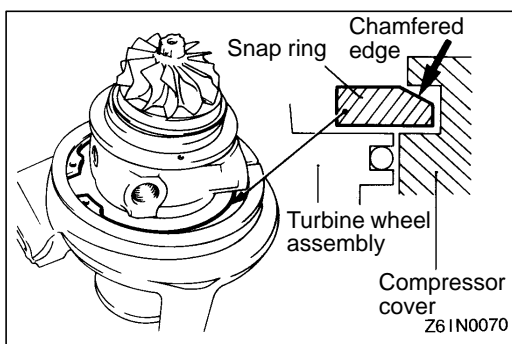


#### ▶B◀ TURBINE WHEEL ASSEMBLY

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.**

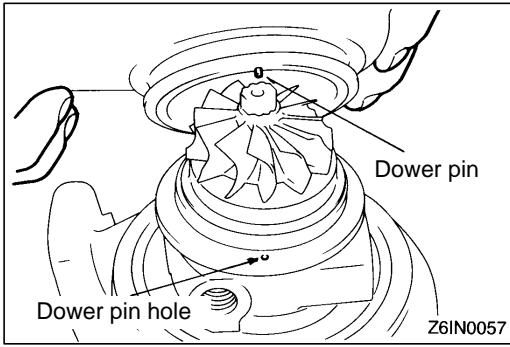


#### ▶C◀ SNAP RING INSTALLATION

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.**

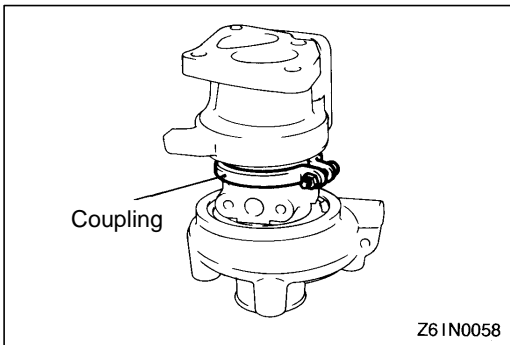


**►D◄ TURBINE HOUSING INSTALLATION**

Install the turbine housing in relation to the dowel pin.

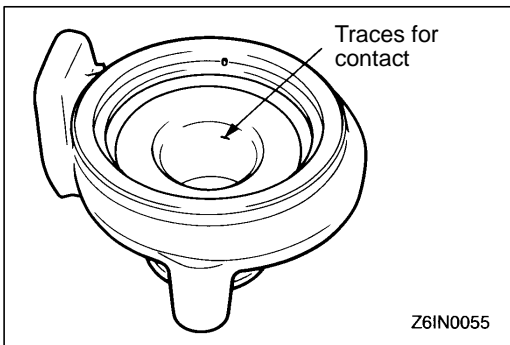
**Caution**

Use care not to damage the blades of turbine wheel.



**►E◄ COUPLING INSTALLATION**

Install the coupling and tighten to specified torque.

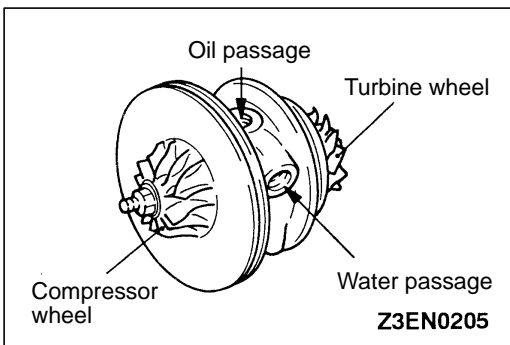


**INSPECTION**

15100610018

**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.

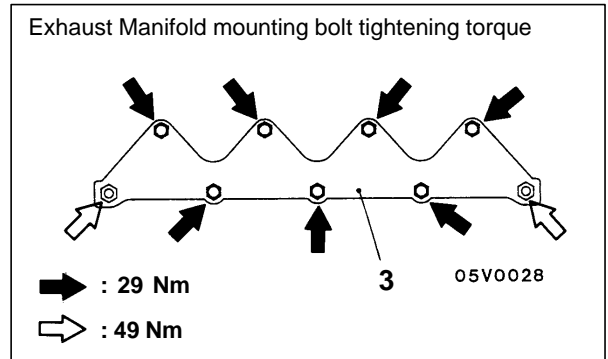
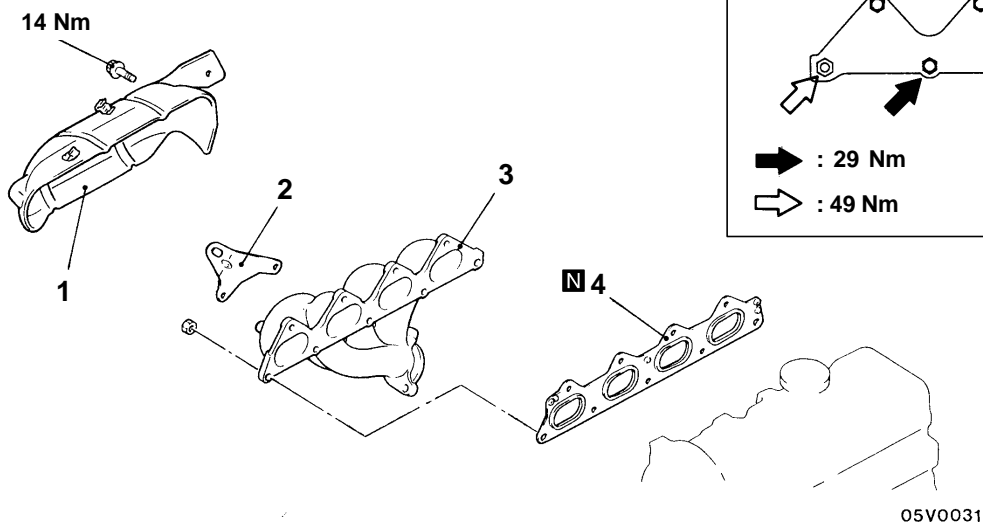
## EXHAUST MANIFOLD &lt;4G6&gt;

15100330327

## 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.)

**Removal steps**

1. Heat protector
2. Engine hanger
3. Exhaust manifold
4. Exhaust manifold gasket

**INSPECTION**

15100340115

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 thickness gauge, check for distortion of the cylinder head installation surface.

**Standard value: 0.15 mm or less**

**Limit: 0.20 mm**

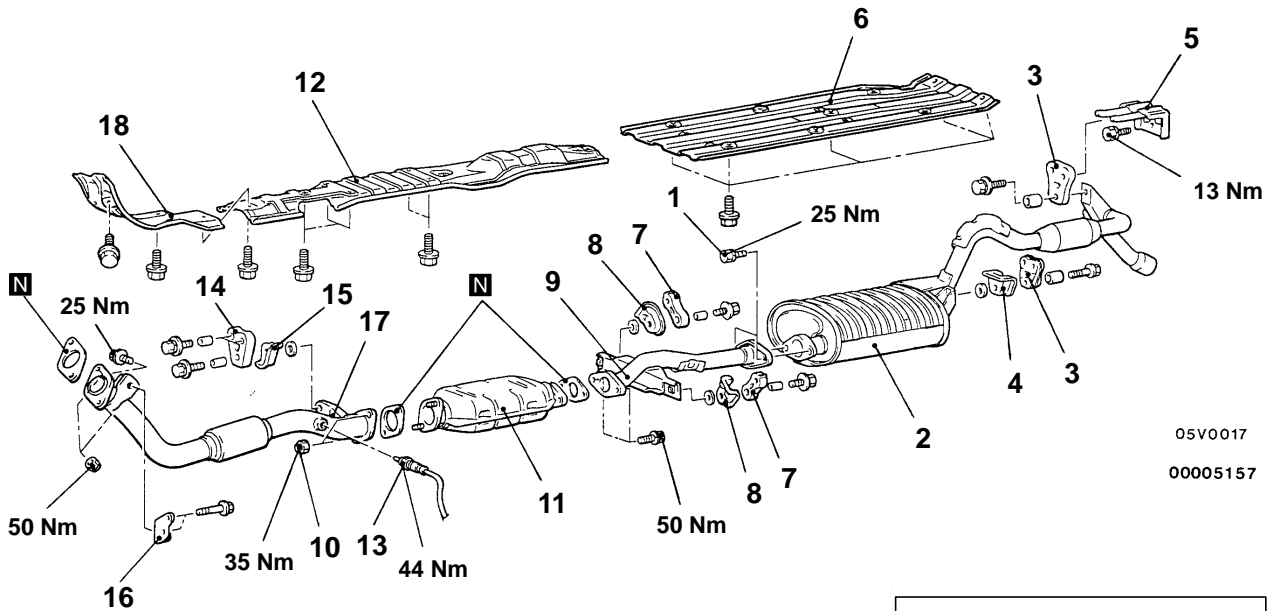
**EXHAUST PIPE AND MAIN MUFFLER**

**REMOVAL AND INSTALLATION**

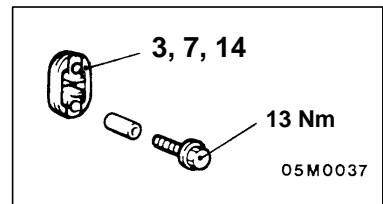
**Pre-removal and Post-installation Operation**

- Front Under Cover Removal and Installation <2WD>
- Front Under Cover and Transfer Case Protector Removal and Installation <4WD>

<4G63>



05V0017  
00005157



**Main muffler removal steps**

1. Bolt
2. Main muffler
3. Hanger
4. Heat protector
5. Hanger bracket
6. Rear body floor heat protector

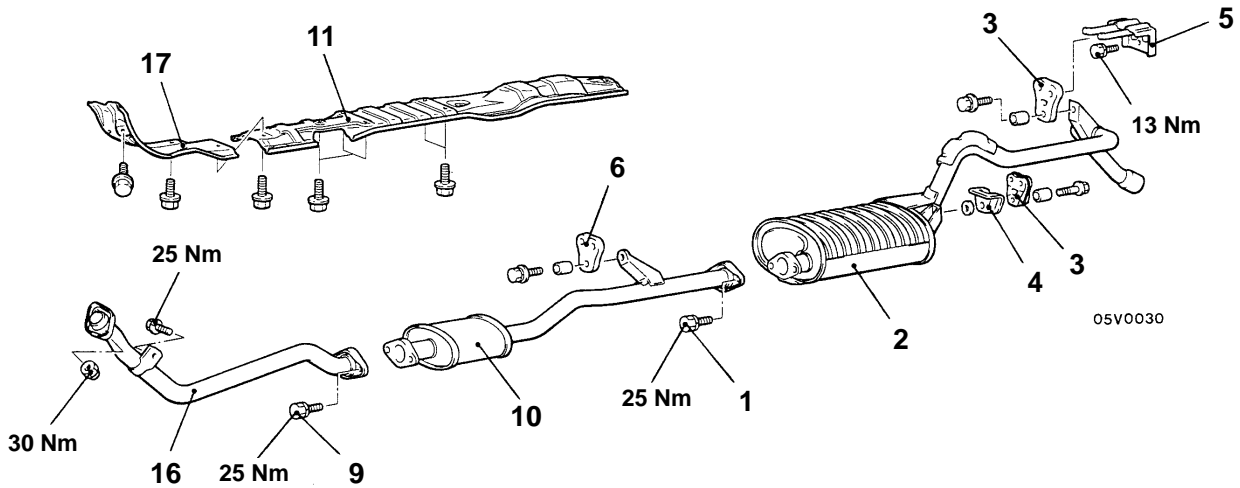
**Main muffler removal steps**

1. Bolt
7. Hanger
8. Heat protector
9. Center exhaust pipe
10. Nut
11. Catalytic converter
12. Front floor heat protector B

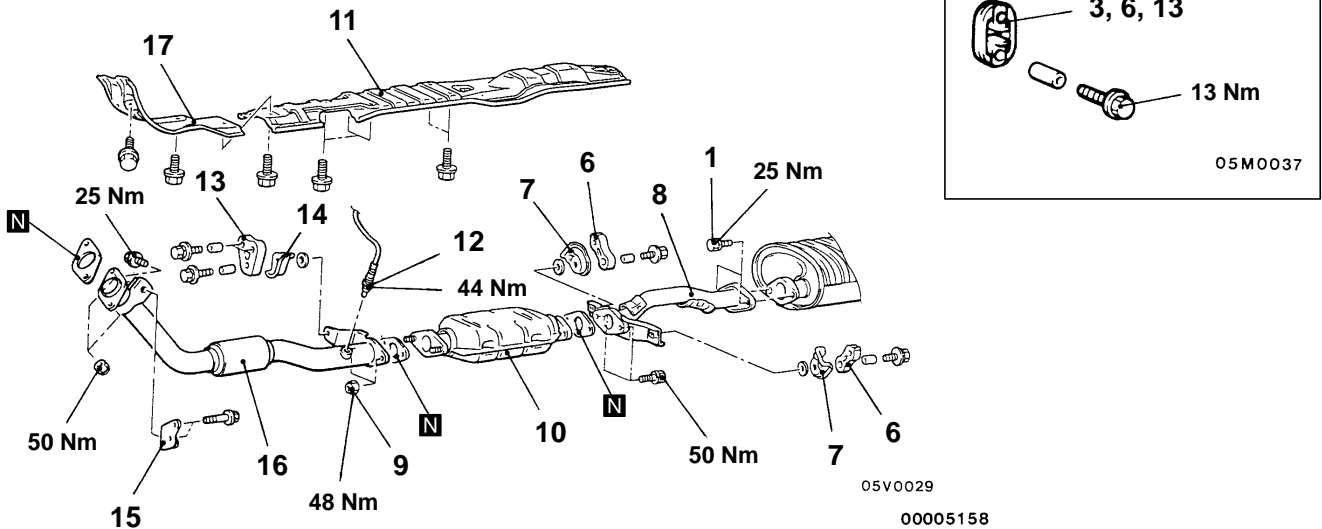
**Front exhaust pipe removal steps**

10. Nut
13. Oxygen sensor
14. Hanger
15. Heat protector
16. Exhaust support bracket
17. Front exhaust pipe
18. Front floor heat protector A

&lt;4D56&gt;



&lt;4G64&gt;

**Main muffler removal steps**

1. Bolt
2. Main muffler
3. Hanger
4. Heat protector
5. Hanger bracket

**Center exhaust pipe removal steps**

1. Bolt
6. Hanger
7. Heat protector
8. Center exhaust pipe
9. Bolt <4D56> or nut <4G64>
10. Catalytic converter
11. Front floor heat protector B

**Front exhaust pipe removal steps**

9. Bolt <4D56> or nut <4G64>
12. Oxygen sensor
13. Hanger
14. Heat protector
15. Exhaust support bracket
16. Front exhaust pipe
17. Front floor heat protector A

## GROUP 15

# INTAKE AND EXHAUST

### GENERAL

#### OUTLINE OF CHANGE(S)

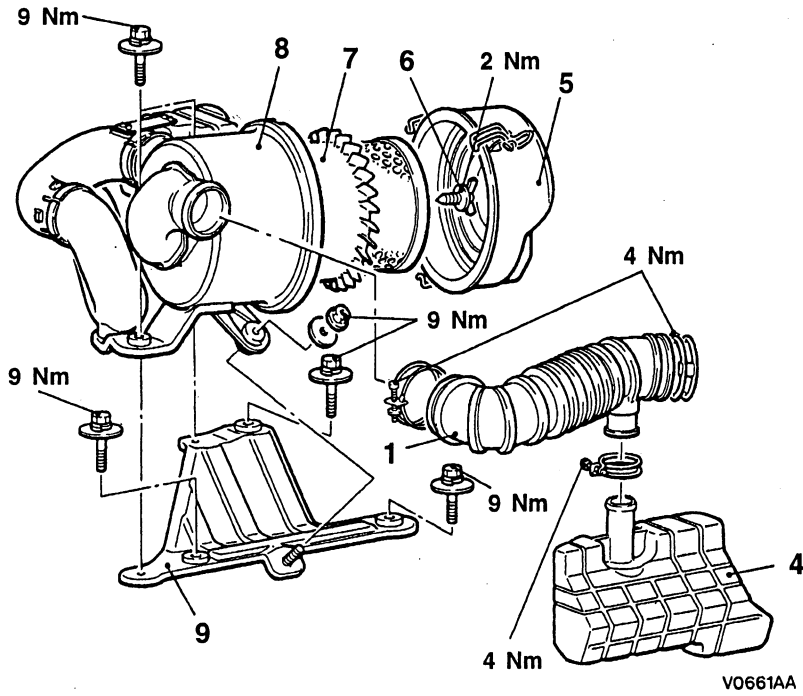
The service procedures have been changed due to the following modification.

- The air cleaner in the vehicles with 4D56 has been modified.
- EGR valves have been newly used in the vehicles with 4D56. Also, the manifold in the 2WD models has been modified.
- A catalytic converter and a flexible tube have been newly used in the 2WD models with 4D56.

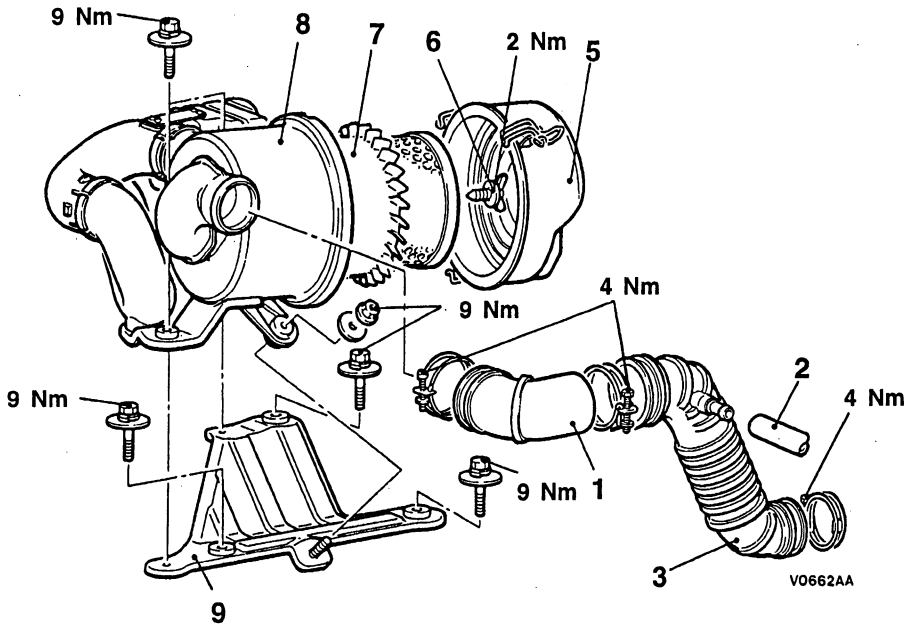
**AIR CLEANER**

**REMOVAL AND INSTALLATION**

<4D56-2WD>



<4D56-4WD>



**Removal steps**

1. Air intake hose A
2. Breather hose connection <4WD>
3. Air intake hose B <4WD>
4. Resonator <2WD>
5. Air cleaner cover

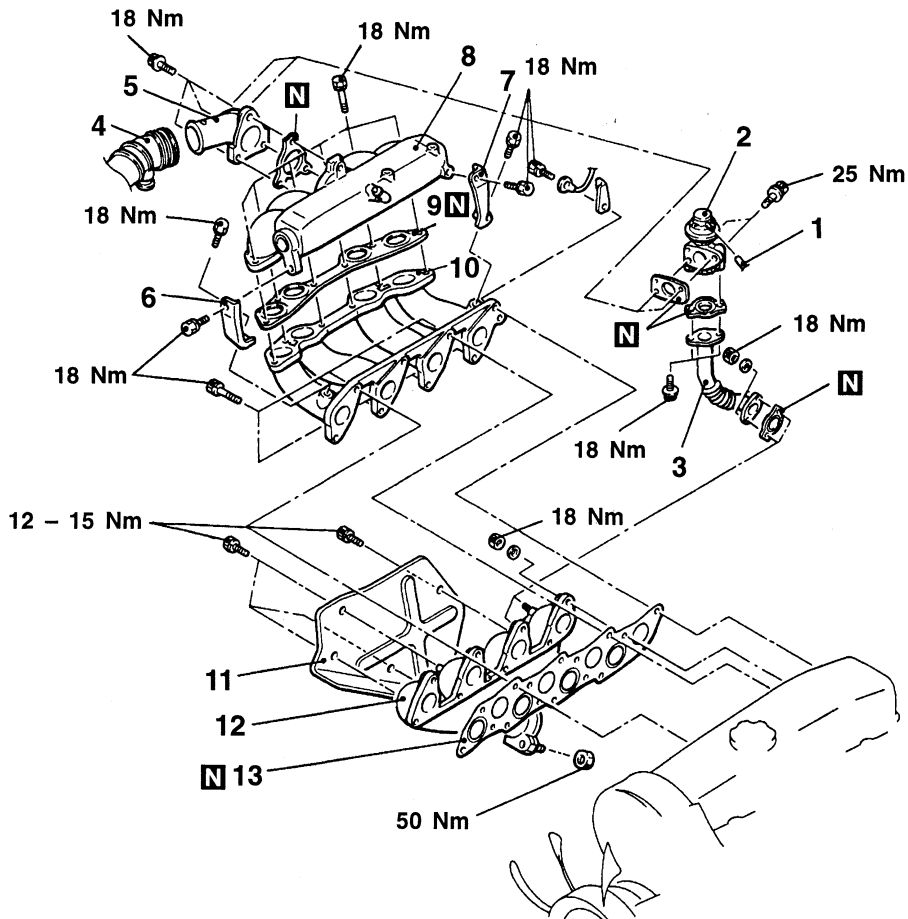
6. Bolt
7. Air cleaner element
8. Air cleaner body
9. Air cleaner bracket

00008511

## INTAKE AND EXHAUST MANIFOLD <4D56-2WD>

### REMOVAL AND INSTALLATION

- Pre-removal and Post-installation Operation**
- Front Exhaust Pipe Removal and Installation  
(Refer to P.15-5.)



AV0663AA

#### Removal steps

- |   |  |
|---|--|
| <ol style="list-style-type: none"> <li>1. Vacuum hose</li> <li>2. EGR valve</li> <li>3. EGR pipe</li> <li>4. Air intake hose A</li> <li>5. Air intake fitting</li> <li>6. Front intake manifold stay</li> <li>7. Rear intake manifold stay</li> </ol> | <ol style="list-style-type: none"> <li>8. Upper intake manifold</li> <li>9. Intake manifold gasket</li> <li>10. Lower intake manifold</li> <li>11. Heat protector</li> <li>12. Exhaust manifold</li> <li>13. Intake and exhaust manifold gasket</li> </ol> |
|---|--|

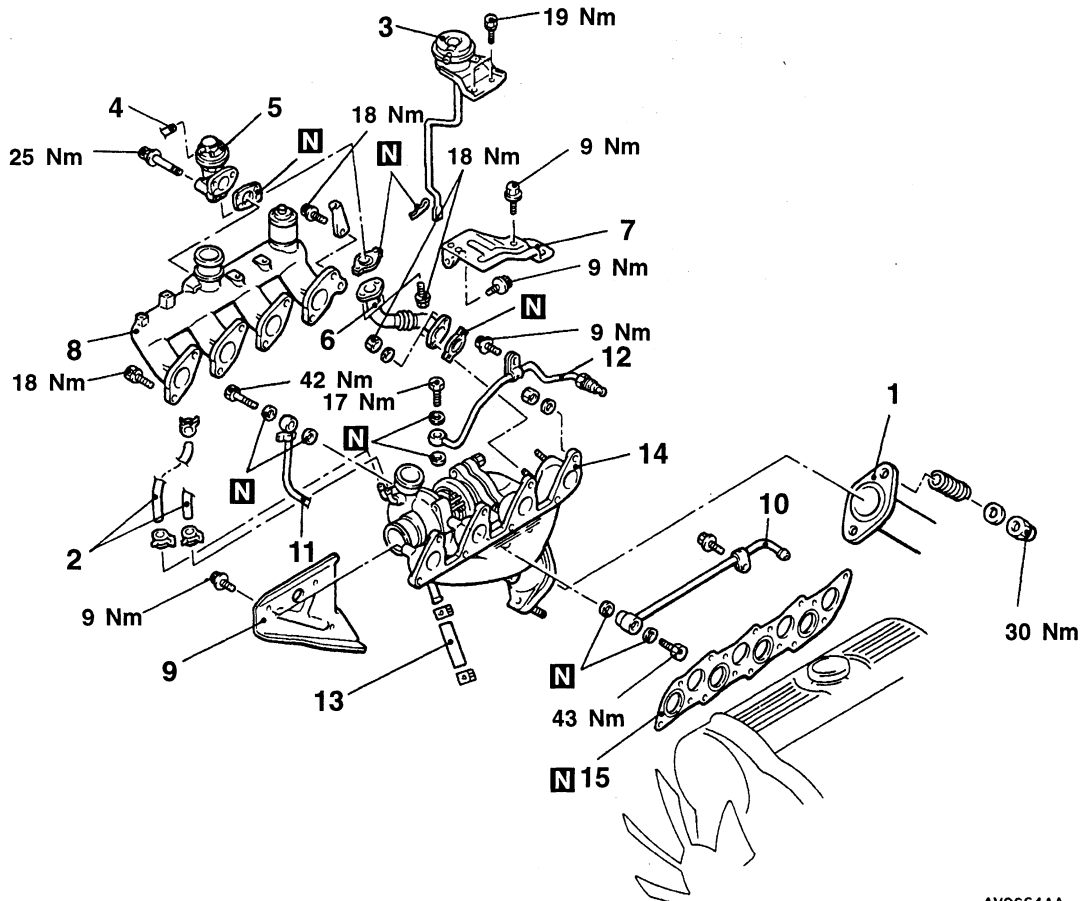


# TURBOCHARGER AND EXHAUST MANIFOLD <4D56-4WD>

## 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.15-2.)
- Intercooler Removal and Installation
- Brake Master Cylinder Heat Protector Removal and Installation



AV0664AA

**Removal steps**

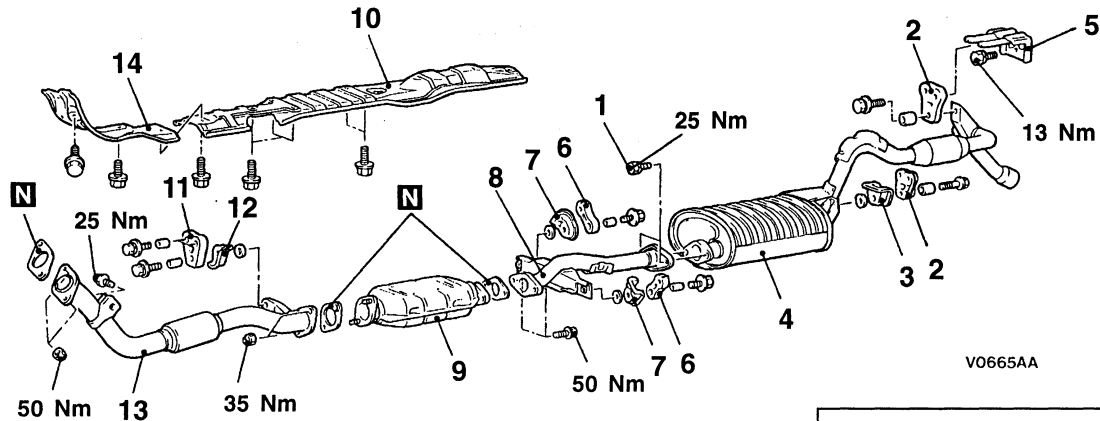
- |                                  |  |
|----------------------------------|--|
| 1. Front exhaust pipe connection | 9. Heat protector                              |
| 2. Boost hoses                   | 10. Water pipe B                               |
| 3. Waste gate actuator           | 11. Water pipe A                               |
| 4. Vacuum hose                   | 12. Oil pipe                                   |
| 5. EGR valve                     | 13. Oil return hose connection                 |
| 6. EGR pipe                      | 14. Exhaust manifold and turbocharger assembly |
| 7. Heat protector A              | 15. Intake and exhaust manifold gasket         |
| 8. Intake manifold               |  |

## EXHAUST PIPE AND MAIN MUFFLER

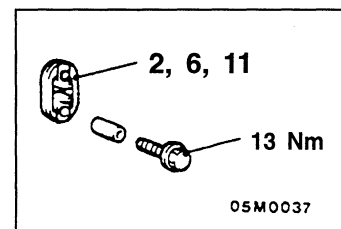
## REMOVAL AND INSTALLATION

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

&lt;4D56-2WD&gt;



V0665AA



00008512

**Main muffler removal steps**

1. Bolt
2. Hangers
3. Heat cover
4. Main muffler
5. Hanger bracket

**Center exhaust pipe removal steps**

1. Bolt
6. Hangers
7. Heat covers

8. Center exhaust pipe
9. Catalytic converter
10. Front floor heat protector B

**Front exhaust pipe removal steps**

11. Hanger
12. Heat cover
13. Front exhaust pipe
14. Front floor heat protector A

---

# INTAKE AND EXHAUST

## CONTENTS

<b>GENERAL</b> .....	<b>2</b>	Variable Geometry Solenoid Valve Check .....	5
Outline of Changes .....	2	Waste Gate Actuator Check .....	6
<b>SPECIAL TOOL &lt;4G64&gt;</b> .....	<b>2</b>	<b>AIR CLEANER &lt;4D56-Step III&gt;</b> .....	<b>6</b>
<b>SERVICE SPECIFICATIONS</b> .....	<b>2</b>	<b>INTERCOOLER &lt;4D56-Step III&gt;</b> .....	<b>6</b>
<b>ON-VEHICLE SERVICE</b> .....	<b>3</b>	<b>INTAKE AND EXHAUST MANIFOLD AND TURBOCHARGER &lt;4D56-Step III&gt;</b> .....	<b>7</b>
Turbocharger Supercharging Pressure Check ...	3	<b>EXHAUST PIPE AND MAIN MUFFLER &lt;4G64&gt;</b> .....	<b>11</b>
Supercharging Pressure Control System Check .....	4		
Variable Geometry Actuator Check .....	5		

---

## GENERAL

### OUTLINE OF CHANGES

With the modification below by additional emission regulation step III compatible 4D56 engine, the service procedure of the part that is different from previous service procedure has been established.

As the VG (Variable Geometry) turbocharger cannot be disassembled, the service procedure for the VG turbocharger is not described.

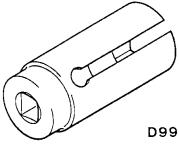
- The turbocharger and intercooler have been added to the vehicle with 2WD.
- The turbocharger of the vehicle with 4WD has been modified to VG (Variable Geometry) turbocharger.

With additional oxygen sensor by compatible emission regulation step III, the service procedure of 4G64 engine that is different from previous service procedure has been established.

#### NOTE

For description of structure and operation of VG (Variable Geometry) turbocharger, refer to '02 MY PAJERO Workshop Manual.

### SPECIAL TOOL <4G64>

Tool	Number	Name	Use
 D998770	MD998770	Oxygen sensor wrench	Removal/Installation of oxygen sensor

### SERVICE SPECIFICATIONS

Items	Standard Value
Variable geometry actuator activation vacuum (Approximately 1 mm stroke) kPa <Step III compatible 4D56-4WD>	Approximately 10.5 – 12.5
Waste gate actuator activation pressure (Approximately 1 mm stroke) kPa <Step III compatible 4D56-2WD>	Approximately 92
Variable geometry solenoid valve coil resistance (at 20°C) Ω <Step III compatible 4D56-4WD>	29 – 35

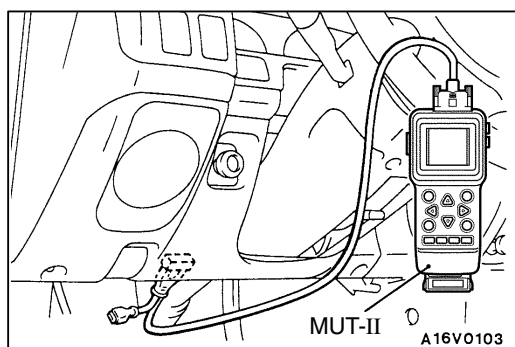
## ON-VEHICLE SERVICE

### TURBOCHARGER SUPERCHARGING PRESSURE CHECK

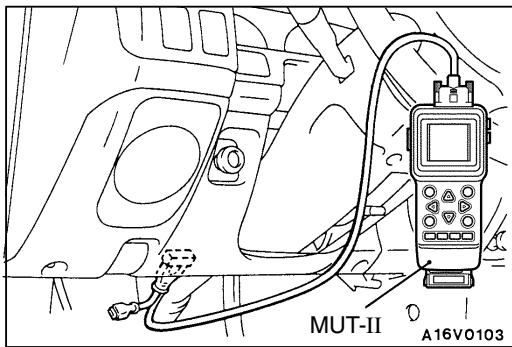
<Step III compatible 4D56-2WD and Step III compatible 4D56-4WD>

#### 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 MUT-II.



1. Set the vehicle to the pre-inspection condition.
2. Turn the ignition switch to “LOCK” (OFF) position, and connect the diagnosis connector to the MUT-II.
3. Use the data list function named “Item No. 04” boost pressure sensor of the MUT-II to check the supercharging pressure when the engine speed increases to approximately 3,000 r/min or more by driving at full acceleration in 2nd.
4. When the indicated supercharging pressure does not become positive pressure, check the following items.
  - Malfunction of the waste gate actuator <Step III compatible 4D56-2WD>
  - Malfunction of the boost pressure sensor
  - Leakage of supercharging pressure
  - Malfunction of the turbocharger
5. When the indicated supercharging pressure is 133 kPa or more <Step III compatible 4D56-4WD> or 84 kPa or more <Step III compatible 4D56-2WD>, supercharging control may be faulty, therefore check the followings.
  - Disconnection or cracks of the waste gate actuator rubber hose <Step III compatible 4D56-2WD>
  - Malfunction of the variable geometry actuator <Step III compatible 4D56-4WD>
  - Malfunction of the waste gate actuator <Step III compatible 4D56-2WD>
  - Malfunction of the variable nozzle <Step III compatible 4D56-4WD>
  - Malfunction of the waste gate valve <Step III compatible 4D56-2WD>
  - Malfunction of the variable geometry solenoid valve <Step III compatible 4D56-4WD>
  - Malfunction of the boost pressure sensor
  - Malfunction of the variable geometry control pressure sensor <Step III compatible 4D56-4WD>



## SUPERCHARGING PRESSURE CONTROL SYSTEM CHECK

### <Step III compatible 4D56-4WD>

1. Set the vehicle to the pre-inspection condition.
2. Turn the ignition switch to “LOCK” (OFF) position, and connect the diagnosis connector to the MUT-II.
3. Start the engine, and let it run at idle.
4. Select the actuator testing function named “Item No. 35 or No. 36” of the MUT-II to check that the variable geometry actuator vacuum and the supercharging pressure increase when the variable geometry solenoid valve is activated.

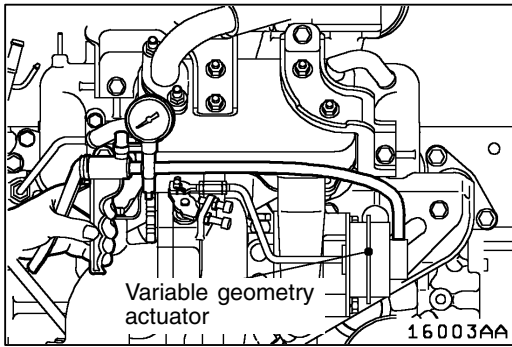
Variable geometry solenoid valve condition	Variable geometry actuator vacuum	Supercharging pressure
OFF	0 kPa	Approximately -1 kPa
ON	Approximately 80 kPa	Approximately 3 kPa

### NOTE

- (1) If the variable geometry actuator vacuum is not in a normal condition, the variable geometry actuator, variable geometry solenoid valve, variable geometry control pressure sensor, vacuum pump or hose may be faulty.
- (2) If the variable geometry actuator vacuum is in a normal condition but the supercharging pressure is not in a normal condition, the variable geometry turbocharger nozzle, boost pressure sensor, or hose may be faulty.

### Caution

**Be careful not to forcibly activate the variable geometry solenoid valve to the fullest degree when running at a high speed. Too much supercharging pressure could damage the engine or the turbocharger.**



**VARIABLE GEOMETRY ACTUATOR CHECK**

<Step III compatible 4D56-4WD>

1. Connect the hand vacuum pump to nipple.
2. While gradually applying vacuum, check the vacuum that begins to active (approximately 1 mm stroke) the variable geometry actuator rod.

**Standard value: Approximately 10.5 – 12.5 kPa**

**Caution**

**In order to avoid damage to the diaphragm, do not apply a vacuum of 59 kPa or higher.**

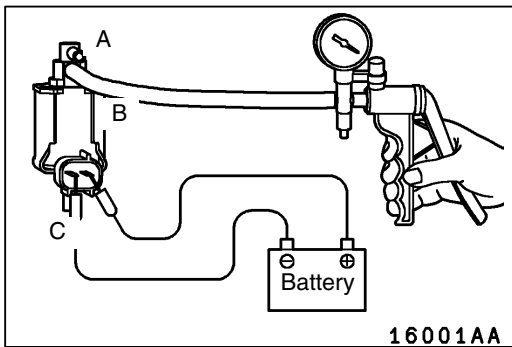
3. If there is a significant deviation from the standard value, check the actuator or the variable nozzle: replace if necessary.

**VARIABLE GEOMETRY SOLENOID VALVE CHECK**

<Step III compatible 4D56-4WD>

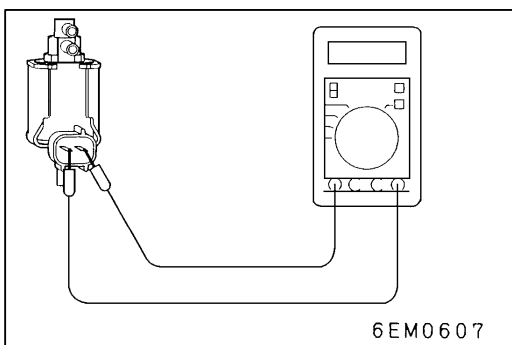
**NOTE**

When disconnecting the vacuum hose, always make a mark so that it can be reconnected at original position.



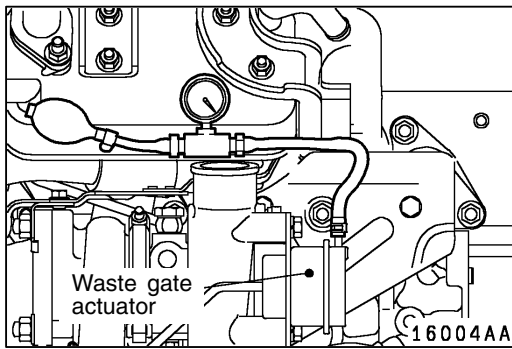
1. Disconnect the vacuum hose (black, red stripe) from the solenoid valve.
2. Disconnect the harness connector.
3. Connect a hand vacuum pump to the nipple to which the red striped vacuum hose was connected.
4. Check airtightness by applying a vacuum with voltage applied directly from the battery to the variable geometry solenoid valve and without applying voltage.

Battery voltage	Nipple condition	Normal condition
Applied	Both nipples are opened.	Vacuum leaks.
	Nipple A is closed.	Vacuum is maintained.
Not applied	Both nipples are opened.	Vacuum leaks.
	Nipple C is closed.	Vacuum is maintained.



5. Measure the resistance between the terminals of the solenoid valve.

**Standard value: 29 – 35 Ω (at 20°C)**



## WASTE GATE ACTUATOR CHECK

### <Step III compatible 4D56-2WD>

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: Approximately 92 kPa**

#### Caution

**In order to avoid damage to the diaphragm, do not apply a pressure of 105 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.

## AIR CLEANER <4D56-Step III>

With additional turbocharger of the vehicle with 2WD, the air cleaner is modified to the air cleaner of the vehicle with 4WD. The service procedure is same as one of the vehicle with 4WD.

## INTERCOOLER <4D56-Step III>

With additional air temperature sensor by adopting electronic-controlled injection pump, the air temperature switch of the intercooler is not adopted. The service procedure is same as previous service procedure except for the air temperature sensor.

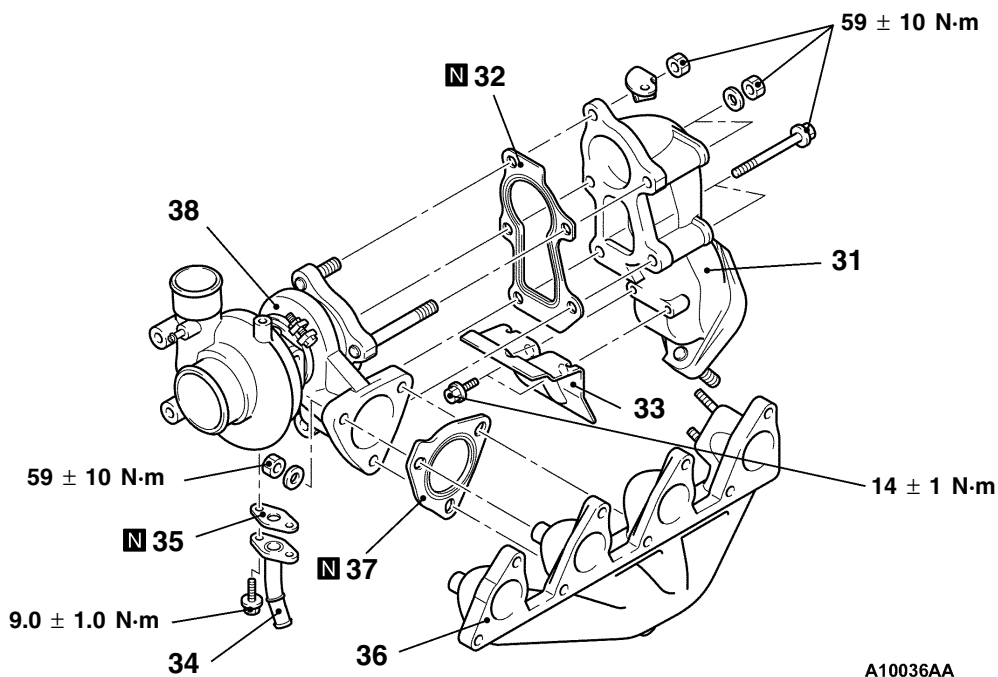
On new models, the engine-ECU controls the intercooler fan. Due to this change, the intercooler fan-ECU has been discontinued.





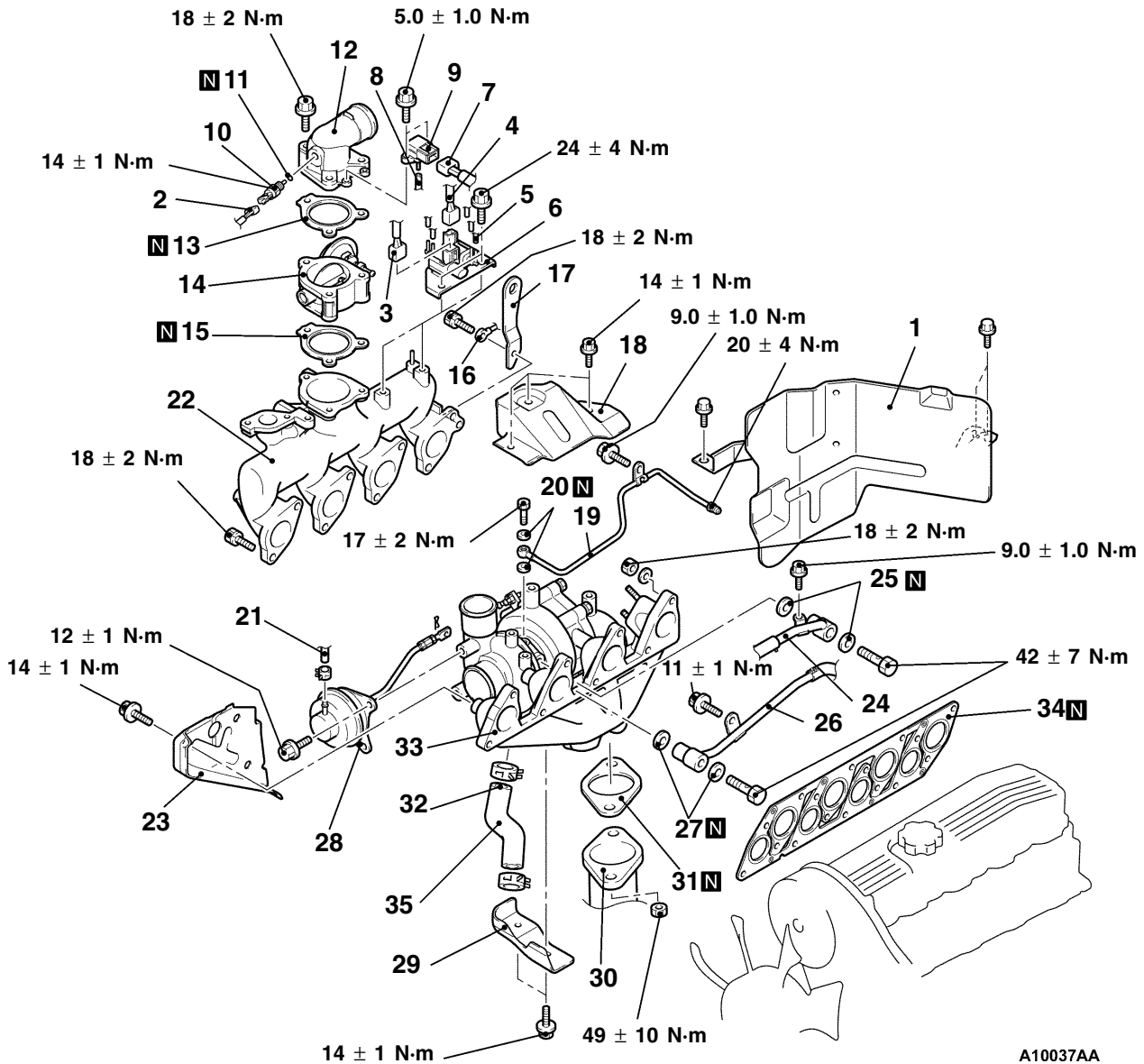
**Removal steps**

- |  |  |
|--|--|
| 1. Brake master cylinder heat protector  | 16. Gasket                                     |
| 2. Air temperature sensor connector      | 17. Oil pipe assembly                          |
| 3. Throttle solenoid valve connector     | 18. Gasket                                     |
| 4. Vacuum hose connection                | 19. Intake manifold                            |
| 5. Throttle valve solenoid assembly      | 20. Exhaust manifold heat protector            |
| 6. Air temperature sensor                | 21. Water pipe B connection                    |
| 7. Gasket                                | 22. Gasket                                     |
| 8. Air intake fitting                    | 23. Boost hose                                 |
| 9. Gasket                                | 24. Waste gate actuator                        |
| 10. Throttle body assembly               | 25. Front exhaust pipe connection              |
| 11. Gasket                               | 26. Gasket                                     |
| 12. Earth cable connection               | 27. Oil return hose connection                 |
| 13. Engine hanger                        | 28. Exhaust manifold and turbocharger assembly |
| 14. Turbocharger heat protector          | 29. Intake and exhaust manifold gasket         |
| 15. Water pipe A and water hose assembly | 30. Oil return hose                            |



- |                            |                               |
|----------------------------|-------------------------------|
| 31. Exhaust fitting        | 35. Oil return pipe gasket    |
| 32. Exhaust fitting gasket | 36. Exhaust manifold          |
| 33. Heat protector         | 37. Turbocharger gasket       |
| 34. Oil return pipe        | ▶A◀ 38. Turbocharger assembly |

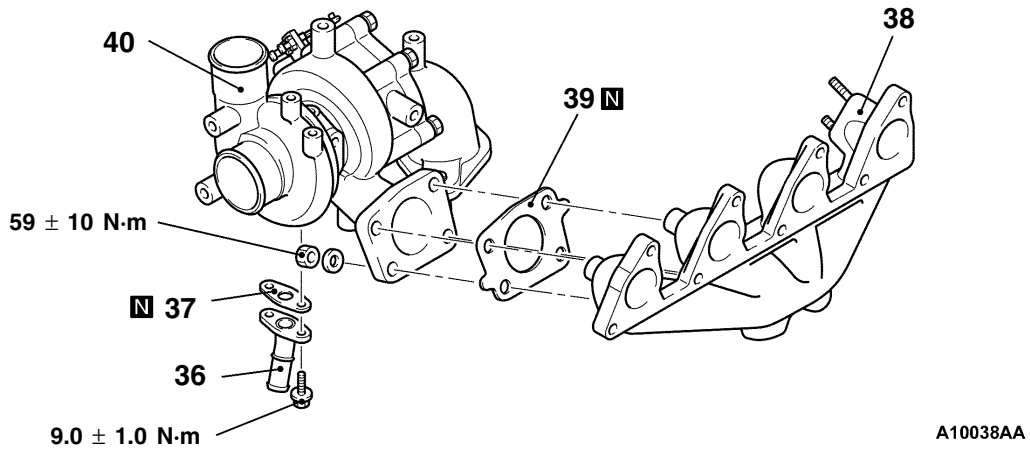
<4WD>



A10037AA

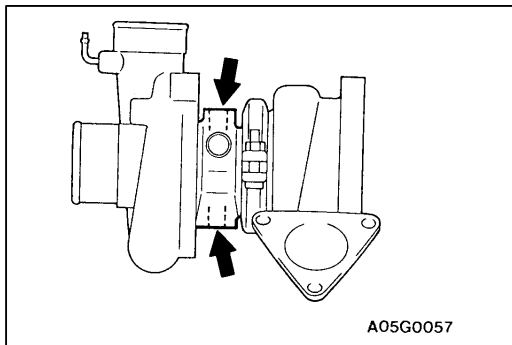
**Removal steps**

- |   |  |
|---|--|
| <ol style="list-style-type: none"> <li>1. Brake master cylinder heat protector</li> <li>2. Air temperature sensor connector</li> <li>3. Throttle solenoid valve connector</li> <li>4. VGT solenoid valve connector</li> <li>5. Vacuum hose connection</li> <li>6. Solenoid valve assembly</li> <li>7. VG control pressure sensor connector</li> <li>8. Vacuum hose connection</li> <li>9. VG control pressure sensor</li> <li>10. Air temperature sensor</li> <li>11. Gasket</li> <li>12. Air intake fitting</li> <li>13. Gasket</li> <li>14. Throttle body assembly</li> <li>15. Gasket</li> <li>16. Earth cable connection</li> <li>17. Engine hanger</li> <li>18. Turbocharger upper heat protector</li> </ol> | <ol style="list-style-type: none"> <li>19. Oil pipe assembly</li> <li>20. Gasket</li> <li>21. Vacuum hose connection</li> <li>22. Intake manifold</li> <li>23. Exhaust manifold heat protector</li> <li>24. Water pipe A and water hose assembly</li> <li>25. Gasket</li> <li>26. Water pipe B connection</li> <li>27. Gasket</li> <li>28. VG actuator</li> <li>29. Turbocharger lower heat protector</li> <li>30. Front exhaust pipe connection</li> <li>31. Gasket</li> <li>32. Oil return hose connection</li> <li>33. Exhaust manifold and turbocharger assembly</li> <li>34. Intake and exhaust manifold gasket</li> <li>35. Oil return hose</li> </ol> |
|---|--|



- 36. Oil return pipe
- 37. Oil return pipe gasket
- 38. Exhaust manifold

- ▶◀ 39. Turbocharger gasket
- ▶◀ 40. Turbocharger assembly



**INSTALLATION SERVICE POINT**

**▶◀ 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**

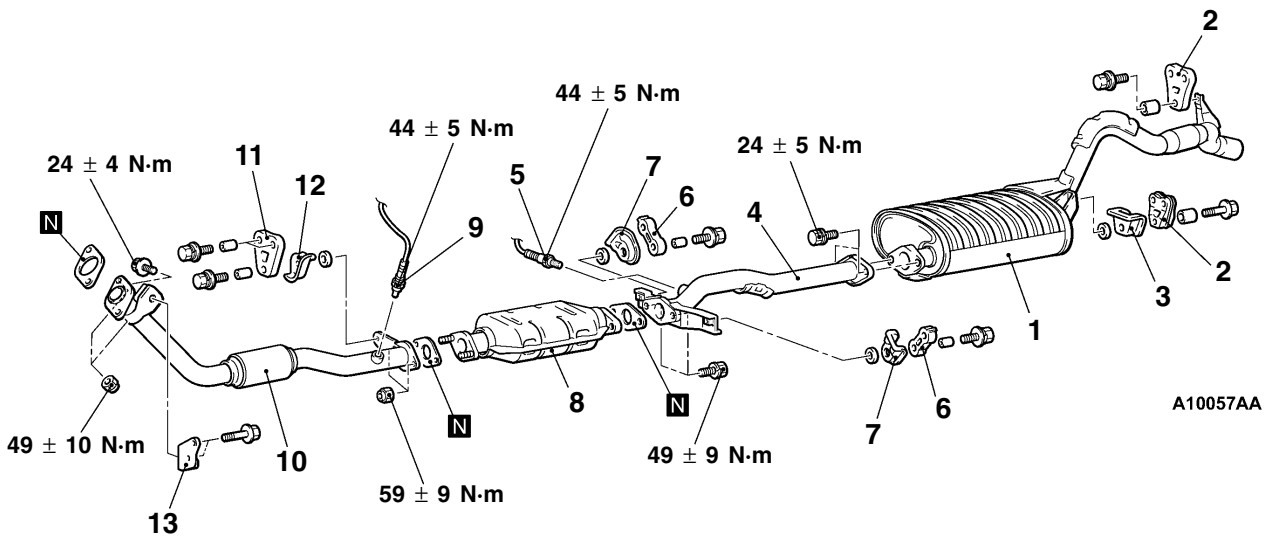
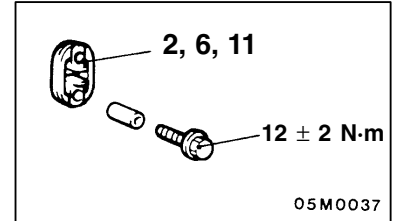
**When cleaning, take care that no foreign material gets into the engine coolant or oil passages hole.**

# EXHAUST PIPE AND MAIN MUFFLER <4G64>

## REMOVAL AND INSTALLATION

**Pre-removal and Post-installation Operation**

- Front Under Cover Removal and Installation <2WD>
- Front Under Cover and Transfer Case Protector Removal and Installation <4WD>



**Main muffler removal steps**

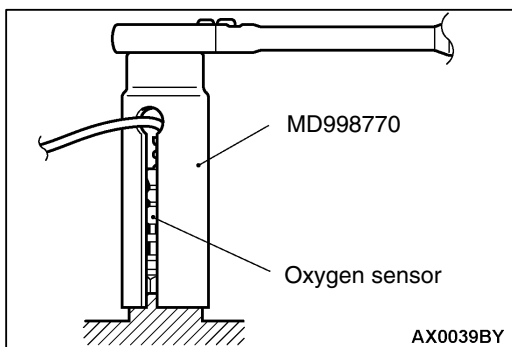
1. Main muffler
2. Hanger
3. Heat protector

**Center exhaust pipe removal steps**

4. Center exhaust pipe
5. Oxygen sensor
6. Hanger
7. Heat protector
8. Catalytic converter

**Front exhaust pipe removal steps**

9. Oxygen sensor
10. Front exhaust pipe
11. Hanger
12. Heat protector
13. Exhaust support bracket



**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.

---

## NOTES