

GROUP 15

INTAKE AND EXHAUST

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GENERAL DESCRIPTION

M1151000100361

The exhaust pipe is divided into three parts.

INTAKE AND EXHAUST DIAGNOSIS

INTRODUCTION

M1151006900291

Intake leaks usually create driveability issues that are not obviously related to the intake system. Exhaust leaks or abnormal noise is caused by cracks, gaskets and fittings, or by when the exhaust pipe or muffler is damaged due to impacts during travel. The exhaust leaks from these sections and causes the exhaust noise to increase. There may be cases when the system contacts the body and vibration noise is generated.

TROUBLESHOOTING STRATEGY

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Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure that you have exhausted most of the possible ways to find an intake or exhaust system fault.

1. Gather information from the customer.

2. Verify that the condition described by the customer exists.
3. Find the malfunction by following the Symptom Chart.
4. Verify malfunction is eliminated.

SYMPTOM CHART

M1151007100298

SYMPTOM	INSPECTION PROCEDURE	REFERENCE PAGE
Exhaust Leakage	1	P.15-2
Abnormal Noise	2	P.15-3

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Exhaust Leakage

DIAGNOSIS

STEP 1. Start the engine. Have an assistant stay in the driver's seat. Raise the vehicle on a hoist. Have the assistant rev the engine while searching for exhaust leaks.

Q: Is the exhaust leaking?

YES : Go to Step 2.

NO : The procedure is complete.

STEP 2. Check the gasket for cracks, damage.

Q: Is the gasket damaged?

YES : Replace the gasket, then go Step 1.

NO : Go to Step 3.

STEP 3. Check for loosening in each coupling section.

Q: Is there any loosening in each section?

YES : Tighten, then go to Step 1.

NO : There is no action to be taken.

INSPECTION PROCEDURE 2: Abnormal Noise

DIAGNOSIS

STEP 1. Start the engine. Have an assistant stay in the drivers seat. Raise the vehicle on a hoist. Have the assistant rev the engine while searching for exhaust leaks.

Q: Is any abnormal noise generated?
YES : Go to Step 2.
NO : The procedure is complete.

STEP 2. Check for missing parts in the muffler. Tap the muffler lightly to check for loose baffles, etc.

Q: Are there any missing parts in the muffler?
YES : Replace, then go to Step 1.
NO : Go to Step 3.

STEP 3. Check the hanger for cracks.

Q: Is the hanger cracked?
YES : Replace, then go to Step 1.
NO : Go to Step 4.

STEP 4. Check for interference of the pipes and muffler with the body.

Q: Are the pipes and muffler interfering with the body?
YES : Repair, then go to Step 1.
NO : Go to Step 5.

STEP 5. Check the heat protectors.

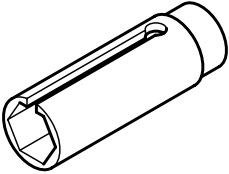
Q: Are any heat protectors loose or damaged?
YES : Tighten or replace, then go to Step 1.
NO : Go to Step 6.

STEP 6. Check the pipes, catalytic converters and muffler for damage.

Q: Are the pipes, catalytic converters and muffler damaged?
YES : Replace, then go to Step 1.
NO : There is no action to be taken.

SPECIAL TOOL

M1151000600333

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
	MD998770 Oxygen sensor wrench	MD998770-01 or General service tool	Removal and installation of heated oxygen sensor

TROUBLESHOOTING

M1151010200024

Symptom	Probable cause	Remedy
Exhaust gas leakage	Loose joints	Retighten
	Broken pipe or muffler	Repair or replace
Abnormal noise	Broken baffle in muffler	Replace
	Broken rubber hangers	Replace
	Interference of pipe or muffler with vehicle body	Correct
	Broken pipe or muffler	Repair or replace

ON-VEHICLE SERVICE

MANIFOLD VACUUM CHECK

M1151001800181

Refer to GROUP 11A, Engine Mechanical –On-vehicle Service
–Manifold Vacuum Check. [P.11A-12](#)

INTAKE CHARGE PRESSURE CHECK

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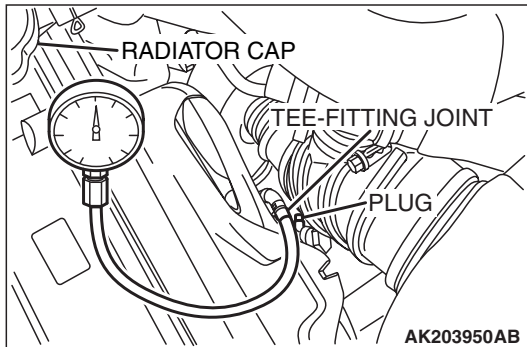
⚠ CAUTION

Do a test drive with two persons in the vehicle and where full throttle acceleration can be safely made. The front passenger should read the pressure gauge, not the driver.

1. Disconnect the hose (black) from the tee-fitting joint and connect the pressure gauge to this joint. Plug the hose (black).
2. Drive the vehicle with full throttle and accelerate the engine to a speed of more than 3,500 r/min at 2nd gear. Measure the intake charge pressure when the pointer is stabilized.

Standard value: 112 – 139 kPa (16.2 – 20.2 psi)

3. If the intake charge pressure is lower than the standard value, check the following items for possible cause.
 - Malfunction of turbocharger wastegate actuator.
 - Intake charge pressure leaks.
 - Faulty turbocharger.
4. If the intake charge pressure is higher than the standard value, the intake charge pressure control may be faulty. Therefore check the following.
 - Malfunction of turbocharger wastegate actuator.
 - Malfunction of turbocharger wastegate regulating valve.
 - Disconnected or cracked turbocharger wastegate actuator hose.



TURBOCHARGER WASTEGATE ACTUATOR CHECK

M1151001200134

1. Connect a hand vacuum pump (pressure-application type) to nipple.

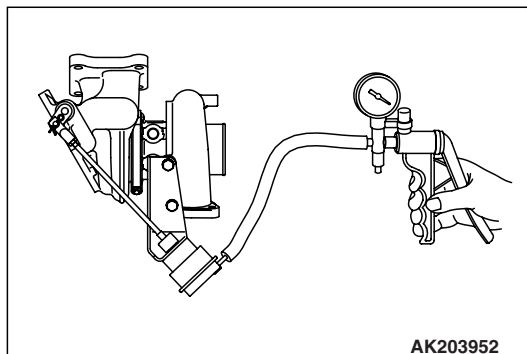
⚠ CAUTION

In order to avoid damage to the diaphragm, do not apply a pressure of 117 kPa (17 psi) or higher.

2. While gradually applying pressure, check the pressure that begins to activate (approximately 1 mm stroke) the wastegate actuator rod.

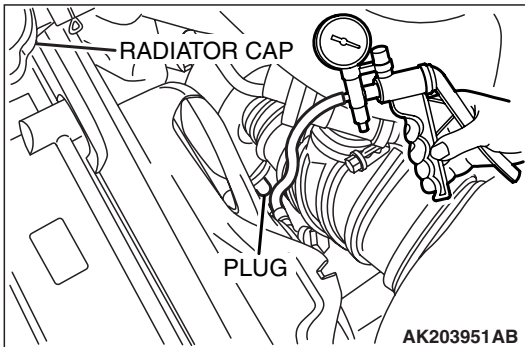
Standard value: Approximately 100 kPa (15 psi)

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



INTAKE CHARGE PRESSURE CONTROL SYSTEM CHECK

M1151001100171



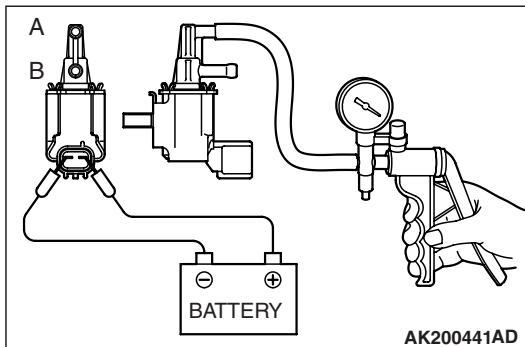
1. After the diagnostic trouble code of MFI system is read, turn off the ignition switch.
2. Disconnect the hose (black) from the turbocharger wastegate actuator control boost nipple at the air outlet fitting and plug this nipple.
3. Connect a hand vacuum pump to the hose (black).
4. Use the vacuum pump to apply negative pressure, and check the negative pressure condition while the engine is stopped and while it is idling.

Engine state	Normal state
Stop (Ignition switch: "ON" position)	Negative pressure is maintained
Idle (after warm-up)	Negative pressure leaks

NOTE: If this check indicates an abnormal condition, the turbocharger wastegate solenoid, the turbocharger wastegate actuator, or the hose is broken.

TURBOCHARGER WASTEGATE SOLENOID CHECK

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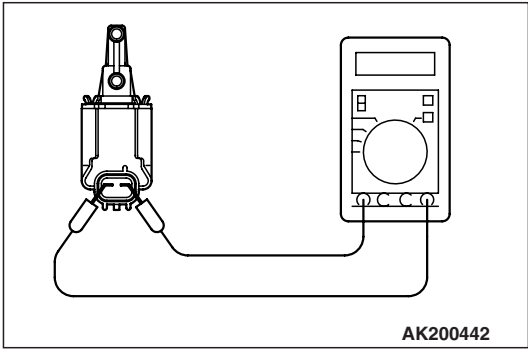
1. Connect a hand vacuum pump to the solenoid valve nipple A.
2. Use a jumper wire to connect between the solenoid valve terminal and battery terminal.
3. Connect and disconnect the jumper wire at the battery negative terminal to apply negative pressure and check tightness.

Jumper wire	B nipple condition	Normal state
Connected	Open	Negative pressure leaks.
	Close	Negative pressure is held.
Disconnected	Open	Negative pressure is held.

COIL RESISTANCE CHECK

Measure resistance between solenoid valve terminals.

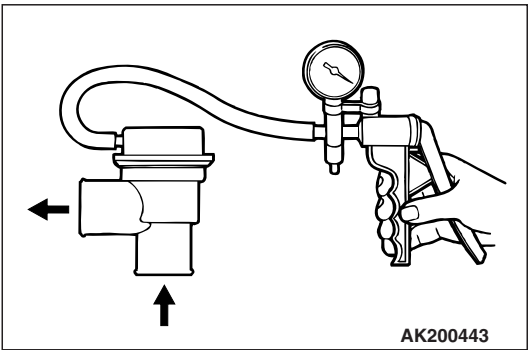
Standard value: 29 – 35 Ω [at 20° C (68° F)]



TURBOCHARGER BYPASS VALVE CHECK

M1151001600110

1. Remove the turbocharger bypass valve.
2. Connect the hand vacuum pump to the nipple of the turbocharger bypass valve.
3. Apply a negative pressure of approximately 53 kPa (15.7 in.Hg) and check operation of the valve. Also check that air tightness is maintained.



Negative pressure	Valve operation
Approximately 53 kPa (15.7 in.Hg)	Starts opening

AIR CLEANER

REMOVAL AND INSTALLATION

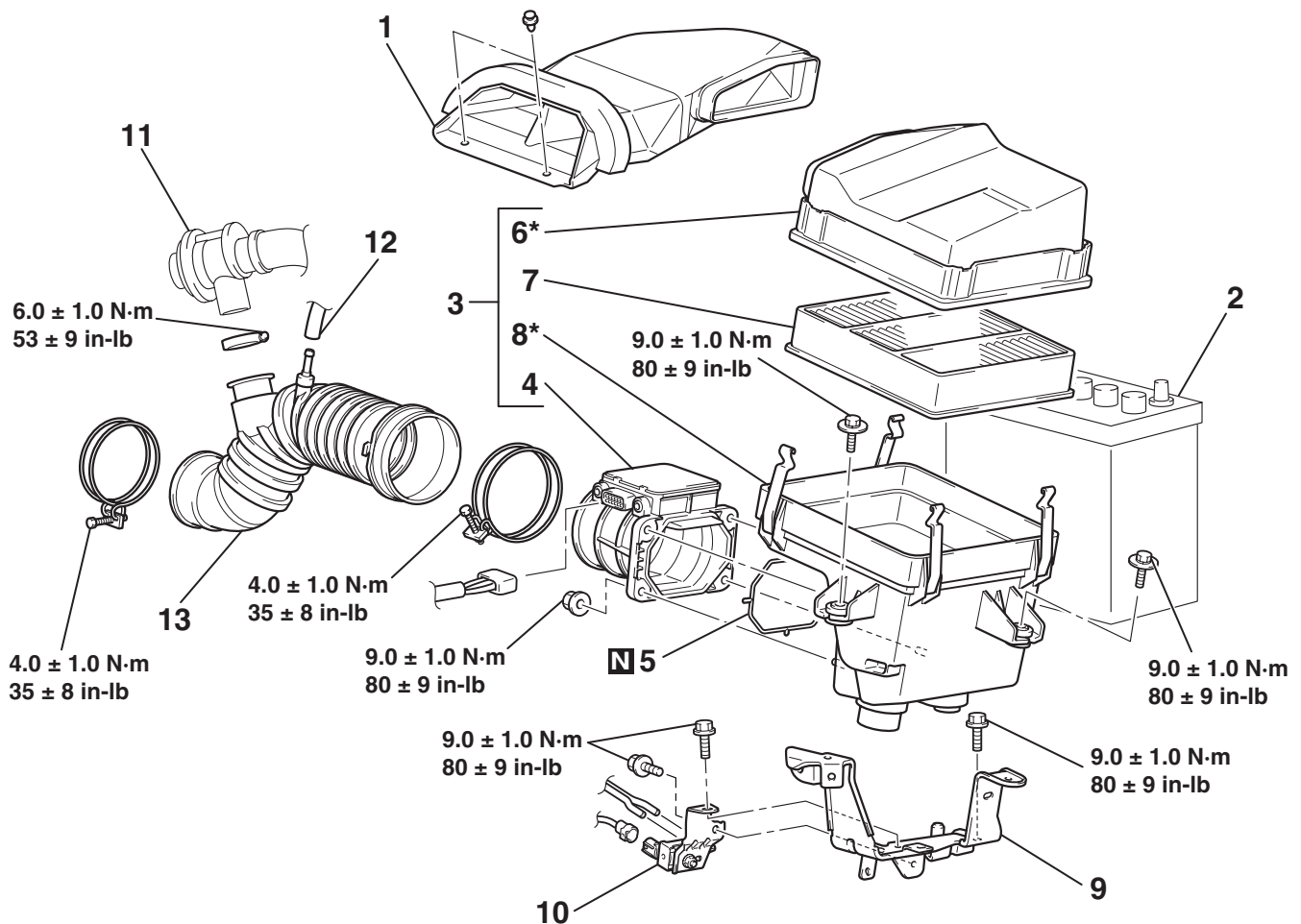
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CAUTION

Parts marked by * are made of recycled-paper mixed plastic material, so observe the following precautions.

1. Avoid any shock or load to these parts when removing and installing them.
2. Engage the case hinges securely when assembling these parts.

*NOTE: Parts marked by * are made of recycled-paper mixed plastic material. Dispose of according to state and local laws*



AC210412 AB

REMOVAL STEPS

1. INTAKE AIR DUCT
2. BATTERY
3. AIR CLEANER ASSEMBLY
4. VOLUME AIRFLOW SENSOR ASSEMBLY
5. GASKET
6. AIR CLEANER HOUSING COVER
7. AIR CLEANER ELEMENT
8. AIR CLEANER HOUSING

REMOVAL STEPS (Continued)

9. AIR CLEANER BRACKET
10. TURBOCHARGER WASTEGATE SOLENOID
11. AIR PIPE C, AIR BY-PASS HOSE AND TURBOCHARGER BYPASS VALVE ASSEMBLY
12. VACUUM HOSE CONNECTION
13. AIR INTAKE HOSE

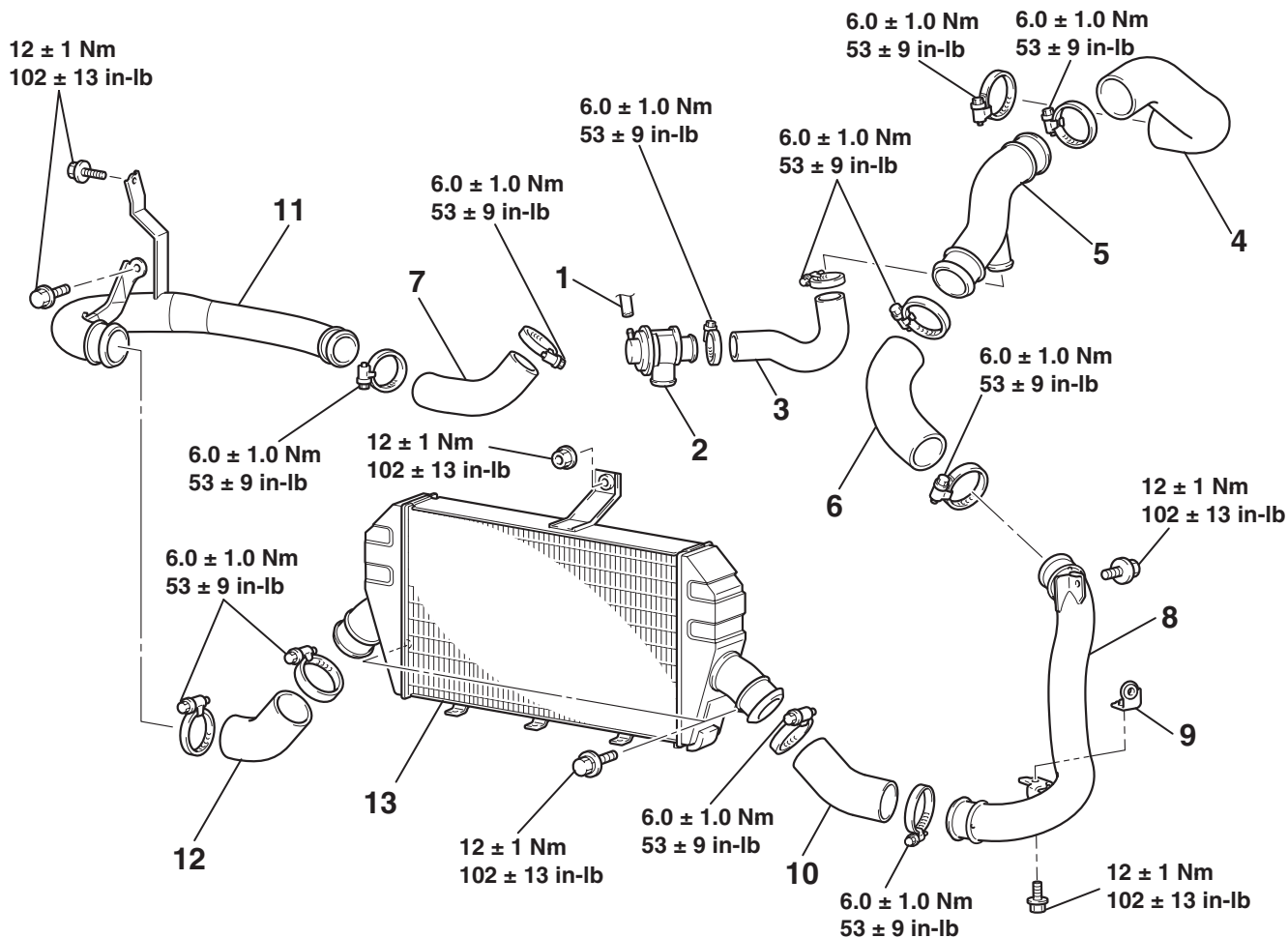
CHARGE AIR COOLER

REMOVAL AND INSTALLATION

M1151002400090

Pre-removal and Post-installation Operation

Intake Air Duct and Air Cleaner Assembly Removal and Installation (Refer to [P.15-7](#)).



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REMOVAL STEPS

1. VACUUM HOSE CONNECTION
2. TURBOCHARGER BYPASS VALVE ASSEMBLY
3. AIR BY-PASS HOSE
4. AIR HOSE E
5. AIR PIPE C
6. AIR HOSE D
- UNDER COVER (REFER TO GROUP 51, FRONT BUMPER ASSEMBLY [P.51-2](#)).
7. AIR HOSE A

REMOVAL STEPS (Continued)

- FRONT BUMPER ASSEMBLY (REFER TO GROUP 51, FRONT BUMPER ASSEMBLY [P.51-2](#)).
- 8. AIR PIPE B
- 9. BRACKET
- 10. AIR HOSE C
- 11. AIR PIPE A
- 12. AIR HOSE B
- 13. CHARGE AIR COOLER ASSEMBLY

INTAKE MANIFOLD

REMOVAL AND INSTALLATION

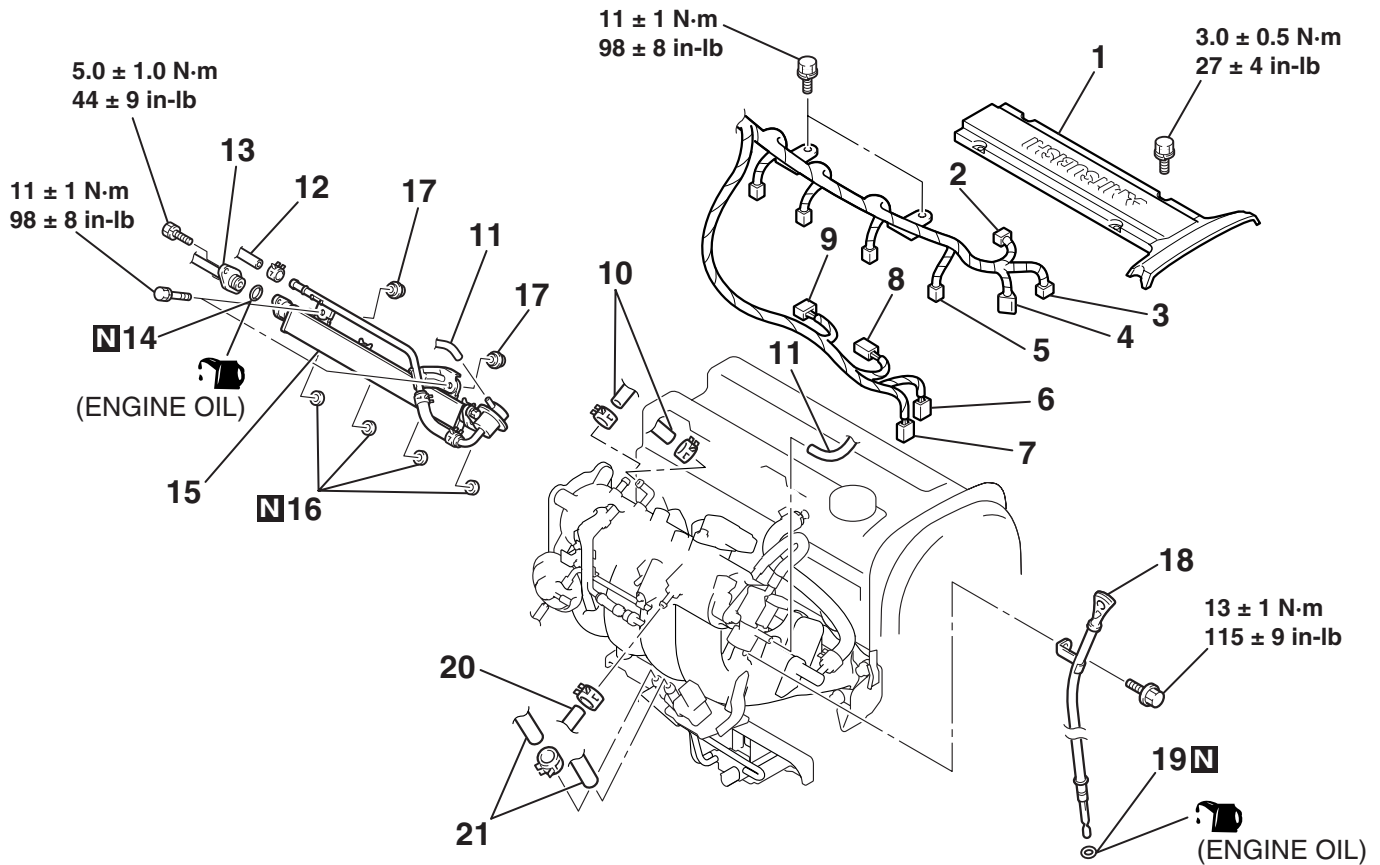
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Pre-removal Operation

- Fuel Discharge Prevention (Refer to GROUP 13A, On-vehicle Service [P.13A-868](#)).
- Under Cover Removal (Refer to GROUP 51, Front Bumper [P.51-2](#)).
- Engine Coolant Draining (Refer to GROUP 14, On-vehicle Service [P.14-19](#)).
- Intake Air Duct Removal (Refer to [P.15-7](#)).
- Strut Tower Bar Removal (Refer to GROUP 42, Strut Tower Bar [P.42-12](#)).
- Throttle Body Removal (Refer to GROUP 13A, Throttle Body [P.13A-883](#)).
- Crossmember Bar Removal (Refer to GROUP 32, Engine Roll Stopper, Centermember [P.32-7](#)).
- Front Exhaust Pipe Removal (Refer to [P.15-17](#)).

Post-installation Operation

- Front Exhaust Pipe Installation (Refer to [P.15-17](#)).
- Crossmember Bar Installation (Refer to GROUP 32, Engine Roll Stopper, Centermember [P.32-7](#)).
- Throttle Body Installation (Refer to GROUP 13A, Throttle Body [P.13A-883](#)).
- Strut Tower Bar Installation (Refer to GROUP 42, Strut Tower Bar [P.42-12](#)).
- Intake Air Duct Installation (Refer to [P.15-7](#)).
- Engine Coolant Refilling (Refer to GROUP 14, On-vehicle Service [P.14-19](#)).
- Under Cover Installation (Refer to GROUP 51, Front Bumper [P.51-2](#)).
- Accelerator Cable Adjustment (Refer to GROUP 17, On-vehicle Service [P.17-4](#)).



AC210646AB

REMOVAL STEPS

1. CENTER COVER
2. IGNITION COIL CONNECTOR
3. HEATED OXYGEN SENSOR (FRONT) CONNECTOR
4. CRANKSHAFT POSITION SENSOR CONNECTOR
5. FUEL INJECTOR CONNECTOR
6. KNOCK SENSOR CONNECTOR
7. EVAPORATIVE EMISSION PURGE SOLENOID CONNECTOR
8. FUEL PRESSURE SOLENOID

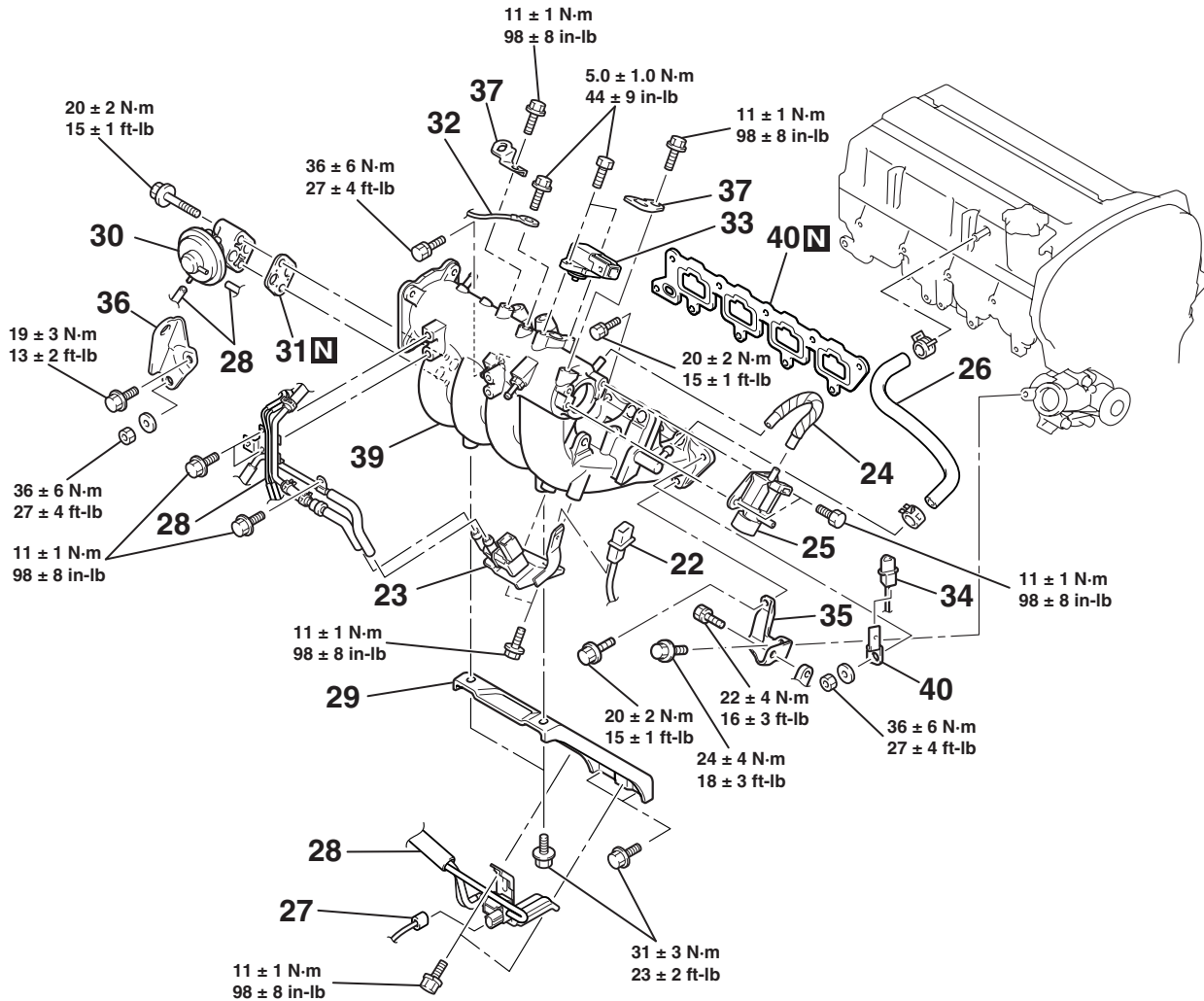
REMOVAL STEPS (Continued)

9. MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR
10. VACUUM HOSES CONNECTION
11. VACUUM HOSE
12. FUEL RETURN HOSE CONNECTION
- >>A<< 13. FUEL HIGH-PRESSURE HOSE CONNECTION
14. O-RING

REMOVAL STEPS (Continued)

<<A>>

15. FUEL RAIL, FUEL INJECTOR, FUEL RETURN PIPE AND FUEL PRESSURE REGULATOR ASSEMBLY
16. INSULATORS
17. INSULATORS
18. OIL LEVEL GAUGE AND GUIDE ASSEMBLY
19. O-RING
20. BRAKE BOOSTER VACUUM HOSE CONNECTION
21. EVAPORATIVE EMISSION PURGE HOSES CONNECTION



AC505098AB

REMOVAL STEPS

22. KNOCK SENSOR CONNECTOR
23. EVAPORATIVE EMISSION PURGE SOLENOID
24. VACUUM HOSE
25. FUEL PRESSURE SOLENOID
26. PCV HOSE
27. EGR VACUUM REGULATOR SOLENOID CONNECTOR
28. EGR VACUUM REGULATOR SOLENOID AND VACUUM PIPE & HOSE ASSEMBLY
29. INTAKE MANIFOLD STAY
30. EGR VALVE
31. EGR VALVE GASKET
32. GROUND CABLE CONNECTION

REMOVAL STEPS (Continued)

27. EGR VACUUM REGULATOR SOLENOID CONNECTOR
28. EGR VACUUM REGULATOR SOLENOID AND VACUUM PIPE & HOSE ASSEMBLY
29. INTAKE MANIFOLD STAY
30. EGR VALVE
31. EGR VALVE GASKET
32. GROUND CABLE CONNECTION

REMOVAL STEPS (Continued)

- 33. MANIFOLD ABSOLUTE PRESSURE
SENSOR
- 34. CRANKSHAFT POSITION SENSOR
CONNECTOR
- 35. GENERATOR BRACE STAY
- 36. ENGINE HANGER
- 37. HARNESS BRACKET
- 38. HARNESS BRACKET
- 39. INTAKE MANIFOLD
- 40. INTAKE MANIFOLD GASKET

REMOVAL SERVICE POINT

**<<A>> FUEL RAIL, FUEL INJECTOR, FUEL
RETURN PIPE AND FUEL PRESSURE REGULA-
TOR ASSEMBLY REMOVAL**

⚠ CAUTION

Be careful not to drop the fuel injector when the fuel rail is removed.

The fuel rail must be removed with the fuel injector, fuel return pipe and fuel pressure regulator attached.

INSTALLATION SERVICE POINT

**>>A<< FUEL HIGH-PRESSURE HOSE INSTALLA-
TION**

⚠ CAUTION

Do not let the engine oil get into the fuel rail, or it will be damaged.

1. Apply a drop of new engine oil to the O-ring.
2. Turn the fuel high-pressure hose to the right and left to install to the fuel rail.
Be careful not to damage the O-ring. After installing, check that the fuel high-pressure hose turns smoothly.
3. If the fuel high-pressure hose does not turn smoothly, the O-ring may be trapped. Remove the fuel high-pressure hose, re-install the fuel high-pressure hose into the fuel rail and check again.
4. Tighten the fuel high-pressure hose to the specified torque.

Tightening torque: 5.0 ± 1.0 N·m (44 ± 9 in-lb)

INSPECTION

M1151003100519

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 exhaust gas recirculation passages.
3. Using a straight edge and feeler gauge, check for distortion of the cylinder head installation surface.

Standard value: 0.15 mm (0.006 inch) or less

Limit: 0.20 mm (0.008 inch)

EXHAUST MANIFOLD AND TURBOCHARGER

REMOVAL AND INSTALLATION

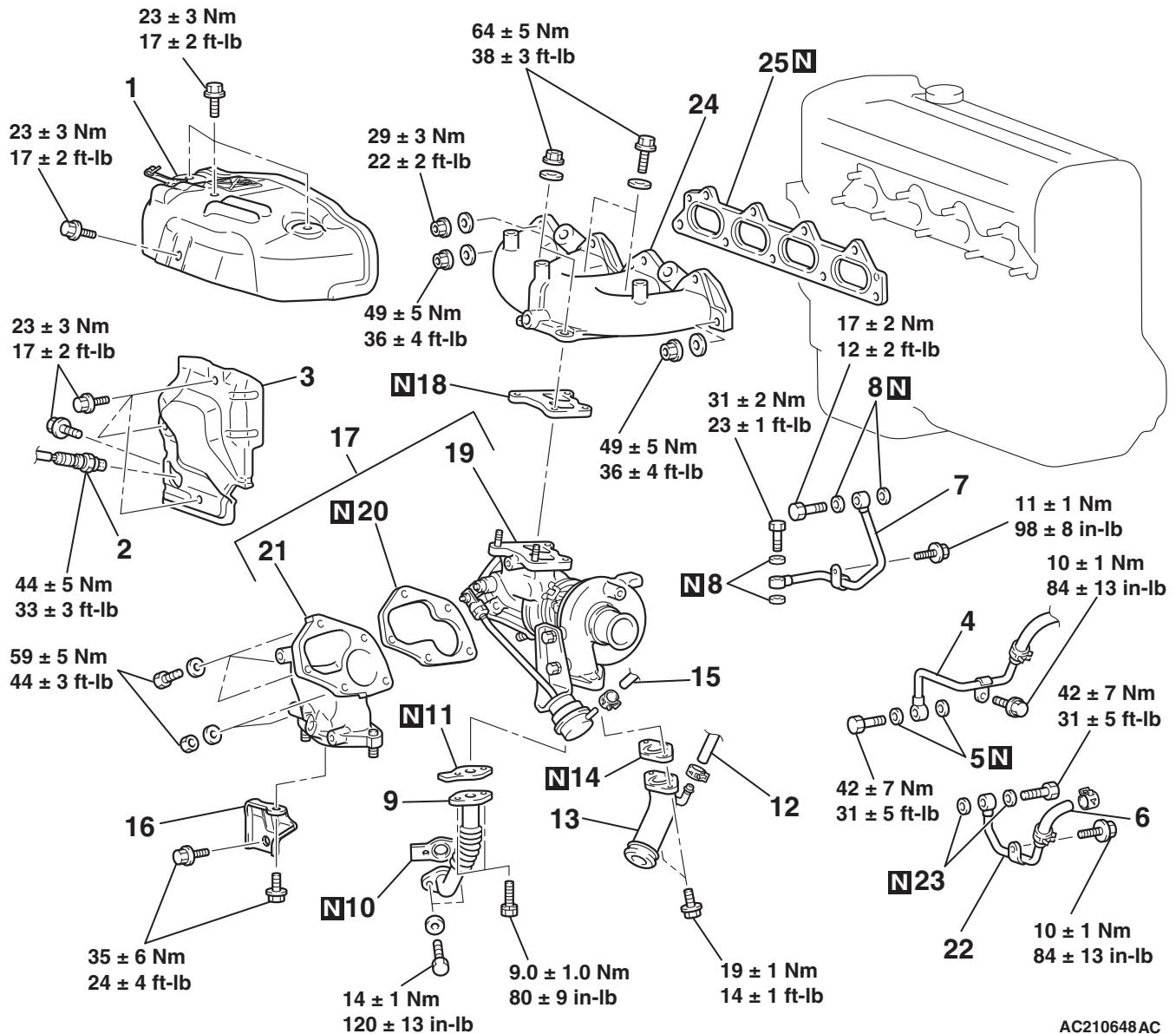
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Pre-removal Operation

- Under Cover Removal (Refer to GROUP 51, Front Bumper [P.51-2](#)).
- Radiator Removal (Refer to GROUP 14, Radiator [P.14-23](#)).
- Air Intake Hose Removal (Refer to [P.15-7](#)).
- Air Pipe A, Air Pipe B, Air Pipe C, Air Hose A and Air Hose D Removal (Refer to [P.15-8](#)).
- Crossmember Bar Removal (Refer to GROUP 32, Engine Roll Stopper, Centermember [P.32-7](#)).
- Front Exhaust Pipe Removal (Refer to [P.15-17](#)).

Post-installation Operation

- Front Exhaust Pipe Installation (Refer to [P.15-17](#)).
- Crossmember Bar Installation (Refer to GROUP 32, Engine Roll Stopper, Centermember [P.32-7](#)).
- Air Pipe A, Air Pipe B, Air Pipe C, Air Hose A and Air Hose D Installation (Refer to [P.15-8](#)).
- Air Intake Hose installation (Refer to [P.15-7](#)).
- Radiator Installation (Refer to GROUP 14, Radiator [P.14-23](#)).
- Under Cover Installation (Refer to GROUP 51, Front Bumper [P.51-2](#)).



AC210648AC

REMOVAL STEPS

- <<A>> >>D<<
1. EXHAUST MANIFOLD COVER
 2. HEATED OXYGEN SENSOR (FRONT)
 3. TURBOCHARGER HEAT PROTECTOR

REMOVAL STEPS (Continued)

4. TURBOCHARGER WATER FEED PIPE CONNECTION
5. GASKET
6. TURBOCHARGER WATER RETURN HOSE CONNECTION

REMOVAL STEPS (Continued)

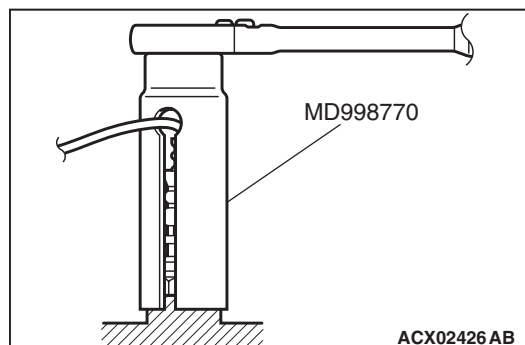
- <>
7. TURBOCHARGER OIL FEED PIPE
 8. GASKET
 - STARTER MOTOR (REFER TO GROUP 16, STARTING SYSTEM - STARTER MOTOR ASSEMBLY [P.16-24](#)).
 9. TURBOCHARGER OIL RETURN PIPE
- >>C<<
10. TURBOCHARGER OIL RETURN PIPE GASKET
 11. TURBOCHARGER OIL RETURN PIPE GASKET
 12. VACUUM HOSE CONNECTION
 13. AIR OUTLET FITTING
- >>B<<
14. AIR OUTLET FITTING GASKET
 15. VACUUM HOSE CONNECTION
 16. EXHAUST FITTING BRACKET
 17. TURBOCHARGER AND EXHAUST FITTING ASSEMBLY
- >>A<<
18. TURBOCHARGER GASKET
 19. TURBOCHARGER ASSEMBLY
 20. EXHAUST FITTING GASKET
 21. EXHAUST FITTING ASSEMBLY
 22. TURBOCHARGER WATER RETURN PIPE AND HOSE ASSEMBLY
 23. GASKET
 24. EXHAUST MANIFOLD
 25. EXHAUST MANIFOLD GASKET

Required Special Tool:

- MD998770: Oxygen Sensor Wrench

REMOVAL SERVICE POINTS**<<A>> HEATED OXYGEN SENSOR (FRONT)
REMOVAL**

Use special tool MD998770 to remove the heated oxygen sensor (front).



<> TURBOCHARGER OIL FEED PIPE REMOVAL

CAUTION

Take care not to allow foreign objects to get into the oil passage hole of the turbocharger assembly after the turbocharger oil feed pipe is removed.

INSTALLATION SERVICE POINTS

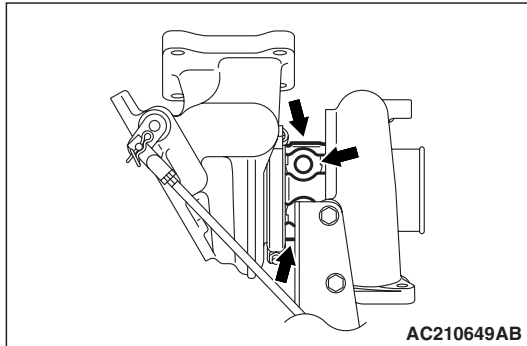
>>A<< TURBOCHARGER ASSEMBLY INSTALLATION

1. Clean the oil pipe and water pipe fitting, the inside of eye bolts, and individual pipe for clogs.

CAUTION

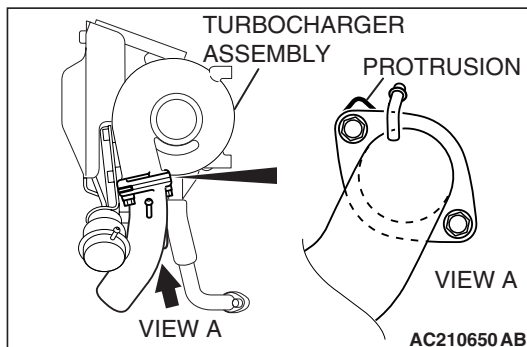
Take care not to allow foreign objects to get into the turbocharger assembly.

2. Clean or use compressed air to remove any carbon particles stuck to the oil passage of the turbocharger assembly.
3. Refill new engine oil at the oil feed pipe fitting hole of the turbocharger assembly.



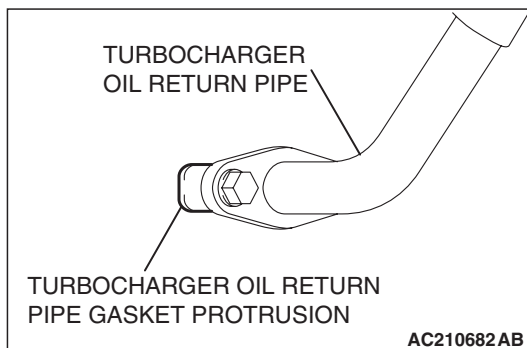
>>B<< AIR OUTLET FITTING GASKET INSTALLATION

Install the gasket so that its protrusion faces in the direction shown in the illustration.



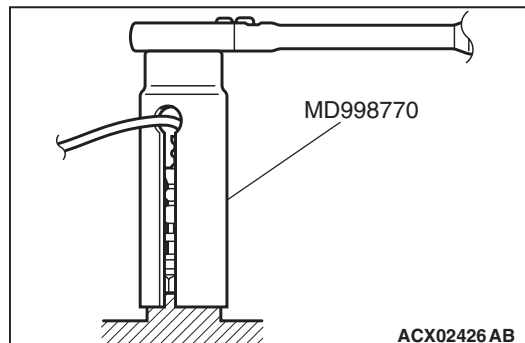
>>C<< TURBOCHARGER OIL RETURN PIPE GASKET INSTALLATION

Install the gasket so that its protrusion faces in the direction shown in the illustration.



>>D<< HEATED OXYGEN SENSOR (FRONT)
INSTALLATION

Use special tool MD998770 to install the heated oxygen sensor (front).



INSPECTION

M1151003400457

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

Exhaust Manifold Check

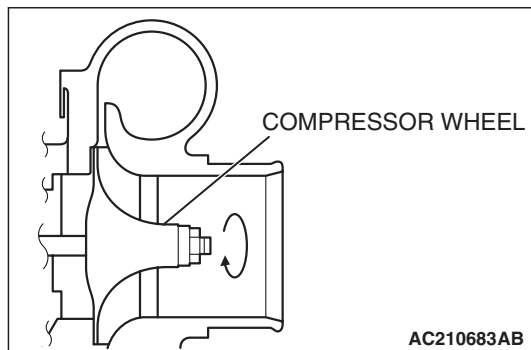
1. Check for damage or cracking of any part.
2. Using a straight edge and a feeler gauge, check for distortion of the cylinder head installation surface.

Standard value: 0.15 mm (0.006 inch) or less

Limit: 0.20 mm (0.008 inch)

Turbocharger assembly Check

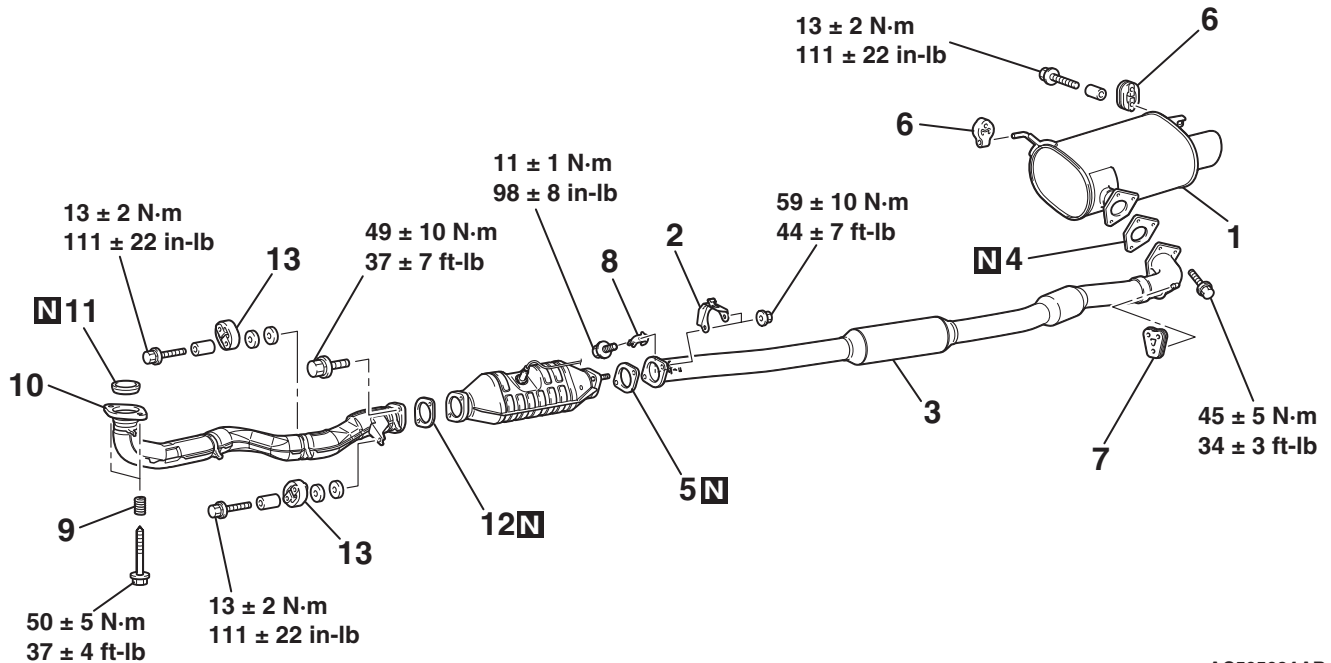
1. Visually check the turbine wheel and the compressor wheel for cracking or other damage.
2. Check whether the turbine wheel and the compressor wheel can be easily turned by hand.
3. Check for oil leakage from the turbocharger assembly.
4. Check whether or not the turbocharger wastegate regulating valve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



EXHAUST PIPE AND MAIN MUFFLER

REMOVAL AND INSTALLATION

M1151008701003



AC505084 AB

EXHAUST MAIN MUFFLER REMOVAL STEPS

1. EXHAUST MAIN MUFFLER
4. EXHAUST PIPE GASKET
6. EXHAUST MUFFLER HANGER

CENTER EXHAUST PIPE REMOVAL STEPS

2. HARNESS BRACKET
3. CENTER EXHAUST PIPE
4. EXHAUST PIPE GASKET
5. EXHAUST PIPE GASKET
7. EXHAUST PIPE HANGER
8. HARNESS BRACKET

FRONT EXHAUST PIPE REMOVAL STEPS

- UNDER COVER (REFER TO GROUP 51, FRONT BUMPER ASSEMBLY [P.51-2](#)).
- CROSSMEMBER BAR (REFER TO GROUP 32, ENGINE ROLL STOPPER, CENTERMEMBER [P.32-7](#)).
- 9. SPRING
- 10. FRONT EXHAUST PIPE
- 11. SEAL RING
- 12. EXHAUST PIPE GASKET
- 13. EXHAUST PIPE HANGER

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1151006800603

ITEM		SPECIFICATION
Air cleaner		
Air cleaner bolt		9.0 ± 1.0 N·m (80 ± 9 in-lb)
Air cleaner bracket bolt		9.0 ± 1.0 N·m (80 ± 9 in-lb)
Volume airflow sensor nut		9.0 ± 1.0 N·m (80 ± 9 in-lb)
Air intake hose clamp bolt		4.0 ± 1.0 N·m (35 ± 8 in-lb)
Air intake hose clamp bolt (air by-pass side)		6.0 ± 1.0 N·m (53 ± 9 in-lb)
Charge air cooler		
Air hose and air by-pass hose clamp bolt		6.0 ± 1.0 N·m (53 ± 9 in-lb)
Air pipe bolt		12 ± 1 N·m (102 ± 13 in-lb)
Air pipe bracket bolt		12 ± 1 N·m (102 ± 13 in-lb)
Charge air cooler bolt		12 ± 1 N·m (102 ± 13 in-lb)
Charge air cooler nut		12 ± 1 N·m (102 ± 13 in-lb)
Exhaust manifold and turbocharger		
Air outlet fitting bolt		19 ± 1 N·m (14 ± 1 ft-lb)
Exhaust fitting bolt		59 ± 5 N·m (44 ± 3 ft-lb)
Exhaust fitting nut		59 ± 5 N·m (44 ± 3 ft-lb)
Exhaust fitting bracket bolt		35 ± 6 N·m (24 ± 4 ft-lb)
Exhaust manifold nut	M8	29 ± 3 N·m (22 ± 2 ft-lb)
	M10	49 ± 5 N·m (36 ± 4 ft-lb)
Exhaust manifold cover bolt		23 ± 3 N·m (17 ± 2 ft-lb)
Heated oxygen sensor (front)		44 ± 5 N·m (33 ± 3 ft-lb)
Turbocharger bolt		64 ± 5 N·m (38 ± 3 ft-lb)
Turbocharger nut		64 ± 5 N·m (38 ± 3 ft-lb)
Turbocharger heat protector bolt		23 ± 3 N·m (17 ± 2 ft-lb)
Turbocharger oil feed pipe eye bolt	M10	17 ± 2 N·m (12 ± 2 ft-lb)
	M12	31 ± 2 N·m (23 ± 1 ft-lb)
Turbocharger oil feed pipe bolt		11 ± 1 N·m (98 ± 8 in-lb)
Turbocharger oil return pipe bolt (oil pan side)		14 ± 1 N·m (120 ± 13 in-lb)
Turbocharger oil return pipe bolt (turbocharger side)		9.0 ± 1.0 N·m (80 ± 9 in-lb)
Turbocharger water feed pipe eye bolt		42 ± 7 N·m (31 ± 5 ft-lb)
Turbocharger water feed pipe bolt		10 ± 1 N·m (84 ± 13 in-lb)
Turbocharger water return pipe eye bolt		42 ± 7 N·m (31 ± 5 ft-lb)
Turbocharger water return pipe bolt		10 ± 1 N·m (84 ± 13 in-lb)

ITEM		SPECIFICATION
Exhaust pipe and main muffler		
Center exhaust pipe nut		59 ± 10 N· m (44 ± 7 ft-lb)
Exhaust main muffler bolt		45 ± 5 N· m (34 ± 3 ft-lb)
Exhaust muffler hanger bolt		13 ± 2 N· m (111 ± 22 in-lb)
Exhaust pipe hanger bolt		13 ± 2 N· m (111 ± 22 in-lb)
Front exhaust pipe bolt (catalytic converter side)		49 ± 10 N· m (37 ± 7 ft-lb)
Front exhaust pipe bolt (exhaust manifold side)		50 ± 5 N· m (37 ± 4 ft-lb)
Intake manifold		
Center cover bolt		3.0 ± 0.5 N· m (27 ± 4 in-lb)
EGR vacuum regulator solenoid bolt		11 ± 1 N· m (98 ± 8 in-lb)
EGR valve bolt		20 ± 2 N· m (15 ± 1 ft-lb)
Evaporative emission purge solenoid bolt		11 ± 1 N· m (98 ± 8 in-lb)
Fuel high-pressure hose bolt		5.0 ± 1.0 N· m (44 ± 9 in-lb)
Fuel pressure solenoid bolt		11 ± 1 N· m (98 ± 8 in-lb)
Fuel rail bolt		11 ± 1 N· m (98 ± 8 in-lb)
Generator brace bolt		22 ± 4 N· m (16 ± 3 ft-lb)
Ground cable bolt		5.0 ± 1.0 N· m (44 ± 9 in-lb)
Intake manifold bolt	M8	20 ± 2 N· m (15 ± 1 ft-lb)
	M10	36 ± 6 N· m (27 ± 4 ft-lb)
Intake manifold nut		36 ± 6 N· m (27 ± 4 ft-lb)
Intake manifold stay bolt		31 ± 3 N· m (23 ± 2 ft-lb)
Manifold absolute pressure sensor bolt		5.0 ± 1.0 N· m (44 ± 9 in-lb)
Oil level gauge guide bolt		13 ± 1 N· m (115 ± 9 in-lb)
Vacuum hose and pipe assembly bolt		11 ± 1 N· m (98 ± 8 in-lb)

SERVICE SPECIFICATION

M1151000300729

ITEM	STANDARD VALUE	LIMIT
Manifold distortion of the installation surface mm (in)	0.15 (0.006) or less	0.20 (0.008)
Intake charge pressure kPa (psi)	112 – 139 (16.2 – 20.2)	–
Turbocharger wastegate actuator pressure kPa (psi)	Approximately 100 (15)	–
Turbocharger wastegate solenoid terminal resistance [at 20° C (68° F)] Ω	29 – 35	–

NOTES