
ENGINE 4H SERIES

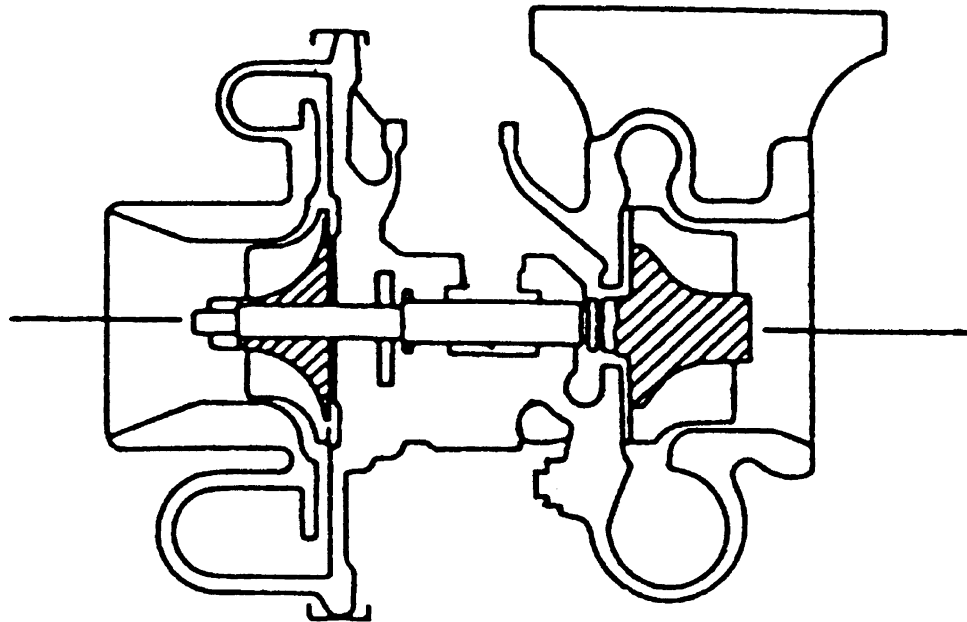
SECTION 6G TURBOCHARGER

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GENERAL DESCRIPTION

Turbocharger



N6A1371E

Garrett turbocharger components are constituted the Center Housing and Rotating Assembly (CHRA), the compressor housing, and the turbine housing.

Rotating parts include the turbine shaft, the compressor wheel, the shaft bearings, the thrust bearings and the oil seal rings. These parts are supported by the center housing.

The turbocharger bearing and turbine shaft are lubricated with engine oil and at the same time are cooled with engine coolant to improve their durability.

The turbocharger increase air intake efficiency, the results in increased engine power, reduced fuel consumption and minimal engine noise.

Turbocharger rotating parts operate at very high speeds and temperatures. The parts materials have been carefully selected and machined to extremely high precision. The turbocharger for 4HG1-T Engine has a unit construction of turbine housing and exhaust manifold.

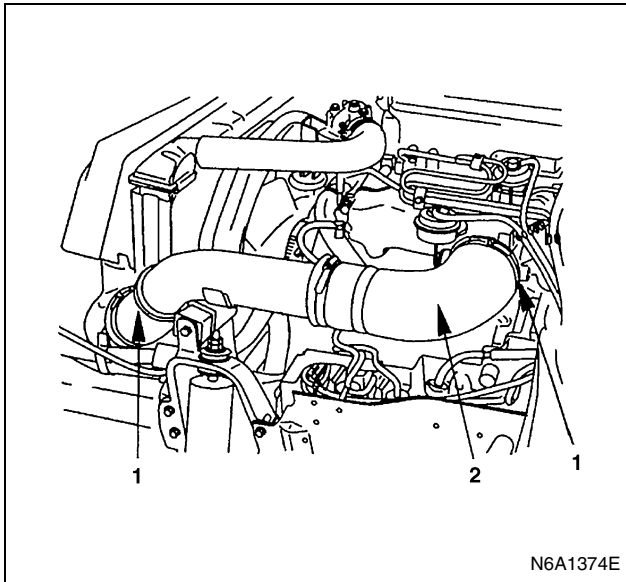
Color for caution plate on the 4HE1-TC turbocharger are, EURO3 vehicles have a blue caution plate. All other vehicles have a silver caution plate.

ON-VEHICLE SERVICE

Charge Air Pipe

Removal

1. Connecting hose clamps.
2. Connecting hoses.



3. Bracket bolts and washers and charge air pipe.

4. Clamps.
5. Connecting hose.
6. Bracket accelerator cable.
7. Bracket engine stop cable and vacuum hose.
8. Engine harness connector.
9. Charge air pipe.
10. Gasket.

Caution:

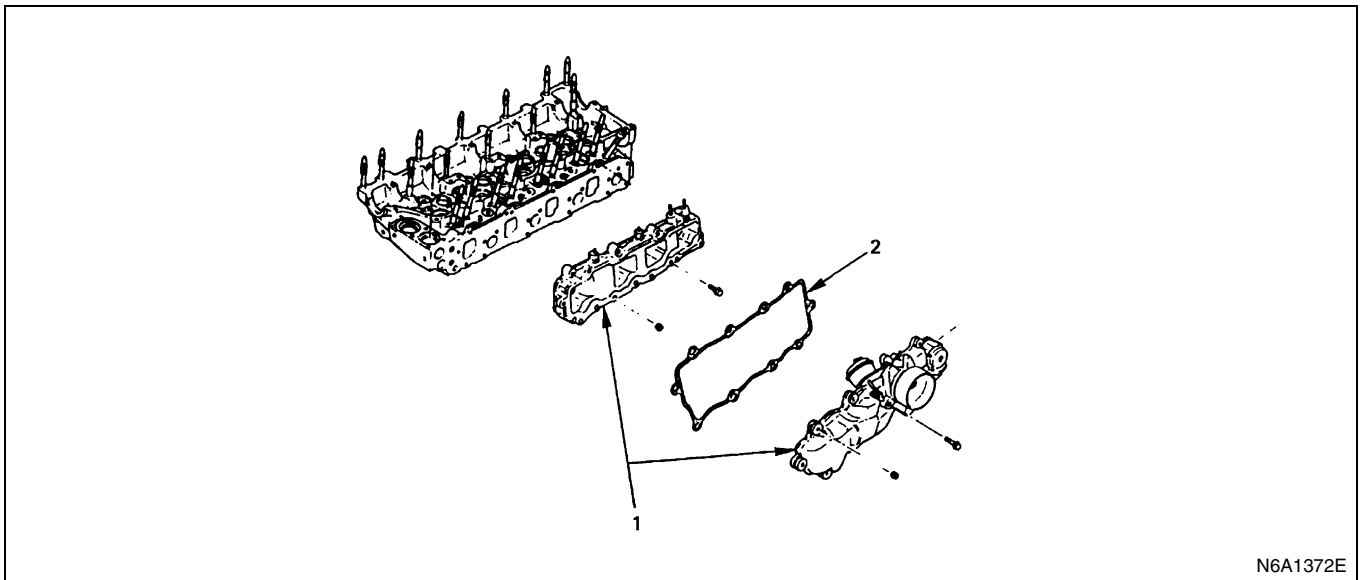
- Check hoses for deterioration, or damage.
- Charge air pipes for damage.

Installation

1. Gasket to the intake manifold.
2. Charge air pipe.
3. Engine harness connector.
4. Bracket engine stop cable and vacuum hose.
5. Bracket accelerator cable.
6. Connecting hose.
7. Clamps.
8. Charge air pipe and bracket bolts.
9. Connecting hoses.
10. Clamps.

Intake Manifold

Component



Legend

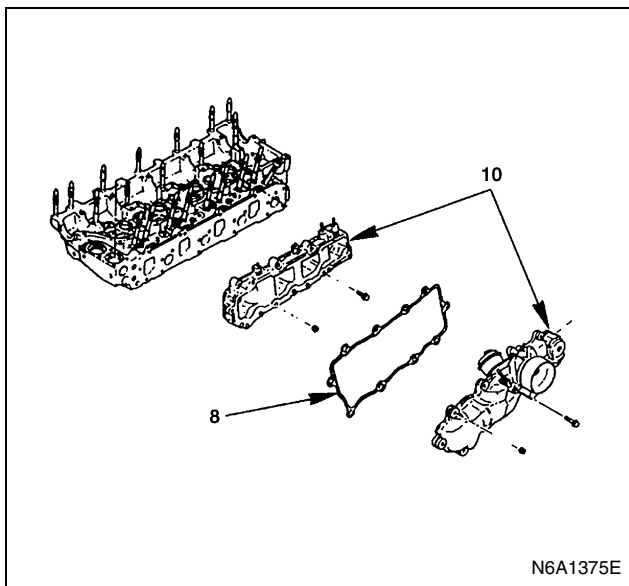
- | | |
|--------------------|---------------------------|
| 1. Intake manifold | 2. Intake manifold gasket |
|--------------------|---------------------------|

Removal

1. PCV hose.
2. Accelerator cable injection pump side.
3. Connecting hose.
4. Bracket accelerator cable.
5. Bracket engine stop cable and vacuum hose.
6. Engine harness connector.
7. Charge air pipe.

6G-4 TURBOCHARGER

8. Gasket.
9. Injection pipe.
10. Intake manifold.
11. Gasket and discard.



Installation

1. Intake manifold.

Tighten:

Intake manifold to 19 N·m(1.9 kg·m/ 14 lb·ft)

2. Injection pipe

Tighten:

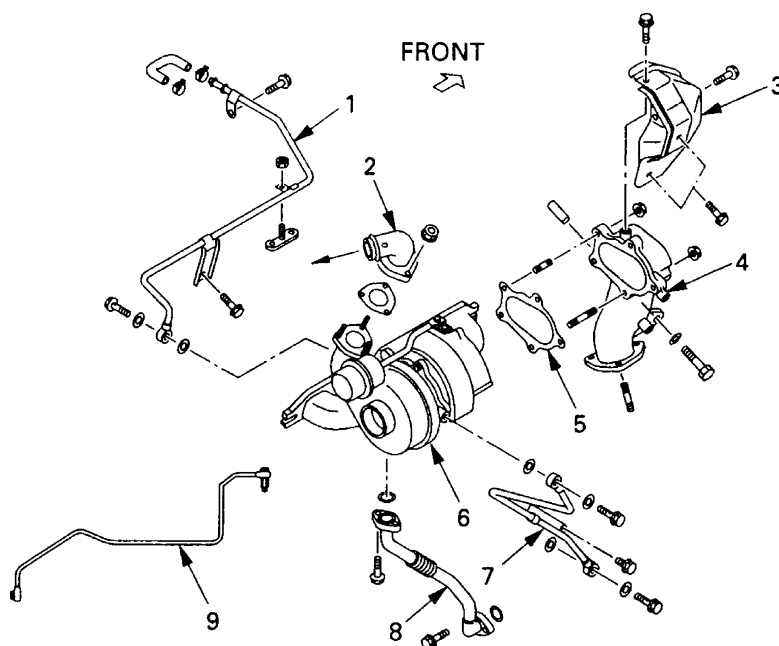
Fuel injector line nuts to 26 N·m(2.7 kg·m/ 20 lb·ft)

3. Gasket
4. Charge air pipe.
5. Engine harness connector.
6. Bracket engine stop cable and vacuum hose.
7. Bracket accelerator cable.
8. Connecting hose.
9. Accelerator cable injection pump side.
10. PCV hose.

Turbocharger

Refer to "Statement on Cleanliness and Care" previously in this section.

Component

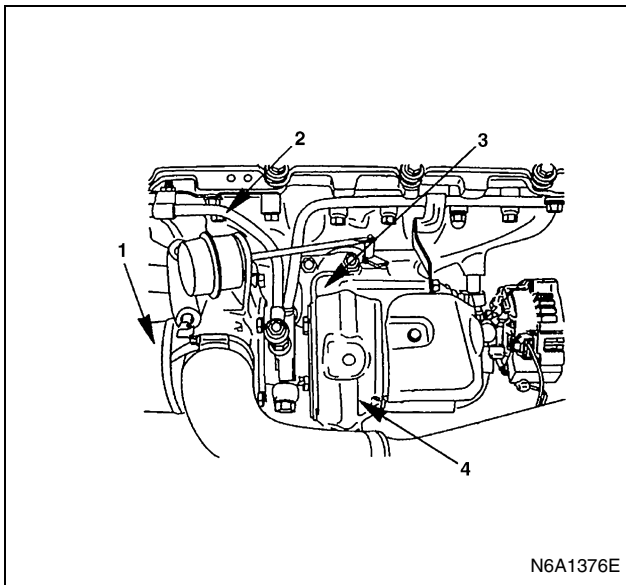


Legend

- | | |
|-----------------------------|--------------------------|
| 1. Water return pipe | 6. Turbocharger assembly |
| 2. Turbocharger intake pipe | 7. Water feed pipe |
| 3. Heat shield | 8. Oil return pipe |
| 4. Exhaust adapter | 9. Oil feed pipe |
| 5. Gasket | |

Removal

1. Turbocharger air inlet pipe.
2. Turbocharger intake pipe.
3. Connecting hose.
4. Exhaust gas recirculation (EGR) pipe.
5. Heat shield bolt.
6. Water feed and drain lines.
7. Oil feed line.
8. Oil drain line.
9. Exhaust pipe to exhaust adapter nuts.
10. Exhaust adapter to turbocharger nuts.
11. Turbocharger to exhaust manifold nuts.



Legend

1. Air inlet pipe
2. Oil supply line
3. Turbo charger
4. Heat shield

Caution:

The turbocharger for 4HG1-T Engine has a unit construction of turbin housing and exhaust manifold.

Inspection and Repair

Caution:

- Turbocharger housing for cracks or damage.
- Gasket surfaces for damage.
- Seals and gaskets for damage.

- Turbine and compressor blades for damage or carbon buildup.
- Air and exhaust exit openings for oil or wetness.
- For grinding or roughness when spinning turbine and compressor wheels by hand.
- For evidence of turbine or compressor blades contacting the shroud or housing. If any of the above conditions exist, the turbocharger must be replaced or repaired by an authorized repair facility.

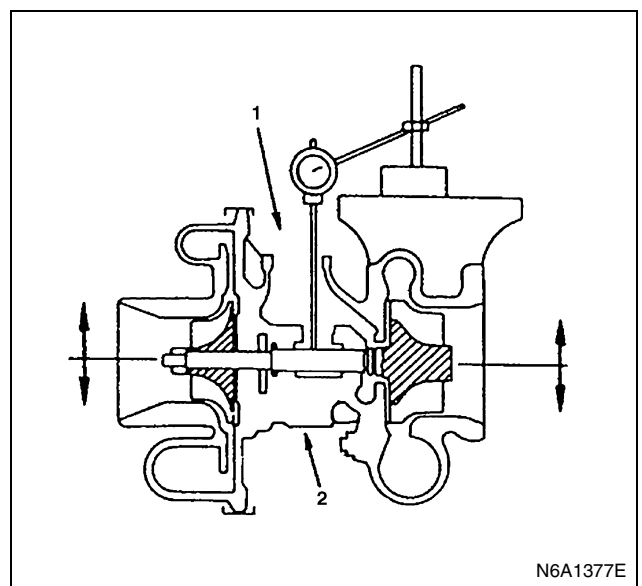
Play in Radial Clearance

Moving the rotor in the radial clearance, measure the play by a dial gage.

- Measure the play at several points while letting the rotor revolve.
- Use only the flat dial gage attachment. Do not use the pointed one.
- Attach the turbocharger and dial gage firmly.

Play in radial clearance		mm (in)
Standard	Limit	
0.056 — 0.127 (0.0022 — 0.0050)	0.140 (0.0055)	

If excessive, replace the turbocharger.



Legend

1. Oil outlet
2. Oil inlet

6G-6 TURBOCHARGER

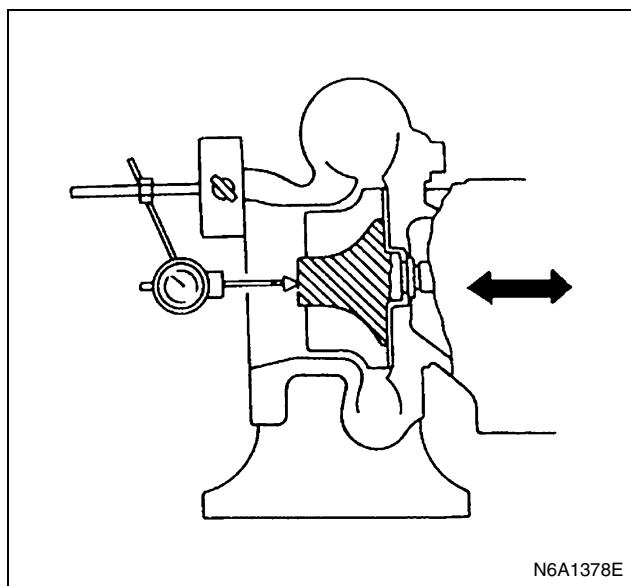
Play in Axial Clearance

Moving the rotor in the axial clearance, measure the play by a dial gage.

- Measure the play at several points while letting the rotor revolve.
- Attach the turbocharger and dial gage firmly.

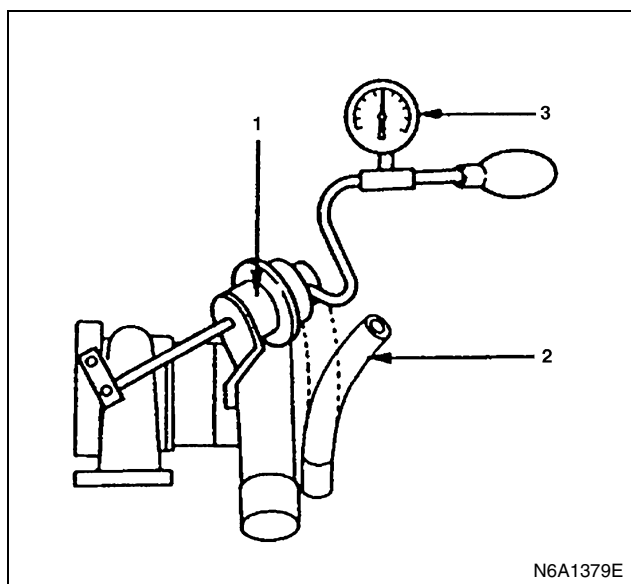
Play in axial clearance		mm (in)
Standard	Limit	
0.013 — 0.097 (0.0005 — 0.0038)	0.097 (0.0038)	

If excessive, replace the turbocharger.



Operation of Waste Gate

- Disconnect hose (2) from waste gate (1), and install pressure gauge (3) as shown in the figure.
- With the engine stopped, operate the pressure gauge pump to apply pressure to the waste gate for check the waste gate function.



Oil Leakage Check

1. Remove the charge air pipe connecting hose to the compressor side of the turbocharger.
2. Clean the area around the compressor wheel.
3. Remove the blow-by hose.
4. Start the engine and let idle. Rev the engine and hold at wide open throttle (WOT) for five seconds, then release and let idle for five seconds. Repeat this cycle for a total of five times then let the engine idle steady for five minutes.
5. Shut off the engine.
6. Check the compressor area for an oil stream.

Caution:

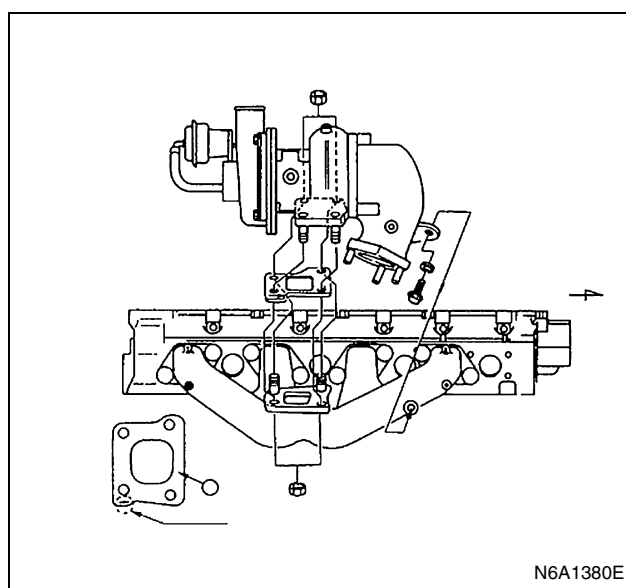
- A stream of oil indicates a possible defective turbocharger. If mist or spray is present, however, this is normal and is NOT indicative of a turbocharger problem.
7. If the turbocharger is suspect, refer to the on-vehicle service procedures in this section.

Installation

1. Exhaust manifold to turbocharger.
2. New gasket and turbocharger to exhaust manifold.

Tighten:

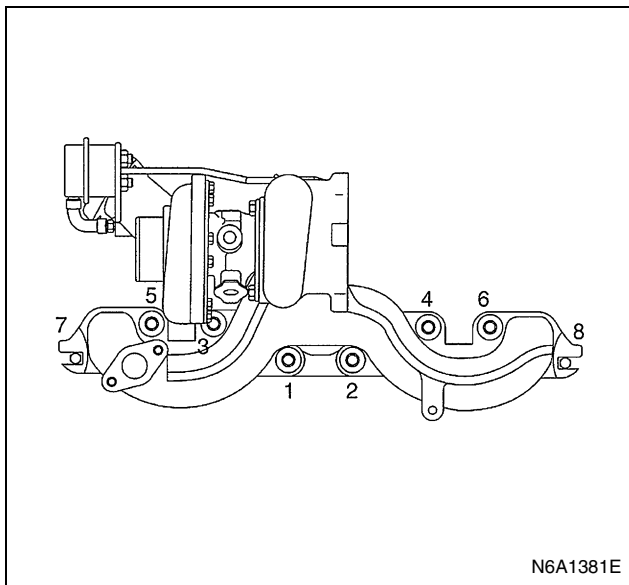
Turbo charger to 52 N·m (5.3 kg·m/ 38 lb·ft)



3. Tighten the cylinder head to turbinhousing and exhaust manifold to the specified torque in the numerical order shown in the illustration. (4HG1-T)

Tighten:

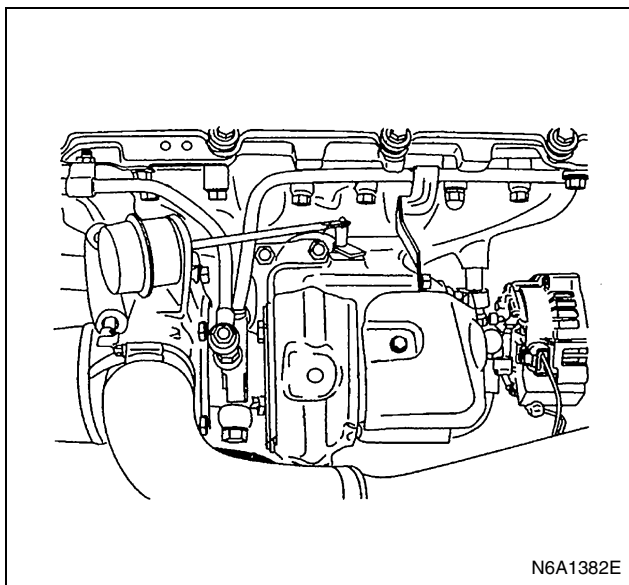
Exhaust manifold to 34 N·m (3.5 kg·m/ 25 lb·ft)



4. Turbocharger to exhaust adapter.

Tighten:

Exhaust adapter to 32 N·m (3.3 kg·m/ 24 lb·ft)



5. Exhaust pipe to exhaust adapter.

Tighten:

Exhaust pipe to 67 N·m (6.8 kg·m/ 49 lb·ft)

6. Turbocharger oil drain line.

Tighten:

Oil drain line to

- Turbocharger 9 N·m (0.9 kg·m/ 6 lb·ft)
- Cylinder body 21 N·m (2.1 kg·m/ 15 lb·ft)

7. Turbocharger oil supply line to turbocharger.

Tighten:

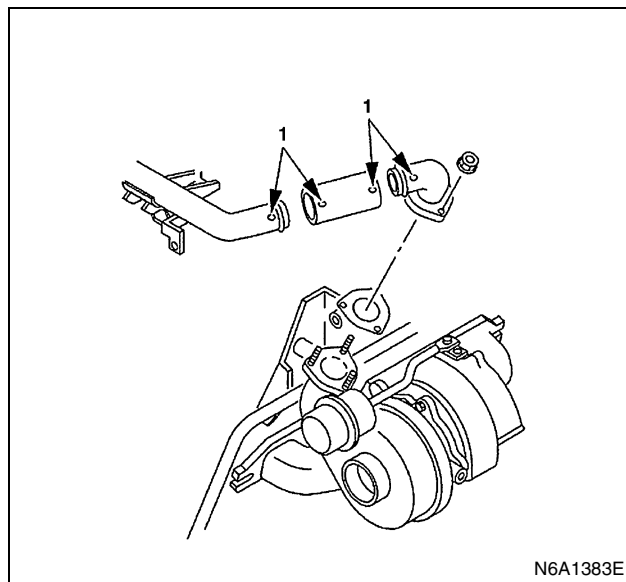
Oil supply line to 27 N·m (2.8 kg·m/ 20 lb·ft)

8. Water supply and drain lines.

Tighten:

Water supply to 41 N·m (4.2 kg·m/ 30 lb·ft)

9. Heat shield to exhaust adapter
10. Charge air pipe connecting hoses and clamps to turbocharger.
11. Air inlet pipe to turbocharger.
12. Fit the connecting hose over the pipe to its projecting part. (4HG1-T)
13. Align connecting hose and pipe marks with each other (4HG1-T)

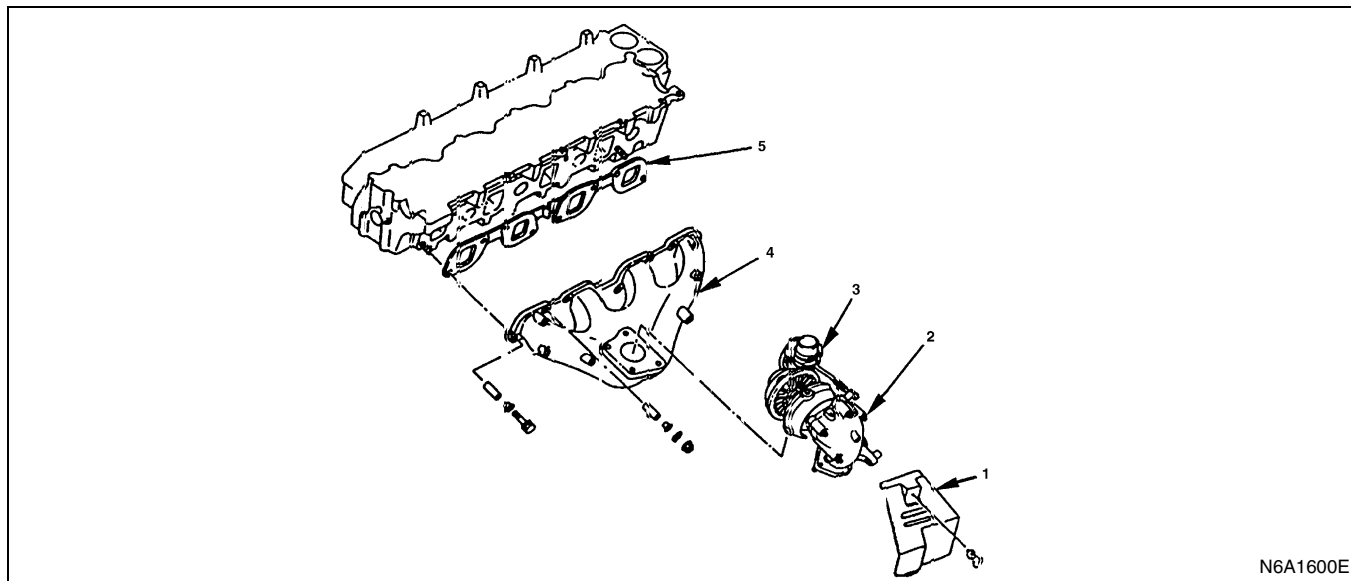


Legend

1. Mark

Exhaust Manifold

Component



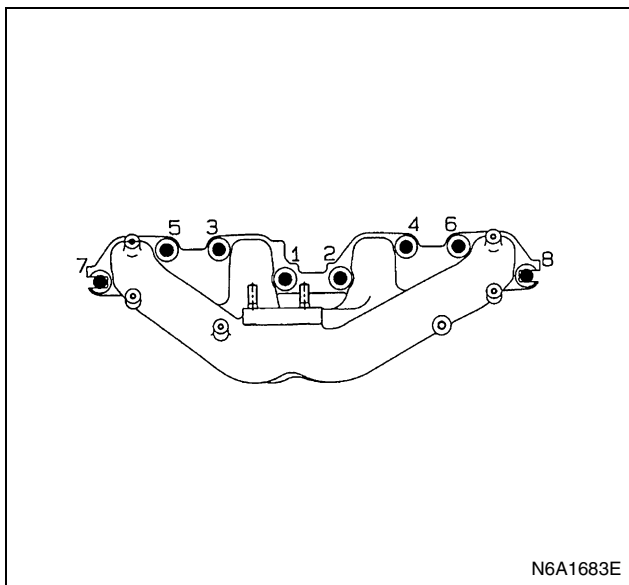
N6A1600E

Legend

- | | |
|--------------------|----------------------------|
| 1. Heat shield | 4. Exhaust manifold |
| 2. Exhaust adapter | 5. Exhaust manifold gasket |
| 3. Turbocharger | |

Removal

1. Turbocharger as outlined previously in this section.
2. Heat shield
3. Loosen the exhaust manifold bolts, nuts and washers in numerical order shown in the illustration.



N6A1683E

4. Exhaust manifold
5. Gaskets

Caution:

- Exhaust manifold and cylinder head for cracks or damage to gasket surfaces.

Installation

1. Gaskets.
2. Exhaust manifold.
3. Washers nuts and bolts.

Tighten:

Exhaust manifold to 34 N·m (3.5 kg·m/ 25 lb·ft)

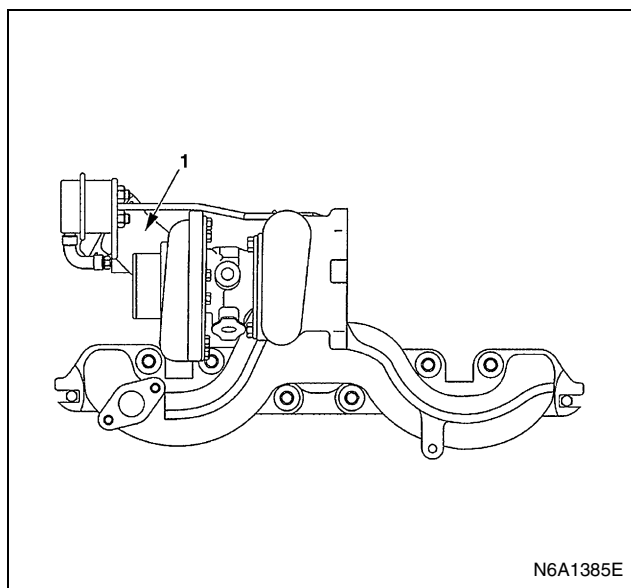
4. Heat shield
5. Turbocharger as outlined previously in this section.

Turbocharger Turbine Housing Replacement (For 4HG1-T Model)

Changing the turbine housing of the turbocharger (integrated with the exhaust manifold)

Inspection

Before replacing the turbine housing, make sure there are no abnormalities in other parts.



Legend

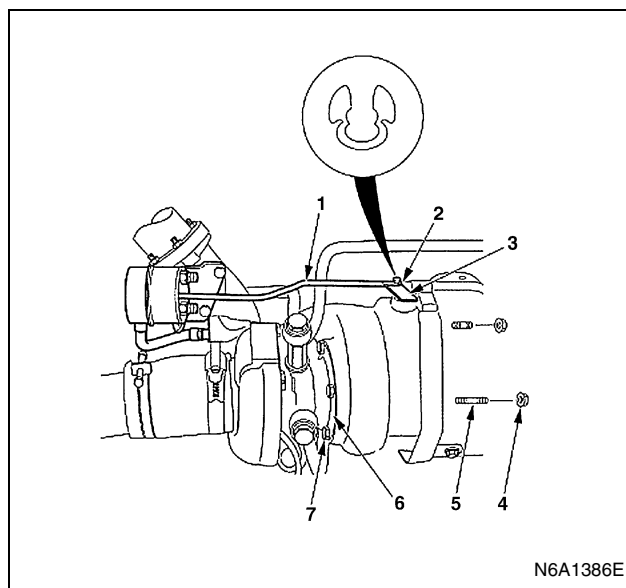
1. Compressor port

Notice:

- It is normal to find some oil inside the compressed-air duct. The oil is to lubricate the turbine shaft, and as long as the exhaust is not abnormally white in color, this does not indicate a problem.
1. Make sure the parts have no cracks, impeded movement, damage, or distortion of shape, that there is no oil leakage from the seal, and that there is no gas leakage.
 2. Turn the rotor to see if it rotates smoothly, also checking the rotation direction as well as the amount of slack.
Refer to the separate reference sheet for the proper amount of slack.
If there is an abnormality in any of the above, you will have to change the turbocharger as a unit.

Disassembly

1. Separate the end of the actuator rod (1) from the E Ring (2), then remove the crank (3) from the end of the rod (1).
2. Remove the turbine housing tie-down bolts (7).



3. Separate the turbine housing from the sensor housing.

Notice:

- Be careful not to scratch the turbine blades when removing parts.

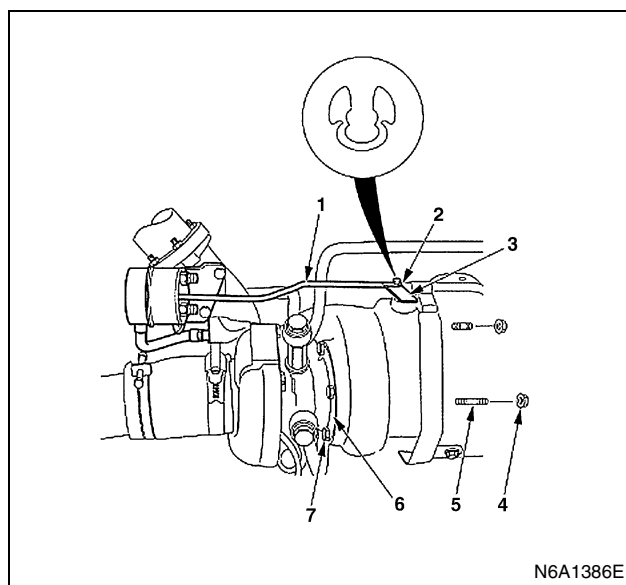
Inspecting the center housing assembly:

Check that none of the blades is bent, cracked, or scratched. Make sure there are no obstructions that would interfere with the movement of the blades or with mounting the new housing. Remove any excess carbon or oil.

Replacing Parts

When reassembling, be sure to replace the following parts. (Use only genuine Isuzu parts.)

1. E Ring (2)
2. Turbine housing tie-down bolts (7)
3. Turbine housing clamp (6)
4. Adapter nut (4)
5. Adapter stud (5)



Cleaning

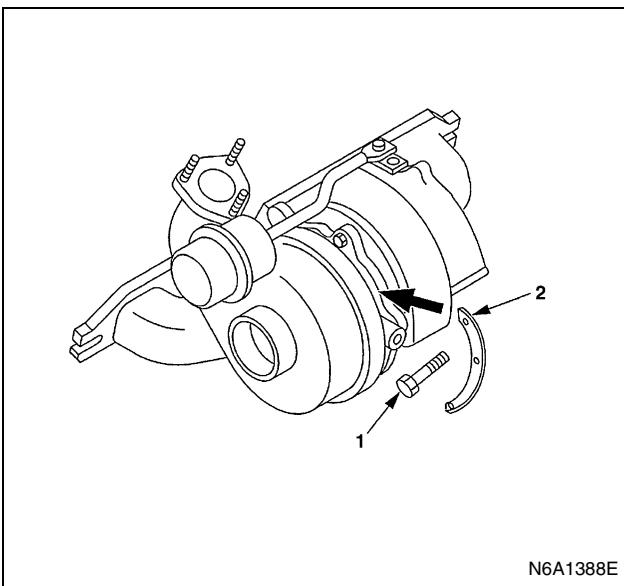
Thoroughly clean off the oil and carbon from abutting surfaces, the oil passages, flange surfaces, air and exhaust ducts, etc. Always air-dry the parts after cleaning.

Assembly

1. Insert the sensor housing into the turbine housing.

Notice:

- When inserting the sensor housing, make sure it will not impede the movement of the turbine blades.
2. Apply molybdenum disulfide to the thread and underside of the head of each bolt (1).
 3. Temporarily secure the sensor housing in place with the clamp (2).



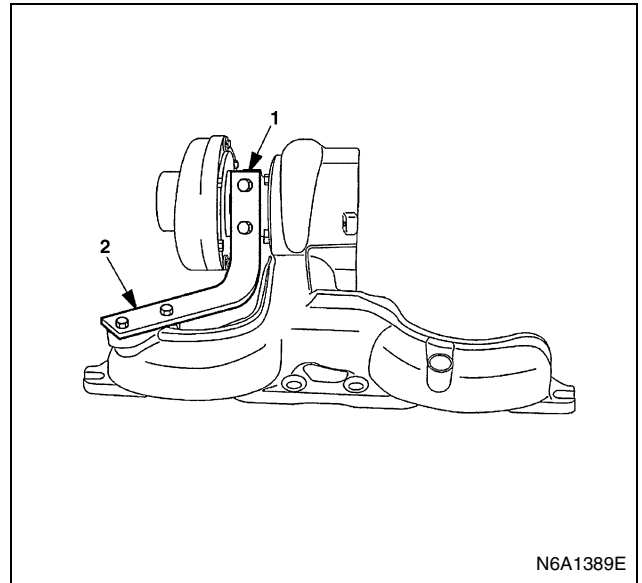
4. Connect the oil side of the sensor housing (1) and the EGR-connection side of the exhaust manifold (2) to the angle setting gauge, then tighten the bolt to secure the gauge in place. (The angle of the sensor housing and turbine housing will be set with the use of this gauge).

Turbocharger housing setting gauge: 5-8840-2673-0

(1) M6 × P = 1.00

(2) M8 × P = 1.25

5. To give the sensor housing some slack, loosen the bolt on side (1) by half a turn.

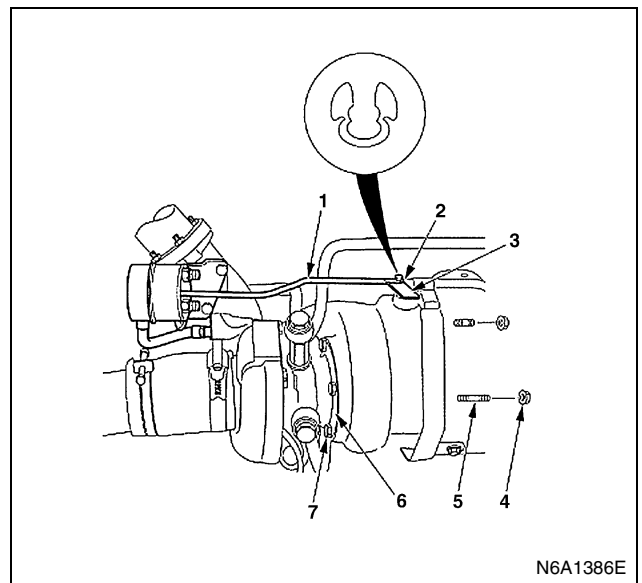


6. Tighten the turbine housing tie-down bolts to the specified torque.

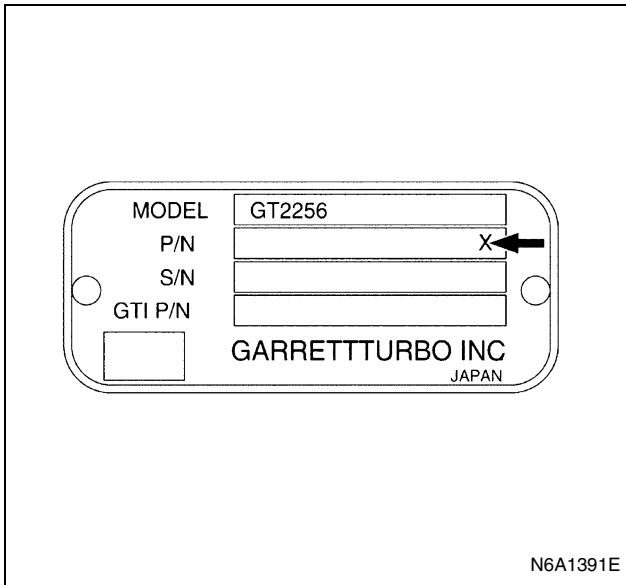
Tighten:

Housing tie-down bolts to 22 N·m (2.2 kg·m/ 16 lb·ft)

7. Remove the bolt that secures the pressure gauge, then remove the gauge.
8. Manually turn the rotor clockwise to be sure it rotates smoothly. Check for abnormal noise, drag, etc.
9. Attach the end of the actuator rod (1) to the crank at the waste gate (3), and secure with the E Ring (2).



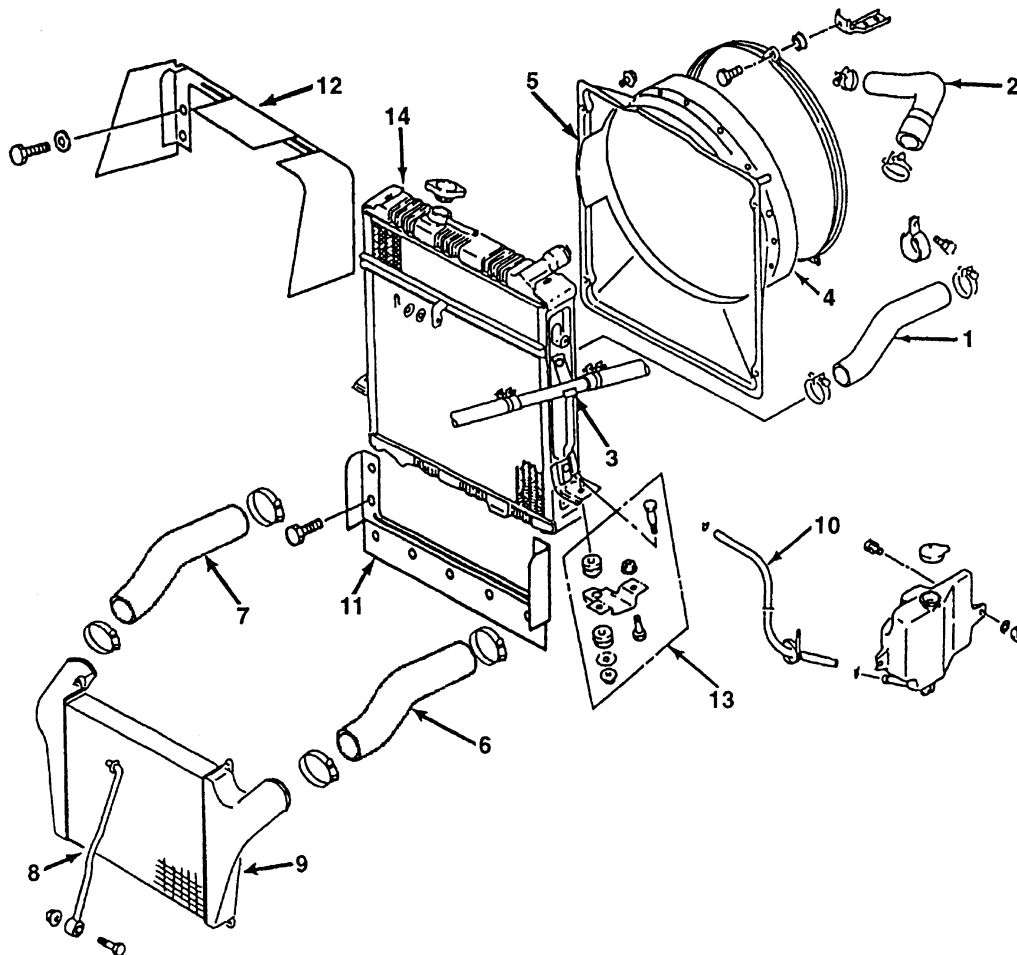
10. (Indicate on the nameplate that parts were replaced.)



11. Pour clean oil through the oil filler port to prevent corrosion.
 12. Seal the air and exhaust ducts of the turbocharger, as well as the water and oil filler ports to prevent foreign matter from entering.
- Follow the assembly directions to reattach to the engine.

Charge Air Cooler

Component



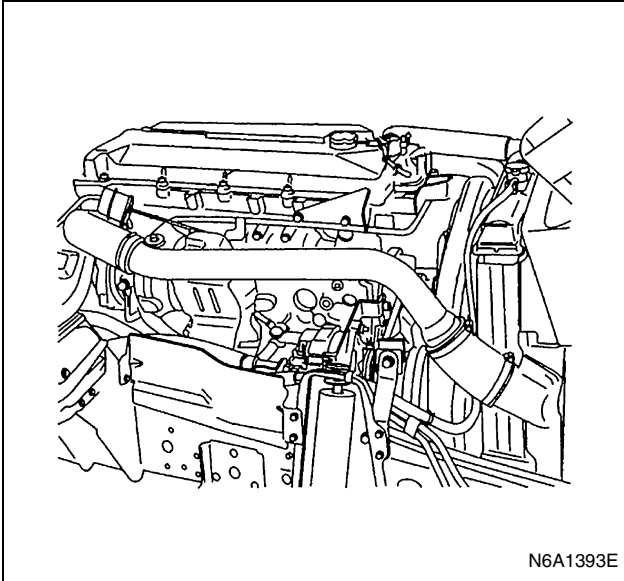
N6A1684E

Legend

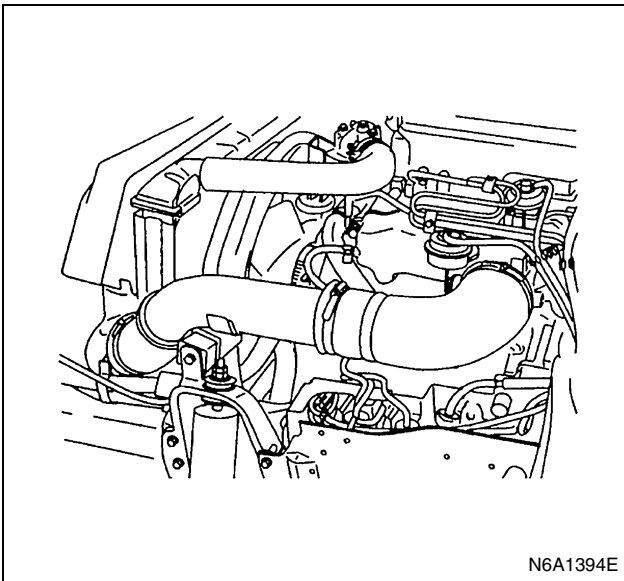
- | | |
|-------------------------------|----------------------------------|
| 1. Lower radiator hose | 8. Stay radiator support |
| 2. Upper radiator hose | 9. Charge air cooler |
| 3. Heater hose bracket | 10. Reserve tank hose |
| 4. Rubber ring and bell-mouth | 11. Air duct panel |
| 5. Fan shroud assembly | 12. Guide panel |
| 6. Flexible hose | 13. Mount nut and cushion rubber |
| 7. Flexible hose | 14. Radiator assembly |

Removal

- Disconnect the battery ground cables.
 - Drain the engine coolant.
1. Lower radiator hoses.



2. Upper radiator hoses.
3. Heater hose bracket.
4. Rubber Ring, bell-mouth to shroud.
5. Fan shroud assembly.
6. Flexible hose LH.
7. Flexible hose RH.

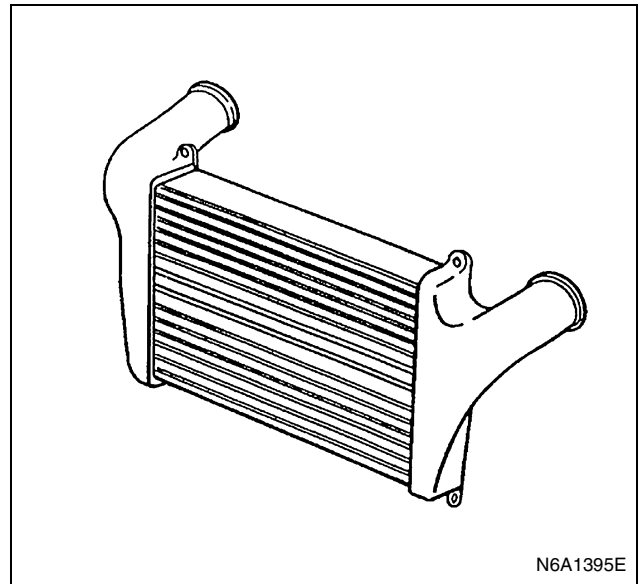


8. Stay radiator support.
9. Charge air cooler.
10. Reserve tank hose.
11. Air duct panel.
12. Guide panel.
13. Mount nut and cushion rubber.
14. Radiator assembly.

Installation

1. Radiator assembly.
2. Mount nut and cushion rubber.
3. Guide panel.
4. Air duct panel.

5. Reserve tank hose.
6. Charge air cooler.



7. Stay radiator support.
 8. Flexible hose RH.
 9. Flexible hose LH.
 10. Fan shroud assembly.
 11. Rubber Ring.
 12. Heater hose bracket.
 13. Upper radiator hoses.
 14. Lower radiator hoses.
or brackets that were removed.
- Fill the system with new engine coolant as described in ENGINE COOLING (SEC. 6B) of this manual. Then check the system for leaks.
 - Connect the battery ground cables.

