

i02748539

Fuel Injector - Remove and Install (Naturally Aspirated Engines)

Removal Procedure

Start By:

- a. Remove the fuel injection lines. Refer to Disassembly and Assembly, "Fuel Injection Lines - Remove and Install".

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Dispose of all fluids according to local regulations and mandates.

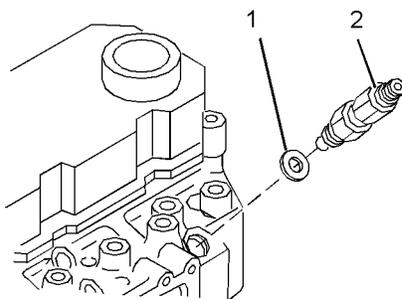


Illustration 29

g01325773

Typical example

1. Use a deep socket to remove fuel injectors (2) from the cylinder head.
2. Remove seat washers (1).

Installation Procedure

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

1. Clean the bore for the fuel injector in the cylinder head. Ensure that no debris enters the cylinder. Clean the threads on the body of the fuel injector.
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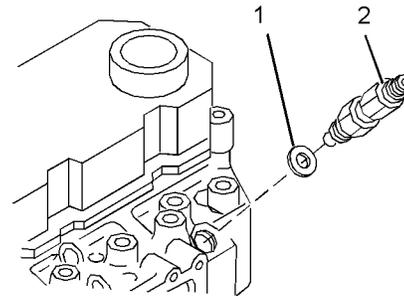


Illustration 30

g01325773

Typical example

2. Install new seat washers (1) into the bore for the fuel injector in the cylinder head.
3. Install fuel injectors (2) into the cylinder head. Use a deep socket to tighten fuel injectors (2) to a torque of 59 N·m (44 lb ft).

End By:

- a. Install the fuel injection lines. Refer to Disassembly and Assembly, "Fuel Injection Lines - Remove and Install".

i02748538

Fuel Injector - Remove and Install (Turbocharged Engines)

Removal Procedure

Start By:

- a. Remove the fuel injection lines. Refer to Disassembly and Assembly, "Fuel Injection Lines - Remove and Install".

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Dispose of all fluids according to local regulations and mandates.

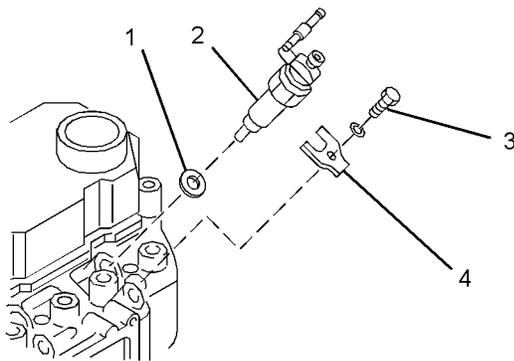


Illustration 31

g01325781

1. Remove bolts (3) and clamps (4) from fuel injectors (2).
2. Remove fuel injectors (2) from the cylinder head.
3. Remove seat washers (1).

Installation Procedure**NOTICE**

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

1. Clean the bores for the fuel injectors in the cylinder head. Ensure that no debris enters the cylinders. Clean the fuel injectors.

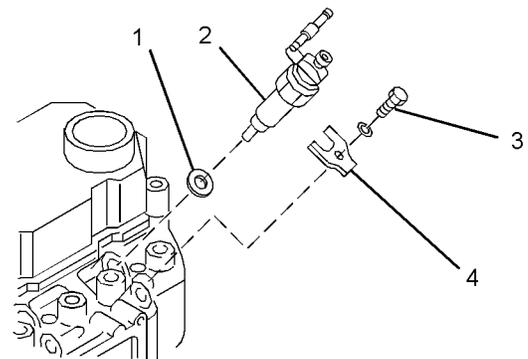


Illustration 32

g01325781

Typical example

2. Install new seat washers (1) to the bores for the fuel injectors in the cylinder head.
3. Install fuel injectors (2) into the cylinder head.
4. Position clamps (4) onto fuel injectors (2) and install bolts (3). Tighten bolts (3) to a torque of 22 N·m (16 lb ft).

End By:

- a. Install the fuel injection lines. Refer to Disassembly and Assembly, "Fuel Injection Lines - Remove and Install".

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Turbocharger - Remove**Removal Procedure****NOTICE**

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Dispose of all fluids according to local regulations and mandates.

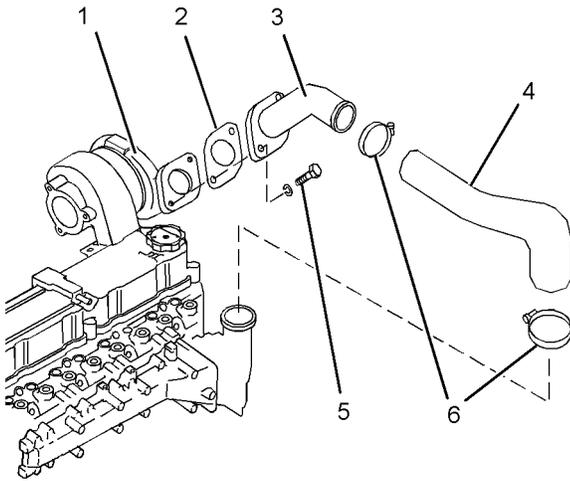


Illustration 33
Typical example g01336694

1. Loosen hose clamps (6) and remove hose (4). Plug the connection on the inlet manifold with a suitable plug.
2. Remove bolts (5) and remove air pipe (3) from turbocharger (1). Remove gasket (2).
3. Plug the opening in the inlet manifold and the opening in the turbocharger with suitable plugs.

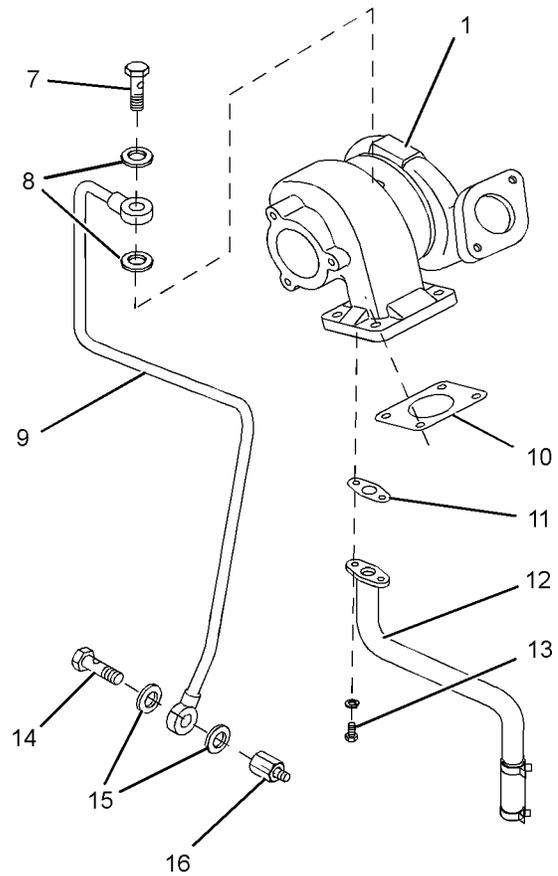


Illustration 34
Typical example g01336699

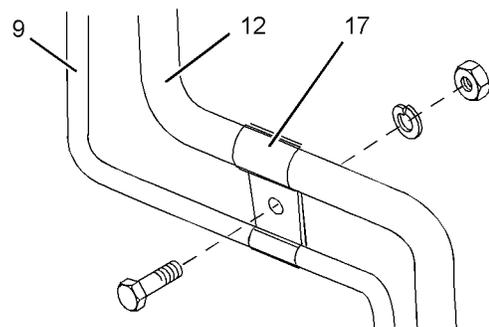


Illustration 35 g01337174

4. Follow Steps 4.a through 4.c in order to remove tube assembly (9) for the oil feed.
 - a. Remove tube clamp (17) that secures tube assembly (9) to tube assembly (12). Note the position of the clamp.

- b. Remove banjo bolt (14) and sealing washers (15). Disconnect tube assembly (9) from adapter (16) in the cylinder block.

Note: Do not allow adapter (16) to turn in the cylinder block when the banjo bolt is loosened. Use two wrenches in order to disconnect the tube assembly.

- c. Remove banjo bolt (7) and sealing washers (8). Remove tube assembly (9) from turbocharger (1).
5. Follow Steps 5 through 5.c in order to remove the tube assembly (12) for the oil drain.
 - a. Remove bolts (13). Disconnect tube assembly (12) from turbocharger (1).
 - b. Remove joint (11).
 - c. If necessary, loosen the hose clips and remove tube assembly (12) from the adapter in the cylinder block.
 6. Remove the double nuts (not shown) that secure turbocharger (1) to the exhaust manifold.
 7. Remove turbocharger (1) from the exhaust manifold. Remove gasket (10).
 8. Plug the oil supply and the oil drain ports in the turbocharger and in the cylinder block with suitable plugs.

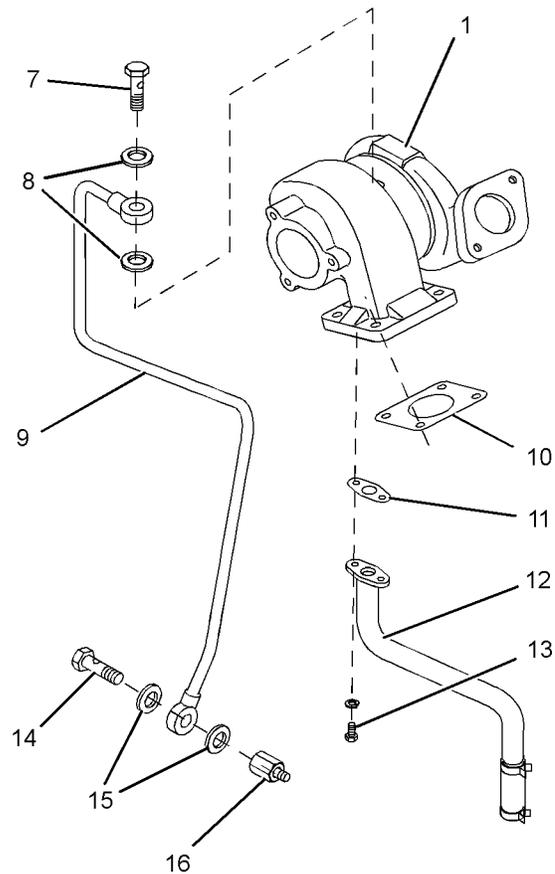


Illustration 36
Typical example

g01336699

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Turbocharger - Install

Installation Procedure

Table 5

Required Tools			
Tool	Part Number	Part Description	Qty
A	CV60889	Anti-Seize Compound	1

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

1. Ensure that the turbocharger is clean and free from damage. Inspect the turbocharger for wear. Refer to Systems Operation, Testing and Adjusting, "Turbocharger - Inspect" for more information. If the turbocharger is worn, the complete turbocharger must be replaced.

2. Clean the mating surface of the exhaust manifold. Install a new gasket (10) over the studs. Apply Tooling (A) to the studs.
 3. Position turbocharger (1) onto the exhaust manifold and install the double nuts. Tighten the nuts to a torque of 18 N·m (13 lb ft).
- Note:** Do not allow the lower nuts to turn when the upper nuts are tightened.
4. Ensure that tube assemblies (9) and (12) are clean and free from damage. If necessary, replace the tube assemblies.
 5. Remove the plugs from the ports in the turbocharger and from the cylinder block.
 6. If necessary, install the lower end of tube assembly (12) to the adapter in the cylinder block. Position a new joint (11) onto tube assembly (12). Connect the tube assembly to turbocharger (1) and install bolts (13). Tighten the bolts to a torque of 9 N·m (80 lb in). If necessary, tighten the hose clips.

7. Lubricate the bearings of turbocharger (1) with clean engine oil through the oil inlet port. Rotate the shaft of the turbocharger in order to distribute the lubricant.
8. Install new sealing washers (8) and banjo bolt (7) to tube assembly (9). Position tube assembly (9) onto turbocharger (1). Tighten the banjo bolt finger tight. Install new sealing washers (15) and banjo bolt (14) to tube assembly (9). Connect the tube assembly to adapter (16) in the cylinder block.
9. Tighten banjo bolts (7) and (14) to a torque of 16 N·m (12 lb ft).

Note: Do not allow adapter (16) to turn in the cylinder block.

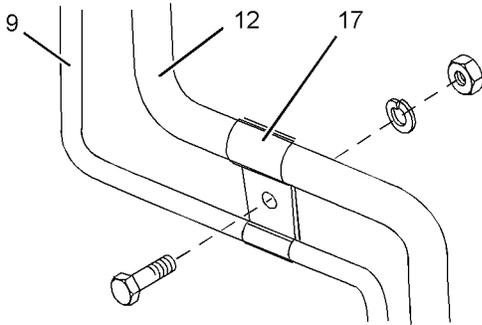


Illustration 37

g01337174

10. Install clamp (17) to tube assemblies (9) and (12). Tighten the fasteners securely.

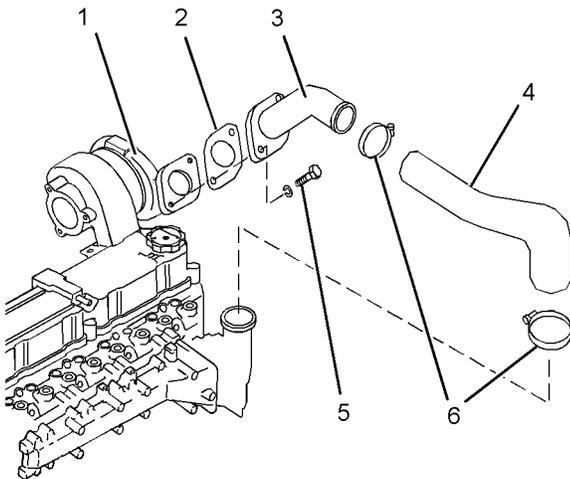


Illustration 38

Typical example

g01336694

11. Position a new joint (2) and air pipe (3) onto turbocharger (1). Install bolts (5). Tighten the bolts to a torque of 18 N·m (13 lb ft).
12. Remove the plugs from the connection on the inlet manifold and from the turbocharger. Install hose (4) and tighten hose clamps (6) securely.

i02748542

Exhaust Manifold - Remove and Install

Removal Procedure

Start By:

- a. If the engine is equipped with a turbocharger, remove the turbocharger. Refer to Disassembly and Assembly, "Turbocharger - Remove".

WARNING

Hot engine components can cause injury from burns. Before performing maintenance on the engine, allow the engine and the components to cool.

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

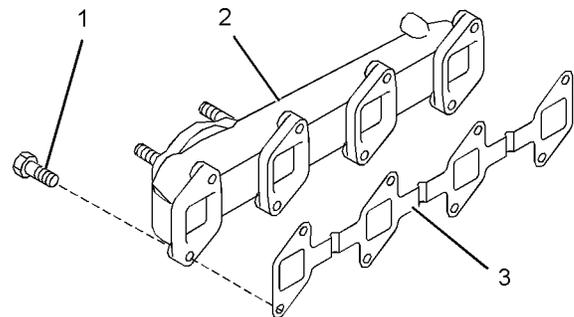


Illustration 39

Exhaust manifold from a naturally aspirated engine

g01333088

1. Loosen bolts (1).

Note: In order to prevent distortion of the exhaust manifold, Loosen the outer bolts first.

2. Remove bolts (1) and remove exhaust manifold (2) from the cylinder head.
3. Remove gasket (3).

Installation Procedure

Table 6

Required Tools			
Tool	Part Number	Part Description	Qty
A	-	Guide Stud (M8 x 1.25 by 100 mm)	2

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

1. Ensure that the exhaust manifold is clean and free from damage. Clean the joint surface of the cylinder head.

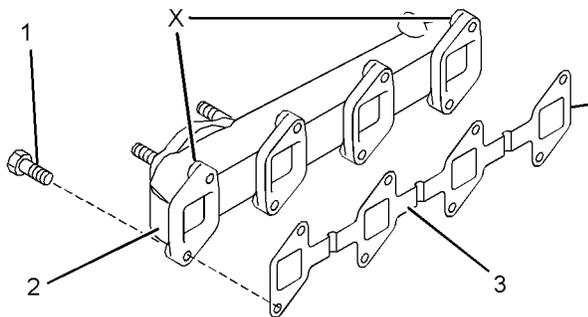


Illustration 40

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Exhaust manifold from a naturally aspirated engine

2. Install Tooling (A) to the cylinder head in positions (X).
3. Position a new exhaust manifold gasket (3) onto Tooling (A).

Note: Ensure that the exhaust manifold gasket is correctly oriented.

4. Align exhaust manifold (2) with Tooling (A). Install the exhaust manifold to the cylinder head.
5. Install bolts (1) finger tight.
6. Remove Tooling (A). Install the remaining bolts (1) finger tight.
7. Tighten bolts (1) to a torque of 30 N·m (22 lb ft).

Note: Tighten the center bolts first.

End By:

- a. If the engine is equipped with a turbocharger, install the turbocharger. Refer to Disassembly and Assembly, "Turbocharger - Install".

i02748543

Inlet Manifold - Remove and Install

Removal Procedure

Start By:

- a. Remove the fuel injection lines. Refer to Disassembly and Assembly, "Fuel Injection Lines - Remove and install".

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

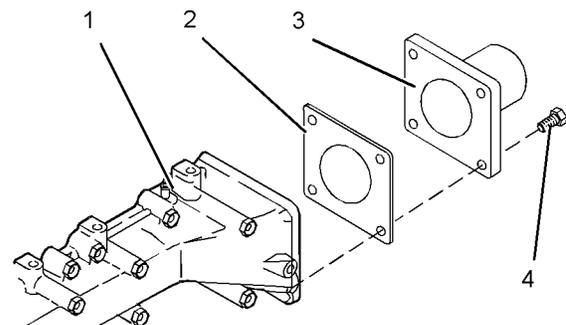


Illustration 41

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Typical example

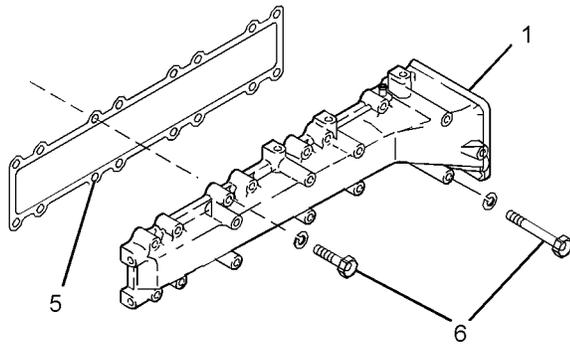


Illustration 42

g01333457

Typical example

1. Loosen the hose clamps and disconnect the air hose (not shown) from connection (3).
2. For naturally aspirated engines, disconnect the hose for the crankcase breather (not shown) from inlet manifold (1).

For turbocharged engines, remove the bolt that secures the hose for the crankcase breather (not shown) from the inlet manifold (1).

3. Remove bolts (6) from inlet manifold (1). Note the position of any brackets that are retained by the bolts for installation.
4. Remove inlet manifold (1) and gasket (5) from the cylinder head.
5. If necessary, remove bolts (4) and remove connection (3) from inlet manifold (1). Remove gasket (2).

Installation Procedure

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

1. Ensure that all mating surfaces are clean and free from debris.

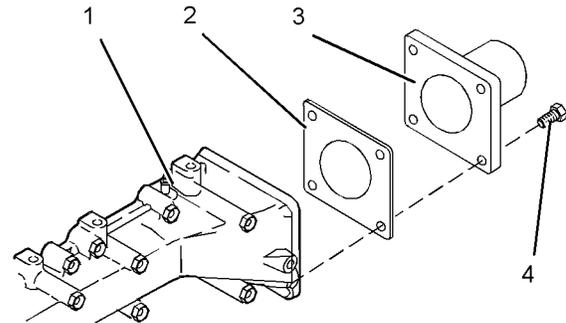


Illustration 43

g01333458

Typical example

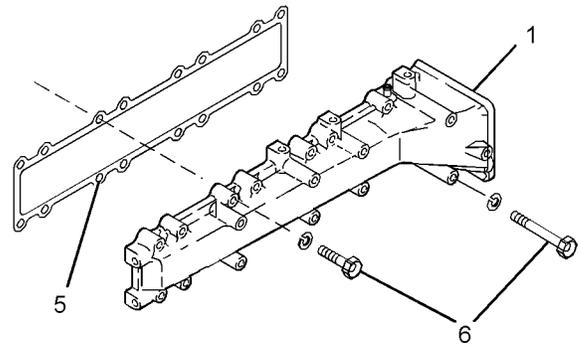


Illustration 44

g01333457

Typical example

2. If necessary, position a new gasket (2) and connection (3) onto inlet manifold (1). Install bolts (4). Tighten the bolts to a torque of 11 N·m (97 lb in).

Note: Ensure correct orientation of the connection.

3. Place a new gasket (5) in position on inlet manifold (1).
4. Position inlet manifold (1) on the cylinder head.
5. Install bolts (6). Ensure that bolts of different lengths are installed in the correct positions. Also ensure that any brackets that are retained by the bolts are installed in the correct positions.
6. Tighten bolts (6) to a torque of 18 N·m (13 lb ft).
7. For naturally aspirated engines, connect the hose for the crankcase breather (not shown) to inlet manifold (1).