Product: INDUSTRIAL ENGINE
Model: C3.3 INDUSTRIAL ENGINE E3K
Configuration: C3.3 Industrial Engine E3K00001-UP

Disassembly and Assembly
C3.3 Industrial Engine
Media Number -KENR6916-01 **Publication Date -01/01/2008** **Date Updated -02/05/2017**

i02752025

Fuel Injection Pump Gear - Remove

SMCS - 1251-011

Removal Procedure

Table 1

Required Tools			
Tool	**Part Number**	**Part Description**	**Qty**
A[1]	9U-6198	Crankshaft Turning Tool	1
A[2]	9U-7336	Housing	1
	5P-7305	Engine Turning Tool	1
B	230-6284	Timing Pin (Camshaft)	1
C	230-6283	Timing Pin (Crankshaft)	1
D	1P-2320	Combination Puller	1

(1) The Crankshaft Turning Tool is used on the front pulley.

(2) This Tool is used in the aperture for the electric starting motor.

Start By:

a. Remove the front cover. Refer to Disassembly and Assembly, "Front Cover - Remove and Install".

Note: Either Tooling (A) can be used. Use the Tooling that is most suitable.

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.

Note: Care must be taken in order to ensure that the fuel injection pump timing is not lost during the removal of the fuel pump gear. Carefully follow the procedure in order to remove the fuel pump gear.

1. Use Tooling (A) in order to rotate the crankshaft so that number one piston is at the top center position on the compression stroke. Refer to Systems Operation, Testing and Adjusting, "Finding Top Center Position for No.1 Piston".

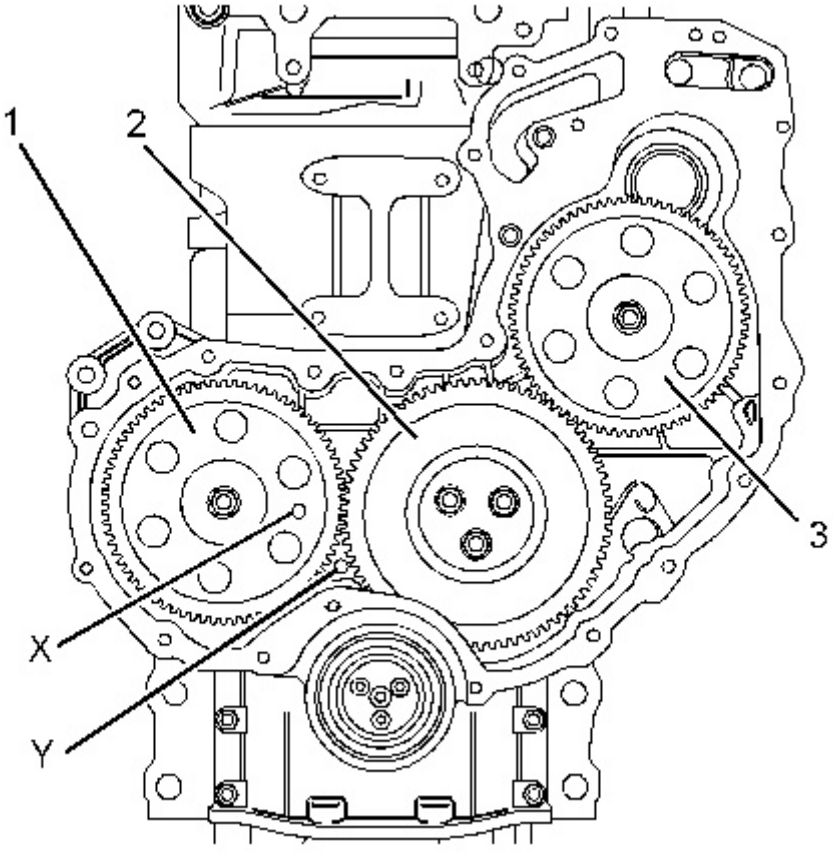

Illustration 1 g01343056

Typical example

2. Install Tooling (B) through Hole (X) in camshaft gear (1) into the front housing. Use Tooling (B) in order to lock the camshaft in the correct position.

3. Install Tooling (C) into Hole (Y) in the front housing. Use Tooling (C) in order to lock the crankshaft in the correct position.

   Note: Do not use excessive force to install Tooling (C). Do not use Tooling (C) to hold the crankshaft during repairs.

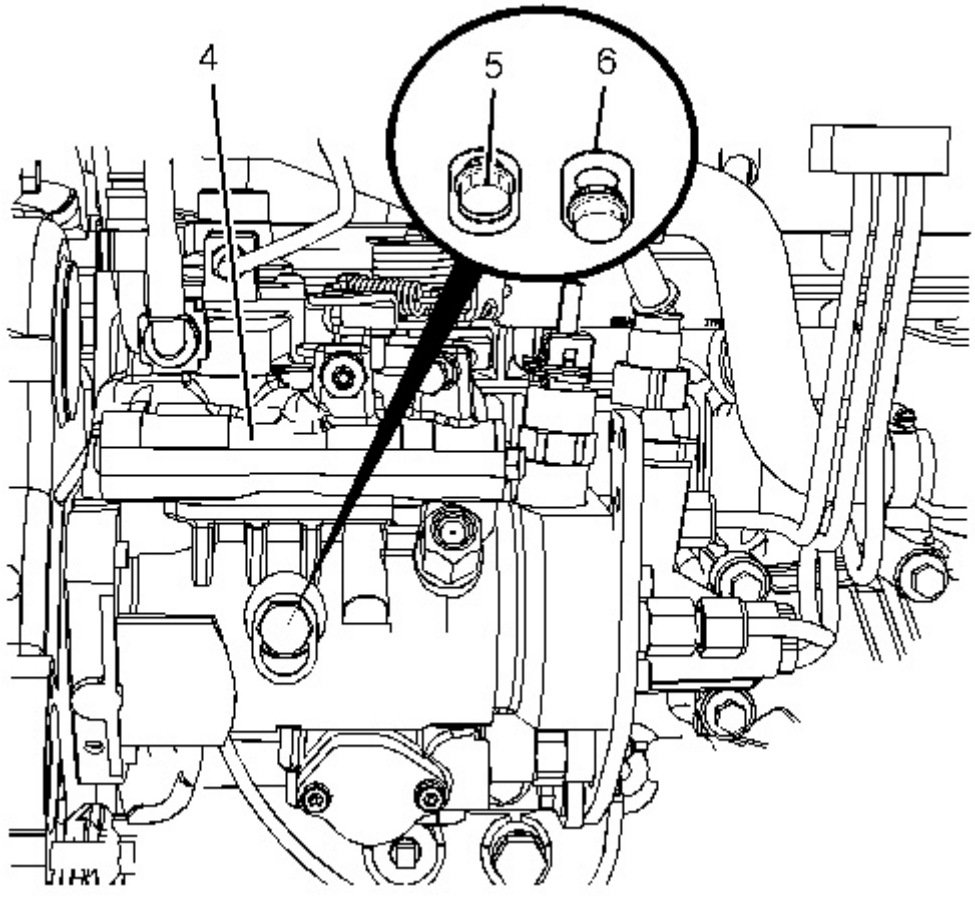

Illustration 2 g01440103

Typical example

4. Apply sufficient pressure to fuel injection pump gear (3) in a counterclockwise direction in order to remove the backlash. Lock fuel injection pump (4) in this position. Loosen locking screw (5). Rotate spacer (6) in order to allow locking screw (5) to tighten against the shaft of the fuel injection pump. Tighten locking screw (5) to a torque of 14.5 N·m (11 lb ft).

   Note: Locking screw (5) must be tightened in order to prevent the shaft of the fuel injection pump from rotating. The shaft of the fuel injection pump must not be rotated after the fuel injection pump has been removed from the engine.

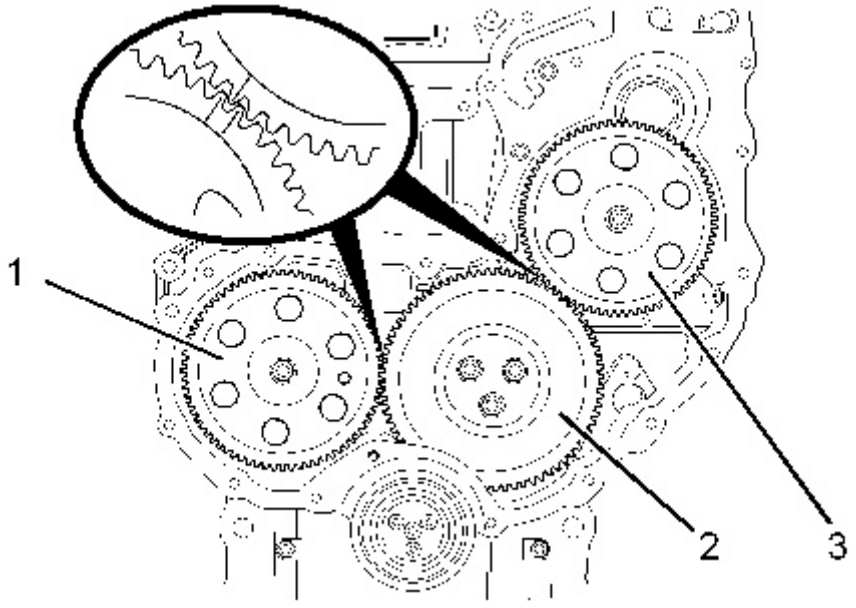

Illustration 3 g01335384

Alignment of timing Marks

5. Mark gears (1), (2), and (3) in order to show alignment. Refer to Illustration 3.

   Note: Identification will ensure that the gears can be installed in the original alignment.

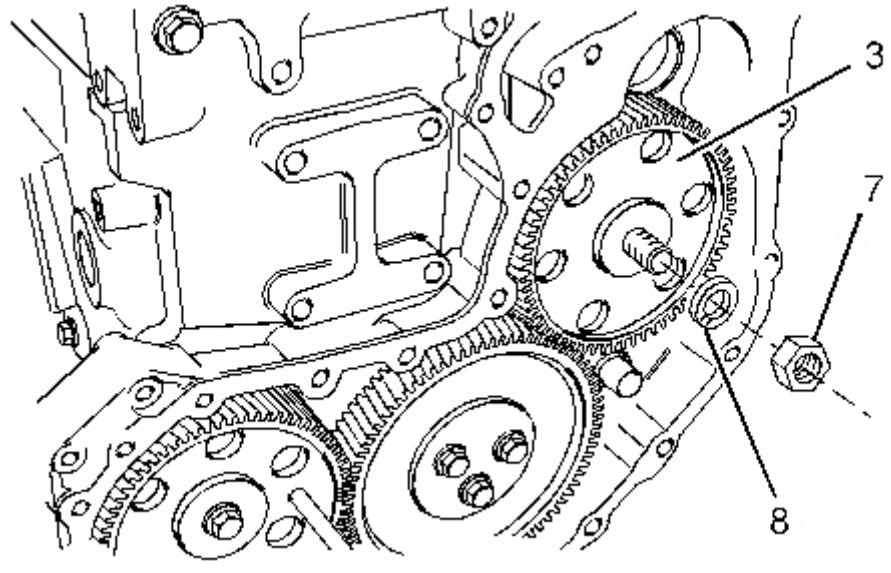

Illustration 4 g01429923

Typical example

6. Loosen nut (7) on fuel pump gear (3).

7. Install Tooling (D) through three holes in fuel pump gear (3). Tighten Tooling (D) until the fuel pump gear is released.

8. Remove Tooling (D) from fuel pump gear (3).
9. Remove nut (7) and washer (8) from fuel pump gear (3). Remove the fuel pump gear.

Product: INDUSTRIAL ENGINE
Model: C3.3 INDUSTRIAL ENGINE E3K
Configuration: C3.3 Industrial Engine E3K00001-UP

Disassembly and Assembly
C3.3 Industrial Engine
Media Number -KENR6916-01 **Publication Date -01/01/2008** **Date Updated -02/05/2017**

i02752026

Fuel Injection Pump Gear - Install

SMCS - 1251-012

Installation Procedure

Table 1

Required Tools			
Tool	**Part Number**	**Part Description**	**Qty**
A[1]	9U-6198	Crankshaft Turning Tool	1
A[2]	9U-7336	Housing	1
	5P-7305	Engine Turning Tool	1
B	230-6284	Timing Pin (Camshaft)	1
C	230-6283	Timing Pin (Crankshaft)	1
D	9U-7324	Indicator Bracket	1
	7H-1942	Dial Indicator	1
	3S-3268	Indicator Contact Point	1
	7H-1940	Universal Attachment	1

[1] The Crankshaft Turning Tool is used on the front pulley.

[2] This Tool is used in the aperture for the electric starting motor.

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.

Note: The fuel injection pump must remain locked until the procedure instructs you to unlock the fuel injection pump.

1. Ensure that number one piston is at the top center position on the compression stroke. Refer to the Systems Operation, Testing and Adjusting, "Finding Top Center Position for No. 1 Piston".

   Note: Either Tooling (A) can be used. Use the Tooling that is most suitable.

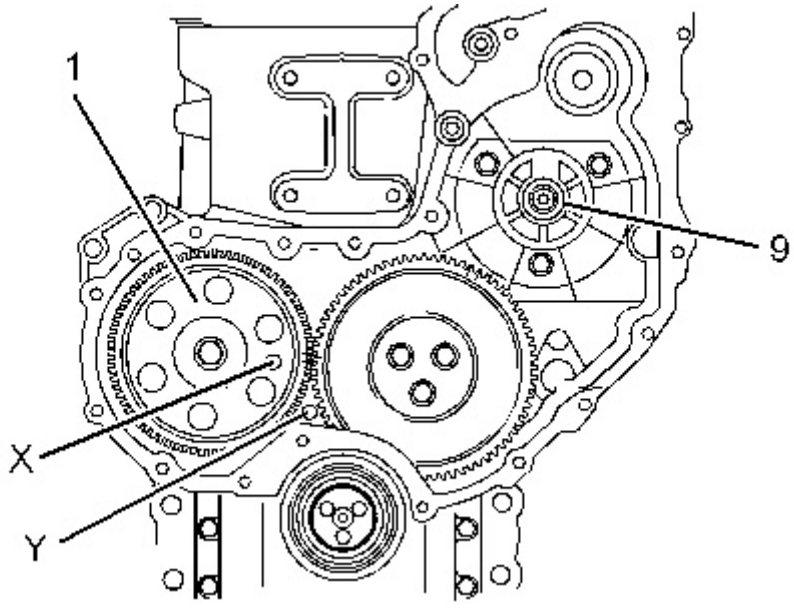

Illustration 1 g01343058

Typical example

2. Ensure that Tooling (C) is installed in Hole (Y) in the front housing. Use Tooling (C) in order to lock the crankshaft in the correct position.

   Note: Do not use excessive force to install Tooling (C). Do not use Tooling (C) to hold the crankshaft during repairs.

3. Ensure that Tooling (B) is installed into Hole (X) in camshaft gear (1).
4. Ensure that shaft (9) on the fuel injection pump is clean, dry and free from damage.
5. Ensure that the fuel injection pump is locked in the correct position. Refer to Disassembly and Assembly, "Fuel Injection Pump - Install".
6. Ensure that the fuel pump gear is clean, dry and free from wear or damage. If necessary, replace the fuel pump gear.

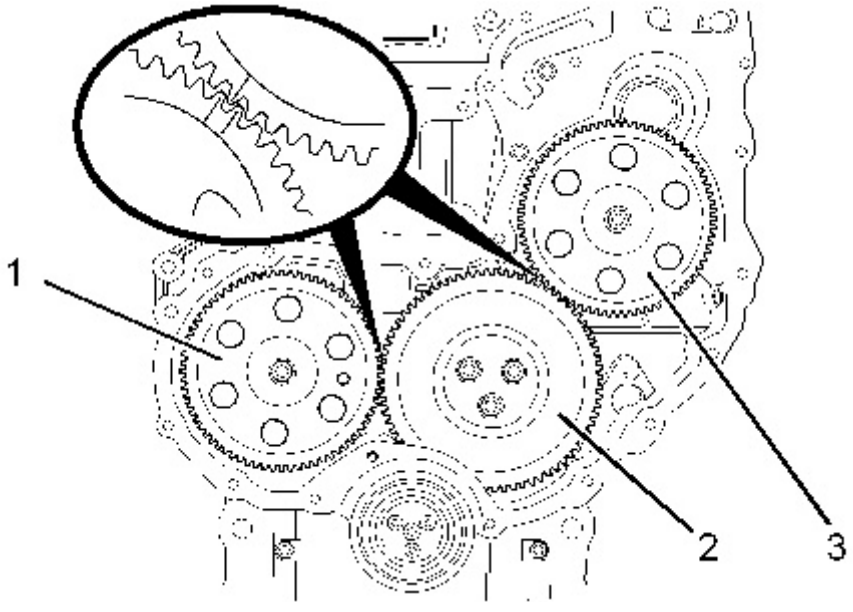

Illustration 2 g01335384

Alignment of timing marks

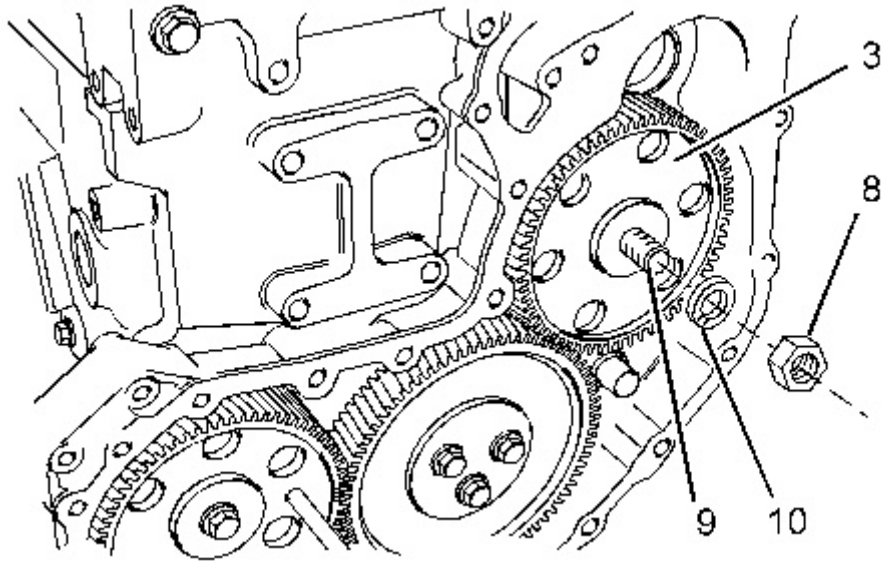

Illustration 3 g01343060

Typical example

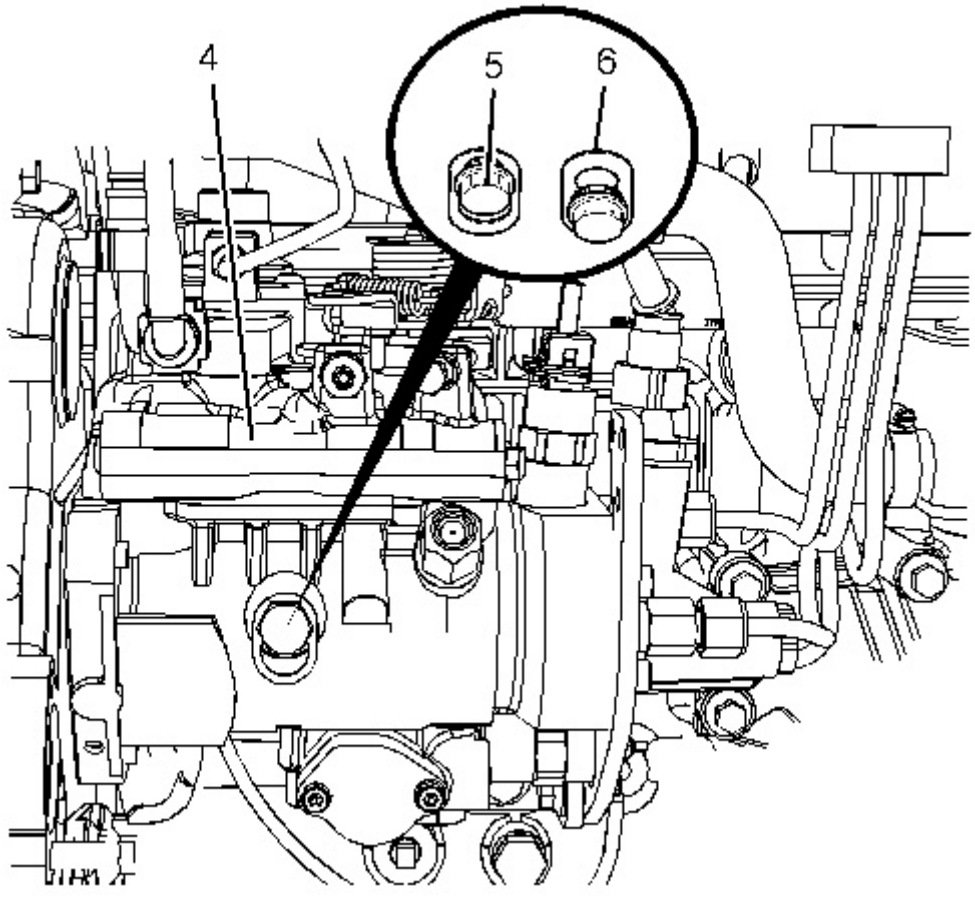

Illustration 4 g01440103

7. Install fuel pump gear (3) to shaft (9) of the fuel injection pump. Ensure that the timing Marks on gears (2) and (3) are in alignment and that the mesh of the gears is correct.

8. Install a new spring washer (10) and install nut (8) to shaft (9) of the fuel injection pump. Apply sufficient pressure to the fuel injection pump gear (3) in a counterclockwise direction in order to remove the backlash. Tighten nut (8) to a torque of 24 N·m (17 lb ft). Unlock the fuel injection pump (5).

   In order to unlock the fuel injection pump, loosen locking screw (5) on the fuel injection pump. Rotate spacer (6) in order to allow locking screw (5) to tighten against the spacer. Tighten the locking screw against the spacer to a torque of 12 N·m (106 lb in). This will prevent the locking screw from tightening against the shaft of the fuel injection pump.

9. Remove Tooling (B) and Tooling (C).

10. Tighten nut (8) to a torque of 90 N·m (66 lb ft).

11. Use Tooling (D) to measure the backlash of gears (2) and (3). Ensure that the backlash for the gears is within specified values. Refer to Specifications, "Gear Group (Front)" for further information.

12. Lubricate the teeth of the gears with clean engine oil.

End By:

a. Install the front cover. Refer to Disassembly and Assembly, "Front Cover - Remove and Install".

Product: INDUSTRIAL ENGINE
Model: C3.3 INDUSTRIAL ENGINE E3K
Configuration: C3.3 Industrial Engine E3K00001-UP

Disassembly and Assembly

C3.3 Industrial Engine

Media Number -KENR6916-01 **Publication Date -01/01/2008** **Date Updated -02/05/2017**

i02752027

Fuel Injector - Remove

SMCS - 1290-011

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.

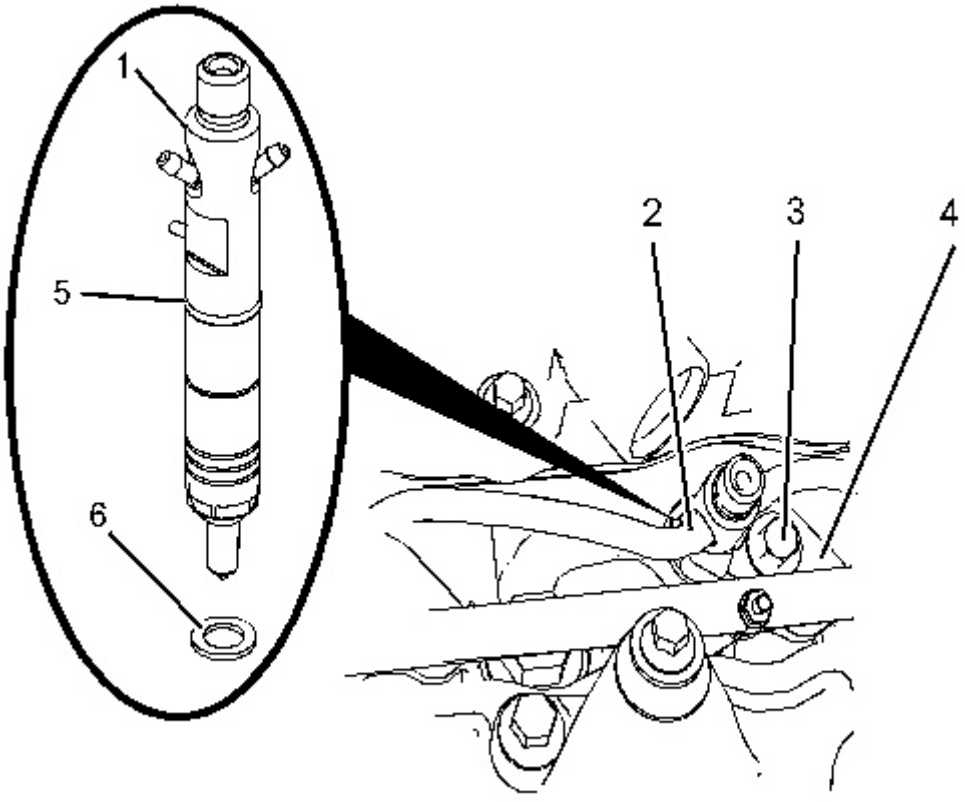

Illustration 1 g01439712

Typical example

1. Remove fuel return lines (2) from fuel injectors (1).
2. Remove bolts (3).
3. Remove clamps (4) from fuel injector (1).
4. Remove fuel injectors (1) from the cylinder head. Remove O-ring seals (5) from fuel injectors (1).
5. Remove washers (6).

Product: INDUSTRIAL ENGINE
Model: C3.3 INDUSTRIAL ENGINE E3K
Configuration: C3.3 Industrial Engine E3K00001-UP

Disassembly and Assembly
C3.3 Industrial Engine
Media Number -KENR6916-01 **Publication Date -01/01/2008** **Date Updated -02/05/2017**

i02752028

Fuel Injector - Install

SMCS - 1290-012

Installation Procedure

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

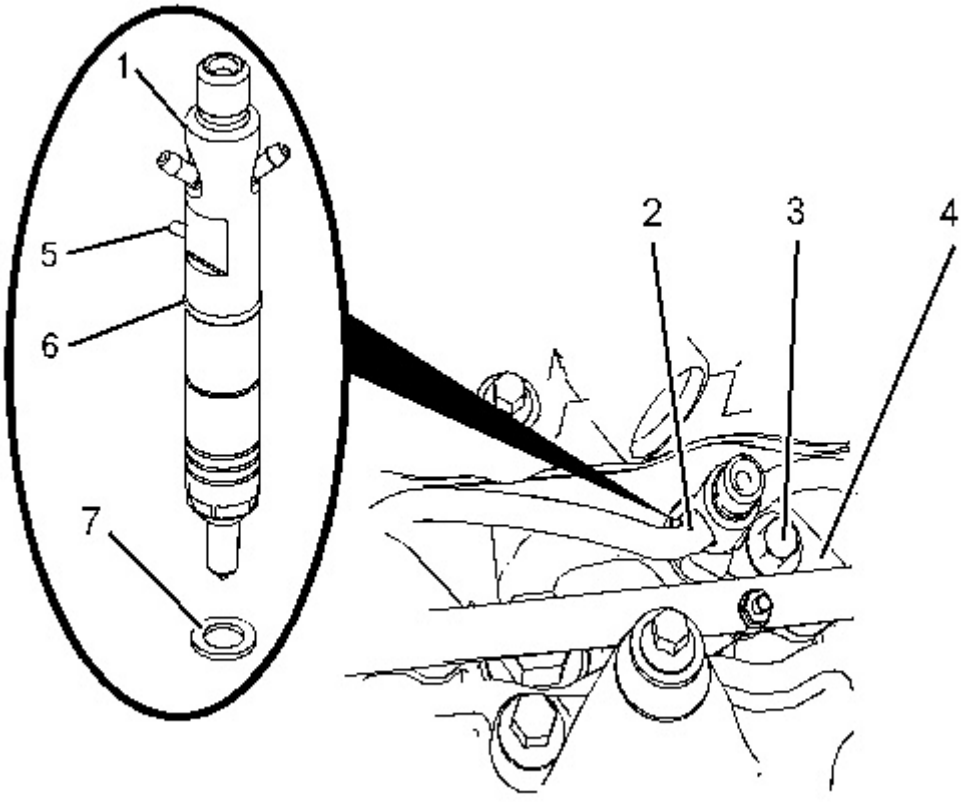

Illustration 1 g01439728

Typical example

1. Ensure that the seat for the fuel injectors in the cylinder head is clean and free from damage. Position a new washer (7) on the seat for the fuel injector in the cylinder head.
2. Install a new O-ring seal (6) on fuel injectors (1).
3. Position clamp (4) onto fuel injectors (1). Install fuel injectors into the cylinder head.

   Note: Alignment Pins (5) must be located opposite clamps (4).
4. Install bolts (3). Tighten the bolts to a torque of 35 N·m (26 lb ft).
5. Install fuel return lines (2) to fuel injectors (1).

End By:

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

Product: INDUSTRIAL ENGINE
Model: C3.3 INDUSTRIAL ENGINE E3K
Configuration: C3.3 Industrial Engine E3K00001-UP

Disassembly and Assembly

C3.3 Industrial Engine

Media Number -KENR6916-01 **Publication Date -01/01/2008** **Date Updated -02/05/2017**

i02752029

Turbocharger - Remove

SMCS - 1052-011

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.

Note: Plug and cap all open ports and tube assemblies.

1. Loosen the hose clamp and disconnect the air inlet hose from the turbocharger.

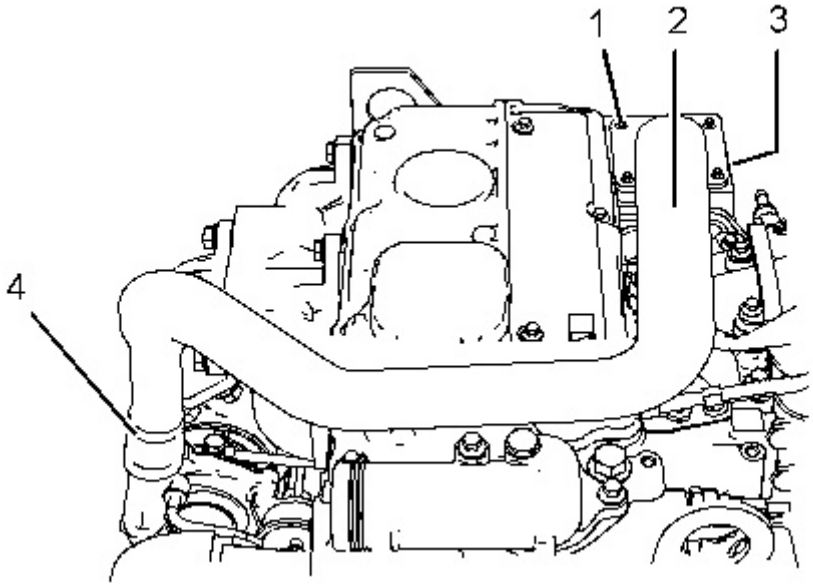

Illustration 1 g01419266

Typical example

2. If the engine is equipped with a air pipe, loosen hose clamp (4) and remove bolts (1). Remove air pipe (2) and remove gasket (3) (not shown) from the cylinder head.

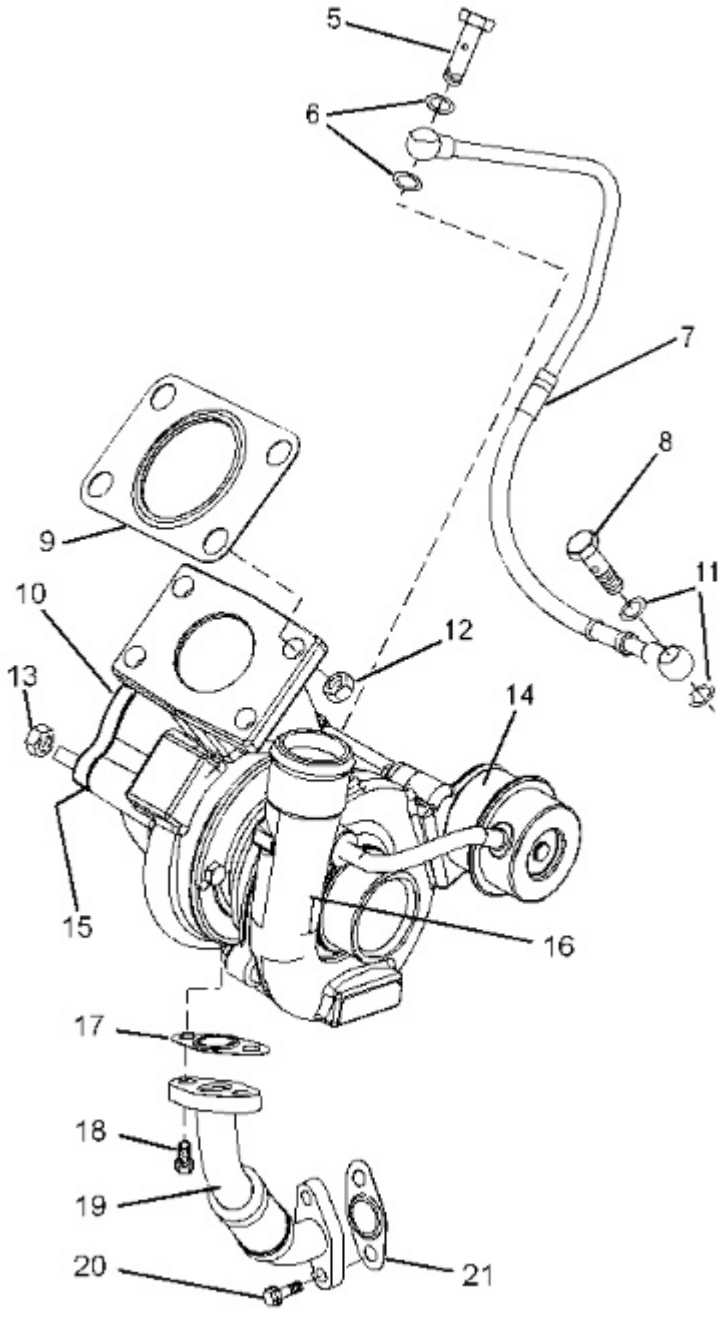

Illustration 2 g01380209

Typical example

3. If the turbocharger is equipped with adapter (10), Remove nuts (13) and remove adapter (10) from turbocharger (16). Remove gasket (15) (not shown).

4. Remove banjo bolt (5) and disconnect tube assembly (7) from turbocharger (16). Remove sealing washers (6) from tube assembly (7).

5. If necessary, remove banjo bolt (8) and disconnect tube assembly (7) from the cylinder block. Remove sealing washers (11) from tube assembly (7). Remove tube assembly (7).

6. Remove bolts (18). Disconnect tube assembly (19) from turbocharger (16). Remove joint (17).

If necessary, remove bolts (20) and remove tube assembly (19) from the cylinder block. Remove joint (21).

7. Remove nuts (12) and remove turbocharger (16).

   Note: Do not use the actuator rod (14) to lift the turbocharger.

8. Remove gasket (9).

9. If necessary, remove the studs from the exhaust elbow and the turbocharger.

Product: INDUSTRIAL ENGINE
Model: C3.3 INDUSTRIAL ENGINE E3K
Configuration: C3.3 Industrial Engine E3K00001-UP

Disassembly and Assembly
C3.3 Industrial Engine
Media Number -KENR6916-01 **Publication Date -01/01/2008** **Date Updated -02/05/2017**

i02752031

Turbocharger - Install

SMCS - 1052-012

Installation Procedure

Table 1

Required Tools			
Tool	**Part Number**	**Part Description**	**Qty**
A	6V-6640	Sealant	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.

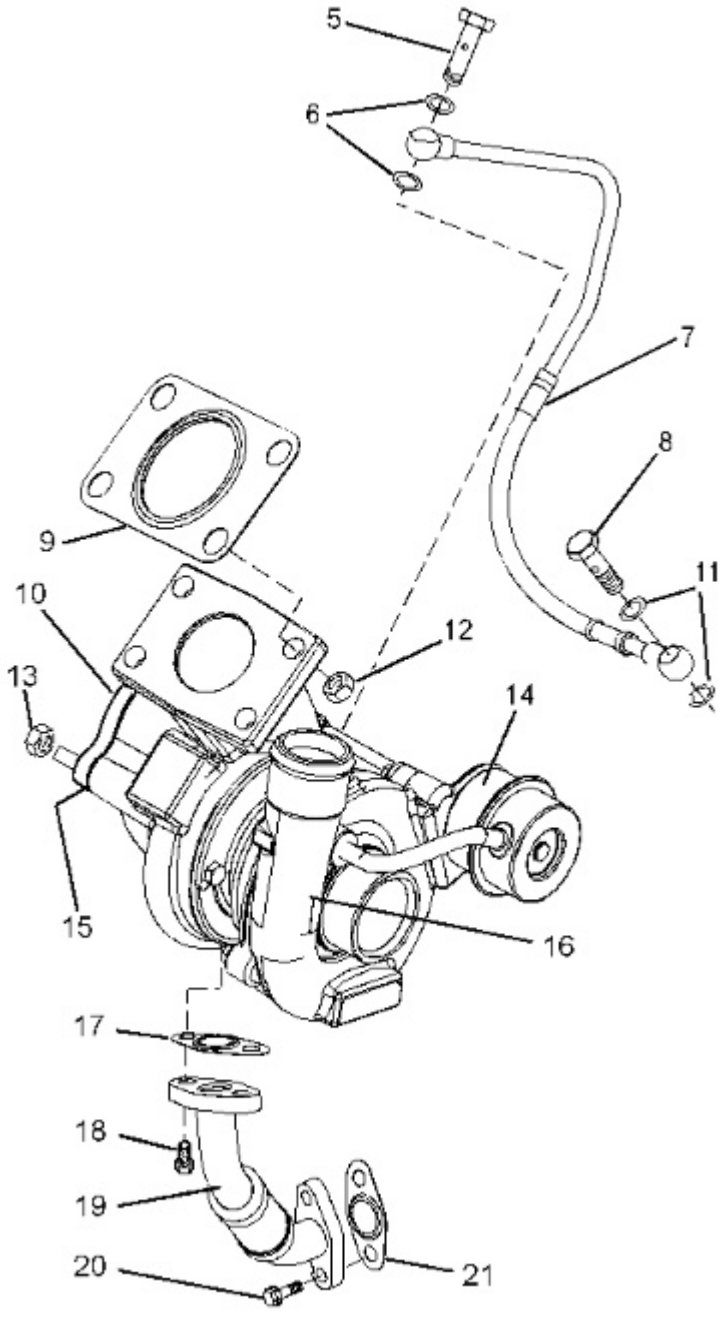

Illustration 1 g01380209

Typical example

2. Test actuator (14) for correct operation. Refer to Systems Operation, Testing and Adjusting, "Turbocharger - Inspect". If the actuator is damaged or the actuator does not operate within the specified limits, the complete turbocharger must be replaced.

3. Clean the mating surfaces of the exhaust elbow. If necessary, install the studs to the exhaust manifold. Tighten the studs to a torque of 18 N·m (13 lb ft).

4. Install a new gasket (9) onto the turbocharger.

5. Position turbocharger (16) onto the exhaust elbow and install nuts (12). Tighten the nuts to a torque of 44 N·m (32 lb ft).

Note: Do not use the actuator rod (14) to lift the turbocharger.

6. If necessary, install tube assembly (19) to the cylinder block. Install a new joint (21) onto tube assembly (19). Position tube assembly onto the cylinder block and install bolts (20) finger tight.

7. Position a new joint (17) onto tube assembly (19). Install tube assembly to turbocharger (16). Install bolts (18) finger tight.

8. The turbocharger has different sized bolts (18) and (20). Tighten M6 bolts to a torque of 9 N·m (80 lb in). Tighten M8 bolts to a torque of 22 N·m (16 lb ft).

9. Lubricate the bearings of turbocharger (16) with clean engine oil through the oil inlet port. Rotate the shaft of the turbocharger in order to distribute the lubricant.

10. If necessary, Install tube assembly (7). Install new washers (11) and banjo bolt (8) to tube assembly (7). Connect the tube assembly to the cylinder block. Tighten the banjo bolt finger tight.

11. Position tube assembly (7) onto turbocharger (16). Install new washers (6) and banjo bolt (5) to tube assembly (7). Tighten the banjo bolt finger tight.

12. Tighten banjo bolts (5) and (8) to a torque of 20 N·m (15 lb ft).

    Note: Ensure that the tube assembly does not come into contact with any other engine components.

13. If the turbocharger was equipped with a adapter (10), install a new gasket (15) (not shown) and position the adapter (10) onto the turbocharger. Install nuts (13). Tighten the nuts to a torque of 44 N·m (33 lb ft).

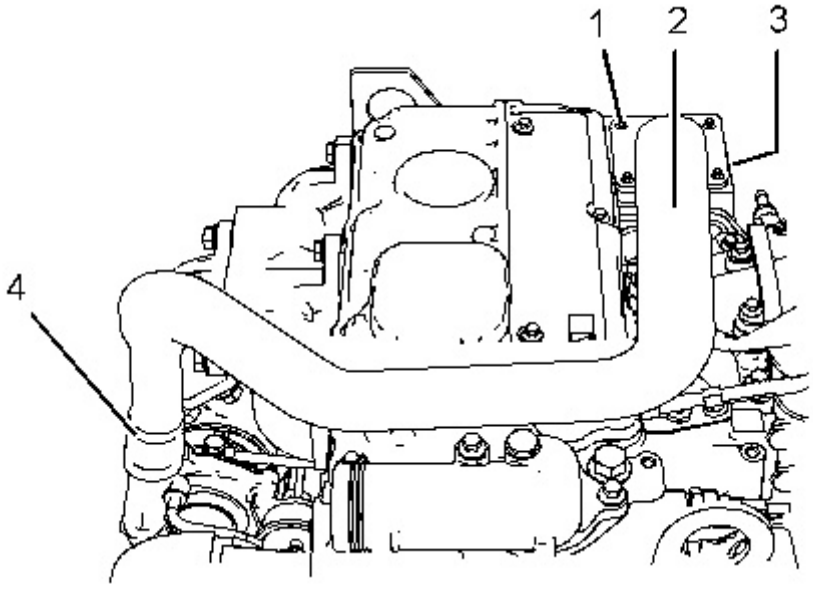

Illustration 2 g01419266

14. If the engine was equipped with an air pipe, install air pipe (2) and a new gasket (3) (not shown) to the cylinder head. Apply Tooling (A) to bolts (1) for the air pipe. Install bolts,and tighten the bolts to a torque of 22 N·m (16 lb ft).

15. Tighten hose clamps (4) securely.

    Note: If the air outlet hose has a reflective heat shield, ensure that the reflective heat shield is installed toward the engine.

16. Connect the air inlet hose to the turbocharger.

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Model: C3.3 INDUSTRIAL ENGINE E3K
Configuration: C3.3 Industrial Engine E3K00001-UP

Disassembly and Assembly
C3.3 Industrial Engine
Media Number -KENR6916-01 **Publication Date -01/01/2008** **Date Updated -02/05/2017**

i02752032

Exhaust Manifold - Remove and Install

SMCS - 1059-010

Removal Procedure

Start By:

a. Remove the turbocharger. Refer to Disassembly and Assembly, "Exhaust Elbow - Remove and Install".

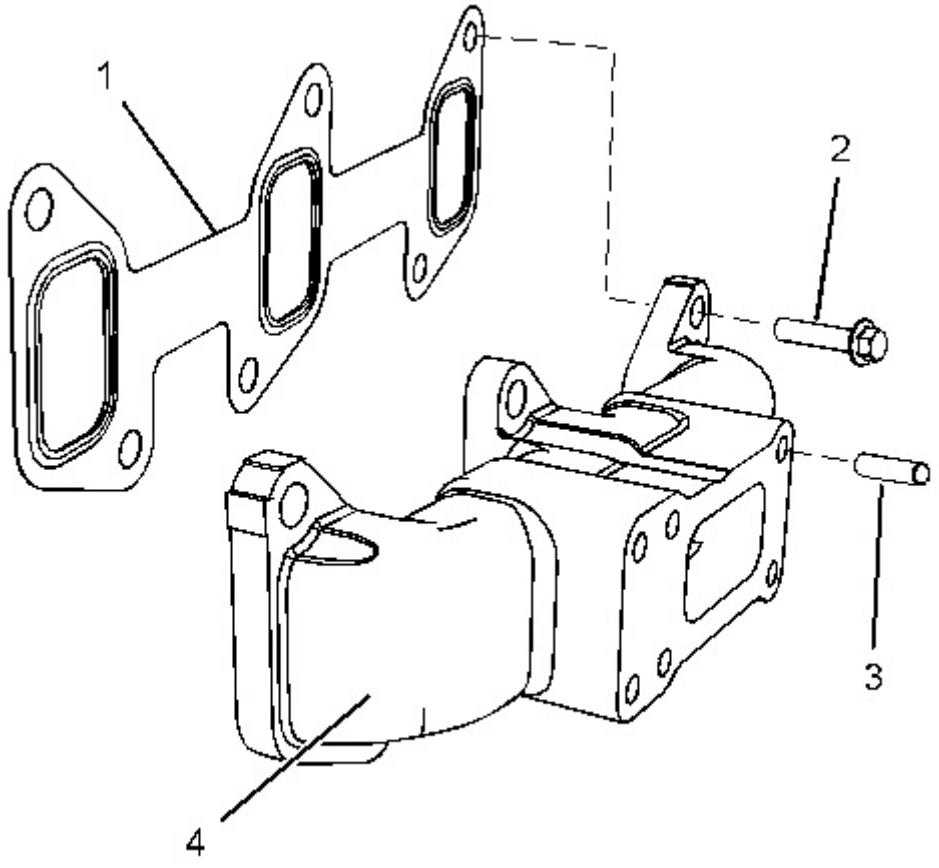

Illustration 1 g01379844

Typical example

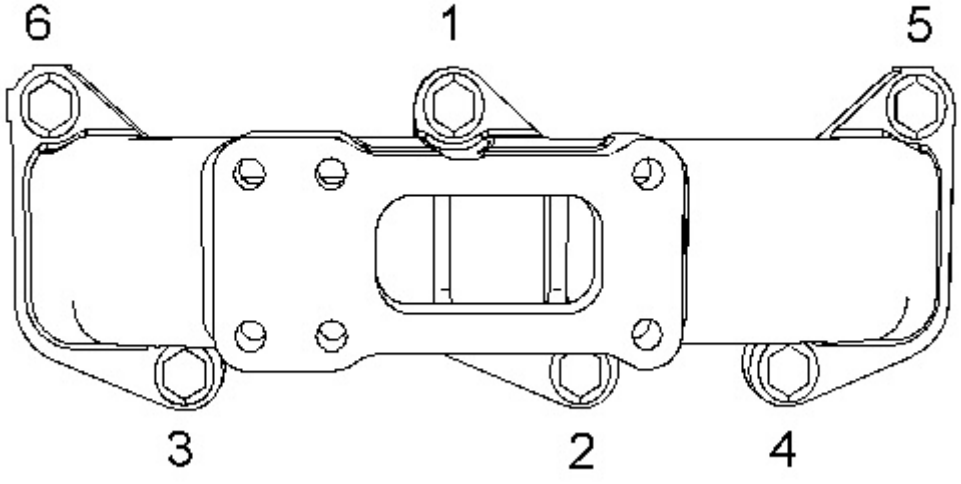

Illustration 2 g01379542

Sequence for loosening the exhaust manifold

1. Loosen bolts (2) in reverse numerical order to the sequence that is shown in Illustration 2.

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