

Product: ENGINE - MACHINE  
Model: C4.4 ENGINE - MACHINE 446  
Configuration: C4.4 Industrial Engine 44600001-UP

## Disassembly and Assembly C4.4 (MECH) Industrial Engine and Generator Sets

Media Number -KENR6249-05

Publication Date -01/03/2014

Date Updated -02/05/2017

i02763413

# Inlet and Exhaust Valves - Remove and Install

SMCS - 1105-010

## Removal Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A	9U-6195	Valve Spring Compressor	1
	268-1969	Adapter	1
	276-1221	Head	1

### Start By:

- a. Remove the cylinder head. Refer to Disassembly and Assembly, "Cylinder Head - Remove".

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### NOTICE

**Keep all parts clean from contaminants.**

**Contaminants may cause rapid wear and shortened component life.**

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1. Clean the bottom face of the cylinder head. Check the depth of the valves below the face of the cylinder head before the valve springs are removed. Refer to Specifications, "Cylinder Head Valves" for the correct dimensions.

2. Place a temporary identification mark on the heads of the valves in order to identify the correct position. Inlet valves have a recess in the center of the head.

**Note:** Do not stamp the heads of the valve. Stamping or punching the heads of the valves could cause the valves to fracture.

3. Use a suitable lifting device to position the cylinder head with the valve springs upward. The weight of the cylinder head is approximately 56 kg (125 lb).

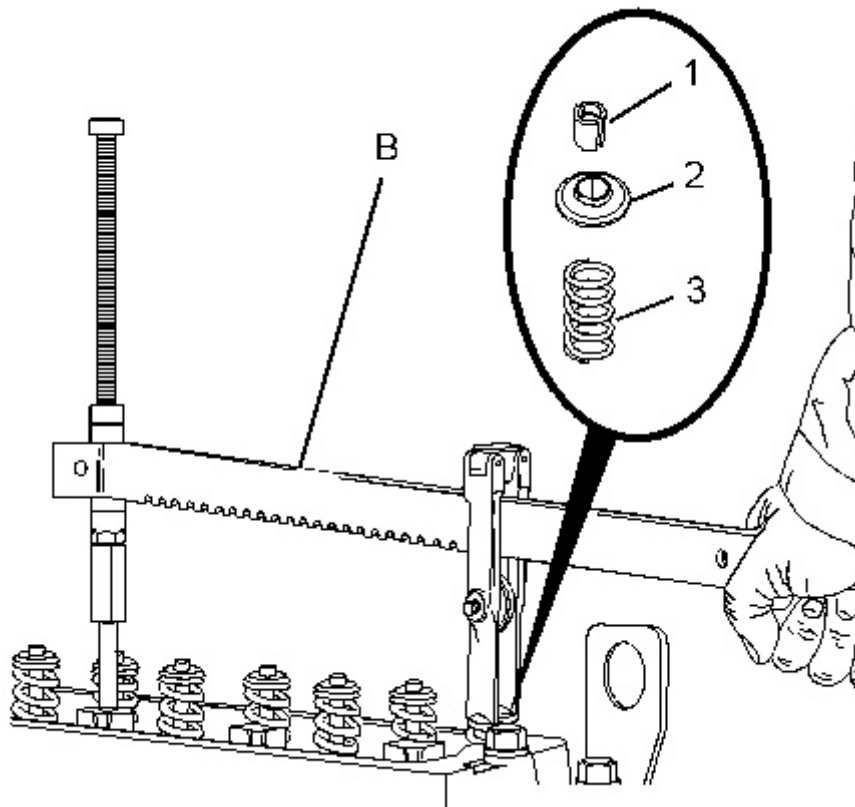
**Note:** Ensure that the cylinder head is kept on a clean, soft surface in order to prevent damage to the machined face.

## **WARNING**

**Personal injury can result from being struck by parts propelled by a released spring force.**

**Make sure to wear all necessary protective equipment.**

**Follow the recommended procedure and use all recommended tooling to release the spring force.**



Typical example

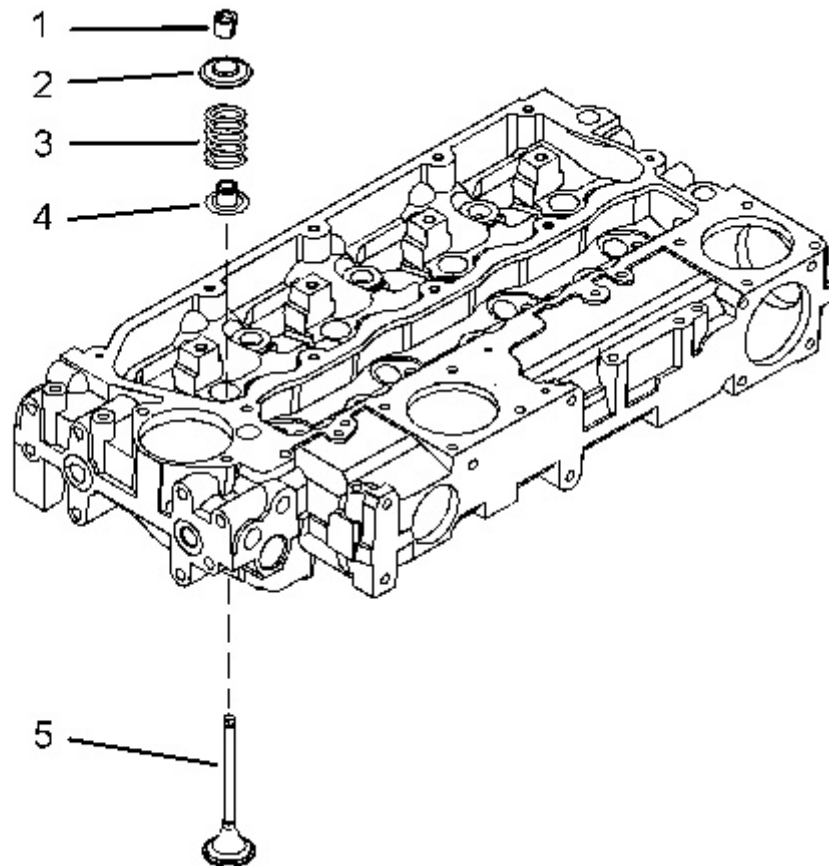
4. Install Tooling (A) in position on the cylinder head in order to compress the appropriate valve spring.

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### NOTICE

**Ensure that the valve spring is compressed squarely or damage to the valve stem may occur.**

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Illustration 2

g01352229

Typical example

5. Apply sufficient pressure to Tooling (A) in order to remove valve keepers (1).

**Note:** Do not compress the spring so that valve spring retainer (2) touches valve stem seal (4).

6. Slowly release the pressure on Tooling (A).
7. Remove valve spring retainer (2). Remove valve spring (3).
8. Repeat Steps 4 to 7 for the remaining valves.

9. Remove Tooling (A).
10. Remove valve stem seals (4).
11. Use a suitable lifting device to carefully turn over the cylinder head.
12. Remove valves (5).

## Installation Procedure

Table 2

Required Tools			
Tool	Part Number	Part Description	Qty
A	9U-6195	Valve Spring Compressor	1
	268-1969	Adapter	1
	276-1221	Head	1

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### NOTICE

**Keep all parts clean from contaminants.**

**Contaminants may cause rapid wear and shortened component life.**

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1. Clean all components of the cylinder head assembly. Ensure that all ports, all coolant passages and all lubrication passages in the cylinder head are free from debris. Follow Steps 1.a through 1.e in order to inspect the components of the cylinder head assembly. Replace any components that are worn or damaged.
    - a. Inspect the cylinder head for wear and for damage. Refer to Systems Operation, Testing and Adjusting, "Cylinder Head Inspect".
    - b. Inspect the valve seats for wear and for damage. Refer to Specifications, "Cylinder Head Valves" for further information.
    - c. Inspect the valve guides for wear and for damage. Refer to Specifications, "Cylinder Head Valves" and Systems Operation, Testing and Adjusting, "Valve Guide - Inspect" for further information.
    - d. Inspect the valves for wear and for damage. Refer to Specifications, "Cylinder Head Valves".
    - e. Inspect the valve springs for the correct length. Refer to Specifications, "Cylinder Head Valves".
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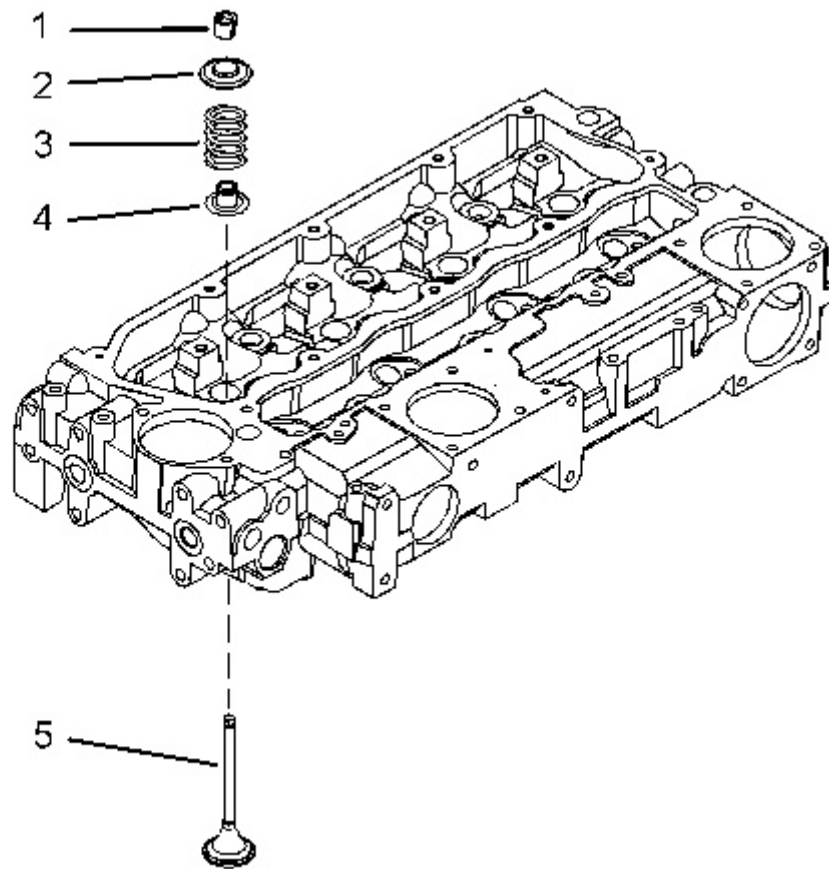


Illustration 3

g01352229

2. Lubricate the stems of valves (5) with clean engine oil. Install valves (5) in the appropriate positions in the cylinder head. Check the depth of the valves below the face of the cylinder head. Refer to Systems Operation, Testing and Adjusting, "Valve Depth - Inspect" for more information.
3. Use a suitable lifting device to carefully turn over the cylinder head. The weight of the cylinder head is approximately 56 kg (125 lb).

**Note:** Ensure that all of the valves remain in place.

4. Install new valve stem seals (4) onto each of the valve guides.

**Note:** The outer face of the valve guides must be clean and dry before installing the valve stem seals.

5. Install valve spring (3) onto the cylinder head. Position valve spring retainer (2) onto valve spring (3).

 **WARNING**

**Personal injury can result from being struck by parts propelled by a released spring force.**

**Make sure to wear all necessary protective equipment.**

**Follow the recommended procedure and use all recommended tooling to release the spring force.**

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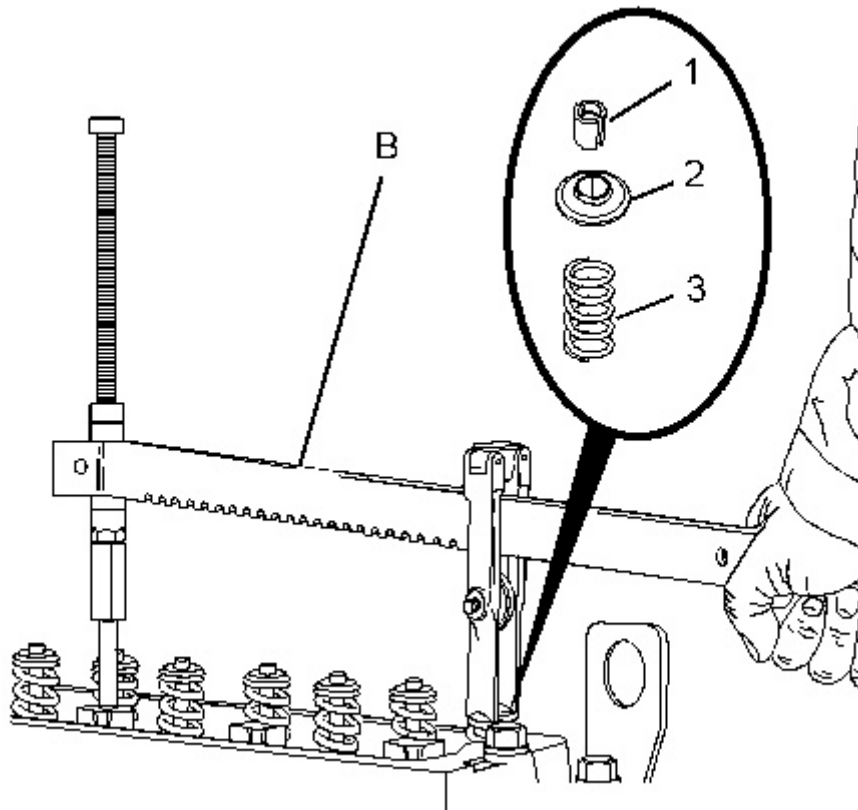


Illustration 4

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Typical example

6. Install Tooling (A) in the appropriate position on the cylinder head in order to compress valve spring (3).

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### NOTICE

**Ensure that the valve spring is compressed squarely or damage to the valve stem may occur.**

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7. Apply sufficient pressure to Tooling (A) in order to install valve keepers (1).

**Note:** Do not compress the spring so that valve spring retainer (2) touches valve stem seal (4).

**WARNING**

**The valve spring keepers can be thrown from the valve when the valve spring compressor is released. Ensure that the valve spring keepers are properly installed on the valve stem. To help prevent personal injury, keep away from the front of the valve spring keepers and valve springs during the installation of the valves.**

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8. Carefully release the pressure on Tooling (A).
9. Repeat Steps 5 to 8 for the remaining valves.
10. Remove Tooling (A) from the cylinder head.
11. Use a suitable lifting device to position the cylinder head on a support. Ensure that the heads of the valves are not obstructed. Lightly strike the top of the valves with a soft hammer in order to ensure that valve keepers (1) are properly installed.

**End By:**

- a. Install the cylinder head. Refer to Disassembly and Assembly, "Cylinder Head - Install".
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## Disassembly and Assembly C4.4 (MECH) Industrial Engine and Generator Sets

Media Number -KENR6249-05

Publication Date -01/03/2014

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i04717030

# Inlet and Exhaust Valve Guides - Remove and Install

SMCS - 1104-010

## Removal Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A	157-3722	Valve Guide Driver	1

### Start By:

- A. Remove the inlet valves and the exhaust valves. Refer to Disassembly and Assembly, "Inlet and Exhaust Valves - Remove and Install".

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### NOTICE

**Removal and installation of the valve guide and valve seat must be carried out by personnel with the correct training. Also special machinery is required. For more information, refer to your authorized Caterpillar dealer.**

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### NOTICE

**Keep all parts clean from contaminants.**

**Contaminants may cause rapid wear and shortened component life.**



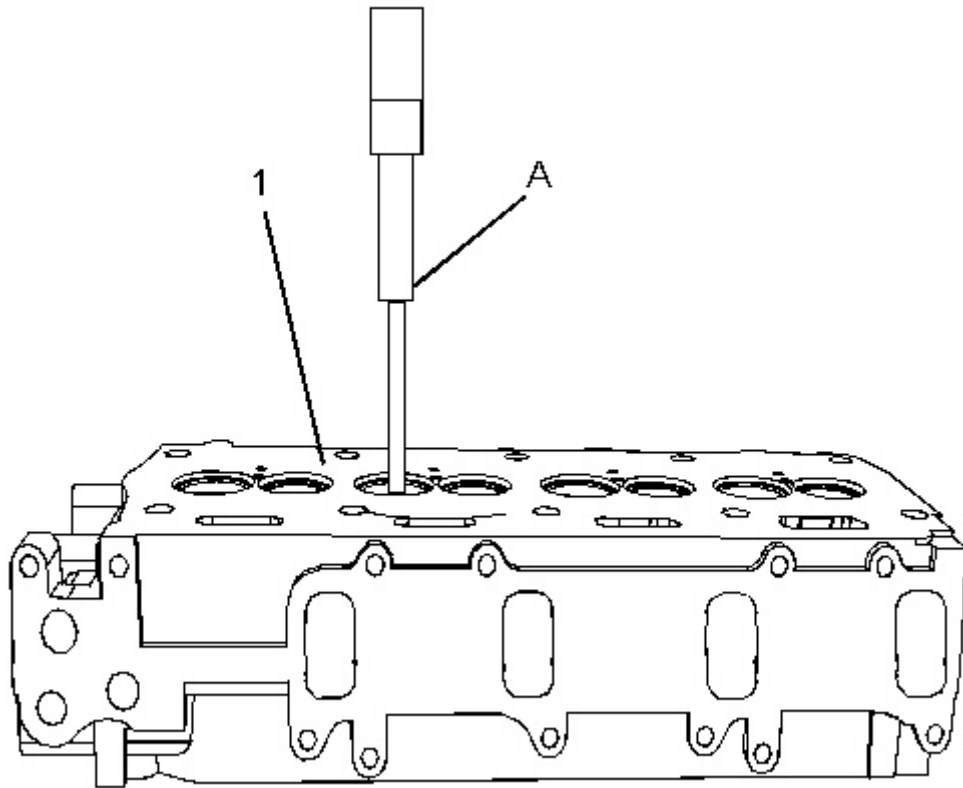


Illustration 1

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1. Use Tooling (A) in order to remove valve guides (2) from cylinder head (1) .
2. Repeat the Step 1 for the remaining valve guides.

## Installation Procedure

Table 2

Required Tools			
Tool	Part Number	Part Description	Qty
A	157-3722	Valve Guide Driver	1
	393-0369	Stop Collar	1
B	157-3720	Valve Seat Cutter	1

**NOTICE**

Removal and installation of the valve guide and valve seat must be carried out by personnel with the correct training. Also special machinery is required. For more information, refer to your authorized Caterpillar dealer.

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## NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

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1. Clean the parent bores in the cylinder head for the valve guides.

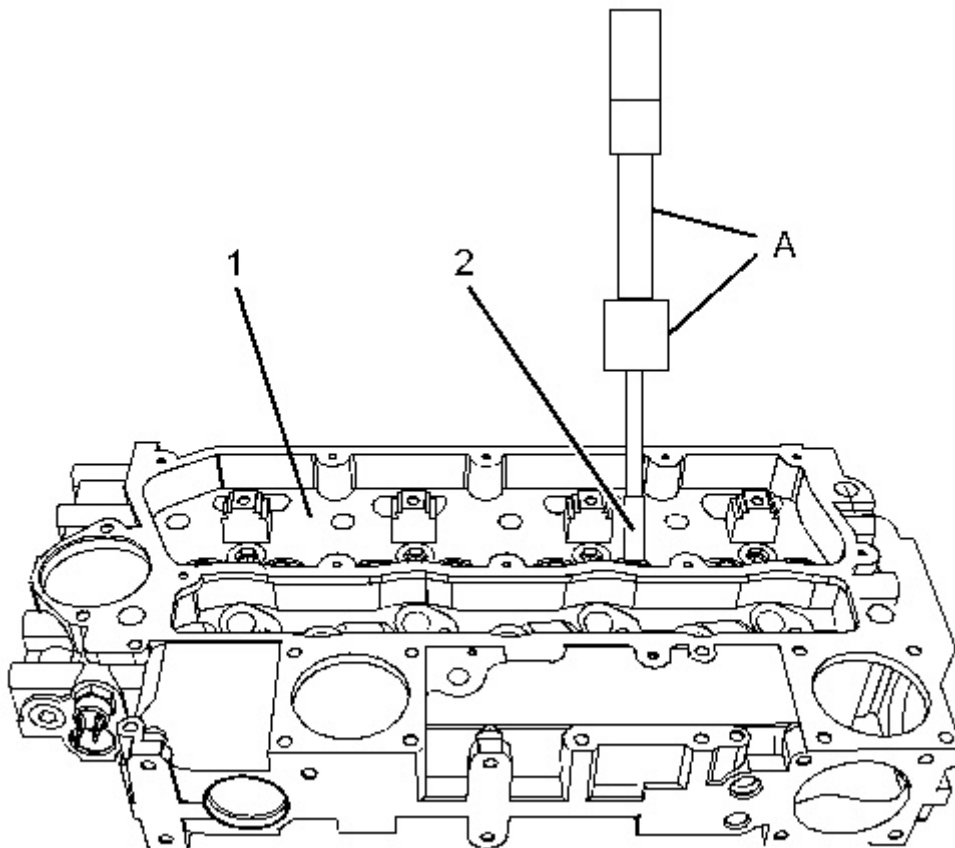


Illustration 2

g01383767

2. Lubricate a new valve guide (2) and place the valve guide in position. Carefully tap the valve guide in order to start the installation. Use Tooling (A) to install the valve guide into the cylinder head.

3. Repeat Step 2 for the remaining valve guides.

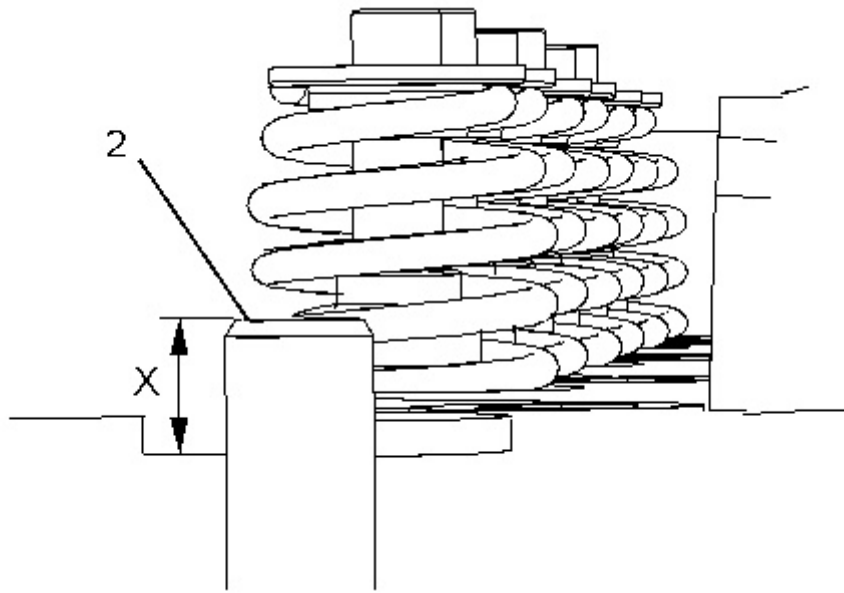


Illustration 3

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4. Check protrusion (X) of valve guides (2). The valve guides should protrude  $12.5 \pm .15$  mm ( $0.4921 \pm 0.0060$  inch) above the valve spring recess. Refer to Specifications, "Cylinder Head Valves" for more information.
5. After installation of valve guides (2), the valve guides must be reamed and the valve seat inserts must be cut to the finished diameter. Follow Steps 5.a through 5.d in order to ream the valve guides and cut the valve seat inserts.
  - a. Lubricate the bores of valve guides (2) with clean engine oil.
  - b. Use Tooling (B) in order to ream the valve guides. Ensure that even pressure is applied to Tooling (B) .
  - c. Use Tooling (B) in order to cut the valve seats. Ensure that even pressure is applied to Tooling (B) .
  - d. Ensure that the cylinder head is clean and free from machining debris.
6. Check the finished diameter of valve guides (2). Refer to Specifications, "Cylinder Head - Valves" for more information.
7. Check the depths of the valves below the face of the cylinder head. Refer to System Operation, Testing and Adjusting, "Valve Depth - Inspect" for more information.

**End By:** Install the inlet valves and the exhaust valves. Refer to Disassembly and Assembly, "Inlet and Exhaust Valves - Remove and Install".

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## Disassembly and Assembly C4.4 (MECH) Industrial Engine and Generator Sets

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i02763416

# Engine Oil Filter Base - Remove and Install

SMCS - 1306-010

## Removal Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A	185-3630	Strap Wrench As	1

**Note:** The oil filter may be installed vertically or the oil filter may be installed horizontally.

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### NOTICE

**Keep all parts clean from contaminants.**

**Contaminants may cause rapid wear and shortened component life.**

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### 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.**

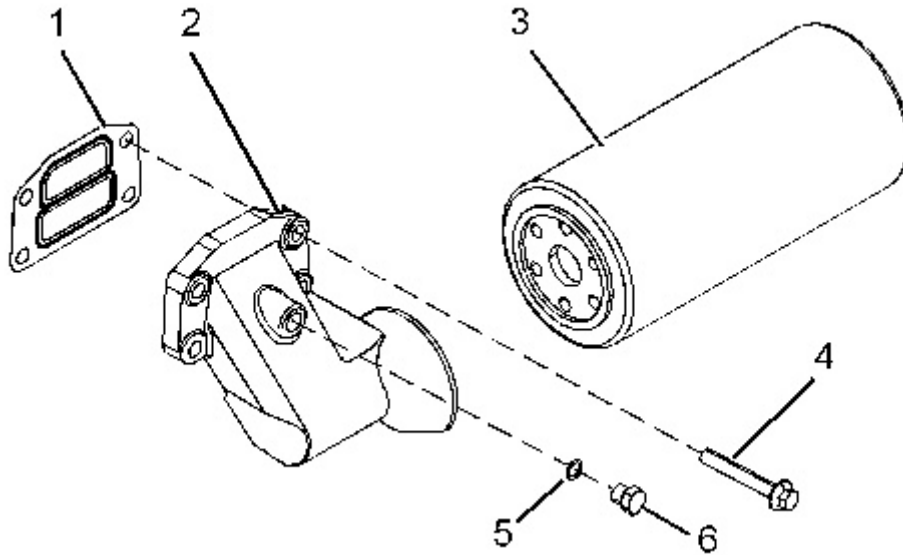


Illustration 1  
Typical example

g01343554

1. Use Tooling (A) to remove engine oil filter (3). Refer to Operation and Maintenance Manual, "Engine Oil and Filter - Change".
2. If the engine oil pressure sensor is located in the engine oil filter base, remove the engine oil pressure sensor. Refer to Disassembly and Assembly, "Engine Oil Pressure Sensor - Remove and Install".
3. Remove bolts (4) and remove engine oil filter base (2).
4. Remove joint (1).
5. If the engine oil filter base has a spacer plate, remove the spacer plate and remove the joint.
6. If necessary, remove plug (6) from engine oil filter base (2). Remove O-ring seal (5) from the plug.

## Installation Procedure

Table 2

Required Tools			
Tool	Part Number	Part Description	Qty
B	6V-6640	Sealant	1

**NOTICE**

**Keep all parts clean from contaminants.**

**Contaminants may cause rapid wear and shortened component life.**

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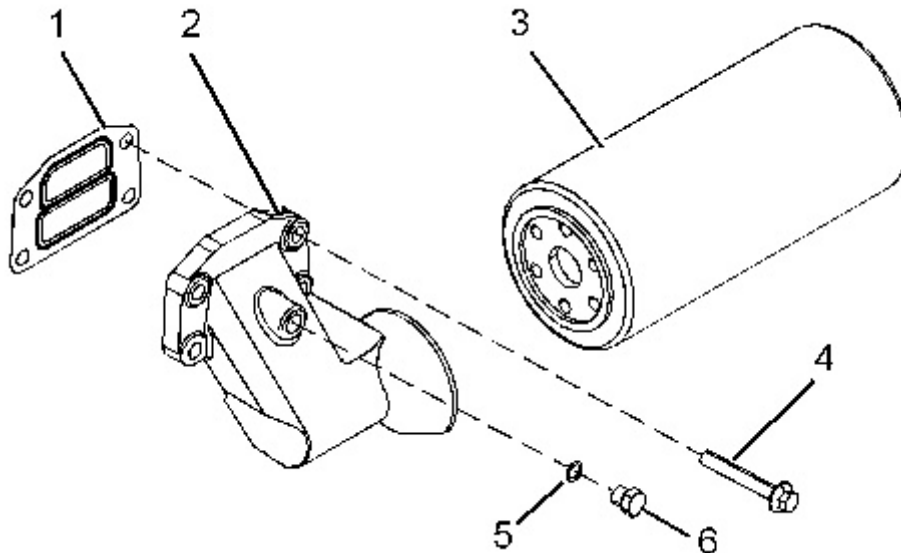


Illustration 2

g01343554

Typical example

1. Ensure that the engine oil filter base is clean. Clean the mating surfaces of the cylinder block.
  2. If necessary, install a new O-ring seal (5) to plug (6). Install plug (6) to engine oil filter base (2). Tighten the plug to a torque of 12 N·m (106 lb in).
  3. Install bolts (4) to engine oil filter base (2).
  4. Install a new joint (1) onto bolts (4). If the engine oil filter base has a spacer plate, install the spacer plate and a new joint onto the bolts.
  5. Apply Tooling (B) to the threads of the bolts. Install the assembly of the engine oil filter base to the cylinder block.
  6. Tighten bolts (4) to a torque of 22 N·m (16 lb ft).
  7. If the engine oil pressure sensor is located in the engine oil filter base, Install the engine oil pressure sensor. Refer to Disassembly and Assembly, "Engine Oil Pressure Sensor - Remove and Install".
  8. Install a new engine oil filter (3). If necessary, fill the engine oil pan to the correct level that is indicated on the oil level gauge. Refer to Operation and Maintenance Manual, "Engine Oil Level - Check".
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## **Disassembly and Assembly**

### **C4.4 (MECH) Industrial Engine and Generator Sets**

Media Number -KENR6249-05

Publication Date -01/03/2014

Date Updated -02/05/2017

i06801068

## **Engine Oil Cooler - Remove**

SMCS - 1378-011

### **Removal Procedure**

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#### **NOTICE**

**Keep all parts clean from contaminants.**

**Contaminants may cause rapid wear and shortened component life.**

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#### **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.**

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1. Drain the coolant from the cooling system into a suitable container. Refer to Operation and Maintenance Manual, "Cooling System Coolant - Change" for the correct procedure.
2. Drain the engine lubricating oil into a suitable container. Refer to Operation and Maintenance Manual, "Engine Oil and Filter - Change" for the correct procedure.

3. If necessary, remove the electric starting motor. Refer to Disassembly and Assembly, "Electric Starting Motor - Remove and Install".

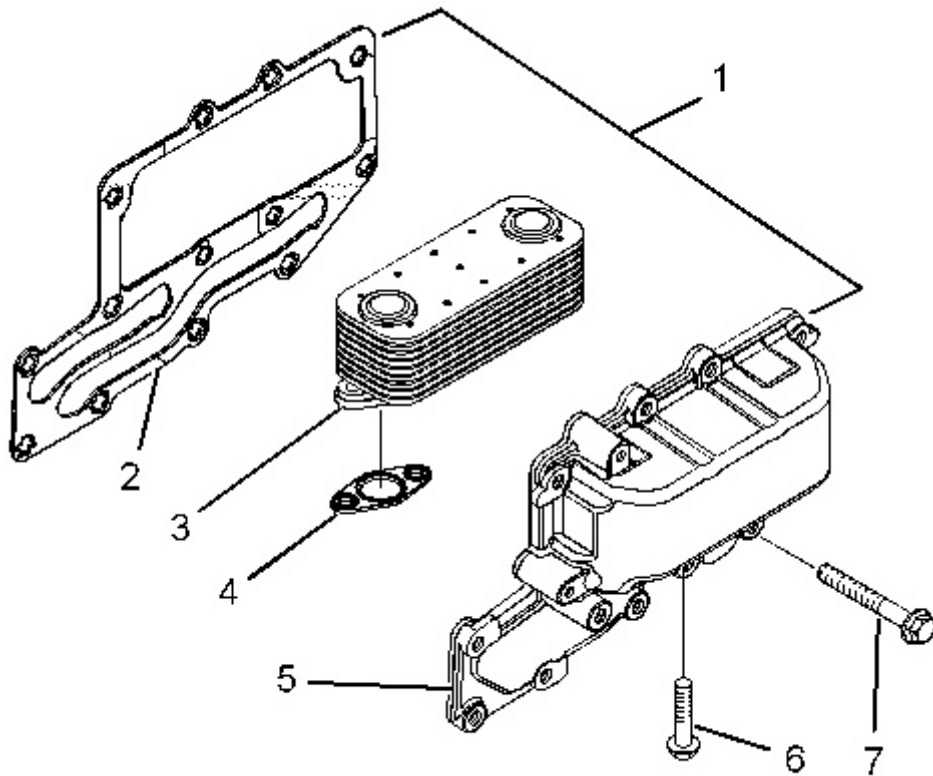


Illustration 1  
Typical example

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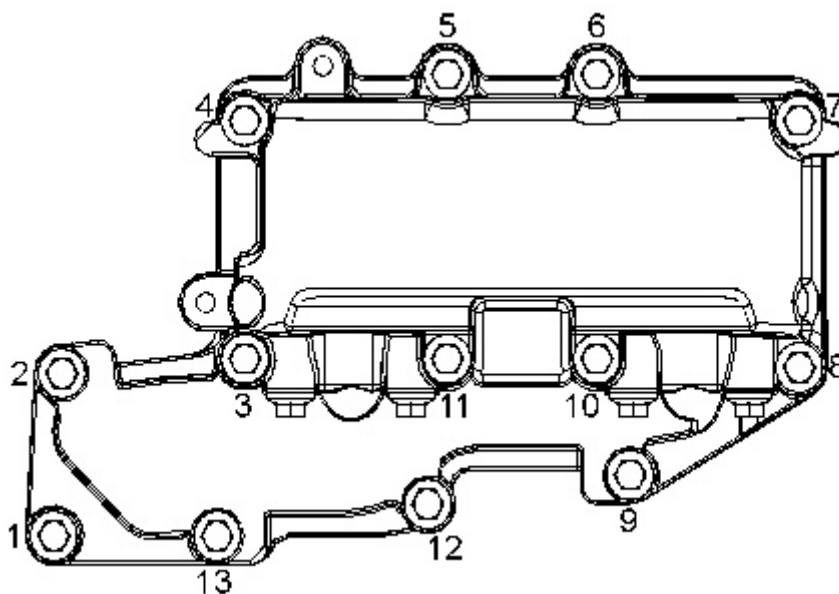


Illustration 2

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Tightening sequence for the engine oil cooler

4. Loosen fasteners (7) in reverse numerical order to the sequence that is shown in Illustration 2. Remove fasteners (7). Support the assembly of engine oil cooler (1) as the fasteners are removed.

**Note:** fasteners (7) are different lengths. Note the correct position of the fasteners. Note the position of any brackets that are secured by the fasteners. Do not remove fasteners (6) .

5. Remove the assembly of oil cooler (1) from the cylinder block.
  6. Remove joint (2).
  7. Follow Steps 7.a through 7.c to disassemble the engine oil cooler.
    - a. Remove bolts (6).
    - b. Remove cooler matrix (3) from housing (5).
    - c. Remove joints (4).
-

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## **Disassembly and Assembly C4.4 (MECH) Industrial Engine and Generator Sets**

Media Number -KENR6249-05

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Date Updated -02/05/2017

i06801078

## **Engine Oil Cooler - Install**

SMCS - 1378-012

### **Installation Procedure**

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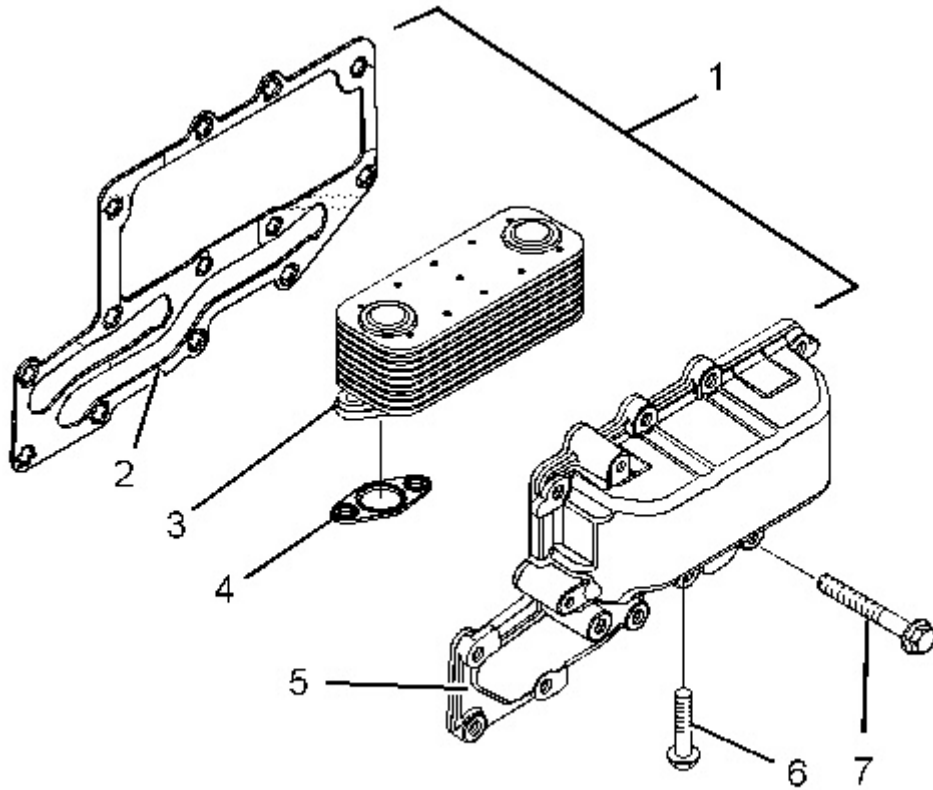
#### **NOTICE**

**Keep all parts clean from contaminants.**

**Contaminants may cause rapid wear and shortened component life.**

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Illustration 1  
Typical example

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1. Follow Steps 1.a through 1.c to assemble the engine oil cooler.
    - a. Ensure that cooler matrix (3) is clean and free from damage. Ensure that housing (5) is clean and free from damage.
    - b. Position new joints (4) onto housing (5). Install cooler matrix (3).
    - c. Install bolts (6). Tighten the bolts to a torque of 22 N·m (16 lb ft).
  2. Clean the mating surface of the cylinder block.
-

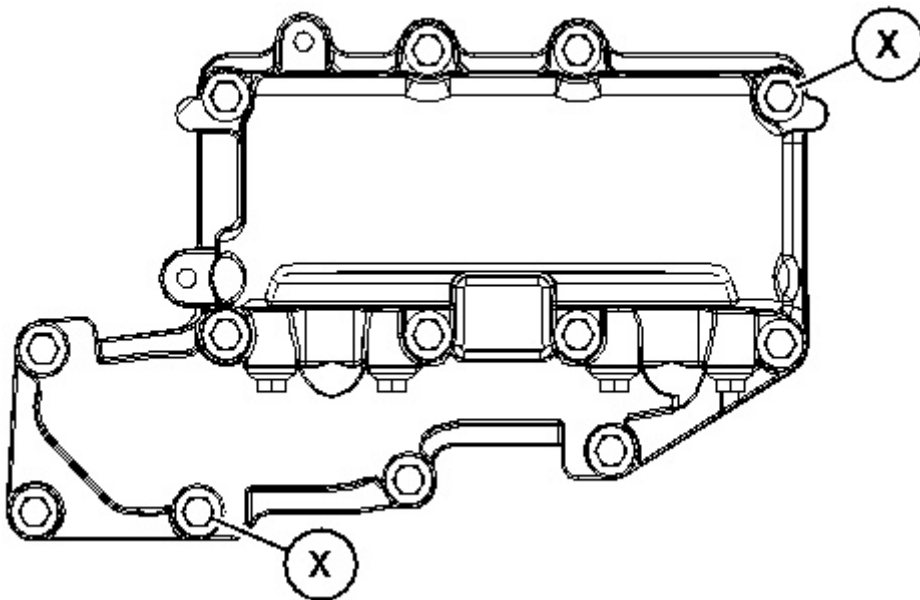


Illustration 2

g06119773

Typical example

3. Position a new joint (2) on the assembly of engine oil cooler (1). Install fasteners (7) to positions (X) on the assembly of engine oil cooler (1).

**Note:** The holes in the joint have serrations that hold the fasteners captive.

4. Install the assembly of engine oil cooler (1) to the cylinder block. Tighten bolts (7) finger tight.

**Note:** The fasteners are different lengths. Ensure that the different fasteners are installed in the correct location. Ensure that any brackets that are secured by the fasteners are installed in the correct location.

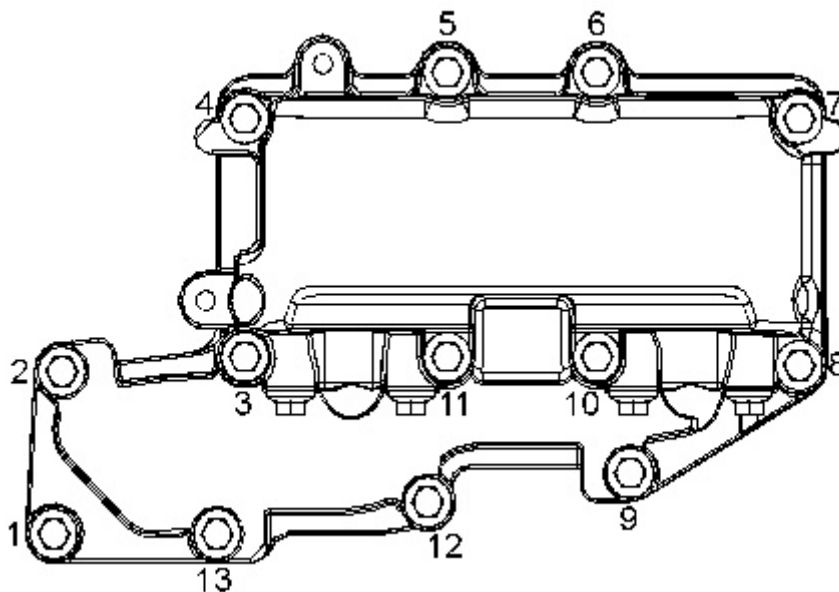


Illustration 3

g06118967

Tightening sequence for the engine oil cooler

5. Install remaining fasteners (7) into engine oil cooler (1). Tighten the fasteners to a torque of 22 N·m (16 lb ft). Tighten the fasteners in the sequence that is shown in Illustration 3.
  6. If necessary, Install the electric starting motor. Refer to Disassembly and Assembly, "Electric Starting Motor - Remove and Install".
  7. Fill the cooling system to the correct level. Refer to Operation and Maintenance Manual, "Cooling System Coolant - Change" for the correct procedure.
  8. Fill the engine oil pan to the correct level. Refer to Operation and Maintenance Manual, "Engine Oil Filter and Change" for the correct procedure.
-

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## Disassembly and Assembly C4.4 (MECH) Industrial Engine and Generator Sets

Media Number -KENR6249-05

Publication Date -01/03/2014

Date Updated -02/05/2017

i02763419

# Engine Oil Relief Valve - Remove and Install - Engines with a Balancer Unit

SMCS - 1315-010

## Removal Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A	1U-7262	Telescoping Magnet	1

### Start By:

- Remove the engine oil pan. Refer to Disassembly and Assembly , "Engine Oil Pan - Remove and Install".

---

### NOTICE

**Keep all parts clean from contaminants.**

**Contaminants may cause rapid wear and shortened component life.**

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**WARNING**

**Personal injury can result from being struck by parts propelled by a released spring force.**

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