

Product: INDUSTRIAL ENGINE  
Model: C1.7 INDUSTRIAL ENGINE G34  
Configuration: C1.7 Industrial Engine G3400001-UP

## **Disassembly and Assembly C1.7 and C2.2 Industrial Engines**

Media Number -M0067512-03

Publication Date -01/09/2015

Date Updated -23/01/2018

i06842842

# **Inlet Manifold - Remove and Install - 3 Cylinder Engines**

SMCS - 1058-010

S/N - G341-UP

## **Removal Procedure**

### **Start By:**

- a. Remove the exhaust gas recirculation valve from the inlet manifold. Refer to Disassembly and Assembly, "Exhaust Gas Recirculation Valve - Remove and Install" for the correct procedure.

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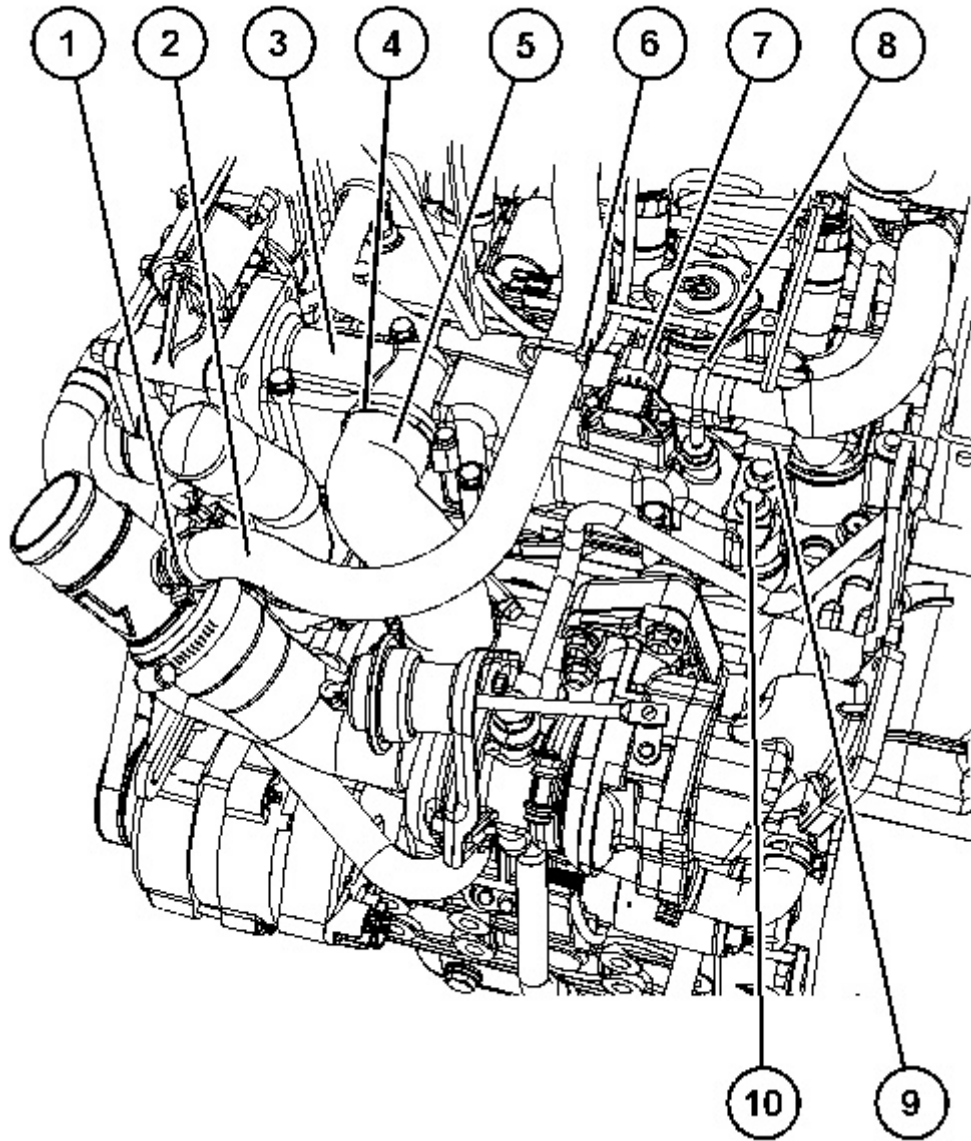
### **NOTICE**

**Keep all parts clean from contaminants.**

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

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Illustration 1

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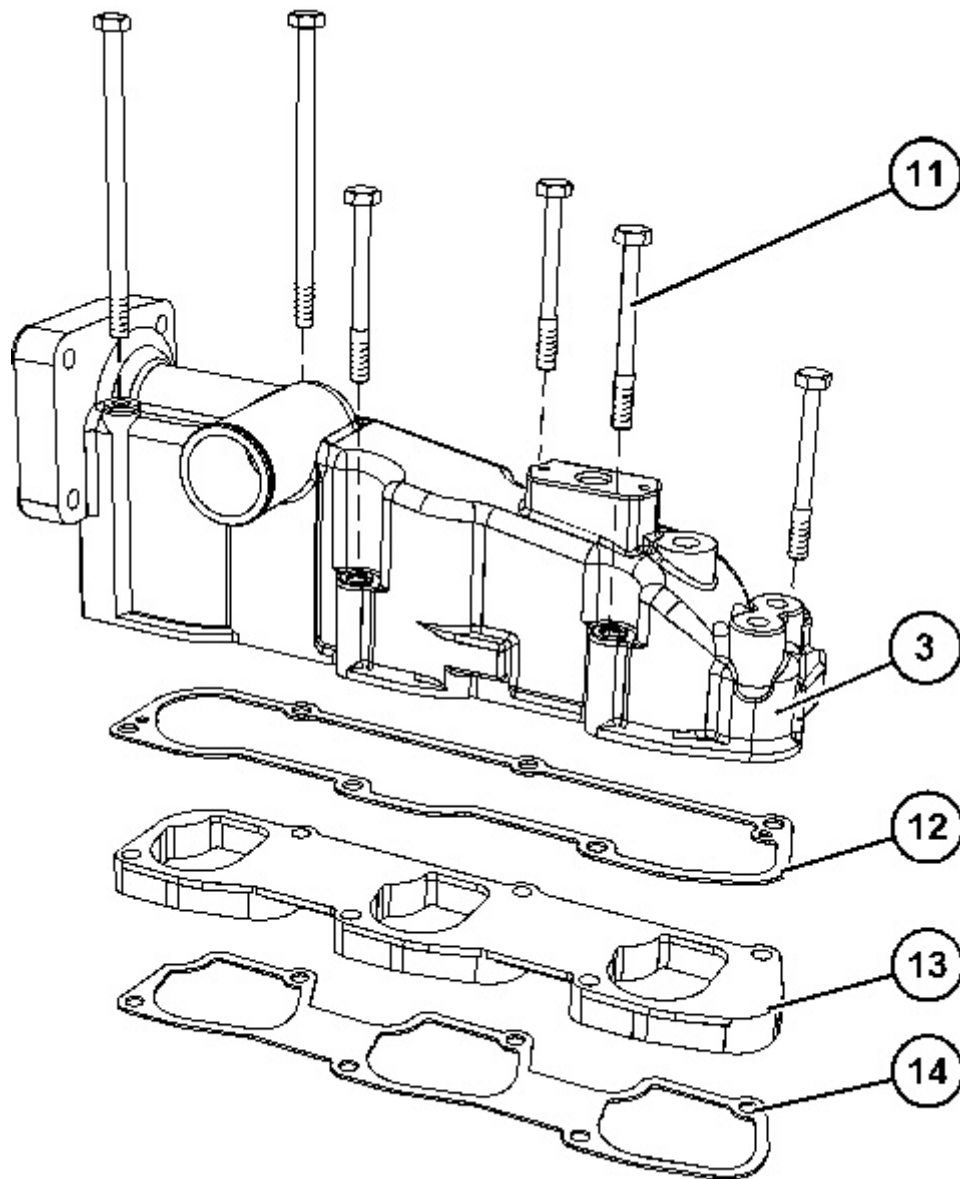


Illustration 2

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1. Cut cable strap (6).
2. Loosen hose clamps (1) and disconnect hose assembly (2) and position the hose away from the inlet manifold.
3. Loosen hose clamps (4) and disconnect hose assembly (5) and position the hose away from the inlet manifold.
4. Disconnect the harness assembly from inlet manifold temperature sensor (8). If necessary, remove the inlet manifold temperature sensor. Refer to Disassembly and Assembly, "Inlet Manifold Temperature Sensor - Remove and Install" for the correct procedure.
5. Disconnect the harness assembly from boost pressure sensor (7). If necessary, remove the boost pressure sensor. Refer to Disassembly and Assembly, "Boost Pressure Sensor - Remove and Install" for the correct procedure.
6. Remove bolts (10). Position harness plate (9) away from the inlet manifold.

7. Remove bolts (11) from inlet manifold (3). Note the positions of the different length bolts.
8. Remove inlet manifold (3) from adaptor (13).
9. Remove gasket (12).
10. Remove adaptor (13) and gasket (14) from the cylinder head.

## Installation procedure

Table 1

Required Tools			
Tool	Part Number	Description	Qty
A	-	Guide Stud (M6 x 1.00 by 100 mm)	2

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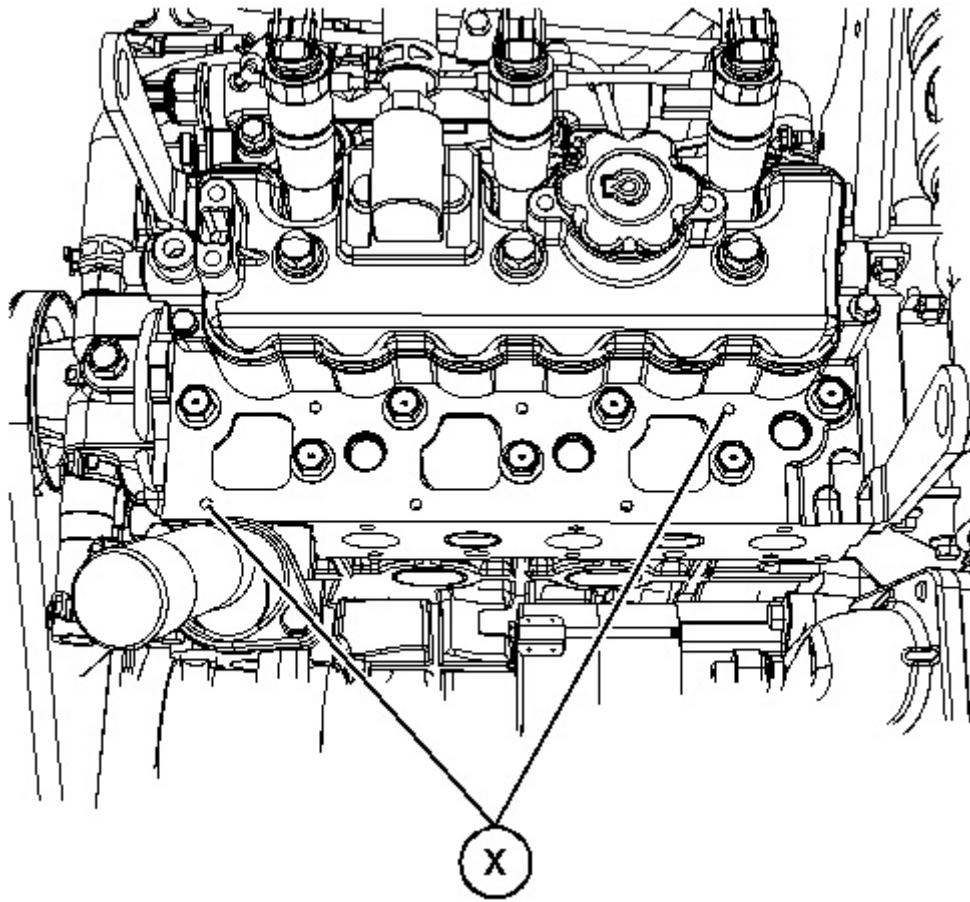
### NOTICE

**Keep all parts clean from contaminants.**

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

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1. Inspect all components for wear and damage. If necessary, replace any components that are worn or damaged.
  2. Clean the gasket surfaces of the inlet manifold, adaptor, and the cylinder head.
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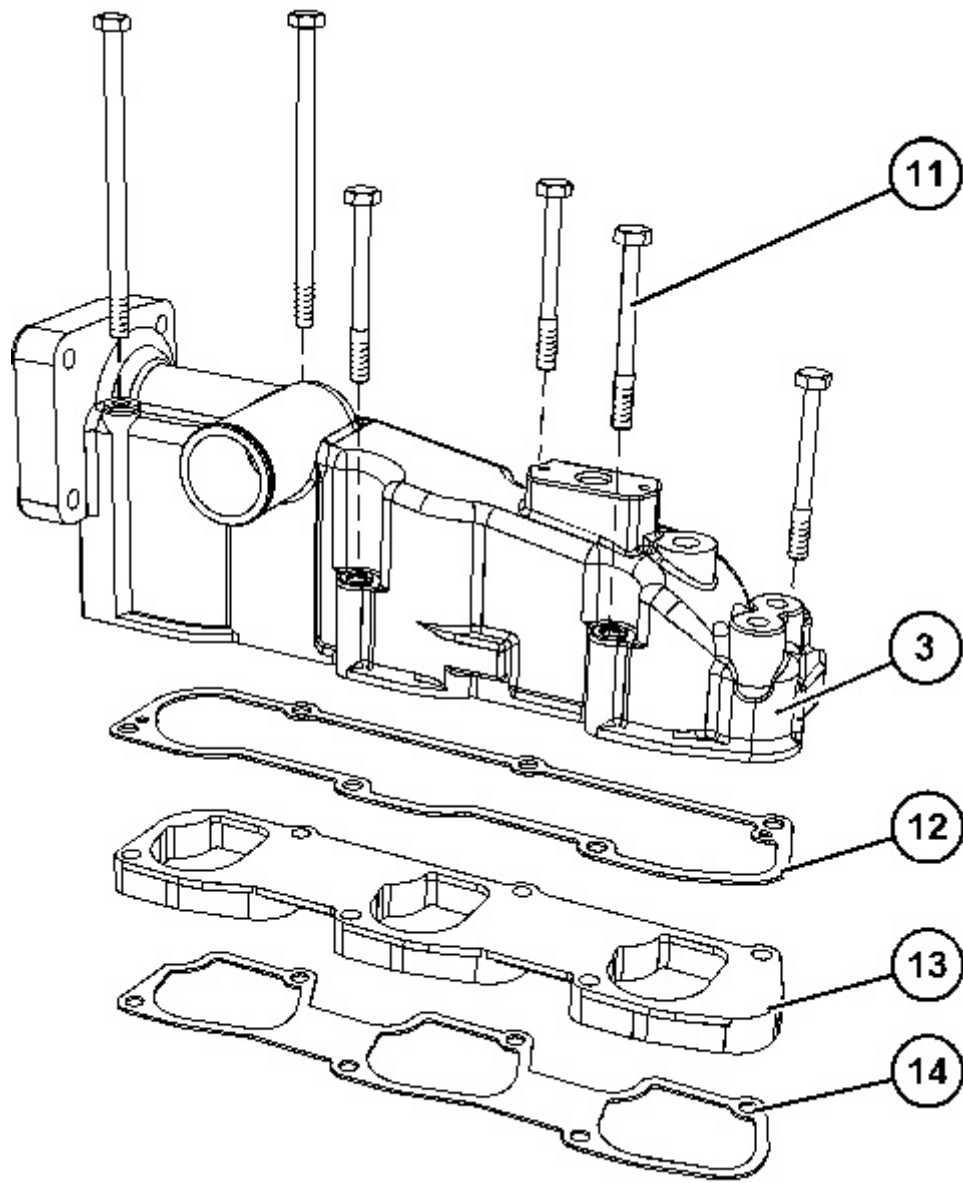


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Illustration 3

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Illustration 4

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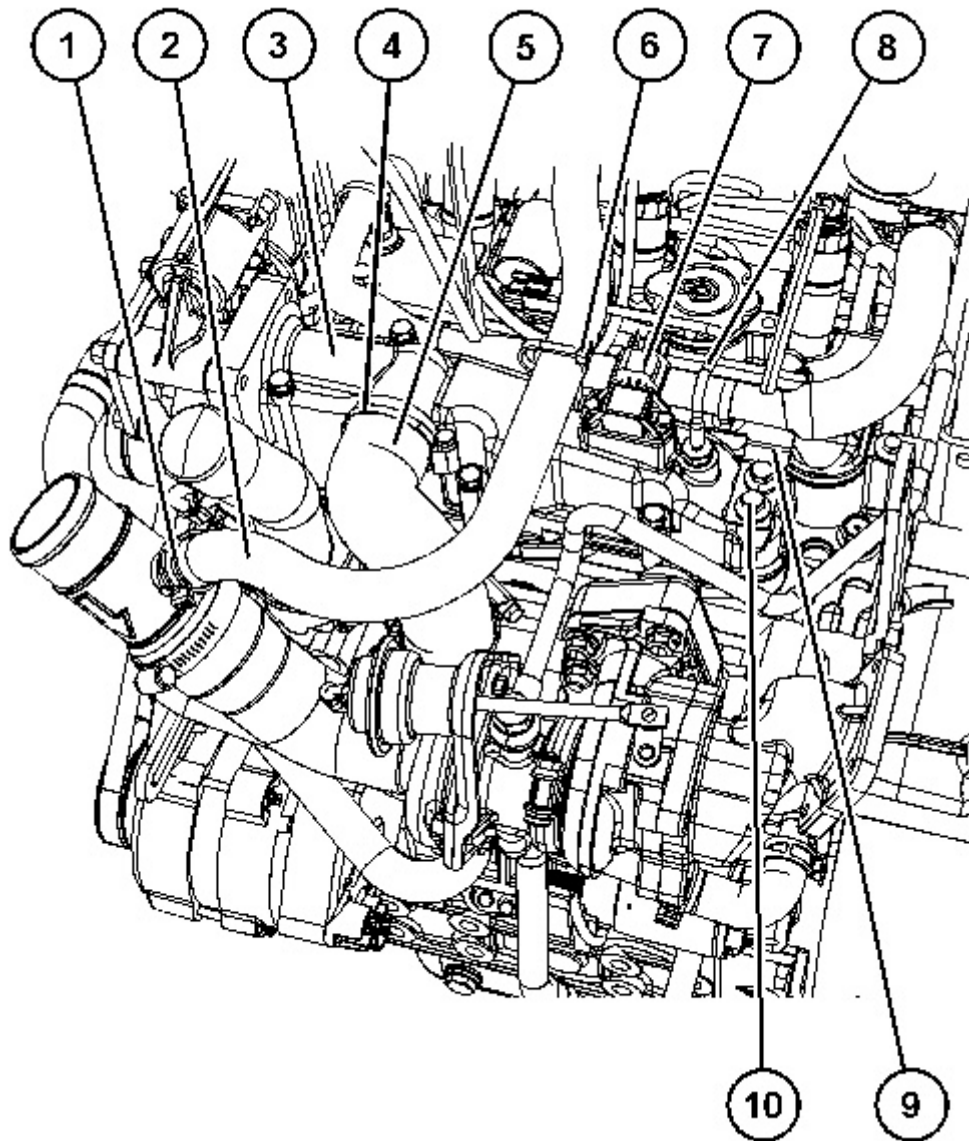


Illustration 5

g06112892

3. If necessary, install inlet manifold temperature sensor (8) to inlet manifold (3). Refer to Disassembly and Assembly, "Inlet Manifold Temperature Sensor - Remove and Install" for the correct procedure.
4. If necessary, install boost pressure sensor (7) to inlet manifold (3). Refer to Disassembly and Assembly, "Boost Pressure Sensor - Remove and Install" for the correct procedure.
5. Install Tooling (A) in Positions (X).
6. Position a new gasket (14) onto the cylinder head. Ensure that the gasket is correctly orientated. Position adaptor (13) onto gasket (14).
7. Position gasket (12) onto adaptor (13). Ensure that the gasket is correctly orientated. Position inlet manifold (3) onto gasket (12).
8. Install bolts (11) into available positions in inlet manifold (3).

9. Remove Tooling (A) and install remaining bolts (11). Tighten all bolts (11) to a torque of 10 N·m (89 lb in).
10. Position harness plate (9) onto the valve mechanism cover and install bolts (10). Tighten the bolts to a torque of 26 N·m (230 lb in).
11. Connect harness assembly to boost pressure sensor (7).
12. Connect harness assembly to inlet manifold temperature sensor (8).
13. Install hose assembly (5) to inlet manifold (3) and tighten hose clamp (4) securely.
14. Install hose assembly (2) to the induction hose and tighten hose clamp (1) securely.
15. Install new cable strap (6) to hose (2).

**End By:**

- a. Install the exhaust gas recirculation valve to the inlet manifold. Refer to Disassembly and Assembly, "Exhaust Gas Recirculation Valve - Remove and Install" for the correct procedure.
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Model: C1.7 INDUSTRIAL ENGINE G34  
Configuration: C1.7 Industrial Engine G3400001-UP

## Disassembly and Assembly C1.7 and C2.2 Industrial Engines

Media Number -M0067512-03

Publication Date -01/09/2015

Date Updated -23/01/2018

i06056236

# Inlet and Exhaust Valve Springs - Remove and Install

SMCS - 1108-010

## Removal Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A	9U-6195	Valve Spring Compressor	1
	416-0288	Head	1
	416-0292	Adapter	1

### Start By:

- Remove the rocker shaft assembly. Refer to Disassembly and Assembly, "Rocker Shaft and Pushrod - Remove" for the correct procedure.



**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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## NOTICE

**Keep all parts clean from contaminants.**

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

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## NOTICE

**Install suitable plugs to the inlet ports of the cylinder head in order to prevent the entry of loose parts into the engine.**

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## NOTICE

**Plug the apertures for the push rods in the cylinder head in order to prevent the entry of loose parts into the engine.**

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**Note:** The following procedure should be adopted in order to remove the valve springs when the cylinder head is installed to the engine. Refer to Disassembly and Assembly, "Inlet and Exhaust Valves - Remove and Install" for the procedure to remove the valve springs from a cylinder head that has been removed from the engine.

**Note:** Ensure that the appropriate piston is at the top center position before the valve spring is removed. Failure to ensure that the piston is at the top center position may allow the valve to drop into the cylinder bore.

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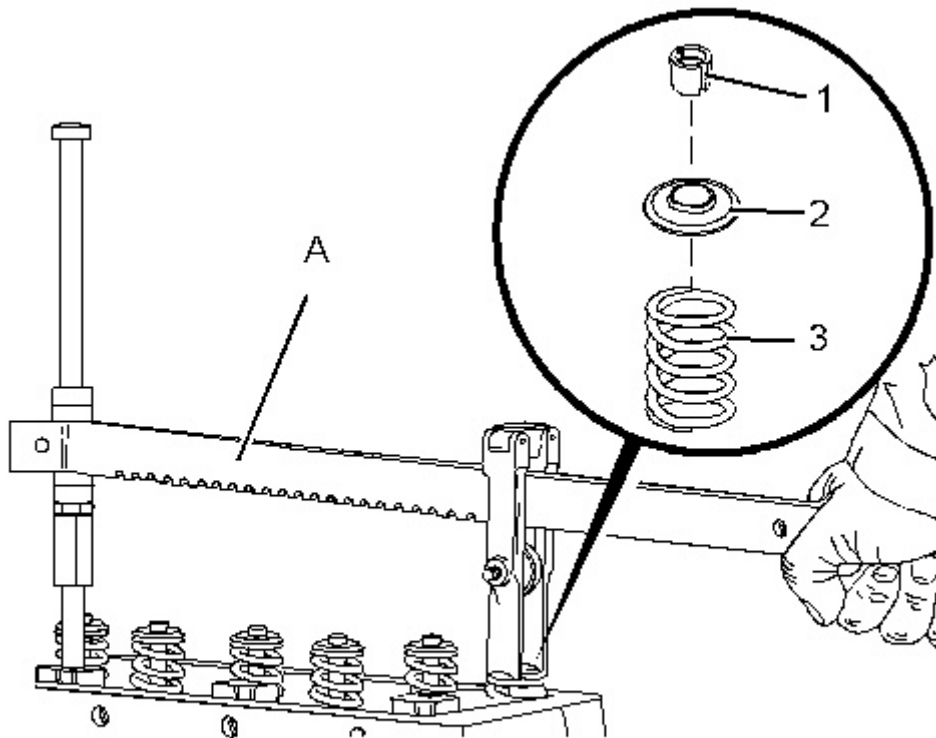


Illustration 1

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1. Follow Step 1.a through Step 1.d in order to position the appropriate piston at top center.

- a. Install Tooling (A) in position on the cylinder head in order to compress a valve spring for the appropriate piston.
- b. Use Tooling (A) in order to compress valve spring (3) and open the valve slightly.

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

c. Carefully rotate the crankshaft until the piston touches the valve.

**Note:** Do not use excessive force to turn the crankshaft. The use of force can result in bent valve stems.

d. Continue to rotate the crankshaft and gradually release the pressure on Tooling (A) until the piston is at the top center position. The valve is now held in a position that allows the valve spring to be safely removed.

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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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**Note:** The procedure can be carried out on the following pairs of cylinders. 1 with 4 and 2 with 3. Ensure that all of the valve springs are installed before changing from one pair of cylinders to another pair of cylinders.

2. Apply sufficient pressure to Tooling (A) in order to allow removal of the valve keepers (1).

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

3. Remove valve keepers (1).
4. Slowly release the pressure on Tooling (A).
5. Remove valve spring retainer (2) and remove valve spring (3).
6. Remove Tooling (A).

## Installation Procedure

Table 2

Required Tools			
Tool	Part Number	Part Description	Qty
A	9U-6195	Valve Spring Compressor	1
	416-0288	Head	1
	416-0292	Adapter	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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### NOTICE

**Do not turn the crankshaft while the valve springs are removed.**

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### NOTICE

**Plug the apertures for the push rods in the cylinder head in order to prevent the entry of loose parts into the engine.**

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### **NOTICE**

**Install suitable plugs to the inlet ports of the cylinder head in order to prevent the entry of loose parts into the engine.**

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1. Inspect the valve springs for the correct length. Refer to Specifications, "Cylinder Head Valves " for the correct procedure.
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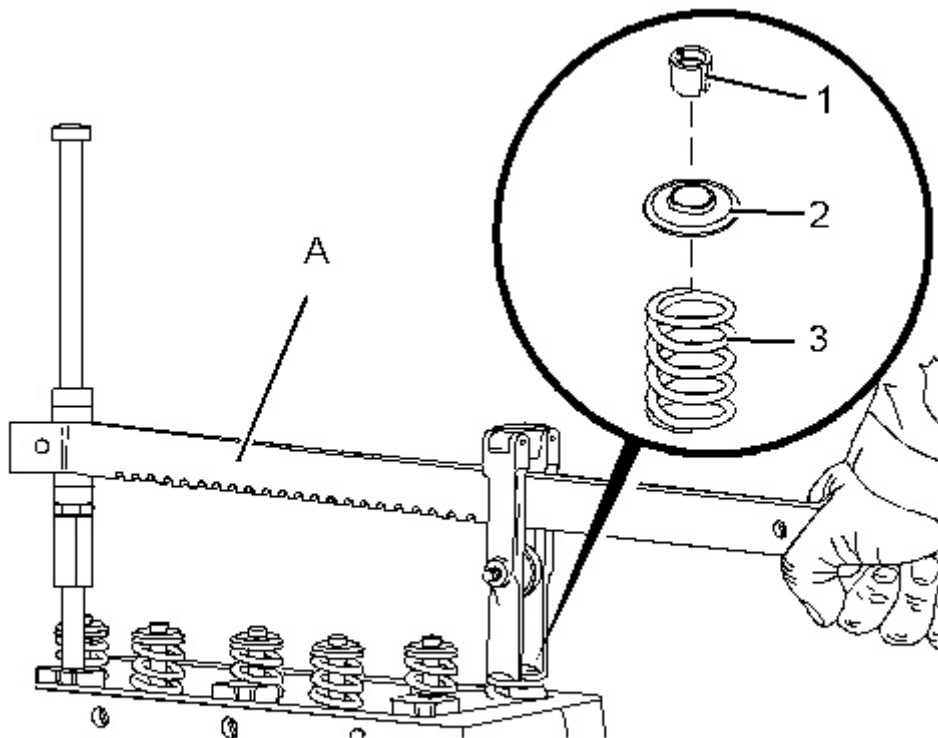


Illustration 2

g03341307

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

 **WARNING**

**Improper assembly of parts that are spring loaded can cause bodily injury.**

**To prevent possible injury, follow the established assembly procedure and wear protective equipment.**

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

Install the valve spring keepers.

5. Carefully release the pressure on Tooling (A).

**Note:** Ensure that the valve keepers are correctly seated.



**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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6. Remove Tooling (A). Ensure that all of the valves are secured in place by a valve spring and valve keepers. Rotate the crankshaft through about 45 degrees in order to clear the piston from the valve. Lightly strike the top of the valve with a soft face hammer in order to ensure that the valve keepers are correctly installed.

### End By:

- a. Install the rocker shaft assembly. Refer to Disassembly and Assembly, "Rocker Shaft and Pushrod - Install" for the correct procedure.
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## Disassembly and Assembly C1.7 and C2.2 Industrial Engines

Media Number -M0067512-03

Publication Date -01/09/2015

Date Updated -23/01/2018

i06056250

# Inlet and Exhaust Valves - Remove and Install

SMCS - 1105-010

## Removal Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A	1P-3527	Valve Spring Compressor	1

### Start By:

- a. Remove the cylinder head. Refer to Disassembly and Assembly, "Cylinder Head - Remove" for the correct 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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**Note:** The removal procedure is identical the three cylinder and the four cylinder engines. The Illustrations show a four cylinder engine.

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.

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



**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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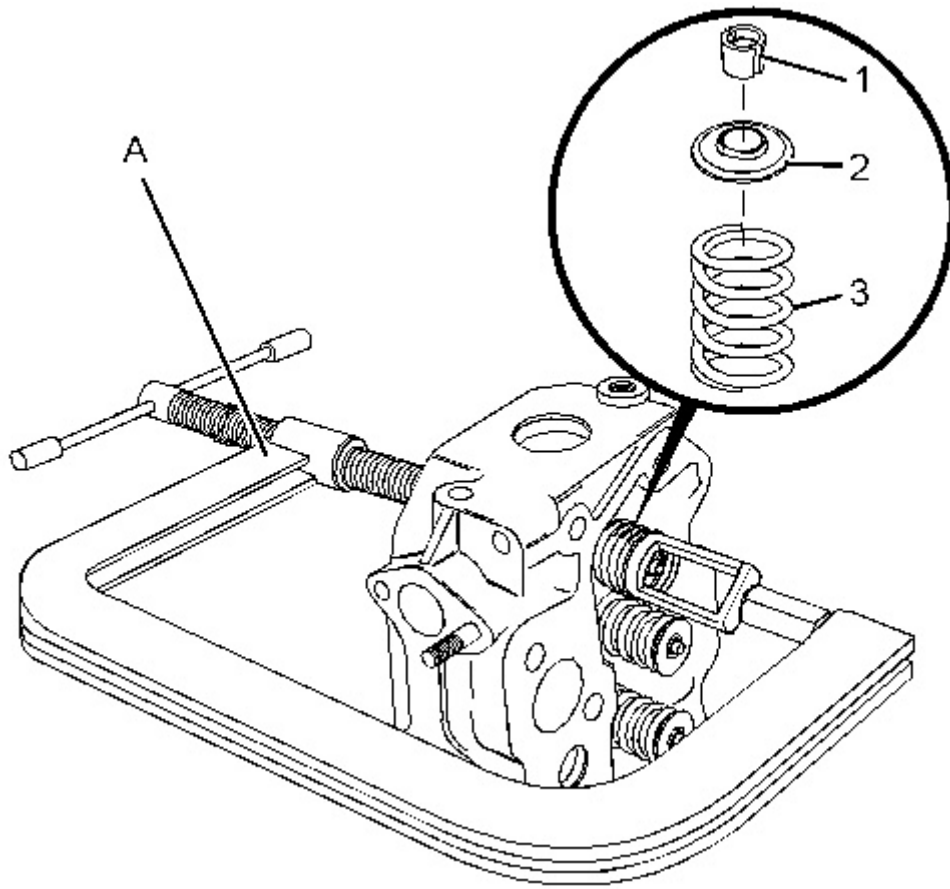
### **NOTICE**

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

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Illustration 1

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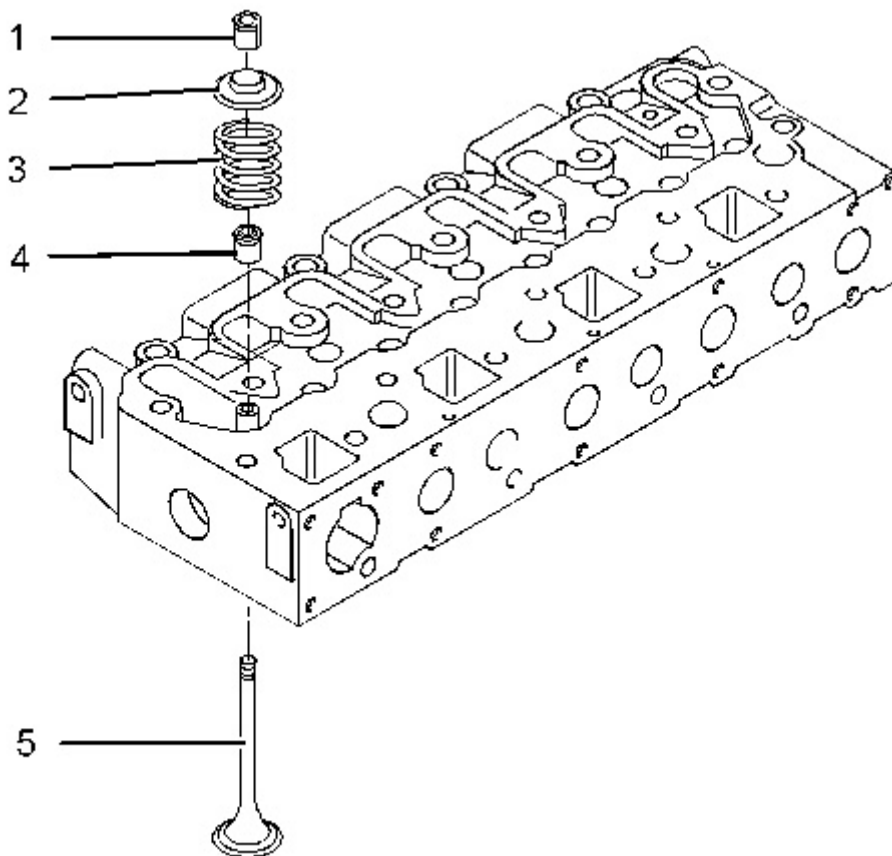


Illustration 2

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3. Use Tooling (A) in order to compress the appropriate valve spring (3).

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

4. Remove valve keepers (1).
5. Remove Tooling (A).
6. Remove valve spring retainer (2).
7. Remove valve spring (3).
8. Remove valve (5).
9. Remove valve stem seal (4).
10. Repeat Step 3 through Step 9 to remove the remaining valves.

## Installation Procedure

Table 2

Required Tools			
Tool	Part Number	Part Description	Qty

A	1P-3527	Valve Spring Compressor	1
B	256-4865	Valve Stem Seal Replacer	1

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## NOTICE

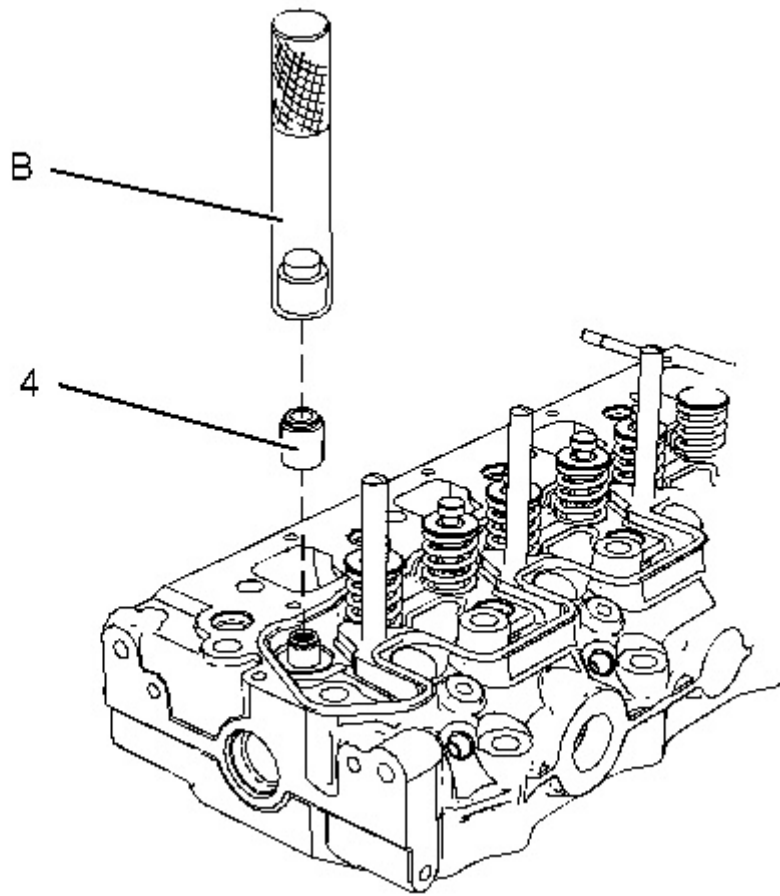
**Keep all parts clean from contaminants.**

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

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**Note:** The installation procedure is identical the three cylinder and the four cylinder engines. The Illustrations show a four cylinder engine.

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 Step 1.a through Step 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" for the correct procedure.
    - 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" for the correct procedure.
    - e. Inspect the valve springs for the correct length. Refer to Specifications, "Cylinder Head Valves" for the correct procedure.
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Illustration 3

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2. Use Tooling (B) to 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.

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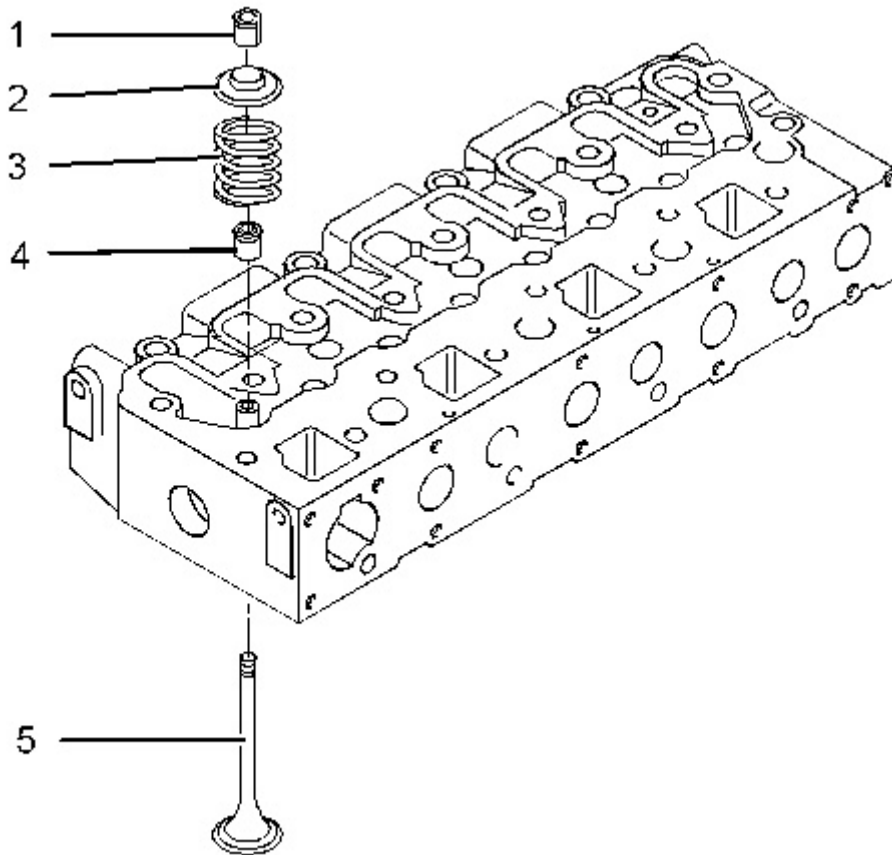


Illustration 4

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3. Lubricate the stem of valve (5) with clean engine oil. Install valve (5) in the appropriate position in the cylinder head. Check the depth of the valve below the face of the cylinder head. Refer to Systems Operation, Testing and Adjusting, "Valve Depth - Inspect" for more information.
4. Install valve spring (3) to the cylinder head.
5. 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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**NOTICE**

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