

Product: ENGINE
Model: 3512E ENGINE SY5
Configuration: 3512E Marine Engine SY500001-UP

Disassembly and Assembly 3512E and 3516E Marine Engines

Media Number -M0075247-08

Publication Date -01/09/2018

Date Updated -11/09/2018

i06885366

Valve Mechanism Cover Base - Remove and Install

SMCS - 1120-010

Removal Procedure

Start By:

- a. Remove the electronic unit injectors. Refer to Disassembly and Assembly, “Electronic Unit Injector - Remove”.

NOTICE

Keep all parts clean from contaminants. Contaminants may cause rapid wear and shortened component life.

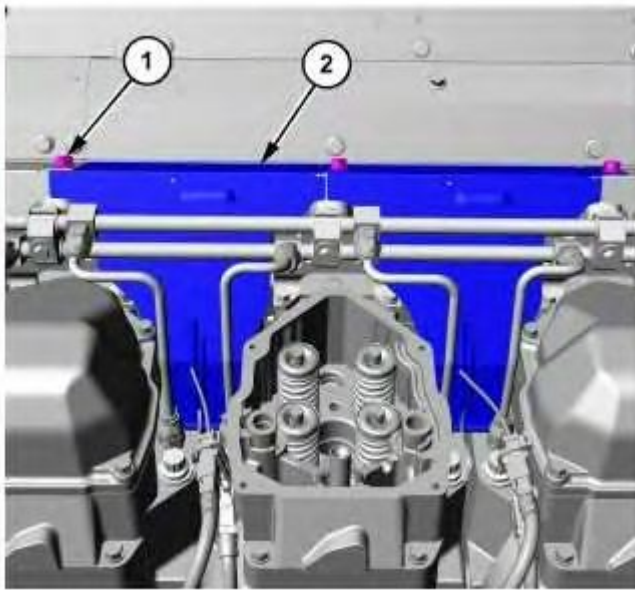


Illustration 1

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1. Remove three bolts (1) and remove two shields (2).

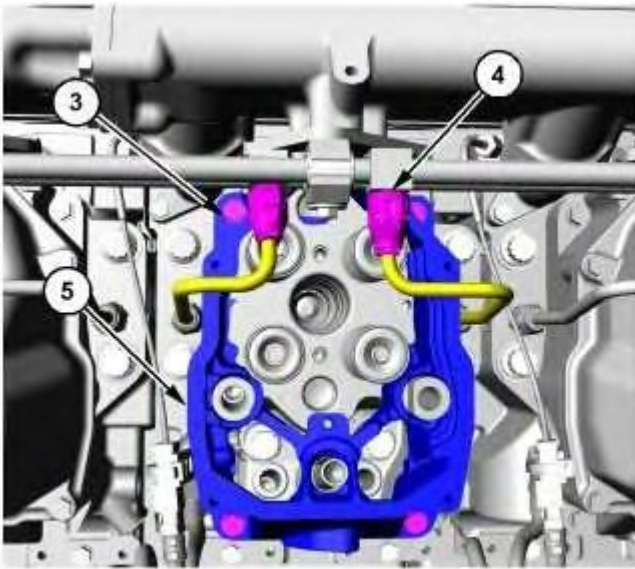


Illustration 2

g06153685

2. Disconnect tube assemblies (4).
3. Remove four bolts (3) and remove valve mechanism cover base (5).

Installation Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty.

A		Loctite 243	-
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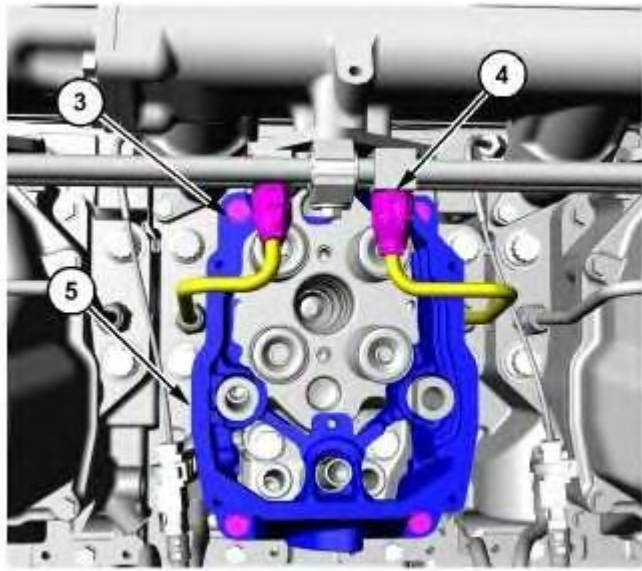


Illustration 3

g06153685

1. Position valve mechanism cover base (5) and install four bolts (3).
2. Connect tube assemblies (4).

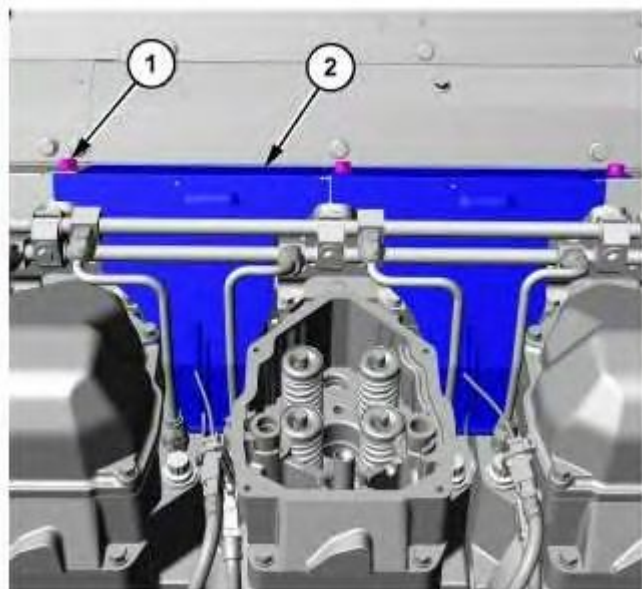


Illustration 4

g06153662

3. Position two shields (2) and install three bolts (1).

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i02315452

Rocker Shaft and Pushrod - Remove

SMCS - 1102-011; 1208-011

Removal Procedure

Start By:

- a. Remove the valve mechanism cover. Refer to Disassembly and Assembly, "Valve Mechanism Cover - Remove and Install".

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

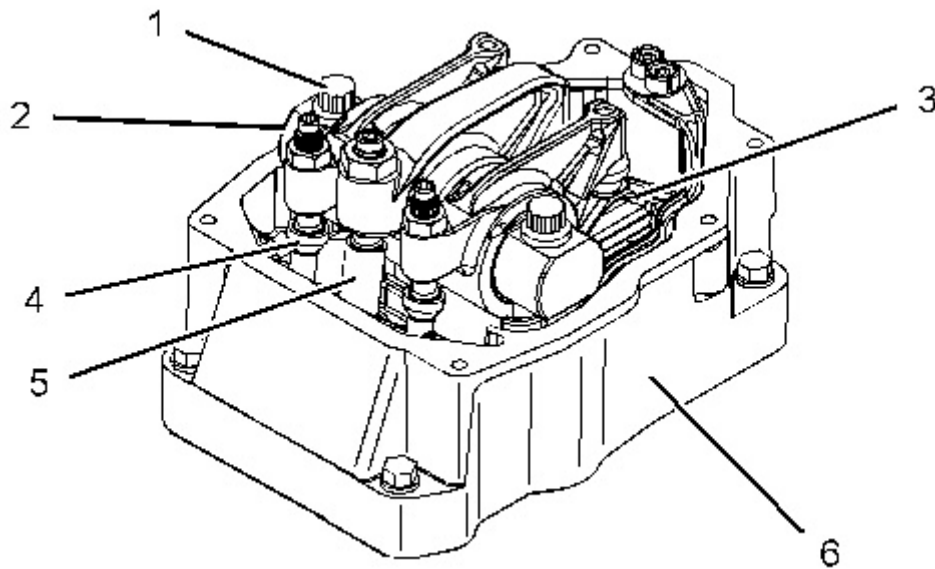


Illustration 1

g01119693

1. Remove bolts (1). Remove rocker shaft assembly (2) from valve mechanism cover base (6). Remove valve pushrods (4).

Note: Mark the valve pushrods for identification of location for assembly.

2. Remove bridge assemblies (3) from the valve stems.

Note: Mark the bridge assemblies with identification of location for assembly.

3. To remove pushrod (5), it is necessary to remove valve mechanism cover base (6).
-

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i02315619

Rocker Shaft - Disassemble

SMCS - 1102-015

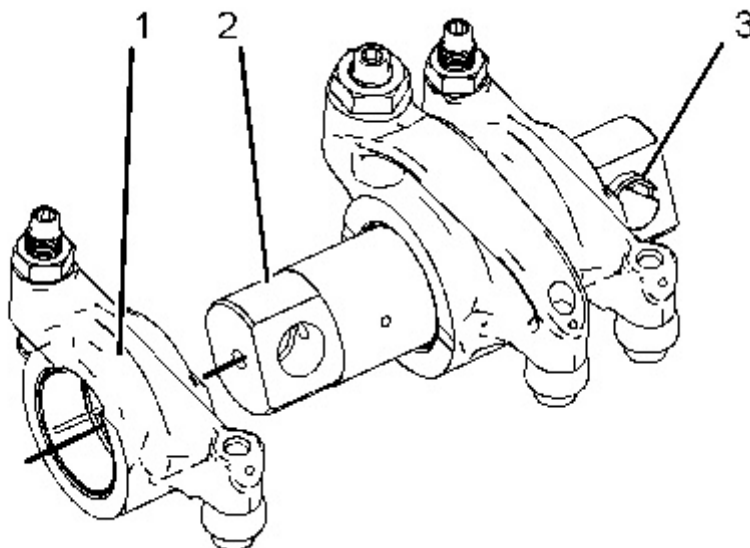
Disassembly Procedure

Table 1

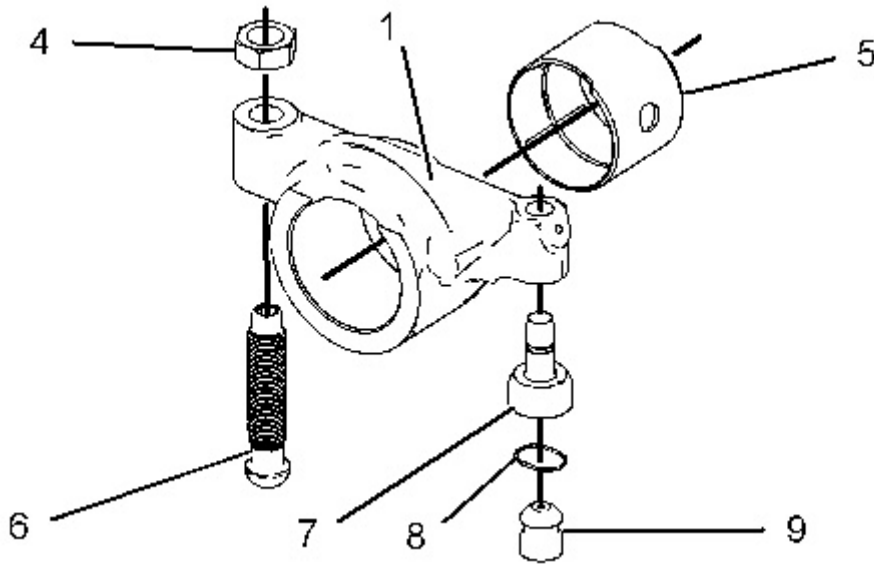
Required Tools			
Tool	Part Number	Part Description	Qty
A	1P-0510	Driver Group	1

Start By:

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



1. Slide shaft (2) out of rocker arm (1). If necessary, remove spring pin (3) from the shaft.



2. Remove jam nut (4) from adjustment screw (6). Remove the adjustment screw from rocker arm (1).
3. Remove button (9) from socket (7). Remove retaining ring (8) from button (9).
4. Use a hammer and a punch to remove socket (7) from rocker arm (1).
5. Use Tooling (A) to remove sleeve bearing (5) from the rocker arm.

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i02706144

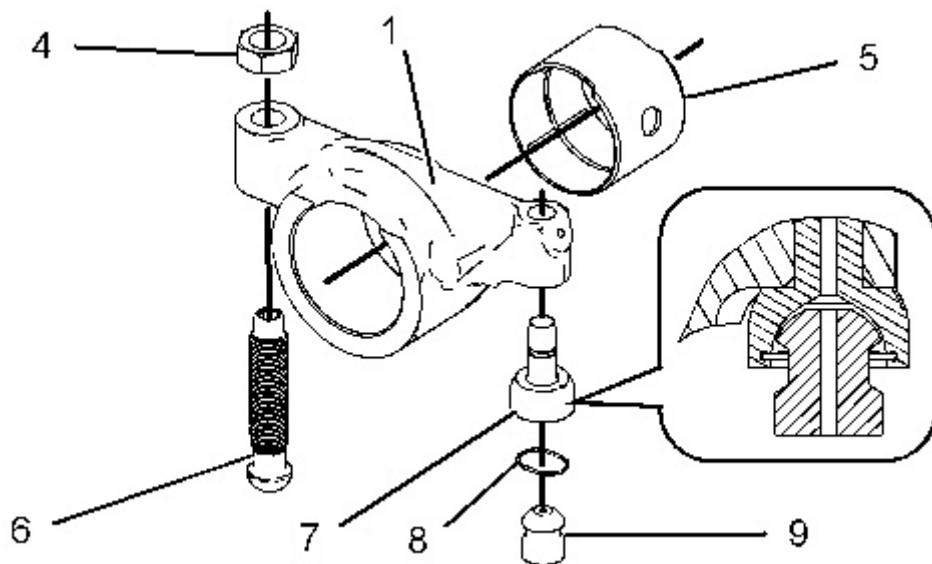
Rocker Shaft - Assemble

SMCS - 1102-016

Assembly Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A	1P-0510	Driver Group	1



1. The sleeve bearing and the rocker arm have oil supply holes. The holes must be aligned when the sleeve bearing is installed in the rocker arm. Align the joint of the sleeve bearing toward the top of the rocker arm. Align the oil hole in the sleeve bearing with the oil hole in the rocker arm. Use Tooling (A) to install sleeve bearing (5) in rocker arm (1).
2. Align the scribe mark on socket (7) with the center line of rocker arm (1). Press socket (7) fully into rocker arm (1).
3. Place retaining ring (8) on button (9). Install button (9) in socket (7).
4. Install adjustment screw (6) in rocker arm (1). Install jam nut (4) on the adjustment screw.

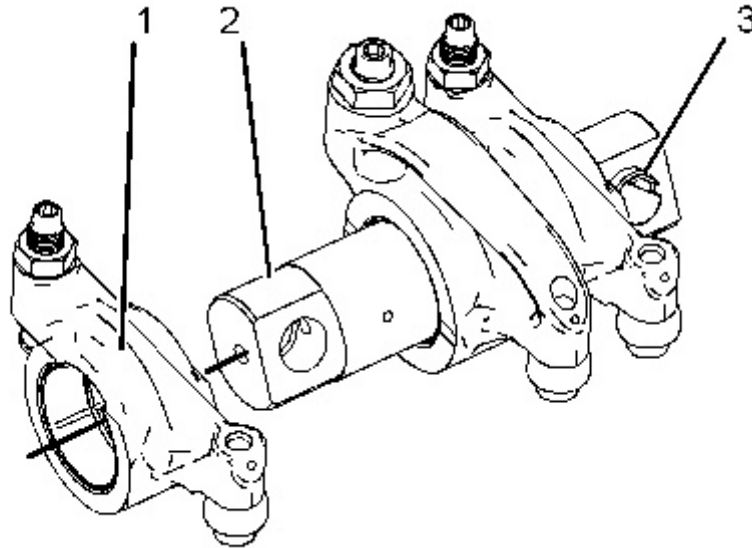


Illustration 2

g01120055

5. If spring pin (3) was removed from shaft (2), install a new spring pin. Position the split in spring pin (3) toward the end of shaft (2) and press the spring pin into the shaft.
6. Apply clean engine oil to the sleeve bearing of rocker arm (1) and to shaft (2). Install the rocker arm on the shaft.

End By:

- a. Install the rocker shaft assembly. Refer to Disassembly and Assembly, "Rocker Shaft and Pushrod - Install".
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i07085947

Rocker Shaft and Push Rods - Install

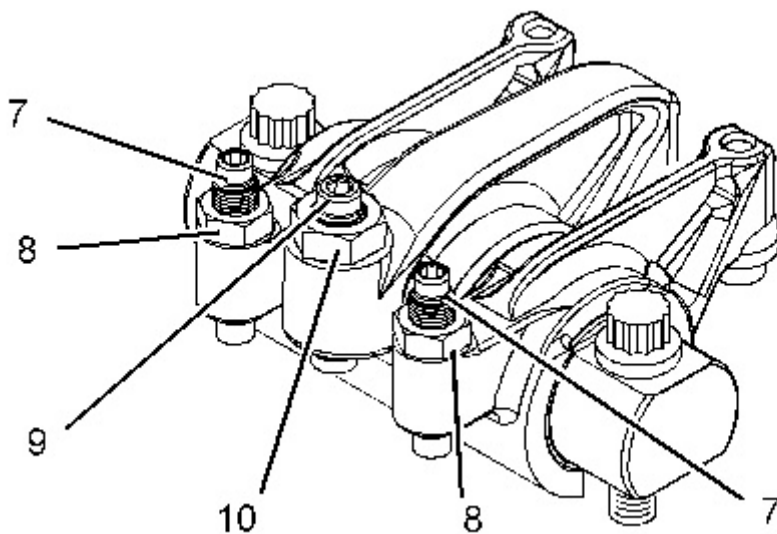
SMCS - 1102-012

Installation Procedure

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.



1. Loosen jam nut (8) and adjustment screw (7). Loosen jam nut (10) and adjustment screw (9).

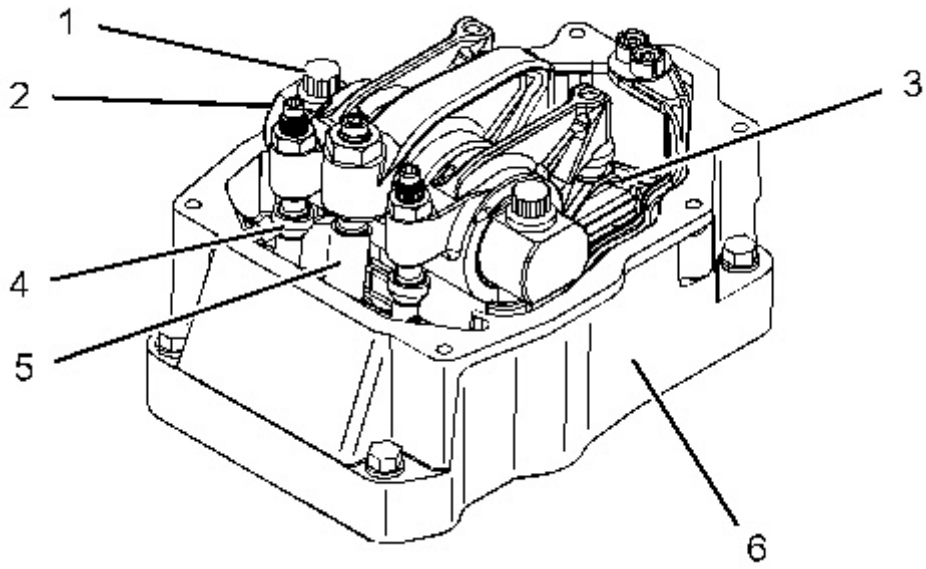


Illustration 2

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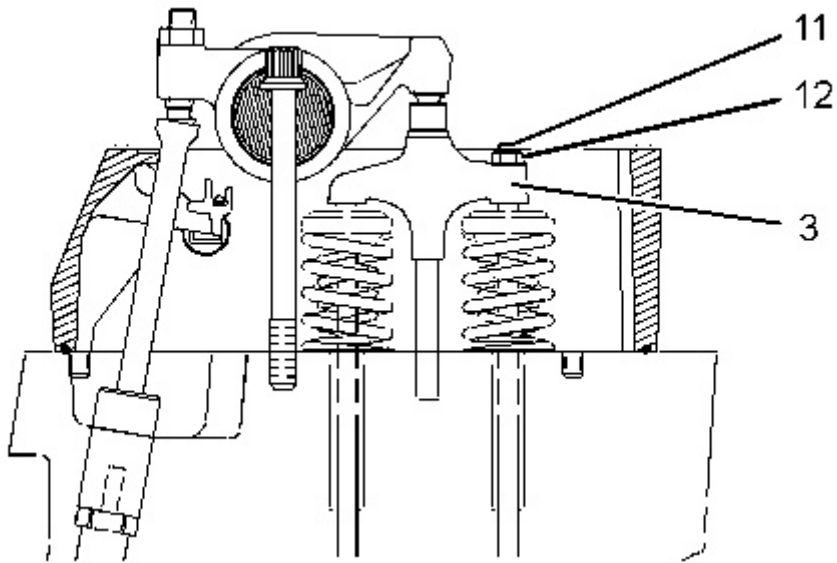


Illustration 3

g01158612

Valve bridge for dowel installations

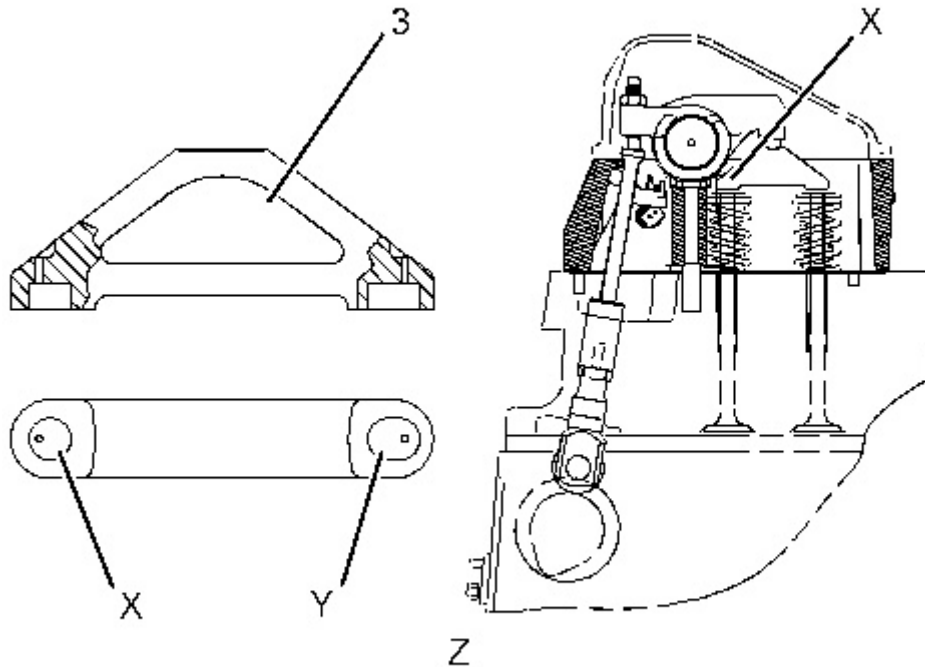


Illustration 4

g01946786

Floating valve bridge

(X) Round pocket

(Y) Slotted pocket

(Z) Outside of engine

2. Apply clean engine oil to pushrod (5).
3. Apply clean engine oil to valve pushrods (4), and the cup of the valve lifters. Install valve pushrods (4) in the original location.
4. Valve bridge assemblies for dowel installations have an adjustment screw and a jam nut. Use the following procedure to install this configuration.
 - a. Loosen adjustment screw (11) and jam nut (12) on bridge assembly (3).
 - b. Coat these items with clean engine oil: the dowels, the receptacle of the bridge assembly for the dowels and the uppermost contact surface of bridge assembly (3).
 - c. Place bridge assembly (3) into position on the dowel. Apply a downward force of 5 to 45 N (1 to 10 lb) on the uppermost contact surface of bridge assembly (3). While you apply the force, turn adjustment screw (11) until the adjustment screw contacts the valve stem.
 - d. Turn the adjustment screw for an additional 20 to 30 degrees (1/3 to 1/2 of the hex).

- e. Hold the adjustment screw in position and tighten jam nut (12) to a torque of $30 \pm 4 \text{ N}\cdot\text{m}$ ($22 \pm 3 \text{ lb ft}$).
5. For floating valve bridge assemblies, use the following procedure.
 - a. Apply clean engine oil to the contact surface of bridge assemblies (3) and the valve stems. Install bridge assemblies (3) on the valve stems.
 - b. Install the bridge assemblies with the round pocket toward the outside of the engine. Refer to Illustration 4.

NOTICE

Ensure that the crankshaft and the camshafts are in time with each other. Also ensure that the adjustment screws in the rocker arms are loosened completely before the bolts on the rocker shaft are tightened or damage to the valves and the pistons may occur.

NOTICE

If the rocker shaft is not positioned correctly, the oil supply to the sleeve bearings in the rocker arm will be shut off. This will cause seizure of the bearings and severe damage to the engine.

Be sure to orient the rocker shaft in the correct position.

6. Place rocker shaft assembly (2) in position on valve mechanism cover base (6). Make sure that valve pushrods (4) and pushrod (5) are aligned with the rocker arms. Install bolts (1). Tighten the bolts evenly to a torque of $215 \pm 40 \text{ N}\cdot\text{m}$ ($160 \pm 30 \text{ lb ft}$).

Note: The rocker shaft dowel must be located on the left-hand side of the rocker shaft when installed.

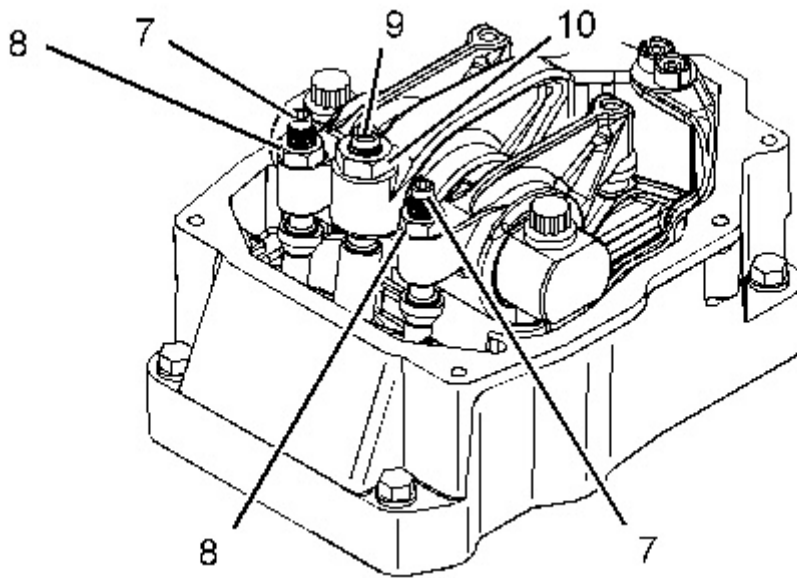


Illustration 5

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7. Adjust the valve lash according to Testing and Adjusting, "Valve Lash and Valve Bridge Adjustment". Hold adjustment screw (7) of the rocker arm assembly and tighten jam nut (8) to a torque of $70 \pm 15 \text{ N}\cdot\text{m}$ ($52 \pm 11 \text{ lb ft}$).
8. Adjust the electronic unit injector lash according to Testing and Adjusting, "Fuel Injector Adjustment". Hold adjustment screw (9) of the rocker arm assembly and tighten nut (10). If nut (10) is 5/8 inch thread, tighten to a torque of $120 \pm 15 \text{ N}\cdot\text{m}$ ($89 \pm 11 \text{ lb ft}$). If nut (10) is 1/2 inch thread, tighten to a torque of $70 \pm 15 \text{ N}\cdot\text{m}$ ($52 \pm 11 \text{ lb ft}$).

End By:

- a. Install the valve mechanism cover.
-

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i02242680

Electronic Unit Injector - Remove

SMCS - 1290-011

Removal Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A	5F-4764	Pry Bar	1

Start By:

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

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.

Refer to Special Publication, NENG2500, "Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Cat[®] products.

Dispose of all fluids according to local regulations and mandates.

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

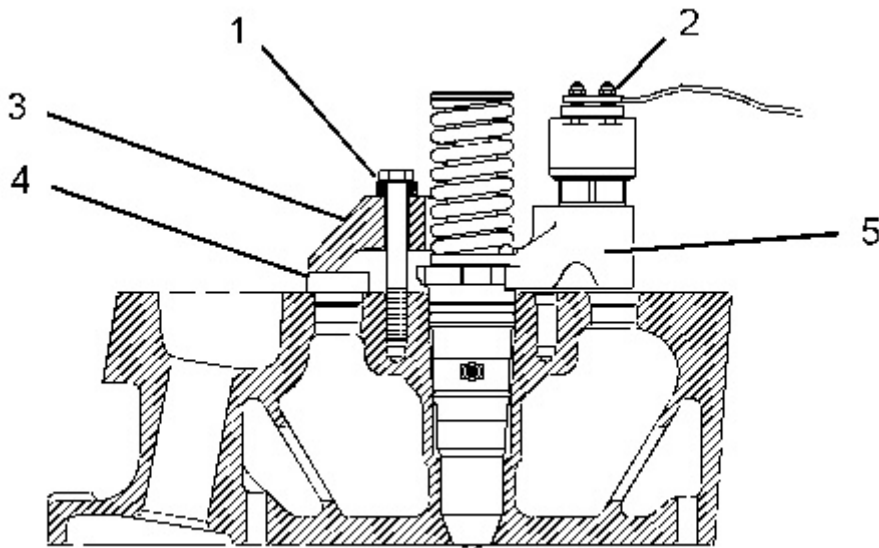


Illustration 1

g01130566

1. Disconnect harness assembly (2) from electronic unit injector (5).
 2. Remove bolt (1) and electronic unit injector clamp (3).
 3. Remove plug (4) from the cylinder head.
 4. Place an identification mark on the electronic unit injector for installation purposes. Each electronic unit injector must be reinstalled in the original location in the cylinder head.
-

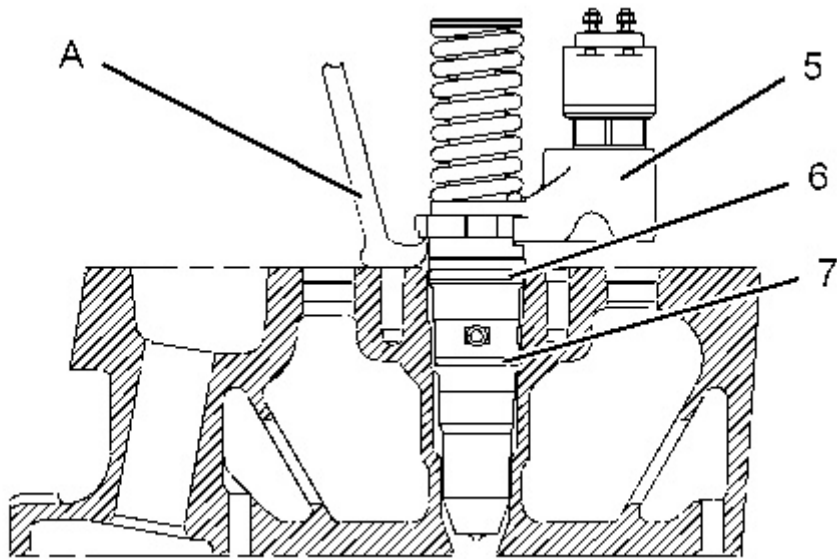


Illustration 2

g01130569

5. Use Tooling (A) to remove electronic unit injector (5) from the cylinder head.
 6. Remove O-ring seal (6) and O-ring seal (7) from the electronic unit injector.
 7. Remove all fuel / liquid from the cylinder. **WARNING!** Turning over (cranking) an engine with an injector removed could result in personal injury or death from fluids escaping through the injector bore at high velocity.
-

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i06601862

Electronic Unit Injector - Install

SMCS - 1290-012

Installation Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
B	9U-6862	Tapered Brush	1
C	4C-5027	Tap Wrench	1
D	4C-6774	Vacuum Gun Kit	1
E	452-6011	Multipurpose Grease	-

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

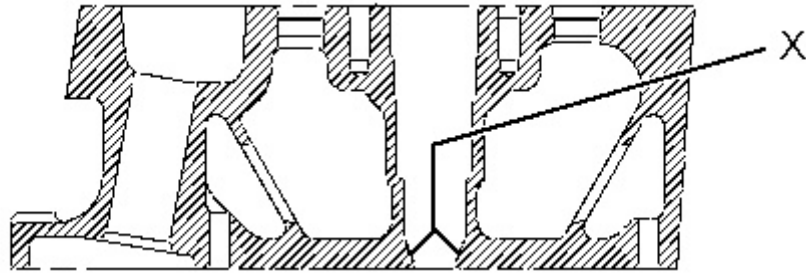


Illustration 1

g01130613

1. Use Tooling (B) to clean the bore for the electronic unit injector in the cylinder head. Hold Tooling (B) with Tooling (C). Rotate Tooling (B) against Surface (X) of the bore. Continue cleaning until Surface (X) is smooth and shiny.
 2. Use Tooling (D) to remove the fuel from the cylinder. Evacuate as much fuel as possible from the cylinder before installing the electronic unit injector. Several evacuations may be necessary.
-

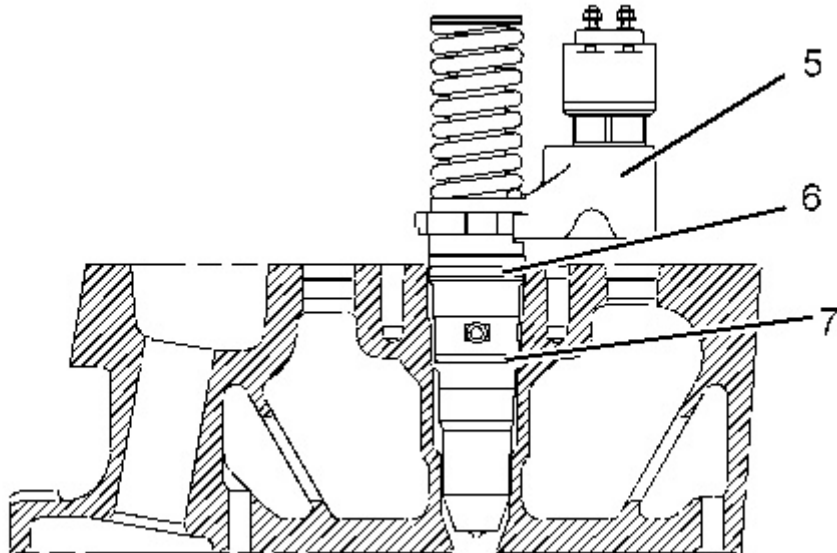


Illustration 2

g01130615

3. Install O-ring seal (6) and O-ring seal (7) on the electronic unit injector.
 4. Apply Tooling (E) to the bore of the cylinder head for the electronic unit injector.
-

NOTICE

When an electronic unit injector is replaced, the new electronic injector code must be programmed into the engine's personality module software by using the calibration menu on the Electronic Service Tool. If the new electronic injector code is not entered, the characteristics of the previous electronic unit injector is assumed.

If it is not possible to immediately reprogram the electronic injector code into the personality module software, the engine will not be severely harmed. The new electronic injector code should be reprogrammed as quickly as possible in order to optimize engine performance.

5. Position electronic unit injector (5) into the original location in the cylinder head. Center the solenoid between the valve springs. Press the electronic unit injector into the cylinder head. Do not strike the electronic unit injector.
-

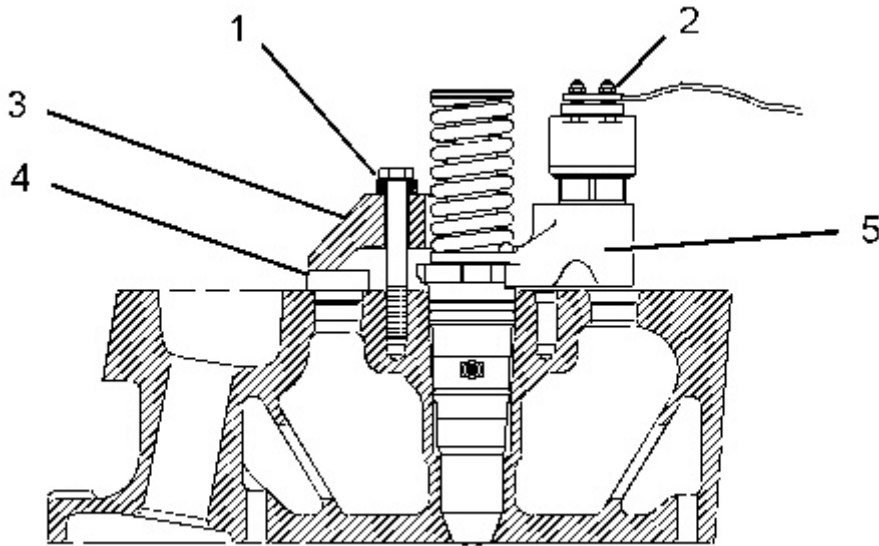


Illustration 3

g01130566

6. Install plug (4) in the cylinder head.
7. Install electronic unit injector clamp (3) and bolt (1). Tighten bolt (1) in order to seat electronic unit injector (5) in the cylinder head. Do not strike the electronic unit injector. Tighten bolt (1) to a torque of 65 ± 7 N·m (48 ± 5 lb ft).
8. Connect harness assembly (2). Tighten the terminal nuts to a torque of 2.5 ± 0.25 N·m (22 ± 2 lb in).

End By:

- a. Install the rocker shaft assembly. Refer to Disassembly and Assembly, "Rocker Shaft and Pushrod - Install".
-

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i06885354

Cylinder Head - Remove

SMCS - 1100-011

Removal Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty.
A	439-3938	Link Bracket	2

Start By:

- a. Remove the valve mechanism cover base. Refer to Disassembly and Assembly, “Valve Mechanism Cover Base - Remove and Install”.

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. Refer to Special Publication, NENG2500, “Dealer Service Tool Catalog” for tools and supplies suitable to collect and contain fluids on Cat ® products. Dispose of all fluids according to local regulations and mandates.

NOTICE

Keep all parts clean from contaminants. Contaminants may cause rapid wear and shortened component life.

Note: Inspect all seals and O-rings for wear or damage and replace if necessary.

1. Drain the coolant from the cooling system into a suitable container for storage or for disposal. Refer to Operation and Maintenance Manual, "Cooling System Coolant - Change".

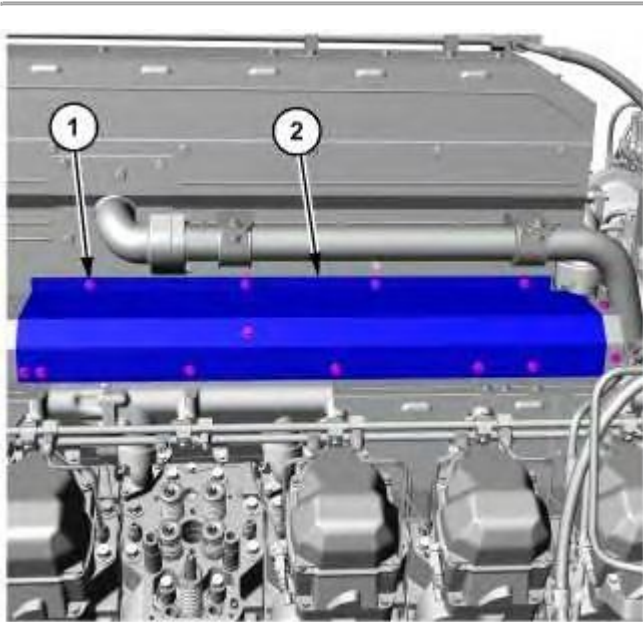


Illustration 1

g06153864

2. Remove 13 bolts (1), and remove shield (2).

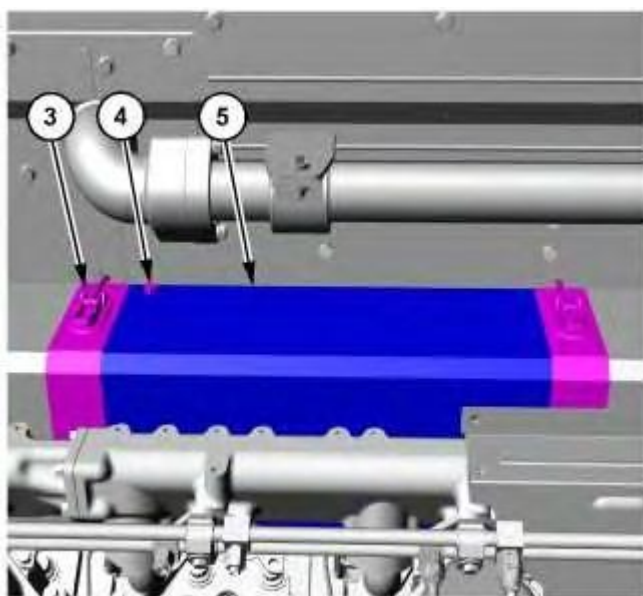


Illustration 2

g06153933

3. Release two brackets (3) and remove one bolt (4).
4. Remove shield (5).

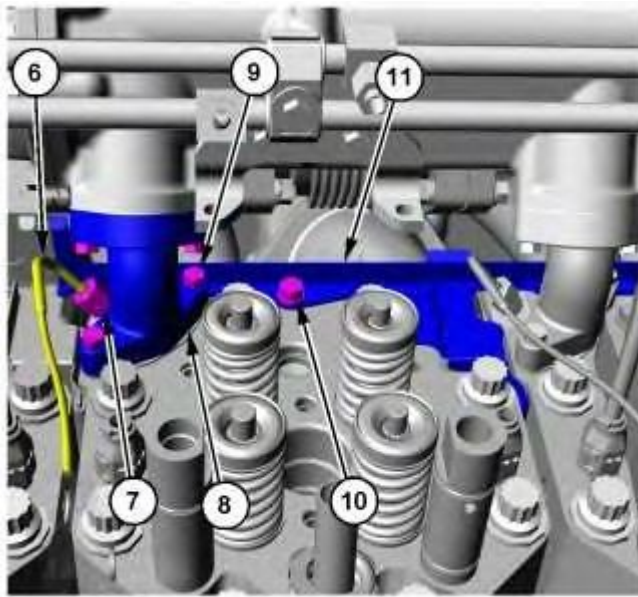


Illustration 3

g06154246

5. Disconnect harness (7) and set line (6) out of the way.
6. Remove four bolts (9) and remove elbow (8).
7. Remove two bolts (10) and remove shield (11). One bolt not shown.

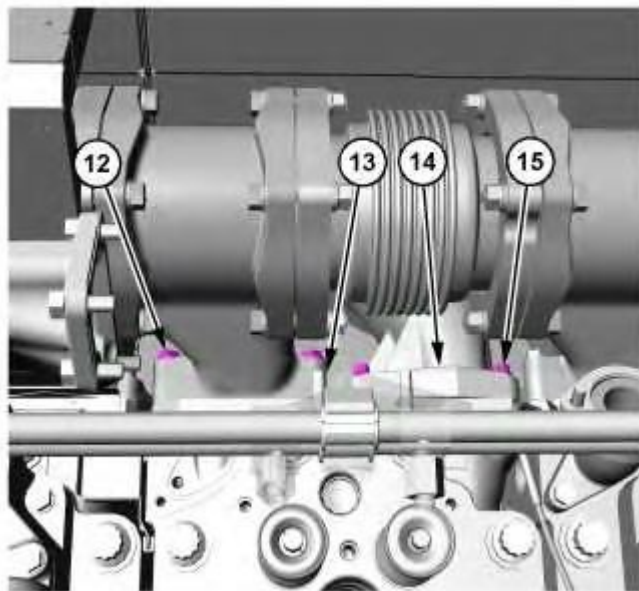


Illustration 4

g06154262

8. Remove four bolts (12) from manifold (13). Two bolts are not shown.
9. Remove four bolts (15) from manifold (14). Two bolts are not shown.

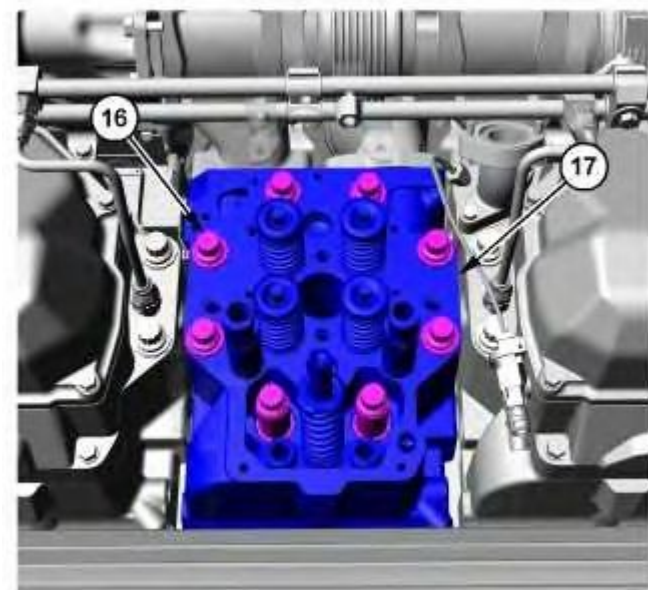


Illustration 5

g06154277

10. Install Tooling (A) and a suitable lifting device on the cylinder head (17). The weight of the cylinder head (85) is approximately 47 kg (104 lb).
 11. Remove eight bolts (16) and remove cylinder head (17).
-

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