

Product: EXCAVATOR

Model: 215 EXCAVATOR 96L

Configuration: 215 EXCAVATOR 96L00787-UP (MACHINE) POWERED BY 3304 ENGINE

Disassembly and Assembly SUPPLEMENT FOR 3304 & 3306 ENGINES WITH SPACER PLATE

Media Number -SEN7883-00

Publication Date -01/12/1978

Date Updated -10/02/2002

Introduction

The specifications given in this book are on the basis of information available at the time it was written. The specifications torques, pressures of operation, measurements, adjustments and other items can change at any time. These changes can effect the service given to the product. Get the complete and most current information before you start any job. Caterpillar Dealers have the most current information which is available. For a list of the most current modules and form numbers available for each Service Manual, see the SERVICE MANUAL CONTENTS MICROFICHE REG1139F.

When the words "use again" are in the description, the specification given can be used to determine if a part can be used again. If the part is equal to or within the specification given, use the part again.

When the word "permissible" is in the description, the specification given is the "maximum or minimum" tolerance permitted before adjustment, repair and/or new parts are needed.

A comparison can be made between the measurements of a worn part, and the specifications of a new part to find the amount of wear. A part that is worn can be safe to use if an estimate of the remainder of its service life is good. If a short service life is expected, replace the part.

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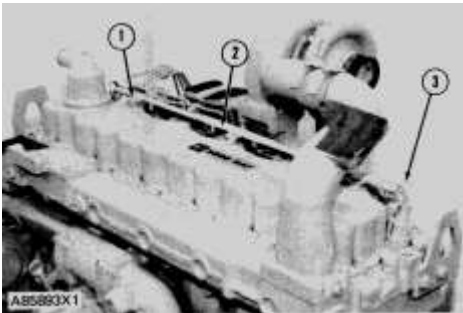
Publication Date -01/12/1978

Date Updated -10/02/2002

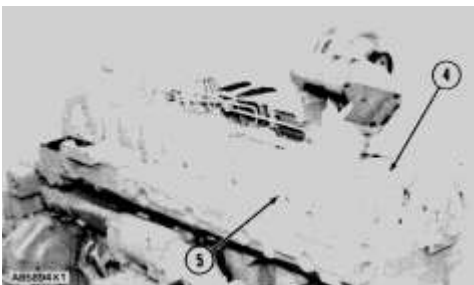
Valve Cover

SMCS - 1107-11; 1107-12

Remove Valve Cover

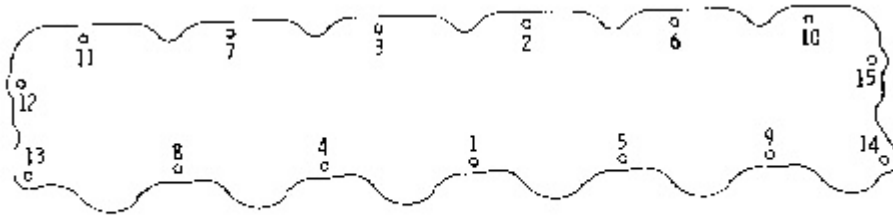
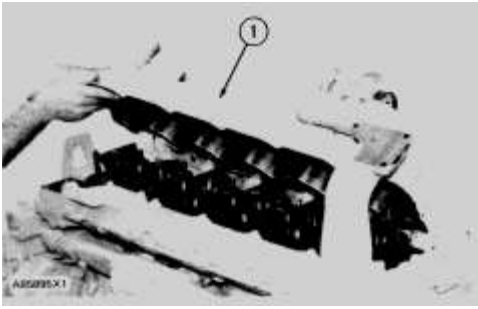


1. Remove wires (3) from the glow plugs. Remove the three bolts (1) that hold the glow plug wiring harness to the valve cover. Remove glow plug wiring harness (2).



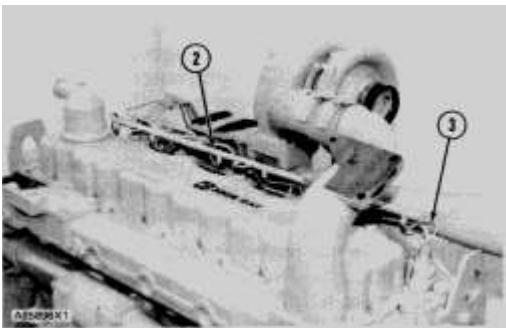
2. Remove the bolts (5) that hold valve cover (4) to the cylinder head. Remove valve cover (4) and gasket.

Install Valve Cover



T98277

1. Put 5H2471 Cement on the face of valve cover (1) and the top side of the valve cover gasket. Put the valve cover in position on the cylinder head. Install the bolts that hold it. Tighten the bolts in number sequence to a torque of 96 ± 24 lb. in. (10.9 ± 2.8 N·m).



2. Install glow plug wiring harness (2) with the three bolts that hold it. Install wires (3) on the glow plugs.

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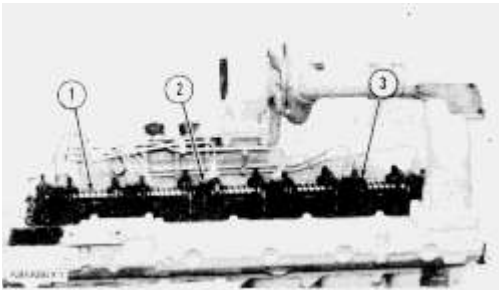
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Rocker Shaft And Push Rods

SMCS - 1102; 1208-11

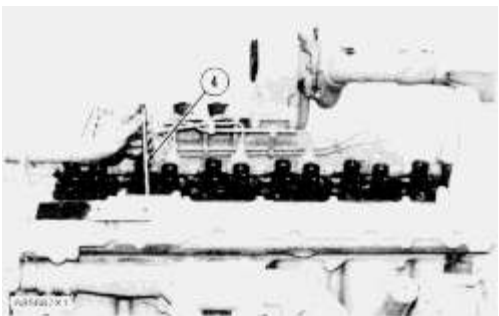
Remove Rocker Shaft And Push Rods



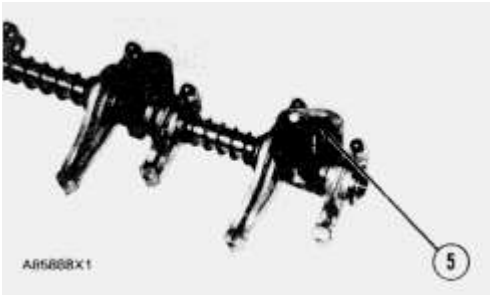
start by:

a) remove valve cover

1. Loosen adjustment screws (3) to have maximum valve clearance.
2. Remove six bolts (2) and washers that hold the rocker shaft in position.
3. Remove rocker shaft assembly (1).



4. Remove push rods (4).



5. Remove O-ring seal (5) from rear support bracket.

NOTE: The O-ring seal (5) must be replaced each time the head bolt is removed from the rear support bracket.

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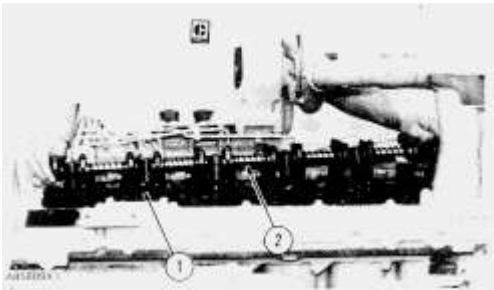
Publication Date -01/12/1978

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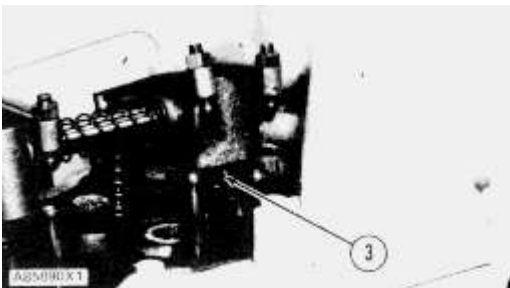
Rocker Shaft And Push Rods

SMCS - 1102; 1208-12

Install Rocker Shaft And Push Rods

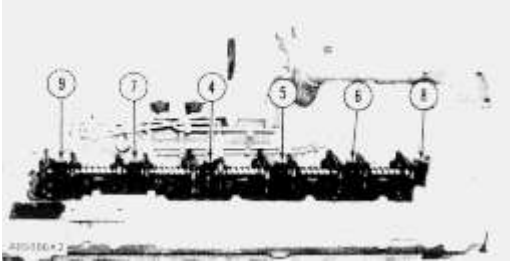


1. Install a new O-ring seal in the rear support bracket of rocker shaft.
2. Install push rods (1).
3. Put rocker shaft (2) in position on the cylinder head.



NOTE: Make sure dowels (3) are in alignment at both ends of the rocker shaft.

4. Put 5P3931 Anti-Seize Compound on the threads of the bolts that hold the rocker shaft in position. Install the six bolts and washers.



5. Tighten all bolts (4), (5), (6), (7), (8), (9) in number sequence to a torque of 115 lb. ft. (155 N·m). Tighten bolts again in number sequence to a torque of 185 ± 13 lb.ft. (250 ± 17 N·m). Last, tighten the bolts again (hand turn only) in number sequence to a torque of 185 ± 13 lb. ft. (250 ± 17 N·m).

6. Make adjustments until the intake valve clearance is .015 in. (0.38 mm) and the exhaust valve clearance is .025 in. (0.64 mm).

7. Check the torque on all of the cylinder head bolts. See CYLINDER HEAD in SPECIFICATIONS, for the correct procedure to tighten the cylinder head bolts.

end by:

a) install valve cover

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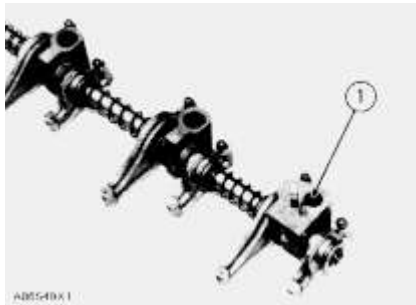
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Rocker Shaft

SMCS - 1102-15; 1102-16

Disassemble Rocker Shaft

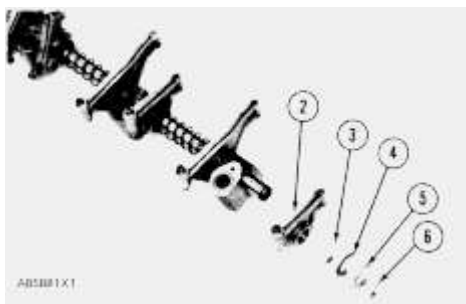


start by:

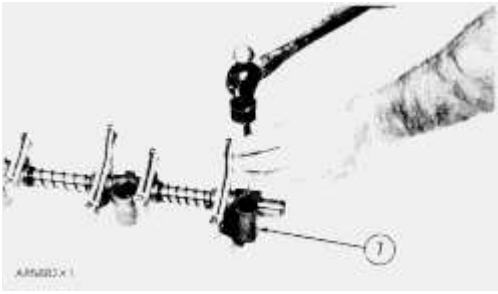
a) remove rocker shaft and push rods

1. Remove O-ring seal (1) from the rear support bracket.

NOTE: A replacement of the O-ring seal must be made each time the head bolt is removed from the rear support bracket.

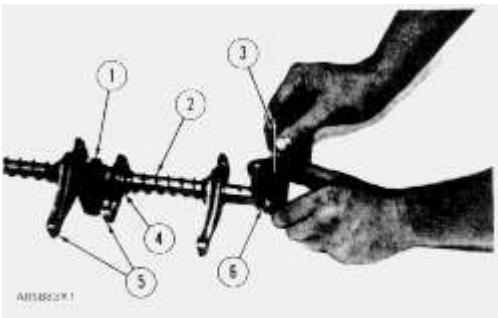


2. Remove retainer ring (6), washer (5), spring (4) and washer (3) from each end of rocker shaft. Remove rocker arm (2).



3. Remove pin from rear support bracket with a hammer and punch. Remove rear support bracket (7) from shaft.
4. Remove remainder of rocker arms, springs, washers and brackets.
5. Remove plugs from each end of the shaft if necessary.

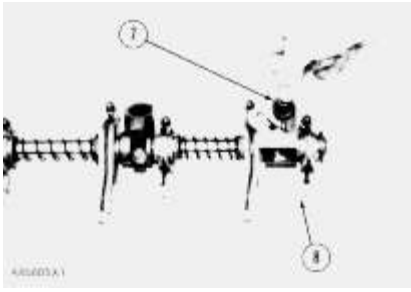
Assemble Rocker Shaft



1. Install rocker arms (5), brackets (1), washers (4) and springs (2) on the rocker shaft.
2. Install rear support bracket (6) on rocker shaft. Make sure hole in rear support bracket is in alignment with hole in rocker shaft.
3. Put pin (3) in position in the bracket.



4. Install pin (3) through bracket and shaft with a hammer.
5. Pin (3) must extend .378 in. (9.60 mm) above the bracket.



6. Install O-ring seal (7) in the rear support bracket. Install rocker arm (8), washer, spring, washer and retainer ring on the rocker shaft.

7. Install the plugs in each end of the rocker shaft if they were removed.

end by:

a) install rocker shaft and push rods

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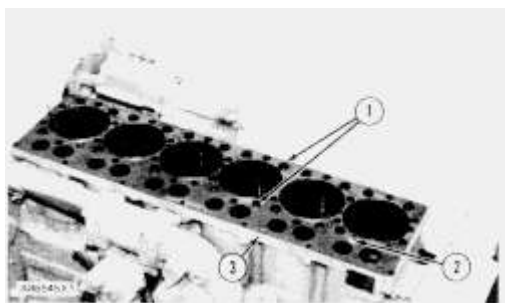
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Spacer Plate

SMCS - 1221-11; 1221-12

Remove Spacer Plate



start by:

a) remove cylinder head

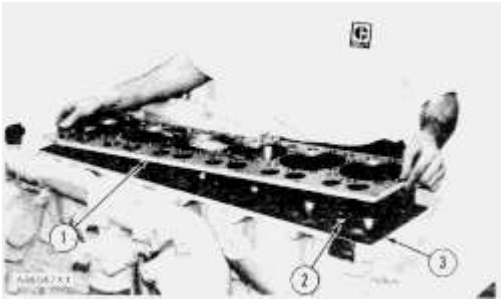
1. Remove large and small water ferrules (1) from the spacer plate.
2. Remove O-ring seal (2) from the hollow dowel.
3. Remove spacer plate (3).



4. Remove O-ring seal (4), then remove spacer plate gasket (5) from the cylinder block.

Install Spacer Plate

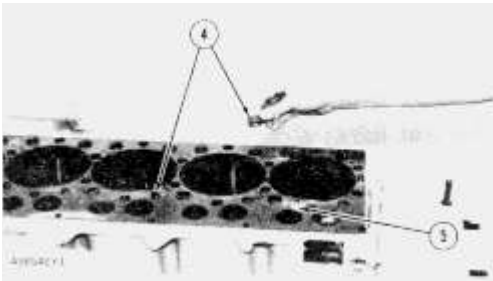
1. Thoroughly clean the spacer plate and cylinder block surface.



2. Install a new spacer plate gasket (3). Install a new O-ring seal (2) on the hollow dowel.
3. Install spacer plate (1).

NOTICE

Both surfaces of spacer plate, top of cylinder block and both sides of spacer plate gasket must be clean and dry. Do not use any gasket adhesives or other substances on these surfaces.



4. Install a new O-ring seal (5) on the hollow dowel.
5. Install new large and small water ferrules (4) in the spacer plates.
6. Check cylinder liner projection. See INSTALL CYLINDER LINERS.

end by:

- a) install cylinder head
-

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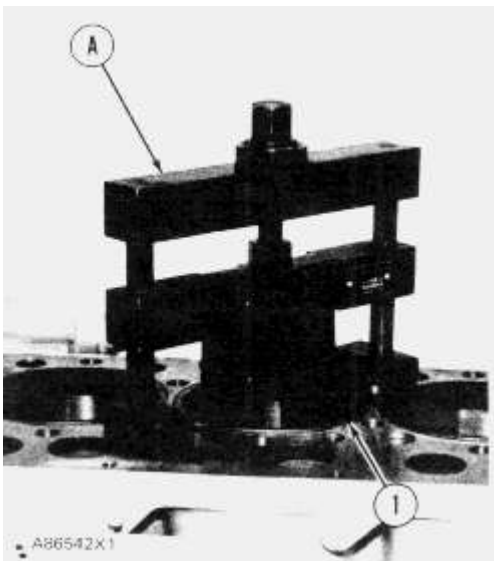
Date Updated -10/02/2002

Cylinder Liners

SMCS - 1216-11; 1216-12

Remove Cylinder Liners

Tools Needed		A
5P8665	Cylinder Liner Puller	1



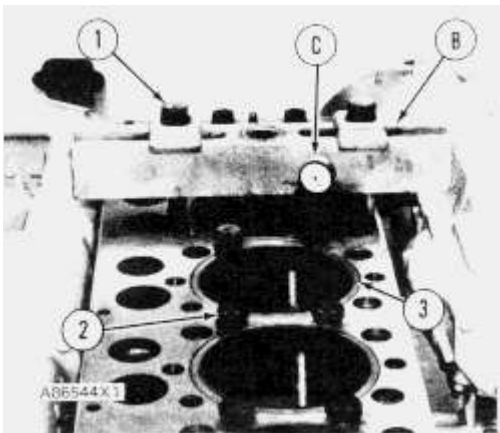
start by:

a) remove pistons

1. Remove the coolant from the cylinder block.
2. Put covers on journals of crankshaft for protection from dirt or water.
3. Remove cylinder liners (1) with tooling (A).

Install Cylinder Liners

	Tools Needed	A	B	C
2P8260	Cylinder Liner Installation Tool	1		
1P5510	Liner Projection Tool			1
8B7548	Puller Crossbar		1	
1P2394	Adapter Plate		1	
3H465	Plate		2	
S1589	Bolt $\frac{5}{8}$ -11 NC—1.75 in. (44.5 mm) long		12	
1S379	Washer (copper)		12	
1D4595	Bolt $\frac{3}{4}$ -11 NC—6.00 in. (152.4 mm) long		2	
2S736	Washer		2	



1. Clean the cylinder liners (3) and the liner bores in the cylinder block.
2. Install the cylinder liners in the block without the O-ring seals or filler bands.
3. Check the cylinder liner projection as follows:
 - a) Install the S1589 Bolts (2) and 1S379 Washers of tooling (B) on the cylinder block next to each liner. Tighten the bolts evenly, in four steps: 10 lb. ft. (14 N·m), 25 lb. ft. (35 N·m), 50 lb. ft. (70 N·m) and 70 lb. ft. (95 N·m).
 - b) Put adapter plate on top of the liner and install the remainder of tooling (B). Tighten the 1D4595 Bolts (1) evenly in four steps: 5 lb. ft. (7 N·m), 15 lb. ft. (20 N·m), 25 lb. ft. (35 N·m) and 50 lb. ft. (70 N·m).
 - c) Check to be sure the distance from the bottom edge of the crossbar to the top of the cylinder block is the same on both sides of the liner.
 - d) Check the cylinder liner projection with tool group (C) at four locations around the liner.

e) Liner projection must be .0013 to .0069 in. (0.033 to 0.175 mm). Measurements on the same liner must not be different by more than .002 in. (0.05 mm). Average measurements between liners next to each other must not be different by more than .002 in. (0.05 mm).

NOTE: If the liner is turned in the bore, it can make a difference in the liner projection.

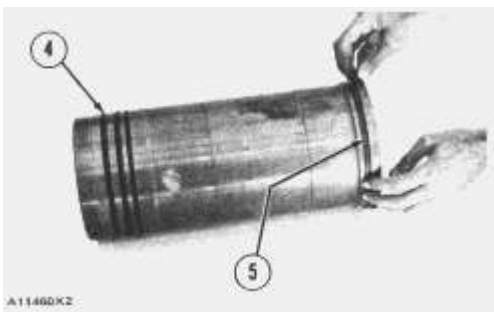
4. If the liner projection is not .0013 to .0069 in. (0.033 to 0.175 mm), check the thickness of the following parts: spacer plate, spacer plate gasket and cylinder liner flange. The thickness of the spacer plate must be $.3925 \pm .0010$ in. (9.970 ± 0.025 mm). The thickness of the spacer plate gasket must be $.0082 \pm .0010$ in. (0.208 ± 0.025 mm). The thickness of the cylinder liner flange must be $.4048 \pm .0008$ in. (10.282 ± 0.020 mm).

NOTE: If the liner projection changes from point to point around the liner, turn the liner to a new position in the bore. If the liner projection is still not to specifications, move the liner to a different bore.

5. When the cylinder projection is correct, put a mark on the liner and block so the liner can be installed in the same position from which it was removed.

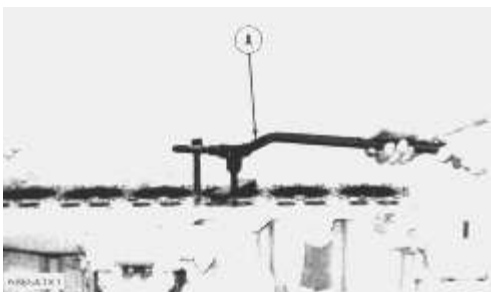
NOTE: Cylinder liner projection can be adjusted by the removal of material from (machining) the contact face of the cylinder block with the use of the 8S3140 Cylinder Block Counterboring Tool Arrangement. Machine to a minimum depth of .030 in. (0.76 mm) and to a maximum depth of .045 in. (1.14 mm). The instructions for the use of the tool group are in Special Instruction Form No. FM055228. Shims are available for the adjustment of the liner projection. See CYLINDER LINER PROJECTION in TESTING AND ADJUSTING for the shim thickness and part number.

6. Remove tooling (B) and (C). Remove the liner.



7. Put liquid soap on bottom liner bore in block, on grooves in lower liner and on O-ring seals (4). Install O-ring seals on the liner.

8. Put filler band (5) in clean SAE 30 oil for a moment and install on liner. Install cylinder liner immediately in the cylinder block (before expansion of filler band).



9. Make sure the mark on liner is in alignment with the mark on the block. Use tooling (A) to push the liner into position.

10. Do Steps 5 through 9 for the remainder of the cylinder liners.

end by:

a) install pistons

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Media Number -SEN7883-00

Publication Date -01/12/1978

Date Updated -10/02/2002

Cylinder Head

SMCS - 1100-11; 1100-12

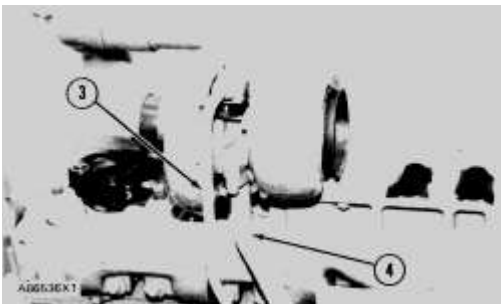
Remove Cylinder Head

start by:

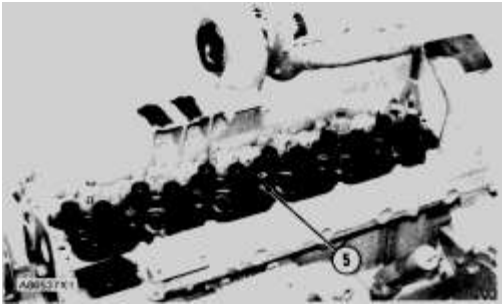
- a) remove rocker shaft and push rods
- b) remove fuel injection lines



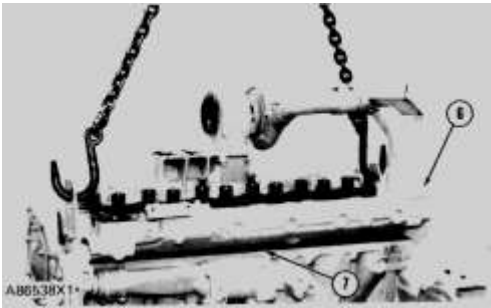
1. Remove two bolts (1) from the top of the water pump. Loosen two bolts (2) in the water pump.



2. Remove oil supply line (3) from the turbocharger. Remove oil return line (4) from the turbocharger.



3. Remove the bolts (5) that hold the cylinder head to the cylinder block.



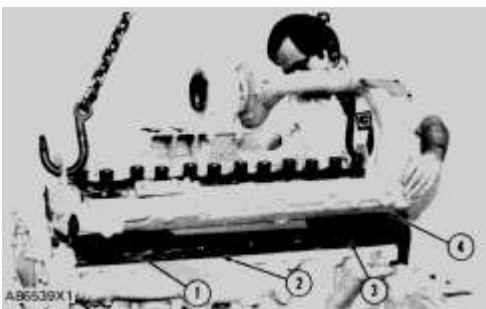
4. Fasten a hoist to the cylinder head assembly (6). Remove the cylinder head assembly from the block. Weight of the assembly is 290 lb. (131 kg). Remove O-ring seal from hollow dowel. Remove cylinder head gasket (7) and water ferrules.

NOTICE

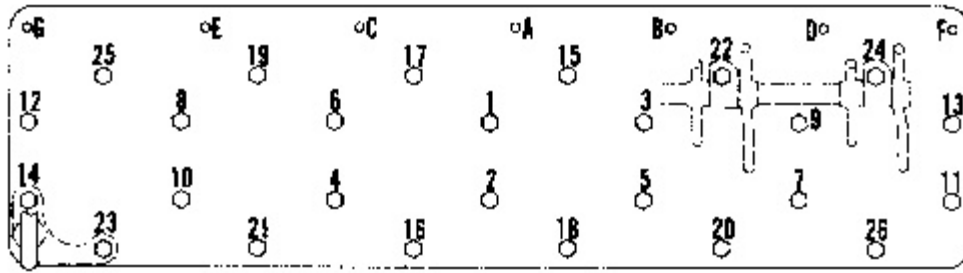
Do not put the cylinder head down on a flat surface. This can cause damage to the fuel injection valves.

NOTE: Always install a new gasket between spacer plate and cylinder block before cylinder head is installed. See REMOVE SPACER PLATE.

Install Cylinder Head



1. Thoroughly clean the spacer plate and bottom surface of the cylinder head. Install a new head gasket (2), water ferrules (1) and O-ring seal (3) on the hollow dowel.



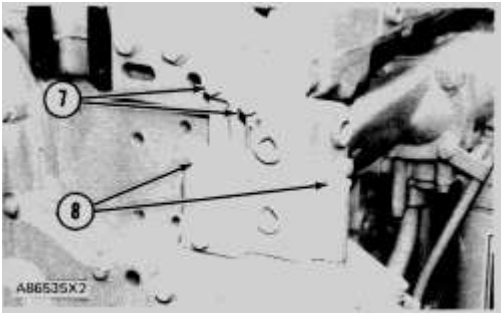
77034X1

NOTE: Be sure a new gasket has been installed between spacer plate and cylinder block. See INSTALL SPACER PLATE.

2. Fasten a hoist and install the cylinder head assembly (4) on the cylinder block.
3. Install the push rods and put the rocker shaft in position on the cylinder head. Put 5P3931 Anti-Seize Compound on the threads of the cylinder head and rocker shaft bolts. Install the bolts and washers and tighten the bolts as follows:
 1. Tighten all bolts in number sequence to a torque of 115 lb. ft. (155 N·m).
 2. Again tighten all bolts in number sequence to a torque of 185 ± 13 lb. ft. (250 ± 17 N·m).
 3. Again tighten all bolts in number sequence (hand torque only) to a torque of 185 ± 13 lb. ft. (250 ± 17 N·m).
 4. Tighten all bolts in letter sequence to a torque of 22 lb. ft. (30 N·m).
 5. Again tighten all bolts in letter sequence to a torque of 32 ± 5 lb. ft. (43 ± 7 N·m).
 6. Again tighten all bolts in letter sequence to a torque of 32 ± 5 lb. ft. (43 ± 7 N·m).
4. Make adjustment of valves to have a clearance of .015 in. (0.38 mm) for intake and .025 in. (0.64 mm) for exhaust.



5. Install oil return line (6) on the turbocharger.
6. Install oil supply line (5) on the turbocharger.



7. Tighten the two bolts (8) in the water pump.

8. Install the two bolts (7) that hold the water pump to the cylinder head.

end by:

a) install fuel injection lines

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Disassembly and Assembly 3304 VEHICULAR ENGINE FOR 215 EXCAVATOR

Media Number -SEN7426-00

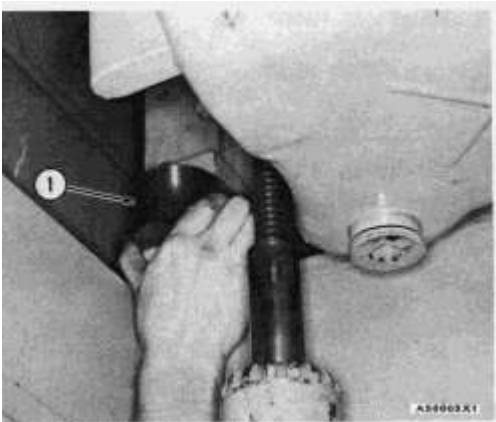
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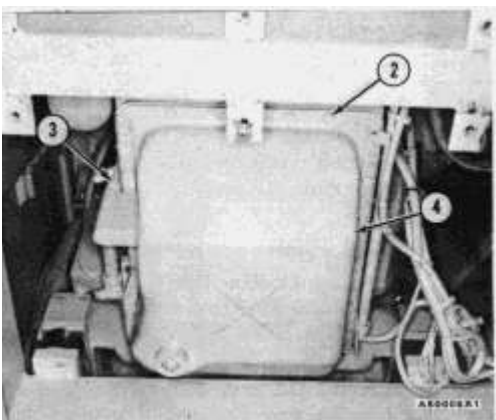
Oil Pan

SMCS - 1302-11; 1302-12

Remove Oil Pan



1. Remove the oil from the engine.



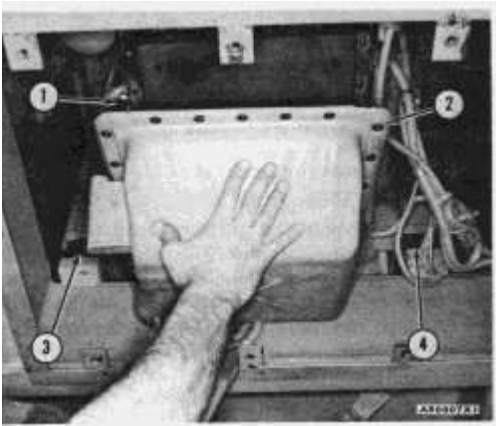
2. Remove the four bolts that hold the front support to the frame. Loosen engine rear mounting bolts. Put two hydraulic jacks under the front of the engine and lift the engine until a 3" (76.2 mm) spacer (1) can be installed between the frame and the engine front support on each side of the engine. Lower the engine on the spacers.

3. Disconnect oil level gauge (3) from the oil pan.

4. Remove twenty-four bolts (2) that hold the oil pan in place and remove oil pan (4).

Install Oil Pan

1. Inspect the gasket for the oil pan. Install a new gasket if needed.



2. Put oil pan (2) in position on the engine and install the bolts that hold the oil pan in place.

NOTE: Make sure oil gauge tube (1) is in correct position when the oil pan is installed.

3. Connect oil gauge tube (1) to the oil pan.
 4. Lift the engine with two hydraulic jacks and remove spacers (3) and (4) from under the front support. Lower the engine to the correct position. Remove the hydraulic jacks.
 5. Install the four front support bolts.
 6. Tighten the engine rear mounting bolts.
 7. Fill the crankcase with oil to the correct level.
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