

# SERVICE MANUAL

WHEELED EXCAVATOR  
**JCB Hydradig 110W**

EN - 9813/8250  
ISSUE 1 - 01/2017


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## Foreword

### The Operator's Manual

 You and others can be killed or seriously injured if you operate or maintain the machine without first studying the Operator's Manual. You must understand and follow the instructions in the Operator's Manual. If you do not understand anything, ask your employer or JCB dealer to explain it.

Do not operate the machine without an Operator's Manual, or if there is anything on the machine you do not understand.

Treat the Operator's Manual as part of the machine. Keep it clean and in good condition. Replace the Operator's Manual immediately if it is lost, damaged or becomes unreadable.

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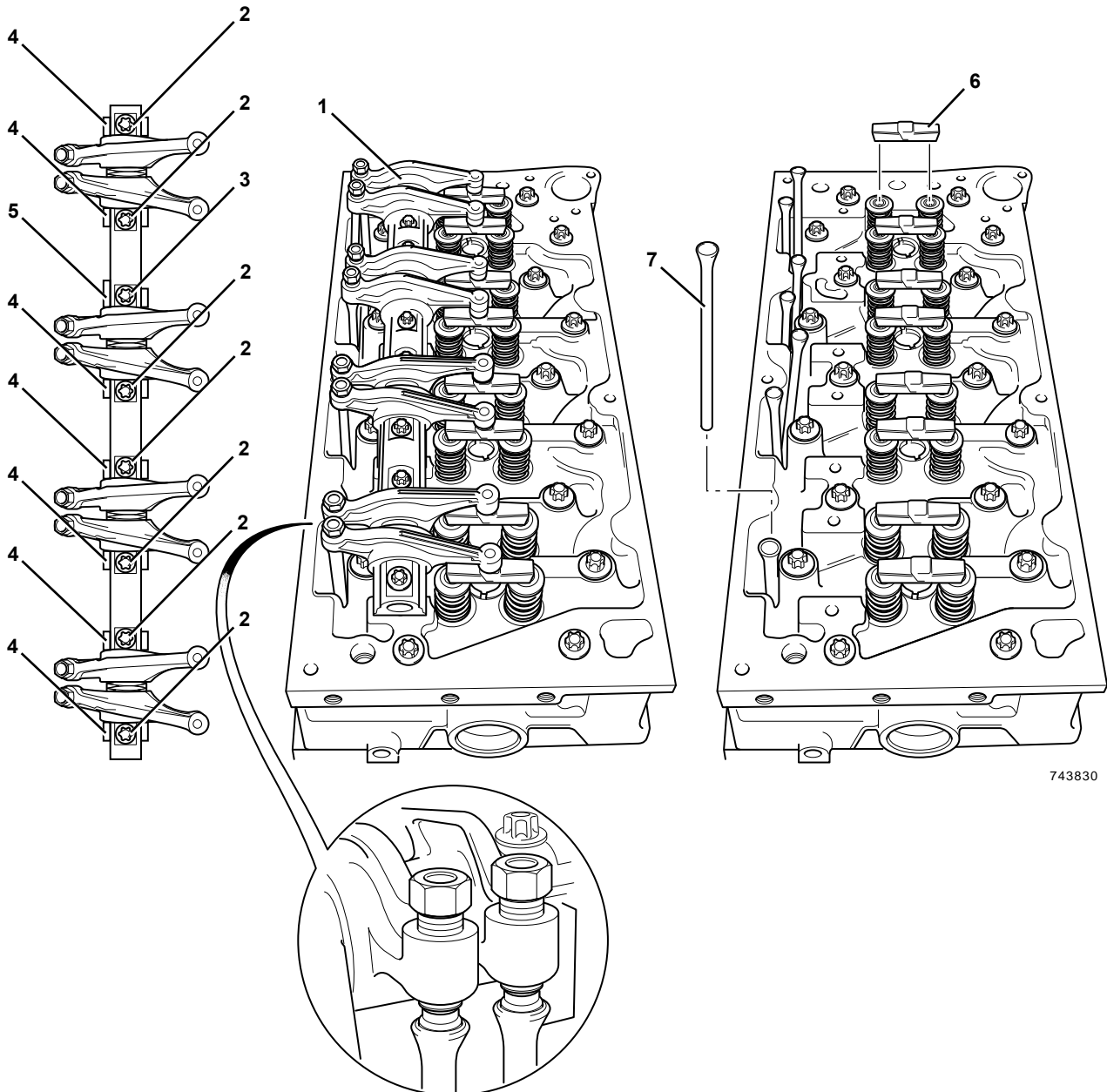
**78 - After Sales**

## Remove and Install

### Before Removal

1. Make sure that the engine is safe to work on. If the engine has been running, let it cool before you start the service work.
2. Get access to the engine.
3. Disconnect and remove the fuel pipes from the fuel injectors, refer to Fuel pipes (PIL 18-96).
4. Remove the rocker cover, refer to (PIL 15-42).

**Figure 206.**



743830

- |   |                                  |
|---|----------------------------------|
| 1 Rocker shaft assembly                             | 2 Rocker shaft fixing bolts (x7) |
| 3 Rocker shaft - oil feed pedestal fixing bolt (x1) | 4 Pedestals (x7)                 |
| 5 Oil feed pedestal (x1)                            | 6 Bridge pieces (x8)             |
| 7 Push rods (x8)                                    |                                  |

## Remove

1. Remove the rocker shaft fixing bolts. DO NOT withdraw the bolts. Lift the rocker shaft assembly from the cylinder head complete with pedestals still attached. Important: Keep all pedestals and fixing bolts in their original positions.
2. Lift off the bridge pieces from the pairs of inlet and exhaust valves.
3. Withdraw the push rods from the cylinder block.

## Before Installation

1. Make sure that all items are clean and free from damage and corrosion. Refer to Check Condition (PIL 15-42).
2. Make sure that all oil-ways and cross drillings in the cylinder head, rocker shaft and pedestals are clear and free from debris. Use an air line to blow through the cross drillings.

## Install

1. The installation procedure is the opposite of the removal procedure. Additionally do the following steps.
2. Use a suitable degreasing agent to clean the top of the cylinder head.
3. Install the bridge pieces on to the pairs of inlet and exhaust valves in the cylinder head.
4. Insert the push rods into the cylinder block. Make sure that they engage with the camshaft tappets.
5. Install the rocker shaft assembly into the cylinder head. Make sure that the pedestals are located in their original positions. Note the position of the oil feed pedestal and the longer bolt. Make sure that the push rods engage with the tappet adjusters and that the rockers are located over the bridge pieces.
6. Tighten the bolts to the correct torque value.

## After Installation

1. Measure and adjust the valve clearances, refer to (PIL 15-30).

**Table 59. Torque Values**

Item	Nm
2	24
3	24

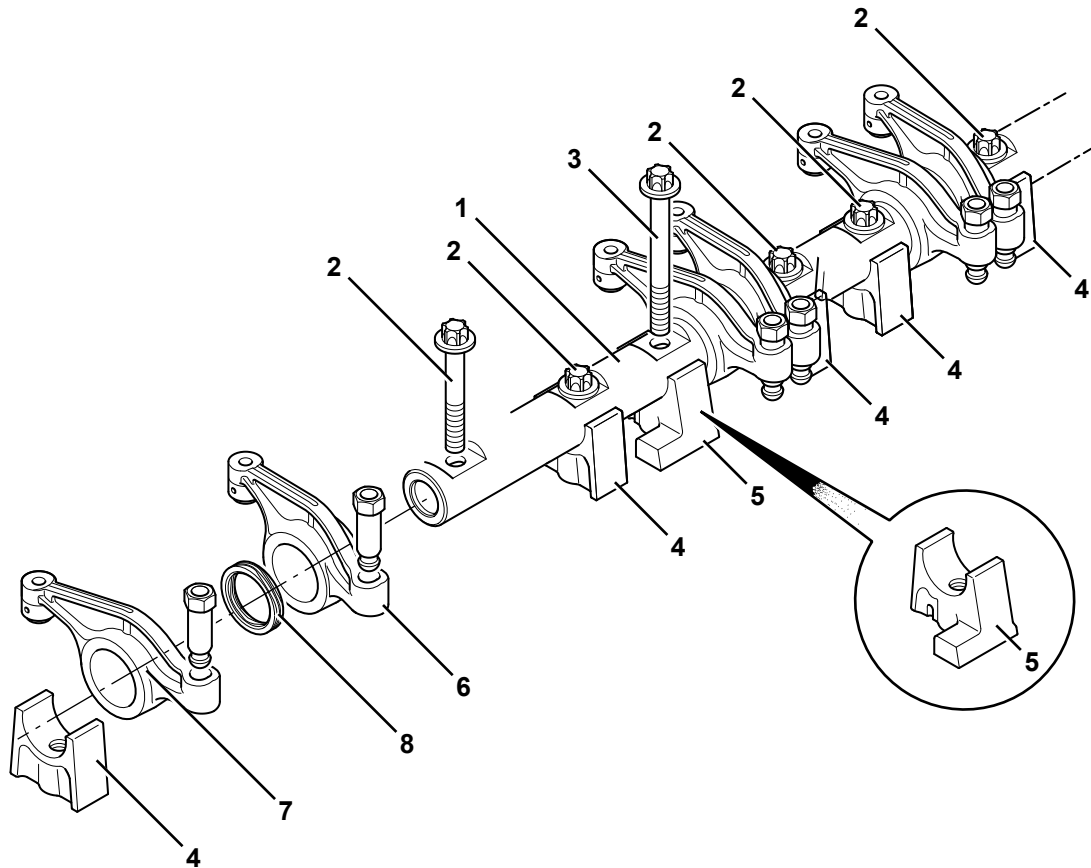
## Disassemble and Assemble

### Before Disassembly

1. Remove the rocker cover. Refer to (PIL 15-42).

2. Remove the rocker assembly. Refer to (PIL 15-42).

**Figure 207.**



- 1 Rocker shaft
- 3 Rocker shaft - Oil feed pedestal fixing bolt (x1)
- 5 Oil feed pedestal (x1)
- 7 Rockers - exhaust (x4)

- 2 Rocker shaft fixing bolts (x7)
- 4 Pedestals (x7)
- 6 Rockers - inlet (x4)
- 8 Wave washers (x8)

## **Disassemble**

1. Lift out the rocker shaft fixing bolts, then slide the pedestals, rockers and wave washers off the rocker shaft as shown. Label the pedestals and rockers to make sure that they are installed in the correct positions on assembly.
2. Check the rocker shaft and rocker bushings for signs of damage and excessive wear. Refer to Check (Condition) (PIL 15-42).

## **Assemble**

1. The assembly procedure is the opposite of the disassemble procedure. Additionally do the following steps.
2. Lubricate the rocker shaft and rocker bearing bushes with clean engine oil.
3. Make sure that the rockers and pedestals are installed in their original positions along the rocker shaft. Note the position of the oil feed pedestal.
4. Insert the rocker shaft fixing bolts to hold the rockers and pedestals loosely in position before fitting the assembly into the cylinder head. Note the position of the longer bolt.

## **After Assembly**

1. Install the rocker assembly. Refer to (PIL 15-42).
2. Install the rocker cover. Refer to (PIL 15-42).

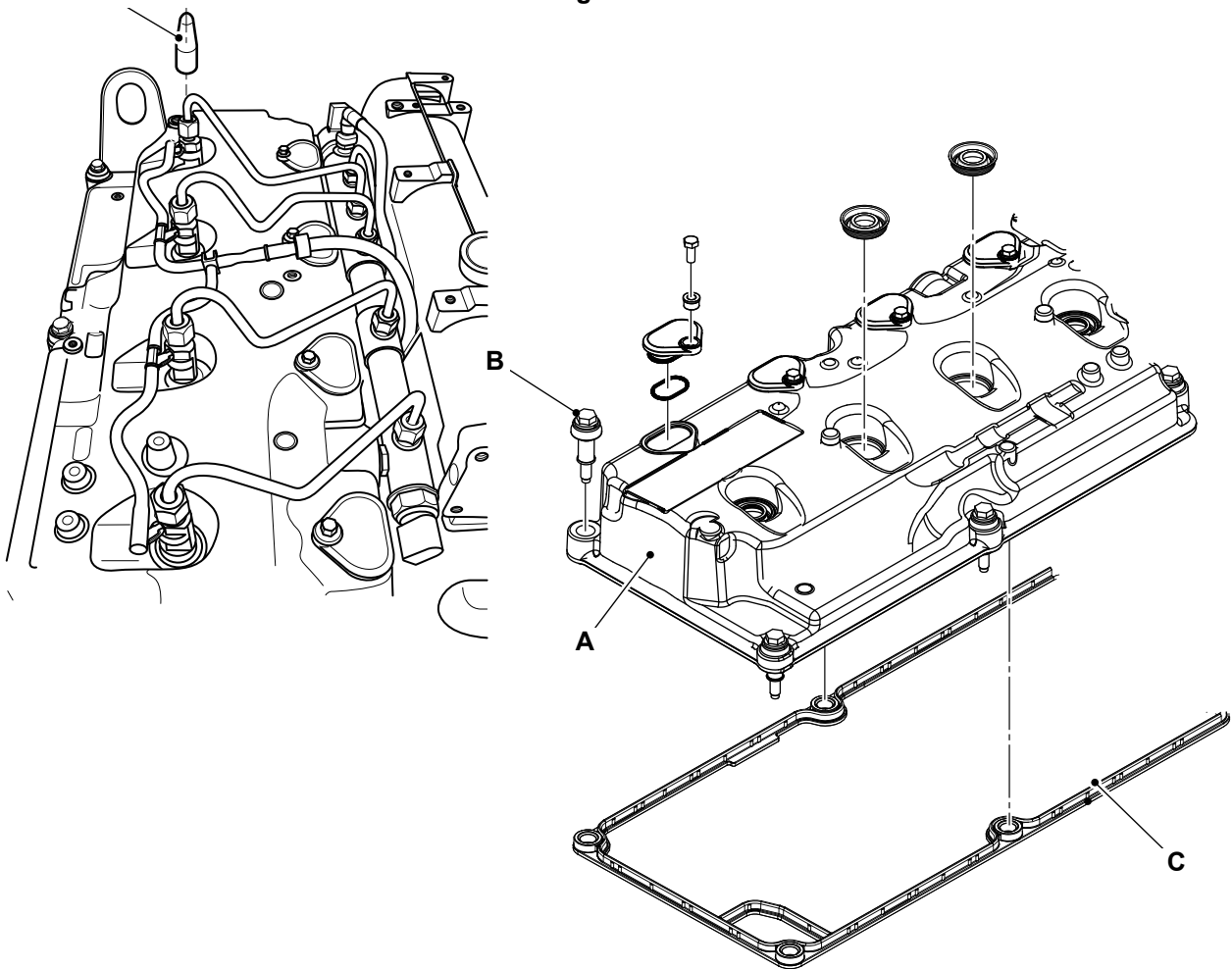
## 06 - Rocker Cover

### Remove and Install

#### Before Removal

1. Make sure that the engine is safe to work on. If the engine has been running, let it cool before you start the service work.
2. Clean the engine. Refer to Engine - Clean (PIL 15-00).

**Figure 208.**



**A** Rocker cover  
**C** Gasket

**B** Bolts  
**D** Injector seals

## Remove

1. Get access to the engine.
2. Remove the high pressure fuel pipes. Refer to Fuel Pipes (PIL 18-96).
3. Remove the fuel bleed off fuel pipes. Refer to Fuel Pipes (PIL 18-96).
4. Disconnect the electrical connectors at the fuel injectors. Refer to Fuel Injection (PIL 18-18).
5. Disconnect the electrical connector at the coolant temperature sensor. Refer to Engine Sensors (PIL 15-84).
6. Move the electrical harness away from the rocker cover.
7. Remove the bolts and lift the rocker cover from the cylinder head.
8. Discard the gasket.
9. The rocker cover injector seals must be replaced. Refer to Injector seals (PIL 18-18).

## Install

1. The installation procedure is the opposite of the removal procedure. Additionally do the following steps.
2. Remove all oil and sludge contamination from inside the rocker chamber.
3. Renew the injector seals. Refer to Injector seals (PIL 18-18).
4. Renew the rocker cover gasket.
5. Prevent damage to the seals. Put sleeves/covers on the four injectors. Apply a rubber lubricant to the seals and then install the rocker cover.
6. Tighten the bolts to the correct torque value.
7. Remove the sleeves/covers.

## After Installation

1. The high pressure fuel pipes must be replaced with new parts. Refer to Fuel Pipes (PIL 18-96).
2. Start the engine and check for oil and fuel leaks.

**Table 60. Torque Values**

Item	Nm
B	24

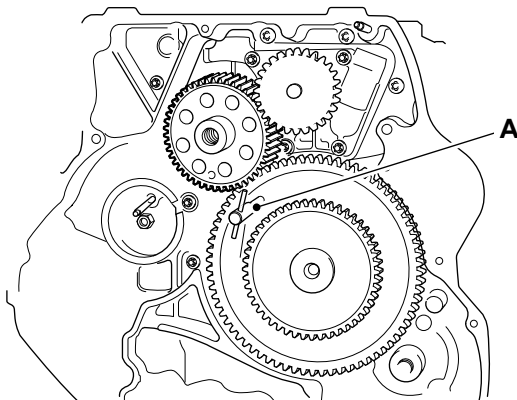
## 21 - Tappet

### Remove and Install

#### Before Removal

1. Drain the oil from the engine.
2. Disconnect and remove the fuel pipes from the injectors. Refer to (PIL 18-96).
3. Remove the rocker cover. Refer to (PIL 15-42).
4. Remove the fuel injection pump. Refer to (PIL 18-18).
5. Remove the rocker assembly and push rods. Refer to (PIL 15-42).
6. Remove the starter motor. Refer to (PIL 15-75).
7. Remove the oil sump. Refer to (PIL 15-45).
8. Remove the flywheel. Refer to (PIL 15-54).
9. Remove the flywheel housing. Refer to (PIL 15-54).
10. Rotate the crankshaft until the camshaft timing pin can be inserted through the gear and into the aligning hole in the rear gear case.

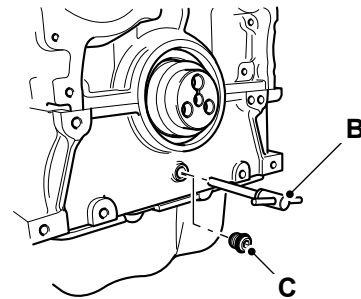
**Figure 209.**



**A** Timing pin - camshaft

11. Remove the taper blanking plug and insert the crankshaft locking pin. The camshaft and crankshaft locking pins must be in position to lock the crankshaft and camshaft before removing the camshaft assembly.

**Figure 210.**



**B** Timing pin - crankshaft  
**C** Blanking plug

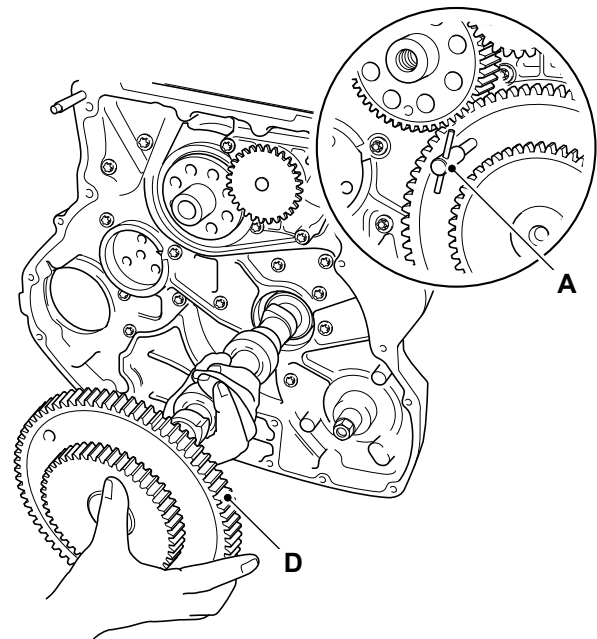
12. Remove the fuel injection pump drive gear. Refer to (PIL 15-51).

#### Removal

The engine must be inverted. DO NOT attempt to remove the camshaft and its drive gears with the engine upright. The tappets and push rods will fall into the engine and further dismantling will be required to retrieve them.

1. Remove the camshaft timing pin.
2. Carefully withdraw the camshaft and gear assembly from the crankcase. Make sure you fully support the camshaft to prevent the lobes contacting the bearing surfaces in the crankcase. The bearing surfaces can easily be damaged by the sharp hard edges on the cam lobes.

**Figure 211.**

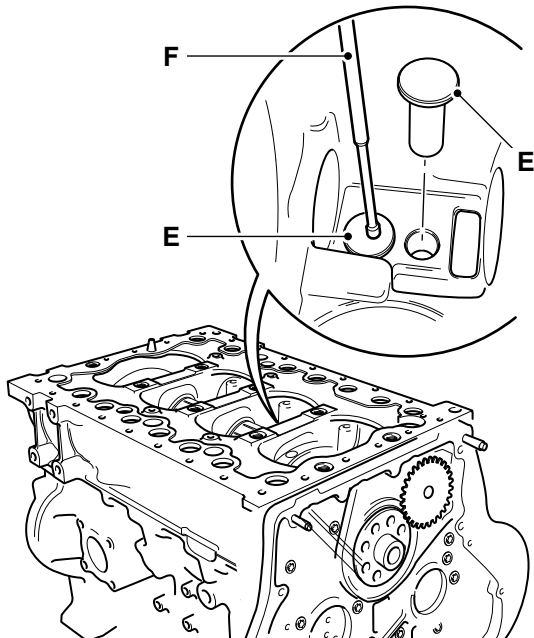


**A** Timing pin - camshaft  
**D** Camshaft and drive gear



3. Access the tappets through the apertures in the crankcase bedplate next to the crankshaft. Lift out the tappets from the crankcase using a suitable magnetic probe. Label the tappets to ensure replacement in their original positions.

**Figure 212.**



**E** Tappet (8 off)  
**F** Magnetic probe

### Inspection

1. Inspect the camshaft gear teeth for signs of damage or excessive wear.
2. Inspect the cam lobes for signs of excessive wear, scoring or pitting.
3. Inspect the cam bearing surfaces for signs of excessive wear, or scoring. Check that the dimensions are within service limits.
4. Inspect the cam bearing surfaces inside the crankcase for signs of excessive wear, or scoring. Check that the dimensions are within service limits.
5. Inspect the bearing surfaces of the tappets for signs of excessive wear or damage. Check that the dimensions are within service limits.
6. Inspect the tappet bores inside the crankcase for signs of excessive wear or damage. Check that the dimensions are within service limits.
7. If any of the camshaft bearings or lobes are worn or damaged then the relative oil feed galleries in the crankcase and camshaft may be blocked. Make sure all oil ways are clear and free from debris.

### Installation

1. Lubricate the tappets and tappet bores inside the crankcase with clean engine oil.
2. Insert the tappets in their original positions in the crankcase using a suitable magnetic probe.
3. Lubricate the camshaft bearing journals inside the crankcase with clean engine oil.
4. Carefully insert the camshaft assembly into the crankcase as shown. Support the camshaft preventing the lobes contacting the bearing surfaces in the crankcase. Before meshing the camshaft gear with the crankshaft gear, rotate the camshaft until the timing hole in the gear aligns with the dowel hole in the gear casing. Insert the timing pin to lock the camshaft in this position.

### After Installation

1. Note that the fuel injection pump drive gear fixing nut is torque tightened as part of the fuel injection pump replacement procedure. Refer to (PIL 18-18).
2. Do the procedures in Before Removal in reverse order.

## 24 - Tappet Cover

### Remove and Install

It is not necessary to remove the tappet covers unless a new rocker cover is to be installed. It is necessary to remove the tappet covers to measure and adjust the valve clearances. Refer to Valve-Adjust, Valve Clearances (PIL 15-30).

#### Remove

1. Make sure that the engine is safe to work on. If the engine has been running, let it cool before you start the service work.
2. Get access to the engine.
3. Clean the tappet covers and the adjacent areas of the rocker cover. Refer to Engine - Clean. Important: Make sure that the screws do not fall into the engine.
4. Remove the tappet cover screws.
5. Keep the screws away from the engine.
6. Use a screwdriver in the slot to remove the tappet covers. Make sure that dirt or debris does not fall into the engine.

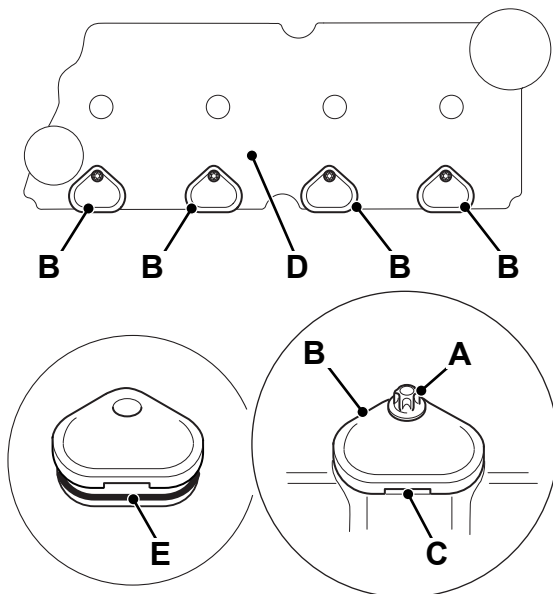
#### Install

1. The installation procedure is the opposite of the removal procedure. Additionally do the following steps.
2. Inspect the tappet cover seals for signs of damage. Replace any damaged seals.
3. Install the tappet covers. Tighten the screws to the correct torque value.

**Table 61. Torque Values**

Item	Nm
A	9

**Figure 213.**



- A** Screws
- B** Tappet covers
- C** Slot
- D** Rocker cover
- E** Tappet cover seals

## 00 - General

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## Introduction

The lubrication system distributes oil around the engine by a system of galleries and drillings in the crankcase and cylinder head. The oil lubricates and seals the moving parts of the engine, reducing friction and wear. In addition the oil plays an important role in cooling the engine by carrying heat from the engine to the cooler. A piston cooling jet sprays oil onto the underside of the pistons to keep them cool, refer to (PIL 15-36).

Oil is drawn from the oil sump by the integral oil pump via the suction strainer. The strainer prevents any large particles of debris passing through, which may damage the pump.

The oil passes from the outlet side of the pump through a relief valve which limits the maximum oil pressure by venting oil back to the inlet side of the pump, refer to (PIL 15-36).

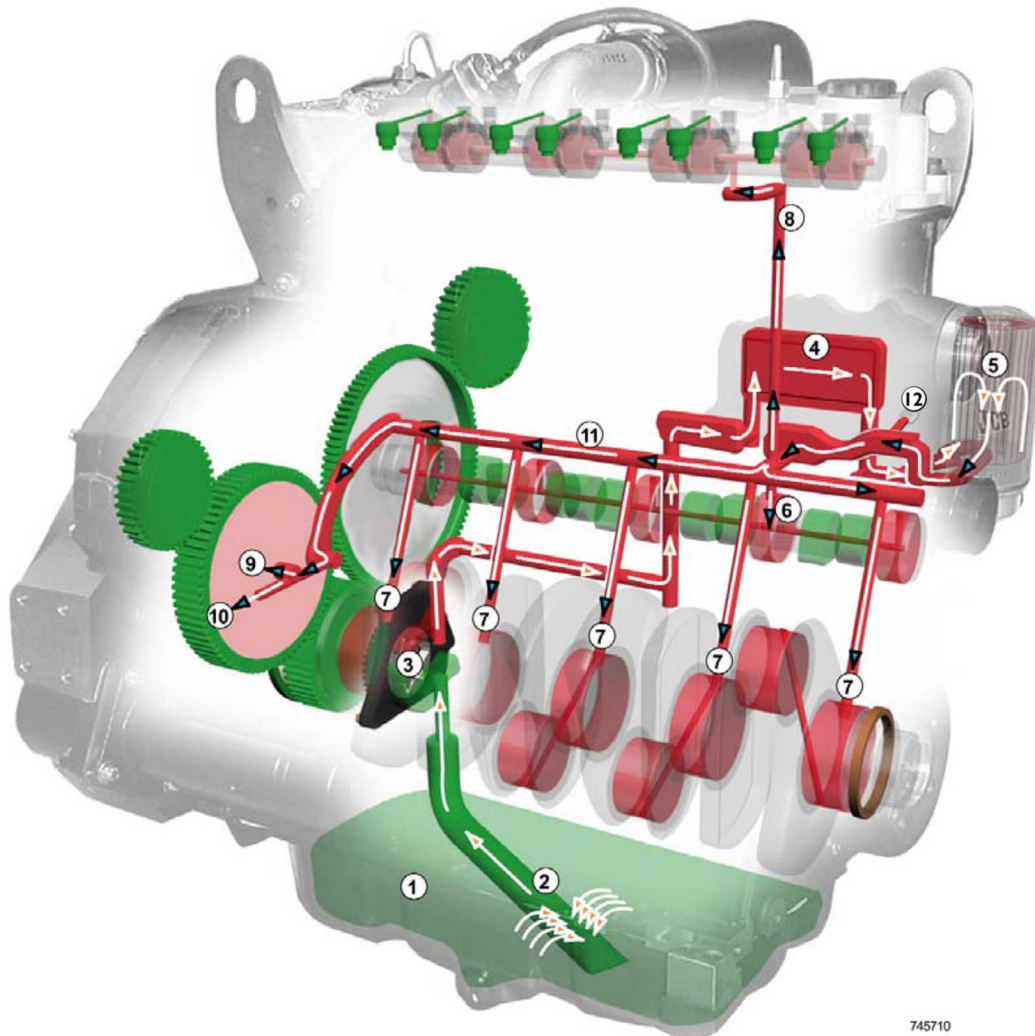
From the pump the oil passes through the oil cooler and filter, refer to (PIL 15-69 and PIL 15-21).

After cooling and filtering, the oil passes into the main oil gallery. An oil pressure switch senses the oil pressure. From the main gallery oil is delivered, via drillings, to the crankshaft main bearings, rocker assembly, camshaft and timing gears. Note that drillings are through the crankcase and cylinder head.

When the high pressure oil has passed through the bearings it reverts to sump pressure and splash lubricates the internal components such as rocker tips, cam lobes and timing gear teeth. Gravity drains the oil via drains into the cylinder head and crankcase, back into the oil sump. A drain slot allows the oil to drain from the timing case back to the oil sump.

## Component Identification

Figure 214.



745710

- |    |   |    |  |
|----|---|----|--|
| 1  | Oil sump  | 2  | Suction strainer   |
| 3  | Oil pump  | 4  | Oil cooler   |
| 5  | Filter  | 6  | Camshaft - high pressure oil feed  |
| 7  | Crankshaft main bearings - high pressure oil feed                             | 8  | Rocker assembly - high pressure oil feed   |
| 9  | PTO (Power Take-Off) idler gear bearing/ timing case - high pressure oil feed | 10 | External high pressure oil feed connection (crankcase) - Turbocharger (if installed) |
| 11 | Main high pressure oil feed gallery (crankcase)                               | 12 | Oil pressure switch  |
- Green- Oil at sump pressure  
 Pink- Oil at lower pressure but higher than sump pressure  
 Red- Oil at high pressure

## Remove and Install

### Special Tools

Tool Category	Description	Part No.	Qty.
Special Tool	Template for Sealant Oil Sump - Pressed	892/01149	1
Special Tool	Oil Sump Location Dowel	892/01150	2
Special Tool	Template for Sealant Oil Sump (Cast)	892/12354	1

### Consumables

Description	Part No.	Size
Clear Silicone Sealant	4102/0901	0.31L

### Before Removal

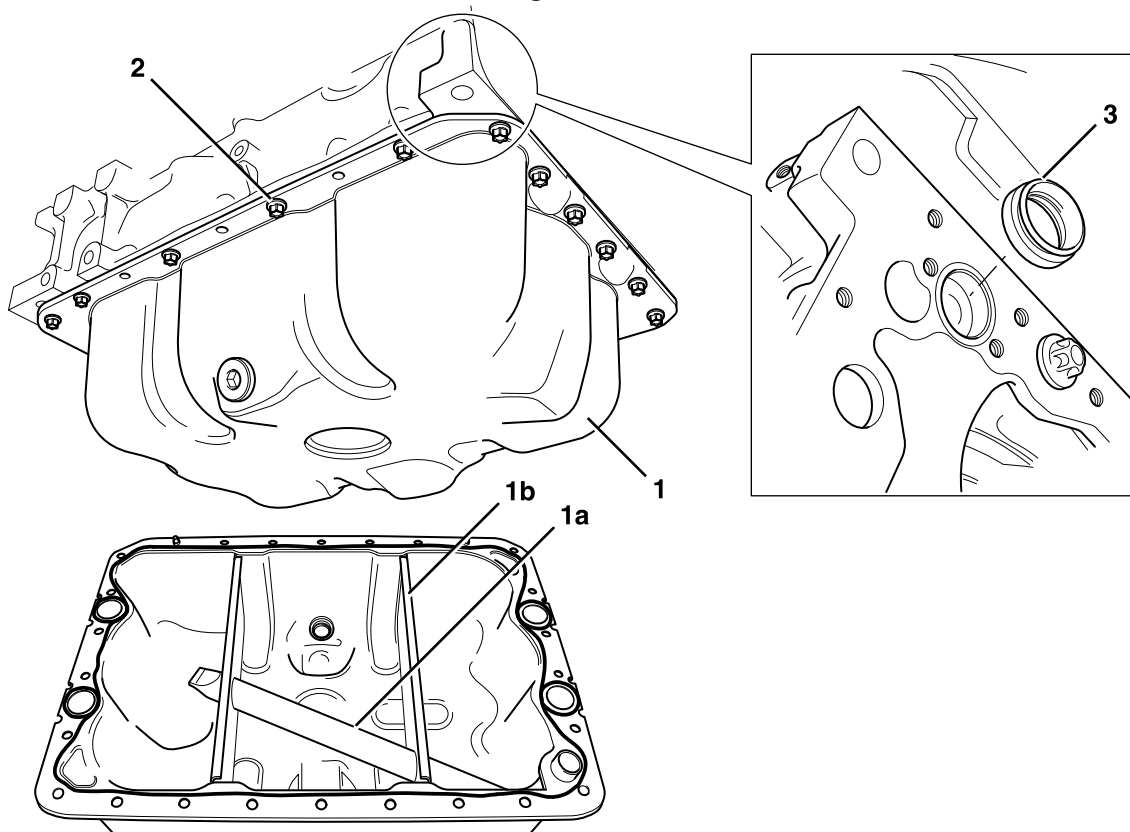
1. Make sure that the engine is safe to work on. If the engine has been running, make sure the engine has cooled sufficiently before you start.

2. Drain the engine oil.

### Removal

1. Remove the fixing bolts and remove the oil sump from the engine. The oil sump may be difficult to remove due to adhesion of sealing compound. If necessary, carefully lever the mating flanges apart. Do not use excessive force, the oil sump could be damaged. Be sure to retrieve the oil pick up seal.
2. Use a gasket removal compound, carefully remove all traces of sealing compound from the oil sump and engine mating faces. Do not allow the sealing compound to enter the engine.
3. Use a suitable degreasing agent to thoroughly clean the oil sump.

Figure 215.



- 1** Oil sump
- 1a** Integral suction tube
- 1b** Integral baffle plates
- 2** Oil sump fixing bolts (x20)
- 3** Oil pick up seal

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