

# SERVICE MANUAL

LOADALL (ROUGH TERRAIN  
VARIABLE REACH TRUCK)  
**526-56, 531-70, 535-95, 536-60,  
536-70, 541-70, 550-80, 560-80**

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This manual contains original instructions, verified by the manufacturer (or their authorized representative).

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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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## Introduction

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### (For: JCB Tier 2/3 Elec Engine 4 Cyl)

This section contains information about the complete engine assembly. For specific engine technical information refer to the technical data section.

Make sure that the correct engine service tools, consumables and torque figures are used when you perform service procedures.

Renewal of oil seals, gaskets, etc., and any component showing obvious signs of wear or damage is expected as a matter of course.

It is expected that components will be cleaned and lubricated where appropriate, and that any opened hose or pipe connections will be blanked to prevent excessive loss of hydraulic fluid, engine oil and ingress of dirt.

## Basic Description

The JCB ecoMax engine is a 4 cylinder diesel engine in which the fuel is ignited by compression ignition. The engine operates on a four stroke cycle.

The engine is started by an electric starter motor. The starter motor turns the engine via a pinion and teeth on the engine flywheel. [Refer to: PIL 15-75.](#)

When the engine runs the crankshaft drives the camshaft via gears. The camshaft opens and closes the inlet and exhaust valves and via push rods in time with the four stroke cycle. The engine has 16 valves, 2 inlet and 2 exhaust valves for each cylinder.

The crankshaft also drives a high pressure fuel pump via gears. The pump is part of the electronically controlled common rail fuel injection system. [Refer to: PIL 18-00.](#)

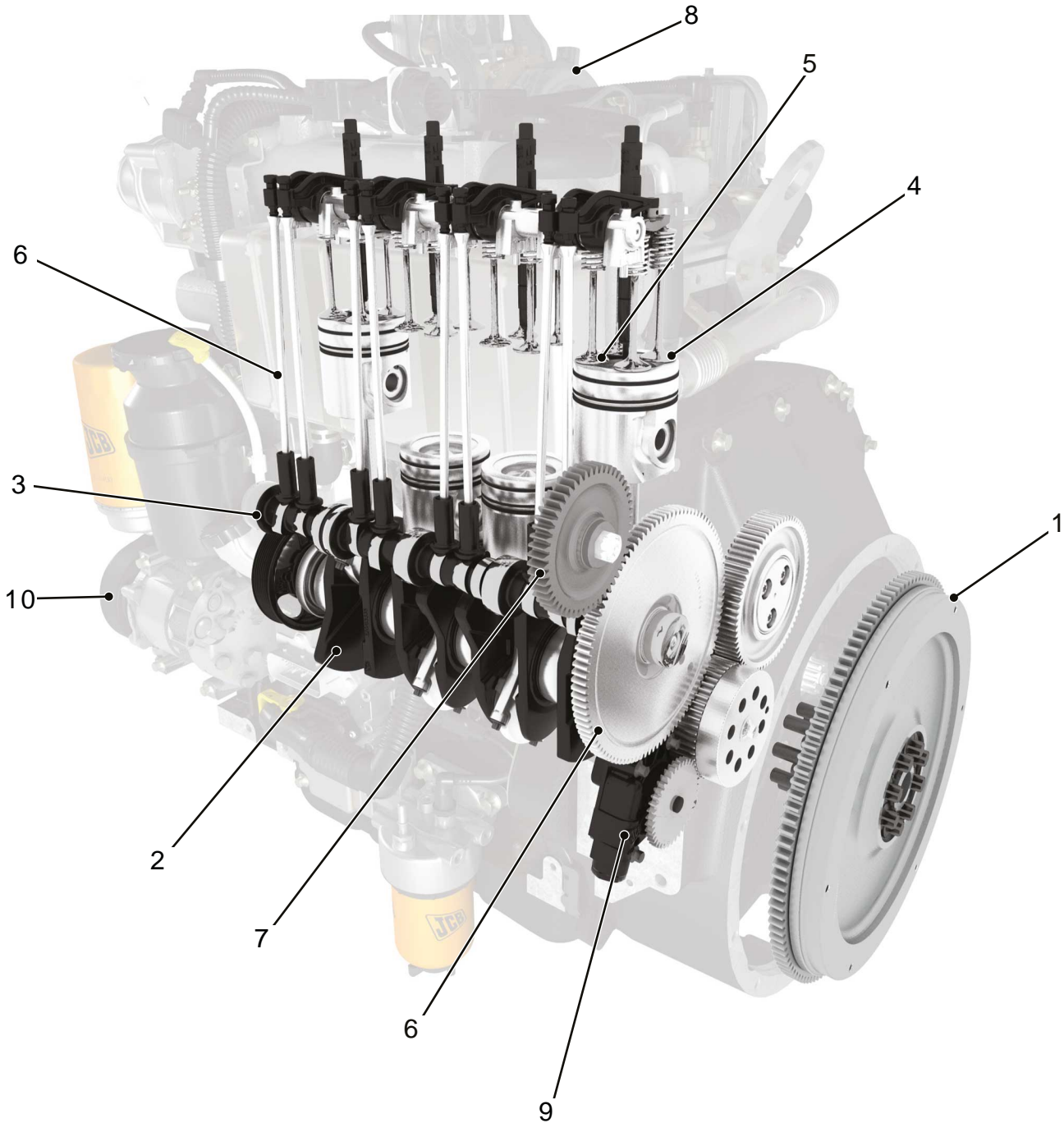
Air is drawn into the engine, via the inlet manifold and exhaust gases exit via the exhaust manifold. The engine uses a VGT (Variable Geometry Turbocharger) which pressurises the air at the inlet manifold. Refer to PIL 18-36.

A mechanical lubrication oil pump is driven by the crankshaft via gears. The pump pressurises and circulates oil for engine lubrication and cooling purposes.

A drive belt driven by the crankshaft, drives a coolant circulation pump, alternator, radiator cooling

fan and other ancillaries such as an air conditioning compressor.

**Figure 172.**

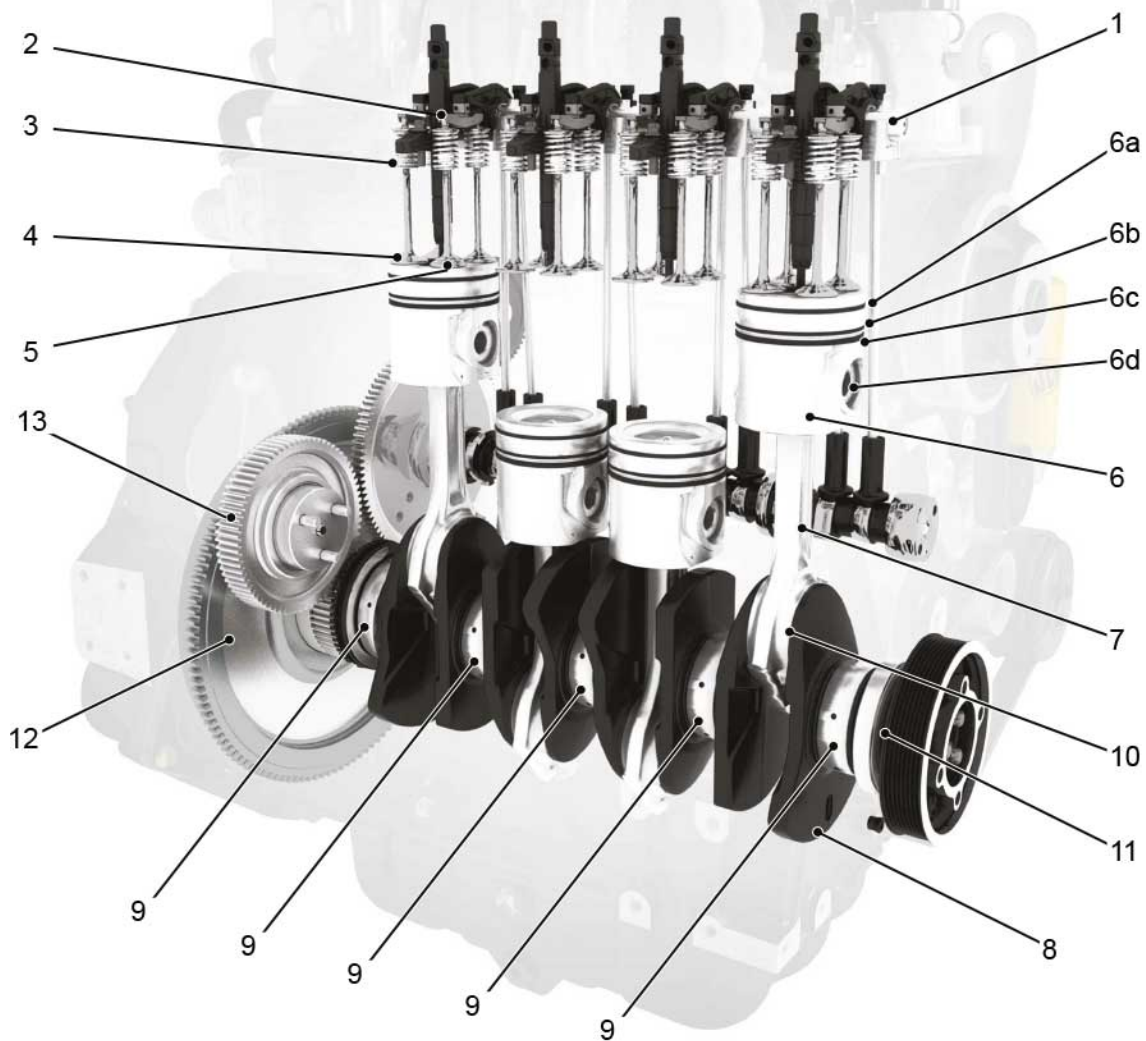


- 1 Flywheel
- 3 Camshaft
- 5 Exhaust valves (x8)
- 7 High pressure fuel pump drive gear
- 9 Lubrication oil pump

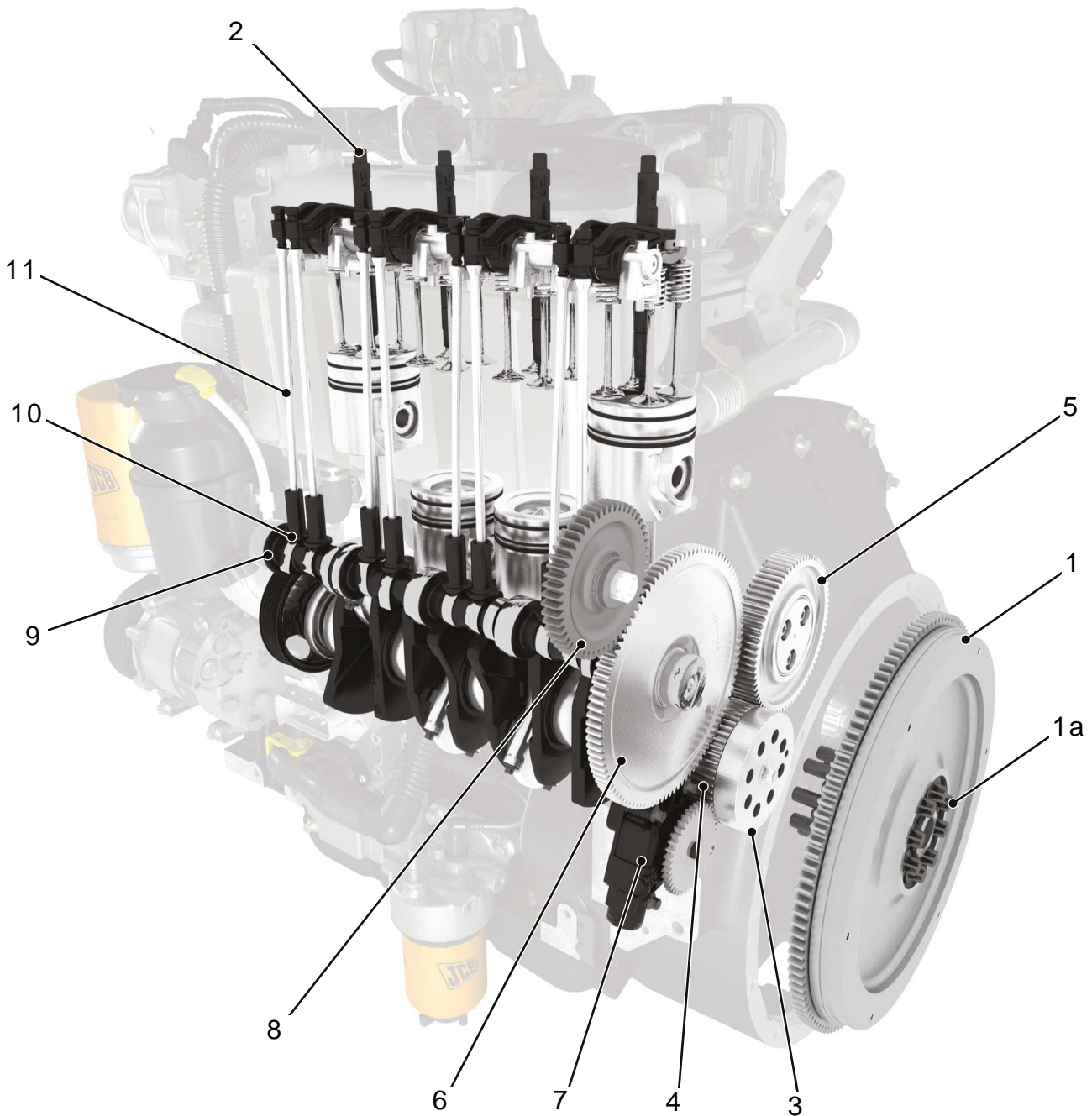
- 2 Crankshaft
- 4 Inlet valves (x8)
- 6 Push rods (x8)
- 8 Turbocharger
- 10 Front end drive belt

**Internal**

The following identifies the main internal components of a typical engine assembly. Some variants may differ in detail.

**Figure 173.**


- |           |  |           |  |
|-----------|--|-----------|--|
| <b>1</b>  | Rocker assembly  | <b>2</b>  | Valve bridge piece (x8)                            |
| <b>3</b>  | Valve spring (x16)                                       | <b>4</b>  | Inlet valve (x8)                                   |
| <b>5</b>  | Exhaust valve (x8)                                       | <b>6</b>  | Piston assembly (x4)                               |
| <b>6a</b> | Piston ring - top compression (x4)                       | <b>6b</b> | Piston ring - 2nd compression (x4)                 |
| <b>6c</b> | Piston ring - oil control (x4)                           | <b>6d</b> | Gudgeon pin (x4)                                   |
| <b>7</b>  | Connecting rod assembly (x4)                             | <b>8</b>  | Crankshaft   |
| <b>9</b>  | Main bearing - crankshaft (x5)                           | <b>10</b> | Big end bearing - crankshaft / connecting rod (x4) |
| <b>11</b> | Front crankshaft oil seal                                | <b>12</b> | Flywheel   |
| <b>13</b> | High duty PTO (Power Take-Off) idler gear (if installed) |           |  |

**Figure 174.**


- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>1 Flywheel</li> <li>2 Fuel injector (atomiser) (x4)</li> <li>4 Crankshaft drive gear</li> <li>6 Camshaft drive gear</li> <li>8 High pressure fuel pump drive gear</li> <li>10 Tappet (x8)</li> </ul> | <ul style="list-style-type: none"> <li>1A Flywheel - crankshaft fixing bolts (x8)</li> <li>3 Flywheel hub</li> <li>5 High duty PTO idler gear (if installed)</li> <li>7 Lubrication oil pump</li> <li>9 Camshaft</li> <li>11 Push rod (x8)</li> </ul> |
|---|---|

(For: JCB Tier 2/3 Mech Engine 4 Cyl)

This section contains information about the complete engine assembly. For specific engine technical

information refer to the technical data section. Make sure that the correct engine service tools, consumables and torque figures are used when you perform service procedures. Renewal of oil seals,

gaskets, etc., and any component showing obvious signs of wear or damage is expected as a matter of course. It is expected that components will be cleaned and lubricated where appropriate, and that any opened hose or pipe connections will be blanked to prevent excessive loss of hydraulic fluid, engine oil and ingress of dirt.

### **Basic Description**

The JCB DieselMax engine is a 4 cylinder diesel engine in which the fuel is ignited by compression ignition (C.I.). The engine operates on a four stroke cycle.

The engine is started by an electric starter motor. The starter motor turns the engine via a pinion and teeth on the engine flywheel, refer to (PIL 15-75).

When the engine runs the crankshaft drives the camshaft via gears. The camshaft opens and closes the inlet and exhaust valves and via push rods in time

with the four stroke cycle. The engine has 16 valves, 2 inlet and 2 exhaust valves for each cylinder.

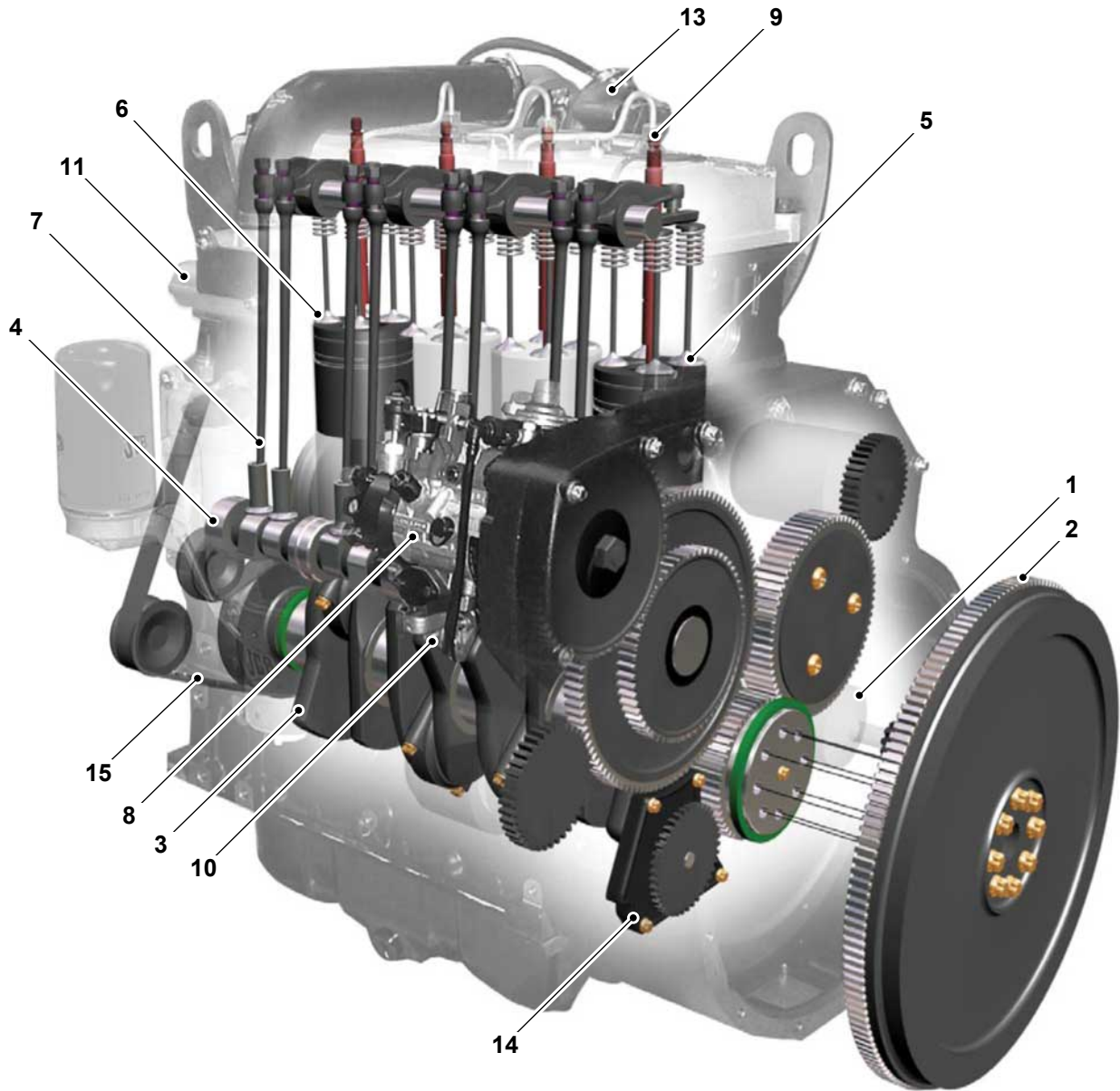
The crankshaft also drives a mechanical fuel injection pump via gears. The pump injects fuel via injectors, or atomisers into each cylinder in time with the four stroke cycle.

Air is drawn into the engine, via the inlet manifold and exhaust gases exit via the exhaust manifold. The engine uses an exhaust driven turbocharger which pressurises the air at the inlet manifold, refer to (PIL 18-36).

A mechanical lubrication oil pump is driven by the crankshaft via gears. The pump pressurises and circulates oil for engine lubrication and cooling purposes.

A drive belt driven by the crankshaft, drives a coolant circulation pump, alternator, radiator cooling fan and other ancillaries such as an air conditioning compressor.



**Figure 175.**


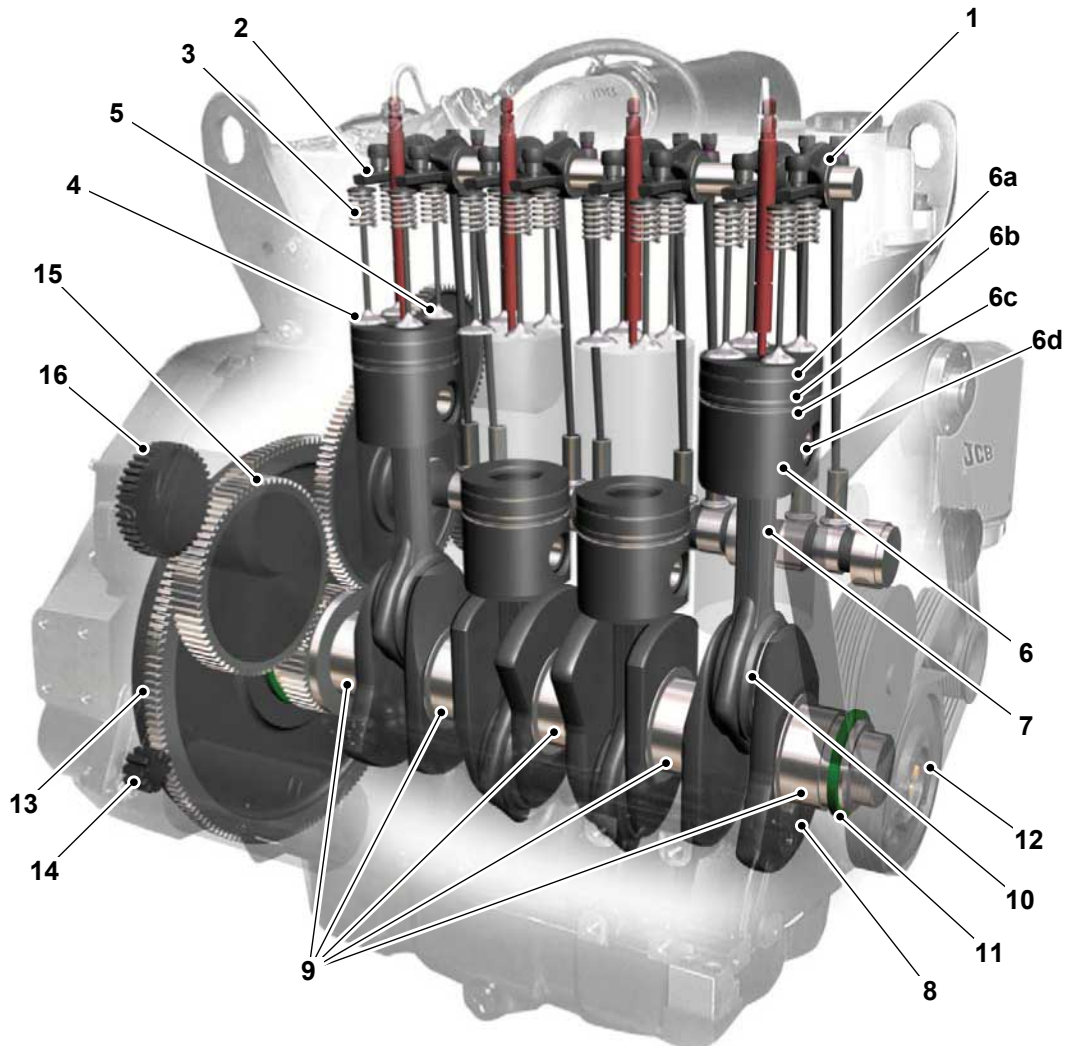
- 1 Starter motor
- 3 Crankshaft
- 5 Inlet valves (x8)
- 7 Push rods (x8)
- 9 Fuel injectors (x4)
- 11 Inlet manifold
- 14 Lubrication oil pump

- 2 Flywheel
- 4 Camshaft
- 6 Exhaust valves (x8)
- 8 Fuel injection pump
- 10 Fuel lift pump
- 13 Turbocharger
- 15 Front end drive belt

**Internal**

As viewed on the right hand side. Refer to Figure 176.

The following identifies the main internal components of a typical engine assembly. Some variants may differ in detail.

**Figure 176.**


- |    |                                    |    |  |
|----|------------------------------------|----|--|
| 1  | Rocker assembly                    | 2  | Valve bridge piece (x8)                          |
| 3  | Valve spring (x8)                  | 4  | Inlet valve (x8)                                 |
| 5  | Exhaust valve (x8)                 | 6  | Piston assembly (x4)                             |
| 6a | Piston ring - top compression (x4) | 6b | Piston ring - 2nd compression (x4)               |
| 6c | Piston ring - oil control (x4)     | 6d | Gudgeon pin (x4)                                 |
| 7  | Connecting rod assembly (x4)       | 8  | Crankshaft                                       |
| 9  | Main bearing - crankshaft (x5)     | 10 | Big end bearing - crankshaft/connecting rod (x4) |
| 11 | Front crankshaft oil seal          | 12 | Front end drive belt pulley                      |
| 13 | Flywheel                           | 14 | Starter motor pinion                             |

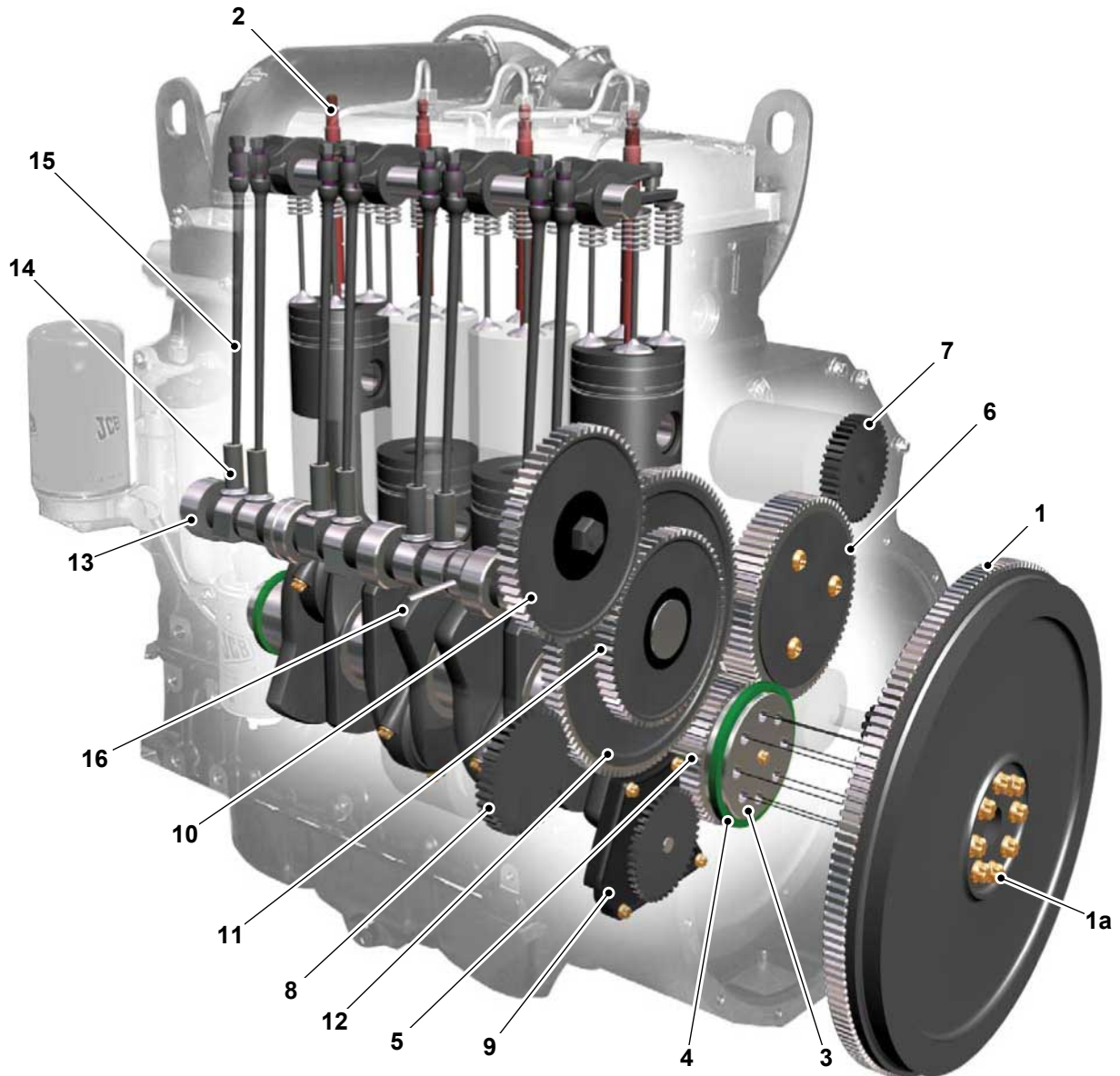


**15** High duty PTO idler gear (if fitted)

**16** High duty PTO device drive gear (if fitted)

As viewed on the rear left side. Refer to Figure 177.

**Figure 177.**



- 1** Flywheel
- 2** Fuel injector (atomiser) (x4)
- 4** Rear crankshaft oil seal
- 6** High duty PTO idler gear (if fitted)
- 8** Low duty PTO device (if fitted)
- 10** Fuel injection pump drive gear
- 12** Camshaft drive gear
- 14** Tappet (x8)
- 16** Fuel lift pump actuator pin

- 1a** Flywheel - crankshaft fixing bolts (x8)
- 3** Flywheel hub
- 5** Crankshaft drive gear
- 7** High duty PTO device drive gear (if fitted)
- 9** Lubrication oil pump
- 11** Camshaft compound gear
- 13** Camshaft
- 15** Push rod (x8)

## Health and Safety

accordance with local regulations. Use authorised waste disposal sites.

### Hot Components

Touching hot surfaces can burn skin. The engine and machine components will be hot after the unit has been running. Allow the engine and components to cool before servicing the unit.

### Turning the Engine

Do not try to turn the engine by pulling the fan or fan belt. This could cause injury or premature component failure.

**Notice:** *The engine and other components could be damaged by high pressure washing systems. Special precautions must be taken if the machine is to be washed using a high pressure system. Make sure that the alternator, starter motor and any other electrical components are shielded and not directly cleaned by the high pressure cleaning system. Do not aim the water jet directly at bearings, oil seals or the engine air induction system.*

**WARNING!** *To bleed the injectors you must turn the engine. When the engine is turning, there are parts rotating in the engine compartment. Before starting this job make sure that you have no loose clothing (cuffs, ties etc) which could get caught in rotating parts. When the engine is turning, keep clear of rotating parts.*

**Notice:** *Clean the engine before you start engine maintenance. Obey the correct procedures. Contamination of the fuel system will cause damage and possible failure of the engine.*

**Notice:** *Do not exceed the correct level of engine oil in the sump. If there is too much engine oil, the excess must be drained to the correct level. An excess of engine oil could cause the engine speed to increase rapidly without control.*

**WARNING!** *The engine has exposed rotating parts. Switch off the engine before working in the engine compartment. Do not use the machine with the engine cover open.*

**WARNING!** *Hot oil and engine components can burn you. Make sure the engine is cool before doing this job. Used engine crankcase lubricants contain harmful contaminants. In laboratory tests it was shown that used engine oils can cause skin cancer.*

**Notice:** *A drive belt that is loose can cause damage to itself and/or other engine parts.*

**WARNING!** *Do not open the high pressure fuel system with the engine running. Engine operation causes high fuel pressure. High pressure fuel spray can cause serious injury or death.*

**CAUTION!** *It is illegal to pollute drains, sewers or the ground. Clean up all spilt fluids and/or lubricants. Used fluids and/or lubricants, filters and contaminated materials must be disposed of in*

## Remove and Install

(For: JCB Tier 2/3 Elec Engine 4 Cyl, JCB Tier 2/3 Mech Engine 4 Cyl)

### Special Tools

Description	Part No.	Qty.
Template for Sealant Bedplate to Crankcase (4 Cyl)	892/12356	1
Torque Wrench (10-100Nm)	993/70111	1

### Consumables

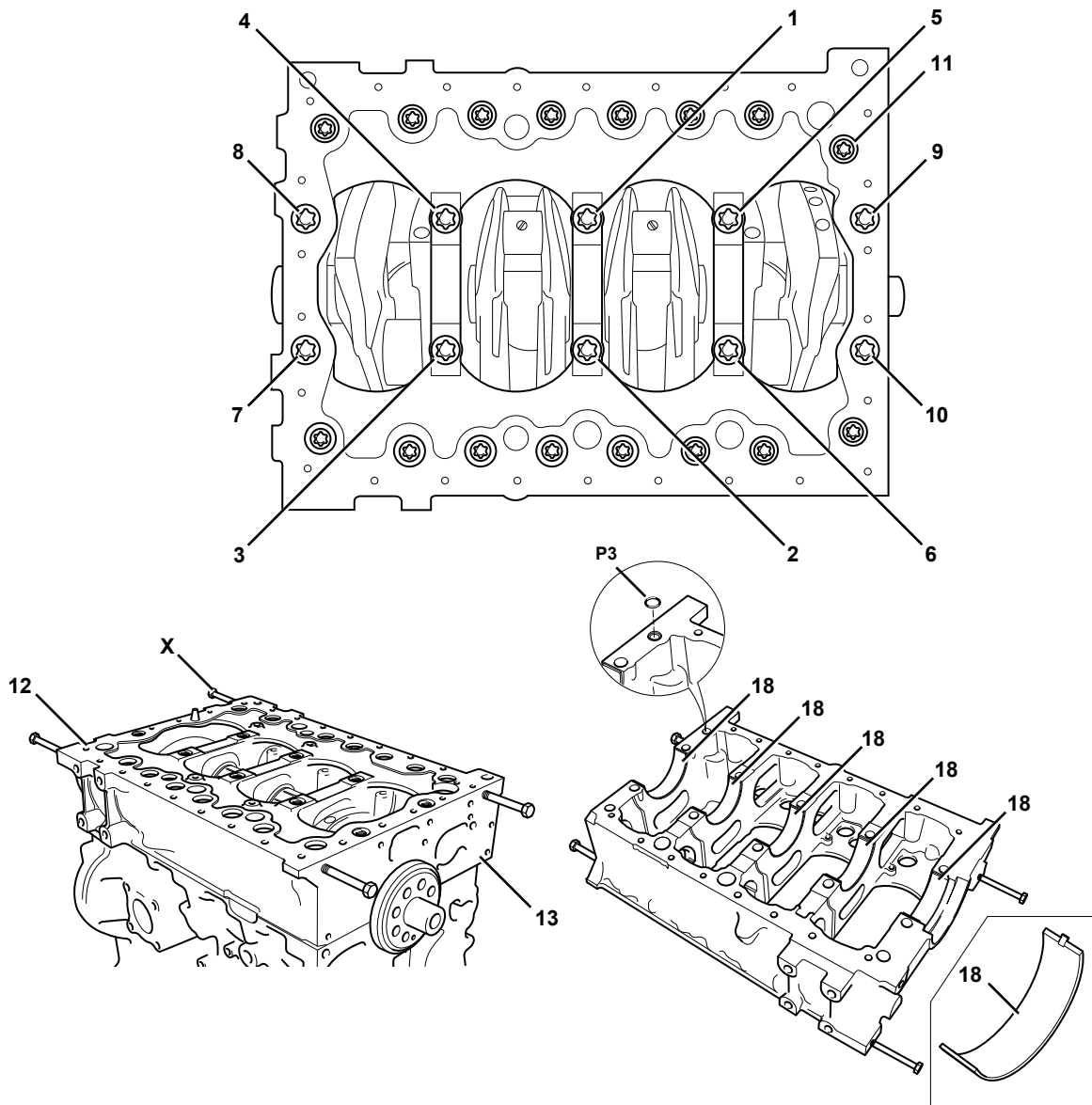
Description	Part No.	Size
Cleaner/Degreaser - General purpose solvent based parts cleaner	4104/1557	0.4L

**▲ CAUTION** This component is heavy. It must only be removed or handled using a suitable lifting method and device.

### Before Removal

- This procedure requires service parts. Make sure you have obtained the correct service parts before you start, refer to Parts Catalogue.
- 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.
- Remove the engine, refer to (PIL 15-00).
- Remove the drive belt, refer to (PIL 15-18).
- Remove the crankshaft pulley, refer to (PIL 15-12).
- Remove the oil sump, refer to (PIL 15-45).
- Disconnect and remove the fuel pipes from the injectors, refer to (PIL 18-96).
- Remove the rocker cover, refer to (PIL 15-42).
- Remove the fuel injectors, refer to (PIL 18-18).
- Remove the rocker assembly including the push rods, refer to (PIL 15-42).
- It is not necessary to remove the cylinder head assembly to remove the crankshaft. If however the cylinder head needs to be removed for other reasons (for piston and connecting rod removal for example) remove it now, refer to (PIL 15-06).
- Remove the fuel injection pump, refer to (PIL 18-18).
- Remove the starter motor, refer to (PIL 15-75).
- Remove the high duty PTO (Power Take-Off) device (if installed).
- Position the engine upside down in a suitable jig or fixture, supported at the front of the cylinder block.
- Remove the flywheel, refer to (PIL 15-54).
- Remove the flywheel housing, refer to (PIL 15-54).
- Remove the fuel injection pump drive gear, refer to (PIL 15-51).
- Remove the oil pump, refer to (PIL 15-60).
- Remove the high duty PTO idler drive gear (if installed), refer to (PIL 15-51).
- Remove the crankshaft drive gear, refer to (PIL 15-51).
- Remove the camshaft, refer to (PIL 15-15).
- Remove the rear timing case, refer to (PIL 15-51).
- If the pistons and connecting rods have not been removed, undo and remove the main bearing caps, refer to (PIL 15-12).

**Figure 200.**



- 1-10** Main bearing bolts (x10)
- 12** Bedplate
- 18** Upper bearing shell (x5)
- T1** Lifting bolts (obtain locally)

- 11** Bedplate peripheral bolts (x16)
- 13** Crankcase
- P3** O-ring (if installed)

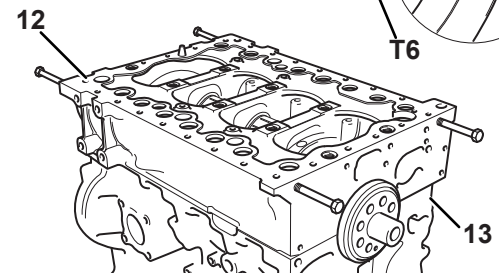
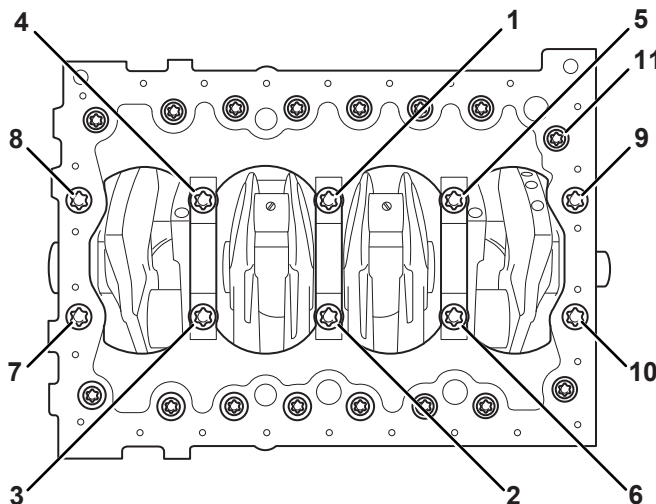
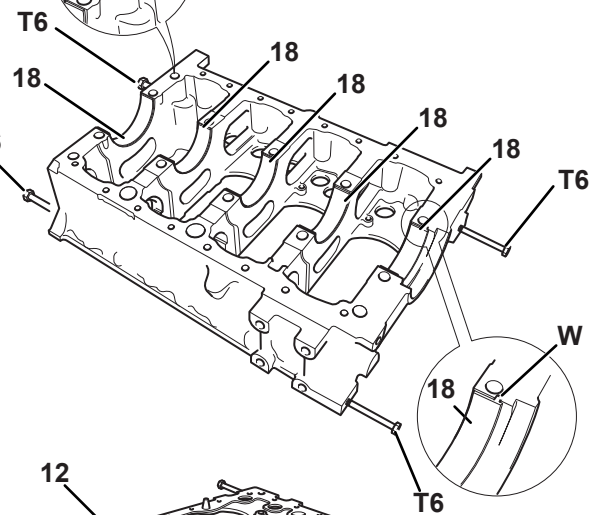
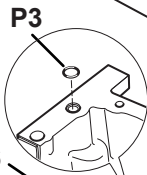
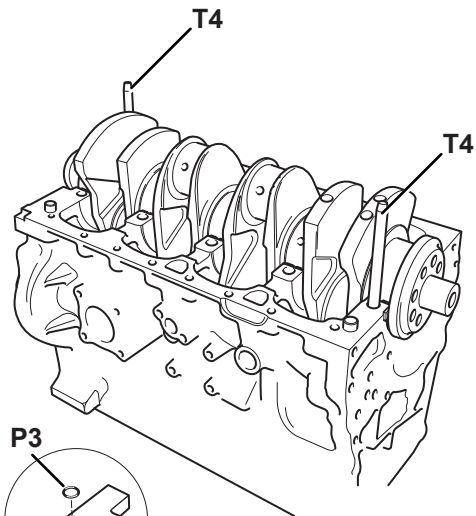
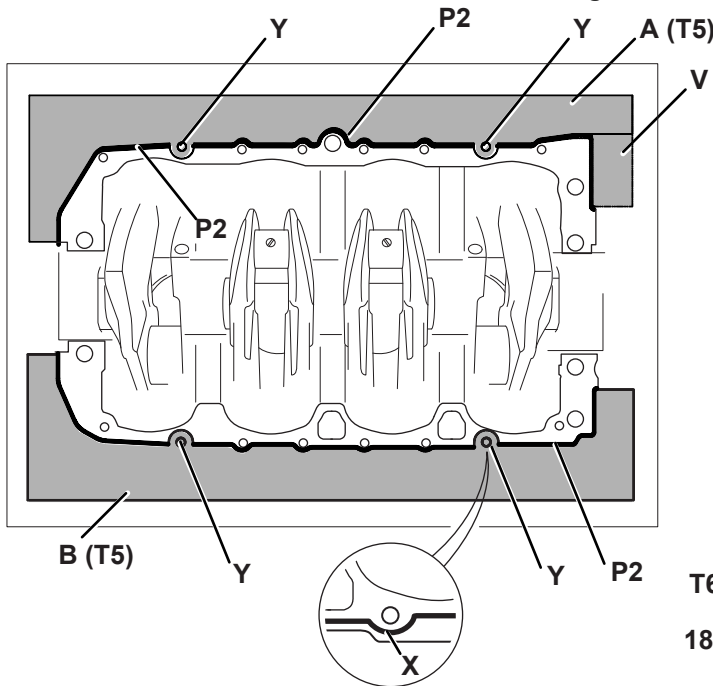
**Remove**

1. Remove the bedplate peripheral bolts.
2. Progressively remove the main bearing bolts in reverse order starting at bolt 10. The bolts MUST NOT be re-used. Discard the bolts.
3. Install the four temporary lifting bolts. Carefully separate the bedplate from the crankcase. Use

suitable lifting equipment (if the bedplate is lifted manually, two people will be required). DO NOT use a lever to separate the bedplate.

4. Remove and discard the O-ring.
5. Carefully remove the upper bearing shells from the bedplate, remove the bedplate.

**Figure 201.**



- 1-10 Main bearing bolts
- 12 Bedplate
- 18 Lower bearing shells (x5)
- B Right side template

- 11 Bedplate peripheral bolts (x16)
- 13 Crankcase
- A Left side template
- T3 Angle Gauge (obtain locally)





**T4** Guide pins (x2 obtain locally)  
**T6** Lifting bolts (x4 obtain locally)  
**W** Bearing tab  
**Y** Bearing location tab  
**P3** O-ring

**T5** Sealant template  
**V** Sealant template portion for removal  
**X** Rear main bearing  
**P2** Anaerobic sealant

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