SERVICE MANUAL

BACKHOE LOADER
3CXG

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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

A crankshaft pulley is used to drive a FEAD (Front End Accessory Drive) belt. The belt drives the coolant pump. Depending on the machine application, the belt is configured to drive engine mounted accessories, such as the alternator, cooling fan and air conditioning compressor.

Some applications have a second pulley on the crankshaft which drives a dedicated fan belt. The belt drives an engine mounted cooling fan.

Health and Safety

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.

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.*

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

Component Identification

Figure 177. A - With air conditioning compressor, no cooling fan

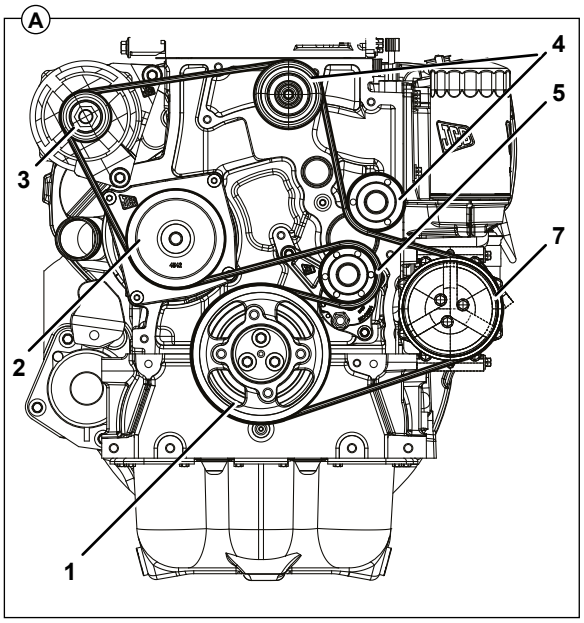
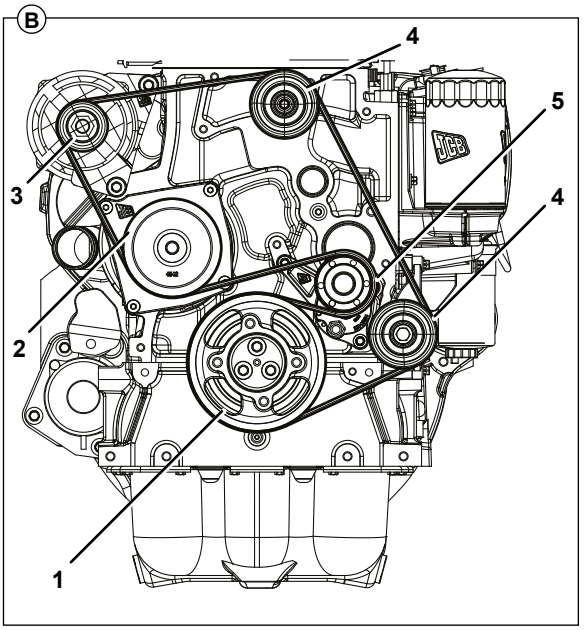


Figure 178. B - Without air conditioning compressor, no cooling fan



1 Crankshaft drive pulley
2 Coolant pump drive pulley
3 Alternator drive pulley
4 Idler pulley
5 Tensioner pulley
7 Air conditioning compressor drive pulley

Figure 179. C - With air conditioning compressor, cooling fan pulley installed

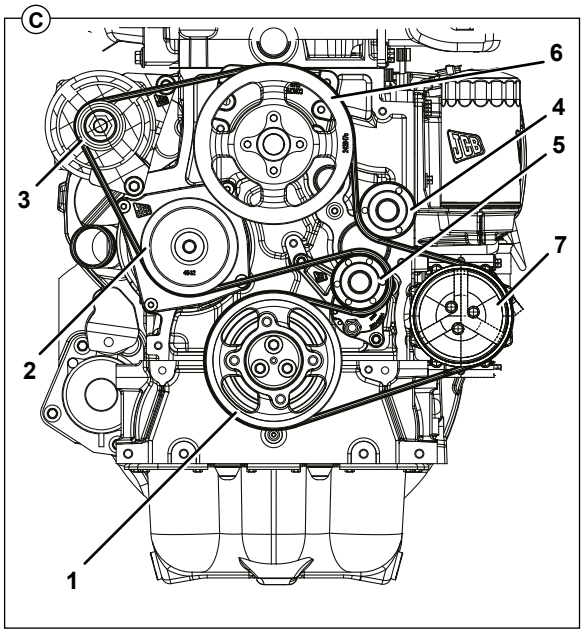
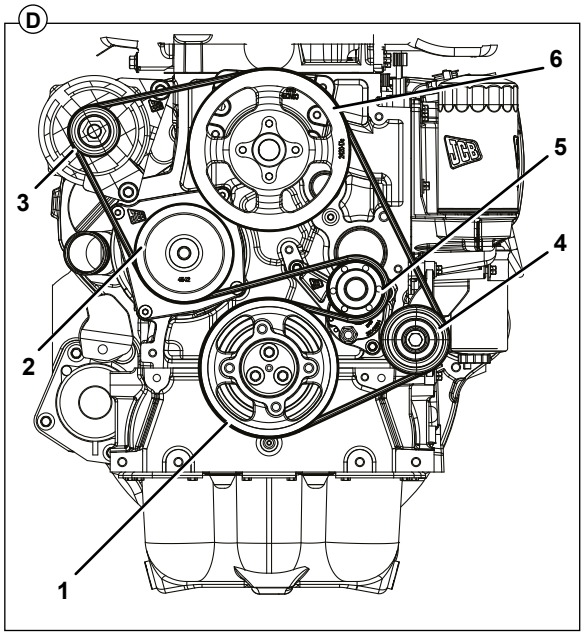


Figure 180. D - Without air conditioning compressor, cooling fan pulley installed



1 Crankshaft drive pulley
2 Coolant pump drive pulley
3 Alternator drive pulley
4 Idler pulley
5 Tensioner pulley
6 Cooling fan drive pulley
7 Air conditioning compressor drive pulley

03 - Drive Belt

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Introduction

The crankshaft pulley is used to drive the coolant pump via a FEAD (Front End Accessory Drive) belt. In addition to the coolant pump the drive belt can also be configured to drive the engine mounted accessories.

The belt is maintained at a constant tension by a spring loaded tensioner. To achieve the necessary belt/pulley contact area the belt is routed around idler wheels as required. The configuration varies depending on the accessories installed.

Health and Safety

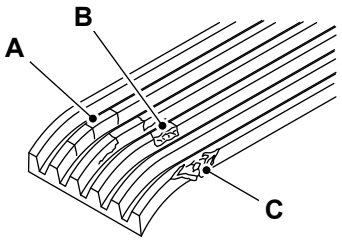
⚠ **Notice:** A drive belt that is loose can cause damage to itself and/or other engine parts.

Check (Condition)

At the recommended service interval, visually inspect the drive belt for damage.

1. Make the machine safe.
   Refer to: PIL 01-03.
2. Stop the engine and let it cool down.
3. Renew the drive belt if it has cracks or if it is frayed or has pieces of material missing.

Figure 181.



A Crack in belt
B Missing piece of belt
C Frayed belt

Adjust

Adjustment is not possible with this drive belt. A spring loaded tensioning unit ensures that the FEAD (Front End Accessory Drive) belt is kept at the correct tension.

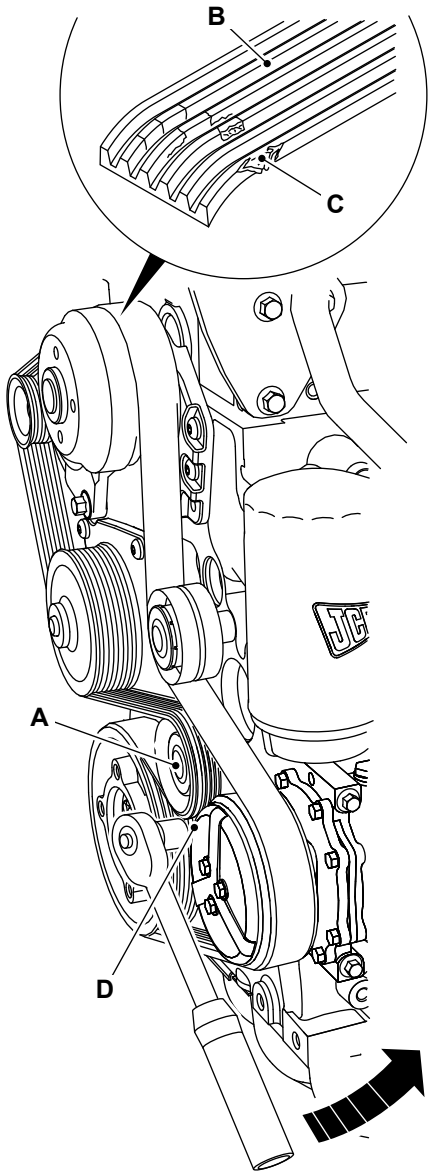
Remove and Install

Remove

1. Make the machine safe. Refer to (PIL 01-03).
2. Stop the engine and let it cool down.
3. Use a socket of the specified size to locate on to the hexagon spigot nut, carefully rotate the tensioner against the spring force in the direction shown. Do not use excessive force or the tensioner will be damaged.

   Dimension: 16mm
4. Keep holding the tensioner against the spring force and lift the belt off the drive tensioner pulley.
5. Slowly release the spring force by rotating the tensioner unit in the opposite direction.

Figure 182.



A Spring loaded tensioner
B Drive belt
C Example of frayed drive belt (refer to Check Condition)
D Spigot nut

Install

1. The installation procedure is the opposite of the removal procedure. Additionally do the following step.

2. Before you install the new belt, check that the tensioner roller and the fan pulley rotate smoothly and that there is no play in the bearings.

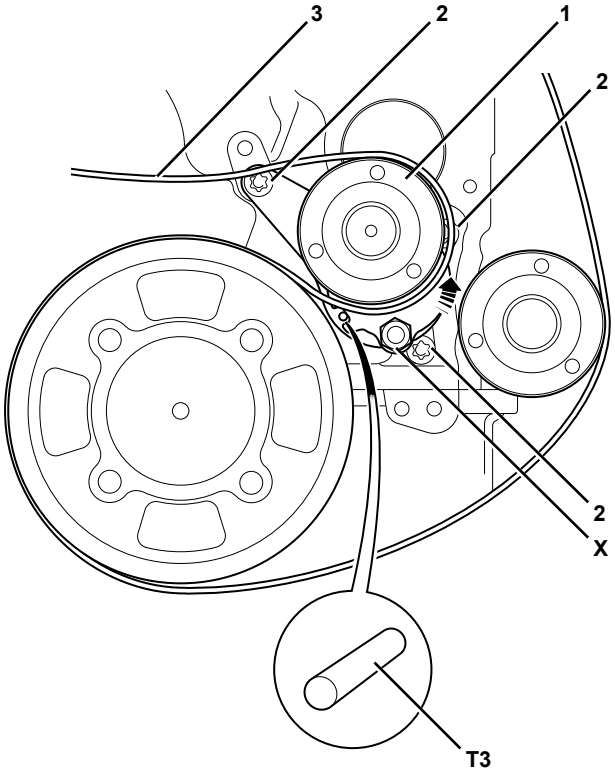
21 - Tensioner

Remove and Install

Before Removal

1. Make the machine safe. Refer to (PIL 01-03).
2. 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.
3. Get access to the engine.
4. Remove the drive belt, refer to (PIL 15-18).

Figure 183.



1 Drive belt tensioner pulley
2 Fixing bolts (x3)
3 Drive belt
T3 Locking pin
X Spigot nut

Remove

The drive belt tensioner is a non-serviceable item. If the drive belt tensioner or the idler wheel is faulty or damaged it must be renewed as a complete assembly.

1. To remove the tensioner assembly, remove the bolts and lift the tensioner pulley from the cylinder block.

Install

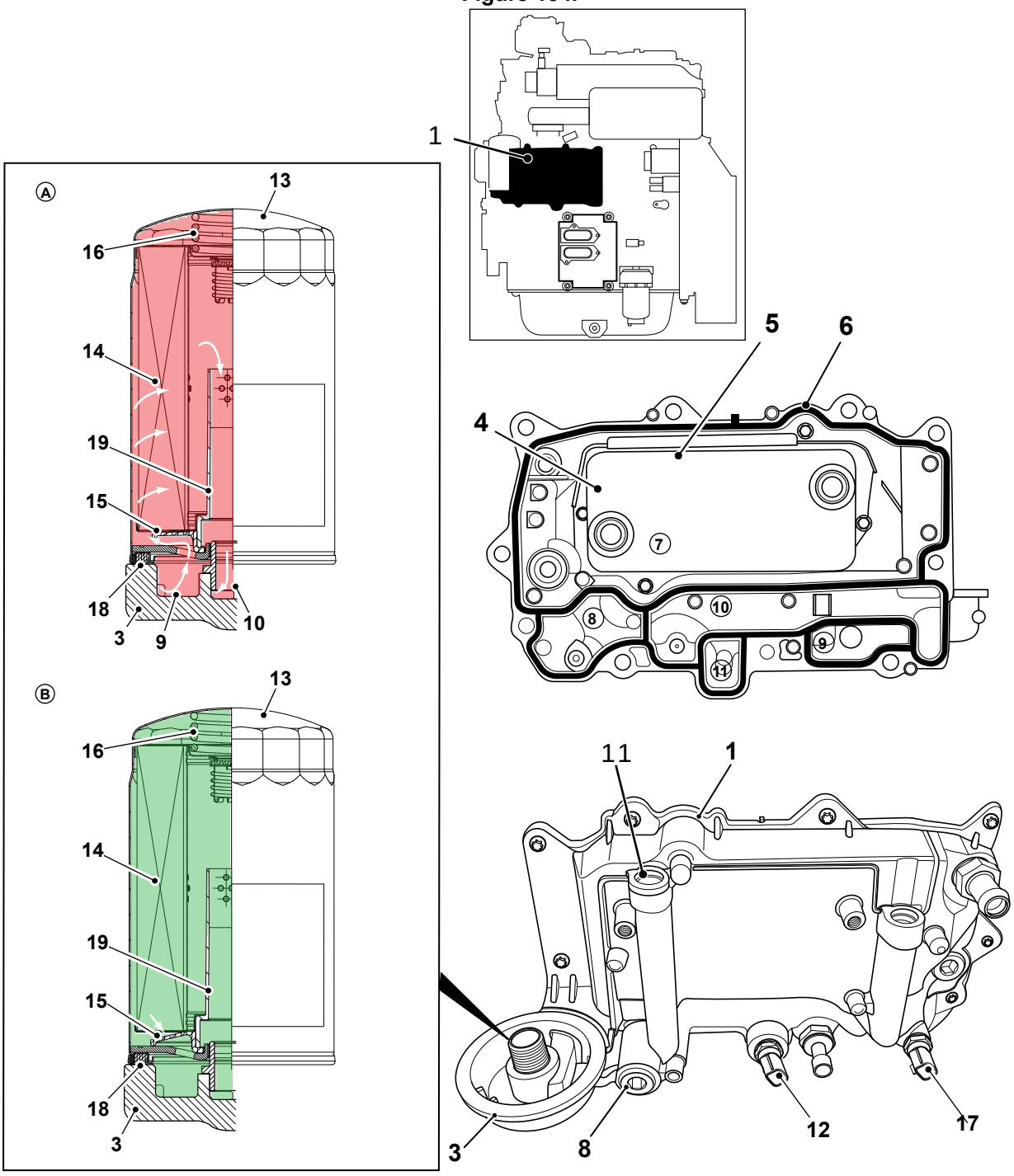
1. The installation procedure is the opposite of the removal procedure. Additionally do the following steps.
2. Tighten the bolts to the correct torque value.
3. Install the drive belt, refer to (PIL 15-18).
4. Make sure that the drive belt is under tension and the locking pin is removed before starting the engine. Refer to Drive Belt - Adjust (PIL 15-18).

Table 77. Torque Values

Item	Nm
2	24

Component Identification

Figure 184.



1 Oil cooler and filter housing
2 Oil filler cap (not shown)
3 Oil filter head
4 Oil gallery - from pump to cooler
5 Oil cooler matrix
6 Sealing gasket - housing to crankcase
7 Coolant gallery
8 Oil filter drain down plug
9 Oil gallery - from cooler to filter head
10 Oil gallery - from filter head to main oil gallery

11 Oil filler port
12 Oil pressure switch
13 Oil filter
14 Filter element
15 Anti-drain seal
16 Spring
17 Oil Temperature Sensor
18 O-ring
19 Anti-drain pipe
A Oil filter state - engine running
B Oil filter state - engine stopped

Operation

At Engine Running

The oil pump delivers oil at pressure to the oil filter via a port. The anti-drain seal is forced off its seat and oil flows through a large area paper element. Filtered oil enters the inner part filter before leaving the filter head via a port.

At Engine Stopped

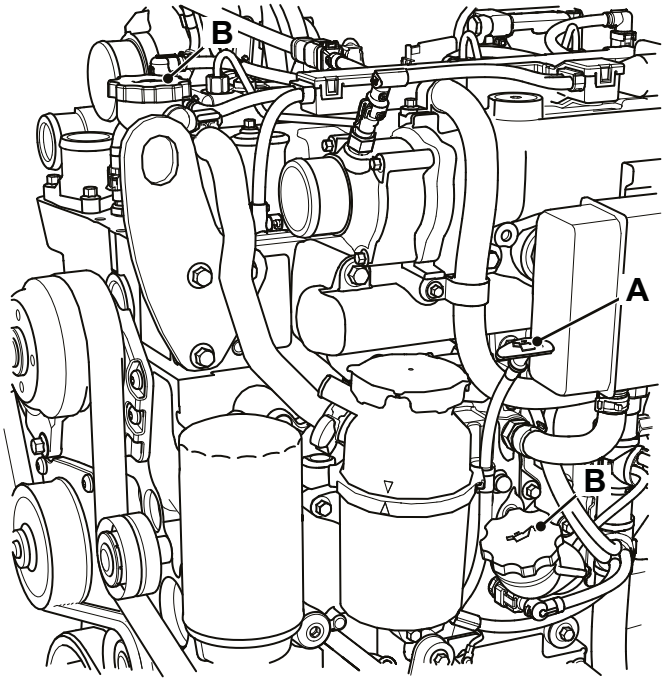
With the engine stopped oil pressure in the galleries and filter decays. The anti-drain seal falls on its seat and oil is prevented from draining from the filter assembly. The anti-drain pipe prevents approximately half the filters oil capacity from draining. These features help protect the engine from oil starvation on start up.

Check (Level)

Engine oil and oil filter replacement must be completed in accordance with the service schedules. Failure to replace the oil and filter at the recommended interval could cause serious engine failure.

1. Make the machine safe, refer to (PIL 01-03).
2. Get access to the engine.
3. Check that the oil level is between the two marks on the dipstick.
4. If necessary, add recommended oil through one of the filler points.

Figure 185.



A Dipstick
B Oil filler point

Check (Operation)

The machine has an electronic daily check system. If the ignition has been turned OFF for more than 30s, the machine will perform a check as soon as the ignition is switched to position II.

If the oil level is low a warning message and an amber warning lamp will light up to alert the operator. Check the engine oil dipstick to confirm. Refer to (PIL 15-21).

The message and warning lamp will automatically go out as soon as the level is above the minimum level.

Remove and Install

Special Tools

Description	Part No.	Qty.
Oil Filter Removal Tool	892/00292	1
Data Link Adaptor (DLA) Kit	892/01174	1

Drain the oil when the engine is warm as contaminants held in suspension will then be drained with the oil.

CAUTION! *Oil will gush from the hole when the drain plug is removed. Keep to one side when you remove the plug.*

1. Place a container of suitable size beneath the drain plug.
2. Remove the oil sump drain plug and 'O' ring. Let the oil drain out, then clean and install the drain plug with a new 'O' ring. Tighten the plug to the correct torque value.
3. Loosen and remove the filter housing drain plug. Let the oil fully drain. Install the plug. Tighten the plug to the correct torque value.
4. Unscrew the filter canister, use special tool if necessary.

   Special Tool: Oil Filter Removal Tool (Qty.: 1)
5. Clean the seal face of the filter head.
6. Smear the seal on the new filter canister with clean engine oil.
7. Screw in the new filter canister (hand tight only).
8. Through one of the filler points, fill the engine with the recommended oil to the MAX mark on the dipstick. Wipe off any spilt oil, install the filler cap and make sure it is secure.
9. If the engine has a dead crank feature, carry out the following procedure.

   9.1. Turn the ignition key to the on position.

   9.2. Turn the ignition key to the off position.

   9.3. Repeat steps 9.1 and 9.2 5 times.

   9.4. Wait for the ECU (Electronic Control Unit) to shutdown.

   Duration: 30s

   9.5. Turn the ignition key to the start position. The engine will crank for an extended time period before starting.

   Duration: 10s
10. If the engine does not have a dead crank feature, carry out the following procedure.

    10.1. Connect a laptop to the engine with a data link adaptor and open Servicemaster.

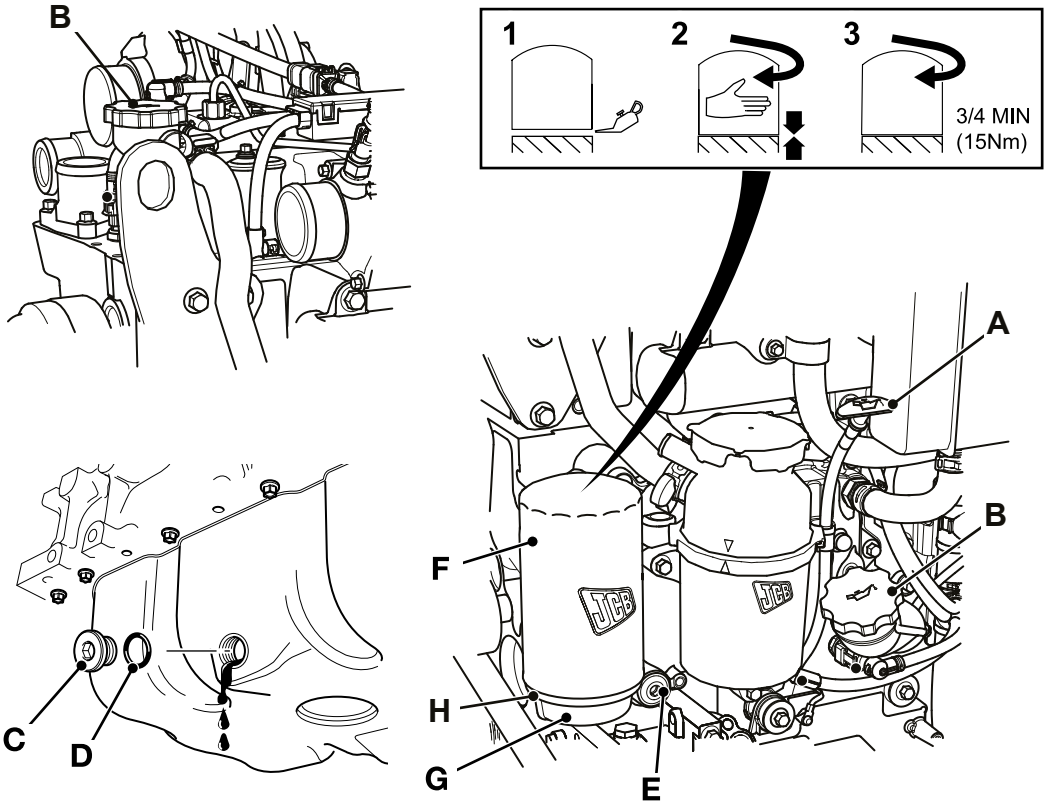
    Special Tool: Data Link Adaptor (DLA) Kit (Qty.: 1)

    10.2. Perform the IMV (Inlet Metering Valve) Override test.

    10.3. The IMV Override test will allow the engine to be cranked for a set time period without starting allowing sufficient time to prime the oil pressure.

    Duration: 10s
11. Operate the engine at idle, make sure that the oil pressure low warning light is extinguished immediately after the engine starts. If it does not extinguish, stop the engine and investigate the cause.
12. Check for oil leakage. When the oil has cooled, check the oil level again, and if necessary top up with clean engine oil.

Figure 186.



A Dipstick
B Oil filler points
C Oil sump drain plug
D 'O' ring
E Filter housing drain plug
F Filter canister
G Filter head
H Seal

Table 78. Torque Values

Item	Description	Nm
C	Oil sump drain plug	40
E	Filter housing drain plug	40

Remove and Install

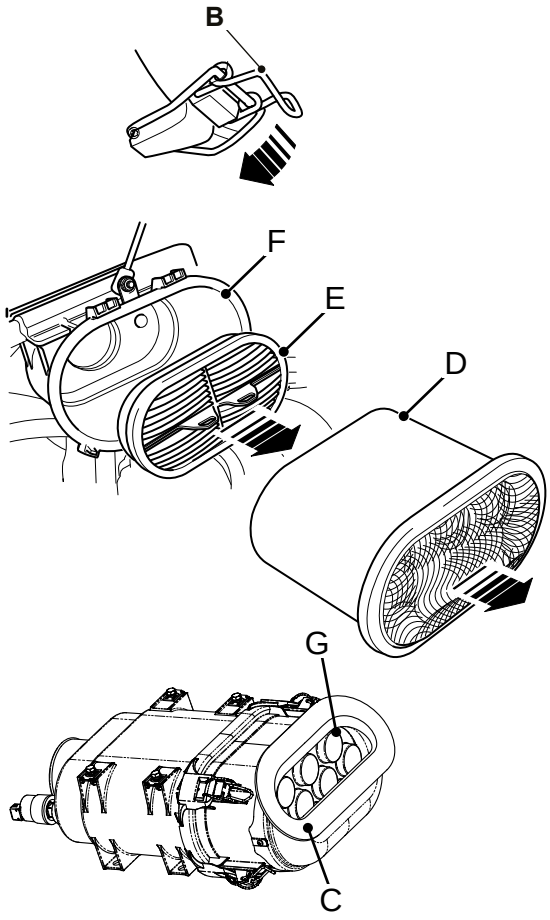
Do not attempt to wash or clean the elements, they must only be renewed.

A new inner element must be installed at least every other time the outer element is changed. As a reminder, mark the inner element with marker pen each time the outer element is changed.

Remove

1. Make the machine safe. Refer to (PIL 01-03).
2. Get access to the engine.
3. Depress the clips and lift off the cover.
4. Remove the outer element. Take care not to tap or knock the element.
5. If the inner element is to be changed, lift up pulls and remove the inner element.

Figure 187.



B Clips
C Cover
D Outer element
E Inner element
F Housing
G Air holes

Install

1. The installation procedure is the opposite of the removal procedure. Additionally do the following steps.
2. Clean inside the housing, and cover, make sure that the air holes are clear.
3. Install the cover and fasten the latch. Make sure that dust valve is at the bottom.

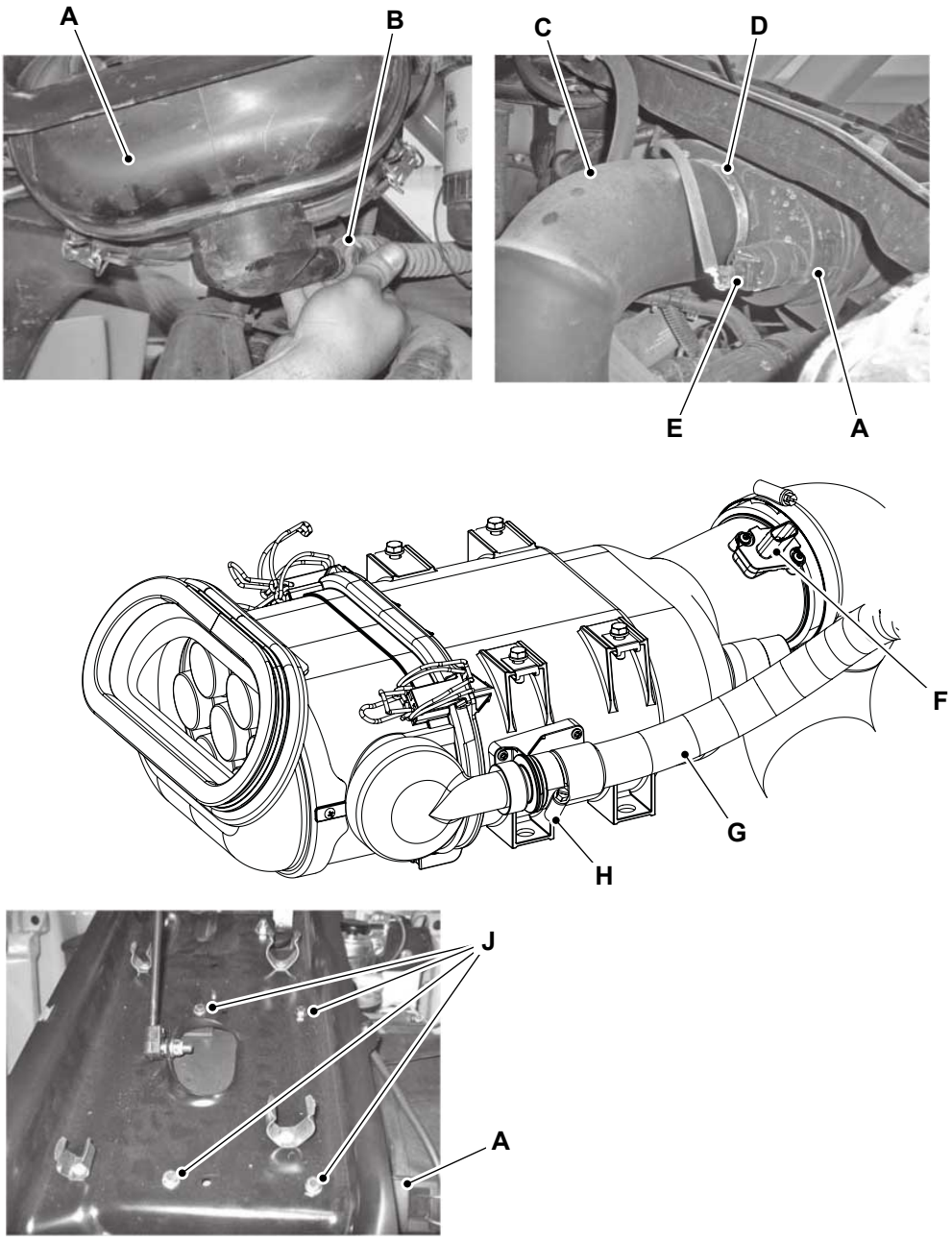
12 - Housing

Remove and Install

Remove

1. Make the machine safe. Refer to (PIL 01-03).
2. Get access to the engine air filter housing. Refer to (PIL 15-00).
3. Disconnect the debris hose from the air filter housing, if installed. Refer to Figure 188.
4. Disconnect the electrical connector from the air filter vacuum switch. Refer to Figure 188.
5. Loosen the clip that attaches the hose to the air filter housing. Refer to Figure 188.
   5.1. Disconnect the hose from the air filter housing.
6. Put a cap on the open hose to prevent contamination. Refer to Figure 188.
   6.1. The cap prevents the ingress of dust or debris into the engine induction system.
7. Disconnect the electrical connector from the TMAF (Temperature and Mass Air Flow) sensor, if installed. Refer to Figure 188.
8. Loosen the clip that attaches the hose to the air filter housing, if installed. Refer to Figure 188.
   8.1. Disconnect the hose from the air filter housing.
9. Remove the bolts that are attached to the air filter assembly. Refer to Figure 188.
   9.1. Support the air filter assembly, before you remove the bolts.
10. Remove the air filter housing from the left hand side of the machine.

Figure 188.



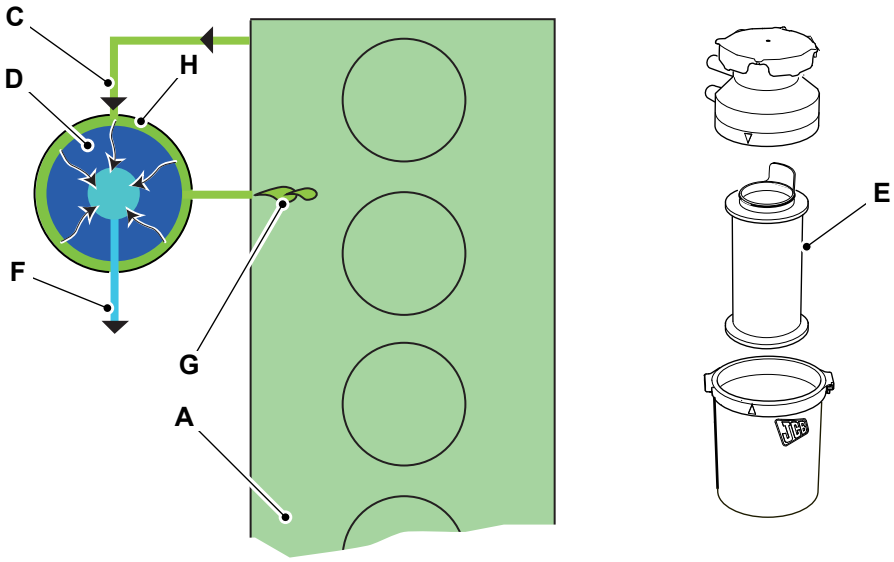
A Air filter housing
B Debris hose
C Hose
D Clip
E Electrical connector - vacuum switch
F Electrical connector - TMAF sensor
G Hose
H Clip
J Bolts

Install

1. Installation is the opposite of the removal procedure.

Component Identification

Figure 189. Filtered open loop crankcase ventilation (CCV) system



A Crankcase vapour
B Pressure relief valve
C Transfer hose
D Filter element - second stage
E Filter element - first stage
F Filtered vapour vent to atmosphere
G Oil droplets - return to sump
H Crankcase ventilation filter assembly

Operation

Filtered open loop crankcase ventilation (CCV) system

Crankcase emissions are created during the combustion process. These emissions include unburned fuel and 'blow by gases' which contain hydrocarbon and engine oil contaminates. A large proportion of these emissions are prevented from entering the atmosphere by the CCV (Crankcase Ventilation) filter assembly.

A series of ports in the crankcase, cylinder head and rocker cover allow pressure to vent from the crankcase. The vapour from the crankcase flows from the rocker cover to the filter assembly. Combined two stage filter elements remove around 90% of contaminates as the vapour passes from the inside to the outside of the filter elements. Trapped oil is allowed to drain back to the sump via a non return valve. The filtered vapour vents to the atmosphere.

If the pressure inside the filter assembly rises due to a blocked filter non return valve in the oil drain line prevents vapour being forced back into the crankcase.

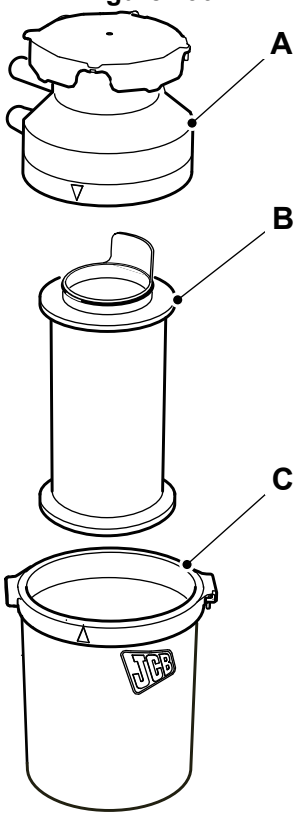
The ventilation circuit incorporates a pressure relief valve. If the filter element becomes blocked the valve opens bypassing the filter and preventing a build up of pressure in the crankcase. Although this prevents serious engine damage it must be remembered that the filtration system does not function when bypassed. The filter element must be replaced at the intervals specified to ensure a bypass condition is avoided.

Remove and Install

The filter element must be changed at the recommended maintenance interval. Refer to (PIL 78-24).

1. Make the machine safe. Refer to (PIL 01-03).
2. Get access to the engine. Refer to (PIL 06-06).
3. Rotate the filter cover anti-clockwise and remove.
4. Lift out the filter element and discard it.
5. Clean the inside of the filter housing. Remove all oil and sludge contamination.
6. Make sure that the oil drain in the bottom of the filter housing is not blocked with sludge.
7. Install a new filter element. Make sure that the correct type of filter element is installed.
8. Align the arrows on both parts to install the filter cover.

Figure 190.



A Filter cover
B Filter element
C Filter housing