

SERVICE MANUAL

TELETRUK (VARIABLE REACH TRUCK)
TLT 25G, TLT 30G

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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

This section contains information about the complete engine assembly. For specific engine technical information refer to the Technical Data. Refer to (PIL 15-00).

For all other engine disassembly and calibration procedures, refer to the engine manual 9806-2150.

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

Replacement of oil seals, gaskets, etc., and any component that show signs of wear or damage, is expected as a matter of course.

It is expected that components will be cleaned and lubricated where required, 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 LPG (Liquid Petroleum Gas) engine is a 4 cylinder engine in which the fuel is ignited by the spark plugs. 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.

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

Air is drawn into the engine through the inlet manifold and exhaust gases exit through the exhaust manifold.

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

A drive belt again driven by the crankshaft, drives a coolant circulation pump and alternator.

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.*

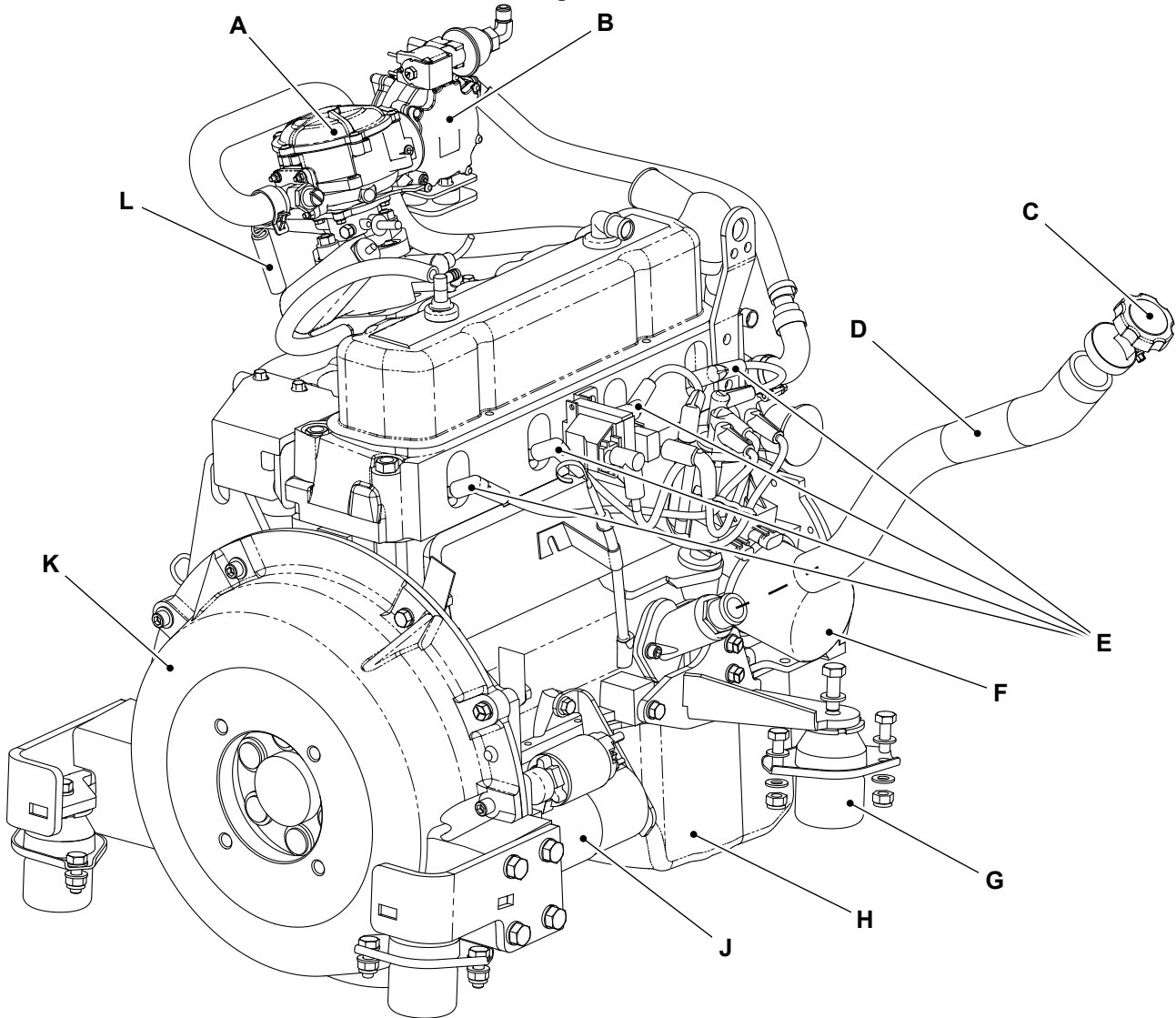
WARNING! *Do not open the high pressure fuel system with the engine running. Engine operation causes high fuel pressure. High pressure fuel spray can cause serious injury or death.*

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*

Technical Data

Table 7.

Description	Data
Engine type	4 cylinder in-line, spark ignition, naturally aspirated
Exhaust system	Cast iron, dry or water jacketed
Valve configuration (2 per cylinder)	Push rod actuated overhead valve.
Displacement	3L
Bore	101.6mm
Stroke	91.44mm
Compression ratio	9:25:1
Firing sequence	1,3,4,2
Spark plug gap	1.12mm
Weight	165kg
Rotation	Anticlockwise (when viewed from flywheel end)
Fuel type	LPG (Liquid Petroleum Gas)
Maximum RPM (Revolutions Per Minute) at full load (intermittent operation)	3600RPM
Maximum RPM at full load (continuous operation)	2600RPM
Idle RPM	700RPM
Timing (LPG)	12°BTDC (Before Top Dead Centre)
Timing (natural gas)	16°BTDC
Moment of inertia	0.3091KgM ²

Component Identification
Figure 77.


- | | |
|--------------------------------------|--|
| A Carburettor (PIL 18-60) | B Vapouriser and valve assembly (PIL 18-60) |
| C Oil filler cap (PIL 15-57) | D Oil filler hose |
| E Spark plug (PIL 15-81) | F Oil filter (PIL 15-21) |
| G Engine mount | H Oil sump |
| J Starter motor (PIL 15-75) | K Flywheel housing (PIL 15-54) |
| L Overload spring (PIL 09-28) | |

Operation

The Four Cylinder Cycle

This section describes the cycle sequence for the 4 cylinder engine.

With the crankshaft positioned as shown, the pistons in numbers 1 and 4 cylinders are at top dead centre and pistons in numbers 2 and 3 cylinders are at bottom dead centre.

It is important to note that number 1 cylinder is firing and about to start its Power stroke. Rotating the crankshaft a further full rotation would position the pistons as described but the engine would be at a different stage in its four stroke cycle, with number 1 cylinder about to start its Induction stroke.

Firing Order

A cylinder is said to be firing, when the spark plug ignites the fuel/air mixture and the piston is about to start its power stroke.

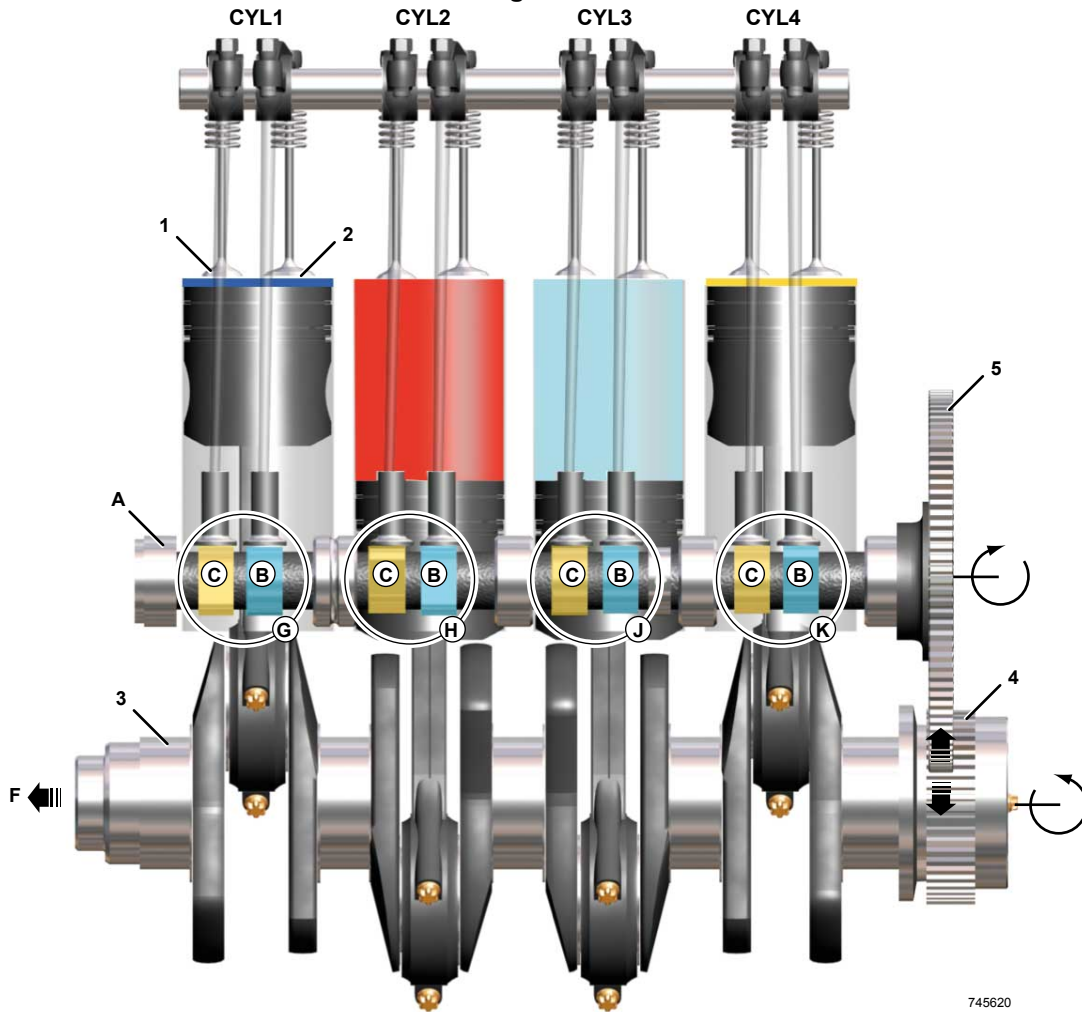
From the stages described, it can be seen that number 1 cylinder will be next to fire. Number 3 cylinder is starting its compression stroke and is next in the cycle, followed by cylinders 4 and 2. The firing order is therefore; 1, 3, 4, 2.

The stages in the four stroke cycle for each cylinder are as follows:

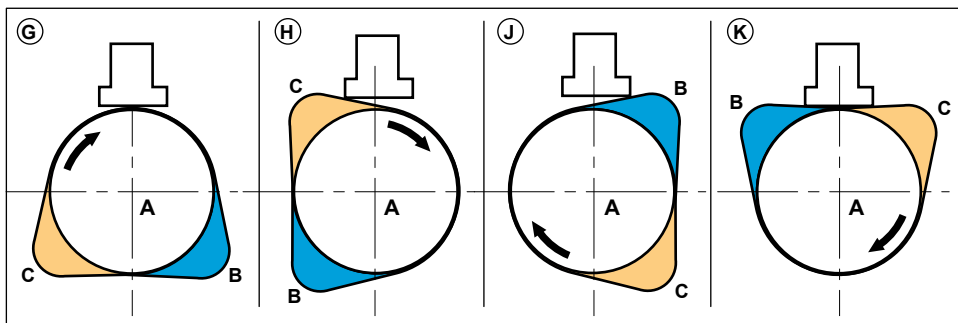
Table 8. The Four Stroke Cycle

Cylinder number	Piston operation	Valve operation
1	The piston is at the top of its Compression stroke and is about to start its Power stroke.	Inlet and exhaust valves closed.
2	The piston is at the bottom of its Power stroke and is about to start its Exhaust stroke.	Inlet valves closed, exhaust valves about to open.
3	The piston is at the bottom of its Induction stroke and is about to start its Compression stroke.	Exhaust valves closed, inlet valves about to close.
4	The piston is at the top of its Exhaust stroke and is about to start its Induction stroke.	Valve Operation Exhaust valves about to close, inlet valves about to open.

Figure 78.



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- CYL1** Cylinder number 1
- CYL2** Cylinder number 2
- CYL3** Cylinder number 3
- A** Camshaft
- B** Camshaft lobe - Inlet valve operation
- C** Camshaft lobe - Exhaust valve operation
- 1** Exhaust valves
- 2** Inlet valves
- 3** Crankshaft
- 4** Crankshaft gear
- 5** Camshaft drive gear

- CYL4** Cylinder number 4
- F** Front of engine

Four Stroke Cycle

Induction

As the piston travels down the cylinder, it draws filtered air at atmospheric pressure and ambient temperature through an air filter and inlet valves into the cylinder.

This stroke of the piston begins at TDC (Top Dead Centre) and ends at BDC (Bottom Dead Centre). In this stroke the intake valve must be in open position, while the piston pulls an fuel/air mixture into the cylinder by producing vacuum pressure into the cylinder.

Compression

When the piston reaches the bottom of its stroke (BDC), the inlet valves close. The piston then starts to rise up the cylinder compressing the fuel/air mixture trapped in the cylinder. This causes the temperature and pressure of the fuel/air mixture to rise.

Power

The piston continues to rise after the start of fuel injection, causing a further increase in pressure and temperature.

When the piston is at TDC the compressed fuel/air mixture is ignited by a spark plug.

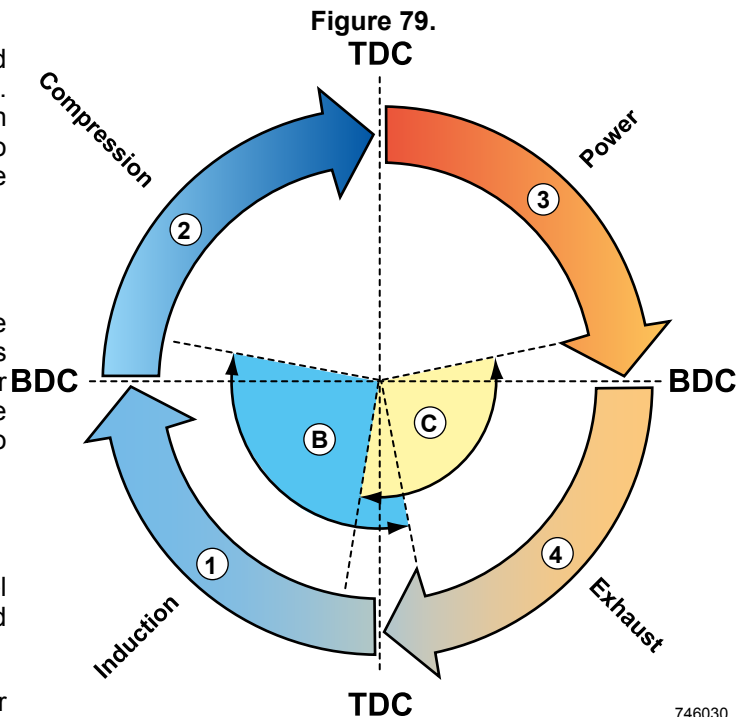
This combustion causes a very rapid rise in both temperature and pressure. The high pressure generated propels the piston downwards turning the crankshaft and producing energy.

Exhaust

Once the piston has reached the bottom of its travel, the exhaust valves open and momentum stored

in the flywheel forces the piston up the cylinder expelling the exhaust gases.

In a running engine, these four phases are continuously repeated. Each stroke is half a revolution of the crankshaft, thus, in one cycle of a four stroke engine, the crankshaft revolves twice.



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- 1 Induction stroke
- 2 Compression stroke
- 3 Power stroke
- 4 Exhaust stroke
- A Camshaft
- B Camshaft lobe - Inlet valve operation
- C Camshaft lobe - Exhaust valve operation
- BDC Bottom dead centre
- TDC Top dead centre

Clean

▲ 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: 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.

Before carrying out any service procedures that require components to be removed, the engine must be properly cleaned.

Cleaning must be carried out either in the area of components to be removed or, in the case of major work, or work on the fuel system, the whole engine and surrounding machine must be cleaned.

Stop the engine and allow it to cool for at least one hour. DO NOT attempt to clean any part of the engine while it is running.

1. Make sure that the electrical system is isolated.
2. Make sure that all electrical connectors are correctly connected. If connectors are open install the correct caps or seal with water proof tape.
3. Cover the alternator with a plastic bag to prevent water ingress.
4. Seal the engine air intake, exhaust and breather system.
5. Make sure that the oil filler caps and dipstick are correctly installed.
6. Use a low pressure water jet and brush to soak off mud or dirt.
7. Apply an approved cleaning and degreasing agent with a brush. Obey the manufacturers instructions.
8. Use a pressure washer to remove the soft dirt and oil. Important: DO NOT aim the water jet directly at oil seals or electrical and electronic components such as the engine electronic control unit (ECU), alternator or fuel injectors. DO NOT place the jet nozzle closer than the specified distance to any part of the engine.

Distance: 600mm

9. When the pressure washing is complete, move the machine away from the wash area, or alternatively, clean away the material washed from the machine.
10. Before working on specific areas of the engine, use a compressed air jet to dry off any moisture. When the area is dry, use a soft clean brush to remove any sand or grit particles that remain.
11. When removing components, be aware of any dirt or debris that may be exposed. Cover any open ports and clean away the deposits before proceeding.

Additional cleaning must be carried out prior to working on the high pressure fuel system. Refer to Fuel System, General, Clean (PIL 18-00).

Remove and Install

Consumables

Description	Part No.	Size
JCB Threadlocker and Sealer (High Strength)	4101/0550	0.01L
	4101/0552	0.2L

Lifting Equipment

You can be injured if you use incorrect or faulty lifting equipment. You must identify the weight of the item to be lifted then choose lifting equipment that is strong enough and suitable for the job. Make sure that lifting equipment is in good condition and complies with all local regulations.

WARNING! Before disconnecting any part of the LPG fuel system, close the shut-off valve on the fuel tank. Run the engine until the fuel lines are empty and the engine stops. If the engine will not run, close the shut-off valve on the fuel tank and release the fuel slowly in a non-hazardous area. LPG can cause an explosion even when the tanks are empty. When replacing the tanks, do not weld, cause sparks or permit flammable material on or near the tanks. Do not change tanks whilst the engine is running. Disconnect the negative battery terminal to prevent sparks. Tanks must be filled by authorised personnel only. Follow all the safety rules. Do not remove any parts from the tank. Use gloves or a cloth to protect your hands from cold metal. Frost on the surface of the tank, the valves or fittings and the odour of LPG fuel indicates a leak. Inspect the system and repair a leak immediately. An LPG fuel leak creates an explosion and fire hazard. Do not attempt to start the engine if there is a leak in the LPG system.

Remove

1. Make the machine safe.
[Refer to: PIL 01-03.](#)
2. Obey all fuel system health and safety information.
3. 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.
4. Get access to the engine.
[Refer to: PIL 06-06-06.](#)
5. Disconnect and remove the battery.
[Refer to: PIL 33-03-00.](#)
6. Disconnect the exhaust system.
[Refer to: PIL 18-24-00.](#)
7. Disconnect the wiring connections from the starter motor.
[Refer to: PIL 15-75-00.](#)

8. Disconnect the wiring connections from the alternator.
[Refer to: PIL 15-72-00.](#)
9. Disconnect the wiring connections from the engine sensors and actuators.
10. Drain the engine oil.
[Refer to: PIL 15-21-00.](#)
11. Remove the cooling pack.
[Refer to: PIL 21-03-00.](#)
12. Discharge the hydraulic pressure.
[Refer to: PIL 30-00-00.](#)
13. Drain the hydraulic tank. Disconnect and plug the hydraulic pipes. Label the hoses to help installation.
[Refer to: PIL 30-03-00.](#)
14. Disconnect the bottom hose from the engine radiator to drain the cooling system.
[Refer to: PIL 21-00-00.](#)
 - 14.1. Disconnect the radiator top hose.
 - 14.2. Remove the radiator.
15. Disconnect the fuel vapouriser water feed hoses from the engine.
[Refer to: PIL 18-66-00.](#)
16. Disconnect and plug the hydraulic cooler hoses. Label the hoses to help installation.
17. Ensure that all relevant harnesses and hoses are unclipped from the engine and tied out of the way.
18. Attach slings to the engine lifting bracket.
19. Take the weight of the engine on the hoist and remove the engine mounting bolts.
20. Withdraw the engine in a level attitude until it is clear of the chassis. Raise the engine to lift it clear of the machine.
21. Lower the engine into a suitable stand that is capable of supporting the weight of the engine.

Install

1. The installation procedure is the opposite of the removal procedure. Additionally do the following steps.
2. Fill the cooling system with the correct mix of coolant fluid.
[Refer to: PIL 75-00-00.](#)
3. Fill and Check the hydraulic fluid level.

Refer to: PIL 30-00-00.

4. Fill and Check the engine oil level.

Refer to: PIL 15-21-00.

5. On completion, check the hydraulic and cooling system for leakage and levels.
6. Check the fuel system for leaks.
7. Check the function of the drive and hydraulic services.
8. Note that if you have removed mounting bracket from the engine block, you must apply the specified to the mounting bolts before installation.

Consumable: JCB Threadlocker and Sealer (High Strength)

Store and Recommission

Consumables

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

Engine Storage (up to 6 months)

Before you store the engine make sure that:

- The environment is not humid or exposed to bad weather.
 - The storage place is not near an electrical panel.
 - Prevent storing the engine in direct contact with the ground.
1. Cover the engine with a proper protective sheet to prevent it from dampness and atmospheric contaminants.

Engine Storage (over 6 months)

1. Follows the precautions mentioned in the above procedure.
2. Fill the engine housing with protective oil up to the maximum level.
3. Refuel the machine with fuel additives for long storage.
4. For machines with expansion tank:
 - 4.1. Make sure that the coolant is up to the maximum level.
5. For machines without expansion tank:
 - 5.1. Fill the coolant until the pipes inside the radiator are covered by specified distance.
Distance: 5mm
 - 5.2. Do not overfill the radiator, but leave sufficient space for the fuel to expand.
6. Start the engine and run it at idle speed for the specified duration.
Duration: 2min
7. Bring the engine to 75% of the maximum rated speed for the specified duration.
Duration: 5–10min
8. Turn off the engine.
9. Drain the fuel tank completely.
10. Spray engine oil (SAE 10W40) on the exhaust and intake manifolds.

11. Seal the exhaust and intake ducts to prevent contamination.
12. Clean the engine.
[Refer to: PIL 15-00-00.](#)
13. Apply protective paints on non-painted parts.
14. Loosen the alternator belt.
15. Cover the engine with a proper protective sheet to prevent it from dampness and atmospheric contaminants.

Engine Starting After Storage

1. Remove the protective sheet.
2. Use a cloth soaked in degreasing fluid to remove the protective treatment from the external parts.
[Consumable: Cleaner/Degreaser - General purpose solvent based parts cleaner](#)
3. Inject lubricating oil (not more than 2cm³) into the intake ducts.
4. Adjust the alternator belt tension.
[Refer to: PIL 15-18-00.](#)
5. Refuel the machine.
6. Make sure that the oil and the coolant are up to the maximum level.
7. Start the engine and run it at idle speed for the specified duration.
Duration: 2min
8. Bring the engine to 75% of the maximum rated speed for the specified duration.
Duration: 5–10min
9. Stop the engine.
10. While the oil is still hot, drain the protective oil in a suitable container.
11. Put new oil up to the maximum level.
12. Replace the filters (air, oil, fuel).
13. Drain the cooling circuit completely and put new coolant up to the maximum level.

Important: Over time, lubricants and filters lose their properties, so it is important to consider whether they need replacing, also based on the criteria mentioned in the maintenance schedules.

If the engine is not to be used for an extended period, the protective treatment procedure must be repeated within 730d of the previous one.

Check (Condition)

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

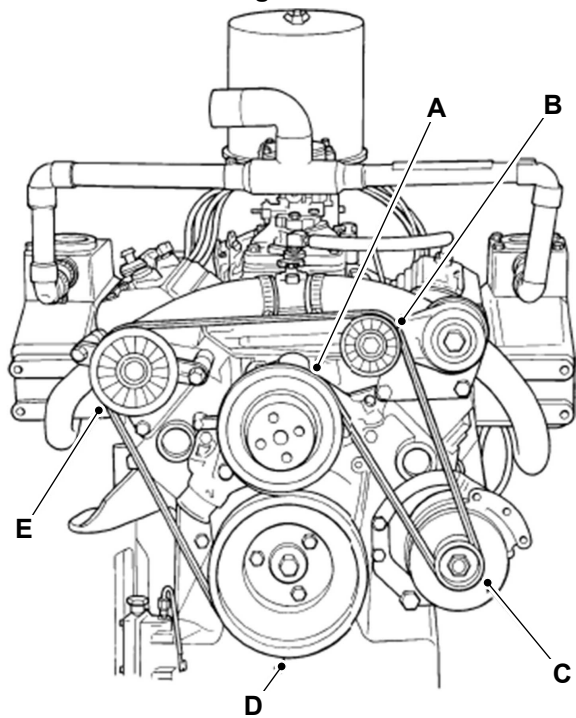
1. Make the machine safe.
 Refer to: [PIL 01-03-27](#).
2. Stop the engine and let it cool down.
3. Replace the drive belt if it has cracks or if it is frayed or has pieces of material missing.

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 1/2 inch breaker bar with a socket placed on the tensioner pulley axis bolt.
 - 3.1. Carefully rotate the tensioner against the spring force to release the belt tension. Do not use excessive force or the tensioner will be damaged.
4. Keep holding the tensioner against the spring force and lift the belt off the tensioner pulley.
5. Slowly release the spring force by rotating the tensioner unit in the opposite direction.

Figure 81.



- A Water pump pulley
- B Belt tensioner
- C Alternator pulley
- D Crankshaft pulley
- E Idler pulley

Install

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



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.
3. Route the belt over all the pulleys except the belt tensioner.
4. Use a 1/2 inch breaker bar with a socket placed on the tensioner pulley axis bolt.
 - 4.1. Rotate the tensioner to the released position.
5. Install the belt over the tensioner pulley.
6. Check the belt for correct W groove tracking around each pulley.
 - 6.1. Make sure that the belt follows the correct routing.
 - 6.2. Make sure that the grooves in the belt matches the grooves in the pulleys.

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