



SERVICE MANUAL

SKIDSTEER LOADER
135 HD, 155 HD

EN - 9813/4450
ISSUE 2 - 03/2017

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.

Contents

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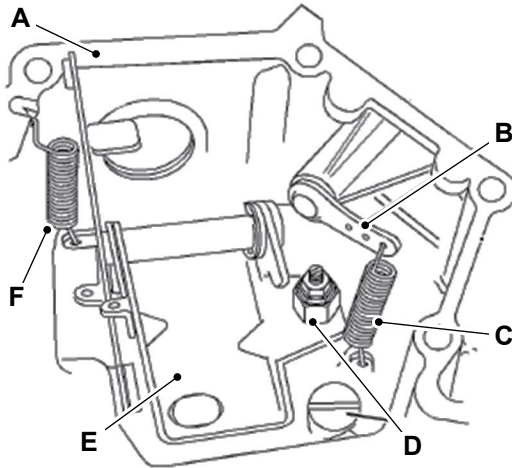
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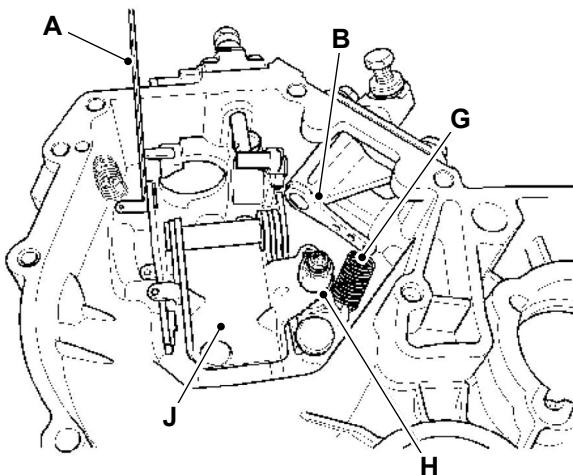
Component Identification

Figure 268. Governor control mechanism in the front housing without a BCD



- A Connection for the linkage to the fuel injection pump
- B Control lever
- C Lever return spring
- D Governor adjustment screw
- E Arm
- F Start spring

Figure 269. Governor control mechanism in the front housing with a BCD



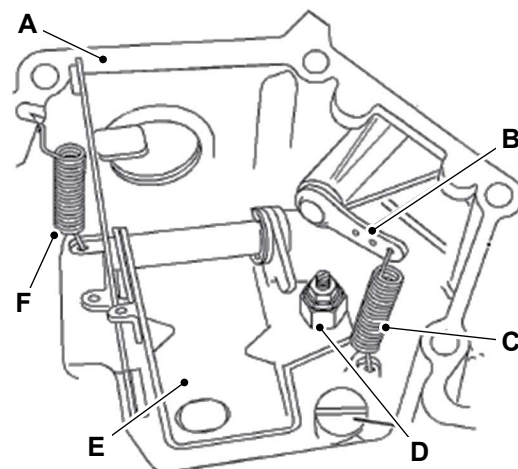
- A Connection for the linkage to the fuel injection pump
- B Control lever
- G Governor main spring
- H Adjuster (Angleich unit)
- J Governor lever

Operation

The fuel rack is connected to the linkage, which controls the fuel injection pump. This linkage is located in the front case.

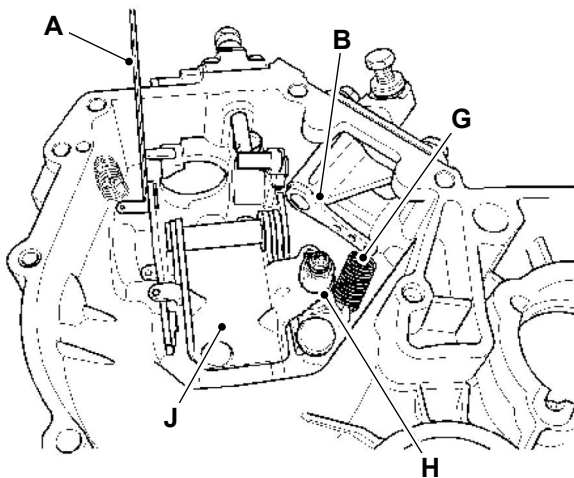
The engine has a mechanical governor to control the engine speed. The governor operates for all engine RPM (Revolutions Per Minute). The governor weight assembly is installed on the front of the camshaft gear. The other components of the governor are installed in the front case.

Figure 270. Governor control mechanism in the front housing without a BCD



- A Connection for the linkage to the fuel injection pump
- B Control lever
- C Lever return spring
- D Governor adjustment screw
- E Arm
- F Start spring

Figure 271. Governor control mechanism in the front housing with a BCD



A spring connects the linkage to the fuel injection pump and the mechanical stop control. When the engine is first started, the spring automatically increases the fuel flow to the cylinders.

- A** Connection for the linkage to the fuel injection pump
- B** Control lever
- G** Governor main spring
- H** Adjuster (Angleich unit)
- J** Governor lever

The movement of the governor weight assembly is transferred to the fuel rack on the fuel injection pump by the control lever, the governor lever and the linkage to the fuel injection pump. The governor main spring connects the governor lever to the control lever. The governor main spring controls the movement of the governor weight assembly on the camshaft. When the angle of the control lever changes, the tension on the governor main spring changes. This action controls the linkage to the fuel rack on the fuel injection pump, which controls the engine RPM.

The maximum fuel adjustment screw is mounted in the front case. This adjustment regulates the fuel injection at high engine RPM. This adjustment should only be made by personnel with the correct training.

The fuel injection pump timing, the low idle and the high idle are preset at the factory. Adjustments to the pump timing and idle RPM should only be made by personnel that have had the correct training. The timing for the fuel injection pump should only change if the camshaft or the crankcase are replaced. The fuel injection pump timing should not change if the fuel injection pump is reinstalled with a shim that is the same size.

The fuel rack automatically returns to the excess fuel position when the engine is stopped. The excess fuel position helps the engine to starting in cold conditions.

Adjust

Special Tools

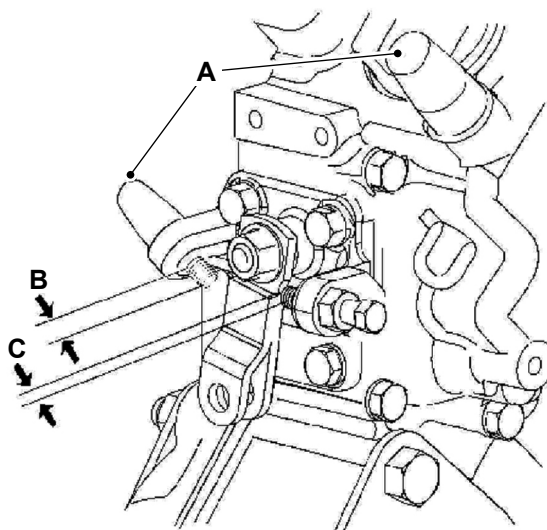
Description	Part No.	Qty.
Digital Tachometer	892/00284	1

The setting of the front case is only necessary if the front case is damaged or if the front case is renewed.

Record the Governor Settings

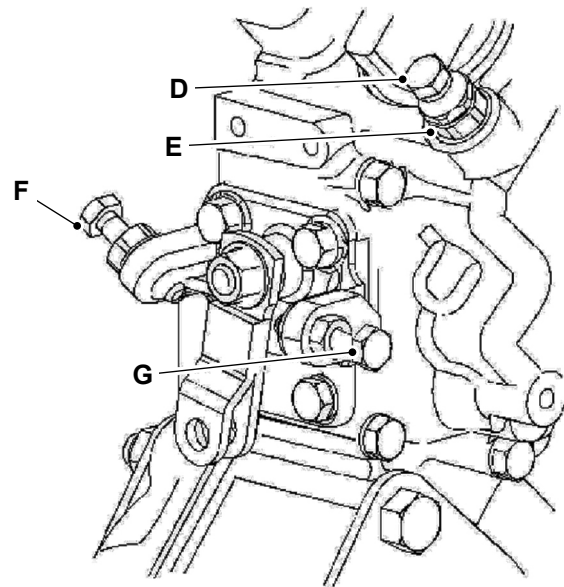
1. If the front case is removed, install the front case. Refer to (PIL 15-51).
2. Record the setting of the low idle stop screw and the high idle stop screw. This is to make sure the governor operation is restored.
3. Operate the engine until the normal operating temperature is reached.
4. Record the engine RPM (Revolutions Per Minute) at low idle with an optical tachometer.
Special Tool: Digital Tachometer (Qty.: 1)
5. Accelerate the engine to high idle. Record the engine RPM as Speed A with an optical tachometer.

Figure 272.



- A Tamperproof caps
B Protrusion of the high idle stop screw
C Protrusion of the low idle stop screw

Figure 273.



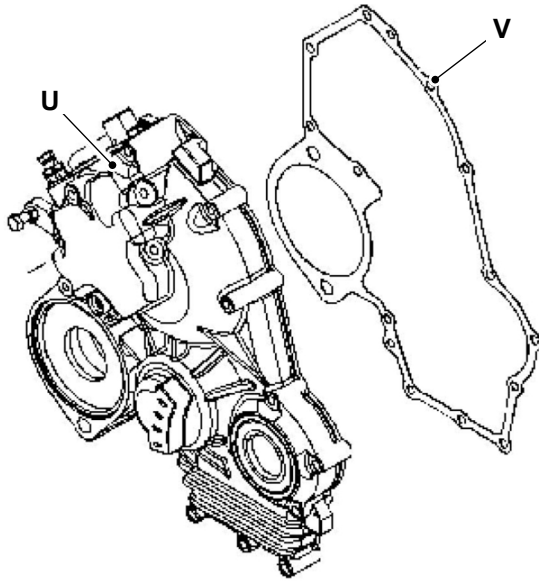
- D Idle trimmer screw
E Locknut
F High idle stop screw
G Low idle stop screw

6. Remove the tamperproof caps.
7. Record the protrusion of the high idle stop screw.
8. Record the protrusion of the low idle stop screw.
9. Release the locknut. Turn the high idle trimmer screw four turns counterclockwise and tighten the locknut.
10. Accelerate the engine to high idle. Record the engine RPM as Speed B with an optical tachometer.
11. Make sure that the recorded Speed B is lower than the recorded Speed A.

Removal of the Old Front Case

1. Remove the fuel injection pump. Refer to (PIL 18-18).
2. Remove the crankshaft pulley. Refer to (PIL 15-12).
3. Remove the front case. Refer to (PIL 15-51).

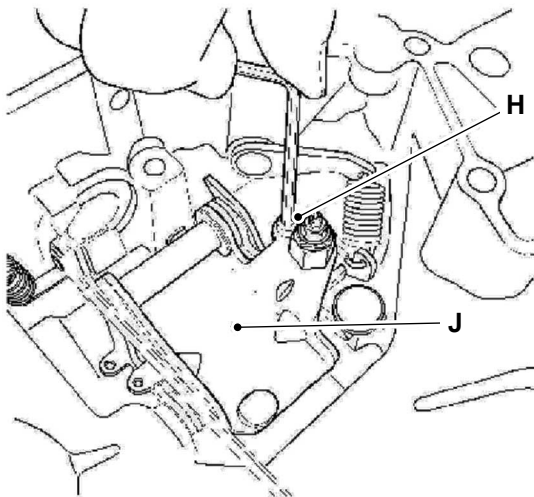
Figure 274.



U Front case
V Gasket

4. Remove the gasket. Make sure that the face of the front plate is clean.
5. Install the Allen head screw to the lever assembly. Tighten the Allen head screw to the correct torque value.

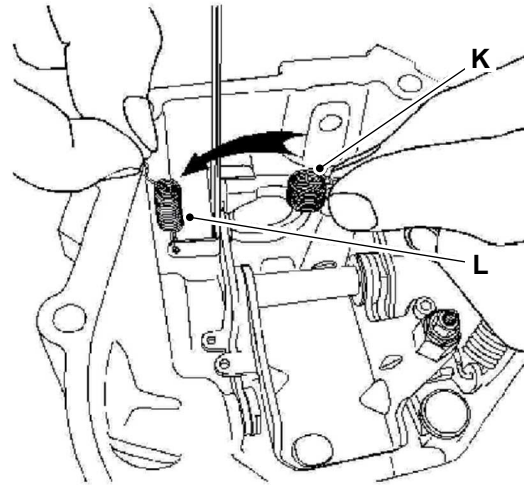
Figure 275.



H Allen head screw (M4 x 20mm x 0.70)
J Lever assembly

6. Remove the start spring and replace the start spring with a calibration spring.

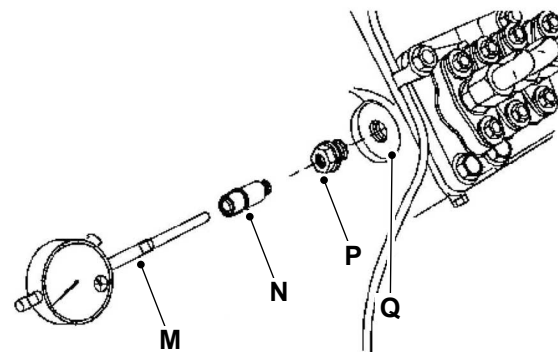
Figure 276.



K Calibration spring
L Start spring

7. Install the front case. Refer to (PIL 15-51).
 - 7.1. Do not install a gasket. Refer to Figure 274.
8. Install the fuel injection pump. Refer to (PIL 18-18).
 - 8.1. Install the original shim.
9. Install the crankcase adaptor into the crankcase.
10. Install the DTI (Dial Test Indicator) holder into the crankcase adaptor.
 - 10.1. The DTI must be graduated to the specified dimension.
Dimension: 0.01mm
11. Assemble the DTI and the extension to the specified dimension.
Dimension: 20mm

Figure 277.

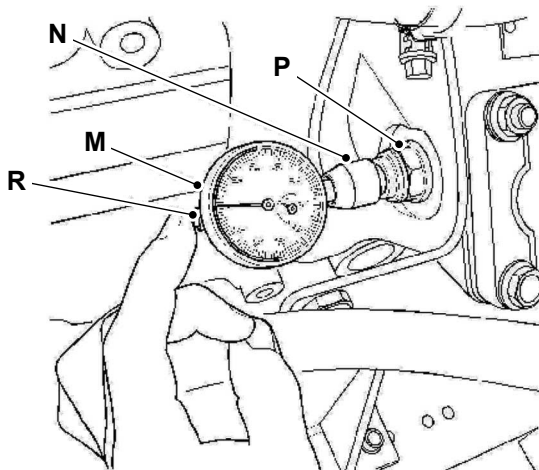


M DTI
N DTI holder
P Crankcase adaptor
Q Crankcase

12. Install the DTI into the DTI holder until the extension on the DTI touches the rack of the fuel injection pump.
13. Push the assembled DTI and the extension into the DTI holder further to the specified distance.

Dimension: 2mm

Figure 278.



- M DTI
- N DTI holder
- P Crankcase adaptor
- R Crankcase

14. Lock the DTI holder to retain the DTI in position. Set the DTI to the specified dimension.

Dimension: $2 \pm 0.01\text{mm}$

15. Push the plunger of the DTI several times to seat the rack of the fuel injection pump. When the plunger is gently released, check that the DTI reads the specified dimension.

Dimension: $2 \pm 0.01\text{mm}$

16. If the rack of the fuel injection pump has heavy resistance to movement:

- 16.1. Remove the DTI.
- 16.2. Remove the fuel injection pump.
- 16.3. Wash the fuel injection pump with a suitable cleaner.
- 16.4. Install the fuel injection pump.
- 16.5. Repeat the steps 12 to 15.

17. Do the calibration of the fuel screw and the front housing. Refer to (PIL 18-18).

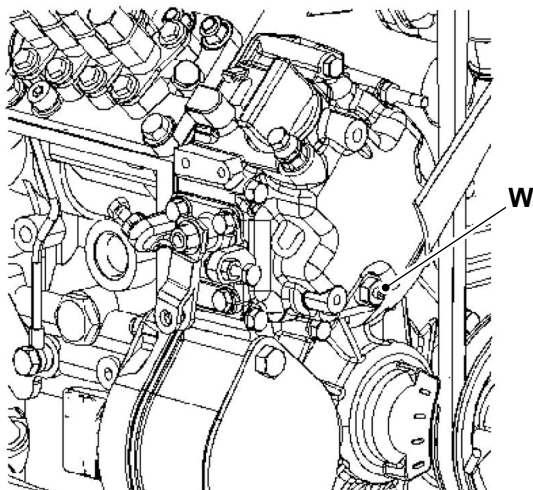
Final Installation of the New Front Case

1. Remove the DTI and the DTI holder. Refer to Figure 277.

2. Remove the crankcase adaptor. Refer to Figure 277.
3. Remove the fuel injection pump. Refer to (PIL 18-18).
4. Remove the front case. Refer to (PIL 15-51).
5. Remove the calibration spring and install the original start spring. Refer to Figure 276.
6. Remove the Allen head screw from the lever assembly. Refer to Figure 275.
7. Install the new gasket on the front case. Make sure that the gasket is clean and free from damage. Refer to Figure 274.
8. Install the new front case. Refer to (PIL 15-51).
9. Set the protrusion of the high idle stop screw to the same dimensions as the stop screws on the original front case. Refer to Figure 272.
10. Set the protrusion of the low idle stop screw to the same dimensions as the stop screws on the original front case. Refer to Figure 272.
11. Set the high idle trimmer screw as follows: Refer to Figure 273.
 - 11.1. Release the locknut.
 - 11.2. Set the high idle trimmer screw to the fully out position.
 - 11.3. Turn the screw clockwise for two turns.
 - 11.4. Tighten the locknut.
12. Install the fuel injection pump. Refer to (PIL 18-18).
13. Start the engine and allow the engine to reach the normal operating temperature.
14. Run the engine at low idle and adjust the low idle stop screw to the speed that was previously recorded, prior to the original front case removal.
15. Run the engine at high idle and adjust the high idle stop screw to the speed that was previously recorded as Speed B.
16. Run the engine at high idle and release the locknut.
17. Adjust the high idle trimmer screw to the speed that was previously recorded as Speed A.
18. Tighten the locknut.
 - 18.1. Make sure that the recorded Speed B is lower than the recorded Speed A.
19. Make sure that the engine operates correctly.

20. Install the tamperproof cap to the high idle trimmer screw and the high idle screw.
21. Carefully install the tamperproof cap to the fuel screw.

Figure 279.



W Fuel screw

Table 98. Torque Values

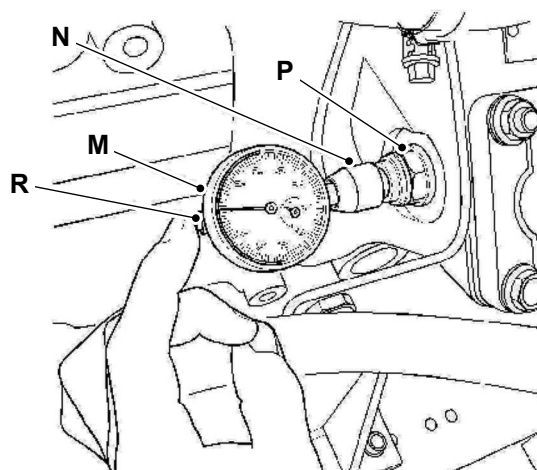
Item	Description	Nm
H	Allen head screw	.4

Calibrate

Setting the Fuel Screw

1. Release the plunger of the DTI (Dial Test Indicator). Refer to Figure 280.

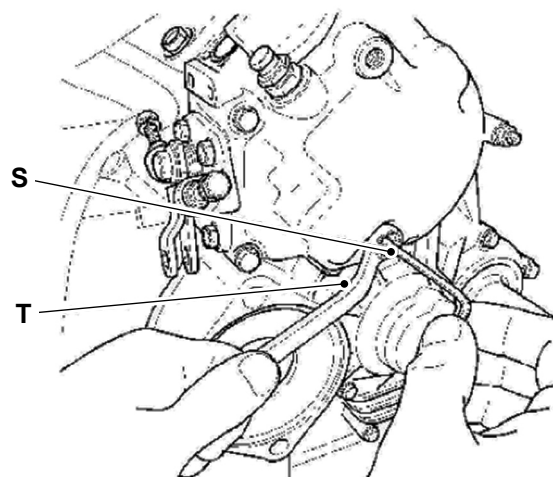
Figure 280.



- M** DTI
- N** DTI holder
- P** Crankcase adaptor
- R** Crankcase

2. Do not move the position of the DTI, DTI holder and crankcase adaptor.
3. Retain the locknut of the fuel screw in position with a ring spanner. Refer to Figure 281.

Figure 281.



- S** Allen wrench
- T** Ring Spanner

4. Turn the Allen head screw and observe the reading on the DTI.

5. Turn the Allen head screw until the DTI reads the specified dimension.
Dimension: $2 \pm 0.01\text{mm}$
6. Tighten the locknut to the correct specified torque value.
Torque: $6\text{N}\cdot\text{m}$
7. Make sure that the reading on the DTI is as specified.
Dimension: $2 \pm 0.01\text{mm}$
8. Install and adjust the new front case. Refer to (PIL 15-51).

Remove and Install

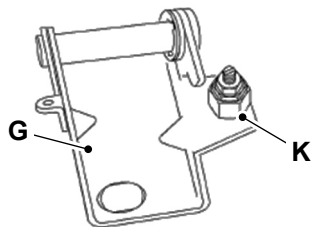
Consumables

Description	Part No.	Size
JCB Threadlocker and Sealer (Medium Strength)	4101/0250	0.01L
	4101/0251	0.05L

Remove

1. Disassemble the timing gear front case. Refer to (PIL 15-51).
2. Remove the lever assembly from the front case.
3. Remove the adjuster unit from the lever assembly. Refer to Figure 282.

Figure 282.



G Lever assembly

K Adjuster unit

Install

1. Apply threadlocker on the first two threads of the adjuster unit.
[Consumable: JCB Threadlocker and Sealer \(Medium Strength\)](#)
2. Install the adjuster unit to the lever assembly.
3. Tighten the adjuster unit to the correct torque value.
4. Make sure that the threadlocker does not contaminate the plunger assembly of the adjuster unit. The contamination of the plunger assembly will make the adjuster unit inoperative.
5. Install the lever assembly to the front case.
6. Assemble the timing gear front case. Refer to (PIL 15-51).

Remove and Install

Observe all the health and safety information. Refer to Fuel system - Health and Safety (PIL 18-00).

Electrical Fuel Pump

Remove

1. Make the machine safe. Refer to (PIL 01-03).
2. Open the rear access cover. Refer to (PIL 06-06).
3. Turn the fuel supply to the OFF position.
4. Disconnect the electrical connector from the fuel pump.
5. Plug all the open ports and hoses to prevent contamination.
6. Loosen the clamps and disconnect the hoses.
7. Put a label on the hoses to help installation.
8. Remove the bolt1 (x2) and remove the fuel pump.

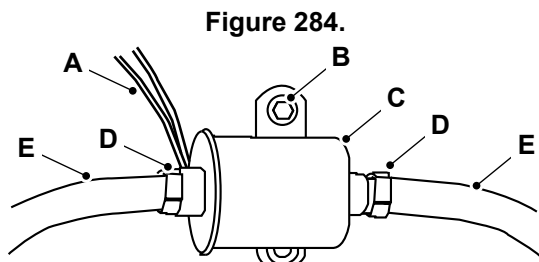


Figure 284.

- A Electrical connectors
- B Bolt1 (x2)
- C Fuel pump (Electrical)
- D Clamps
- E Hoses

Install

1. The installation procedure is the opposite of the removal procedure. Additionally do the following steps.
2. Make sure that the electric transfer pump is clean and free from damage.
3. Bleed the fuel system. Refer to Fuel system (PIL 18-00).

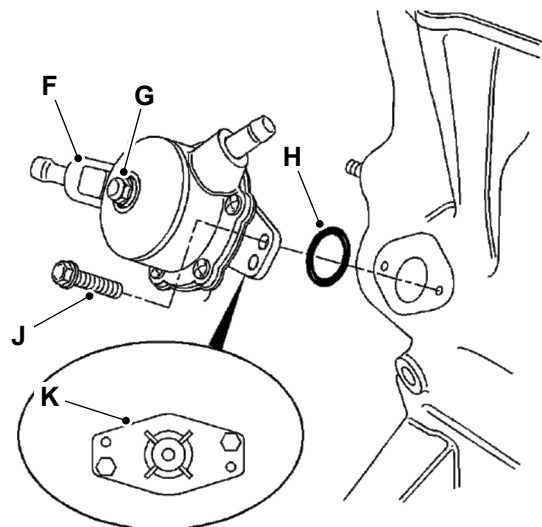
Mechanical pump

Remove

1. Make the machine safe. Refer to (PIL 01-03).
2. Open the rear access cover. Refer to (PIL 06-06).
3. Turn the fuel supply to the OFF position.

4. Disconnect the electrical connector from the fuel pump.
5. Plug all the open ports and hoses to prevent contamination.
6. The fuel transfer pump can be oriented in two positions. Before you remove the fuel pump from the crankcase, note the orientation of flange on the fuel pump for installation.
7. Loosen the clamps and disconnect the hoses.
8. Put a label on the hoses to help installation.
9. Loosen the bolt and remove the fuel pump from the crankcase.
 - 9.1. If necessary, rotate the crankshaft until the operating plunger of the fuel pump is not under pressure to remove the fuel pump.
10. Remove the O-ring seal from the fuel pump.

Figure 285.



- F Fuel pump (Mechanical)
- G Bolt2
- H O-ring seal
- J Bolt3
- K Flange

Install

1. Clean the mating surfaces of the crankcase and the flange on the fuel pump.
2. Make sure that the camshaft lobe for the fuel pump is at the minimum lift before the fuel pump is installed.
3. Make sure that the fuel pump is oriented in the correct position.
4. Install the new O-ring seal to the fuel pump.

5. Lubricate the operating plunger of the fuel pump with clean engine oil.
6. Position the fuel pump on the crankcase.
7. Make sure that the operating plunger is positioned correctly on the camshaft lobe.
8. Install the bolt3.
9. Tighten the bolt3 to the correct torque value.
10. Connect the hoses to the fuel pump.
11. Tighten the hose clamps.
12. The inlet for the fuel pump can be rotated to the specified angle by loosening bolt2.
Angle: 360°
 - 12.1. The fuel inlet is adjustable to the specified degree increments.
Angle: 15°
 - 12.2. If adjustment is made to the position of the fuel inlet, tighten bolt2 to the correct torque value.
13. Turn the fuel supply to the ON position.
14. Bleed the fuel system. Refer to Fuel system (PIL 18-00).

Table 99. Torque Values

Item	Description	Nm
B	Bolt1	9
G	Bolt2	2.5
J	Bolt3	6

00 - General

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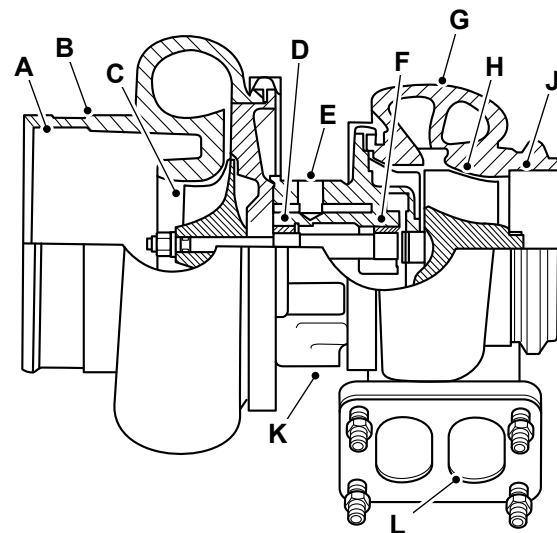
Introduction

A turbocharger increases the temperature and the density of the air sent to the engine cylinder. This condition causes a lower temperature of ignition to develop earlier in the compression stroke. The compression stroke is also timed in a more accurate way with the fuel injection. The surplus air lowers the temperature of combustion. This surplus air also provides internal cooling.

A turbocharger improves the following aspects of engine performance:

- Power output is increased.
- Engine torque is increased.
- Engine efficiency is increased.

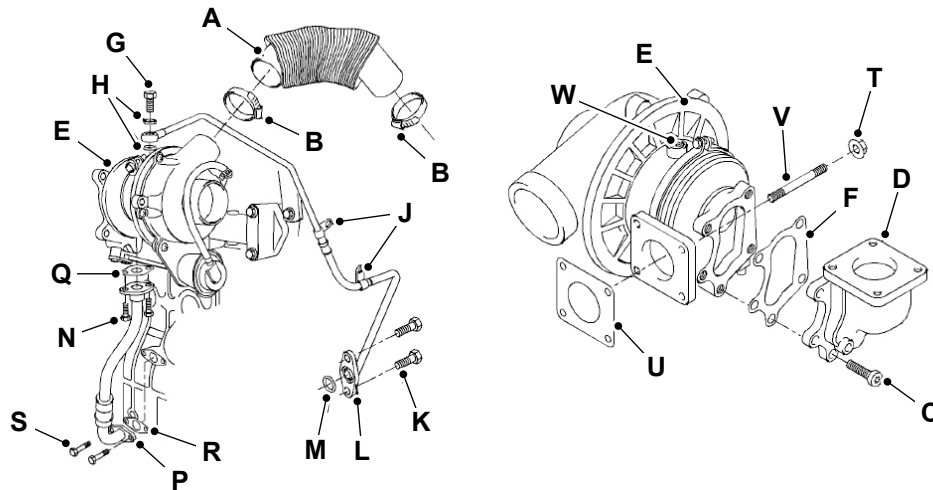
Figure 289.



- A** Air intake
- B** Compressor housing
- C** Compressor wheel
- D** Bearing
- E** Oil inlet port
- F** Bearing
- G** Turbine housing
- H** Turbine wheel
- J** Exhaust outlet
- K** Oil outlet port
- L** Exhaust inlet

Component Identification

Figure 290.



- A Air inlet hose
- C Screw
- E Turbocharger
- G Banjo bolt
- J Tube clips
- L Tube assembly 1
- N Bolt 2
- Q Joint 1
- S Bolt 3
- U Gasket 2
- W Tube connector

- B Hose clamp
- D Exhaust elbow
- F Gasket 1
- H Washer
- K Bolt1
- M O-ring
- P Tube assembly 2
- R Joint 2
- T Nut
- V Stud

Operation

The turbocharger is installed between the exhaust manifold and the intake manifold. The turbocharger is driven by exhaust gases which flow through the exhaust inlet. The energy of the exhaust gas turns the turbine wheel. Then, the exhaust gas flows out of the turbine housing through the exhaust outlet.

The turbine wheel and the compressor wheel are installed on the same shaft. Therefore, the turbine wheel and the compressor wheel rotate at the same RPM (Revolutions Per Minute). The compressor wheel is enclosed by the compressor housing. The compressor wheel compresses the intake air. The intake air flows into the engine cylinders through the inlet valves of the cylinders.

The oil from the main gallery of the crankcase flows through the oil inlet port to lubricate the turbocharger bearings (Bearing1 and bearing2). The pressurised oil passes through the bearing housing of the turbocharger. The oil is returned through the oil outlet port to the oil pan.

The turbocharger has a wastegate. The wastegate is controlled by the boost pressure. This allows some of the exhaust gases to bypass the turbine wheel at higher engine speeds. The wastegate is a type of flapper valve that automatically opens at a preset level of boost pressure in order to allow the exhaust gas to flow around the turbine. The wastegate allows the design of the turbocharger to be more effective at lower engine speeds.

Check (Condition)

1. Inspect the compressor and turbine for damage.
2. Make sure that the compressor blades do not rub on the housing and rotate freely. It is normal to detect a bit of play on the blades.
3. Make sure that the shaft rotates freely.
4. Before you install the turbocharger, make sure that the code of the component is correct for the type of engine, as installation of the wrong turbocharger can damage the turbo and engine and void the warranty.



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