



SERVICE MANUAL

TANDEM ROLLER
CT160, CT260

EN - 9813/7750 - ISSUE 1 - 06/2018

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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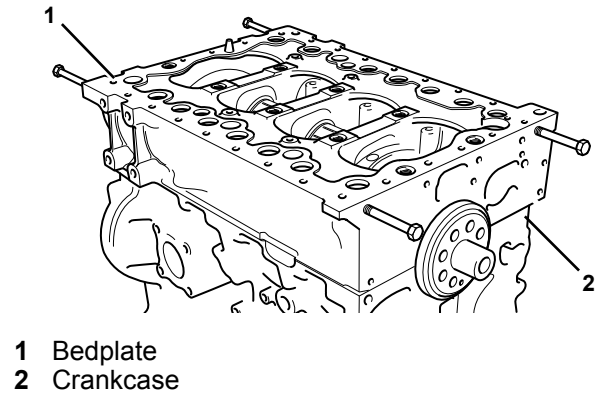
00 - General

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Introduction

The bedplate acts as the main strength component of the engine. it maintains the correct alignment and supports the weight of the internal components.

Figure 52.



Repair

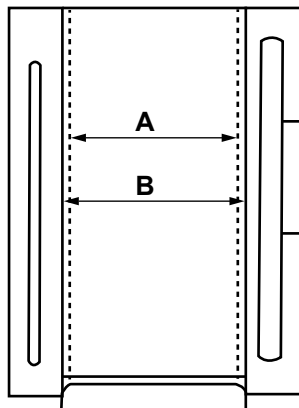
1. When the cylinder is worn beyond the allowable limit, bore and hone it to the specified dimension.

Refer to: PIL 15-00-00.

2. Replace the piston and piston rings with specified oversized.

Dimension: 0.25 mm

Figure 53.



- A** Cylinder inside diameter (Before Correction)
B Cylinder inside diameter (Oversize)

Check (Condition)

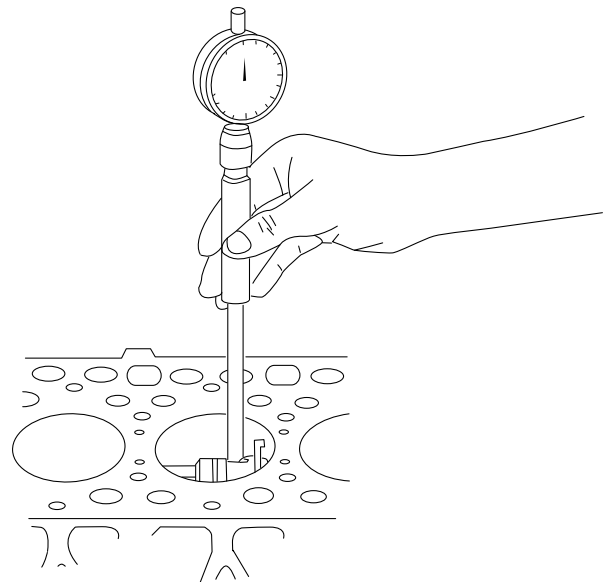
1. Measure the inside diameter of the cylinder at the six positions with a cylinder gauge to find the maximum and minimum inside diameter. Refer to Figure 55.

2. Calculate the difference (Maximum wear) between the maximum and the minimum inside diameter.

3. Make sure that the cylinder inside diameter is within the specified limits.

Refer to: PIL 15-00-00.

Figure 54.



4. If the wear exceeds the allowable limit, bore and hone to the oversize dimension.

5. Check condition of the cylinder wall for scratches. If deep scratches are found, bore the cylinder.

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Hello dear friend!

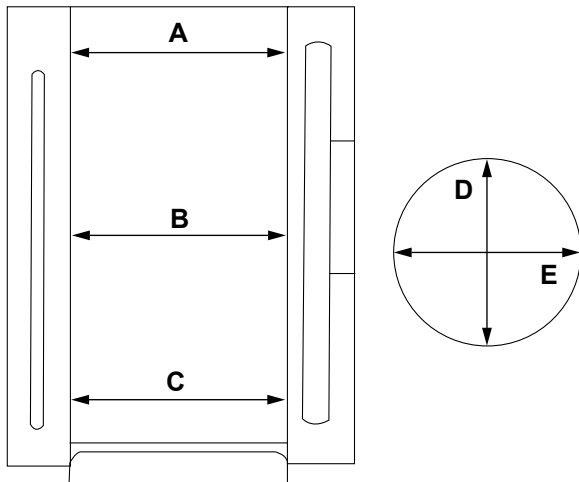
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The full manual is available for immediate download.

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Figure 55.



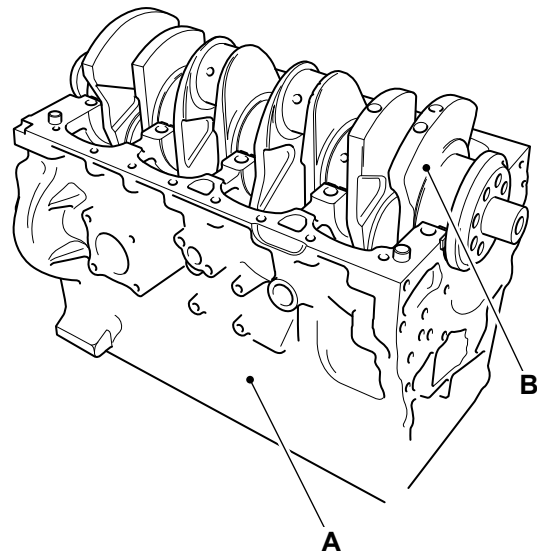
- A** Top
- B** Middle
- C** Bottom (At cylinder skirt)
- D** Right angle to piston pin
- E** Piston pin direction

00 - General

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Introduction

Figure 56.



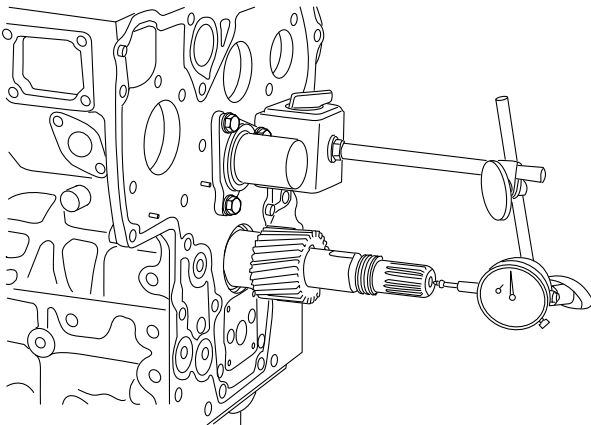
- A** Crankcase
- B** Crankshaft

Check (Condition)

Side Clearance Check

1. Set a DTI (Dial Test Indicator) with its tip on the end of the crankshaft.
2. Move the crankshaft to the front and rear to measure the side clearance.

Figure 57.

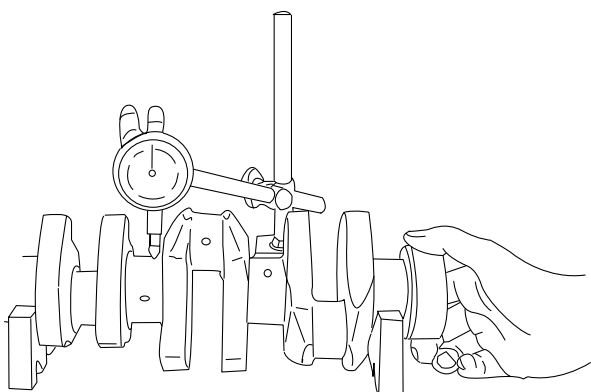


3. Make sure that the side clearance is within the specified limits.
[Refer to: PIL 15-00-00.](#)
4. If the measurement exceeds the allowable limit, replace the thrust bearings.

Alignment Check

1. Support the crankshaft with V-blocks on the surface plate at both end journals.
2. Set a DTI with its tip on the intermediate journal.
3. Measure the crankshaft alignment.

Figure 58.



4. Make sure that the alignment is within the specified limits.

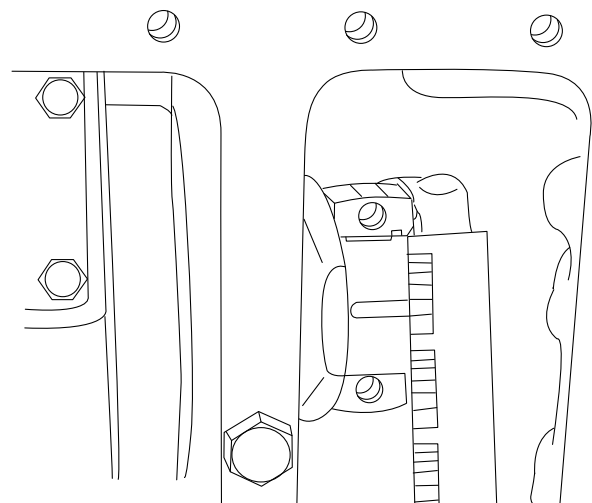
[Refer to: PIL 15-00-00.](#)

5. If the measurement exceeds the allowable limit, replace the crankshaft.

Oil Clearance between Crankpin and Crankpin Bearing

1. Clean the crankpin and crankpin bearing.
2. Put a strip of plastigauge on the centre of the crankpin.
 - 2.1. Do not insert the plastigauge into the crankpin oil hole.
3. Install the connecting rod cap.
4. Tighten the connecting rod screws to the correct torque value.
 - 4.1. Make sure you do not move the crankshaft while the connecting rod screws are tightened.
5. Remove the connecting rod cap.
6. Measure the amount of flattening with the scale, and get the oil clearance.
7. If the oil clearance exceeds the allowable limit, replace the crankpin bearing.

Figure 59.



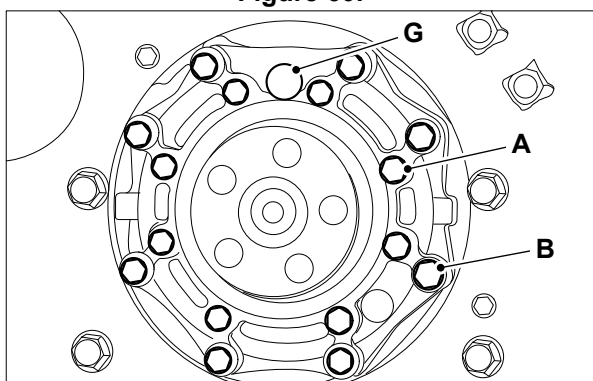
Remove and Install

This procedure is part of the engine disassembly task. The correct sequence of removal of engine components is given in the engine disassembly task.
[Refer to: PIL 15-00-00.](#)

Remove

1. Remove the screws from the bearing case cover.
2. Remove the bearing case cover.

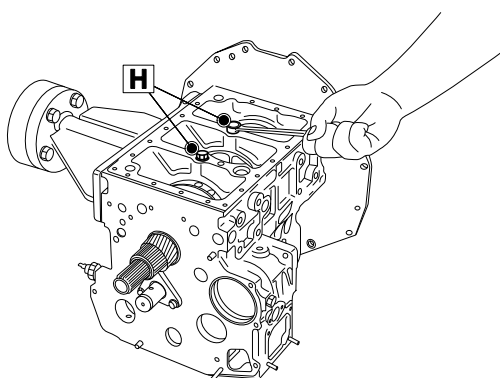
Figure 60.



- A** Bearing case cover mounting screw (inside)
- B** Bearing case cover mounting screw (outside)
- G** Top mark 'UP'

3. Remove the main bearing case screw.
4. Pull out the crankshaft assembly.
5. Take care not to damage the crankshaft bearing 1.

Figure 61.



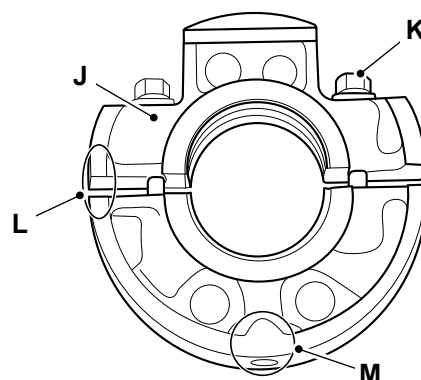
- H** Main bearing case screw

6. Remove the main bearing case assembly.
 - 6.1. Remove the screw 3 (x2) from each main bearing case.
 - 6.2. Remove the main bearing case assembly.

Install

1. The installation procedure is the opposite of the removal procedure. Additionally do the following steps.
2. Install the main bearing case assembly.
 - 2.1. Clean the oil passage in the main bearing case.
 - 2.2. Apply clean engine oil on the bearings.
 - 2.3. Install the main bearing case assemblies in the original positions. Make a note that the diameters of main bearing cases vary, install them in order of markings (A, B for 3 cylinders and A, B, C for 4 cylinders) from the gear case side.

Figure 62.



- J** Main bearing case assembly
- K** Main bearing case screw
- L** Alignment number
- M** Alignment marking

- 2.4. Match the alignment numbers and mark on the main bearing case.

Figure 63.



- J** Main bearing case assembly
- K** Main bearing case screw
- N** Thrust bearing

- 2.5. When installing the main bearing case 1 and 2, face the mark FLYWHEEL to the flywheel.
- 2.6. Install the thrust bearing with its oil groove facing outward.
- 2.7. Make sure that the main bearing case moves smoothly after tightening the main bearing case screw to the specified torque.
Torque: 46 –50 N·m

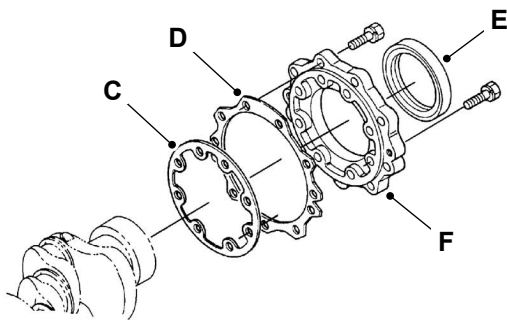
3. Install the crankshaft sub assembly.

- 3.1. Clean the oil passage of the crankshaft with compressed air.
- 3.2. Apply engine oil to the screw.
- 3.3. Align the screw hole of main bearing case with the screw hole of cylinder block.
- 3.4. Tighten the screws the correct torque value.
Torque: 49 –53.9 N·m
- 3.5. Clean the oil passage of the crankshaft with compressed air.

4. Install the bearing case covers.

- 4.1. Install the bearing case gasket and the bearing case cover gasket with correct directions.

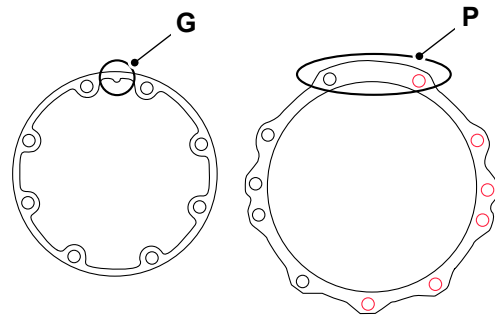
Figure 64.



- C** Bearing case gasket
- D** Bearing case cover gasket
- E** Oil seal
- F** Bearing case cover

- 4.2. Install the bearing case cover to position the casting mark UP on it upward.

Figure 65.



- G** Top mark 'UP'
- P** Up side

- 4.3. Apply engine oil to the oil seal lip. Take care that it does not roll when installing.
- 4.4. Tighten the bearing case cover mounting screws with even force on the diagonal line.
Torque: 9.8 –11.3 N·m

03 - Main Bearing

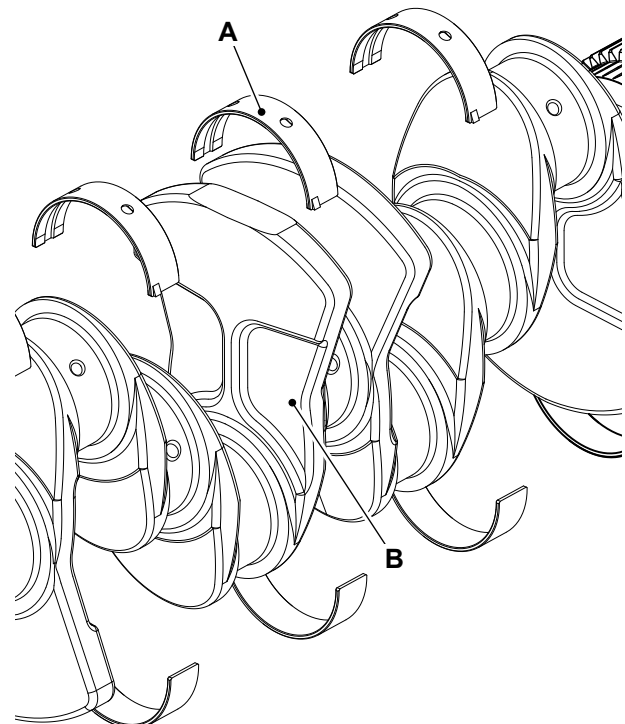
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Introduction

In a piston engine, the main bearings are the bearings on which the crankshaft rotates.

The bearings hold the crankshaft in place and prevent the forces created by the piston and transmitted to the crankshaft by the connecting rods from dislodging the crankshaft, instead forcing the crank to convert the reciprocating movement into rotation.

Figure 66.



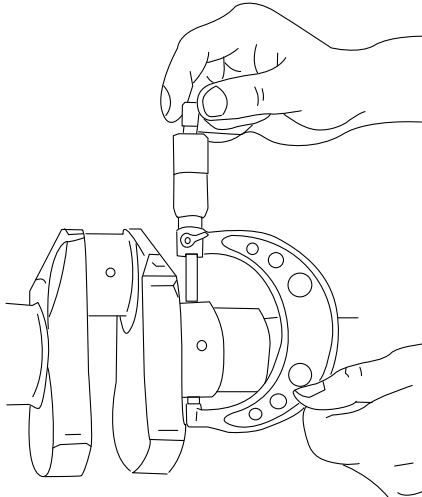
A Main bearing
B Crankshaft

Check (Condition)

1. Measure the oil clearance between the crankshaft journal and crankshaft bearing 1.

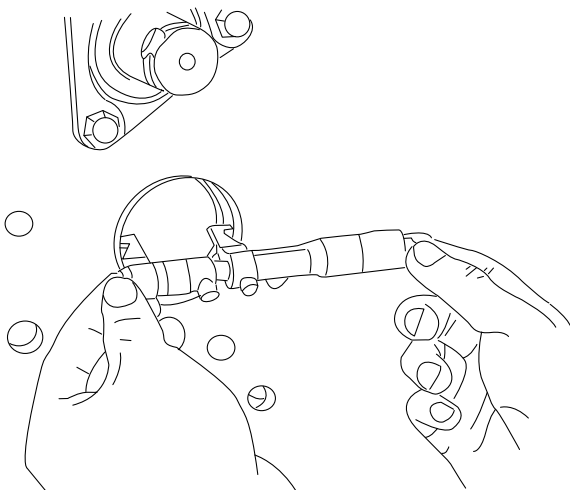
- 1.1. Measure the outside diameter of the crankshaft journal with an outside micrometer.

Figure 67.



- 1.2. Measure the inside diameter of the crankshaft bearing 1 with an inside micrometer.

Figure 68.



- 1.3. Calculate the oil clearance.
- 1.4. Make sure that the clearance is within the specified limits.

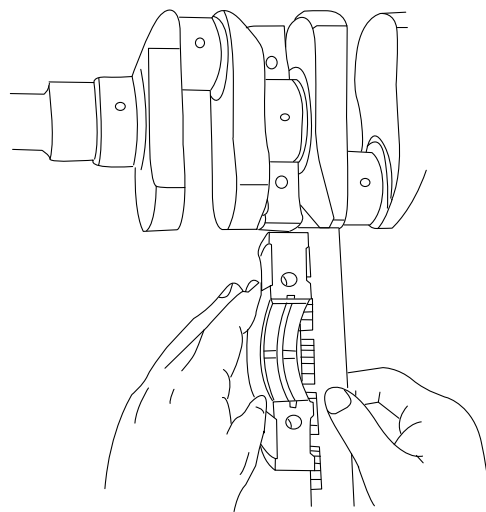
[Refer to: PIL 15-00-00.](#)

- 1.5. If the clearance exceeds the allowable limit, replace the crankshaft bearing 1.

2. Measure the oil clearance between the crankshaft journal and crankshaft bearing 2.

- 2.1. Put a strip of plastigauge on the centre of the journal.
- 2.2. Install the bearing case.
- 2.3. Tighten the bearing case screws to the specified torque value.
- 2.4. Remove the bearing case again.
- 2.5. Measure the amount of the flattening with the scale and get the oil clearance.

Figure 69.



- 2.6. Make sure that the clearance is within the specified limits.

[Refer to: PIL 15-00-00.](#)

- 2.7. If the clearance exceeds the allowable limit, replace the crankshaft bearing 2.
- 2.8. Make sure that you do not move the crankshaft while the bearing case screws are tightened.

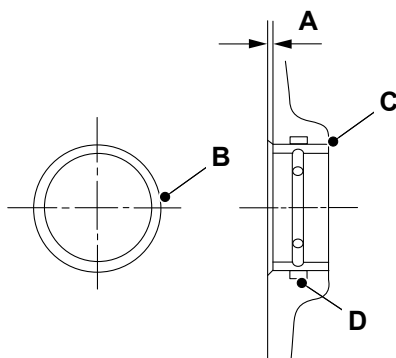
Remove and Install

Remove

1. Remove the crankshaft from the engine.
2. Remove the crankshaft bearing with a suitable crankshaft bearing installation tool.

Refer to: [PIL 78-93](#).

Figure 70.



- A** Dimension A
- B** Seam
- C** Crankshaft bearing
- D** Crankcase

Install

1. Clean a new crankshaft bearing and crankshaft journal bore.
2. Apply clean engine oil to the crankshaft bearing and crankshaft journal bore.
3. Remove the crankshaft bearing with a suitable crankshaft bearing installation tool.

Refer to: [PIL 15-00-00](#).

4. Make sure that the crankshaft seam directs toward the exhaust manifold side.

00 - General

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Introduction

The relationship between the rotation of the camshaft and the rotation of the crankshaft is of critical importance.

Since the valves control the flow of the air/fuel mixture intake and exhaust gases, they must be opened and closed at the appropriate time during the stroke of the piston.

For this reason, the camshaft is connected to the crankshaft through a gear mechanism.

When the engine runs the crankshaft drives the camshaft through the gears. The camshaft opens and closes the inlet and exhaust valves through the push rods in time with the four stroke cycle.

Check (Condition)

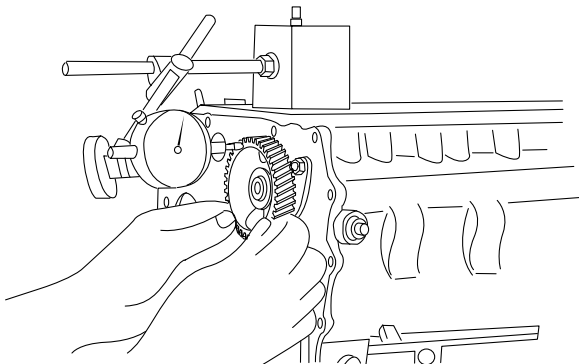
Camshaft Side Clearance

1. Set a DTI (Dial Test Indicator) with its tip on the camshaft.
2. Move the cam gear from front to rear.
3. Measure the side clearance.
4. Make sure that the camshaft side clearance is within the specified limits.

[Refer to: PIL 15-00-00.](#)

5. If the measurement exceeds the allowable limit, replace the camshaft stopper.

Figure 71.



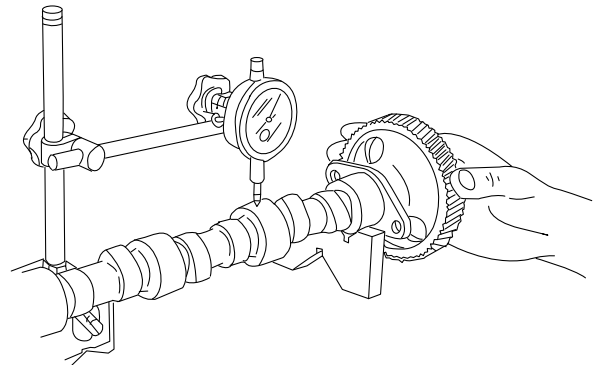
Camshaft Alignment

1. Support the camshaft with V blocks on the surface plate at both end journals.
2. Set a DTI with its tip on the intermediate journal.
3. Measure the camshaft alignment.
4. Make sure that the camshaft alignment is within the specified limits.

[Refer to: PIL 15-00-00.](#)

5. If the measurement exceeds the allowable limit, replace the camshaft.

Figure 72.



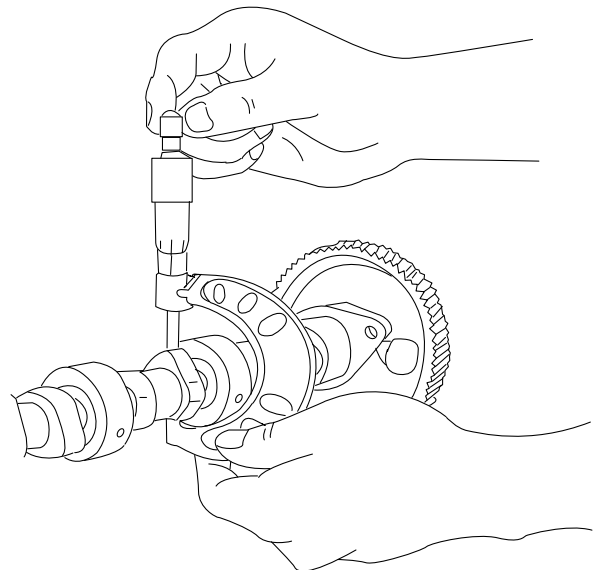
Cam Height

1. Measure the height of the cam at its highest point with an outside micrometer.
2. Make sure that the cam height is within the specified limits.

[Refer to: PIL 15-00-00.](#)

3. If the measurement is less than the allowable limit, replace the camshaft.

Figure 73.

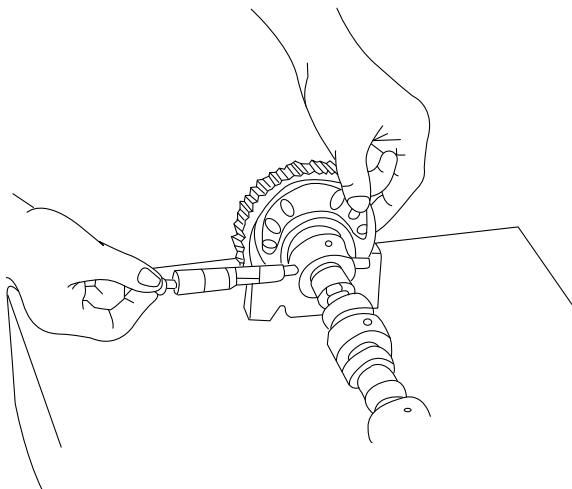


Oil Clearance of Camshaft Journal

1. Measure the camshaft journal outside diameter with an outside micrometer.
2. Make sure that the camshaft journal outside diameter is within the specified limits.

[Refer to: PIL 15-00-00.](#)

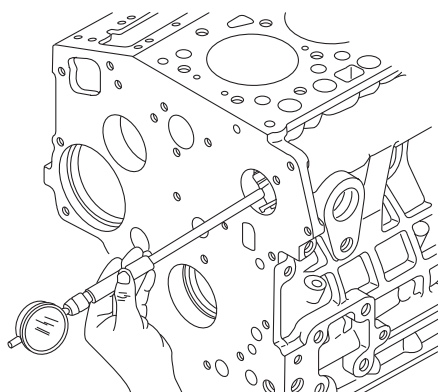
Figure 74.



3. Measure the crankcase bore inside diameter for camshaft with a cylinder gauge.
4. Make sure that the cylinder block bore inside diameter is within the specified limits.

[Refer to: PIL 15-00-00.](#)

Figure 75.



5. Calculate the oil clearance.
 6. Make sure that the oil clearance is within the specified limits.
- [Refer to: PIL 15-00-00.](#)
7. If the oil clearance exceeds the allowable limit, replace the camshaft.

00 - General

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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.*

03 - Drive Belt

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Health and Safety	15-68
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Adjust	15-69

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

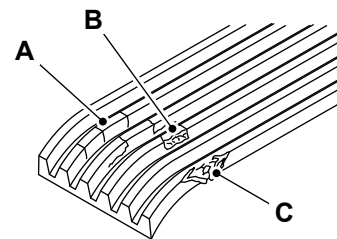
⚠ **Notice:** A drive belt that is loose can cause damage to itself and/or other engine parts.

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 76.



- 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.

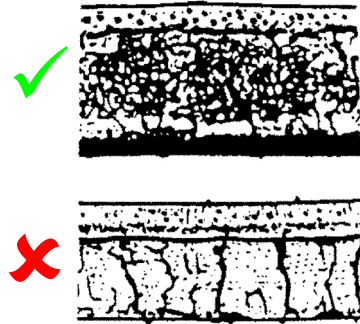
06 - Fan Belt

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Check (Condition)

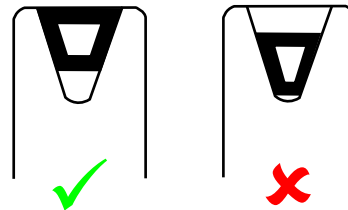
1. Check the condition of the fan belt for damage. Refer to Figure 77.
2. If the fan belt is damaged, replace it.

Figure 77.



3. Check if the fan belt is worn and sunk in the pulley groove. Refer to Figure 78.
4. If the fan belt is nearly worn out and deeply sunk in the pulley groove, replace it.

Figure 78.



Adjust

1. Make the machine safe.
[Refer to: PIL 01-03-27.](#)
2. Remove the ignition key.
3. Apply the approximately specified force with your finger to belt between the pulleys and measure the belt deflection.
Force: 10 kg
4. Make sure that the belt deflection is within the specified limit.
Dimension: 7 –9 mm
5. If necessary, adjust the belt tension.
 - 5.1. Loosen the alternator mounting bolt.
 - 5.2. Pull out the alternator until the deflection of the belt is within the specified limits.
 - 5.3. If damaged, replace the fan belt.
[Refer to: PIL 15-18-06.](#)

Remove and Install

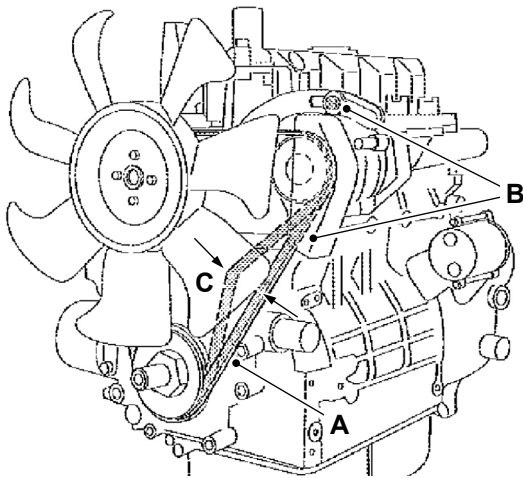
Remove

1. Make the machine safe.
[Refer to: PIL 01-03-27.](#)
2. Open the engine compartment cover.
3. Remove the alternator.
[Refer to: PIL 15-72-00.](#)
4. Remove the fan belt from the engine.

Install

1. The installation procedure is the opposite of the removal procedure. Additionally do the following step.
2. Adjust the fan belt tension.

Figure 79.



- A** Fan belt
B Alternator mounting bolt
C Belt deflection (7 –9 mm at 10 kg force)



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27 - Drive Pulley

Remove and Install

This procedure is part of the engine disassembly task. The correct sequence of removal of engine components is given in the engine disassembly task.

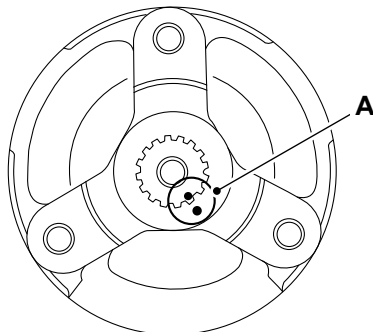
Remove

1. Hold the flywheel with a flywheel locking tool.
2. Remove the screw from the fan drive pulley.
3. Remove the fan drive pulley with a gear puller.

Install

1. The installation procedure is the opposite of the removal procedure. Additionally do the following steps.
2. Align the identification mark on the crankshaft gear and fan drive pulley.

Figure 80.



A Alignment mark

3. Apply engine oil to the screws.
4. Tighten the screws to the correct torque value.

Torque: 235.4 –245.2 N·m

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