

Product: EXCAVATOR

Model: 320D LRR EXCAVATOR FXK

Configuration: 320D RR & 320D LRR Excavators FXK00001-UP (MACHINE) POWERED BY 3066 Engine

## Disassembly and Assembly 3064 and 3066 Engines for Caterpillar Built Machines

Media Number -SEN5553-10

Publication Date -01/05/2012

Date Updated -15/05/2012

i03706683

# Crankshaft Main Bearings - Remove

SMCS - 1203-011

## Removal Procedure

### Start By:

- a. Remove the crankshaft. Refer to Disassembly and Assembly, "Crankshaft - Remove".

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### NOTICE

**Keep all parts clean from contaminants.**

**Contaminants may cause rapid wear and shortened component life.**

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Illustration 1

g00602470

1. Remove the main bearings (1) (upper shell) from the main bearing housing of the engine cylinder block. The 3066 Engine has seven main bearings while the 3064 Engine has five main bearings.
2. Remove thrust washers (2) from the cylinder block and from the rear main cap.

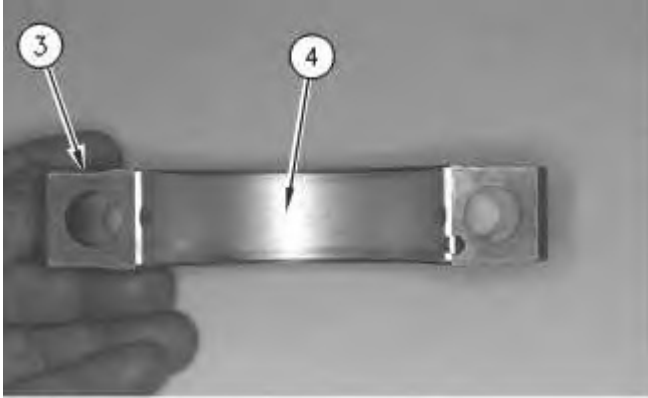


Illustration 2

g00602678

3. Remove the lower halves of the crankshaft main bearings (4) from the main bearing cap (3).

**Note:** Be careful not to damage the bearings. Mark each main bearing in order to ensure installation in the original location.

**Note:** Check the condition of the crankshaft main bearings. Refer to the Guideline For Reusable Parts, SEBF8009, "Main and Connecting Rod Bearings" or refer to the Guideline For Reusable Parts, SEBV0544, "Engine Bearings and Crankshafts".

**Note:** Refer to the Specifications Module, "Main Bearing Journal" for more information on crankshaft main bearings and the main bearing journals.

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i01135299

# Crankshaft Main Bearings - Install

SMCS - 1203-012

## Installation Procedure

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### NOTICE

**Keep all parts clean from contaminants.**

**Contaminants may cause rapid wear and shortened component life.**

---



Illustration 1

g00602470

1. Install the upper halves of the crankshaft main bearings (1) in the main bearing housing of the cylinder block.

**Note:** Ensure that the main bearing tab fits in the tab groove of the bearing housing of the cylinder block.

2. Install thrust washers (2) into the cylinder block and the rear main cap.

**Note:** Install the thrust washers with the oil grooves toward the outside.

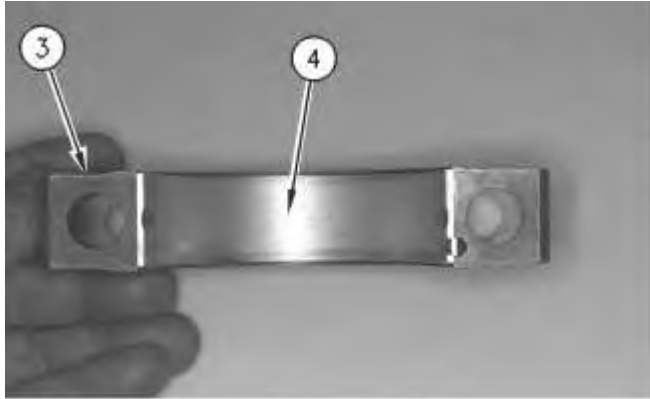


Illustration 2

g00602678

3. Install the lower halves of the crankshaft main bearings (4) into the crankshaft main bearing caps (3).

**Note:** Ensure that the main bearing tab fits in the tab groove of the crankshaft main bearing cap.

**End By:**

- a. Install the crankshaft. Refer to Disassembly and Assembly, "Crankshaft - Install".
-

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Publication Date -01/05/2012

Date Updated -15/05/2012

i01576856

# Crankshaft - Remove

SMCS - 1202-011

## Removal Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A	6V-9120	Socket <sup>(1)</sup>	1

<sup>(1)</sup> Tool (A) is a 46 mm socket.

### Start By:

- A. Remove the front housing. Refer to Disassembly and Assembly, "Housing (Front) - Remove".
- B. Remove the crankshaft rear seal. Refer to Disassembly and Assembly, "Crankshaft Rear Seal - Remove".
- C. Remove the flywheel housing. Refer to Disassembly and Assembly, "Flywheel Housing - Remove and Install".
- D. Remove the engine oil pan. Refer to Disassembly and Assembly, "Engine Oil Pan - Remove and Install".

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### NOTICE

**Keep all parts clean from contaminants.**

**Contaminants may cause rapid wear and shortened component life.**

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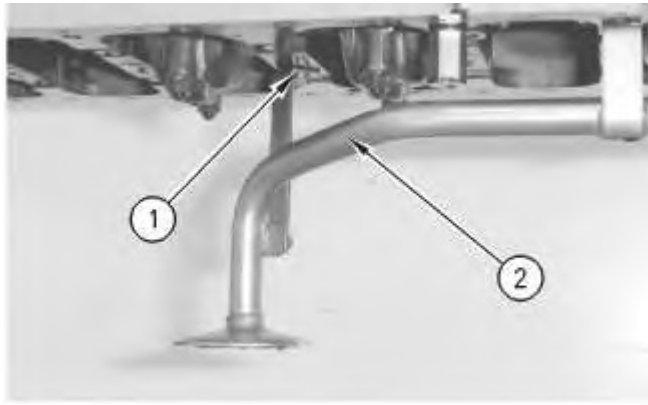


Illustration 1

g00604627

1. Remove two bolts (1) from oil supply tube (2). Remove oil supply tube (2) from the engine cylinder block.



Illustration 2

g00604637

2. Check condition of the O-ring seal (3) on the oil supply tube (2). If the O-ring is damaged, use a new part for replacement.

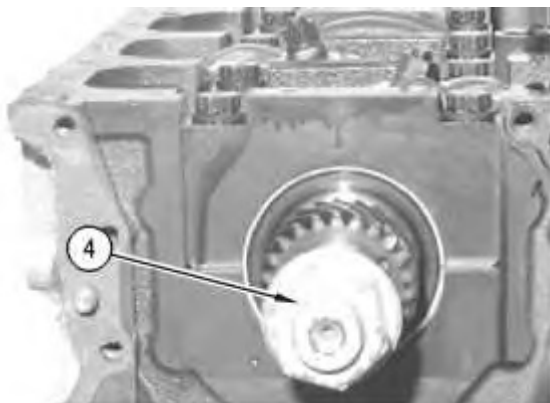


Illustration 3

g00604549

3. Install nut (4) and the washer onto the crankshaft. Use Tool (A) to turn the crankshaft.

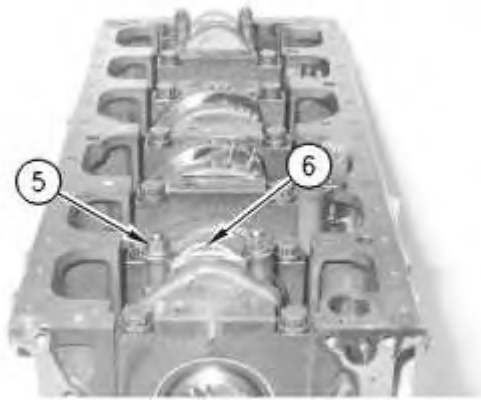


Illustration 4

g00604552

4. Remove nuts and bolts (5) that secure connecting rod caps (6) to the connecting rods. Remove connecting rod caps (6) from the connecting rods.

**Note:** Be careful not to damage the bearings. Mark each connecting rod cap and the bearing in order to ensure installation in the original location.

5. Carefully push the connecting rods and the pistons into the top of bores.

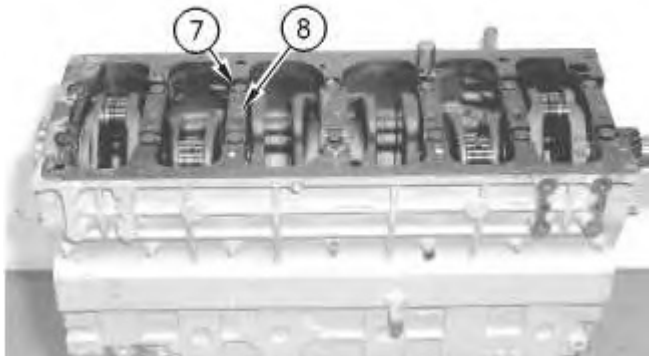


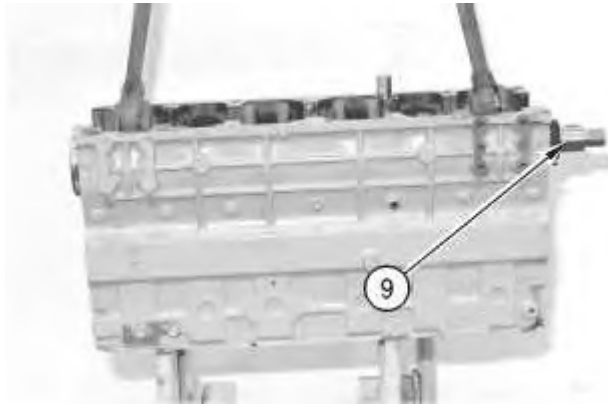
Illustration 5

g00604582

6. Remove bolts (7) that secure crankshaft main bearing caps (8) in position in the engine cylinder block. Remove crankshaft main bearing caps (8) from the engine.

**Note:** Be careful not to damage the bearings. Mark each crankshaft main bearing cap and the bearing in order to ensure installation in the original location.

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Illustration 6

g00604584

7. Fasten a suitable lifting device and straps to crankshaft (9). Remove the crankshaft. The weight of the crankshaft for the 3064 engine is 84 kg (185 lb). The weight of the crankshaft for the 3066 engine is 99 kg (220 lb).

**Note:** Be careful not to damage the finished surfaces on the crankshaft.



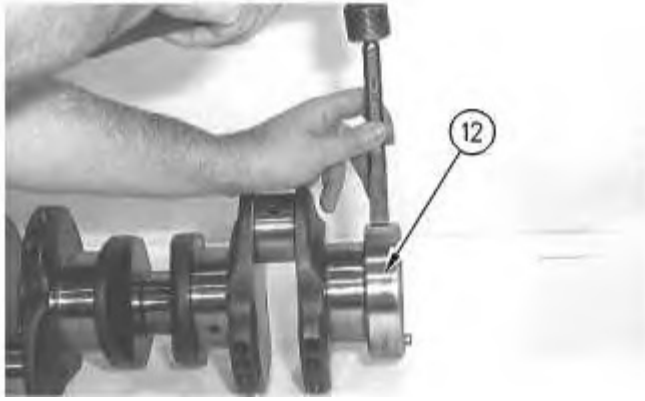
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Illustration 7

g00604687

8. Remove the upper halves of crankshaft main bearings (10). If necessary, remove thrust washers (11).
-





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Illustration 8

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9. If necessary, use a hammer and a chisel to remove the wear sleeve (12) for the crankshaft rear seal. Hold the chisel at right angles to the surface of the wear sleeve. Tap the wear sleeve in three places. You can remove the wear sleeve once the tension is released.

**Note:** When you are removing the wear sleeve, take extreme care not to damage the crankshaft.

**Note:** Take extreme care not to damage the wear sleeve, if it is not necessary to remove the wear sleeve.

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Publication Date -01/05/2012

Date Updated -15/05/2012

i01568784

# Crankshaft - Install

SMCS - 1202-012

## Installation Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A	6V-9120	Socket <sup>(1)</sup>	1
B	8T-5096	Dial Indicator	1

<sup>(1)</sup> Tool (A) is a 46 mm socket.

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### NOTICE

**Keep all parts clean from contaminants.**

**Contaminants may cause rapid wear and shortened component life.**

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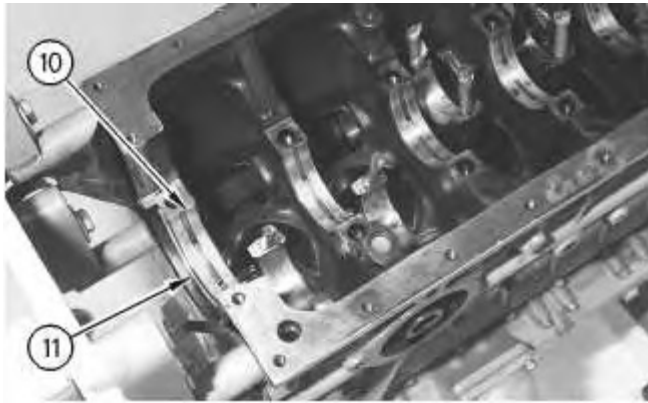


Illustration 1

g00604687

1. If the thrust washers were removed, then install a thrust washer (11) on the rear face of the crankshaft with the oil groove toward the outside.
2. Place the upper halves of crankshaft main bearings (10) in the cylinder block. Place the lower halves of the crankshaft main bearings in crankshaft main bearing caps. Install the bearings with the main bearing tabs in the correct position. Lubricate the bearings with clean engine oil.

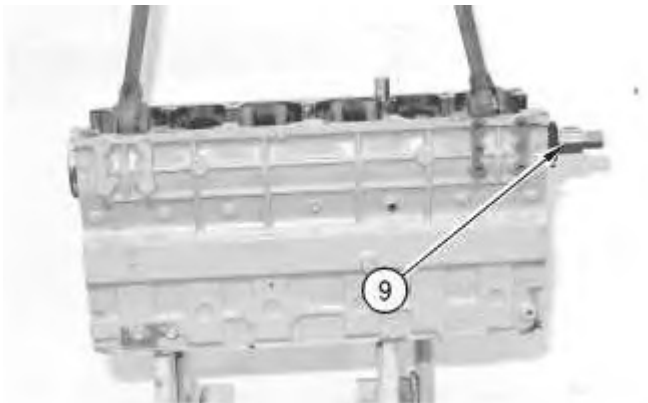


Illustration 2

g00604584

3. Lubricate the crankshaft journals with clean engine oil. Fasten a suitable lifting device and straps to crankshaft (9). The weight of the crankshaft for the 3064 engine is 84 kg (185 lb). The weight of the crankshaft for the 3066 engine is 99 kg (220 lb). Position crankshaft (9) onto the upper halves of the crankshaft main bearings.

**Note:** Be careful not to damage the finished surfaces on the crankshaft.

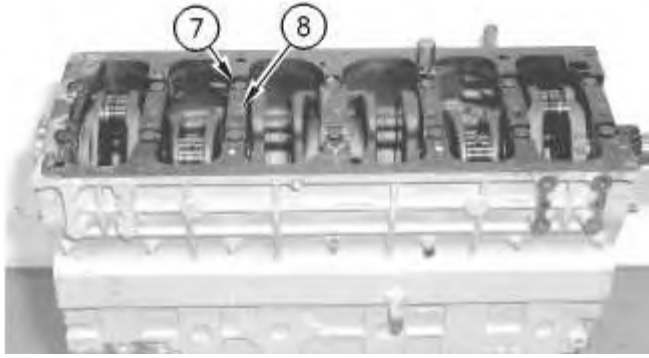


Illustration 3

g00604582

4. Install main bearings into main bearing caps (8). Install the bearings with the main bearing tabs in the correct position. Lubricate the bearings with clean engine oil.
5. Place the thrust washers on the rear main bearing cap. Install the rear main bearing cap and two seals on the rear journal of the cylinder block.
6. Install crankshaft main bearing caps (8). Put clean engine oil on the threads of the main bearing cap bolts. Install main bearing cap bolts (7). Tighten the bolts evenly to a torque of  $137 \pm 5 \text{ N}\cdot\text{m}$  ( $101 \pm 4 \text{ lb ft}$ ).

**Note:** Ensure that the crankshaft main bearing caps are installed in the original locations.

7. Cut off the excess length on the two seals on the rear journal of the cylinder block.

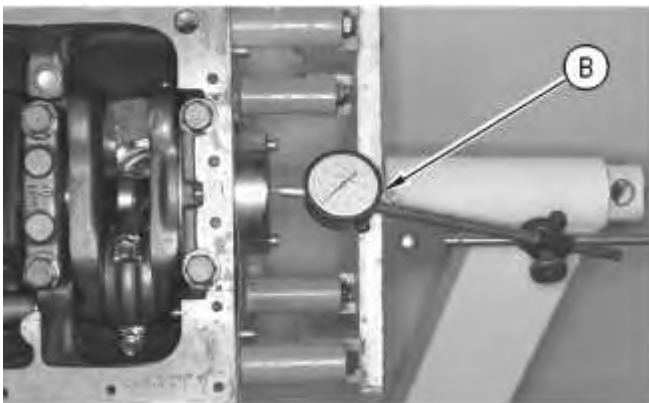
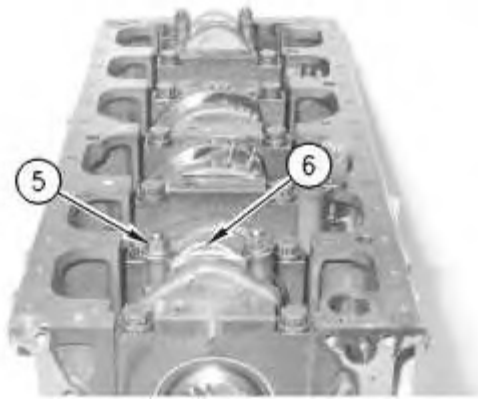


Illustration 4

g00604753

8. Check the end play of the crankshaft with Tool (B). The end play must be 0.100 to 0.264 mm (0.0039 to 0.0104 inch). Refer to the Testing and Adjusting Module, "Basic Block" for more information on crankshaft end play.



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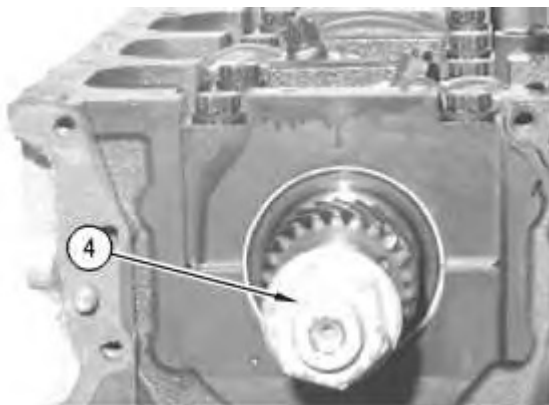
Illustration 5

g00604552

9. Apply a light coat of clean engine oil to the connecting rod bearing surfaces and to the connecting rod journals. Install the connecting rods onto the connecting rod journals.
10. Install the lower half of the connecting bearings into the corresponding connecting rod caps and install connecting rod caps (6) .

**Note:** Align the tabs on the back of the connecting rod bearings with the tab grooves in the connecting rod caps.

Install the pistons and connecting rods. Refer to Disassembly and Assembly, "Pistons and Connecting Rods - Install".



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Illustration 6

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11. Check for free crankshaft rotation by rotating the crankshaft for two complete revolutions. Use Tool (A) on crankshaft pulley nut (4) in order to rotate the crankshaft.
-



Illustration 7

g00604637

12. Install O-ring seal (3) on oil supply tube (2) .

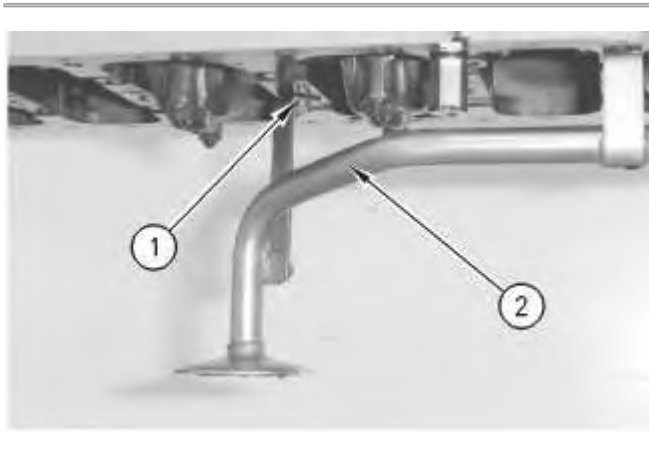


Illustration 8

g00604627

13. Position oil supply tube (2). Install two bolts (1) in order to secure the oil supply tube to the cylinder block.

**End By:**

- a. Install the engine oil pan. Refer to Disassembly and Assembly, "Engine Oil Pan - Remove and Install".
  - b. Install the flywheel housing. Refer to Disassembly and Assembly, "Flywheel Housing - Remove and Install".
  - c. Install the front housing. Refer to Disassembly and Assembly, "Housing (Front) - Install".
  - d. Install the crankshaft rear seal, if the crankshaft wear sleeve was removed. Refer to Disassembly and Assembly, "Crankshaft Rear Seal - Install".
-

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Media Number -SEN5553-10

Publication Date -01/05/2012

Date Updated -15/05/2012

i01131265

# Crankshaft Gear - Remove and Install

SMCS - 1204-010-GE

## Removal Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A	1P-0820	Hydraulic Puller	1
	9U-6600	Hand Hydraulic Pump	1
	0S-2398	Step Plate	1
	3H-0468	Puller Plate	4
	8B-7549	Puller Leg	2
	1B-4207	Full Nut	2
	8B-7551	Bearing Puller	1

### Start By:

- a. Remove the crankshaft. Refer to Disassembly and Assembly, "Crankshaft - Remove".
-

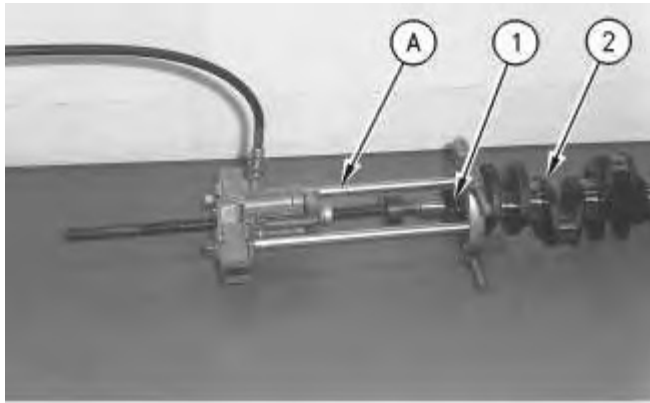


Illustration 1

g00541880

1. Use Tool (A) to remove crankshaft gear (1) from crankshaft (2).

**Note:** Do not remove the gear by tapping with a hammer.

**Note:** Be careful not to damage the finished surfaces on the crankshaft.

2. Check the key on the crankshaft. If the key is damaged, use a new part for replacement.

## Installation Procedure

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### NOTICE

**Keep all parts clean from contaminants.**

**Contaminants may cause rapid wear and shortened component life.**

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**Always wear protective gloves when handling parts that have been heated.**

---

1. Use an oven and heat the crankshaft gear to a temperature of about 100 °C (212 °F). The crankshaft gear is heated in order to ease installation of the crankshaft gear.



**Wear eye protection in order to prevent possible personal injury while performing the following steps.**



---

**Note:** Be careful not to damage the finished surfaces on the crankshaft.

2. Install the crankshaft gear on the end of the crankshaft. Ensure that the key in the crankshaft is aligned with the keyway in the gear. Tap lightly with a copper hammer until the crankshaft gear is seated. Ensure that the crankshaft gear is seated against the shoulder on the crankshaft.

**Note:** Ensure that the timing marks of the crankshaft gear are on the front.

**End By:**

- a. Install the crankshaft. Refer to Disassembly and Assembly, "Crankshaft - Install".
-

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Date Updated -15/05/2012

i05977048

## Bearing Clearance - Check

SMCS - 1203-535; 1219-535

## Measurement Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A	198-9142	Plastic Gauge (Green) 0.025 to 0.076 mm (0.001 to 0.003 inch)	1
	198-9143	Plastic Gauge (Red) 0.051 to 0.152 mm (0.002 to 0.006 inch)	1
	198-9144	Plastic Gauge (Blue) 0.102 to 0.229 mm (0.004 to 0.009 inch)	1
	198-9145	Plastic Gauge (Yellow) 0.230 to 0.510 mm (0.009 to 0.020 inch)	1

**Note:** Plastic gauge may not be necessary when the engine is in the chassis.

---

### NOTICE

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**Contaminants may cause rapid wear and shortened component life.**

---

**Note:** Cat does not recommend the checking of the actual bearing clearances particularly on small engines. This is because of the possibility of obtaining inaccurate results and the possibility of damaging the bearing or the journal surfaces. Each Cat engine bearing is quality checked for specific wall thickness.

**Note:** The measurements should be within specifications and the correct bearings should be used. If the crankshaft journals and the bores for the block and the rods were measured during disassembly, no further checks are necessary. However, if the technician still wants to measure the bearing clearances, Tooling (A) is an acceptable method. Tooling (A) is less accurate on journals with small diameters if clearances are less than 0.10 mm (0.004 inch).

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## **NOTICE**

**Lead wire, shim stock or a dial bore gauge can damage the bearing surfaces.**

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The technician must be very careful to use Tooling (A) correctly. The following points must be remembered:

- Ensure that the backs of the bearings and the bores are clean and dry.
- Ensure that the bearing locking tabs are properly seated in the tab grooves.
- The crankshaft must be free of oil at the contact points of Tooling (A).

1. Put a piece of Tooling (A) on the crown of the bearing that is in the cap.

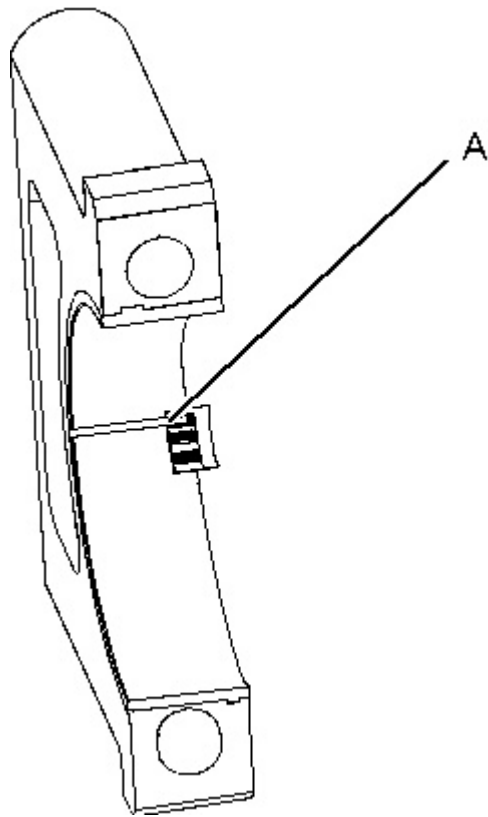
**Note:** Do not allow Tooling (A) to extend over the edge of the bearing.

2. Use the correct torque-turn specifications in order to install the bearing cap. Do not use an impact wrench. Be careful not to dislodge the bearing when the cap is installed.

**Note:** Do not turn the crankshaft when Tooling (A) is installed.

3. Carefully remove the cap, but do not remove Tooling (A). Measure the width of Tooling (A) while Tooling (A) is in the bearing cap or on the crankshaft journal. Refer to Illustration 1.

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Illustration 1  
Typical Example

g01152855

4. Remove all of Tooling (A) before you install the bearing cap.

**Note:** When Tooling (A) is used, the readings can sometimes be unclear. For example, all parts of Tooling (A) are not the same width. Measure the major width in order to ensure that the parts are within the specification range. Refer to Specifications Manual, "Connecting Rod Bearing Journal" and Specifications Manual, "Main Bearing Journal" for the correct clearances.

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Media Number -SEN5553-10

Publication Date -01/05/2012

Date Updated -15/05/2012

i01569484

# **Coolant Temperature Switch - Remove and Install**

SMCS - 1906-010

## **Removal Procedure**



**Personal injury can result from hot coolant, steam and alkali.**

**At operating temperature, engine coolant is hot and under pressure. The radiator and all lines to heaters or the engine contain hot coolant or steam. Any contact can cause severe burns.**

**Remove cooling system pressure cap slowly to relieve pressure only when engine is stopped and cooling system pressure cap is cool enough to touch with your bare hand.**

**Do not attempt to tighten hose connections when the coolant is hot, the hose can come off causing burns.**

**Cooling System Coolant Additive contains alkali. Avoid contact with skin and eyes.**

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## **NOTICE**

**Keep all parts clean from contaminants.**

**Contaminants may cause rapid wear and shortened component life.**

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## NOTICE

**Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.**

**Refer to Special Publication, NENG2500, "Caterpillar Tools and Shop Products Guide" for tools and supplies suitable to collect and contain fluids on Caterpillar products.**

**Dispose of all fluids according to local regulations and mandates.**

---

1. Drain the level of coolant from the radiator below the coolant temperature switch. Drain the coolant into a suitable container for storage or disposal.
2. Disconnect the electrical connection to the coolant temperature switch.



Illustration 1

g00814982

3. Remove coolant temperature switch (1) from the elbow.

## Installation Procedure

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### NOTICE

**Keep all parts clean from contaminants.**

**Contaminants may cause rapid wear and shortened component life.**

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1. Apply a thin coat of **5P-3413** Pipe Sealant to coolant temperature switch (1) .



Illustration 2

g00814982

2. Install coolant temperature switch (1). Tighten coolant temperature switch (1) to a torque of 7 to 12 N·m (62 to 106 lb in).
  3. Reconnect the electrical connection to the coolant temperature switch.
  4. Fill the cooling system with coolant to the correct level. Refer to the Operation and Maintenance Manual, "Refill Capacities" topic for more information.
-

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Media Number -SEN5553-10

Publication Date -01/05/2012

Date Updated -15/05/2012

i01569542

# **Engine Oil Pressure Switch - Remove and Install**

SMCS - 1924

## **Removal Procedure**

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### **NOTICE**

**Keep all parts clean from contaminants.**

**Contaminants may cause rapid wear and shortened component life.**

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### **NOTICE**

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**Dispose of all fluids according to local regulations and mandates.**

---

**Note:** Disconnect all electrical connections to the engine oil pressure switch before proceeding. Mark all connections for later installation.





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