

Product: INDUSTRIAL ENGINE  
Model: C15 INDUSTRIAL ENGINE LDN  
Configuration: C15 Industrial Engine LDN00001-UP

## Disassembly and Assembly C15 and C18 Industrial Engines

Media Number -UENR0112-05

Publication Date -01/11/2017

Date Updated -20/11/2017

i04557373

# Vibration Damper and Pulley - Remove and Install

SMCS - 1205-010

## Removal Procedure

Table 1

| Required Tools |             |                                     |     |
|----------------|-------------|-------------------------------------|-----|
| Tool           | Part Number | Part Description                    | Qty |
| A              | -           | Guide Bolt<br>5/8 - 18 NF by 7 inch | 1   |
| B              | 4C-5593     | Thread Lubricant                    | -   |

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### NOTICE

**Keep all parts clean from contaminants.**

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

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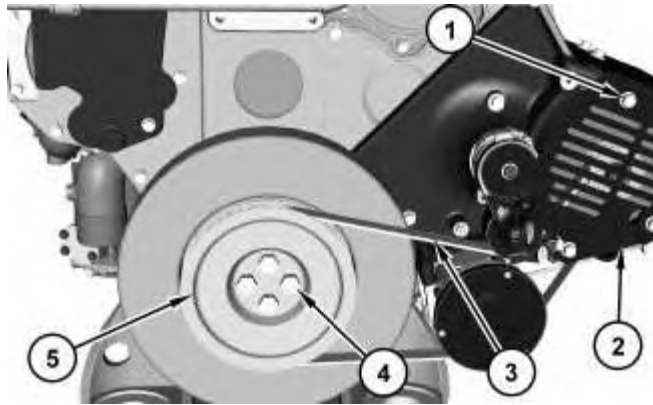


Illustration 1

g02160891

1. Remove bolts (1) and remove guard (2) .
2. Release the tension on the belt tensioner in order to position belt (3) out of the way.
3. Remove bolts (4) and remove pulley (5) .

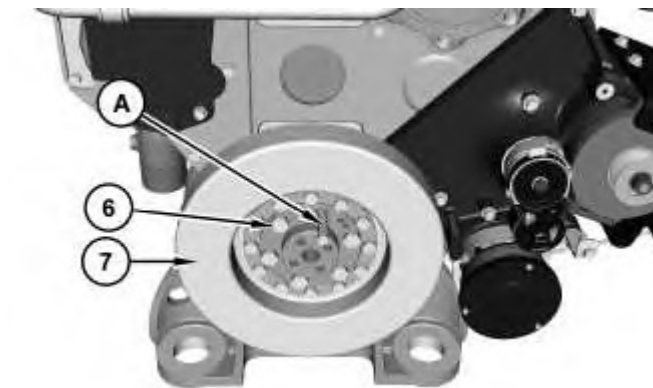
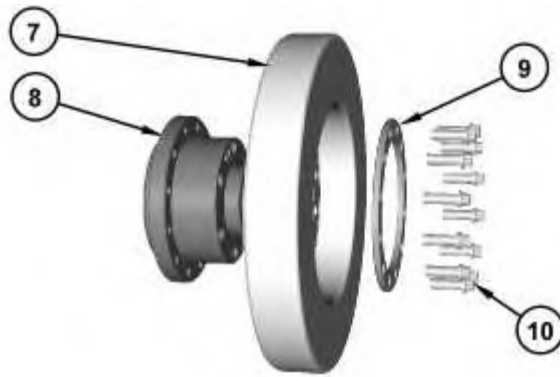


Illustration 2

g02160924

4. Remove one bolt (6) and install Tooling (A) .
5. Remove remaining bolts (6) . Use two people in order to remove vibration damper assembly (7) . The weight of vibration damper assembly (2) is approximately 46 kg (100 lb).



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Illustration 3

g02161096

6. Remove bolts (10) and remove spacer (9) .
7. Separate damper (7) from adapter (8) .

## Installation Procedure

1. Install vibration damper (7) in the reverse order.
    - a. Apply Tooling (B) to bolts (6) .
    - b. Tighten bolts (6) to a torque of  $270 \pm 40$  N·m ( $200 \pm 30$  lb ft).
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i02507762

### Crankshaft Front Seal - Remove

SMCS - 1160-011

### Removal Procedure

Table 1

| Required Tools |             |                     |     |
|----------------|-------------|---------------------|-----|
| Tool           | Part Number | Part Description    | Qty |
| A              | 1U-7600     | Slide Hammer Puller | 1   |

#### Start By:

- a. Remove the vibration damper and the pulley. Refer to Disassembly and Assembly, "Vibration Damper and Pulley - Remove and Install".

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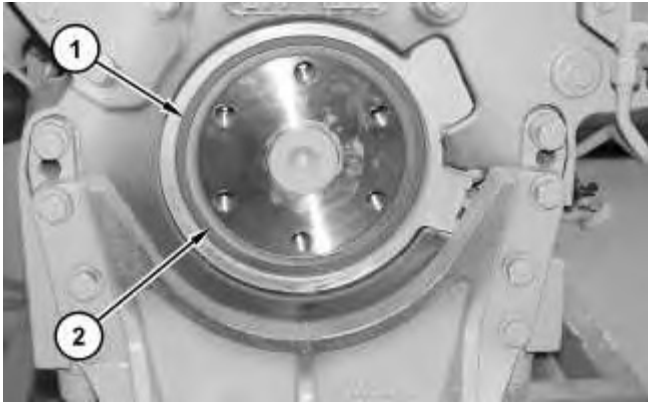
#### NOTICE

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Illustration 1

g01255652

1. If necessary, use Tooling (A) or a punch and hammer in order to puncture three or more holes in wear sleeve (1).
  2. If necessary, use Tooling (A) in order to remove wear sleeve (1).
  3. Use Tooling (A) or a punch and hammer in order to puncture three or more holes in crankshaft front seal (2).
  4. Use Tooling (A) in order to remove crankshaft front seal (2).
-

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i02507763

# Crankshaft Front Seal - Install

SMCS - 1160-012

## Installation Procedure

Table 1

| Required Tools |             |                      |     |
|----------------|-------------|----------------------|-----|
| Tool           | Part Number | Part Description     | Qty |
| B              | 5P-1733     | Seal Locator         | 1   |
| C              | 5P-1737     | Bolt                 | 3   |
| D              | 9S-8858     | Nut (Seal Installer) | 1   |
| E              | 6V-6142     | Seal Installer       | 1   |

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**Note:** Do not use any type of lubricant during the installation of the crankshaft front seal and the wear sleeve.

1. Before installation of the crankshaft front seal and the wear sleeve, inspect the crankshaft for scratches. Also, inspect the crankshaft for any distortion on the surface that may lead to an out of round condition. Use a polishing cloth in order to remove any imperfections on the crankshaft.

2. Clean the outside diameter of the crankshaft.

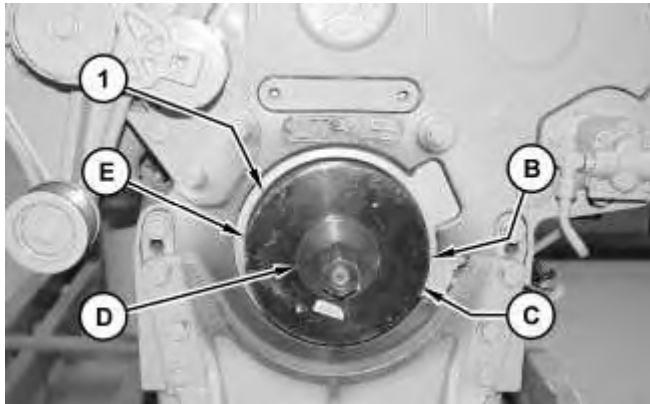


Illustration 1

g01255654

3. Use Tooling (C) in order to attach Tooling (B) to the crankshaft.

**Note:** Install the crankshaft front seal with the arrow that shows the direction of crankshaft rotation toward the front of the engine.

4. Position wear sleeve (2) and crankshaft front seal (1) as a unit on Tooling (B). Install Tooling (E) on Tooling (B). Lubricate the face of the washer on Tooling (D). Install Tooling (D) on Tooling (B).
5. Tighten Tooling (D) until Tooling (E) contacts Tooling (B).
6. Remove Tooling (D) and Tooling (E) from Tooling (B).
7. Remove Tooling (C) and Tooling (B) from the crankshaft.

**End By:**

- a. Install the vibration damper and the pulley. Refer to Disassembly and Assembly, "Vibration Damper and Pulley - Remove and Install".
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Publication Date -01/11/2017

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i06902195

# Front Cover - Remove and Install

SMCS - 1166-010

## Removal Procedure

Table 1

| Required Tools |             |                            |     |
|----------------|-------------|----------------------------|-----|
| Tool           | Part Number | Part Description           | Qty |
| A              | 193-9199    | Socket As                  | 1   |
| B              | -           | LOCTITE 263                | -   |
|                | -           | LOCTITE 270 <sup>(1)</sup> | -   |

<sup>(1)</sup> Europe Only

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### NOTICE

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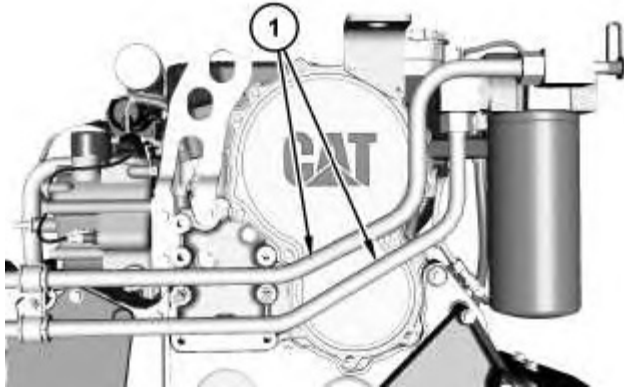


Illustration 1

g02161453

1. Remove tube assemblies (1).

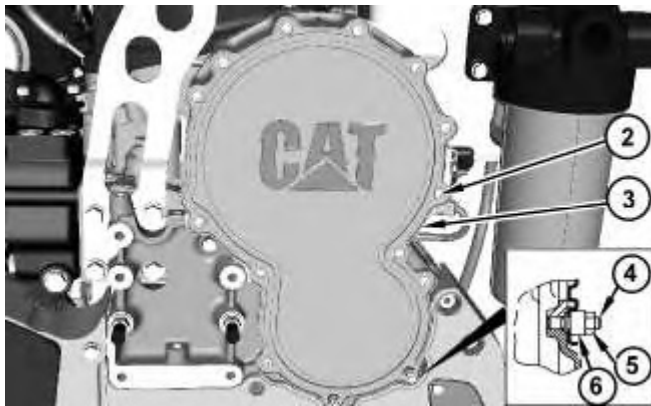


Illustration 2

g01865343

2. Use Tooling (A) to remove button head screws (2).
3. Remove nuts (5) and spacers (6) from studs (4).
4. Remove front cover (3) from the front housing. Remove the seal from the front cover.

## Installation Procedure

1. Install the front cover in reverse order.
  - a. Tighten button head screws (2) to a torque of  $21 \pm 3$  N·m ( $186 \pm 27$  lb in).
  - b. Apply Tooling (B) to studs (4) prior to installation.

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i02519560

### Gear Group (Front) - Remove

SMCS - 1206-011

### Removal Procedure

Table 1

| Required Tools |             |                  |     |
|----------------|-------------|------------------|-----|
| Tool           | Part Number | Part Description | Qty |
| A              | 1P-0510     | Driver Group     | 1   |

#### Start By:

- Remove the front housing. Refer to Disassembly and Assembly, "Housing (Front) - Remove".
- Remove the air compressor, if necessary. Refer to Disassembly and Assembly, "Air Compressor - Remove and Install".
- Remove the water pump, if necessary. Refer to Disassembly and Assembly, "Water Pump - Remove".

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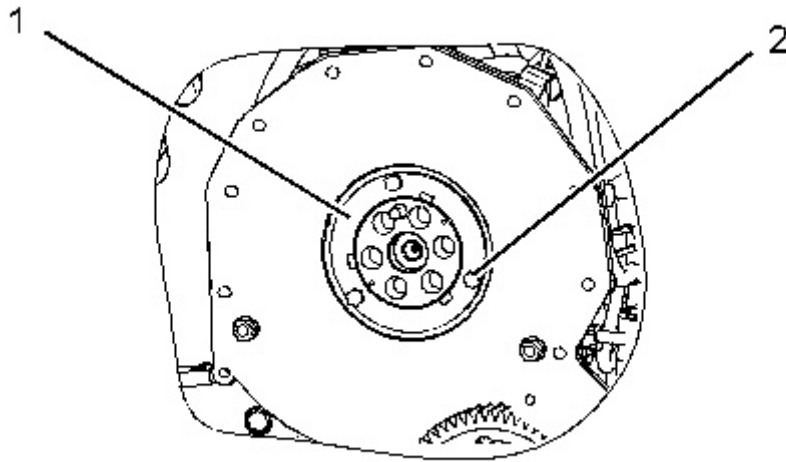
#### NOTICE

**Do not turn the crankshaft or the camshaft while the camshaft gear is removed. If the front gear group is not correctly timed during installation, interference can occur between the pistons and the valves, resulting in damage to the engine.**

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**Note:** Be sure to mark the orientation of each of the gears for installation purposes.

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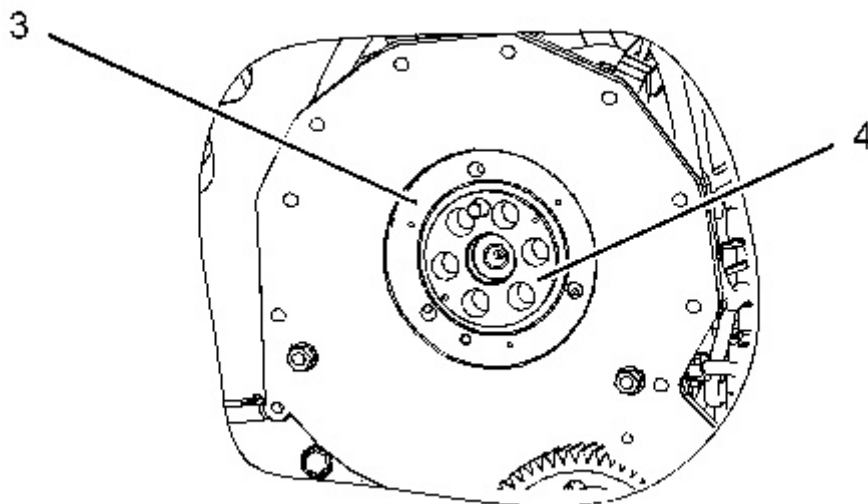


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Illustration 1

g01008429

1. Remove bolts (2) and thrust plate (1).
- 



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Illustration 2

g01008430

2. Remove sealing plate (3) and adapter (4).

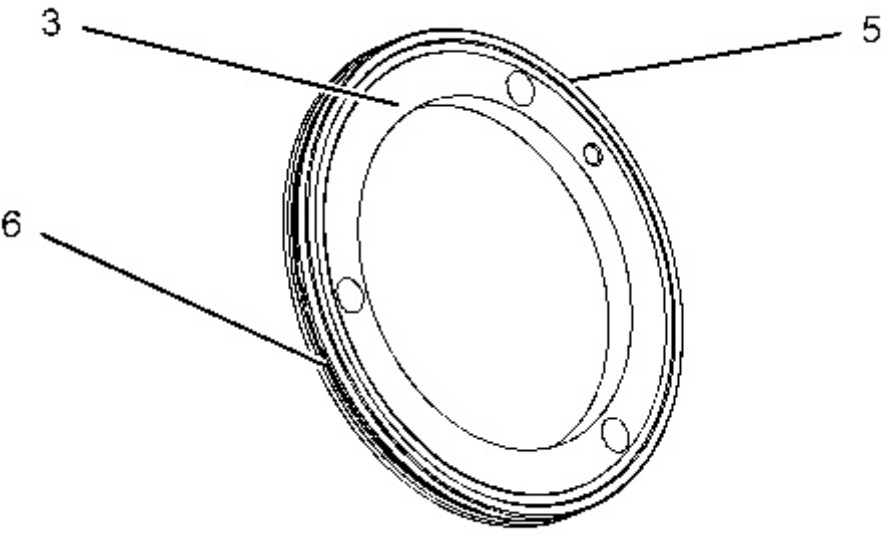


Illustration 3

g01008431

3. Remove O-ring seal (5) and O-ring seal (6) from sealing plate (3).

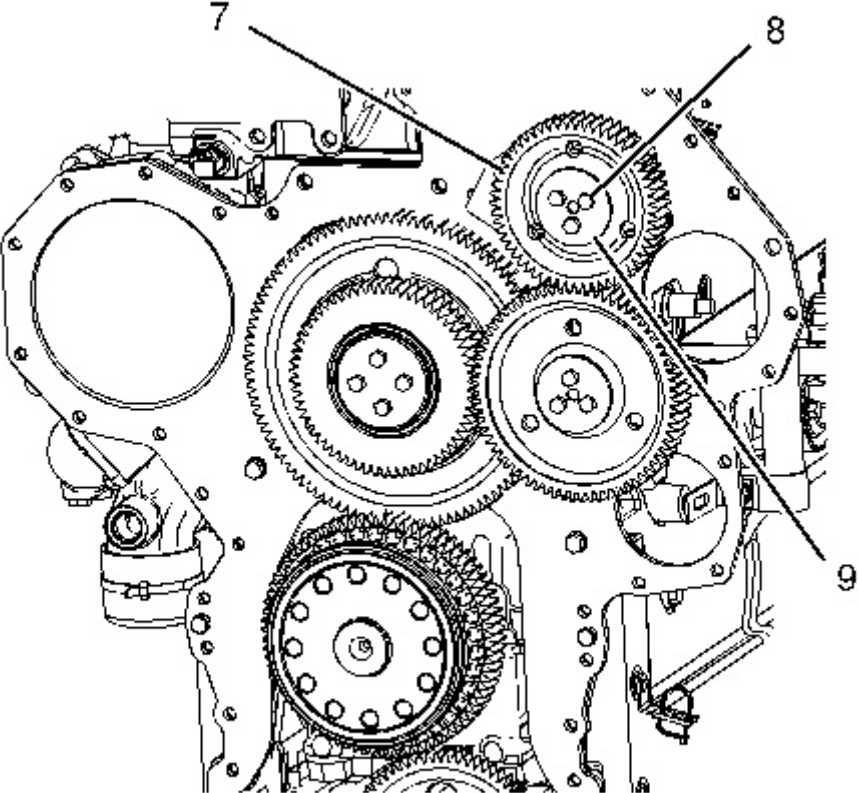
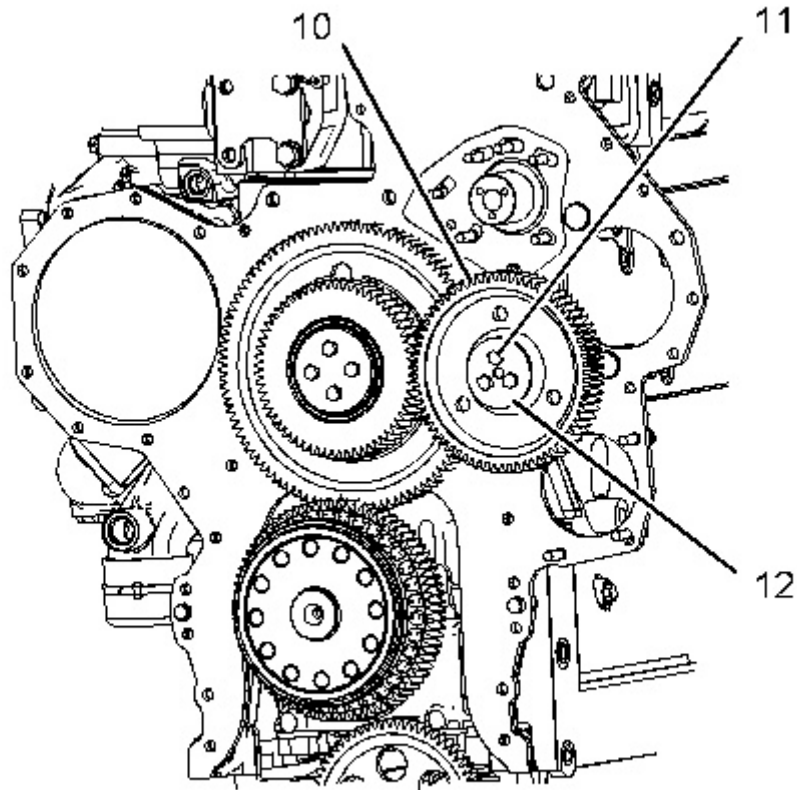


Illustration 4

g01101536

4. Remove bolts (8), plate (9), and adjustable idler gear assembly (7).
  5. Use Tooling (A) and remove the sleeve bearing from adjustable idler gear assembly (7).
- 

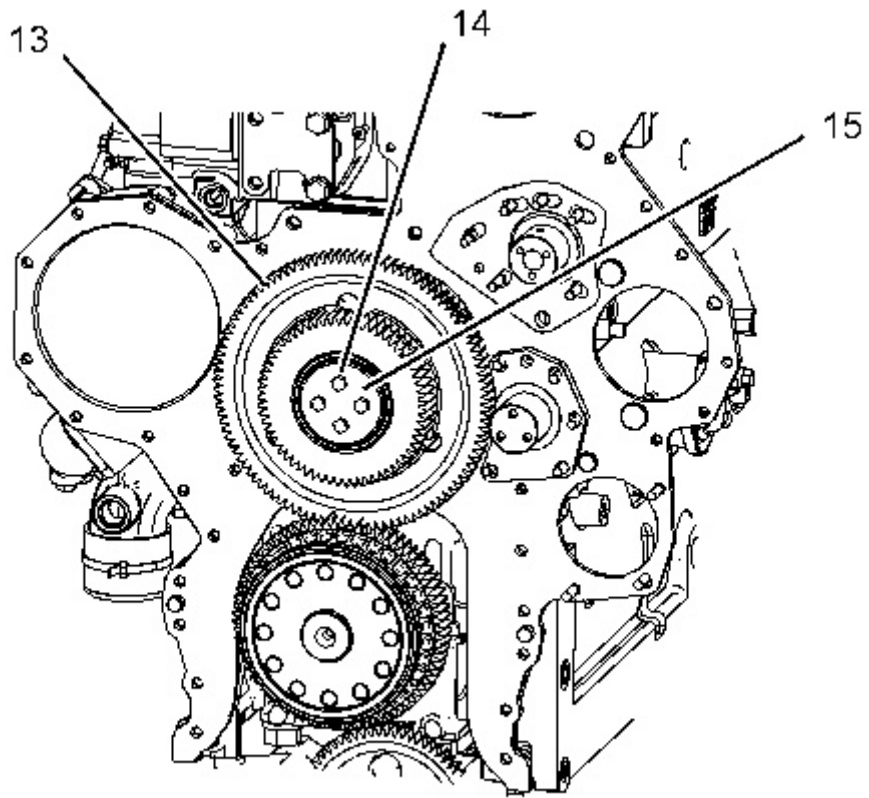


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Illustration 5

g01101045

6. Remove bolts (11), plate (12), and idler gear assembly (10).
  7. Use Tooling (A) and remove the sleeve bearing from idler gear assembly (10).
-

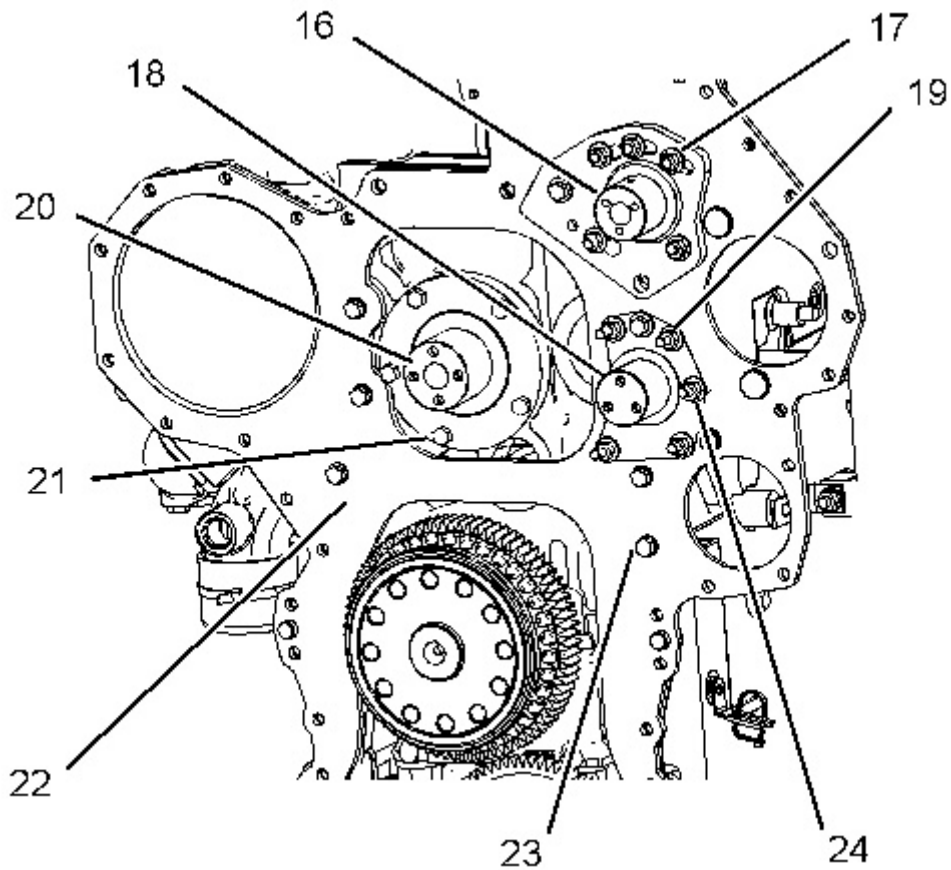


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Illustration 6

g01101048

8. Remove bolts (14), plate (15), and cluster gear assembly (13).
  9. Use Tooling (A) and remove the sleeve bearing from cluster gear assembly (13).
-



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Illustration 7

g01101050

**Note:** Stub shaft assembly (16) must be removed in order to remove plate (22). The backlash for the camshaft gear and the adjustable idler gear assembly will need to be readjusted at assembly.

10. Remove nuts (17) and remove stub shaft assembly (16).

**Note:** Stub shaft (18) must be removed in order to remove plate (22).

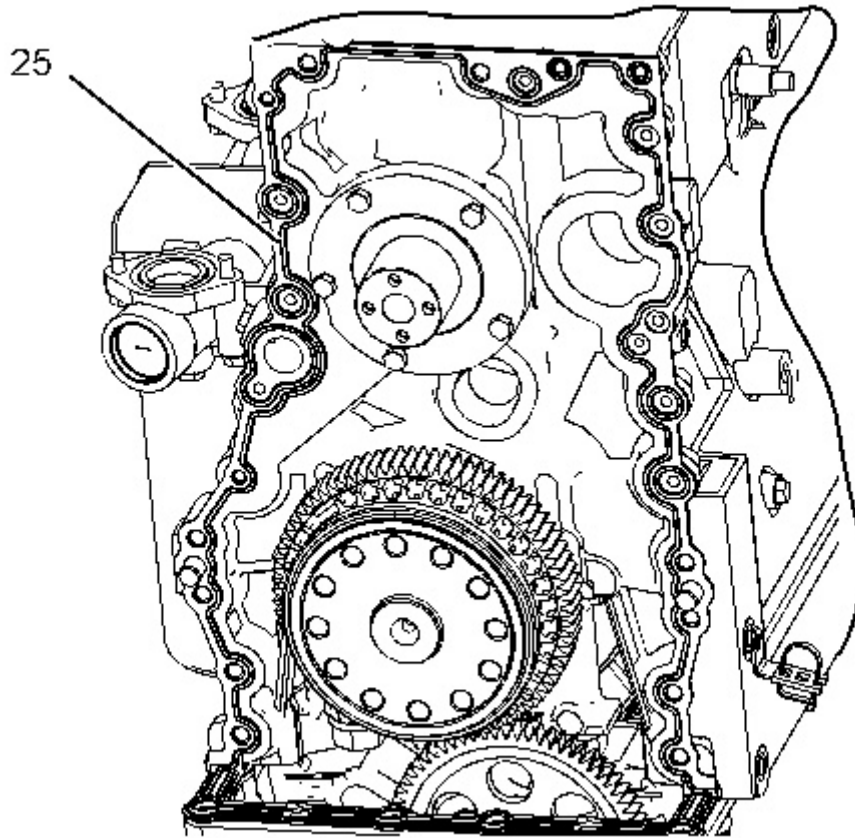
11. Remove nuts (19) and remove stub shaft (18).

12. Remove bolts (21) and remove stub shaft (20).

13. Remove bolts (23) that hold plate (22) to the cylinder block. Remove plate (22).

14. If studs (24) are loose or the threads are damaged, remove the studs from the front plate.

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Illustration 8

g01101052

15. Remove integral seal (25) from the cylinder block.
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i05949715

# Gear Group (Front) - Install

SMCS - 1206-012

## Installation Procedure

Table 1

| Required Tools |             |                  |     |
|----------------|-------------|------------------|-----|
| Tool           | Part Number | Part Description | Qty |
| A              | 1P-0510     | Driver Gp        | 1   |
| B              | 8T-2998     | Lubricant        | -   |
| C              | -           | Loctite 5900     | -   |
| D              | -           | Loctite 243      | -   |

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### NOTICE

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### NOTICE

**Do not turn the crankshaft or the camshaft while the camshaft gear is removed. If the front gear group is not correctly timed during installation, interference can occur between the pistons and the valves, resulting in damage to the engine.**

- 
1. Thoroughly clean the gasket material from the cylinder block and both sides of the plate.
- 

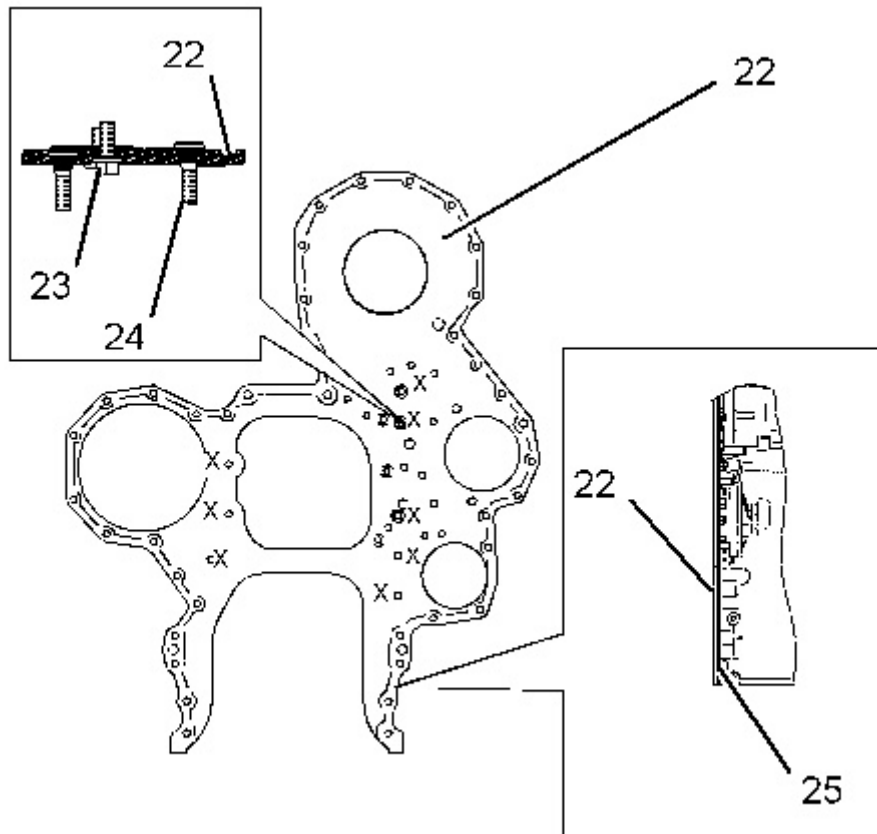


Illustration 1

g01101567

2. If studs (24) are loose or the threads are damaged, install new studs (24) in the front plate. Apply Tooling (D) to the serrations of studs (24). Install studs (24) in the front plate.

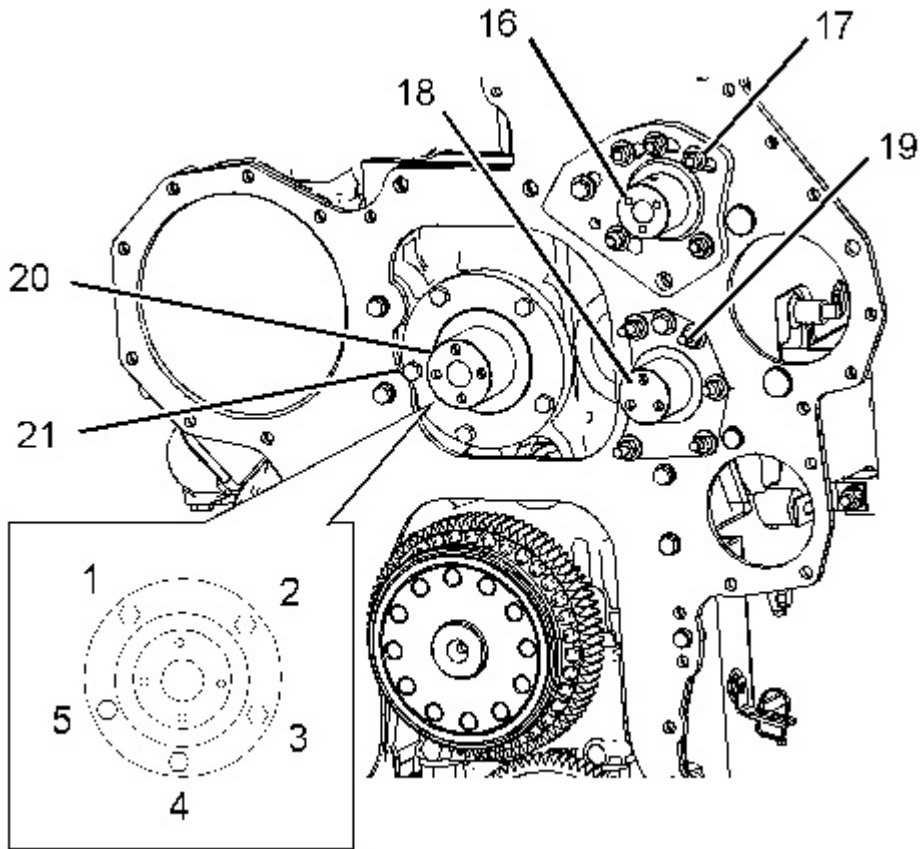
3. Install integral seal (25) on the dowel pins on the cylinder block.

**Note:** Apply Tooling (C) to the bottom of integral seal (25) in order to fill the space at the cylinder block, the front housing, and the engine oil pan.

4. Install plate (22) on the dowel pins on the cylinder block. Install new locking bolts (23) (Marked "X") in order to fasten the front plate to the cylinder block. Tighten locking bolts (23) to a torque of 55 N·m (41 lb ft).

**Note:** Clean the old sealant from the bolts and apply Tooling (D) to the bolts.

5. Tighten locking bolts (23) again to a torque of 55 N·m (41 lb ft).
-

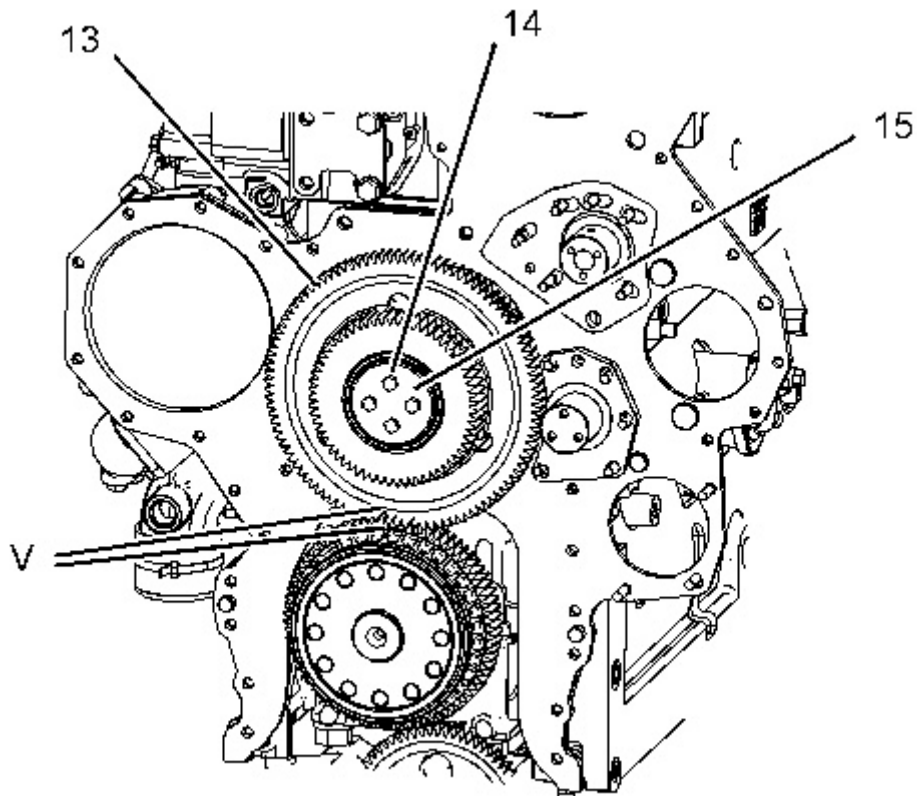


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Illustration 2

g01101565

6. Install stub shaft (18). Apply Tooling (D) to the studs and the bolt for stub shaft (18). Tighten nuts (19) and the bolt to a torque of  $55 \pm 10 \text{ N}\cdot\text{m}$  ( $41 \pm 7 \text{ lb ft}$ ).
  7. Install stub shaft assembly (16). Apply Tooling (D) to the studs and the bolt for stub shaft assembly (16). Do not tighten nuts (17) and the bolt for stub shaft assembly (16) at this time. Nuts (17) and the bolt for stub shaft assembly (16) will need to be tightened when the backlash is adjusted.
  8. Adjust the backlash between the camshaft gear and the adjustable idler gear assembly. The backlash should be  $0.356 \pm 0.254 \text{ mm}$  ( $0.014 \pm 0.010 \text{ inch}$ ). Refer to Testing and Adjusting, "Gear Group (Front) - Time" for the backlash adjustment procedure. Tighten nuts (17) and the bolt to a torque of  $55 \pm 10 \text{ N}\cdot\text{m}$  ( $41 \pm 7 \text{ lb ft}$ ).
  9. Install stub shaft (20). Apply Tooling (D) to bolts (21). Install bolts (21) and tighten in a numeric sequence 1, 3, 4, 5, 2, 1, 2, 3, 4, 5, 1 to a torque of  $55 \pm 10 \text{ N}\cdot\text{m}$  ( $41 \pm 7 \text{ lb ft}$ ).
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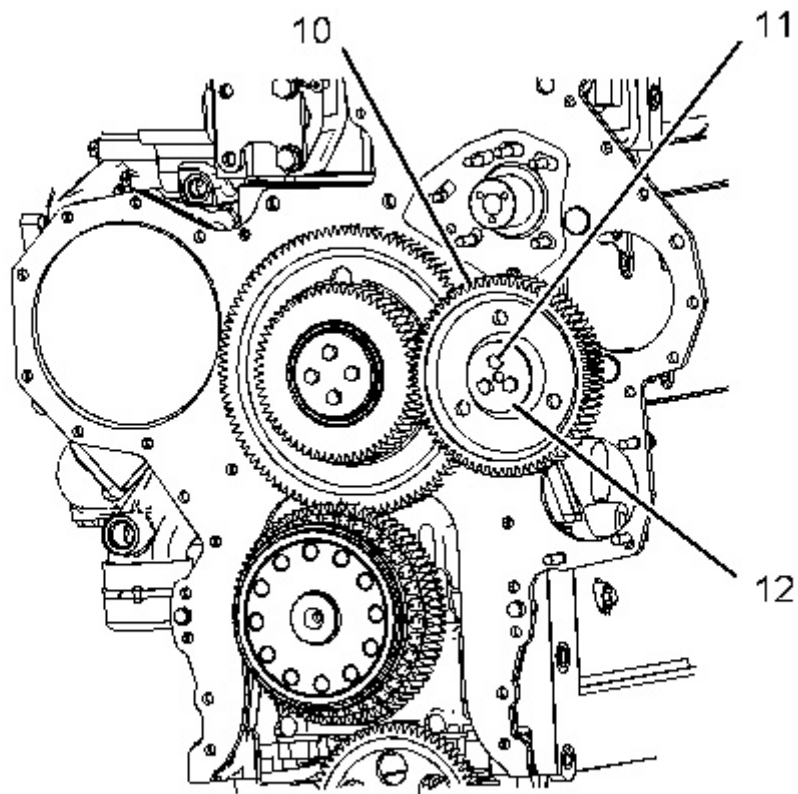


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Illustration 3

g01101161

10. Use Tooling (A) to install the sleeve bearing in cluster gear assembly (13).
  11. Put cluster gear assembly (13) on the stub shaft. Ensure that Timing Marks (V) are aligned on the cluster gear assembly and the crankshaft gear.
  12. Position plate (15) with the oil groove toward the face of the gear. Apply Tooling (D) to bolts (14). Install bolts (14). Tighten bolts (14) to a torque of  $30 \pm 7 \text{ N}\cdot\text{m}$  ( $22 \pm 5 \text{ lb ft}$ ).
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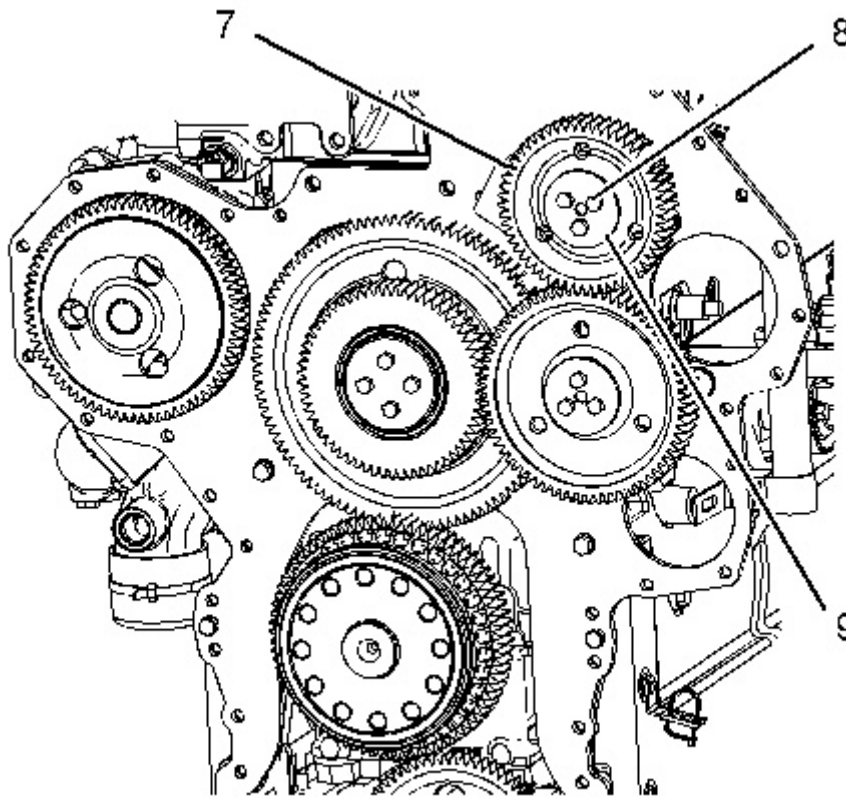


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Illustration 4

g01101045

13. Use Tooling (A) to install the sleeve in idler gear (10).
  14. Put idler gear assembly (10) on the stub shaft. Install plate (12) with the oil groove toward the gear face. Apply Tooling (D) to bolts (11). Install bolts (11). Tighten bolts (11) to a torque of  $30 \pm 7 \text{ N}\cdot\text{m}$  ( $22 \pm 5 \text{ lb ft}$ ).
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Illustration 5

g01008436

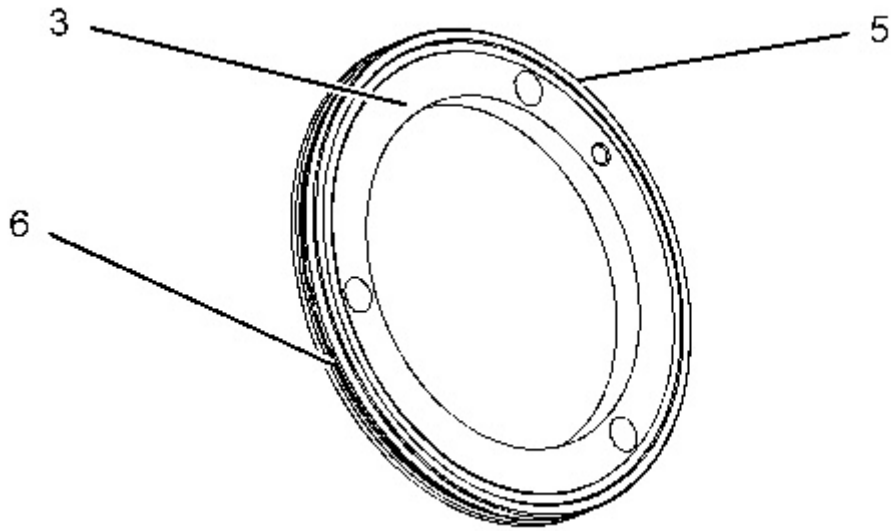
15. Use Tooling (A) to install the sleeve bearing in adjustable idler gear (7).

**Note:** Align the oil hole in the bearing with the oil hole in the adjustable idler gear.

16. Put adjustable idler gear assembly (7) on the stub shaft assembly. Position plate (9) with the oil groove toward the face of the gear. Apply Tooling (D) to bolts (8). Install bolts (8). Tighten bolts (8) to a torque of  $30 \pm 7 \text{ N}\cdot\text{m}$  ( $22 \pm 5 \text{ lb ft}$ ).

**Note:** Check the backlash for the camshaft gear and the adjustable idler gear assembly. The camshaft gear must be installed and the adjustable idler gear assembly must be removed in order to perform the backlash adjustment procedure. Refer to Testing and Adjusting, "Gear Group (Front) - Time".

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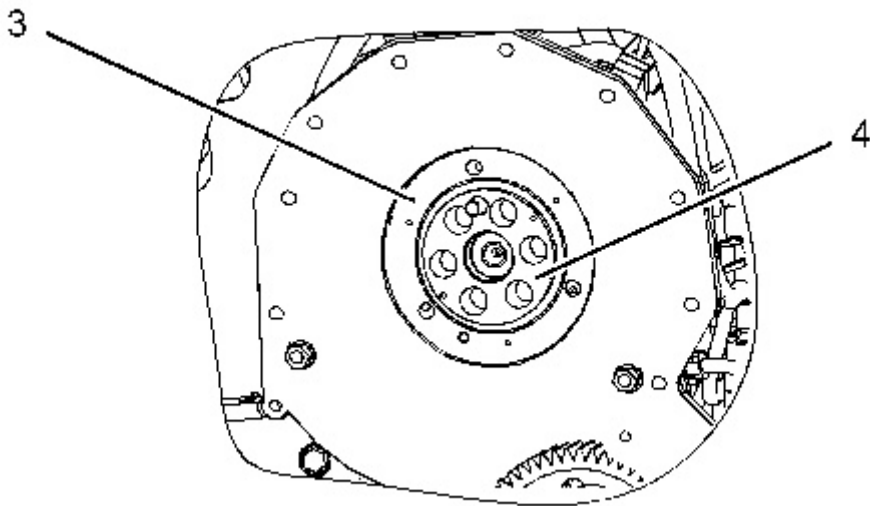


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Illustration 6

g01008431

17. Install O-ring seal (5) and O-ring seal (6) in sealing plate (3). Lubricate O-ring seal (6) with a 50/50 mixture of Tooling (B) and clean engine oil.
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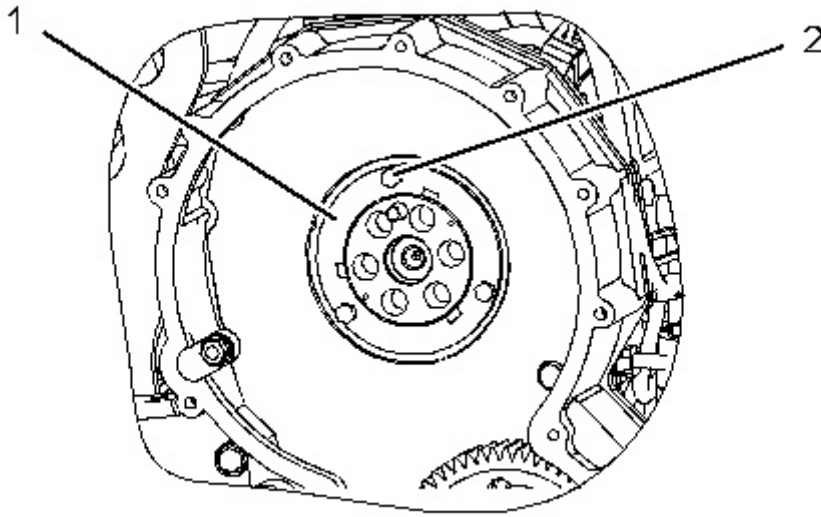


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Illustration 7

g01008430

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Illustration 8

g01010256

18. Install adapter (4). Ensure that the dowel in the adapter engages the hole in the camshaft.
19. Install sealing plate (3) and thrust plate (1). Ensure that the dowel in the adapter engages the hole in the thrust plate. Apply Tooling (D) to bolts (2). Install bolts (2). Evenly tighten bolts (2) in order to ensure that sealing plate (3) and O-ring seal (5) are seated against the cylinder head.
20. Adjust the backlash for the camshaft gear and the adjustable idler gear, if necessary. Refer to Testing and Adjusting, "Gear Group (Front) - Time".

**Note:** The camshaft gear must be installed and the adjustable idler gear must be removed in order to perform the backlash adjustment procedure.

**End By:**

- a. Install the water pump. Refer to Disassembly and Assembly, "Water Pump - Install".
  - b. Install the air compressor, if necessary. Refer to Disassembly and Assembly, "Air Compressor - Remove and Install".
  - c. Install the front housing. Refer to Disassembly and Assembly, "Housing (Front) - Install".
-



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