Product: TRACK-TYPE TRACTOR
Model: D4K2 LGP TRACK-TYPE TRACTOR KRR
Configuration: D4K2 XL & LGP Track Type Tractor KRR00001-UP (MACHINE) POWERED BY C4.4 Engine

Disassembly and Assembly
C4.4 Engines for Caterpillar Built Machines
Media Number -UENR0642-00 **Publication Date -01/10/2011** **Date Updated -20/10/2011**

i04537830

Crankshaft Front Seal

SMCS - 1160

Removal Procedure

Table 1

Required Tools			
Tool	**Part Number**	**Part Description**	**Qty**
A	367-3534	Oil Seal Removal & installer Tool	1

Start By:

A. Remove the crankshaft pulley. Refer to Disassembly and Assembly, "Crankshaft Front Pulley" for the correct procedure.

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

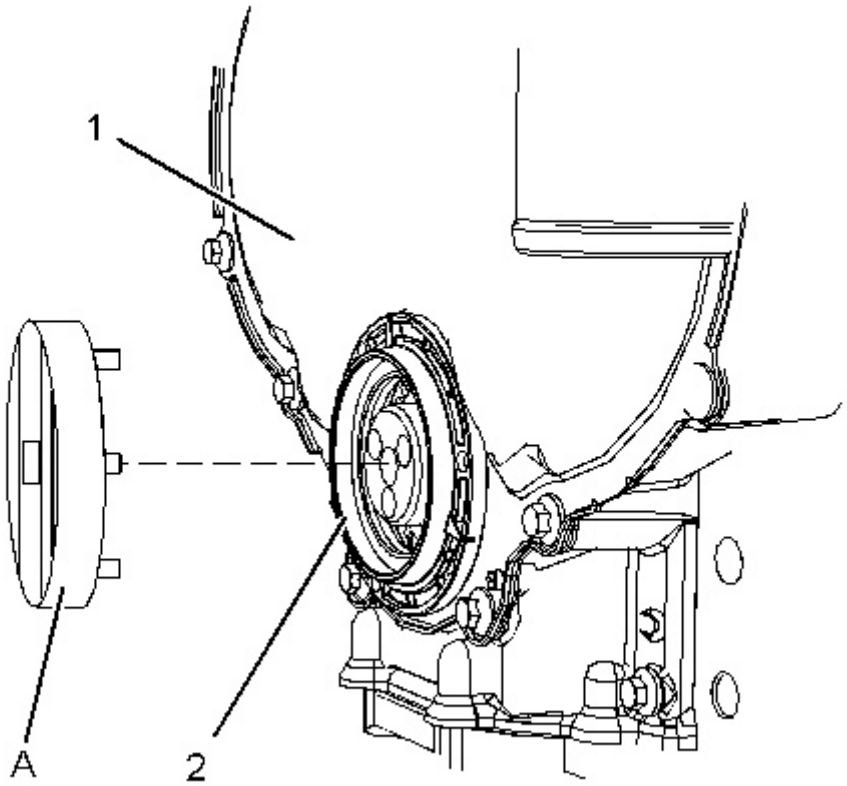

Illustration 1 g02445196

1. Align Tooling (A) onto crankshaft front seal (2) .
2. Turn Tooling (A) in a counterclockwise direction and remove crankshaft front seal (2) from front cover (1) .

Installation Procedure

Table 2

Required Tools			
Tool	**Part Number**	**Part Description**	**Qty**
A	367-3534	Oil Seal Removal & installer Tool	1
B	8T-9022	Silicone Gasket	1

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

1. Ensure that the front cover is clean and free from damage.

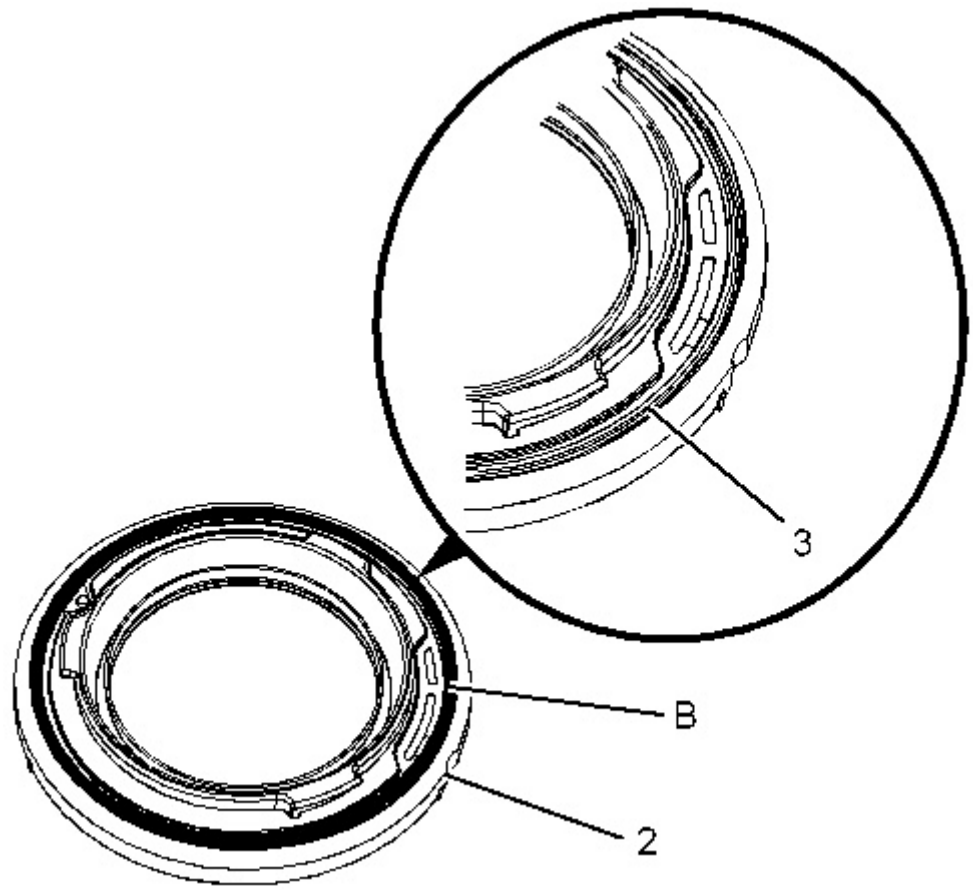

Illustration 2 g02445217

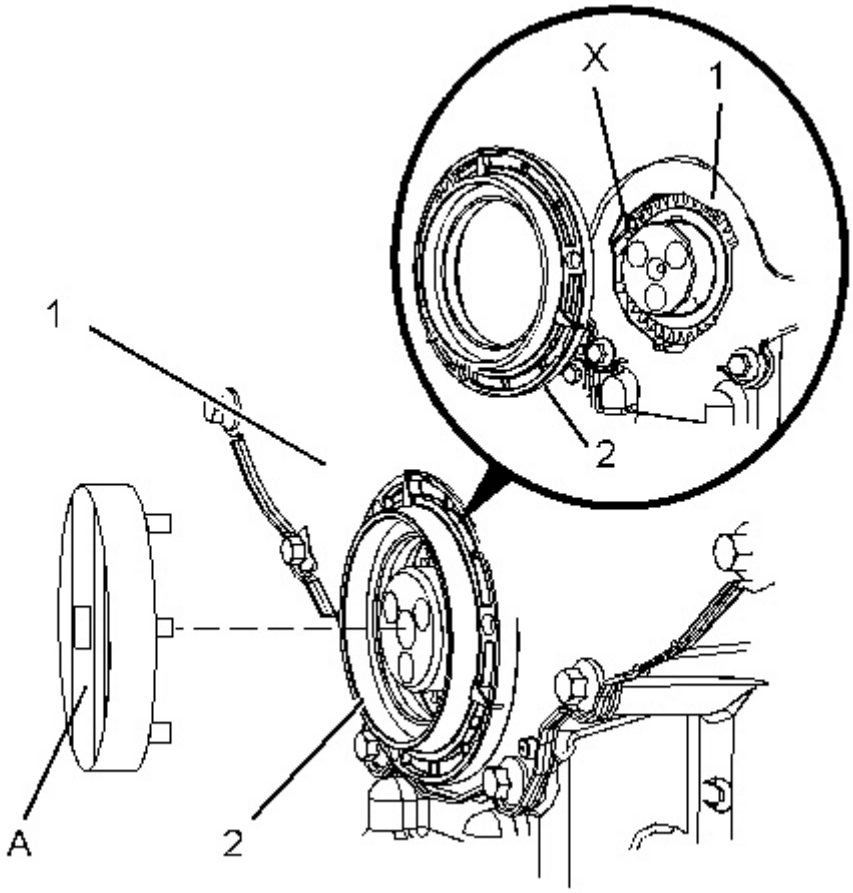

Illustration 3 g02445197

2. Apply a continuous bead of Tooling (B), approximately 3 mm (0.118 inch) in diameter, to the top of the static seal beads (3) .
3. Correctly position a new crankshaft front seal (2) in Position (X) onto front cover (1) .
4. Position Tooling (A) onto crankshaft front seal (2) .
5. Use Tooling (A) in order to turn crankshaft front seal (2) in clockwise direction.
6. If it is necessary, to apply a torque greater than 50 N·m (37 lb ft) in order to install crankshaft front seal (2). Remove crankshaft front seal (2). Inspect the crankshaft front seal and the front cover for faults or damage.
7. If necessary repeat Step 2 through Step 6 in order to install crankshaft front seal (2) .

End By: Install the crankshaft pulley. Refer to Disassembly and Assembly, "Crankshaft Front Pulley" for the correct procedure.

Product: TRACK-TYPE TRACTOR
Model: D4K2 LGP TRACK-TYPE TRACTOR KRR
Configuration: D4K2 XL & LGP Track Type Tractor KRR00001-UP (MACHINE) POWERED BY C4.4 Engine

Disassembly and Assembly

C4.4 Engines for Caterpillar Built Machines

Media Number -UENR0642-00 **Publication Date -01/10/2011** **Date Updated -20/10/2011**

i04539617

Front Cover

SMCS - 1166

Specifications

Table 1

Specifications for **371-8059** Front Cover and **371-8057** Front Cover			
Callout	Part Number	Part Name	Specification Description
3	6I-0217	Bolt	Torque to..... **22 N·m (195 lb in)**
4	100-3751	Bolt	Torque to..... **22 N·m (195 lb in)**

Removal Procedure

Start By:

A. Remove the crankshaft pulley. Refer to Disassembly and Assembly, "Crankshaft Pulley" for the correct procedure.
B. If the engine has a fan, remove the fan. Refer to Disassembly and Assembly, "Fan" for the correct procedure.

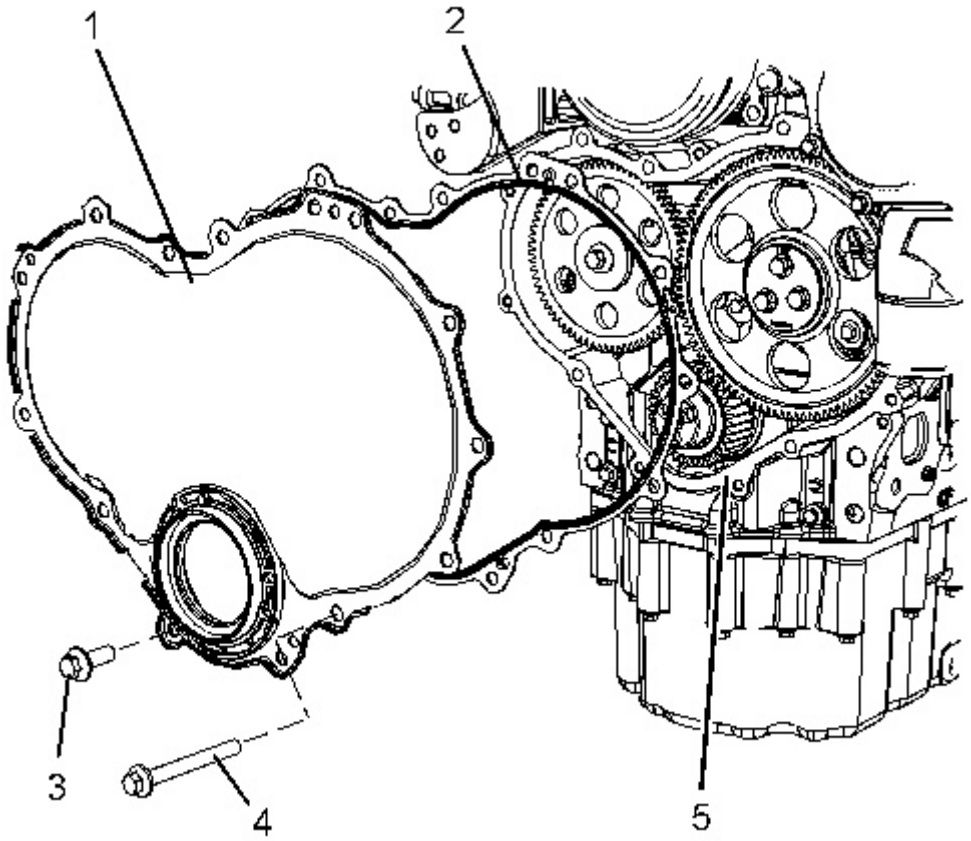

Illustration 1 g02481028

1. Remove the front seal from the front cover. Refer to Disassembly and Assembly, "Crankshaft Front Seal" for the correct procedure.
2. Remove bolts (3) and bolts (4). Identify the positions of bolts of different length.
3. Remove front cover (1) from front housing (5) .
4. Remove gasket (2) .

Installation Procedure

Table 2

Required Tools			
Tool	**Part Number**	**Part Description**	**Qty**
A	-	Guide Stud M8 by 70 mm	2
B	342-9206	Front Cover Alignment Tool	1

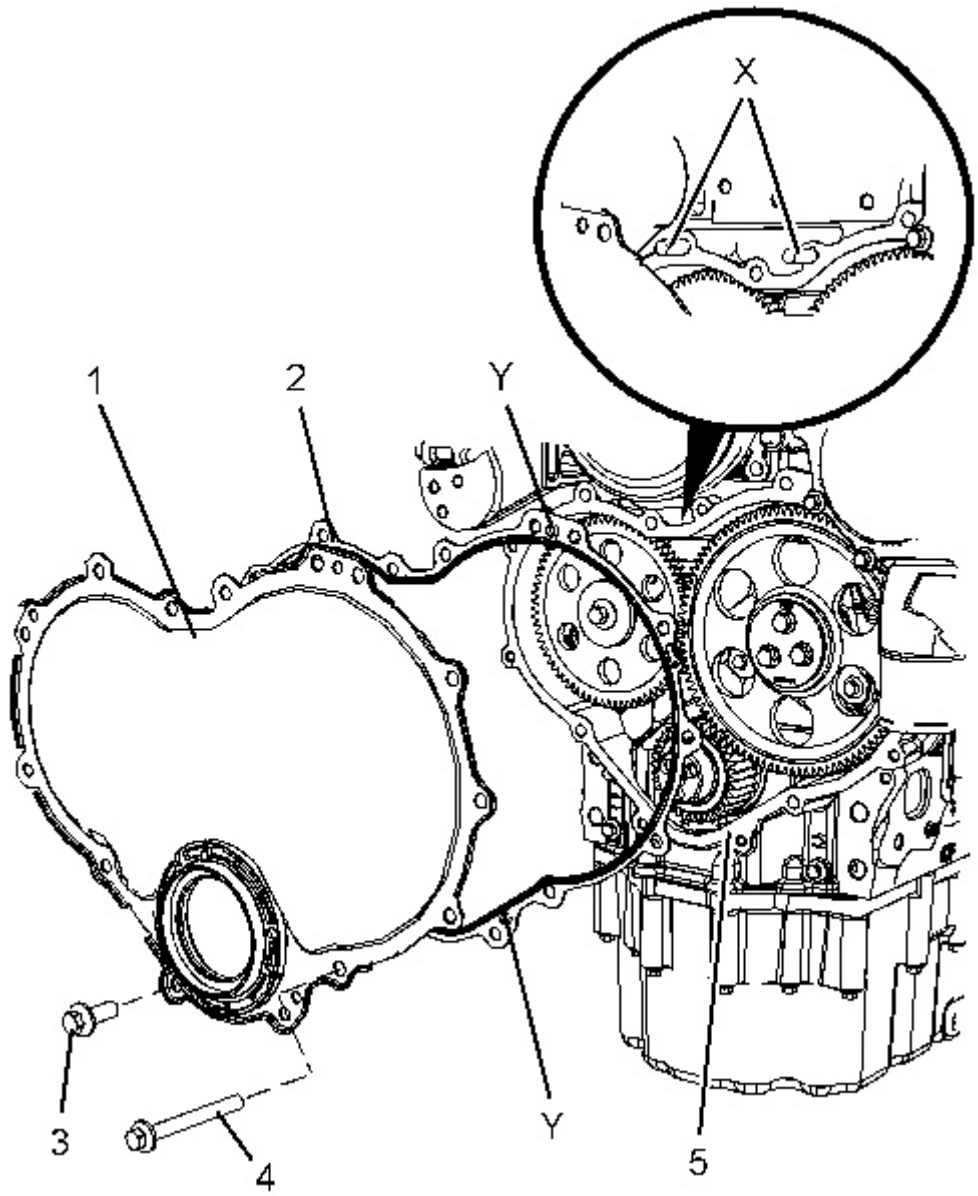

Illustration 2 g02481030

1. Thoroughly clean the gasket surface of the front housing.
2. If the original front cover is installed, follow Step 2.a through Step 2.b.
    a. Thoroughly clean front cover (1) .
    b. Install a new gasket (2) to front cover (1). Engage Locators (Y) into the holes in the front cover.
3. Install Tooling (A) into Holes (X) in front housing (5) .
4. Use Tooling (A) in order to position the front cover assembly onto the front housing.
5. Install bolts (3) and bolts (4) finger tight. Ensure that the bolts of different length are installed in the correct positions.

6. Install a new front seal to the front cover. Refer to Disassembly and Assembly, "Crankshaft Front Seal" for the correct procedure.
7. Use Tooling (B) in order to align the front cover.
8. Remove Tooling (A) and install the remaining bolts.
9. Tighten bolts (3) and bolts (4) to a torque of 22 N·m (195 lb in).
10. Remove Tooling (B) from the front cover.

End By:

a. Install the crankshaft pulley. Refer to Disassembly and Assembly, "Crankshaft Pulley" for the correct procedure.
b. If the engine has a fan, install the fan. Refer to Disassembly and Assembly, "Fan" for the correct procedure.

Disassembly and Assembly
C4.4 Engines for Caterpillar Built Machines
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i04539634

Gear Group (Front)

SMCS - 1206

Specifications

Table 1

Specifications for **329-8423** Front Housing Gp			
Callout	Part Number	Part Name	Specification Description
6	340-0571	Gear	Torque 8.8 graded bolt to..... **95 N·m (70 lb ft)** Torque 10.9 graded bolt to..... **120 N·m (89 lb ft)** Number of teeth.....**72**
7	342-1306	Idler As	Torque bolts to..... **44 N·m (33 lb ft)** Width of light duty idler gear and bearing assembly is **19.95 to 20.05 mm (0.78543 to 0.78937 inch)**. Width of medium duty and heavy duty idler gear and bearing assembly is **25.45 to 25.55 mm (1.00197 to 1.00590 inch)**. Inside diameter of light duty idler gear bearings is **60.022 to 60.052 mm (2.36307 to 2.36425 inch)**. Inside diameter of medium duty and heavy duty idler gear bearings is **56.00 to 56.03 mm (2.20472 to 2.20590 inch)**. Outside diameter of light duty idler gear hub is **59.95 to 59.97 mm (2.36023 to 2.36102 inch)**. Outside diameter of medium duty and heavy duty idler gear hub is **55.95 to 55.97 mm (2.20275 to 2.20354 inch)**.

			Clearance of light duty idler gear bearing on hub is **0.052 to 0.102 mm (0.00205 to 0.00402 inch)**. Clearance of medium duty and heavy duty idler gear bearing on hub is **0.03 to 0.08 mm (0.00118 to 0.00315 inch)**. The end play of the light duty idler gear is **0.05 to 0.25 mm (0.00197 to 0.00984 inch)**. The end play of the medium duty and heavy duty idler gear is **0.05 to 0.25 mm (0.00197 to 0.00984 inch)**. Number of teeth.....**97**
-	328-7837	Gear	Torque the nut to..... **64 N·m (47 lb ft)** Number of teeth.....**36**
-	-	Gear	Number of teeth.....**21**
-	-	Gear	Inside diameter of oil pump idler gear bearing is **16.012 to 16.038 mm (0.6304 to 0.6314 inch)**. Outside diameter of oil pump idler gear shaft is **15.966 to 15.984 mm (0.6286 to 0.6293 inch)**. Clearance of oil pump idler gear bearing on shaft is **0.028 to 0.072 mm (0.0011 to 0.0028 inch)**. End play of the oil pump idler gear is **0.050 to 0.275 mm (0.0019 to 0.0108 inch)**. End play of the oil pump drive gear is **0.005 to 0.090 mm (0.00020 to 0.00354 inch)**.
9	338-1402	Crankshaft Gear	Bore diameter of crankshaft gear is **51.00 to 51.03 mm (2.0079 to 2.0091 inch)**. Outside diameter of crankshaft hub is **51.021 to 51.002 mm (2.0087 to 2.0079 inch)**. Clearance of gear on crankshaft is **−0.021 to +0.028 mm (−0.00083 to 0.00110 inch)**. Number of teeth.....**36**

Removal Procedure

Table 2

Required Tools			
Tool	**Part Number**	**Part Description**	**Qty**
A	9U-7336	Housing	1
	5P-7305	Engine Turning Tool	1
B	230-6284	Timing Pin (Camshaft)	1
C	364-9107	Timing Pin (Fuel Injection Pump)	1
D	136-4632	Timing Pin (Crankshaft)	1

	268-1966	Adapter	1
E	298-5564	T40Torx Socket	1

Start By:

A. Remove the front cover. Refer to Disassembly and Assembly, "Front Cover" for the correct procedure.
B. Remove the valve mechanism cover. Refer to Disassembly and Assembly, "Valve Mechanism Cover" for the correct procedure.

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

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.

Dispose of all fluids according to local regulations and mandates.

Note: Care must be taken in order to ensure that the fuel injection pump timing is not lost during the removal of the front gear group. Carefully follow the procedure in order to remove the gear group.

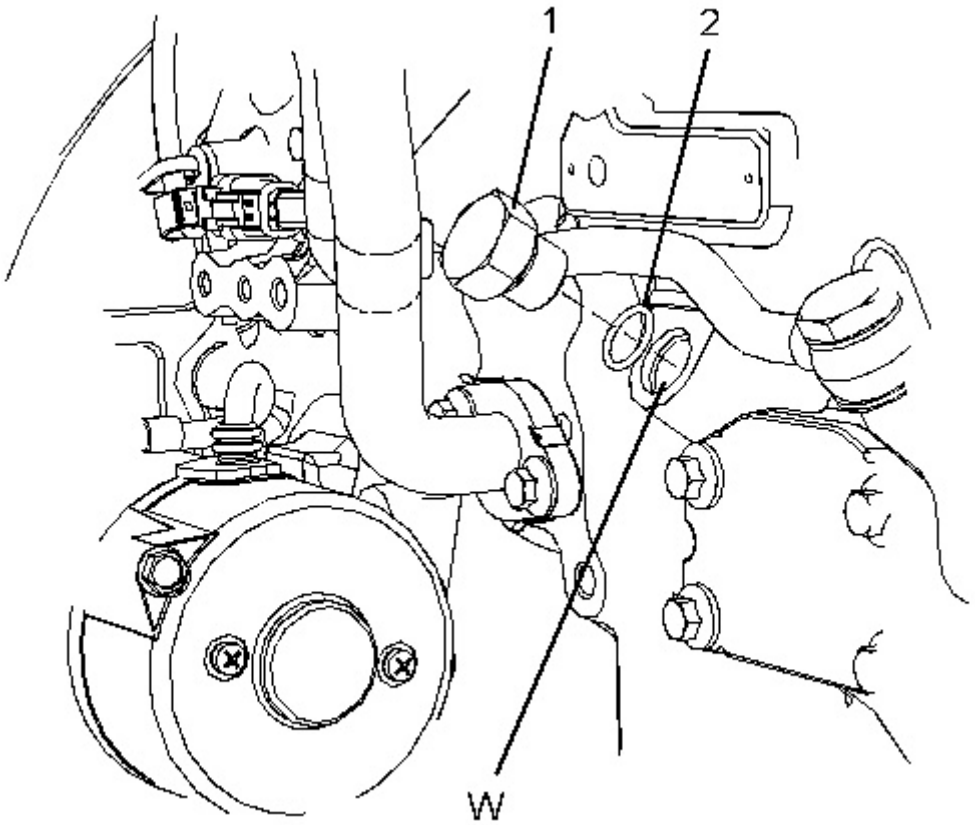

Illustration 1 g02485936

1. Remove plug (1) from the cylinder block. Remove O-ring seal (2) from the plug.
2. Use Tooling (A) in order to rotate the crankshaft so that number one piston is at top dead center on the compression stroke. Refer to System Operation, Testing and Adjusting, "Finding Top Center Position for No.1 Piston" for the correct procedure. Install Tooling (D) through Hole (W) in order to lock the crankshaft so that number one piston is at top dead center on the compression stroke.
3. Remove Tooling (D) .
4. Use Tooling (A) in order to rotate the crankshaft in a clockwise direction and position the crankshaft at the safe position. Refer to System Operation, Testing and Adjusting, "Position the Valve Mechanism Before Maintenance Procedures" for the correct procedure.

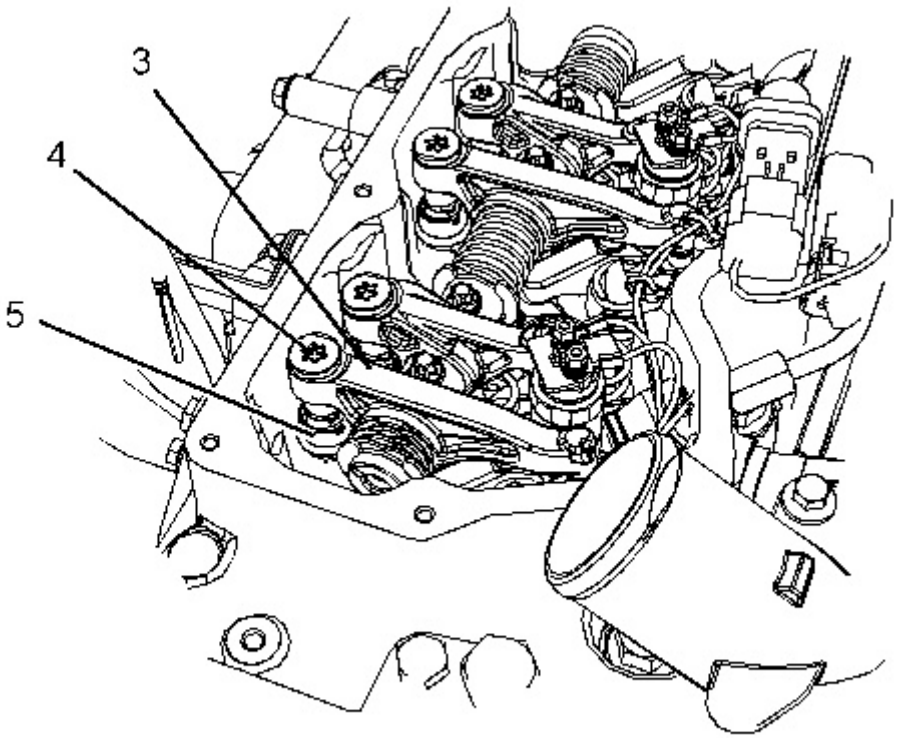

Illustration 2 g01992077

5. Use Tooling (E) in order to loosen threaded inserts (4) on all rocker arms (3). Unscrew threaded inserts (4) on all rocker arms (3) until all valves are fully closed. Ensure that the guides (5) for the pushrods are left in position on the threaded inserts (4) .

   Note: Ensure that ALL threaded inserts are fully unscrewed.

6. Use Tooling (A) in order to rotate the crankshaft so that number one piston is at top dead center on the compression stroke. Refer to System Operation, Testing and Adjusting, "Finding Top Center Position for No.1 Piston" for the correct procedure. Install Tooling (D) through Hole (W) in order to lock the crankshaft so that number one piston is at top dead center on the compression stroke. Refer to Illustration 1.

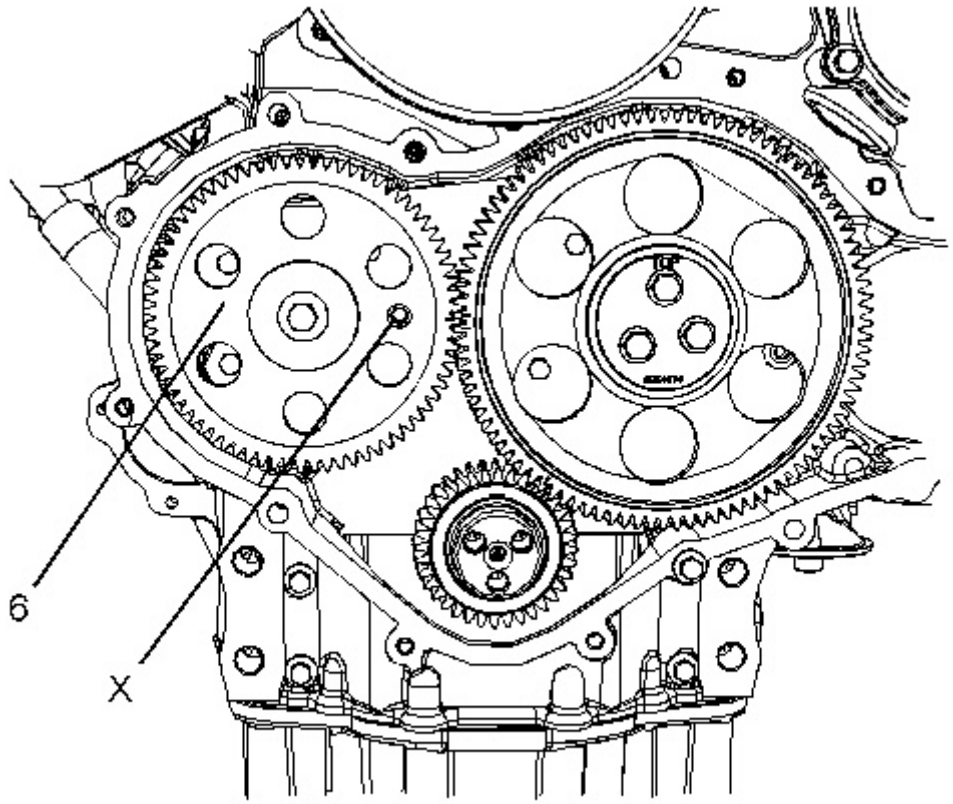

Illustration 3 g02485937

7. Install Tooling (B) through Hole (X) in camshaft gear (6) into the front housing. Use Tooling (B) in order to lock the camshaft in the correct position. Refer to System Operation, Testing and Adjusting, "Finding Top Center Position for No.1 Piston" for the correct procedure.

8. Install Tooling (D) into Hole (W) in the cylinder block. Use Tooling (D) in order to lock the crankshaft in the correct position. Refer to System Operation, Testing and Adjusting, "Finding Top Center Position for No.1 Piston" for the correct procedure.

   Note: Do not use excessive force to install Tooling (D). Do not use Tooling (D) to hold the crankshaft during repairs.

9. Use Tooling (C) in order to lock the fuel injection pump gear in the correct position. Refer to Disassembly and Assembly, "Fuel Injection Pump" for the correct procedure.

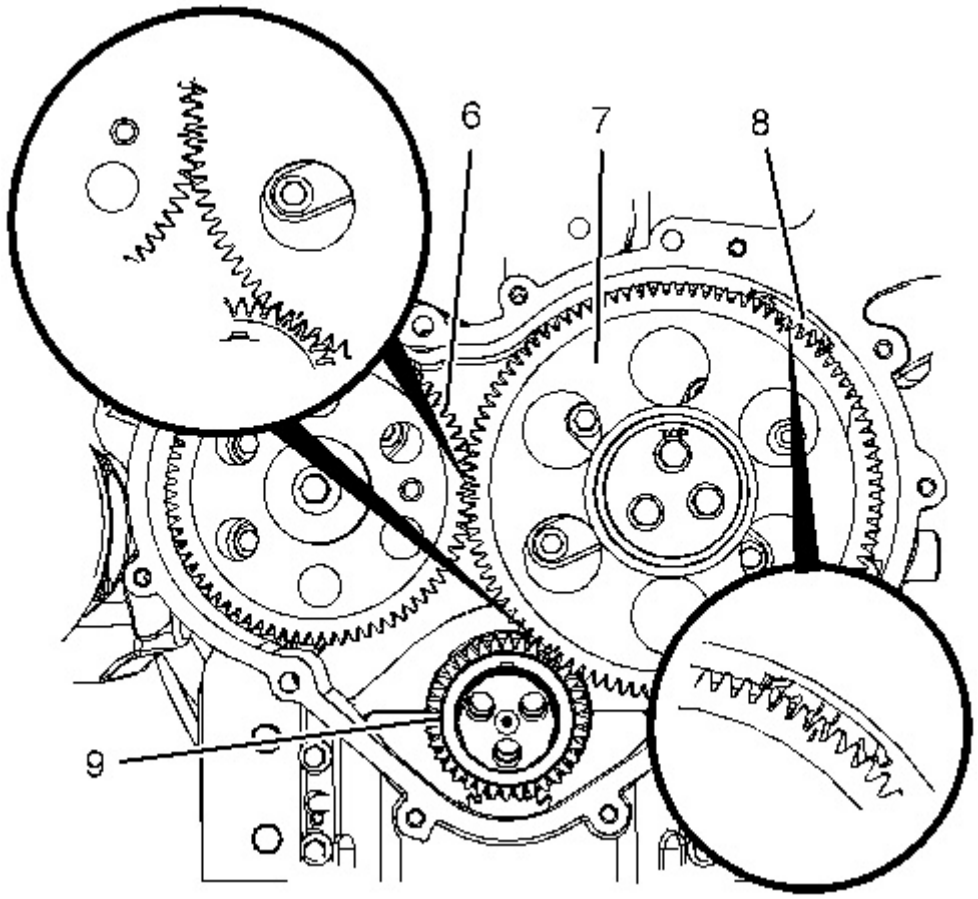

Illustration 4 g01992078

10. Mark gear (6), gear (7), gear (8) and gear (9) in order to show alignment. Refer to Illustration 4.

    Note: Identification will ensure that the gears can be installed in the original alignment.

11. Remove camshaft gear (6). Refer to Disassembly and Assembly, "Camshaft Gear" for the correct procedure.

12. Remove idler gear (7). Refer to Disassembly and Assembly, "Idler Gear" for the correct procedure.

Installation Procedure

Table 3

Required Tools			
Tool	**Part Number**	**Part Description**	**Qty**
A	9U-7336	Housing	1
	5P-7305	Engine Turning Tool	1
B	230-6284	Timing Pin (Camshaft)	1
C	364-9107		1

		Timing Pin (Fuel Injection Pump)	
D	136-4632	Timing Pin (Crankshaft)	1
	268-1966	Adapter	1
E	298-5564	T40 Torx Socket	1
F	9U-7324	Indicator Bracket	1
	7H-1942	Dial Indicator	1
	3S-3268	Indicator Contact Point	1
	7H-1940	Universal Attachment	1

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

Note: The fuel injection pump must remain locked until the procedure instructs you to unlock the fuel injection pump.

1. Ensure that number one piston is at top dead center on the compression stroke. Refer to System Operation, Testing and Adjusting, "Finding Top Center Position for No.1 Piston" for the correct procedure.

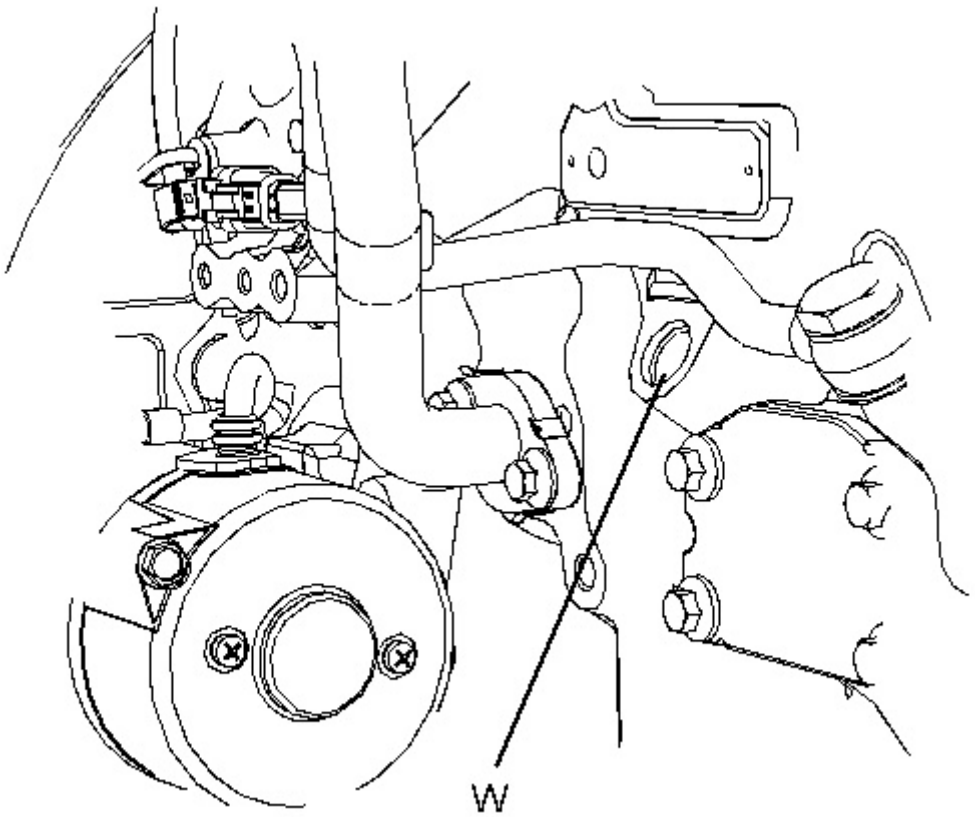

Illustration 5 g02485938

2. If necessary, install Tooling (D) into Hole (W) in the cylinder block. Use Tooling (D) in order to lock the crankshaft in the correct position. Refer to System Operation, Testing and Adjusting, "Finding Top Center Position for No.1 Piston" for the correct procedure.

   Note: Do not use excessive force to install Tooling (D). Do not use Tooling (D) to hold the crankshaft during repairs.

3. Ensure that all of the components of the front gear group are clean and free from wear and damage. If necessary, replace any components that are worn or damaged.

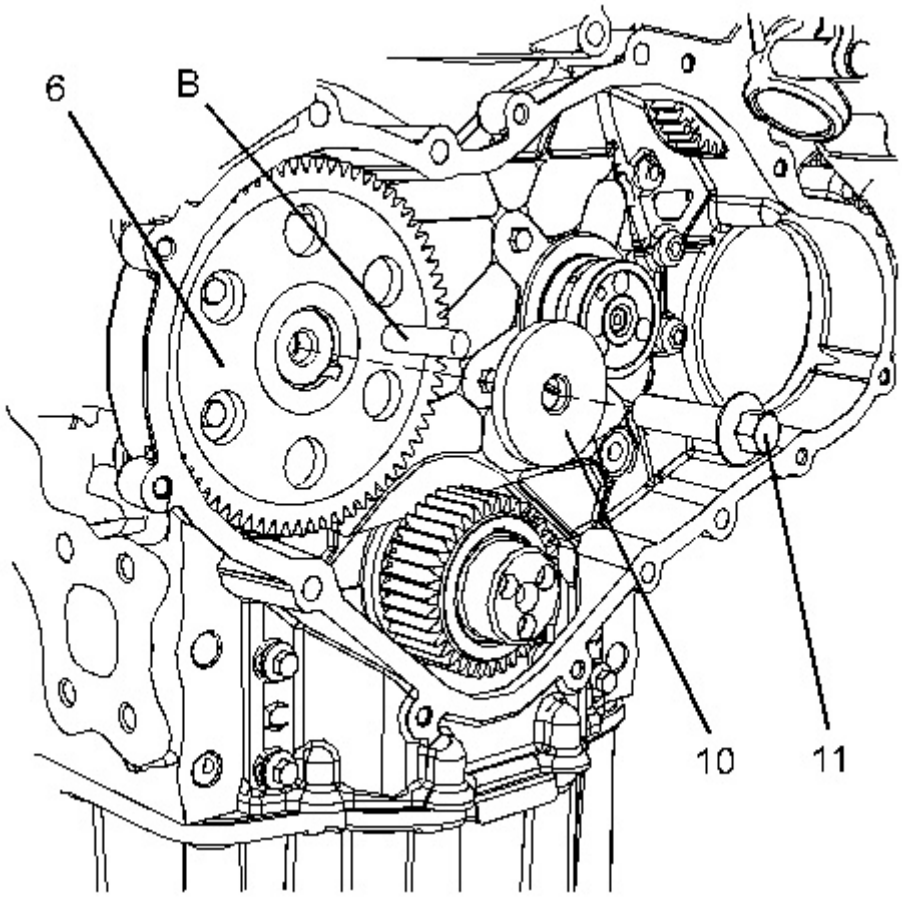

Illustration 6 g02485939

4. Install camshaft gear (6). Loosely install bolt (11) and washer (10) for the camshaft gear. Refer to Disassembly and Assembly, "Camshaft Gear" for more information.

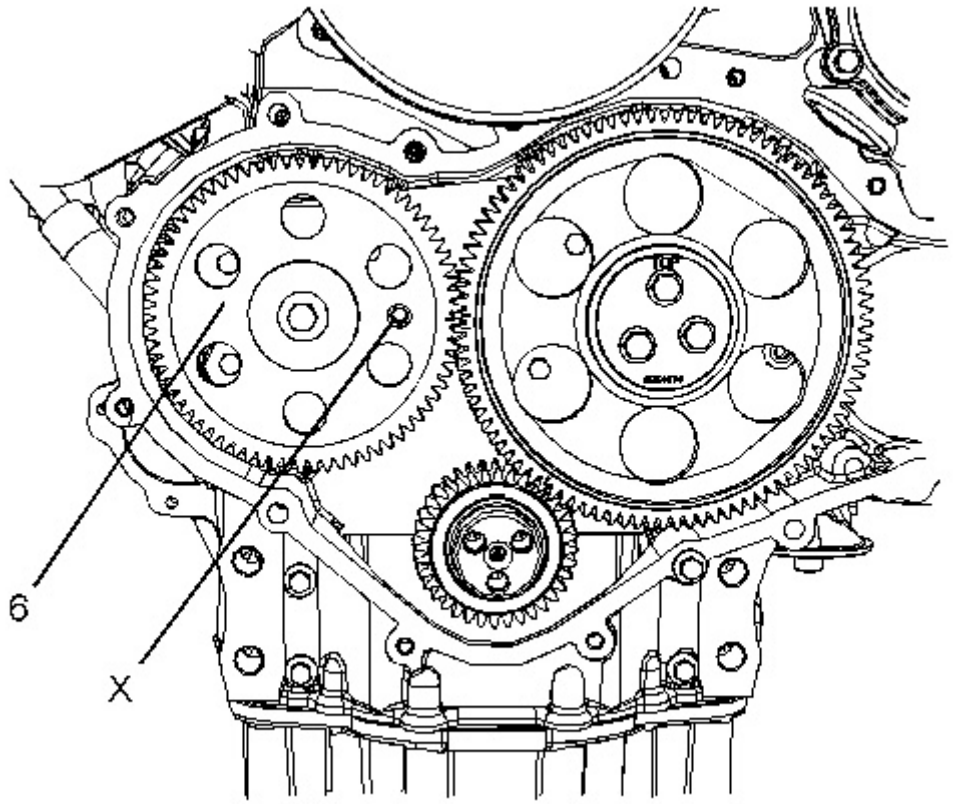

Illustration 7 g02485937

5. Install Tooling (B) through Hole (X) in camshaft gear (6) into the front housing.

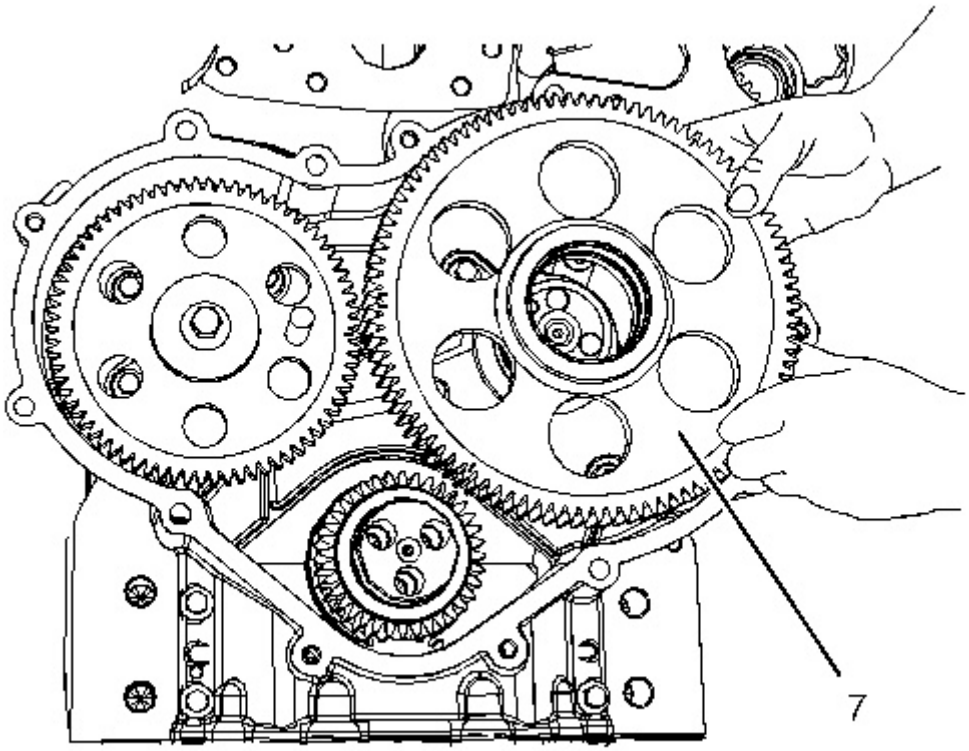

Illustration 8 g01993576

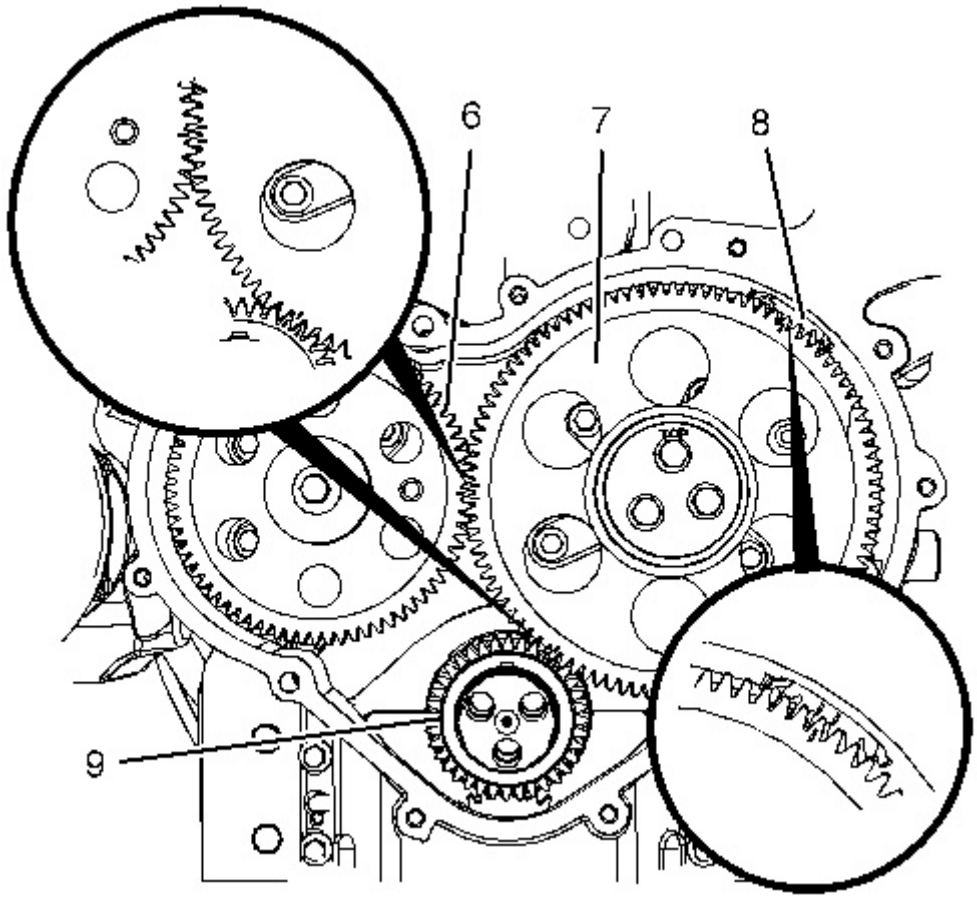

Illustration 9 g01992078

Alignment of timing marks

6. Install idler gear (7). Ensure that the timing marks on gear (6), gear (7), gear (8) and gear (9) are in alignment and that the mesh of the gears is correct.
7. Refer to Disassembly and Assembly, "Idler Gear" for the correct procedure.
8. Use Tooling (F) in order to check the end play of the idler gear. Refer to Specifications, "Gear Group (Front)" and refer to Disassembly and Assembly, "Idler Gear" for further information.

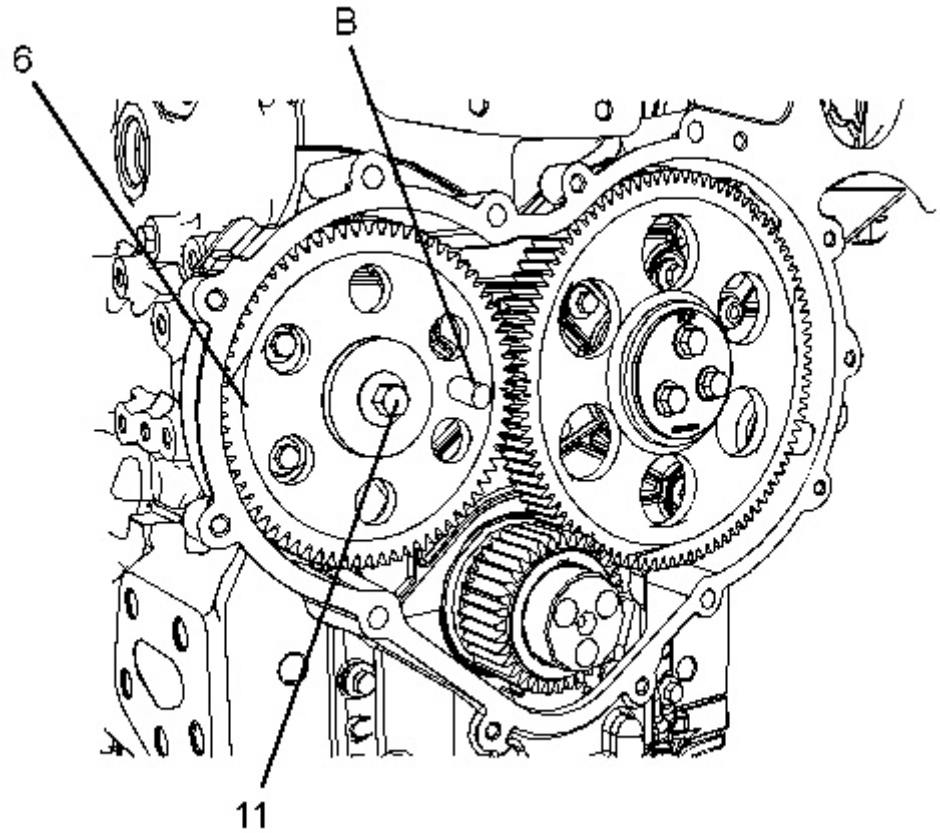

Illustration 10 g02485940

9. Ensure that the fuel injection pump is locked in the correct position. Refer to Disassembly and Assembly, "Fuel Injection Pump" for the correct procedure.
10. Remove Tooling (B) and Tooling (C) .
11. When bolt (11) is a 8.8 Grade. Tighten bolt (11) for camshaft gear (6) to a torque of 95 N·m (70 lb ft).

    When bolt (11) is a 10.9 Grade. Tighten bolt (11) to a torque of 120 N·m (89 lb ft).
12. Use Tooling (F) in order to check the end play of the camshaft gear. Refer to Specifications, "Camshaft" for more information.

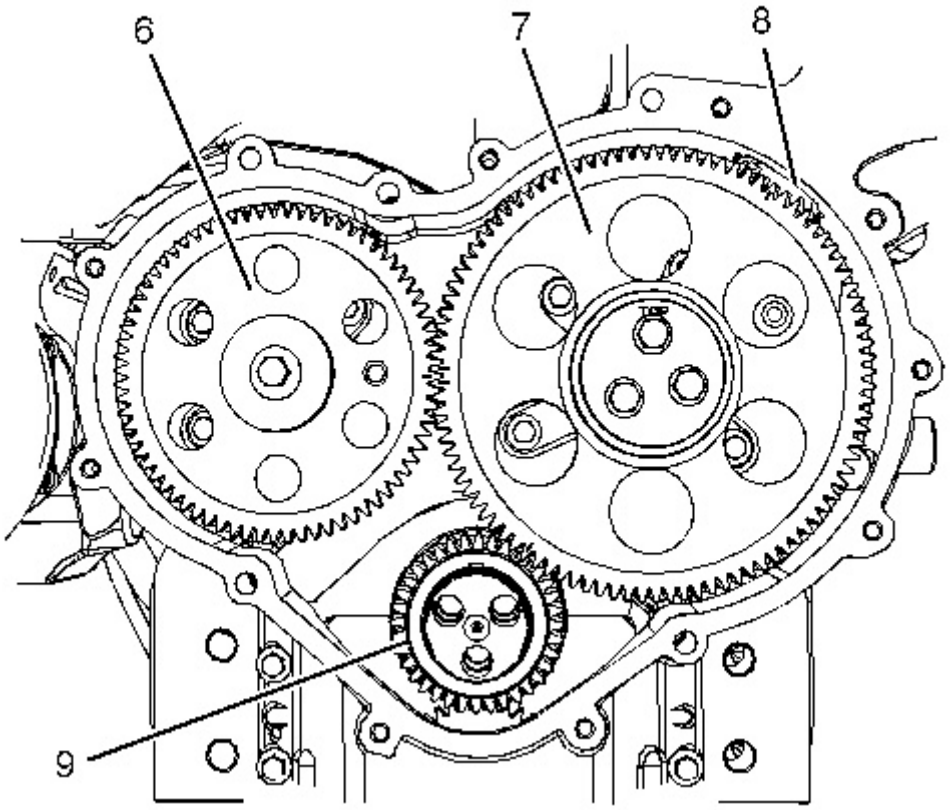

Illustration 11 g02086053

13. Use Tooling (F) in order to measure the backlash for gear (6), gear (7), gear (8) and gear (9). Refer to Specifications, "Gear Group (Front)" for further information.

14. Lubricate each gear with clean lubricating engine oil.

15. If necessary, use Tooling (A) in order to rotate the crankshaft so that number one piston is at top dead center on the compression stroke. Refer to System Operation, Testing and Adjusting, "Finding Top Center Position for No.1 Piston" for the correct procedure. If necessary, use Tooling (D) in order to lock the crankshaft so that number one piston is at top dead center on the compression stroke.

16. Remove Tooling (D) .

NOTICE

Failure to ensure that the crankshaft is positioned at the safe position will result in interference between the pistons and the valves. Interference between the pistons and the valves will result in damage to the engine.

17. Use Tooling (A) in order to rotate the crankshaft in a clockwise direction and position the crankshaft at the safe position. Refer to System Operation, Testing and Adjusting, "Position the Valve Mechanism Before Maintenance Procedures" for the correct procedure.

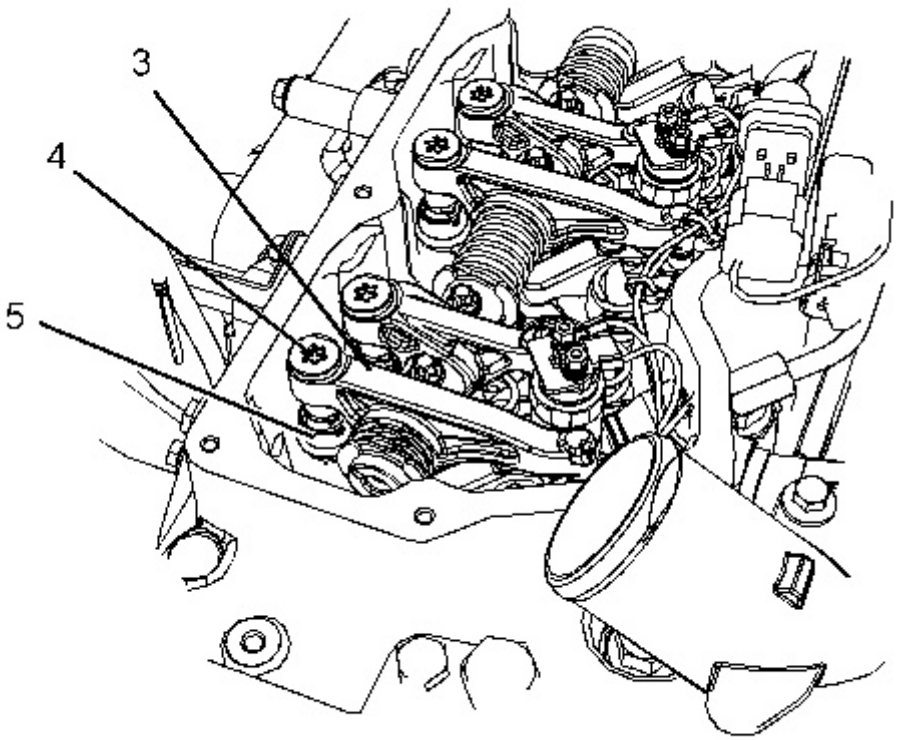

Illustration 12 g01992077

18. Ensure that the guides (5) for the pushrods are correctly positioned on the threaded inserts (4). Use Tooling (E) in order to tighten threaded inserts (4) on all rocker arms (3). Tighten the threaded inserts to a torque of 30 N·m (265 lb in).

    Note: When the threaded insert is tightened, the threaded insert must be correctly seated into the cup for the pushrod.

19. The engine should not be operated for a period 30 minutes after the threaded inserts on all the rocker arms have been tightened. This period of time will allow the force from the valve springs to purge off excessive engine oil from the hydraulic lifters.

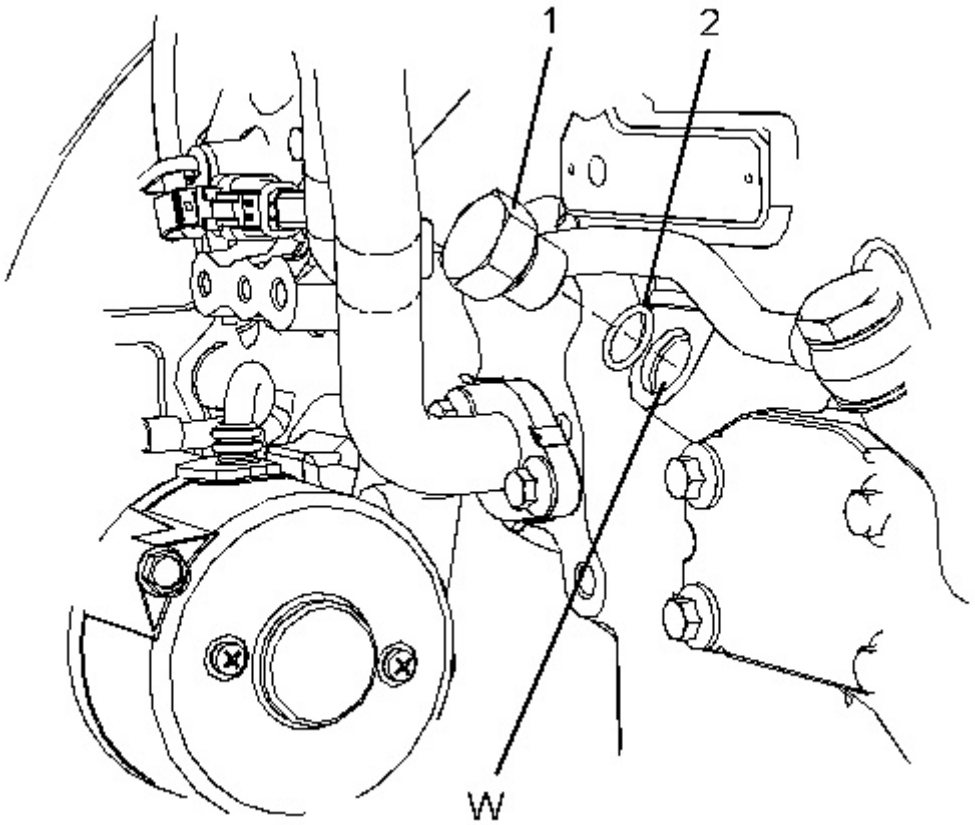

Illustration 13 g02485936

20. Install a new O-ring seal (1) to plug (2). Install the plug into Hole (W) in the cylinder block. Tighten plug (2) to a torque of 21 N·m (186 lb in).

End By:

a. Install the front cover. Refer to Disassembly and Assembly, "Front Cover" for the correct procedure.
b. Install the valve mechanism cover. Refer to Disassembly and Assembly, "Valve Mechanism Cover" for the correct procedure.

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