

DETROIT DIESEL



SERIES 60[®] Service Information

NUMBER: 11-60-02 **S.M. REF.:** 1.23 **ENGINE:** 60 **DATE:** December 2002

SUBJECT: COMPACT GEAR TRAIN ASSEMBLY

INTRODUCTION

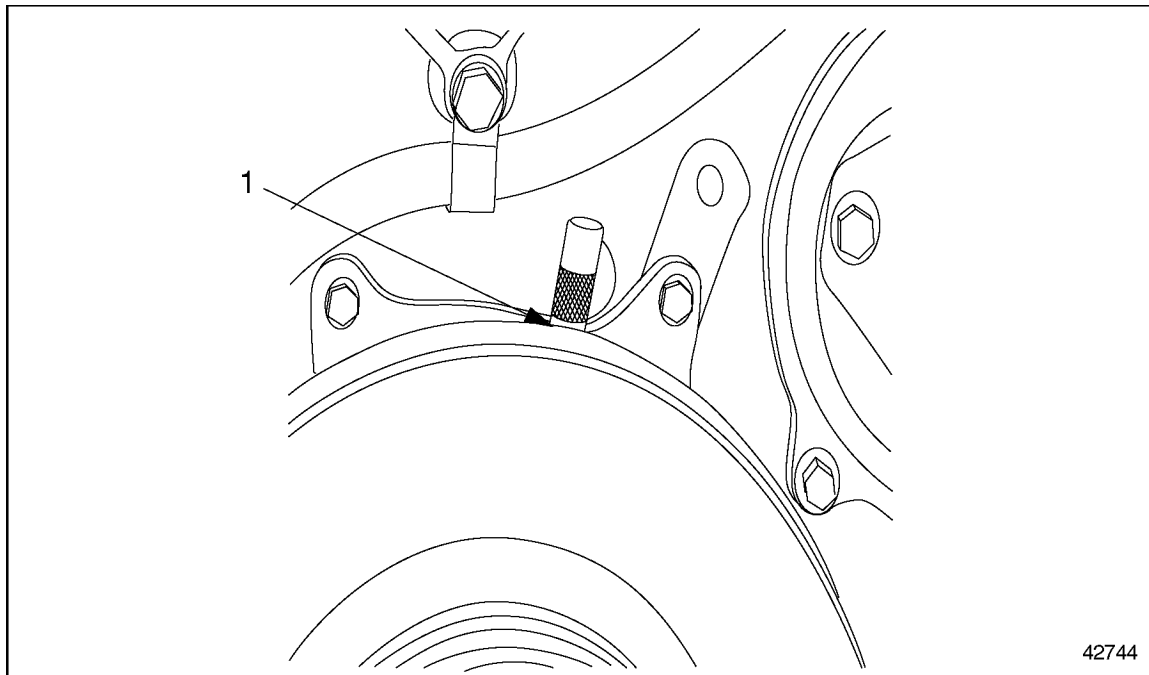
Detroit Diesel has released a new Compact Gear Train Assembly for the Series 60 2002 engine. This new assembly offers weight savings, noise reduction and height reduction. The bullgear is a straight cut gear that now rides on bushings.

DETAILS AND REASON

Series 60 2002 Engines are equipped with a new Compact Gear Train Assembly. Camshaft, Camshaft Drive Gear and Camshaft Gear Cover will be installed and removed as a assembly.

For engines equipped with a Compact Gear Train Assembly remove camshaft assembly as follows.

1. Rotate the engine by hand to get the No. 1 piston at TDC. Do this by installing the crankshaft timing pin J 45947 into its bracket and the barring engine over by hand until the timing pin drops into the locating hole in the crankshaft, the engine is now at TDC on cylinder No.1. See Figure 1.

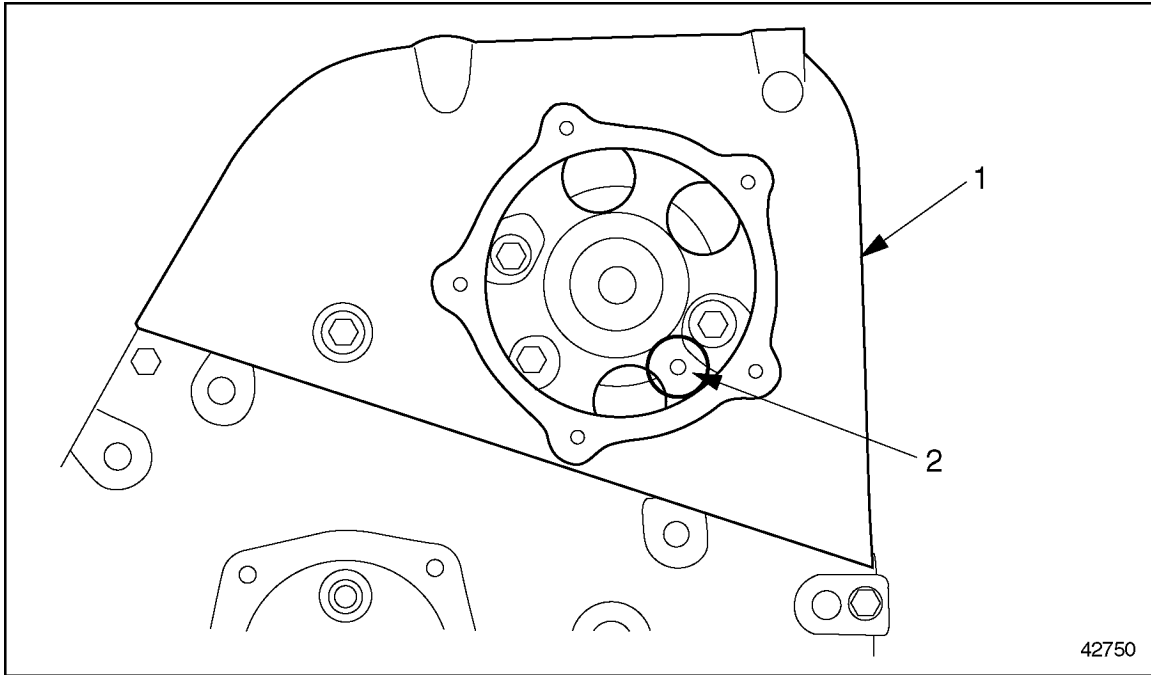


1. Timing Pin

Figure 1 Crankshaft Timing Pin

2. Remove the five bolts for the camshaft gear cover inspection plate and remove the plate. To verify camshaft timing proceed as follows:
 - [a] Look at the timing hole in the camshaft gear.
 - [b] The timing hole should be aligned with the timing hole in the back of the gear cover, located at the 5 o'clock position. See Figure 2.

- [c] If the timing holes are not aligned correctly remove the crankshaft timing pin and rotate the engine one more complete revolution. When the timing pin drops back into the hole in the crankshaft check the timing of the camshaft. Refer to step 2.

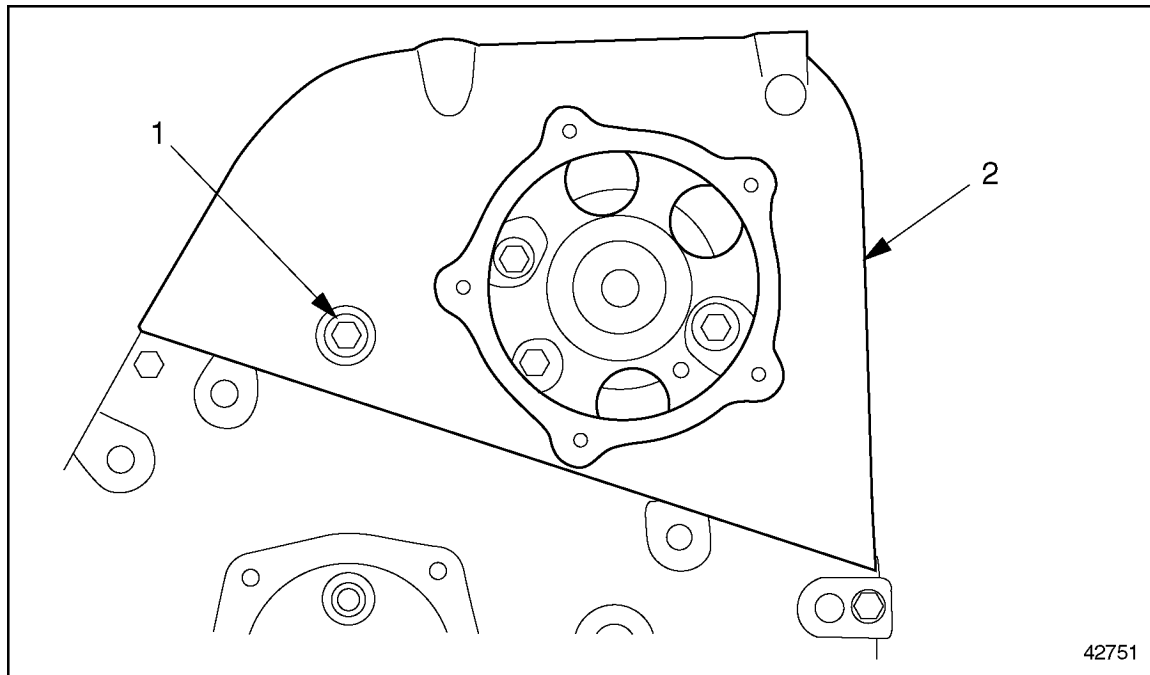


1. Camshaft Gear Cover

2. Timing Hole

Figure 2 Timing Verification

3. Remove bolt from front of camshaft gear cover. See Figure 3.



1. Bolt

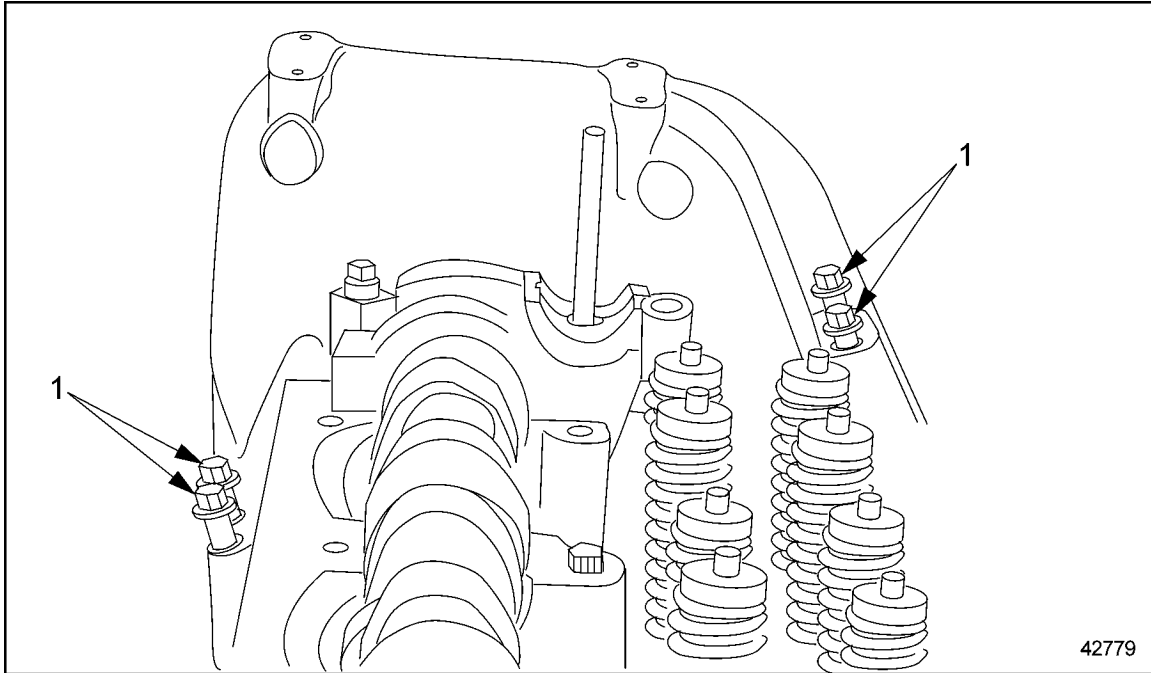
2. Camshaft Gear Cover

Figure 3 Camshaft Gear Cover Bolt

NOTE:

If timing is correct and the repair being made does not require that the engine is turned over, clean off an area where the camshaft gear and idler gear teeth mesh and mark the teeth with a suitable marker for a reference point when reassembling the camshaft. This procedure will make assembly easier.

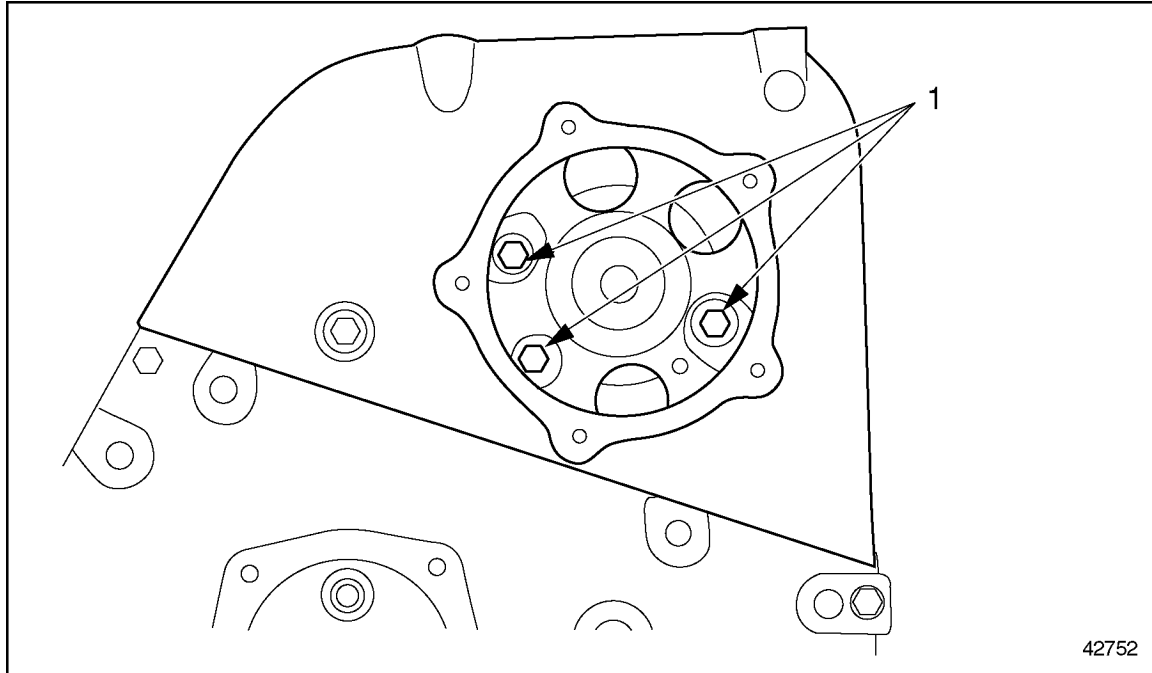
4. Remove four camshaft gear cover bolts. See Figure 4.



1. Bolt

Figure 4 Camshaft Gear Cover Bolts

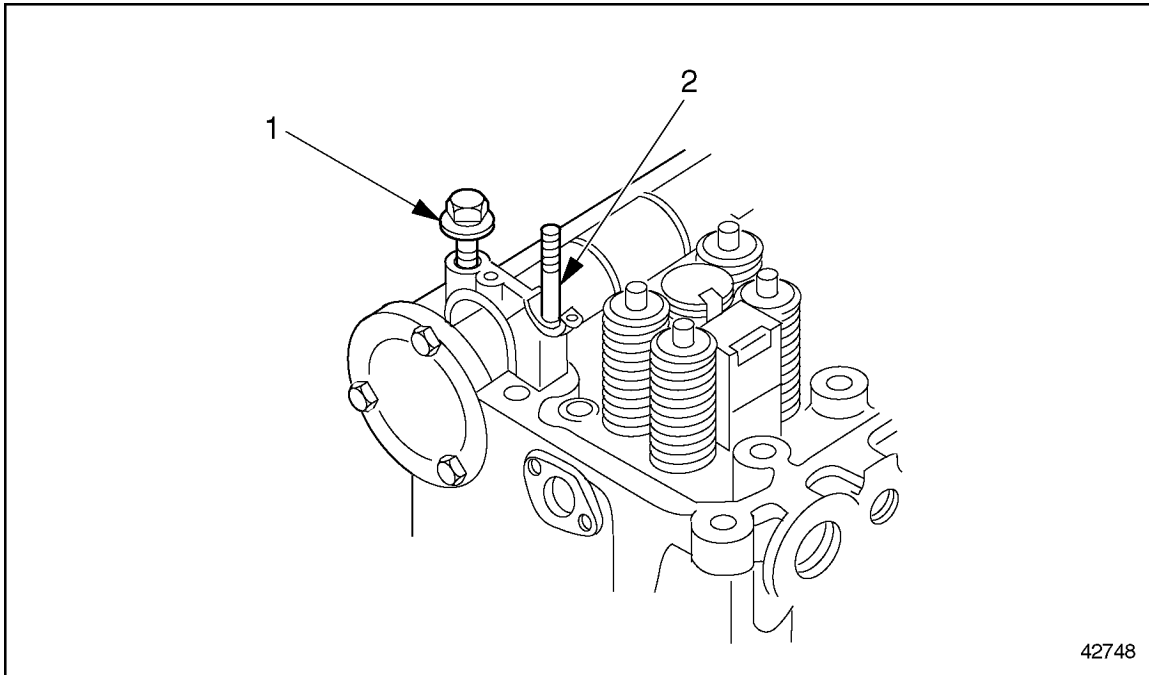
5. Remove three bolts inside of camshaft gear cover. See Figure 5.



1. Bolt

Figure 5 Camshaft Gear Cover Bolts

6. Remove one bolt and one stud bolt from camshaft caps No.1 and 7, remove camshaft caps. See Figure 6.



1. Bolt

2. Stud Bolt

Figure 6 Camshaft Cap Bolt and Stud Bolt

7. Remove the remaining five camshaft cap bolts, and camshaft caps.

⚠ CAUTION:

To avoid injury when removing or installing a heavy engine component, ensure the component is properly supported and securely attached to an adequate lifting device to prevent the component from falling.

8. Lift camshaft and camshaft gear cover assembly from camshaft bearings and gear case. Use lifting tool J 46305 to assist in lifting camshaft gear cover assembly.

For Series 60 engines equipped with Compact Geartrain Assembly disassemble camshaft from the camshaft gear as follows.

1. Use suitable fixture to secure the camshaft assembly from movement.
2. Install a heavy duty gear puller capable of withstanding the 7000 PSI required to remove the gear from the camshaft. Support the backside of the camshaft gear cover as close to the camshaft as possible to prevent damaging the gear cover and gently press the camshaft off the gear holding the camshaft as it is pressed through the gear. Removing the camshaft gear and cover together.

NOTICE:
Extreme care must be taken <u>not</u> to support the camshaft gear cover at the outer edges.

Install the camshaft gear on the camshaft as follows:

1. Using a suitable press, support the camshaft securely on the press. The bottom of camshaft must be firmly secured to prevent any movement.
 2. Install the camshaft gear into the camshaft gear cover and lower it as a assembly onto the nose of the camshaft.
 3. Align the key in the camshaft with the keyway in the camshaft gear.
 4. Gently press the gear all the way onto the camshaft until it bottoms and is fully seated on the camshaft.
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For engines equipped with the new Compact Geartrain Assembly install camshaft assembly on engine as follows:

1. Install camshaft alignment tool J 45946 on the camshaft gear cover and through the camshaft gear, making sure the pin on the tool is entered into the timing hole in the backside of the camshaft gear cover. See Figure 7.

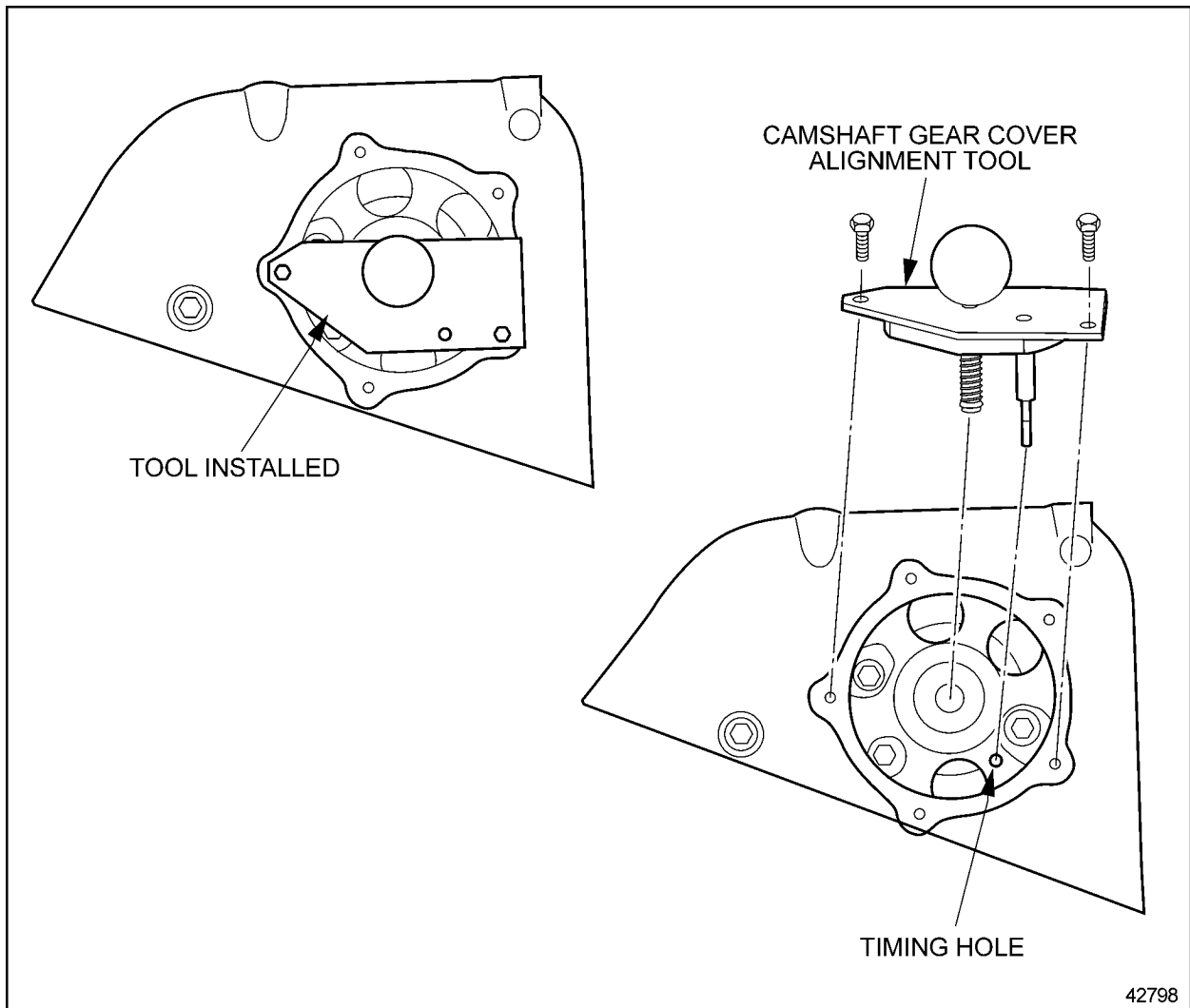
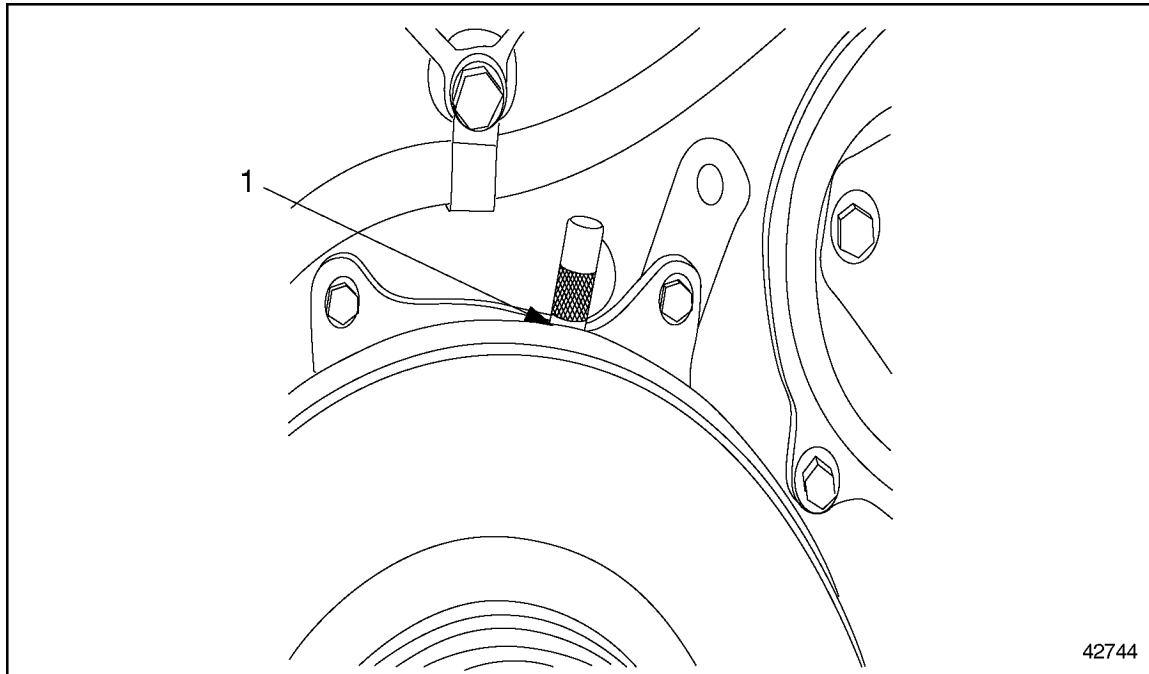


Figure 7 Camshaft Alignment Tool

NOTICE:

Do not bar the engine over with the timing pin installed. The timing pin is designed to break and will not damage the crankshaft.

2. Verify timing pin is in crankshaft locator hole. See Figure 8.



1. Timing Pin

Figure 8 Crankshaft Timing Pin

3. If the adjustable idler gear was removed or replaced remove the cover plate and loosen the three hub retaining nuts so the gear hub can be easily moved. Install tool to J 46306 hold idler gear hub at the middle of travel, this procedure will assist in correctly installing the camshaft gear.

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4. Ensure two seals are properly installed in camshaft gear cover. See Figure 9.

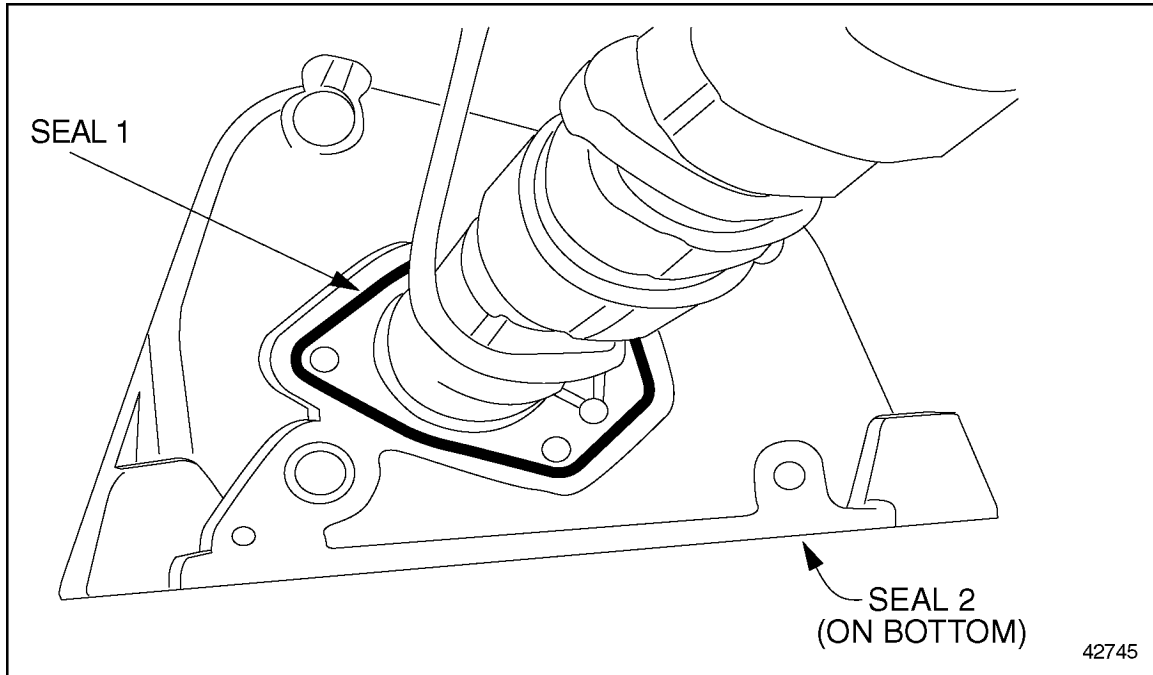
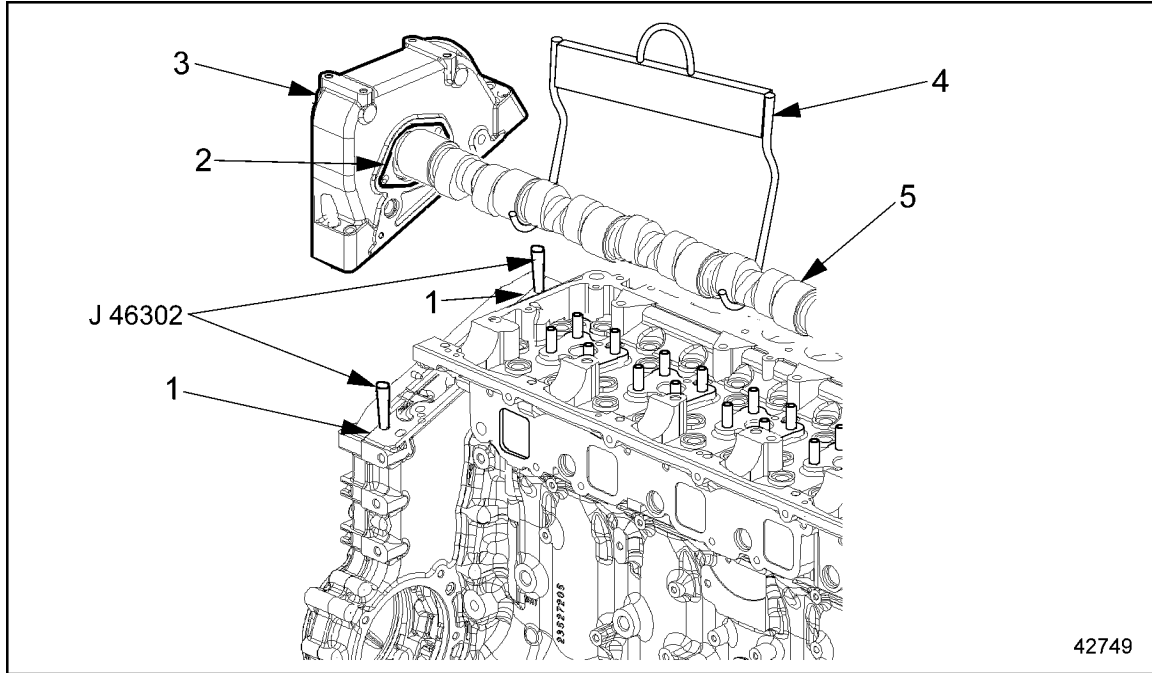


Figure 9 Camshaft Seals

5. Apply RTV along split line on gear case. See Figure 10.



- | | |
|------------------------|-----------------|
| 1. RTV Sealant | 4. Lifting Tool |
| 2. Seal | 5. Camshaft |
| 3. Camshaft Gear Cover | |

Figure 10 Apply RTV Sealant along Split line

NOTE:

Camshaft gear cover assembly must be installed promptly to avoid the setting of the RTV.



CAUTION:

To avoid injury when removing or installing a heavy engine component, ensure the component is properly supported and securely attached to an adequate lifting device to prevent the component from falling.

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6. Install two guide studs J 46302 into gearcase to guide camshaft gear cover assembly onto gearcase. Using lifting tool J 46305 place front lifting hook between the number 2 injector lobe and intake valve and the rear hook between the number 4 injector lobe and intake valve, lower camshaft assembly into position on bearings and gear case. See Figure 10.

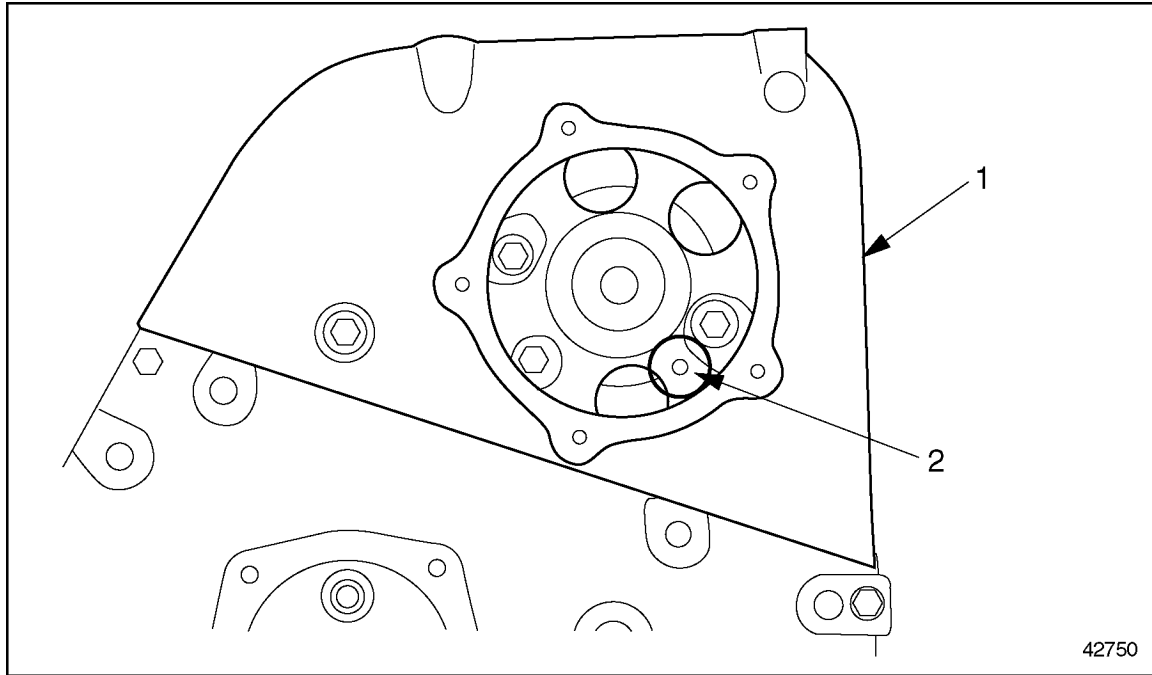
NOTE:

Insure that the seal on the rear of the camshaft gear cover does not catch on the edge of the cylinder head.

7. After the assembly is in position remove the alignment tool and guide studs and install the camshaft gear cover bolts by hand. The timing hole in the back of the camshaft gear cover should be visible in the center of the hole in the gear. Install and tighten the four attachment bolts to the gear case until the camshaft gear cover just contacts the gear case do not torque. Reinstall the alignment tool to verify timing is correct. If timing is correct proceed with installing the No.1 camshaft cap. See Figure 11
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NOTE:

Verify alignment tool is installed correctly. Incorrect installation will result in gear not being in time and the procedure will need to be repeated.



1. Camshaft Gear Cover

2. Timing Hole

Figure 11 Timing Verification

For Series 60 engines equipped with Compact Gear Train Assembly install camshaft bearing caps as follows:

8. Apply RTV to grooves in camshaft cap No. 1 and Gasket Eliminator[®] to camshaft cap No.7.
See Figure 12.

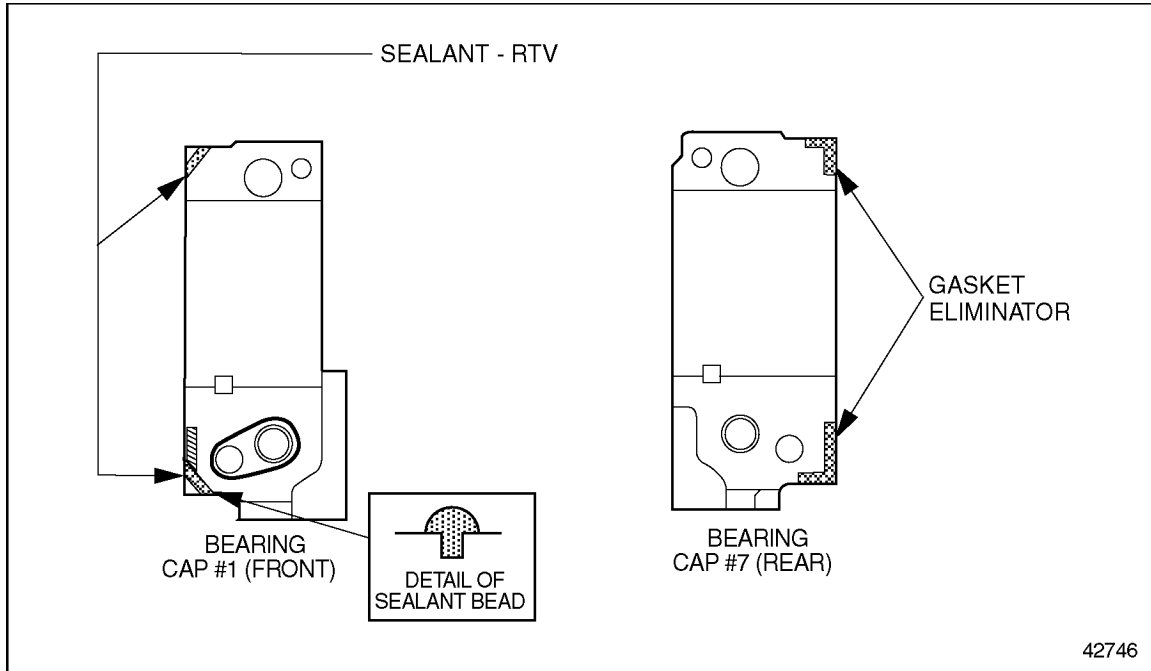
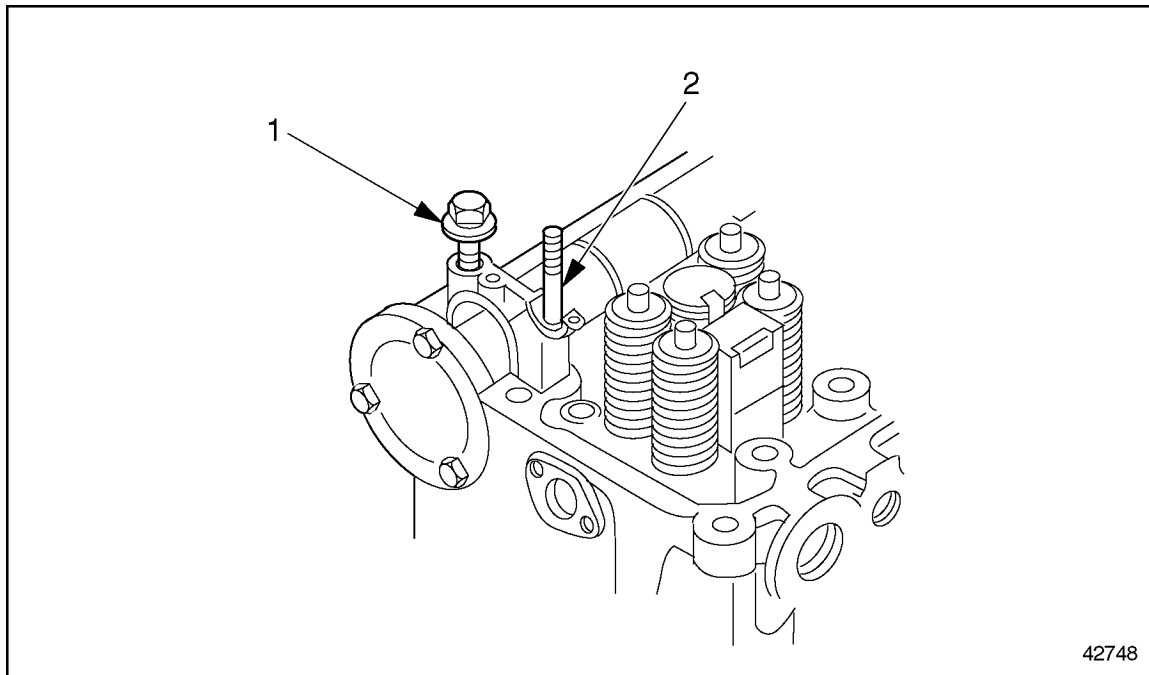


Figure 12 Sealant Application

Notice:

If the camshaft gear cover bolts and/or the camshaft cap bolts are tightened down with the camshaft gear out of time damage to the camshaft gear cover and timing pin will result.

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9. Install No. 1 and 7 camshaft bearing caps with one bolt and one stud bolt in each and tighten.
See Figure 13



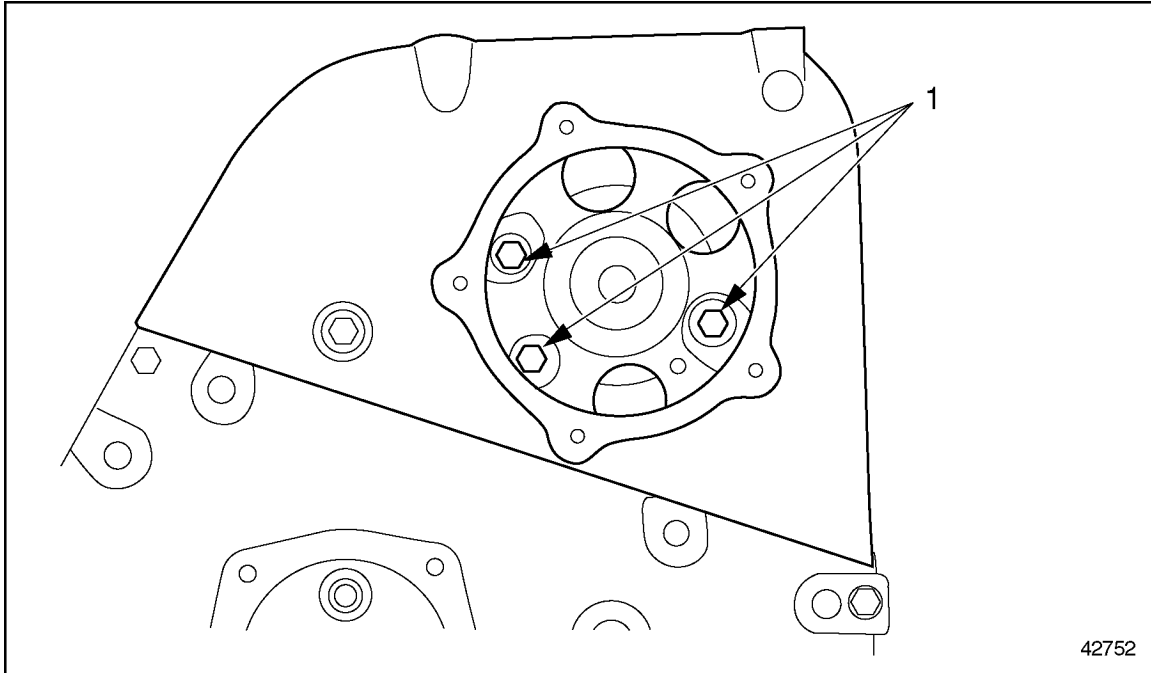
1. Bolt

2. Stud Bolt

Figure 13 Camshaft Bearing Cap Bolt and Stud Bolt

10. Install the remaining five camshaft caps onto cylinder head with one bolt for each camshaft cap.
11. Torque all camshaft cap bolts and stud bolts to 126-146 N·m (93-108 lb·ft).

12. Install three bolts inside camshaft gear cover and torque to 10 N·m (7 lb·ft). See Figure 14.



1. Bolt

Figure 14 Camshaft Gear Cover Bolts

13. Install four camshaft gear cover bolts torque to 56-66 N·m (44-48 lb·ft) using torque sequence as shown in Figure 15.

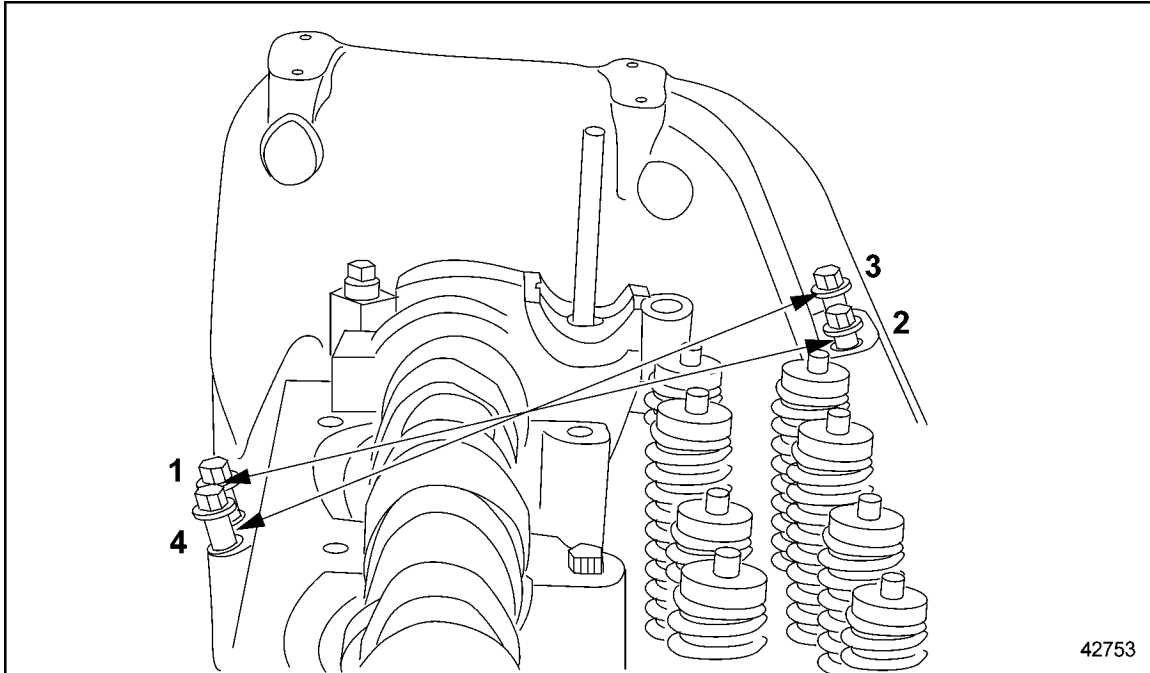
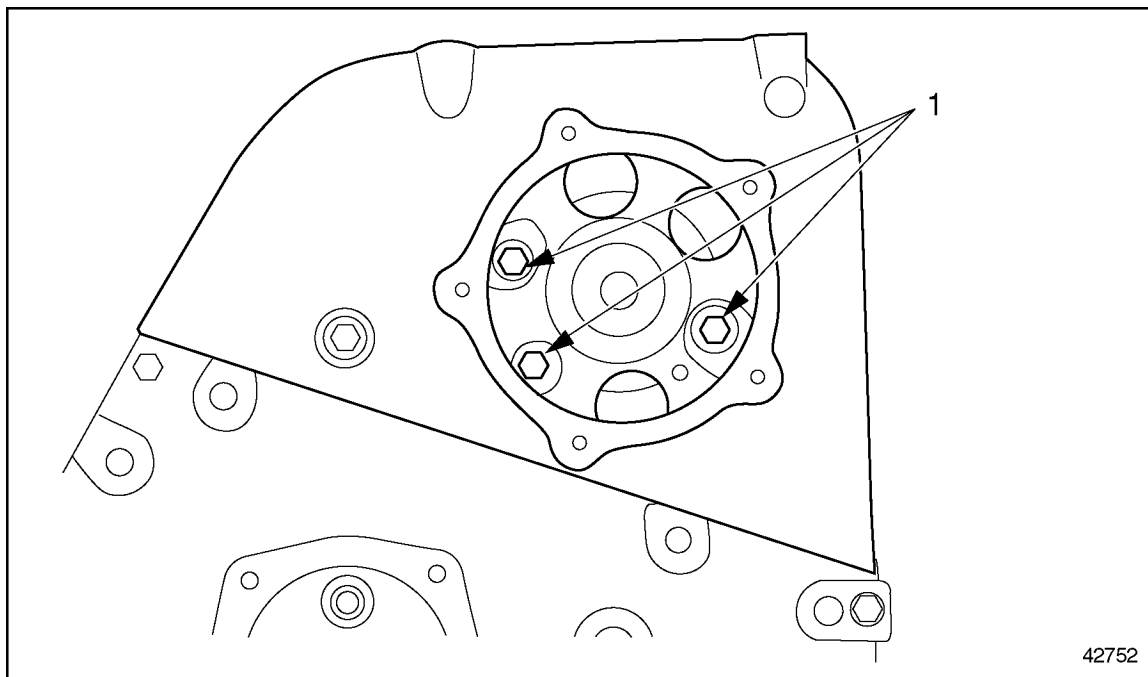


Figure 15 Bolt Torque Sequence

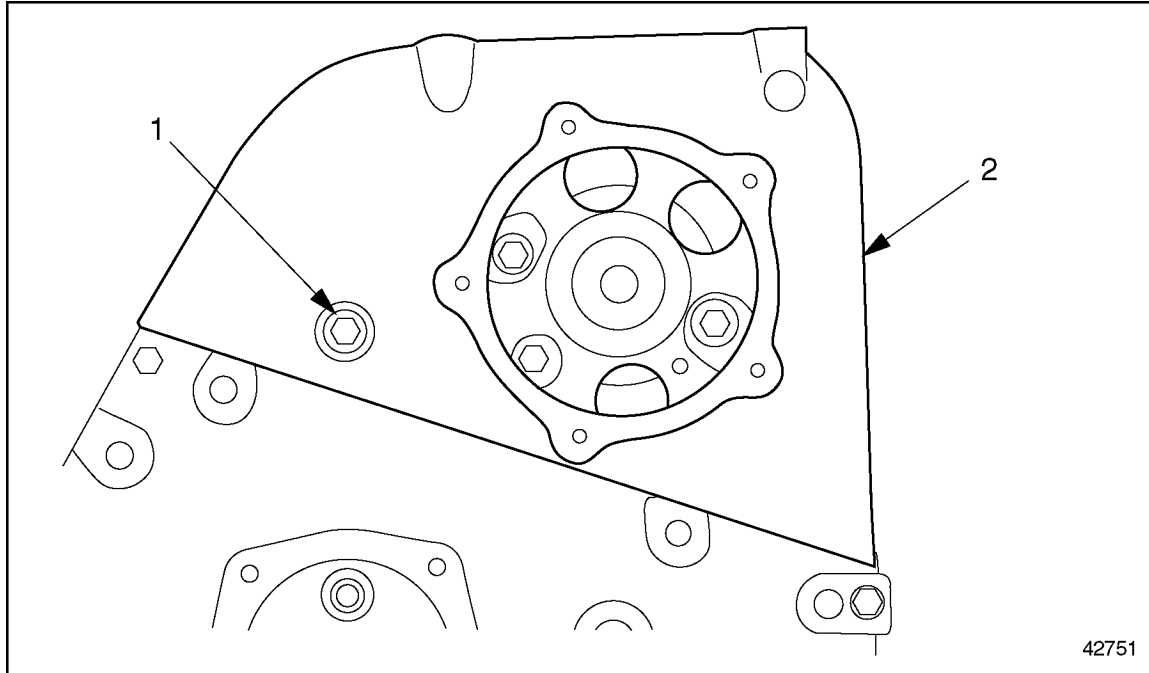
14. Torque the three bolts previously installed inside camshaft gear cover to 56-66 N·m (44-48 lb·ft). See Figure 16.



1. Bolt

Figure 16 Camshaft Gear Cover Bolts

15. Install remaining bolt to camshaft gear cover and torque to 136 N·m (100 lb·ft). See Figure 17.



1. Bolt

2. Camshaft Gear Cover

Figure 17 Camshaft Bolt

16. Ensure timing of the gear has been verified. Refer to Step 6.
17. Remove timing pin from crankshaft and alignment tool from gearcase cover.
18. Check camshaft gear lash and adjust if necessary. Refer to section 1.21.

ADDITIONAL SERVICE INFORMATION

Additional service information is available in the Detroit Diesel *Series 60 Service Manual*, 6SE483. The next revision to this manual will include the revised information. As a convenience to holders of the *Series 60 Service Manual*, information in service manual format is attached. The page(s) may be inserted into the manual.

NOTE:

Manual insert pages are numbered for insertion into the current *Series 60 Service Manual* dated April 2002. Service manuals are available from authorized Detroit Diesel distributors. If this bulletin was obtained from the Internet, service manual page(s) are available by returning to the screen "SIB Index", selecting attachment pages, and printing the page(s).

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