



DD15™ Service Information

NUMBER: 08 DD15-1 S.M. REF.: 1.4 ENGINE: DD15 DATE: June 2008

SUBJECT: REVISION TO THE CAMSHAFT AND ROCKER SHAFT ASSEMBLIES SECTION

PUBLICATION: DDC-SVC-MAN-0002

The Camshaft and Rocker Shaft Assemblies Section of the DD15 Workshop Manual is revised.

1.4 CAMSHAFT AND ROCKER SHAFT ASSEMBLIES

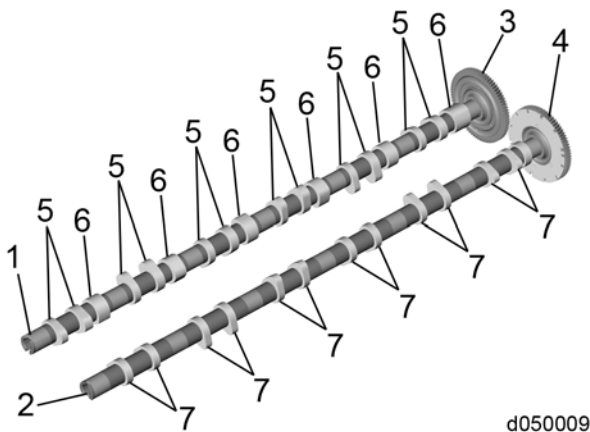
The exhaust camshaft (1) and the intake camshaft (2) are driven by the No. 5 idler gear.

There are two intake lobes (7) on the intake camshaft (2) per cylinder. The corresponding intake valves are opened by the intake lobes (7) and the intake rocker arm.

There are two exhaust lobes (5) and one brake lobe (6) on the exhaust camshaft (1) per cylinder.

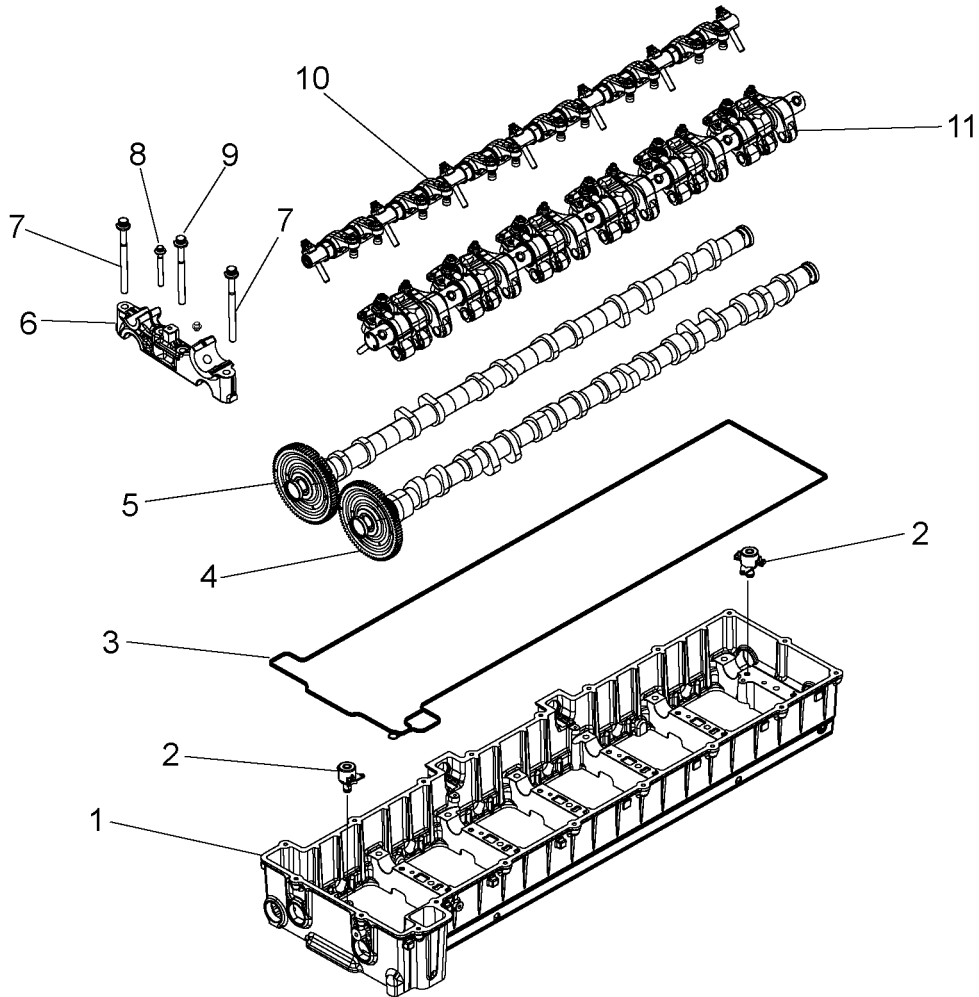
The exhaust valves are opened by the exhaust lobes (5) and the exhaust rocker arm.

For an activated engine brake, one exhaust valve is opened per cylinder by the brake cam lobe (6), after the beginning and before the end of the compression cycle.



- | | |
|------------------------------------|-----------------|
| 1. Exhaust Camshaft | 5. Exhaust Lobe |
| 2. Intake Camshaft | 6. Brake Lobe |
| 3. Drive Gear for Exhaust Camshaft | 7. Intake Lobe |
| 4. Drive Gear for Intake Camshaft | |

Figure 1 Camshaft and Gears



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- | | |
|------------------------------|---------------------------------------|
| 1. Camshaft Housing | 7. Bolt, 120 mm |
| 2. Engine Brake Solenoid | 8. Bolt, 63 mm |
| 3. Gasket | 9. Bolt, 108 mm |
| 4. Exhaust Camshaft and Gear | 10. Intake Rocker Arm Shaft Assembly |
| 5. Intake Camshaft and Gear | 11. Exhaust Rocker Arm Shaft Assembly |
| 6. Camshaft Cap | |

Figure 2 Camshaft Housing and Related Parts

1.4.1 CAMSHAFT AND ROCKER SHAFT ASSEMBLIES REMOVAL

Remove as follows:

1. Steam clean the engine.
2. Remove pipe, air cleaner and turbocharger inlet hose.
3. Remove air cleaner housing.
4. Remove eight bolts from air cleaner bracket and remove bracket.
5. Remove nineteen bolts from rocker cover and remove rocker cover.
6. Remove the injector harness.

NOTE:

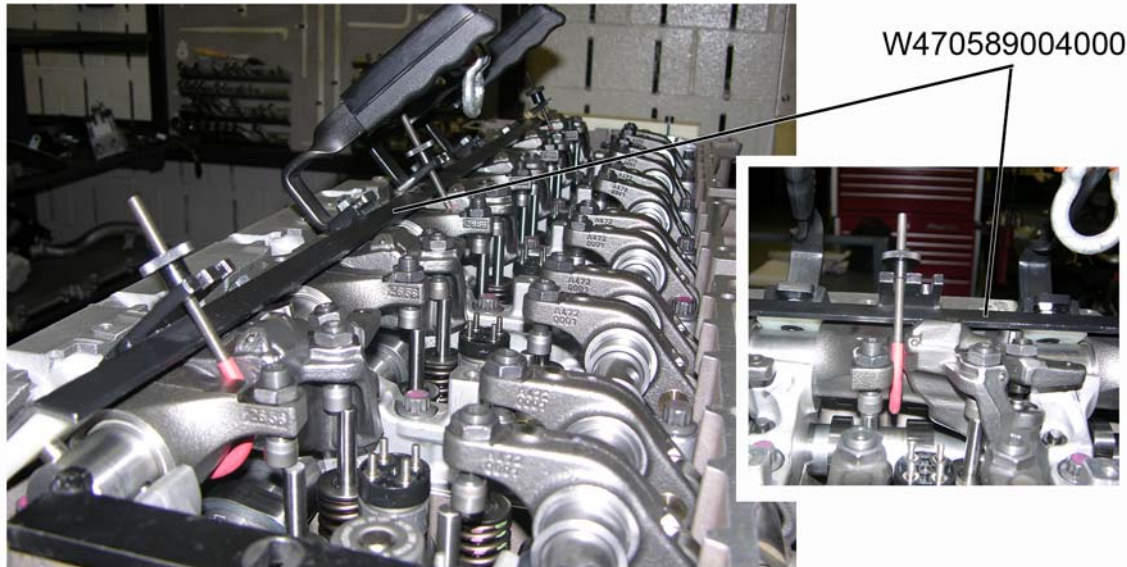
TDC can be confirmed by installing front camshaft timing tool W470589024000.

7. Rotate the engine to top dead center (TDC) on cylinder No. 1.
8. Remove the Crankshaft Position Sensor (CKP) from the rear of the flywheel housing. Refer to section 2.13.
9. Install flywheel housing TDC locating pin (W470589001500) into the CKP hole located in the rear of the flywheel housing. The plastic tip protrudes into the cutout in the tone ring to accurately locate TDC.

NOTICE:
Ensure when loosening the rocker shaft bolts that the bolts are loosened from the inside bolts outward in 1/2 turn increments. The increment procedure needs to be followed to prevent the rocker shaft from breaking.

10. Loosen the seven bolts securing the intake rocker shaft to the camshaft caps.
11. Using rocker arm lifter spacer tool (W470589004000), remove the intake rocker shaft assembly. See Figure 3.
12. Loosen the seven bolts securing the exhaust rocker shaft to the camshaft cap.

- Using rocker arm lifter spacer tool (W470589004000), remove the exhaust rocker shaft assembly from the camshaft cap. See Figure 3.



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Figure 3 Tool W470589004000

NOTE:

The engine brake solenoids do not have to be removed unless damaged.

- Remove the remaining bolts from the camshaft caps and remove with J-48883.
- Remove the intake and exhaust camshaft assemblies from the camshaft housing.

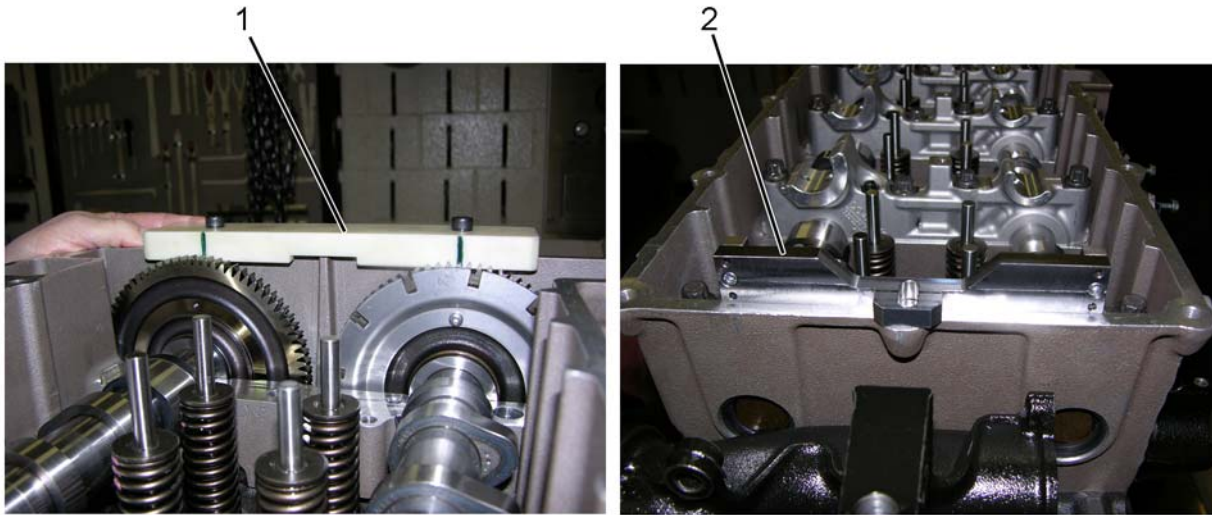
1.4.1.1 INSPECTION OF THE CAMSHAFT AND ROCKER SHAFT ASSEMBLIES

Inspect the camshaft and rocker shaft assemblies as follows:

- Inspect the camshafts for lobe damage, replace if necessary.
- Inspect the camshaft gears for damage, replace if necessary.
- Inspect the rocker shaft for scoring or scuffing, replace if necessary.
- Inspect rocker arms for roller and bushing damage, replace if necessary.
- Inspect adjusting screws and buttons, replace if necessary.

1.4.2 INSTALLATION OF THE CAMSHAFT AND ROCKER SHAFT ASSEMBLIES

Install as follows:



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1. Rear Timing Tool

2. Front Timing Tool

Figure 4 Timing Tool W470589024000

1. Verify that the crankshaft is at top dead center (TDC) on cylinder No.1 using tool (W470589001500) installed in CKP hole.
2. Remove flywheel housing TDC locating pin (W470589001500) from CKP sensor hole in the rear of the flywheel housing.
3. Install camshaft timing tool (W470589024000) to the rear of the camshaft housing. Tighten the two bolts. See Figure 4.
4. Locate the etched triangle on the camshaft gear teeth and mark the teeth with a paint pen.
5. Lubricate the lower camshaft bearing surfaces and camshaft journals before installation of the camshafts. Install the exhaust and intake camshaft gear assemblies onto camshaft housing caps.
6. Align the marked gear teeth with the marks on the timing tool.

7. Install timing tool (W470589024000) to the front of the camshaft frame and into the grooves cut into the camshafts. Secure timing tool to the camshaft with a bolt. See Figure 4.
 - [a] At this point the front timing tool should slide into the camshaft grooves easily with no drag.
 - [b] If there is excessive drag when installing the tool the camshafts are out of time.
8. Verify that the marks on the gear teeth match the marks on the timing tool.
9. Install a dial indicator onto gear case and zero out the dial indicator.
10. Position the stem of dial indicator to rest between the teeth on the camshaft gear.
11. Hold the No. 5 idler gear with a screw driver. Check the lash between the camshaft gear and idler gear No. 5.
12. The dial indicator should read 0.051 - 0.257 mm (0.002002 - 0.01010 in.).

NOTICE
The camshaft caps are numbered and need to be installed correctly.

13. Install the seven camshaft caps onto intake and exhaust camshafts.
14. The first and seventh camshaft caps hold the engine brake solenoid to camshaft cap. Replace the O-rings on the solenoid prior to reinstallation. Install the engine brake solenoid. Refer to section 1.16.

NOTE:

There are 28 bolts retaining the camshaft assemblies, 14 120 mm (M10) bolts, seven 108 mm (M10) bolts and seven 63 mm (M8).

15. Install the 28 bolts to camshaft caps; finger tighten the bolts. See Figure 5.
16. Torque fourteen 120 mm M10 camshaft cap bolts and seven 108 mm M10 bolts to 20 N·m (15 lb·ft) and then torque to 50 - 55 N·m (37 - 40 lb·ft) using torque sequence shown in Figure 6.

17. Torque the seven 63 mm M8 bolts to 30 N·m (22 lb·ft) using the torque sequence shown in Figure 6.

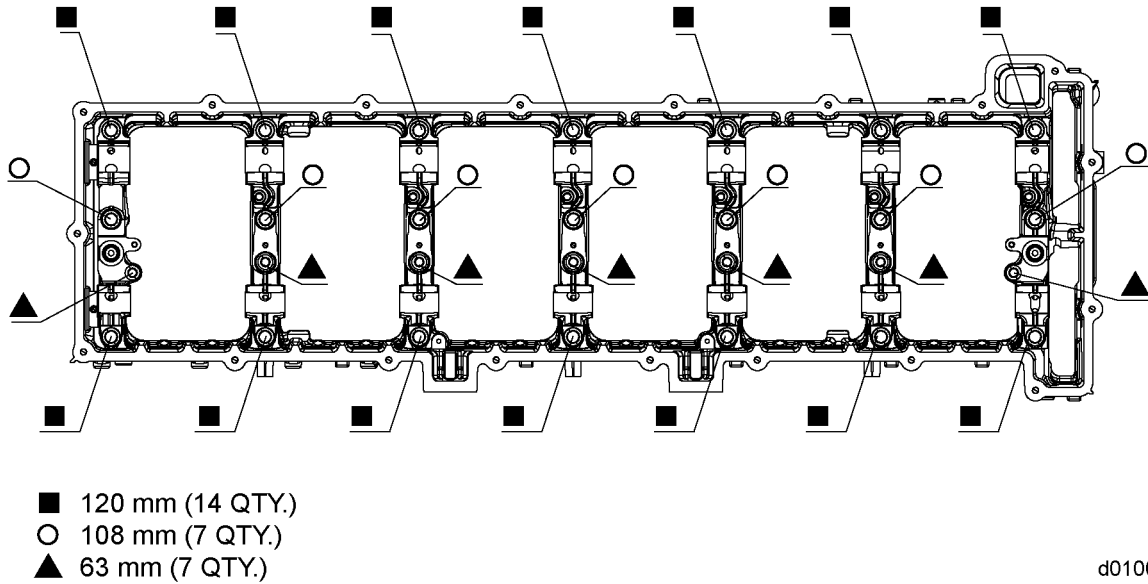


Figure 5 Bolt Size and Location

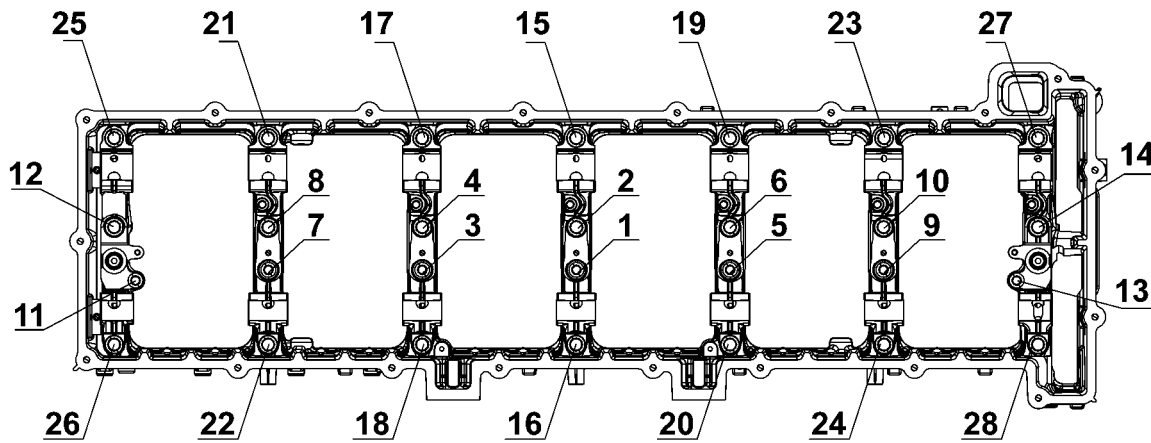
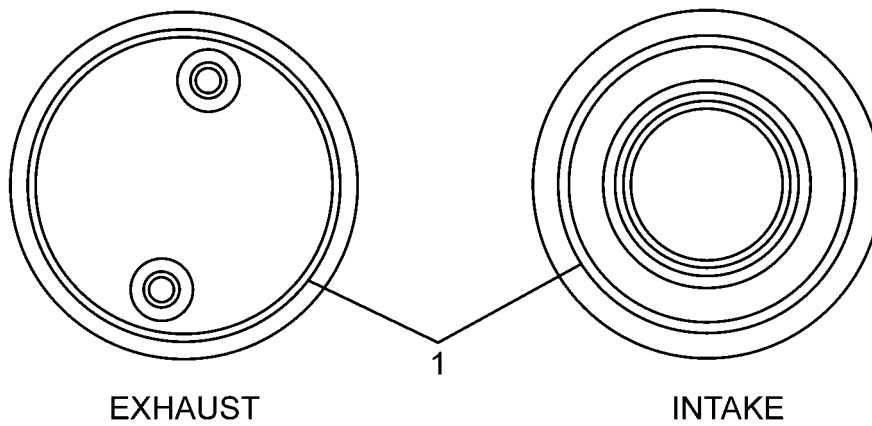


Figure 6 Camshaft Bolt Torque Sequence

NOTICE:

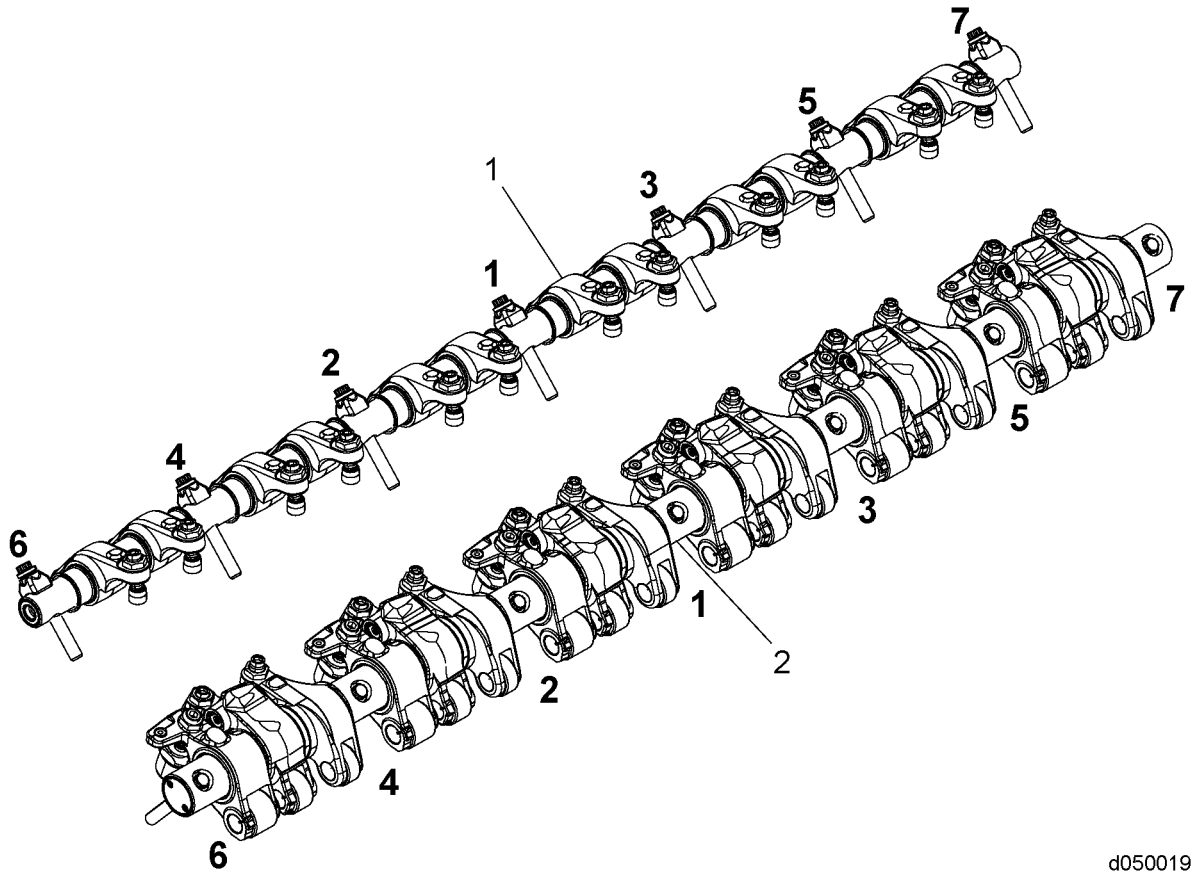
The camshaft journal area is lubricated by oil that has to travel through the rocker shaft. If the rocker shaft is installed incorrectly, oil passages do not line up. This results in insufficient lubrication and damage to the camshaft journals. Incorrect shaft installation may also result in the engine brakes not functioning and cause damage to the rocker arm bushings. See Figure 7.



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1. Marking Groove – faces rear of engine

Figure 7 Marking Groove



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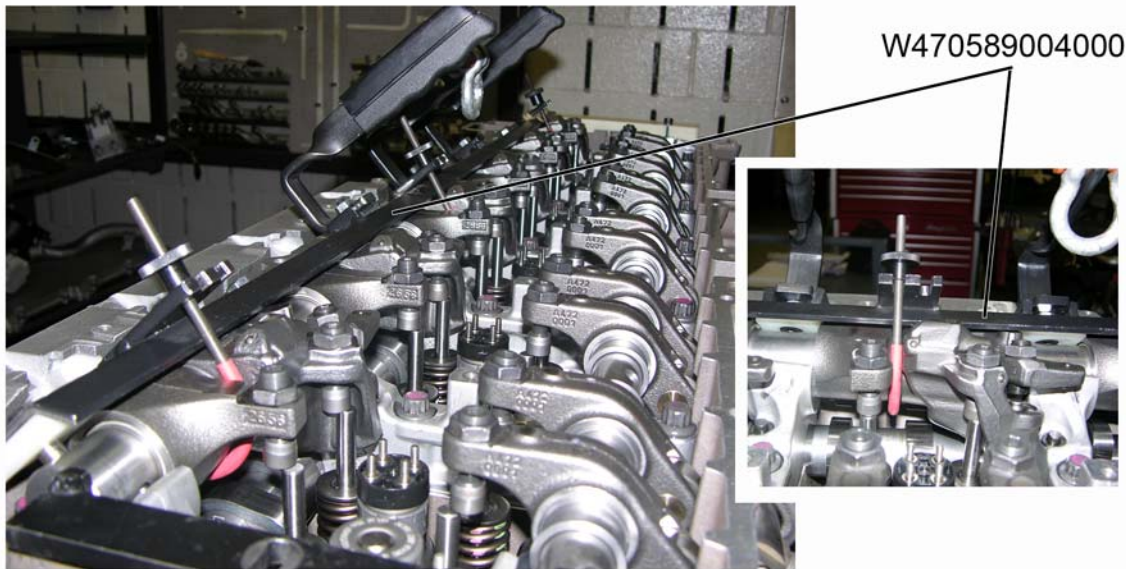
1. Intake Rocker Shaft Assembly

2. Exhaust Rocker Shaft Assembly

Figure 8 Intake and Exhaust Rocker Shaft Torque Sequence

NOTICE:

Ensure when tightening the rocker shaft bolts that the bolts are drawn down from the inside bolts outward in 1/2 turn increments, before final torque. If the rocker shaft bolt is fully torqued without using the increment procedure the rocker shaft can break. See Figure 8.



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Figure 9 Tool W470589004000

18. Using tool (W470589004000), install the assembled intake rocker arm assembly to the camshaft cap and secure with seven clamping blocks and bolts. Torque the bolts to 55 - 60 N·m (41 - 44 lb·ft) 90 degrees. See Figures 8 and 9.
19. Using tool (W470589004000), install the assembled exhaust rocker arm assembly to the camshaft cap. Torque the bolts to 55 - 60 N·m (41 - 44 lb·ft) 90 degrees. See Figures 8 and 9.
20. Install the injectors and harness. Refer to section 2.2.
21. Lash the valves and engine brakes. Refer to section 11.
22. Install the rocker cover. Refer to section 1.9.
23. Install air cleaner bracket with eight bolts.
24. Install air cleaner housing.
25. Install pipe, air cleaner and turbo inlet hose.

26. Install CKP, refer to section 2.13.

ADDITIONAL SERVICE INFORMATION

Additional service information is available in the Detroit Diesel *DD15 Workshop Manual*, (DDC-SVC-MAN-0002). The next revision to this manual will include the revised information.

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