11.1 Poor Engine Brake Performance

Use this procedure to determine the cause of poor engine brake performance when no codes are present. Verify the customer complaint before beginning any troubleshooting.

Check as follows:

Note : Engine brakes do not enable until engine oil temperature reaches 50°C (122°F). The front engine brake solenoid controls cylinders 1, 2, and 3. The rear engine brake solenoid controls cylinders 4, 5, and 6. The engine brakes are most effective at higher engine speeds; performance increases as engine speed increases.

Typical engine brake solenoid related brake performance symptoms are:

- Front solenoid - Loss of low engine braking.
- Rear solenoid - Medium engine braking feels like low and high will be slightly better than low due to EGR flow.

Note : Not everyone can accurately "feel" the difference between low, medium and high engine braking as it varies with engine speed. Additionally, there are other causes for poor engine brake performance. Complete all troubleshooting before replacing the engine brake solenoids.

1. Using DiagnosticLink , check all modules, including Transmission Control Module (TCM), Antilock Brake System (ABS and chassis) for active or inactive codes. Are faults present?
   - 1.a Yes; perform the troubleshooting for all fault codes first.
   - 1.b No; Go to step 2.
2. Is the vehicle equipped with a manual transmission?
   - 2.a Yes; Go to step 3.
   - 2.b No; Go to step 4.
3. Using DiagnosticLink, view the clutch switch status. Push the clutch pedal to the floor, then release the clutch pedal to the original position. Does the clutch pedal status change?
   - 3.a Yes; Go to step 4.
   - 3.b No; diagnose and repair the clutch switch.
4. Using DiagnosticLink, view the service brake switch status. Push the service brake to the floor, then release the service brake to the original position. Does the service brake status change?
   - 4.a Yes; Go to step 5.
   - 4.b No; diagnose and repair the service brake switch.
5. With the engine OFF for a minimum of five minutes, check the oil level. Is the oil level within the minimum and maximum marks on the dipstick?
   - 5.a Yes; Go to step 10.
   - 5.b No; Go to step 6.
6. Is the oil level above the maximum mark on the dipstick with no oil previously added?
   - 6.a Yes; Go to step 7.
   - 6.b No; Go to step 8.
7. Visually inspect and/or test for contamination in the oil. Is the oil contaminated with coolant or fuel?
   - 7.a Yes; Refer to section "Coolant in Oil" or Refer to section "Fuel in Oil" . Repair as necessary and verify repairs.
   - 7.b No; Go to step 8.
8. Fill oil to the proper level and Go to step 9.
9. Does the engine still have poor engine brake performance?
   - 9.a Yes; Go to step 10.
   - 9.b No; release vehicle.
10. Check the oil pressure using DiagnosticLink. . Is the oil pressure within specification?

For DD13, Refer to section " Engine Mechanical Specifications" .

For DD15, Refer to section " Engine Mechanical Specifications" .

10.a Yes; Go to step 11.

10.b No; perform the low oil pressure troubleshooting for fault code SPN 100/FMI 1 low oil pressure. Refer to section "SPN 100/FMI 1 - GHG21" .

11. Measure air inlet restriction and/or inspect the air filter. Is the air filter restricted or plugged?

11.a Yes; replace and verify repairs.

11.b No; Go to step 12.

12. Pressurize the intake tract, including the Charge Air Cooler (CAC) and associated piping. Inspect for leaks. Was a leak found?

12.a Yes; repair and/or replace as necessary and verify repairs.

12.b No; Go to step 13.

13. Inspect the exhaust manifolds and turbocharger mounting flange for exhaust leaks. Are leaks present?

13.a Yes; repair and/or replace as necessary and verify repairs.

13.b No; Go to step 14.

14. Inspect the EGR pipes (hot pipe, venturi and delivery pipe) for leaks. Are leaks present?

14.a Yes; repair and/or replace as necessary and verify repairs.

14.b No; Go to step 15.

Note : Oil residue at the turbocharger compressor wheel is normal. Excessive oil can be caused by excessive idle time, high air inlet restriction, or high crankcase pressure. Do NOT replace the turbocharger.

15. Remove the turbo inlet pipe/elbow and inspect the turbo compressor wheel for damage. Is damage present?

15.a Yes; replace the turbocharger and verify repairs.

15.b No; Go to step 16.

16. Perform a Relative Compression Test using DiagnosticLink. Refer to section "Relative Cylinder Compression Test" . Was a faulty cylinder found?

16.a Yes; perform a Mechanical Cylinder Compression Test. Refer to section "Mechanical Cylinder Compression Test" and then repair as necessary. Verify repairs.

16.b No; Go to step 17.

17. Remove the rocker cover. Go to step 18.

For DD13, Refer to section "Removal of the Rocker Cover" .

For DD15, Refer to section "Removal of the Rocker Cover" .

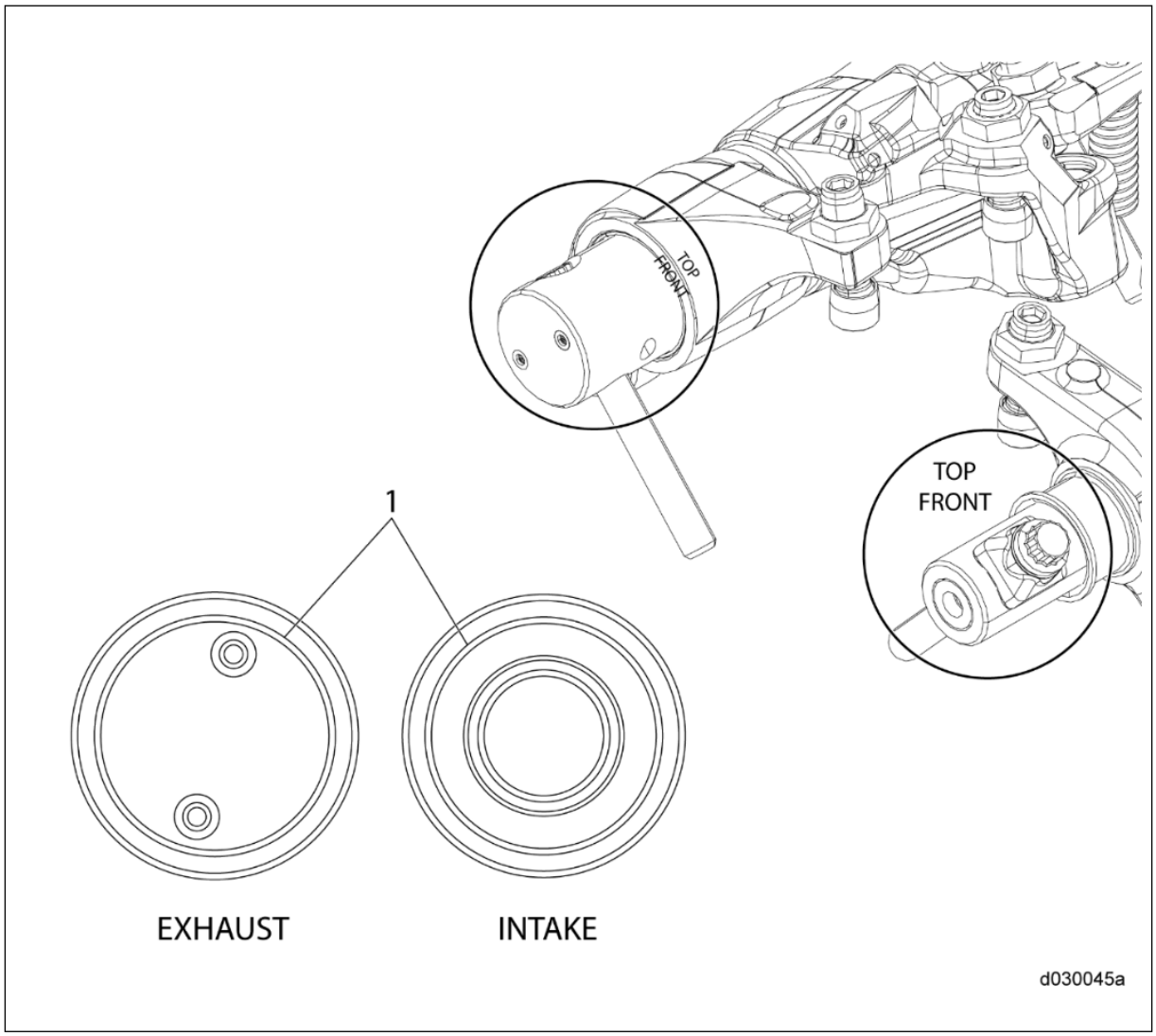
NOTICE

The cam journal area is lubricated by oil that has to travel through the rocker shaft. If the shaft is installed incorrectly, the oil passages do not line up. This will result in insufficient lubrication and damage to the cam journal and rocker arm bushings.

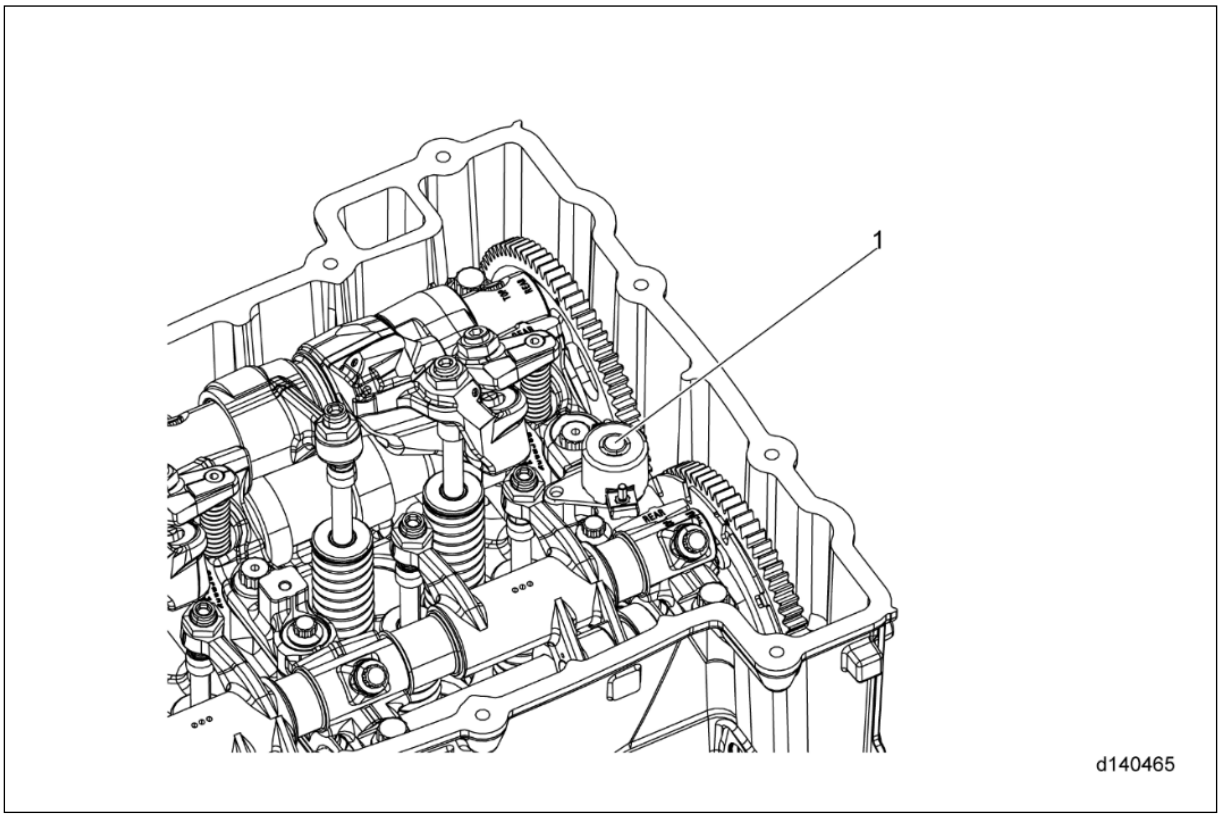
18. Inspect the exhaust rocker shaft to ensure it is installed with the groove towards the rear of the engine. Is the exhaust rocker shaft installed correctly?

18.a Yes; Go to step 19.

18.b No; check the camshafts and valve train for damage, and repair as necessary.



19. Remove the engine brake solenoids from the cam frame housing. Go to step 20.
    For DD13, Refer to section "Removal of the Front Engine Brake Solenoid" .
    For DD13, Refer to section "Removal of the Rear Engine Brake Solenoid" .
    For DD15, Refer to section "Removal of the Front Engine Brake Solenoid" .
    For DD15, Refer to section "Removal of the Rear Engine Brake Solenoid" .



20. Inspect the engine brake solenoids for damage, including the screen and O-rings. Is any damage found?

    20.a Yes; replace the parts on the engine brake solenoid and verify repairs.

    20.b No; Go to step 21.

Note : The front engine brake solenoid controls cylinders 1, 2, and 3. The rear engine brake solenoid controls cylinders 4, 5, and 6.

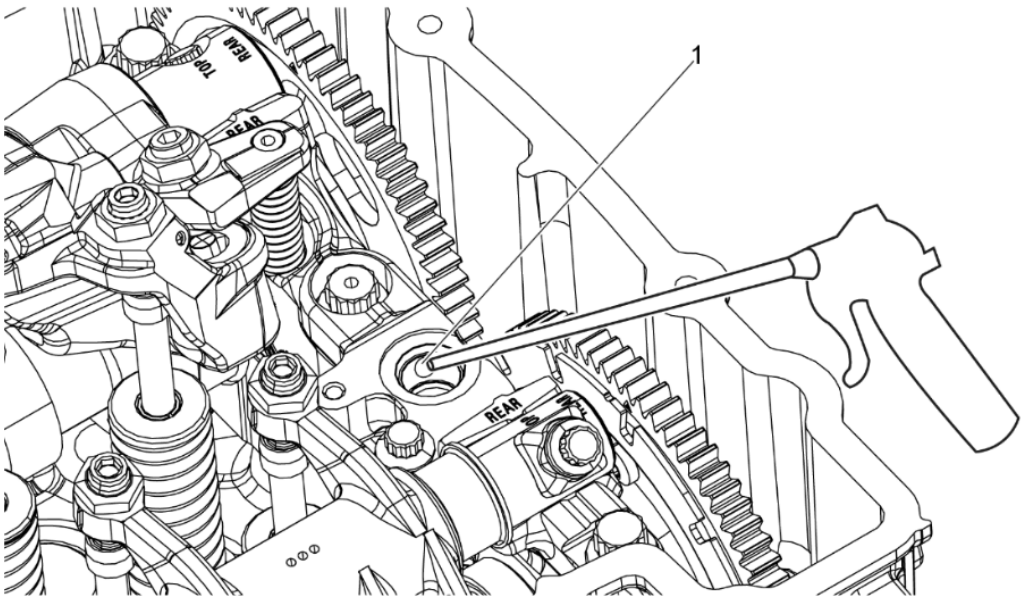
21. With the **front** engine brake solenoid removed from the cam frame housing, use a rubber tip blow gun regulated at 345 kPa (50 psi). Apply 345 kPa (50 psi) into the solenoid outlet port/engine activation port (1) of the cam frame housing. Do all the actuator pistons in the engine brake rocker arms extend upwards for the appropriate cylinders?

    21.a Yes; Go to step 22.

    21.b No; replace the engine brake rocker with the stuck actuator pistons.

        For DD13, Refer to section "Removal of the Exhaust Rocker Shaft Assembly" .

        For DD15, Refer to section "Removal of the Exhaust Rocker Shaft Assembly" .



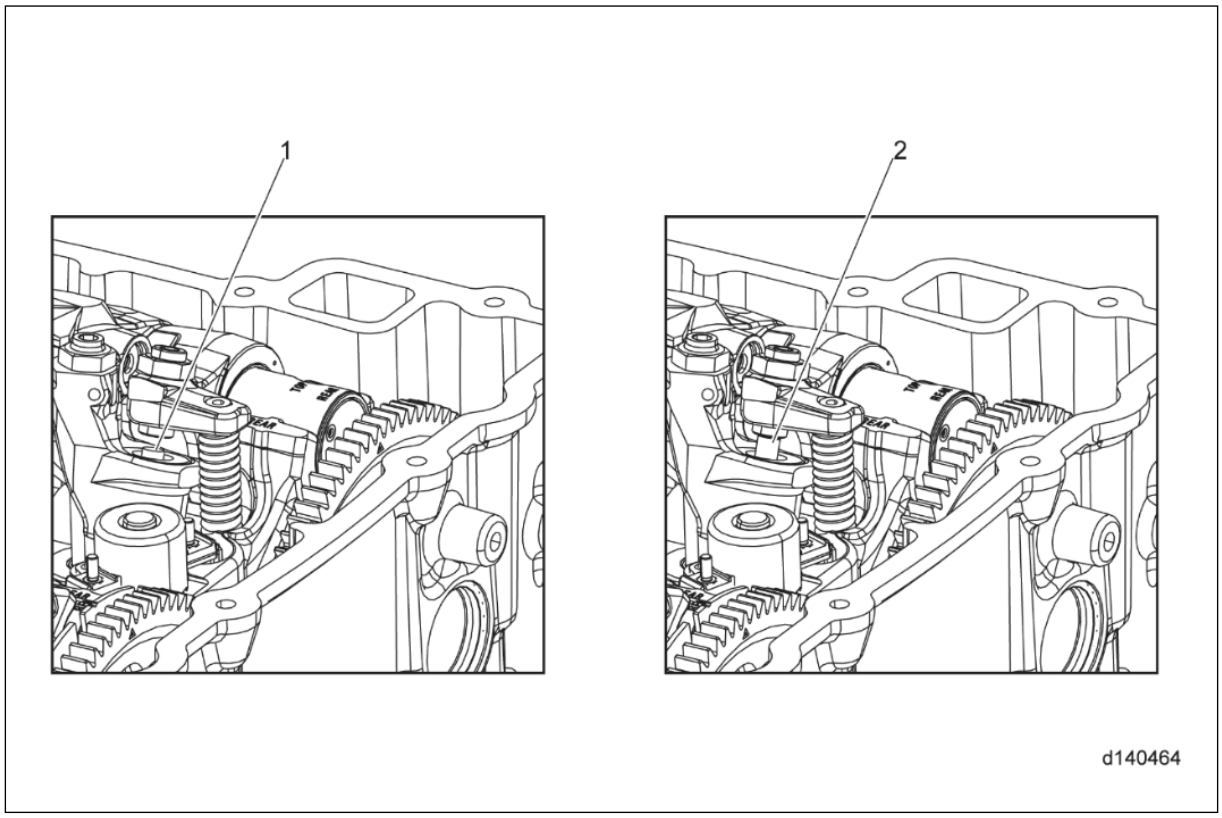
22. Remove the air pressure; do the actuator pistons (1) retract?

22.a Yes; Go to step 23.

22.b No; replace the engine brake rocker with the stuck actuator pistons (2).

For DD13, Refer to section "Removal of the Exhaust Rocker Shaft Assembly" .

For DD15, Refer to section "Removal of the Exhaust Rocker Shaft Assembly" .



23. With the rear engine brake solenoid removed from the cam frame housing, use a rubber-tip blow gun regulated at 345 kPa (50 psi). Apply 345 kPa (50 psi) into the solenoid outlet port/engine activation port of the cam frame housing. Do the actuator pistons in the engine brake rocker arms extend outwards for the appropriate cylinders?

    23.a Yes; Go to step 24.

    23.b No; replace the engine brake rocker(s) with the stuck actuator pistons.

    For DD13, Refer to section "Removal of the Exhaust Rocker Shaft Assembly" .

    For DD15, Refer to section "Removal of the Exhaust Rocker Shaft Assembly" .

24. Remove the air pressure; do the actuator pistons retract?

    24.a Yes; Go to step 25.

    24.b No; replace the engine brake rocker(s) with the stuck actuator pistons.

    For DD13, Refer to section "Removal of the Exhaust Rocker Shaft Assembly" .

    For DD15, Refer to section "Removal of the Exhaust Rocker Shaft Assembly" .

25. Check the camshaft timing. Do camshaft timing marks line up per procedures?

    For DD13, Refer to section "Camshaft Timing Verification" .

    For DD15, Refer to section "Camshaft Timing Verification" .

    25.a Yes; Go to step 26.

    25.b No; repair as necessary and verify repair.

26. Check valve lash and engine brake adjustments. Was valve lash correct?

    For DD13, Refer to section "Setting the Valve and Engine Brake Lash" .

    For DD15, Refer to section "Setting the Valve and Engine Brake Lash" .

    26.a Yes; Go to step 27.

    26.b No; adjust valve lash, assemble the engine and verify repairs.

27. Replace both engine brake solenoids. Go to step 28.
    For DD13, Refer to section "Installation of the Front Engine Brake Solenoid" .
    For DD13, Refer to section "Installation of the Rear Engine Brake Solenoid" .
    For DD15, Refer to section "Installation of the Front Engine Brake Solenoid" .
    For DD15, Refer to section "Installation of the Rear Engine Brake Solenoid" .
28. Does the engine still have poor engine brake performance?
    28.a Yes; replace all six exhaust rockers arms that have actuator pistons.
        For DD13, Refer to section "Removal of the Exhaust Rocker Shaft Assembly" . Verify repairs.
        For DD15, Refer to section "Removal of the Exhaust Rocker Shaft Assembly" . Verify repairs.
    28.b No; troubleshooting is complete.