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Service Information Bulletin

SUBJECT	DATE
Symptom Diagnostics - Engine Brake	August 2016

Additions, Revisions, or Updates

Publication Number / Title	Platform	Section Title	Change
DDC-SVC-MAN-0191	GHG17 DD Platform	Symptom Diagnostics - Poor Engine Brake Performance	New GHG17 HD diagnostic procedures.
		Symptom Diagnostics - Inoperative Engine Brake	

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2 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?
    a. Yes; perform the troubleshooting for all fault codes first.
    b. No; Go to step 2.
2. Is the vehicle equipped with a manual transmission?
    a. Yes; Go to step 3.
    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?
    a. Yes; Go to step 4.
    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?
    a. Yes; Go to step 5.
    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?
    a. Yes; Go to step 10.
    b. No; Go to step 6.
6. Is the oil level above the maximum mark on the dipstick with no oil previously added?
    a. Yes; Go to step 7.
    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?
    a. Yes; Refer to section "Coolant in Oil" or Refer to section "Oil in Coolant". Repair as necessary and verify repairs.
    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?
    a. Yes; Go to step 10.
    b. No; release vehicle.
10. Check the oil pressure using DiagnosticLink. Refer to section "Engine Mechanical Specifications". Is the oil pressure within specification?
    a. Yes; Go to step 11.

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 - GHG17".

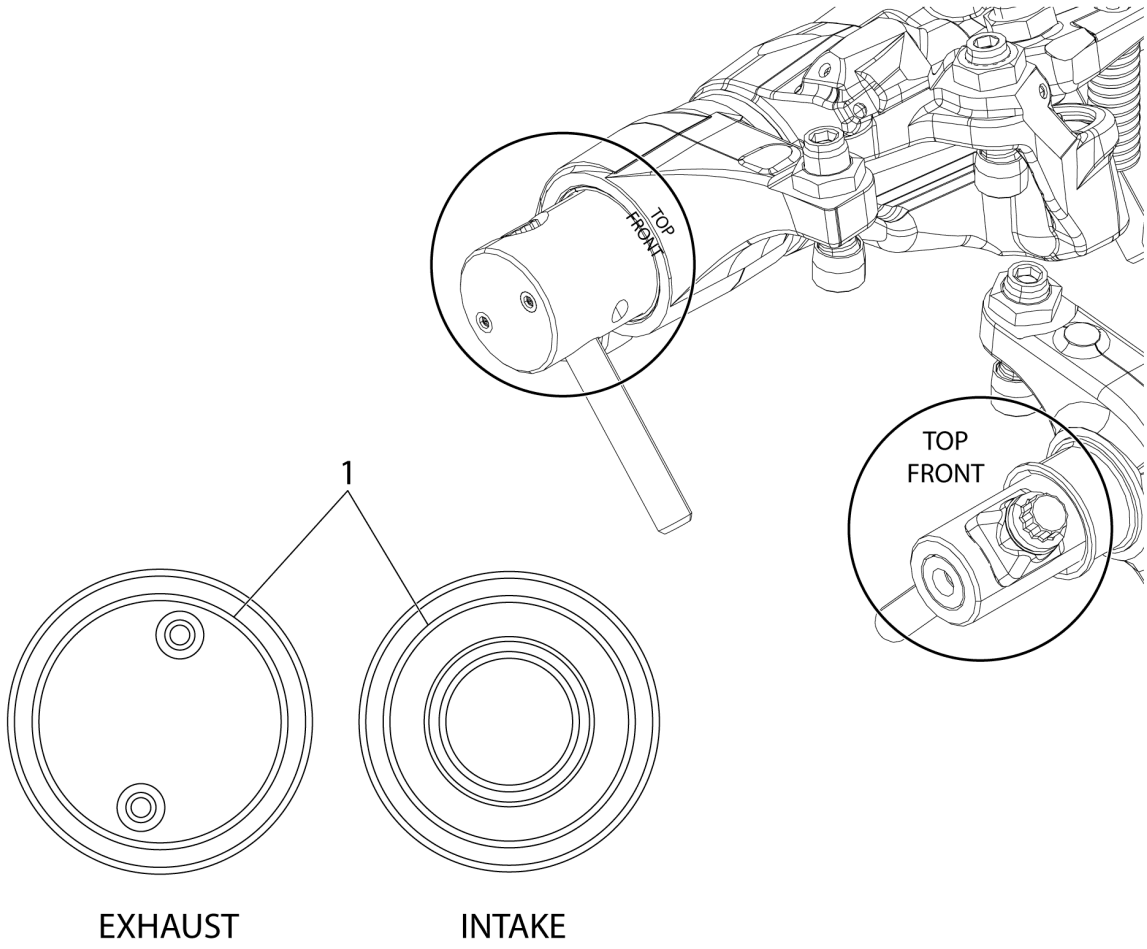
11. Measure air inlet restriction and/or inspect the air filter. Is the air filter restricted or plugged?
    a. Yes; replace and verify repairs.
    b. No; Go to step 12.
12. Pressurize the intake tract, including the Charge Air Cooler (CAC) and associated piping. Inspect for leaks. Was a leak found?
    a. Yes; repair and/or replace as necessary and verify repairs.
    b. No; Go to step 13.
13. Inspect the exhaust manifolds and turbocharger mounting flange for exhaust leaks. Are leaks present?
    a. Yes; repair and/or replace as necessary and verify repairs.
    b. No; Go to step 14.
14. Inspect the EGR pipes (hot pipe, venturi and delivery pipe) for leaks. Are leaks present?
    a. Yes; repair and/or replace as necessary and verify repairs.
    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.

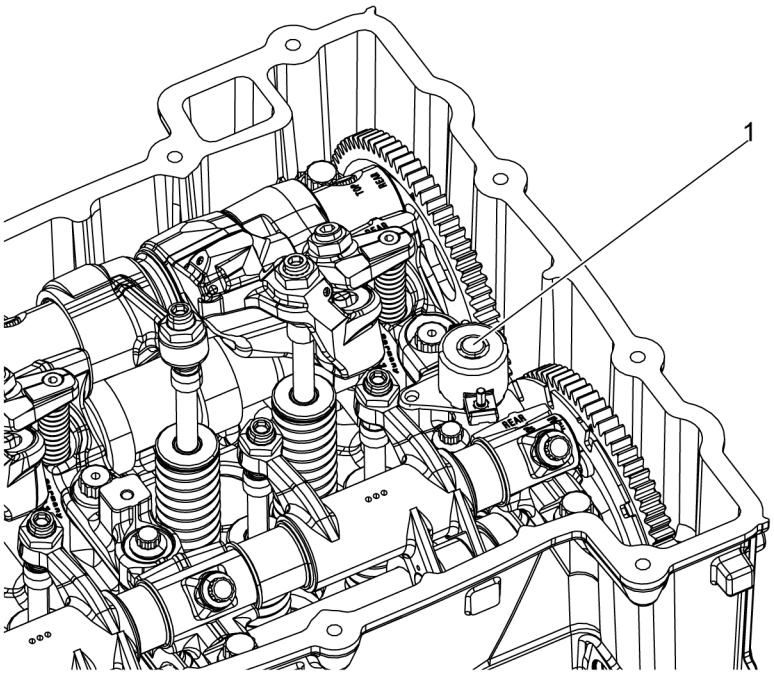
15. Remove the turbo inlet pipe/elbow and inspect the turbo compressor wheel for damage. Is damage present?
    a. Yes; replace the turbocharger and verify repairs.
    b. No; Go to step 16.
16. Perform a Relative Compression Test using DiagnosticLink. Refer to section "Relative Cylinder Compression Test". Was a faulty cylinder found?
    a. Yes; perform a Mechanical Cylinder Compression Test. Refer to section "Mechanical Cylinder Compression Test" and then repair as necessary. Verify repairs.
    b. No; Go to step 17.
17. Remove the rocker cover. Refer to section "Removal of the Rocker Cover". Go to step 18.

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?
    a. Yes; Go to step 19.
    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. Refer to section "Removal of the Engine Brake Solenoid". Go to step 20.



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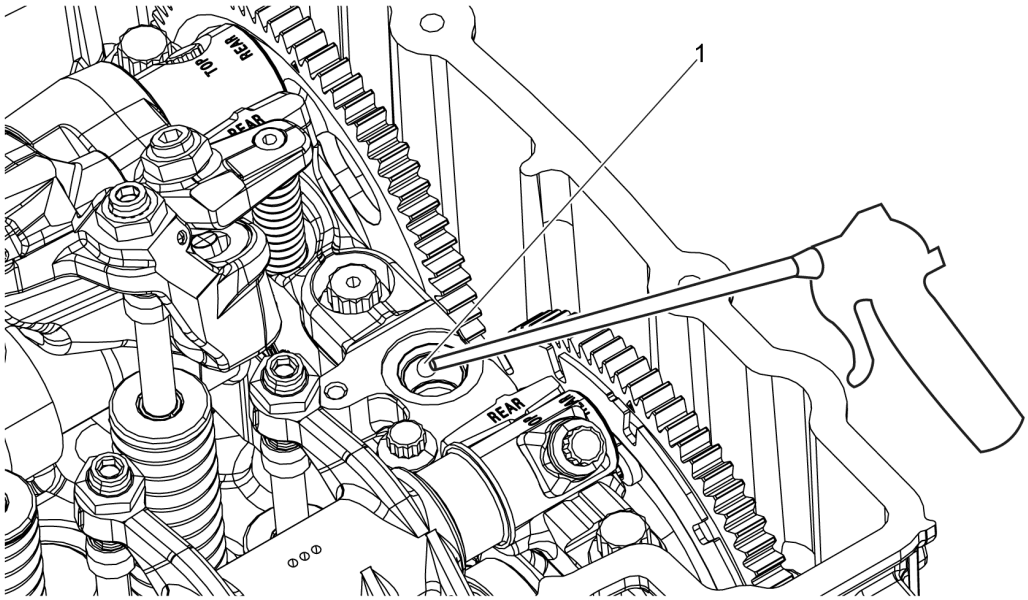
20. Inspect the engine brake solenoids for damage, including the screen and O-rings. Is any damage found?
    a. Yes; replace the parts on the engine brake solenoid and verify repairs.
    b. No; Go to step 21.

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?
    a. Yes; Go to step 22.
    b. No; replace the engine brake rocker with the stuck actuator pistons. Refer to section "Removal of the Exhaust Rocker Shaft Assembly".



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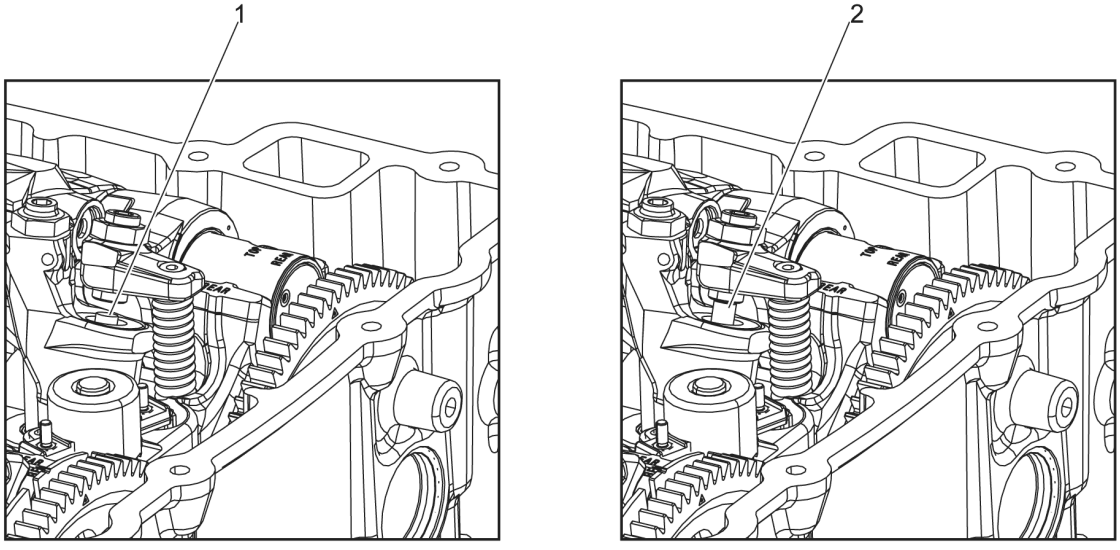
22. Remove the air pressure; do the actuator pistons (1) retract?
    a. Yes; Go to step 23.
    b. No; replace the engine brake rocker with the stuck actuator pistons (2). Refer to section "Removal of the Exhaust Rocker Shaft Assembly".



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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?
    a. Yes; Go to step 24.

b. No; replace the engine brake rocker(s) with the stuck actuator pistons. Refer to section "Removal of the Exhaust Rocker Shaft Assembly".

24. Remove the air pressure; do the actuator pistons retract?
    a. Yes; Go to step 25.
    b. No; replace the engine brake rocker(s) with the stuck actuator pistons. Refer to section "Removal of the Exhaust Rocker Shaft Assembly".
25. Check the camshaft timing. Refer to section "Camshaft Timing Verification". Do camshaft timing marks line up per procedures?
    a. Yes; Go to step 26.
    b. No; repair as necessary and verify repair.
26. Check valve lash and engine brake adjustments. Refer to section "Setting the Valve and Engine Brake Lash". Was valve lash correct?
    a. Yes; Go to step 27.
    b. No; adjust valve lash, assemble the engine and verify repairs.
27. Replace both engine brake solenoids. Refer to section "Installation of the Engine Brake Solenoid" then Go to step 28.
28. Does the engine still have poor engine brake performance?
    a. Yes; replace all six exhaust rockers arms that have actuator pistons. Refer to section "Removal of the Exhaust Rocker Shaft Assembly" and verify repairs.
    b. No; troubleshooting is complete.

3 Inoperative Engine Brake

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.

NOTE: There are various conditions that will inhibit the operation of the engine brakes such as oil temperature, engine rpm, wheel slip and fault codes in other modules. Engine brakes do not enable until engine oil temperature reaches 50°C (122°F). The engine brakes are most effective at higher engine speeds. Refer to section "Engine Brake System" in the operator's manual for more information.

Check as follows:

1. Connect DiagnosticLink ®.
2. Turn the ignition ON (key ON, engine OFF).
3. Check for any engine oil temperature sensor fault codes. Are any engine oil temperature sensor fault codes present?
   a. Yes; diagnose the engine oil temperature sensor fault codes first.
   b. No; Go to step 4.
4. Check for fault codes in the other drivetrain-related modules. Are there any fault codes present in the other vehicle drivetrain modules?
   a. Yes; diagnose the other fault codes first.
   b. No; Go to step 5.
5. Does the engine have any performance concerns?
   a. Yes; diagnose the engine power performance concerns.
   b. No; Go to step 6.
6. Check the CPC parameters to determine if the engine brakes are properly configured. Refer to the GHG17 DDEC Electronic Controls Manual (DDC-SVC-MAN-0127) to verify the parameters. Are the engine brakes correctly configured?

Table 1.

Engine Brake Switch Programming Options				
Parameter Group	Parameter	Options	Default	Access
13	Engine Brake Switch Config	0 = Hardwired	0 = Hardwired	DiagnosticLink Professional, VEPS
		1 = Info from J1939 (muxed)		
		2 = Info from LIN		
		255 = Not Available		
13	2 14 DI Selection	0 = Disable	1 = Engine Brake Low	DiagnosticLink Professional, VEPS
		1 = Engine Brake Low		
		2 = Evobus Retarder Lever Stage 1		
		3 = CC Hysteresis Low		
		4 = RemAP IVS1		
13	2 15 DI Selection	0 = Disable	1 = Engine Brake High	DiagnosticLink Professional, VEPS
		1 = Engine Brake High		
		2 = Evobus Retarder Lever Stage 2		
		3 = CC Hysteresis High		
		4 = RemAP IVS1		

   a. Yes; Go to step 7.
   b. No; correct the engine brake parameter configuration.
7. Is the vehicle equipped with a clutch pedal?

a. Yes; Go to step 8.
b. No; Go to step 9.

8. Use DiagnosticLink to monitor the clutch pedal status. Does the clutch pedal status change when the clutch pedal is depressed and then released?
   a. Yes; Go to step 9.
   b. No; diagnose and repair the clutch pedal switch.
9. Monitor the accelerator pedal position. Is the clutch pedal position zero%?
   a. Yes; Go to step 10.
   b. No; repair the accelerator pedal concern.
10. Use DiagnosticLink to check the engine brake parameter status. Does the engine brake status parameter change from red (off/disable/false) to green when the engine brake on/off switch is turned on?
    a. Yes; Go to step 11.
    b. No; repair the engine brake on/off switch concern.
11. Monitor the "Engine Brake Low" status. Does the engine brake low status change from red (open) to green (closed, short to ground) when the engine brake low switch is turned on?

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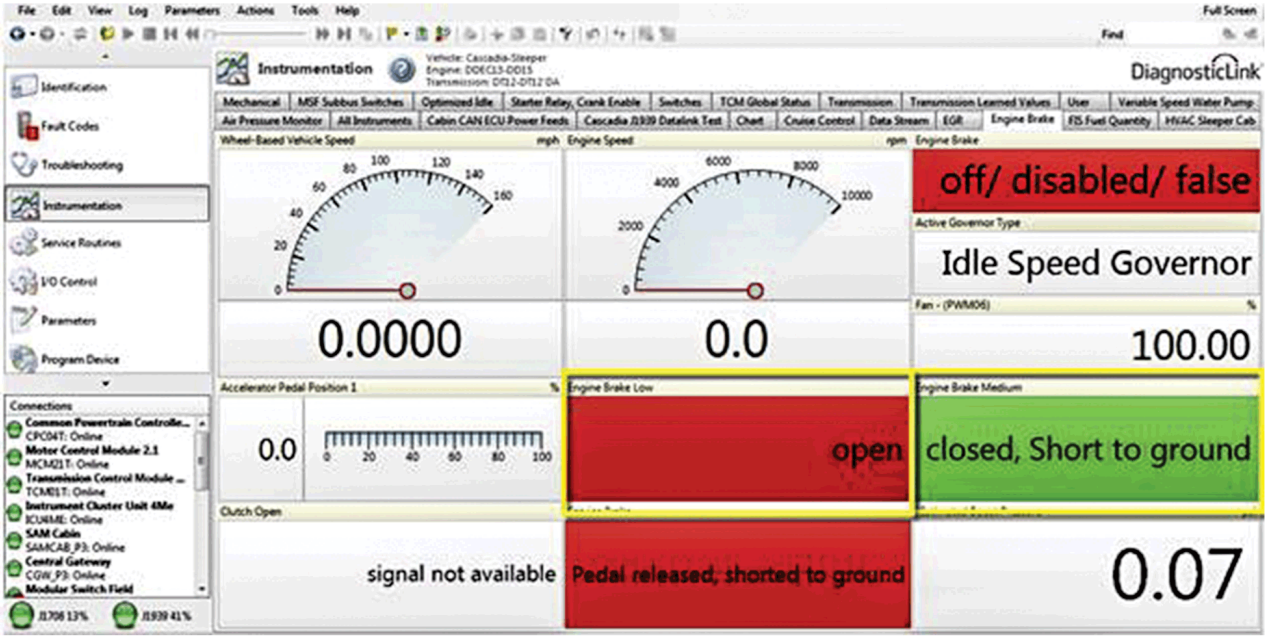
a. Yes; Go to step 12.
b. No; diagnose and repair the "engine brake low" switch concern.

12. Monitor the "engine brake medium" status when the engine brake medium on/off switch is turned to the on position. Does the engine brake low status change from red (open) to green (closed, short to ground) when the engine brake low switch is turned on?



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a. Yes; Go to step 13.
b. No; diagnose and repair the engine brake medium on/off switch concern.

WARNING: PERSONAL INJURY

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

- Always start and operate an engine in a well ventilated area.
- If operating an engine in an enclosed area, vent the exhaust to the outside.
- Do not modify or tamper with the exhaust system or emission control system.

WARNING: PERSONAL INJURY

To avoid injury before starting and running the engine, ensure the vehicle is parked on a level surface, parking brake is set, and the wheels are blocked.

WARNING: ENGINE EXHAUST

To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

13. Start and run the engine until the oil temperature is greater than 50°C (122°F) degrees.
14. Turn the engine OFF.
15. Remove the rocker cover.
16. Install the cam shaft gear timing cover.

WARNING: PERSONAL INJURY

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WARNING: ENGINE EXHAUST

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17. Start and let the engine run at idle.
18. Use DiagnosticLink to activate the front engine brakes. Do the pistons on the front engine brakes move?
    a. Yes; Go to step 19.
    b. No; replace the front engine brake solenoid.
19. Use DiagnosticLink to activate the rear engine brakes. Do the pistons on the rear engine brakes move?
    a. Yes; Go to step 20.
    b. No; replace the rear engine brake solenoid.
20. Turn the engine OFF.
21. Adjust the engine brake lash. Remove the camshaft gear cover and reinstall the rocker cover. Release the vehicle.