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Service Information Bulletin

SUBJECT	DATE
SPN 3216 (ACM) (GHG17) SPN 3217 (ACM) (GHG17)	March 2017

Additions, Revisions, or Updates

Publication Number / Title	Platform	Section Title	Change
DDC-SVC-MAN-0193	GHG17 Medium Duty	SPN 3216/FMI 16 - GHG17	Substantial changes to both sections.
		SPN 3217/FMI 2 - GHG17	

DiagnosticLink users: Please update the troubleshooting guides in DiagnosticLink with this newest version. To update the tool troubleshooting guide, open DiagnosticLink and from the Help – Troubleshooting Guides menu, select the appropriate troubleshooting manual, then click Update.

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2 SPN 3216/FMI 16 - GHG17

Engine Out NOx Sensor Drifted Low

Table 1.

SPN 3216/FMI 16			
Description	NOx Sensor Plausibility Check		
Monitored Parameter	Aftertreatment Inlet NOx Sensor		
Typical Enabling Conditions	**General Enabling Condition:** Engine is Not in Regeneration and Operating at High Speed and Loads		
	Specific Enabling Conditions: (see below):		
	Engine Parameter	**Min**	**Max**
	Engine Speed (rpm)	1350	1600
	Torque (N·m)	1100	1500
	Battery Voltage (Volts)	11.08	
	Engine Coolant Outlet Temperature	70°C (158°F)	
	Ambient Temperature	-8°C (17.6°F)	
	Barometric Pressure (mbar)	755 mbar (11 psi)	
	Time Since DPF Regen (Min.)	15	
	Beginning of Injection (BOI) - Degrees of Crankshaft Rotation	10	
	EGR Mass (Kg/min)	5	
Monitor Sequence	None		
Execution Frequency	Continuous When Enabling Conditions Met		
Typical Duration	150 seconds (Two-Cycle)		
Dash Lamps	MIL		
Engine Reaction	None		
Verification	Parked SCR Efficiency Test		

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.

Check as follows:

1. Connect DiagnosticLink ®.
2. Are any other faults also present?
    a. Yes; repair those fault codes first.
    b. No; Go to step 3.
3. Monitor (chart) the following parameters:
    - ASL102 engine speed
    - AS019 SCR outlet temperature
    - AS035 SCR inlet NOx sensor
    - AS036 SCR outlet NOx sensor
    - AS101 NOx conversion efficiency

NOTICE: Do not attempt to operate engine with the DEF lines disconnected. DEF pump runs and circulates DEF through the system at a limited rate (default) to aid in system cooling.

4. Disconnect the Diesel Exhaust Fluid (DEF) dosing unit electrical connector only. Leave dosing unit bolted to aftertreatment and DEF lines connected.
5. Inspect the DEF dosing unit harness connector for signs of damaged, bent, spread, corroded, or unseated (pushed out) pins and signs of moisture in the connector or wire damage near the connector. Are any signs of damage present?
    a. Yes; repair as necessary. Go to step 20.
    b. No; Go to step 6.

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- 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.

NOTE: SPN 3361/FMI 5 will set when the DEF dosing unit electrical connector is disconnected. The fault code can be cleared using DiagnosticLink after the DEF dosing unit electrical connector is reconnected.

6. Start the engine.

WARNING: HOT EXHAUST

During parked regeneration the exhaust gases will be extremely HOT and could cause a fire if directed at combustible materials. The vehicle must be parked outside.

7. Using DiagnosticLink, start a parked regen.

NOTICE: It may take 30 minutes or longer for the SCR Outlet NOx sensor to turn on.

8. Let the regen run for 40 to 45 minutes, then start monitoring the SCR inlet NOx sensor and SCR outlet NOx sensor parts per million (ppm) values. Are the inlet and outlet NOx sensor values within 50 ppm of each other?
    a. Yes; Go to step 9.
    b. No; replace the selective catalyst reduction inlet NOx sensor. Refer to section "Removal of the Selective Catalytic Reduction Inlet NOx Sensor". Verify repairs.
9. Shut OFF the engine.
10. Reconnect the DEF doser electrical connector.
11. Perform Charge Air Cooler (CAC) inspection and leak test. Refer to OEM literature for procedure. Is there any damage found?
    a. Yes; repair as necessary. Go to step 20.
    b. No; Go to step 12.
12. Visually inspect the entire Exhaust Gas Recirculation (EGR) and exhaust system (turbine housing, exhaust manifold, etc.) for evidence of external leakage (e.g. soot, coolant deposits at joints). Is there evidence of external leakage?
    a. Yes; repair as necessary. Go to step 20.
    b. No; Go to step 13.
13. Compare Inlet Manifold Pressure (IMP) value with the barometric pressure value. Are the values within 10.3 kPa (1.5 psi) of each other?
    a. Yes; Go to step 16.
    b. No; Go to step 14.
14. Disconnect the intake pressure/temperature sensor.
15. Inspect the intake pressure/temperature sensor and wiring connector for signs of damaged, bent, spread, corroded or unseated (pushed out) pins and signs of moisture in the connector or wire damage near the connector. Is there any sign of damage present?
    a. Yes; repair as necessary. Go to step 20.
    b. No; replace intake pressure/temperature sensor. Refer to section "Removal of the Intake Pressure/Temperature Sensor". Go to step 20.
16. Remove EGR cooler hot pipe, EGR crossover pipe and delivery pipe and inspect for excessive build-up or blockage. Is there excessive build-up or blockage?
    a. Yes; clean piping and replace EGR cooler. Refer to section "Removal of the Exhaust Gas Recirculation Cooler". Go to step 20.
    b. No; Go to step 17.
17. Inspect the EGR valve for physical damage (broken butterfly, etc.). Refer to section "Inspection of the Exhaust Gas Recirculation Valve". Is the EGR valve damaged?
    a. Yes; replace the EGR valve. Refer to section "Removal of the Exhaust Gas Recirculation Valve". Go to step 20.
    b. No; Go to step 18.
18. Disconnect the inlet NOx sensor harness connector.
19. Inspect the inlet NOx sensor and wiring connector for signs of damaged, bent, spread, corroded, or unseated (pushed out) pins and signs of moisture in the connector or wire damage near the connector. Is any pin damage found?
    a. Yes; repair as necessary. Go to step 20.
    b. No; replace the SCR inlet NOx sensor. Refer to section "Removal of the Selective Catalytic Reduction Inlet NOx Sensor". Go to step 20.
20. Verify repairs by performing a Parked SCR Efficiency Test. Refer to *section "GHG17 Perform Parked SCR Efficiency Test".

3 SPN 3217/FMI 2 - GHG17

Engine Out Lambda Sensor Drift Low

Table 2.

SPN 3217/FMI 2	
Description	Goal of This Engine No-Fueling Mode Diagnostic is to Detect the Engine Out Lambda Signal Lower Than Expected In
Monitored Parameter	Inlet NOx Sensor
Typical Enabling Conditions	• Engine at 1200 to 1800 rpm • Above 40% Load • In Diesel Exhaust Fluid (DEF) Dosing Mode • Coolant Temp Above 65°C (149°F) • Ambient Air Temp Above 18°C (64°F) • Ambient Pressure Above 752 mbar (10.9 psi) • Not in Exhaust Gas Recirculation (EGR) Mode • Not in Regen Mode
Monitor Sequence	Inlet NOx Sensor vs. Outlet NOx Sensor
Execution Frequency	Continuous When Enabling Conditions Met
Typical Duration	1.2 Seconds
Dash Lamps	MIL
Engine Reaction	None
Verification	Road Test at Operating Temperature with Engine Above 1200 rpm, Above 40% Load, in DEF Dosing Mode. Not in Regen or EGR Mode.

WARNING: PERSONAL INJURY

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- 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.

Check as follows:

WARNING: PERSONAL INJURY

To avoid injury, never remove any engine component while the engine is running.

WARNING: PERSONAL INJURY

To avoid injury from hot surfaces, wear protective gloves, or allow engine to cool before removing any component.

1. Connect DiagnosticLink ® . Are there any other fault codes?
    a. Yes; repair other fault codes first.
    a. No; Go to step 2.
2. Was another emission component-related fault code repaired prior to this step?
    a. Yes; perform a parked regeneration to verify repairs and clear fault codes.
    b. No; Go to step 3.
3. Are any EGR system faults also present?
    a. Yes; repair the EGR system faults first.
    b. No; Go to step 4.
4. Visually inspect the entire air inlet, Charge Air Cooler (CAC), and EGR piping and hose for visible signs of leaks or damage. Is there any damage or leaks found?
    a. Yes; repair as necessary.
    b. No; Go to step 5.
5. Check Aftertreatment System (ATS) for visible exhaust leaks or damage. Is there any damage found?
    a. Yes; repair as necessary.
    b. No; Go to step 6.
6. Use DEF test strip A0005850202 to check for diesel fuel or oil contamination of the DEF fluid; Refer to section "Checking Diesel Exhaust Fluid Quality". Do the test strips or visual inspection indicate that the DEF is contaminated?
    a. Yes; refer to 13 TS-17 (https://ddcsn-ddc.freightliner.com/cps/rde/xbcr/ddcsn/13TS17.pdf) and refer to appropriate Original Equipment Manufacturer (OEM) literature for DEF tank cleaning/flushing procedures. Refill the DEF tank with new DEF. Verify repair.
    b. No; Go to step 7.
7. Using the refractometer from DEF Test Kit W060589001900, measure the DEF urea percentage. Is DEF urea percentage between 31 and 34 percent?
    a. Yes; Go to step 8.
    b. No; clean/flush the DEF tank and the DEF system. Refer to section "Flushing of the Diesel Exhaust Fluid System". Refill the DEF tank with new DEF. Verify repair.
8. Remove the DEF doser. Refer to section "Removal of the Diesel Exhaust Fluid Dosing Unit". Leave the DEF lines and electrical harness connected to the doser.
9. Place the DEF doser over the graduated cylinder provided in DEF test kit W060589001900.
10. Perform a DEF Quantity Test service routine.
11. Monitor the amount of DEF dispensed into the DEF-safe container included in DEF test kit W060589001900. Is the amount of DEF dispensed between 108 and 132 mL (3.7 and 4.5 oz.)?
    a. Yes; reinstall the DEF dosing unit. Refer to section "Installation of the Diesel Exhaust Fluid Dosing Unit". Go to step 12.
    b. No; replace the DEF Dosing Unit. Refer to section "Installation of the Diesel Exhaust Fluid Dosing Unit". Go to step 12.
12. Disconnect the DEF doser electrical connector.

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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 the engine and perform a parked regeneration.

NOTICE: It may take 30 minutes or longer for the SCR Outlet NOx sensor to turn on.

14. Let the regen run for 40 to 45 minutes, then start monitoring the SCR inlet NOx sensor and SCR outlet NOx sensor parts per million (ppm) values. Are the inlet NOx sensor and outlet NOx sensor readings within 50) of each other?
    a. Yes; reconnect the DEF dosing unit electrical connector, diagnostics completed.
    b. No; replace the SCR inlet NOx sensor. Refer to section "Removal of the Selective Catalytic Reduction Inlet NOx Sensor". Verify repair.

