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Service Information Bulletin

SUBJECT	DATE
SPN 4374 (ACM) (GHG14) SPN 4374 (ACM) (GHG17)	January 2016

Additions, Revisions, or Updates

Publication Number / Title	Platform	Section Title	Change
DDC-SVC-MAN-0084	GHG14 DD Platform	SPN 4374/FMI 0 - GHG14	Update procedures.
		SPN 4364/FMI 18 - GHG14	
DDC-SVC-MAN-0191	GHG17 DD Platform	SPN 4374/FMI 0 - GHG17	Implement GHG14 changes in GHG17 manual.
		SPN 4364/FMI 18 - GHG17	



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2 SPN 4374/FMI 0 – GHG14

Under Pressurized Diesel Exhaust Fluid System

Table 1.

SPN 4374/FMI 0	
Description	This Code Sets When the Diesel Exhaust Fluid (DEF) Pump Speed is Higher than Normal For a Given DEF Pressure
Monitored Parameter	DEF Pump Speed, DEF Pressure
Monitor Sequence	None
Execution Frequency	Continuous When Enabling Conditions Met
Typical Duration	Continuous Until Resolved
Dash Lamps	MIL, CEL
Engine Reaction	Derate 25%
Verification	SCR ADS Self-Check

Possible causes:

- Restriction in the DEF line between the DEF tank and the DEF pump
- Restriction in the DEF line between the DEF pump and the DEF dosing unit
- Air in the DEF line between the DEF tank and the DEF pump
- Restriction in the DEF pump
- Failed DEF pump

Check as follows:

1. Connect DiagnosticLink[®].
2. Turn the ignition ON (key ON, engine OFF).
3. Check for multiple codes. Are codes SPN 4334/FMI 3, 4, SPN 4375/FMI 3, 4, or SPN 3361/FMI 3, 4, 5 also present?
 - a. Yes; diagnose and repair the other fault codes first. Verify repair.
 - b. No; Go to step 4.
4. Turn the ignition OFF.
5. Using DEF test strip A0005850202, check for diesel fuel or oil contamination of the DEF fluid. Does the test strip indicate contamination?
 - a. Yes; replace the following components and refill the system with new DEF:
 - DEF tank
 - DEF tank header
 - DEF supply line from the DEF tank to the DEF pump
 - DEF line from the DEF pump to the DEF dosing unit
 - DEF return line from the DEF dosing unit to the DEF tank
 - DEF pump
 - DEF dosing unit
 - b. No; Go to step 6.



WARNING: EYE INJURY

To avoid injury from flying debris when using compressed air, wear adequate eye protection (face shield or safety goggles) and do not exceed 276 kPa (40 psi) air pressure.

6. Inspect the DEF line that runs from the DEF pump to the DEF dosing unit. Is the DEF line damaged, pinched, or kinked?
 - a. Yes; replace the DEF line from the DEF pump to the DEF dosing unit.
 - b. No; Go to step 7.
7. Inspect the DEF line that runs from the DEF tank to the DEF pump. Is the DEF line damaged, pinched, or kinked?

- a. Yes; replace the DEF line from the DEF tank to the DEF pump.
 - b. No; Go to step 8.
8. Disconnect the DEF supply line at the dosing unit. Fill the graduated cylinder supplied in DEF test kit (P/N: W060589001900) with water. Place the end of the DEF line into the graduated cylinder as far as possible.

NOTE: Place the graduated cylinder in a secondary container to catch over flowing DEF fluid, making sure you still have clear sight of the end of the DEF line.

9. Using DiagnosticLink, perform the Selective Catalyst Reduction Airless Dosing System (SCR ADS) Self-Check routine. When the service routine is running, visually inspect the DEF line for continuous air bubbles coming from the line and DEF flow.
10. Were any bubbles coming from the DEF pump supply line indicating a crack in the DEF pump feed line?
 - a. Yes; replace the DEF supply line from the DEF tank to the DEF pump. Verify repair.
 - b. No; Go to step 11.
11. Using the DEF/Doser Kit (RS SUPPLY KIT - available through eParts catalog), replace the DEF pump module filter. Refer to section "Installation of the GHG14 Diesel Exhaust Fluid Pump Module Filter". Go to step 12.
12. Replace the DEF pump inlet screen. Refer to section "Installation of the Diesel Exhaust Fluid Pump Module Filter Screen". Go to step 13.
13. Replace DEF Pressure Relief Valve (PRV). Refer to section "Removal of the Diesel Exhaust Fluid Pump Pressure Relief Valve". Go to step 14.
14. Replace DEF dosing unit inlet screen. Refer to section "Removal of the GHG14 Diesel Exhaust Fluid Dosing Unit Inlet Screen". Go to step 15.
15. Connect all DEF lines and electrical connections. Go to step 16.
16. Perform Selective Catalytic Reduction Airless Dosing System (SCR ADS) Self-Check Routine. Did the SCR ADS test pass?
 - a. Yes; clear the codes and release the vehicle.
 - b. No; replace the DEF pump. Refer to section "Removal of the GHG14 Diesel Exhaust Fluid Pump Module".

3 SPN 4364/FMI 18 – GHG14

SCR NOx Conversion Efficiency Low

Table 2.

SPN 4364/FMI 18	
Description	This Code Sets When the Aftertreatment Control Module (ACM) detects That the Selective Catalyst Reduction (SCR) NOx Conversion Efficiency Is Low
Monitored Parameter	SCR Inlet NOx Sensor and SCR Outlet NOx Sensor
Typical Enabling Conditions	Diesel Exhaust Fluid (DEF) Dosing Enabled, 1000 to 2100 rpm, 15 to 100% Load
Monitor Sequence	None
Execution Frequency	Continuous When Enabling Conditions Met
Typical Duration	30 Minutes
Dash Lamps	MIL
Engine Reaction	None
Verification	Parked Regeneration

Possible causes:

- Contaminated DEF
- Incorrect concentration of urea in the DEF
- Biased NOx sensor
- Excessive DEF build-up in the exhaust

NOTICE: DEF crystallization inside the SCR mixing chamber or around the dosing unit does not indicate a failed/ leaking DEF doser. Do not replace the DEF dosing unit unless directed.

Check as follows:

1. Connect DiagnosticLink[®].
2. Turn the ignition ON (key ON, engine OFF).
3. Check for other fault codes. Are there any air management system (Intake Throttle Valve (ITV), Intake Manifold Pressure (IMP), Intake Air Temperature (IAT), turbocharger etc.) fault codes present?
 - a. Yes; diagnose the air management system fault codes first.
 - b. No; Go to step 4.
4. Are there any Exhaust Gas Recirculation (EGR) system fault codes present?
 - a. Yes; repair the EGR system fault codes first.
 - b. No; Go to step 5.
5. Are there any fuel system fault codes present?
 - a. Yes; diagnose the fuel system fault codes first.
 - b. No; Go to step 6.
6. Are there any other NOx sensor fault codes present?
 - a. Yes; diagnose the other NOx sensor fault codes first.
 - b. No; Go to step 7.
7. 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 8.
8. Are there any ACM temperature or pressure fault codes present?
 - a. Yes; diagnose the fault first.
 - b. No; Go to step 9.

9. Turn the ignition OFF.
10. 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; for diesel fuel or oil contamination, refer to **13 TS-17** (<http://ddcsn-ddc.freightliner.com/cps/rde/xbcrr/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 11.
11. 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 12.
 - 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.
12. Turn the ignition ON (key ON, engine OFF).
13. Inspect the area around the DEF dosing unit gasket for DEF crystallization. Is there any DEF crystallization build-up present?
 - a. Yes; this indicates the gasket has failed, NOT the DEF dosing unit. Replace the gasket after completing the DEF quantity test in the next step. Go to step 14.
 - b. No; Go to step 14.
14. Perform a DEF quantity test service routine; Refer to section "Diesel Exhaust Fluid Quantity Test - GHG14".
15. 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 to 132 mL (3.7 to 4.5 oz.)?
 - a. Yes; reinstall the DEF Dosing Unit, using a new gasket and bolts, as these parts are one-time-use components. Refer to section "Installation of the GHG14 Dosing System Doser. Go to step 16.
 - b. No; replace the DEF Dosing Unit, using a new gasket and bolts, as these parts are one-time-use components. Refer to section "Removal of the GHG14 Dosing System Doser". Verify repair.
16. Disconnect the DEF dosing unit electrical connector.


WARNING: ENGINE EXHAUST

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


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.


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.

NOTE: Running the engine with DEF Doser Unit electronically disconnected will induce a DEF doser circuit fault code. This code can be erased using DiagnosticLink™ once the DEF doser electrical connector is reconnected.

17. Start the engine and perform a complete parked regeneration. The regen will burn off any DEF deposits in the aftertreatment before checking the NOx sensors.
18. Run the "Perform the GHG14 Perform Performance Check - Low Temp ATD". Refer to section "GHG14 Perform Performance Check - Low Temperature ATD". Are the NOx sensor readings within 50 Parts Per Million (PPM) of each other?
 - a. Yes; Go to step 20.
 - b. No; replace the outlet NOx sensor. Refer to section "Removal of the GHG14 Selective Catalytic Reduction Outlet NOx Sensor". Go to step 19.

19. Run the "GHG14 Perform Performance Check - Low Temperature ATD". Refer to section "GHG14 Perform Performance Check - Low Temperature ATD". Are the NOx inlet sensor and outlet NOx sensor readings within 50 Parts Per Million (PPM) of each other?
 - a. Yes; Go to step 20.
 - b. No; replace the inlet NOx sensor. Refer to section "Removal of the GHG14 Selective Catalytic Reduction Inlet NOx Sensor". Go to step 20.
20. Reconnect the DEF dosing unit electrical connector.

**WARNING: ENGINE EXHAUST**

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

**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.

**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.

21. Start the engine and perform a parked regeneration and monitor the NOx efficiency. Is the NOx efficiency above 85%?
 - a. Yes; this fault was likely caused by the DEF build-up in the exhaust which was cleared by the parked regeneration procedures. Release the vehicle.

NOTE: Excessive DEF build-up in the exhaust can be caused by a vehicle with a high speed, high average drive load, etc.

- b. No; Go to step 22.
22. Review the last seven minutes of the parked regeneration log file; is the Selective Catalyst Reduction (SCR) inlet temperature more than 38°C (68.4°F) lower than SCR outlet temperature?
 - a. Yes; Go to step 23.
 - b. No; for a One-box system, replace the DOC/SCR module. For a two-box system, replace the SCR module. Complete the ATD check list to identify cause of failure. Refer to section "ATD Checklist - EPA07/EPA10/ GHG14".
23. Perform a low temperature Aftertreatment Device (ATD) check using DiagnosticLink to check for a drifted temperature sensor. Refer to section "GHG14 Perform Performance Check - Low Temperature ATD". Are the SCR inlet and SCR outlet temperatures within 25°C (45°F) during the last five minutes of this test?
 - a. Yes; for a One-box system, replace the DOC/SCR module. This indicates an internal failure of the DOC/SCR module.
 - b. No; replace the drifted SCR temperature sensor and verify repair.

4 SPN 4374/FMI 0 – GHG17

Under Pressurized Diesel Exhaust Fluid System

Table 3.

SPN 4374/FMI 0	
Description	This Code Sets When the Diesel Exhaust Fluid (DEF) Pump Speed is Higher than Normal For a Given DEF Pressure
Monitored Parameter	DEF Pump Speed, DEF Pressure
Monitor Sequence	None
Execution Frequency	Continuous When Enabling Conditions Met
Typical Duration	Continuous Until Resolved
Dash Lamps	MIL, CEL
Engine Reaction	Derate 25%
Verification	SCR ADS Self-Check

Possible causes:

- Restriction in the DEF line between the DEF tank and the DEF pump
- Restriction in the DEF line between the DEF pump and the DEF dosing unit
- Air in the DEF line between the DEF tank and the DEF pump
- Restriction in the DEF pump
- Failed DEF pump

Check as follows:

1. Connect DiagnosticLink[®].
2. Turn the ignition ON (key ON, engine OFF).
3. Check for multiple codes. Are codes SPN 4334/FMI 3, 4, SPN 4375/FMI 3, 4, or SPN 3361/FMI 3, 4, 5 also present?
 - a. Yes; diagnose and repair the other fault codes first. Verify repair.
 - b. No; Go to step 4.
4. Turn the ignition OFF.
5. Using DEF test strip A0005850202, check for diesel fuel or oil contamination of the DEF fluid. Does the test strip indicate contamination?
 - a. Yes; replace the following components and refill the system with new DEF:
 - DEF tank
 - DEF tank header
 - DEF supply line from the DEF tank to the DEF pump
 - DEF line from the DEF pump to the DEF dosing unit
 - DEF return line from the DEF dosing unit to the DEF tank
 - DEF pump
 - DEF dosing unit
 - b. No; Go to step 6.



WARNING: EYE INJURY

To avoid injury from flying debris when using compressed air, wear adequate eye protection (face shield or safety goggles) and do not exceed 276 kPa (40 psi) air pressure.

6. Inspect the DEF line that runs from the DEF pump to the DEF dosing unit. Is the DEF line damaged, pinched, or kinked?
 - a. Yes; replace the DEF line from the DEF pump to the DEF dosing unit.
 - b. No; Go to step 7.
7. Inspect the DEF line that runs from the DEF tank to the DEF pump. Is the DEF line damaged, pinched, or kinked?

- a. Yes; replace the DEF line from the DEF tank to the DEF pump.
 - b. No; Go to step 8.
8. Disconnect the DEF supply line at the dosing unit. Fill the graduated cylinder supplied in DEF test kit (P/N: W060589001900) with water. Place the end of the DEF line into the graduated cylinder as far as possible.

NOTE: Place the graduated cylinder in a secondary container to catch over flowing DEF fluid, making sure you still have clear sight of the end of the DEF line.

9. Using DiagnosticLink, perform the Selective Catalyst Reduction Airless Dosing System (SCR ADS) Self-Check routine. When the service routine is running, visually inspect the DEF line for continuous air bubbles coming from the line and DEF flow.
10. Were any bubbles coming from the DEF pump supply line indicating a crack in the DEF pump feed line?
 - a. Yes; replace the DEF supply line from the DEF tank to the DEF pump. Verify repair.
 - b. No; Go to step 11.
11. Using the DEF/Doser Kit (RS SUPPLY KIT - available through eParts catalog), replace the DEF pump module filter. Refer to section "Removal of the Diesel Exhaust Fluid Pump Module Filter". Go to step 12.
12. Replace the DEF pump inlet screen. Refer to section "Removal of the Diesel Exhaust Fluid Pump Module Inlet Screen". Go to step 13.
13. Replace DEF Pressure Relief Valve (PRV). Refer to section "Removal of the Diesel Exhaust Fluid Pump Pressure Relief Valve". Go to step 14.
14. Replace DEF dosing unit inlet screen. Refer to section "Removal of the Diesel Exhaust Fluid Dosing Unit Inlet Screen". Go to step 15.
15. Connect all DEF lines and electrical connections. Go to step 16.
16. Perform Selective Catalytic Reduction Airless Dosing System (SCR ADS) Self-Check Routine. Did the SCR ADS test pass?
 - a. Yes; clear the codes and release the vehicle.
 - b. No; replace the DEF pump. Refer to section "Removal of the Diesel Exhaust Fluid Pump Module".

5 SPN 4364/FMI 18 - GHG17

SCR NOx Conversion Efficiency Low

Table 4.

SPN 4364/FMI 18	
Description	This Code Sets When the Aftertreatment Control Module (ACM) detects That the Selective Catalyst Reduction (SCR) NOx Conversion Efficiency Is Low
Monitored Parameter	SCR Inlet NOx Sensor and SCR Outlet NOx Sensor
Typical Enabling Conditions	Diesel Exhaust Fluid (DEF) Dosing Enabled, 1000 to 2100 rpm, 15 to 100% Load
Monitor Sequence	None
Execution Frequency	Continuous When Enabling Conditions Met
Typical Duration	30 Minutes
Dash Lamps	MIL
Engine Reaction	None
Verification	Parked Regeneration

Possible causes:

- Contaminated DEF
- Incorrect concentration of urea in the DEF
- Biased NOx sensor
- Excessive DEF build-up in the exhaust

NOTICE: DEF crystallization inside the SCR mixing chamber or around the dosing unit does not indicate a failed/ leaking DEF doser. Do not replace the DEF dosing unit unless directed.

Check as follows:

1. Connect DiagnosticLink[®].
2. Turn the ignition ON (key ON, engine OFF).
3. Check for other fault codes. Are there any air management system [Intake Throttle Valve (ITV), Intake Manifold Pressure (IMP), Intake Air Temperature (IAT), turbocharger etc.] fault codes present?
 - a. Yes; diagnose the air management system fault codes first.
 - b. No; Go to step 4.
4. Are there any Exhaust Gas Recirculation (EGR) system fault codes present?
 - a. Yes; repair the EGR system fault codes first.
 - b. No; Go to step 5.
5. Are there any fuel system fault codes present?
 - a. Yes; diagnose the fuel system fault codes first.
 - b. No; Go to step 6.
6. Are there any other NOx sensor fault codes present?
 - a. Yes; diagnose the other NOx sensor fault codes first.
 - b. No; Go to step 7.
7. 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 8.
8. Are there any ACM temperature or pressure fault codes present?
 - a. Yes; diagnose the fault first.
 - b. No; Go to step 9.
9. Turn the ignition OFF.

10. 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; for diesel fuel or oil contamination, refer to 13 TS-17 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 11.
11. Using the refractometer from DEF Test Kit W060589001900, measure the DEF urea percentage. Is DEF urea percentage between 31 to 34 percent?
 - a. Yes; Go to step 12.
 - 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.
12. Turn the ignition ON (key ON, engine OFF).
13. Inspect the area around the DEF dosing unit gasket for DEF crystallization. Is there any DEF crystallization build-up present?
 - a. Yes; this indicates the gasket has failed, NOT the DEF dosing unit. Replace the gasket after completing the DEF quantity test in the next step. Go to step 14.
 - b. No; Go to step 14.
14. Perform a DEF quantity test service routine; Refer to section "Diesel Exhaust Fluid Quantity Test - GHG17".
15. 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 to 132 mL (3.7 to 4.5 oz.)?
 - a. Yes; reinstall the DEF Dosing Unit, using a new gasket and bolts, as these parts are one-time-use components. Refer to section "Installation of the Diesel Exhaust Fluid Dosing Unit ". Go to step 16.
 - b. No; replace the DEF Dosing Unit, using a new gasket and bolts, as these parts are one-time-use components. Refer to section "Installation of the Diesel Exhaust Fluid Dosing Unit ". Verify repair.
16. Disconnect the DEF dosing unit electrical connector.

**WARNING: ENGINE EXHAUST**

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

**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.

**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.

NOTE: Running the engine with DEF Doser Unit electronically disconnected will induce a DEF doser circuit fault code. This code can be erased using DiagnosticLink™ once the DEF doser electrical connector is reconnected.

17. Start the engine and perform a complete parked regeneration. The regen will burn off any DEF deposits in the aftertreatment before checking the NOx sensors.
18. Run the "Perform the GHG14 Perform Performance Check - Low Temperature ATD". Refer to section "GHG17 Perform Performance Check - Low Temperature ATD". Are the NOx sensor readings within 50 Parts Per Million (PPM) of each other?
 - a. Yes; Go to step 20.
 - b. No; replace the outlet NOx sensor. Refer to section "Removal of the Selective Catalytic Reduction Outlet NOx Sensor". Go to step 19.

19. Run the "GHG14 Perform Performance Check - Low Temperature ATD". Refer to section "GHG17 Perform Performance Check - Low Temperature ATD". Are the NOx inlet sensor and outlet NOx sensor readings within 50 Parts Per Million (PPM) of each other?
 - a. Yes; Go to step 20.
 - b. No; replace the inlet NOx sensor. Refer to section "Removal of the Selective Catalytic Reduction Outlet NOx Sensor". Go to step 20.
20. Reconnect the DEF dosing unit electrical connector.


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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.

21. Start the engine and perform a parked regeneration and monitor the NOx efficiency. Is the NOx efficiency above 85%?
 - a. Yes; this fault was likely caused by the DEF build-up in the exhaust which was cleared by the parked regeneration procedures. Release the vehicle.

NOTE: Excessive DEF build-up in the exhaust can be caused by a vehicle with a high speed, high average drive load, etc.

- b. No; Go to step 22.
22. Review the last seven minutes of the parked regeneration log file; is the Selective Catalyst Reduction (SCR) inlet temperature more than 38°C (68.4°F) lower than SCR outlet temperature?
 - a. Yes; Go to step 23.
 - b. No; for a 1-Box™ emissions package, replace the DOC/SCR module. For a Two-box option, replace the SCR module. Complete the ATD check list to identify cause of failure. Refer to section "ATD Checklist - GHG17".
23. Perform a low temperature Aftertreatment Device (ATD) check using DiagnosticLink to check for a drifted temperature sensor. Refer to section "GHG17 Perform Performance Check - Low Temperature ATD". Are the SCR inlet and SCR outlet temperatures within 25°C (45°F) during the last five minutes of this test?
 - a. Yes; for a 1-Box, replace the DOC/SCR module. This indicates an internal failure of the DOC/SCR module.
 - b. No; replace the drifted SCR temperature sensor and verify repair.