



## 10.8 Engine Control System

### 10.8.1 Download Fault Archive and Review

#### To download the fault archive:

- 1 Connect the translator box to the USB port on the laptop and using the 15 D-R adapter connect to the access port on the interface module mounted to the ECMS.
- 2 Note that both the red and green LEDs on the side of the translator box are illuminated.
- 3 Click on the Start button in the lower left corner of the computer screen. When the menu options appear, click on All Programs/Programs. Select WinEMMON. A message will appear stating that the program is searching for the interface box.

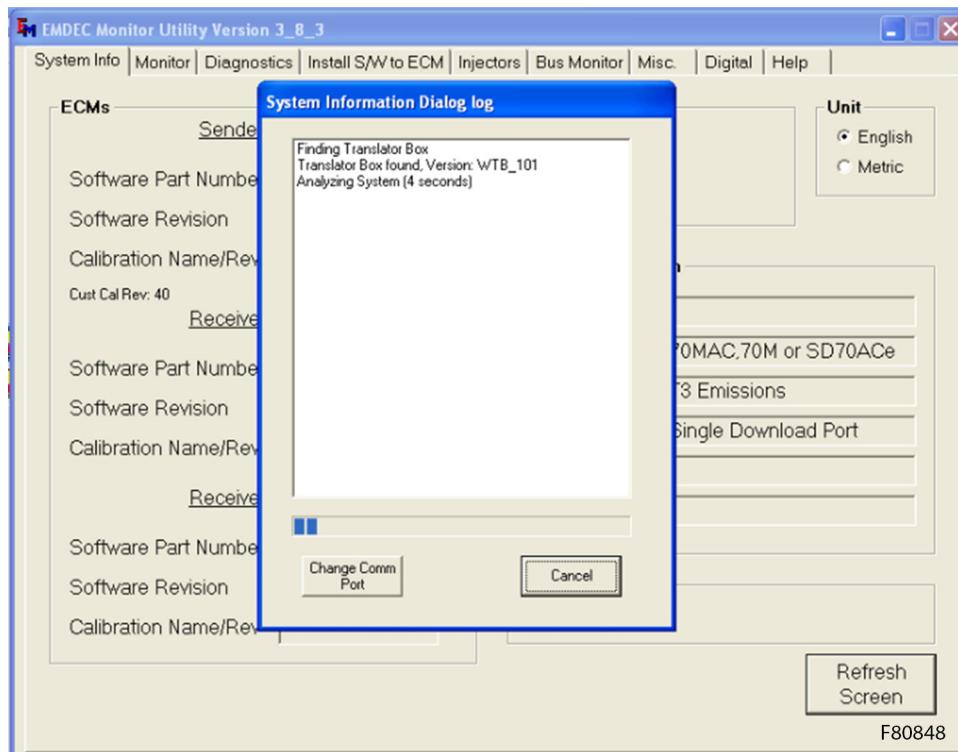


Figure 10-205: Translator Box Found

- 4 The translator's red light indicates that the box is being powered by the 24 volts from the system. The green light will flash when data messages from the ECMS are being correctly received by the translator box.

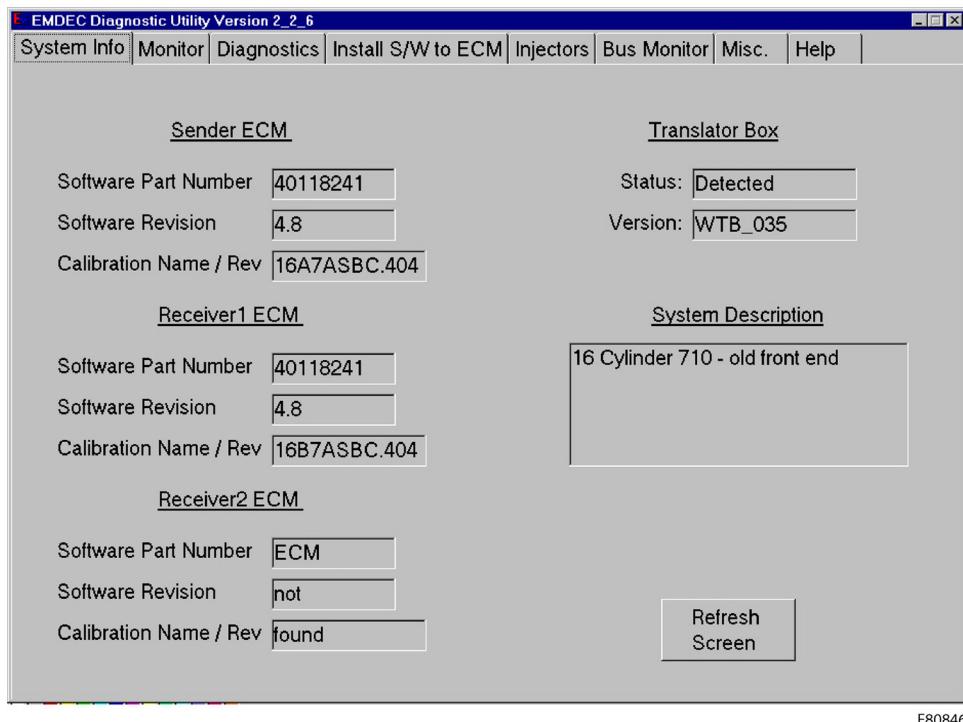


**Note:** The Communication Problem window gives the option of trying the connection again (Retry), canceling (Cancel), or getting help. If the Help button is pressed, another window will appear diagramming the proper cable setup for connecting. There is also a description of the light functions on the translator box.



**Figure 10-206: WinEMMON Communication Problem**

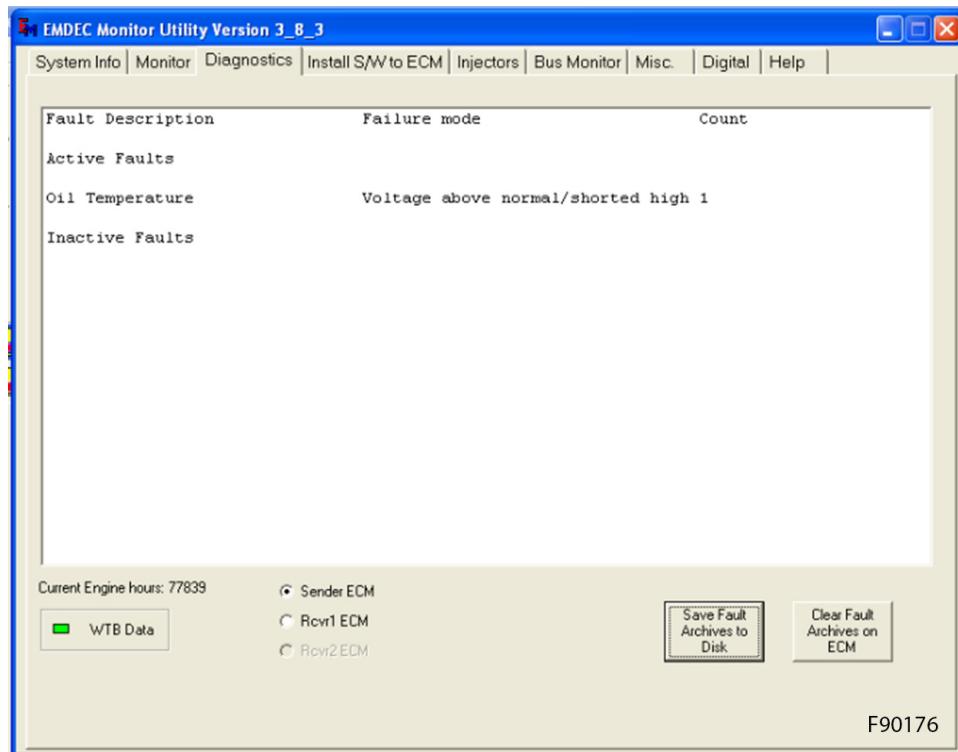
5 Once in the WinEMMON program, an EMMON main screen will appear.



**Figure 10-207: System Info Screen**



- 6 From the tabs across the top of the window, select Diagnostics. The Diagnostics screen is a “real time” display of current faults, both active and inactive, from the ECMS. This screen shows:
  - Fault Description (Active or Inactive)
  - Failure Mode (what the failure is)
  - Count (how many times the failure occurred)



**Figure 10-208: Diagnostics Screen**

- 7 For example in [Figure 10-208](#), the Diagnostics screen shows an Active Fault for Oil Temperature. The Failure Mode reads “Voltage above normal/shorted high”. This is what the Oil Temperature fault actually was. The far right column is the count, in this case “1”, which indicates the fault has occurred one time.
- 8 Click on the Save Fault Archives to Disk button toward the lower right corner of the window. A Get User Information window will open to enter customer information. This helps create more useful file-names for the fault archive files.



9 From the next window, select the folder to save the fault archive to.

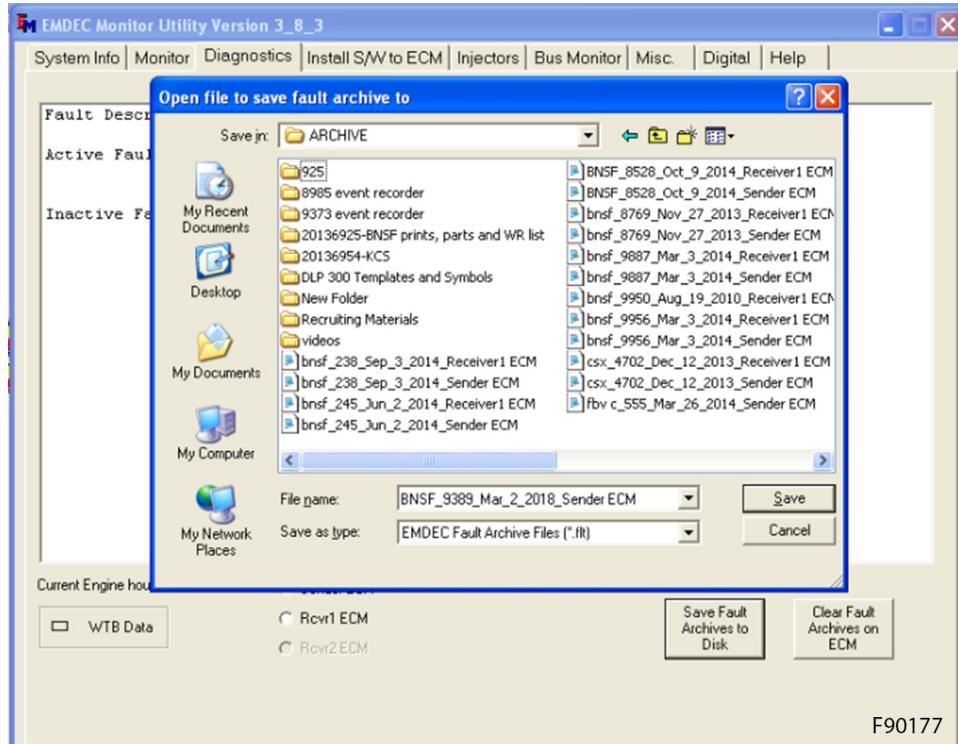


Figure 10-209: Fault Archive Save Location

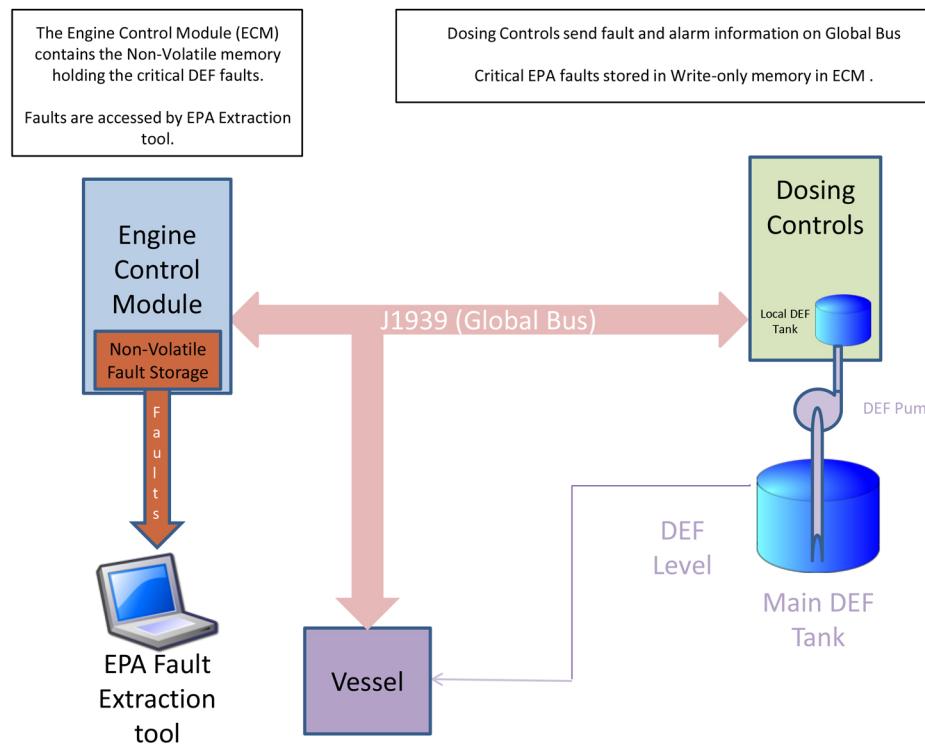
10 Click the Save button.



### 10.8.2 EPA Fault Extraction

A PC based software utility is available to view and extract specific EPA-mandated faults from Tier 4 Engine Control System. In these applications, the engine controller permanently logs EPA-mandated faults. The Fault Extraction Utility can view the faults logged and generate a text file report of the faults logged.

## T4 Marine Architecture



**Figure 10-210: Tier 4 Marine System Architecture**

The EPA Fault Extraction Utility is a 32 bit Windows-based system that provides access to specific faults stored in the engine control system. The Extraction Utility, running on a laptop computer, connects to the control system using the USB port. The USB port connects to a small translator box (WTB), which

converts the USB signals into J1708 signals, native to the engine controller. The translator box connects through a port on the ECMS.

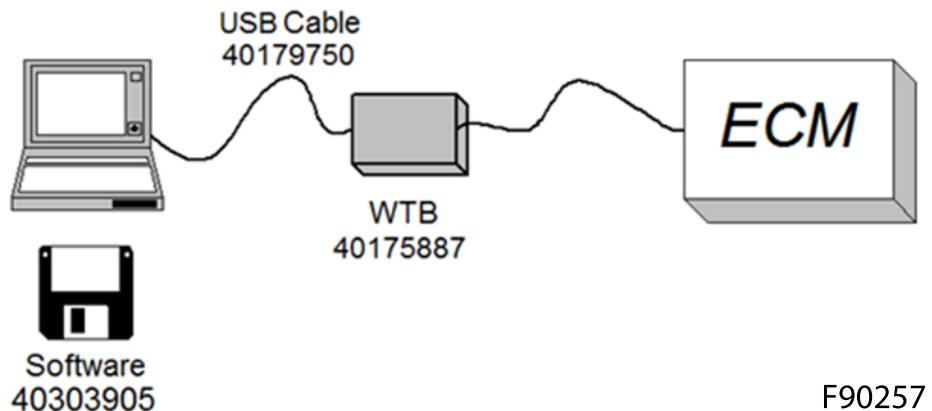


Figure 10-211: Tier 4 Translator Box

**To download EPA faults:**

- 1 Launch the utility. The utility launches to show a system information tab that details the configuration of the engine control software loaded in the ECMS.

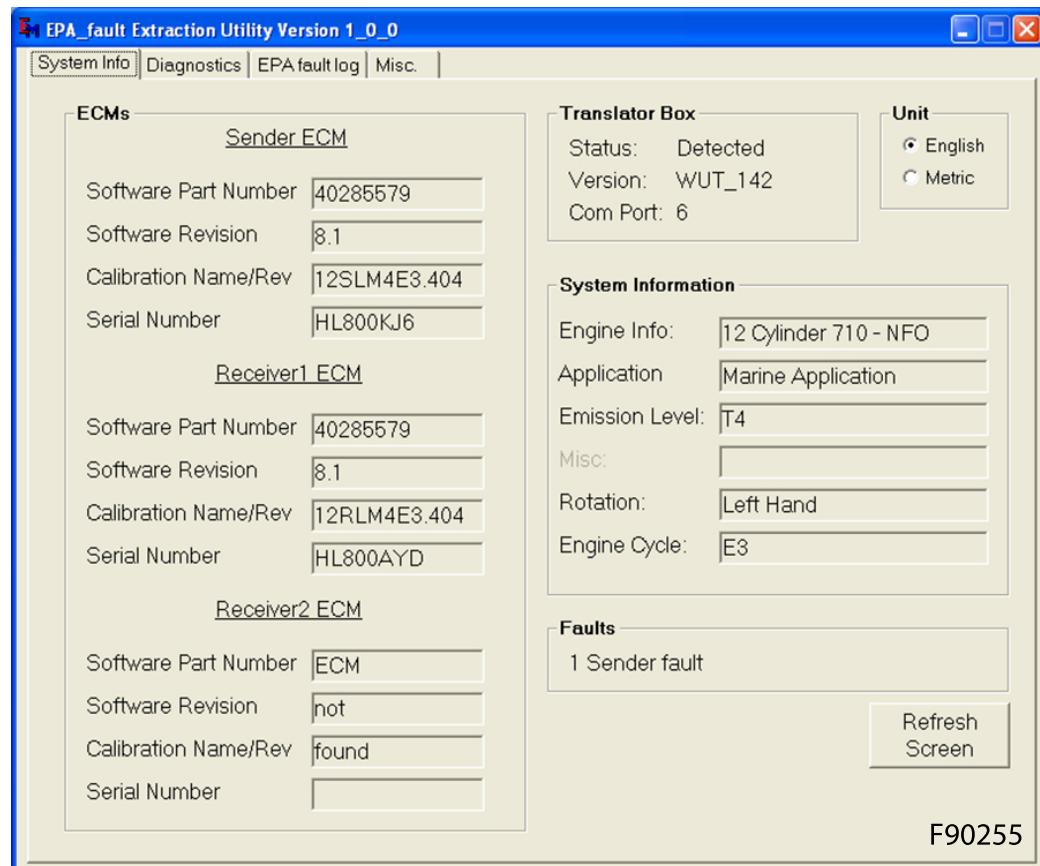
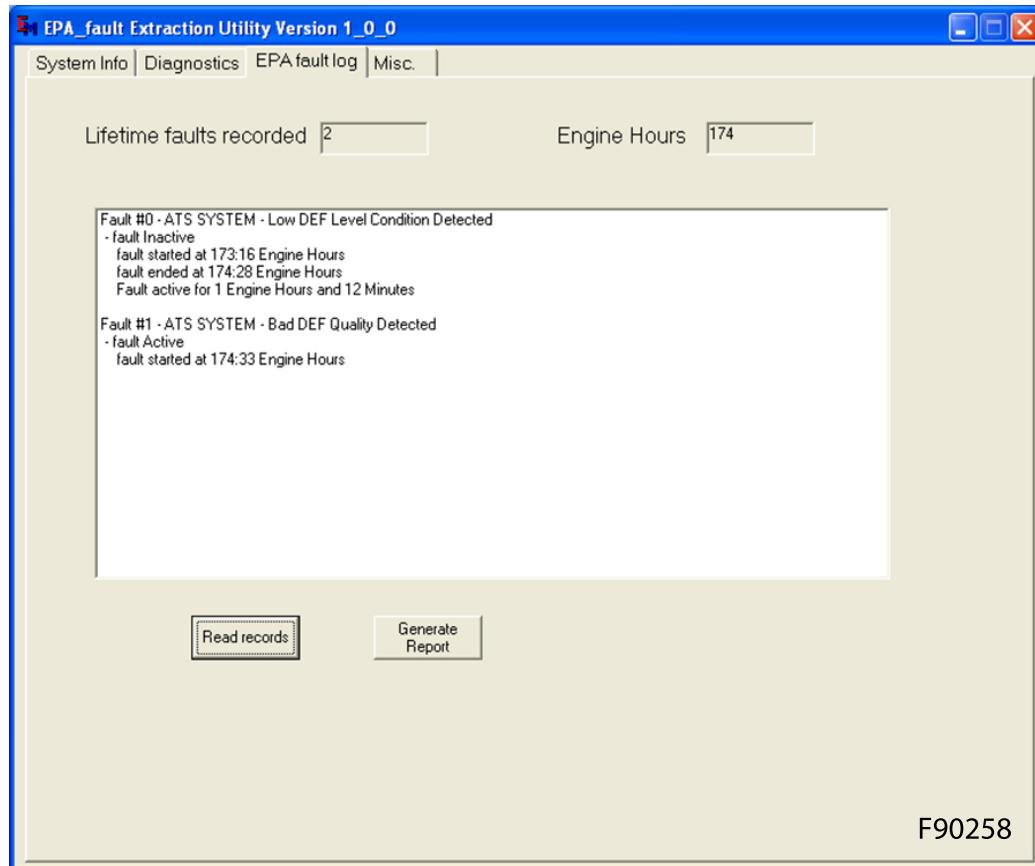


Figure 10-212: Fault Extraction Main Screen



- 2 Select the EPA Fault Log tab. This will show the status of the faults logged in the ECM's memory.

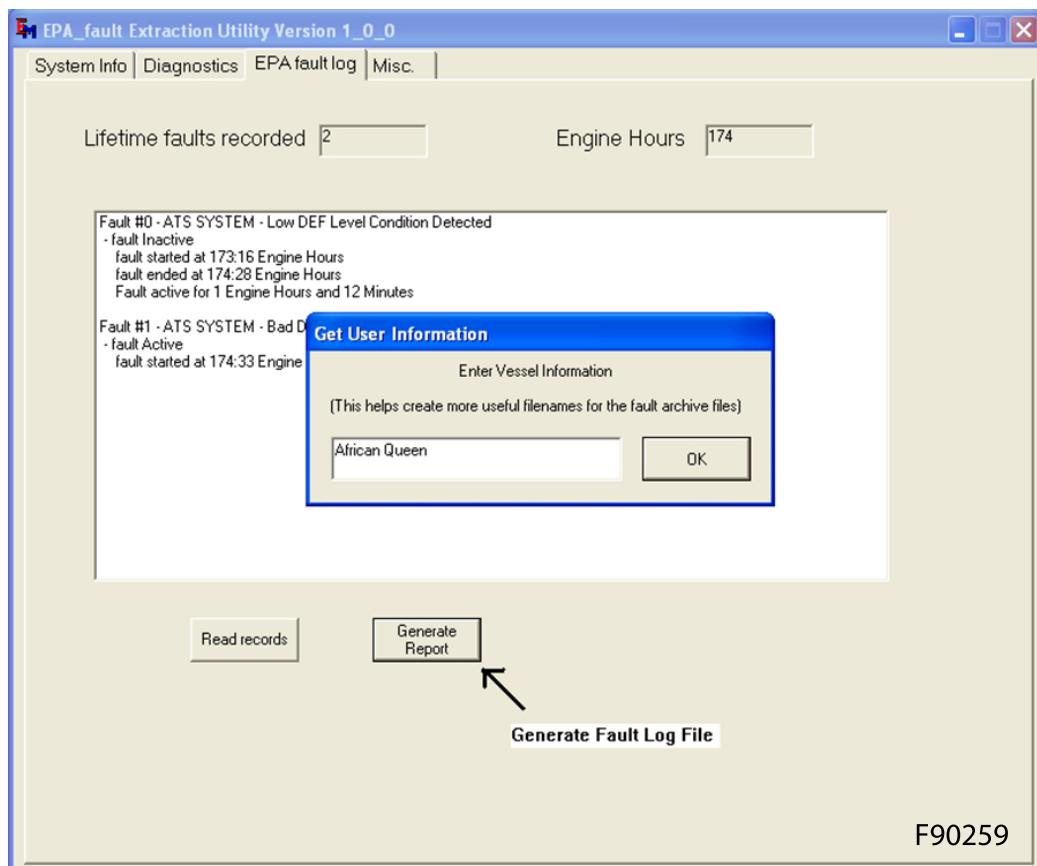


**Figure 10-213: EPA Fault Log Screen**

- 3 Click the Generate Report button. Clicking the Generate Report button will save the fault information into an easily readable text file. Clicking the button exposes a user dialog where information about the vessel is entered. This descriptive string is inserted into the fault report filename as well as in the



body of the report.



**Figure 10-214: Generate Report**

4 The report generated is shown in [Figure 10-215](#). The fault report is in text file format, readable on



any PC system. The fault file can be transferred to any other computer for archiving.

```
EPA Fault Log_African Queen_Apr_26_2018.txt - Notepad
File Edit Format View Help
EMDEC EPA Fault Archive
Created on 4/26/2018 at 8:59:44 AM
By EPA_fault Extraction Utility Version 1_0_0 (WUT_142 )
Vessel description: African Queen

EMDEC Sender Software P/N: 40285579
EMDEC Sender Calibration: 12SLM4E3 Version: 404
EMDEC Sender Software Version: 8.1
EMDEC Receiver Software P/N: 40285579
EMDEC Receiver Calibration: 12RLM4E3 Version: 404
EMDEC Receiver Software Version: 8.1

Current Engine Hours: 174
Lifetime EPA Faults Logged: 2

Fault #0 - ATS SYSTEM - Low DEF Level Condition Detected
- fault Inactive
  fault started at 173:16 Engine Hours
  fault ended at 174:28 Engine Hours
  Fault active for 1 Engine Hours and 12 Minutes

Fault #1 - ATS SYSTEM - Bad DEF Quality Detected
- fault Active
  fault started at 174:33 Engine Hours

F90260
```

Figure 10-215: Fault File Report

### 10.8.3 Load Engine and Verify that Engine Parameters and Injector Response Times are within Acceptable Ranges

To check engine parameters and injector response times:

- 1 From the Local Engine Control Cabinet screen, view system data.
- 2 Particular attention should be payed to the following parameters:
  - Air & Fuel Sensors
  - Diagnostics
  - Injectors
  - Load Data
  - Oil & Water
  - Voltage Data
  - Sensors
- 3 Check recorded values to make sure they are within acceptable ranges.
- Return to [9.1.9 Engine Control System Scheduled Maintenance](#).

#### 10.8.4 Replace Crankcase Pressure Sensor

To replace crankcase pressure sensor:

- 1 Disconnect wiring harness from connector on sensor.
- 2 Using a wrench with 1-1/2 inch wrench flats and a backup wrench on the fitting on the sensor port, remove sensor from sensor port.



Figure 10-216: Crankcase Pressure Sensor

- 3 Apply thread sealant to sensor threads.
- 4 Thread replacement sensor into sensor port.

**CAUTION**



Crankcase pressure sensor must be installed within  $\pm 30^\circ$  of vertical (pressure port down).

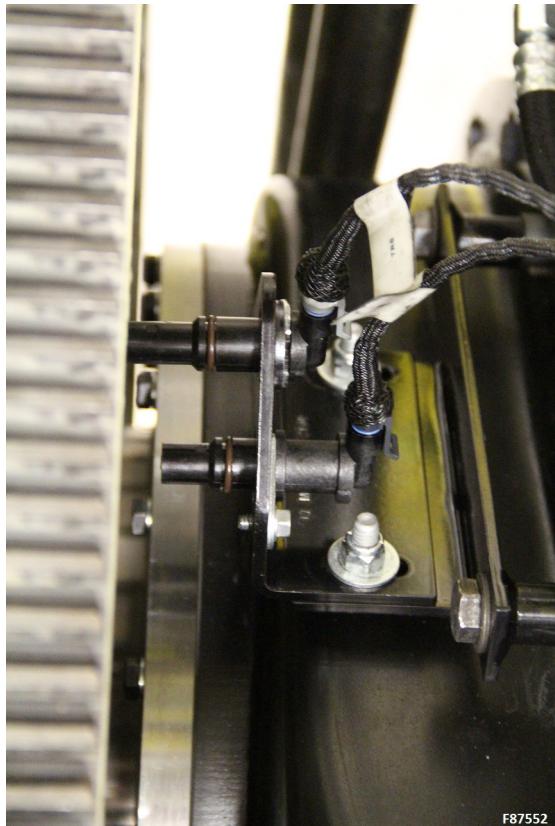
- 5 Reconnect wiring harness to sensor.
- Return to [9.1.9 Engine Control System Scheduled Maintenance](#).



### 10.8.5 Replace TRS Sensor

#### To replace Timing Reference Sensor (TRS):

- 1 Disconnect wiring harness from sensor.
- 2 Remove screw from TRS hold down.



F87552

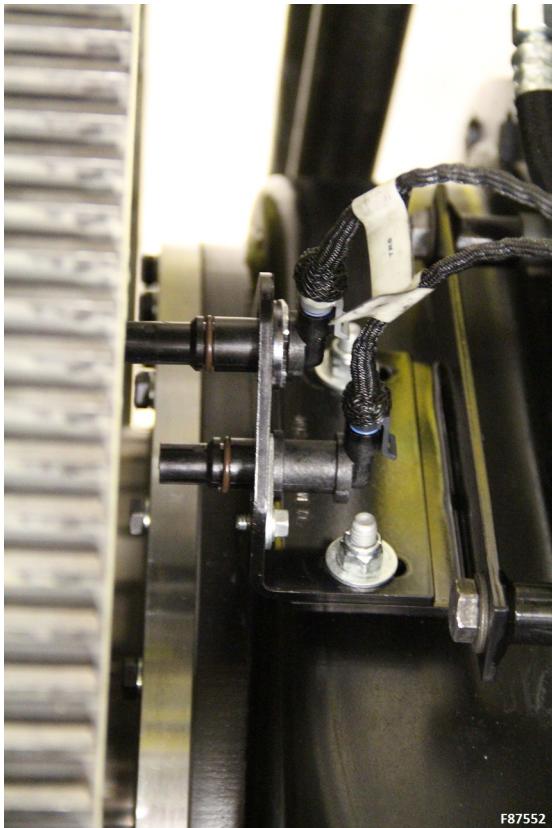
**Figure 10-217: TRS Sensor (Upper)**

- 3 Remove TRS from mounting bracket.
  - 4 Install replacement TRS on mounting bracket.
  - 5 Measure the air gap from the closest timing spoke to the TRS. It must be no greater than 0.15 inches (3.81 mm).
  - 6 If the air gap exceeds 0.15 inches, reset the gap using the adjusting screw located at the top of the bracket. Once the correct gap is achieved, tighten the locknut on the adjusting screw securely against the underside of the bracket. Adjusting the TRS will also properly set the gap of the SRS sensor.
  - 7 Adjust the deflection bolt so that it has a 0.060 inch (1.52 mm) air gap to the ring gear. Exercise the sensor bracket and verify that it returns to position and maintains the correct air gaps. If it does not, examine the bracket spring to make sure it is compressed to 1-1/2 inches. If the spring is properly compressed and the bracket does not return to position, replace the bracket.
  - 8 Reconnect wiring harness to sensor.
- Return to [9.1.9 Engine Control System Scheduled Maintenance](#).

### 10.8.6 Replace SRS Sensor

To replace Synchronous Reference Sensor (SRS):

- 1 Disconnect wiring harness from sensor.
- 2 Remove screw from SRS hold down.



**Figure 10-218: SRS Sensor (Lower)**

- 3 Remove SRS from mounting bracket.
  - 4 Install replacement SRS on mounting bracket.
  - 5 Measure the air gap from the SRS tab on the target. It must be no greater than 0.15 inches (3.81 mm).
  - 6 If the air gap exceeds 0.15 inches, reset the gap using the adjusting screw located at the top of the bracket. Once the correct gap is achieved, tighten the locknut on the adjusting screw securely against the underside of the bracket.
  - 7 Adjust the deflection bolt so that it has a 0.060 inch (1.52 mm) air gap to the ring gear. Exercise the sensor bracket and verify that it returns to position and maintains the correct air gaps. If it does not, examine the bracket spring to make sure it is compressed to 1-1/2 inches. If the spring is properly compressed and the bracket does not return to position, replace the bracket.
  - 8 Reconnect wiring harness to sensor.
- Return to [9.1.9 Engine Control System Scheduled Maintenance](#).

### 10.8.7 Replace Fuel Pressure into Engine Sensor

To replace fuel pressure into engine sensor:

- 1 Disconnect wiring harness from connector on sensor.
- 2 Using a wrench with 1-1/4 inch wrench flats and a backup wrench on the fitting on the sensor port, remove sensor from sensor port.

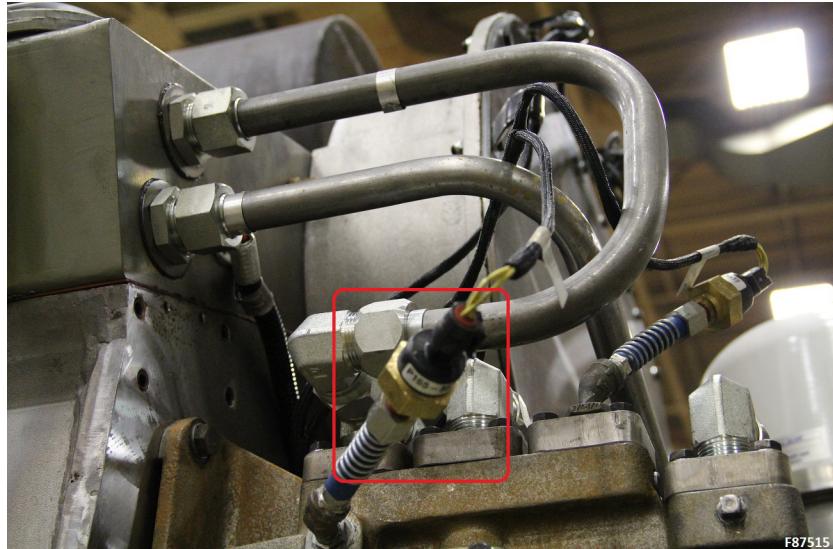


Figure 10-219: Fuel Pressure Into Engine Sensor

- 3 Apply thread sealant to sensor threads.
  - 4 Thread replacement sensor into sensor port.
  - 5 Reconnect wiring harness to sensor.
- Return to [9.1.9 Engine Control System Scheduled Maintenance](#).

### 10.8.8 Replace Fuel Pressure into Filter Sensor

To replace fuel pressure into filter sensor:

- 1 Disconnect wiring harness from connector on sensor.
- 2 Using a wrench with 1-1/4 wrench flats and a backup wrench on the fitting on the sensor port, unscrew sensor from sensor port.

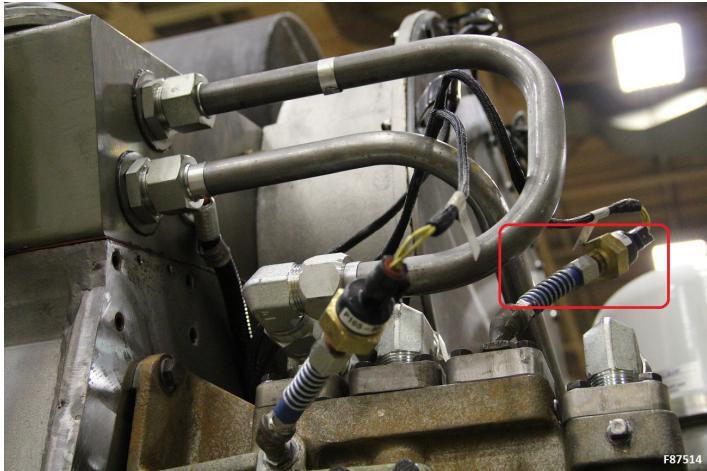


Figure 10-220: Fuel Pressure Into Filter Sensor

- 3 Apply thread sealant to sensor threads.
  - 4 Thread replacement sensor into sensor port.
  - 5 Reconnect wiring harness to sensor.
- Return to [9.1.9 Engine Control System Scheduled Maintenance](#).

### 10.8.9 Replace Fuel Temperature Sensor

To replace fuel temperature sensor:

- 1 Disconnect wiring harness from sensor pigtail.
- 2 Using a wrench with 3/4 inch wrench flats, remove sensor from sensor port.

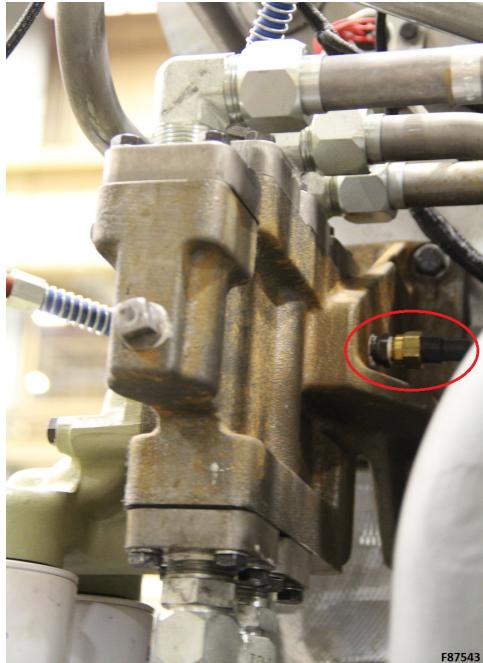


Figure 10-221: Fuel Temperature Sensor

- 3 Thread replacement sensor into sensor port.
  - 4 Using a torque wrench with 3/4 inch wrench flats, torque sensor to 20-25 ft-lb.
  - 5 Reconnect wiring harness to sensor pigtail.
- Return to [9.1.9 Engine Control System Scheduled Maintenance](#).

### 10.8.10 Replace Air Box Temperature Sensor

To replace air box temperature sensor:

- 1 Disconnect sensor pigtail from wiring harness.
- 2 Using a wrench with 3/4 inch wrench flats, remove sensor from air box.



Figure 10-222: Air Box Temperature Sensor

- 3 Thread replacement sensor into sensor port.
  - 4 Using a torque wrench with 3/4 inch wrench flats, torque sensor to 20-25 ft-lb.
  - 5 Reconnect wiring harness to sensor pigtail.
- Return to [9.1.9 Engine Control System Scheduled Maintenance](#).

### 10.8.11 Replace Air Box Pressure Sensor

To replace air box pressure sensor:

- 1 Disconnect wiring harness from connector on sensor.
- 2 Using a wrench with 1-1/4 inch wrench flats and a backup wrench on the fitting on the sensor port, remove sensor from sensor port.

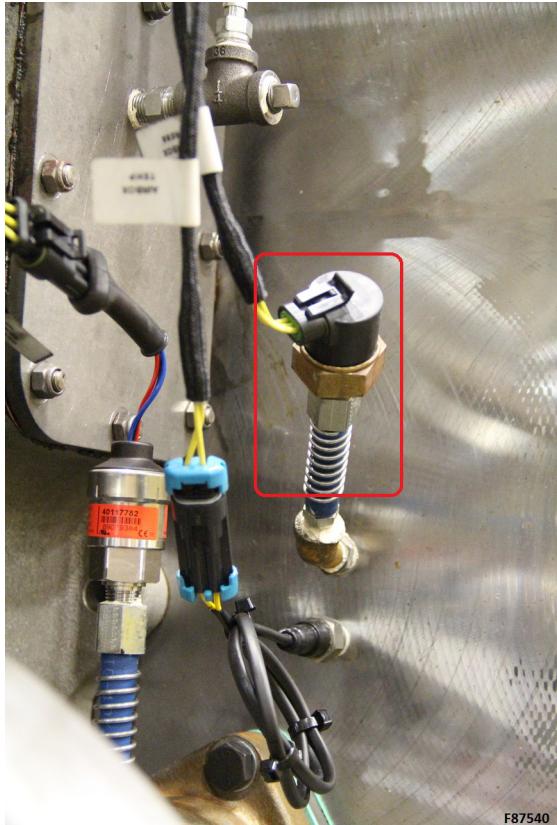


Figure 10-223: Air Box Pressure Sensor

- 3 Apply thread sealant to sensor threads.
  - 4 Thread replacement sensor into sensor port.
  - 5 Reconnect wiring harness to sensor.
- Return to [9.1.9 Engine Control System Scheduled Maintenance](#).

### 10.8.12 Replace Air Inlet Temperature Sensor

To replace air inlet temperature sensor:

- 1 Disconnect sensor pigtail from wiring harness.
- 2 Using a wrench with 3/4 inch wrench flats, remove sensor from turbocharger inlet.

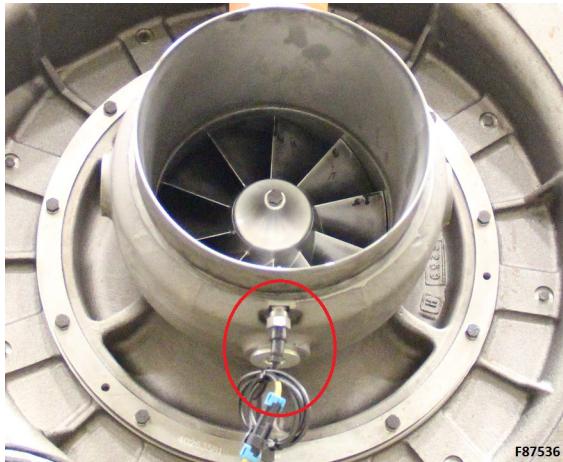


Figure 10-224: Air Inlet Temperature Sensor

- 3 Thread replacement sensor into sensor port.
  - 4 Using a torque wrench with 3/4 inch wrench flats, torque sensor to 20-25 ft-lb.
  - 5 Reconnect wiring harness to sensor pigtail.
- Return to [9.1.9 Engine Control System Scheduled Maintenance](#).

### 10.8.13 Replace Turbo Speed Sensor

To replace turbo speed sensor:

- 1 Disconnect wiring harness from sensor.
- 2 Using a wrench with 15/16 inch (24 mm) wrench flats, remove sensor from turbocharger.

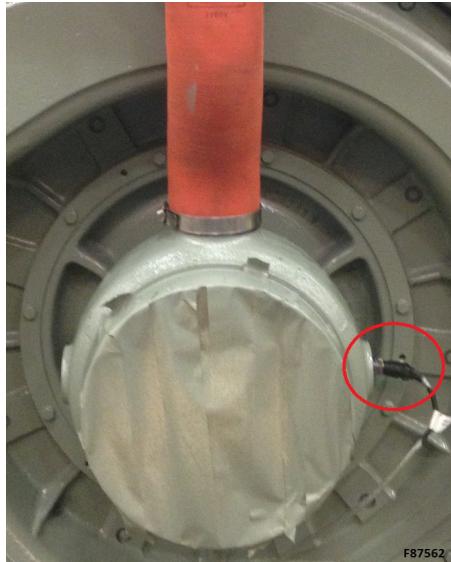


Figure 10-225: Turbo Speed Sensor

- 3 Thread replacement sensor into sensor port.
  - 4 Using a wrench with 15/16 inch wrench flats, tighten sensor into port.
  - 5 Reconnect wiring harness to sensor.
- Return to [9.1.9 Engine Control System Scheduled Maintenance](#).

### 10.8.14 Replace Oil Pressure into Filter Sensor

To replace oil pressure into turbo filter sensor:

- 1 Disconnect wiring harness from sensor pigtail.
- 2 Using a wrench with 1 inch wrench flats and a backup wrench on the fitting on the sensor port, remove sensor from sensor port.

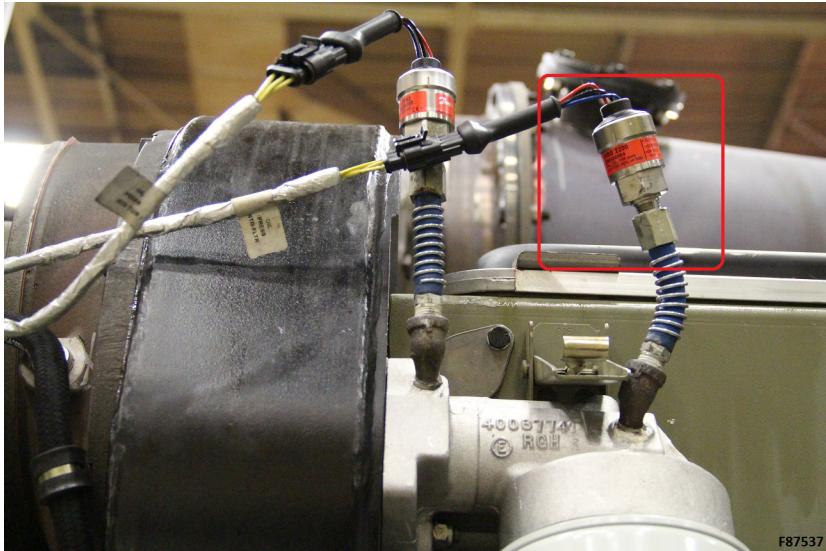


Figure 10-226: Oil Pressure Into Turbo Filter Sensor

- 3 Apply thread sealant to sensor threads.
  - 4 Thread replacement sensor into sensor port.
  - 5 Reconnect wiring harness to sensor pigtail.
- Return to [9.1.9 Engine Control System Scheduled Maintenance](#).

### 10.8.15 Replace Oil Pressure into Turbo Sensor

To replace oil pressure into turbo sensor:

- 1 Disconnect wiring harness from sensor pigtail.
- 2 Using a wrench with 1 inch wrench flats and a backup wrench on the fitting on the sensor port, remove sensor from sensor port.

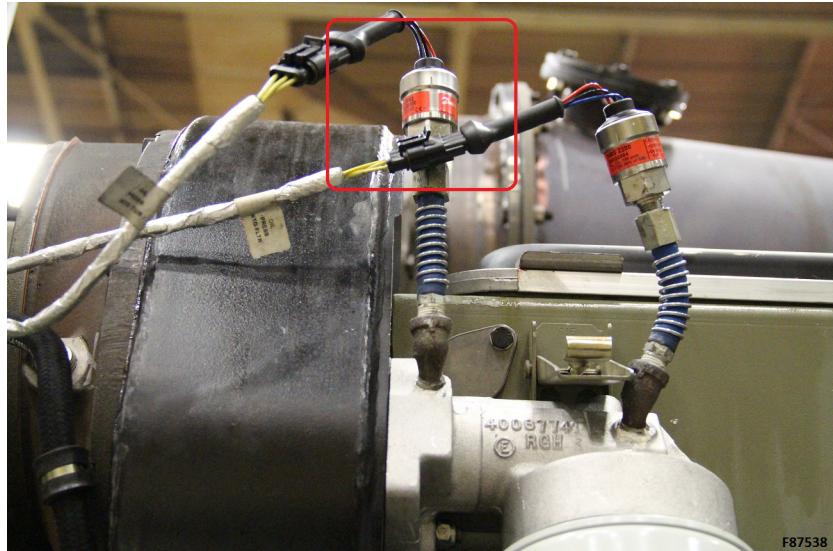


Figure 10-227: Oil Pressure Into Turbo Sensor

- 3 Apply thread sealant to sensor threads.
  - 4 Thread replacement sensor into sensor port.
  - 5 Reconnect wiring harness to sensor pigtail.
- Return to [9.1.9 Engine Control System Scheduled Maintenance](#).

### 10.8.16 Replace Oil Temperature into Engine Sensor

To replace oil temperature into engine sensor:

- 1 Disconnect wiring harness from sensor pigtail.
- 2 Using a wrench with 3/4 inch wrench flats, remove sensor from sensor port.

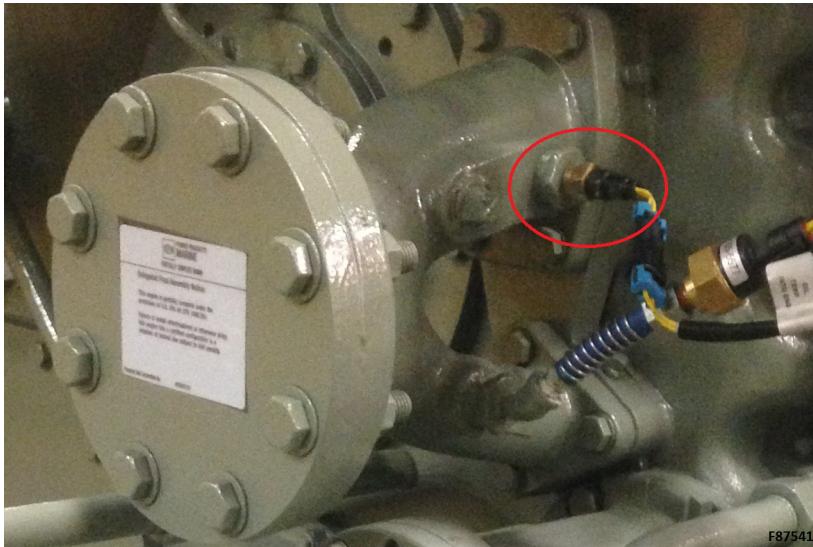


Figure 10-228: Oil Temperature Into Engine Sensor

- 3 Thread replacement sensor into sensor port.
- 4 Using a torque wrench with 3/4 inch wrench flats, torque sensor to 20-25 ft-lb.
- 5 Reconnect wiring harness to sensor pigtail.
  - Return to [10.5.19 Replace Lube Oil Y-Pipe](#).
  - Return to [9.1.9 Engine Control System Scheduled Maintenance](#).

### 10.8.17 Replace Oil Pressure into Engine Sensor

To replace oil pressure into engine sensor:

- 1 Disconnect wiring harness from connector on sensor.
- 2 Using a wrench with 1-1/4 inch wrench flats and a backup wrench on the fitting on the sensor port, remove sensor from sensor port.

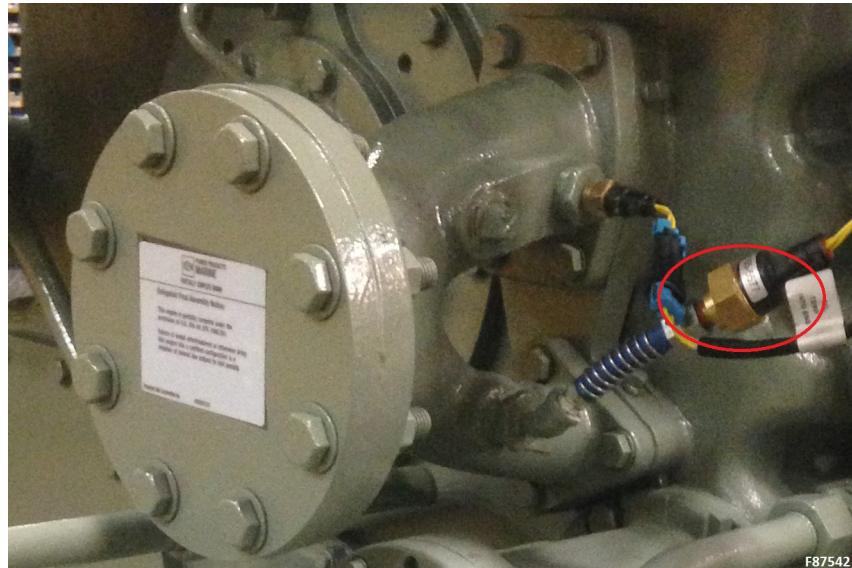


Figure 10-229: Oil Pressure Into Engine Sensor

- 3 Apply thread sealant to sensor threads.
  - 4 Thread replacement sensor into sensor port.
  - 5 Reconnect wiring harness to sensor.
- Return to [10.5.19 Replace Lube Oil Y-Pipe](#).
  - Return to [9.1.9 Engine Control System Scheduled Maintenance](#).

### 10.8.18 Replace Coolant Pressure - Engine Out Sensor

To replace coolant pressure - engine out sensor:

- 1 Disconnect wiring harness from sensor pigtai.
- 2 Using a wrench with 1 inch (25.4 mm) wrench flats and a backup wrench on the fitting on the sensor port, remove sensor from sensor port.

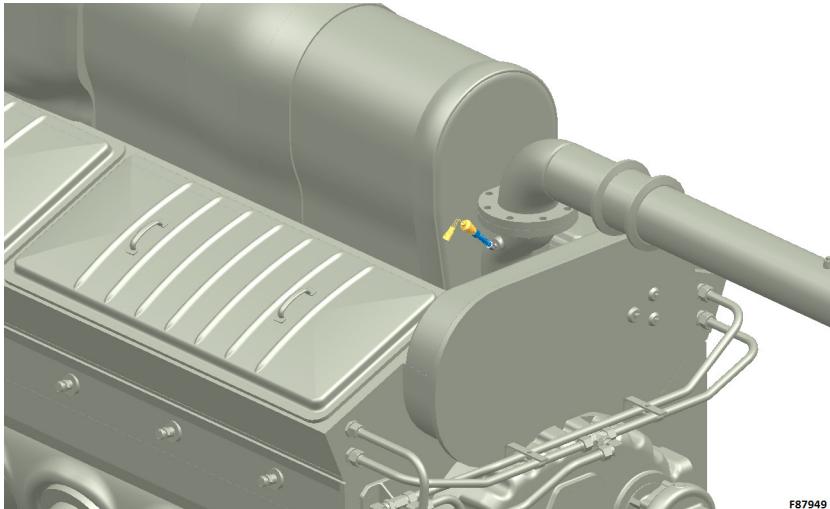


Figure 10-230: Coolant Pressure - Engine Out Sensor

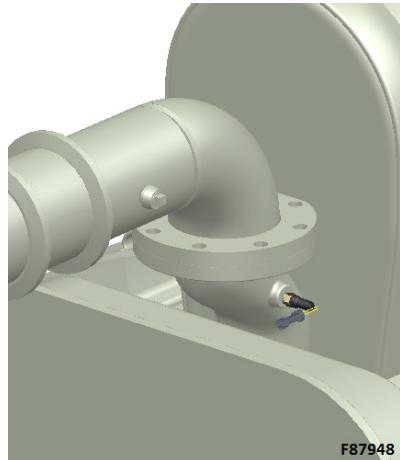
- 3 Apply thread sealant to replacement sensor threads.
  - 4 Thread sensor into sensor port.
  - 5 Using a wrench with 1 inch (25.4 mm) wrench flats, tighten sensor into sensor port.
  - 6 Reconnect wiring harness to sensor pigtai.
- Return to [9.1.9 Engine Control System Scheduled Maintenance](#).



### 10.8.19 Replace Coolant Temperature - Engine Out Sensor

To replace coolant temperature - engine out sensor:

- 1 Disconnect wiring harness from sensor pigtail.
- 2 Using a wrench with 3/4 inch (19 mm) wrench flats, remove sensor.



**Figure 10-231: Coolant Temperature - Engine Out Sensor**

- 3 Apply high temperature anti-seize to sensor threads.
  - 4 Thread in replacement sensor.
  - 5 Using a wrench with 3/4 inch (19 mm) wrench flats, tighten sensor.
  - 6 Reconnect wiring harness to sensor pigtail.
- Return to [9.1.9 Engine Control System Scheduled Maintenance](#).

### 10.8.20 Replace Coolant Pressure - Pump Out Sensor

To replace coolant pressure - pump out sensor:

- 1 Disconnect wiring harness from connector on sensor.
- 2 Using a wrench with 1 inch wrench flats and a backup wrench on the fitting on the sensor port, remove sensor from sensor port.

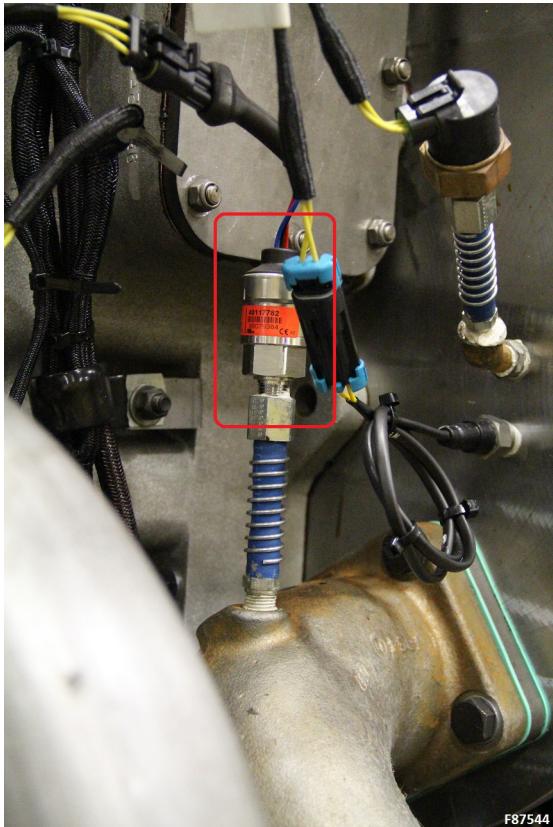


Figure 10-232: Coolant Pressure - Pump Out Sensor

- 3 Apply thread sealant to sensor threads.
  - 4 Thread replacement sensor into sensor port.
  - 5 Reconnect wiring harness to sensor.
- Return to [9.1.9 Engine Control System Scheduled Maintenance](#).

### 10.8.21 Replace NOx Out Sensor

To replace NOx Out sensor:

- 1 Disconnect wiring harness from sensor pigtail.
- 2 Using a wrench with 7/8 inch (22 mm) wrench flats, unscrew sensor from sensor port.

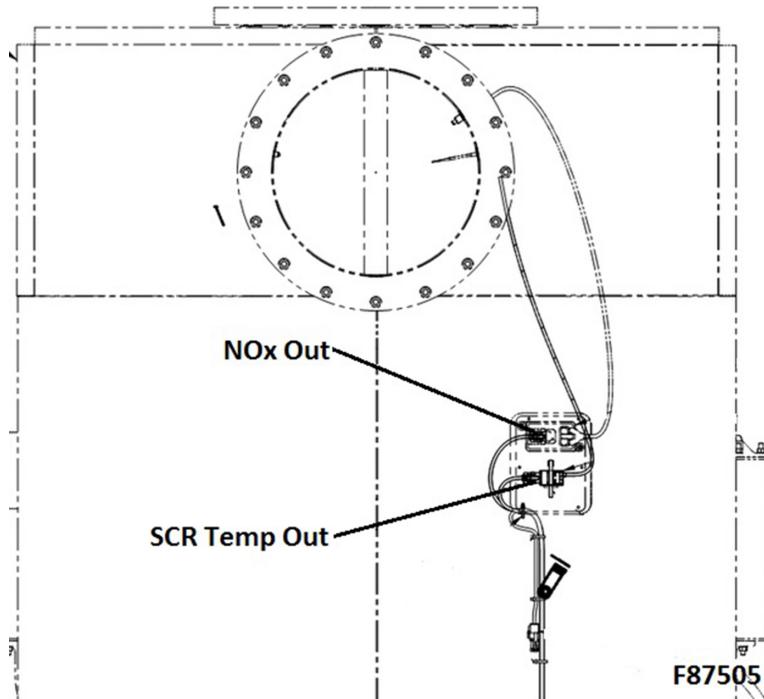


Figure 10-233: SCR NOx Out Sensor Location

- 3 Apply high temperature anti-seize to the threads of the replacement sensor.
  - 4 Thread replacement sensor into sensor port.
  - 5 Using a wrench, tighten sensor. Torque to  $37 \pm 7$  ft-lb ( $50 \pm 10$  N·m).
  - 6 Reconnect sensor wiring harness.
- Return to [9.1.9 Engine Control System Scheduled Maintenance](#).

### 10.8.22 Replace NOx In Sensor

To replace NOx In sensor:

- 1 Disconnect wiring harness from sensor pigtail.
- 2 Using a wrench with 7/8 inch (22 mm) wrench flats, remove sensor from mixing tube.

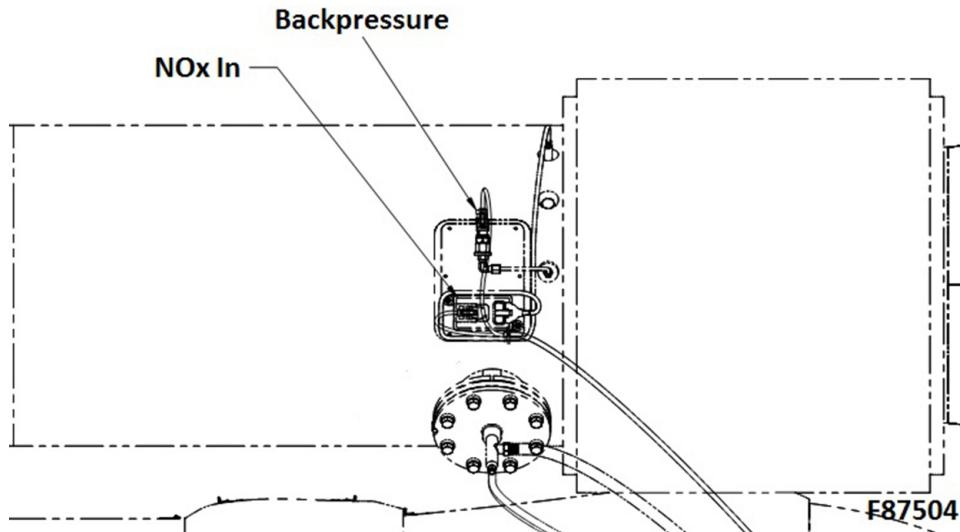


Figure 10-234: NOx In Sensor Location

- 3 Apply high temperature anti-seize to the threads of the replacement sensor.
  - 4 Thread replacement sensor into sensor port.
  - 5 Using a wrench, tighten sensor. Torque sensor to  $37 \pm 7$  ft-lb ( $50 \pm 10$  N·m).
  - 6 Reconnect sensor wiring harness.
- Return to 9.1.9 Engine Control System Scheduled Maintenance.

### 10.8.23 Replace Backpressure Sensor

To replace SCR backpressure sensor:

- 1 Disconnect wiring harness from sensor pigtail.

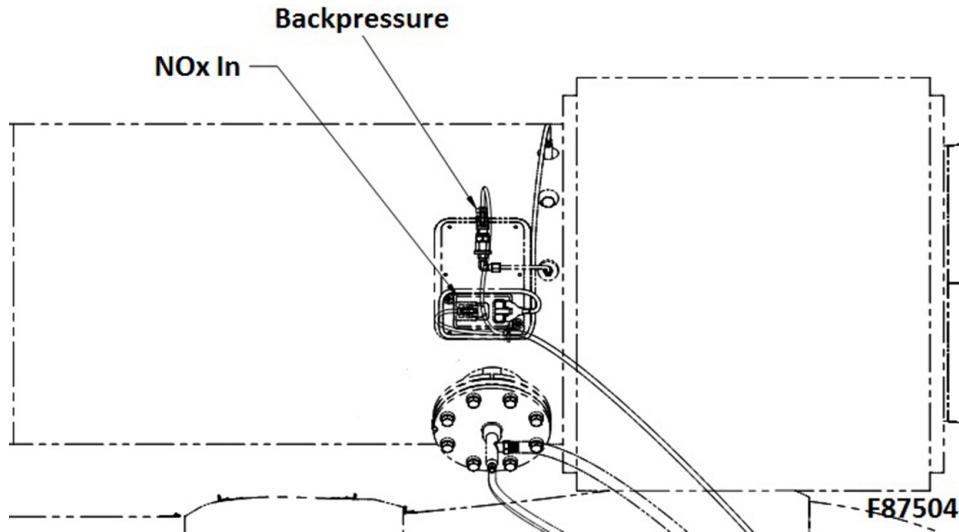


Figure 10-235: SCR Backpressure Sensor

- 2 Using a wrench, remove sensor from mixing tube.

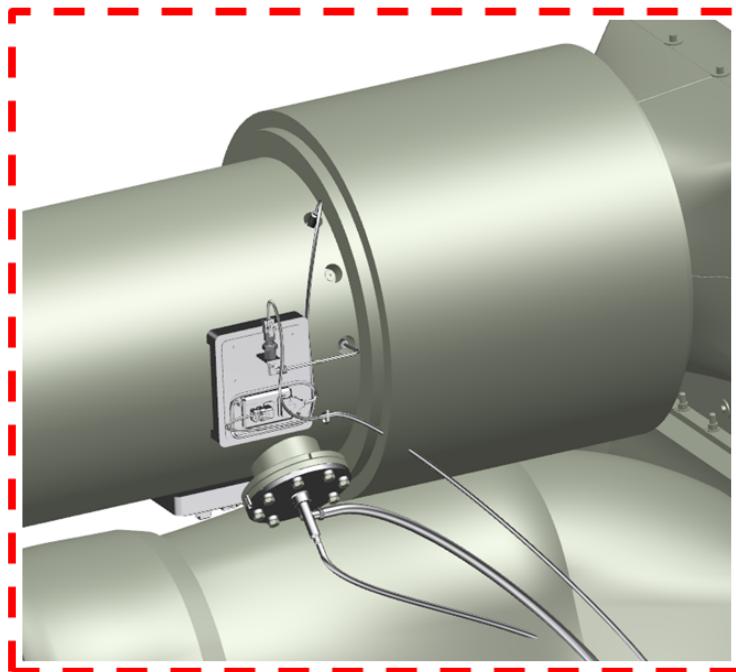


Figure 10-236: SCR Backpressure Sensor Location

- 3 Apply high temperature anti-seize to the threads of the replacement sensor.
- 4 Thread replacement sensor into sensor port.

- 5 Using a wrench, tighten sensor.
  - 6 Reconnect sensor wiring harness.
- Return to [9.1.9 Engine Control System Scheduled Maintenance](#).

#### 10.8.24 Replace SCR Inlet Temperature Sensor

To replace SCR inlet temperature sensor:

- 1 Disconnect wiring harness from sensor pigtail.
- 2 Using a wrench with 17mm wrench flats, remove sensor from sensor port.

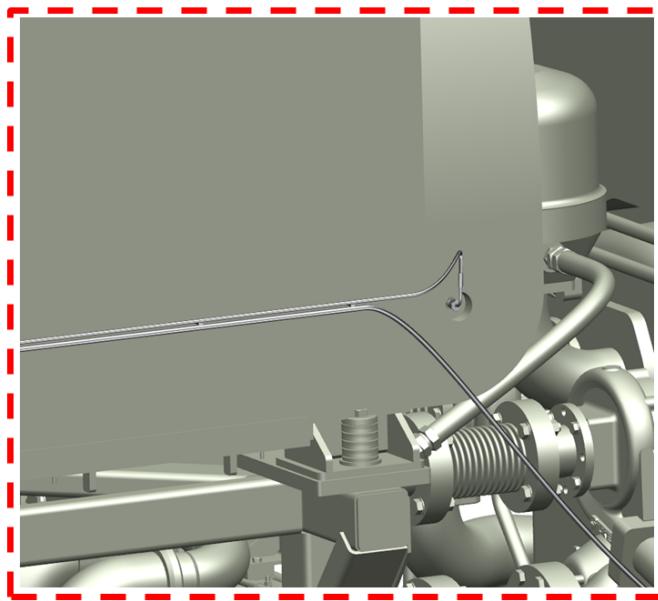


Figure 10-237: SCR Inlet Temperature Sensor

- 3 Apply high temperature anti-seize to threads on replacement sensor.
  - 4 Thread replacement sensor into sensor port.
  - 5 Using a torque wrench with 17mm wrench flats, torque sensor to 33.19 ft-lb (45 N·m).
  - 6 Reconnect wiring harness to sensor pigtail.
- Return to [9.1.9 Engine Control System Scheduled Maintenance](#).

### 10.8.25 Replace SCR Outlet Temperature Sensor

To replace SCR outlet temperature sensor:

- 1 Disconnect wiring harness from sensor pigtail.

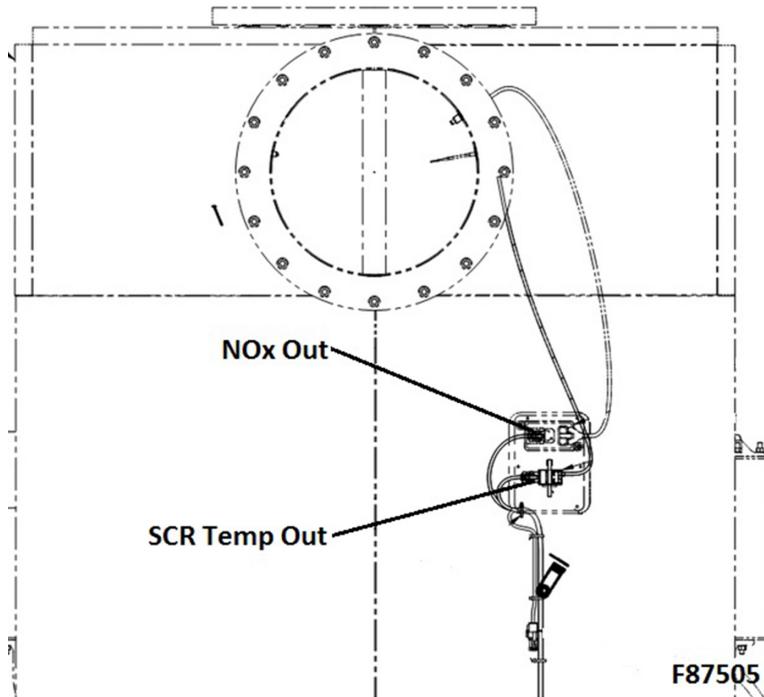


Figure 10-238: SCR Outlet Temperature Sensor

- 2 Using a wrench with 17mm wrench flats, remove sensor from sensor port.

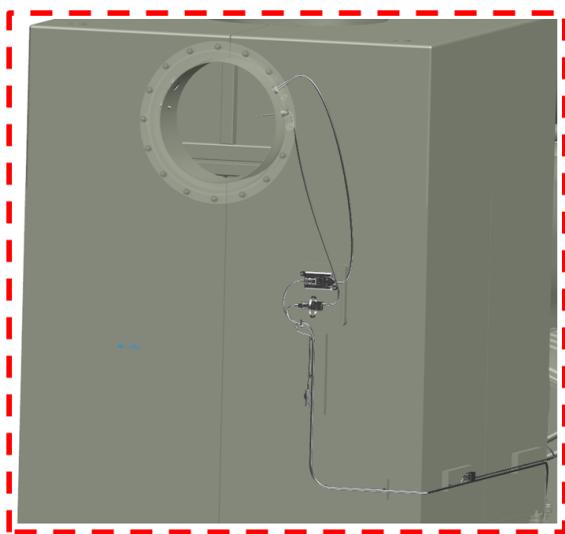


Figure 10-239: SCR Outlet Temperature Sensor

- 3 Apply high temperature anti-seize to threads of replacement sensor.
- 4 Thread replacement sensor into sensor port.



- 5 Using a torque wrench with 17mm wrench flats, torque sensor to 33.19 ft-lb (45 N·m).
  - 6 Reconnect wiring harness to sensor pigtail.
- Return to [9.1.9 Engine Control System Scheduled Maintenance](#).