

07/24/2024

Data Link - Test (M0170502-03)

SMCS - 1900

i10207530

Use this procedure to troubleshoot the Data link system. Also use this procedure if a diagnostic code in Table 1 is active or easily repeated.

Table 1

J1939 Code and Description	CDL Code and Description	Comments
639-9 J1939 Network #1 : Abnormal Update Rate	247-9 SAE J1939 Data Link : Abnormal Update Rate	Communication has been lost to one or more of the devices on the datalink. If multiple devices are not communicating, there is likely a problem with the data link wiring, power, or ground circuits.
639-14 J1939 Network #1 : Special Instruction	247-14 SAE J1939 Data Link : Special Instruction	The affected ECM is missing expected parameters.
1231-9 J1939 Network #2 : Abnormal Update Rate	2348-9 SAE J1939 Data Link #2 : Abnormal Update Rate	Communication has been lost to one or more of the devices on the datalink. If multiple devices are not communicating, there is likely a problem with the data link wiring, power, or ground circuits.
1231-14 J1939 Network #2 : Special Instruction	2348-14 SAE J1939 Data Link #2 : Special Instruction	The affected ECM is missing expected parameters.
1235-9 J1939 Network #3 : Abnormal Update Rate	5856-9 SAE J1939 Data Link #3 : Abnormal Update Rate	Communication has been lost to one or more of the devices on the datalink. If multiple devices are not communicating, there is likely a problem with the data link wiring, power, or ground circuits.
1235-14 J1939 Network #3 : Special Instruction	5856-14 SAE J1939 Data Link #3 : Special Instruction	The affected ECM is missing expected parameters.

2853-9 Communications Connection : Abnormal Update Rate	N/A	Communication has been lost to one or more of the devices on the datalink. If multiple devices are not communicating, there is likely a problem with the data link wiring, power, or ground circuits.
3360-9 Aftertreatment #1 DEF Controller : Abnormal Update Rate	3820-9 Aftertreatment #1 DEF Controller #1 : Abnormal Update Rate	The DCU triggered a CAN communication diagnostic code and shut the SCR system down. Troubleshoot and repair the same as a 1235-9 code, perform an Aftertreatment System Functional Test to verify the repair

Table 2

Associated Diagnostic Trouble Codes	
J1939 Code	CDL Code
5965-5	3838-5
5965-6	3838-6
5966-6	3965-6

If the Cat® Electronic Technician (ET) will not communicate with the ECM, refer to Troubleshooting, "Electronic Service Tool Does Not Communicate" before you begin this procedure. The procedure verifies that electrical power is being supplied to the ECM and to the service tool connector.

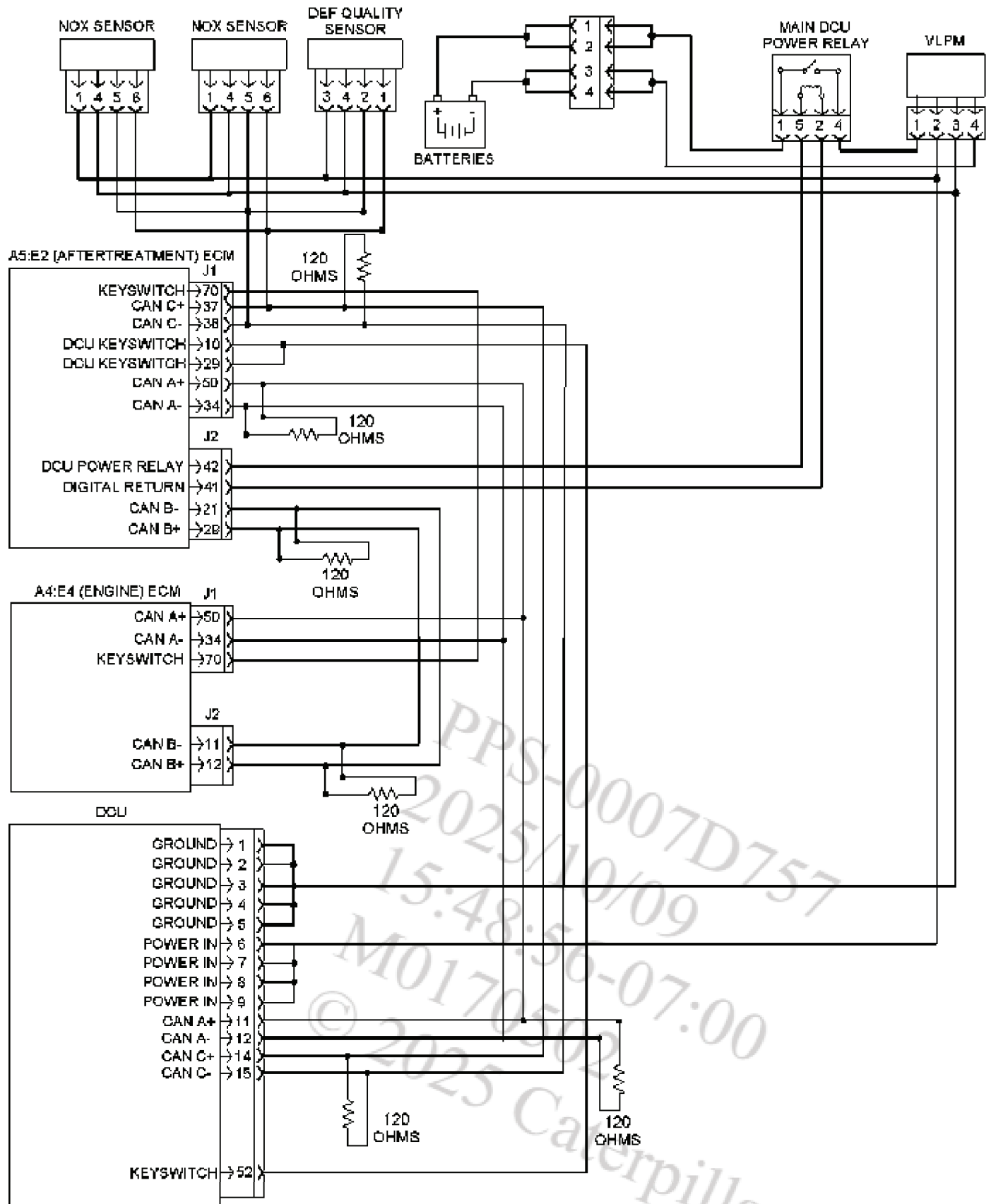
The Systems Communication Status is located under the diagnostics tab in Cat ET. Click the "System Communication Status" option. Once the screen opens up, the information will automatically be loaded from the ECM. If there is an issue with the data link and the data link is repaired, the "Load from ECM" button will have to be clicked again to see the updated status. If there are communication issues between multiple modules, each module can be selected individually to determine which components are having communication issues. If the problem is intermittent, the "View History" button can be clicked to see all the communication faults that have previously logged.

Table 3

Cat® ET Diagnostic Code Cross Reference to Wiring Schematic	
Code Description	Data Link
J1939 Network #1	Can A

J1939 Network #2	Can B
J1939 Network #3	Can C

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M0170502
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Not all connectors are shown, refer to the appropriate schematic

Note: The DEF Quality Sensor is from the factory on 2017 model or later.

Note: The DEF Quality Sensor can be added to 2016 and older models.

-9 Detected Problems:

Device 1 is unable to communicate on the data link.

- Device 1 cannot communicate with other devices on the data link, but can communicate with the service tool, indicating a problem with the data link wiring.

Device 1 is unable to communicate with Device 2 on the data link.

- Device 1 cannot communicate with Device 2, indicating a problem with the data link wiring, power or ground circuit, or Device 2.

Note: If a 639-9 or 247-9 code is active and the "System Communication Status" indicates a communication problem with the "Aftertreatment #1 DEF Sensor", confirm that the "Aftertreatment #1 DEF Quality Sensor Installation Status" configuration parameter is programmed properly.

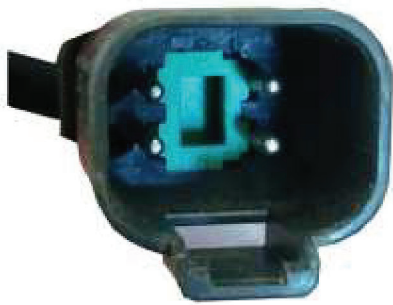
The "Aftertreatment #1 DEF Quality Sensor Installation Status" parameter must be programmed to "Not Installed", if equipped with a DEF header having a 3-pin connector without an internal DEF quality sensor. A 2016 or older model may have a DEF Quality Sensor Manifold having a 4-pin connector installed in the DEF tank and the "Aftertreatment #1 DEF Quality Sensor Installation Status" programmed to "Not Installed".



Illustration 2

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3-pin connector DEF Manifold without DEF Quality Sensor



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Illustration 3

g06741435

4-pin connector DEF Manifold with DEF Quality Sensor

Description	Value	TT
ECM Identification Parameters		
Selected Engine Rating		
Speed Control		
Engine Configuration Parameters		
Engine Idle Shutdown		
Delayed Engine Shutdown		
Fan Control		
Aftertreatment Configuration		
ARD Manual Disable Status	Not Disabled	
High Soot Load Aftertreatment Protection Enable Status	Enabled	
Operator Inducement Progress Configuration	Reduced Performance	
Operator Inducement Regulation Configuration	Worldwide	
Operator Inducement Emergency Override Enable Status	Disabled	
Operator Inducement Emergency Override Activation	Not Activated	
Operator Final Inducement Action	Shutdown	
Delayed Engine Shutdown Aftertreatment Gas Temperature Threshold	428.0 Deg F	
Aftertreatment #1 DEF Quality Sensor Installation Status	Not Installed	
System Settings		
Security Access Parameters		

Illustration 4

g06741741

DEF Quality Sensor Installation

-14 Detected Problems:

Device 1 is unable to obtain a network address on the data link.

- Device 1 is trying to claim the same address as another Device. An example of this is 2 devices being configured the same.

Device 1 detects a failed address claim from Device 2 on the data link.

- Device 1 detects that Device 2 is trying to claim the same address as another device.

Device 1 is not receiving all expected parameters from Device 2 on the data link.

- A component is configured as installed in the device, but is not installed on the application.
- The incorrect component is installed.
- The incorrect software file has been installed.

Table 4

Troubleshooting Test Steps	Values	Results
1. Check for Associated Diagnostic Trouble Codes A. Establish communication between Cat ET and the ECM. Refer to Troubleshooting, "Electronic Service Tools", if necessary. B. Download the "Warranty Report" from the engine ECM before performing any troubleshooting or clearing diagnostic trouble codes. Troubleshoot any associated diagnostic codes that are present before continuing with this procedure.	Associated Codes	Result: An associated diagnostic trouble code is not active or logged. Proceed to Test Step 2. Result: An associated code is active or logged. Repair: Troubleshoot the associated codes before continuing with this procedure. Refer to Troubleshooting, "Diagnostic Trouble Codes" to troubleshoot the associated diagnostic code.
2. Use the "System Communication Status" to Determine the Communication Issue A. In Cat ET, click the "Diagnostics" tab on the tool bar. B. Select the "System Communication Status"	Component Identified	Result: A -9 code is active. Repair: Refer to the above -9 detected problems for more information. Proceed to Test Step 6.

option from the drop-down list.

Note: The **Aftertreatment #1 Intake NOx Level Sensor** is displayed as **Aftertreatment #1 Information #1** in some versions of software.

Result: A -14 code is active.

Refer to the above -14 detected problems for more information.

If the NOx sensors are listed as Device 2, Proceed to Test Step 3.

For all other components, Proceed to Test Step 4.

3. Check the Part Number of the Component

A. Locate the part number of the component that was identified by the "System Communication Status". Check to see if the part number is correct for the application.

Part Number

Result: The part number is correct for the application.

Proceed to Test Step 4.

Result: The part number is incorrect for the application.

Repair: Replace the component with the correct part number. Refer to Special Instruction, [REHS8151](#) for special handling instructions if replacing a NOx sensor.

Proceed to Test Step 11.

4. Check the Software Flash File (if applicable)

A. Check the flash file part number to make sure that the file matches the most current revision.

Flash File

Result: The flash file is correct for the application.

Proceed to Test Step 5.

Result: The flash file is incorrect for the application.

Repair: Reflash the component to the correct flash file.

Proceed to Test Step 11.

Result: The components are configured correctly.

Repair: A failed component has been identified. Replace the failed component.

Proceed to Test Step 11.

Result: The components are not configured correctly.

Repair: Configure the components properly for the application.

Proceed to Test Step 11.

5. Check the Programmable Parameters

A. Navigate to the configuration screen in Cat ET.

B. Identify the component that logged the -14 code.

C. Determine if the component is configured correctly for the application.

Configuration

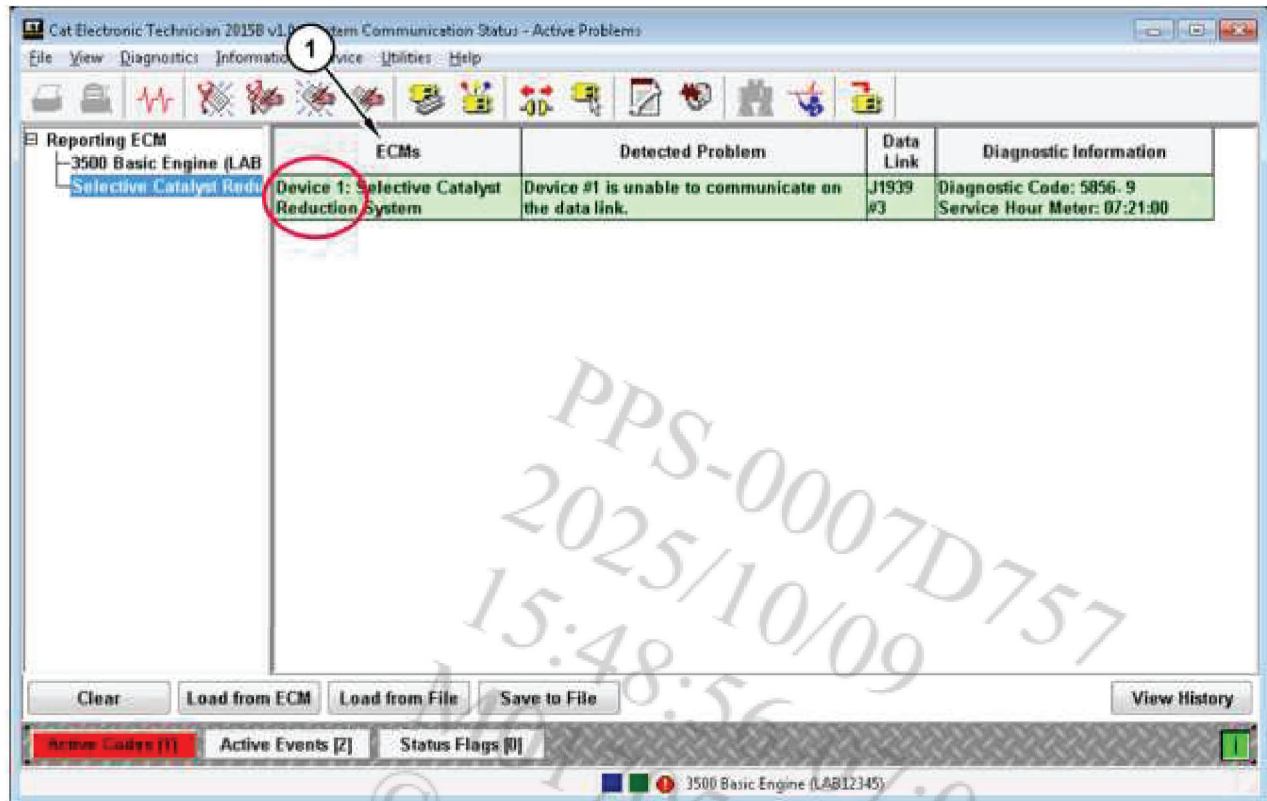


Illustration 5

g03846524

Device 1 present

(1) Column 1

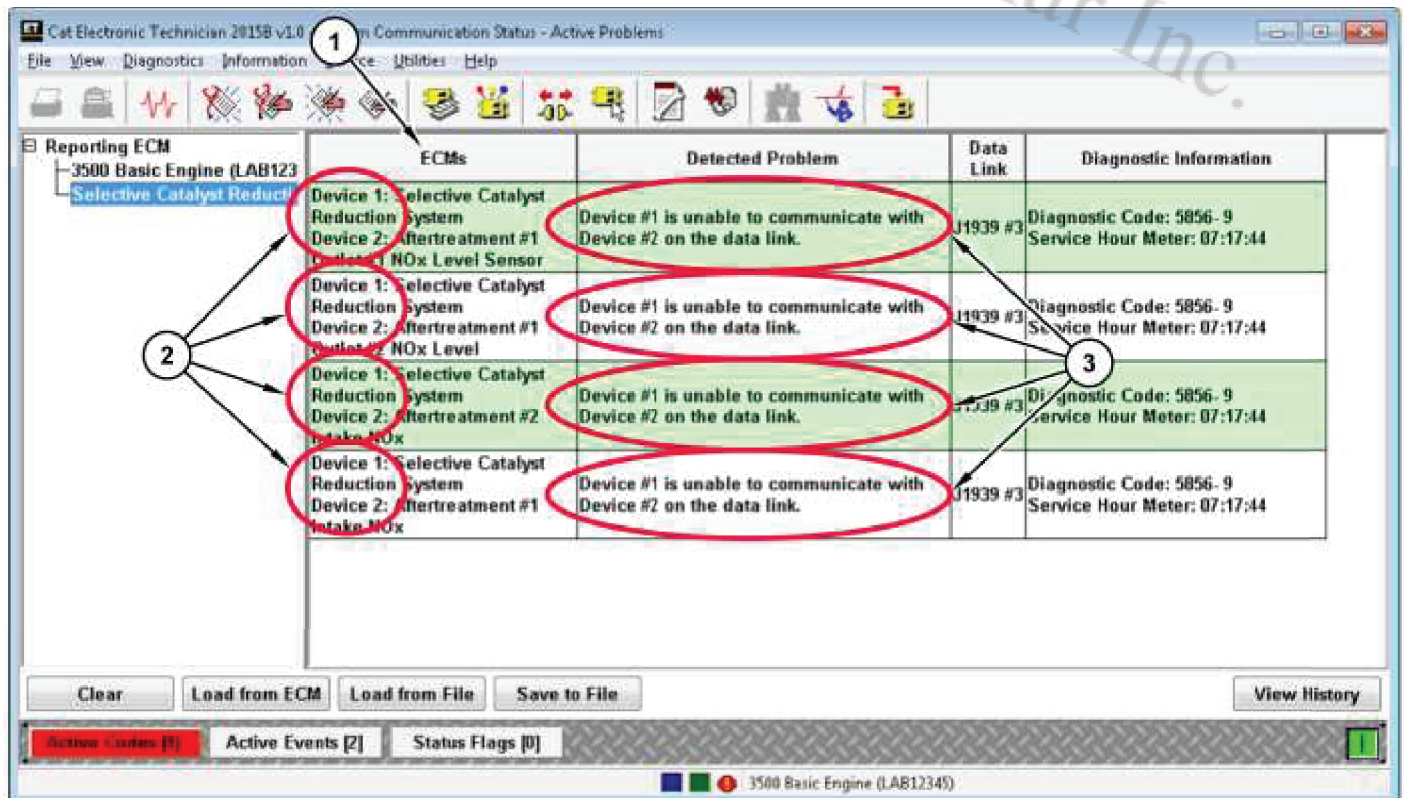


Illustration 6

g03846007

Device 1 and Device 2 present

(1) Column 1

(2) Multiple Device 1 and Device 2 can be displayed

(3) Device 2 is the affected ECM/device that cannot be recognized by Device 1. Device 2 is the ECM/device with the problem.

Table 5

Troubleshooting Test Steps	Values	Results
6. Use the System Communication Status to Determine the Cause A. Determine if both Device 1 and Device 2 are present in the "Device's" column (1) within the "System Communication Status" screen. Refer to Illustration 6. Note: The Aftertreatment #1 Intake NOx Level Sensor is displayed as Aftertreatment #1 Information #1 in some versions of software.	Component Identified	Result: Device 1 and Device 2 are both present. Record the devices identified as Device 1 and Device 2 in column 1. Refer to Illustration 6 Proceed to Test Step 7. Result: Only Device 1 is present. Record the device identified as Device 1 in column 1. Refer to Illustration 5 Proceed to Test Step 9.
7. Check the Resistance of the Data link A. Turn the keyswitch to the OFF position. B. Measure the resistance of the datalink between Device 2 datalink (CAN +) wire and the datalink (CAN -) wire on the wiring	60+/-10 Ohms	Result: The resistance is less than 50 Ohms. There are more than 2 terminating resistors installed in the wiring harness or a short circuit has been detected.

harness connector of Device 2. Refer to the appropriate wiring diagram.

Note: If Device 2 is the Aftertreatment Diesel Exhaust Fluid Controller (DCU), the **398-5063** Break-out Connector must be used to prevent damage to the DCU connector.

Repair: Repair or replace parts as necessary.

Proceed to Test Step 11.

Result: The resistance is 60 ± 10 Ohms.

The terminating resistors are OK.

Proceed to Test Step 8.

Result: The resistance is 120 ± 10 Ohms.

There is a problem with a terminating resistor.

Repair: Check the resistance on each terminating resistor. Replace the failed terminating resistor.

Proceed to Test Step 11.

Result: The resistance is greater than 130 Ohms.

There is a problem with both terminating resistors or an open circuit has been detected.

Repair: Determine the cause of the problem. Repair the problem, when possible. Replace parts, if necessary. Verify that the problem is resolved.

Proceed to Test Step 11.

8. Check the Power and Ground to

Battery

Result: The voltage is not equal to battery voltage.

Device 2 A. Turn the keyswitch to the ON position. B. Measure the voltage between the battery (+) and battery (-) terminals on the wiring harness connector of Device 2. Refer to the appropriate wiring diagram. Note: If Device 2 is the DCU, the 398-5063 Break-out Connector must be used to prevent damage to the DCU connector.	Voltage	There is an open or short in the wiring circuit. Repair or replace the wiring circuit as necessary. Refer to the machine-specific schematic for wiring information. Proceed to Test Step 11. Result: The voltage is equal to battery voltage and Device 2 is NOT the DCU. Repair: Replace the component identified as Device 2. Refer to Special Instruction, REHS8151 for special handling instructions if replacing a NOx sensor. Proceed to Test Step 11. Result: The voltage is equal to battery voltage and Device 2 is the DCU. Proceed to Test Step 10.
9. Check the Resistance of the Data Link A. Turn the keyswitch to the OFF position. B. Measure the resistance of the data link between ECM 1 data link (+) wire and the data link (-) wire on the wiring harness connector of ECM 1. Refer to the appropriate wiring diagram. Note: If measuring at the DCU wiring harness connector, the 398-5063 Break-	60+/-10 Ohms	Result: The resistance is less than 50 Ohms. There are more than 2 terminating resistors installed in the wiring harness or a short circuit has been detected. Repair: Repair or replace parts as necessary. Proceed to Test Step 11. Result: The resistance is 60 ±10

out Connector must be used to prevent damage to the DCU connector.

Ohms.

The terminating resistors are OK.

Check the power, ground, and keyswitch (if applicable) supply to each module on the affected data link. Refer to the appropriate wiring diagram.

Note: Keyswitch must be in the ON position when checking the power supply.

Repair the power or ground supply to the modules if necessary.

Proceed to Test Step 11.

Result: The resistance is 120 ± 10 Ohms.

There is a problem with a terminating resistor. Check the resistance on each terminating resistor.

Repair: Replace the failed terminating resistor.

Proceed to Test Step 11.

Result: The resistance is greater than 130 Ohms.

There is a problem with the wiring harness between ECM 1 and the splice point into the data link wiring. Refer to the appropriate wiring diagram.

Repair: Determine the cause of the

		problem. Repair the problem, when possible. Replace parts, if necessary. Verify that the problem is resolved. Proceed to Test Step 11. Result: : If resistance is 60 Ohms and the technician has repaired any power and ground supply issues, then they should proceed to Test Step 12.
10. Check the Keyswitch Circuit to the DCU A. Turn the keyswitch to the OFF position. B. Disconnect the 53-pin connector from the DCU. C. Connect the 398-5063 Break-out Connector to pin 52 at the DCU connector. The connectors must be used to prevent damage to the DCU connector. D. Turn the keyswitch to the ON position. E. Measure the voltage between keyswitch power (pin 52) and a known good ground source.	Battery Voltage	Result: The voltage is equal to battery voltage. Repair: Replace the DCU. Proceed to Test Step 11. Result: The voltage is not equal to battery voltage. Repair: There is an open circuit or a short circuit in the keyswitch wiring circuit. Repair or replace the wiring circuit as necessary. Refer to Troubleshooting, "DEF Control Module Power - Test".
11. Use the "Systems Communication Status" to Determine the Communication Issue A. In Cat ET, click the "Diagnostics" tab on the tool bar.	Component Identified	Result: The "Systems Communication Status" does not show any communication issues. Return the unit to service.

B. Select the "System Communication Status" option from the drop-down list.

C. Click the "Load from ECM" button to determine if any devices are not communicating.

Result: The datalink health monitor shows that there are devices that are not communicating.

Contact your TC for assistance.

12. Check Harness for a Short

1. Check CAN (+) for a short to B+ or Ground

A. The ECM is disconnected from the harness.

B. Turn the disconnect switch and key start switch to the OFF position.

C. Locate pins for the appropriate CAN bus on the harness side of the ECM connector.

D. Measure resistance between CAN (+) and all possible sources of B+.

E. Measure resistance between CAN (+) and all other non datalink contacts in the harness connector as well as a machine ground.

Note: Resistance is greater than 5K Ohms for all readings.

1. Check CAN (-) for a Short to B+ or ground.

A. The ECM is disconnected from the harness.

5K Ohms

Result: Resistance between datalink and supplied power is below 5K Ohms.

Repair: Repair or replace the damaged harness.

Result: Resistance between datalink and supplied power and ground is above 5K Ohms.

Repair: Proceed to Test Step 11.

B. Turn the disconnect switch and the key start switch to the OFF position.

C. Locate pins for the appropriate CAN bus on the harness side of the ECM connector.

D. Measure resistance between CAN (-) and all possible sources of B+.

E. Measure resistance between CAN (-) and all other non datalink contacts in the harness connector as well as a machine ground.

If the procedure did not correct the issue, contact your Cat dealer Technical Communicator (TC). For further assistance, your TC can confer with the Dealer Solutions Network (DSN).

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