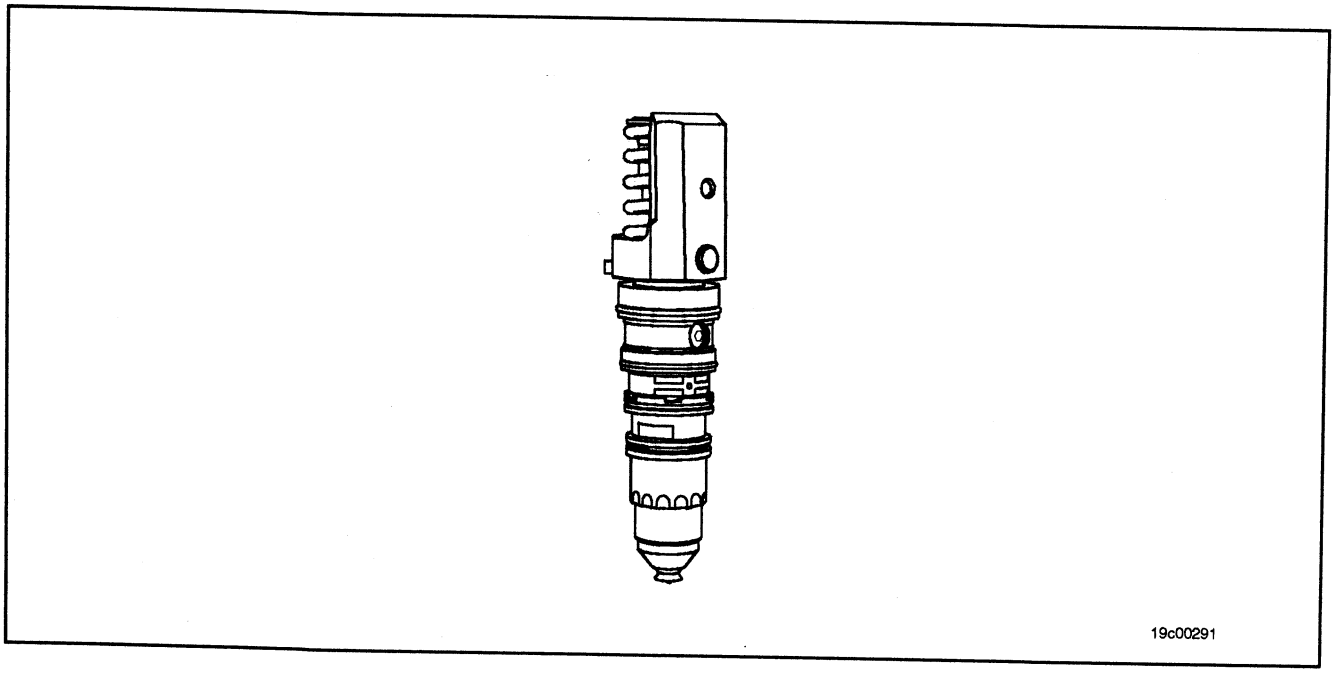
Fault Code 758

Fuel Injector

CODES	REASON	EFFECT
Fault Code: 758 PID(P), SID(S): P129 SPN: 1349 FMI: 7/7 Lamp: Yellow	Incorrect fueling was detected on the rear three cylinders.	Engine will misfire.

Fuel Injector



Circuit Description:

The electronic control module (ECM) supplies voltage to open the fueling actuators for a short length of time. This allows a short pulse of fuel to flow to the injector. The injector then injects this fuel into the cylinder for combustion.

Component Location:

The injectors are located in the cylinder head under the valve cover.

Shop Talk:

The ECM measures the amount of fuel metered into each injector by using the rear fuel rail pressure sensor. If the ECM detects that no fuel is entering an injector, the fault code is activated.

TROUBLESHOOTING SUMMARY

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the fuel system.		
STEP 1A: Measure the drain line restriction.	**Less than 4.0 in Hg**	
STEP 1B: Check for air in the pressure-side fuel.	**No air in fuel**	
STEP 2: Perform the cylinder performance test.		
STEP 2A: Inspect for rear cylinder performance.	**Cylinder contribution above 70%**	
STEP 3: Check the rear fuel injectors.		
STEP 3A: Inspect the rear fuel injectors.	**Fault Code 758 goes inactive**	
STEP 4: Clear the fault codes.		
STEP 4A: Disable the fault code.	**Fault Code 758 inactive**	
STEP 4B: Clear the inactive fault codes.	**All fault codes cleared**	

TROUBLESHOOTING STEP

STEP 1: Check the fuel system.

STEP 1A: Measure the drain line restriction.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Measure the drain line restriction.	**OK** **Less than 4.0 in Hg**	1B
	NOT OK **More than 4.0 in Hg** Refer to Procedure 006-012 in the Signature, ISX and QSX15 Troubleshooting and Repair Manual, Bulletin No. 3666239.	4A

STEP 1B: Check for air in the pressure-side fuel.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Check for air in the pressure-side fuel.	**OK** **No air in fuel**	2A
	NOT OK **Air in fuel** Refer to Procedure 006-003 in the Signature, ISX and QSX15 Troubleshooting and Repair Manual, Bulletin No. 3666239.	4A

STEP 2: Perform the cylinder performance test.

STEP 2A: Inspect for rear cylinder performance.

Condition:
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Perform cylinder performance test on rear cylinders. • Use INSITE™ to determine cylinder with lowest power. • It is normal for next cylinder in firing order of the rear bank of three cylinders to have high power; above 125% is acceptable.	**OK** **Cylinder contribution above 70%**	4A
	NOT OK	3A

STEP 3: Check the rear fuel injectors.

STEP 3A: Inspect the rear fuel injectors.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Replace the appropriate fuel injector in the rear bank. • Replace the fuel injector at the cylinder with the lowest power output.	**OK** **Fault Code 758 goes inactive**	4A
	NOT OK **Replace the appropriate fuel injector** Refer to Procedure 006-026 in the Signature, ISX and QSX15 Troubleshooting and Repair Manual, Bulletin No. 3666239.	4A

STEP 4: Clear the fault codes.

STEP 4A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and run it above 1000 rpm for at least 1 minute. • Using INSITE™, verify Fault Code 758 is inactive.	**OK** **Fault Code 758 inactive**	4B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location if all the steps have been completed and checked again.	1A

STEP 4B: Clear the inactive fault codes.

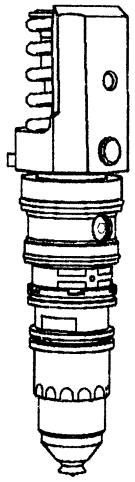
Condition: • Connect all components. • Turn keyswitch ON.		
Action	**Specifications/Repair**	**Next Step**
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes	Appropriate troubleshooting charts

Fault Code 755

Fuel Injector

CODES	REASON	EFFECT
Fault Code: 755 PID(P), SID(S): P157 SPN: 157 FMI: 7/7 Lamp: Yellow	Incorrect fueling was detected on the front three cylinders.	Engine will misfire.

Fuel Injector



19c00291

Circuit Description:

The electronic control module (ECM) supplies voltage to open the fueling actuators for a short length of time. This allows a short pulse of fuel to flow to the injector. The injector then injects this fuel into the cylinder for combustion.

Component Location:

The injectors are located in the cylinder head under the valve cover.

Shop Talk:

The ECM measures the amount of fuel metered into each injector by using the front fuel rail pressure sensor. If the ECM detects that no fuel is entering an injector, the fault code is activated.
This fault can be caused by air in the fuel.

TROUBLESHOOTING SUMMARY

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the fuel system.		
STEP 1A: Measure the drain line restriction.	Less than 4.0 in Hg	
STEP 1B: Check for air in the pressure-side fuel.	No air in fuel	
STEP 2: Perform the cylinder performance test.		
STEP 2A: Inspect for front cylinder performance.	Cylinder contribution above 70%	
STEP 3: Check the front fuel injectors.		
STEP 3A: Inspect the front fuel injectors.	Fault Code 755 goes inactive	
STEP 4: Clear the fault codes.		
STEP 4A: Disable the fault code.	Fault Code 755 inactive	
STEP 4B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check the fuel system.

STEP 1A: Measure the drain line restriction.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Measure the drain line restriction.	**OK** **Less than 4.0 in Hg**	1B
	NOT OK **More than 4.0 in Hg** Refer to Procedure 006-012 in the Signature, ISX and QSX15 Troubleshooting and Repair Manual, Bulletin No. 3666239.	4A

STEP 1B: Check for air in the pressure-side fuel.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Check for air in the pressure-side fuel.	**OK** **No air in fuel**	2A
	NOT OK **Air in fuel** Refer to Procedure 006-003 in the Signature, ISX and QSX15 Troubleshooting and Repair Manual, Bulletin No. 3666239.	4A

STEP 2: Perform the cylinder performance test.

STEP 2A: Inspect for front cylinder performance.

Condition:
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Perform cylinder performance test on front cylinders. • Use INSITE™ to determine cylinder with lowest power. • It is normal for next cylinder in firing order of the front bank of three cylinders to have high power; above 125% is acceptable.	**OK** **Cylinder contribution above 70%**	4A
	NOT OK	3A

STEP 3: Check the front fuel injectors.

STEP 3A: Inspect the front fuel injectors.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Replace the appropriate fuel injector in the front bank. • Replace the fuel injector at the cylinder with the lowest power output.	**OK** **Fault Code 755 goes inactive**	4A
	NOT OK **Replace the appropriate fuel injector** Refer to Procedure 006-026 in the Signature, ISX and QSX15 Troubleshooting and Repair Manual, Bulletin No. 3666239.	4A

STEP 4: Clear the fault codes.

STEP 4A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and run it above 1000 rpm for at least 1 minute. • Using INSITE™, verify Fault Code 755 is inactive.	**OK** **Fault Code 755 inactive**	4B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location if all the steps have been completed and checked again.	1A

STEP 4B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

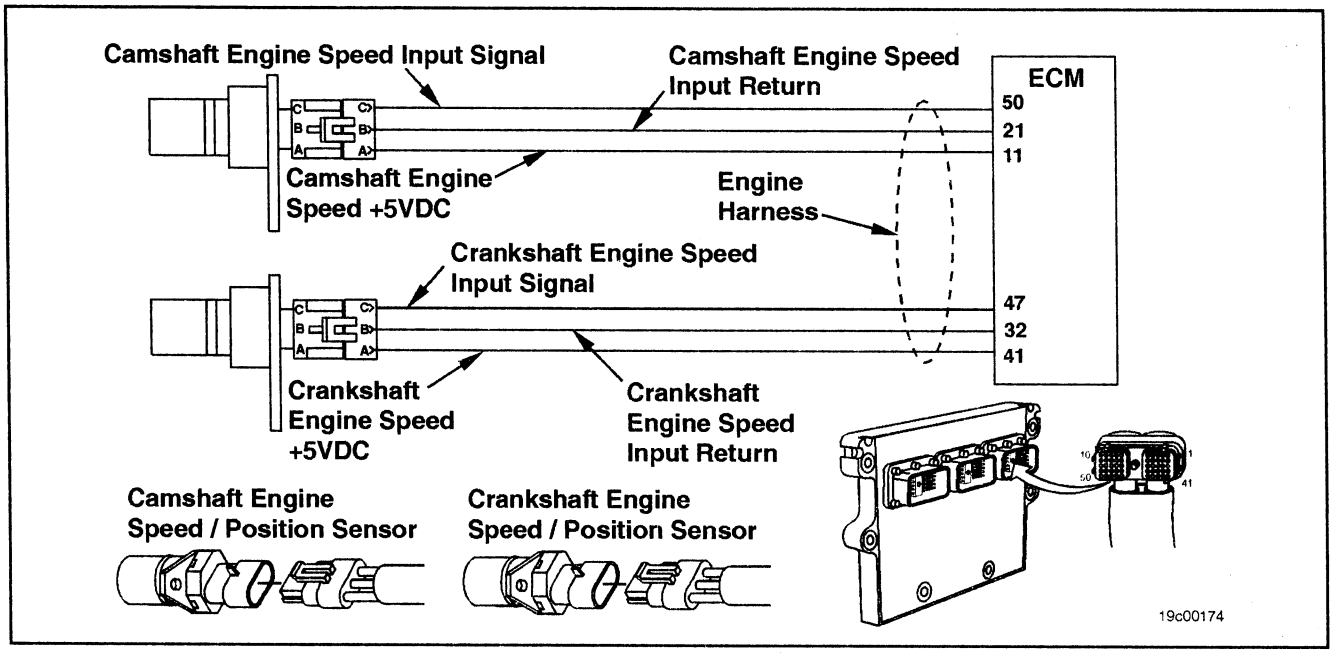
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 753

Engine Speed Sensor Circuit

CODES	REASON	EFFECT
Fault Code: 753 PID(P), SID(S): S064 SPN: 723 FMI: 2/2 Lamp: Yellow	Engine position signal from the camshaft and crankshaft engine position sensors do **not** match up.	Low power, rough idle, or possible white smoke.

Engine Speed Sensor Circuit



Circuit Description:

The engine speed sensor is a solid-state sensor that provides the engine speed signal to the electronic control module (ECM) through the engine harness.

Component Location:

The crankshaft engine speed sensor is located on the front cover of the gear housing. This is on the intake side of the vibration damper. The camshaft engine speed sensor is located in the cylinder head above the ECM.

Shop Talk:

If the problem occurs **only** at a certain engine temperature, be sure to check the engine speed sensor circuit while the engine is at that particular temperature.

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3824775 - breakout cable.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the camshaft engine speed sensor.		
STEP 1A: Inspect the camshaft engine speed sensor and engine harness connector pins.	No damaged pins	
STEP 1B: Inspect the camshaft engine speed sensor.	No damaged engine speed sensor	
STEP 1C: Check the camshaft engine speed sensor operation.	Positive ([+] 4.0 to 5.0 VDC to (+) 0.5 to 2.3 VDC) and back about every 360° of rotation	
STEP 1C-1: Check the engine speed sensor supply voltage.	(+) 4.75 to 5.25 VDC	
STEP 2: Check the crankshaft engine speed sensor.		
STEP 2A: Inspect the crankshaft engine speed sensor and engine harness connector pins.	No damaged pins	
STEP 2B: Inspect the crankshaft engine speed sensor.	No damaged engine speed sensor	
STEP 2C: Check the crankshaft engine speed sensor operation.	Positive ([+] 4.0 to 5.0 VDC to (+) 0.5 to 2.3 VDC) and back about every 60° of rotation	
STEP 2C-1: Check the engine speed sensor supply voltage.	(+) 4.75 to 5.25 VDC	
STEP 3: Check the engine harness for both circuits.		
STEP 3A: Inspect the engine harness and ECM connector pins.	No damaged pins	
STEP 3B: Check for an open circuit.	Less than 10 ohms	
STEP 3C: Check for a short circuit to engine block ground.	More than 100k ohms	
STEP 3D: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 4: Clear the fault codes.		
STEP 4A: Disable the fault code.	Fault Code 753 inactive	

STEP 4B: Clear the inactive fault codes.	**All fault codes cleared**
STEP 4C: Should the fault code return.	**All fault codes cleared and timing checked**

TROUBLESHOOTING STEP

STEP 1: Check the camshaft engine speed sensor.

STEP 1A: Inspect the camshaft engine speed sensor and engine harness connector pins.

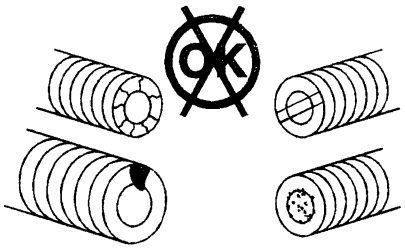
Condition:
- Turn keyswitch OFF.
- Disconnect the engine harness from the engine speed sensor.

Action	Specifications/Repair	Next Step
Inspect the engine speed sensor and engine harness connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	1B
	NOT OK **Repair damaged pins** Repair or replace the engine harness or the engine speed sensor, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-204. • Replace the engine harness. Refer to Procedure 019-043. • Replace the engine speed sensor. Refer to Procedure 019-038.	4A

STEP 1B: Inspect the camshaft engine speed sensor.

Condition:
- Turn keyswitch OFF.
- Disconnect the engine harness from the engine speed sensor.
- Remove the engine speed sensor.

Action	Specifications/Repair	Next Step
Inspect the engine speed sensor for the following: • Metal debris on end of sensor • Damage to end of sensor caused by camshaft gear • Oil leakage or insulation problems such as swelling • Damaged electrical potting in sensing end of sensor.	**OK** **No damaged engine speed sensor**	1C
	NOT OK **Replace the engine speed sensor** Refer to Procedure 019-038.	4A



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STEP 1C: Check the camshaft engine speed sensor operation.

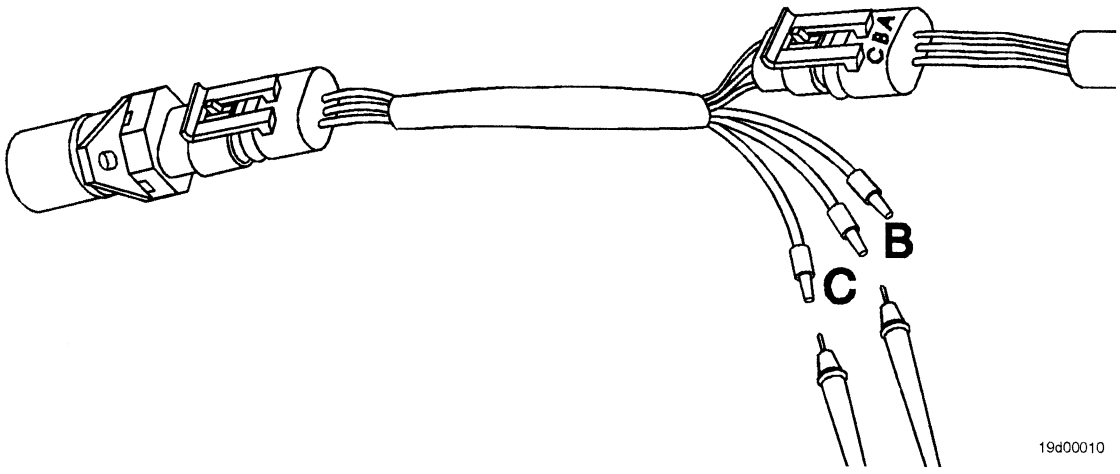
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3824775 - breakout cable.

Condition:

- Install wiring breakout cable.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check for a signal from engine speed sensor. • Measure the voltage from pin B (or BLACK) to pin C (or YELLOW) at the breakout cable, while barring the engine over.	**OK** **Positive ([+] 4.0 to 5.0 VDC to (+) 0.5 to 2.3 VDC) and back again about every 360° of rotation**	1C-1
	NOT OK **Replace the engine speed sensor** Refer to Procedure 019-038.	4A



STEP 1C-1: Check the engine speed sensor supply voltage.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

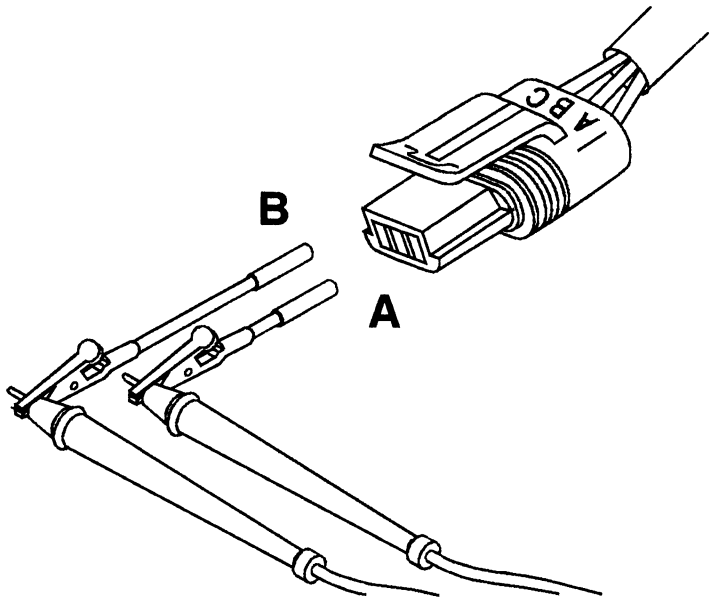
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the engine harness from the engine speed sensor.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the engine speed sensor supply voltage. • Measure the voltage from pin A (or RED) to pin B (or BLACK) on the harness side of the engine speed sensor connector.	**OK** **(+) 4.75 to 5.25 VDC**	2A
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	4A



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STEP 2: Check the crankshaft engine speed sensor.

STEP 2A: Inspect the crankshaft engine speed sensor and engine harness connector pins.

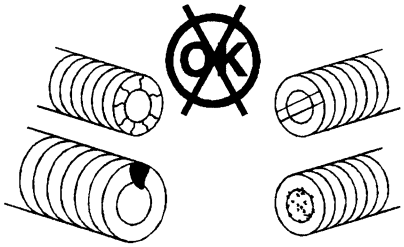
Condition:
- Turn keyswitch OFF.
- Disconnect the engine harness from the engine speed sensor.

Action	Specifications/Repair	Next Step
Inspect the engine speed sensor and engine harness connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	2B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness or the engine speed sensor, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-024. • Replace the engine harness. Refer to Procedure 019-043. • Replace the engine speed sensor. Refer to Procedure 019-038.	4A

STEP 2B: Inspect the crankshaft engine speed sensor.

Condition:
- Turn keyswitch OFF.
- Disconnect the engine harness from the engine speed sensor.
- Remove the engine speed sensor.

Action	Specifications/Repair	Next Step
Inspect engine speed sensor for the following: • Metal debris on end of sensor • Damage to end of sensor caused by crankshaft gear • Oil leakage or insulation problems such as swelling • Damaged electrical potting in sensing end of sensor.	**OK** **No damaged engine speed sensor**	2C
	NOT OK **Replace the engine speed sensor** Refer to Procedure 019-038.	4A



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STEP 2C: Check the crankshaft engine speed sensor operation.

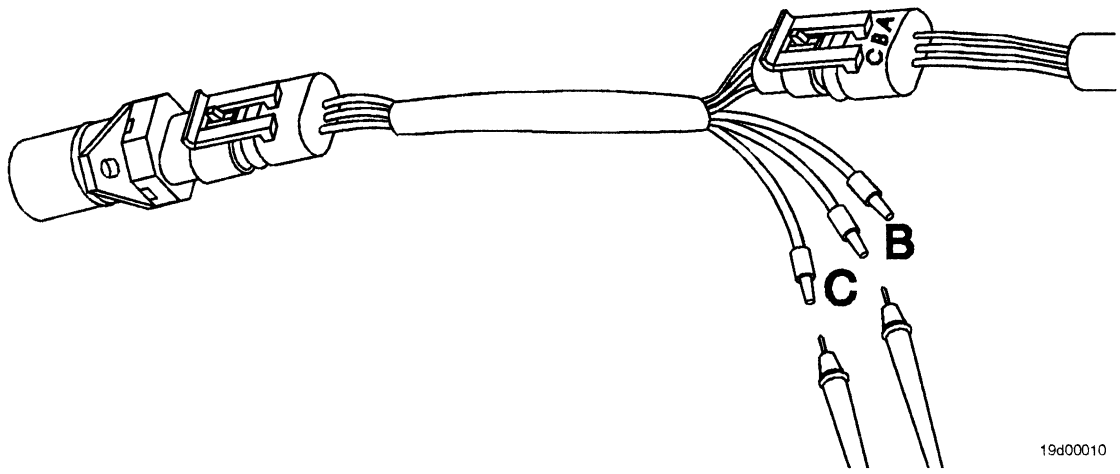
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3824775 - breakout cable.

Condition:

- Install wiring breakout cable, Part No. 3824775 between the crankshaft engine speed sensor and the engine harness.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check for a signal from the engine speed sensor. • Measure the voltage from pin B (or BLACK) to pin C (or YELLOW) at the breakout cable, while barring the engine over.	**OK** **Positive ([+] 4.0 to 5.0 VDC to (+) 0.5 to 2.3 VDC) and back again about every 60° of rotation**	2C-1
	NOT OK **Replace the engine speed sensor** Refer to Procedure 019-038.	4A



STEP 2C-1: Check the engine speed sensor supply voltage

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

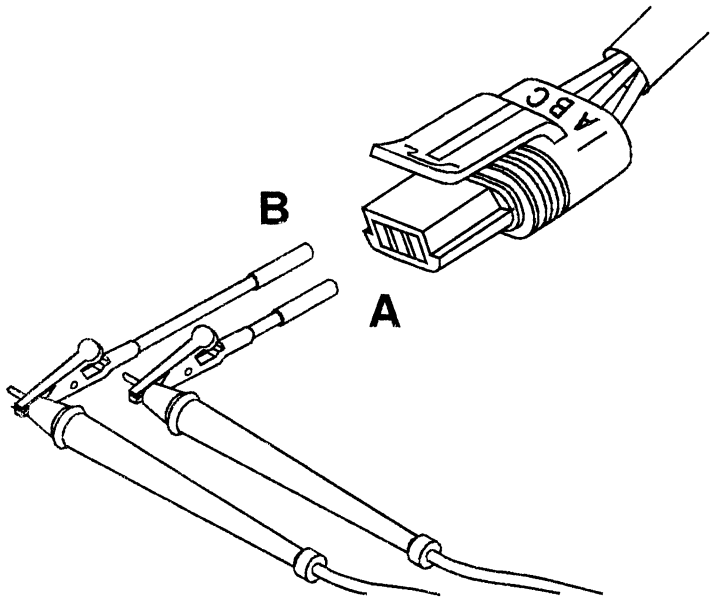
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the engine harness from the engine speed sensor.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the engine speed sensor supply voltage. • Measure the voltage from pin A (or RED) to pin B (or BLACK) on the harness side of the engine speed sensor connector.	**OK** **(+) 4.75 to 5.25 VDC**	4A
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	4A



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STEP 3: Check the engine harness for both circuits.

STEP 3A: Inspect the engine harness and ECM connector pins.

⚠CAUTION⚠

To avoid damaging the new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect engine harness and ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	3B
	NOT OK **Repair damaged pins** Repair or replace the engine harness or the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250 and 019-199. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	4A

STEP 3B: Check for an open circuit.

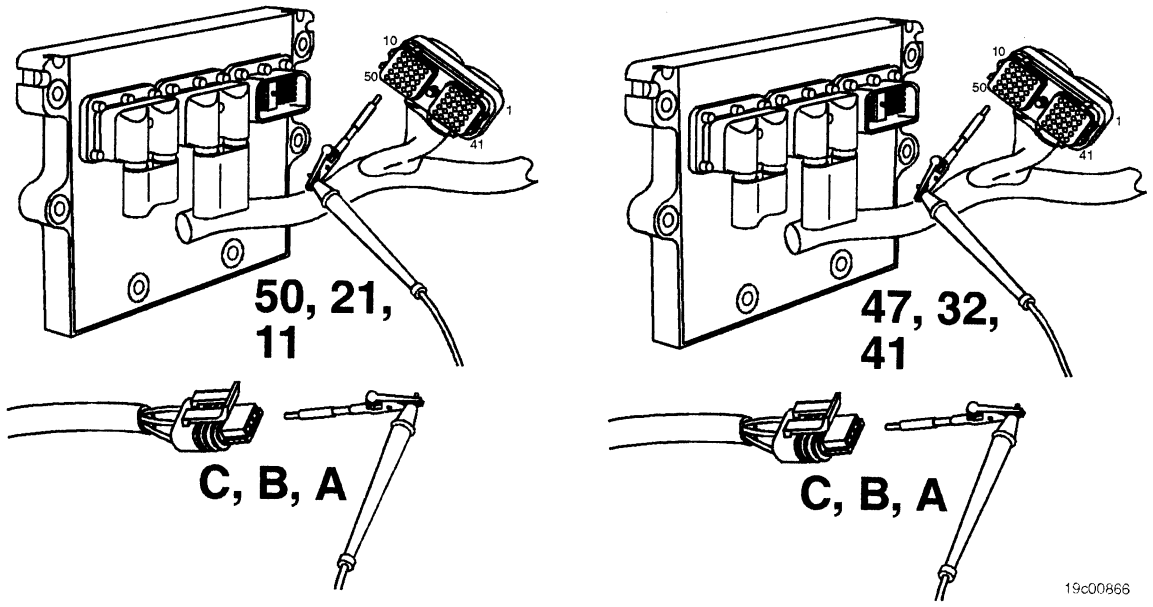
⚠CAUTION⚠

**To avoid pin and harness damage, use the following test lead when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead**

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Connect the engine harness to the engine speed sensor.

Action	Specifications/Repair	Next Step
Check for open circuit. • Measure resistance from pin 50 of the sensor harness ECM connector to pin C (or 3) at the **camshaft** position sensor connector. • Measure resistance from pin 21 of the sensor harness ECM connector to pin B (or 2) at the **camshaft** position sensor connector. • Measure resistance from pin 11 of the sensor harness ECM connector to pin A (or 1) at the **camshaft** position sensor connector. • Measure resistance from pin 47 of the sensor harness ECM connector to pin C (or 3) at the **crankshaft** position sensor connector. • Measure resistance from pin 32 of the sensor harness ECM connector to pin B (or 2) at the **crankshaft** position sensor connector. • Measure resistance from pin 41 of the sensor harness ECM connector to pin A (or 1) at the **crankshaft** position sensor connector.	**OK** **Less than 10 ohms**	3C
	NOT OK **Repair or replace engine harness** • Repair the engine harness. Refer to Procedures 019-250 and 019-199. • Replace the engine harness. Refer to Procedure 019-043.	4A



STEP 3C: Check for a short circuit to engine block ground.

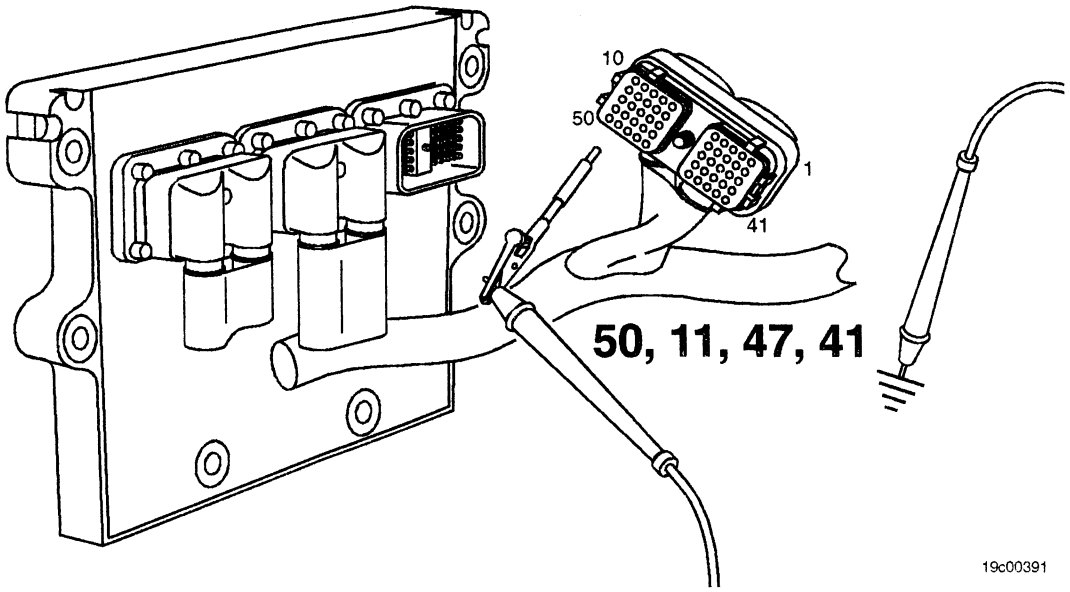
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the engine harness from the engine speed sensor.

Action	Specifications/Repair	Next Step
Check for short circuit to ground. • Measure the resistance from pin 50 of the sensor harness ECM connector to the engine block ground. • Measure the resistance from pin 11 of the sensor harness ECM connector to the engine block ground. • Measure the resistance from pin 47 of the sensor harness ECM connector to the engine block ground. • Measure the resistance from pin 41 of the sensor harness ECM connector to the engine block ground.	**OK** **More than 100k ohms**	3D
	NOT OK **Repair or replace engine harness** • Repair the engine harness. Refer to Procedures 019-250 and 019-199. • Replace the engine harness. Refer to Procedure 019-043.	4A



STEP 3D: Check for a short circuit from pin to pin.

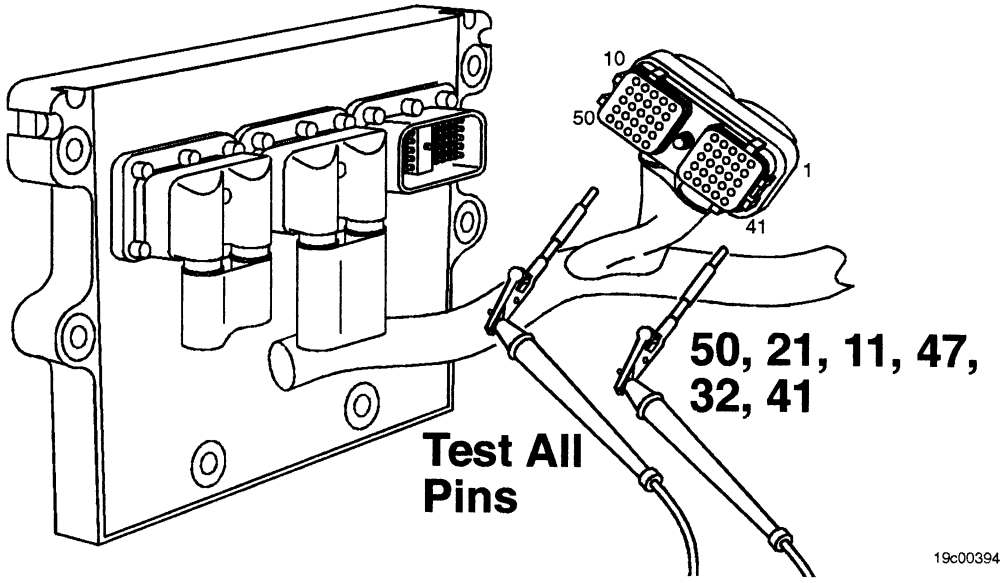
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the engine harness from the engine speed sensor.

Action	Specifications/Repair	Next Step
Check for short circuit from pin to pin • Measure resistance from pin 50 to all other pins of the sensor harness ECM connector. • Measure resistance from pin 21 to all other pins of the sensor harness ECM connector. • Measure resistance from pin 11 to all other pins of the sensor harness ECM connector. • Measure resistance from pin 47 to all other pins of the sensor harness ECM connector. • Measure resistance from pin 32 to all other pins of the sensor harness ECM connector. • Measure resistance from pin 41 to all other pins of the sensor harness ECM connector.	**OK** **More than 100k ohms**	4A
	NOT OK **Repair or replace engine harness** • Repair the engine harness. Refer to Procedures 019-250 and 019-199. • Replace the engine harness. Refer to Procedure 019-043.	4A



STEP 4: Clear the fault codes.

STEP 4A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify that Fault Code 753 is inactive.	**OK** **Fault Code 753 inactive**	4B
	NOT OK Return to troubleshooting steps or contact your local Cummins Authorized Repair Location if all steps have been completed and checked again.	1A

STEP 4B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Using INSITE™, clear the inactive fault codes.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	4C

STEP 4C: Should the fault code return.

Condition:
- Complete all steps above and recheck.

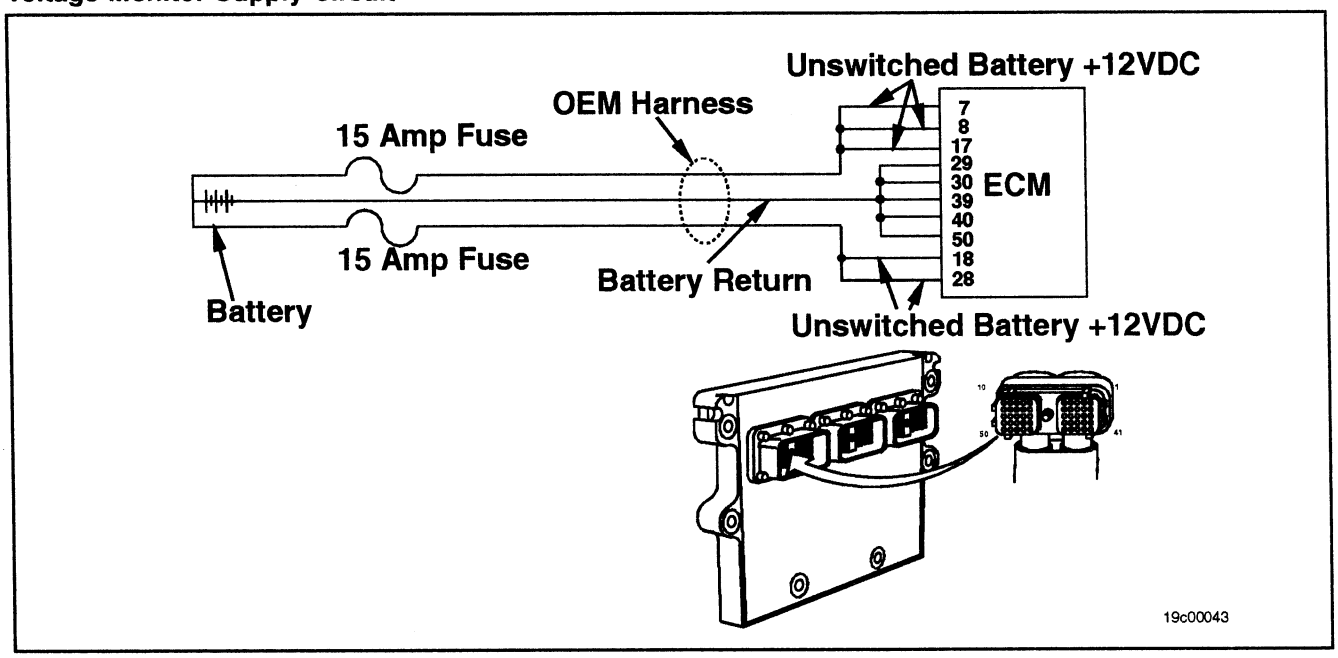
Action	Specifications/Repair	Next Step
Check the static timing of the injector camshaft. • Refer to Procedure 003-004 in the Signature, ISX and QSX15 Troubleshooting and Repair Bulletin No. 3666239.	**OK** **All fault codes cleared and timing checked**	Repair complete
	NOT OK Refer to appropriate troubleshooting charts for any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 598

Voltage Monitor - Very Low Voltage

CODES	REASON	EFFECT
Fault Code: 598 PID(P), SID(S): P167 SPN: 167 FMI: 1/1 Lamp: Red	Very low battery voltage detected by the battery voltage monitor feature.	Red lamp lit until very low battery voltage condition is corrected. The electronic control module (ECM) can increase idle speed and deactivate idle decrement switch if idle speedup is enabled. The engine will run continuously if ICON™ is active (automotive **only**).

Voltage Monitor Supply Circuit



Circuit Description:

The ECM receives unswitched battery input through the OEM harness. There are two in-line 15-amp fuses in the unswitched battery wire of the OEM harness to protect the engine harness from overheating. The battery return wires are connected directly to the negative (–) battery post.

Component Location:

The ECM is connected to the battery by the OEM harness. This direct link provides a constant power supply for the ECM. The location of the battery will vary with the OEM. Refer to the OEM manual for the battery location.

Shop Talk:

Make sure the ECM unswitched battery supply is coming directly from the battery and **not** the starter.
Possible causes of this fault code:

- Undercharged batteries caused by a faulty alternator or regulator.

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the equipment battery system.		
STEP 1A: Inspect the battery cable and alternator connections.	No damaged connections	
STEP 1B: Check the battery voltage.	Normal conditions: At least (+) 12 VDC During cranking: At least (+) 6.2 VDC	
STEP 2: Check the alternator and OEM harness.		
STEP 2A: Inspect the alternator.	Alternator charging within OEM specifications	
STEP 2B: Inspect the battery power connector.	No damaged pins	
STEP 2C: Check for an open circuit in the unswitched battery supply circuit.	Less than 10 ohms	
STEP 2D: Check for a short circuit.	More than 100k ohms	
STEP 2E: Check the add-on or accessory wiring at the positive (+) terminal of the battery.	No damaged wires	
STEP 3: Clear the fault codes.		
STEP 3A: Disable the fault code.	Fault Code 598 inactive	
STEP 3B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check the equipment battery system.

STEP 1A: Inspect the battery cable and alternator connections.

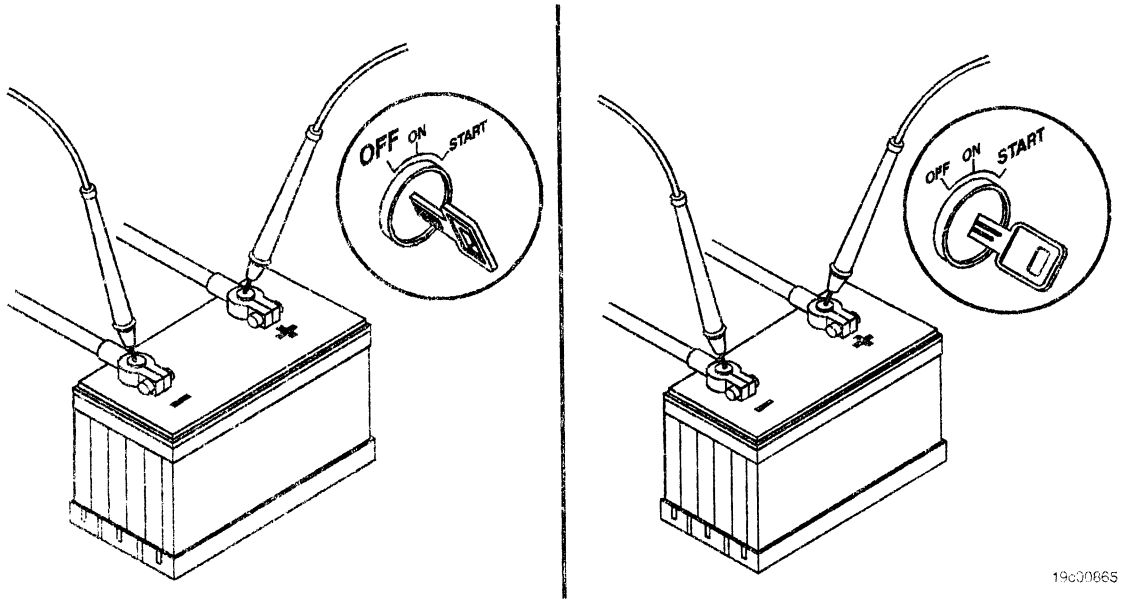
Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Inspect the battery cable and alternator connections for the following: • Corrosion • Loose connection.	**OK** **No damaged connections**	1B
	NOT OK **Repair the damaged connections** Tighten the battery connections and clean the battery terminals. Refer to the OEM troubleshooting and repair manual.	3A

STEP 1B: Check the battery voltage.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Check the battery voltage. • Measure the battery voltage from the positive (+) terminal to the negative (−) terminal. • Measure the battery voltage from the positive (+) terminal to the negative (−) terminal while trying to start the engine.	**OK** **Normal conditions:** At least (+) 12 VDC **During cranking:** At least (+) 6.2 VDC	2A
	NOT OK **Charge or replace the battery** Refer to the OEM troubleshooting and repair manual.	2A



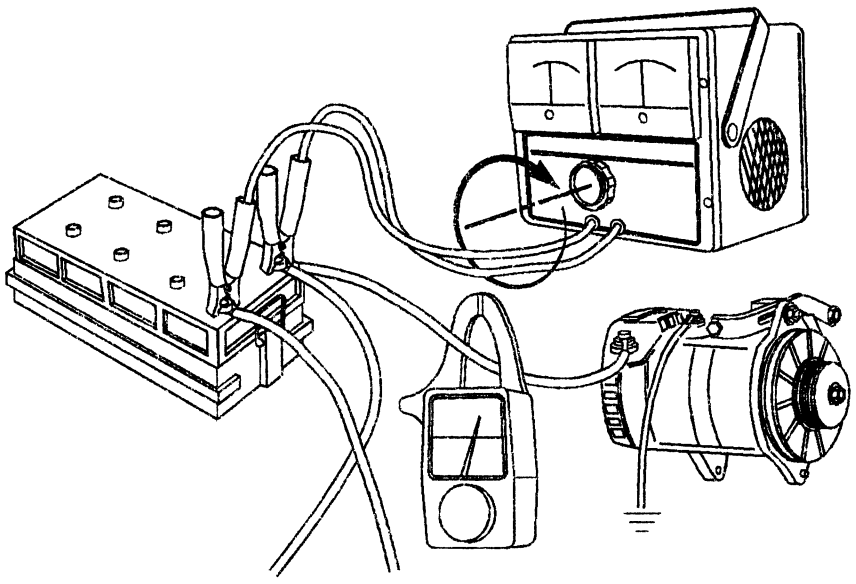
STEP 2: Check the alternator and OEM harness.

STEP 2A: Inspect the alternator.

Condition:

- Turn keyswitch OFF.
- Use OEM ammeter or install an ammeter between the alternator and the battery.

Action	Specifications/Repair	Next Step
Check the charging rate of the alternator. Start the engine and check the alternator's charging rate (amps).	**OK** **Alternator charging within OEM specifications**	2B
NOTE: It will probably be necessary to place a load on the batteries to measure the alternator output properly.	**NOT OK** **Repair or replace the alternator and/or OEM wiring to the alternator** Refer to the OEM troubleshooting and repair manual.	3A



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STEP 2B: Inspect the battery power connector.

Condition:
- Turn keyswitch OFF.
- Disconnect the OEM harness from the battery at the power connector.

Action	Specifications/Repair	Next Step
Inspect the battery power connector on both the battery side and the harness side for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	2C
	NOT OK **Repair the battery power connector** Refer to the OEM troubleshooting and repair manual for location and procedure. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing.	3A

STEP 2C: Check for an open circuit in the unswitched battery supply circuit.

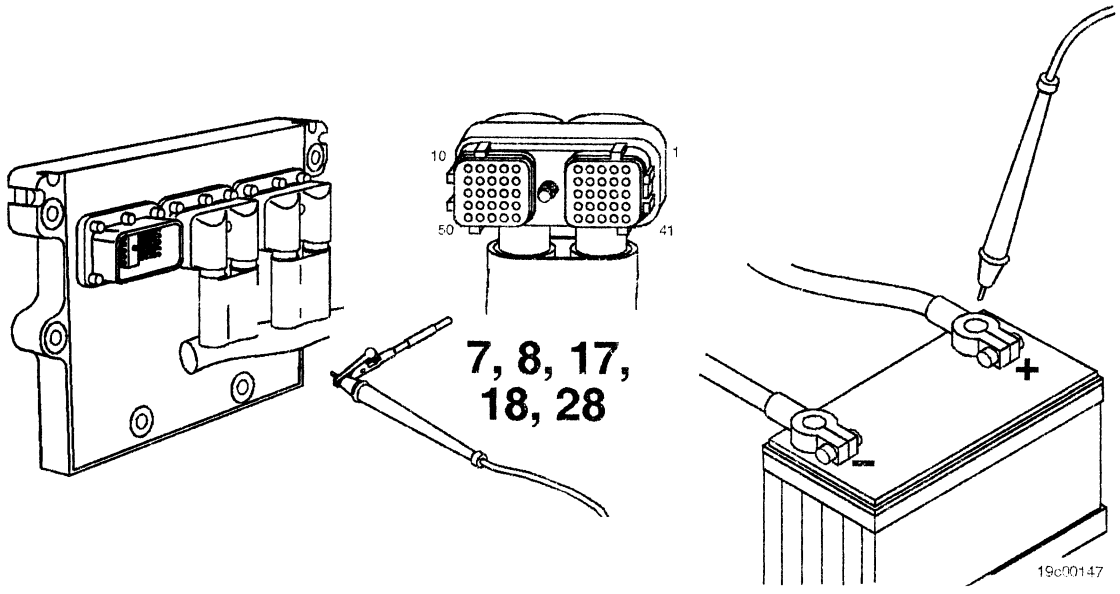
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the OEM harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for an open circuit in the unswitched battery supply circuit. • Measure the resistance between pin 7 of the OEM harness connector and the positive (+) terminal of the battery. • Measure the resistance between pin 8 of the OEM harness connector and the positive (+) terminal of the battery. • Measure the resistance between pin 17 of the OEM harness connector and the positive (+) terminal of the battery. • Measure the resistance between pin 18 of the OEM harness connector and the positive (+) terminal of the battery. • Measure the resistance between pin 28 of the OEM harness connector and the positive (+) terminal of the battery.	**OK** **Less than 10 ohms**	2D
	NOT OK **Repair or replace the battery harness** Refer to the OEM troubleshooting and repair manual.	3A



STEP 2D: Check for a short circuit.

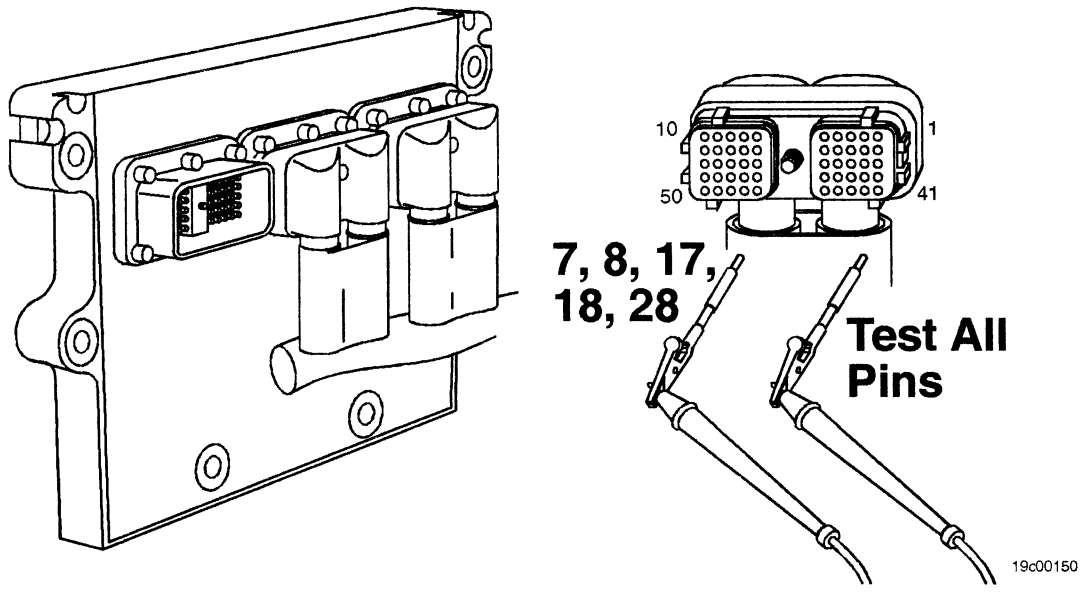
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the OEM harness connector from the ECM.
- Disconnect the OEM harness at the battery power connector.

Action	Specifications/Repair	Next Step
Check for a short circuit. • Measure the resistance from pin 7 of the OEM harness connector to all other pins in the OEM harness connector. • Measure the resistance from pin 8 of the OEM harness connector to all other pins in the OEM harness connector. • Measure the resistance from pin 17 of the OEM harness connector to all other pins in the OEM harness connector. • Measure the resistance from pin 18 of the OEM harness connector to all other pins in the OEM harness connector. • Measure the resistance from pin 28 of the OEM harness connector to all other pins in the OEM harness connector. **NOTE:** Pin 7, 8, 17, 18, and 28 should have continuity.	**OK** **More than 100k ohms**	2E
	NOT OK **Repair or replace the OEM harness** • Repair the OEM harness. Refer to Procedure 019-250. • Replace the OEM harness. Refer to Procedure 019-071.	3A



STEP 2E: Check the add-on or accessory wiring at the positive (+) terminal of the battery.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Check the add-on or accessory wiring at the positive (+) terminal of the battery. Starting at the positive (+) terminal, follow any add-on or accessory wiring and examine the wire(s) for damaged insulation or installation error that can cause a short circuit at supply wire to the engine block ground.	**OK** **No damaged wires**	3A
	NOT OK **Repair the damaged wiring.**	3A

STEP 3: Clear the fault codes.

STEP 3A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify that Fault Code 598 is inactive.	**OK** **Fault Code 598 inactive**	3B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location if all the steps have been completed and checked again.	1A

STEP 3B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

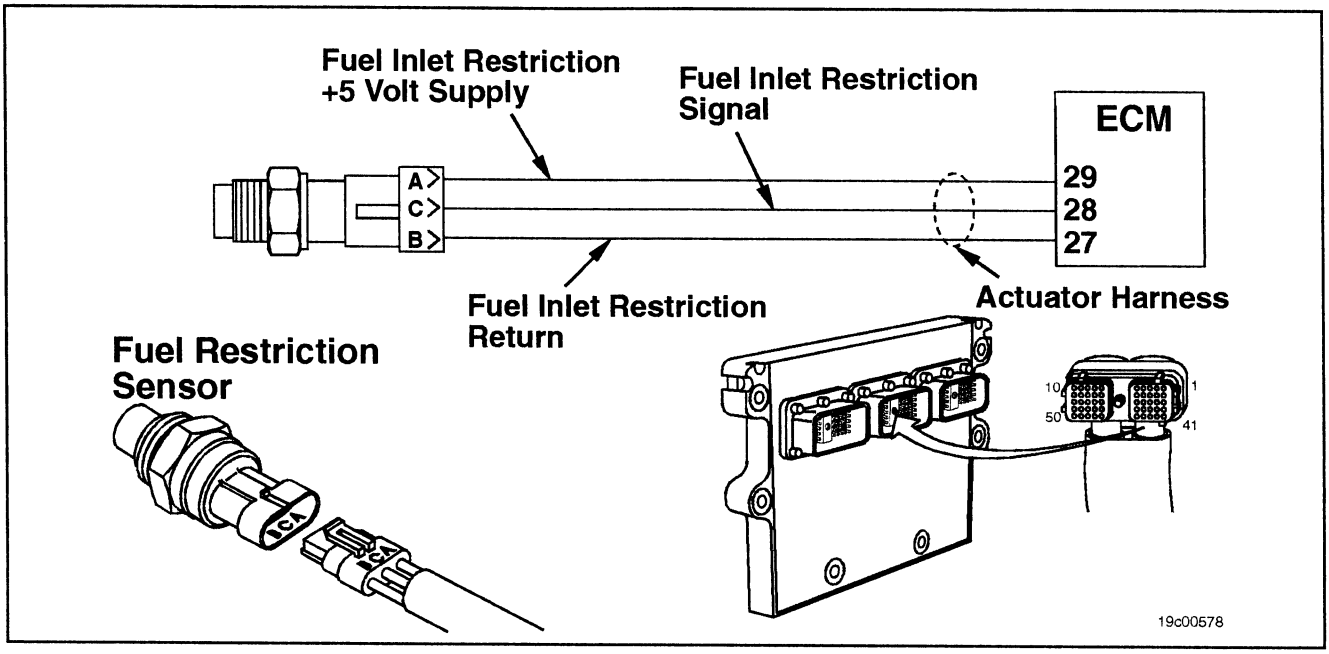
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 583

Fuel Inlet Restriction Sensor Circuit

CODES	REASON	EFFECT
Fault Code: 583 PID(P), SID(S): P015 SPN: 1381 FMI: 1/18 Lamp: Yellow	Restriction has been detected by the fuel inlet restriction sensor.	Fuel inlet restriction monitor warning is set.

Fuel Inlet Restriction Sensor Circuit



Circuit Description:

The fuel inlet restriction sensor provides a signal to the electronic control module (ECM).

Component Location:

The fuel inlet restriction sensor is located on the inlet to the fuel filter head.

Shop Talk:

This fault indicates that the fuel inlet restriction has exceeded 12 in Hg. Typical causes for this fault code include a plugged fuel filter and a collapsed fuel supply hose.

TROUBLESHOOTING SUMMARY

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Measure the fuel inlet restriction.		
STEP 1A: Measure the fuel inlet restriction.	Less than 12 in Hg	
STEP 1A-1: Recheck the fuel inlet restriction.	Less than 6 in Hg	
STEP 2: Inspect the fuel lines or fuel hoses.		
STEP 2A: Inspect the metal fuel lines.	No damage	
STEP 2B: Inspect the fuel hoses.	No damage	
STEP 3: Clear the fault codes.		
STEP 3A: Disable the fault code.	Fault Code 583 inactive	
STEP 3B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Measure the fuel inlet restriction.

STEP 1A: Measure the fuel inlet restriction.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Measure the fuel inlet restriction. • Remove the fuel supply hose from the gear pump and install a manometer. • Hold the manometer at the same level as the gear pump connection. • Operate the engine at rated speed and no load. • Observe the fuel inlet restriction reading on the manometer.	OK Less than 12 in Hg	3A
	NOT OK Replace the fuel filter	1A-1

STEP 1A-1: Recheck the fuel inlet restriction.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Measure the fuel inlet restriction. • Remove the fuel supply hose to the gear pump and install a manometer. • Hold the manometer at the same level as the gear pump connection. • Operate the engine at rated speed and no load. • Observe the fuel inlet restriction reading on the manometer.	OK Less than 6 in Hg	3A
	NOT OK Does **not** meet specifications.	2A

STEP 2: Inspect the fuel lines or fuel hoses.

STEP 2A: Inspect the metal fuel lines.

Condition:

Action	Specifications/Repair	Next Step
Inspect the metal fuel lines for these conditions: • Sharp bends, which can cause a pressure restriction.	**OK** **No damage**	2B
	NOT OK **Replace the damaged line(s)**	3A

STEP 2B: Inspect the fuel hoses.

Condition:
• Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Inspect the fuel hoses. • Check fuel hoses for separation of the inner lining from the center of the hose, which can cause restriction.	**OK** **No damage**	3A
	NOT OK **Replace the damaged hose**	3A

STEP 3: Clear the fault codes.

STEP 3A: Disable the fault code.

Condition:
• Connect all components.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Verify that Fault Code 583 is inactive.	**OK** **Fault Code 583 inactive**	3B
	NOT OK Return to the troubleshooting steps, or contact your local Cummins Authorized Repair Location if all troubleshooting steps have been completed and checked again.	1A

STEP 3B: Clear the inactive fault codes.

Condition:
• Connect all components.

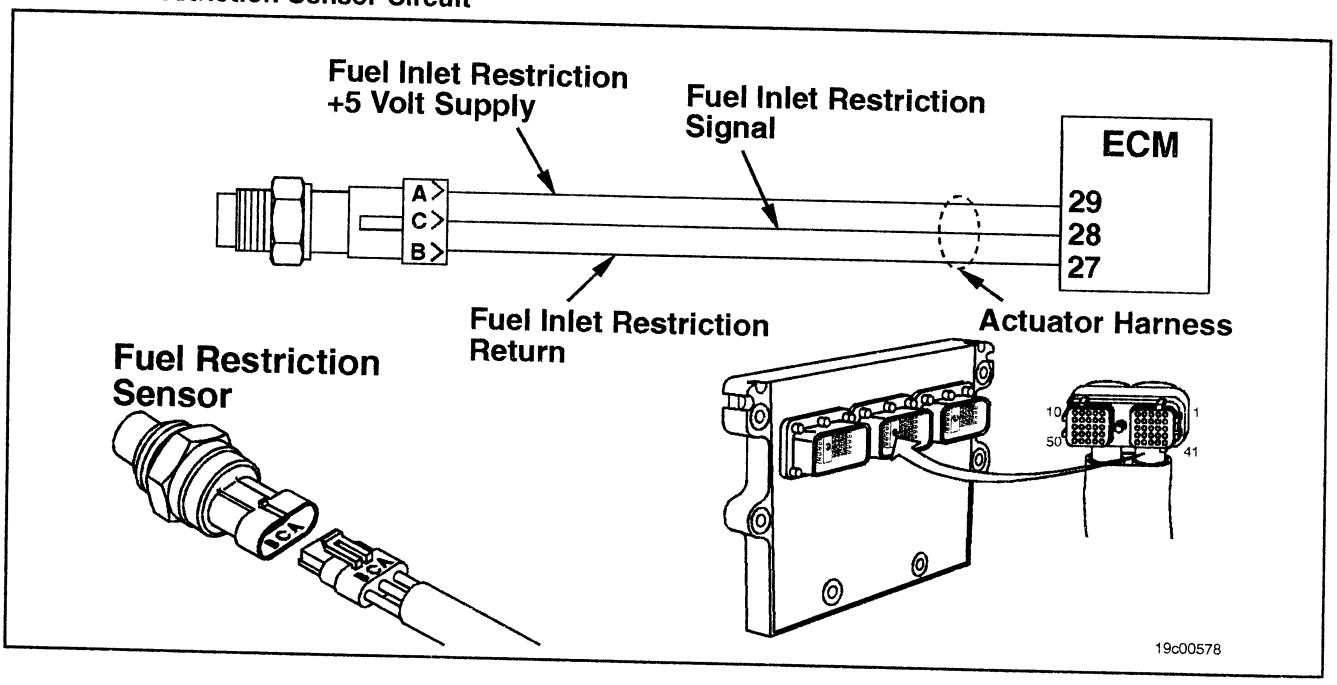
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Clear the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 582

Fuel Inlet Restriction Sensor Circuit

CODES	REASON	EFFECT
Fault Code: 582 PID(P), SID(S): P015 SPN: 1381 FMI: 4/4 Lamp: Yellow	Low voltage detected at the fuel inlet restriction sensor signal pin.	Fuel inlet restriction monitor deactivated.

Fuel Inlet Restriction Sensor Circuit



Circuit Description:

The fuel inlet restriction sensor provides a fuel pressure signal to the electronic control module (ECM).

Component Location:

The fuel inlet restriction sensor is located on the fuel filter head.

Shop Talk:

- This fault indicates that the voltage at signal pin 28 on the ECM is out of specification.
- The ECM provides a supply voltage of (+) 4.75 to 5.25 VDC. The sensor signal voltage to the ECM is from (+) 4.16 to 4.83 VDC.
- A quick check to determine if the sensor is functioning is to measure the pin-to-pin resistance of the sensor.

Description	Pin-to-Pin Resistance (k ohms)
Supply voltage to ground	13.35
Supply voltage to signal	1.77
Signal to ground	14.68

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging the new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead
Part No. 3824776 - breakout cable.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the fuel inlet restriction sensor.		
STEP 1A: Inspect the harness and sensor connector pins.	No damaged pins	
STEP 1B: Read the fault codes.	Fault Code 582 inactive	
STEP 1C: Check the supply voltage.	(+) 4.75 to 5.25 VDC	
STEP 1C-1: Measure the voltage from the ECM.	(+) 4.75 to 5.25 VDC	
STEP 1D: Check the signal voltage.	(+) 0.5 to 4.16 VDC	
STEP 1D-1: Check for a short circuit to ground in the supply and signal wires.	More than 100k ohms	
STEP 1D-2: Check for a short circuit from the supply and signal wires to all other wires in the engine harness.	More than 100k ohms	
STEP 2: Check the engine harness.		
STEP 2A: Inspect the engine harness and ECM connector pins.	No damaged pins	
STEP 2B: Read the fault codes.	Fault Code 582 inactive	
STEP 2C: Check for an open circuit in the supply and signal wires.	Less than 10 ohms	
STEP 3: Check for an ECM response.		
STEP 3A: Check for the appropriate ECM response.	Fault Code 582 inactive Fault Code 581 active	
STEP 4: Clear the fault codes.		
STEP 4A: Disable the fault code.	Fault Code 582 inactive	
STEP 4B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check the fuel inlet restriction sensor.

STEP 1A: Inspect the engine harness and sensor connector pins.

Condition:
- Turn keyswitch OFF.
- Disconnect the fuel inlet restriction sensor from the engine harness.

Action	Specifications/Repair	Next Step
Inspect the fuel inlet restriction sensor and engine harness connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	1B
	NOT OK **Repair the damaged pins** • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Replace the 3-pin Metri-Pack connector. Refer to Procedure 019-203. • Replace the fuel inlet restriction sensor. Refer to Procedure 019-128.	4A

STEP 1B: Read the fault codes.

Condition:
- Connect all components.
- Connect the INSITE™ electronic service tool.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start the engine and let it idle for 1 minute. • Using INSITE™, read the fault codes.	**OK** **Fault Code 582 inactive**	4B
	NOT OK Fault Code 581 active.	1C

STEP 1C: Check the supply voltage.

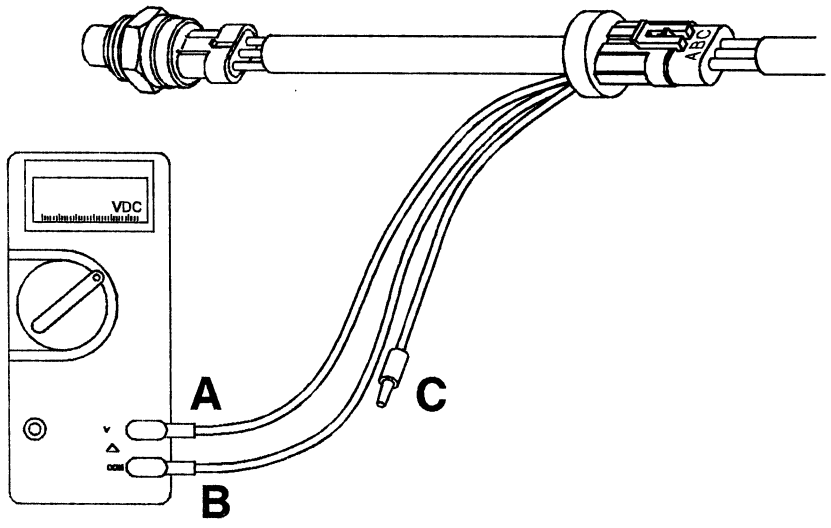
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3824776 - breakout cable.

Condition:

- Install breakout cable, Part No. 3824776, between the sensor and the engine harness sensor connector.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the supply voltage. • Measure the supply voltage by install the breakout cable's supply pin A (or RED) and return pin B (or BLACK) connectors into the multimeter.	**OK** **(+) 4.75 to 5.25 VDC**	1D
	NOT OK Does **not** meet specifications.	1C-1



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STEP 1C-1: Measure the voltage from the ECM.

⚠CAUTION⚠

To avoid damaging the new ECM, all other active fault codes must be investigated prior to replacing the ECM.

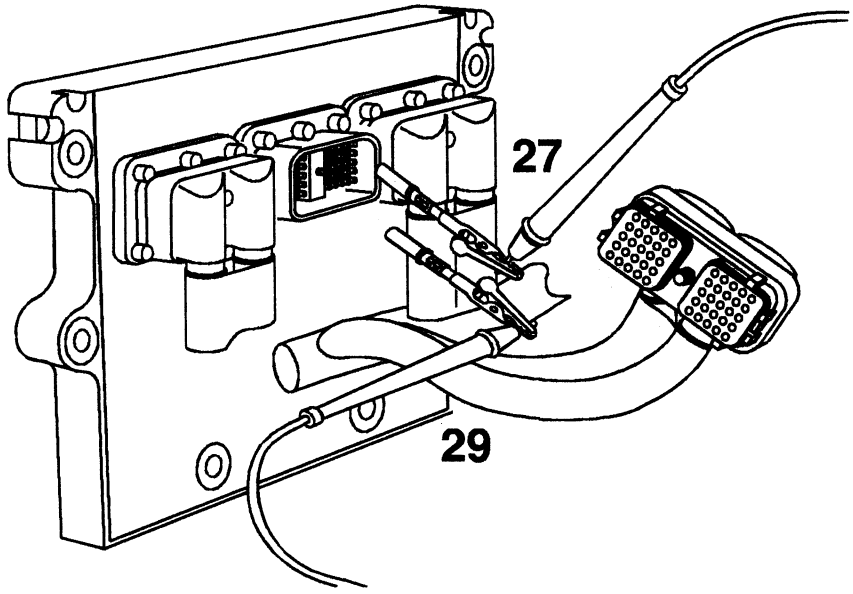
⚠CAUTION⚠

To avoid pin and harness damage, use the following test leads when taking a measurement: Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the actuator harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Measure the ECM output voltage. • Measure the voltage from pin 29 to pin 27 at the actuator port of the ECM.	**OK** **(+) 4.75 to 5.25 VDC** **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 091-043.	4A
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	4A



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STEP 1D: Check the signal voltage.

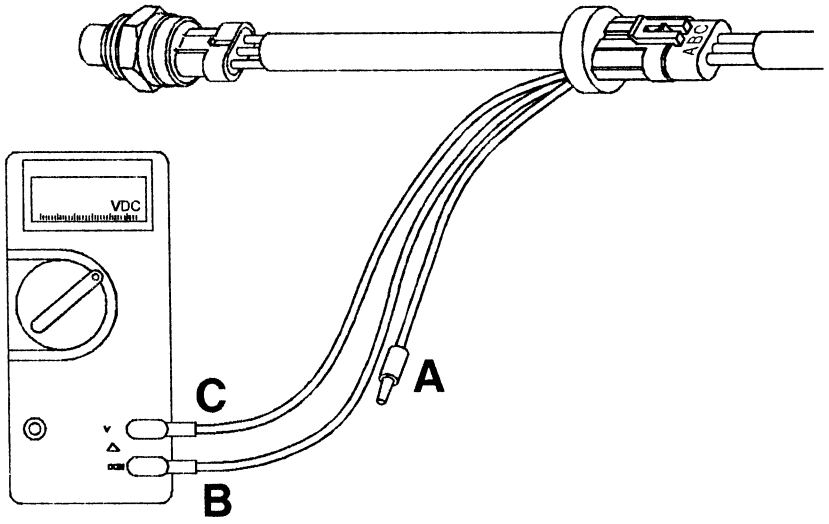
⚠CAUTION⚠

**To avoid pin and harness damage, use the following test lead when taking a measurement:
Part No. 3824776 - breakout cable.**

Condition:

- Install breakout cable, Part No. 3824776, between the sensor and the engine harness sensor connector.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the signal voltage. • Measure the supply voltage by installing the breakout cable's signal pin C (or YELLOW) and return pin B (or BLACK) connectors into the multimeter.	**OK** **(+) 0.5 to 4.16 VDC**	2A
	NOT OK Does **not** meet specifications.	1D-1



19c00875

STEP 1D-1: Check for a short circuit to ground in the supply and signal wires.

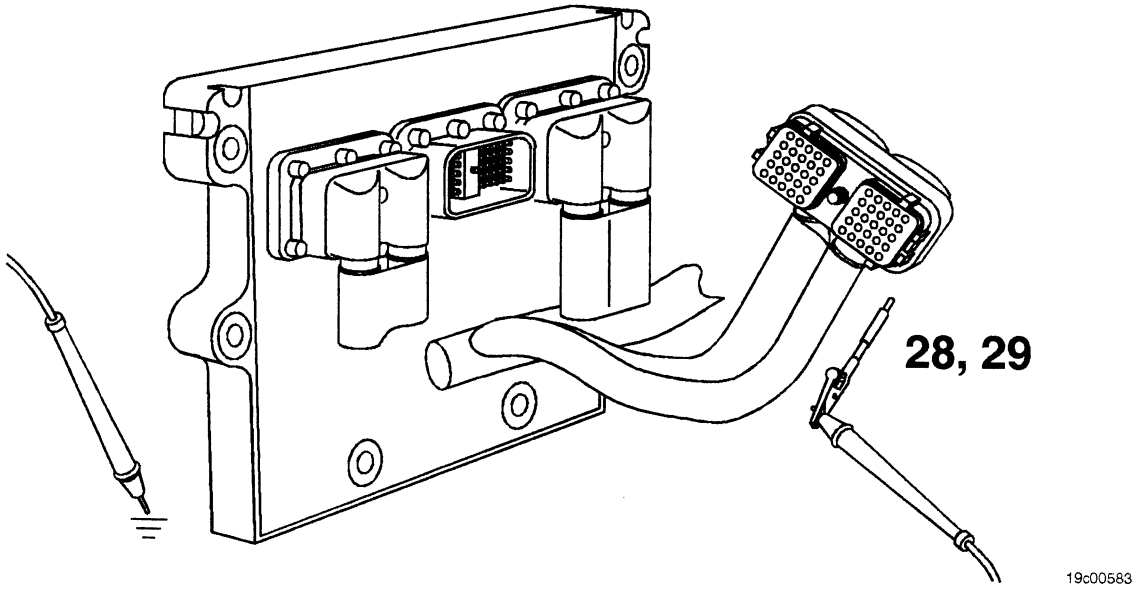
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the 50-pin actuator harness connector from the ECM.
- Disconnect the fuel inlet restriction sensor from the engine harness.

Action	Specifications/Repair	Next Step
Check for a short circuit to ground in the supply and signal wires. • Measure the resistance from pin 28 in the actuator harness connector to the engine block ground. • Measure the resistance from pin 29 in the actuator harness connector to the engine block ground.	**OK** **More than 100k ohms**	1D-2
	NOT OK **Replace the engine harness** Replace the engine harness. Refer to Procedure 019-043.	4A



STEP 1D-2: Check for a short circuit from the supply and signal wires to all other wires in the engine harness.

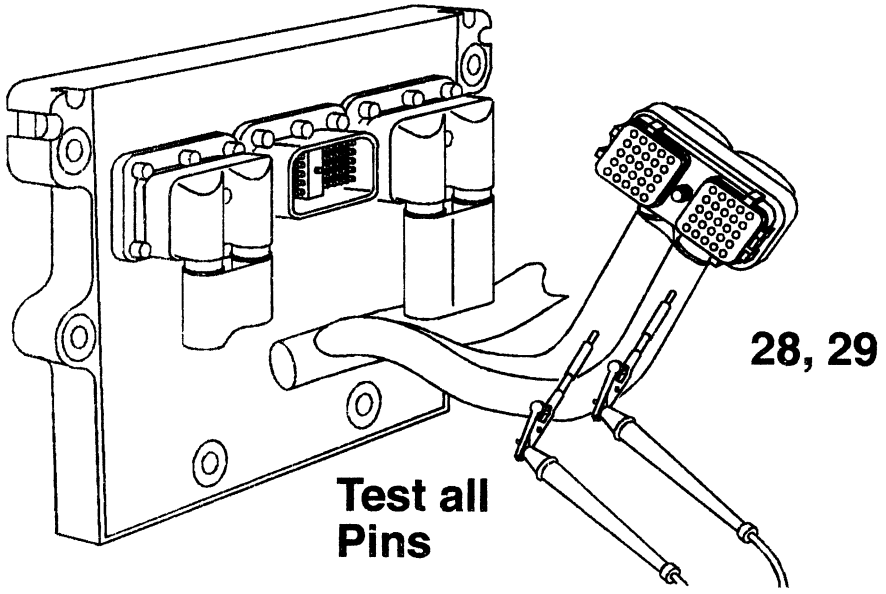
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.
- Disconnect the fuel inlet restriction sensor from the engine harness.

Action	Specifications/Repair	Next Step
Check for a short circuit from the supply and signal wires to all other wires in the engine harness. • Measure the resistance from pin 28 in the actuator harness connector to all other pins in the connector. • Measure the resistance from pin 29 in the actuator harness connector to all other pins in the connector.	**OK** **More than 100k ohms** **Replace the fuel inlet restriction sensor** Refer to Procedure 019-128.	4A
	NOT OK **Replace the engine harness** Replace the engine harness. Refer to Procedure 019-043.	4A



STEP 2: Check the engine harness.

STEP 2A: Inspect the engine harness and ECM connector pins.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the engine harness and ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	2B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	4A

STEP 2B: Read the fault codes.

Condition:
- Connect all components.
- Connect the INSITE™ electronic service tool.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start the engine and let it idle for 1 minute. • Using INSITE™, read the fault codes.	**OK** **Fault Code 582 inactive**	4B
	NOT OK Fault Code 582 active.	2C

STEP 2C: Check for an open circuit in the supply and signal wires.

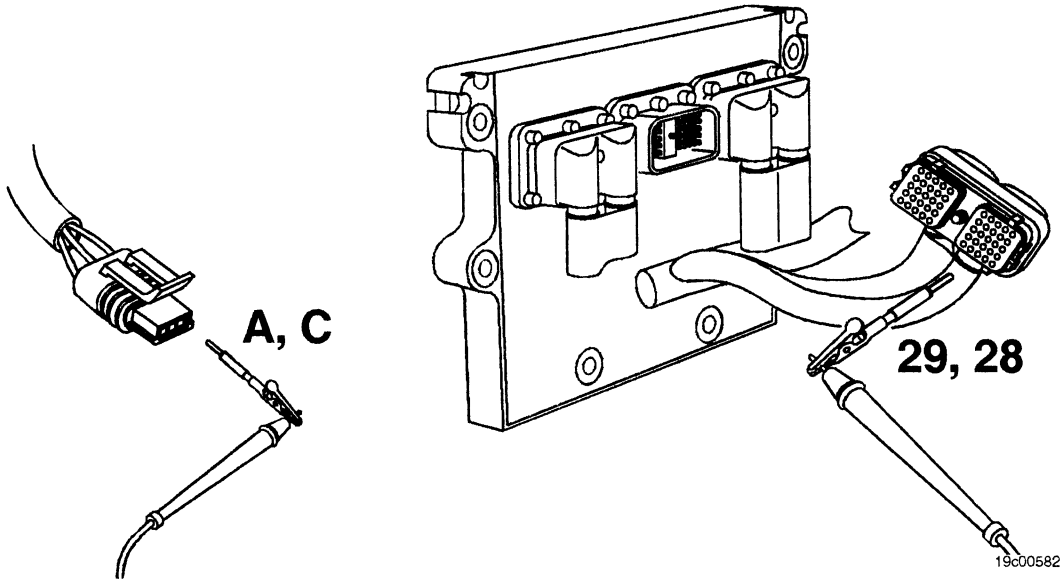
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.
- Disconnect the fuel inlet restriction sensor from the engine harness.

Action	Specifications/Repair	Next Step
Check for an open circuit in the supply and signal wires. • Measure the resistance from pin 29 of the actuator harness connector to pin A (or 1) of the 3-pin connector. • Measure the resistance from pin 28 of the actuator harness connector to pin C (or 3) of the 3-pin connector.	**OK** **Less than 10 ohms**	3A
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250 or 019-203. • Replace the engine harness. Refer to Procedure 019-043.	4A



STEP 3: Check for an ECM response.

STEP 3A: Check for the appropriate ECM response.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the actuator harness connector from the ECM.
- Install a jumper wire, Part No. 3822917, from pin 28 to pin 29 at the ECM actuator port.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check for the appropriate ECM response. • Using INSITE™, read the fault codes.	**OK** **Fault Code 582 inactive** **Fault Code 581 active**	4A
	NOT OK **Fault Code 582 active** **Replace the ECM** Refer to Procedure 019-031.	4A

STEP 4: Clear the fault codes.

STEP 4A: Disable the fault code.

Condition:

- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Verify that Fault Code 582 inactive.	**OK** **Fault Code 582 inactive**	4B
	NOT OK Return to troubleshooting steps or contact your local Cummins Authorized Repair Location, if all steps have been completed and checked again	1A

STEP 4B: Clear the inactive fault codes.

Condition:

- Connect all components.
- Turn keyswitch ON.

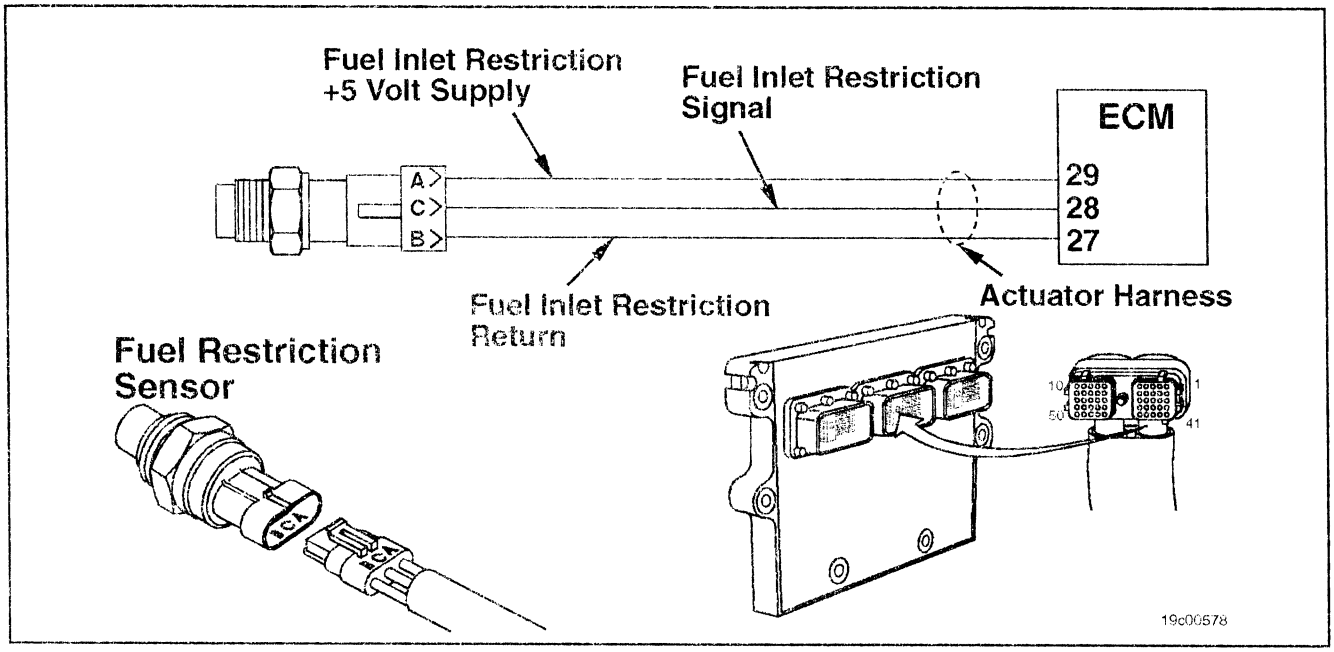
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 581

Fuel Inlet Restriction Sensor Circuit

CODES	REASON	EFFECT
Fault Code: 581 PID(P), SID(S): P015 SPN: 1381 FMI: 3/3 Lamp: Yellow	High voltage detected on fuel inlet restriction sensor signal pin.	Fuel inlet restriction monitor deactivated.

Fuel Inlet Restriction Sensor Circuit



Circuit Description:

The fuel inlet restriction sensor provides a fuel pressure signal to the electronic control module (ECM).

Component Location:

The fuel inlet restriction sensor is located on the fuel filter head.

Shop Talk:

This fault indicates that a short circuit of at least positive (+) 5 VDC has occurred at signal pin 28 on the actuator harness connector at the ECM.

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging the new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead
Part No. 3824775 - breakout cable.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the fuel inlet restriction sensor.		
STEP 1A: Inspect the harness and sensor connector pins.	No damaged pins	
STEP 1B: Read the fault codes.	Fault Code 581 inactive	
STEP 1C: Check the supply voltage.	(+) 4.75 to 5.25 VDC	
STEP 1C-1: Measure the voltage from the ECM.	(+) 4.75 to 5.25 VDC	
STEP 1D: Check the signal voltage.	(+) 0.5 to 4.16 VDC	
STEP 2: Check the engine harness.		
STEP 2A: Inspect the engine harness and ECM connector pins.	No damaged pins	
STEP 2B: Read the fault codes.	Fault Code 581 inactive	
STEP 2C: Check for an open circuit in the return wire.	Less than 10 ohms	
STEP 2D: Check for a short circuit to ground in the supply, signal, and return wires.	More than 100k ohms	
STEP 2E: Check for a short circuit from the supply, signal, and return wires to all other wires in the engine harness.	More than 100k ohms	
STEP 3: Check for an ECM response.		
STEP 3A: Check for the appropriate ECM response.	Fault Code 581 inactive Fault Code 582 active	
STEP 4: Clear the fault codes.		
STEP 4A: Disable the fault code.	Fault Code 581 inactive	
STEP 4B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check the fuel inlet restriction sensor.

STEP 1A: Inspect the engine harness and sensor connector pins.

Condition:
- Turn keyswitch OFF.
- Disconnect the fuel inlet restriction sensor from the engine harness.

Action	Specifications/Repair	Next Step
Inspect fuel inlet restriction sensor and engine harness connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	1B
	NOT OK **Repair the damaged pins** • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Replace the 3-pin Metri-Pack connector. Refer to Procedure 019-203. • Replace the fuel inlet restriction sensor. Refer to Procedure 019-128.	4A

STEP 1B: Read the fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start the engine and let it idle for 1 minute. • Using INSITE™, read the fault codes.	**OK** **Fault Code 581 inactive**	4B
	NOT OK Fault Code 582 active.	1C

STEP 1C: Check the supply voltage.

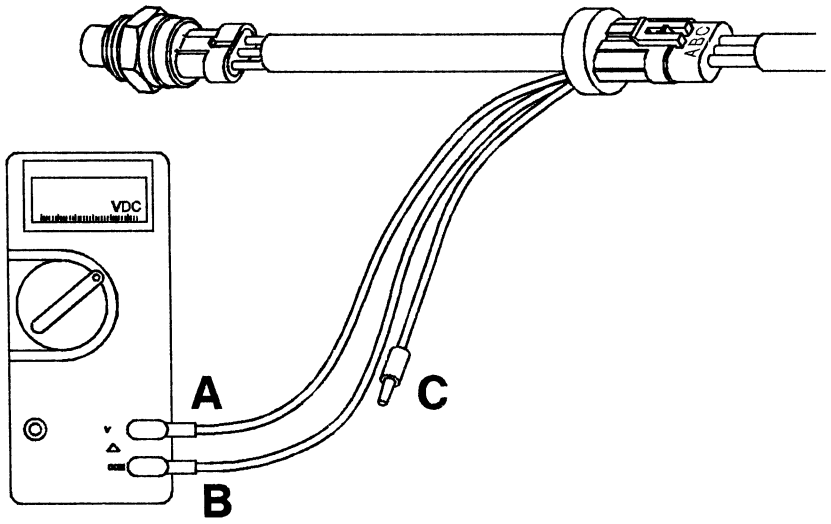
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3824775 - breakout cable.

Condition:

- Install breakout cable, Part No. 3824775, between the sensor and the harness connector.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the supply voltage. • Measure the supply voltage by installing the breakout cable's supply pin A (or RED) and return pin B (or BLACK) connectors into the multimeter.	**OK** **(+) 4.75 to 5.25 VDC**	1D
	NOT OK Does **not** meet specifications.	1C-1



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STEP 1C-1: Measure the voltage from the ECM.

⚠CAUTION⚠

To avoid damaging the new ECM, all other active fault codes must be investigated prior to replacing the ECM.

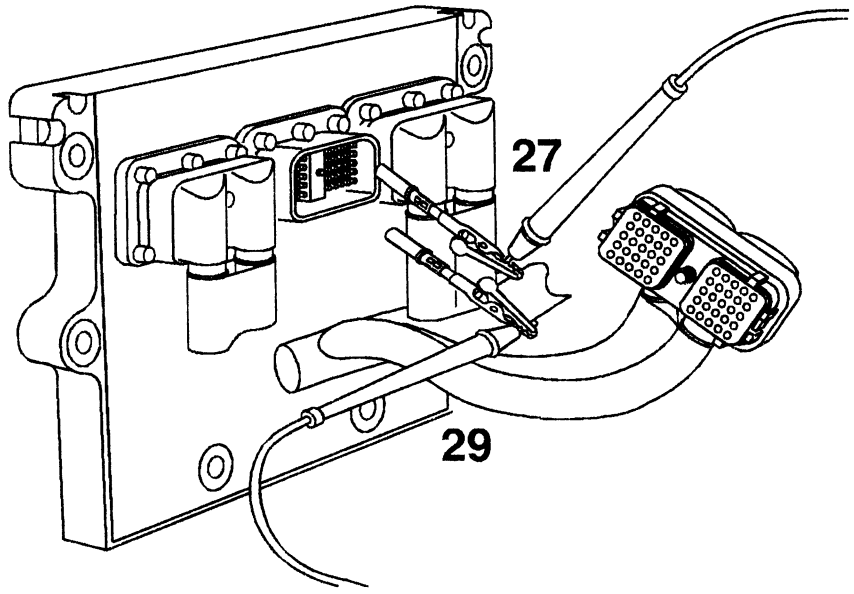
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the actuator harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Measure the ECM output voltage. • Measure the voltage from pin 29 to pin 27 at the actuator port of the ECM.	**OK** **(+) 4.75 to 5.25 VDC** **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	1D
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	4A



STEP 1D: Check the signal voltage.

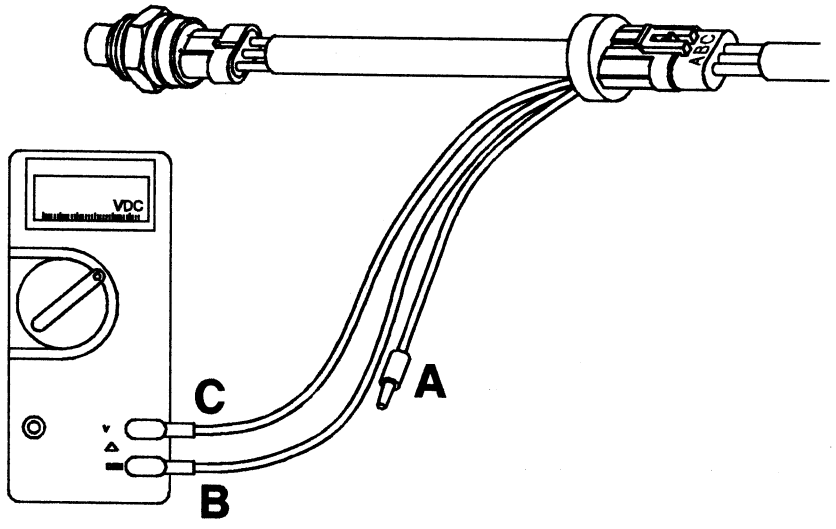
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3824775 - breakout cable.

Condition:

- Install breakout cable, Part No. 3824775, between the sensor and the harness connector.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the signal voltage. • Measure the signal voltage by installing the breakout cable's signal pin C (or YELLOW) and return pin B (or BLACK) connectors into the multimeter.	**OK** **(+) 0.5 to 4.16 VDC**	3A
	NOT OK Does **not** meet specifications.	2A



19c00875

STEP 2: Check the engine harness.

STEP 2A: Inspect the engine harness and ECM connector pins.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the ECM and engine harness connectors for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	2B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	4A

STEP 2B: Read the fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start the engine and let it idle for 1 minute. • Using INSITE™, read the fault codes.	**OK** **Fault Code 581 inactive**	4A
	NOT OK Fault Code 581 active.	2C

STEP 2C: Check for an open circuit in the return wire.

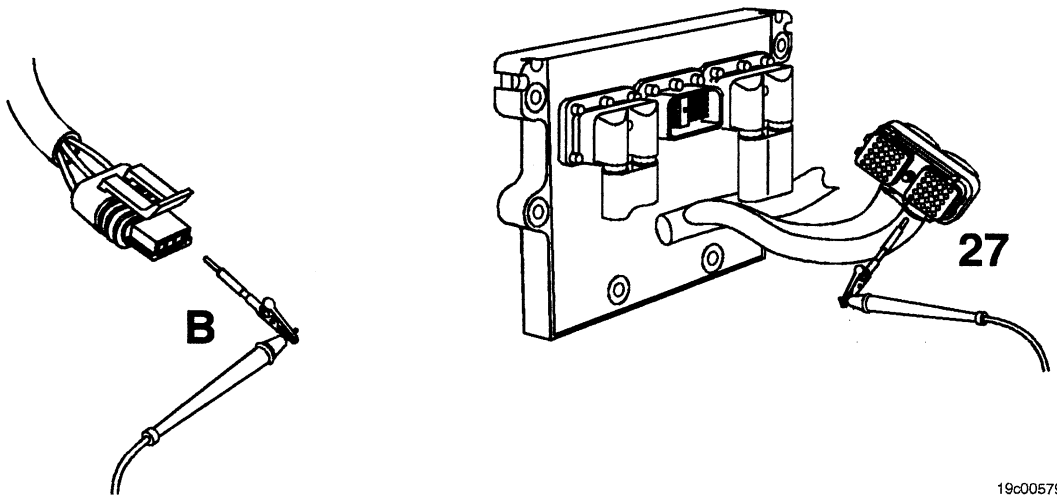
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.
- Disconnect the fuel inlet restriction sensor from the engine harness.

Action	Specifications/Repair	Next Step
Check for an open circuit in the return wire. • Measure the resistance from pin 27 of the actuator harness connector to pin B (or 2) of the 3-pin connector at the sensor.	**OK** **Less than 10 ohms**	2D
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-203 or 019-250. • Replace the engine harness. Refer to Procedure 019-043.	4A



STEP 2D: Check for a short circuit to ground in the supply, signal, and return wires.

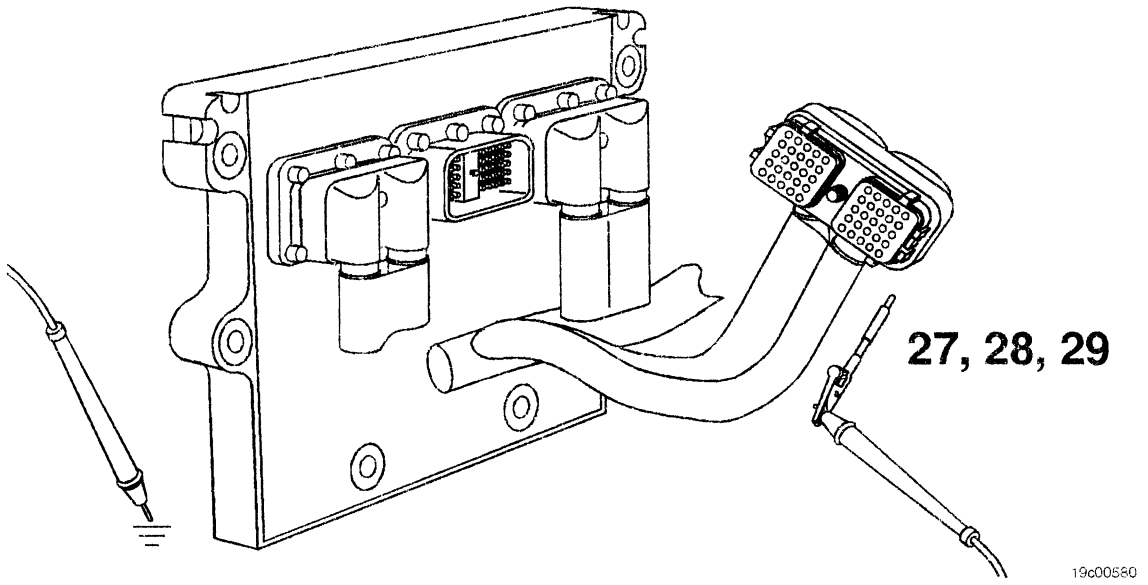
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.
- Disconnect the fuel inlet restriction sensor from the engine harness.

Action	Specifications/Repair	Next Step
Check for a short circuit to ground in the supply, signal, and return wires. • Measure the resistance from pin 27 in the actuator harness connector to the engine block ground. • Measure the resistance from pin 28 in the actuator harness connector to the engine block ground. • Measure the resistance from pin 29 in the actuator harness connector to the engine block ground.	**OK** **More than 100k ohms**	2E
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-203 or 019-250. • Replace the engine harness. Refer to Procedure 019-043.	4A



STEP 2E: Check for a short circuit from the supply, signal, and return wires to all other wires in the engine harness.

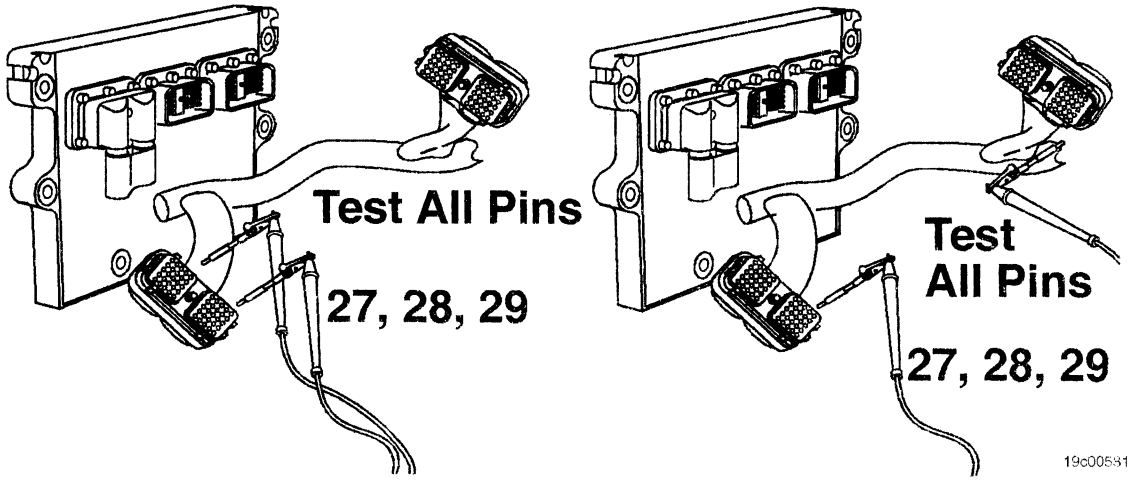
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the fuel inlet restriction sensor from the engine harness.

Action	Specifications/Repair	Next Step
Check for a short circuit from the supply, signal, and return wires to all other wires in the engine harness. • Measure the resistance from pin 27 in the actuator harness connector to all other pins in the connector. • Measure the resistance from pin 27 in the actuator harness connector to all other pins in the sensor harness connector. • Measure the resistance from pin 28 in the actuator harness connector to all other pins in the connector. • Measure the resistance from pin 28 in the actuator harness connector to all other pins in the sensor harness connector. • Measure the resistance from pin 29 in the actuator harness connector to all other pins in the connector. • Measure the resistance from pin 29 in the actuator harness connector to all other pins in the sensor harness connector.	**OK** **More than 100k ohms** **Replace the fuel inlet restriction sensor** Refer to Procedure 019-128.	4A
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	4A



STEP 3: Check for an ECM response.

STEP 3A: Check for the appropriate ECM response.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Disconnect the sensor harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check for the appropriate ECM response. • Read the fault codes using INSITE™.	**OK** **Fault Code 581 inactive** **Fault Code 582 active**	4A
	NOT OK **Fault Code 581 active** **Replace the ECM** Refer to Procedure 019-031.	4A

STEP 4: Clear the fault codes.

STEP 4A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Verify that Fault Code 581 is inactive.	**OK** **Fault Code 581 inactive**	4B
	NOT OK Return to troubleshooting steps, or contact your local Cummins Authorized Repair Location, if all steps have been completed and checked again.	1A

STEP 4B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

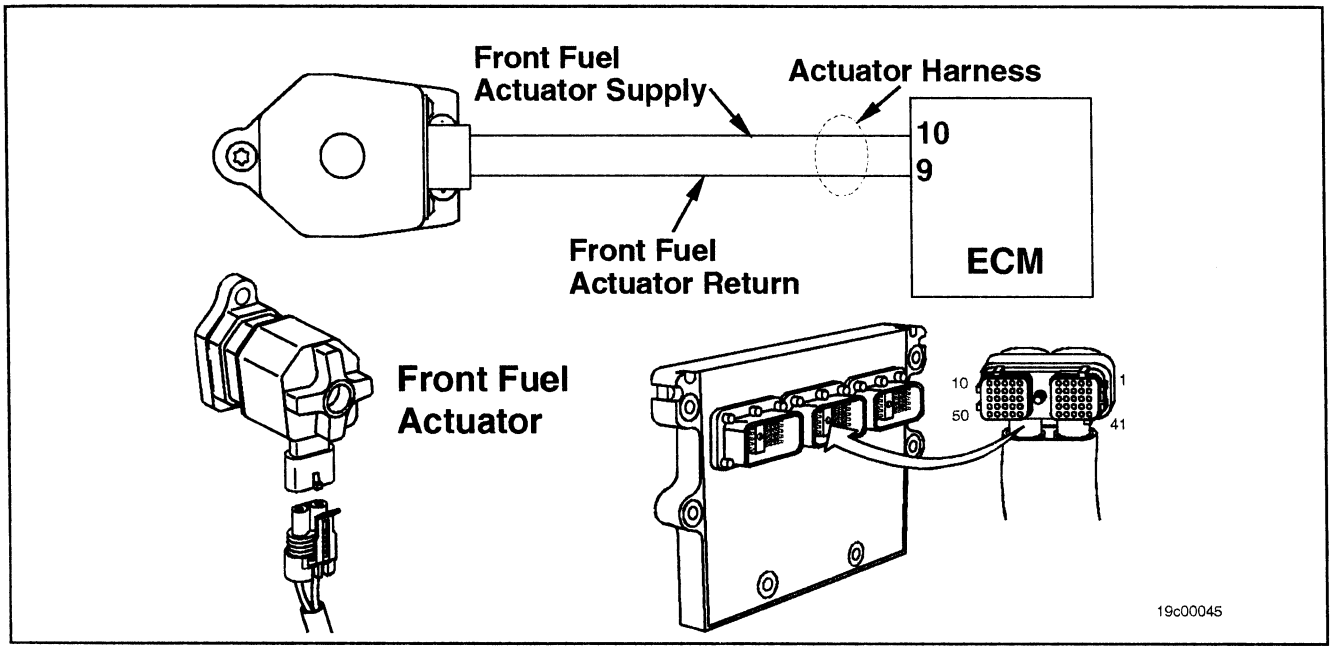
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 553

Fuel System Overfueling

CODES	REASON	EFFECT
Fault Code: 553 PID(P), SID(S): P157 SPN: 157 FMI: 0/16 Lamp: Red	Unexpectedly high rail pressure was detected on the front three cylinders.	Engine will return to idle speed, then **only** idle or shut down.

Hydraulic Fuel System



Circuit Description:

The electronic control module (ECM) supplies voltage to open the fueling actuators for a short length of time. This allows a short pulse of fuel to flow to the injector. The injector then injects this fuel into the cylinder for combustion.

Component Location:

The front fueling actuators are located on the fuel delivery housing below the air inlet horn. It is the actuator that is closest to the front of the engine. The injectors are located in the cylinder head under the valve cover.

Shop Talk:

The ECM measures the amount of fuel metered into the injector by using the front rail pressure sensor. If the amount of fuel is above what the ECM expected, the fault code is activated.

TROUBLESHOOTING SUMMARY

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check for active fault codes.		
STEP 1A: Inspect for Fault Code 449 or high inactive counts.	Fault Code 449 is not active	
STEP 1A-1: Check for air in pressure-side fuel.	No air in fuel	
STEP 1A-2: Measure for drain line restriction	Less than 4.0 in Hg	
STEP 2: Check the front fueling actuators.		
STEP 2A: Inspect the front fueling actuators.	Fault Code 553 goes inactive	
STEP 3: Clear the fault codes.		
STEP 3A: Disable the fault code.	Fault Code 553 inactive	
STEP 3B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check for active fault codes.

STEP 1A: Inspect for Fault Code 449 or high inactive counts.

Condition:
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Read the fault codes using INSITE™.	**OK** **Fault Code 449 is not active**	1A-1
	NOT OK Fault Code 449 active.	Refer to Fault Code 449

STEP 1A-1: Check for air in pressure-side fuel.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Check for air in pressure-side fuel.	**OK** **No air in fuel**	1A-2
	NOT OK **Air in fuel** Refer to Procedure 006-003 in the Signature, ISX and QSX15 Troubleshooting and Repair Manual, Bulletin No. 3666239.	3A

STEP 1A-2: Measure for drain line restriction.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Inspect drain line. • Measure for drain line restriction.	**OK** **Less than 4.0 in Hg**	2A
	NOT OK **More than 4.0 in Hg** Refer to Procedure 006-012 in the Signature, ISX and QSX15 Troubleshooting and Repair Manual, Bulletin No. 3666239.	3A

STEP 2: Check the front fueling actuators.

STEP 2A: Inspect the front fueling actuators.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Replace the front fueling actuators.	**OK** **Fault Code 553 goes inactive**	3A
	NOT OK **Replace the front fueling actuators** Refer to Procedure 019-110.	3A

STEP 3: Clear the fault codes.

STEP 3A: Disable the fault code.

Condition:
- Connect all the components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify Fault Code 553 is inactive	**OK** **Fault Code 553 inactive**	3B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location if all the steps have been completed and checked again.	1A

STEP 3B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

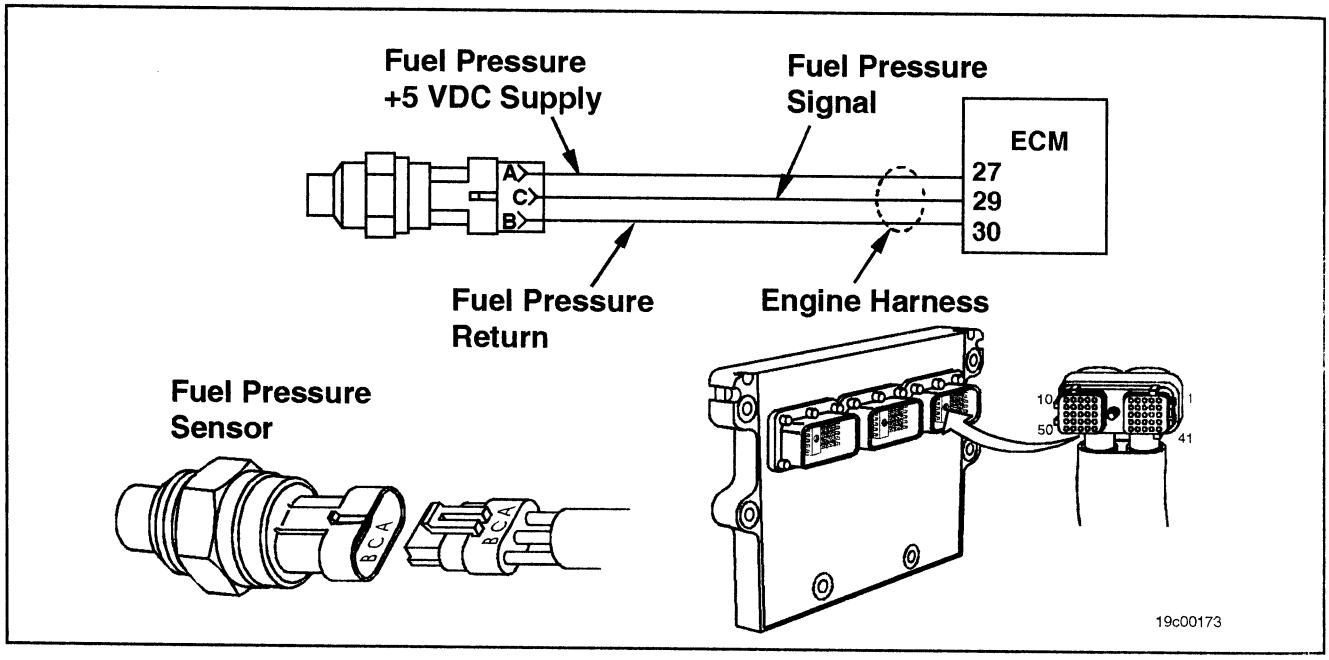
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 547

Fuel Pressure Sensor Circuit

CODES	REASON	EFFECT
Fault Code: 547 PID(P), SID(S): P094 SPN: 94 FMI: 4/4 Lamp: Yellow	Low voltage detected on the fuel pressure sensor circuit.	Engine will run derated.

Fuel Pressure Sensor Circuit



Circuit Description:

The fuel pressure sensor provides the fuel supply pressure signal to the electronic control module (ECM).

Component Location:

The fuel pressure sensor is located on the fuel delivery housing to the left of the front fueling actuator.

Shop Talk:

This fault indicates that voltage at signal pin 29 on the ECM has a short circuit to ground.

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging the new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test lead when taking a measurement:
Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3824775 - breakout cable.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check for multiple fault codes.		
STEP 1A: Read fault codes.	Fault Code 352 is not active	
STEP 2: Check the fuel pressure sensor.		
STEP 2A: Inspect the engine harness and sensor connector pins.	No damaged pins	
STEP 2B: Read the fault codes.	Fault Code 547 inactive	
STEP 2C: Check the supply voltage.	(+) 4.75 to 5.25 VDC	
STEP 2C-1: Check the voltage from the ECM.	(+) 4.75 to 5.25 VDC	
STEP 2D: Check the signal voltage.	(+) 0.4 to 4.5 VDC	
STEP 2D-1: Check for a short circuit to ground.	More than 100k ohms	
STEP 2D-2: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 3: Check the engine harness.		
STEP 3A: Inspect the engine harness and ECM connector pins.	No damaged pins	
STEP 3B: Read the fault codes.	Fault Code 547 inactive	
STEP 3C: Check for an open circuit in the engine harness.	Less than 10 ohms	
STEP 4: Check for an ECM response.		
STEP 4A: Check for the appropriate ECM response.	Fault Code 547 inactive and Fault Code 546 active	
STEP 5: Clear the fault codes.		
STEP 5A: Disable the fault code.	Fault Code 547 inactive	
STEP 5B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check for multiple fault codes.

STEP 1A: Read fault codes.

Condition:
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read fault codes. • Read active fault codes using INSITE™.	**OK** **Fault Code 352 is not active**	2A
	NOT OK	Fault Code 352

STEP 2: Check the fuel pressure sensor.

STEP 2A: Inspect the engine harness and sensor connector pins.

Condition:
- Turn keyswitch OFF.
- Disconnect the fuel pressure sensor from the engine harness.

Action	Specifications/Repair	Next Step
Inspect the engine harness and sensor connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	2B
	NOT OK **Repair the damaged pins** Replace the sensor connector or the sensor, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Replace the sensor connector. Refer to Procedure 019-203. • Replace the fuel pressure sensor. Refer to Procedure 019-188.	5A

STEP 2B: Read the fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start the engine and let it idle for 1 minute. • Read the fault codes using INSITE™.	**OK** **Fault Code 547 inactive**	5B
	NOT OK Fault Code 547 active.	2C

STEP 2C: Check the supply voltage.

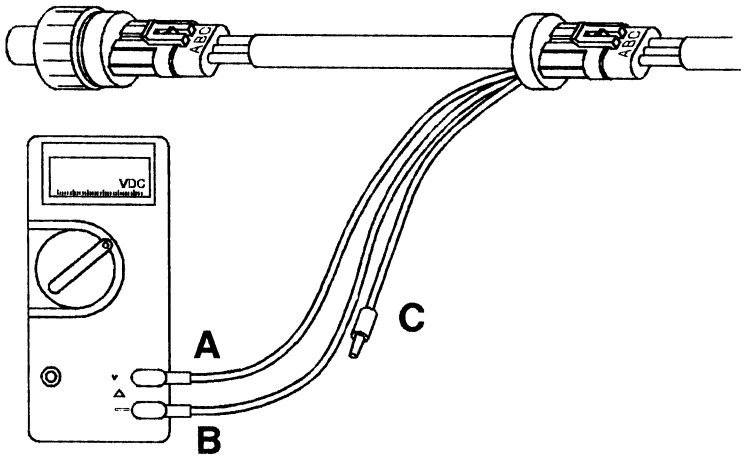
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3824775 - breakout cable.

Condition:

- Install breakout cable, Part No. 3824775, between the sensor and the engine harness connector.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the supply voltage. • Measure the supply voltage at supply, pin A (or RED) and return, pin B (or BLACK) connectors with the multimeter.	**OK** **(+) 4.75 to 5.25 VDC**	2D
	NOT OK Does **not** meet specifications.	2C-1



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STEP 2C-1: Check the voltage from the ECM.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

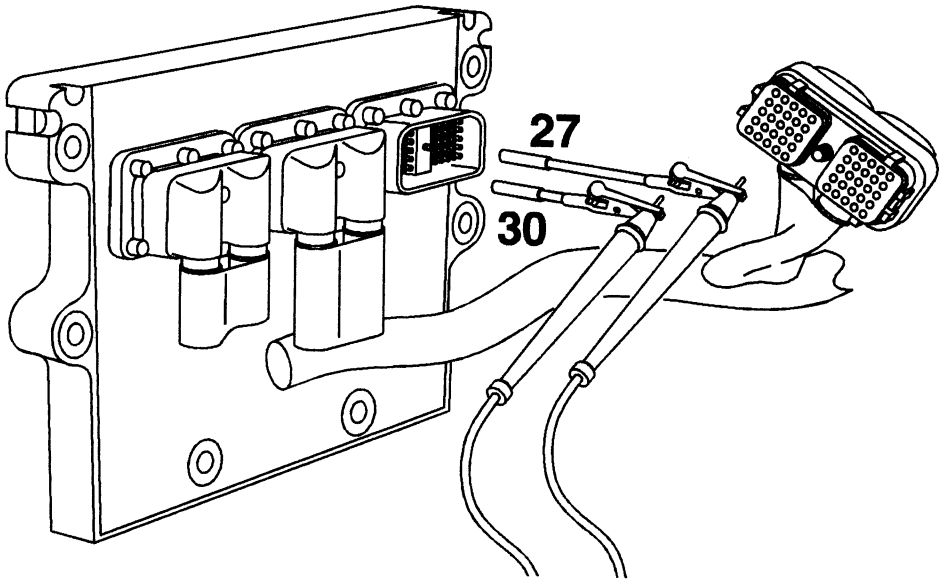
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the sensor harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the voltage from the ECM. • Measure the voltage at the ECM from pin 27 to pin 30 of the ECM sensor port.	**OK** **(+) 4.75 to 5.25 VDC** **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	5A
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	5A



STEP 2D: Check the signal voltage.

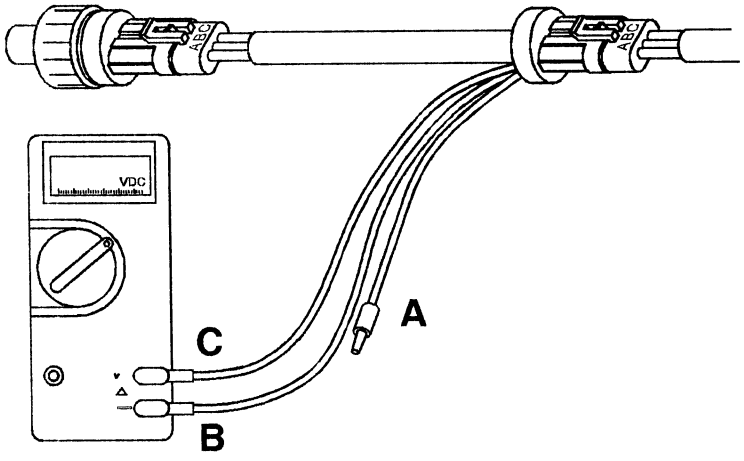
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3824775 - breakout cable.

Condition:

- Install breakout cable, Part No. 3824775, between the sensor and the engine harness.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the signal voltage. • Measure the signal voltage by installing the break out cable's signal, pin C (or YELLOW) and return, pin B (or BLACK) into the multimeter.	**OK** **(+) 0.4 to 4.5 VDC**	2D-1
	NOT OK Does **not** meet specifications.	3A



19c00095

STEP 2D-1: Check for a short circuit to ground.

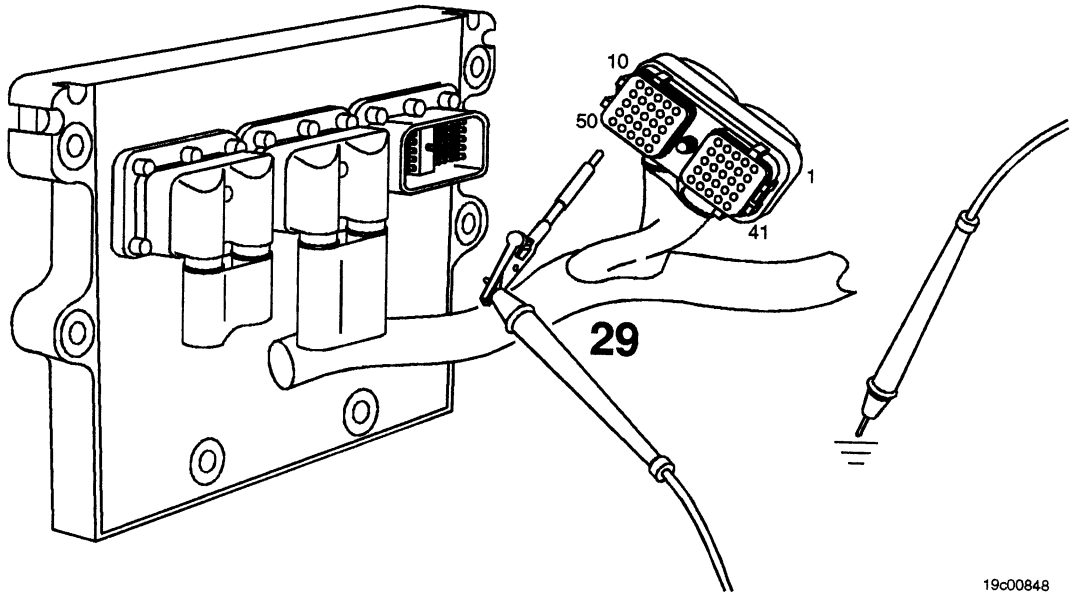
⚠CAUTION⚠

To avoid pin and harness damage use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the fuel pressure sensor from the engine harness.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for a short circuit to ground. • Measure the resistance from pin 29 of the sensor harness connector to chassis ground.	**OK** **More than 100k ohms**	2D-2
	NOT OK **Replace the engine harness** Refer to Procedure 019-043.	5A



STEP 2D-2: Check for a short circuit from pin to pin.

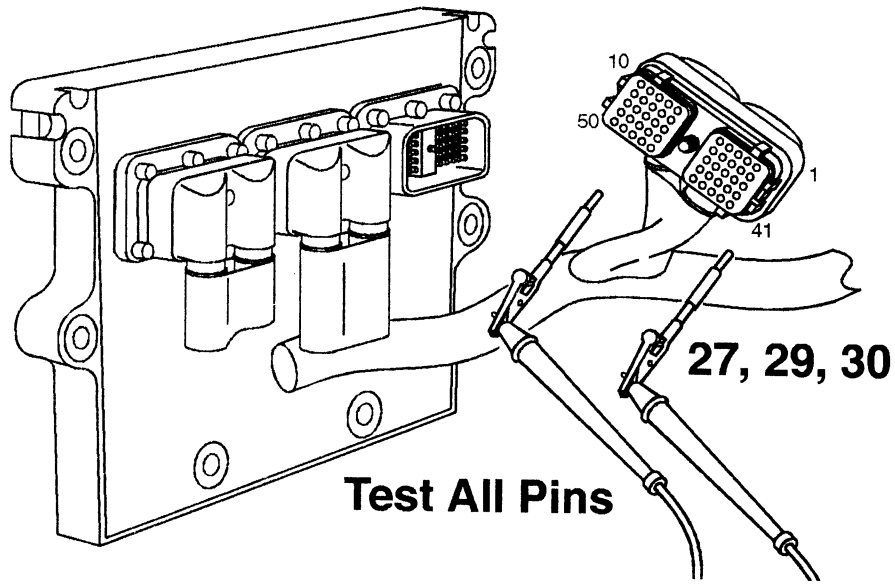
⚠CAUTION⚠

To avoid pin and harness damage use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the engine harness from the fuel pressure sensor.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin. • Measure the resistance from pin 27 of the sensor harness connector to all other pins in the connector. • Measure the resistance from pin 29 of the sensor harness connector to all other pins in the connector. • Measure the resistance from pin 30 of the sensor harness connector to all other pins in the connector.	**OK** **More than 100k ohms** **Replace the fuel pressure sensor** Refer to Procedure 019-188.	5A
	NOT OK **Replace the engine harness** Refer to Procedure 019-043.	5A



STEP 3: Check the engine harness.

STEP 3A: Inspect the engine harness and ECM connector pins.

⚠CAUTION⚠

To avoid damaging the new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the engine harness from the fuel pressure sensor.

Action	Specifications/Repair	Next Step
Inspect the engine harness and ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	3B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	5A

STEP 3B: Read the fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start engine and let it idle for 1 minute. • Read the fault codes using INSITE™.	**OK** **Fault Code 547 inactive**	5B
	NOT OK Fault Code 547 active.	3C

STEP 3C: Check for an open circuit in the engine harness.

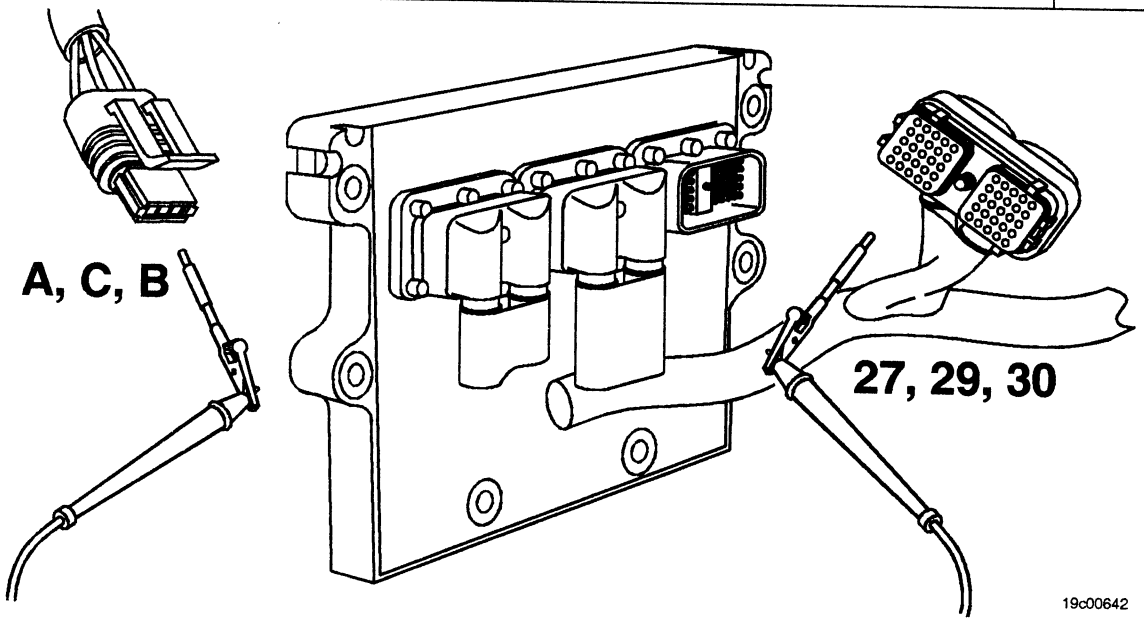
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the engine harness from the fuel pressure sensor.

Action	Specifications/Repair	Next Step
Check for an open circuit in the engine harness. • Measure the resistance from pin 27 of the sensor harness connector to pin A (or 1) on the engine harness side of the fuel pressure sensor connector. • Measure the resistance from pin 29 of the sensor harness connector to pin C (or 3) on the engine harness side of the fuel pressure sensor connector. • Measure the resistance from pin 30 of the sensor harness connector to pin B (or 2) on the engine harness side of the fuel pressure sensor connector.	**OK** **Less than 10 ohms**	4A
	NOT OK **Correct the pin to pin wiring or open circuit** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	5A



STEP 4: Check for an ECM response.

STEP 4A: Check for the appropriate ECM response.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Disconnect the sensor harness connector from the ECM.
- Install a jumper wire, Part No. 3822917, between pin 27 and 29 at the ECM sensor port.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check for the appropriate ECM response. • Using INSITE™, read the fault codes.	**OK** **Fault Code 546 active and** **Fault Code 547 inactive**	5A
	NOT OK **Fault Code 547 active** **Replace the ECM** Refer to Procedure 019-031.	5A

STEP 5: Clear the fault codes.

STEP 5A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify that Fault Code 547 is inactive.	**OK** **Fault Code 547 inactive**	5B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location, if all steps have been completed and checked again.	1A

STEP 5B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

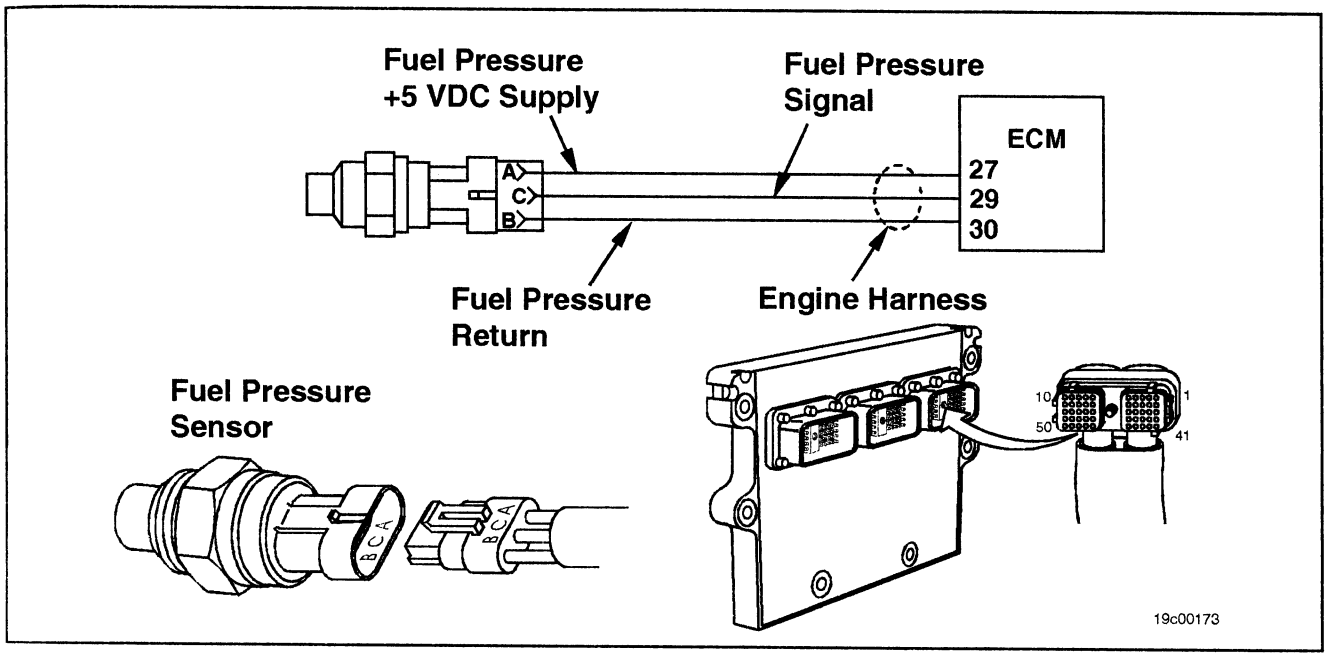
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Use INSITE™ to clear all inactive fault codes.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 546

Fuel Pressure Sensor Circuit

CODES	REASON	EFFECT
Fault Code: 546 PID(P), SID(S): P094 SPN: 94 FMI: 3/3 Lamp: Yellow	High voltage detected on the fuel pressure sensor circuit.	Engine will run derated.

Fuel Pressure Sensor Circuit



Circuit Description:

The fuel pressure sensor provides the fuel supply pressure signal to the electronic control module (ECM).

Component Location:

The fuel pressure sensor is located on the fuel delivery housing to the left of the front fueling actuator.

Shop Talk:

This fault indicates that signal pin 29 on the ECM has been shorted on the circuit to at least positive (+) 5 VDC.

TROUBLESHOOTING SUMMARY

CAUTION

To avoid damaging the new ECM, all other active fault codes must be investigated prior to replacing the ECM.

CAUTION

To avoid pin and harness damage, use the following test lead when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead
Part No. 3824775 - breakout cable.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the fuel pressure sensor.		
STEP 1A: Inspect the sensor harness and sensor connector pins.	No damaged pins	
STEP 1B: Read the fault codes.	Fault Code 546 inactive	
STEP 1C: Check the supply voltage.	(+) 4.75 to 5.25 VDC	
STEP 1C-1: Check the voltage from the ECM.	(+) 4.75 to 5.25 VDC	
STEP 1D: Check the signal voltage.	(+) 0.4 to 4.5 VDC	
STEP 2: Check the engine harness.		
STEP 2A: Inspect the engine harness and the ECM connector pins for damage.	No damaged pins	
STEP 2B: Read the fault codes.	Fault Code 546 inactive	
STEP 2C: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 2D: Check for an open circuit in the return wire.	Less than 10 ohms	
STEP 3: Check for an ECM response.		
STEP 3A: Check for the appropriate ECM response.	Fault Code 546 inactive and Fault Code 547 active	
STEP 4: Clear the fault codes.		
STEP 4A: Disable the fault code.	Fault Code 546 inactive	
STEP 4B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check the fuel pressure sensor.

STEP 1A: Inspect the sensor harness and sensor connector pins.

Condition:
- Disconnect the fuel pressure sensor from the sensor harness.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Inspect the sensor harness and sensor connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	1B
	NOT OK **Repair the damaged pins** Replace the sensor connector or the sensor, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Replace the sensor connector. Refer to Procedure 019-203. • Replace the fuel pressure sensor. Refer to Procedure 019-188.	4A

STEP 1B: Read the fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start engine and let idle for 1 minute. • Read the fault codes using INSITE™.	**OK** **Fault Code 546 inactive**	4B
	NOT OK Fault Code 546 active.	1C

STEP 1C: Check the supply voltage.

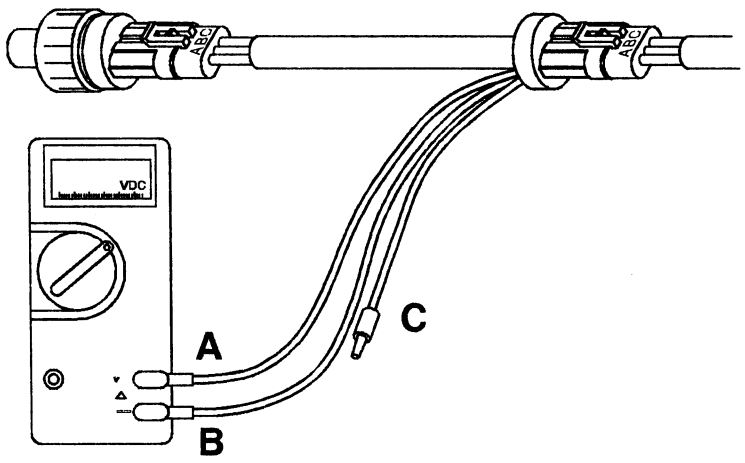
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3824775 - breakout cable.

Condition:

- Install breakout cable, Part No. 3824775, between the fuel pressure sensor and the harness connector.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the supply voltage. • Measure the supply voltage at supply, pin A (or RED) and return, pin B (or BLACK) connectors with the multimeter.	**OK** **(+) 4.75 to 5.25 VDC**	1D
	NOT OK Does **not** meet specifications.	1C-1



19c00094

STEP 1C-1: Check the voltage from the ECM.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

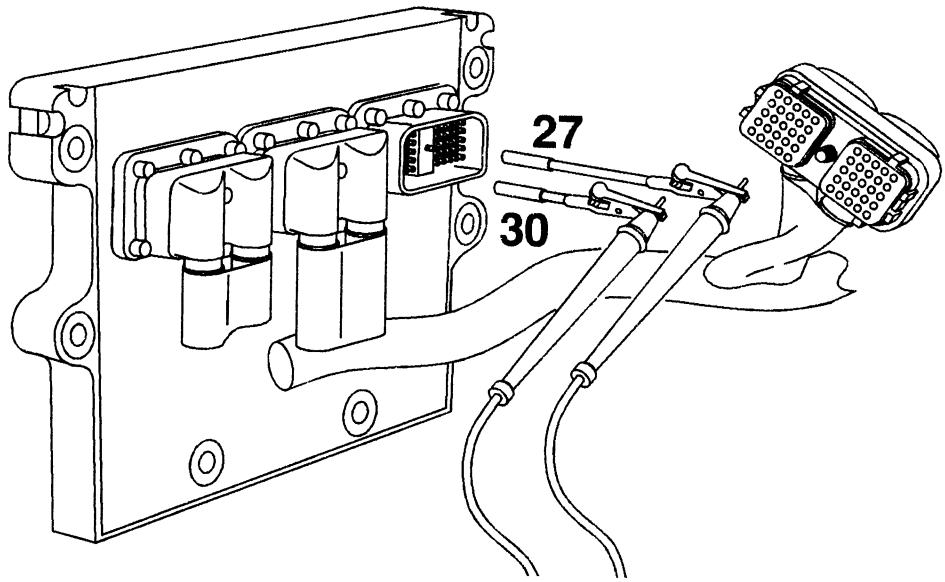
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the sensor harness connector from the ECM.
- Connect test lead, Part No. 3822917, to ECM sensor port pins 27 and 30.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Measure the voltage from the ECM. • Measure the voltage at the ECM from pin 27 to pin 30 of the ECM sensor port.	**OK** **(+) 4.75 to 5.25 VDC** **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	1D
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	4A



19c00157

STEP 1D: Check the signal voltage.

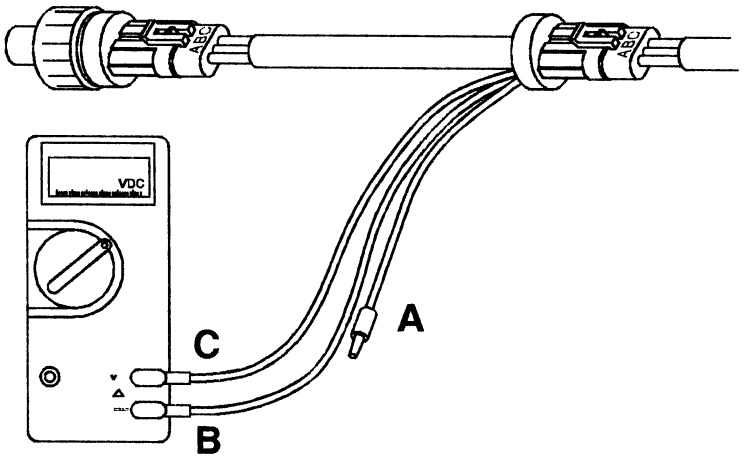
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3824775 - breakout cable.

Condition:

- Turn keyswitch ON.
- Install breakout cable, Part No. 3824775, between the fuel pressure sensor and the engine harness.

Action	Specifications/Repair	Next Step
Check the signal voltage. • Measure the signal voltage by installing the breakout cable's signal, pin C (or YELLOW) and return, pin B (or BLACK) connectors into the multimeter.	**OK** **(+) 0.4 to 4.5 VDC**	3A
	NOT OK Does **not** meet specifications.	2A



19c00095

STEP 2: Check the engine harness.

STEP 2A: Inspect the engine harness and the ECM connector pins for damage.

⚠CAUTION⚠

To avoid damaging the new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the engine harness from the fuel pressure sensor.

Action	Specifications/Repair	Next Step
Inspect the engine harness and the ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	2B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	4A

STEP 2B: Read the fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start engine and let idle for 1 minute. • Read the fault codes using INSITE™.	**OK** **Fault Code 546 inactive**	4B
	NOT OK Fault Code 546 active.	2C

STEP 2C: Check for a short circuit from pin to pin.

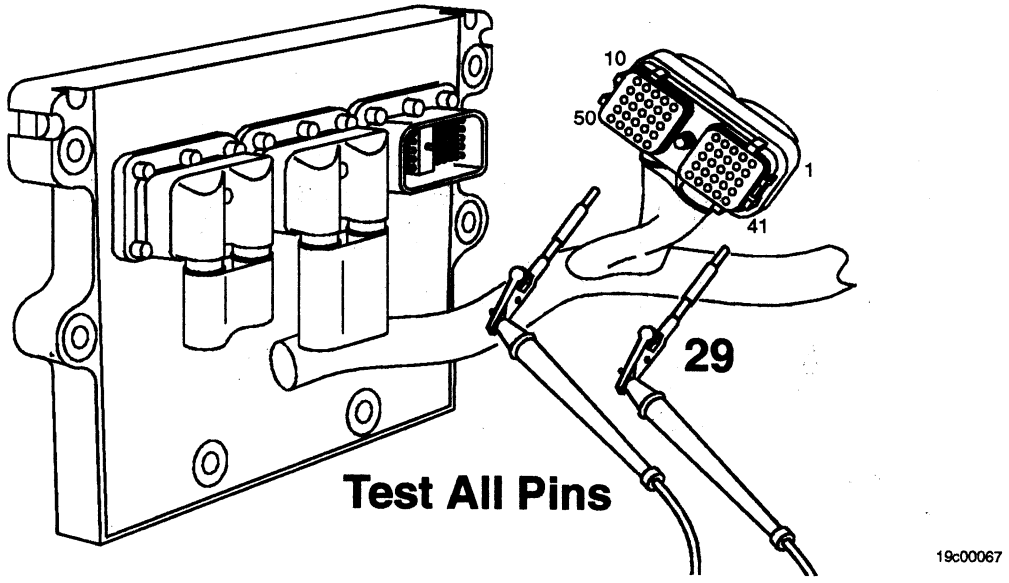
⚠CAUTION⚠

To avoid pin and harness damage use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the engine harness from the fuel pressure sensor.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin. • Measure the resistance between pin 29 of the sensor harness connector to **all** other pins in the connector.	**OK** **More than 100k ohms**	2D
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	4A



STEP 2D: Check for an open circuit in the return wire.

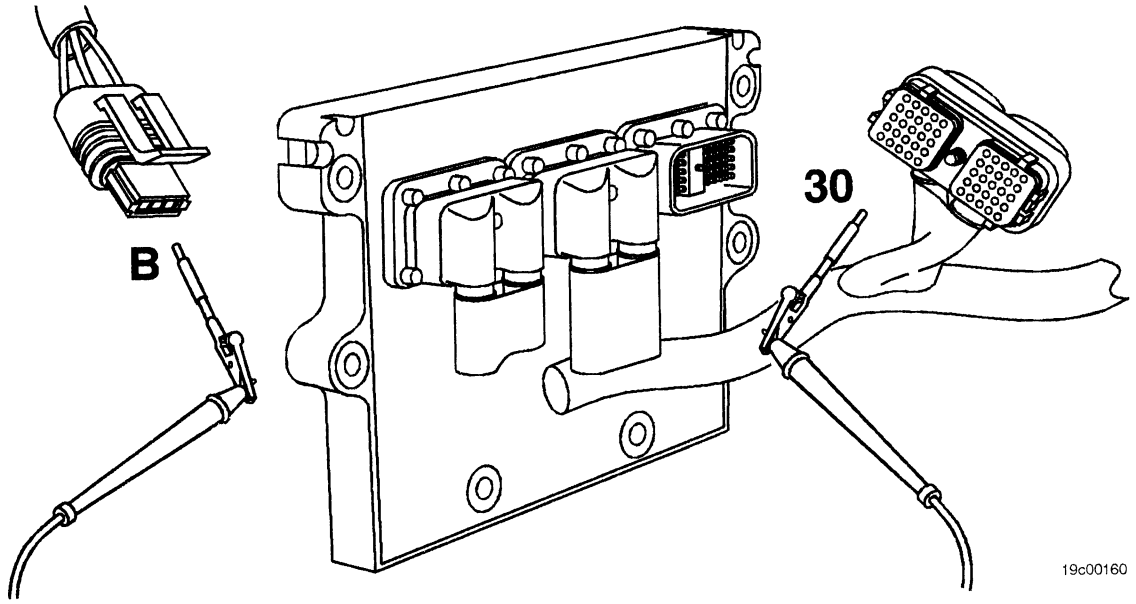
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the engine harness from the fuel pressure sensor.

Action	Specifications/Repair	Next Step
Check for an open circuit. • Measure the resistance from pin 30 of the sensor harness connector to pin B on the engine harness side of the fuel pressure sensor connector.	**OK** **Less than 10 ohms** **Replace the fuel pressure sensor** Refer to Procedure 019-188.	4A
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	4A



STEP 3: Check for an ECM response.

STEP 3A: Check for the appropriate ECM response.

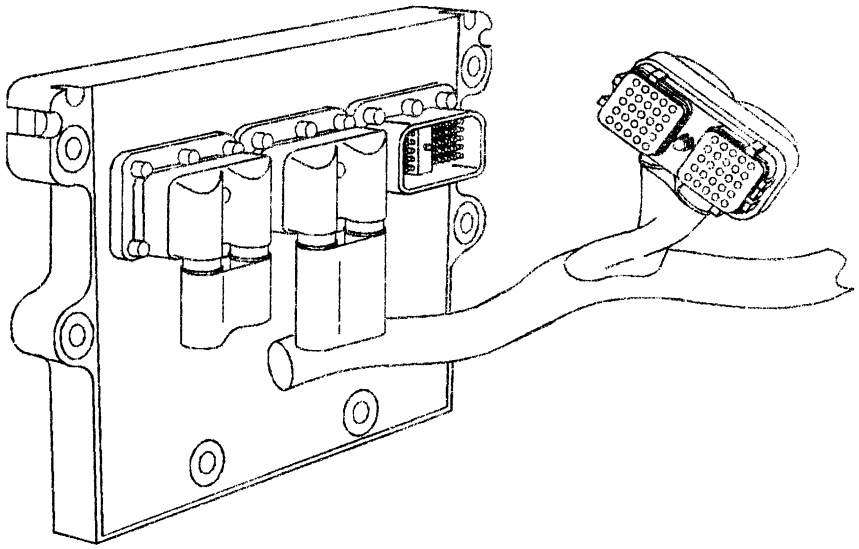
⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:

- Disconnect the sensor harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check for the appropriate ECM response. • Using INSITE™, read the fault codes.	**OK** **Fault Code 546 inactive and Fault Code 547 active**	4A
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	4A



19600008

STEP 4: Clear the fault codes.

STEP 4A: Disable the fault code.

Condition:

- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify that Fault Code 546 is inactive.	**OK** **Fault Code 546 inactive**	4B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location, if all steps have been completed and checked again.	1A

STEP 4B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

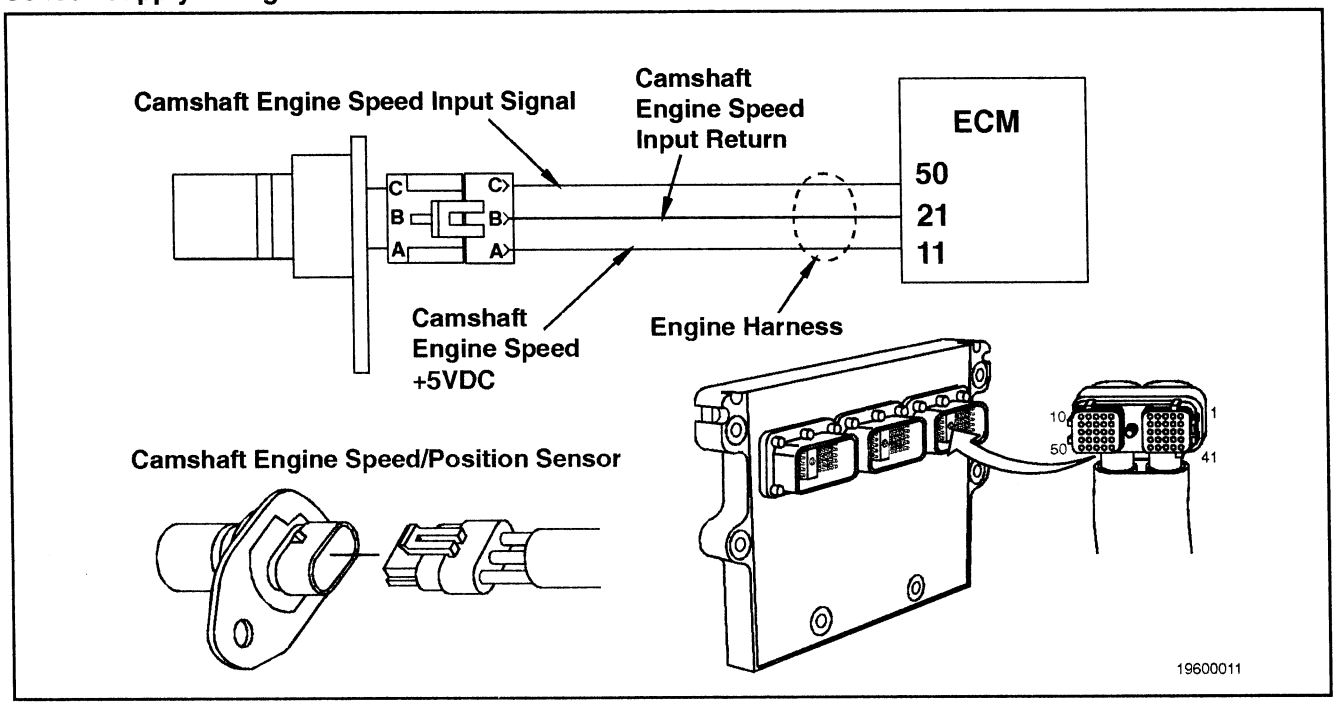
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Use INSITE™ to clear all inactive fault codes.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 496

Sensor Supply Voltage

CODES	REASON	EFFECT
Fault Code: 496 PID(P), SID(S): S221 SPN: 1043 FMI: 11/11 Lamp: Yellow	Incorrect voltage detected on the electronic control module (ECM) voltage supply line to the camshaft engine position sensor.	Engine does **not** run, is hard to start, or will run derated.

Sensor Supply Voltage Circuit



Circuit Description:

The ECM supplies the camshaft engine position with positive (+) 5 VDC. If the supply line is damaged, the sensors will **not** work correctly.

Component Location:

The camshaft engine position sensor is located on the intake side of the engine block on the cylinder head to the right of the ECM.

Shop Talk:

Low voltage on the positive (+) 5-VDC supply line will be caused by a short circuit to ground in a supply line, a short circuit between a supply line or a return line, a failed sensor, or a failed ECM power supply.

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging the new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead
Part No. 3824775 - breakout cable.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the failed sensor.		
STEP 1A: Check the camshaft engine position sensor.	Fault Code 496 active	
STEP 2: Check the sensor harness.		
STEP 2A: Inspect the sensor harness and ECM connector pins.	No damaged pins	
STEP 2B: Check the sensor supply voltage.	(+) 4.75 to 5.25 VDC	
STEP 2B-1: Check the voltage from the ECM.	(+) 4.75 to 5.25 VDC	
STEP 2C: Check for a short circuit to ground in the sensor supply line.	More than 100k ohms	
STEP 2D: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 3: Check the camshaft engine position sensor.		
STEP 3A: Check for a signal from the camshaft engine position sensor.	Signal present	
STEP 4: Clear the fault codes.		
STEP 4A: Disable the fault code.	Fault Code 496 inactive	
STEP 4B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check the failed sensor.

STEP 1A: Check the camshaft engine position sensor.

Condition:
- Connect INSITE™.

Action	Specifications/Repair	Next Step
Check the camshaft engine position sensor. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify Fault Code 496 is still active.	**OK** **Fault Code 496 active**	2A
	NOT OK **Replace the camshaft engine position sensor** Refer to Procedure 019-038.	4A

STEP 2: Check the sensor harness.

STEP 2A: Inspect the sensor harness and ECM connector pins.

⚠CAUTION⚠

To avoid damaging the new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the harness and the ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	2B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	4A

STEP 2B: Check the sensor supply voltage.

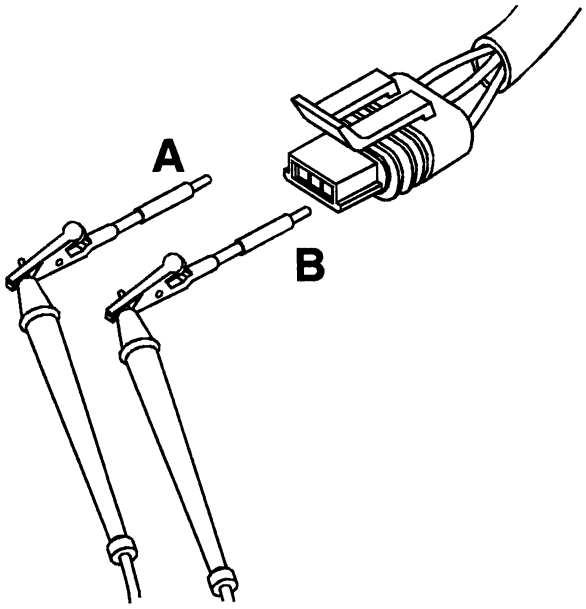
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the sensor harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the sensor supply voltage. • Measure the voltage from pin A (or 1) to pin B (or 2) on the engine harness connector side of the camshaft engine sensor.	**OK** **(+) 4.75 to 5.25 VDC**	2C
	NOT OK Does **not** meet specifications.	2B-1



19400751

STEP 2B-1: Check the voltage from the ECM.

⚠CAUTION⚠

To avoid damaging the new ECM, all other active fault codes must be investigated prior to replacing the ECM.

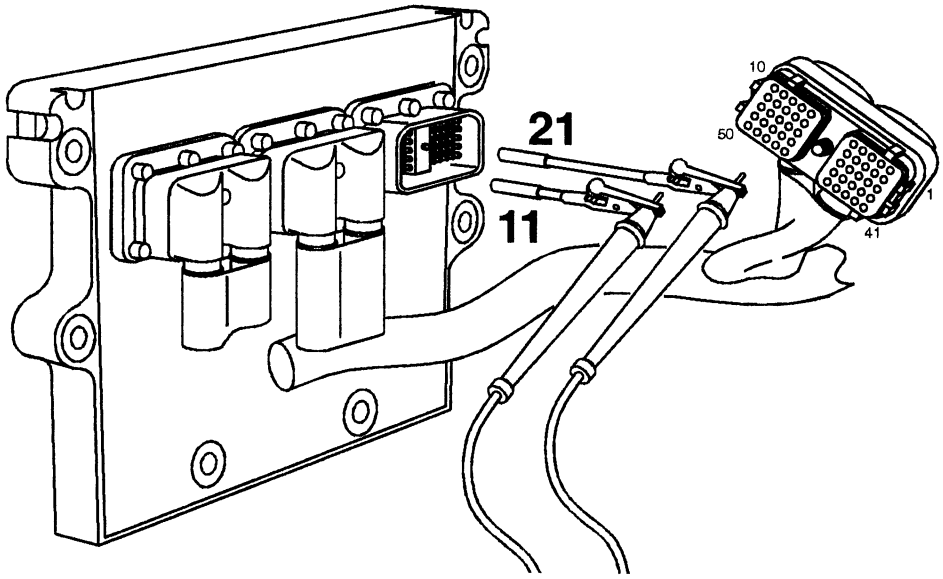
⚠CAUTION⚠

To avoid pin and harness damage use the following test lead when taking a measurement: Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the camshaft engine speed sensor from the sensor harness.
- Disconnect the sensor harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the voltage from the ECM. • Measure the voltage at the ECM from pin 11 to pin 21 of the ECM sensor port.	**OK** **(+) 4.75 to 5.25 VDC** **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	4A
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	4A



STEP 2C: Check for a short circuit to ground in the sensor supply line

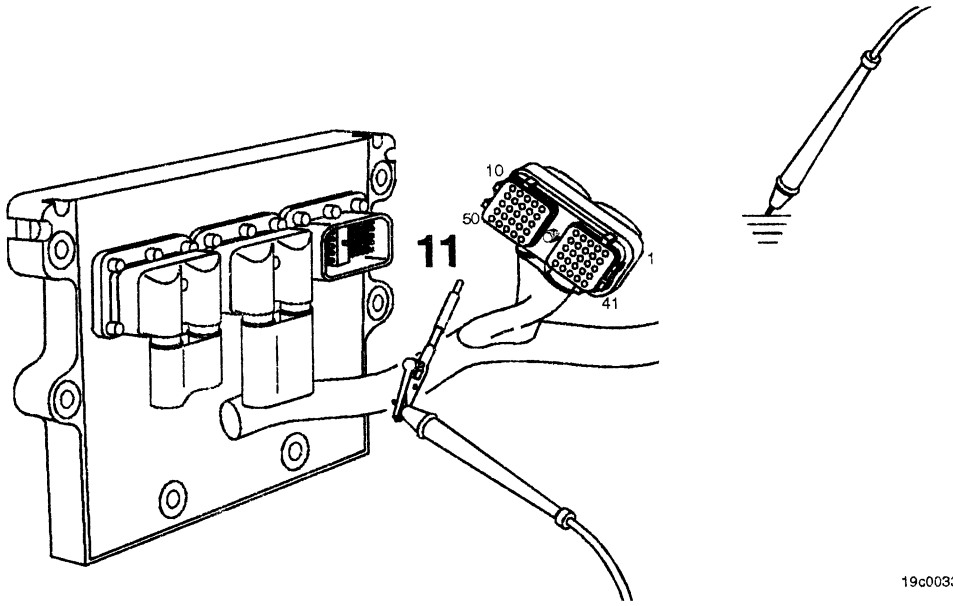
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for a short circuit to ground in the sensor supply line. • Measure the resistance from pin 11 in the sensor harness connector to engine block ground.	**OK** **More than 100k ohms**	2D
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	4A



STEP 2D: Check for a short circuit from pin to pin.

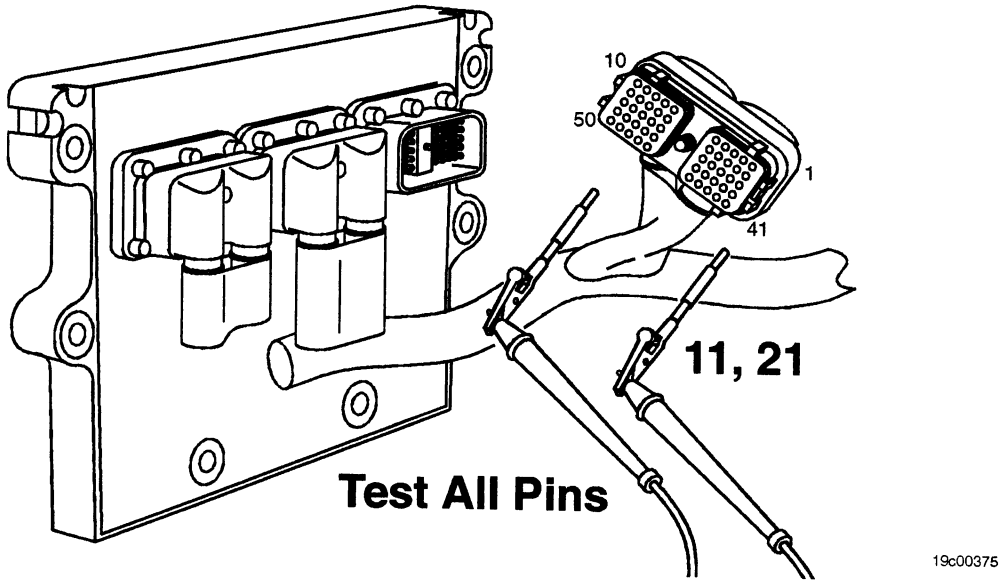
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin. • Measure the resistance from pin 11 in the sensor harness connector to all other pins in the connector. • Measure the resistance from pin 21 in the sensor harness connector to all other pins in the connector.	**OK** **More than 100k ohms**	3A
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	4A



STEP 3: Check the camshaft engine position sensor.

STEP 3A: Check for a signal from the camshaft engine position sensor.

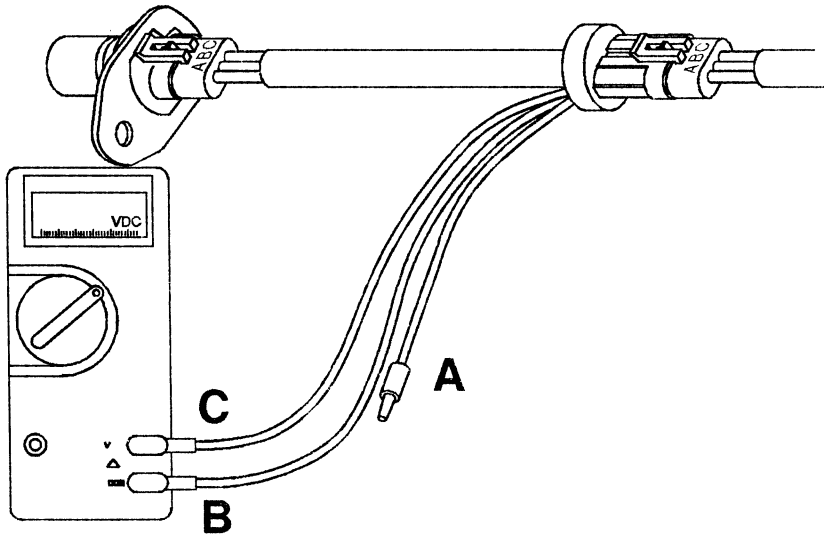
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3824775 - breakout cable.

Condition:

- Install breakout cable, Part No. 3824775, between the camshaft engine position sensor and the engine harness.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check for a signal from the camshaft engine position sensor. • Measure the voltage from the signal, pin C (or YELLOW) to the return, pin B (or BLACK) on the breakout cable, while barring the engine over.	**OK** **Signal present;** **signal should change from positive (+) 4 to 5 VDC to positive (+) 0.5 to 2.3 VDC and back about every 60° of crankshaft rotation.**	4A
	NOT OK **Replace camshaft engine position sensor** Refer to Procedure 019-038.	4A



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STEP 4: Clear the fault codes.

STEP 4A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify Fault Code 496 is inactive.	**OK** **Fault Code 496 inactive**	4B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location if all the steps have been completed and checked again.	1A

STEP 4B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

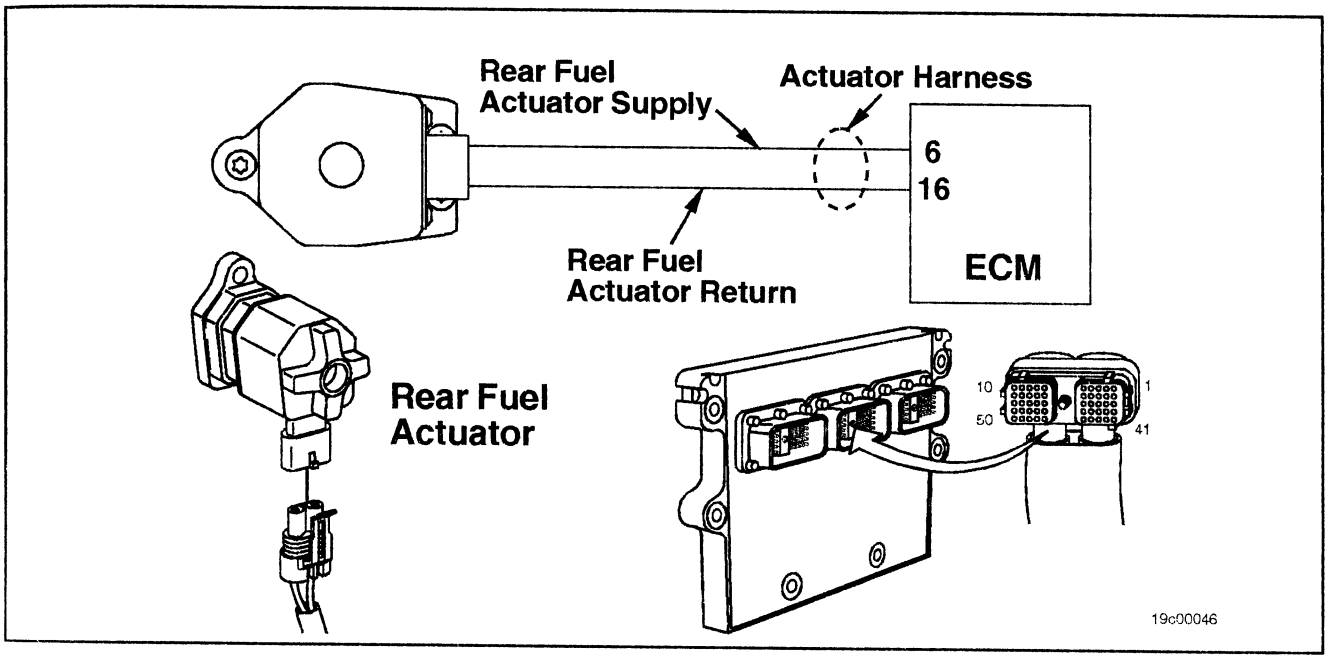
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 486

Fuel System Underfueling

CODES	REASON	EFFECT
Fault Code: 486 PID(P), SID(S): P129 SPN: 1349 FMI: 1/18 Lamp: Yellow	Unexpectedly low rail pressure was detected on the rear three cylinders.	Low power or rough idle.

Hydraulic Fuel System



Circuit Description:

The electronic control module (ECM) supplies voltage to open the fueling actuators for a short length of time. This allows a short pulse of fuel to flow to the injector. The injector then injects this fuel into the cylinder for combustion.

Component Location:

The rear fueling actuators are located on the fuel delivery housing below the air inlet horn. It is the actuator that is closest to the rear of the engine. The injectors are located in the cylinder head under the valve cover.

Shop Talk:

The ECM measures the amount of fuel metered into the injector by using the rear rail pressure sensor. If the amount of fuel is below what the ECM expected, the fault code is activated.

TROUBLESHOOTING SUMMARY

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check for active fault codes.		
STEP 1A: Inspect for Fault Codes 396, 397, and 482 or high inactive counts.	Fault Codes 396, 397, and 482 are not active	
STEP 2: Check for air in the pressure-side fuel.		
STEP 2A: Inspect for air in the pressure-side fuel.	No air in fuel	
STEP 3: Check the rear fueling actuators.		
STEP 3A: Inspect the rear fueling actuators.	Fault Code 486 goes inactive	
STEP 4: Check the injector o-rings.		
STEP 4A: Inspect the bottom two injector o-rings on the rear three cylinders.	The o-rings are OK	
STEP 5: Check the fuel passages in the head.		
STEP 5A: Inspect the fuel passages in the rear of the head.	No leaks to the drain passage, crankcase, cylinders, or coolant system	
STEP 6: Clear the fault codes.		
STEP 6A: Disable the fault code.	Fault Code 486 inactive	
STEP 6B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check for active fault codes.

STEP 1A: Inspect for Fault Codes 396, 397, and 482 or high inactive counts.

Condition:
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check for active or high counts of inactive fault codes.	**OK** **Fault Codes 396, 397, and 482 are not active**	2A
	NOT OK Fault Codes 396, 397, and 482 are active.	Refer to Fault Codes 396, 397, and 482

STEP 2: Check for air in the pressure-side fuel.

STEP 2A: Inspect for air in the pressure-side fuel.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Check for air in the pressure-side fuel.	**OK** **No air in fuel**	3A
	NOT OK **Air in fuel** Refer to Procedure 006-003, in the Trouble-shooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239.	6A

STEP 3: Check the rear fueling actuators.

STEP 3A: Inspect the rear fueling actuators.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Replace the rear fueling actuators. • Refer to Procedure 019-110. • Check that Fault Code 486 goes inactive.	**OK** **Fault Code 486 goes inactive**	6A
	NOT OK **Reinstall the rear fueling actuator** Refer to Procedure 019-110.	4A

STEP 4: Check the injector o-rings.

STEP 4A: Inspect the bottom two injector o-rings on the rear three cylinders.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Inspect for nicks or tears on the bottom two o-rings. • Check that o-rings are in good condition.	**OK** **The o-rings are OK**	5A
	NOT OK **Replace the o-rings** Refer to Procedure 005-011 in the Trouble-shooting and Repair Manual, Signature, ISX and QSX15 Engines Bulletin No. 3666239.	6A

STEP 5: Check the fuel passages in the head.

STEP 5A: Inspect the fuel passages in the rear of the head.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Inspect the rear of the head for leaks or obstructions.	**OK** **No leaks to the drain passage, crankcase, cylinders, or coolant system**	6A
	NOT OK Correct the problem. Refer to the Troubleshooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239.	6A

STEP 6: Clear the fault codes.

STEP 6A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it run above 1000 rpm for at least 1 minute. • Using INSITE™, verify Fault Code 486 is inactive	**OK** **Fault Code 486 inactive**	6B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location if all the steps have been completed and checked again.	1A

STEP 6B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

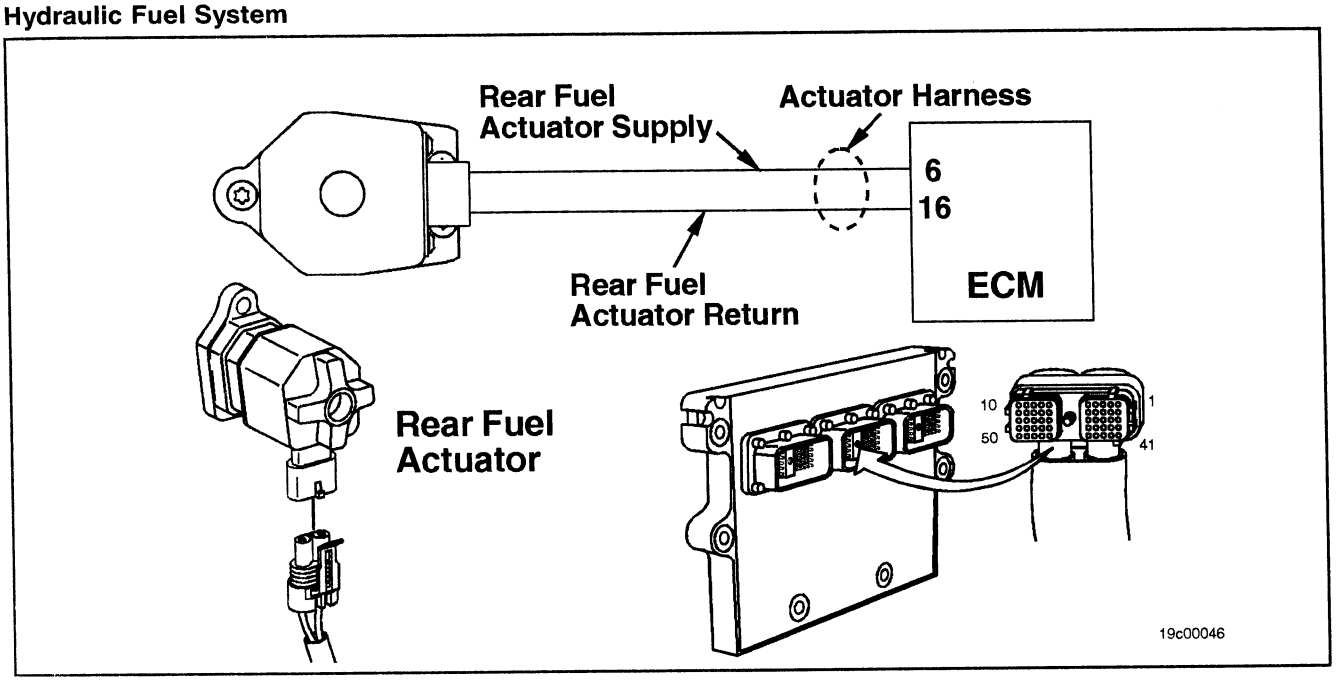
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 485

Fuel System Overfueling

CODES	REASON	EFFECT
Fault Code: 485 PID(P), SID(S): P129 SPN: 1349 FMI: 0/16 Lamp: Red	Unexpectedly high rail pressure was detected on the rear three cylinders.	Engine will return to idle speed, then **only** idle or shut down.

Hydraulic Fuel System



Circuit Description:

The electronic control module (ECM) supplies voltage to open the fueling actuators for a short length of time. This allows a short pulse of fuel to flow to the injector. The injector then injects this fuel into the cylinder for combustion.

Component Location:

The rear fueling actuators are located on the fuel delivery housing below the air inlet horn. It is the actuator that is closest to the rear of the engine. The injectors are located in the cylinder head under the valve cover.

Shop Talk:

The ECM measures the amount of fuel metered into the injector by using the rear rail pressure sensor. If the amount of fuel is above what the ECM expected, the fault code is activated.

TROUBLESHOOTING SUMMARY

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check for active fault codes.		
STEP 1A: Inspect for Fault Code 449 or high inactive counts.	Fault Code 449 inactive	
STEP 1A-1: Check for air in the pressure-side fuel.	No air in fuel	
STEP 1A-2: Measure for drain line restriction.	Less than 4.0 in Hg	
STEP 2: Check the rear fueling actuators.		
STEP 2A: Inspect the rear fueling actuators.	Fault Code 485 inactive	
STEP 3: Clear the fault codes.		
STEP 3A: Disable the fault code.	Fault Code 485 inactive	
STEP 3B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check for active fault codes.

STEP 1A: Inspect for Fault Code 449 or high inactive counts.

Condition:
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Read the fault codes using INSITE™.	**OK** **Fault Code 449 inactive**	1A-1
	NOT OK Fault Code 449 active.	Fault Code 449

STEP 1A-1: Check for air in the pressure-side fuel.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Inspect for air in the pressure-side fuel.	**OK** **No air in fuel**	1A-2
	NOT OK **Air in fuel** Refer to Procedure 006-003 in the Troubleshooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239.	3A

STEP 1A-2: Measure for drain line restriction

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Measure for drain line restriction.	**OK** **Less than 4.0 in Hg**	2A
	NOT OK **More than 4.0 in Hg** Refer to Procedure 006-012 in the Troubleshooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239.	3A

STEP 2: Check the rear fueling actuators.

STEP 2A: Inspect the rear fueling actuators.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Replace the rear fueling actuators.	**OK** **Fault Code 485 inactive**	3A
	NOT OK **Reinstall the original rear fueling actuators** Refer to Procedure 019-110.	3A

STEP 3: Clear the fault codes.

STEP 3A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and run above 1000 rpm for 1 minute. • Using INSITE™, verify Fault Code 485 inactive	**OK** **Fault Code 485 inactive**	3B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location if all the steps have been completed and checked again.	1A

STEP 3B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

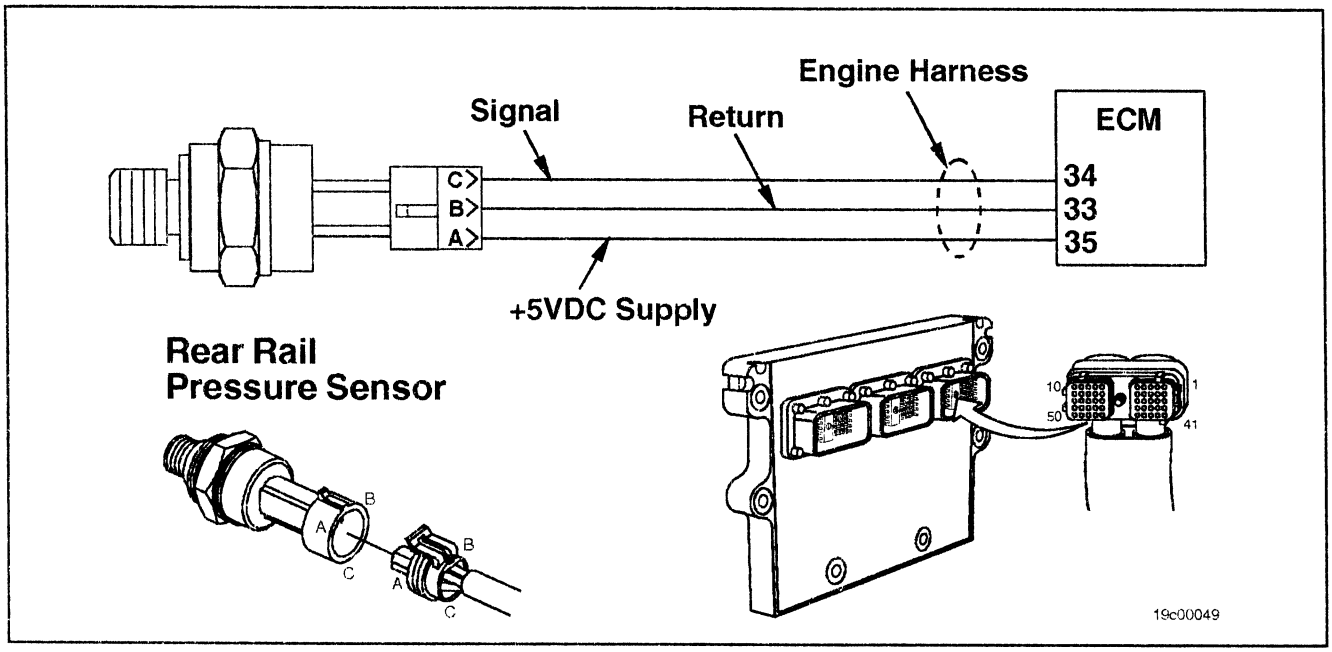
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 484

Rear Rail Pressure Sensor Circuit

CODES	REASON	EFFECT
Fault Code: 484 PID(P), SID(S): P129 SPN: 1349 FMI: 4/4 Lamp: Yellow	Low voltage detected on the rear rail pressure sensor circuit.	Engine will run derated.

Rear Rail Pressure Sensor Circuit



Circuit Description:

The rear rail pressure sensor provides the rail pressure signal to the electronic control module (ECM).

Component Location:

The rear rail pressure sensor is located on the fuel delivery housing below the gear pump.

Shop Talk:

This fault could be caused by the signal wire shorted to ground, the supply wire shorted to ground, an open circuit in the supply wire, an open circuit in the signal wire, a failed sensor, or a faulty ECM power supply.

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead
Part No. 3824774 - breakout cable.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check for active fault codes.		
STEP 1A: Read the fault codes.	Fault Code 187 inactive	
STEP 2: Check the rear rail pressure sensor.		
STEP 2A: Inspect the engine harness and sensor connector pins.	No damaged pins	
STEP 2B: Read the fault codes.	Fault Code 484 inactive	
STEP 2C: Check the supply voltage.	(+) 4.75 to 5.25 VDC	
STEP 2C-1: Measure the voltage from the ECM.	(+) 4.75 to 5.25 VDC	
STEP 2D: Check the signal voltage.	(+) 0.5 to 4.7 VDC	
STEP 2D-1: Check for a short circuit to ground.	More than 100k ohms	
STEP 2D-2: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 3: Check the sensor harness.		
STEP 3A: Inspect the sensor harness connector pins and the ECM for damage.	No damaged pins	
STEP 3B: Read the fault codes.	Fault Code 484 inactive	
STEP 3C: Check for an open circuit in the signal wire.	Less than 10 ohms	
STEP 4: Check for an ECM response.		
STEP 4A: Check for the appropriate ECM response.	Fault Code 484 inactive and Fault Code 483 active	
STEP 5: Clear the fault codes.		
STEP 5A: Disable the fault code.	Fault Code 484 inactive	
STEP 5B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check for active fault codes.

STEP 1A: Read the fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check for active fault codes. • Using INSITE™, read the fault codes.	**OK** **Fault Code 187 inactive**	2A
	NOT OK Fault Code 187 active.	Fault Code 187

STEP 2: Check the rear rail pressure sensor.

STEP 2A: Inspect the engine harness and sensor connector pins.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the rear rail pressure sensor from the engine harness.

Action	Specifications/Repair	Next Step
Inspect the engine harness and sensor connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	2B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-203 or 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	5A

STEP 2B: Read the fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start the engine and let it idle for 1 minute. • Read the fault codes using INSITE™.	**OK** **Fault Code 484 inactive**	5B
	NOT OK Fault Code 484 active.	2C

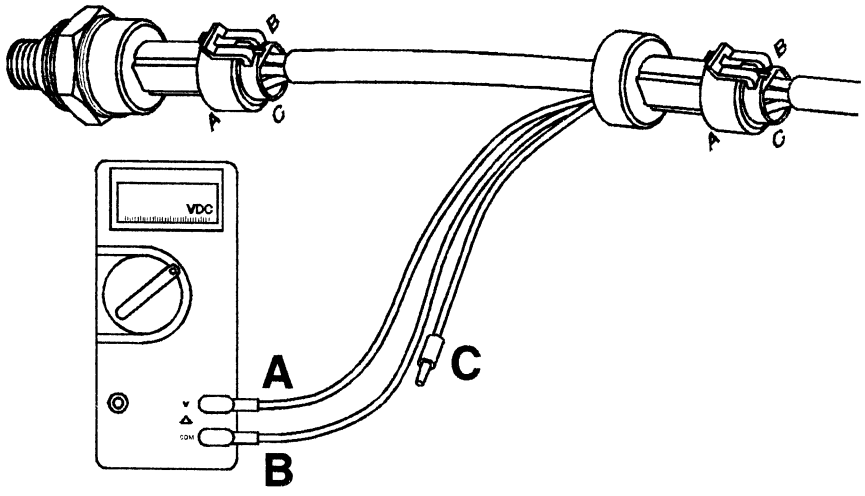
STEP 2C: Check the supply voltage.

⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3824774 - breakout cable.

Condition:
- Install breakout cable, Part No. 3824774, between the sensor and the engine harness connector.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the supply voltage. • Measure the supply voltage by installing the breakout cable's supply, pin A (or RED) and return, pin B (or BLACK) connectors into the multimeter.	**OK** **(+) 4.75 to 5.25 VDC**	2D
	NOT OK Does **not** meet specifications.	2C-1



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STEP 2C-1: Measure the voltage from the ECM.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

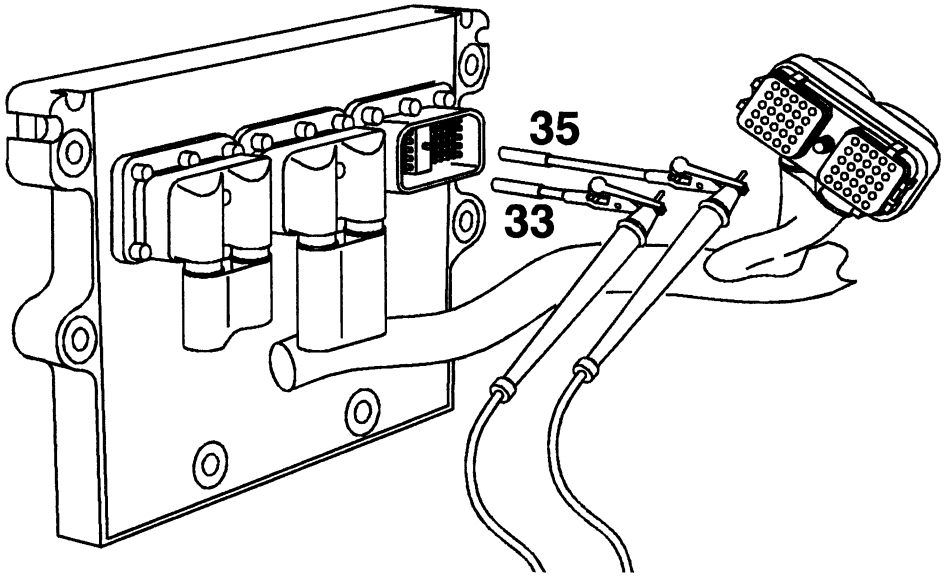
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the sensor harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Measure the voltage from the ECM. • Measure the voltage at the ECM from pin 35 to pin 33 of the ECM sensor port.	**OK** **(+) 4.75 to 5.25 VDC** **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	5A
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	5A



STEP 2D: Check the signal voltage.

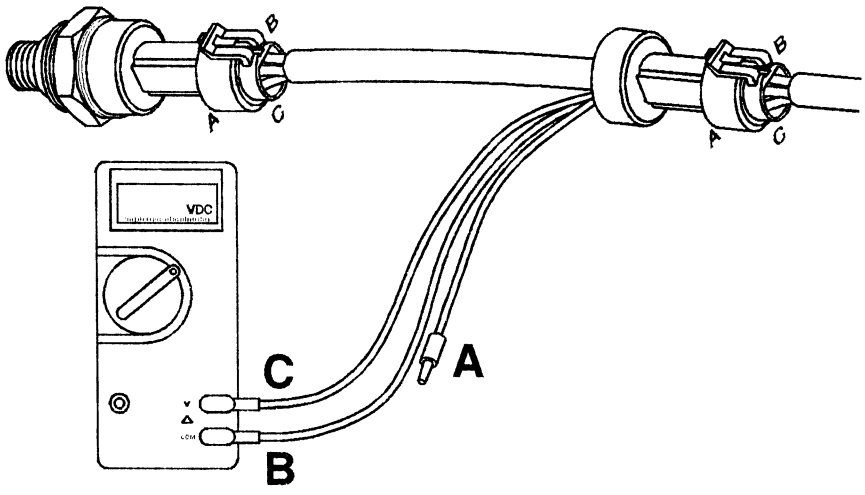
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3824774 - breakout cable.

Condition:

- Disconnect the rear rail pressure sensor from the engine harness.
- Install the breakout cable, Part No. 3824774, between the engine harness and the rear rail pressure sensor.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the signal voltage. • Measure the signal voltage by installing the breakout cable's signal pin C (or YELLOW) and return pin B (or BLACK) connectors into the multimeter.	**OK** **(+) 0.5 to 4.7 VDC**	2D-1
	NOT OK Does **not** meet specifications.	3A



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STEP 2D-1: Check for a short circuit to ground.

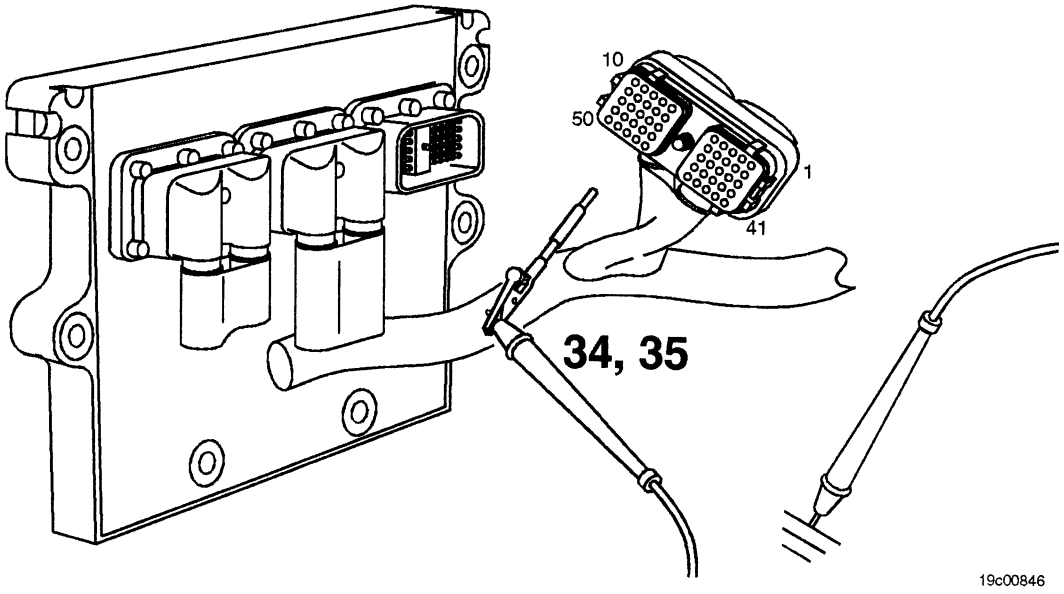
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the rear rail pressure sensor from the engine harness.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for a short circuit to ground. • Measure the resistance from pin 34 of the sensor harness connector to engine block ground. • Measure the resistance from pin 35 of the sensor harness connector to engine block ground.	**OK** **More than 100k ohms**	2D-2
	NOT OK **Replace the engine harness** Refer to Procedure 019-043.	5A



STEP 2D-2: Check for a short circuit from pin to pin.

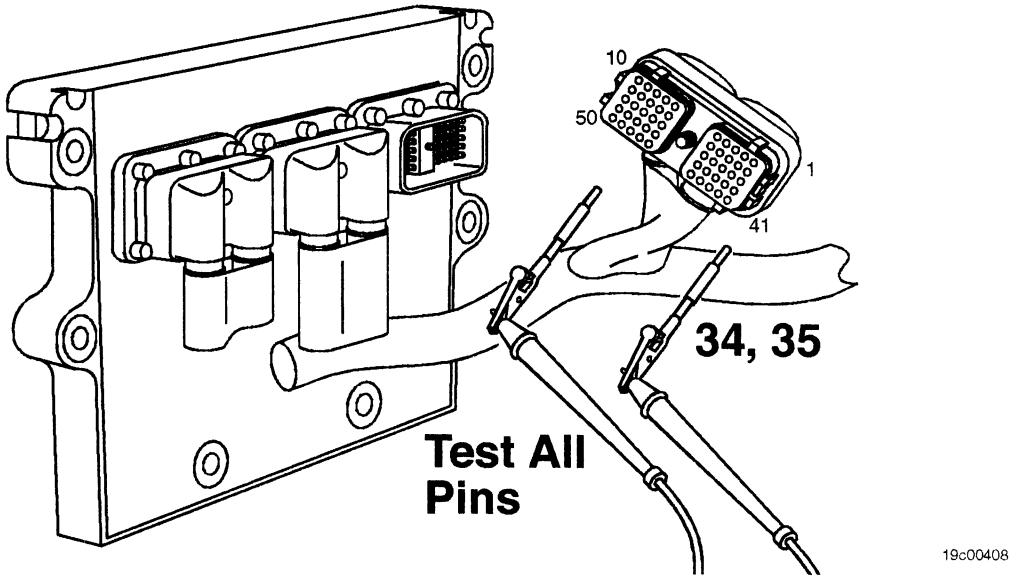
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the engine harness from the rear rail pressure sensor.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin. • Measure the resistance from pin 34 of the sensor harness connector to all other pins in the connector. • Measure the resistance from pin 35 of the sensor harness connector to all other pins in the connector.	**OK** **More than 100k ohms** **Replace the rear rail pressure sensor** Refer to Procedure 019-115.	5A
	NOT OK **Replace the engine harness** Refer to Procedure 019-043.	5A



STEP 3: Check the sensor harness.

STEP 3A: Inspect the sensor harness connector pins and the ECM for damage.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the rear rail pressure sensor from the engine harness.

Action	Specifications/Repair	Next Step
Inspect the sensor harness connector pins and the ECM for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	3B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-203 or 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	5A

STEP 3B: Read the fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start the engine and let it idle for 1 minute. • Read the fault codes using INSITE™.	**OK** **Fault Code 484 inactive**	5B
	NOT OK Fault Code 484 active.	3C

STEP 3C: Check for an open circuit in the signal wire.

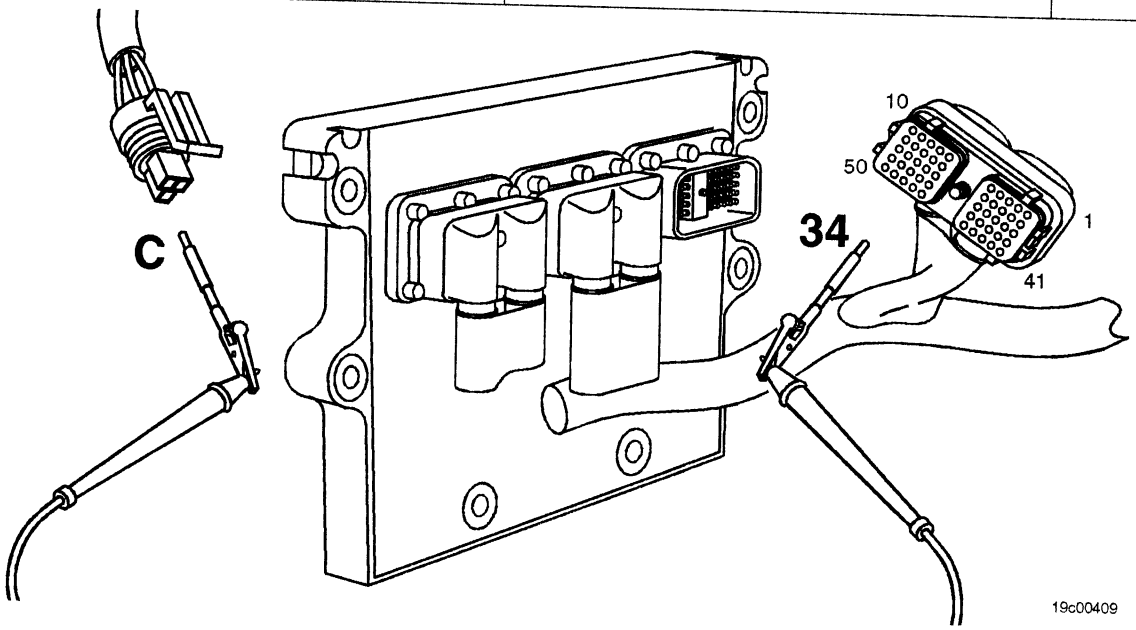
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the engine harness from the rear rail pressure sensor.

Action	Specifications/Repair	Next Step
Check for an open circuit in the signal wire. • Measure the resistance from pin 34 of the sensor harness connector to pin C (or 3) of the rear rail pressure sensor connector.	**OK** **Less than 10 ohms** **Replace the rear rail pressure sensor** Refer to Procedure 019-115.	4A
	NOT OK **Repair or replace the sensor harness** • Repair the sensor harness. Refer to Procedure 019-250. • Replace the sensor harness. Refer to Procedure 019-043.	5A



STEP 4: Check for an ECM response.

STEP 4A: Check for the appropriate ECM response.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

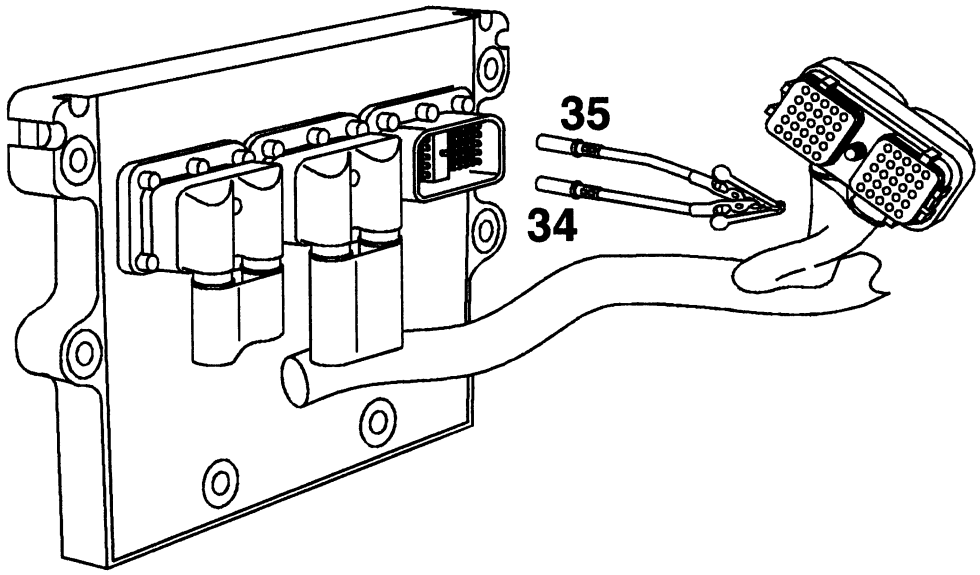
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the ECM response. • Install Part No. 3822917 as a jumper wire between pin 35 and pin 34 in the ECM sensor harness port. • Read the fault codes using INSITE™.	**OK** **Fault Code 484 inactive and** **Fault Code 483 active**	5A
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	5A



STEP 5: Clear the fault codes.

STEP 5A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Using INSITE™, verify that Fault Code 484 is inactive.	**OK** **Fault Code 484 inactive**	5B
	NOT OK Return to troubleshooting steps or contact your local Cummins Authorized Repair Location if all steps have been completed and checked again.	1A

STEP 5B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

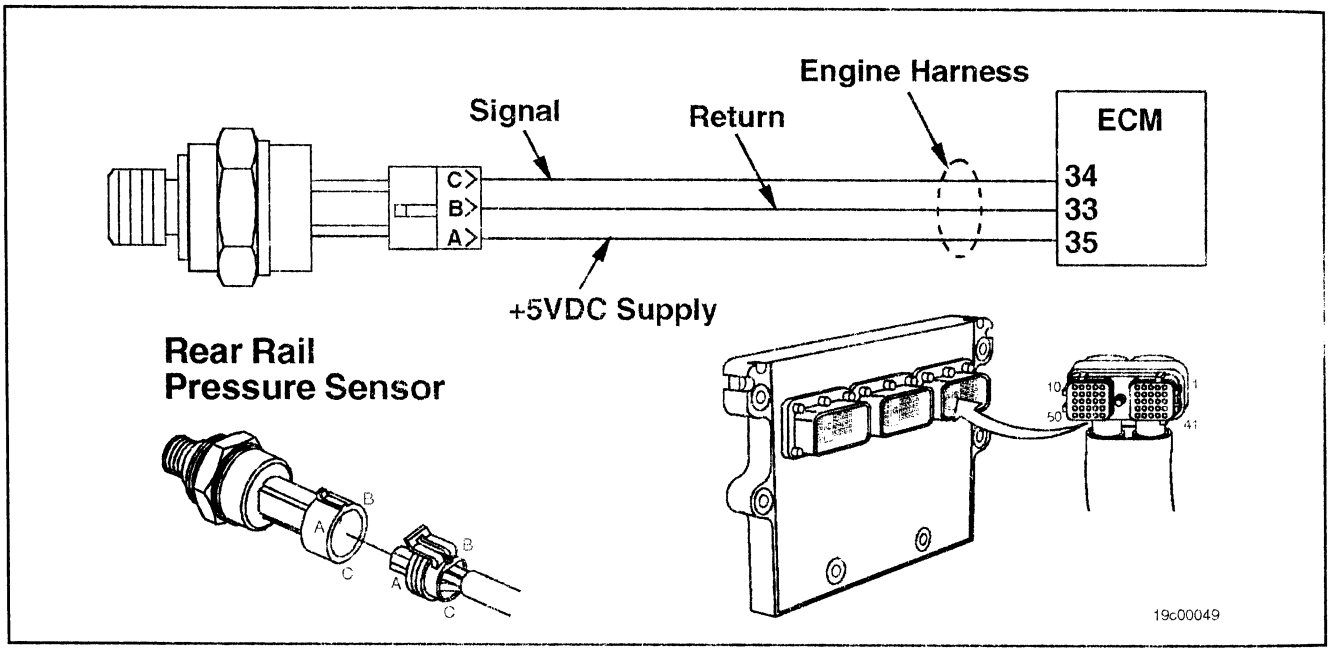
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Using INSITE™, clear the inactive fault codes.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 483

Rear Rail Pressure Sensor Circuit

CODES	REASON	EFFECT
Fault Code: 483 PID(P), SID(S): P129 SPN: 1349 FMI: 3/3 Lamp: Yellow	High voltage detected on the rear rail pressure sensor circuit.	Engine will run derated.

Rear Rail Pressure Sensor



Circuit Description:

The rear rail pressure sensor provides the rail pressure signal to the electronic control module (ECM).

Component Location:

The rear rail pressure sensor is located on the rear of the fuel delivery housing.

Shop Talk:

This fault could be caused by the return or signal wire shorted to positive (+) 5 VDC or positive (+) 12 VDC, an open circuit in the return wire, or a failed sensor.

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging the new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3824774 - breakout cable.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the rear rail pressure sensor.		
STEP 1A: Inspect the engine harness and sensor connector pins.	No damaged pins	
STEP 1B: Read the fault codes.	Fault Code 483 inactive	
STEP 1C: Check the supply voltage.	(+) 4.75 to 5.25 VDC	
STEP 1C-1: Measure the voltage from the ECM.	(+) 4.75 to 5.25 VDC	
STEP 1D: Check the signal voltage.	(+) 0.5 to 4.7 VDC	
STEP 2: Check the sensor harness.		
STEP 2A: Inspect the sensor harness connector pins and the ECM for damage.	No damaged pins	
STEP 2B: Read the fault codes.	Fault Code 483 inactive	
STEP 2C: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 2D: Check for an open circuit in the return wire.	Less than 10 ohms	
STEP 3: Check for an ECM response.		
STEP 3A: Check for the appropriate ECM response.	Fault Code 483 inactive and Fault Code 484 active	
STEP 4: Clear the fault codes.		
STEP 4A: Disable the fault code.	Fault Code 483 inactive	
STEP 4B: Clear the inactive fault codes.	All faults codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check the rear rail pressure sensor.

STEP 1A: Inspect the engine harness and sensor connector pins.

Condition:
- Turn keyswitch OFF.
- Disconnect the rear rail pressure sensor from the engine harness.

Action	Specifications/Repair	Next Step
Inspect the sensor harness and sensor connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	1B
	NOT OK **Repair the damaged pins** Replace the 3-pin Metri-Pack connector or the sensor, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Replace the 3-pin Metri-Pack connector. Refer to Procedure 019-203. • Replace the rear rail pressure sensor. Refer to Procedure 019-115.	4A

STEP 1B: Read the fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start the engine and let it idle for 1 minute. • Read the fault codes using INSITE™.	**OK** **Fault Code 483 inactive**	4B
	NOT OK Fault Code 483 active.	1C

STEP 1C: Check the supply voltage.

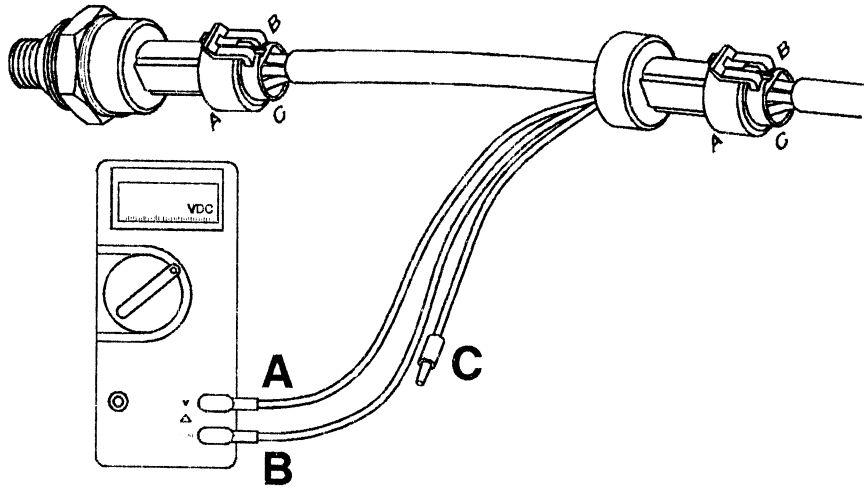
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3824774 - breakout cable.

Condition:

- Install breakout cable, Part No. 3824774, between the sensor and the engine harness connector.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the supply voltage. • Measure the supply voltage by installing the breakout cable's supply pin A (or RED) and return pin B (or BLACK) connectors into the multimeter.	**OK** **(+) 4.75 to 5.25 VDC**	1D
	NOT OK Does **not** meet specifications.	1C-1



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STEP 1C-1: Measure the voltage from the ECM.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

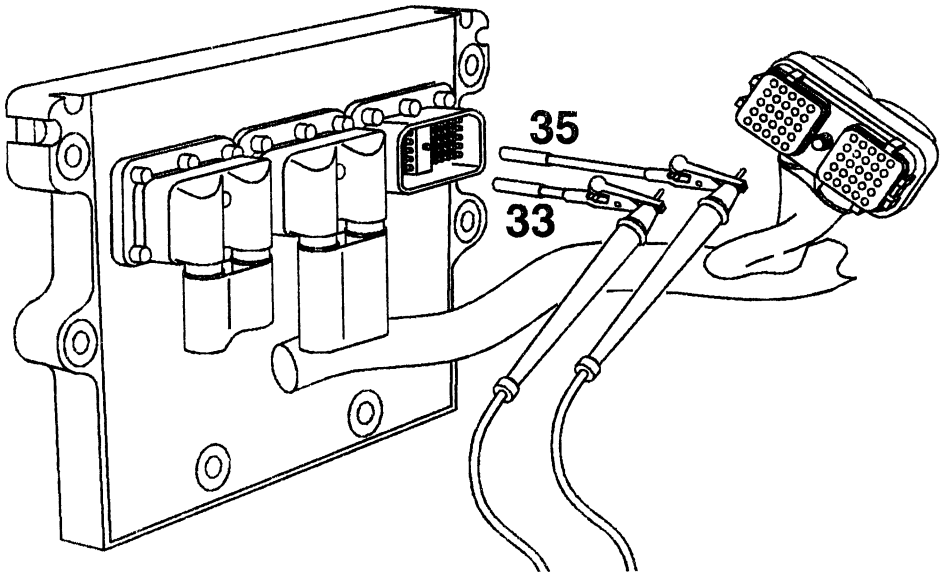
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the sensor harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Measure the voltage from the ECM. • Measure the voltage at the ECM from pin 35 to pin 33 of the ECM sensor port.	**OK** **(+) 4.75 to 5.25 VDC** **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	4A
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	4A



STEP 1D: Check the signal voltage.

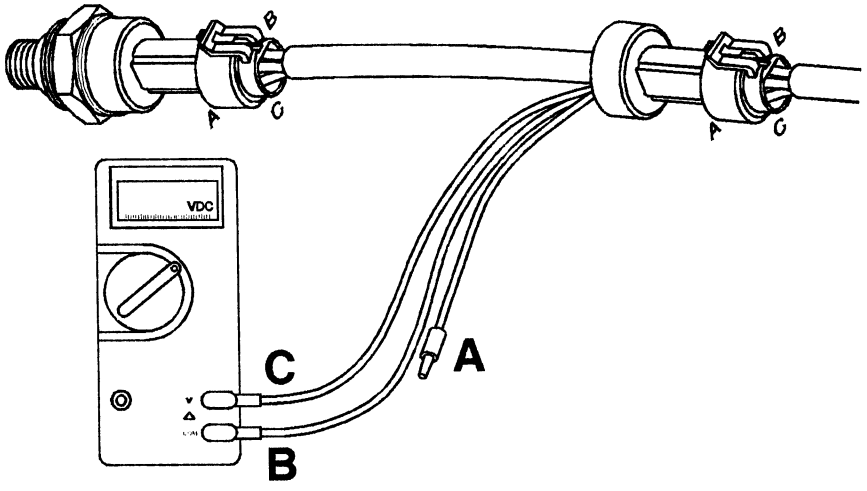
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3824774 - breakout cable.

Condition:

- Install breakout cable, Part No. 3824774, between the engine harness connector and the rear rail pressure sensor.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the signal voltage. • Measure the signal voltage by installing the breakout cable's signal pin C (or YELLOW) and return pin B (or BLACK) connectors into the multimeter.	**OK** **(+) 0.5 to 4.7 VDC**	3A
	NOT OK Does **not** meet specifications.	2A



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STEP 2: Check the sensor harness.

STEP 2A: Inspect the sensor harness connector pins and the ECM for damage.

⚠CAUTION⚠

To avoid damaging the new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the sensor harness connector pins and the ECM for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	2B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	4A

STEP 2B: Read the fault codes

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start the engine and let it idle for 1 minute. • Read the fault codes.	**OK** **Fault Code 483 inactive**	4B
	NOT OK Fault Code 483 active.	2C

STEP 2C: Check for a short circuit from pin to pin.

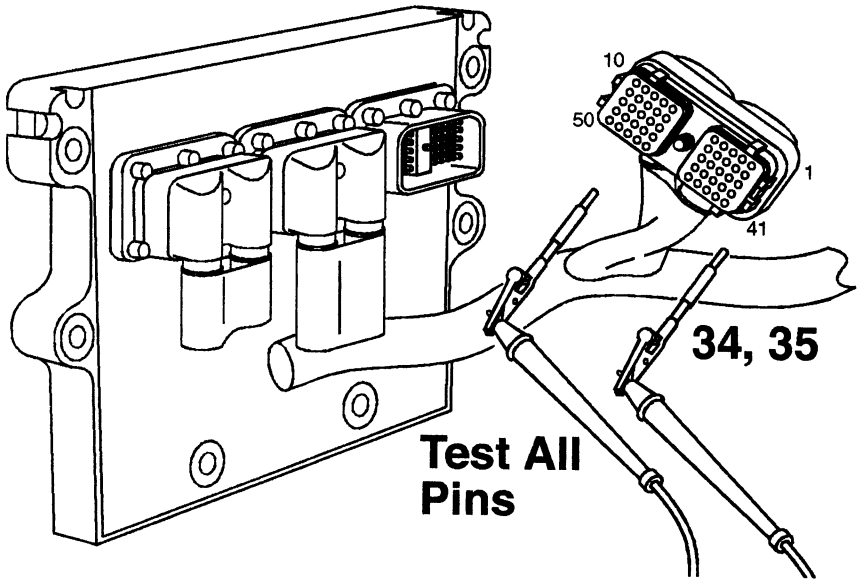
⚠CAUTION⚠

To avoid pin and harness, damage use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the rear rail pressure sensor from the sensor harness.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin. • Measure the resistance between pin 35 in the sensor harness connector to all other pins in the connector. • Measure the resistance between pin 34 in the sensor harness connector to all other pins in the connector.	**OK** **More than 100k ohms**	2D
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	4A



STEP 2D: Check for an open circuit in the return wire.

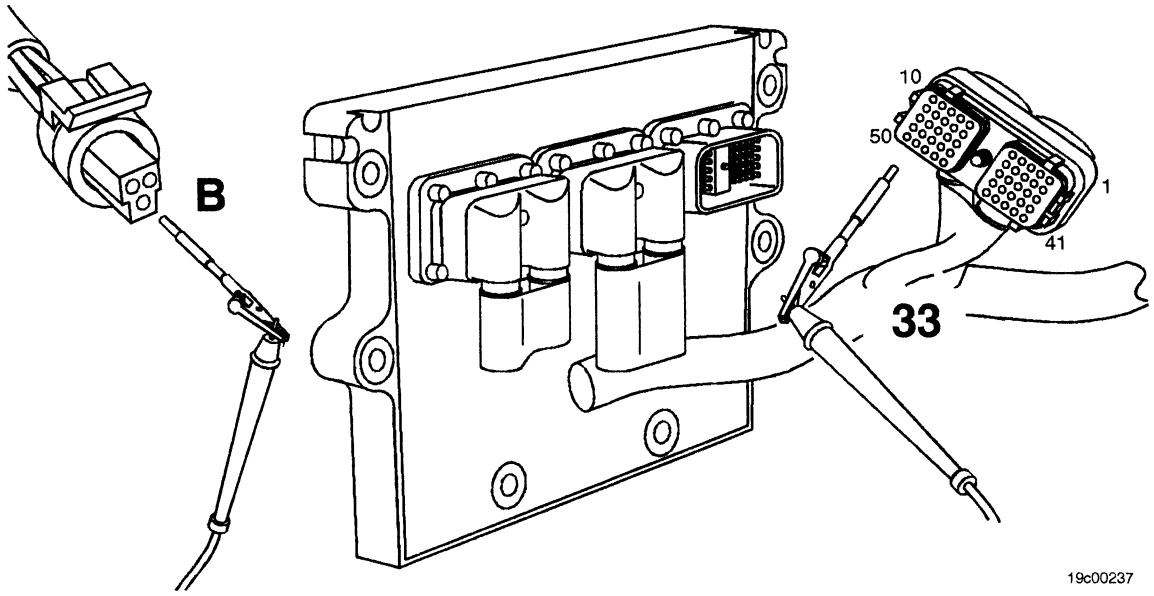
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the rear rail pressure sensor from the sensor harness.

Action	Specifications/Repair	Next Step
Check for an open circuit in the return wire. • Measure the resistance from pin 33 on the ECM sensor harness connector to pin B (or 2) on the rear rail pressure sensor harness connector.	**OK** **Less than 10 ohms** **Replace the rear rail pressure sensor** Refer to Procedure 019-115.	4A
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-202 or 019-250. • Replace the engine harness. Refer to Procedure 019-043.	4A



STEP 3: Check for an ECM response.

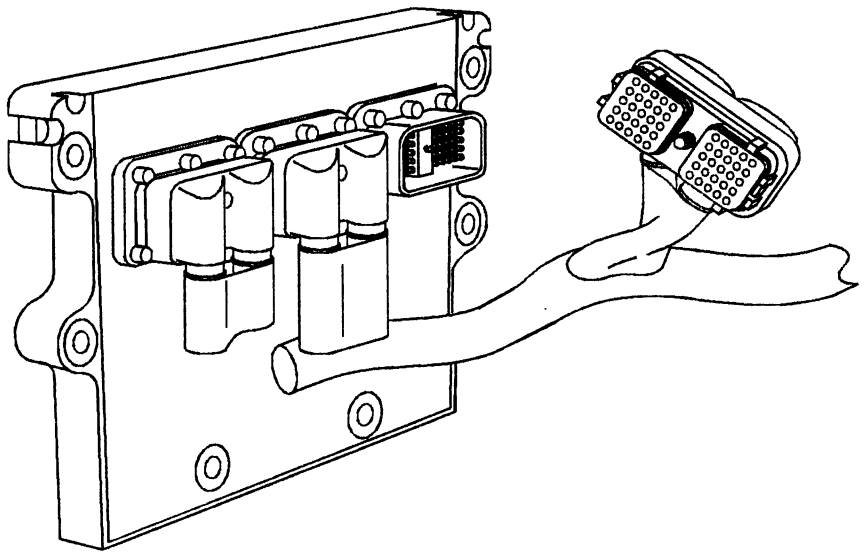
STEP 3A: Check for the appropriate ECM response.

⚠CAUTION⚠

To avoid damaging the new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Disconnect the sensor harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check for the appropriate ECM response. • Read the fault codes using INSITE™.	**OK** **Fault Code 483 inactive and** **Fault Code 484 active**	4A
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	4A



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STEP 4: Clear the fault codes.

STEP 4A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify that Fault Code 483 is inactive.	**OK** **Fault Code 483 inactive**	4B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location, if all steps have been completed and checked again.	1A

STEP 4B: Clear the inactive fault codes.

Condition:
- Connect all components
- Turn keyswitch ON.

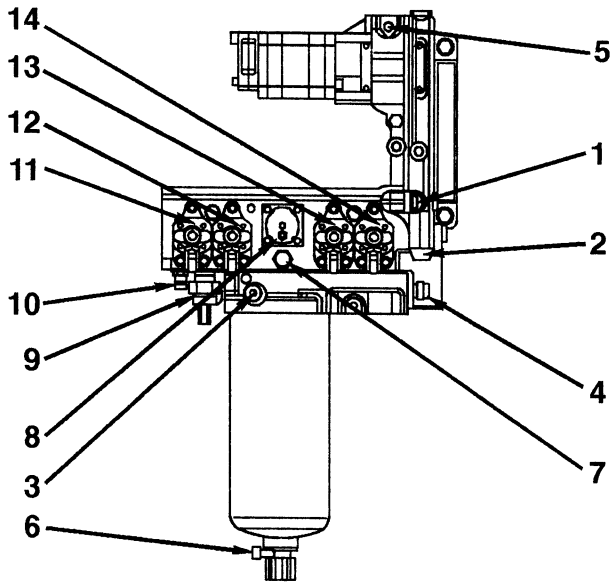
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Use INSITE™ to clear all inactive fault codes.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 482

Low Fuel Pressure

CODES	REASON	EFFECT
Fault Code: 482 PID(P), SID(S): P094 SPN: 94 FMI: 1/18 Lamp: Yellow	Low fuel supply pressure was detected at the fuel pressure sensor.	Engine does **not** start, has low power, may have white smoke, or run rough.

Fuel System Circuit



Circuit Description:

The gear pump draws fuel from the fuel tank through the fuel filter and antidrainback valve. The gear pump develops 100 to 320 psi of fuel pressure. The fuel flows through the fuel filter screen and fuel shutoff valve to the fueling and timing actuators and the fuel pressure sensor.

Component Location:

Hydraulic Fuel System Circuit Callouts							
1	320-psi Pressure RegulatorPriming By-pass Valve	5	Quick-Disconnect Pressure Tap-Suction Side	9	Fuel Pressure Sensor	13	Rear Timing Actuator
2	36 mc Filter Screen	6	WIF Sensor	10	Quick-Disconnect Pressure Tap-Pressure Side	14	Rear Rail Actuator
3	Fuel Inlet Restriction Sensor	7	250-psi Pressure Regulator	11	Front Rail Actuator		
4	Fuel Inlet	8	Fuel Shutoff Valve	12	Front Timing Actuator		

The 250 psi regulator controls the fuel pressure. All components are located on the fuel delivery housing on the intake side of the engine

Shop Talk:

The fuel pressure is monitored by the electronic control module (ECM). If the fuel pressure is outside an acceptable range, the fault code is activated. The acceptable range of fuel pressure can be viewed as "Fuel Pressure Lower Limit" and "Fuel Pressure Upper Limit" in INSITE™ using the monitor screen. The fault will log quickly for large differences in pressure and slower for small differences in pressure.

TROUBLESHOOTING SUMMARY

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check for active fault codes.		
STEP 1A: Check for active fault codes.	Fault Code 254 or 259 inactive	
STEP 2: Check fuel supply.		
STEP 2A: Check fuel supply.	Fuel in tank	
STEP 3: Check engine operation.		
STEP 3A: Check engine operation.	Engine starts	
STEP 4: Check fuel inlet restriction.		
STEP 4A: Check fuel inlet restriction.	Clean filter: 8 in Hg (max) Dirty filter: 12 in Hg (max)	
STEP 4A-1: Replace fuel filter and check fuel inlet restriction pressure.	Less than 8 in Hg (max)	
STEP 4A-2: Inspect the fuel lines and supply tank for debris and obstructions.	Lines clear	
STEP 5: Inspect the check valves.		
STEP 5A: Remove and inspect check valves for debris.	Check valves clear	
STEP 6: Check for air in the pressure-side fuel.		
STEP 6A: Check for air in the pressure-side fuel.	No air in the pressure-side fuel	
STEP 7: Check the fuel pressure sensor accuracy.		
STEP 7A: Verify the fuel pressure sensor accuracy by comparing the reading in INSITE™ to a mechanical gauge connected to the pressure-side Compuchek™ fitting.	Fuel pressure while cranking engine: at least 50 psi Fuel pressure at idle: (600-700 rpm): 250 to 265 psi Fuel pressure at 2000 rpm: 250 to 285 psi NOTE: Gauge and sensor should read within 10 psi	
STEP 8: Inspect the filter screen.		
STEP 8A: Inspect the filter screen for debris.	No debris in the filter screen	
STEP 9: Check for fuel shutoff valve restriction.		
STEP 9A: Check for mechanical restriction of the fuel shutoff valve; disassemble fuel shutoff valve and verify that parts are free to move.	Fuel shutoff valve not restricted	
STEP 10: Read the fault codes.		
STEP 10A: Read the fault codes.	Fault Code 482 inactive	

STEP 11: Read the fault codes.

STEP 11A: Read the fault codes.	Fault Code 482 inactive

STEP 12: Inspect the priming bypass valve.

STEP 12A: Inspect the priming bypass valve.	Priming bypass valve functions properly

STEP 13: Read the fault codes.

STEP 13A: Read the fault codes.	Fault Code 482 inactive

STEP 14: Inspect the gear pump.

STEP 14A: Remove and inspect the gear pump and check for sheared hex shaft or damaged gears.	No damage to gear pump

STEP 15: Check the fuel injectors.

STEP 15A: Remove and inspect the injectors for damaged or missing o-rings.	No damaged or missing injector o-rings

STEP 16: Inspect the fuel delivery housing.

STEP 16A: Inspect the fuel delivery housing for obstructions or internal leaks from the pressure-side of the pump to the drain of the inlet side of the pump.	No internal leaks or obstructions

STEP 17: Check for fuel coming out of the drain while cranking the engine.

STEP 17A: Check for fuel coming out of the drain while cranking the engine.	Fuel coming out of drain line

STEP 18: Prime the fuel system.

STEP 18A: Prime the system and verify that it maintains prime.	System holds prime
STEP 18A-1: Check for loose fittings on fuel delivery housing.	No loose fittings
STEP 18A-2: Inspect check valves for debris.	No debris in check valves

STEP 19: Check the fuel pressure sensor accuracy.

STEP 19A: Verify the fuel pressure sensor accuracy by comparing the reading in INSITE™ to a mechanical gauge connected to the pressure-side Compuchek™ fitting.	Fuel pressure while cranking engine: at least 50 psi Fuel pressure at idle: (600-700 rpm): 250 to 265 psi Fuel pressure at 2000 rpm: 250 to 285 psi NOTE: Gauge and sensor should read within 10 psi

STEP 20: Inspect the filter screen.

STEP 20A: Inspect the filter screen for debris.	No debris in the filter screen

STEP 21: Check the fuel shutoff valve.

STEP 21A: Check to see if the fuel shutoff valve is mechanically or electrically stuck closed. — Fuel shutoff valve not stuck closed

STEP 22: Read the fault codes.

STEP 22A: Read the fault codes. — Fault Code 482 inactive

STEP 23: Read the fault codes.

STEP 23A: Read the fault codes. — Fault Code 482 inactive

STEP 24: Inspect the priming bypass valve.

STEP 24A: Inspect and replace the priming bypass valve. — Priming bypass valve functions properly

STEP 25: Read the fault codes.

STEP 25A: Read the fault codes. — Fault Code 482 inactive

STEP 26: Inspect the gear pump.

STEP 26A: Remove and inspect the gear pump and check for sheared hex shaft or damaged gears. — No damage to hex shaft or gear teeth

STEP 27: Inspect the injectors.

STEP 27A: Remove and inspect the injectors for damaged or missing o-rings. — No damaged injector o-rings

STEP 28: Inspect the fuel delivery housing.

STEP 28A: Inspect the fuel delivery housing for obstructions or internal leaks from the pressure-side of the pump to the drain of the inlet side of the pump. — No internal leaks or obstructions

STEP 29: Clear the fault codes.

STEP 29A: Disable the fault code. — Fault Code 482 inactive

STEP 29B: Clear the inactive fault codes. — All fault codes cleared

TROUBLESHOOTING STEP

STEP 1: Check for active fault codes.

STEP 1A: Check for active fault codes.

Condition:
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check for active fault codes. • Using INSITE™, check for active fault codes. • Refer to the Troubleshooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239, for test procedures.	**OK** **Fault Codes 254 or 259 inactive**	2A
	NOT OK Fault Codes 254 or 259 active.	Check fault codes that are active

STEP 2: Check fuel supply.

STEP 2A: Check fuel supply.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Check fuel in tank.	**OK** **Fuel in tank**	3A
	NOT OK **No fuel in tank** Fill tank.	3A

STEP 3: Check engine operation.

STEP 3A: Check engine operation.

Condition:
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check engine operation. - Start the engine.	**OK** **Engine starts**	4A
	NOT OK Engine does **not** start.	17A

STEP 4: Check fuel inlet restriction.

STEP 4A: Check fuel inlet restriction.

Condition:
- Turn keyswitch OFF.
- Check for fuel inlet restriction.

Action	Specifications/Repair	Next Step
Check for fuel inlet restriction. - Refer to Procedure 006-020 in the Troubleshooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239.	**OK** **Clean filter: 8 in. Hg (max)** **Dirty filter: 12 in Hg (max)**	5A
	NOT OK Does **not** meet specifications.	4A-1

STEP 4A-1: Replace fuel filter and check fuel inlet restriction pressure.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Remove and replace the fuel filter. Recheck fuel inlet restriction. - Refer to the Troubleshooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239, for repair and test procedures.	**OK** **Less than 8 in Hg (max)**	29A
	NOT OK **More than 12 in Hg (max)** Does **not** meet specifications.	4A-2

STEP 4A-2: Inspect the fuel lines and supply tank for debris and obstructions.

Condition: • Turn keyswitch OFF.		
Action	**Specifications/Repair**	**Next Step**
Inspect the fuel lines and supply tank for debris and obstructions. • Refer to Procedure 006-024 in the Troubleshooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239.	**OK** **Lines clear**	29A
	NOT OK **Fuel lines and/or tank obstructed** Remove the debris or obstructions.	29A

STEP 5: Inspect the check valves.

STEP 5A: Inspect the check valves.

Condition: Turn keyswitch OFF.		
Action	**Specifications/Repair**	**Next Step**
Remove check valves and check for debris. • Refer to Procedure 005-073 in the Troubleshooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239.	**OK** **Check valves clear**	6A
	NOT OK **Clear or replace the check valves** Refer to Procedure 005-073 in the Troubleshooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239.	29A

STEP 6: Check for air in the pressure-side fuel.

STEP 6A: Check for air in the pressure-side fuel.

Condition: • Turn keyswitch OFF.		
Action	**Specifications/Repair**	**Next Step**
Check for air in the pressure-side fuel. • Refer to Procedure 006-003 in the Troubleshooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239.	**OK** **No air in the pressure-side fuel**	7A
	NOT OK **Air in pressure-side fuel** Refer to Procedure 006-003 in the Troubleshooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239.	29A

STEP 7: Check the fuel pressure sensor accuracy.

STEP 7A: Verify the fuel pressure sensor accuracy.

Condition:
- Turn keyswitch OFF.
- Install a mechanical gauge to the Compuchek™ fitting.
- Install INSITE™.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the fuel pressure while cranking the engine, running the engine at idle, and with the engine at 2000 rpm. • Refer to the Troubleshooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239, for repair and test procedures.	**OK** **Fuel pressure while cranking engine: at least 50 psi** **Fuel pressure at idle: (600-700 rpm): 250 to 265 psi** **Fuel pressure at 2000 rpm: 250 to 285 psi** **NOTE: Gauge and sensor should read within 10 psi.**	8A
	NOT OK **Replace the sensor** Refer to Procedure 019-188.	29A

STEP 8: Inspect the filter screen.

STEP 8A: Inspect the filter screen for debris.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Remove and inspect the filter screen for debris. • Refer to Procedure 006-057 in the Troubleshooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239.	**OK** **No debris in the filter screen**	9A
	NOT OK **Clean or replace the filter screen** Refer to Procedure 006-057 in the Troubleshooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239.	29A

STEP 9: Check for fuel shutoff valve restriction.

STEP 9A: Check for mechanical restriction of the fuel shutoff valve.

Condition: Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Remove and inspect the fuel shutoff valve for mechanical restriction. • Refer to Procedure 005-043 in the Troubleshooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239.	**OK** **Fuel shutoff valve not restricted** **Replace the 250 psi regulator** Refer to Procedure 005-073 in the Troubleshooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239.	10A
	NOT OK **Repair or replace the fuel shutoff valve** Refer to Procedure 019-050.	29A

STEP 10: Read the fault codes.

STEP 10A: Read the fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start the engine and let it idle for 1 minute. • Using INSITE™, read the fault codes.	**OK** **Fault Code 482 inactive**	29B
	NOT OK Fault Code 482 active. **Replace the 320 psi regulator** Refer to Procedure 005-073 in the Trouble-shooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239.	11A

STEP 11: Read the fault codes.

STEP 11A: Read the fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start the engine and let it idle for 1 minute. • Using INSITE™, read the fault codes.	**OK** **Fault Code 482 inactive**	29A
	NOT OK Fault Code 482 active.	12A

STEP 12: Inspect the priming bypass valve.

STEP 12A: Inspect the priming bypass valve.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Inspect the priming bypass valve and replace it if the fuel delivery housing matches the part number below. • Refer to Procedure 005-016 in the Trouble-shooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239. **NOTE:** Fuel delivery housing part numbers are as follows: For 12 VDC: 4001840 or 4009811 HD-129. For 24 VDC: 4001843 or 4009813 HD-129.	**OK** **Replaced priming bypass valve (if part number matched)**	13A
	NOT OK Did not replace priming bypass valve.	14A

STEP 13: Read the fault codes.

STEP 13A: Read the fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start the engine and let it idle for 1 minute. • Using INSITE™, read the fault codes.	**OK** **Fault Code 482 inactive**	29B
	NOT OK Fault Code 482 active.	14A

STEP 14: Inspect the gear pump.

STEP 14A: Remove and inspect the gear pump.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Remove and inspect the gear pump. • Refer to Procedure 005-016 in the Troubleshooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239.	**OK** **No damage to gear pump**	15A
	NOT OK **Gear pump damaged** **Replace gear pump** Refer to Procedure 005-016 in the Troubleshooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239.	29A

STEP 15: Check the fuel injectors.

STEP 15A: Remove and inspect the fuel injectors.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Remove and inspect the fuel injectors for damaged or missing o-rings. • Refer to Procedure 006-026 in the Troubleshooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239.	**OK** **No damaged or missing injector o-rings**	16A
	NOT OK **Replace damaged injector o-rings** Refer to Procedure 006-026 in the Troubleshooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239.	29A

STEP 16: Inspect the fuel delivery housing.

STEP 16A: Inspect the fuel delivery housing.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Inspect the fuel delivery housing. Inspect the fuel delivery housing for obstructions or internal leaks from the pressure-side of the pump to the drain of the inlet side of the pump. • Refer to Procedure 005-073 in the in the Troubleshooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239.	**OK** **No internal leaks or obstructions**	29A
	NOT OK **Replace the fuel delivery housing** Refer to Procedure 005-016 in the Troubleshooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239.	29A

STEP 17: Check for fuel coming out of drain while cranking the engine.

STEP 17A: Check for fuel coming out of drain while cranking the engine.

Condition:
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check for fuel coming out of drain while cranking engine. • Crank engine over while watching for fuel coming out of drain.	**OK** **Fuel coming out of drain line**	19A
	NOT OK No fuel coming out of drain line. **Replace the fuel filter** Refer to Procedure 005-016 in the Troubleshooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239.	18A

STEP 18: Prime the fuel system.

STEP 18A: Prime the fuel system.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Prime the fuel system and verify that it maintains prime. • Refer to Procedure 005-016 in the Troubleshooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239.	**OK** **System holds prime**	19A
	NOT OK System does **not** hold prime.	18A-1

STEP 18A-1: Check for loose fittings on fuel delivery housing.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Check for loose fittings on fuel delivery housing.	**OK** **No loose fittings**	18A-2
	NOT OK **Repair loose fittings**	29A

STEP 18A-2: Inspect check valves for debris.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Inspect check valves for debris. • Refer to Procedure 005-073 in the Troubleshooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239.	**OK** **No debris in check valves**	29A
	NOT OK **Clean or replace check valves** Refer to Procedure 005-073 in the Troubleshooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239.	29A

STEP 19: Check the fuel pressure sensor accuracy.

STEP 19A: Verify the fuel pressure sensor accuracy.

Condition:
- Turn keyswitch OFF.
- Install a mechanical gauge to the Compuchek™ fitting.
- Connect INSITE™.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the fuel pressure while cranking the engine. • Refer to the Troubleshooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239, for repair and test procedures.	**OK** **Fuel pressure while cranking engine: at least 50 psi** **Fuel pressure at idle: (600-700 rpm): 250 to 265 psi** **Fuel pressure at 2000 rpm: 250 to 285 psi** **NOTE: Gauge and sensor should read within 10 psi.**	20A
	NOT OK **Replace the sensor** Refer to Procedure 019-188.	29A

STEP 20: Inspect the filter screen.

STEP 20A: Inspect the filter screen for debris.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Remove and inspect the filter screen. • Remove the filter screen and inspect it for debris. Refer to Procedure 006-057 in the Troubleshooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239.	**OK** **No debris in the filter screen**	21A
	NOT OK **Clean or replace the filter screen** Refer to Procedure 006-057 in the Troubleshooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239.	29A

STEP 21: Check the fuel shutoff valve.

STEP 21A: Check the fuel shutoff valve to see if it is mechanically or electrically stuck closed.

Condition: Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Check to see if the fuel shutoff valve is mechanically or electrically stuck closed. • Disassemble the fuel shutoff valve and check that the parts are free to move. Refer to Procedure 005-043 in the Troubleshooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239, and Procedures 019-049 and 019-050.	**OK** **Fuel shutoff valve not stuck closed** **Replace the 250 psi regulator** Refer to Procedure 005-073 in the Troubleshooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239.	22A
	NOT OK **Replace the fuel shutoff valve** Refer to Procedure 019-050.	29A

STEP 22: Read the fault codes.

STEP 22A: Read the fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start the engine and let it idle for 1 minute. • Using INSITE™, read the fault codes.	**OK** **Fault Code 482 inactive**	29A
	NOT OK Engine fails to start or Fault Code 482 is active **Replace the 320 psi regulator** Refer to Procedure 005-073 in the Troubleshooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239.	23A

STEP 23: Read the fault codes.

STEP 23A: Read the fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start the engine and let it idle for 1 minute. • Using INSITE™, read the fault codes.	**OK** **Fault Code 482 inactive**	29B
	NOT OK Engine fails to start or Fault Code 482 is active.	24A

STEP 24: Check the priming bypass valve.

STEP 24A: Check the priming bypass valve.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Inspect the priming bypass valve and replace it if the fuel delivery housing matches the part number below. • Refer to Procedure 005-016 in the Troubleshooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239. **NOTE:** Fuel delivery housing part numbers are as follows: For 12 VDC: 4001840 or 4009811 HD-129. For 24 VDC: 4001843 or 4009813 HD-129.	**OK** **Replaced priming bypass valve (if part number matched)**	25A
	NOT OK Did not replace priming bypass valve.	26A

STEP 25: Read the fault codes.

STEP 25A: Read the fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start the engine and let it idle for 1 minute. • Using INSITE™, read the fault codes.	**OK** **Fault Code 482 inactive**	29B
	NOT OK Engine fails to start or Fault Code 482 is active	26A

STEP 26: Inspect the gear pump.

STEP 26A: Remove and inspect the gear pump.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Check the gear pump. • Remove the gear pump and check for sheared hex shaft or damaged gears. Refer to Procedure 005-016 in the Troubleshooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239.	**OK** **No damage to the hex shaft or the gear teeth**	27A
	NOT OK **Replace the fuel gear pump** Refer to Procedure 005-016 in the Troubleshooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239.	29A

STEP 27: Inspect the injectors.

STEP 27A: Remove and inspect the injectors.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Check the injectors for missing or damaged o-rings. • Refer to Procedure 006-026 in the Troubleshooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239.	**OK** **No damaged or missing o-rings**	28A
	NOT OK **Replace damaged injector o-rings** Refer to Procedure 006-026 in the Troubleshooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239.	29A

STEP 28: Inspect the fuel delivery housing.

STEP 28A: Inspect the fuel delivery housing.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Inspect the fuel delivery housing for obstructions or internal leaks. • Inspect the fuel delivery housing for obstructions or internal leaks from the pressure-side of the pump to the drain of the inlet side of the pump. Refer to Procedure 005-073 in the Troubleshooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239.	**OK** **No internal leaks or obstructions**	29A
	NOT OK **Repair or replace the fuel delivery housing** Refer to Procedure 005-073 in the Troubleshooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239.	29A

STEP 29: Clear the fault codes.

STEP 29A: Disable the fault code.

Condition:
- Connect all components.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Verify that Fault Code 482 is inactive.	**OK** **Fault Code 482 inactive**	29B
	NOT OK Return to the troubleshooting steps, or contact your local Cummins Authorized Repair Location if all the steps have been completed and checked again.	1A

STEP 29B: Clear the inactive fault codes.

Condition:
- Connect all components.

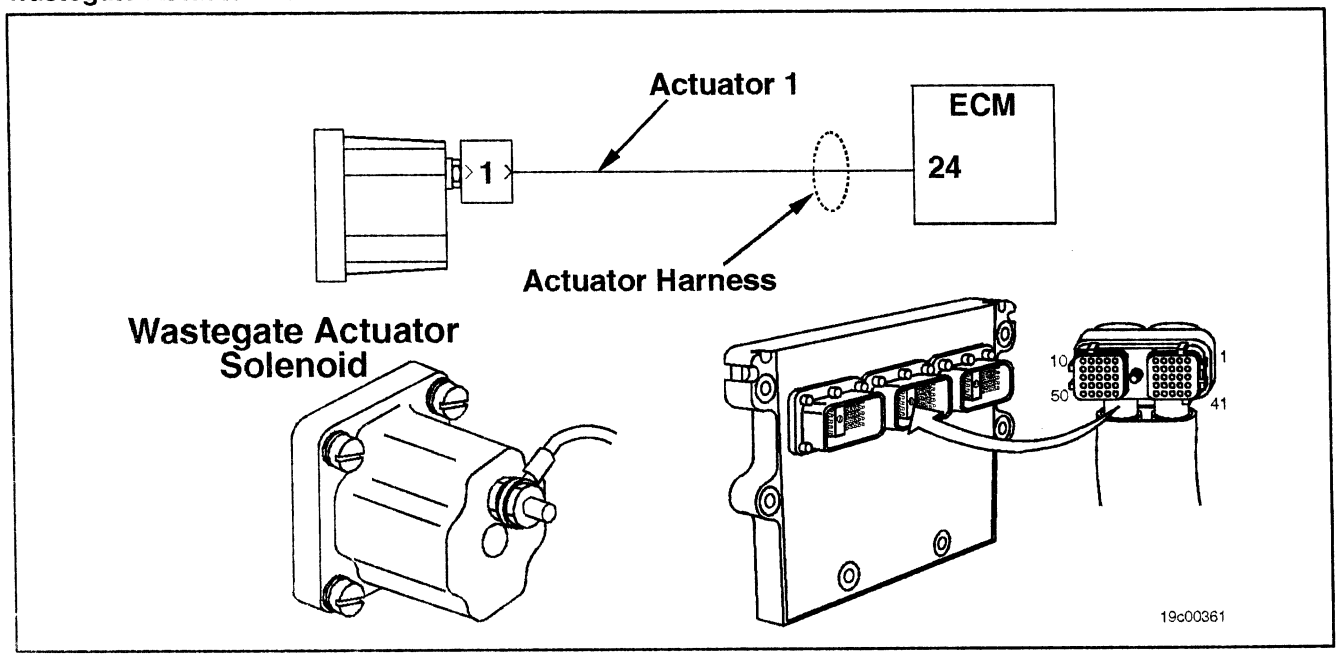
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting chart

Fault Code 466

Wastegate Actuator No. 1 Circuit

CODES	REASON	EFFECT
Fault Code: 466 PID(P), SID(S): S032 SPN: 1188 FMI: 4/4 Lamp: Yellow	Less than (+) 6 VDC detected at the wastegate actuator No. 1 circuit when on indicates an excessive current draw from the electronic control module (ECM) or faulty ECM output circuit.	Engine will run derated.

Wastegate Actuator No. 1 Circuit



Circuit Description:
The wastegate actuators are devices used by the ECM to control boost pressure.

Component Location:
The wastegate controller is located on the air inlet horn. Actuator No. 1 is the frontmost solenoid on the controller.

Shop Talk:
- Inspect the engine block to chassis ground wire to make sure it is securely fastened to a clean, dry surface.
- Check the starter solenoid (+) terminal for a loose connector or accessory wiring with damaged insulation.
- Low voltage can be caused by a short circuit to ground, a short circuit to another wire in the harness, or a shorted solenoid coil.
- Inspect the wastegate actuator No. 1 circuit for external wires that can be spliced into powering another device. Remove any extra wires that are found in the circuit.

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging the new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the engine harness and ECM connector pins.		
STEP 1A: Inspect the engine harness and ECM connector pins.	No damaged pins	
STEP 1B: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 1C: Check for a short circuit to ground.	More than 100k ohms	
STEP 1D: Check for an open circuit.	Less than 10 ohms	
STEP 2: Check the wastegate actuator.		
STEP 2A: Inspect the wastegate actuator connector for damaged pins.	No damaged pins	
STEP 2B: Check the actuator post for corrosion.	No corrosion	
STEP 2C: Check the wastegate actuator resistance.	7 to 8 ohms for (+) 12-VDC solenoids, 28 to 32 ohms for (+) 24-VDC solenoids	
STEP 3: Clear the fault codes.		
STEP 3A: Disable the fault code.	Fault Code 466 inactive	
STEP 3B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check the engine harness and ECM connector pins.

STEP 1A: Inspect the engine harness and ECM connector pins.

⚠CAUTION⚠

To avoid damaging the new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.
- Disconnect the engine harness from the wastegate actuator No. 1.

Action	Specifications/Repair	Next Step
Inspect the engine harness and ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	1B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	3A

STEP 1B: Check for a short circuit from pin to pin.

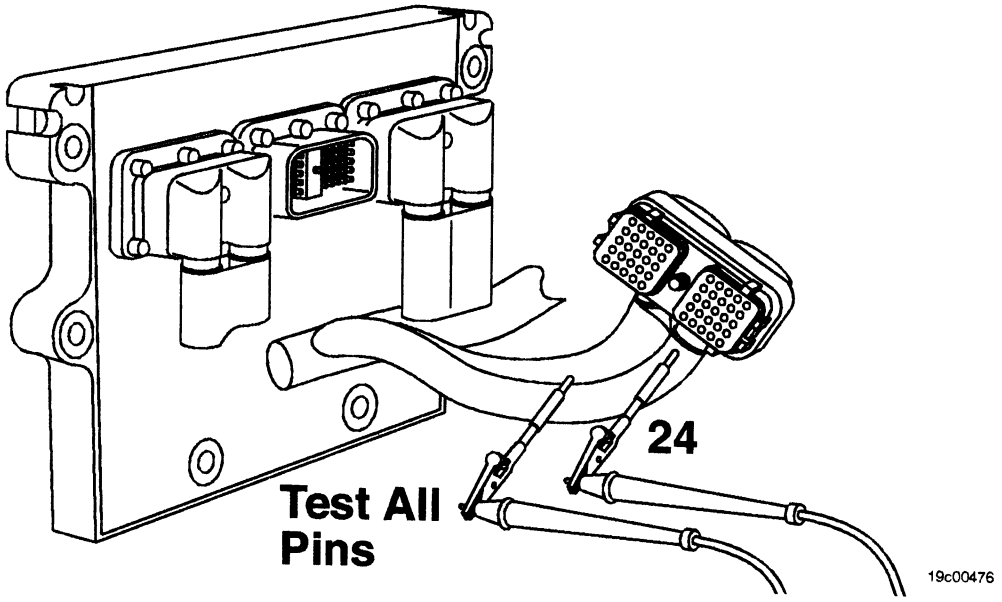
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.
- Disconnect the engine harness from the wastegate actuator No. 1.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin. • Measure the resistance from pin 24 of the actuator harness connector to all other pins in the connector.	**OK** **More than 100k ohms**	1C
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



STEP 1C: Check for a short circuit to ground.

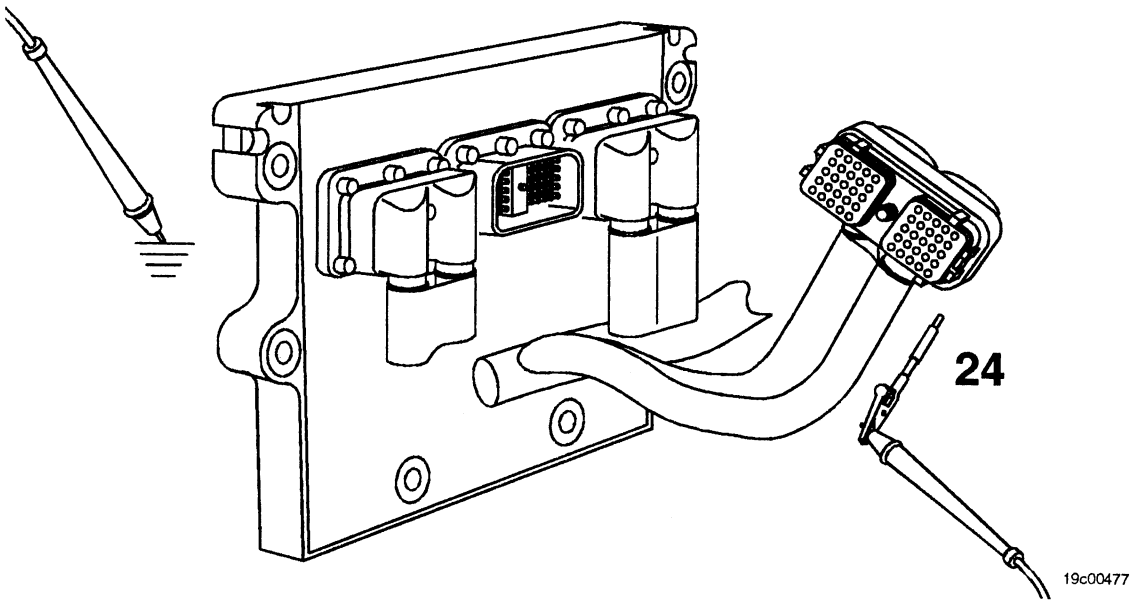
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.
- Disconnect the engine harness from the wastegate actuator No. 1.

Action	Specifications/Repair	Next Step
Check for a short circuit to ground. • Measure the resistance from pin 24 of the actuator harness connector to ground.	**OK** **More than 100k ohms**	1D
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



STEP 1D: Check for an open circuit.

⚠CAUTION⚠

To avoid damaging the new ECM, all other active fault codes must be investigated prior to replacing the ECM.

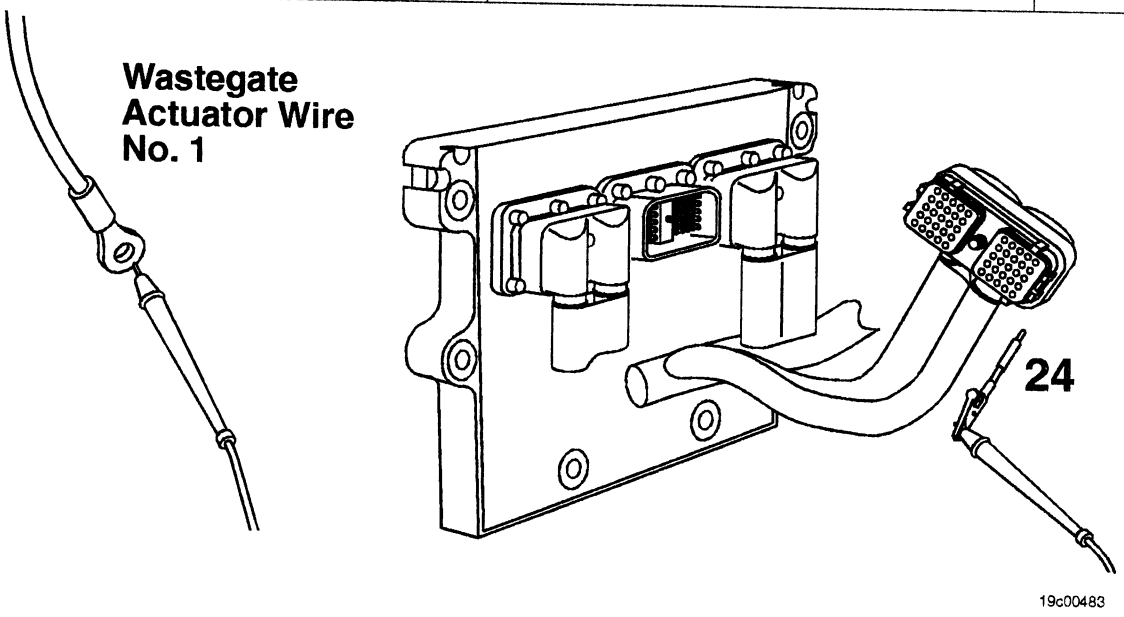
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.
- Disconnect the engine harness from the wastegate actuator No. 1.

Action	Specifications/Repair	Next Step
Check for an open circuit. • Measure the resistance from pin 24 of the actuator harness connector to the wastegate actuator No. 1 wire.	**OK** **Less than 10 ohms**	2A
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



STEP 2: Check the wastegate actuator.

STEP 2A: Inspect the wastegate actuator connector for damaged pins.

Condition:
- Turn keyswitch OFF.
- Disconnect the engine harness from the wastegate actuator No. 1.
- Disconnect the actuator harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the wastegate actuator connector. • Check the wastegate actuator connector for damaged pins.	**OK** **No damaged pins**	2B
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-202. • Replace the engine harness. Refer to Procedure 019-043.	3A

STEP 2B: Check the actuator post for corrosion.

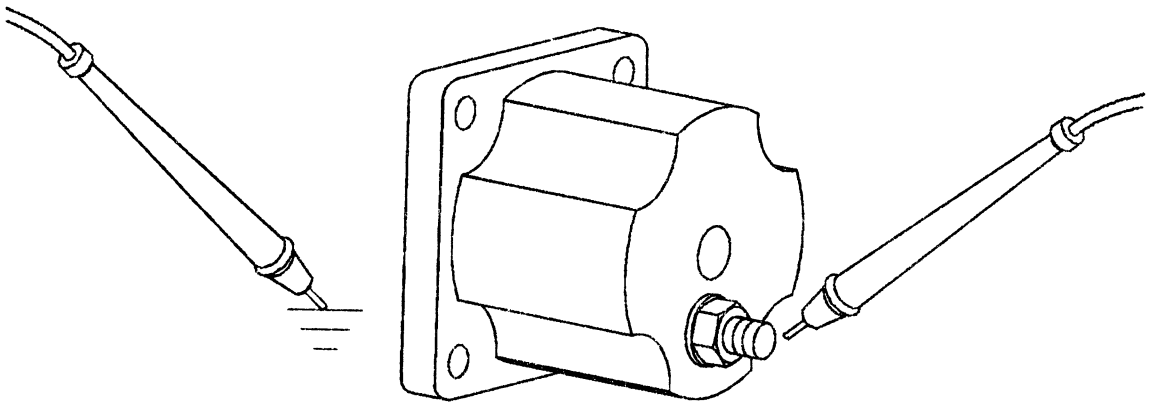
Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Inspect the solenoid post. • Check the solenoid post for corrosion.	**OK** **No corrosion**	2C
	NOT OK Clean the solenoid post.	3A

STEP 2C: Check the wastegate actuator resistance.

Condition:
- Turn keyswitch OFF.
- Disconnect the wastegate actuator from the engine harness.

Action	Specifications/Repair	Next Step
Check the wastegate actuator resistance. • Measure the resistance from the wastegate actuator No. 1 to engine block ground.	**OK** **7 to 8 ohms for (+) 12-VDC solenoids** **28 to 32 ohms for (+) 24-VDC solenoids**	3A
	NOT OK **Replace the actuator solenoid** Refer to Procedure 010-109 in the Troubleshooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239.	3A



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STEP 3: Clear the fault codes.

STEP 3A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify that Fault Code 466 is inactive.	**OK** **Fault Code 466 inactive**	3B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location if all steps have been completed and checked again.	1A

STEP 3B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

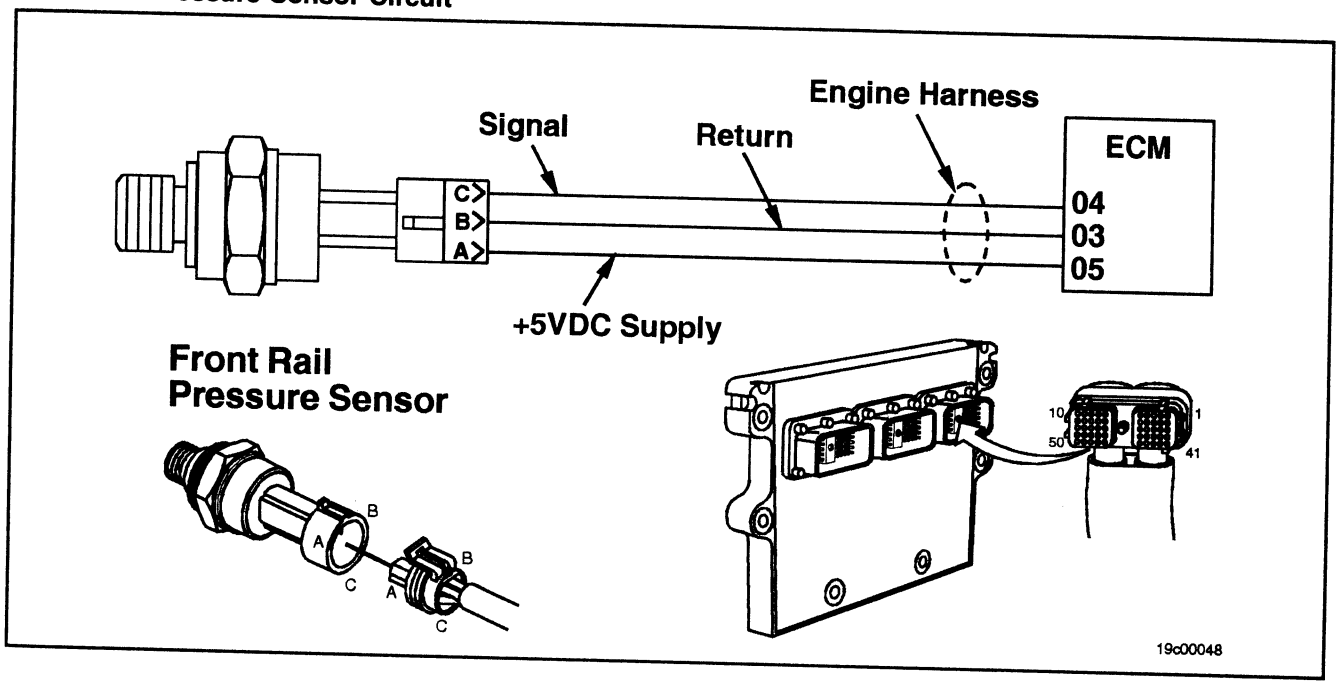
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Clear the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 452

Front Rail Pressure Sensor Circuit

CODES	REASON	EFFECT
Fault Code: 452 PID(P), SID(S): P157 SPN: 157 FMI: 4/4 Lamp: Yellow	Low voltage detected on the front rail pressure sensor circuit.	Engine will run derated.

Front Rail Pressure Sensor Circuit



Circuit Description:

The front rail pressure sensor provides the rail pressure signal to the electronic control module (ECM).

Component Location:

The front rail pressure sensor is located on the front of the fuel delivery housing.

Shop Talk:

This fault could be caused by the signal wire having a short circuit to ground, the supply wire having a short circuit to ground, an open circuit in the supply wire, an open circuit in the signal wire, a failed sensor, or a faulty ECM power supply.

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging the new ECM, all other active fault codes must be investigated before replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead
Part No. 3824774 - breakout cable.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check for multiple fault codes.		
STEP 1A: Read the fault codes.	Fault Code 187 inactive	
STEP 2: Check the front rail pressure sensor.		
STEP 2A: Inspect the sensor harness and sensor connector pins.	No damaged pins	
STEP 2B: Read the fault codes.	Fault Code 452 inactive	
STEP 2C: Check the supply voltage.	(+) 4.75 to 5.25 VDC	
STEP 2C-1: Measure the voltage from the ECM.	(+) 4.75 to 5.25 VDC	
STEP 2D: Check the front rail pressure sensor signal voltage.	(+) 0.5 to 4.7 VDC	
STEP 2D-1: Check for a short circuit to ground.	More than 100k ohms	
STEP 2D-2: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 3: Check the sensor harness.		
STEP 3A: Inspect the sensor harness connector pins and the ECM for damage.	No damaged pins	
STEP 3B: Read the fault codes.	Fault Code 452 inactive	
STEP 3C: Check for an open circuit in the signal wire.	Less than 10 ohms	
STEP 4: Check for an ECM response.		
STEP 4A: Check for the appropriate ECM response.	Fault Code 452 inactive and Fault Code 451 active	
STEP 5: Clear the fault codes.		
STEP 5A: Disable the fault code.	Fault Code 452 inactive	
STEP 5B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check for multiple fault codes.

STEP 1A: Read the fault codes.

Condition:
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read fault codes. • Read active fault codes using INSITE™.	**OK** **Fault Code 187 inactive**	2A
	NOT OK Possible sensor failure, short circuit to ground in the sensor, or in the sensor (+) 5 VDC common supply.	Fault Code 187

STEP 2: Check the front rail pressure sensor.

STEP 2A: Inspect the sensor harness and sensor connector pins.

Condition:
- Turn keyswitch OFF.
- Disconnect the front rail pressure sensor from the sensor harness.

Action	Specifications/Repair	Next Step
Inspect the sensor harness and sensor connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	2B
	NOT OK **Repair the damaged pins** Repair or replace the connector, or replace the sensor, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair or replace the connector. Refer to Procedure 019-203. • Replace the front rail pressure sensor. Refer to Procedure 019-115.	5A

STEP 2B: Read the fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start the engine and let it idle for 1 minute. • Read the fault codes using INSITE™.	**OK** **Fault Code 452 inactive**	5B
	NOT OK Fault Code 452 active.	2C

STEP 2C: Check the supply voltage.

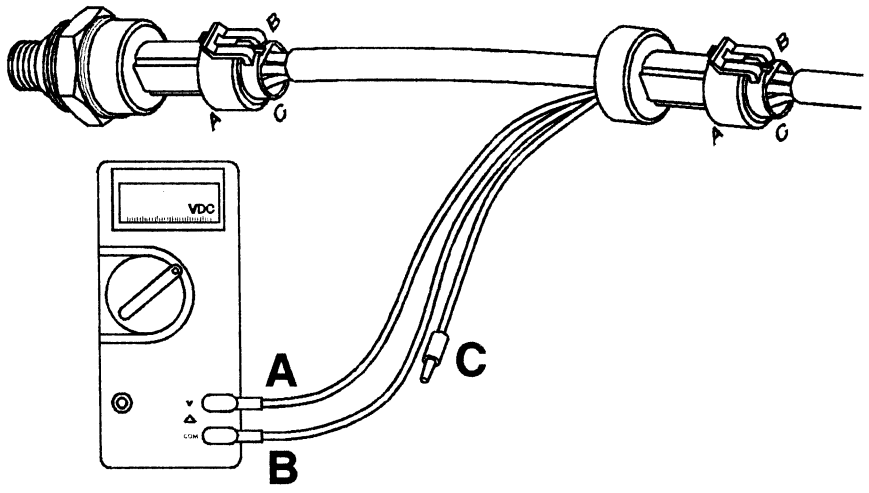
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3824774 - breakout cable.

Condition:

- Install breakout cable, Part No. 3824774, between the sensor and the harness connector.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the supply voltage. • Measure the supply voltage by installing the breakout cable's supply pin A (or RED) and return pin B (or BLACK) connectors into the multimeter.	**OK** **(+) 4.75 to 5.25 VDC**	2D
	NOT OK Does **not** meet specifications.	2C-1



19c00841

STEP 2C-1: Measure the voltage from the ECM.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

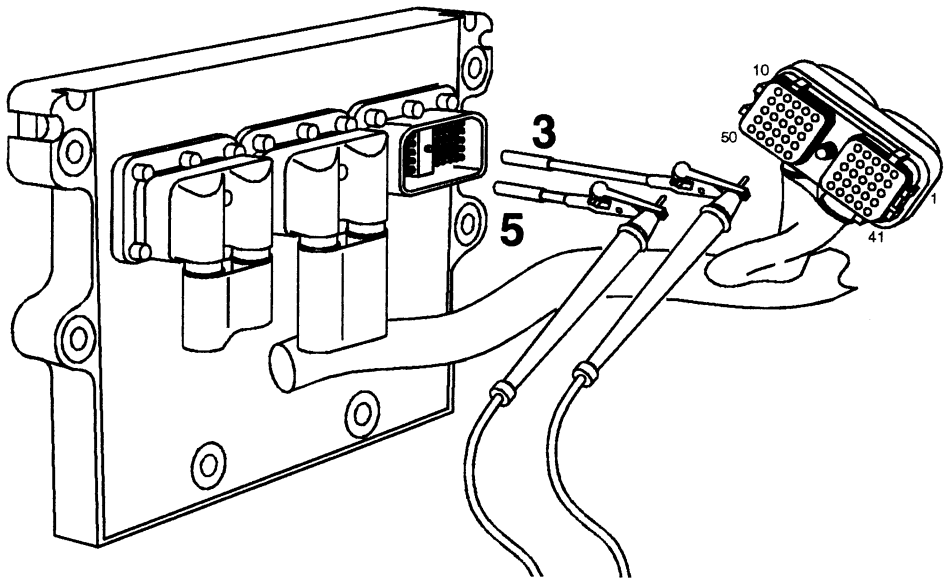
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the sensor harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Measure the voltage from the ECM. • Measure the voltage at the ECM from pin 5 to pin 3 of the ECM sensor port.	**OK** **(+) 4.75 to 5.25 VDC** **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	5A
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	5A



STEP 2D: Check the front rail pressure sensor signal voltage.

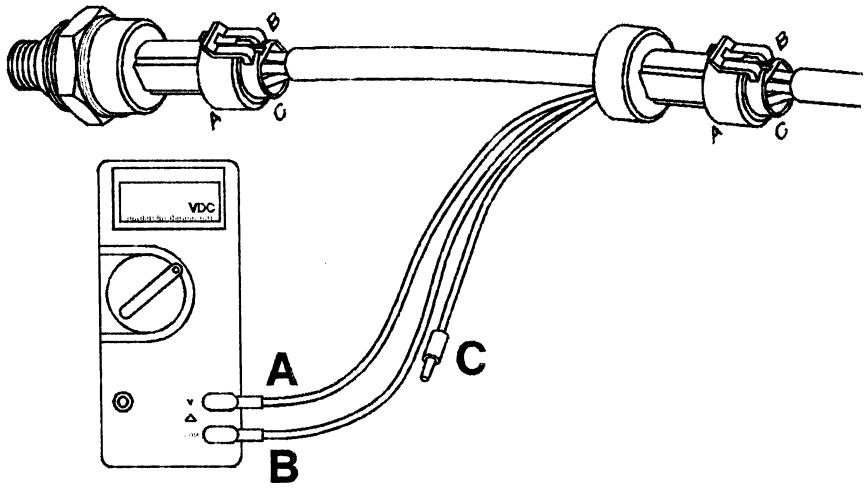
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3854774 - breakout cable.

Condition:

- Install breakout cable between the sensor and the harness connector.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the supply voltage. • Measure the signal voltage from pin C (or YELLOW) to pin B (or BLACK) of the breakout cable.	**OK** **(+) 0.5 to 4.7 VDC**	2D-1
	NOT OK Does **not** meet specifications.	3A



19c00841

STEP 2D-1: Check for a short circuit to ground.

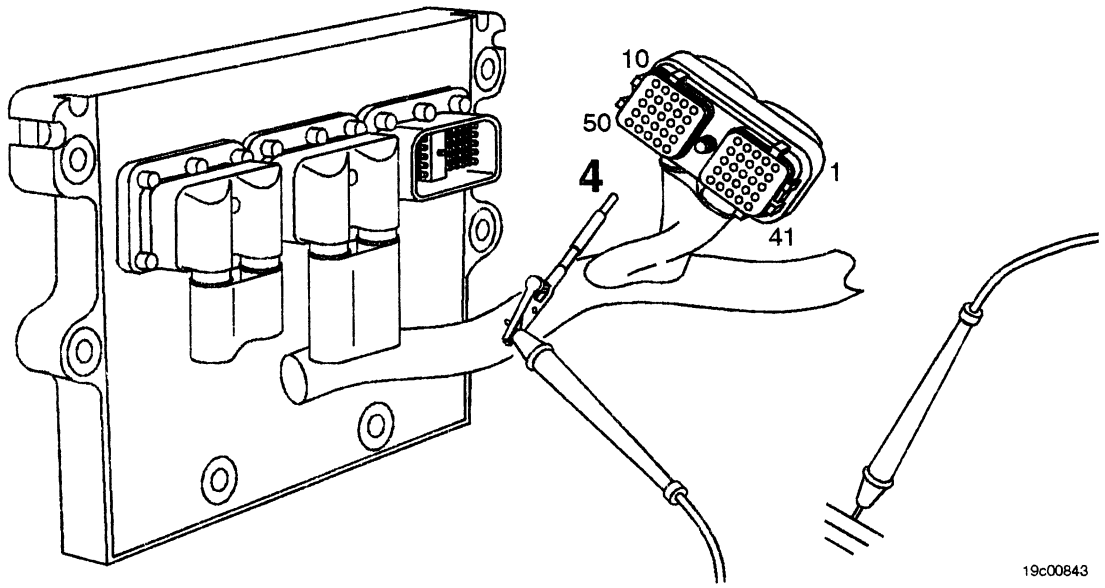
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the front rail pressure sensor from the engine harness.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for a short circuit to ground. • Measure the resistance from pin 4 of the sensor harness connector to ground.	**OK** **More than 100k ohms**	2D-2
	NOT OK **Replace the engine harness** Refer to Procedure 019-043.	5A



STEP 2D-2: Check for a short circuit from pin to pin.

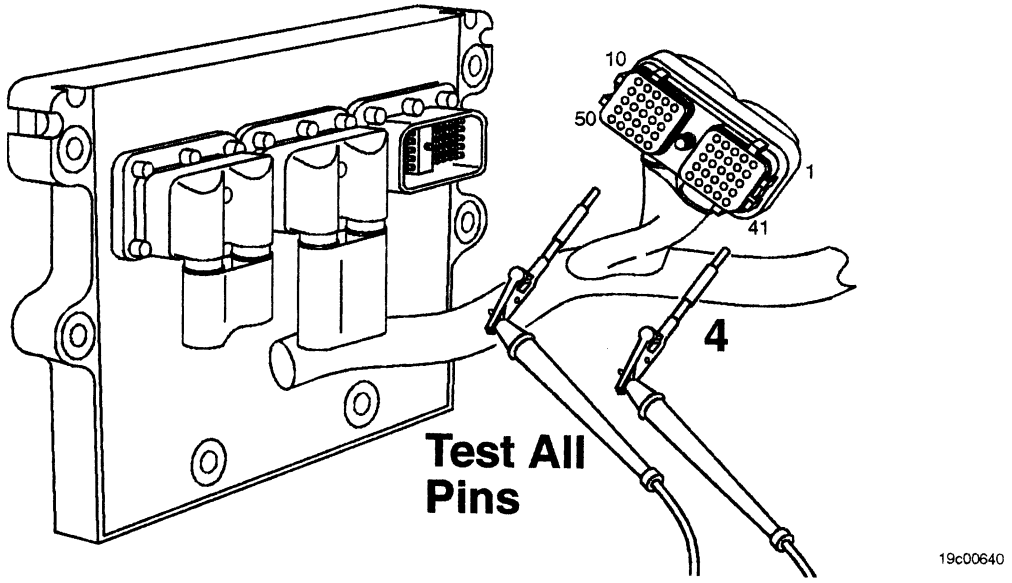
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the front rail pressure sensor from the sensor harness

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin. • Measure the resistance from pin 4 of the sensor harness connector at the ECM to all other pins in the connector.	**OK** **More than 100k ohms** **Replace the front rail pressure sensor** Refer to Procedure 019-115.	5A
	NOT OK **Replace the engine harness** Refer to Procedure 019-043.	5A



STEP 3: Check the sensor harness.

STEP 3A: Inspect the sensor harness connector pins and the ECM for damage.

⚠CAUTION⚠

To avoid damaging the new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the sensor harness connector pins and the ECM for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	3B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	5A

STEP 3B: Read the fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start the engine and let it idle for 1 minute. • Read the fault codes, using INSITE™.	**OK** **Fault Code 452 inactive**	5B
	NOT OK Fault Code 452 active.	3C

STEP 3C: Check for an open circuit in the signal wire.

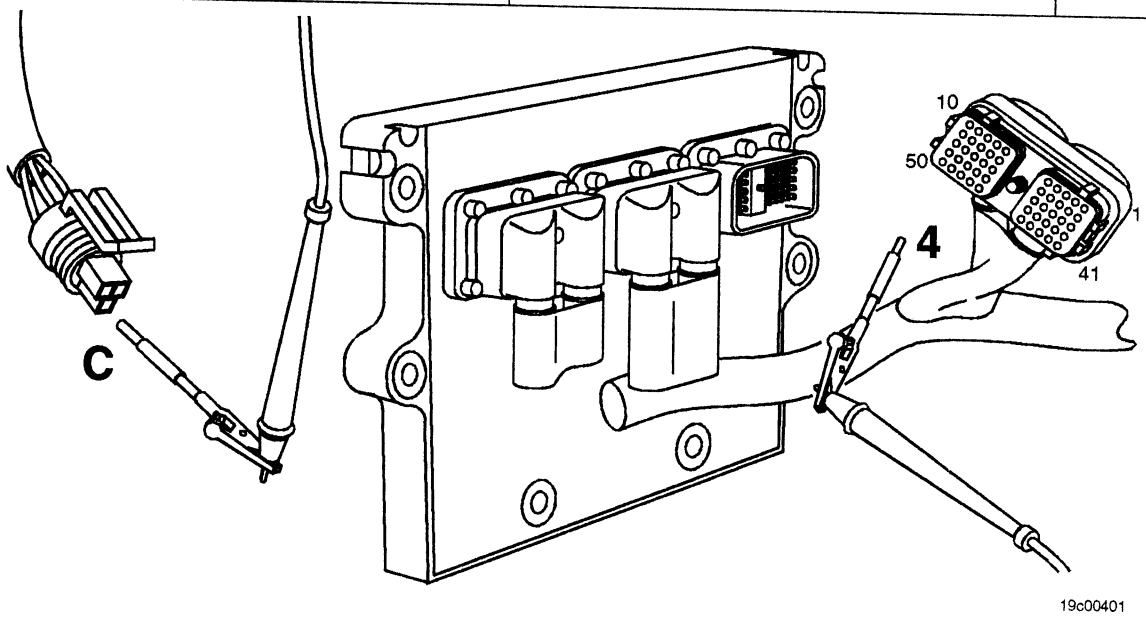
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the front rail pressure sensor from the sensor harness.

Action	Specifications/Repair	Next Step
Check for an open circuit in the signal wire. • Measure the resistance from pin 4 of the sensor harness connector to pin C (or 3) of the fuel rail pressure sensor connector.	**OK** **Less than 10 ohms**	4A
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	5A



STEP 4: Check for an ECM response.

STEP 4A: Check for the appropriate ECM response.

⚠CAUTION⚠

To avoid damaging the new ECM, all other active fault codes must be investigated prior to replacing the ECM.

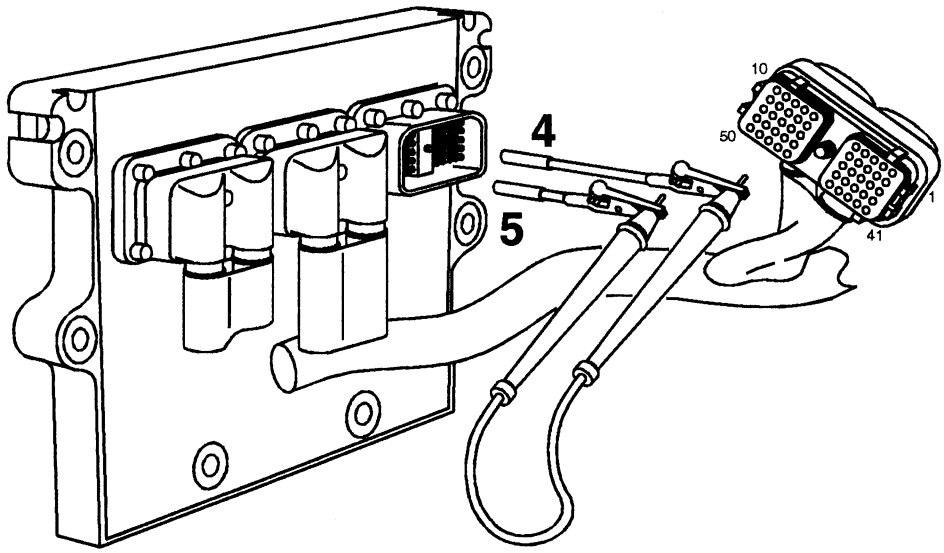
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the sensor harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check for the appropriate ECM response. • Install a jumper wire between ECM sensor port pin 4 and pin 5.	**OK** **Fault Code 452 inactive and** **Fault Code 451 active**	5A
	NOT OK **Fault Code 452 active** **Replace the ECM** Refer to Procedure 019-031.	5A



STEP 5: Clear the fault codes.

STEP 5A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify that Fault Code 452 is inactive.	**OK** **Fault Code 452 inactive**	5B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location, if all steps have been completed and checked again.	1A

STEP 5B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

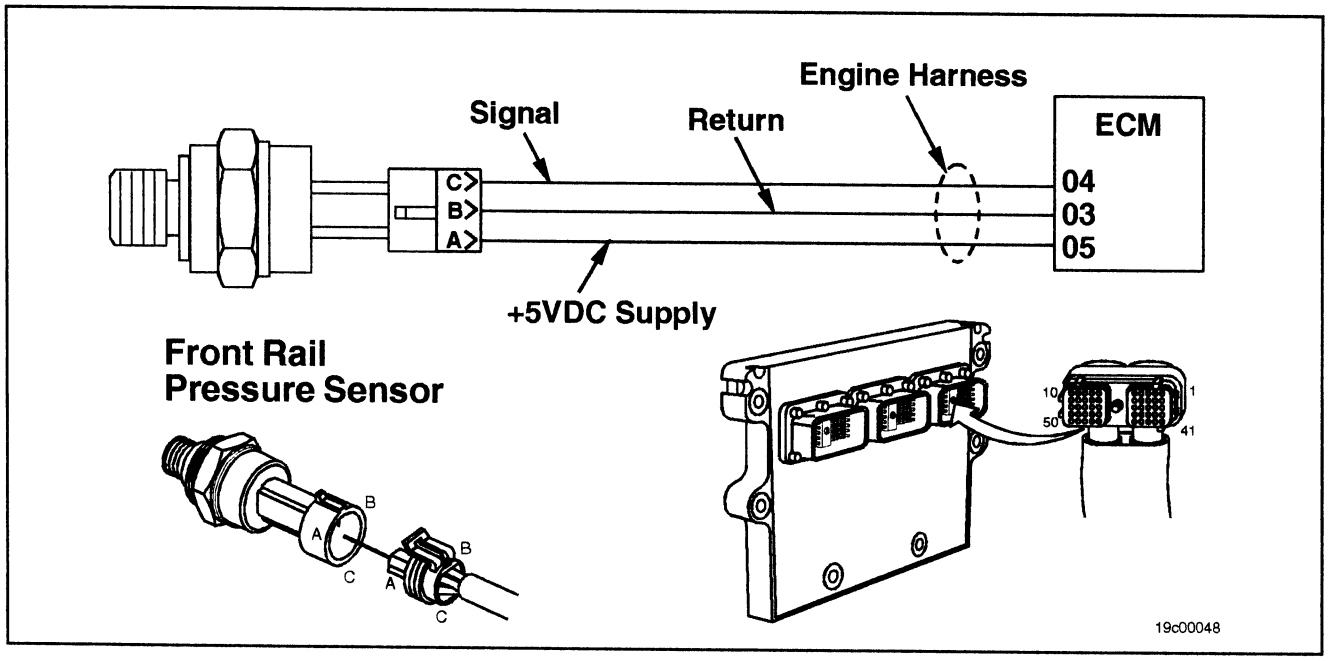
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Use INSITE™ to clear all inactive fault codes.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 451

Front Rail Pressure Sensor Circuit

CODES	REASON	EFFECT
Fault Code: 451 PID(P), SID(S): P157 SPN: 157 FMI: 3/3 Lamp: Yellow	High voltage detected on the front rail pressure sensor circuit.	Engine will run derated.

Front Rail Pressure Sensor Circuit



Circuit Description:

The front rail pressure sensor provides the rail pressure signal to the electronic control module (ECM).

Component Location:

The front rail pressure sensor is located on the front of the fuel delivery housing.

Shop Talk:

This fault could be caused by the return or signal wire that has a short circuit to (+) 5 VDC or (+) 12 VDC, an open circuit in the return wire, or a failed sensor.

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging the new ECM, all other active fault codes must be investigated before replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead
Part No. 3824774 - breakout cable.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the front rail pressure sensor.		
STEP 1A: Inspect the sensor harness and sensor connector pins.	No damaged pins	
STEP 1B: Read the fault codes.	Fault Code 451 inactive	
STEP 1C: Check the supply voltage.	(+) 4.75 to 5.25 VDC	
STEP 1C-1: Measure the voltage from the ECM.	(+) 4.75 to 5.25 VDC	
STEP 1D: Check the front rail pressure sensor signal voltage.	(+) 0.5 to 4.7 VDC	
STEP 2: Check the sensor harness.		
STEP 2A: Inspect the sensor harness connector pins and the ECM for damage.	No damaged pins	
STEP 2B: Read the fault codes.	Fault Code 451 inactive	
STEP 2C: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 2D: Check for open circuit in the return wire.	Less than 10 ohms	
STEP 3: Check for an ECM response.		
STEP 3A: Check for the appropriate ECM response.	Fault Code 451 inactive and Fault Code 452 active	
STEP 4: Clear fault code.		
STEP 4A: Disable fault code.	Fault Code 451 inactive	
STEP 4B: Clear inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

TEP 1: Check the front rail pressure sensor.

STEP 1A: Inspect the sensor harness and sensor connector pins.

Condition:
- Turn keyswitch OFF.
- Disconnect the front rail pressure sensor from the engine harness.

Action	Specifications/Repair	Next Step
Inspect the sensor harness and sensor connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	1B
	NOT OK **Repair the damaged pins** Replace the 3-pin Metri-Pack connector or the sensor, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Replace the 3-pin Metri-Pack connector. Refer to Procedure 019-203. • Replace the front rail pressure sensor. Refer to Procedure 019-115.	4A

STEP 1B: Read the fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start the engine and let it idle for 1 minute. • Read the fault codes using INSITE™.	**OK** **Fault Code 451 inactive**	4B
	NOT OK Fault Code 451 active.	1C

STEP 1C: Check the supply voltage.

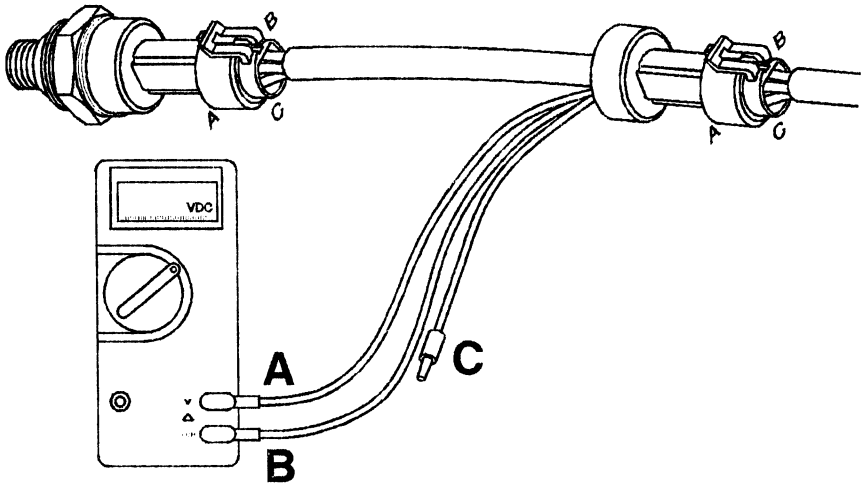
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3854774 - breakout cable.

Condition:

- Install breakout cable between the sensor and the harness connector.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the supply voltage. • Measure the supply voltage by installing the breakout cable's supply pin A (or RED) and return pin B (or BLACK) leads into the multimeter.	**OK** **(+) 4.75 to 5.25 VDC**	1D
	NOT OK Does **not** meet specifications.	1C-1



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STEP 1C-1: Measure the voltage from the ECM.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

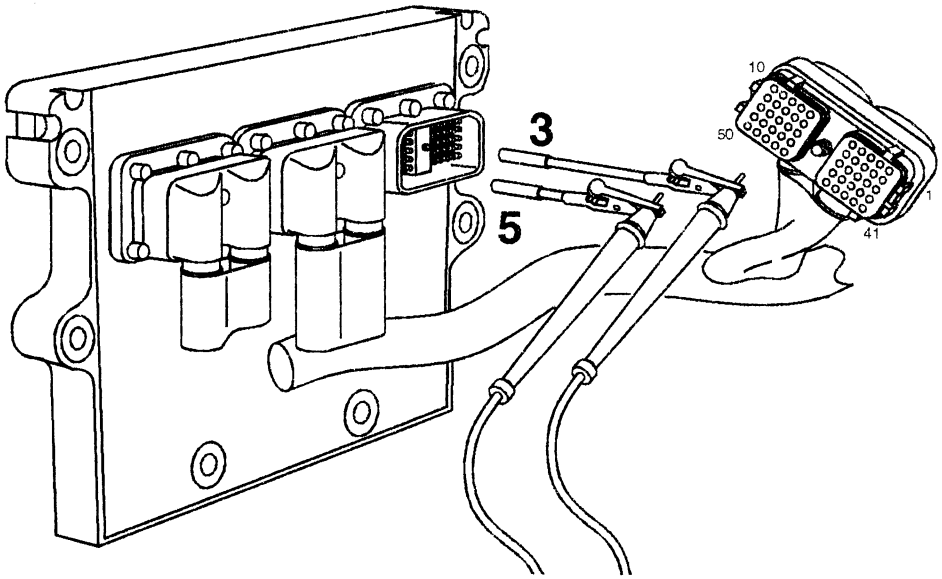
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the sensor harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Measure the voltage from the ECM. • Measure the voltage at the ECM from pin 5 to pin 3 of the ECM sensor port.	**OK** **(+) 4.75 to 5.25 VDC** **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	4A
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	4A



STEP 1D: Check the front rail pressure sensor signal voltage.

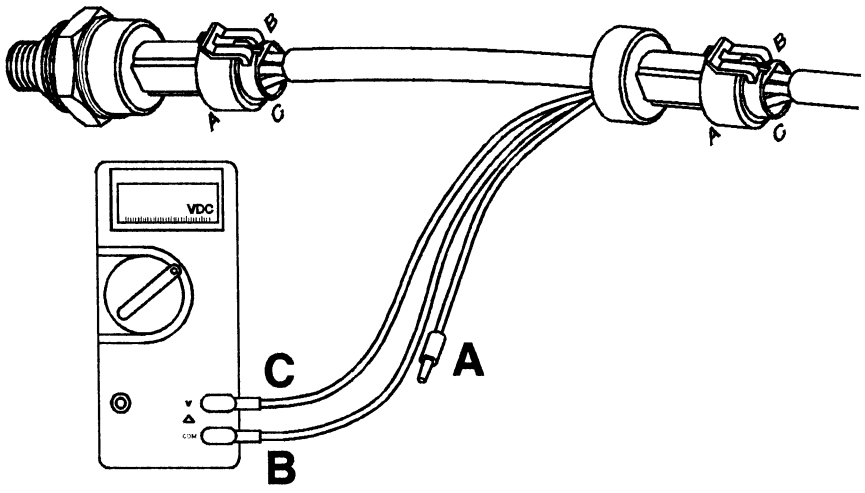
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3854774 - breakout cable.

Condition:

- Install breakout cable between the sensor and the harness connector.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the front rail pressure sensor signal voltage. • Measure the signal voltage from pin C (or YELLOW) to pin B (or BLACK) of the breakout cable.	**OK** **(+) 0.5 to 4.7 VDC**	3A
	NOT OK Does **not** meet specifications.	2A



19c00842

STEP 2: Check the sensor harness.

STEP 2A: Inspect the sensor harness connector pins and the ECM for damage.

⚠CAUTION⚠

To avoid damaging the new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the sensor harness connector pins and the ECM for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	2B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	4A

STEP 2B: Read the fault codes.

Condition:
- Connect all the components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start the engine and let it idle for 1 minute. • Read the fault codes using INSITE™.	**OK** **Fault Code 451 inactive**	4A
	NOT OK Fault Code 451 active.	2C

STEP 2C: Check for a short circuit from pin to pin.

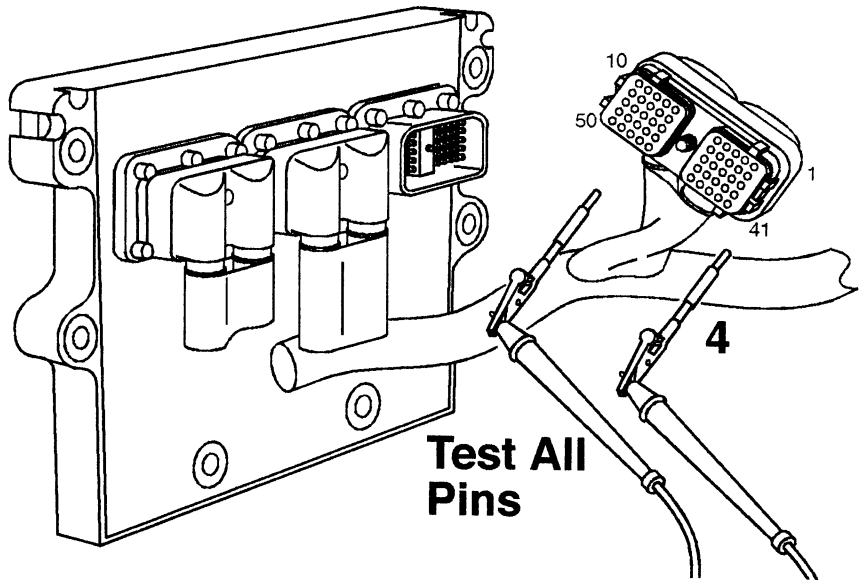
⚠CAUTION⚠

To avoid pin and harness damage use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the front rail pressure sensor from the engine harness.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin. • Measure the resistance from pin 4 of the sensor harness connector to all other pins in the connector.	**OK** **More than 100k ohms**	2D
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	4A



STEP 2D: Check for an open circuit in the return wire.

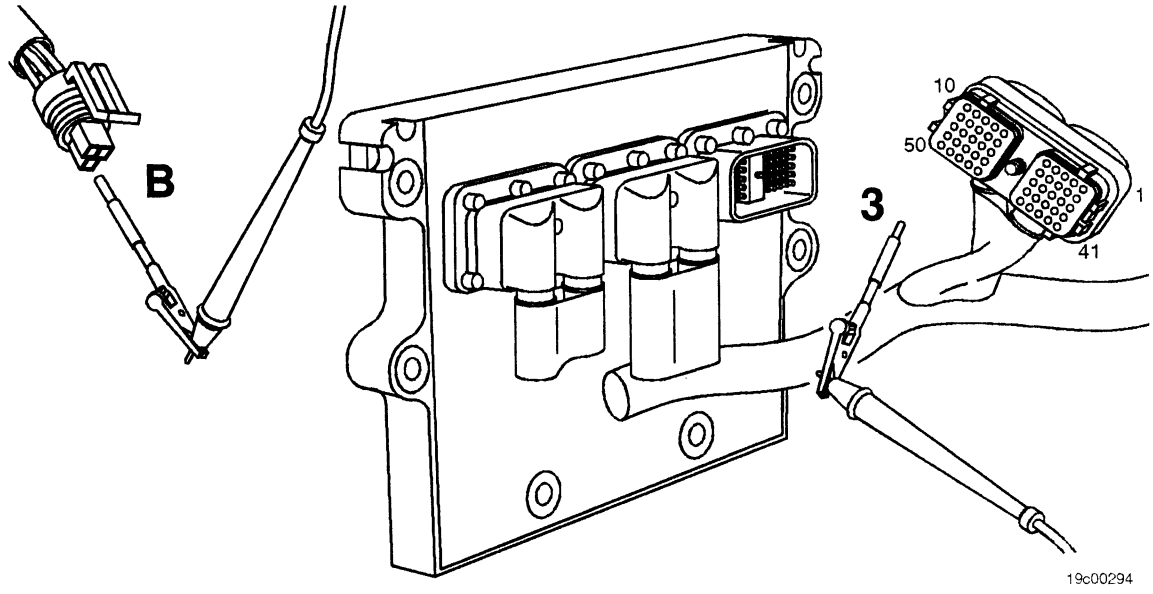
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the front rail pressure sensor from the sensor harness.

Action	Specifications/Repair	Next Step
Check for an open circuit in the return wire. • Measure the resistance from pin 3 of the ECM sensor harness connector to pin B (or 2) of the front rail pressure sensor harness connector.	**OK** **Less than 10 ohms** **Replace the front rail pressure sensor** Refer to Procedure 019-115.	4A
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	4A



STEP 3: Check for an ECM response.

STEP 3A: Check for the appropriate ECM response.

⚠CAUTION⚠

To avoid damaging the new ECM, all other active fault codes must be investigated prior to replacing the ECM.

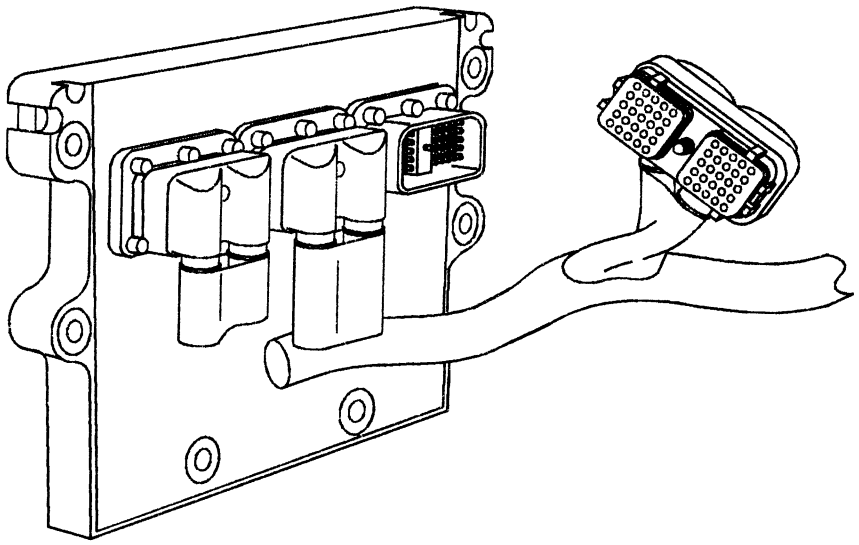
⚠CAUTION⚠

To avoid pin and harness damage use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the sensor harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check for the appropriate ECM response. • Read the fault codes using INSITE™.	**OK** **Fault Code 451 inactive and** **Fault Code 452 active**	4A
	NOT OK **Fault Code 451 active** **Replace the ECM** Refer to Procedure 019-031.	4A



19600008

STEP 4: Clear fault code.

STEP 4A: Disable fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify that Fault Code 451 inactive.	**OK** **Fault Code 451 inactive**	4B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location, if all steps have been completed and checked again.	1A

STEP 4B: Clear inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

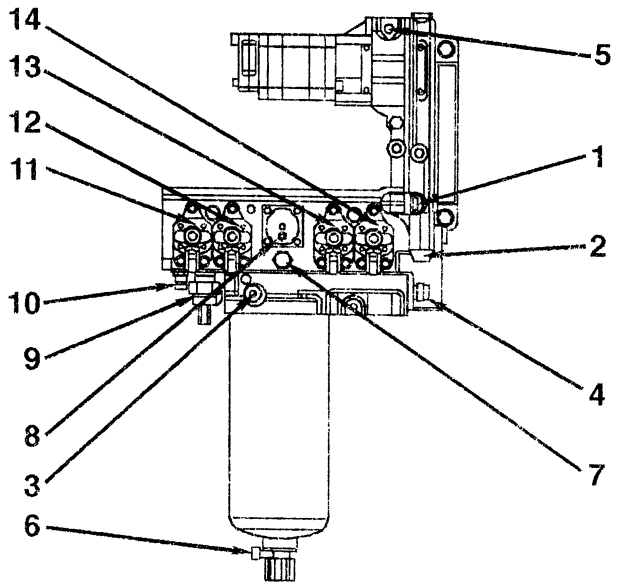
Action	Specifications/Repair	Next Step
Clear inactive fault codes. • Use INSITE™ to clear all inactive fault codes.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 449

High Fuel Pressure

CODES	REASON	EFFECT
Fault Code: 449 PID(P), SID(S): P094 SPN: 94 FMI: 0/16 Lamp: Yellow	Excessive fuel supply pressure was detected at the fuel pressure sensor.	Engine will have black smoke and will run derated.

Hydraulic Fuel System Circuit



Circuit Description:

The gear pump draws fuel from the fuel tank through the fuel filter and antidrainback valve. The gear pump develops 100 to 320 psi of fuel pressure. The fuel flows through the fuel filter screen and fuel shutoff valve to the fueling and timing actuators and the fuel pressure sensor. The 250-psi regulator controls the fuel pressure.

Component Location:

Hydraulic Fuel System Circuit Callouts							
1	320-psi Pressure Regulator	5	Quick-Disconnect Pressure Tap-Suction Side	9	Fuel Pressure Sensor	13	Rear Timing Actuator
2	36-mc Filter Screen	6	WIF Sensor	10	Quick-Disconnect Pressure Tap-Pressure Side	14	Rear Rail Actuator
3	Fuel Inlet Restriction Sensor	7	250-psi Pressure Regulator	11	Front Rail Actuator		
4	Fuel Inlet	8	Fuel Shutoff Valve	12	Front Timing Actuator		

The 250-psi regulator controls the fuel pressure. All components are located on the fuel delivery housing on the intake side of the engine.

Shop Talk:

The fuel pressure is monitored by the ECM. If the fuel pressure is outside an acceptable range, the fault code is activated. The acceptable range of the fuel pressure can be viewed as "Minimum Fuel Pressure" and "Maximum Fuel Pressure" using the INSITE™ monitor screen. The fault will log quickly for large differences and slower for small differences.

TROUBLESHOOTING SUMMARY

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check for fuel restriction.		
STEP 1A: Check for fuel restriction in the drain line.	Restriction below 4.0 in Hg	
STEP 2: Check the sensor accuracy.		
STEP 2A: Verify the sensor accuracy with a mechanical gauge.	Gauge and sensor pressures are within 10 psi	
STEP 3: Replace fuel regulator.		
STEP 3A: Replace the 250-psi fuel regulator.	Fault Code 449 goes inactive	
STEP 4: Clear the fault code.		
STEP 4A: Disable the fault code.	Fault Code 449 inactive	
STEP 4B: Clear the inactive fault code.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check for fuel restriction.

STEP 1A: Check for fuel restriction in the drain line.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Check for fuel restriction in the drain line. • Install restriction gauge in fuel return line.	**OK** **Restriction below 4.0 in Hg**	2A
	NOT OK **Correct drain line restriction** Refer to the Signature, ISX and QSX15 Engines, Troubleshooting and Repair Manual, Bulletin No. 3666239.	4A

STEP 2: Check the sensor accuracy.

STEP 2A: Verify the sensor accuracy with a mechanical gauge.

Condition:
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Verify the sensor accuracy. • Connect a mechanical fuel pressure gauge to the pressure-side Compuchek™ fitting. • Connect INSITE™ to the vehicle datalink. • Start the engine and compare the fuel pressure reading on the service tool monitor screen to the reading on the mechanical fuel pressure gauge.	**OK** **Gauge and sensor pressures are within 10 psi**	3A
	NOT OK **Replace the fuel pressure sensor** Refer to Procedure 019-115.	4A

STEP 3: Replace the fuel regulator.

STEP 3A: Replace the 250-psi regulator.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Replace the 250-psi regulator. • Refer to the Troubleshooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239.	**OK** **Fault Code 449 goes inactive**	4A
	NOT OK	4A

STEP 4: Clear the fault code.

STEP 4A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify that Fault Code 449 is inactive.	**OK** **Fault Code 449 inactive**	4B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location if all the steps have been completed and checked again.	1A

STEP 4B: Clear the fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

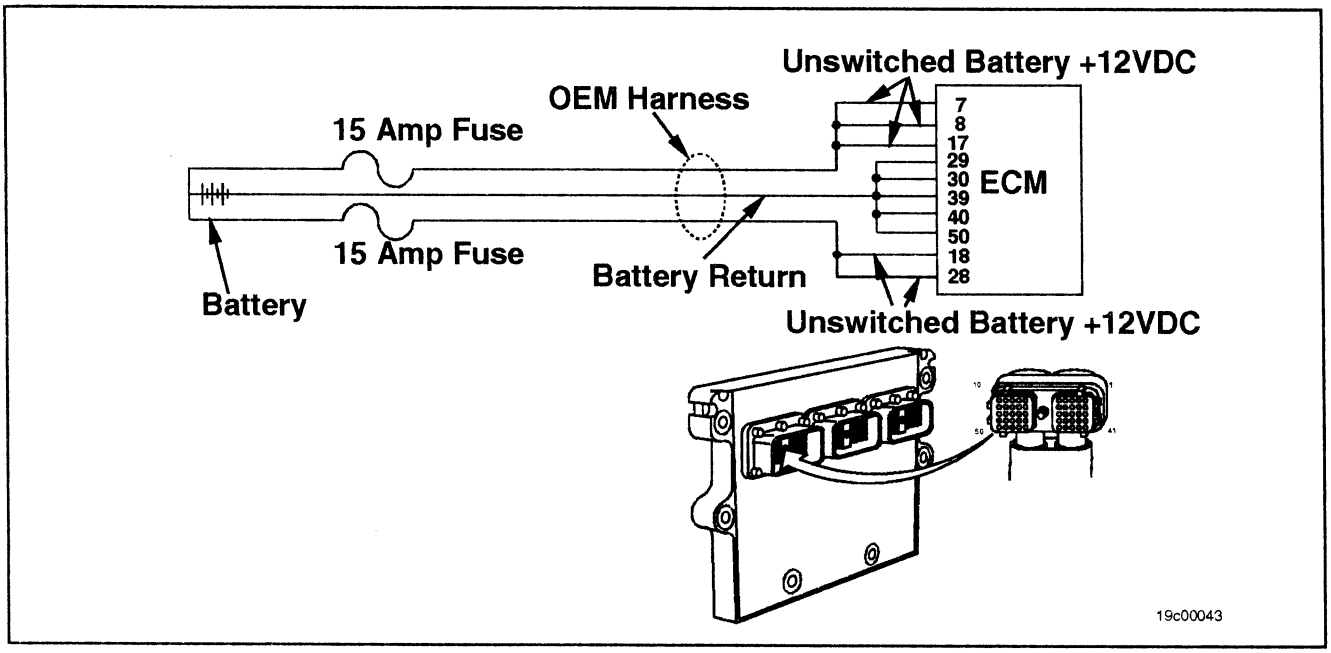
Action	Specifications/Repair	Next Step
Clear the fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 442

Unswitched Battery Supply Circuit

CODES	REASON	EFFECT
Fault Code: 442 PID(P), SID(S): P168 SPN: 168 FMI: 0/16 Lamp: Yellow	Battery voltage above normal operating level.	None on performance.

Unswitched Battery Supply Circuit



Circuit Description:

The electronic control module (ECM) receives unswitched battery input through the OEM harness. There are two in-line 15-amp fuses in the unswitched battery wire to protect the OEM harness from overheating. The battery return wires are connected directly to the negative (–) battery post.

Component Location:

The ECM is connected to the battery by the OEM harness. This direct link provides a constant power supply for the ECM. Refer to the OEM troubleshooting and repair manual for battery location.

Shop Talk:

Disconnect all aftermarket devices from the battery supply circuit. Make sure the proper-size fuses are being used (15-amp fuses).

TROUBLESHOOTING SUMMARY

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the equipment battery system.		
STEP 1A: Check the battery voltage.	Normal conditions: At least (+) 12 VDC During cranking: At least (+) 6.2 VDC	
STEP 1B: Check the alternator.	Alternator functioning normally	
STEP 2: Clear the fault code.		
STEP 2A: Disable the fault code.	Fault Code 442 inactive	
STEP 2B: Clear the inactive fault codes.	All fault codes cleared	

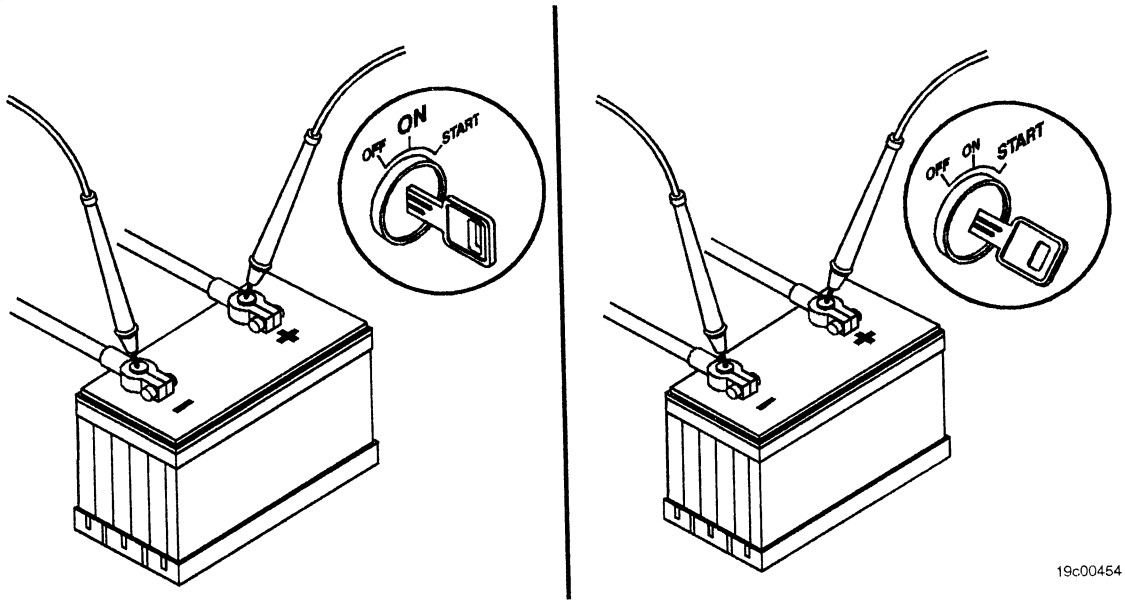
TROUBLESHOOTING STEP

STEP 1: Check the equipment battery system.

STEP 1A: Check the battery voltage.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Check the battery voltage. • Measure the battery voltage from the positive (+) terminal to the (–) terminal. • Measure the battery voltage from the (+) terminal to the (–) terminal while cranking the engine.	**OK** **Normal conditions:** **At least (+) 12 VDC** **During cranking:** **At least (+) 6.2 VDC**	1B
	NOT OK **Charge or replace the battery** Refer to the OEM troubleshooting and repair manual.	2A



STEP 1B: Check the alternator.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Inspect the alternator for normal operation. Refer to the OEM troubleshooting and repair manual for procedure.	**OK** **Alternator functioning normally**	2A
	NOT OK **Repair the alternator** Refer to the OEM troubleshooting and repair manual.	2A

STEP 2: Clear the fault code.

STEP 2A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify Fault Code 442 is inactive.	**OK** **Fault Code 442 inactive**	2B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location if all the steps have been completed and checked again.	1A

STEP 2B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

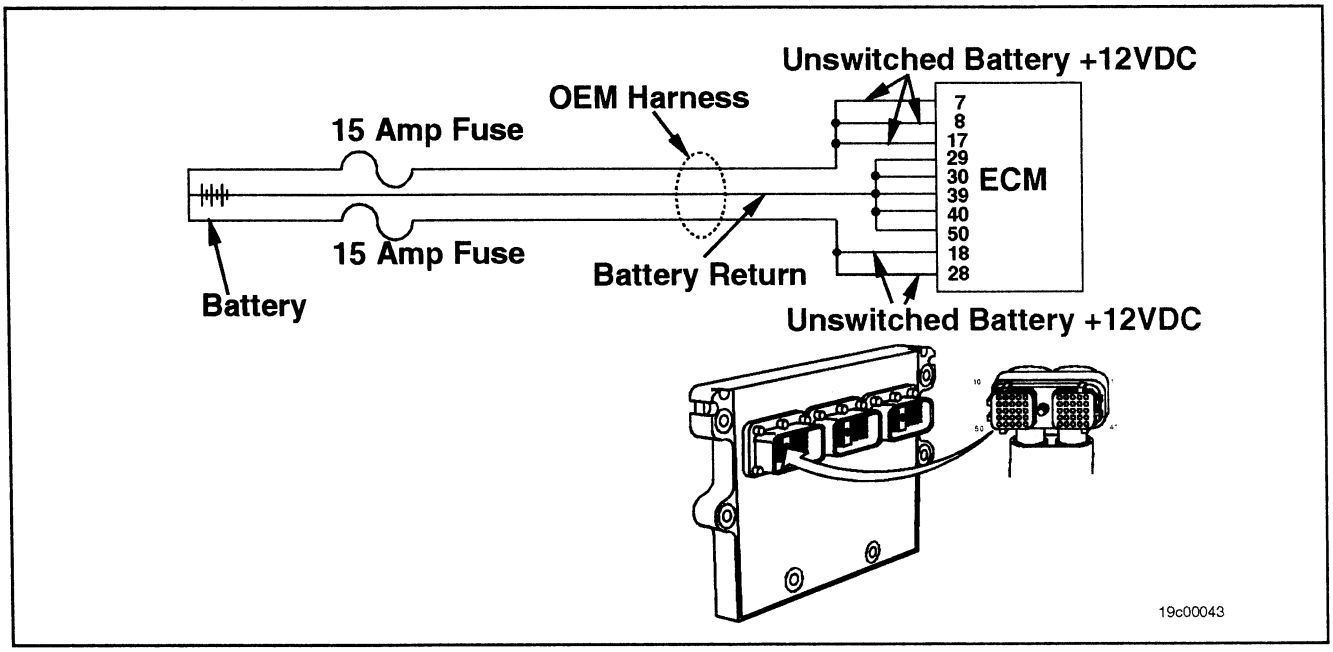
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 441

Unswitched Battery Supply Circuit

CODES	REASON	EFFECT
Fault Code: 441 PID(P), SID(S): P168 SPN: 168 FMI: 1/18 Lamp: Yellow	Battery voltage below normal operating level.	Possible no noticeable performance effects or possible rough idle.

Unswitched Battery Supply Circuit



Circuit Description:

The electronic control module (ECM) receives unswitched battery input through the OEM harness. There are two in-line 15-amp fuses in the unswitched battery wire of the OEM harness to protect the engine harness from overheating. The battery return wires are connected directly to the negative (–) battery post.

Component Location:

The ECM is connected to the battery by the OEM harness. This direct link provides a constant power supply for the ECM. Refer to the OEM troubleshooting and repair manual for the battery location.

Shop Talk:

Make sure the ECM unswitched battery supply is coming directly from the battery and **not** the starter.

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

**To avoid pin and harness damage, use the following test lead when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.**

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the equipment battery system.		
STEP 1A: Inspect the battery cable connections.	No damaged connections	
STEP 1B: Check the battery voltage.	Normal conditions: At least (+) 12 VDC During cranking: At least (+) 6.2 VDC	
STEP 2: Check the OEM harness.		
STEP 2A: Inspect the fuse connections.	Fuses installed correctly	
STEP 2B: Check the fuses.	Fuses not blown	
STEP 2C: Inspect the OEM harness and ECM connector pins.	No damaged pins	
STEP 2D: Check for an open circuit in the battery power circuit.	Less than 10 ohms	
STEP 2E: Check for a short circuit.	More than 100k ohms	
STEP 2F: Check the add-on or the accessory wiring at (+) terminal of the battery.	No damaged wires	
STEP 3: Clear the fault codes.		
STEP 3A: Disable the fault code.	Fault Code 441 inactive	
STEP 3B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check the equipment battery system.

STEP 1A: Inspect the battery cable connections.

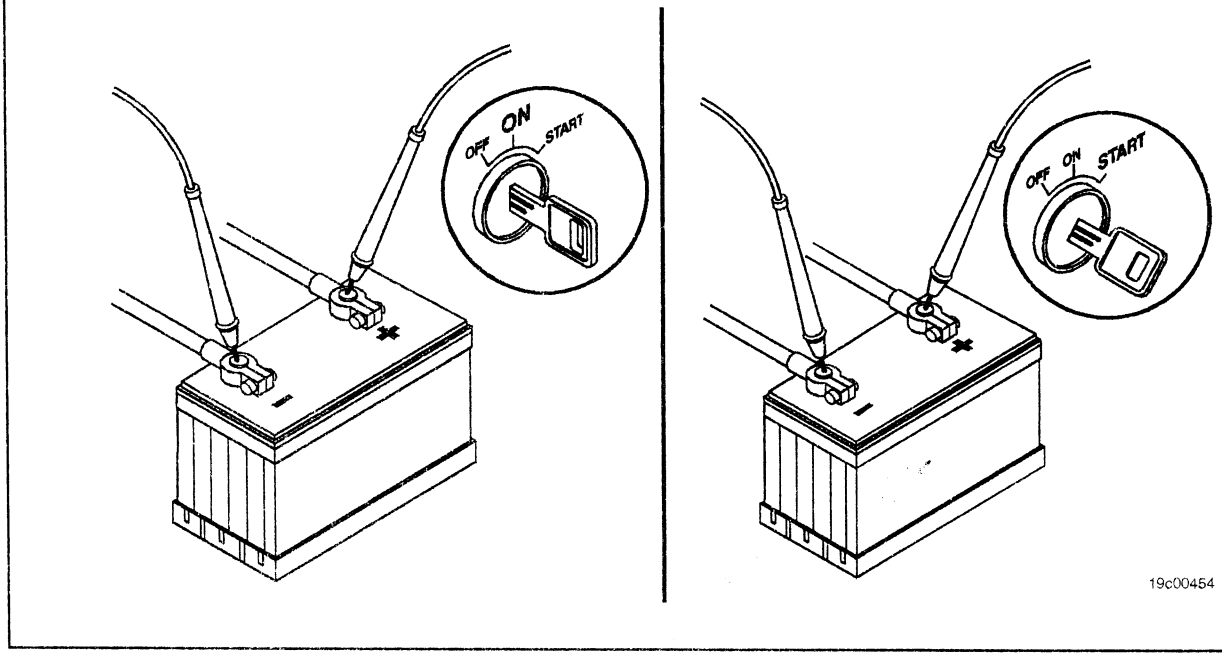
Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Inspect the battery cable connections for the following: • Corrosion • Loose connections.	**OK** **No damaged connections**	1B
	NOT OK **Repair the damaged connections** Tighten the battery connections and clean the battery terminals. Refer to the OEM troubleshooting and repair manual.	3A

STEP 1B: Check the battery voltage.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Check the battery voltage. • Measure the battery voltage from the positive (+) terminal to the negative (–) terminal. • Measure the battery voltage from the positive (+) terminal to the negative (–) terminal while trying to start the engine.	**OK** **Normal conditions:** **At least (+) 12 VDC** **During cranking:** **At least (+) 6.2 VDC**	2A
	NOT OK **Charge or replace the battery** Refer to the OEM troubleshooting and repair manual.	3A



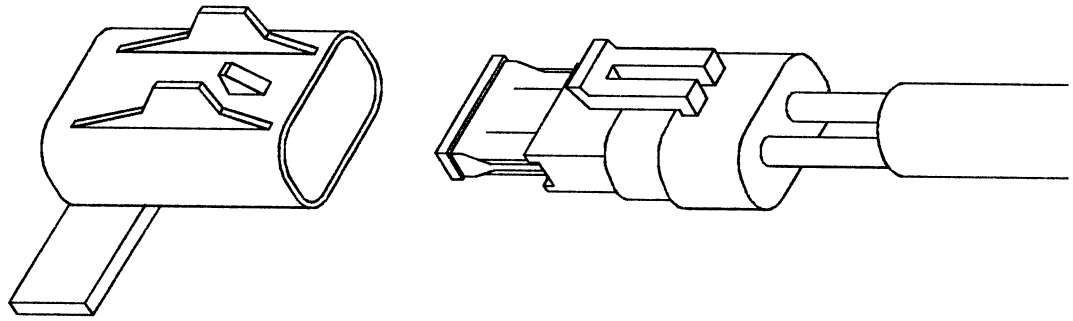
STEP 2: Check the OEM harness.

STEP 2A: Inspect the fuse connections.

Condition:

- Turn keyswitch OFF.
- Disconnect the 15-amp fuses from the OEM harness.

Action	Specifications/Repair	Next Step
Check if the two 15-amp fuses are installed correctly.	**OK** **Fuses installed correctly**	2B
	NOT OK **Install fuses correctly** Refer to Procedure 019-003.	3A

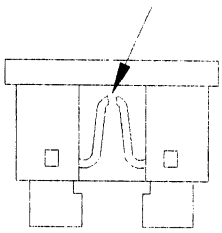


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STEP 2B: Check the fuses.

Condition:
- Turn keyswitch OFF.
- Disconnect the 15-amp fuses from the OEM harness.

Action	Specifications/Repair	Next Step
Check if the two 15-amp fuses are blown.	**OK** **Fuses not blown**	2C
	NOT OK **Replace the fuses** Refer to Procedure 019-003.	3A



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STEP 2C: Inspect the OEM harness and ECM connector pins.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the OEM harness and ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	2D
	NOT OK **Replace the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	3A

STEP 2D: Check for an open circuit in the battery power circuit.

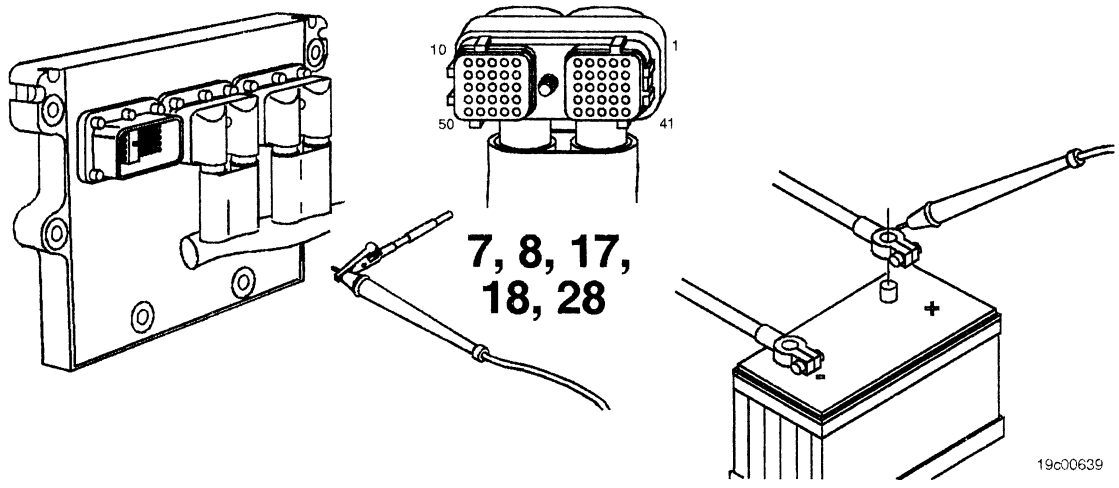
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the OEM harness connector from the ECM.
- Disconnect the positive (+) battery terminal.

Action	Specifications/Repair	Next Step
Check for an open circuit in the battery power circuit. • Measure the resistance from pin 7 of the OEM harness connector to the positive (+) battery terminal connector. • Measure the resistance from pin 8 of the OEM harness connector to the positive (+) battery terminal connector. • Measure the resistance from pin 17 of the OEM harness connector to the positive (+) battery terminal connector. • Measure the resistance from pin 18 of the OEM harness connector to the positive (+) battery terminal connector. • Measure the resistance from pin 28 of the OEM harness connector to the positive (+) battery terminal connector.	**OK** **Less than 10 ohms**	2E
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



STEP 2E: Check for a short circuit.

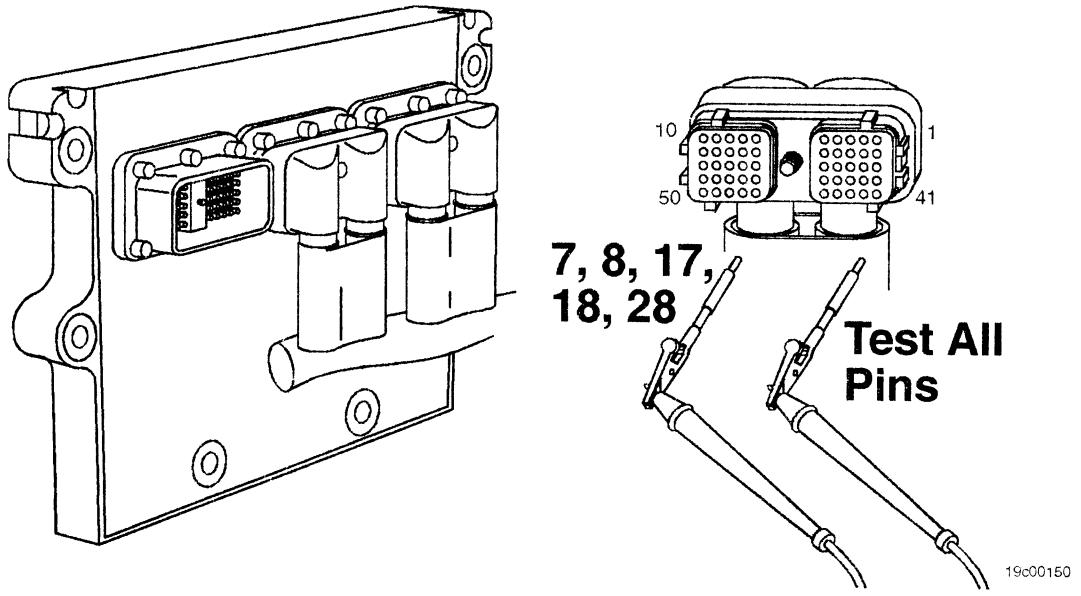
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the OEM harness connector from the ECM.
- Disconnect the positive (+) battery terminal.

Action	Specifications/Repair	Next Step
Check for a short circuit. • Measure the resistance from pin 7 to all other pins in the OEM harness connector **except** for pins 8, 17, 18, and 28. • Measure the resistance from pin 8 to all other pins in the OEM harness connector **except** for pins 7, 17, 18, and 28. • Measure the resistance from pin 17 to all other pins in the OEM harness connector **except** for pins 7, 8, 18, and 28. • Measure the resistance from pin 18 to all other pins in the OEM harness connector **except** for pins 7, 8, 17, and 28. • Measure the resistance from pin 28 to all other pins in the OEM harness connector **except** for pins 7, 8, 17, and 18.	**OK** **More than 100k ohms**	2F
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



STEP 2F: Check the add-on or the accessory wiring at (+) terminal of the battery.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Check the add-on or the accessory wiring at (+) terminal of the battery. • Starting at the (+) terminal, follow any add-on or accessory wiring and examine the wire(s) for damaged insulation or installation error that can cause the supply wire to have a short circuit to the engine block.	**OK** **No damaged wires**	3A
	NOT OK **Repair the damaged wiring**	3A

STEP 3: Clear the fault codes.

STEP 3A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify that Fault Code 441 is inactive.	**OK** **Fault Code 441 inactive**	3B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location if all the steps have been completed and checked again.	1A

STEP 3B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

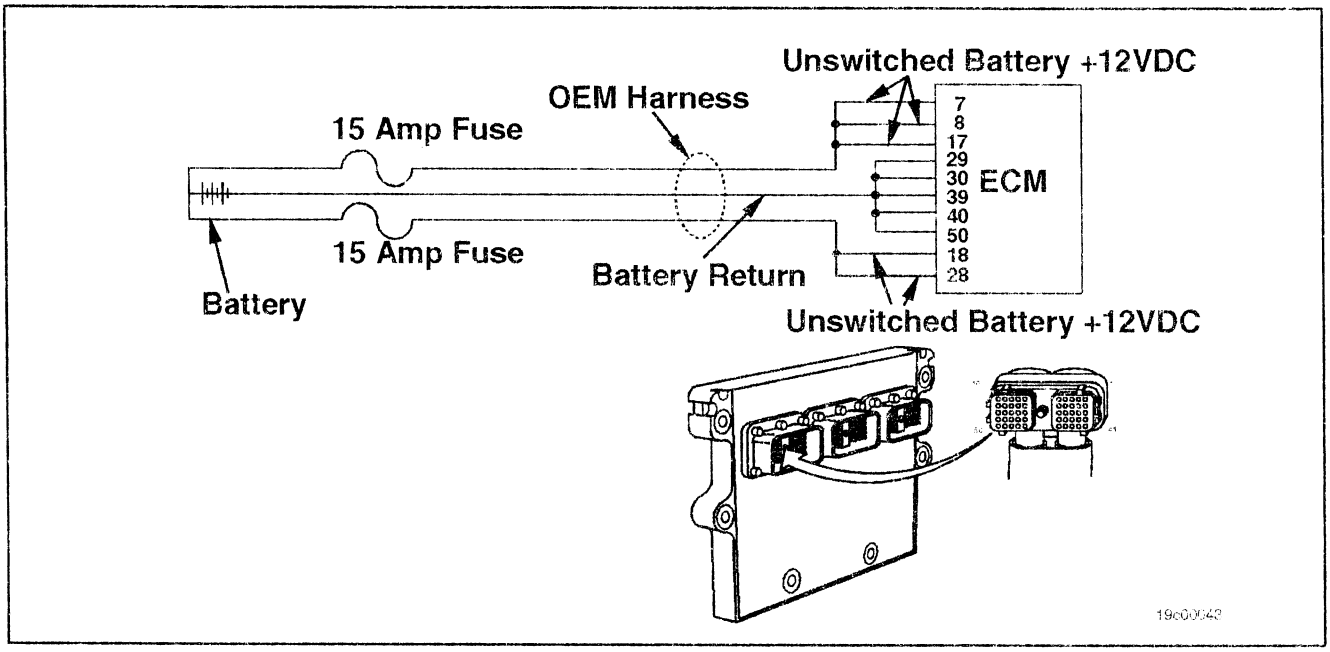
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 434

Unswitched Battery Supply Circuit

CODES	REASON	EFFECT
Fault Code: 434 PID(P), SID(S): S251 SPN: 627 FMI: 2/2 Lamp: Yellow	Supply voltage to the electronic control module (ECM) fell below (+) 6.2 VDC for a fraction of a second or the ECM was **not** allowed to power down correctly (retain battery voltage for 30 seconds after keyswitch is turned off).	Possible no noticeable performance effects or engine dying or hard starting. Fault information, trip information, and maintenance monitor data can be inaccurate.

Unswitched Battery Supply



Circuit Description:

The ECM receives constant voltage from the batteries through the unswitched battery wires that are connected directly to the positive (+) battery post. There are two in-line 15-amp fuses in the unswitched battery wires to protect the engine harness from overheating. The ECM receives switched battery input through the vehicle keyswitch wire, and one 5-amp fuse when the vehicle keyswitch is turned on. The battery return wires are connected directly to the negative (–) battery post.

Component Location:

The ECM is connected to the battery by the OEM harness. This direct link provides a constant power supply for the ECM. The location of the battery will vary with the OEM. Refer to the OEM troubleshooting and repair manual.

Shop Talk:

If the ECM unswitched battery supply is taken from the starter, check for low voltage during cranking. Low voltage during cranking can cause the ECM power supply to drop below specifications and log Fault Code 434.

TROUBLESHOOTING SUMMARY

⚠ WARNING ⚠

The injector solenoids receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the injector solenoids or the solenoid wires when the engine is operating.

⚠ CAUTION ⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the batteries and the power connector.		
STEP 1A: Check the resistance of the battery supply circuit.	Less than 10 ohms	
STEP 1B: Check the battery voltage.	Normal conditions: At least (+) 12 VDC During cranking: At least (+) 6.2 VDC	
STEP 1C: Check the battery connections.	Connections are tight and corrosion-free	
STEP 2: Check the fuses.		
STEP 2A: Check if the two 15-amp fuses are installed correctly.	Fuses installed correctly	
STEP 2B: Check if the two 15-amp fuses are blown.	Fuses not blown	
STEP 2C: Check if the 5-amp fuse is installed correctly.	Fuses installed correctly	
STEP 2D: Check if the 5-amp fuse is blown.	Fuse not blown	
STEP 3: Check the OEM harness.		
STEP 3A: Inspect the OEM harness and the ECM connector pins.	No damaged pins	
STEP 3B: Check for an open circuit in the battery power circuits.	(+) 10 to 15 VDC	
STEP 3C: Check for a short circuit.	More than 100k ohms	
STEP 3D: Check the add-on or the accessory wiring at (+) terminal of the battery.	No damaged wires	
STEP 4: Clear the fault codes.		
STEP 4A: Disable the fault code.	Fault Code 434 inactive	
STEP 4B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check the batteries and the power connector.

STEP 1A: Check the resistance of the battery supply circuit.

⚠WARNING⚠

The injector solenoids receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the injector solenoids or the solenoid wires when the engine is operating.

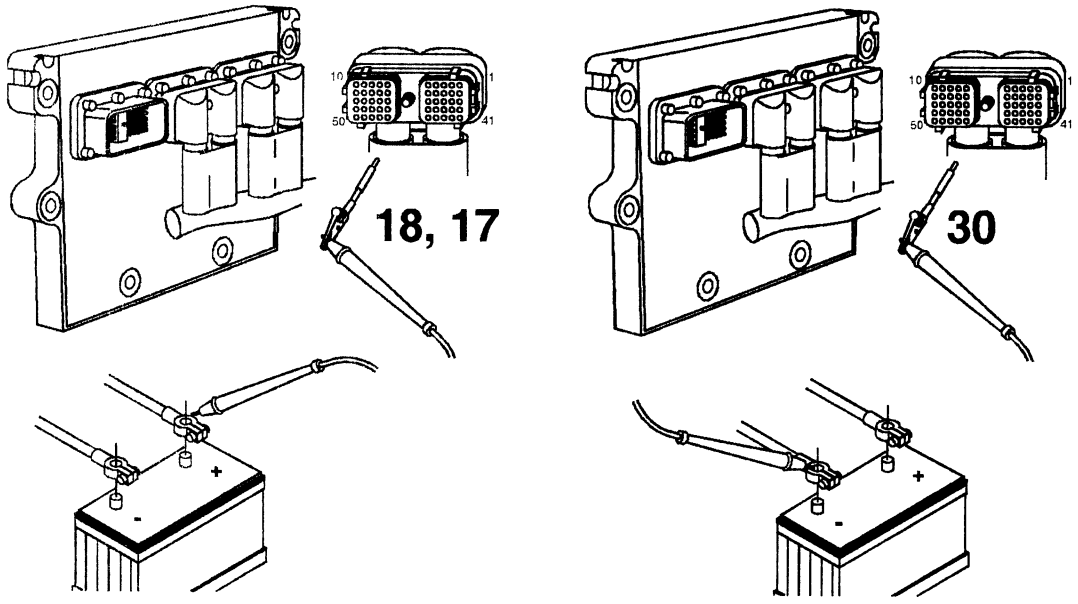
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the OEM harness connector from the ECM.
- Disconnect both positive and negative terminals from the battery.

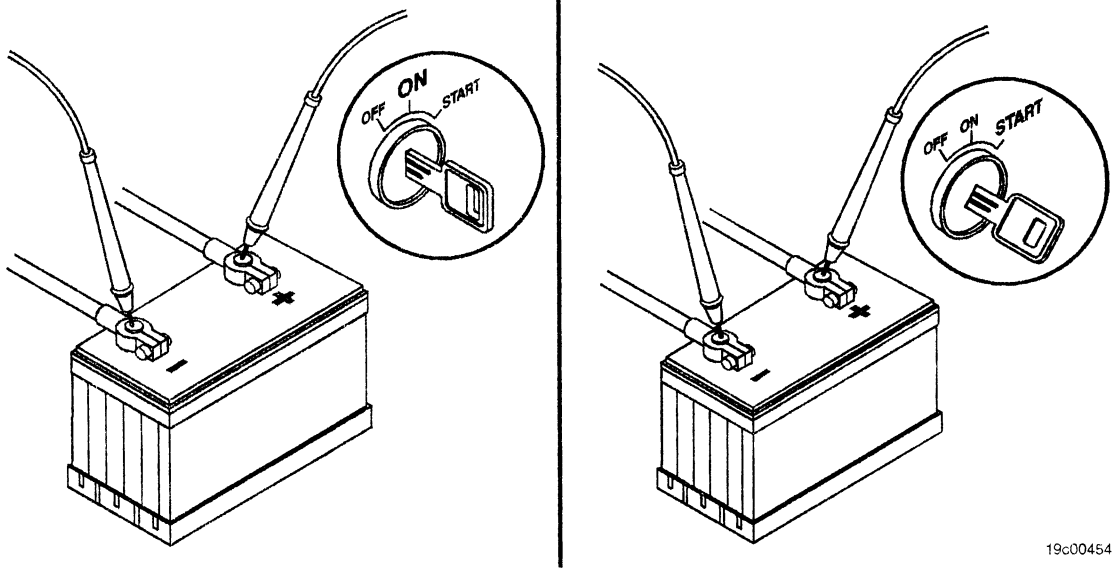
Action	Specifications/Repair	Next Step
Check the resistance of the battery supply circuit. • Measure the resistance from pin 18 of the OEM harness connector to the positive (+) battery terminal connector. • Measure the resistance from pin 17 of the OEM harness connector to the positive (+) battery terminal connector. • Measure the resistance from pin 30 of the OEM harness connector to the negative (–) battery terminal connector.	**OK** **Less than 10 ohms**	1B
	NOT OK **Repair or replace the OEM harness** • Repair the OEM harness. Refer to Procedure 019-250. • Replace the OEM harness. Refer to the OEM troubleshooting and repair manual.	4A



STEP 1B: Check the battery voltage.

Condition:
- Turn keyswitch ON.

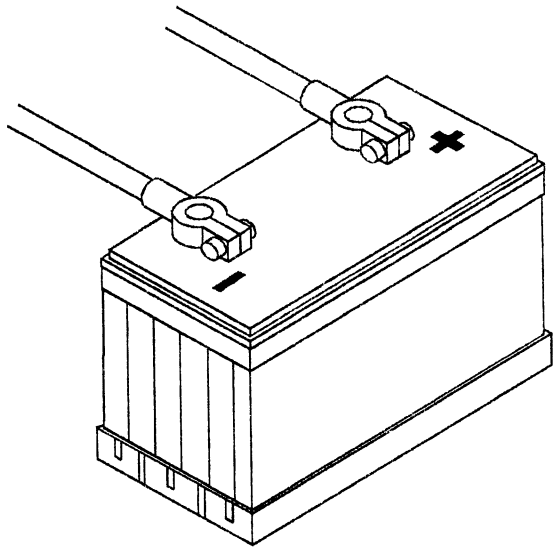
Action	Specifications/Repair	Next Step
Check the battery voltage. • Place positive (+) probe of the multimeter on the positive battery terminal and touch negative (–) probe to the negative battery terminal while trying to start engine.	**OK** **Normal conditions: At least (+) 12 VDC** **During cranking: At least (+) 6.2 VDC**	1C
	NOT OK **Charge or replace the battery** Refer to the OEM troubleshooting and repair manual.	4A



STEP 1C: Check the battery connections.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Check the battery connections. • Check the battery terminal connections.	**OK** **Connections are tight and corrosion-free**	2A
	NOT OK **Tighten the connections** Tighten the loose connections and clean the terminals. Refer to the OEM troubleshooting and repair manual.	4A



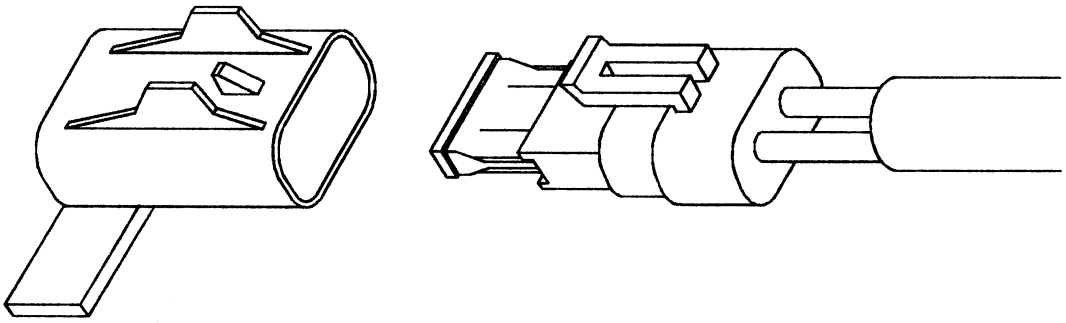
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STEP 2: Check the fuses.

STEP 2A: Check if the two 15-amp fuses are installed correctly.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Check if the two 15-amp fuses are installed correctly. • Inspect the two 15-amp fuses for correct installation.	**OK** **Fuses installed correctly**	2B
	NOT OK **Install the fuses correctly** Refer to Procedure 019-198.	4A

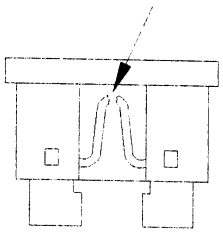


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STEP 2B: Check if the two 15-amp fuses are blown.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Check if the two 15-amp fuses are blown. • Inspect the two 15-amp fuses to see if they are blown.	**OK** **Fuses not blown**	2C
	NOT OK **Locate the short circuit** • Replace the engine harness. Refer to Procedure 019-043. • Replace the blown fuse(s).	4A

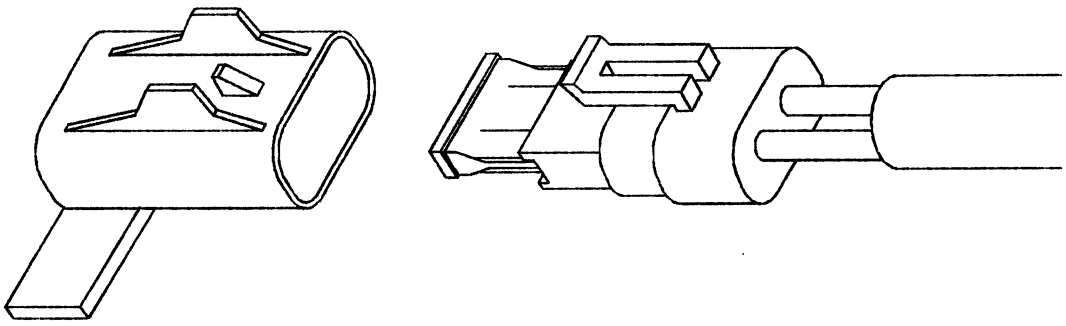


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STEP 2C: Check if the 5-amp fuse is installed correctly.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Check if the 5-amp fuse is installed correctly. • Inspect the 5-amp fuse for correct installation.	**OK** **Fuse installed correctly**	2D
	NOT OK **Install the fuse correctly** Refer to Procedure 019-198.	4A

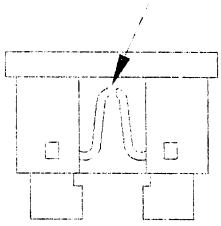


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STEP 2D: Check if the 5-amp fuse is blown.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Check if the 5-amp fuse is blown. • Inspect the 5-amp fuse to see if it is blown.	**OK** **Fuse not blown**	3A
	NOT OK **Locate the short circuit** • Replace the engine harness. Refer to Procedure 019-043. • Replace the blown fuse.	4A



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STEP 3: Check the OEM harness.

STEP 3A: Inspect the harness and the ECM connector pins.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:

- Turn keyswitch OFF.
- Disconnect the OEM harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the harness and the ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	3B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	4A

STEP 3B: Check for an open circuit in the battery power circuits.

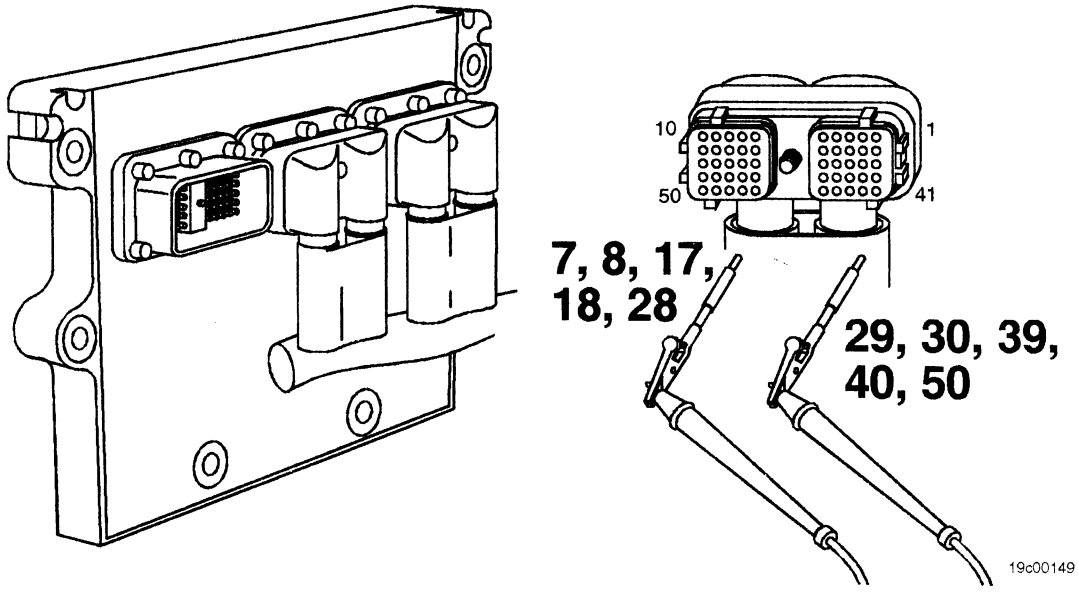
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the OEM harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for an open circuit in the battery power circuits. • Measure the voltage from pin 7 to pin 29 of the OEM harness connector. • Measure the voltage from pin 8 to pin 30 of the OEM harness connector. • Measure the voltage from pin 17 to pin 39 of the OEM harness connector. • Measure the voltage from pin 18 to pin 40 of the OEM harness connector. • Measure the voltage from pin 28 to pin 50 of the OEM harness connector.	**OK** **(+) 10 to 15 VDC**	3C
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	4A



STEP 3C: Check for a short circuit.

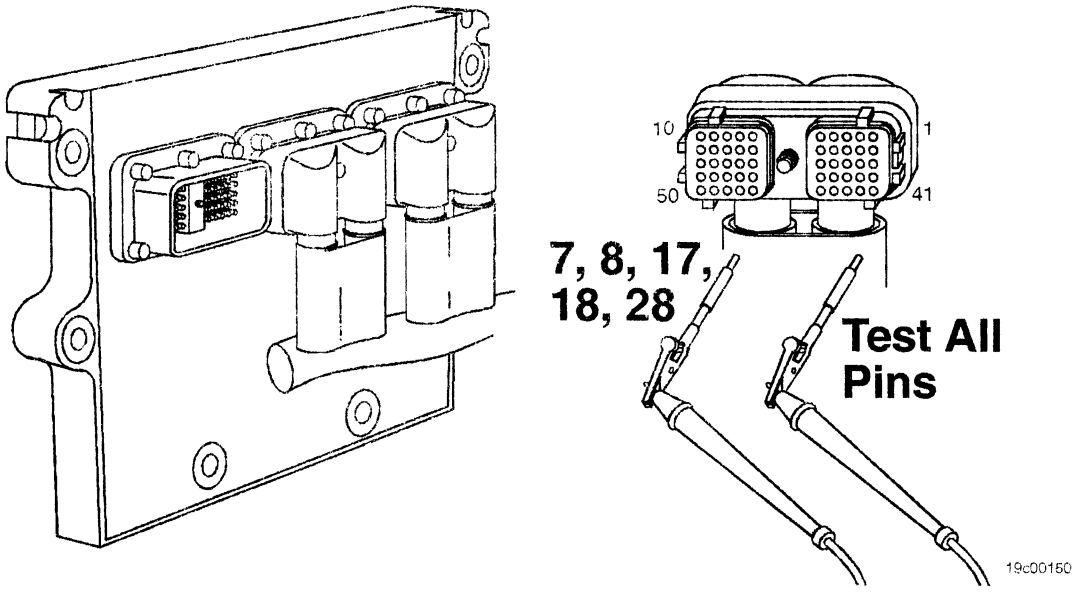
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the OEM harness connector from the ECM.
- Disconnect both positive (+) and negative (-) terminals from the battery.

Action	Specifications/Repair	Next Step
Check for a short circuit. • Measure the resistance from pin 7 of the OEM harness connector to all other pins in the connector **except** pins 8, 17, 18, and 28. • Measure the resistance from pin 8 of the OEM harness connector to all other pins in the connector **except** pins 7, 17, 18, and 28. • Measure the resistance from pin 17 of the OEM harness connector to all other pins in the connector **except** pins 7, 8, 18, and 28. • Measure the resistance from pin 18 of the OEM harness connector to all other pins in the connector **except** pins 7, 8, 17, and 28. • Measure the resistance from pin 28 of the OEM harness connector to all other pins in the connector **except** pins 7, 8, 17, and 18.	**OK** **More than 100k ohms**	3D
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	4A



STEP 3D: Check the add-on or the accessory wiring at (+) terminal of the battery.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Check the add-on or the accessory wiring at (+) terminal of the battery. • Starting at the (+) terminal, follow any add-on or accessory wiring and examine wire(s) for damaged insulation or an installation error that can cause the supply wire to be shorted to the engine block.	**OK** **No damaged wires**	4A
	NOT OK **Repair or replace the damaged wiring**	4A

STEP 4: Clear the fault codes.

STEP 4A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify Fault Code 434 is inactive.	**OK** **Fault Code 434 inactive**	4B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location if all the steps have been completed and checked again.	1A

STEP 4B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

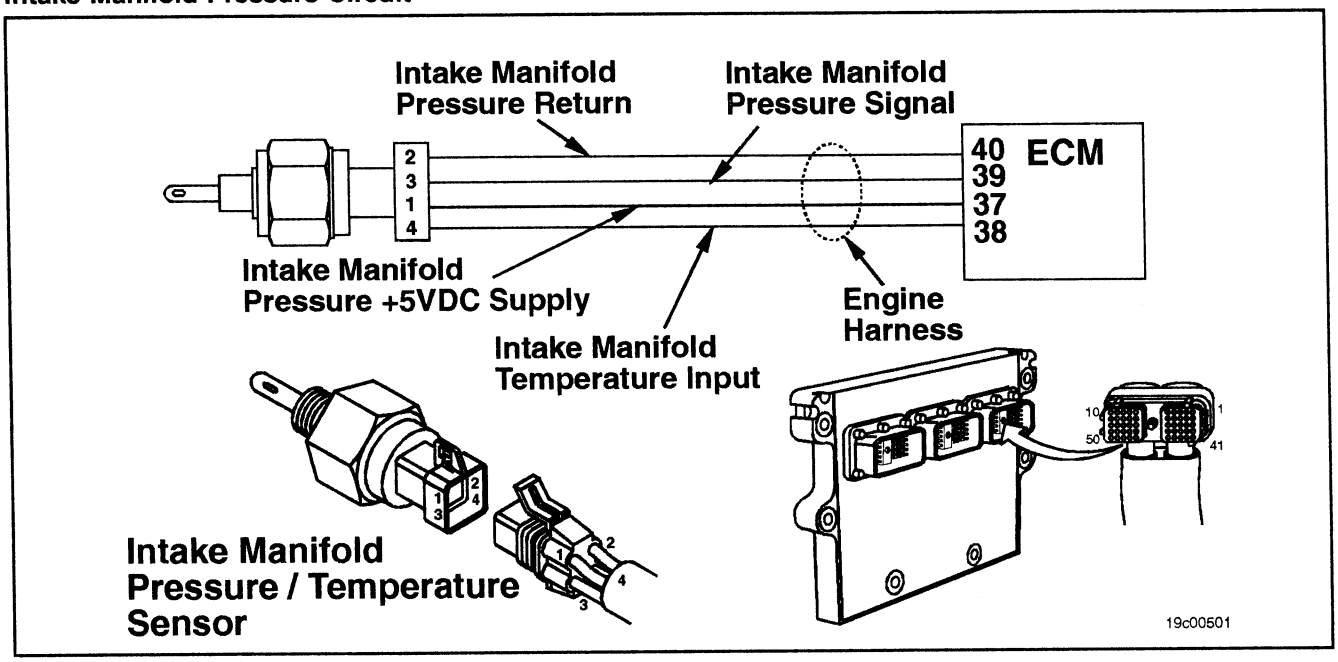
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 433

Intake Manifold Pressure Circuit

CODES	REASON	EFFECT
Fault Code: 433 PID(P), SID(S): P102 SPN: 102 FMI: 2/2 Lamp: Yellow	Voltage signal at the intake manifold pressure circuit indicates high intake manifold pressure, but other engine characteristics indicate that intake manifold pressure **must** be low.	Derate to no-air setting.

Intake Manifold Pressure Circuit



Circuit Description:

The intake manifold pressure/temperature sensor monitors intake manifold pressure and passes information to the electronic control module (ECM) through the sensor harness. If intake manifold pressure becomes too high, it will cause a derate condition.

Component Location:

The intake manifold pressure/temperature sensor is located on the cylinder head between the air horn and the front of engine.

Shop Talk:

The ECM checks for this fault **only** at idle speed. If the intake manifold pressure shows too high of a value at this time, the ECM will log this fault code.

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the intake manifold pressure/temperature sensor.		
STEP 1A: Inspect the sensor circuit for tampering.	No tampering	
STEP 1B: Inspect the harness and sensor connector pins.	No damaged pins	
STEP 2: Check the sensor harness.		
STEP 2A: Inspect the sensor harness and ECM connector pins.	No damaged pins	
STEP 2B: Check for an open circuit in the return line.	Less than 10 ohms	
STEP 2C: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 2D: Check for a short circuit to ground.	More than 100k ohms	
STEP 3: Clear the fault codes.		
STEP 3A: Disable the fault code.	Fault Code 433 inactive	
STEP 3B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check the intake manifold pressure/temperature sensor.

STEP 1A: Inspect the sensor circuit for tampering.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Inspect the sensor circuit for tampering. • Check the intake manifold pressure/ temperature sensor and the sensor harness for external wires or damaged harness braiding.	**OK** **No tampering**	1B
	NOT OK **Remove and record tampering** If tampering has occurred, repair the circuit and record the tampering.	3A

STEP 1B: Inspect the harness and sensor connector pins.

Condition:
- Turn keyswitch OFF.
- Disconnect the engine harness from the intake manifold pressure/temperature sensor.

Action	Specifications/Repair	Next Step
Inspect the harness and sensor connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	2A
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the sensor, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-204. • Replace the engine harness. Refer to Procedure 019-043. • Replace the intake manifold pressure/ temperature sensor. Refer to Procedure 019-159.	3A

STEP 2: Check the sensor harness.

STEP 2A: Inspect the sensor harness and ECM connector pins.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the harness and the ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	2B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	3A

STEP 2B: Check for an open circuit in the return line.

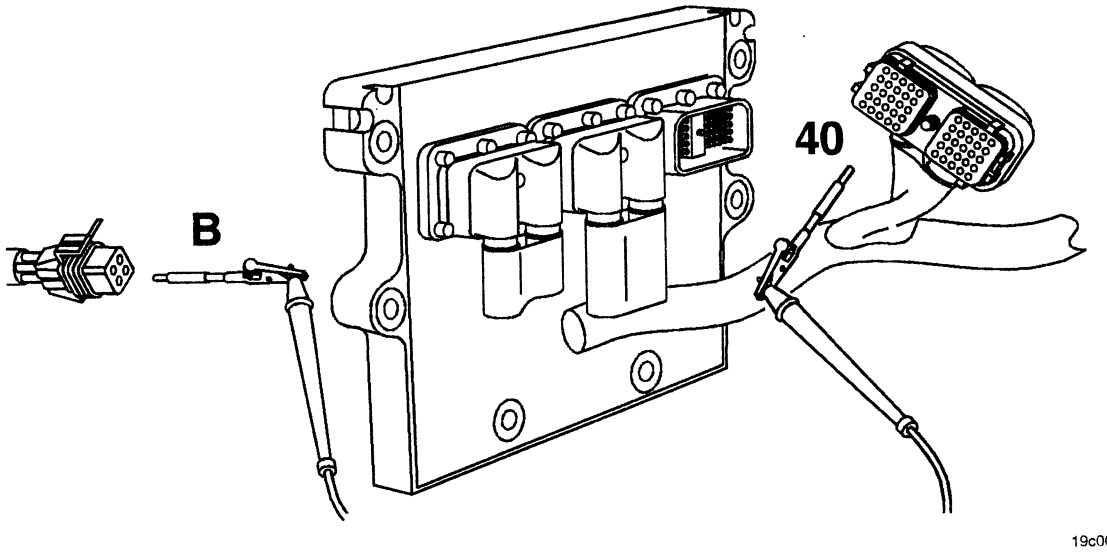
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness from the intake manifold pressure/temperature sensor.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for an open circuit in the return line. • Measure the resistance from pin 40 of the sensor harness connector to pin 2 (or B) of the intake manifold pressure/temperature sensor connector on the harness side.	**OK** **Less than 10 ohms**	2C
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-204 or 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



STEP 2C: Check for a short circuit from pin to pin.

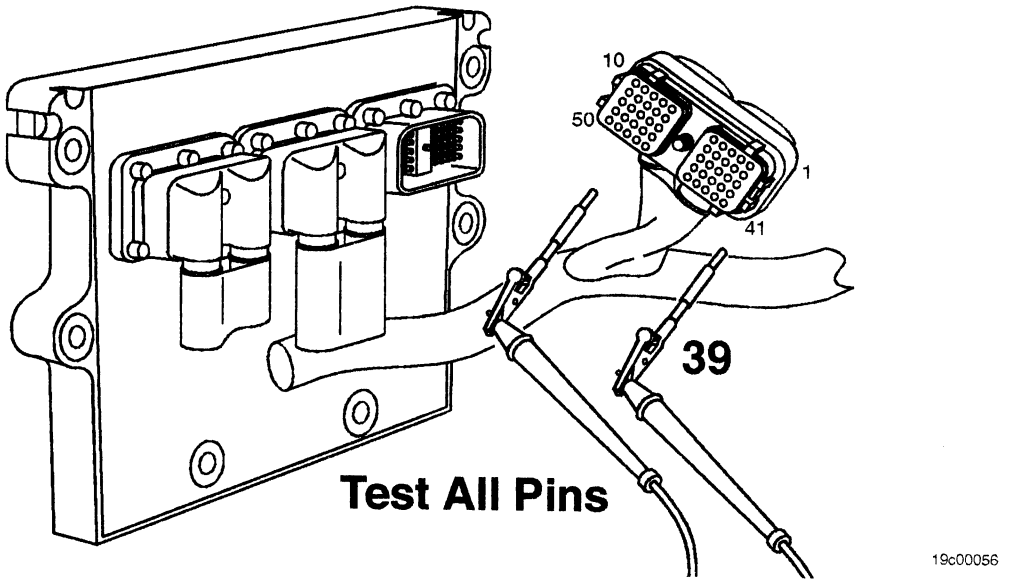
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness from the intake manifold pressure/temperature sensor.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin. • Measure the resistance from pin 39 of the sensor harness connector to all other pins in the connector.	**OK** **More than 100k ohms**	2D
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



STEP 2D: Check for a short circuit to ground.

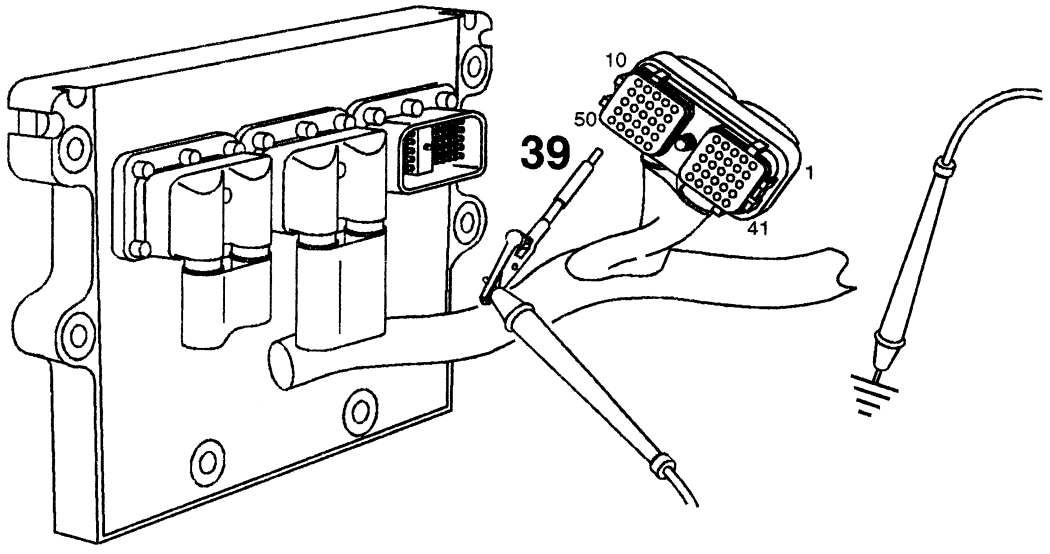
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the sensor harness from the intake manifold pressure/temperature sensor.
- Disconnect the sensor harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check for a short circuit to ground. • Measure the voltage from pin 39 in the sensor harness connector to the engine block ground.	**OK** **More than 100k ohms** **Replace the intake manifold pressure/ temperature sensor** Refer to Procedure 019-159.	3A
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250 and Procedure 019-204. • Replace the engine harness. Refer to Procedure 019-043.	3A



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STEP 3: Clear the fault codes.

STEP 3A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify Fault Code 433 is inactive.	**OK** **Fault Code 433 inactive**	3B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location if all the steps have been completed and checked again.	1A

STEP 3B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

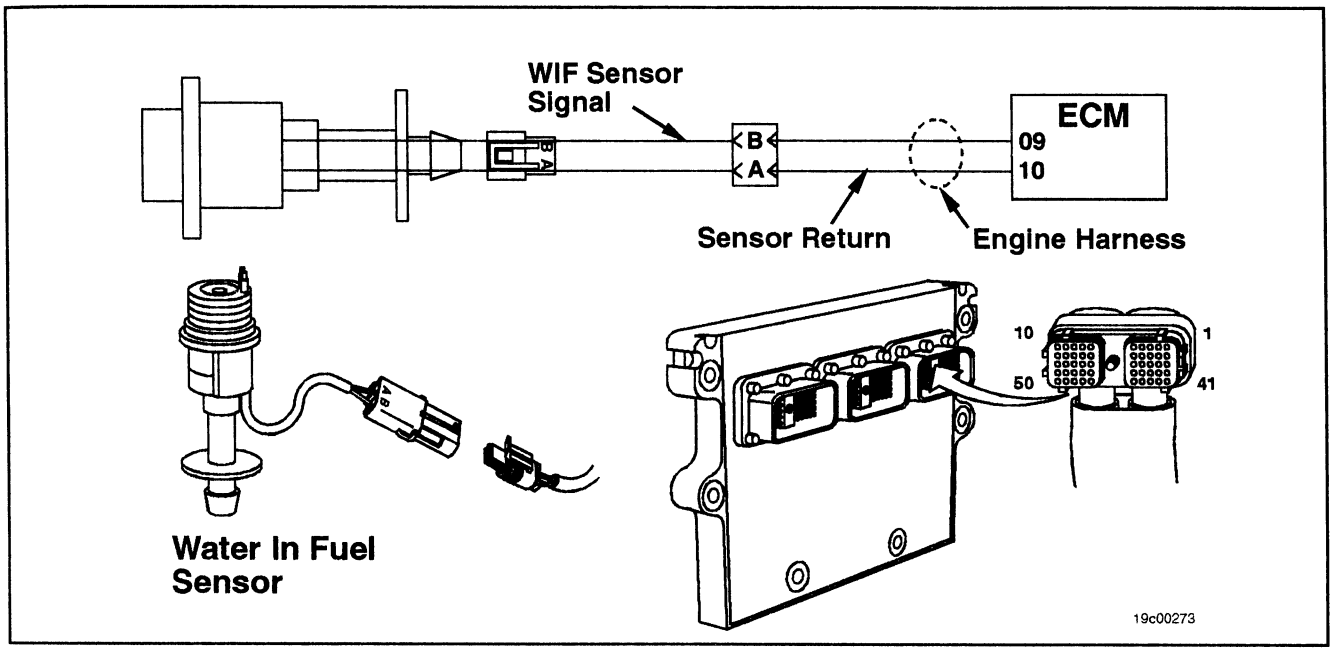
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 429

Water-In-Fuel (WIF) Sensor Circuit

CODES	REASON	EFFECT
Fault Code: 429 PID(P), SID(S): P097 SPN: 97 FMI: 4/4 Lamp: Yellow	Low voltage detected at water-in-fuel (WIF) sensor circuit.	None on performance.

WIF Sensor Circuit



Circuit Description:

The WIF sensor is attached to the fuel filter. The WIF sensor sends a signal to the electronic control module (ECM) when a set volume of water has accumulated in the fuel filter. The WIF circuit contains two wires: A return ground (pin 10) and a signal wire (pin 9).

Component Location:

The WIF sensor is installed in the fuel filter and is located on the side of the head approximately midengine.

Shop Talk:

The WIF sensor uses the same internal ECM power supply as sensors on engine harness. If Fault Code 352 is also active, use that troubleshooting logic and tree.

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check engine harness.		
STEP 1A: Inspect the engine harness, WIF sensor, and ECM connectors.	No damaged pins	
STEP 1B: Check for a short circuit to ground.	More than 100k ohms	
STEP 1C: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 1D: Check sensor supply voltage.	(+) 4.75 to 5.25 VDC	
STEP 1E: Measure supply voltage from the ECM.	(+) 4.75 to 5.25 VDC	
STEP 2: Clear the fault codes.		
STEP 2A: Disable the fault code.	Fault Code 429 inactive	
STEP 2B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check engine harness.

STEP 1A: Inspect the engine harness, WIF sensor, and ECM connectors.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness from the WIF sensor.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the sensor harness, WIF sensor, and ECM connectors for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	1B
	NOT OK **Repair the damaged pins** Repair or replace the OEM harness, or replace the WIF sensor or ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal, if it is damaged or missing. • Repair engine harness. Refer to Procedure 019-202 or 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the WIF sensor. Refer to Procedure 019-127. • Replace the ECM. Refer to Procedure 019-031.	2A

STEP 1B: Check for a short circuit to ground.

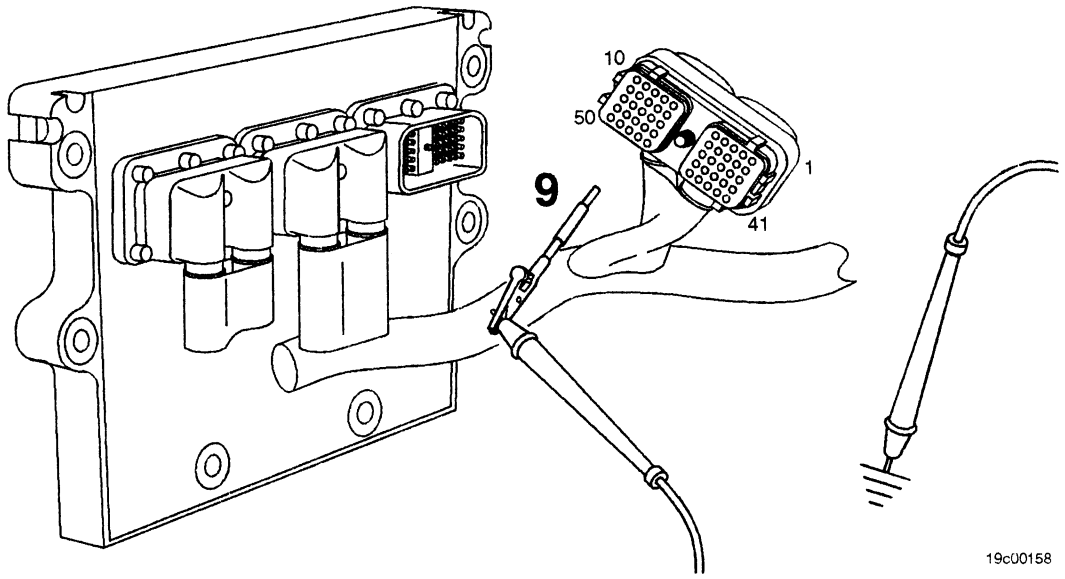
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness from the WIF sensor.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for a short circuit to ground. • Measure the resistance from pin 9 of the sensor harness connector to engine block ground.	**OK** **More than 100k ohms**	1C
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	2A



STEP 1C: Check for a short circuit from pin to pin.

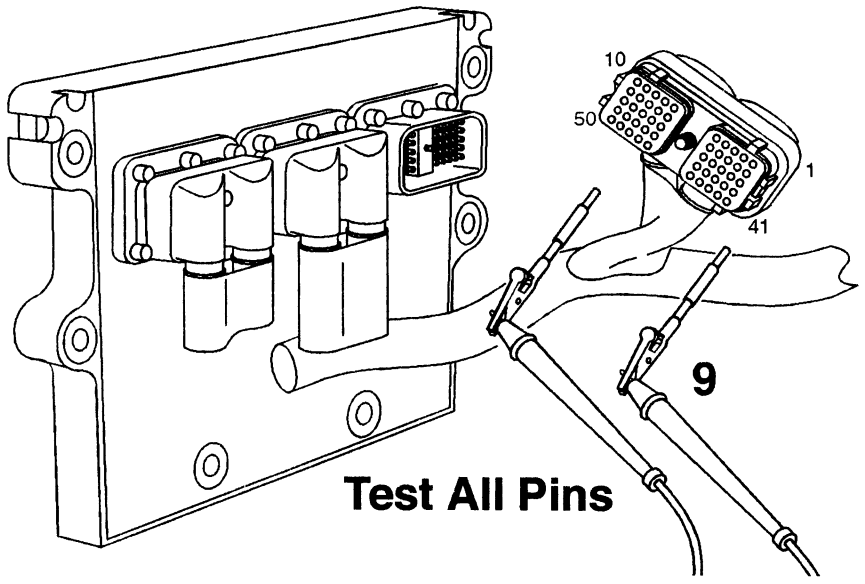
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness from the WIF sensor.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin. • Measure the resistance from pin 9 in the sensor harness connector to all other pins in the connector.	**OK** **More than 100k ohms**	1D
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	2A



STEP 1D: Check sensor supply voltage.

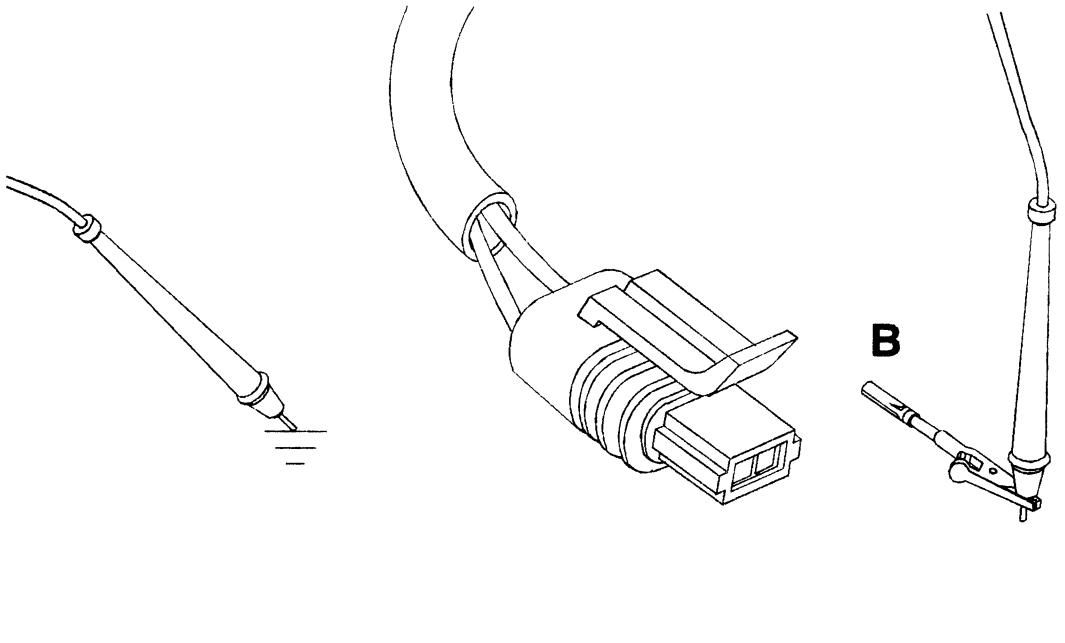
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the sensor harness from the WIF sensor.
- Connect the sensor harness connector to the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check sensor supply voltage. • Measure the voltage from pin B (or 2) on the harness side of the WIF sensor connector to engine block ground.	**OK** **(+) 4.75 to 5.25 VDC** **Replace WIF sensor** Refer to Procedure 019-127.	2A
	NOT OK Does **not** meet specifications.	1E



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STEP 1E: Measure supply voltage from the ECM.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

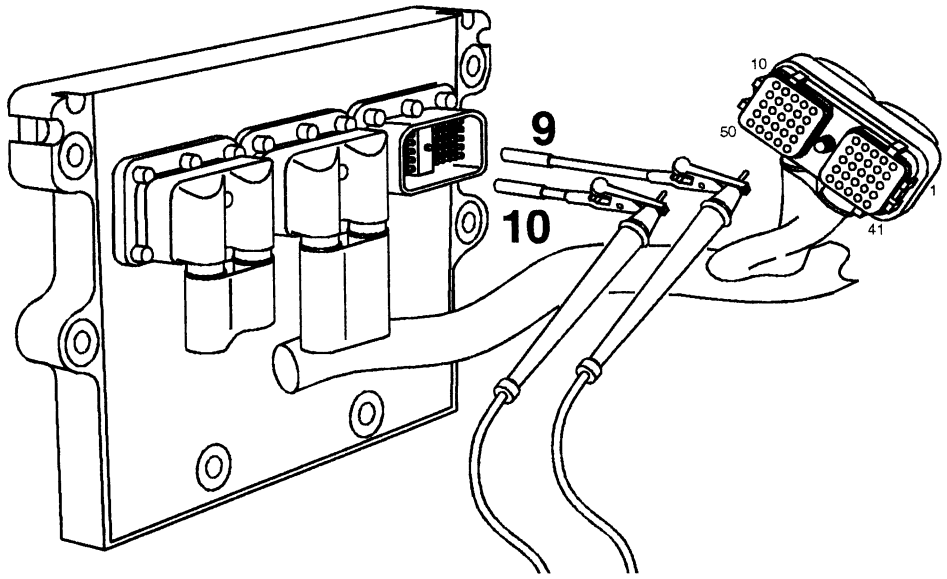
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the sensor harness from the WIF sensor.
- Disconnect the sensor harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Measure supply voltage out of ECM. • Measure the voltage from pin 9 to pin 10 of the ECM sensor port.	**OK** **(+) 4.75 to 5.25 VDC**	2A
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	2A



STEP 2: Clear the fault codes.

STEP 2A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let idle for 1 minute. • Using INSITE™, verify that Fault Code 429 is inactive.	**OK** **Fault Code 429 inactive**	2B
	NOT OK Return to troubleshooting steps or contact your local Cummins Authorized Repair Location if all steps have been completed and checked again.	1A

STEP 2B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

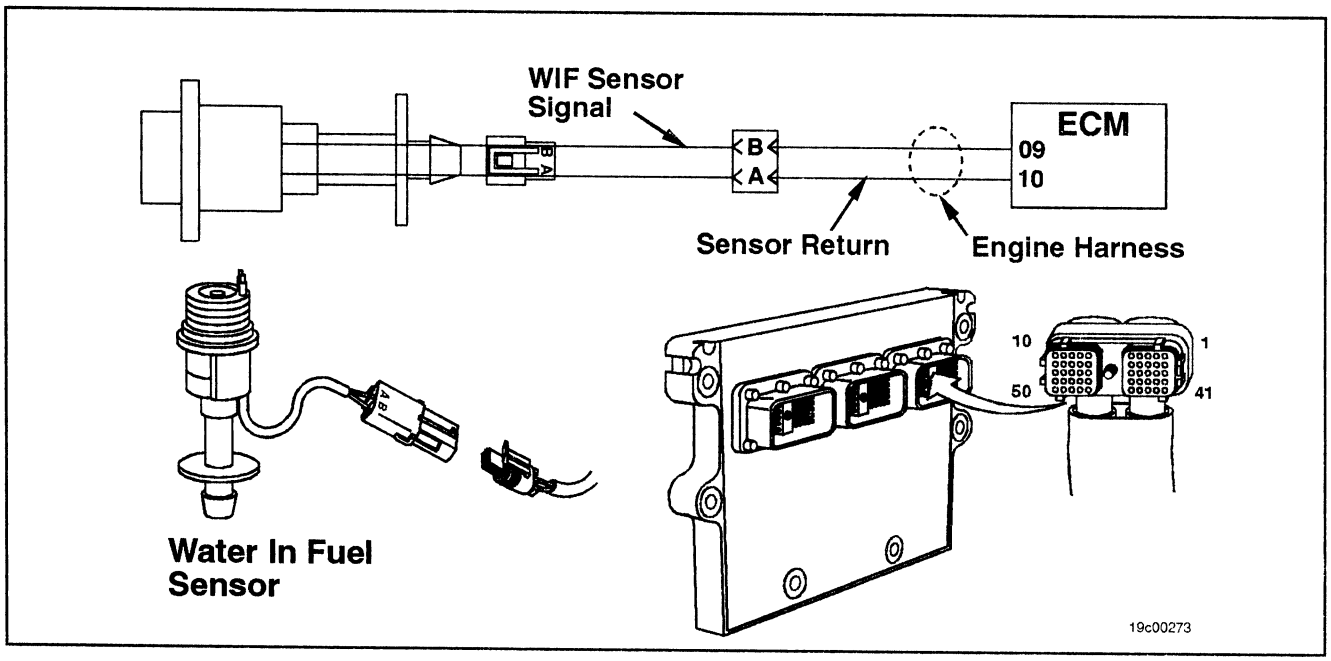
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 428

Water-In-Fuel (WIF) Sensor Circuit

CODES	REASON	EFFECT
Fault Code: 428 PID(P), SID(S): P097 SPN: 97 FMI: 3/3 Lamp: Yellow	High voltage detected at water-in-fuel (WIF) sensor circuit.	None on performance.

WIF Sensor Circuit



Circuit Description:

The WIF sensor is attached to the fuel filter. The WIF sensor sends a signal to the electronic control module (ECM) when a set volume of water has accumulated in the fuel filter. The WIF circuit contain two wires: A return ground (pin 10) and a signal wire (pin 9).

Component Location:

The WIF sensor is installed in the fuel filter and is located on the side of the head, approximately midengine.

Shop Talk:

Possible causes for this fault code include:
Short circuit to a (+) 5-VDC supply wire.

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test lead when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check engine harness.		
STEP 1A: Inspect the engine harness, WIF sensor, and ECM connectors.	No damaged pins	
STEP 1B: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 1C: Check sensor supply voltage.	(+) 4.75 to 5.25 VDC	
STEP 1D: Measure the voltage from the ECM.	(+) 4.75 to 5.25 VDC	
STEP 2: Clear the fault codes.		
STEP 2A: Disable the fault code.	Fault Code 428 inactive	
STEP 2B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check engine harness.

STEP 1A: Inspect the engine harness, WIF sensor, and ECM connectors.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness from the WIF sensor.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the sensor harness, WIF sensor, and ECM connectors for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	1B
	NOT OK **Repair the damaged pins** Repair or replace the OEM harness, or replace the ECM or WIF sensor, or whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair engine harness. Refer to Procedure 019-202 or 019-250 • Replace the engine harness. Refer to Procedure 019-043. • Replace the WIF sensor. Refer to Procedure 019-127. • Replace the ECM. Refer to Procedure 019-031.	2A

STEP 1B: Check for a short circuit from pin to pin.

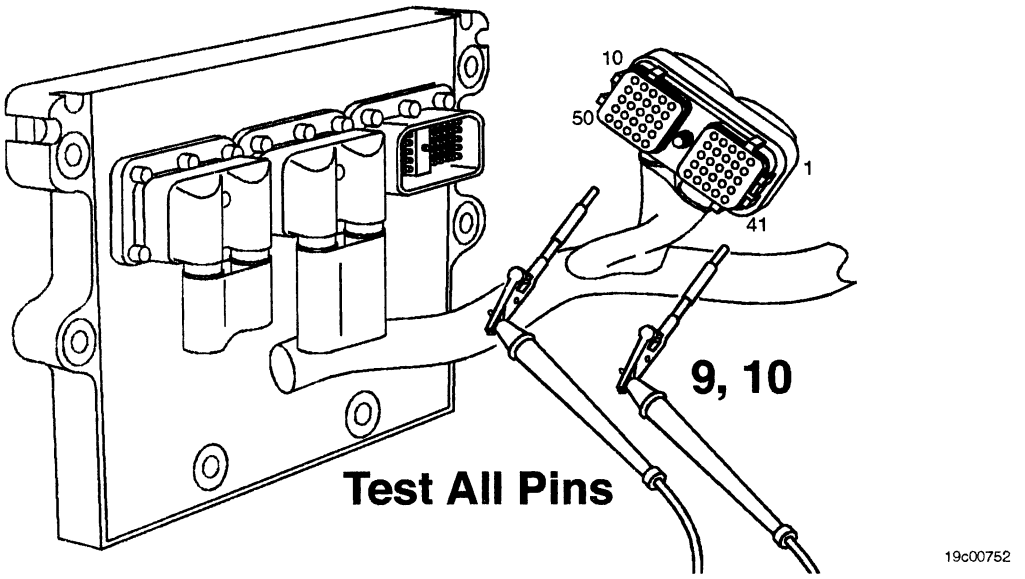
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness from the WIF sensor.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin. • Measure the resistance from pin 9 of the sensor harness connector to all other pins in the connector. • Measure the resistance from pin 10 of the sensor harness connector to all other pins in the connector.	**OK** **More than 100k ohms**	1C
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-202 or 019-250. • Replace the engine harness. Refer to Procedure 019-043.	2A



STEP 1C: Check sensor supply voltage.

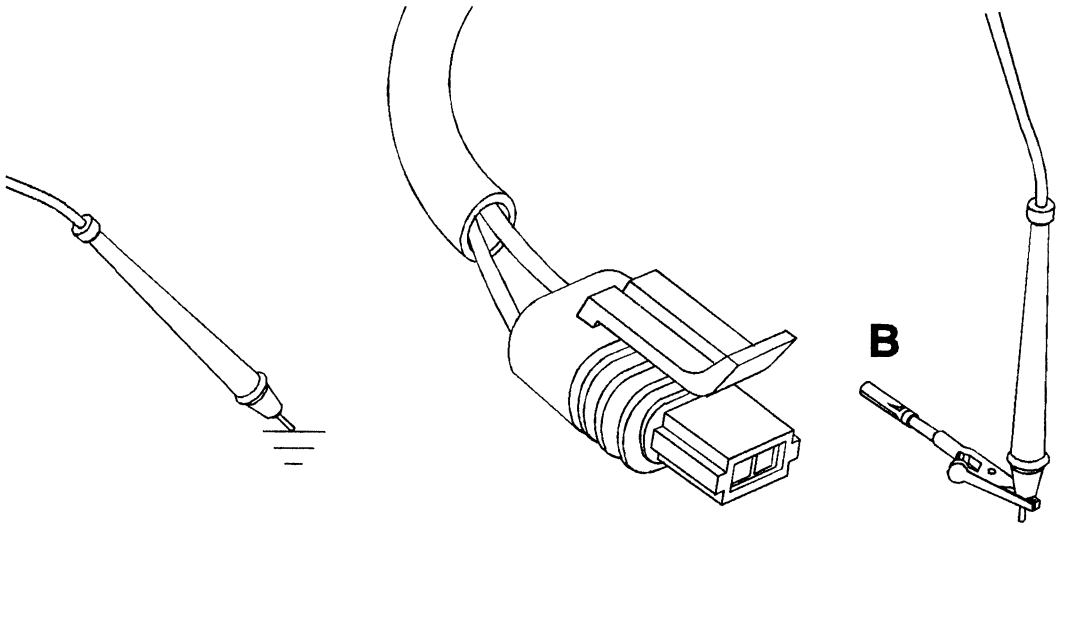
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the sensor harness from the WIF sensor.
- Connect the sensor harness connector to the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check sensor supply voltage. • Measure the voltage from pin B (or 2) on the harness side of the WIF sensor connector to engine block ground.	**OK** **(+) 4.75 to 5.25 VDC** **Replace the WIF sensor** Refer to Procedure 019-127.	2A
	NOT OK	1D



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STEP 1D: Measure the voltage from the ECM.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

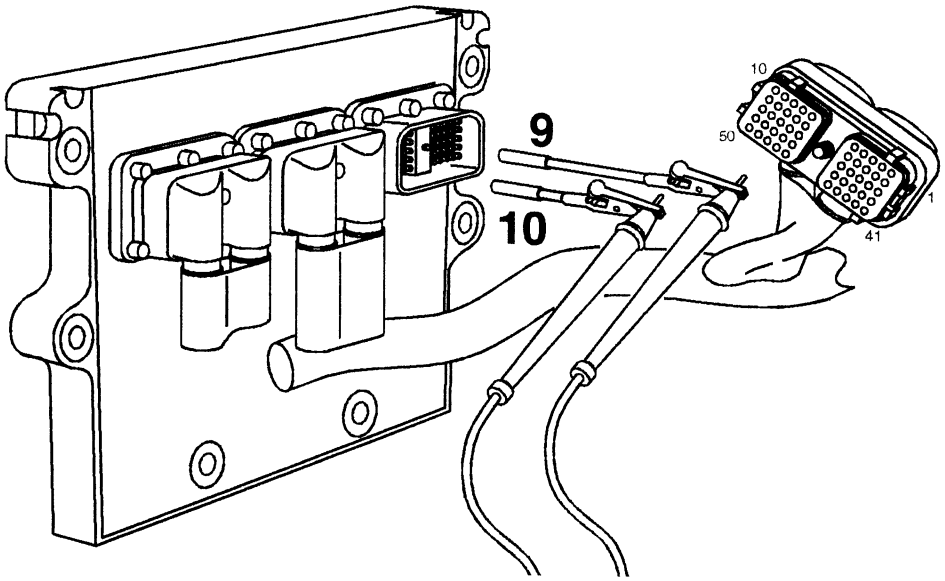
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the sensor harness from the WIF sensor.
- Connect the sensor harness connector to the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Measure the voltage from the ECM. • Measure the voltage out of the ECM from pins 9 to pin 10 of the ECM sensor port.	**OK** **(+) 4.75 to 5.25 VDC** **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-202 or 019-250. • Replace the engine harness. Refer to Procedure 019-043.	2A
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	2A



STEP 2: Clear the fault codes.

STEP 2A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify that the Fault Code 428 is inactive.	**OK** **Fault Code 428 inactive**	2B
	NOT OK Return to troubleshooting steps or contact your local Cummins Authorized Repair Location if all steps have been completed and checked again.	1A

STEP 2B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

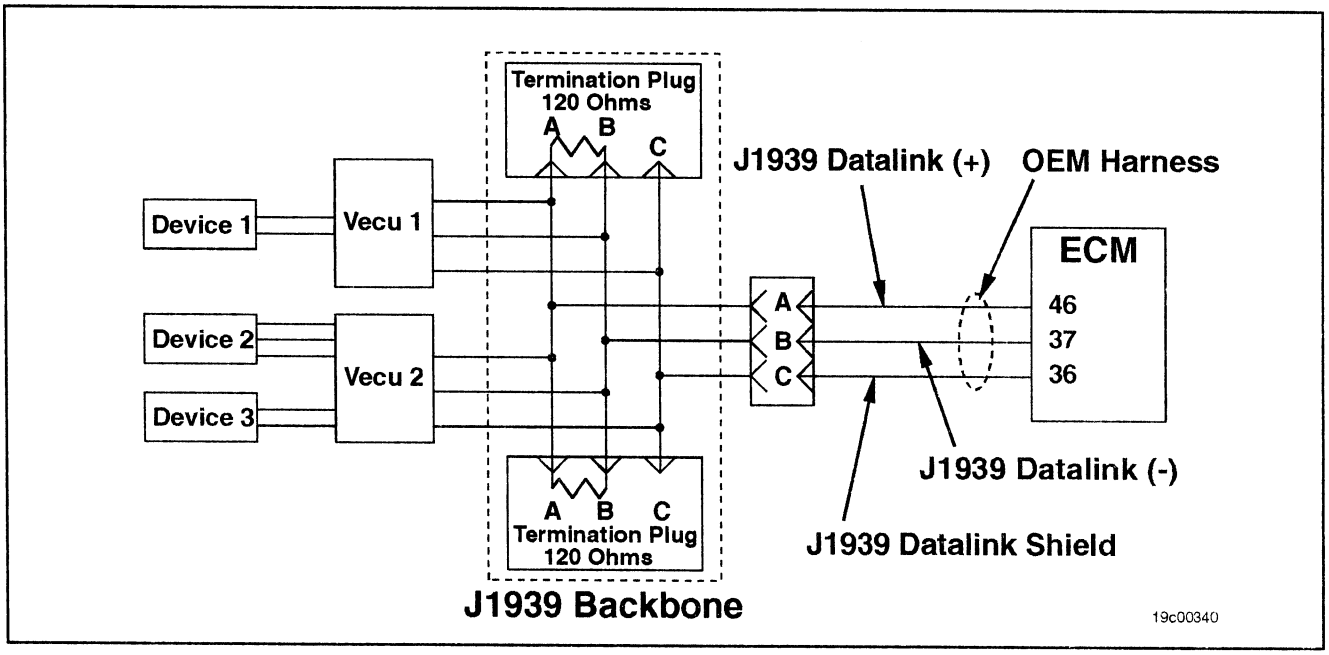
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 426

J1939 Datalink Communication

CODES	REASON	EFFECT
Fault Code: 426 PID(P), SID(S): S231 SPN: 639 FMI: 2/2 Lamp: None	Communication between the electronic control module (ECM) and another device on the J1939 datalink has been lost.	None on performance. J1939 devices possibly do **not** operate.

J1939 Datalink Circuit



Circuit Description:

Devices such as ABS controllers, autoshift transmissions, ASR systems, electronic displays, electronic information systems, electronic service tools, and VECUs can communicate with the ECM over the J1939 datalink. Messages sent from the devices are received by the ECM and used for controlling the engine. The ECM also transmits information to these devices over the J1939 datalink.

Component Location:

The ECM is located on the intake side of the engine, near the front. The J1939 datalink wiring and the J1939 devices vary by OEM options.

Shop Talk:

This fault occurs whenever the ECM starts communicating with **any** other device using the J1939 datalink and then can no longer transmit on the datalink. Possible causes could be the following: Unplugging an electronic service tool before keying off the ECM, the J1939 datalink having an intermittent electrical problem, the ECM (or another J1939 device) tying up communications by an electrical problem, or by sending too many messages without stopping.

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the ECM for proper multiplexing configuration.		
STEP 1A: Verify that the proper devices are set.	INSITE™ readout matches ECM settings for devices	
STEP 1B: Check datalink output by reading INSITE™.	Fault Code 426 inactive	
STEP 2: Inspect the SAE J1939 connectors on the backbone harness and engine harness connectors.		
STEP 2A: Inspect the ECM connectors.	No damaged pins	
STEP 2B: Inspect the connectors on any other device connected to the J1939 data-link.	No damaged pins	
STEP 3: Inspect the SAE J1939 backbone harness.		
STEP 3A: Check for an open circuit in the supply wire.	Less than 10 ohms	
STEP 3B: Check for an open circuit in the return wire.	Less than 10 ohms	
STEP 3C: Check the resistance value in the J1939 harness.	55 to 65 ohms	
STEP 3D: Check for an open circuit in the shield wire.	Less than 10 ohms	
STEP 3E: Check for a short circuit to power in the supply wire.	Less than (+) 1.5 VDC	
STEP 3F: Check for a short circuit to power in the return wire.	Less than (+) 1.5 VDC	
STEP 3G: Check for a short circuit to ground in the supply wire.	More than 100k ohms	
STEP 3H: Check for a short circuit to ground in the return wire.	More than 100k ohms	
STEP 3I: Check for a short circuit from pin to pin in the OEM connector.	More than 100k ohms	
STEP 4: Check for malfunctioning J1939 devices.		
STEP 4A: Check communication between the ECM and the multiplex devices.	Established communication	

STEP 4A-1: Check for malfunctioning J1939 devices. — **Proper communication between J1939 devices and J1939 backbone**

STEP 5: Clear the fault codes.

STEP 5A: Disable the fault code. — **Fault Code 426 inactive**

STEP 5B: Clear the inactive fault codes. — **All fault codes cleared**

TROUBLESHOOTING STEP

STEP 1: Check the ECM for proper multiplexing configuration.

STEP 1A: Verify that the proper devices are set.

Condition:
- Install INSITE™.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check that the vehicle inputs are multiplexed over the J1939 datalink. • Read the devices that are sending input information with INSITE™. • Information for settings are in menu: Adjustable Features and Parameters – J1939 Multiplexing.	**OK** **INSITE™ readout matches ECM settings for devices**	1B
	NOT OK **Configure the ECM to match the multiplexing devices**	5A

STEP 1B: Check datalink output by reading INSITE™.

Condition:
- Install the INLINE 2™ datalink adapter.
- Install INSITE™. Refer to the INSITE™ manual for details.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Using INSITE™, read the engine speed. • Check for any active fault codes.	**OK** **Fault Code 426 inactive**	5A
	NOT OK	2A

STEP 2: Inspect the SAE J1939 connectors on the backbone harness and engine harness connectors.

STEP 2A: Inspect the ECM connectors.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:

- Disconnect the OEM harness connector from the ECM.
- Disconnect the multiplexed devices.

Action	Specifications/Repair	Next Step
Inspect the ECM, OEM harness, J1939 connectors, and multiplexed devices for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	2B
	NOT OK **Repair the damaged pins** Repair or replace the OEM harness, J1939, 3-pin, or multiplexed devices, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair or replace the OEM harness. Refer to Procedure 019-071. • Repair or replace the 3-pin connectors. Refer to Procedure 019-203. • Refer to Signature, ISX and QSX15 Troubleshooting and Repair Manual, Bulletin No. 3666239, for specific multiplexed device. • Replace the ECM. Refer to Procedure 019-031.	5A

STEP 2B: Inspect the connectors on any other device connected to the J1939 datalink.

Condition:
- Turn keyswitch OFF.
- Disconnect the VECU(s) from the J1939 backbone harness.
- Disconnect the multiplexed devices from the VECU(s).

Action	Specifications/Repair	Next Step
Inspect the connectors on the VECU(s), 3-pin, and multiplexed devices connectors for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	3A
	NOT OK **Repair the damaged pins** Repair or replace the VECU(s), 3-pin connector, or multiplexed devices, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair or replace the VECU(s). Refer to the OEM troubleshooting and repair manual for repair procedure. • Repair the 3-pin connector. Refer to Procedure 019-203. • Repair or replace the multiplexed devices. Refer to the Signature, ISX and QSX15 Troubleshooting and Repair Manual, Bulletin No. 3666239.	5A

STEP 3: Inspect the SAE J1939 backbone harness.

STEP 3A: Check for an open circuit in the supply wire.

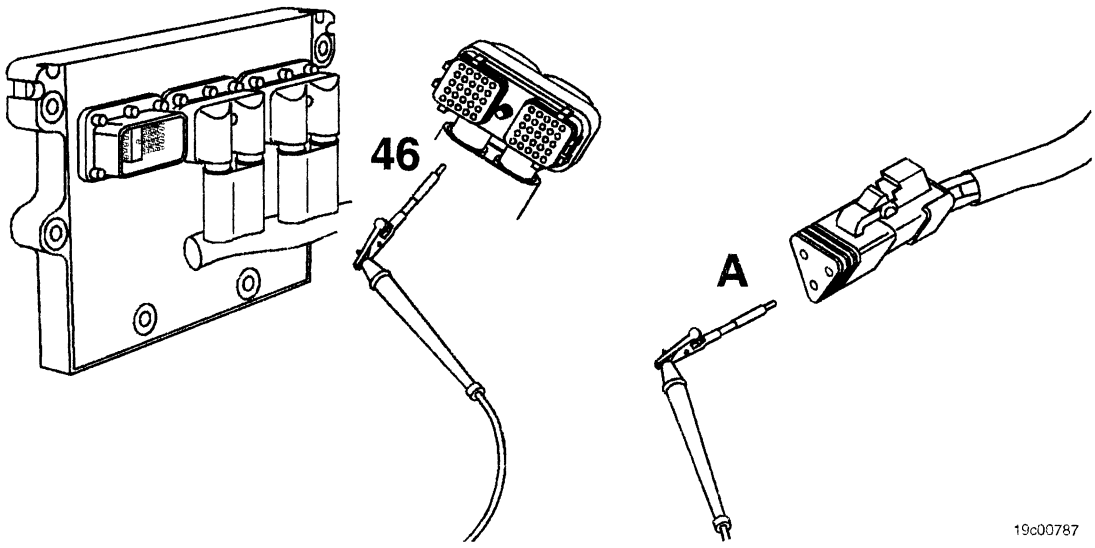
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the OEM harness connector from the ECM.
- Disconnect the J1939 connector from the VECU(s).

Action	Specifications/Repair	Next Step
Check for an open circuit in the supply wire. • Measure resistance from supply pin 46 at the OEM harness connector to pin A at the datalink connector at the VECU(s).	**OK** **Less than 10 ohms**	3B
	NOT OK **Repair or replace the OEM harness** • Repair the OEM harness. Refer to Procedure 019-203 or 019-250. • Replace the OEM harness. Refer to Procedure 019-071.	5A



STEP 3B: Check for an open circuit in the return wire.

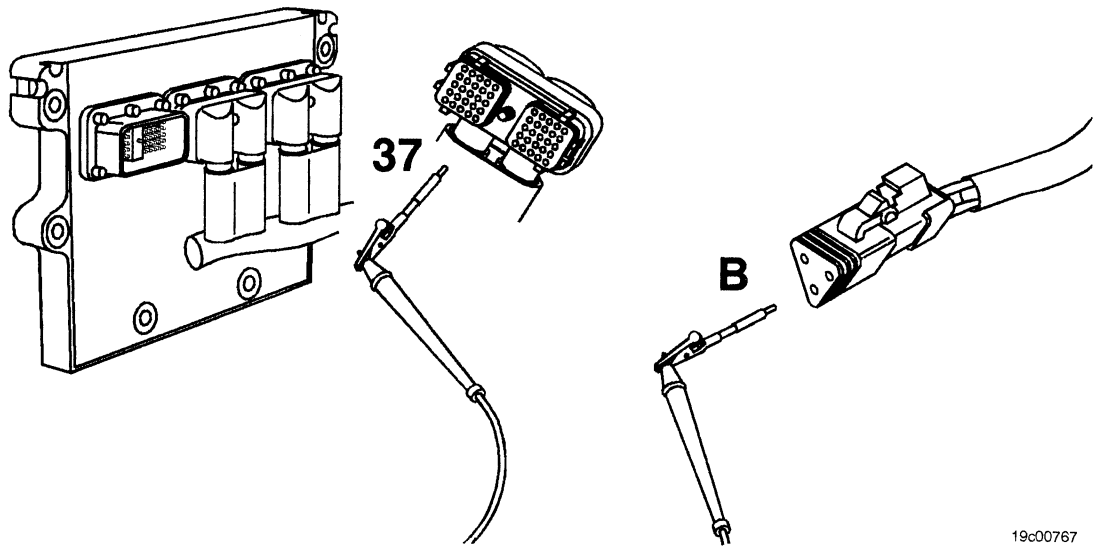
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the OEM harness connector from the ECM.
- Disconnect the J1939 harness from the VECU(s).

Action	Specifications/Repair	Next Step
Check for an open circuit in the return wire. • Measure the resistance from pin 37 at the OEM connector to pin B at the VECU(s).	**OK** **Less than 10 ohms**	3C
	NOT OK **Repair or replace the OEM harness** • Repair the OEM harness. Refer to Procedure 019-203 or 019-250. • Replace the OEM harness. Refer to Procedure 019-071.	5A



STEP 3C: Check the resistance value in the J1939 harness.

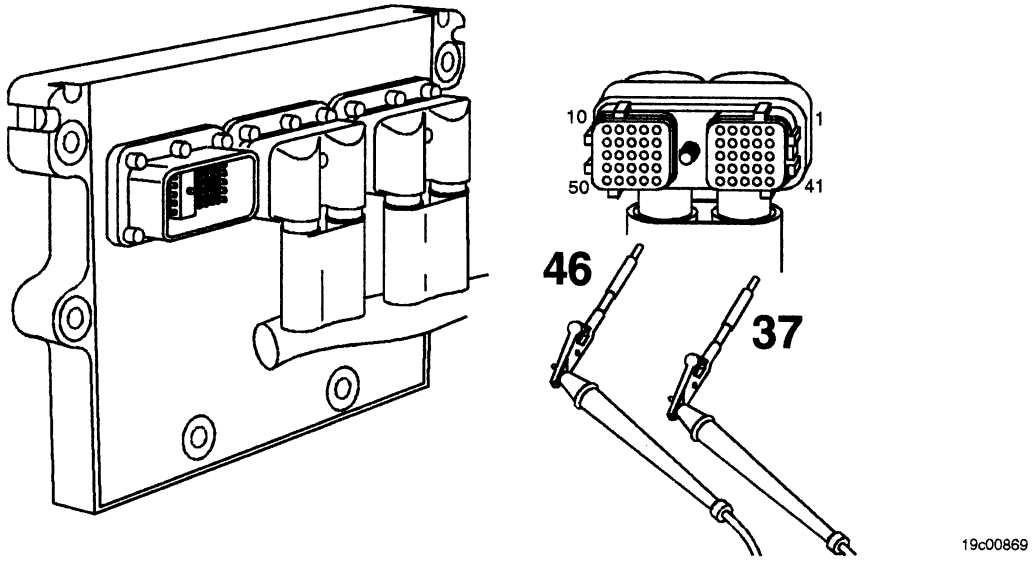
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the J1939 harness form the VECU(s).
- Disconnect the OEM harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check the resistance value of the J1939 harness. • Measure from pin 46 in the OEM harness connector to pin 37 in the OEM harness connector.	**OK** **55 to 65 ohms**	3D
	NOT OK **J1939 backbone termination resistors missing or damaged** Replace both termination resistors.	5A



STEP 3D: Check for an open circuit in the shield wire.

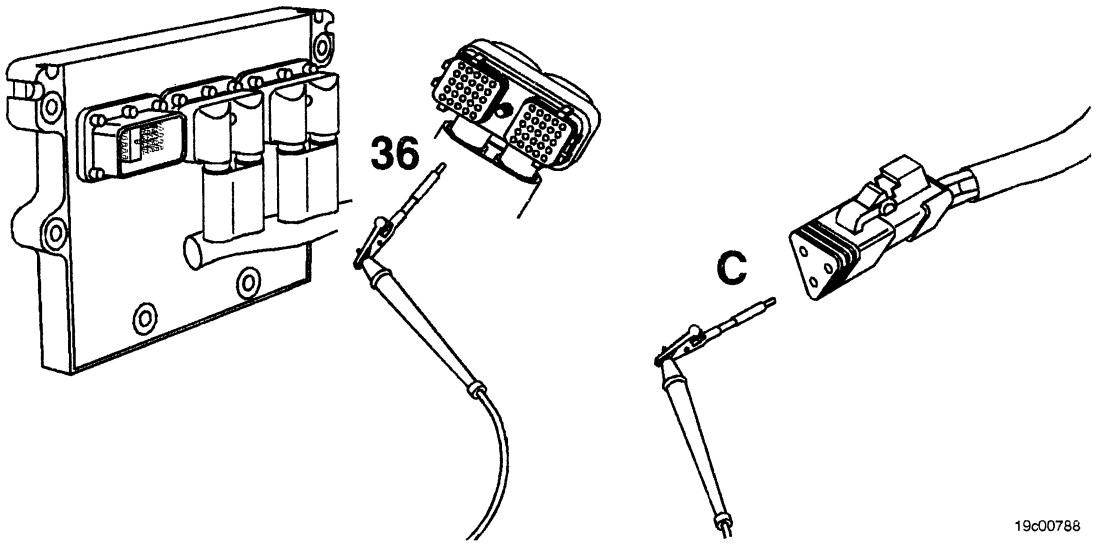
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the OEM harness connector from the ECM.
- Disconnect the J1939 harness from the VECU(s).

Action	Specifications/Repair	Next Step
Check for an open circuit in the shield wire. • Measure the resistance from pin 36 at the OEM harness connector at the ECM to pin C at the VECU(s).	**OK** **Less than 10 ohms**	3E
	NOT OK **Repair or replace the OEM harness** • Repair the OEM harness. Refer to Procedure 019-203 or 019-250. • Replace the OEM harness. Refer to Procedure 019-071.	5A



STEP 3E: Check for a short circuit to power in the supply wire.

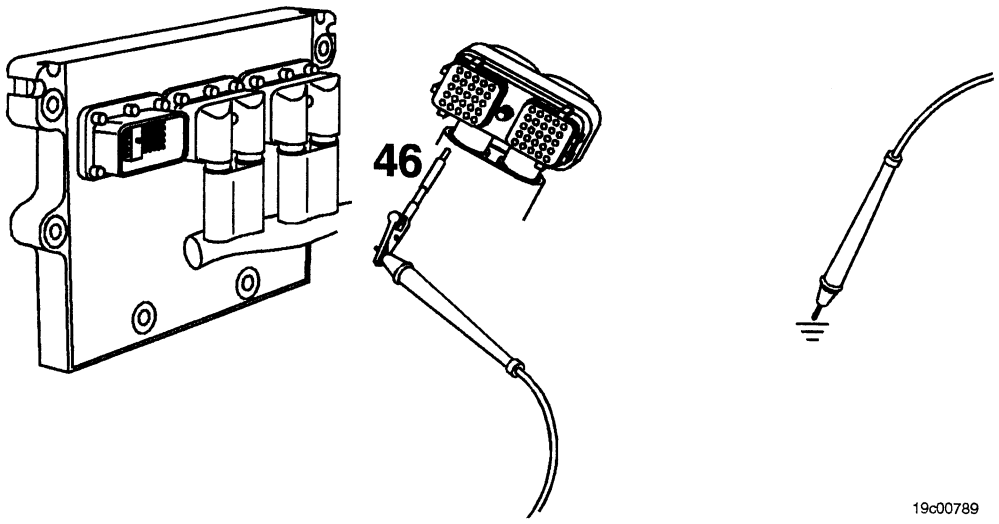
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the J1939 harness from the VECU(s).
- Disconnect the OEM harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check for a short to power in the supply wire. • Measure the voltage from pin 46 at the ECM to ground at the J1939 connector.	**OK** **Less than (+) 1.5 VDC**	3F
	NOT OK **Repair or replace the OEM harness** • Repair the OEM harness. Refer to Procedure 019-203 or 019-250. • Replace the OEM harness. Refer to Procedure 019-071.	5A



STEP 3F: Check for a short circuit to power in the return wire.

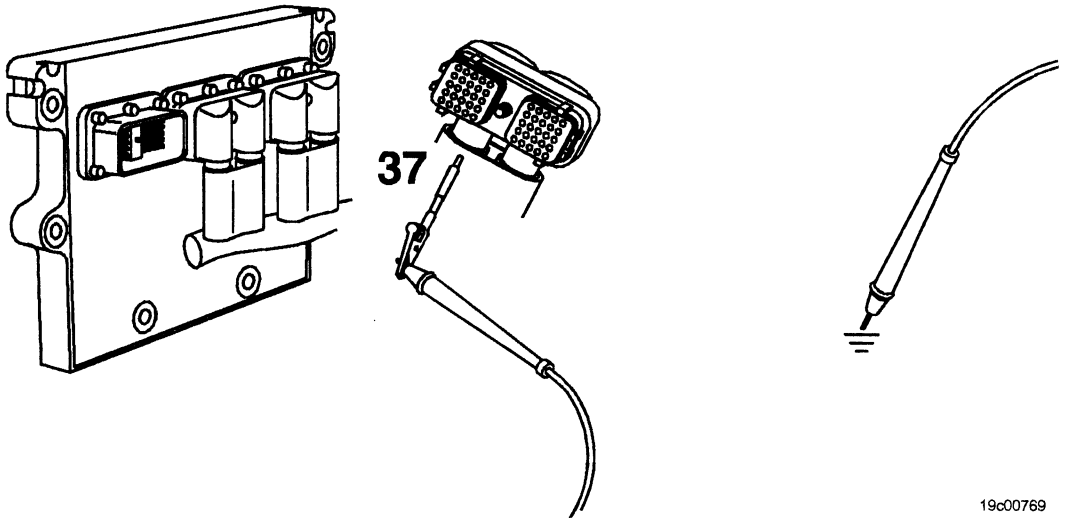
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the J1939 harness from the VECU(s).
- Disconnect the OEM harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check for a short circuit to power in the return wire. • Measure the voltage from pin 37 at the OEM harness connector to ground at the VECU(s) connector.	**OK** **Less than (+) 1.5 VDC**	3G
	NOT OK **Repair or replace the OEM harness** • Repair the OEM harness. Refer to Procedure 019-203 or 019-250. • Replace the OEM harness. Refer to Procedure 019-071.	5A



STEP 3G: Check for a short circuit to ground in the supply wire.

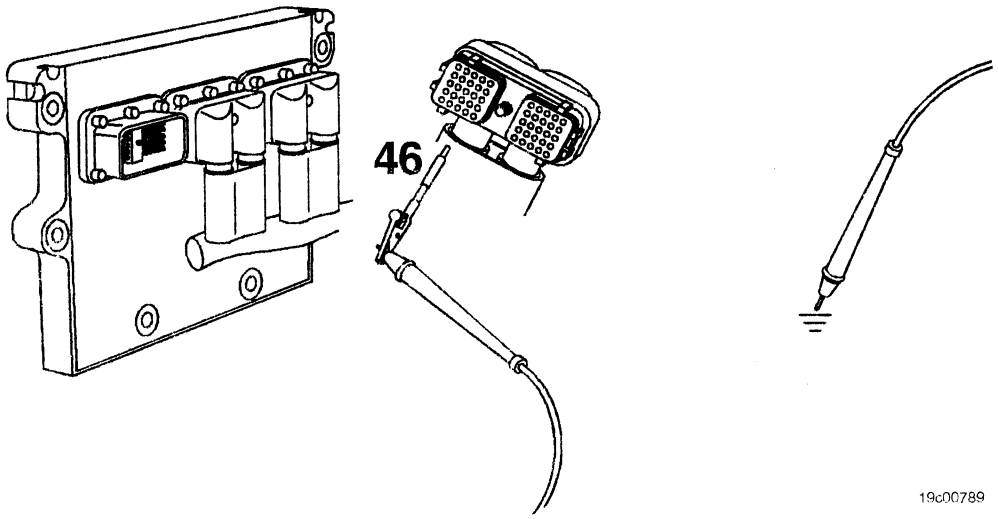
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the OEM harness connector from the ECM.
- Disconnect the J1939 harness from the VECU(s).

Action	Specifications/Repair	Next Step
Check for short to ground in the supply wire. • Measure the resistance from pin 46 in the OEM harness connector to ground.	**OK** **More than 100k ohms**	3H
	NOT OK **Repair or replace the OEM harness** • Repair the OEM harness. Refer to Procedure 019-203 or 019-250. • Replace the OEM harness. Refer to Procedure 019-071.	5A



STEP 3H: Check for a short circuit to ground in the return wire.

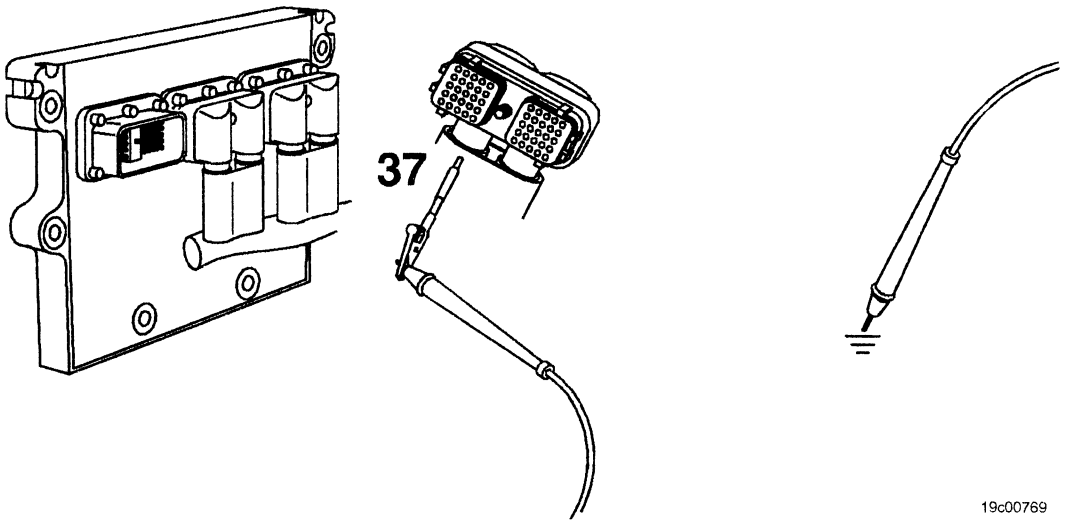
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the OEM harness connector from the ECM.
- Disconnect the J1939 harness from the VECU(s).

Action	Specifications/Repair	Next Step
Check for a short to ground in the return wire. • Measure the resistance from pin 37 in the OEM harness connector to ground.	**OK** **More than 100k ohms**	3I
	NOT OK **Repair or replace the OEM harness** • Repair the OEM harness. Refer to Procedure 019-250. • Replace the OEM harness. Refer to Procedure 019-071.	5A



STEP 3I: Check for a short circuit from pin to pin in the OEM connector.

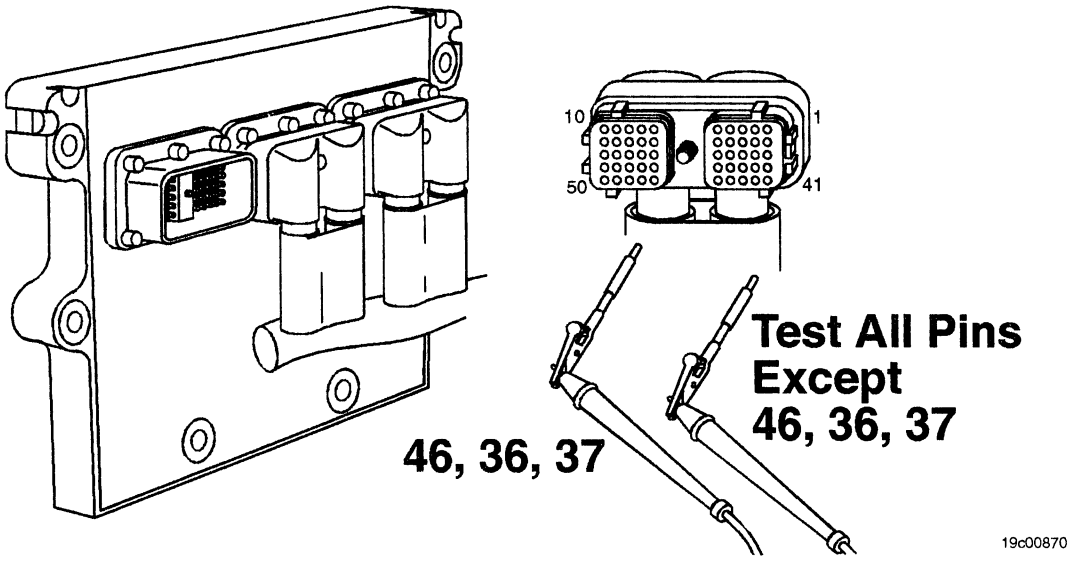
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the OEM harness connector from the ECM.
- Disconnect the J1939 harness from the VECU(s).

Action	Specifications/Repair	Next Step
Check for a short from pin to pin in the OEM connector. • Measure the resistance from pin 46 in the OEM harness connector to all other pins in the connector, except pins 36 and 37. • Measure the resistance from pin 36 in the OEM harness connector to all other pins in the connector, except pins 46 and 37. • Measure the resistance from pin 37 in the OEM harness connector to all other pins in the connector, except pins 36 and 46.	**OK** **More than 100k ohms**	4A
	NOT OK **Repair or replace the OEM harness** • Repair the OEM harness. Refer to Procedure 019-250. • Replace the OEM harness. Refer to Procedure 019-071.	5A



STEP 4: Check for malfunctioning J1939 devices.

STEP 4A: Check communication between the ECM and the multiplex devices.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Install INSITE™.
- Install INLINE 2™ datalink adapter.
- Disconnect all J1939 devices from the J1939 datalink.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check communication with ECM using INSITE over J1939. • Using INSITE™, confirm communication between ECM and multiplexing devices.	**OK** **Established communication**	4A-1
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	5A

STEP 4A-1: Check for malfunctioning J1939 devices.

Condition:
- Install INSITE™.
- Install INLINE 2™ datalink adapter.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check for malfunctioning J1939 devices. • Disconnect J1939 devices from the J1939 backbone one-by-one until communication can be established using INSITE™. **NOTE: BEFORE** disconnecting J1939 devices, remember to turn keyswitch OFF, so ECM will **not** register fault code.	**OK** **Proper communication between J1939 devices and J1939 backbone**	5A
	NOT OK **Replace malfunctioning J1939 device** Refer to OEM troubleshooting and repair manual for repair procedures.	5A

STEP 5: Clear the fault codes.

STEP 5A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify that Fault Code 426 is inactive.	**OK** **Fault Code 426 inactive**	5B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location if all the steps have been completed and checked again.	1A

STEP 5B: Clear the inactive fault codes.

Condition:
- Connect all the components.
- Turn keyswitch ON.

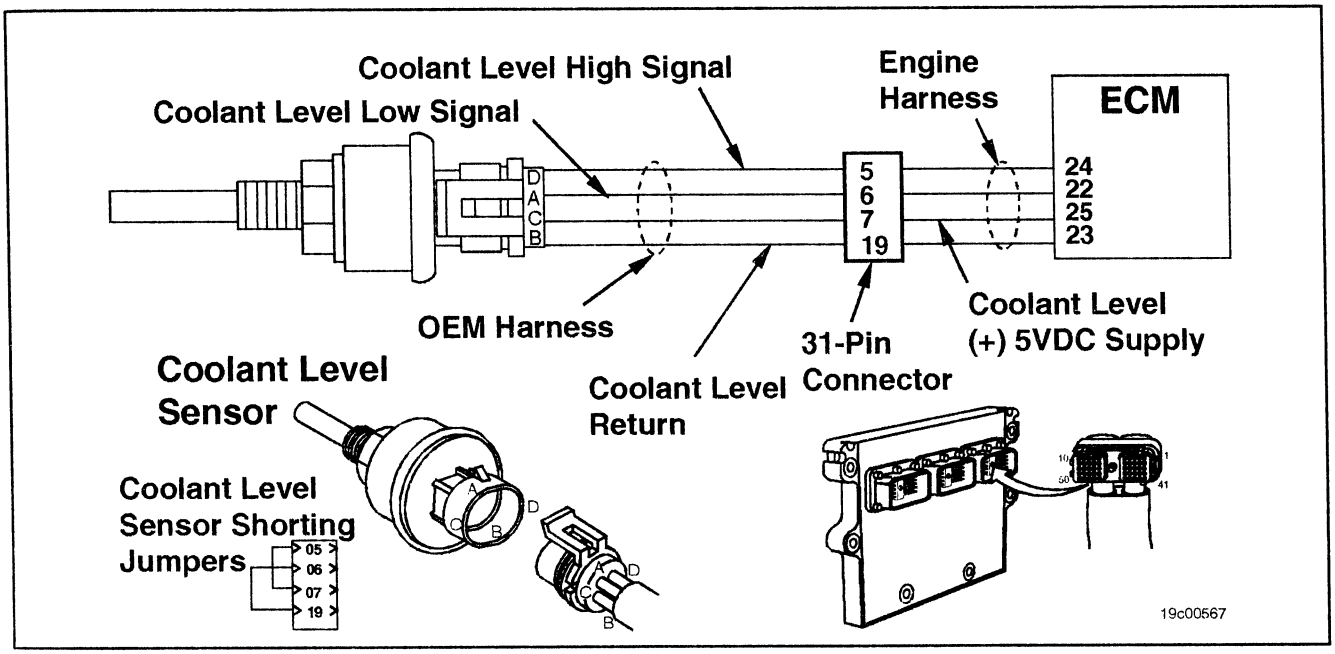
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 422

Coolant Level Sensor Circuit

CODES	REASON	EFFECT
Fault Code: 422 PID(P), SID(S): P111 SPN: 111 FMI: 2/2 Lamp: Yellow	Voltage detected simultaneously on both the coolant level high and low signal circuits **or** no voltage detected on **both** circuits.	No engine protection for coolant level.

Coolant Level Sensor Circuit



Circuit Description:

The coolant level sensor monitors the coolant level within the coolant system and passes information to the electronic control module (ECM) through the sensor harness. This sensor is very complex. Do **not** use a multimeter to check the coolant level sensor. If the radiator coolant level drops below a certain level, a power derate will occur and become greater as time goes by.

Component Location:

The coolant level sensor is located in the radiator top tank or surge tank.

Shop Talk:

Possible causes for this fault code include:

- Open circuit
- Short circuit to ground
- Short circuit to another wire.

TROUBLESHOOTING SUMMARY

⚠ WARNING ⚠

Do not remove the pressure cap from a hot engine. Wait until the coolant temperature is below 50°C [122°F] before removing the pressure cap. Heated coolant spray or steam can cause personal injury.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead
Part No. 3823995 - male Weather-Pack test lead.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check for multiple fault codes and the presence of the coolant level sensor.		
STEP 1A: Read the fault codes.	Fault Code 187 inactive	
STEP 1B: Check if vehicle has a coolant level sensor.	Coolant level sensor present	
STEP 1B-1: Check if a shorting plug is installed in place of the coolant level sensor harness connection.	Shorting plug installed	
STEP 2: Check the coolant level sensor.		
STEP 2A: Inspect the harness and coolant level sensor connectors.	No damaged pins	
STEP 2B: Inspect the harness and ECM connectors.	No damaged pins	
STEP 2C: Check for an open circuit in the coolant level sensor circuit.	Less than 10 ohms	
STEP 2C-1: Inspect the 31-pin Deutsch connector pins.	No damaged pins	
STEP 2C-2: Check for an open circuit in the engine harness.	Less than 10 ohms	
STEP 2C-3: Check for an open circuit in the OEM harness.	Less than 10 ohms	
STEP 3: Check for a short circuit to ground in the signal wires.		
STEP 3A: Check for a short circuit to ground in the coolant level signal wires.	More than 100k ohms	
STEP 3A-1: Check for a short circuit to ground in the engine harness.	More than 100k ohms	
STEP 3A-2: Check for a short circuit to ground in the OEM harness.	More than 100k ohms	
STEP 4: Check for a short circuit between the signal wires and any other wires in the engine harness or OEM harness.		
STEP 4A: Check for a short circuit between the signal wires and any other wires in the engine harness or OEM harness.	More than 100k ohms	

STEP 4A-1: Check for a short circuit in the engine harness. — More than 100k ohms

STEP 4A-2: Check for a short circuit in the OEM harness. — More than 100k ohms

STEP 5: Check for a short circuit to ground in the supply wires.

STEP 5A: Check for a short circuit to ground in the supply wires. — More than 100k ohms

STEP 5A-1: Check for a short circuit in the engine harness. — More than 100k ohms

STEP 5A-2: Check for a short circuit in the OEM harness. — More than 100k ohms

STEP 6: Clear the fault codes.

STEP 6A: Disable the fault code. — Fault Code 422 inactive

STEP 6B: Clear the inactive fault codes. — All fault codes cleared

TROUBLESHOOTING STEP

STEP 1: Check for multiple fault codes and the presence of the coolant level sensor.

STEP 1A: Read the fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the active fault codes. • Read fault codes using INSITE™.	**OK** **Fault Code 187 inactive**	1B
	NOT OK Fault Code 187 active.	Fault Code 187

STEP 1B: Check if vehicle has a coolant level sensor.

⚠WARNING⚠

Do not remove the pressure cap from a hot engine. Wait until the coolant temperature is below 50°C [122°F] before removing the pressure cap. Heated coolant spray or steam can cause personal injury.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Check to see if the vehicle has a coolant level sensor.	**OK** **Coolant level sensor present**	2A
	NOT OK	1B-1

STEP 1B-1: Check if a shorting plug is installed in place of the coolant level sensor harness connection.

⚠WARNING⚠

Do not remove the pressure cap from a hot engine. Wait until the coolant temperature is below 50°C [122°F] before removing the pressure cap. Heated coolant spray or steam can cause personal injury.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Check if a shorting plug is installed in place of the coolant level sensor harness connection. **NOTE:** Check the OEM wiring from the shorting plug to the engine harness connection for problems. Refer to the OEM and the engine harness wiring diagrams.	**OK** **Shorting plug installed**	2A
	NOT OK **Install the shorting plug**	6A

STEP 2: Check the coolant level sensor.

STEP 2A: Inspect the harness and the coolant level sensor connectors.

⚠WARNING⚠

Do not remove the pressure cap from a hot engine. Wait until the coolant temperature is below 50°C [122°F] before removing the pressure cap. Heated coolant spray or steam can cause personal injury.

Condition:
- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the OEM harness from the coolant level sensor.

Action	Specifications/Repair	Next Step
Inspect the harness and the coolant level sensor connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	2B
	NOT OK **Repair the damaged pins** Repair or replace the OEM harness, or replace the coolant level sensor, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the OEM harness. Refer to Procedure 019-204 or 019-231. • Replace the OEM harness. Refer to Procedure 019-071. • Replace the coolant level sensor. Refer to Procedure 019-017.	6A

STEP 2B: Inspect the harness and the ECM connectors.

⚠WARNING⚠

Do not remove the pressure cap from a hot engine. Wait until the coolant temperature is below 50°C [122°F] before removing the pressure cap. Heated coolant spray or steam can cause personal injury.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the harness and the ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	2C
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	6A

STEP 2C: Check for an open circuit in the coolant level sensor circuit.

⚠WARNING⚠

Do not remove the pressure cap from a hot engine. Wait until the coolant temperature is below 50°C [122°F] before removing the pressure cap. Heated coolant spray or steam can cause personal injury.

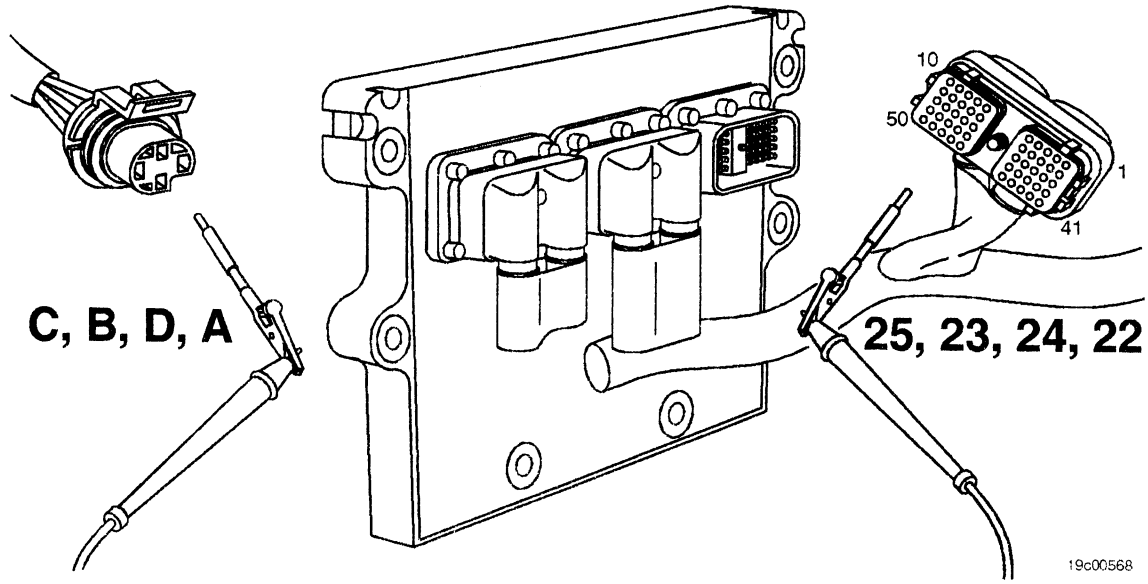
⚠CAUTION⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the OEM harness from the coolant level sensor.

Action	Specifications/Repair	Next Step
Check for an open circuit in the coolant level sensor circuit. • Measure the resistance from pin 25 in the sensor harness connector to pin C (or 3) on the harness side of the coolant level sensor connector. • Measure the resistance from pin 23 in the sensor harness connector to pin B (or 2) on the harness side of the coolant level sensor connector. • Measure the resistance from pin 24 in the sensor harness connector to pin D (or 4) on the harness side of the coolant level sensor connector. • Measure the resistance from pin 22 in the sensor harness connector to pin A (or 1) on the harness side of the coolant level sensor connector.	**OK** **Less than 10 ohms**	3A
	NOT OK	2C-1



STEP 2C-1: Inspect the 31-pin Deutsch connector pins.

⚠WARNING⚠

Do not remove the pressure cap from a hot engine. Wait until the coolant temperature is below 50°C [122°F] before removing the pressure cap. Heated coolant spray or steam can cause personal injury.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the OEM harness from the coolant level sensor.
- Disconnect the engine harness from the OEM harness at the Deutsch 31-pin connector.

Action	Specifications/Repair	Next Step
Inspect the harness and the sensor connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	2C-2
	NOT OK **Repair the damaged pins** Repair or replace the engine harness or the OEM harness, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-231. • Replace the engine harness. Refer to Procedure 019-043. • Repair the OEM harness. Refer to Procedure 019-231 or 019-250. • Replace the OEM harness. Refer to Procedure 019-071.	6A

STEP 2C-2: Check for an open circuit in the engine harness.

⚠WARNING⚠

Do not remove the pressure cap from a hot engine. Wait until the coolant temperature is below 50°C [122°F] before removing the pressure cap. Heated coolant spray or steam can cause personal injury.

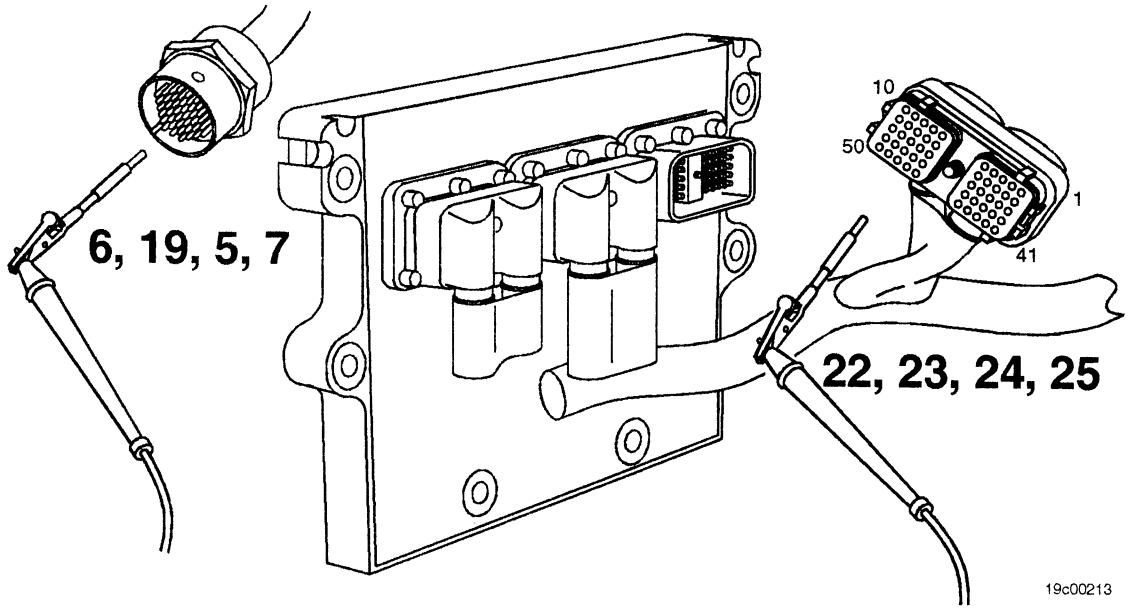
⚠CAUTION⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the OEM harness from the coolant level sensor.
- Disconnect the engine harness from the OEM harness at the Deutsch 31-pin connector.

Action	Specifications/Repair	Next Step
Check for an open circuit in the engine harness. • Measure the resistance from pin 22 in the sensor harness connector to pin 6 on the engine harness side of the 31-pin connector. • Measure the resistance from pin 23 in the sensor harness connector to pin 19 on the engine harness side of the 31-pin connector. • Measure the resistance from pin 24 in the sensor harness connector to pin 5 on the engine harness side of the 31-pin connector. • Measure the resistance from pin 25 in the sensor harness connector to pin 7 on the engine harness side of the 31-pin connector.	**OK** **Less than 10 ohms**	2C-3
	NOT OK **Repair or replace the engine harness or OEM harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Repair the OEM harness. Refer to Procedure 019-231. • Replace the OEM harness. Refer to Procedure 019-071.	6A



STEP 2C-3: Check for an open circuit in OEM harness.

⚠WARNING⚠

Do not remove the pressure cap from a hot engine. Wait until the coolant temperature is below 50°C [122°F] before removing the pressure cap. Heated coolant spray or steam can cause personal injury.

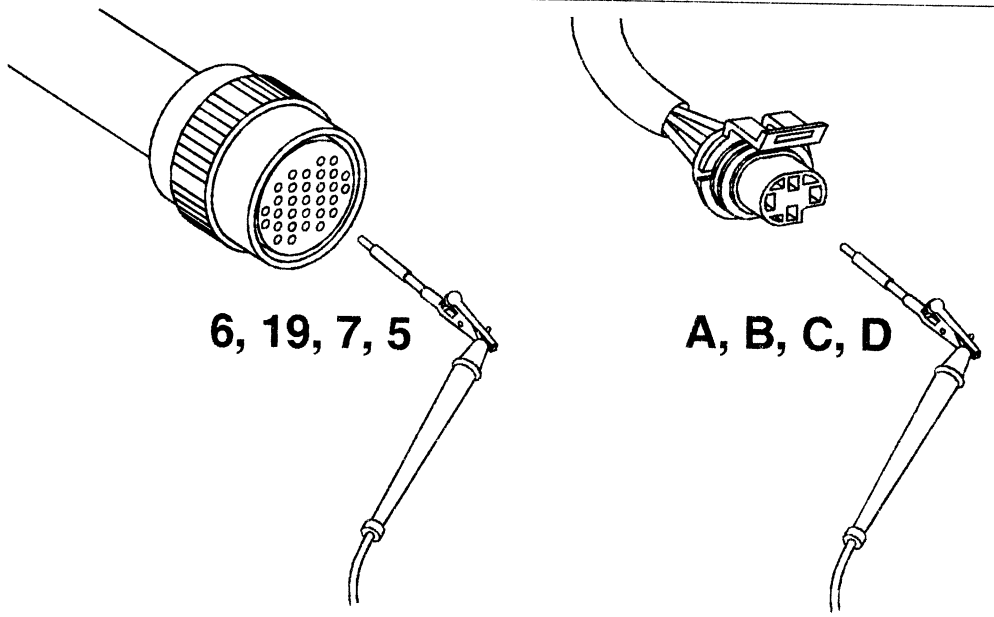
△CAUTION△

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3823995 - male Weather-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the engine harness from the OEM harness at the Deutsch 31-pin connector.
- Disconnect the OEM harness at the Weather-Pack four-way connector.

Action	Specifications/Repair	Next Step
Check for an open circuit in the OEM harness. • Measure the resistance from pin 6 on the OEM wiring harness side of the 31-pin connector to pin A (or 1) on the OEM harness side of the 4-pin connector. • Measure the resistance from pin 19 on the OEM wiring harness side of the 31-pin connector to pin B (or 2) on the OEM harness side of the 4-pin connector. • Measure the resistance from pin 7 on the OEM wiring harness side of the 31-pin connector to pin C (or 3) on the OEM harness side of the 4-pin connector. • Measure the resistance from pin 5 on the OEM wiring harness side of the 31-pin connector to pin D (or 4) on the OEM harness side of the 4-pin connector.	**OK** **Less than 10 ohms**	3A
	NOT OK **Repair or replace the OEM harness** • Repair the OEM harness. Refer to Procedure 019-204 or 019-231. • Replace the OEM harness. Refer to Procedure 019-071.	6A



STEP 3: Check for a short circuit to ground in the signal wires.

STEP 3A: Check for a short circuit to ground in the coolant level sensor signal wires.

⚠WARNING⚠

Do not remove the pressure cap from a hot engine. Wait until the coolant temperature is below 50°C [122°F] before removing the pressure cap. Heated coolant spray or steam can cause personal injury.

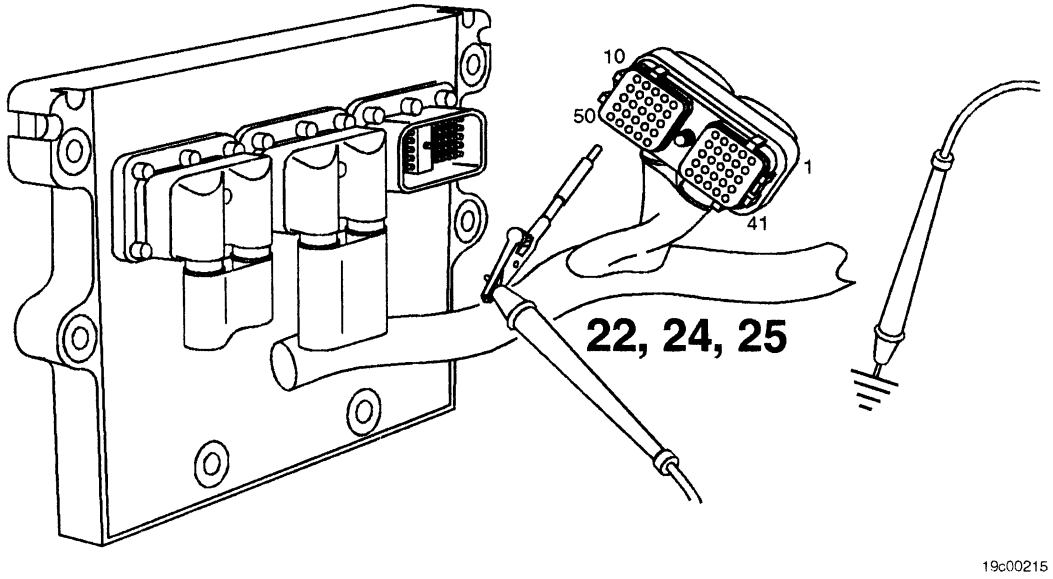
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the OEM harness from the coolant level sensor.

Action	Specifications/Repair	Next Step
Check for a short circuit to ground in the coolant level sensor signal wires. • Measure the resistance from pin 22 to engine block ground. • Measure the resistance from pin 24 to engine block ground. • Measure the resistance from pin 25 to engine block ground.	**OK** **More than 100k ohms**	4A
	NOT OK Does **not** meet specifications.	3A-1



STEP 3A-1: Check for a short circuit to ground in the engine harness.

⚠WARNING⚠

Do not remove the pressure cap from a hot engine. Wait until the coolant temperature is below 50°C [122°F] before removing the pressure cap. Heated coolant spray or steam can cause personal injury.

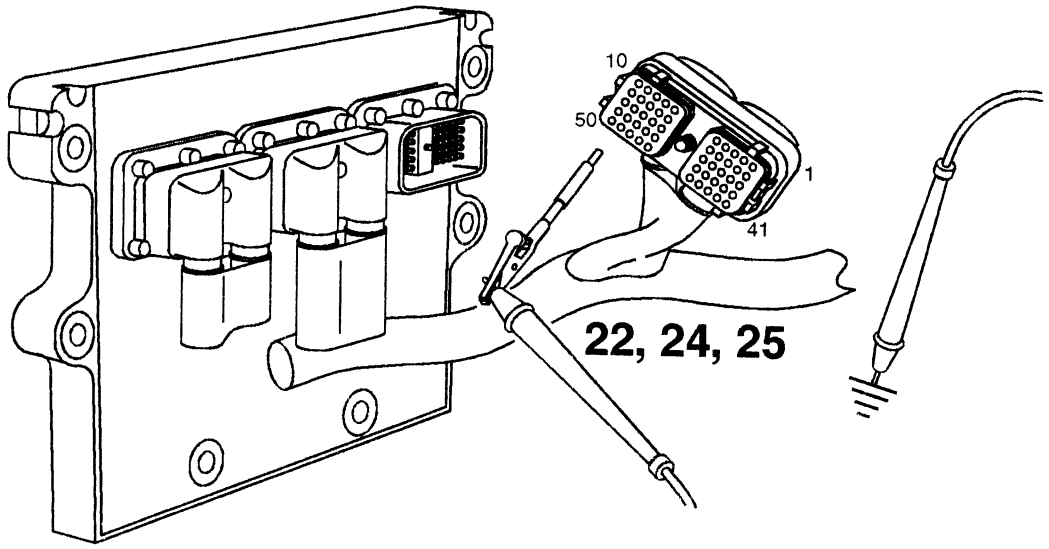
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the OEM harness from the coolant level sensor.
- Disconnect the engine harness from the OEM harness at the Deutsch 31-pin connector.

Action	Specifications/Repair	Next Step
Check for a short circuit to ground in the engine harness. • Measure the resistance from pin 22 in the sensor harness connector to the engine block ground. • Measure the resistance from pin 24 in the sensor harness connector to the engine block ground. • Measure the resistance from pin 25 in the sensor harness connector to the engine block ground.	**OK** **More than 100k ohms**	3A-2
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	6A



19c00215

STEP 3A-2: Check for a short circuit to ground in the OEM harness.

⚠WARNING⚠

Do not remove the pressure cap from a hot engine. Wait until the coolant temperature is below 50°C [122°F] before removing the pressure cap. Heated coolant spray or steam can cause personal injury.

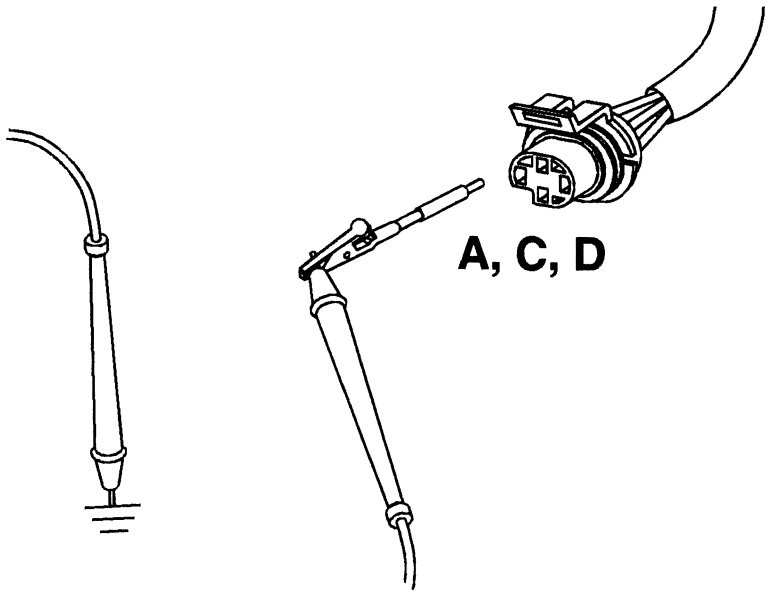
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3823995 - male Weather-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the OEM harness from the coolant level sensor.
- Disconnect the engine harness from the OEM harness at the 31-pin Deutsch connector.

Action	Specifications/Repair	Next Step
Check for a short circuit to ground in the OEM harness. • Measure the resistance from pin A (or 1) on the OEM harness side of the 4-pin connector to engine block ground. • Measure the resistance from pin C (or 3) on the OEM harness side of the 4-pin connector to engine block ground. • Measure the resistance from pin D (or 4) on the OEM harness side of the 4-pin connector to engine block ground.	**OK** **More than 100k ohms**	4A
	NOT OK **Repair or replace the OEM harness** • Repair the OEM harness. Refer to Procedure 019-204 or 019-231. • Replace the OEM harness. Refer to Procedure 019-071.	6A



19c00216

STEP 4: Check for a short circuit between the signal wires and any other wires in the engine harness or OEM harness.

STEP 4A: Check for a short circuit between the signal wires and any other wires in the engine harness or OEM harness.

⚠WARNING⚠

Do not remove the pressure cap from a hot engine. Wait until the coolant temperature is below 50°C [122°F] before removing the pressure cap. Heated coolant spray or steam can cause personal injury.

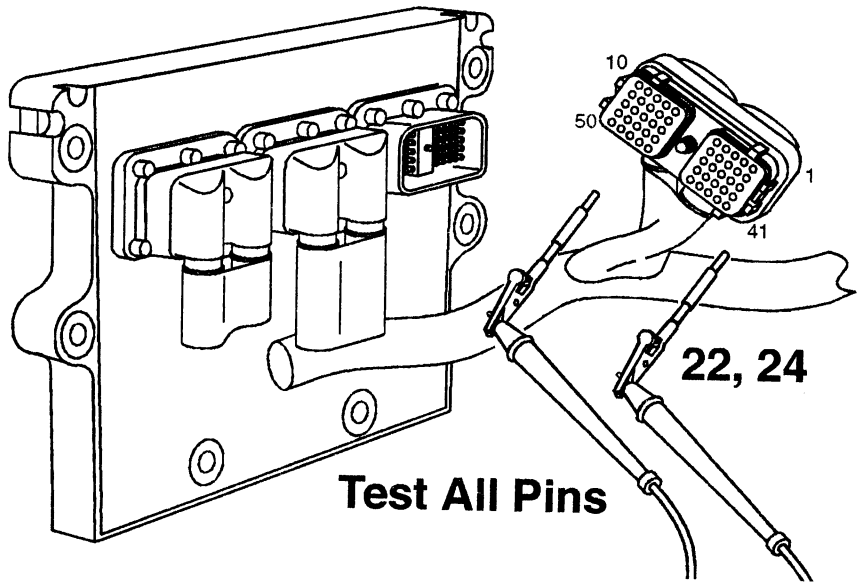
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the OEM connector from the coolant level sensor.

Action	Specifications/Repair	Next Step
Check for a short circuit between the signal wires and any other wires in the OEM harness or engine harness. • Measure the resistance from pin 22 of the sensor harness connector to all other pins in the connector. • Measure the resistance from pin 24 of the sensor harness connector to all other pins in the connector.	**OK** **More than 100k ohms** **Replace the coolant level sensor** Refer to Procedure 019-017.	6A
	NOT OK	4A-1



STEP 4A-1: Check for a short circuit in the engine harness.

⚠WARNING⚠

Do not remove the pressure cap from a hot engine. Wait until the coolant temperature is below 50°C [122°F] before removing the pressure cap. Heated coolant spray or steam can cause personal injury.

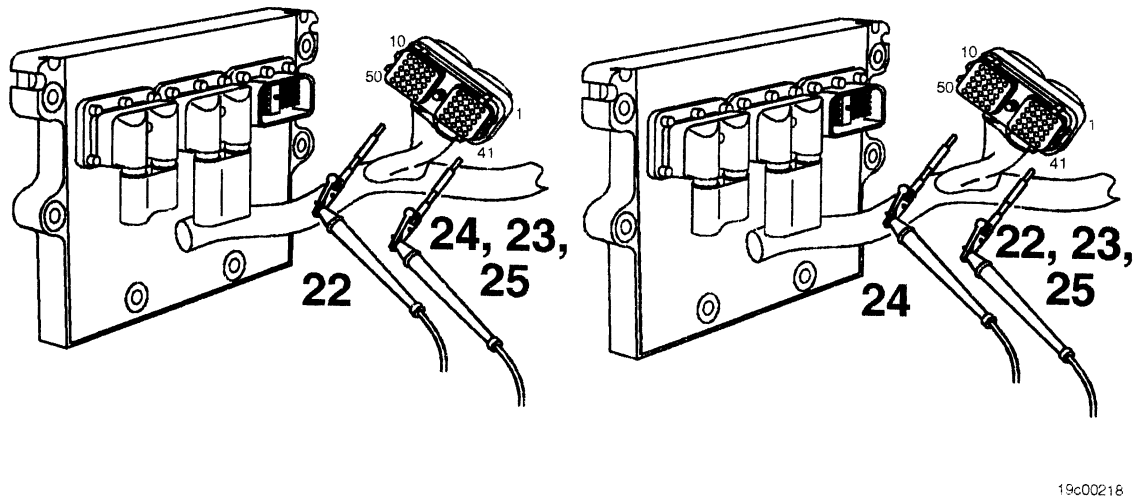
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the OEM connector from the coolant level sensor.
- Disconnect the engine harness from the OEM harness at the 31-pin Deutsch connector.

Action	Specifications/Repair	Next Step
Check for a short circuit in the engine harness. • Measure the resistance from pin 22 in the sensor harness connector to pins 24, 23, and 25. • Measure the resistance from pin 24 in the sensor harness connector to pins 22, 23, and 25.	**OK** **More than 100k ohms**	4A-2
	NOT OK **Repair or replace the engine or OEM harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Repair the OEM harness. Refer to OEM troubleshooting and repair manual. • Replace the OEM harness. Refer to the OEM troubleshooting and repair manual.	6A



STEP 4A-2: Check for a short circuit in the OEM harness.

⚠WARNING⚠

Do not remove the pressure cap from a hot engine. Wait until the coolant temperature is below 50°C [122°F] before removing the pressure cap. Heated coolant spray or steam can cause personal injury.

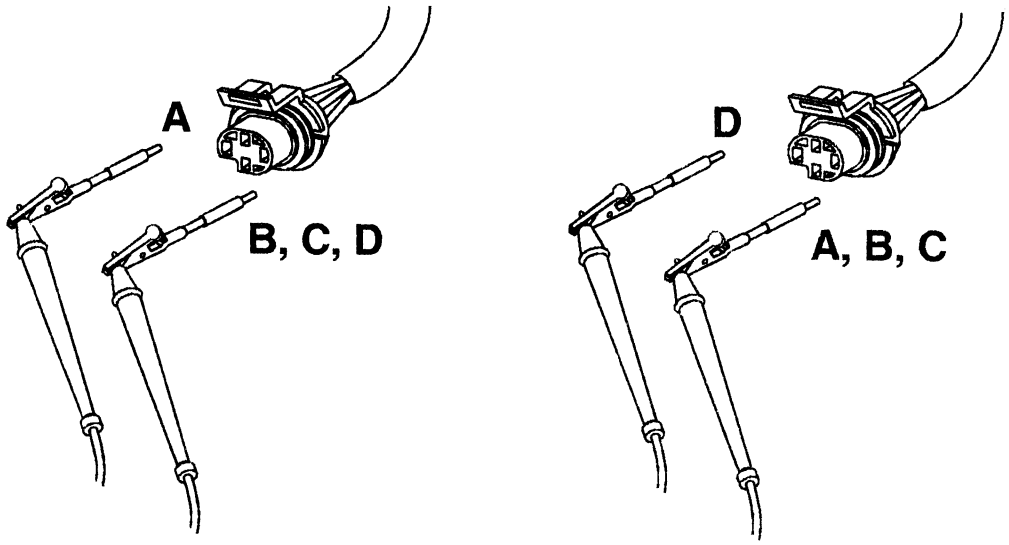
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3823995 - male Weather-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the OEM harness from the coolant level sensor.
- Disconnect the OEM harness at the OEM side of the Deutsch 31-pin connector.

Action	Specifications/Repair	Next Step
Check for a short circuit in the OEM harness. • Measure the resistance from pin A (or 1) in the OEM harness connector to pins B (or 2), C (or 3), and D (or 4). • Measure the resistance from pin D (or 4) in the OEM harness connector to pins A (or 1), B (or 2), and C (or 3).	**OK** **More than 100k ohms**	5A
	NOT OK **Repair or replace the OEM harness** • Repair the OEM harness. Refer to the OEM troubleshooting and repair manual. • Replace the OEM harness. Refer to the OEM troubleshooting and repair manual.	6A



19c00219

STEP 5: Check for a short circuit to ground in the supply wires.

STEP 5A: Check for a short circuit to ground in the supply wires.

⚠WARNING⚠

Do not remove the pressure cap from a hot engine. Wait until the coolant temperature is below 50°C [122°F] before removing the pressure cap. Heated coolant spray or steam can cause personal injury.

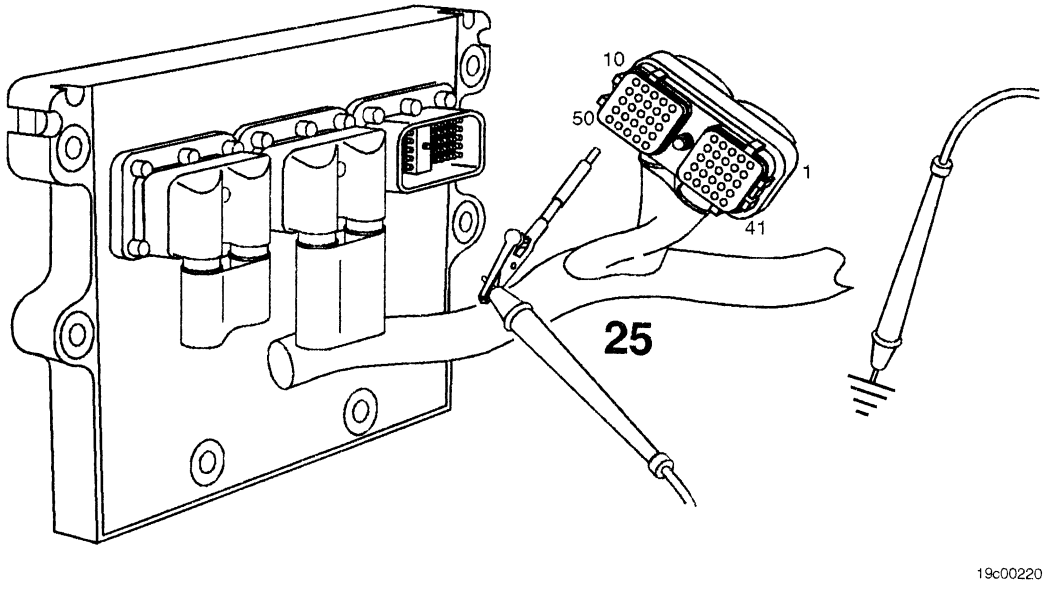
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the OEM harness from the coolant level sensor.

Action	Specifications/Repair	Next Step
Check for a short circuit between the supply wire and ground. • Measure the resistance from pin 25 in the sensor harness connector to engine block ground.	**OK** **More than 100k ohms**	5A-1
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	6A



19c00220

STEP 5A-1: Check for a short circuit in the engine harness.

⚠WARNING⚠

Do not remove the pressure cap from a hot engine. Wait until the coolant temperature is below 50°C [122°F] before removing the pressure cap. Heated coolant spray or steam can cause personal injury.

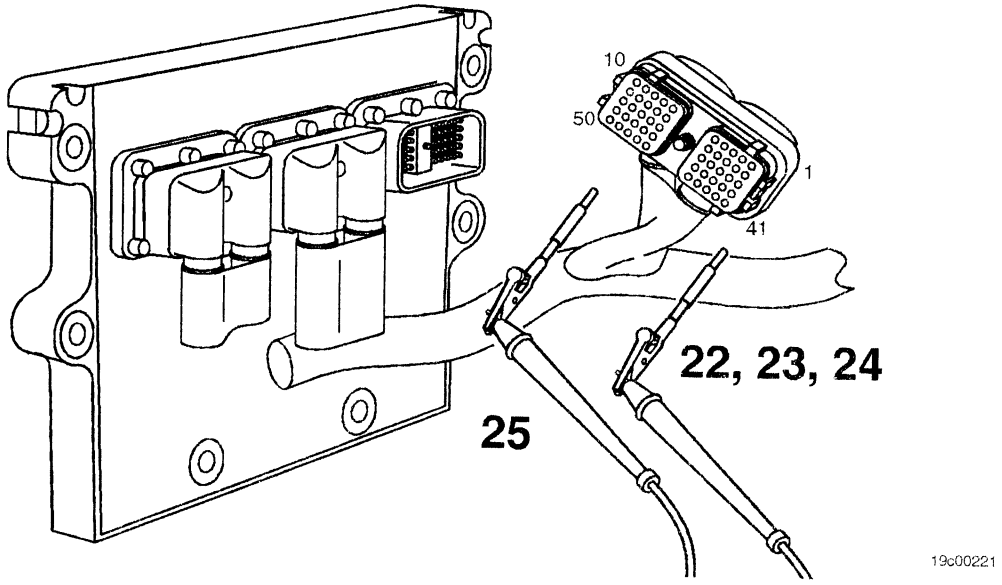
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the OEM harness from the coolant level sensor.
- Disconnect the sensor harness from the OEM harness at the Deutsch 31-pin connector.

Action	Specifications/Repair	Next Step
Check for a short circuit in the engine harness. • Measure the resistance from pin 25 in the sensor harness connector to pins 22, 23, and 24.	**OK** **More than 100k ohms**	5A-2
	NOT OK **Repair or replace the engine or OEM harnesses** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Repair the OEM harness. Refer to OEM troubleshooting and repair manual. • Replace the OEM harness. Refer to the OEM troubleshooting and repair manual.	6A



STEP 5A-2: Check for a short circuit in the OEM harness.

⚠WARNING⚠

Do not remove the pressure cap from a hot engine. Wait until the coolant temperature is below 50°C [122°F] before removing the pressure cap. Heated coolant spray or steam can cause personal injury.

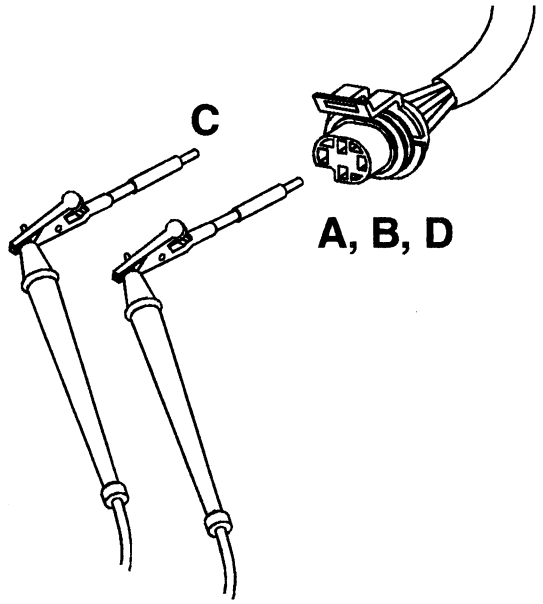
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3823995 - male Weather-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the OEM harness from the coolant level sensor.
- Disconnect the sensor harness from the OEM harness at the Deutsch 31-pin connector.
- Disconnect the OEM harness at the Weather-Pack four-way connector.

Action	Specifications/Repair	Next Step
Check for a short circuit in the OEM harness. • Measure the resistance from pin C (or 3) in the OEM harness connector to pins A (or 1), B (or 2), and D (or 4).	**OK** **More than 100k ohms**	6A
	NOT OK **Repair or replace the OEM harness** • Repair the OEM harness. Refer to the OEM troubleshooting and repair manual. • Replace the OEM harness. Refer to the OEM troubleshooting and repair manual.	6A



19c00222

STEP 6: Clear the fault codes.

STEP 6A: Disable the fault code.

⚠WARNING⚠

Do not remove the pressure cap from a hot engine. Wait until the coolant temperature is below 50°C [122°F] before removing the pressure cap. Heated coolant spray or steam can cause personal injury.

Condition:

- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify that Fault Code 422 is inactive.	**OK** **Fault Code 422 inactive**	6B
	NOT OK Return to troubleshooting steps or contact your local Cummins Authorized Repair Location if all steps have been completed and checked again.	1A

STEP 6B: Clear the inactive fault codes.

⚠WARNING⚠

Do not remove the pressure cap from a hot engine. Wait until the coolant temperature is below 50°C [122°F] before removing the pressure cap. Heated coolant spray or steam can cause personal injury.

Condition:

- Connect all components.
- Turn keyswitch ON.

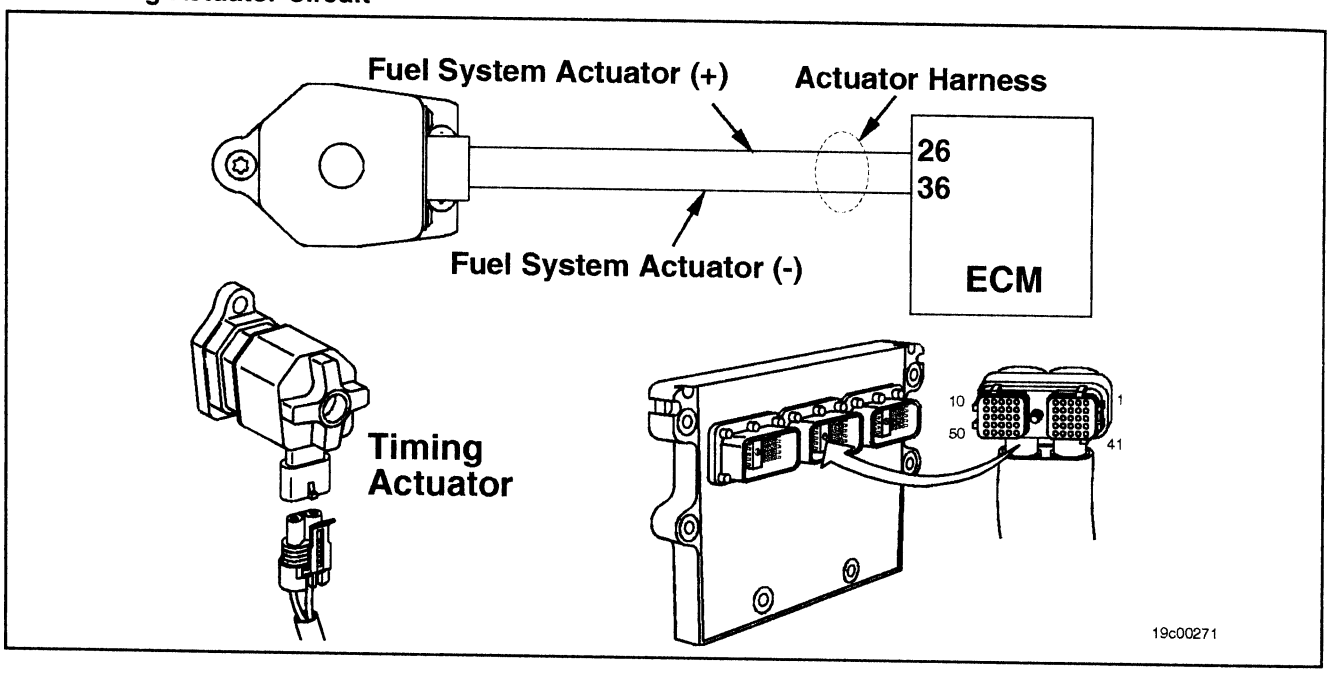
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 399

Actuator Circuit

CODES	REASON	EFFECT
Fault Code: 399 PID(P), SID(S): S084 SPN: 1245 FMI: 6/6 Lamp: Yellow	High current detected at rear timing actuator circuit.	Engine is run using **only** the front three cylinders.

Rear Timing Actuator Circuit



Circuit Description:

The timing actuators are actuated by the electronic control module (ECM) to control fuel timing. Each timing actuator is connected to the ECM by a supply and a return wire. An electrical pulse is sent to the timing actuator from the ECM on the supply wire and returns to the ECM on the return wire. Each solenoid valve is normally closed, and it is **only** opened by an electrical pulse from the ECM during metering.

Component Location:

The rear timing actuator is mounted on the fuel delivery housing. It is the third actuator from the front of the engine.

Shop Talk:

The possible failure modes are short circuit to battery, low actuator resistance, or short circuit between supply and return.

TROUBLESHOOTING SUMMARY

⚠ WARNING ⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

⚠ CAUTION ⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the actuator harness.		
STEP 1A: Inspect the harness and ECM connector pins.	No damaged pins	
STEP 1B: Check the resistance of the whole circuit.	Less than 10 ohms	
STEP 1B-1: Inspect the actuator harness and connector pins.	No damaged pins	
STEP 1B-2: Check the resistance of the actuator solenoid.	0.87 ohm at -17°C [0° F] to 1.73 ohms at 54°C [130°F] 1.10 ohms at 38°C [100°F] to 1.97 ohms at 93°C [200°F]	
STEP 1C: Check for a short circuit to battery in the circuit.	More than 100k ohms	
STEP 1D: Check for a short circuit from pin to pin in the ECM connector.	More than 100k ohms	
STEP 2: Clear the fault codes.		
STEP 2A: Disable the fault code.	Fault Code 399 is inactive	
STEP 2B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check the actuator harness.

STEP 1A: Inspect the harness and ECM connector pins.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the harness and ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	1B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	2A

STEP 1B: Check the resistance of the whole circuit.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

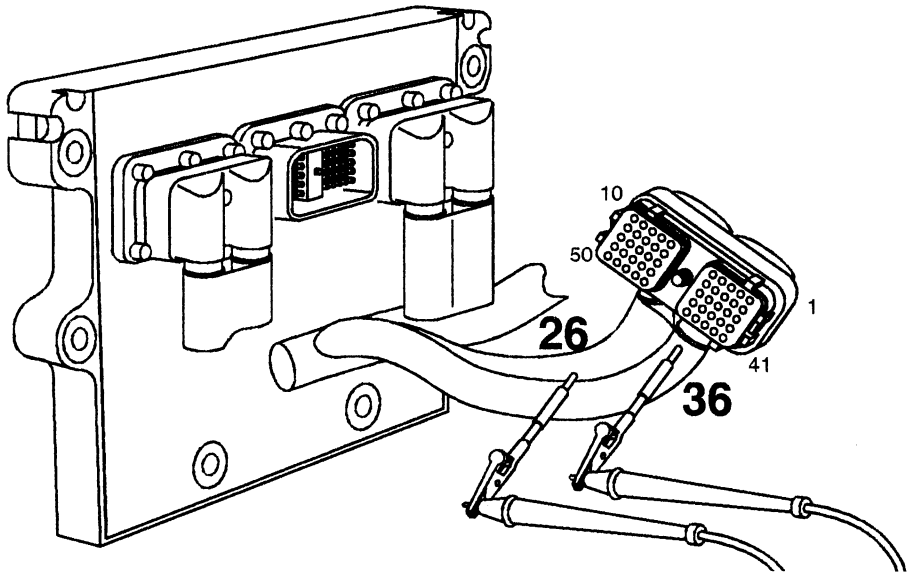
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check the resistance of the whole circuit. • Measure the resistance from pin 26 to pin 36 of the actuator harness connector.	**OK** **Less than 10 ohms**	1B-1
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	2A



STEP 1B-1: Inspect the actuator harness and connector pins.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness from the timing actuator solenoid.

Action	Specifications/Repair	Next Step
Inspect the actuator harness and connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	1B-2
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	2A

STEP 1B-2: Check the resistance of the actuator solenoid.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

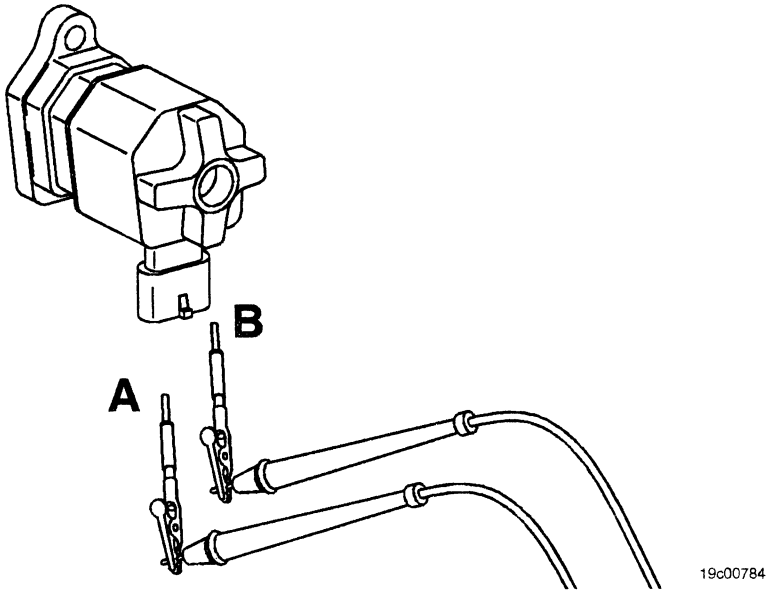
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness from the timing actuator solenoid.

Action	Specifications/Repair	Next Step
Check the resistance of the actuator solenoid. • Measure the resistance across the two terminals on the timing actuator solenoid.	**OK** **0.87 ohm at -17°C [0°F]** **to 1.73 ohms at 54°C [130°F]** **1.10 ohms at 38°C [100°]** **to 1.97 ohms at 93°C [200°F]**	1C
	NOT OK **Replace the rear timing actuator solenoid** Refer to Procedure 019-111.	2A



STEP 1C: Check for a short circuit to battery in the circuit.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

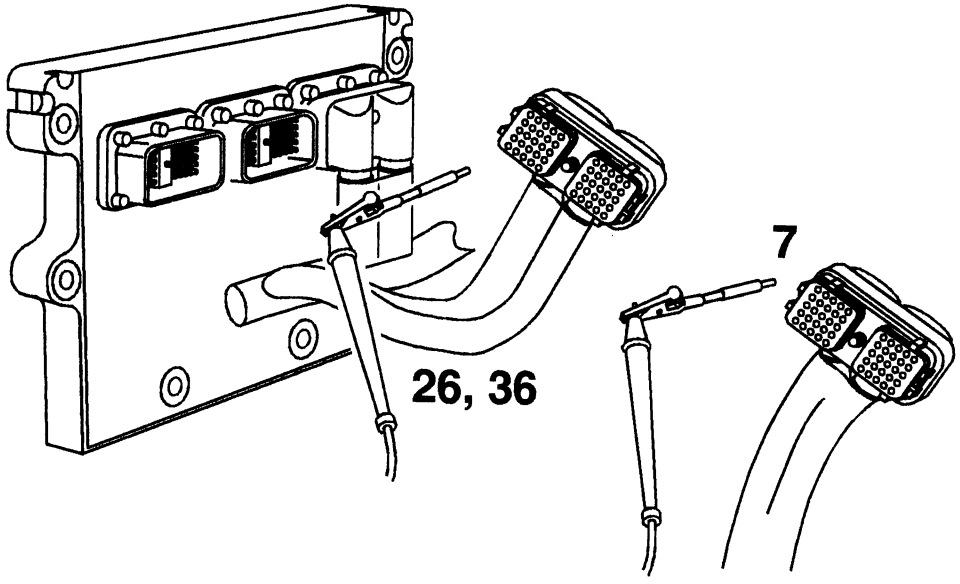
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness from the timing actuator solenoid.
- Disconnect the OEM harness connector from the ECM.
- Disconnect the actuator harness connector from the ECM.
- Disconnect the positive (+) battery terminal from battery.

Action	Specifications/Repair	Next Step
Check for a short circuit to battery in the circuit. • Measure the resistance between actuator harness connector pins 26 and 36 to pin 7 of the OEM harness connector.	**OK** **More than 100k ohms**	1D
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	2A



STEP 1D: Check for a short circuit from pin to pin in the ECM connector.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

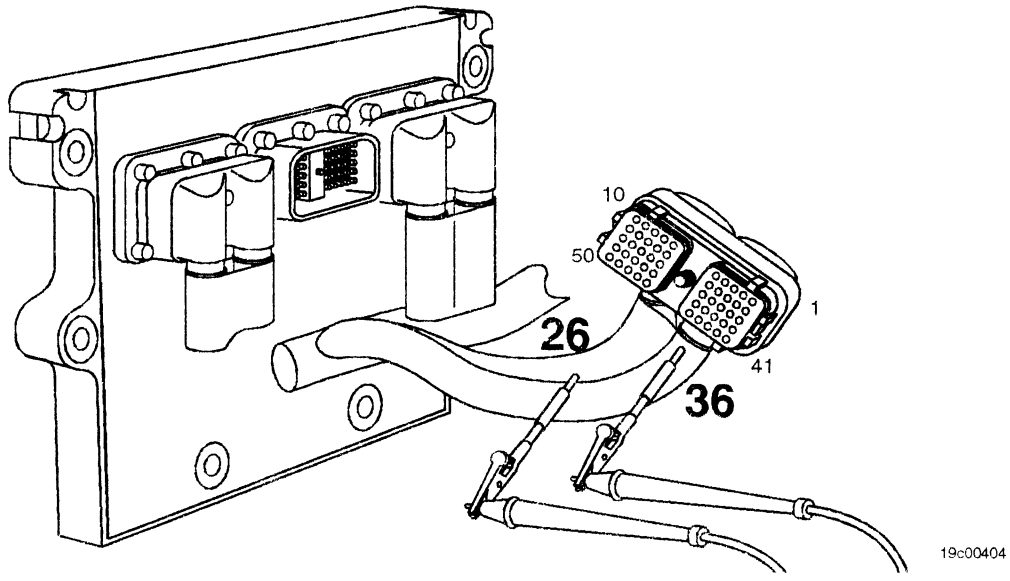
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.
- Disconnect the actuator harness from the timing actuator solenoid.

Action	Specifications/Repair	Next Step
Check for short circuit from pin to pin in the ECM connector. • Measure the resistance from pin 26 in the actuator harness connector to all other pins in the connector. • Measure the resistance from pin 36 in the actuator harness connector to all other pins in the connector.	**OK** **More than 100k ohms**	2A
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	2A



STEP 2: Clear the fault codes.

STEP 2A: Disable the fault code.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and road test it for at least 1 mile. • Using INSITE™, verify that Fault Code 399 is inactive.	**OK** **Fault Code 399 inactive**	2B
	NOT OK **Fault Code 399 active** **Replace the ECM** Refer to Procedure 019-031.	2B

STEP 2B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

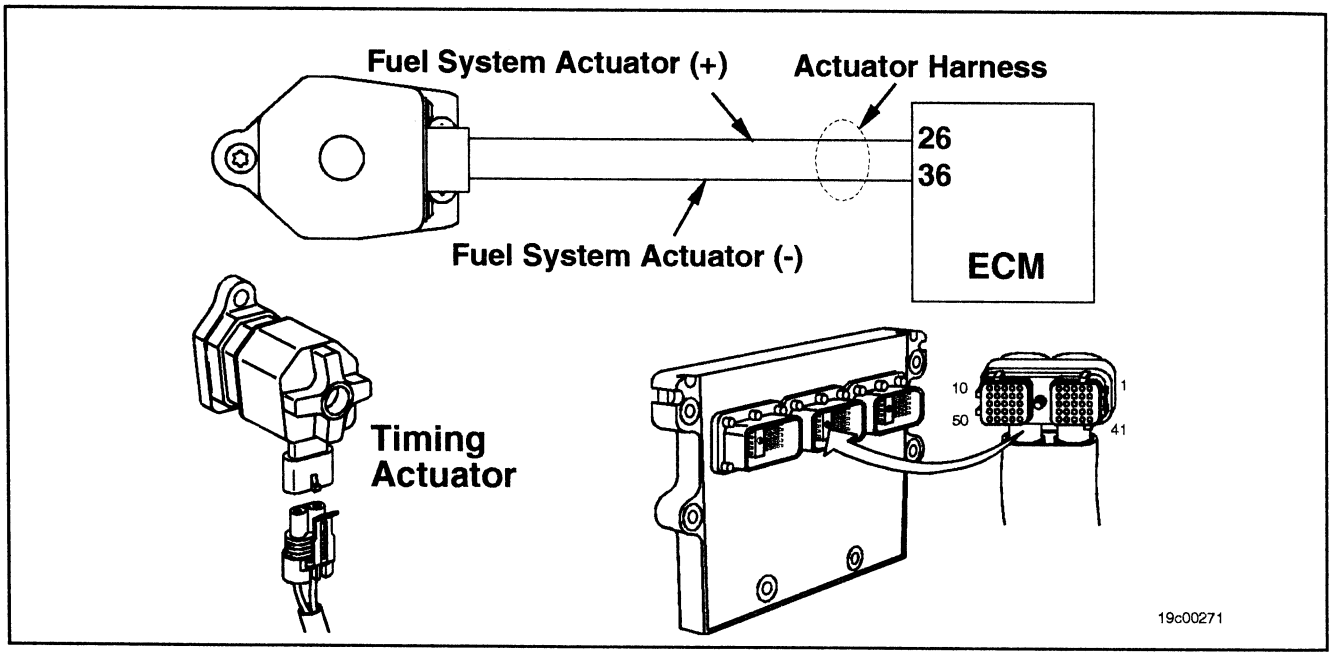
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 398

Actuator Circuit

CODES	REASON	EFFECT
Fault Code: 398 PID(P), SID(S): S084 SPN: 1245 FMI: 5/5 Lamp: Yellow	Low current or open circuit detected at rear timing actuator circuit.	Engine is run using **only** the front three cylinders.

Rear Timing Actuator Circuit



Circuit Description:

The timing actuators are actuated by the electronic control module (ECM) to control fuel metering. Each timing actuator is connected to the ECM by a supply and a return wire. An electrical pulse is sent to the timing actuator from the ECM on the supply wire and returns to the ECM on the return wire. Each solenoid valve is normally closed, and it is **only** opened by an electrical pulse from the ECM during metering.

Component Location:

The rear timing actuator is mounted on the fuel delivery housing. It is the third actuator from the front of the engine.

Shop Talk:

The possible failure modes are an open circuit, a short circuit to ground, high actuator resistance, and loss of boost voltage inside of ECM.

TROUBLESHOOTING SUMMARY

⚠ WARNING ⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

⚠ CAUTION ⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the actuator harness.		
STEP 1A: Inspect the harness and ECM connector pins.	No damaged pins	
STEP 1B: Check the resistance of the whole circuit.	Less than 10 ohms	
STEP 1B-1: Inspect the actuator harness and connector pins.	No damaged pins	
STEP 1B-2: Check for an open circuit in the actuator harness.	Less than 5 ohms	
STEP 1B-3: Check the resistance of the actuator solenoid.	0.87 ohm at -17°C (0°F) to 1.73 ohms at 54°C (130°F) 1.10 ohms at 38°C (100°F) to 1.97 ohms at 93°C (200°F)	
STEP 1C: Check for a short circuit from pin to pin in the ECM connector.	More than 100k ohms	
STEP 1D: Check for a short circuit to ground in the actuator solenoid.	More than 100k ohms	
STEP 2: Clear the fault codes.		
STEP 2A: Disable the fault code.	Fault Code 398 inactive	
STEP 2B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check the actuator harness.

STEP 1A: Inspect the harness and ECM connector pins.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the harness and ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	1B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	2A

STEP 1B: Check the resistance of the whole circuit.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

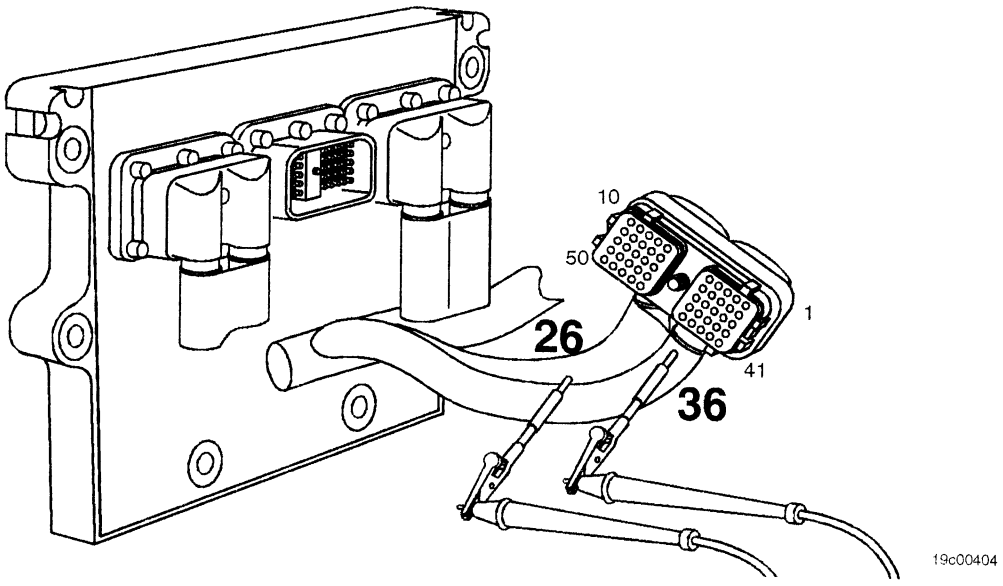
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check the resistance of the whole circuit. • Measure the resistance from pin 26 to pin 36 of the actuator harness connector.	**OK** **Less than 10 ohms**	1B-1
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	2A



STEP 1B-1: Inspect the actuator harness and connector pins.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness from the actuator solenoid.

Action	Specifications/Repair	Next Step
Inspect the actuator harness and connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	1B-2
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	2A

STEP 1B-2: Check for an open circuit in the actuator harness.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

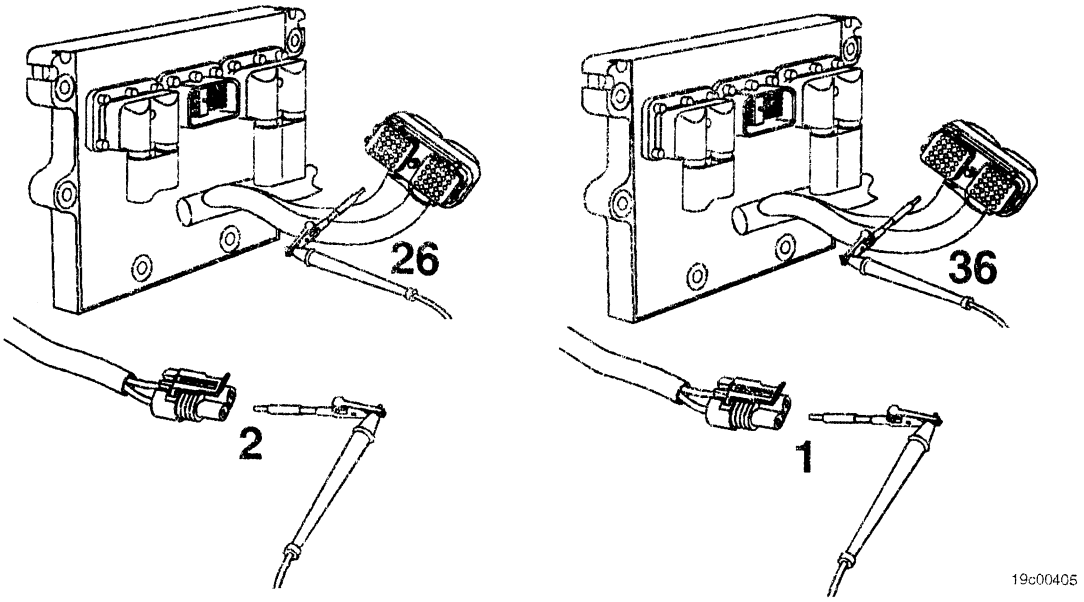
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness from the actuator solenoid.
- Disconnect the actuator harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for an open circuit in the actuator harness. • Measure the resistance from pin 26 of the actuator harness connector to pin 2 (or B) of the actuator solenoid connector. • Measure the resistance from pin 36 of the actuator harness connector to pin 1 (or A) of the actuator solenoid connector.	**OK** **Less than 5 ohms**	1B-3
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	2A



STEP 1B-3: Check the resistance of the actuator solenoid.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

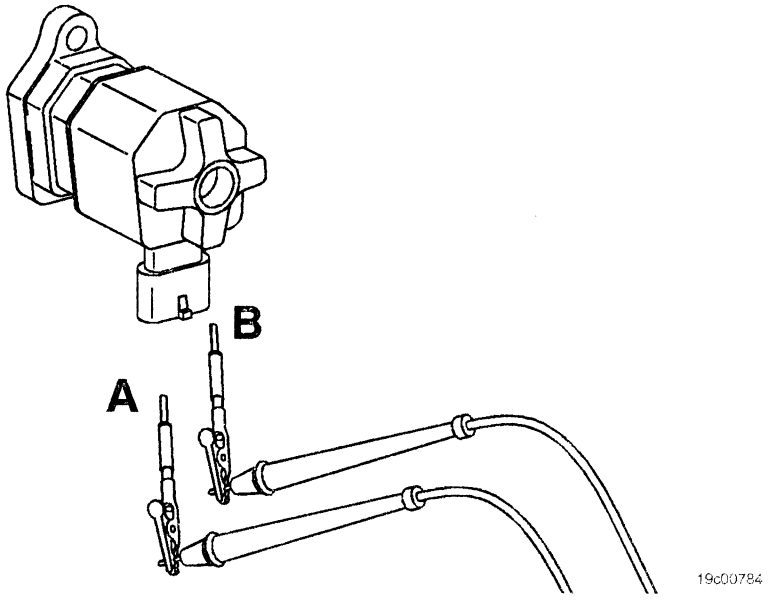
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness from the actuator solenoid.

Action	Specifications/Repair	Next Step
Check the resistance of the actuator solenoid. • Measure the resistance across the two terminals on the actuator solenoid.	**OK** **0.87 ohm at -17°C (0°F)** **to 1.73 ohms at 54°C (130°F)** **1.10 ohms at 38°C (100°F)** **to 1.97 ohms at 93°C (200°F)**	1C
	NOT OK **Replace the rear timing actuator solenoid** Refer to Procedure 019-111.	2A



STEP 1C: Check for a short circuit from pin to pin in the ECM connector.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

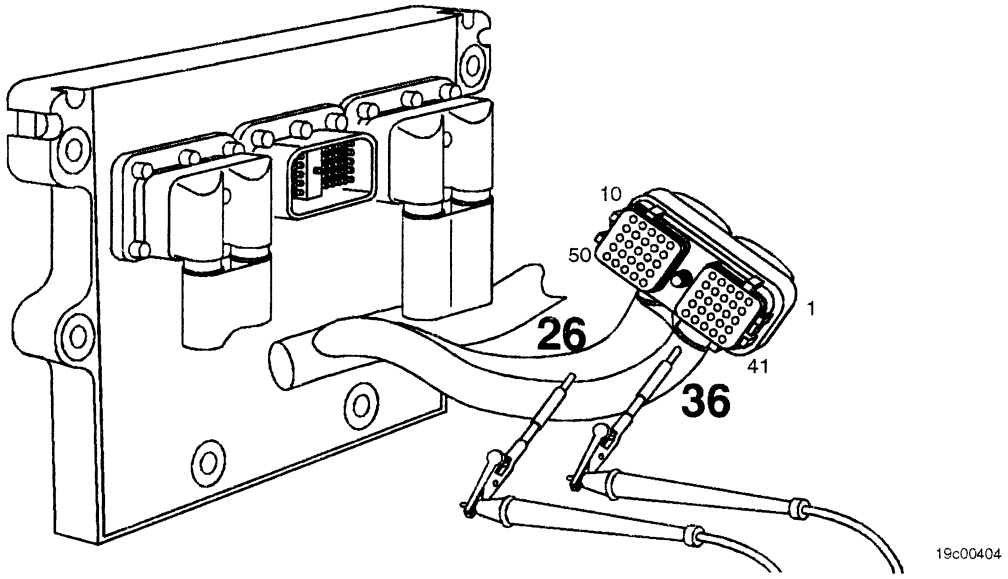
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.
- Disconnect the actuator harness from the actuator solenoid.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin. • Measure the resistance from pin 26 in the actuator harness connector to all other pins in the connector. • Measure the resistance from pin 36 in the actuator harness connector to all other pins in the connector.	**OK** **More than 100k ohms**	1D
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	2A



STEP 1D: Check for a short circuit to ground in the actuator solenoid.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

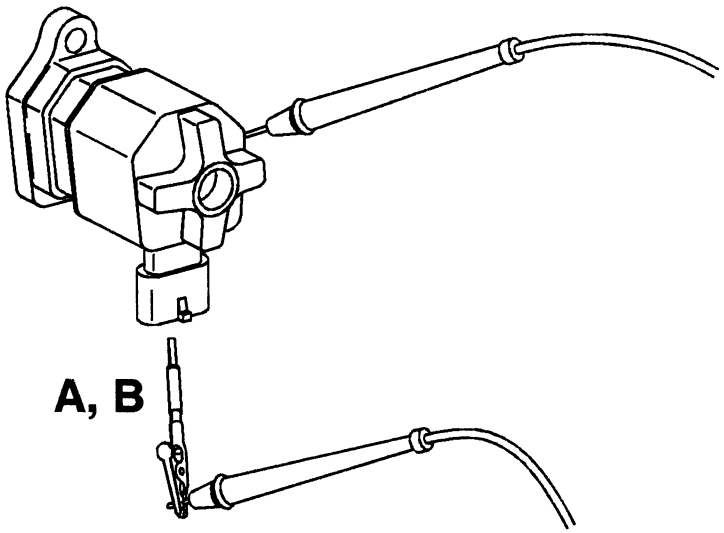
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness from the actuator solenoid.

Action	Specifications/Repair	Next Step
Check for a short circuit to ground in the actuator solenoid. • Measure the resistance between each of the actuator solenoid pins to the actuator body.	**OK** **More than 100k ohms**	2A
	NOT OK **Replace the rear timing actuator solenoid** Refer to Procedure 019-111.	2A



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STEP 2: Clear the fault codes.

STEP 2A: Disable the fault code.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and road test the vehicle for at least 1 mile. • Using INSITE™, verify that Fault Code 398 is inactive.	**OK** **Fault Code 398 inactive**	2B
	NOT OK **Fault Code 398 active** **Replace the ECM** Refer to Procedure 019-031.	2B

STEP 2B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

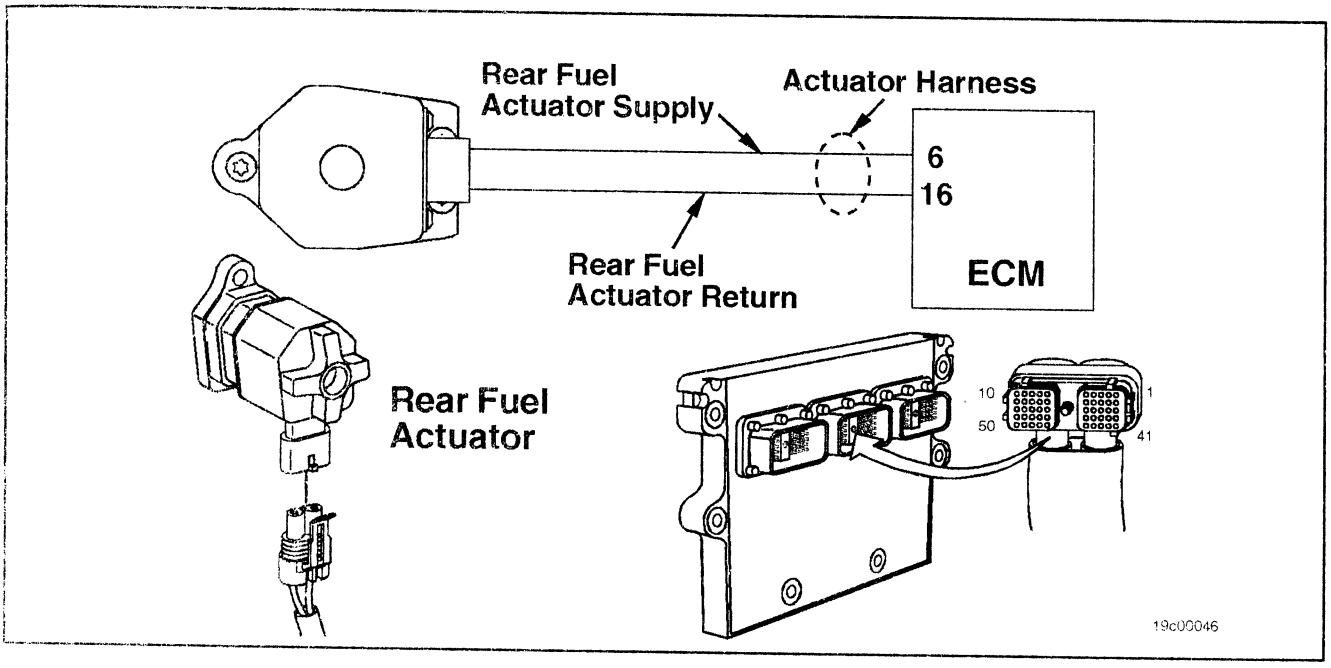
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 397

Actuator Circuit

CODES	REASON	EFFECT
Fault Code: 397 PID(P), SID(S): S083 SPN: 1244 FMI: 6/6 Lamp: Yellow	High current detected at rear fueling actuator circuit.	Engine will run using **only** the front three cylinders.

Rear Fueling Actuator Circuit



Circuit Description:

The fuel actuators are actuated by the electronic control module (ECM) to control fuel metering. Each fuel actuator is connected to the ECM by a supply and a return wire. An electrical pulse is sent to the fuel actuator from the ECM on the supply wire and returns to the ECM on the return wire. Each solenoid valve is normally closed, and it is **only** opened by an electrical pulse from the ECM during metering.

Component Location:

The rear fueling actuator is mounted on the fuel delivery housing. It is the actuator closest to the rear of the engine.

Shop Talk:

The possible failure modes are short circuit to battery, low actuator resistance, or short circuit between supply and return.

TROUBLESHOOTING SUMMARY

⚠ WARNING ⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

⚠ CAUTION ⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the actuator harness.		
STEP 1A: Inspect the harness and ECM connector pins.	No damaged pins	
STEP 1B: Check the resistance of the whole circuit.	Less than 10 ohms	
STEP 1B-1: Inspect the actuator harness and connector pins.	No damaged pins	
STEP 1B-2: Check the resistance of the actuator solenoid.	0.5 to 1.5 ohms	
STEP 1C: Check for a short circuit to battery in the circuit.	More than 100k ohms	
STEP 1D: Check for a short circuit from pin to pin in the ECM connector.	More than 100k ohms	
STEP 2: Clear the fault codes.		
STEP 2A: Disable the fault code.	Fault Code 397 inactive	
STEP 2B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check the actuator harness.

STEP 1A: Inspect the harness and ECM connector pins.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the harness and ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	1B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	2A

STEP 1B: Check the resistance of the whole circuit.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

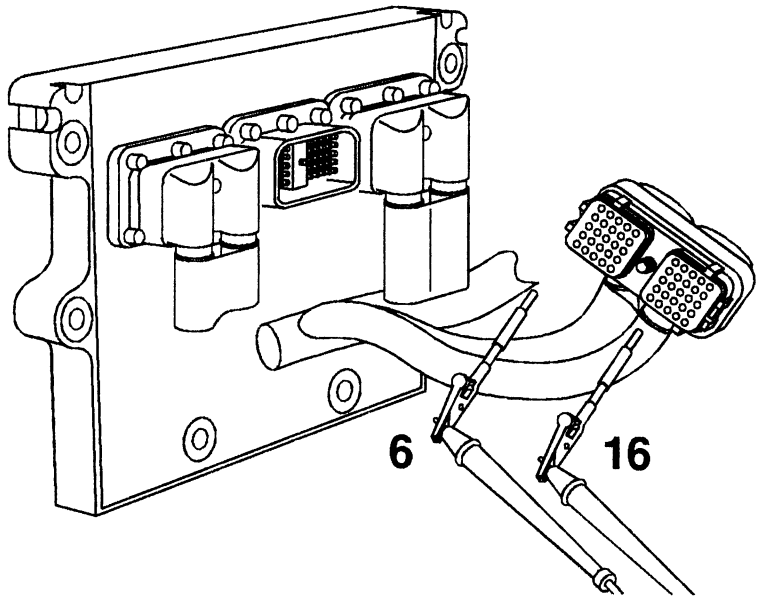
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check the resistance of the whole circuit. • Measure the resistance from pin 6 to pin 16 of the actuator harness connector.	**OK** **Less than 10 ohms**	1B-1
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	2A



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STEP 1B-1: Inspect the actuator harness and connector pins.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness from the actuator solenoid.

Action	Specifications/Repair	Next Step
Inspect the harness and the actuator connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	1B-2
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-202 or 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	2A

STEP 1B-2: Check the resistance of the actuator solenoid.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

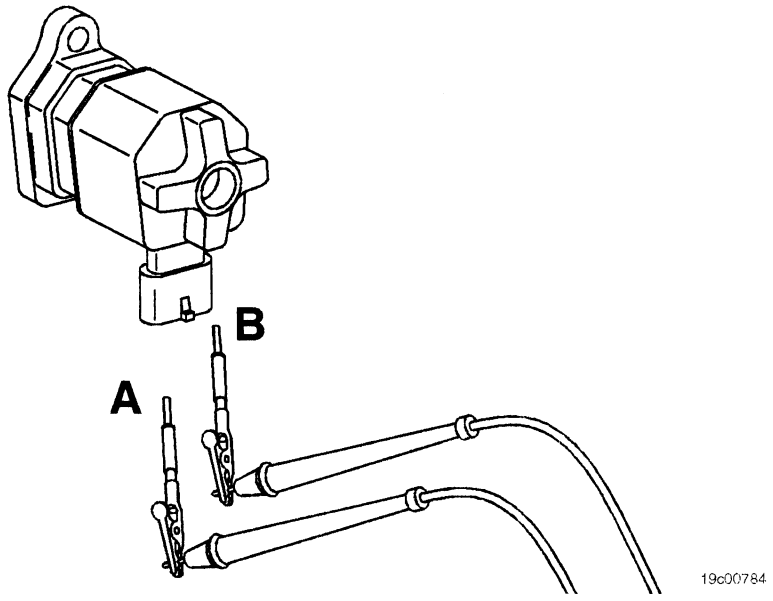
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness from the actuator solenoid.

Action	Specifications/Repair	Next Step
Check the resistance of the actuator solenoid. • Measure the resistance across the two terminals on the actuator solenoid.	**OK** **0.5 to 1.5 ohms**	1C
	NOT OK **Replace the rear fueling actuator solenoid** Refer to Procedure 019-110.	2A



STEP 1C: Check for a short circuit to battery in the circuit.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

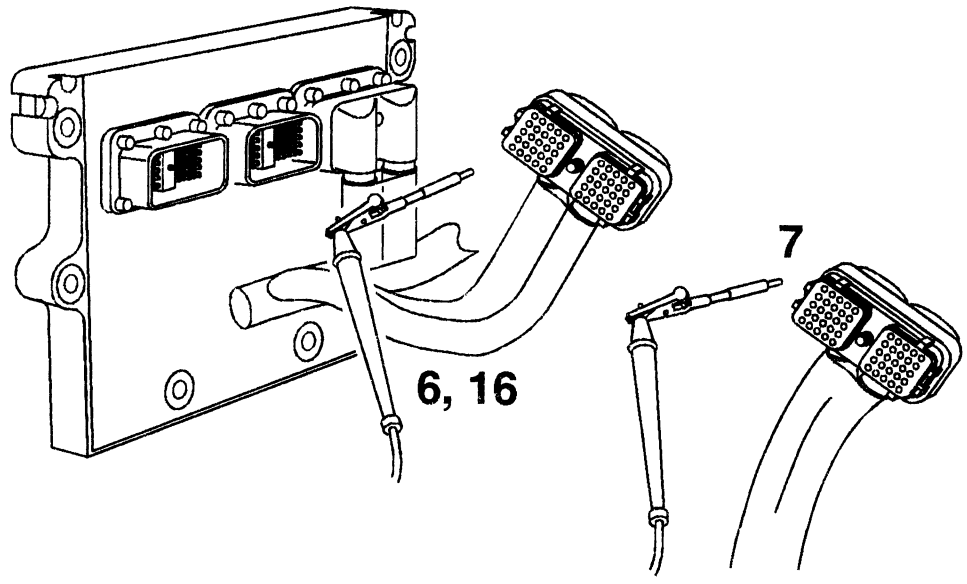
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness from the actuator solenoid.
- Disconnect the OEM harness connector from the ECM.
- Disconnect the actuator harness connector from the ECM.
- Disconnect the positive (+) battery terminal from battery.

Action	Specifications/Repair	Next Step
Check for short circuit to battery in the actuator solenoid. • Measure the resistance between pins 6 and 16 in the actuator harness connector to pin 7 of the OEM harness connector.	**OK** **More than 100k ohms**	1D
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	2A



STEP 1D: Check for a short circuit from pin to pin in the ECM connector.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

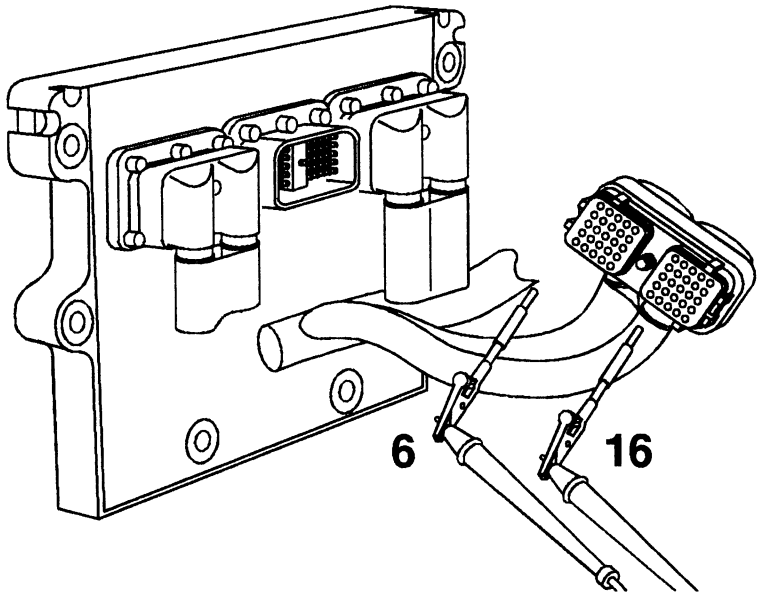
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.
- Disconnect the actuator harness from the actuator solenoid.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin. • Measure the resistance from pin 6 in the actuator harness connector to all other pins in the connector. • Measure the resistance from pin 16 in the actuator harness connector to all other pins in the connector.	**OK** **More than 100k ohms**	2A
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	2A



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STEP 2: Clear the fault codes.

STEP 2A: Disable the fault code.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and test drive the vehicle for at least 1 mile. • Using INSITE™, verify that Fault Code 397 is inactive.	**OK** **Fault Code 397 inactive**	2B
	NOT OK **Fault Code 397 active** **Replace the ECM** Refer to Procedure 019-031.	2B

STEP 2B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

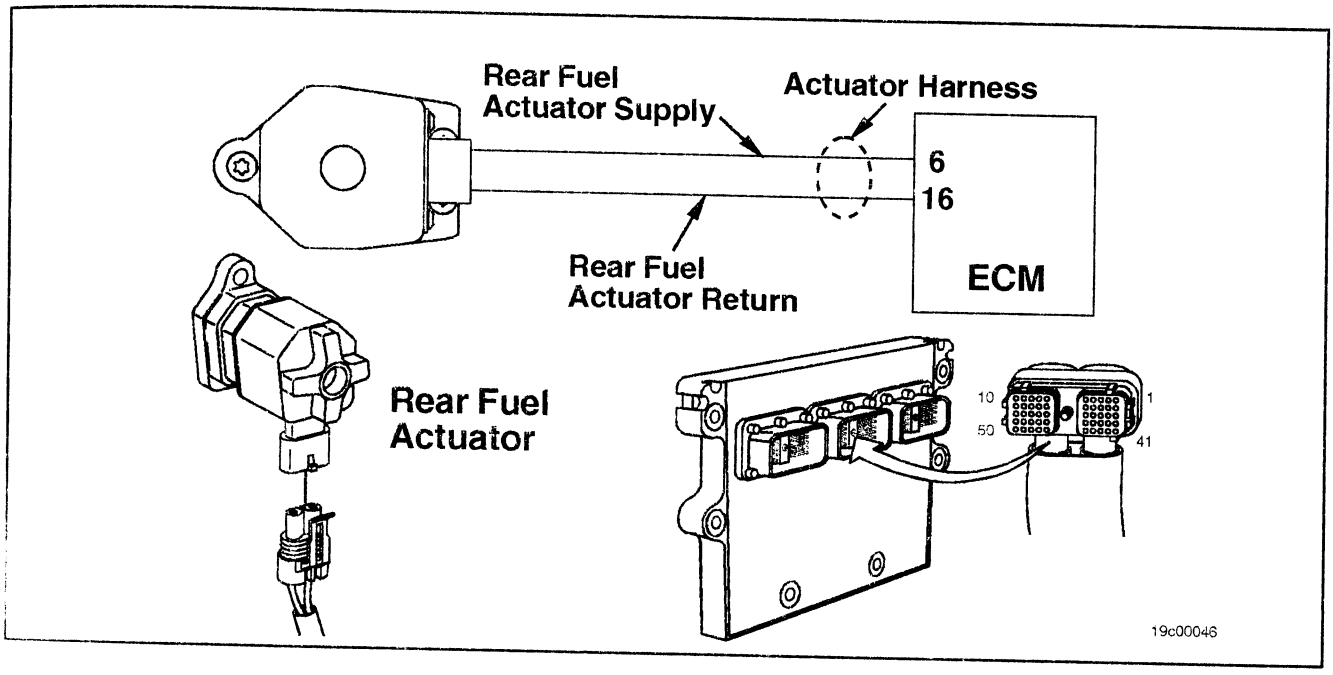
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 396

Actuator Circuit

CODES	REASON	EFFECT
Fault Code: 396 PID(P). SID(S): S083 SPN: 1244 FMI: 5/5 Lamp: Yellow	Low current or open circuit detected at rear fueling actuator circuit.	Engine will run using **only** the front three cylinders.

Rear Fueling Actuator Circuit



Circuit Description:

The fuel actuators are actuated by the electronic control module (ECM) to control fuel metering. Each fuel actuator is connected to the ECM by a supply and a return wire. An electrical pulse is sent to the fuel actuator from the ECM on the supply wire and returns to the ECM on the return wire. Each solenoid valve is normally closed, and it is **only** opened by an electrical pulse from the ECM during metering.

Component Location:

The rear fueling actuator is mounted on the fuel delivery housing. It is the actuator closest to the rear of the engine.

Shop Talk:

The possible failure modes are an open circuit, short to ground, and high actuator resistance.

TROUBLESHOOTING SUMMARY

WARNING

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

CAUTION

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

CAUTION

To avoid pin and harness damage, use the following test lead when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the actuator harness.		
STEP 1A: Inspect the harness and ECM connector pins.	No damaged pins	
STEP 1B: Check the resistance of the whole circuit.	Less than 10 ohms	
STEP 1B-1: Inspect the actuator harness and connector pins.	No damaged pins	
STEP 1B-2: Check for an open circuit in the actuator harness.	Less than 5 ohms	
STEP 1B-3: Check the resistance of the actuator solenoid.	0.5 to 1.5 ohms	
STEP 1C: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 1D: Check for a short circuit to ground in the actuator solenoid.	More than 100k ohms	
STEP 2: Clear the fault codes.		
STEP 2A: Disable the fault code.	Fault Code 396 inactive	
STEP 2B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check the actuator harness.

STEP 1A: Inspect the harness and the ECM connector pins.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the harness and the ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins.**	1B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	2A

STEP 1B: Check the resistance of the whole circuit.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

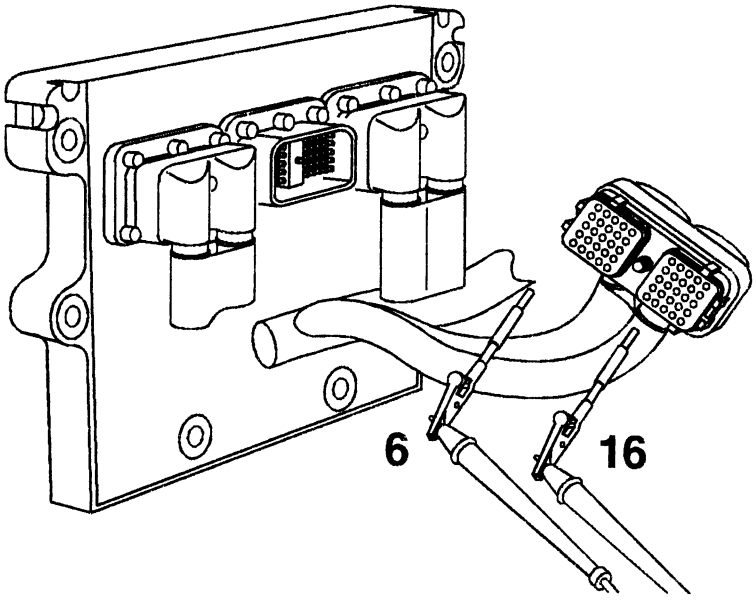
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check the resistance of the actuator harness. • Measure the resistance from pin 6 to pin 16 of the actuator harness connector.	**OK** **Less than 10 ohms**	1B-1
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	2A



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STEP 1B-1: Inspect the actuator harness and connector pins.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

△CAUTION△

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness from the actuator solenoid.

Action	Specifications/Repair	Next Step
Inspect the actuator harness and connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	1B-2
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	2A

STEP 1B-2: Check for an open circuit in the actuator harness.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

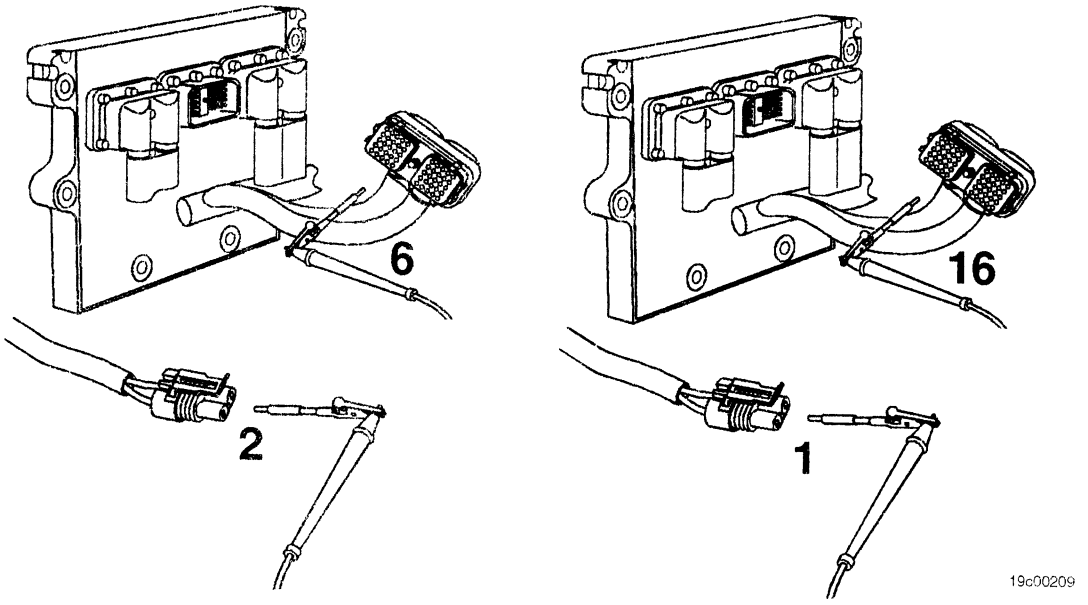
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness from the actuator solenoid.
- Disconnect the actuator harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for an open circuit in the actuator harness. • Measure the resistance from pin 6 of the actuator harness connector to pin 2 (or B) of the actuator solenoid connector. • Measure the resistance from pin 16 of the actuator harness connector to pin 1 (or A) of the actuator solenoid connector.	**OK** **Less than 5 ohms**	1B-3
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-202 or 019-250. • Replace the engine harness. Refer to Procedure 019-043.	2A



STEP 1B-3: Check the resistance of the actuator solenoid.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

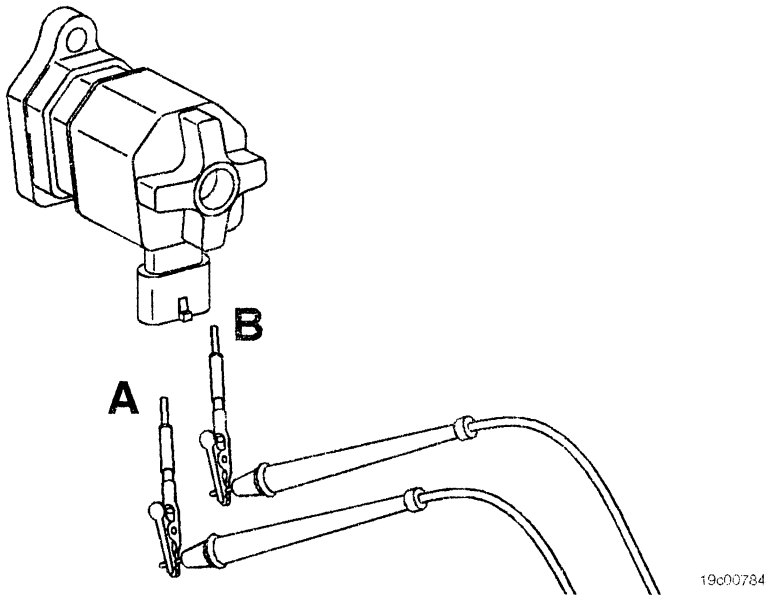
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness from the actuator solenoid.

Action	Specifications/Repair	Next Step
Check the resistance of the actuator solenoid. • Measure the resistance across the two terminals on the actuator solenoid.	**OK** **0.5 to 1.5 ohms**	1C
	NOT OK **Replace the rear fueling actuator solenoid** Refer to Procedure 019-110.	2A



STEP 1C: Check for a short circuit from pin to pin.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

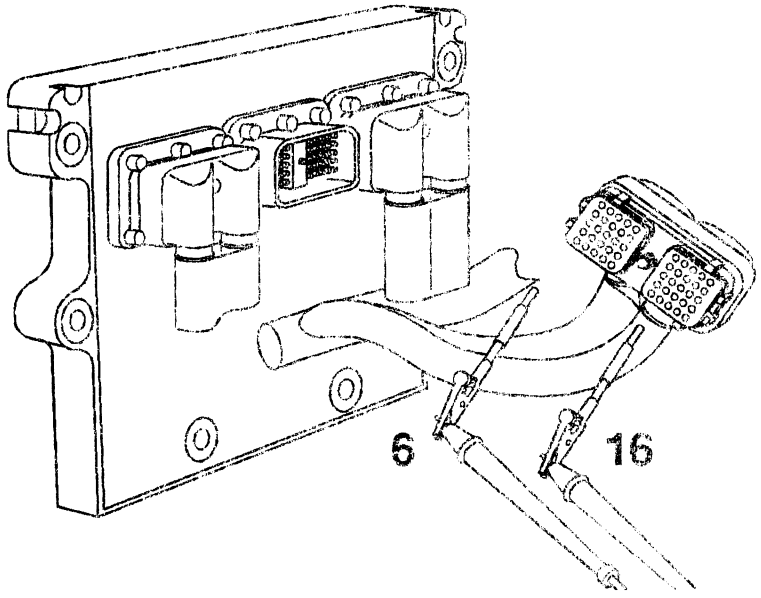
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.
- Disconnect the actuator harness from the actuator solenoid.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin. • Measure the resistance from pin 6 in the actuator harness connector to all other pins in the connector. • Measure the resistance from pin 16 in the actuator harness connector to all other pins in the connector.	**OK** **More than 100k ohms**	1D
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	2A



STEP 1D: Check for a short circuit to ground in the actuator solenoid.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

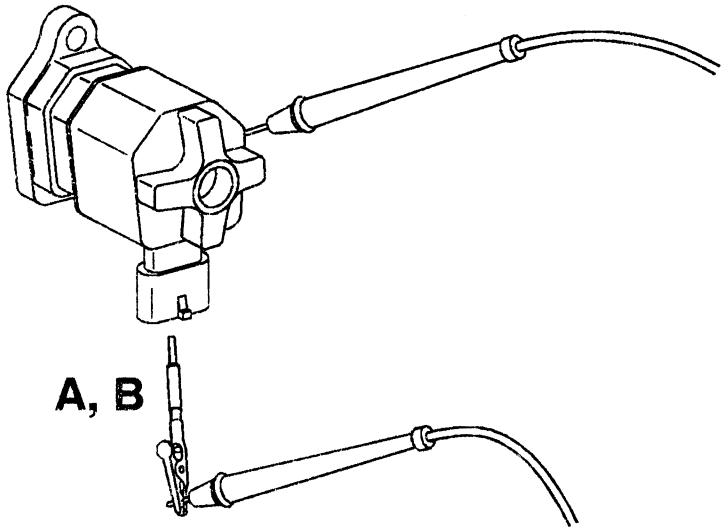
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the actuator solenoid.

Action	Specifications/Repair	Next Step
Check for short circuit to ground in the actuator solenoid. • Measure the resistance between pin 1 (or A) on the actuator connector to the actuator body. • Measure the resistance between pin 2 (or B) on the actuator connector to the actuator body.	**OK** **More than 100k ohms**	2A
	NOT OK **Replace the rear fueling actuator solenoid** Refer to Procedure 019-110.	2A



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STEP 2: Clear the fault codes.

STEP 2A: Disable the fault code.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and road test vehicle for at least 1 mile. • Using INSITE™, verify that Fault Code 396 is inactive.	**OK** **Fault Code 396 inactive**	2B
	NOT OK **Fault Code 396 active** **Replace the ECM** Refer to Procedure 019-031.	2B

STEP 2B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

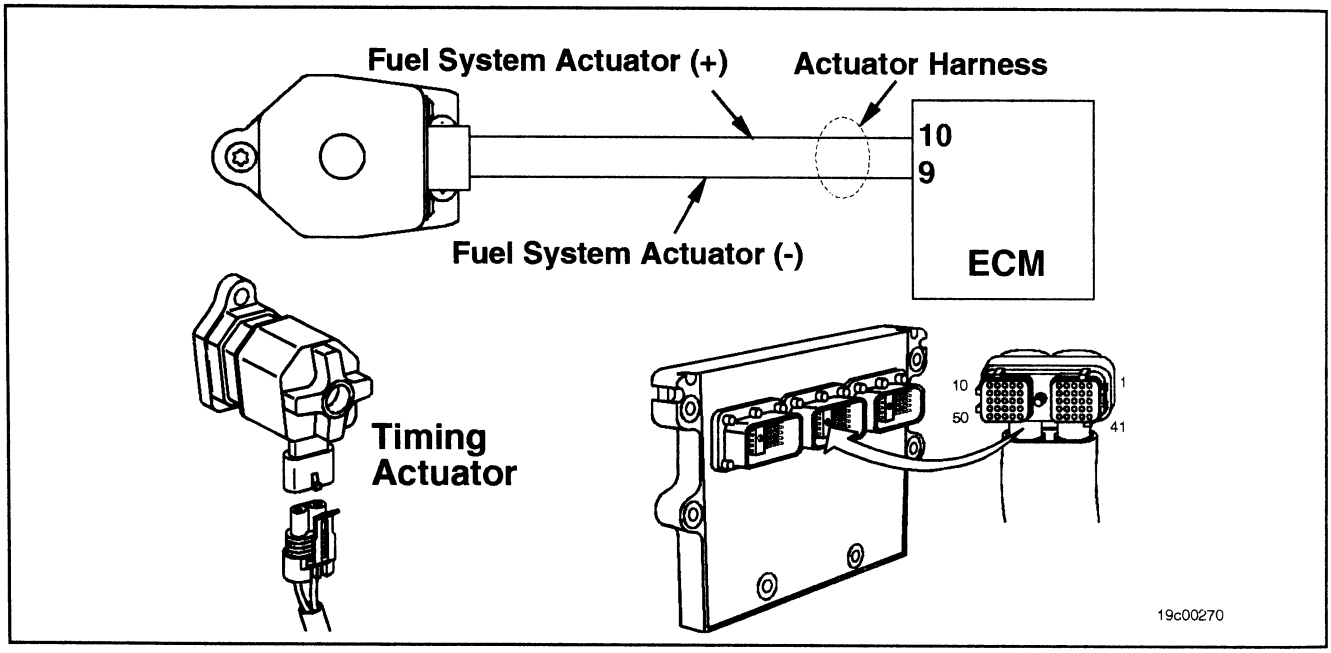
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 395

Actuator Circuit

CODES	REASON	EFFECT
Fault Code: 395 PID(P), SID(S): S020 SPN: 635 FMI: 6/6 Lamp: Yellow	High current detected at front timing actuator circuit.	Engine is run using **only** the rear three cylinders.

Front Timing Actuator Circuit



Circuit Description:

The timing actuators are actuated by the electronic control module (ECM) to control fuel timing. Each timing actuator is connected to the ECM by a supply and a return wire. An electrical pulse is sent to the timing actuator from the ECM on the supply wire and returns to the ECM on the return wire. Each solenoid valve is normally closed, and it is **only** opened by an electrical pulse from the ECM during metering.

Component Location:

The front timing actuator is mounted on the fuel delivery housing. It is the second actuator from the front of the engine.

Shop Talk:

The possible failure modes are short circuit to battery, low actuator resistance, or short circuit between supply and return wires.

TROUBLESHOOTING SUMMARY

⚠ WARNING ⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jeweiry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

⚠ CAUTION ⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the actuator harness.		
STEP 1A: Inspect the harness and ECM connector pins.	No damaged pins	
STEP 1B: Check the resistance of the whole circuit.	Less than 10 ohms	
STEP 1B-1: Inspect the actuator harness and connector pins.	No damaged pins	
STEP 1B-2: Check the resistance of the actuator solenoid.	0.87 ohms at -17°C (0°F) to 1.73 ohms at 54°C (130°F) 1.10 ohms at 38°C (100°F) to 1.97 ohms at 93°C (200°F)	
STEP 1C: Check for a short circuit to battery in the circuit.	More than 100k ohms	
STEP 1D: Check for a short circuit from pin to pin in the ECM connector.	More than 100k ohms	
STEP 2: Clear the fault codes.		
STEP 2A: Disable the fault code.	Fault Code 395 inactive	
STEP 2B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check the actuator harness.

STEP 1A: Inspect the harness and the ECM connector pins.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the harness and the ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	1B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	2A

STEP 1B: Check the resistance of the whole circuit.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

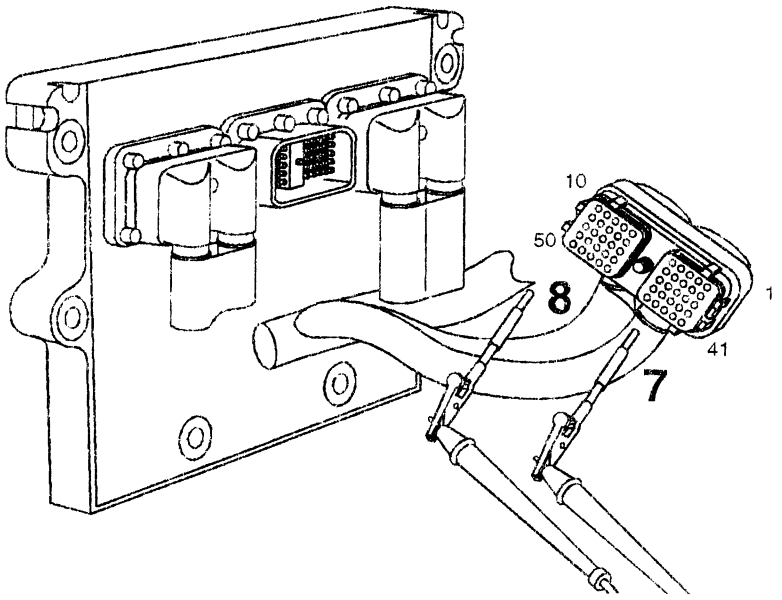
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check the resistance of the actuator harness. • Measure the resistance from pin 7 to pin 8 of the actuator harness connector.	**OK** **Less than 10 ohms**	1B-1
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	2A



STEP 1B-1: Inspect the actuator harness and connector pins.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness from the timing actuator solenoid.

Action	Specifications/Repair	Next Step
Inspect the actuator harness and connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	1B-2
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	2A

STEP 1B-2: Check the resistance of the actuator solenoid.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

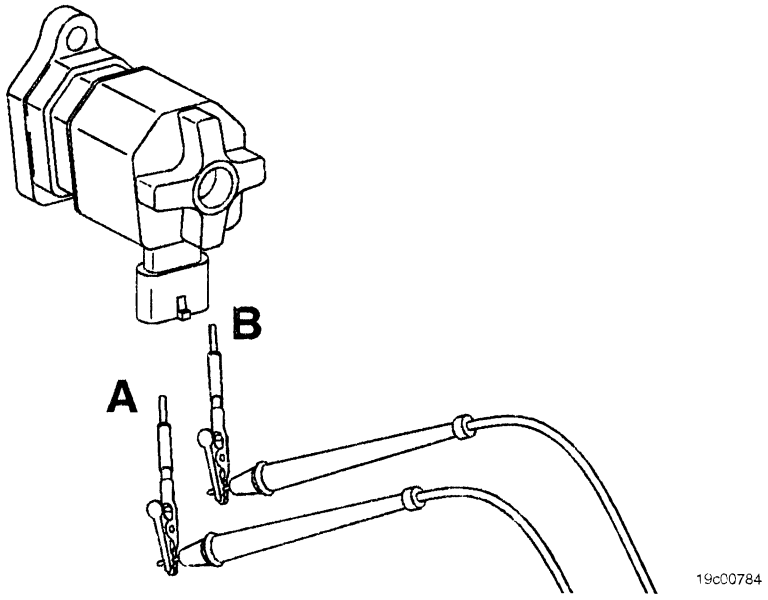
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness from the timing actuator solenoid.

Action	Specifications/Repair	Next Step
Check the resistance of the timing actuator solenoid. • Measure the resistance across the two terminals on the timing actuator solenoid.	**OK** **0.87 ohms at -17°C (0°F)** **to 1.73 ohms at 54°C (130°F)** **1.10 ohms at 38°C (100°F)** **to 1.97 ohms at 93°C (200°F)**	1C
	NOT OK **Replace the timing actuator solenoid** Refer to Procedure 019-111.	2A



STEP 1C: Check for a short circuit to battery in the circuit.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

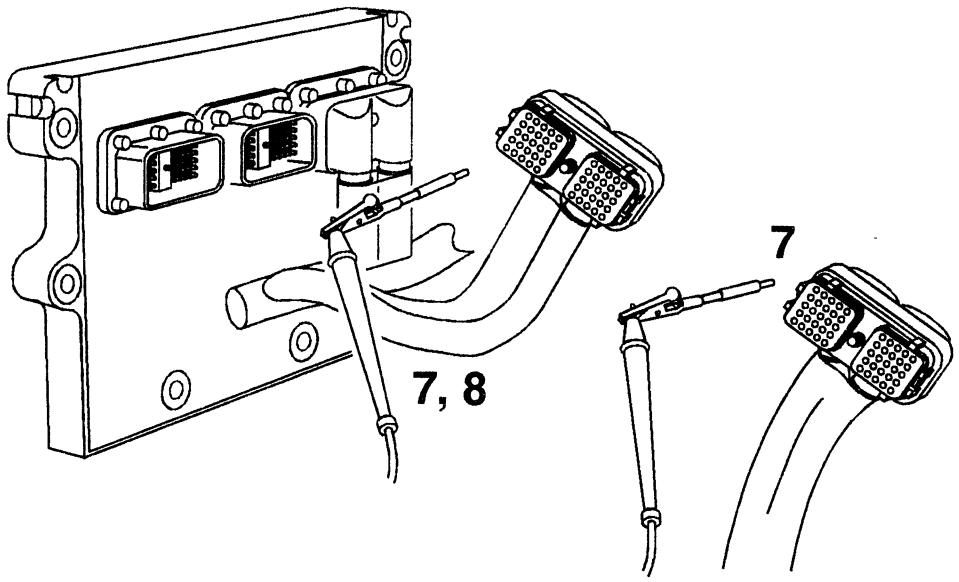
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness from the timing actuator solenoid.
- Disconnect the OEM harness connector from the ECM.
- Disconnect the actuator harness connector from the ECM.
- Disconnect the positive (+) battery terminal from battery.

Action	Specifications/Repair	Next Step
Check for short circuit to battery in the timing actuator solenoid. • Measure the resistance between the timing actuator harness connector pins 7 and 8 to pin 7 of the OEM harness connector.	**OK** **More than 100k ohms**	1D
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	2A



STEP 1D: Check for a short circuit from pin to pin in the ECM connector.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

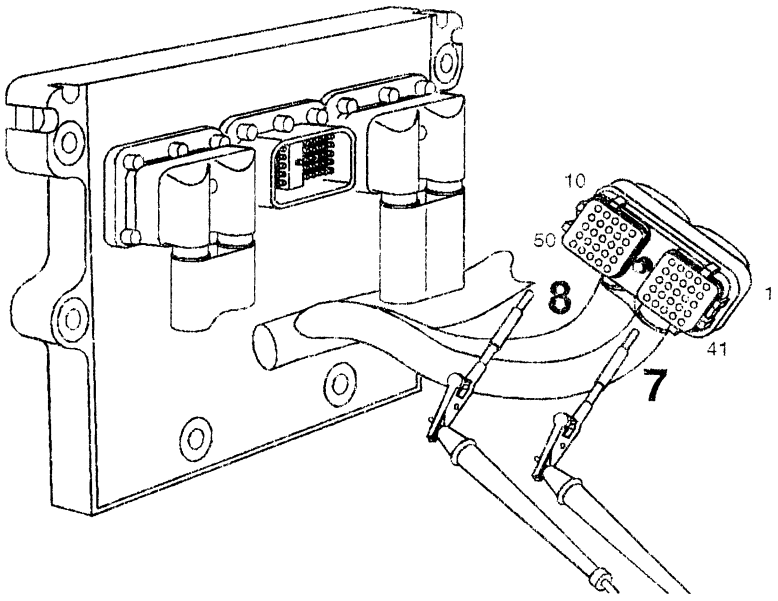
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.
- Disconnect the actuator harness from the timing actuator solenoid.

Action	Specifications/Repair	Next Step
Check for short circuit from pin to pin. • Measure the resistance from pin 7 in the actuator harness connector to all other pins in the connector. • Measure the resistance from pin 8 in the actuator harness connector to all other pins in the connector.	**OK** **More than 100k ohms**	2A
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	2A



STEP 2: Clear the fault codes.

STEP 2A: Disable the fault code.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify that Fault Code 395 is inactive.	**OK** **Fault Code 395 inactive**	2B
	NOT OK **Fault Code 395 active** **Replace the ECM** Refer to Procedure 019-031.	2B

STEP 2B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

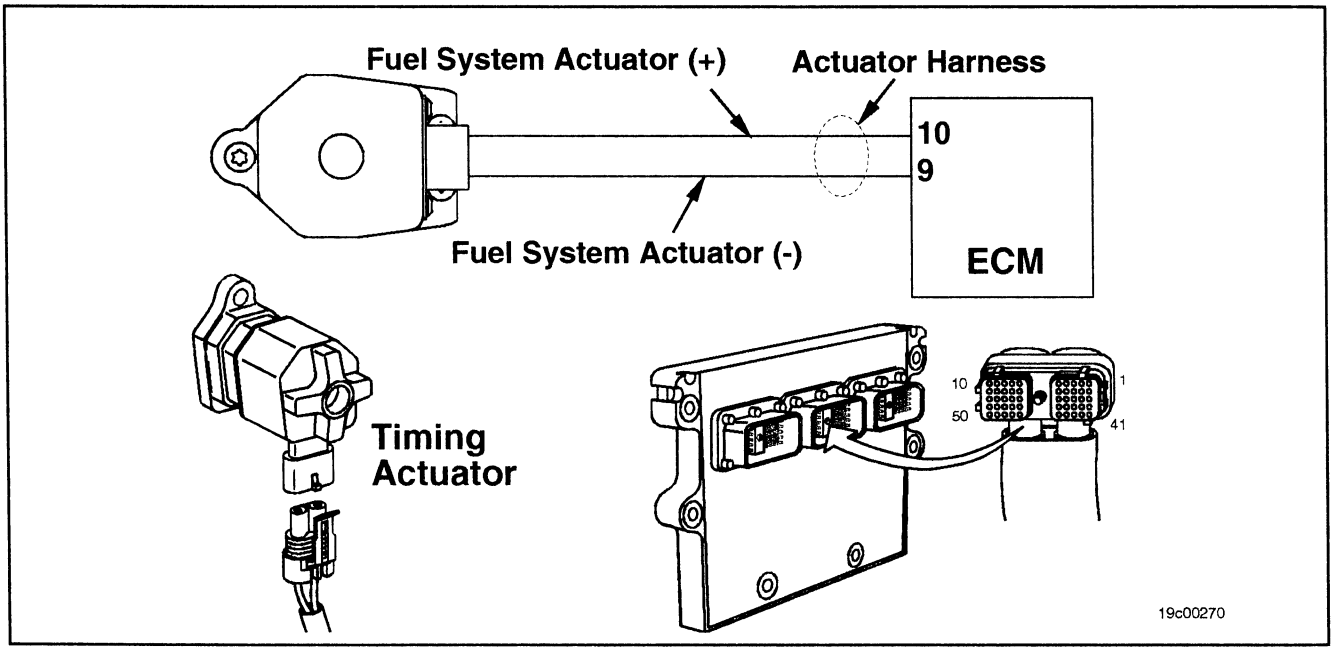
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 394

Actuator Circuit

CODES	REASON	EFFECT
Fault Code: 394 PID(P), SID(S): S020 SPN: 635 FMI: 5/5 Lamp: Yellow	Low current or open circuit detected at front timing actuator circuit.	Engine is run using **only** the rear three cylinders.

Front Timing Actuator Circuit



Circuit Description:

The timing actuators are actuated by the electronic control module (ECM) to control fuel metering. Each timing actuator is connected to the ECM by a supply and a return wire. An electrical pulse is sent to the timing actuator from the ECM on the supply wire and returns to the ECM on the return wire. Each solenoid valve is normally closed, and it is **only** opened by an electrical pulse from the ECM during metering.

Component Location:

The front timing actuator is mounted on the fuel delivery housing. It is the second actuator from the front of the engine.

Shop Talk:

The possible failure modes are open circuit, short circuit to ground, high actuator resistance, and loss of boost voltage inside the ECM.

TROUBLESHOOTING SUMMARY

⚠ WARNING ⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

⚠ CAUTION ⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the actuator harness.		
STEP 1A: Inspect the harness and the ECM connector pins.	No damaged pins	
STEP 1B: Check the resistance of the whole circuit.	Less than 10 ohms	
STEP 1B-1: Inspect the actuator harness and connector pins.	No damaged pins	
STEP 1B-2: Check for an open circuit in the actuator harness.	Less than 5 ohms	
STEP 1B-3: Check the resistance of the actuator solenoid.	0.87 ohm at -17°C (0°F) to 1.73 ohms at 54°C (130°F) 1.10 ohms at 38°C (100°F) to 1.97 ohms at 93°C (200°F)	
STEP 1C: Check for a short circuit from pin to pin in the ECM connector.	More than 100k ohms	
STEP 1D: Check for a short circuit to ground in the actuator solenoid.	More than 100k ohms	
STEP 2: Clear the fault codes.		
STEP 2A: Disable the fault code.	Fault Code 394 inactive	
STEP 2B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check the actuator harness.

STEP 1A: Inspect the harness and the ECM connector pins.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the harness and the ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	1B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	2A

STEP 1B: Check the resistance of the whole circuit.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

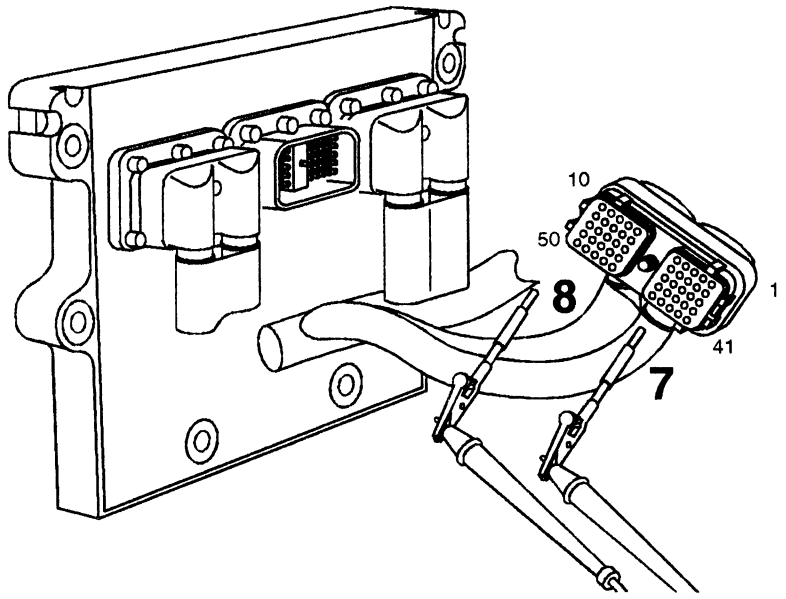
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check the resistance of the whole circuit. • Measure the resistance from pin 7 to pin 8 of the actuator harness connector.	**OK** **Less than 10 ohms**	1B-1
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	2A



STEP 1B-1: Inspect the actuator harness and connector pins.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Turn keyswitch OFF.
- Disconnect the actuator harness from the actuator solenoid.

Action	Specifications/Repair	Next Step
Inspect the harness and the connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	1B-2
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-202 or 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	2A

STEP 1B-2: Check for an open circuit in the actuator harness.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

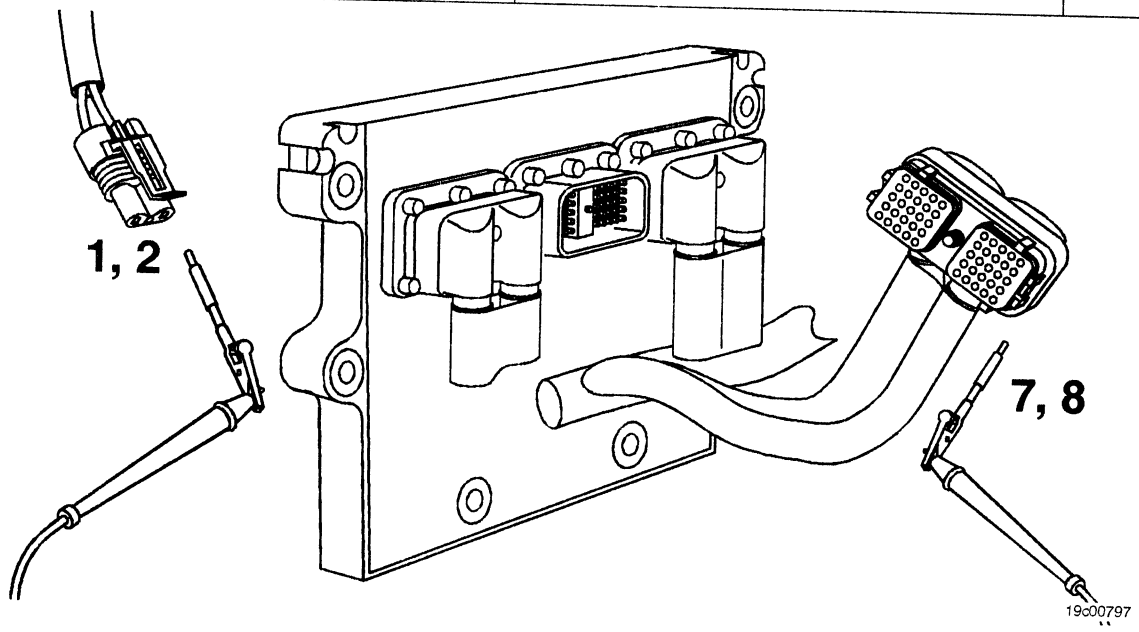
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness from the actuator solenoid.
- Disconnect the actuator harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for an open circuit in the actuator harness. • Measure the resistance from pin 7 of the actuator harness connector to pin 1 (or A) of the actuator solenoid connector. • Measure the resistance from pin 8 of the actuator harness connector to pin 2 (or B) of the actuator solenoid connector.	**OK** **Less than 5 ohms**	1B-3
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-202 or 019-250. • Replace the engine harness. Refer to Procedure 019-043.	2A



STEP 1B-3: Check the resistance of the actuator solenoid.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

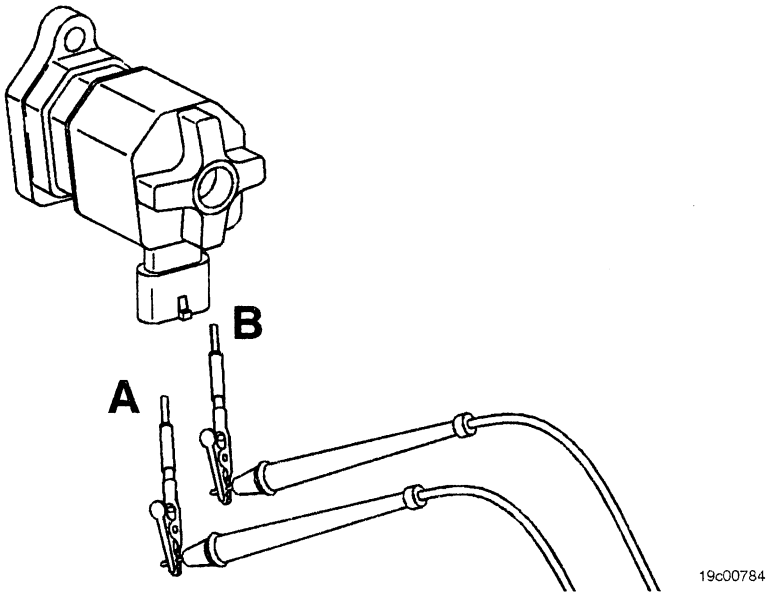
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness from the actuator solenoid.

Action	Specifications/Repair	Next Step
Check the resistance of the actuator solenoid. • Measure the resistance across the two terminals on the actuator solenoid.	**OK** **0.87 ohms at -17°C (0°F)** **to 1.73 ohms at 54°C (130°F)** **1.10 ohms at 38°C (100°F)** **to 1.97 ohms at 93°C (200°F)**	1C
	NOT OK **Replace the actuator solenoid** Refer to Procedure 019-110.	2A



STEP 1C: Check for a short circuit from pin to pin in the ECM connector.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

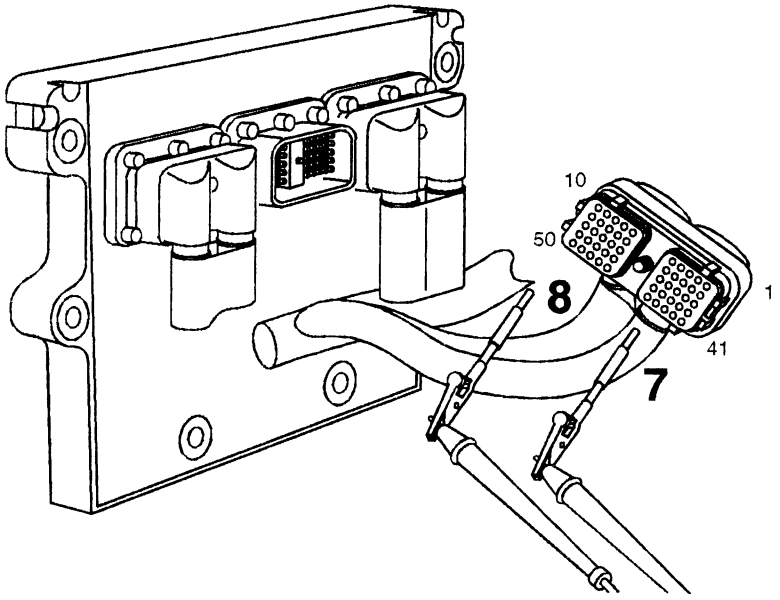
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.
- Disconnect the actuator harness from the actuator solenoid.

Action	Specifications/Repair	Next Step
Check for short circuit from pin to pin. • Measure the resistance from pin 7 in the actuator harness connector to all other pins in the connector. • Measure the resistance from pin 8 in the actuator harness connector to all other pins in the connector.	**OK** **More than 100k ohms**	1D
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	2A



STEP 1D: Check for a short circuit to ground in the actuator solenoid.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

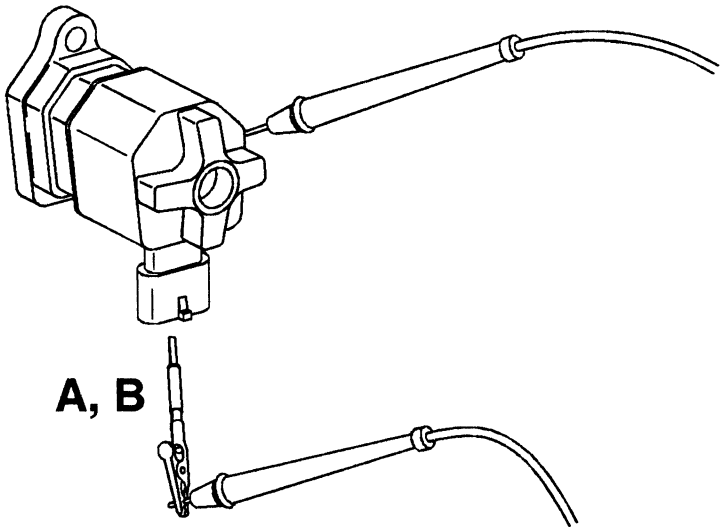
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness from the actuator solenoid.

Action	Specifications/Repair	Next Step
Check for short circuit to ground in the actuator solenoid. • Measure the resistance between both actuator solenoid pins to the actuator body.	**OK** **More than 100k ohms**	2A
	NOT OK **Replace the actuator solenoid** Refer to Procedure 019-110.	2A



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STEP 2: Clear the fault codes.

STEP 2A: Disable the fault code.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and road test vehicle for 1 mile. • Using INSITE™, verify that Fault Code 394 is inactive.	**OK** **Fault Code 394 inactive**	2B
	NOT OK **Fault Code 394 active** **Replace the ECM** Refer to Procedure 019-031.	2B

STEP 2B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

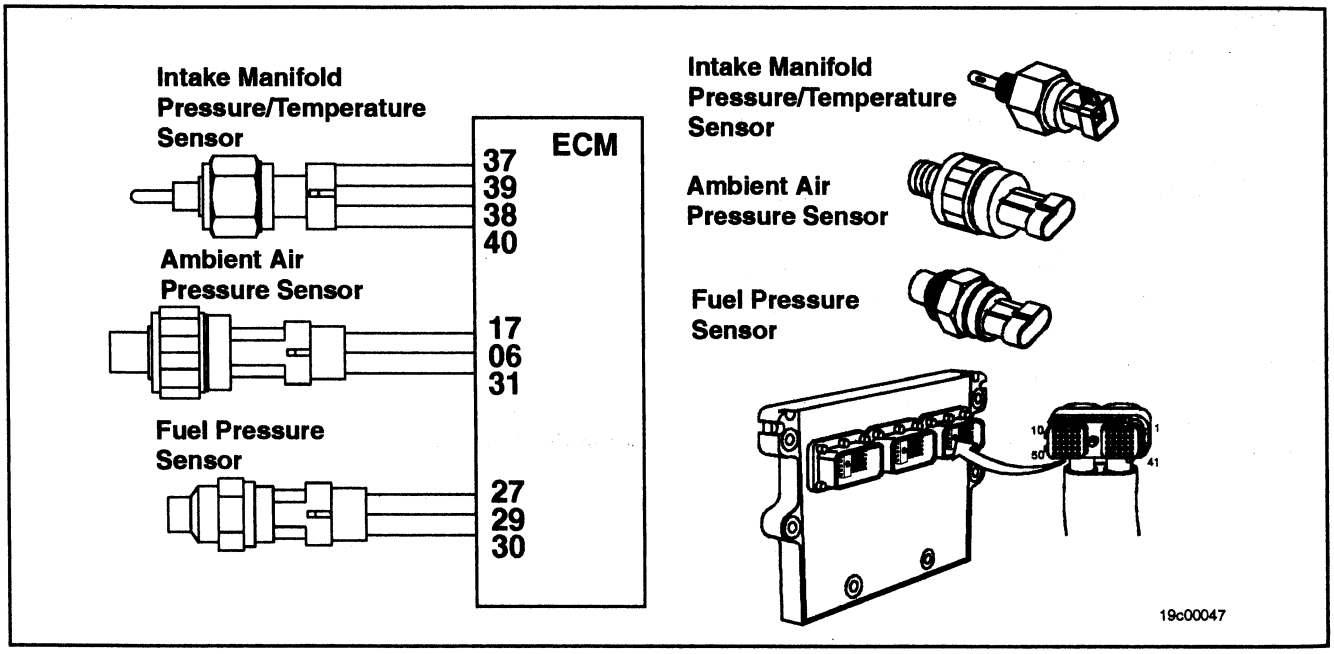
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 386

Sensor Voltage Supply

CODES	REASON	EFFECT
Fault Code: 386 PID(P), SID(S): S232 SPN: 1079 FMI: 3/3 Lamp: Yellow	High voltage detected on the electronic control module (ECM) voltage supply wire to the sensors (VSEN1 supply).	Engine is derated to no-air setting.

Sensor Voltage Supply Circuit



Circuit Description:

The electronic control module (ECM) supplies each of these sensors with positive (+) 5 VDC. If the supply wire to any sensor is damaged, the sensor will **not** work correctly.

Component Location:

There are three components involved in the sensor voltage supply: Intake manifold pressure/temperature sensor, ambient air pressure/temperature sensor, and the fuel pressure sensor. See Section E for component location.

Shop Talk:

High voltage on the sensor (+) 5-VDC supply wire will be caused by a short circuit to battery of the supply wire or a short circuit between an actuator wire and the supply wire.

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the sensor harness.		
STEP 1A: Inspect the harness and the ECM connector pins.	No damaged pins	
STEP 1B: Check the supply voltage.	(+) 4.75 to 5.25 VDC	
STEP 1C: Check for a short circuit to the battery.	More than 100k ohms	
STEP 1D: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 2: Clear the fault codes.		
STEP 2A: Disable the fault code.	Fault Code 386 inactive	
STEP 2B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check the sensor harness.

STEP 1A: Inspect the harness and the ECM connector pins.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the engine harness from each sensor.

Action	Specifications/Repair	Next Step
Inspect the sensor harness and the ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector. • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	1B
	NOT OK **Repair the damaged pins** Repair or replace the harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-203, 019-204, or 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	2A

STEP 1B: Check the supply voltage.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

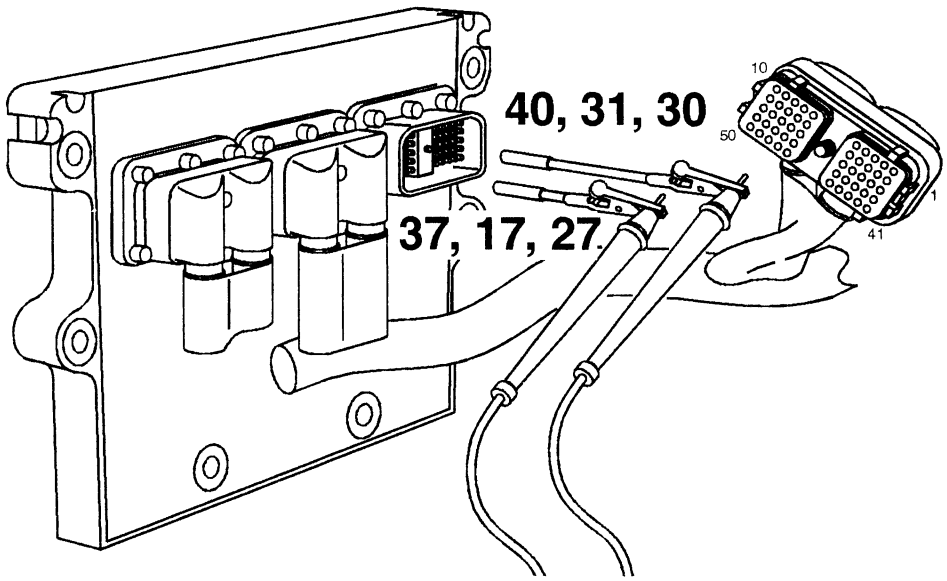
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the sensor harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Measure the voltage out of the ECM for each sensor. • Measure the voltage from pin 37 to pin 40 in the sensor port of the ECM. • Measure the voltage from pin 17 to pin 31 in the sensor port of the ECM. • Measure the voltage from pin 27 to pin 30 in the sensor port of the ECM.	**OK** **(+) 4.75 to 5.25 VDC**	1C
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	2A



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STEP 1C: Check for a short circuit to the battery.

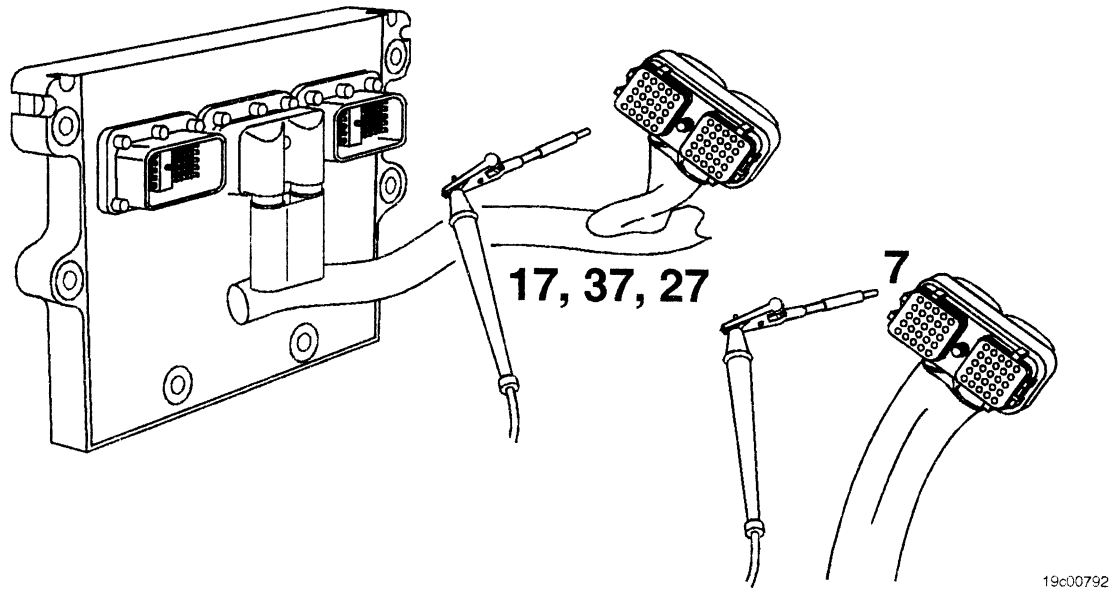
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the OEM harness connector from the ECM.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the engine harness from the intake manifold pressure/temperature sensor.
- Disconnect the engine harness from the ambient air pressure sensor.
- Disconnect the engine harness from the fuel pressure sensor.

Action	Specifications/Repair	Next Step
Check for a short circuit to ground. • Measure the resistance from pin 17 of the sensor harness connector to pin 7 of the OEM harness connector. • Measure the resistance from pin 37 of the sensor harness connector to pin 7 of the OEM harness connector. • Measure the resistance from pin 27 of the sensor harness connector to pin 7 of the OEM harness connector.	**OK** **More than 100k ohms**	1D
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	2A



STEP 1D: Check for a short circuit from pin to pin.

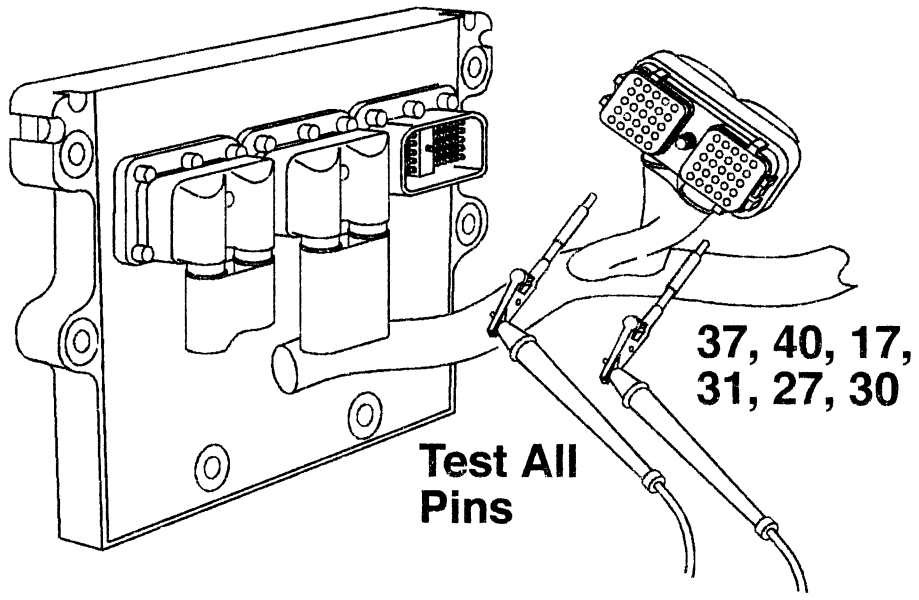
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the engine harness from the intake manifold pressure/temperature sensor.
- Disconnect the engine harness from the ambient air pressure sensor.
- Disconnect the engine harness from the fuel pressure sensor.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin. • Measure the resistance from pin 37 of the sensor harness connector to all other pins in the connector. • Measure the resistance from pin 40 of the sensor harness connector to all other pins in the connector. • Measure the resistance from pin 17 of the sensor harness connector to all other pins in the connector. • Measure the resistance from pin 31 of the sensor harness connector to all other pins in the connector. • Measure the resistance from pin 27 of the sensor harness connector to all other pins in the connector. • Measure the resistance from pin 30 of the sensor harness connector to all other pins in the connector.	**OK** **More than 100k ohms**	2A
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	2A



STEP 2: Clear the fault codes.

STEP 2A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Using INSITE™, verify that Fault Code 386 is inactive.	**OK** **Fault Code 386 inactive**	2B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location if all the steps have been completed and checked again.	1A

STEP 2B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

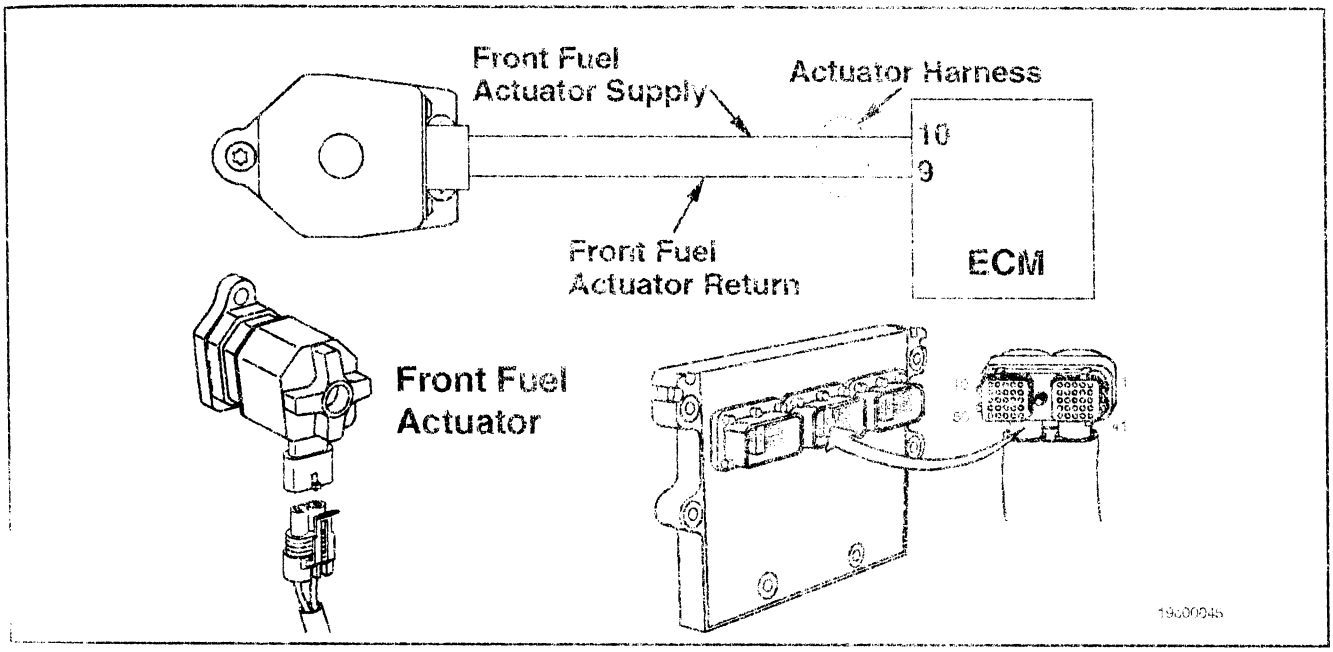
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 379

Actuator Circuit

CODES	REASON	EFFECT
Fault Code: 379 PID(P), SID(S): S018 SPN: 633 FMI: 6/6 Lamp: Yellow	High current detected at front fueling actuator circuit.	Engine will run using **only** the rear three cylinders.

Front Fueling Actuator Circuit



Circuit Description:

The fuel actuators are actuated by the electronic control module (ECM) to control fuel metering. Each fuel actuator is connected to the ECM by a supply and a return wire. An electrical pulse is sent to the fuel actuator from the ECM on the supply wire and returns to the ECM on the return wire. Each solenoid valve is normally closed, and it is **only** opened by an electrical pulse from the ECM during metering.

Component Location:

The front fueling actuator is mounted on the fuel delivery housing. It is the actuator closest to the front of the engine.

Shop Talk:

The possible failure modes are short circuit to battery, low actuator resistance, or short circuit between supply and return wires.

TROUBLESHOOTING SUMMARY

WARNING

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

CAUTION

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

CAUTION

To avoid pin and harness damage, use the following test lead when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the actuator harness.		
STEP 1A: Inspect the harness and the ECM connector pins.	No damaged pins	
STEP 1B: Check the resistance of the whole circuit.	Less than 10 ohms	
STEP 1B-1: Inspect the actuator harness and connector pins.	No damaged pins	
STEP 1B-2: Check the resistance of the actuator solenoid.	0.5 to 1.5 ohms	
STEP 1C: Check for a short circuit to battery in the circuit.	More than 100k ohms	
STEP 1D: Check for a short circuit from pin to pin in the ECM connector.	More than 100k ohms	
STEP 2: Clear the fault codes.		
STEP 2A: Disable the fault code.	Fault Code 379 inactive	
STEP 2B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check the actuator harness.

STEP 1A: Inspect the harness and the ECM connector pins.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the harness and the ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	1B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	2A

STEP 1B: Check the resistance of the whole circuit.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

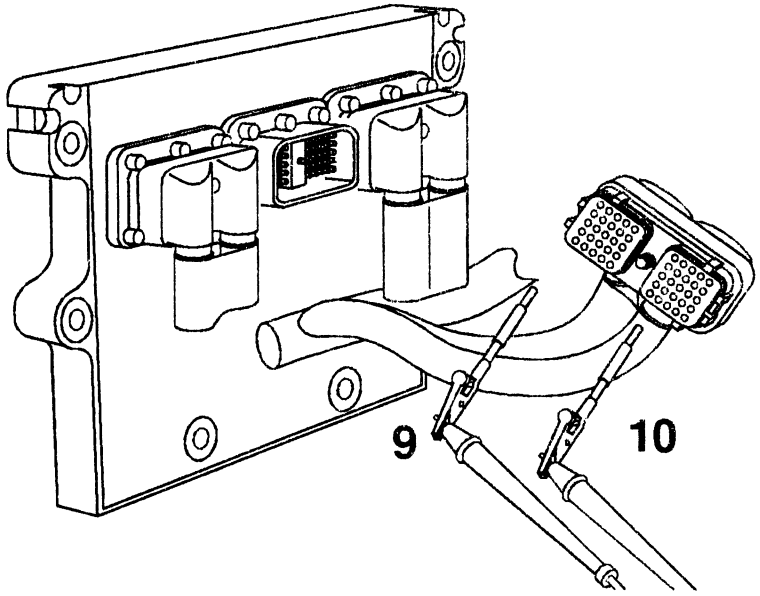
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check the resistance of the whole circuit. • Measure the resistance from pin 9 to pin 10 of the actuator harness connector.	**OK** **Less than 10 ohms**	1B-1
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	2A



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STEP 1B-1: Inspect the actuator harness and connector pins.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness from the actuator solenoid.

Action	Specifications/Repair	Next Step
Inspect the harness and the actuator connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	1B-2
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	2A

STEP 1B-2: Check the resistance of the actuator solenoid.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

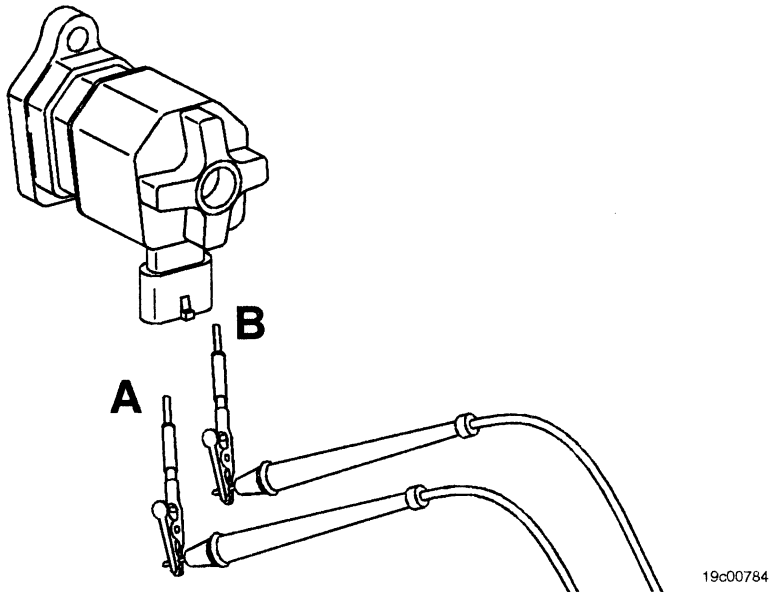
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness from the actuator solenoid.

Action	Specifications/Repair	Next Step
Check the resistance of the actuator solenoid. • Measure the resistance across the two terminals on the actuator solenoid.	**OK** **0.5 to 1.5 ohms**	1C
	NOT OK **Replace the actuator solenoid** Refer to Procedure 019-110.	2A



STEP 1C: Check for a short circuit to battery in the circuit.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

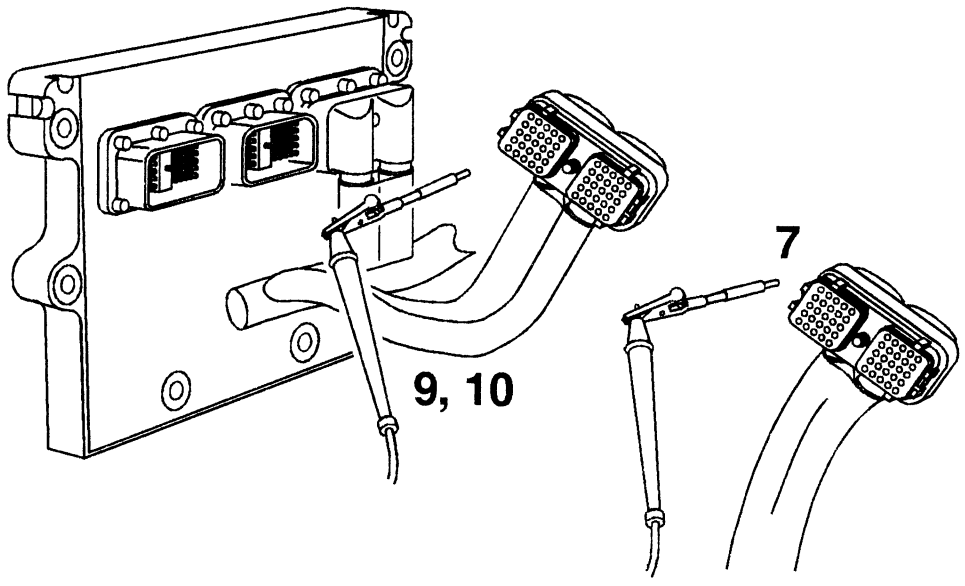
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness from the actuator solenoid.
- Disconnect the OEM harness connector from the ECM.
- Disconnect the actuator harness connector from the ECM.
- Disconnect the positive (+) battery terminal from battery.

Action	Specifications/Repair	Next Step
Check for a short circuit to battery in the actuator solenoid. • Measure the resistance between connector pin 9 of the actuator harness connector to pin 7 of the OEM harness connector. • Measure the resistance between connector pin 10 of the actuator harness connector to pin 7 of the OEM harness connector.	**OK** **More than 100k ohms**	1D
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	2A



STEP 1D: Check for a short circuit from pin to pin in the ECM connector.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

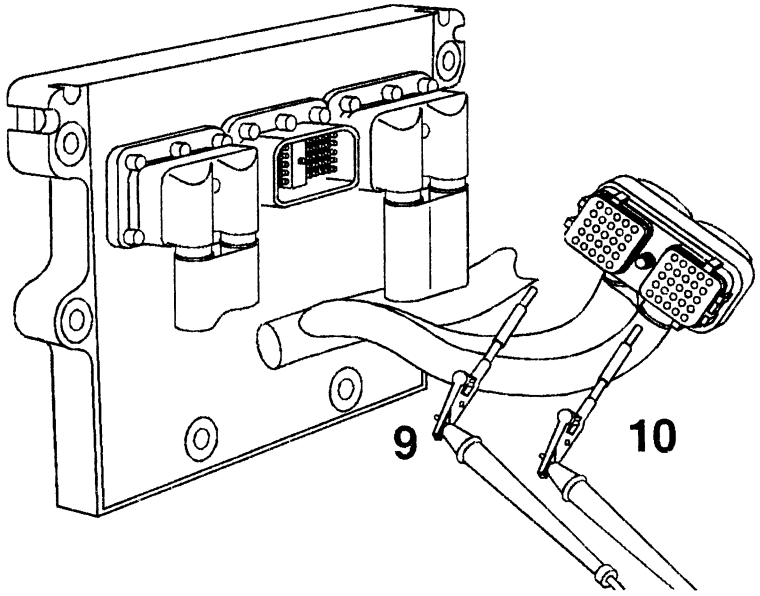
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.
- Disconnect the actuator harness from the actuator solenoid.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin. • Measure the resistance from pin 9 in the actuator harness connector to all other pins in the connector. • Measure the resistance from pin 10 in the actuator harness connector to all other pins in the connector.	**OK** **More than 100k ohms**	2A
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	2A



STEP 2: Clear the fault codes.

STEP 2A: Disable the fault code.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and road test vehicle for at least 1 mile. • Using INSITE™, verify that Fault Code 379 is inactive.	**OK** **Fault Code 379 inactive**	2B
	NOT OK **Fault Code 379 active** **Replace the ECM** Refer to Procedure 019-031.	2B

STEP 2B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

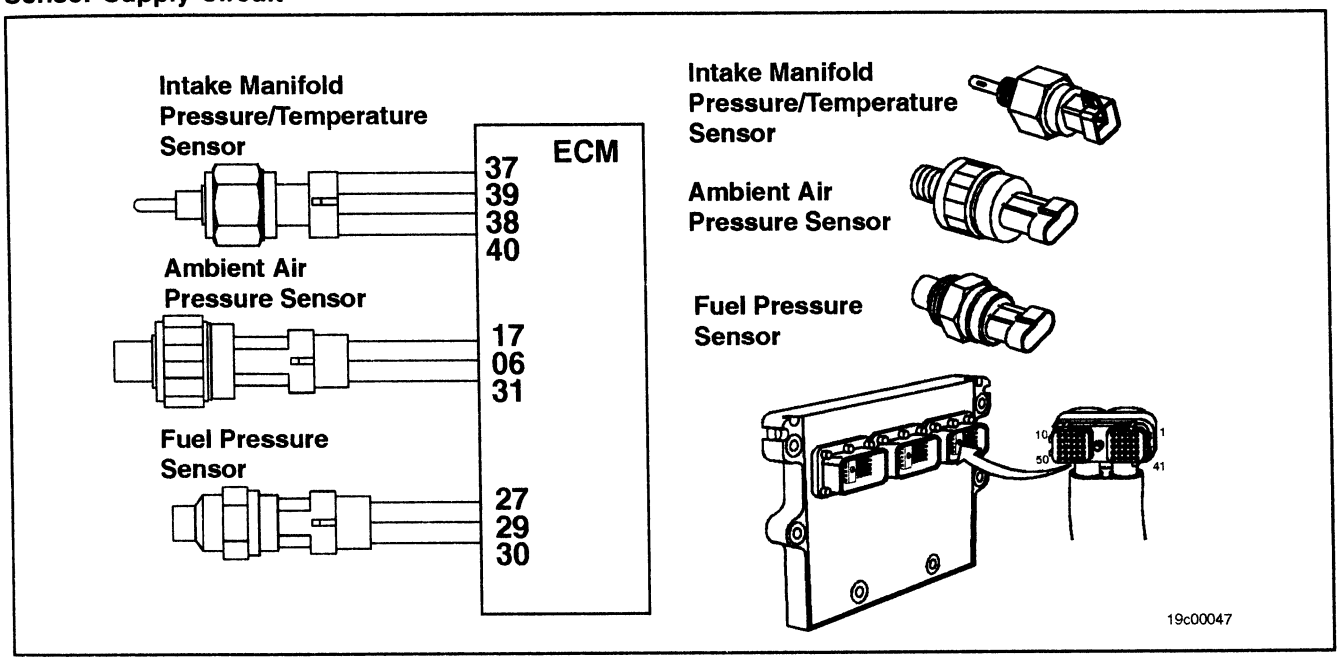
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 352

Sensor Voltage Supply

CODES	REASON	EFFECT
Fault Code: 352 PID(P), SID(S): S232 SPN: 620 FMI: 4/4 Lamp: Yellow	Low voltage detected on the electronic control module (ECM) voltage supply line to some of the sensors.	Engine is derated to no-air setting.

Sensor Supply Circuit



Circuit Description:

The electronic control module (ECM) supplies each of these sensors with (+) 5 VDC. If the supply line to any sensor is damaged, the sensor will **not** work correctly.

Component Location:

- Intake manifold pressure/temperature sensor is located on the intake manifold housing.
- Ambient air pressure sensor is located below the ECM.
- Fuel pressure sensor is located on the fuel manifold housing.

Shop Talk:

Low voltage on the sensor (+) 5-VDC supply line will be caused by a short circuit to ground in a supply line, a short circuit between a supply line or a return line, a failed sensor, or a failed ECM power supply.

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging the new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check for failed sensors.		
STEP 1A: Check the intake manifold pressure/ temperature sensor.	Less than (+) 4.5 VDC	
STEP 1B: Check the ambient air pressure sensor.	Less than (+) 4.5 VDC	
STEP 1C: Check the fuel pressure sensor.	Less than (+) 4.5 VDC	
STEP 2: Check the sensor harness.		
STEP 2A: Inspect the harness and the ECM connector pins.	No damaged pins	
STEP 2B: Check the supply voltage.	(+) 4.75 to 5.25 VDC	
STEP 2C: Check for a short circuit to ground in the sensor supply lines.	More than 100k ohms	
STEP 2D: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 3: Clear the fault codes.		
STEP 3A: Disable the fault code.	Fault Codes 352 inactive	
STEP 3B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check for failed sensors.

STEP 1A: Check the intake manifold pressure/temperature sensor.

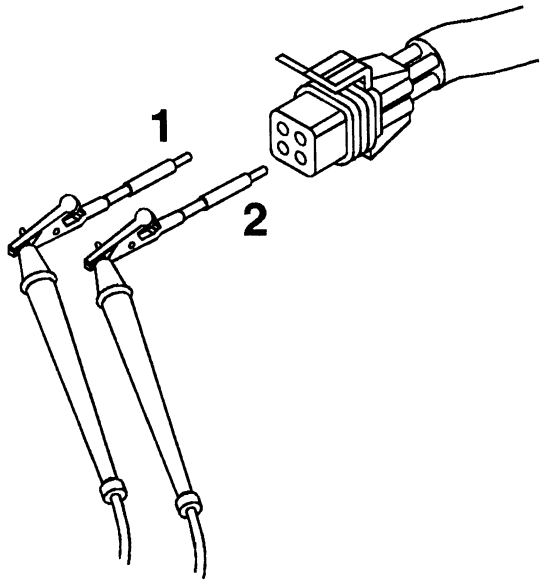
⚠CAUTION⚠

**To avoid pin and harness damage, use the following test lead when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.**

Condition:

- Disconnect the engine harness from the intake manifold pressure/temperature sensor.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the intake manifold pressure/temperature sensor. • Measure the voltage from pin A (or 1) to pin B (or 2) on the intake manifold pressure/ temperature sensor connector.	**OK** **Less than (+) 4.5 VDC**	1B
	NOT OK **Replace the intake manifold pressure/ temperature sensor** Refer to Procedure 019-159.	3A



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STEP 1B: Check the ambient air pressure sensor.

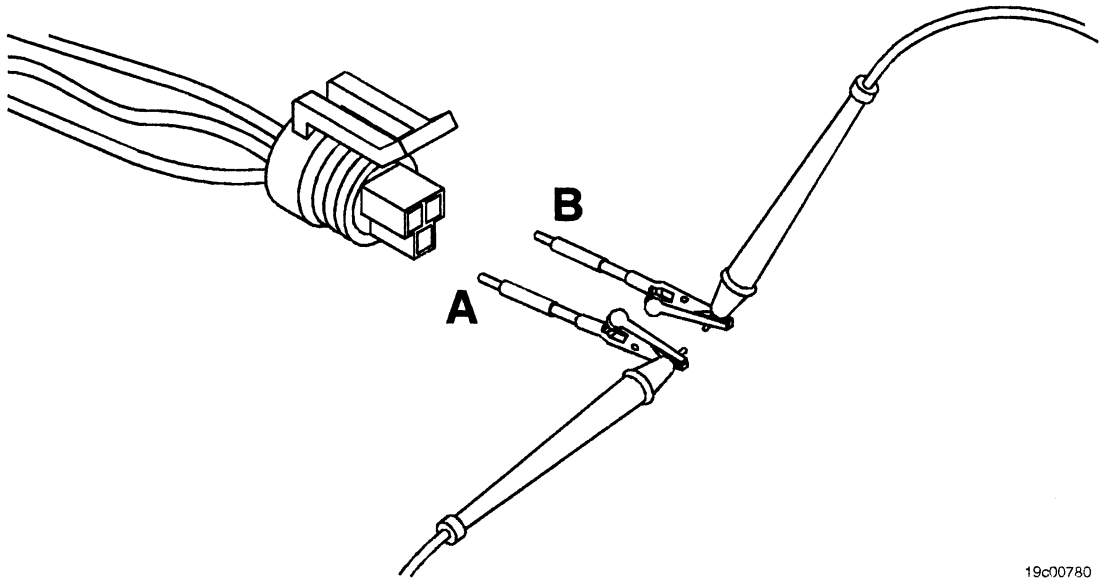
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the engine harness from the ambient air pressure sensor.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the ambient air pressure sensor. • Measure the voltage from pin A (or 1) to pin B (or 2) on the ambient air pressure sensor connector.	**OK** **Less than (+) 4.5 VDC**	1C
	NOT OK **Replace the ambient air pressure sensor** Refer to Procedure 019-004.	3A



STEP 1C: Check the fuel pressure sensor.

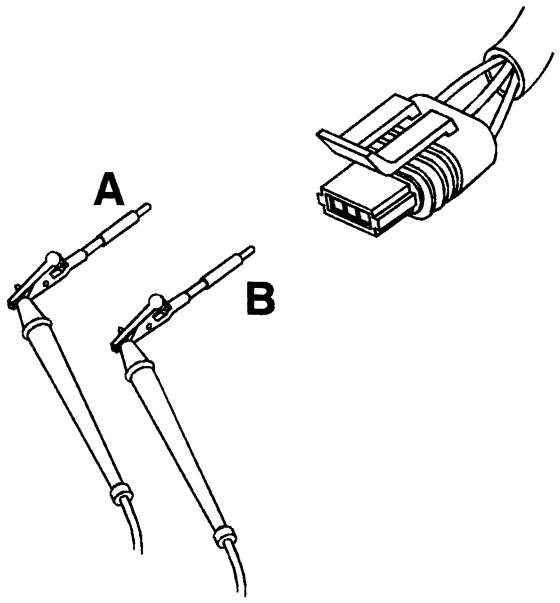
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the engine harness from the fuel pressure sensor.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the fuel pressure sensor. • Measure the voltage from pin A (or 1) to pin B (or 2) on the fuel pressure sensor connector.	**OK** **Less than (+) 4.5 VDC**	2A
	NOT OK **Replace the fuel pressure sensor** Refer to Procedure 019-188.	3A



19200191

STEP 2: Check the sensor harness.

STEP 2A: Inspect harness and the ECM connector pins.

⚠CAUTION⚠

To avoid damaging the new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the harness and the ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	2B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	3A

STEP 2B: Check the supply voltage.

⚠CAUTION⚠

To avoid damaging the new ECM, all other active fault codes must be investigated prior to replacing the ECM.

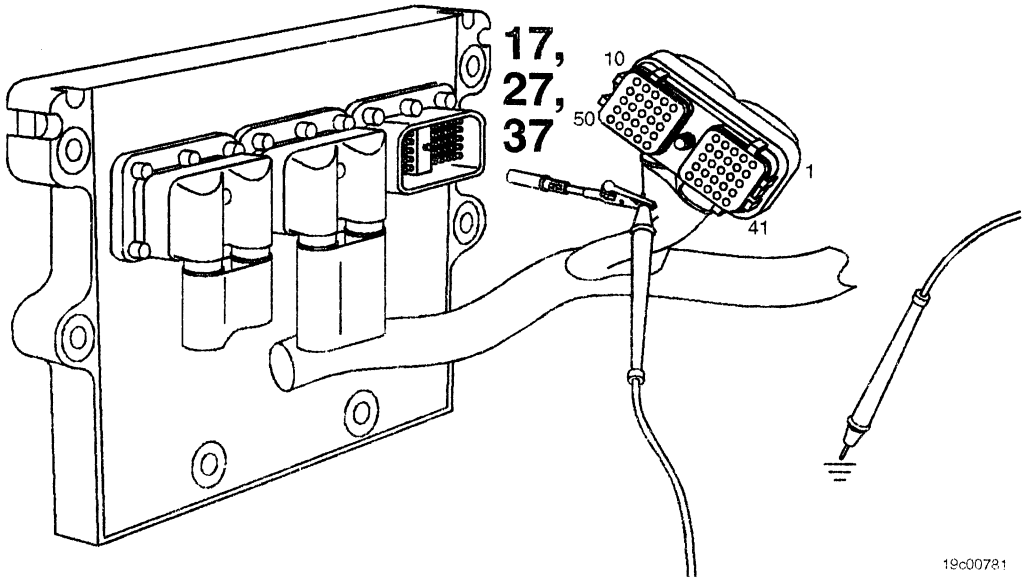
⚠CAUTION⚠

To avoid pin and harness damage use the following test lead when taking a measurement: Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the sensor harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the supply voltage. • Measure the supply voltage from the ECM sensor harness port pins 17, 27, and 37 to ground.	**OK** **(+) 4.75 to 5.25 VDC**	2C
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	3A



STEP 2C: Check for a short circuit to ground in the sensor supply lines.

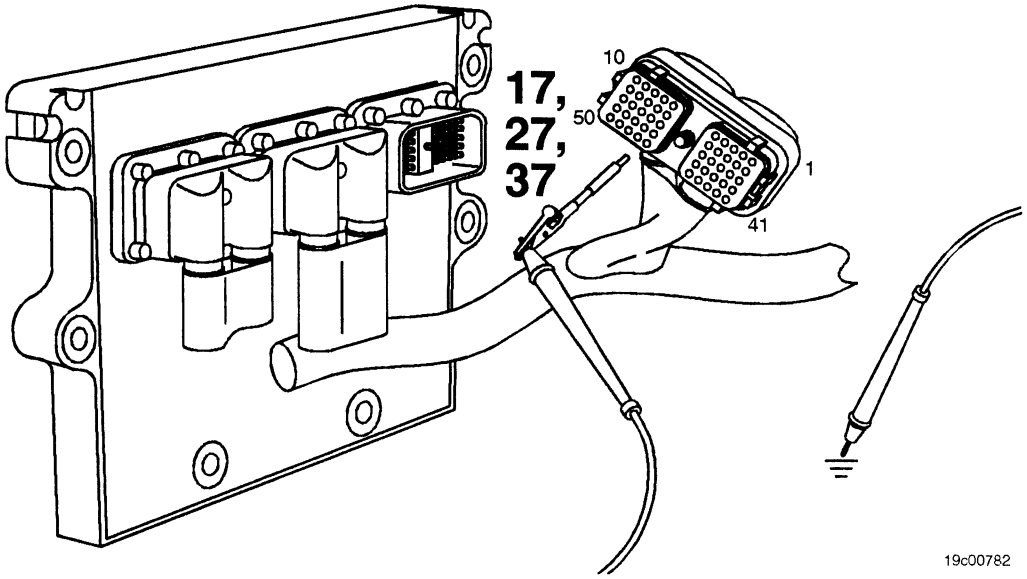
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for a short circuit to ground in the sensor supply lines. • Measure the resistance from pins 17, 27, and 37 in the sensor harness to engine block ground.	**OK** **More than 100k ohms**	2D
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



STEP 2D: Check for a short circuit from pin to pin.

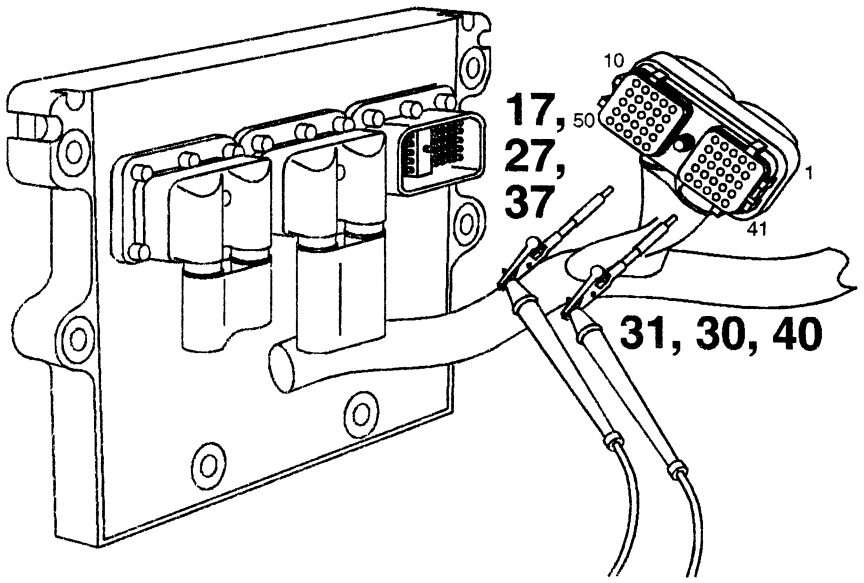
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the fuel pressure sensor from the engine harness.
- Disconnect the ambient air pressure sensor from the engine harness.
- Disconnect the intake manifold pressure/temperature sensor from the engine harness.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin. • Measure the resistance from pin 17 to pin 31 in the sensor harness. • Measure the resistance from pin 27 to pin 30 in the sensor harness. • Measure the resistance from pin 37 to pin 40 in the sensor harness.	**OK** **More than 100k ohms**	3A
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



STEP 3: Clear the fault codes.

STEP 3A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify Fault Code 352 is inactive.	**OK** **Fault Code 352 inactive**	3B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location if all the steps have been completed and checked again.	1A

STEP 3B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

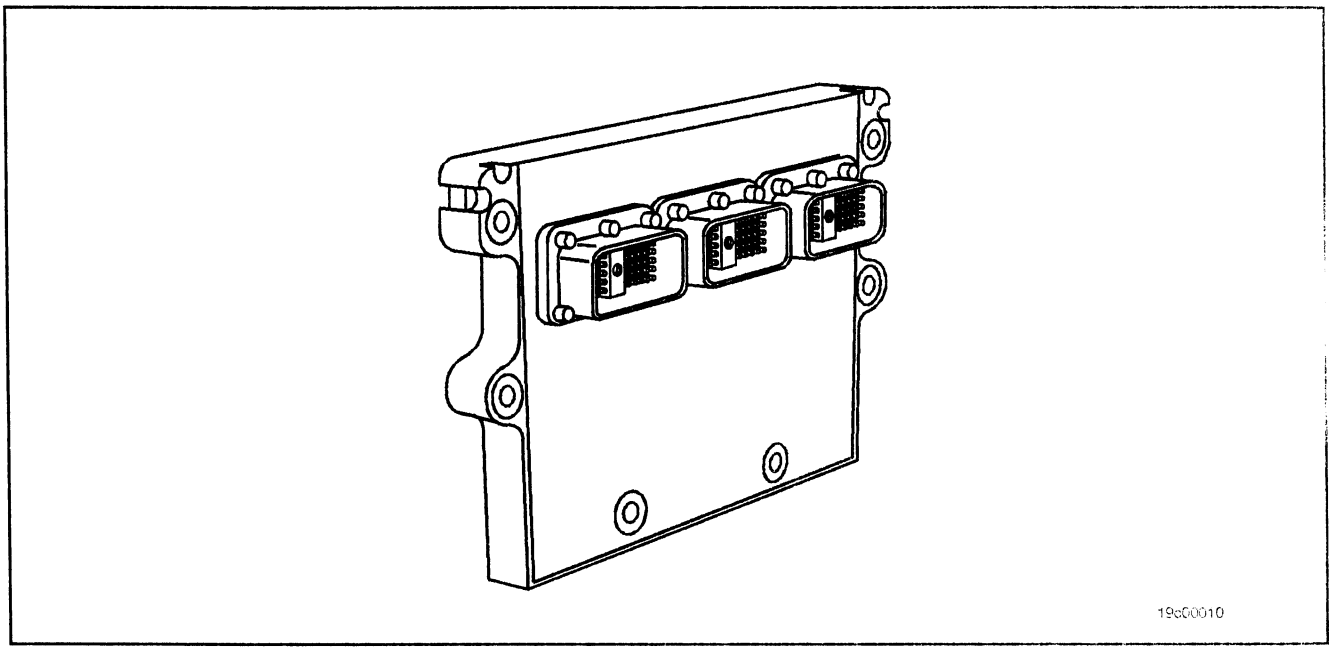
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 343

Electronic Control Module (ECM)

CODES	REASON	EFFECT
Fault Code: 343 PID(P), SID(S): S254 SPN: 629 FMI: 12/12 Lamp: Yellow	Internal ECM error.	Possibly none on performance or severe derate.

Electronic Control Module



Circuit Description:

The ECM monitors both signal voltage output to the injectors and ECM input from the engine sensors.

Component Location:

The ECM is bolted to the intake side of the cylinder head between the air inlet horn and the front of the engine.

Shop Talk:

- Loose engine or chassis ground connections can cause Fault Code 343 to be logged, as well as complaints of an intermittent stumble. Pay special attention to the negative starter post connection.
- Moisture in the ECM connectors can also cause the ECM to log Fault Code 343.

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check for multiple fault codes.		
STEP 1A: Read the fault codes.	Fault Codes 115 and 121 are not active	
STEP 2: Check the power and ground connections.		
STEP 2A: Check all engine and chassis power and ground connections.	Clean and tight	
STEP 2B: Check all power resistances.	Less than 10 ohms	
STEP 2C: Check all ground resistances.	Less than 10 ohms	
STEP 3: Check for moisture in the ECM connectors.		
STEP 3A: Check for moisture in the ECM connectors.	All connectors dry	
STEP 4: Clear the fault codes.		
STEP 4A: Disable the fault code.	Fault Code 343 inactive	
STEP 4B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check for multiple fault codes.

STEP 1A: Read the fault codes.

Condition:
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Read the fault codes using INSITE™.	**OK** **Fault Codes 115 and 121 are not active**	2A
	NOT OK Go to Fault Codes 115 and 121.	Fault Code 115 and 121

STEP 2: Check the power and ground connections.

STEP 2A: Check all engine and chassis power and ground connections.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Check all engine and vehicle power and ground connections for the following: • Corrosion • Loose connections.	**OK** **Clean and tight**	2B
	NOT OK **Repair damaged connections** Repair or replace the damaged connections.	4A

STEP 2B: Check all power resistances.

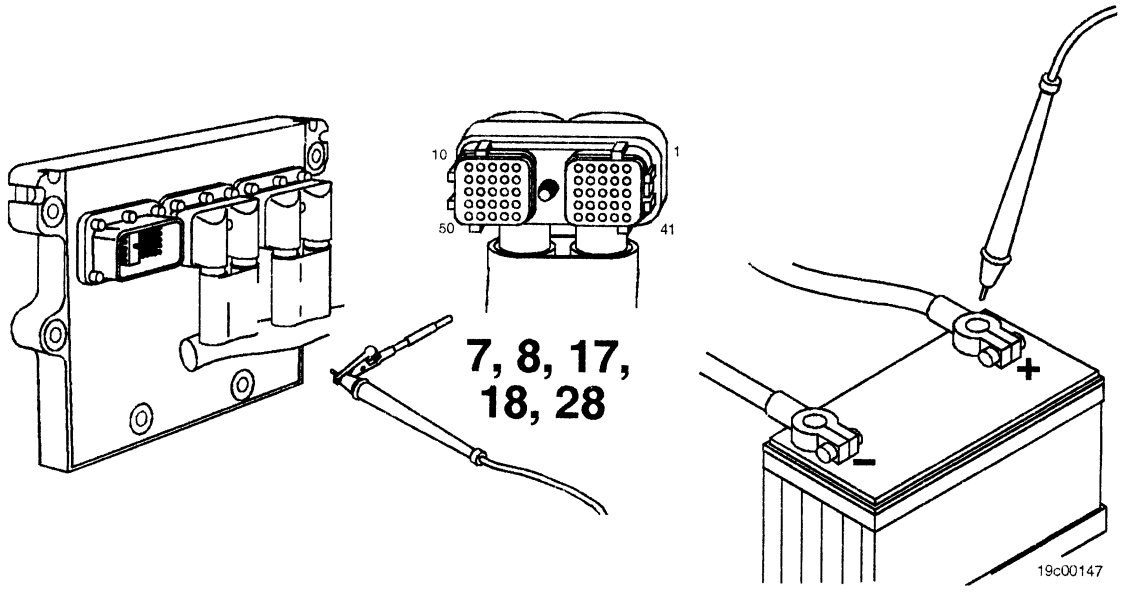
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the OEM harness connector from the ECM.
- Disconnect the negative (-) battery cable from the battery.
- Disconnect the positive (+) battery cable from the battery.

Action	Specifications/Repair	Next Step
Check all power resistances. • Measure the resistance from pin 7 of OEM harness connector to the positive (+) battery terminal connector. • Measure the resistance from pin 8 of OEM harness connector to the positive (+) battery terminal connector. • Measure the resistance from pin 17 of OEM harness connector to the positive (+) battery terminal connector. • Measure the resistance from pin 18 of OEM harness connector to the positive (+) battery terminal connector. • Measure the resistance from pin 28 of OEM harness connector to the positive (+) battery terminal connector.	**OK** **Less than 10 ohms**	2C
	NOT OK **Repair or replace the OEM harness** • Repair the OEM harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-071.	4A



STEP 2C: Check all ground resistances.

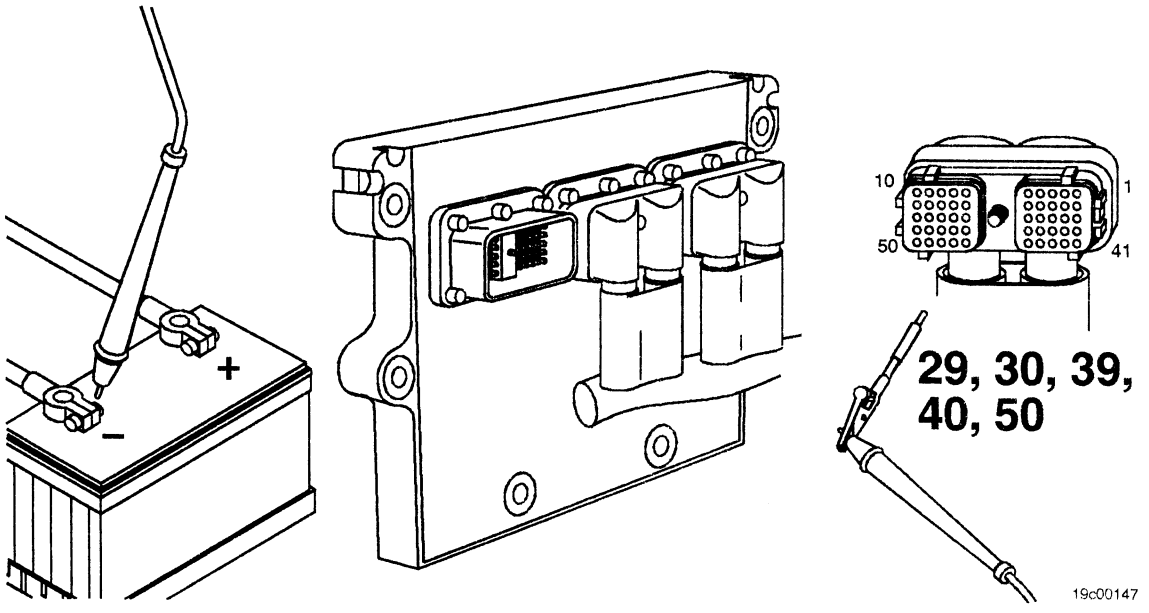
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the OEM harness connector from the ECM.
- Disconnect the negative (–) battery cable from the battery.
- Disconnect the positive (+) battery cable from the battery.

Action	Specifications/Repair	Next Step
Check all ground resistances. • Measure the resistance from pin 29 of OEM harness connector to the negative (–) battery terminal connector. • Measure the resistance from pin 30 of OEM harness connector to the negative (–) battery terminal connector. • Measure the resistance from pin 39 of OEM harness connector to the negative (–) battery terminal connector. • Measure the resistance from pin 40 of OEM harness connector to the negative (–) battery terminal connector. • Measure the resistance from pin 50 of OEM harness connector to the negative (–) battery terminal connector.	**OK** **Less than 10 ohms**	3A
	NOT OK **Repair or replace the OEM harness** • Repair the OEM harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-071.	4A



STEP 3: Check for moisture in the ECM connectors.

STEP 3A: Check for moisture in the ECM connectors.

Condition:
- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for moisture in the ECM connectors. • Check for moisture in the ECM connectors.	**OK** **All connectors dry**	4A
	NOT OK **Dry the connectors** Dry the connectors with electrical contact cleaner, Part No. 3824510.	4A

STEP 4: Clear the fault codes.

STEP 4A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let idle for 1 minute. • Using INSITE™, verify Fault Code 343 is inactive.	**OK** **Fault Code 343 inactive**	4B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location if all the steps have been completed and checked again.	1A

STEP 4B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

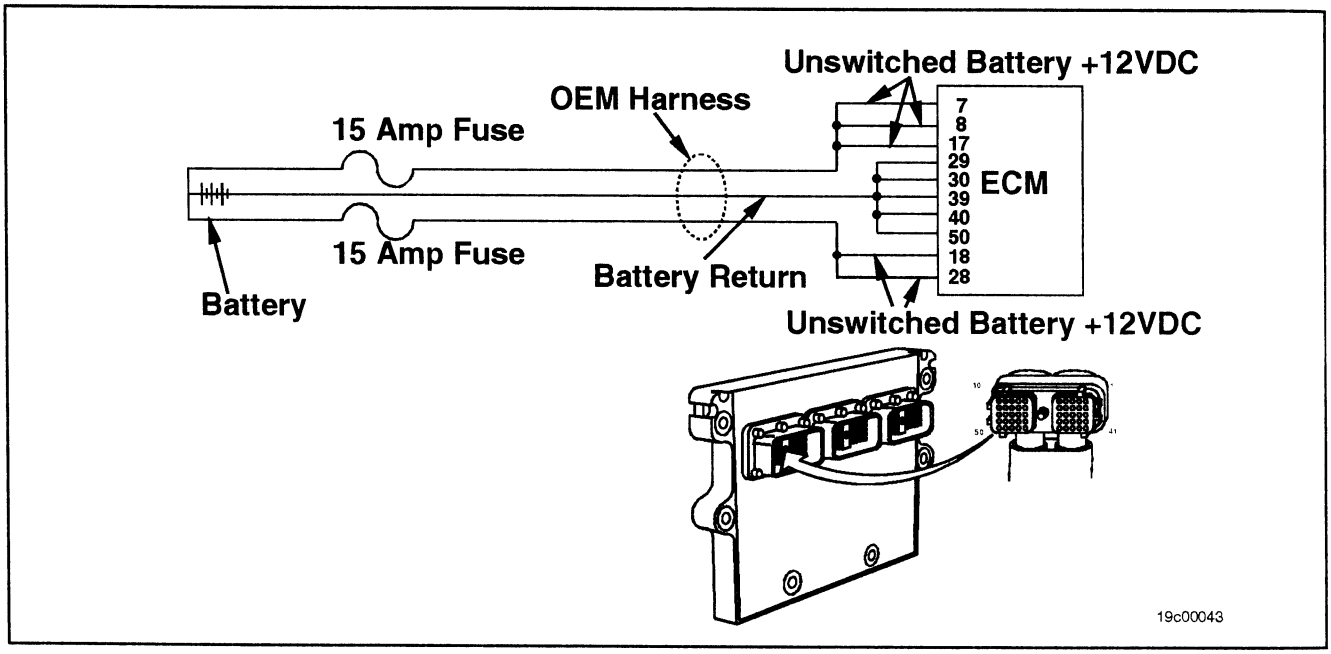
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 341

Unswitched Battery Supply Circuit

CODES	REASON	EFFECT
Fault Code: 341 PID(P), SID(S): S253 SPN: 630 FMI: 2/2 Lamp: Yellow	Severe loss of data from the ECM.	Possibly no noticeable performance effects, **or** engine dying, **or** difficulty in starting the engine. Fault information, trip information, and maintenance monitor data can be inaccurate.

Unswitched Battery Supply



Circuit Description:

The ECM receives constant voltage from the batteries through the unswitched battery wires that are connected directly to the positive (+) battery post. There are two in-line 15-amp fuses in the unswitched battery wires to protect the engine harness from overheating. The ECM receives switched battery input through the vehicle keyswitch wire when the vehicle keyswitch is turned on. The battery return wires are connected directly to the negative (–) battery post.

Component Location:

The ECM is connected to the battery by the OEM harness. This direct link provides a constant power supply for the ECM. The location of the battery will vary with the OEM. Refer to the OEM troubleshooting and repair manual.

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Read the fault codes.		
STEP 1A: Read the fault codes.	No other active fault codes	
STEP 2: Check the batteries and the power connector.		
STEP 2A: Check the resistance of the battery supply circuit.	Less than 10 ohms	
STEP 2B: Check the battery voltage.	Normal conditions: At least (+) 12 VDC During cranking: At least (+) 6.2 VDC	
STEP 2C: Check the battery connections.	Connections are tight and corrosion-free	
STEP 3: Check the two 15-amp fuses.		
STEP 3A: Verify that the two 15-amp fuses are installed correctly.	Fuses installed correctly	
STEP 3B: Verify that the two 15-amp fuses are not blown.	Fuses not blown	
STEP 4: Check the OEM harness		
STEP 4A: Check the add-on or the accessory wiring at (+) terminal of the battery.	No damaged wires	
STEP 5: Recalibrate the ECM.		
STEP 5A: Recalibrate the ECM.	Fault Code 341 inactive	
STEP 6: Clear the fault codes.		
STEP 6A: Disable the fault code.	Fault Code 341 inactive	
STEP 6B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Read the fault codes.

STEP 1A: Read the fault codes.

Condition:
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Read the fault codes using INSITE™.	**OK** **No other active fault codes**	2A
	NOT OK Troubleshoot the active fault codes.	5A

STEP 2: Check the batteries and the power connector.

STEP 2A: Check the resistance of the battery supply circuit.

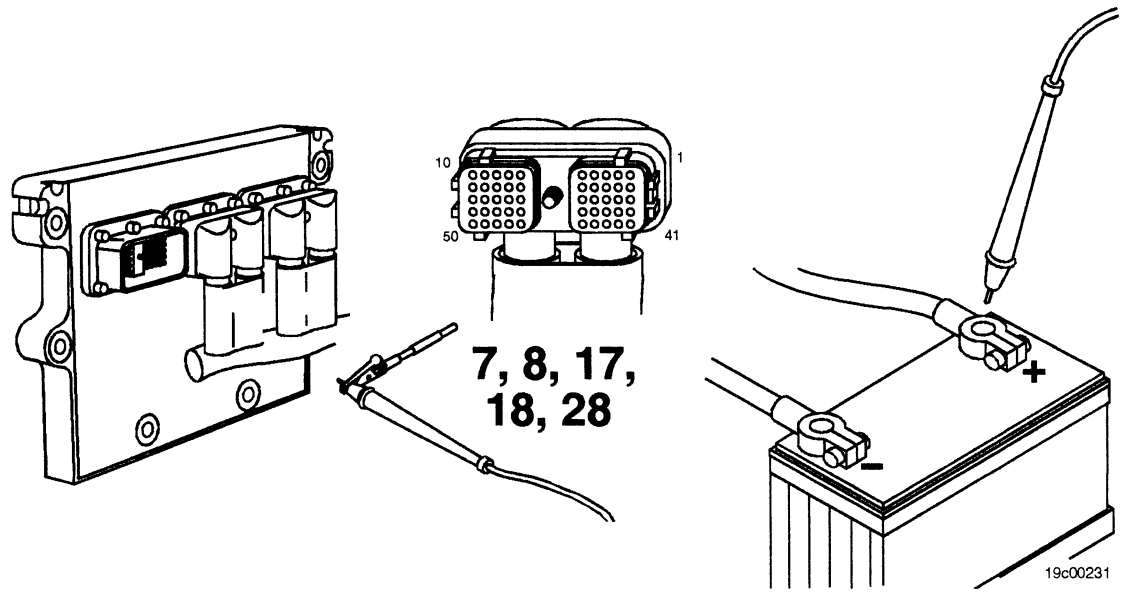
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the OEM harness connector from the ECM.

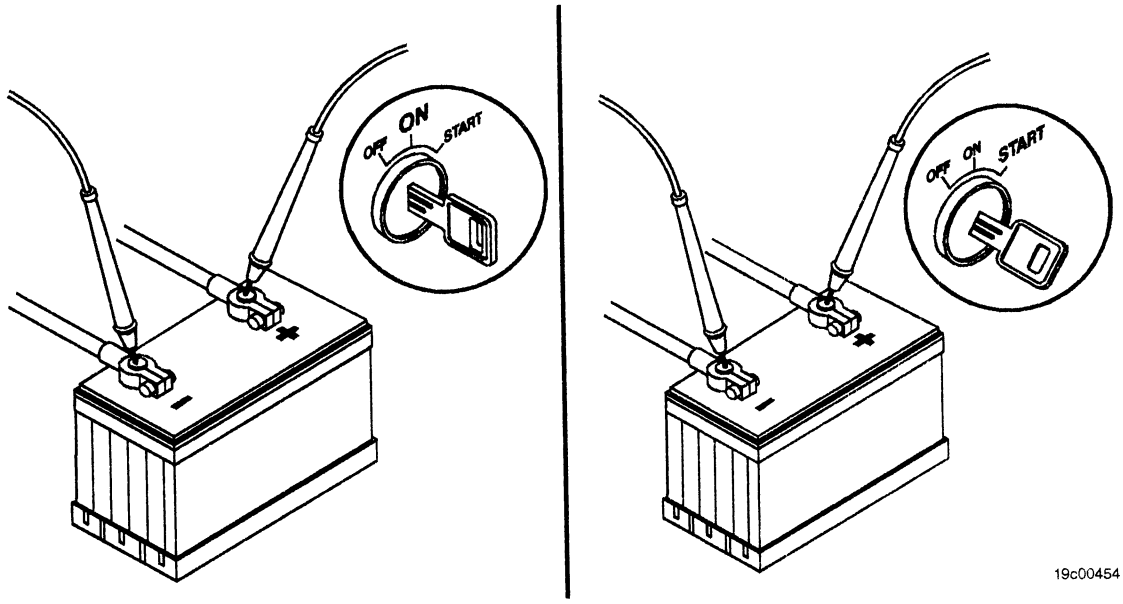
Action	Specifications/Repair	Next Step
Check the resistance of the battery supply circuit. • Measure the resistance from pin 7 of the OEM harness connector to the positive (+) battery terminal. • Measure the resistance from pin 8 of the OEM harness connector to the positive (+) battery terminal. • Measure the resistance from pin 17 of the OEM harness connector to the positive (+) battery terminal. • Measure the resistance from pin 18 of the OEM harness connector to the positive (+) battery terminal. • Measure the resistance from pin 28 of the OEM harness connector to the positive (+) battery terminal.	**OK** **Less than 10 ohms**	2B
	NOT OK **Repair or replace the OEM harness** • Repair the OEM harness. Refer to Procedure 019-250. • Replace the OEM harness. Refer to Procedure 019-071.	5A



STEP 2B: Check the battery voltage.

Condition:
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the battery voltage. • Place positive (+) probe of the multimeter on the positive battery terminal and touch negative (–) probe to the negative battery terminal while trying to start engine.	**OK** **Normal conditions: at least (+) 12 VDC** **During cranking: at least (+) 6.2 VDC**	2C
	NOT OK **Charge or replace the battery** Refer to the OEM troubleshooting and repair manual.	5A



STEP 2C: Check the battery connections.

Condition:
- Turn keyswitch OFF.

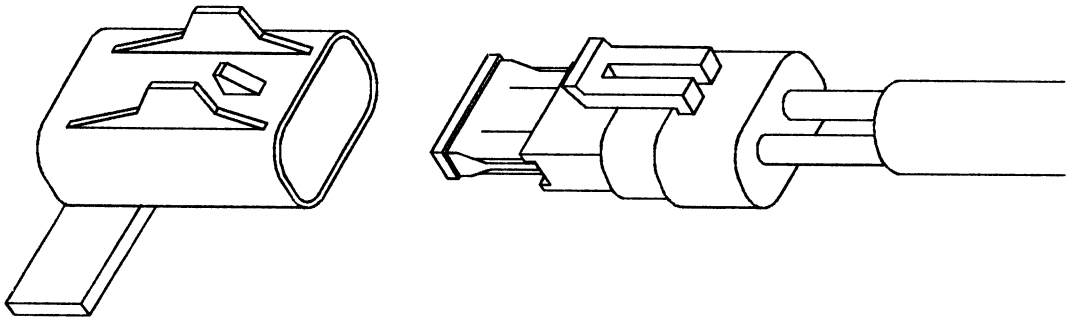
Action	Specifications/Repair	Next Step
Check the battery connections. • Inspect the battery terminal connections.	**OK** **Connections are tight and corrosion-free**	3A
	NOT OK **Tighten the connections** Tighten the loose connections and clean the terminals. Refer to the OEM troubleshooting and repair manual.	5A

STEP 3: Check the two 15-amp fuses.

STEP 3A: Verify that the two 15-amp fuses are installed correctly.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Verify that the two 15-amp fuses are installed correctly. • Inspect the two 15 AMP fuses for correct installation.	**OK** **Fuses installed correctly**	3B
	NOT OK **Install the fuses correctly** Refer to Procedure 019-198.	5A

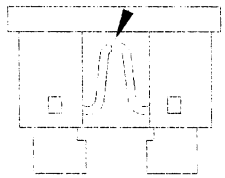


19c00455

STEP 3B: Verify that the two 15-amp fuses are not blown.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Verify that the two 15-amp fuses are not blown. • Inspect the two 15 AMP fuses to see if they are blown.	**OK** **Fuses not blown**	4A
	NOT OK **Locate the short circuit** • Replace the engine harness. Refer to Procedure 019-043. • Replace the blown fuse(s). Refer to Procedure 019-198.	5A



19800238

STEP 4: Check the OEM harness.

STEP 4A: Check the add-on or the accessory wiring at (+) terminal of the battery.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Check the add-on or the accessory wiring at (+) terminal of the battery. • Starting at the (+) terminal, follow any add-on or accessory wiring and examine wire(s) for damaged insulation or an installation error that can cause the supply wire to be shorted to the engine block.	**OK** **No damaged wires**	5A
	NOT OK **Repair or replace the damaged wiring**	5A

STEP 5: Recalibrate the ECM.

STEP 5A: Recalibrate the ECM.

Condition: Connect all components.

Action	Specifications/Repair	Next Step
Recalibrate the ECM • Use ESDN™ to recalibrate the ECM.	**OK** **Fault Code 341 inactive**	6A
	NOT OK Fault code active.	6A

STEP 6: Clear the fault codes.

STEP 6A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify Fault Code 341 is inactive.	**OK** **Fault Code 341 inactive**	6B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location if all the steps have been completed and checked again.	1A

STEP 6B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging the new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check for failed sensors.		
STEP 1A: Check the intake manifold pressure/ temperature sensor.	Less than (+) 4.5 VDC	
STEP 1B: Check the ambient air pressure sensor.	Less than (+) 4.5 VDC	
STEP 1C: Check the fuel pressure sensor.	Less than (+) 4.5 VDC	
STEP 2: Check the sensor harness.		
STEP 2A: Inspect the harness and the ECM connector pins.	No damaged pins	
STEP 2B: Check the supply voltage.	(+) 4.75 to 5.25 VDC	
STEP 2C: Check for a short circuit to ground in the sensor supply lines.	More than 100k ohms	
STEP 2D: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 3: Clear the fault codes.		
STEP 3A: Disable the fault code.	Fault Codes 352 inactive	
STEP 3B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check for failed sensors.

STEP 1A: Check the intake manifold pressure/temperature sensor.

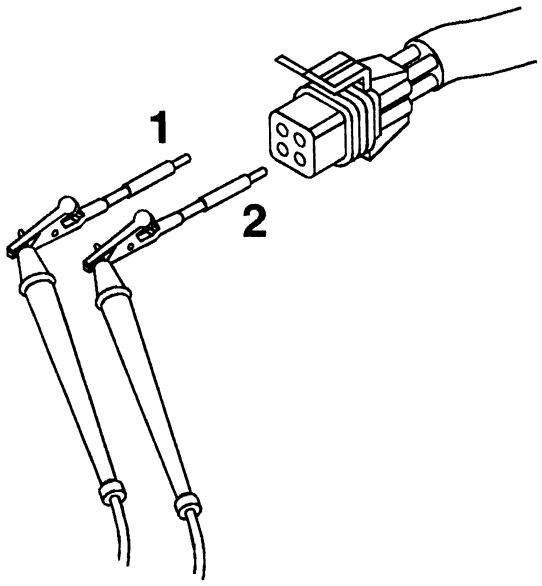
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the engine harness from the intake manifold pressure/temperature sensor.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the intake manifold pressure/temperature sensor. • Measure the voltage from pin A (or 1) to pin B (or 2) on the intake manifold pressure/ temperature sensor connector.	**OK** **Less than (+) 4.5 VDC**	1B
	NOT OK **Replace the intake manifold pressure/ temperature sensor** Refer to Procedure 019-159.	3A



19c00081

STEP 1B: Check the ambient air pressure sensor.

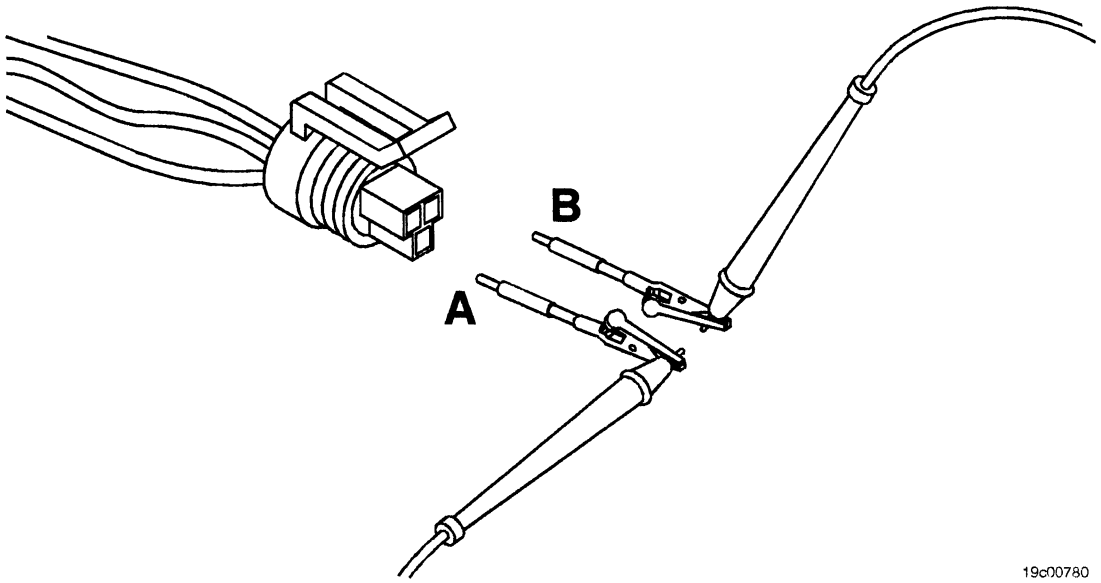
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the engine harness from the ambient air pressure sensor.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the ambient air pressure sensor. • Measure the voltage from pin A (or 1) to pin B (or 2) on the ambient air pressure sensor connector.	**OK** **Less than (+) 4.5 VDC**	1C
	NOT OK **Replace the ambient air pressure sensor** Refer to Procedure 019-004.	3A



STEP 1C: Check the fuel pressure sensor.

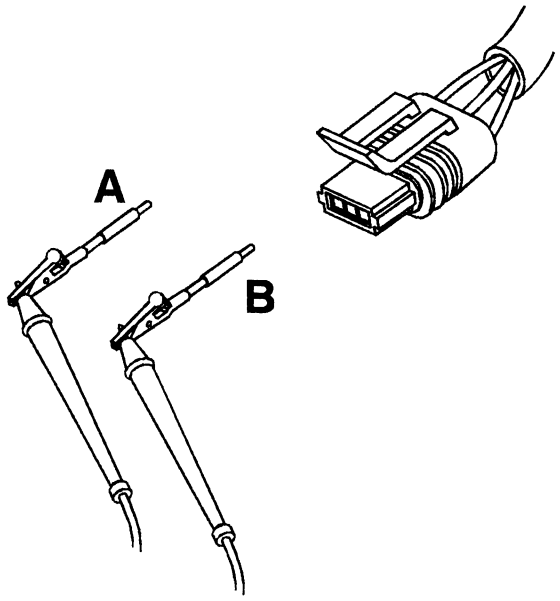
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the engine harness from the fuel pressure sensor.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the fuel pressure sensor. • Measure the voltage from pin A (or 1) to pin B (or 2) on the fuel pressure sensor connector.	**OK** **Less than (+) 4.5 VDC**	2A
	NOT OK **Replace the fuel pressure sensor** Refer to Procedure 019-188.	3A



19200191

STEP 2: Check the sensor harness.

STEP 2A: Inspect harness and the ECM connector pins.

⚠CAUTION⚠

To avoid damaging the new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the harness and the ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	2B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	3A

STEP 2B: Check the supply voltage.

⚠CAUTION⚠

To avoid damaging the new ECM, all other active fault codes must be investigated prior to replacing the ECM.

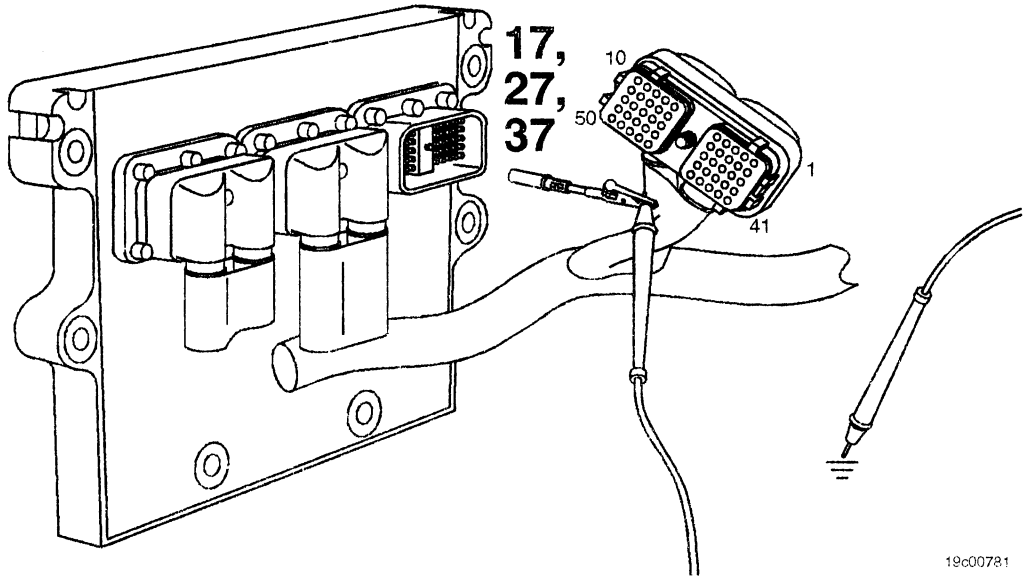
⚠CAUTION⚠

To avoid pin and harness damage use the following test lead when taking a measurement: Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the sensor harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the supply voltage. • Measure the supply voltage from the ECM sensor harness port pins 17, 27, and 37 to ground.	**OK** **(+) 4.75 to 5.25 VDC**	2C
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	3A



STEP 2C: Check for a short circuit to ground in the sensor supply lines.

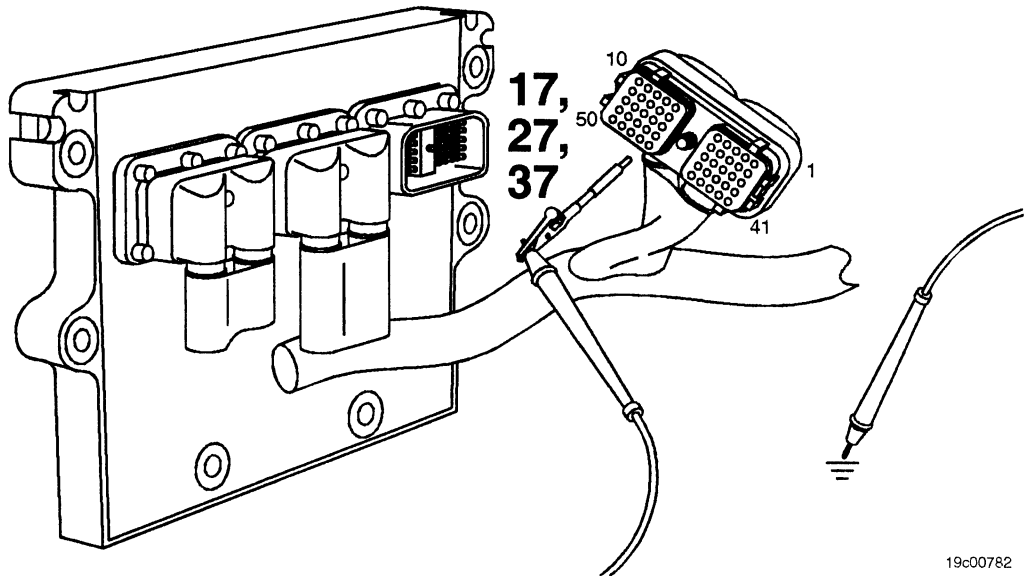
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for a short circuit to ground in the sensor supply lines. • Measure the resistance from pins 17, 27, and 37 in the sensor harness to engine block ground.	**OK** **More than 100k ohms**	2D
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



STEP 2D: Check for a short circuit from pin to pin.

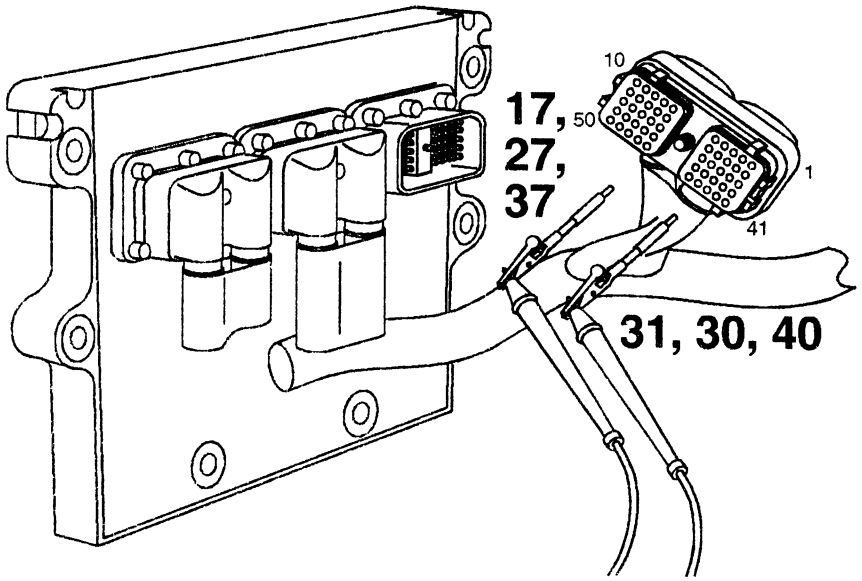
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the fuel pressure sensor from the engine harness.
- Disconnect the ambient air pressure sensor from the engine harness.
- Disconnect the intake manifold pressure/temperature sensor from the engine harness.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin. • Measure the resistance from pin 17 to pin 31 in the sensor harness. • Measure the resistance from pin 27 to pin 30 in the sensor harness. • Measure the resistance from pin 37 to pin 40 in the sensor harness.	**OK** **More than 100k ohms**	3A
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



STEP 3: Clear the fault codes.

STEP 3A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify Fault Code 352 is inactive.	**OK** **Fault Code 352 inactive**	3B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location if all the steps have been completed and checked again.	1A

STEP 3B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

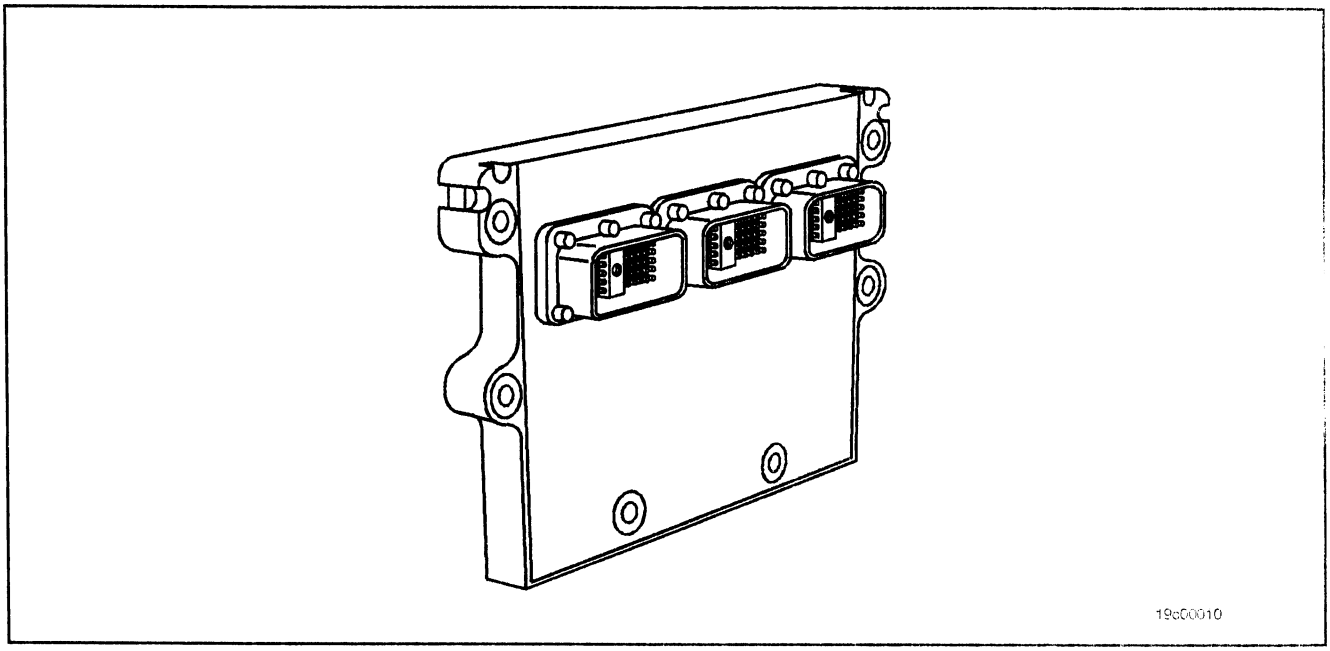
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 343

Electronic Control Module (ECM)

CODES	REASON	EFFECT
Fault Code: 343 PID(P), SID(S): S254 SPN: 629 FMI: 12/12 Lamp: Yellow	Internal ECM error.	Possibly none on performance or severe derate.

Electronic Control Module



Circuit Description:

The ECM monitors both signal voltage output to the injectors and ECM input from the engine sensors.

Component Location:

The ECM is bolted to the intake side of the cylinder head between the air inlet horn and the front of the engine.

Shop Talk:

- Loose engine or chassis ground connections can cause Fault Code 343 to be logged, as well as complaints of an intermittent stumble. Pay special attention to the negative starter post connection.
- Moisture in the ECM connectors can also cause the ECM to log Fault Code 343.

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check for multiple fault codes.		
STEP 1A: Read the fault codes.	Fault Codes 115 and 121 are not active	
STEP 2: Check the power and ground connections.		
STEP 2A: Check all engine and chassis power and ground connections.	Clean and tight	
STEP 2B: Check all power resistances.	Less than 10 ohms	
STEP 2C: Check all ground resistances.	Less than 10 ohms	
STEP 3: Check for moisture in the ECM connectors.		
STEP 3A: Check for moisture in the ECM connectors.	All connectors dry	
STEP 4: Clear the fault codes.		
STEP 4A: Disable the fault code.	Fault Code 343 inactive	
STEP 4B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check for multiple fault codes.

STEP 1A: Read the fault codes.

Condition:
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Read the fault codes using INSITE™.	**OK** **Fault Codes 115 and 121 are not active**	2A
	NOT OK Go to Fault Codes 115 and 121.	Fault Code 115 and 121

STEP 2: Check the power and ground connections.

STEP 2A: Check all engine and chassis power and ground connections.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Check all engine and vehicle power and ground connections for the following: • Corrosion • Loose connections.	**OK** **Clean and tight**	2B
	NOT OK **Repair damaged connections** Repair or replace the damaged connections.	4A

STEP 2B: Check all power resistances.

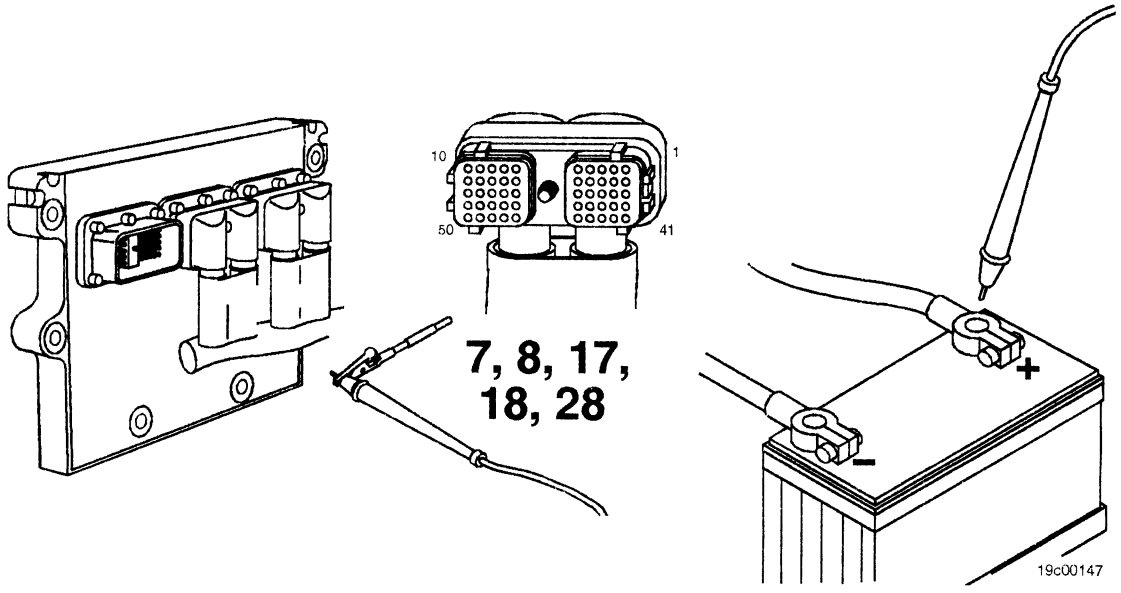
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the OEM harness connector from the ECM.
- Disconnect the negative (-) battery cable from the battery.
- Disconnect the positive (+) battery cable from the battery.

Action	Specifications/Repair	Next Step
Check all power resistances. • Measure the resistance from pin 7 of OEM harness connector to the positive (+) battery terminal connector. • Measure the resistance from pin 8 of OEM harness connector to the positive (+) battery terminal connector. • Measure the resistance from pin 17 of OEM harness connector to the positive (+) battery terminal connector. • Measure the resistance from pin 18 of OEM harness connector to the positive (+) battery terminal connector. • Measure the resistance from pin 28 of OEM harness connector to the positive (+) battery terminal connector.	**OK** **Less than 10 ohms**	2C
	NOT OK **Repair or replace the OEM harness** • Repair the OEM harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-071.	4A



STEP 2C: Check all ground resistances.

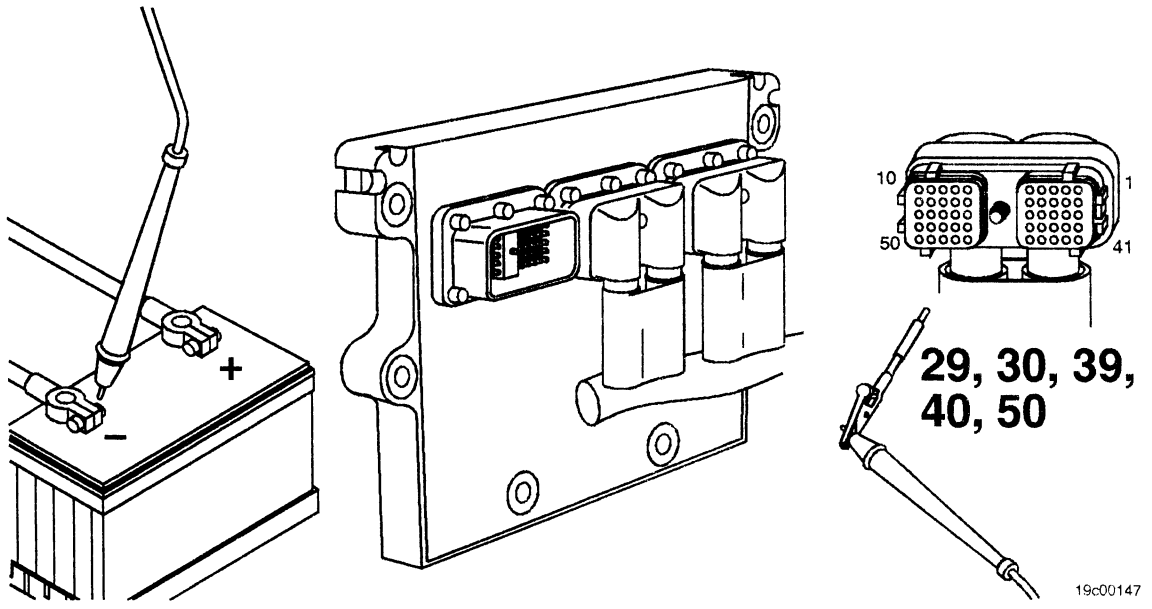
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the OEM harness connector from the ECM.
- Disconnect the negative (–) battery cable from the battery.
- Disconnect the positive (+) battery cable from the battery.

Action	Specifications/Repair	Next Step
Check all ground resistances. • Measure the resistance from pin 29 of OEM harness connector to the negative (–) battery terminal connector. • Measure the resistance from pin 30 of OEM harness connector to the negative (–) battery terminal connector. • Measure the resistance from pin 39 of OEM harness connector to the negative (–) battery terminal connector. • Measure the resistance from pin 40 of OEM harness connector to the negative (–) battery terminal connector. • Measure the resistance from pin 50 of OEM harness connector to the negative (–) battery terminal connector.	**OK** **Less than 10 ohms**	3A
	NOT OK **Repair or replace the OEM harness** • Repair the OEM harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-071.	4A



STEP 3: Check for moisture in the ECM connectors.

STEP 3A: Check for moisture in the ECM connectors.

Condition:
- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for moisture in the ECM connectors. • Check for moisture in the ECM connectors.	**OK** **All connectors dry**	4A
	NOT OK **Dry the connectors** Dry the connectors with electrical contact cleaner, Part No. 3824510.	4A

STEP 4: Clear the fault codes.

STEP 4A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let idle for 1 minute. • Using INSITE™, verify Fault Code 343 is inactive.	**OK** **Fault Code 343 inactive**	4B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location if all the steps have been completed and checked again.	1A

STEP 4B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

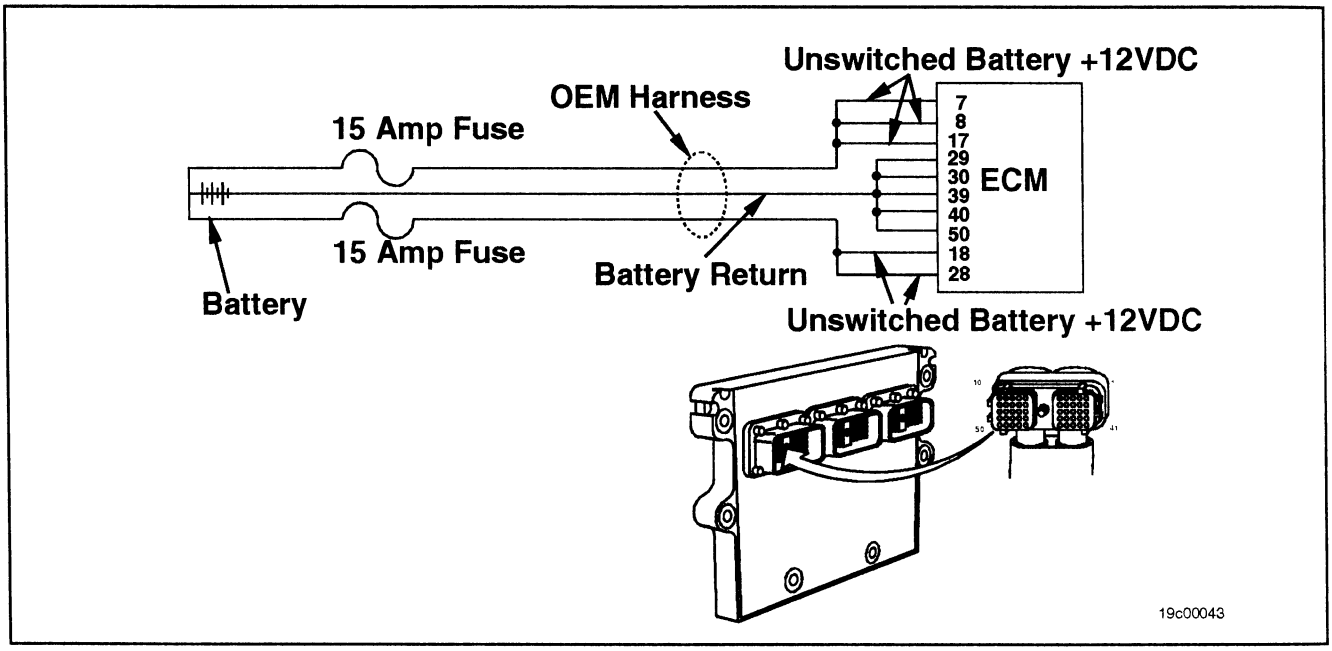
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 341

Unswitched Battery Supply Circuit

CODES	REASON	EFFECT
Fault Code: 341 PID(P), SID(S): S253 SPN: 630 FMI: 2/2 Lamp: Yellow	Severe loss of data from the ECM.	Possibly no noticeable performance effects, **or** engine dying, **or** difficulty in starting the engine. Fault information, trip information, and maintenance monitor data can be inaccurate.

Unswitched Battery Supply



Circuit Description:

The ECM receives constant voltage from the batteries through the unswitched battery wires that are connected directly to the positive (+) battery post. There are two in-line 15-amp fuses in the unswitched battery wires to protect the engine harness from overheating. The ECM receives switched battery input through the vehicle keyswitch wire when the vehicle keyswitch is turned on. The battery return wires are connected directly to the negative (–) battery post.

Component Location:

The ECM is connected to the battery by the OEM harness. This direct link provides a constant power supply for the ECM. The location of the battery will vary with the OEM. Refer to the OEM troubleshooting and repair manual.

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Read the fault codes.		
STEP 1A: Read the fault codes.	No other active fault codes	
STEP 2: Check the batteries and the power connector.		
STEP 2A: Check the resistance of the battery supply circuit.	Less than 10 ohms	
STEP 2B: Check the battery voltage.	Normal conditions: At least (+) 12 VDC During cranking: At least (+) 6.2 VDC	
STEP 2C: Check the battery connections.	Connections are tight and corrosion-free	
STEP 3: Check the two 15-amp fuses.		
STEP 3A: Verify that the two 15-amp fuses are installed correctly.	Fuses installed correctly	
STEP 3B: Verify that the two 15-amp fuses are not blown.	Fuses not blown	
STEP 4: Check the OEM harness		
STEP 4A: Check the add-on or the accessory wiring at (+) terminal of the battery.	No damaged wires	
STEP 5: Recalibrate the ECM.		
STEP 5A: Recalibrate the ECM.	Fault Code 341 inactive	
STEP 6: Clear the fault codes.		
STEP 6A: Disable the fault code.	Fault Code 341 inactive	
STEP 6B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Read the fault codes.

STEP 1A: Read the fault codes.

Condition: • Turn keyswitch ON.		
Action	**Specifications/Repair**	**Next Step**
Read the fault codes. • Read the fault codes using INSITE™.	**OK** **No other active fault codes**	2A
	NOT OK Troubleshoot the active fault codes.	5A

STEP 2: Check the batteries and the power connector.

STEP 2A: Check the resistance of the battery supply circuit.

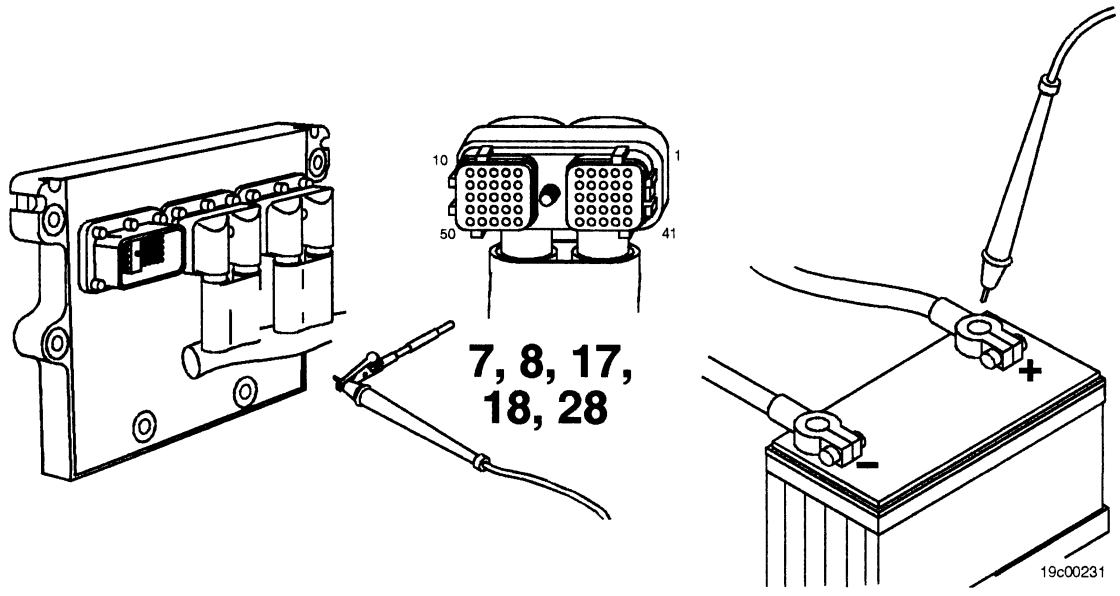
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the OEM harness connector from the ECM.

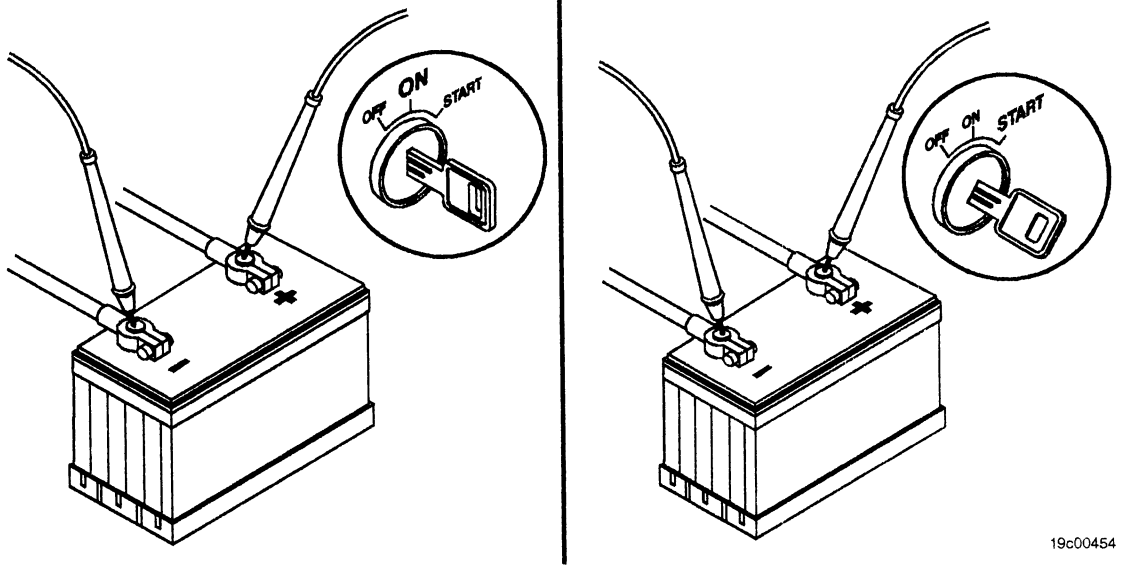
Action	Specifications/Repair	Next Step
Check the resistance of the battery supply circuit. • Measure the resistance from pin 7 of the OEM harness connector to the positive (+) battery terminal. • Measure the resistance from pin 8 of the OEM harness connector to the positive (+) battery terminal. • Measure the resistance from pin 17 of the OEM harness connector to the positive (+) battery terminal. • Measure the resistance from pin 18 of the OEM harness connector to the positive (+) battery terminal. • Measure the resistance from pin 28 of the OEM harness connector to the positive (+) battery terminal.	**OK** **Less than 10 ohms**	2B
	NOT OK **Repair or replace the OEM harness** • Repair the OEM harness. Refer to Procedure 019-250. • Replace the OEM harness. Refer to Procedure 019-071.	5A



STEP 2B: Check the battery voltage.

Condition:
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the battery voltage. • Place positive (+) probe of the multimeter on the positive battery terminal and touch negative (–) probe to the negative battery terminal while trying to start engine.	**OK** **Normal conditions: at least (+) 12 VDC** **During cranking: at least (+) 6.2 VDC**	2C
	NOT OK **Charge or replace the battery** Refer to the OEM troubleshooting and repair manual.	5A



STEP 2C: Check the battery connections.

Condition:
- Turn keyswitch OFF.

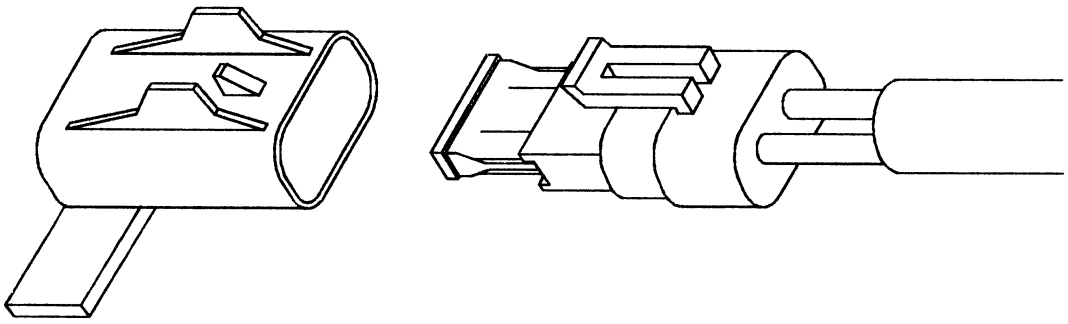
Action	Specifications/Repair	Next Step
Check the battery connections. • Inspect the battery terminal connections.	**OK** **Connections are tight and corrosion-free**	3A
	NOT OK **Tighten the connections** Tighten the loose connections and clean the terminals. Refer to the OEM troubleshooting and repair manual.	5A

STEP 3: Check the two 15-amp fuses.

STEP 3A: Verify that the two 15-amp fuses are installed correctly.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Verify that the two 15-amp fuses are installed correctly. • Inspect the two 15 AMP fuses for correct installation.	**OK** **Fuses installed correctly**	3B
	NOT OK **Install the fuses correctly** Refer to Procedure 019-198.	5A

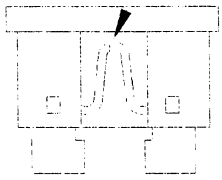


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STEP 3B: Verify that the two 15-amp fuses are not blown.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Verify that the two 15-amp fuses are not blown. • Inspect the two 15 AMP fuses to see if they are blown.	**OK** **Fuses not blown**	4A
	NOT OK **Locate the short circuit** • Replace the engine harness. Refer to Procedure 019-043. • Replace the blown fuse(s). Refer to Procedure 019-198.	5A



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STEP 4: Check the OEM harness.

STEP 4A: Check the add-on or the accessory wiring at (+) terminal of the battery.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Check the add-on or the accessory wiring at (+) terminal of the battery. • Starting at the (+) terminal, follow any add-on or accessory wiring and examine wire(s) for damaged insulation or an installation error that can cause the supply wire to be shorted to the engine block.	**OK** **No damaged wires**	5A
	NOT OK **Repair or replace the damaged wiring**	5A

STEP 5: Recalibrate the ECM.

STEP 5A: Recalibrate the ECM.

Condition: Connect all components.

Action	Specifications/Repair	Next Step
Recalibrate the ECM • Use ESDN™ to recalibrate the ECM.	**OK** **Fault Code 341 inactive**	6A
	NOT OK Fault code active.	6A

STEP 6: Clear the fault codes.

STEP 6A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify Fault Code 341 is inactive.	**OK** **Fault Code 341 inactive**	6B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location if all the steps have been completed and checked again.	1A

STEP 6B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

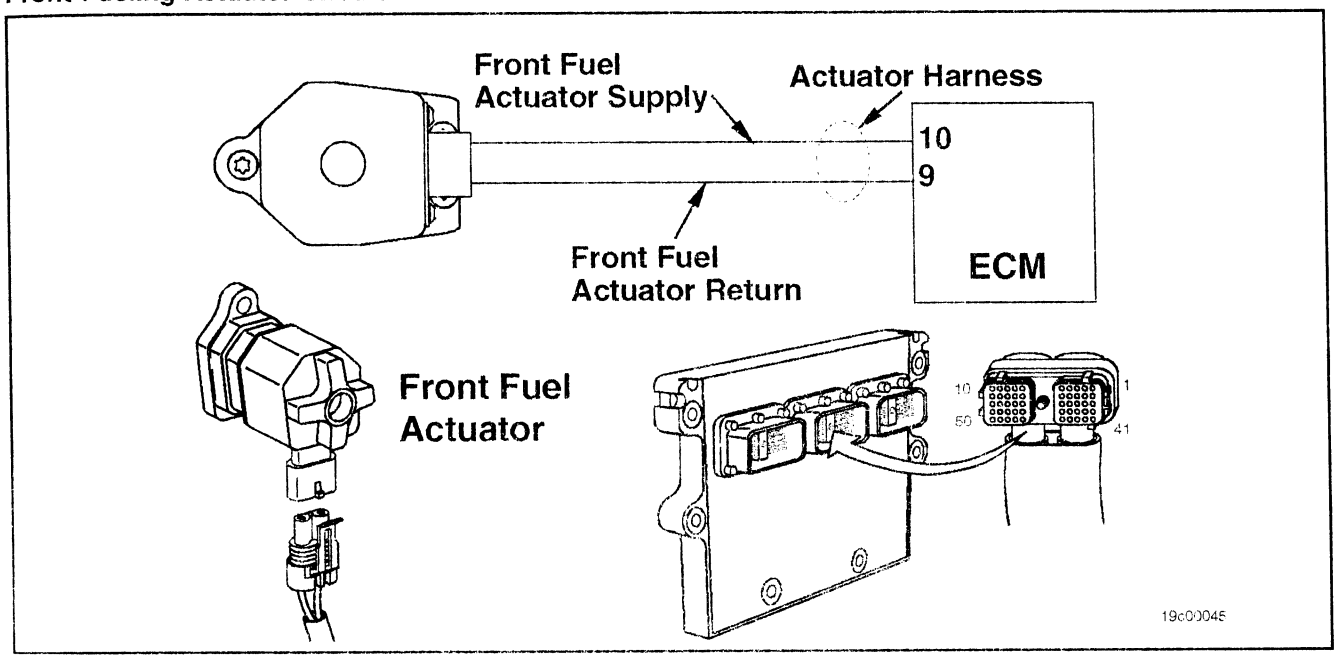
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 378

Actuator Circuit

CODES	REASON	EFFECT
Fault Code: 378 PID(P), SID(S): S018 SPN: 633 FMI: 5/5 Lamp: Yellow	Low current or open circuit detected at front fueling actuator circuit.	Engine will run using **only** the rear three cylinders.

Front Fueling Actuator Circuit



Circuit Description:

The fuel actuators are actuated by the electronic control module (ECM) to control fuel metering. Each fuel actuator is connected to the ECM by a supply and a return wire. An electrical pulse is sent to the fuel actuator from the ECM on the supply wire and returns to the ECM on the return wire. Each solenoid valve is normally closed, and it is **only** opened by an electrical pulse from the ECM during metering.

Component Location:

The front fueling actuator is mounted on the fuel delivery housing. It is the actuator closest to the front of the engine.

Shop Talk:

The possible failure modes are open circuit, short circuit to ground, high actuator resistance, supply wire shorted to battery, and loss of boost voltage inside of ECM.

TROUBLESHOOTING SUMMARY

⚠ WARNING ⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

⚠ CAUTION ⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

**To avoid pin and harness damage, use the following test lead when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.**

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the actuator harness.		
STEP 1A: Inspect the harness and ECM connector pins.	No damaged pins	
STEP 1B: Check the resistance of the whole circuit.	Less than 10 ohms	
STEP 1B-1: Inspect the actuator harness and connector pins.	No damaged pins	
STEP 1B-2: Check for an open circuit in the actuator harness.	Less than 5 ohms	
STEP 1B-3: Check the resistance of the actuator solenoid.	0.5 to 1.5 ohms	
STEP 1C: Check for a short circuit from pin to pin in the ECM connector.	More than 100k ohms	
STEP 1D: Check for a short circuit to ground in the actuator solenoid.	More than 100k ohms	
STEP 2: Clear the fault codes.		
STEP 2A: Disable the fault code.	Fault Code 378 inactive	
STEP 2B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check the actuator harness.

STEP 1A: Inspect the harness and the ECM connector pins.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the harness and the ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	1B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins with electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	2A

STEP 1B: Check the resistance of the whole circuit.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

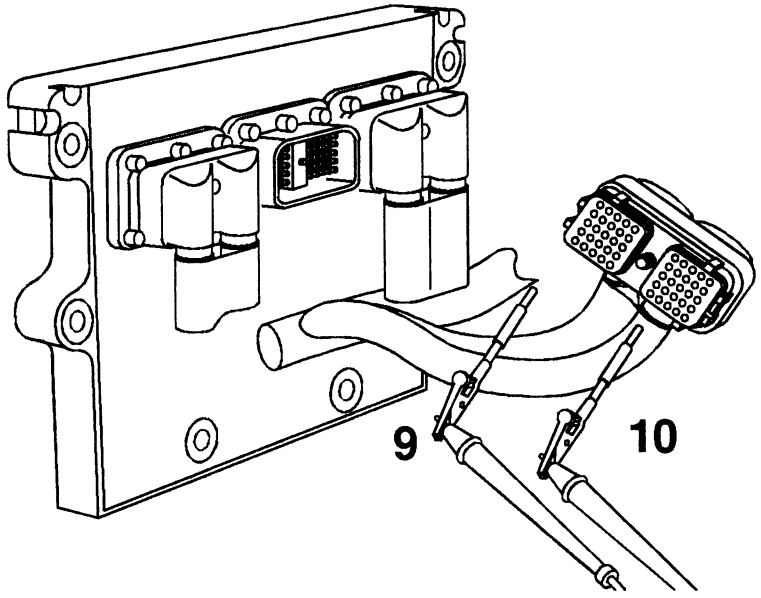
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check the resistance of the whole circuit. • Measure the resistance from pin 9 to pin 10 of the actuator harness connector.	**OK** **Less than 10 ohms**	1B-1
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	2A



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STEP 1B-1: Inspect the actuator harness and connector pins.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness from the actuator solenoid.

Action	Specifications/Repair	Next Step
Inspect the harness and the actuator connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	1B-2
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins with electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-202 or 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	2A

STEP 1B-2: Check for an open circuit in the actuator harness.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

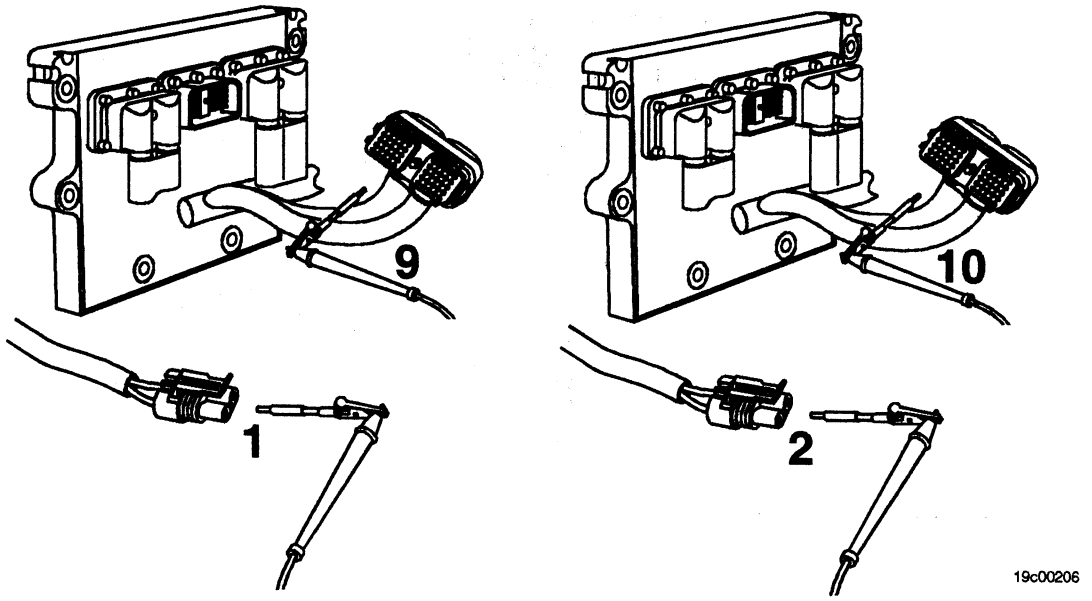
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness from the actuator solenoid.
- Disconnect the actuator harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for an open circuit in the actuator harness. • Measure the resistance from pin 9 of the actuator harness connector to pin 1 (or A) of the actuator solenoid connector. • Measure the resistance from pin 10 of the actuator harness connector to pin 2 (or B) of the actuator solenoid connector.	**OK** **Less than 5 ohms**	1B-3
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-202 or 019-250. • Replace the engine harness. Refer to Procedure 019-043.	2A



STEP 1B-3: Check the resistance of the actuator solenoid.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

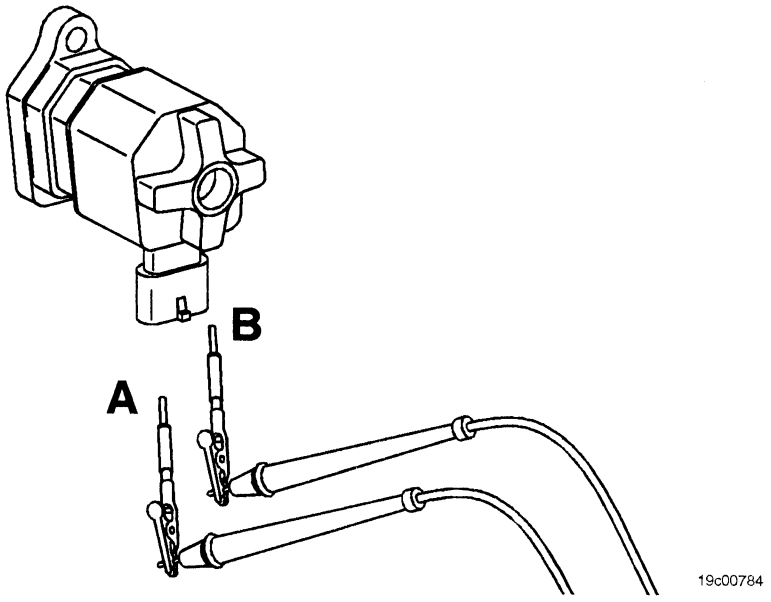
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness from the actuator solenoid.

Action	Specifications/Repair	Next Step
Check the resistance of the actuator solenoid. • Measure the resistance across the two terminals on the actuator solenoid.	**OK** **0.5 to 1.5 ohms**	1C
	NOT OK **Replace the actuator solenoid** Refer to Procedure 019-110.	2A



STEP 1C: Check for a short circuit from pin to pin in the ECM connector.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

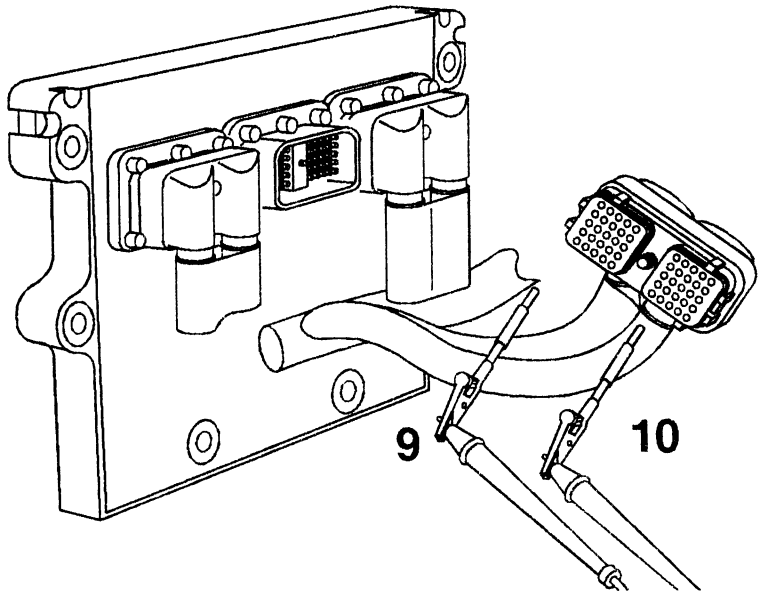
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.
- Disconnect the actuator harness from the actuator solenoid.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin. • Measure the resistance from pin 9 in the actuator harness connector to all other pins in the connector. • Measure the resistance from pin 10 in the actuator harness connector to all other pins in the connector.	**OK** **More than 100k ohms**	1D
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	2A



STEP 1D: Check for a short circuit to ground in the actuator solenoid.

⚠WARNING⚠

The actuators receive high voltage when the engine is operating. To avoid personal injury or death from electrical shock, do not wear jewelry or damp clothing, and do not touch the actuators or the actuator wires when the engine is operating.

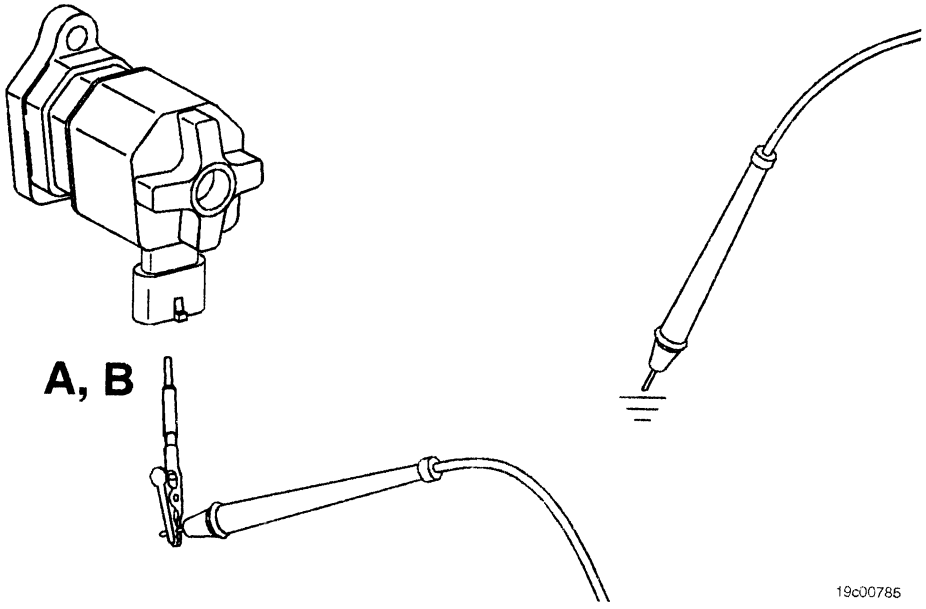
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness from the actuator solenoid.

Action	Specifications/Repair	Next Step
Check for a short circuit to ground in the actuator solenoid. • Measure the resistance between both actuator solenoid pins to chassis ground.	**OK** **More than 100k ohms**	2A
	NOT OK **Replace the actuator solenoid** Refer to Procedure 019-110.	2A



STEP 2: Clear the fault codes.

STEP 2A: Disable the fault code.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and road test the vehicle for at least 1 mile. • Using INSITE™, verify that Fault Code 378 is inactive.	**OK** **Fault Code 378 inactive**	2B
	NOT OK **Fault Code 378 active** **Replace the ECM** Refer to Procedure 019-031.	2B

STEP 2B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

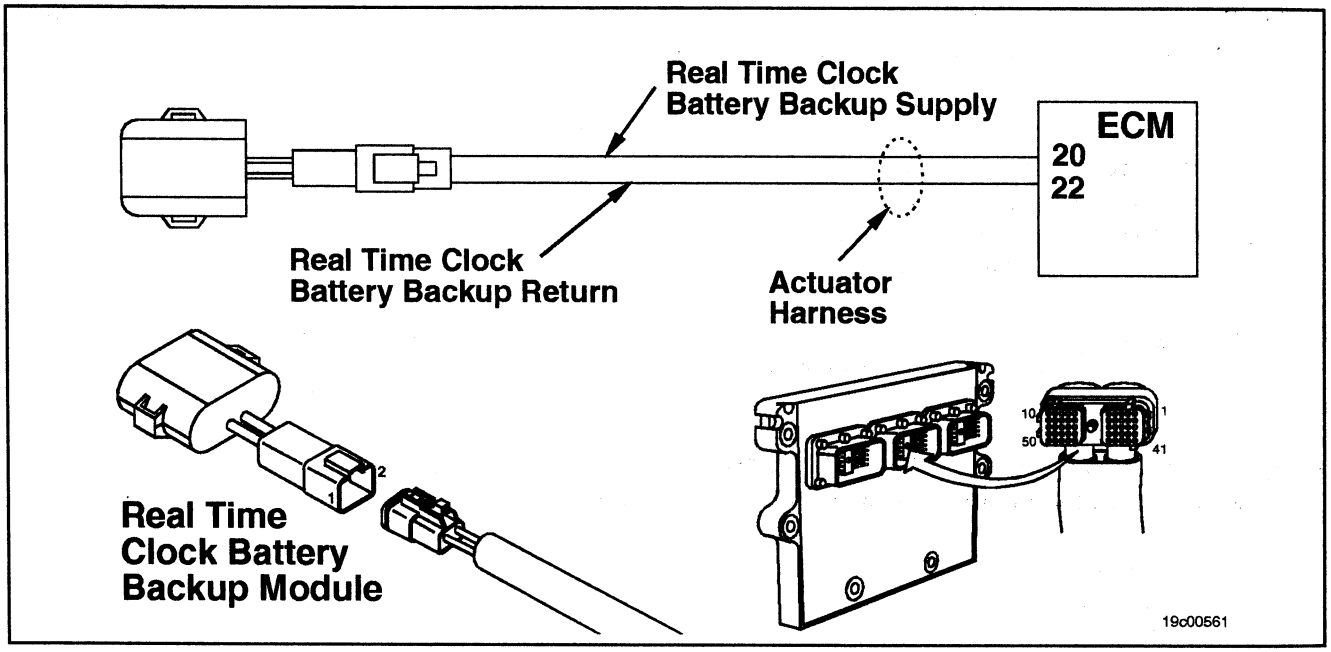
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 319

Real-Time Clock Power Circuit

CODES	REASON	EFFECT
Fault Code: 319 PID(P), SID(S): P251 SPN: 251 FMI: 2/2 Lamp: Maintenance	Real-time clock lost power.	None on performance. Data in the ECM will **not** have accurate time and date information.

Real-Time Clock Power Circuit



Circuit Description:

Under ordinary operating conditions, the real-time clock in the ECM is powered by the vehicle's batteries. If battery power to the ECM is lost, then the real-time clock will be powered by a battery backup module (if equipped).

Component Location:

The real-time clock battery backup module is secured to the wiring harness in the vicinity of the ECM.

Shop Talk:

This fault indicates that the real-time clock in the ECM lost power. Possible causes for this fault:

- A weak or failed battery backup module
- Failed wiring or connectors between the battery backup module and ECM
- The engine is **not** equipped with a battery backup module, and lost vehicle battery power to the ECM.

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check battery backup module.		
STEP 1A: Inspect the ECM and actuator harness connectors.	No damaged pins	
STEP 1B: Check the battery backup voltage at the ECM actuator connector.	(+) 3.3 to 3.6 VDC	
STEP 1B-1: Inspect the battery backup module harness and actuator harness connector pins.	No damaged pins	
STEP 1B-2: Check the battery backup voltage at the battery module connector.	(+) 3.3 to 3.6 VDC	
STEP 2: Check the battery backup module harness.		
STEP 2A: Check for an open circuit in the supply line.	Less than 10 ohms	
STEP 2B: Check for an open circuit in the return line.	Less than 10 ohms	
STEP 2C: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 2D: Check for a short circuit to ground.	More than 100k ohms	
STEP 3: Clear the fault codes.		
STEP 3A: Disable the fault code.	Fault Code 319 inactive	
STEP 3B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check the battery backup module.

STEP 1A: Inspect the ECM and actuator harness connector pins.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the ECM and actuator harness connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	1B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	3A

STEP 1B: Check the battery backup voltage at the ECM actuator connector.

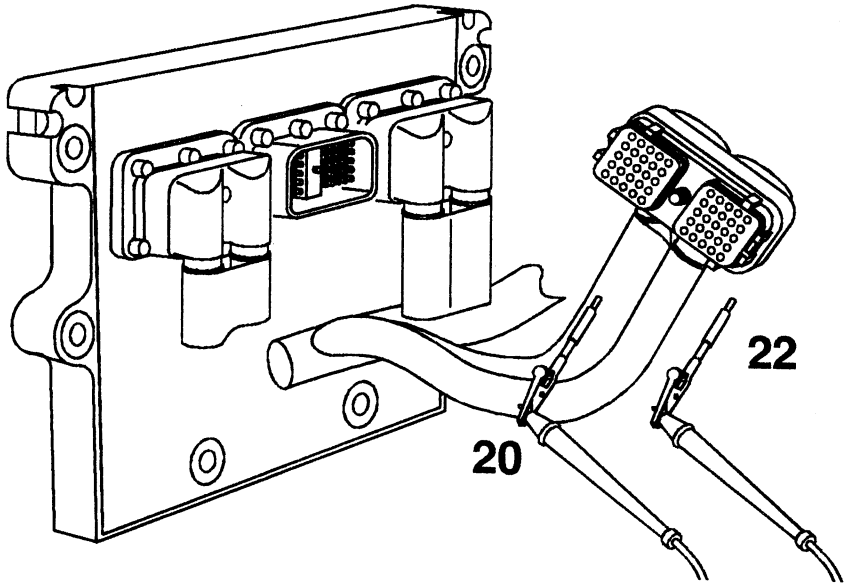
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Engine equipped with optional real-time clock battery backup module.
- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check the battery backup voltage at the ECM connector. • Measure battery voltage from pin 20 to pin 22 at the ECM connector. **NOTE:** Gently flex the harness when checking the voltage to check for internally broken or frayed wires.	**OK** **(+) 3.3 to 3.6 VDC**	3A
	NOT OK Does **not** meet specifications.	1B-1



STEP 1B-1: Inspect the battery backup module and actuator harness connector pins.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:

- Turn keyswitch OFF.
- Disconnect the battery backup module from the actuator harness.
- Disconnect the actuator harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the battery backup module and actuator harness connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	1B-2
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	3A

STEP 1B-2: Check the battery backup voltage at the battery module connector.

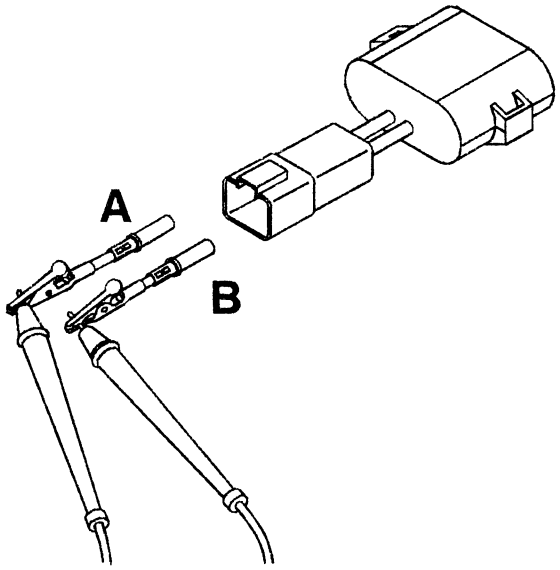
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

Condition:

- Engine equipped with optional real-time clock battery backup module.
- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.
- Disconnect the engine harness from the battery backup module.

Action	Specifications/Repair	Next Step
Check the battery backup voltage at the battery module connector. • Measure the battery voltage from battery supply (+) to battery return (–) at the battery module connector, battery module side. **NOTE:** Gently flex the harness when checking the voltage to check for internally broken or frayed wires.	**OK** **(+) 3.3 to 3.6 VDC**	2A
	NOT OK Does **not** meet specifications. **Replace the battery backup module** Refer to Procedure 019-311.	3A



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STEP 2: Check the battery backup module harness.

STEP 2A: Check for an open circuit in the supply line.

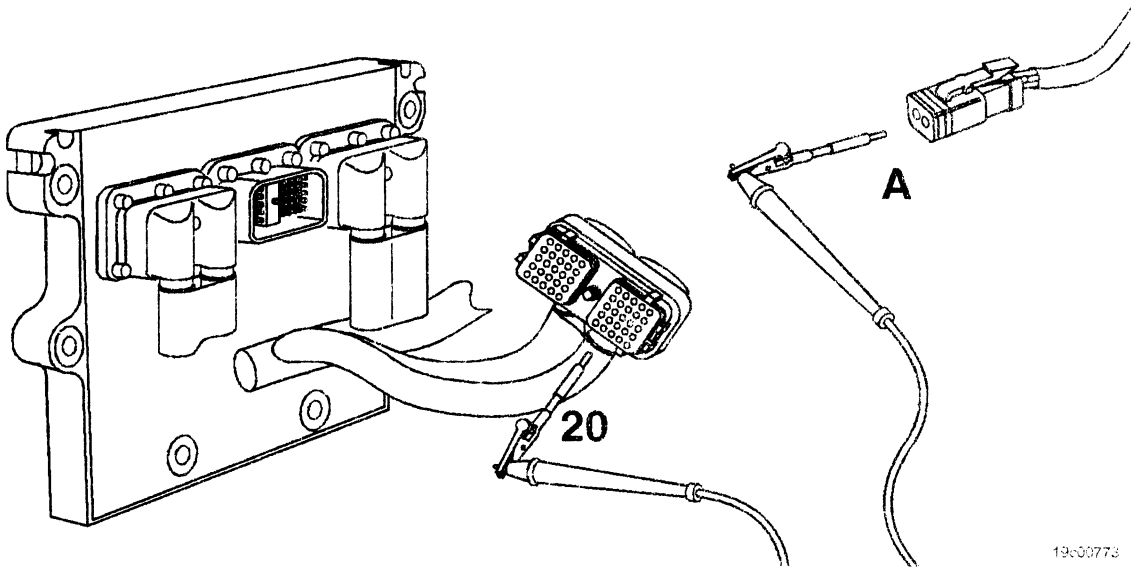
⚠CAUTION⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the battery backup module from the engine harness.
- Disconnect the actuator harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect for continuity in the supply line. • Measure the resistance from pin 20 at the actuator harness connector to pin A (or 1) at the engine harness connector at the battery backup module. **NOTE:** Gently flex the harness when checking the resistance to check for internally broken or frayed wires.	**OK** **Less than 10 ohms**	2B
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-202 or 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



STEP 2B: Check for an open circuit in the return line.

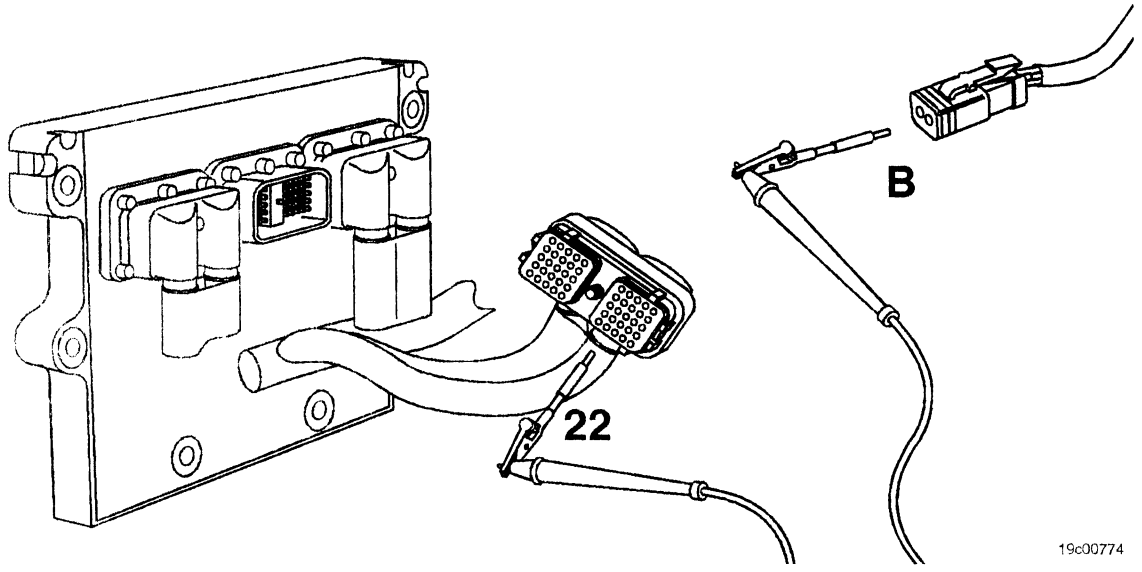
⚠CAUTION⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the battery backup module from the engine harness.
- Disconnect the actuator harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect for continuity in the return line. • Measure the resistance from pin 22 at the actuator harness connector to pin B (or 2) at the engine harness connector at the battery backup module. **NOTE:** Gently flex the harness when checking the resistance to check for internally broken or frayed wires.	**OK** **Less than 10 ohms**	2C
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-202 or 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



STEP 2C: Check for a short circuit from pin to pin.

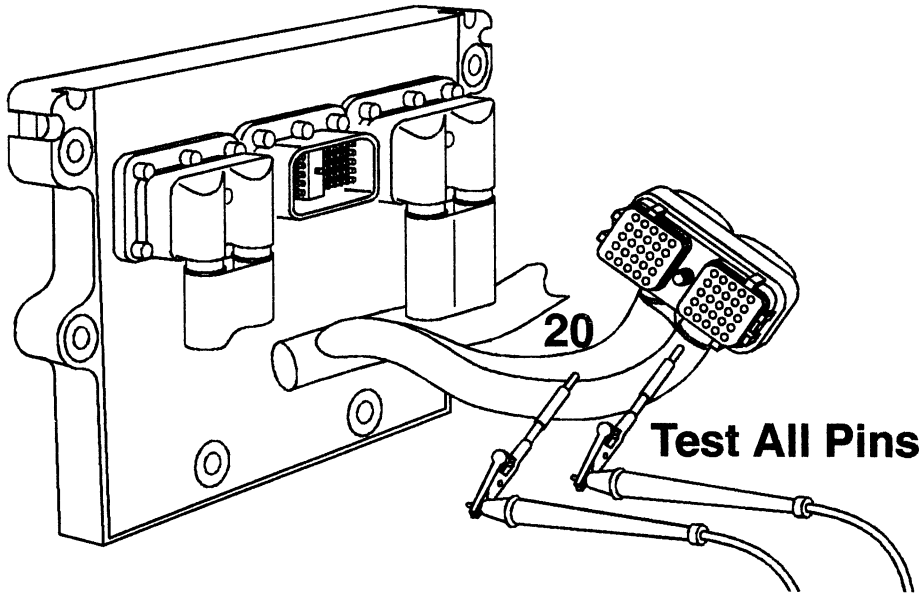
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.
- Disconnect the battery backup module from the engine harness.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin. • Measure the resistance from pin 20 of the actuator harness connector to all the other pins in the connector. **NOTE:** Gently flex the harness when checking the resistance to check for internally broken or frayed wires.	**OK** **More than 100k ohms**	2D
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



STEP 2D: Check for a short circuit to ground.

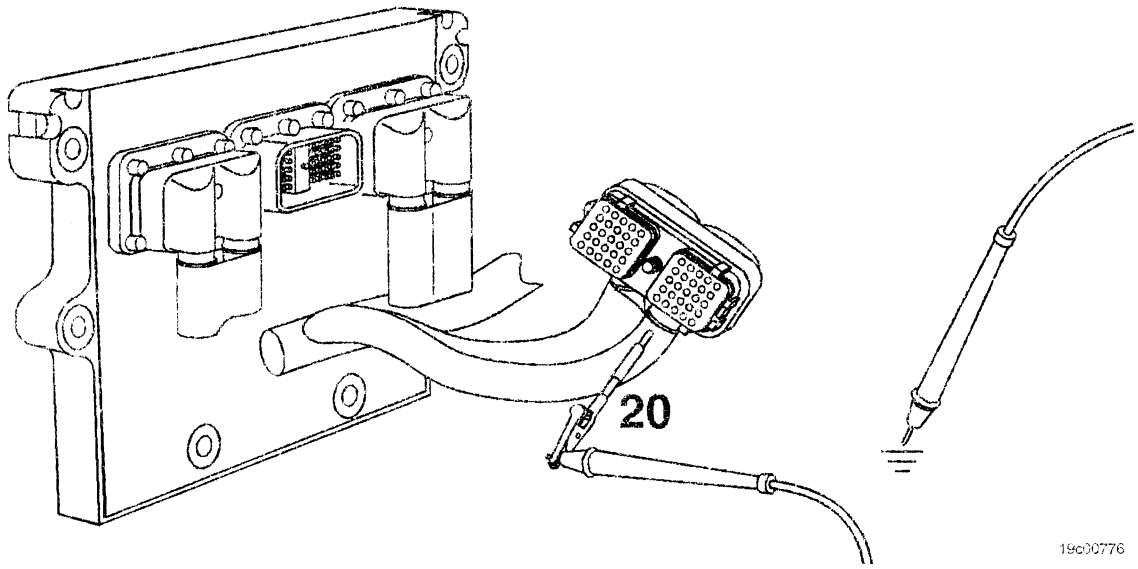
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.
- Disconnect the battery backup module from the engine harness.

Action	Specifications/Repair	Next Step
Check for a short circuit to ground in the battery backup module harness. • Measure the resistance from pin 20 in the actuator harness connector to engine block ground. **NOTE:** Gently flex the harness when checking the resistance to check for internally broken or frayed wires.	**OK** **More than 100k ohms**	3A
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



STEP 3: Clear the fault codes.

STEP 3A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Using INSITE™, set real-time clock to correct time. • Using INSITE™, verify that Fault Code 319 is inactive. **NOTE:** It is necessary to set the real-time clock with the INSITE™ service tool to make Fault Code 319 go inactive.	**OK** **Fault Code 319 inactive**	3B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location if all the steps have been completed and checked again.	1A

STEP 3B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

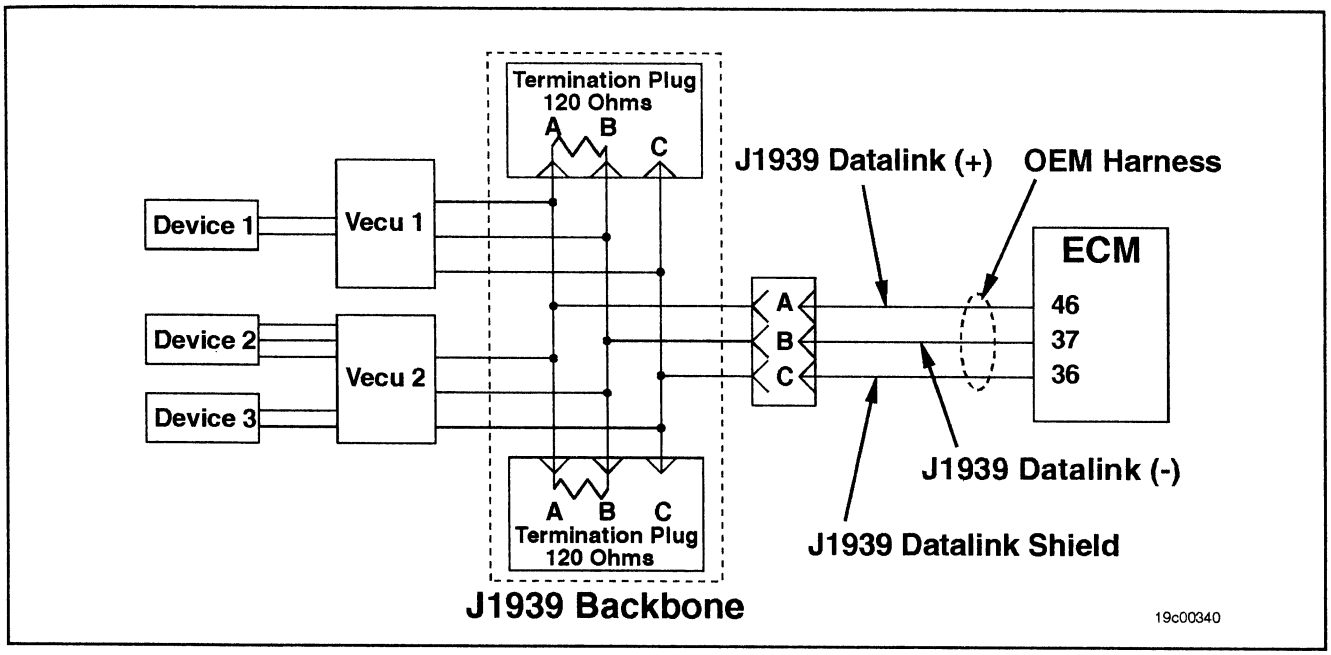
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 286

J1939 Datalink Multiplexing

CODES	REASON	EFFECT
Fault Code: 286 PID(P), SID(S): S231 SPN: 639 FMI: 13/13 Lamp: Yellow	The ECM expected information from a multiplexed device but **only** received a portion of the necessary information.	At least one multiplexed device will **not** operate properly.

J1939 Datalink Multiplexing Circuit



Circuit Description:

Inputs such as throttle pedals, switches, and sensors can be communicated to the ECM over the J1939 datalink. Messages sent from the vehicle electronic control units (VECU) are received by the ECM and used for controlling the engine. Both the ECM and VECU **must** be properly configured so that each device's information is transmitted by the VECU and received by the ECM.

Component Location:

The ECM is located on the intake side of the engine, near the front. The J1939 datalink wiring and VECU(s) vary by OEM options.

Shop Talk:

This fault occurs when the ECM is set up to receive information from several multiplexed switches from VECU(s) and **only** gets some of the switches. It indicates the ECM is setup to receive too many switches or the VECU(s) is set up to transmit too few switches.

TROUBLESHOOTING SUMMARY

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Verify that the VECU(s) and ECM have matching settings.		
STEP 1A: Consult OEM information and/or use OEM service tool to verify which input parameters are wired to VECU(s).	Physical input devices to VECU match VECU configuration	
STEP 1B: Determine which parameters are set to be received over the J1939 datalink. Look at the menu: Adjustments — Features and Parameters 2.	INSITE™ readout matches ECM setting for devices (devices in step 1B match step 1A)	
STEP 2: Change the settings.		
STEP 2A: ECM is set up to receive parameters that the VECU(s) is not transmitting.	ECM setting now matches VECU configuration	
STEP 2B: The VECU(s) is not set up to transmit information from all of the multiplex devices.	VECU(s) parameters match all input devices that are wired to VECU(s)	
STEP 3: Clear the fault code.		
STEP 3A: Disable the fault code.	Fault Code 286 inactive	
STEP 3B: Clear the inactive fault codes.	All faults cleared	

TROUBLESHOOTING STEP

STEP 1: Verify that the VECU(s) and ECM have matching settings.

STEP 1A: Consult OEM information and/or use OEM service tool to verify which input parameters are wired to VECU(s).

Condition:
- Turn keyswitch to the ON position.
- Connect to the vehicle VECU with OEM service tool.

Action	Specifications/Repair	Next Step
Check that the vehicle inputs are multiplexed. Determine which input devices (throttle, cruise switches, clutch switch, etc.) are wired to the vehicle's VECU(s).	**OK** **Physical input devices to VECU match VECU configuration**	1B
Using OEM service tool, verify the VECU is configured properly.	**NOT OK** **Change multiplex settings**	2B

STEP 1B: Determine which parameters are set to be received over the J1939 datalink. Look at the menu: Adjustments – Features and Parameters 2.

Condition:
- Install the INLINE 2™ datalink adapter to the engine and PC.
- Connect INSITE™.
- Turn keyswitch ON and start INSITE™ job.

Action	Specifications/Repair	Next Step
ECM settings match devices installed on vehicle. • Read the ECM settings for devices using INSITE™. • Information for settings in menu: Adjustments – Features and Parameters 2.	**OK** **INSITE™ readout matches ECM settings for devices (devices in step 1B match step 1A)**	3A
	NOT OK The INSITE™ configuration does **not** match the VECU configuration.	2A

STEP 2: Change the settings.

STEP 2A: ECM is set up to receive parameters that the VECU(s) is not transmitting.

Condition:
- Start INSITE™ and connect to ECM.

Action	Specifications/Repair	Next Step
Change ECM setting to match VECU configuration. • If the ECM is set up to receive any of the parameters that the VECU(s) is **not** transmitting over the datalink, turn off multiplexing for those parameters in the ECM using INSITE™ .	**OK** **ECM setting now matches VECU configuration**	3A
	NOT OK Check OEM multiplex settings.	1A

STEP 2B: The VECU(s) is not set up to transmit all of the information from all of the multiplex devices.

Condition:
- Install OEM service tool.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Change the setting of the VECU(s) to transmit all information. • VECU(s) is **not** set up to transmit information from all of the devices connected to it. Change the setting in the VECU(s). Refer to the OEM troubleshooting and repair manual for instruction.	**OK** **VECU(s) parameters match all input devices that are wired to VECU(s)**	3A
	NOT OK Check OEM multiplex settings.	1A

STEP 3: Clear the fault code.

STEP 3A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify that Fault Code 286 is inactive.	**OK** **Fault Code 286 inactive**	3B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location if all the steps have been completed and checked again.	1A

STEP 3B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

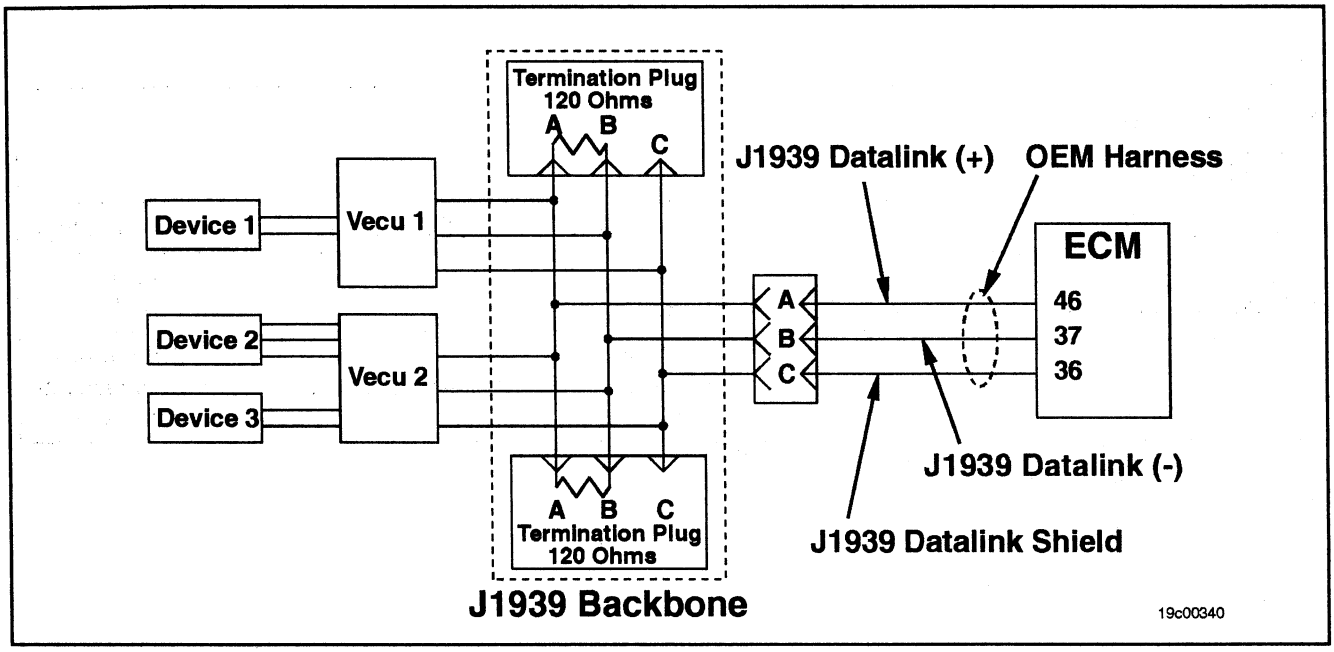
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All faults cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 285

J1939 Datalink Multiplexing

CODES	REASON	EFFECT
Fault Code: 285 PID(P), SID(S): S231 SPN: 639 FMI: 9/9 Lamp: Yellow	The ECM expected information from a multiplexed device but did **not** receive it soon enough, or did **not** receive it at all.	At least one multiplexed device will **not** operate properly.

J1939 Datalink Multiplexing Circuit



Circuit Description:

Inputs such as throttle pedals, switches, and sensors can be communicated to the ECM over the J1939 datalink. Messages sent from the vehicle electronic control units (VECU) are received by the ECM and used for controlling the engine. Both the ECM and VECU **must** be properly configured so that each device's information is transmitted by the VECU and received by the ECM.

Component Location:

The ECM is located on the intake side of the engine, near the front. The J1939 datalink wiring and VECU(s) vary by OEM options.

Shop Talk:

This fault occurs when the ECM is set up to receive information about a multiplexed device from a VECU over the J1939 datalink and does **not** receive a message with that information. This fault can also be caused if the ECM does **not** get the information fast enough to control the engine properly. This condition can be caused by the J1939 datalink having an electrical problem, a lack of terminating plugs on the J1939 datalink backbone, the ECM **not** being set up to receive information, a multiplexed device that truly is **not** multiplexed, or a VECU **not** being correctly set up to transmit information on one of its multiplexed devices.

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3823996 - female Weather-Pack test lead.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the ECM for proper multiplexing configuration.		
STEP 1A: Determine which vehicle inputs (throttle, switches, lamps, sensors) are multiplexed over the J1939 data-link.	Devices in step 1A must match devices in step 1B	
STEP 1B: Verify that the proper devices are set to be multiplexed in the ECM using INSITE™.	INSITE™ readout matches ECM settings for devices (devices in step 1A match step 1B)	
STEP 1B-1: Change the ECM settings to match the vehicle's multiplexed devices.	ECM matches multiplex devices	
STEP 2: Inspect the J1939 connectors on the backbone harness and engine harness connectors.		
STEP 2A: Inspect the ECM, OEM harness, and 3-pin connectors.	No damaged pins	
STEP 2B: Inspect the VECU 3-pin and associated connectors.	No damaged pins	
STEP 3: Inspect the SAE J1939 backbone harness and engine harness connectors.		
STEP 3A: Check for an open circuit in the supply wire.	Less than 10 ohms	
STEP 3B: Check for an open circuit in the return wire.	Less than 10 ohms	
STEP 3C: Check for an open circuit in the shield wire.	Less than 10 ohms	
STEP 3D: Check the resistance value of the J1939 harness.	55 to 65 ohms	
STEP 3E: Check for a short circuit to power in the supply wire.	Less than (+) 1.5 VDC	
STEP 3F: Check for a short circuit to power in the return wire.	Less than (+) 1.5 VDC	
STEP 3G: Check for a short circuit to ground in the supply wire.	More than 100k ohms	
STEP 3H: Check for a short circuit to ground in the return wire.	More than 100k ohms	

STEP 3I: Check for a short circuit pin to pin in the OEM connector. — More than 100k ohms

STEP 4: Check for proper communication with the J1939 devices.

STEP 4A: Check communication with the ECM. — Established communication by monitoring engine speed

STEP 4B: Check communication with the VECU(s). — Proper communication between multiplexing devices and VECU(s)

STEP 5: Clear the fault codes.

STEP 5A: Disable the fault code. — Fault Code 285 inactive

STEP 5B: Clear the inactive fault codes. — All fault codes cleared

TROUBLESHOOTING STEP

STEP 1: Check the ECM for proper multiplexing configuration.

STEP 1A: Determine which vehicle inputs (throttle, switches, lamps, sensors) are multiplexed over the J1939 datalink.

Condition:
- Install the INLINE 2™ datalink adapter.
- Install INSITE™.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check that the vehicle inputs are multiplexed over the J1939 datalink. • Read the devices that are sending input information with INSITE™.	**OK** **Devices in step 1A must match devices in step 1B**	1B
	NOT OK	1B

STEP 1B: Verify that the proper devices are set to be multiplexed in the ECM using INSITE™.

Condition:
- Install the INLINE 2™ datalink adapter.
- Install INSITE™.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
ECM settings match devices installed on vehicle. • Read the ECM settings for devices using INSITE™	**OK** **INSITE™ readout matches ECM settings for devices (devices in step 1A match step 1B)**	2A
	NOT OK Configure ECM to match vehicle devices.	1B-1

STEP 1B-1: Change the ECM settings to match the vehicle's multiplexed devices.

Condition:
- Install the INLINE 2™ datalink adapter.
- Install INSITE™.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Match the multiplexed devices to the ECM. • Using INSITE™, configure the ECM to work with the multiplexed devices.	**OK** **ECM matches multiplex devices**	2A
	NOT OK	5A

STEP 2: Inspect the J1939 connectors on the backbone harness and engine harness connectors.

STEP 2A: Inspect the ECM, OEM harness, and 3-pin connectors.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Turn keyswitch OFF.
- Disconnect the ECM connector.
- Disconnect the OEM harness.
- Disconnect the multiplexed devices.

Action	Specifications/Repair	Next Step
Inspect the ECM, OEM harness, J1939 connectors, and multiplexed devices for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	2B
	NOT OK **Repair the damaged pins** Repair or replace the OEM harness, J1939 backbone harness, or the multiplexed device(s), or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using the electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the OEM harness. Refer to Procedure 019-203. • Replace the OEM harness. Refer to Procedure 019-071. • Repair or replace the backbone harness J1939 connector(s). Refer to Procedure 019-203. • Repair or replace the multiplexed devices. Refer to the Troubleshooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239, for specific device. • Replace the ECM. Refer to Procedure 019-031.	5A

STEP 2B: Inspect the VECU 3-pin and associated connectors.

Condition:
- Disconnect the VECU(s) from the J1939 backbone harness.
- Disconnect the multiplexed devices from the VECU(s).

Action	Specifications/Repair	Next Step
Inspect the VECU(s), 3-pin, and multiplexed devices connectors for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	3A
	NOT OK **Repair the damaged pins** Repair or replace the VECU(s), 3-pin connector, or multiplexed devices, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair or replace the VECU(s). Refer to the OEM troubleshooting and repair manual for repair procedure. • Repair the 3-pin connector. Refer to Procedure 019-203. • Repair or replace the multiplexed devices. Refer to the Troubleshooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239.	5A

STEP 3: Inspect the SAE J1939 backbone harness and engine harness connectors.

STEP 3A: Check for an open circuit in the supply wire.

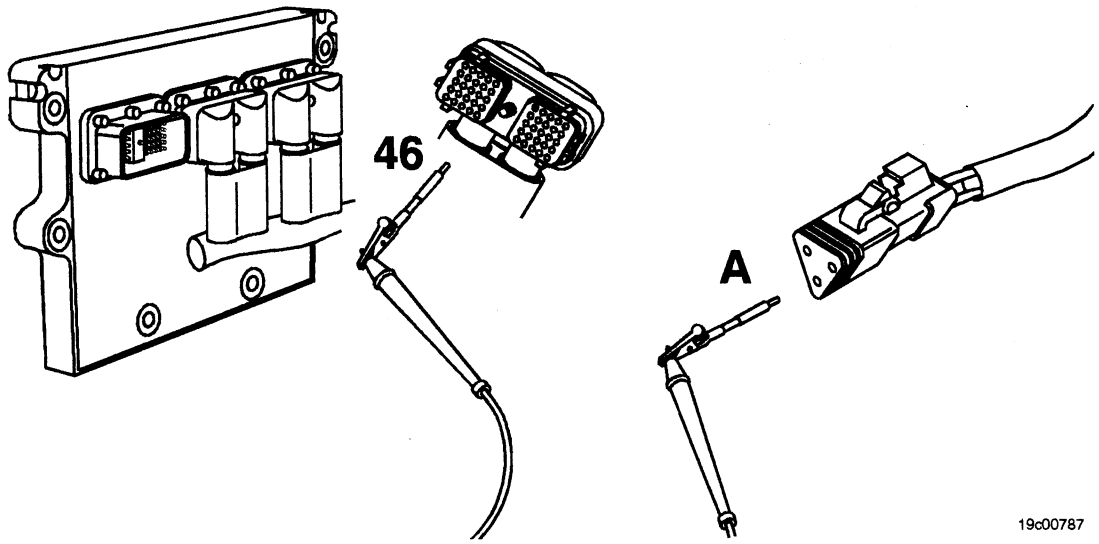
⚠CAUTION⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3823996 - female Weather-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the OEM harness connector from the ECM.
- Disconnect the J1939 connector from the VECU(s).

Action	Specifications/Repair	Next Step
Check continuity in the supply wire. • Measure resistance from supply pin 46 at the OEM harness connector to pin A at the datalink connector at the VECU(s).	**OK** **Less than 10 ohms**	3B
	NOT OK **Repair or replace the OEM harness** • Repair the OEM harness. Refer to Procedure 019-250. • Replace the OEM harness. Refer to Procedure 019-071.	5A



STEP 3B: Check for an open circuit in the return wire.

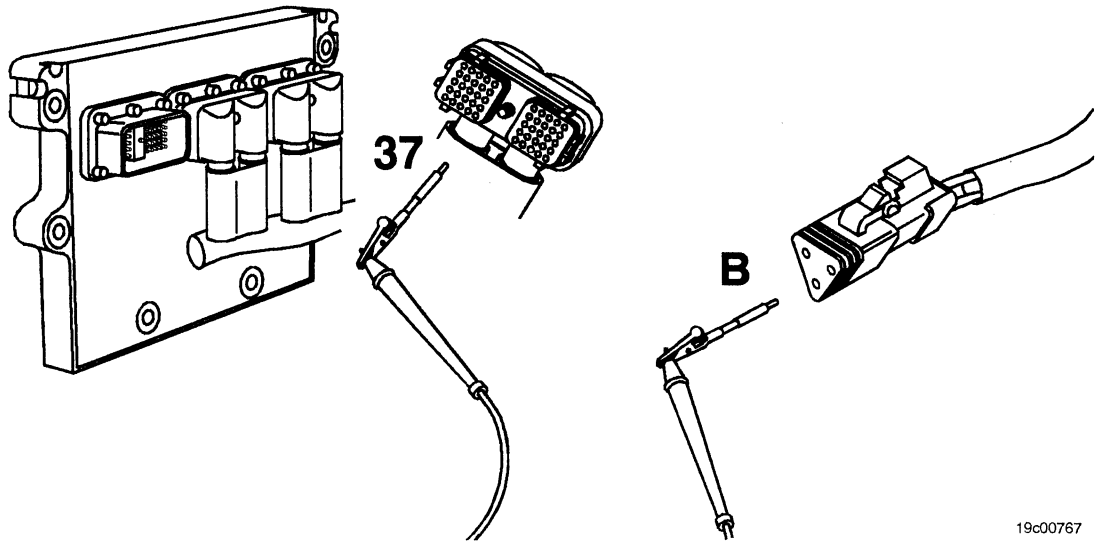
⚠CAUTION⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3823996 - female Weather-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the OEM harness connector from the ECM.
- Disconnect the J1939 harness from the VECU(s).

Action	Specifications/Repair	Next Step
Check for an open circuit in the return wire. • Measure the resistance from pin 37 at the OEM connector to pin B at the VECU(s).	**OK** **Less than 10 ohms**	3C
	NOT OK **Repair or replace the OEM harness** • Repair the OEM harness. Refer to Procedure 019-250. • Replace the OEM harness. Refer to Procedure 019-071.	5A



STEP 3C: Check for an open circuit in the shield wire.

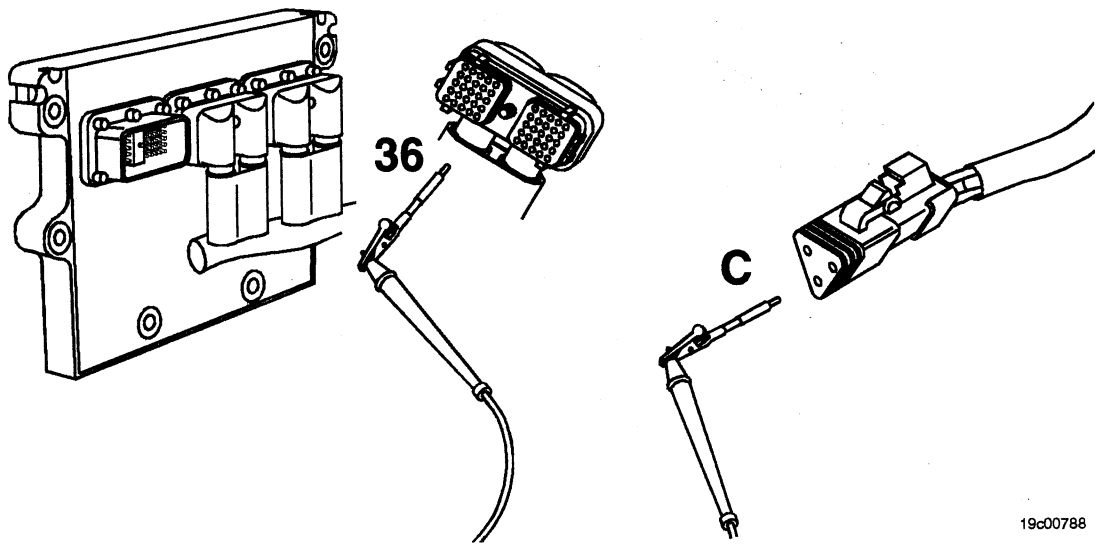
⚠CAUTION⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3823996 - female Weather-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the OEM harness connector from the ECM.
- Disconnect the J1939 harness from the VECU(s).

Action	Specifications/Repair	Next Step
Check for an open circuit in the shield wire. • Measure the resistance from pin 36 at the OEM connector to pin C at the VECU(s).	**OK** **Less than 10 ohms**	3D
	NOT OK **Repair or replace the OEM harness** • Repair the OEM harness. Refer to Procedure 019-250. • Replace the OEM harness. Refer to Procedure 019-071.	5A



STEP 3D: Check the resistance value of the J1939 harness.

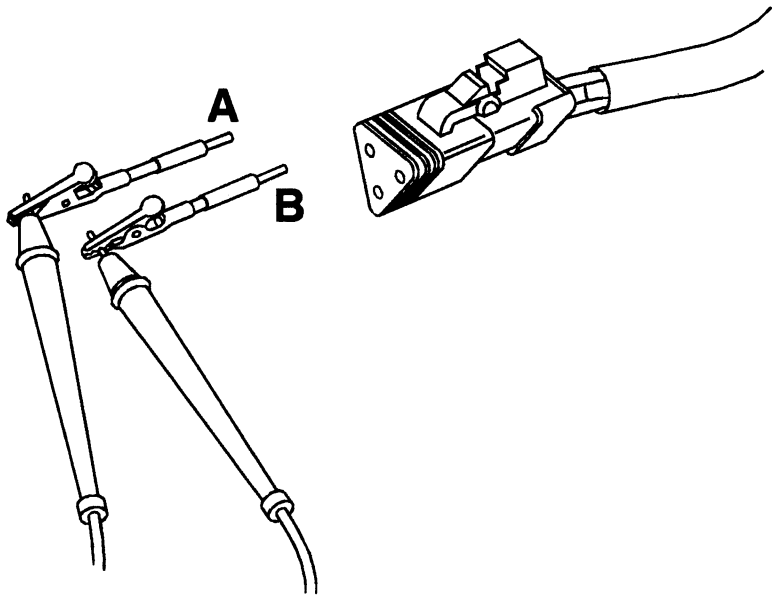
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3823996 - female Weather-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the J1939 harness from the VECU(s).
- Disconnect the engine harness from the J1939 backbone harness.

Action	Specifications/Repair	Next Step
Check the resistance value of the J1939 harness. • Measure the resistance from pin A to pin B of the J1939 harness connector, OEM side.	**OK** **55 to 65 ohms**	3E
	NOT OK **J1939 backbone termination resistors missing or damaged** Replace the termination resistors.	5A



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STEP 3E: Check for a short circuit to power in the supply wire.

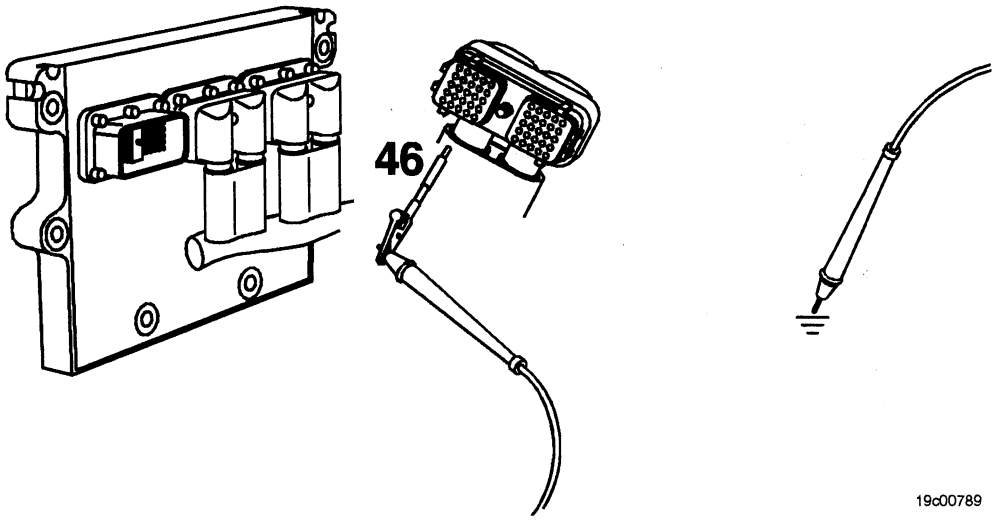
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the J1939 harness from the VECU(s).
- Disconnect the OEM harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check for a short circuit to power in the supply wire. • Measure the voltage from pin 46 at the ECM to engine block ground.	**OK** **Less than (+) 1.5 VDC**	3F
	NOT OK **Repair or replace the OEM harness** • Repair the OEM harness. Refer to Procedure 019-250. • Replace the OEM harness. Refer to Procedure 019-071.	5A



STEP 3F: Check for a short circuit to power in the return wire.

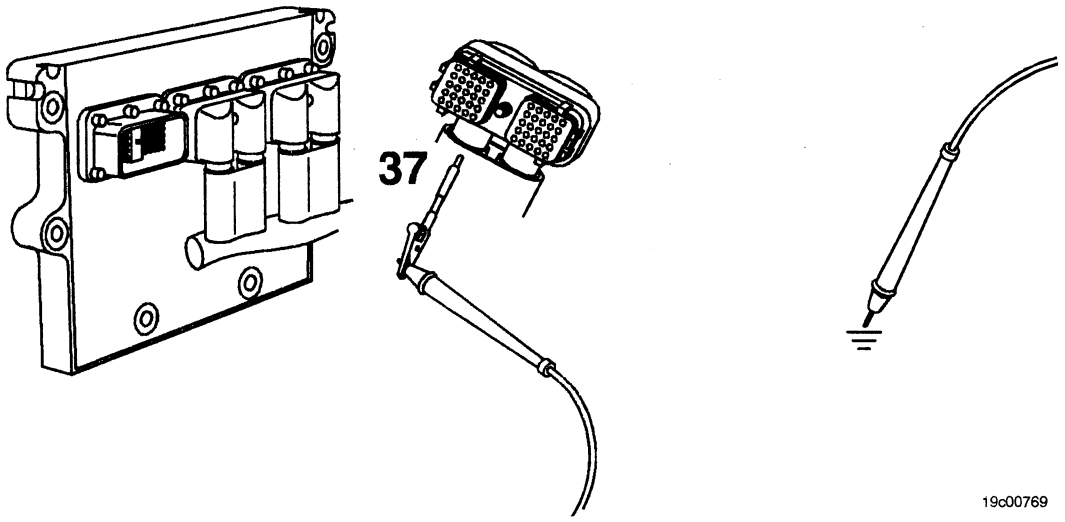
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the J1939 harness from the VECU(s).
- Disconnect the OEM harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check for a short circuit to power in the return wire. • Measure the voltage from pin 37 at the OEM harness connector to engine block ground.	**OK** **Less than (+) 1.5 VDC**	3G
	NOT OK **Repair or replace the OEM harness** • Repair the OEM harness. Refer to Procedure 019-250. • Replace the OEM harness. Refer to Procedure 019-071.	5A



STEP 3G: Check for a short circuit to ground in the supply wire.

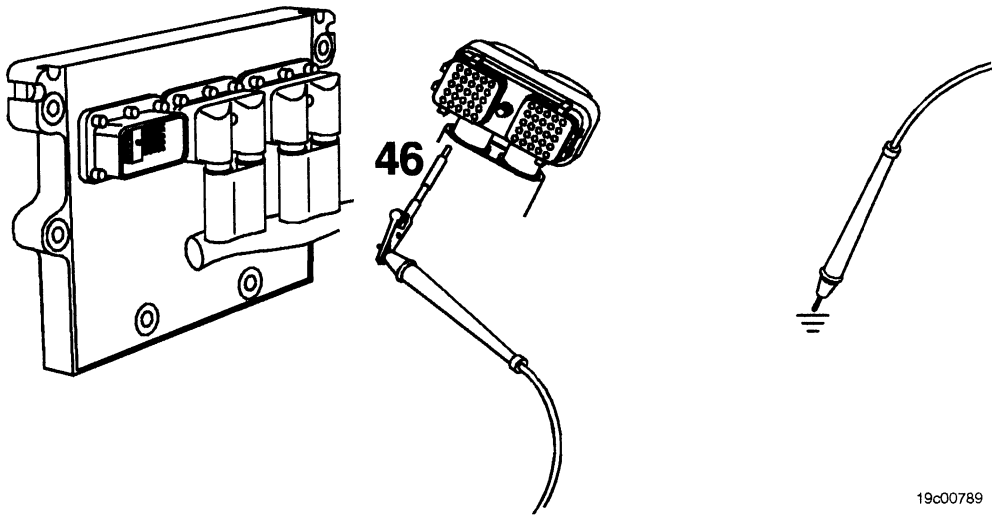
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the OEM harness connector from the ECM.
- Disconnect the J1939 harness from the VECU(s).

Action	Specifications/Repair	Next Step
Check for a short circuit to ground in the supply wire. • Measure the resistance from pin 46 in the OEM harness connector to ground.	**OK** **More than 100k ohms**	3H
	NOT OK **Repair or replace the OEM harness** • Repair the OEM harness. Refer to Procedure 019-250. • Replace the OEM harness. Refer to Procedure 019-071.	5A



STEP 3H: Check for a short circuit to ground in the return wire.

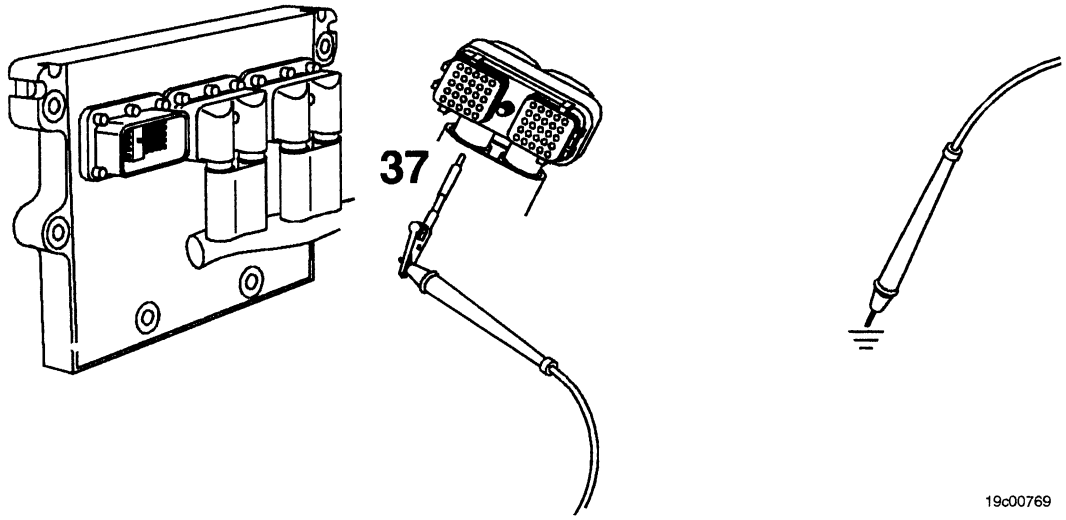
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the OEM harness connector from the ECM.
- Disconnect the J1939 harness from the VECU(s).

Action	Specifications/Repair	Next Step
Check for a short circuit to ground in the return wire. • Measure the resistance from pin 37 in the OEM harness connector to ground.	**OK** **More than 100k ohms**	3I
	NOT OK **Repair or replace the OEM harness** • Repair the OEM harness. Refer to Procedure 019-250. • Replace the OEM harness. Refer to Procedure 019-071.	5A



STEP 3I: Check for a short circuit from pin to pin in the OEM connector.

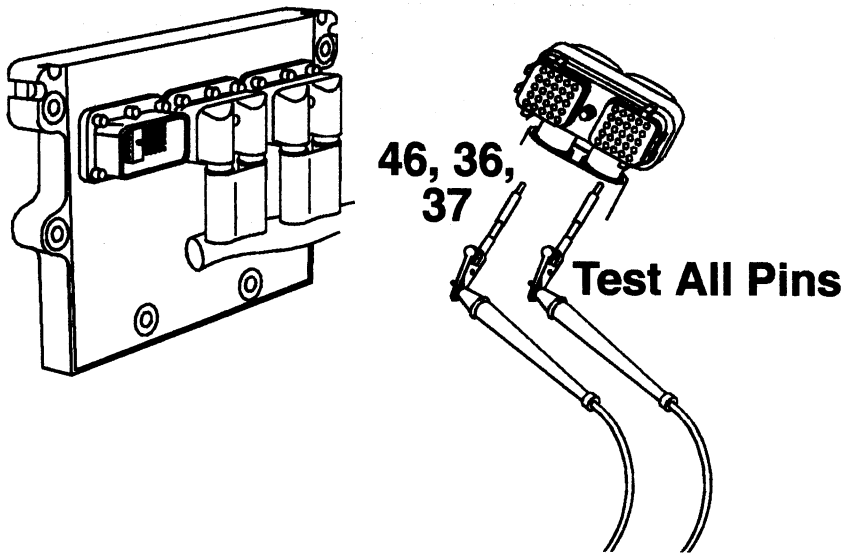
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the OEM harness connector from the ECM.
- Disconnect the J1939 harness from the VECU(s).
- Disconnect the engine harness from the J1939 backbone harness.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin in the OEM connector. • Measure the resistance from pin 46 in the OEM harness connector to all other pins in the connector. • Measure the resistance from pin 36 in the OEM harness connector to all other pins in the connector. • Measure the resistance from pin 37 in the OEM harness connector to all other pins in the connector.	**OK** **More than 100k ohms**	4A
	NOT OK **Repair or replace the OEM harness** • Repair the OEM harness. Refer to Procedure 019-250. • Replace the OEM harness. Refer to Procedure 019-071.	5A



STEP 4: Check for proper communication with the J1939 devices.

STEP 4A: Check communication with the ECM.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Install INLINE 2™ datalink adapter.
- Install INSITE™.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check communication with ECM. • Set up INSITE™ to use the J1939 datalink. Refer to the INSITE™ manual for details.	**OK** **Established communication by monitoring engine speed**	4B
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	5A

STEP 4B: Check communication with the VECU(s).

Condition:
- Install the OEM service tool software.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check communication with the VECU(s). • Using the OEM service tool software, confirm communication between VECU(s) and multiplexing devices.	**OK** **Proper communication between multiplexing devices and VECU(s)**	5A
	NOT OK **Replace the VECU(s)** Refer to the OEM troubleshooting and repair manual for repair procedures.	5A

STEP 5: Clear the fault codes.

STEP 5A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify that Fault Code 285 is inactive.	**OK** **Fault Code 285 inactive**	5B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location if all the steps have been completed and checked again.	1A

STEP 5B: Clear the inactive fault codes.

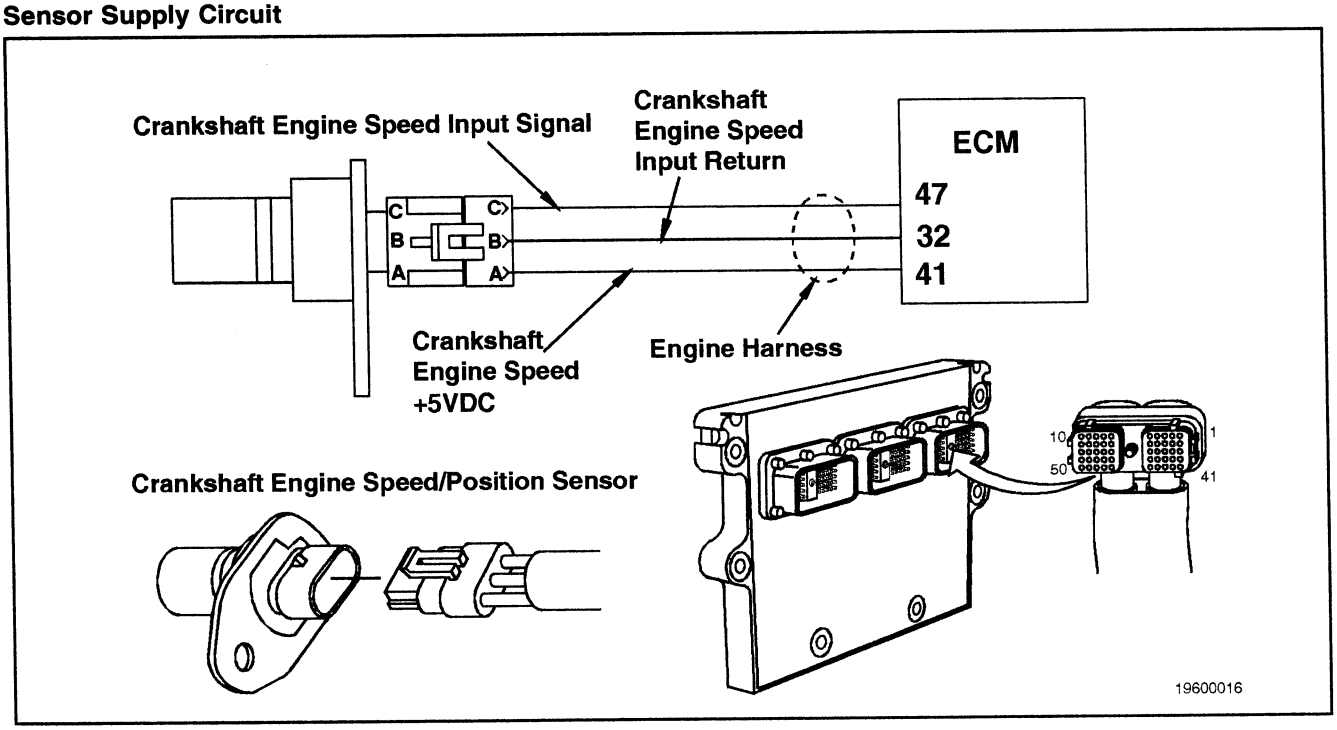
Condition: • Connect all components. • Turn keyswitch ON.		
Action	**Specifications/Repair**	**Next Step**
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 284

Sensor Supply Voltage

CODES	REASON	EFFECT
Fault Code: 284 PID(P), SID(S): P221 SPN: 1043 FMI: 4/4 Lamp: Yellow	Incorrect voltage detected on the electronic control module (ECM) voltage supply wire to the crankshaft engine position sensor.	Engine can possibly **not** run or will run derated. Possible hard starting, low power, or white smoke.

Sensor Supply Circuit



Circuit Description:

The ECM supplies the crankshaft engine position sensor with (+) 5 VDC. If the supply wire to any sensor is damaged, the sensor will **not** work correctly.

Component Location:

The crankshaft engine position sensor is located in the front cover on the intake side of the engine.

Shop Talk:

Incorrect voltage on the sensor (+) 5 VDC supply line will be caused by a short circuit to ground in a supply line, a short circuit between a supply line or a return line, a failed sensor, or a failed ECM power supply.

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging the new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3824775 - breakout cable
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check for a signal from the crankshaft engine position sensor.		
STEP 1A: Check the crankshaft engine position sensor.	Signal present	
STEP 2: Check the sensor harness.		
STEP 2A: Inspect the harness and the ECM connector pins.	No damaged pins	
STEP 2B: Check the supply voltage.	(+) 4.75 to 5.25 VDC	
STEP 2C: Check for a short circuit to ground in the sensor supply wire.	More than 100k ohms	
STEP 2D: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 3: Clear the fault code.		
STEP 3A: Disable the fault code.	Fault Code 284 inactive	
STEP 3B: Clear the inactive fault codes.	All faults cleared	

TROUBLESHOOTING STEP

STEP 1: Check for a signal from the crankshaft engine position sensor.

STEP 1A: Check the crankshaft engine position sensor.

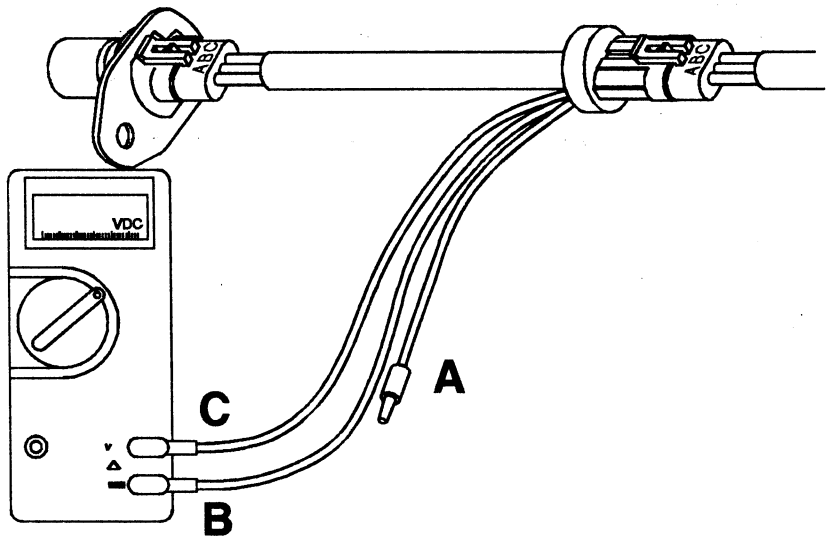
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3824775 - breakout cable.

Condition:

- Disconnect the engine harness from the crankshaft engine position sensor.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check for a signal from the crankshaft engine position sensor. • Measure the voltage from pin C (or YELLOW) to pin B (or BLACK) on the breakout cable while barring the engine over.	**OK** **Signal present;** **signal should change from (+) 4 - 5 VDC to (+) 0.5 - 2.3 VDC and back about every 60° of crankshaft rotation**	2A
	NOT OK **Replace the crankshaft engine position sensor** Refer to Procedure 019-038.	3A



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STEP 2: Check the sensor harness.

STEP 2A: Inspect the harness and the ECM connector pins.

⚠CAUTION⚠

To avoid damaging the new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the harness and the ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	2B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using the electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	3A

STEP 2B: Check the supply voltage.

⚠CAUTION⚠

To avoid damaging the new ECM, all other active fault codes must be investigated prior to replacing the ECM

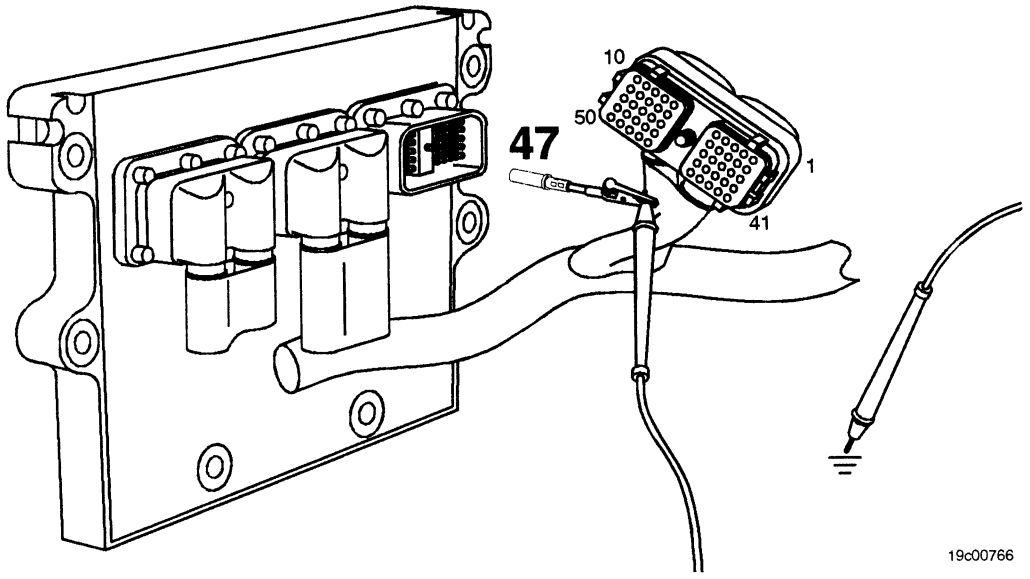
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the sensor harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the supply voltage. • Measure the supply voltage from the ECM sensor port pin 47 to ground.	**OK** **(+) 4.75 to 5.25 VDC**	2C
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	3A



STEP 2C: Check for a short circuit to ground in the sensor supply wire.

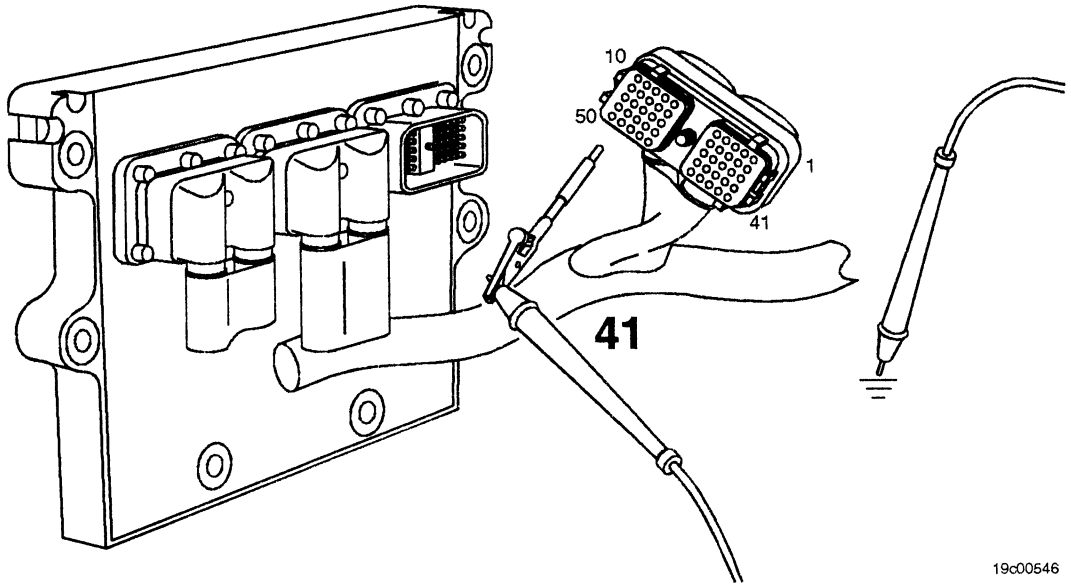
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for a short circuit to ground in the sensor supply wire. • Measure the resistance from pin 41 of the sensor harness connector to engine block ground.	**OK** **More than 100k ohms**	2D
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



STEP 2D: Check for a short circuit from pin to pin.

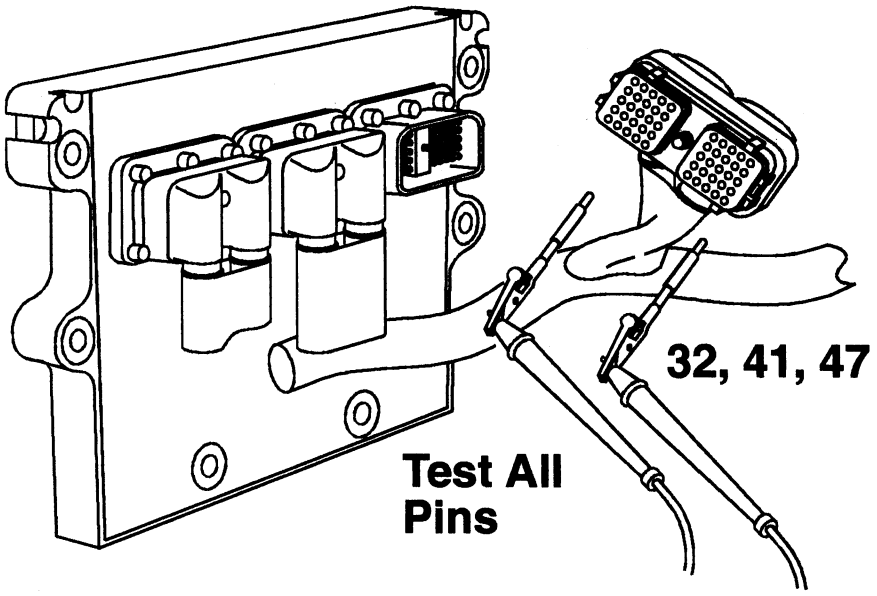
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin. • Measure the resistance from pin 32 of the sensor harness connector to all other pins in the connector. • Measure the resistance from pin 41 of the sensor harness connector to all other pins in the connector. • Measure the resistance from pin 47 of the sensor harness connector to all other pins in the connector.	**OK** **More than 100k ohms**	3A
	NOT OK **Repair or replace the engine harness..** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



STEP 3: Clear the fault code.

STEP 3A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify Fault Code 284 inactive.	**OK** **Fault Code 284 inactive**	3B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location if all the steps have been completed and checked again.	1A

STEP 3B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

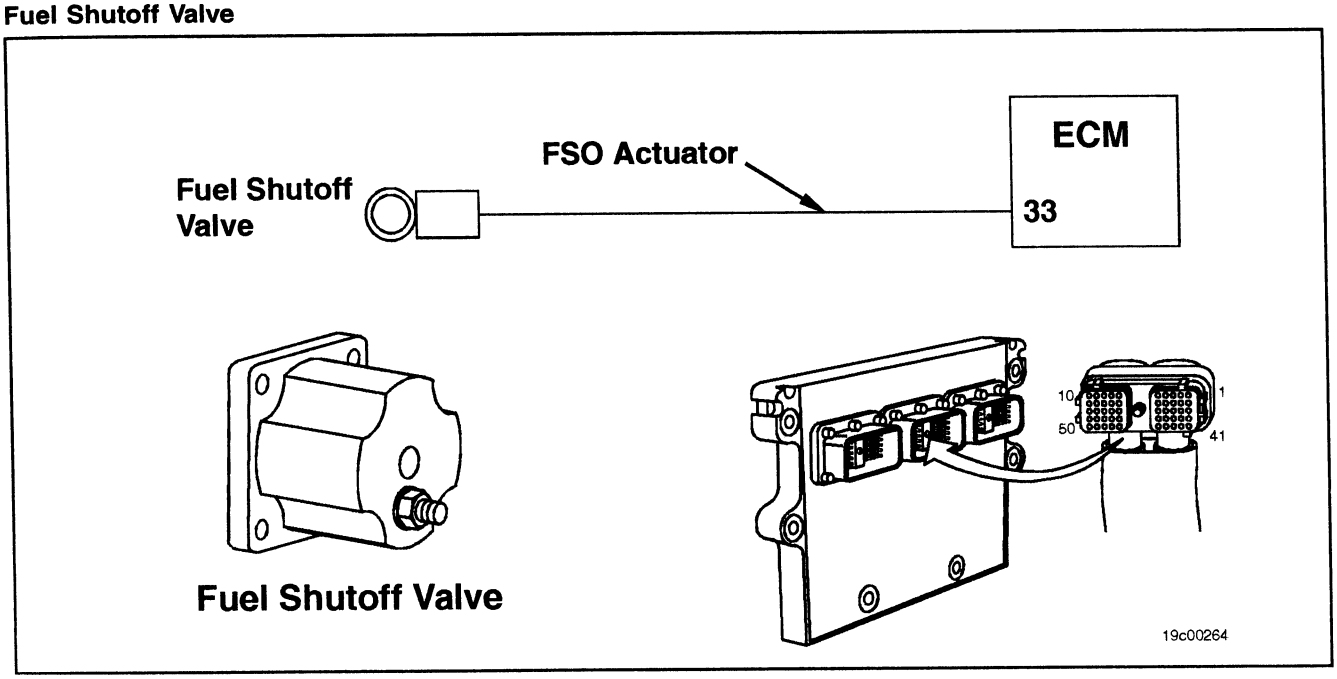
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All faults cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 259

Fuel Shutoff Valve

CODES	REASON	EFFECT
Fault Code: 259 PID(P), SID(S): S017 SPN: 632 FMI: 7/7 Lamp: Yellow	The ECM detected that the fuel shutoff valve is stuck open mechanically or leaking.	Engine will run derated.

Fuel Shutoff Valve



Circuit Description:

Voltage is supplied to the fuel shutoff valve by the ECM while the engine keyswitch is on. When the keyswitch is off, the voltage to the fuel shutoff valve is turned off by the ECM. The fuel shutoff valve closes and stops fuel from flowing to the fueling and timing actuators.

Component Location:

The fuel shutoff valve is located on the fuel delivery housing, below the air inlet horn.

Shop Talk:

Upon turning the keyswitch off, the ECM turns off the voltage supplied to keep the fuel shutoff open. The ECM continues to fire the fueling and timing actuators as the engine spins down. The ECM monitors fuel pressure using the fuel pressure sensor during this time. If the fuel pressure does **not** drop after the fuel shutoff valve is turned off, the ECM activates this fault.

TROUBLESHOOTING SUMMARY

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the fault status.		
STEP 1A: Check for active Fault Code 255 or high inactive counts.	Fault Code 255 not active	
STEP 2: Check for wires.		
STEP 2A: Check for extra wires attached to the fuel shutoff valve solenoid.	No extra wires	
STEP 3: Replace the fuel shutoff valve.		
STEP 3A: Replace the fuel shutoff valve.	Fault Code 259 inactive	
STEP 4: Clear the fault codes.		
STEP 4A: Disable the fault code.	Fault Code 259 inactive	
STEP 4B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check the fault status.

STEP 1A: Check for active Fault Code 255 or high inactive counts.

Condition:
- All the components connected.
- Turn keyswitch ON.

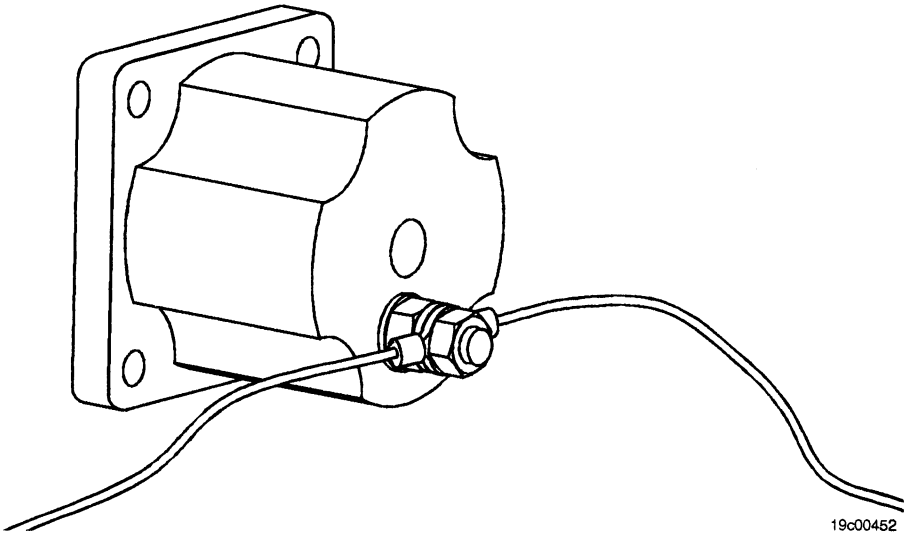
Action	Specifications/Repair	Next Step
Read the fault codes. • Read the fault codes using INSITE™.	**OK** **Fault Code 255 not active**	2A
	NOT OK Fault Code 255 active.	Refer to Fault Code 255

STEP 2: Check for wires.

STEP 2A: Check for extra wires attached to the fuel shutoff valve solenoid.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Check for extra wires attached to the fuel shutoff valve solenoid. • Visually check the fuel shutoff valve solenoid.	**OK** **No extra wires**	3A
	NOT OK **Remove extra wires attached to the fuel shutoff valve solenoid**	4A



STEP 3: Replace the fuel shutoff valve.

STEP 3A: Replace the fuel shutoff valve.

Condition:
- Turn keyswitch OFF.
- Disconnect the engine harness from the fuel shutoff valve.

Action	Specifications/Repair	Next Step
Replace the fuel shutoff valve. • Refer to Procedure 019-050.	**OK** **Fault Code 259 inactive**	4A
	NOT OK Return to troubleshooting steps or contact your local Cummins Authorized Repair Location if all steps have been completed and checked again.	1A

STEP 4: Clear the fault codes.

STEP 4A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Turn keyswitch OFF for 30 seconds. • Using INSITE™, verify Fault Code 259 is inactive.	**OK** **Fault Code 259 inactive**	4B
	NOT OK Return to troubleshooting steps or contact your local Cummins Authorized Repair Location if all steps have been completed and checked again.	1A

STEP 4B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

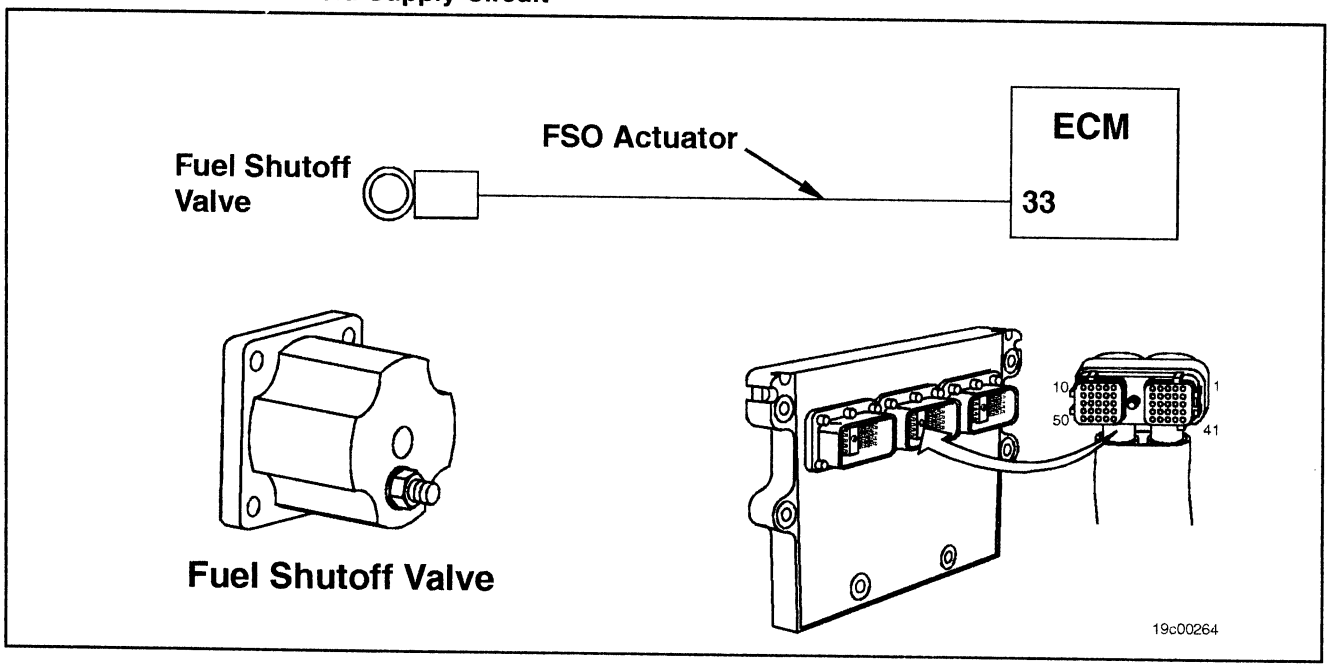
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 255

Fuel Shutoff Valve Solenoid Supply Circuit

CODES	REASON	EFFECT
Fault Code: 255 PID(P), SID(S): S017 SPN: 632 FMI: 3/3 Lamp: Yellow	Externally supplied voltage detected going to fuel shutoff valve solenoid supply circuit.	None on performance. Fuel shutoff valve stays on.

Fuel Shutoff Valve Solenoid Supply Circuit



Circuit Description:

If voltage is externally supplied to the fuel shutoff valve, it will stay open.

Component Location:

The fuel shutoff valve solenoid is located on the fuel delivery housing, below the air inlet horn. The solenoid is controlled by the ECM.

Shop Talk:

If there is an external shutdown system on the vehicle, make sure it is **not** miswired and feeding voltage into the fuel shutoff supply circuit.

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the actuator harness.		
STEP 1A: Inspect the harness and the ECM connector pins.	No damaged pins	
STEP 1B: Check for the external voltage source.	Less than (+) 1.5 VDC	
STEP 1C: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 2: Clear the fault codes.		
STEP 2A: Disable the fault code.	Fault Code 255 inactive	
STEP 2B: Clear the fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check the actuator harness.

STEP 1A: Inspect the harness and the ECM connector pins.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the harness and the ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	1B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	2A

STEP 1B: Check for the external voltage source.

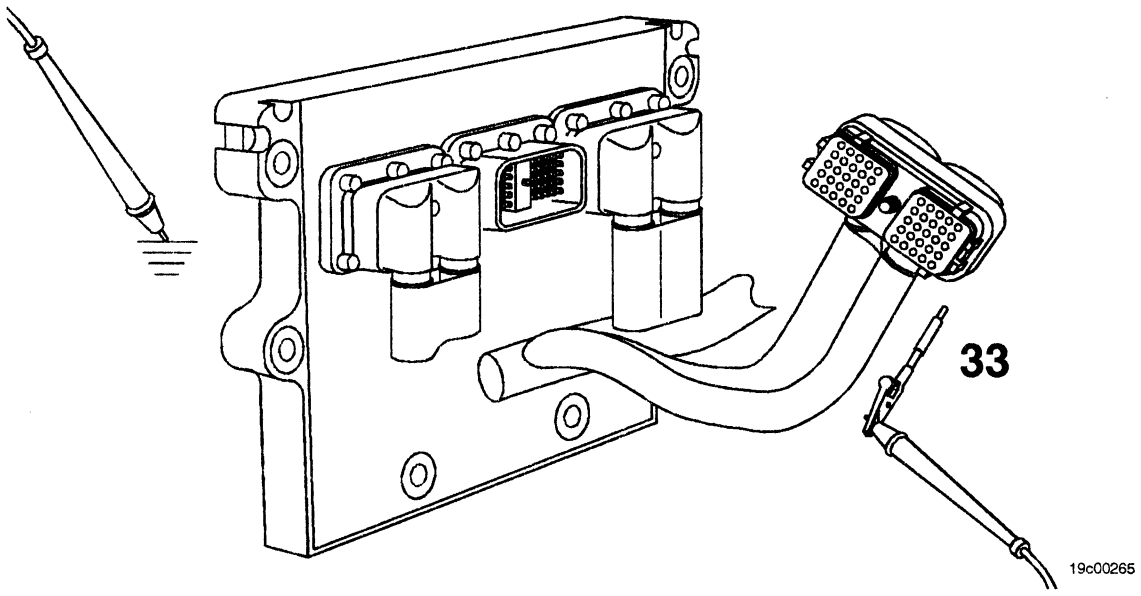
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the actuator harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check for the external voltage source. • Measure the voltage from pin 33 in actuator harness connector to engine block ground.	**OK** **Less than (+) 1.5 VDC**	1C
	NOT OK **Remove the external voltage source** There is an external source connected to the wire at which more than (+) 1.5 VDC was measured. Find the voltage source and remove it from the circuit.	2A



STEP 3E: Check for a short circuit to power in the supply wire.

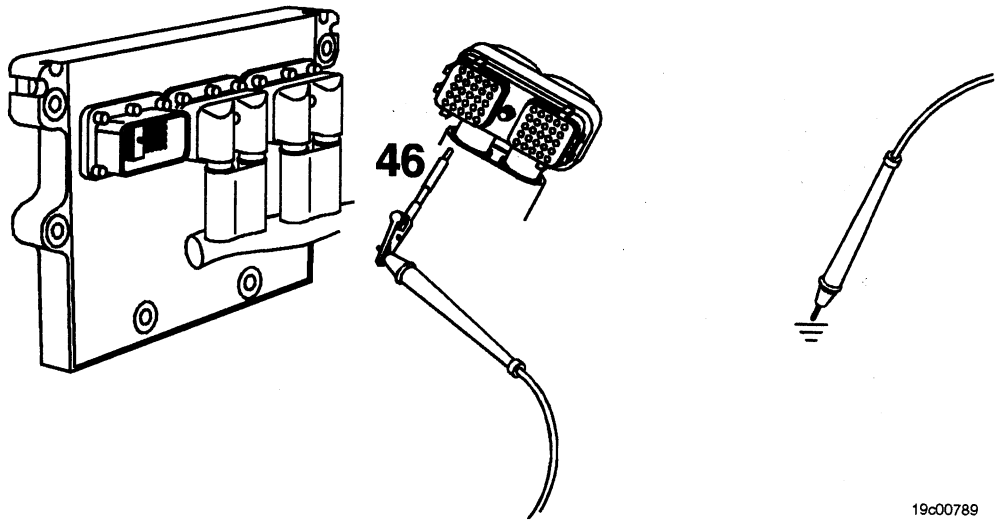
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the J1939 harness from the VECU(s).
- Disconnect the OEM harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check for a short circuit to power in the supply wire. • Measure the voltage from pin 46 at the ECM to engine block ground.	**OK** **Less than (+) 1.5 VDC**	3F
	NOT OK **Repair or replace the OEM harness** • Repair the OEM harness. Refer to Procedure 019-250. • Replace the OEM harness. Refer to Procedure 019-071.	5A



STEP 3F: Check for a short circuit to power in the return wire.

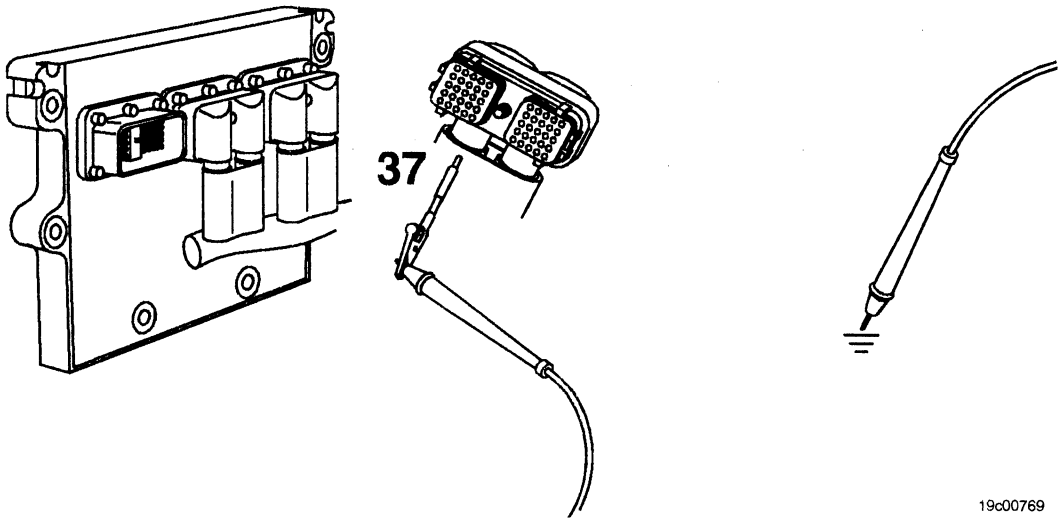
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the J1939 harness from the VECU(s).
- Disconnect the OEM harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check for a short circuit to power in the return wire. • Measure the voltage from pin 37 at the OEM harness connector to engine block ground.	**OK** **Less than (+) 1.5 VDC**	3G
	NOT OK **Repair or replace the OEM harness** • Repair the OEM harness. Refer to Procedure 019-250. • Replace the OEM harness. Refer to Procedure 019-071.	5A



STEP 3G: Check for a short circuit to ground in the supply wire.

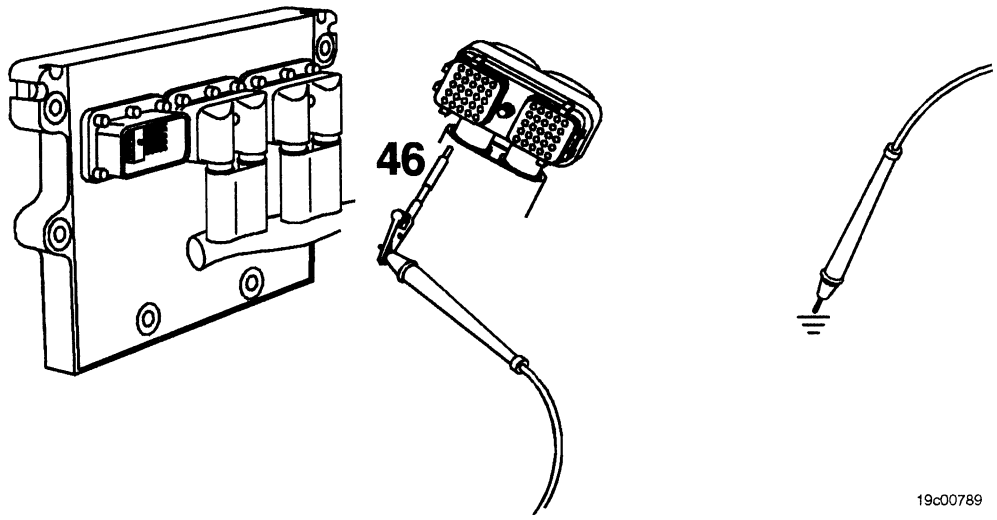
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the OEM harness connector from the ECM.
- Disconnect the J1939 harness from the VECU(s).

Action	Specifications/Repair	Next Step
Check for a short circuit to ground in the supply wire. • Measure the resistance from pin 46 in the OEM harness connector to ground.	**OK** **More than 100k ohms**	3H
	NOT OK **Repair or replace the OEM harness** • Repair the OEM harness. Refer to Procedure 019-250. • Replace the OEM harness. Refer to Procedure 019-071.	5A



STEP 3H: Check for a short circuit to ground in the return wire.

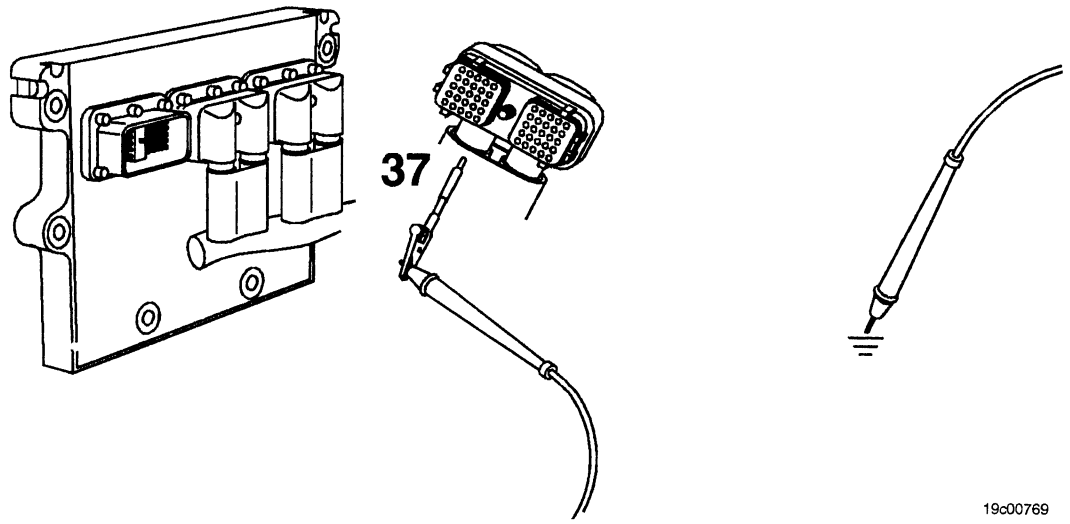
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the OEM harness connector from the ECM.
- Disconnect the J1939 harness from the VECU(s).

Action	Specifications/Repair	Next Step
Check for a short circuit to ground in the return wire. • Measure the resistance from pin 37 in the OEM harness connector to ground.	**OK** **More than 100k ohms**	3I
	NOT OK **Repair or replace the OEM harness** • Repair the OEM harness. Refer to Procedure 019-250. • Replace the OEM harness. Refer to Procedure 019-071.	5A



STEP 3I: Check for a short circuit from pin to pin in the OEM connector.

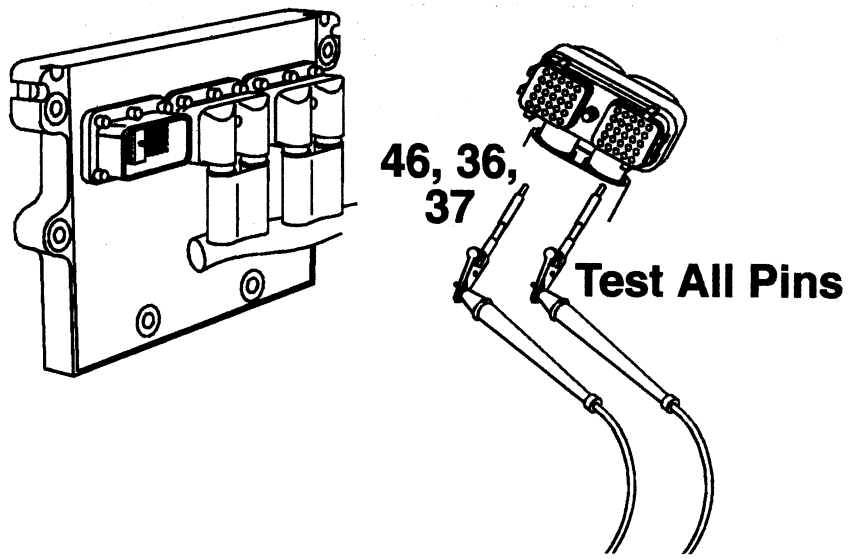
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the OEM harness connector from the ECM.
- Disconnect the J1939 harness from the VECU(s).
- Disconnect the engine harness from the J1939 backbone harness.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin in the OEM connector. • Measure the resistance from pin 46 in the OEM harness connector to all other pins in the connector. • Measure the resistance from pin 36 in the OEM harness connector to all other pins in the connector. • Measure the resistance from pin 37 in the OEM harness connector to all other pins in the connector.	**OK** **More than 100k ohms**	4A
	NOT OK **Repair or replace the OEM harness** • Repair the OEM harness. Refer to Procedure 019-250. • Replace the OEM harness. Refer to Procedure 019-071.	5A



STEP 4: Check for proper communication with the J1939 devices.

STEP 4A: Check communication with the ECM.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Install INLINE 2™ datalink adapter.
- Install INSITE™.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check communication with ECM. • Set up INSITE™ to use the J1939 datalink. Refer to the INSITE™ manual for details.	**OK** **Established communication by monitoring engine speed**	4B
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	5A

STEP 4B: Check communication with the VECU(s).

Condition:
- Install the OEM service tool software.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check communication with the VECU(s). • Using the OEM service tool software, confirm communication between VECU(s) and multiplexing devices.	**OK** **Proper communication between multiplexing devices and VECU(s)**	5A
	NOT OK **Replace the VECU(s)** Refer to the OEM troubleshooting and repair manual for repair procedures.	5A

STEP 5: Clear the fault codes.

STEP 5A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify that Fault Code 285 is inactive.	**OK** **Fault Code 285 inactive**	5B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location if all the steps have been completed and checked again.	1A

STEP 5B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

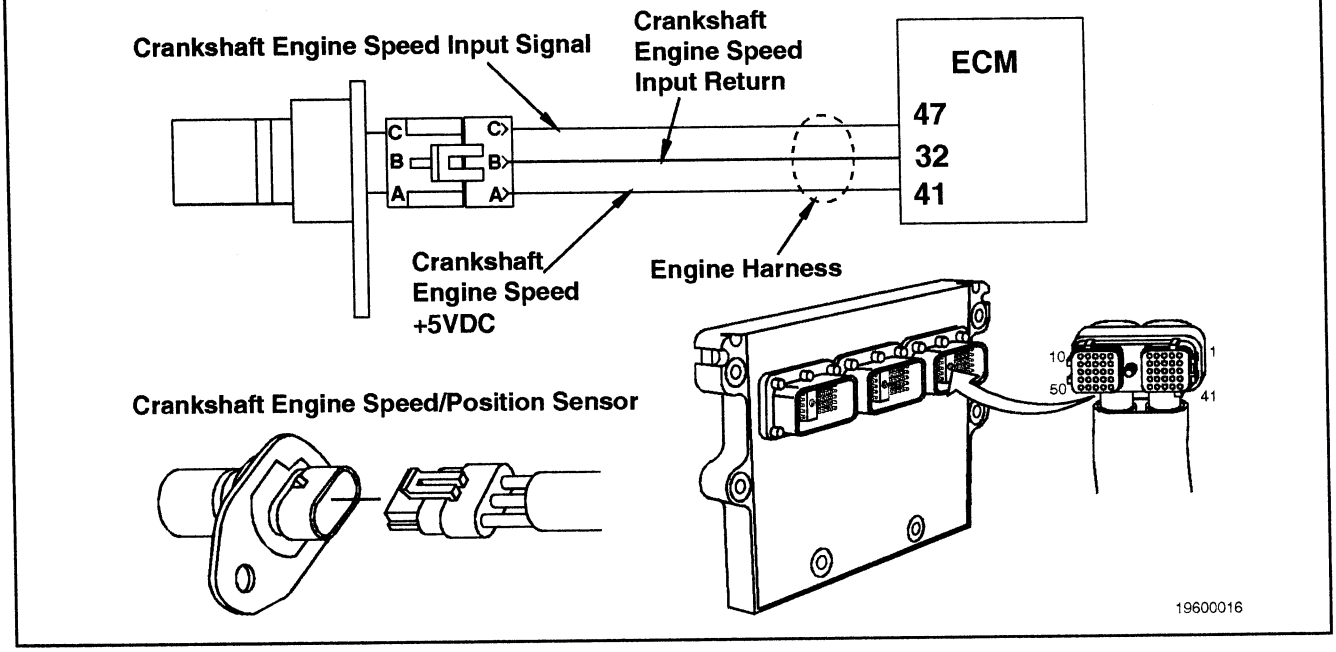
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 284

Sensor Supply Voltage

CODES	REASON	EFFECT
Fault Code: 284 PID(P), SID(S): P221 SPN: 1043 FMI: 4/4 Lamp: Yellow	Incorrect voltage detected on the electronic control module (ECM) voltage supply wire to the crankshaft engine position sensor.	Engine can possibly **not** run or will run derated. Possible hard starting, low power, or white smoke.

Sensor Supply Circuit



Circuit Description:

The ECM supplies the crankshaft engine position sensor with (+) 5 VDC. If the supply wire to any sensor is damaged, the sensor will **not** work correctly.

Component Location:

The crankshaft engine position sensor is located in the front cover on the intake side of the engine.

Shop Talk:

Incorrect voltage on the sensor (+) 5 VDC supply line will be caused by a short circuit to ground in a supply line, a short circuit between a supply line or a return line, a failed sensor, or a failed ECM power supply.

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging the new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3824775 - breakout cable
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check for a signal from the crankshaft engine position sensor.		
STEP 1A: Check the crankshaft engine position sensor.	Signal present	
STEP 2: Check the sensor harness.		
STEP 2A: Inspect the harness and the ECM connector pins.	No damaged pins	
STEP 2B: Check the supply voltage.	(+) 4.75 to 5.25 VDC	
STEP 2C: Check for a short circuit to ground in the sensor supply wire.	More than 100k ohms	
STEP 2D: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 3: Clear the fault code.		
STEP 3A: Disable the fault code.	Fault Code 284 inactive	
STEP 3B: Clear the inactive fault codes.	All faults cleared	

TROUBLESHOOTING STEP

STEP 1: Check for a signal from the crankshaft engine position sensor.

STEP 1A: Check the crankshaft engine position sensor.

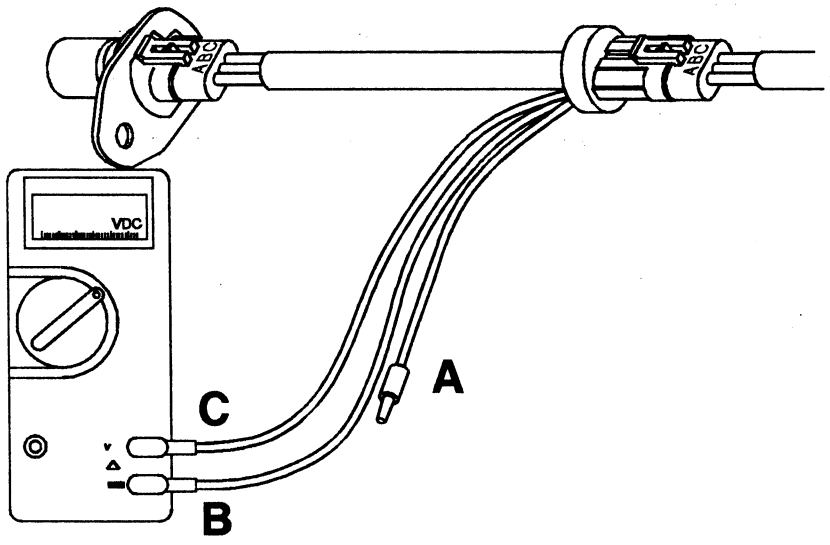
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3824775 - breakout cable.

Condition:

- Disconnect the engine harness from the crankshaft engine position sensor.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check for a signal from the crankshaft engine position sensor. • Measure the voltage from pin C (or YELLOW) to pin B (or BLACK) on the breakout cable while barring the engine over.	**OK** **Signal present;** **signal should change from (+) 4 - 5 VDC to (+) 0.5 - 2.3 VDC and back about every 60° of crankshaft rotation**	2A
	NOT OK **Replace the crankshaft engine position sensor** Refer to Procedure 019-038.	3A



19c00765

STEP 2: Check the sensor harness.

STEP 2A: Inspect the harness and the ECM connector pins.

⚠CAUTION⚠

To avoid damaging the new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the harness and the ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	2B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using the electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	3A

STEP 2B: Check the supply voltage.

⚠CAUTION⚠

To avoid damaging the new ECM, all other active fault codes must be investigated prior to replacing the ECM

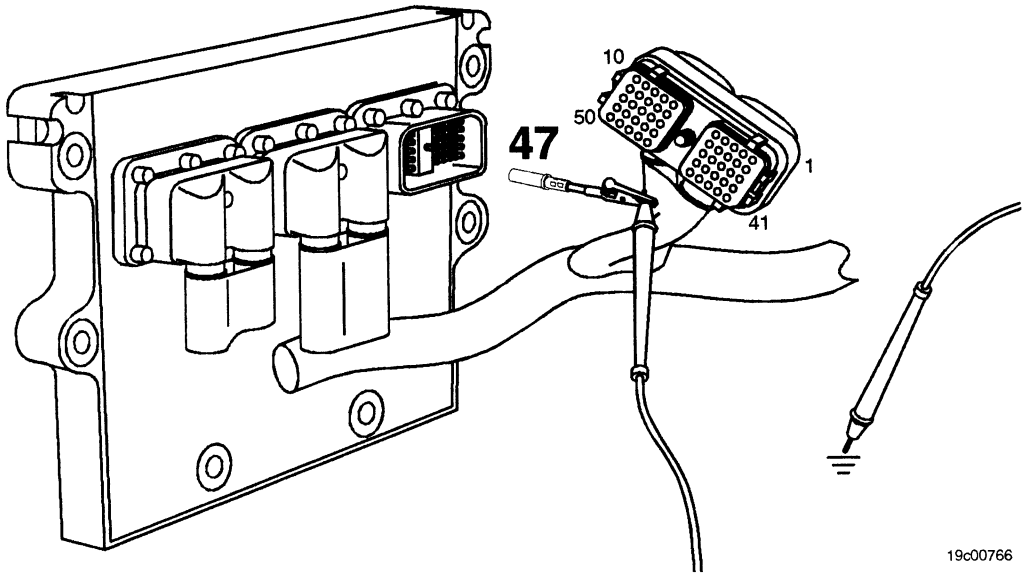
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the sensor harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the supply voltage. • Measure the supply voltage from the ECM sensor port pin 47 to ground.	**OK** **(+) 4.75 to 5.25 VDC**	2C
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	3A



STEP 2C: Check for a short circuit to ground in the sensor supply wire.

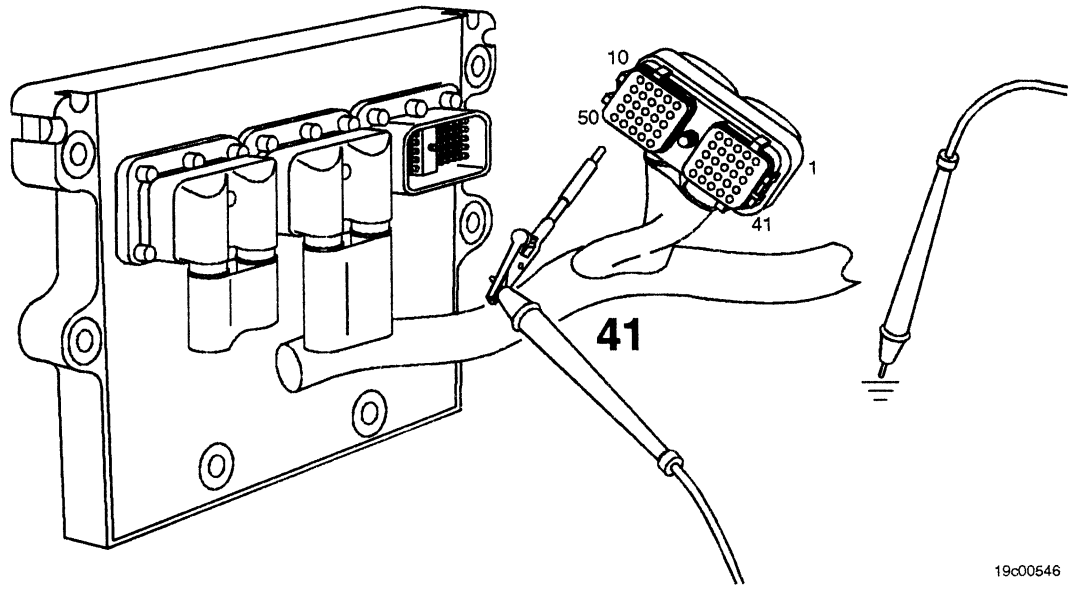
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for a short circuit to ground in the sensor supply wire. • Measure the resistance from pin 41 of the sensor harness connector to engine block ground.	**OK** **More than 100k ohms**	2D
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



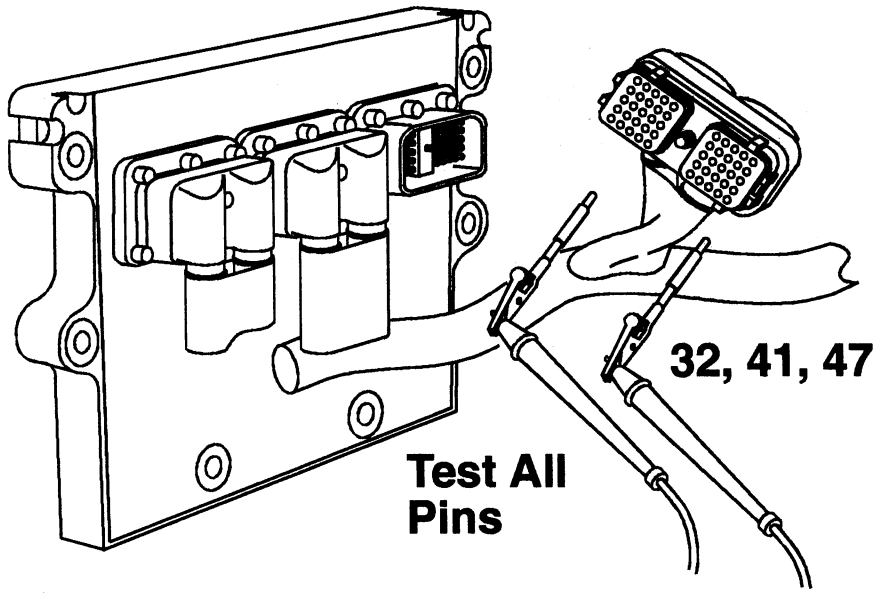
STEP 2D: Check for a short circuit from pin to pin.

⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:
- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin. • Measure the resistance from pin 32 of the sensor harness connector to all other pins in the connector. • Measure the resistance from pin 41 of the sensor harness connector to all other pins in the connector. • Measure the resistance from pin 47 of the sensor harness connector to all other pins in the connector.	**OK** **More than 100k ohms**	3A
	NOT OK **Repair or replace the engine harness..** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



STEP 3: Clear the fault code.

STEP 3A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify Fault Code 284 inactive.	**OK** **Fault Code 284 inactive**	3B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location if all the steps have been completed and checked again.	1A

STEP 3B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

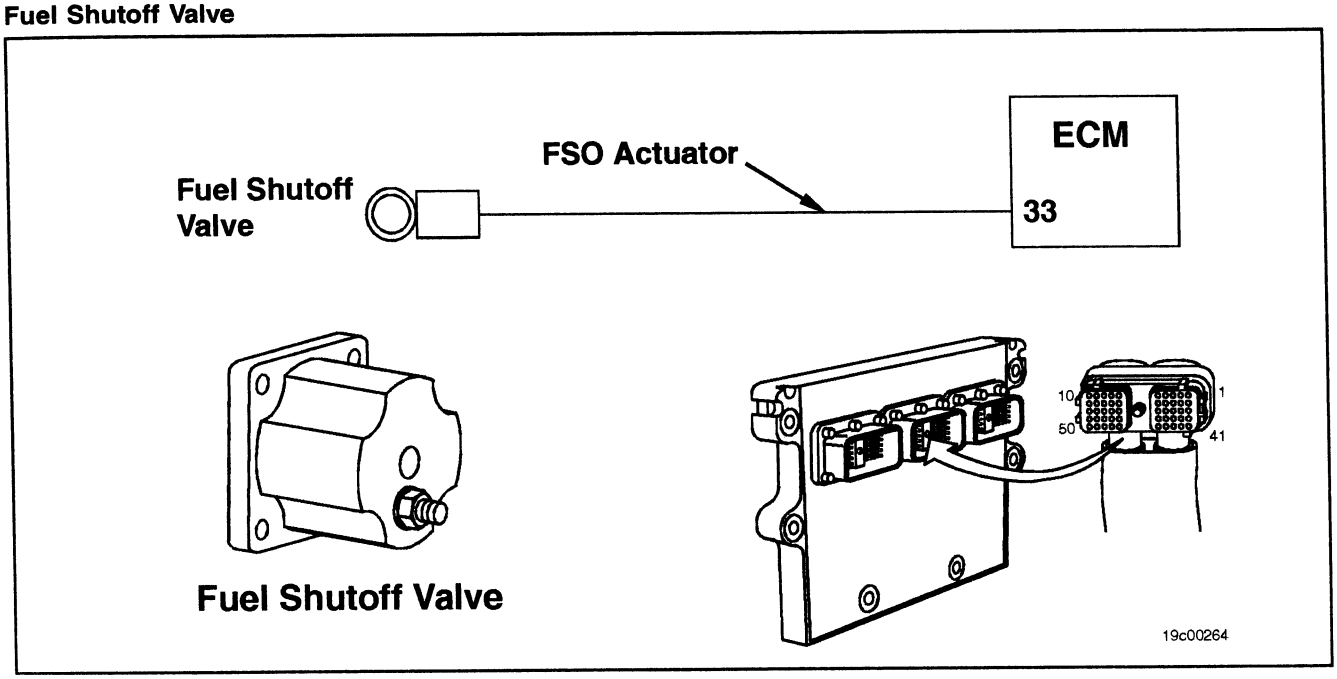
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All faults cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 259

Fuel Shutoff Valve

CODES	REASON	EFFECT
Fault Code: 259 PID(P), SID(S): S017 SPN: 632 FMI: 7/7 Lamp: Yellow	The ECM detected that the fuel shutoff valve is stuck open mechanically or leaking.	Engine will run derated.

Fuel Shutoff Valve



Circuit Description:

Voltage is supplied to the fuel shutoff valve by the ECM while the engine keyswitch is on. When the keyswitch is off, the voltage to the fuel shutoff valve is turned off by the ECM. The fuel shutoff valve closes and stops fuel from flowing to the fueling and timing actuators.

Component Location:

The fuel shutoff valve is located on the fuel delivery housing, below the air inlet horn.

Shop Talk:

Upon turning the keyswitch off, the ECM turns off the voltage supplied to keep the fuel shutoff open. The ECM continues to fire the fueling and timing actuators as the engine spins down. The ECM monitors fuel pressure using the fuel pressure sensor during this time. If the fuel pressure does **not** drop after the fuel shutoff valve is turned off, the ECM activates this fault.

TROUBLESHOOTING SUMMARY

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the fault status.		
STEP 1A: Check for active Fault Code 255 or high inactive counts.	Fault Code 255 not active	
STEP 2: Check for wires.		
STEP 2A: Check for extra wires attached to the fuel shutoff valve solenoid.	No extra wires	
STEP 3: Replace the fuel shutoff valve.		
STEP 3A: Replace the fuel shutoff valve.	Fault Code 259 inactive	
STEP 4: Clear the fault codes.		
STEP 4A: Disable the fault code.	Fault Code 259 inactive	
STEP 4B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check the fault status.

STEP 1A: Check for active Fault Code 255 or high inactive counts.

Condition:
- All the components connected.
- Turn keyswitch ON.

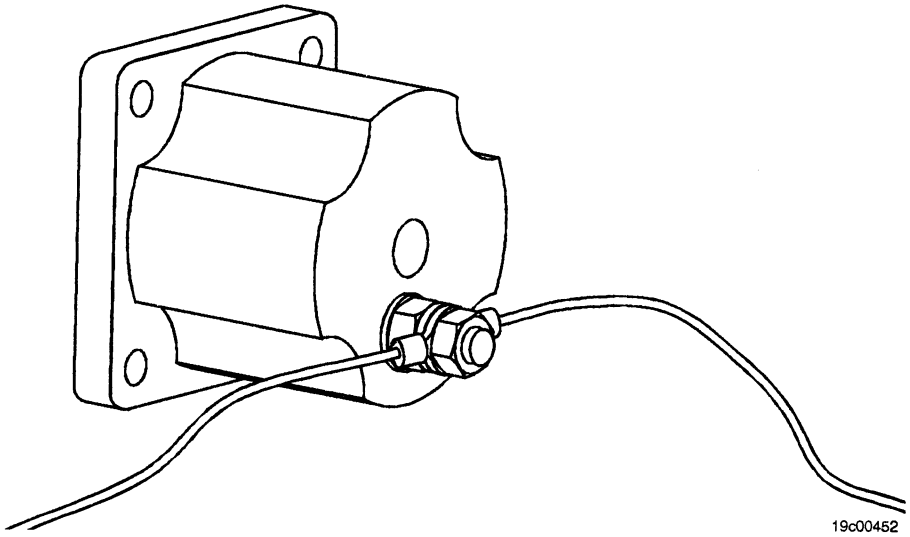
Action	Specifications/Repair	Next Step
Read the fault codes. • Read the fault codes using INSITE™.	**OK** **Fault Code 255 not active**	2A
	NOT OK Fault Code 255 active.	Refer to Fault Code 255

STEP 2: Check for wires.

STEP 2A: Check for extra wires attached to the fuel shutoff valve solenoid.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Check for extra wires attached to the fuel shutoff valve solenoid. • Visually check the fuel shutoff valve solenoid.	**OK** **No extra wires**	3A
	NOT OK **Remove extra wires attached to the fuel shutoff valve solenoid**	4A



STEP 3: Replace the fuel shutoff valve.

STEP 3A: Replace the fuel shutoff valve.

Condition:
- Turn keyswitch OFF.
- Disconnect the engine harness from the fuel shutoff valve.

Action	Specifications/Repair	Next Step
Replace the fuel shutoff valve. • Refer to Procedure 019-050.	**OK** **Fault Code 259 inactive**	4A
	NOT OK Return to troubleshooting steps or contact your local Cummins Authorized Repair Location if all steps have been completed and checked again.	1A

STEP 4: Clear the fault codes.

STEP 4A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Turn keyswitch OFF for 30 seconds. • Using INSITE™, verify Fault Code 259 is inactive.	**OK** **Fault Code 259 inactive**	4B
	NOT OK Return to troubleshooting steps or contact your local Cummins Authorized Repair Location if all steps have been completed and checked again.	1A

STEP 4B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

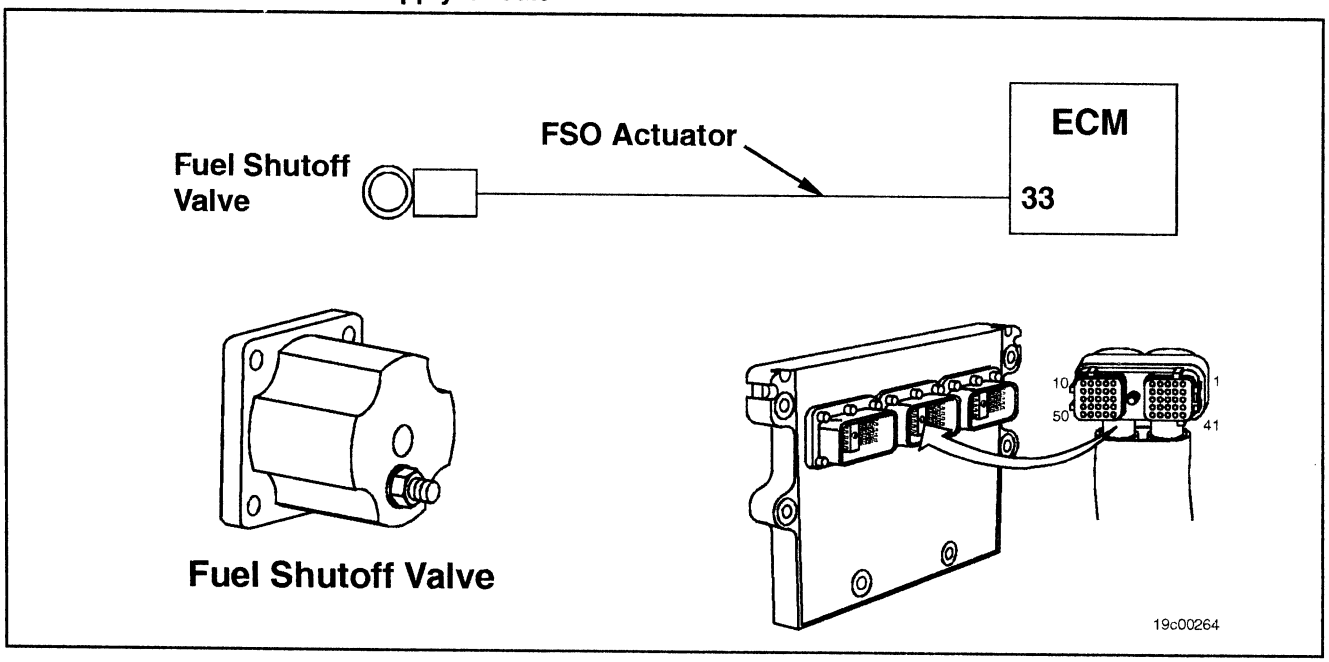
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 255

Fuel Shutoff Valve Solenoid Supply Circuit

CODES	REASON	EFFECT
Fault Code: 255 PID(P), SID(S): S017 SPN: 632 FMI: 3/3 Lamp: Yellow	Externally supplied voltage detected going to fuel shutoff valve solenoid supply circuit.	None on performance. Fuel shutoff valve stays on.

Fuel Shutoff Valve Solenoid Supply Circuit



Circuit Description:

If voltage is externally supplied to the fuel shutoff valve, it will stay open.

Component Location:

The fuel shutoff valve solenoid is located on the fuel delivery housing, below the air inlet horn. The solenoid is controlled by the ECM.

Shop Talk:

If there is an external shutdown system on the vehicle, make sure it is **not** miswired and feeding voltage into the fuel shutoff supply circuit.

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

**To avoid pin and harness damage, use the following test lead when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.**

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the actuator harness.		
STEP 1A: Inspect the harness and the ECM connector pins.	No damaged pins	
STEP 1B: Check for the external voltage source.	Less than (+) 1.5 VDC	
STEP 1C: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 2: Clear the fault codes.		
STEP 2A: Disable the fault code.	Fault Code 255 inactive	
STEP 2B: Clear the fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check the actuator harness.

STEP 1A: Inspect the harness and the ECM connector pins.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the harness and the ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	1B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	2A

STEP 1B: Check for the external voltage source.

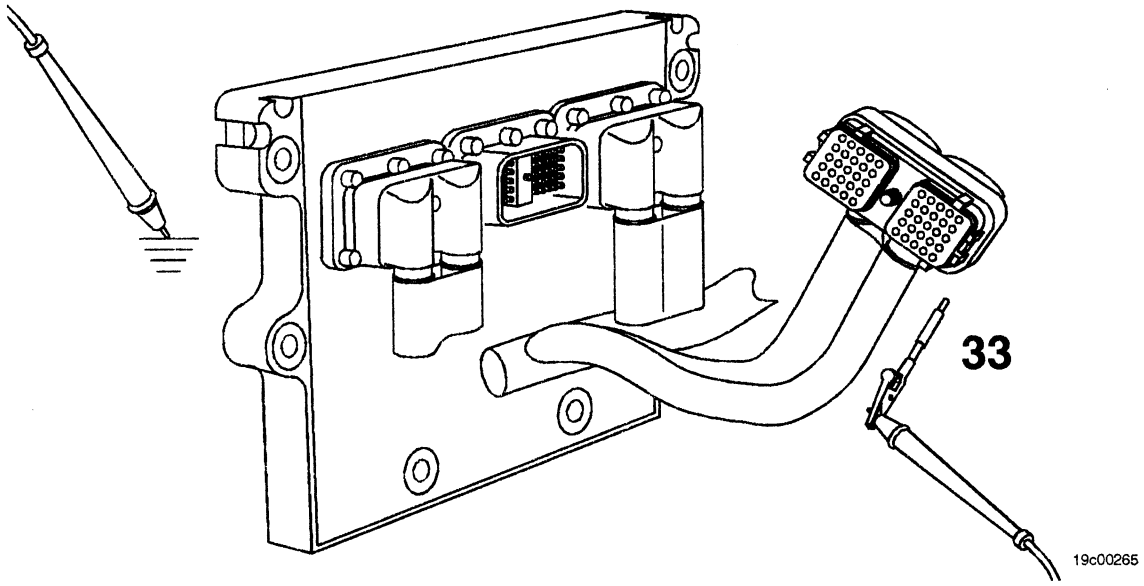
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the actuator harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check for the external voltage source. • Measure the voltage from pin 33 in actuator harness connector to engine block ground.	**OK** **Less than (+) 1.5 VDC**	1C
	NOT OK **Remove the external voltage source** There is an external source connected to the wire at which more than (+) 1.5 VDC was measured. Find the voltage source and remove it from the circuit.	2A



STEP 1C: Check for a short circuit from pin to pin.

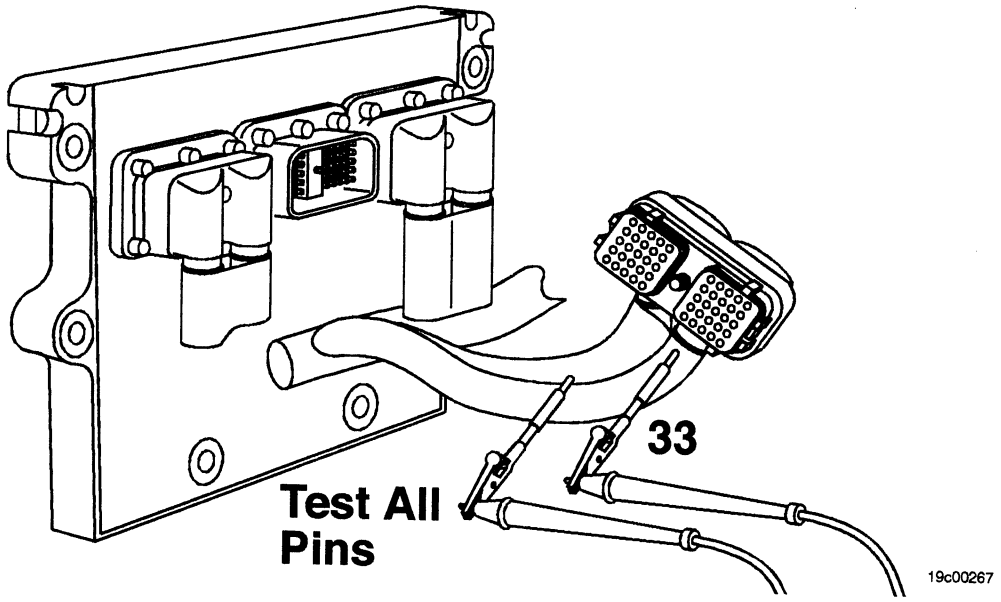
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.
- Disconnect the engine harness from the fuel shutoff valve solenoid.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin. • Measure the resistance from pin 33 of the actuator harness connector to all other pins in the connector.	**OK** **More than 100k ohms**	2A
	NOT OK **Replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	2A



STEP 2: Clear the fault codes.

STEP 2A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify Fault Code 255 is inactive.	**OK** **Fault Code 255 inactive**	2B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location if all the steps have been completed and checked again.	1A

STEP 2B: Clear the fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

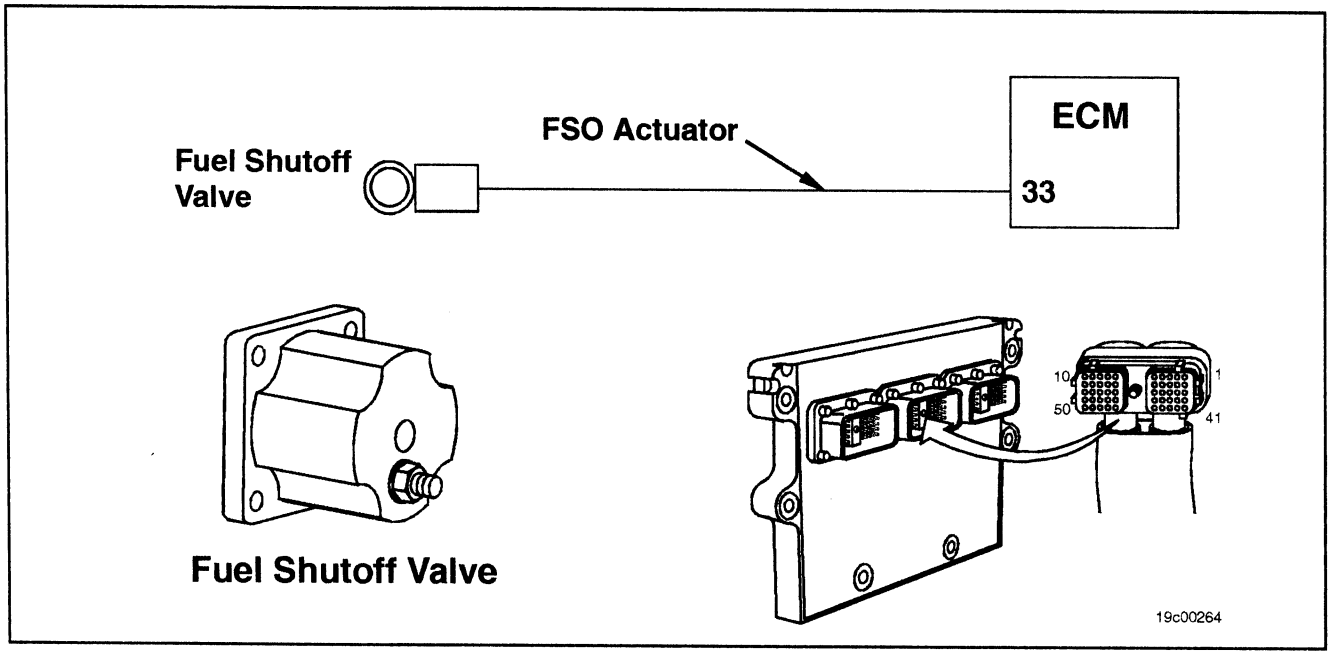
Action	Specifications/Repair	Next Step
Clear the fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 254

Fuel Shutoff Valve Solenoid Supply Circuit

CODES	REASON	EFFECT
Fault Code: 254 PID(P), SID(S): S017 SPN: 632 FMI: 4/4 Lamp: Red	Less than (+) 6 VDC detected at fuel shutoff circuit or an excessive current draw from the ECM or faulty ECM output circuit.	The ECM turns off the fuel shutoff supply voltage. The engine will shut down.

Fuel Shutoff Valve Solenoid Supply Circuit



Circuit Description:

The fuel shutoff valve solenoid is a device used by the ECM to control the engine fuel supply. The ECM can shut down the engine by cutting off the power to the fuel shutoff valve solenoid.

Component Location:

The fuel shutoff valve solenoid is located on the fuel delivery housing above the fuel filter.

Shop Talk:

- Inspect the fuel shutoff supply circuit for external wires that can be spliced in to power another device. Remove any extra wires that are found in the circuit.
- If there is an external shutdown system on the vehicle that uses the fuel shutoff valve for engine shutdown, make sure it has **not** failed and pulled down the voltage on the fuel shutoff circuit.
- Inspect the engine-block-to-chassis ground wire to make sure it is securely fastened to a clean, dry, conductive surface.
- Check the starter solenoid (+) terminal for a loose connector or accessory wiring with damaged insulation.

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging the new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the fuel shutoff valve solenoid.		
STEP 1A: Check for extra wires on the fuel shutoff valve solenoid post.	No extra wires	
STEP 1B: Check for corrosion on the solenoid post.	No corrosion found	
STEP 1C: Check the supply voltage at the fuel shutoff valve solenoid.	More than (+) 6 VDC	
STEP 1C-1: Check the actuator harness and the ECM connector pins.	No damaged pins	
STEP 1C-2: Check for an open circuit.	Less than 10 ohms	
STEP 1C-3: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 1C-4: Measure the voltage from the ECM.	More than (+) 6 VDC	
STEP 1D: Check the fuel shutoff valve solenoid resistance.	7 to 8 ohms for (+) 12-VDC solenoids, 28 to 32 ohms for (+) 24-VDC solenoids	
STEP 2: Clear the fault codes.		
STEP 2A: Disable the fault code.	Fault Code 254 inactive	
STEP 2B: Clear the inactive fault codes.	All fault codes cleared	

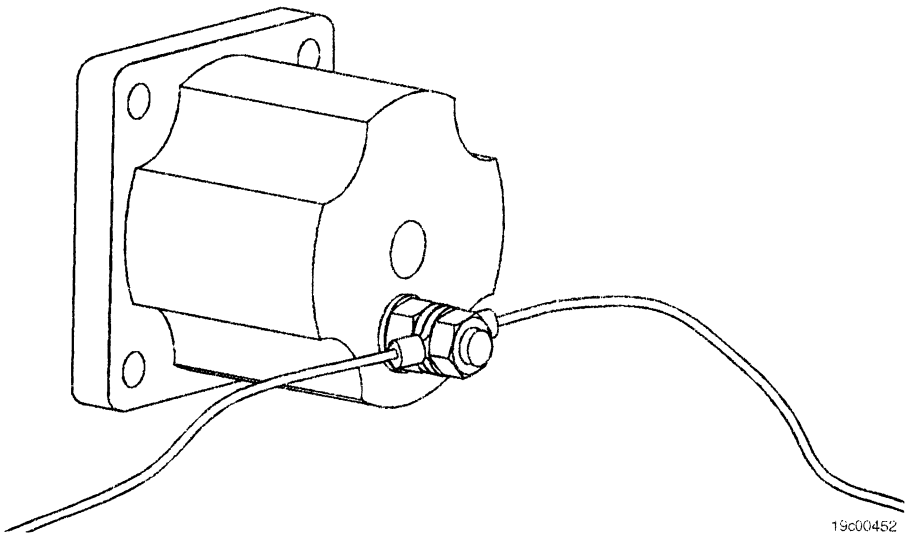
TROUBLESHOOTING STEP

STEP 1: Check the fuel shutoff valve solenoid.

STEP 1A: Check for extra wires on the fuel shutoff valve solenoid post.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Check for extra wires on the fuel shutoff valve solenoid post.	**OK** **No extra wires**	1B
	NOT OK **Remove extra wires and connect to (+) 12-VDC supply**	2A



STEP 1B: Check for corrosion on the solenoid post.

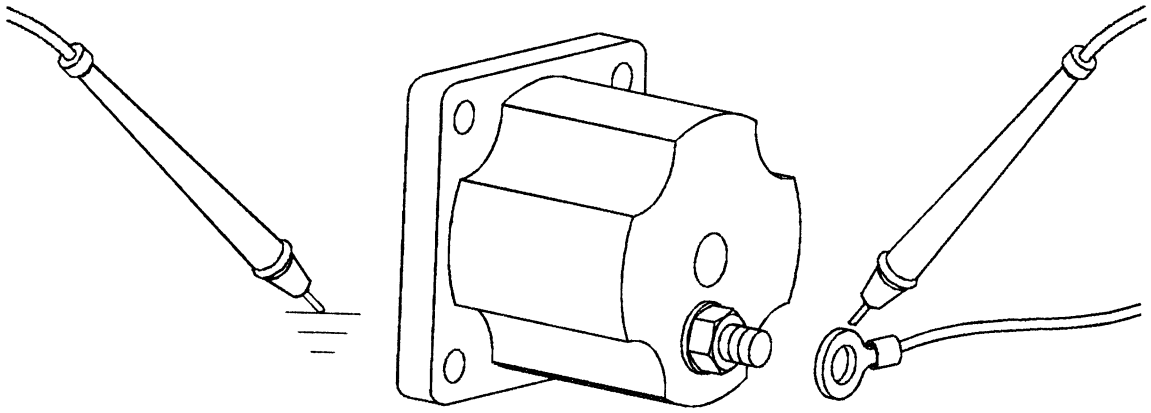
Condition:
- Turn keyswitch OFF.
- Disconnect the fuel shutoff control wire from the fuel shutoff valve solenoid.

Action	Specifications/Repair	Next Step
Check for corrosion on the solenoid post.	**OK** **No corrosion found**	1C
	NOT OK **Clean the solenoid post and the wiring terminal** Refer to Procedure 019-050.	2A

STEP 1C: Check the supply voltage at the fuel shutoff valve solenoid.

Condition:
- Disconnect the actuator harness from the fuel shutoff valve solenoid.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the supply voltage at the fuel shutoff valve solenoid. • Measure the voltage from the fuel shutoff control wire connectors on the harness side to engine block ground.	**OK** **More than (+) 6 VDC**	1D
	NOT OK Does **not** meet specifications.	1C-1



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STEP 1C-1: Check the actuator harness and the ECM connector pins.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check the actuator harness and the ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	1C-2
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using the electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	2A

STEP 1C-2: Check for an open circuit.

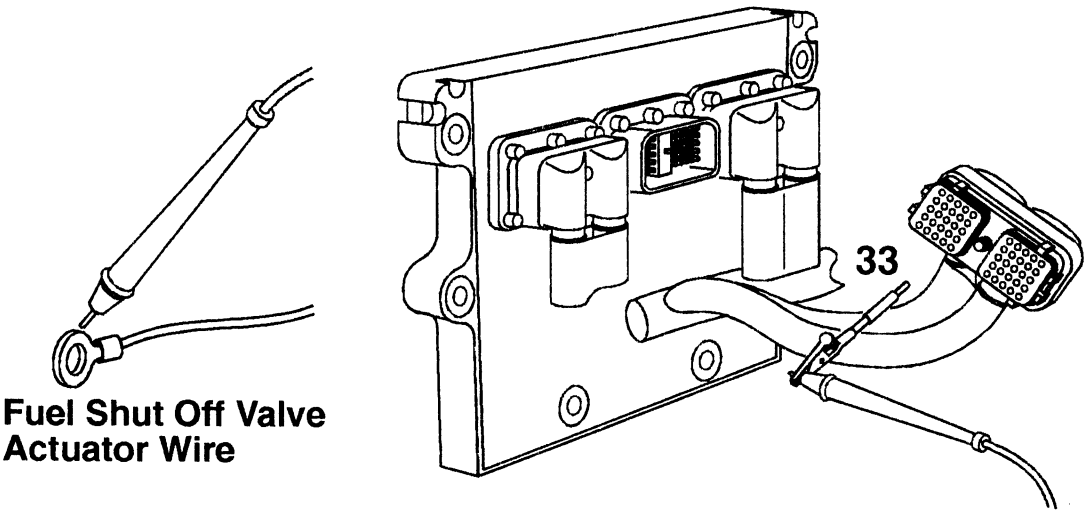
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness from the fuel shutoff valve solenoid.
- Disconnect the actuator harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for an open circuit. • Measure the resistance from pin 33 of the actuator harness to the fuel shutoff control wire.	**OK** **Less than 10 ohms**	1C-3
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	2A



STEP 1C-3: Check for a short circuit from pin to pin.

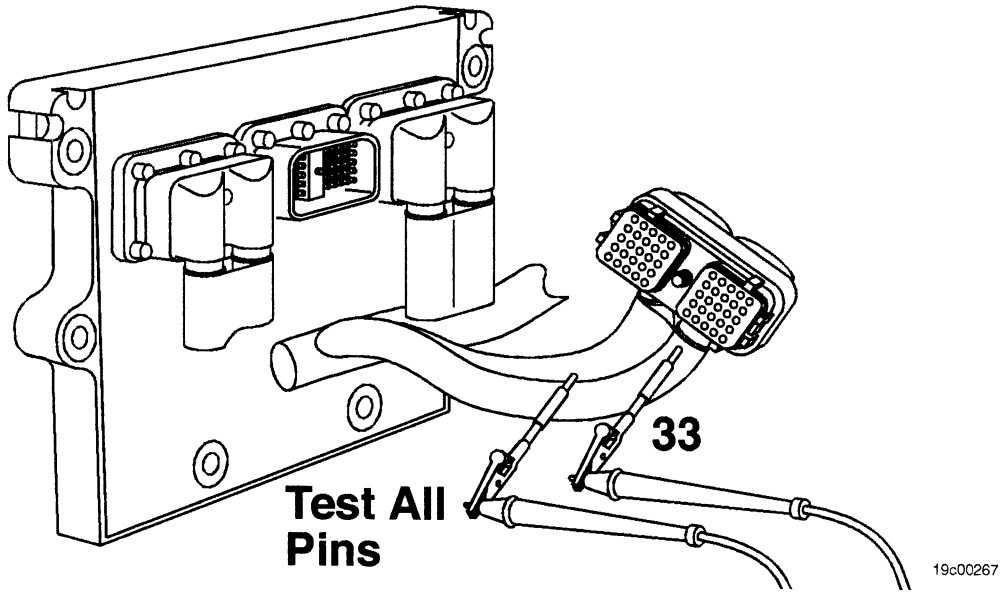
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness from the fuel shutoff valve solenoid.
- Disconnect the actuator harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin. • Measure the resistance from pin 33 of the actuator harness connector to all other pins in the connector.	**OK** **More than 100k ohms**	1C-4
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	2A



STEP 1C-4: Measure the voltage from the ECM.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

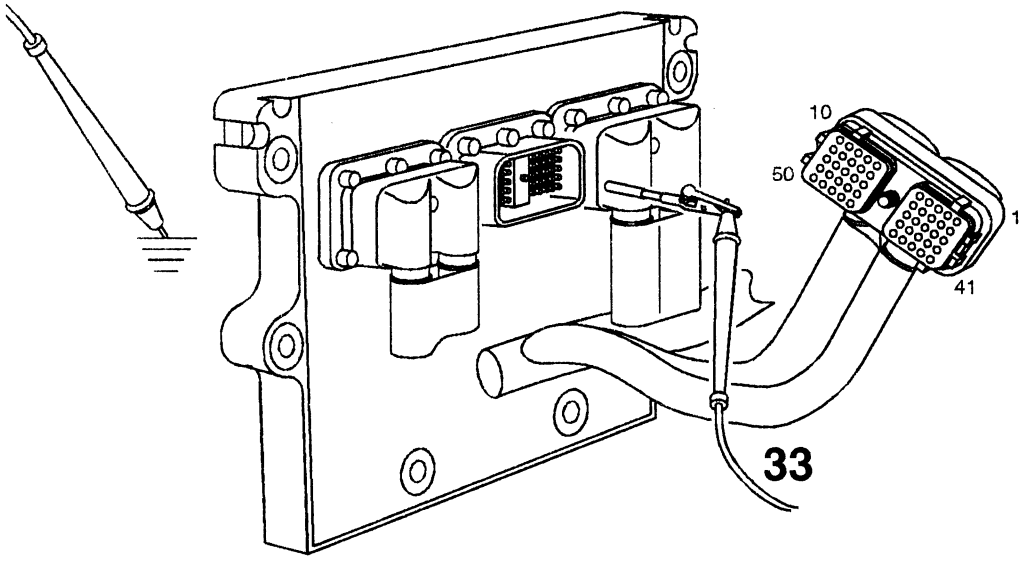
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the actuator harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Measure the voltage from the ECM. • Measure the voltage at the ECM from pin 33 of the actuator harness connector port to engine block ground.	**OK** **More than (+) 6 VDC** **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	2A
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	2A



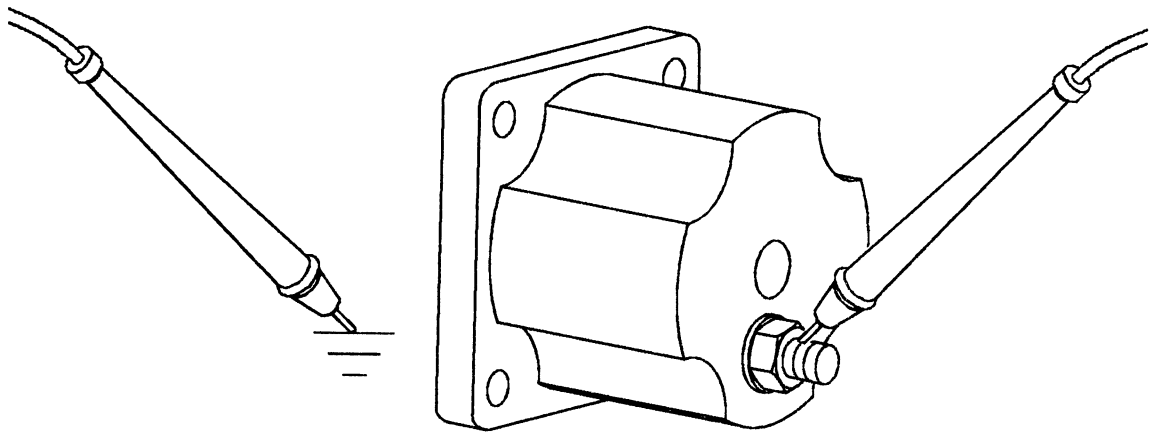
STEP 1D: Check the fuel shutoff valve solenoid resistance.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Turn keyswitch OFF.
- Disconnect the actuator harness from the fuel shutoff valve solenoid.

Action	Specifications/Repair	Next Step
Check the fuel shutoff valve solenoid resistance. • Measure the resistance from the fuel shutoff valve solenoid to engine block ground.	**OK** **7 to 8 ohms for (+) 12-VDC solenoids** **28 to 32 ohms for (+) 24-VDC solenoids**	2A
	NOT OK **Replace the fuel shutoff valve solenoid** Refer to Procedure 019-050.	2A



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STEP 2: Clear the fault codes.

STEP 2A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify Fault Code 254 is inactive.	**OK** **Fault Code 254 inactive**	2B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location if all the steps have been completed and checked again.	1A

STEP 2B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

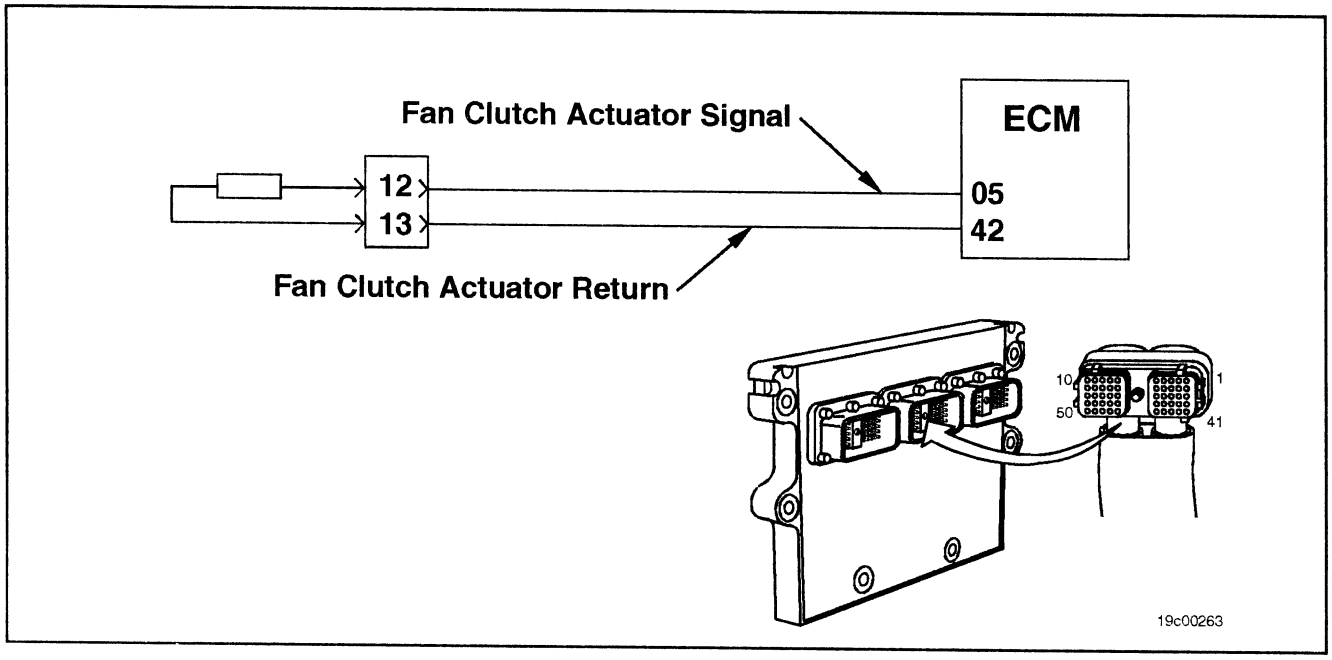
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 245

Engine Fan Clutch Supply Circuit

CODES	REASON	EFFECT
Fault Code: 245 PID(P), SID(S): S033 SPN: 647 FMI: 4/4 Lamp: Yellow	Less than 6 VDC detected at fan clutch when on. Indicates an excessive current draw from the electronic control module (ECM) or a faulty ECM output circuit.	The fan can stay on all the time.

Engine Fan Clutch Supply Circuit



Circuit Description:

The fan clutch solenoid is a device used by the ECM to control the engine fan by sending a signal to open or close the fan clutch solenoid.

Component Location:

Refer to an OEM diagram for the location of the fan clutch solenoid.

Shop Talk:

Possible cause for this fault code:

- ECM fan clutch supply has a short circuit to ground.

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the actuator harness.		
STEP 1A: Inspect the harness and the fan clutch connector pins.	No damaged pins	
STEP 1B: Check for an open circuit in the engine harness.	Less than 10 ohms	
STEP 1C: Check for a short circuit to ground.	More than 100k ohms	
STEP 1D: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 2: Check the OEM harness.		
STEP 2A: Inspect the 31-pin Deutsch connector pins.	No damaged pins	
STEP 2B: Check for an open circuit in the OEM harness.	Less than 10 ohms	
STEP 2C: Check for a short circuit to ground in the OEM harness.	More than 100k ohms	
STEP 2D: Check for a short circuit from pin to pin in the OEM harness.	More than 100k ohms	
STEP 3: Clear the fault codes.		
STEP 3A: Disable the fault code.	Fault Code 245 inactive	
STEP 3B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check the actuator harness.

STEP 1A: Inspect the harness and the fan clutch connector pins.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the harness and the ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on connector the pins.	**OK** **No damaged pins**	1B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace engine harness. Refer to Procedure 019-043. • Replace ECM. Refer to Procedure 019-031.	3A

STEP 1B: Check for an open circuit in the engine harness.

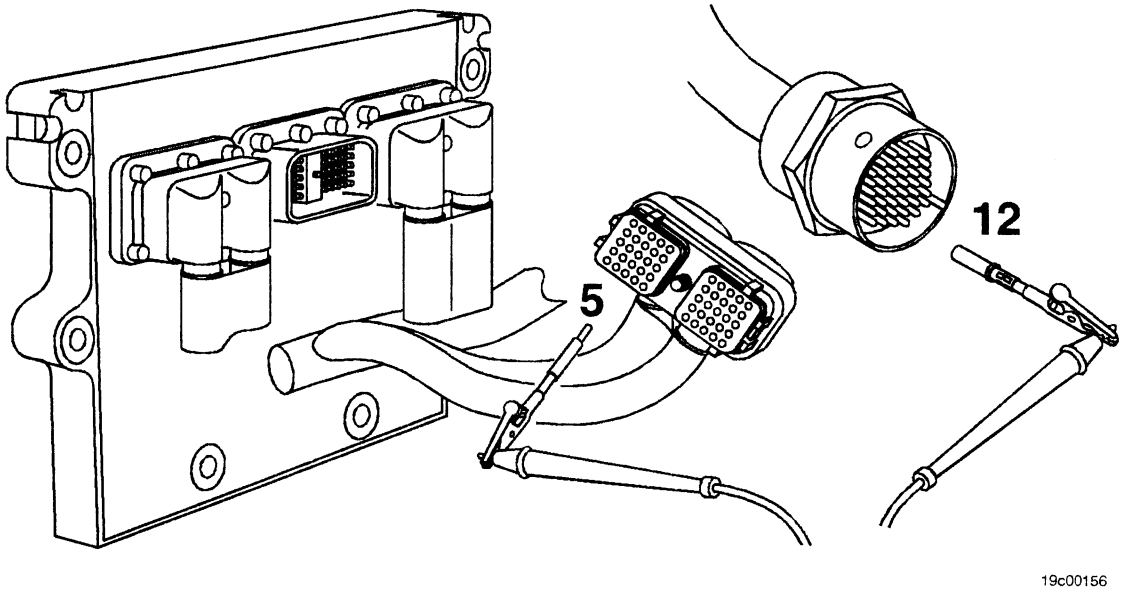
⚠CAUTION⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the OEM 31-pin connector.
- Disconnect the actuator harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for an open circuit in the engine harness. • Measure the resistance from pin 12 of the OEM 31-pin connector, engine harness side, to pin 5 of the actuator harness connector.	**OK** **Less than 10 ohms**	1C
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-231 or 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



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STEP 1C: Check for a short circuit to ground.

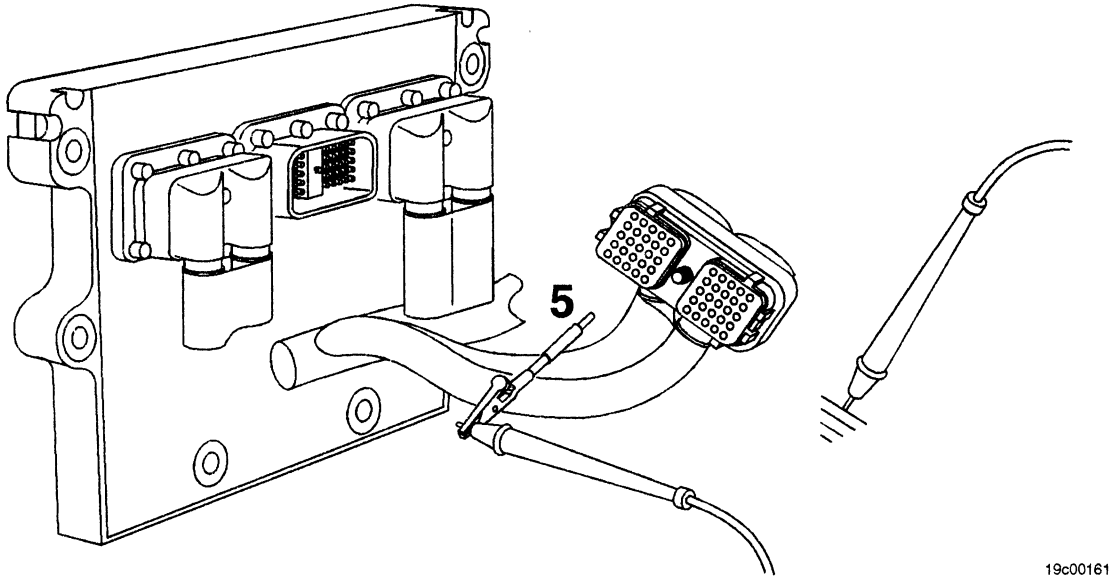
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.
- Disconnect the actuator harness from the OEM 31-pin connector.

Action	Specifications/Repair	Next Step
Check for a short circuit to ground. • Measure the resistance from pin 5 in the actuator harness connector to engine block ground.	**OK** **More than 100k ohms**	1D
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



STEP 1D: Check for a short circuit from pin to pin.

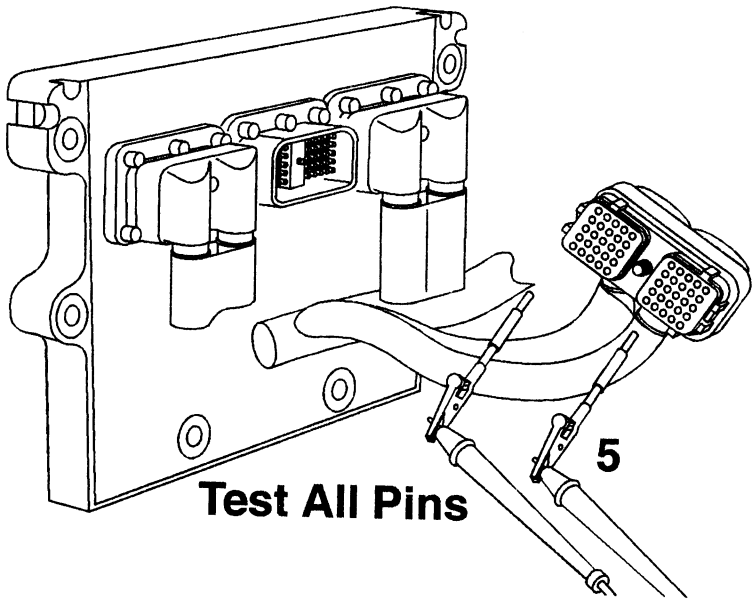
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the OEM harness from the fan clutch solenoid.
- Disconnect the actuator harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin. • Measure the resistance from pin 5 in the actuator harness connector to all other pins in the connector.	**OK** **More than 100k ohms**	2A
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



STEP 2: Check the OEM harness.

STEP 2A: Inspect the 31-pin Deutsch connector pins.

Condition:
- Turn keyswitch OFF.
- Disconnect the OEM harness from the 31-pin Deutsch connector.
- Disconnect the actuator harness from the 31-pin Deutsch connector.

Action	Specifications/Repair	Next Step
Inspect the 31-pin Deutsch connector for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	2B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness or the OEM harness, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Repair the OEM harness. Refer to Procedure 019-231. • Replace the OEM harness. Refer to Procedure 019-071.	3A

STEP 2B: Check for an open circuit in the OEM harness.

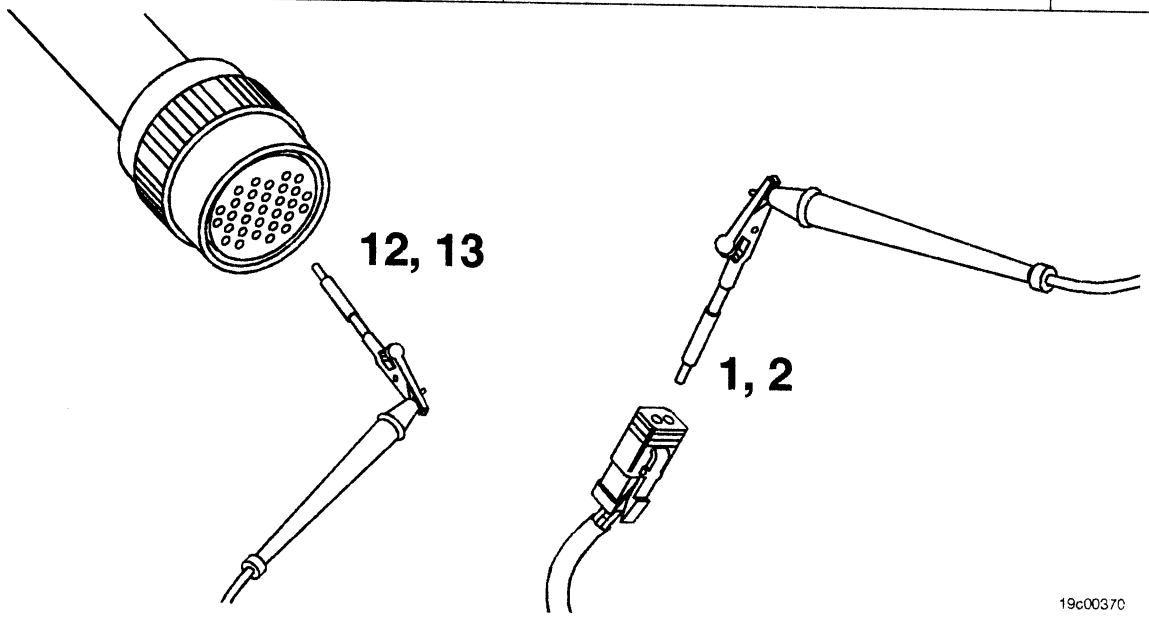
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness from the OEM 31-pin connector.
- Disconnect the OEM harness connector from the fan clutch solenoid.

Action	Specifications/Repair	Next Step
Check for an open circuit. • Measure the resistance from pin 12 of the OEM 31-pin connector to pin A (or 1) of the fan clutch solenoid connector. • Measure the resistance from pin 13 of the OEM 31-pin connector to pin B (or 2) of the fan clutch solenoid connector.	**OK** **Less than 10 ohms**	2C
	NOT OK **Repair or replace the OEM harness** • Repair the OEM harness. Refer to Procedure 019-202 or 019-231. • Replace the OEM harness. Refer to Procedure 019-071.	3A



STEP 2C: Check for a short circuit to ground in the OEM harness.

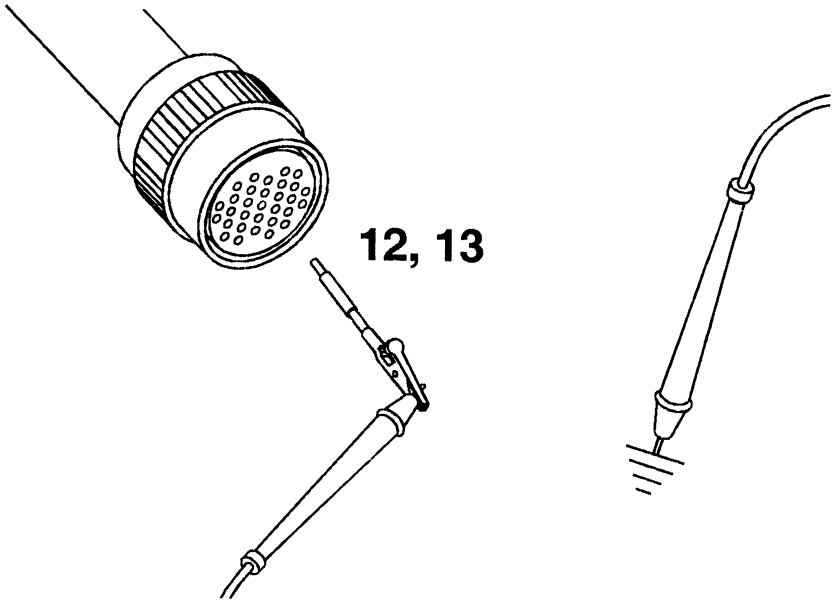
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the OEM harness from the fan clutch solenoid.
- Disconnect the actuator harness from the 31-pin connector.

Action	Specifications/Repair	Next Step
Check for a short circuit to ground. • Measure the resistance from pin 12 of the 31-pin connector, OEM harness side, to engine block ground. • Measure the resistance from pin 13 of the 31-pin connector, OEM harness side, to engine block ground.	**OK** **More than 100k ohms**	2D
	NOT OK **Repair or replace the OEM harness** • Repair the OEM harness. Refer to Procedure 019-231. • Replace the OEM harness. Refer to Procedure 019-071.	3A



STEP 2D: Check for a short circuit from pin to pin in the OEM harness.

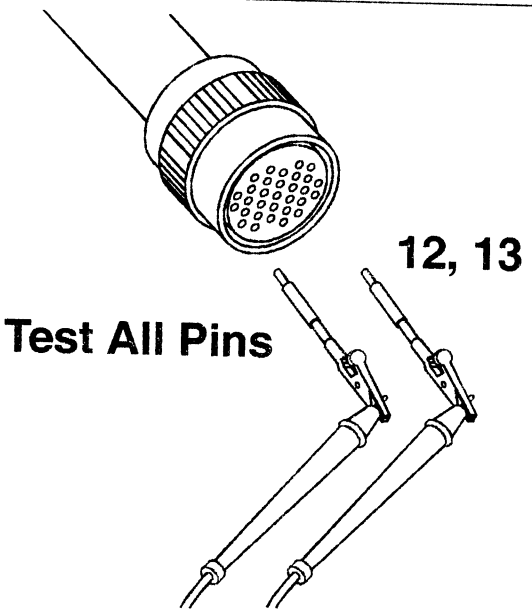
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the OEM harness from the fan clutch solenoid.
- Disconnect the actuator harness from the 31-pin connector.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin in the OEM harness. • Measure the resistance from pin 12 of the 31-pin connector, OEM harness side, to all other pins in the connector. • Measure the resistance from pin 13 of the 31-pin connector, OEM harness side, to all other pins in the connector.	**OK** **More than 100k ohms**	3A
	NOT OK **Repair or replace the OEM harness** • Repair the OEM harness. Refer to Procedure 019-231. • Replace the OEM harness. Refer to Procedure 019-071.	3A



STEP 3: Clear the fault codes.

STEP 3A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify Fault Code 245 is inactive.	**OK** **Fault Code 245 inactive**	3B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location if all the steps have been completed and checked again.	1A

STEP 3B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

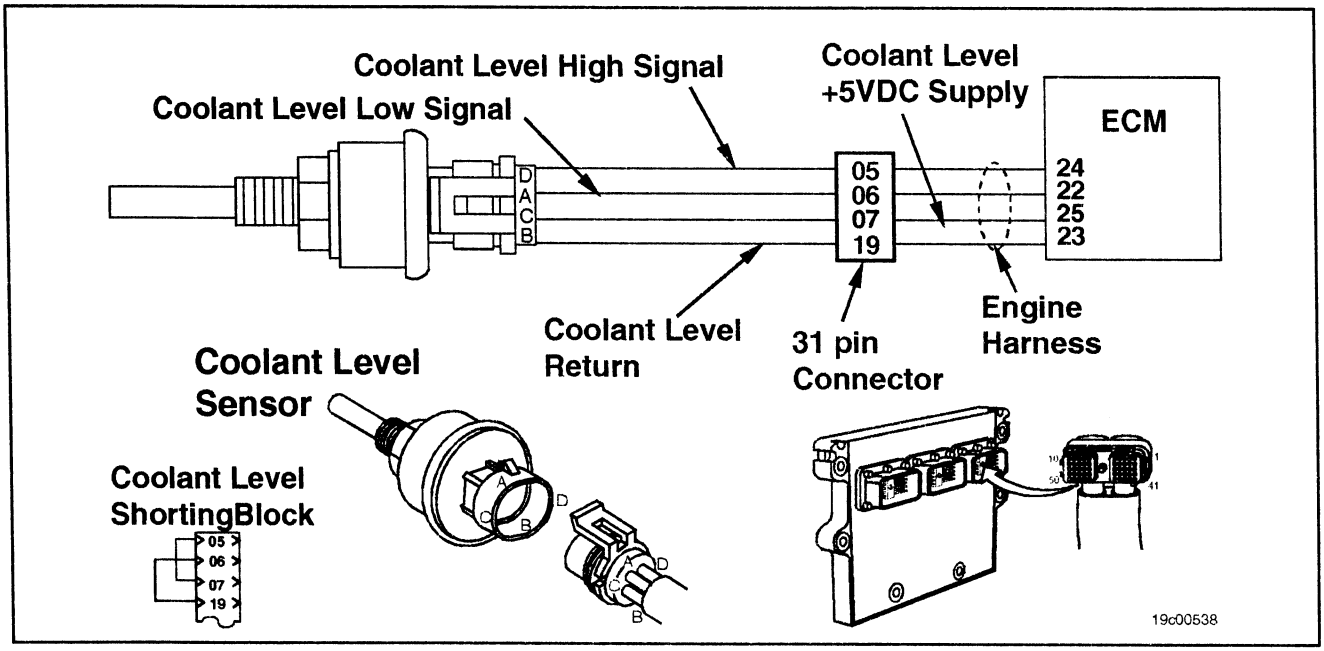
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 235

Engine Coolant Level - Engine Protection

CODES	REASON	EFFECT
Fault Code: 235 PID(P), SID(S): P111 SPN: 111 FMI: 1/1 Lamp: Red	Coolant level signal at pin 22 of the sensor harness connector indicates coolant level is below the normal range.	Progressive power and speed derate with increasing time after alert. If engine protection shutdown is enabled, engine will shut down 30 seconds after the engine protection lamp starts flashing.

Engine Coolant Level - Engine Protection



Circuit Description:

The coolant level sensor monitors the coolant level within the coolant system and passes information to the electronic control module (ECM) through the engine harness. Because this sensor is complex, do **not** use a multimeter to check it. If the radiator coolant level drops below a certain level, a progressive power and/or speed derate will occur. Engine can shut down if the engine protection shutdown feature is enabled.

Component Location:

The coolant level sensor is located in the radiator top tank or surge tank.

Shop Talk:

This is an OEM-supplied component and can vary in location.

- If a shorting plug is used in the coolant level circuit, verify that it is wired correctly.
- Inspect the wiring harness between the Weather-Pack four-way connector and the coolant level sensor for damage.
- Make sure the coolant level sensor is located in the middle of the tank rather than off to one side where the coolant level can change when the vehicle turns a corner.

TROUBLESHOOTING SUMMARY

⚠ WARNING ⚠

Do not remove the pressure cap from a hot engine. Wait until the coolant temperature is below 50°C [122°F] before removing the pressure cap. Heated coolant spray or steam can cause personal injury.

⚠ CAUTION ⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

Do not add cold coolant to a hot engine. Castings can be damaged. Allow engine to cool to below 50°C [122°F] before adding coolant.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Verify the coolant level.		
STEP 1A: Check the coolant level.	Coolant level is normal	
STEP 2: Check the coolant level sensor.		
STEP 2A: Confirm the fault is still active with the engine running.	Fault Code 235 still active	
STEP 3: Check engine harness.		
STEP 3A: Inspect the engine harness, 31-pin OEM connector, and ECM connector.	No damaged pins	
STEP 3B: Check sensor supply voltage.	(+) 4.5 to 5.5 VDC	
STEP 3B-1: Measure voltage from the ECM.	(+) 4.5 to 5.5 VDC	
STEP 3C: Check for an open circuit.	Less than 10 ohms	
STEP 4: Check the OEM harness.		
STEP 4A: Inspect the OEM harness, coolant level sensor, and the ECM connector.	No damaged pins	
STEP 4B: Check the sensor supply voltage.	(+) 4.5 to 5.5 VDC	
STEP 4C: Check for an open circuit.	Less than 10 ohms	
STEP 5: Clear the fault codes.		
STEP 5A: Disable the fault code.	Fault Code 235 inactive	
STEP 5B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Verify the coolant level.

STEP 1A: Check the coolant level.

⚠WARNING⚠

Do not remove the pressure cap from a hot engine. Wait until the coolant temperature is below 50°C [122°F] before removing the pressure cap. Heated coolant spray or steam can cause personal injury.

⚠CAUTION⚠

Do not add cold coolant to a hot engine. Castings can be damaged. Allow engine to cool to below 50°C [122°F] before adding coolant.

Condition:

- Allow engine to cool. See CAUTION statement above.

Action	Specifications/Repair	Next Step
Check coolant level. • Remove the radiator cap and inspect coolant level.	**OK** **Coolant level is normal**	2A
	NOT OK **Add coolant to the radiator** **NOTE:** Make sure the coolant has the proper ratio of antifreeze and water.	5A

STEP 2: Check the coolant level sensor.

STEP 2A: Confirm the fault is still active with the engine running.

Condition:

- Turn the keyswitch ON.

Action	Specifications/Repair	Next Step
Confirm the fault is still active with the engine running. • Start the engine and let it idle for at least 1 minute. • Read the fault codes using INSITE™.	**OK** **Fault Code 235 still active**	3A
	NOT OK Fault Code 235 inactive.	5A

STEP 3: Check engine harness.

STEP 3A: Inspect the engine harness, 31-pin OEM connector, and ECM connector.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:

- Turn the keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the engine harness from the 31-pin OEM connector.

Action	Specifications/Repair	Next Step
Inspect the engine harness, 31-pin connector, and ECM connector for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	3B
	NOT OK **Repair damaged pins** Repair or replace the engine harness, or replace the coolant level sensor or the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-231 or 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the coolant level sensor. Refer to Procedure 019-017. • Replace the ECM. Refer to Procedure 019-031.	5A

STEP 3B: Check sensor supply voltage.

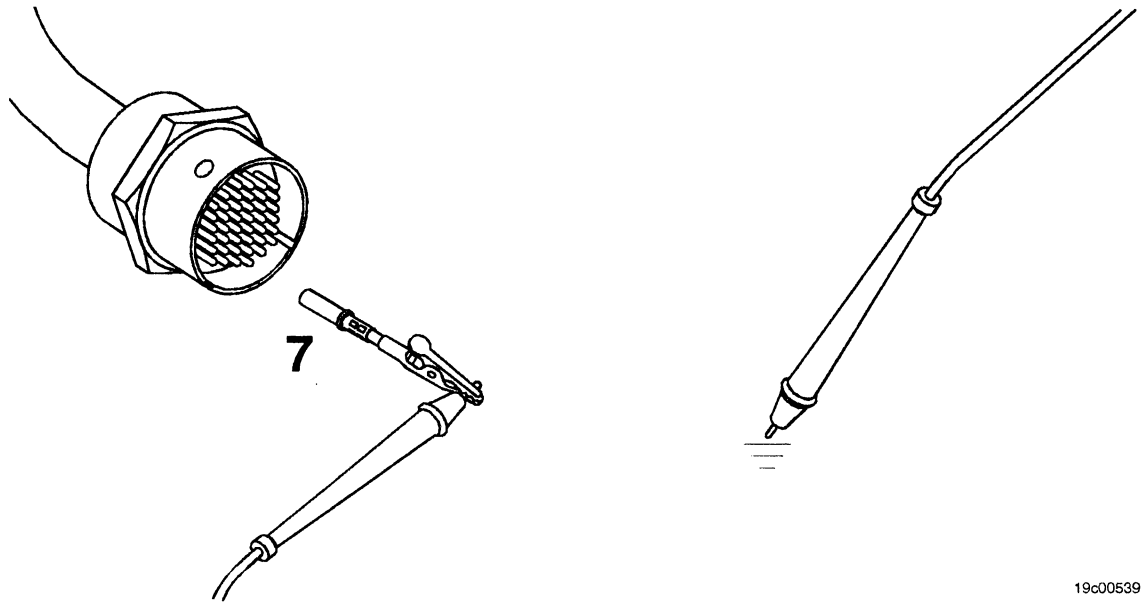
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822917 -female Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the engine harness from the 31-pin OEM connector.
- Connect the sensor harness connector to the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check sensor supply voltage. • Measure the voltage from pin 7 of the 31-pin OEM connector, engine harness side, to engine block ground.	**OK** **(+) 4.5 to 5.5 VDC**	3C
	NOT OK Does **not** meet specifications.	3B-1



STEP 3B-1: Measure voltage from the ECM.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

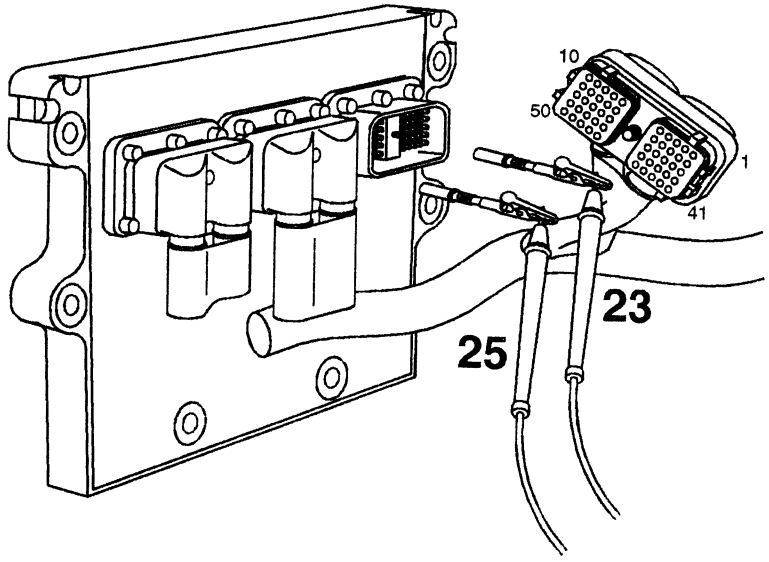
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the sensor from the 31-pin OEM connector.
- Disconnect the sensor connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Measure voltage from the ECM. • Measure the voltage from pin 25 to pin 23 of the ECM sensor port.	**OK** **(+) 4.5 to 5.5 VDC** **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	5A
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	5A



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STEP 3C: Check for an open circuit.

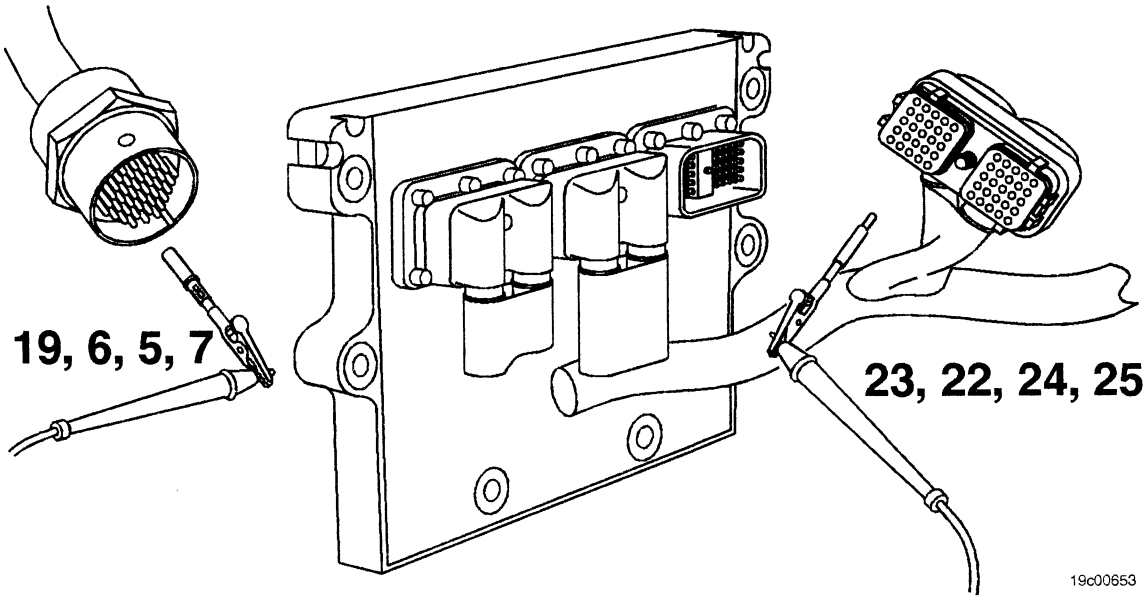
⚠CAUTION⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the sensor harness from the 31-pin OEM connector at the engine harness.

Action	Specifications/Repair	Next Step
Check for open circuit in the coolant level sensor circuit. • Measure the resistance from pin 19 on the sensor harness side of the 31-pin OEM connector to pin 23 of the sensor harness connector at the ECM. • Measure the resistance from pin 6 on the sensor harness side of the 31-pin OEM connector to pin 22 of the sensor harness connector at the ECM. • Measure the resistance from pin 5 on the sensor harness side of the 31-pin OEM connector to pin 24 of the sensor harness connector at the ECM. • Measure the resistance from pin 7 on the sensor harness side of the 31-pin OEM connector to pin 25 of the sensor harness connector at the ECM.	**OK** **Less than 10 ohms**	4A
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250 or 019-231. • Replace the engine harness. Refer to Procedure 019-043.	5A



STEP 4: Check the OEM harness.

STEP 4A: Inspect the OEM harness, coolant level sensor, and the ECM connector.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:

- Turn keyswitch OFF.
- Disconnect the engine harness from the 31-pin OEM connector.
- Disconnect the OEM harness from the coolant level sensor.

Action	Specifications/Repair	Next Step
Inspect the OEM harness, coolant level sensor, and ECM connector for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	4B
	NOT OK **Repair the damaged pins** Repair or replace the OEM harness, or replace the coolant level sensor or the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the OEM harness. Refer to Procedure 019-204 or 019-250. • Replace the OEM harness. Refer to Procedure 019-071. • Replace the coolant level sensor. Refer to Procedure 019-017. • Replace the ECM. Refer to Procedure 019-031.	5A

STEP 4B: Check the sensor supply voltage.

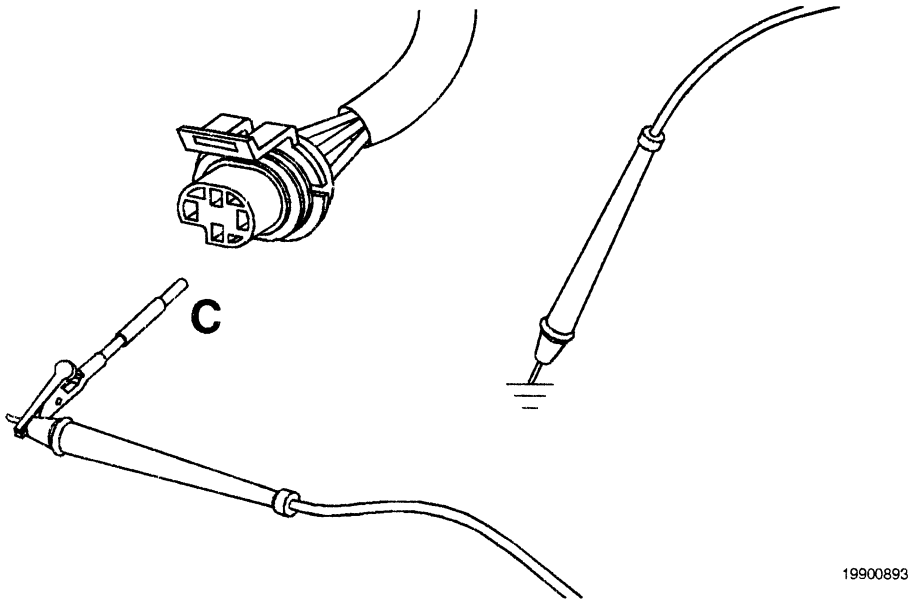
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the OEM harness from the coolant level sensor.
- Connect the engine harness to the 31-pin OEM connector.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the sensor supply voltage. • Measure the voltage from supply, pin C (or 3) of the sensor connector, engine harness side to engine block ground.	**OK** **(+) 4.5 to 5.5 VDC**	4C
	NOT OK **Repair or replace the OEM harness** • Repair the OEM harness. Refer to Procedure 019-204. • Replace the OEM harness. Refer to Procedure 019-071.	5A



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STEP 4C: Check for an open circuit.

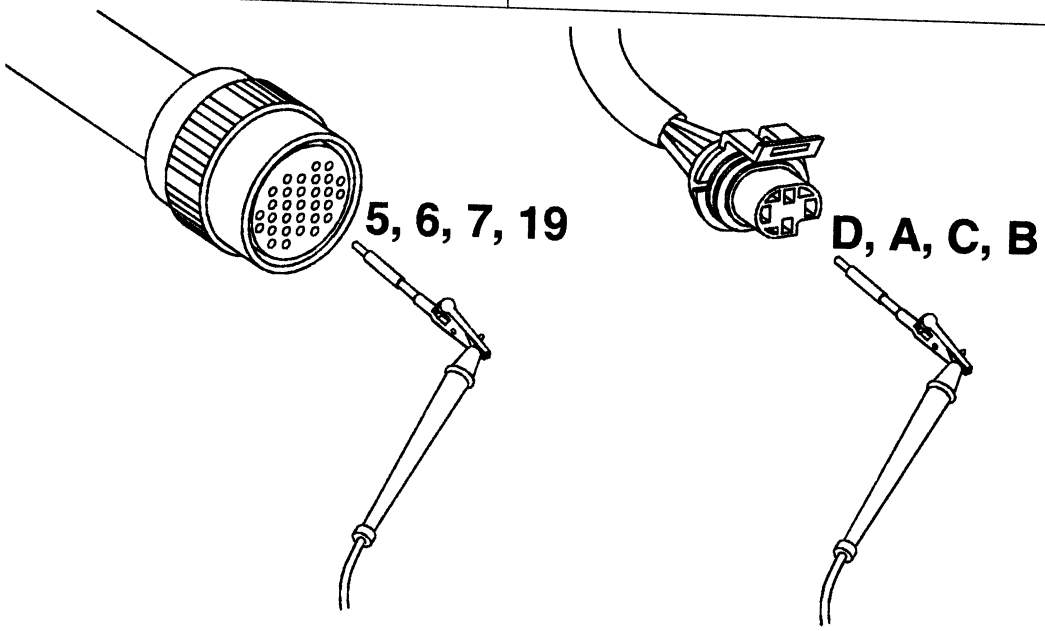
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the engine harness from the 31-pin OEM connector.
- Disconnect the OEM harness from the coolant level sensor.

Action	Specifications/Repair	Next Step
Check for an open circuit in the coolant level sensor circuit. • Measure the resistance from pin D (or 4) on the OEM harness side of the coolant level sensor connector to pin 5 of the OEM 31-pin connector, OEM harness side. • Measure the resistance from pin A (or 1) on the OEM harness side of the coolant level sensor connector to pin 6 of the OEM 31-pin connector, OEM harness side. • Measure the resistance from pin C (or 3) on the OEM harness side of the coolant level sensor connector to pin 7 of the OEM 31-pin connector, OEM harness side. • Measure the resistance from pin B (or 2) on the OEM harness side of the coolant level sensor connector to pin 19 of the OEM 31-pin connector, OEM harness side.	**OK** **Less than 10 ohms** **Replace the coolant level sensor** Refer to Procedure 019-017.	5A
	NOT OK **Repair or replace the OEM harness** • Repair the OEM harness. Refer to Procedure 019-204 or 019-231. • Replace the OEM harness. Refer to Procedure 019-071.	5A



STEP 5: Clear the fault codes.

STEP 5A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine, and let it idle for 1 minute. • Using INSITE™, verify Fault Code 235 is inactive.	**OK** **Fault Code 235 inactive**	5B
	NOT OK Return to the troubleshooting steps, or contact your local Cummins Authorized Repair Location if all the steps have been completed and checked again.	1A

STEP 5B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

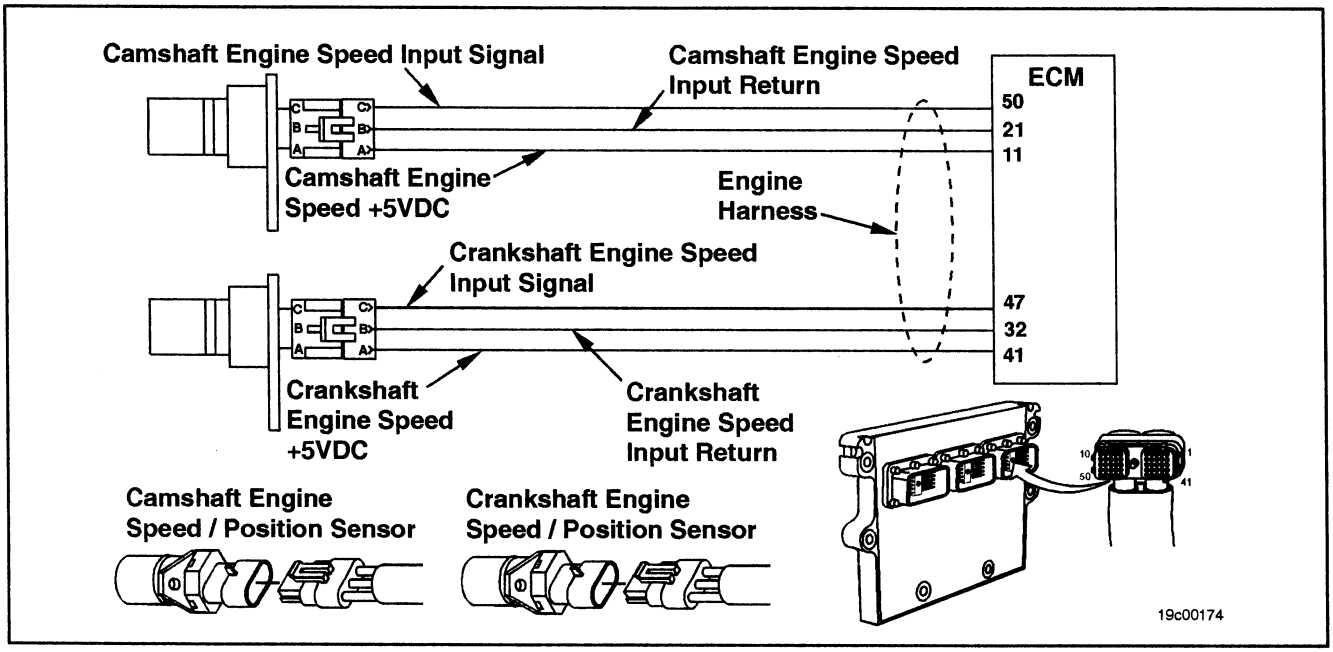
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault code using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting chart

Fault Code 234

Engine Overspeed

CODES	REASON	EFFECT
Fault Code: 234 PID(P), SID(S): P190 SPN: 190 FMI: 0/0 Lamp: Red	Engine speed signal indicated engine speed is greater than 2650 rpm.	Fuel shutoff valve closed until the engine speed falls to 2000 rpm.

Engine Overspeed Circuit



Circuit Description:

The crankshaft and camshaft engine speed/position sensor provides engine speed and position information to the electronic control module (ECM) through the engine harness.

Component Location:

The crankshaft engine speed/position sensor is located in the front cover on the intake side of the engine.
The camshaft engine speed/position sensor is located on the intake side of the cylinder head.

Shop Talk:

Possible causes of this fault code include external fuel sources drawn into the intake air passage, reverse powering (motoring) of the engine, and tampering of the engine speed/position sensors.
Inspect the intake manifold for sources of flammable vapors. Check the turbocharger seals to verify that there are no oil leaks.

- Inspect the engine speed/position sensors for damage or tampering.

TROUBLESHOOTING SUMMARY

⚠ WARNING ⚠

To avoid personal injury and property damage, the engine must be shut off immediately if the engine speed stays above 2650 rpm.

⚠ CAUTION ⚠

To avoid damaging the new ECM, all other active fault codes must be investigated prior to replacing the ECM.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Identify the reason for the overspeed.		
STEP 1A: Check for proper operating conditions.	Not motoring downhill	
STEP 1B: Check for an alternate fuel source.	No alternate fuel source	
STEP 1C: Check the engine rpm with the monitor mode.	Correct rpm reading	
STEP 1D: Check the injector overhead settings.	Correct injector overhead settings	
STEP 1E: Check for an active fault at low engine rpm.	Inactive fault at low rpm	
STEP 1F: Test vehicle.	Inactive fault	
STEP 2: Clear the fault code.		
STEP 2A: Disable the fault code.	Fault Code 234 inactive	
STEP 2B: Clear the inactive fault codes.	All faults cleared	

TROUBLESHOOTING STEP

STEP 1: Identify the reason for the overspeed.

STEP 1A: Check for proper operating conditions.

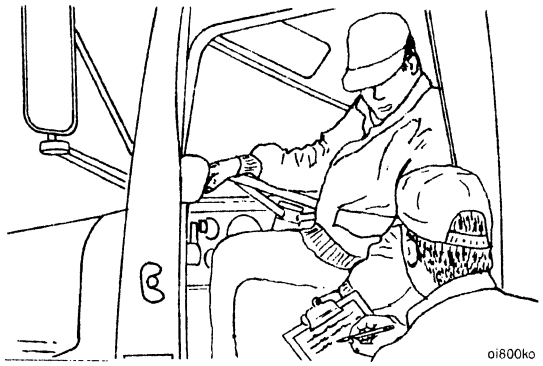
Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Check for proper operating conditions. • Check if the engine was motoring downhill when the fault was logged.	**OK** **Not motoring downhill**	1B
	NOT OK **Check the engine for damage** • Electronics are OK. • Check the base engine for damage due to overspeed condition.	2A

STEP 1B: Check for an alternate fuel source.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Check for an alternate fuel source. • Check if the driver reported a fuel-controlled event where the engine rapidly accelerated to or past 2650 rpm, followed by moderate deceleration to 2000 rpm.	**OK** **No alternate fuel source**	1C
	NOT OK **Locate the alternative fuel source** Locate any alternate fuel sources, such as operating the engine near flammable vapors, blown turbocharger seals, etc.	2A



STEP 1C: Check the engine rpm with the monitor mode.

⚠WARNING⚠

To avoid personal injury and property damage, the engine must be shut off immediately if the engine speed stays above 2650 rpm.

Condition:
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the engine rpm with the monitor mode. • Monitor the engine rpm using INSITE™.	**OK** **Correct rpm reading**	1D
	NOT OK **Inspect the engine position sensor** Check the engine position sensor as outlined for Fault Codes 115 and 121.	Fault Codes 115 and 121

STEP 1D: Check the injector overhead settings.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Check the injector overhead settings. • Check for correct injector overhead settings. Refer to Procedure 003-006 in theTroubleshooting and Repair Manual, Signature, ISX and QSX15 Engines, Bulletin No. 3666239.	**OK** **Correct injector overhead settings**	1E
	NOT OK **Reset the overhead** Reset the overhead using the outer base circle method. Inspect the base engine for damage due to overspeed condition.	2A

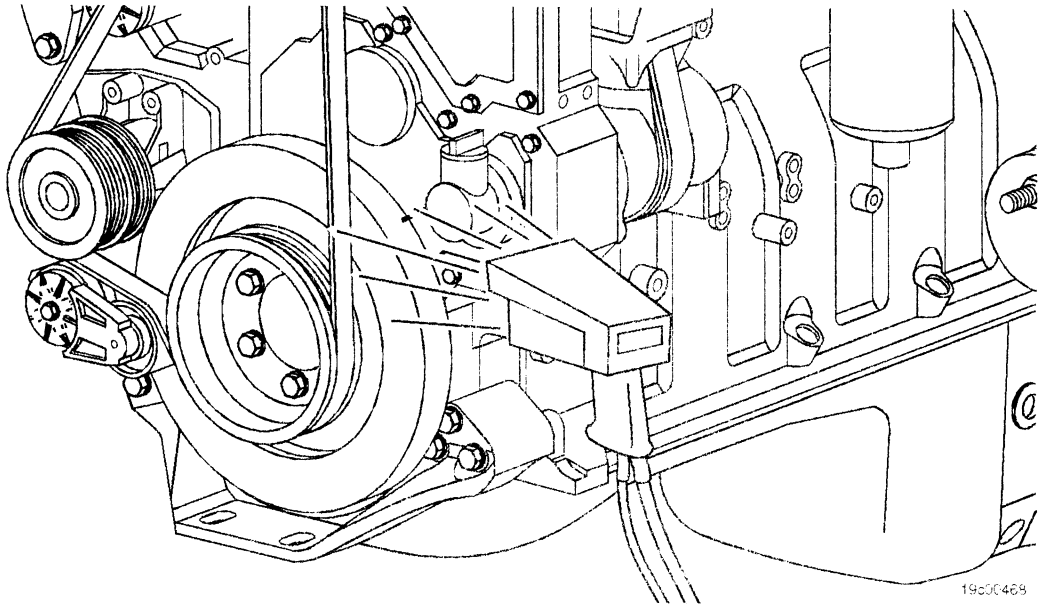
STEP 1E: Check for an active fault at low engine rpm.

⚠CAUTION⚠

To avoid damaging the new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check for an active fault at low engine rpm. • Check for active Fault Code 234 when the engine is **not** running above 2650 rpm.	**OK** **Inactive fault at the low rpm**	1F
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	2A



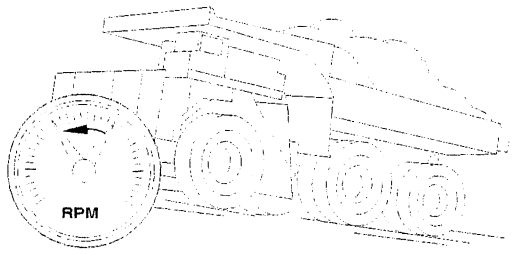
STEP 1F: Test the vehicle.

⚠WARNING⚠

To avoid personal injury and property damage, the engine must be shut off immediately if the engine speed stays above 2650 rpm.

Condition:
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Test the vehicle. • Check if the overspeed condition is still present.	**OK** **Inactive fault**	2A
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location if all the steps have been completed and check again.	1A



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STEP 2: Clear the fault code.

STEP 2A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify Fault Code 234 is inactive.	**OK** **Fault Code 234 inactive**	2B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location if all the steps have been completed and checked again.	1A

STEP 2B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

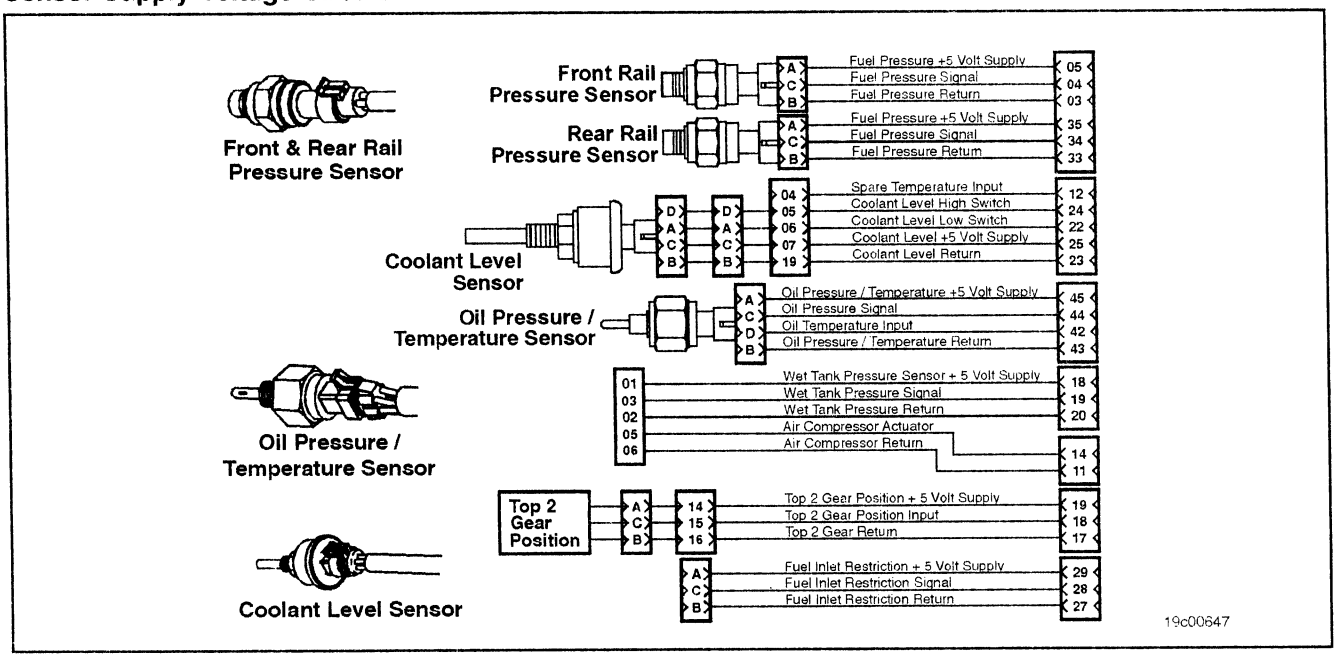
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes with INSITE™.	**OK** **All faults cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 227

Sensor Voltage Supply

CODES	REASON	EFFECT
Fault Code: 227 PID(P), SID(S): S232 SPN: 620 FMI: 3/3 Lamp: Yellow	High voltage detected on the ECM voltage supply line to some sensors.	Engine will run derated. No engine protection for oil pressure or coolant level.

Sensor Supply Voltage Circuit



Circuit Description:

The ECM supplies each of these sensors with (+) 5 VDC. If the supply wire to any sensor is damaged, the sensor will **not** work correctly.

NOTE: In the above picture, the circuits for the wet tank pressure sensor/air compressor and Top 2 Gear Position wires are labeled differently on the industrial wiring diagram. The equivalent differences in the industrial labels are as follows:

Wet Tank Pressure Sensor + 5-Volt Supply = OEM Pressure Supply (Pins 1 to 18)
Wet Tank Pressure Signal = OEM Pressure Signal (Pins 3 to 19)
Wet Tank Pressure Return = OEM Pressure Return (Pins 2 to 20)
Air Compressor Actuator = Switched Output A (Pins 5 to 14)
Air Compressor Return = Spare (Pins 6 to 11)
Top 2 Gear Position + 5-Volt Supply = Spare (Pins 14 to 19)
Top 2 Gear Position Input = Spare (Pins 15 to 18)
Top 2 Gear Position Return = Spare (Pins 16 to 17)

Component Location:

1. Front rail pressure sensor is located on the fuel delivery housing.
2. Rear rail pressure sensor is located on the fuel delivery housing.
3. Fuel inlet restriction sensor is located on the fuel delivery housing.
4. Oil pressure/temperature sensor is located below the air compressor (automotive **only**).

5. Wet tank pressure sensor is located on the air compressor (automotive **only**).
6. Coolant level sensor. Refer to the OEM troubleshooting and repair manual for proper location.
7. Top 2 transmission position sensor - located on the transmission if vehicle has a Spicer™ Top 2 transmission. Refer to the OEM troubleshooting and repair manual for proper location (automotive **only**).

Shop Talk:

High voltage on the sensor (+) 5 VDC supply line will be caused by a short circuit to battery in the supply wire or a short circuit between an actuator wire and the supply wire.

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging the new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the sensor and actuator harness.		
STEP 1A: Inspect the harness and the ECM connector pins.	No damaged pins	
STEP 1B: Check the supply voltage from the ECM.	(+) 4.75 to 5.25 VDC	
STEP 1C: Check for a short circuit to battery in the sensor supply lines.	More than 100k ohms	
STEP 1D: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 2: Clear the fault codes.		
STEP 2A: Disable the fault code.	Fault Code 227 inactive	
STEP 2B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check the sensor and actuator harness.

STEP 1A: Inspect harness and the ECM connector pins.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the sensor and actuator harness and the ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	1B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using the electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	2A

STEP 1B: Check the supply voltage from the ECM.

⚠CAUTION⚠

To avoid damaging the new ECM, all other active fault codes must be investigated prior to replacing the ECM.

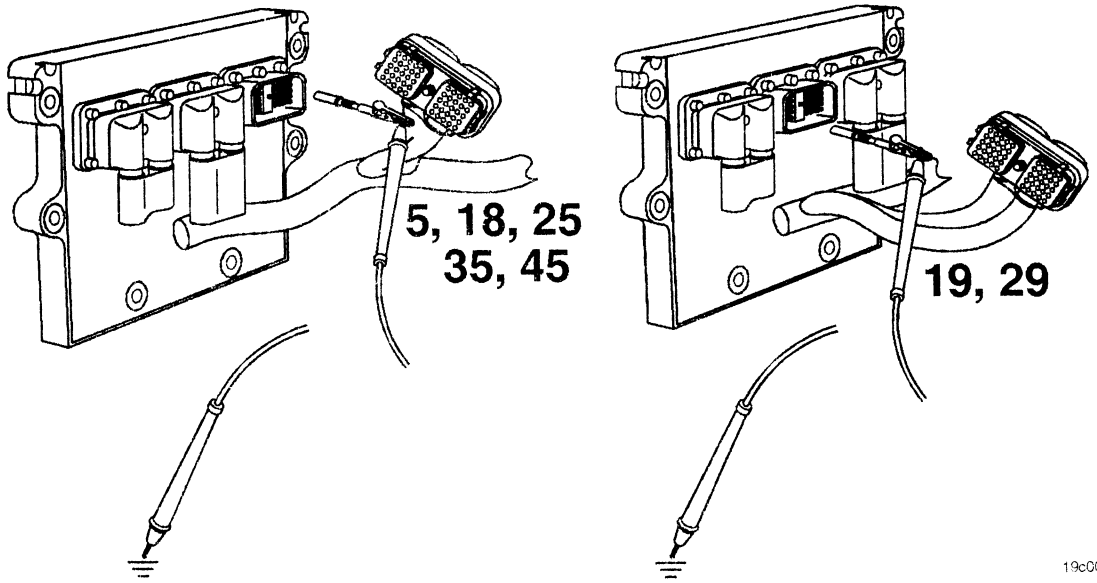
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the actuator harness connector from the ECM.
- Disconnect the sensor harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the supply voltage from the ECM. • Measure the supply voltage out of the ECM sensor harness port from pins 5, 25, 35, 18, and 45 to ground. • Measure the supply voltage out of the ECM actuator harness port from pins 19 and 29 to ground.	**OK** **(+) 4.75 to 5.25 VDC**	1C
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	2A



STEP 1C: Check for a short circuit to battery in the sensor supply lines.

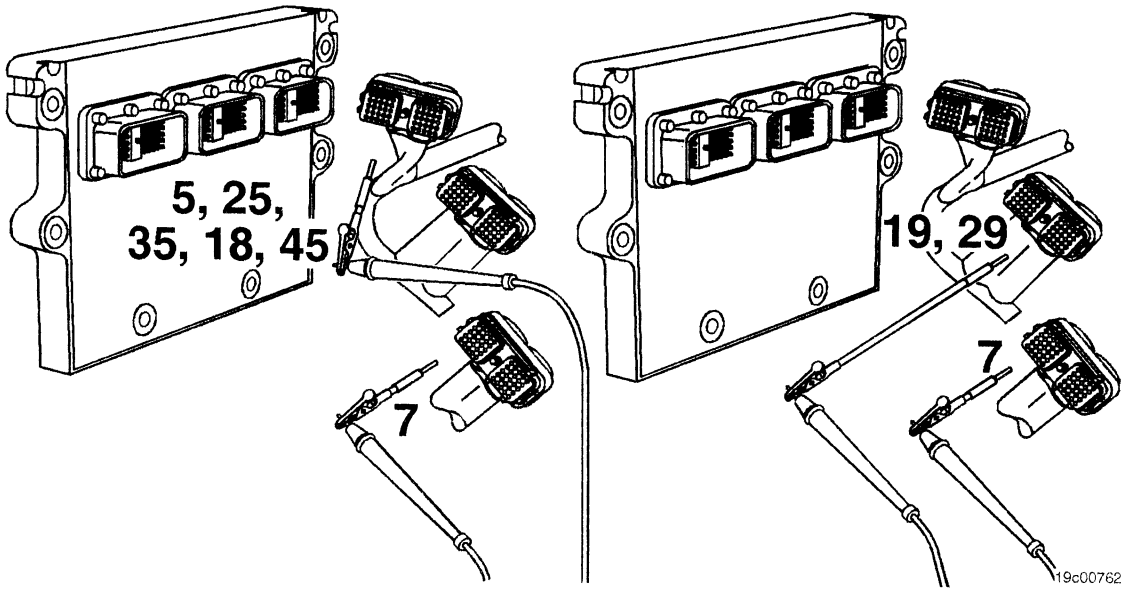
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the OEM harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for a short circuit to battery in the sensor supply lines. • Measure the resistance from pins 5, 25, 35, 18, and 45 in the sensor harness connector to pin 7 in the OEM harness connector. • Measure the resistance from pins 19 and 29 in the actuator harness connector to pin 7 in the OEM harness connector.	**OK** **More than 100k ohms**	1D
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	2A



STEP 1D: Check for a short circuit from pin to pin.

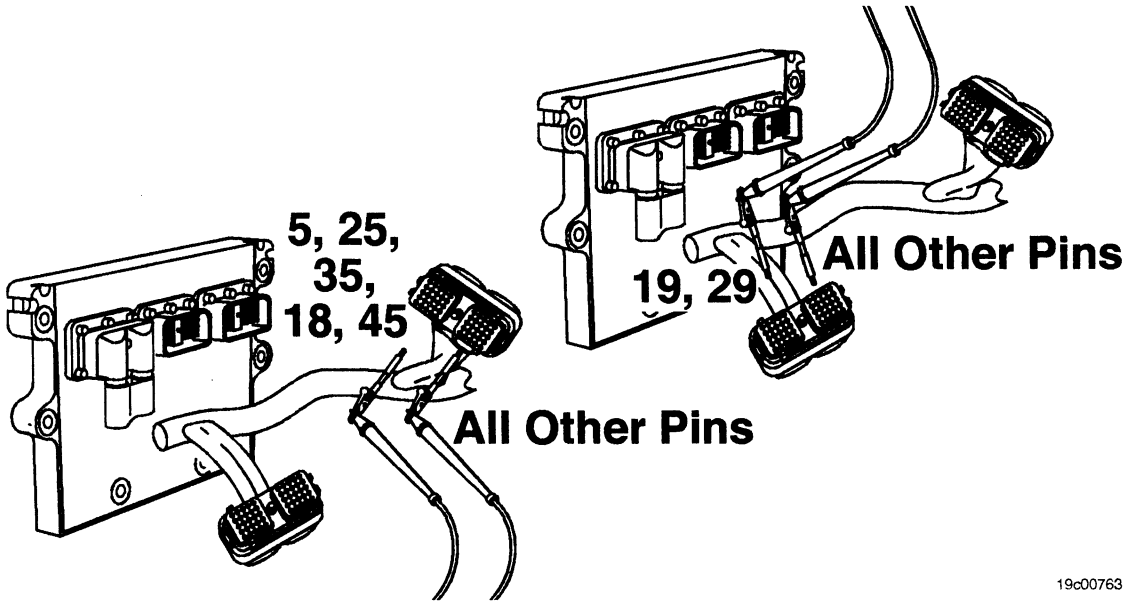
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin. • Measure the resistance from pins 5, 25, 35, 18, and 45 in the sensor harness connector to all other pins in the connector. • Measure the resistance from pins 19 and 29 in the actuator connector to all other pins in the connector.	**OK** **More than 100k ohms**	2A
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	2A



STEP 2: Clear the fault codes.

STEP 2A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify Fault Code 227 is inactive.	**OK** **Fault Code 227 inactive**	2B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location if all the steps have been completed and checked again.	1A

STEP 2B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

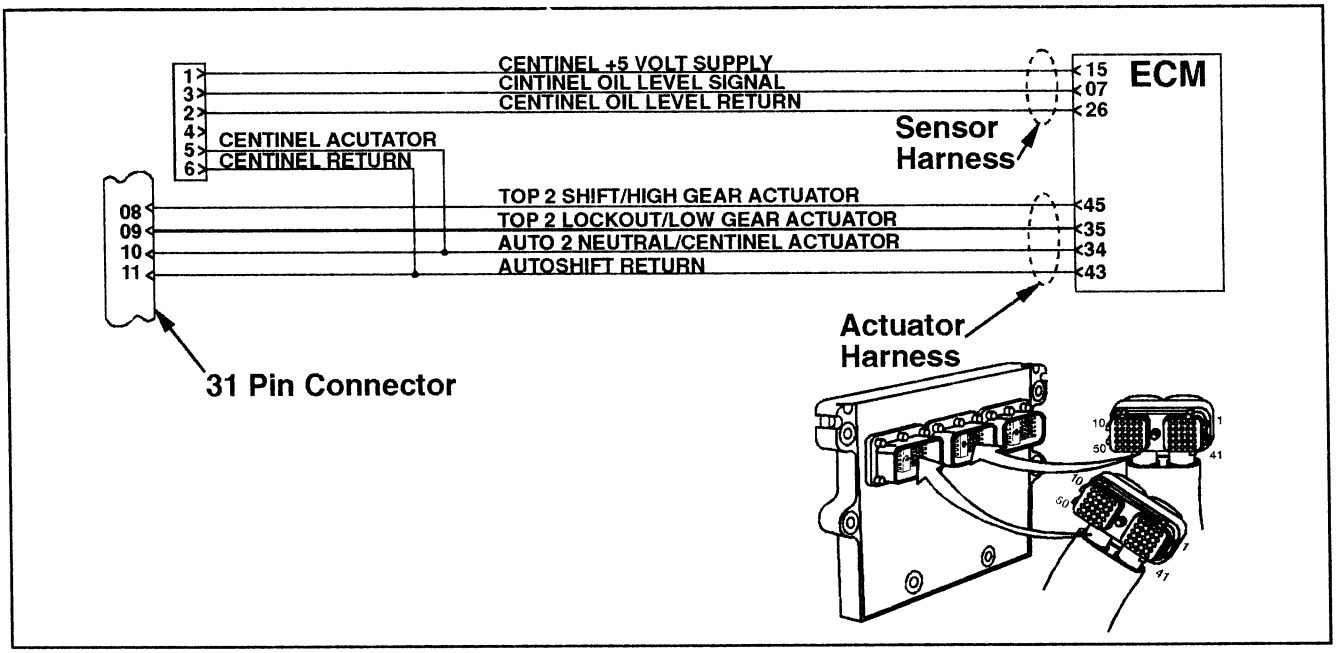
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 223

Burn Valve Solenoid

CODES	REASON	EFFECT
Fault Code: 223 PID(P), SID(S): S085 SPN: 1265 FMI: 4/4 Lamp: Yellow	Incorrect voltage detected at the Centinel™ actuator circuit by the ECM.	None on performance. Centinel™ deactivated.

Burn Valve Solenoid



Circuit Description:

The burn valve solenoid controls the flow of oil into the fuel drainline during the burn cycle.

Component Location:

The burn valve solenoid is on top of the oil control valve. The oil control valve is on the left side of the engine below the fuel delivery housing.

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test lead when taking measurements: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the burn valve solenoid.		
STEP 1A: Verify the burn valve solenoid is connected to the engine harness.	Solenoid is connected	
STEP 1B: Inspect the burn valve solenoid and the solenoid connector on the engine harness.	No damaged pins	
STEP 1C: Check the burn valve solenoid for an open circuit.	Less than 120 ohms	
STEP 1D: Check the burn valve solenoid for a short circuit.	More than 80 ohms	
STEP 2: Check the engine harness.		
STEP 2A: Inspect the engine harness and the ECM connectors.	No damaged pins	
STEP 2B: Check for an open circuit.	Less than 10 ohms	
STEP 2B-1: Check for an open circuit in the Centinel™ jumper harness.	Less than 10 ohms	
STEP 2C: Check for a short circuit to ground.	More than 100k ohms	
STEP 2C-1: Check for a short circuit to ground in the Centinel™ jumper harness.	More than 100k ohms	
STEP 2D: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 3: Clear the fault codes.		
STEP 3A: Disable the fault code.	Fault Code 223 inactive	
STEP 3B: Clear the inactive fault codes.	All fault codes cleared	

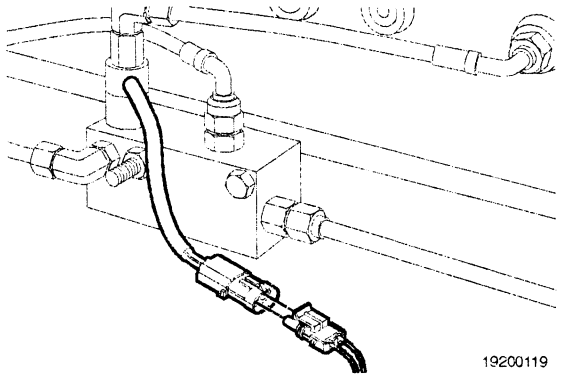
TROUBLESHOOTING STEP

STEP 1: Check the burn valve solenoid.

STEP 1A: Verify the burn valve solenoid is connected to the engine harness.

Condition:
- Turn keyswitch OFF.

Action	Specifications/Repair	Next Step
Verify the burn valve solenoid is connected to the engine harness.	**OK** **Solenoid is connected**	1B
	NOT OK Connect the solenoid to the engine harness.	3A



STEP 1B: Inspect the burn valve solenoid and the solenoid connector on the engine harness.

Condition:
- Turn keyswitch OFF.
- Disconnect the engine harness from the burn valve solenoid.

Action	Specifications/Repair	Next Step
Inspect the burn valve solenoid and the engine harness connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	1C
	NOT OK **Repair the damaged pins** Repair or replace the engine harness or replace the burn valve solenoid, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-202. • Replace the engine harness. Refer to Procedure 019-043. • Replace the burn valve solenoid. Refer to the Centinel™ Master Repair Manual, Bulletin No. 3666231.	3A

STEP 1C: Check the burn valve solenoid for an open circuit.

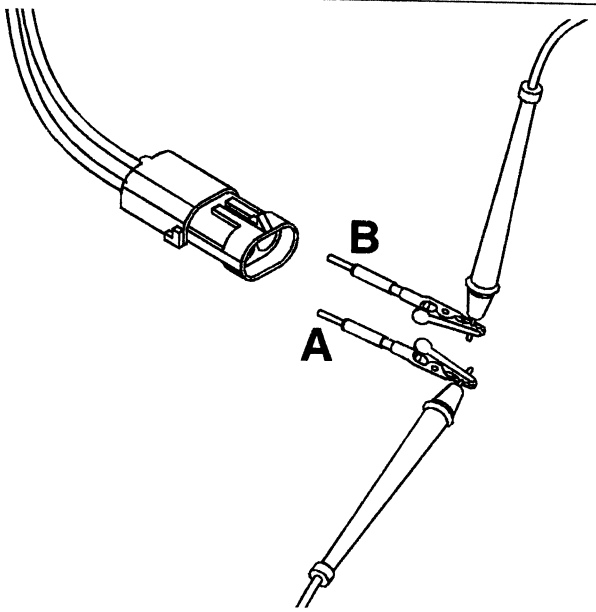
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking measurements: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the burn valve solenoid from the engine harness.

Action	Specifications/Repair	Next Step
Check the burn valve solenoid for an open circuit. • Measure the resistance from pin A (or 1) to pin B (or 2) of the burn valve solenoid connector.	**OK** **Less than 120 ohms**	1D
	NOT OK **Replace the burn valve solenoid** Refer to the Centinel™ Master Repair Manual, Bulletin No. 3666231.	3A



19c00759

STEP 1D: Check the burn valve solenoid for a short circuit.

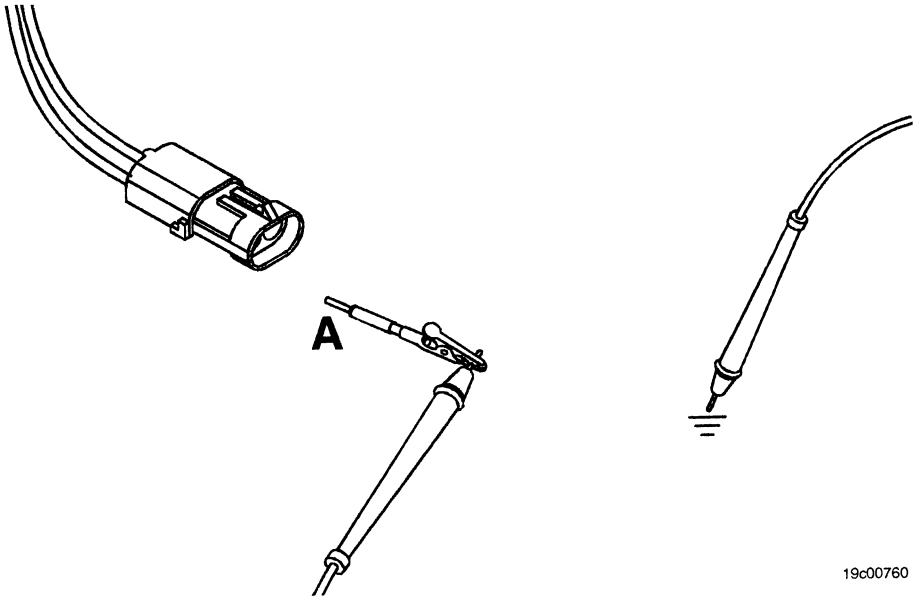
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking measurements: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the engine harness from the burn valve solenoid.

Action	Specifications/Repair	Next Step
Check the burn valve solenoid for a short circuit to ground. • Measure the resistance from pin A (or 1) of the burn valve solenoid to engine block ground.	**OK** **More than 80 ohms**	2A
	NOT OK **Replace the burn valve solenoid** Refer to the Centinel™ Master Repair Manual, Bulletin No. 3666231.	3A



STEP 2: Check the engine harness.

STEP 2A: Inspect the engine harness and ECM connectors.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:

- Turn keyswitch OFF.
- Disconnect the engine harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the engine harness and ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	2B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	3A

STEP 2B: Check for an open circuit.

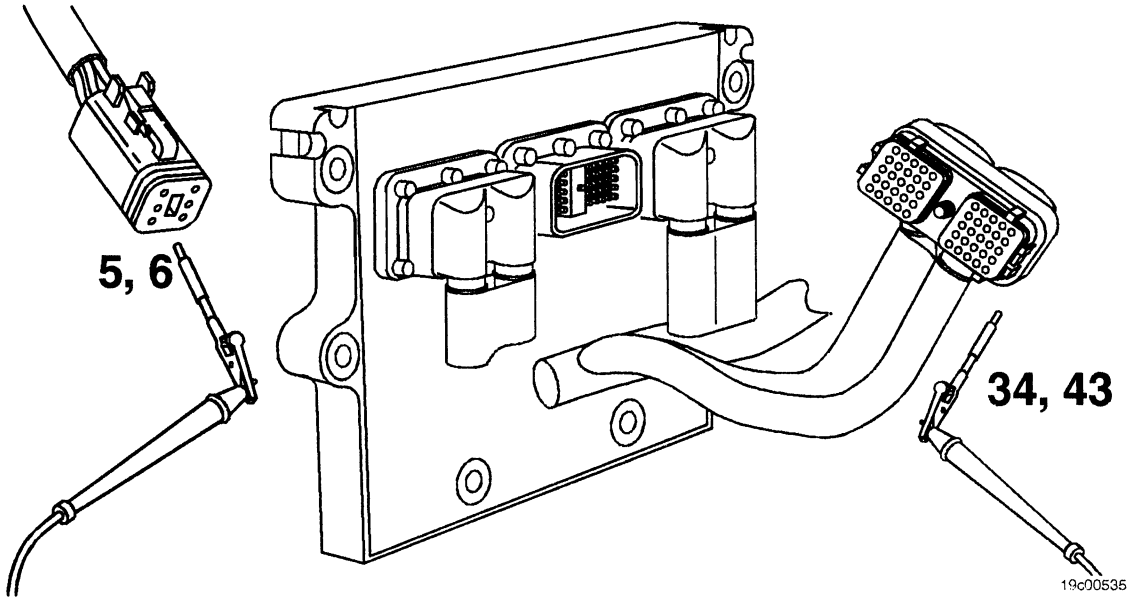
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking measurements: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the burn valve solenoid from the engine harness.
- Disconnect the actuator harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for an open circuit in the burn valve solenoid circuit. • Measure the resistance from pin 34 of the actuator harness connector to pin 5 of the burn valve solenoid, harness side. • Measure the resistance from pin 43 of the actuator harness connector to pin 6 of the burn valve solenoid, harness side.	**OK** **Less than 10 ohms**	2B-1
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-206 or 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



STEP 2B-1: Check for an open circuit in the Centinel™ jumper harness.

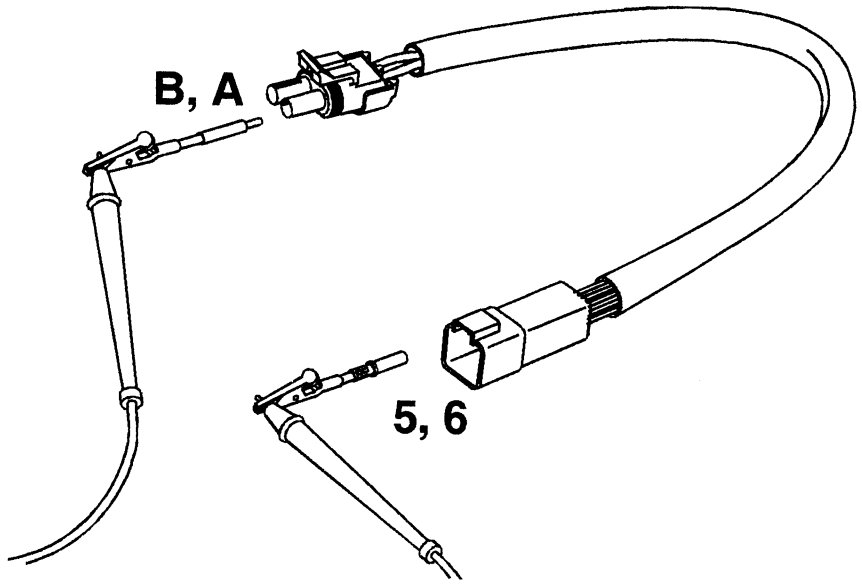
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking measurements: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the jumper harness from the burn valve solenoid.
- Disconnect the jumper harness from the engine harness.

Action	Specifications/Repair	Next Step
Check for an open circuit in the Centinel™ jumper harness.. • Measure the resistance from the signal pin of the 2-pin connector end of the Centinel™ jumper harness to pin 5 of the 6-pin connnector end of the harness. • Measure the resistance from the return pin of the 2-pin connector end of the Centinel™ jumper harness to pin 6 of the 6-pin connnector end of the harness.	**OK** **Less than 10 ohms**	2C
	NOT OK **Repair or replace the Centinel™ jumper harness** Refer to the Centinel™ Master Repair Manual, Bulletin No. 3666231.	3A



STEP 2C: Check for a short circuit to ground.

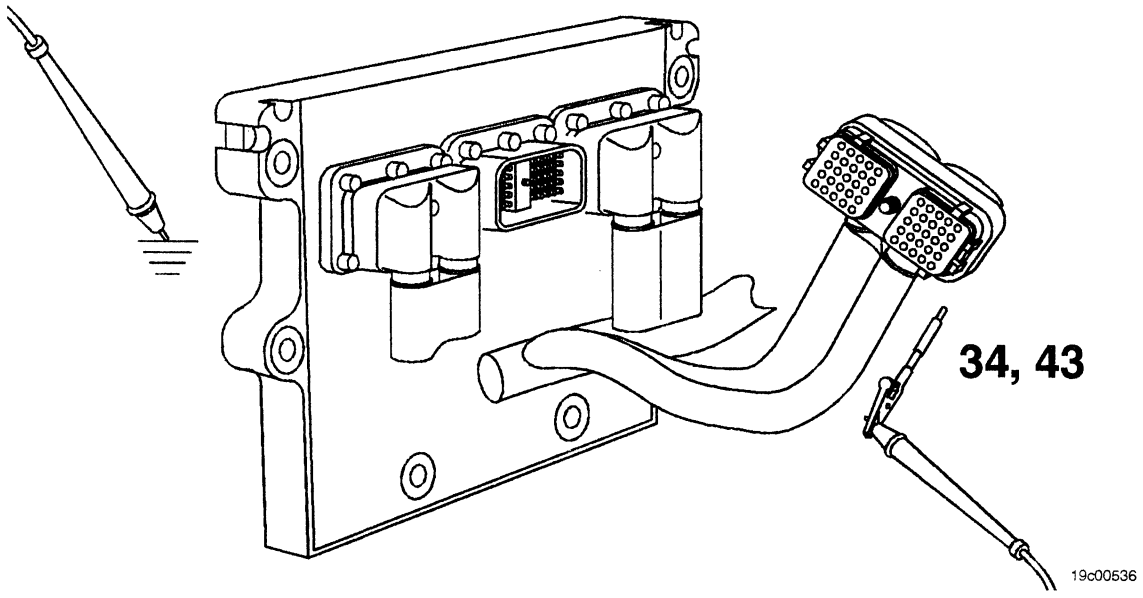
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking measurements: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the burn valve solenoid from the engine harness.
- Disconnect the actuator harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for a short circuit to ground. • Measure the resistance from pin 34 of the actuator harness connector to engine block ground. • Measure the resistance from pin 43 of the actuator harness connector to engine block ground.	**OK** **More than 100k ohms**	2C-1
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



STEP 2C-1: Check for a short circuit to ground in the Centinel™ jumper harness.

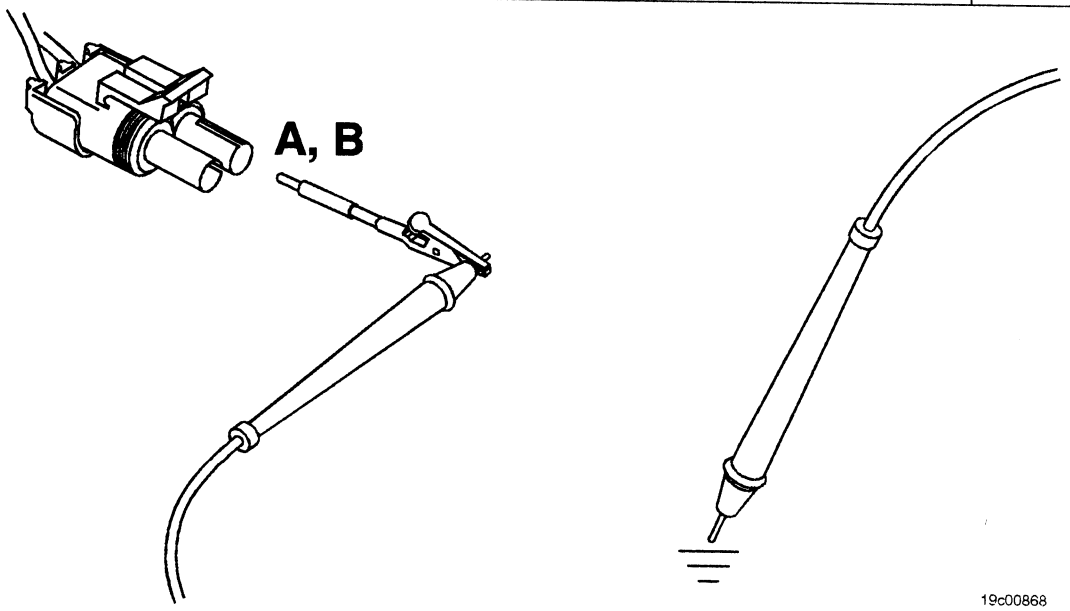
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking measurements: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the jumper harness from the burn valve solenoid.
- Disconnect the jumper harness from the engine harness.

Action	Specifications/Repair	Next Step
Check for a short circuit to ground in the Centinel™ jumper harness. • Measure the resistance from pin A (or 1) of the 2-pin jumper harness connector to engine block ground. • Measure the resistance from pin B (or 2) of the 2-pin jumper harness connector to engine block ground.	**OK** **More than 100k ohms**	2D
	NOT OK **Repair or replace the Centinel™ jumper harness** Refer to the Centinel™ Master Repair Manual, Bulletin No. 3666231.	3A



STEP 2D: Check for a short circuit from pin to pin.

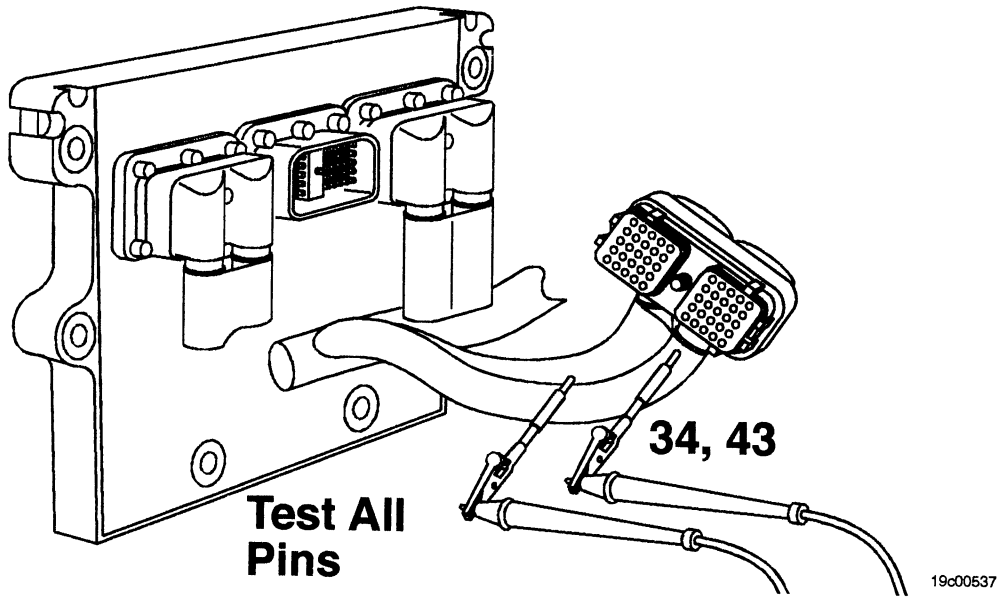
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking measurements: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the engine harness from the burn valve solenoid.
- Disconnect the actuator harness connector from the ECM.
- Disconnect the 31-pin OEM connector.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin. • Measure the resistance from pin 34 of the actuator harness connector to all other pins in the connector. • Measure the resistance from pin 43 of the actuator harness connector to all other pins in the connector.	**OK** **More than 100k ohms**	3A
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



STEP 3: Clear the fault codes.

STEP 3A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Verify that Fault Code 223 is inactive.	**OK** **Fault Code 223 inactive**	3B
	NOT OK Return to troubleshooting steps or contact your local Cummins Authorized Repair Location if all the steps have been completed and checked again.	1A

STEP 3B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

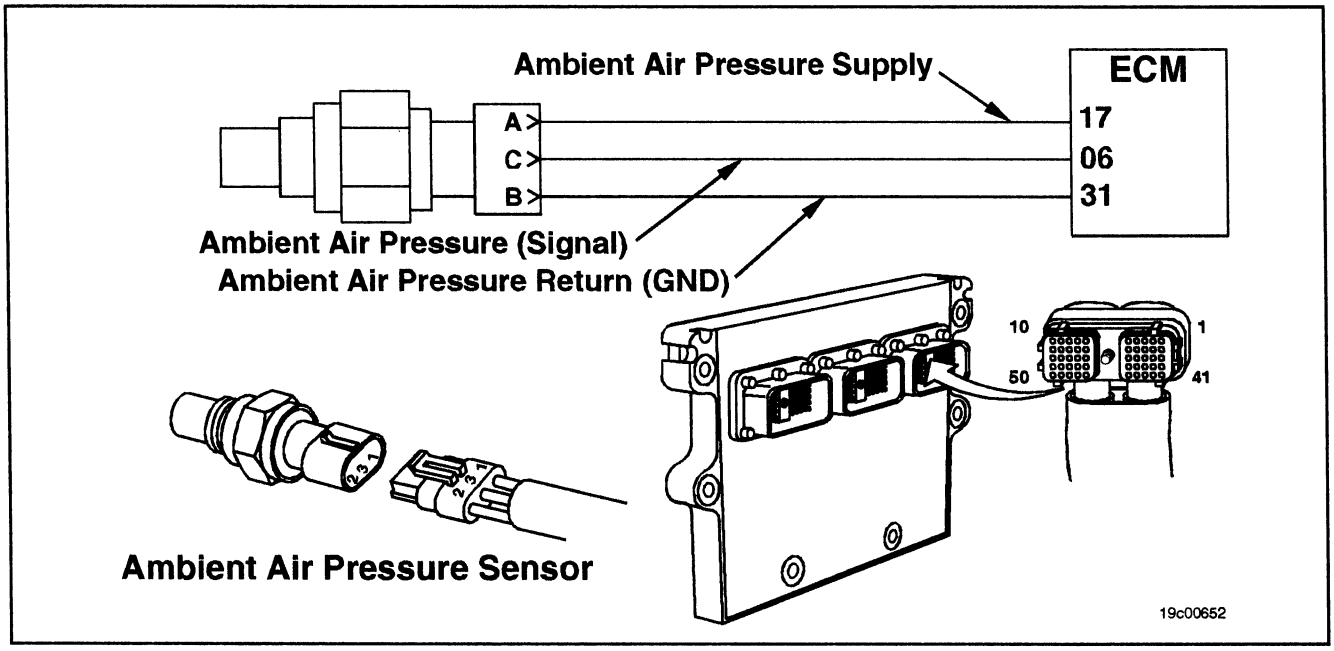
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 222

Ambient Air Pressure Sensor Circuit

CODES	REASON	EFFECT
Fault Code: 222 PID(P), SID(S): P108 SPN: 108 FMI: 4/4 Lamp: Yellow	Low voltage detected at the ambient air pressure circuit.	Derate in power output of engine.

Ambient Air Pressure Sensor Circuit



Circuit Description:

The ambient air pressure sensor monitors atmospheric pressure and passes information to the electronic control module (ECM) through the sensor harness.

Component Location:

The ambient air pressure sensor is located below the ECM.

Shop Talk:

Monitor the ambient air pressure reading with a service tool to confirm that the pressure reading matches the actual air pressure.

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.
Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead
Part No. 3824774 - breakout cable.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check for multiple fault codes.		
STEP 1A: Read the fault codes.	Fault Code 123 inactive	
STEP 2: Check the ambient air pressure sensor.		
STEP 2A: Inspect the ambient air pressure sensor and sensor harness connector pins.	No damaged pins	
STEP 2B: Read the fault codes.	Fault Code 222 inactive	
STEP 2C: Check the ECM ambient air pressure supply voltage.	(+) 4.75 to 5.25 VDC	
STEP 2C-1: Measure the voltage from the ECM.	(+) 4.75 to 5.25 VDC	
STEP 2D: Check the ECM ambient air pressure signal voltage.	Altitude (ft) Voltage (VDC) 0 (sea level) - (+) 3.40 to 4.50 3000 - (+) 2.80 to 3.80 6000 - 2.20 to 3.25 9000 - (+) 1.70 to 2.70 12000 - (+) 1.20 to 2.20	
STEP 2D-1: Check for a short circuit to ground.	More than 100k ohms	
STEP 2D-2: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 3: Check the sensor harness.		
STEP 3A: Inspect the sensor harness and the ECM connector for damaged pins.	No damaged pins	
STEP 3B: Read the fault codes.	Fault Code 222 inactive	
STEP 3C: Check for an open circuit.	Less than 10 ohms	
STEP 4: Check for an ECM response.		
STEP 4A: Check for the appropriate ECM response.	Fault Code 222 inactive and Fault Code 221 active	
STEP 5: Clear the fault codes.		
STEP 5A: Disable the fault code.	Fault Code 222 inactive	
STEP 5B: Clear the inactive fault codes.	All faults cleared	

TROUBLESHOOTING STEP

STEP 1: Check for multiple fault codes.

STEP 1A: Read the fault codes.

Condition:
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Read the fault codes using INSITE™.	**OK** **Fault Code 123 inactive**	2A
	NOT OK	Fault Code 352

STEP 2: Check the ambient air pressure sensor.

STEP 2A: Inspect the ambient air pressure sensor and sensor harness connector pins.

Condition:
- Turn keyswitch OFF.
- Disconnect the engine harness from the ambient air pressure sensor.

Action	Specifications/Repair	Next Step
Inspect the ambient air pressure sensor and sensor harness connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	2B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the sensor, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using the electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-203. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ambient air pressure sensor. Refer to Procedure 019-004.	5A

STEP 2B: Read the fault codes.

Condition:
- Turn keyswitch OFF.
- Connect all components.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start the engine and let it idle for 1 minute. • Read the fault codes using INSITE™.	**OK** **Fault Code 222 inactive**	2C
	NOT OK Repair complete.	5B

STEP 2C: Check the ECM ambient air pressure supply voltage.

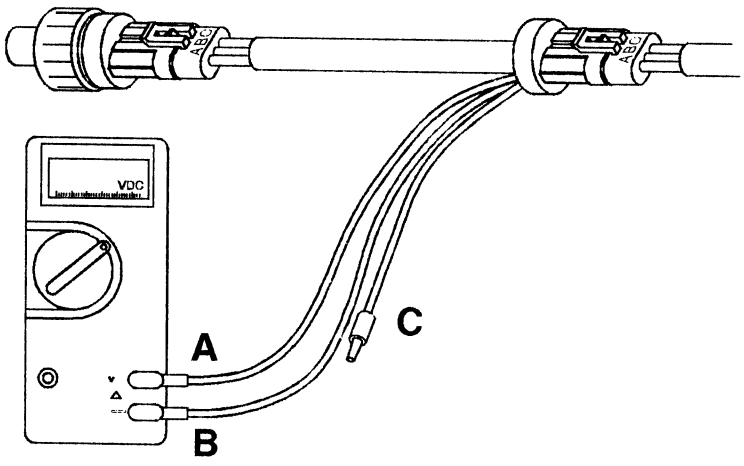
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3824774 - breakout cable.

Condition:

- Install the breakout cable, Part No. 3824774, between the sensor and the engine harness connector.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the ECM ambient air pressure supply voltage. • Using a multimeter, measure the supply voltage from pin A (or RED) to pin B (or BLACK) of the breakout cable.	**OK** **(+) 4.75 to 5.25 VDC**	2D
	NOT OK Does **not** meet specifications.	2C-1



19c00094

STEP 2C-1: Measure the voltage from the ECM.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

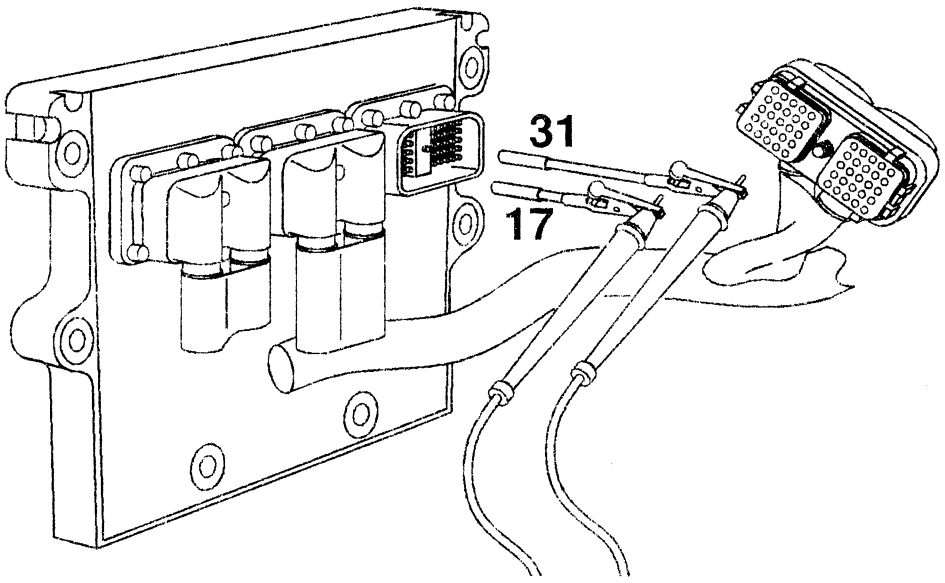
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822917 - female Deustch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the sensor harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Measure the voltage out of the ECM. • Measure the voltage at the ECM from pin 17 to pin 31 of the ECM sensor port.	**OK** **(+) 4.75 to 5.25 VDC** **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	5A
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	5A



19c00125

STEP 2D: Check the ECM ambient air pressure signal voltage.

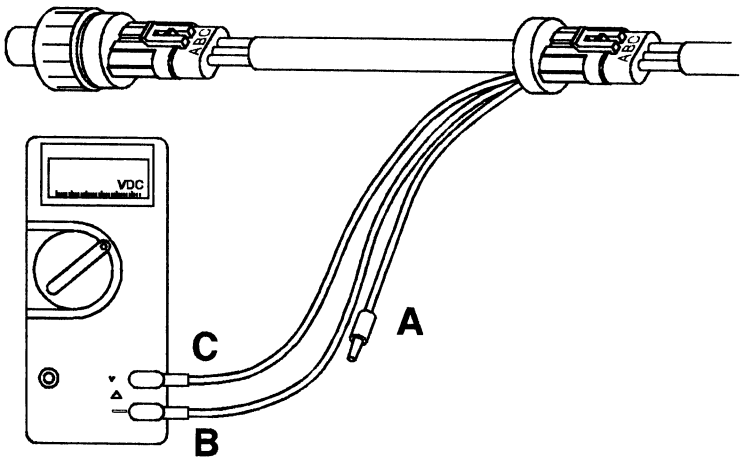
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3824774 - breakout cable.

Condition:

- Install the breakout cable, Part No. 3824774, between the sensor and the engine harness connector.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the ECM ambient air pressure signal voltage. • Measure the signal voltage from pin B (or BLACK) to pin C (or YELLOW) of the breakout cable.	**OK** **Altitude (ft) - Voltage (VDC)** **0 (sea level) - (+) 3.40 to 4.50** **3000 - (+) 2.80 to 3.80** **6000 - (+) 2.20 to 3.25** **9000 - (+) 1.70 to 2.70** **12000 - (+) 1.20 to 3.40**	2D-1
	NOT OK	3A



19c00095

STEP 2D-1: Check for a short circuit to ground.

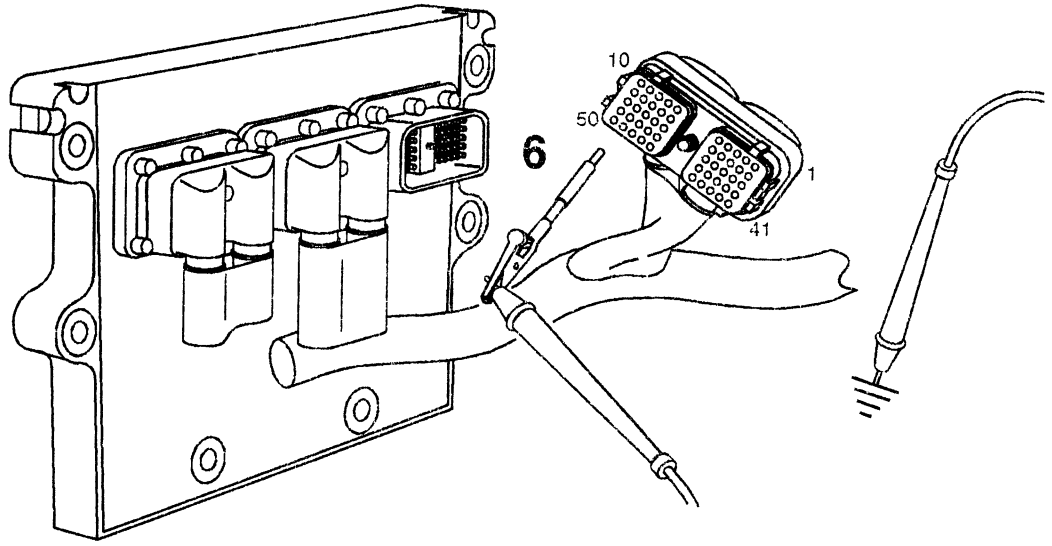
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the ambient air pressure sensor from the engine harness.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for a short circuit to ground. • Measure the resistance from sensor harness connector pin 6 to the chassis ground.	**OK** **More than 100k ohms**	2D-2
	NOT OK **Replace the engine harness** Replace the engine harness. Refer to Procedure 019-043.	5A



STEP 2D-2: Check for a short circuit from pin to pin.

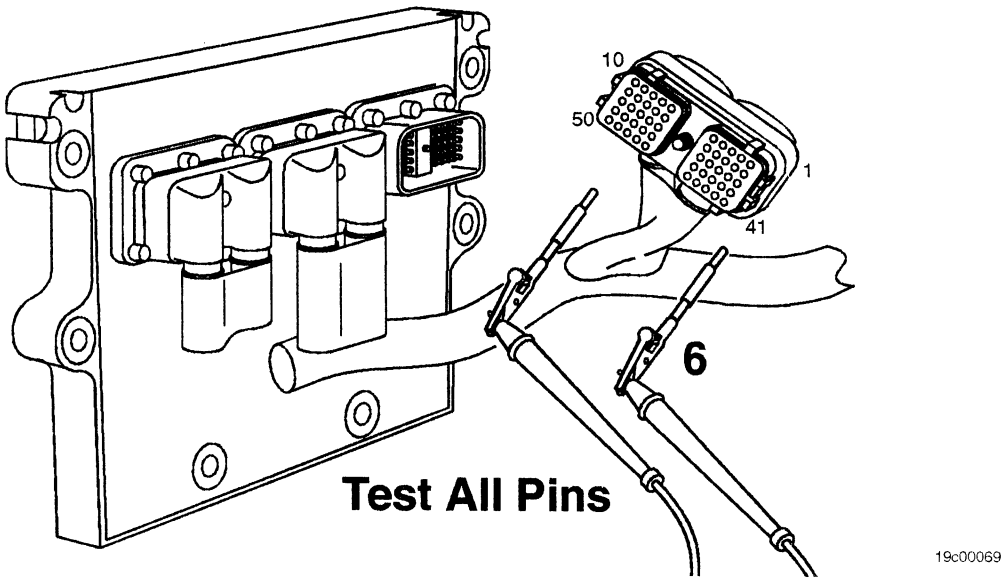
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the engine harness from the ambient air pressure sensor.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin. • Measure the resistance from pin 6 of the sensor harness connector to all other pins in the connector.	**OK** **More than 100k ohms** **Replace the ambient air temperature sensor** Refer to Procedure 019-004.	5A
	NOT OK **Replace the engine harness** Replace the engine harness. Refer to Procedure 019-043.	5A



STEP 3: Check the sensor harness.

STEP 3A: Inspect the sensor harness and the ECM connector for damaged pins.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the sensor harness and the ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	3B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	5A

STEP 3B: Read the fault codes.

Condition:
- Turn keyswitch OFF.
- Connect all components.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start the engine and let it idle for 1 minute. • Read the fault codes using INSITE™.	**OK** **Fault Code 222 inactive**	3C
	NOT OK Repair complete.	5B

STEP 3C: Check for an open circuit.

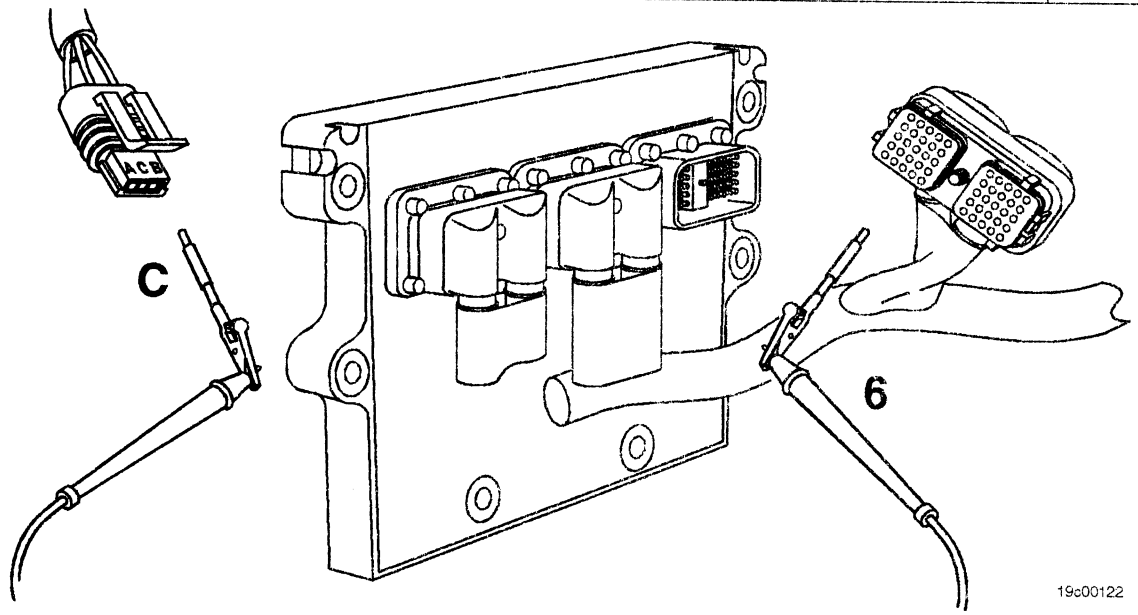
⚠CAUTION⚠

To avoid pin and harness damage, use the following test leads when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the ambient air pressure sensor from the engine harness.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for an open circuit in the ambient air pressure signal wire. • Measure the resistance from sensor harness connector pin 6 to the ambient air pressure sensor signal pin C (or 3).	**OK** **Less than 10 ohms**	4A
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-203 or 019-250. • Replace the engine harness. Refer to Procedure 019-043.	5A



STEP 4: Check for an ECM response.

STEP 4A: Check for the appropriate ECM response.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

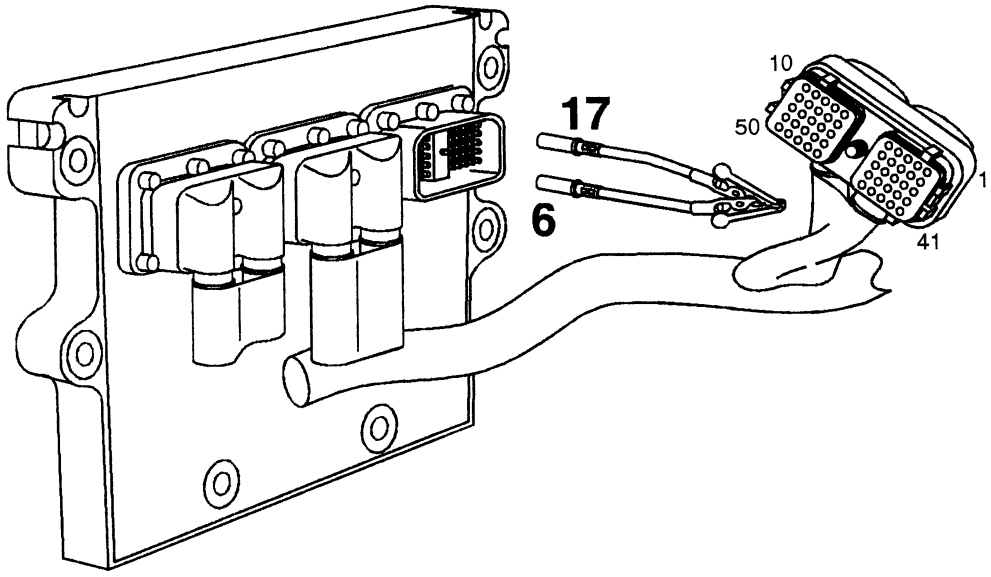
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the sensor harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check for the appropriate ECM response. • Install a jumper wire between ECM sensor port pin 6 and pin 17. • Read the fault codes using INSITE™.	**OK** **Fault Code 222 inactive** **Fault Code 221 active**	5A
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	5A



STEP 5: Clear the fault codes.

STEP 5A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify that Fault Code 222 is inactive.	**OK** **Fault Code 222 inactive**	5B
	NOT OK Return to troubleshooting steps or contact your local Cummins Authorized Repair Location if all the steps have been completed and checked again.	1A

STEP 5B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

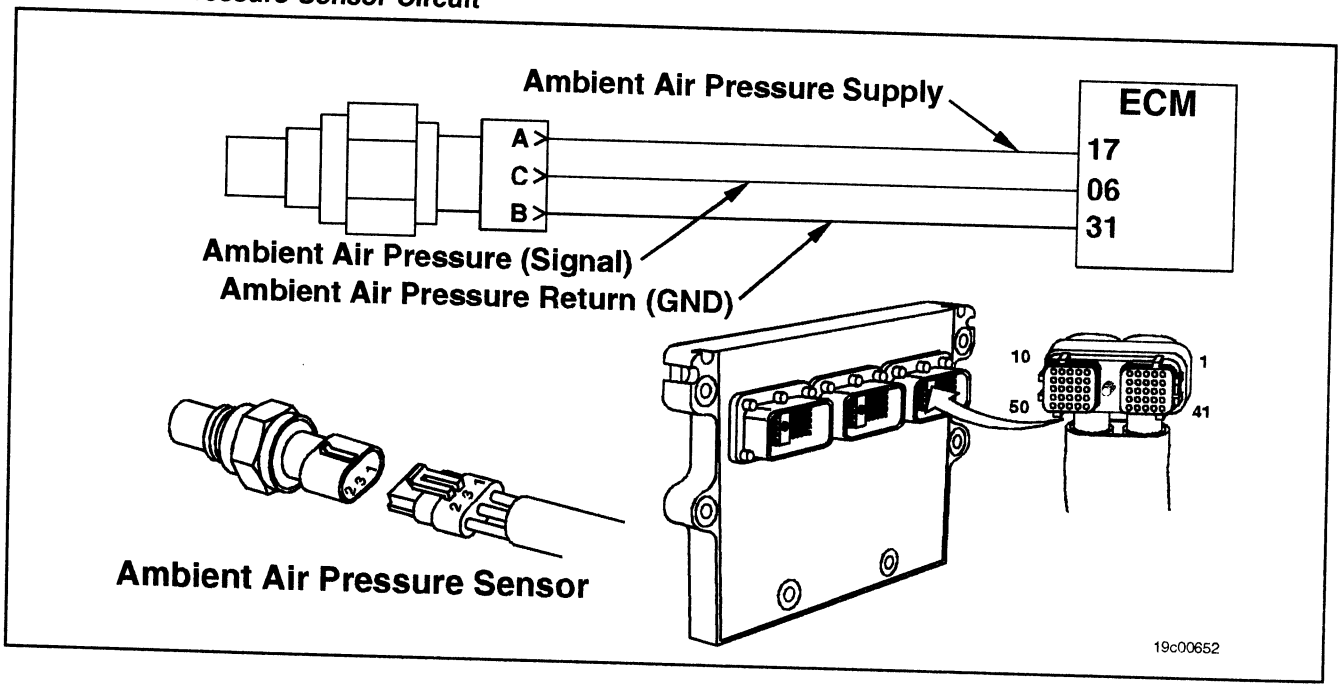
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All faults cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 221

Ambient Air Pressure Sensor Circuit

CODES	REASON	EFFECT
Fault Code: 221 PID(P), SID(S): P108 SPN: 108 FMI: 3/3 Lamp: Yellow	High voltage detected at the ambient air pressure sensor circuit.	Derate in power output of engine.

Ambient Air Pressure Sensor Circuit



Circuit Description:

The ambient air pressure sensor monitors atmospheric pressure and passes the information to the electronic control module (ECM) through the engine harness.

Component Location:

The ambient air pressure sensor is located below ECM.

Shop Talk:

Monitor the ambient air pressure reading with a service tool to confirm that the pressure reading matches the actual air pressure.

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead
Part No. 3824774 - breakout cable.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the ambient air pressure sensor.		
STEP 1A: Inspect the ambient air pressure sensor and engine harness connector pins.	No damaged pins	
STEP 1B: Read the fault codes.	Fault Code 221 inactive	
STEP 1C: Check the ECM ambient air pressure sensor supply voltage.	(+) 4.75 to 5.25 VDC	
STEP 1C-1: Measure the voltage from the ECM.	(+) 4.75 to 5.25 VDC	
STEP 1D: Check the ECM ambient air pressure sensor signal voltage.	Altitude (ft) Voltage (VDC) 0 (sea level) - (+) 3.40 to 4.50 3000 - (+) 2.80 to 3.80 6000 - (+) 2.20 to 3.25 9000 - (+) 1.70 to 2.70 12000 - (+) 1.20 to 2.20	
STEP 2: Check the sensor harness.		
STEP 2A: Inspect the sensor harness and the ECM connector for damaged pins.	No damaged pins	
STEP 2B: Read the fault codes.	Fault Code 221 inactive	
STEP 2C: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 2D: Check for an open circuit in the return wire.	Less than 10 ohms	
STEP 3: Check for an ECM response.		
STEP 3A: Check for the appropriate ECM response.	Fault Code 221 inactive Fault Code 222 active	
STEP 4: Clear the fault codes.		
STEP 4A: Disable the fault code.	Fault Code 221 inactive	
STEP 4B: Clear the inactive fault codes.	All faults cleared	

TROUBLESHOOTING STEP

STEP 1: Check the ambient air pressure sensor.

STEP 1A: Inspect the ambient air pressure sensor and engine harness connector pins.

Condition:
- Turn keyswitch OFF.
- Disconnect the engine harness from the ambient air pressure sensor.

Action	Specifications/Repair	Next Step
Inspect the ambient air pressure sensor and sensor harness connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	1B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the sensor, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using the electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-203. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ambient air pressure sensor. Refer to Procedure 019-004.	4A

STEP 1B: Read the fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start the engine and let it idle for 1 minute. • Read the fault codes using INSITE™.	**OK** **Fault Code 221 inactive**	4B
	NOT OK Fault Code 221 active.	1C

STEP 1C: Check the ECM ambient air pressure sensor supply voltage.

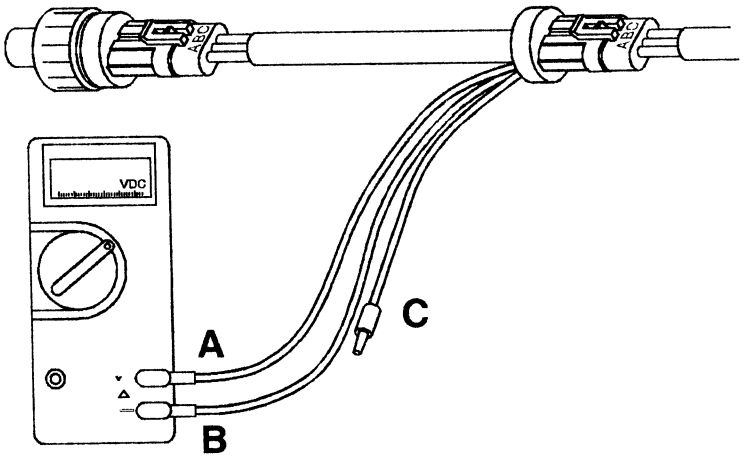
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking measurements: Part No. 3824774 - breakout cable.

Condition:

- Install breakout cable, Part No. 3824774, between the sensor and the sensor harness connector.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the ECM ambient air pressure sensor supply voltage. • Measure the supply voltage from pin A (or RED) to pin B (or BLACK) of the breakout cable.	**OK** **(+) 4.75 to 5.25 VDC**	1D
	NOT OK Does **not** meet specifications.	1C-1



19c00094

STEP 1C-1: Measure the voltage from the ECM.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

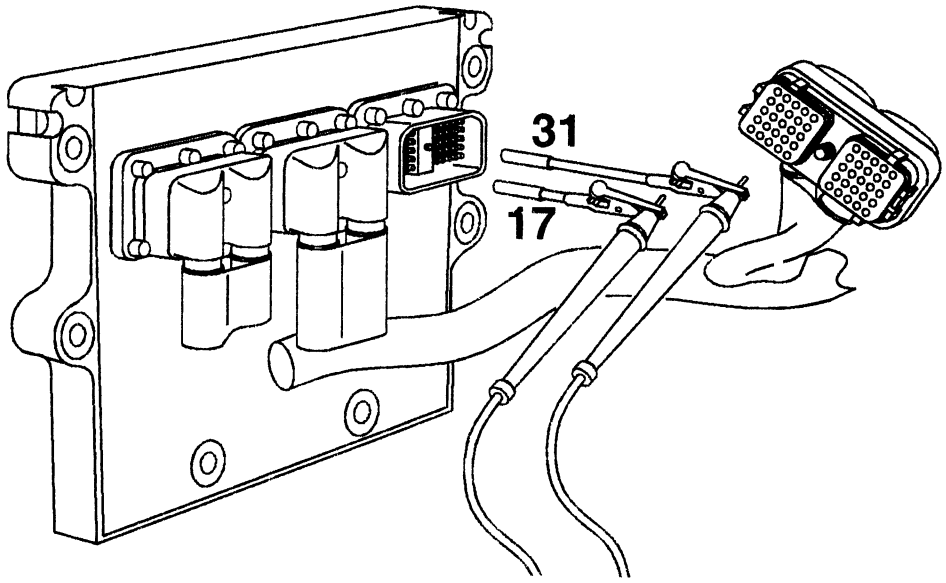
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the sensor harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Measure the voltage out of the ECM. • Measure the voltage at the ECM from pin 17 to pin 31 of the ECM sensor port.	**OK** **(+) 4.75 to 5.25 VDC** **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	4A
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	4A



19c00125

STEP 1D: Check the ECM ambient air pressure sensor signal voltage.

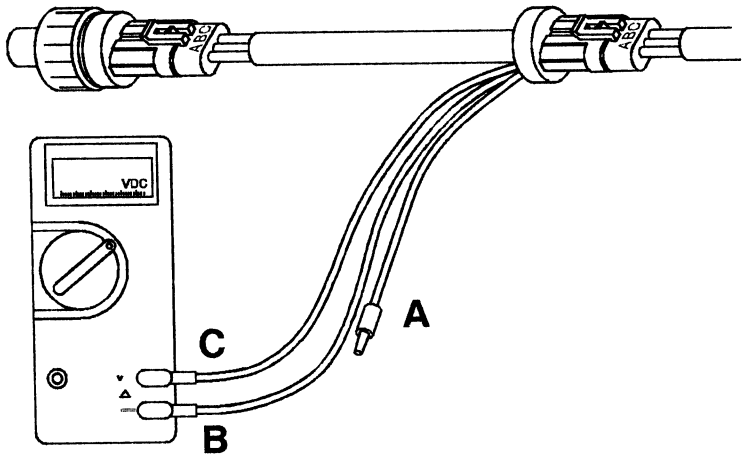
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking measurements: Part No. 3824774 - breakout cable.

Condition:

- Install the breakout cable, Part No. 3824774, between the sensor and the sensor harness connector.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the ECM ambient air pressure signal voltage. • Measure the signal voltage from pin C (or YELLOW) to pin B (or BLACK) of the breakout cable.	**OK** **Altitude (ft) Voltage (VDC)** **0 (sea level) - (+) 3.40 to 4.50** **3000 - (+) 2.80 to 3.80** **6000 - (+) 2.20 to 3.25** **9000 - (+) 1.70 to 2.70** **12000 - (+) 1.20 to 2.20**	3A
	NOT OK	2A



19c00095

STEP 2: Check the sensor harness.

STEP 2A: Inspect the sensor harness and the ECM connector for damaged pins.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the sensor harness and the ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	2B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	4A

STEP 2B: Read the fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start the engine and let it idle for 1 minute. • Read the fault codes using INSITE™.	**OK** **Fault Code 221 inactive**	4B
	NOT OK Fault Code 221 active.	2C

STEP 2C: Check for a short circuit from pin to pin.

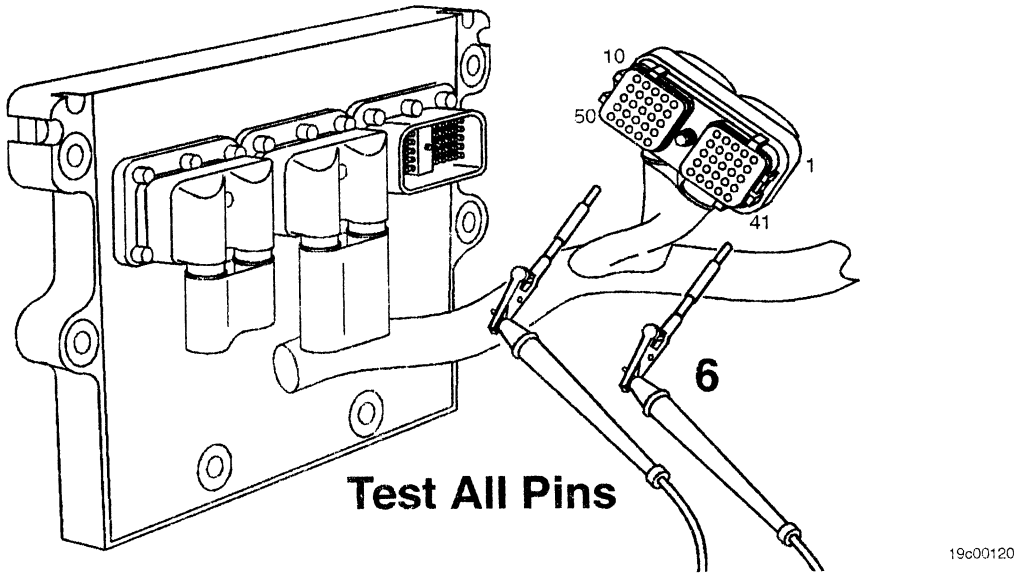
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin. • Measure the resistance from pin 6 of the sensor harness connector to all other pins in the connector.	**OK** **More than 100k ohms**	2D
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043	4A



STEP 2D: Check for an open circuit in the return wire.

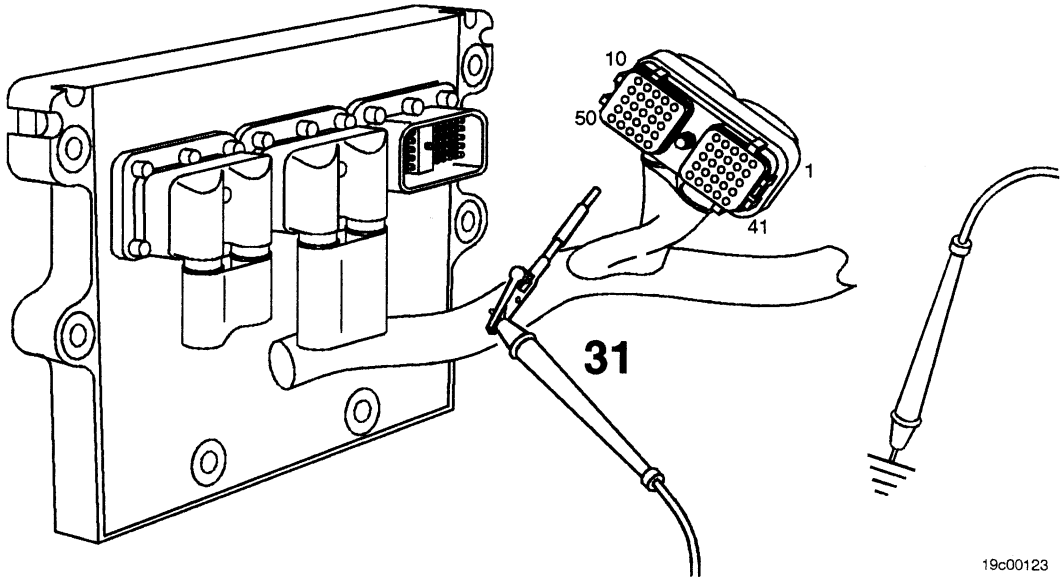
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the engine harness from the ambient air pressure sensor.

Action	Specifications/Repair	Next Step
Check for an open circuit in the return wire. • Measure the resistance from pin 31 of the sensor harness connector to the engine block ground.	**OK** **Less than 10 ohms** **Replace the ambient air pressure sensor** Refer to Procedure 019-004.	3A
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043	4A



STEP 3: Check for an ECM response.

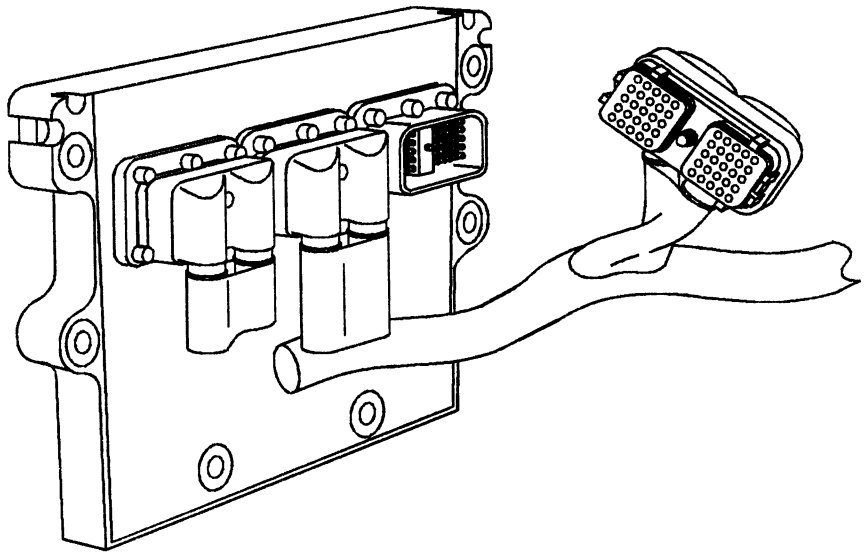
STEP 3A: Check for the appropriate ECM response.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Disconnect the sensor harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check for the appropriate ECM response. • Disconnect the sensor harness connector from the ECM. • Read the fault codes using INSITE™.	**OK** **Fault Code 221 inactive** **Fault Code 222 active**	4A
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	4A



19600008

STEP 4: Clear the fault codes.

STEP 4A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify that Fault Code 221 is inactive.	**OK** **Fault Code 221 inactive**	4B
	NOT OK Return to troubleshooting steps or contact your local Cummins Authorized Repair Location if all steps have been completed and checked again.	1A

STEP 4B: Clear the inactive fault codes.

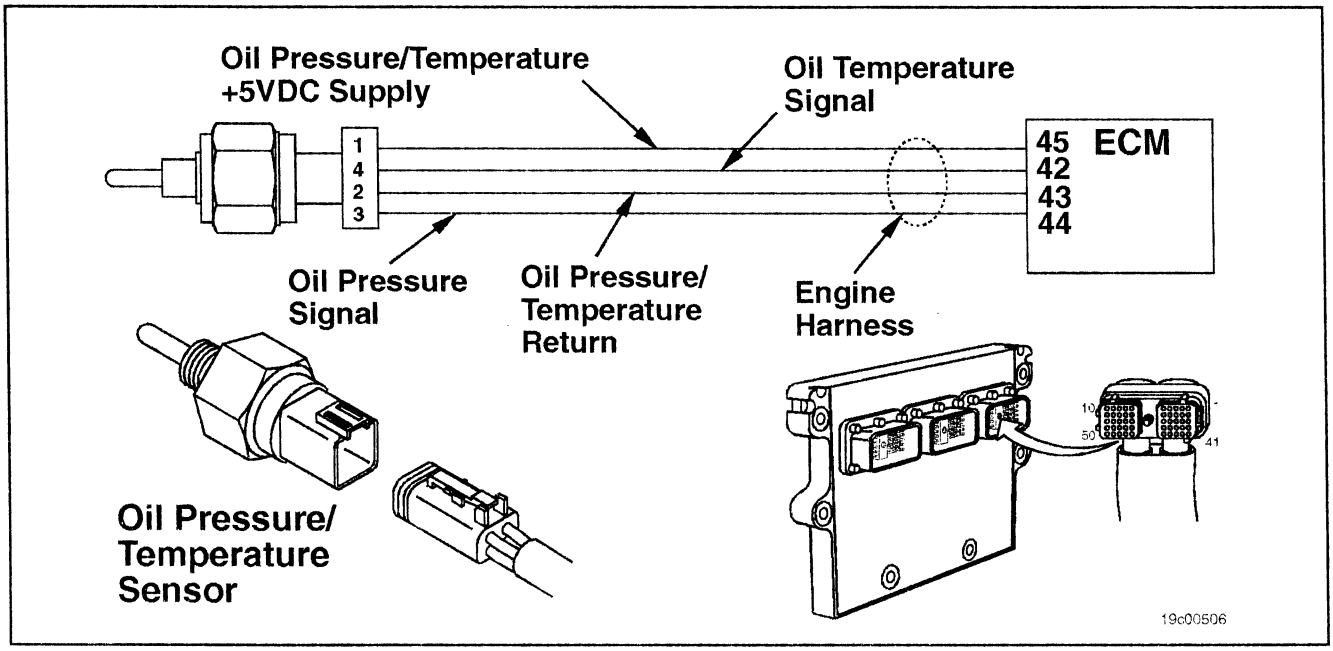
Condition: • Connect all components. • Turn keyswitch ON.		
Action	**Specifications/Repair**	**Next Step**
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All faults cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 141

Oil Pressure Sensor Circuit

CODES	REASON	EFFECT
Fault Code: 141 PID(P), SID(S): P100 SPN: 100 FMI: 4/4 Lamp: Yellow	Low voltage detected at the oil pressure circuit.	No engine protection for oil pressure.

Oil Pressure Sensor Circuit



Circuit Description:

The oil pressure/temperature sensor is used by the electronic control module (ECM) to monitor the lubricating oil pressure. The ECM monitors the voltage on the signal pin and converts this to a pressure value. The oil pressure value is used by the ECM for the engine protection system.

Component Location:

The oil pressure/temperature sensor is located on the engine block to the left of the fuel filter, behind the air compressor.

Shop Talk:

If Fault Code 143 or 415 is present, the problem is probably base engine related.

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging the new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead
Part No. 3162898 - breakout cable.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check for multiple fault codes.		
STEP 1A: Read the fault codes.	Fault Codes 187, 452, and 484 are not active	
STEP 2: Check the oil pressure/temperature sensor.		
STEP 2A: Inspect the oil pressure/temperature sensor and engine harness connector pins.	No damaged pins	
STEP 2B: Read the fault codes.	Fault Code 141 inactive	
STEP 2C: Check the oil pressure/temperature sensor supply voltage.	(+) 4.75 to 5.25 VDC	
STEP 2C-1: Check the voltage from the ECM.	(+) 4.75 to 5.25 VDC	
STEP 2D: Check the oil pressure/temperature sensor signal voltage.	(+) 0.50 to 1.40 VDC	
STEP 2D-1: Check for a short circuit to ground.	More than 100k ohms	
STEP 2D-2: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 3: Check the engine harness.		
STEP 3A: Inspect the engine harness and ECM connector for damaged pins.	No damaged pins	
STEP 3B: Read the fault codes.	Fault Code 141 inactive	
STEP 3C: Check for an open circuit.	Less than 10 ohms	
STEP 4: Check for an ECM response.		
STEP 4A: Check for the appropriate ECM response.	Fault Code 141 inactive Fault Code 135 active	
STEP 5: Clear the fault codes.		
STEP 5A: Disable the fault code.	Fault Code 141 inactive	
STEP 5B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check for multiple fault codes.

STEP 1A: Read the fault codes.

Condition:
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Read the fault codes using INSITE™.	**OK** **Fault Codes 187, 452, and 484 are not active**	2A
	NOT OK Possible sensor failure, a short circuit to ground in the sensor (+) 5-VDC common supply, or a short circuit from pin to pin.	Fault Code 187

STEP 2: Check the oil pressure/temperature sensor.

STEP 2A: Inspect the oil pressure/temperature sensor and engine harness connector pins.

Condition:
- Turn keyswitch OFF.
- Disconnect the engine harness from the oil pressure/temperature sensor.

Action	Specifications/Repair	Next Step
Inspect the oil pressure/temperature sensor and engine harness connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	2B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the oil pressure/temperature sensor, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using the electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-204. • Replace the engine harness. Refer to Procedure 019-043. • Replace the oil pressure sensor. Refer to Procedure 019-155.	5A

STEP 2B: Read the fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start the engine and let it idle for 1 minute. • Read the fault codes using INSITE™.	**OK** **Fault Code 141 inactive**	5B
	NOT OK Fault Code 141 active.	2C

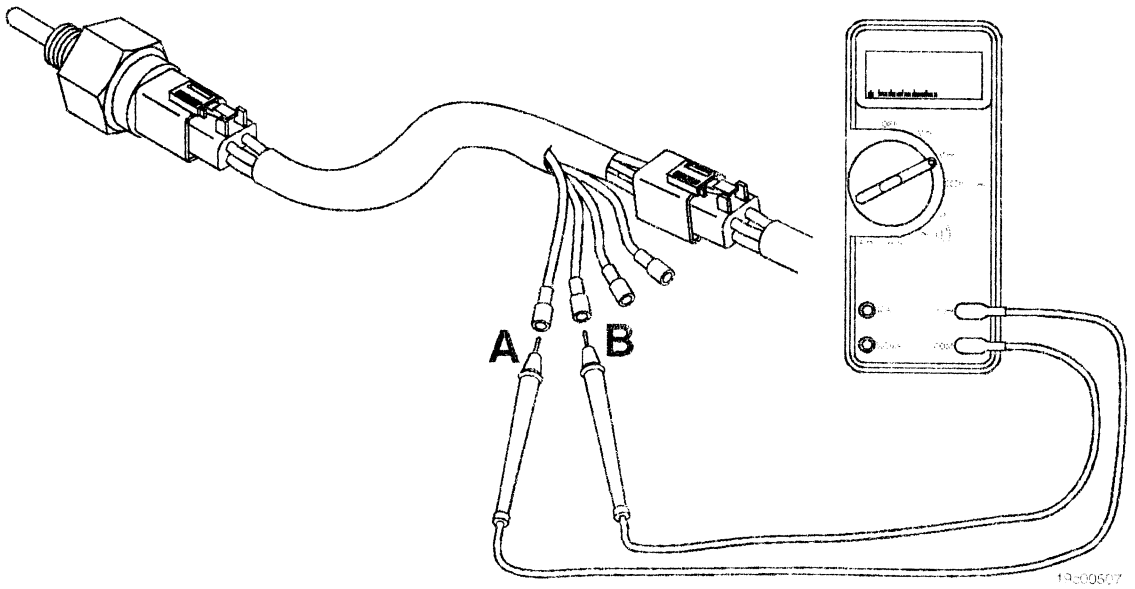
STEP 2C: Check the oil pressure/temperature sensor supply voltage.

△CAUTION△

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3162898 - breakout cable.

Condition:
- Disconnect the engine harness from the oil pressure sensor.
- Install the breakout cable, Part No. 3162898, between the sensor and the engine harness connector.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the oil pressure/temperature sensor supply voltage. • Measure the supply voltage from pin A (or RED) to pin B (or BLACK) on the harness side of the oil pressure sensor.	**OK** **(+) 4.75 to 5.25 VDC**	2D
	NOT OK Does **not** meet specifications.	2C-1



⚠CAUTION⚠

To avoid damaging the new ECM, all other active fault codes must be investigated prior to repla ECM.

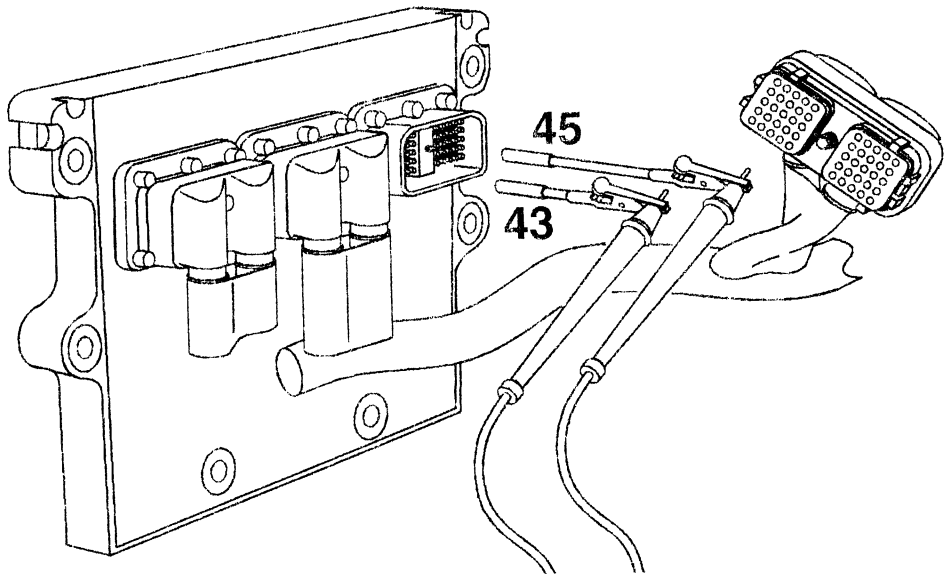
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the sensor harness connector from the ECM.
- Set the multimeter to the voltage function and connect the two test leads to the multimeter.
- Turn keyswitch ON.

Action	Specifications/Repair	N
Measure the voltage from the ECM. • Measure the voltage from pin 45 to pin 43 of the ECM sensor port.	**OK** **(+) 4.75 to 5.25 VDC**	5/
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	5/



19

STEP 2D: Check the oil pressure/temperature sensor signal voltage.

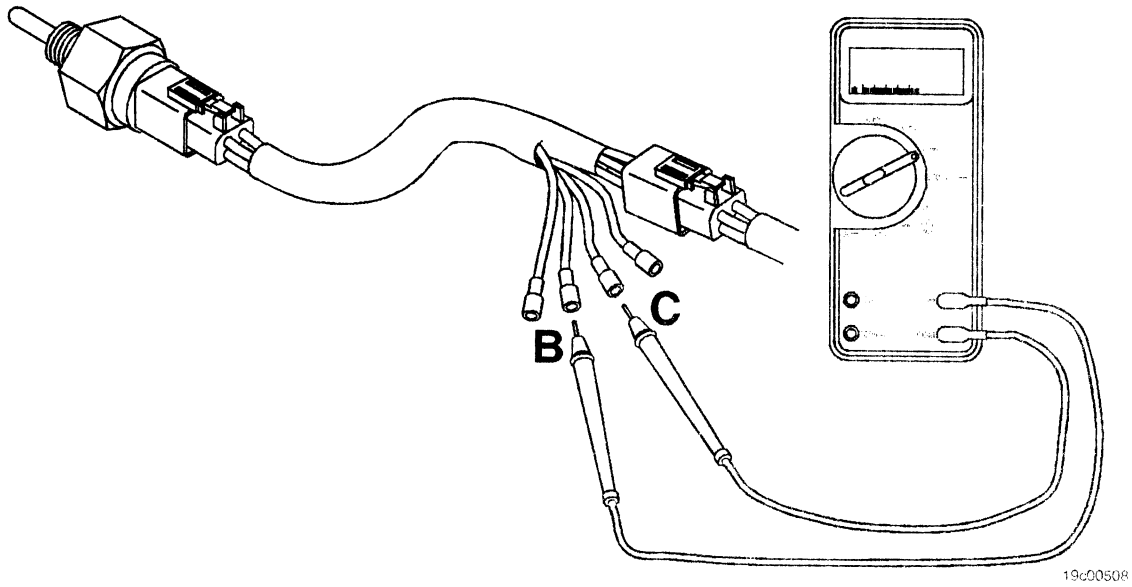
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3162898 - breakout cable.

Condition:

- Disconnect the oil pressure/temperature sensor from the engine harness.
- Install the breakout cable, Part No. 3162898, between the sensor and the engine harness.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the oil pressure/temperature sensor signal voltage. • Measure the voltage from pin C (or YELLOW) to pin B (or BLACK) of the breakout cable.	**OK** **(+) 0.50 to 1.40 VDC**	2D-1
	NOT OK Does **not** meet specifications.	3A



STEP 2D-1: Check for a short circuit to ground.

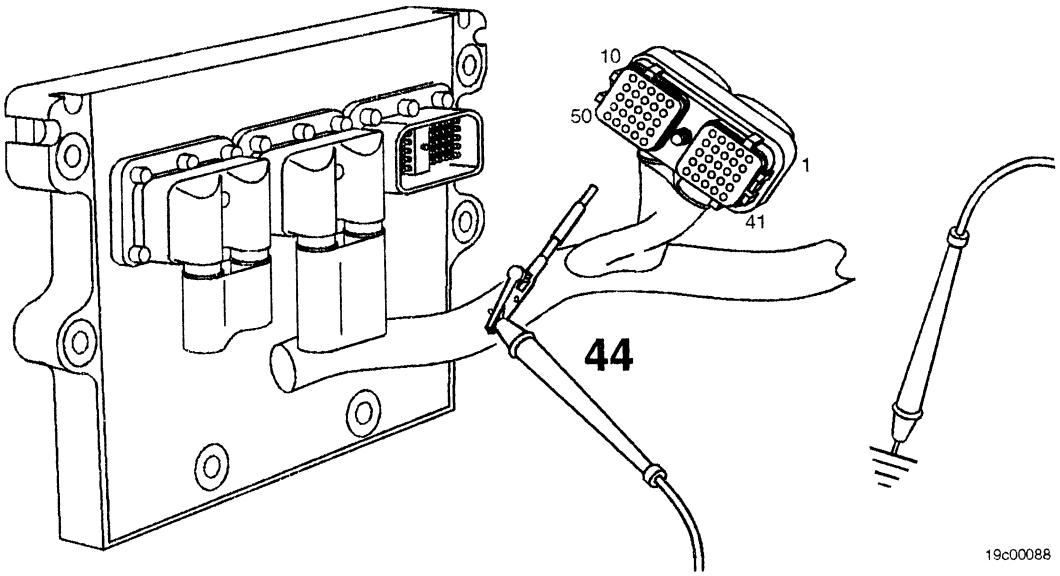
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the engine harness from the oil pressure sensor.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for a short circuit to ground. • Measure the resistance from pin 44 (or pressure signal) of the sensor harness connector to chassis ground.	**OK** **More than 100k ohms**	2D-2
	NOT OK **Replace the engine harness** Replace the engine harness. Refer to Procedure 019-043.	5A



STEP 2D-2: Check for a short circuit from pin to pin.

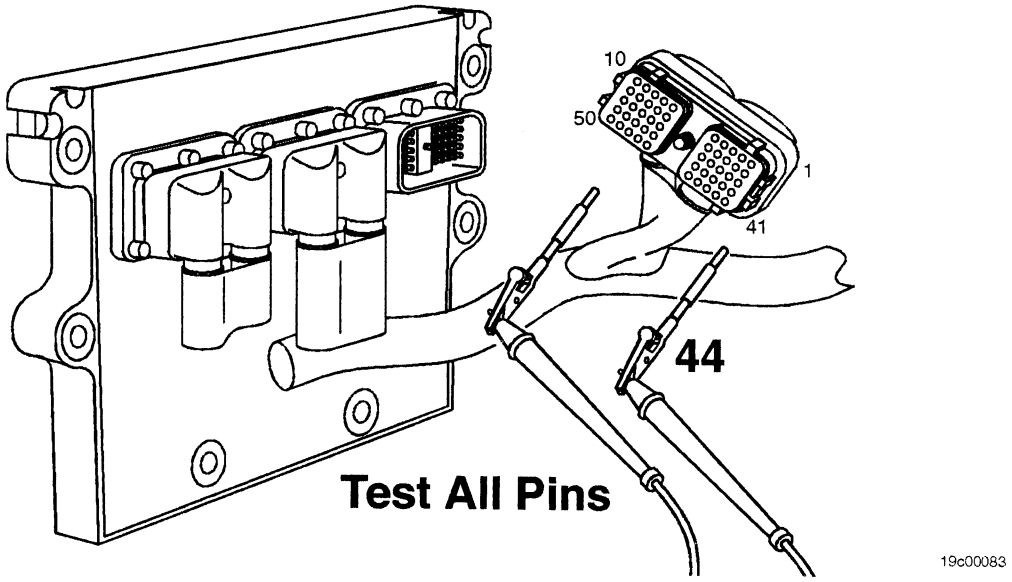
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the engine harness from the oil pressure sensor.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin. • Measure the resistance from pin 44 (or pressure signal) of the sensor harness connector to all other pins in the connector.	**OK** **More than 100k ohms** **Replace the oil pressure sensor** Refer to Procedure 019-155.	5A
	NOT OK **Replace the engine harness** Refer to Procedure 019-043.	5A



STEP 3: Check the engine harness.

STEP 3A: Inspect the engine harness and ECM connector for damaged pins.

⚠CAUTION⚠

To avoid damaging the new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the engine harness and ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	3B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using the electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-204 or 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	5A

STEP 3B: Read the fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start the engine and let it idle for 1 minute. • Read the fault codes using INSITE™.	**OK** **Fault Code 141 inactive**	5B
	NOT OK Fault Code 141 active	3C

STEP 3C: Check for an open circuit.

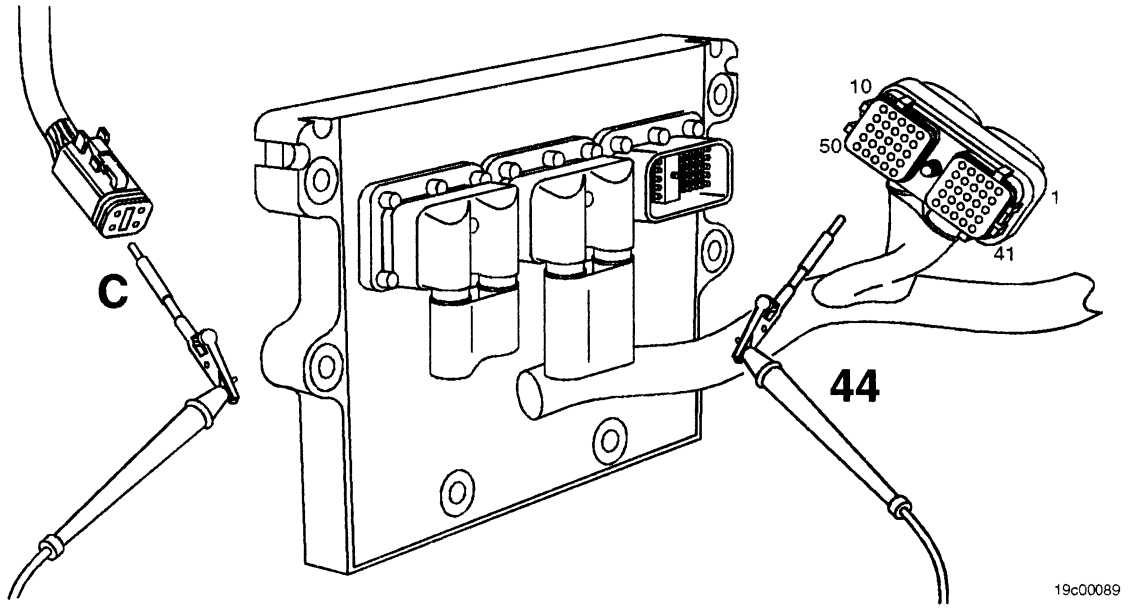
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the engine harness from the oil pressure sensor.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for an open circuit. • Measure the resistance from pin 44 (or pressure signal) of the sensor harness connector to pin C (or 3) of the oil pressure sensor connector, harness side.	**OK** **Less than 10 ohms**	4A
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-204 or 019-250. • Replace the engine harness. Refer to Procedure 019-043.	5A



STEP 4: Check for an ECM response.

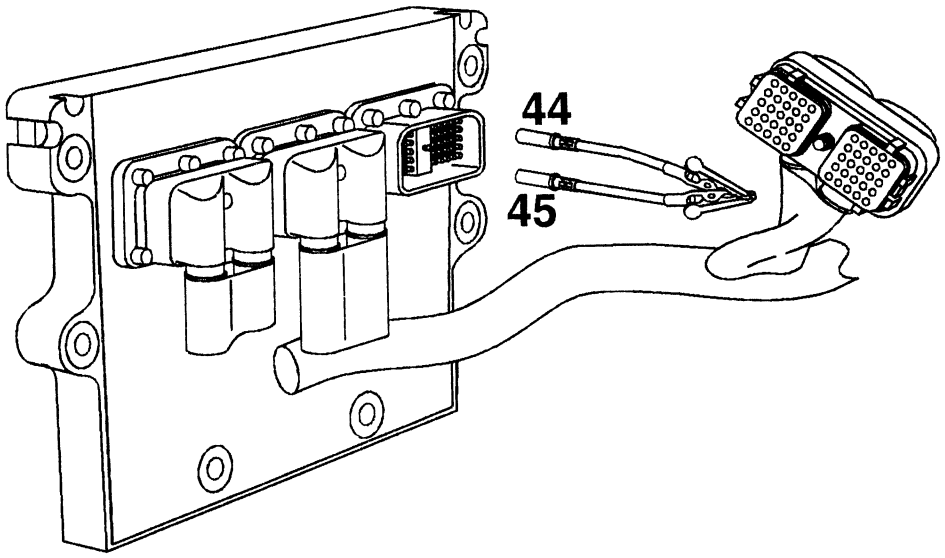
STEP 4A: Check for the appropriate ECM response.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Disconnect the sensor harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check for the appropriate ECM response. • Install a jumper wire between the ECM sensor port pin 44, the pressure signal and pin 45, the (+) 5-VDC supply.	**OK** **Fault Code 141 inactive** **Fault Code 135 active**	5A
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	5A



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STEP 5: Clear the fault codes.

STEP 5A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify Fault Code 141 is inactive and did **not** reoccur.	**OK** **Fault Code 141 inactive**	5B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location if all the steps have been completed and checked again.	1A

STEP 5B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

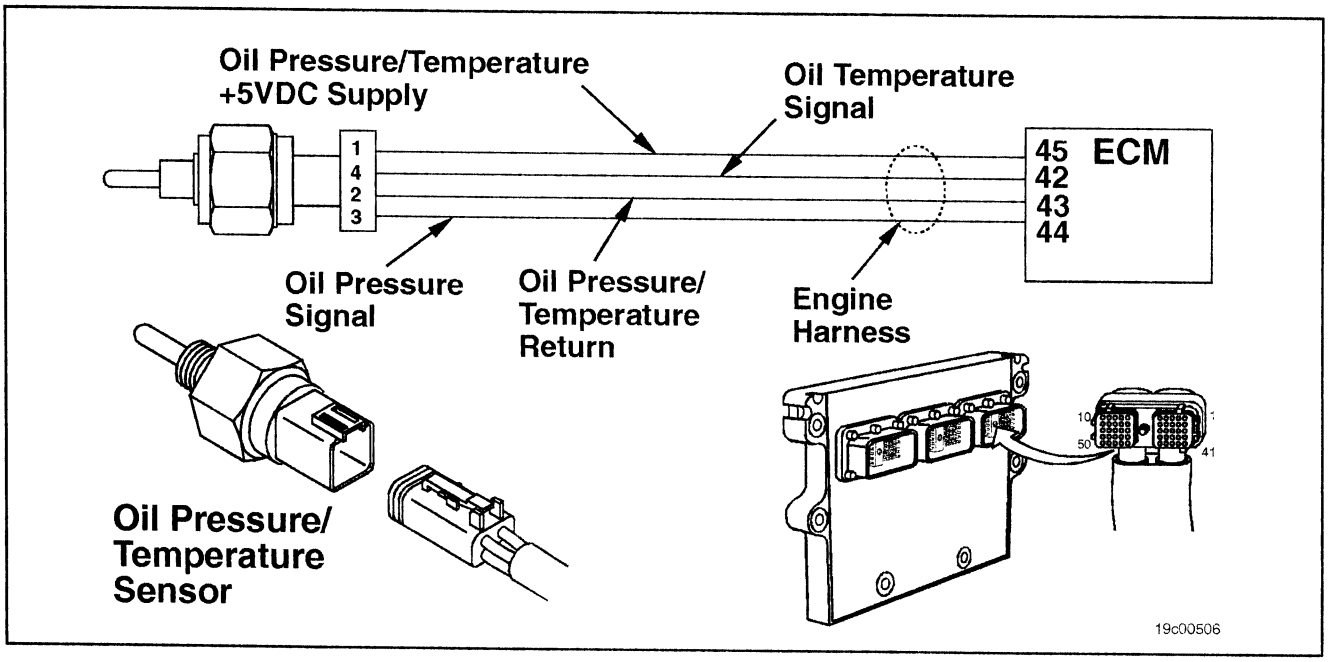
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 135

Oil Pressure Sensor Circuit

CODES	REASON	EFFECT
Fault Code: 135 PID(P), SID(S): P100 SPN: 100 FMI: 3/3 Lamp: Yellow	High voltage detected at the oil pressure circuit.	No engine protection for oil pressure.

Oil Pressure Sensor Circuit



Circuit Description:

The oil pressure/temperature sensor is used by the electronic control module (ECM) to monitor the lubricating oil pressure. The ECM monitors the voltage on the signal pin and converts this to a pressure value. The oil pressure value is used by the ECM for the engine protection system.

Component Location:

The oil pressure/temperature sensor is located on the engine block to the left of the fuel filter, behind the air compressor.

Shop Talk:

Does the fault occur **only** in cold weather? If so, allow the oil to warm up and see if the fault goes inactive.

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead
Part No. 3162898 - breakout cable.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the oil pressure/temperature sensor.		
STEP 1A: Inspect the oil pressure/temperature sensor and the engine harness connector pins.	No damaged pins	
STEP 1B: Read the fault codes.	Fault Code 135 inactive	
STEP 1C: Check the oil pressure/temperature sensor supply voltage.	(+) 4.75 to 5.25 VDC	
STEP 1C-1: Measure the voltage from the ECM.	(+) 4.75 to 5.25 VDC	
STEP 1D: Check the oil pressure/temperature sensor signal voltage.	(+) 0.50 to 1.40 VDC	
STEP 2: Check the engine harness.		
STEP 2A: Inspect the engine harness and ECM connector pins.	No damaged pins	
STEP 2B: Read the fault codes.	Fault Code 135 inactive	
STEP 2C: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 2D: Check for an open circuit in the return wire.	Less than 10 ohms	
STEP 3: Check for an ECM response.		
STEP 3A: Check for the appropriate ECM response.	Fault Code 135 inactive Fault Code 141 active	
STEP 4: Clear the fault codes.		
STEP 4A: Disable the fault code.	Fault Code 135 inactive	
STEP 4B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check the oil pressure/temperature sensor.

STEP 1A: Inspect the oil pressure/temperature sensor and the engine harness connector pins.

Condition:
- Turn keyswitch OFF.
- Disconnect the engine harness from the oil pressure/temperature sensor.

Action	Specifications/Repair	Next Step
Inspect the oil pressure/temperature sensor and the engine harness connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	1B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the oil pressure/temperature sensor, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using the electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-204. • Replace the engine harness. Refer to Procedure 019-043. • Replace the oil pressure/temperature sensor. Refer to Procedure 019-155.	4A

STEP 1B: Read the fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start the engine and let it idle for 1 minute. • Read the fault codes using INSITE™.	**OK** **Fault Code 135 inactive**	4B
	NOT OK Fault Code 135 active.	1C

STEP 1C: Check the oil pressure/temperature sensor supply voltage.

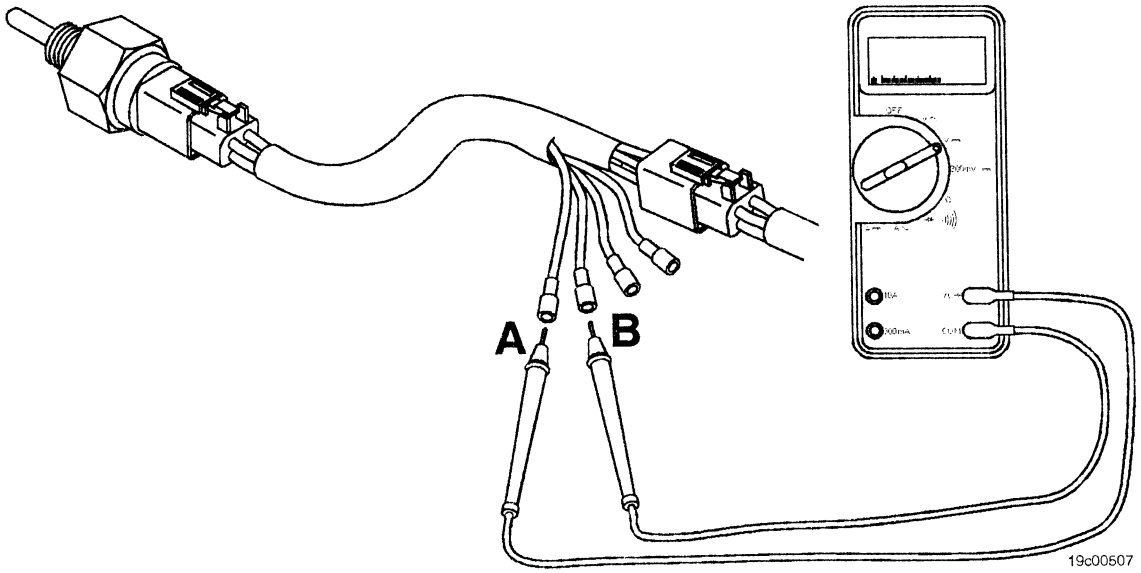
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3162898 - breakout cable.

Condition:

- Install breakout cable, Part No. 3162898, between the sensor and the engine harness connector.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the oil pressure/temperature sensor supply voltage. • Measure the supply voltage from pin A (or RED) to pin B (or BLACK) of the breakout cable.	**OK** **(+) 4.75 to 5.25 VDC**	1D
	NOT OK Does **not** meet specifications.	1C-1



STEP 1C-1: Measure the voltage from the ECM.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

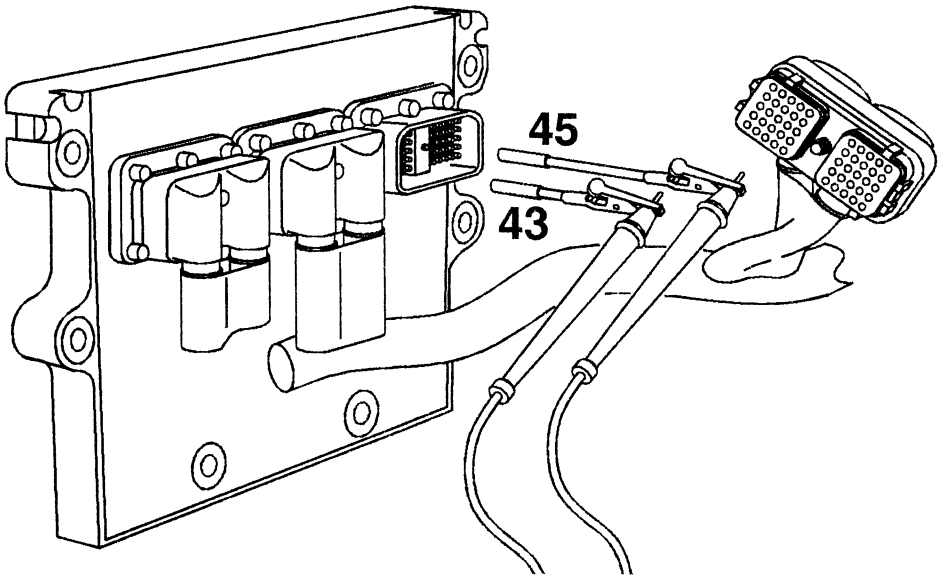
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the sensor harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Measure the voltage from the ECM. • Measure the voltage at the ECM from pin 45 to pin 43 of the ECM sensor port.	**OK** **(+) 4.75 to 5.25 VDC** **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	4A
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	4A



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STEP 1D: Check the oil pressure/temperature sensor signal voltage.

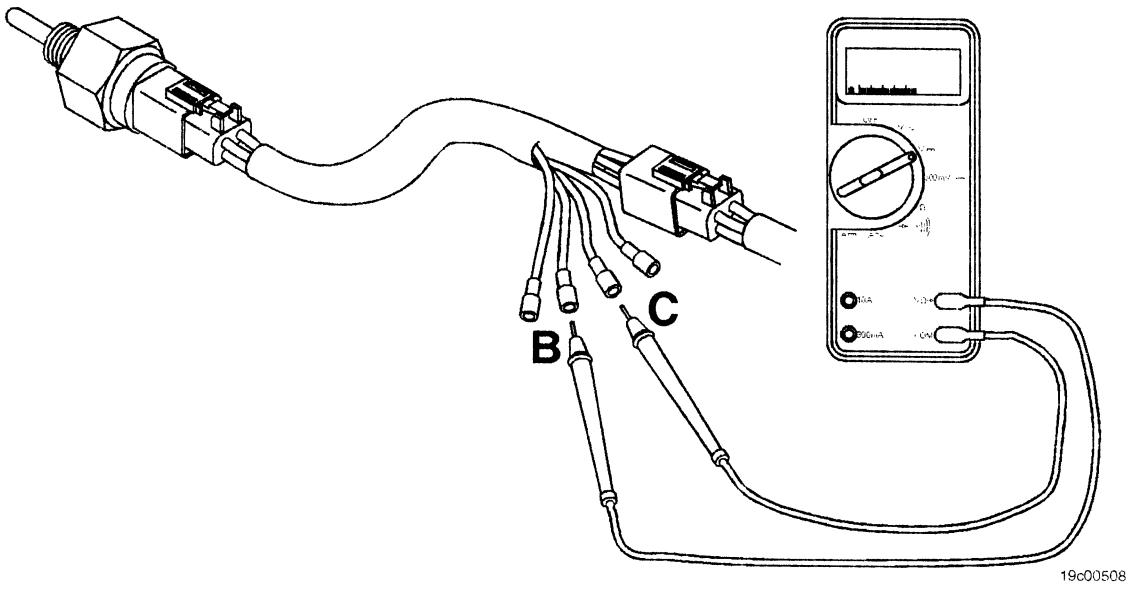
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3162898 - breakout cable.

Condition:

- Install breakout cable, Part No. 3162898, between the sensor and the engine harness connector.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the oil pressure/temperature sensor signal voltage. • Measure the signal voltage from pin C (or YELLOW) to pin B (or BLACK) of the breakout cable.	**OK** **0.50 to 1.40 VDC**	3A
	NOT OK Does **not** meet specifications.	2A



STEP 2: Check the engine harness.

STEP 2A: Inspect the engine harness and ECM connector pins.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the engine harness and ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	2B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has damaged pins. • Flush the dirt, debris, or moisture from the connector pins using the electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	4A

STEP 2B: Read the fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start the engine and let it idle for 1 minute. • Read the fault codes using INSITE™.	**OK** **Fault Code 135 inactive**	4B
	NOT OK Fault Code 135 active.	2C

STEP 2C: Check for a short circuit from pin to pin.

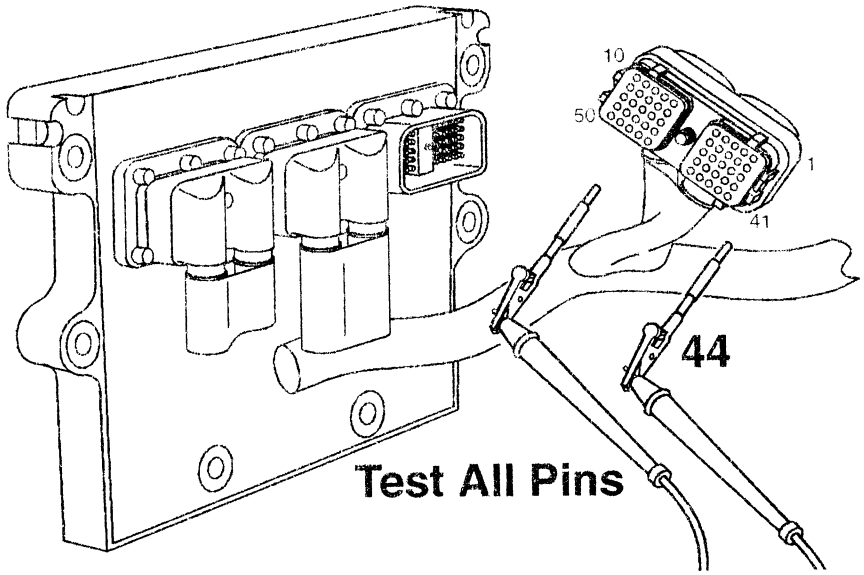
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin from pin. • Measure the resistance from pin 44 of the sensor harness connector to all other pins in the connector.	OK **More than 100k ohms**	2D
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	4A



STEP 2D: Check for an open circuit in the return wire.

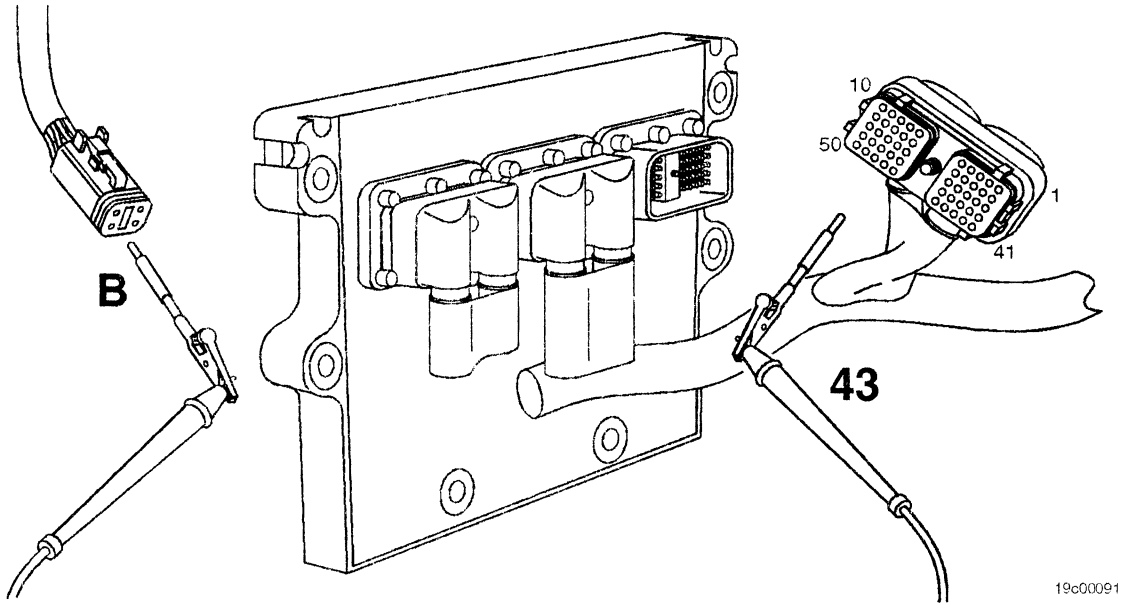
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the engine harness from the oil pressure/temperature sensor.

Action	Specifications/Repair	Next Step
Check for an open circuit. • Measure the resistance from pin 43 of the sensor harness connector to pin B (or 2) on the harness side of the oil pressure/ temperature sensor connector.	**OK** **Less than 10 ohms** **Replace the oil pressure/temperature sensor** Refer to Procedure 019-155.	4A
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-204 or 019-250. • Replace the engine harness. Refer to Procedure 019-043.	4A



STEP 3: Check for an ECM response.

STEP 3A: Check for the appropriate ECM response.

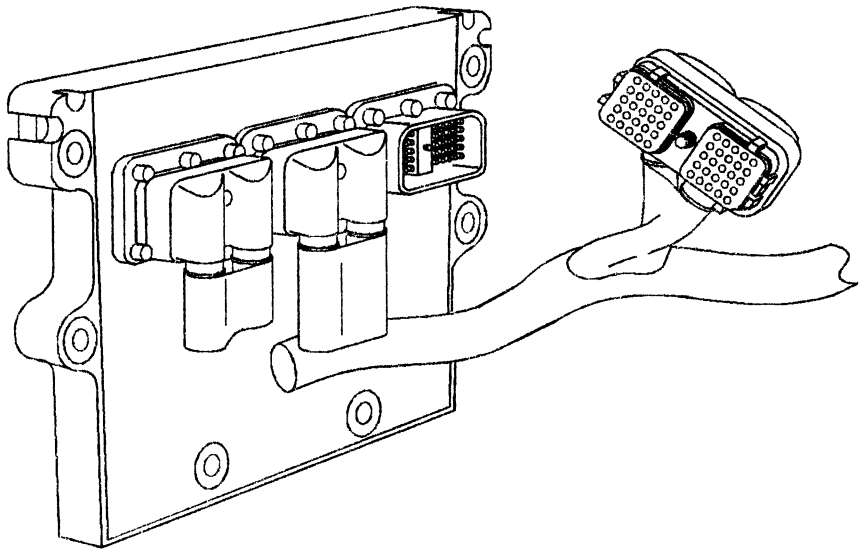
⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:

- Disconnect the sensor harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check for the appropriate ECM response. • Disconnect the sensor harness connector from the ECM. • Using INSITE™, check for the appropriate ECM response.	**OK** **Fault Code 135 inactive** **Fault Code 141 active**	4A
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	4A



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STEP 4: Clear the fault codes.

STEP 4A: Disable the fault code.

Condition:

- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify Fault Code 135 is inactive.	**OK** **Fault Code 135 inactive**	4B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location if all the steps have been completed and checked again.	1A

STEP 4B: Clear the inactive fault codes.

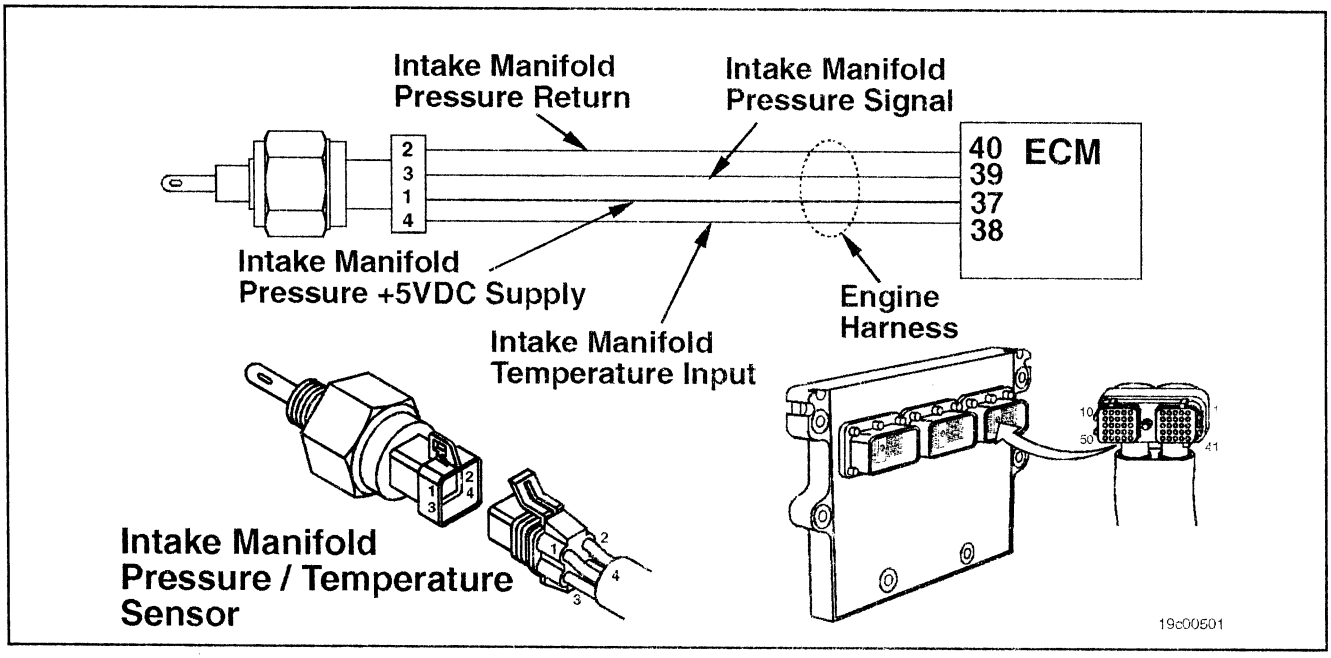
Condition: • Connect all components. • Turn keyswitch ON.		
Action	**Specifications/Repair**	**Next Step**
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 123

Intake Manifold Pressure Sensor Circuit

CODES	REASON	EFFECT
Fault Code: 123 PID(P), SID(S): P102 SPN: 102 FMI: 4/4 Lamp: Yellow	Low voltage detected on the intake manifold pressure/temperature sensor.	Derate in power output of the engine.

Intake Manifold Pressure Sensor Circuit



Circuit Description:

The intake manifold pressure/temperature sensor monitors intake manifold pressure and passes information to the electronic control module (ECM) through the engine harness. If intake manifold pressure becomes too high, it will cause a derate condition.

Component Location:

The intake manifold pressure/temperature sensor is located in the intake air manifold toward the front of the engine.

Shop Talk:

- Check for high restriction in the intake air manifold due to a shutdown device in the manifold if the vehicle is equipped with a shutdown device. Do **not** remove this device. If the engine is operated in a flammable atmosphere, the device is an essential safety feature. Removing it could cause severe personal injury or death.
- Check for installation of a torque limiting device (TLD) breakout wiring harness. Temporarily remove the TLD from the engine harness, and install the intake manifold pressure/temperature sensor directly to the engine harness. If Fault Code 123 becomes inactive, inspect the TLD.

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead
Part No. 3162898 - breakout cable.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check for multiple fault codes.		
STEP 1A: Read the fault codes.	Fault Codes 222, 352, and 452 are not active	
STEP 2: Check for mechanical failure.		
STEP 2A: Check for proper operation of the turbocharger.	Positive intake manifold pressure from the turbocharger	
STEP 3: Check the intake manifold pressure/temperature sensor.		
STEP 3A: Inspect the intake manifold pressure/temperature sensor and engine harness connector pins.	No damaged pins	
STEP 3B: Read the fault codes.	Fault Code 123 inactive	
STEP 3C: Check the ECM intake manifold pressure/temperature sensor supply voltage.	(+) 4.75 to 5.25 VDC	
STEP 3C-1: Measure the voltage from the ECM.	(+) 4.75 to 5.25 VDC	
STEP 3D: Check the ECM intake manifold pressure/temperature sensor signal voltage.	(+) 0.42 to 0.58 VDC	
STEP 3D-1: Check for a short circuit to ground.	More than 100k ohms	
STEP 3D-2: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 4: Check the engine harness.		
STEP 4A: Inspect the engine harness and the ECM connector for damaged pins.	No damaged pins	
STEP 4B: Read the fault codes.	Fault Code 123 inactive	
STEP 4C: Check for an open circuit.	Less than 10 ohms	
STEP 5: Check for an ECM response.		
STEP 5A: Check for the appropriate ECM response.	Fault Code 123 inactive and Fault Code 122 active	

STEP 6: Clear the fault codes.

STEP 6A: Disable the fault code. — **Fault Code 123 inactive**

STEP 6B: Clear the inactive fault codes. — **All faults cleared**

TROUBLESHOOTING STEP

STEP 1: Check for multiple fault codes.

STEP 1A: Read the fault codes.

Condition:
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Read the fault codes using INSITE™.	**OK** **Fault Codes 222, 352, and 452 are not active**	2A
	NOT OK Possible sensor failure, short circuit to ground in sensor (+) 5-VDC common supply, or short circuit from pin to pin.	Fault Code 352

STEP 2: Check for mechanical failure.

STEP 2A: Check for proper operation of the turbocharger.

Condition:
- Turn keyswitch OFF.
- Disconnect the engine harness from the intake manifold pressure/temperature sensor.

Action	Specifications/Repair	Next Step
Check for proper operation of the turbocharger. • Check for positive intake manifold pressure.	**OK** **Positive intake manifold pressure from the turbocharger**	3A
	NOT OK **Low intake manifold pressure** Correct the base engine malfunction causing low intake manifold pressure. Refer to the Signature, ISX and QSX15 Engines Troubleshooting and Repair Manual, Bulletin No. 3666239.	6A

STEP 3: Check the intake manifold pressure/temperature sensor.

STEP 3A: Inspect the intake manifold pressure/temperature sensor and engine harness connector pins.

Condition:
- Turn keyswitch OFF.
- Disconnect the engine harness from the intake manifold pressure/temperature sensor.

Action	Specifications/Repair	Next Step
Inspect the engine harness and the sensor connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	3B
	NOT OK **Repair the damaged pins.** Repair or replace the engine harness, or replace the intake manifold pressure/temperature sensor, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using the electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-204. • Replace the engine harness. Refer to Procedure 019-043. • Replace the intake manifold pressure/temperature sensor. Refer to Procedure 019-059.	6A

STEP 3B: Read the fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start the engine and let it idle for 1 minute. • Read the fault codes using INSITE™.	**OK** **Fault Code 123 inactive**	6B
	NOT OK Fault Code 123 active.	3C

STEP 3C: Check the ECM intake manifold pressure/temperature sensor supply voltage.

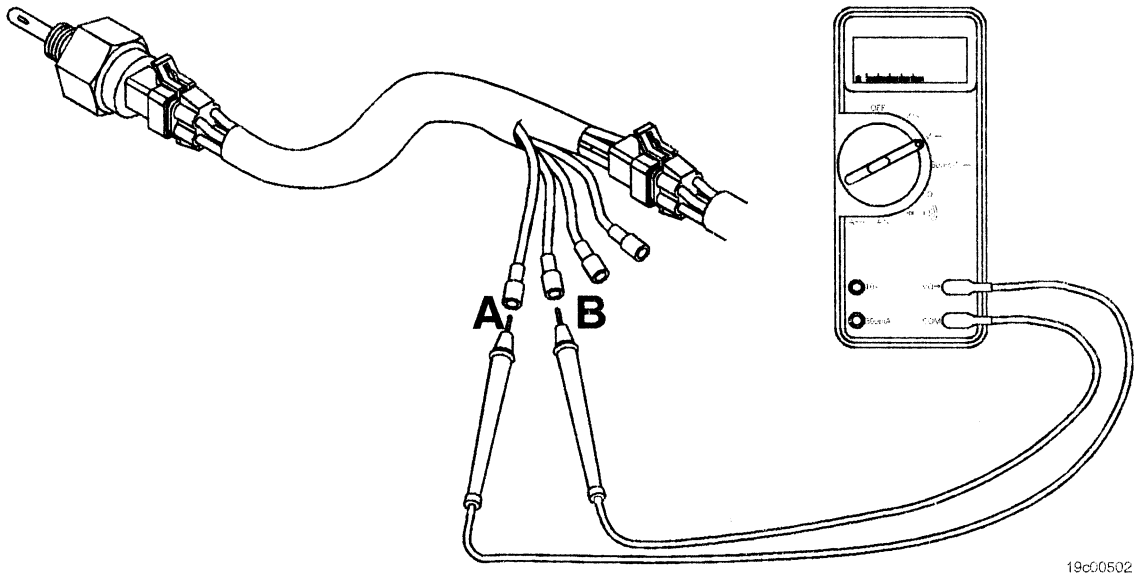
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 31262898 - breakout cable.

Condition:

- Install the intake manifold pressure/temperature sensor breakout cable, Part No. 31262898, between the sensor and the engine harness connector.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the intake manifold pressure/temperature sensor supply voltage. • Measure the supply voltage from pin A (or RED) to pin B (or BLACK) of the breakout cable.	**OK** **(+) 4.75 to 5.25 VDC**	3D
	NOT OK Does **not** meet specifications.	3C-1



STEP 3C-1: Measure the voltage from the ECM.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

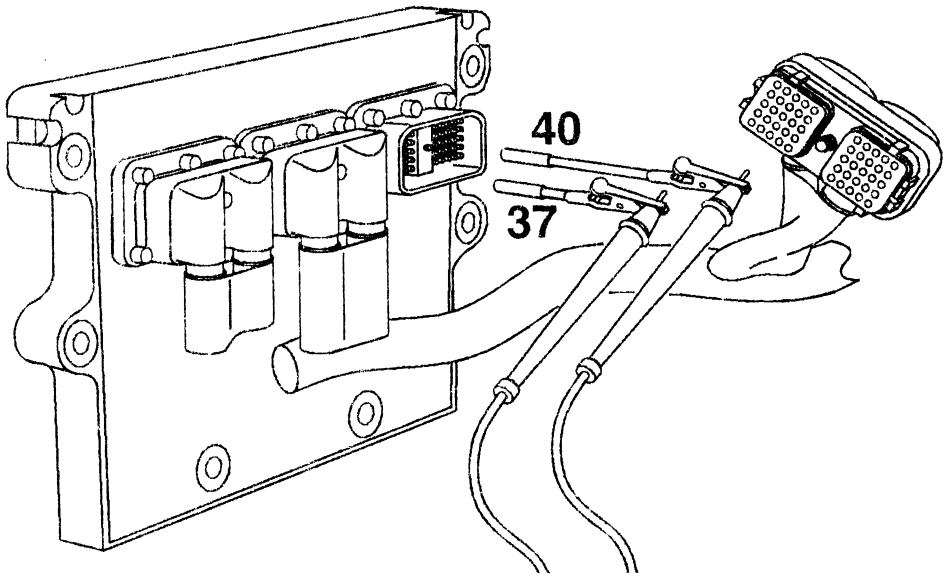
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the sensor harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Measure the voltage out of the ECM. • Measure the voltage at the ECM from pin 37 to pin 40 of the ECM sensor port.	**OK** **(+) 4.75 to 5.25 VDC** **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	6A
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	6A



STEP 3D: Check the ECM intake manifold pressure/temperature sensor signal voltage.

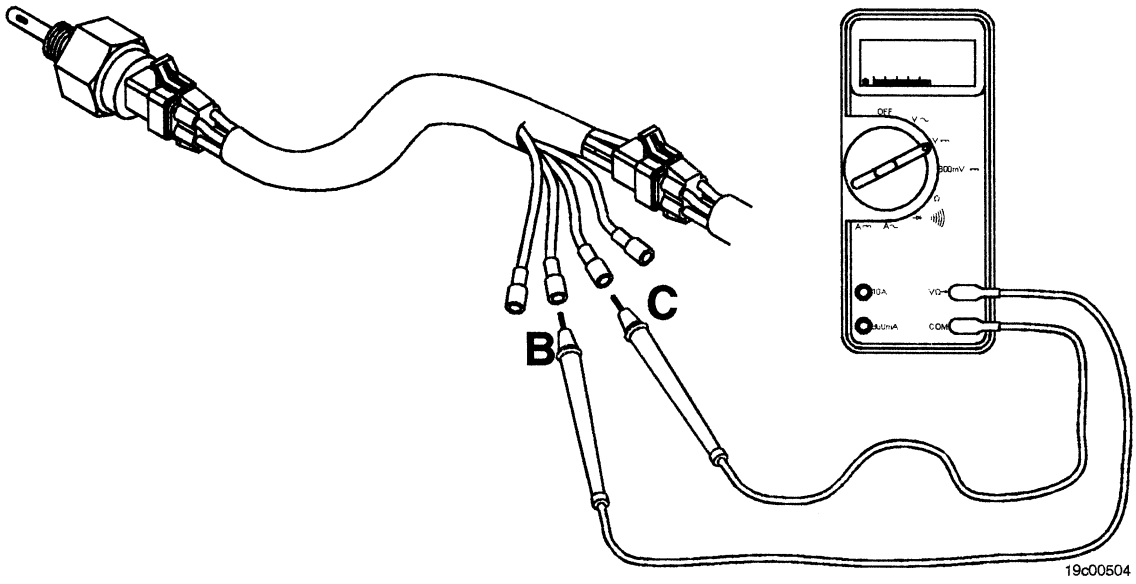
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 31262898 - breakout cable.

Condition:

- Install the breakout cable, Part No. 3162898, between the intake manifold pressure/temperature sensor and the engine harness connector.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the intake manifold pressure/temperature sensor signal voltage. • Measure the signal voltage from pin B (or BLACK) to pin C (or YELLOW) of the breakout cable.	**OK** **(+) 0.42 to 0.58 VDC**	3D-1
	NOT OK Does **not** meet specifications.	4A



STEP 3D-1: Check for a short circuit to ground.

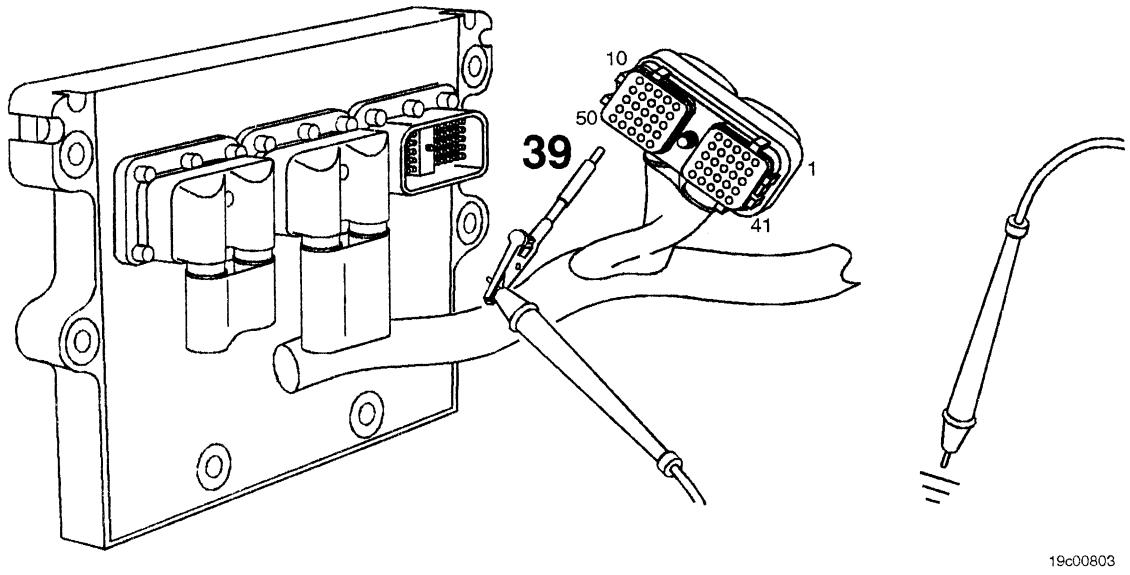
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the intake manifold pressure/temperature sensor from the engine harness.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for a short circuit to ground. • Measure the resistance from pin 39 of the sensor harness connector to chassis ground.	**OK** **More than 100k ohms**	3D-2
	NOT OK **Replace the engine harness** Refer to Procedure 019-043.	6A



STEP 3D-2: Check for a short circuit from pin to pin.

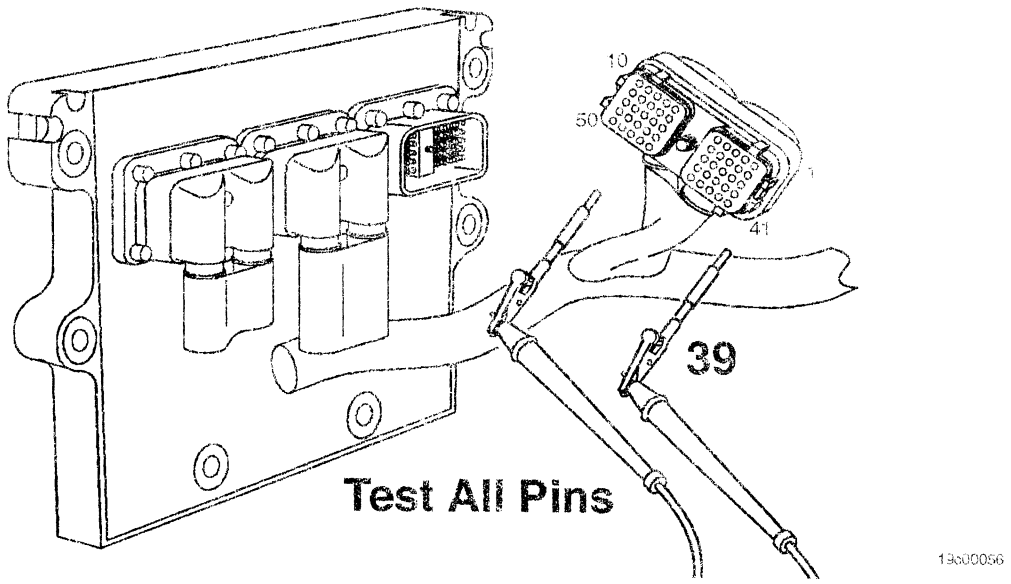
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the engine harness from the intake manifold pressure/temperature sensor.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin. • Measure the resistance from pin 39 of the sensor harness connector to all other pins in the connector.	OK **More than 100k ohms** **Replace the intake manifold pressure/ temperature sensor** Refer to Procedure 019-059.	6A
	NOT OK **Replace the engine harness** Refer to Procedure 019-043.	6A



STEP 4: Check the engine harness.

STEP 4A: Inspect the engine harness and the ECM connector for damaged pins.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the engine harness and the ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	4B
	NOT OK **Repair the damaged pins.** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using the electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	6A

STEP 4B: Read the fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start the engine and let it idle for 1 minute. • Read the fault codes using INSITE™.	**OK** **Fault Code 123 inactive**	6B
	NOT OK Fault Code 123 active.	4C

STEP 4C: Check for an open circuit.

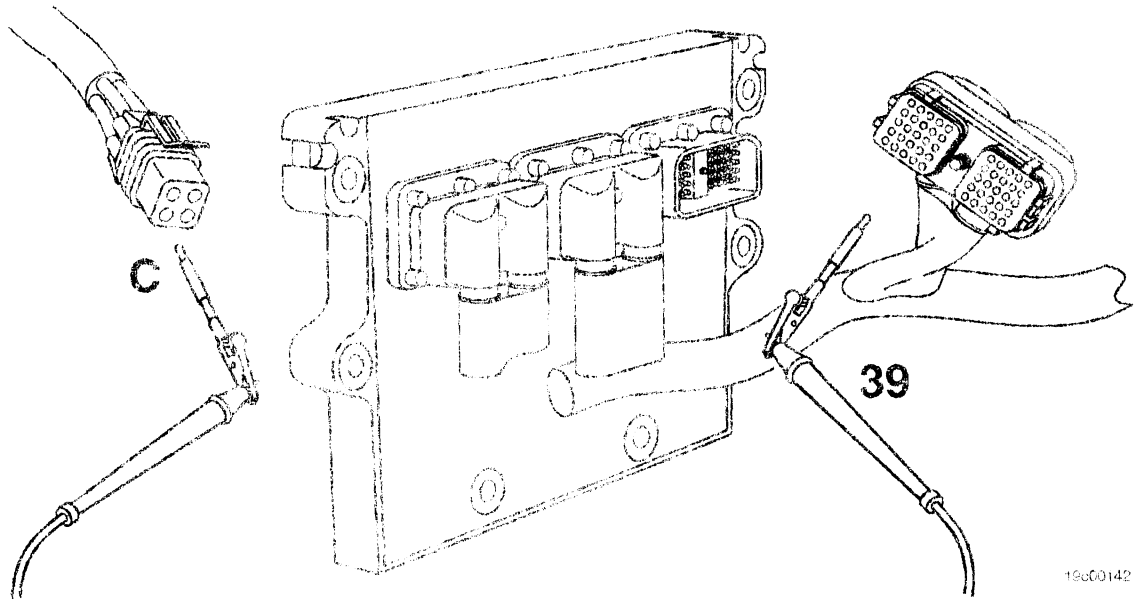
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the intake manifold pressure/temperature sensor from the engine harness.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for an open circuit. • Measure the resistance from pin 39 of the sensor harness connector to pin C (or 3) of the intake manifold pressure/temperature sensor connector, harness side.	OK **Less than 10 ohms**	5A
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-204 or 019-250. • Replace the engine harness. Refer to Procedure 019-043.	6A



STEP 5: Check for an ECM response.

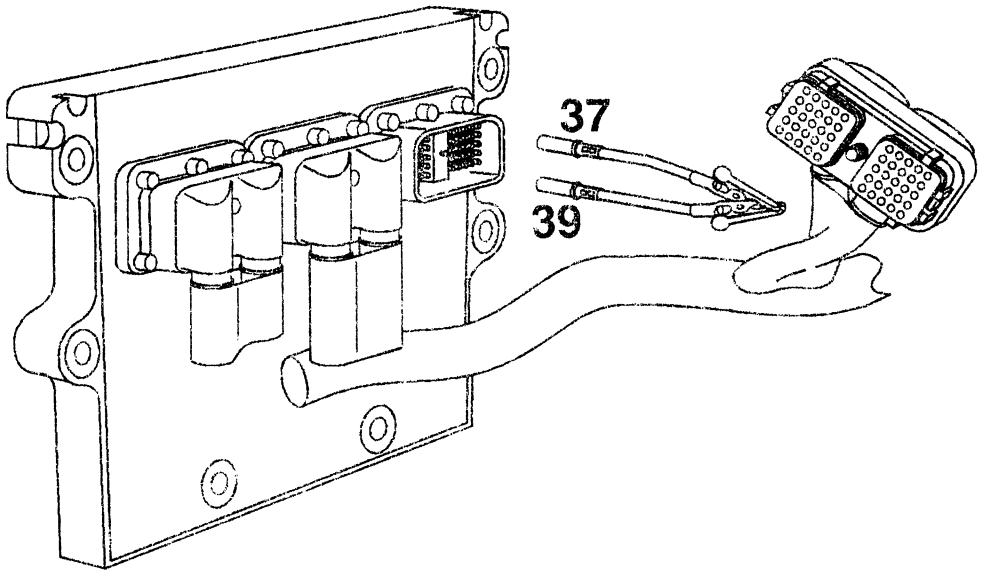
STEP 5A: Check for the appropriate ECM response.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Disconnect the sensor harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check for the appropriate ECM response. • Install a jumper wire between ECM sensor port pin 37 and pin 39.	**OK** **Fault Code 123 inactive and** **Fault Code 122 active**	6A
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	6A



STEP 6: Clear the fault codes.

STEP 6A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify that Fault Code 123 is inactive.	**OK** **Fault Code 123 inactive**	6B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location if all the steps have been completed and checked again.	1A

STEP 6B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

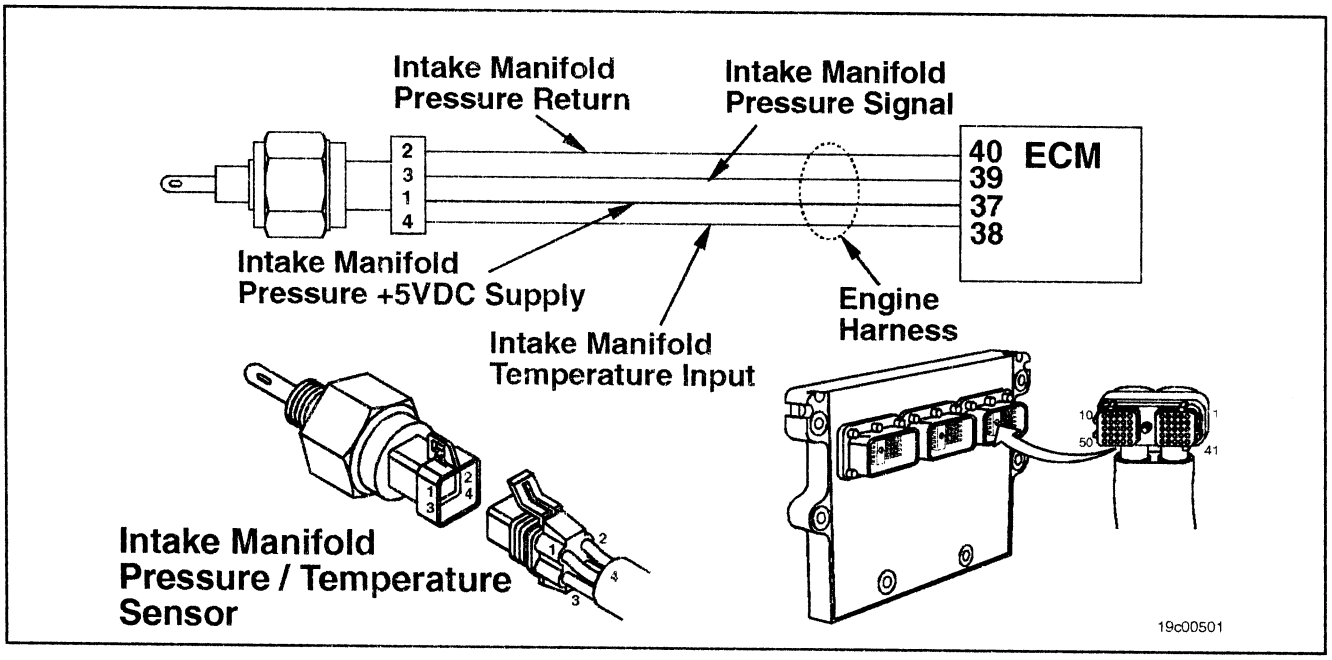
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase inactive fault codes using INSITE™.	**OK** **All faults cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 122

Intake Manifold Pressure Sensor Circuit

CODES	REASON	EFFECT
Fault Code: 122 PID(P), SID(S): P102 SPN: 102 FMI: 3/3 Lamp: Yellow	High voltage detected at the intake manifold pressure sensor circuit.	Derate in power output of the engine.

Intake Manifold Pressure Sensor Circuit



Circuit Description:

The intake manifold pressure/temperature sensor monitors intake manifold pressure and passes information to the electronic control module (ECM) through the engine harness. If the intake manifold pressure becomes too high, it will cause a derate condition.

Component Location:

The intake manifold pressure/temperature sensor is located in the air intake manifold toward the front of the engine.

Shop Talk:

- Determine if engine is being overfueled.
- Confirm that the correct intake manifold pressure/temperature sensor part number is being used.
- Confirm that the correct turbocharger is being used.
- If it is suspected that cold intake air is the cause of the high intake manifold pressure, test the engine with warm intake air.
- Inspect the intake manifold pressure/temperature sensor circuit for signs of tampering. Remove any extra wires from the circuit.

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead
Part No. 3162898 - breakout cable.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the intake manifold pressure/temperature sensor.		
STEP 1A: Inspect the intake manifold pressure/temperature sensor and engine harness connector pins.	No damaged pins	
STEP 1B: Read the fault codes.	Fault Code 122 inactive	
STEP 1C: Check the intake manifold pressure/temperature sensor supply voltage.	(+) 4.75 to 5.25 VDC	
STEP 1C-1: Measure the voltage from the ECM.	(+) 4.75 to 5.25 VDC	
STEP 1D: Check the intake manifold pressure/temperature sensor signal voltage.	(+) 0.42 to 0.58 VDC	
STEP 2: Check the engine harness and the ECM.		
STEP 2A: Inspect the engine harness and the ECM connector pins.	No damaged pins	
STEP 2B: Read the fault codes.	Fault Code 122 inactive	
STEP 2C: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 2D: Check for an open circuit in the return wire.	Less than 10 ohms	
STEP 3: Check for an ECM response.		
STEP 3A: Check for the appropriate ECM response.	Fault Code 122 inactive Fault Code 123 active	
STEP 4: Clear the fault codes.		
STEP 4A: Disable the fault code.	Fault Code 122 inactive	
STEP 4B: Clear the inactive fault codes.	All faults cleared	

TROUBLESHOOTING STEP

STEP 1: Check the intake manifold pressure/temperature sensor.

STEP 1A: Inspect the intake manifold pressure/temperature sensor and engine harness connector pins.

Condition:
- Turn keyswitch OFF.
- Disconnect the engine harness from the intake manifold pressure/temperature sensor.
- Flush and clean the connector pins using electronic contact cleaner, Part No. 3824510.

Action	Specifications/Repair	Next Step
Inspect the engine harness and sensor connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	1B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the intake manifold pressure/temperature sensor, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. Refer to Procedure 019-203. • Repair the engine harness. Refer to Procedure 019-204. • Replace the engine harness. Refer to Procedure 019-043. • Replace the intake manifold pressure/temperature sensor. Refer to Procedure 019-061.	4A

STEP 1B: Read the fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start the engine and let it idle for 1 minute. • Read the fault codes using INSITE™.	**OK** **Fault Code 122 inactive**	4B
	NOT OK Fault Code 122 active.	1C

STEP 1C: Check the intake manifold pressure/temperature sensor supply voltage.

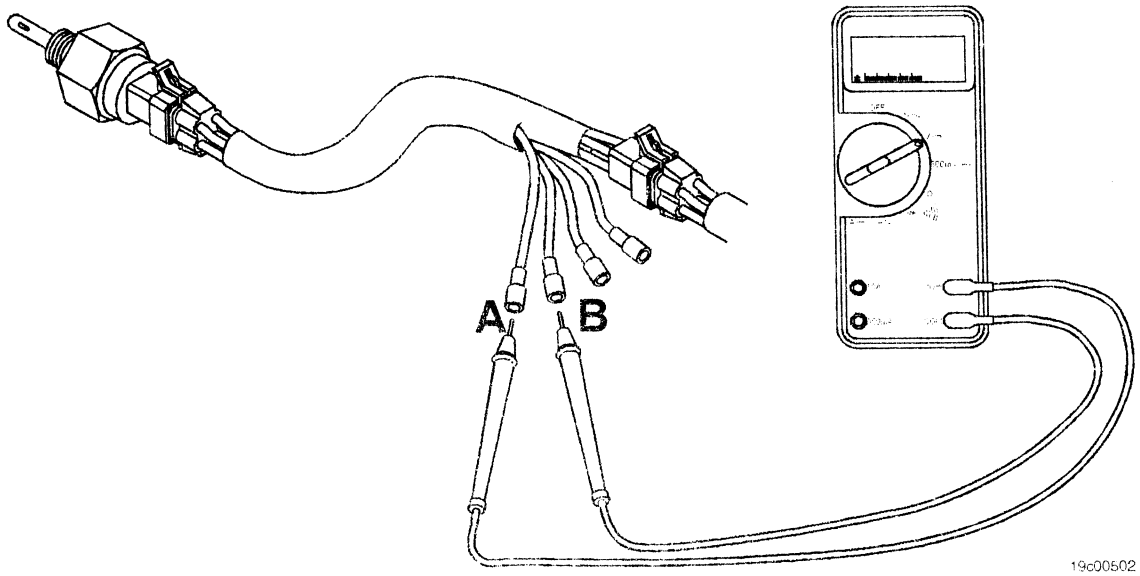
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3162898 - breakout cable.

Condition:

- Install the breakout cable, Part No. 3162898, between the sensor and the engine harness connector.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the intake manifold pressure/temperature sensor supply voltage. • Using a multimeter, measure the supply voltage from pin A (or RED) to pin B (or BLACK) of the breakout cable.	**OK** **(+) 4.75 to 5.25 VDC**	1D
	NOT OK Does **not** meet specifications.	1C-1



STEP 1C-1: Measure the voltage from the ECM.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

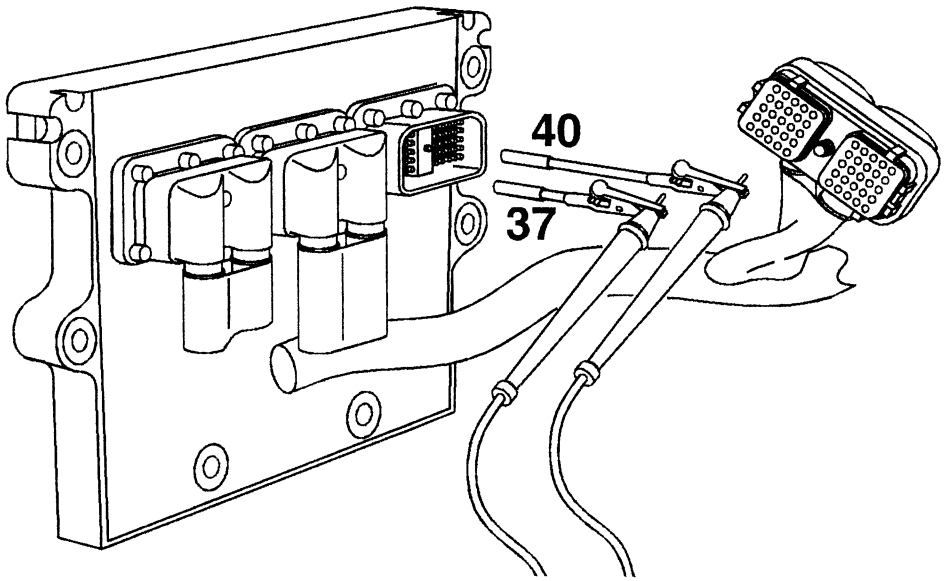
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the sensor harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Verify ECM output voltage. • Measure the voltage out of the ECM from pin 40 to pin 37 at the ECM sensor port.	**OK** **(+) 4.75 to 5.25 VDC** **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	4A
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	4A



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STEP 1D: Check the intake manifold pressure/temperature sensor signal voltage.

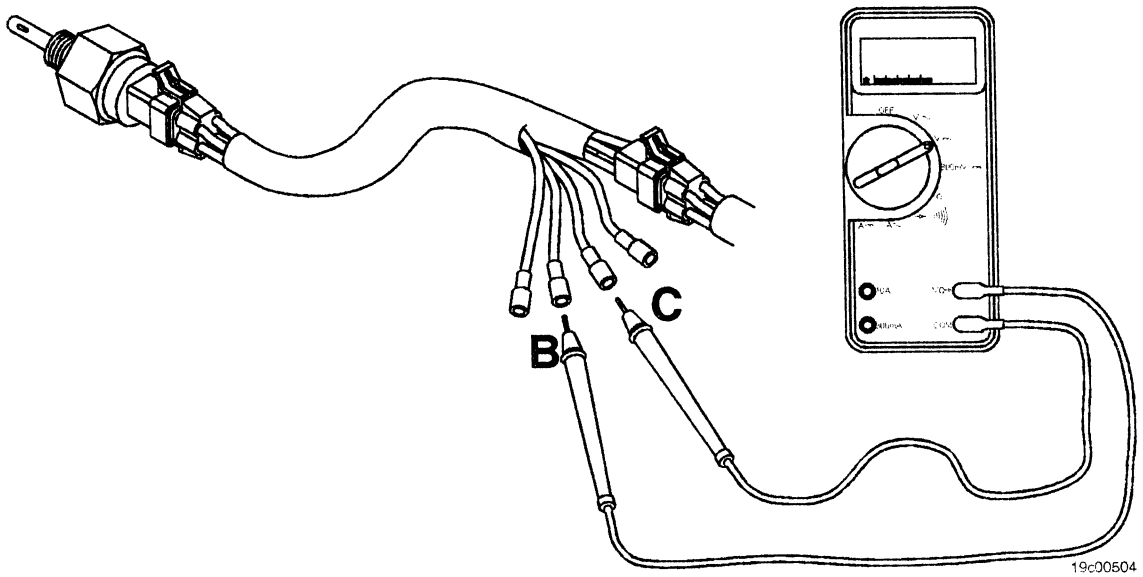
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3162898 - breakout cable.

Condition:

- Install the breakout cable, Part No. 3162898, between the sensor and the engine harness connector.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the intake manifold pressure/temperature sensor signal voltage. • Measure the signal voltage from pin C (or YELLOW) to pin B (or BLACK) of the breakout cable.	**OK** **(+) 0.42 to 0.58 VDC**	3A
	NOT OK Does **not** meet specifications.	2A



STEP 2: Check the engine harness and the ECM.

STEP 2A: Inspect the engine harness and the ECM connector pins.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Flush and clean the connector pins using electrical contact cleaner, Part No. 3824510.

Action	Specifications/Repair	Next Step
Inspect the engine harness and the ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	2B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	4A

STEP 2B: Read the fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start the engine and let it idle for 1 minute. • Read the fault codes using INSITE™.	**OK** **Fault Code 122 inactive**	4B
	NOT OK Fault Code 122 active.	2C

STEP 2C: Check for a short circuit from pin to pin.

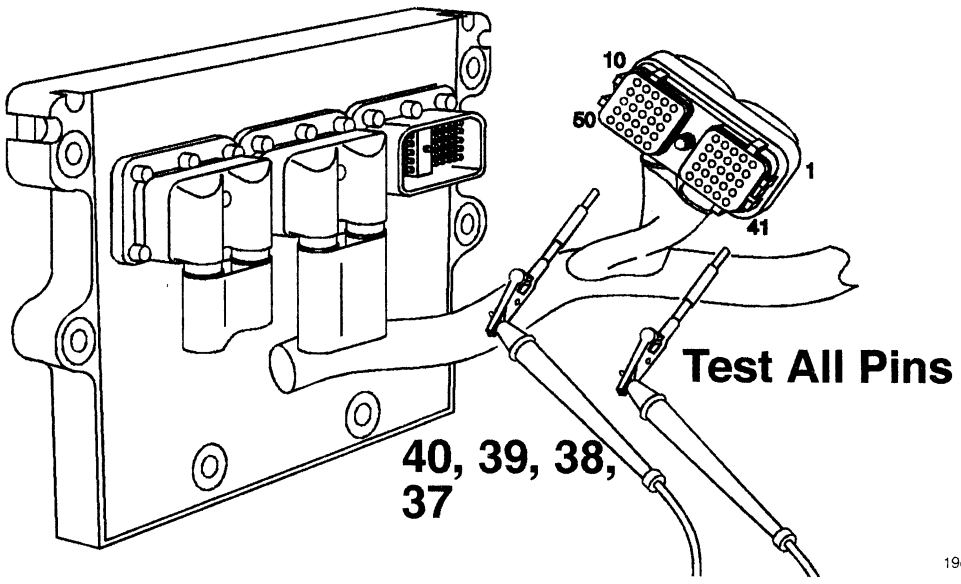
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin. • Measure the resistance from pin 40 of the sensor harness connector to all other pins in the connector. • Measure the resistance from pin 39 of the sensor harness connector to all other pins in the connector. • Measure the resistance from pin 38 of the sensor harness connector to all other pins in the connector. • Measure the resistance from pin 37 of the sensor harness connector to all other pins in the connector.	**OK** **More than 100k ohms**	2D
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	4A



STEP 2D: Check for an open circuit in the return wire.

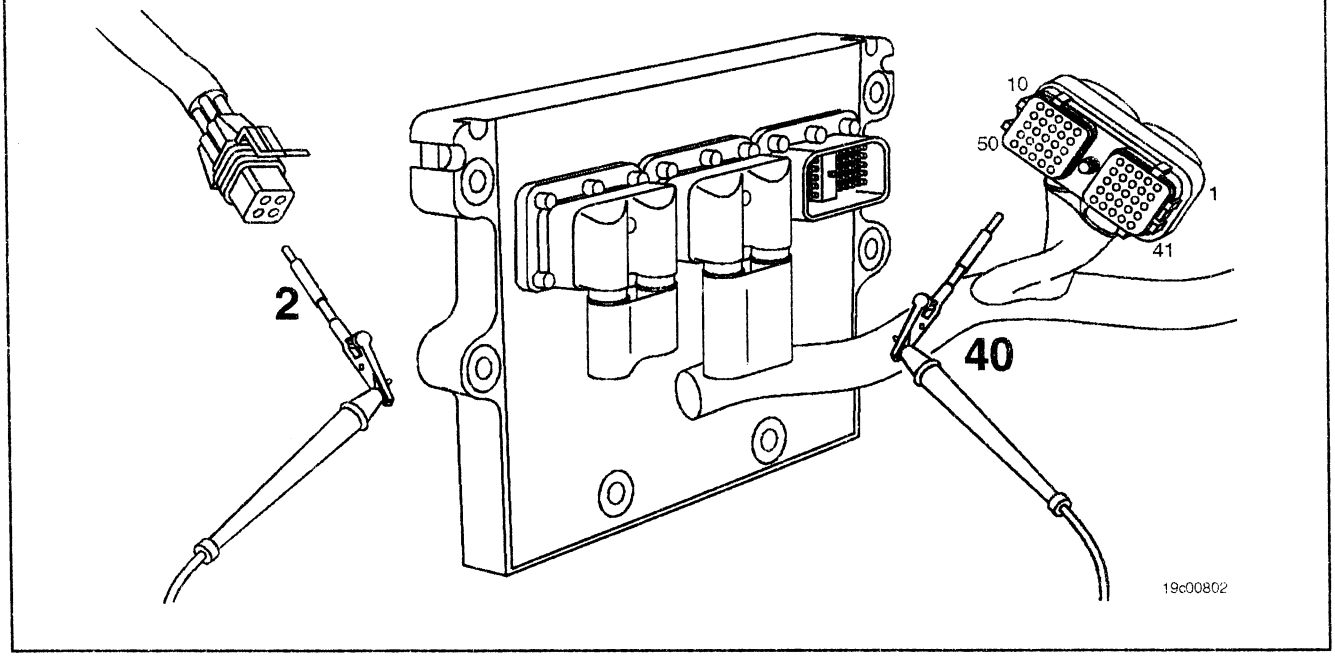
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect sensor harness connector from ECM.
- Disconnect intake manifold pressure/temperature sensor from sensor harness.

Action	Specifications/Repair	Next Step
Check for an open circuit in the return wire. • Measure the resistance from pin 40 of the sensor harness connector at the ECM to pin 2 (or B) of the sensor harness connector, at the sensor end of the harness.	**OK** **Less than 10 ohms** **Replace the intake manifold pressure/ temperature sensor** Refer to Procedure 019-159.	4A
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-204 or 019-250. • Replace the engine harness. Refer to Procedure 019-043.	4A



STEP 3: Check for an ECM response.

STEP 3A: Check for the appropriate ECM response.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Disconnect the sensor harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check for the appropriate ECM response. • Read the fault codes using INSITE™.	**OK** **Fault Code 122 inactive** **Fault Code 123 active**	4A
	NOT OK **Fault Code 122 active** **Replace the ECM** Refer to Procedure 019-031.	4A

STEP 4: Clear the fault codes.

STEP 4A: Disable the fault code.

Condition:
- Connect all components.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Verify that Fault Code 122 is inactive.	**OK** **Fault Code 122 inactive**	4B
	NOT OK Return to troubleshooting steps or contact your local Cummins Authorized Repair Location if all steps have been completed and checked again.	1A

STEP 4B: Clear the inactive fault codes.

Condition:
- Connect all components.

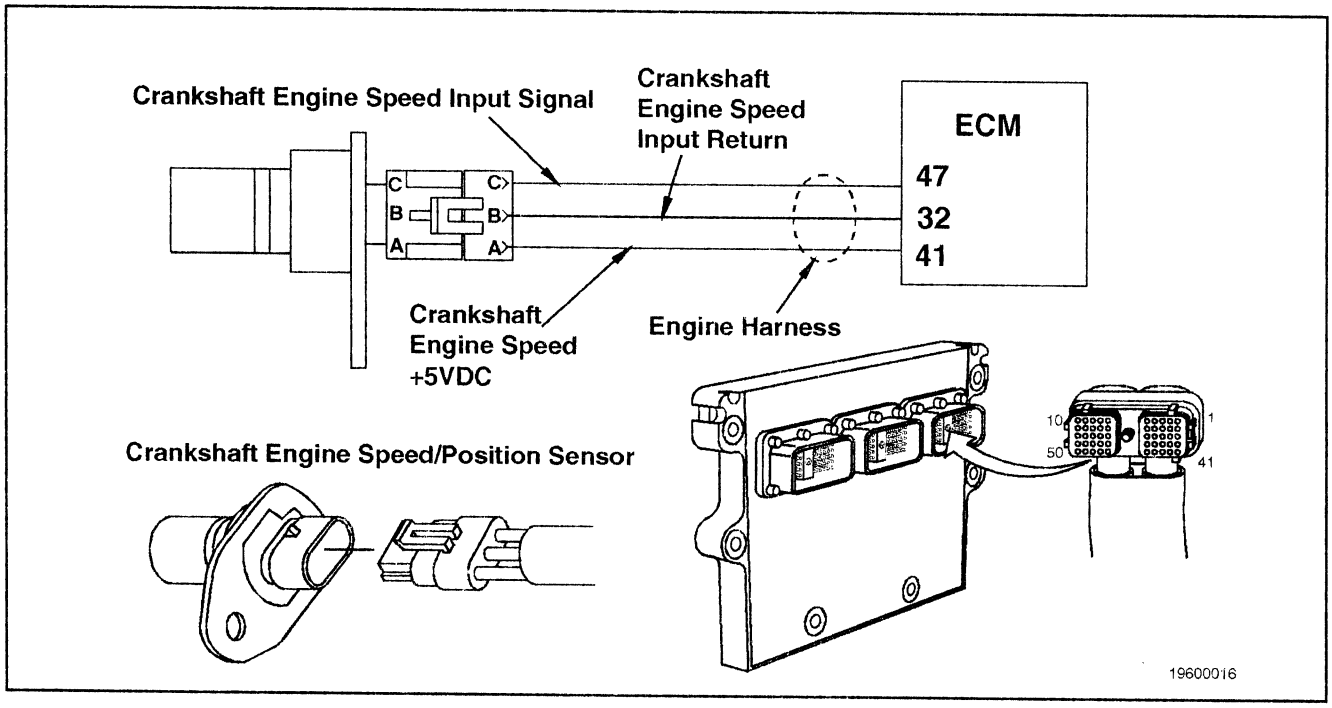
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All faults cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 121

Crankshaft Engine Position Sensor Circuit

CODES	REASON	EFFECT
Fault Code: 121 PID(P), SID(S): P190 SPN: 190 FMI: 10/10 Lamp: Yellow	No engine speed signal detected from the crankshaft engine position sensor.	Hard starting, low power, rough idle, or possible white smoke.

Crankshaft Engine Position Sensor Circuit



Circuit Description:

The crankshaft engine position sensor provides engine speed and position information to the electronic control module (ECM). The sensor **must** be powered up by (+) 5 VDC to operate. The sensor generates the signal by sensing the movement of target teeth machined into a tone wheel that is mounted to the crankshaft.

Component Location:

The crankshaft engine position sensor is located on the side of the front cover on the intake side of the engine.

Shop Talk:

Possible causes of this fault code include a damaged crankshaft engine position sensor, an open or a short circuit, or power supply voltage failure.

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3823995 - male Weather-Pack test lead
Part No. 3824775 - breakout cable.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the crankshaft engine position sensor.		
STEP 1A: Inspect the crankshaft engine position sensor and engine harness connectors.	No damaged pins	
STEP 1B: Check for signal from the crankshaft engine position sensor.	Signal present	
STEP 1B-1: Check crankshaft engine position sensor supply voltage.	(+) 4.75 to 5.25 VDC	
STEP 2: Check the engine harness.		
STEP 2A: Inspect the engine harness and the ECM connectors.	No damaged pins	
STEP 2B: Check for an open circuit.	Less than 10 ohms	
STEP 2C: Check for a short circuit to ground.	More than 100k ohms	
STEP 2D: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 3: Clear the fault codes.		
STEP 3A: Disable the fault code.	Fault Code 121 inactive	
STEP 3B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check the crankshaft engine position sensor.

STEP 1A: Inspect the crankshaft engine position sensor and the engine harness connectors.

Condition:
- Turn keyswitch OFF.
- Disconnect the engine harness from the crankshaft engine position sensor.
- Connect the sensor harness connector to the ECM.

Action	Specifications/Repair	Next Step
Inspect the crankshaft engine position sensor and the engine harness connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	1B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the sensor, whichever has the damaged pins • Flush the dirt, debris, or moisture from the connector pins using the electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-203. • Replace the engine harness. Refer to Procedure 019-043. • Replace the crankshaft engine position sensor. Refer to Procedure 019-042.	3A

STEP 1B: Check for signal from the crankshaft engine position sensor.

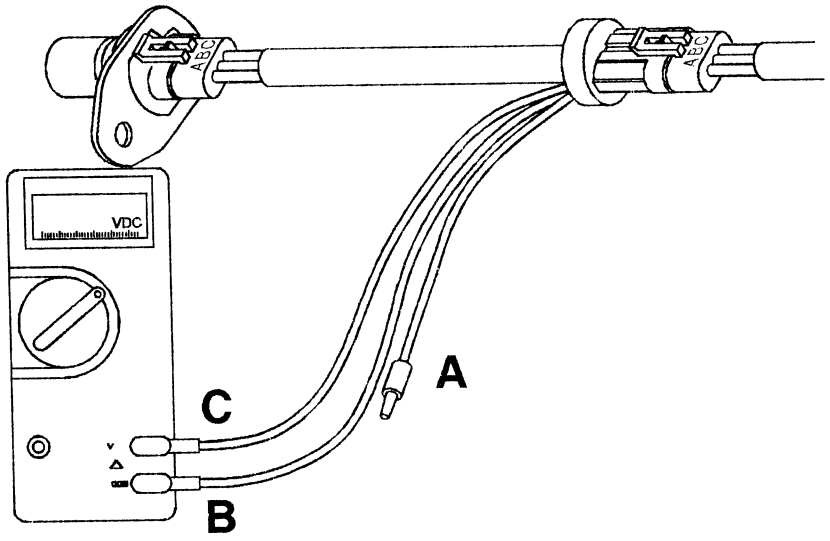
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement:
Part No. 3824775 - breakout cable

Condition:

- Install breakout cable, Part No. 3824775, between the crankshaft engine position sensor and the engine harness.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check for signal from the crankshaft engine position sensor. • Measure the voltage from pin C (or YELLOW) to pin B (or BLACK) on the breakout cable while barring the engine over.	**OK** **Signal present;** **signal should change from** **(+) 4 - 5 VDC to 0.5 - 2.3 VDC** **and back about every 60° of crankshaft rotation**	2A
	NOT OK Does **not** meet specifications.	1B-1



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STEP 1B-1: Check crankshaft engine position sensor supply voltage.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

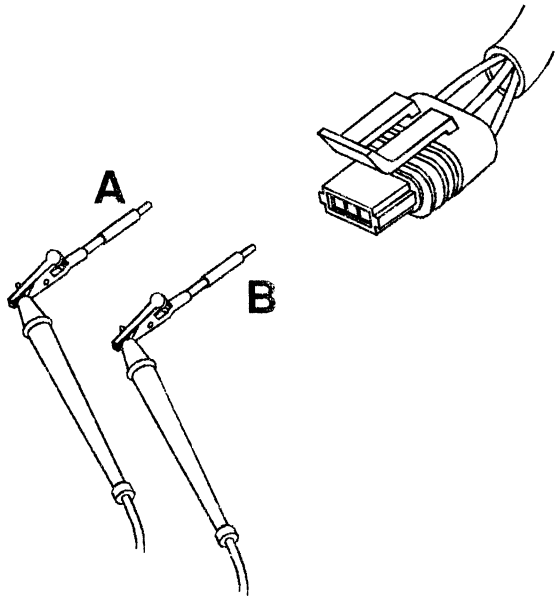
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3823995 - male Weather-Pack test lead.

Condition:

- Disconnect the engine harness from the crankshaft engine position sensor.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check crankshaft engine position sensor supply voltage. • Measure the voltage from pin A (or 1) to pin B (or 2) on the harness side of the crankshaft engine position sensor connector.	**OK** **(+) 4.75 to 5.25 VDC** **Replace the crankshaft engine position sensor** Refer to Procedure 019-042.	3A
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	3A



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STEP 2: Check the engine harness.

STEP 2A: Inspect the engine harness and the ECM connectors.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the engine harness and the ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	2B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins • Flush the dirt, debris, or moisture from the connector pins using the electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	3A

STEP 2B: Check for an open circuit.

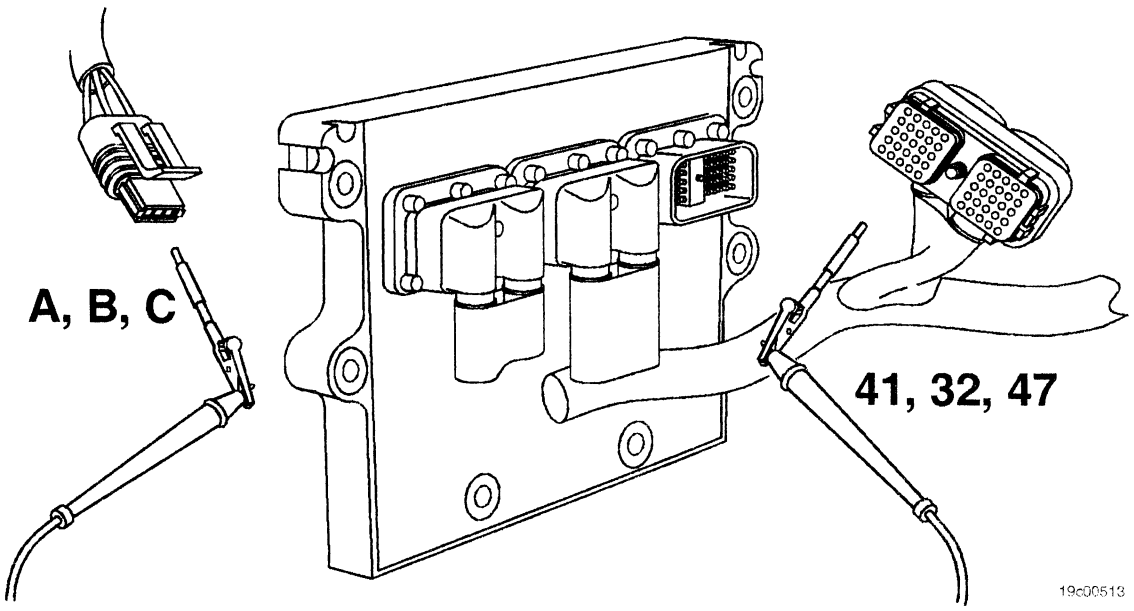
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the sensor harness from the crankshaft engine position sensor.

Action	Specifications/Repair	Next Step
Check for an open circuit. • Measure the resistance from pin 41 of the sensor harness connector to pin A (or 1) on the harness side of the crankshaft engine position sensor connector. • Measure the resistance from pin 32 of the sensor harness connector to pin B (or 2) on the harness side of the crankshaft engine position sensor connector. • Measure the resistance from pin 47 of the sensor harness connector to pin C (or 3) on the harness side of the crankshaft engine position sensor connector.	**OK** **Less than 10 ohms**	2C
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-203 or 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



STEP 2C: Check for a short circuit to ground.

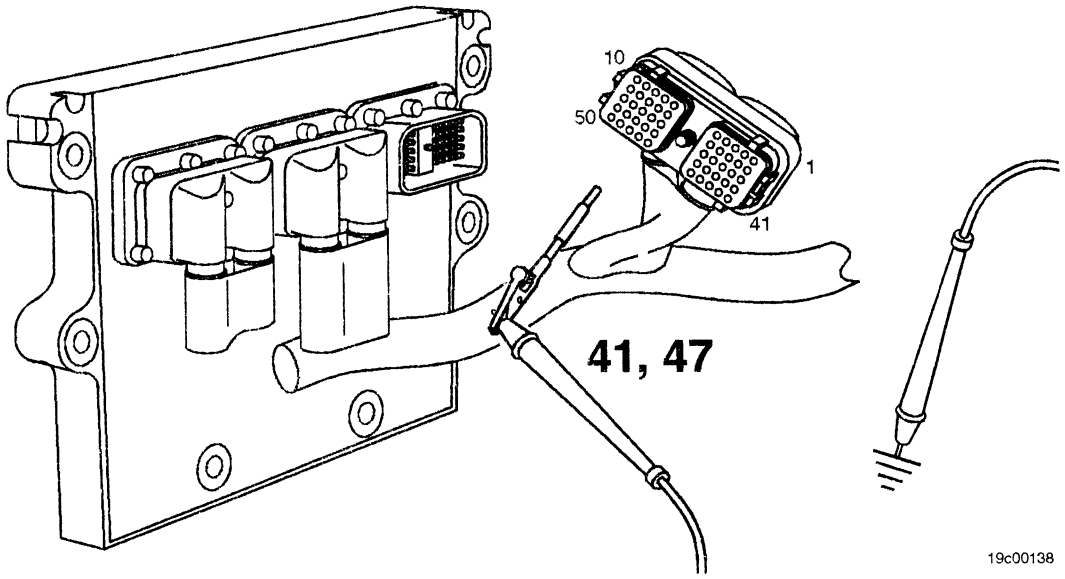
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the engine harness from the crankshaft engine position sensor.

Action	Specifications/Repair	Next Step
Check for a short circuit to ground. • Measure the resistance from pin 41 of the sensor harness connector to engine block ground. • Measure the resistance from pin 47 of the sensor harness connector to engine block ground.	**OK** **More than 100k ohms**	2D
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



STEP 2D: Check for a short circuit from pin to pin.

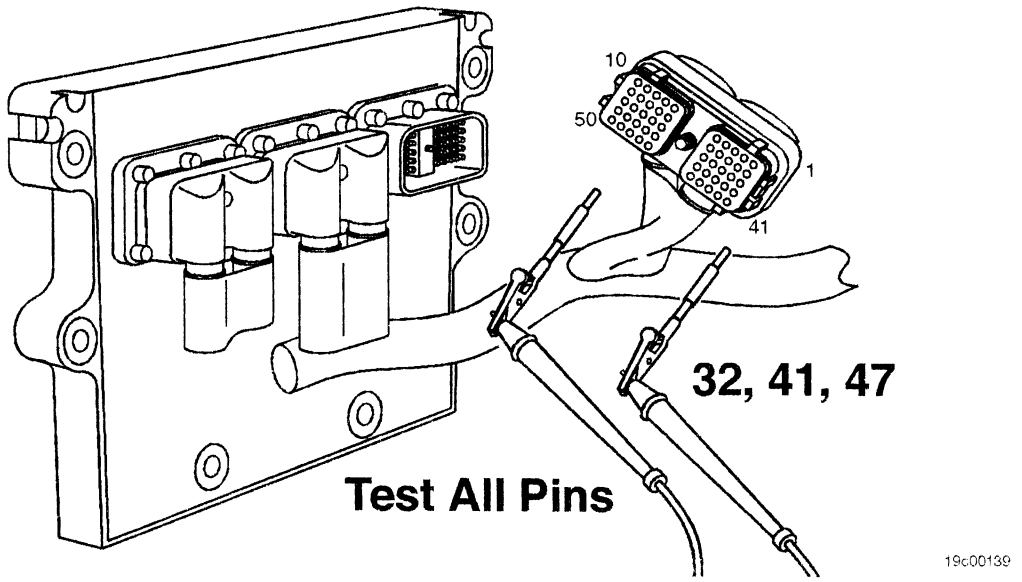
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the engine harness from the crankshaft engine position sensor.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin in the (+) 5-VDC supply wire and the signal wire. • Measure resistance from pin 32 of the sensor harness connector to all other pins in the connector. • Measure resistance from pin 41 of the sensor harness connector to all other pins in the connector. • Measure resistance from pin 47 of the sensor harness connector to all other pins in the connector.	**OK** **More than 100k ohms**	3A
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



STEP 3: Clear the fault codes.

STEP 3A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify Fault Code 121 is inactive.	**OK** **Fault Code 121 inactive**	3B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location if all the steps have been completed and checked again.	1A

STEP 3B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

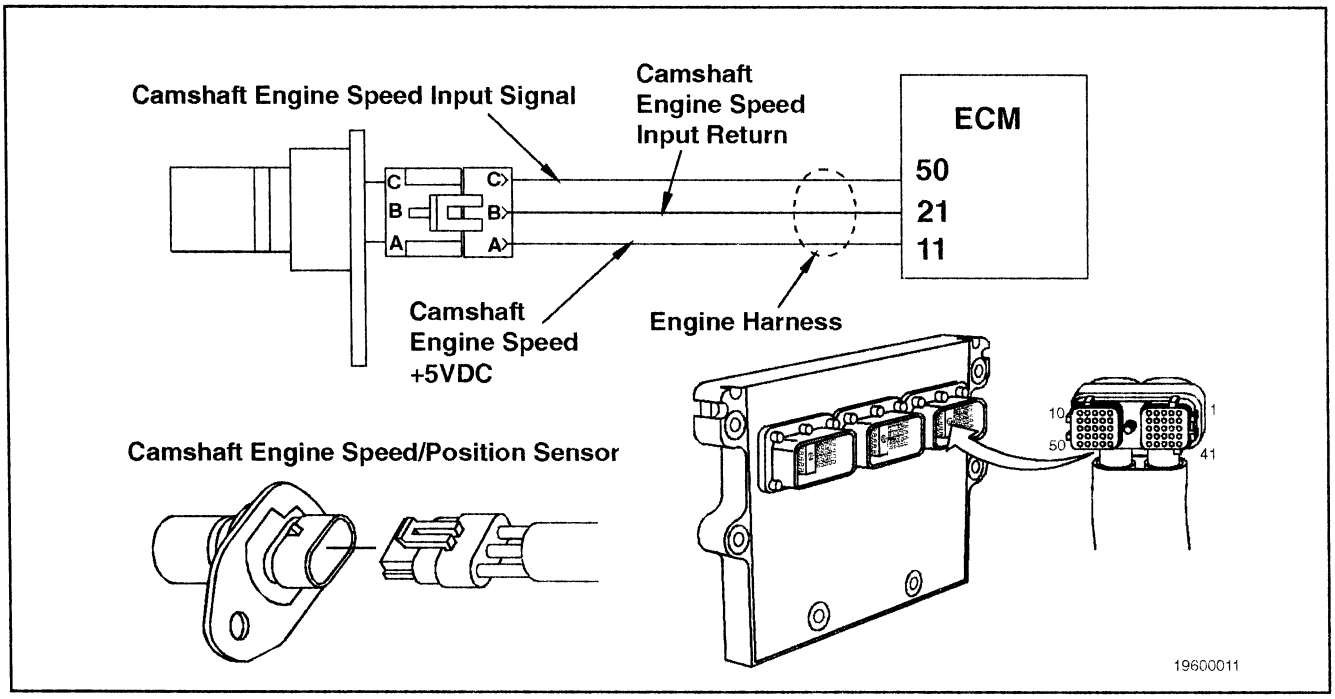
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 115

Camshaft Engine Position Sensor Circuit

CODES	REASON	EFFECT
Fault Code: 115 PID(P), SID(S): P190 SPN: 190 FMI: 2/2 Lamp: Red	No engine speed signal detected from the camshaft engine position sensor.	Engine may take longer to start.

Camshaft Engine Position Sensor Circuit



Circuit Description:

The camshaft engine position sensor provides engine speed and position information to the electronic control module (ECM). The sensor **must** be powered up by (+) 5 VDC to operate. The sensor generates the signal from an extra lobe on the camshaft.

Component Location:

The camshaft engine position sensor is located on the intake side of the engine block on the cylinder head to the right of the ECM.

Shop Talk:

Possible causes of this fault code include a damaged camshaft engine position sensor, an open or a short circuit, or power supply voltage failure.

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3823995 - male Weather-Pack test lead
Part No. 3824775 - breakout cable.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the camshaft engine position sensor.		
STEP 1A: Inspect the camshaft engine position sensor and engine harness connectors.	No damaged pins	
STEP 1B: Check for a signal from the camshaft engine position sensor.	Signal present	
STEP 1B-1: Check the camshaft engine position sensor supply voltage.	(+) 4.75 to 5.25 VDC	
STEP 2: Check the engine harness.		
STEP 2A: Inspect the engine harness and the ECM connectors.	No damaged pins	
STEP 2B: Check for an open circuit.	Less than 10 ohms	
STEP 2C: Check for a short circuit to ground.	More than 100k ohms	
STEP 2D: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 3: Clear the fault codes.		
STEP 3A: Disable the fault code.	Fault Code 115 inactive	
STEP 3B: Clear the inactive fault codes.	All fault codes cleared	

STEP 1C: Check the intake manifold pressure/temperature sensor supply voltage.

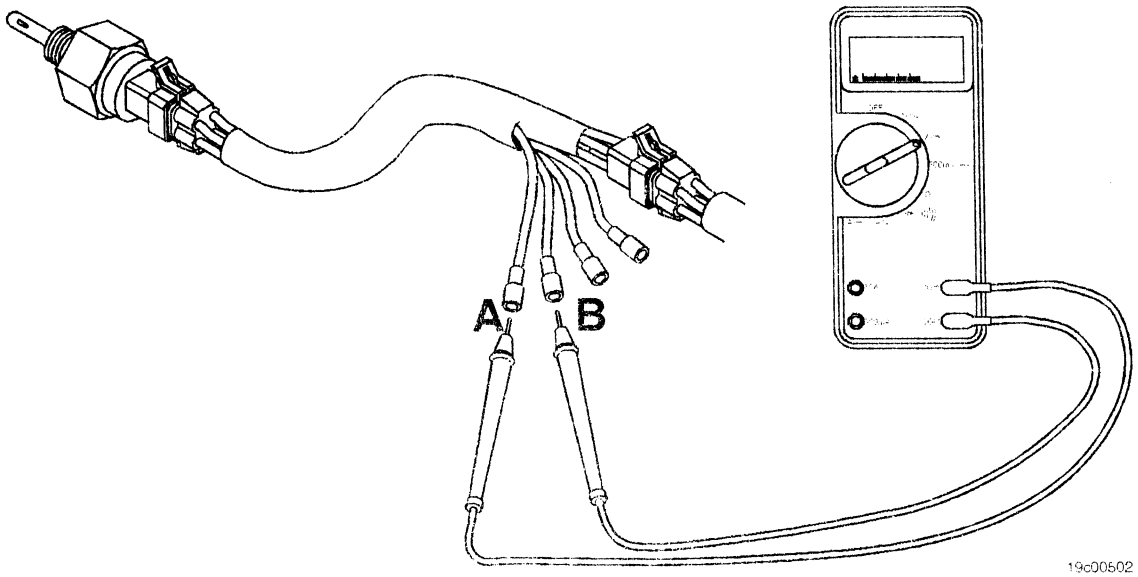
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3162898 - breakout cable.

Condition:

- Install the breakout cable, Part No. 3162898, between the sensor and the engine harness connector.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the intake manifold pressure/temperature sensor supply voltage. • Using a multimeter, measure the supply voltage from pin A (or RED) to pin B (or BLACK) of the breakout cable.	**OK** **(+) 4.75 to 5.25 VDC**	1D
	NOT OK Does **not** meet specifications.	1C-1



STEP 1C-1: Measure the voltage from the ECM.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

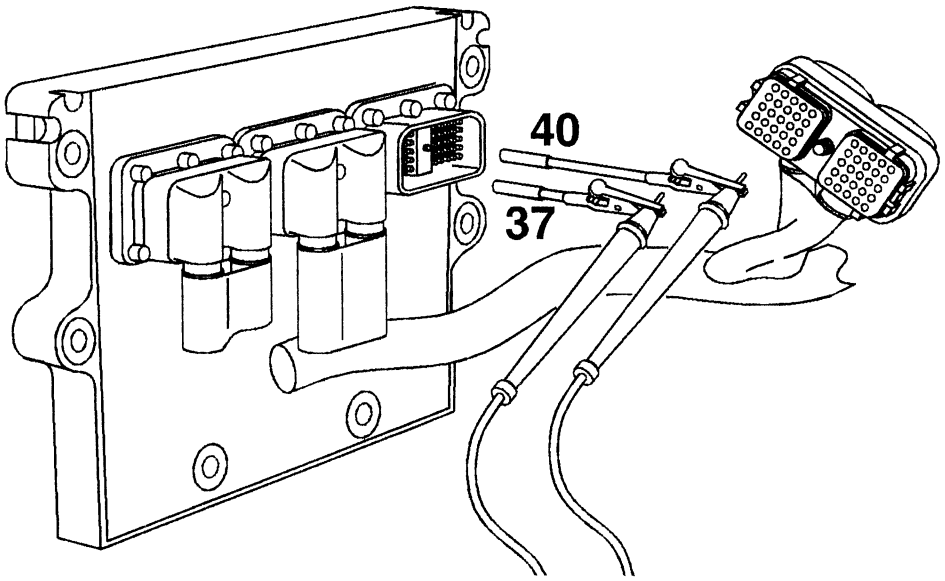
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the sensor harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Verify ECM output voltage. • Measure the voltage out of the ECM from pin 40 to pin 37 at the ECM sensor port.	**OK** **(+) 4.75 to 5.25 VDC** **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	4A
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	4A



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STEP 1D: Check the intake manifold pressure/temperature sensor signal voltage.

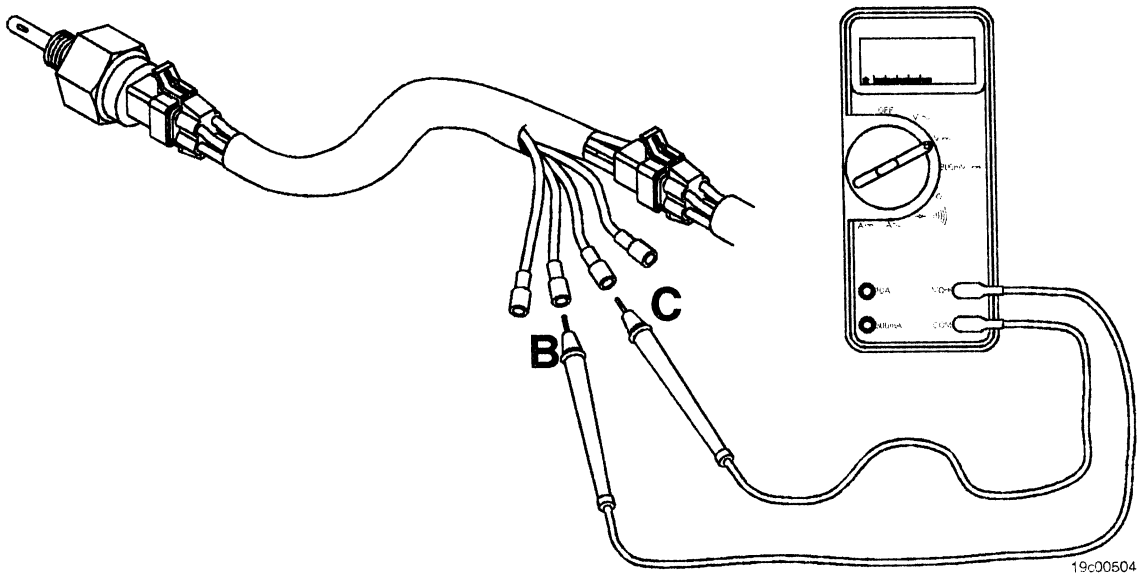
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3162898 - breakout cable.

Condition:

- Install the breakout cable, Part No. 3162898, between the sensor and the engine harness connector.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the intake manifold pressure/temperature sensor signal voltage. • Measure the signal voltage from pin C (or YELLOW) to pin B (or BLACK) of the breakout cable.	**OK** **(+) 0.42 to 0.58 VDC**	3A
	NOT OK Does **not** meet specifications.	2A



STEP 2: Check the engine harness and the ECM.

STEP 2A: Inspect the engine harness and the ECM connector pins.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Flush and clean the connector pins using electrical contact cleaner, Part No. 3824510.

Action	Specifications/Repair	Next Step
Inspect the engine harness and the ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	2B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	4A

STEP 2B: Read the fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start the engine and let it idle for 1 minute. • Read the fault codes using INSITE™.	**OK** **Fault Code 122 inactive**	4B
	NOT OK Fault Code 122 active.	2C

STEP 2C: Check for a short circuit from pin to pin.

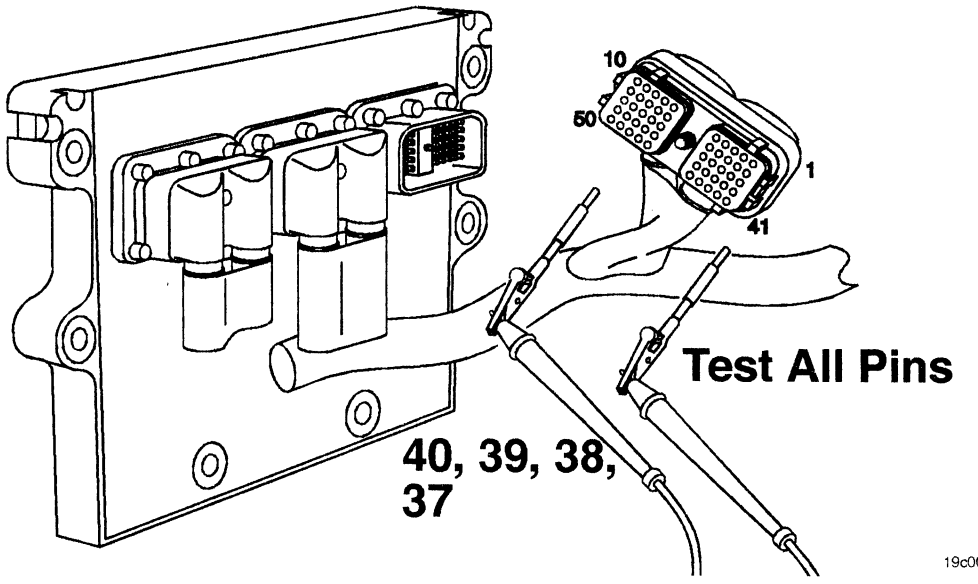
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin. • Measure the resistance from pin 40 of the sensor harness connector to all other pins in the connector. • Measure the resistance from pin 39 of the sensor harness connector to all other pins in the connector. • Measure the resistance from pin 38 of the sensor harness connector to all other pins in the connector. • Measure the resistance from pin 37 of the sensor harness connector to all other pins in the connector.	**OK** **More than 100k ohms**	2D
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	4A



STEP 2D: Check for an open circuit in the return wire.

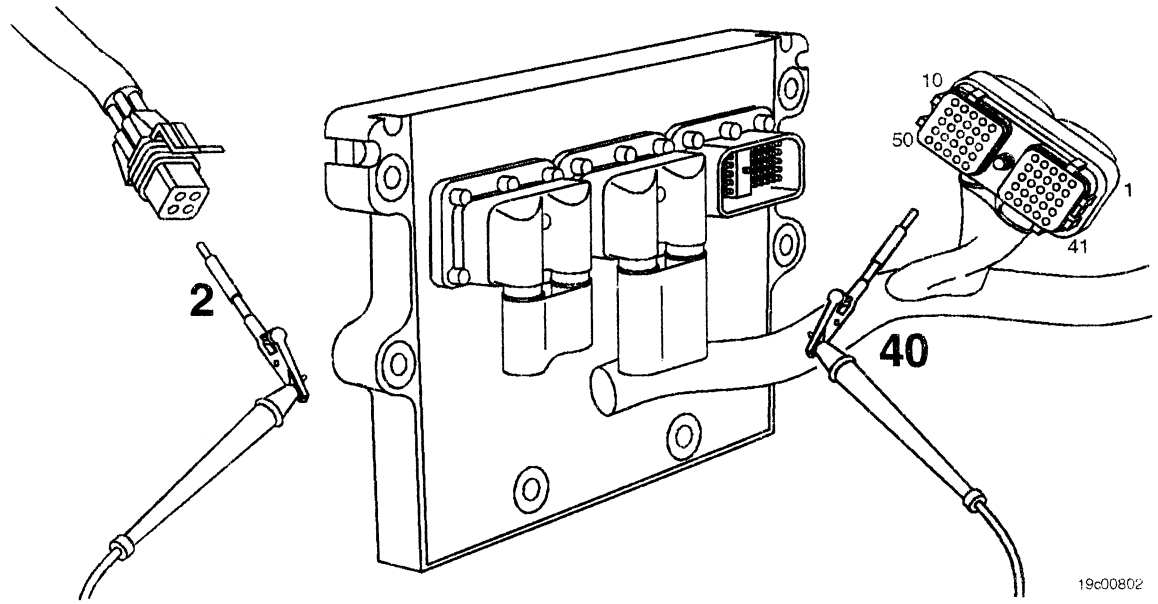
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect sensor harness connector from ECM.
- Disconnect intake manifold pressure/temperature sensor from sensor harness.

Action	Specifications/Repair	Next Step
Check for an open circuit in the return wire. • Measure the resistance from pin 40 of the sensor harness connector at the ECM to pin 2 (or B) of the sensor harness connector, at the sensor end of the harness.	**OK** **Less than 10 ohms** **Replace the intake manifold pressure/ temperature sensor** Refer to Procedure 019-159.	4A
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-204 or 019-250. • Replace the engine harness. Refer to Procedure 019-043.	4A



STEP 3: Check for an ECM response.

STEP 3A: Check for the appropriate ECM response.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Disconnect the sensor harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check for the appropriate ECM response. • Read the fault codes using INSITE™.	**OK** **Fault Code 122 inactive** **Fault Code 123 active**	4A
	NOT OK **Fault Code 122 active** **Replace the ECM** Refer to Procedure 019-031.	4A

STEP 4: Clear the fault codes.

STEP 4A: Disable the fault code.

Condition:
- Connect all components.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Verify that Fault Code 122 is inactive.	**OK** **Fault Code 122 inactive**	4B
	NOT OK Return to troubleshooting steps or contact your local Cummins Authorized Repair Location if all steps have been completed and checked again.	1A

STEP 4B: Clear the inactive fault codes.

Condition:
- Connect all components.

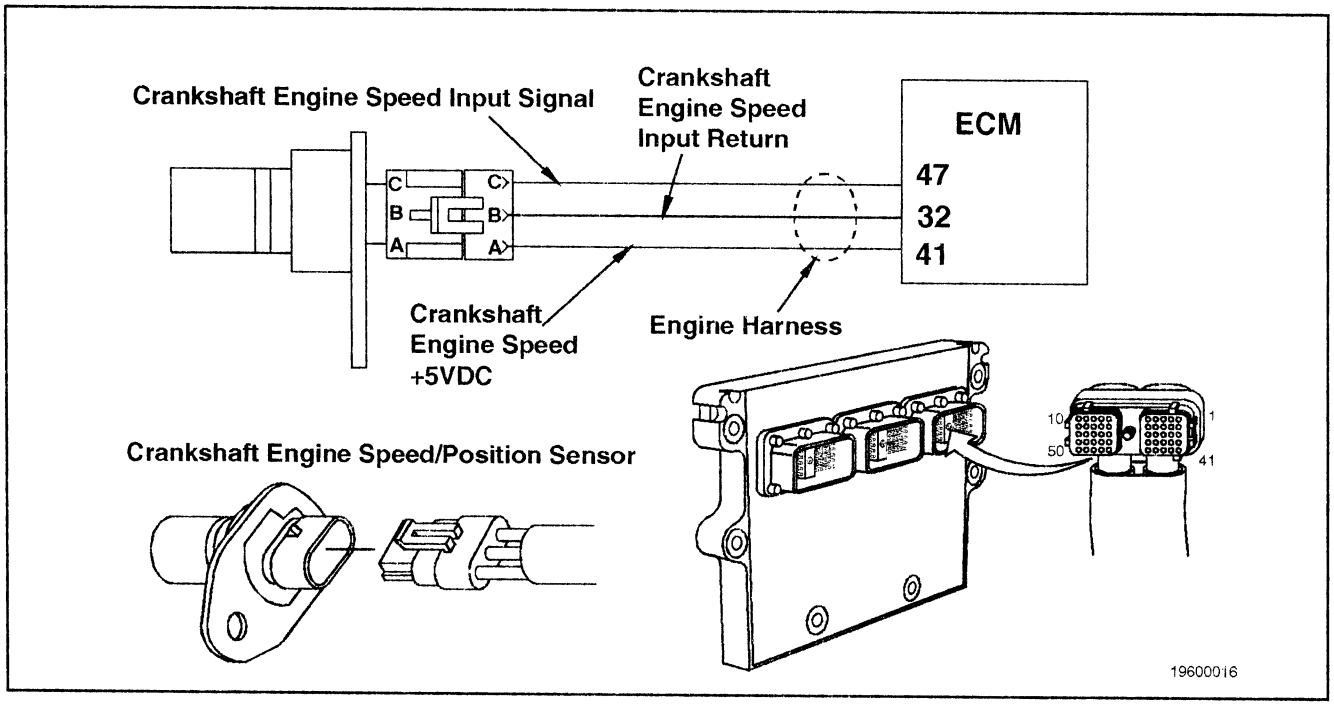
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All faults cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 121

Crankshaft Engine Position Sensor Circuit

CODES	REASON	EFFECT
Fault Code: 121 PID(P), SID(S): P190 SPN: 190 FMI: 10/10 Lamp: Yellow	No engine speed signal detected from the crankshaft engine position sensor.	Hard starting, low power, rough idle, or possible white smoke.

Crankshaft Engine Position Sensor Circuit



Circuit Description:

The crankshaft engine position sensor provides engine speed and position information to the electronic control module (ECM). The sensor **must** be powered up by (+) 5 VDC to operate. The sensor generates the signal by sensing the movement of target teeth machined into a tone wheel that is mounted to the crankshaft.

Component Location:

The crankshaft engine position sensor is located on the side of the front cover on the intake side of the engine.

Shop Talk:

Possible causes of this fault code include a damaged crankshaft engine position sensor, an open or a short circuit, or power supply voltage failure.

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3823995 - male Weather-Pack test lead
Part No. 3824775 - breakout cable.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the crankshaft engine position sensor.		
STEP 1A: Inspect the crankshaft engine position sensor and engine harness connectors.	No damaged pins	
STEP 1B: Check for signal from the crankshaft engine position sensor.	Signal present	
STEP 1B-1: Check crankshaft engine position sensor supply voltage.	(+) 4.75 to 5.25 VDC	
STEP 2: Check the engine harness.		
STEP 2A: Inspect the engine harness and the ECM connectors.	No damaged pins	
STEP 2B: Check for an open circuit.	Less than 10 ohms	
STEP 2C: Check for a short circuit to ground.	More than 100k ohms	
STEP 2D: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 3: Clear the fault codes.		
STEP 3A: Disable the fault code.	Fault Code 121 inactive	
STEP 3B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check the crankshaft engine position sensor.

STEP 1A: Inspect the crankshaft engine position sensor and the engine harness connectors.

Condition:
- Turn keyswitch OFF.
- Disconnect the engine harness from the crankshaft engine position sensor.
- Connect the sensor harness connector to the ECM.

Action	Specifications/Repair	Next Step
Inspect the crankshaft engine position sensor and the engine harness connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	1B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the sensor, whichever has the damaged pins • Flush the dirt, debris, or moisture from the connector pins using the electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-203. • Replace the engine harness. Refer to Procedure 019-043. • Replace the crankshaft engine position sensor. Refer to Procedure 019-042.	3A

STEP 1B: Check for signal from the crankshaft engine position sensor.

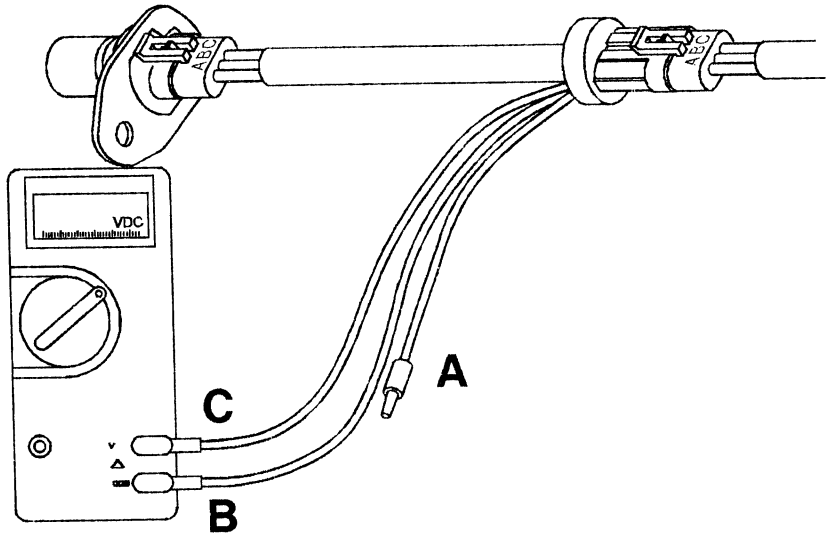
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement:
Part No. 3824775 - breakout cable

Condition:

- Install breakout cable, Part No. 3824775, between the crankshaft engine position sensor and the engine harness.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check for signal from the crankshaft engine position sensor. • Measure the voltage from pin C (or YELLOW) to pin B (or BLACK) on the breakout cable while barring the engine over.	**OK** **Signal present;** **signal should change from** **(+) 4 - 5 VDC to 0.5 - 2.3 VDC** **and back about every 60° of crankshaft rotation**	2A
	NOT OK Does **not** meet specifications.	1B-1



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STEP 1B-1: Check crankshaft engine position sensor supply voltage.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

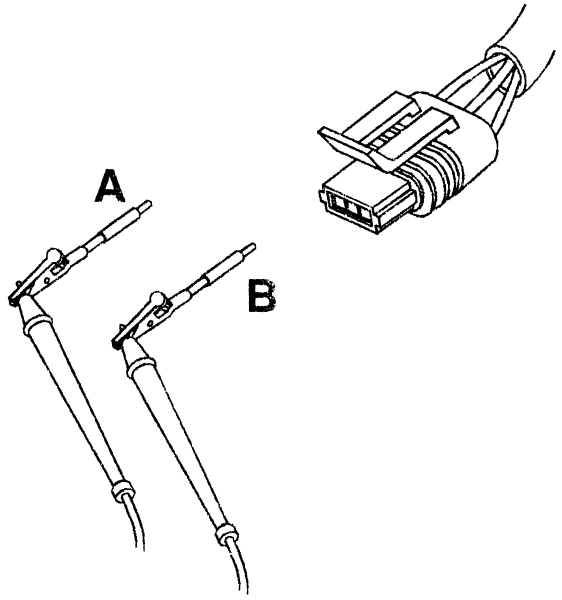
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3823995 - male Weather-Pack test lead.

Condition:

- Disconnect the engine harness from the crankshaft engine position sensor.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check crankshaft engine position sensor supply voltage. • Measure the voltage from pin A (or 1) to pin B (or 2) on the harness side of the crankshaft engine position sensor connector.	**OK** **(+) 4.75 to 5.25 VDC** **Replace the crankshaft engine position sensor** Refer to Procedure 019-042.	3A
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	3A



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STEP 1C: Check the intake manifold pressure/temperature sensor supply voltage.

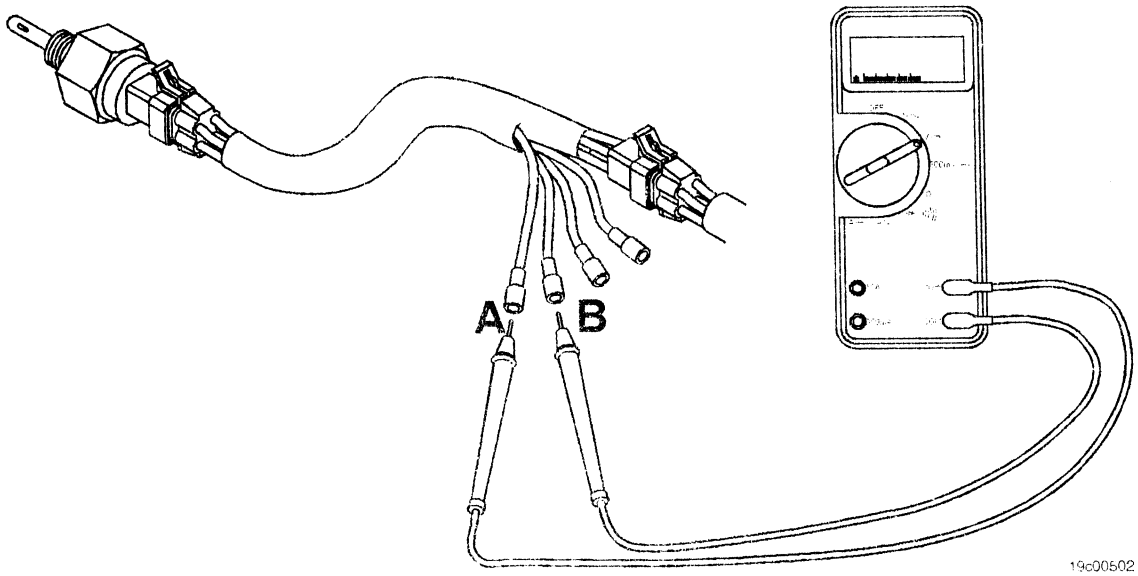
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3162898 - breakout cable.

Condition:

- Install the breakout cable, Part No. 3162898, between the sensor and the engine harness connector.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the intake manifold pressure/temperature sensor supply voltage. • Using a multimeter, measure the supply voltage from pin A (or RED) to pin B (or BLACK) of the breakout cable.	**OK** **(+) 4.75 to 5.25 VDC**	1D
	NOT OK Does **not** meet specifications.	1C-1



STEP 1C-1: Measure the voltage from the ECM.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

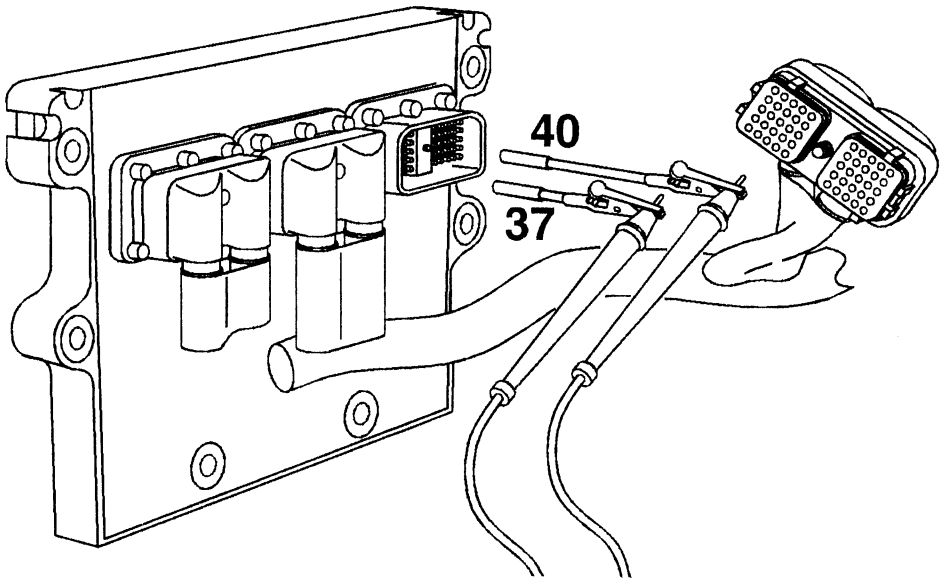
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the sensor harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Verify ECM output voltage. • Measure the voltage out of the ECM from pin 40 to pin 37 at the ECM sensor port.	**OK** **(+) 4.75 to 5.25 VDC** **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	4A
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	4A



STEP 1D: Check the intake manifold pressure/temperature sensor signal voltage.

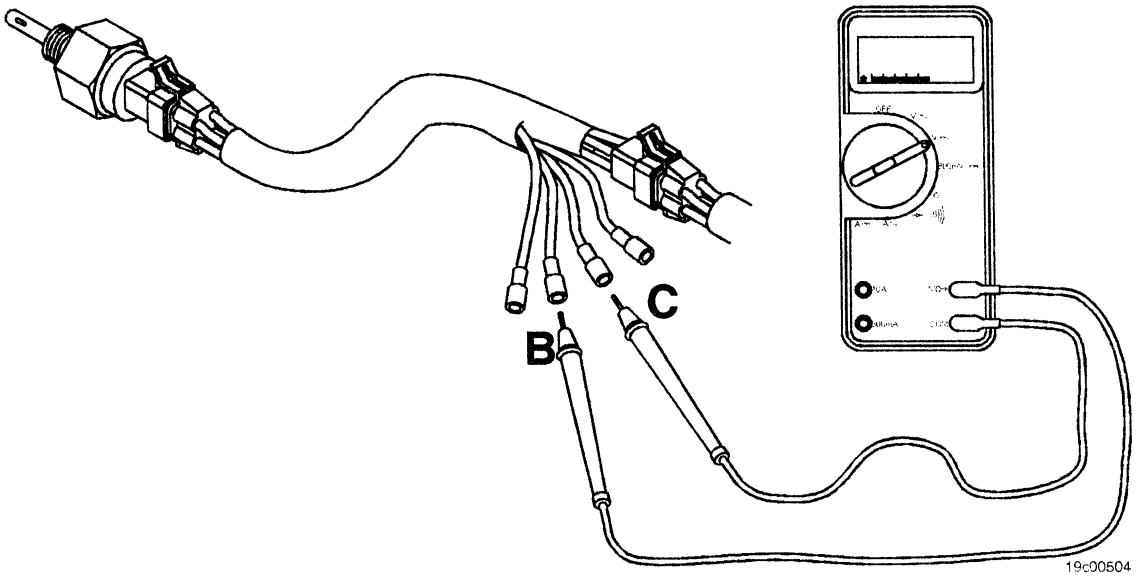
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3162898 - breakout cable.

Condition:

- Install the breakout cable, Part No. 3162898, between the sensor and the engine harness connector.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the intake manifold pressure/temperature sensor signal voltage. • Measure the signal voltage from pin C (or YELLOW) to pin B (or BLACK) of the breakout cable.	**OK** **(+) 0.42 to 0.58 VDC**	3A
	NOT OK Does **not** meet specifications.	2A



STEP 2: Check the engine harness and the ECM.

STEP 2A: Inspect the engine harness and the ECM connector pins.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Flush and clean the connector pins using electrical contact cleaner, Part No. 3824510.

Action	Specifications/Repair	Next Step
Inspect the engine harness and the ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	2B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	4A

STEP 2B: Read the fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start the engine and let it idle for 1 minute. • Read the fault codes using INSITE™.	**OK** **Fault Code 122 inactive**	4B
	NOT OK Fault Code 122 active.	2C

STEP 2C: Check for a short circuit from pin to pin.

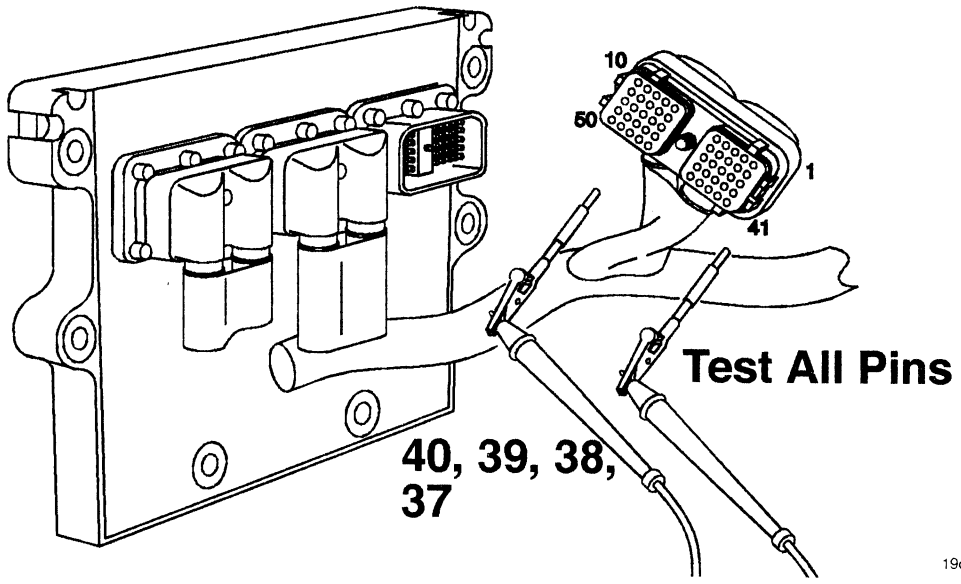
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin. • Measure the resistance from pin 40 of the sensor harness connector to all other pins in the connector. • Measure the resistance from pin 39 of the sensor harness connector to all other pins in the connector. • Measure the resistance from pin 38 of the sensor harness connector to all other pins in the connector. • Measure the resistance from pin 37 of the sensor harness connector to all other pins in the connector.	**OK** **More than 100k ohms**	2D
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	4A



STEP 2D: Check for an open circuit in the return wire.

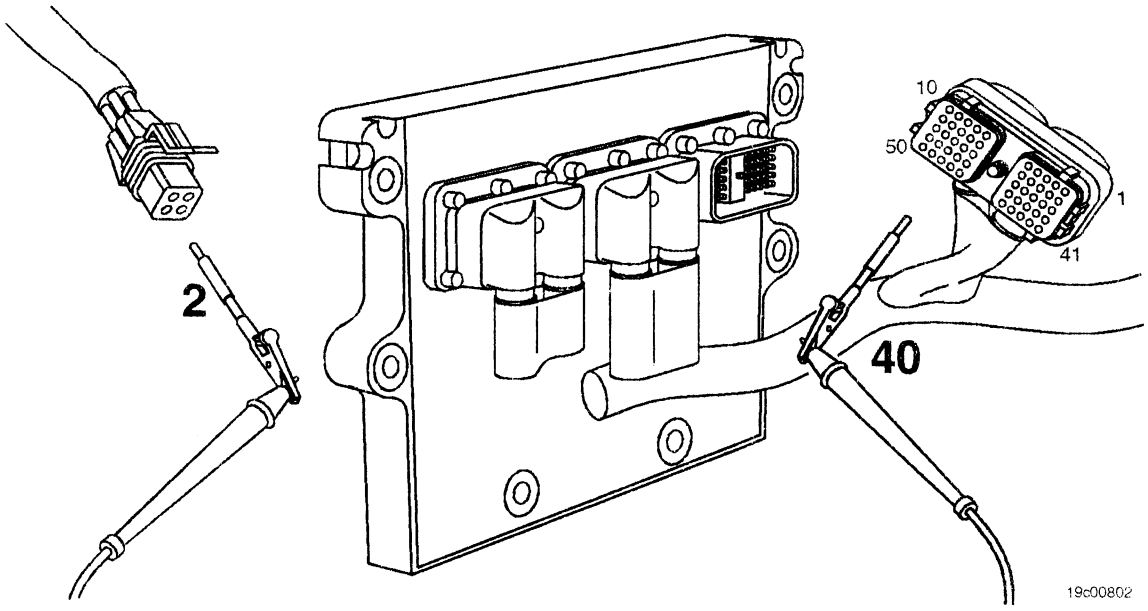
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect sensor harness connector from ECM.
- Disconnect intake manifold pressure/temperature sensor from sensor harness.

Action	Specifications/Repair	Next Step
Check for an open circuit in the return wire. • Measure the resistance from pin 40 of the sensor harness connector at the ECM to pin 2 (or B) of the sensor harness connector, at the sensor end of the harness.	**OK** **Less than 10 ohms** **Replace the intake manifold pressure/ temperature sensor** Refer to Procedure 019-159.	4A
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-204 or 019-250. • Replace the engine harness. Refer to Procedure 019-043.	4A



STEP 3: Check for an ECM response.

STEP 3A: Check for the appropriate ECM response.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Disconnect the sensor harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check for the appropriate ECM response. • Read the fault codes using INSITE™.	**OK** **Fault Code 122 inactive** **Fault Code 123 active**	4A
	NOT OK **Fault Code 122 active** **Replace the ECM** Refer to Procedure 019-031.	4A

STEP 4: Clear the fault codes.

STEP 4A: Disable the fault code.

Condition:
- Connect all components.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Verify that Fault Code 122 is inactive.	**OK** **Fault Code 122 inactive**	4B
	NOT OK Return to troubleshooting steps or contact your local Cummins Authorized Repair Location if all steps have been completed and checked again.	1A

STEP 4B: Clear the inactive fault codes.

Condition:
- Connect all components.

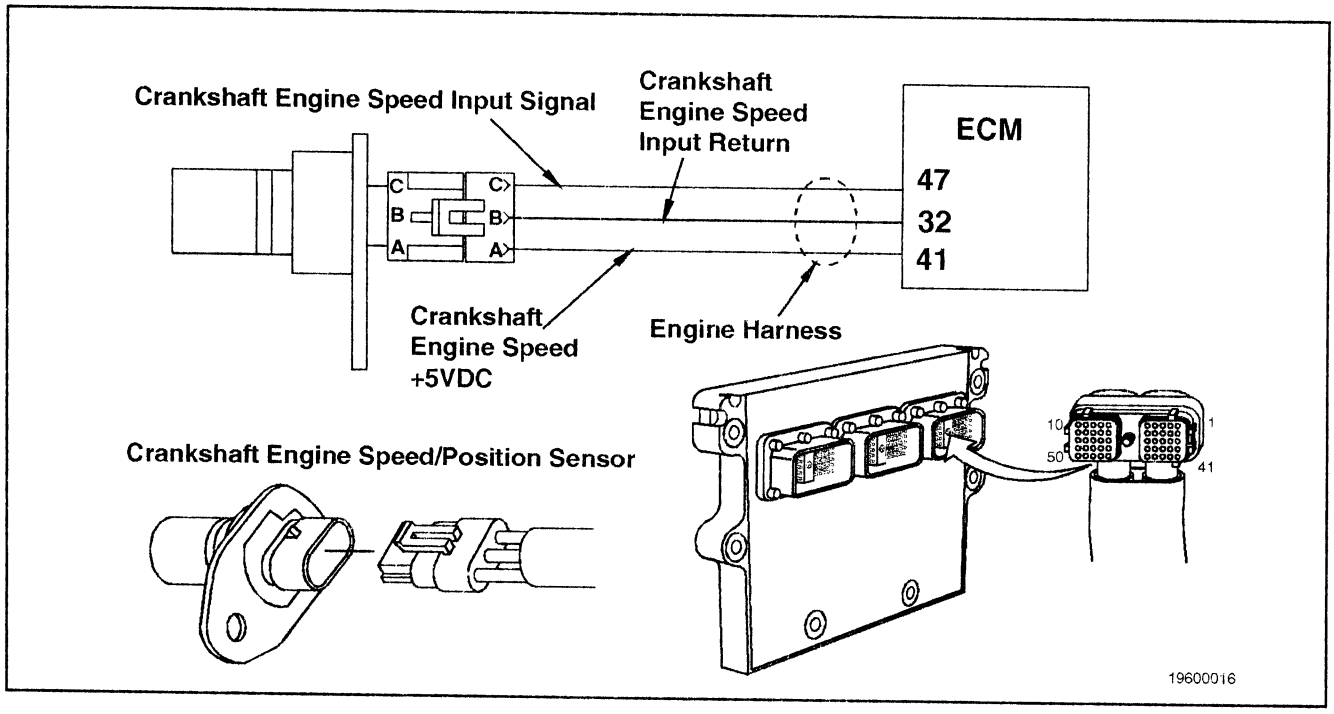
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All faults cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 121

Crankshaft Engine Position Sensor Circuit

CODES	REASON	EFFECT
Fault Code: 121 PID(P), SID(S): P190 SPN: 190 FMI: 10/10 Lamp: Yellow	No engine speed signal detected from the crankshaft engine position sensor.	Hard starting, low power, rough idle, or possible white smoke.

Crankshaft Engine Position Sensor Circuit



Circuit Description:

The crankshaft engine position sensor provides engine speed and position information to the electronic control module (ECM). The sensor **must** be powered up by (+) 5 VDC to operate. The sensor generates the signal by sensing the movement of target teeth machined into a tone wheel that is mounted to the crankshaft.

Component Location:

The crankshaft engine position sensor is located on the side of the front cover on the intake side of the engine.

Shop Talk:

Possible causes of this fault code include a damaged crankshaft engine position sensor, an open or a short circuit, or power supply voltage failure.

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3823995 - male Weather-Pack test lead
Part No. 3824775 - breakout cable.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the crankshaft engine position sensor.		
STEP 1A: Inspect the crankshaft engine position sensor and engine harness connectors.	No damaged pins	
STEP 1B: Check for signal from the crankshaft engine position sensor.	Signal present	
STEP 1B-1: Check crankshaft engine position sensor supply voltage.	(+) 4.75 to 5.25 VDC	
STEP 2: Check the engine harness.		
STEP 2A: Inspect the engine harness and the ECM connectors.	No damaged pins	
STEP 2B: Check for an open circuit.	Less than 10 ohms	
STEP 2C: Check for a short circuit to ground.	More than 100k ohms	
STEP 2D: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 3: Clear the fault codes.		
STEP 3A: Disable the fault code.	Fault Code 121 inactive	
STEP 3B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check the crankshaft engine position sensor.

STEP 1A: Inspect the crankshaft engine position sensor and the engine harness connectors.

Condition:
- Turn keyswitch OFF.
- Disconnect the engine harness from the crankshaft engine position sensor.
- Connect the sensor harness connector to the ECM.

Action	Specifications/Repair	Next Step
Inspect the crankshaft engine position sensor and the engine harness connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	1B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the sensor, whichever has the damaged pins • Flush the dirt, debris, or moisture from the connector pins using the electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-203. • Replace the engine harness. Refer to Procedure 019-043. • Replace the crankshaft engine position sensor. Refer to Procedure 019-042.	3A

STEP 1B: Check for signal from the crankshaft engine position sensor.

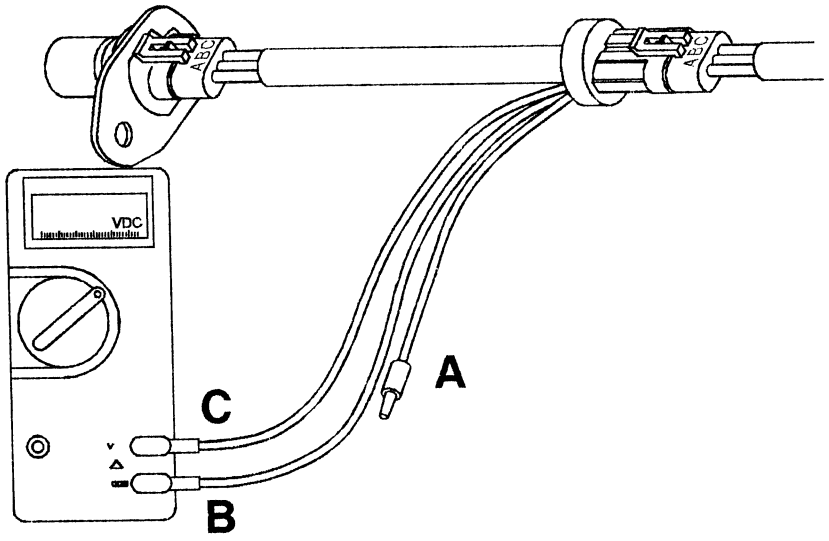
△CAUTION△

To avoid pin and harness damage, use the following test lead when taking a measurement:
Part No. 3824775 - breakout cable

Condition:

- Install breakout cable, Part No. 3824775, between the crankshaft engine position sensor and the engine harness.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check for signal from the crankshaft engine position sensor. • Measure the voltage from pin C (or YELLOW) to pin B (or BLACK) on the breakout cable while barring the engine over.	**OK** **Signal present;** **signal should change from** **(+) 4 - 5 VDC to 0.5 - 2.3 VDC** **and back about every 60° of crankshaft rotation**	2A
	NOT OK Does **not** meet specifications.	1B-1



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STEP 1B-1: Check crankshaft engine position sensor supply voltage.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

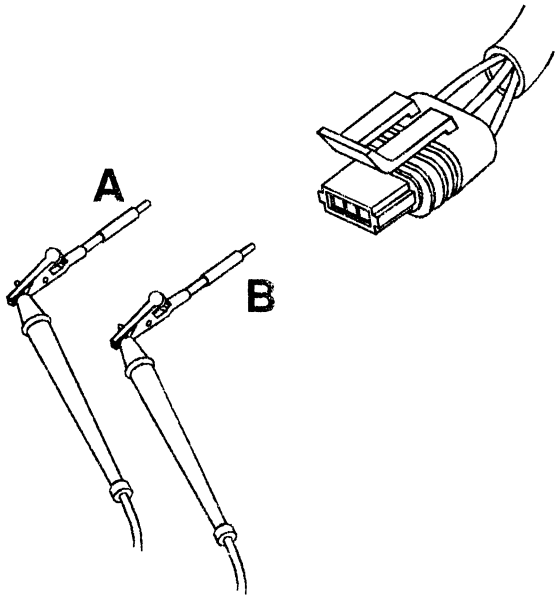
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3823995 - male Weather-Pack test lead.

Condition:

- Disconnect the engine harness from the crankshaft engine position sensor.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check crankshaft engine position sensor supply voltage. • Measure the voltage from pin A (or 1) to pin B (or 2) on the harness side of the crankshaft engine position sensor connector.	**OK** **(+) 4.75 to 5.25 VDC** **Replace the crankshaft engine position sensor** Refer to Procedure 019-042.	3A
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	3A



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STEP 2: Check the engine harness.

STEP 2A: Inspect the engine harness and the ECM connectors.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the engine harness and the ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	2B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins • Flush the dirt, debris, or moisture from the connector pins using the electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	3A

STEP 2B: Check for an open circuit.

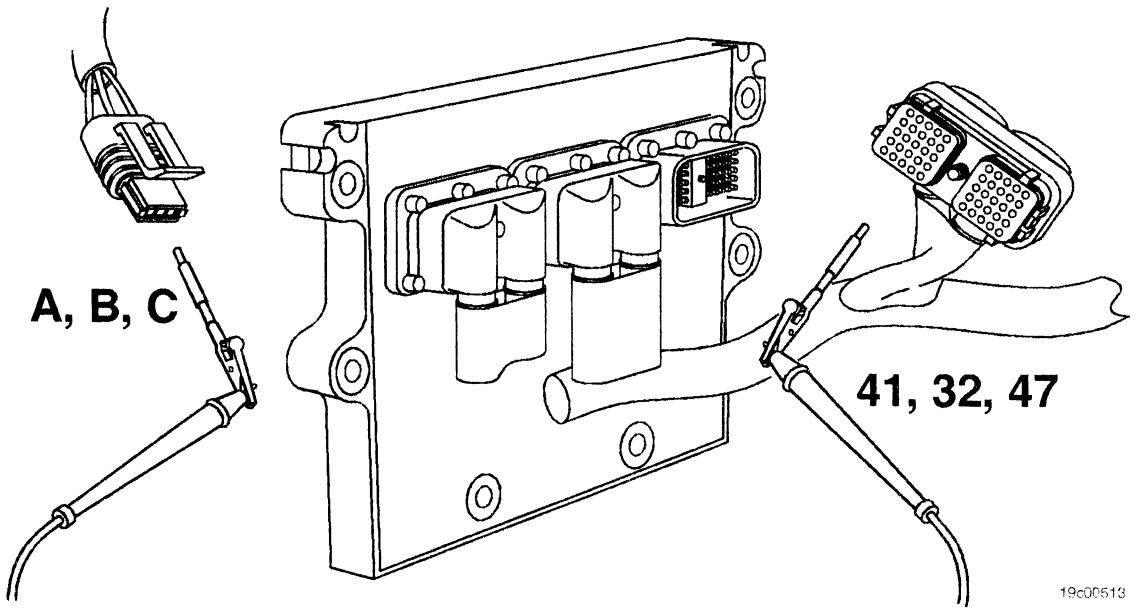
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the sensor harness from the crankshaft engine position sensor.

Action	Specifications/Repair	Next Step
Check for an open circuit. • Measure the resistance from pin 41 of the sensor harness connector to pin A (or 1) on the harness side of the crankshaft engine position sensor connector. • Measure the resistance from pin 32 of the sensor harness connector to pin B (or 2) on the harness side of the crankshaft engine position sensor connector. • Measure the resistance from pin 47 of the sensor harness connector to pin C (or 3) on the harness side of the crankshaft engine position sensor connector.	**OK** **Less than 10 ohms**	2C
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-203 or 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



STEP 2C: Check for a short circuit to ground.

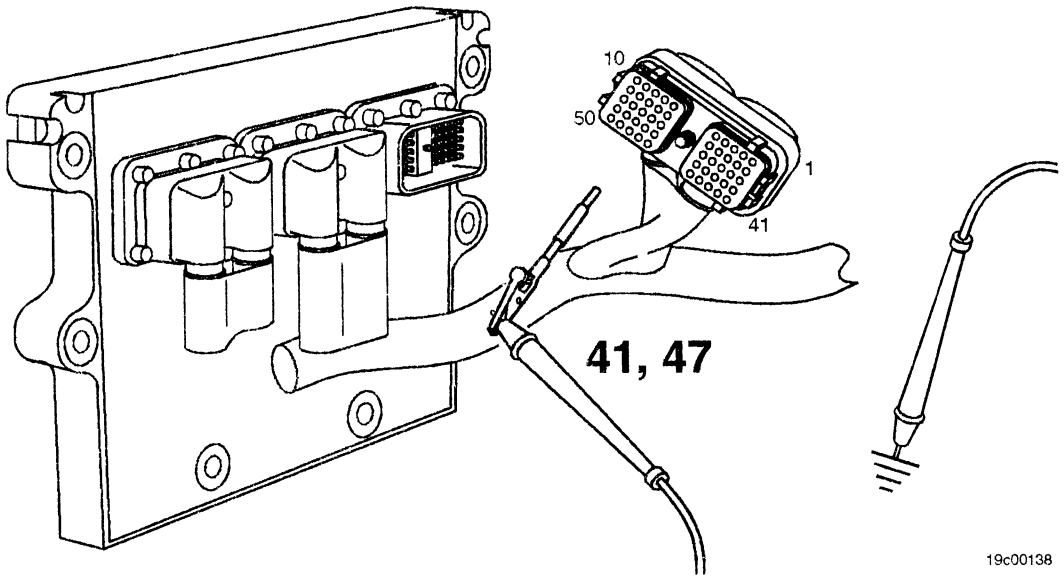
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the engine harness from the crankshaft engine position sensor.

Action	Specifications/Repair	Next Step
Check for a short circuit to ground. • Measure the resistance from pin 41 of the sensor harness connector to engine block ground. • Measure the resistance from pin 47 of the sensor harness connector to engine block ground.	**OK** **More than 100k ohms**	2D
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



STEP 2D: Check for a short circuit from pin to pin.

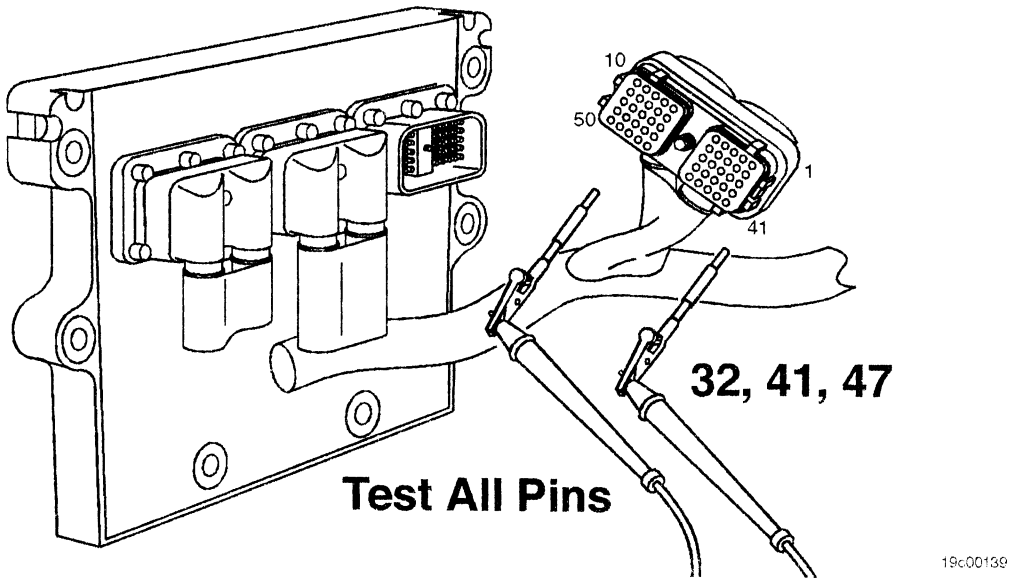
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the engine harness from the crankshaft engine position sensor.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin in the (+) 5-VDC supply wire and the signal wire. • Measure resistance from pin 32 of the sensor harness connector to all other pins in the connector. • Measure resistance from pin 41 of the sensor harness connector to all other pins in the connector. • Measure resistance from pin 47 of the sensor harness connector to all other pins in the connector.	**OK** **More than 100k ohms**	3A
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



STEP 3: Clear the fault codes.

STEP 3A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify Fault Code 121 is inactive.	**OK** **Fault Code 121 inactive**	3B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location if all the steps have been completed and checked again.	1A

STEP 3B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

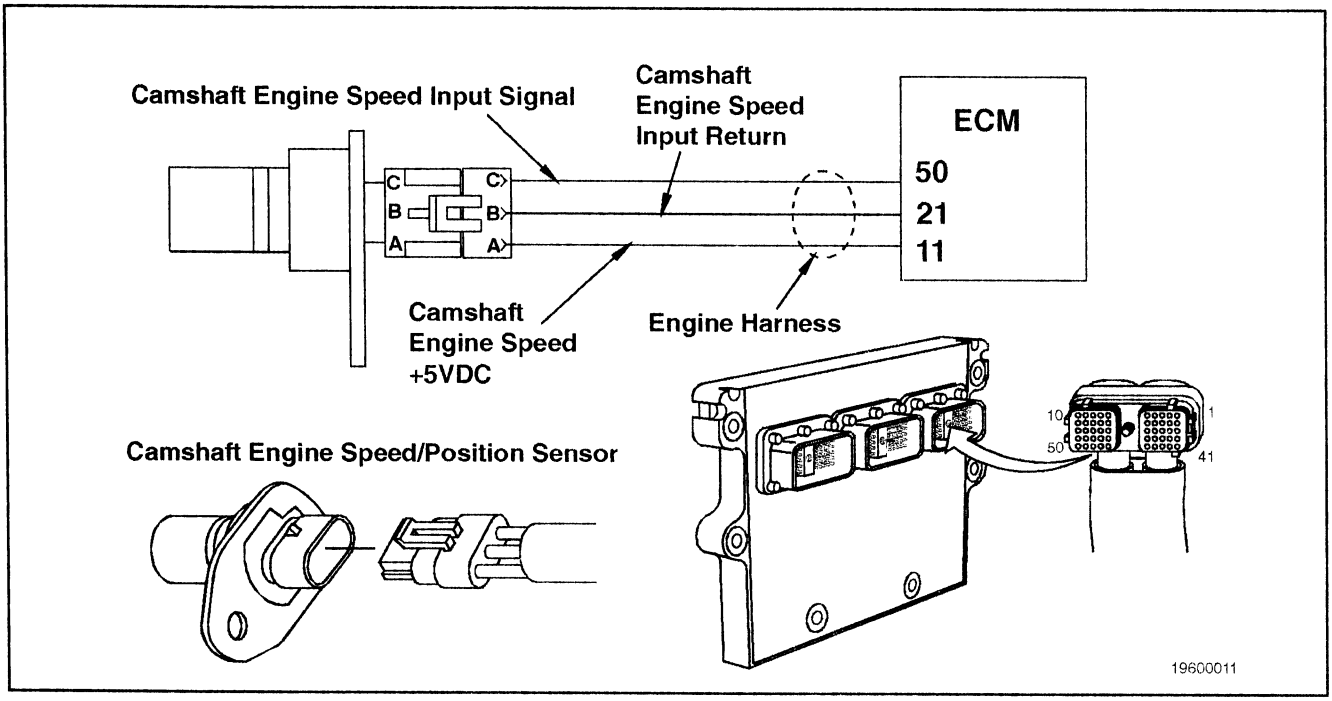
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 115

Camshaft Engine Position Sensor Circuit

CODES	REASON	EFFECT
Fault Code: 115 PID(P), SID(S): P190 SPN: 190 FMI: 2/2 Lamp: Red	No engine speed signal detected from the camshaft engine position sensor.	Engine may take longer to start.

Camshaft Engine Position Sensor Circuit



Circuit Description:

The camshaft engine position sensor provides engine speed and position information to the electronic control module (ECM). The sensor **must** be powered up by (+) 5 VDC to operate. The sensor generates the signal from an extra lobe on the camshaft.

Component Location:

The camshaft engine position sensor is located on the intake side of the engine block on the cylinder head to the right of the ECM.

Shop Talk:

Possible causes of this fault code include a damaged camshaft engine position sensor, an open or a short circuit, or power supply voltage failure.

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3823995 - male Weather-Pack test lead
Part No. 3824775 - breakout cable.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the camshaft engine position sensor.		
STEP 1A: Inspect the camshaft engine position sensor and engine harness connectors.	No damaged pins	
STEP 1B: Check for a signal from the camshaft engine position sensor.	Signal present	
STEP 1B-1: Check the camshaft engine position sensor supply voltage.	(+) 4.75 to 5.25 VDC	
STEP 2: Check the engine harness.		
STEP 2A: Inspect the engine harness and the ECM connectors.	No damaged pins	
STEP 2B: Check for an open circuit.	Less than 10 ohms	
STEP 2C: Check for a short circuit to ground.	More than 100k ohms	
STEP 2D: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 3: Clear the fault codes.		
STEP 3A: Disable the fault code.	Fault Code 115 inactive	
STEP 3B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check the camshaft engine position sensor.

STEP 1A: Inspect the camshaft engine position sensor and the engine harness connectors.

Condition:
- Turn keyswitch OFF.
- Disconnect the engine harness from the camshaft engine speed sensor.
- Connect the engine harness to the ECM.

Action	Specifications/Repair	Next Step
Inspect the camshaft engine position sensor and the engine harness connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	1B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the sensor, whichever has the damaged pins • Flush the dirt, debris, or moisture from the connector pins using the electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-203 or 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the camshaft engine position sensor. Refer to Procedure 019-038.	3A

STEP 1B: Check for a signal from the camshaft engine position sensor.

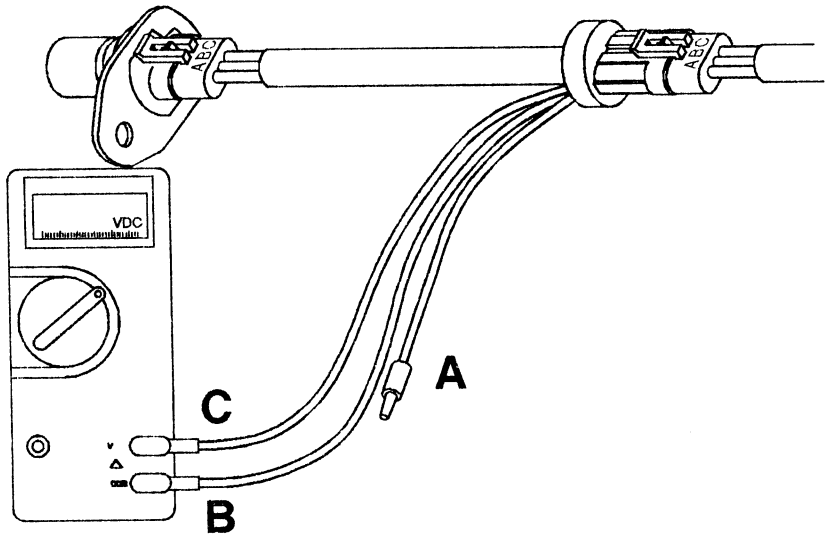
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3824775 - breakout cable.

Condition:

- Install breakout cable, Part No. 3824775, between the camshaft engine position sensor and the engine harness.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check for a signal from the camshaft engine position sensor. • Measure the voltage from pin C (or YELLOW) to pin B (or BLACK) on the breakout cable while barring the engine over.	**OK** **Signal present;** **signal should change from (+) 4.0-5.0 VDC to 0.5-2.3 VDC and back again about every 360° of crankshaft rotation**	3A
	NOT OK Does **not** meet specifications.	1B-1



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STEP 1B-1: Check the camshaft engine position sensor supply voltage.

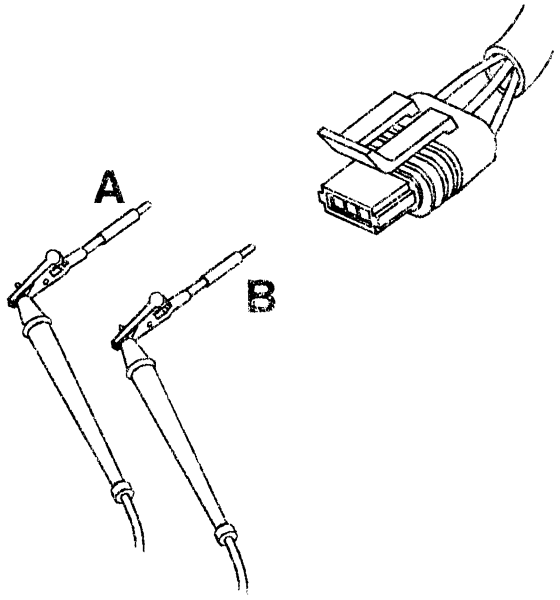
△CAUTION△

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3823995 - male Weather-Pack test lead.

Condition:

- Disconnect the engine harness from the camshaft engine position sensor.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the engine position sensor supply voltage. • Measure the voltage from pin A (or 1) to pin B (or 2) on the harness side of the camshaft engine position sensor connector.	**OK** **(+) 4.75 to 5.25 VDC** **Replace the camshaft engine position sensor** Refer to Procedure 019-038.	3A
	NOT OK Does **not** meet specifications.	2A



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STEP 2: Check the engine harness.

STEP 2A: Inspect the engine harness and the ECM connectors.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the engine harness and the ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	2B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using the electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace engine harness. Refer to Procedure 019-043. • Replace ECM. Refer to Procedure 019-031.	3A

STEP 2B: Check for an open circuit.

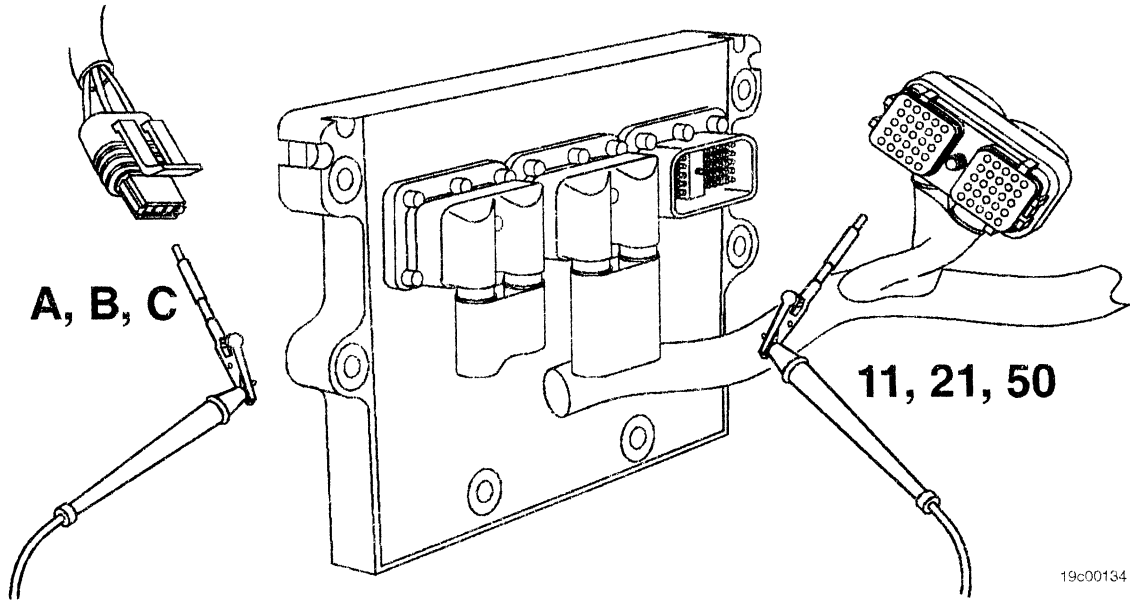
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the engine harness from the camshaft engine position sensor.

Action	Specifications/Repair	Next Step
Check for an open circuit. • Measure the resistance from pin 11 of the sensor harness connector to pin A (or 1) on the harness side of the camshaft engine position sensor connector. • Measure the resistance from pin 21 of the sensor harness connector to pin B (or 2) on the harness side of the camshaft engine position sensor connector. • Measure the resistance from pin 50 of the sensor harness connector to pin C (or 3) on the harness side of the camshaft engine position sensor connector.	**OK** **Less than 10 ohms**	2C
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-203 or 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



STEP 2C: Check for a short circuit to ground.

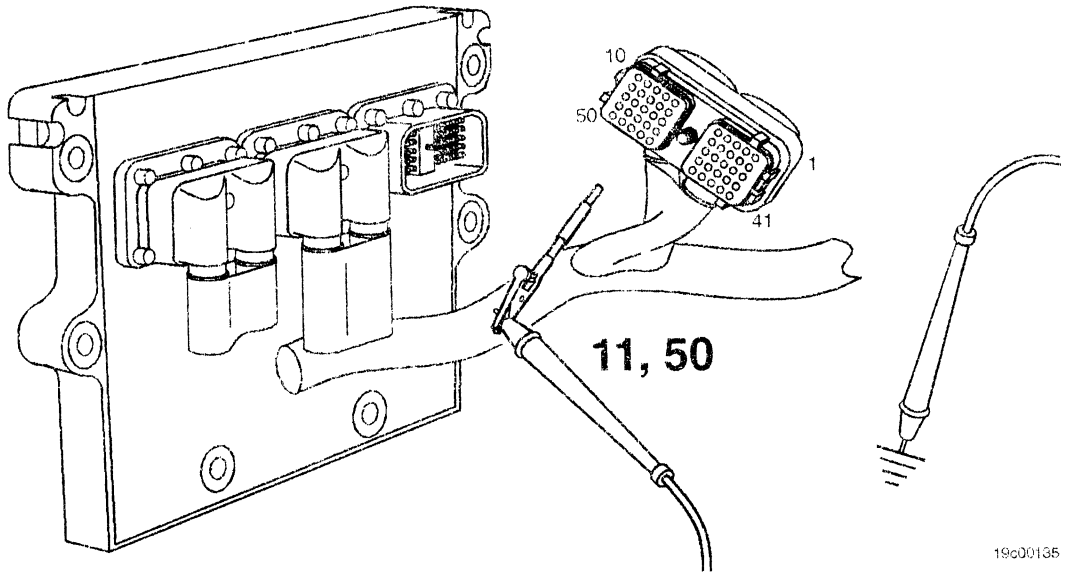
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the engine harness from the camshaft engine position sensor.

Action	Specifications/Repair	Next Step
Check for a short circuit to ground. • Measure the resistance from pin 11 of the sensor harness connector to engine block ground. • Measure the resistance from pin 50 of the sensor harness connector to engine block ground.	OK **More than 100k ohms**	2D
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



STEP 2D: Check for a short circuit from pin to pin.

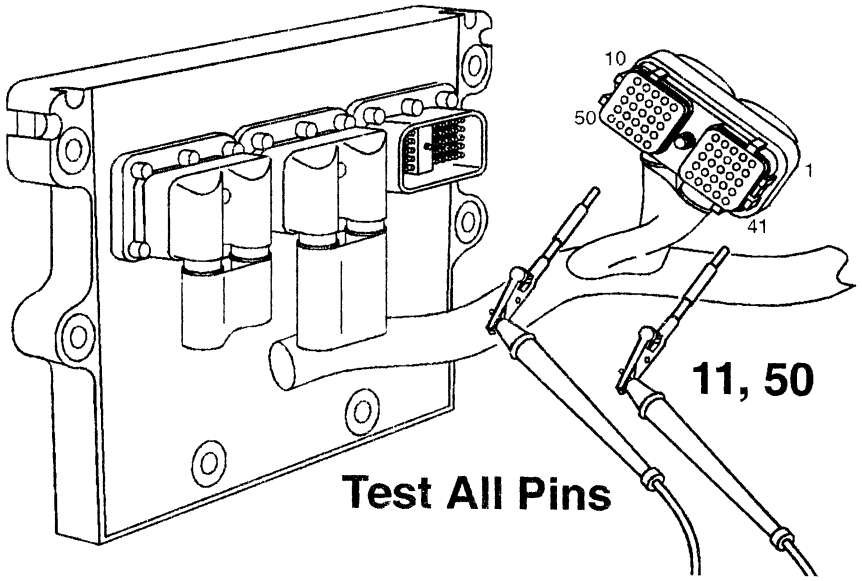
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the engine harness from the camshaft engine position sensor.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin. • Measure the resistance from pin 11 of the sensor harness connector to all other pins in the connector. • Measure the resistance from pin 50 of the sensor harness connector to all other pins in the connector.	**OK** **More than 100k ohms**	3A
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



STEP 3: Clear the fault codes.

STEP 3A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let idle for one 1 minute. • Using INSITE™, verify Fault Code 115 is inactive.	**OK** **Fault Code 115 inactive**	3B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location if all the steps have been completed and checked again.	1A

STEP 3B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

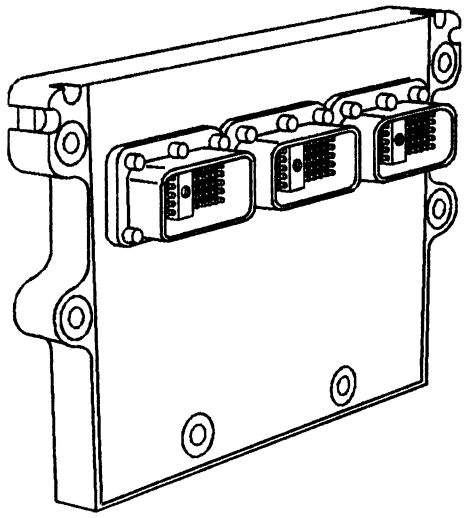
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 111

Electronic Control Module (ECM) Microprocessor

CODES	REASON	EFFECT
Fault Code: 111 PID(P), SID(S): S254 SPN: 629 FMI: 12/12 Lamp: Red	Error internal to the ECM related to the memory hardware failures or internal ECM voltage supply circuits.	Engine will **not** start.

ECM Microprocessor



19c00010

Circuit Description:

The ECM is a computer that is responsible for engine control, diagnostics, and user features.

Component Location:

The ECM is bolted to the intake side of the engine between the air horn and the front of the engine.

Shop Talk:

This fault code can **only** be caused by an internal ECM problem. Repairs are **not** possible for the ECM.

STEP 1B: Check the inactive counts of Fault Code 111.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the inactive counts of Fault Code 111. • Read the inactive counts of Fault Code 111 using INSITE™.	**OK** **Less than 3 counts**	2B
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	2A

STEP 2: Clear the fault codes.

STEP 2A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for at least 1 minute. • Using INSITE™, verify that Fault Code 111 is inactive.	**OK** **Fault Code 111 inactive**	2B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location if all the steps have been completed and checked again.	1A

STEP 2B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All faults cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the ECM.		
STEP 1A: Check the ECM.	Fault Code 111 inactive	
STEP 1B: Check the inactive counts of Fault Code 111.	Less than 3 counts	
STEP 2: Clear the fault codes.		
STEP 2A: Disable the fault code.	Fault Code 111 inactive	
STEP 2B: Clear the inactive fault codes.	All faults cleared	

TROUBLESHOOTING STEP

STEP 1: Check the ECM.

STEP 1A: Check the ECM.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Connect all the components.

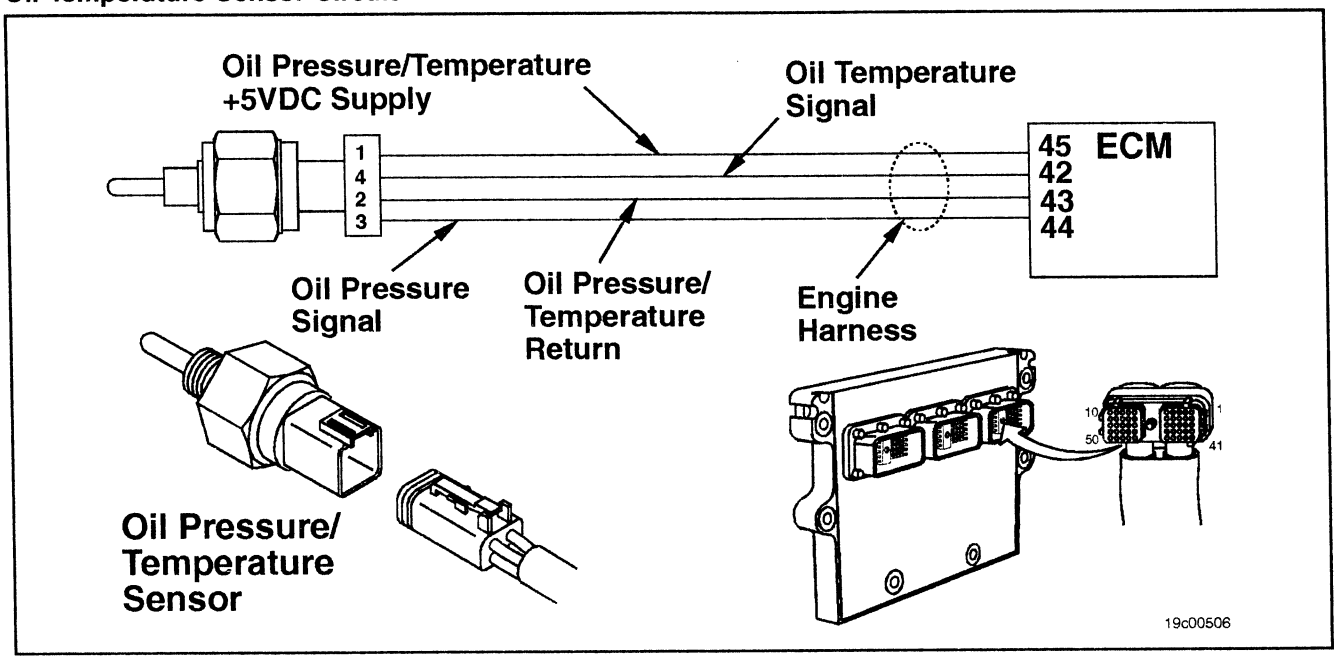
Action	Specifications/Repair	Next Step
Check the ECM. • Turn keyswitch OFF and wait 5 seconds. • Start the engine and let it idle for 1 minute.	**OK** **Fault Code 111 inactive**	1B
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	2A

Fault Code 213

Oil Temperature Sensor Circuit

CODES	REASON	EFFECT
Fault Code: 213 PID(P), SID(S): P175 SPN: 175 FMI: 4/4 Lamp: Yellow	Low voltage detected at the oil temperature circuit.	No engine protection for oil temperature.

Oil Temperature Sensor Circuit



Circuit Description:

The oil pressure/temperature sensor is used by the electronic control module (ECM) to monitor the temperature of the engine oil. If the oil temperature becomes too high and engine protection is enabled, a derate condition could be incurred, possibly leading to shutdown.

Component Location:

The oil pressure/temperature sensor is located on the engine block to the left of the fuel filter, behind the air compressor.

Shop Talk:

The resistance of the sensor varies with the temperature. Compare your readings with this table:

Temperature (°C)	Temperature [°F]	Resistance (ohms)
0	32	30k to 36k
25	77	9k to 11k
50	122	3k to 4k
75	167	1350 to 1500
100	212	600 to 675

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check for multiple fault codes.		
STEP 1A: Read the fault codes.	Fault Codes 145 and 154 are not active	
STEP 2: Check the oil pressure/temperature sensor.		
STEP 2A: Inspect the oil pressure/temperature sensor and the sensor harness connector pins.	No damaged pins	
STEP 2B: Read the fault codes.	Fault Code 213 inactive	
STEP 2C: Check the resistance of the oil pressure/temperature sensor.	300 ohms to 90k ohms	
STEP 2D: Check for a short circuit to ground.	More than 100k ohms	
STEP 3: Check the sensor harness.		
STEP 3A: Inspect the harness and the ECM connector pins.	No damaged pins	
STEP 3B: Read the fault codes.	Fault Code 213 inactive	
STEP 3C: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 3D: Check for a short circuit to ground.	More than 100k ohms	
STEP 4: Clear the fault code.		
STEP 4A: Disable the fault code.	Fault Code 213 inactive	
STEP 4B: Clear the inactive fault codes.	All faults cleared	

TROUBLESHOOTING STEP

STEP 1: Check for multiple fault codes.

STEP 1A: Read the fault codes.

Condition:
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Read the fault codes using INSITE™.	**OK** **Fault Codes 145 and 154 and are not active**	2A
	NOT OK	Fault Code 187

STEP 2: Check the oil pressure/temperature sensor.

STEP 2A: Inspect the oil pressure/temperature sensor and the sensor harness connector pins.

Condition:
- Turn keyswitch OFF.
- Disconnect the engine harness from the oil pressure/temperature sensor.

Action	Specifications/Repair	Next Step
Inspect the harness and the sensor connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	2B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the sensor, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using the electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-204. • Replace the engine harness. Refer to Procedure 019-043. • Replace the oil pressure/temperature sensor. Refer to Procedure 019-155.	4A

STEP 2B: Read the fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start the engine and let it idle for 1 minute. • Read the fault codes using INSITE™.	**OK** **Fault Code 213 inactive**	4B
	NOT OK Fault Code 213 active	2C

STEP 2C: Check the resistance of the oil pressure/temperature sensor.

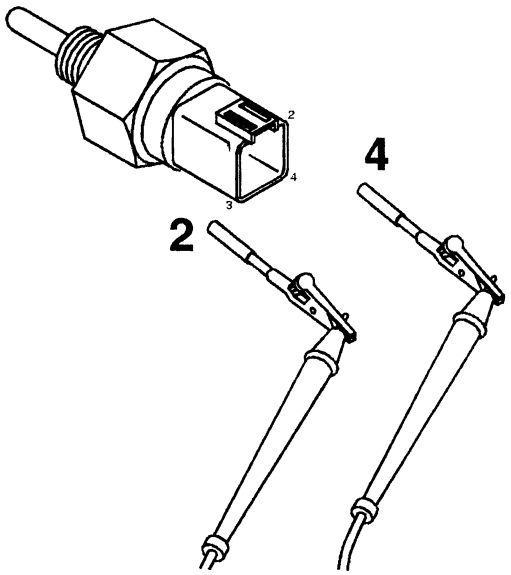
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the engine harness from the oil pressure/temperature sensor.

Action	Specifications/Repair	Next Step
Check the resistance of the oil pressure/ temperature sensor. • Measure the resistance from pin 4 (or D) to pin 2 (or B) of the oil pressure/temperature sensor.	**OK** **300 ohms to 90k ohms**	2D
	NOT OK **Replace the oil pressure/temperature sensor** Refer to Procedure 019-155.	4A



STEP 2D: Check for a short circuit to ground.

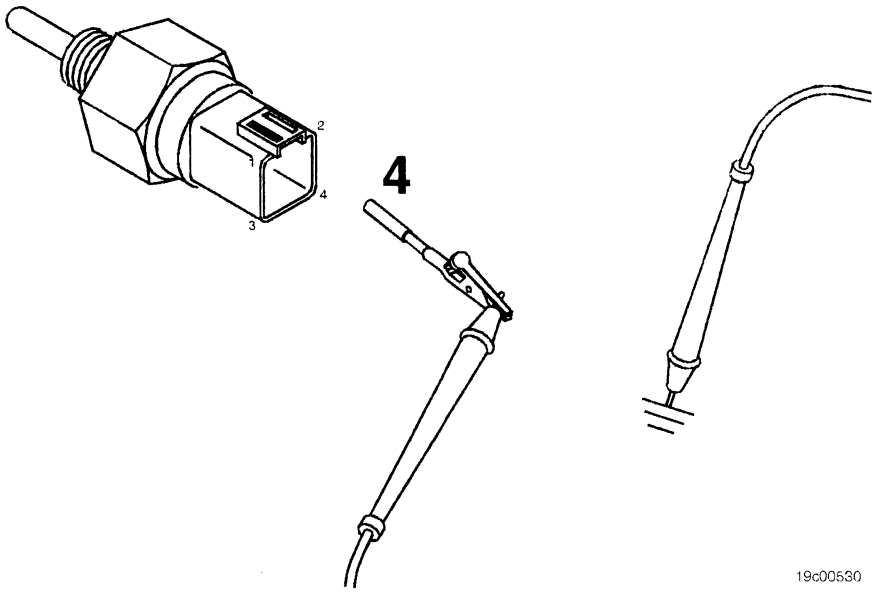
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the engine harness from the oil pressure/temperature sensor.

Action	Specifications/Repair	Next Step
Check for a short circuit to ground. • Measure the resistance from pin 4 (or D) of the oil pressure/temperature sensor to the engine block ground.	**OK** **More than 100k ohms**	3A
	NOT OK **Replace the oil pressure/temperature sensor** Refer to Procedure 019-155.	4A



STEP 3: Check the sensor harness.

STEP 3A: Inspect the harness and the ECM connector pins.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the harness and the ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	3B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using the electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	4A

STEP 3B: Read the fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start the engine and let it idle for 1 minute. • Read the fault codes using INSITE™.	**OK** **Fault Code 213 inactive**	4B
	NOT OK Fault Code 213 active.	3C

STEP 3C: Check for a short circuit from pin to pin.

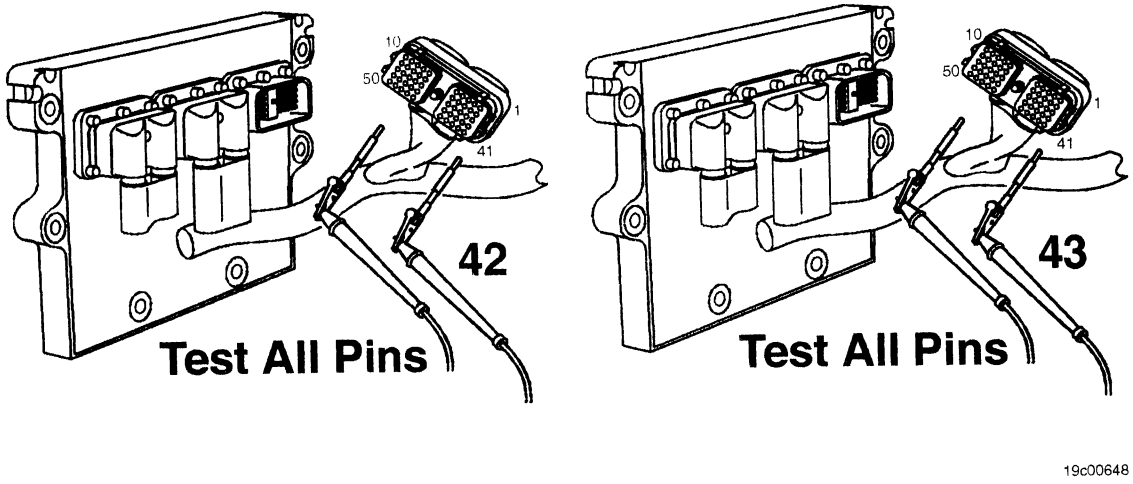
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the engine harness from the oil pressure/temperature sensor.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin. • Measure the resistance from pin 42 of the sensor harness connector to all other pins in the connector. • Measure the resistance from pin 43 of the sensor harness connector to all other pins in the connector.	**OK** **More than 100k ohms**	3D
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	4A



STEP 3D: Check for a short circuit to ground.

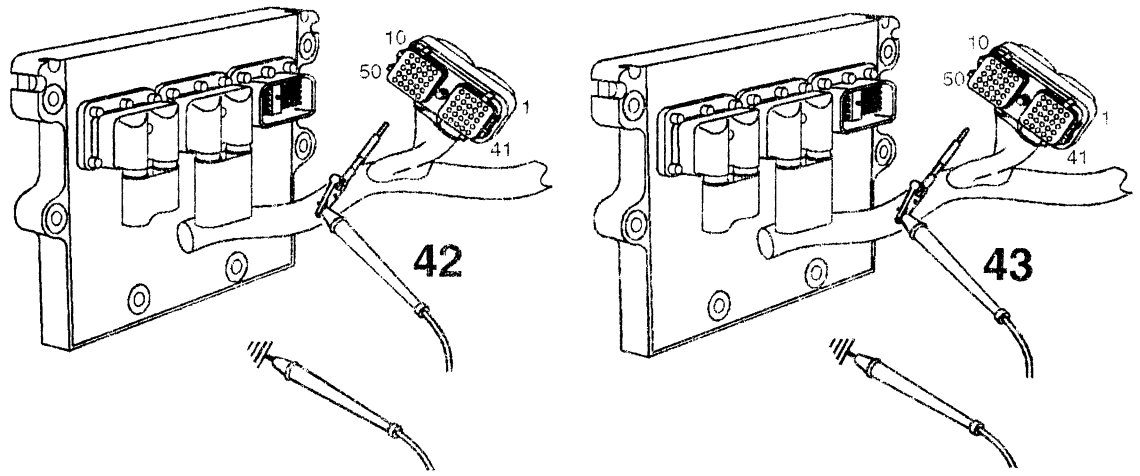
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the engine harness from the oil pressure/temperature sensor.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for a short circuit to ground. • Measure the resistance from pin 42 of the sensor harness connector to the engine block ground. • Measure the resistance from pin 43 of the sensor harness connector to the engine block ground.	**OK** **More than 100k ohms**	4A
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	4A



19c00650

STEP 4: Clear the fault code.

STEP 4A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify that Fault Code 213 is inactive.	**OK** **Fault Code 213 inactive**	4B
	NOT OK Return to troubleshooting steps or contact your local Cummins Authorized Repair Location if all steps have been completed and checked again.	1A

STEP 4B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

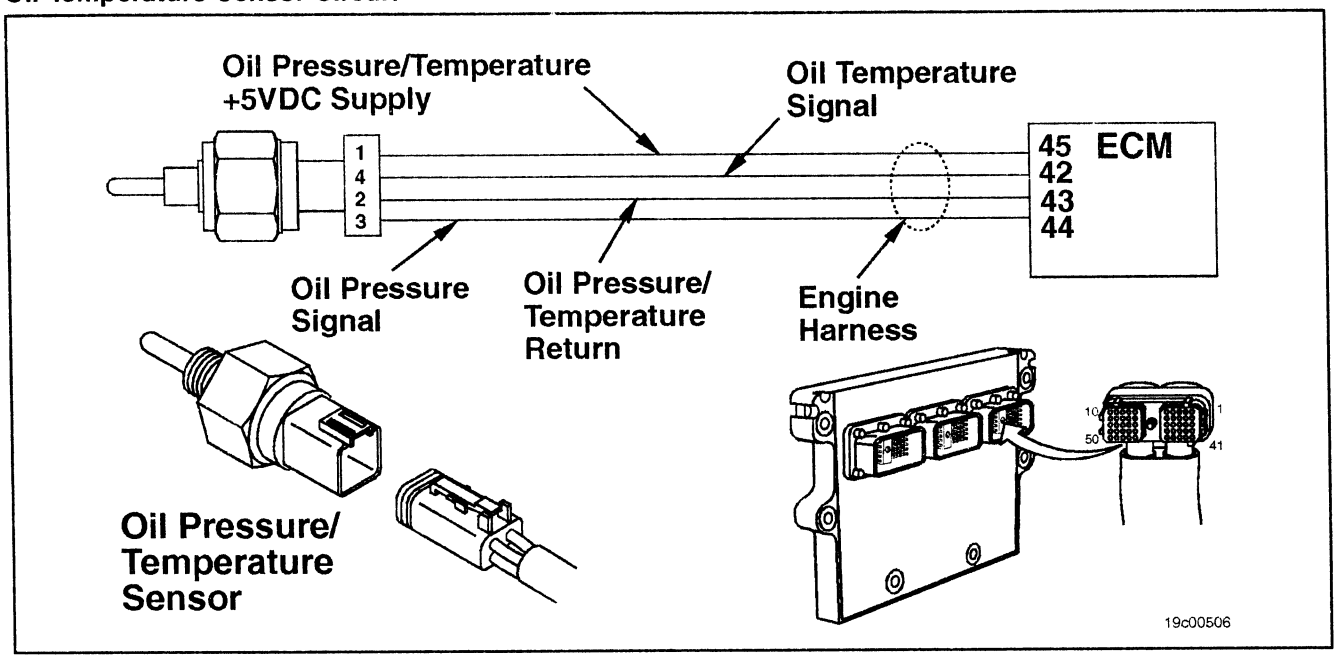
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All faults cleared**	Repair complete
	NOT OK Troubleshooting any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 212

Oil Temperature Sensor Circuit

CODES	REASON	EFFECT
Fault Code: 212 PID(P), SID(S): P175 SPN: 175 FMI: 3/3 Lamp: Yellow	High voltage detected at the oil temperature circuit.	No engine protection for oil temperature.

Oil Temperature Sensor Circuit



Circuit Description:

The oil pressure/temperature sensor is used by the electronic control module (ECM) to monitor the temperature of the engine oil. If the oil temperature becomes too high and the engine protection is enabled, a derate condition can be incurred, possibly leading to shutdown.

Component Location:

The oil pressure/temperature sensor is located on the engine block to the left of the fuel filter, behind the air compressor.

Shop Talk:

Sensor resistance varies with temperature. Compare your reading to this table:

Temperature (°C)	Temperature [°F]	Resistance (ohms)
0	32	30k to 36k
25	77	9k to 11k
50	122	3k to 4k
75	167	1350 to 1500
100	212	600 to 675

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the oil pressure/temperature sensor.		
STEP 1A: Inspect the oil pressure/temperature sensor and sensor harness connector pins.	No damaged pins	
STEP 1B: Read the fault codes.	Fault Code 212 inactive	
STEP 1C: Check the resistance of the oil pressure/temperature sensor.	300 ohms to 90k ohms	
STEP 2: Check the sensor harness.		
STEP 2A: Inspect the sensor harness and the ECM connector pins.	No damaged pins	
STEP 2B: Read the fault codes.	Fault Code 212 inactive	
STEP 2C: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 2D: Check for an open circuit.	Less than 10 ohms	
STEP 3: Clear the fault codes.		
STEP 3A: Disable the fault codes.	Fault Code 212 inactive	
STEP 3B: Clear the inactive fault codes.	All faults cleared	

TROUBLESHOOTING STEP

STEP 1: Check the oil pressure/temperature sensor.

STEP 1A: Inspect the oil pressure/temperature sensor and sensor harness connector pins.

Condition:
- Turn keyswitch OFF.
- Disconnect the engine harness from the oil pressure/temperature sensor.

Action	Specifications/Repair	Next Step
Inspect the oil pressure/temperature sensor and sensor harness connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector.	**OK** **No damaged pins**	1B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the oil pressure/temperature sensor, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using the electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-204. • Replace the engine harness. Refer to Procedure 019-043. • Replace the sensor. Refer to Procedure 019-155.	3A

STEP 1B: Read the fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start the engine and let it idle for 1 minute. • Read the fault codes using INSITE™.	**OK** **Fault Code 212 inactive**	3B
	NOT OK Fault Code 212 active.	1C

STEP 1C: Check the resistance of the oil pressure/temperature sensor.

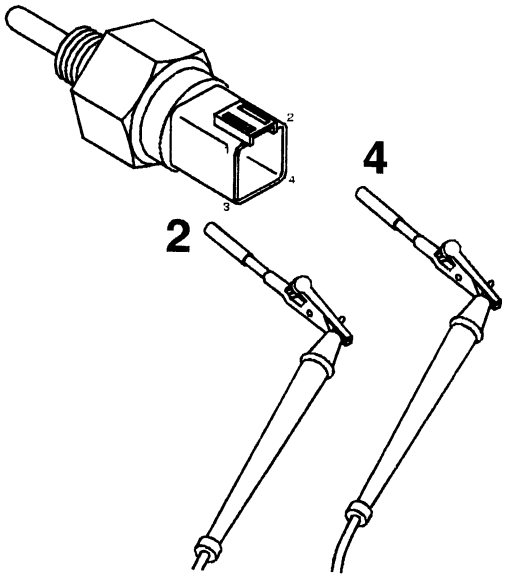
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the engine harness from the oil pressure/temperature sensor.

Action	Specifications/Repair	Next Step
Check the resistance of the oil pressure/ temperature sensor. • Measure the resistance from pin 4 (or D) to pin 2 (or B) of the oil pressure/temperature sensor.	**OK** **300 ohms to 90k ohms**	2A
	NOT OK **Replace the oil pressure/temperature sensor** Refer to Procedure 019-155.	3A



STEP 2: Check the sensor harness.

STEP 2A: Inspect the sensor harness and the ECM connector pins.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the sensor harness and the ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	2B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using the electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	3A

STEP 2B: Read the fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start the engine and let it idle for 1 minute. • Read the fault codes using INSITE™.	**OK** **Fault Code 212 inactive**	3B
	NOT OK Fault Code 212 active.	2C

STEP 2C: Check for a short circuit from pin to pin.

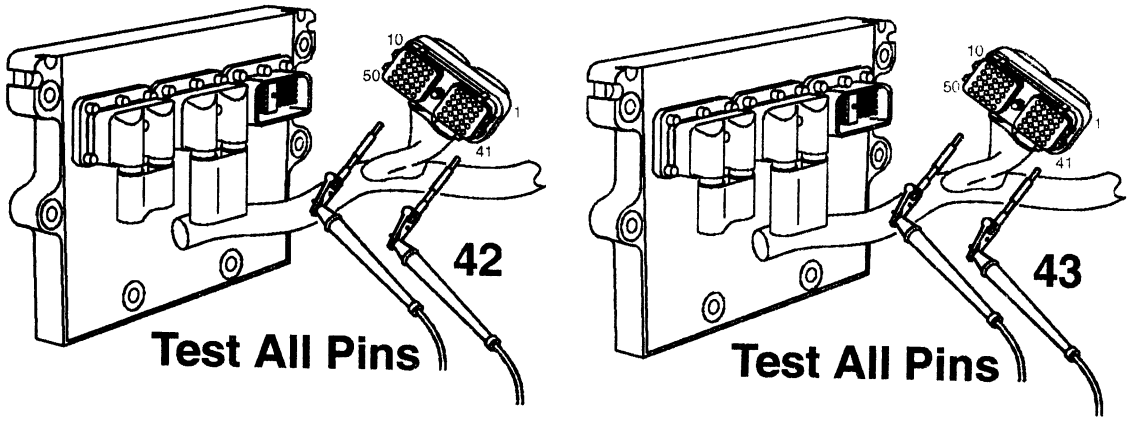
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the engine harness from the oil pressure/temperature sensor.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin. • Measure the resistance from pin 42 of the sensor harness connector to all other pins in the connector. • Measure the resistance from pin 43 of the sensor harness connector to all other pins in the connector.	**OK** **More than 100k ohms**	2D
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



STEP 2D: Check for an open circuit.

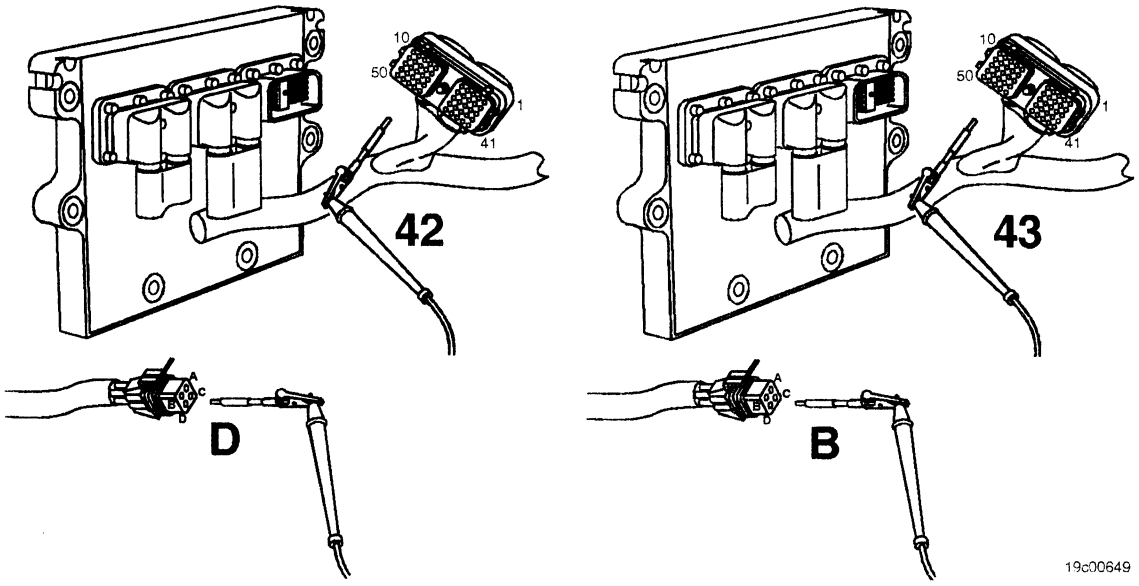
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the engine harness from the oil pressure/temperature sensor.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for an open circuit. • Measure the resistance from pin 42 of the sensor harness connector to pin 4 (or D) of the oil pressure/temperature sensor. • Measure the resistance from pin 43 of the sensor harness connector to pin 2 (or B) of the oil pressure/temperature sensor.	**OK** **Less than 10 ohms**	3A
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-204 or 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



STEP 3: Clear the fault code.

STEP 3A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify that Fault Code 212 is inactive.	**OK** **Fault Code 212 inactive**	3B
	NOT OK Return to troubleshooting steps or contact your local Cummins Authorized Repair Location if all the steps have been completed and checked again.	1A

STEP 3B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

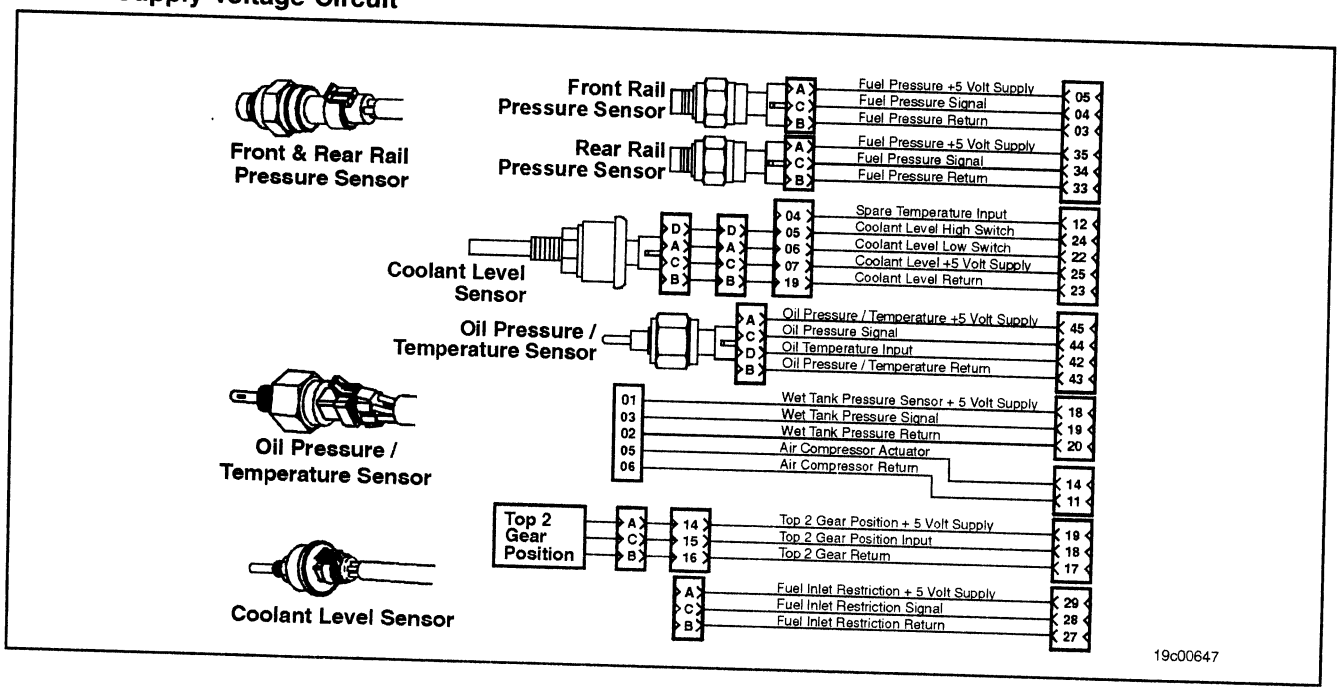
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All faults cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 187

Sensor Voltage Supply

CODES	REASON	EFFECT
Fault Code: 187 PID(P), SID(S): S232 SPN: 620 FMI: 4/4 Lamp: Yellow	Low voltage detected on the ECM voltage supply line to some sensors (VSEN2 supply).	Engine will run derated. No engine protection for oil pressure or coolant level.

Sensor Supply Voltage Circuit



Circuit Description:

The ECM supplies each of these sensors with (+) 5 VDC. If the supply line to any sensor is damaged, the sensor will **not** work correctly.

Component Location:

1. Front fuel rail pressure sensor is located on the fuel delivery housing.
2. Rear fuel rail pressure sensor is located on the fuel delivery housing.
3. Fuel inlet restriction sensor is located on the fuel delivery housing.
4. Oil pressure/temperature sensor is located below the air compressor.
5. Wet tank pressure sensor is located on the air compressor.
6. Coolant level sensor. Refer to the OEM troubleshooting and repair manual for proper location.
7. Top 2 transmission position sensor; located on the transmission if vehicle has a Spicer™ Top 2 Automate transmission. Refer to the OEM troubleshooting and repair manual for proper location.

Shop Talk:

Low voltage on the sensor (+) 5-VDC supply line will be caused by a short circuit to ground in a supply line, a short circuit between a supply line or a return line, a failed sensor, or a failed ECM power supply.

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging the new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check for the failed sensors.		
STEP 1A: Check the oil pressure/temperature sensor.	Less than (+) 4.5 VDC	
STEP 1B: Check the front fuel rail pressure sensor.	Less than (+) 4.5 VDC	
STEP 1C: Check the rear fuel rail pressure sensor.	Less than (+) 4.5 VDC	
STEP 1D: Check the fuel inlet restriction sensor.	Less than (+) 4.5 VDC	
STEP 1E: Check the wet tank pressure sensor.	Less than (+) 4.5 VDC	
STEP 1F: Check coolant level sensor.	Less than (+) 4.5 VDC	
STEP 1G: Check Top 2 transmission position sensor.	Less than (+) 4.5 VDC	
STEP 2: Check the sensor harness.		
STEP 2A: Inspect the sensor harness and the ECM connector pins.	No damaged pins	
STEP 2B: Check the supply voltage from the ECM.	(+) 4.75 to 5.25 VDC	
STEP 2C: Check for a short circuit to ground in the sensor supply lines.	More than 100k ohms	
STEP 2D: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 3: Clear the fault codes.		
STEP 3A: Disable the fault code.	Fault Code 187 inactive	
STEP 3B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check for the failed sensors.

STEP 1A: Check the oil pressure/temperature sensor.

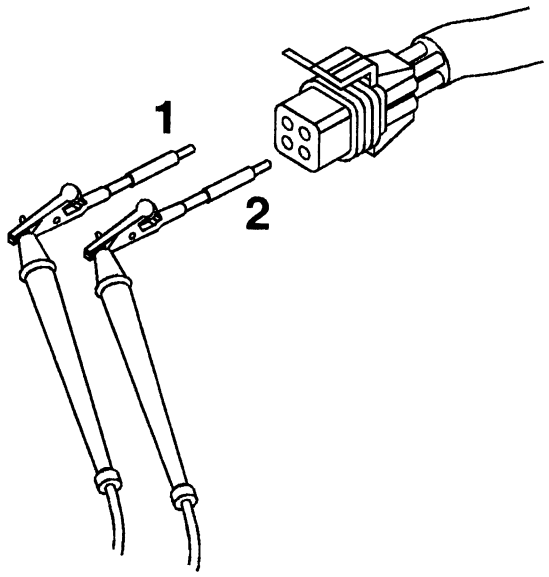
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the engine harness from the oil pressure/temperature sensor.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the oil pressure/temperature sensor. • Measure the voltage from pin 1 (or A) to pin 2 (or B) on the oil pressure/temperature sensor connector.	**OK** **Less than (+) 4.5 VDC**	1B
	NOT OK **Replace the oil pressure/temperature sensor** Refer to Procedure 019-155.	3A



19c00081

STEP 1B: Check the front fuel rail pressure sensor.

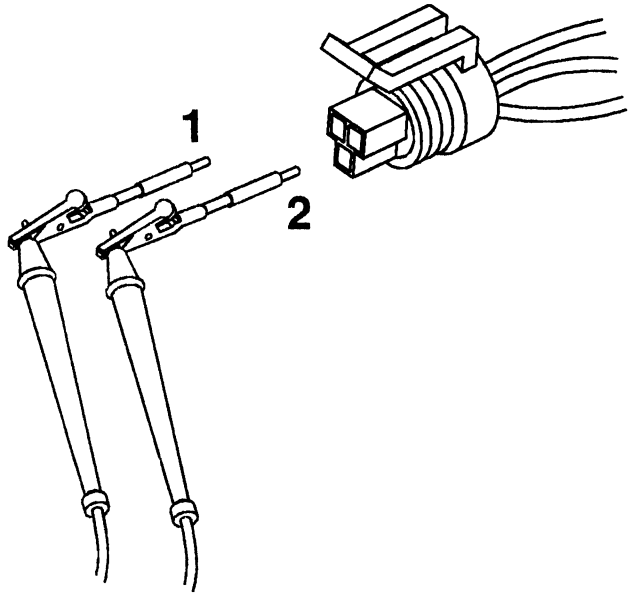
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the engine harness from the front fuel rail pressure sensor.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the front fuel rail pressure sensor. • Measure the voltage from pin 1 (or A) to pin 2 (or B) on the front fuel rail pressure sensor connector.	**OK** **Less than (+) 4.5 VDC**	1C
	NOT OK **Replace the front fuel rail pressure sensor** Refer to Procedure 019-115.	3A



19c00810

STEP 1C: Check the rear fuel rail pressure sensor.

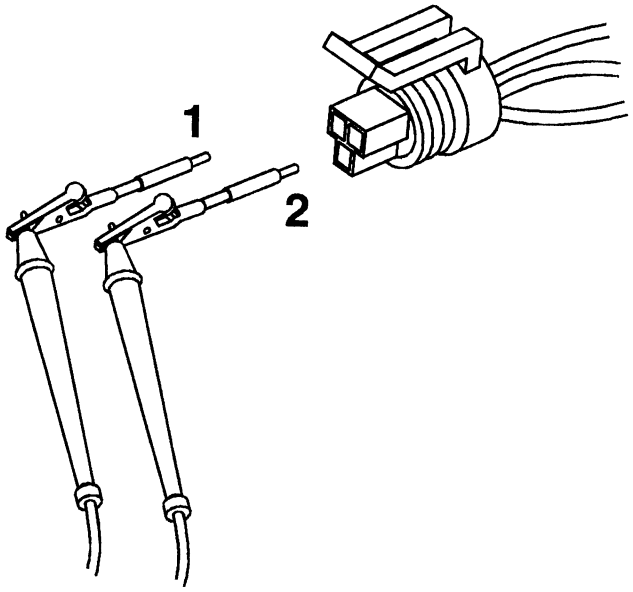
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the engine harness from the rear fuel rail pressure sensor.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the rear fuel rail pressure sensor. • Measure the voltage from pin 1 (or A) to pin 2 (or B) on the rear fuel rail pressure sensor connector.	**OK** **Less than (+) 4.5 VDC**	1D
	NOT OK **Replace the rear fuel rail pressure sensor** Refer to Procedure 019-115.	3A



19c00810

STEP 1D: Check the fuel inlet restriction sensor.

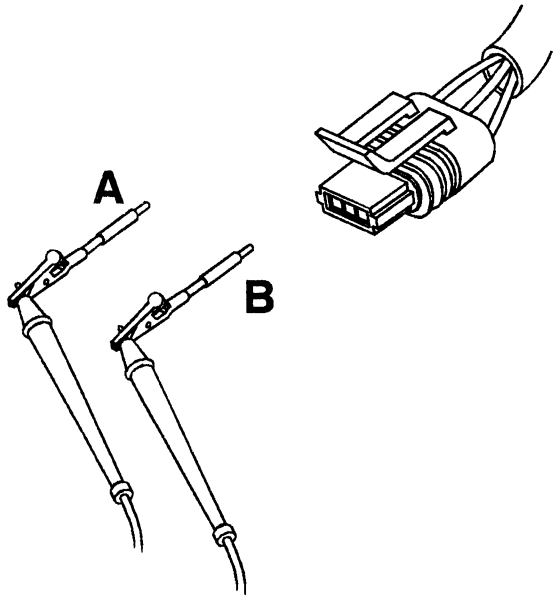
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- OPTIONAL EQUIPMENT; check vehicle to see if so equipped.
- If **not** equipped, go to Step 1E.
- Disconnect the engine harness from the fuel inlet restriction sensor.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the fuel inlet restriction sensor. • Measure the voltage from pin 1 (or A) to pin 2 (or B) on the fuel inlet restriction sensor connector.	**OK** **Less than (+) 4.5 VDC**	1E
	NOT OK **Replace the fuel inlet restriction sensor** Refer to Procedure 019-128.	3A



19200191

STEP 1E: Check the wet tank pressure sensor.

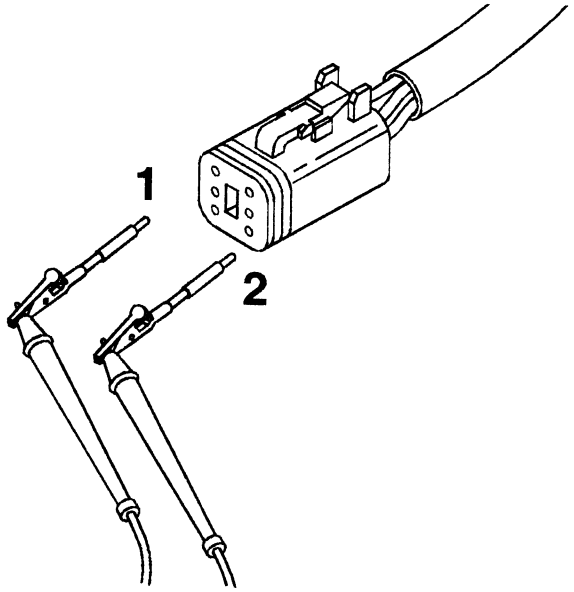
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- OPTIONAL EQUIPMENT; check vehicle to see if so equipped.
- If **not** equipped, go to Step 1F.
- Disconnect the engine harness from the wet tank pressure sensor.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the wet tank pressure sensor. • Measure the voltage from pin 1 (or A) to pin 2 (or B) on the wet tank pressure sensor connector.	**OK** **Less than (+) 4.5 VDC**	1F
	NOT OK **Replace the wet tank pressure sensor/ governor assembly** Refer to the OEM troubleshooting and repair manual.	3A



19c00526

STEP 1F: Check the coolant level sensor.

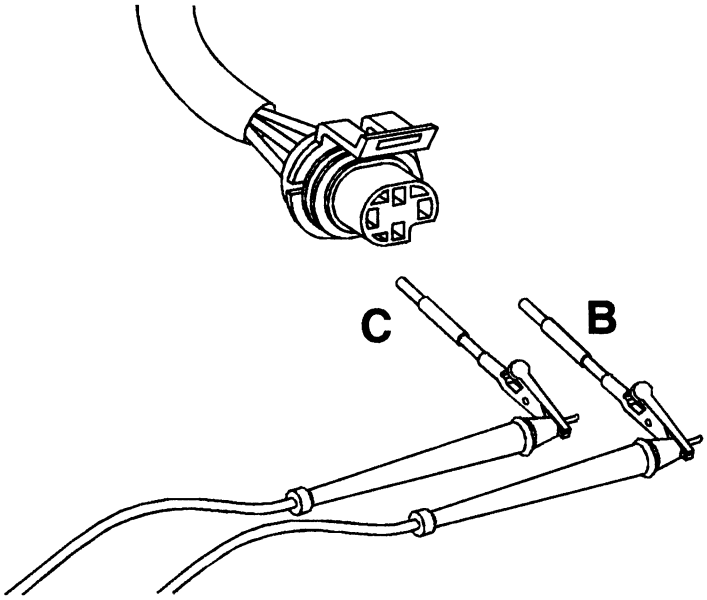
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the engine harness from the coolant level sensor.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the coolant level sensor. • Measure the voltage from supply pin 3 (or C) to return pin 2 (or B) on the coolant level sensor connector.	**OK** **Less than (+) 4.5 VDC**	1G
	NOT OK **Replace the coolant level sensor** Refer to Procedure 019-017.	3A



STEP 1G: Check the Top 2 transmission position sensor.

⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- OPTIONAL EQUIPMENT; check vehicle to see if so equipped.
- Following step **only** applies if vehicle has Spicer Top 2 transmission.
- If **not** equipped, go to Step 2A.
- Disconnect the engine harness from the Top 2 transmission position sensor.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the Top 2 transmission position sensor. • Measure the voltage from pin 1 (or A) to pin 2 (or B) on the Top 2 transmission position connector.	**OK** **Less than (+) 4.5 VDC**	2A
	NOT OK **Replace the Top 2 transmission position sensor** Refer to the OEM troubleshooting and repair manual for proper procedure.	3A

STEP 2: Check the sensor harness.

STEP 2A: Inspect the sensor harness and the ECM connector pins.

⚠CAUTION⚠

To avoid damaging the new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the sensor harness and the ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	2B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using the electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	3A

STEP 2B: Check the supply voltage from the ECM.

⚠CAUTION⚠

To avoid damaging the new ECM, all other active fault codes must be investigated prior to replacing the ECM.

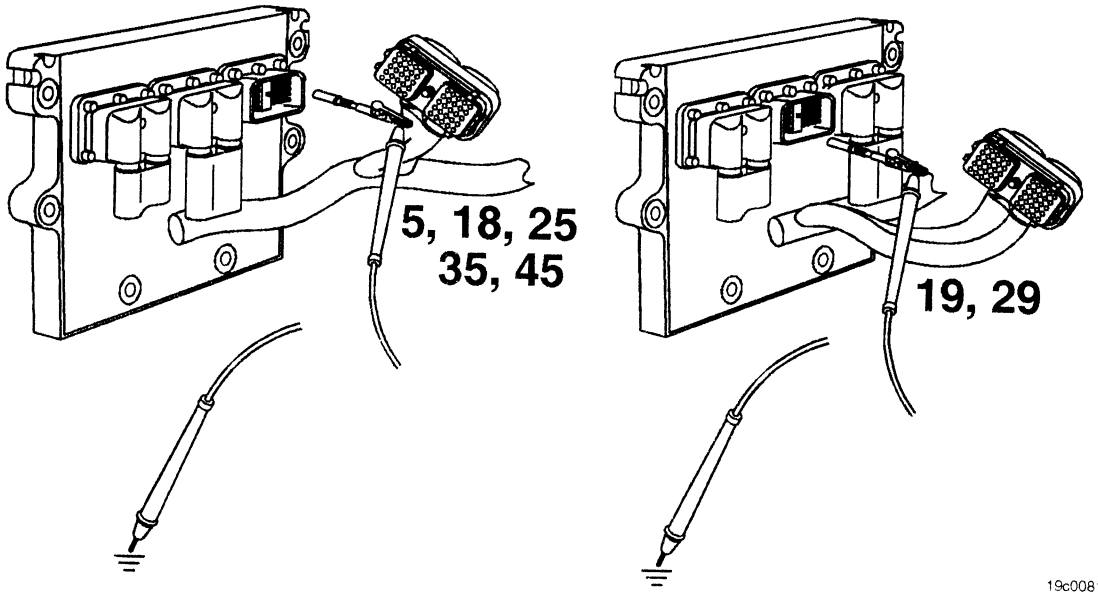
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

Condition:

- Disconnect the sensor harness connector from the ECM.
- Disconnect the actuator harness connector from the ECM.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Check the supply voltage from the ECM. • Measure the supply voltage out of the ECM sensor harness connector port from pins 5, 18, 25, 35, and 45 to ground. • Measure the supply voltage out of the ECM actuator harness connector port from pins 19 and 29 to ground.	**OK** **(+) 4.75 to 5.25 VDC**	2C
	NOT OK **Replace the ECM** Refer to Procedure 019-031.	3A



STEP 2C: Check for a short circuit to ground in the sensor supply lines.

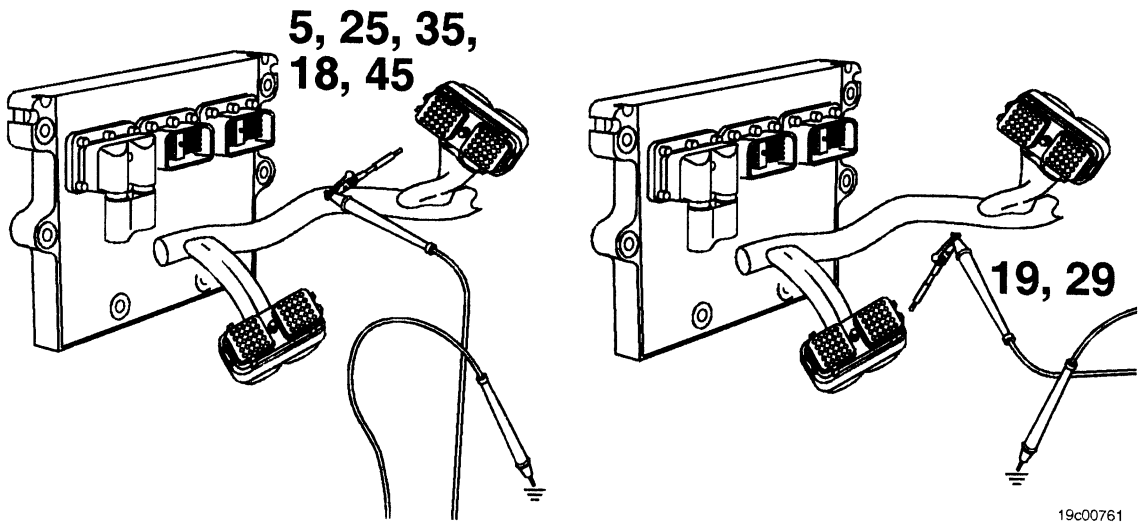
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.
- Disconnect the actuator harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for a short circuit to ground in the sensor supply lines. • Measure the resistance from pins 5, 18, 25, 35, and 45 in the sensor harness connector to engine block ground. • Measure the resistance from pins 19 and 29 in the actuator harness connector to engine block ground.	**OK** **More than 100k ohms**	2D
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



STEP 2D: Check for a short circuit from pin to pin.

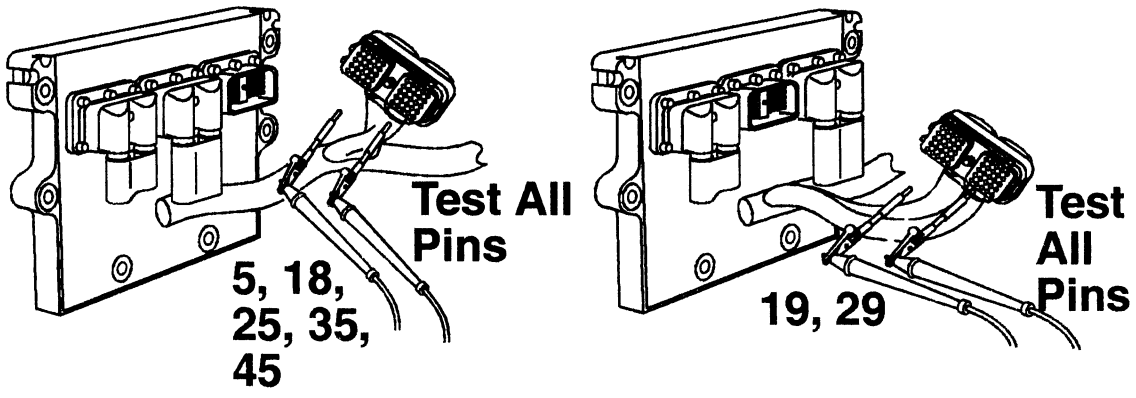
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the sensor harness and actuator harness connectors from the ECM.
- Disconnect the oil pressure/temperature sensor from the engine harness.
- Disconnect the front fuel rail pressure sensor from the engine harness.
- Disconnect the rear fuel rail pressure sensor from the engine harness.
- Disconnect the fuel inlet restriction sensor from the engine harness.
- Disconnect the wet tank pressure sensor from the engine harness.
- Disconnect the coolant level sensor from the engine harness.
- Disconnect the Top 2 transmission position sensor (if equipped) from the engine harness.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin. • Measure the resistance from pin 5 to all other pins in the sensor harness connector. • Measure the resistance from pin 18 to all other pins in the sensor harness connector. • Measure the resistance from pin 25 to all other pins in the sensor harness connector. • Measure the resistance from pin 35 to all other pins in the sensor harness connector. • Measure the resistance from pin 45 to all other pins in the sensor harness connector. • Measure the resistance from pin 19 to all other pins in the actuator harness connector. • Measure the resistance from pin 29 to all other pins in the actuator harness connector.	**OK** **More than 100k ohms**	3A
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



STEP 3: Clear the fault codes.

STEP 3A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify Fault Code 187 is inactive.	**OK** **Fault Code 187 inactive**	3B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location if all the steps have been completed and checked again.	1A

STEP 3B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

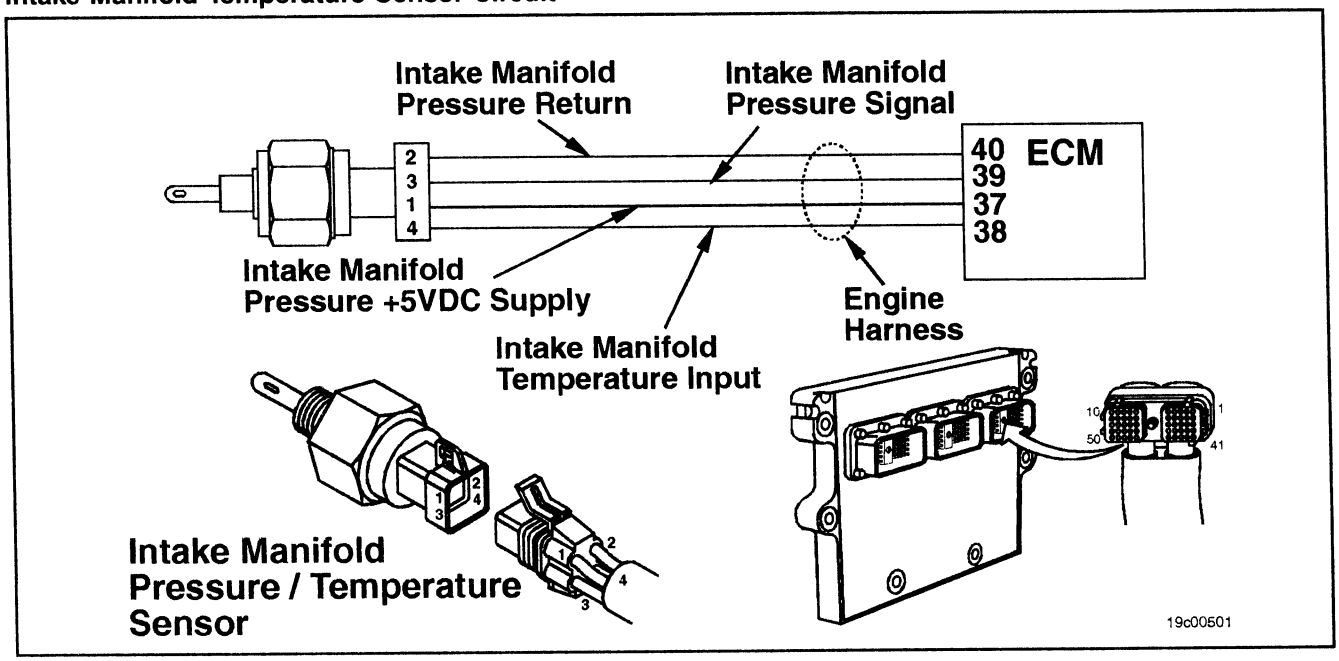
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 154

Intake Manifold Temperature Sensor Circuit

CODES	REASON	EFFECT
Fault Code: 154 PID(P), SID(S): P105 SPN: 105 FMI: 4/4 Lamp: Yellow	Low voltage detected at the intake manifold temperature circuit.	Possible white smoke. Fan will stay on if controlled by the electronic control module (ECM). No engine protection for coolant temperature.

Intake Manifold Temperature Sensor Circuit



Circuit Description:

The ECM uses the intake manifold pressure/temperature sensor to monitor the temperature of the engine intake air. The ECM uses the intake manifold temperature signal for the engine protection system, timing, and fueling control.

Component Location:

The intake manifold pressure/temperature sensor is on the side of the intake manifold in front of the air horn.

Shop Talk:

The sensor resistance varies with the temperature. Compare your reading to this table:

Temperature (°C)	Temperature [°F]	Resistance (ohms)
0	32	30k to 36k
25	77	9k to 11k
50	122	3k to 4k
75	167	1350 to 1500
100	212	600 to 675

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3823996 - female Weather-Pack test lead.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check for multiple fault codes.		
STEP 1A: Read the fault codes.	Fault Codes 145 and 213 are not active	
STEP 2: Check the intake manifold pressure/temperature sensor.		
STEP 2A: Inspect the intake manifold pressure/ temperature sensor and the sensor harness connector pins.	No damaged pins	
STEP 2B: Read the fault codes.	Fault Code 154 inactive	
STEP 2C: Check the resistance of the intake manifold pressure/temperature sensor.	300 ohms to 90k ohms	
STEP 2D: Check for a short circuit to ground.	More than 100k ohms	
STEP 3: Check the sensor harness.		
STEP 3A: Inspect the sensor harness and the ECM connector pins.	No damaged pins	
STEP 3B: Read the fault codes.	Fault Code 154 inactive	
STEP 3C: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 3D: Check for a short circuit to ground.	More than 100k ohms	
STEP 4: Clear the fault code.		
STEP 4A: Disable the fault code.	Fault Code 154 inactive	
STEP 4B: Clear the inactive fault codes.	All faults cleared	

TROUBLESHOOTING STEP

STEP 1: Check for multiple fault codes.

STEP 1A: Read the fault codes.

Condition:
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Read the fault codes using INSITE™.	**OK** **Fault Codes 145 and 213 are not active**	2A
	NOT OK	Fault Code 352

STEP 2: Check the intake manifold pressure/temperature sensor.

STEP 2A: Inspect the intake manifold pressure/temperature sensor and the sensor harness connector pins.

Condition:
- Turn keyswitch OFF.
- Disconnect the engine harness from the intake manifold pressure/temperature sensor.

Action	Specifications/Repair	Next Step
Inspect the intake manifold pressure/ temperature sensor and the sensor harness connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	2B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the intake manifold pressure/ temperature sensor, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using the electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-204. • Replace the engine harness. Refer to Procedure 019-043. • Replace the intake manifold pressure/ temperature sensor. Refer to Procedure 019-159.	4A

STEP 2B: Read the fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start the engine and let it idle for 1 minute. • Read the fault codes using INSITE™.	**OK** **Fault Code 154 inactive**	4B
	NOT OK Fault Code 154 active.	2C

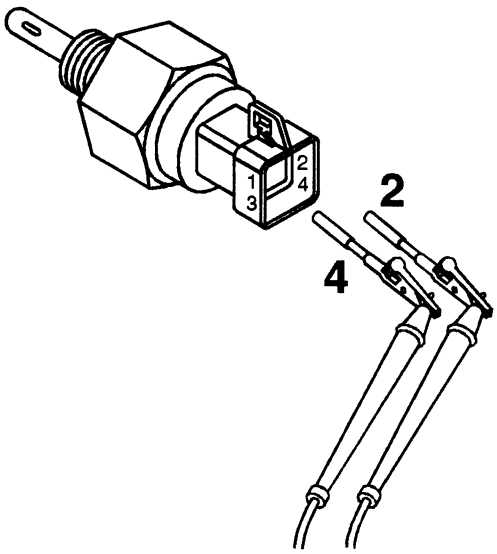
STEP 2C: Check the resistance of the intake manifold pressure/temperature sensor.

⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3823996 - female Weather-Pack test lead.

Condition:
- Turn keyswitch OFF.
- Disconnect the engine harness from the intake manifold pressure/temperature sensor.

Action	Specifications/Repair	Next Step
Check the resistance of the intake manifold pressure/temperature sensor. • Measure the resistance from pin 4 (or D) to pin 2 (or B) of the intake manifold pressure/temperature sensor.	**OK** **300 ohms to 90k ohms**	2D
	NOT OK **Replace the intake manifold pressure/temperature sensor** Refer to Procedure 019-159.	4A



19c00681

STEP 2D: Check for a short circuit to ground.

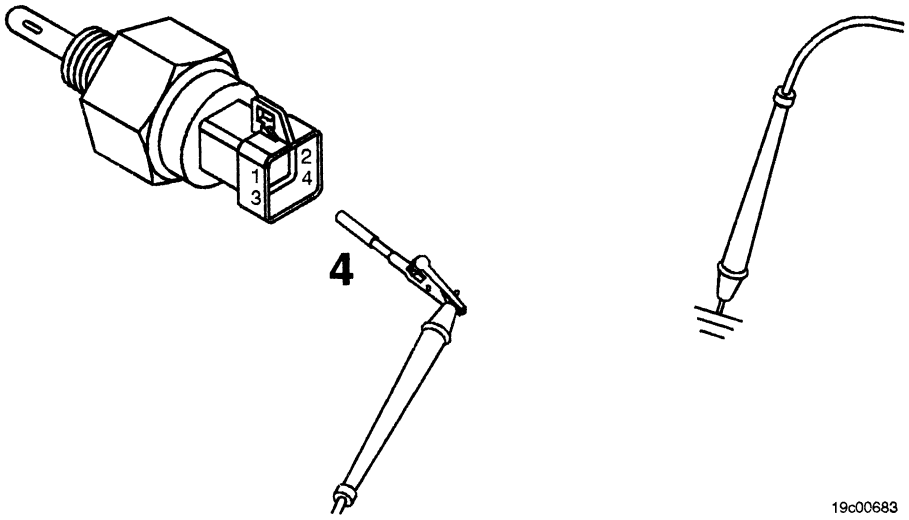
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3823996 - female Weatherpack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the engine harness from the intake manifold pressure/temperature sensor.

Action	Specifications/Repair	Next Step
Check for a short circuit to ground. • Measure the resistance from pin 4 (or D) of the intake manifold pressure/temperature sensor to the engine block.	**OK** **More than 100k ohms**	3A
	NOT OK **Replace the intake manifold pressure/ temperature sensor** Refer to Procedure 019-159.	4A



19c00683

STEP 3: Check the sensor harness.

STEP 3A: Inspect the sensor harness and the ECM connector pins.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the sensor harness and the ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	3B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using the electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	4A

STEP 3B: Read the fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start the engine and let it idle for 1 minute. • Read the fault codes using INSITE™.	**OK** **Fault Code 154 inactive**	4B
	NOT OK Fault Code 154 active.	3C

STEP 3C: Check for a short circuit from pin to pin.

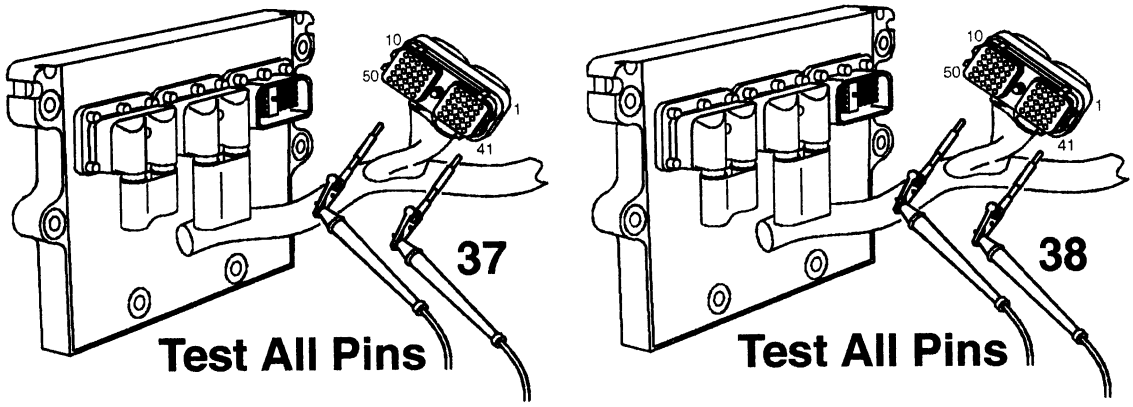
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the engine harness from the intake manifold pressure/temperature sensor.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin. • Measure the resistance from pin 37 of the sensor harness connector to all other pins in the connector. • Measure the resistance from pin 38 of the sensor harness connector to all other pins in the connector.	**OK** **More than 100k ohms**	3D
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	4A



STEP 3D: Check for a short circuit to the ground.

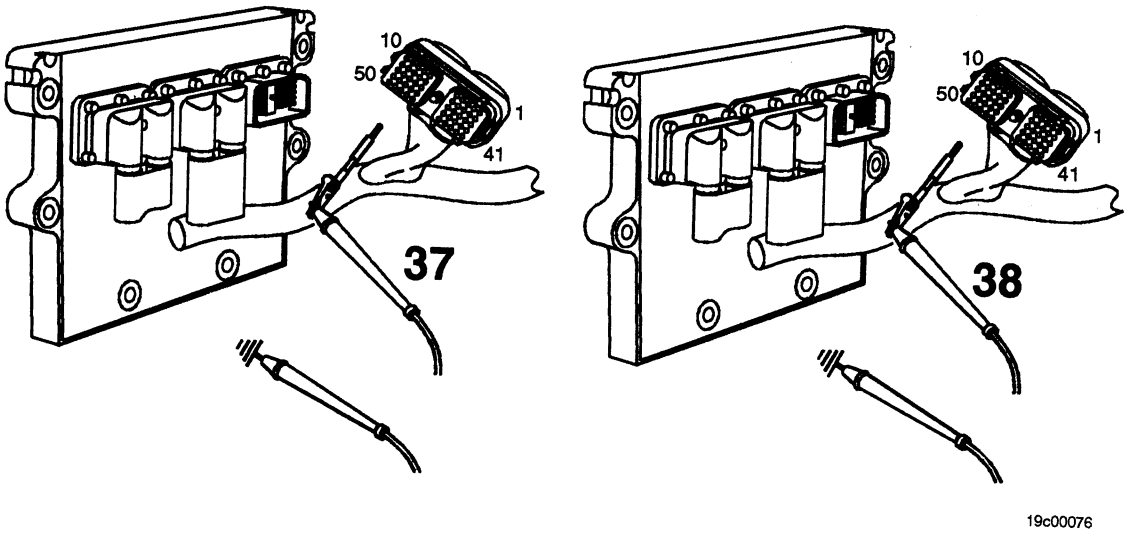
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the engine harness from the intake manifold pressure/temperature sensor.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for a short circuit to ground. • Measure the resistance from pin 37 of the sensor harness connector to the engine block ground. • Measure the resistance from pin 38 of the sensor harness connector to the engine block ground.	**OK** **More than 100k ohms**	4A
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	4A



19c00076

STEP 4: Clear the fault code.

STEP 4A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify that Fault Code 154 is inactive.	**OK** **Fault Code 154 inactive**	4B
	NOT OK Return to troubleshooting steps or contact your local Cummins Authorized Repair Location if all steps have been completed and checked again.	1A

STEP 4B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

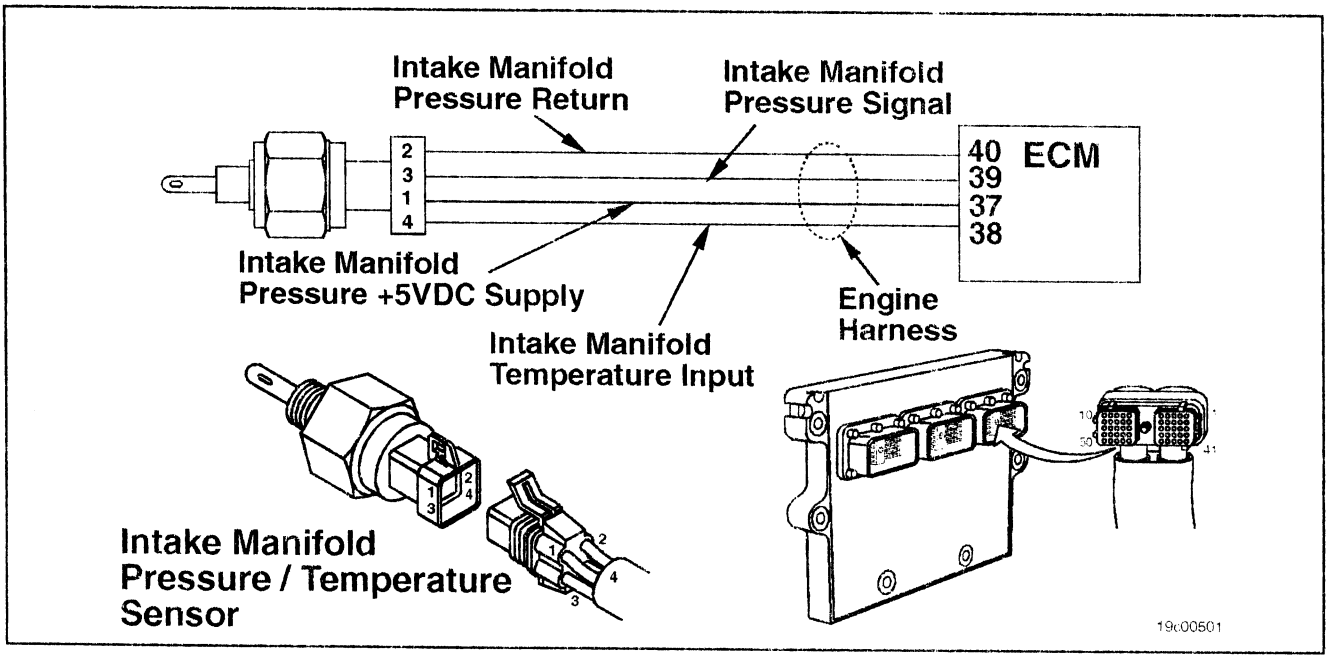
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All faults cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 153

Intake Manifold Temperature Sensor Circuit

CODES	REASON	EFFECT
Fault Code: 153 PID(P), SID(S): P105 SPN: 105 FMI: 3/3 Lamp: Yellow	High voltage detected at the intake manifold temperature circuit.	Possible white smoke. Fan will stay on if controlled by the electronic control module (ECM). No engine protection for coolant temperature.

Intake Manifold Temperature Sensor Circuit



Circuit Description:

The intake manifold pressure/temperature sensor is used by the ECM to monitor the temperature of the engine intake air. The ECM uses the intake manifold temperature signal for the engine protection system, timing, and fueling control.

Component Location:

The intake manifold pressure/temperature sensor is located on the side of the intake manifold in front of the air inlet horn.

Shop Talk:

Sensor resistance varies with the temperature. Compare your readings with this table:

Temperature (°C)	Temperature [°F]	Resistance (ohms)
0	32	30k to 36k
25	77	9k to 11k
50	122	3k to 4k
75	167	1350 to 1500
100	212	600 to 675

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3823995 - male Weather-Pack test lead
Part No. 3823996 - female Weather-Pack test lead
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the intake manifold pressure/temperature sensor.		
STEP 1A: Inspect the intake manifold pressure/ temperature sensor and the sensor harness connector pins.	No damaged pins	
STEP 1B: Read the fault codes.	Fault Code 153 inactive	
STEP 1C: Check the resistance of the intake manifold pressure/temperature sensor.	300 ohms to 90k ohms	
STEP 2: Check the sensor harness.		
STEP 2A: Inspect the sensor harness and the ECM connector pins.	No damaged pins	
STEP 2B: Read the fault codes.	Fault Code 153 inactive	
STEP 2C: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 2D: Check for an open circuit.	Less than 10 ohms	
STEP 3: Clear the fault code.		
STEP 3A: Disable the fault code.	Fault Code 153 inactive	
STEP 3B: Clear the inactive fault codes.	All faults cleared	

TROUBLESHOOTING STEP

STEP 1: Check the intake manifold pressure/temperature sensor.

STEP 1A: Inspect the intake manifold pressure/temperature sensor and the sensor harness connector pins.

Condition:
- Turn keyswitch OFF.
- Disconnect the engine harness from the intake manifold pressure/temperature sensor.

Action	Specifications/Repair	Next Step
Inspect the intake manifold pressure/ temperature sensor and the sensor harness connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	1B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the intake manifold pressure/ temperature sensor, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using the electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-204. • Replace the engine harness. Refer to Procedure 019-043. • Replace the intake manifold pressure/ temperature sensor. Refer to Procedure 019-159.	3A

STEP 1B: Read the fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start the engine and let it idle for 1 minute. • Read the fault codes using INSITE™.	**OK** **Fault Code 153 inactive**	3B
	NOT OK Fault Code 153 active.	1C

STEP 1C: Check the resistance of the intake manifold pressure/temperature sensor.

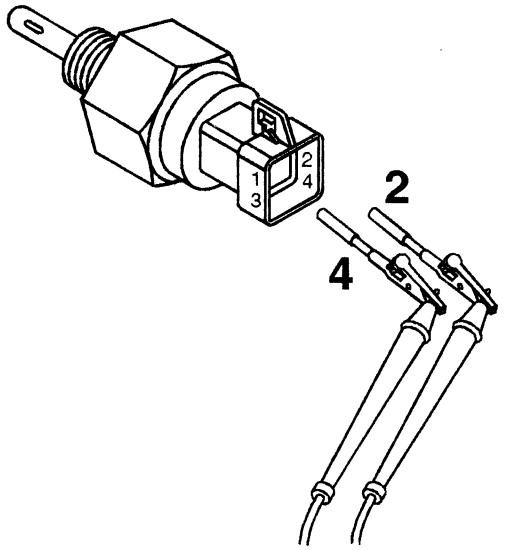
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3823996 - female Weather-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the engine harness from the intake manifold pressure/temperature sensor.

Action	Specifications/Repair	Next Step
Check the resistance of the intake manifold pressure/temperature sensor. • Measure the resistance from pin 4 (or D) to pin 2 (or B) of the intake manifold pressure/ temperature sensor.	**OK** **300 ohms to 90k ohms**	2A
	NOT OK **Replace the intake manifold pressure/ temperature sensor** Refer to Procedure 019-159.	3A



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STEP 2: Check the sensor harness.

STEP 2A: Inspect the sensor harness and the ECM connector pins.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the sensor harness and the ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	2B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using the electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	3A

STEP 2B: Read the fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start the engine and let it idle for 1 minute. • Read the fault codes using INSITE™.	**OK** **Fault Code 153 inactive**	3B
	NOT OK Fault Code 153 active.	2C

STEP 2C: Check for a short circuit from pin to pin.

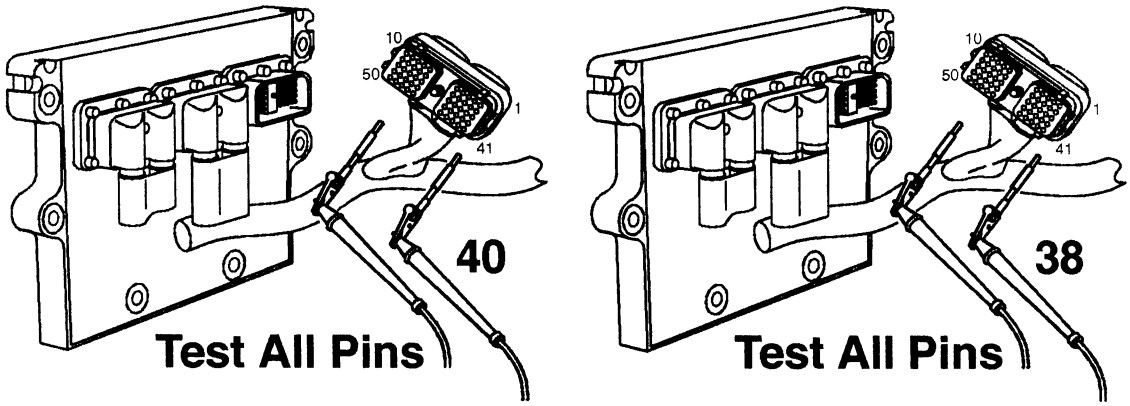
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the engine harness from the intake manifold pressure/temperature sensor.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin. • Measure the resistance from pin 40 to all other pins in the sensor harness connector. • Measure the resistance from pin 38 to all other pins in the sensor harness connector.	**OK** **More than 100k ohms**	2D
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



STEP 2D: Check for an open circuit.

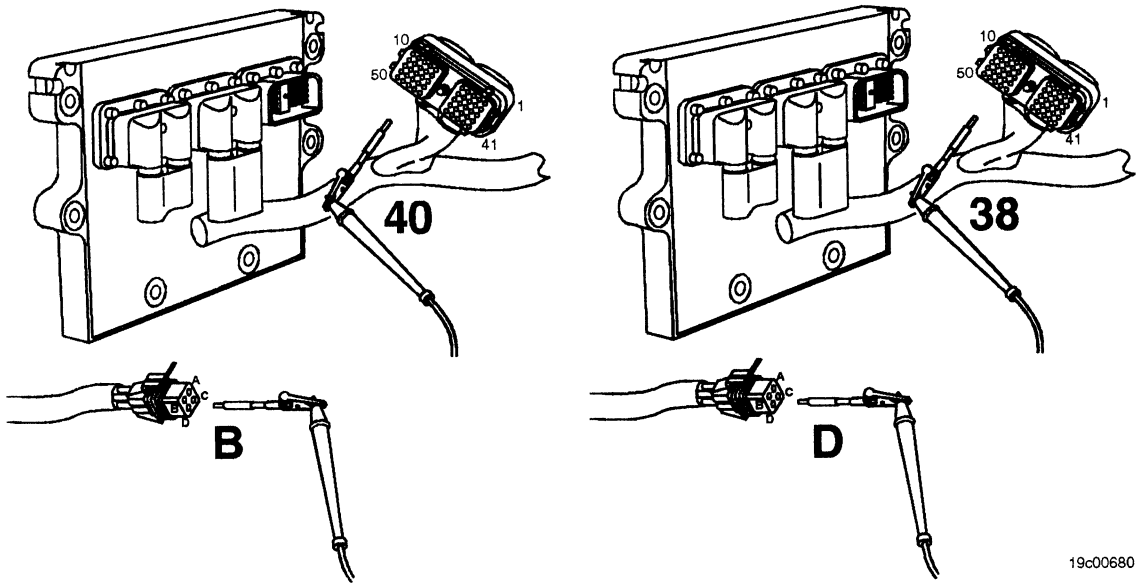
⚠CAUTION⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3823995 - male Weather-Pack test lead
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the engine harness from the intake manifold pressure/temperature sensor.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for an open circuit. • Measure the resistance from pin 40 of the sensor harness connector to pin 2 (or B) of the intake manifold pressure/temperature sensor connector, harness side. • Measure the resistance from pin 38 of the sensor harness connector to pin 4 (or D) of the intake manifold pressure/temperature sensor connector, harness side.	**OK** **Less than 10 ohms**	3A
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-204 or 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



STEP 3: Clear the fault code.

STEP 3A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify that Fault Code 153 is inactive.	**OK** **Fault Code 153 inactive**	3B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location if all steps have been completed and checked again.	1A

STEP 3B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

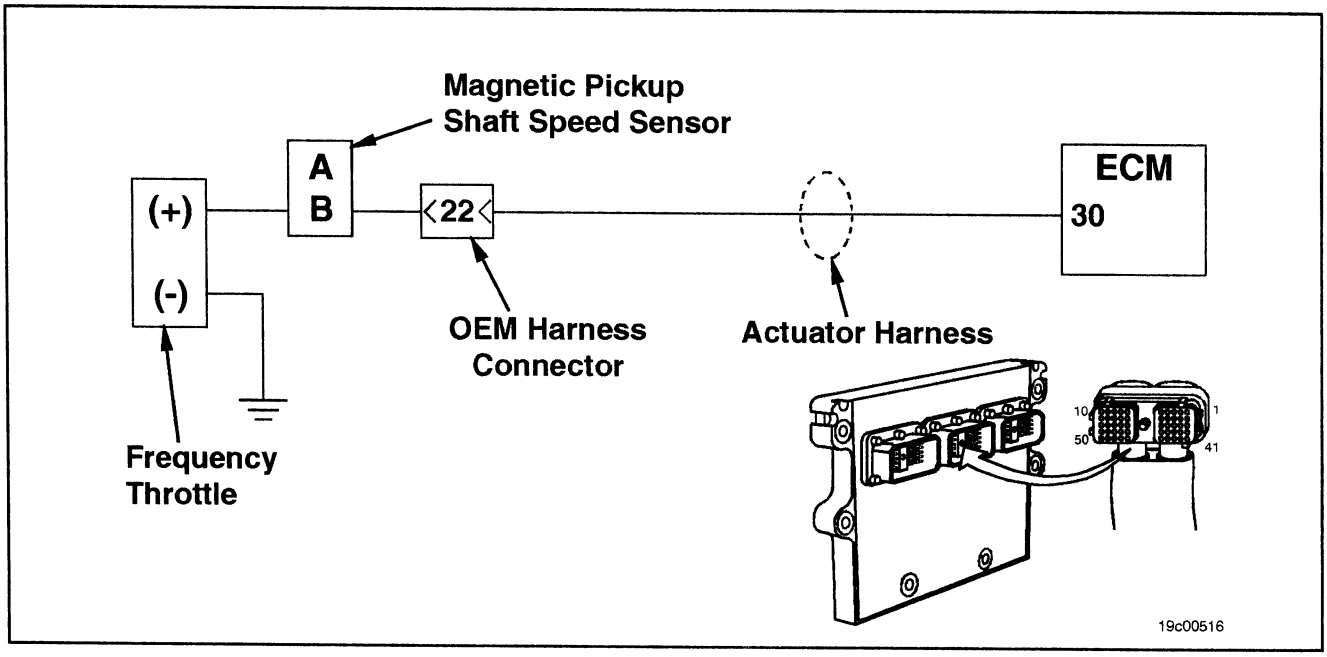
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All faults cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 147 (INDUSTRIAL)

Frequency Throttle Circuit

CODES	REASON	EFFECT
Fault Code: 147 PID(P), SID(S): P91 SPN: 091 FMI: 8/8 Lamp: Red	A frequency of less than 100 Hz was detected at frequency throttle signal pin of the actuator harness connector at the ECM.	Calibration-dependent power and speed derate.

Frequency Throttle Circuit



Circuit Description:

The frequency throttle provides the driver's throttle command to the electronic control module (ECM) through the actuator harness and the OEM engine harness. The ECM uses this signal to determine the fueling command.

Component Location:

Throttle location varies with each OEM. Refer to the OEM troubleshooting and repair manual.

Shop Talk:

The frequency throttle can either be used in conjunction with a voltage throttle or by itself.

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

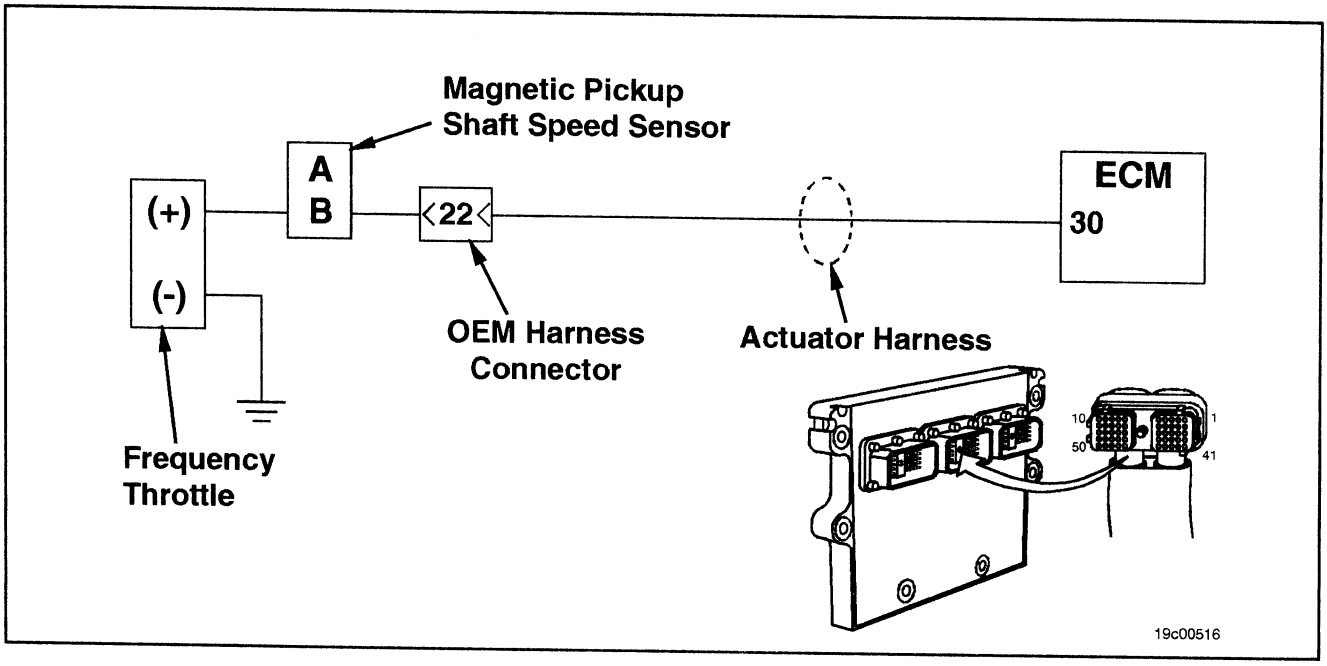
STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the OEM harness.		
STEP 1A: Inspect the OEM harness and the actuator harness connectors.	No damaged pins	
STEP 1B: Check for an open circuit.	Less than 10 ohms	
STEP 1C: Check for a short circuit to ground.	More than 100k ohms	
STEP 1D: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 2: Check the actuator harness.		
STEP 2A: Inspect the actuator harness and the ECM connectors.	No damaged pins	
STEP 2B: Check for an open circuit.	Less than 10 ohms	
STEP 2C: Check for a short circuit to ground.	More than 100k ohms	
STEP 2D: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 3: Clear the fault codes.		
STEP 3A: Disable the fault code.	Fault Code 147 inactive	
STEP 3B: Clear the inactive fault codes.	All fault codes cleared	

Fault Code 147 (INDUSTRIAL)

Frequency Throttle Circuit

CODES	REASON	EFFECT
Fault Code: 147 PID(P), SID(S): P91 SPN: 091 FMI: 8/8 Lamp: Red	A frequency of less than 100 Hz was detected at frequency throttle signal pin of the actuator harness connector at the ECM.	Calibration-dependent power and speed derate.

Frequency Throttle Circuit



Circuit Description:

The frequency throttle provides the driver's throttle command to the electronic control module (ECM) through the actuator harness and the OEM engine harness. The ECM uses this signal to determine the fueling command.

Component Location:

Throttle location varies with each OEM. Refer to the OEM troubleshooting and repair manual.

Shop Talk:

The frequency throttle can either be used in conjunction with a voltage throttle or by itself.

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

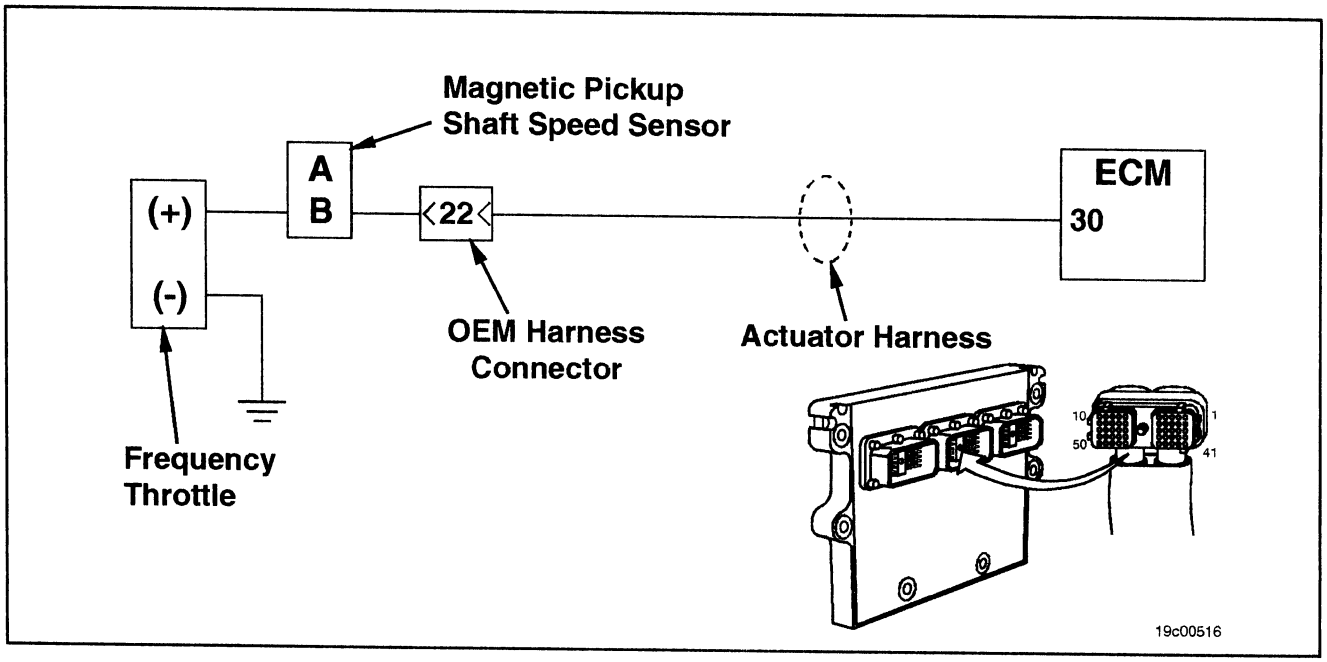
STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the OEM harness.		
STEP 1A: Inspect the OEM harness and the actuator harness connectors.	No damaged pins	
STEP 1B: Check for an open circuit.	Less than 10 ohms	
STEP 1C: Check for a short circuit to ground.	More than 100k ohms	
STEP 1D: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 2: Check the actuator harness.		
STEP 2A: Inspect the actuator harness and the ECM connectors.	No damaged pins	
STEP 2B: Check for an open circuit.	Less than 10 ohms	
STEP 2C: Check for a short circuit to ground.	More than 100k ohms	
STEP 2D: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 3: Clear the fault codes.		
STEP 3A: Disable the fault code.	Fault Code 147 inactive	
STEP 3B: Clear the inactive fault codes.	All fault codes cleared	

Fault Code 147 (INDUSTRIAL)

Frequency Throttle Circuit

CODES	REASON	EFFECT
Fault Code: 147 PID(P), SID(S): P91 SPN: 091 FMI: 8/8 Lamp: Red	A frequency of less than 100 Hz was detected at frequency throttle signal pin of the actuator harness connector at the ECM.	Calibration-dependent power and speed derate.

Frequency Throttle Circuit



Circuit Description:

The frequency throttle provides the driver's throttle command to the electronic control module (ECM) through the actuator harness and the OEM engine harness. The ECM uses this signal to determine the fueling command.

Component Location:

Throttle location varies with each OEM. Refer to the OEM troubleshooting and repair manual.

Shop Talk:

The frequency throttle can either be used in conjunction with a voltage throttle or by itself.

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the OEM harness.		
STEP 1A: Inspect the OEM harness and the actuator harness connectors.	No damaged pins	
STEP 1B: Check for an open circuit.	Less than 10 ohms	
STEP 1C: Check for a short circuit to ground.	More than 100k ohms	
STEP 1D: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 2: Check the actuator harness.		
STEP 2A: Inspect the actuator harness and the ECM connectors.	No damaged pins	
STEP 2B: Check for an open circuit.	Less than 10 ohms	
STEP 2C: Check for a short circuit to ground.	More than 100k ohms	
STEP 2D: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 3: Clear the fault codes.		
STEP 3A: Disable the fault code.	Fault Code 147 inactive	
STEP 3B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING SUMMARY

⚠ CAUTION ⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the OEM harness.		
STEP 1A: Inspect the OEM harness and the actuator harness connectors.	No damaged pins	
STEP 1B: Check for an open circuit.	Less than 10 ohms	
STEP 1C: Check for a short circuit to ground.	More than 100k ohms	
STEP 1D: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 2: Check the actuator harness.		
STEP 2A: Inspect the actuator harness and the ECM connectors.	No damaged pins	
STEP 2B: Check for an open circuit.	Less than 10 ohms	
STEP 2C: Check for a short circuit to ground.	More than 100k ohms	
STEP 2D: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 3: Clear the fault codes.		
STEP 3A: Disable the fault code.	Fault Code 147 inactive	
STEP 3B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check the OEM harness.

STEP 1A: Inspect the OEM harness and the actuator harness connectors.

Condition:
- Turn keyswitch OFF.
- Disconnect the OEM harness from the actuator harness at the 31-pin connector.

Action	Specifications/Repair	Next Step
Inspect the OEM harness and the actuator harness connectors for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	1B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness or the OEM harness, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electronic contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-231. • Replace the engine harness. Refer to Procedure 019-043. • Repair the OEM harness. Refer to Procedure 019-231. • Replace the OEM harness. Refer to Procedure 019-071.	3A

STEP 1B: Check for an open circuit.

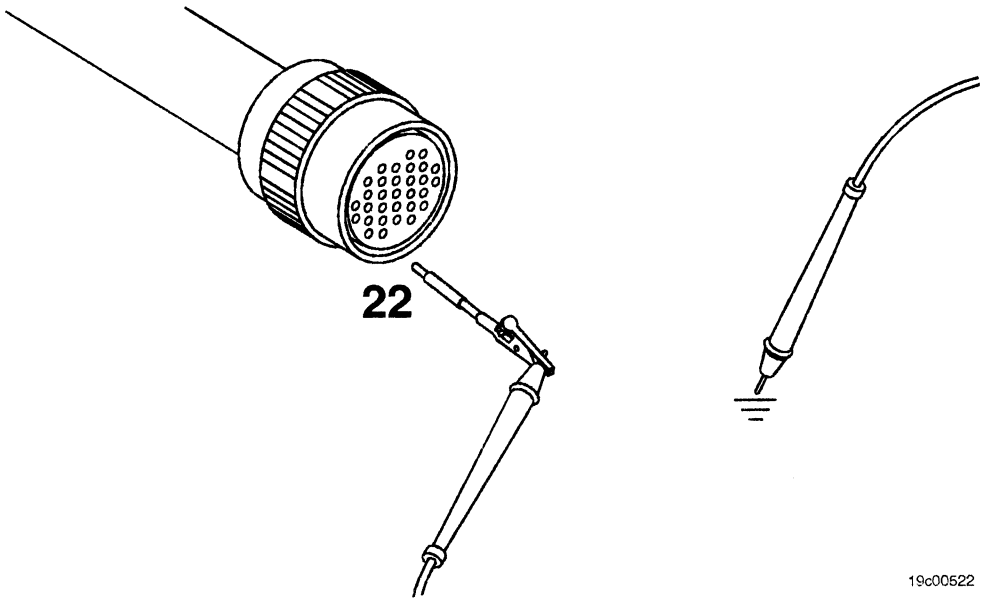
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the OEM engine harness from the actuator harness at the 31-pin connector.
- Connect the frequency throttle to the OEM harness.

Action	Specifications/Repair	Next Step
Check for an open circuit. • Measure the resistance from pin 22 of the OEM 31-pin connector to engine block ground.	**OK** **Less than 10 ohms**	1C
	NOT OK **Repair or replace the OEM harness** • Repair the OEM harness. Refer to Procedure 019-231. • Replace the OEM harness. Refer to Procedure 019-071.	3A



STEP 1C: Check for a short circuit to ground.

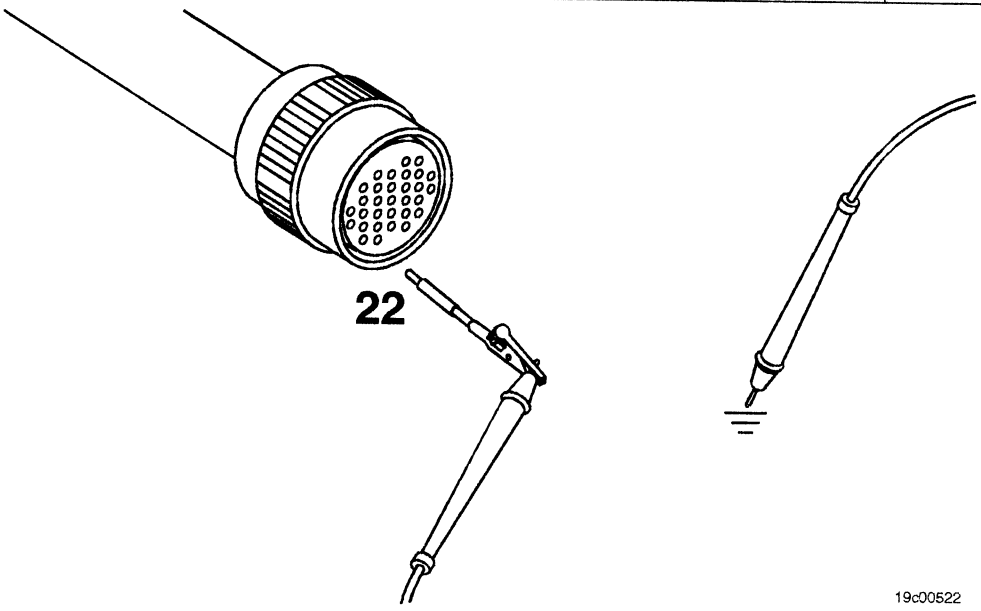
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the OEM engine harness from the actuator harness at the 31-pin connector.
- Disconnect the OEM engine harness from the frequency throttle.

Action	Specifications/Repair	Next Step
Check for a short circuit to ground. • Measure the resistance from pin 22 of the OEM 31-pin connector to engine block ground.	**OK** **More than 100k ohms**	1D
	NOT OK **Repair or replace the OEM harness** • Repair the OEM harness. Refer to Procedure 019-231. • Replace the OEM harness. Refer to Procedure 019-071.	3A



STEP 1D: Check for a short circuit from pin to pin.

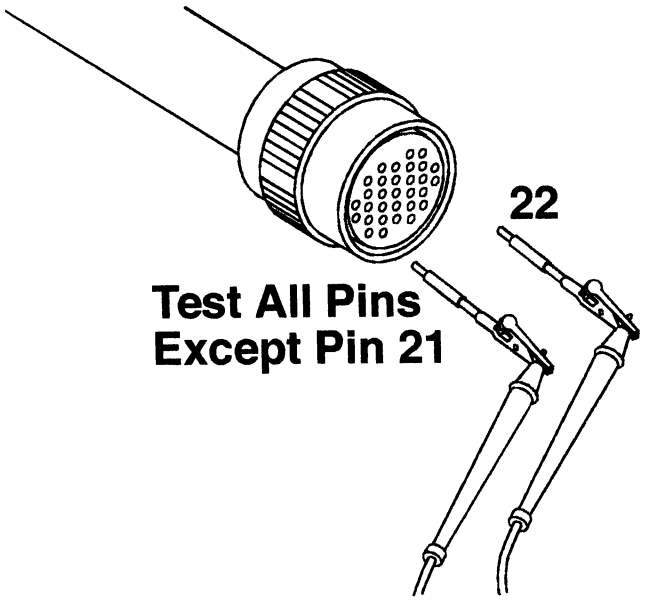
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the OEM engine harness from the actuator harness at the 31-pin connector.
- Disconnect the OEM engine harness from the frequency throttle.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin. • Measure the resistance from pin 22 of the OEM engine harness 31-pin connector to all other pins in the connector, except pin 21.	**OK** **More than 100k ohms**	2A
	NOT OK **Repair or replace the OEM harness** • Repair the OEM harness. Refer to Procedure 019-231. • Replace the OEM harness. Refer to Procedure 019-071.	3A



STEP 2: Check the actuator harness.

STEP 2A: Inspect the actuator harness and the ECM connectors.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:

- Turn keyswitch OFF.
- Disconnect the actuator harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the actuator harness and the ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	2B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using electronic contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-231. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	3A

STEP 2B: Check for an open circuit.

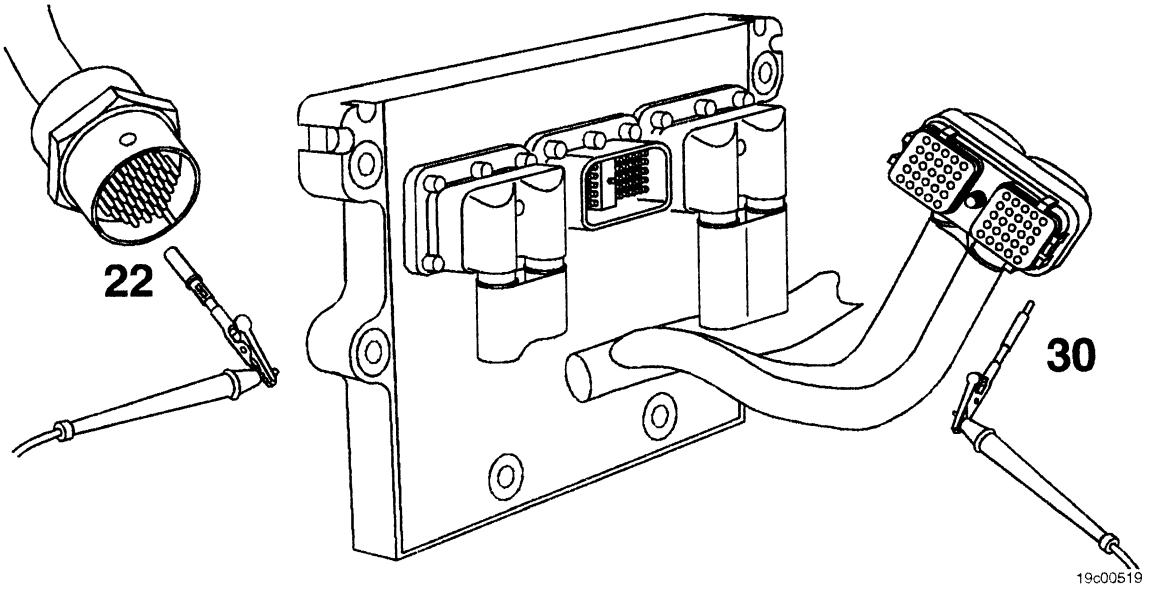
⚠CAUTION⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3822917 - female Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the OEM engine harness from the actuator harness at the 31-pin connector.
- Disconnect the actuator harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for an open circuit. • Measure the resistance from pin 30 of the actuator harness connector to pin 22 of the engine harness 31-pin OEM connector.	**OK** **Less than 10 ohms**	2C
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-231 or 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



STEP 2C: Check for a short circuit to ground.

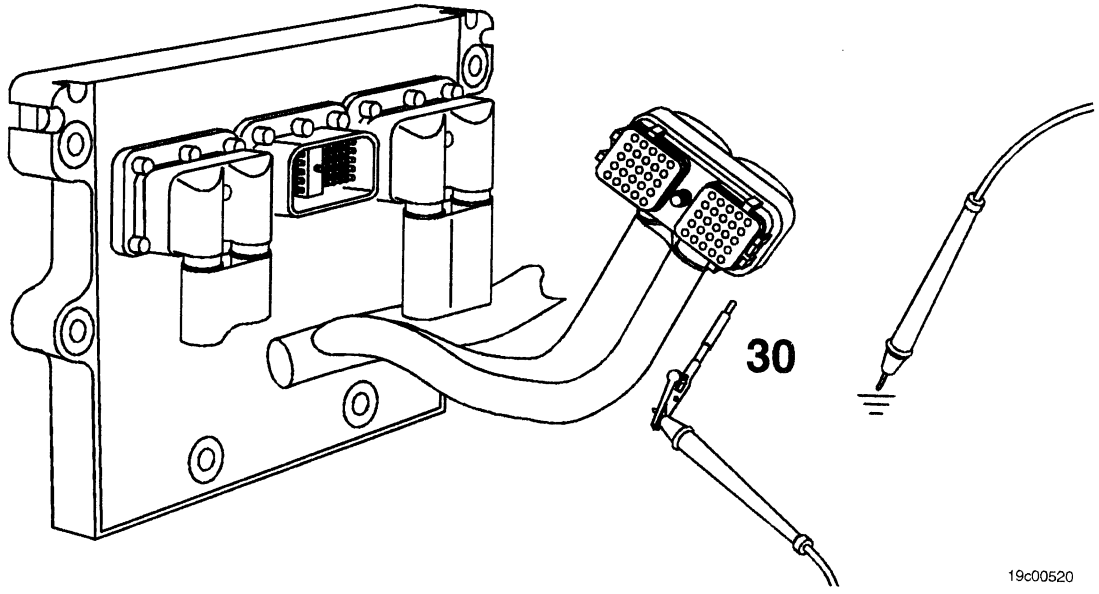
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the OEM engine harness from the actuator harness at the 31-pin connector.
- Disconnect the actuator harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for a short circuit to ground. • Measure the resistance from pin 30 of the actuator harness ECM connector to engine block ground.	**OK** **More than 100k ohms**	2D
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



STEP 2D: Check for a short circuit from pin to pin.

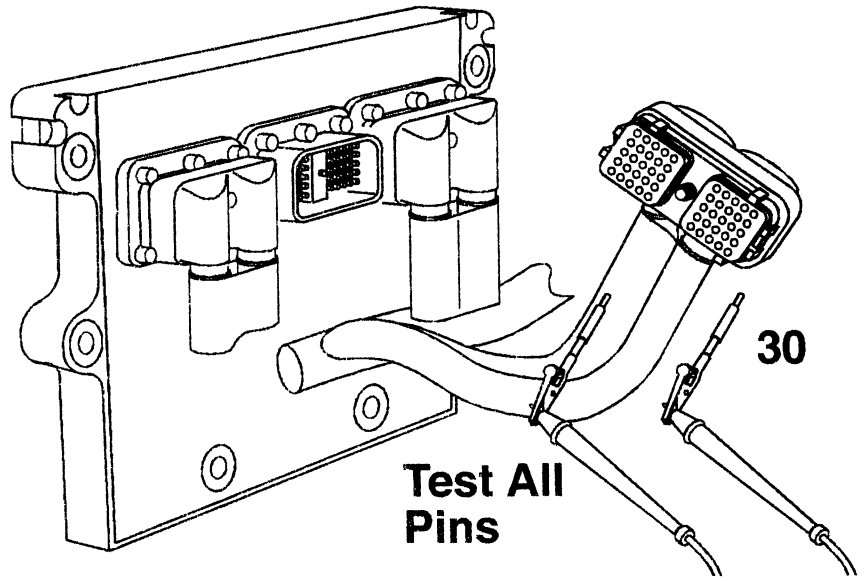
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the OEM engine harness from the actuator harness at the 31-pin connector.
- Disconnect the actuator harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin. • Measure the resistance from pin 30 of the actuator harness ECM connector to all other pins in the connector.	**OK** **More than 100k ohms**	3A
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



STEP 3: Clear the fault codes.

STEP 3A: Disable the fault code.

Condition:
- Connect all components.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Verify that Fault Code 147 is inactive.	**OK** **Fault Code 147 inactive**	3B
	NOT OK Return to troubleshooting steps or contact your local Cummins Authorized Repair Location if all steps have been completed and checked again.	1A

STEP 3B: Clear the inactive fault codes.

Condition:
- Connect all components.

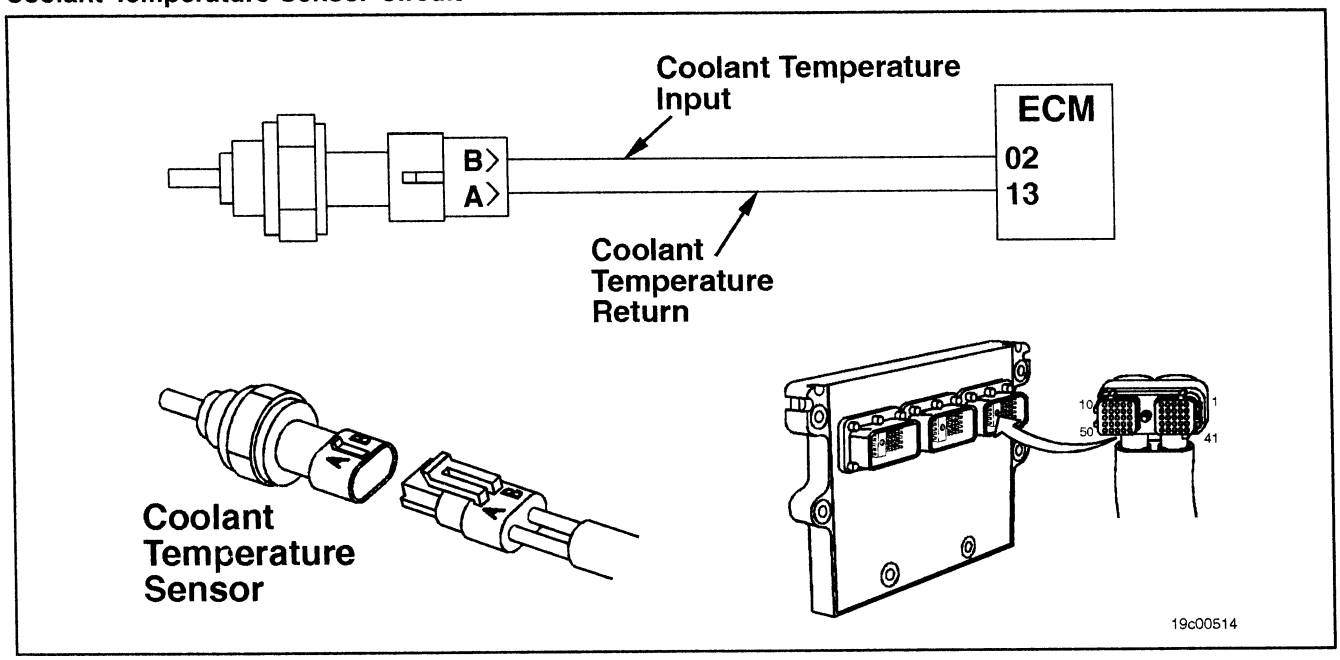
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 145

Coolant Temperature Sensor Circuit

CODES	REASON	EFFECT
Fault Code: 145 PID(P), SID(S): P110 SPN: 110 FMI: 4/4 Lamp: Yellow	Low voltage detected at the coolant temperature circuit.	Possible white smoke. Fan will stay on if controlled by the electronic control module (ECM). No engine protection for coolant temperature.

Coolant Temperature Sensor Circuit



Circuit Description:

The coolant temperature sensor is used by the ECM to monitor the temperature of the engine coolant. The coolant temperature is used by the ECM for the engine protection system, timing, and fueling control.

Component Location:

The coolant temperature sensor is located in front of the turbocharger.

Shop Talk:

The resistance of the sensor varies with the temperature. Compare your reading to this table:

Temperature (°C)	Temperature [°F]	Resistance (ohms)
0	32	30k to 36k
25	77	9k to 11k
50	122	3k to 4k
75	167	1350 to 1500
100	212	600 to 675

TROUBLESHOOTING SUMMARY

⚠ WARNING ⚠

Do not remove the pressure cap from a hot engine. Wait until the coolant temperature is below 50°C [122°F] before removing the pressure cap. Heated coolant spray or steam can cause personal injury.

⚠ CAUTION ⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3823256 - 2-way Metri-Pack test lead.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the coolant temperature sensor.		
STEP 1A: Inspect the coolant temperature sensor and sensor harness connector pins.	No damaged pins	
STEP 1B: Read the fault codes.	Fault Code 145 inactive	
STEP 1C: Check the resistance of the coolant temperature sensor.	300 ohms to 90k ohms	
STEP 1D: Check for a short circuit to ground.	More than 100k ohms	
STEP 2: Check the sensor harness.		
STEP 2A: Inspect the sensor harness and the ECM connector pins.	No damaged pins	
STEP 2B: Read the fault codes.	Fault Code 145 inactive	
STEP 2C: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 2D: Check for a short circuit to ground.	More than 100k ohms	
STEP 3: Clear the fault codes.		
STEP 3A: Disable the fault code.	Fault Code 145 inactive	
STEP 3B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check the coolant temperature sensor.

STEP 1A: Inspect the coolant temperature sensor and sensor harness connector pins.

⚠WARNING⚠

Do not remove the pressure cap from a hot engine. Wait until the coolant temperature is below 50°C [122°F] before removing the pressure cap. Heated coolant spray or steam can cause personal injury.

Condition:
- Turn keyswitch OFF.
- Disconnect the sensor harness from the coolant temperature sensor.

Action	Specifications/Repair	Next Step
Inspect the harness and the sensor connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	1B
	NOT OK **Repair the damaged pins** Repair or replace the sensor harness, or replace the coolant temperature sensor, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using the electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the sensor harness. Refer to Procedure 019-202. • Replace the sensor harness. Refer to Procedure 019-043. • Replace the coolant temperature sensor. Refer to Procedure 019-019.	3A

STEP 1B: Read the fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start the engine and let it idle for 1 minute. • Read the fault codes using INSITE™.	**OK** **Fault Code 145 inactive**	3B
	NOT OK Fault Code 145 active.	1C

STEP 1C: Check the resistance of the coolant temperature sensor.

⚠WARNING⚠

Do not remove the pressure cap from a hot engine. Wait until the coolant temperature is below 50°C [122°F] before removing the pressure cap. Heated coolant spray or steam can cause personal injury.

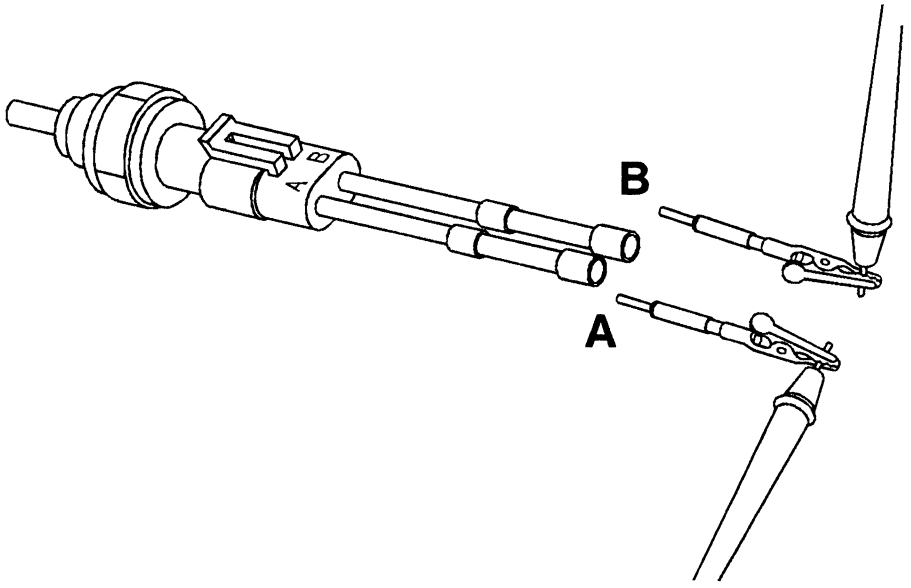
⚠CAUTION⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3823256 - 2-way Metri-Pack test lead
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the engine harness from the coolant temperature sensor.

Action	Specifications/Repair	Next Step
Check the resistance of the coolant temperature sensor. • Measure the resistance from pin A (or 1) to pin B (or 2) of the coolant temperature sensor.	**OK** **300 ohms to 90k ohms**	1D
	NOT OK **Replace the coolant temperature sensor** Refer to Procedure 019-019.	3A



STEP 1D: Check for a short circuit to ground.

⚠WARNING⚠

Do not remove the pressure cap from a hot engine. Wait until the coolant temperature is below 50°C [122°F] before removing the pressure cap. Heated coolant spray or steam can cause personal injury.

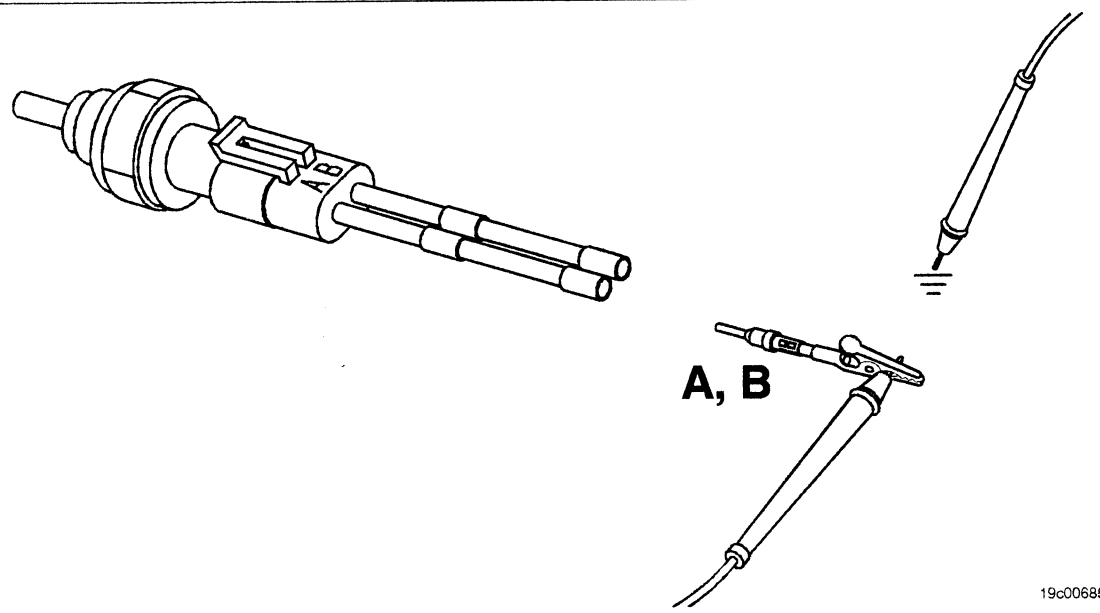
⚠CAUTION⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3823256 - 2-way Metri-Pack test lead
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the engine harness from the coolant temperature sensor.

Action	Specifications/Repair	Next Step
Check for a short circuit to ground. • Measure the resistance from pin A (or 1) of the coolant temperature sensor to engine block ground. • Measure the resistance from pin B (or 2) of the coolant temperature sensor to engine block ground.	**OK** **More than 100k ohms**	2A
	NOT OK **Replace the coolant temperature sensor** Refer to Procedure 019-019.	3A



STEP 2: Check the sensor harness.

STEP 2A: Inspect the sensor harness and the ECM connector pins.

⚠WARNING⚠

Do not remove the pressure cap from a hot engine. Wait until the coolant temperature is below 50°C [122°F] before removing the pressure cap. Heated coolant spray or steam can cause personal injury.

△CAUTION△

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the sensor harness and the ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	2B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using the electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	3A

STEP 2B: Read the fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start the engine and let it idle for 1 minute. • Read the fault codes using INSITE™.	**OK** **Fault Code 145 inactive**	3B
	NOT OK Fault Code 145 active.	2C

STEP 2C: Check for a short circuit from pin to pin.

⚠WARNING⚠

Do not remove the pressure cap from a hot engine. Wait until the coolant temperature is below 50°C [122°F] before removing the pressure cap. Heated coolant spray or steam can cause personal injury.

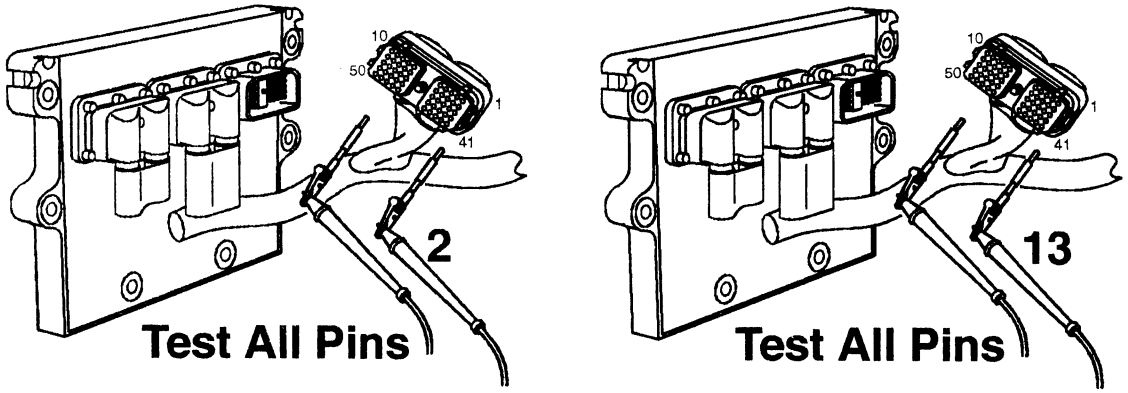
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the engine harness from the coolant temperature sensor.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin. • Measure the resistance from pin 2 of the sensor harness connector to all other pins in the connector. • Measure the resistance from pin 13 of the sensor harness connector to all other pins in the connector.	**OK** **More than 100k ohms**	2D
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



19c00512

STEP 2D: Check for a short circuit to ground.

⚠WARNING⚠

Do not remove the pressure cap from a hot engine. Wait until the coolant temperature is below 50°C [122°F] before removing the pressure cap. Heated coolant spray or steam can cause personal injury.

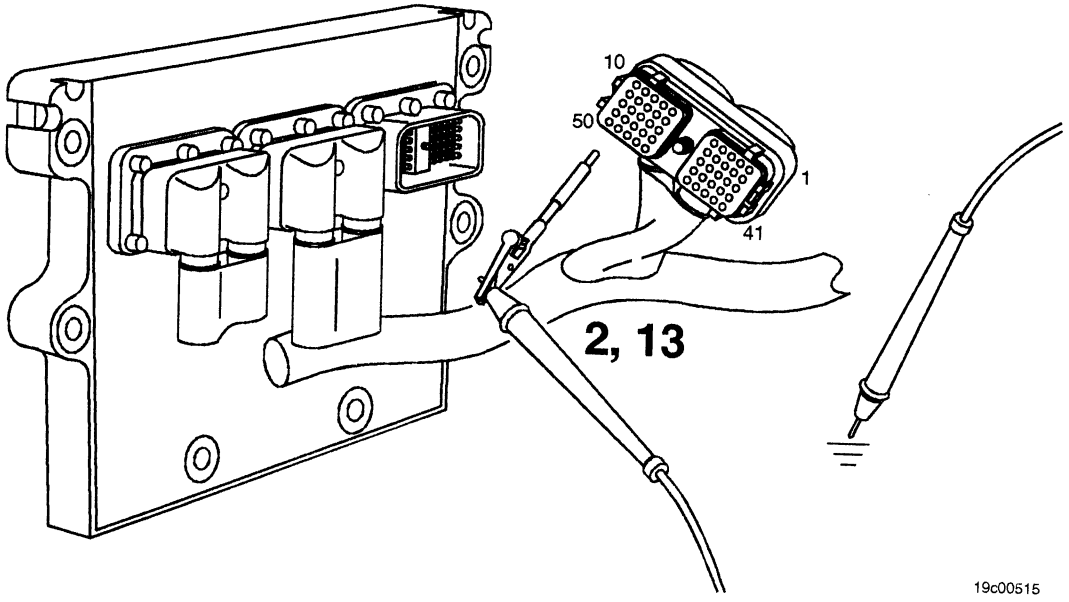
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the engine harness from the coolant temperature sensor.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for a short circuit to ground. • Measure the resistance from pin 2 of the sensor harness connector to the engine block ground. • Measure the resistance from pin 13 of the sensor harness connector to the engine block ground.	**OK** **More than 100k ohms**	3A
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



STEP 3: Clear the fault codes.

STEP 3A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify Fault Code 145 is inactive.	**OK** **Fault Code 145 inactive**	3B
	NOT OK Return to the troubleshooting steps or contact your local Cummins Authorized Repair Location if all the steps have been completed and checked again.	1A

STEP 3B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

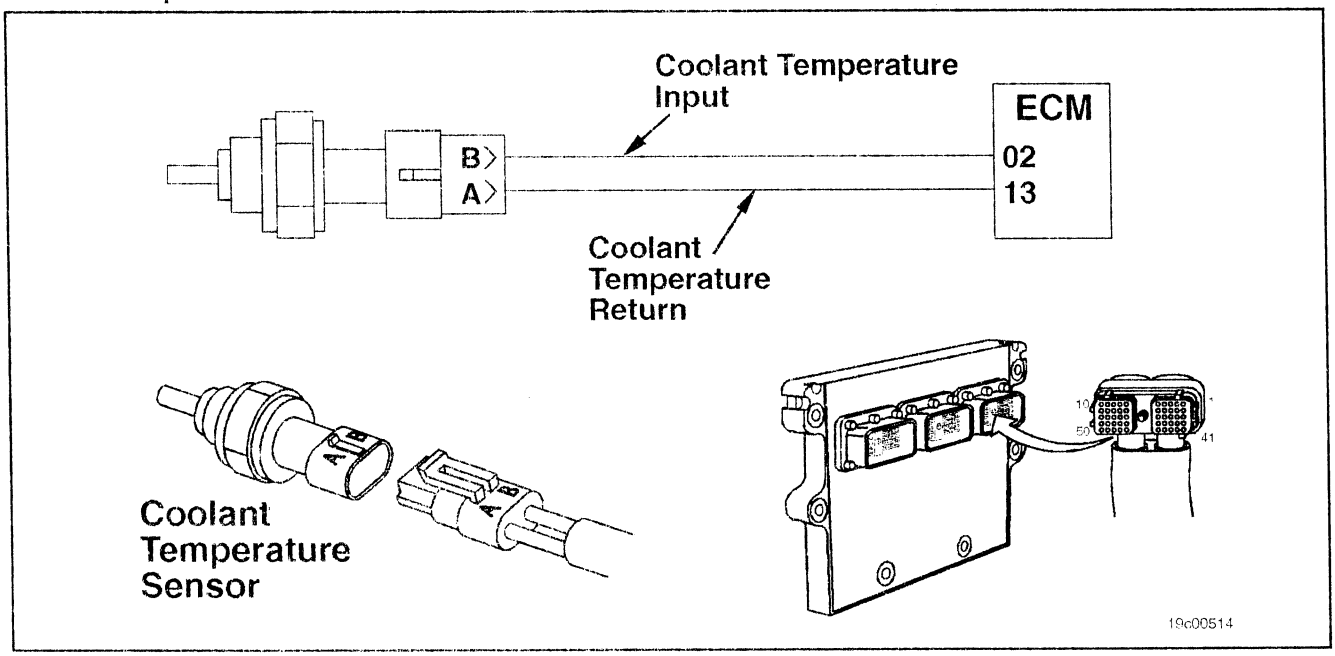
Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts

Fault Code 144

Coolant Temperature Sensor Circuit

CODES	REASON	EFFECT
Fault Code: 144 PID(P), SID(S): P110 SPN: 110 FMI: 3/3 Lamp: Yellow	High voltage detected at the coolant temperature circuit.	Possible white smoke. Fan will stay on if controlled by the electronic control module (ECM). No engine protection for coolant temperature.

Coolant Temperature Sensor Circuit



Circuit Description:

The coolant temperature sensor is used by the ECM to monitor the temperature of the engine coolant. The coolant temperature is used by the ECM for the engine protection system, timing, and fueling control.

Component Location:

The coolant temperature sensor is located in front of the turbocharger.

Shop Talk:

The resistance of the sensor varies with the temperature. Compare your reading to this table:

Temperature (°C)	Temperature [°F]	Resistance (ohms)
0	32	30k to 36k
25	77	9k to 11k
50	122	3k to 4k
75	167	1350 to 1500
100	212	600 to 675

TROUBLESHOOTING SUMMARY

⚠ WARNING ⚠

Do not remove the pressure cap from a hot engine. Wait until the coolant temperature is below 50°C [122°F] before removing the pressure cap. Heated coolant spray or steam can cause personal injury.

⚠ CAUTION ⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

⚠ CAUTION ⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead
Part No. 3823256 - 2-way Metri-Pack test lead.

STEPS	SPECIFICATIONS	SRT CODE
STEP 1: Check the coolant temperature sensor.		
STEP 1A: Inspect the coolant temperature sensor and sensor harness connector pins.	No damaged pins	
STEP 1B: Read the fault codes.	Fault Code 144 inactive	
STEP 1C: Check the resistance of the coolant temperature sensor.	300 ohms to 90k ohms	
STEP 2: Check the sensor harness.		
STEP 2A: Inspect the sensor harness and the ECM connector pins.	No damaged pins	
STEP 2B: Read the fault codes.	Fault Code 144 inactive	
STEP 2C: Check for a short circuit from pin to pin.	More than 100k ohms	
STEP 2D: Check for an open circuit.	Less than 10 ohms	
STEP 3: Clear the fault codes.		
STEP 3A: Disable the fault code.	Fault Code 144 inactive	
STEP 3B: Clear the inactive fault codes.	All fault codes cleared	

TROUBLESHOOTING STEP

STEP 1: Check the coolant temperature sensor.

STEP 1A: Inspect the coolant temperature sensor and sensor harness connector pins.

⚠WARNING⚠

Do not remove the pressure cap from a hot engine. Wait until the coolant temperature is below 50°C [122°F] before removing the pressure cap. Heated coolant spray or steam can cause personal injury.

Condition:
- Turn keyswitch OFF.
- Disconnect the sensor harness from the coolant temperature sensor.

Action	Specifications/Repair	Next Step
Inspect the coolant temperature sensor and sensor harness connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	1B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the coolant temperature sensor, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using the electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-204. • Replace the engine harness. Refer to Procedure 019-043. • Replace the coolant temperature sensor. Refer to Procedure 019-019.	3A

STEP 1B: Read the fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start the engine and let it idle for 1 minute. • Read the fault codes using INSITE™.	**OK** **Fault Code 144 inactive**	3B
	NOT OK Fault Code 144 active.	1C

STEP 1C: Check the resistance of the coolant temperature sensor.

⚠WARNING⚠

Do not remove the pressure cap from a hot engine. Wait until the coolant temperature is below 50°C [122°F] before removing the pressure cap. Heated coolant spray or steam can cause personal injury.

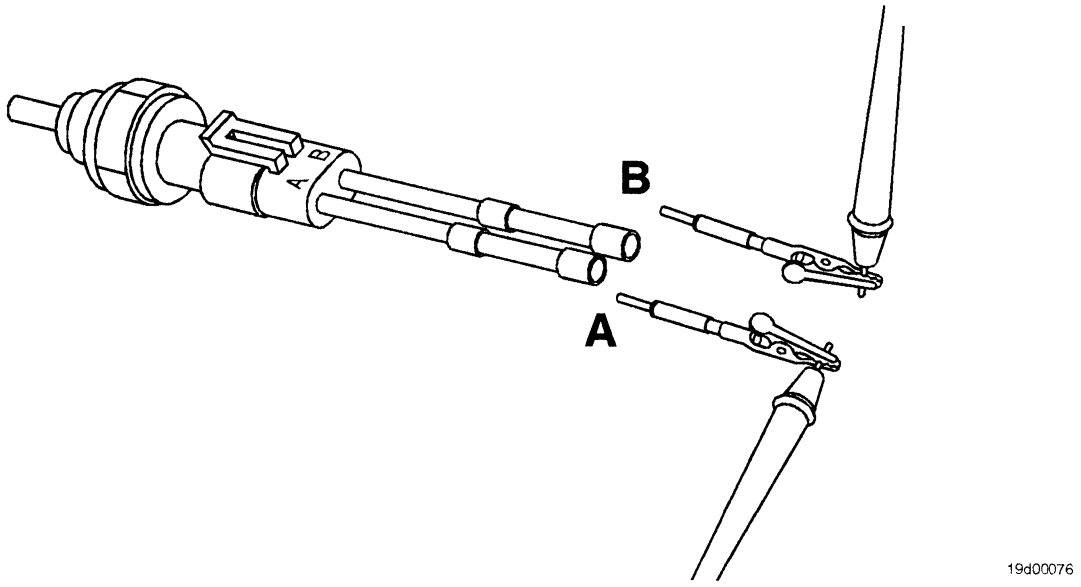
⚠CAUTION⚠

To avoid pin and harness damage, use the following test leads when taking a measurement:
Part No. 3823256 - 2-way Metri-Pack test lead
Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the engine harness from the coolant temperature sensor.

Action	Specifications/Repair	Next Step
Check the resistance of the coolant temperature sensor. • Measure the resistance from pin A (or 1) to pin B (or 2) of the coolant temperature sensor.	**OK** **300 ohms to 90k ohms**	2A
	NOT OK **Replace the coolant temperature sensor** Refer to Procedure 019-019.	3A



STEP 2: Check the sensor harness.

STEP 2A: Inspect the sensor harness and the ECM connector pins.

⚠WARNING⚠

Do not remove the pressure cap from a hot engine. Wait until the coolant temperature is below 50°C [122°F] before removing the pressure cap. Heated coolant spray or steam can cause personal injury.

⚠CAUTION⚠

To avoid damaging a new ECM, all other active fault codes must be investigated prior to replacing the ECM.

Condition:
- Turn keyswitch OFF.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Inspect the sensor harness and the ECM connector pins for the following: • Corroded pins • Bent or broken pins • Pushed back or expanded pins • Moisture in or on the connector • Missing or damaged connector seals • Dirt or debris in or on the connector pins.	**OK** **No damaged pins**	2B
	NOT OK **Repair the damaged pins** Repair or replace the engine harness, or replace the ECM, whichever has the damaged pins. • Flush the dirt, debris, or moisture from the connector pins using the electrical contact cleaner, Part No. 3824510. • Install the appropriate connector seal if it is damaged or missing. • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043. • Replace the ECM. Refer to Procedure 019-031.	3A

STEP 2B: Read the fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Read the fault codes. • Start the engine and let it idle for 1 minute. • Read the fault codes using INSITE™.	**OK** **Fault Code 144 inactive**	3B
	NOT OK Fault Code 144 active.	2C

STEP 2C: Check for a short circuit from pin to pin.

⚠WARNING⚠

Do not remove the pressure cap from a hot engine. Wait until the coolant temperature is below 50°C [122°F] before removing the pressure cap. Heated coolant spray or steam can cause personal injury.

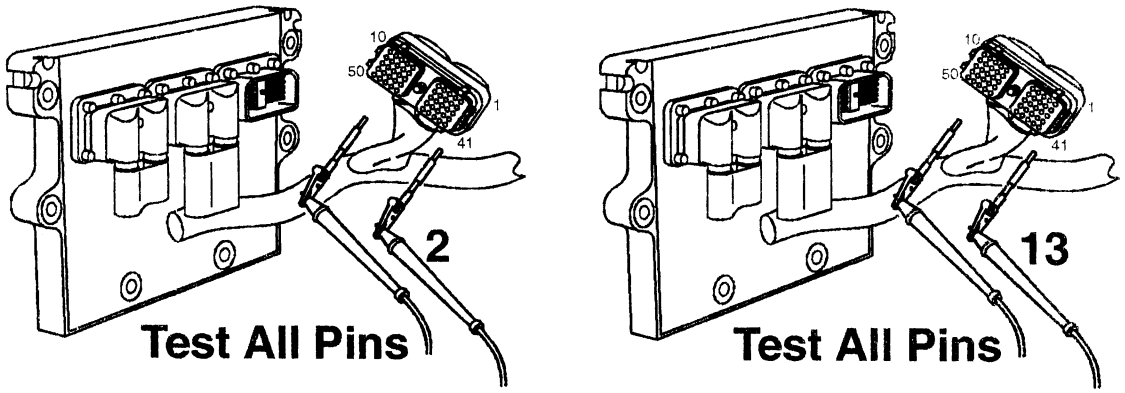
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the engine harness from the coolant temperature sensor.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for a short circuit from pin to pin. • Measure the resistance from pin 2 of the sensor harness connector to all other pins. • Measure the resistance from pin 13 of the sensor harness connector to all other pins.	**OK** **More than 100k ohms**	2D
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



STEP 2D: Check for an open circuit.

⚠WARNING⚠

Do not remove the pressure cap from a hot engine. Wait until the coolant temperature is below 50°C [122°F] before removing the pressure cap. Heated coolant spray or steam can cause personal injury.

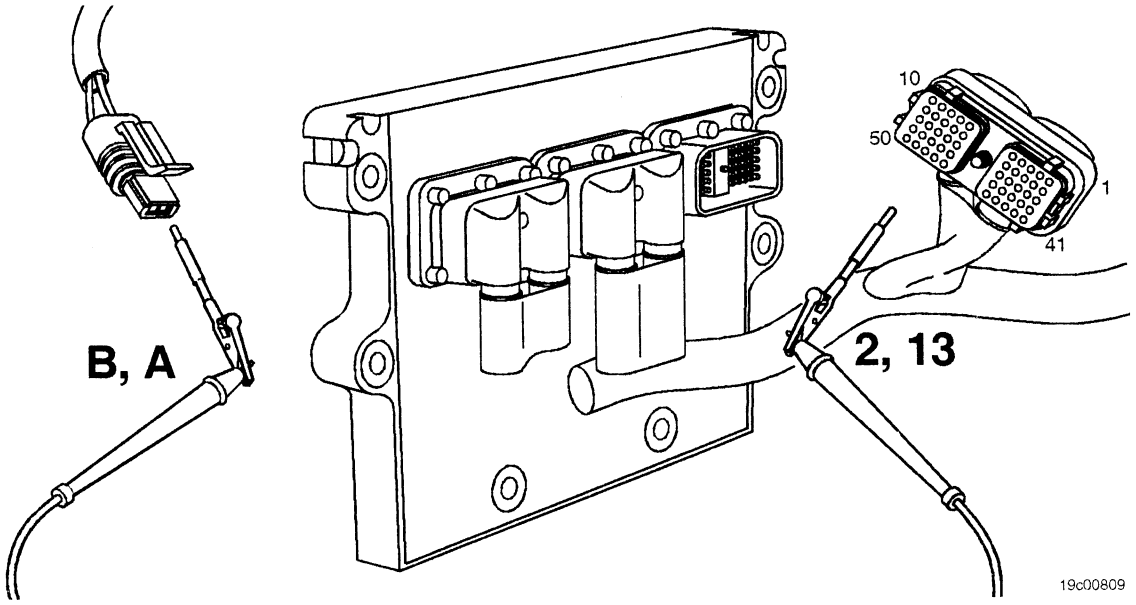
⚠CAUTION⚠

To avoid pin and harness damage, use the following test lead when taking a measurement: Part No. 3822758 - male Deutsch/AMP/Metri-Pack test lead.

Condition:

- Turn keyswitch OFF.
- Disconnect the engine harness from the coolant temperature sensor.
- Disconnect the sensor harness connector from the ECM.

Action	Specifications/Repair	Next Step
Check for an open circuit. • Measure the resistance from pin 2 of the sensor harness connector to pin B (or 2) of the coolant temperature sensor connector. • Measure the resistance from pin 13 of the sensor harness connector to pin A (or 1) of the coolant temperature sensor connector.	**OK** **Less than 10 ohms**	3A
	NOT OK **Repair or replace the engine harness** • Repair the engine harness. Refer to Procedure 019-202 or 019-250. • Replace the engine harness. Refer to Procedure 019-043.	3A



STEP 3: Clear the fault codes.

STEP 3A: Disable the fault code.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Disable the fault code. • Start the engine and let it idle for 1 minute. • Using INSITE™, verify that Fault Code 144 is inactive.	**OK** **Fault Code 144 inactive**	3B
	NOT OK Return to troubleshooting steps or contact your local Cummins Authorized Repair Location if all steps have been completed and checked again.	1A

STEP 3B: Clear the inactive fault codes.

Condition:
- Connect all components.
- Turn keyswitch ON.

Action	Specifications/Repair	Next Step
Clear the inactive fault codes. • Erase the inactive fault codes using INSITE™.	**OK** **All fault codes cleared**	Repair complete
	NOT OK Troubleshoot any remaining active fault codes.	Appropriate troubleshooting charts