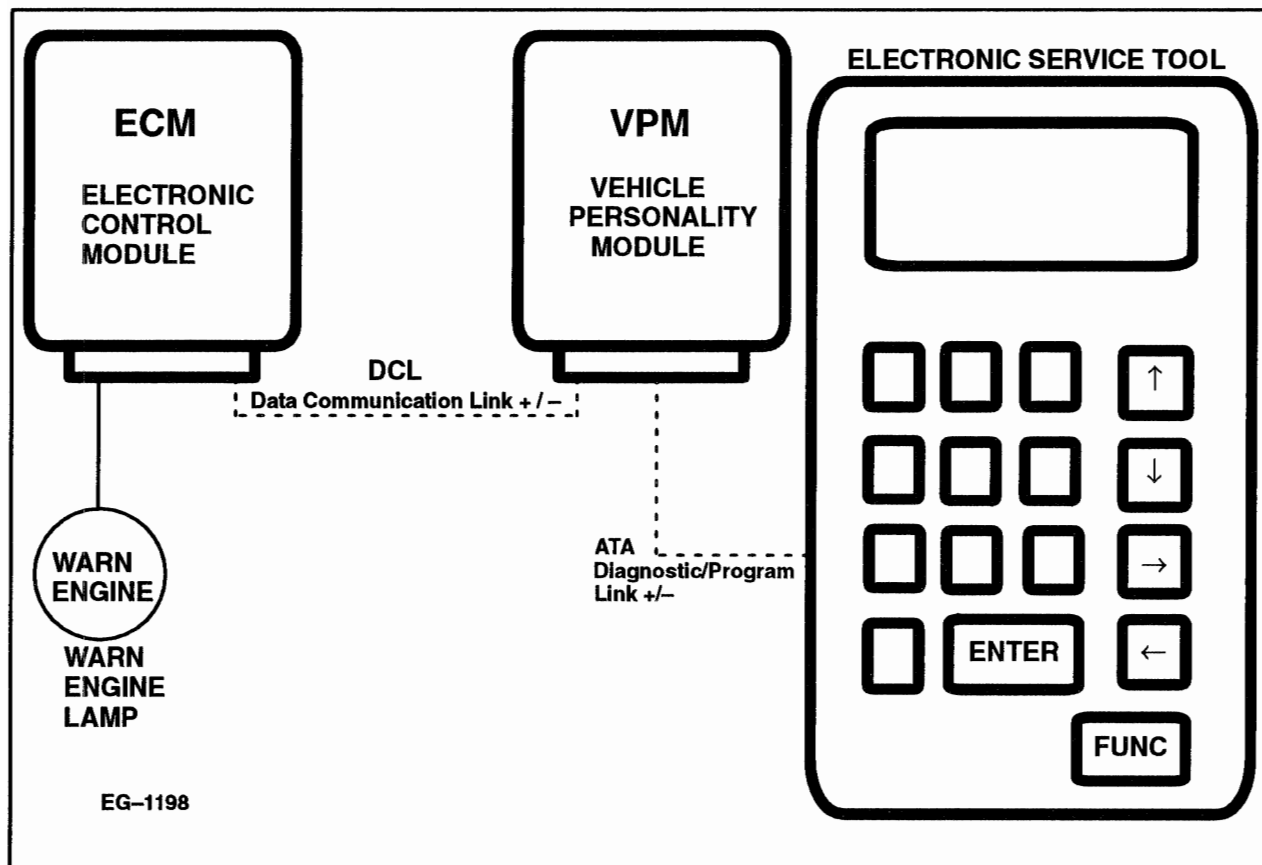


ELECTRONIC CONTROL SYSTEM DIAGNOSTICS

DCL/ATA COMMUNICATION LINKS (DCL/ATA)

VPM COMMUNICATIONS

(Data Communications Link, ATA Link)



SIGNAL FUNCTIONS

Data Communication Link – the Data Communication Link signal is a 0 to 5 volt variable width wave form signal that enables communication between the Vehicle Personality Module (VPM) and the ECM. It is used for communication of diagnostic and calibration data.

ATA Diagnostic/Programming Link – The ATA signal is a 0 to 5 volt width wave form signal that enables communication between the VPM and the Electronic Service Tool (EST). It is used for communication of calibration, programming and diagnostic information.

Tachometer Signal – The ECM provides the VPM with a 0 to 12 volt tachometer signal. The frequency of the signal is one-fifth (1/5th) the RPM.

FAULT DETECTION/MANAGEMENT

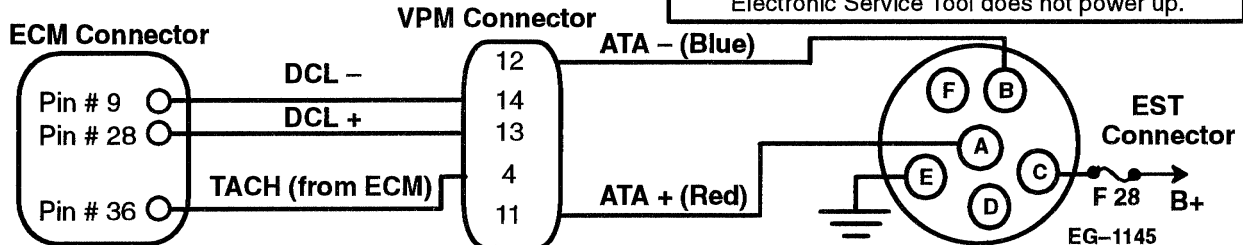
The VPM and ECM can detect on a continuous basis an open, short or intermittent connection on the DCL and ATA lines.

DCL/ATA COMMUNICATION LINKS (DCL/ATA)

VPM Communications**DCL ± Data Communication Link****ATA ± American Trucking Association****Fault Codes:**

223 VPM Not Communicating with ECM
 231 ATA Common Fault
 232 Unable to Forward ECM Message to ATA DCL
 234 Unable to Forward ATA Message to ECM
 235 VPM/ECM DCL Fault
 633 ECM/VPM Common Fault

No Data Stream or Fault Codes displayed on EST
 Electronic Service Tool does not power up.



After removing connector always check for damaged pins, corrosion, loose terminals etc.

Key ON Engine OFF – Voltage Checks at EST Connector

+Test Points	Spec.	Signal	Comments
C to E	B+	Power	Should be power at C at all times.

Connector Checks to Ground at ECM

(Check with breakout box installed, ignition key should be in the OFF position)

Test Points	Spec.	Signal	Comments
#9 to #46	> 1000 ohm	DCL-	< 1000 ohms indicates a short to grd. either thru the harness or internal in the ECM or VPM. Disconnect VPM and measure to grd again. If short still present, disconnect ECM and measure to grd. If short is still present, repair harness.
#28 to #46	> 1000 ohm	DCL+	

Harness Resistance Checks

(Check with breakout box installed, ignition key should be in the OFF position)

Test Points	Spec.	Signal	Comments
#9 to 14	< 5 ohm	DCL-	Resistance from 60 pin connector to harness connector – DCL Signal
#28 to 13	< 5 ohm	DCL+	Resistance from 60 pin connector to harness connector – DCL Signal
12 to B	< 5 ohm	ATA-	Resistance from VPM connector to EST connector – ATA Signal
11 to A	< 5 ohm	ATA+	Resistance from VPM connector to EST connector – ATA Signal
C to B+	< 5 ohm	PWR	Resistance from EST connector to Fuse F28 – EST Power
E to Grd.	< 5 ohm	GRD	Resistance from EST connector to grd (ECM pin #46 if breakout box installed)

Fault Code Descriptions

223 VPM not communicating with ECM, DCL wiring faults, faulty VPM
 231 ATA Common Fault – ATA wiring faults, faulty VPM
 232 Unable to forward ECM message to ATA DCL – ATA wiring faults, faulty VPM
 234 Unable to forward ATA message to ECM—key is off w/EST installed, DCL wiring faults, faulty ECM
 235 VPM/ECM DCL Fault – DCL wiring faults, faulty ECM
 633 ECM/VPM Common Fault – DCL wiring fault, SW mismatch, faulty VPM

No Data Stream or Fault Codes displayed on Electronic Service Tool
 Electronic Service Tool does not power up.

ELECTRONIC CONTROL SYSTEM DIAGNOSTICS

DCL/ATA COMMUNICATION LINKS (DCL/ATA)

EXTENDED DESCRIPTION

ECM/VPM COMMUNICATION

The Navistar engine control system includes the Electronic Control Module (ECM), Vehicle Personality Module (VPM), and Injector Driver Module (IDM). Refer to **Figure 3.5-4.** for the following discussion.

The engine control system "communicates" with the Electronic Service Tool through connector (384) as shown in **Figure 3.5-4.** The EST communicates with the VPM using the American Trucking Association (ATA) data link lines⁽¹⁾.

The ECM communicates with the VPM through a proprietary data link channel (DCL). The Data Communications Link (DCL) channel connects the ECM and the VPM.

Both the ATA and DCL circuits use twisted wire pairs. All repairs to these pairs must maintain one complete twist per inch along the entire length of the circuits. These circuits are polarized (one positive and one negative) and reversing the polarity of these circuits will disrupt communications.

(1) - The ATA data link is defined by SAE recommended practices J1708 and J1587. This link and connector (384) were adopted by the Recommended Practices 1201 and 1202.

ATA COMMUNICATIONS

Refer to the circuit diagram on page 42 for the following discussion.

ATA DATA LINK CONNECTOR (384)

All communications between the EST (Prolink 9000™ using the Navistar cartridge) and the engine control system is done through the EST connector (384). This communications link supports:

- Displaying fault codes and operating conditions on the EST.
- Performing proprietary diagnostic tests programmed into the cartridge.
- Clearing fault codes.
- Programming performance parameter values.

EST connector (384) has six pins, labeled A through F, **Figure 3.5-4.** that provide the following:

- A. Fused BATTERY power is provided to Pin "C" to provide battery power for electronic service tools. Pin "E" provides a battery ground for the EST.
- B. Connector (384) terminal A is connected by circuit 98B(+) to the positive RED ATA bus and EST connector (384) terminal B is connected by circuit 98D(-) to the negative BLUE (428) bus. These two connections allow communication with all components connected to the data link at these same two busses.

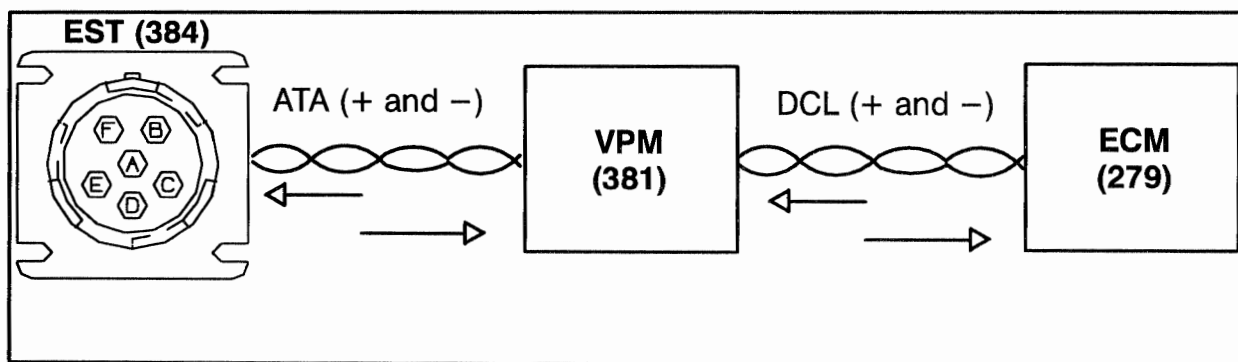


Figure 3.5-4. – ATA and DCL Communication

DCL/ATA COMMUNICATION LINKS (DCL/ATA)**EXTENDED DESCRIPTION (Continued)****POSITIVE AND NEGATIVE ATA DATA LINKS**

The RED Positive and BLUE Negative Data Link Busses connect the EST connector (384) and the VPM (381). They are also the connection point for other electronic components that require access to the engine control system through the ATA communications link.

The RED positive bus (427) is connected by circuit 98A(+) to the VPM at connector (381), terminal 11. The BLUE negative bus (428) is connected by circuit 98C(-) to the VPM at connector (381), terminal 12.

DCL COMMUNICATION LINKS

The VPM is connected to the ECM through the DCL. The DCL connection between the ECM and the VPM serves as a conduit for data sent on the ATA to be shared with the ECM. Communications between the ECM and the EST connector go through the VPM.

VPM - ECM COMMUNICATIONS

The positive (+) DCL link is circuit 97AS, which connects ECM connector (379) terminal 28, to the VPM through connector (381), terminal 13. The negative (-) DCL link is circuit 97AT, which connects ECM connector (379), terminal 9 to the VPM through connector (381), terminal 14. These two circuits (97AS and 97AT) are a twisted wire pair and pass through dash connector (3) at terminals 8 and 1.

Both the ATA and DCL circuits use twisted wire pairs. All repairs to these wire pairs must maintain one complete twist per inch along the entire length of the circuits. Both circuits are polarized (one positive and one negative) and reversing the polarity of the circuit will disrupt communications.

ECM DIAGNOSTICS

Flash codes that can be caused by defects occurring in the ATA or DCL circuits are discussed in this section. There are also Flash Codes related to or caused by faulty communication (corrupt or invalid data transmitted between the ECM and VPM), that are discussed in this section.

EST CONNECTOR (384)

The engine control system does not detect faults in the power or ground circuits to EST connector (384). If the service tool does not power up when

connected, try the service tool on another vehicle if one is available to determine if the service tool is working properly. If the service tool is OK, then perform Testing EST Connector (384) Power and Ground Circuits on page 43.

EST DISPLAYS

Should the EST display NO DATA, the ATA data link circuit from the EST connector to the VPM may be disrupted. Verify that the key is ON and then perform Testing The ATA Data Link Circuits on page 44.

FAULT CODES**FLASH CODE 223****ATA CODE SID 252 FMI 7****VPM NOT COMMUNICATING WITH ECM**

Symptom: Flash code 223 causes the engine to operate in Field Defaults, which turns the Engine Warning Light ON. When Field Defaults are being used by the ECM, Flash Code 622 also is set. If the condition causing code 223 is intermittent, and the condition is no longer present, the code will change to an inactive code, and the engine will resume normal operation.

Wiring Causes: DCL circuits 97AS and/or 97AT between the ECM and VPM: shorted Low or High or Open.

If code 223 is active:

1. Perform TESTING DCL CIRCUITS on page 47.
 - A. If defect is found in DCL circuit, correct defect.
 - B. If the DCL circuits (97AT and 97AS) check good, replace the VPM.

FLASH CODE 231**ATA CODE SID 250 FMI 2****VPM: ATA COMMON FAULT**

SYMPTOM: Code 231 **does not** turn Engine Warning light ON. This code can occur when the VPM can't access the ATA data link. If this occurs, there will not be any ATA data available at the electronic service tool (EST). The code can be "flashed" using the STI switch located on the instrument panel.

WIRING CAUSES: ATA positive or negative circuits between EST and VPM and any other electronic devices (transmissions, brakes etc.) using the ATA bus: Shorted (high or low), open, or busy (too many devices).

ELECTRONIC CONTROL SYSTEM DIAGNOSTICS

DCL/ATA COMMUNICATION LINKS (DCL/ATA)

DIAGNOSTICS (Continued)

FLASH CODE 231

ATA CODE SID 250 FMI 2

VPM: *ATA COMMON FAULT (Continued)*

If code 231 is active:

1. Perform Testing the ATA Data Link Circuits on page 44.
 - A. If defect is found in ATA circuits, correct defect.
 - B. If defect is not found in ATA circuits, investigate SYSTEM CAUSES.

SYSTEM CAUSES: System causes can include:

- A. A defective ATA device (such as transmission controller or antilock brake controller) connected to the ATA bus is pulling the signal to ground.
- B. Too many ATA devices, although this would be rare.
- C. If no system causes are present, replace the VPM.

FLASH CODE 232

ATA CODE SID 250 FMI 9

VPM: *UNABLE TO FORWARD ECM MESSAGE TO ATA DCL*

SYMPTOM: There are no ECM replies to requests from the EST or VPM. Flash Code 232 **does not** turn the Engine Warn Light ON.

WIRING CAUSES: The positive and/or negative ATA data link circuits between the EST and VPM (or other devices installed using the ATA link): Shorted High or Low or Open.

If code 232 is active:

1. Perform Testing the ATA Data Link Circuits on page 44.
 - A. If wiring defect is found, correct defect.
 - B. If no wiring defects are found, investigate System Causes.

SYSTEM CAUSES: Code 232 can occur when the ECM is sending more messages than the VPM can transmit on the ATA bus. This can be caused by:

- A. A defective ATA device (such as transmission controller or antilock brake controller) connected to the ATA bus pulling the signal to ground.

- B. Too many ATA devices or an incompatible ATA device has been connected to the ATA bus.

- C. May be caused by code 231 occurring.

- D. If none of the system causes are present, replace the VPM.

FLASH CODE 234

ATA CODE SID 248 FMI 9

VPM: *UNABLE TO FORWARD ATA MESSAGE TO ECM.*

SYMPTOM: There are no ECM replies to requests from the EST or VPM. There is NO Engine Warning Light. Code 223 may also be present.

NOTE: Code 234 can be set by connecting the EST when the key is OFF. If the key was recently turned off, the VPM may still be powered. The VPM can stay on for up to 30 minutes after turning the key off. If the prolink is connected (key off), the VPM will unsuccessfully request data from the ECM, which is not powered with the key off. If this occurs, turn the key on and clear the codes.

WIRING CAUSES: DCL positive or negative circuits (97AT and/or 97AS): Shorted High or Low or open between ECM and VPM.

If code 234 is active:

1. Verify that ignition key is ON.
2. Perform Testing DCL Data Link Circuits on page 47.
 - A. If defect is found in DCL, correct defect.
 - B. If no defects are in DCL, replace the ECM.

FLASH CODE 235

ATA CODE SID 248 FMI 2

VPM: *VPM/ECM DCL FAULT*

SYMPTOM: There are no ECM diagnostic replies to requests from the EST or VPM. Engine Warning Light OFF. If the condition causing code 235 to set is intermittent and the condition is no longer present, the code will go to inactive status.

WIRING CAUSES: DCL circuits 97AT and/or 97AS are: shorted High or Low or Open between VPM and ECM.

If code 235 is active, Perform Testing DCL Data Link Circuits on page 47.

- A. If wiring defect is found, correct defect.
- B. If wiring defect is not found, replace the ECM.

DCL/ATA COMMUNICATION LINKS (DCL/ATA)

DIAGNOSTICS (Continued)

FLASH CODE 633

ATA CODE SID 252 FMI 2

ECM: ECM/VPM COMMON FAULT

SYMPTOM: The engine operates on Field Defaults turning the Engine Warning Light ON and setting code 622.

This code indicates that the ECM and VPM are communicating incorrectly. The message from the VPM contains bad data, or the VPM takes too long to respond to ECM requests for data. If this code is caused by an intermittent condition, and the condition is no longer present, the code will become inactive and normal engine operation will resume.

WIRING CAUSES: DCL circuits 97AT or 97AS between ECM and VPM are: shorted Low, High or Open.

If code 633 is active:

1. Perform Testing DCL Data Link Circuits on page 47.
 - A. If defect is found in DCL, correct.
 - B. If there are no defects in the DCL, refer to codes 613 and 614 and verify that the ECM and VPM have the correct software versions. If the software versions are correct, replace the VPM.

ELECTRONIC CONTROL SYSTEM DIAGNOSTICS

DCL/ATA COMMUNICATION LINKS (DCL/ATA)

CIRCUIT DIAGRAM

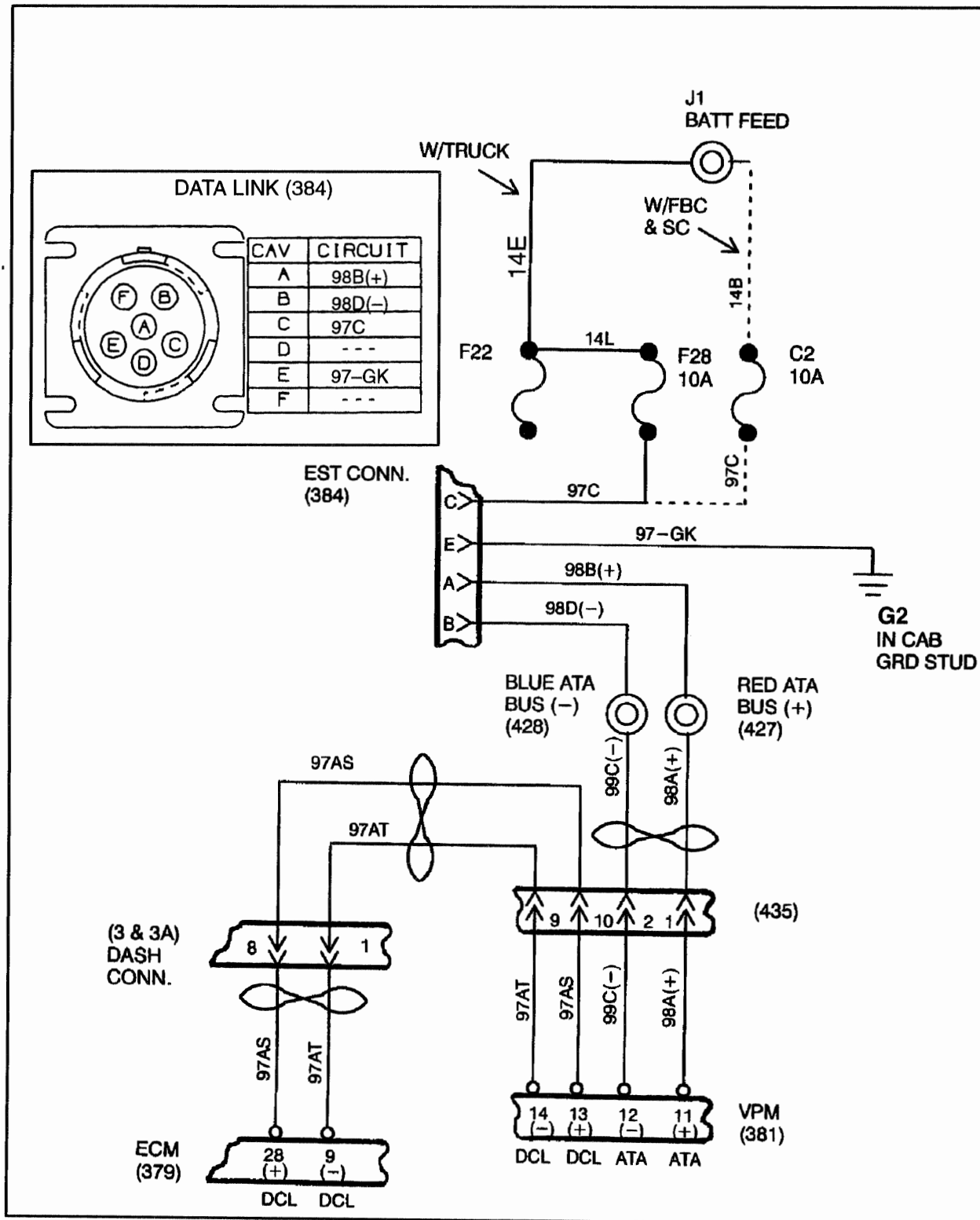


Figure 3.5-5. – ATA and DCL Communication Links

DCL/ATA COMMUNICATION LINKS (DCL/ATA)

TROUBLESHOOTING

The DCL and ATA circuits operate with very low current levels. When troubleshooting the DCL or ATA, pay special attention to the connectors.

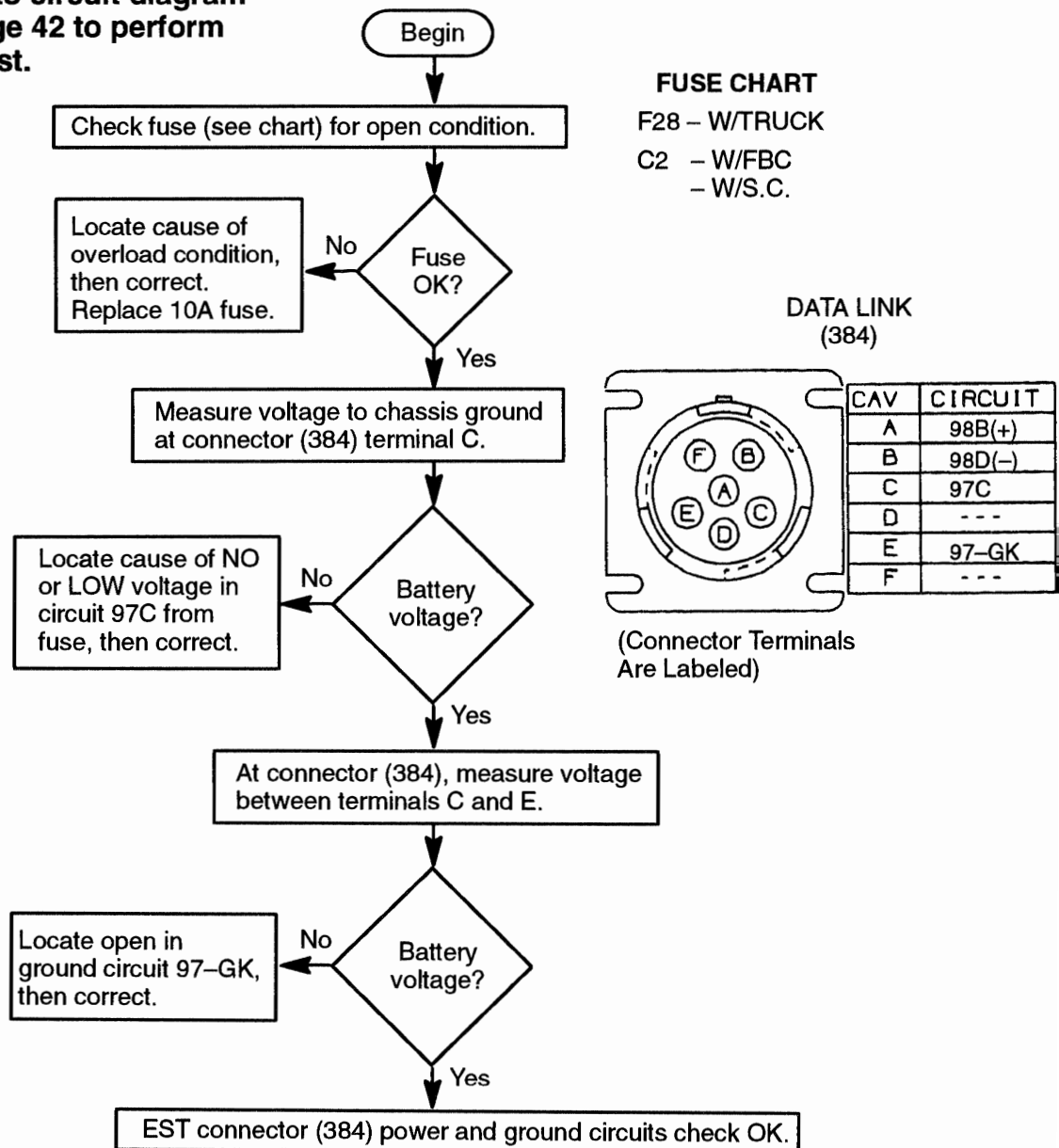
BEFORE PERFORMING ANY TEST

Inspect for pushed back, damaged, corroded or

dirty terminals as well as making sure that the terminal and wire are properly crimped. Make sure the connectors are properly joined together. Also check for damage to wiring, and clean tight ground connections.

TESTING EST CONNECTOR (384) POWER AND GROUND CIRCUITS

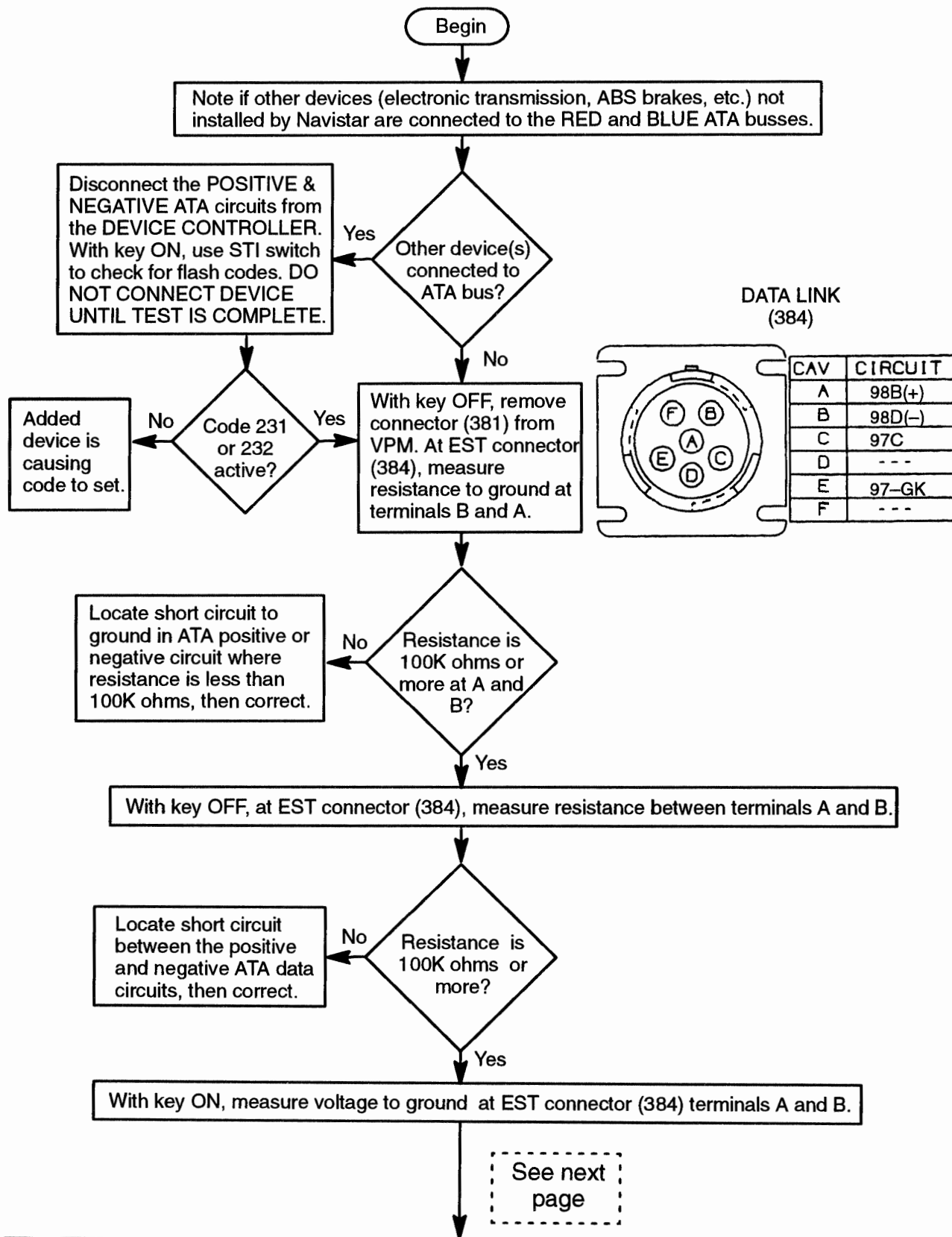
Refer to circuit diagram on page 42 to perform this test.



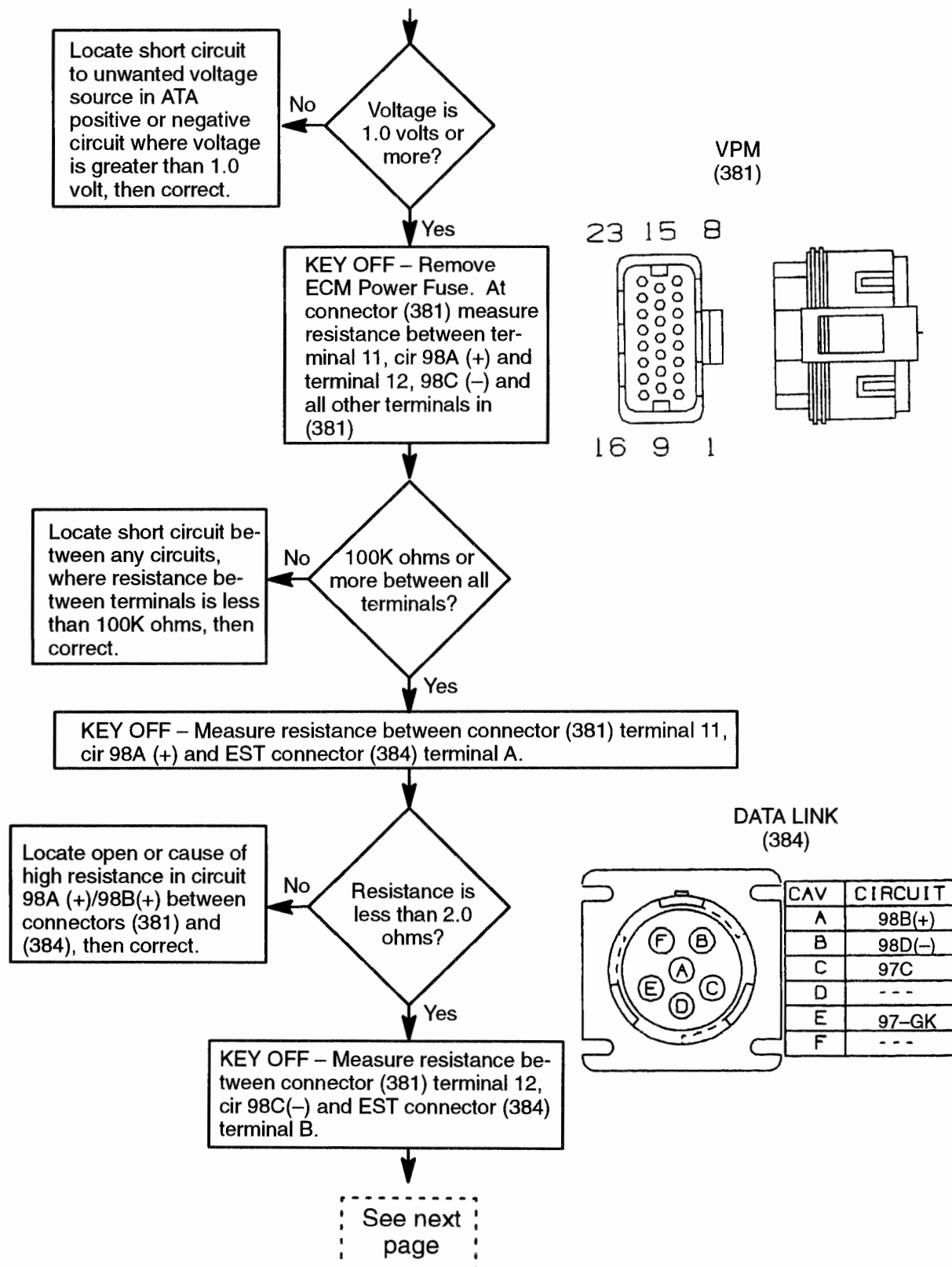
ELECTRONIC CONTROL SYSTEM DIAGNOSTICS

DCL/ATA COMMUNICATION LINKS (DCL/ATA)

TESTING THE ATA DATA LINK CIRCUITS



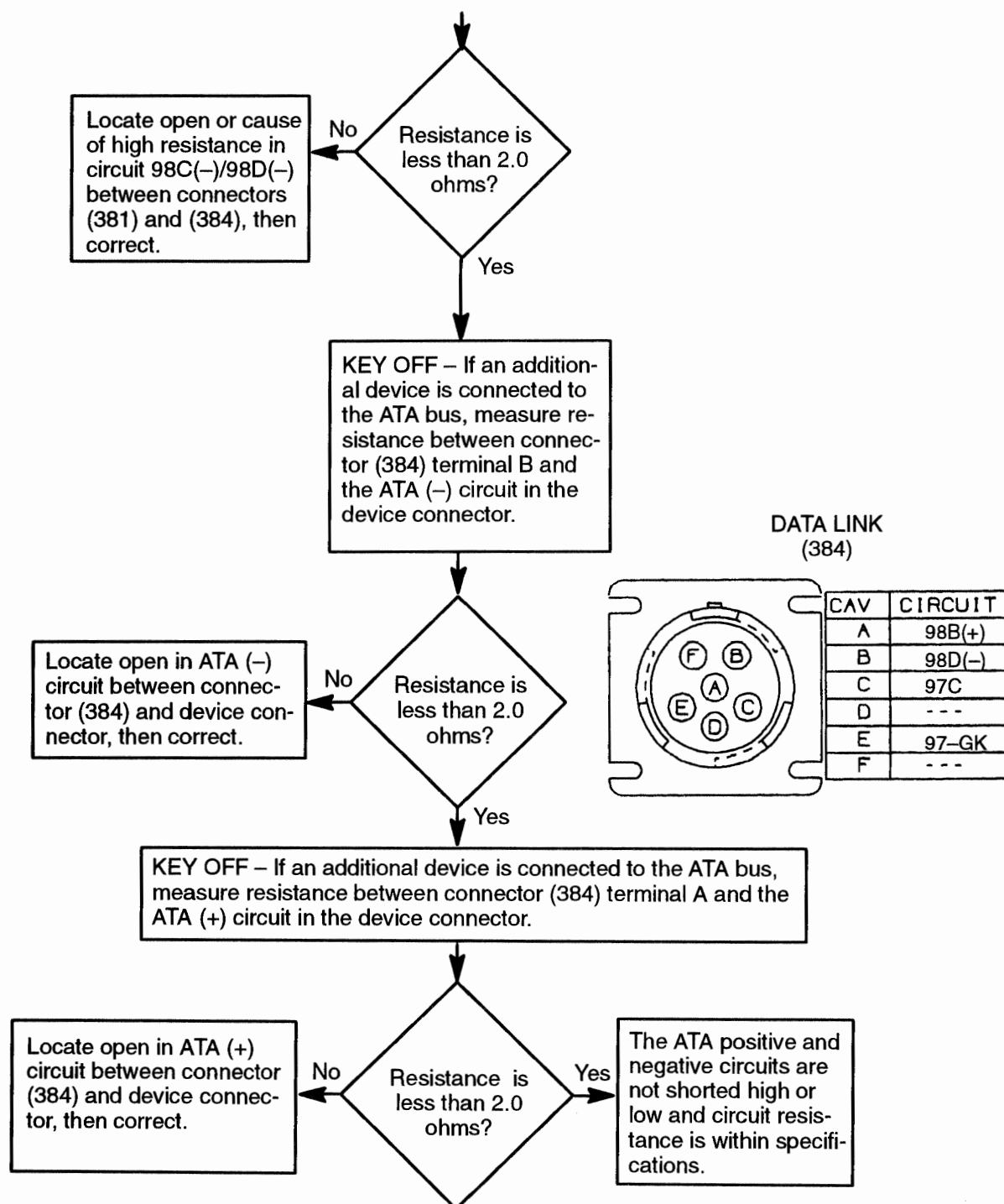
TESTING THE ATA DATA LINK CIRCUITS (Continued)



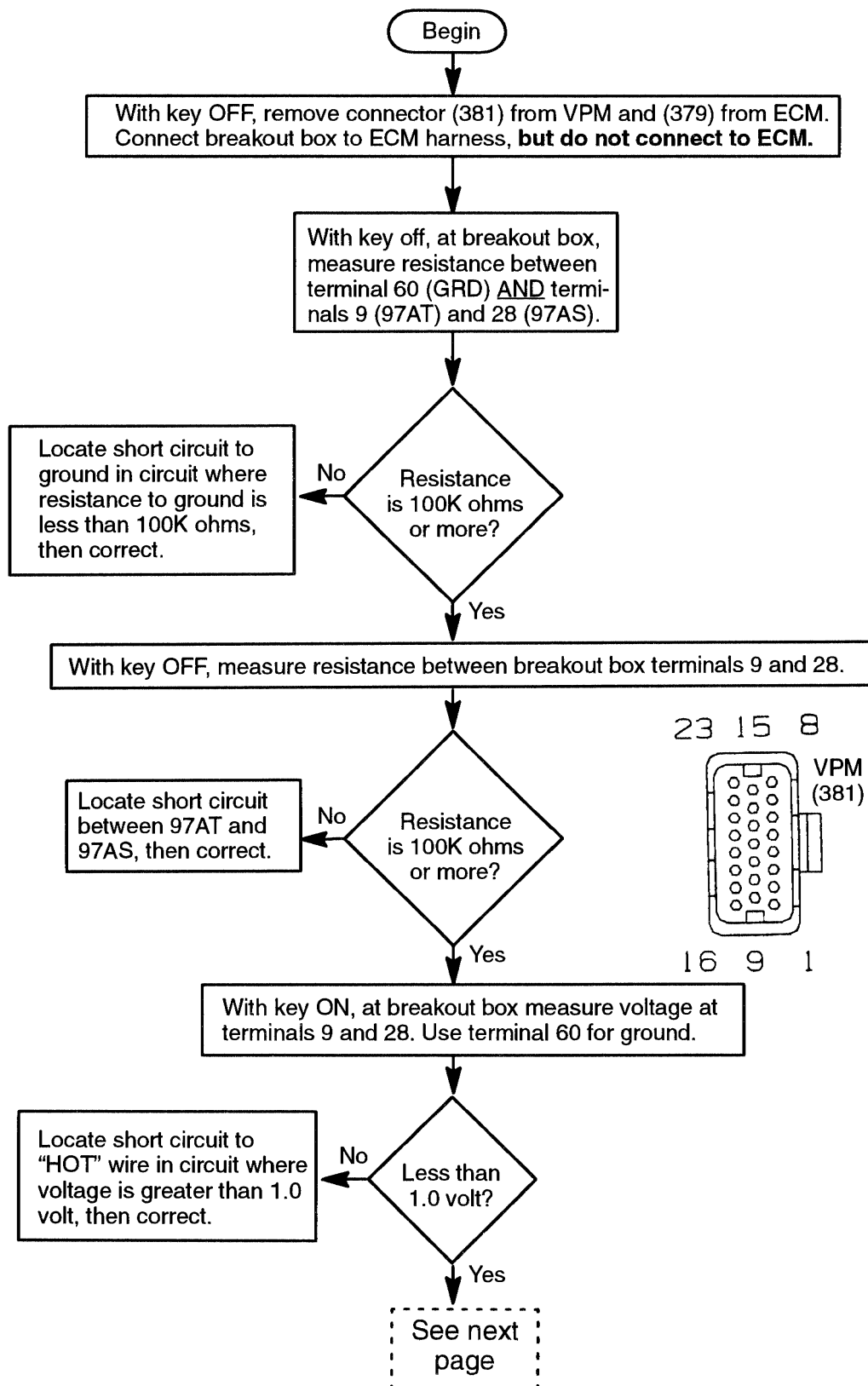
ELECTRONIC CONTROL SYSTEM DIAGNOSTICS

DCL/ATA COMMUNICATION LINKS (DCL/ATA)

TESTING THE ATA DATA LINK CIRCUITS (Continued)



TESTING DCL DATA LINK CIRCUITS



ELECTRONIC CONTROL SYSTEM DIAGNOSTICS

DCL/ATA COMMUNICATION LINKS (DCL/ATA)

TESTING DCL DATA LINK CIRCUITS (Continued)

