Troubleshooting Guide for Jacobs Electronic Controls with DDEC

Introduction

The Jacobs Electronic Control and Dash Modules are sealed electronic devices and are not user serviceable. To determine if these devices require replacement, follow the step-by-step procedures within this troubleshooting guide.

The Model 760/760A/765 and Model 71/92A electronic controls can be operated using either the electronic dash module or the standard dash toggle switches.

The on-board diagnostic features of these electronic controls can only be used when the electronic dash module is installed.

Equipment Required

- Voltmeter with 20,000 ohm/volt input impedance, minimum. Keep the voltmeter on the 20 VDC/DIV scale for the 12V control and 200 VDC/DIV scale for the 24V control for all test measurements.

  NOTE:
  THIS CONTROL CAN BE USED FOR EITHER 12 VDC AND 24 VDC OPERATIONS. +12/24 VOLTS IS USED WHEN REFERRING TO THE (+) BATTERY VOLTAGE. IF MEASURING THE VOLTAGE AT THE SOLENOID VALVES, MAKE SURE THAT ALL WIRING HARNESSES ARE CONNECTED. IF THE VOLTAGE AT THE OUTPUT OF THE CONTROL IS MEASURED WITHOUT THE SOLENOID VALVES CONNECTED, BOTH THE BLUE AND YELLOW WIRES WILL MEASURE APPROXIMATELY +12/24 VOLTS. THESE ARE INTERNAL VOLTAGES ESTABLISHED BY THE CONTROL MODULE WHEN THE OUTPUT WIRES ARE DISCONNECTED.

Application Information

Engine Brake Model	Engine Model	Current Controls
760 760A 765	Series 60	3-position: LO/MED/HI
71/92A	6V-71, 6V-92, 8V-71, 8V-92, 6-71	2-position: LO/HI

Operational Function

Custom Control System

The electronic controls for the Models 760/760A/765 and 71/92A engine brakes include a dash module, a control module and associated wire harnesses. The 71/92A Electronic Control has a "Jake Brake" logo in place of the "MED", and has only two modes of operation: HI and LO.

With the ignition switch turned ON, the engine brake control system is energized. The RED light will be on, indicating that the control module is "OFF".

To turn the control module "ON", press the ON/OFF button. The RED light in the ON/OFF quadrant will go off and the GREEN light in the LO quadrant will come on, indicating that the engine brake is operational in the low mode, center housing, only two engine cylinders retarding.

Pressing the MED button will turn off the light in the LO quadrant and turn on the light in the MED quadrant indicating that the engine brake is operational in the MED mode, front and rear housings, four engine cylinders retarding.

Pressing the HI button will cause the light in the MED quadrant to go out and the light in the HI quadrant to come on, indicating that the engine brake is operational in the HI mode, all housings, six engine cylinders retarding.

For Allison Electronic Transmission applications (ATEC), ensure that the BLUE/WHITE wire on wire harness, P/N 015709, is connected to ATEC ECM Wire No. 211. Ensure that the BLACK and WHITE wires are butt spliced together.

For non-Electronic Allison Transmissions applications, a pressure switch must be used to sense lock-up in the transmission. The pressure switch takes the place of the clutch switch.

NOTE:
CHECK WIRING BEFORE TROUBLESHOOTING IS BEGUN (REFER TO FIGS. 4 AND 5).

1. Check that all wiring and harness connections are good.

⚠ CAUTION

INSURE A GOOD SECURE GROUND CONNECTION IS MADE, PREFERABLY TO THE ENGINE BLOCK.

2. Check the circuit breaker to ensure that it is not tripped or that the fuse is not blown for the power feed to the electronic control module.

3. Check to ensure that the clutch switch is installed correctly and is wired into the control module.

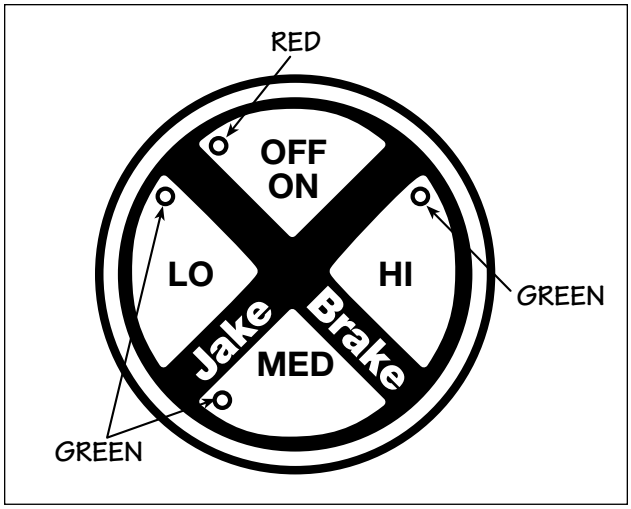


FIG. 1

Troubleshooting DDEC Electronic Control System Utilizing the Dash Module

If the RED light fails to come on when the ignition is turned on, make the following checks:

1. **Check the Supply Voltage.**
   Turn the ignition ON. Disconnect the harness, P/N 015708, from the control module connector. Measure the voltage at the REDwire. Place the positive (+) probe of the voltmeter on the terminal of the RED wire of the harness, P/N 015708, and the negative (-) probe to ground. The voltmeter should read+12 volts. If it does not, check the connections and make sure the system is energized. Reconnect the harness to the control module weather-pack connector.

2. **Check the Regulator Voltage.**
   If the supply voltage checked in Step 1 reads +12 volts and the RED light still fails to come on, measure the voltage at the end of the ORANGE wire coming from the 015708 harness. Place the (+) probe of the voltmeter to the ORANGE wire and the negative (-) probe to ground. The voltmeter should read +5 volts, +/- 0.5 volts. If it does not, replace the control module. Insulate the wire.

3. **Check the Dash Module.**
   If the voltage checks in Steps 1 and 2 are correct and the RED light remains off, the problem exists in either the dash module or the ribbon cable coming from the dash module to the control module. Remove and replace these units one at a time to correct the problem.

Diagnostic Functions: Models 760/760A/765 and 71/92A

By using Dash Module, P/N 015641 and 015640, troubleshooting of the Jake Brake Models 760/760A/765 and 71/92A control module is simplified, with most of the troubleshooting being done within the cab.

The electronic control has self-testing features which allow the user or mechanic to check all input and output connections without leaving the driver's seat.

Diagnostic Features

- Open circuit and short circuit conditions on the solenoid enable lines.
- Dash module light test
- Status of input connections
- Status of engine brake signal from the engine ECM.

Flashing RED Light During Power Up

When the ignition is turned on, the electronic control will automatically be in the OFF position. At this time the control will sense any open circuit condition associated with the engine brake enable output lines. These are the BLUE and YELLOW wires coming from the control module to the Jake Brake housings.

If the RED light begins to flash during power up an open connection is being sensed. A steady GREEN light will then come on, indicating which output wire has an open connection.

Steady GREEN in the LO quadrant indicates an open connection associated with BLUE output wire.

Steady GREEN in the MED quadrant indicates an open connection associated with YELLOW output wire(s).

When an open indication occurs, the chances are that a connection has fallen off one of the terminals. Major points to check are the solenoid terminal connections and the under valve cover wiring. Insure no wires are broken. Fig. 2 shows the Model 760/760A/765 under valve cover wiring.

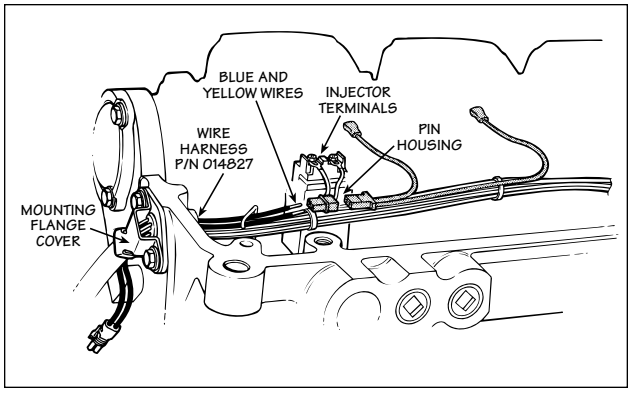


FIG. 2

Flashing GREEN Light During Engine Brake Operation

When the engine brake(s) are energized and a GREEN light in either the LO or MED quadrant begins to flash, it is indicating a short circuit condition associated with the engine brake enable output lines. These are the BLUE and YELLOW wires coming from the Electronic Control Module to the Jake Brake housings.

Flashing GREEN in the LO quadrant indicates a short circuit connection associated with the BLUE output wire.

Flashing GREEN in the MED quadrant indicates a short circuit connection associated with the YELLOW output wire(s).

When a short circuit connection occurs, the chances are that a wire may have been pinched to ground. Major points to check are the solenoid terminal connections and the under valve cover wiring. Fig. 2 shows the Model 760/760A/765 under valve cover wiring.

⚠ CAUTION

WHEN A SHORT CIRCUIT CONDITION OCCURS, THE ELECTRONIC CONTROL MODULE IS EQUIPPED WITH LIMP HOME CAPABILITY. IF A SHORT CIRCUIT CONDITION OCCURS IN THE LO QUADRANT, SWITCH THE ELECTRONIC DASH MODULE TO THE MED MODE. IF A SHORT CIRCUIT CONDITION OCCURS IN THE MED QUADRANT, SWITCH THE ELECTRONIC DASH MODULE TO THE LO MODE.

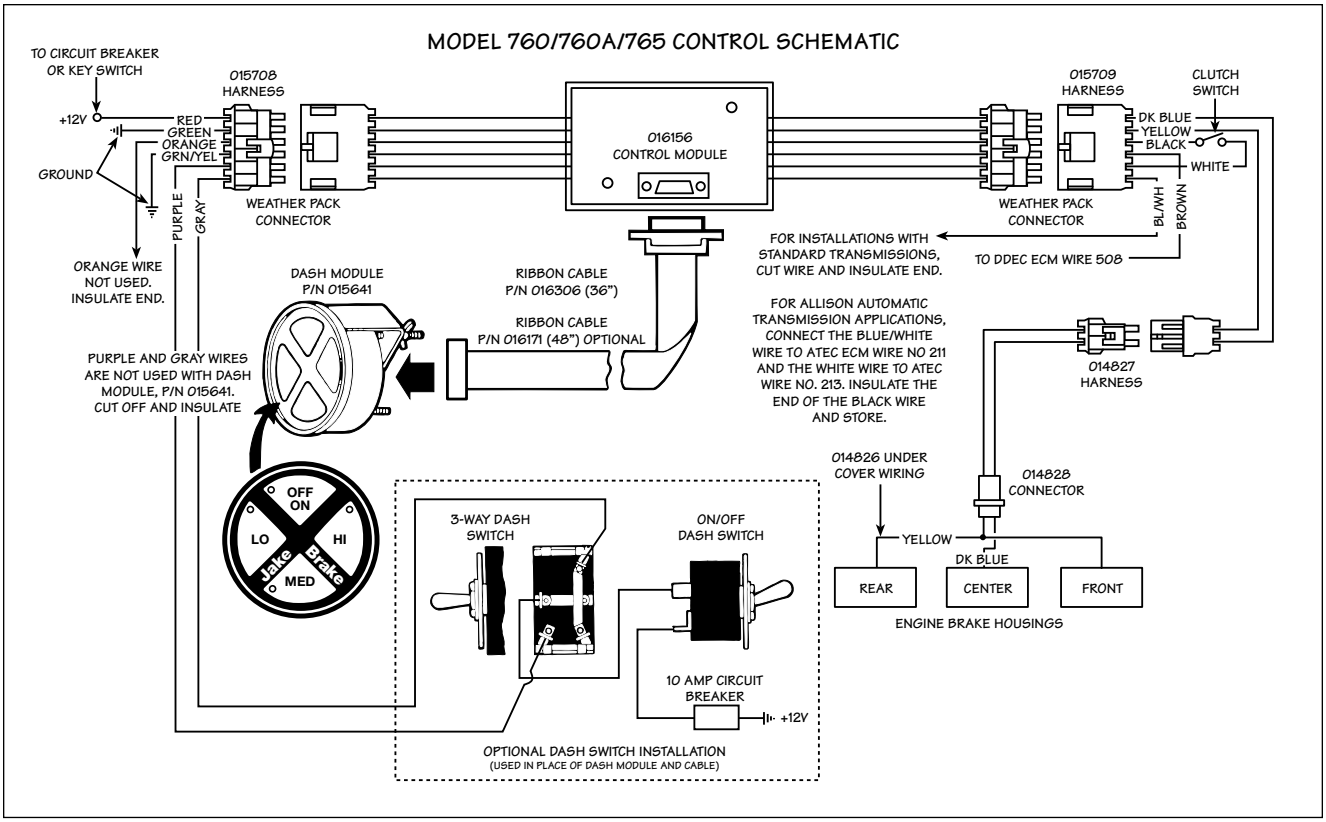
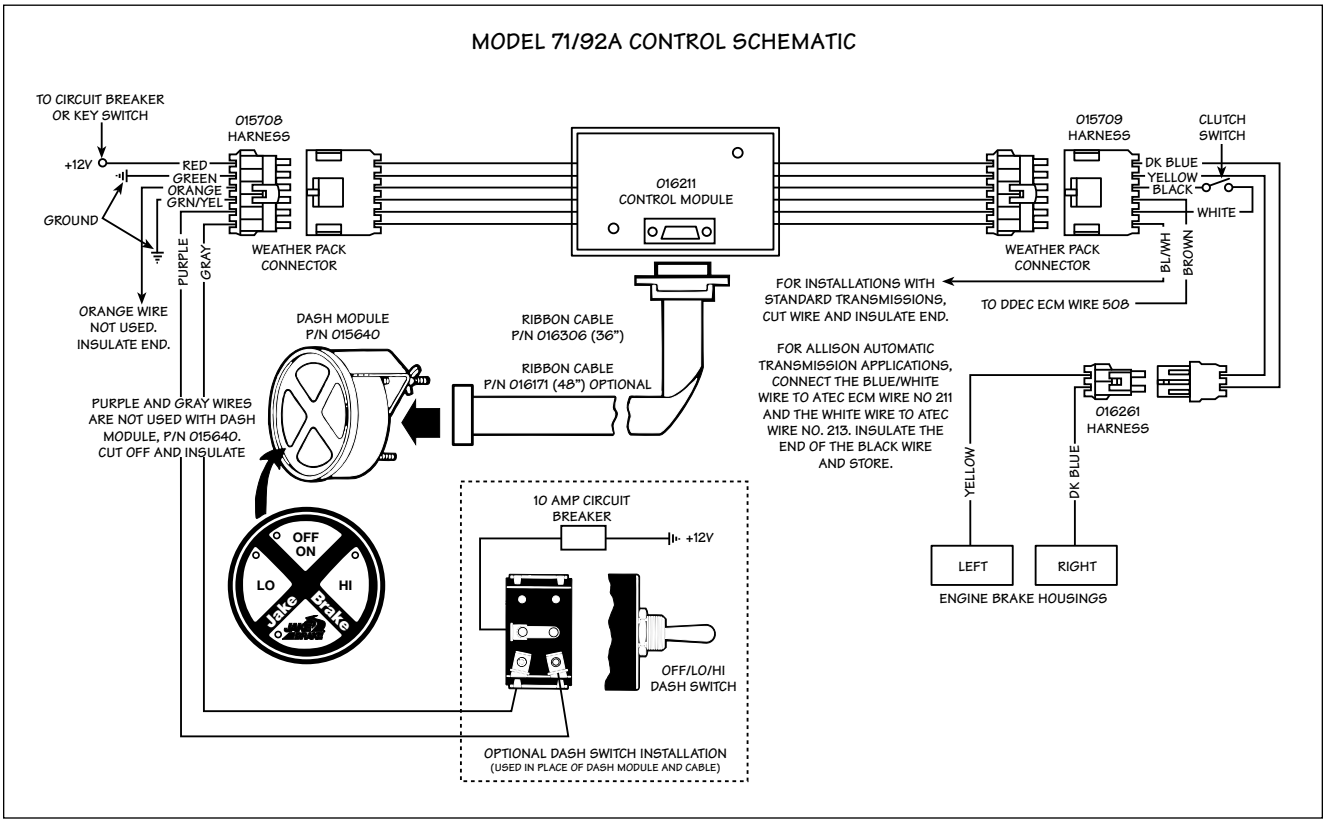

MODEL 760/760A/765 CONTROL SCHEMATIC
TO CIRCUIT BREAKER OR KEY SWITCH
+12V
GROUND
015708 HARNESS
RED
GREEN
ORANGE
GRN/YEL
PURPLE
GRAY
WEATHER PACK CONNECTOR
016156 CONTROL MODULE
015709 HARNESS
CLUTCH SWITCH
DK BLUE
YELLOW
BLACK
WHITE
BL/WH
BROWN
WEATHER PACK CONNECTOR
FOR INSTALLATIONS WITH STANDARD TRANSMISSIONS, CUT WIRE AND INSULATE END.
TO DDEC ECM WIRE 508
ORANGE WIRE NOT USED. INSULATE END.
DASH MODULE P/N 015641
RIBBON CABLE P/N 016306 (36")
RIBBON CABLE P/N 016171 (48") OPTIONAL
FOR ALLISON AUTOMATIC TRANSMISSION APPLICATIONS, CONNECT THE BLUE/WHITE WIRE TO ATEC ECM WIRE NO 211 AND THE WHITE WIRE TO ATEC WIRE NO. 213. INSULATE THE END OF THE BLACK WIRE AND STORE.
014827 HARNESS
PURPLE AND GRAY WIRES ARE NOT USED WITH DASH MODULE, P/N 015641. CUT OFF AND INSULATE
OFF
ON
LO
HI
MED
Jake Brake
014826 UNDER COVER WIRING
014828 CONNECTOR
YELLOW
DK BLUE
REAR
CENTER
FRONT
ENGINE BRAKE HOUSINGS
3-WAY DASH SWITCH
ON/OFF DASH SWITCH
10 AMP CIRCUIT BREAKER
+12V
OPTIONAL DASH SWITCH INSTALLATION
(USED IN PLACE OF DASH MODULE AND CABLE)

FIG. 4


MODEL 71/92A CONTROL SCHEMATIC
TO CIRCUIT BREAKER OR KEY SWITCH
+12V
GROUND
015708 HARNESS
RED
GREEN
ORANGE
GRN/YEL
PURPLE
GRAY
WEATHER PACK CONNECTOR
016211 CONTROL MODULE
015709 HARNESS
CLUTCH SWITCH
DK BLUE
YELLOW
BLACK
WHITE
BL/WH
BROWN
WEATHER PACK CONNECTOR
FOR INSTALLATIONS WITH STANDARD TRANSMISSIONS, CUT WIRE AND INSULATE END.
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ORANGE WIRE NOT USED. INSULATE END.
DASH MODULE P/N 015640
RIBBON CABLE P/N 016306 (36")
RIBBON CABLE P/N 016171 (48") OPTIONAL
FOR ALLISON AUTOMATIC TRANSMISSION APPLICATIONS, CONNECT THE BLUE/WHITE WIRE TO ATEC ECM WIRE NO 211 AND THE WHITE WIRE TO ATEC WIRE NO. 213. INSULATE THE END OF THE BLACK WIRE AND STORE.
016261 HARNESS
PURPLE AND GRAY WIRES ARE NOT USED WITH DASH MODULE, P/N 015640. CUT OFF AND INSULATE
OFF
ON
LO
HI
Jake Brake
YELLOW
DK BLUE
LEFT
RIGHT
ENGINE BRAKE HOUSINGS
10 AMP CIRCUIT BREAKER
+12V
OFF/LO/HI DASH SWITCH
OPTIONAL DASH SWITCH INSTALLATION
(USED IN PLACE OF DASH MODULE AND CABLE)

FIG. 5

DDEC Electronic Control Diagnostic Features

The Jake Brake Models 760/760A/765 and 71/92A electronic control module is equipped with diagnostic features to indicate the operational status of the control. For proper testing and diagnostic status indication, the engine should be running. To check the status of the engine brake enable signal, increase the engine RPMs to rated engine speed and release the throttle. The electronic control will not enable the engine brakes when in the diagnostic mode, it will only give a visual indication.

With the electronic control module "ON", depress the "HI" button for at least 5 seconds. All four indicator lights will flash four times.

⚠ CAUTION

WHEN THE LIGHTS BEGIN TO FLASH, IF ANY ONE OF THE FOUR LIGHTS DO NOT COME ON, REPLACE THE DASH MODULE.

The electronic control is now in the diagnostic mode. Refer to Table 1 for proper status indication.

For the electronic control to enable the engine brakes, the diagnostic status indicator lights should all be illuminated.

To exit the diagnostic mode press the ON/OFF button.

This procedure is used to troubleshoot the Jake Brake Models 760/760A/765 and 71/92A control module using selector toggle switches instead of the dash module. Refer to Figs. 4 and 5 for the following procedures.

Once all connections have been checked, energize the system. Turn the engine brake ON/OFF switch to the "ON" position, and place the mode selector switch in the "HI" mode. Increase the engine RPMs to the rated engine speed and release the throttle, with the clutch engaged, the engine brakes should come on. If they fail to do so, check all connections and repeat. If the same result occurs, follow the step-by-step procedure on page 6, keeping the system energized.

1. **Check the Supply Voltage.**
   Turn the ignition ON. Disconnect the harness, P/N 015708, from the control module connector. Measure the voltage at the REDwire. Place the positive (+) probe of the voltmeter on the terminal of the RED wire of the harness, P/N 015708, and the negative (-) probe to ground. The voltmeter should read +12 volts. If it does not, check the connections and make sure the system is energized. Reconnect the harness to the control module weather-pack connector.

(continued on page 6)

Indicator Light	Status
ON/OFF	If illuminated, there is an engine brake signal coming from the ECM, Wire 508. Engine RPMs must be increased above 1000 RPMs to obtain this signal
LO	Illuminated when the GREEN/YELLOW wire is grounded.
MED	Illuminated when the ORANGE wire is not grounded.
HI	Illuminated when the clutch pedal is not depressed.

TABLE 1

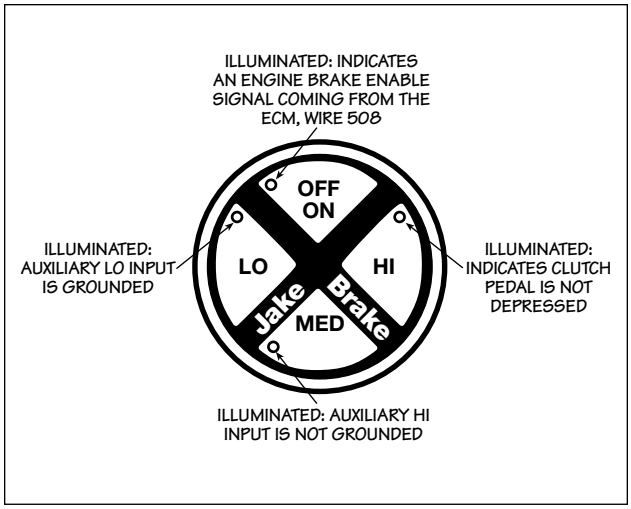

FIG. 3

2. **Check the Regulator Voltage.**
   If the supply voltage checked in Step 1 reads +12 volts, measure the voltage at the end of the ORANGE wire coming from the harness, P/N 015708. Place the (+) probe of the voltmeter to the ORANGE wire and the negative (-) probe to ground. The voltmeter should read +5 volts, +/- 0.5 volts. If it does not, replace the control module. Insulate the wire.

3. **Check the Selector Switch Connections.**
   If both Steps 1 and 2 are operating correctly, continue. Disconnect the harness, P/N 015708, from the control module connector. Measure the voltage at the PURPLE and GRAY wires. Both measurements should read +12 volts. If they do not, check the connections on the selector switch. The PURPLE and GRAY wires should supply +12 volts to the control module when in the HI mode. Refer to Fig. 1 and check the connections.

4. **Check the Clutch Switch Operation.**
   If the voltage at the selector toggle switches is correct, check the operations of the clutch switch. Place the (+) probe of the VOM on the terminal of the WHITE wire. With the clutch pedal up, the VOM should read +5 volts, +/- 0.5 volts. With the clutch pedal depressed, the VOM should read 0 volts. If the voltmeter does not read 0 volts when the clutch pedal is depressed, check all wiring associated with the clutch pedal.

5. **Check the ECM Signal.**
   If the operation of Step 4 was correct and the control still does not operate, check the DDEC control signal coming from the engine computer. With the (+) probe of the voltmeter on the terminal of the BROWN wire and the (-) probe on ground, increase the engine RPMs to the rated engine speed and release the throttle. As the RPMs decrease, watch the voltmeter. It should change from approximately +5 volts (with throttle) to 0 volts when the RPMs decrease (no throttle). If the voltage does not change, make sure the clutch pedal is up. If the voltage still does not change, check Wire 508 on DDEC engine computer.

   If the control module still does not operate when replaced, then the problem may be in the interface signal provided by the DDEC ECM.

Automatic Transmissions

For Allison Electronic Transmission applications (ATEC) ensure that the BLUE/WHITE wire on wire harness, P/N 015709, is connected to ATEC ECM Wire No. 211. Ensure that the BLACK and WHITE wires are butt spliced together.

For non-Electronic Allison Transmissions applications (non-ATEC), a pressure switch must be used to sense lock-up in the transmission. The pressure switch takes the place of the clutch switch.

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