

2021 ELECTRICAL

Wiring Systems and Power Management - Diagnostic Information and Procedures - Canyon, Colorado

DIAGNOSTIC INFORMATION AND PROCEDURES

DTC B1370-B1379, B1380-B1389, OR B1440-B1443

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptors

DTC B1370

Control Module Ignition ON and Start Circuit

DTC B1380

Control Module Ignition Accessory Circuit

DTC B1441

Control Module Ignition Off, Run, and Crank Circuit

For symptom byte information refer to [Symptom Byte List](#)

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+ terminal 2	B1370 04, B1380 04	B1370 04, B1380 04	-	-
Ignition Terminal 1	B1370 04, B1380 04	B1370 04	B1370 01	-
Ignition Terminal 3	B1370 04, B1380 04	B1380 04	B1380 01	-
Ignition Terminal 4	B1370 04, B1380 04, B1441 04	B1441 04	B1441 01	-
5 V Reference	-	1	-	-
1. Vehicle will not change power mode				

Circuit/System Description

The vehicle power mode master is the body control module (BCM). The ignition switch is a low current switch with multiple discrete circuits to the BCM. The BCM logic uses the ignition switch positions to identify the operator's desired power mode and activate specific discrete signals, and serial data messages for the operation of different subsystems as necessary. Other modules which have switched voltage inputs may operate in a default mode if the power mode master serial data message does not match what the individual module can detect from its own connections.

The power mode master will activate relays and other direct outputs of the power mode master as needed according to the calculated power mode. Some relays controlled by the BCM are switched ignition voltage

outputs that are pass through circuits within the BCM directly from the ignition switch. If these circuits short to ground, the B+ circuit fuse to the ignition switch will open.

Conditions for Running the DTC

B1370 01, B1370 04

Ignition switch is in the RUN or CRANK positions.

B1380 01, B1380 04

Ignition switch is in the RUN or ACCESSORY positions.

B1441 01, B1441 04

Ignition switch is in the CRANK position.

Conditions for Setting the DTC

B1370 01

Ignition circuit is shorted to voltage.

B1370 04

- Ignition circuit is open.
- Ignition, accessory, or off/run/crank circuit shorted to ground.
- B+ circuit of the ignition switch is open or shorted to ground.
- Ignition relay control circuit open, including relay coil and ground.

B1380 01

Ignition, accessory circuit is shorted to voltage.

B1380 04

- Ignition, accessory circuit is open.
- Ignition, accessory, or off/run/crank circuit shorted to ground.
- B+ circuit of the ignition switch is open or shorted to ground.

B1441 01

Ignition, off/run/crank signal circuit is shorted to voltage.

B1441 04

Ignition, off/run/crank signal circuit is open.

Actions Taken When the DTC Sets

- The BCM operates in a fail-safe power mode dependent on the last valid power mode detected and the state of the engine run flag data on the serial data communications circuits.
- The other modules on the vehicle operate in a fail-safe power mode dependent on the last valid power mode transmitted by the BCM and the state of the engine run flag on the serial data communications circuits.

Conditions for Clearing the DTC

- The condition responsible for setting the DTC no longer exists.

- A history DTC will clear once 50 consecutive malfunction-free ignition cycles have occurred.

Diagnostic Aids

An open in the ignition switch B+ circuit or circuit fuse will cause the key in ignition warning chime to be inoperative.

Reference Information

Schematic Reference

- [Power Moding Wiring Schematics](#)
- [Power Distribution Wiring Schematics](#)

Connector End View Reference

[Master Electrical Component List](#) , or [Inline Harness Connector End Views - Index](#) or [Component Connector End Views - Index](#)

Description and Operation

[Power Mode Description and Operation](#)

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

[Control Module References](#) for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify DTC U1814 is not set.
 - **If DTC is set**
Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#) .
 - **Go to next step: If DTC is not set**
3. Verify the scan tool power mode parameters change when cycling the S39 Ignition Switch between OFF, ACCESSORY, ON, and CRANK.
 - **If the power mode parameters do not change**
Refer to Circuit/System Testing.
 - **Go to next step: If the power mode parameters change**
4. All OK.

Circuit/System Testing

1. Ignition OFF, disconnect the S39 Ignition Switch.
2. Verify a test lamp illuminates between the B+ circuit terminal 2 and ground.
 - **If the test lamp does not illuminate and the circuit fuse is good**

1. Remove the test lamp.
2. Test for less than 2 Ω in the B+ circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , verify the fuse is not open and there is voltage at the fuse.
- **If the test lamp does not illuminate and the circuit fuse is open**
 1. Remove the test lamp.
 2. Test for infinite resistance between the B+ circuit and ground.
 - If less than infinite resistance, repair the short to ground on one of the following circuits listed below:

NOTE: To help isolate a short to ground, it may be necessary to disconnect modules that are connected to the following circuits:

-
- B+ circuit terminal 2
- Ignition circuit terminal 1
- Ignition circuit terminal 3
- Ignition circuit terminal 4

• **Go to next step: If the test lamp illuminates**

3. Connect the S39 Ignition Switch.
4. Ignition ON, disconnect the harness connector at the S39 Ignition Switch while the ignition is ON.
5. Test for 4.8 - 5.2 V between the 5 V reference circuit terminal 6 and ground.
 - **If less than 4.8 V**
 1. Connect the S39 Ignition Switch.
 2. Ignition OFF, disconnect the X3 harness connector at the K9 Body Control Module and S39 Ignition Switch.
 3. Test for infinite resistance between the 5 V reference circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - Go to next step: If infinite resistance
 4. Test for less than 2 Ω in the 5 V reference circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K9 Body Control Module.
 - **If greater than 5.2 V**
 1. Connect the S39 Ignition Switch.
 2. Ignition OFF, disconnect the X3 harness connector at the K9 Body Control Module.
 3. Ignition ON, disconnect the harness connector at the S39 Ignition Switch while the ignition is ON.
 4. Test for less than 1 V between the 5 V reference circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K9 Body Control Module.
 - **Go to next step: If between 4.8 - 5.2 V**
6. Connect the harness connector at the S39 Ignition Switch.
7. Ignition OFF.
8. Disconnect the X3 harness connector at the K9 Body Control Module, ignition ON.
9. Verify a test lamp illuminates between each of the ignition circuits listed below and ground:
 - Ignition circuit terminal 5
 - Ignition circuit terminal 6

- **If the test lamp does not illuminate and the circuit fuse is good**

1. Ignition OFF, remove the test lamp, disconnect the harness connector at the S39 Ignition Switch.
2. Test for less than 2 Ω in the ignition circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , verify the fuse is not open and there is voltage at the fuse.

- **If the test lamp does not illuminate and the circuit fuse is open**

1. Ignition OFF, remove the test lamp.
2. Test for infinite resistance between the ignition circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - Go to next step: If infinite resistance, replace the K9 Body Control Module.

- **Go to next step: If the test lamp illuminates**

10. Ignition OFF with the key in.

11. Verify a test lamp illuminates between ignition circuit terminal 15 and ground.

- **If the test lamp does not illuminate and the circuit fuse is good**

1. Ignition OFF with the key out, remove the test lamp.
2. Test for less than 2 Ω in the ignition circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , verify the fuse is not open and there is voltage at the fuse.

- **If the test lamp does not illuminate and the circuit fuse is open**

1. Ignition OFF with the key out remove the test lamp.
2. Test for infinite resistance between the ignition circuit terminal 15 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - Go to next step: If infinite resistance, replace the K9 Body Control Module.

- **Go to next step: If the test lamp illuminates**

12. Connect the X3 harness connector at the K9 Body Control Module, ignition ON.

13. Disconnect the harness connector at the S39 Ignition Switch.

14. Test for less than 1 V between each of the ignition circuits listed below and ground.

- Ignition circuit terminal 1
- Ignition circuit terminal 3
- Ignition circuit terminal 4
- **If 1 V or greater**

Repair the short to voltage on the circuit.

- **Go to next step: If less than 1 V**

15. Test or replace the S39 Ignition Switch.

Component Testing

1. Ignition OFF, disconnect the harness connector at the S39 Ignition Switch.
2. Using the Resistance Test below, verify the resistance between the terminals listed below match for each S39 Ignition Switch position.

- **If any reading is other than specified**

Replace the S39 Ignition Switch.

- **Go to next step: If the readings match**

3. All OK.

Resistance Test

Ignition Switch Position	Terminals 1 and 2	Terminals 2 and 3	Terminals 2 and 4	Terminals 2 and 6	Terminals 4 and 6
OFF Key Out	Infinite	Infinite	Infinite	Infinite	Infinite
OFF Key In	Infinite	Infinite	<5.0 Ω	Infinite	Infinite
ACCESSORY	Infinite	<5.0 Ω	Infinite	Infinite	Infinite
ON/RUN	<5.0 Ω	<5.0 Ω	Infinite	Infinite	<5.0 Ω
CRANK	<5.0 Ω	Infinite	Infinite	Infinite	1275 - 1325 Ω

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [Ignition and Start Switch Replacement](#)
- [Control Module References](#) for control module replacement, programming and setup.

DTC B1445

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptor

DTC B1445 02

Control Module Voltage Output Circuit Short to Ground

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Relay Coil Control	B1445 02	1	1	-
Ground	-	1	-	-
1. Retained Accessory Power Malfunction				

Circuit/System Description

The body control module (BCM) controls the retained accessory power relay through the control circuit by applying voltage to the retained accessory power relay coil control circuit. The retained accessory power relay is energized when the ignition switch is in the ACCESSORY or the ON position.

Conditions for Running the DTC

- The system voltage is between 9 - 16 V.
- The DTC can only set when the output is actively being requested by the module.

Conditions for Setting the DTC

The DTC will set only when the module requests the output and there is a short to ground in the ignition voltage circuit.

Action Taken When the DTC Sets

The module output driver will be shut down and not supply voltage to the circuit.

Conditions for Clearing the DTC

- The current DTC will clear when the malfunction is no longer present.
- A history DTC clears when the module ignition cycle counter reaches the reset threshold of 50, without a repeat of the malfunction.

Reference Information

Schematic Reference

Power Distribution Wiring Schematics

Connector End View Reference

Master Electrical Component List , or Inline Harness Connector End Views - Index or Component Connector End Views - Index

Description and Operation

Retained Accessory Power Description and Operation

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify the KR76 Retained Accessory Power Relay clicks ON and OFF when commanding the Accessory/Retained Accessory Power Relay On and Off with a scan tool.
 - **If the KR76 Retained Accessory Power Relay does not click ON and OFF**

Refer to Circuit/System Testing.
 - **Go to next step: If the KR76 Retained Accessory Power Relay clicks ON and OFF**
3. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the KR76 Retained Accessory Power Relay. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 85 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **Go to next step: If less than 10 Ω**
3. Ignition ON, connect a test lamp between the control circuit terminal 86 and ground circuit terminal 85.

4. Verify the test lamp turns ON and OFF when commanding the Accessory/Retained Accessory Power Relay On and Off with a scan tool.

- **If the test lamp is always OFF**

1. Ignition OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module.

2. Test for infinite resistance between the control circuit and ground.

- If less than infinite resistance, repair the short to ground on the circuit.
- Go to next step: If infinite resistance

3. Test for less than 2 Ω in the control circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the K9 Body Control Module.

- **If the test lamp is always ON**

1. Ignition OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module, ignition ON.

2. Test for less than 1 V between the control circuit and ground.

- If 1 V or greater, repair the short to voltage on the circuit.
- If less than 1 V, replace the K9 Body Control Module.

- **Go to next step: If the test lamp turns ON and OFF**

5. Test or replace the KR76 Retained Accessory Power Relay.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [Electrical Relay Replacement \(Attached to Wire Harness\)](#) , or [Electrical Relay Replacement \(Within an Electrical Center\)](#)
- [Control Module References](#) for body control module replacement, programming and setup.

DTC B144A

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptor

DTC B144A

Run Power Relay Circuit

For symptom byte information refer to [Symptom Byte List](#)

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Relay Coil Control	B144A 02	B144A 01, B144A 04	B144A 01, B144A 04	-

Circuit/System Description

The body control module (BCM) feeds the ignition circuit by applying voltage when the ignition is in the ON position.

Conditions for Running the DTC

- The system voltage is between 9 - 16 V.
- The DTC can only run when the output is activated.

Conditions for Setting the DTC

B144A 01

The ignition output is not active and a short to battery is detected 3 consecutive times on the ignition voltage circuit.

B144A 02

A short to ground is detected on the ignition run relay coil control circuit.

B144A 04

The ignition output is not active and an open is detected 20 consecutive times on the ignition voltage circuit.

Action Taken When the DTC Sets

B144A 01, B144A 04

No action is taken.

B144A 02

The module output driver will be shut down and not supply voltage to the ignition run relay control circuit.

Conditions for Clearing the DTC

- The current DTC will clear when the module request for the output is removed or the malfunction is no longer present.
- A history DTC clears when the module ignition cycle counter reaches the reset threshold of 50, without a repeat of the malfunction.

Reference Information

Schematic Reference

Transfer Case Control Wiring Schematics

Connector End View Reference

[Master Electrical Component List](#) , or [Inline Harness Connector End Views - Index](#) or [Component Connector End Views - Index](#)

Description and Operation

Power Mode Description and Operation

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)

- [Wiring Repairs](#)

Scan Tool Reference

[Control Module References](#) for scan tool information

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the S77 Transfer Case Control Switch.
2. Connect a test lamp between the ignition circuit terminal 2 below and ground.
3. Verify the test lamp turns ON and OFF when cycling the ignition between ON and OFF.
 - **If the test lamp is always OFF**
 1. Ignition OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module.
 2. Test for infinite resistance between the ignition circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - Go to next step: If infinite resistance
 3. Test for less than 2 Ω in the ignition circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K9 Body Control Module.
 - **If the test lamp is always ON**
 1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module, ignition ON.
 2. Test for less than 1 V between the ignition circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K9 Body Control Module.
 - **Go to next step: If the test lamp turns ON and OFF**
4. Test or replace the appropriate S77 Transfer Case Control Switch.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [Transfer Case Selector Switch Replacement](#)
- [Control Module References](#) for body control module replacement, programming and setup.

DTC B144B

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptors

DTC B144B

Run/Crank Power Relay Circuit

For symptom byte information refer to [Symptom Byte List](#)

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Relay coil control	B144B 02	B144B 04	B144B 01	-

Circuit/System Description

The body control module (BCM) controls the ignition main relay (underhood) and the ignition main relay (instrument panel) through their control circuits by applying voltage to the ignition run/crank relay coil control circuit. The ignition main relay (underhood) and ignition main relay (instrument panel) are energized when the ignition switch is in the RUN or the CRANK position, or when a remote start is requested

Conditions for Running the DTC

System voltage greater than 9 V.

Conditions for Setting the DTC

B144B 01

The ignition output is not active and a short to battery is detected 3 consecutive times on the ignition voltage circuit.

B144B 02

A short to ground is detected on the ignition run/crank relay coil control circuit.

B144B 04

The ignition output is not active and an open is detected 20 consecutive times on the ignition voltage circuit.

Action Taken When the DTC Sets

B144B 01, B144B 04

No action is taken.

B144B 02

The ignition main relay (underhood) and the ignition main relay (instrument panel) are deactivated when the fault is set. After 100 ms, the ignition main relay (underhood) and the ignition main relay (instrument panel) will be activated. If the fault is still set, the relays will be deactivated. The ignition main relay (underhood) and the ignition main relay (instrument panel) will again be activated after 100 ms. If this also results in a fault, the ignition main relay (underhood) and the ignition main relay (instrument panel) will be deactivated until a new ignition request is received.

Conditions for Clearing the DTC

- The current DTC will clear when the malfunction is no longer present and an ignition request is received.
- A history DTC will clear after 40 malfunction-free ignition cycles.

Diagnostic Aids

A short to voltage on the ignition run/crank relay coil control will cause the engine to remain running after the ignition mode is changed to OFF.

Reference Information

Schematic Reference

Power Moding Wiring Schematics

[Master Electrical Component List](#) , or [Inline Harness Connector End Views - Index](#) or [Component Connector End Views - Index](#)

Description and Operation

[Power Mode Description and Operation](#)

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

[Control Module References](#) for scan tool information

[Circuit/System Verification](#)

1. Ignition ON.
2. Verify the KR73 Ignition Main Relay (underhood) and the KR73 Ignition Main Relay (instrument panel) click ON and OFF when commanding the Run/Crank relay On and Off with a scan tool.
 - **If the KR73 Ignition Main Relay (underhood) or the KR73 Ignition Main Relay (instrument panel) do not click ON and OFF**

Refer to Circuit/System Testing.
 - **Go to next step: If the KR73 Ignition Main Relay (underhood) and the KR73 Ignition Main Relay (instrument panel) click ON and OFF**
3. All OK.

[Circuit/System Testing](#)

1. Ignition OFF, disconnect the KR73 Ignition Main Relay (underhood) and the KR73 Ignition Main Relay (instrument panel). It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuits listed below and ground.
 - KR73 Ignition Main Relay (underhood) - Ground circuit terminal 85
 - KR73 Ignition Main Relay (instrument panel) - Ground circuit terminal 86
 - **If 10 Ω or greater**
 1. Ignition OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **Go to next step: If less than 10 Ω**
3. Ignition ON, connect a test lamp between the control circuits listed below and ground.
 - KR73 Ignition Main Relay (underhood) - Control circuit terminal 86
 - KR73 Ignition Main Relay (instrument panel) - Control circuit terminal 85
4. Verify the test lamp turns ON and OFF when commanding the Run/Crank relay On and Off with a scan tool.
 - **If the test lamp is always OFF**

1. Ignition OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module.
2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - Go to next step: If infinite resistance
3. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K9 Body Control Module.
- **If the test lamp is always ON**
 1. Ignition OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module, ignition ON.
 2. Test for less than 1 V between the control circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K9 Body Control Module.
- **Go to next step: If the test lamp turns ON and OFF**
5. Test or replace the appropriate KR73 Ignition Main Relay (underhood) or the KR73 Ignition Main Relay (instrument panel).

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [Electrical Relay Replacement \(Attached to Wire Harness\)](#), or [Electrical Relay Replacement \(Within an Electrical Center\)](#)
- [Control Module References](#) for body control module replacement, programming and setup.

DTC B2B0D OR B2B0E

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: [Diagnostic System Check - Vehicle](#)
- Review the description of Strategy Based Diagnosis: [Strategy Based Diagnosis](#)
- An overview of each diagnostic category can be found here: [Diagnostic Procedure Instructions](#)

Ignition Mode Switch

DTC Descriptor

DTC B2B0D

Serial Data Gateway Module Ignition On/Start Switch Circuit Low Voltage

DTC B2B0E

Serial Data Gateway Module Ignition On/Start Switch Circuit High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ignition	B2B0D	B2B0D	B2B0E	-

Circuit/System Description

For an overview of the component/system, refer to: [Power Mode Description and Operation](#)

Component	Description
K56 Serial Data Gateway Module	The control module is used to handle communications between multiple serial data busses and functions as a gateway to isolate the secure networks from the unsecured networks.

Conditions for Running the DTC

B2B0D, B2B0E

Ignition = Accessory or On

Conditions for Setting the DTC

B2B0D, B2B0E

Ignition Voltage @ K56 Serial Data Gateway Module Ignition Voltage @ K20 Engine Control Module Via CAN Bus

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type B DTC

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type B DTC

Diagnostic Aids

- If the voltage for the ignition circuit voltage between the K56 Serial Data Gateway Module and K20 Engine Control Module is greater than within 1 V of each other the DTC will set.
- If the fault is not current, the high system voltage could be a result of overcharging with a battery charger or after jump starting the vehicle.
- Schematics for the component(s) being tested need to be used to accurately identify the specific circuit numbers and terminals.
- The last 2 digits of the circuit number are significant in identifying its power and/or ground function.
 - Circuits ending in 42 are primary fused B+ circuits (generally the first fuse in the circuit after the battery)
 - Circuits ending in 40 are secondary fused circuits (generally fuses in a fuse block after the primary circuit)
 - Circuits ending in 39 and 41 are ignition voltage circuits.
 - Circuits ending in 50 are grounds.
 - Circuits ending in 51 are low reference (ground).

Reference Information

Schematic Reference

[Data Communication Wiring Schematics](#)

Connector End View Reference

[Master Electrical Component List](#) , or [Inline Harness Connector End Views - Index](#) or [Component Connector End Views - Index](#)

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

[Control Module References](#)

[Circuit/System Verification](#)

1. Ignition - On/Vehicle - In Service Mode
2. Verify DTC B144B is not set.

- **If DTC B144B is set**

Refer to: [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)

- **Go to next step: DTC B144B = Not set**

3. Refer to: Circuit/System Testing

[Circuit/System Testing](#)

1. Ignition/Vehicle & All vehicle systems - Off
2. Disconnect the electrical connector: X2 @ K56 Serial Data Gateway Module
3. Test for less than 1 V between the test points: Ignition circuit terminal 23 & Ground

- **If 1 V or greater**

Repair the short to voltage on the circuit.

- **Go to next step: If less than 1 V**

4. Ignition - On/Vehicle - In Service Mode
5. Verify a test lamp turns On between the test points: Ignition circuit terminal 23 & Ground

- **If the test lamp does not turn On and the circuit fuse is OK**

1. Ignition/Vehicle - Off

2. Test for less than 2 ohms between the test points: Ignition circuit terminal 23 @ Component harness & Fuse

- If 2 ohms or greater - Repair the open/high resistance in the circuit.

- If less than 2 ohms - Refer to: [Power Mode Mismatch](#)

- **If the test lamp does not turn On and the circuit fuse is open**

1. Ignition/Vehicle - Off

2. Test for infinite resistance between the test points: Ignition circuit terminal 23 @ Component harness & Ground

- If less than infinite resistance - Repair the short to ground on the circuit.

- **Go to next step: If the test lamp turns On**

6. Verify voltage at each B+ circuit terminal is within 1 V of the C1 Battery voltage.

- **If not the specified value**

Repair the high resistance on B+ circuit.

- **Go to next step: If the specified value**

7. Verify voltage at each ignition circuit terminal is within 1 V of the C1 Battery voltage.

- **If not the specified value**

Repair the high resistance on ignition circuit.

- **Go to next step: If the specified value**

8. Replace the component: K56 Serial Data Gateway Module

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: [Diagnostic Repair Verification](#)

- For control module replacement, programming, and setup refer to: [Control Module References](#)

DTC P2534 OR P2535

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptors

DTC P2534

Ignition On/Start Switch Circuit Low Voltage

DTC P2535

Ignition On/Start Switch Circuit High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ignition	P2534	P2535	P2535	-
Ground	-	P2534	-	-

Circuit/System Description

The body control module (BCM) controls the ignition main relay through the control circuit by applying voltage to the circuit. The control module samples the system voltage on the Ignition 1 voltage circuit from the ignition main relay every 0.1 s.

Conditions for Running the DTC

P2534

The control module ignition voltage signal is valid, with the ignition ON.

P2535

The control module ignition voltage signal is valid, with the ignition OFF.

Conditions for Setting the DTC

P2534

The control module detects 6 V or less on the ignition voltage circuit, with the ignition turned ON.

P2535

The control module detects greater than 6 V or greater on the ignition voltage circuit, with the ignition turned OFF.

Action Taken When the DTC Sets

DTCs P2534 and P2535 are Type A DTCs.

Conditions for Clearing the DTC

DTCs P2534 and P2535 are Type A DTCs.

Diagnostic Aids

A short to voltage in the ignition circuit will keep the vehicle modules awake, which can drain the vehicle's battery.

Reference Information

Schematic Reference

Power Distribution Wiring Schematics

Connector End View Reference

Master Electrical Component List , or Inline Harness Connector End Views - Index or Component Connector End Views - Index

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

Description and Operation

Power Mode Description and Operation

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Engine running.
2. Verify DTC B144B is not set.

- **If the DTC is set**

Refer to **DTC B144B**.

- **Go to next step: If the DTC is not set**

3. Verify the scan tool control module Ignition 1 Signal parameter is between 12.6 - 15 V.

- **If not between 12.6 - 15 V**

Refer to Circuit/System Testing.

- **Go to next step: If between 12.6 - 15 V**

4. Verify that the DTC does not reset by operating the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions you observe from the Freeze Frame/Failure Records data. If the vehicle passes the Circuit/System Verification procedure, then STOP. Do not perform the Circuit/System Testing or Component Testing as this may result in an unnecessary part replacement. Refer to [Testing for Intermittent Conditions and Poor Connections](#).

Circuit/System Testing

1. Ignition OFF, and all vehicle systems OFF, disconnect the appropriate harness connector at the control module setting the DTC.

2. Test for less than 1 V between the ignition circuit terminal and ground.

- **If 1 V or greater**

Repair the short to voltage on the circuit.

- **Go to next step: If less than 1 V**

3. Ignition ON.

4. Verify a test lamp illuminates between the ignition circuit terminal and ground.

- **If the test lamp does not illuminate and the circuit fuse is good**

1. Ignition OFF remove the test lamp.

2. Test for less than 2 Ω in the ignition circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , refer to [Power Mode Mismatch](#).

- **If the test lamp does not illuminate and the circuit fuse is open**

1. Ignition OFF remove the test lamp

2. Test for infinite resistance between the ignition circuit and ground.

- If less than infinite resistance, repair the short to ground on the circuit.

- **Go to next step: If the test lamp illuminates**

5. Replace the control module setting the DTC.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

Refer to [Control Module References](#) for control module replacement, programming, and setup.

DTC P2537

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptor

DTC P2537

Ignition Accessory Switch Circuit Low Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ignition	P2537, U1814, U2099	P2537	-	-

Circuit/System Description

The control module continuously monitors the voltage on the Ignition Accessory/Run circuit from the body control module (BCM). When the ignition is in the ACCESSORY or RUN position, the BCM sends a 12 V wake up signal to the control module. This wake up signal allows the control module to power up and start functioning before the engine is started.

Conditions for Running the DTC

The ignition is in the ACCESSORY or RUN position.

Conditions for Setting the DTC

The control module detects the Ignition Accessory/Run circuit is less than 6 V for 1 min.

Action Taken When the DTC Sets

DTC P2537 is a Type B DTC.

Conditions for Clearing the DTC

DTC P2537 is a Type B DTC.

Reference Information

Schematic Reference

Data Communication Wiring Schematics

Connector End View Reference

[Master Electrical Component List](#) , or [Inline Harness Connector End Views - Index](#) or [Component Connector End Views - Index](#)

Description and Operation

Data Link Communications Description and Operation

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

[Control Module References](#) for scan tool information

Circuit/System Verification

1. Verify DTC U1814 or U2099 is not set.

- **If any of the DTCs are set**

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#).

- **Go to next step: If none of the DTCs are set**

2. Refer to Circuit/System Testing.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the control module setting the DTC.

2. Ignition ON.

3. Verify a test lamp illuminates between the accessory wake up serial data circuit and ground.

- **If the test lamp does not illuminate.**

1. Ignition OFF remove the test lamp, disconnect the X4 connector at the K9 Body Control Module.

2. Test for less than 2 Ω on the ignition circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the K9 Body Control Module.

- **Go to next step: If the test lamp illuminates**

4. Replace the control module setting the DTC.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

Refer to [Control Module References](#) for control module replacement, programming, and setup.

SYMPTOMS - WIRING SYSTEMS

NOTE: The following steps must be completed before using the symptom tables.

1. Perform the [Diagnostic System Check - Vehicle](#) before using the symptom tables in order to verify that all of the following are true:

- There are no DTCs set.
- The control modules can communicate via the serial data links.

2. Review the system operation in order to familiarize yourself with the system functions. Refer to:

- [Power Mode Description and Operation](#)
- [Retained Accessory Power Description and Operation](#)

Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the systems.
- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.

Intermittent

Faulty electrical connections or wiring may be the cause of intermittent conditions. Refer to [Testing for Intermittent Conditions and Poor Connections](#).

Symptom List

Refer to a symptom diagnostic procedure from the following list in order to diagnose the symptom:

- [Power Mode Mismatch](#)

- [Retained Accessory Power Malfunction](#)
- [Vehicle Will Not Change Power Mode](#)

IGNITION CAN/CANNOT BE TURNED OFF WITH TRANSMISSION IN ANY GEAR

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ignition	1	1	-	-
Control	2	1	-	-
Ground	-	1	-	-
1. Ignition key will not turn to OFF with vehicle in park. 2. Ignition key will turn to OFF with vehicle out of park.				

Circuit/System Description

If the vehicle is equipped with automatic transmission and a floor mounted console gear shift, it has an electronic park lock system. The electronic park lock system purpose is to prevent the ignition key from being turned to the OFF position when the transmission is in any position other than PARK and the vehicle may still be moving. The electronic park lock system consists of an ignition lock cylinder solenoid, and a park position switch that is located in the A/T shift lock control switch. The ignition lock cylinder solenoid contains a pin that is spring loaded to mechanically prevent the ignition key cylinder from being turned to the lock position when it is not energized. The park position switch receives voltage from the body control module (BCM) when the ignition is turned ON. When the transmission shift selector is in PARK, the park position switch closes and energizes the key capture solenoid actuator retracting the pin, allowing the ignition switch to be turned OFF. If vehicle power is lost, power is lost to the ignition switch, the ignition switch has a fault, and/or the transmission is not in the Park position the operator will not be able to turn the ignition key to the lock position and will not be able to remove the ignition key from the column.

Diagnostic Aids

- Verify that the transmission shift selector indicator matches the position of the gear shift lever while selecting between the Park, Reverse, Drive and Low positions.
- Lost power to the ignition switch or a faulty ignition switch can prevent the ignition key from turning to the lock position and prevent ignition key removal from the column.

Reference Information

Schematic Reference

[Ignition Lock Wiring Schematics](#)

Connector End View Reference

[Master Electrical Component List](#) , or [Inline Harness Connector End Views - Index](#) or [Component Connector End Views - Index](#)

Description and Operation

[Electronic Park Lock Description and Operation](#)

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Circuit/System Verification

1. Ignition OFF, gear shift selector in PARK, ignition ON.
2. Verify that S39 Ignition Switch can be rotated to the ON position.
 - **If the ignition switch cannot be rotated to the ON position.**

Refer to [Ignition Key Cannot Be Inserted, Rotated, or Removed from the Ignition Lock Cylinder](#).
 - **Go to next step: If the ignition switch can be rotated to the ON position**
3. Verify the S39 Ignition Switch can be rotated to the OFF Position.
 - **If the ignition switch cannot be rotated to the OFF position and [Ignition Key Cannot Be Inserted, Rotated, or Removed from the Ignition Lock Cylinder](#) has NOT been performed**

Refer to [Ignition Key Cannot Be Inserted, Rotated, or Removed from the Ignition Lock Cylinder](#).
 - **Go to next step: If the ignition switch can be rotated to the OFF position**
4. Ignition ON, parking brake applied, place the gear shift selector in NEUTRAL.
5. Verify that the S39 Ignition Switch cannot be rotated to the LOCK position.
 - **If the ignition switch can be rotated to the LOCK position and [Ignition Key Cannot Be Inserted, Rotated, or Removed from the Ignition Lock Cylinder](#) has NOT been performed**

Refer to [Ignition Key Cannot Be Inserted, Rotated, or Removed from the Ignition Lock Cylinder](#).
 - **If the ignition switch can be rotated to the LOCK position and [Ignition Key Cannot Be Inserted, Rotated, or Removed from the Ignition Lock Cylinder](#) has been performed**

Refer to Circuit/System Testing.
 - **Go to next step: If the ignition switch cannot be rotated to the LOCK position**
6. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the M93 Key Capture Solenoid Actuator and the S3 Transmission Shift Lever. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuits listed below and ground.
 - M93 Key Capture Solenoid Actuator - Ground circuit terminal 2
 - S3 Transmission Shift Lever - Ground circuit terminal 2
 - **If 10 Ω or greater**
 1. Ignition OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.

- **Go to next step: If less than 10 Ω**

3. Ignition ON.

4. Test for greater than 11.5 V between the S3 Transmission Shift Lever signal circuit terminal 6 and ground.

- **If less than 11.5 V**

1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module.

2. Test for infinite resistance between the signal circuit and ground.

- If less than infinite resistance, repair the short to ground on the circuit.
- Go to next step: If infinite resistance

3. Test for less than 2 Ω in the signal circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the K9 Body Control Module.

- **Go to next step: If 11.5 V or greater**

5. Verify a test lamp illuminates between the M93 Key Capture Solenoid Actuator control circuit terminal 1 and ground.

- **If the test lamp does not illuminate**

1. Ignition OFF, remove the test lamp.

2. Test for infinite resistance between the ignition circuit and ground.

- If less than infinite resistance, repair the short to ground on the circuit.
- Go to next step: If infinite resistance

3. Test for less than 2 Ω in the ignition circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the K9 Body Control Module.

- **Go to next step: If the test lamp illuminates**

6. Connect the S3 Transmission Shift Lever.

7. Ignition ON, parking brake applied, place the gear shift selector in Neutral.

8. Verify a test lamp illuminates between the M93 Key Capture Solenoid Actuator control circuit terminal 1 and ground.

- **If the test lamp does not illuminate**

Replace the S3 Transmission Shift Lever.

- **Go to next step: If the test lamp illuminates**

9. Place the gear shift selector in Park.

10. Verify that a test lamp does not illuminate between the M93 Key Capture Solenoid Actuator control circuit terminal 1 and ground.

- **If the test lamp illuminates**

1. Ignition OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module.

2. Test for less than 1 V between the ignition circuit and ground.

- If 1 V or greater, repair the short to voltage on the circuit.
- If less than 1 V, replace the S3 Transmission Shift Lever.

- **Go to next step: If the test lamp does not illuminate**

11. Test or replace the M93 Key Capture Solenoid Actuator.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [Transmission Control Replacement](#)
- [Control Module References](#) for body control module replacement, programming, and setup.

POWER MODE MISMATCH

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

Circuit/System Description

The body control module (BCM) controls the ignition main (underhood), ignition main (instrument panel), and retained accessory power relay by applying voltage to their individual relay control circuits. The ignition main relay (underhood) and ignition main relay (instrument panel) are energized when the ignition switch is in the ON or the CRANK position. The retained accessory power relay is energized during all power modes, except OFF-awake and CRANK. The relays are also energized for approximately 10 min after shutting the ignition OFF and removing the key, providing no door is opened.

The engine control module (ECM) controls the engine controls the ignition relay by providing ground to the engine controls relay control circuit.

Diagnostic Aids

A short to voltage on the ignition run/crank relay coil control will cause the engine to remain running after the mode is changed to OFF.

Reference Information

Schematic Reference

- [Power Moding Wiring Schematics](#)
- [Engine Controls Wiring Schematics](#)

Connector End View Reference

[Master Electrical Component List](#) , or [Inline Harness Connector End Views - Index](#) or [Component Connector End Views - Index](#)

Description and Operation

[Power Mode Description and Operation](#)

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

[Control Module References](#) for scan tool information

Circuit/System Verification

NOTE: Use schematics to determine which ignition relay supplies the ignition feed for the appropriate devices. Use the connector end view to identify the ignition circuit terminal for each of those devices.

1. Ignition ON.
2. Verify that the appropriate devices controlled by the KR73 Ignition Main Relay (underhood) and KR73 Ignition Main Relay (instrument panel) turn ON and OFF when commanding the Run/Crank Relay On and Off with a scan tool.
 - **If the devices do not turn ON and OFF**

Refer to Circuit/System Testing - Diagnostic A.
 - **Go to next step: If the devices turn ON and OFF**
3. Verify that the appropriate devices controlled by the KR75 Engine Controls Ignition Relay turn ON and OFF when switching the ignition between ON and OFF.
 - **If the devices do not turn ON and OFF**

Refer to Circuit/System Testing - Diagnostic B.
 - **Go to next step: If the devices turn ON and OFF**
4. Verify that the appropriate devices controlled by the KR76 Retained Accessory Power Relay turns ON and OFF when commanding the Accessory/Retained Accessory Power Relay On and Off with a scan tool.
 - **If the devices do not turn ON and OFF**

Refer to Circuit/System Testing - Diagnostic C.
 - **Go to next step: If the devices turn ON and OFF**
5. All OK.

Circuit/System Testing

Diagnostic A

1. Ignition OFF and all vehicle systems OFF, disconnect the KR73 Ignition Main Relay (underhood) and KR73 Ignition Main Relay (instrument panel). It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuits listed below and ground.
 - KR73 Ignition Main Relay (underhood) - Ground circuit terminal 85
 - KR73 Ignition Main Relay (instrument panel) - Ground circuit terminal 86
 - **If 10 Ω or greater**
 1. Ignition OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **Go to next step: If less than 10 Ω**
3. Ignition ON.
4. Verify a test lamp illuminates between the B+ circuits below and ground.
 - KR73 Ignition Main Relay (underhood) - B+ circuit terminal 30
 - KR73 Ignition Main Relay (instrument panel) - B+ circuit terminal 30
 - **If the test lamp does not illuminate**

Replace the appropriate fuse block.

- **Go to next step: If the test lamp illuminates**

5. Connect a test lamp between the control circuits listed below and ground

- KR73 Ignition Main Relay (underhood) - Control circuit terminal 86
- KR73 Ignition Main Relay (instrument panel) - Control circuit terminal 85

6. Verify the test lamp turns ON and OFF when commanding the Run/Crank Relay On and Off with a scan tool.

- **If the test lamp is always OFF**

1. Ignition OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module.

2. Test for infinite resistance between the control circuit and ground.

- If less than infinite resistance, repair the short to ground on the circuit.
- Go to next step: If infinite resistance

3. Test for less than 2 Ω in the control circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the K9 Body Control Module.

- **If the test lamp is always ON**

1. Ignition OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module, ignition ON.

2. Test for less than 1 V between the control circuit and ground.

- If 1 V or greater, repair the short to voltage on the circuit.
- If less than 1 V, replace the K9 Body Control Module.

- **Go to next step: If the test lamp turns ON and OFF**

7. Verify that a test lamp does not illuminate between the ignition circuits below and ground.

- KR73 Ignition Main Relay (underhood) - Ignition circuit terminal 87
- KR73 Ignition Main Relay (instrument panel) - Ignition circuit terminal 87

- **If the test lamp illuminates**

Repair the short to voltage on the ignition circuit

- **Go to next step: If the test lamp does not illuminate**

8. Ignition ON, connect a 40 A fused jumper wire between the circuits listed below.

- KR73 Ignition Main Relay (underhood) - B+ circuit Terminal 30 and ignition control circuit terminal 87
- KR73 Ignition Main Relay (instrument panel) - B+ circuit Terminal 30 and ignition control circuit terminal 87

9. Verify device is activated.

- **If the device does not activate**

1. Ignition OFF, disconnect the harness connector at the device.

2. Test for infinite resistance between the ignition circuit and ground.

- If less than infinite resistance, repair the short to ground on the circuit.
- Go to next step: If infinite resistance

3. Test for less than 2 Ω in the ignition circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the device.

- **Go to next step: If the device activates**

10. Test or replace the appropriate KR73 Ignition Main Relay (underhood) or KR73 Ignition Main Relay (instrument panel).

Diagnostic B

1. Ignition OFF and all vehicle systems OFF, disconnect the KR75 Engine Controls Ignition Relay, ignition ON.
2. Verify a test lamp illuminates between the B+ circuit terminal 30 and ground.
 - **If the test lamp does not illuminate**
Replace the X50A Fuse Block Underhood
 - **Go to next step: If the test lamp illuminates**
3. Verify a test lamp illuminates between the B+ circuit terminal 85 and ground.
 - **If the test lamp does not illuminate**
Replace the X50A Fuse Block Underhood
 - **Go to next step: If the test lamp illuminates**
4. Connect a test lamp between the B+ circuit terminal 85 and the control circuit terminal 86.
5. Verify the test lamp turns ON and OFF when cycling the ignition ON and OFF.
 - **If the test lamp is always OFF**
 1. Ignition OFF, remove the test lamp, disconnect the harness connector at the K20 Engine Control Module, ignition ON.
 2. Test for less than 1 V between the control circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - Go to next step: If less than 1 V
 3. Ignition OFF.
 4. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K20 Engine Control Module.
 - **If the test lamp is always ON**
 1. Ignition OFF, remove the test lamp, disconnect the harness connector at the K20 Engine Control Module.
 2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K20 Engine Control Module.
 - **Go to next step: If the test lamp turns ON and OFF**
6. Verify a test lamp does not illuminate between the ignition circuit terminal 87 and ground.
 - **If the test lamp illuminates**
Repair the short to voltage on the circuit.
 - **Go to next step: If the test lamp does not illuminate**
7. Ignition ON, connect a 40 A fused jumper wire between the B+ circuit terminal 30 and the ignition circuit terminal 87.
8. Verify device is activated.
 - **If the device does not activate**
 1. Ignition OFF, disconnect the harness connector at the device.
 2. Test for infinite resistance between the ignition circuit terminal 87 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - Go to next step: If infinite resistance
 3. Test for less than 2 Ω in the ignition circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the device.

- **Go to next step: If the device activates**

9. Test or replace the KR75 Engine Controls Ignition Relay.

Diagnostic C

1. Ignition OFF and all vehicle systems OFF, disconnect the KR76 Retained Accessory Power Relay. It may take up to 2 min for all vehicle systems to power down.

2. Test for less than 10 Ω between the ground circuit terminal 85 and ground.

- **If 10 Ω or greater**

1. Ignition OFF.

2. Test for less than 2 Ω in the ground circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , repair the open/high resistance in the ground connection.

- **Go to next step: If less than 10 Ω**

3. Ignition ON.

4. Verify a test lamp illuminates between the B+ circuit terminal 30 and ground.

- **If the test lamp does not illuminate**

Replace the X51A Fuse Block - Instrument Panel

- **Go to next step: If the test lamp illuminates**

5. Connect a test lamp between the control circuit terminal 86 and the ground circuit terminal 85.

6. Verify the test lamp turns ON and OFF when commanding the Accessory/Retained Accessory Power Relay On and Off with a scan tool.

- **If the test lamp is always OFF**

1. Ignition OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module.

2. Test for infinite resistance between the control circuit and ground.

- If less than infinite resistance, repair the short to ground on the circuit.
- Go to next step: If infinite resistance

3. Test for less than 2 Ω in the control circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the K9 Body Control Module.

- **If the test lamp is always ON**

1. Ignition OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module, ignition ON.

2. Test for less than 1 V between the control circuit and ground.

- If 1 V or greater, repair the short to voltage on the circuit.
- If less than 1 V, replace the K9 Body Control Module.

- **Go to next step: If the test lamp turns ON and OFF**

7. Verify that a test lamp does not illuminate between the ignition circuit terminal 87 and ground.

- **If the test lamp illuminates**

Repair the short to voltage on the ignition circuit

- **Go to next step: If the test lamp does not illuminate**

8. Ignition ON, connect a 40 A fused jumper wire between the B+ circuit terminal 30 and the ignition circuit terminal 87.
9. Verify device is activated.
 - **If the device does not activate**
 1. Ignition OFF, disconnect the harness connector at the device.
 2. Test for infinite resistance between the ignition circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - Go to next step: If infinite resistance
 3. Test for less than 2 Ω in the ignition circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the device.
 - **Go to next step: If the device activates**
10. Test or replace the KR76 Retained Accessory Power Relay.

Component Testing

Relay Test

1. Ignition OFF, disconnect the appropriate relay.
2. Test for 70 - 150 Ω between terminals (85 or 1) and (86 or 2).
 - **If less than 70 or greater than 150 Ω**

Replace the relay.
 - **Go to next step: If between 70 - 150 Ω**
3. Test for infinite resistance between the terminals listed below:
 - (30 or 3) and (86 or 2)
 - (30 or 3) and (87 or 5)
 - (30 or 3) and (85 or 1)
 - (85 or 1) and (87 or 5)
 - (86 or 2) and (87 or 5)
 - **If less than infinite resistance**

Replace the relay.
 - **Go to next step: If infinite resistance**
4. Install a 3 A fused jumper wire between relay terminal (85 or 1) and 12 V. Install a jumper wire between relay terminal (86 or 2) and ground.
5. Test for less than 5.0 Ω between terminals (30 or 3) and (87 or 5).
 - **If 5.0 Ω or greater**

Replace the relay.
 - **Go to next step: If less than 5.0 Ω**
6. All OK

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

- **Electrical Relay Replacement (Attached to Wire Harness)** , or **Electrical Relay Replacement (Within an Electrical Center)**

- [Control Module References](#) for the appropriate control module replacement, programming and setup.

RETAINED ACCESSORY POWER MALFUNCTION

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Relay Switch B+	1	1	1	-
Relay Switch Ignition	1	1	1, 2	-
Relay Coil Control	B1445 02	B1445 04	B1445 01	-
Relay Coil Ground	-	1	-	-
1. Retained Accessory Power Malfunction 2. Retained Accessory Power Relay Always ON				

Circuit/System Description

The body control module (BCM) controls the retained accessory power relay through the control circuit by applying voltage to the retained accessory power relay coil control circuit. The retained accessory power relay is energized when the ignition switch is in the ACCESSORY or the ON position.

Reference Information

Schematic Reference

Power Distribution Wiring Schematics

Connector End View Reference

[Master Electrical Component List](#) , or [Inline Harness Connector End Views - Index](#) or [Component Connector End Views - Index](#)

Description and Operation

Retained Accessory Power Description and Operation

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

[Control Module References](#) for scan tool information

Circuit/System Verification

NOTE: Use schematics to determine which devices are controlled by the KR76 Retained Accessory Power Relay. Use the connector end view to identify the ignition circuit terminal for each of those devices.

1. Ignition ON.
2. Verify the appropriate devices controlled by the KR76 Retained Accessory Power Relay turn ON and OFF when commanding the Accessory/Retained Accessory Power Relay On and Off with a scan tool.
 - **If the devices do not turn ON and OFF**

Refer to Circuit/System Testing
 - **Go to next step: If the devices turn ON and OFF**
3. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the KR76 Retained Accessory Power Relay. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 85 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **Go to next step: If less than 10 Ω**
3. Ignition ON.
4. Verify a test lamp illuminates between the B+ circuit terminal 30 and ground.
 - **If the test lamp does not illuminate**

Replace the X51A Fuse Block - Instrument Panel.
 - **Go to next step: If the test lamp illuminates**
5. Connect a test lamp between the control circuit terminal 86 and the ground circuit terminal 85.
6. Verify the test lamp turns ON and OFF when commanding the Accessory/Retained Accessory Power Relay On and Off with a scan tool.
 - **If the test lamp is always OFF**
 1. Ignition OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module.
 2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - Go to next step: If infinite resistance
 3. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K9 Body Control Module.
 - **If the test lamp is always ON**
 1. Ignition OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module, ignition ON.
 2. Test for less than 1 V between the control circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K9 Body Control Module.
 - **Go to next step: If the test lamp turns ON and OFF**
7. Connect the KR76 Retained Accessory Power Relay.
8. Disconnect the appropriate X80 Accessory Power Receptacle, E32 Cigarette Lighter Receptacle, or the P2 Transmission Shift Lever Position Indicator.

9. Ignition OFF.

10. Verify that a test lamp does not illuminate between each of the ignition circuits listed below and ground.

- X80A Accessory Power Receptacle - Center Console 1 - Ignition circuit terminal A
- X80B Accessory Power Receptacle - Center Console 2 - Ignition circuit terminal A
- E32 Cigarette Lighter Receptacle - Ignition circuit terminal A
- P2 Transmission Shift Lever Position Indicator - Ignition circuit terminal 1
- **If the test lamp illuminates**

Repair the short to voltage on the ignition circuit.

- **Go to next step: If the test lamp does not illuminate**

11. Ignition ON.

12. Verify that a test lamp illuminates between each of the ignition circuits listed below and ground.

- X80A Accessory Power Receptacle - Center Console 1 - Ignition circuit terminal A
- X80B Accessory Power Receptacle - Center Console 2 - Ignition circuit terminal A
- E32 Cigarette Lighter Receptacle - Ignition circuit terminal A
- P2 Transmission Shift Lever Position Indicator - Ignition circuit terminal 1
- **If the test lamp does not illuminate and the circuit fuse is good**

1. Ignition OFF, remove the test lamp.

2. Test for less than 2 Ω in the ignition circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , test or replace the KR76 Retained Accessory Power Relay.

- **If the test lamp does not illuminate and the circuit fuse is open**

1. Ignition OFF, remove the test lamp.

2. Test for infinite resistance between the ignition circuit and ground.

- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance, test or replace the appropriate X80 Accessory Power Receptacle, E32 Cigarette Lighter Receptacle, or the P2 Transmission Shift Lever Position Indicator.

- **Go to next step: If the test lamp illuminates**

13. Test or replace the appropriate X80 Accessory Power Receptacle, E32 Cigarette Lighter Receptacle, or the P2 Transmission Shift Lever Position Indicator.

Component Testing

Relay Test

1. Ignition OFF, disconnect the KR76 Retained Accessory Power Relay.

2. Test for 70 - 150 Ω between terminals 85 and 86.

- **If less than 70 or greater than 150 Ω**

Replace the relay.

- **Go to next step: If between 70 - 150 Ω**

3. Test for infinite resistance between the terminals listed below:

- 30 and 86
- 30 and 87
- 30 and 85
- 85 and 87

- **If less than infinite resistance**

Replace the relay.

- **Go to next step: If infinite resistance**

4. Test for less than 5.0 Ω between terminals 30 and 87.

- **If 5.0 Ω or greater**

Replace the relay.

- **Go to next step: If less than 5.0 Ω**

5. Install a 3 A fused jumper wire between relay terminal 85 and 12 V. Install a jumper wire between relay terminal 86 and ground.

6. Test for less than 5.0 Ω between terminals 30 and 87.

- **If 5.0 Ω or greater**

Replace the relay.

- **Go to next step: If less than 5.0 Ω**

7. All OK

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [Electrical Relay Replacement \(Attached to Wire Harness\)](#), or [Electrical Relay Replacement \(Within an Electrical Center\)](#)
- [Accessory Power Receptacle Replacement](#)
- [Control Module References](#) for the appropriate control module replacement, programming and setup.

VEHICLE WILL NOT CHANGE POWER MODE

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	B1370 04, B1380 04	B1370 04, B1380 04	-	-
Ignition Terminal 1	B1370 04, B1380 04	B1370 04, B1380 04	B1370 01	-
Ignition Terminal 3	B1370 04, B1380 04	B1380 04	B1380 01	-
Ignition Terminal 4	B1370 04, B1380 04, B1441 04	B1441 04	B1441 01	-
5 V Reference	-	1	-	-
1. Power Mode Mismatch				

Circuit/System Description

The vehicle power mode master is the body control module (BCM). The ignition switch is a low current switch with multiple discrete circuits to the BCM. The BCM logic uses the ignition switch positions to identify the

operator's desired power mode and activate specific discrete signals, and serial data messages for the operation of different subsystems as necessary. Other modules which have switched voltage inputs may operate in a default mode if the power mode master serial data message does not match what the individual module can detect from its own connections.

The power mode master will activate relays and other direct outputs of the power mode master as needed according to the calculated power mode. Some relays controlled by the BCM are switched ignition voltage outputs that are pass through circuits within the BCM directly from the ignition switch. If these circuits short to ground, the B+ circuit fuse to the ignition switch will open.

Reference Information

Schematic Reference

Power Distribution Wiring Schematics

Connector End View Reference

Master Electrical Component List , or **Inline Harness Connector End Views - Index** or **Component Connector End Views - Index**

Description and Operation

Power Mode Description and Operation

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Verify DTC U1814 is not set.
 - **If DTC is set**

Refer to **Diagnostic Trouble Code (DTC) List - Vehicle** .
 - **Go to next step: If DTC is not set**
2. Ignition ON.
3. Verify the scan tool power mode parameters change when cycling the S39 Ignition Switch between OFF, ACCESSORY, ON, and CRANK.
 - **If the power mode parameters do not change**

Refer to Circuit/System Testing.
 - **Go to next step: If the power mode parameters change**
4. All OK.

Circuit/System Testing

1. Ignition OFF, disconnect the S39 Ignition Switch.
2. Verify a test lamp illuminates between the B+ circuit terminal 2 and ground.

- **If the test lamp does not illuminate and the circuit fuse is good**

1. Remove the test lamp.
2. Test for less than 2 Ω in the B+ circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , verify the fuse is good and there is voltage at the fuse.

- **If the test lamp does not illuminate and the circuit fuse is open**

1. Remove the test lamp.
2. Test for infinite resistance between the B+ circuit and ground.
 - If less than infinite resistance, repair the short to ground on one of the following circuits listed below:

NOTE: To help isolate a short to ground, it may be necessary to disconnect modules that are connected to the following circuits:

-
- B+ circuit terminal 2
- Ignition circuit terminal 1
- Ignition circuit terminal 3
- Ignition circuit terminal 4

- **Go to next step: If the test lamp illuminates**

3. Connect the S39 Ignition Switch.
4. Ignition ON, disconnect the harness connector at the S39 Ignition Switch while the ignition is ON.
5. Test for 4.8 - 5.2 V between the 5 V reference circuit terminal 6 and ground.
 - **If less than 4.8 V**
 1. Connect the S39 Ignition Switch.
 2. Ignition OFF, disconnect the X3 harness connector at the K9 Body Control Module and S39 Ignition Switch.
 3. Test for infinite resistance between the 5 V reference circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - Go to next step: If infinite resistance
 4. Test for less than 2 Ω in the 5 V reference circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K9 Body Control Module.
 - **If greater than 5.2 V**
 1. Connect the S39 Ignition Switch.
 2. Ignition OFF, disconnect the X3 harness connector at the K9 Body Control Module.
 3. Ignition ON, disconnect the harness connector at the S39 Ignition Switch while the ignition is ON.
 4. Test for less than 1 V between the 5 V reference circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K9 Body Control Module.
 - **Go to next step: If between 4.8 - 5.2 V**
6. Connect the S39 Ignition Switch.
7. Ignition OFF.
8. Disconnect the X3 harness connector at the K9 Body Control Module, ignition ON.
9. Verify a test lamp illuminates between each of the ignition circuits listed below and ground:
 - Ignition circuit terminal 5

- Ignition circuit terminal 6
- **If the test lamp does not illuminate and the circuit fuse is good**
 1. Ignition OFF remove the test lamp.
 2. Test for less than 2 Ω in the ignition circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , verify the fuse is good and there is voltage at the fuse.
- **If the test lamp does not illuminate and the circuit fuse is open**
 1. Ignition OFF remove the test lamp.
 2. Test for infinite resistance between the ignition circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K9 Body Control Module.
- **Go to next step: If the test lamp illuminates**

10. Ignition OFF with the key in.

11. Verify a test lamp illuminates between ignition circuit terminal 15 and ground.

- **If the test lamp does not illuminate and the circuit fuse is good**
 1. Ignition OFF with the key out, remove the test lamp.
 2. Test for less than 2 Ω in the ignition circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , verify the fuse is good and there is voltage at the fuse.
- **If the test lamp does not illuminate and the circuit fuse is open**
 1. Ignition OFF with the key out remove the test lamp.
 2. Test for infinite resistance between the ignition circuit terminal 15 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K9 Body Control Module.
- **Go to next step: If the test lamp illuminates**

12. Connect the X3 harness connector at the K9 Body Control Module, ignition ON.

13. Disconnect the S39 Ignition Switch.

14. Test for less than 1 V between each of the ignition circuits listed below and ground.

- Ignition circuit terminal 1
- Ignition circuit terminal 3
- Ignition circuit terminal 4
- **If 1 V or greater**

Repair the short to voltage on the circuit.

- **Go to next step: If less than 1 V**

15. Test or replace the S39 Ignition Switch.

Component Testing

1. Ignition OFF, disconnect the harness connector at the S39 Ignition Switch.
2. Using the Resistance Test below, verify the resistance between the terminals listed below match for each S39 Ignition Switch position.
 - **If any reading is other than specified**

Replace the S39 Ignition Switch.
 - **Go to next step: If the readings match**
3. All OK.

Resistance Test

Ignition Switch Position	Terminals 1 and 2	Terminals 2 and 3	Terminals 2 and 4	Terminals 2 and 6	Terminals 4 and 6
OFF Key Out	Infinite	Infinite	Infinite	Infinite	Infinite
OFF Key In	Infinite	Infinite	<5.0 Ω	Infinite	Infinite
Accessory	Infinite	<5.0 Ω	Infinite	Infinite	Infinite
Run	<5.0 Ω	<5.0 Ω	Infinite	Infinite	<5.0 Ω
Start	<5.0 Ω	Infinite	Infinite	Infinite	1275 - 1325 Ω

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [Ignition and Start Switch Replacement](#)
- [Control Module References](#) for the appropriate control module replacement, programming and setup.

CIRCUIT TESTING

The Circuit Testing section contains the following diagnostic testing information. Using this information along with the diagnostic procedures will identify the cause of the electrical malfunction.

- [Using Connector Test Adapters](#)
- [Probing Electrical Connectors](#)
- [Troubleshooting with a Digital Multimeter](#)
- [Troubleshooting with a Test Lamp](#)
- [Using Fused Jumper Wires](#)
- [Measuring Voltage](#)
- [Measuring Voltage Drop](#)
- [Measuring Frequency](#)
- [Testing Ground and Low Reference Circuits](#)
- [Testing for Continuity](#)
- [Testing for Short to Ground](#)
- [Testing for a Short to Voltage](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Inducing Intermittent Fault Conditions](#)
- [Testing for Electrical Intermittents](#)
- [Scan Tool Snapshot Procedure](#)
- [Circuit Protection - Fuses](#)
- [Circuit Protection - Circuit Breakers](#)
- [Circuit Protection - Fusible Links](#)

TESTING FOR INTERMITTENT CONDITIONS AND POOR CONNECTIONS

Special Tools

EL-35616 Terminal Test Probe Kit

For equivalent regional tools, refer to [Special Tools](#) .

When the condition is not currently present, but is indicated in DTC history, the cause may be intermittent. An intermittent may also be the cause when there is a customer complaint, but the symptom cannot be duplicated. Refer to the Symptom Table of the system that is suspect of causing the condition before trying to locate an intermittent condition.

Most intermittent conditions are caused by faulty electrical connections or wiring. Inspect for the following items:

- Loose, corroded, or painted terminal stud/fastener
- Wiring broken inside the insulation
- Poor connection between the male and female terminal at a connector
- A terminal not seated all the way into the connector body
- Poor terminal to wire connection - Some conditions which fall under this description are poor crimps, poor solder joints, crimping over the wire insulation rather than the wire itself, and corrosion in the wire to terminal contact area, etc.
- Pierced or damaged insulation can allow moisture to enter the wiring causing corrosion. The conductor can corrode inside the insulation, with little visible evidence. Look for swollen and stiff sections of wire in the suspect circuits.
- Wiring which has been pinched, cut, or its insulation rubbed through may cause an intermittent open or short as the bare area touches other wiring or parts of the vehicle.
- Wiring that comes in contact with hot or exhaust components
- Refer to [Inducing Intermittent Fault Conditions](#) in order to duplicate the conditions required, in order to verify the customer concern.
- Refer to [Testing for Electrical Intermittents](#) for test procedures to detect intermittent open, high resistance, short to ground, and short to voltage conditions.
- Refer to [Scan Tool Snapshot Procedure](#) for advanced intermittent diagnosis and Vehicle Data Recorder operation.

Testing for Terminal Fretting

Some intermittent conditions can be caused by wire terminal fretting corrosion. Fretting and corrosion can only occur on tin plated terminals, but can also cause high insertion forces when engaging connectors. Fretting corrosion is a build-up of insulating, oxidized wear debris that can form when there is a small motion between electrical contacts. The oxidized wear debris can pile up enough at the electrical contact spots that the electrical resistance across the connection increases. Movement between the contacting surfaces as small as 10 to 100 microns can cause fretting. To put this in perspective, a sheet of paper is about 100 microns thick, so fretting motion is small and hard to see. Vibration and thermal expansion/contraction are the main sources that create fretting motion. Since vehicles vibrate and can experience large temperature swings, they are a good source for fretting motion. Tin, copper, nickel, and iron surfaces are all susceptible to fretting corrosion. Fretting corrosion can be difficult to see but it looks like small, dark smudges on the terminals contact surface.

NOTE: The procedure below does not apply to the following types of connections:

- **Gold Plated Terminals (example squib connectors)**
- **Silver Plated Terminals**
- **Coax Terminals**
- **High Voltage Cable connections**

To correct a fretting condition disconnect the suspect connector and add dielectric grease/lubricant (Nyogel 760G or equivalent, meeting GM specification 9986087) to both sides of the connector terminals. Then reconnect the connector and wipe away any excess lubricant. This will correct the additional terminal contact resistance due to the terminal fretting corrosion.

Testing for Proper Terminal Contact

It is important to test terminal contact at the component and any inline connectors before replacing a suspect component. Mating terminals must be inspected to ensure good terminal contact. A poor connection between the male and female terminal at a connector may be the result of contamination or deformation.

Contamination may be caused by the connector halves being improperly connected. A missing or damaged connector seal, damage to the connector itself, or exposing the terminals to moisture and dirt can also cause contamination. Contamination, usually in the underhood or underbody connectors, leads to terminal corrosion, causing an open circuit or intermittently open circuit.

Deformation is caused by probing the mating side of a connector terminal without the proper adapter. Always use the **EL-35616** kit when probing connectors. Other causes of terminal deformation are improperly joining the connector halves, or repeatedly separating and joining the connector halves. Deformation, usually to the female terminal contact tang, can result in poor terminal contact causing an open or intermittently open circuit.

Testing for Proper Terminal Contact in Bussed Electrical Centers

It is very important to use the correct test adapter when testing for proper terminal contact of fuses and relays in a bussed electrical center. Use the **EL-35616** kit to test for proper terminal contact. Failure to use the **EL-35616** kit can result in improper diagnosis of the bussed electrical center.

Follow the procedure below in order to test terminal contact:

1. Separate the connector halves.
2. Visually inspect the connector halves for contamination. Contamination may result in a white or green build-up within the connector body or between terminals. This causes high terminal resistance, intermittent contact, or an open circuit. An underhood or underbody connector that shows signs of contamination should be replaced in its entirety: terminals, seals, and connector body.
3. Using an equivalent male terminal/terminated lead, verify that the retention force is significantly different between a known good terminal and the suspect terminal. Replace the female terminal in question.

Flat Wire Connectors

There are no serviceable parts for flat wire connectors on the harness side or the component side.

Follow the procedure below in order to test terminal contact:

1. Remove the component in question.
2. Visually inspect each side of the connector for signs of contamination. Avoid touching either side of the connector as oil from your skin may be a source of contamination as well.
3. Visually inspect the terminal bearing surfaces of the flat wire circuits for splits, cracks, or other imperfections that could cause poor terminal contact. Visually inspect the component side connector to ensure that all of the terminals are uniform and free of damage or deformation.
4. Insert the appropriate adapter into the flat wire harness connector in order to test the circuit in question.

Control Module/Component Voltage and Grounds

Poor voltage or ground connections can cause widely varying symptoms.

- Test all control module voltage supply circuits. Many vehicles have multiple circuits supplying voltage to a control module. Other components in the system may have separate voltage supply circuits that may also need to be tested. Inspect connections at the module/component connectors, fuses, and any intermediate connections between the voltage source and the module/component. A test lamp or a DMM may indicate that voltage is present, but neither tests the ability of the circuit to carry sufficient current. Operate the component to test the ability of the circuit to carry sufficient current. Refer to [Circuit Testing](#), and [Power Distribution Wiring Schematics](#).
- Test all control module ground and system ground circuits. The control module may have multiple ground circuits. Other components in the system may have separate grounds that may also need to be tested. Inspect grounds for clean and tight connections at the grounding point (screw or stud). Inspect the connections at the component and in splice packs, where applicable. Operate the component to test the ability of the circuit to carry sufficient current. Refer to [Circuit Testing](#), and [Ground Distribution Wiring Schematics](#).

Temperature Sensitivity

- An intermittent condition may occur when a component/connection reaches normal operating temperature. The condition may occur only when the component/connection is cold, or only when the component/connection is hot.
- Freeze Frame, Failure Records, Snapshot, or Vehicle Data Recorder data may help with this type of intermittent condition, where applicable.
- If the intermittent is related to heat, review the data for a relationship with the following:
 - High ambient temperatures
 - Underhood/engine generated heat
 - Circuit generated heat due to a poor connection, or high electrical load
 - Higher than normal load conditions, towing, etc.
- If the intermittent is related to cold, review the data for the following:
 - Low ambient temperatures - In extremely low temperatures, ice may form in a connection or component. Inspect for water intrusion.
 - The condition only occurs on a cold start.
 - The condition goes away when the vehicle warms up.
- Information from the customer may help to determine if the trouble follows a pattern that is temperature related.
- If temperature is suspected of causing an intermittent fault condition, attempt to duplicate the condition. Refer to [Inducing Intermittent Fault Conditions](#) in order to duplicate the conditions required.

Electromagnetic Interference and Electrical Noise

Some electrical components/circuits are sensitive to electromagnetic interference or other types of electrical noise. Inspect for the following conditions:

- A mis-routed harness that is too close to high voltage/high current devices such as secondary ignition components, motors, generator etc. - These components may induce electrical noise on a circuit that could interfere with normal circuit operation.
- Electrical system interference caused by a malfunctioning relay, or a control module driven solenoid or switch - These conditions can cause a sharp electrical surge. Normally, the condition will occur when the malfunctioning component is operating.
- Installation of non-factory or aftermarket add on accessories such as lights, 2-way radios, amplifiers, electric motors, remote starters, alarm systems, cell phones, etc. - These accessories may create interference in other circuits while operating and the interference would disappear when the accessory is not operating. Refer to [Checking Aftermarket Accessories](#).
- Test for an open diode across the A/C compressor clutch and for other open diodes. Some relays may contain a clamping diode.
- The generator may be allowing AC noise into the electrical system.

Incorrect Control Module

- There are only a few situations where reprogramming a control module is appropriate:
 - A new service control module is installed.
 - A control module from another vehicle is installed.
 - Revised software/calibration files have been released for this vehicle.

NOTE: **DO NOT re-program the control module with the SAME software/calibration files that are already present in the control module. This is not an effective repair for any type of concern.**

- Verify that the control module contains the correct software/calibration. If incorrect programming is found, reprogram the control module with the most current software/calibration. Refer to [Control Module References](#) for replacement, setup, and programming.

IGNITION KEY CANNOT BE INSERTED, ROTATED, OR REMOVED FROM THE IGNITION LOCK CYLINDER

Step	Action	Yes	No
1	1. Ensure the transmission shift lever is in the PARK position and the steering column is NOT in the locked position. 2. Verify the ignition key cannot be removed from the ignition lock cylinder. Can the ignition key be removed from the ignition lock cylinder?	Go to Step 4	Go to Step 2
2	Verify the ignition key cannot be turned to the OFF position. Can the ignition key be turned to the OFF position?	Go to Step 3	Go to Step 7
3	Verify the ignition key cannot be removed from the ignition lock cylinder. Can the ignition key be removed from the ignition lock cylinder?	Go to Step 7	Go to Step 12
4	Verify the ignition key cannot be fully inserted and rotated without sticking in any position. Can the ignition key be fully inserted into the ignition lock cylinder and be rotated without sticking in any position?	Go to Step 7	Go to Step 5
5	Inspect for an incorrect, worn, or damaged ignition key. Is the ignition key incorrect, worn, or damaged?	Go to Step 10	Go to Step 6
6	Inspect the ignition key and clean the entire middle groove area of the side milled ignition key. Can the cleaned ignition key be fully inserted into the ignition lock cylinder and be rotated without sticking in any position?	Go to Step 13	Go to Step 12
7	Verify the adjustment of the shift control cable. Range Selector Lever Cable Adjustment Can the ignition key be turned to the OFF position and be removed?	Go to Step 13	Go to Step 8
8	Attempt to override the ignition lock solenoid on the ignition and start switch housing. Can the ignition key be turned to the OFF position and be removed?	Go to Step 9	Go to Step 12
9	Inspect the electrical system for improper operation. Ignition Can/Cannot Be Turned Off with Transmission in Any Gear , or Testing for Intermittent Conditions and Poor Connections Can the ignition key be turned to the OFF position and be removed?	Go to Step 13	Go to Step 11
10	1. Replace the ignition key. Door Lock and Ignition Lock Folding and Non-Folding Key Cutting 2. Program the ignition key. Replacing Keys Did you complete the repair?	Go to Step 13	-

Step	Action	Yes	No
11	Replace the floor shifter. Transmission Control Replacement Did you complete the repair?	Go to Step 13	-
12	Replace the ignition lock cylinder. Ignition Lock Cylinder Replacement Did you complete the repair?	Go to Step 13	-
13	Operate the system in order to verify the repair. Did you correct the condition?	System OK	-

WIRING REPAIRS

The Wiring Repairs section contains the following types of wiring repair information. Using these elements together will make wiring repair faster and easier:

- [Coaxial Cable Repairs](#)
- [Flat Wire Repairs](#)
- [Heated Oxygen Sensor Wiring Repairs](#)
- [High Temperature Wiring Repairs](#)
- [Serial Data Circuit Wiring Repairs](#)
- [SIR/SRS Wiring Repairs](#)
- [Splicing Twisted or Shielded Cable](#)
- [Wire to Wire Repair](#)

CONNECTOR REPAIRS

Connector Repairs contains a list of all connector repairs. The connector repairs are listed by the connector manufacturer and then by connector type. If the technician cannot identify the manufacturer of the connector, refer to Identifying Connectors below. Knowing the connector manufacturer will assist in finding the correct connector repair from the following list:

- [Connector Position Assurance Locks](#)
- [Terminal Position Assurance Locks](#)
- [AFL/EPC Connectors](#)
- [Bosch Connectors \(0.64\)](#) , or [Bosch Connectors \(BSK\)](#) , or [Bosch Connectors \(2.8 JPT\)](#) , or [Bosch Connectors \(ECM\)](#)
- [Delphi Connectors \(Weather Pack\)](#) , or [Delphi Connectors \(Push to Seat\)](#) , or [Delphi Connectors \(Pull to Seat\)](#) , or [Delphi Connectors \(Micro Pack 100W\)](#) , or [Delphi Connectors \(Micro.64\)](#) , or [Delphi Connectors \(12-Way\)](#) , or [Delphi Connectors \(Steering Gear\)](#)
- [FCI Connectors \(Lever Lock\)](#) , or [FCI Connectors \(SIR\)](#)
- [FEP Connectors \(Steering Gear\)](#)
- [JST Connectors](#)
- [Kostal Connectors \(Glow Plug Control Module\)](#) , or [Kostal Connectors \(Transmission\)](#)
- [Molex Connectors \(Lever Lock\)](#) , or [Molex Connectors \(SIR\)](#)
- [Sumitomo Connectors](#)
- [Tyco/AMP Connectors \(CM 42-Way\)](#) , or [Tyco/AMP Connectors \(Sensor\)](#) , or [Tyco/AMP Connectors \(0.25 Cap\)](#) , or [Tyco/AMP Connectors \(43-Way\)](#) , or [Tyco/AMP Connectors \(Door Module\)](#) , or [Tyco/AMP Connectors \(Seat\)](#) , or [Tyco/AMP Connectors \(102-Way Inline\)](#) , or [Tyco/AMP Connectors \(SIR\)](#)
- [Yazaki Connectors \(2-Way\)](#) , or [Yazaki Connectors \(16-Way\)](#)
- [Repairing Connector Terminals \(Terminated Lead Repair\)](#) , or [Repairing Connector Terminals \(Terminal Repair\)](#)

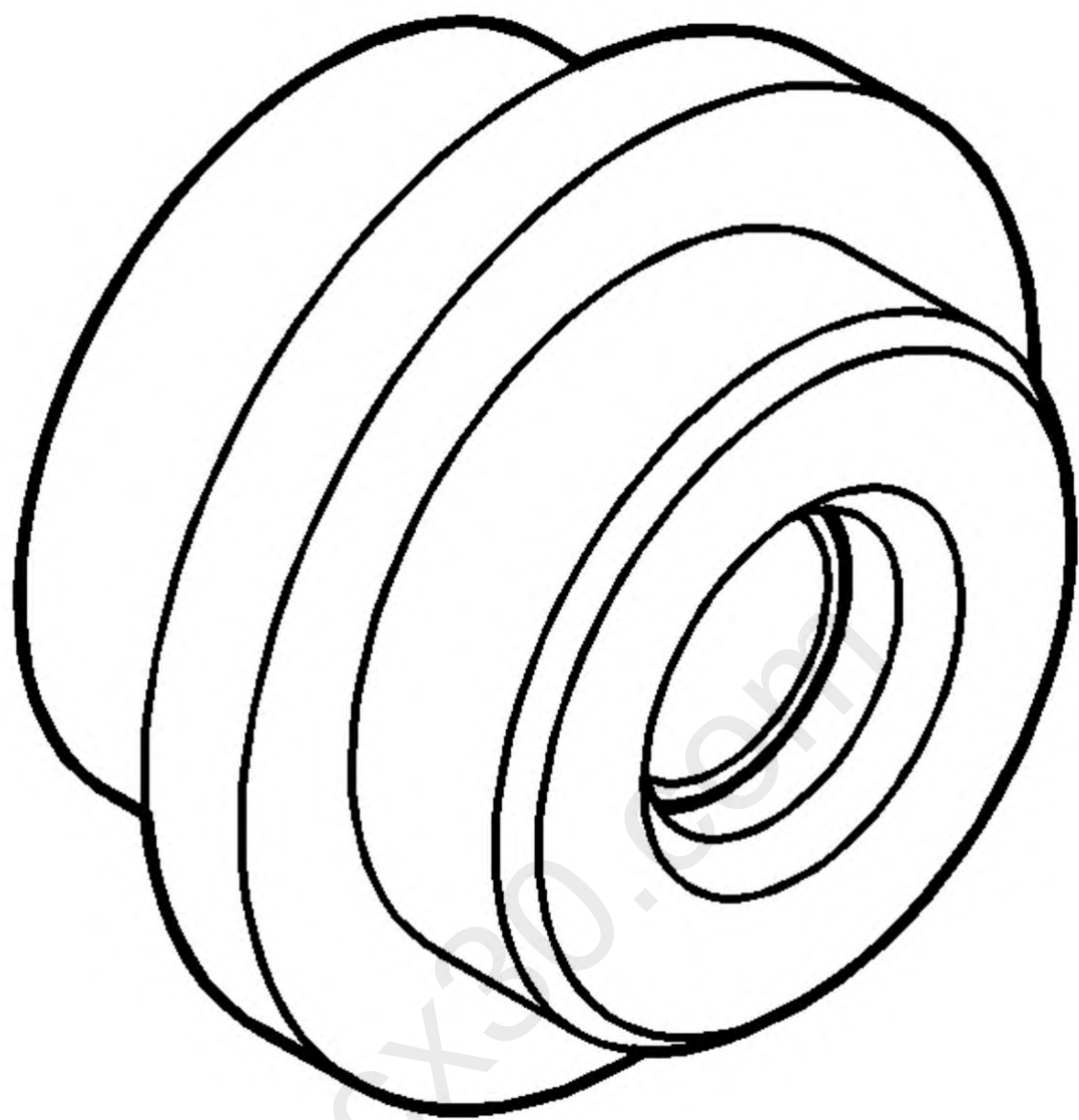


Fig. 1: Exploded View Of Connector Anatomy Components
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Connector Positive Assurance (CPA)
2	Assist Lever
3	Wire Dress Cover
4	Seal Strain/Relief
5	Slide Left Hand
6	Slide Right Hand
7	Terminal Positive Assurance (TPA)
8	Terminal Positive Assurance (TPA)
9	Connector Seal
10	Connector Housing
11	Inner Connector

Identifying Connectors

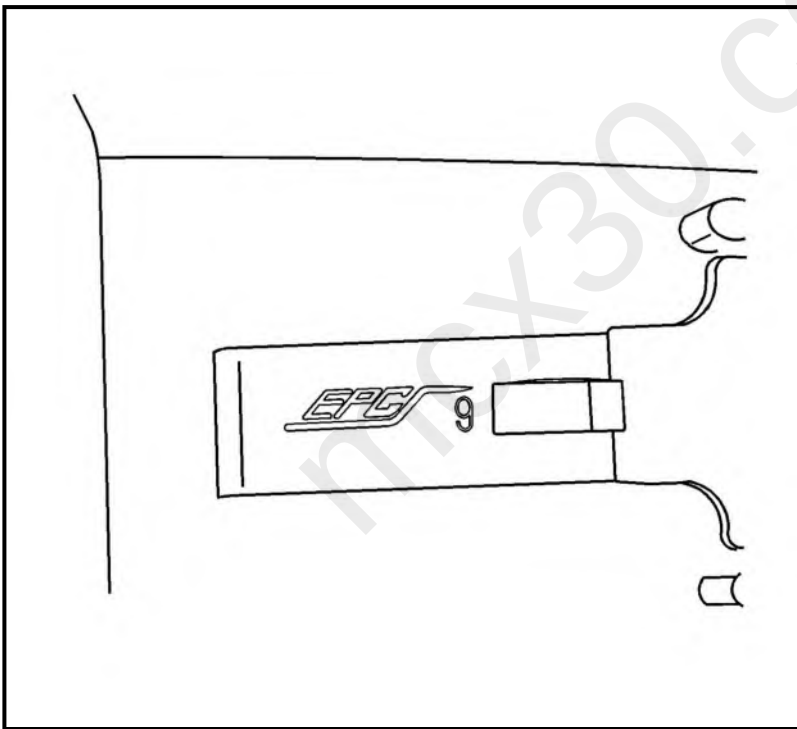
Knowing the connector manufacturer is helpful when trying to locating the correct connector repair procedure. There are many different connector designs used on GM vehicles and it is sometimes difficult to identify the

connector manufacturer. The information in this document should help with the identification of connector manufactures.

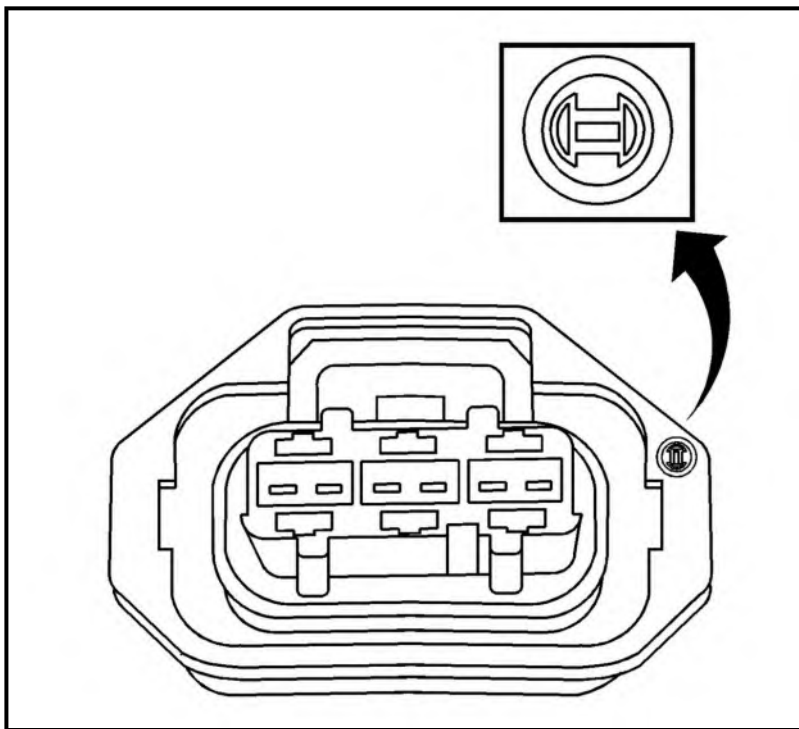
The following connector manufacturers make most of the connectors found in GM vehicles:

- AFL/EPC (Alcoa Fujikura Ltd./Engineered Plastics Components)
- Bosch
- Delphi
- FCI (Framatome Connectors International)
- JAE (Japan Aviation Electronics)
- JST (Japan Solderless Terminals)
- Kostal
- Molex
- Sumitomo
- Tyco/AMP
- Yazaki

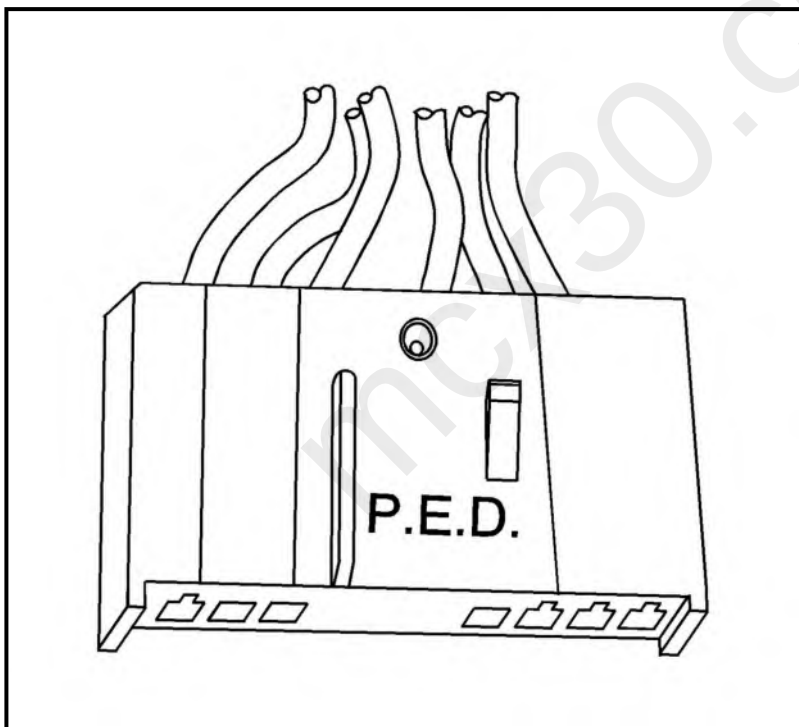
Identifying the manufacturer of a connector is often difficult. When trying to determine the manufacturer of a connector, look for specific identifying marks that are unique to that connector supplier. Most of these identify marks are hard to find or see. Check the connector carefully and refer to the information below for pictures and descriptions of connector identification markings.



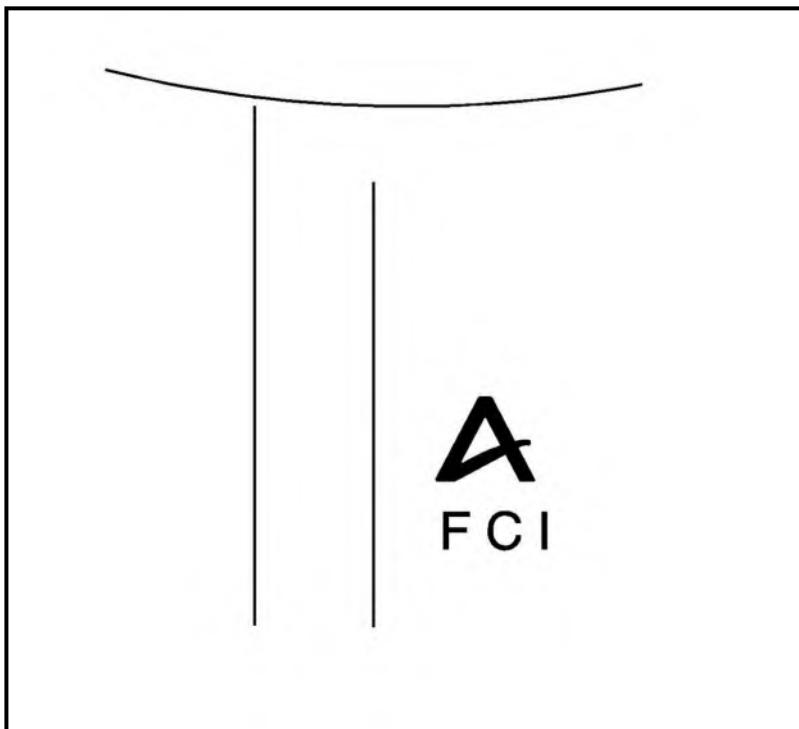
Most of AFL's connectors have EPC on their connector body. Some of the smaller connectors will not have any markings on them.



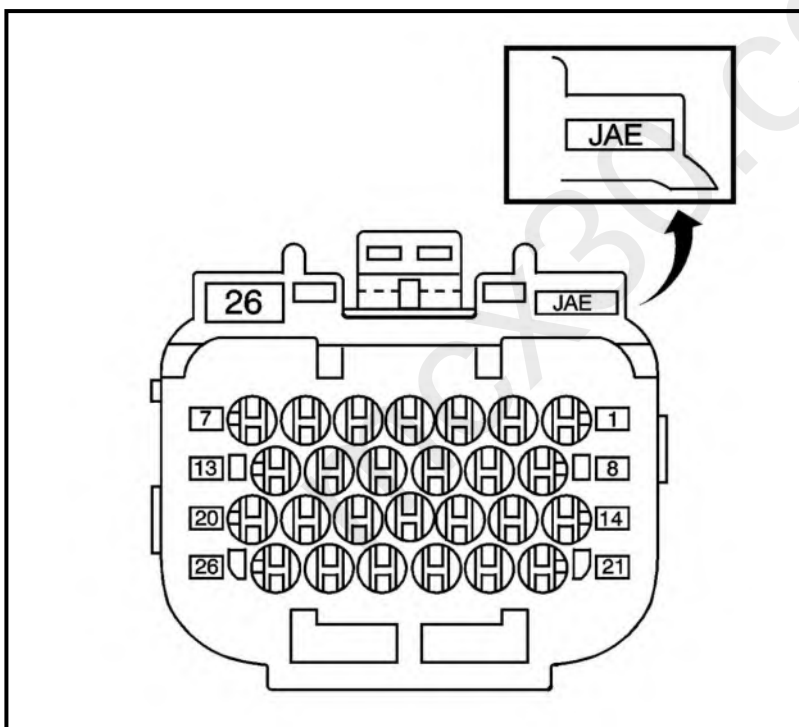
In some cases Bosch will actually be printed on the connector. If Bosch does not appear on the connector, look for the Bosch logo. The Bosch logo is a circle with a blunted arrow inside. This logo can appear anywhere on the connector and is often very small.



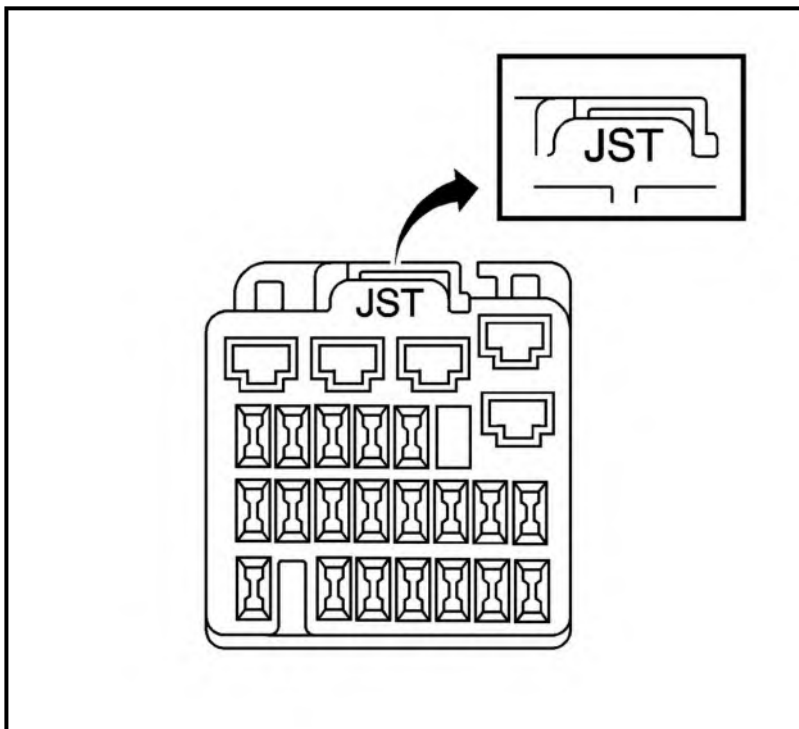
In some cases Delphi will actually be printed on the connector. If Delphi is not printed on the connector, look for PED. In both cases there is no specific orientation for Delphi or PED and they can appear anywhere on the connector.



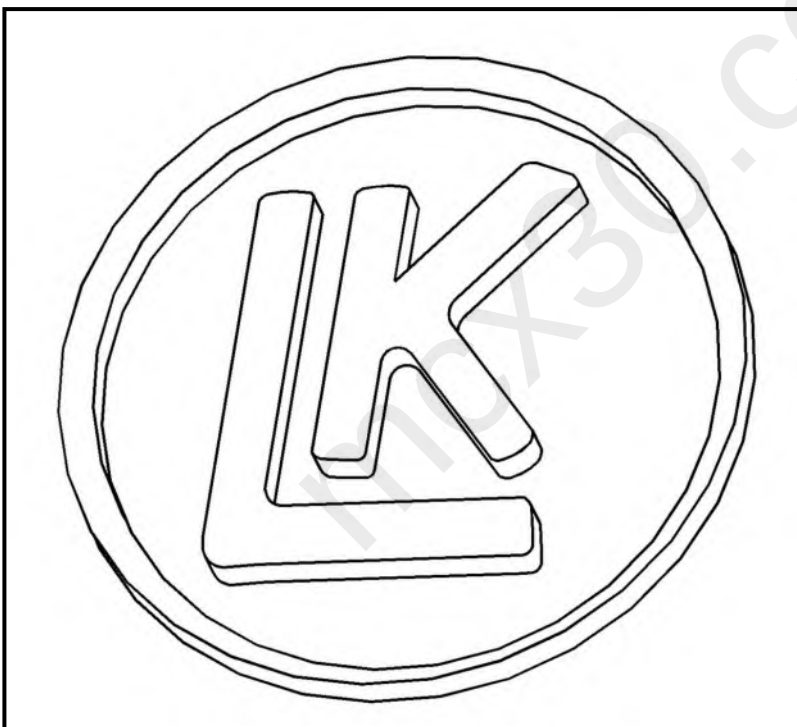
FCI connectors may have the FCI logo on their connectors. The logo is the letters FCI with an "A" above it.



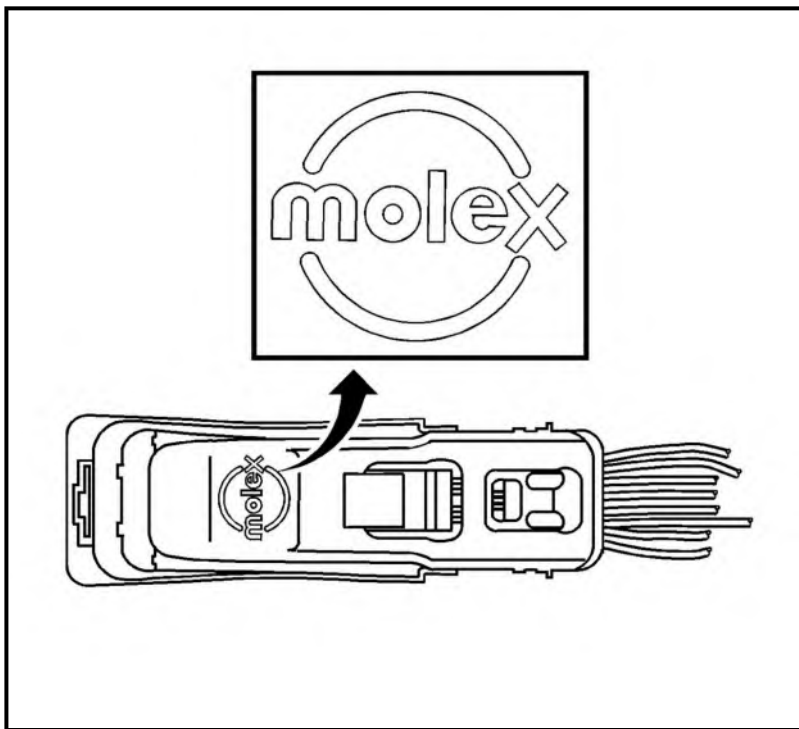
JAE connector have JAE in small letters on their connectors.



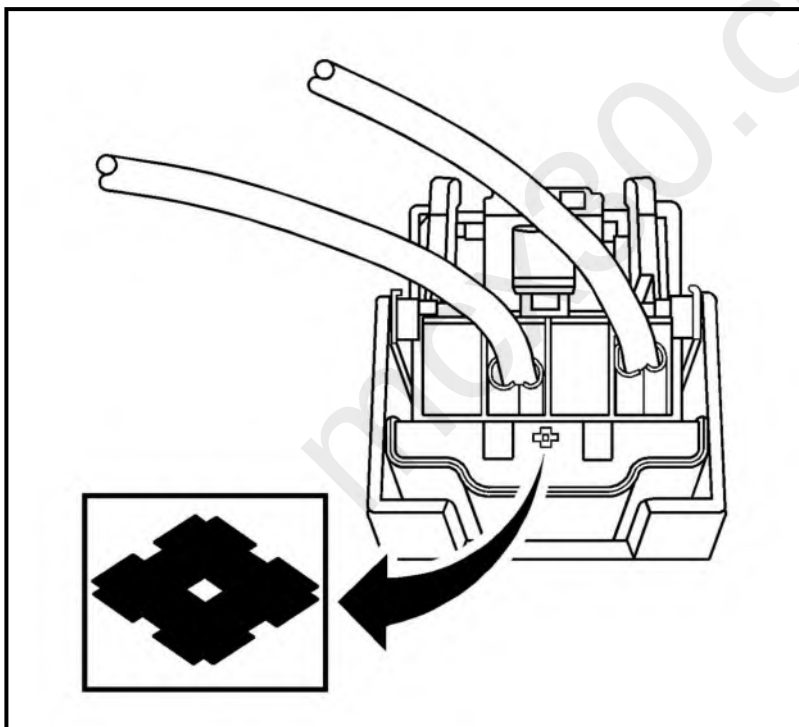
JST connectors have JST in small letters on their connectors, similar to that above. The location of the logo will vary with the connector size and style.



Kostel has an "LK" with a circle around it. These connector are usually used as a transmissions connection.

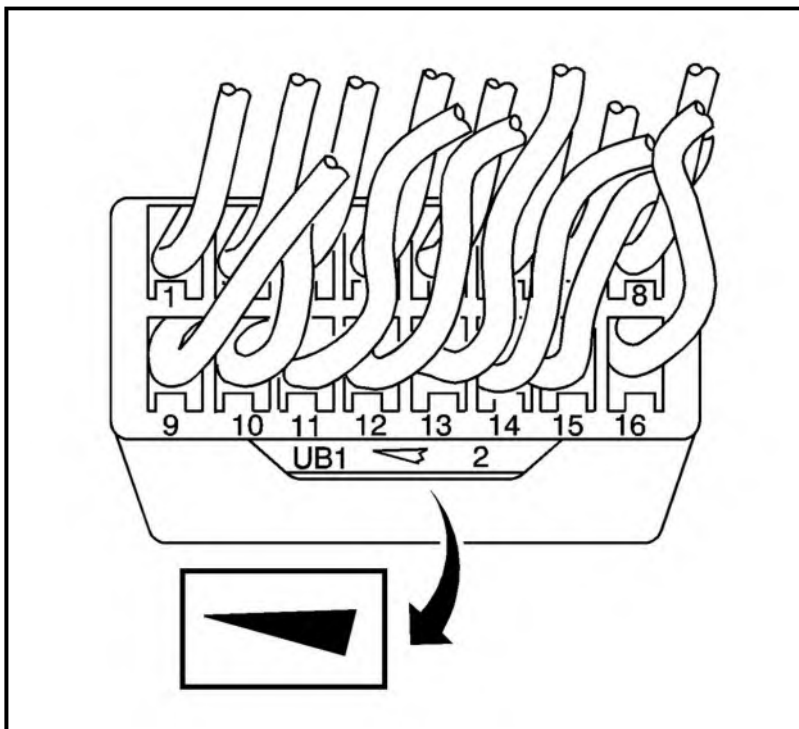


Most Molex connectors will have the Molex logo on the dress cover of the connector. In some cases the connectors may have MX followed by another letter. The third letter indicates where the connector was made. A connector with MXD is a Molex connector made in Detroit.



Sumitomo has a unique symbol on their connector and possibly a part number. The symbol is similar to that of a diamond lying on its side, similar to that shown. The logo could appear anywhere but the most common place is at the wire side of the housing.

- Tyco/AMP has many different and unique connector designs. Some may or may not have identifiable marks on them.



Yazaki has a wedge or arrow shape, similar to that shown.

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