

2017 ELECTRICAL

Wiring Systems and Power Management - Diagnostic Information and Procedures - CT6

DIAGNOSTIC INFORMATION AND PROCEDURES

DTC B097B: POWER MODE START SWITCH CIRCUIT

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 B097B

Power Mode Start Switch 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
Signal - Terminal 3	B097B 02*	B097B 05*	B097B05*, B097B08*	-
Signal - Terminal 6	B097B 02	B097B 04	B097B04	-
Low Reference	-	B097B 05*, B097B 08*	-	-
Ground	-	B097B 04	-	-
*DTC set in keyless entry control module				

Circuit/System Description

The ignition mode switch contains two individual switches that provide redundant switch inputs to both the body control module and the keyless entry control module. The body control module supplies the ignition mode switch a constant B+ signal. The body control module monitors this signal to determine if the switch is released or pressed. When the ignition mode switch is not pressed, voltage on the signal circuit is pulled down through two resistors in the switch. When the ignition mode switch is pressed, voltage on the signal circuit is pulled down through only one resistor, changing the voltage seen at the body control module and indicating that the ignition mode switch is pressed. The keyless entry control module monitors voltage on the switch in the same manner as the body control module, but monitors the other individual switch in the ignition mode switch.

Conditions for Running the DTC

Control module voltage is 9-16 V.

Conditions for Setting the DTC

B097B 02

- The control module detects a short to ground in the vehicle ignition mode switch signal circuit
- The above condition exists for more than 1 s

B097B 04

- The control module detects an open in the vehicle ignition mode switch signal circuit
- The above condition exists for more than 1 s

B097B 05

- The control module detects an open in the vehicle ignition mode switch circuit
- The above condition exists for more than 1 s

B097B 08

- The control module detects a change in the ignition mode without observing a switch press
- The above condition occurs 4 consecutive times

B097B 61

- The control module detects a continuously closed ignition mode switch
- The above condition exists for more than 1 min

Action Taken When the DTC Sets

B097B 00, B097B 04, B097B 05, B097B 08, B097B 61

No action is taken.

B097B 02

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

Conditions for Clearing the DTC

- A current DTC clears when the malfunction is no longer present.
- A history DTC clears after 40 consecutive module ignition cycles without a repeat of the malfunction.

Reference Information

Schematic Reference

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

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

- [Power Mode Description and Operation \(Without HP9\)](#) [Power Mode Description and Operation \(With HP9\)](#)
- [Keyless Entry System Description and Operation \(Without ATH\)](#) [Keyless Entry System Description and Operation \(With ATH\)](#)

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 B097B 61 is not set.
 - **If DTC B097B 61 is set**

Test or replace the S38 Ignition Mode Switch.
 - **If DTC B097B 61 is not set**
2. Refer to Circuit/System Testing.

Circuit/System Testing

1. Ignition OFF/Vehicle OFF and all vehicle systems OFF, disconnect the harness connector at the S38 Ignition Mode Switch. 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 4 and ground.
 - **If 10 Ω or greater**
 1. 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.
 - **If less than 10 Ω**
3. Test for less than 10 Ω between the low reference circuit terminal 7 and ground.
 - **If 10 Ω or greater**
 1. 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 , replace the K84 Keyless Entry Control Module.
 - **If less than 10 Ω**
4. Connect the S38 Ignition Mode Switch, ignition ON/Vehicle in Service Mode.
5. Disconnect the S38 Ignition Mode Switch.
6. Verify the scan tool K9 Body Control Module Push Button Ignition Switch Voltage parameter is greater than 11 V.
 - **If 11 V or less**
 1. Connect the S38 Ignition Mode Switch.
 2. Ignition OFF/Vehicle OFF, disconnect the X2 harness connector at the K9 Body Control Module and S38 Ignition Mode Switch.
 3. Test for infinite resistance between the signal circuit terminal 6 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K9 Body Control Module.
 - **If greater than 11 V**
7. Install a 3 A fused jumper wire between the signal circuit terminal 6 and ground.
8. Verify the scan tool K9 Body Control Module Push Button Ignition Switch Voltage parameter is less than 1 V.
 - **If 1 V or greater**
 1. Disconnect the harness connector at the K9 Body Control Module.
 2. Test for less than 1 V between the signal circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V
 3. Test for less than 2 Ω in 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.
 - **If less than 1 V**
9. Connect the harness connector at the S38 Ignition Mode Switch.

10. Verify the scan tool K9 Body Control Module Push Button Ignition Switch Voltage parameter is 8-10 V, with the S38 Ignition Mode Switch released.

- **If not between 8-10 V**

Test or replace the S38 Ignition Mode Switch.

- **If between 8-10 V**

11. Verify the scan tool K9 Body Control Module Push Button Ignition Switch Voltage parameter is 4-7 V, with the S38 Ignition Mode Switch pressed.

- **If not between 4-7 V**

Test or replace the S38 Ignition Mode Switch.

- **If between 4-7 V**

12. Disconnect the X1 harness connector at the K84 Keyless Entry Control Module.

13. Test for infinite resistance between the signal circuit terminal 11 and ground.

- **If less than infinite resistance**

Repair the short to ground on the circuit.

- **If infinite resistance**

14. Ignition ON/Vehicle in Service Mode.

15. Test for less than 1 V between the signal circuit terminal 11 and ground.

- **If 1 V or greater**

Repair the short to voltage on the circuit.

- **If less than 1 V**

16. Test for 4.5-5.5 k Ω between the signal circuit terminal 11 and the low reference circuit terminal 12, with the S38 Ignition Mode Switch released.

- **If not between 4.5-5.5 k Ω**

1. Ignition OFF/Vehicle OFF, disconnect the harness connector at the S38 Ignition Mode Switch.

2. 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 , test or replace the S38 Ignition Mode Switch.

- **If between 4.5-5.5 k Ω**

17. Test for 1-1.5 k Ω between the signal circuit terminal 11 and the low reference circuit terminal 12, with the S38 Ignition Mode Switch pressed.

- **If not between 1-1.5 k Ω**

Test or replace the S38 Ignition Mode Switch.

- **If between 1-1.5 k Ω**

18. Replace the K84 Keyless Entry Control Module.

Component Testing

Ignition Mode Switch Test

1. Ignition OFF/Vehicle OFF, disconnect the harness connector at the S38 Ignition Mode Switch.

2. Test for 4.5-5.5 k Ω between the terminals listed below with the S38 Ignition Mode Switch released:

- Signal terminal 6 and ground terminal 4
- Signal terminal 3 and low reference terminal 7
- **If not between 4.5-5.5 k Ω**

Replace the S38 Ignition Mode Switch.

- **If between 4.5-5.5 k Ω**

3. Test for 1-1.5 k Ω between the terminals listed below with the S38 Ignition Mode Switch pressed :

- Signal terminal 6 and ground terminal 4
- Signal terminal 3 and low reference terminal 7
- **If not between 1-1.5 k Ω**

Replace the S38 Ignition Mode Switch.

- **If between 1-1.5 k Ω**

4. All OK.

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 B097C: POWER MODE RUN/START INDICATOR CIRCUIT

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 B097C

Power Mode Run/Start Indicator 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
Control circuit terminal 5	B097C 02	1	2	-
Ground	-	1	-	-
1. Ignition Mode switch indicator always off 2. Ignition mode switch indicator always on				

Circuit/System Description

The ignition mode switch has two LEDs that indicate the vehicle power mode. When the vehicle is in the off mode, both LEDs will be off. Pressing the ignition mode switch button once (without the brake pedal applied), the vehicle enters the accessory mode and the amber LED (Accessory) will illuminate. The accessory mode has a 10 min time-out to reduce battery drain. Pressing and holding the push button start switch (without the brake pedal applied) for 5s will place the vehicle in run/start mode/Vehicle in Service Mode (without the vehicle running) and the green LED (Run/Start) will illuminate. With the ignition OFF/vehicle OFF (with the brake pedal applied), pressing the ignition mode switch button once, the vehicle will enter run/start mode/Vehicle ON and the green LED (run/start) will illuminate. This will start the engine. Both LEDs have the voltage supplied from the body control module.

Conditions for Running the DTC

Control module voltage is 9-16 V

Conditions for Setting the DTC

B097C 02

- The BCM detects a short to ground in the control circuit.
- The above condition exists for more than 1 min.

Action Taken When the DTC Sets

The BCM disables the control output.

Conditions for Clearing the DTC

- A current DTC clears when the malfunction is no longer present.
- A history DTC clears when the module power mode cycle counter reaches 40, without a repeat of the malfunction.

Reference Information

Schematic Reference

Power Moding Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Power Mode Description and Operation (Without HP9) Power Mode Description and Operation (With HP9)

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/Vehicle in Service Mode.
2. Verify the green LED turns ON and OFF when commanding the Run/Start Power Mode Indicator On and Off with the scan tool.
 - **If the green LED does not turn ON and OFF**
Refer to Circuit/System Testing.
 - **If the green LED turns ON and OFF**
3. All OK.

Circuit/System Testing

1. Ignition OFF/Vehicle OFF and all vehicle systems OFF, disconnect the harness connector at the S38 Ignition Mode Switch. 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 4 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF/Vehicle 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 connections.
- **If less than 10 Ω**
3. Connect the harness connector at the S38 Ignition Mode Switch.
4. Ignition ON/Vehicle in Service Mode, disconnect the harness connector at the S38 Ignition Mode Switch.
5. Connect a test lamp between the control circuit terminal 5 and ground.
6. Verify the test lamp stays OFF when commanding Run/Start Power Mode Indicator Off with the scan tool.
 - **If the test lamp is always ON**
 1. Connect the harness connector at the S38 Ignition Mode Switch.
 2. Ignition OFF/Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module.
 3. Ignition ON/Vehicle in Service Mode, disconnect the harness connector at the S38 Ignition Mode Switch.
 4. 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.
 - **If the test lamp is always OFF**
7. Test for greater than 3 V between the control circuit terminal 5 and ground while commanding Run/Start Power Mode Indicator On with the scan tool.
 - **If 3 V or less**
 1. Ignition OFF/Vehicle OFF, 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.
 - 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 3 V or greater**
8. Test or replace the S38 Ignition Mode Switch.

Component Testing

1. Ignition OFF/Vehicle OFF, disconnect the harness at the S38 Ignition Mode Switch.
2. Connect a jumper wire between the S38 Ignition Mode Switch terminal 4 and ground.
3. Connect a 3 A fused jumper wire between the S38 Ignition Mode Switch terminal 5 and B+.
4. Verify the green LED illuminates.
 - **If the LED does not illuminate**

Replace the S38 Ignition Mode Switch.
 - **If the LED illuminates**
5. Connect a 3 A fused jumper wire between the S38 Ignition Mode Switch terminal 2 and B+.
6. Verify the amber LED illuminates.
 - **If the LED does not illuminate**

Replace the S38 Ignition Mode Switch.
 - **If the LED illuminates**
7. All OK.

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 B1370: CONTROL MODULE IGNITION ON AND START CIRCUIT (INSTRUMENT CLUSTER)

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

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Instrument Cluster Ignition (Instrument Cluster terminal 8)	B1370 06	B1370 06	B1370 01	-

Circuit/System Description

The vehicle power mode master is the body control module (BCM). The BCM monitors switch inputs and will activate relays and other direct outputs of the power mode master as needed according to the calculated power mode.

The instrument cluster has a switched voltage input and may operate in a default mode if the power mode master serial data message does not match what the individual module can see from its own connections.

Conditions for Running the DTC

B1370 01

Ignition is in Accessory mode.

B1370 06

Ignition is in Accessory/Ignition ON/Vehicle in Service Mode.

Conditions for Setting the DTC

B1370 01

Ignition circuit is shorted to voltage.

B1370 06

- Ignition circuit is open.
- Ignition circuit is shorted to ground.

Action Taken When the DTC Sets

The instrument cluster still functions except check engine light is always off.

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.

Reference Information

Schematic Reference

Instrument Cluster Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

- [Instrument Cluster Description and Operation](#)
- [Power Mode Description and Operation \(Without HP9\)](#) [Power Mode Description and Operation \(With HP9\)](#)

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 that DTC B144B or B1380 is not set.

- **If DTC B144B or B1380 is set**

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

- **If DTC B144B or B1380 is not set**

2. Refer to Circuit/System Testing.

Circuit/System Testing

1. Ignition OFF/Vehicle OFF, disconnect the harness connector at the P16 Instrument Cluster.
2. Verify that a test lamp does not illuminate between the ignition circuit terminal 8 and ground.

- **If the test lamp illuminates**

Repair the short to voltage on the ignition circuit.

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

3. Ignition ON/Vehicle in Service Mode.

4. Verify that a test lamp illuminates between the ignition terminal 8 and ground.

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

1. Ignition OFF/Vehicle 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 \(Without HP9\)](#) and/or [Power Mode Mismatch \(With HP9\)](#).

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

1. Ignition OFF/Vehicle 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 P16 Instrument Cluster.

- **If the test lamp illuminates**

5. Replace the P16 Instrument Cluster.

Repair Instructions

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

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

DTC B1445: CONTROL MODULE VOLTAGE OUTPUT CIRCUIT (BODY CONTROL MODULE)

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

Control Module Voltage Output 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	B1445 02	-	-	-

Circuit/System Description

The body control module (BCM) controls the ignition circuit by applying voltage to the retained accessory power relay coil control circuit. The ignition circuit is energized during all power modes except OFF - awake. The ignition circuit is also energized for approximately 10 min after shutting the vehicle OFF, providing no door is opened.

Conditions for Running the DTC

- The system voltage is between 9-16 V.

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 Moding Schematics

Connector End View Reference

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 Testing

1. Ignition OFF/Vehicle OFF and all vehicle systems OFF, disconnect the P2 Transmission Shift Lever Position Indicator.
2. Connect a test lamp between the ignition circuit terminal 3 and ground, Ignition ON/Vehicle in Service Mode.
3. 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/Vehicle OFF, remove 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.
 - 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/Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module, ignition ON/Vehicle in Service Mode.
 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.
 - **If the test lamp turns ON and OFF**
4. Test or replace the P2 Transmission Shift Lever Position Indicator.

Repair Instructions

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

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

DTC B1445: DEVICE VOLTAGE OUTPUT CIRCUIT (ACCESSORY DC/AC POWER INVERTER MODULE 220V)

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

Device Voltage Output Circuit

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

Diagnostic Fault Information

Device Voltage Output Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
220 V AC Circuits	B1445 0B, B1445 03	1	B1445 07	-
1. Power Outlet Receptacle Malfunction				

Circuit/System Description

The alternating current (AC) accessory power outlet system consists of the accessory DC/AC power inverter module and the accessory power receptacle - 220V AC. The accessory DC/AC power inverter module converts 12 V direct current (DC) battery power to 220-230 V at 50 Hertz (Hz) AC power to operate AC powered devices. The accessory DC/AC power inverter module provides up to 150 watts of power. The accessory power receptacle - 220V AC provides the usual connection for AC powered devices.

Conditions for Running the DTC

Ignition is ON/Vehicle in Service Mode for 5 s.

Engine not running.

The system voltage is greater than 12 V.

Conditions for Setting the DTC

B1445 0B

The output is active and the power output is above 150 watts for greater than 5 s.

B1445 03

Output voltage is less than 90% nominal voltage for greater than 1 s.

B1445 07

Output voltage is greater than 110% nominal voltage for greater than 1 s.

Action Taken When the DTC Sets

B1445 0B

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

No action is taken.

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 40, without a repeat of the malfunction.

Reference Information

Schematic Reference

Cigar Lighter/Power Outlet Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Power Outlets 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/Vehicle in Service Mode.
2. Connect an AC powered device to the X81B Accessory Power Receptacle - 220V AC.
3. Verify the device is powered.
 - **If the device is not powered**
Refer to Circuit/System Testing.
 - **If the device is powered**
4. All OK.

Circuit/System Testing

1. Ignition OFF/Vehicle OFF and all vehicle systems OFF, disconnect the X81B Accessory Power Receptacle - 220V AC and T1 Accessory DC/AC Power Inverter Module.
2. Ignition ON/Vehicle in Service Mode.
3. Test for less than 1 V between the AC circuit terminals listed below and ground.
 - X81B Accessory Power Receptacle - 220V AC - AC Terminal 3 X1
 - X81B Accessory Power Receptacle - 220V AC - AC Terminal 3 X2
 - **If greater than 1 V**
Repair the short to voltage in the AC circuit.

- **If less than 1 V**

4. Ignition OFF/Vehicle OFF.

5. Test for infinite resistance between the AC circuit terminals listed below and ground.

- X81B Accessory Power Receptacle - 220V AC - AC Terminal 3 X1
- X81B Accessory Power Receptacle - 220V AC - AC Terminal 3 X2
- **If less than infinite resistance**

Repair the short to ground in the AC circuit.

- **If infinite resistance**

6. Test for less than 2 Ω in the AC circuit terminals listed below end to end.

- X81B Accessory Power Receptacle - 220V AC terminal 3 X1 and the T1 Accessory DC/AC Power Inverter Module terminal 1 X2.
- X81B Accessory Power Receptacle - 220V AC terminal 3 X2 and the T1 Accessory DC/AC Power Inverter Module terminal 8 X2.
- **If greater than 2 Ω**

Repair the open/high resistance in the AC circuit.

- **If less than 2 Ω**

7. Replace the X81B Accessory Power Receptacle - 220V AC.

8. Verify that DTC B1445 becomes history.

- **If the DTC remains current**

Replace the T1 Accessory DC/AC Power Inverter Module.

- **If the DTC becomes history**

9. All OK.

Repair Instructions

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

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

DTC B1445: DEVICE VOLTAGE OUTPUT CIRCUIT (ACCESSORY DC/AC POWER INVERTER MODULE 110V)

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

Device Voltage Output Circuit

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

Diagnostic Fault Information

Device Voltage Output Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
110 V AC Circuits	B1445 0B, B1445 03	1	B1445 07	-
1. Power Outlet Receptacle Malfunction				

Circuit/System Description

The alternating current (AC) accessory power outlet system consists of the accessory DC/AC power inverter module and the accessory power receptacle - 110 V AC. The accessory DC/AC power inverter module converts 12 V direct current (DC) battery power to 110 V at 60 Hertz (Hz) AC power to operate AC powered devices. The accessory DC/AC power inverter module provides up to 150 watts of power. The accessory power receptacle - 110 V AC provides the usual connection for AC powered devices.

Conditions for Running the DTC

Ignition is ON/Vehicle in Service Mode for 5 s.

Engine not running.

The system voltage is greater than 12 V.

Conditions for Setting the DTC

B1445 0B

The output is active and the power output is above 150 watts for greater than 5 s.

B1445 03

Output voltage is less than 90% nominal voltage for greater than 1 s.

B1445 07

Output voltage is greater than 110% nominal voltage for greater than 1 s.

Action Taken When the DTC Sets

B1445 0B

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

B1445 07

No action is taken.

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 40, without a repeat of the malfunction.

Reference Information

Schematic Reference

Cigar Lighter/Power Outlet Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Power Outlets 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/Vehicle in Service Mode.
2. Connect an AC powered device to the X81 Accessory Power Receptacle - 110V AC.
3. Verify the device is powered.
 - **If the device is not powered**
Refer to Circuit/System Testing.
 - **If the device is powered**
4. All OK.

Circuit/System Testing

1. Ignition OFF/Vehicle OFF and all vehicle systems OFF, disconnect the X81 Accessory Power Receptacle - 110V AC and T1 Accessory DC/AC Power Inverter Module.
2. Ignition ON/Vehicle in Service Mode.
3. Test for less than 1 V between the AC circuit terminals listed below and ground.
 - X81 Accessory Power Receptacle - 110V AC - AC Terminal 3 X1
 - X81 Accessory Power Receptacle - 110V AC - AC Terminal 3 X2
 - **If greater than 1 V**
Repair the short to voltage in the AC circuit.
 - **If less than 1 V**
4. Ignition OFF/Vehicle OFF.
5. Test for infinite resistance between the AC circuit terminals listed below and ground.
 - X81 Accessory Power Receptacle - 110V AC - AC Terminal 3 X1
 - X81 Accessory Power Receptacle - 110V AC - AC Terminal 3 X2
 - **If less than infinite resistance**
Repair the short to ground in the AC circuit.
 - **If infinite resistance**
6. Test for less than 2 Ω in the AC circuit terminals listed below end to end.
 - X81 Accessory Power Receptacle - 110V AC terminal 3 X1 and the T1 Accessory DC/AC Power Inverter Module terminal 1 X2.
 - X81 Accessory Power Receptacle - 110V AC terminal 3 X2 and the T1 Accessory DC/AC Power Inverter Module terminal 8 X2.
 - **If greater than 2 Ω**
Repair the open/high resistance in the AC circuit.
 - **If less than 2 Ω**
7. Replace the X81 Accessory Power Receptacle - 110V AC.
8. Verify that DTC B1445 becomes history.
 - **If the DTC remains current**
Replace the T1 Accessory DC/AC Power Inverter Module.
 - **If the DTC becomes history**
9. All OK.

Repair Instructions

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

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

DTC B144B: RUN/CRANK POWER RELAY CIRCUIT

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
Ignition	B144B 02*	B144B 05*	B144B 01*	-
Control	B144B 02**	-	-	-
* DTC set in keyless entry control module				
** DTC Set in BCM				

Circuit/System Description

The body control module (BCM) controls the ignition main relay (underhood) and the ignition main relay (rear body) 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 (rear body) are energized when the ignition is ON or when a remote start is requested.

The keyless entry control module controls the backup power for the ignition main relays through the control circuit by applying voltage to the ignition circuit. This circuit is a pass-thru in the BCM and will energize the ignition circuit when the ignition is ON 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 05

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

No action is taken.

B144B 02

The ignition main relay (underhood) and the ignition main relay (rear body) are deactivated when the fault is set. After 100 ms, the ignition main relay (underhood) and the ignition main relay (rear body) will be activated. If the fault is still set, the relays will be deactivated. The ignition main relay (underhood) and the ignition main relay (rear body) will again be activated after 100 ms. If this also results in a fault, the ignition main relay (underhood) and the ignition main relay (rear body) 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 50 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 Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Power Mode Description and Operation (Without HP9) Power Mode Description and Operation (With HP9)

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Relay Replacement (Attached to Wire Harness) Relay Replacement (Within an Electrical Center)**
- **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/Vehicle in Service Mode.
2. Verify the KR73 Ignition Main Relay (underhood) and the KR73 Ignition Main Relay (rear body) 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 (rear body) do not click ON and OFF**

Refer to Circuit/System Testing.

- If the KR73 Ignition Main Relay (underhood) and the KR73 Ignition Main Relay (rear body) click ON and OFF

3. All OK.

Circuit/System Testing

1. Ignition/Vehicle OFF, disconnect the X3 harness connector at the K9 Body Control Module.
2. Test for less than 1 V between the ignition circuit terminal 6 and ground.

- **If 1 V or greater**

Repair the short to voltage on the circuit.

- **If less than 1 V**

3. Ignition ON/Vehicle in Service Mode.

4. Verify a test lamp illuminates between the ignition circuit terminal 6 and ground.

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

1. Ignition/Vehicle 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.

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 K84 Keyless Entry Control Module.

- **If the test lamp illuminates**

5. Ignition/Vehicle OFF, connect the X3 harness connector at the K9 Body Control Module.

6. Disconnect the KR73 Ignition Main Relay (underhood) and the KR73 Ignition Main Relay (rear body). It may take up to 2 min for all vehicle systems to power down.

7. Test for less than 10 Ω between the ground circuits listed below and ground.

- KR73 Ignition Main Relay (underhood) - Ground circuit terminal 86
- KR73 Ignition Main Relay (rear body) - Ground circuit terminal 86

- **If 10 Ω or greater**

1. Ignition/Vehicle 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.

- **If less than 10 Ω**

8. Ignition ON/Vehicle in Service Mode, connect a test lamp between the control circuits listed below and ground.

- KR73 Ignition Main Relay (underhood) - Control circuit terminal 85
- KR73 Ignition Main Relay (rear body) - Control circuit terminal 85

9. 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/Vehicle 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.
- 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/Vehicle 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.
- **If the test lamp turns ON and OFF**
10. Test or replace the KR73 Ignition Main Relay (underhood) or the KR73 Ignition Main Relay (rear body).

Repair Instructions

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

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

DTC B1451: ACCESSORY POWER CIRCUIT

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 B1451

Accessory Power 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
Ignition	B1451 02	B1451 04	B1451 01	-

Circuit/System Description

The keyless entry control module provides as a backup control for the ignition power circuit, by applying voltage to the ignition power circuit. The ignition power circuit is energized when the vehicle power mode is in ACCESSORY mode or Ignition ON mode.

Conditions for Running the DTC

B1451 01, B1451 04

- Vehicle power mode is Ignition OFF
- Module is awake
- DTC B1451 not already set
- System voltage between 6 and 16 V

B1451 02

- Vehicle power mode is ACCESSORY or Ignition ON mode
- Module is awake
- The DTC is only run when the output is active
- DTC B1451 is not already set
- System voltage between 6 and 16 V

Conditions for Setting the DTC

B1451 01

Ignition output is not active and a short to battery is detected 3 consecutive times.

B1451 02

Ignition output is active and a short to ground is detected 3 consecutive times.

B1451 04

Ignition output is not active and an open circuit is detected 20 consecutive times.

Action Taken When the DTC Sets

B1451 02

The ignition output is deactivated when a short to ground is detected. After 100 ms the output is activated again. This happens 3 times and then the output is deactivated until a new ACCESSORY or Ignition ON mode request is received.

B1451 01, B1451 04

No action is taken.

Conditions for Clearing the DTC

- The current DTC will clear when the malfunction is no longer present during a DTC check.
- A history DTC clears when the module power mode cycle counter reaches the reset threshold of 40, without a repeat of the malfunction.

Diagnostic Aids

- A short to voltage in the ignition control circuit will keep the vehicle modules awake, which can drain the vehicle's battery.
- A short to ground in the extension of this circuit through the body control module can back feed to the keyless entry control module. Check for a short to ground on the ignition circuit on the other side of the ignition pass thru, in the body control module, before replacing the body control module.

Reference Information

Schematic Reference

- [Power Distribution Schematics](#)
- [Remote Function Schematics](#)
- [Body Control System Schematics](#)

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

[Power Mode Description and Operation \(Without HP9\)](#) [Power Mode Description and Operation \(With HP9\)](#)

Electrical Information Reference

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

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

Circuit/System Verification

1. Verify DTC U1814 is not set.

- **If DTC U1814 is set**

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

- **If DTC U1814 is not set**

2. Refer to Circuit/System Testing.

Circuit/System Testing

1. Ignition ON/Vehicle in Service Mode, disconnect the X2 harness connector at the K84 Keyless Entry Control Module.

2. Verify a test lamp illuminates between the B+ circuit terminal 5 and ground.

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

1. Ignition OFF/Vehicle OFF, 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. Ignition OFF/Vehicle OFF, 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 the circuit.
- If infinite resistance, replace the K84 Keyless Entry Control Module.

- **If the test lamp illuminates**

3. Ignition OFF/Vehicle OFF, connect the X2 harness connector at the K84 Keyless Entry Control Module and disconnect the X3 harness connector at the K9 Body Control Module.

4. Test for less than 1 V between the ignition circuit terminal 5 and ground.

- **If 1 V or greater**

Repair the short to voltage on the circuit.

- **If less than 1 V**

5. Ignition ON/Vehicle in Service Mode.

6. Verify a test lamp illuminates between the ignition circuit terminal 5 and ground.

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

1. Ignition OFF/Vehicle 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.

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 K84 Keyless Entry Control Module.

- **If the test lamp illuminates**

7. Replace the K9 Body Control Module.

Repair Instructions

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

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

DTC B147E OR B147F: BATTERY SAVER RELAY SET/RESET SECONDARY CIRCUIT (WITH START/STOP)

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 B147E

Battery Saver Relay Set Secondary Circuit

DTC B147F

Battery Saver Relay Reset Secondary 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
F4DA (BCM 2) Fuse B+	B147F 01, B147F 04	B147F 01, B147F 04	-	-
Set Relay Coil Control	B147E 02	B147E 04	B147E 01	-
Reset Relay Coil Control	B147F 02	B147F 04	B147F 01	-

Circuit/System Description

The battery saver mode (transport mode) reduces the parasitic load of some modules during overseas shipment or during vehicle storage conditions. This improves the drain time on the battery (up to 70 days without the battery going dead). When the vehicle is in transport/storage, some features may have reduced functionality while in the battery saver mode (transport mode), such as disabling the keyless entry or content theft features.

The battery saver mode (transport mode) incorporates a latching relay that when enabled disconnects some modules from their ignition power or memory power sources. Battery saver mode (transport mode) is initiated by turning on the hazard flashers and then pushing the push button mode switch for greater than 15 s. The mode is disengaged by repeating the previous process. After battery saver mode (transport mode) has been enabled, the body control module (BCM) may not send the command to unlatch the relay until after the ignition has been switched to the off position for up to 1 min after retained accessory power is inactive. In battery saver mode (transport mode) the BCM will send a command to latch the relay for operation of those modules while the vehicle is ON and then again unlatching the relay after the vehicle turned OFF. The driver information center (if equipped) will display Transport Mode is On when the transport mode is enabled and Transport Mode is Off when the transport mode is disabled. For vehicles not equipped with a driver information center, the battery indicator light will constantly flash on the instrument cluster when transport mode is enabled. This feature can be used as many times as necessary if the vehicle is to be stored for an extended period of time.

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

B147E 01 or B147F 01

The BCM detects short to battery in the battery saver relay set/reset circuits.

B147E 02 or B147F 02

The BCM detects a short to ground in the battery saver relay set/reset circuits.

B147E 04 or B147F 04

The BCM detects an open/high resistance in the battery saver relay set/reset circuits.

Action Taken When the DTC Sets

B147E 01, B147E 04, B147F 01 and B147F 04

No action is taken.

B147E 02 and B147F 02

The module output driver will be shut down and not supply voltage to the battery saver relay set/reset circuits.

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

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

Connector End View Reference

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- [Connector Repairs](#)
- [Relay Replacement \(Attached to Wire Harness\)](#) [Relay Replacement \(Within an Electrical Center\)](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

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

Circuit/System Verification

1. Enable battery saver mode (transport mode) in the vehicle.

2. Verify that the appropriate devices controlled by the KR104A Battery Saver Relay 1 turn ON and OFF after enabling battery saver mode (transport mode).

- **If the devices do not turn ON and OFF**

Refer to Circuit/System Testing - Diagnostic A.

- **If the devices turn ON and OFF**

3. Verify that the appropriate devices controlled by the KR104B Battery Saver Relay 2 turn ON and OFF after enabling battery saver mode (transport mode).

- **If the devices do not turn ON and OFF**

Refer to Circuit/System Testing - Diagnostic B.

- **If the devices turn ON and OFF**

4. All OK.

Circuit/System Testing

Diagnostic A

1. Ignition OFF/Vehicle OFF, disconnect the KR104A Battery Saver Relay 1. 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 6 and ground.

- **If 10 Ω or greater**

1. Ignition OFF/Vehicle 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.

- **If less than 10 Ω**

3. Ignition ON/Vehicle in Service Mode.

4. Verify a test lamp illuminates between the B+ circuit terminal 14 and ground.

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

1. Test for infinite resistance between the B+ circuit and ground.

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

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 , refer to **Stop/Start System Malfunction**.

- **If the test lamp illuminates**

5. Enable battery saver mode (transport mode).

6. Ignition OFF/Vehicle OFF.

7. Connect a test lamp between the control terminal 13 and ground.

8. Verify the test lamp momentarily flashes ON and OFF when cycling the ignition ON/Vehicle in Service Mode.

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

1. Ignition OFF/Vehicle 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.
- If infinite resistance

3. Test for less than 2 Ω on 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/Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module, ignition ON/Vehicle in Service Mode.
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.
- **If the test lamp turns ON and OFF**
9. Connect a test lamp between the control circuit terminal 15 and ground.
10. Verify the test lamp momentarily flashes ON and OFF after cycling the ignition OFF/Vehicle OFF.

NOTE: It may take up to 1 min after the ignition is cycled OFF/Vehicle OFF and retained accessory power is disabled before the body control module sends a command to unlatch the relay.

- **If the test lamp is always OFF**
 1. Ignition OFF/Vehicle 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.
 - 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/Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module, ignition ON/Vehicle in Service Mode.
 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.
 - **If the test lamp turns ON and OFF**
11. Test or replace the appropriate KR104A Battery Saver Relay 1.

Diagnostic B

1. Enable battery saver mode (transport mode).
2. Ignition OFF and all vehicle systems OFF, disconnect the X2 harness connector at the X53A Fuse Block - Rear Body.
3. Connect a test lamp between the control circuit terminal 22 and the ground.
4. Verify the test lamp momentarily flashes ON and OFF when turning the ignition ON.
 - **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.
 - 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.

- **If the test lamp turns ON and OFF**

5. Ignition OFF, Connect the X2 harness connector at the X53A Fuse Block - Rear Body.
6. Disconnect X3 harness connector at the X53A Fuse Block - Rear Body.
7. Connect a test lamp between the control circuit terminal 28 and ground.
8. Verify the test lamp momentarily flashes ON and OFF after turning the ignition OFF.

NOTE: It may take up to 1 min after the ignition is switched OFF and retained accessory power is disabled before the K9 Body Control Module sends a command to unlatch the relay.

- **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.
 - 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.

- **If the test lamp turns ON and OFF**

9. Connect the harness connector at the X53A Fuse Block - Rear Body.
10. Disconnect the harness connector at the appropriate device controlled by the KR104B Battery Saver Relay 2.

NOTE: The vehicle may not be equipped with all components as listed below. Use schematics to determine which components are supplied their B+ feed by the KR104B Battery Saver Relay 2. Use the connector end view to identify the B+ circuit terminal for each of those components.

11. Ignition OFF.
12. Verify that a test lamp does not illuminate between each of the B+ circuits listed below and ground.
 - K171 Hands-Free Liftgate Sensor Control Module - B+ circuit terminal 2 X1
 - K39 Liftgate Control Module - B+ circuit terminal 4 X2
 - X82 Audio/Video Input Adapter - B+ circuit terminal 6 X1
 - A11 Radio - B+ circuit terminal 1 X1
 - B218L Side Object Sensor Module - Left - B+ circuit terminal 8
 - B218R Side Object Sensor Module - Right - B+ circuit terminal 8
 - B233R Radar Sensor Module - Short Range Rear - B+ circuit terminal 1
 - K124 Active Safety Control Module - B+ circuit terminal 1 X1
 - B117 Rain Sensor - B+ circuit terminal 1
 - B165 Content Theft Deterrent Sensor Module - B+ circuit terminal 3 X1
 - S25 Garage Door Opener - B+ circuit terminal 1 X1
 - P25 Power Sounder Content Theft Deterrent Alarm Module - B+ circuit terminal 3

- **If the test lamp illuminates**

Repair the short to voltage on the B+ circuit.

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

13. Ignition ON.

14. Verify that a test lamp illuminates between each of the B+ circuits listed below and ground.

- K171 Hands-Free Liftgate Sensor Control Module - B+ circuit terminal 2 X1
- K39 Liftgate Control Module - B+ circuit terminal 4 X2
- X82 Audio/Video Input Adapter - B+ circuit terminal 6 X1
- A11 Radio - B+ circuit terminal 1 X1
- B218L Side Object Sensor Module - Left - B+ circuit terminal 8
- B218R Side Object Sensor Module - Right - B+ circuit terminal 8
- B233R Radar Sensor Module - Short Range Rear - B+ circuit terminal 1
- K124 Active Safety Control Module - B+ circuit terminal 1 X1
- B117 Rain Sensor - B+ circuit terminal 1
- B165 Content Theft Deterrent Sensor Module - B+ circuit terminal 3 X1
- S25 Garage Door Opener - B+ circuit terminal 1 X1
- P25 Power Sounder Content Theft Deterrent Alarm Module - B+ circuit terminal 3
- **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 B+ 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 X53A Fuse Block - Rear Body.

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

1. Ignition OFF.

2. Test for infinite resistance between the B+ circuit and ground.

- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance, test or replace the appropriate device controlled by the KR104B Battery Saver Relay 2.

- **If the test lamp illuminates**

15. Test or replace the appropriate device controlled by the KR104B Battery Saver Relay 2.

Component Testing

Latching Relay Test

1. Ignition OFF/Vehicle OFF, disconnect the appropriate KR104A Battery Saver Relay 1 or KR104B Battery Saver Relay 2.

2. Test for 70-150 Ω between terminals 1 and 6.

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

Replace the relay.

- **If between 70-150 Ω**

3. Test for 70-150 Ω between terminals 2 and 6.

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

Replace the relay.

- **If between 70-150 Ω**

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

- 3 and 1
- 3 and 2

- 3 and 6
- 5 and 1
- 5 and 2
- 5 and 6
- **If less than infinite resistance**

Replace the relay.

- **If infinite resistance**

5. Install a 3 A fused jumper wire between relay terminal 1 and 12 V. Install a jumper wire between relay terminal 6 and ground.

6. Test for less than 5.0 Ω between terminals 3 and 5.

- **If 5.0 Ω or greater**

Replace the relay.

- **If less than 5.0 Ω**

7. Install a 3 A fused jumper wire between relay terminal 2 and 12 V. Install a jumper wire between relay terminal 6 and ground.

8. Test infinite resistance between terminals 3 and 5.

- **If less than infinite resistance**

Replace the relay.

- **If infinite resistance**

9. All OK

Repair Instructions

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

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

DTC B147E OR B147F: BATTERY SAVER RELAY SET/RESET SECONDARY CIRCUIT (WITHOUT START/STOP)

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 B147E

Battery Saver Relay Set Secondary Circuit

DTC B147F

Battery Saver Relay Reset Secondary 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
F4DA (BCM 2) Fuse B+	B147F 01, B147F 04	B147F01, B147F04	-	-

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Set Relay Coil Control	B147E 02	B147E 04	B147E 01	-
Reset Relay Coil Control	B147F 02	B147F 04	B147F 01	-

Circuit/System Description

The battery saver mode (transport mode) reduces the parasitic load of some modules during overseas shipment or during vehicle storage conditions. This improves the drain time on the battery (up to 70 days without the battery going dead). When the vehicle is in transport/storage, some features may have reduced functionality while in the battery saver mode (transport mode), such as disabling the keyless entry or content theft features.

The battery saver mode (transport mode) incorporates a latching relay that when enabled disconnects some modules from their ignition power or memory power sources. Battery saver mode (transport mode) is initiated by turning on the hazard flashers and then pushing the push button mode switch for greater than 15 s. The mode is disengaged by repeating the previous process. After battery saver mode (transport mode) has been enabled, the body control module (BCM) may not send the command to unlatch the relay until after the ignition has been switched to the off position for up to 1 min after retained accessory power is inactive. In battery saver mode (transport mode) the BCM will send a command to latch the relay for operation of those modules while the vehicle is ON and then again unlatching the relay after the vehicle turned OFF. The driver information center (if equipped) will display Transport Mode is On when the transport mode is enabled and Transport Mode is Off when the transport mode is disabled. For vehicles not equipped with a driver information center, the battery indicator light will constantly flash on the instrument cluster when transport mode is enabled. This feature can be used as many times as necessary if the vehicle is to be stored for an extended period of time.

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

B147E 01 or B147F 01

The BCM detects short to battery in the battery saver relay set/reset circuits.

B147E 02 or B147F 02

The BCM detects a short to ground in the battery saver relay set/reset circuits.

B147E 04 or B147F 04

The BCM detects an open/high resistance in the battery saver relay set/reset circuits.

Action Taken When the DTC Sets

B147E 01, B147E 04, B147F 01 and B147F 04

No action is taken.

B147E 02 and B147F 02

The module output driver will be shut down and not supply voltage to the battery saver relay set/reset circuits.

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

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

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Power Mode Description and Operation (Without HP9) Power Mode Description and Operation (With HP9)

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Relay Replacement \(Attached to Wire Harness\) Relay Replacement \(Within an Electrical Center\)](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Enable battery saver mode (transport mode) in the vehicle.
2. Verify that the appropriate devices controlled by the KR104A Battery Saver Relay 1 turn ON and OFF after enabling battery saver mode (transport mode).
 - **If the devices do not turn ON and OFF**
Refer to Circuit/System Testing - Diagnostic A.
 - **If the devices turn ON and OFF**
3. Verify that the appropriate devices controlled by the KR104B Battery Saver Relay 2 turn ON and OFF after enabling battery saver mode (transport mode).
 - **If the devices do not turn ON and OFF**
Refer to Circuit/System Testing - Diagnostic B.
 - **If the devices turn ON and OFF**
4. All OK.

Circuit/System Testing

Diagnostic A

1. Ignition OFF/Vehicle OFF, disconnect the KR104A Battery Saver Relay 1. 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 6 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF/Vehicle 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.
 - **If less than 10 Ω**
3. Ignition ON/Vehicle in Service Mode.
 4. Verify a test lamp illuminates between the B+ circuit 14 and ground.
 - **If the test lamp does not illuminate and the circuit fuse is good**
 1. Ignition OFF/Vehicle OFF, 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. Ignition OFF/Vehicle OFF, 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 the circuit.
 - If infinite resistance, replace the KR104A Battery Saver Relay 1.
 - **If the test lamp illuminates**
 5. Enable battery saver mode (transport mode).
 6. Ignition OFF/Vehicle OFF.
 7. Connect a test lamp between the control terminal 13 and ground.
 8. Verify the test lamp momentarily flashes ON and OFF when cycling the ignition ON/Vehicle in Service Mode.
 - **If the test lamp is always OFF**
 1. Ignition OFF/Vehicle 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.
 - If infinite resistance
 3. Test for less than 2 Ω on 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/Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module, ignition ON/Vehicle in Service Mode.
 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.
 - **If the test lamp turns ON and OFF**
 9. Connect a test lamp between the control circuit terminal 15 and ground.
 10. Verify the test lamp momentarily flashes ON and OFF after cycling the ignition OFF/Vehicle OFF.

NOTE: It may take up to 1 min after the ignition is cycled OFF/Vehicle OFF and retained accessory power is disabled before the body control module sends a command to unlatch the relay.

- **If the test lamp is always OFF**
 1. Ignition OFF/Vehicle 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.
 - 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/Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module, ignition ON/Vehicle in Service Mode.
 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.
 - **If the test lamp turns ON and OFF**
11. Test or replace the appropriate KR104A Battery Saver Relay 1.

Diagnostic B

1. Enable battery saver mode (transport mode).
2. Ignition OFF and all vehicle systems OFF, disconnect the X2 harness connector at the X53A Fuse Block - Rear Body.
3. Connect a test lamp between the control circuit terminal 22 and the ground.
4. Verify the test lamp momentarily flashes ON and OFF when turning the ignition ON.
 - **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.
 - 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.
 - **If the test lamp turns ON and OFF**
5. Ignition OFF, Connect the X2 harness connector at the X53A Fuse Block - Rear Body.
6. Disconnect X3 harness connector at the X53A Fuse Block - Rear Body.
7. Connect a test lamp between the control circuit terminal 28 and ground.
8. Verify the test lamp momentarily flashes ON and OFF after turning the ignition OFF.

NOTE: It may take up to 1 min after the ignition is switched OFF and retained accessory power is disabled before the K9 Body Control Module sends a command to unlatch the relay.

- **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.
 - 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.

- **If the test lamp turns ON and OFF**

9. Connect the harness connector at the X53A Fuse Block - Rear Body.
10. Disconnect the harness connector at the appropriate device controlled by the KR104B Battery Saver Relay 2.

NOTE: The vehicle may not be equipped with all components as listed below. Use schematics to determine which components are supplied their B+ feed by the KR104B Battery Saver Relay 2. Use the connector end view to identify the B+ circuit terminal for each of those components.

11. Ignition OFF.

12. Verify that a test lamp does not illuminate between each of the B+ circuits listed below and ground.

- K171 Hands-Free Liftgate Sensor Control Module - B+ circuit terminal 2 X1
- K39 Liftgate Control Module - B+ circuit terminal 4 X2
- X82 Audio/Video Input Adapter - B+ circuit terminal 6 X1
- A11 Radio - B+ circuit terminal 1 X1
- B218L Side Object Sensor Module - Left - B+ circuit terminal 8
- B218R Side Object Sensor Module - Right - B+ circuit terminal 8
- B233R Radar Sensor Module - Short Range Rear - B+ circuit terminal 1
- K124 Active Safety Control Module - B+ circuit terminal 1 X1
- B117 Rain Sensor - B+ circuit terminal 1
- B165 Content Theft Deterrent Sensor Module - B+ circuit terminal 3 X1
- S25 Garage Door Opener - B+ circuit terminal 1 X1
- P25 Power Sounder Content Theft Deterrent Alarm Module - B+ circuit terminal 3
- **If the test lamp illuminates**

Repair the short to voltage on the B+ circuit.

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

13. Ignition ON.

14. Verify that a test lamp illuminates between each of the B+ circuits listed below and ground.

- K171 Hands-Free Liftgate Sensor Control Module - B+ circuit terminal 2 X1
- K39 Liftgate Control Module - B+ circuit terminal 4 X2
- X82 Audio/Video Input Adapter - B+ circuit terminal 6 X1
- A11 Radio - B+ circuit terminal 1 X1
- B218L Side Object Sensor Module - Left - B+ circuit terminal 8
- B218R Side Object Sensor Module - Right - B+ circuit terminal 8
- B233R Radar Sensor Module - Short Range Rear - B+ circuit terminal 1
- K124 Active Safety Control Module - B+ circuit terminal 1 X1
- B117 Rain Sensor - B+ circuit terminal 1
- B165 Content Theft Deterrent Sensor Module - B+ circuit terminal 3 X1
- S25 Garage Door Opener - B+ circuit terminal 1 X1
- P25 Power Sounder Content Theft Deterrent Alarm Module - B+ circuit terminal 3
- **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 $2\ \Omega$ in the B+ circuit end to end.

- If $2\ \Omega$ or greater, repair the open/high resistance in the circuit.
- If less than $2\ \Omega$, test or replace the X53A Fuse Block - Rear Body.

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

1. Ignition OFF.

2. Test for infinite resistance between the B+ circuit and ground.

- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance, test or replace the appropriate device controlled by the KR104B Battery Saver Relay 2.

• **If the test lamp illuminates**

15. Test or replace the appropriate device controlled by the KR104B Battery Saver Relay 2.

Component Testing

Latching Relay Test

1. Ignition OFF/Vehicle OFF, disconnect the appropriate KR104A Battery Saver Relay 1 or KR104B Battery Saver Relay 2.

2. Test for $70\text{-}150\ \Omega$ between terminals 1 and 6.

- **If less than 70 or greater than $150\ \Omega$**

Replace the relay.

- **If between $70\text{-}150\ \Omega$**

3. Test for $70\text{-}150\ \Omega$ between terminals 2 and 6.

- **If less than 70 or greater than $150\ \Omega$**

Replace the relay.

- **If between $70\text{-}150\ \Omega$**

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

- 3 and 1
- 3 and 2
- 3 and 6
- 5 and 1
- 5 and 2
- 5 and 6

- **If less than infinite resistance**

Replace the relay.

- **If infinite resistance**

5. Install a 3 A fused jumper wire between relay terminal 1 and 12 V. Install a jumper wire between relay terminal 6 and ground.

6. Test for less than $5.0\ \Omega$ between terminals 3 and 5.

- **If $5.0\ \Omega$ or greater**

Replace the relay.

- **If less than $5.0\ \Omega$**

7. Install a 3 A fused jumper wire between relay terminal 2 and 12 V. Install a jumper wire between relay terminal 6 and ground.

8. Test infinite resistance between terminals 3 and 5.

- **If less than infinite resistance**

Replace the relay.

- **If infinite resistance**

9. All OK

Repair Instructions

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

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

DTC B305E: INTERRUPTIBLE RAP RELAY CIRCUIT

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 B305E

Interruptible RAP 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	B305E 02	B305E 05	B305E 01, B305E 05	-

Circuit/System Description

The keyless entry control module controls the retained accessory power relays through the control circuit by applying voltage to the interruptible retained accessory power relay coil control circuit. The retained accessory power relays are energized when the ignition is in the ACCESSORY or ON/Vehicle in Service Mode. The relays are also energized for approximately 10 min after shutting the vehicle OFF, providing no door is opened.

Conditions for Running the DTC

- System voltage is greater than 6 V.
- The DTC can only set when the output is actively being requested by the module.

Conditions for Setting the DTC

B305E 01

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

B305E 02

The ignition output is active and a short to ground is detected on the ignition voltage circuit.

B305E 05

The ignition output is active and an open or short to battery is detected on the ignition voltage circuit.

Action Taken When the DTC Sets

No action is taken.

B305E 02

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 and the ignition output is active.
- 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 Moding Schematics

Power Distribution Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Retained Accessory Power Description and Operation

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Relay Replacement (Attached to Wire Harness) Relay Replacement (Within an Electrical Center)**
- **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/Vehicle OFF, disconnect the harness connector at the K84 Keyless Entry Control Module.
2. Momentarily Install a 3 A fused jumper wire between the control circuit terminal 7 X1 and B+.
3. Verify the test lamp turns ON and OFF at the appropriate ignition circuits listed below and ground when connecting and disconnecting the jumper wire.
 - X51A Fuse Block - Instrument Panel - Fuse F1DA
 - X51A Fuse Block - Instrument Panel - Fuse F27DA
 - X51A Fuse Block - Instrument Panel - Fuse F28DA
 - X53A Fuse Block - Rear Body - Fuse F41RA
 - X53A Fuse Block - Rear Body - Circuit breaker F41RA
 - **If the test lamp is always OFF**
 1. 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.

2. 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 appropriate X51A Fuse Block - Instrument Panel or X53A Fuse Block - Rear Body.

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

1. 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 the test lamp turns ON and OFF**

4. Replace the K84 Keyless Entry Control Module.

Repair Instructions

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

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

DTC P156D: DC/DC CONVERTER IGNITION SWITCH RUN/START POSITION SIGNAL MESSAGE COUNTER INCORRECT

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 P156D

DC/DC Converter Ignition Switch Run/Start Position Signal Message Counter Incorrect

Circuit/System Description

The DC/DC converter provides continuous power to certain devices during a stop start event to achieve uninterrupted performance during engine cranking. The ECM monitors the ignition status of the DC/DC converter during start stop events.

Conditions for Running the DTC

- The ignition is ON.
- Ignition voltage is greater than 11 V.

Conditions for Setting the DTC

The engine control module detects a corrupted data message from the DC/DC converter. Communication of the Alive Rolling Count from the DC/DC Converter over CAN bus is incorrect for at least 10 counts for greater than a 3 s period.

Action Taken When the DTC Sets

DTC P156D is a Type B DTC.

Conditions for Clearing the DTC

DTC P156D is a Type B DTC.

Reference Information

Schematic Reference

[Starting and Charging Schematics](#)

Connector End View Reference

Description and Operation

Stop/Start System 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. Verify that no other DTCs are set except for DTC P156D.
 - **If any other DTCs are set**
Refer to **Diagnostic Trouble Code (DTC) List - Vehicle** .
 - **If only DTC P156D is set**
2. Replace the T19 Power Supply Transformer.
3. Verify the DTC does not set while operating the vehicle within the Conditions for Running the DTC.
 - **If DTC sets**
Replace the K20 Engine Control Module.
 - **If DTC does not set**
4. All OK.

Repair Instructions

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

Control Module References for control module replacement, programming and setup.

DTC P15B9 OR P15BA: ELECTRIC A/C COMPRESSOR CONTROL MODULE IGNITION ON/START SWITCH CIRCUIT

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 P15B9

Electric A/C Compressor Control Module Ignition On/Start Switch Circuit Low Voltage

DTC P15BA

Electric A/C Compressor Control Module Ignition On/Start Switch Circuit High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Electric A/C compressor control module ignition	P15B9	P15B9	P15BA	-

Circuit/System Description

The body control module (BCM) controls the ignition main relay through the control circuit by applying voltage to the run/crank coil circuit. The ignition circuit is energized when the vehicle power mode is Vehicle ON or Ignition ON/Vehicle in Service Mode. The hybrid powertrain control module 2 sends the vehicle power mode status in a serial data message to the battery charger control module, A/C compressor, battery energy control module, fuel pump control module and the transmission control module (TCM).

Conditions for Running the DTC

P15B9

- Hybrid powertrain control module 2 is awake.
- Vehicle power mode is Vehicle ON or Ignition ON/Vehicle in Service Mode.
- System voltage greater than 10.25 V.

P15BA

- Hybrid powertrain control module 2 is awake.
- Vehicle power mode is Ignition OFF/Vehicle OFF.
- System voltage greater than 10.25 V.

Conditions for Setting the DTC

P15B9

- Hybrid powertrain control module 2 is awake.
- Vehicle power mode is Vehicle ON or Ignition ON/Vehicle in Service Mode.
- Hybrid powertrain control module 2 ignition input is active.
- A/C compressor ignition input is not active and not greater than 5 V.

P15BA

- Hybrid powertrain control module 2 is awake.
- Vehicle power mode is Ignition OFF/Vehicle OFF.
- Hybrid powertrain control module 2 ignition input is not active.
- A/C compressor ignition input is active and not below 5 V.

Action Taken When the DTC Sets

P15B9, P15BA

DTCs P15B9 and P15BA are type A DTCs.

Conditions for Clearing the DTC

P15B9 or P15BA

DTCs P15B9 and P15BA, 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.

Schematic Reference

Power Distribution Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Power Mode Description and Operation (Without HP9) **Power Mode Description and Operation (With HP9)**

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 B144B is not set.
 - **If the DTC is set**
Refer to **DTC B144B**.
 - **If the DTC is not set**
2. Ignition ON/Vehicle in Service Mode, verify that DTC P15B9, P15BA, P1A5E, P1A5F, P1EF6, P1EF7, P2534 or P2535 or is not set.
 - **If two or more DTCs are set**
Refer to Circuit/System Testing - Hybrid Powertrain Control Module 2 Circuit Malfunction.
 - **If DTC P15B9 or P15BA are set**
3. Refer to Circuit/System Testing - Electric A/C compressor Control Module Ignition Circuit Malfunction.

Circuit/System Testing

WARNING: High voltage enabling and disabling shall be only performed by High Voltage Qualified Technicians. The procedures for high voltage enabling/disabling can be found in the service instructions and must be strictly followed at all times. The usage of the Protocol High Voltage Disabling/Enabling is mandatory. The High Voltage Qualified Technician is responsible for the adherence to the manufacturer's service instructions as well as current national legal regulations.

Failure to follow the procedures exactly as written may result in serious injury or death.

Questions regarding training can be answered by your national training center.

WARNING:

Any hybrid/EV battery pack replacement shall be performed by High Voltage Qualified Technicians only. The replacement procedure can be found in the service instruction and must be strictly followed at all times. The High Voltage Qualified Technician is responsible for adherence to the manufacturer's service instructions as well as current national legal regulations. If the hybrid/EV battery pack needs to be replaced contact the Technical Assistance Centre for further instructions prior removal of the battery pack.

Hybrid Powertrain Control Module 2 Circuit Malfunction

1. Ignition OFF/Vehicle OFF, disconnect the X2 harness connector at the K114B Hybrid/EV Powertrain Control Module 2.
2. Verify that a test lamp does not illuminate between the ignition circuit terminal 27 and ground.
 - **If the test lamp illuminates**
Repair the short to voltage on the ignition circuit.
 - **If the test lamp does not illuminate**
3. Ignition ON/Vehicle in Service Mode.
4. Verify a test lamp illuminates between the ignition circuit terminal 27 and ground.
 - **If the test lamp does not illuminate and the circuit fuse is good**
 1. Ignition OFF/Vehicle OFF.
 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 (Without HP9)** and/or **Power Mode Mismatch (With HP9)**.
 - **If the test lamp does not illuminate and the circuit fuse is open**
 1. Ignition OFF/Vehicle 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 K114B Hybrid/EV Powertrain Control Module 2.
 - **If the test lamp illuminates**
5. Replace the K114B Hybrid/EV Powertrain Control Module 2.

Electric A/C Compressor Module Ignition Circuit Malfunction

1. Perform the High Voltage Disabling procedure before proceeding with this diagnostic. Refer to **High Voltage Disabling**.
2. Reconnect the 12 V battery.
3. Ignition OFF/Vehicle OFF, disconnect the X1 harness connector at the G1 A/C Compressor.
4. Verify that a test lamp does not illuminate between the ignition circuit terminal 3 and ground.
 - **If the test lamp illuminates**
Repair the short to voltage on the ignition circuit.
 - **If the test lamp does not illuminate**
5. Ignition ON/Vehicle in Service Mode
6. Verify a test lamp illuminates between the ignition circuit terminal 3 and ground.
 - **If the test lamp does not illuminate and the circuit fuse is good**
 1. Ignition OFF/Vehicle OFF.
 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 \(Without HP9\)](#) and/or [Power Mode Mismatch \(With HP9\)](#).
- **If the test lamp does not illuminate and the circuit fuse is open**
 1. Ignition OFF/Vehicle OFF, disconnect the harness connector at the G1 A/C Compressor and all devices that share the same ignition circuit.
 2. Test for infinite resistance between the ignition circuit terminal 3 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance.
 3. Connect each of the devices one at a time and test for greater than 10 Ω between the ignition circuit terminal 3 and ground.
 - If 10 Ω or less, disconnect the appropriate device and retest to verify if the short is in the circuit or the component.
 - If greater than 10 Ω replace the appropriate device.
- **If the test lamp illuminates**
 7. Replace the G1 A/C Compressor.

Repair Instructions

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

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

DTC P1A5E OR P1A5F: BATTERY ENERGY CONTROL MODULE IGNITION ON/START SWITCH CIRCUIT

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 P1A5E

Battery Energy Control Module Ignition On/Start Switch Circuit Low Voltage

DTC P1A5F

Battery Energy Control Module Ignition On/Start Switch Circuit High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Battery Energy Control Module Ignition	P1A5E	P1A5E	P1A5F	-

Circuit/System Description

The body control module (BCM) controls the ignition main relay through the control circuit by applying voltage to the run/crank coil control circuit. The ignition circuit is energized when the vehicle power mode is Vehicle ON or Vehicle in Service Mode.

Conditions for Running the DTC

P1A5E

- Hybrid powertrain control module 2 is awake.
- Vehicle power mode is Vehicle ON or Ignition ON/Vehicle in Service Mode.

- Battery energy control module is awake.
- System voltage greater than 9 V.

P1A5F

- Hybrid powertrain control module 2 is awake.
- Vehicle power mode is Ignition OFF/Vehicle OFF.
- Battery energy control module is awake.
- System voltage greater than 9 V.

Conditions for Setting the DTC

P1A5E

- Hybrid powertrain control module 2 is awake.
- Ignition input is active and not above 5 V.

P1A5F

- Hybrid powertrain control module 2 is awake.
- Ignition input is not active and not below 5 V.

Action Taken When the DTC Sets

P1A5E, P1A5F

DTCs P1A5E and P1A5F are type B DTCs.

Conditions for Clearing the DTC

P1A5E, P1A5F

DTCs P1A5E and P1A5F are type B 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 Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Power Mode Description and Operation (Without HP9) Power Mode Description and Operation (With HP9)

Electrical Information Reference

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

DTC Type Reference

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Verify DTC B144B is not set.

- **If the DTC is set**

Refer to **DTC B144B**.

- **If the DTC is not set**

2. Refer to Circuit/System Testing.

Circuit/System Testing

WARNING: Always perform the High Voltage Disabling procedure prior to servicing any High Voltage component or connection. Personal Protection Equipment (PPE) and proper procedures must be followed.

The High Voltage Disabling procedure includes the following steps:

- Identify how to disable high voltage.
- Identify how to test for the presence of high voltage.
- Identify condition under which high voltage is always present and personal protection equipment (PPE) and proper procedures must be followed.

Before working on any high voltage system, be sure to wear the following Personal Protection Equipment:

- Safety glasses with appropriate side shields when within 15 meters (50 feet) of the vehicle, either indoors or outdoors.
- Certified and up-to-date Class "0" Insulation gloves rated at 1000V with leather protectors.
 - Visually and functionally inspect the gloves before use.
 - Wear the Insulation gloves with leather protectors at all times when working with the high voltage battery assembly, whether the system is energized or not.

Failure to follow the procedures may result in serious injury or death.

1. Vehicle OFF, disable the high voltage at the A4 Hybrid/EV Battery Pack. Refer to **High Voltage Disabling**

2. Connect the 12 V battery, disconnect the X358 harness connector at the A4 Hybrid/EV Battery Pack.

3. Verify that a test lamp does not illuminate between the ignition circuit terminal 4 and ground.

- **If the test lamp illuminates**

Repair the short to voltage on the ignition circuit.

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

4. Vehicle in Service Mode

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

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

1. Vehicle OFF.

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 \(Without HP9\)](#) and/or [Power Mode Mismatch \(With HP9\)](#).
- **If the test lamp does not illuminate and the circuit fuse is open**
 1. Vehicle OFF, disconnect the harness connector at all devices that share the same ignition circuit.
 2. Test for infinite resistance between the ignition circuit terminal 4 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance.
 3. Vehicle OFF, remove the A4 Hybrid/EV Battery Pack cover. Refer to [High Voltage Battery Cover Replacement \(Top Cover\)](#), [High Voltage Battery Cover Replacement \(Front Cover\)](#), [High Voltage Battery Cover Replacement \(Left Side\)](#) and/or [High Voltage Battery Cover Replacement \(Right Side\)](#).
 4. Connect the **EL-50211** low voltage jumper harness extension.
 5. Disconnect the X8 harness connector at the K16 Battery Energy Control Module.
 6. Test for infinite resistance between the ignition circuit terminal 9 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance.
 7. Connect each of the devices that share the same ignition circuit one at a time and test for greater than 100 Ω between the ignition circuit terminal 9 and ground.
 - If 100 Ω or less, disconnect the appropriate device and retest to verify if the short is in the circuit or the component.
 - If greater than 100 Ω replace the appropriate device.
- **If the test lamp illuminates**
 6. Vehicle OFF, remove the A4 Hybrid/EV Battery Pack cover. Refer to [High Voltage Battery Cover Replacement \(Top Cover\)](#), [High Voltage Battery Cover Replacement \(Front Cover\)](#), [High Voltage Battery Cover Replacement \(Left Side\)](#) and/or [High Voltage Battery Cover Replacement \(Right Side\)](#).
 7. Connect the **EL-50211** low voltage jumper harness extension.
 8. Disconnect the X8 harness connector at the K16 Battery Energy Control Module.
 9. Verify that a test lamp does not illuminate between the ignition circuit terminal 9 and ground.
 - **If the test lamp illuminates**
Repair the short to voltage on the ignition circuit.
 - **If the test lamp does not illuminate**
- 10. Vehicle in Service Mode
- 11. Verify a test lamp illuminates between the ignition circuit terminal 9 and ground.
 - **If the test lamp does not illuminate.**
 1. Vehicle OFF.
 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 the test lamp illuminates**
- 12. Replace the K16 Battery Energy Control Module.

Repair Instructions

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

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

DTC P1A60: BATTERY ENERGY CONTROL MODULE IGNITION ACCESSORY SWITCH CIRCUIT

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 P1A60

Battery Energy Control Module Ignition Accessory Switch Circuit Low Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Serial Data Wake-Up	P1A60, P06E4, U1814, U2099	P1A60	-	-

Circuit/System Description

The hybrid powertrain control module 2 sends the serial data wake-up power mode status in a serial data message to the battery energy control module. The hybrid powertrain control module 2 also powers up the serial data wake-up circuit to the battery energy control module when the vehicle power mode is Vehicle ON or Ignition ON/Vehicle in Service Mode.

Conditions for Running the DTC

- Vehicle power mode is Vehicle ON or Ignition ON/Vehicle in Service Mode
- Battery energy control module is awake
- System voltage greater than 9 V

Conditions for Setting the DTC

Ignition input is active and 500 ms after the ignition input transitions high, a voltage below 5 V is detected 3 consecutive times

Action Taken When the DTC Sets

DTC P1A60 is a type B DTC.

Conditions for Clearing the DTC

DTC P1A60 is a type B DTC.

Diagnostic Aids

A short to voltage in the serial data wake-up circuit will keep the vehicle bus awake, which can drain the vehicle's battery.

Reference Information

Schematic Reference

Data Communication Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

[Power Mode Description and Operation \(Without HP9\)](#) [Power Mode Description and Operation \(With HP9\)](#)

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, U2099 or P06E4 is not set.

- If any of the DTCs are set

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

- If none of the DTCs are set

2. Refer to Circuit/System Testing.

Circuit/System Testing

WARNING: Always perform the High Voltage Disabling procedure prior to servicing any High Voltage component or connection. Personal Protection Equipment (PPE) and proper procedures must be followed.

The High Voltage Disabling procedure includes the following steps:

- Identify how to disable high voltage.
- Identify how to test for the presence of high voltage.
- Identify condition under which high voltage is always present and personal protection equipment (PPE) and proper procedures must be followed.

Before working on any high voltage system, be sure to wear the following Personal Protection Equipment:

- Safety glasses with appropriate side shields when within 15 meters (50 feet) of the vehicle, either indoors or outdoors.
- Certified and up-to-date Class "0" Insulation gloves rated at 1000V with leather protectors.
 - Visually and functionally inspect the gloves before use.
 - Wear the Insulation gloves with leather protectors at all times when working with the high voltage battery assembly, whether the system is energized or not.

Failure to follow the procedures may result in serious injury or death.

1. Vehicle OFF, disable the high voltage at the A4 Hybrid/EV Battery Pack. Refer to [High Voltage Disabling](#)
2. Connect the 12 V battery, disconnect the X358 harness connector at the A4 Hybrid/EV Battery Pack.
3. Connect a test lamp between the serial data wake-up circuit terminal 3 and ground.
4. Verify the test lamp turns ON and OFF when cycling the S39 Ignition Mode Switch between Vehicle in Service Mode and Vehicle OFF.
 - If the test lamp is always OFF

1. Vehicle OFF, disconnect the harness connector at the K114B Hybrid/EV Powertrain Control Module 2.
2. Test for less than 2 Ω in the serial data wake-up circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K114B Hybrid/EV Powertrain Control Module 2.
- **If the test lamp is always ON**
 1. Vehicle OFF, disconnect the harness connector at the K114B Hybrid/EV Powertrain Control Module 2.
 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 K114B Hybrid/EV Powertrain Control Module 2.
- **If the test lamp turns ON and OFF**
5. Vehicle OFF, remove the A4 Hybrid/EV Battery Pack cover. Refer to [High Voltage Battery Cover Replacement \(Top Cover\)](#) , [High Voltage Battery Cover Replacement \(Front Cover\)](#) , [High Voltage Battery Cover Replacement \(Left Side\)](#) and/or [High Voltage Battery Cover Replacement \(Right Side\)](#)
6. Connect the **EL-50211** low voltage jumper harness extension.
7. Disconnect the X8 harness connector at the K16 Battery Energy Control Module.
8. Connect a test lamp between the serial data wake-up circuit terminal 3 and ground.
9. Verify the test lamp turns ON and OFF when cycling the S39 Ignition Mode Switch between Vehicle in Service Mode and Vehicle OFF.
 - **If the test lamp is always OFF**
 1. Vehicle OFF, disconnect the **EL-50211** low voltage jumper harness extension.
 2. Test for less than 2 Ω in the serial data wake-up circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - **If the test lamp is always ON**
 1. Vehicle OFF, disconnect the **EL-50211** low voltage jumper harness extension.
 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 the test lamp turns ON and OFF**
10. Replace the K16 Battery Energy Control Module.

Repair Instructions

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

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

DTC P2534 OR P2535: IGNITION ON/START SWITCH CIRCUIT

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	P2534	P2535	-

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/Vehicle in Service Mode.

P2535

The control module ignition voltage signal is valid, with the ignition OFF/Vehicle 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/Vehicle in Service Mode.

P2535

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

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Electrical Information Reference

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

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**.
 - **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.
 - **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/Vehicle 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.
 - **If less than 1 V**
3. Ignition ON/Vehicle in Service Mode.
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/Vehicle 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 (Without HP9)** and/or **Power Mode Mismatch (With HP9)**.
 - **If the test lamp does not illuminate and the circuit fuse is open**
 1. Ignition OFF/Vehicle 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 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: IGNITION ACCESSORY SWITCH CIRCUIT

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 Schematics

Connector End View Reference

- [COMPONENT CONNECTOR END VIEWS - INDEX](#)
- [INLINE HARNESS CONNECTOR END VIEWS - INDEX](#)

Description and Operation

Data Link Communications Description and Operation

- [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](#) .

- **If none of the DTCs are set**

2. Refer to Circuit/System Testing.

[Circuit/System Testing](#)

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

2. Ignition ON/Vehicle in Service Mode.

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/Vehicle 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.

- **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.

DTC P305B OR P305C: DC/DC CONVERTER IGNITION ON/START SWITCH CIRCUIT

[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 P305B

DC/DC Converter Ignition On/Start Switch Circuit High Voltage

DTC P305C

DC/DC Converter Ignition On/Start Switch Circuit Low Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ignition	P305C	P305C	P305B	-

Circuit/System Description

The body control module (BCM) controls the ignition main relay through the control circuit by applying voltage to the circuit. The power supply transformer samples the system voltage on the Ignition 1 voltage circuit from the ignition main relay. If the power supply transformer detects a fault in the circuit it will request the ECM to set the DTC and illuminate the MIL.

Conditions for Running the DTC

P305B

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

P305C

The control module ignition voltage signal is valid, with the ignition ON/Vehicle in Service Mode.

Conditions for Setting the DTC

P305B

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

P305C

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

Action Taken When the DTC Sets

DTCs P305B and P305C are Type B DTCs.

Conditions for Clearing the DTC

DTCs P305B and P305C are Type B 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 Schematics

Starting and Charging Schematics

Connector End View Reference

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 \(Without HP9\)](#) [Power Mode Description and Operation \(With HP9\)](#)

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](#).
 - **If the DTC is not set**
3. Refer to Circuit/System Testing.

Circuit/System Testing

1. Ignition OFF/Vehicle OFF and all vehicle systems OFF, disconnect the X1 harness connector at the T19 Power Supply Transformer.
2. Test for less than 1 V between the ignition circuit terminal 6 and ground.
 - **If 1 V or greater**
Repair the short to voltage on the circuit.
 - **If less than 1 V**
3. Ignition ON/Vehicle in Service Mode.
4. Verify a test lamp illuminates between the ignition circuit terminal 6 and ground.
 - **If the test lamp does not illuminate and the circuit fuse is good**
 1. Ignition OFF/Vehicle 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 \(Without HP9\)](#) and/or [Power Mode Mismatch \(With HP9\)](#).
 - **If the test lamp does not illuminate and the circuit fuse is open**
 1. Ignition OFF/Vehicle 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 the test lamp illuminates**
5. Replace the T19 Power Supply Transformer.

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 the following:
 - [Electronic Park Lock Description and Operation](#)
 - [Power Mode Description and Operation \(Without HP9\)](#) [Power Mode Description and Operation \(With HP9\)](#)
 - [Retained Accessory Power Description and Operation](#)

Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the systems. Refer to [Checking Aftermarket Accessories](#).
- 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:

- [Ignition Can/Cannot Be Turned Off with Transmission in Any Gear](#)
- [Ignition Mode Switch Indicator Malfunction](#)
- [Power Mode Mismatch \(Without HP9\)](#) [Power Mode Mismatch \(With HP9\)](#)
- [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
Signal	2	1	-	-
Ground	-	1	-	-
1. Ignition will not turn to OFF with vehicle in park 2. Ignition 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 from

being switched to the OFF/Vehicle OFF position when the transmission is in any position other than Park and the vehicle may still be moving. The electronic park lock system incorporates the park position switch that located in the A/T shift lock control switch. When the transmission shift selector is in Park, the park position switch closes and the BCM allows the ignition to be turned OFF/Vehicle OFF.

If the vehicle is not in Park, the ignition will return to ACC/ACCESSORY and display the message SHIFT TO PARK in the Driver Information Center. When the vehicle is shifted into Park, the ignition system will switch to OFF/Vehicle OFF.

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.

Reference Information

Schematic Reference

Shift Lock Control Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Electronic Park Lock Description and Operation

Electrical Information Reference

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

Circuit/System Verification

1. Ignition ON/Vehicle in Service Mode.
2. Verify the scan tool Body Control Module In Park Switch Status parameter changes between On and Off when shifting the S3 Transmission Shift Lever in and out of Park.
 - **If the parameter does not change**
Refer to Circuit/System Testing.
 - **If the parameter changes**
3. All OK.

Circuit/System Testing

1. Ignition OFF/Vehicle OFF and all vehicle systems OFF, disconnect the harness connector at 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 circuit terminal 2 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF/Vehicle 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.
 - **If less than 10 Ω**
3. Ignition ON/Vehicle in Service Mode.
4. Verify the scan tool Body Control Module In Park Switch Status parameter is Off.

- **If not Off**

1. Ignition OFF/Vehicle OFF, disconnect the harness connector at the K9 Body Control Module.
2. Test for infinite resistance between the signal circuit terminal 6 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K9 Body Control Module.

- **If Off**

5. Install a 3 A fused jumper wire between the signal circuit terminal 6 and the ground circuit terminal 2.
6. Verify the scan tool Body Control Module In Park Switch Status parameter is On.

- **If not On**

1. Ignition OFF/Vehicle OFF, remove the jumper wire, disconnect the harness connector at the K9 Body Control Module, ignition ON/Vehicle in Service Mode.
2. Test for less than 1 V between the signal circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V
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.

- **If On**

7. Test or replace the S3 Transmission Shift Lever.

Repair Instructions

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

- **Transmission Control Replacement**
- **Control Module References** for control module replacement, programming and setup.

IGNITION MODE SWITCH INDICATOR 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
Control	2	2	1	-
Ground	-	2	-	-
1. Ignition mode switch indicator always On 2. Ignition mode switch indicator inoperative				

Circuit/System Description

The ignition mode switch has two LEDs that indicate the vehicle power mode. When the vehicle is in the off mode, both LEDs will be off. Pressing the ignition mode switch button once (without the brake pedal applied), the vehicle enters the accessory mode and the amber LED (Accessory) will illuminate. The accessory mode has a 10 min time-out to reduce battery drain. Pressing and holding the push button start switch (without the brake pedal applied) for 5 s will place the vehicle in run/start mode (without the vehicle running) and the green LED (Run/Start) will illuminate. With the ignition off (with the brake pedal applied), pressing the ignition mode switch button once, the vehicle will enter run/start mode and the green LED (run/start) will illuminate. This will start the engine. Both LEDs have the voltage supplied from the body control module.

Schematic Reference

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

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Power Mode Description and Operation (Without HP9) **Power Mode Description and Operation (With HP9)**

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/Vehicle ON.
2. Verify the green LED turns ON and OFF when commanding the Run/Start Power Mode Indicator On and Off with the scan tool.
 - **If the green LED does not turn ON and OFF**
Refer to Circuit/System Testing - Green LED Test.
 - **If the green LED turns ON and OFF**
3. Verify the amber LED turns ON and OFF when commanding the Accessory Power Mode Indicator On and Off with the scan tool.
 - **If the amber LED does not turn ON and OFF**
Refer to Circuit/System Testing - Amber LED Test.
 - **If the amber LED turns ON and OFF**
4. All OK.

Circuit/System Testing

Green LED Test

1. Ignition OFF/Vehicle OFF and all vehicle systems OFF, disconnect the harness connector at the S38 Ignition Mode Switch. 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 4 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF/Vehicle 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 connections.
 - **If less than 10 Ω**
3. Connect the harness connector at the S38 Ignition Mode Switch.

4. Ignition ON/Vehicle in Service Mode, disconnect the harness connector at the S38 Ignition Mode Switch.
5. Connect a test lamp between the control circuit terminal 5 and ground.
6. Verify the test lamp stays OFF when commanding Run/Start Power Mode Indicator Off with the scan tool.
 - **If the test lamp is always ON**
 1. Connect the harness connector at the S38 Ignition Mode Switch.
 2. Ignition OFF/Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module.
 3. Ignition ON/Vehicle in Service Mode, disconnect the harness connector at the S38 Ignition Mode Switch.
 4. 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.
 - **If the test lamp is always OFF**
7. Test for greater than 3 V between the control circuit terminal 5 and ground while commanding Run/Start Power Mode Indicator On with the scan tool.
 - **If 3 V or less**
 1. Ignition OFF/Vehicle OFF, 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.
 - 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 3 V or greater**
8. Test or replace the S38 Ignition Mode Switch.

Amber LED Test

1. Ignition OFF/Vehicle OFF and all vehicle systems OFF, disconnect the harness connector at the S38 Ignition Mode Switch. 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 4 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF/Vehicle 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 connections.
 - **If less than 10 Ω**
3. Connect the harness connector at the S38 Ignition Mode Switch.
4. Ignition ON/Vehicle in Service Mode, disconnect the harness connector at the S38 Ignition Mode Switch.
5. Connect a test lamp between the control circuit terminal 2 and ground.
6. Verify the test lamp stays OFF when commanding Accessory Power Mode Indicator Off with the scan tool.
 - **If the test lamp is always ON**
 1. Connect the harness connector at the S38 Ignition Mode Switch.
 2. Ignition OFF/Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module.
 3. Ignition ON/Vehicle in Service Mode, disconnect the harness connector at the S38 Ignition Mode Switch.

4. 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.
- **If the test lamp is always OFF**
7. Test for greater than 3 V between the control circuit terminal 2 and ground while commanding Accessory Power Mode Indicator On with the scan tool.
 - **If 3 V or less**
 1. Ignition OFF/Vehicle OFF, 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.
 - 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 3 V or greater**
8. Test or replace the S38 Ignition Mode Switch.

Component Testing

1. Ignition OFF/Vehicle OFF, disconnect the harness at the S38 Ignition Mode Switch.
2. Connect a jumper wire between the S38 Ignition Mode Switch terminal 4 and ground.
3. Connect a 3 A fused jumper wire between the S38 Ignition Mode Switch terminal 5 and B+.
4. Verify the green LED illuminates.
 - **If the LED does not illuminate**

Replace the S38 Ignition Mode Switch.
 - **If the LED illuminates**
5. Connect a 3 A fused jumper wire between the S38 Ignition Mode Switch terminal 2 and B+.
6. Verify the amber LED illuminates.
 - **If the LED does not illuminate**

Replace the S38 Ignition Mode Switch.
 - **If the LED illuminates**
7. All OK.

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.

POWER MODE MISMATCH (WITHOUT HP9)

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) and ignition main (rear body) relays by applying voltage to the run/crank relay coil control circuit. The ignition main (underhood) and

ignition main (rear body) relays are energized when the ignition is in the ON or the CRANK position.

The BCM also controls the battery saver relays through individual circuits by applying voltage to the battery saver set and reset circuits. The battery saver relays are a latching relays that when enabled disconnect some modules from their ignition power or memory power sources.

The keyless entry control module controls the retained accessory power relay (instrument panel) and retained accessory power relay (rear body) by applying voltage to the interruptible retained accessory power relay coil control circuit. The retained accessory power relays are energized during all power modes, except OFF-awake, CRANK and during transmitter authentication. The keyless entry control module will deactivate components that may cause radio frequency (RF) interference when the ignition mode switch is pressed which may result in NO REMOTE DETECTED displayed on the driver information center. The relays are also energized for approximately 10 min after shutting the ignition OFF, providing no door is opened.

The engine control module (ECM) controls the engine controls the ignition relay by applying voltage 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 Distribution Schematics**](#)
- [**Power Moding Schematics**](#)

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Power Mode Description and Operation (Without HP9) Power Mode Description and Operation (With HP9)

Electrical Information Reference

- [**Circuit Testing**](#)
- [**Connector Repairs**](#)
- [**Relay Replacement \(Attached to Wire Harness\) Relay Replacement \(Within an Electrical Center\)**](#)
- [**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/Vehicle in Service Mode.
2. Verify that the appropriate devices controlled by the KR73 Ignition Main Relay (underhood) 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.

- **If the devices turn ON and OFF**

3. Verify that the appropriate devices controlled by the KR73 Ignition Main Relay (rear body) 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 B.

- **If the devices turn ON and OFF**

4. Verify that the appropriate devices controlled by the KR75 Engine Controls Ignition Relay turn ON and OFF when cycling the ignition between ON/Vehicle in Service Mode and OFF/Vehicle OFF.

- **If the devices do not turn ON and OFF**

Refer to Circuit/System Testing - Diagnostic C.

- **If the devices turn ON and OFF**

5. Verify that the appropriate devices controlled by the KR76 Retained Accessory Power Relay (instrument panel) and KR76 Retained Accessory Power Relay (rear body) turn ON and OFF when switching the ignition between ON/Vehicle in Service Mode and OFF/Vehicle OFF.

- **If the devices do not turn ON and OFF**

Refer to Circuit/System Testing - Diagnostic D.

- **If the devices turn ON and OFF**

6. Verify that the appropriate devices controlled by the KR104A Battery Saver Relay 1 turn ON and OFF after enabling battery saver mode (transport mode).

- **If the devices do not turn ON and OFF**

Refer to Circuit/System Testing - Diagnostic E.

- **If the devices turn ON and OFF**

7. Verify that the appropriate devices controlled by the KR104B Battery Saver Relay 2 turn ON and OFF after enabling battery saver mode (transport mode).

- **If the devices do not turn ON and OFF**

Refer to Circuit/System Testing - Diagnostic F.

- **If the devices turn ON and OFF**

8. All OK.

Circuit/System Testing

Diagnostic A

1. Ignition OFF/Vehicle OFF and all vehicle systems OFF, disconnect the KR73 Ignition Main Relay (underhood). 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 86 and ground.

- **If 10 Ω or greater**

1. Ignition OFF/Vehicle 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.

- **If less than 10 Ω**

3. Ignition ON/Vehicle in Service Mode.

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

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

- **If the test lamp illuminates**

5. Connect a test lamp between the control circuit terminal 85 and the ground circuit terminal 86.
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/Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module and the KR73 Ignition Main Relay (rear body).
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
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/Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module, ignition ON/Vehicle in Service Mode.
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.

- **If the test lamp turns ON and OFF**

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

- KR73 Ignition Main Relay (underhood) - Ignition circuit terminal 87
- KR73 Ignition Main Relay (underhood) - Ignition circuit terminal 87A

- **If the test lamp illuminates**

Repair the short to voltage on the ignition circuit.

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

8. Ignition ON/Vehicle in Service Mode, connect a 40 A fused jumper wire between the B+ circuit terminal 30 and the ignition circuits listed below.

- KR73 Ignition Main Relay (underhood) - Ignition circuit terminal 87
- KR73 Ignition Main Relay (underhood) - Ignition circuit terminal 87A

9. Verify the device is activated.

- **If the device does not activate**

1. Ignition OFF/Vehicle 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.
 - 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.

- **If the device activates**

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

Diagnostic B

1. Ignition OFF/Vehicle OFF and all vehicle systems OFF, disconnect the KR73 Ignition Main Relay (rear body). 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 86 and ground.

- **If 10 Ω or greater**

1. Ignition OFF/Vehicle 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.
- **If less than 10 Ω**
3. Ignition ON/Vehicle in Service Mode.
4. Verify a test lamp illuminates between the B+ circuit terminal 30 and ground.
 - **If the test lamp does not illuminate**

Replace the X53A Fuse Block - Rear Body
 - **If the test lamp illuminates**
5. Connect a test lamp between the control circuit terminal 85 and the ground circuit terminal 86.
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/Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module and the KR73 Ignition Main Relay (underhood).
 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
 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/Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module, ignition ON/Vehicle in Service Mode.
 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.
 - **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.
 - **If the test lamp does not illuminate**
8. Ignition ON/Vehicle in Service Mode, connect a 40 A fused jumper wire between the B+ circuit terminal 30 and the ignition circuit 87.
9. Verify the device is activated.
 - **If the device does not activate**
 1. Ignition OFF/Vehicle 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.
 - 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.
 - **If the device activates**
10. Test or replace the KR73 Ignition Main Relay (rear body).

1. Ignition OFF/Vehicle OFF and all vehicle systems OFF, disconnect the KR75 Engine Controls Ignition Relay, ignition ON/Vehicle in Service Mode.
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
 - **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
 - **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 switching the ignition ON/Vehicle in Service Mode and OFF/Vehicle OFF.
 - **If the test lamp is always OFF**
 1. Ignition OFF/Vehicle OFF, remove the test lamp, disconnect the harness connector at the K20 Engine Control Module, ignition ON/Vehicle in Service Mode.
 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
 3. Ignition OFF/Vehicle 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/Vehicle 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.
 - **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.
 - **If the test lamp does not illuminate**
7. Ignition ON/Vehicle in Service Mode, 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/Vehicle 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.
 - 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.
 - **If the device activates**
9. Test or replace the KR75 Engine Controls Ignition Relay.

1. Ignition OFF/Vehicle OFF, connect a test lamp between the ignition circuits listed below and ground.
 - X51A Fuse Block - Instrument Panel - Fuse F1DA
 - X51A Fuse Block - Instrument Panel - Fuse F27DA
 - X51A Fuse Block - Instrument Panel - Fuse F28DA
 - X53A Fuse Block - Rear Body - Fuse F41RA
 - X53A Fuse Block - Rear Body - Circuit breaker F41RA
2. Disconnect the harness connector at the K84 Keyless Entry Control Module.
3. Momentarily Install a 3 A fused jumper wire between the control circuit terminal 7 X1 and B+.
4. Verify the test lamp turns ON and OFF when connecting and disconnecting the jumper wire.
 - **If the test lamp is always OFF**
 1. 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.
 2. 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 appropriate X51A Fuse Block - Instrument Panel or X53A Fuse Block - Rear Body.
 - **If the test lamp is always ON**
 1. 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 the test lamp turns ON and OFF**
5. Ignition OFF/Vehicle OFF, connect the harness connector at the K84 Keyless Entry Control Module.
6. Disconnect the harness connector at the appropriate device controlled by the KR76 Retained Accessory Power Relay (Instrument Panel) and KR76 Retained Accessory Power Relay (Rear Body).

NOTE: **The vehicle may not be equipped with all components as listed below.**

7. Ignition ON/Vehicle in Service Mode.
8. Verify that a test lamp illuminates between each of the ignition circuits listed below and ground.
 - X80 Accessory Power Receptacle - Rear Seat - Ignition circuit terminal A
 - E32R Cigarette Lighter Receptacle - Rear - Ignition circuit terminal A
 - X81 Accessory Power Receptacle - 110V AC - Ignition circuit terminal 1 X1
 - X81B Accessory Power Receptacle - 220V AC - Ignition circuit terminal 1 X1
 - T22 Mobile Device Wireless Charger Module - Ignition circuit terminal 1
 - X92B USB Receptacle - Rear Seat - Ignition circuit terminal 8
 - X80F Accessory Power Receptacle - Front - Ignition circuit terminal A
 - E32F Cigarette Lighter Receptacle - Front - Ignition circuit terminal A
 - P2 Transmission Shift Lever Position Indicator - Ignition circuit terminal 3.
 - **If the test lamp does not illuminate and the circuit fuse good**
 1. Ignition OFF/Vehicle 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 , Replace the K84 Keyless Entry Control Module.
 - **If the test lamp does not illuminate and the circuit fuse is open**
 1. Ignition OFF/Vehicle 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 resistance, test or replace the appropriate device controlled by the KR76 Retained Accessory Power Relay (Instrument Panel) and KR76 Retained Accessory Power Relay (Rear Body).

- **If the test lamp illuminates**

9. Test or replace the appropriate device controlled by the KR76 Retained Accessory Power Relay (Instrument Panel) and KR76 Retained Accessory Power Relay (Rear Body).

Diagnostic E

1. Ignition OFF/Vehicle OFF, disconnect the KR104A Battery Saver Relay 1. 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 6 and ground.

- **If 10 Ω or greater**

1. Ignition OFF/Vehicle 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.

- **If less than 10 Ω**

3. Ignition ON/Vehicle in Service Mode.

4. Verify a test lamp illuminates between the B+ circuit terminal 3 and ground.

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

1. Test for infinite resistance between the B+ circuit and ground.

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

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 , refer to [Stop/Start System Malfunction](#).

- **If the test lamp illuminates**

5. Enable battery saver mode (transport mode).

6. Ignition OFF/Vehicle OFF.

7. Connect a test lamp between the control terminal 1 and ground.

8. Verify the test lamp momentarily flashes ON and OFF when turning the ignition ON/Vehicle in Service Mode.

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

1. Ignition OFF/Vehicle 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.
- If infinite resistance

3. Test for less than 2 Ω on 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/Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module, ignition ON/Vehicle in Service Mode.

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.

- **If the test lamp turns ON and OFF**

9. Connect a test lamp between the control circuit terminal 2 and ground.
10. Verify the test lamp momentarily flashes ON and OFF after turning the ignition OFF/Vehicle OFF.

NOTE: It may take up to 1 min after the ignition is switched OFF and retained accessory power is disabled before the body control module sends a command to unlatch the relay.

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

1. Ignition OFF/Vehicle 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.
 - 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/Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module, ignition ON/Vehicle in Service Mode.
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.

- **If the test lamp turns ON and OFF**

11. Verify that a test lamp does not illuminate between the ignition circuit terminal 5 and ground.

- **If the test lamp illuminates**

Repair the short to voltage on the ignition circuit

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

12. Ignition ON/Vehicle in Service Mode, connect a 40 A fused jumper wire between the B+ circuit terminal 3 and the ignition circuit terminal 5.

13. Verify device is activated.

- **If the device does not activate**

1. Ignition OFF/Vehicle 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.
 - 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.

- **If the device activates**

14. Test or replace the appropriate KR104A Battery Saver Relay 1.

Diagnostic F

1. Enable battery saver mode (transport mode).
2. Ignition OFF/Vehicle OFF and all vehicle systems OFF, disconnect the X2 harness connector at the X53A Fuse Block - Rear Body.
3. Connect a test lamp between the control circuit terminal 22 and the ground.
4. Verify the test lamp momentarily flashes ON and OFF when turning the Ignition ON/Vehicle in Service Mode.

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

1. Ignition OFF/Vehicle 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.
 - 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/Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module, Ignition ON/Vehicle in Service Mode.
 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.
- **If the test lamp turns ON and OFF**
5. Ignition OFF/Vehicle OFF, Connect the X2 harness connector at the X53A Fuse Block - Rear Body.
6. Disconnect X3 harness connector at the X53A Fuse Block - Rear Body.
7. Connect a test lamp between the control circuit terminal 28 and ground.
8. Verify the test lamp momentarily flashes ON and OFF after turning the Ignition OFF/Vehicle OFF.

NOTE: It may take up to 1 min after the ignition is switched OFF and retained accessory power is disabled before the K9 Body Control Module sends a command to unlatch the relay.

- **If the test lamp is always OFF**
 1. Ignition OFF/Vehicle 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.
 - 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/Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module, Ignition ON/Vehicle in Service Mode.
 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.
- **If the test lamp turns ON and OFF**
- 9. Connect the harness connector at the X53A Fuse Block - Rear Body.
- 10. Disconnect the harness connector at the appropriate device controlled by the KR104B Battery Saver Relay 2.

NOTE: The vehicle may not be equipped with all components as listed below. Use schematics to determine which components are supplied their B+ feed by the KR104B Battery Saver Relay 2. Use the connector end view to identify the B+ circuit terminal for each of those components.

11. Ignition OFF/Vehicle OFF.

12. Verify that a test lamp does not illuminate between each of the B+ circuits listed below and ground.

- K171 Hands-Free Liftgate Sensor Control Module - B+ circuit terminal 2 X1
- K39 Liftgate Control Module - B+ circuit terminal 4 X2
- X82 Audio/Video Input Adapter - B+ circuit terminal 6 X1
- A11 Radio - B+ circuit terminal 1 X1
- B218L Side Object Sensor Module - Left - B+ circuit terminal 8
- B218R Side Object Sensor Module - Right - B+ circuit terminal 8
- B233R Radar Sensor Module - Short Range Rear - B+ circuit terminal 1
- K124 Active Safety Control Module - B+ circuit terminal 1 X1
- B117 Rain Sensor - B+ circuit terminal 1
- B165 Content Theft Deterrent Sensor Module - B+ circuit terminal 3 X1
- S25 Garage Door Opener - B+ circuit terminal 1 X1
- P25 Power Sounder Content Theft Deterrent Alarm Module - B+ circuit terminal 3
- **If the test lamp illuminates**

Repair the short to voltage on the B+ circuit.

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

13. Ignition ON/Vehicle in Service Mode.

14. Verify that a test lamp illuminates between each of the B+ circuits listed below and ground.

- K171 Hands-Free Liftgate Sensor Control Module - B+ circuit terminal 2 X1
- K39 Liftgate Control Module - B+ circuit terminal 4 X2
- X82 Audio/Video Input Adapter - B+ circuit terminal 6 X1
- A11 Radio - B+ circuit terminal 1 X1
- B218L Side Object Sensor Module - Left - B+ circuit terminal 8
- B218R Side Object Sensor Module - Right - B+ circuit terminal 8
- B233R Radar Sensor Module - Short Range Rear - B+ circuit terminal 1
- K124 Active Safety Control Module - B+ circuit terminal 1 X1
- B117 Rain Sensor - B+ circuit terminal 1
- B165 Content Theft Deterrent Sensor Module - B+ circuit terminal 3 X1
- S25 Garage Door Opener - B+ circuit terminal 1 X1
- P25 Power Sounder Content Theft Deterrent Alarm Module - B+ circuit terminal 3
- **If the test lamp does not illuminate and the circuit fuse is good**

1. Ignition OFF/Vehicle OFF, 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 , test or replace the X53A Fuse Block - Rear Body.

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

1. Ignition OFF/Vehicle OFF.

2. Test for infinite resistance between the B+ circuit and ground.

- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance, test or replace the appropriate device controlled by the KR104B Battery Saver Relay 2.

- **If the test lamp illuminates**

15. Test or replace the appropriate device controlled by the KR104B Battery Saver Relay 2.

Component Testing

Relay Test

1. Ignition OFF/Vehicle 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.

- **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.

- **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.

- **If less than 5.0 Ω**

6. All OK

Latching Relay Test

1. Ignition OFF/Vehicle OFF, disconnect the appropriate KR104A Battery Saver Relay 1 or KR104B Battery Saver Relay 2.

2. Test for 70-150 Ω between terminals 1 and 6.

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

Replace the relay.

- **If between 70-150 Ω**

3. Test for 70-150 Ω between terminals 2 and 6.

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

Replace the relay.

- **If between 70-150 Ω**

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

- 3 and 1
- 3 and 2
- 3 and 6
- 5 and 1
- 5 and 2
- 5 and 6

- **If less than infinite resistance**

Replace the relay.

- **If infinite resistance**

5. Install a 3 A fused jumper wire between relay terminal 1 and 12 V. Install a jumper wire between relay terminal 6 and ground.

6. Test for less than 5.0 Ω between terminals 3 and 5.

- **If 5.0 Ω or greater**

Replace the relay.

- **If less than 5.0 Ω**

7. Install a 3 A fused jumper wire between relay terminal 2 and 12 V. Install a jumper wire between relay terminal 6 and ground.

8. Test infinite resistance between terminals 3 and 5.

- **If less than infinite resistance**

Replace the relay.

- **If infinite resistance**

9. All OK

Repair Instructions

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

- **Control Module References** for control module replacement, programming and setup.

POWER MODE MISMATCH (WITH HP9)

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) and ignition main (rear body) relays by applying voltage to the run/crank relay coil control circuit. The ignition main (underhood) and ignition main (rear body) relays are energized when the ignition is in the ON or the CRANK position.

The BCM also controls the battery saver relays through individual circuits by applying voltage to the battery saver set and reset circuits. The battery saver relays are a latching relays that when enabled disconnect some modules from their ignition power or memory power sources.

The keyless entry control module controls the retained accessory power relay (instrument panel) and retained accessory power relay (rear body) by applying voltage to the interruptible retained accessory power relay coil control circuit. The retained accessory power relays are energized during all power modes, except OFF-awake, CRANK and during transmitter authentication. The keyless entry control module will deactivate components that may cause radio frequency (RF) interference when the ignition mode switch is pressed which may result in NO REMOTE DETECTED displayed on the driver information center. The relays are also energized for approximately 10 min after shutting the Ignition OFF/Vehicle OFF, providing no door is opened.

The engine control module (ECM) controls the engine controls the ignition relay by applying voltage 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 Distribution Schematics**
- **Power Moding Schematics**

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Power Mode Description and Operation (Without HP9) Power Mode Description and Operation (With HP9)

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Relay Replacement (Attached to Wire Harness) Relay Replacement (Within an Electrical Center)
- 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/Vehicle in Service Mode.
2. Verify that the appropriate devices controlled by the KR73 Ignition Main Relay (underhood) 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.
 - **If the devices turn ON and OFF**
3. Verify that the appropriate devices controlled by the KR73 Ignition Main Relay (rear body) 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 B.
 - **If the devices turn ON and OFF**
4. Verify that the appropriate devices controlled by the KR75 Engine Controls Ignition Relay turn ON and OFF when cycling the ignition between ON/Vehicle in Service Mode and OFF/Vehicle OFF.
 - **If the devices do not turn ON and OFF**
Refer to Circuit/System Testing - Diagnostic C.
 - **If the devices turn ON and OFF**
5. Verify that the appropriate devices controlled by the KR76 Retained Accessory Power Relay (instrument panel) and KR76 Retained Accessory Power Relay (rear body) turn ON and OFF when switching the ignition between ON/Vehicle in Service Mode and OFF/Vehicle OFF.
 - **If the devices do not turn ON and OFF**
Refer to Circuit/System Testing - Diagnostic D.
 - **If the devices turn ON and OFF**

6. Verify that the appropriate devices controlled by the KR104A Battery Saver Relay 1 turn ON and OFF after enabling battery saver mode (transport mode).

- **If the devices do not turn ON and OFF**

Refer to Circuit/System Testing - Diagnostic E.

- **If the devices turn ON and OFF**

7. Verify that the appropriate devices controlled by the KR104B Battery Saver Relay 2 turn ON and OFF after enabling battery saver mode (transport mode).

- **If the devices do not turn ON and OFF**

Refer to Circuit/System Testing - Diagnostic F.

- **If the devices turn ON and OFF**

8. All OK.

Circuit/System Testing

Diagnostic A

1. Ignition OFF/Vehicle OFF and all vehicle systems OFF, disconnect the KR73 Ignition Main Relay (underhood). 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 86 and ground.

- **If 10 Ω or greater**

1. Ignition OFF/Vehicle 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.

- **If less than 10 Ω**

3. Ignition ON/Vehicle in Service Mode.

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

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

Replace the X53A Fuse Block - Underhood

- **If the test lamp illuminates**

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

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/Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module and the KR73 Ignition Main Relay (rear body).

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

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/Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module, ignition ON/Vehicle in Service Mode.

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.

- **If the test lamp turns ON and OFF**

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

- KR73 Ignition Main Relay (underhood) - Ignition circuit terminal 87
- KR73 Ignition Main Relay (underhood) - Ignition circuit terminal 87A
- **If the test lamp illuminates**

Repair the short to voltage on the ignition circuit.

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

8. Ignition ON/Vehicle in Service Mode, connect a 40 A fused jumper wire between the B+ circuit terminal 30 and the ignition circuits listed below.

- KR73 Ignition Main Relay (underhood) - Ignition circuit terminal 87
- KR73 Ignition Main Relay (underhood) - Ignition circuit terminal 87A

9. Verify the device is activated.

- **If the device does not activate**

1. Ignition OFF/Vehicle 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.
- 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.

- **If the device activates**

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

Diagnostic B

1. Ignition OFF/Vehicle OFF and all vehicle systems OFF, disconnect the KR73 Ignition Main Relay (rear body). 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 86 and ground.

- **If 10 Ω or greater**

1. Ignition OFF/Vehicle 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.

- **If less than 10 Ω**

3. Ignition ON/Vehicle in Service Mode.

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

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

Replace the X53A Fuse Block - Rear Body

- **If the test lamp illuminates**

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

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/Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module and the KR73 Ignition Main Relay (underhood).

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

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/Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module, ignition ON/Vehicle in Service Mode.
 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.
- **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.
 - **If the test lamp does not illuminate**
- 8. Ignition ON/Vehicle in Service Mode, connect a 40 A fused jumper wire between the B+ circuit terminal 30 and the ignition circuit 87.
- 9. Verify the device is activated.
 - **If the device does not activate**
 1. Ignition OFF/Vehicle 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.
 - 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.
 - **If the device activates**
- 10. Test or replace the KR73 Ignition Main Relay (rear body).

Diagnostic C

1. Ignition OFF/Vehicle OFF and all vehicle systems OFF, disconnect the KR75 Engine Controls Ignition Relay, ignition ON/Vehicle in Service Mode.
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
 - **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
 - **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 switching the ignition ON/Vehicle in Service Mode and OFF/Vehicle OFF.
 - **If the test lamp is always OFF**
 1. Ignition OFF/Vehicle OFF, remove the test lamp, disconnect the harness connector at the K20 Engine Control Module, ignition ON/Vehicle in Service Mode.
 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
 3. Ignition OFF/Vehicle 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/Vehicle 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.
- **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.
 - **If the test lamp does not illuminate**
7. Ignition ON/Vehicle in Service Mode, 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/Vehicle 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.
 - 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.
 - **If the device activates**
9. Test or replace the KR75 Engine Controls Ignition Relay.

Diagnostic D

1. Ignition OFF/Vehicle OFF, connect a test lamp between the ignition circuits listed below and ground.
 - X51A Fuse Block - Instrument Panel - Fuse F1DA
 - X51A Fuse Block - Instrument Panel - Fuse F27DA
 - X51A Fuse Block - Instrument Panel - Fuse F28DA
 - X53A Fuse Block - Rear Body - Fuse F41RA
 - X53A Fuse Block - Rear Body - Circuit breaker F41RA
2. Disconnect the harness connector at the K84 Keyless Entry Control Module.
3. Momentarily Install a 3 A fused jumper wire between the control circuit terminal 7 X1 and B+.
4. Verify the test lamp turns ON and OFF when connecting and disconnecting the jumper wire.
 - **If the test lamp is always OFF**
 1. 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.
 2. 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 appropriate X51A Fuse Block - Instrument Panel or X53A Fuse Block - Rear Body.
 - **If the test lamp is always ON**
 1. 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 the test lamp turns ON and OFF**
5. Ignition OFF/Vehicle OFF, connect the harness connector at the K84 Keyless Entry Control Module.
 6. Disconnect the harness connector at the appropriate device controlled by the KR76 Retained Accessory Power Relay (Instrument Panel) and KR76 Retained Accessory Power Relay (Rear Body).

NOTE: The vehicle may not be equipped with all components as listed below.

7. Ignition ON/Vehicle in Service Mode.
8. Verify that a test lamp illuminates between each of the ignition circuits listed below and ground.
 - X80 Accessory Power Receptacle - Rear Seat - Ignition circuit terminal A
 - E32R Cigarette Lighter Receptacle - Rear - Ignition circuit terminal A
 - X81 Accessory Power Receptacle - 110V AC - Ignition circuit terminal 1 X1
 - X81B Accessory Power Receptacle - 220V AC - Ignition circuit terminal 1 X1
 - T22 Mobile Device Wireless Charger Module - Ignition circuit terminal 1
 - X92B USB Receptacle - Rear Seat - Ignition circuit terminal 8
 - X80F Accessory Power Receptacle - Front - Ignition circuit terminal A
 - E32F Cigarette Lighter Receptacle - Front - Ignition circuit terminal A
 - P2 Transmission Shift Lever Position Indicator - Ignition circuit terminal 3.
 - **If the test lamp does not illuminate and the circuit fuse good**
 1. Ignition OFF/Vehicle 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 , Replace the K84 Keyless Entry Control Module.
 - **If the test lamp does not illuminate and the circuit fuse is open**
 1. Ignition OFF/Vehicle 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 resistance, test or replace the appropriate device controlled by the KR76 Retained Accessory Power Relay (Instrument Panel) and KR76 Retained Accessory Power Relay (Rear Body).
 - **If the test lamp illuminates**
9. Test or replace the appropriate device controlled by the KR76 Retained Accessory Power Relay (Instrument Panel) and KR76 Retained Accessory Power Relay (Rear Body).

Diagnostic E

1. Ignition OFF/Vehicle OFF, disconnect the KR104A Battery Saver Relay 1. 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 6 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF/Vehicle 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.
 - **If less than 10 Ω**
3. Ignition ON/Vehicle in Service Mode.
4. Verify a test lamp illuminates between the B+ circuit terminal 14 and ground.
 - **If the test lamp does not illuminate and the circuit fuse is good**

1. Test for infinite resistance between the B+ circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance.
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. Ignition OFF/Vehicle OFF, 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 the circuit.
 - If infinite resistance, replace the KR104A Battery Saver Relay 1.
- **If the test lamp illuminates**
5. Enable battery saver mode (transport mode).
6. Ignition OFF/Vehicle OFF.
7. Connect a test lamp between the control terminal 15 and ground.
8. Verify the test lamp momentarily flashes ON and OFF when turning the ignition ON/Vehicle in Service Mode.
 - **If the test lamp is always OFF**
 1. Ignition OFF/Vehicle 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.
 - If infinite resistance
 3. Test for less than 2 Ω on 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/Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module, ignition ON/Vehicle in Service Mode.
 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.
 - **If the test lamp turns ON and OFF**
9. Connect a test lamp between the control circuit terminal 13 and ground.
10. Verify the test lamp momentarily flashes ON and OFF after turning the ignition OFF/Vehicle OFF.

NOTE: It may take up to 1 min after the ignition is switched OFF and retained accessory power is disabled before the body control module sends a command to unlatch the relay.

- **If the test lamp is always OFF**
 1. Ignition OFF/Vehicle 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.
 - 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/Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module, ignition ON/Vehicle in Service Mode.
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.
- **If the test lamp turns ON and OFF**
11. Verify that a test lamp does not illuminate between the ignition circuit terminal 5 and ground.
 - **If the test lamp illuminates**

Repair the short to voltage on the ignition circuit
 - **If the test lamp does not illuminate**
12. Ignition ON/Vehicle in Service Mode, connect a 40 A fused jumper wire between the B+ circuit terminal 14 and the ignition circuit terminal 8.
13. Verify device is activated.
 - **If the device does not activate**
 1. Ignition OFF/Vehicle 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.
 - 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.
 - **If the device activates**
14. Test or replace the appropriate KR104A Battery Saver Relay 1.

Diagnostic F

1. Enable battery saver mode (transport mode).
2. Ignition OFF/Vehicle OFF and all vehicle systems OFF, disconnect the X2 harness connector at the X53A Fuse Block - Rear Body.
3. Connect a test lamp between the control circuit terminal 22 and the ground.
4. Verify the test lamp momentarily flashes ON and OFF when turning the Ignition ON/Vehicle in Service Mode.
 - **If the test lamp is always OFF**
 1. Ignition OFF/Vehicle 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.
 - 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/Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module, Ignition ON/Vehicle in Service Mode.
 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.
 - **If the test lamp turns ON and OFF**
5. Ignition OFF/Vehicle OFF, Connect the X2 harness connector at the X53A Fuse Block - Rear Body.

6. Disconnect X3 harness connector at the X53A Fuse Block - Rear Body.
7. Connect a test lamp between the control circuit terminal 28 and ground.
8. Verify the test lamp momentarily flashes ON and OFF after turning the Ignition OFF/Vehicle OFF.

NOTE: It may take up to 1 min after the ignition is switched OFF and retained accessory power is disabled before the K9 Body Control Module sends a command to unlatch the relay.

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

1. Ignition OFF/Vehicle 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.
 - 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/Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module, Ignition ON/Vehicle in Service Mode.
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.

- **If the test lamp turns ON and OFF**

9. Connect the harness connector at the X53A Fuse Block - Rear Body.
10. Disconnect the harness connector at the appropriate device controlled by the KR104B Battery Saver Relay 2.

NOTE: The vehicle may not be equipped with all components as listed below. Use schematics to determine which components are supplied their B+ feed by the KR104B Battery Saver Relay 2. Use the connector end view to identify the B+ circuit terminal for each of those components.

11. Ignition OFF/Vehicle OFF.
12. Verify that a test lamp does not illuminate between each of the B+ circuits listed below and ground.

- K171 Hands-Free Liftgate Sensor Control Module - B+ circuit terminal 2 X1
- K39 Liftgate Control Module - B+ circuit terminal 4 X2
- X82 Audio/Video Input Adapter - B+ circuit terminal 6 X1
- A11 Radio - B+ circuit terminal 1 X1
- B218L Side Object Sensor Module - Left - B+ circuit terminal 8
- B218R Side Object Sensor Module - Right - B+ circuit terminal 8
- B233R Radar Sensor Module - Short Range Rear - B+ circuit terminal 1
- K124 Active Safety Control Module - B+ circuit terminal 1 X1
- B117 Rain Sensor - B+ circuit terminal 1
- B165 Content Theft Deterrent Sensor Module - B+ circuit terminal 3 X1
- S25 Garage Door Opener - B+ circuit terminal 1 X1
- P25 Power Sounder Content Theft Deterrent Alarm Module - B+ circuit terminal 3
- **If the test lamp illuminates**

Repair the short to voltage on the B+ circuit.

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

13. Ignition ON/Vehicle in Service Mode.

14. Verify that a test lamp illuminates between each of the B+ circuits listed below and ground.

- K171 Hands-Free Liftgate Sensor Control Module - B+ circuit terminal 2 X1
- K39 Liftgate Control Module - B+ circuit terminal 4 X2
- X82 Audio/Video Input Adapter - B+ circuit terminal 6 X1
- A11 Radio - B+ circuit terminal 1 X1
- B218L Side Object Sensor Module - Left - B+ circuit terminal 8
- B218R Side Object Sensor Module - Right - B+ circuit terminal 8
- B233R Radar Sensor Module - Short Range Rear - B+ circuit terminal 1
- K124 Active Safety Control Module - B+ circuit terminal 1 X1
- B117 Rain Sensor - B+ circuit terminal 1
- B165 Content Theft Deterrent Sensor Module - B+ circuit terminal 3 X1
- S25 Garage Door Opener - B+ circuit terminal 1 X1
- P25 Power Sounder Content Theft Deterrent Alarm Module - B+ circuit terminal 3
- **If the test lamp does not illuminate and the circuit fuse is good**

1. Ignition OFF/Vehicle OFF, 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 , test or replace the X53A Fuse Block - Rear Body.

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

1. Ignition OFF/Vehicle OFF.

2. Test for infinite resistance between the B+ circuit and ground.

- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance, test or replace the appropriate device controlled by the KR104B Battery Saver Relay 2.

- **If the test lamp illuminates**

15. Test or replace the appropriate device controlled by the KR104B Battery Saver Relay 2.

Component Testing

Relay Test

1. Ignition OFF/Vehicle 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.

- **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.

- **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.

- **If less than 5.0 Ω**

6. All OK

Latching Relay Test

1. Ignition OFF/Vehicle OFF, disconnect the appropriate KR104A Battery Saver Relay 1 or KR104B Battery Saver Relay 2.

2. Test for 70-150 Ω between terminals 1 and 6.

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

Replace the relay.

- **If between 70-150 Ω**

3. Test for 70-150 Ω between terminals 2 and 6.

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

Replace the relay.

- **If between 70-150 Ω**

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

- 3 and 1
- 3 and 2
- 3 and 6
- 5 and 1
- 5 and 2
- 5 and 6
- **If less than infinite resistance**

Replace the relay.

- **If infinite resistance**

5. Install a 3 A fused jumper wire between relay terminal 1 and 12 V. Install a jumper wire between relay terminal 6 and ground.

6. Test for less than 5.0 Ω between terminals 3 and 5.

- **If 5.0 Ω or greater**

Replace the relay.

- **If less than 5.0 Ω**

7. Install a 3 A fused jumper wire between relay terminal 2 and 12 V. Install a jumper wire between relay terminal 6 and ground.

8. Test infinite resistance between terminals 3 and 5.

- **If less than infinite resistance**

Replace the relay.

- **If infinite resistance**

9. All OK

Repair Instructions

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

- [Control Module References](#) for 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	-
Interruptible Retained Accessory Power Relay Coil Control	B305E 02*	B305E 05*	B305E 01*, B305E 05*	-
Retained Accessory Power Relay Coil Control	B1445 02	1	1	-
Relay Coil Ground	-	1	-	-
1. Retained accessory power malfunction 2. Retained accessory power relay always ON * DTC set in keyless entry control module				

Circuit/System Description

The body control module (BCM) controls certain components through a control circuit by applying voltage to the retained accessory power relay coil control circuit. The keyless entry control module controls the retained accessory power relay by applying voltage to the interruptible retained accessory power relay coil control circuit. The components and retained accessory power relay are energized when the ignition is in the ACCESSORY or ON/Vehicle in Service Mode. The components and relay are also energized for approximately 10 min after shutting the vehicle OFF, providing no door is opened.

The keyless entry control module will deactivate the retained accessory power relay during transmitter authentication. The purpose is to deactivate components that may cause radio frequency (RF) interference when the ignition mode switch is pressed and may result in a "NO REMOTE DETECTED" message displayed on the driver information center.

Reference Information

Schematic Reference

Power Distribution Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Retained Accessory Power Description and Operation

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Relay Replacement \(Attached to Wire Harness\)](#) [Relay Replacement \(Within an Electrical Center\)](#)
- [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 on the K9 Body Control Module's ignition circuit terminal 12 X4 or controlled by the KR76 Retained Accessory Power Relays. Use the connector end view to identify the ignition circuit terminal for each of those devices.

1. Ignition ON/Vehicle in Service Mode.
2. Verify that the appropriate devices controlled by the KR76 Retained Accessory Power Relay (instrument panel) and KR76 Retained Accessory Power Relay (rear body) turn ON and OFF when cycling the ignition between ON/Vehicle in Service Mode and OFF/Vehicle OFF.
 - **If the devices do not turn ON and OFF**
Refer to Circuit/System Testing - Diagnostic A.
 - **If the devices turn ON and OFF**
3. Verify that the appropriate devices controlled by the K9 Body Control Module's circuit terminal 12 X4 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 - Diagnostic B.
 - **If the devices turn ON and OFF**
4. All OK.

Circuit/System Testing

Diagnostic A

1. Ignition OFF/Vehicle OFF, connect a test lamp between the ignition circuits listed below and ground.
 - X51A Fuse Block - Instrument Panel - Fuse F1DA
 - X51A Fuse Block - Instrument Panel - Fuse F27DA
 - X51A Fuse Block - Instrument Panel - Fuse F28DA
 - X53A Fuse Block - Rear Body - Fuse F41RA
 - X53A Fuse Block - Rear Body - Circuit breaker F41RA
2. Disconnect the harness connector at the K84 Keyless Entry Control Module.
3. Momentarily Install a 3 A fused jumper wire between the control circuit terminal 7 X1 and B+.
4. Verify the test lamp turns ON and OFF when connecting and disconnecting the jumper wire.
 - **If the test lamp is always OFF**
 1. 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.
 2. 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 appropriate X51A Fuse Block - Instrument Panel or X53A Fuse Block - Rear Body.
 - **If the test lamp is always ON**
 1. 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 the test lamp turns ON and OFF**

5. Ignition OFF/Vehicle OFF, connect the harness connector at the K84 Keyless Entry Control Module.
6. Disconnect the harness connector at the appropriate device controlled by the KR76 Retained Accessory Power Relay (Instrument Panel) and KR76 Retained Accessory Power Relay (Rear Body).

NOTE: **The vehicle may not be equipped with all components as listed below.**

7. Ignition ON/Vehicle in Service Mode.
8. Verify that a test lamp illuminates between each of the ignition circuits listed below and ground.
 - X80 Accessory Power Receptacle - Rear Seat - Ignition circuit terminal A
 - E32R Cigarette Lighter Receptacle - Rear - Ignition circuit terminal A
 - X81 Accessory Power Receptacle - 110V AC - Ignition circuit terminal 1 X1
 - X81B Accessory Power Receptacle - 220V AC - Ignition circuit terminal 1 X1
 - T22 Mobile Device Wireless Charger Module - Ignition circuit terminal 1
 - X92B USB Receptacle - Rear Seat - Ignition circuit terminal 8
 - X80F Accessory Power Receptacle - Front - Ignition circuit terminal A
 - E32F Cigarette Lighter Receptacle - Front - Ignition circuit terminal A
 - P2 Transmission Shift Lever Position Indicator - Ignition circuit terminal 3.
 - **If the test lamp does not illuminate and the circuit fuse good**
 1. Ignition OFF/Vehicle 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 , Replace the K84 Keyless Entry Control Module.
 - **If the test lamp does not illuminate and the circuit fuse is open**
 1. Ignition OFF/Vehicle 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 resistance, test or replace the appropriate device controlled by the KR76 Retained Accessory Power Relay (Instrument Panel) and KR76 Retained Accessory Power Relay (Rear Body).
 - **If the test lamp illuminates**
9. Test or replace the appropriate device controlled by the KR76 Retained Accessory Power Relay (Instrument Panel) and KR76 Retained Accessory Power Relay (Rear Body).

Diagnostic B

1. Ignition OFF/Vehicle OFF and all vehicle systems OFF, disconnect the P2 Transmission Shift Lever Position Indicator.
2. Connect a test lamp between each of the ignition circuit terminal 1 and ground.
3. 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/Vehicle OFF, remove 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.
 - 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/Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module, Ignition ON/Vehicle in Service Mode.
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.

- **If the test lamp turns ON and OFF**

4. Test or replace the P2 Transmission Shift Lever.

Component Testing

Relay Test

1. Ignition OFF/Vehicle 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.

- **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.

- **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.

- **If less than 5.0 Ω**

6. All OK

Repair Instructions

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

- [Accessory Power Receptacle Replacement](#)
- [Control Module References](#) for 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.

DTC Descriptors

DTC B097B

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal - Terminal 3	B097B 02*	B097B 05*	B097B 05*, B097B 08*	-
Signal - Terminal 6	B097B 02	B097B 04	B097B 04	-
Low Reference	-	B097B 05*, B097B 08*	-	-
Ground	-	B097B 04	-	-
*DTC set in keyless entry control module				

Circuit/System Description

The ignition mode switch contains two individual switches that provide redundant switch inputs to both the body control module and the keyless entry control module. The body control module supplies the ignition mode switch a constant B+ signal. The body control module monitors this signal to determine if the switch is released or pressed. When the ignition mode switch is not pressed, voltage on the signal circuit is pulled down through two resistors in the switch. When the ignition mode switch is pressed, voltage on the signal circuit is pulled down through only one resistor, changing the voltage seen at the body control module and indicating that the ignition mode switch is pressed. The keyless entry control module monitors voltage on the switch in the same manner as the body control module, but monitors the other individual switch in the ignition mode switch.

Conditions for Running the DTC

Control module voltage is 9-16 V.

Conditions for Setting the DTC

B097B 02

- The control module detects a short to ground in the vehicle ignition mode switch signal circuit
- The above condition exists for more than 1 s

B097B 04

- The control module detects an open in the vehicle ignition mode switch signal circuit
- The above condition exists for more than 1 s

B097B 05

- The control module detects an open in the vehicle ignition mode switch circuit
- The above condition exists for more than 1 s

B097B 08

- The control module detects a change in the ignition mode without observing a switch press
- The above condition occurs 4 consecutive times

B097B 61

- The control module detects a continuously closed ignition mode switch
- The above condition exists for more than 1 min

Action Taken When the DTC Sets

No action is taken.

B097B 02

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

Conditions for Clearing the DTC

- A current DTC clears when the malfunction is no longer present.
- A history DTC clears after 40 consecutive module ignition cycles without a repeat of the malfunction.

Reference Information

Schematic Reference

- **Power Distribution Schematics**
- **Power Moding Schematics**

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

- **Power Mode Description and Operation (Without HP9)** **Power Mode Description and Operation (With HP9)**
- **Keyless Entry System Description and Operation (Without ATH)** **Keyless Entry System Description and Operation (With ATH)**

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 B097B 61 is not set.
 - **If DTC B097B 61 is set**
Test or replace the S38 Ignition Mode Switch.
 - **If DTC B097B 61 is not set**
2. Refer to Circuit/System Testing.

Circuit/System Testing

1. Ignition OFF/Vehicle OFF and all vehicle systems OFF, disconnect the harness connector at the S38 Ignition Mode Switch. 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 4 and ground.
 - **If 10 Ω or greater**
 1. 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.
 - **If less than 10 Ω**
3. Test for less than 10 Ω between the low reference circuit terminal 7 and ground.
 - **If 10 Ω or greater**
 1. 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 , replace the K84 Keyless Entry Control Module.
 - **If less than 10 Ω**
 4. Connect the S38 Ignition Mode Switch, ignition ON/Vehicle in Service Mode.
 5. Disconnect the S38 Ignition Mode Switch.
 6. Verify the scan tool K9 Body Control Module Push Button Ignition Switch Voltage parameter is greater than 11 V.
 - **If 11 V or less**
 1. Connect the S38 Ignition Mode Switch.
 2. Ignition OFF/Vehicle OFF, disconnect the X2 harness connector at the K9 Body Control Module and S38 Ignition Mode Switch.
 3. Test for infinite resistance between the signal circuit terminal 6 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K9 Body Control Module.
 - **If greater than 11 V**
 7. Install a 3 A fused jumper wire between the signal circuit terminal 6 and ground.
 8. Verify the scan tool K9 Body Control Module Push Button Ignition Switch Voltage parameter is less than 1 V.
 - **If 1 V or greater**
 1. Disconnect the harness connector at the K9 Body Control Module.
 2. Test for less than 1 V between the signal circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V
 3. Test for less than 2 Ω in 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.
 - **If less than 1 V**
 9. Connect the harness connector at the S38 Ignition Mode Switch.
 10. Verify the scan tool K9 Body Control Module Push Button Ignition Switch Voltage parameter is 8-10 V, with the S38 Ignition Mode Switch released.
 - **If not between 8-10 V**

Test or replace the S38 Ignition Mode Switch.
 - **If between 8-10 V**
 11. Verify the scan tool K9 Body Control Module Push Button Ignition Switch Voltage parameter is 4-7 V, with the S38 Ignition Mode Switch pressed.
 - **If not between 4-7 V**

Test or replace the S38 Ignition Mode Switch.
 - **If between 4-7 V**
 12. Disconnect the X1 harness connector at the K84 Keyless Entry Control Module.
 13. Test for infinite resistance between the signal circuit terminal 11 and ground.
 - **If less than infinite resistance**

Repair the short to ground on the circuit.

- **If infinite resistance**

14. Ignition ON/Vehicle in Service Mode.

15. Test for less than 1 V between the signal circuit terminal 11 and ground.

- **If 1 V or greater**

Repair the short to voltage on the circuit.

- **If less than 1 V**

16. Test for 4.5-5.5 k Ω between the signal circuit terminal 11 and the low reference circuit terminal 12, with the S38 Ignition Mode Switch released.

- **If not between 4.5-5.5 k Ω**

1. Ignition OFF/Vehicle OFF, disconnect the harness connector at the S38 Ignition Mode Switch.

2. 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 , test or replace the S38 Ignition Mode Switch.

- **If between 4.5-5.5 k Ω**

17. Test for 1-1.5 k Ω between the signal circuit terminal 11 and the low reference circuit terminal 12, with the S38 Ignition Mode Switch pressed.

- **If not between 1-1.5 k Ω**

Test or replace the S38 Ignition Mode Switch.

- **If between 1-1.5 k Ω**

18. Replace the K84 Keyless Entry Control Module.

Component Testing

Ignition Mode Switch Test

1. Ignition OFF/Vehicle OFF, disconnect the harness connector at the S38 Ignition Mode Switch.

2. Test for 4.5-5.5 k Ω between the terminals listed below with the S38 Ignition Mode Switch released:

- Signal terminal 6 and ground terminal 4
- Signal terminal 3 and low reference terminal 7
- **If not between 4.5-5.5 k Ω**

Replace the S38 Ignition Mode Switch.

- **If between 4.5-5.5 k Ω**

3. Test for 1-1.5 k Ω between the terminals listed below with the S38 Ignition Mode Switch pressed :

- Signal terminal 6 and ground terminal 4
- Signal terminal 3 and low reference terminal 7
- **If not between 1-1.5 k Ω**

Replace the S38 Ignition Mode Switch.

- **If between 1-1.5 k Ω**

4. All OK.

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.

GENERAL ELECTRICAL DIAGNOSIS

Without a basic knowledge of electricity, it will be difficult to use the diagnostic procedures contained in the service manual. You should understand the basic theory of electricity and know the meaning of voltage (V), current (A) and resistance (Ω). You should also be able to read and understand a wiring diagram, as well as understand what happens in a circuit with an open or a shorted wire.

CHECKING AFTERMARKET ACCESSORIES

WARNING: Refer to [SIR Warning](#) .

Do not connect aftermarket accessories into the SIR circuits, all such circuits are indicated on circuit diagrams with the SIR symbol.

Always check for aftermarket accessories (non-OEM) as the first step in diagnosing electrical problems. If the vehicle is so equipped, disconnect the system to verify that these add-on accessories are not the cause of the problems.

Possible causes of vehicle problems related to aftermarket accessories include:

- Power feeds connected to points other than the battery
- Antenna location
- Transceiver wiring located too close to vehicle electronic modules or wiring
- Poor shielding or poor connectors on antenna feed line
- Check for recent service bulletins detailing installation guidelines for aftermarket accessories.

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](#)
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- [Scan Tool Snapshot Procedure](#)
- [Circuit Protection - Fuses](#)
- [Circuit Protection - Circuit Breakers](#)
- [Circuit Protection - Fusible Links](#)

USING CONNECTOR TEST ADAPTERS

Special Tools

- EL-35616 Terminal Test Probe Kit
- EL-38125-550 Terminal Release Tool Kit

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

CAUTION: Do not insert test equipment probes (DMM etc.) into any connector or fuse block terminal. The diameter of the test probes will deform most terminals. A deformed terminal will cause a poor connection, which will result in a system failure. Always use the EL-35616 GM Approved Terminal Test Probe Kit in order to front probe terminals. Do not use paper clips or other substitutes to probe terminals.

When using the EL-35616 GM Approved Terminal Test Probe Kit, ensure the terminal test adapter choice is the correct size for the connector terminal. Do not visually choose the terminal test adapter because some connector terminal cavities may appear larger than the actual terminal in the cavity. Using a larger terminal test adapter will damage the terminal. Refer to the EL-35616 GM Approved Terminal Test Probe Kit label on the inside of the EL-35616 GM Approved Terminal Test Probe Kit for the correct adapter along with the connector end view.

PROBING ELECTRICAL CONNECTORS

Special Tools

EL-35616 Terminal Test Probe Kit

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

NOTE: Always be sure to reinstall the connector position assurance (CPA) and terminal position assurance (TPA) when reconnecting connectors or replacing terminals.

Front probe

Disconnect the connector and probe the terminals from the mating side (front) of the connector.

CAUTION: Refer to [Test Probe Caution](#).

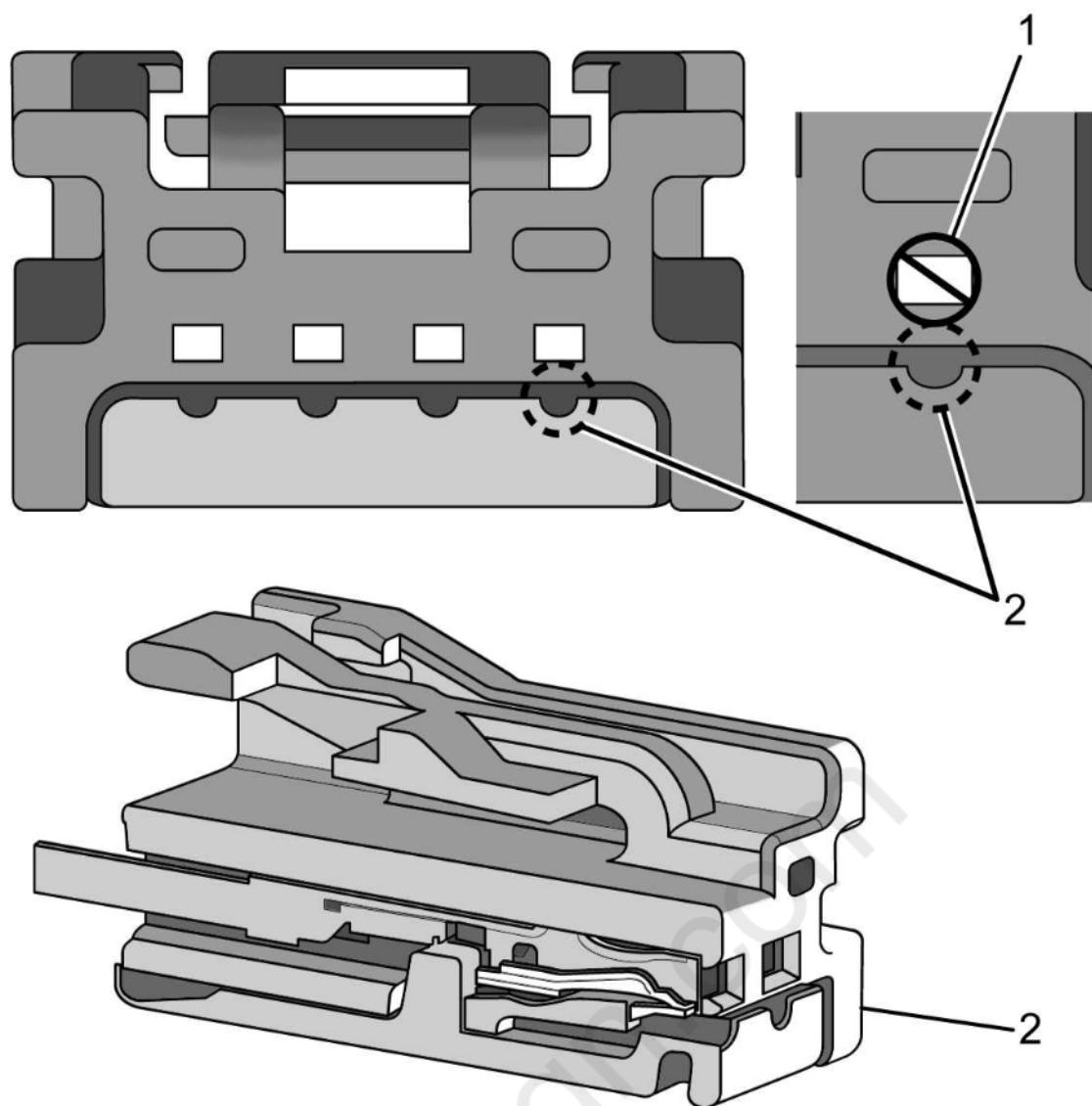


Fig. 1: Probing Terminal

Courtesy of GENERAL MOTORS COMPANY

NOTE: Connectors with 0.50 terminals should not be probed within the female terminal (1). Damage may occur to the terminal and result in improper diagnosis. There is a test point on the connector (2) next to the terminal where testing should be performed.

NOTE: When probing female 0.64 terminals, it is important to use the correct adapter. There have been some revisions to the test adapter for 0.64 terminals. The proper adapter for 0.64 terminals is the J-35616-64B which has a gold terminal and a black wire between the base and tip. Failure to use the proper test adapter may result in damage to the terminal being tested and improper diagnosis.

NOTE: The proper adapter for probing the terminals for fuses, relays or diodes in an electrical center is J-35616-35 . Using any other tool or adapter may damage the terminal being tested.

Refer to the following table as a guide in selecting the correct test adapter for front probing connectors:

Test Adapter	Description
J-35616-2A	150 Male Probe Adapter (gray)
J-35616-3	150 Female Probe Adapter (gray)
J-35616-4A	280 Male Probe Adapter (purple)
J-35616-5	280 Female Probe Adapter (purple)
J-35616-6	100W Male (round) Probe Adapter (brown)

Test Adapter	Description
J-35616-7	100W Female (round) Probe Adapter (brown)
J-35616-8	Weather Pack Male Probe Adapter (orange)
J-35616-9	Weather Pack Female Probe Adapter (orange)
J-35616-10	100W Male (round) Probe Adapter (green)
J-35616-11	100W Female (round) Probe Adapter (green)
J-35616-12	130 Male Probe Adapter (blue)
J-35616-13	130 Female Probe Adapter (blue)
J-35616-14	150 Male Probe Adapter (green)
J-35616-16	100 Male Probe Adapter (lt green)
J-35616-17	100 Female Probe Adapter (lt green)
J-35616-18	220 Male Probe Adapter (black)
J-35616-19	220 Female Probe Adapter (black)
J-35616-21	950 Female Probe Adapter (red)
J-35616-22	950 Male Probe Adapter (red)
J-35616-31	500 Male Probe Adapter (orange)
J-35616-32	500 Female Probe Adapter (orange)
J-35616-33	160/180 Male Probe Adapter (yellow)
J-35616-34	160/180 Female Probe Adapter (yellow)
J-35616-35	280 Male Probe Adapter (violet)
J-35616-40	480 Male Probe Adapter (dk blue)
J-35616-41	480 Female Probe Adapter (dk blue)
J-35616-42	630 Male Probe Adapter (red)
J-35616-43	630 Female Probe Adapter (red)
J-35616-44	800 Male Probe Adapter (yellow)
J-35616-45	800 Female Probe Adapter (yellow)
J-35616-54	280 Male (round) Probe Adapter (tan)
J-35616-55	280 Female (round) Probe Adapter (tan)
J-35616-64B	0.64 Male Probe Adapter (lt blue)
J-35616-65B	0.64 Female Probe Adapter (lt blue)
J-35616-66	150 Male (round) Probe Adapter (yellow)
J-35616-67	150 Female (round) Probe Adapter (yellow)

Backprobe

NOTE:

- Backprobe connector terminals only when specifically required in diagnostic procedures.
- Do not backprobe a sealed (Weather Pack[®]) connector, less than a 280 series Metri-Pack connector, a Micro-Pack connector or a flat wire connector.
- Backprobing can be a source of damage to connector terminals. Use care in order to avoid deforming the terminal, either by forcing the test probe too far into the cavity or by using too large of a test probe.
- After backprobing any connector, inspect for terminal damage. If terminal damage is suspected, test for proper terminal contact.

Do not disconnect the connector and probe the terminals from the harness side (back) of the connector.

TROUBLESHOOTING WITH A DIGITAL MULTIMETER

Special Tools

EL-39200 Digital Multimeter (DMM)

CAUTION: Refer to [Test Probe Caution](#).

Digital Multimeter (DMM) Basic Requirements

Service information is validated using digital multimeters that meet or exceed the following requirements. Using a multimeter that does not meet these basic requirements may give inaccurate readings which could lead to an incorrect diagnosis.

Display and Settings

1. Four digits displayed
2. Voltage, current, resistance, frequency, diode test settings and min-max function
3. Display positive and negative values

Voltage

1. Have at least 10 M Ω input impedance
2. Test a DC voltage range of 0.1-1000 V.
3. Test an AC voltage range of 0.1-1000 V.

Current

1. Test a DC current range of 0.1 μ A-10 A.
2. Test an AC current range of 0.1 μ A-10 A.

Resistance

Test a resistance range of 0.1 Ω -40 M Ω and displays infinite for a value greater than 40 M Ω (O.L. (Over-load))

Frequency

Test for a frequency range of 0.5 Hz-199 k Hz

Diode Test

1. Apply at least 1 mA when performing the diode bias test
2. Display the break over voltage drop (0-3 V) of a forward biased diode
3. Display infinite (O.L. (Over-load)) when a diode is reverse biased

Min-Max Readings

1. Can update at a 25 ms sample rate
2. Saves and displays minimum and maximum values

NOTE: Circuits which include any solid state control modules, such as the engine control module (ECM), should only be tested with a 10 M Ω or higher impedance digital multimeter such as the EL-39200.

The DMM instruction manual is a good source of information and should be read thoroughly upon receipt of the DMM as well as kept on hand for future reference.

A DMM should be used instead of a test lamp in order to test for voltage in high impedance circuits. While a test lamp shows whether voltage is present if the impedance is low enough, a DMM indicates how much voltage is present. In other words, if there is not enough current, the test lamp will not illuminate even though voltage is present.

The ohmmeter function on a DMM shows how much resistance exists between 2 points along a circuit. Low resistance in a circuit means good continuity.

NOTE: Disconnect the power feed from the suspect circuit when measuring resistance with a DMM. This prevents incorrect readings. DMMs apply such a small voltage to measure resistance that the presence of voltages can upset a resistance reading.

Diodes and solid state components in a circuit can cause a DMM to display a false reading. To find out if a component is affecting a measurement take a reading once, then reverse the leads and take a second reading. If the readings differ the solid state component is affecting the measurement.

Following are examples of the various methods of connecting the DMM to the circuit to be tested:

- Probe both ends of the connector and either hold the leads in place while manipulating the connector or tape the leads to the harness for continuous monitoring while you perform other operations or test driving. Refer to [Probing Electrical Connectors](#).
- Disconnect the harness at both ends of the suspected circuit where it connects either to a component or to other harnesses.
- If the system that is being diagnosed has a specified pinout or breakout box, it may be used in order to simplify connecting the DMM to the circuit or for testing multiple circuits quickly.

TROUBLESHOOTING WITH A TEST LAMP

Special Tools

EL-35616-210 Test Light - Probe Kit

NOTE: Always use the proper replacement bulb (**6614F** Test Light Bulb (not LED)).

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

CAUTION: Refer to [Test Probe Caution](#).

A test lamp can simply and quickly test a low impedance circuit for voltage. A Digital Multimeter (DMM) should be used instead of a test lamp in order to test for voltage in high impedance circuits. While a test lamp shows whether voltage is present if the impedance is low enough, a DMM indicates how much voltage is present. In other words, if there is not enough current, the test lamp will not illuminate even though voltage is present.

The **EL-35616-210** kit is Micro-Pack compatible and includes a 12 V test lamp.

To properly operate this tool use the following procedures.

When testing for voltage:

1. Attach one lead to ground.
2. Touch the other lead to various points along the circuit where voltage should be present.
3. When the bulb illuminates, there is voltage at the point being tested.

When testing for ground:

1. Attach one lead to battery positive voltage.
2. Touch the other lead to various points along the circuit where ground should be present.
3. When the bulb illuminates, there is ground at the point being tested.

USING FUSED JUMPER WIRES

Special Tools

EL 35616-20F Fused Jumper Wire

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

NOTE:

A fused jumper may not protect solid state components from being damaged.

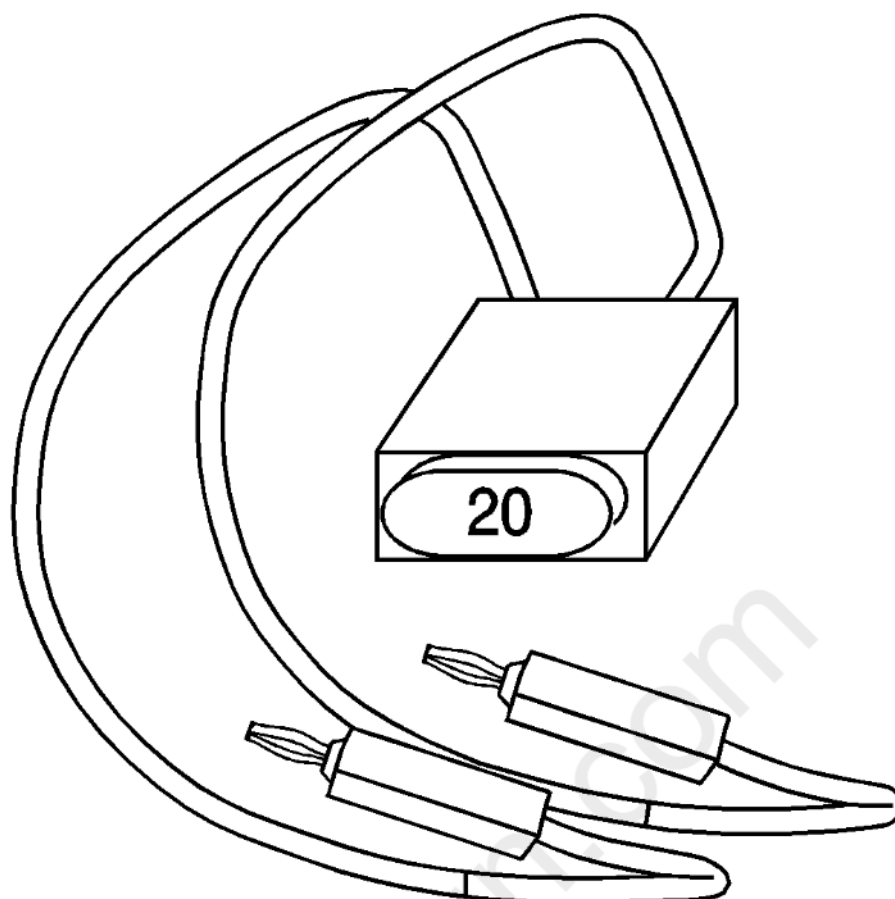


Fig. 2: Fused Jumper Wire

Courtesy of GENERAL MOTORS COMPANY

The **EL 35616-20F** Fused Jumper Wire includes banana jack connectors that provide adaptation to most connectors without damage. This fused jumper wire is supplied with a 20 A fuse which may not be suitable for some circuits. Do not use a fuse with a higher rating than the fuse that protects the circuit being tested.

MEASURING VOLTAGE

Special Tools

EL-39200 Digital Multimeter (DMM)

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

CAUTION: Refer to [Test Probe Caution](#).

The following procedure measures the voltage at a selected point in a circuit.

1. Disconnect the electrical harness connector for the circuit being tested, if necessary.
2. Enable the circuit and/or system being tested. Use the following methods:
 - Turn ON the ignition, with the engine OFF.
 - Turn ON the engine.
 - Turn ON the circuit and/or system with a scan tool in Output Controls.
 - Turn ON the switch for the circuit and/or system being tested.
3. Select the V (AC) or V (DC) position on the Digital Multimeter (DMM).

4. Connect the positive lead of the DMM to the point of the circuit to be tested.
5. Connect the negative lead of the DMM to a good ground.
6. The DMM displays the voltage measured at that point.

MEASURING VOLTAGE DROP

Special Tools

EL-39200 Digital Multimeter (DMM)

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

CAUTION: Refer to [Test Probe Caution](#).

The following procedure determines the difference in voltage potential between 2 points.

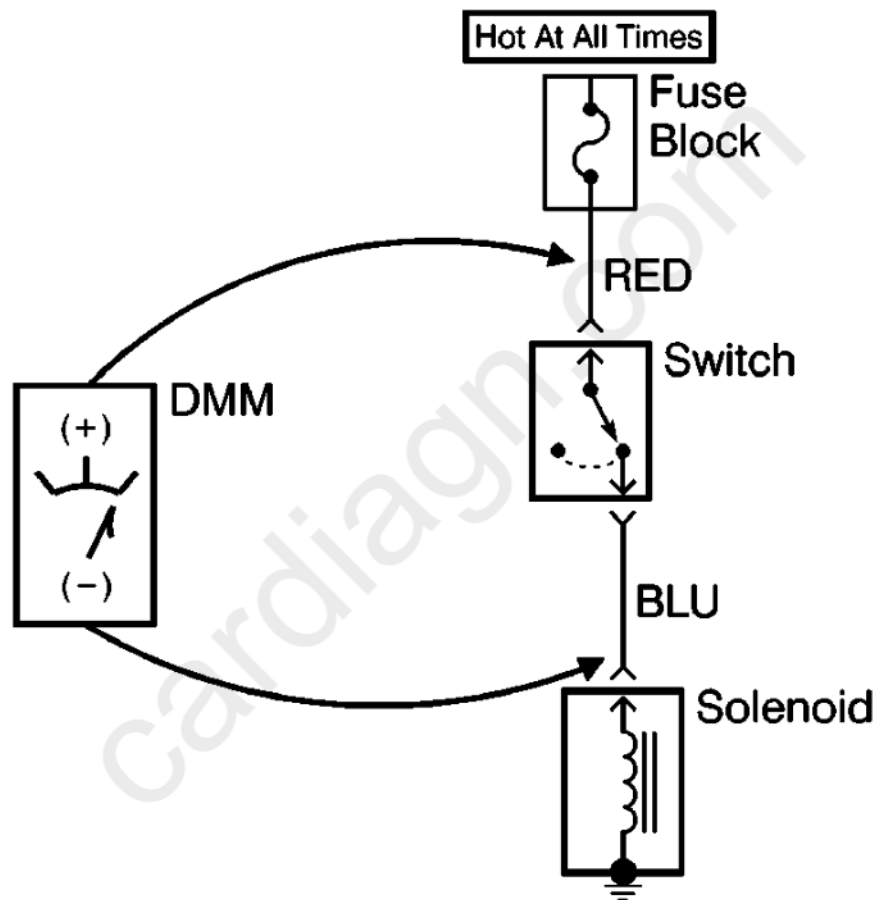


Fig. 3: Measuring Voltage Drop

Courtesy of GENERAL MOTORS COMPANY

1. Set the Digital Multimeter (DMM) to the V (DC) position.
2. Connect the positive lead of the DMM to one point of the circuit to be tested.
3. Connect the negative lead of the DMM to the other point of the circuit.
4. Operate the circuit.
5. The DMM displays the difference in voltage between the 2 points.

MEASURING FREQUENCY

Special Tools

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

CAUTION: Refer to [Test Probe Caution](#) .

The following procedure determines the frequency of a signal.

NOTE: Connecting the Digital Multimeter (DMM) to the circuit before pressing the Hz button will allow the DMM to autorange to an appropriate range.

1. Apply power to the circuit.
2. Set the DMM to the V (AC) position.
3. Connect the positive lead of the DMM to the circuit to be tested.
4. Connect the negative lead of the DMM to a good ground.
5. Set to Hz on the DMM.
6. The DMM will display the frequency measured.

TESTING GROUND AND LOW REFERENCE CIRCUITS

Because a test lamp can light with up to 200 Ω in a ground or low reference circuit they are not recommended to be used for this type of test. A low impedance test lamp can light and indicate the circuit is good when there is as much as 20-30 Ω present, while a high impedance test lamp can light with up to 200 Ω present in the circuit. This is why the Digital Multi-Meter (DMM) is used when validating a ground or low reference circuit continuity.

When using the DMM there are many vehicle conditions that can affect the ground and low reference continuity testing. If these conditions are not met, a ground or low reference circuit test can fail on a good circuit. This may cause longer diagnosis time and incorrect component replacement.

Any current flow through a ground or low reference circuit, while being tested, will skew the DMM continuity reading or display a reading higher than when there is no current flowing. Performing a ground or low reference circuit continuity test, in reference to the vehicles battery negative terminal, will have the highest risk of failing a good ground or low reference circuit test than any other ground reference point. The best ground test points would be a control module housing (if the control modules housing is metal and grounded), under dash metal frame work, engine block or body ground studs (other than where the negative battery cable is attached).

A typical DMM ground or low reference circuit continuity reading can be as high as 100 Ω with the ignition ON and drop to 15-25 Ω after the ignition is turned OFF. The reading will drop below 10 Ω after 30-40 seconds, then below 5 Ω after 60 seconds. Once the vehicle completely goes to sleep (generally 3-10 minutes) the reading will drop below 0.3 Ω .

The following list of conditions may need to be met to ensure a valid continuity reading on a ground or low reference circuit:

- Ignition OFF
- Key out of the ignition switch (when not equipped with keyless entry and remote start)
- Retained Accessory Power (RAP) OFF (open and close the driver door after ignition OFF)
- Battery charger set at a 2 A or less charge rate
- Scan tool not communicating with any vehicle control module (in some cases it may need to be disconnected from the DLC)
- All entry doors closed
- Headlamps OFF (auto headlamps disabled)
- Any delay lighting OFF
- HVAC after blow OFF
- Any accessory that can work when the ignition is OFF
- Wait up to 60 seconds (after all other listed conditions are met)

Activating the DOOR LOCK function with a key fob can greatly reduce the time to achieve a valid ground or low reference continuity test result.

TESTING FOR CONTINUITY

Special Tools

EL-39200 Digital Multimeter (DMM)

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

CAUTION: Refer to [Test Probe Caution](#) .

The following procedures verify good continuity in a circuit.

With a Digital Multimeter (DMM)

1. Set the DMM to the Ω position.
2. Disconnect the power feed (i.e. fuse, control module) from the suspect circuit.
3. Disconnect the load.
4. Select the MIN MAX function on the DMM.
5. Connect one lead of the DMM to one end of the circuit to be tested.
6. Connect the other lead of the DMM to the other end of the circuit.
7. If the DMM displays low or no resistance, the circuit has good continuity.

With a Test Lamp

NOTE: Only use the test lamp procedure on low impedance power and ground circuits.

1. Remove the power feed (i.e. fuse, control module) from the suspect circuit.
2. Disconnect the load.
3. Connect one lead of the test lamp to one end of the circuit to be tested.
4. Connect the other lead of the test lamp to battery positive voltage.
5. Connect the other end of the circuit to ground.
6. If the test lamp illuminates (full intensity), then the circuit has good continuity.

TESTING FOR SHORT TO GROUND

CAUTION: Refer to [Test Probe Caution](#) .

The following procedures test for a short to ground in a circuit.

With a Digital Multimeter (DMM)

1. Remove the power feed (i.e. fuse, control module) from the suspect circuit.
2. Disconnect the load.
3. Set the rotary dial of the DMM to the Ω position.
4. Connect one lead of the DMM to one end of the circuit to be tested.
5. Connect the other lead of the DMM to a good ground.
6. If the DMM does NOT display infinite resistance (OL), there is a short to ground in the circuit.

With a Test Lamp

1. Remove the power feed (i.e. fuse, control module) from the suspect circuit.
2. Disconnect the load.
3. Connect one lead of the test lamp to battery positive voltage.
4. Connect the other lead of the test lamp to one end of the circuit to be tested.

5. If the test lamp illuminates, there is a short to ground in the circuit.

Fuse Powering Several Loads

1. Review the system schematic and locate the fuse that is open.
2. Open the first connector or switch leading from the fuse to each load.
3. Connect a DMM across the fuse terminals (be sure that the fuse is powered).
 - When the DMM displays voltage the short is in the wiring leading to the first connector or switch.
 - If the DMM does not display voltage refer to the next step.
4. Close each connector or switch until the DMM displays voltage in order to find which circuit is shorted.

TESTING FOR A SHORT TO VOLTAGE

Special Tools

EL-39200 Digital Multimeter (DMM)

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

CAUTION: Refer to [Test Probe Caution](#).

The following procedure tests for a short to voltage in a circuit.

1. Remove the power feed (i.e. fuse, control module) from the suspect circuit.
2. Disconnect the load.
3. Set the Digital Multimeter (DMM) to the V (DC) position.
4. Connect the positive lead of the DMM to one end of the circuit to be tested.
5. Connect the negative lead of the DMM to a good ground.
6. Turn ON the ignition and operate all accessories.
7. If the voltage measured is greater than 1 V, there is a short to voltage in the circuit.

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 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.

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 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 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.
- 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.

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.**

INDUCING INTERMITTENT FAULT CONDITIONS

Special Tools

J-25070 Heat Gun

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

Many intermittent open or shorted circuits are affected by harness/connector movement that is caused by vibration, engine torque, bumps/rough pavement, etc. In order to duplicate the customer's concern, it may be necessary to manipulate the wiring harness if the malfunction appears to be vibration related. Manipulation of a circuit can consist of a wide variety of actions, including:

- Wiggling the harness
- Disconnecting a connector and reconnecting
- Stressing the mechanical connection of a connector
- Pulling on the harness or wire in order to identify a separation/break inside the insulation
- Relocating a harness or wires

All these actions should be performed with some goal in mind. For instance, with a scan tool connected, wiggling the wires may uncover a faulty input to the control module. The snapshot option would be appropriate here. Refer to [Scan Tool Snapshot Procedure](#). Another option is, with the component commanded ON and OFF by the scan tool, to move related connectors and wiring and observe the component operation. With the engine running, move related connectors and wiring while monitoring engine operation. If harness or connector movement affects the data displayed, component/system operation or engine operation, inspect and repair the harness/connections as necessary.

You may need to load the vehicle in order to duplicate the concern. This may require the use of weights, floor jacks, jackstands, frame machines, etc. In these cases you are attempting to duplicate the concern

by manipulating the suspension or frame. This method is useful in finding harnesses that are too short and their connectors pull apart enough to cause a poor connection. A DMM set to the Min/Max mode and connected to the suspect circuit while testing can yield desirable results. Refer to [Testing for Electrical Intermittents](#).

Certainly, using the senses of sight, smell and hearing while manipulating the circuit can provide good results as well.

There may be instances where circuit manipulation alone will not meet the required criteria for the fault condition to appear. In such cases it may be necessary to expose the suspect circuit to other conditions while manipulating the harness. Such conditions would include high moisture conditions, along with exceptionally high or low temperatures. The following discusses how to expose the circuit to these kinds of conditions.

High Temperature Conditions

If the complaint tends to be heat related, you can simulate the condition using the **J-25070** heat gun.

Using the heat gun, you can heat up the suspected area or component. Manipulate the harnesses under high temperature conditions while monitoring the scan tool or DMM to locate the fault condition.

The high temperature condition may be achieved simply by test driving the vehicle at normal operating temperature. If a heat gun is unavailable, consider this option to enhance your diagnosis. This option does not allow for the same control, however.

Low Temperature Conditions

Depending on the nature of the fault condition, placing a fan in front of the vehicle while the vehicle is in the shade can have the desired effect.

If this is unsuccessful, use local cooling treatments such as ice or a venturi type nozzle (one that provides hot or cold air). This type of tool is capable of producing air stream temperatures down to -18°C (0°F) from one end and $+71^{\circ}\text{C}$ (160°F) from the other. This is ideally suited for localized cooling needs. In addition, circuit cooling spray can be used to cool down a component or circuit.

Once the vehicle, component or harness has been sufficiently cooled, manipulate the harness or components in an effort to duplicate the concern.

Duplicating Failure Conditions

- If none of the previous tests are successful, attempt to duplicate and/or capture the failure conditions.
- Freeze Frame/Failure Records data, where applicable, contains the conditions that were present when the DTC set.
 1. Review and record Freeze Frame/Failure Records data.
 2. Clear the DTCs using the scan tool.
 3. Turn the key to OFF and wait 15 seconds.
 4. Operate the vehicle under the same conditions that were noted in Freeze Frame/Failure Records data, as closely as possible. The vehicle must also be operating within the Conditions for Running the DTC. Refer to Conditions for Running the DTC in the supporting text if a DTC is being diagnosed.
 5. Monitor DTC Status for the DTC being tested. The scan tool will indicate Ran, when the enabling conditions have been satisfied long enough for the DTC to run. The scan tool will also indicate whether the DTC passed or failed.
- An alternate method is to drive the vehicle with the DMM connected to a suspected circuit. An abnormal reading on the DMM when the concern occurs, may help you locate the concern.

TESTING FOR ELECTRICAL INTERMITTENTS

Special Tools

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

Perform the following procedures while wiggling the harness from side to side. Continue this at convenient points (about 6 inches apart) while watching the test equipment.

- [Testing for Short to Ground](#)
- [Testing for Continuity](#)
- [Testing for a Short to Voltage](#)

If the fault is not identified, perform the procedure below using the MIN MAX feature on the **EL-39200** digital multimeter (DMM). This feature allows you to manipulate the circuit without having to watch the DMM. The DMM will generate an audible tone when a change is detected.

NOTE: **The DMM must be used in order to perform the following procedure since the DMM can monitor current, resistance or voltage while recording the minimum (MIN) and maximum (MAX) values measured.**

1. Connect the DMM to both sides of a suspected connector (still connected) or from one end of a suspected circuit to the other. Refer to [Troubleshooting with a Digital Multimeter](#) for information on connecting the DMM to the circuit.
2. Set the DMM to the V (AC) or V (DC) position.
3. Select the voltage range feature of the DMM in order to select the desired voltage range.
4. Select the MIN MAX function of the DMM. The DMM displays the 100 ms RECORD and emits an audible tone (beep).

NOTE: **The 100 ms RECORD mode is the length of time an input must stay at a new value in order to record the full change.**

5. Simulate the condition that is potentially causing the intermittent connection, either by wiggling the connections or the wiring, test driving or performing other operations. Refer to [Inducing Intermittent Fault Conditions](#).
6. Listen for the audible Min Max Alert which indicates that a new minimum or maximum value has been recorded.
7. Press the MIN MAX button until the MAX value is displayed and note the value.
8. Press the MIN MAX button until the MIN value is displayed and note the value.
9. Determine the difference between the MIN and MAX values.
 - If the variation between the recorded MIN and MAX voltage values is 1 V or greater an intermittent open or high resistance condition exists. Repair the condition as necessary.
 - If the variation between the recorded MIN and MAX voltage values is less than 1 V, an intermittent open or high resistance condition does not exist.

SCAN TOOL SNAPSHOT PROCEDURE

Reviewing Stored Data in Global Diagnostic System (GDS)

Overview

A snapshot is a recording of what a control module on the vehicle was receiving for information while the snapshot is being made. A snapshot is used to analyze the data during the time a vehicle condition is current. In GDS 2 there is not a traditional snapshot as there has been in the past. GDS 2 saves all past VIN and diagnostic data for future viewing. GDS 2 automatically records data whenever the user views Module Diagnostics, Vehicle Diagnostics and/or Systems Diagnostics. Module Diagnostics includes DTC Data, Identification Information, Data Display, Control Functions and Configuration/Reset Functions. Vehicle Diagnostics includes Vehicle Wide DTCs. Systems Diagnostics includes Inspection/Maintenance Status and Inspection/Maintenance Information.

Reviewing Stored Data

The Review Stored Data function allows viewing and playing of previously recorded vehicle data. This information can be used in analysis of vehicle problems and detection of trigger error conditions. The graph function can be used to compare multiple parameters to see if a component is functioning properly. Recorded sessions can be selected for viewing by the following two methods:

- From the Home Page, click on Review Stored Data. In the Review Stored Data page, highlight a vehicle in the Sessions screen located in the upper pane and highlight the desired Stored Data in the lower pane, then click the Review button.
- The user can view stored data without ending a current on-vehicle diagnostic session by clicking the Vehicle Menu button (when active) or Back button until the Session Manager is displayed in the menu. This is used when a user is viewing live data and wants the quickest way to review the data. Click on the Session Manager button. Highlight the desired Stored Data in the lower pane and click the Review button.

Stored Data Review Selections

The following information can be selected in the tabs at the top of the screen:

- Graphical Data Display - Allows a detailed review of parameter data. The buttons on the right side modify the graph data
- Diagnostic Data Display - Displays incoming information from the file. The current value of the parameters is displayed on the screen.
- Line Graph - Allows selected locked parameters to be graphed with parameters overlaid for data comparison. The current value of the parameters is displayed on the screen. Use the buttons on the right side to modify the graph data.
- Bookmarks - If bookmarks are present, this displays the Type, Description and Time of automatic and manually generated bookmarks.
- System Information - Displays the GDS 2 Software Version and MDI Serial Number used when the session was recorded.
- Selected Vehicle Configuration - Displays vehicle identifiers, such as transmission type, for the vehicle selected on the Stored Data Review screen in the Sessions field.
- RPO - Displays vehicle build information.

Graphical Data Display

On the Graphical Data Display tab there are multiple selections at the top of the page. The selections available are:

- Create Report - Opens an internet browser page where a data display report can be printed or saved for future reference.
- Unit Switch - Toggles graph units between English and metric.
- Lock - When a parameter is selected, clicking the lock button locks a selected parameter for viewing in the Line Graph tab. In the Line Graph tab, locked parameters are isolated and overlaid for data comparison.
- Up Arrow - Click the up arrow to move a highlighted parameter up a position on the list.
- Down Arrow - Click the down arrow to move a highlighted parameter down a position on the list.
- Save As - This selection is available in the Graphical Data Display and Diagnostic Data Display tabs. This allows the user to export the graph data to a worksheet for in depth analysis and to timestamp data.

Review Stored Data Functions

To review the session there are buttons at the bottom of the window to control the cursor. From left to right the buttons are:

- Insert Bookmark - This button allows the user to insert bookmarks anywhere along the timeline. This provision allows the user to record notes regarding the inserted bookmark.
- Return Bookmark - This button moves the cursor to the previous bookmark.
- Back - This button moves the cursor back 1 frame.

- Timeline Slider Control - This allows the user to slide and select any position on the Timeline required.
- Forward - This button moves the cursor forward 1 frame.
- Forward Bookmark - This button moves the cursor forward 1 bookmark.
- Bookmarks - Allows the user to toggle bookmark visibility ON and OFF.

Graphical Preference Selections

The vertical side bar on the right side of the screen in the Graphical Data Display and Line Graph tabs toggles the Graphical Selection Panel from hidden to visible. The graphical preference selections available are:

- Reset - Resets the graph display back to the initial standard GDS 2 setting.
- Grid Line Toggle - This toggle reverses the current state of showing or removing grid lines.
- Hash Mark Toggle - This toggle reverses the current state of showing or removing data acquisition points or hash marks.
- Horizontal Graph Compression - Compresses the scale of the graph horizontally.
- Horizontal Graph Expansion - Expands the scale of the graph horizontally.
- Vertical Graph Compression - Compresses the scale of the graph vertically.
- Vertical Graph Expansion - Expands the scale of the graph vertically.
- Move Centerline of Graph Up - Moves the centerline of the graph up incrementally.
- Move Centerline of Graph Down - Moves the centerline of the graph down incrementally.

CIRCUIT PROTECTION - FUSES

Special Tools

EL-39200 Digital Multimeter (DMM)

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

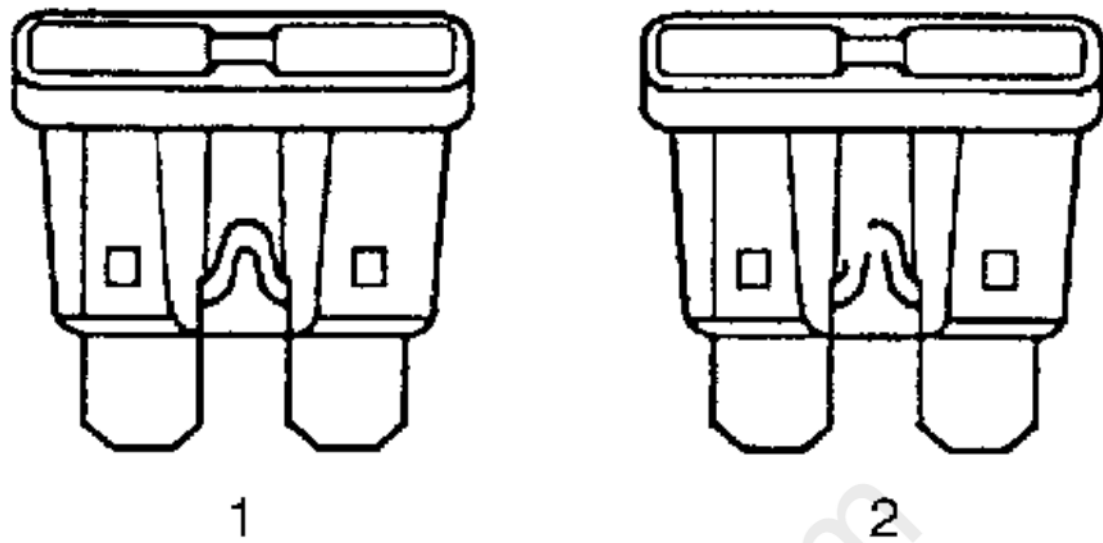


Fig. 4: Identifying Open Fuse Element
Courtesy of GENERAL MOTORS COMPANY

The fuse is the most common method of an automotive wiring circuit protection. Whenever there is an excessive amount of current flowing through a circuit the fusible element will melt and create an open or incomplete circuit. Fuses are a one time protection device and must be replaced each time the circuit is overloaded. To determine if a fuse is open, remove the suspected fuse and examine if the element in the fuse is broken (2). If not broken (1), also check for continuity using a Digital Multimeter (DMM) or a continuity tester. If the element is broken or continuity is suspect, replace the fuse with one of equal current rating.

Fuse Types

Current Rating Amperes	Color
Auto Fuses, Mini Fuses	
2	Gray
3	Violet
5	Tan
7.5	Brown
10	Red
15	Blue
20	Yellow
25	White or Natural
30	Green
Maxi Fuses	
20	Yellow

Current Rating Amperes	Color
30	Light Green
40	Orange or Amber
60	Blue
50	Red
J-Case Fuses	
20	Blue
30	Pink
40	Green
50	Red
60	Yellow
Midi Fuses	
80	Black
Mega Fuses	
100	Black
150	Black
200	Black

CIRCUIT PROTECTION - CIRCUIT BREAKERS

A circuit breaker is a protective device that is designed to open the circuit when a current load is in excess of the rated breaker capacity. If there is a short or other type of overload condition in the circuit, the excessive current will open the circuit between the circuit breaker terminals. Two types of circuit breakers are used.

Circuit Breaker

This type opens when excessive current passes through it for a period of time. It closes again after a few seconds and if the cause of the high current is still present, it will open again. The circuit breaker will continue to cycle open and closed until the condition causing the high current is removed.

Positive Temperature Coefficient (PTC) Circuit Breaker

This type greatly increases its resistance when excessive current passes through it. The excessive current heats the PTC device, as the device heats its resistance increases. Eventually the resistance gets so high that the circuit is effectively open. Unlike the ordinary circuit breaker the PTC unit will not reset until the circuit is opened, by removing the voltage from its terminals. Once the voltage is removed the circuit breaker will re-close within a second or 2.

CIRCUIT PROTECTION - FUSIBLE LINKS

Special Tools

EL-39200 Digital Multimeter (DMM)

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

NOTE: When repairing a fusible link, fusible links cut longer than 225 mm (approximately 9 in) will not provide sufficient overload protection.

Fusible link is wire designed to melt and break continuity when excessive current is applied. It is often located between or near the battery and starter or electrical center. Use a continuity tester or a Digital Multimeter (DMM) at each end of the wire containing the fusible link in order to determine if it is broken. If broken, it must be replaced with fusible link of the same gauge size.

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:

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

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

Connector Anatomy

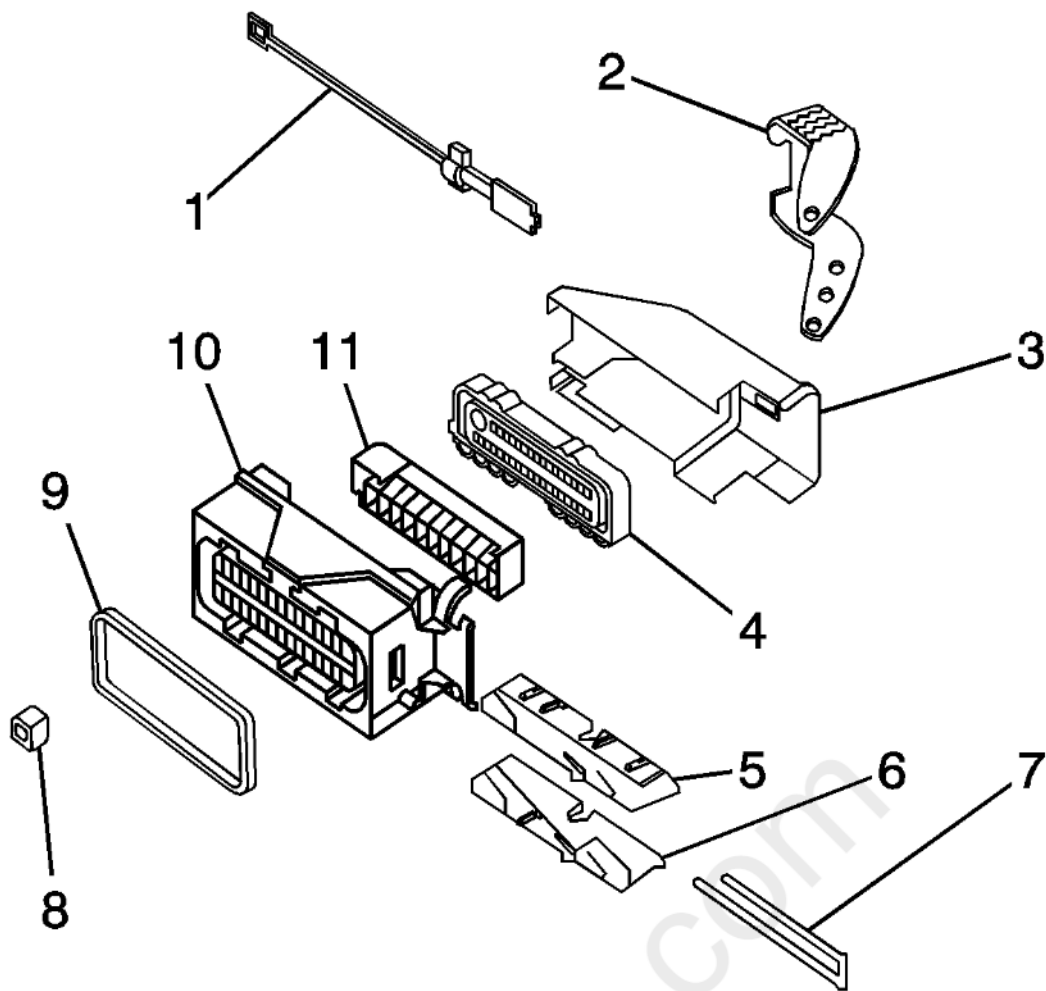


Fig. 5: Identifying Typical Connector Components
 Courtesy of GENERAL MOTORS COMPANY

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.

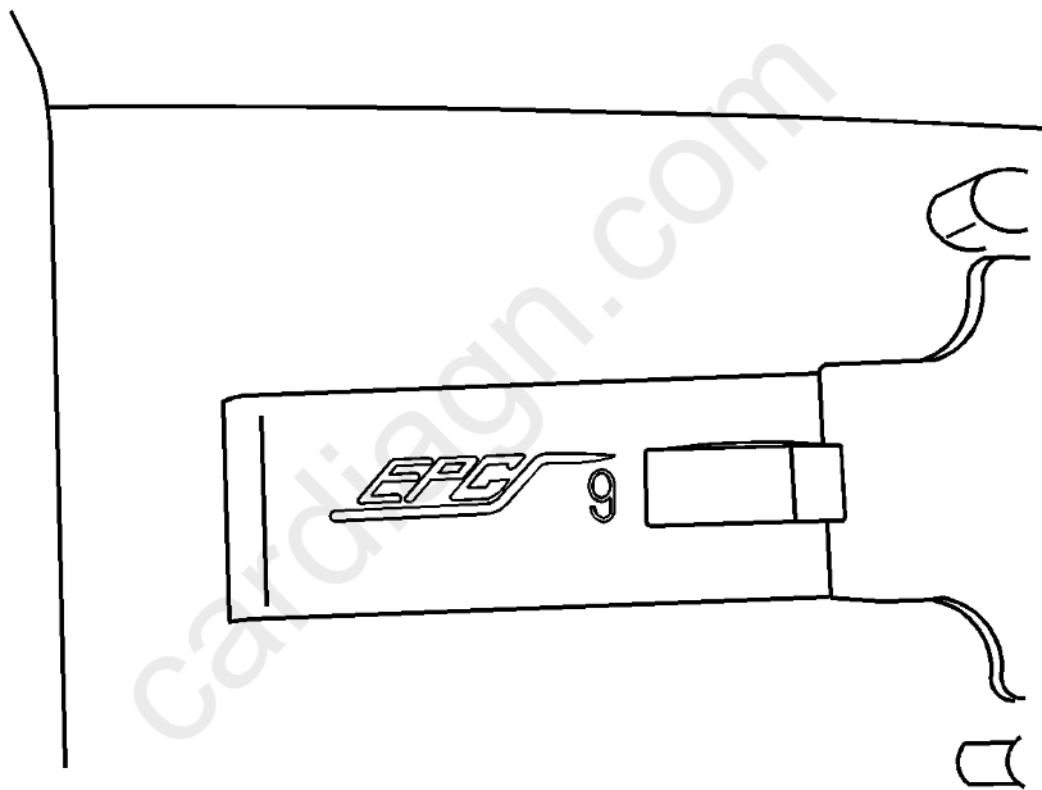


Fig. 6: View Of EPC Identification On Connector Body.
Courtesy of GENERAL MOTORS COMPANY

- 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.

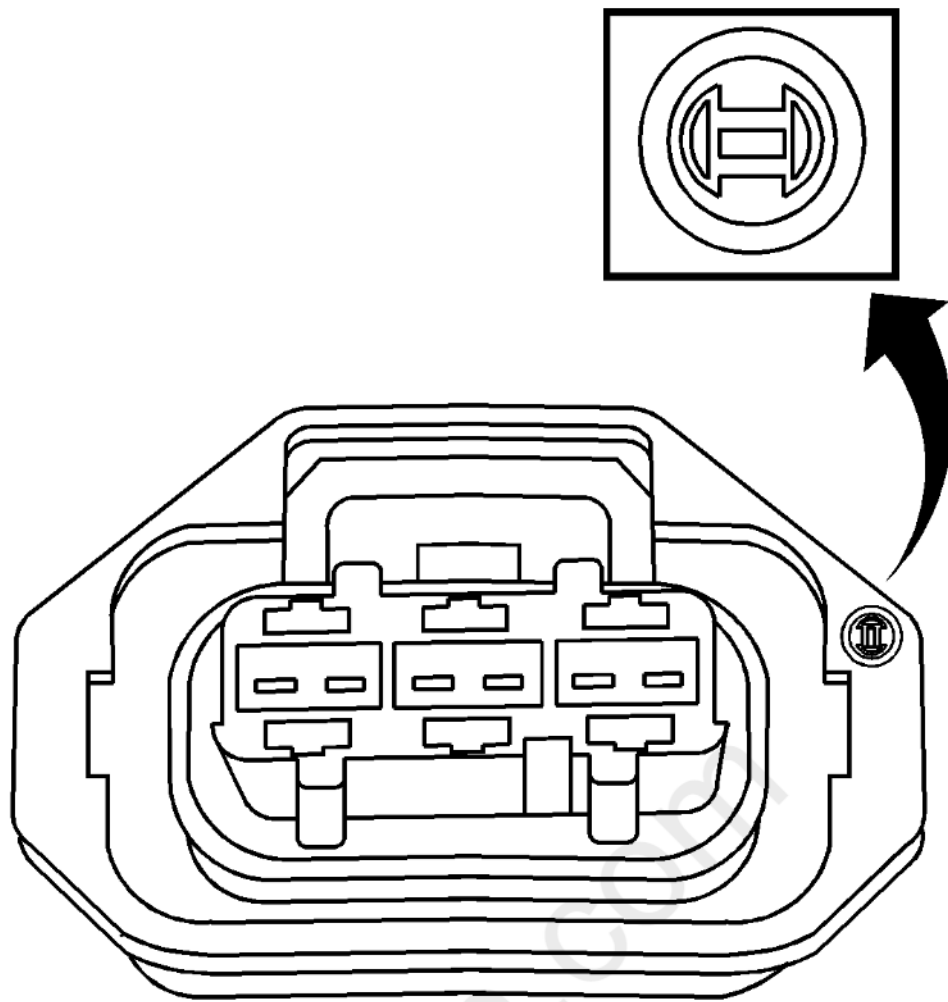


Fig. 7: View Of Bosch Identification On Connector Body

Courtesy of GENERAL MOTORS COMPANY

- 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.

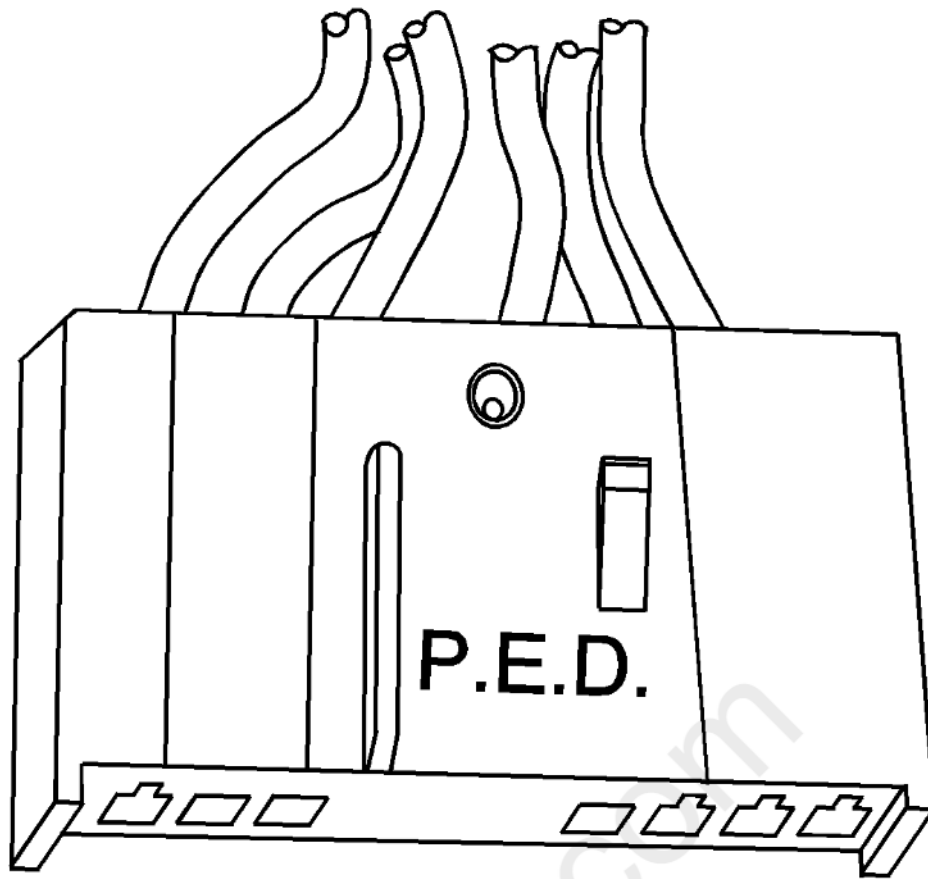


Fig. 8: View Of PED Identification On Connector Body.

Courtesy of GENERAL MOTORS COMPANY

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

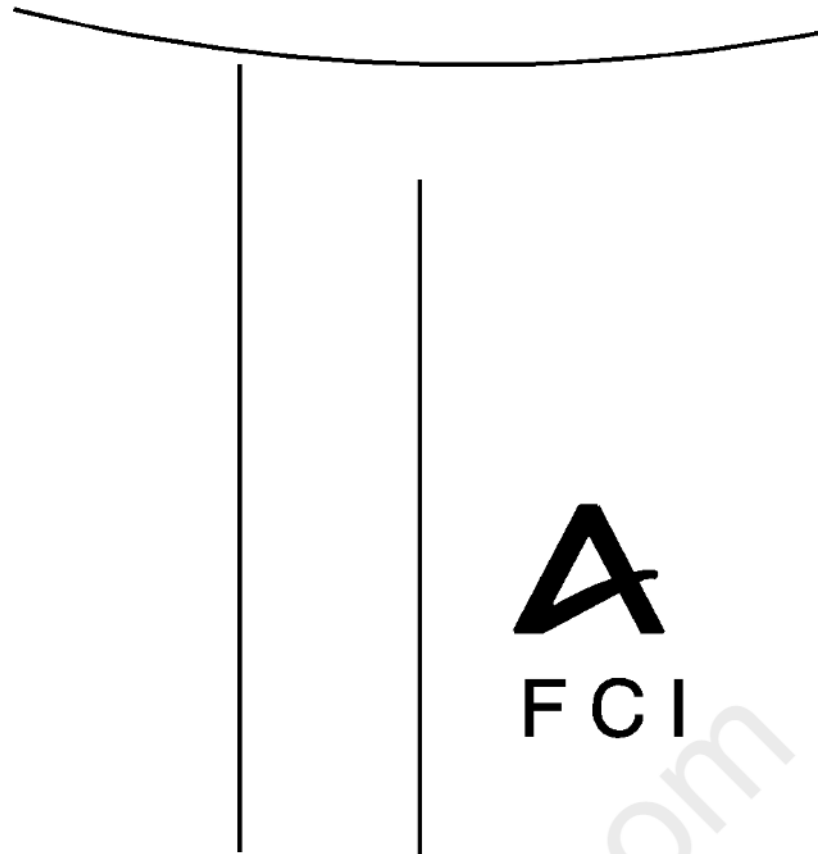


Fig. 9: View Of FCI Identification On Connector Body.
Courtesy of GENERAL MOTORS COMPANY

- JAE connector have JAE in small letters on their connectors.

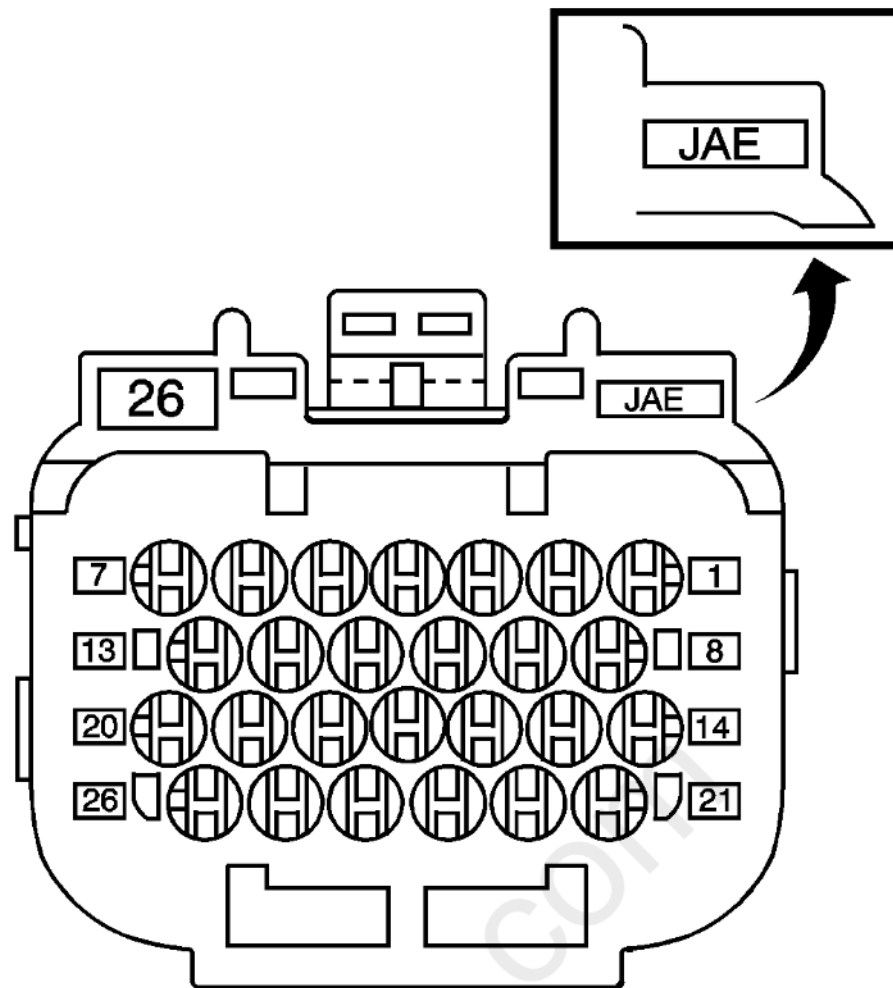


Fig. 10: View Of JAF Identification On Connector Body

Courtesy of GENERAL MOTORS COMPANY

- 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.

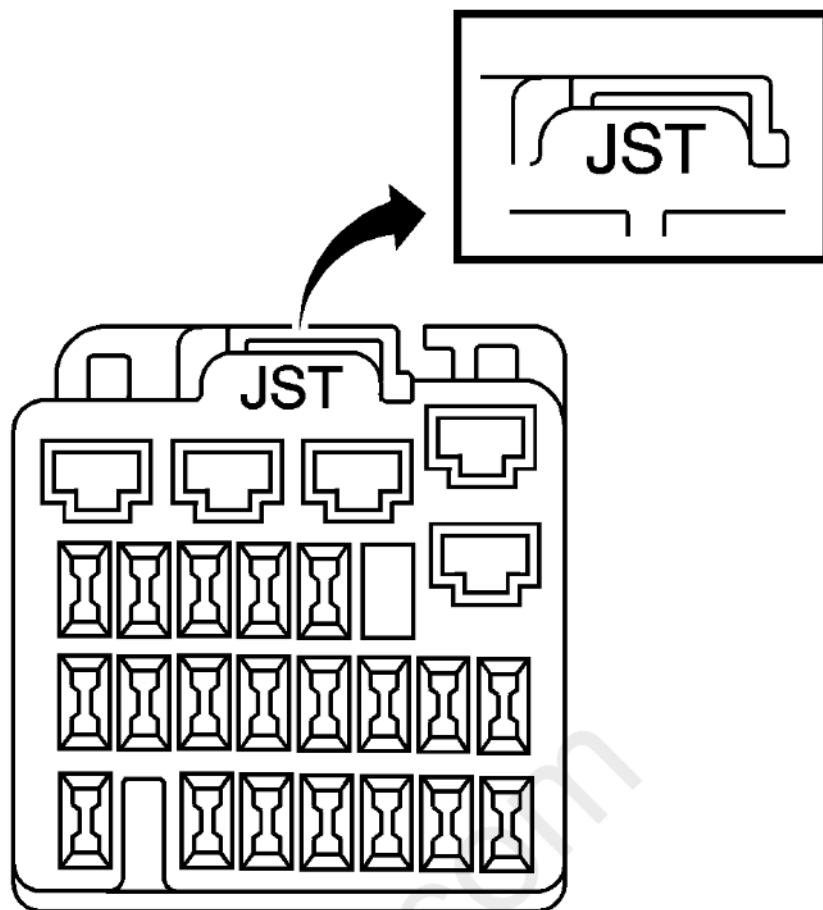


Fig. 11: View Of JST Identification On Connector Body

Courtesy of GENERAL MOTORS COMPANY

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

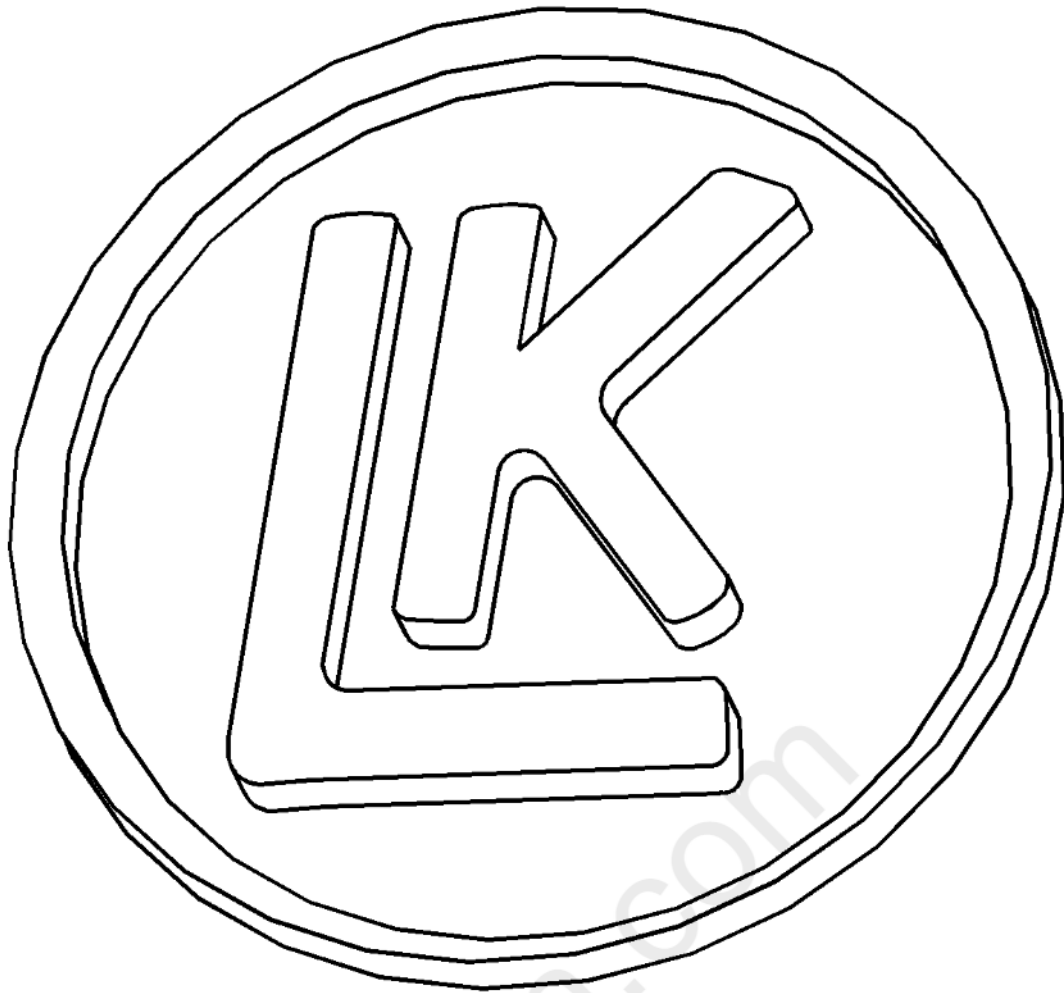


Fig. 12: View Of Kostel Connector Identifier

Courtesy of GENERAL MOTORS COMPANY

- Most Molex connectors will have the Molex logo on the dresscover 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.

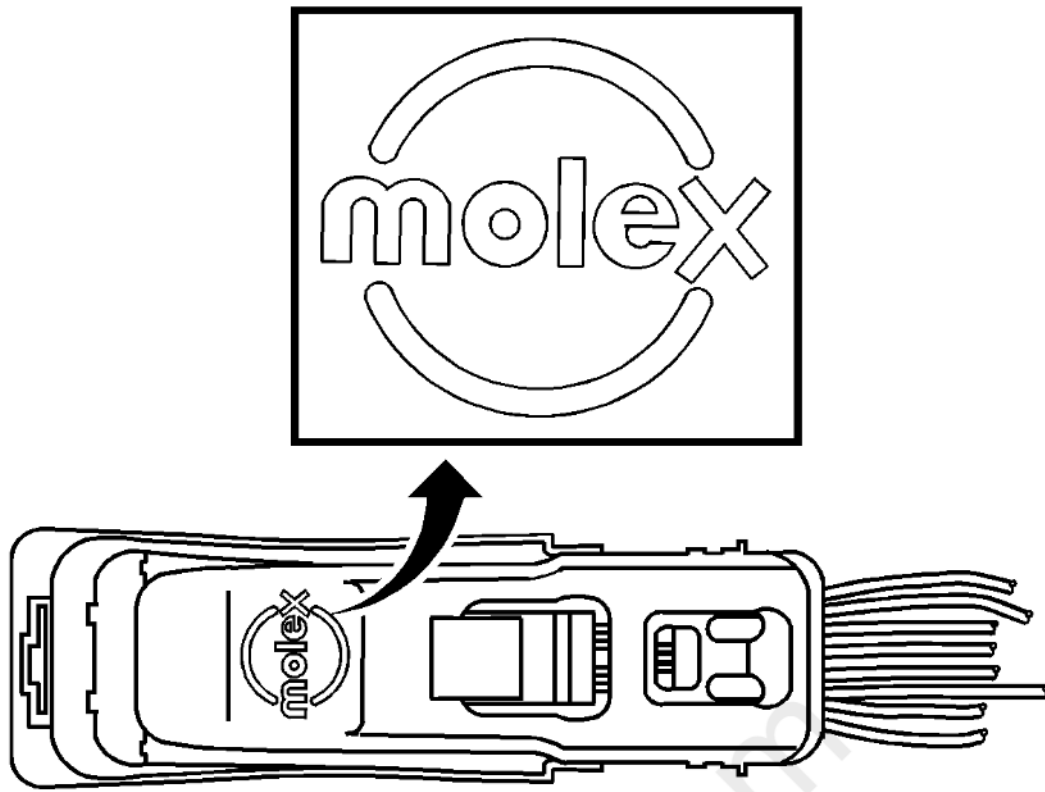


Fig. 13: View Of Molex Identification On Connector Body.
Courtesy of GENERAL MOTORS COMPANY

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.

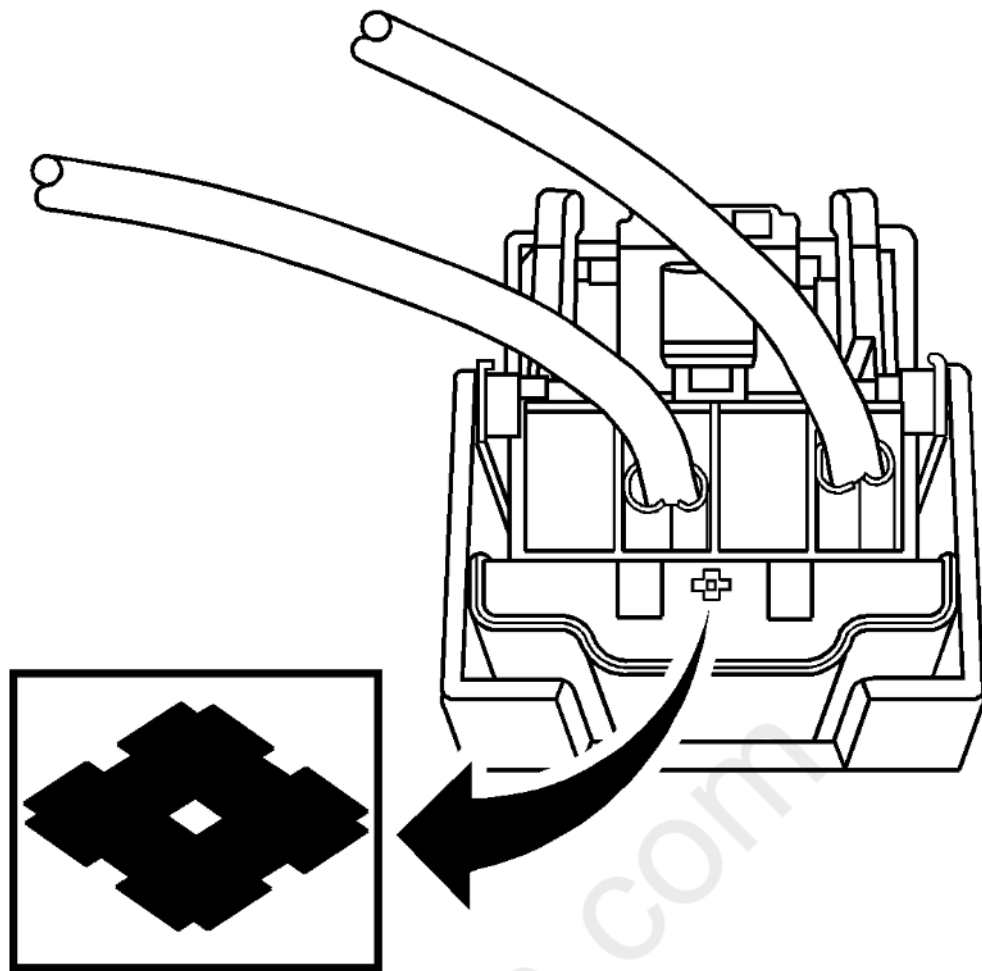


Fig. 14: View Of Sumitono Identification On Connector Body

Courtesy of GENERAL MOTORS COMPANY

- 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.

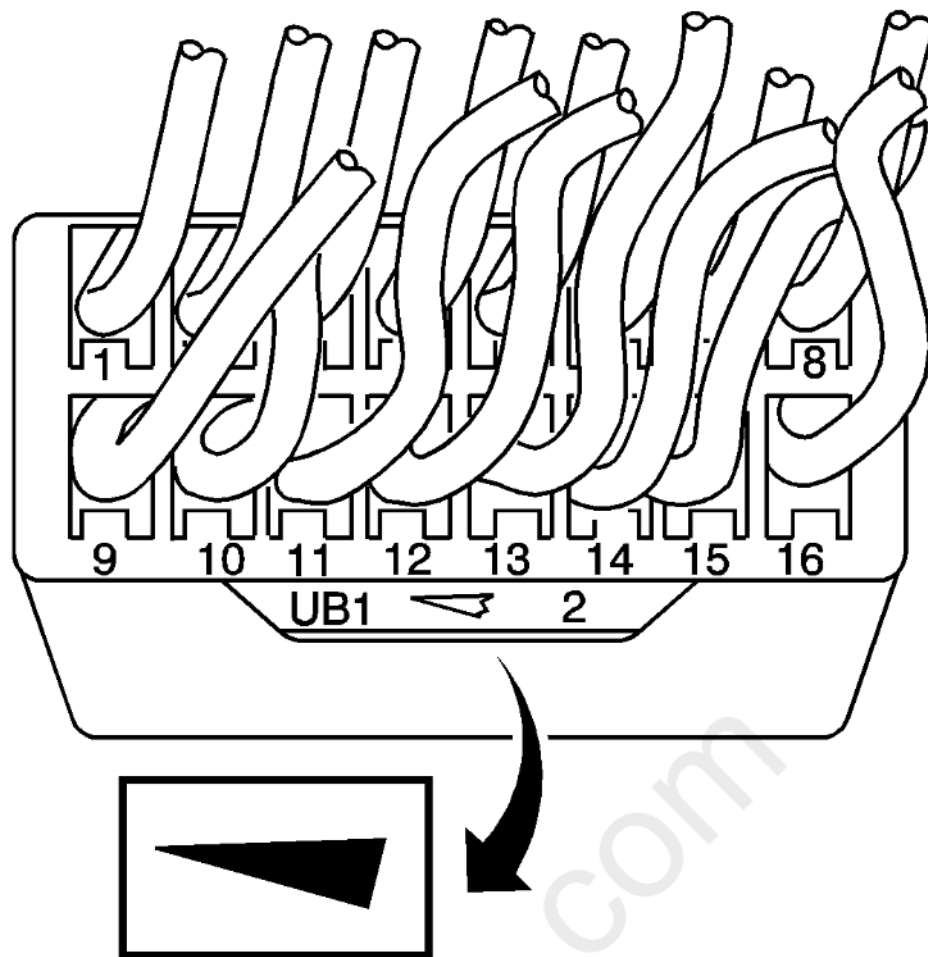


Fig. 15: View Of Yazaki Identification On Connector Body
Courtesy of GENERAL MOTORS COMPANY