

2018 ELECTRICAL

Wiring Systems And Power Management - Component Locator - Powertrain Component Views - Equinox & Terrain

POWERTRAIN COMPONENT VIEWS

TOP OF THE ENGINE (LH7)

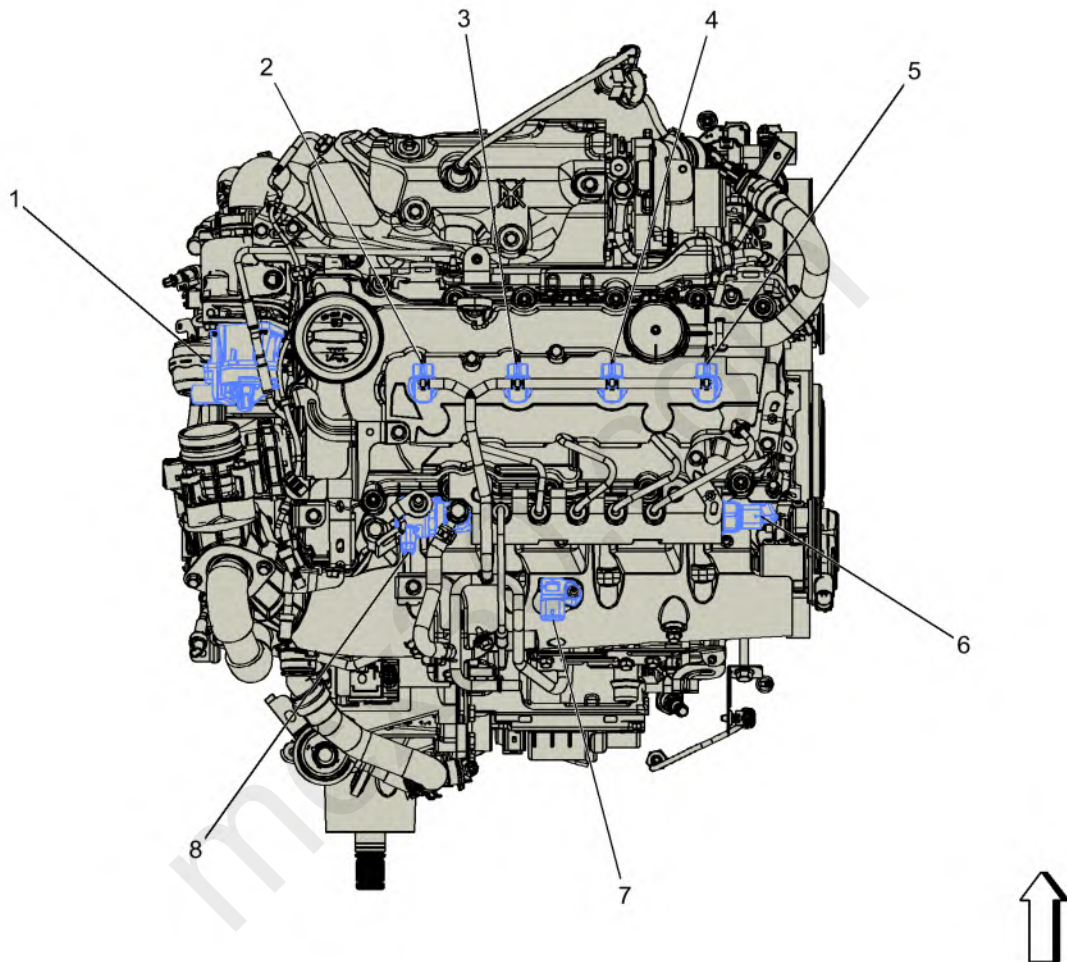


Fig. 1: Top Of The Engine (LH7).

Courtesy of GENERAL MOTORS COMPANY

Items

1. Q14 Exhaust Gas Recirculation Valve (LH7) **Q14 Exhaust Gas Recirculation Valve (LH7).**
2. Q17D Fuel Injector 4 **Q17D Fuel Injector 4 (LH7).**
3. Q17C Fuel Injector 3 **Q17C Fuel Injector 3 (LH7).**
4. Q17B Fuel Injector 2 **Q17B Fuel Injector 2 (LH7).**
5. Q17A Fuel Injector 1 **Q17A Fuel Injector 1 (LH7).**
6. B47B Fuel Rail Pressure Sensor (LH7) **B47B Fuel Rail Pressure Sensor (LH7).**
7. B65 Intake Manifold Pressure and Air Temperature Sensor **B65 Intake Manifold Pressure and Air Temperature Sensor (LH7/LYX).**
8. Q18B Fuel Pressure Regulator 2 (LH7) **Q18B Fuel Pressure Regulator 2 (LH7).**

TOP OF THE ENGINE (LTG) 1 OF 2

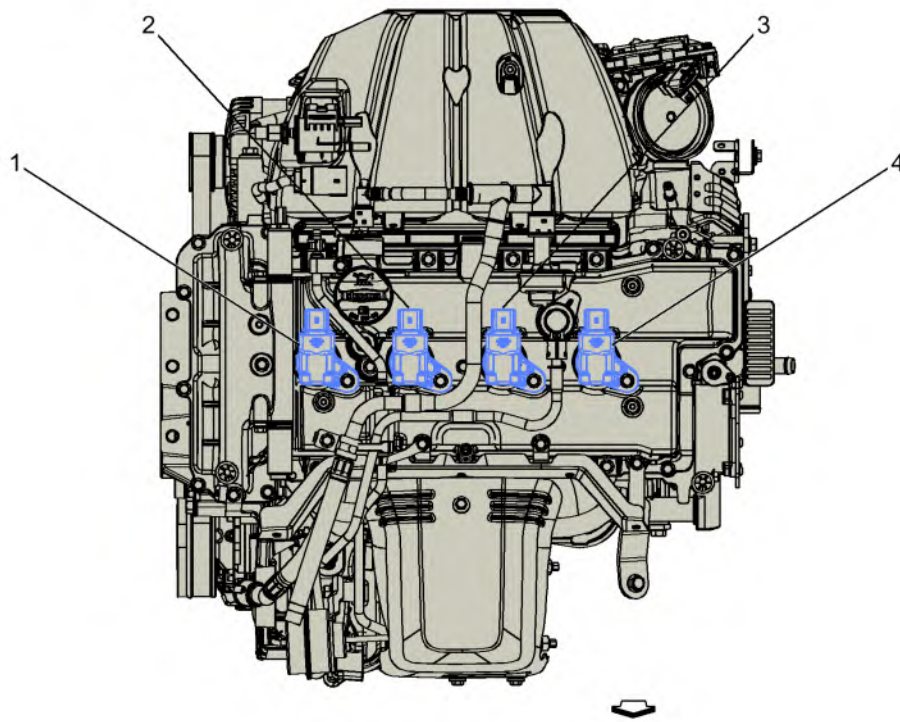


Fig. 2: Top Of The Engine (LTG) 1 Of 2
 Courtesy of GENERAL MOTORS COMPANY

Items

1. T8A Ignition Coil 1 (LTG/LYX) [T8A Ignition Coil 1 \(LTG\)](#)
2. T8B Ignition Coil 2 (LTG/LYX) [T8B Ignition Coil 2 \(LTG\)](#)
3. T8C Ignition Coil 3 (LTG/LYX) [T8C Ignition Coil 3 \(LTG\)](#)
4. T8D Ignition Coil 4 (LTG/LYX) [T8D Ignition Coil 4 \(LTG\)](#)

TOP OF THE ENGINE (LTG) 2 OF 2

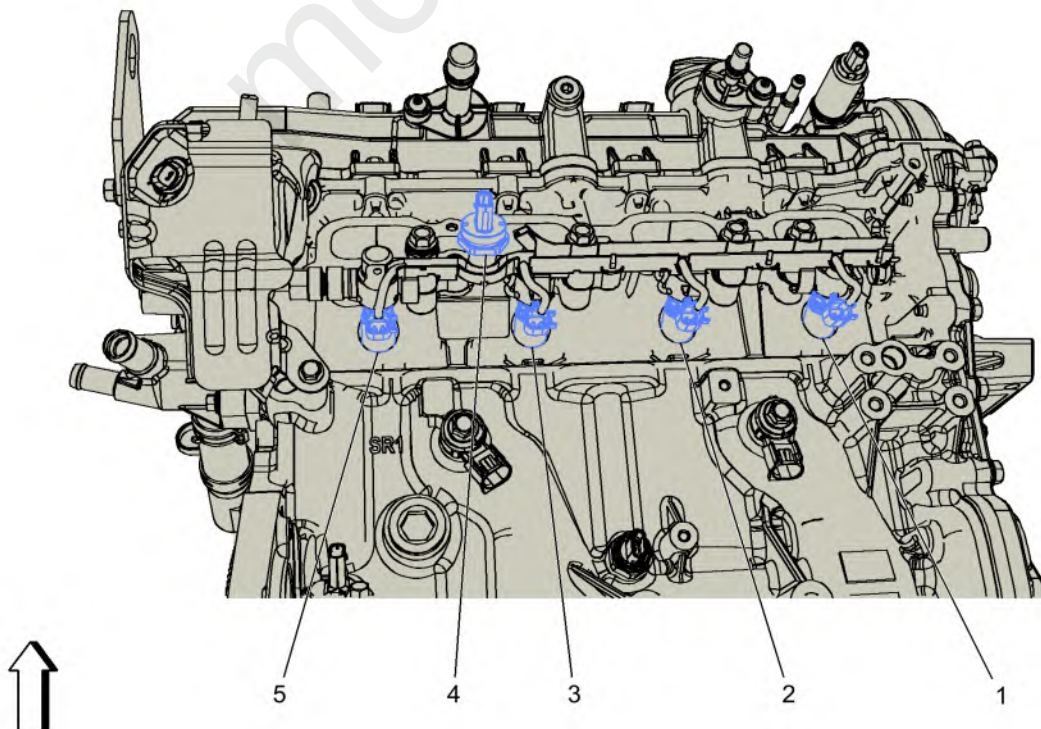


Fig. 3: Top Of The Engine (LTG) 2 Of 2
 Courtesy of GENERAL MOTORS COMPANY

Items

1. Q17D Fuel Injector 4 [Q17D Fuel Injector 4 \(LTG\)](#)
2. Q17C Fuel Injector 3 [Q17C Fuel Injector 3 \(LTG\)](#)
3. Q17B Fuel Injector 2 [Q17B Fuel Injector 2 \(LTG\)](#)
4. B310 Fuel Pressure/Temperature Sensor (LTG/LYX) [B310 Fuel Pressure/Temperature Sensor \(LTG/LYX\)](#)
5. Q17A Fuel Injector 1 [Q17A Fuel Injector 1 \(LTG\)](#)

TOP OF THE ENGINE (LYX)

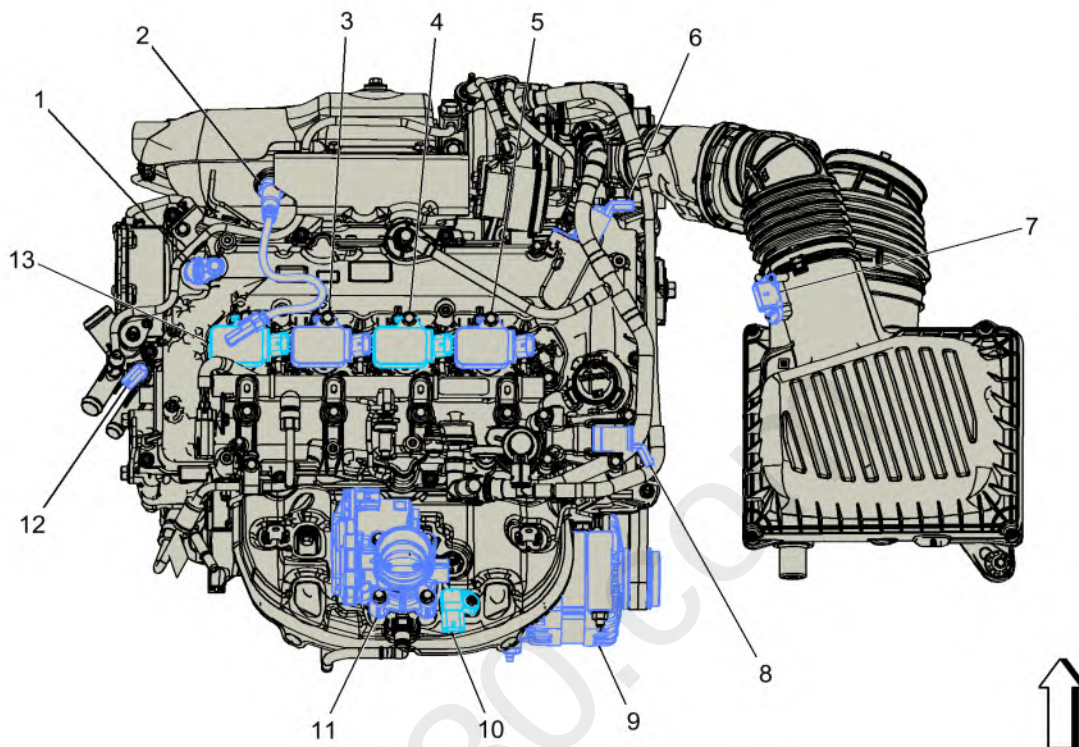


Fig. 4: Top Of The Engine (LYX)

Courtesy of GENERAL MOTORS COMPANY

Items

1. B23E Camshaft Position Sensor - Exhaust (LTG/LYX) [B23E Camshaft Position Sensor - Exhaust \(LYX\)](#)
2. B52A Heated Oxygen Sensor 1 (LTG/LYX) [B52A Heated Oxygen Sensor 1 \(LYX\)](#)
3. T8C Ignition Coil 3 (LTG/LYX) [T8C Ignition Coil 3 \(LYX\)](#)
4. T8B Ignition Coil 2 (LTG/LYX) [T8B Ignition Coil 2 \(LYX\)](#)
5. T8A Ignition Coil 1 (LTG/LYX) [T8A Ignition Coil 1 \(LYX\)](#)
6. Q6E Camshaft Position Actuator Solenoid Valve - Exhaust (LTG/LYX) [Q6E Camshaft Position Actuator Solenoid Valve - Exhaust \(LYX\)](#)
7. B75C Multifunction Intake Air Sensor [B75C Multifunction Intake Air Sensor](#)
8. Q84C Camshaft Position Actuator Park Lock Solenoid Valve - Intake (LYX) [Q84C Camshaft Position Actuator Park Lock Solenoid Valve - Intake \(LYX\)](#)
9. G13 Generator [G13 Generator X1 G13 Generator X2 \(LYX\)](#)
10. B65 Intake Manifold Pressure and Air Temperature Sensor [B65 Intake Manifold Pressure and Air Temperature Sensor \(LH7/LYX\)](#)
11. Q38 Throttle Body [Q38 Throttle Body \(LTG/LYX\)](#)
12. B34 Engine Coolant Temperature Sensor [B34 Engine Coolant Temperature Sensor \(LH7/LYX\)](#)
13. T8D Ignition Coil 4 (LTG/LYX) [T8D Ignition Coil 4 \(LYX\)](#)

LEFT FRONT OF THE ENGINE/CRANKSHAFT POSITION SENSOR (LH7)

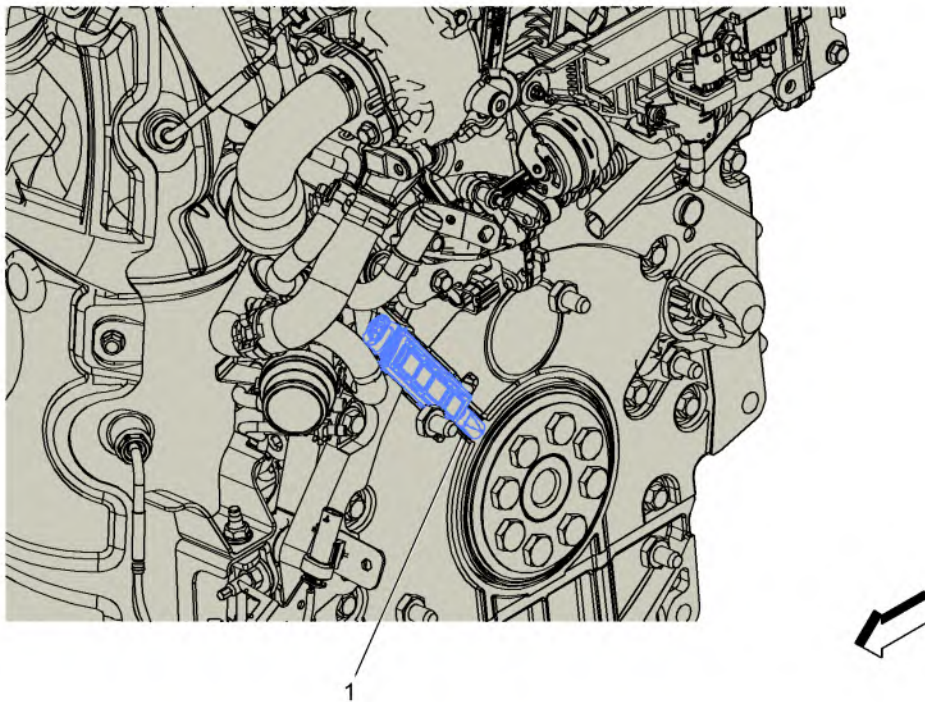


Fig. 5: Left Front Of The Engine/Crankshaft Position Sensor (LH7).
 Courtesy of GENERAL MOTORS COMPANY

Items	
1. B26 Crankshaft Position Sensor	<u>B26 Crankshaft Position Sensor (LH7).</u>

RIGHT FRONT OF THE ENGINE (LTG)

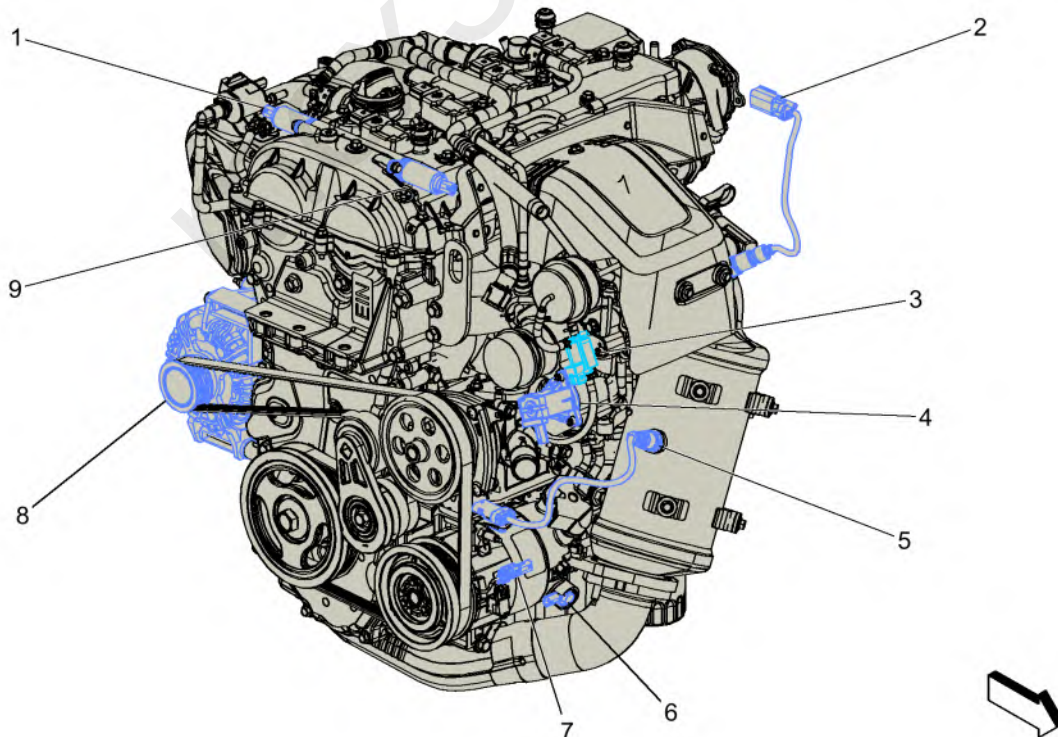


Fig. 6: Right Front Of The Engine (LTG).
 Courtesy of GENERAL MOTORS COMPANY

Items	

Items

1. Q6F Camshaft Position Actuator Solenoid Valve - Intake (LTG/LYX) [Q6F Camshaft Position Actuator Solenoid Valve - Intake \(LTG/LYX\)](#)
2. B52A Heated Oxygen Sensor 1 (LTG/LYX) [B52A Heated Oxygen Sensor 1 \(LTG\)](#)
3. Q42 Turbocharger Wastegate Solenoid Valve (LTG/LYX) [Q42 Turbocharger Wastegate Solenoid Valve \(LTG\)](#)
4. Q40 Turbocharger Bypass Solenoid Valve (LTG/LYX) [Q40 Turbocharger Bypass Solenoid Valve \(LTG/LYX\)](#)
5. B52B Heated Oxygen Sensor 2 [B52B Heated Oxygen Sensor 2 \(LTG\)](#)
6. Q46 A/C Compressor Solenoid Valve [Q46 A/C Compressor Solenoid Valve](#)
7. Q2 A/C Compressor Clutch [Q2 A/C Compressor Clutch](#)
8. G13 Generator [G13 Generator X1](#) [G13 Generator X2 \(LH7/LTG\)](#)
9. Q6E Camshaft Position Actuator Solenoid Valve - Exhaust (LTG/LYX) [Q6E Camshaft Position Actuator Solenoid Valve - Exhaust \(LTG\)](#)

RIGHT FRONT OF THE ENGINE (LYX)

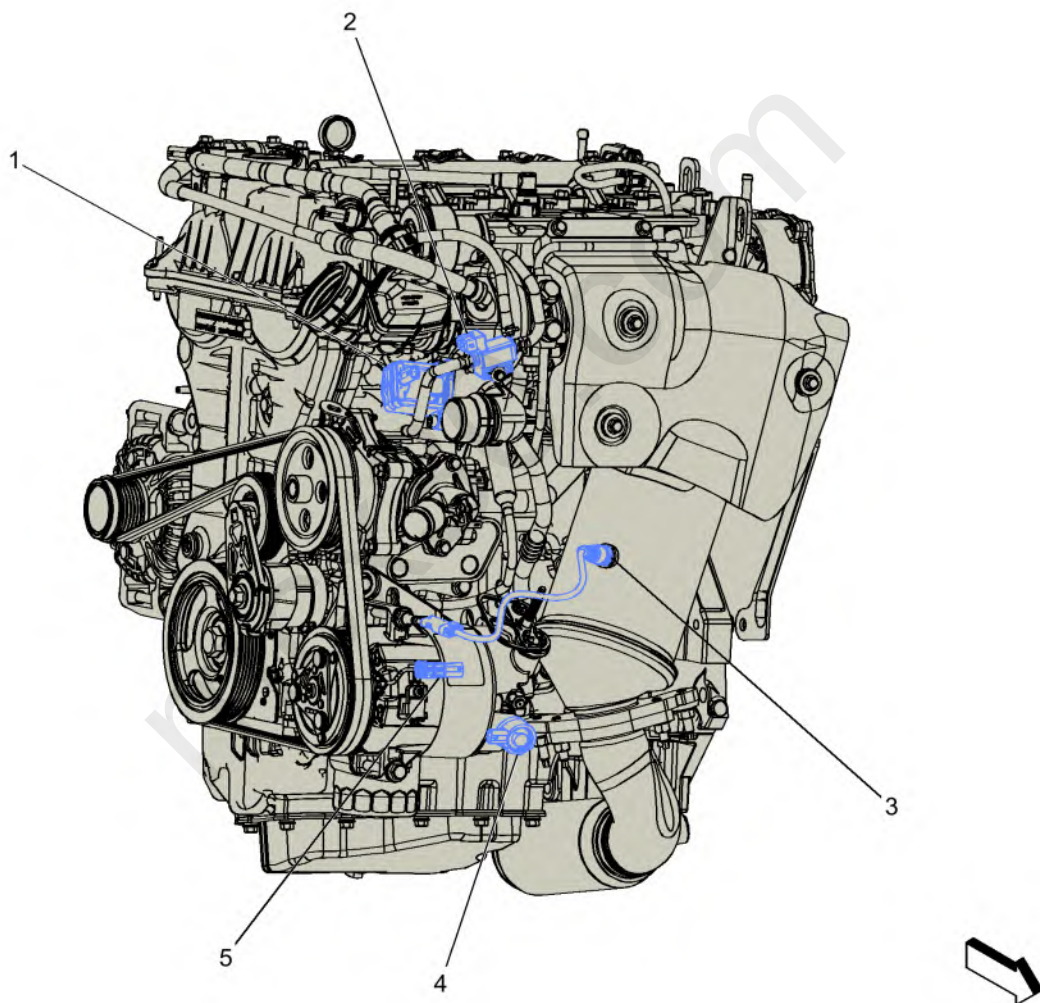


Fig. 7: Right Front Of The Engine (LYX)

Courtesy of GENERAL MOTORS COMPANY

Items

1. Q40 Turbocharger Bypass Solenoid Valve (LTG/LYX) [Q40 Turbocharger Bypass Solenoid Valve \(LTG/LYX\)](#)
2. Q42 Turbocharger Wastegate Solenoid Valve (LTG/LYX) [Q42 Turbocharger Wastegate Solenoid Valve \(LYX\)](#)
3. B52B Heated Oxygen Sensor 2 [B52B Heated Oxygen Sensor 2 \(LYX\)](#)
4. Q46 A/C Compressor Solenoid Valve [Q46 A/C Compressor Solenoid Valve](#)
5. Q2 A/C Compressor Clutch [Q2 A/C Compressor Clutch](#)

FRONT OF THE ENGINE/HEATED OXYGEN SENSOR (LYX+MNK)

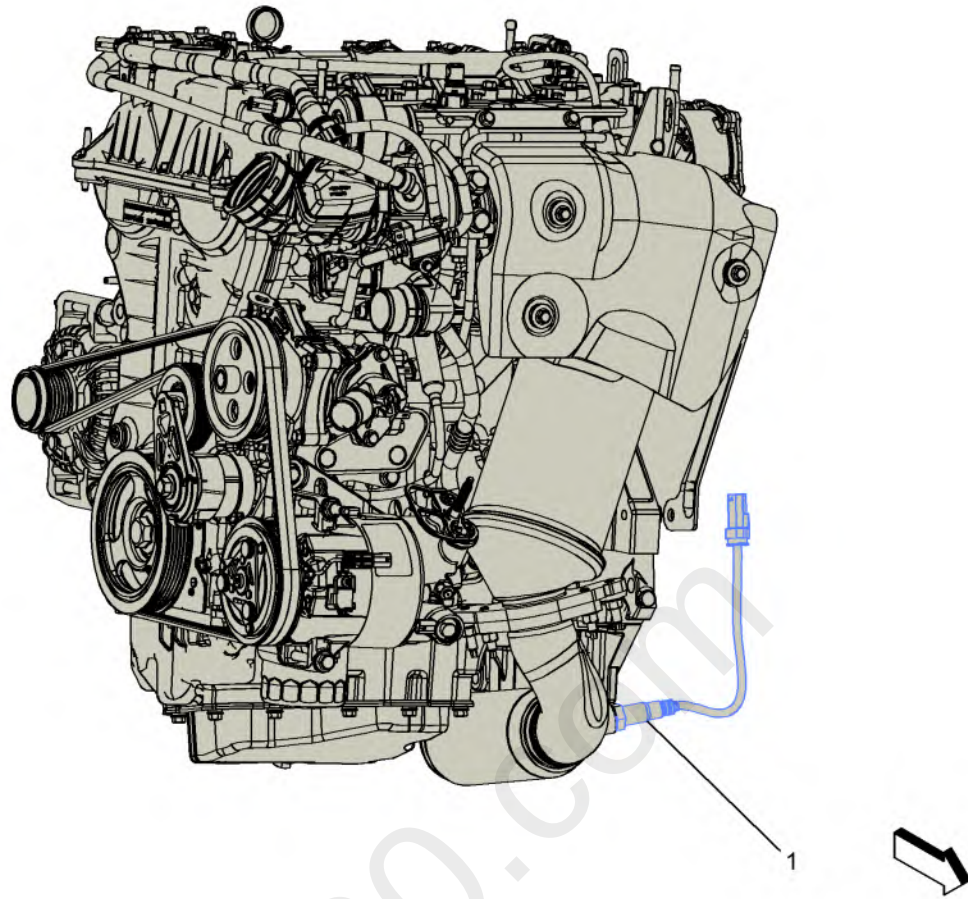


Fig. 8: Front Of The Engine/Heated Oxygen Sensor (LYX+MNK).

Courtesy of GENERAL MOTORS COMPANY

Items

1. B52B Heated Oxygen Sensor 2 **B52B Heated Oxygen Sensor 2 (LYX).**

FRONT OF THE ENGINE (LH7)

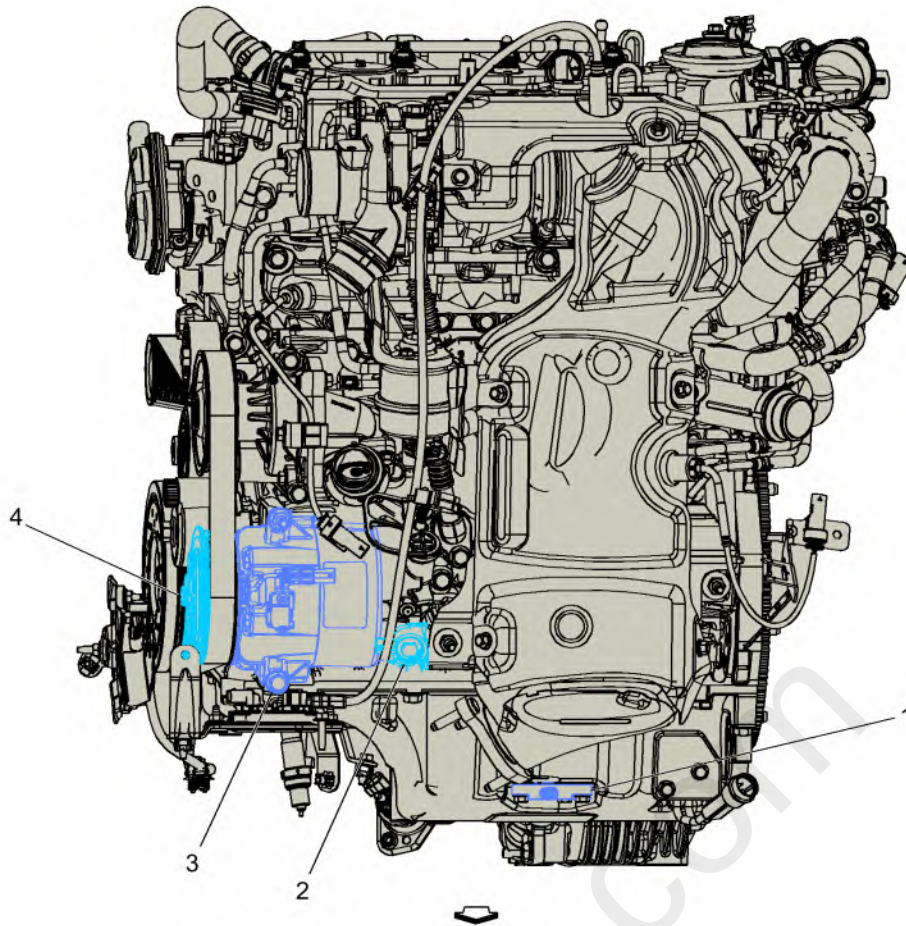


Fig. 9: Front Of The Engine (LH7)

Courtesy of GENERAL MOTORS COMPANY

Items

1. B35 Engine Oil Level Switch **B35 Engine Oil Level Switch (LH7)**
2. Q46 A/C Compressor Solenoid Valve **Q46 A/C Compressor Solenoid Valve**
3. G1 A/C Compressor
4. Q2 A/C Compressor Clutch **Q2 A/C Compressor Clutch**

REAR OF THE ENGINE (LH7)

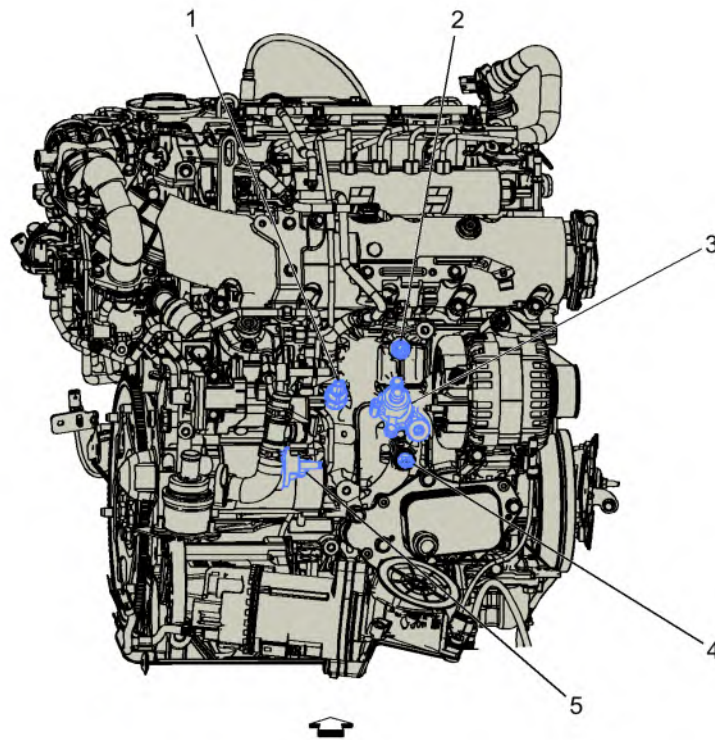


Fig. 10: Rear Of The Engine (LH7)

Courtesy of GENERAL MOTORS COMPANY

Items

1. B267 Piston Cooling Oil Pressure Switch (LH7) [B267 Piston Cooling Oil Pressure Switch \(LH7\)](#)
2. B34 Engine Coolant Temperature Sensor [B34 Engine Coolant Temperature Sensor \(LH7/LYX\)](#)
3. Q45 Piston Cooling Oil Jet Solenoid Valve (LH7) [Q45 Piston Cooling Oil Jet Solenoid Valve \(LH7\)](#)
4. B37B Engine Oil Pressure Sensor [B37B Engine Oil Pressure Sensor \(LH7/LYX\)](#)
5. M64 Starter Motor [M64 Starter Motor X1 \(-KL9\)](#), [M64 Starter Motor X1 \(KL9\)](#), [M64 Starter Motor X2](#)

REAR OF THE ENGINE (LTG)

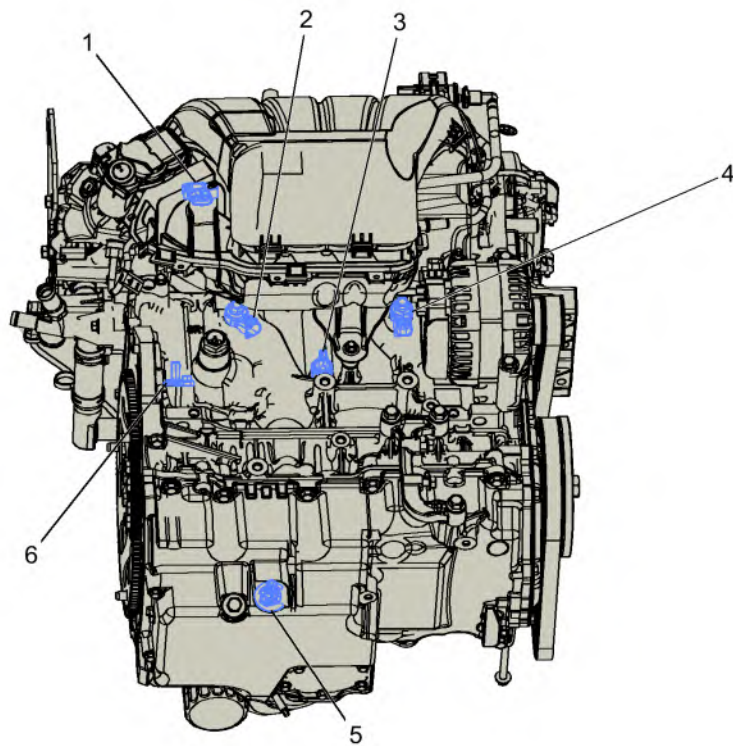


Fig. 11: Rear Of The Engine (LTG)

Courtesy of GENERAL MOTORS COMPANY

Items

1. B74 Manifold Absolute Pressure Sensor (LTG) **B74 Manifold Absolute Pressure Sensor (LTG)**
2. B68B Knock Sensor 2 (LTG/LYX) **B68B Knock Sensor 2 (LTG/LYX)**
3. B37B Engine Oil Pressure Sensor **B37B Engine Oil Pressure Sensor (LTG)**
4. B68A Knock Sensor 1 (LTG/LYX) **B68A Knock Sensor 1 (LTG/LYX)**
5. Q44 Engine Oil Pressure Control Solenoid Valve **Q44 Engine Oil Pressure Control Solenoid Valve (LTG)**
6. B26 Crankshaft Position Sensor **B26 Crankshaft Position Sensor (LTG)**

REAR OF THE ENGINE (LYX)

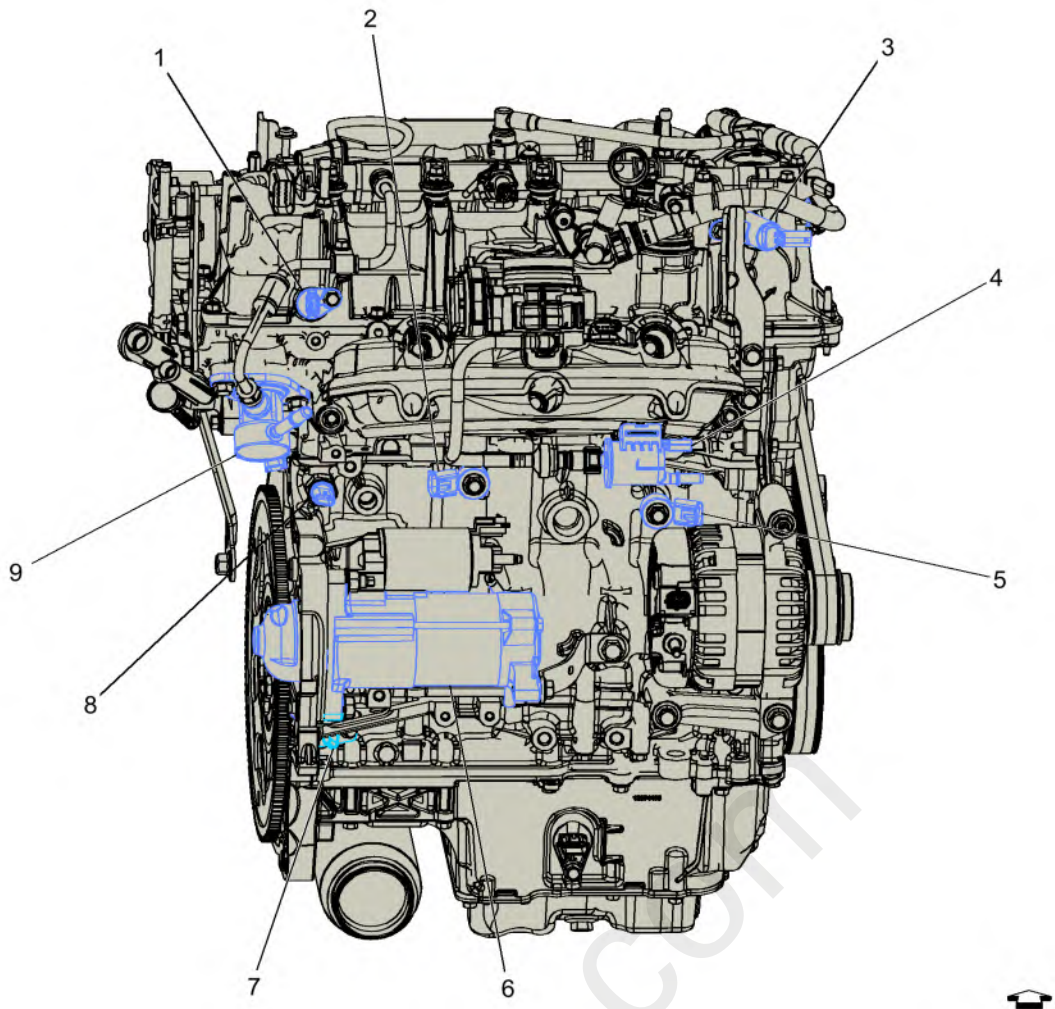


Fig. 12: Rear Of The Engine (LYX)

Courtesy of GENERAL MOTORS COMPANY

Items

1. B23F Camshaft Position Sensor - Intake (LTG/LYX) **B23F Camshaft Position Sensor - Intake (LYX)**
2. B68B Knock Sensor 2 (LTG/LYX) **B68B Knock Sensor 2 (LTG/LYX)**
3. Q6F Camshaft Position Actuator Solenoid Valve - Intake (LTG/LYX) **Q6F Camshaft Position Actuator Solenoid Valve - Intake (LTG/LYX)**
4. Q12 Evaporative Emission Purge Solenoid Valve (LTG/LYX) **Q12 Evaporative Emission Purge Solenoid Valve (LTG/LYX)**
5. B68A Knock Sensor 1 (LTG/LYX) **B68A Knock Sensor 1 (LTG/LYX)**
6. M64 Starter Motor **M64 Starter Motor X1 (-KL9), M64 Starter Motor X1 (KL9), M64 Starter Motor X2**
7. B26 Crankshaft Position Sensor **B26 Crankshaft Position Sensor (LYX)**
8. B37B Engine Oil Pressure Sensor **B37B Engine Oil Pressure Sensor (LH7/LYX)**
9. G18 High Pressure Fuel Pump (LTG/LYX) **G18 High Pressure Fuel Pump (LTG/LYX)**

LEFT FRONT OF THE ENGINE (LH7)

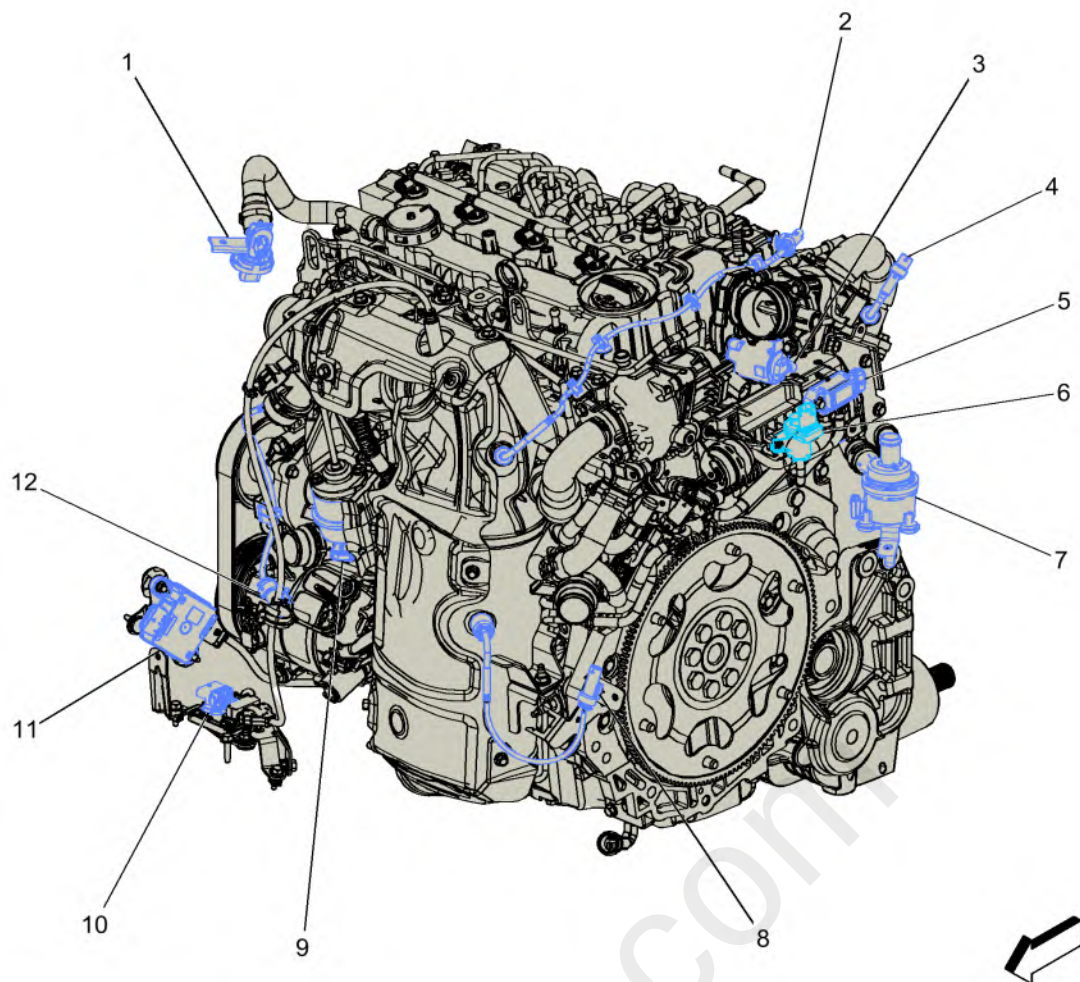


Fig. 13: Left Front Of The Engine (LH7)
Courtesy of GENERAL MOTORS COMPANY

Items

1. E45 Positive Crankcase Ventilation Heater (LH7) **E45 Positive Crankcase Ventilation Heater (LH7)**
2. B131A Exhaust Temperature Sensor 1 (LH7) **B131A Exhaust Temperature Sensor 1 (LH7)**
3. Q20 Intake Air Flow Valve **Q20 Intake Air Flow Valve (LH7)**
4. B130B Exhaust Gas Recirculation Temperature Sensor 2 (LH7) **B130B Exhaust Gas Recirculation Temperature Sensor 2 (LH7)**
5. B154 Diesel Particulate Filter Exhaust Differential Pressure Sensor (LH7) **B154 Diesel Particulate Filter Exhaust Differential Pressure Sensor (LH7)**
6. Q47 Exhaust Gas Recirculation Cooler Bypass Solenoid Valve (LH7) **Q47 Exhaust Gas Recirculation Cooler Bypass Solenoid Valve (LH7)**
7. G36 Auxiliary Heater Coolant Pump (KL9) **G36 Auxiliary Heater Coolant Pump (KL9)**
8. B131B Exhaust Temperature Sensor 2 (LH7) **B131B Exhaust Temperature Sensor 2 (LH7)**
9. B112 Turbocharger Vane Position Sensor (LH7) **B112 Turbocharger Vane Position Sensor (LH7)**
10. B195A Nitrogen Oxides Sensor 1 (LH7) **B195A Nitrogen Oxides Sensor 1 (LH7)**
11. B136 Exhaust Particulate Matter Sensor (LH7) **B136 Exhaust Particulate Matter Sensor (LH7)**
12. B130A Exhaust Gas Recirculation Temperature Sensor 1 (LH7) **B130A Exhaust Gas Recirculation Temperature Sensor 1 (LH7)**

RIGHT REAR OF THE ENGINE (LH7)

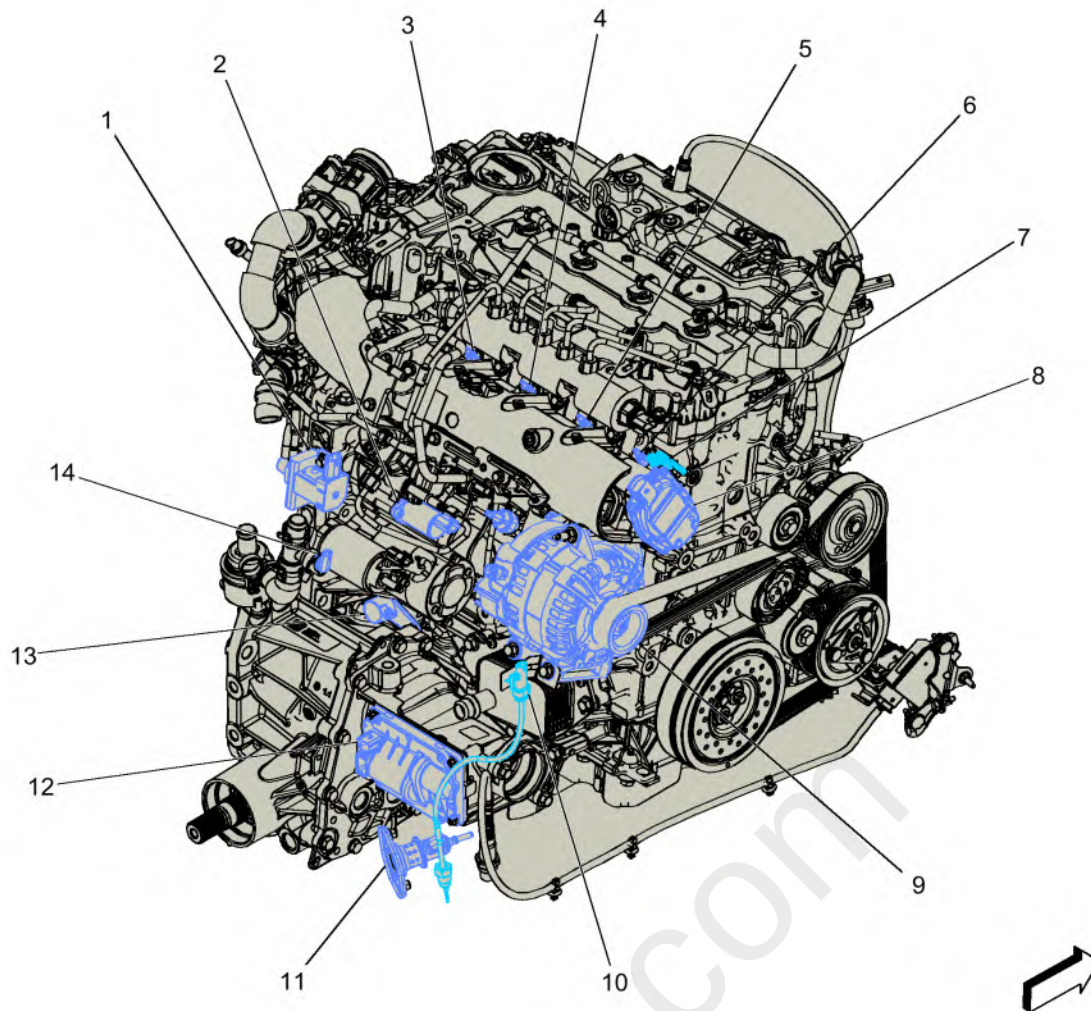


Fig. 14: Right Rear Of The Engine (LH7)
Courtesy of GENERAL MOTORS COMPANY

Items

1. Q41 Turbocharger Vane Position Control Solenoid Valve (LH7) **Q41 Turbocharger Vane Position Control Solenoid Valve (LH7)**
2. Q18A Fuel Pressure Regulator 1 (LH7) **Q18A Fuel Pressure Regulator 1 (LH7)**
3. E12D Glow Plug 4 (LH7) **E12D Glow Plug 4 (LH7)**
4. E12C Glow Plug 3 (LH7) **E12C Glow Plug 3 (LH7)**
5. E12B Glow Plug 2 (LH7) **E12B Glow Plug 2 (LH7)**
6. E12A Glow Plug 1 (LH7) **E12A Glow Plug 1 (LH7)**
7. B23 Camshaft Position Sensor (LH7) **B23 Camshaft Position Sensor (LH7)**
8. M98 Intake Manifold Runner Valve Actuator (LH7) **M98 Intake Manifold Runner Valve Actuator (LH7)**
9. G13 Generator **G13 Generator X1 G13 Generator X2 (LH7/LTG)**
10. B131C Exhaust Temperature Sensor 3 (LH7) **B131C Exhaust Temperature Sensor 3 (LH7)**
11. Q61 Reductant Injector (LH7) **Q61 Reductant Injector (LH7)**
12. M115 Power Transfer Unit Shift Actuator (F48) **M115 Power Transfer Unit Shift Actuator X1 (F48) M115 Power Transfer Unit Shift Actuator X2 (F48)**
13. Q44 Engine Oil Pressure Control Solenoid Valve **Q44 Engine Oil Pressure Control Solenoid Valve (LH7)**
14. B203 Engine Coolant Radiator Temperature Sensor (LH7) **B203 Radiator Coolant Temperature Sensor (LH7)**

LEFT REAR OF THE ENGINE (LTG)

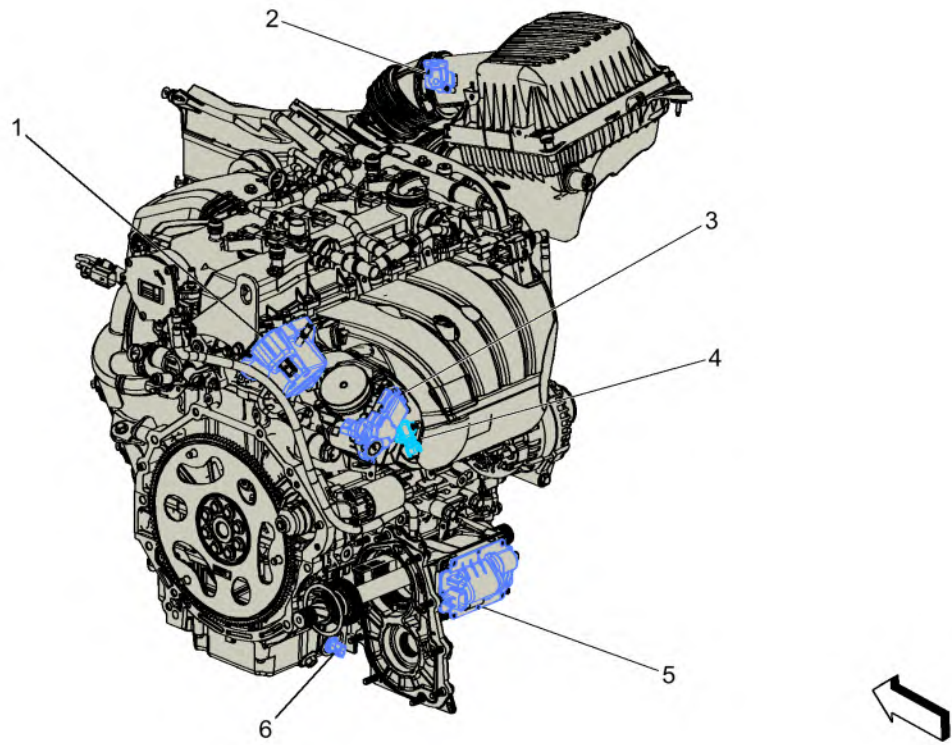


Fig. 15: Left Rear Of The Engine (LTG)

Courtesy of GENERAL MOTORS COMPANY

Items	
1. G18 High Pressure Fuel Pump (LTG/LYX)	<u>G18 High Pressure Fuel Pump (LTG/LYX)</u>
2. B75C Multifunction Intake Air Sensor	<u>B75C Multifunction Intake Air Sensor</u>
3. Q38 Throttle Body	<u>Q38 Throttle Body (LTG/LYX)</u>
4. B74 Manifold Absolute Pressure Sensor (LTG)	<u>B74 Manifold Absolute Pressure Sensor (LTG)</u>
5. M115 Power Transfer Unit Shift Actuator (F48)	<u>M115 Power Transfer Unit Shift Actuator X1 (F48)</u> , <u>M115 Power Transfer Unit Shift Actuator X2 (F48)</u>
6. B35 Engine Oil Level Switch	<u>B35 Engine Oil Level Switch (LTG)</u>

BOTTOM OF ENGINE (LYX)

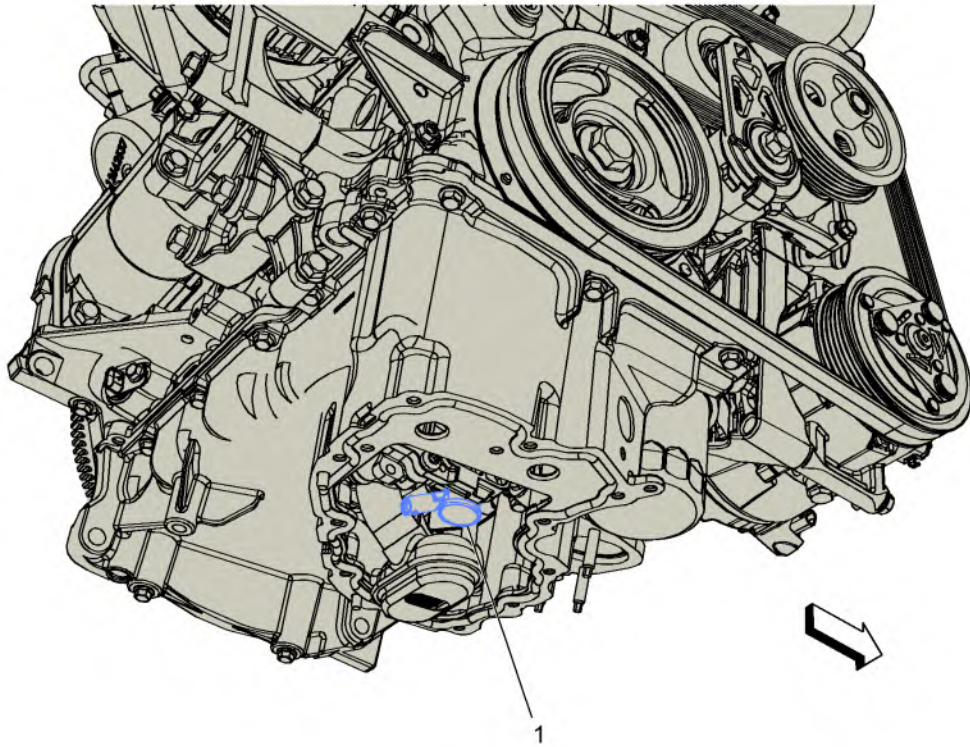


Fig. 16: Bottom Of Engine (LYX)

Courtesy of GENERAL MOTORS COMPANY

Items

1. Q44 Engine Oil Pressure Control Solenoid Valve Q44 Engine Oil Pressure Control Solenoid Valve (LYX).

RIGHT FRONT OF THE TRANSMISSION (M3D/M3H/M3U)

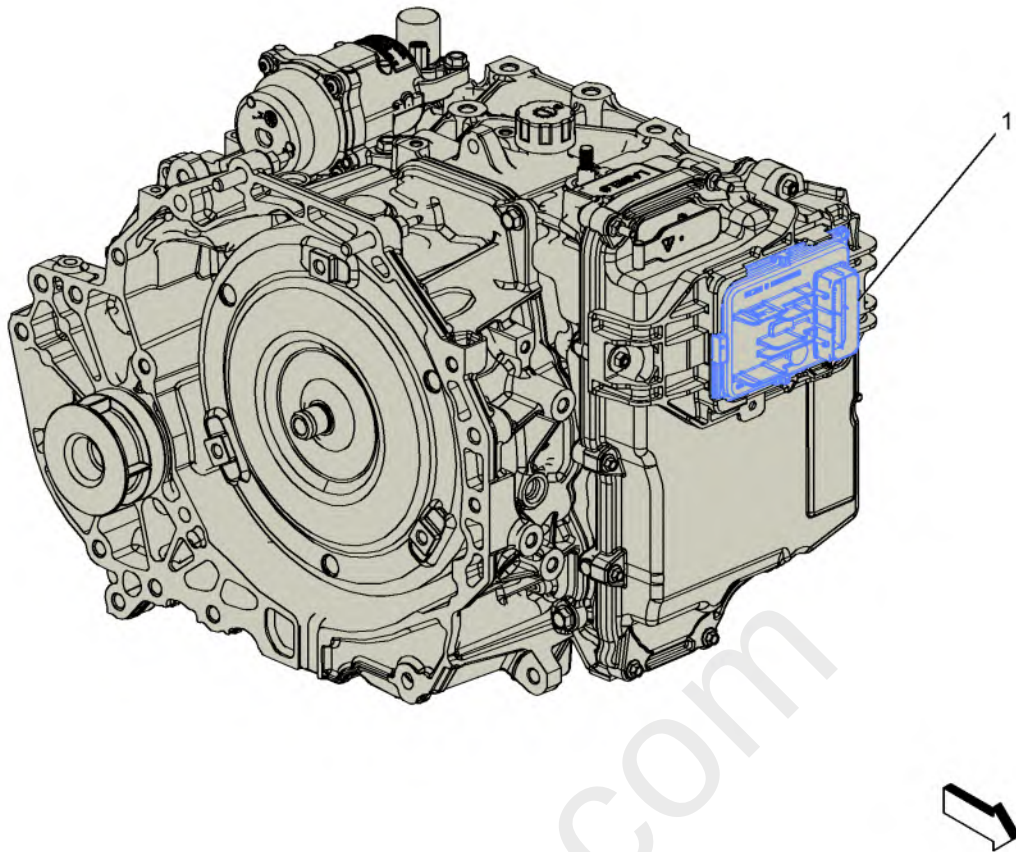


Fig. 17: Right Front Of The Transmission (M3D/M3H/M3U).

Courtesy of GENERAL MOTORS COMPANY

Items

1. K71 Transmission Control Module **K71 Transmission Control Module (M3D/M3H/M3U).**

RIGHT REAR OF THE TRANSMISSION (MHG/MNH/MNK)

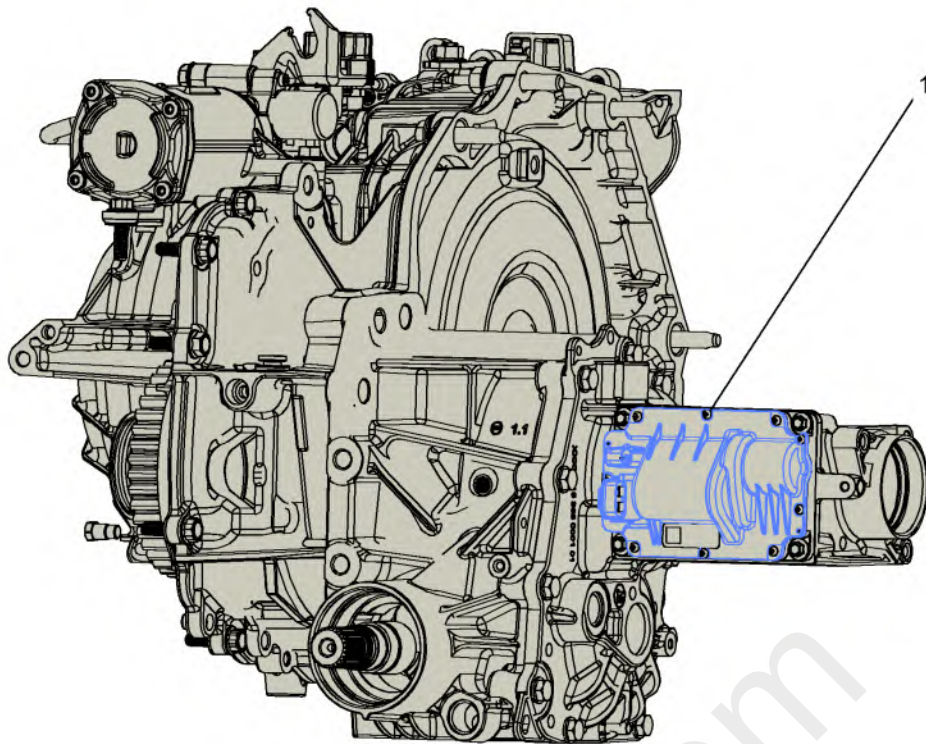


Fig. 18: Right Rear Of The Transmission (MHG/MNH/MNK)

Courtesy of GENERAL MOTORS COMPANY

Items

1. M115 Power Transfer Unit Shift Actuator (F48) **M115 Power Transfer Unit Shift Actuator X1 (F48)**, **M115 Power Transfer Unit Shift Actuator X2 (F48)**.

LEFT FRONT OF THE TRANSMISSION/INPUT SPEED SENSOR (MHG/MNH/MNK)

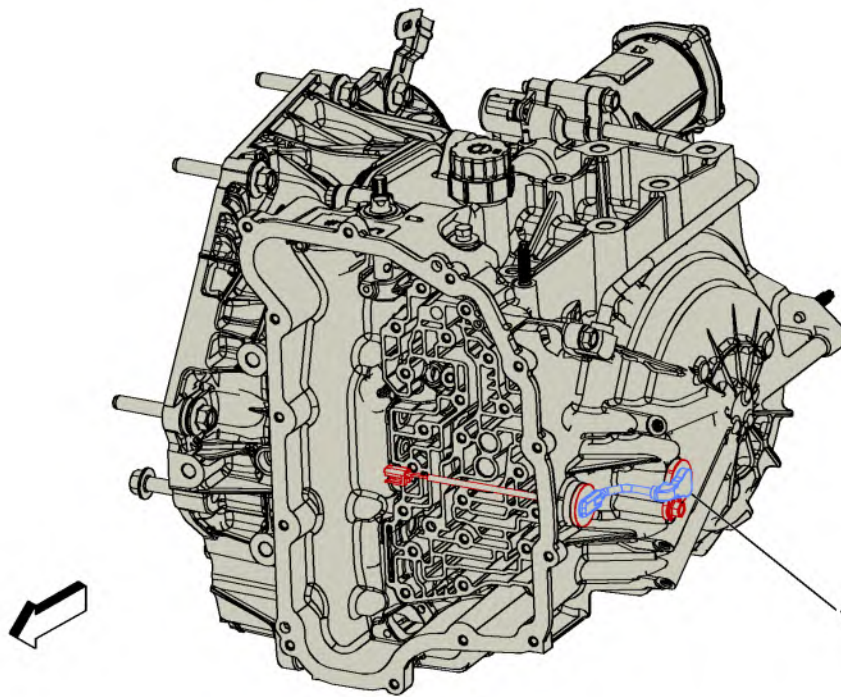


Fig. 19: Left Front Of The Transmission/Input Speed Sensor (MHG/MNH/MNK)
Courtesy of GENERAL MOTORS COMPANY

Items
1. B14C Transmission Input Shaft Speed Sensor

LEFT FRONT OF THE TRANSMISSION (MHG/MNH/MNK)

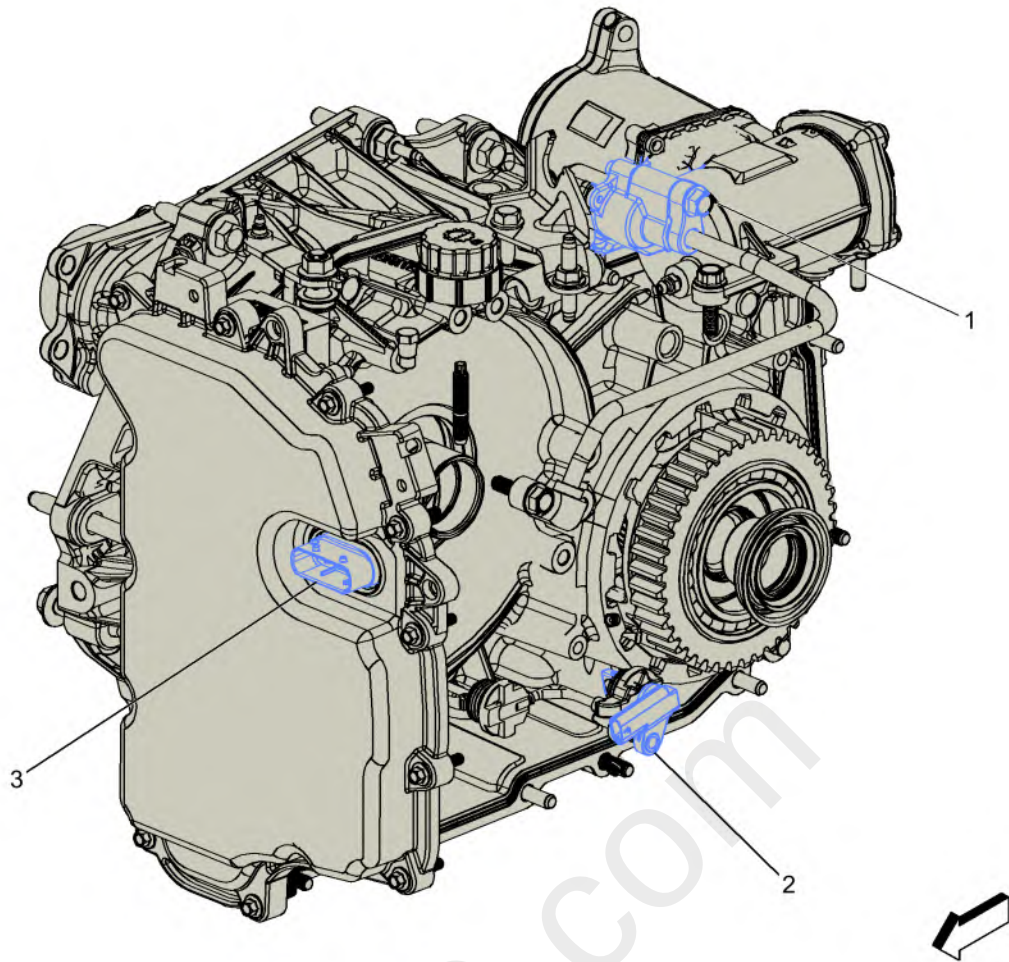


Fig. 20: Left Front Of The Transmission (MHG/MNH/MNK).

Courtesy of GENERAL MOTORS COMPANY

Items

1. B280 Automatic Transmission Accumulator Solenoid Valve (KL9) **B280 Automatic Transmission Accumulator Solenoid Valve (KL9+MHG/MNH).**
2. B14E Transmission Input/Intermediate Shaft Speed Sensor (M3D/M3H/M3U)
3. Q8 Control Solenoid Valve Assembly **Q8 Control Solenoid Valve Assembly X1 (MHG/MNH/MNK), Q8 Control Solenoid Valve Assembly X2 (MHG/MNH/MNK), Q8 Control Solenoid Valve Assembly X3 (MHG/MNH/MNK), Q8 Control Solenoid Valve Assembly X4 (MHG/MNH/MNK).**

LEFT FRONT OF THE TRANSMISSION/TRANSMISSION RANGE CONTROL MODULE (EPH)

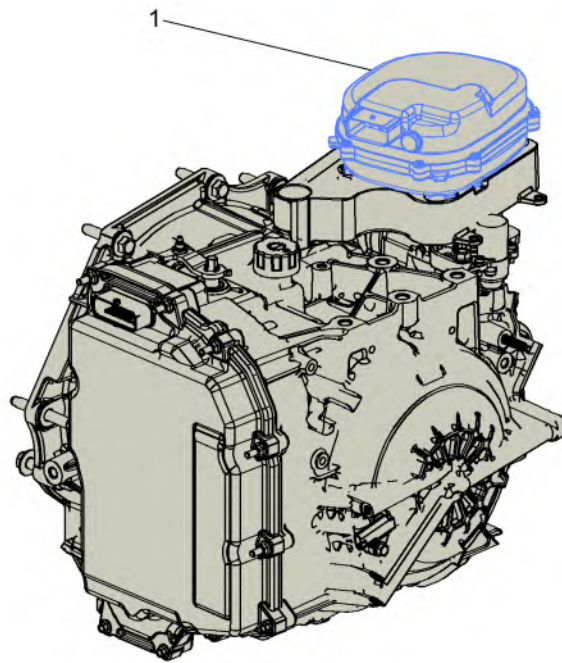
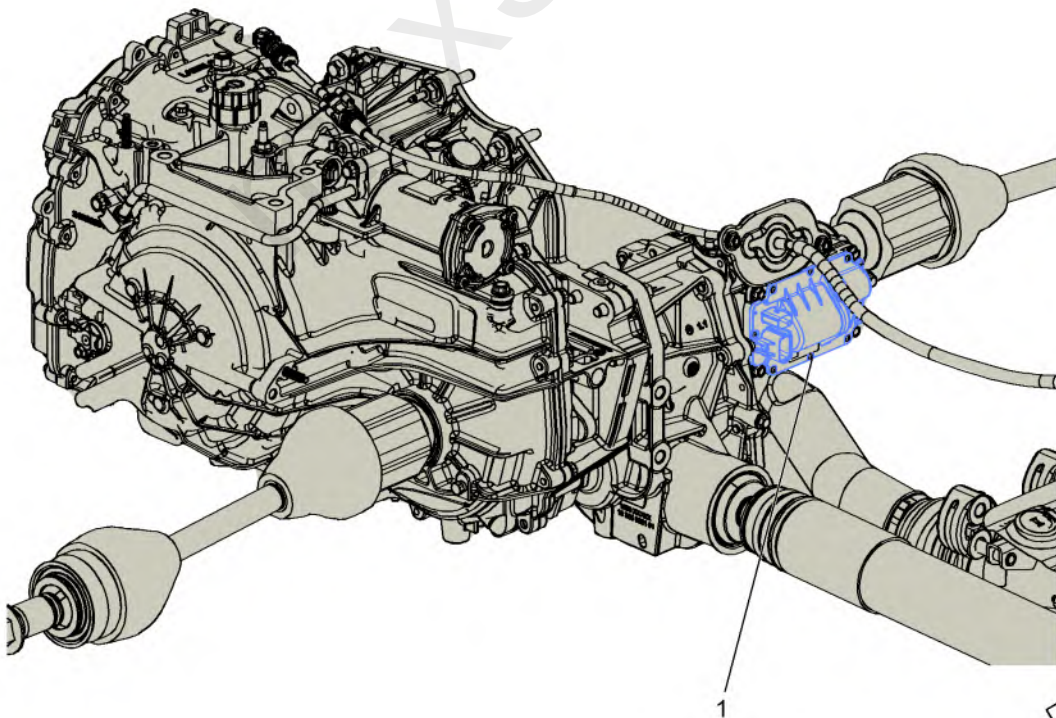


Fig. 21: Left Front Of The Transmission/Transmission Range Control Module (EPH).
 Courtesy of GENERAL MOTORS COMPANY

Items

1. K173 Transmission Range Control Module (EPH) **K173 Transmission Range Control Module (LH7+EPH).**

POWER TRANSFER UNIT SHIFT ACTUATOR (F48)



1



Fig. 22: Power Transfer Unit Shift Actuator (F48).
 Courtesy of GENERAL MOTORS COMPANY

Items

Items

1. M115 Power Transfer Unit Shift Actuator (F48) **M115 Power Transfer Unit Shift Actuator X1 (F48)**, **M115 Power Transfer Unit Shift Actuator X2 (F48)**.

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2018 ELECTRICAL

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WHEELS/VEHICLE UNDERBODY COMPONENT VIEWS

LEFT FRONT WHEELWELL

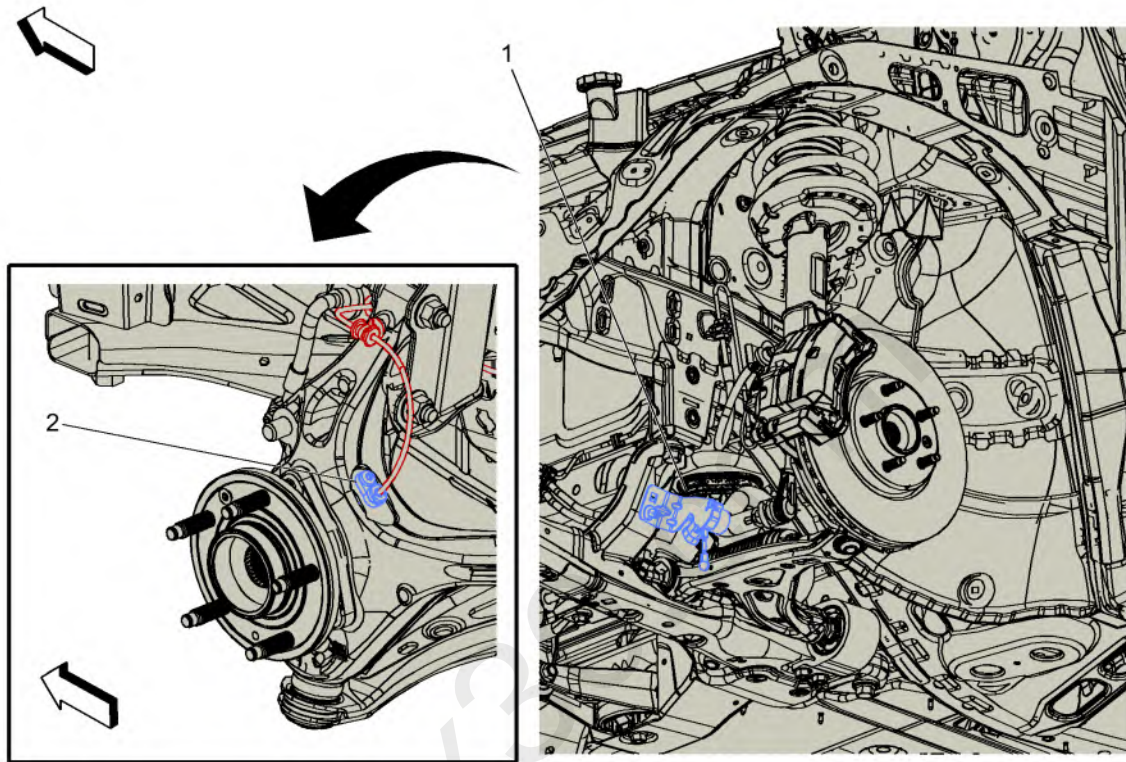


Fig. 1: Left Front Wheelwell

Courtesy of GENERAL MOTORS COMPANY

Items

1. B51F Suspension Height Sensor - Front (TR7) [B51F Suspension Height Sensor - Front \(TR7\)](#)
2. B5LF Wheel Speed Sensor - Left Front [B5LF Wheel Speed Sensor - Left Front](#)

LEFT REAR WHEELWELL

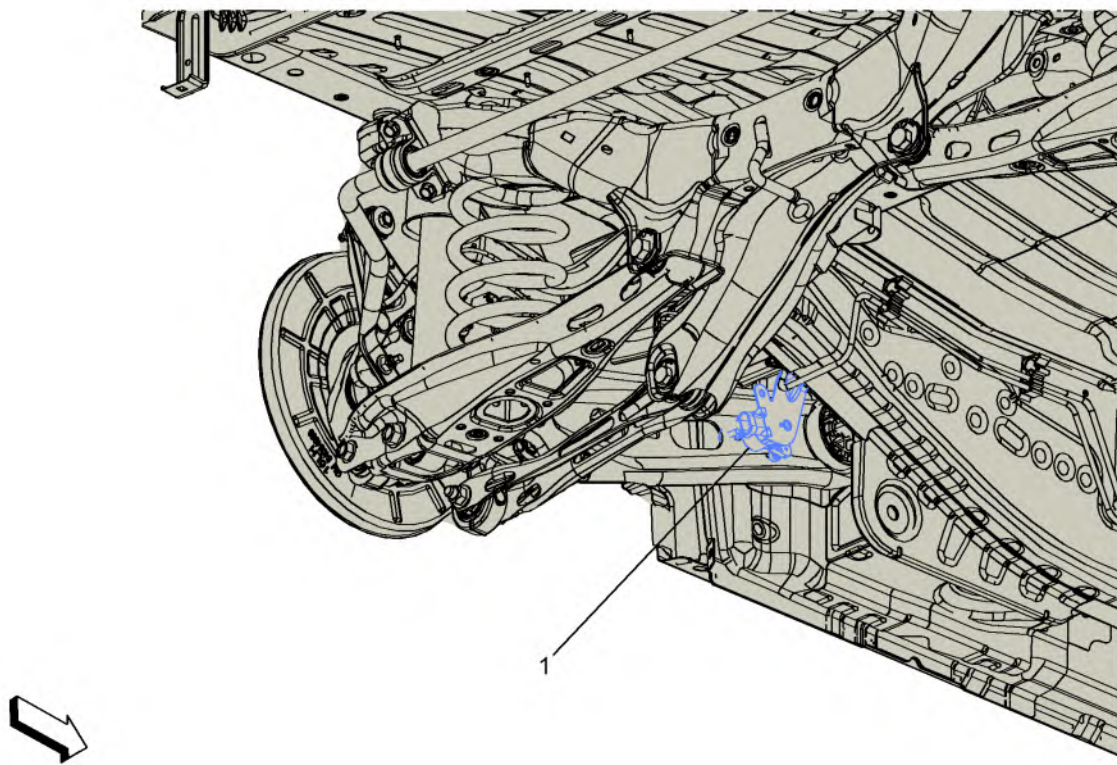


Fig. 2: Left Rear Wheelwell

Courtesy of GENERAL MOTORS COMPANY

Items

- | | |
|---|--|
| 1. B51R Suspension Height Sensor - Rear (TR7) | <u>B51R Suspension Height Sensor - Rear (TR7)</u> |
|---|--|

RIGHT FRONT WHEELWELL

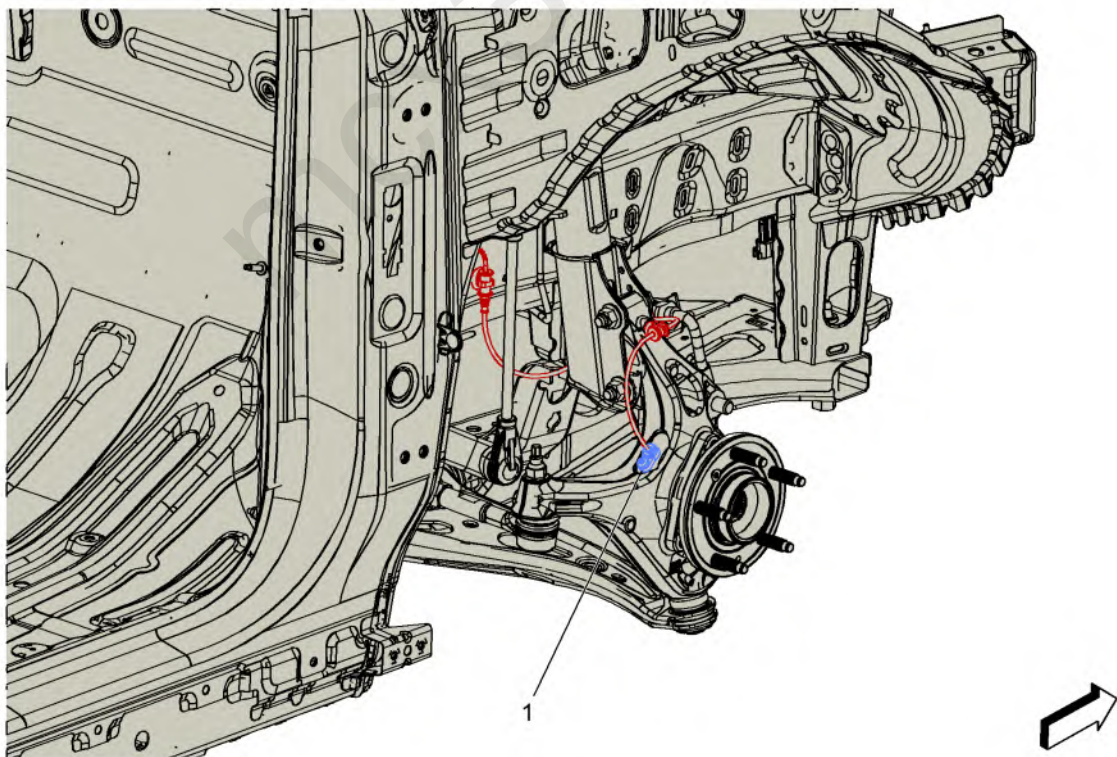


Fig. 3: Right Front Wheelwell

Courtesy of GENERAL MOTORS COMPANY

Items

- | | |
|--|---|
| 1. B5RF Wheel Speed Sensor - Right Front | <u>B5RF Wheel Speed Sensor - Right Front</u> |
|--|---|

LEFT REAR UNDERBODY

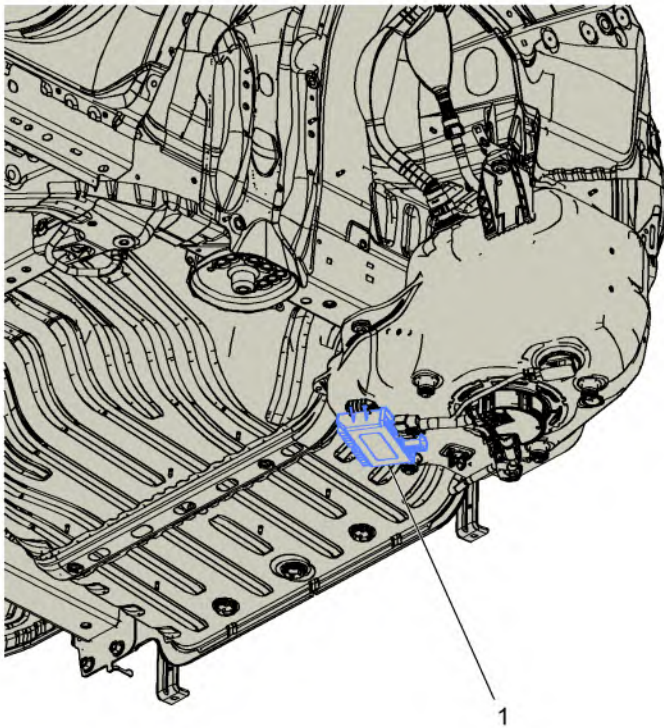


Fig. 4: Left Rear Underbody.

Courtesy of GENERAL MOTORS COMPANY

Items

1. K115 Reductant Control Module (LH7) [K115 Reductant Control Module X1 \(LH7\)](#), [K115 Reductant Control Module X2 \(LH7\)](#).

UNDERBODY

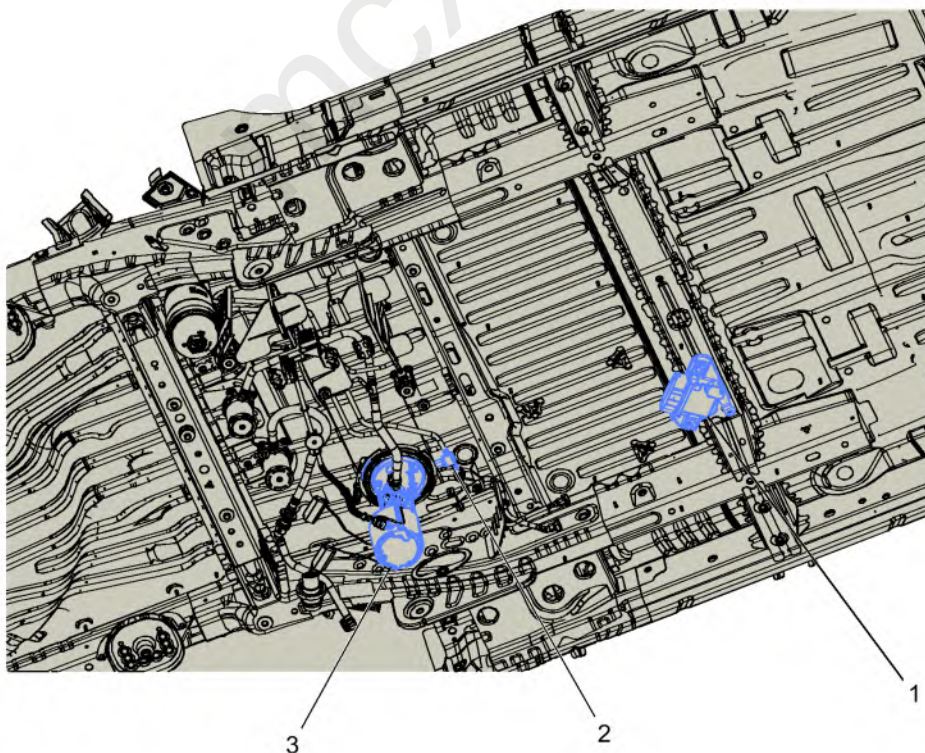


Fig. 5: Underbody.

Courtesy of GENERAL MOTORS COMPANY

Items

1. K111 Fuel Pump Driver Control Module [K111 Fuel Pump Driver Control Module \(LH7\)](#) [K111 Fuel Pump Driver Control Module \(LTG/LYX+X88\)](#) [K111 Fuel Pump Driver Control Module \(LTG/LYX+Z88\)](#)
2. B47 Fuel Pressure Sensor [B47 Fuel Pressure Sensor](#)
3. A7 Fuel Pump and Level Sensor Assembly [A7 Fuel Pump and Level Sensor Assembly \(LH7+F48\)](#) [A7 Fuel Pump and Level Sensor Assembly \(LTG/LYX\)](#) [A7 Fuel Pump and Level Sensor Assembly \(LTG/LYX+NTB/NUB\)](#)

FUEL TANK

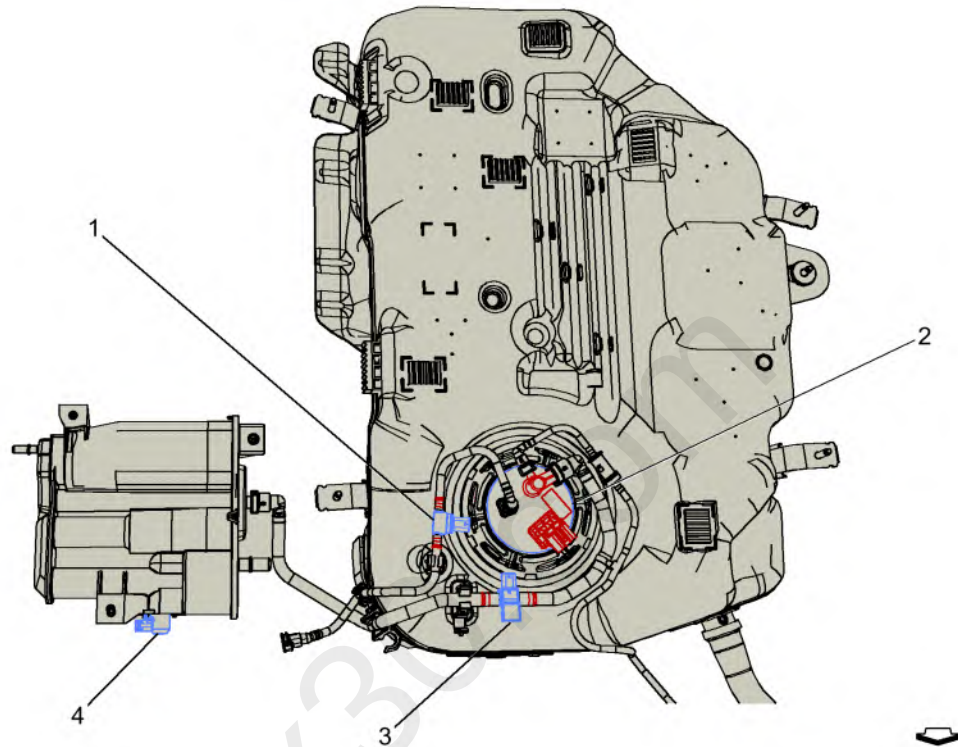


Fig. 6: Fuel Tank

Courtesy of GENERAL MOTORS COMPANY

Items

1. B47 Fuel Pressure Sensor [B47 Fuel Pressure Sensor](#)
2. A7 Fuel Pump and Level Sensor Assembly [A7 Fuel Pump and Level Sensor Assembly \(LH7+F48\)](#) [A7 Fuel Pump and Level Sensor Assembly \(LTG/LYX\)](#) [A7 Fuel Pump and Level Sensor Assembly \(LTG/LYX+NTB/NUB\)](#)
3. B150 Fuel Tank Pressure Sensor (LTG/LYX) [B150 Fuel Tank Pressure Sensor \(LTG/LYX+NTB/NUB\)](#)
4. Q13 Evaporative Emission Vent Solenoid Valve (LTG/LYX) [Q13 Evaporative Emission Vent Solenoid Valve \(LTG/LYX\)](#)

REAR CHASSIS

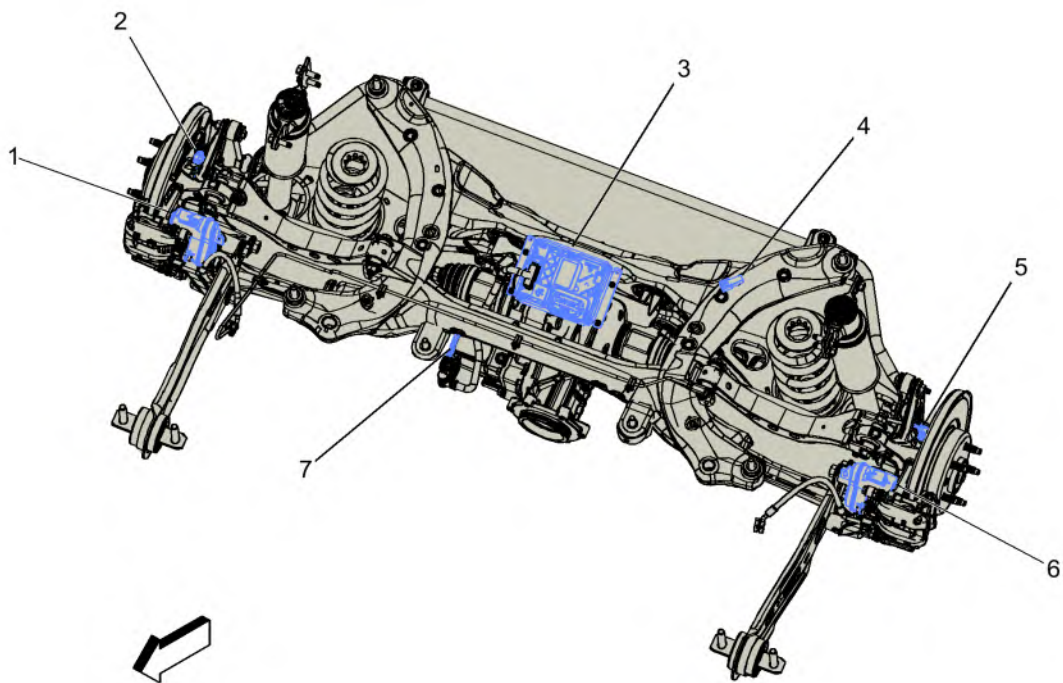


Fig. 7: Rear Chassis

Courtesy of GENERAL MOTORS COMPANY

Items

1. B5RR Wheel Speed Sensor - Right Rear [B5RR Wheel Speed Sensor - Right Rear](#)
2. M104R Park Brake Actuator - Right [M104R Park Brake Actuator - Right](#)
3. K47 Rear Differential Clutch Control Module (F48) [K47 Rear Differential Clutch Control Module X1 \(F48\)](#), [K47 Rear Differential Clutch Control Module X2 \(F48\)](#)
4. R6A Terminating Resistor - High Speed Bus [R6A Terminating Resistor - High Speed Bus](#)
5. M104L Park Brake Actuator - Left [M104L Park Brake Actuator - Left](#)
6. B5LR Wheel Speed Sensor - Left Rear [B5LR Wheel Speed Sensor - Left Rear](#)
7. M32 Differential Clutch Pump (F48) [M32 Differential Clutch Pump \(F48\)](#)

REAR UNDERBODY/TRAILER CONNECTOR (WITHOUT V92)

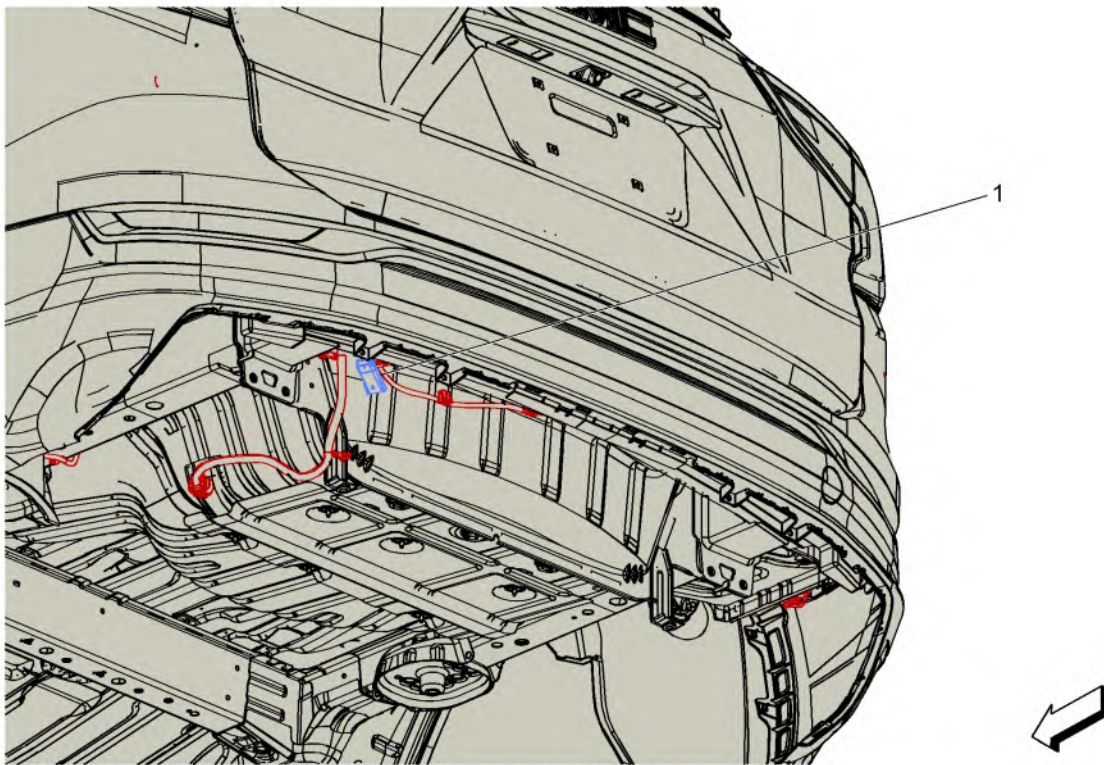


Fig. 8: Rear Underbody/Trailer Connector (without V92).
Courtesy of GENERAL MOTORS COMPANY

Items
1. X88 Trailer Connector <u>X88 Trailer Connector (-V92)</u> , <u>X88 Trailer Connector (V92)</u> .

2018 ELECTRICAL

Wiring Systems And Power Management - Description And Operation - Equinox & Terrain

DESCRIPTION AND OPERATION

ELECTRONIC PARK LOCK DESCRIPTION AND OPERATION

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 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.

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.

POWER MODE DESCRIPTION AND OPERATION

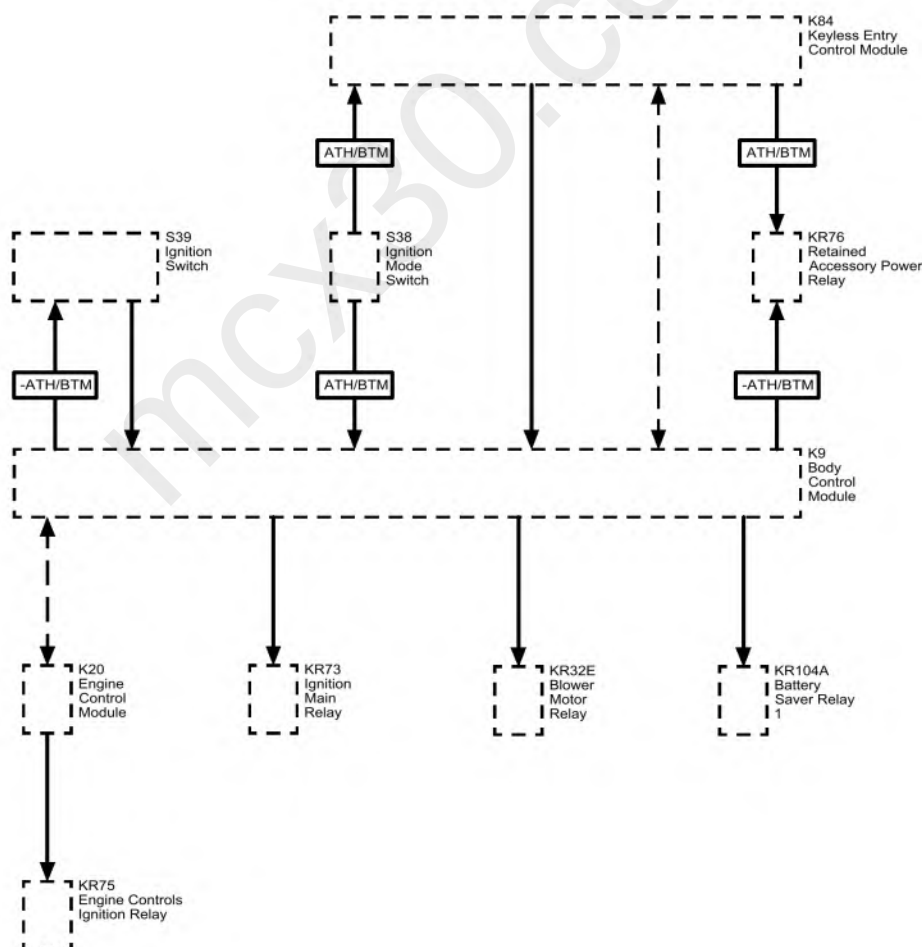


Fig. 1: Power Mode Description and Operation Block Diagram

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name

Callout	Component Name
ATH	LOCK CONTROL, ENTRY: REMOTE ENTRY, EXTENDED RANGE, PASSIVE ENTRY, ALL DOORS
BTM	SWITCH: ENGINE START, KEYLESS
ATH	LOCK CONTROL, ENTRY: REMOTE ENTRY, EXTENDED RANGE, PASSIVE ENTRY, ALL DOORS
BTM	SWITCH: ENGINE START, KEYLESS
ATH	LOCK CONTROL, ENTRY: REMOTE ENTRY, EXTENDED RANGE, PASSIVE ENTRY, ALL DOORS
BTM	SWITCH: ENGINE START, KEYLESS
ATH	LOCK CONTROL, ENTRY: REMOTE ENTRY, EXTENDED RANGE, PASSIVE ENTRY, ALL DOORS
BTM	SWITCH: ENGINE START, KEYLESS
ATH	LOCK CONTROL, ENTRY: REMOTE ENTRY, EXTENDED RANGE, PASSIVE ENTRY, ALL DOORS
BTM	SWITCH: ENGINE START, KEYLESS
K9	K9 Body Control Module
S39	S39 Ignition Switch
K20	K20 Engine Control Module
KR75	KR75 Engine Controls Ignition Relay
KR73	KR73 Ignition Main Relay
KR104A	KR104A Battery Saver Relay 1
S38	S38 Ignition Mode Switch
KR76	KR76 Retained Accessory Power Relay
K84	K84 Keyless Entry Control Module
KR32E	KR32E Blower Motor Relay

Serial Data Power Mode Master

Power to many of this vehicles circuits is controlled by the module that is designated the power mode master. This vehicles power mode master is the body control module (BCM). The BCM has multiple B+ circuits that feed into it. Each of those circuits are partitioned within the controller to drive certain outputs of the vehicle's body functions. An open or short in any one of the B+ circuits may induce multiple codes/or a section of non-functionality within the BCM with the rest of the BCM functioning normally. In this case it is useful to refer to the power distribution schematics to determine if the non-functional partition of the controller shares a common B+ circuit. The ignition mode switch is a low current switch with a discrete ignition signal to the power mode master for determination of the power mode that will be sent over the serial data circuits to the other modules that need this information. The power mode master will also activate relays and other direct outputs of the power mode master as needed. The power mode master determines which power mode (Off, Accessory, Run/Start) is required, and reports this information to other modules via serial data. Modules which have switched voltage inputs may operate in a default mode if the power mode serial data message does not match what the individual module can see from its own connections.

The power mode master receives ignition mode switch signals to identify the operators desired power mode. The Power Mode Parameter table below illustrates the correct state of these input parameters in correspondence to the ignition mode switch with the transmitter to vehicle range:

Power Mode Parameters (Without BTM)

Ignition Switch Position	Power Mode Transmitted	Ign. Off/Run/Crank (Off/Run Crank Voltage Circuit)	Ignition Accessory/Run (Accessory Voltage Circuit)	Ignition Run/Crank (Ignition 1 Voltage Circuit)
Off Key Out	Off	Key Out / ACC	Inactive	Inactive
Off Key IN	Off	Key In / Off	Inactive	Inactive
Accessory	Accessory	Key Out / ACC	Active	Inactive
Run	Run	Run	Active	Active
Start	Crank Request	Crank	Inactive	Active

Power Mode Parameters (With BTM)

Power Mode	Power Mode Transmitted	Push Button Ignition Switch (Power Button Switch Circuit Input to the BCM)	Push Button Ignition Switch Voltage Push Button Ignition Switch Voltage Input to the BCM	Key in Cylinder Switch/Key Fob in Vehicle (Transmitter in Range to the BCM Signal)
Transmitter in Range	Off	Inactive	9 V	Yes
Transmitter out of Range	Off	Inactive	9 V	No
Vehicle On Power Mode, then Press the Power Button Switch (Foot on or off the Brake Pedal) Transmitter in Vehicle	Off	Active (pushed) / Inactive (not pushed)	5-6 V (pressed)	Yes
Vehicle Off Power Mode, then Press the Power Button Switch with foot off the Brake Pedal; Transmitter in Vehicle	Accessory Mode	Active (pushed) / Inactive (not pushed)	5-6 V (pressed)	Yes
Vehicle Off Power Mode, then Press the Power Button Switch with foot on the Brake Pedal; Transmitter in Vehicle	Vehicle in Run/Start Mode (Ignition ON engine running.)	Active (pushed) / Inactive (not pushed)	5-6 V (pressed)	Yes
Vehicle OFF Power Mode, then Press and Hold the Power Button Switch for 5 s with foot OFF the Brake Pedal; Transmitter in Vehicle	Vehicle in Run/Start Mode (Ignition ON without the engine running)	Active (pushed) / Inactive (not pushed)	5-6 V (pressed)	Yes
Vehicle OFF Power Mode, then Press and Hold the Power Button Switch for 10 s with foot OFF the Brake Pedal; Transmitter in Vehicle	Vehicle In Service Mode (Ignition ON without the engine running)	Active (pushed) / Inactive (not pushed)	5-6 V (pressed)	Yes

Relay Controlled Power Mode (Without BTM)

The BCM uses the discrete ignition switch inputs Off/Run/Crank Voltage, Accessory Voltage, and Ignition 1 Voltage, to distinguish the correct power mode. The BCM, after determining the desired power mode, will activate the appropriate relays for that power mode.

The retained accessory power relay remains on for a timed period after the Ignition key is removed. Refer to [**Retained Accessory Power Description and Operation**](#) for more information on the retained accessory power function.

Relay Controlled Power Mode (With BTM)

The BCM uses discrete push button switch inputs, transmitter in range status, current power mode state, and brake pedal position state to distinguish the correct power mode (Off, Accessory Mode, Vehicle in Run/Start Mode). The BCM, after determining the desired power mode, will activate the appropriate relays for that power mode.

The retained accessory power relay remains on for a timed period after the Ignition key is removed. Refer to [**Retained Accessory Power Description and Operation**](#) for more information on the retained accessory power function.

Push Button Start (If Equipped)

The ignition mode switch has 2 LEDs that indicate the vehicle power mode. When the vehicle is in the OFF mode, both LED's will be OFF. Momentarily pressing the ignition mode switch button once (brake pedal not applied), will enter the vehicle into accessory mode and the amber LED (ACC) will illuminate. The accessory mode has a 10 min time out to reduce battery drain. With the ignition OFF (brake pedal not applied) then pressing and holding the push button start switch for 5 s will place the vehicle in run/start mode (Ignition ON without the engine running). The vehicle will stay powered up for 3 hours and the green LED (Run/Start) will illuminate. After being in run/start mode (ignition ON without the engine running) for 1.5 hours, the vehicle will look to see if the transmitter is still present. If the transmitter is not present in the vehicle, it will power down instead of staying powered up for the full 3 hours. With the ignition OFF, (brake pedal not applied) then pressing and holding the push button start switch for at least 10 s will place the vehicle into Vehicle In Service Mode (Ignition ON without the engine running) and the green LED (Run/Start) will illuminate. Vehicle In Service Mode is used for service and diagnostics not requiring the operation of the gas engine. The vehicle will stay in Vehicle In Service mode until the vehicle is manually turned OFF.

With the ignition OFF (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. If the vehicle is left in PARK with the engine running and the transmitter out of the vehicle, the vehicle will automatically turn off after 1.5 hours. If the vehicle is left in PARK with the engine running and the transmitter in the vehicle, the vehicle will automatically turn OFF after 3 hours. The timer will stop when the vehicle is shifted out of PARK and the timer will reset after the vehicle is placed back in PARK with the engine running.

Both LED's have the voltage supplied from the body control module (BCM). The ignition mode switch sends the ignition mode switch status to the passive entry passive start module (PEPS) and to the BCM. The PEPS module sends a redundant signal to the BCM with the ignition mode switch status.

Battery Saver Mode (Transport Mode) (If Equipped)

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 a vehicle is in transport/storage, some features may have reduced functionality while in the battery saver mode, such as disabling the Remote Function Actuator or content theft features. Battery saver mode is initiated by turning on the hazard flashers, applying the brake pedal, and then turning the ignition key to the start position or pushing the ignition mode switch with the foot on the brake for greater than 15 s. The mode is disengaged by repeating the previous process. The DIC (if equipped) will display Transport Mode is On when battery saver mode is enabled and Transport Mode is Off when battery saver mode is disabled. For vehicles not equipped with a DIC, the battery indicator light will constantly flash on the Instrument Cluster when battery saver 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.

Battery saver mode incorporates a latching relay that when enabled disconnects some modules from their ignition power or memory power sources. When battery saver mode is enabled and the vehicle is switched OFF, the BCM sends a momentary command to unlatch the relay disconnecting power up to 1 min after RAP is inactive. Every time the vehicle is switched ON the BCM will send a momentary command to latch the battery saver relay. This allows the use of all features when the ignition is ON. The BCM will send another command to unlatch the relay once the vehicle is switched OFF and RAP is inactive.

BCM Awake/Sleep States

The BCM is able to control or perform all of the BCM functions in the awake state. The BCM enters the sleep state when active control or normal monitoring of system functions has stopped and a time limit has passed. The BCM must detect certain wake-up inputs before entering the awake state. The BCM monitors for these inputs during the sleep state.

The BCM will enter the awake state if any of the following wake-up inputs are detected:

- Activity on the serial data line
- Detection of a battery reconnect
- Any door open signal
- Headlamps ON
- Key-in-ignition
- Ignition ON
- Park lamps ON
- Keyless entry or remote start message

The BCM will enter a sleep state when all of the following conditions exist:

- The ignition switch is OFF, key out.
- Ignition OFF, transmitter is out of range
- No activity exists on the serial data line.
- No outputs are commanded.
- No delay timers are actively counting.
- No wake-up inputs are present.

If all these conditions are met, the BCM will enter a low power or sleep condition.

RETAINED ACCESSORY POWER DESCRIPTION AND OPERATION

Retained Accessory Power

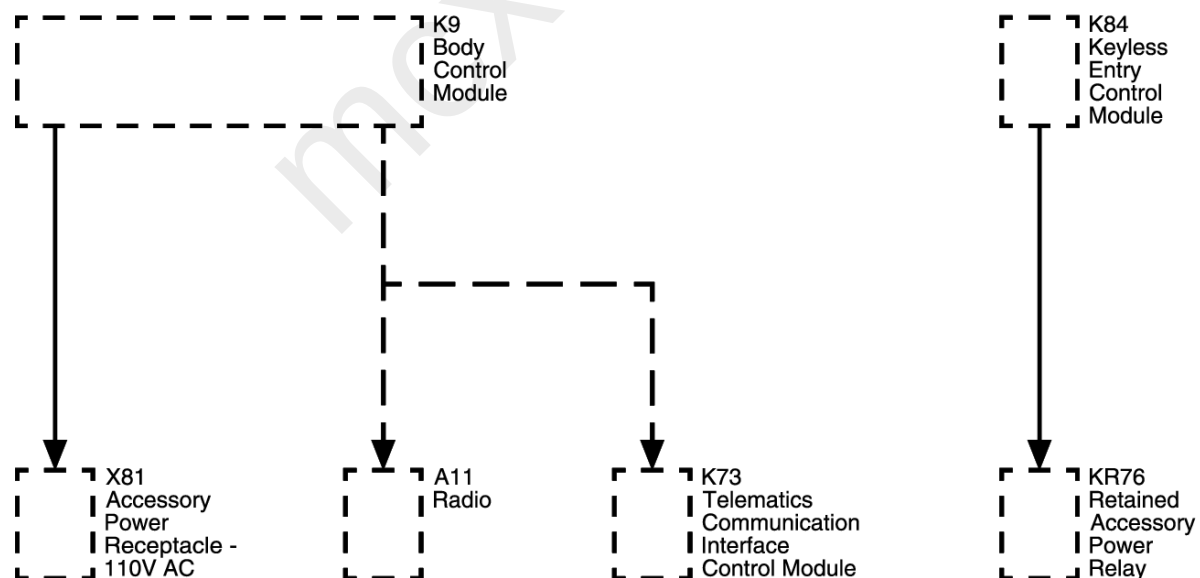


Fig. 2: Retained Accessory Power Block Diagram

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
K9	K9 Body Control Module
X81	X81 Accessory Power Receptacle - 110V AC

Callout	Component Name
A11	A11 Radio
K73	K73 Telematics Communication Interface Control Module
K84	K84 Keyless Entry Control Module
KR76	KR76 Retained Accessory Power Relay

The body control module (BCM) monitors the ignition position, battery condition, and each door ajar/open switch status to determine whether the retained accessory power should be initiated or terminated. Retained accessory power is controlled by two different methods; retained accessory power relay coil control circuit and serial data. Some modules receive a retained accessory power message from the BCM over the serial data circuits. Serial data controlled retained accessory power is deactivated as required by their modules retained accessory power mode operation. Other subsystems are activated directly by the BCM or by the BCM through a relay. Components and systems that are active in retained accessory power are also activated anytime the ignition is any position other than OFF regardless of the door switch signals.

Retained Accessory Power Relay Coil Control Circuit.

The BCM keeps the device or relay energized during all power modes, except Off-Awake and Crank. The device or relay is also energized for approximately 10 min after shutting the ignition OFF providing no door is opened.

Relay controlled retained accessory power will end when one of the following conditions is met:

- The BCM receives an input from any door ajar or open switch indicating the opening of any door after the ignition key is out of the ignition.

NOTE: If the BCM is receiving any door ajar or open signal from those switches when the ignition key is turned OFF, retained accessory power will not initiate.

- The BCM internal timer for the retained accessory power expires after approximately 10 min.
- The BCM detects a decrease in battery capacity below a prescribed limit.

Systems powered by the retained accessory power relay coil control circuit during the retained accessory power mode are as follows:

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

-
- Accessory Power Receptacle
- Transmission Shift Lever Position Indicator (w/floor mounted console gear shift)

Serial Data Controlled Retained Accessory Power

Retained accessory power systems controlled by serial data are as follows:

Radio

Radio retained accessory power activation/termination is the same as relay operation with one exception; the only door switch that will turn off the radio during retained accessory power is the driver door open switch.

Vehicle Communication Interface Module (VCIM) (Onstar®) (If Equipped)

VCIM RAP activation/termination is the same as radio operation with 1 exception; if there is an active call when the ignition key is turned off the VCIM will remain in RAP mode, and keep the radio in RAP mode until the call is terminated.

Interruptible Retained Accessory Power

The keyless entry control module controls components in the same manner as BCM relay controlled retained accessory power with one exception; interruptible retained accessory power is deactivated 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.

Systems powered by the interruptible retained accessory power relay coil control circuit during the retained accessory power mode are as follows:

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

- - Mobile Device Wireless Charger Module
 - USB Receptacle
-

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2018 ELECTRICAL

Wiring Systems And Power Management - Diagnostic Information And Procedures - Equinox & Terrain

DIAGNOSTIC INFORMATION AND PROCEDURES

DTC B000A: PARK SWITCH - SHIFT LEVER POSITION NOT PLAUSIBLE

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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

DTC Descriptors

DTC B000A

Park Switch - Shift Lever Position Not Plausible

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
In Park Switch Signal	B000A 00	B000A 00	B000A 00	-

Circuit/System Description

When the transmission shift selector is in Park, the park position switch closes and pull the signal circuit low.

Conditions for Running the DTC

- The system voltage is between 9 - 16 V.
- The ignition is in the RUN position.

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 control circuit.

B000A 00

Shift lever position has changed and the park switch status has not changed.

Action Taken When the DTC Sets

B000A 00

No action 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 50, without a repeat of the malfunction.

Schematic Reference

Ignition Lock Wiring Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Power Mode Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify the 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.
 - **Go to next step: If the parameter changes**
3. All OK.

Circuit/System Testing

1. Ignition 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.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **Go to next step: If less than 10 Ω**
3. Ignition ON.
4. Verify the scan tool Body Control Module In Park Switch Status parameter is Off.
 - **If not Off**
 1. Ignition 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.
 - **Go to next step: 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, remove the jumper wire, disconnect the harness connector at the K9 Body Control Module, ignition ON.
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.

- **Go to next step: If On**

7. Test or replace the S3 Transmission Shift Lever.

Repair Instructions

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

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

DTC B097B: POWER MODE START SWITCH CIRCUIT

Diagnostic Instructions

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

DTC Descriptor

NOTE: This procedure may also diagnose malfunctions that are not detected by a DTC.

DTC B097B

Power Mode Start Switch Circuit

Symptom Byte Information: [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*, 08*	-
Signal terminal 6	B097B 02**	B097B 04**	B097B 04**	-
Low Reference	-	B097B 05*, 08*	-	-
Ground	-	B097B 04**	-	-
* K84 Keyless Entry Control Module				
** K9 Body Control Module				

Circuit/System Description

Circuit	Description
Signal terminal 3	When the switch is closed it will pull the signal voltage low.

Circuit	Description
Signal terminal 6	When the switch is closed it will pull the signal voltage low.
Low Reference	Grounded through the control module.
Ground	Chassis Ground

Component	Description
K9 Body Control Module	The control module contains a microprocessor used to process input data to control outputs.
K84 Keyless Entry Control Module	The control module contains a microprocessor used to process input data to control outputs.
S38 Ignition Mode Switch	The switch has a resistance ladder and is wired to both the body control module and keyless entry control modules

The ignition mode switch contains two individual switches that provide redundant switch inputs to 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 between 9 - 16 V

Conditions for Setting the DTC

B097B 00

- The voltage seen at the body control module monitored switch does not match the voltage seen at the keyless entry control module monitored switch.
- The above condition(s) must occur for greater than 1 s.

B097B 02

- The control module detects a short to ground.
- The above condition(s) must occur for greater than 1 s.

B097B 04

- The control module detects an open circuit.
- The above condition(s) must occur for greater than 1 s.

B097B 05

- The control module detects an open circuit.
- The above condition(s) must occur for greater than 1 s.

B097B 08

- The control module detects a change in the ignition mode without observing a switch press.
- The above condition(s) must occur 4 times.

B097B 61

- The control module detects a continuously closed switch.
- The above condition(s) must occur for greater than 60 s.

Actions Taken When the DTC Sets

B097B 00, 04, 05, 08, 61

No action is taken.

B097B 02

The concerned output is switched off.

Conditions for Clearing the DTC

The conditions for setting the DTC no longer exist.

A history DTC will clear after 40 consecutive malfunction-free ignition cycles.

Reference Information

Schematic Reference

Power Moding Wiring Schematics

Power Distribution Wiring Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Power Mode Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Ignition - On/Vehicle - In Service Mode
2. Verify DTC B097B 61 is not set.
 - **If the DTC is set**

Test or replace the component: S38 Ignition Mode Switch
 - **Go to next step: If the DTC is not set**
3. Refer to Circuit/System Testing

Circuit/System Testing

NOTE: It may take up to 2 min for all vehicle systems to power down before an accurate ground or low reference circuit continuity test can be performed.

1. Ignition/Vehicle & All vehicle systems - Off
2. Disconnect the electrical connector: S38 Ignition Mode Switch

3. Test for less than 10 Ω between the test points: Ground circuit terminal @ Component harness & Ground
 - **If 10 Ω or greater**
 1. Test for less than 2 Ω between the test points: Ground circuit terminal @ Component harness & Ground Connection
 - If 2 Ω or greater - Repair the open/high resistance in the circuit.
 - If less than 2 Ω - Repair the open/high resistance in the ground connection.
 - **Go to next step: If less than 10 Ω**
4. Test for less than 10 Ω between the test points: Low Reference terminal 7 @ Component harness & Ground
 - **If 10 Ω or greater**
 1. Disconnect the electrical connector: X1 @ K84 Keyless Entry Control Module
 2. Test for less than 2 Ω between the test points: Low Reference terminal 7 @ Component harness & Terminal 12 @ K84 Keyless Entry Control Module
 - If 2 Ω or greater - Repair the open/high resistance in the circuit.
 - If less than 2 Ω - Replace the component: K84 Keyless Entry Control Module
 - **Go to next step: If less than 10 Ω**
5. Connect the electrical connector: S38 Ignition Mode Switch
6. Ignition - On/Vehicle - In Service Mode
7. Disconnect the electrical connector: S38 Ignition Mode Switch
8. Verify the scan tool parameter: K9 Body Control Module Push Button Ignition Switch = Greater than 11 V
 - **If less than 11 V**
 1. Ignition/Vehicle - Off
 2. Disconnect the electrical connector: X2 @ K9 Body Control Module
 3. Test for infinite resistance between the test points: Signal circuit terminal 17 @ Control module harness & Ground
 - If less than infinite resistance - Repair the short to ground on the circuit.
 - If infinite resistance - Replace the component: K9 Body Control Module
 - **Go to next step: If greater than 11 V**
9. Connect a 3 A fused jumper wire between the test points: Signal circuit terminal 6 & Ground
10. Verify the scan tool parameter: K9 Body Control Module Push Button Ignition Switch = Less than 1 V
 - **If 1 V or greater**
 1. Disconnect the electrical connector: X2 @ K9 Body Control Module
 2. Test for less than 1 V between the test points: Signal circuit terminal 17 @ Control module harness & 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 between the test points: Signal circuit terminal 6 @ Component harness & Terminal 17 @ K9 Body Control Module
 - If 2 Ω or greater - Repair the open/high resistance in the circuit.
 - If less than 2 Ω - Replace the component: K9 Body Control Module
 - **Go to next step: If less than 1 V**
11. Connect the electrical connector: S38 Ignition Mode Switch
12. Verify the scan tool parameter: K9 Body Control Module Push Button Ignition Switch = 8 to 10 V
 - **If not between 8 and 10 V**

Replace the component: S38 Ignition Mode Switch
 - **Go to next step: If between 8 and 10 V**
13. Press and hold the switch: S38 Ignition Mode Switch

14. Verify the scan tool parameter: K9 Body Control Module Push Button Ignition Switch = 4 to 7 V

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

Replace the component: S38 Ignition Mode Switch

- **Go to next step: If between 4 and 7 V**

15. Disconnect the electrical connector: X1 @ K84 Keyless Entry Control Module

16. Test for infinite resistance between the test points: Signal circuit terminal 11 @ Control module harness & Ground

- **If less than infinite resistance**

Repair the short to ground on the circuit.

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

17. Test for less than 1 V between the test points: Signal circuit terminal 11 @ Control module harness & Ground

- **If 1 V or greater**

Repair the short to voltage on the circuit.

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

18. Test for 4.5 to 5.5 k Ω between the test points: Signal circuit terminal 11 @ K84 Keyless Entry Control Module & Low Reference terminal 12 @ K84 Keyless Entry Control Module

- **If not between 4.5 and 5.5 k Ω**

1. Ignition/Vehicle - Off

2. Disconnect the electrical connector: S38 Ignition Mode Switch

3. Test for less than 2 Ω between the test points: Signal circuit terminal 11 @ K84 Keyless Entry Control Module & Signal circuit terminal 3 @ S38 Ignition Mode Switch

- If 2 Ω or greater - Repair the open/high resistance in the circuit.
- If less than 2 Ω - Replace the component: S38 Ignition Mode Switch

- **Go to next step: If between 4.5 and 5.5 k Ω**

19. Press and hold the switch: S38 Ignition Mode Switch

20. Test for 1 to 1.5 k Ω between the test points: Signal circuit terminal 11 @ K84 Keyless Entry Control Module & Low Reference terminal 12 @ K84 Keyless Entry Control Module

- **If not between 1 and 1.5 k Ω**

Test or replace the component: S38 Ignition Mode Switch

- **Go to next step: If between 1 and 1.5 k Ω**

21. Replace the component: K84 Keyless Entry Control Module

Component Testing

1. Ignition/Vehicle - Off

2. Disconnect the electrical connector: S38 Ignition Mode Switch

3. Test for 4.5 to 5.5 k Ω between the test points:

- Signal circuit terminal 6 & Ground circuit terminal 4
- Signal circuit terminal 3 & Low Reference terminal 7
- **If not between 4.5 and 5.5 k Ω**

Replace the component: S38 Ignition Mode Switch

- **Go to next step: If between 4.5 and 5.5 k Ω**

4. Press and hold the switch: S38 Ignition Mode Switch

5. Test for 1 to 1.5 k Ω between the test points:

- Signal circuit terminal 6 & Ground circuit terminal 4

- Signal circuit terminal 3 & Low Reference terminal 7
- **If not between 1 and 1.5 kΩ**

Replace the component: S38 Ignition Mode Switch

- **Go to next step: If between 1 and 1.5 kΩ**

6. All OK.

Repair Instructions

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

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

DTC B097C: POWER MODE START INDICATOR CIRCUIT

Diagnostic Instructions

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

DTC Descriptor

DTC B097C

Power Mode Start Indicator Circuit

Symptom Byte Information: [Symptom Byte List](#)

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Control Circuit	B097C 02*	1	2	-
Ground	-	1	-	-
1. Ignition mode switch indicator always OFF 2. Ignition mode switch indicator always ON				

Circuit/System Description

Circuit	Description
Control terminal 5	The output circuit varies between ground and 12 V.
Ground	Chassis Ground

Component	Description
K9 Body Control Module	The control module contains a microprocessor used to process input data to control outputs.
S38 Ignition Mode Switch	The ignition mode switch has two LEDs that indicate the vehicle power mode.

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.

Conditions for Running the DTC

- Control Module voltage is between 9 - 16 V

Conditions for Setting the DTC

B097C 02

- The control module detects a short to ground.
- The above condition(s) must occur for greater than 1 s.

Actions Taken When the DTC Sets

The concerned output is switched off.

Conditions for Clearing the DTC

The conditions for setting the DTC no longer exist.

A history DTC will clear after 40 consecutive malfunction-free ignition cycles.

Reference Information

Schematic Reference

Power Moding Wiring Schematics

Power Distribution Wiring Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Power Mode Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Ignition - On/Vehicle - In Service Mode
2. Perform the scan tool control function: Run/Crank Power Mode Indicator Command

Verify the indicator status:

Run/Crank Power Mode Indicator Command - OFF = LED Off.

Run/Crank Power Mode Indicator Command - ON = LED On.

- **If not the specified state**

Refer to Circuit/System Testing

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

3. All OK.

Circuit/System Testing

NOTE: It may take up to 2 min for all vehicle systems to power down before an accurate ground or low reference circuit continuity test can be performed.

1. Ignition/Vehicle & All vehicle systems - Off
2. Disconnect the electrical connector: S38 Ignition Mode Switch
3. Test for less than 10 Ω between the test points: Ground circuit terminal 4 @ Component harness & Ground
 - **If 10 Ω or greater**
 1. Test for less than 2 Ω between the test points: Ground circuit terminal 4 @ Component harness & Ground Connection
 - If 2 Ω or greater - Repair the open/high resistance in the circuit.
 - If less than 2 Ω - Repair the open/high resistance in the ground connection.
 - **Go to next step: If less than 10 Ω**
4. Connect the electrical connector: S38 Ignition Mode Switch
5. Ignition - On/Vehicle - In Service Mode
6. Disconnect the electrical connector: S38 Ignition Mode Switch
7. Perform the scan tool control function: Run/Crank Power Mode Indicator Command - OFF
8. Test for less than 1 V between the test points: Control circuit terminal 5 @ Component harness & Ground
 - **If 1 V or greater**

Repair the short to voltage on the circuit.
 - **Go to next step: If less than 1 V**
9. Perform the scan tool control function: Run/Crank Power Mode Indicator Command - ON
10. Test for greater than 3 V between the test points: Control circuit terminal 5 @ Component harness & Ground
 - **If 3 V or less**
 1. Disconnect the electrical connector: K9 Body Control Module
 2. Test for infinite resistance between the test points: Control circuit terminal @ Control module harness & Ground
 - If less than infinite resistance - Repair the short to ground on the circuit.
 - If less than infinite resistance
 1. Test for less than 2 Ω between the test points: Control circuit terminal @ Control module harness & Control circuit terminal @ Component harness
 - If 2 Ω or greater - Repair the open/high resistance in the circuit.
 - If less than 2 Ω - Replace the component: K9 Body Control Module
 - **Go to next step: If 3 V or greater**
11. Replace the component: S38 Ignition Mode Switch

Repair Instructions

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

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

DTC B1370: CONTROL MODULE IGNITION ON AND START 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.
- Refer to [Diagnostic Procedure Instructions](#) to provide 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 Mode is in Accessory position.

B1370 06

Ignition Mode is in Accessory, Run, or Crank positions.

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 the malfunction indicator lamp 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 Wiring Schematics](#)

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

- **[Instrument Cluster Description and Operation](#)**
- **[Power Mode Description and Operation](#)**

Electrical Information Reference

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

Scan Tool Reference

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

Circuit/System Verification

1. Verify that DTC B144B is not set.

- **If DTC B144B is set**

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

- **Go to next step: If DTC B144B is not set**

2. Refer to Circuit/System Testing.

Circuit/System Testing

1. Ignition 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.

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

3. Ignition ON.

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, remove the test lamp.

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

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

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

1. Ignition OFF, remove the test lamp.

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

- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance, replace the P16 Instrument Cluster.

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

5. Replace the P16 Instrument Cluster.

Repair Instructions

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

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

DTC B1370, B1380 OR B1441: CONTROL MODULE IGNITION CIRCUITS

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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

DTC Descriptors

DTC B1370

Control Module Ignition ON and Start Circuit

DTC B1380

Control Module Ignition Accessory Circuit

DTC B1441

Control Module Ignition Off, Run, and Crank Circuit

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

Diagnostic Fault Information

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

Circuit/System Description

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

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

Conditions for Running the DTC

B1370 01, B1370 04

Ignition switch is in the RUN or CRANK positions.

B1380 01, B1380 04

Ignition switch is in the RUN or ACCESSORY positions.

B1441 01, B1441 04

Ignition switch is in the CRANK position.

Conditions for Setting the DTC

B1370 01

Ignition circuit is shorted to voltage.

B1370 04

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

B1380 01

Ignition, accessory circuit is shorted to voltage.

B1380 04

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

B1441 01

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

B1441 04

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

Actions Taken When the DTC Sets

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

Conditions for Clearing the DTC

- The condition responsible for setting the DTC no longer exists.
- A history DTC will clear once 50 consecutive malfunction-free ignition cycles have occurred.

Diagnostic Aids

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

Reference Information

Schematic Reference

Power Moding Wiring Schematics

Power Distribution Wiring Schematics

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Power Mode Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify DTC U1814 is not set.
 - **If DTC is set**

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

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

Circuit/System Testing

1. Ignition OFF, disconnect the S39 Ignition Switch.
2. Verify a test lamp illuminates between the B+ circuit terminal 2 and ground.
 - **If the test lamp does not illuminate and the circuit fuse is good**
 1. Remove the test lamp.
 2. Test for less than 2 Ω in the B+ circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , verify the fuse is not open and there is voltage at the fuse.
 - **If the test lamp does not illuminate and the circuit fuse is open**
 1. Remove the test lamp.
 2. Test for infinite resistance between the B+ circuit and ground.
 - If less than infinite resistance, repair the short to ground on one of the following circuits listed below:

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

-
- B+ circuit terminal 2

- Ignition circuit terminal 1
- Ignition circuit terminal 3
- Ignition circuit terminal 4

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

3. Connect the S39 Ignition Switch.

4. Ignition ON, disconnect the harness connector at the S39 Ignition Switch while the ignition is ON.

5. Test for 4.8 - 5.2 V between the 5 V reference circuit terminal 6 and ground.

- **If less than 4.8 V**

1. Connect the S39 Ignition Switch.

2. Ignition OFF, disconnect the X3 harness connector at the K9 Body Control Module and S39 Ignition Switch.

3. Test for infinite resistance between the 5 V reference circuit and ground.

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

4. Test for less than 2 Ω in the 5 V reference circuit end to end.

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

- **If greater than 5.2 V**

1. Connect the S39 Ignition Switch.

2. Ignition OFF, disconnect the X3 harness connector at the K9 Body Control Module.

3. Ignition ON, disconnect the harness connector at the S39 Ignition Switch while the ignition is ON.

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

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

- **Go to next step: If between 4.8 - 5.2 V**

6. Connect the harness connector at the S39 Ignition Switch.

7. Ignition OFF.

8. Disconnect the X3 harness connector at the K9 Body Control Module, ignition ON.

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

- Ignition circuit terminal 5
- Ignition circuit terminal 6

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

1. Ignition OFF, remove the test lamp, disconnect the harness connector at the S39 Ignition Switch.

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

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , verify the fuse is not open and there is voltage at the fuse.

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

1. Ignition OFF, remove the test lamp.

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

- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance, replace the K9 Body Control Module.

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

10. Ignition OFF with the key in.

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

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

1. Ignition OFF with the key out, remove the test lamp.

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

- If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , verify the fuse is not open and there is voltage at the fuse.
 - **If the test lamp does not illuminate and the circuit fuse is open**
 1. Ignition OFF with the key out remove the test lamp.
 2. Test for infinite resistance between the ignition circuit terminal 15 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K9 Body Control Module.
 - **Go to next step: If the test lamp illuminates**
12. Connect the X3 harness connector at the K9 Body Control Module, ignition ON.
 13. Disconnect the harness connector at the S39 Ignition Switch.
 14. Test for less than 1 V between each of the ignition circuits listed below and ground.
 - Ignition circuit terminal 1
 - Ignition circuit terminal 3
 - Ignition circuit terminal 4
 - **If 1 V or greater**
Repair the short to voltage on the circuit.
 - **Go to next step: If less than 1 V**
 15. Test or replace the S39 Ignition Switch.

Component Testing

1. Ignition OFF, disconnect the harness connector at the S39 Ignition Switch.
2. Using the Resistance Test below, verify the resistance between the terminals listed below match for each S39 Ignition Switch position.
 - **If any reading is other than specified**
Replace the S39 Ignition Switch.
 - **Go to next step: If the readings match**
3. All OK.

Resistance Test

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

Repair Instructions

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

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

DTC B1445: CONTROL MODULE VOLTAGE OUTPUT 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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

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	B1445 04	B1445 01	-

Circuit/System Description

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

Conditions for Running the DTC

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

Conditions for Setting the DTC

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

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

Power Distribution Wiring Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Retained Accessory Power Description and Operation

Electrical Information Reference

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

Scan Tool Reference

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

Circuit/System Verification

1. Ignition ON.
2. Verify the KR76 Retained Accessory Power Relay clicks ON and OFF when commanding the Accessory/Retained Accessory Power Relay On and Off with a scan tool.
 - **If the KR76 Retained Accessory Power Relay does not click ON and OFF**
Refer to Circuit/System Testing.
 - **Go to next step: If the KR76 Retained Accessory Power Relay clicks ON and OFF**
3. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the KR76 Retained Accessory Power Relay. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 11 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **Go to next step: If less than 10 Ω**
3. Ignition ON, connect a test lamp between the control circuit terminal 13 and ground circuit terminal 11.
4. Verify the test lamp turns ON and OFF when commanding the Accessory/Retained Accessory Power Relay On and Off with a scan tool.
 - **If the test lamp is always OFF**
 1. Ignition OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module.
 2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K9 Body Control Module.
 - **If the test lamp is always ON**
 1. Ignition OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module, ignition ON.
 2. Test for less than 1 V between the control circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K9 Body Control Module.
 - **Go to next step: If the test lamp turns ON and OFF**
5. Test or replace the KR76 Retained Accessory Power Relay.

Repair Instructions

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

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

DTC B1448: ACCESSORY POWER RELAY CIRCUIT SHORT TO GROUND

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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

DTC Descriptor

DTC B1448 02

Accessory Power Relay Circuit Short to Ground

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Relay Coil Control	B1448 02	1	1	-
1. Retained Accessory Power Malfunction				

Circuit/System Description

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

Conditions for Running the DTC

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

Conditions for Setting the DTC

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

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

Power Distribution Wiring Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Retained Accessory Power Description and Operation

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)

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

Scan Tool Reference

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

Circuit/System Verification

1. Ignition ON.
2. Verify the KR76 retained accessory power relay turns ON and OFF when commanding the accessory/retained accessory power relay ON and OFF with a scan tool.
 - **If the KR76 retained accessory power relay does not turn ON and OFF**
Refer to Circuit/System Testing below
 - **Go to next step: If the KR76 retained accessory power relay turns ON and OFF**
3. All OK.

Circuit/System Testing

1. Ignition OFF, disconnect the KR76 retained accessory power relay, ignition ON.
2. Connect a test lamp between the control circuit terminal 86 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, 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, disconnect the harness connector at the K9 body control module, ignition ON.
 2. Test for less than 1 V between the control circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K9 body control module.
 - **Go to next step: If the test lamp turns ON and OFF**
4. Test or replace the KR76 retained accessory power relay.

Repair Instructions

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

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

DTC B144A: RUN 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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

DTC Descriptor

DTC B144A

RUN Power Relay Circuit

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

Diagnostic Fault Information

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

Circuit/System Description

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

Conditions for Running the DTC

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

Conditions for Setting the DTC

B144A 02

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

Action Taken When the DTC Sets

B144A 02

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

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

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

Connector End View Reference

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- [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.
2. Verify the HVAC control module scan tool Ignition Signal parameter is 12.6-15 V.
 - **If not between 12.6 - 15 V**

Refer to Circuit/System Testing - Diagnostic A.

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

NOTE: The vehicle may not be equipped with the ignition relay below.

- 3.
4. Verify the KR32E Blower Motor Relay turns ON and OFF when commanding the Auxiliary Ignition Run Relay On and Off with a scan tool.
 - **If the KR32E Blower Motor Relay does not turn ON and OFF**

Refer to Circuit/System Testing - Diagnostic B.

 - **Go to next step: If the KR32E Blower Motor Relay turns ON and OFF**
5. All OK.

Circuit/System Testing

Diagnostic A

1. Ignition OFF and all vehicle systems OFF, disconnect the X2 harness connector at the K33 HVAC Control Module.
2. Connect a test lamp between the ignition circuit terminals listed below and ground, Ignition ON.
 - K33 HVAC Control Module - Ignition circuit terminal 2 (With C67 or C4P)
 - K33 HVAC Control Module - Ignition circuit terminal 9 (With CJ2, C41 or C60)
3. Verify the test lamp turns ON and OFF when commanding the Auxiliary Ignition Run Relay On and Off with a scan tool.
 - **If the test lamp is always OFF**
 1. Ignition OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module.
 2. Test for infinite resistance between the 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 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 ignition circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K9 Body Control Module.

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

4. Replace the K33 HVAC Control Module.

Diagnostic B

1. Ignition OFF and all vehicle systems OFF, disconnect the KR32E Blower Motor Relay. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 1 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **Go to next step: If less than 10 Ω**
3. Ignition ON, connect a test lamp between the control circuit terminal 2 and ground circuit terminal 1.
4. Verify the test lamp turns ON and OFF when commanding the Auxiliary Ignition Run Relay On and Off with a scan tool.
 - **If the test lamp is always OFF**
 1. Ignition OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module and K33 HVAC 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 appropriate K9 Body Control Module or K33 HVAC Control Module.
 - **If the test lamp is always ON**
 1. Ignition OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module, ignition ON.
 2. Test for less than 1 V between the control circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K9 Body Control Module.
 - **Go to next step: If the test lamp turns ON and OFF**
5. Test or replace the appropriate KR32E Blower Motor Relay.

Repair Instructions

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

- Refer to [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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

DTC Descriptors

DTC B144B

Run/Crank Power Relay Circuit

Diagnostic Fault Information

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

Circuit/System Description

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

Conditions for Running the DTC

System voltage greater than 9 V.

Conditions for Setting the DTC

B144B 01

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

B144B 02

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

B144B 04

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

Action Taken When the DTC Sets

B144B 01, B144B 04

No action is taken.

B144B 02

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

Conditions for Clearing the DTC

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

Diagnostic Aids

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

Reference Information

Schematic 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

NOTE: The vehicle may not be equipped with all components as listed below. Use wiring schematics to determine which ignition relay supplies the ignition feed for the appropriate devices. Use the connector end view to identify the ignition circuit terminal for each of those devices.

1. Ignition ON.
2. Verify the appropriate devices controlled by the KR73 Ignition Main Relay (underhood) and 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 appropriate devices controlled by the KR73 Ignition Main Relay (underhood) or KR73 Ignition Main Relay (rear body) do not turn ON and OFF**Refer to Circuit/System Testing.
 - **Go to next step: If the appropriate devices controlled by the KR73 Ignition Main Relay (underhood) and KR73 Ignition Main Relay (rear body) turn ON and OFF**
3. All OK.

Circuit/System Testing

Without ATH/BTM

1. Ignition OFF, 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.
2. Test for less than 10 Ω between the ground circuits listed below and ground.
 - KR73 Ignition Main Relay (underhood) - Ground circuit terminal 85
 - KR73 Ignition Main Relay (rear body) - Ground circuit terminal 2
 - **If 10 Ω or greater**
 1. Ignition OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **Go to next step: If less than 10 Ω**
3. Ignition ON, connect a test lamp between the control circuits listed below and ground.

- KR73 Ignition Main Relay (underhood) - Control circuit terminal 86
 - KR73 Ignition Main Relay (rear body) - Control circuit terminal 1
4. Verify the test lamp turns ON and OFF when commanding the Run/Crank relay On and Off with a scan tool.
- **If the test lamp is always OFF**
 1. Ignition OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module.
 2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K9 Body Control Module.
 - **If the test lamp is always ON**
 1. Ignition OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module, ignition ON.
 2. Test for less than 1 V between the control circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K9 Body Control Module.
 - **Go to next step: If the test lamp turns ON and OFF**
5. Test or replace the appropriate KR73 Ignition Main Relay (underhood) or the KR73 Ignition Main Relay (rear body).

With ATH/BTM

1. Ignition ON, disconnect the X2 harness connector at the K84 Keyless Entry Control Module.
2. Verify a test lamp illuminates between the B+ circuit terminal 1 and ground.
 - **If the test lamp does not illuminate and the circuit fuse is good**
 1. Ignition OFF, remove the test lamp.
 2. Test for less than 2 Ω in the 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, 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 K84 Keyless Entry Control Module.
 - **Go to next step: If the test lamp illuminates**
3. Ignition 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 6 and ground.
 - **If 1 V or greater**

Repair the short to voltage on the circuit.
 - **Go to next step: If less than 1 V**
5. Ignition ON.
6. Verify a test lamp illuminates between the ignition circuit terminal 6 and ground.
 - **If the test lamp does not illuminate**
 1. Ignition OFF, remove the test lamp.
 2. Test for infinite resistance between the ignition circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.

- 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.
 - **Go to next step: If the test lamp illuminates**
 7. Ignition OFF, remove the test lamp, connect the X3 harness connector at the K9 Body Control Module.
 8. Ignition OFF, 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.
 9. Test for less than 10 Ω between the ground circuits listed below and ground.
 - KR73 Ignition Main Relay (underhood) - Ground circuit terminal 85
 - KR73 Ignition Main Relay (rear body) - Ground circuit terminal 2
 - **If 10 Ω or greater**
 1. Ignition OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **Go to next step: If less than 10 Ω**
 10. Ignition ON, connect a test lamp between the control circuits listed below and ground.
 - KR73 Ignition Main Relay (underhood) - Control circuit terminal 86
 - KR73 Ignition Main Relay (rear body) - Control circuit terminal 1
 11. Verify the test lamp turns ON and OFF when commanding the Run/Crank relay On and Off with a scan tool.
 - **If the test lamp is always OFF**
 1. Ignition OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module.
 2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K9 Body Control Module.
 - **If the test lamp is always ON**
 1. Ignition OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module, ignition ON.
 2. Test for less than 1 V between the control circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K9 Body Control Module.
 - **Go to next step: If the test lamp turns ON and OFF**
 - 12. 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.

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

DTC B144D: DEVICE VOLTAGE OUTPUT 2 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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

DTC Descriptor

DTC B144D

Device Voltage Output 2 Circuit

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

Diagnostic Fault Information

Device Voltage Output 2 Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Control	B144D 0B	B144D 04	-	-

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 output voltage is kept at a constant level during engine cranking.

Conditions for Running the DTC

Engine not running.

The system voltage is greater than 12 V.

Conditions for Setting the DTC

B144D 0B

The output is active and the current level is above 20 A for greater than 5 s.

B144D 04

The output active and no current is detected for greater than 5 s.

Action Taken When the DTC Sets

B144D 0B

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

B144D 04

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

[Starting and Charging Wiring Schematics](#)

Power Distribution Wiring 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 Verification

NOTE: Use wiring schematics to determine which devices are powered up on the T19 Power Supply Transformer control circuit terminal 9 X1.

1. Ignition ON.
2. Verify that the appropriate devices controlled by the T19 Power Supply Transformer control circuit terminal 9 X1 turn ON when cycling the ignition ON.
 - **If the devices do not turn ON**
Refer to Circuit/System Testing.
 - **Go to next step: If the devices turn ON**
3. All OK.

Circuit/System Testing

1. Ignition ON.
2. Verify that a test lamp illuminates between each of the B+ circuits listed below and ground.
 - X51A Fuse Block - Instrument Panel - Fuse F10DA
 - X51A Fuse Block - Instrument Panel - Fuse F15DA
 - **If the test lamp does not illuminate**
 1. Ignition OFF, remove the test lamp, remove fuses, disconnect the harness connector at the T19 Power Supply Transformer.
 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.
 3. 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 , replace the T19 Power Supply Transformer.
 - **Go to next step: If the test lamp illuminates**
3. Ignition OFF, Disconnect the harness connector at the appropriate device powered by the T19 Power Supply Transformer B+ supply circuit terminal 9 X1, ignition ON.
4. Verify that a test lamp illuminates between each of the B+ circuits listed below and ground.
 - K9 Body Control Module - B+ circuit terminal 4 X1
 - K71 Transmission Control Module - B+ circuit terminal 1 X1
 - **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 , verify the fuse is not open and there is voltage at the fuse.
- **If the test lamp does not illuminate and the circuit fuse is open**
 1. Ignition OFF remove the test lamp.
 2. Test for infinite resistance between the 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 powered by the T19 Power Supply Transformer B+ supply circuit terminal 9 X1.
- **Go to next step: If the test lamp illuminates**
- 5. Test or replace the appropriate device powered by the T19 Power Supply Transformer B+ supply circuit terminal 9 X1.

Repair Instructions

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

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

DTC B1451: ACCESSORY POWER CIRCUIT

Diagnostic Instructions

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

DTC Descriptor

NOTE: This procedure may also diagnose malfunctions that are not detected by a DTC.

DTC B1451

Accessory Power Circuit

Symptom Byte Information: [Symptom Byte List](#)

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+ circuit terminal 2 X1	-	B1451 04	-	-
Ignition terminal 5 X3	B1451 02	B1451 04	B1451 01	-

Circuit/System Description

Circuit	Description
K84 Keyless Entry Control Module B+ circuit terminal 2 X1	Supplied from a fuse.
K9 Body Control Module Ignition terminal 5 X3	When the ignition is turned on or in accessory, the keyless entry control module sends a 12 V signal to the body control module.

Component	Description
K9 Body Control Module	The control module contains a microprocessor used to process input data to control outputs.

Component	Description
K84 Keyless Entry Control Module	The control module contains a microprocessor used to process input data to control outputs.

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

- Vehicle power mode is Ignition OFF
- Module is awake
- System voltage between 6 and 16 V

B1451 04

- Vehicle power mode is Ignition OFF
- Module is awake
- 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
- System voltage between 6 and 16 V

Conditions for Setting the DTC

B1451 01, 04

- 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.

Conditions for Setting the DTC

B1451 01, 04

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.

Actions Taken When the DTC Sets

B1451 01, 04

No action is taken.

B1451 02

The concerned output is switched off.

Conditions for Clearing the DTC

The conditions for setting the DTC no longer exist.

A history DTC will clear after 40 consecutive malfunction-free ignition cycles.

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 Moding Wiring Schematics

Power Distribution Wiring Schematics

Connector End View Reference

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Scan Tool Reference

Control Module References

Circuit/System Verification

1. Ignition - On/Vehicle - In Service Mode
2. Verify DTC B1451 and one or more of the DTCs B1380, U1814 is set.
 - **If DTC B1451 and one or more of the DTCs B1380, U1814 is set**

Refer to the following: [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)
 - **Go to next step: If DTC B1451 is set but none of the DTCs B1380, U1814 is set**
3. Refer to Circuit/System Testing below

Circuit/System Testing

1. Ignition/Vehicle & All vehicle systems - Off
2. Disconnect the electrical connector: X3 @ K9 Body Control Module
3. Test for less than 1 V between the test points: Ignition circuit terminal 5 @ K9 Body Control Module & Ground
 - If 1 V or greater - Repair the short to voltage on the circuit.
 - If less than 1 V
4. Ignition - On/Vehicle - In Service Mode
5. Verify a test lamp turns On between the test points: Ignition circuit terminal 5 @ K9 Body Control Module & Ground
 - **If the test lamp is always Off**

1. Ignition/Vehicle - Off & Remove - Test lamp
2. Disconnect the electrical connector: X1 @ K84 Keyless Entry Control Module
3. Test for infinite resistance between the test points: Ignition circuit terminal 5 @ K84 Keyless Entry Control Module & Ground
 - If less than infinite resistance - Repair the short to ground on the circuit.
 - If infinite resistance
4. Test for less than 2 Ω between the test points: Ignition circuit terminal 5 @ K84 Keyless Entry Control Module & Ignition circuit terminal 5 @ K9 Body Control Module
 - If 2 Ω or greater - Repair the open/high resistance in the circuit.
 - If less than 2 Ω - Replace the component: K84 Keyless Entry Control Module
- **Go to next step: If the test lamp turns On**
6. Replace the component: K9 Body Control Module

Repair Instructions

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

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

DTC B147E OR B147F: BATTERY SAVER RELAY SET/RESET SECONDARY 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.
- Refer to [Diagnostic Procedure Instructions](#) to provide 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
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 turning the ignition key into the crank position or pushing the push button start switch (if equipped) 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. In battery saver mode (transport mode) the BCM will send a command to latch the relay for operation of those modules while the ignition is in the run position and then again unlatching the relay after the ignition is 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 in driver information center 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

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

Action Taken When the DTC Sets

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

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

Connector End View Reference

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[Power Mode Description and Operation](#)

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- [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 the KR104A Battery Saver Relay 1 clicks open and closed when cycling the ignition between ON and OFF.

- **If the KR104A Battery Saver Relay 1 does not click open and closed**

Refer to Circuit/System Testing.

- **Go to next step: If the KR104A Battery Saver Relay 1 clicks open and closed**

3. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems 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.

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

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

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

3. Ignition ON.

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

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

1. Ignition OFF, remove test lamp, disconnect the harness connector at the T19 Power Supply Transformer.

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.

3. 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 , replace the T19 Power Supply Transformer.

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

5. Enable battery saver mode (transport mode).

6. Ignition OFF.

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

8. 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.

- **Go to next step: 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.

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.

- **Go to next step: 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

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

12. Ignition ON, connect a 30 A fused jumper wire between the B+ circuit terminal 3 and the ignition circuit terminal 5.

13. Verify the device is activated.

- **If the device does not activate**

1. Ignition OFF, disconnect the harness connector at the device.
2. Test for infinite resistance between the ignition circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
3. Test for less than 2 Ω in the ignition circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the device.

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

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

Component Testing

Relay Test

1. Ignition OFF, disconnect the KR104A Battery Saver Relay 1.
2. Test for 70 - 150 Ω between terminals the following terminals.
 - 1 and 6
 - 2 and 6
 - **If less than 70 or greater than 150 Ω**

Replace the relay.

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

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

4. Test for infinite resistance between the following terminals:

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

Replace the relay.

- **Go to next step: 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.

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

7. All OK

Repair Instructions

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

- Refer to [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.
- Refer to [Diagnostic Procedure Instructions](#) to provide 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 relay through the control circuit by applying voltage to the interruptible retained accessory power relay coil control circuit. The retained accessory power relay is energized when the ignition is in the ACCESSORY or the ON position. The

relay is also energized for approximately 10 min after shutting the ignition 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

B305E 01, B305E 05

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 Wiring 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 Verification

1. Ignition ON.
2. Verify the KR76 Retained Accessory Power Relay clicks ON and OFF when cycling the ignition between ON and OFF.
 - **If the KR76 Retained Accessory Power Relay does not click ON and OFF**
Refer to Circuit/System Testing - Diagnostic A.
 - **Go to next step: If the KR76 Retained Accessory Power Relay clicks ON and OFF**
3. All OK.

Circuit/System Testing

1. Ignition OFF/Vehicle OFF and all vehicle systems OFF, disconnect the KR76 Retained Accessory Power Relay. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 85 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF/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.
 - **Go to next step: If less than 10 Ω**
3. Ignition ON/Vehicle in Service Mode, connect a test lamp between the control circuit terminal 86 and ground circuit terminal 85.
4. Verify the test lamp turns ON and OFF when cycling the ignition between ON and OFF.
 - **If the test lamp is always OFF**
 1. Ignition OFF/Vehicle OFF, remove the test lamp, disconnect the harness connector at the K84 Keyless Entry 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 K84 Keyless Entry Control Module.
 - **If the test lamp is always ON**
 1. Ignition OFF/Vehicle OFF, remove the test lamp, disconnect the harness connector at the K84 Keyless Entry 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 K84 Keyless Entry Control Module.
 - **Go to next step: If the test lamp turns ON and OFF**
5. Test or replace the KR76 Retained Accessory Power Relay.

Repair Instructions

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

- Refer to [Relay Replacement \(Attached to Wire Harness\)](#), [Relay Replacement \(Within an Electrical Center\)](#).
- Refer to [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.
- Refer to [Diagnostic Procedure Instructions](#) to provide 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 Wiring Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

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](#).

- **Go to next step: 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.

- **Go to next step: If DTC does not set**

4. All OK.

Repair Instructions

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

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

DTC P16E8: ENGINE CONTROLS IGNITION RELAY 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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

DTC Descriptors

DTC P16E8

Engine Controls Ignition Relay Signal Message Counter Incorrect

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Engine Controls Ignition	P16E8	P16E8	-	-
Run/Crank ignition 1	P17B3	P17B3	P17B4	-

Circuit/System Description

The transmission range control module monitors and compares the voltage of the engine controls ignition voltage circuit to the run/crank ignition 1 voltage circuit.

Conditions for Running the DTC

Ignition 1 voltage is greater than 6 V for 5 s.

Conditions for Setting the DTC

The transmission range control module detects that the ignition state of the engine controls ignition circuit and the run/crank ignition 1 circuit do not match.

Action Taken When the DTC Sets

DTC P16E8 is a Type B DTC.

Conditions for Clearing the DTC

DTC P16E8 is a Type B DTC.

Reference Information

[Electronic Transmission Range Selector Wiring 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

- [Electronic Transmission Range Selector Description](#)

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 that DTC P17B3 or P13B4 is not set.
 - **If DTC P17B3 or P13B4 is set**
Refer to [DTC P17B3 or P17B4](#).
 - **Go to next step: If DTC P17B3 or P13B4 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 K173 Transmission Range Control Module. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between ground circuit terminal 8 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.
 - **Go to next step: If less than 10 Ω**
3. Test for less than 1 V between the ignition circuit terminal 1 and ground.
 - **If 1 V or greater**
Repair the short to voltage on the circuit.
 - **Go to next step: If less than 1 V**
4. Ignition ON/Vehicle in Service Mode.
5. Verify a test lamp illuminates between terminal 1 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 $2\ \Omega$ or greater, repair the open/high resistance in the circuit.
- If less than $2\ \Omega$, refer to [Power Mode Mismatch](#).
- **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 ignition circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - **Go to next step: If the test lamp illuminates**
- 6. Replace the K173 Transmission Range Control Module.

Repair Instructions

- Perform the [Diagnostic Repair Verification](#) after completing the repair.
- Refer to [Control Module References](#) for control module replacement, programming and setup.

DTC P17B3 OR P17B4: TRANSMISSION RANGE CONTROL MODULE IGNITION 1 SWITCH CIRCUIT LOW/HIGH VOLTAGE

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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

DTC Descriptors

DTC P17B3

Transmission Range Control Module Ignition 1 Switch Circuit Low Voltage

DTC P17B4

Transmission Range Control Module Ignition 1 Switch Circuit High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ignition	P17B3	P17B3	P17B4	-
Ground	-	P17B3	-	-

Circuit/System Description

The transmission range control module samples the system voltage on the Ignition 1 voltage circuit every 0.25 s. Lower than normal voltage may be inadequate to operate properly.

Conditions for Running the DTC

P17B3

The ignition voltage signal is valid, with the ignition turned ON.

P17B4

The ignition voltage signal is valid, with the Ignition turned OFF.

Conditions for Setting the DTC

P17B3

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

P17B4

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

Action Taken When the DTC Sets

DTCs P17B3 and P17B4 are Type B DTCs.

Conditions for Clearing the DTC

DTCs P17B3 and P17B4 are Type B DTCs.

Reference Information

Schematic Reference

Electronic Transmission Range Selector Wiring 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

Electronic Transmission Range Selector Description

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

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 X1 harness connector at the K173 Transmission Range Control Module. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between ground circuit terminal 8 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.
 - **Go to next step: If less than 10 Ω**
3. Ignition ON/Vehicle in Service Mode, verify a test lamp illuminates between B+ circuit terminal 16 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 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.
 2. Test for infinite resistance between the B+ circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - **Go to next step: If the test lamp illuminates**
- 4. Test for less than 1 V between the ignition circuit terminal 2 and ground.
 - **If 1 V or greater**

Repair the short to voltage on the circuit.

 - **Go to next step: If less than 1 V**
- 5. Ignition ON/Vehicle in Service Mode.
- 6. Verify a test lamp illuminates between terminal 2 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](#).
 - **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 ignition circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - **Go to next step: If the test lamp illuminates**
- 7. Replace the K173 Transmission Range Control Module.

Repair Instructions

- Perform the [Diagnostic Repair Verification](#) after completing the repair.
- Refer to [Control Module References](#) for control module replacement, programming, and setup.

DTC P17B5: TRANSMISSION RANGE CONTROL MODULE IGNITION SWITCH ACCESSORY POSITION CIRCUIT LOW VOLTAGE

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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

DTC Descriptor

DTC P17B5

Transmission Range Control Module Ignition Switch Accessory Position Circuit Low Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ignition	P17B5, U1814, U2099	P17B5	-	-

Circuit/System Description

The transmission range 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 P17B5 is a Type C DTC.

Conditions for Clearing the DTC

DTC P17B5 is a Type C DTC.

Reference Information

Schematic Reference

Data Communication Wiring 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

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Verify DTC U1814 or U2099 is not set.

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

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

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

2. Refer to Circuit/System Testing.

Circuit/System Testing

1. Ignition OFF/Vehicle OFF, disconnect the harness X1 connector at the K173 Transmission Range Control Module.
2. Ignition ON/Vehicle in Service Mode.

3. Verify a test lamp illuminates between the ignition circuit terminal 3 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 infinite resistance between the ignition circuit and ground.

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

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

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

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

4. Replace the K173 Transmission Range Control Module.

Repair Instructions

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

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

DTC P2534 OR P2535: IGNITION ON/START SWITCH CIRCUIT LOW/HIGH VOLTAGE

Diagnostic Instructions

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

DTC Descriptor

DTC P2534

Ignition On/Start Switch Circuit Low Voltage

DTC P2535

Ignition On/Start Switch Circuit High Voltage

Symptom Byte Information: [Symptom Byte List](#)

Diagnostic Fault Information

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

Circuit/System Description

Circuit	Description
Ignition circuit	The output circuit varies between ground and 12 V.

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

Conditions for Running the DTC

P2534

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

P2535

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

Conditions for Setting the DTC

P2534

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

P2535

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

Actions Taken When the DTC Sets

P2534, P2535

- DTCs P2534 and P2535 are Type A DTCs.

Conditions for Clearing the DTC

P2534, P2535

- DTCs P2534 and P2535 are Type A DTCs.

Reference Information

Schematic Reference

Power Distribution Wiring Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Power Mode Description and Operation

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

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

- **If DTC B144B is set**

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

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

3. Refer to: Circuit/System Testing

Circuit/System Testing

1. Ignition/Vehicle & All vehicle systems - Off
2. Disconnect the electrical connector: Appropriate control module.
3. Test for less than 1 V between the test points: Ignition circuit terminal @ Component harness & Ground
 - **If 1 V or greater**
Repair the short to voltage on the circuit.
 - **Go to next step: If less than 1 V**
4. Ignition - On/Vehicle - In Service Mode
5. Verify a test lamp turns On between the test points: Ignition circuit terminal @ Component harness & Ground
 - **If the test lamp does not turn On and the circuit fuse is OK**
 1. Ignition/Vehicle - Off
 2. Test for less than 2 Ω between the test points: Ignition circuit terminal @ Component harness & Fuse
 - If 2 Ω or greater - Repair the open/high resistance in the circuit.
 - If less than 2 Ω - Refer to [Power Mode Mismatch](#)
 - **If the test lamp does not turn On and the circuit fuse is open**
 1. Ignition/Vehicle - Off
 2. Test for infinite resistance between the test points: Ignition circuit terminal @ Component harness & Ground
 - If less than infinite resistance - Repair the short to ground on the circuit.
 - **Go to next step: If the test lamp turns On**
6. Replace the component: Appropriate control module.

Repair Instructions

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

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

DTC P2537: IGNITION ACCESSORY SWITCH CIRCUIT LOW VOLTAGE

Diagnostic Instructions

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

DTC Descriptor

DTC P2537

Ignition Accessory Switch Circuit Low Voltage

Symptom Byte Information: [Symptom Byte List](#)

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance

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

Circuit/System Description

Circuit	Description
Ignition circuit	The output circuit varies between ground and 12 V.

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.

Actions Taken When the DTC Sets

DTC P2537 is a Type B DTC.

Conditions for Clearing the DTC

DTC P2537 is a Type B DTC.

Reference Information

Schematic Reference

Data Communication Wiring Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Data Link Communications Description and Operation

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Ignition - On/Vehicle - In Service Mode

2. Verify DTC P2537 and one or more of the DTCs U1814, U2099 is set.

- If DTC P2537 and one or more of the DTCs U1814, U2099 is set

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

- Go to next step: If DTC P2537 is set but none of the DTCs U1814, U2099 is set

3. Refer to Circuit/System Testing below

Circuit/System Testing

1. Ignition/Vehicle & All vehicle systems - Off
2. Disconnect the electrical connector: Appropriate control module.
3. Ignition - On/Vehicle - In Service Mode
4. Verify a test lamp turns On between the test points: accessory wake up serial data circuit terminal @ Component harness & Ground
 - If the test lamp does not turn On
 1. Ignition/Vehicle - Off
 2. Test for less than 2 Ω between the test points: accessory wake up serial data circuit terminal @ Component harness & Component harness & accessory wake up serial data circuit terminal @ K9 Body Control Module
 - If 2 Ω or greater - Repair the open/high resistance in the circuit.
 - If less than 2 Ω - Replace the component: K9 Body Control Module
 - Go to next step: If the test lamp turns On
5. Replace the component: Appropriate control module.

Repair Instructions

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

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

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

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.
- Refer to [Diagnostic Procedure Instructions](#) to provide 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.

P305C

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

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 Wiring Schematics

Starting and Charging Wiring 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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Circuit/System Verification

1. Engine running.
2. Verify DTC B144B is not set.
 - **If the DTC is set**

Refer to [DTC B144B](#).
 - **Go to next step: If the DTC is not set**
3. Refer to Circuit/System Testing.

Circuit/System Testing

1. Ignition 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.
 - **Go to next step: If less than 1 V**
3. Ignition ON.
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 remove the test lamp.
 2. Test for less than 2 Ω in the ignition circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , refer to [Power Mode Mismatch](#).
 - **If the test lamp does not illuminate and the circuit fuse is open**
 1. Ignition OFF remove the test lamp
 2. Test for infinite resistance between the ignition circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - **Go to next step: If the test lamp illuminates**
5. Replace the 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](#)
 - [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](#)
- [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.
- Refer to [Diagnostic Procedure Instructions](#) to provide 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 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.

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.

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

Ignition Lock Wiring Schematics

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.
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.
 - **Go to next step: If the parameter changes**
3. All OK.

Circuit/System Testing

1. Ignition 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.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **Go to next step: If less than 10 Ω**
3. Ignition ON.
4. Verify the scan tool Body Control Module In Park Switch Status parameter is Off.
 - **If not Off**
 1. Ignition 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.
 - **Go to next step: 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, remove the jumper wire, disconnect the harness connector at the K9 Body Control Module, ignition ON.
 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.

• **Go to next step: If On**

7. Test or replace the S3 Transmission Shift Lever.

Repair Instructions

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

Refer to [Control Module References](#)

IGNITION MODE SWITCH INDICATOR MALFUNCTION

Diagnostic Instructions

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

DTC Descriptor

DTC B097C

Power Mode Start Indicator Circuit

Symptom Byte Information: [Symptom Byte List](#)

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Control terminal 5	B097C 02*	1	2	-
Control terminal 2	1	1	2	-
Ground	-	1	-	-
1. Ignition mode switch indicator always OFF 2. Ignition mode switch indicator always ON				

Circuit/System Description

Circuit	Description
Control terminal 5	The output circuit varies between ground and 12 V.
Control terminal 2	The output circuit varies between ground and 12 V.
Ground	Chassis Ground

Component	Description
K9 Body Control Module	The control module contains a microprocessor used to process input data to control outputs.
S38 Ignition Mode Switch	The ignition mode switch has two LEDs that indicate the vehicle power mode.

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.

Conditions for Running the DTC

- Control Module voltage is between 9 - 16 V

Conditions for Setting the DTC

B097C 02

- The control module detects a short to ground.
- The above condition(s) must occur for greater than 1 s.

Actions Taken When the DTC Sets

The concerned output is switched off.

Conditions for Clearing the DTC

The conditions for setting the DTC no longer exist.

A history DTC will clear after 40 consecutive malfunction-free ignition cycles.

Reference Information

Schematic Reference

Power Moding Wiring Schematics

Power Distribution Wiring Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Power Mode Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Ignition - On/Vehicle - In Service Mode
2. Perform the scan tool control function: Run/Crank Power Mode Indicator Command

Verify the indicator status:

Run/Crank Power Mode Indicator Command - OFF = LED Off.

Run/Crank Power Mode Indicator Command - ON = LED On.

- **If not the specified state**

Refer to Circuit/System Testing - Run/Start Power Mode Indicator Malfunction

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

3. Perform the scan tool control function: Accessory Power Mode Indicator Command

Verify the indicator status:

Accessory Power Mode Indicator Command - OFF = LED Off.

Accessory Power Mode Indicator Command - ON = LED On.

- **If not the specified state**

Refer to Circuit/System Testing - Accessory Power Mode Indicator

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

4. All OK.

Circuit/System Testing

Run/Start Power Mode Indicator Malfunction

NOTE: It may take up to 2 min for all vehicle systems to power down before an accurate ground or low reference circuit continuity test can be performed.

1. Ignition/Vehicle & All vehicle systems - Off

2. Disconnect the electrical connector: S38 Ignition Mode Switch

3. Test for less than 10 Ω between the test points: Ground circuit terminal 4 @ Component harness & Ground

- **If 10 Ω or greater**

1. Test for less than 2 Ω between the test points: Ground circuit terminal 4 @ Component harness & Ground Connection

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

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

4. Connect the electrical connector: S38 Ignition Mode Switch

5. Ignition - On/Vehicle - In Service Mode

6. Disconnect the electrical connector: S38 Ignition Mode Switch

7. Perform the scan tool control function: Run/Crank Power Mode Indicator Command - OFF

8. Test for less than 1 V between the test points: Control circuit terminal 5 @ Component harness & Ground

- **If 1 V or greater**

Repair the short to voltage on the circuit.

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

9. Perform the scan tool control function: Run/Crank Power Mode Indicator Command - ON

10. Test for greater than 3 V between the test points: Control circuit terminal 5 @ Component harness & Ground

- **If 3 V or less**

1. Disconnect the electrical connector: K9 Body Control Module

2. Test for infinite resistance between the test points: Control circuit terminal @ Control module harness & Ground

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

1. Test for less than 2 Ω between the test points: Control circuit terminal @ Control module harness & Control circuit terminal @ Component harness

- If 2 Ω or greater - Repair the open/high resistance in the circuit.
- If less than 2 Ω - Replace the component: K9 Body Control Module

- **Go to next step: If 3 V or greater**

11. Replace the component: S38 Ignition Mode Switch

Accessory Power Mode Indicator Malfunction

NOTE: It may take up to 2 min for all vehicle systems to power down before an accurate ground or low reference circuit continuity test can be performed.

1. Ignition/Vehicle & All vehicle systems - Off
2. Disconnect the electrical connector: S38 Ignition Mode Switch
3. Test for less than 10 Ω between the test points: Ground circuit terminal 4 @ Component harness & Ground
 - **If 10 Ω or greater**
 1. Test for less than 2 Ω between the test points: Ground circuit terminal 4 @ Component harness & Ground Connection
 - If 2 Ω or greater - Repair the open/high resistance in the circuit.
 - If less than 2 Ω - Repair the open/high resistance in the ground connection.
 - **Go to next step: If less than 10 Ω**
4. Connect the electrical connector: S38 Ignition Mode Switch
5. Ignition - On/Vehicle - In Service Mode
6. Disconnect the electrical connector: S38 Ignition Mode Switch
7. Perform the scan tool control function: Accessory Power Mode Indicator Command - OFF
8. Test for less than 1 V between the test points: Control circuit terminal 2 @ Component harness & Ground
 - **If 1 V or greater**

Repair the short to voltage on the circuit.

 - **Go to next step: If less than 1 V**
9. Perform the scan tool control function: Accessory Power Mode Indicator Command - ON
10. Test for greater than 3 V between the test points: Control circuit terminal 2 @ Component harness & Ground
 - **If 3 V or less**
 1. Disconnect the electrical connector: K9 Body Control Module
 2. Test for infinite resistance between the test points: Control circuit terminal @ Control module harness & Ground
 - If less than infinite resistance - Repair the short to ground on the circuit.
 - If less than infinite resistance
 1. Test for less than 2 Ω between the test points: Control circuit terminal @ Control module harness & Control circuit terminal @ Component harness
 - If 2 Ω or greater - Repair the open/high resistance in the circuit.
 - If less than 2 Ω - Replace the component: K9 Body Control Module
 - **Go to next step: If 3 V or greater**
11. Replace the component: S38 Ignition Mode Switch

Repair Instructions

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

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

POWER MODE MISMATCH

Diagnostic Instructions

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

Circuit/System Description

The body control module (BCM) controls the ignition main relay, and steering wheel heater relays by applying voltage to their individual relay control circuits. The ignition main relay is energized when the ignition is in the ON or the CRANK position. The steering wheel heater relay is energized when the ignition switch is in the ACCESSORY or the ON 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 relay 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 1 and retained accessory power relay 2 by applying voltage to their individual relay control circuits. The retained accessory power relays are energized during all power modes, except OFF-awake, and CRANK. 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 main relay coil control will cause the engine to remain running after the mode is changed to OFF.

Reference Information

Schematic Reference

- Power Distribution Wiring Schematics
- Power Moding Wiring Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Electrical Center Identification View Reference

Electrical Center Identification Views

Description and Operation

Power Mode Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

NOTE: The vehicle may not be equipped with all components as listed below. Use wiring schematics to determine which ignition relay supplies the

ignition feed for the appropriate devices. Use the connector end view to identify the ignition circuit terminal for each of those devices.

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

Refer to Circuit/System Testing - Diagnostic A.
 - **Go to next step: If the devices turn ON and OFF**
3. Verify that the appropriate devices controlled by the KR148 Steering Wheel Heater Relay turns ON and OFF when switching the ignition between ON and OFF.
 - **If the devices do not turn ON and OFF**

Refer to Circuit/System Testing - Diagnostic B.
 - **Go to next step: If the devices turn ON and OFF**
4. Verify the appropriate devices controlled by the K84 Keyless Entry Control Module's ignition circuit terminal 7 X1 turn ON and OFF when switching the ignition between ON and OFF.
 - **If the devices do not turn ON and OFF**

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

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

Circuit/System Testing

Diagnostic A

1. Ignition OFF and all vehicle systems OFF, disconnect the KR73 Ignition Main Relay. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 2 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.

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

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

3. Ignition ON.

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

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

Replace the X50A Fuse Block - Underhood

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

5. Connect a test lamp between the control circuit terminal 1 and the ground circuit terminal 2.

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

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

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

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

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

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

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

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

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

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

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

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

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

- Ignition circuit terminal 4
- Ignition circuit terminal 5

- **If the test lamp illuminates**

Repair the short to voltage on the ignition circuit.

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

8. Ignition ON, connect a 40 A fused jumper wire between the B+ circuit terminal 3 and the ignition circuits listed below.

- Ignition circuit terminal 4
- Ignition circuit terminal 5

9. Verify the appropriate device is activated.

- **If the device does not activate**

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

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

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

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

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

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

10. Test or replace the KR73 Ignition Main Relay.

1. Ignition OFF and all vehicle systems OFF, disconnect the KR148 Steering Wheel Heater Relay. It may take up to 2 min for all vehicle systems to power down.

2. Test for less than 10 Ω between the ground circuit terminal 1 and ground.

- **If 10 Ω or greater**

1. Ignition OFF.

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

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

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

3. Ignition ON.

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

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

Replace the X53A Fuse Block - Rear Body

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

5. Connect a test lamp between the control circuit terminal 2 and the ground circuit terminal 1.

6. Verify the test lamp turns ON and OFF when switching the ignition between ON and OFF.

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

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

2. Test for infinite resistance between the 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.

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

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

- **If the test lamp illuminates**

Repair the short to voltage on the ignition circuit

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

8. Ignition ON, connect a 10 A fused jumper wire between the B+ circuit terminal 5 and the ignition control circuit terminal 3.

9. Verify device is activated.

- **If the device is not activated**

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

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

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

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

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

- If less than 2 Ω , replace the device.

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

10. Test or replace the KR148 Steering Wheel Heater Relay.

Diagnostic C

1. Ignition OFF and all vehicle systems OFF, disconnect the X81 Accessory Power Receptacle - 110V AC and P2 Transmission Shift Lever Position Indicator.
2. Connect a test lamp between the ignition circuits listed below and ground.

NOTE:

The vehicle may not be equipped with all components as listed below. Use wiring schematics to determine which devices are controlled directly by the K84 Keyless Entry Control Module's ignition circuit terminal 7 X1. Use the connector end view to identify the ignition circuit terminal for each of those devices.

- P2 Transmission Shift Lever Position Indicator - Control circuit terminal 4
 - X81 Accessory Power Receptacle - 110V AC - Control circuit terminal 1 X1
 - X51A Fuse Block - Instrument Panel - Fuse F4DA
 - X51A Fuse Block - Instrument Panel - Fuse F30DA
 - X51A Fuse Block - Instrument Panel - Circuit Breaker F8DA
3. Verify the test lamp turns ON and OFF when cycling the ignition between ON and OFF.
 - **If the test lamp is always OFF**
 1. Ignition OFF, remove test lamp, disconnect the harness connector at the K84 Keyless Entry Control Module and X51A Fuse Block - Instrument Panel.
 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 .
 4. Replace the K84 Keyless Entry Control Module.
 5. Connect the harness connector at the X51A Fuse Block - Instrument Panel.
 6. Verify the test lamp turns ON and OFF when cycling the ignition between ON and OFF.
 - If the test lamp is always OFF, replace the X51A Fuse Block - Instrument Panel.
 - If the test lamp turns ON and OFF.
 7. All OK.
 - **If the test lamp is always ON**
 1. Ignition OFF, remove the test lamp, disconnect the harness connector at the K84 Keyless Entry 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 K84 Keyless Entry Control Module.
 - **Go to next step: If the test lamp turns ON and OFF**
 4. Disconnect the harness connector at the appropriate X80 Accessory Power Receptacle and X92 USB Receptacle.
 5. Ignition OFF.
 6. Verify that a test lamp does not illuminate between each of the ignition circuits listed below and ground.
 - X92 USB Receptacle - Ignition circuit terminal
 - X80L Accessory Power Receptacle - Center Console - Ignition circuit terminal
 - X80F Accessory Power Receptacle - Front - Ignition circuit terminal

- X8H Accessory Power Receptacle - Center Console - Ignition circuit terminal
- **If the test lamp illuminates**

Repair the short to voltage on the ignition circuit.

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

7. Ignition ON.

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

- X92 USB Receptacle - Ignition circuit terminal
- X80L Accessory Power Receptacle - Center Console - Ignition circuit terminal
- X80F Accessory Power Receptacle - Front - Ignition circuit terminal
- X8H Accessory Power Receptacle - Center Console - Ignition circuit terminal
- **If the test lamp does not illuminate and the circuit fuse is good**

1. Ignition OFF, remove the test lamp.

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

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , test or replace the X51A Fuse Block - Instrument Panel.

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

1. Ignition OFF.

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

- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance, test or replace the appropriate X80 Accessory Power Receptacle or X92 USB Receptacle.

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

9. Test or replace the appropriate X80 Accessory Power Receptacle or X92 USB Receptacle.

Diagnostic D

1. Ignition OFF and all vehicle systems OFF, disconnect the KR75 Engine Controls Ignition Relay, ignition ON.

2. Verify a test lamp illuminates between the B+ circuit terminal 1 and ground.

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

Replace the X50A Fuse Block - Underhood

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

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

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

Replace the X50A Fuse Block - Underhood

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

4. Connect a test lamp between the B+ circuit terminal 1 and the control circuit terminal 2.

5. Verify the test lamp turns ON and OFF when cycling the ignition between ON and OFF.

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

1. Ignition OFF, remove the test lamp, disconnect the harness connector at the K20 Engine Control Module, ignition ON.

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

- If 1 V or greater, repair the short to voltage on the circuit.
- If less than 1 V

3. Ignition OFF.

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

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

- If less than 2 Ω , replace the K20 Engine Control Module.
- **If the test lamp is always ON**
 1. Ignition OFF, remove the test lamp, disconnect the harness connector at the K20 Engine Control Module.
 2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K20 Engine Control Module.
 - **Go to next step: If the test lamp turns ON and OFF**
- 6. Verify a test lamp does not illuminate between the ignition circuit terminal 5 and ground.
 - **If the test lamp illuminates**

Repair the short to voltage on the circuit.
 - **Go to next step: If the test lamp does not illuminate**
- 7. Ignition ON, connect a 40 A fused jumper wire between the B+ circuit terminal 3 and the ignition circuit terminal 5.
- 8. Verify device is activated.
 - **If the device is not activated**
 1. Ignition OFF, disconnect the harness connector at the device.
 2. Test for infinite resistance between the ignition circuit terminal 5 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.
 - **Go to next step: If the device activates**
- 9. Test or replace the KR75 Engine Controls Ignition Relay.

Diagnostic E

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the X51A Fuse Block - Instrument Panel.
2. Ignition ON.
3. Verify a test lamp illuminates between the B+ circuit terminal 55 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 , replace the T19 Power Supply Transformer.
 - **Go to next step: If the test lamp illuminates**
4. Connect the X51A Fuse Block - Instrument Panel.
5. Enable battery saver mode (transport mode).
6. Ignition OFF and all vehicle systems OFF, disconnect the in-line harness connector X200.
7. Connect a test lamp between the control circuit terminal 38 and ground.
8. 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 and KR104B Battery Saver Relay 2.
 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.
 - **Go to next step: If the test lamp turns ON and OFF**
9. Connect a test lamp between the control circuit terminal 58 and ground.
 10. 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 and KR104B Battery Saver Relay 2.
 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.
 - **Go to next step: If the test lamp turns ON and OFF**
11. Connect the in-line harness connector X200.
 12. Disconnect the harness connector at the appropriate devices powered by the T19 Power Supply Transformer B+ supply circuit terminal 10 X1.
 13. Ignition ON.
 14. Verify that a test lamp illuminates between each of the B+ circuits listed below and ground.

NOTE: The vehicle may not be equipped with all components as listed below. Use wiring schematics to determine which components are supplied their B+ feed by the KR104A Battery Saver Relay 1. Use the connector end view to identify the B+ circuit terminal for each of those components.

- K9 Body Control Module - B+ circuit terminal 1 X2
- K41 Front and Rear Parking Assist Control Module - B+ circuit terminal 1 X1
- S25 Garage Door Opener - B+ circuit terminal 1
- A26 HVAC Controls - B+ circuit terminal 1
- S136 Infotainment Control Touchpad - B+ circuit terminal 1
- K48 Infotainment Faceplate Control Module - B+ circuit terminal 1 X1

- K74 Human Machine Interface Control Module - B+ circuit terminal 7 X1
- K73 Telematics Communication Interface Control Module - B+ circuit terminal 15 X1
- P16 Instrument Cluster - B+ circuit terminal 7
- X83 Auxiliary Audio Input - B+ circuit terminal 6 X1
- P6 Clock - B+ circuit terminal 1
- C2 Remote CD Changer - B+ circuit terminal 10
- P29 Head-Up Display B+ circuit terminal 6 X1
- A11 Radio - B+ circuit terminal 1 X1

• **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 , replace the X51A Fuse Block - Instrument Panel.

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

1. Ignition OFF.
2. Test for infinite resistance between the Ignition circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, test or replace the appropriate device powered by the T19 Power Supply Transformer B+ supply circuit terminal 10 X1.

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

15. Test or replace the appropriate device powered by the T19 Power Supply Transformer B+ supply circuit terminal 10 X1.

Diagnostic F

1. Ignition OFF and all vehicle systems OFF, disconnect the KR104B Battery Saver Relay 2. 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.
2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.

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

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

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

1. Ignition OFF, remove the test lamp.
2. Test for less than 2 Ω in the 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, 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 KR104B Battery Saver Relay 2.

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

5. Enable battery saver mode (transport mode).
6. Ignition OFF.
7. Connect a test lamp between the control circuit terminal 1 and ground.

8. 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 and X51A Fuse Block - Instrument Panel.
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.

- **Go to next step: 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.

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 and X51A Fuse Block - Instrument Panel.
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.

- **Go to next step: 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

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

12. Ignition ON, 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, 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.
 - **Go to next step: If the device activates**
14. Test or replace the KR104B Battery Saver Relay 2.

Component Testing

Relay Test

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

Replace the relay.

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

Replace the relay.

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

Replace the relay.

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

Repair Instructions

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

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

RETAINED ACCESSORY POWER MALFUNCTION

Diagnostic Instructions

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Relay Switch B+	1	1	1	-
Relay Switch Ignition	1	1	1, 2	-
Relay Coil Control	B305E 02	B305E 05	B305E 01, B305E 05	-
Relay Coil Ground	-	B305E 05	-	-
1. Retained accessory power malfunction 2. Retained accessory power relay always ON				

Circuit/System Description

The keyless entry control module controls certain components and 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 position. The components and relay are also energized for approximately 10 min after shutting the ignition OFF, providing no door is opened.

The keyless entry control module will deactivate the interruptible retained accessory power relay coil control circuit 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 Wiring Schematics
- Power Moding Wiring 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

1. Ignition ON.
2. Verify the appropriate devices controlled by the K84 Keyless Entry Control Module's ignition circuit terminal 7 X1 turn ON and OFF when switching the ignition between ON and OFF.
 - **If the devices do not turn ON and OFF**

Refer to Circuit/System Testing.

- **Go to next step: If the devices turn ON and OFF**

3. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the X81 Accessory Power Receptacle - 110V AC and P2 Transmission Shift Lever Position Indicator.
2. Connect a test lamp between the ignition circuits listed below and ground.

NOTE:

The vehicle may not be equipped with all components as listed below. Use wiring schematics to determine which devices are controlled directly by the K84 Keyless Entry Control Module's ignition circuit terminal 7 X1. Use the connector end view to identify the ignition circuit terminal for each of those devices.

- P2 Transmission Shift Lever Position Indicator - Control circuit terminal 4
 - X81 Accessory Power Receptacle - 110V AC - Control circuit terminal 1 X1
 - X51A Fuse Block - Instrument Panel - Fuse F4DA
 - X51A Fuse Block - Instrument Panel - Fuse F30DA
 - X51A Fuse Block - Instrument Panel - Circuit Breaker F8DA
3. Verify the test lamp turns ON and OFF when cycling the ignition between ON and OFF.
 - **If the test lamp is always OFF**
 1. Ignition OFF, remove test lamp, disconnect the harness connector at the K84 Keyless Entry Control Module and X51A Fuse Block - Instrument Panel.
 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 .
 4. Replace the K84 Keyless Entry Control Module.
 5. Connect the harness connector at the X51A Fuse Block - Instrument Panel.
 6. Verify the test lamp turns ON and OFF when cycling the ignition between ON and OFF.
 - If the test lamp is always OFF, replace the X51A Fuse Block - Instrument Panel.
 - If the test lamp turns ON and OFF.
 7. All OK.
 - **If the test lamp is always ON**
 1. Ignition OFF, remove the test lamp, disconnect the harness connector at the K84 Keyless Entry 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 K84 Keyless Entry Control Module.
 - **Go to next step: If the test lamp turns ON and OFF**
 4. Disconnect the harness connector at the appropriate X80 Accessory Power Receptacle and X92 USB Receptacle.
 5. Ignition OFF.
 6. Verify that a test lamp does not illuminate between each of the ignition circuits listed below and ground.
 - X92 USB Receptacle - Ignition circuit terminal
 - X80L Accessory Power Receptacle - Center Console - Ignition circuit terminal
 - X80F Accessory Power Receptacle - Front - Ignition circuit terminal
 - X8H Accessory Power Receptacle - Center Console - Ignition circuit terminal

- **If the test lamp illuminates**

Repair the short to voltage on the ignition circuit.

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

7. Ignition ON.

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

- X92 USB Receptacle - Ignition circuit terminal
- X80L Accessory Power Receptacle - Center Console - Ignition circuit terminal
- X80F Accessory Power Receptacle - Front - Ignition circuit terminal
- X8H Accessory Power Receptacle - Center Console - Ignition circuit terminal

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

1. Ignition OFF, remove the test lamp.

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

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , test or replace the X51A Fuse Block - Instrument Panel.

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

1. Ignition OFF.

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

- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance, test or replace the appropriate X80 Accessory Power Receptacle or X92 USB Receptacle.

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

9. Test or replace the appropriate X80 Accessory Power Receptacle or X92 USB Receptacle.

Repair Instructions

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

- Refer to [Transmission Control Replacement](#)
- Refer to [Accessory Power Receptacle Replacement](#)
- Refer to [Control Module References](#) for the keyless entry control module replacement, programming and setup.

VEHICLE WILL NOT CHANGE POWER MODE

Diagnostic Instructions

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

DTC Descriptor

NOTE: This procedure may also diagnose malfunctions that are not detected by a DTC.

DTC B097B

Power Mode Start Switch Circuit

Symptom Byte Information: [Symptom Byte List](#)

Diagnostic Fault Information

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Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal terminal 3	B097B 02*	B097B 05*	B097B 05*, 08*	-
Signal terminal 6	B097B 02**	B097B 04**	B097B 04**	-
Low Reference	-	B097B 05*, 08*	-	-
Ground	-	B097B 04**	-	-
* K84 Keyless Entry Control Module ** K9 Body Control Module				

Circuit/System Description

Circuit	Description
Signal terminal 3	When the switch is closed it will pull the signal voltage low.
Signal terminal 6	When the switch is closed it will pull the signal voltage low.
Low Reference	Grounded through the control module.
Ground	Chassis Ground

Component	Description
K9 Body Control Module	The control module contains a microprocessor used to process input data to control outputs.
K84 Keyless Entry Control Module	The control module contains a microprocessor used to process input data to control outputs.
S38 Ignition Mode Switch	The switch has a resistance ladder and is wired to both the body control module and keyless entry control modules

The ignition mode switch contains two individual switches that provide redundant switch inputs to 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 between 9 - 16 V

Conditions for Setting the DTC

B097B 00

- The voltage seen at the body control module monitored switch does not match the voltage seen at the keyless entry control module monitored switch.
- The above condition(s) must occur for greater than 1 s.

B097B 02

- The control module detects a short to ground.
- The above condition(s) must occur for greater than 1 s.

B097B 04

- The control module detects an open circuit.
- The above condition(s) must occur for greater than 1 s.

B097B 05

- The control module detects an open circuit.
- The above condition(s) must occur for greater than 1 s.

B097B 08

- The control module detects a change in the ignition mode without observing a switch press.
- The above condition(s) must occur 4 times.

B097B 61

- The control module detects a continuously closed switch.
- The above condition(s) must occur for greater than 60 s.

Actions Taken When the DTC Sets

B097B 00, 04, 05, 08, 61

No action is taken.

B097B 02

The concerned output is switched off.

Conditions for Clearing the DTC

The conditions for setting the DTC no longer exist.

A history DTC will clear after 40 consecutive malfunction-free ignition cycles.

Reference Information

Schematic Reference

Power Moding Wiring Schematics

Power Distribution Wiring Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Power Mode Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Ignition - On/Vehicle - In Service Mode
2. Verify DTC B2097B 61 is not set.
 - **If the DTC is set**

Test or replace the component: S38 Ignition Mode Switch

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

3. Refer to Circuit/System Testing below

Circuit/System Testing

NOTE: It may take up to 2 min for all vehicle systems to power down before an accurate ground or low reference circuit continuity test can be performed.

1. Ignition/Vehicle & All vehicle systems - Off
2. Disconnect the electrical connector: S38 Ignition Mode Switch
3. Test for less than 10 Ω between the test points: Ground circuit terminal @ Component harness & Ground
 - **If 10 Ω or greater**
 1. Test for less than 2 Ω between the test points: Ground circuit terminal @ Component harness & Ground Connection
 - If 2 Ω or greater - Repair the open/high resistance in the circuit.
 - If less than 2 Ω - Repair the open/high resistance in the ground connection.
 - **Go to next step: If less than 10 Ω**
4. Test for less than 10 Ω between the test points: Low Reference terminal 7 @ Component harness & Ground
 - **If 10 Ω or greater**
 1. Disconnect the electrical connector: X1 @ K84 Keyless Entry Control Module
 2. Test for less than 2 Ω between the test points: Low Reference terminal 7 @ Component harness & Terminal 12 @ K84 Keyless Entry Control Module
 - If 2 Ω or greater - Repair the open/high resistance in the circuit.
 - If less than 2 Ω - Replace the component: K84 Keyless Entry Control Module
 - **Go to next step: If less than 10 Ω**
5. Connect the electrical connector: S38 Ignition Mode Switch
6. Ignition - On/Vehicle - In Service Mode
7. Disconnect the electrical connector: S38 Ignition Mode Switch
8. Verify the scan tool parameter: K9 Body Control Module Push Button Ignition Switch = Greater than 11 V
 - **If less than 11 V**
 1. Ignition/Vehicle - Off
 2. Disconnect the electrical connector: X2 @ K9 Body Control Module
 3. Test for infinite resistance between the test points: Signal circuit terminal 17 @ Control module harness & Ground
 - If less than infinite resistance - Repair the short to ground on the circuit.
 - If infinite resistance - Replace the component: K9 Body Control Module
 - **Go to next step: If greater than 11 V**
9. Connect a 3 A fused jumper wire between the test points: Signal circuit terminal 6 & Ground
10. Verify the scan tool parameter: K9 Body Control Module Push Button Ignition Switch = Less than 1 V
 - **If 1 V or greater**
 1. Disconnect the electrical connector: X2 @ K9 Body Control Module
 2. Test for less than 1 V between the test points: Signal circuit terminal 17 @ Control module harness & 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 between the test points: Signal circuit terminal 6 @ Component harness & Terminal 17 @ K9 Body Control Module
 - If 2 Ω or greater - Repair the open/high resistance in the circuit.
 - If less than 2 Ω - Replace the component: K9 Body Control Module
 - **Go to next step: If less than 1 V**
11. Connect the electrical connector: S38 Ignition Mode Switch
12. Verify the scan tool parameter: K9 Body Control Module Push Button Ignition Switch = 8 to 10 V
 - **If not between 8 and 10 V**
 Replace the component: S38 Ignition Mode Switch
 - **Go to next step: If between 8 and 10 V**
13. Press and hold the switch: S38 Ignition Mode Switch
14. Verify the scan tool parameter: K9 Body Control Module Push Button Ignition Switch = 4 to 7 V
 - **If not between 4 and 7 V**
 Replace the component: S38 Ignition Mode Switch
 - **Go to next step: If between 4 and 7 V**
15. Disconnect the electrical connector: X1 @ K84 Keyless Entry Control Module
16. Test for infinite resistance between the test points: Signal circuit terminal 11 @ Control module harness & Ground
 - **If less than infinite resistance**
 Repair the short to ground on the circuit.
 - **Go to next step: If infinite resistance**
17. Test for less than 1 V between the test points: Signal circuit terminal 11 @ Control module harness & Ground
 - **If 1 V or greater**
 Repair the short to voltage on the circuit.
 - **Go to next step: If less than 1 V**
18. Test for 4.5 to 5.5 k Ω between the test points: Signal circuit terminal 11 @ K84 Keyless Entry Control Module & Low Reference terminal 12 @ K84 Keyless Entry Control Module
 - **If not between 4.5 and 5.5 k Ω**
 1. Ignition/Vehicle - Off
 2. Disconnect the electrical connector: S38 Ignition Mode Switch
 3. Test for less than 2 Ω between the test points: Signal circuit terminal 11 @ K84 Keyless Entry Control Module & Signal circuit terminal 3 @ S38 Ignition Mode Switch
 - If 2 Ω or greater - Repair the open/high resistance in the circuit.
 - If less than 2 Ω - Replace the component: S38 Ignition Mode Switch
 - **Go to next step: If between 4.5 and 5.5 k Ω**
19. Press and hold the switch: S38 Ignition Mode Switch
20. Test for 1 to 1.5 k Ω between the test points: Signal circuit terminal 11 @ K84 Keyless Entry Control Module & Low Reference terminal 12 @ K84 Keyless Entry Control Module
 - **If not between 1 and 1.5 k Ω**
 Test or replace the component: S38 Ignition Mode Switch
 - **Go to next step: If between 1 and 1.5 k Ω**
21. Replace the component: K84 Keyless Entry Control Module

1. Ignition/Vehicle - Off
2. Disconnect the electrical connector: S38 Ignition Mode Switch
3. Test for 4.5 to 5.5 k Ω between the test points:
 - Signal circuit terminal 6 & Ground circuit terminal 4
 - Signal circuit terminal 3 & Low Reference terminal 7
 - **If not between 4.5 and 5.5 k Ω**

Replace the component: S38 Ignition Mode Switch

- **Go to next step: If between 4.5 and 5.5 k Ω**
4. Press and hold the switch: S38 Ignition Mode Switch
 5. Test for 1 to 1.5 k Ω between the test points:
 - Signal circuit terminal 6 & Ground circuit terminal 4
 - Signal circuit terminal 3 & Low Reference terminal 7
 - **If not between 1 and 1.5 k Ω**

Replace the component: S38 Ignition Mode Switch

- **Go to next step: If between 1 and 1.5 k Ω**
6. All OK.

Repair Instructions

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

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

GENERAL ELECTRICAL DIAGNOSIS

Basic Knowledge Required

Without a basic knowledge of electricity, it will be difficult to use the diagnostic procedures contained in the service information. 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](#)
- [Testing for Electrical Intermittents](#)
- [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.

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

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

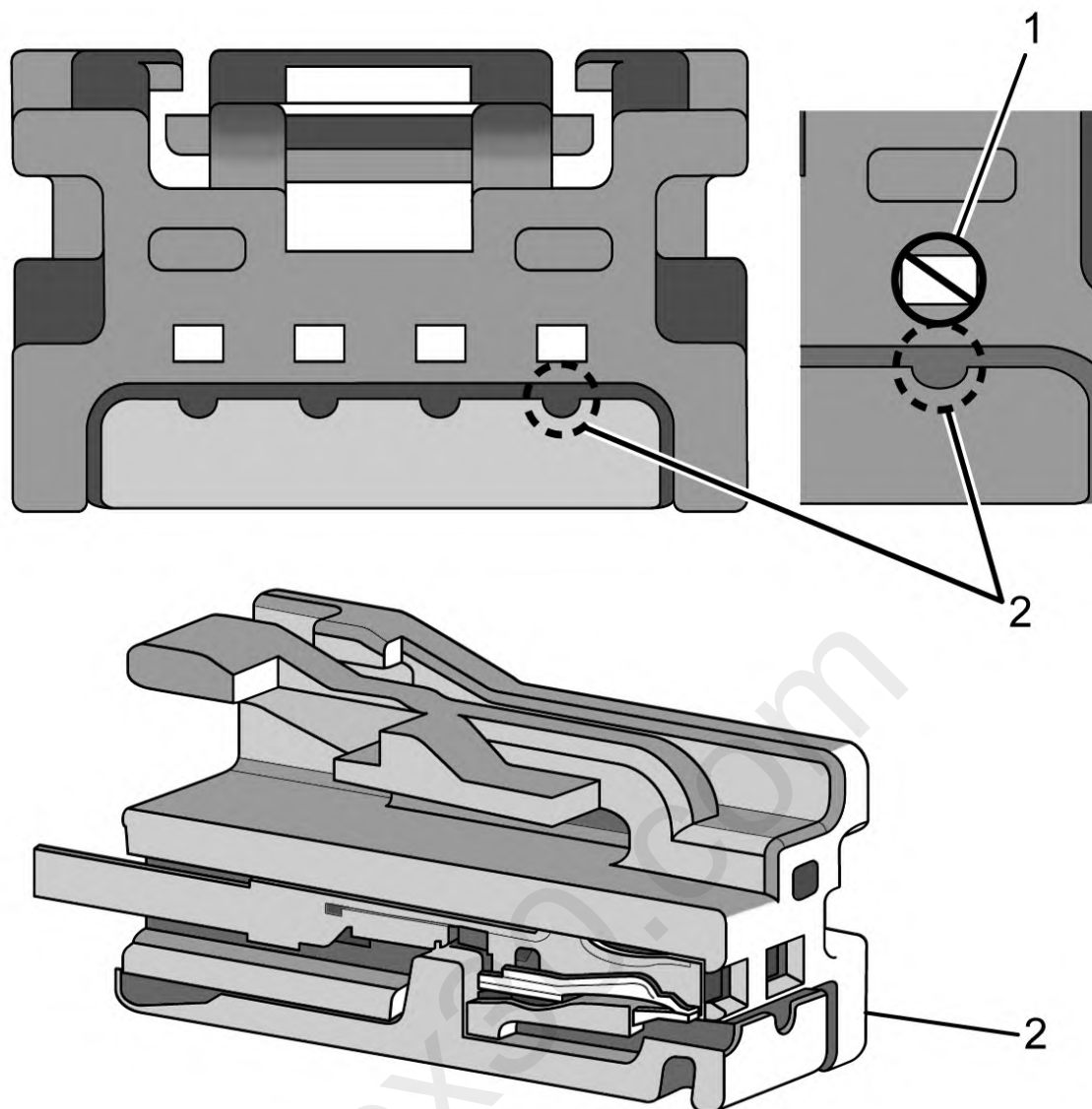


Fig. 1: Female Terminal And Connector Test Point

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)

Test Adapter	Description
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)
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

EL-39200 Digital Multimeter (DMM)

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

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 kHz

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

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

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

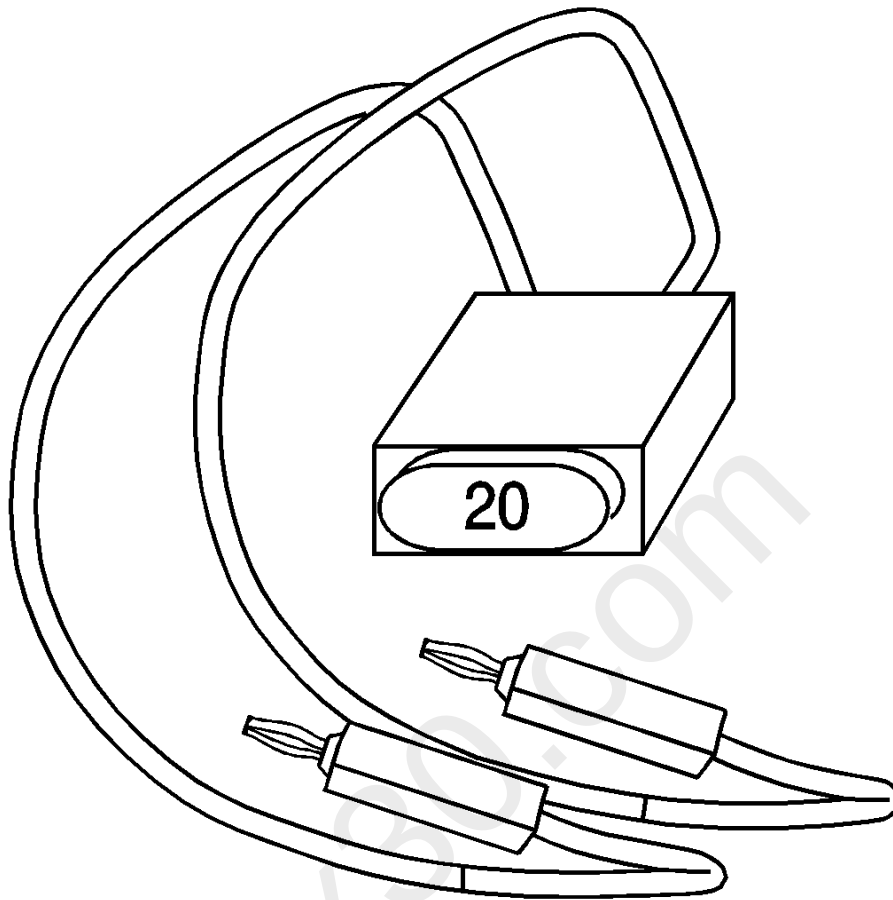


Fig. 2: Fused Jumper Wire

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.

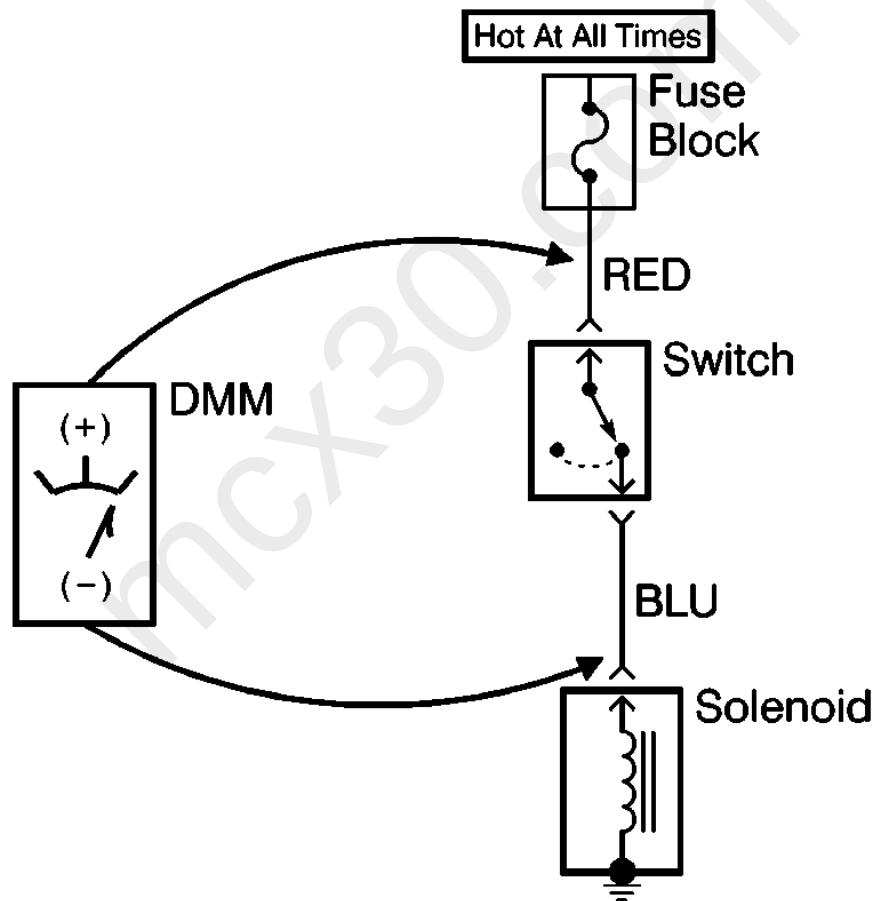


Fig. 3: Measuring Voltage Drop

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.

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 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 Wiring Schematics .
- Test all control module ground and system ground circuits. The control module may have multiple ground circuits. Other components in the system may have separate grounds that may also need to be tested. Inspect grounds for clean and tight connections at the grounding point (screw or stud). Inspect the connections at the component and in splice packs, where applicable. Operate the component to test the ability of the circuit to carry sufficient current. Refer to [Circuit Testing](#), and Ground Distribution Wiring Schematics .

Temperature Sensitivity

- An intermittent condition may occur when a component/connection reaches normal operating temperature. The condition may occur only when the component/connection is cold, or only when the component/connection is hot.
- Freeze Frame, Failure Records, Snapshot, or Vehicle Data Recorder data may help with this type of intermittent condition, where applicable.
- If the intermittent is related to heat, review the data for a relationship with the following:
 - High ambient temperatures
 - Underhood/engine generated heat
 - Circuit generated heat due to a poor connection, or high electrical load
 - Higher than normal load conditions, towing, etc.
- If the intermittent is related to cold, review the data for the following:
 - Low ambient temperatures - In extremely low temperatures, ice may form in a connection or component. Inspect for water intrusion.
 - The condition only occurs on a cold start.
 - The condition goes away when the vehicle warms up.

- Information from the customer may help to determine if the trouble follows a pattern that is temperature related.
- If temperature is suspected of causing an intermittent fault condition, attempt to duplicate the condition. Refer to [Inducing Intermittent Fault Conditions](#) in order to duplicate the conditions required.

Electromagnetic Interference and Electrical Noise

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

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

Incorrect Control Module

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

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

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

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

EL-39200 Digital Multimeter

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.

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.

4. Select the MIN MAX function of the DMM. The DMM displays the 100 ms RECORD and emits an audible tone (beep).
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.

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](#).

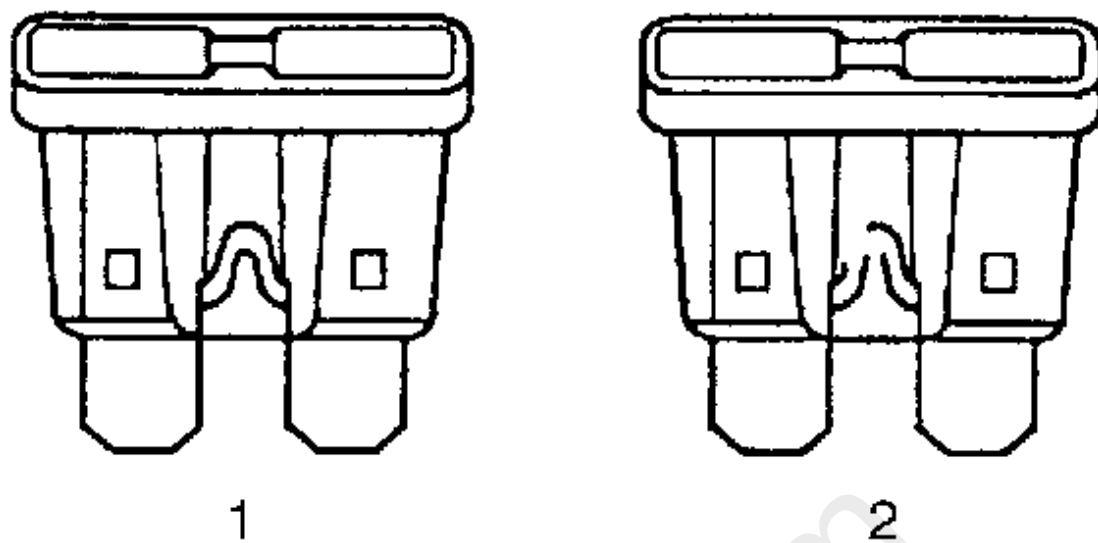


Fig. 4: Good Fuse And Open (Melted) Fuse
Courtesy of GENERAL MOTORS COMPANY

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 \(Micro.64\)](#) [Delphi Connectors \(12-Way\)](#) [Delphi Connectors \(Steering Gear\)](#)
- [FCI Connectors \(Lever Lock\)](#) [FCI Connectors \(SIR\)](#)
- [FEP Connectors \(Steering Gear\)](#)
- [JST Connectors](#)
- [Kostal Connectors \(Glow Plug Control Module\)](#) [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

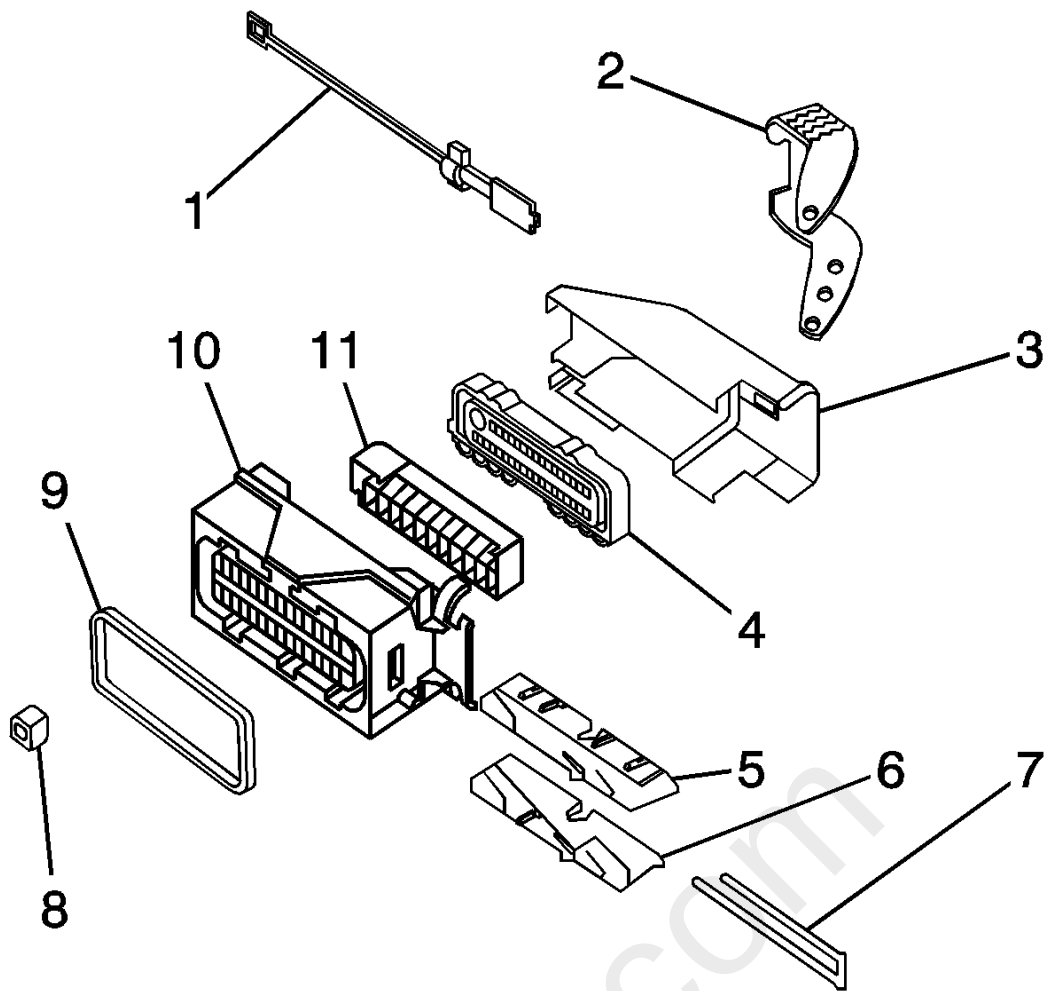


Fig. 5: Identifying Typical Connector Components
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Connector Positive Assurance (CPA)
2	Assist Lever
3	Wires/Cables
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.

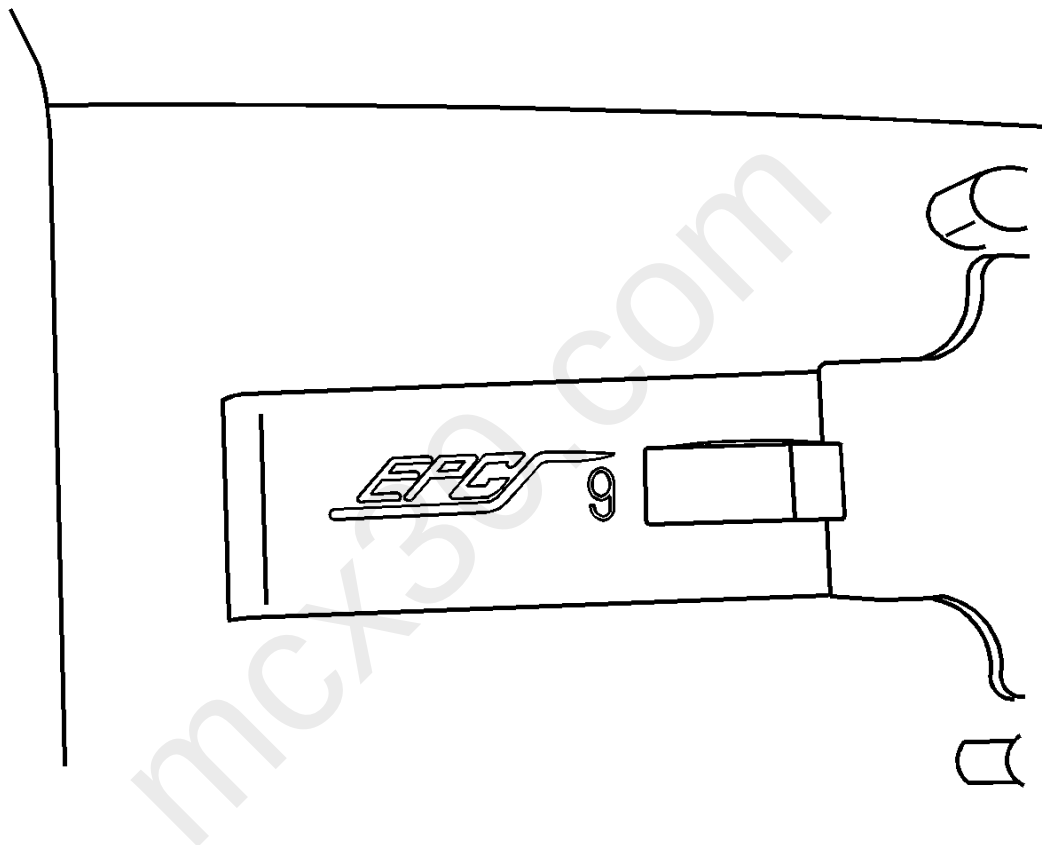


Fig. 6: EPC Identification On Connector Body.
Courtesy of GENERAL MOTORS COMPANY

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

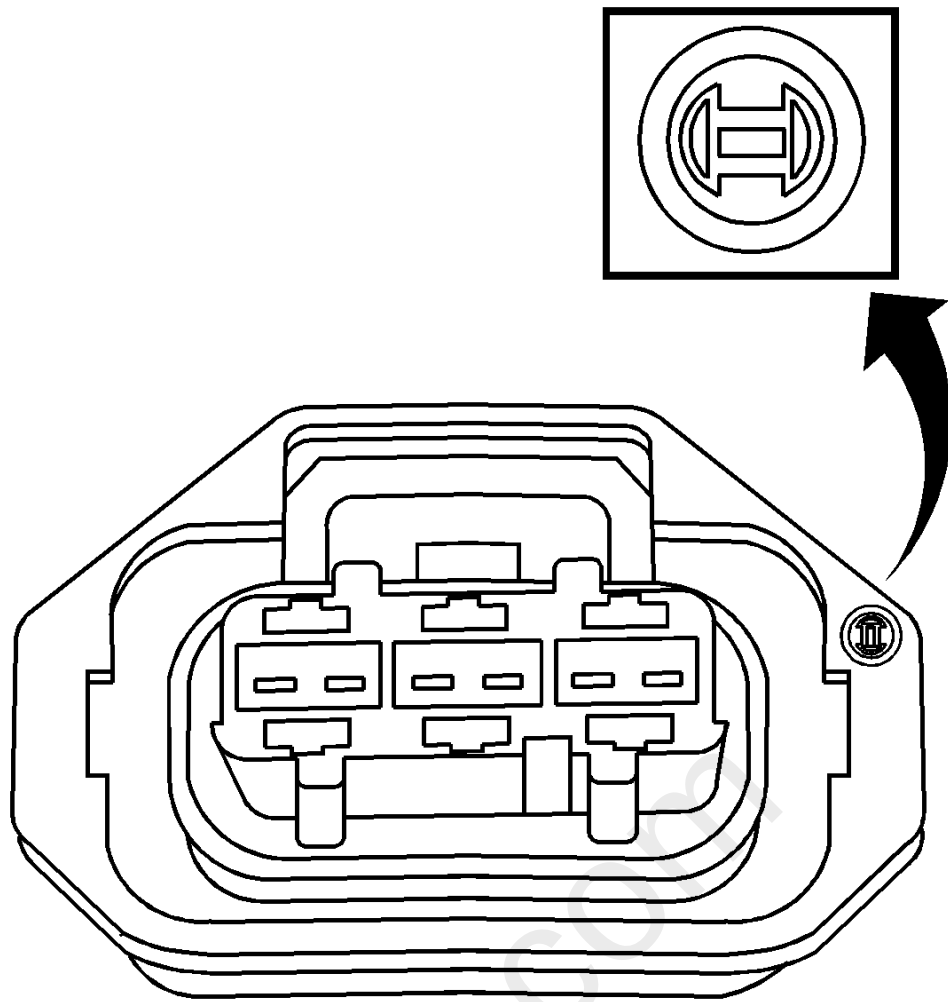


Fig. 7: Bosch Identification On Connector Body.
Courtesy of GENERAL MOTORS COMPANY

- 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.

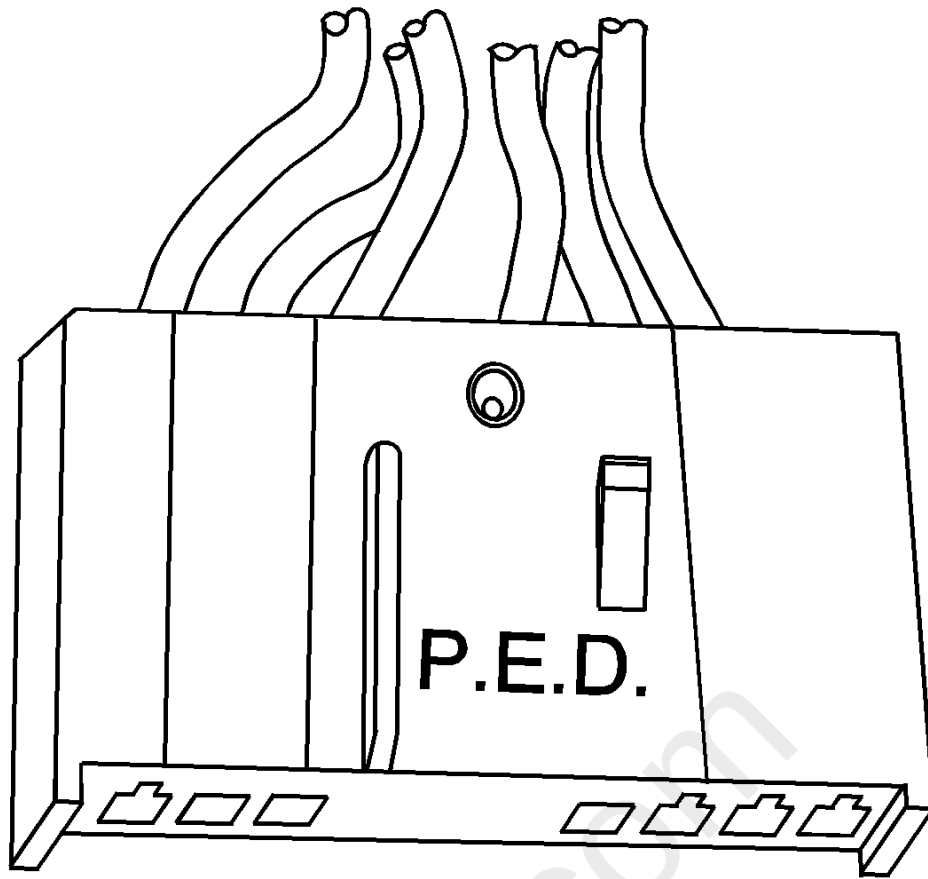


Fig. 8: PED Identification On Connector Body.

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.

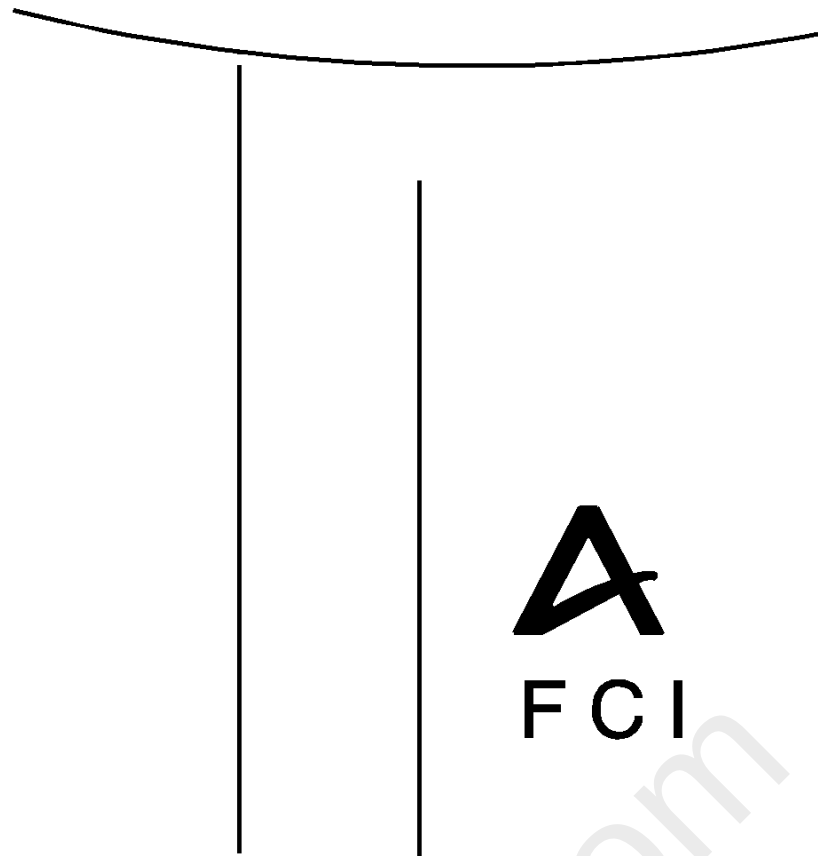


Fig. 9: FCI Identification On Connector Body.
Courtesy of GENERAL MOTORS COMPANY

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

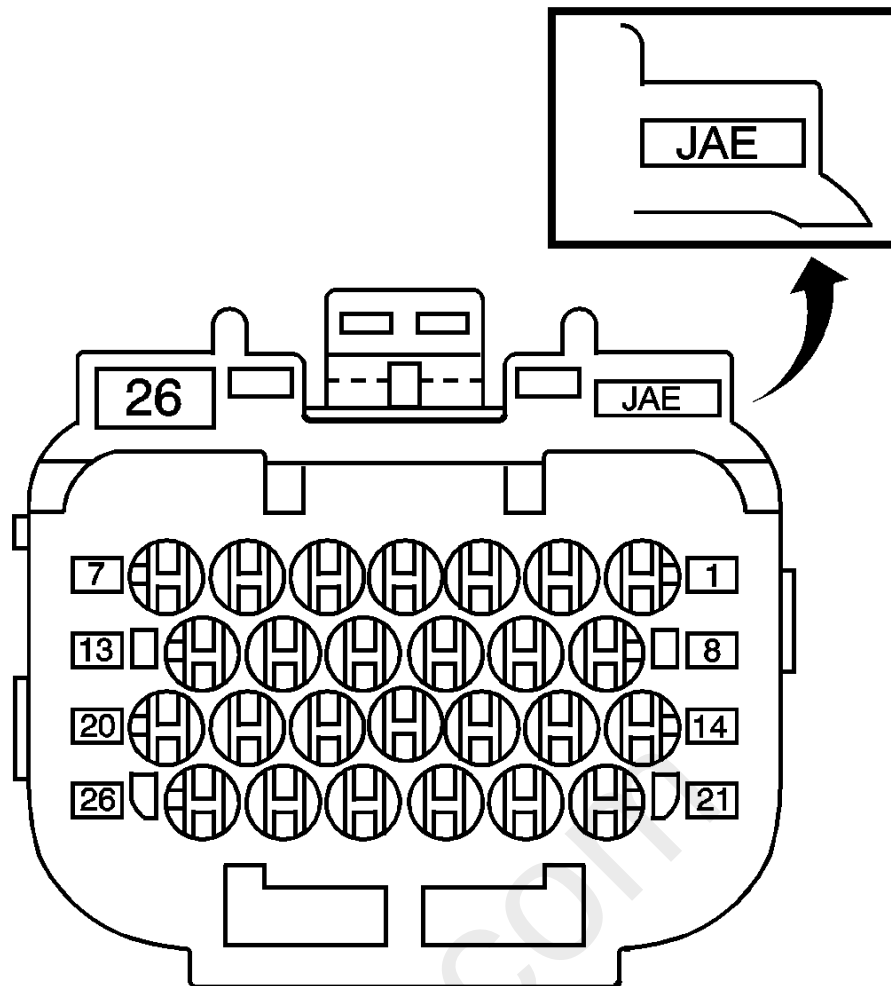


Fig. 10: JAE Identification On Connector Body.
Courtesy of GENERAL MOTORS COMPANY

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

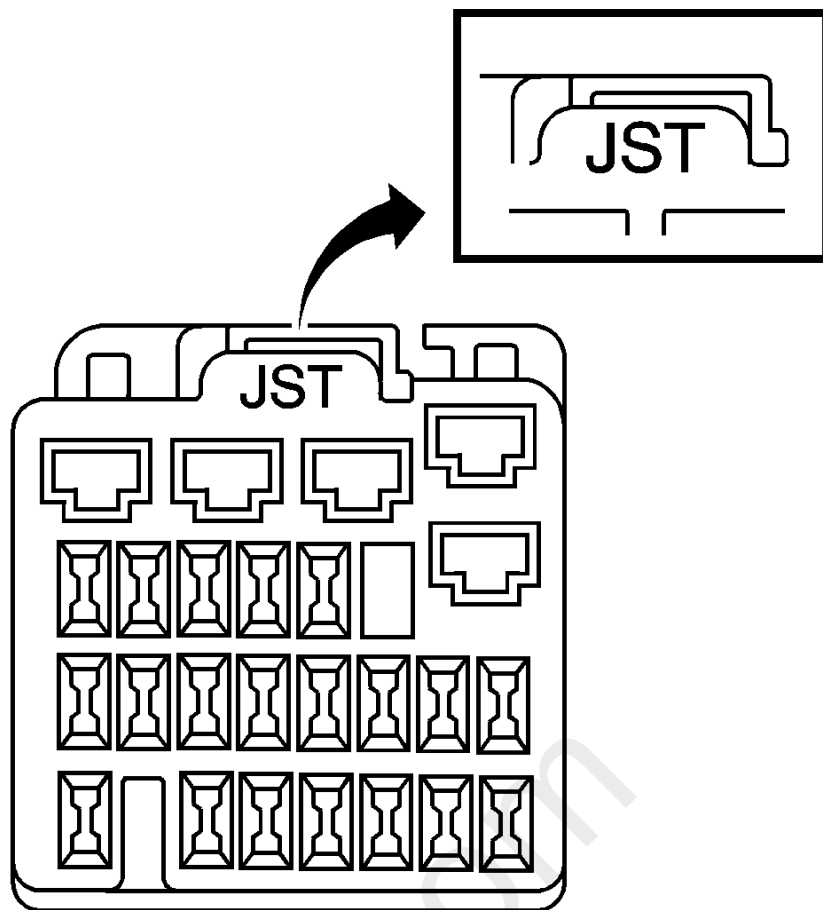


Fig. 11: JST Identification On Connector Body.

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.

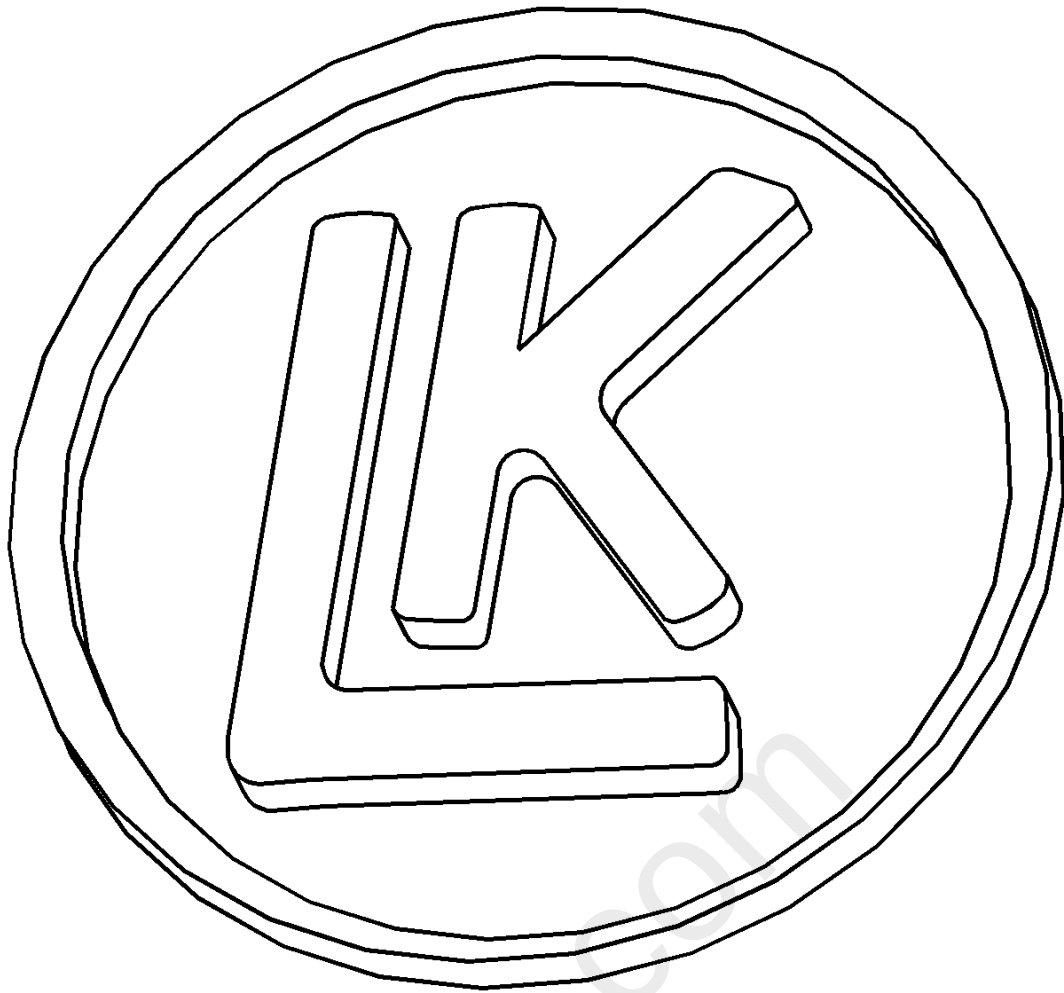


Fig. 12: Kostel Identification On Connector Body.

Courtesy of GENERAL MOTORS COMPANY

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

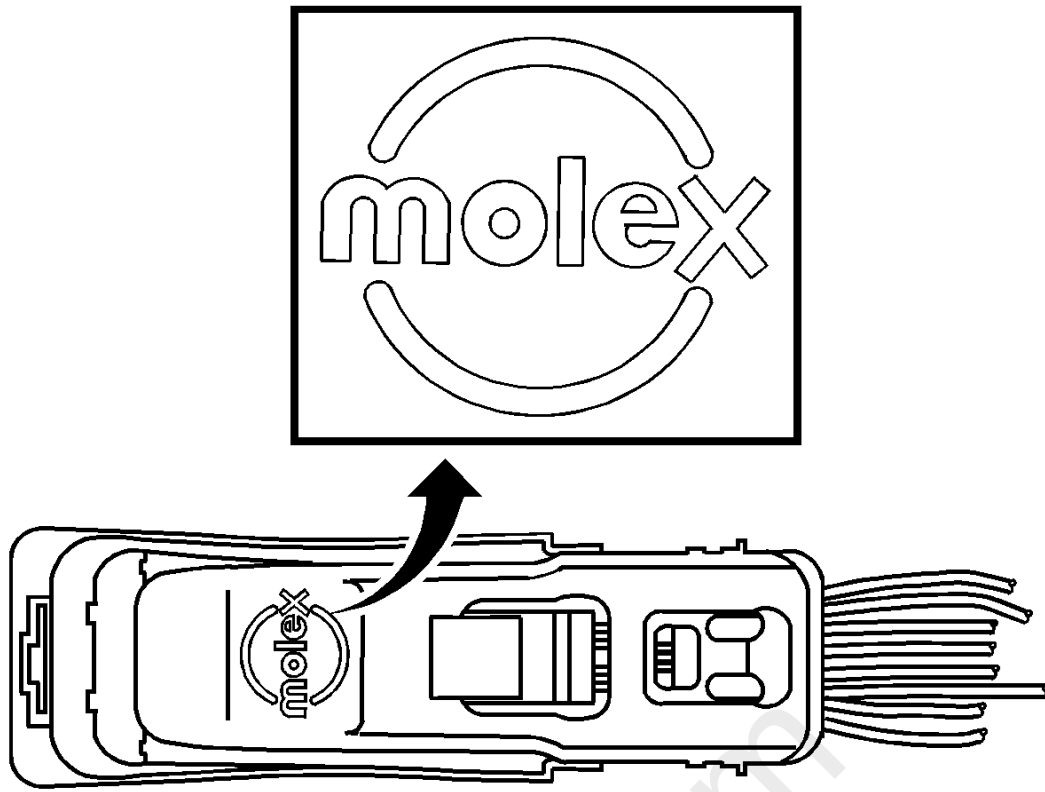


Fig. 13: Molex Identification On Connector Body.
Courtesy of GENERAL MOTORS COMPANY

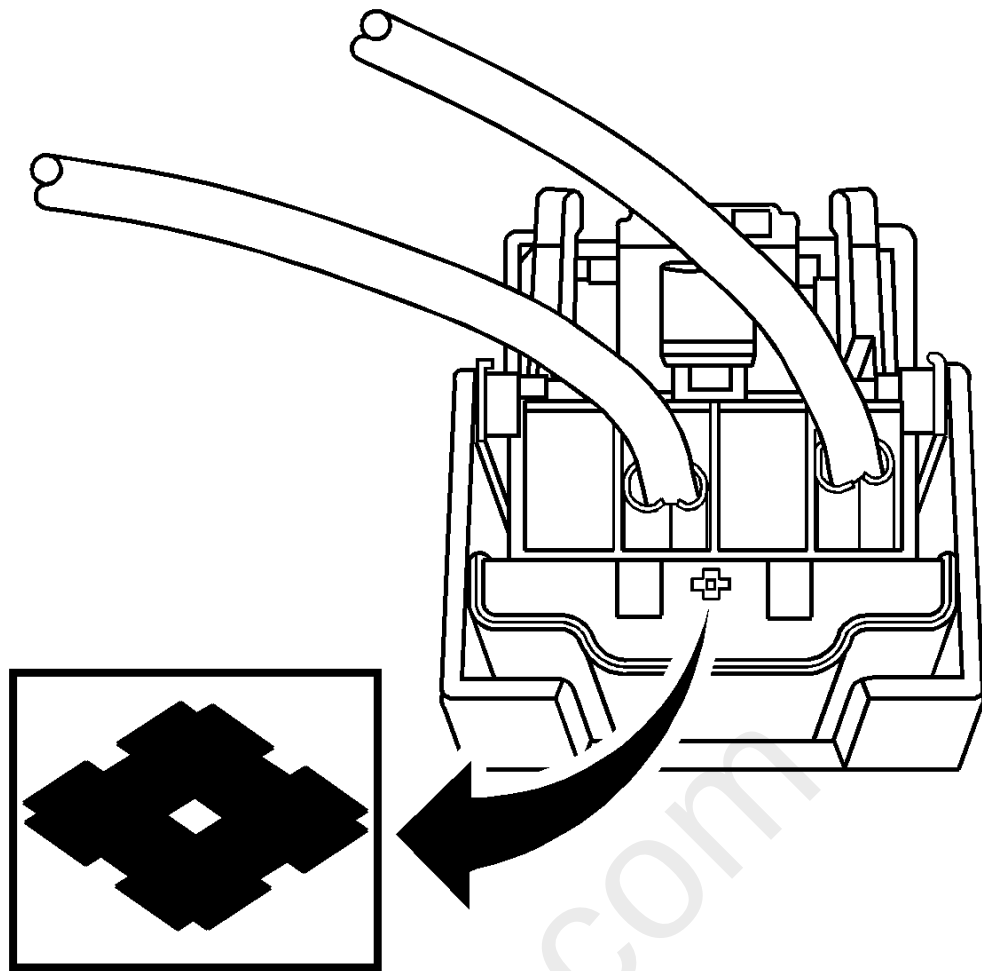


Fig. 14: Sumitomo Identification On Connector Body.
 Courtesy of GENERAL MOTORS COMPANY

- 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.

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

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

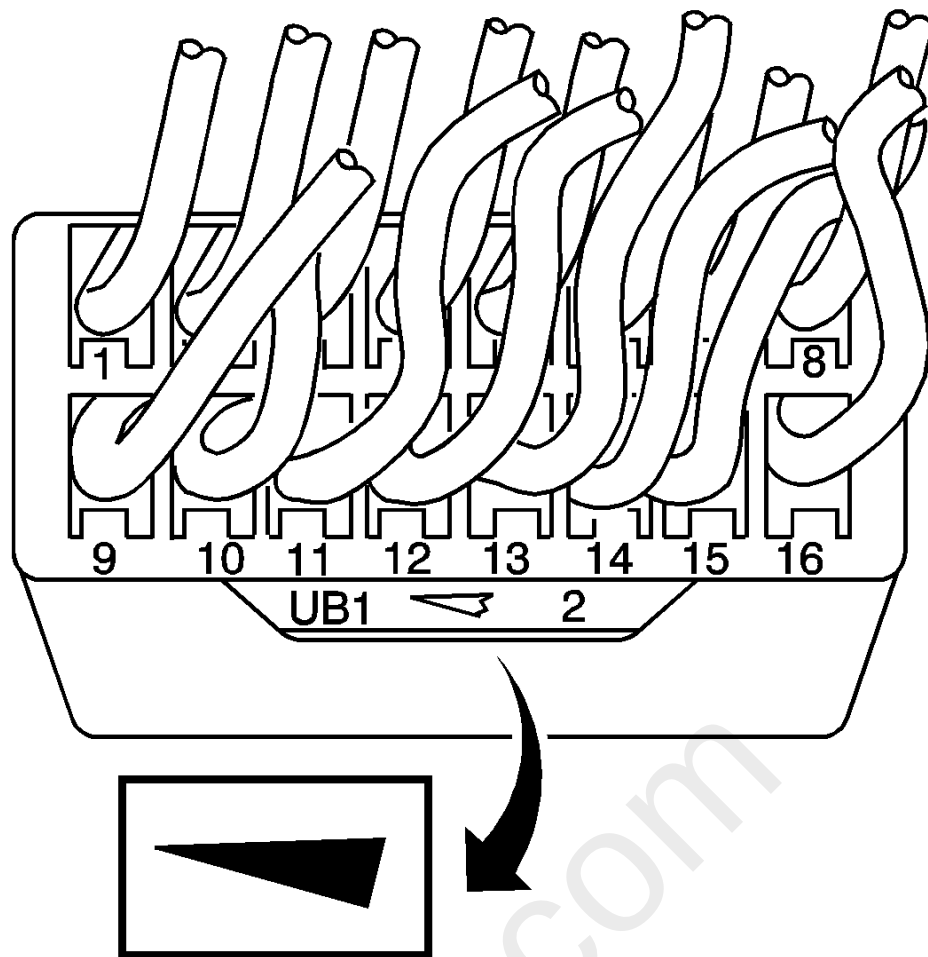


Fig. 15: Yazaki Identification On Connector Body.

Courtesy of GENERAL MOTORS COMPANY

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