

2017 ELECTRICAL

Wiring Systems and Power Management - Description and Operation - Impala

DESCRIPTION AND OPERATION

ELECTRONIC PARK LOCK DESCRIPTION AND OPERATION

Without ATH or BTM

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

With ATH or BTM

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

Serial Data Power Mode Master

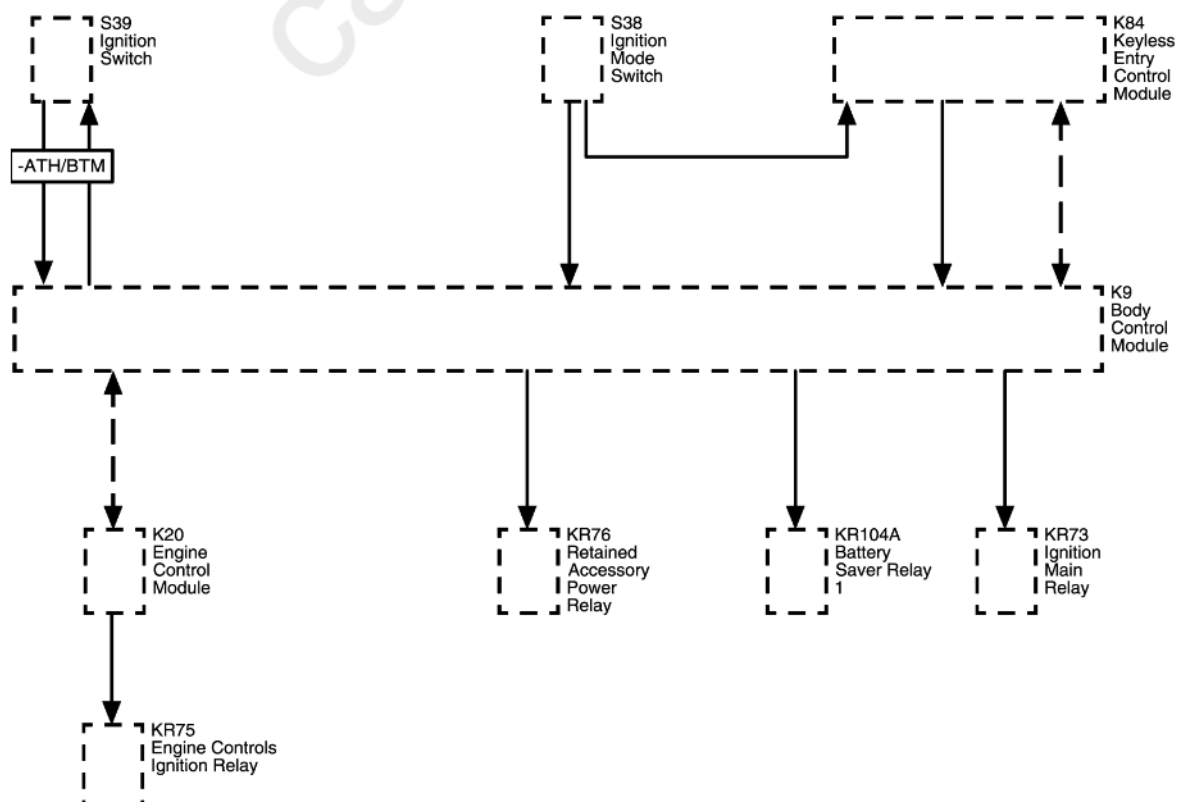


Fig. 1: Power Moding D&O Block Diagram
Courtesy of GENERAL MOTORS COMPANY

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 switch is a low current switch with multiple discrete ignition switch signals 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, Crank Request) 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 switch or ignition mode switch signals to identify the operators desired power mode. The Power Mode Parameter tables below illustrate the correct state of these input parameters (circuits) in correspondence to the ignition switch position or 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

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)
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. 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. 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.

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 seconds. 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

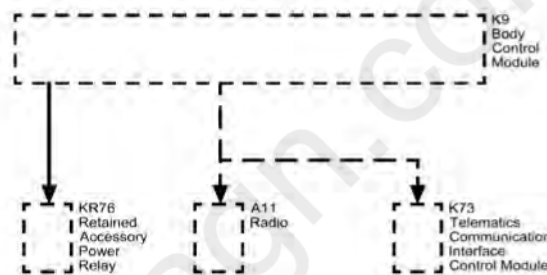


Fig. 2: RAP Description and Operation Block Diagram

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
K9	K9 Body Control Module
K73	K73 Telematics Communication Interface Control Module
A11	A11 Radio
KR76	KR76 Retained Accessory Power Relay

Retained Accessory Power

The body control module (BCM) monitors the ignition switch 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; relay control 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 through

a relay. Components and systems that are active in retained accessory power are also activated anytime the ignition is in any position other than OFF regardless of the door switch signals.

Relay Controlled Retained Accessory Power

The BCM keeps the relay energized during all power modes, except Off-Awake and Crank. The relay is also energized for approximately 10 minutes after shutting the ignition OFF and removing the key, 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 minutes.
- The BCM detects a decrease in battery capacity below a prescribed limit.

Systems powered by the retained accessory power relay 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
- Cigarette Lighter Receptacle
- Window Switches
- Sunroof Control Module
- Sunroof Switch
- Mobile Device Wireless Charger Module
- Mobile Telephone Control Module
- Traffic Data Receiver
- Transmission Shift Lever Position Indicator (w/floor mounted console gear shift)
- Seat Heating Control Module

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.

2017 ELECTRICAL

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

DIAGNOSTIC INFORMATION AND PROCEDURES

DTC B097B: POWER MODE START SWITCH CIRCUIT

Diagnostic Instructions

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

DTC Descriptors

DTC B097B

Power Mode Start Switch Circuit

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal - Terminal 3	B097B 02*	B097B 05*	B097B 05*, B097B 08*	-
Signal - Terminal 6	B097B 02	B097B 04	B097B 04	-
Low Reference	-	B097B 05*, B097B 08*	-	-
Ground	-	B097B 04	-	-

* DTC set in keyless entry control module

Circuit/System Description

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

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

Conditions for Running the DTC

Control module voltage is 9 - 16 V.

Conditions for Setting the DTC

B097B 02

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

B097B 04

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

B097B 05

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

B097B 08

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

B097B 61

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

Action Taken When the DTC Sets

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

No action is taken.

B097B 02

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

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

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

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

- [Power Mode Description and Operation](#)
- [Keyless Entry System Description and Operation \(without BTM\)](#) [Keyless Entry System Description and Operation \(with BTM\)](#)

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

Scan Tool Reference

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

Circuit/System Verification

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

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

Circuit/System Testing

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

2. Test for less than 1 V between the signal circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V
3. Test for less than 2 Ω in signal circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K9 Body Control Module.
- **If less than 1 V**
9. Connect the harness connector at the S38 Ignition Mode Switch.
10. Verify the scan tool K9 Body Control Module Push Button Ignition Switch Voltage parameter is 8 - 10 V, with the S38 Ignition Mode Switch released.
 - **If not between 8 - 10 V**

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

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

Repair the short to ground on the circuit.
 - **If infinite resistance**
14. Ignition ON.
15. Test for less than 1 V between the signal circuit terminal 11 and ground.
 - **If 1 V or greater**

Repair the short to voltage on the circuit.
 - **If less than 1 V**
16. Test for 4.5 - 5.5 k Ω between the signal circuit terminal 11 and the low reference circuit terminal 12, with the S38 Ignition Mode Switch released.
 - **If not between 4.5 - 5.5 k Ω**
 1. Ignition OFF, disconnect the harness connector at the S38 Ignition Mode Switch.
 2. Test for less than 2 Ω in the signal circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , test or replace the S38 Ignition Mode Switch.
 - **If between 4.5 - 5.5 k Ω**
17. Test for 1 - 1.5 k Ω between the signal circuit terminal 11 and the low reference circuit terminal 12, with the S38 Ignition Mode Switch pressed.
 - **If not between 1 - 1.5 k Ω**

Test or replace the S38 Ignition Mode Switch.
 - **If between 1 - 1.5 k Ω**
18. Replace the K84 Keyless Entry Control Module.

Component Testing

Ignition Mode Switch Test

1. Ignition OFF, disconnect the harness connector at the S38 Ignition Mode Switch.
2. Test for 4.5 - 5.5 k Ω between the terminals listed below with the S38 Ignition Mode Switch released:

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

Replace the S38 Ignition Mode Switch.

- **If between 4.5 - 5.5 k Ω**

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

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

Replace the S38 Ignition Mode Switch.

- **If between 1 - 1.5 k Ω**

4. All OK.

Repair Instructions

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

- Refer to [Ignition and Start Switch Replacement \(Without BTM\)](#) [Ignition and Start Switch Replacement \(With BTM\)](#)
- Refer to [Control Module References](#) for the appropriate control module replacement, programming and setup.

DTC B097C: POWER MODE RUN/START INDICATOR CIRCUIT

Diagnostic Instructions

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

DTC Descriptors

DTC B097C

Power Mode Run/Start Indicator Circuit

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Control circuit terminal 5	B097C 02	1	2	-
Ground	-	1	-	-
1. Ignition Mode switch indicator always off 2. Ignition mode switch indicator always on				

Circuit/System Description

The ignition mode switch has two LEDs that indicate the vehicle power mode. When the vehicle is in the off mode, both LEDs will be off. Pressing the ignition mode switch button once (without the brake pedal applied), the vehicle enters the accessory mode and the amber LED (Accessory) will illuminate.

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

Conditions for Running the DTC

Control module voltage is 9 - 16 V

Conditions for Setting the DTC

B097C 02

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

Action Taken When the DTC Sets

The BCM disables the control output.

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

Power Moding Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Power Mode Description and Operation

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

3. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the S38 Ignition Mode Switch. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 4 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connections.
 - **If less than 10 Ω**
3. Connect the harness connector at the S38 Ignition Mode Switch.
4. Ignition ON, disconnect the harness connector at the S38 Ignition Mode Switch.
5. Connect a test lamp between the control circuit terminal 5 and ground.
6. Verify the test lamp stays OFF when commanding Run/Start Power Mode Indicator Off with the scan tool.
 - **If the test lamp is always ON**
 1. Connect the harness connector at the S38 Ignition Mode Switch.
 2. Ignition OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module.
 3. Ignition ON, disconnect the harness connector at the S38 Ignition Mode Switch.
 4. Test for less than 1 V between the control circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K9 Body Control Module.
 - **If the test lamp is always OFF**
7. Test for greater than 3 V between the control circuit terminal 5 and ground while commanding Run/Start Power Mode Indicator On with the scan tool.
 - **If 3 V or less**
 1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module.
 2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K9 Body Control Module.
 - **If 3 V or greater**
8. Test or replace the S38 Ignition Mode Switch.

Component Testing

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

Replace the S38 Ignition Mode Switch.
 - **If the LED illuminates**
5. Connect a 3 A fused jumper wire between the S38 Ignition Mode Switch terminal 2 and B+.
6. Verify the amber LED illuminates.

- If the LED does not illuminate

Replace the S38 Ignition Mode Switch.

- If the LED illuminates

7. All OK.

Repair Instructions

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

- Refer to [Ignition and Start Switch Replacement \(Without BTM\)](#) [Ignition and Start Switch Replacement \(With BTM\)](#)
- Refer to [Control Module References](#) for the body control module replacement, programming and setup.

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

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- 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 is in the Accessory position.

B1370 06

Ignition is in the 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 check engine light is always off.

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

Instrument Cluster Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

- **Instrument Cluster Description and Operation**
- **Power Mode Description and Operation**

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Verify that DTC B144B or B1380 is not set.
 - **If DTC B144B or B1380 is set**
Refer to **Diagnostic Trouble Code (DTC) List - Vehicle** .
 - **If DTC B144B or B1380 is not set**
2. Refer to Circuit/System Testing.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the P16 Instrument Cluster.
2. Verify that a test lamp does not illuminate between the ignition circuit terminal 8 and ground.
 - **If the test lamp illuminates**
Repair the short to voltage on the ignition circuit.
 - **If the test lamp does not illuminate**
3. Ignition ON.

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.

- **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: BODY CONTROL MODULE IGNITION ON AND START CIRCUIT/ACCESSORY CIRCUIT/OFF, RUN, AND CRANK 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

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	-	-

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
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 Schematics](#)
- [Power Distribution Schematics](#)

Connector End View Reference

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- [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](#) .

- **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.

- **If the power mode parameters change**

4. All OK.

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 $2\ \Omega$ in the B+ circuit end to end.
 - If $2\ \Omega$ or greater, repair the open/high resistance in the circuit.
 - If less than $2\ \Omega$, 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
- **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 $2\ \Omega$ in the 5 V reference circuit end to end.
 - If $2\ \Omega$ or greater, repair the open/high resistance in the circuit.
 - If less than $2\ \Omega$, 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.
 - **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.

- **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.

- **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.

- **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.

- **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 \(Without BTM\)](#) [Ignition and Start Switch Replacement \(With BTM\)](#)
- Refer to [Control Module References](#) for control module replacement, programming and setup.

DTC B1445: BODY 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 Descriptor

DTC B1445

Control Module Voltage Output Circuit

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Relay Coil Control	B1445 02	B1445 04	B1445 01	-
Ground	-	B1445 04	-	-

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 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.
 - **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 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.
 - **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 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.
 - **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 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	B144A 04	B144A 01	-

Circuit/System Description

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

Conditions for Running the DTC

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

Conditions for Setting the DTC

B144A 01

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

B144A 02

The BCM detects a short to ground in the ignition circuit.

B144A 04

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

Action Taken When the DTC Sets

B144A 01, B144A 04

No action is taken.

B144A 02

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

Instrument Cluster Schematics

Connector End View Reference

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Description and Operation

Power Mode Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the K18 Compass Module. 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.
 - **If less than 10 Ω**
3. Connect a test lamp between the ignition circuit terminal 1 and ground circuit terminal 2.
 4. Verify the test lamp turns ON and OFF when switching the ignition ON and OFF.
 - **If the test lamp is always OFF**
 1. Ignition OFF remove the test lamp, disconnect the harness connector at the 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.
 - **If the test lamp turns ON and OFF**
 5. Test or replace the K18 Compass Module.

Repair Instructions

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

- Refer to [Control Module References](#) for the body control module or compass 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

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ignition	B144B 02*	B144B 04*	B144B 01*	-
Control	B144B 02**	B144B 04**	B144B 01**	-
* DTC set in keyless entry control module				
** DTC Set in BCM				

Circuit/System Description

The body control module (BCM) controls the ignition main relay through the control circuit by applying voltage to the run/crank relay control circuit. The ignition main relay is energized when the ignition switch is in the ON mode or the Ignition CRANK mode.

The keyless entry control module controls the backup power for the ignition main relay through the control circuit by applying voltage to the ignition circuit. This circuit is a pass-thru in the BCM and will energize the ignition circuit when the vehicle is in the ON, CRANK positions 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 relay is deactivated when the fault is set. After 100 ms, the ignition main relay will be activated. If the fault is still set, the relay will be deactivated. The ignition main relay will again be activated after 100 ms. If this also results in a fault, the ignition main relay 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 ground or open on the ignition main relay coil control will cause a no start.

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

Connector End View Reference

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- [Wiring Repairs](#)

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Verify the KR73 Ignition Main Relay clicks ON and OFF when commanding the Run/Crank Relay On and Off with a scan tool.

- **If the KR73 Ignition Main Relay does not click ON and OFF**

Refer to Circuit/System Testing.

- **If the KR73 Ignition Main Relay clicks ON and OFF**

2. All OK.

Circuit/System Testing

Without BTM

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 85 and ground.

- **If 10 Ω or greater**

1. Ignition OFF.

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

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

- **If less than 10 Ω**

3. Ignition ON, connect a test lamp between the control circuit terminal 86 and ground circuit terminal 85.
4. Verify the test lamp turns ON and OFF when commanding the 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, disconnect the harness connector at the K9 Body Control Module, ignition ON.
2. Test for less than 1 V between the control circuit and ground.

- If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K9 Body Control Module.
 - **If the test lamp turns ON and OFF**
5. Test or replace the KR73 Ignition Main Relay.

With 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.
 - **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.
 - **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.
 - **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 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.
9. Test for less than 10 Ω between the ground circuit terminal 85 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **If less than 10 Ω**
10. Connect a test lamp between the control circuit terminal 86 and the ground circuit terminal 85.

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.

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

12. Test or replace the KR73 Ignition Main 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 or keyless entry control module replacement, programming and setup.

DTC B1451: ACCESSORY POWER CIRCUIT

Diagnostic Instructions

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

DTC Descriptors

DTC B1451

Accessory Power Circuit

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ignition	B1451 02	B1451 04	B1451 01	-

Circuit/System Description

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

Conditions for Running the DTC

B1451 01, B1451 04

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

B1451 02

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

Conditions for Setting the DTC

B1451 01

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

B1451 02

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

B1451 04

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

Action Taken When the DTC Sets

B1451 02

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

B1451 01, B1451 04

No action is taken.

Conditions for Clearing the DTC

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

Diagnostic Aids

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

Reference Information

Schematic Reference

- [Power Distribution Schematics](#)
- [Remote Function Schematics](#)

- [Body Control System Schematics](#)

Connector End View Reference

[COMPONENT CONNECTOR END VIEWS - INDEX](#)

Description and Operation

[Power Mode Description and Operation](#)

Electrical Information Reference

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

Scan Tool Reference

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

[Circuit/System Verification](#)

1. Verify DTC U1814 is not set.

- **If DTC U1814 is set**

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

- **If DTC U1814 is not set**

2. Refer to Circuit/System Testing.

[Circuit/System Testing](#)

1. Ignition ON, disconnect the X2 harness connector at the K84 Keyless Entry Control Module.

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

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

1. Ignition OFF, 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 B+ circuit and ground.

- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance, replace the K84 Keyless Entry Control Module.

- **If the test lamp illuminates**

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

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

- **If 1 V or greater**

Repair the short to voltage on the circuit.

- **If less than 1 V**

5. Ignition ON.

6. Verify a test lamp illuminates between the ignition circuit terminal 5 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.
- **If the test lamp illuminates**
7. Replace the K9 Body Control Module.

Repair Instructions

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

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

DTC B147E OR B147F: BATTERY SAVER RELAY SET/RESET SECONDARY 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 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
F24DA (BCM 2) Fuse B+	B147F 01, B147F 04	B147F 01, B147F 04	-	-
Set Relay Coil Control	B147E 02	B147E 04	B147E 01	-
Reset Relay Coil Control	B147F 02	B147F 04	B147F 01	-

Circuit/System Description

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

The battery saver mode (transport mode) incorporates a latching relay that when enabled disconnects some modules from their ignition power or memory power sources. Battery saver mode (transport mode) is initiated by turning on the hazard flashers and then 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 ON position and then again unlatching the relay after the ignition is turned OFF. The mode is disengaged by repeating the previous process causing the relay to latch in the other direction. The driver information center (if equipped) will display Transport Mode is On when the transport mode is enabled and Transport Mode is Off when the transport mode is disabled. For vehicles not equipped with a driver information center, the battery indicator light will constantly flash on the instrument cluster when transport mode is enabled. Once the vehicle is running and the hazard flashers are on, turning the ignition key into the crank position or pushing the push button start switch (if equipped) for greater than 15 s will latch the relay in the other direction. 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 Schematics](#)
- [Power Distribution 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](#)
- [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.

- **If the KR104A Battery Saver Relay 1 clicks open and closed**

3. All OK.

Circuit/System Testing

1. Ignition OFF, disconnect the X1 harness connector at the K9 Body Control Module, ignition ON.

2. Verify a test lamp illuminates between the B+ circuit terminal 4 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 K9 Body Control Module

- **If the test lamp illuminates**

3. Ignition OFF, Connect the X1 harness connector at the K9 Body Control Module.

4. 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.

5. Test for less than 10 Ω between the ground circuit terminal 4 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.

- **If less than 10 Ω**

6. Ignition ON.

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

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

Replace the X51A Fuse Block - Instrument Panel.

- **If the test lamp illuminates**

8. Enable battery saver mode (transport mode).

9. Ignition OFF.

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

11. Verify the test lamp momentarily flashes ON and OFF when turning the ignition ON.

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

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

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

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

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

- If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K9 Body Control Module.
 - **If the test lamp is always ON**
 1. Ignition OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module, ignition ON.
 2. Test for less than 1 V between the control circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K9 Body Control Module.
 - **If the test lamp turns ON and OFF**
12. Connect a test lamp between the control circuit terminal 2 and ground.
 13. Verify the test lamp momentarily flashes ON and OFF after turning the ignition OFF.

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

- **If the test lamp is always OFF**
 1. Ignition OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module.
 2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K9 Body Control Module.
 - **If the test lamp is always ON**
 1. Ignition OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module, ignition ON.
 2. Test for less than 1 V between the control circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K9 Body Control Module.
 - **If the test lamp turns ON and OFF**
14. Verify that a test lamp does not illuminate between the ignition circuit terminal 5 and ground.
 - **If the test lamp illuminates**

Repair the short to voltage on the ignition circuit
 - **If the test lamp does not illuminate**
 15. Ignition ON, connect a 40 A fused jumper wire between the B+ circuit terminal 3 and the ignition circuit terminal 5.
 16. 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.
 - **If the device activates**
 17. Test or replace the KR104A Battery Saver Relay 1.

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 4
 - 2 and 4
 - **If less than 70 or greater than 150 Ω**
Replace the relay.
 - **If between 70 - 150 Ω**
3. Install a 3 A fused jumper wire between relay terminal 2 and 12 V. Install a jumper wire between relay terminal 4 and ground.
4. Test for infinite resistance between the following terminals:
 - 3 and 2
 - 3 and 1
 - 3 and 4
 - 3 and 5
 - 2 and 5
 - 1 and 5
 - **If less than infinite resistance**
Replace the relay.
 - **If infinite resistance**
5. Install a 3 A fused jumper wire between relay terminal 1 and 12 V. Install a jumper wire between relay terminal 4 and ground.
6. Test for less than 5.0 Ω between terminals 3 and 5.
 - **If 5.0 Ω or greater**
Replace the relay.
 - **If less than 5.0 Ω**
7. All OK

Repair Instructions

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

- Refer to [Control Module References](#) for body 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 - 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 P2534

Ignition On/Start Switch Circuit Low Voltage

DTC P2535

Diagnostic Fault Information

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

Circuit/System Description

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

Conditions for Running the DTC

P2534

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

P2535

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

Conditions for Setting the DTC

P2534

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

P2535

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

Action Taken When the DTC Sets

DTCs P2534 and P2535 are Type A DTCs.

Conditions for Clearing the DTC

DTCs P2534 and P2535 are Type A DTCs.

Diagnostic Aids

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

Reference Information

Schematic Reference

Power Distribution 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

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

[Circuit/System Verification](#)

1. Engine running.
2. Verify DTC B144B is not set.
 - **If the DTC is set**
Refer to [DTC B144B](#).
 - **If the DTC is not set**
3. Verify the scan tool control module Ignition 1 Signal parameter is between 12.6 - 15 V.
 - **If not between 12.6 - 15 V**
Refer to Circuit/System Testing.
 - **If between 12.6 - 15 V**
4. Verify that the DTC does not reset by operating the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions you observe from the Freeze Frame/Failure Records data. If the vehicle passes the Circuit/System Verification procedure, then STOP. Do not perform the Circuit/System Testing or Component Testing as this may result in an unnecessary part replacement. Refer to [Testing for Intermittent Conditions and Poor Connections](#).

[Circuit/System Testing](#)

1. Ignition OFF, and all vehicle systems OFF, disconnect the appropriate harness connector at the control module setting the DTC.
2. Test for less than 1 V between the ignition circuit terminal and ground.
 - **If 1 V or greater**
Repair the short to voltage on the circuit.
 - **If less than 1 V**
3. Ignition ON.
4. Verify a test lamp illuminates between the ignition circuit terminal and ground.
 - **If the test lamp does not illuminate and the circuit fuse is good**
 1. Ignition OFF remove the test lamp.
 2. Test for less than 2 Ω in the ignition circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , refer to [Power Mode Mismatch](#).
 - **If the test lamp does not illuminate and the circuit fuse is open**
 1. Ignition OFF remove the test lamp
 2. Test for infinite resistance between the ignition circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - **If the test lamp illuminates**

5. Replace the control module setting the DTC.

Repair Instructions

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

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

DTC P2537: IGNITION ACCESSORY SWITCH CIRCUIT 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 P2537

Ignition Accessory Switch Circuit Low Voltage

Diagnostic Fault Information

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

Circuit/System Description

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

Conditions for Running the DTC

The ignition is in the ACCESSORY or RUN position.

Conditions for Setting the DTC

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

Action Taken When the DTC Sets

DTC P2537 is a Type B DTC.

Conditions for Clearing the DTC

DTC P2537 is a Type B DTC.

Reference Information

Schematic Reference

Data Communication Schematics

Connector End View Reference

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

Description and Operation

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** .

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

2. Refer to Circuit/System Testing.

Circuit/System Testing

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

2. Ignition ON.

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

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

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

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

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

- **If the test lamp illuminates**

4. Replace the control module setting the DTC.

Repair Instructions

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

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

SYMPTOMS - WIRING SYSTEMS

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

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

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

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

- **Power Mode Description and Operation**
- **Retained Accessory Power Description and Operation**

- **Ignition Can/Cannot Be Turned Off with Transmission in Any Gear (With BTM)**
- **Ignition Mode Switch Indicator Malfunction**
- **Vehicle Will Not Change Power Mode**

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:

- **Power Mode Mismatch**
- **Retained Accessory Power Malfunction**

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

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

Ignition Lock Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Electronic Park Lock Description and Operation

Electrical Information Reference

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

Circuit/System Verification

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

Circuit/System Testing

1. Ignition OFF 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.
 - **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.
 - **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.
 - **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.

IGNITION CAN/CANNOT BE TURNED OFF WITH TRANSMISSION IN ANY GEAR (WITHOUT BTM)

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	-	-
Control	2	2	1	-
Ground	-	2	-	-
1. Ignition key will not turn to OFF with vehicle in park. 2. Ignition key will turn to OFF with vehicle out of park.				

Circuit/System Description

If the vehicle is equipped with automatic transmission and a floor mounted console gear shift, it has an electronic park lock system. The electronic park lock system purpose is to prevent the ignition key from being turned to the OFF position when the transmission is in any position other than PARK and the vehicle may still be moving. The electronic park lock system consists of an ignition lock cylinder solenoid, and a park position switch that is located in the A/T shift lock control switch. The ignition lock cylinder solenoid contains a pin that mechanically prevents the ignition key cylinder from being turned to the lock position when the vehicle is not in park. The park position switch receives voltage from the body control module (BCM) when the ignition is turned ON. When the transmission shift selector is in PARK, the park position switch closes and the BCM then de-energizes the key capture solenoid actuator retracting the pin, allowing the ignition switch to be turned 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.
- Lost power to the ignition switch or a faulty ignition switch can prevent the ignition key from turning to the lock position and prevent ignition key removal from the column.

Reference Information

Schematic Reference

Ignition Lock Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Electronic Park Lock Description and Operation

Electrical Information Reference

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

Circuit/System Verification

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

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

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

Refer to Circuit/System Testing.
 - **If the ignition switch cannot be rotated to the LOCK position**
5. 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. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **If less than 10 Ω**
3. Ignition ON.
4. Verify the scan tool 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.
- **If OFF**
5. Install a 3 A fused jumper wire between the signal circuit terminal 6 and Ground.
6. Verify the scan tool 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.
 - **If ON**
 7. Ignition OFF, disconnect the harness connector at the M93 Key Capture Solenoid Actuator. It may take up to 2 min for all vehicle systems to power down.
 8. Test for less than 10 Ω between the ground circuit terminal 2 and ground.
 - **If 10 Ω or greater**
 1. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **If less than 10 Ω**
 9. Ignition ON, verify a test lamp illuminates between the control circuit terminal 1 and ground.
 - **If the test lamp does not illuminate**
 1. Ignition OFF, remove the test lamp.
 2. Test for infinite resistance between the 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 illuminates**
 10. Ignition OFF, remove the jumper wire and connect the harness connector at the S3 Transmission Shift Lever, ignition ON.
 11. Verify the scan tool In Park Switch Status parameter switches from ON to OFF while placing the shift lever in and out of park.
 - **If the In Park Switch Status parameter does not change**
 1. Replace the S3 Transmission Shift Lever.
 - **If the In Park Switch Status parameter does change**
 12. Verify that a test lamp does not illuminate between the control circuit terminal 1 and ground.
 - **If the test lamp illuminates**
 1. Ignition OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module.
 2. Test for less than 1 V between the control circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K9 Body Control Module.
 - **If the test lamp does not illuminate**
 13. Replace the M93 Key Capture Solenoid Actuator.

Repair Instructions

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

- Refer to **Ignition and Start Switch Housing Replacement**
- Refer to **Transmission Control Replacement**
- Refer to **Control Module References** for body control module replacement, programming, and setup.

IGNITION MODE SWITCH INDICATOR MALFUNCTION

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- 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
Control	2	2	1	-
Ground	-	2	-	-
1. Ignition mode switch indicator always On 2. Ignition mode switch indicator inoperative				

Circuit/System Description

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

Reference Information

Schematic Reference

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

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Power Mode Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Circuit/System Verification

1. Ignition ON.
2. Verify the green LED turns ON and OFF when commanding the Run/Start Power Mode Indicator On and Off with the scan tool.
 - **If the green LED does not turn ON and OFF**

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

Refer to Circuit/System Testing - Amber LED Test.
 - **If the amber LED turns ON and OFF**
4. All OK.

Circuit/System Testing

Green LED Test

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the S38 Ignition Mode Switch. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 4 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connections.
 - **If less than 10 Ω**
3. Connect the harness connector at the S38 Ignition Mode Switch.
4. Ignition ON, disconnect the harness connector at the S38 Ignition Mode Switch.
5. Connect a test lamp between the control circuit terminal 5 and ground.
6. Verify the test lamp stays OFF when commanding Run/Start Power Mode Indicator Off with the scan tool.
 - **If the test lamp is always ON**
 1. Connect the harness connector at the S38 Ignition Mode Switch.
 2. Ignition OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module.
 3. Ignition ON, disconnect the harness connector at the S38 Ignition Mode Switch.
 4. Test for less than 1 V between the control circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K9 Body Control Module.
 - **If the test lamp is always OFF**
7. Test for greater than 3 V between the control circuit terminal 5 and ground while commanding Run/Start Power Mode Indicator On with the scan tool.
 - **If 3 V or less**
 1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module.
 2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance

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

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

- **If 3 V or greater**

8. Test or replace the S38 Ignition Mode Switch.

Amber LED Test

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the S38 Ignition Mode Switch. It may take up to 2 min for all vehicle systems to power down.

2. Test for less than 10 Ω between the ground circuit terminal 4 and ground.

- **If 10 Ω or greater**

1. Ignition OFF.

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

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

- **If less than 10 Ω**

3. Connect the harness connector at the S38 Ignition Mode Switch.

4. Ignition ON, disconnect the harness connector at the S38 Ignition Mode Switch.

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

6. Verify the test lamp stays OFF when commanding Accessory Power Mode Indicator Off with the scan tool.

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

1. Connect the harness connector at the S38 Ignition Mode Switch.

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

3. Ignition ON, disconnect the harness connector at the S38 Ignition Mode Switch.

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

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

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

7. Test for greater than 3 V between the control circuit terminal 2 and ground while commanding Accessory Power Mode Indicator On with the scan tool.

- **If 3 V or less**

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

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

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

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

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

- **If 3 V or greater**

8. Test or replace the S38 Ignition Mode Switch.

Component Testing

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

2. Connect a jumper wire between the S38 Ignition Mode Switch terminal 4 and ground.

3. Connect a 3 A fused jumper wire between the S38 Ignition Mode Switch terminal 5 and B+.

4. Verify the green LED illuminates.

- **If the LED does not illuminate**

Replace the S38 Ignition Mode Switch.

- **If the LED illuminates**

5. Connect a 3 A fused jumper wire between the S38 Ignition Mode Switch terminal 2 and B+.

6. Verify the amber LED illuminates.

- **If the LED does not illuminate**

Replace the S38 Ignition Mode Switch.

- **If the LED illuminates**

7. All OK.

Repair Instructions

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

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

POWER MODE MISMATCH

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- 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 and retained accessory power 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 retained accessory power relay is energized during all power modes, except OFF-awake and CRANK. The relay is also energized for approximately 10 min after shutting the ignition OFF, provided no door is opened.

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

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 Schematics**
- **Power Moding 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](#)
- [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.

1. Ignition ON.
2. Verify that 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 - Diagnostic A.
 - **If the KR76 Retained Accessory Power Relay clicks ON and OFF**
3. Verify that the KR73 Ignition Main Relay clicks ON and OFF when commanding the Run/Crank Relay On and Off with a scan tool.
 - **If the KR73 Ignition Main Relay does not click ON and OFF**
Refer to Circuit/System Testing - Diagnostic B.
 - **If the KR73 Ignition Main Relay clicks ON and OFF**
4. Verify that the KR75 Engine Controls Ignition Relay clicks ON and OFF when commanding the Engine Controls Ignition Relay On and Off with a scan tool.
 - **If the KR75 Engine Controls Ignition Relay does not click ON and OFF**
Refer to Circuit/System Testing - Diagnostic C.
 - **If the KR75 Engine Controls Ignition Relay clicks ON and OFF**
5. Verify that the KR104A Battery Saver Relay 1 clicks ON and OFF when enabling and disabling the battery saver mode.
 - **If the KR104A Battery Saver Relay 1 does not click ON and OFF**
Refer to Circuit/System Testing - Diagnostic D.
 - **If the KR104A Battery Saver Relay 1 clicks ON and OFF**
6. All OK.

Circuit/System Testing

Diagnostic A

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 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.

- **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 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 KR76 Retained Accessory Power Relay.

- **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 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.

- **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

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

8. Ignition ON, connect a 40 A fused jumper wire between the B+ circuit terminal 5 and the ignition circuit terminal 3.

9. Verify device is activated.

- **If the device does not activate**

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

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

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

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

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

- **If the device activates**

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

Diagnostic B

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 85 and ground.

- **If 10 Ω or greater**

1. Ignition OFF.
2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.

- **If less than 10 Ω**

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

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

Replace the X50A Fuse Block - Underhood

- **If the test lamp illuminates**

5. Connect a test lamp between the control circuit terminal 86 and the ground circuit terminal 85.
6. Verify the test lamp turns ON and OFF when commanding the 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.

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

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

- **If the test lamp illuminates**

Repair the short to voltage on the ignition circuit.

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

8. Ignition ON, connect a 40 A fused jumper wire between the B+ circuit terminal 30 and the ignition circuit terminal 87.
9. 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.
 - **If the device activates**
10. Test or replace the KR73 Ignition Main Relay.

Diagnostic C

1. Ignition OFF and all vehicle systems OFF, disconnect the KR75 Engine Controls Ignition Relay, ignition ON.
2. Verify a test lamp illuminates between the B+ circuit terminal 30 and ground.
 - **If the test lamp does not illuminate**
Replace the X50A Fuse Block - Underhood
 - **If the test lamp illuminates**
3. Verify a test lamp illuminates between the B+ circuit terminal 85 and ground.
 - **If the test lamp does not illuminate**
Replace the X50A Fuse Block - Underhood
 - **If the test lamp illuminates**
4. Connect a test lamp between the B+ circuit terminal 85 and the control circuit terminal 86.
5. Verify the test lamp turns ON and OFF when commanding the Engine Controls Ignition 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 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.
 - **If the test lamp turns ON and OFF**
6. Verify a test lamp does not illuminate between the ignition circuit terminal 87 and ground.
 - **If the test lamp illuminates**
Repair the short to voltage on the circuit.
 - **If the test lamp does not illuminate**
7. Ignition ON, connect a 40 A fused jumper wire between the B+ circuit terminal 30 and the ignition circuit terminal 87.
8. Verify device is activated.
 - **If the device does not activate**
 1. Ignition OFF, disconnect the harness connector at the device.

2. Test for infinite resistance between the ignition circuit terminal 87 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
3. Test for less than 2 Ω in the ignition circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the device.
- **If the device activates**
9. Test or replace the KR75 Engine Controls Ignition Relay.

Diagnostic D

1. Ignition OFF, disconnect the X1 harness connector at the K9 Body Control Module, ignition ON.
2. Verify a test lamp illuminates between the B+ circuit terminal 4 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 K9 Body Control Module
 - **If the test lamp illuminates**
3. Ignition OFF, Connect the X1 harness connector at the K9 Body Control Module.
4. 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.
5. Test for less than 10 Ω between the ground circuit terminal 4 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.
 - **If less than 10 Ω**
6. Ignition ON.
7. Verify a test lamp illuminates between the B+ circuit terminal 3 and ground.
 - **If the test lamp does not illuminate**

Replace the X51A Fuse Block - Instrument Panel.
 - **If the test lamp illuminates**
8. Enable battery saver mode (transport mode).
9. Ignition OFF.
10. Connect a test lamp between the control circuit terminal 1 and ground.
11. Verify the test lamp momentarily flashes ON and OFF when turning the ignition ON.
 - **If the test lamp is always OFF**
 1. Ignition OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module.
 2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance

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

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

• **If the test lamp is always ON**

1. Ignition OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module, ignition ON.
2. Test for less than 1 V between the control circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K9 Body Control Module.

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

12. Connect a test lamp between the control circuit terminal 2 and ground.
13. Verify the test lamp momentarily flashes ON and OFF after turning the ignition OFF.

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

• **If the test lamp is always OFF**

1. Ignition OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module.
2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
3. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K9 Body Control Module.

• **If the test lamp is always ON**

1. Ignition OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module, ignition ON.
2. Test for less than 1 V between the control circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K9 Body Control Module.

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

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

• **If the test lamp illuminates**

Repair the short to voltage on the ignition circuit

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

15. Ignition ON, connect a 40 A fused jumper wire between the B+ circuit terminal 3 and the ignition circuit terminal 5.
16. 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.

• **If the device activates**

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

Relay Test

1. Ignition OFF, disconnect the appropriate relay.
2. Test for 70 - 150 Ω between terminals 85 and 86.

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

Replace the relay.

- **If between 70 - 150 Ω**

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

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

- **If less than infinite resistance**

Replace the relay.

- **If infinite resistance**

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

- **If 5.0 Ω or greater**

Replace the relay.

- **If less than 5.0 Ω**

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

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

- **If 5.0 Ω or greater**

Replace the relay.

- **If less than 5.0 Ω**

7. All OK

Latching 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 4
- 2 and 4
- **If less than 70 or greater than 150 Ω**

Replace the relay.

- **If between 70 - 150 Ω**

3. Install a 3 A fused jumper wire between relay terminal 2 and 12 V. Install a jumper wire between relay terminal 4 and ground.

4. Test for infinite resistance between the following terminals:

- 3 and 2
- 3 and 1
- 3 and 4
- 3 and 5
- 2 and 5

- 1 and 5
- **If less than infinite resistance**

Replace the relay.

- **If infinite resistance**

5. Install a 3 A fused jumper wire between relay terminal 1 and 12 V. Install a jumper wire between relay terminal 4 and ground.

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

- **If 5.0 Ω or greater**

Replace the relay.

- **If less than 5.0 Ω**

7. 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.

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	B1445 02	1	1	-
Relay Coil Ground	-	1	-	-
1. Retained Accessory Power Malfunction 2. Retained Accessory Power Relay Always ON				

Circuit/System Description

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

Reference Information

Schematic Reference

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

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

[Retained Accessory Power Description and Operation](#)

- [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
 - **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 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.
 - **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 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 KR76 Retained Accessory Power Relay.
 - **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 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.
 - **If the test lamp turns ON and OFF**
7. Connect the KR76 Retained Accessory Power Relay.
 8. Disconnect the appropriate X80 Accessory Power Receptacle.
 9. Ignition OFF.
 10. Verify that a test lamp does not illuminate between each of the ignition circuits listed below and ground.
 - X80D Accessory Power Receptacle - Center Console Compartment - Ignition circuit terminal A
 - X80G Accessory Power Receptacle - Instrument Panel - Ignition circuit terminal A
 - X80H Accessory Power Receptacle - Center Console - Ignition circuit terminal A
 - **If the test lamp illuminates**

Repair the short to voltage on the ignition circuit.
 - **If the test lamp does not illuminate**
 11. Ignition ON.
 12. Verify that a test lamp illuminates between each of the ignition circuits listed below and ground.
 - X80D Accessory Power Receptacle - Center Console Compartment - Ignition circuit terminal A
 - X80G Accessory Power Receptacle - Instrument Panel - Ignition circuit terminal A
 - X80H Accessory Power Receptacle - Center Console - Ignition circuit terminal A
 - **If the test lamp does not illuminate and the circuit fuse is good**
 1. Ignition OFF, remove the test lamp.
 2. Test for less than 2 Ω in the ignition circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , test or replace the KR76 Retained Accessory Power Relay.
 - **If the test lamp does not illuminate and the circuit fuse is open**
 1. Ignition OFF.
 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
 - **If the test lamp illuminates**
 13. Test or replace the appropriate X80 Accessory Power Receptacle.

Component Testing

Relay Test

1. Ignition OFF, disconnect the KR76 Retained Accessory Power Relay.
2. Test for 70 - 150 Ω between terminals 85 and 86.
 - **If less than 70 or greater than 150 Ω**

Replace the relay.

- **If between 70 - 150 Ω**

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

- 30 and 86
- 86 and 87
- 30 and 85
- 85 and 87
- **If less than infinite resistance**

Replace the relay.

- **If infinite resistance**

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

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

- **If 5.0 Ω or greater**

Replace the relay.

- **If less than 5.0 Ω**

6. All OK

Repair Instructions

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

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

VEHICLE WILL NOT CHANGE POWER MODE

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- 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
B+ terminal 2	B1370 04, B1380 04	B1370 04, B1380 04	-	-
Ignition Terminal 1	B1370 04, B1380 04	B1370 04, B1380 04	B1370 01	-
Ignition Terminal 3	B1370 04, B1380 04	B1380 04	B1380 01	-
Ignition Terminal 4	B1370 04, B1380 04, B1441 04	B1441 04	B1441 04	-
Signal - Terminal 3	B097B 02*	B097B 05*	B097B 05*	-
Signal - Terminal 6	2	B097B 05*	2	-
5 V Reference	-	2	-	-
Low Reference	-	B097B 05*	-	-

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ground	-	1	-	-
* DTC set in keyless entry control module 1. Ignition mode switch indicator always Off 2. Power mode mismatch				

Circuit/System Description

Without Push Button Start

The vehicle power mode master is the body control module. The ignition switch is a low current switch with multiple discrete circuits to the body control module. The body control module 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 body control module are switched ignition voltage outputs that are pass through circuits within the body control module directly from the ignition switch. If these circuits short to ground, the B+ circuit fuse to the ignition switch will open.

With Push Button Start

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

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

Reference Information

Schematic Reference

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

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Power Mode Description and Operation

- [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

Without Push Button Start

1. Ignition ON.
2. Verify the scan tool power mode parameters change when cycling the S39 Ignition Switch between OFF, ACCESSORY, ON, and CRANK.
 - **If the parameters do not change**
Refer to Circuit/System Testing - Without Push Button Start.
 - **If the parameters change**
3. All OK.

With Push Button Start

1. Verify DTC B097B 61 is not set.
 - **If DTC B097B 61 is set**
Test or replace the S38 Ignition Mode Switch.
 - **If DTC B097B 61 is not set**
2. Verify the green LED illuminates when the S38 Ignition Mode Switch is pressed and held for up to 10 s, with the brake pedal released.
 - **If the green LED does not illuminate**
Refer to Circuit/System Testing - With Push Button Start.
 - **If the green LED illuminates**
3. All OK.

Circuit/System Testing

Without Push Button Start

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

- **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.

- **If between 4.8 - 5.2 V**

6. Connect the S39 Ignition Switch.

7. Ignition OFF.

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

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

- Ignition circuit terminal 5
- Ignition circuit terminal 6

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

1. Ignition OFF remove the test lamp.

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

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , verify the fuse is 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.

- **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.

- **If the test lamp illuminates**

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

13. Disconnect the S39 Ignition Switch.

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

- Ignition circuit terminal 1

- Ignition circuit terminal 3

- Ignition circuit terminal 4

- **If 1 V or greater**

Repair the short to voltage on the circuit.

- **If less than 1 V**

15. Test or replace the S39 Ignition Switch.

With Push Button Start

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the S38 Ignition Mode Switch. It may take up to 2 min for all vehicle systems to power down.

2. Test for less than 10 Ω between the ground circuit terminal 4 and ground.

- **If 10 Ω or greater**

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

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

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

- **If less than 10 Ω**

3. Test for less than 10 Ω between the low reference circuit terminal 7 and ground.

- **If 10 Ω or greater**

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

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

- If less than 2 Ω , replace the K84 Keyless Entry Control Module.

- **If less than 10 Ω**

4. Connect the S38 Ignition Mode Switch, ignition ON.

5. Disconnect the S38 Ignition Mode Switch.

6. Verify the scan tool K9 Body Control Module Push Button Ignition Switch Voltage parameter is greater than 11 V.

- **If 11 V or less**

1. Connect the S38 Ignition Mode Switch.

2. Ignition OFF, disconnect the X2 harness connector at the K9 Body Control Module and S38 Ignition Mode Switch.

3. Test for infinite resistance between the signal circuit terminal 6 and ground.

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

- If infinite resistance, replace the K9 Body Control Module.

- **If greater than 11 V**

7. Install a 3 A fused jumper wire between the signal circuit terminal 6 and ground.

8. Verify the scan tool K9 Body Control Module Push Button Ignition Switch Voltage parameter is less than 1 V.

- **If 1 V or greater**

1. Disconnect the harness connector at the K9 Body Control Module.

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

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

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

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

- **If less than 1 V**

9. Connect the harness connector at the S38 Ignition Mode Switch.

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

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

Test or replace the S38 Ignition Mode Switch.

- **If between 8 - 10 V**

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

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

Test or replace the S38 Ignition Mode Switch.

- **If between 4 - 7 V**

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

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

- **If less than infinite resistance**

Repair the short to ground on the circuit.

- **If infinite resistance**

14. Ignition ON.

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

- **If 1 V or greater**

Repair the short to voltage on the circuit.

- **If less than 1 V**

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

- **If not between 4.5 - 5.5 k Ω**

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

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

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , test or replace the S38 Ignition Mode Switch.

- **If between 4.5 - 5.5 k Ω**

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

- **If not between 1 - 1.5 k Ω**

Test or replace the S38 Ignition Mode Switch.

- **If between 1 - 1.5 k Ω**

18. Replace the K84 Keyless Entry Control Module.

Component Testing

S39 Ignition Switch

1. Ignition OFF, disconnect the X1 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.

- **If the readings match**

3. All OK.

Resistance Test

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

S38 Ignition Mode Switch

1. Ignition OFF, disconnect the harness connector at the S38 Ignition Mode Switch.
2. With the S38 Ignition Mode Switch released, test for 4.5 - 5.5 k Ω between the terminals listed below:

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

Replace the S38 Ignition Mode Switch

- **If between 4.5 - 5.5 k Ω**

3. With the S38 Ignition Mode Switch pressed, test for 1 - 1.5 k Ω between the terminals listed below:

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

Replace the S38 Ignition Mode Switch.

- **If between 1 - 1.5 k Ω**

4. All OK.

Repair Instructions

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

- Refer to [Ignition and Start Switch Replacement \(Without BTM\)](#) [Ignition and Start Switch Replacement \(With BTM\)](#)

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

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 manual. You should understand the basic theory of electricity, and know the meaning of voltage (V), current (A), and resistance (Ω). You should also be able to read and understand a wiring diagram, as well as understand what happens in a circuit with an open or a shorted wire.

CHECKING AFTERMARKET ACCESSORIES

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

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

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

Possible causes of vehicle problems related to aftermarket accessories include:

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

CIRCUIT TESTING

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

- [Using Connector Test Adapters](#)
- [Probing Electrical Connectors](#)
- [Troubleshooting with a Digital Multimeter](#)
- [Troubleshooting with a Test Lamp](#)
- [Using Fused Jumper Wires](#)
- [Measuring Voltage](#)
- [Measuring Voltage Drop](#)
- [Measuring Frequency](#)
- [Testing Ground and Low Reference Circuits](#)
- [Testing for Continuity](#)
- [Testing for Short to Ground](#)
- [Testing for a Short to Voltage](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Inducing Intermittent Fault Conditions](#)
- [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

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

WARNING: This procedure should not be performed on high voltage circuits. Performing this procedure on high voltage circuits may result in serious injury or death.

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 J-35616-F GM Approved Terminal Release Tool Kit in order to front probe terminals. Do not use paper clips or other substitutes to probe terminals.

When using the J-35616-F GM Approved Terminal Release Tool 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 J-35616-F GM Approved Terminal Release Tool Kit label on the inside of the J-35616-F GM Approved Terminal Release Tool Kit for the correct adapter along with the connector end view for terminal size.

PROBING ELECTRICAL CONNECTORS

Special Tools

EL-35616 Terminal Test Probe Kit

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

WARNING: This procedure should not be performed on high voltage circuits. Performing this procedure on high voltage circuits may result in serious injury or death.

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

Front probe

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

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

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

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

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

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

Special Tools

EL-39200 Digital Multimeter (DMM)

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

WARNING: High voltage circuits should only be tested using a digital multimeter (DMM) and test leads with at least a CAT III rating, such as the J 39200-A Digital Multimeter. Failure to follow the procedures may result in serious injury or death.

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

Digital Multimeter (DMM) Basic Requirements

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

Display and Settings

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

Voltage

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

Current

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

Resistance

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

Frequency

Test for a frequency range of 0.5 HZ - 199 K HZ

Diode Test

1. Apply at least 2 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 megohm 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-35616-200 Test Light - Probe Kit

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

WARNING: **This procedure should not be performed on high voltage circuits. Performing this procedure on high voltage circuits may result in serious injury or death.**

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-35616-200** kit is Micro-Pack compatible and comprised of a 12 V light bulb with an attached pair of leads.

To properly operate this tool use the following procedures.

When testing for voltage:

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

When testing for ground:

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

USING FUSED JUMPER WIRES

Special Tools

EL 35616-20F Fused Jumper Wire

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

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

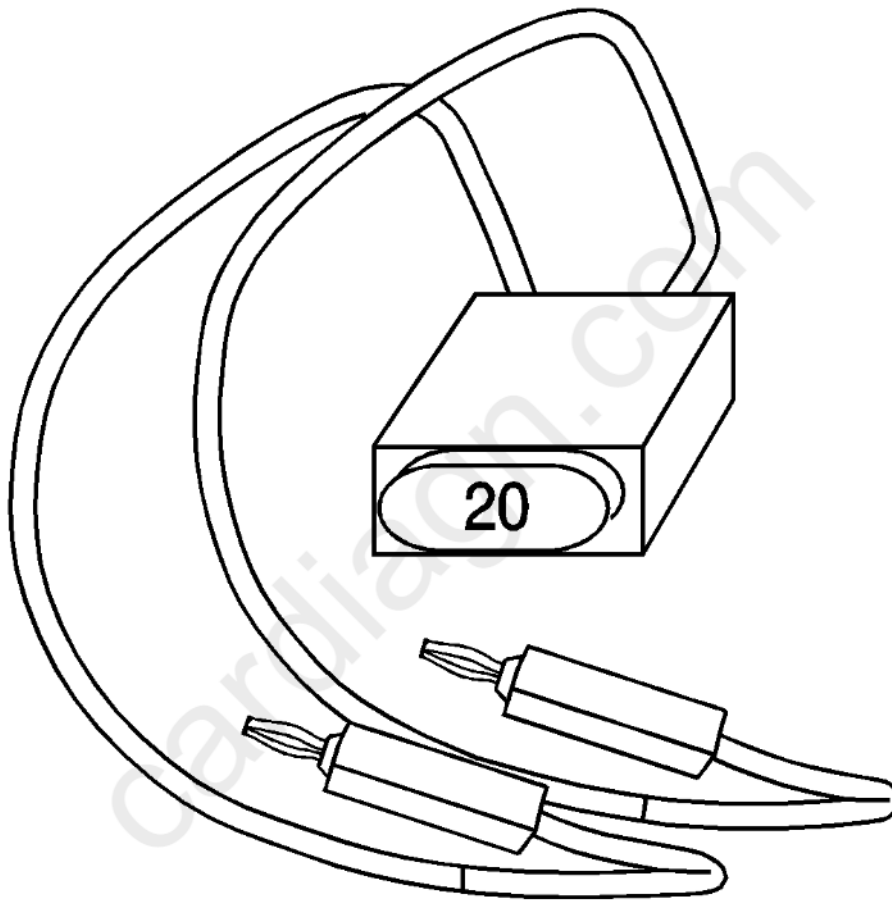


Fig. 1: Fused Jumper Wire

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](#) .

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

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

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

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.

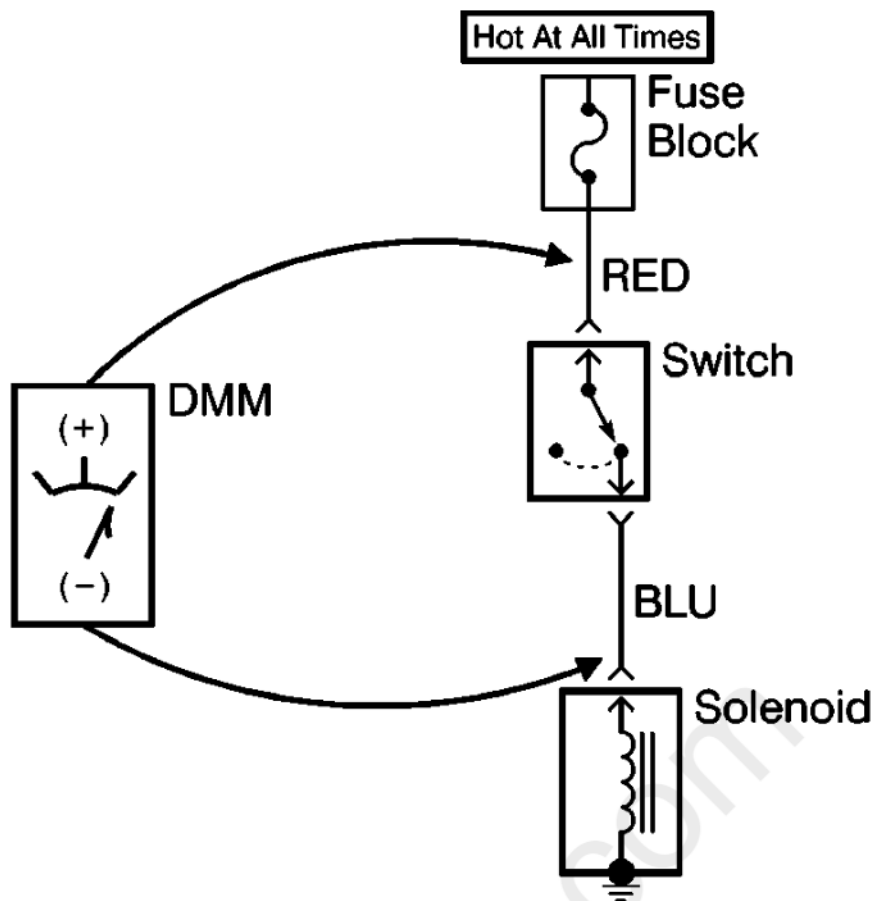


Fig. 2: Measuring Voltage Drop

Courtesy of GENERAL MOTORS COMPANY

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

MEASURING FREQUENCY

Special Tools

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](#) .

WARNING: This procedure should not be performed on high voltage circuits. Performing this procedure on high voltage circuits may result in serious injury or death.

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

WARNING: This procedure should not be performed on high voltage circuits. Performing this procedure on high voltage circuits may result in serious injury or death.

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](#) .

WARNING: This procedure should not be performed on high voltage circuits. Performing this procedure on high voltage circuits may result in serious injury or death.

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](#) .

WARNING: This procedure should not be performed on high voltage circuits. Performing this procedure on high voltage circuits may result in serious injury or death.

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:

- Wiring broken inside the insulation
- Poor connection between the male and female terminal at a connector
- 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 (BEC)

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 (BEC). Use **EL-35616** kit to test for proper terminal contact. Failure to use **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 from the on the flat wire harness connector in order to test the circuit in question.

Control Module/Component Voltage and Grounds

Poor voltage or ground connections can cause widely varying symptoms.

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

Temperature Sensitivity

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

Electromagnetic Interference and Electrical Noise

Some electrical components/circuits are sensitive to electromagnetic interference (EMI) 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.
- Improper 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 (DMM)

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

WARNING: This procedure should not be performed on high voltage circuits. Performing this procedure on high voltage circuits may result in serious injury or death.

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** 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 rotary dial of the DMM to the V (AC) or V (DC) position.
3. Press the range button 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.

Review Stored Data Functions

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

- Insert Bookmark - This button allows the user to insert bookmarks anywhere along the timeline. This provision allows the user to record notes regarding the inserted bookmark.
- Return Bookmark - This button moves the cursor to the previous bookmark.
- Back - This button moves the cursor back 1 frame.
- Timeline Slider Control - This allows the user to slide and select any position on the Timeline required.
- Forward - This button moves the cursor forward 1 frame.
- Forward Bookmark - This button moves the cursor forward 1 bookmark.
- Bookmarks - Allows the user to toggle bookmark visibility ON and OFF.

Graphical Preference Selections

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

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

CIRCUIT PROTECTION - FUSES

Special Tools

EL - 39200 Digital Multimeter (DMM)

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

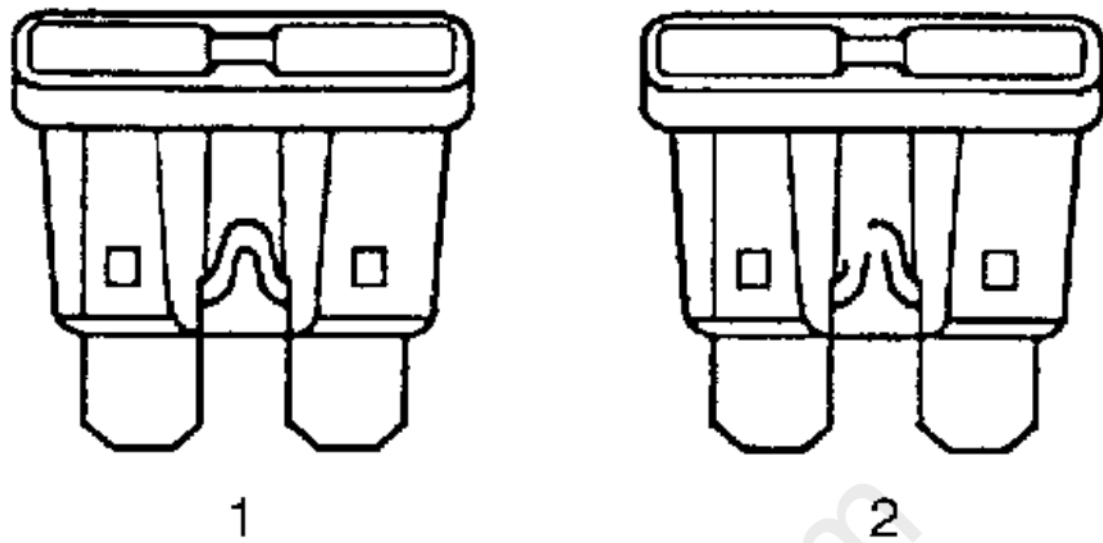


Fig. 3: Good Fuse And Open (Melted) Fuse
Courtesy of GENERAL MOTORS COMPANY

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.

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

Step	Action	Yes	No
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Step	Action	Yes	No
1	1. Ensure the transmission shift lever is in the PARK position and the steering column is NOT in the locked position. 2. Verify the ignition key cannot be removed from the ignition lock cylinder. Can the ignition key be removed from the ignition lock cylinder?	Go to Step 4	Go to Step 2
2	Verify the ignition key cannot be turned to the OFF position. Can the ignition key be turned to the OFF position?	Go to Step 3	Go to Step 7
3	Verify the ignition key cannot be removed from the ignition lock cylinder. Can the ignition key be removed from the ignition lock cylinder?	Go to Step 7	Go to Step 12
4	Verify the ignition key cannot be fully inserted and rotated without sticking in any position. Can the ignition key be fully inserted into the ignition lock cylinder and be rotated without sticking in any position?	Go to Step 7	Go to Step 5
5	Inspect for an incorrect, worn, or damaged ignition key. Is the ignition key incorrect, worn, or damaged?	Go to Step 10	Go to Step 6
6	Inspect the ignition key. Clean the entire middle groove area of the side milled ignition key. Can the cleaned key be fully inserted into the ignition lock cylinder and be rotated without sticking in any position?	Go to Step 13	Go to Step 12
7	Verify the adjustment of the shift control cable. Refer to Range Selector Lever Cable Adjustment, if equipped with the MH7 or the MHH transmission. Refer to Range Selector Lever Cable Adjustment if equipped with the M7W transmission. Can the ignition key be turned to the OFF position and be removed?	Go to Step 13	Go to Step 8
8	Attempt to override the ignition lock solenoid on the ignition and start switch housing. Can the ignition key be turned to the OFF position and be removed?	Go to Step 9	Go to Step 12
9	Inspect the electrical system for improper operation. Refer to Ignition Can/Cannot Be Turned Off with Transmission in Any Gear (With BTM), Ignition Can/Cannot Be Turned Off with Transmission in Any Gear (Without BTM), and to Testing for Intermittent Conditions and Poor Connections. Can the ignition key be turned to the OFF position and be removed?	Go to Step 13	Go to Step 11
10	Replace the ignition key. Refer to Key with Integrated Transmitter Programming (without BTM), Key with Integrated Transmitter Programming (with BTM). Did you complete the repair?	Go to Step 13	-

Step	Action	Yes	No
11	Replace the floor shifter. Refer to Transmission Control Replacement , if equipped with the MH7 or the MHH transmission. Refer to Transmission Control Replacement if equipped with the M7W transmission. Did you complete the repair?	Go to Step 13	-
12	Replace the ignition lock cylinder. Refer to Ignition Lock Cylinder Replacement . Did you complete the repair?	Go to Step 13	-
13	Operate the system in order to verify the repair. Did you correct the condition?	System OK	-

WIRING REPAIRS

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

- [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 \(Terminal Repair\)](#)

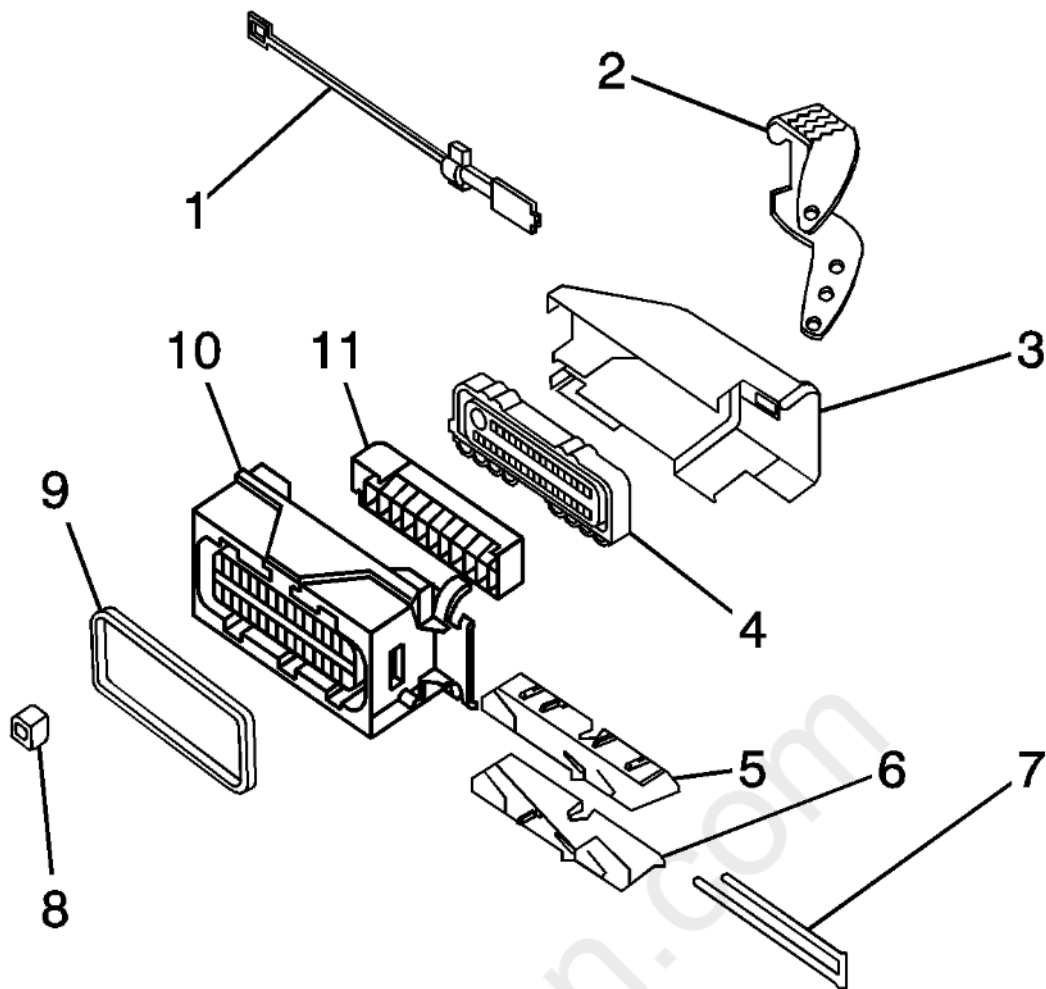


Fig. 4: Identifying Typical Connector Components
 Courtesy of GENERAL MOTORS COMPANY

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

Identifying Connectors

Knowing the connector manufacturer is helpful when trying to locating the correct connector repair procedure. There are many different connector designs used on GM vehicles and it is sometimes difficult to identify the connector manufacturer. The information in this document should help with the identification of connector manufactures.

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

- AFL/EPC (Alcoa Fujikura Ltd./Engineered Plastics Components)
- Bosch

- Delphi
- FCI (Framatome Connectors International)
- JAE (Japan Aviation Electronics)
- JST (Japan Solderless Terminals)
- Kostal
- Molex
- Sumitomo
- Tyco/AMP
- Yazaki

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

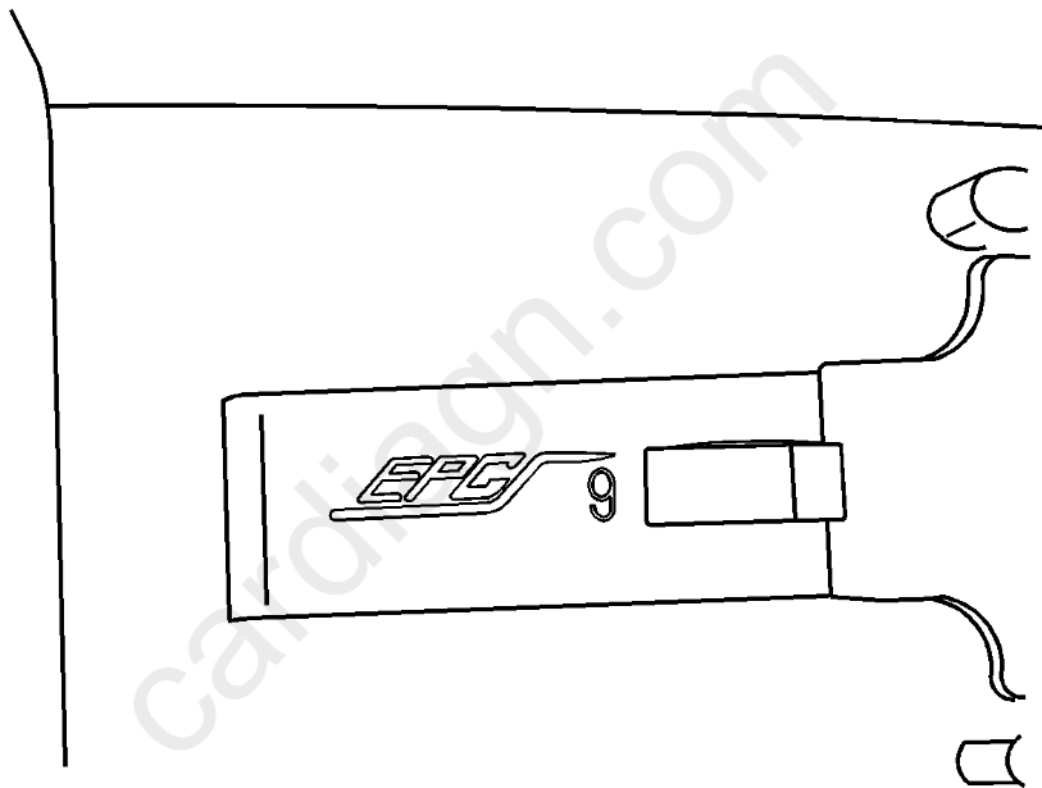


Fig. 5: EPC Identification On Connector Body
Courtesy of GENERAL MOTORS COMPANY

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

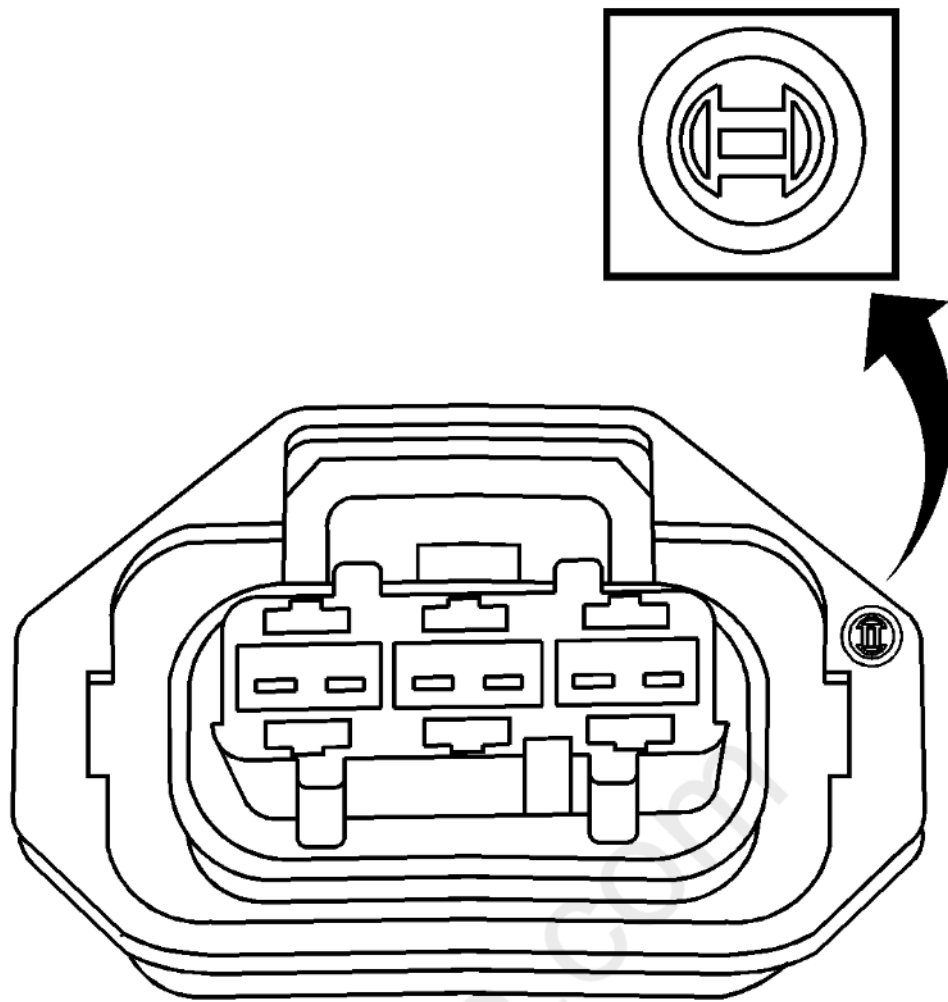


Fig. 6: Bosch Identification On Connector Body

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.

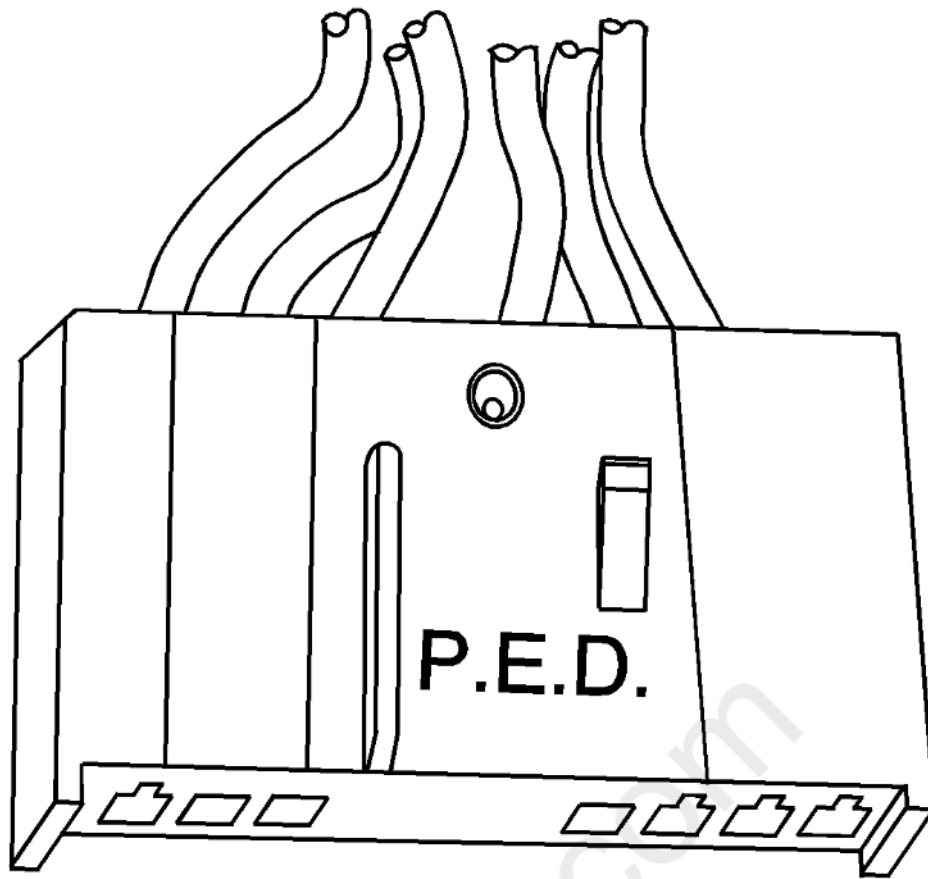


Fig. 7: PED Identification On Connector Body

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.

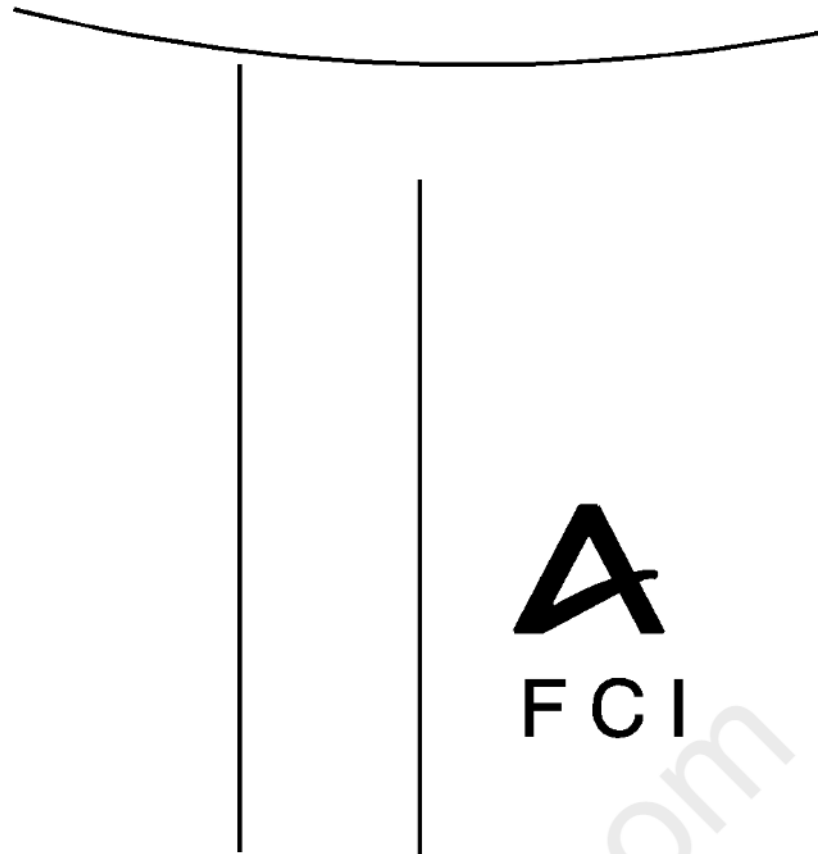


Fig. 8: FCI Identification On Connector Body
Courtesy of GENERAL MOTORS COMPANY

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

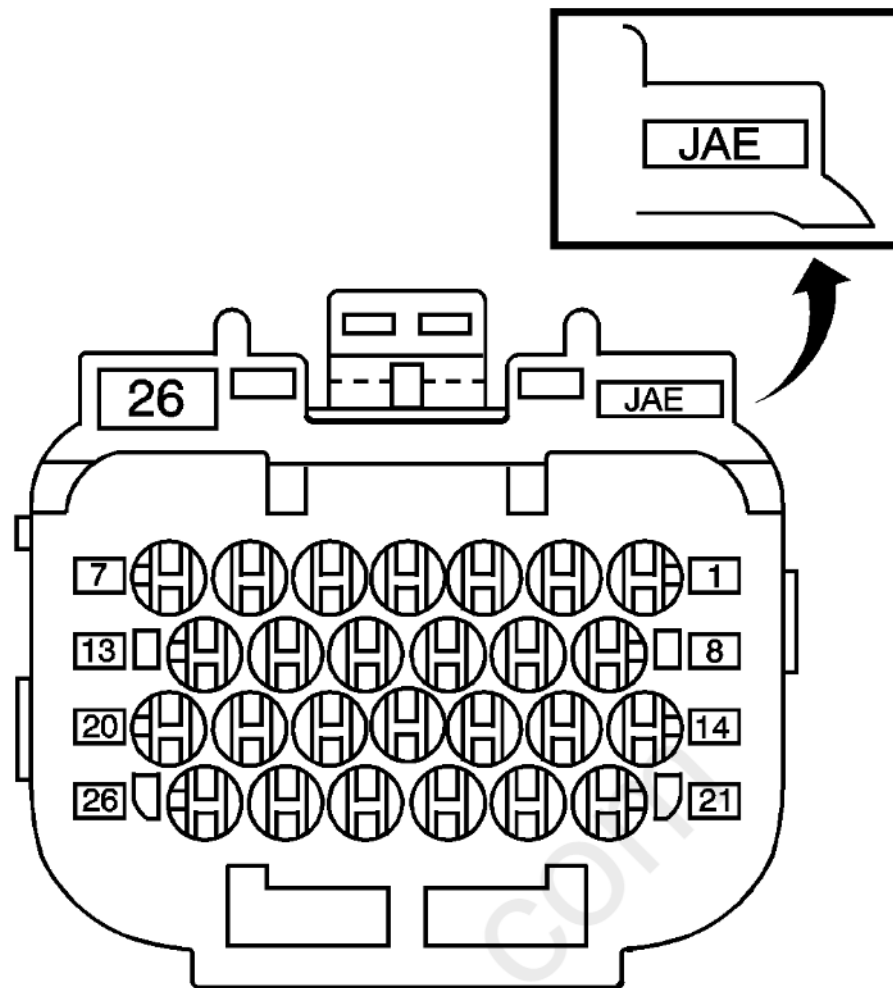


Fig. 9: JAE Identification On Connector Body

Courtesy of GENERAL MOTORS COMPANY

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

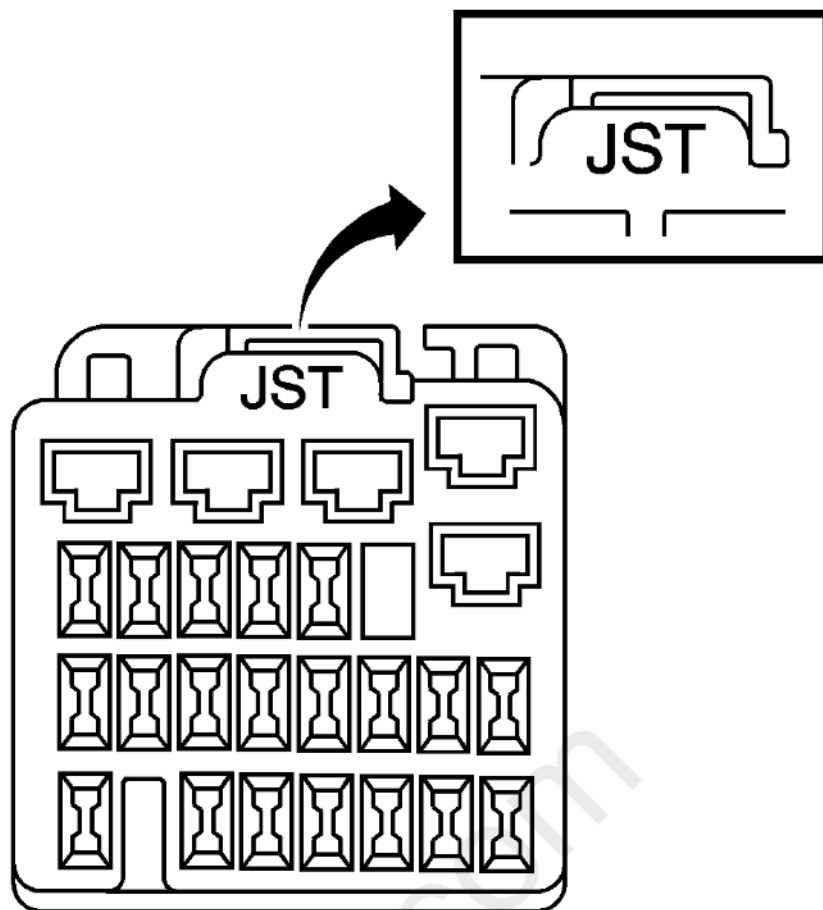


Fig. 10: JST Identification On Connector Body

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.

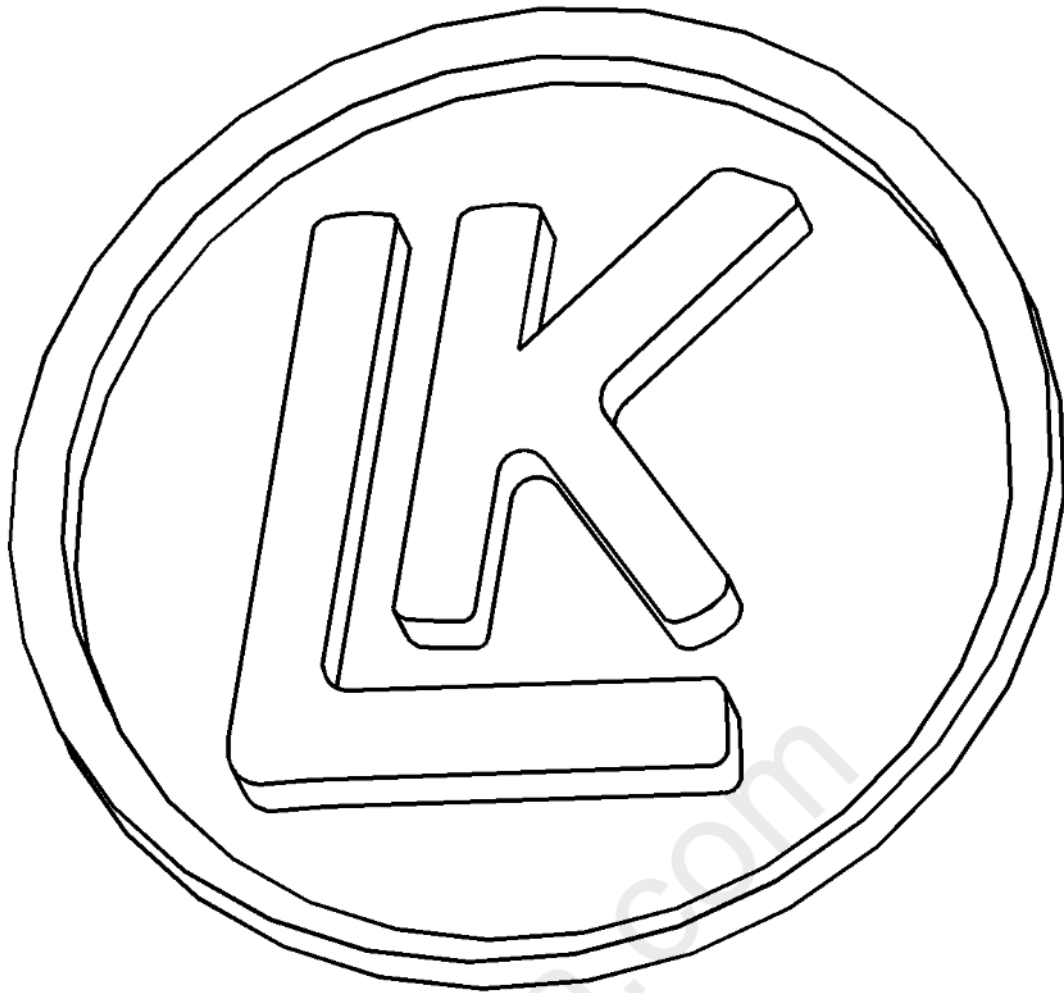


Fig. 11: Kostel Identification On Connector Body.

Courtesy of GENERAL MOTORS COMPANY

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

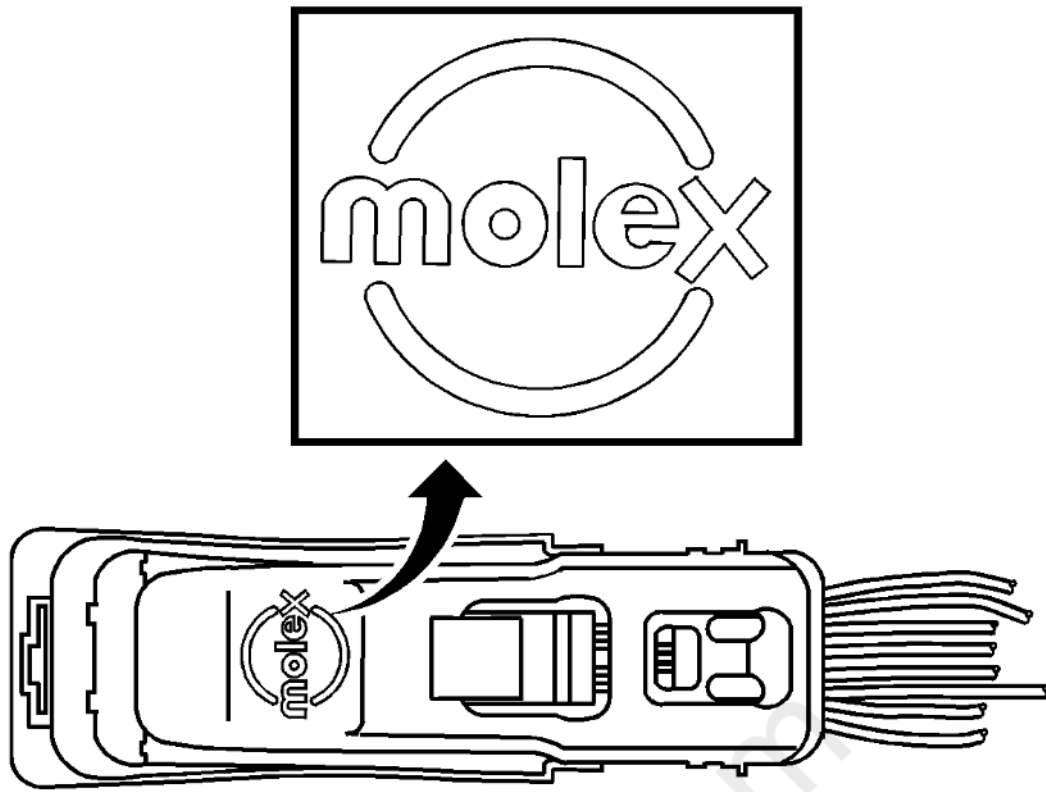


Fig. 12: Molex Identification On Connector Body.
Courtesy of GENERAL MOTORS COMPANY

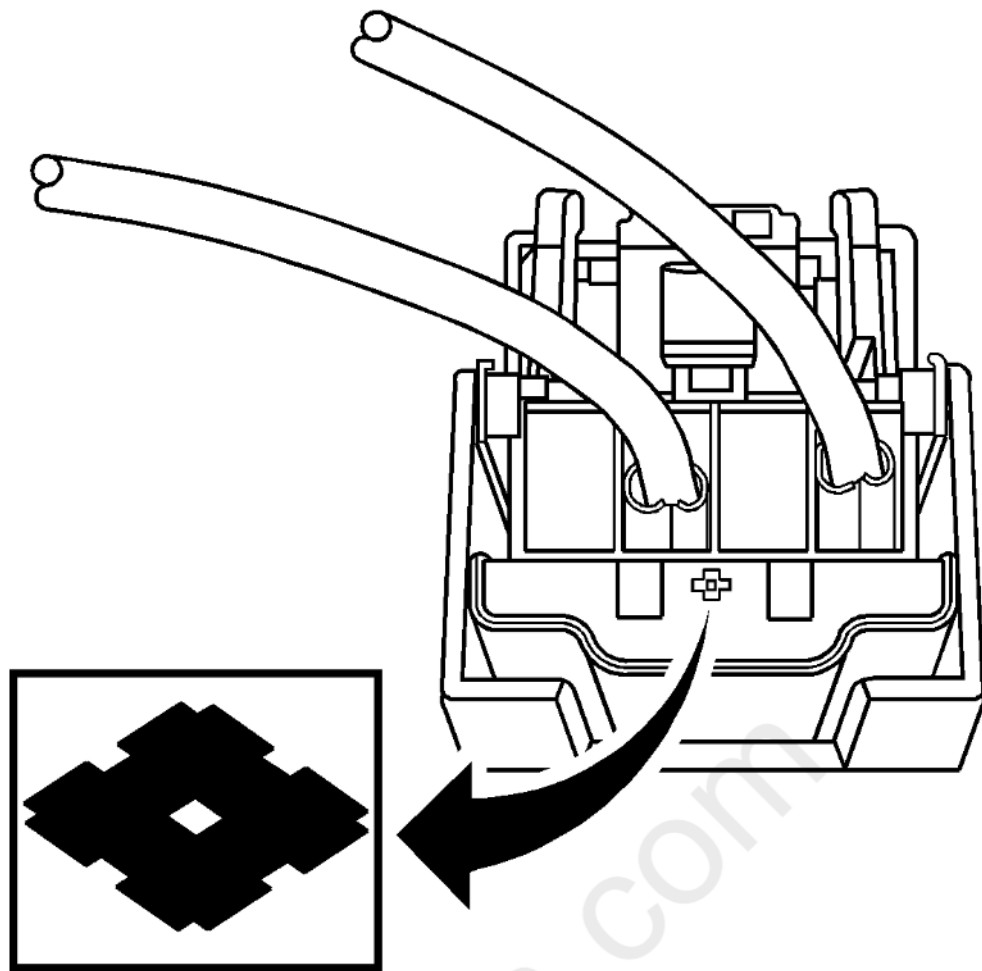


Fig. 13: Sumitomo Identification On Connector Body
 Courtesy of GENERAL MOTORS COMPANY

- 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.

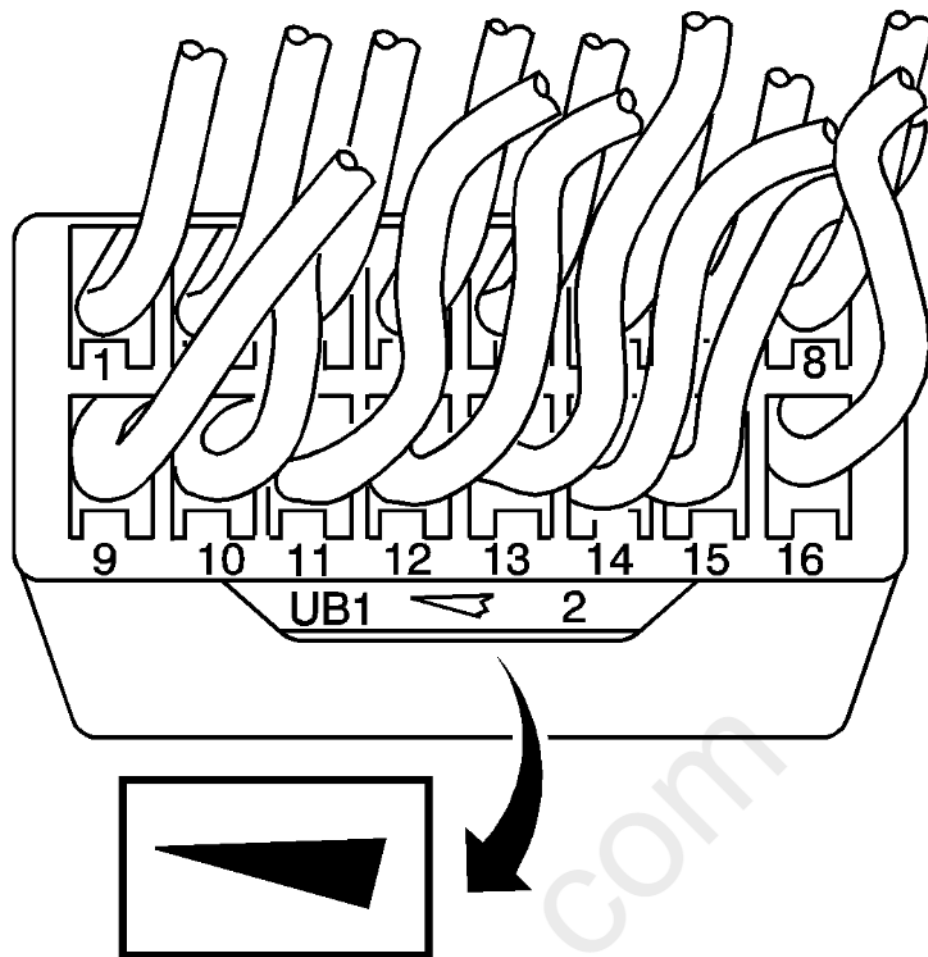


Fig. 14: Yazaki Identification On Connector Body

Courtesy of GENERAL MOTORS COMPANY

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

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Wiring Systems And Power Management - Inline Harness Connector End Views - Index - Impala

INLINE HARNESS CONNECTOR END VIEWS - INDEX

INLINE HARNESS CONNECTOR END VIEWS - INDEX

Description
<u>X105 Forward Lamp Harness to Front Fascia Harness (9H8)</u>
<u>X105 Forward Lamp Harness to Front Fascia Harness (-9H8-VRI)</u>
<u>X105 Forward Lamp Harness to Front Fascia Harness (VRI)</u>
<u>X110 Forward Lamp Harness to Left Headlamp Harness (T4A)</u>
<u>X110 Forward Lamp Harness to Left Headlamp Harness (T4F)</u>
<u>X113 Engine Harness to Body Harness</u>
<u>X115 Engine Harness to Body Harness</u>
<u>X116 Forward Lamp Harness to Cooling Fan Harness</u>
<u>X117 Cooling Fan Harness to Forward Lamp Harness</u>
<u>X120 Forward Lamp Harness to Right Headlamp Harness (T4A)</u>
<u>X120 Forward Lamp Harness to Forward Lamp Harness (T4F)</u>
<u>X150 Forward Lamp Harness to Body Harness</u>
<u>X160 Engine Harness to Fuel Rail Harness (LFR)</u>
<u>X160 Engine Harness to Fuel Rail Bank 1 Harness (LFX)</u>
<u>X160 Engine Harness to Fuel Rail Harness (LCV)</u>
<u>X161 Engine Harness to Alternative Fuel Rail Harness (LFR)</u>
<u>X161 Engine Harness to Fuel Rail Bank 2 Harness (LFX)</u>
<u>X190 Forward Lamp Harness to Fuel Composition Sensor Jumper Harness</u>
<u>X200 Windshield Sensor Harness to Body Harness</u>
<u>X202 Steering Wheel Harness to Steering Wheel Switch Harness</u>
<u>X205 Instrument Panel Harness to Passenger Air Bag Harness</u>
<u>X210 Instrument Panel Harness to Body Harness</u>
<u>X213 Instrument Panel Harness to HVAC Harness</u>
<u>X214 Accent Lamp Harness to Instrument Panel Harness</u>
<u>X220 Instrument Panel Harness to Body Harness</u>
<u>X221 Body Harness to Instrument Panel Harness</u>
<u>X222 Body Harness COAX to Instrument Panel Harness COAX (IO6 with U2K or U2M)</u>
<u>X222 Body Harness COAX to Instrument Panel Harness COAX (IO6 without U2K or U2M)</u>
<u>X222 Body Harness COAX to Instrument Panel Harness COAX (U2K or U2M without IO6)</u>
<u>X222 Body Harness to Instrument Panel Harness</u>
<u>X225 Body Harness to Rear Roof Antenna Harness</u>
<u>X226 Body Harness to Cellular Phone, Navigation, And Digital Radio Antenna Harness</u>
<u>X300 Console Harness to Instrument Panel Harness</u>
<u>X301 Instrument Panel Harness to Console Harness</u>
<u>X302 Rain Sensor Jumper Harness to Body Harness</u>
<u>X305 Console Harness to Shifter Harness</u>
<u>X310 Body Harness to Driver Seat Cushion Harness</u>
<u>X311 Driver Seat Back Harness to Driver Seat Cushion Harness (-KA1)</u>
<u>X311 Driver Seat Back Harness to Driver Seat Cushion Harness (KA1)</u>
<u>X312 Driver Seat Harness to Driver Seat Cushion Harness (KU1)</u>
<u>X320 Body Harness to Passenger Seat Cushion Harness</u>
<u>X321 Passenger Seat Back Harness to Passenger Seat Cushion Harness (-KA1)</u>

Description
<u>X321 Passenger Seat Back Harness to Passenger Seat Cushion Harness (KA1-KU3)</u>
<u>X321 Passenger Seat Back Harness to Passenger Seat Cushion Harness (KU3)</u>
<u>X322 Passenger Seat Harness to Passenger Seat Cushion Harness</u>
<u>X330 Body Harness to Left Roof Rail Air Bag Harness</u>
<u>X340 Body Harness to Right Roof Rail Air Bag Harness</u>
<u>X350 Fuel Tank Harness to Body Harness</u>
<u>X351 Body Harness to Body Harness (LFR)</u>
<u>X360 Rear Seat Harness to Body Harness</u>
<u>X367 Rear Seat Harness to Rear Armrest Harness</u>
<u>X370 Body Harness to Left Rear Seat Side Air Bag Harness</u>
<u>X380 Body Harness to Right Rear Seat Side Air Bag Harness</u>
<u>X390 Sunroof Harness to Body Harness</u>
<u>X400 Headliner Harness to Body Harness</u>
<u>X410 Body Harness to Left Tail Lamp Assembly Harness</u>
<u>X415 Rear Bumper Harness to Body Harness</u>
<u>X420 Body Harness to Right Tail Lamp Assembly Harness</u>
<u>X495 Body Harness to Body Harness</u>
<u>X500 Driver Door Harness to Body Harness</u>
<u>X505 Driver Door Harness to Driver Door Trim Harness</u>
<u>X506 Driver Door Trim Harness to Memory Seat Switch Harness</u>
<u>X510 Driver Door Harness to Outside Rearview Mirror - Driver Harness</u>
<u>X600 Passenger Door Harness to Body Harness</u>
<u>X605 Passenger Door Harness to Passenger Door Trim Harness</u>
<u>X610 Passenger Door Harness to Outside Rearview Mirror - Passenger Harness</u>
<u>X700 Left Rear Door Harness to Body Harness</u>
<u>X800 Right Rear Door Harness to Body Harness</u>
<u>X900 Body Harness to Rear Compartment Lid Harness</u>
<u>X915 License Lamp Harness to Rear Compartment Lid Harness</u>

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Wiring Systems and Power Management - Repair Instructions - Impala

REPAIR INSTRUCTIONS

REPAIRING DAMAGED WIRE INSULATION

WARNING: In order to reduce the risk of personal injury, loss of high voltage isolation to ground and higher system impedance, do not attempt to repair any HV wiring, connector, or terminal that is damaged. High voltage coaxial type cables are not repairable. Never attempt to repair a coaxial type cable. The entire cable/harness or component must be replaced. In order to maintain system integrity and personal safety, never attempt to repair any high voltage wiring, cables, or terminals. Performing this procedure on high voltage circuits may result in serious injury or death.

If the wire insulation has been chafed, or broken, enough to show the conductive portion of the wire, and the wire is not damaged, determine the length of insulation that needs to be repaired. If the repair is less than 280 mm (11 in), cut the wire within the damaged area. Then slide the appropriate heat shrink tubing (listed below) over the wire, and repair the wire by splicing the wires together. Refer to [Wire to Wire Repair](#). Once the wire is spliced together slide heat shrink tubing over the damaged area and apply heat to seal the repaired wire.

If the wire is damaged, or the damaged area is larger than 280 mm (11 in), then replace the damaged wire by splicing in a new section of wire. Refer to [Wire to Wire Repair](#).

GM Part Number	Diameter		Description	Color	Length	
	Metric	English			Metric	English
12355003	9.5 mm ²	0.375 in	Tubing, Shrink 3/8	Black	305 mm ²	12 in
12355005	12.7 mm ²	0.5 in	Tubing, Shrink 1/2	Black	305 mm ²	12 in
12355011	19.1 mm ²	0.75 in	Tubing, Shrink 3/4	Black	305 mm ²	12 in
12355008	25.4 mm ²	1.0 in	Tubing, Shrink 1.00	Black	305 mm ²	12 in

Wire Size Conversion

Metric Wire Sizes (mm ²)	AWG Sizes
0.13	26
0.20	24
0.32	22
0.52	20
0.82	18
1.31	16
2.09	14
3.30	12
5.27	10
8.35	8
13.3	6

COAXIAL CABLE REPAIRS

The GM global coaxial (coax) cable repair strategy uses coaxial cables, connectors and jumpers to repair coaxial cables. The intent is to install the new service cable in vehicle, but removal of the old cable is not necessary. There are several repair scenarios:

- New cables, jumpers, and connector housing are required.
- Only new cables are required while it is possible to reuse the existing connector housing in vehicle. A jumper may or may not be needed.
- Only new connector housing are required, while it is possible to reuse the existing cable in the vehicle.
- A new cable would need to be installed from source to destination and by-pass the inline connector in some cases when an inline connector is unrepairable (Example: a cracked male end of a 1-way connector).

Coaxial Cable Kits

Four different kits will be available to repair coaxial cables. Components of each kit cannot be ordered separately from the kit.

- **Communication Interface Module Antenna Cable Kit** (Kit # 13581174) is used to repair Cellular coaxial cables. This kit uses RG58 low loss coaxial cables that are available in four lengths. The coaxial cables can be attached together in various lengths to closely match the length of the faulty/damaged coaxial cable.
- **Digital Radio and Vehicle Locator Antenna Coaxial Cable Kit** (Kit # 13581173) is used to repair XM and GPS coaxial cables. For vehicles that have a combined GPS and Cellular/OnStar signal on one cable, use Kit # 13581174. This kit uses RG316 low loss coaxial cables that are available in three lengths. The coaxial cables can be attached together in various lengths to closely match the length of the faulty/damaged coaxial cable.
- **Digital Radio, Mobile Telephone and Vehicle Locator Antenna Coaxial Cable Kit** (Kit # 19119056) is used with OnStar, XM, and GPS cables. This kit consists of jumpers and connectors. The jumpers are used to adapt different types of connectors together (to attach 2-way and 3-way connector onto the long 7, 5, and 3 foot cables). The connectors are used to replace existing connectors. The 1-way and 2-way connectors in the kit are in water-blue color (different than what the vehicle is built with) and are non-keyed (universal fit). The 3-way connectors in the kit are in the same color as in the vehicle.
- **Communication Interface Module Antenna Cable Kit** (Kit # 22803854) is used for the OnStar module on some vehicles built before the 2011 model year.

Coaxial Cable Repair Kits

Repair Kit Name	Description
Communication Interface Module Antenna Cable Kit (Kit # 13581174)	RG58 coaxial cable with female/female connectors - 7ft/2.1m
	RG58 coaxial cable with female/male connectors - 5ft/1.5m
	RG58 coaxial cable with female/male connectors - 3.5ft/1.1m
	RG58 coaxial cable with female/male connectors - 3.5ft/1.1m
Digital Radio and Vehicle Locator Antenna Coaxial Cable Kit (Kit # 13581173)	RG316 coaxial cable with female/female connectors - 7ft/2.1m
	RG316 coaxial cable with female/male connectors - 5ft/1.5m
	RG316 coaxial cable with female/male connectors - 3.5ft/1.1m

Repair Kit Name		Description
Digital Radio, Mobile Telephone and Vehicle Locator Antenna Coaxial Cable Kit (Kit # 19119056)	3-way Gen 1 sub-kit	1-way to 3-way Gen 1 jumper for female connector - Part # 13581154 - 4in/10cm
		1-way to 3-way Gen 1 jumper for male connector - Part # 19119052 - 4in/10cm
		White female connector
		White male connector
		Blue female connector
		Blue male connector
	3-way Gen 2 sub-kit	1-way to 3-way Gen 2 jumper for female connector - Part # 13581155 - 4in/10cm
		1-way to 3-way Gen 2 jumper for male connector - Part # 19119058 - 4in/10cm
		Tan female connector
		Tan male connector
		Gray female connector
		Gray male connector
	2-way Gen 1 sub-kit	1-way to 2-way Gen 1 jumper for female connector - Part # 13581156 - 4in/10cm
		Water-blue female connector
	2-way Gen 2 sub-kit (wide)	1-way to 2-way Gen 2 jumper for female connector - Part # 13581157 - 4in/10cm
		1-way to 2-way Gen 2 jumper for male connector - Part # 13581158 - 4in/10cm
		Water-blue female connector
		Water-blue male connector
	2-way Gen 2 and 3 sub-kit (narrow)	1-way to 2-way Gen 2 and 3 jumper for female connector - Part # 13582468 - 4in/10cm
		Use the 1-way to 2-way Gen 2 jumper for female connector 19119058 - 4in/10cm from the 2-way Gen 2 sub-kit.
		Water-blue female connector
		Water-blue male connector
	Right-angle jumper with water-blue universal 1-way connector - 4in/10cm	
Communication Interface Module Antenna Cable Kit (Kit # 22803854)		1-way to mini UHF jumper - 4in/10cm

Connector Housing Repair Procedure

The connector housings (available in Digital Radio, Mobile Telephone and Vehicle Locator Antenna Coaxial Cable Kit) are available for 1-way housings, 2-way housings and 3-way housings. Determine the connector housing required:

1-way housing

No change to the service coaxial cable is necessary in order to install the new coaxial cable into the vehicle.

2-way housing

A 4-inch jumper is required.

1. Determine the appropriate generation (1, 2, or 3) and/or size (12.7mm or 8mm) of the 2-way housing that is in the vehicle.
2. Remove the faulty/damaged coaxial cable from the 2-way connector housing by removing the terminal position assurance (TPA) from the connector housing and then slide the cable out of the connector.

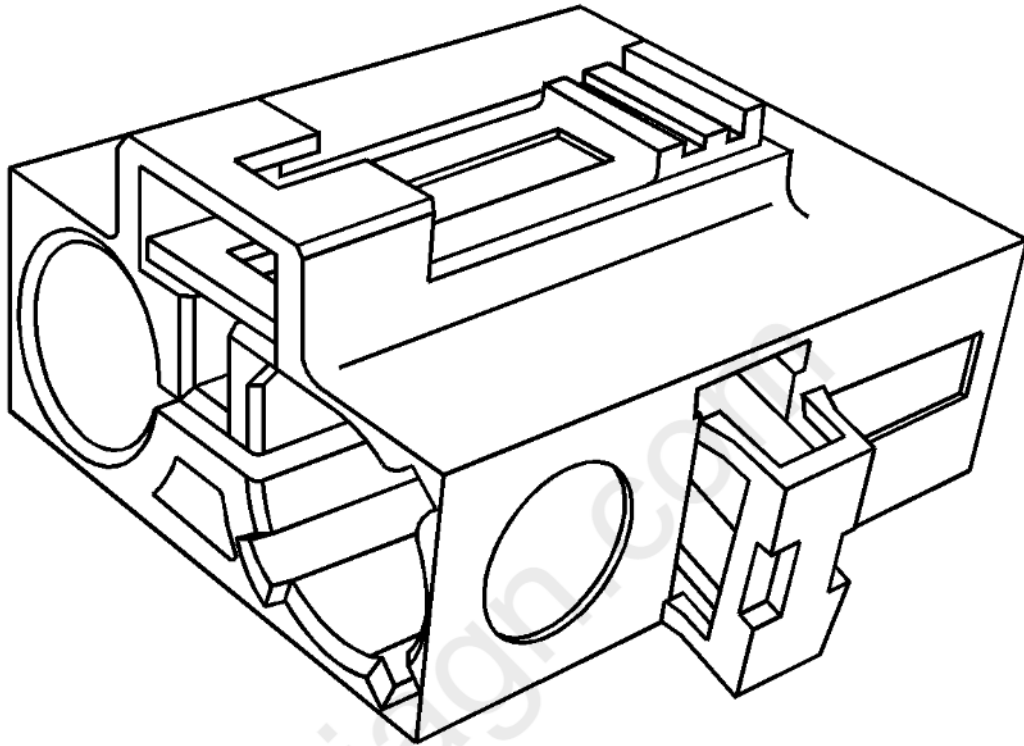


Fig. 1: Connector Housing

Courtesy of GENERAL MOTORS COMPANY

3. Install the new service coaxial cable into the vehicle. Use the 4-inch jumper for the appropriate 2-way connector housing to connect the new service coaxial cable to the connector housing.
4. If the issue is found to be the connector housing and not cable, a new connector housing may be installed while reusing all other components.

3-way housing

A 4-inch jumper is required.

1. Determine the appropriate generation (1 or 2) and keyed 3-way connector housing based on the connector housing color.
2. Note the locations of each of the cables in 3-way housing, as it is important for new cables be placed in the appropriate terminal location in the new connector. The connector housing colors are not interchangeable.
3. Remove the faulty/damaged coaxial cable from the 3-way connector housing by using a pair of side/diagonal cutters to nip and break away the housing.

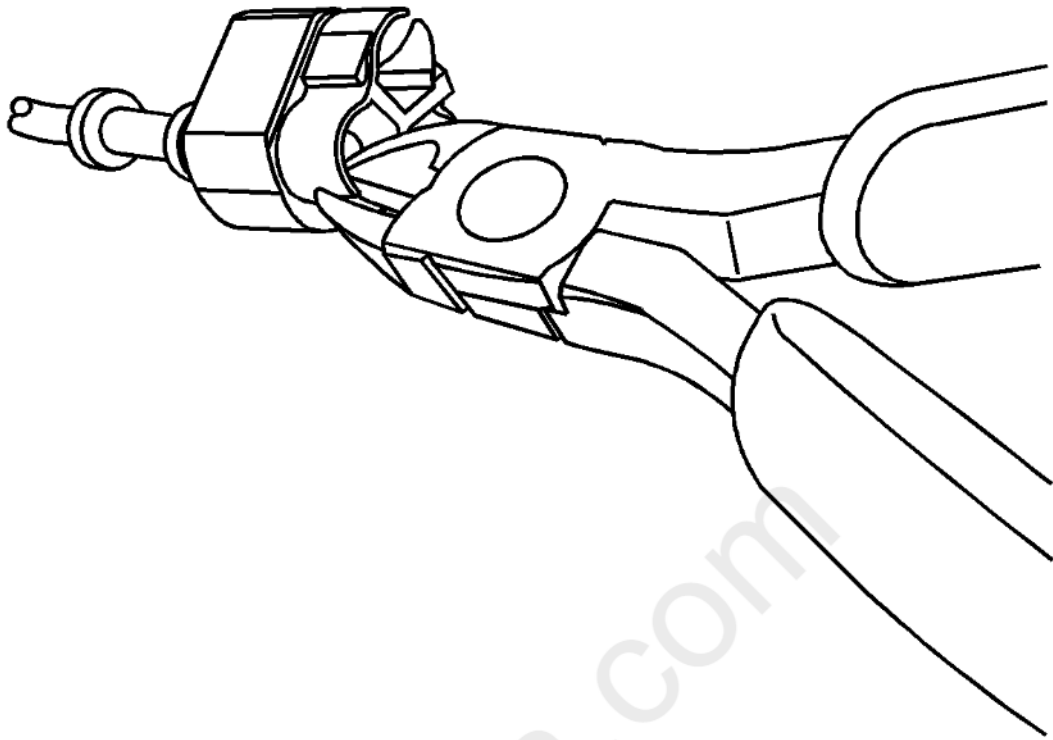


Fig. 2: Using Side/Diagonal Cutters To Nip And Break Away Connector Housing
Courtesy of GENERAL MOTORS COMPANY

4. Use caution not to damage the conductive ends of the coaxial cables inside the connector housing. Do not bend or force the terminal out or it could be damaged.

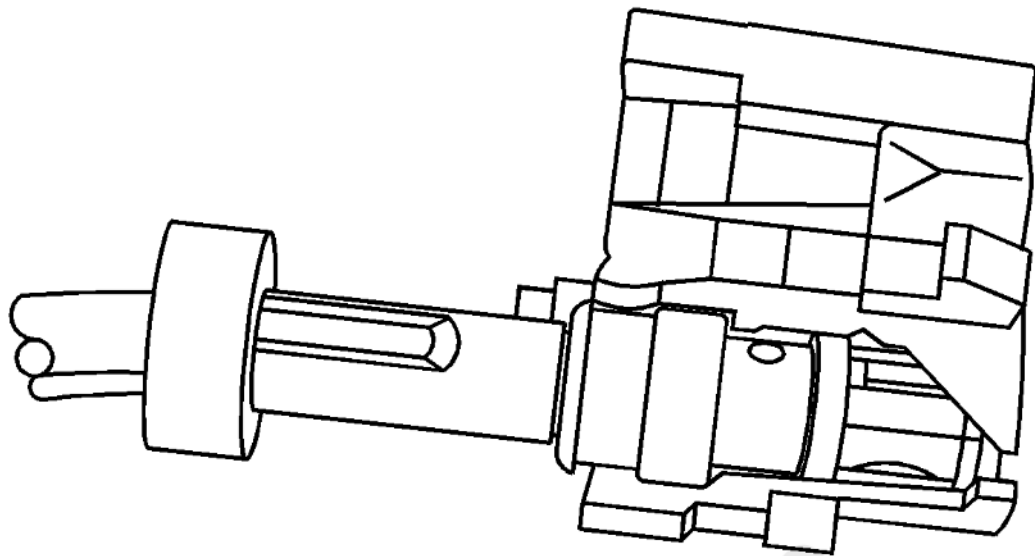


Fig. 3: Connecting New Service Coaxial Cable To New 3-Way Connector Housing
Courtesy of GENERAL MOTORS COMPANY

5. Install the new service coaxial cable into the vehicle. Use the 4-inch jumper for the appropriate color 3-way connector housing to connect the new service coaxial cable to the new 3-way connector housing.
6. If the issue is found to be the connector housing and not cable, a new connector housing may be installed while reusing all other components.

Coaxial Cable Repair Procedure

1. Identify the faulty/damaged coaxial cable.
2. Disconnect the faulty/damaged coaxial cable and leave it in the vehicle.
3. Identify the type of coaxial cable to be replaced and match up with the appropriate pieces to repair the damaged coaxial cable. Match up the type of coaxial cable, cable length and connector types. In some cases there may be extra length of cable left over.

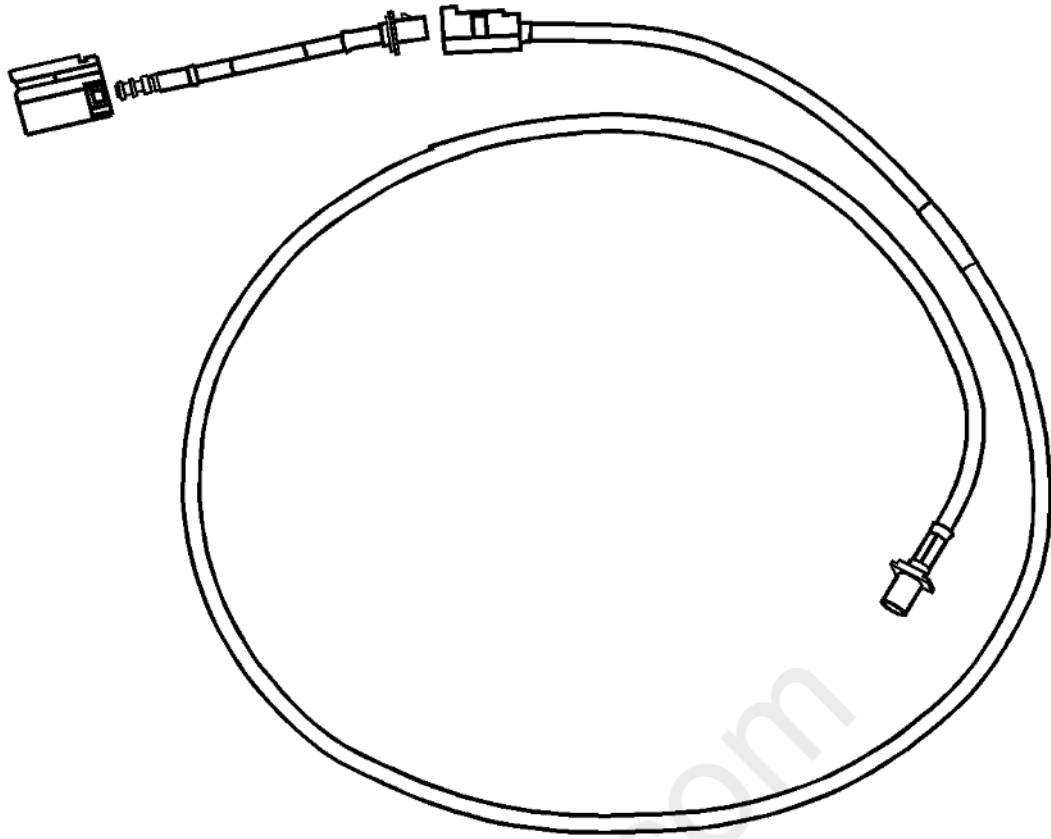


Fig. 4: Coaxial Cable

Courtesy of GENERAL MOTORS COMPANY

NOTE: Avoid routing the new coaxial cable near sharp edges that can damage the new coaxial cable.

4. Install the new coaxial cable in the vehicle.

Use tie-straps to attach the new service coaxial cable to existing harnesses or brackets. Use felt tape/foam to reduce rattles, as necessary.

NOTE: To avoid permanent damage, do not pinch the cable or bend it tighter than a 2 inch (5 centimeter) radius.

5. Remove the faulty/damaged connectors, if applicable.
6. Install new connectors or jumpers, as needed. Refer to Connector Housing Repair Procedure.
7. Verify the repair by operating the system with the engine running.

FLAT WIRE REPAIRS

The flat wire within the flex wiring harness is not serviceable. If an open or short exists within the flex wiring harness the complete harness must be replaced.

FOLDED-OVER WIRE REPAIR

Special Tools

- **EL-38125-10** Splice Sleeve Crimping Tool (non GMNA)
- **J-38125-5A** Ultra Torch Special Tool
- **J-38125-8** Splice Sleeve Crimping Tool (GMNA)

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

The GM global wire repair strategy uses connector assemblies (pigtails) and terminated leads to repair wiring harnesses.

To reduce and manage GM Service Parts proliferation, the service pigtails and terminated leads are designed with the largest wire gauge size that can be held by either the terminal or the connector housing.

The folded over wire repair technique, in which the copper wire strands are folded over before being installed into a splice sleeve, allows the service part to be used when repairing a smaller gauge size wire in a vehicle. This technique has passed all GM testing standards.

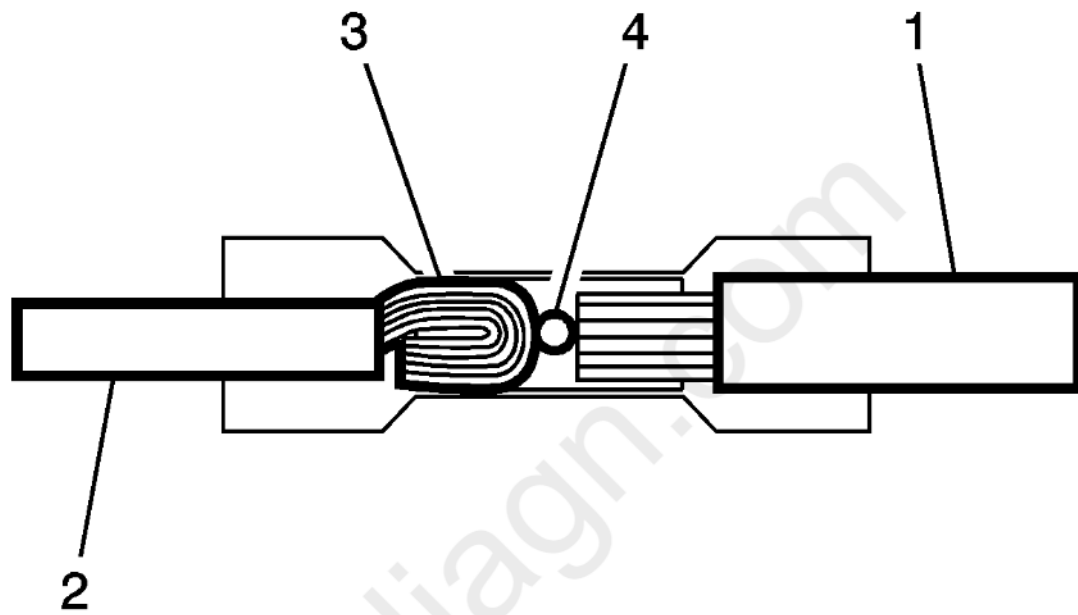


Fig. 5: View Of Stripped Wires In Splice Sleeve Connector

Courtesy of GENERAL MOTORS COMPANY

The larger harness size wires (1) will be placed in one side of the splice sleeve and match the splice sleeve closely in size. The wires are moved into the splice sleeve until they hit the stop (4) in the splice sleeve. The smaller harness size wires (2) will be placed in the other side of the splice sleeve. The smaller harness size wires will be folded over (3) to match up with the splice sleeve size.

Use the folded over wire repair for:

NOTE: Increasing the amount of copper strands in the smaller gauge size will allow for a better crimp

- Splicing wires of 0.35 mm or less (22, 24, 26 gauge sizes)

NOTE: Vehicle side needs to be of same or less gauge size (not greater than the service part's gauge size)

- Splicing wires of different gauges

Use the Service Information (SI) connector end-views to determine:

- Gauge size of wiring harness
- Recommended Repair: Terminated Lead or Pigtail

The following table lists the acceptable variance within the gauge size

Folded-Over Wire Selection Table

Harness Wire Gauge		Connector Assembly (Pigtail) or Terminated Lead Wire Gauge Size			
-		Salmon Color Splice Sleeve		Blue Color Splice Sleeve	Yellow Color Splice Sleeve
Metric	-	0.35 mm	0.5 - 0.8 mm	1.0 - 2.0 mm	3.0 - 6.0 mm
-	Wire Gauge (AWG)	22	20 - 18	16 - 14	12 - 10
0.13 mm	26	Fold Over Wire	Double Fold Over Wire	Not Acceptable	Not Acceptable
0.22 mm	24	Fold Over Wire	Fold Over Wire	Not Acceptable	Not Acceptable
0.35 mm	22	Wire to Wire	Fold Over Wire	Double Fold Over Wire	Not Acceptable
0.5 mm	20	Not Acceptable	Wire to Wire	Fold Over Wire	Not Acceptable
0.75 mm	-	Not Acceptable	Wire to Wire	Fold Over Wire	Double Fold Over Wire
0.8 mm	18	Not Acceptable	Wire to Wire	Fold Over Wire	Double Fold Over Wire
1.0 mm	16	Not Acceptable	Not Acceptable	Wire to Wire	Double Fold Over Wire
1.5 mm	-	Not Acceptable	Not Acceptable	Wire to Wire	Fold Over Wire
2.0 mm	14	Not Acceptable	Not Acceptable	Wire to Wire	Fold Over Wire
2.5 mm	-	Not Acceptable	Not Acceptable	Wire to Wire	Fold Over Wire
3.0-6.0 mm	12 - 10	Not Acceptable	Not Acceptable	Not Acceptable	Wire to Wire

Example

For an IP Harness of 0.22 mm (24 gauge on left side of table) wire size, the SI connector end-view recommends a pigtail with leads of 0.8 mm (18 gauge on the top of the table) with a salmon colored DuraSeal splice sleeve of 0.5 - 1.0 mm (20 - 16 gauge).

Follow these steps to use the folded over wire (1) technique on an IP Harness.

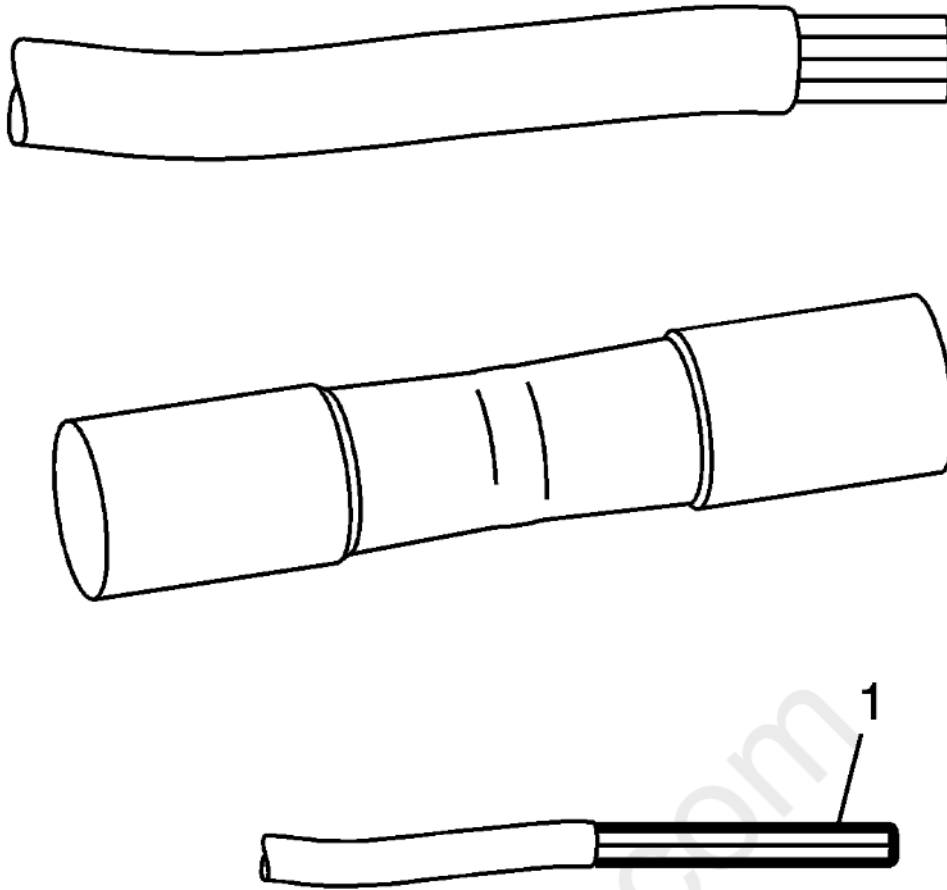


Fig. 6: View Of Stripped Wires

Courtesy of GENERAL MOTORS COMPANY

Strip twice the amount of insulation on the smaller (1) wire (IP Harness is the lower wire) than normally required. Normally, the terminated leads have 5 mm of insulation stripped off the wire.

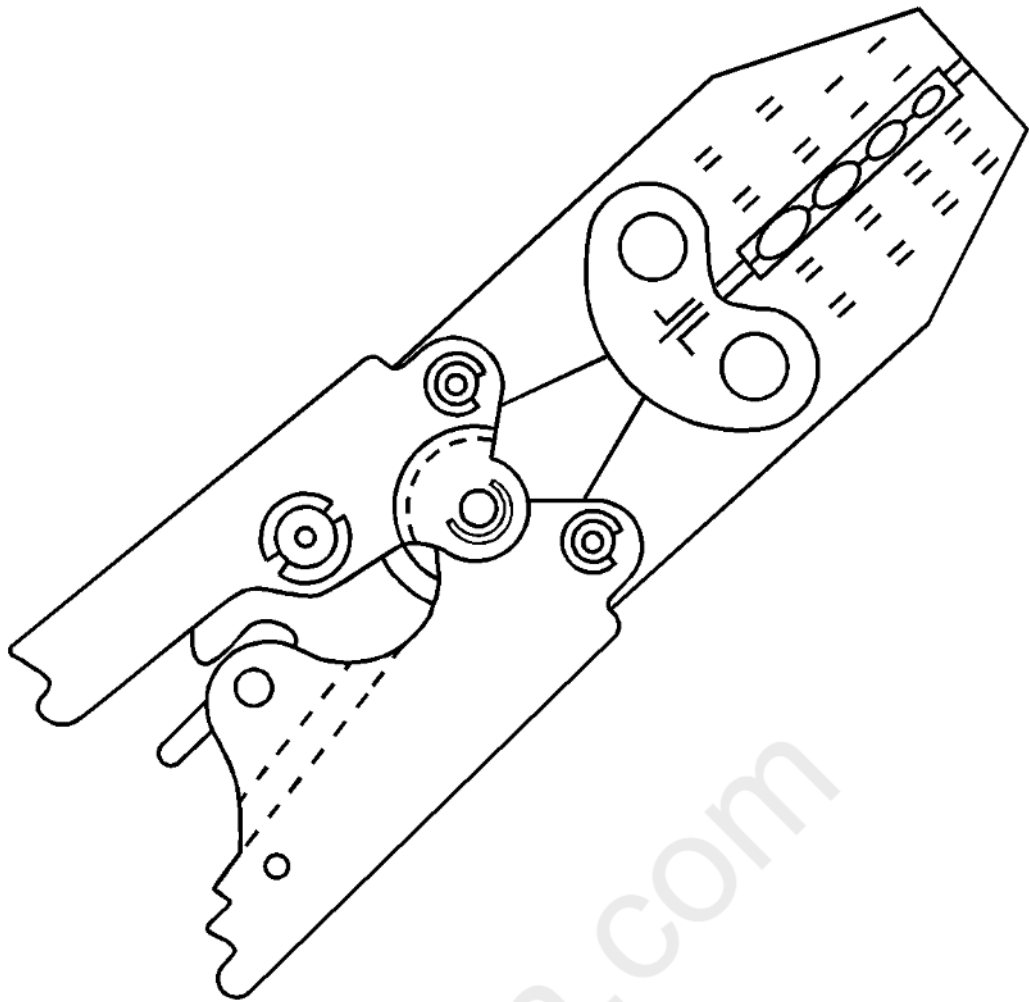


Fig. 7: Splice Sleeve Crimping Tool

Courtesy of GENERAL MOTORS COMPANY

NOTE: Use EL-38125-10 splice sleeve crimping tool (non GMNA) or J-38125-8 splice sleeve crimping tool (GMNA).

1. For wiring repair, refer to [Wire to Wire Repair](#).

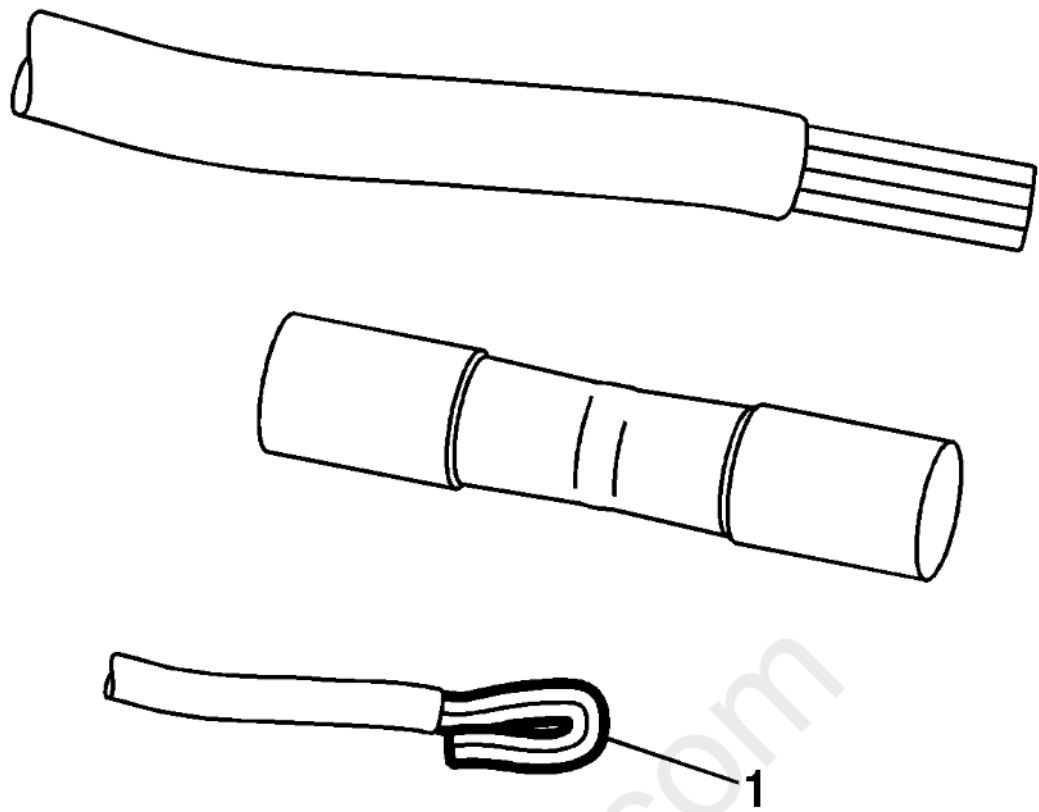


Fig. 8: View Of Twisted And Folded Wire To Length

Courtesy of GENERAL MOTORS COMPANY

2. Twist the wires before you fold them over to prevent the wire strands from opening up. Fold over the copper wire strands of the smaller (1) gauge wire so that it is the same length as the non-folded wire.

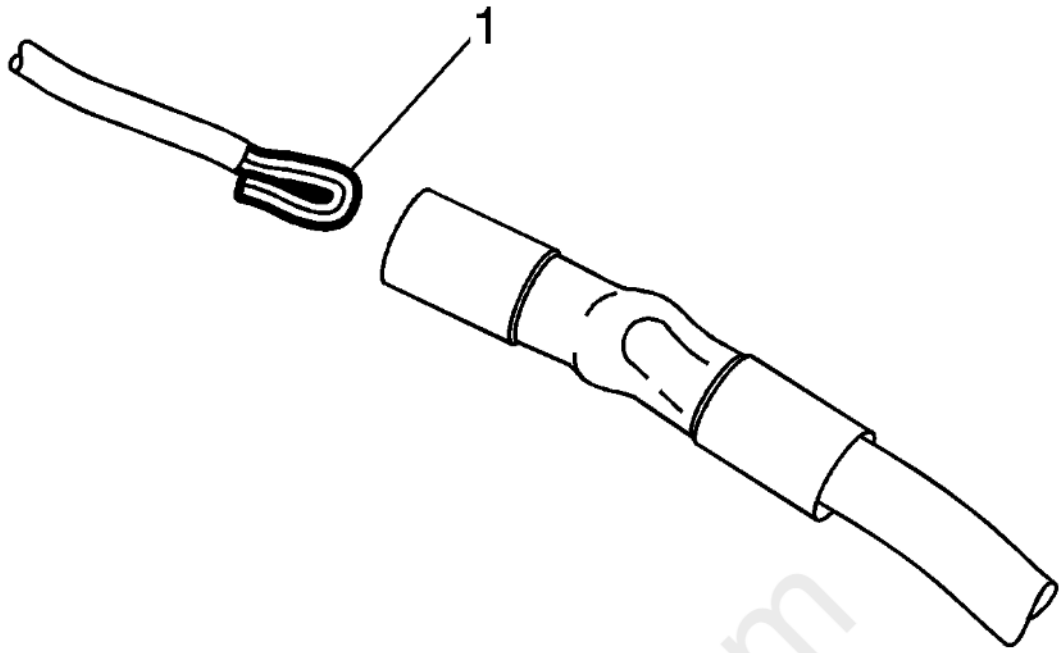


Fig. 9: View Of Folded Wire & Splice Sleeve

Courtesy of GENERAL MOTORS COMPANY

3. Insert the folded over wire (1) into the splice sleeve.

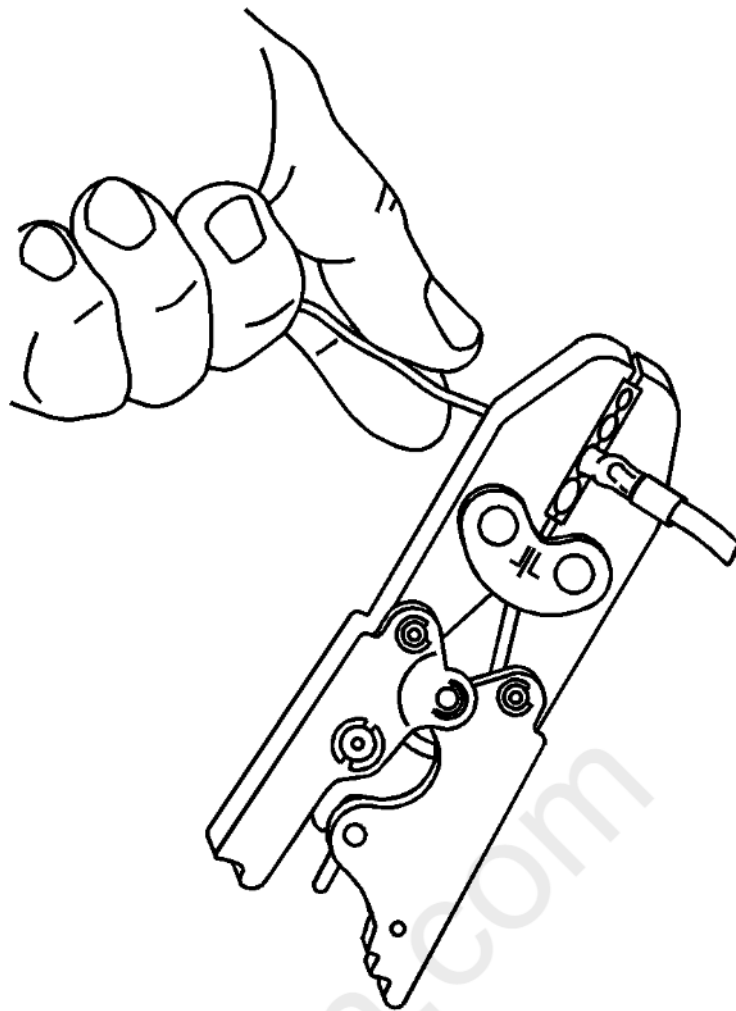


Fig. 10: Crimping Splice Sleeve

Courtesy of GENERAL MOTORS COMPANY

4. Use the proper crimp tool to crimp the splice sleeve to the smaller wire (harness side of repair). Complete the crimp as usual (using the heat tool to shrink the tube).

SERIAL DATA CIRCUIT WIRING REPAIRS

Special Tools

- **EL-38125-10** Splice Sleeve Crimping Tool
- DuraSeal splice sleeves
- A wire stripping tool

For equivalent regional tools, refer to **Special Tools** .

The DuraSeal splice sleeves have the following 2 critical features:

- A special heat shrink sleeve environmentally seals the splice. The heat shrink sleeve contains a sealing adhesive inside.
- A cross hatched (knurled) core crimp provides necessary contact integrity for the sensitive, low energy circuits.

The GM Local Area Network (GMLAN) System requires special wiring repair procedures due to the sensitive nature of the circuitry. Follow the specific procedures and instructions when working on GMLAN connectors and terminals.

GMLAN Repairs

NOTE: When making a repair to any GMLAN network, the original wire length after the repair must be the same length as before the repair. If the network is a

twisted pair, the twist must be maintained after the repair is completed.

GMLAN has 2 types of networks, low speed and high speed. Low speed GMLAN has a single wire and works at slow speeds. High speed GMLAN has 2 wires in a twisted pair and works at higher speeds. For more information on GMLAN, refer to [Data Link Communications Description and Operation](#).

GMLAN Connector Terminal Repair

NOTE: A terminated lead can be used to replace damaged connector terminals for both high speed and low speed GMLAN systems. When making a connector terminal repair on a GMLAN high speed system with twisted pair wires, do not untwist the wires more than necessary to make the repair.

If the individual terminals are damaged on any GMLAN connection, use the appropriate connector repair procedure in order to repair the terminal. Refer to [Connector Repairs](#) for the appropriate connector repair procedure.

GMLAN Wire Repair

NOTE: Refer to Wiring Repairs in the service information connector end views or the vehicle schematics in order to determine the correct wire size for the circuit you are repairing. You must obtain this information in order to ensure circuit integrity.

If any wire except the pigtail is damaged, repair the wire by splicing in a new section of wire of the same gauge size (0.5 mm², 0.8 mm², 1.0 mm² etc.). Use the DuraSeal splice sleeves and EL-38125-10 tool. For wiring repair, refer to [Wire to Wire Repair](#).

Media Oriented Systems Transport (MOST) Wiring Repair

NOTE: If harness repair/analysis is performed, MOST bus Twist Pair unshielded wire should be 0.35 mm² (22 AWG) wire with at least one twist per each 1 45/64 inch (45 mm) and must not be untwisted for more than 3 15/16 of an inch (10 cm).

The following conditions need to be met to ensure a valid continuity:

- Untwisted length for all MOST 50 circuits at each wire harness connector should be no longer 50 mm max (25 mm preferred).
- When wire repairs are made, a minimum 25 twists/meter for all MOST 50 circuits.
- MOST 50 has specific receive and transmit I/O.

The transmit of one module is connected to receive of the next module in ring topology.

HEATED OXYGEN SENSOR WIRING REPAIRS

CAUTION: Do not solder repairs under any circumstances as this could result in the air reference being obstructed.

If the heated oxygen sensor pigtail wiring, connector, or terminal is damaged the entire oxygen sensor assembly must be replaced. Do not attempt to repair the wiring, connector, or terminals. In order for the sensor to function properly it must have a clean air reference. This clean air reference is obtained by way of the oxygen sensor signal and heater wires. Any attempt to repair the wires, connectors or terminals could result in the obstruction of the air reference and degrade oxygen sensor performance.

The following guidelines should be used when servicing the heated oxygen sensor:

- Do not apply contact cleaner or other materials to the sensor or vehicle harness connectors. These materials may get into the sensor, causing poor performance. Also, the sensor pigtail and harness wires must not be damaged in such a way that the wires inside are exposed. This could provide a path for foreign materials to enter the sensor and cause performance problems.

- Neither the sensor nor vehicle lead wires should be bent sharply or kinked. Sharp bends, kinks, etc., could block the reference air path through the lead wire.
- Do not remove or defeat the oxygen sensor ground wire (where applicable). Vehicles that utilize the ground wire sensor may rely on this ground as the only ground contact to the sensor. Removal of the ground wire will also cause poor engine performance.
- To prevent damage due to water intrusion, be sure that the peripheral seal remains intact on the vehicle harness connector.

HIGH TEMPERATURE WIRING REPAIRS

NOTE: All wiring repairs need to be 200 mm from the heat zone. Areas of consideration would be any area located near the exhaust manifolds, catalytic converter, exhaust pipes, and turbocharged engines.

Items Required

- DuraSeal splice sleeves to crimp and seal connections
- High temperature SCT1 shrink tubing to protect the splice sleeves
- Terminated leads or pigtails
- The correct tools to remove the terminals from the connectors

Use high temperature bulk wire rated at 150°C (302°F) continuous temperature of the same or larger gauge size as the original wire when repair damage wire. Also replace any reflective tape that you remove during the repair.

High Temperature Wiring

Wiring that is exposed to high temperatures, 135°C (275°F) or higher, for prolonged periods of time may use materials i.e. wires, connectors, and shielding that has a higher heat rating than typical wiring. When making a repair in a high temperature area observe the following:

- Use high temperature bulk wire rated at 150°C (302°F) continuous temperature to replace any damaged wire.
- Replace any heat shielding that is removed.
- Cover any DuraSeal splice sleeves with SCT1 shrink tubing.
- After making a wiring repair, ensure that the location of the wiring is not moved closer to the heat source.

Identifying High Temperature Wiring

NOTE: High temperature areas would be areas located near exhaust manifolds, catalytic converters, exhaust pipes, and turbocharged engines.

Wiring that is exposed to high temperature, 135°C (275°F) or higher, for prolonged periods of time need special considerations when making wiring repairs. Areas that may be exposed to higher temperatures can be identified by heat resistant materials that are being used in those areas. These materials may include heat reflective tape and high temperature shrink tubing. Also conduit and other protective coverings may be used. Because conduit or similar coverings are used throughout the vehicle regardless of the temperature, it may be necessary for the technician to determine if an area is exposed to excessive heat before making a wiring repair.

SIR/SRS WIRING REPAIRS

NOTE: Refer to [SIR Service Precautions](#).

For European Regions

CAUTION: If the SIR/SRS wiring, connector, or terminal is damaged, the affected wiring harness must be replaced. Do not attempt to repair the wiring, connector, or terminals. Any attempt to repair the wires, connectors, or

terminals could result in performance problems of the SIR/SRS System. Operations on restraint systems must only be performed by trained and qualified personnel.

For Non-European Regions

Special Tools

Splice Sleeve Crimping Tool, refer to [Special Tools](#).

The Supplemental Inflatable Restraint (SIR) System/Supplemental Restraint System (SRS) requires special wiring repair procedures due to the sensitive nature of the circuitry. Follow the specific procedures and instructions when working with the SIR/SRS, and the wiring components, such as connectors and terminals.

SIR/SRS Connector Repair (Plastic Body and Terminal Metal Pin)

NOTE: Do not use the terminals in the kit in order to replace damaged SIR/SRS system terminals. Use either an SIR/SRS pigtail or a terminated lead from the SIR Repair Kit Tray.

The terminals in the SIR/SRS system are made with a special plating. This plating provides the necessary contact integrity for the sensitive, low energy circuits.

Pigtail repair packs are available for SIR/SRS connectors with eight or less terminals. Only the connector body is available for connectors with more than eight terminals. Terminated leads can be used to replace damaged terminals when replacing the connector body.

SIR/SRS Component Wire Pigtail Repair

NOTE: Do not make wire, connector, or terminal repairs on components with wire pigtails.

A wire pigtail is a wire or wires attached directly to the device, not by a connector. If a wiring pigtail is damaged, you must replace the entire component, with pigtail. The inflatable restraint steering wheel module coil is an example of a pigtail component.

SIR/SRS Wire Repair

CAUTION: Do not install more than 2 DuraSeal splice sleeves per SIR deployment loop. A deployment loop consists of both wires from the K36 Inflatable Restraint Sensing and Diagnostic Module to the deployable component. If more than 2 DuraSeal splice sleeves are required for any SIR deployment loop, the complete circuit of the loop must be replaced. More than 2 DuraSeal splice sleeves per deployment loop may increase the resistance in the circuit causing a DTC to be set.

NOTE: Refer to Wiring Repairs in the service information connector end views or the vehicle schematics in order to determine the correct wire size for the circuit you are repairing. You must obtain this information in order to ensure circuit integrity.

If any wire except the pigtail is damaged, repair the wire by splicing in a new section of wire of the same gauge size (0.5 mm, 0.8 mm, 1.0 mm etc.). Use the DuraSeal splice sleeves and the appropriate splice sleeve crimping tool. For wiring repair, refer to [Wire to Wire Repair](#).

For connector position assurance (CPA), refer to [Connector Position Assurance Locks](#).

For terminal position assurance (TPA), refer to [Terminal Position Assurance Locks](#).

SPlicing INLINE HARNESS DIODES

Many vehicle electrical systems use a diode to isolate circuits and protect the components from voltage spikes. When installing a new diode use the following procedure.

1. Open the harness.
 - If the harness is taped, remove the tape.
 - To avoid wiring insulation damage, use a sewing seam ripper (available from sewing supply stores) in order to cut open the harness.
 - If the harness has a black plastic conduit, pull out the diode.
2. If the diode is taped to the harness, remove all of the tape.
3. Check and record the current flow direction and orientation of diode.
4. Remove the inoperative diode from the harness with a suitable soldering tool.

NOTE: If the diode is located next to a connector terminal remove the terminal(s) from the connector to prevent damage from the soldering tool.

5. Carefully strip away a section of insulation next to the old soldered portion of the wire(s). Do not remove any more than is needed to attach the new diode.
6. Check current flow direction of the new diode, being sure to install the diode with correct bias. Reference the appropriate service manual wiring schematic to obtain the correct diode installation position.
7. Attach the new diode to the wire(s) using 60/40 rosin core solder. Before soldering attach some heat sinks (aluminum alligator clips) across the diode wire ends to protect the diode from excessive heat. Follow the manufacturer's instruction for the soldering equipment.
8. Reinstall terminal(s) into the connector body if previously removed.

NOTE: To prevent shorts to ground and water intrusion, completely cover all exposed wire and diode attachment points with tape.

9. Tape the diode to the harness or connector using electrical tape.

SPlicing Twisted or Shielded Cable

WARNING: In order to reduce the risk of personal injury, loss of high voltage isolation to ground and higher system impedance, do not attempt to repair any HV wiring, connector, or terminal that is damaged. High voltage coaxial type cables are not repairable. Never attempt to repair a coaxial type cable. The entire cable/harness or component must be replaced. In order to maintain system integrity and personal safety, never attempt to repair any high voltage wiring, cables, or terminals. Performing this procedure on high voltage circuits may result in serious injury or death.

Twisted/shielded cable is used in order to protect wiring from electrical noise. Two-conductor cable of this construction is used between the radio and the Delco-Bose® speaker/amplifier units and other applications where low level, sensitive signals must be carried. Follow the instructions below in order to repair the twisted/shielded cable.

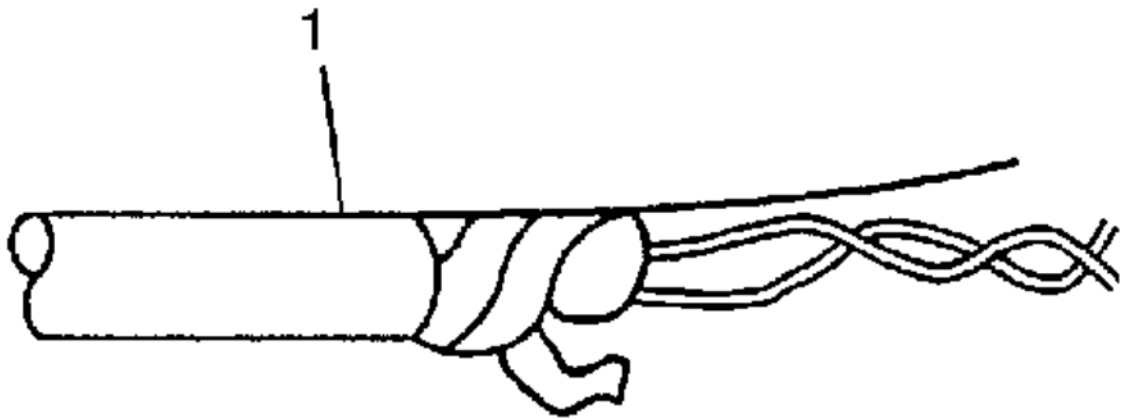


Fig. 11: View Of Outer Wiring Jacket

Courtesy of GENERAL MOTORS COMPANY

1. Remove the outer jacket (1). Use care not to cut into the drain wire of the mylar tape.
2. Unwrap the tape. Do not remove the tape. Use the tape in order to rewrap the twisted conductors after the splice is made.



Fig. 12: Identifying Staggered Splices

Courtesy of GENERAL MOTORS COMPANY

3. Prepare the splice. Untwist the conductors and follow the instructions for **Wire to Wire Repair**. Staggering the splices by 65 mm (2.5 in) is recommended.

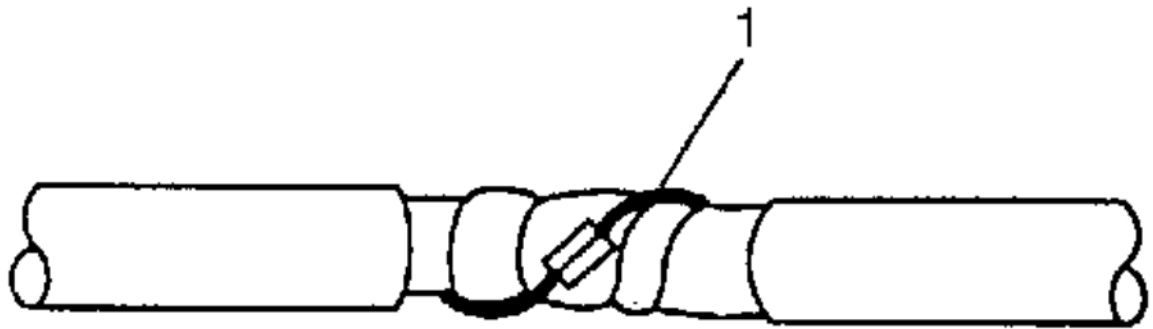


Fig. 13: Identifying Diode On Wire

Courtesy of GENERAL MOTORS COMPANY

NOTE: Apply the mylar tape with the aluminum side inward. This ensures good electrical contact with the drain wire.

4. Re-assemble the cable.

- Rewrap the conductors with the mylar tape. If the mylar tape is damaged, use 3M product AL-36FR to replace the damaged mylar tape.
- Use caution not to wrap the drain wire in the tape (1).
- Follow the splicing instructions for copper wire and splice the drain wire.
- Wrap the drain wire around the conductors and tape with electrical tape to replace the outer insulation.



Fig. 14: View Of Repaired Wire Covered With Electrical Tape
Courtesy of GENERAL MOTORS COMPANY

5. Tape over the entire cable. Use a winding motion when you apply the tape.

WIRE TO WIRE REPAIR

Special Tools

- EL-38125-10 Splice Sleeve Crimping Tool
- EL-38125-5 Ultra Torch Special Tool
- DuraSeal splice sleeves, in order to repair the SIR/SRS wiring

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

WARNING:

In order to reduce the risk of personal injury, loss of high voltage isolation to ground and higher system impedance, do not attempt to repair any HV wiring, connector, or terminal that is damaged. High voltage coaxial type cables are not repairable. Never attempt to repair a coaxial type cable. The entire cable/harness or component must be replaced. In order to maintain system integrity and personal safety, never attempt to repair any high voltage wiring, cables, or terminals. Performing this procedure on high voltage circuits may result in serious injury or death.

NOTE:

If the wiring harness internal to the transmission is damaged, the wiring harness must be replaced. The use of splice sleeves in an attempt to

repair the internal transmission wires, connectors, or terminals could result in performance issues.

NOTE: Do not splice wires in Door Harness Grommets.

NOTE:

- Use only DuraSeal splice sleeves. Other splice sleeves may not protect the splice from moisture or provide a good electrical connection.
- For wire Gauge smaller than.5 mm (18 gauge) refer to [Folded-Over Wire Repair](#)

Use DuraSeal splice sleeves to form a one-to-one splice on all types of insulation except high voltage and specialty cables. Use DuraSeal splice sleeves where there are special requirements such as moisture sealing. Follow the instructions below in order to splice copper wire using DuraSeal splice sleeves.

Splice Sleeve Color	Crimp Tool Nest Color		Wire Gauge mm ² / (AWG)
	3 Crimp Nests	4 Crimp Nests	
Salmon (Yellow-Pink) 19168446	Red (1) or Red/Green (1)	Red (2)	0.5 - 0.8/(18 - 20)
Blue 19168447	Blue (2)	Blue (3)	1.0 - 2.6/(14 - 16)
Yellow 19168448	Yellow (3)	Yellow (4)	3.0 - 5.0/(10 - 12)

NOTE: You must perform the following procedures in the listed order. Repeat the procedure if any wire strands are damaged. You must obtain a clean strip with all of the wire strands intact.

1. Open the harness by removing any tape:
 - Use a sewing seam ripper, available from sewing supply stores, in order to cut open the harness in order to avoid wire insulation damage.
 - Use the DuraSeal splice sleeves on all types of insulation except Tefzel and coaxial.
 - Do not use the crimp and DuraSeal splice sleeve to form a splice with more than 2 wires coming together.
2. Cut as little wire off the harness as possible. You may need the extra length of wire in order to change the location of a splice.

Adjust splice locations so that each splice is at least 40 mm (1.5 in) away from the other splices, harness branches, or connectors.

3. Strip the insulation:
 - When adding a length of wire to the existing harness, use the same size wire as the original wire.
 - Perform one of the following items in order to find the correct wire size:
 - Find the wire on the schematic and convert to regional wiring gauge size.
 - If you are unsure of the wire size, begin with the largest opening in the wire stripper and work down until achieving a clean strip of the insulation.
 - Strip approximately 5.0 mm (0.20 in) of insulation from each wire to be spliced.
 - Do not nick or cut any of the strands. Inspect the stripped wire for nicks or cut strands.
 - If the wire is damaged, repeat this procedure after removing the damaged section.
4. For high temperature wiring, slide a section of high temperature SCT1 shrink tubing down the length of wire to be spliced. Ensure that the shrink tubing will not interfere with the splice procedure.
5. Select the proper DuraSeal splice sleeve according to the wire size. Refer to the above table at the beginning of the repair procedure for the color coding of the DuraSeal splice sleeves and the crimp

tool nests.

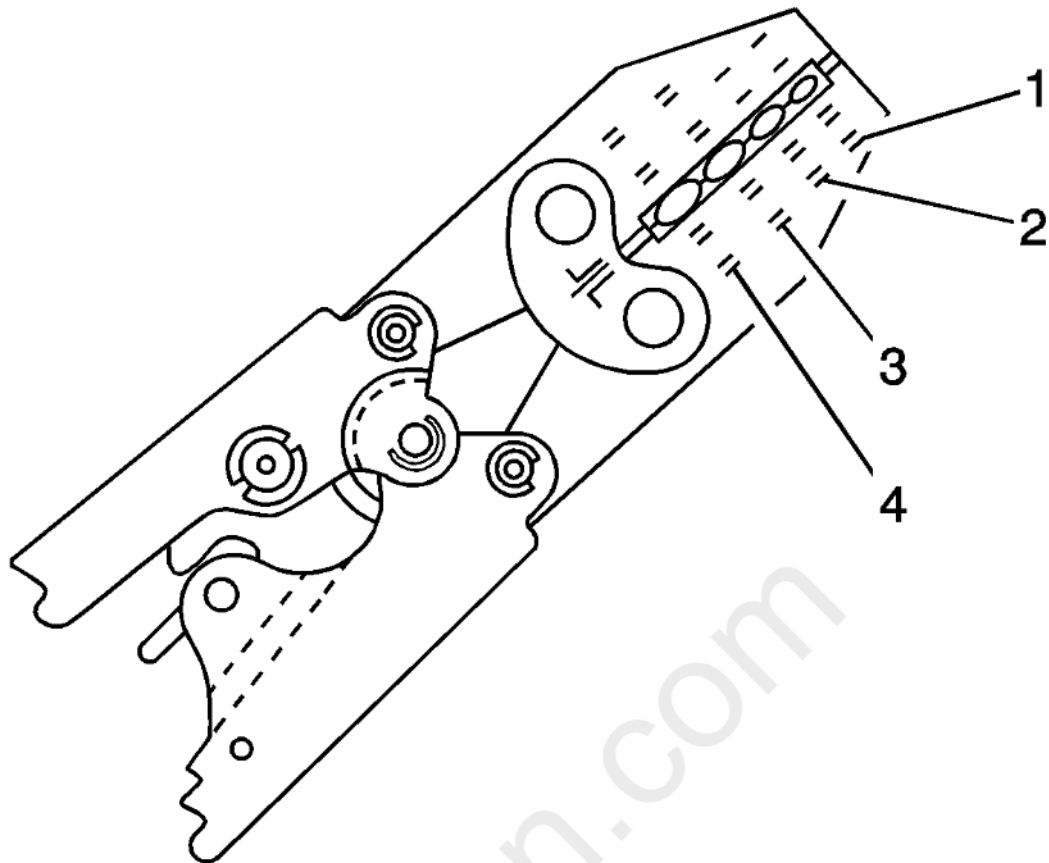


Fig. 15: Splice Sleeve Crimping Tool With 4 Crimp Nests

Courtesy of GENERAL MOTORS COMPANY

6. The **EL-38125-10** splice sleeve crimping tool has four crimp nests. The largest crimp nest (4) is used for crimping 10 and 12 gauge wires. The second largest crimp nest (3) is used for crimping 14 and 16 gauge wires. The third largest crimp nest (2) is used for crimping 18 and 20 gauge wires. The smallest crimp nest (1) is used for crimping 22 to 26 gauge wires. The crimp nests are referenced in the table (farther above) under the crimp tool nest color.

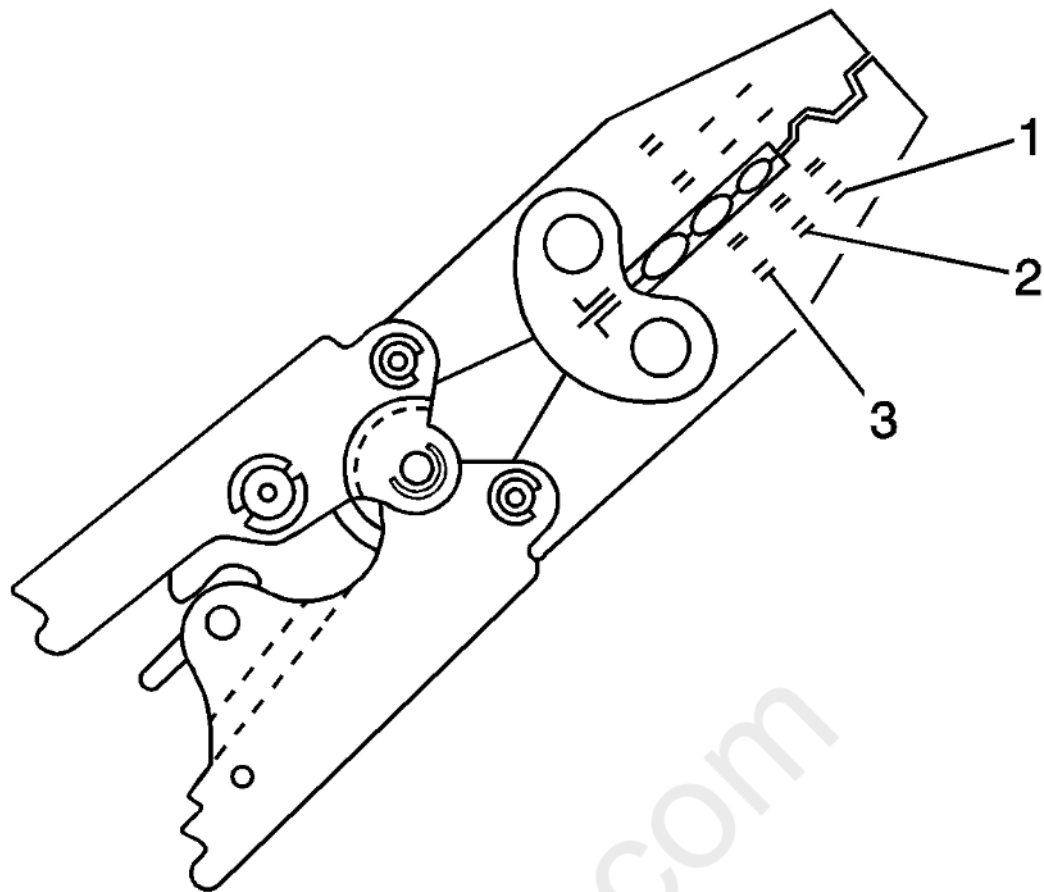


Fig. 16: Splice Sleeve Crimping Tool With 3 Crimp Nests

Courtesy of GENERAL MOTORS COMPANY

7. The **J-38125-8** splice sleeve crimping tool has three crimp nests. The largest crimp nest (3) is used for crimping 10 and 12 gauge wires. The second largest crimp nest (2) is used for crimping 14 and 16 gauge wires. The smallest crimp nest (1) is used for crimping 18 to 20 gauge wires. The crimp nests are referenced in the table (farther above) under the crimp tool nest color.
8. Use the splice sleeve crimp tool in order to position the DuraSeal splice sleeve in the proper color nest of the splice sleeve crimp tool. For the four crimp nest tool, use the three largest crimp nests to crimp the splice sleeves. For the three crimp nest tool, use all three crimp nests to crimp the splice sleeves. Use the four and three crimp tool diagrams (above) and the table (farther above) to match the splice sleeve with the correct crimp nest. The crimp tool diagram callout numbers match the numbers in the table (under crimp tool nest color).

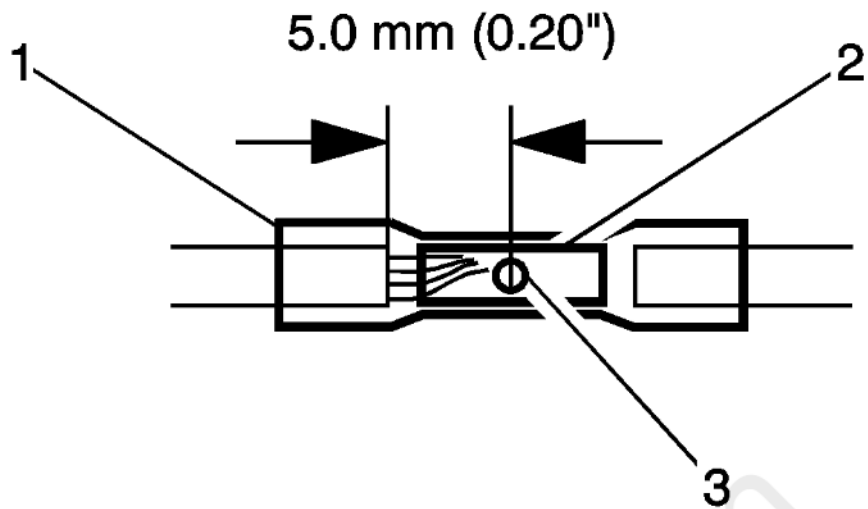


Fig. 17: Identifying Duraseal Splice Sleeve
Courtesy of GENERAL MOTORS COMPANY

9. Place the DuraSeal splice sleeve in the nest. Ensure that the crimp falls midway between the end of the barrel and the stop. The sleeve has a stop (3) in the middle of the barrel (2) in order to prevent the wire (1) from going further. Close the hand crimper handles slightly in order to firmly hold the DuraSeal splice sleeve in the proper nest.



Fig. 18: Crimped Duraseal Splice Sleeve

Courtesy of GENERAL MOTORS COMPANY

10. Insert the wire into the splice sleeve barrel until the wire hits the barrel stop.
11. Tightly close the handles of the crimp tool until the crimper handles open when released.

The crimper handles will not open until you apply the proper amount of pressure to the DuraSeal splice sleeve. Repeat steps 4 and 6 for the opposite end of the splice.



Fig. 19: Crimped Duraseal Splice Sleeve
Courtesy of GENERAL MOTORS COMPANY

12. Using the EL-38125 - 5 ultra torch, apply heat to the crimped area of the barrel.
13. Start in the middle and gradually move the heat barrel to the open ends of the tubing:
 - The tubing will shrink completely as the heat is moved along the insulation.
 - A small amount of sealant will come out of the end of the tubing when sufficient shrinkage is achieved.

Weatherpack™ Wiring Repair

NOTE: Some replacement pigtail connectors may be delivered without the terminated leads installed into the connector. For Weatherpack™ connectors, all terminated leads included in the package should to be installed into the connector. If the connector end view shows that a terminal is not occupied, the extra terminated lead(s) need to be installed and the end(s) sealed using a DuraSeal splice sleeve and taped back into the harness.

1. Insert the wire into the splice sleeve barrel until the wire hits the barrel stop. Refer to **Folded-Over Wire Repair** for splicing wires of 0.35 mm or less (22, 24, 26 gauge sizes) and for splicing wires of different gauges.

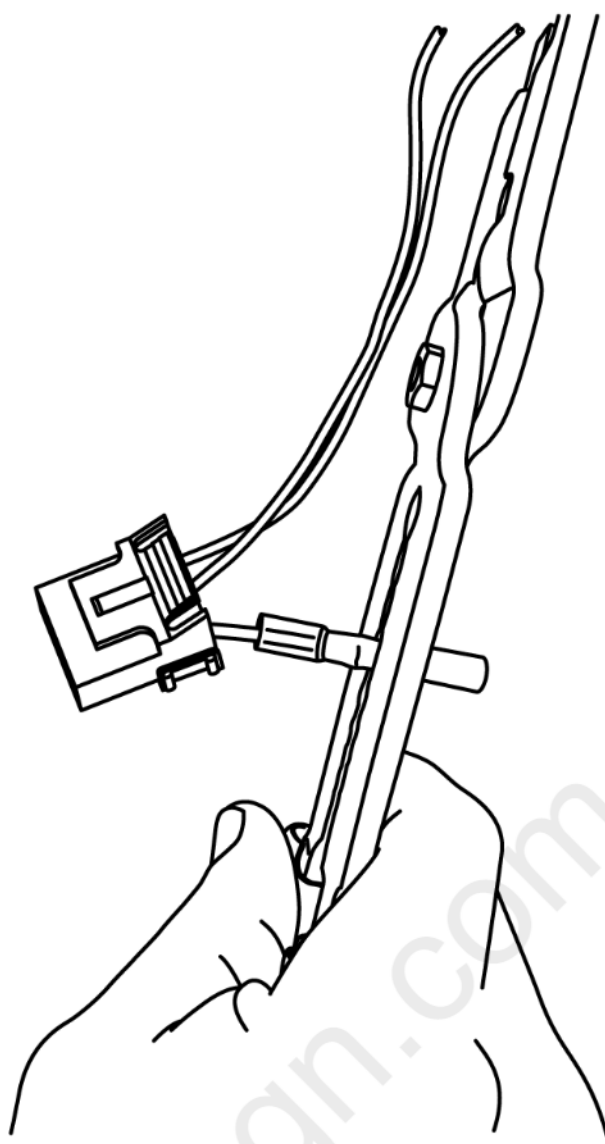


Fig. 20: Tightly Close Handles Of Crimp Tool

Courtesy of GENERAL MOTORS COMPANY

2. Tightly close the handles of the crimp tool until the crimper handles open when released.

The crimper handles will not open until you apply the proper amount of pressure to the DuraSeal splice sleeve. Holding the DuraSEAL with one hand gently tug on the wire to ensure it is crimped in the DuraSeal.

3. Using the heat torch, apply heat to the crimped area of the barrel.

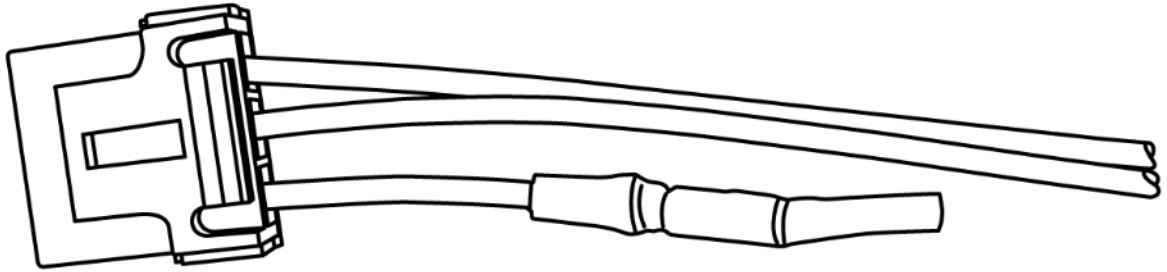


Fig. 21: Heat To Crimped Area Of Barrel

Courtesy of GENERAL MOTORS COMPANY

4. Start in the middle and gradually move the heat barrel to the open ends of the tubing:
 - The tubing will shrink completely as the heat is moved along the insulation.
 - A small amount of sealant will come out of the end of the tubing when sufficient shrinkage is achieved.

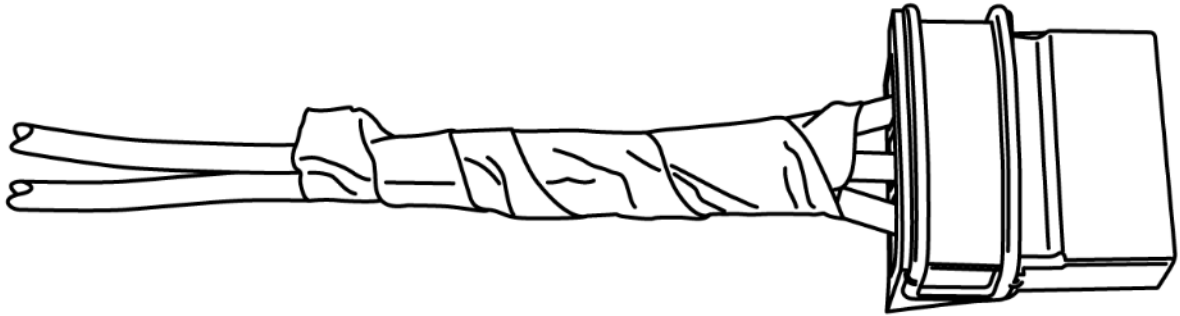


Fig. 22: Taping Extra Terminated Leads Back Into Harness
Courtesy of GENERAL MOTORS COMPANY

5. Tape the extra terminated lead(s) back into the harness.

High Temperature Wiring Repairs

Use the following procedures to perform high temperature wiring repairs:

1. Center the high temperature SCT1 shrink tube over the DuraSeal splice sleeve.
2. Using the EL-38125 - 5 ultra torch, apply heat to the high temperature heat shrink tubing.
3. Gradually move the heat from the center to the open end of the tubing:
 - The tubing will shrink completely as the heat is moved along the insulation.
 - A small amount of sealant will come out of the end of the tubing when sufficient shrinkage is achieved.
4. Replace any reflective tape and clips that may have been removed during the repair.

CONNECTOR POSITION ASSURANCE LOCKS

The connector position assurance (CPA) is a small plastic insert that fits through the locking tabs of the connector. CPAs are used in various connectors throughout the vehicle. CPAs are also used in all SIR system electrical connectors. The CPA ensures that the connector halves cannot vibrate apart. You must have the CPA in place in order to ensure good contact between the mating terminals of the connector.

TERMINAL POSITION ASSURANCE LOCKS

The terminal position assurance (TPA) insert resembles the plastic combs used in the control module connectors. The TPA keeps the terminal securely seated in the connector body. Do not remove the TPA

from the connector body unless you remove a terminal for replacement. If the TPA is removed, be sure to reinstall it before reconnecting the connector.

AFL/EPC CONNECTORS

Special Tools

- **EL-38125-550** Terminal Release Tool Kit
- **EL-38125-580** Terminal Release Tool Kit
- **J-38125-12A** Terminal Release Tool
- **J-38125-216** Terminal Release Tool

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

Terminal Removal Procedure

Follow the steps below in order to remove terminals from the connector.

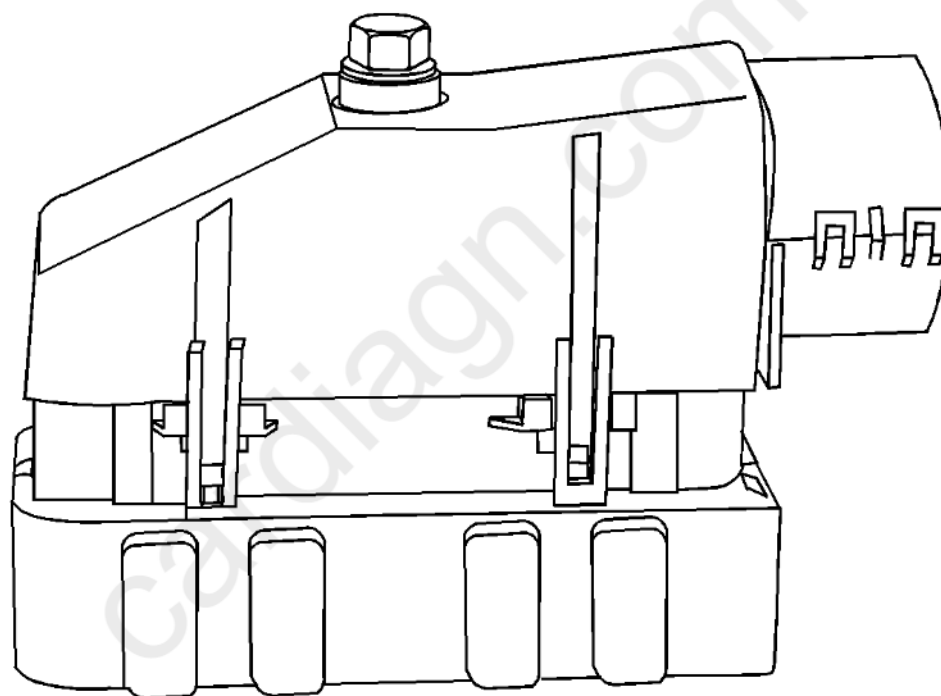


Fig. 23: View Of Bolt On Connector Cover

Courtesy of GENERAL MOTORS COMPANY

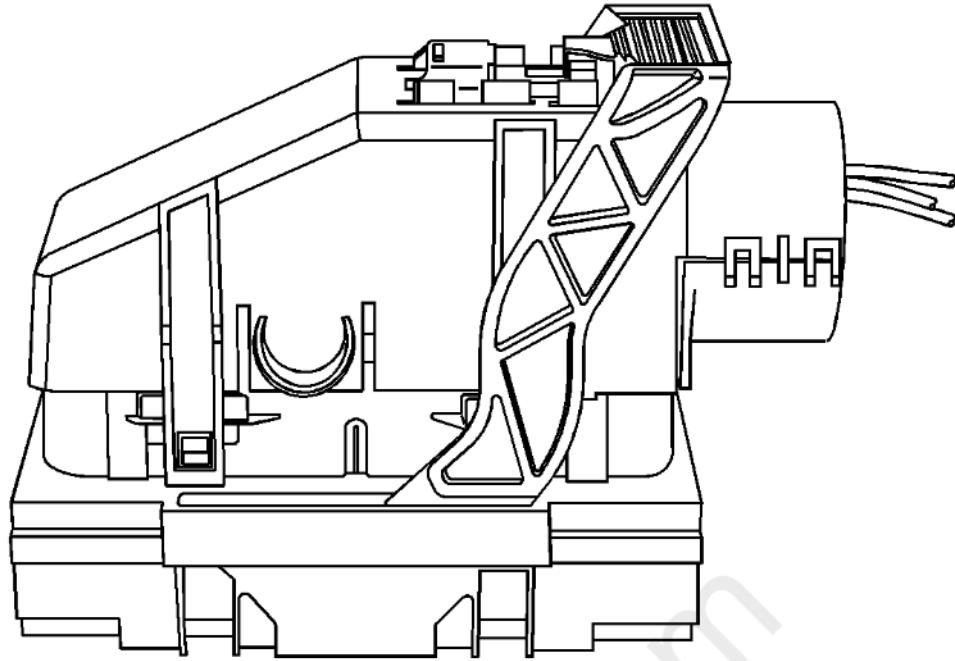


Fig. 24: Identifying Connector Position Assurance (CPA)

Courtesy of GENERAL MOTORS COMPANY

1. For connectors with a bolt in the dress cover, turn the bolt counterclockwise to remove the connector from the component.
2. Locate the connector position assurance (CPA) on the top of the wire dress cover. Slide the CPA forward.

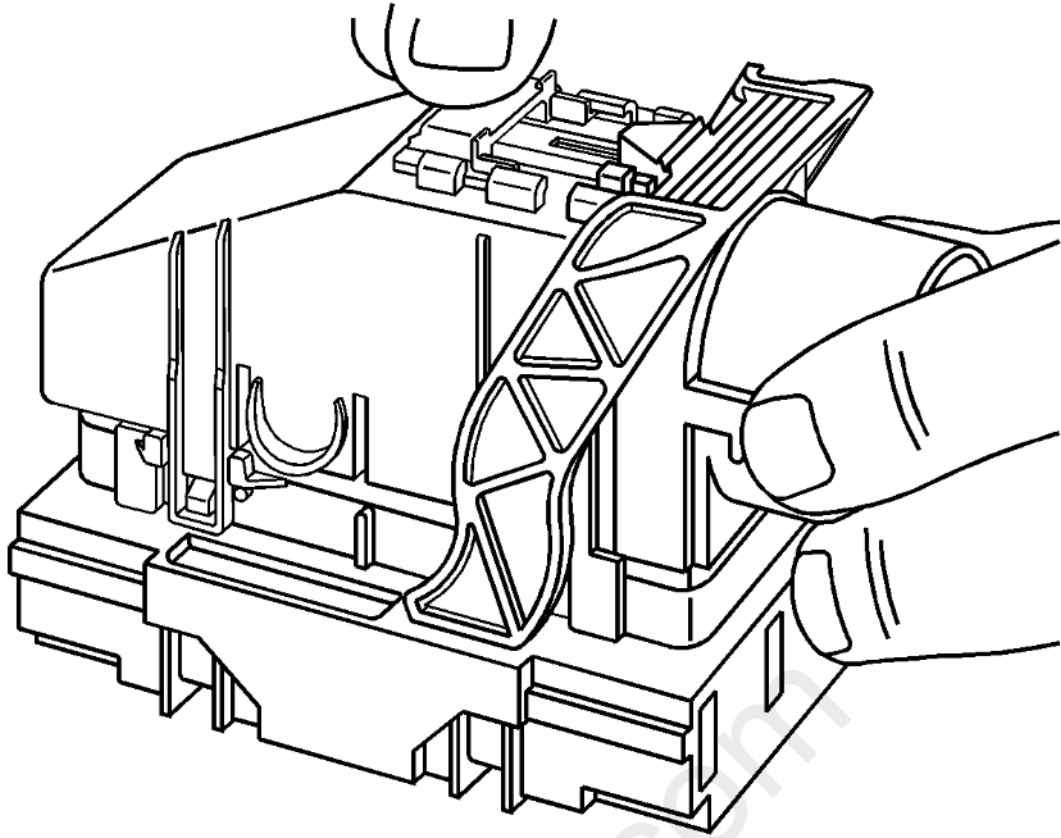


Fig. 25: Identifying Lever Lock & Lever Lock Release Tab

Courtesy of GENERAL MOTORS COMPANY

3. Slide the lever lock forward while pressing down on the lever lock release tab.

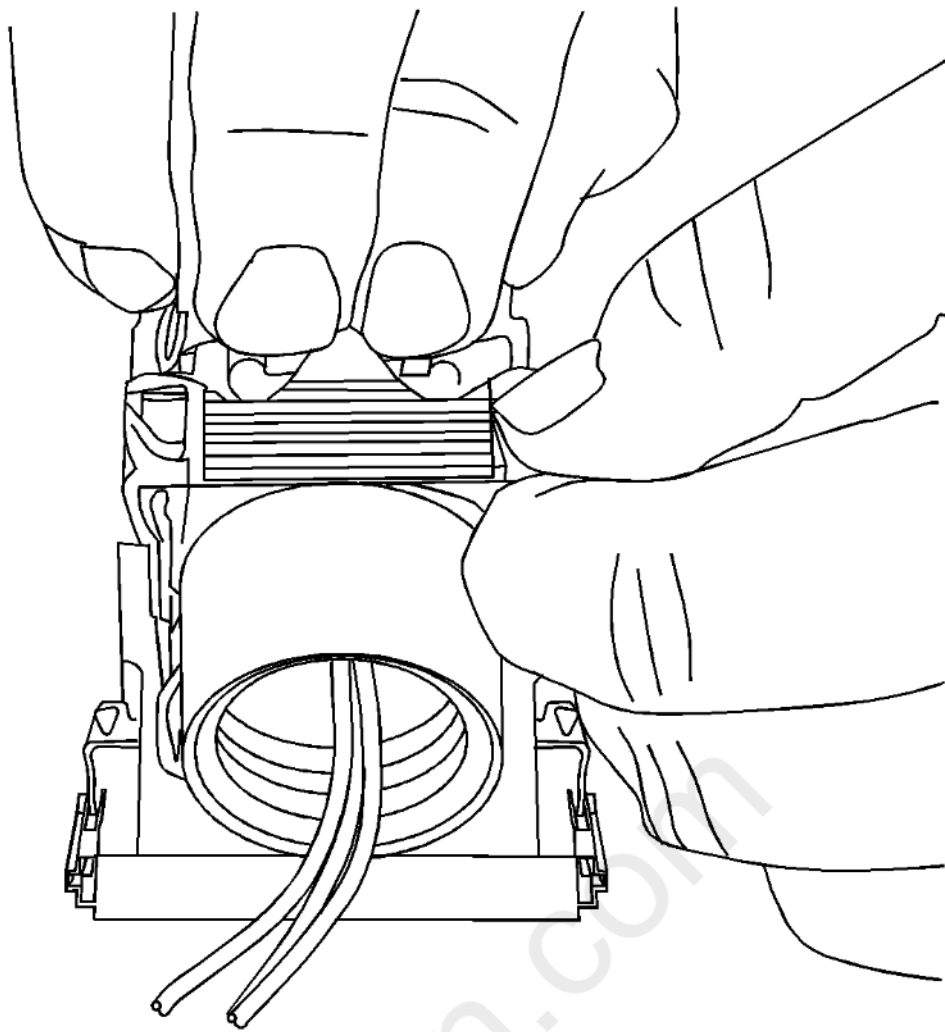


Fig. 26: View Showing Depressing Lever Lock Release Tab
Courtesy of GENERAL MOTORS COMPANY

4. View showing depressing of the lever lock release tab.

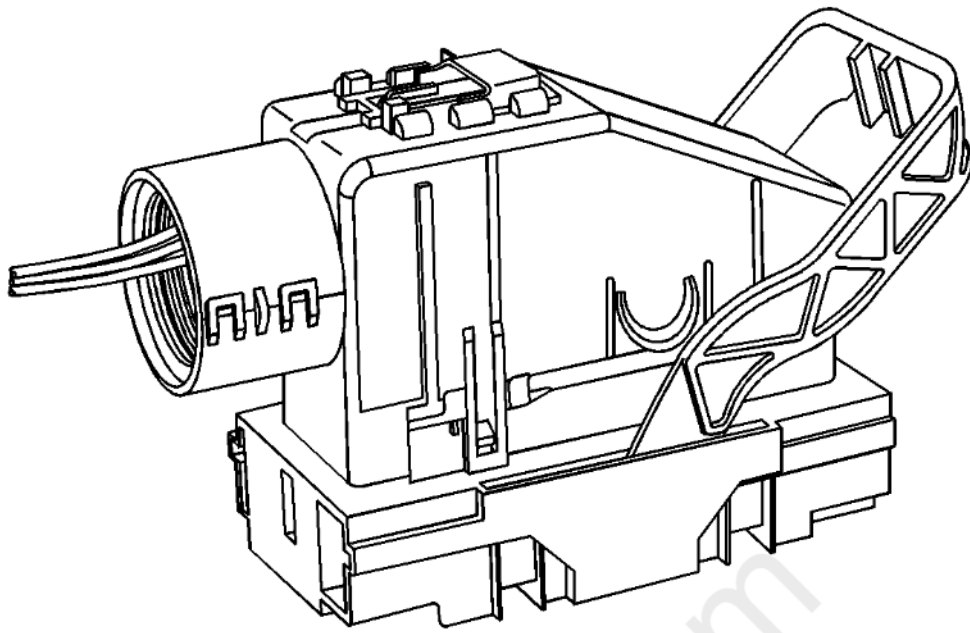


Fig. 27: View Of Connector In Released Position (1 Of 2)

Courtesy of GENERAL MOTORS COMPANY

5. View of connector in released position.
6. Disconnect the connector from the component.
7. Locate the dress cover locking tabs at the corners of the dress cover. Use a small flat-blade tool to release the locking tabs and remove the dress cover.

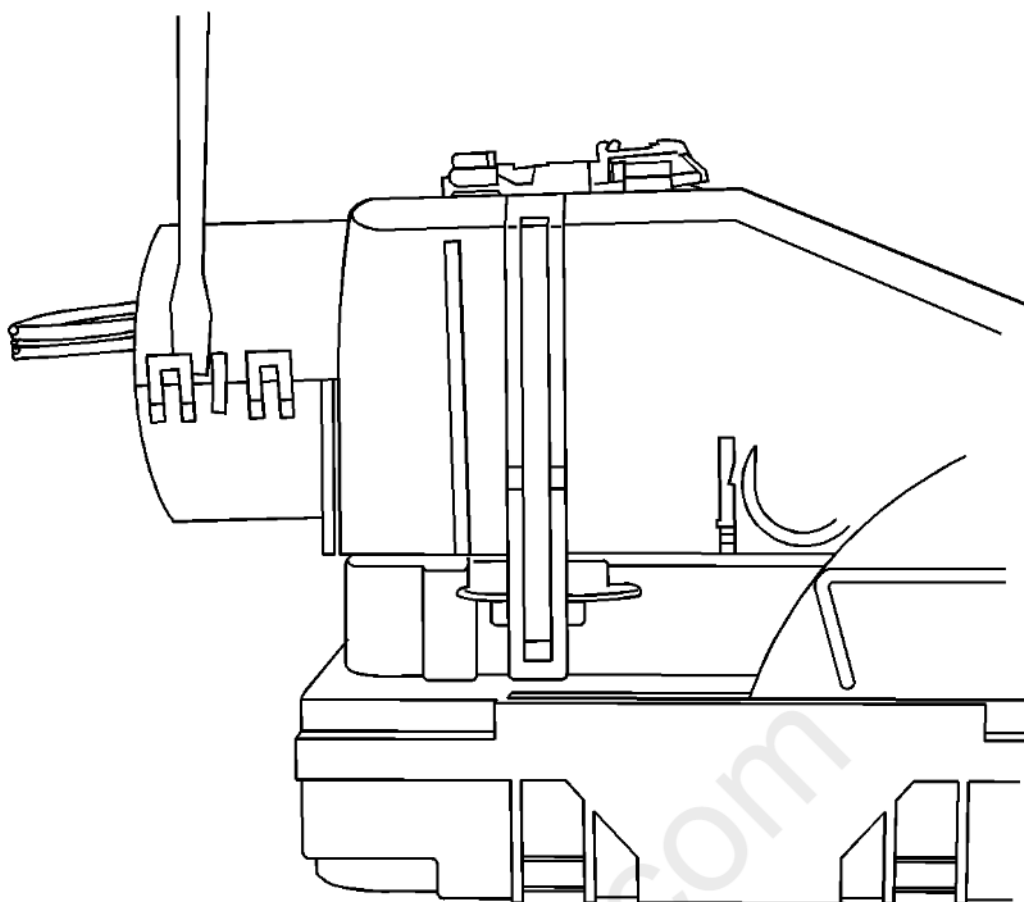


Fig. 28: View Of Connector In Released Position (2 Of 2)

Courtesy of GENERAL MOTORS COMPANY

8. Release the rear lower half of the wiredress cover.

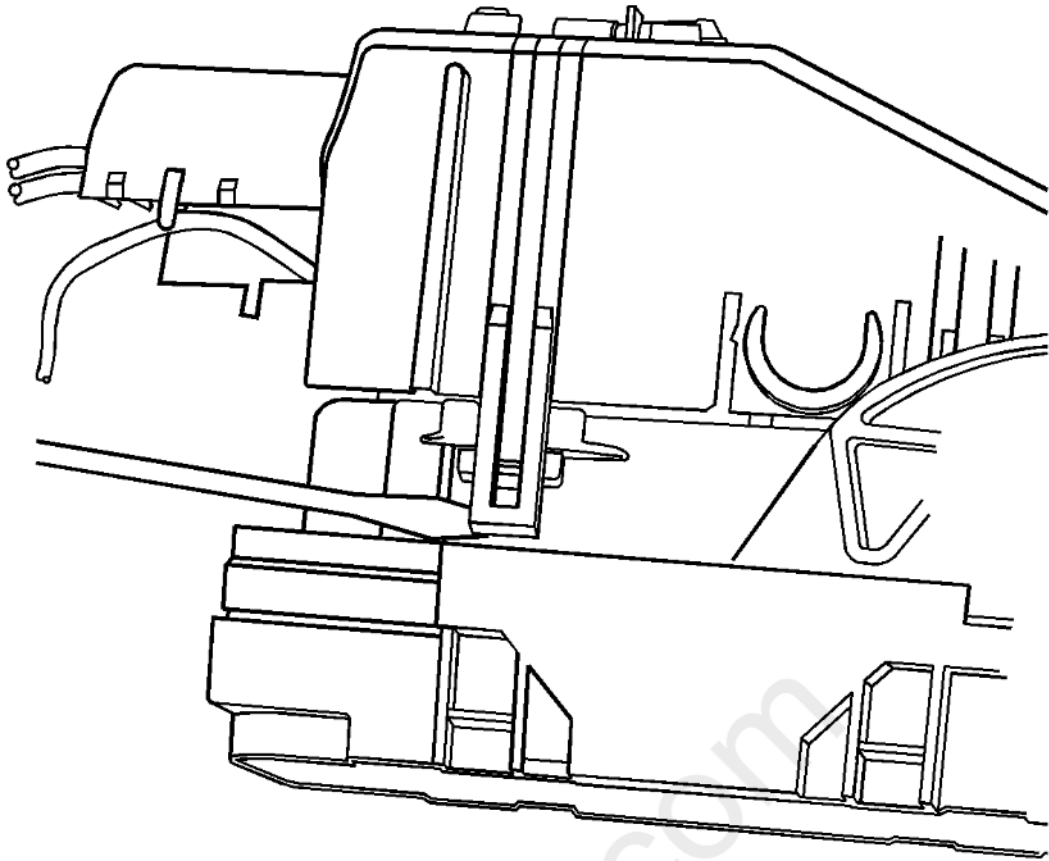


Fig. 29: Identifying Tabs Holding Wiredress Cover

Courtesy of GENERAL MOTORS COMPANY

9. Release the tabs that are holding the wiredress cover to the connector body.
10. Remove the nose piece by inserting a small flat-blade tool into the slots on both ends of the connector body. Gently pry the nose piece out of the connector. J-38125-216 can also be used to remove the nose piece.

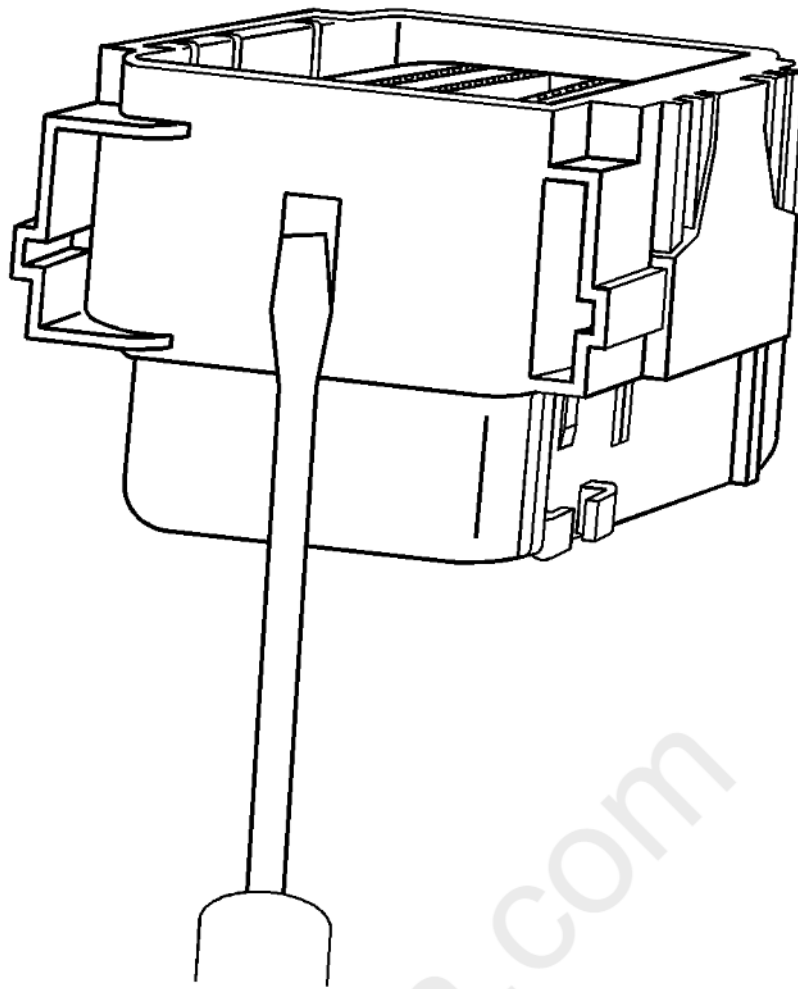


Fig. 30: Lifting Terminal Retaining Tabs
Courtesy of GENERAL MOTORS COMPANY

11. Use the J-38125-12A tool to release the terminals by lifting the terminal retaining tabs on the inside of the connector.

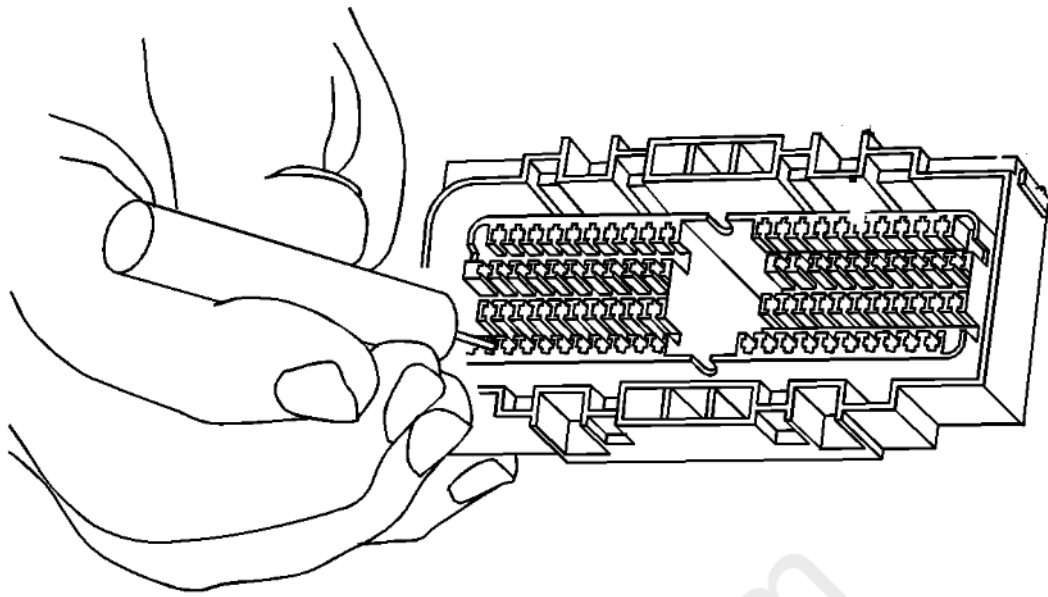


Fig. 31: Pulling Wire Out Of Back Of Connector

Courtesy of GENERAL MOTORS COMPANY

12. While holding the removal tool in place, gently pull the wire out of the back of the connector. Always remember never use force when pulling a terminal out of a connector.
13. Repair the terminal by following the [Repairing Connector Terminals \(Terminated Lead Repair\)](#)[Repairing Connector Terminals \(Terminal Repair\)](#) procedure.
14. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

BOSCH CONNECTORS (BSK)

Special Tools

- **EL-38125-550** Terminal Release Tool Kit
- **EL-38125-580** Terminal Release Tool Kit
- **J-38125-561** Terminal Release Tool

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

Terminal Removal Procedure

1. Disconnect the connector from the component.
2. Remove the wire dress cover, if necessary.
3. Push the wire side of the terminal that is being removed toward the connector and hold it in position.

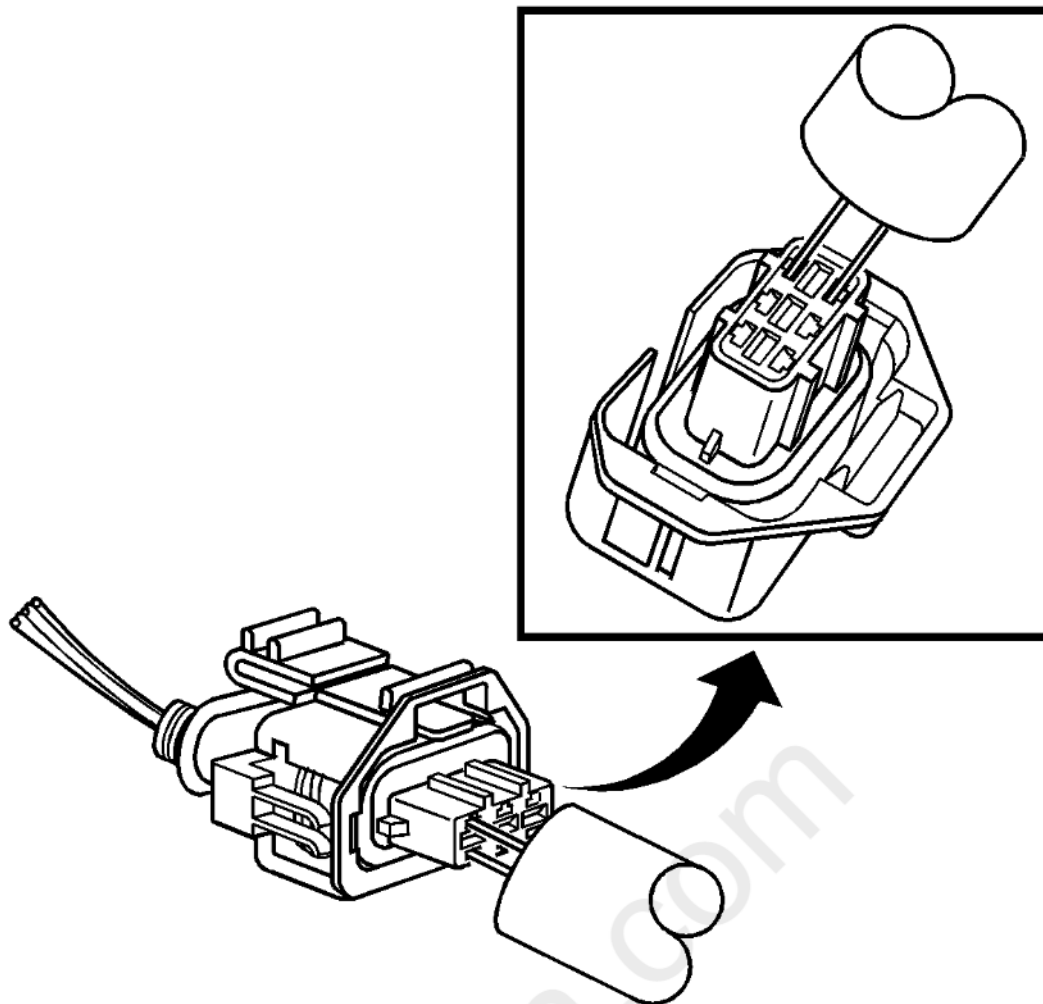


Fig. 32: View Of Bosch Connector Terminals (BSK)

Courtesy of GENERAL MOTORS COMPANY

4. Insert the J-38125-561 tool into the 2 cavities on each side of the terminal at the front of the connector and push until you feel the tool disengage the terminal retainers.
5. Carefully pull the terminal out of the connector. Always remember never use force when pulling a terminal out of a connector. If the terminal is difficult to remove, repeat the entire procedure.
6. Repair the terminal by following the [Repairing Connector Terminals \(Terminated Lead Repair\)](#) procedure.
7. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

BOSCH CONNECTORS (0.64)

Special Tools

- EL-38125-550 Terminal Release Tool Kit
- EL-38125-580 Terminal Release Tool Kit
- J-38125-560 Terminal Release Tool

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

Terminal Removal Procedure

1. Locate the lever lock on the wire dress cover. While pressing the lock, pull the lever over and past the lock until the lever is at the end of its travel.
2. Disconnect the connector from the component.
3. Pull the rubber boot that covers the wires back to expose the end of the connector dress cover.
4. Place the connector locking lever in the center of the connector.

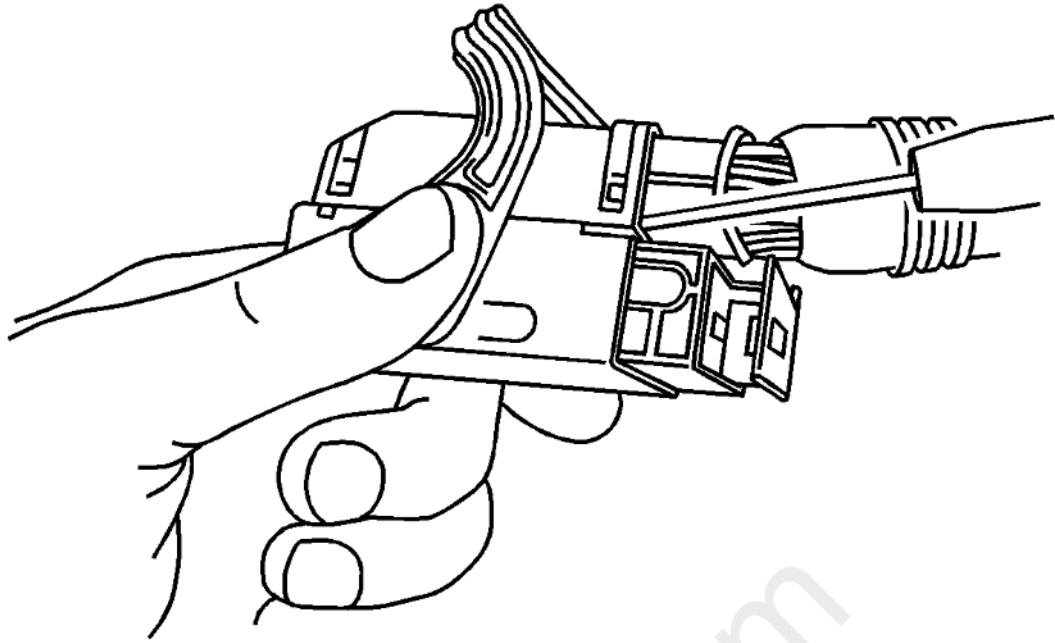


Fig. 33: View Of Flat-Bladed Tool Being Inserted Between Cover & Connector Body.
Courtesy of GENERAL MOTORS COMPANY

5. Locate the 2 dress cover locking tabs that are on the wire end of the connector. Insert a small flat-bladed tool between the cover and connector body and pry up.

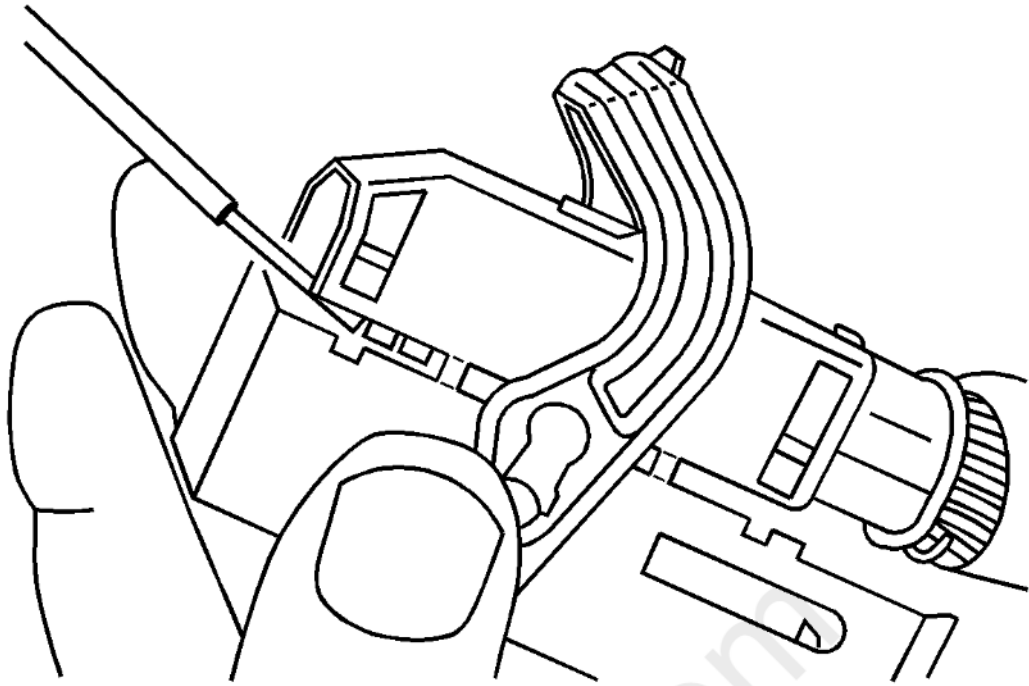


Fig. 34: View Of Flat-Bladed Tool Between Cover & Connector End

Courtesy of GENERAL MOTORS COMPANY

6. Locate the 2 dress cover locking tabs located on the opposite side of the connector. Insert a small flat-bladed tool between the cover at the connector end and pry up.
7. Remove the dress cover.
8. Cut the tie wrap on the wire bundle.

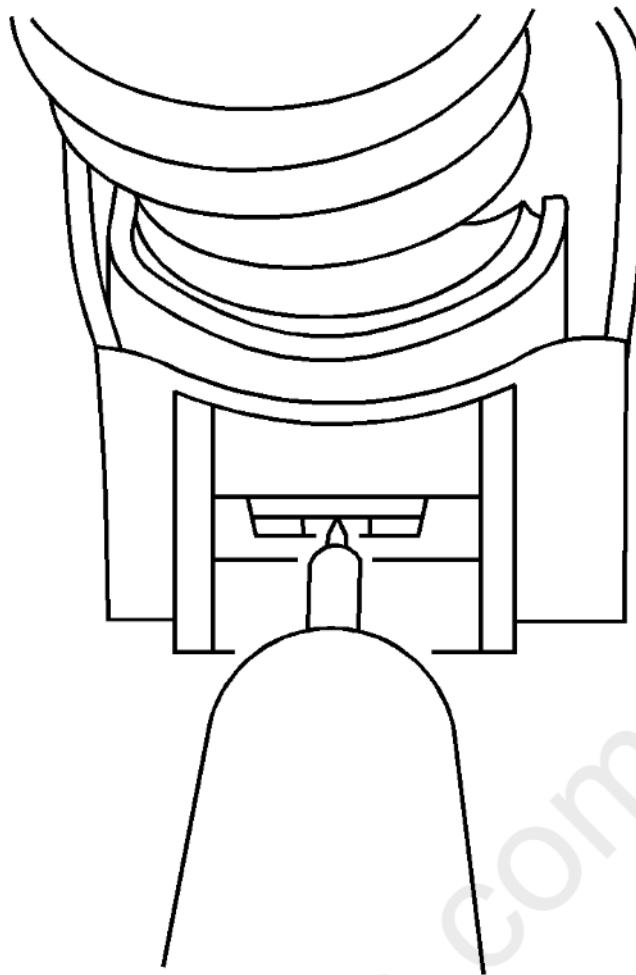


Fig. 35: View Of Terminal Position Assurance (TPA)

Courtesy of GENERAL MOTORS COMPANY

9. Remove the terminal position assurance (TPA) by inserting a small flat-bladed tool into the small slot in the end of the slider and pushing on the TPA until it comes out of the connector. When the TPA exits the opposite side of the connector, grasp the TPA and pull it completely out of the connector.
10. Push the wire side of the terminal that is being removed toward the connector and hold it in position.

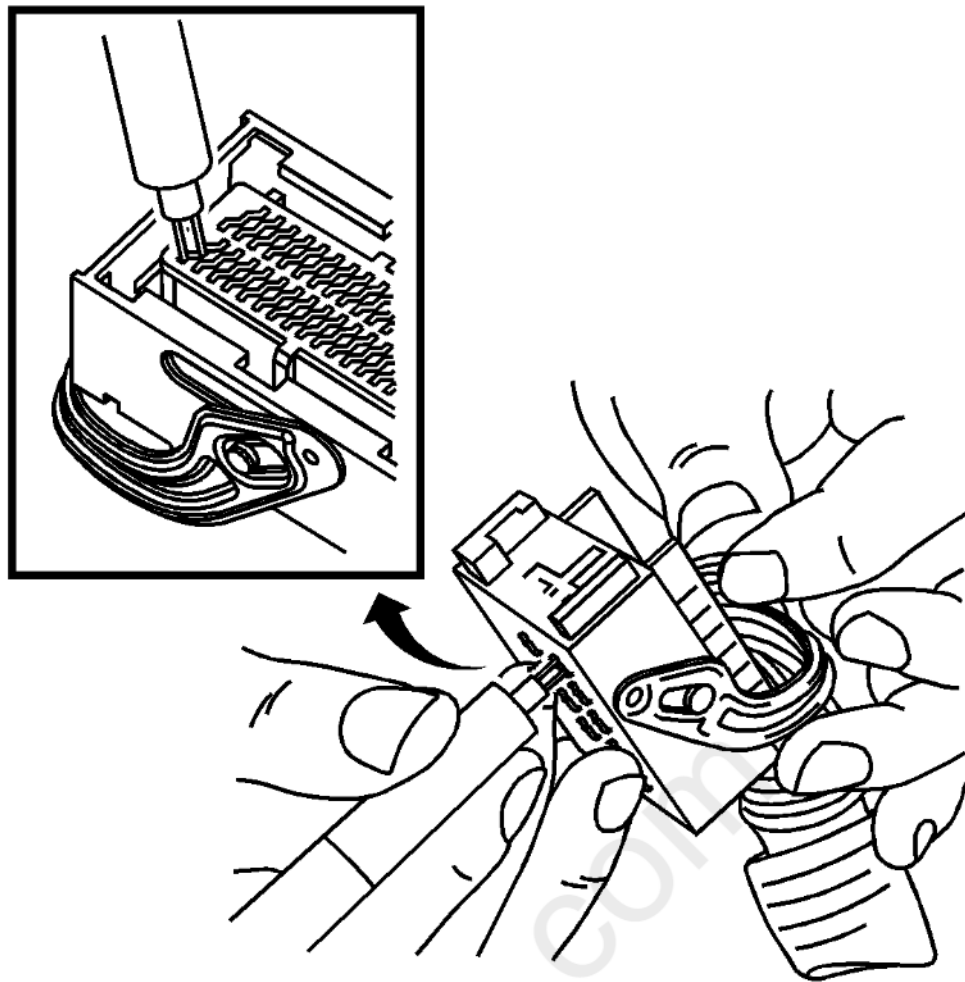


Fig. 36: View Of J 38125-560 Being Inserted Into Triangular Cavities
Courtesy of GENERAL MOTORS COMPANY

11. Insert the J-38125-560 into the 2 triangular cavities on each side of the terminal at the front of the connector.
12. Carefully pull the terminal out of the connector. Always remember never use force when pulling a terminal out of a connector. If the terminal is difficult to remove, repeat the entire procedure.
13. Repair the terminal by following the [**Repairing Connector Terminals \(Terminated Lead Repair\)Repairing Connector Terminals \(Terminal Repair\)**](#) procedure.
14. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

Terminal Insertion Procedure

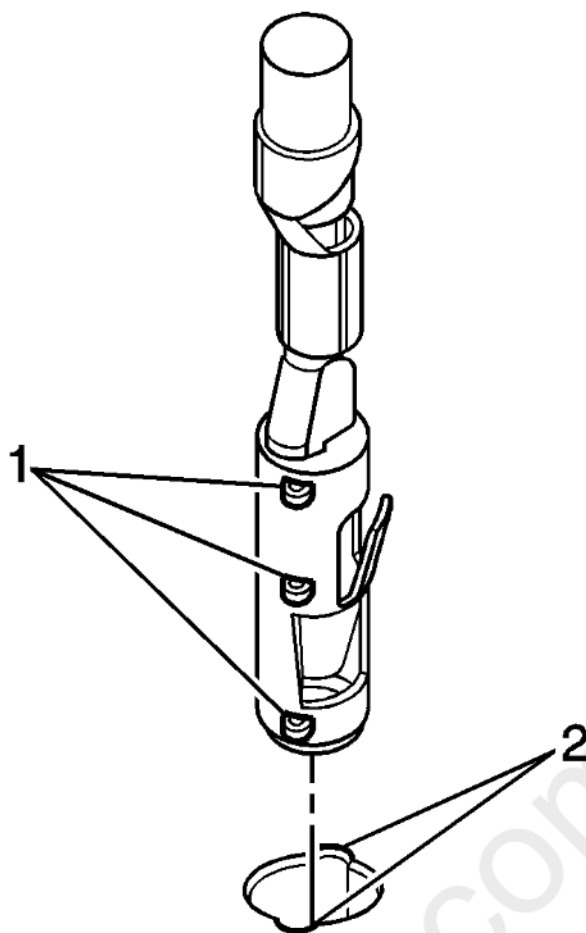


Fig. 37: Aligning Coding Lugs With Connector Coding Grooves
 Courtesy of GENERAL MOTORS COMPANY

1. Prior to installation the terminal must be aligned so the (1) coding lugs align with the (2) coding grooves on the connector.
2. Once the terminal is aligned, slide the terminal into the cavity until the retainer has engaged in the cavity of the connector.
3. Slide the TPA in the connector body and seat it using a small flat bladed tool. The TPA is seated when it is flush with the contact housing.
4. Secure the wires to the connector body using a tie wrap and replace the dress cover and grommet.

BOSCH CONNECTORS (2.8 JPT)

Special Tools

- **EL-38125-550** Terminal Release Tool Kit
- **EL-38125-580** Terminal Release Tool Kit
- **J-38125-557** Terminal Release Tool

For equivalent regional tools, refer to **Special Tools** .

Terminal Removal Procedure

1. Pull out the slider on the connector position assurance (CPA) until it is at the end of its travel.
2. Disconnect the connector from the component.
3. Remove the wire dress cover, if necessary.
4. Push the wire side of the terminal that is being removed toward the connector and hold it in position.

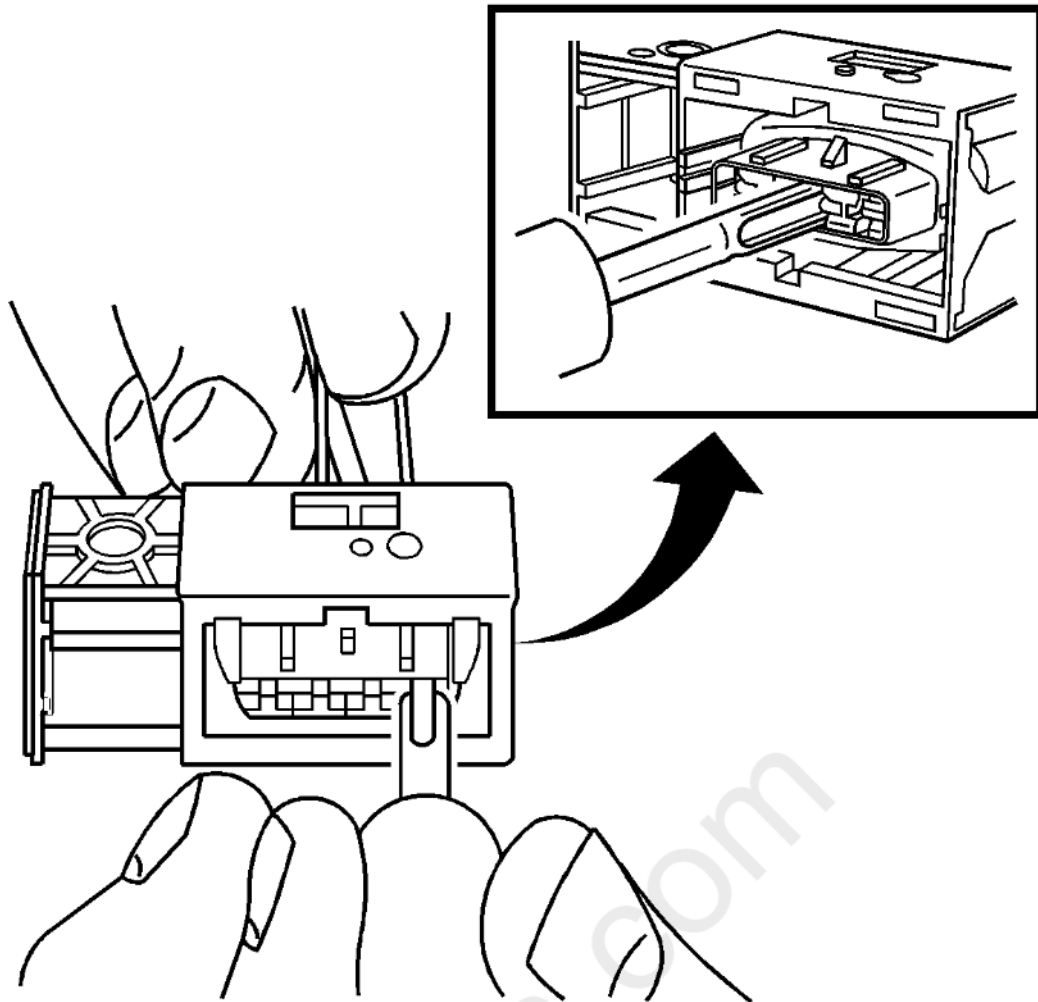


Fig. 38: View Of Bosch Connector Terminals (2.8 JPT)

Courtesy of GENERAL MOTORS COMPANY

5. Insert the J-38125-557 into the 2 cavities on each side of the terminal at the front of the connector and push until you feel the tool disengage the terminal retainers.
6. Carefully pull the terminal out of the connector. Always remember never use force when pulling a terminal out of a connector. If the terminal is difficult to remove, repeat the entire procedure.
7. Repair the terminal by following the [Repairing Connector Terminals \(Terminated Lead Repair\)](#) procedure.
8. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

BOSCH CONNECTORS (ECM)

Special Tools

- EL-38125-550 Terminal Release Tool Kit
- EL-38125-580 Terminal Release Tool Kit
- J-38125-213 Terminal Release Tool
- J-38125-556 Terminal Release Tool

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

Terminal Removal Procedure

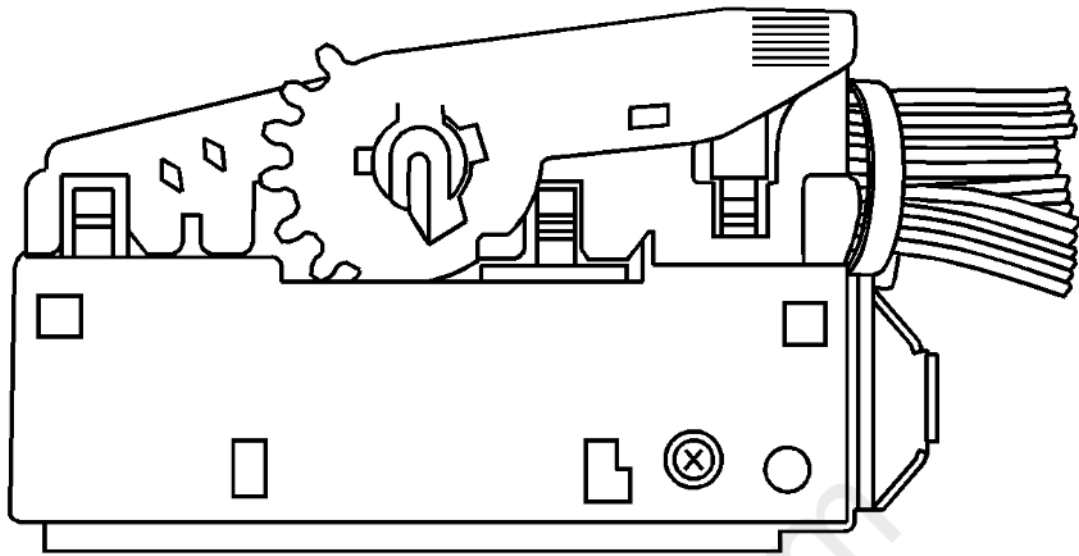


Fig. 39: View Of Bosch Connectors

Courtesy of GENERAL MOTORS COMPANY

1. Locate the assist lever on the top of the connector. Move the assist lever to the forward position.

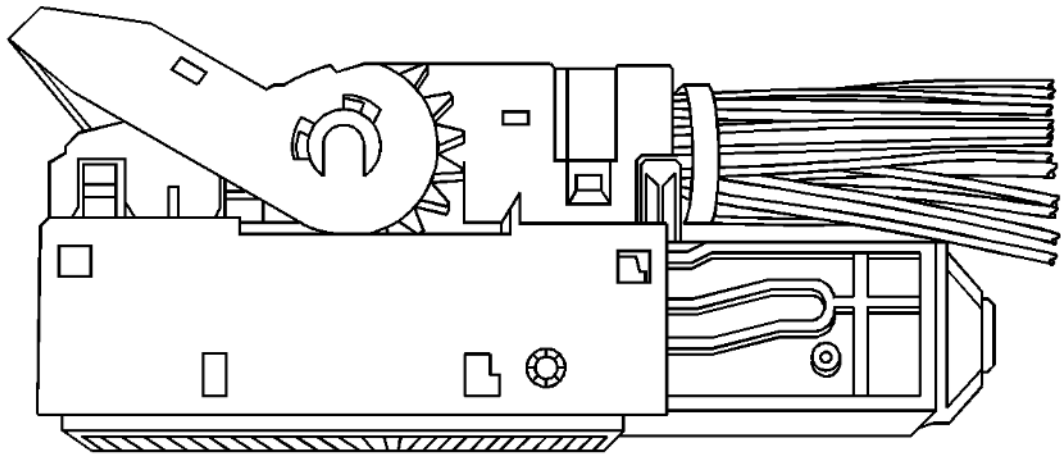


Fig. 40: Identifying Assist Lever In Forward Position
Courtesy of GENERAL MOTORS COMPANY

2. Disconnect the connector from the component.

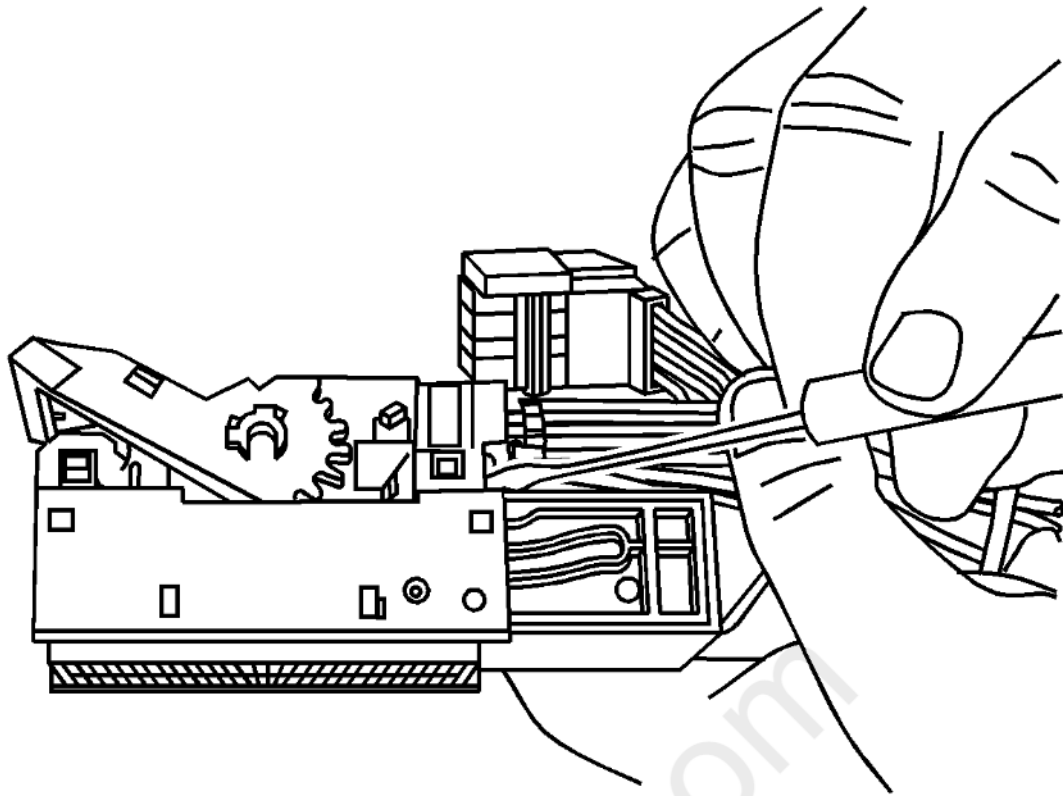


Fig. 41: View Of Releasing Locking Tabs

Courtesy of GENERAL MOTORS COMPANY

3. Locate the dress cover locking tabs at the corners of the connector. Use a small flat-blade tool to release the locking tabs and remove the dress cover.

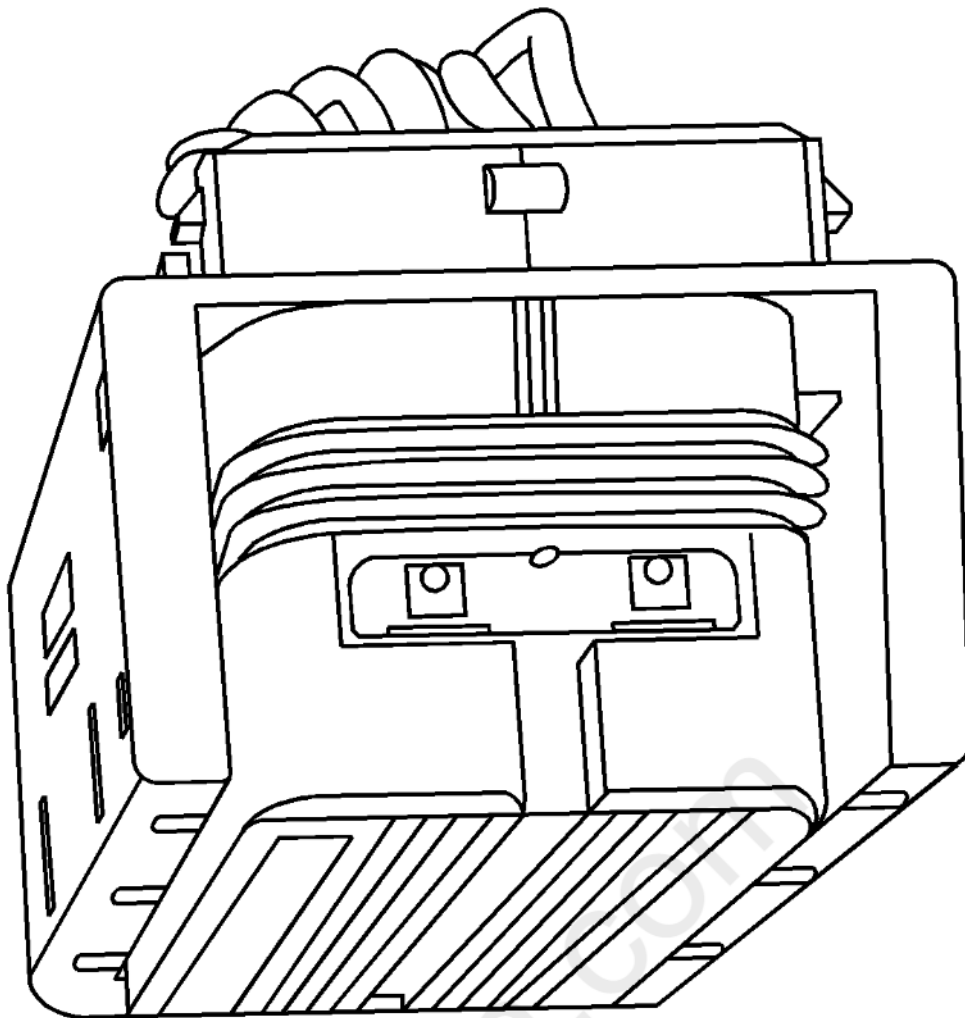


Fig. 42: View Of Terminal Positive Assurance (TPA) Connector

Courtesy of GENERAL MOTORS COMPANY

4. The terminal positive assurance (TPA) is located in the front of the connector.

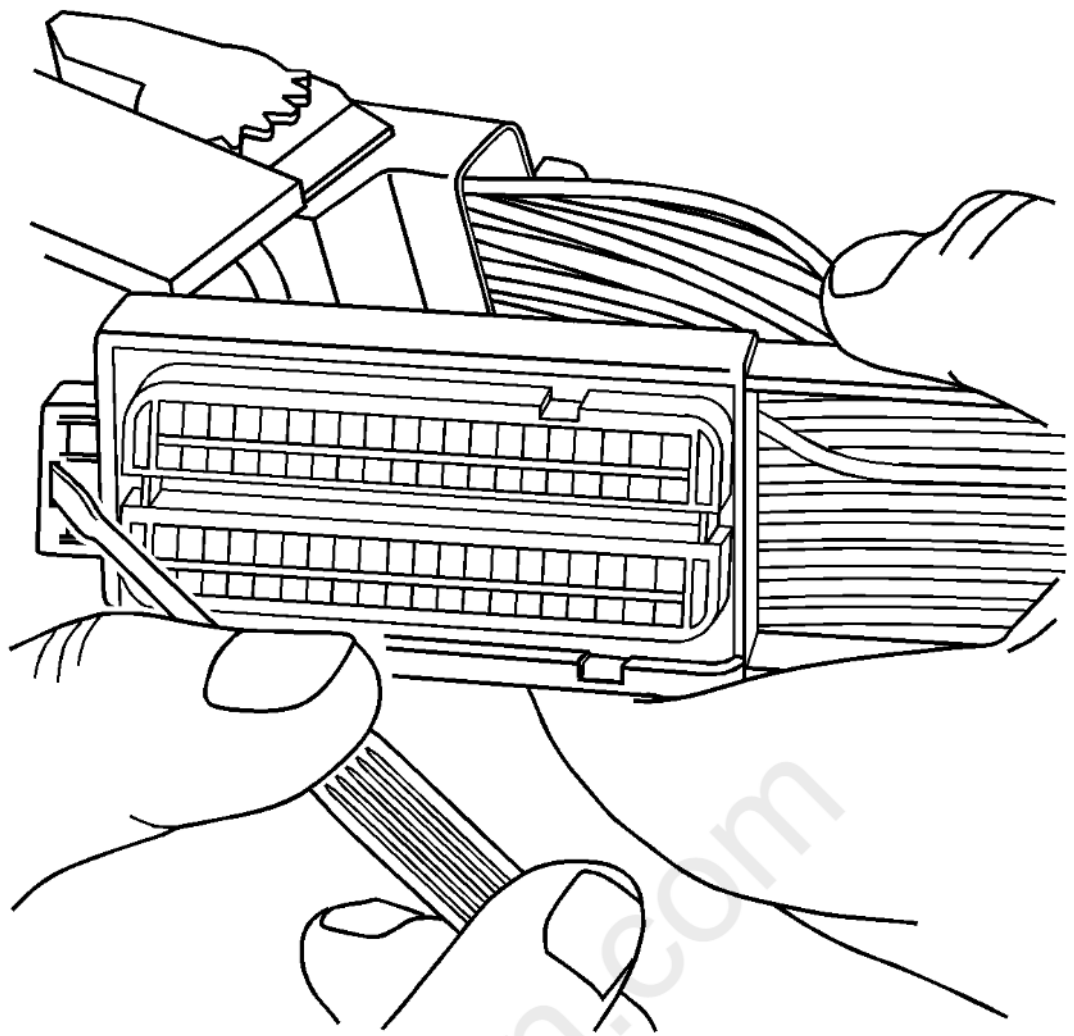


Fig. 43: View Of Removing TPA From Connector

Courtesy of GENERAL MOTORS COMPANY

5. Use a small flat-blade tool to remove TPA from the connector.

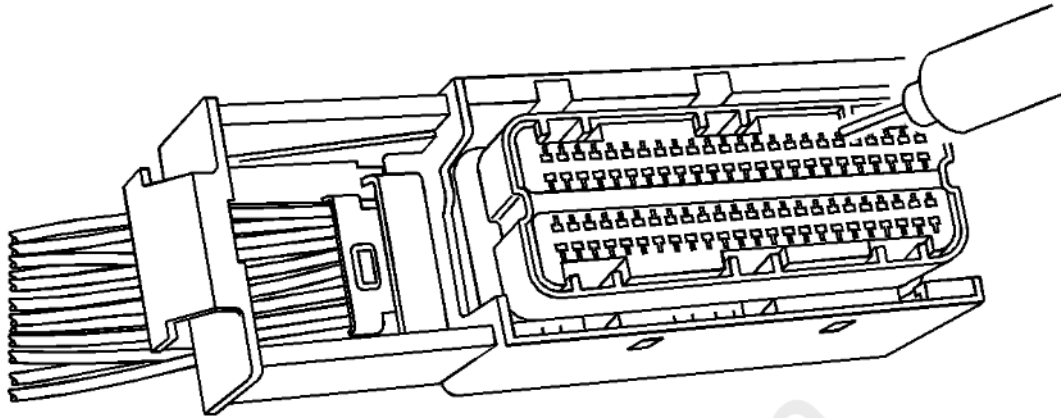


Fig. 44: View Of Special Tools And Terminals
Courtesy of GENERAL MOTORS COMPANY

6. Use the J-38125-213 or the J-38125-556 tool to release the terminals by inserting the tool into the terminal release cavity.
7. While holding the removal tool in place, gently pull the wire out of the back of the connector. Always remember never use force when pulling a terminal out of a connector.
8. Repair the terminal by following the [Repairing Connector Terminals \(Terminated Lead Repair\)](#) procedure.
9. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

NOTE: Ensure that the dress cover and connector body are both in the released position before reassembling. Failure to do so may cause damage to the connector and component.

10. Reconnect the connector bodies.

DELPHI CONNECTORS (WEATHER PACK)

Special Tools

- EL-38125-550 Terminal Release Tool Kit
- EL-38125-580 Terminal Release Tool Kit
- J-38125-10A Terminal Release Tool

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

Terminal Removal Procedure

The following is the proper procedure for the repair of Weather Pack® Connectors.

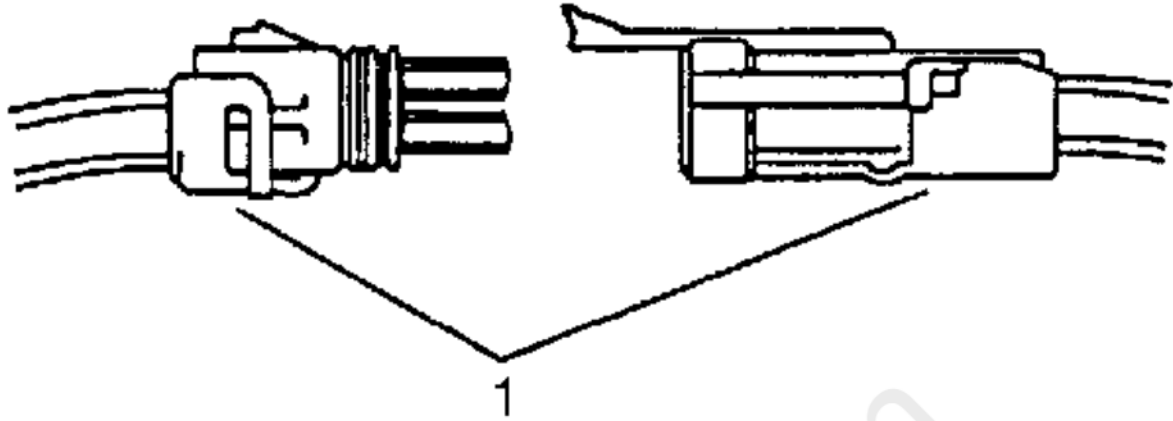


Fig. 45: View Of Connector Halves

Courtesy of GENERAL MOTORS COMPANY

1. Separate the connector halves (1).
2. Open the secondary lock. A secondary lock aids in terminal retention and is usually molded to the connector (1).
3. Grasp the wire and push the terminal to the forward most position. Hold the wire in this position.

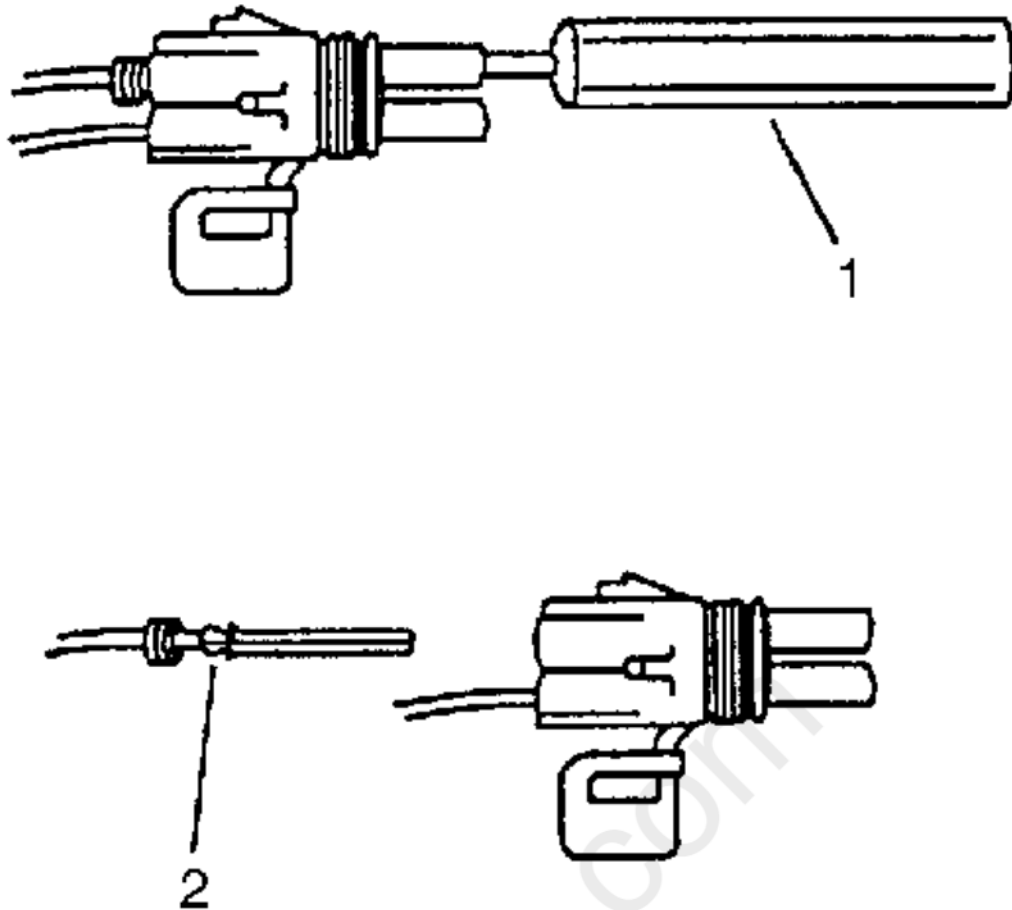


Fig. 46: Identifying Removal Tool & Terminal
 Courtesy of GENERAL MOTORS COMPANY

4. Insert the Weather Pack® terminal removal tool J-38125-10A into the front (mating end) of the connector cavity until it rests on the cavity shoulder (1).
5. Gently pull on the wire to remove the terminal through the back of the connector (2).

NOTE: Never use force to remove a terminal from a connector.

6. Inspect the terminal and connector for damage. Repair as necessary. Refer to [Repairing Connector Terminals \(Terminated Lead Repair\)](#) [Repairing Connector Terminals \(Terminal Repair\)](#).
7. Reform the lock tang (2) and reset terminal in connector body.
8. Close secondary locks and join connector halves.
9. Verify that circuit is complete and working satisfactorily.
10. Perform system check.
11. Repair the terminal by following the [Repairing Connector Terminals \(Terminated Lead Repair\)](#) [Repairing Connector Terminals \(Terminal Repair\)](#) procedure.
12. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

DELPHI CONNECTORS (PUSH TO SEAT)

Special Tools

- EL-38125-550 Terminal Release Tool Kit
- EL-38125-580 Terminal Release Tool Kit

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

Terminal Removal Procedure

Follow the steps below in order to repair push to seat connectors.

1. Remove the terminal position assurance (TPA) device, the connector position assurance (CPA) device, and/or the secondary lock.

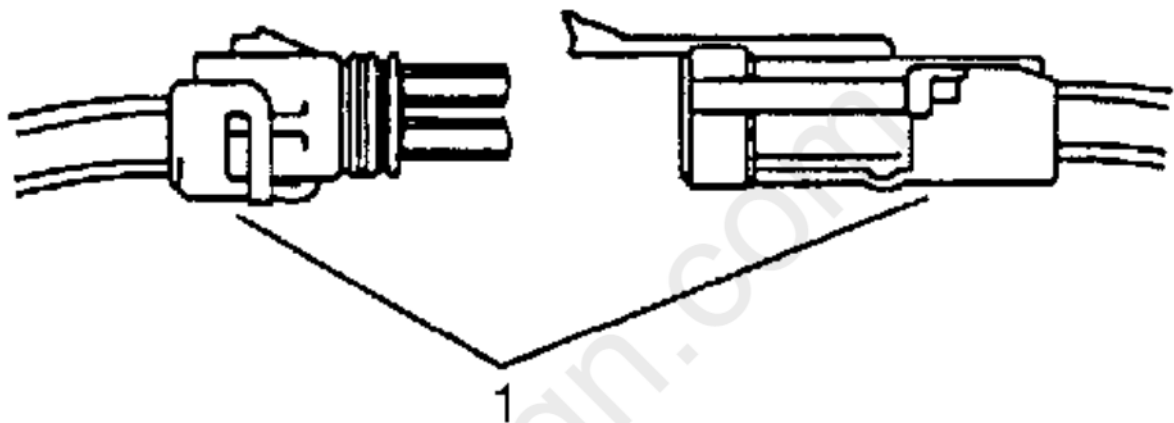


Fig. 47: View Of Connector Halves

Courtesy of GENERAL MOTORS COMPANY

2. Separate the connector halves (1).

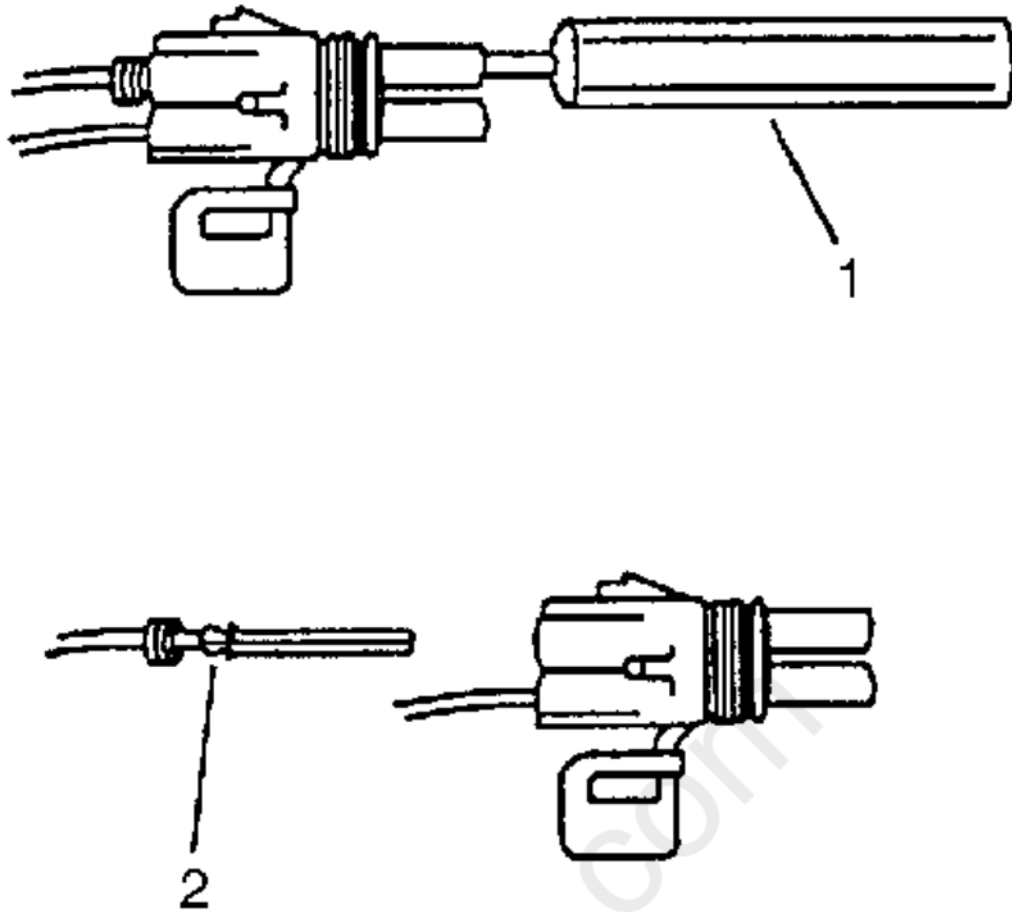


Fig. 48: Identifying Removal Tool & Terminal
Courtesy of GENERAL MOTORS COMPANY

3. Use the proper pick or removal tool (1) in order to release the terminal.
4. Gently pull the cable and the terminal (2) out of the back of the connector.

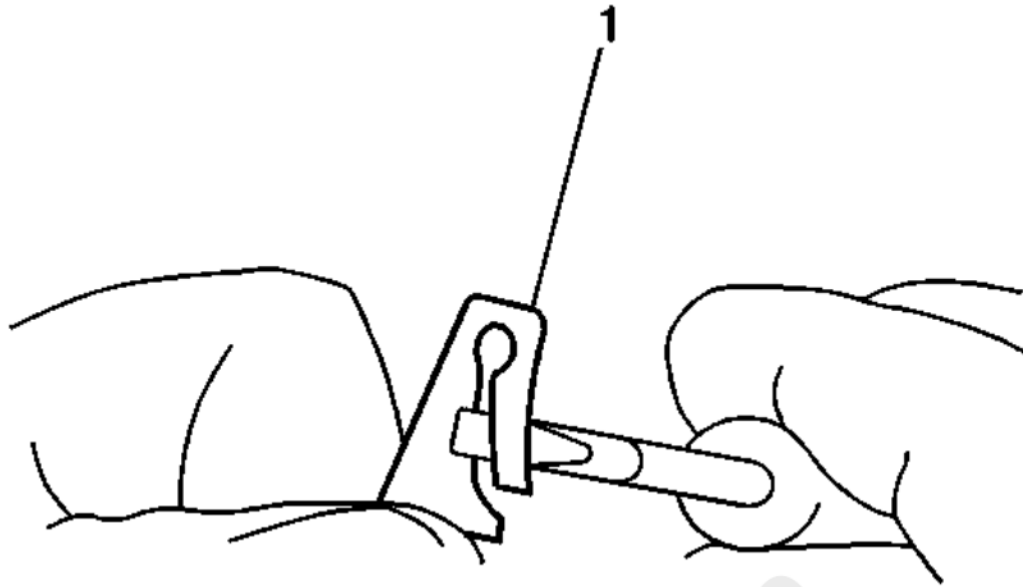


Fig. 49: Identifying Locking Device

Courtesy of GENERAL MOTORS COMPANY

5. Re-form the locking device if you are going to reuse the terminal (1).
6. Repair the terminal by following the [Repairing Connector Terminals \(Terminated Lead Repair\)](#) procedure.
7. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

Terminal Insertion Procedure

1. In order to reuse a terminal or lead assembly, refer to [Wiring Repairs](#) .
2. Ensure that the cable seal is kept on the terminal side of the splice.
3. Insert the lead from the back until it catches.
4. Install the TPA, CPA, and/or the secondary locks.

DELPHI CONNECTORS (PULL TO SEAT)

Special Tools

- **EL-38125-550** Terminal Release Tool Kit
- **EL-38125-580** Terminal Release Tool Kit

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

Terminal Removal Procedure

If the terminal is visibly damaged or is suspected of having a faulty connection, the terminal should be replaced.

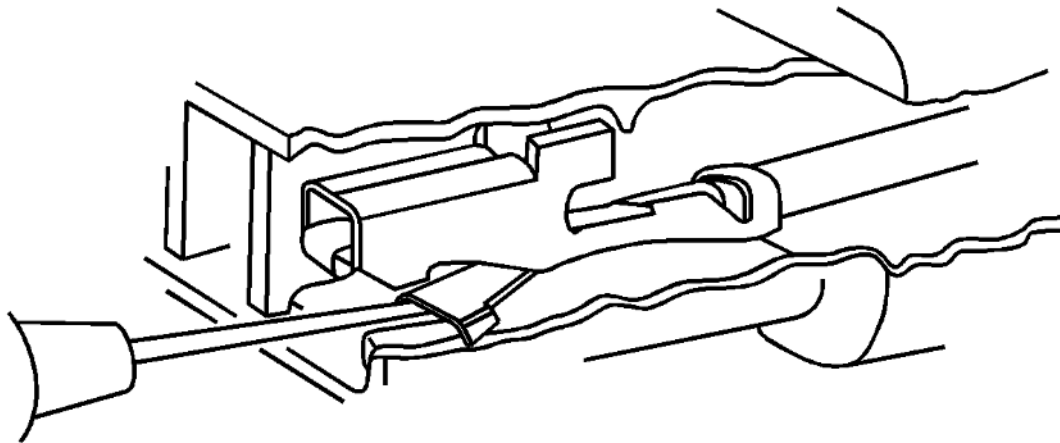


Fig. 50: Aligning Removal Tool - Delphi (Pull To Seat)

Courtesy of GENERAL MOTORS COMPANY

Follow the steps below in order to repair pull-to-seat connectors:

1. Remove the connector position assurance (CPA) device and/or the secondary lock.
2. Disconnect the connector from the component or separate the connectors for in-line connectors.
3. Remove the terminal position assurance (TPA) device.
4. Review the connector end view to determine the proper test probe and release tool.
5. Insert the release tool into the front of the connector body.
6. Grasp the wire at the back of the connector body and gently push the terminal out the front of the connector body.
7. Repair the terminal by following the [Repairing Connector Terminals \(Terminated Lead Repair\)](#)[Repairing Connector Terminals \(Terminal Repair\)](#) procedure.
8. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

Terminal Insertion Procedure

1. Align the terminal and pull the wire from the back of the connector in order to seat the terminal.
2. If the connector is outside of the passenger compartment, apply dielectric grease to the connector.
3. Install the TPA, CPA, and/or the secondary locks.

DELPHI CONNECTORS (MICRO-PACK 100W)

Special Tools

- EL-38125-550 Terminal Release Tool Kit
- EL-38125-580 Terminal Release Tool Kit

- J-38125-12A Terminal Release Tool

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

Terminal Removal Procedure

There are 2 styles of Micro-Pack 100W connectors. These connectors are very similar but use different terminals and have some minor physical differences also.

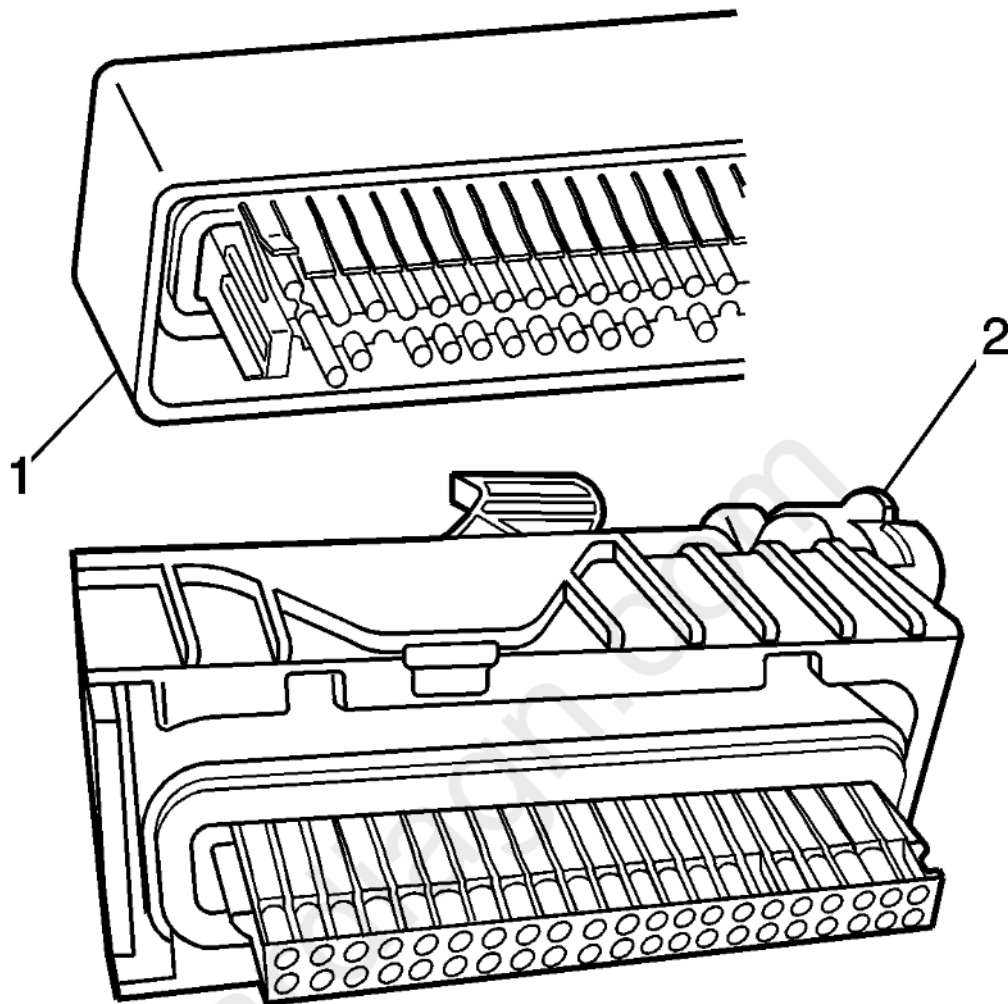


Fig. 51: Identifying Micro-Pack 100W First & Second Connector Designs

Courtesy of GENERAL MOTORS COMPANY

The first connector design of the Micro-Pack 100W (1) has a white connector interface that holds the terminals. The second design of the Micro-Pack 100W (2) has a gray interface to hold the terminals. Also, the first design has terminal cavities that are further apart (3 mm centerline) and offset from the other row of terminal cavities in the connector. The second design has terminal cavities that are closer together (2.54 mm centerline) and aligned vertically. One other way to identify the second design is the thin strip of material that runs along the outside of the cavities.

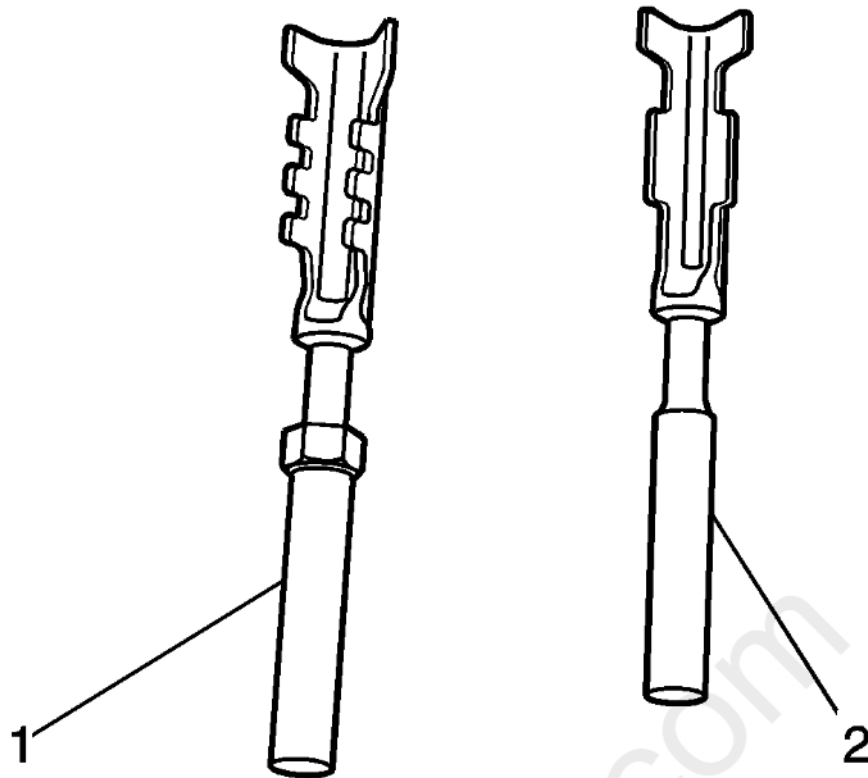


Fig. 52: Identifying Micro-Pack 100W Short & Long Terminals

Courtesy of GENERAL MOTORS COMPANY

NOTE: There are 2 styles of Micro-Pack 100W terminals which are very similar. Ensure that you have the correct terminal before crimping the new terminal to the wire. The first design connector uses the longer terminal (1) that has a raised area in front of the recess in the terminal. The second design connector uses the shorter terminal without the raised area.

Follow the steps below in order to remove terminals from Micro-Pack 100W connectors. Some Micro-Pack 100W connector disassembly procedures will vary. Use this procedure as a guide.

1. Disconnect the connector from the component.

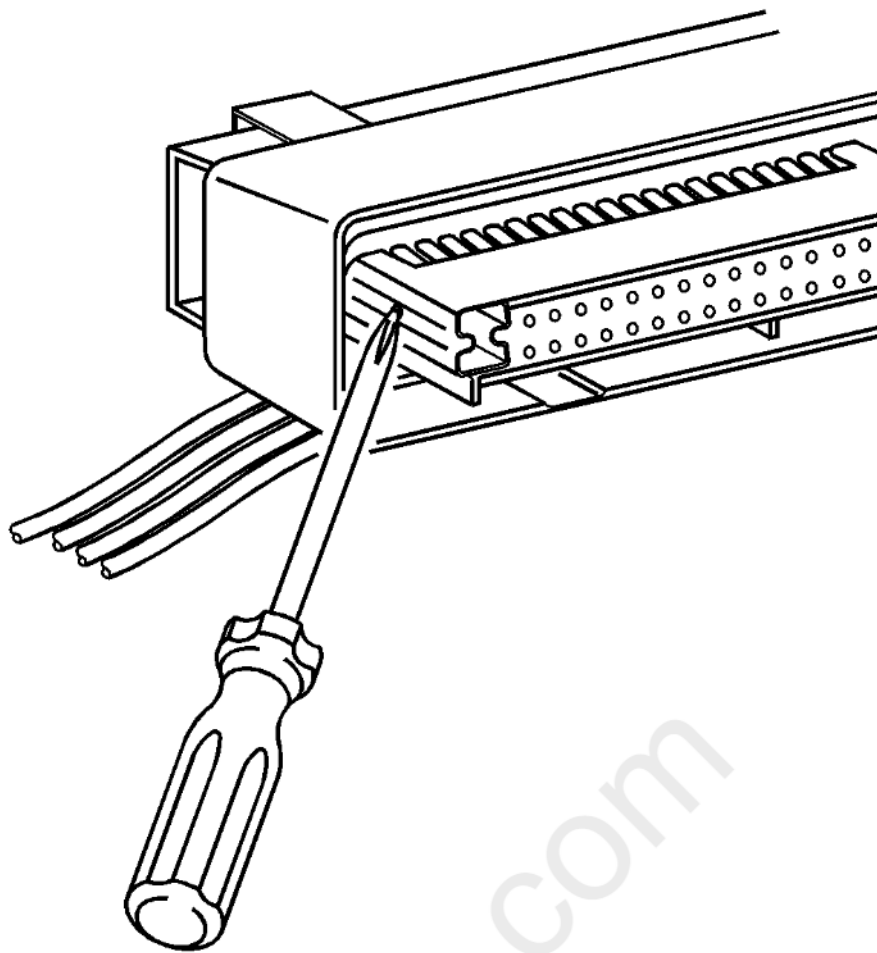


Fig. 53: Locating Nose Piece Locking Tabs

Courtesy of GENERAL MOTORS COMPANY

2. Locate the nose piece locking tabs that are positioned on the side of the connector nose piece. The connector nose piece acts as a terminal positive assurance (TPA) and may be referred to as such.

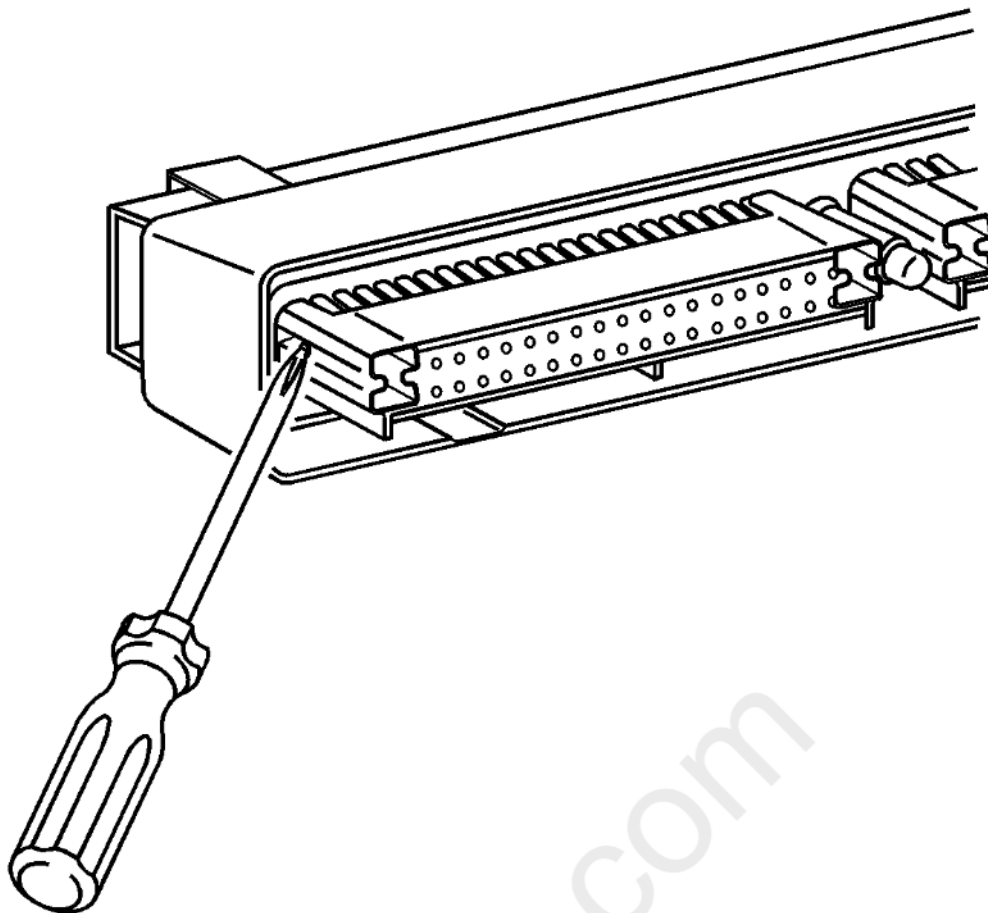


Fig. 54: Loosening Nose Piece Locking Tabs

Courtesy of GENERAL MOTORS COMPANY

3. Use a small flat-blade tool to push in one of the locking tabs while gently pulling on the same side of the nose piece.
4. Repeat the procedure for the other locking tab and remove the nose piece.
5. Remove the wire dress cover. The following is a general procedure for wire dress cover removal. Use this procedure as a guide, some dress cover removal procedures may vary.

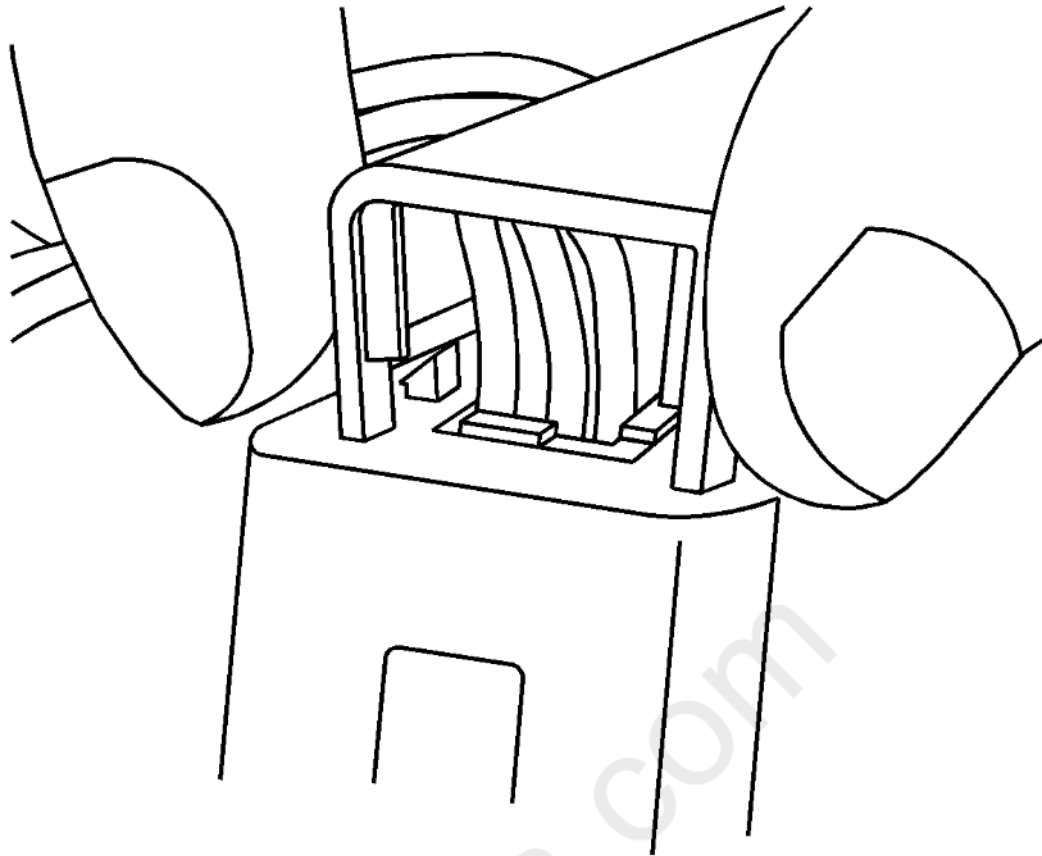


Fig. 55: Squeezing Cover Locking Legs
Courtesy of GENERAL MOTORS COMPANY

6. Use fingers to squeeze the 2 locking legs of the cover.

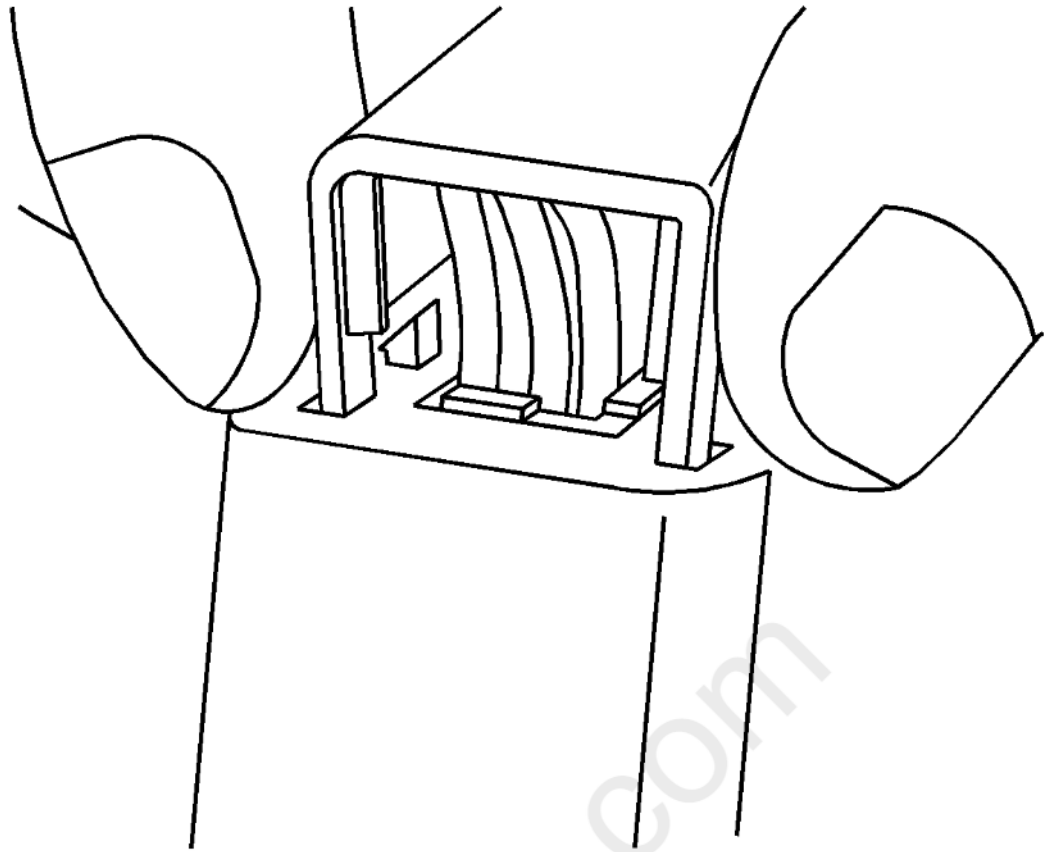


Fig. 56: Unseating Locking Leg
Courtesy of GENERAL MOTORS COMPANY

7. Apply pressure and gently rock the cover until one locking leg is unseated.

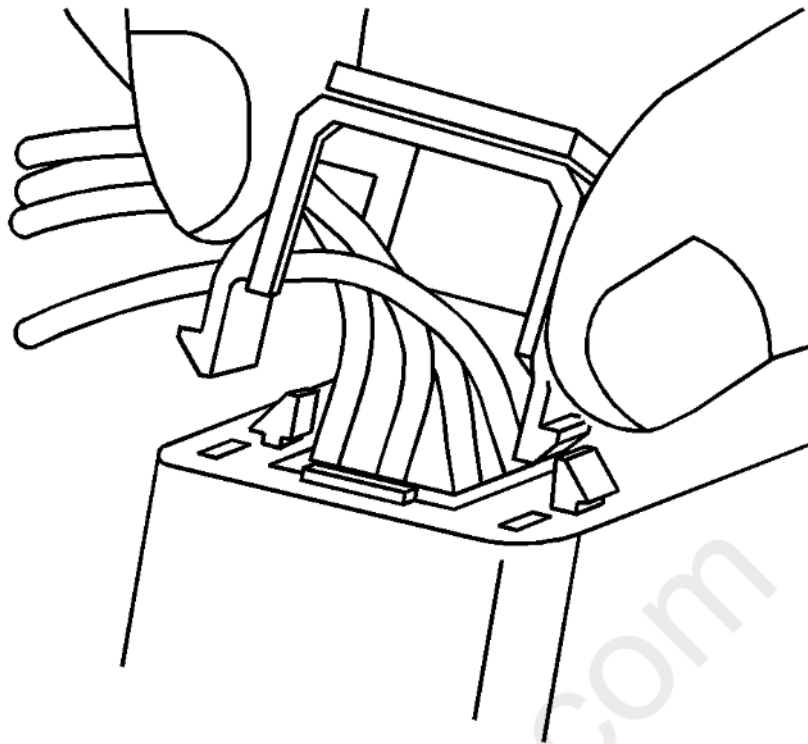


Fig. 57: Removing Cover

Courtesy of GENERAL MOTORS COMPANY

8. Continue to apply pressure and rock the cover until the second locking leg is unseated. Repeat procedure for the other side of the dress cover and remove the cover.

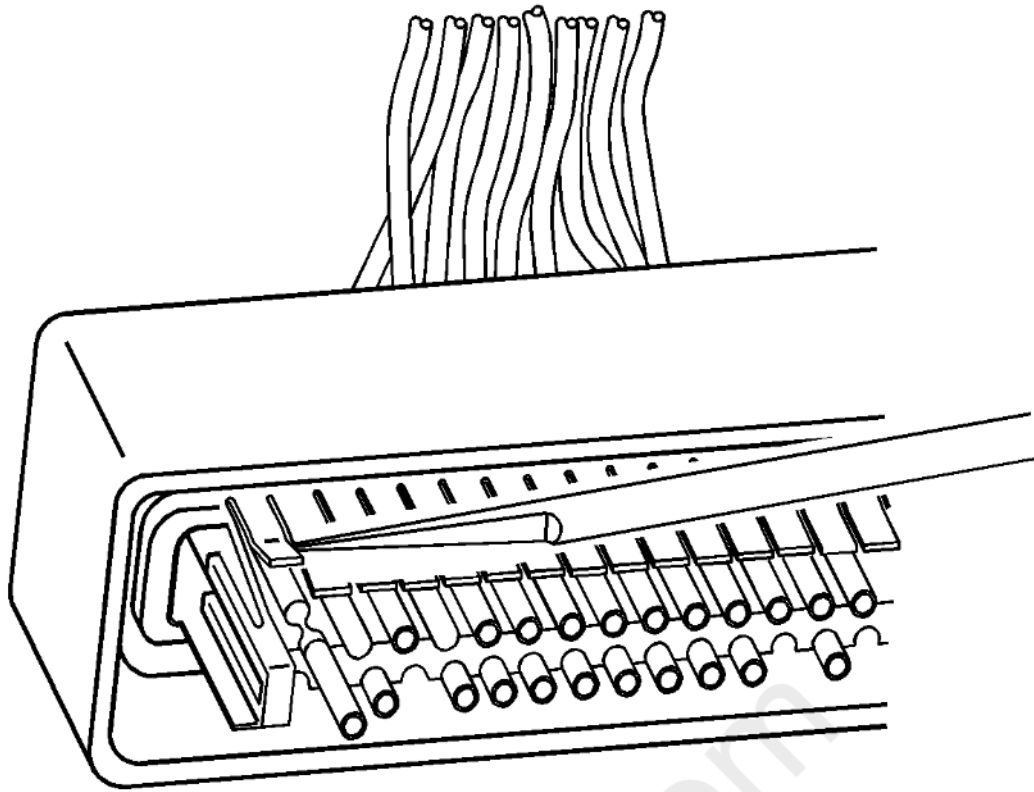


Fig. 58: Identifying Terminal Retaining Tab

Courtesy of GENERAL MOTORS COMPANY

9. Use J-38125-12A to gently lift the terminal retaining tab while gently pulling the wire out of the back of the connector. Always remember never use force when pulling a terminal out of a connector.
10. If the terminal is severely bent or damaged, it may be possible on some connectors to push the wire out of the front of the connector instead of pulling it through. This will prevent damage to the internal seals of the connector. Once the terminal is pushed out of the connector, cut the wire as close to the terminal as possible and pull the wire through the connector.
11. Repair the terminal by following the **Repairing Connector Terminals (Terminated Lead Repair)** procedure.
12. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

Terminal Insertion Procedure

After the terminal is crimped to the wire perform the following procedure in order to replace Micro-Pack 100 terminals.

1. Slide the new terminal into the correct cavity at the back of the connector.
2. Push the terminal into the connector until it locks into place. The new terminal should be even with the other terminals. Ensure that the terminal is locked in place by gently pulling on the wire.
3. To assemble the connector, reverse the Terminal Removal Procedure.

DELPHI CONNECTORS (MICRO.64)

Special Tools

- EL-38125-550 Terminal Release Tool Kit

- **EL-38125-580** Terminal Release Tool Kit
- **J-38125-21** Terminal Release Tool

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

Terminal Removal Procedure

Follow the steps below in order to remove terminals from Micro.64 connectors.

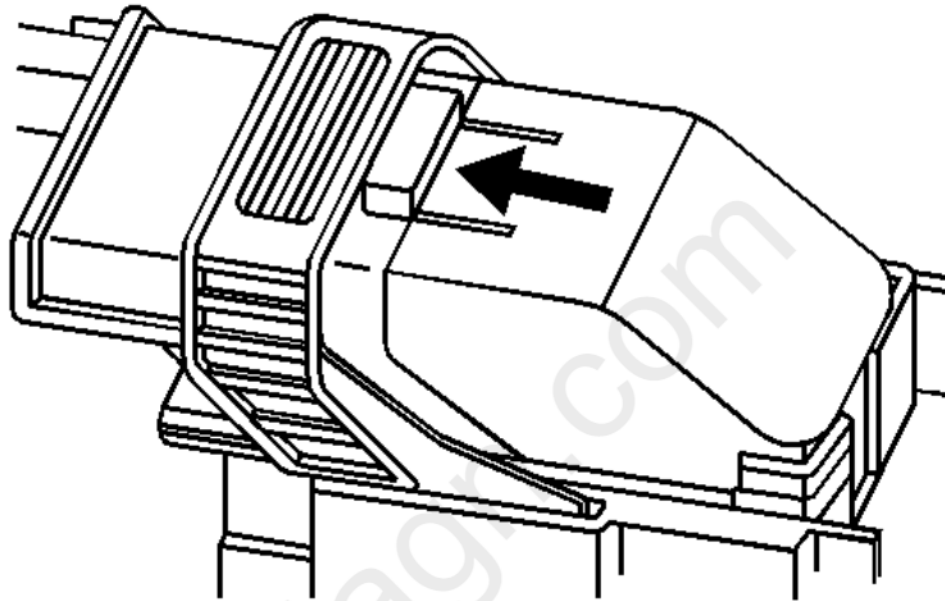


Fig. 59: Identifying Wire Dress Cover Lever Lock
Courtesy of GENERAL MOTORS COMPANY

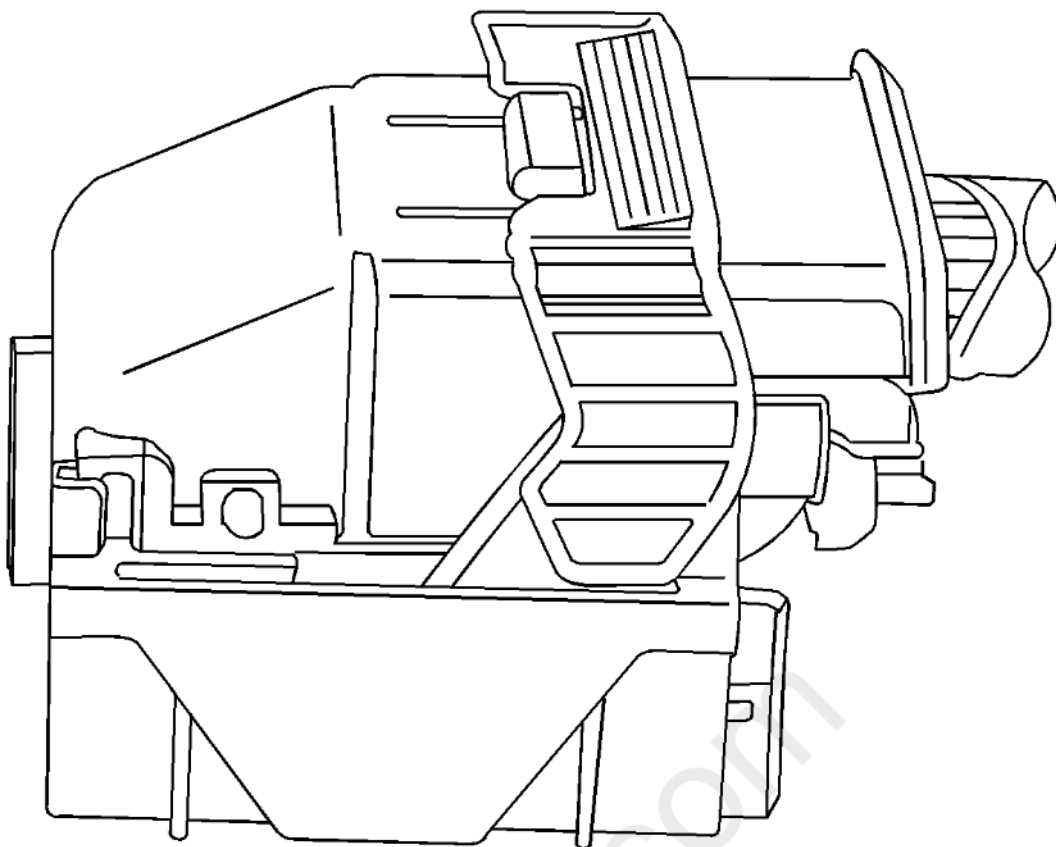


Fig. 60: View Of Typical Micro 64 Connector
Courtesy of GENERAL MOTORS COMPANY

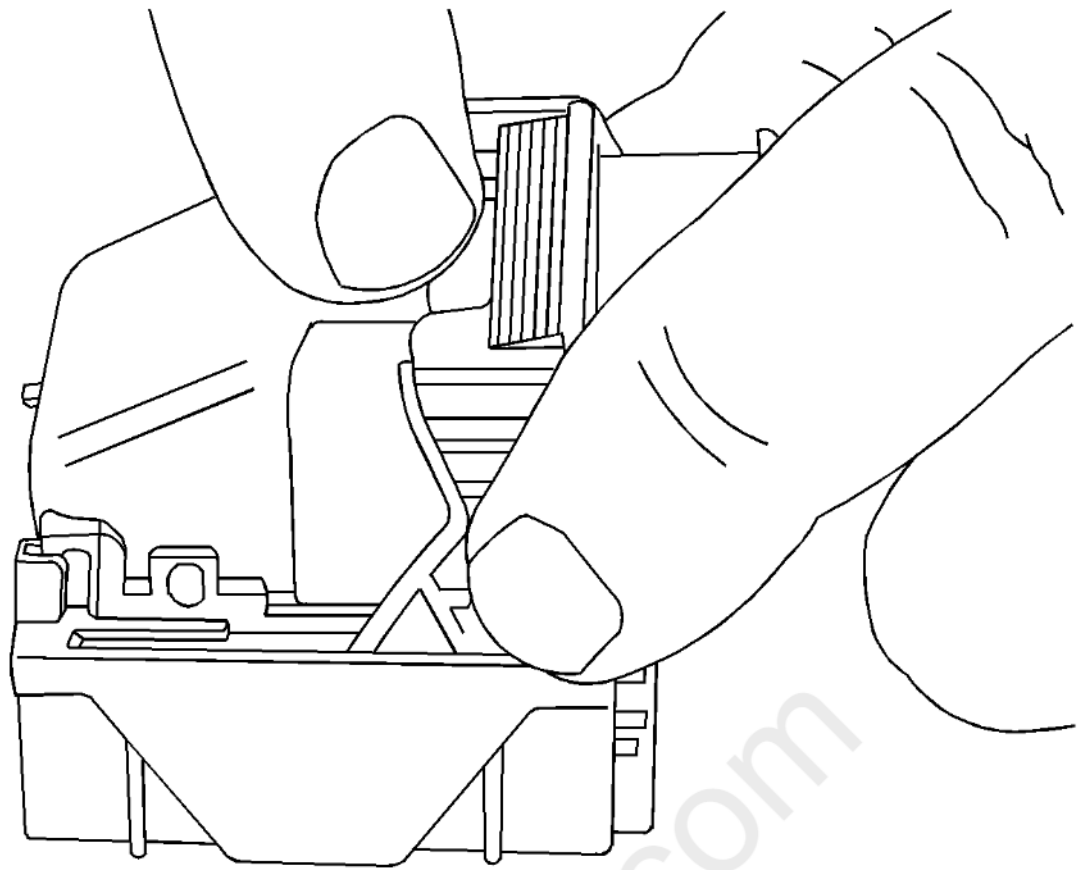


Fig. 61: Depressing Lock And Pulling Lever
Courtesy of GENERAL MOTORS COMPANY

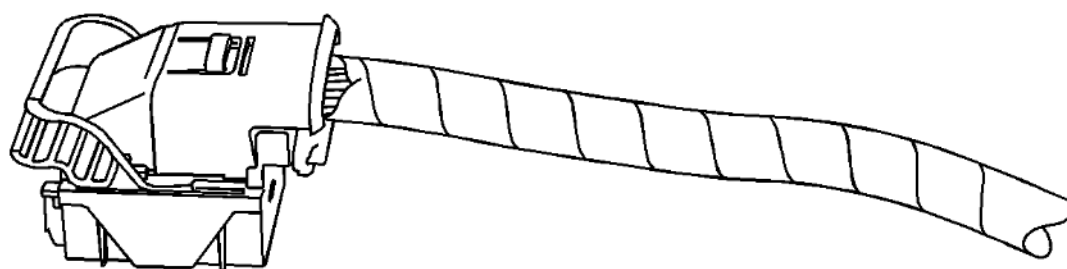


Fig. 62: View Of Connector When Released From Component
Courtesy of GENERAL MOTORS COMPANY

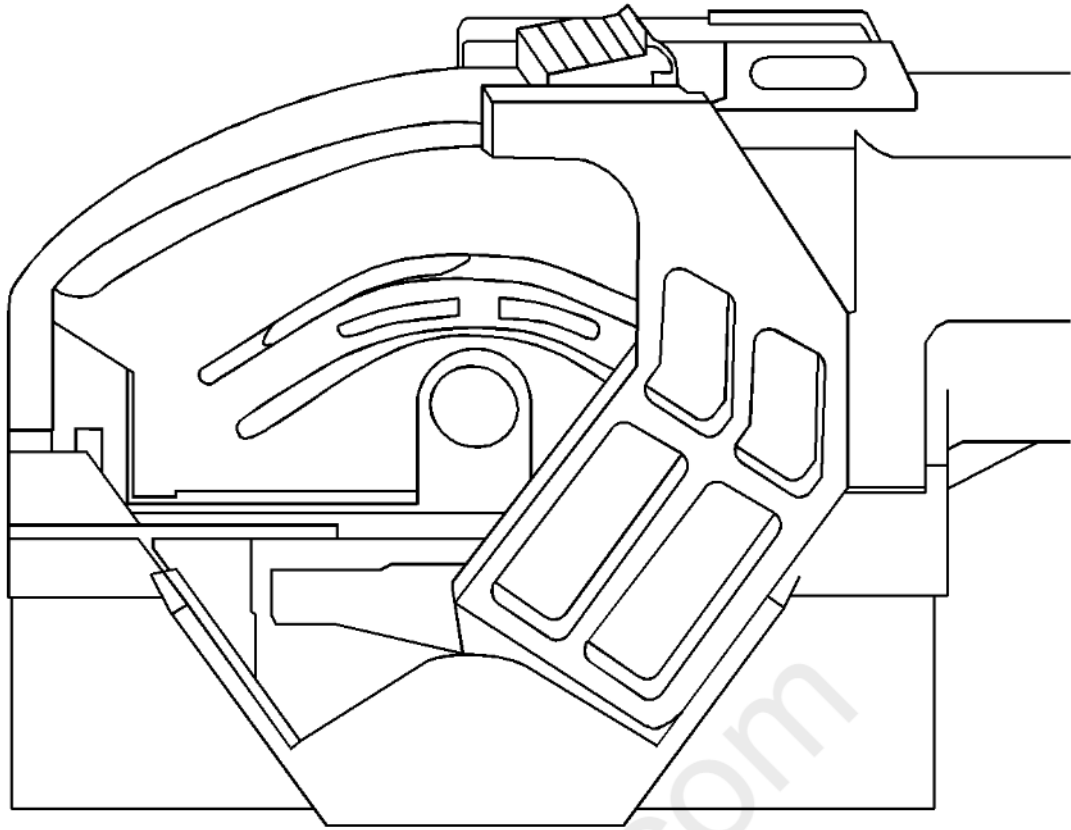


Fig. 63: View Of Another Type Of Micro 64 Connector
Courtesy of GENERAL MOTORS COMPANY

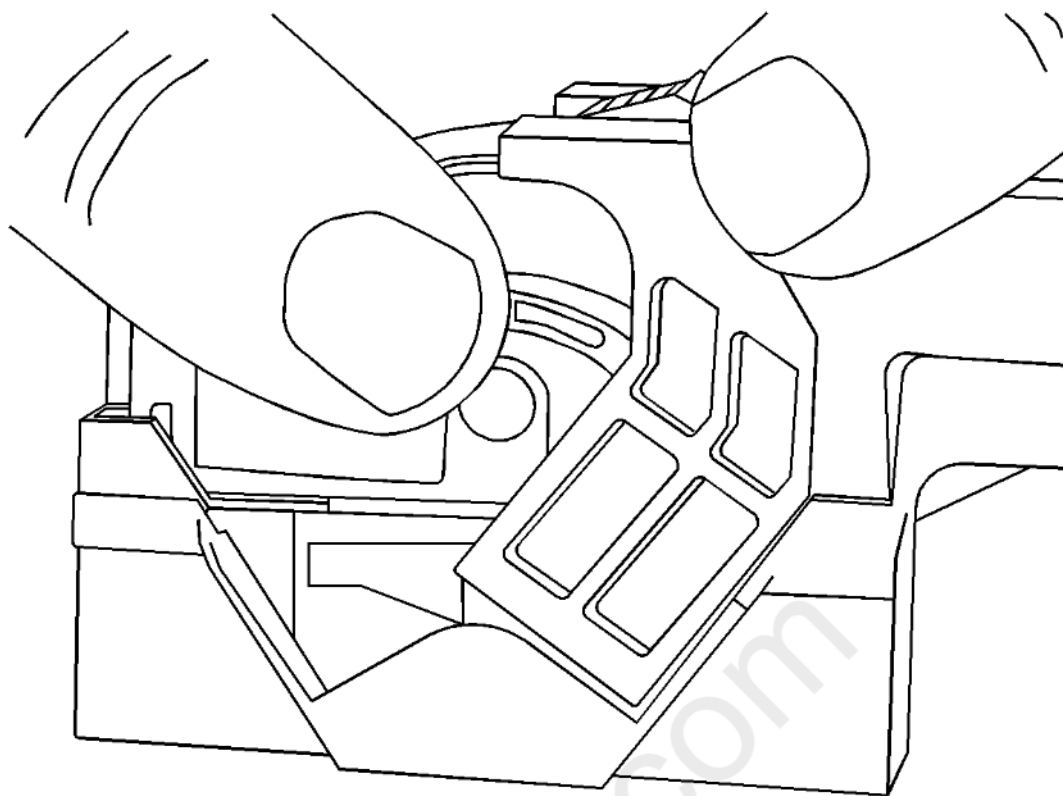


Fig. 64: Locating Locks On Both Sides Of Wiredress Cover
Courtesy of GENERAL MOTORS COMPANY

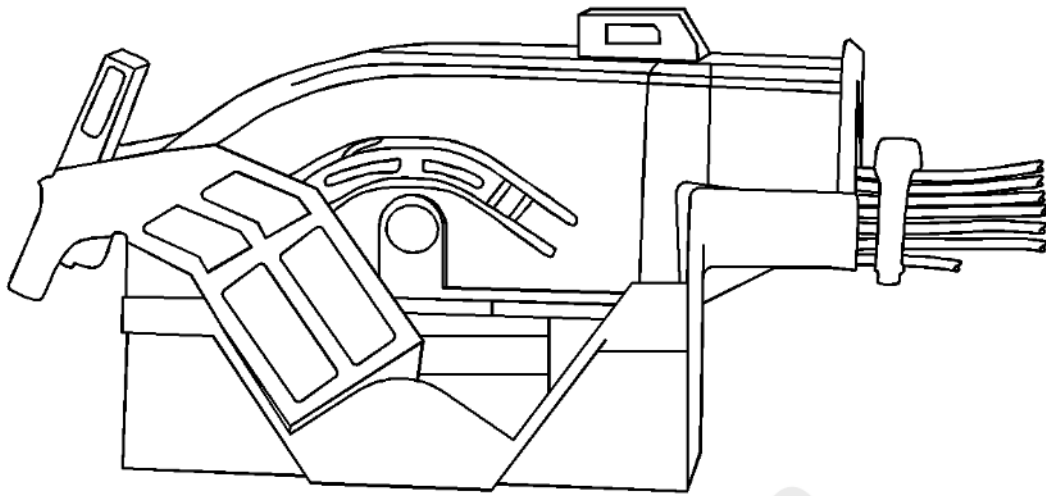


Fig. 65: View Of Connector When Released From Component

Courtesy of GENERAL MOTORS COMPANY

1. Locate the lever lock on the wire dress cover. While depressing the lock, pull the lever over and past the lock. The lever lock may be located on the top or sides of the wire dress cover.

View of a typical Micro 64 connector.

Depress the lock and pull the lever over and past the lock.

View of the connector when released from the component.

View of another type of Micro 64 connector.

Depress the locks that are located on both sides of the wire dress cover and pull the lever over and past the locks.

View of the connector when released from the component.

2. Disconnect the connector from the component.

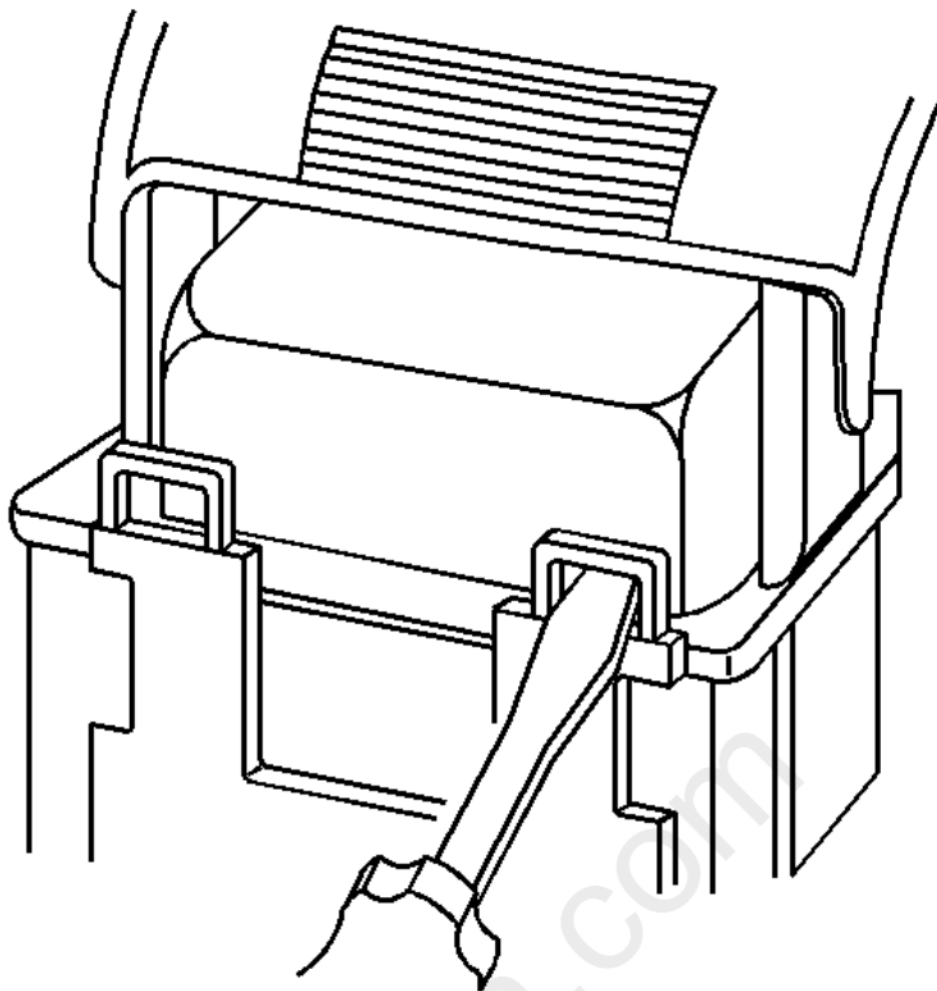


Fig. 66: View Of Releasing Locking Tabs

Courtesy of GENERAL MOTORS COMPANY

3. Locate the dress cover locking tabs at the front of the connector. Using a small flat-blade tool push down on one of the locking tabs and pull the cover up until the dress cover releases. Repeat this procedure for the other locking tab.
4. Once the front 2 locks are unlocked, lift the front of the dress cover and pull it forward.

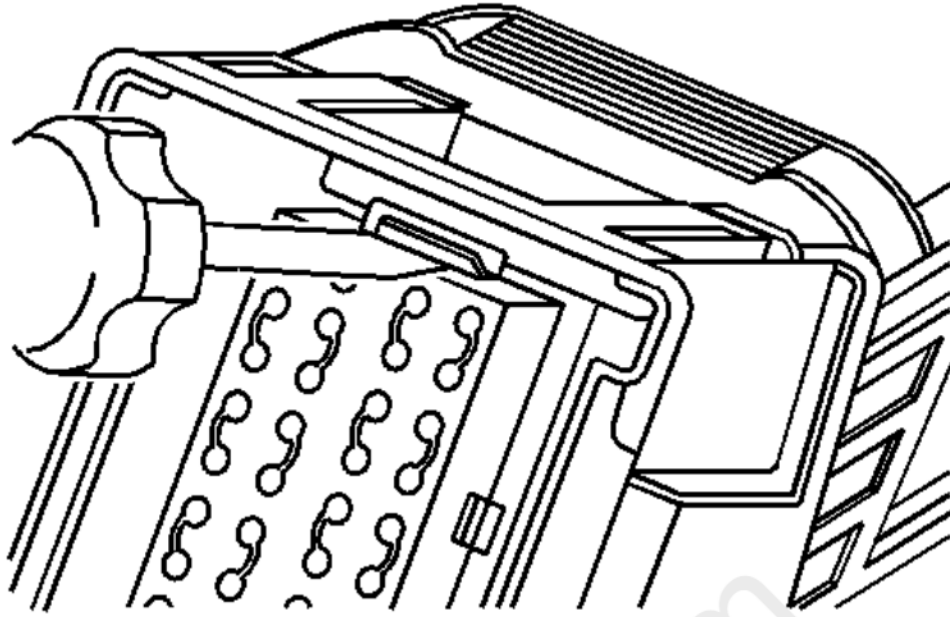


Fig. 67: View Of Removing Terminal Position Assurance

Courtesy of GENERAL MOTORS COMPANY

NOTE: Always use care when removing a terminal position assurance (TPA) in order to avoid damaging it.

5. Remove the TPA by inserting a small flat-blade tool into the small slot on the TPA and pushing down until the TPA releases. Gently pry the TPA out of the connector.

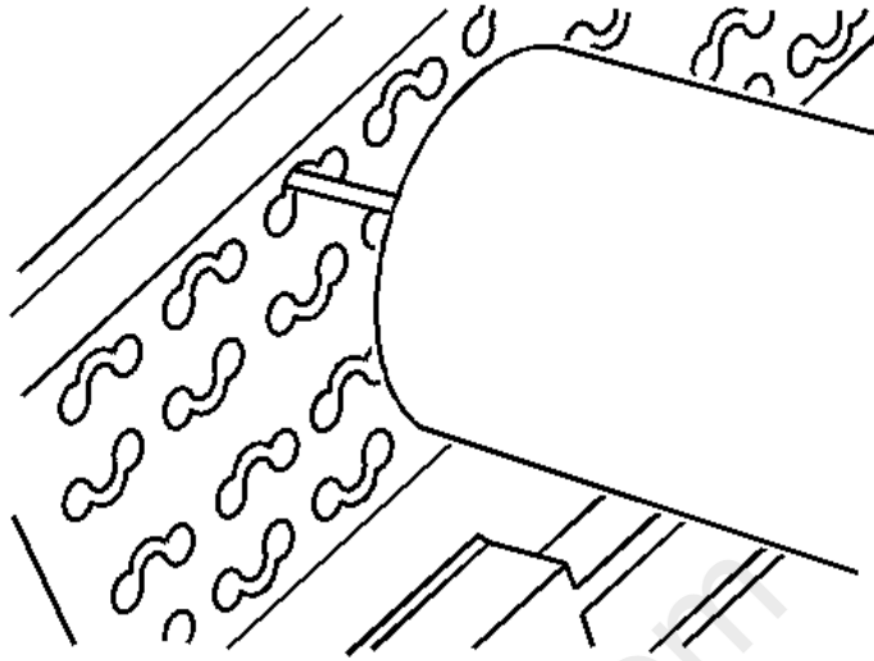


Fig. 68: Identifying Terminal Release Tool

Courtesy of GENERAL MOTORS COMPANY

NOTE: Be careful not to angle or rock the J-38125-21 tool when inserting it into the connector or the tool may break.

6. Insert the J-38125-21 tool into the round canal between the terminals cavities at the front of the connector.

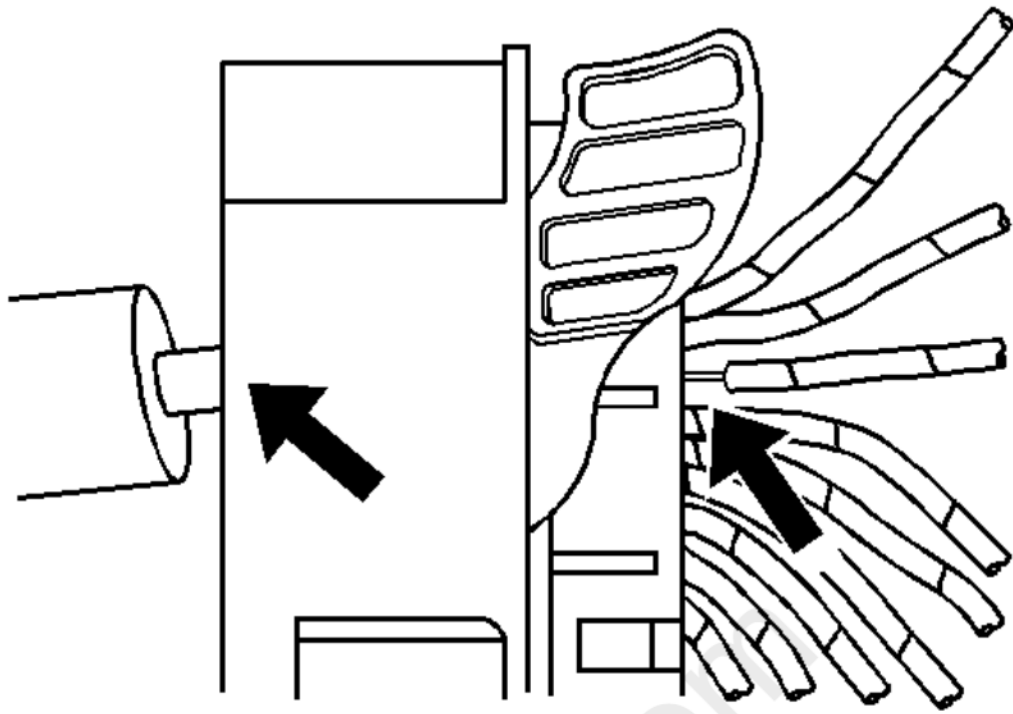


Fig. 69: Removing Wire From Back Of Connector

Courtesy of GENERAL MOTORS COMPANY

7. While holding the removal tool in place, gently pull the wire out of the back of the connector. Always remember never use force when pulling a terminal out of a connector.
8. Repair the terminal by following the [Repairing Connector Terminals \(Terminated Lead Repair\)](#)[Repairing Connector Terminals \(Terminal Repair\)](#) procedure.
9. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

DELPHI CONNECTORS (12-WAY)

Special Tools

- **EL-38125-550** Terminal Release Tool Kit
- **EL-38125-580** Terminal Release Tool Kit
- **J-38125-12A** Terminal Release Tool

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

Terminal Removal Procedure

Follow the steps below in order to remove terminals from the connector.

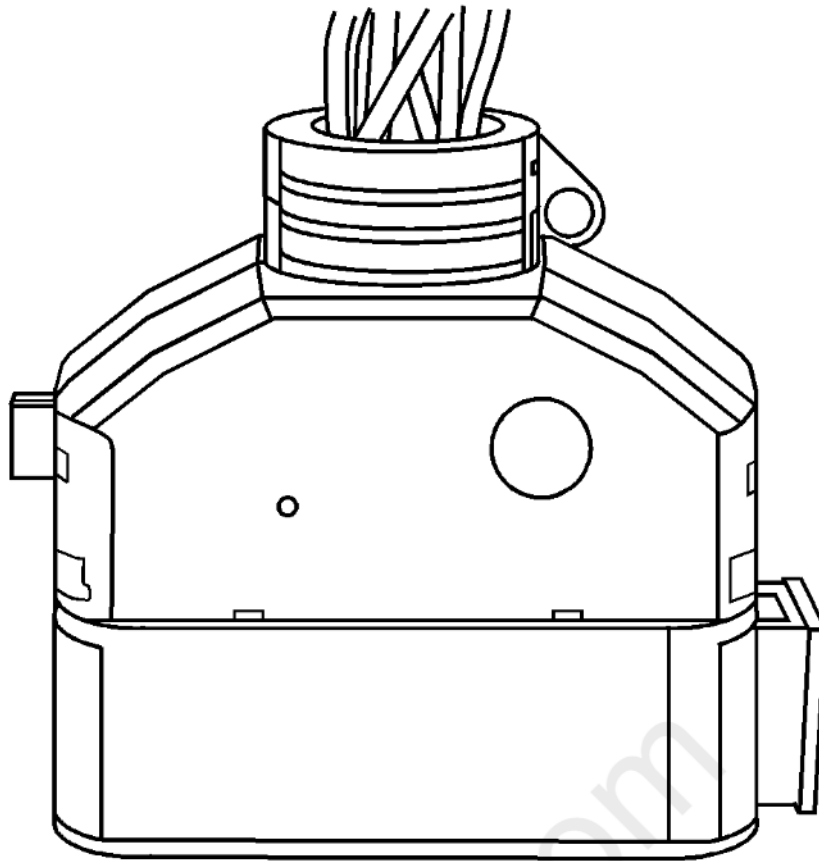


Fig. 70: Identifying Lever Lock

Courtesy of GENERAL MOTORS COMPANY

1. Locate the lever lock on the wire dress cover. Remove the connector position assurance (CPA) and slide the lever lock away from the connector body.
2. Disconnect the connector from the component.

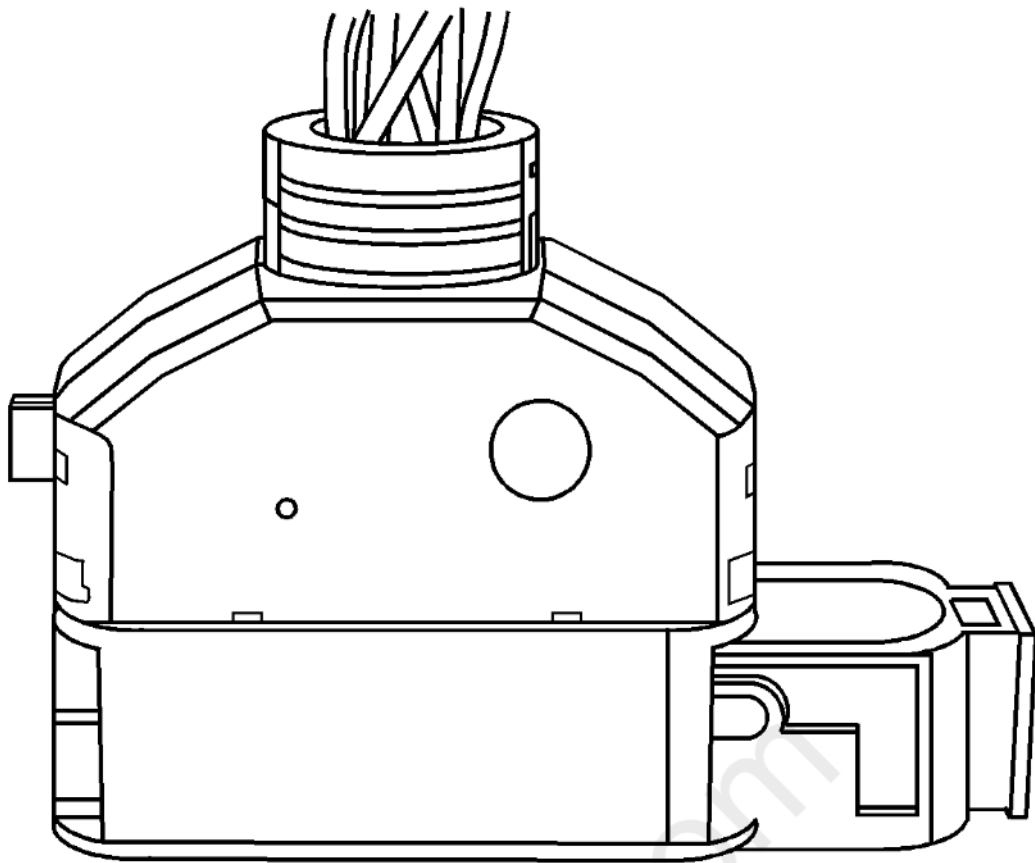


Fig. 71: Identifying Dress Cover Locking Tabs

Courtesy of GENERAL MOTORS COMPANY

3. Locate the dress cover locking tabs on the dress cover of the connector. Using a small flat-blade tool release all of the locking tabs.

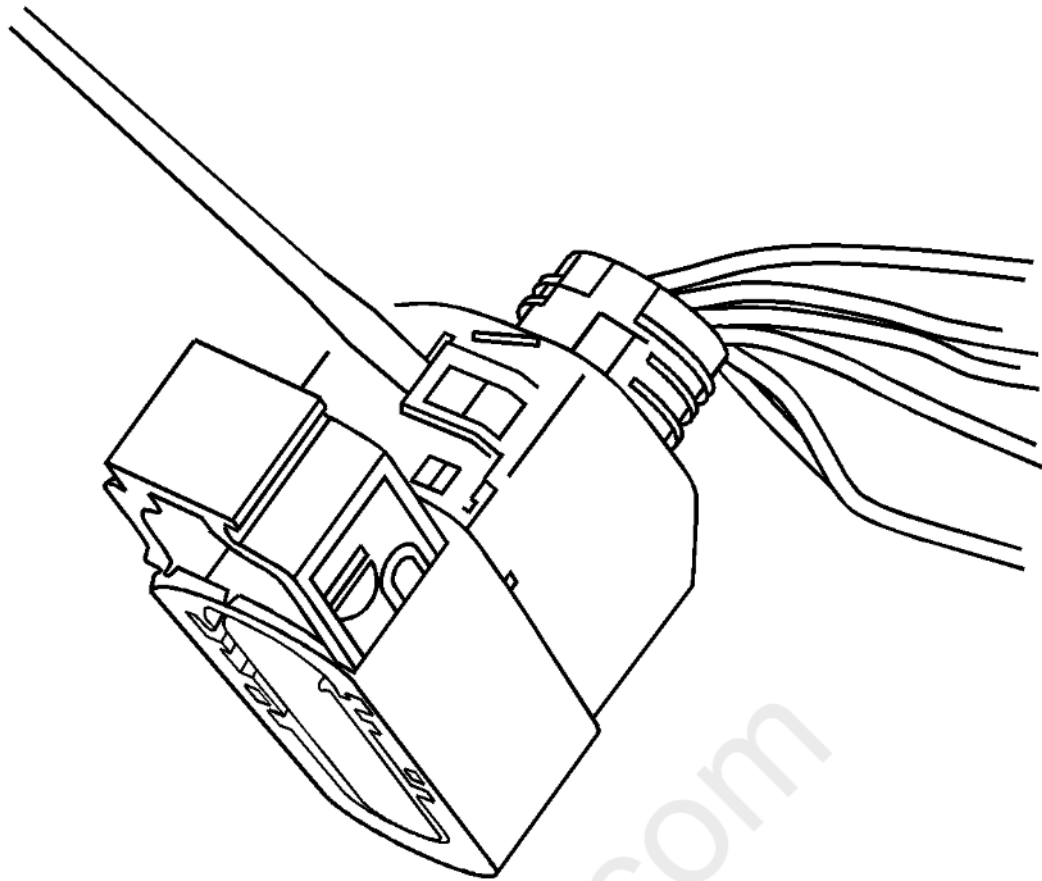


Fig. 72: Identifying Lower Wire Dress Cover Locking Tab
Courtesy of GENERAL MOTORS COMPANY

4. Release the lower wire dress cover locking tab.

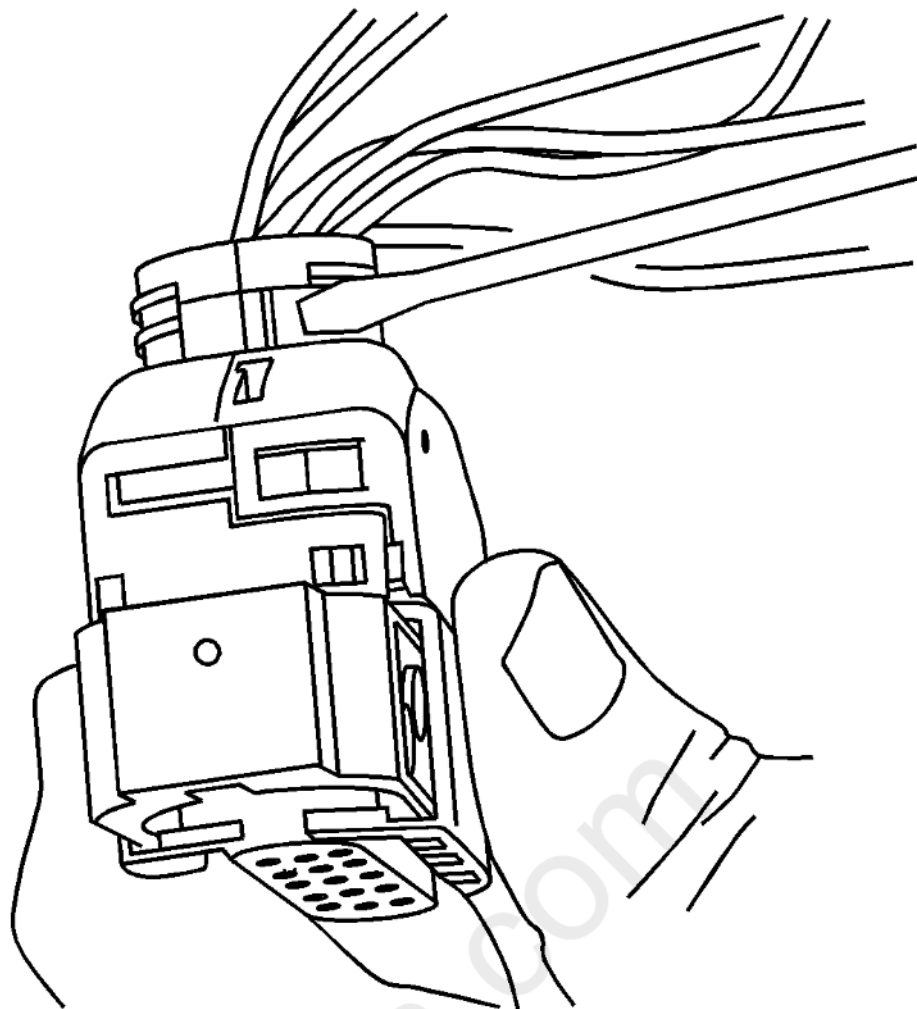


Fig. 73: Identifying Upper Wire Dress Cover Locking Tab
Courtesy of GENERAL MOTORS COMPANY

5. Release the upper wire dress cover locking tab.
6. Once the locks are unlocked, lift the dress cover off.

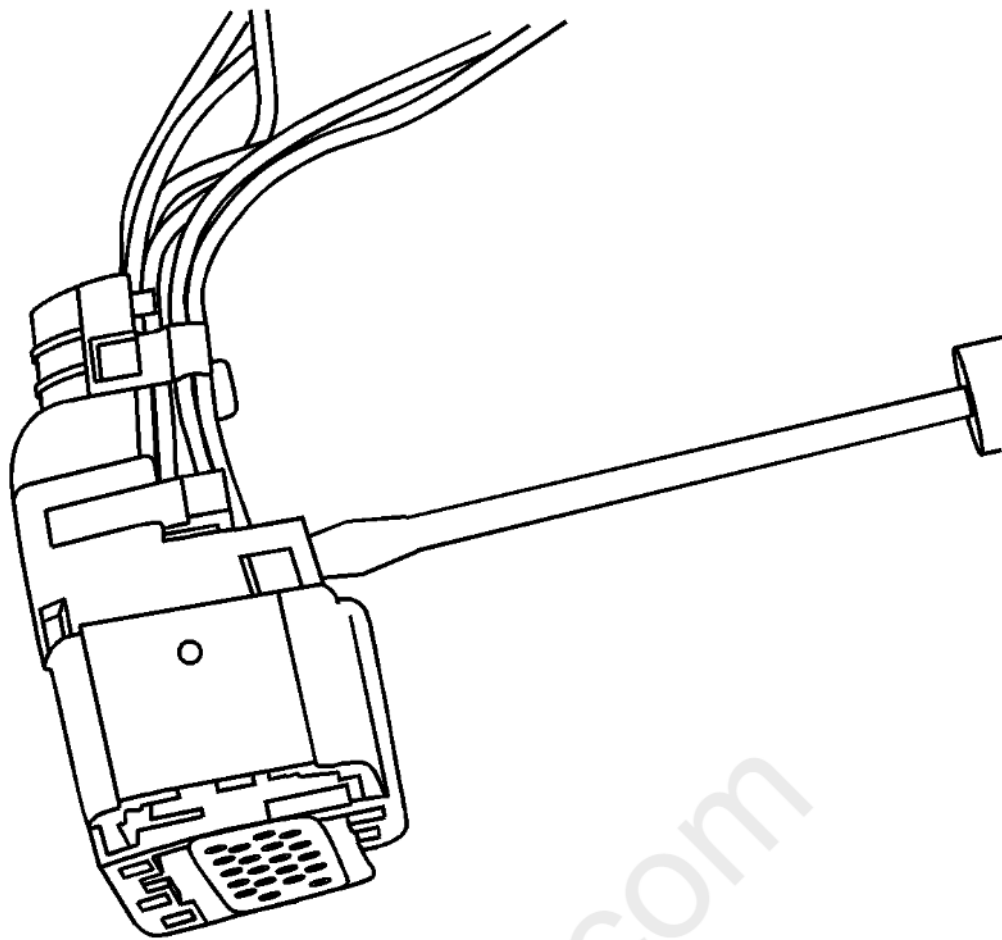


Fig. 74: View Of TPA Being Pried Out Of Connector

Courtesy of GENERAL MOTORS COMPANY

NOTE: Always use care when removing a terminal position assurance (TPA) in order to avoid damaging it.

7. Remove the TPA by inserting a small flat-blade tool into the locking tabs on both sides of the TPA. Gently pry the TPA out of the connector.

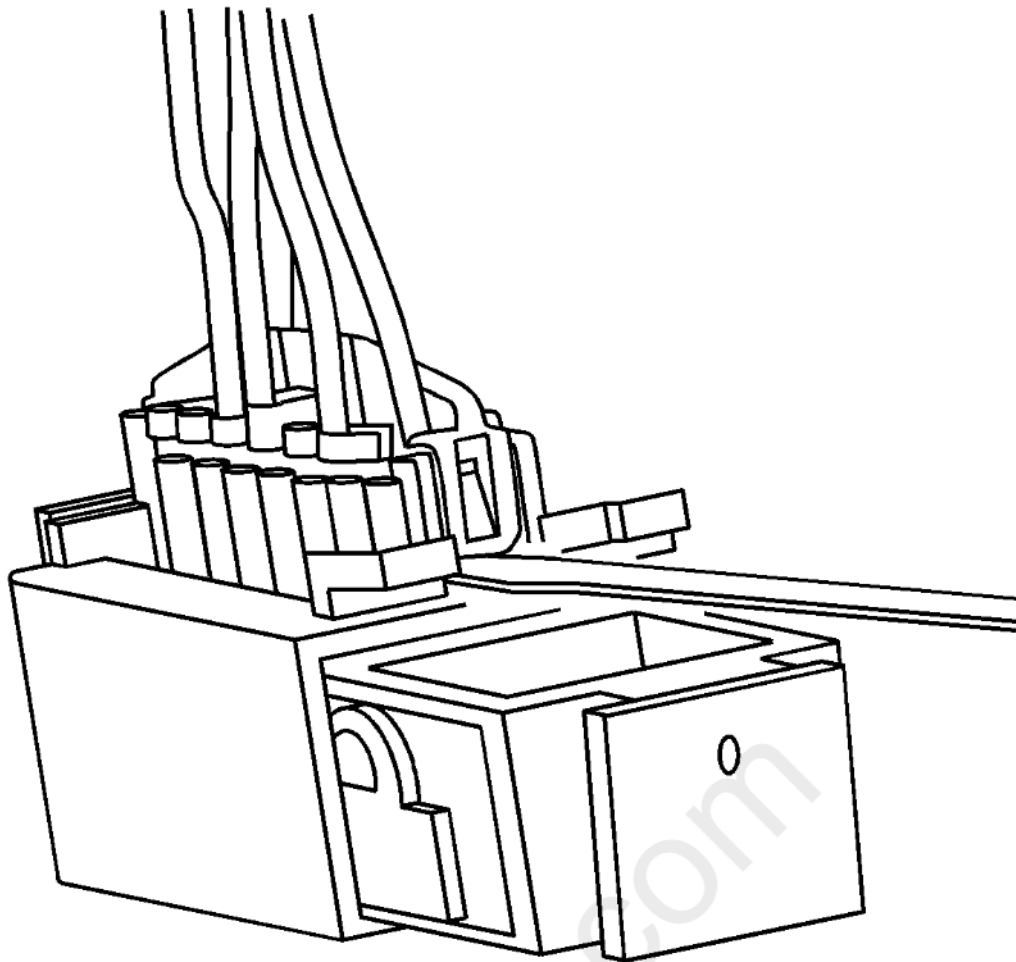


Fig. 75: Removing Nose Piece

Courtesy of GENERAL MOTORS COMPANY

8. Remove the nose piece by inserting a small flat-blade tool into the locking tabs on both sides of the nose piece. Gently pry the nose piece out of the connector.

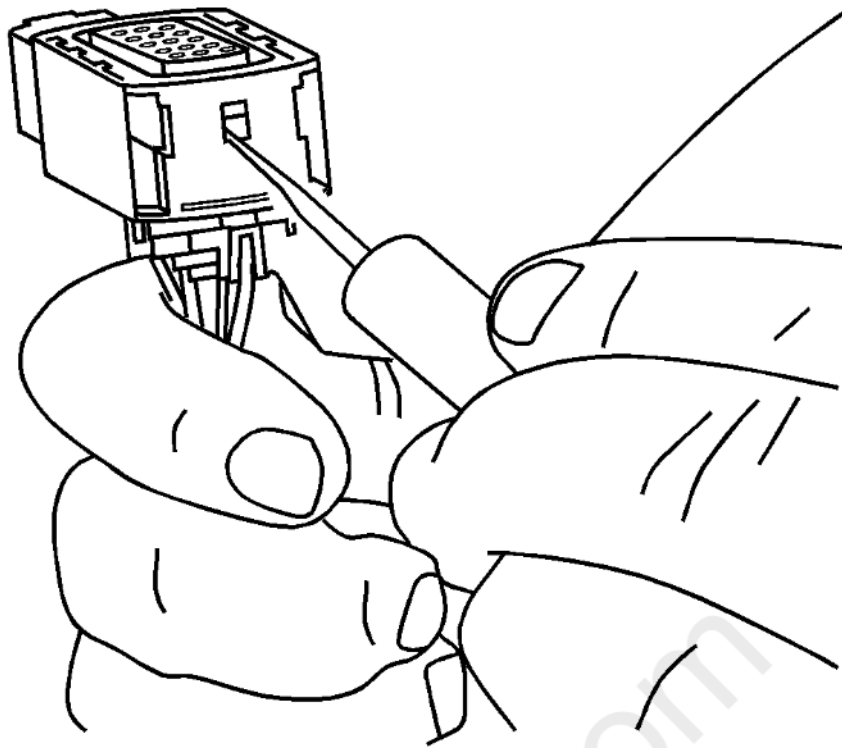


Fig. 76: Inserting Special Tool Into Terminal Release Cavity.

Courtesy of GENERAL MOTORS COMPANY

9. Insert the J-38125-12A tool to release the terminals by inserting the tool into the terminal release cavity.

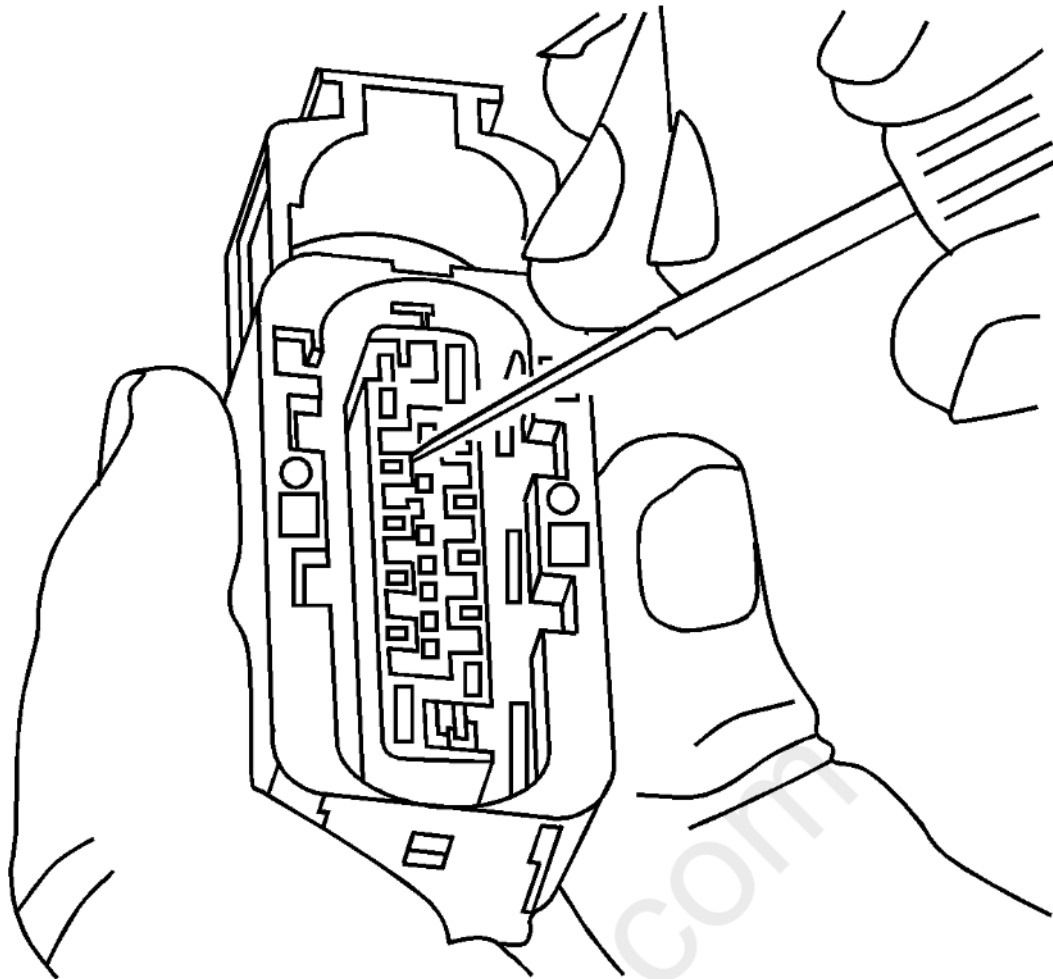


Fig. 77: Pulling Wire Out Of Back Of Connector

Courtesy of GENERAL MOTORS COMPANY

10. While holding the removal tool in place, gently pull the wire out of the back of the connector. Always remember never use force when pulling a terminal out of a connector.
11. Repair the terminal by following the [Repairing Connector Terminals \(Terminated Lead Repair\)](#)[Repairing Connector Terminals \(Terminal Repair\)](#) procedure.
12. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

DELPHI CONNECTORS (STEERING GEAR)

Removal Procedure

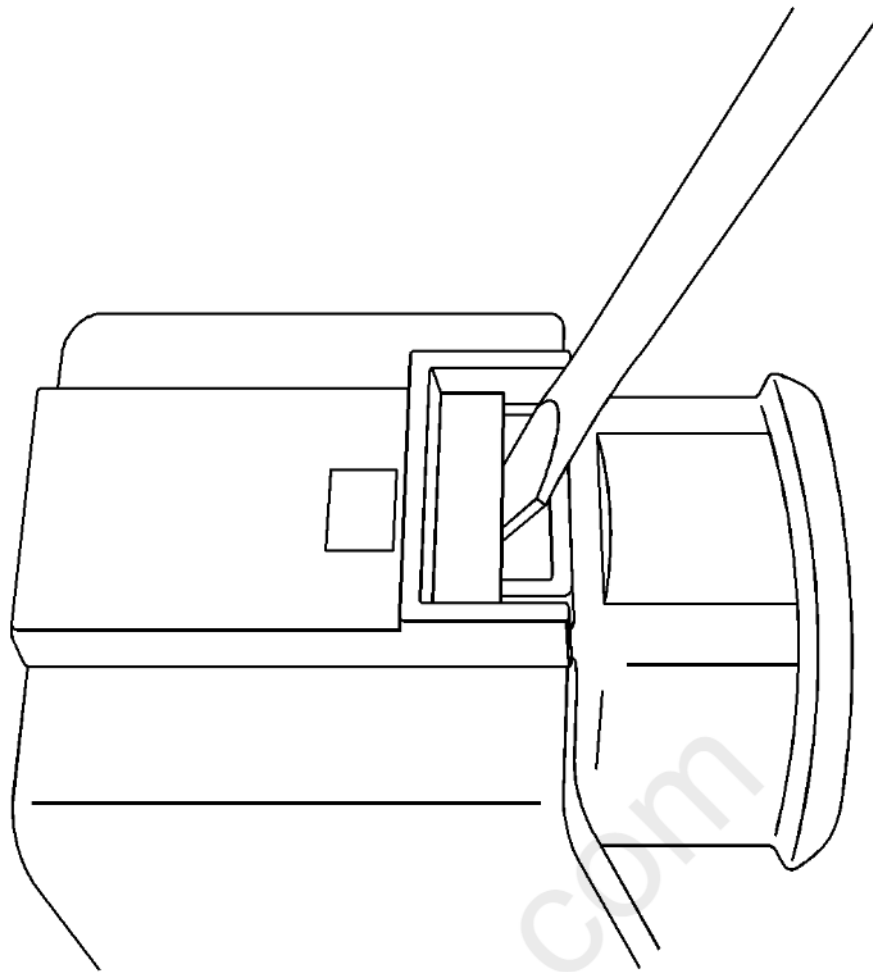


Fig. 78: Releasing Locking Tab On Connector

Courtesy of GENERAL MOTORS COMPANY

1. Use a small flat-bladed tool to release the locking tab on the connector.

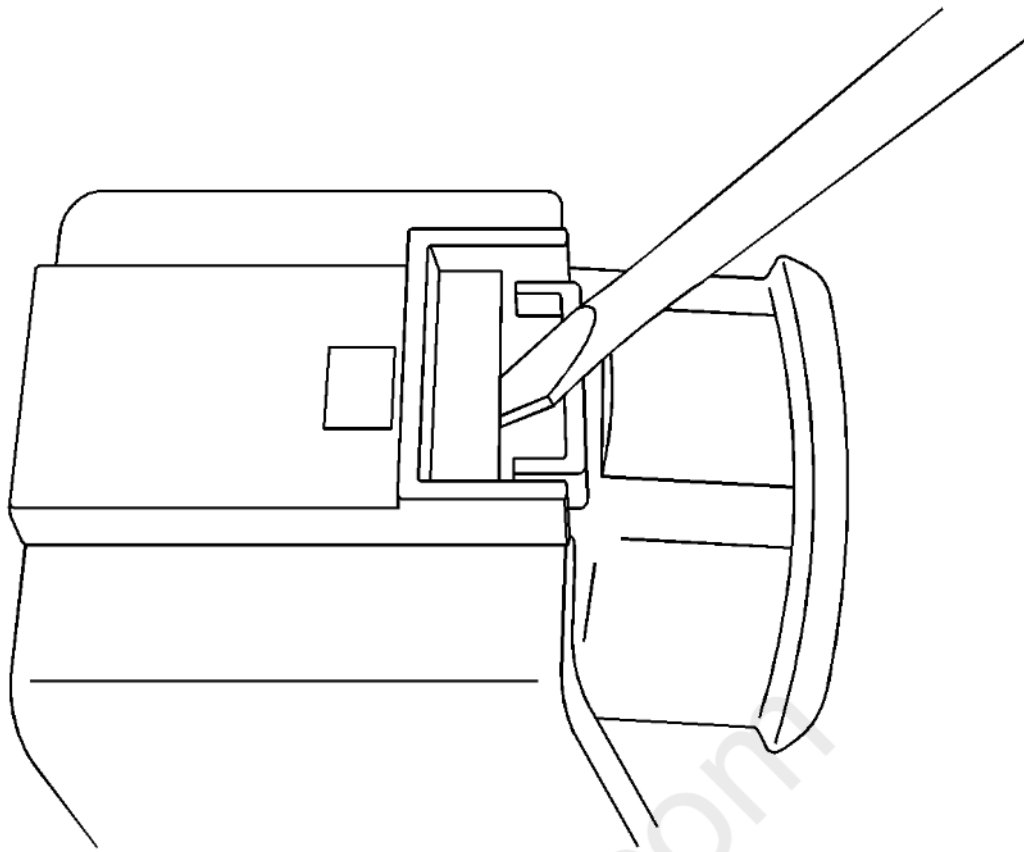


Fig. 79: Releasing Connector

Courtesy of GENERAL MOTORS COMPANY

2. Push down the locking tab to release the connector. The small flat-bladed tool may need to be pushed down and angled back slightly to depress the locking tab. Pull on the connector body while releasing the locking tab to disconnect the connector.

FCI CONNECTORS (LEVER LOCK)

Special Tools

- **EL-38125-550** Terminal Release Tool Kit
- **EL-38125-580** Terminal Release Tool Kit
- **J-38125-556** Terminal Release Tool
- **J-38125-560** Terminal Release Tool

For equivalent regional tools, refer to **Special Tools** .

Terminal Removal Procedure

Follow the steps below in order to remove terminals from the connector.

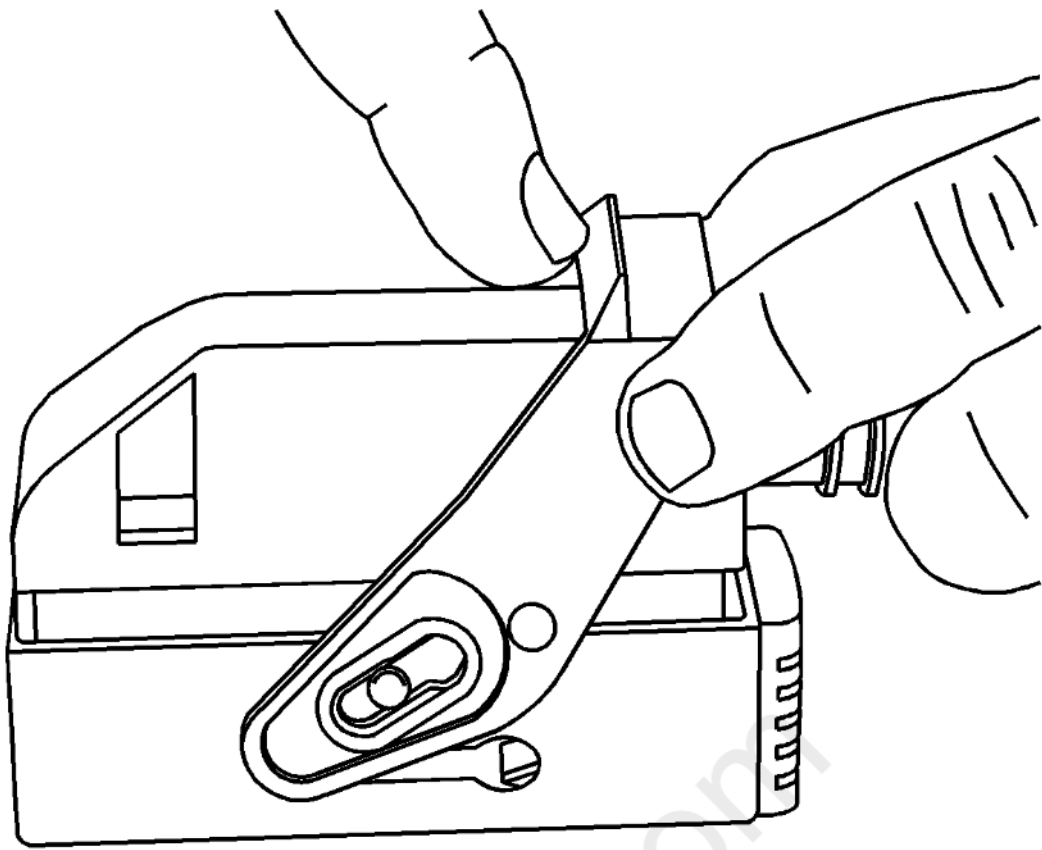


Fig. 80: Identifying Release Tab

Courtesy of GENERAL MOTORS COMPANY

1. Slide the lever lock forward while pressing down on the lever lock release tab.
2. The release tab is located on the top of the wiredress cover.

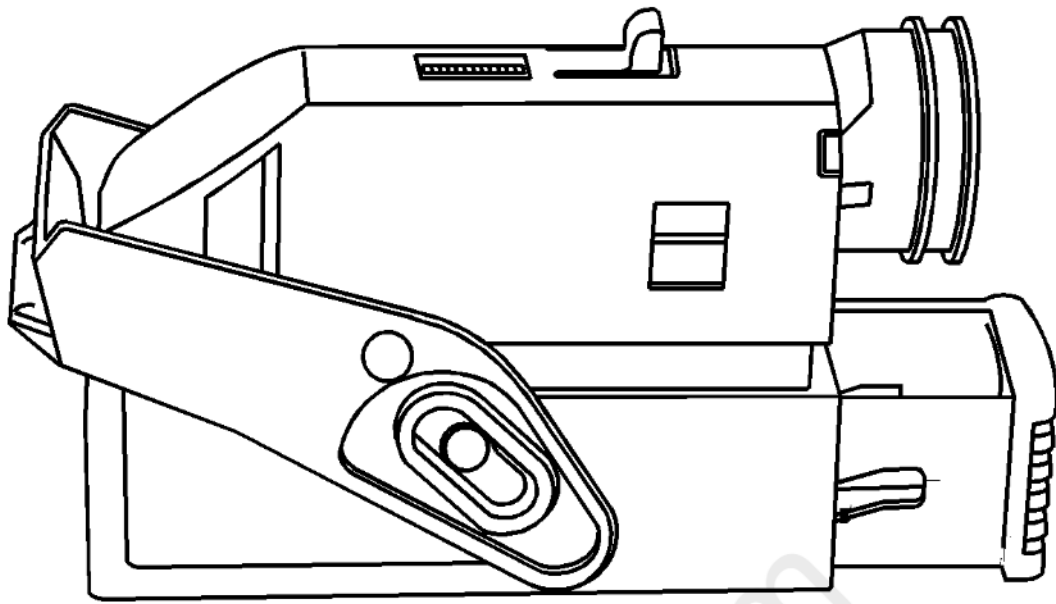


Fig. 81: View Of Connector In Released Position

Courtesy of GENERAL MOTORS COMPANY

3. View of connector in released position.
4. Disconnect the connector from the component.
5. Locate the dress cover locking tabs at the corners of the dress cover. Use a small flat-blade tool to release the locking tabs and remove the dress cover.

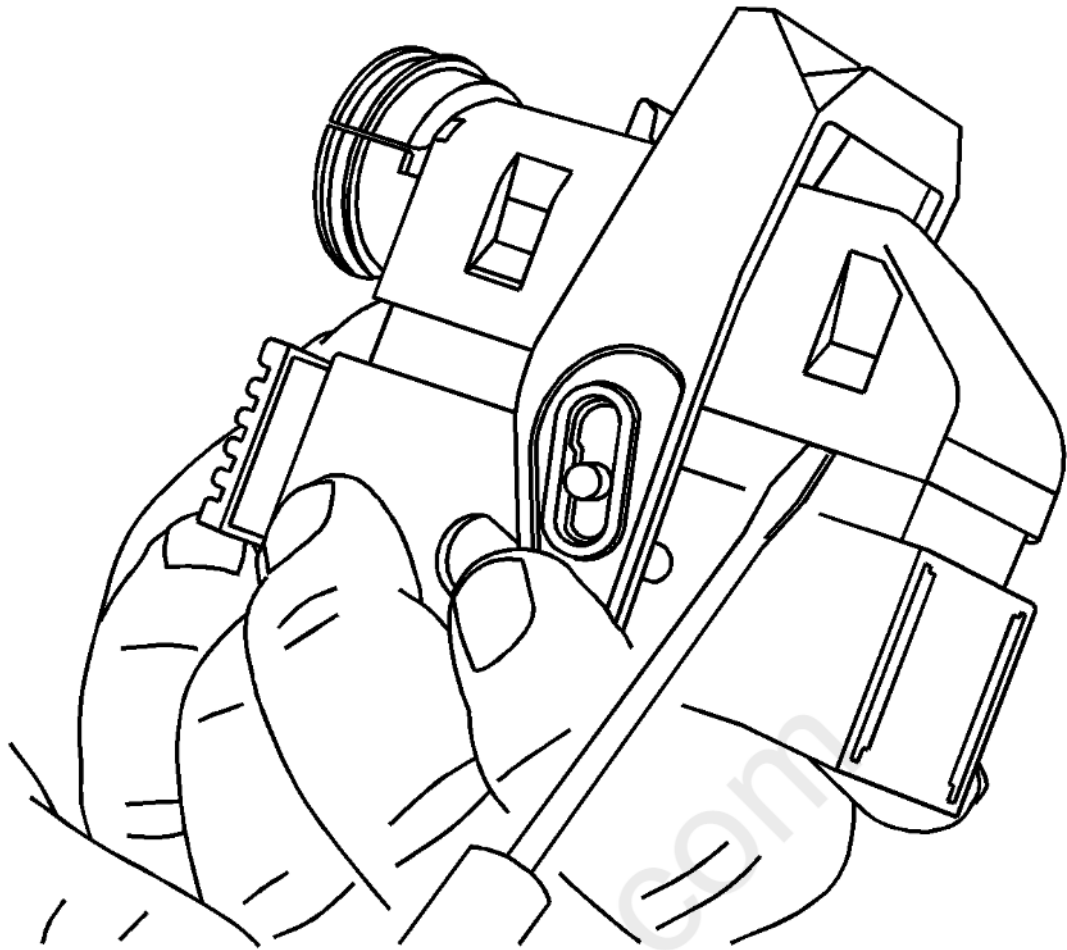


Fig. 82: View Of Sliding Terminal Position Assurance (TPA) Up One Notch
Courtesy of GENERAL MOTORS COMPANY

6. Use a small flat-blade tool to slide the terminal position assurance (TPA) up one notch on both ends of the connector. The TPA is located underneath the wire dress cover.

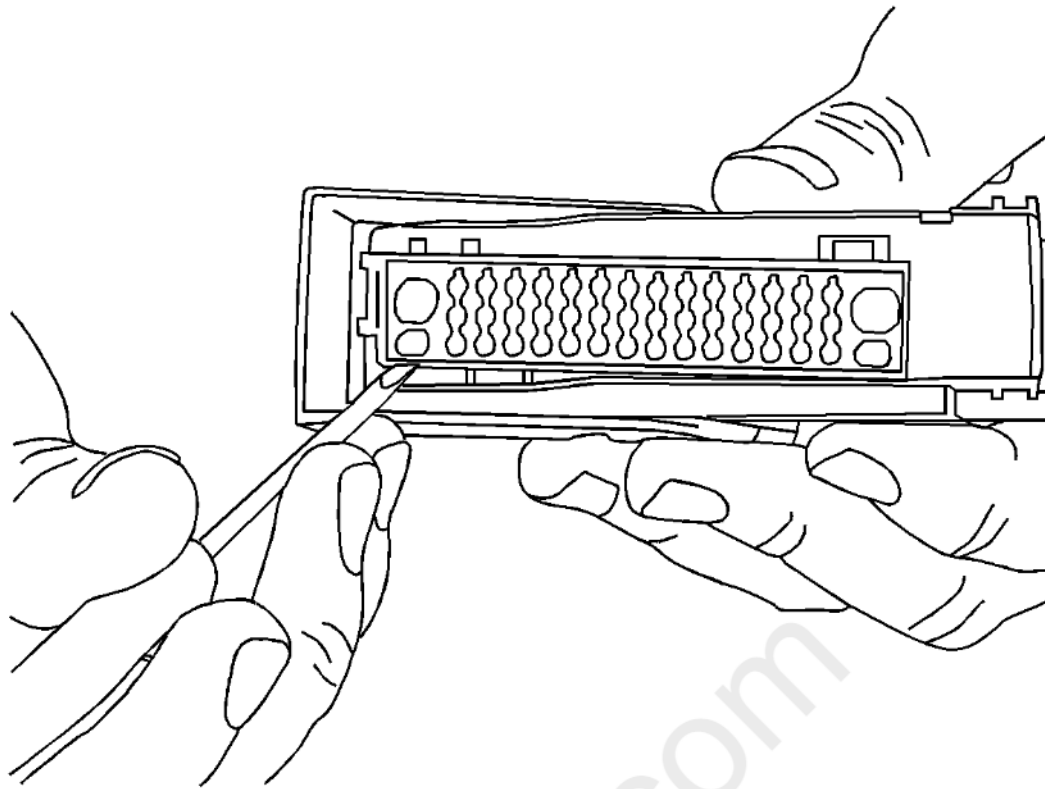


Fig. 83: View Of Releasing Terminals

Courtesy of GENERAL MOTORS COMPANY

7. For the larger terminals insert the J-38125-556 tool to release the terminals by inserting the tool into the terminal release cavity. For the smaller terminals insert the J-38125-560 tool to release the terminals by inserting the tool into the terminal release cavity.

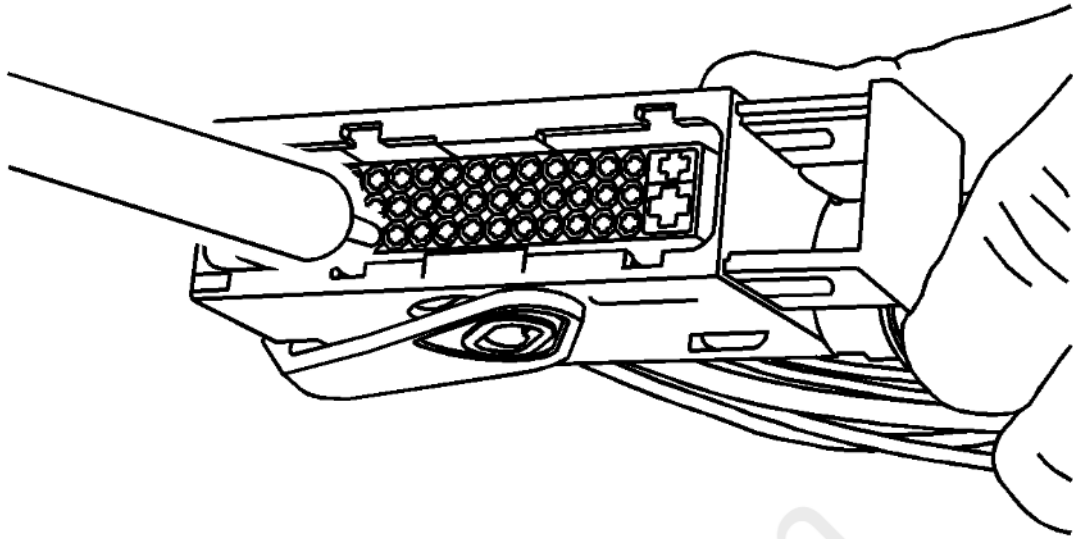


Fig. 84: View Of Wire Being Pulled Out Of Back Of Connector While Holding Removal Tool In Place

Courtesy of GENERAL MOTORS COMPANY

8. While holding the removal tool in place, gently pull the wire out of the back of the connector. Always remember never use force when pulling a terminal out of a connector.
9. Repair the terminal by following the [Repairing Connector Terminals \(Terminated Lead Repair\)](#)[Repairing Connector Terminals \(Terminal Repair\)](#) procedure.
10. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

FCI CONNECTORS (SIR)

Removal Procedure

NOTE: The orange or yellow connector position assurance (CPA) must be released first to disconnect or to connect the connector.

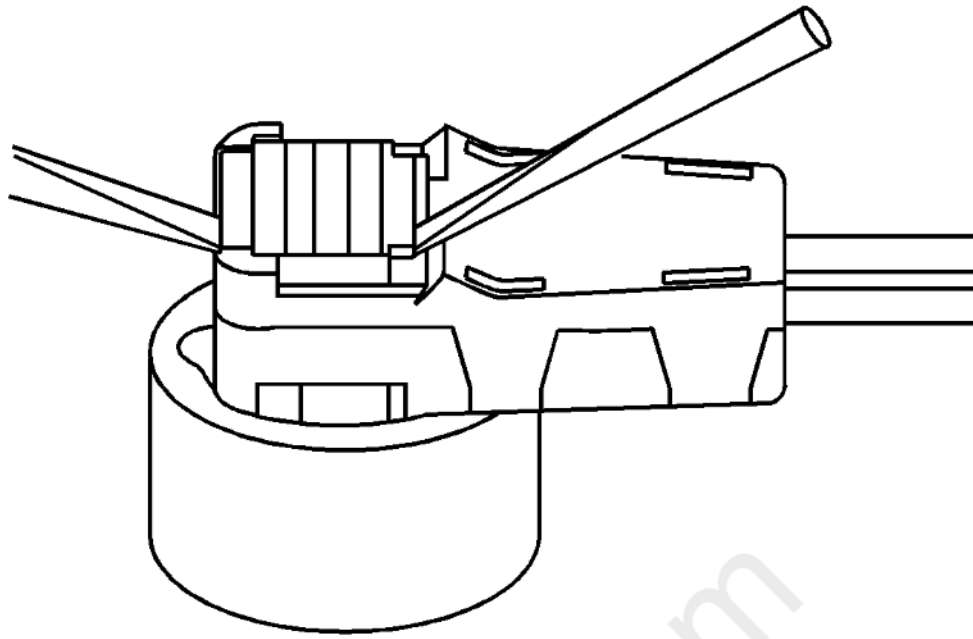


Fig. 85: Lifting Orange CPA

Courtesy of GENERAL MOTORS COMPANY

1. Lift the orange or yellow CPA vertically (avoid lifting on an angle to the connector) approximately 4 mm to release the connector. Use a small flat-bladed tool to help release the CPA. The CPA may also be released manually without any tools.

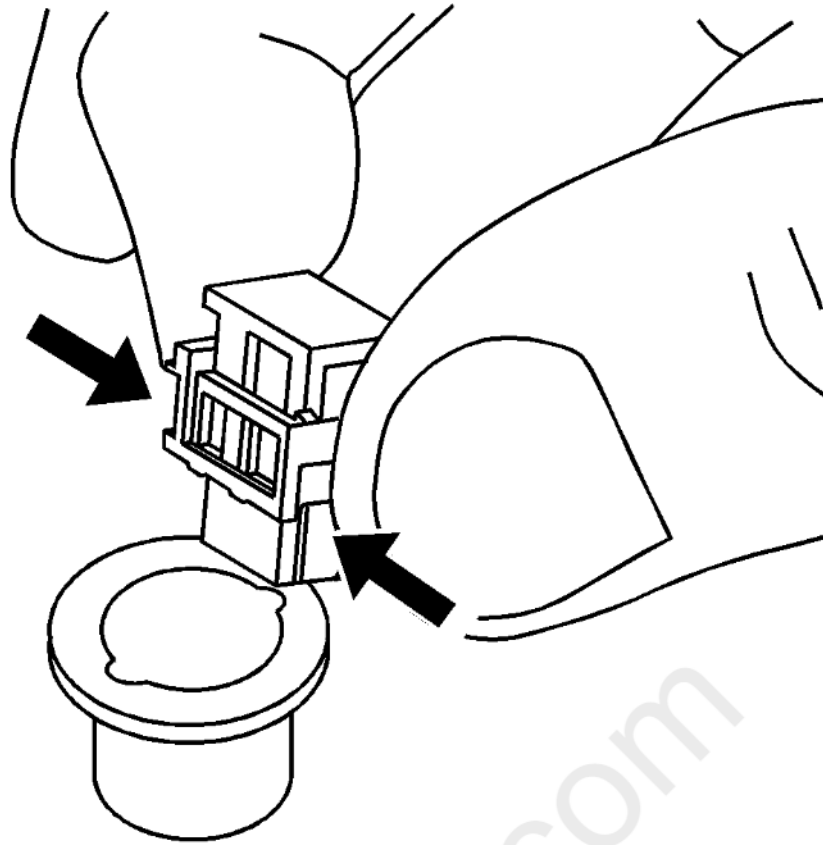


Fig. 86: Grabbing Connector On Both Sides
Courtesy of GENERAL MOTORS COMPANY

2. Grab the connector on both sides and lift vertically to disconnect the connector.

Installation Procedure

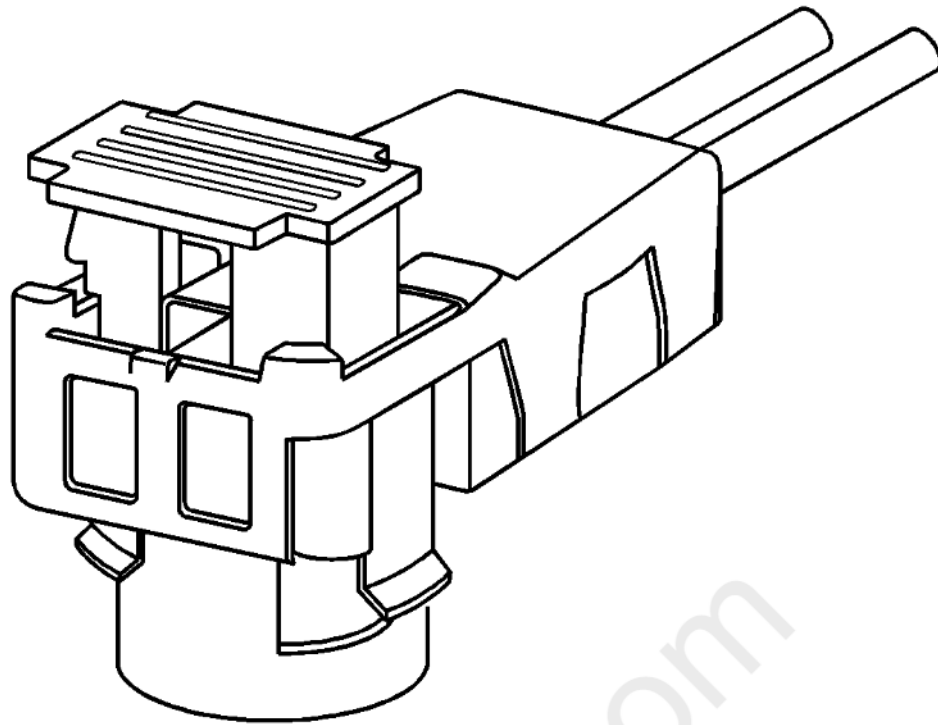


Fig. 87: Lifting Orange CPA

Courtesy of GENERAL MOTORS COMPANY

1. The CPA should be approximately 4 mm above the yellow cover before installing the connector. If not, use a small flat-bladed tool to help release the CPA. The CPA may also be released manually without any tools.

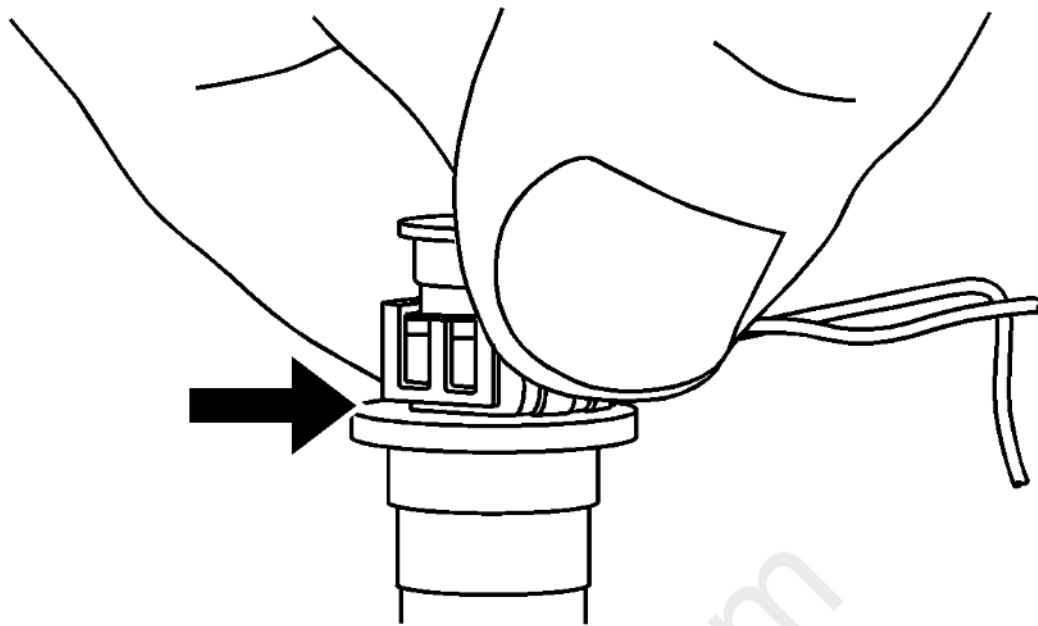


Fig. 88: Seating Connector Sub-Assembly
Courtesy of GENERAL MOTORS COMPANY

2. Line up the connector key tabs with the initiator key slots. Grab the connector on both sides and push down into the initiator connector sub assembly until fully seated.

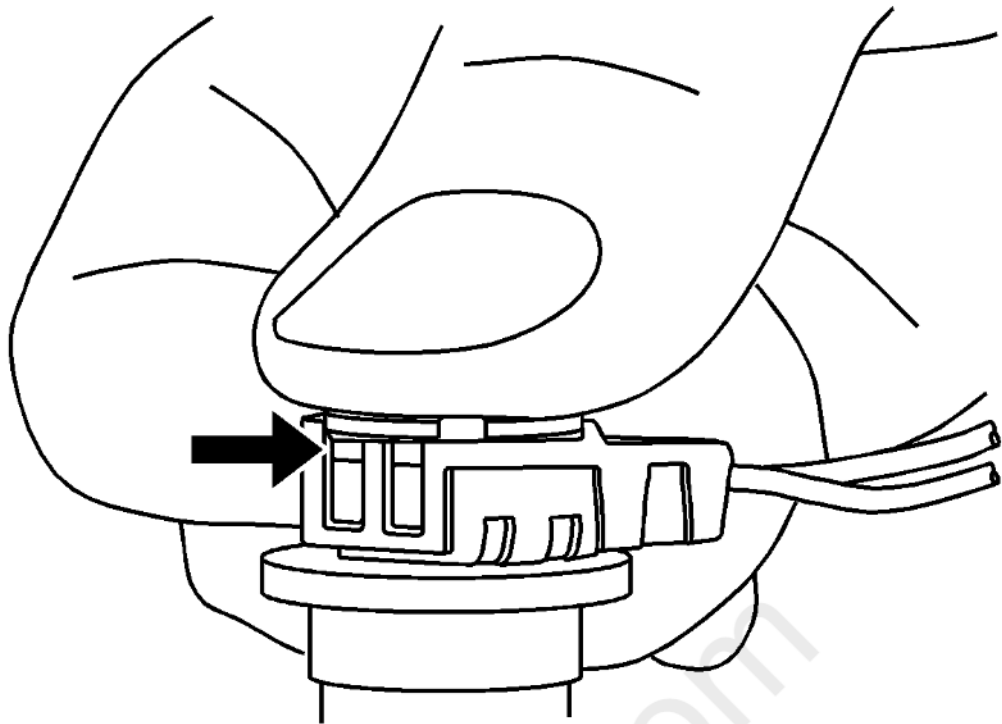


Fig. 89: Pushing CPA Down

Courtesy of GENERAL MOTORS COMPANY

3. After the connector is fully seated, push the CPA down with your thumb until the CPA is touching the yellow cover on the connector.
4. After the CPA is seated, lightly pull on the connector, it should not pull off if the connector and CPA are properly engaged.

FEP CONNECTORS (STEERING GEAR)

Removal Procedure

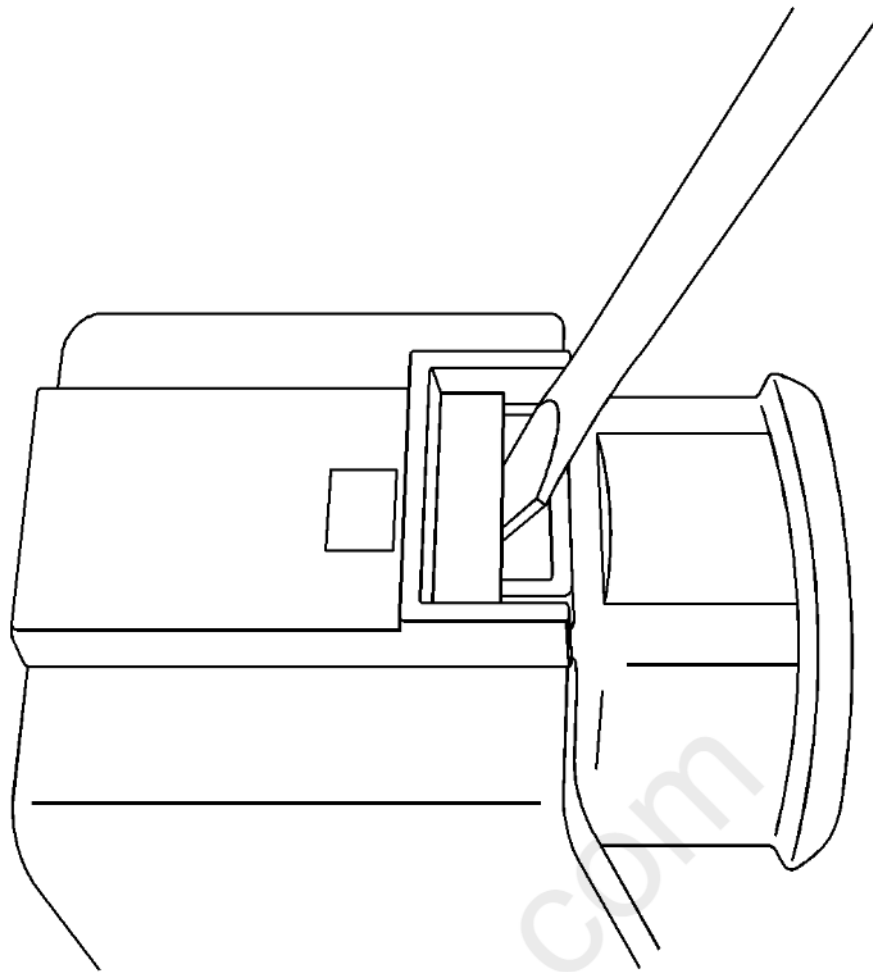


Fig. 90: Releasing Locking Tab On Connector

Courtesy of GENERAL MOTORS COMPANY

1. Use a flat-bladed tool to release the locking tab on the connector.

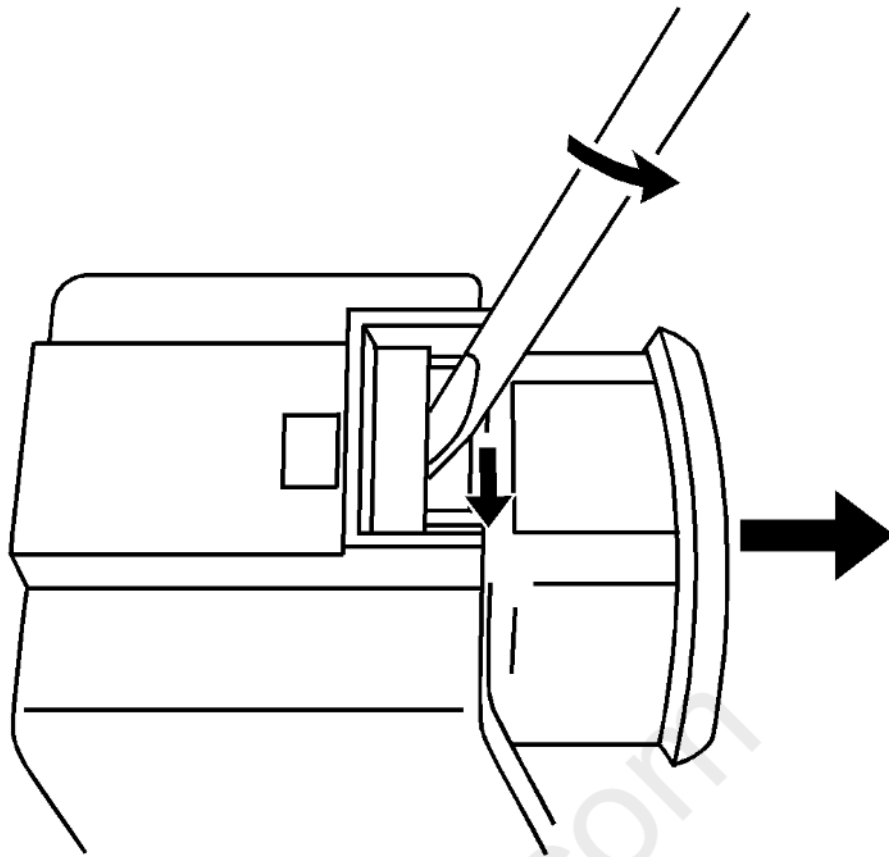


Fig. 91: Twisting Flat-Bladed Tool To Push Top Of Locking Tab Inward

Courtesy of GENERAL MOTORS COMPANY

2. Option 1: Twist the flat-bladed tool to push the top of the locking tab inward while pulling the connector body out.

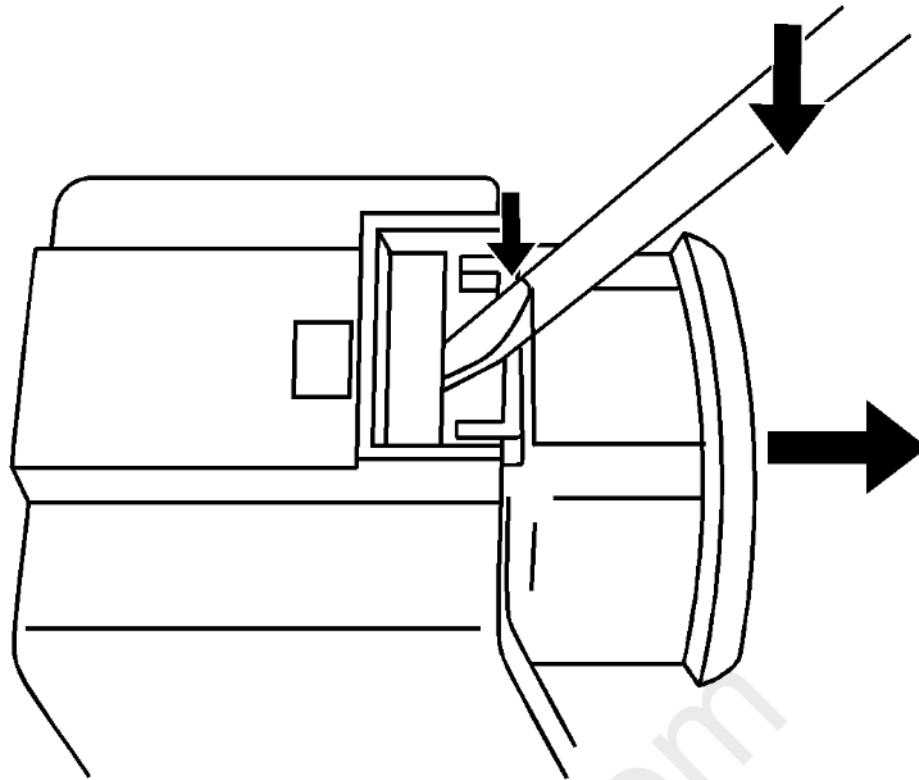


Fig. 92: Using Flat-Bladed Tool To Depress Locking Tab

Courtesy of GENERAL MOTORS COMPANY

3. Option 2: Pry using the flat-bladed tool to depress the locking tab while pulling the connector body out.

JST CONNECTORS

Special Tools

- **EL-38125-550** Terminal Release Tool Kit
- **EL-38125-580** Terminal Release Tool Kit
- **J-38125-553** Terminal Release Tool

For equivalent regional tools, refer to **Special Tools** .

Terminal Removal Procedure

The JST connector family consists of seven unique connector housings differentiated by color and keying. This connector family is designed to use both 0.64 and 2.8 sized terminals.

JST BCM Connector

GM Service Part #	Color
88988806	Gray
88988837	Brown
88988838	Lt Green
88988839	Natural
88988840	Lt Blue
88988841	Black
88988842	Pink

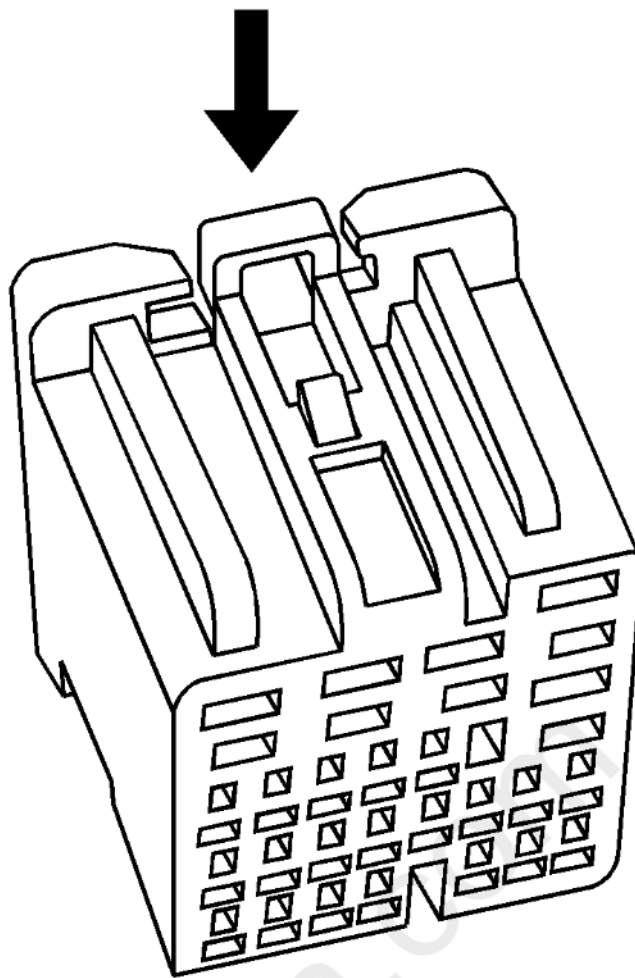


Fig. 93: Identifying Terminal Position Assurance (TPA)

Courtesy of GENERAL MOTORS COMPANY

1. While depressing the lock, remove the connector from the component.

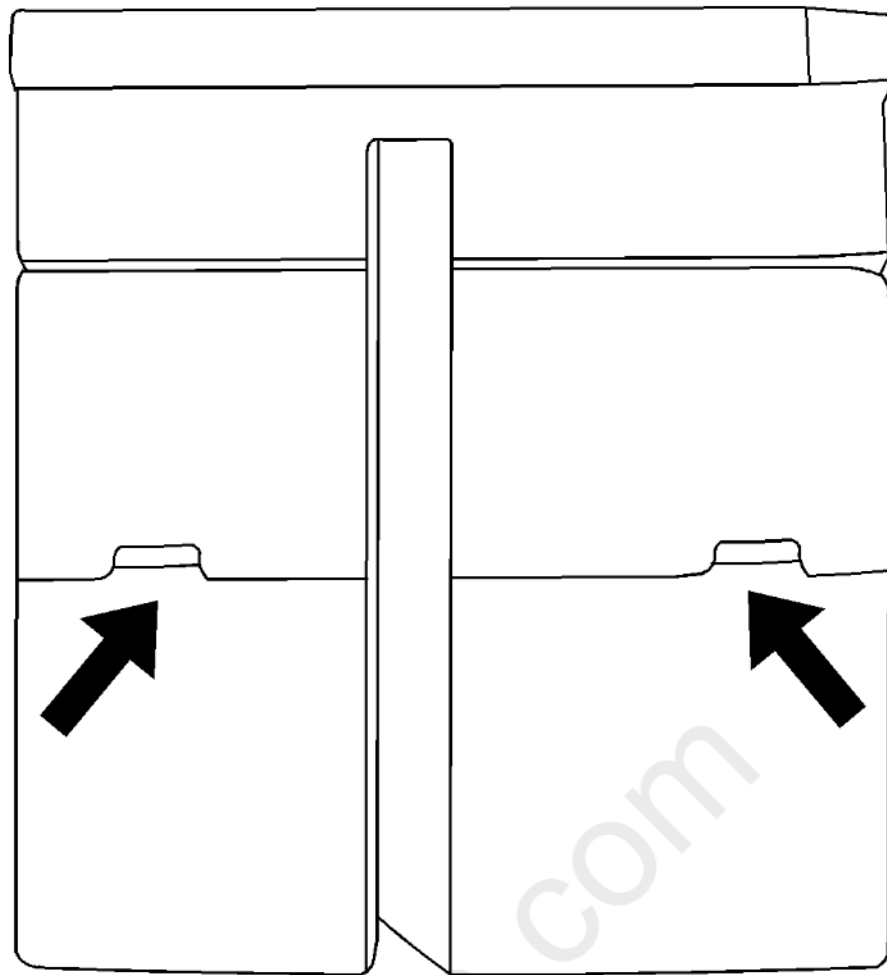


Fig. 94: Identifying TPA On Both Sides Of Connector

Courtesy of GENERAL MOTORS COMPANY

2. Unlock the terminal position assurance (TPA):
 - Position connector as shown (above) and locate TPA staging cavities.

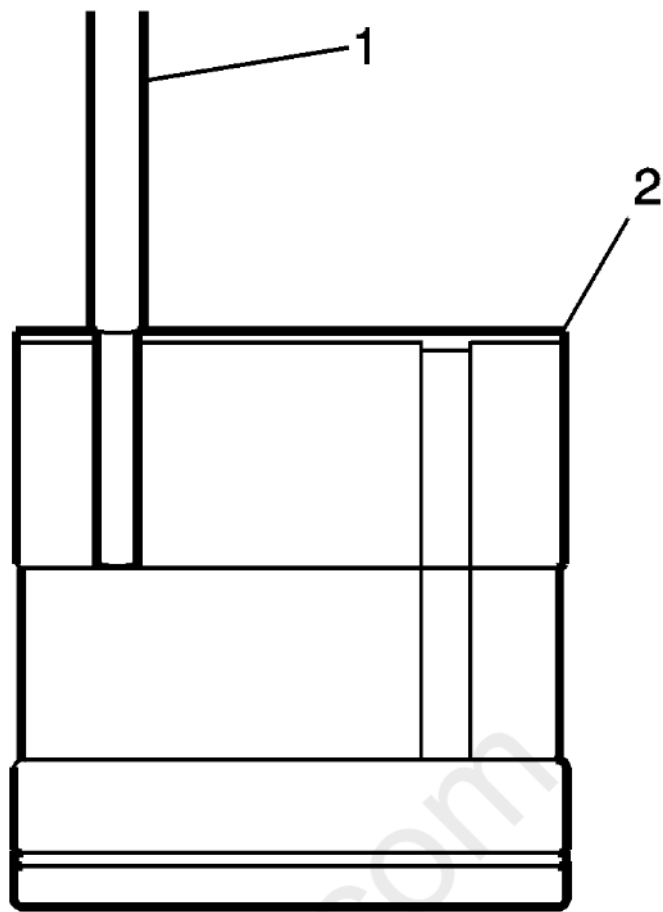


Fig. 95: Terminal Release Tool

Courtesy of GENERAL MOTORS COMPANY

- Using connector terminal release tool J-38125-553 (1) lift the TPA into the staged position. Perform this step on both sides of the TPA.

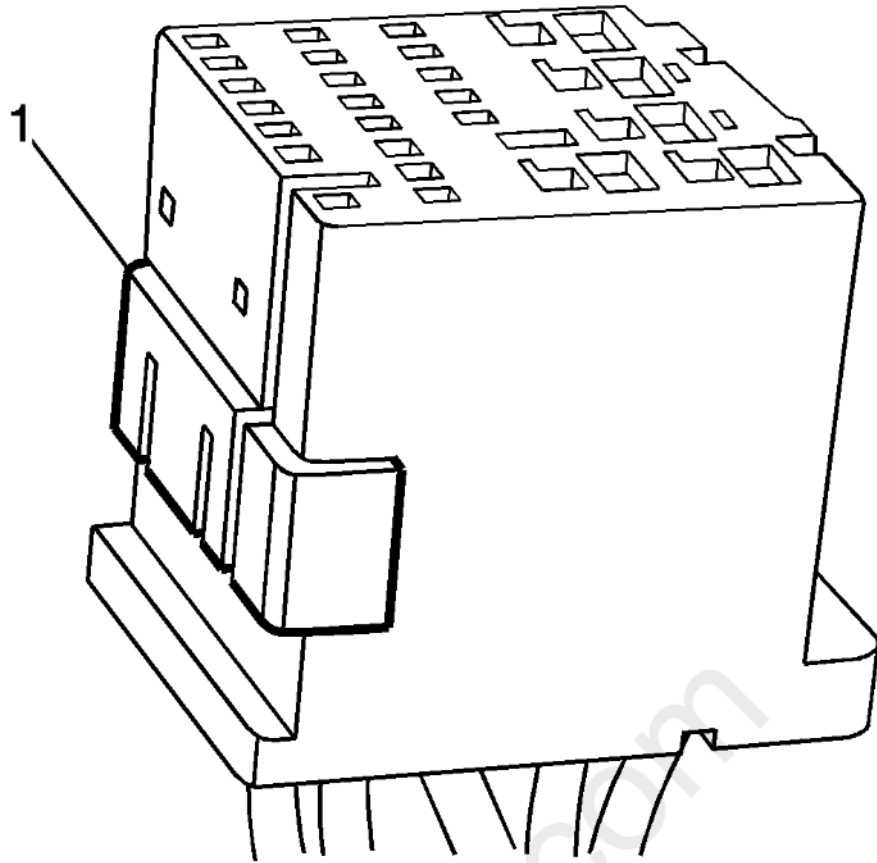


Fig. 96: TPA In Staged Position

Courtesy of GENERAL MOTORS COMPANY

- You will feel the TPA click into place when fully extended into the staged position. The figure above shows the TPA (1) in the staged position.

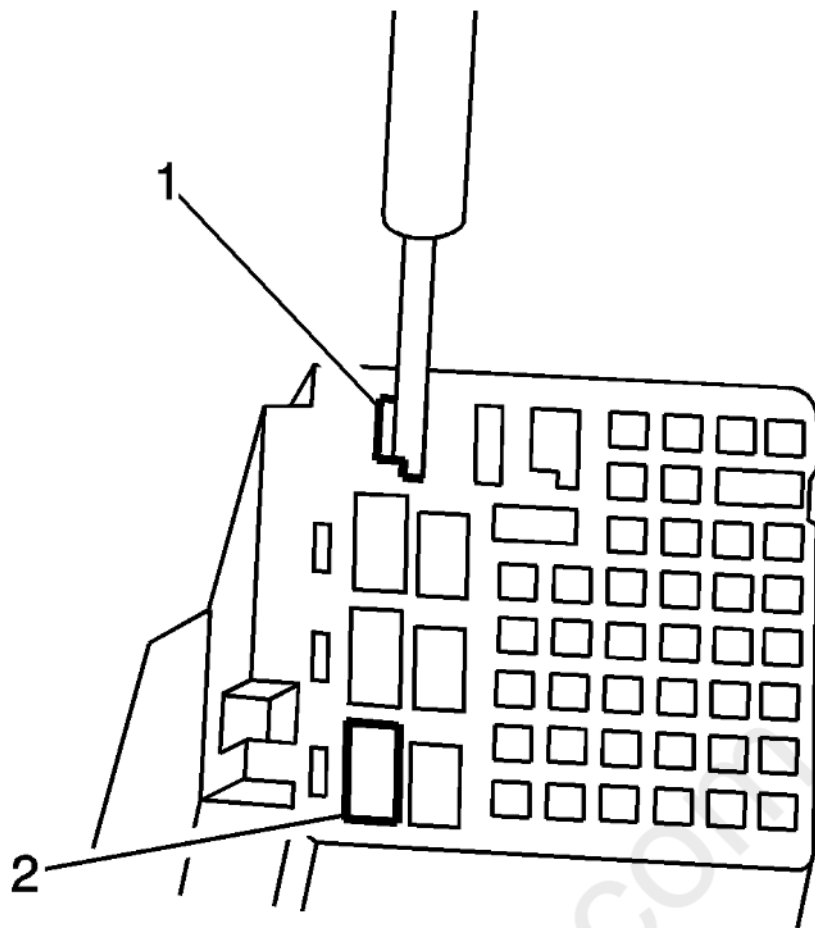


Fig. 97: Connector Terminal Release Tool
Courtesy of GENERAL MOTORS COMPANY

3. Release the terminal from the connector:

- Position the connector as shown (above) and locate the terminal release entry canal (1) of the suspect terminal.
- Insert the connector terminal release tool J-38125-553 into the entry canal with the angled side of the tool facing the connector wall containing cavity 4 (2).

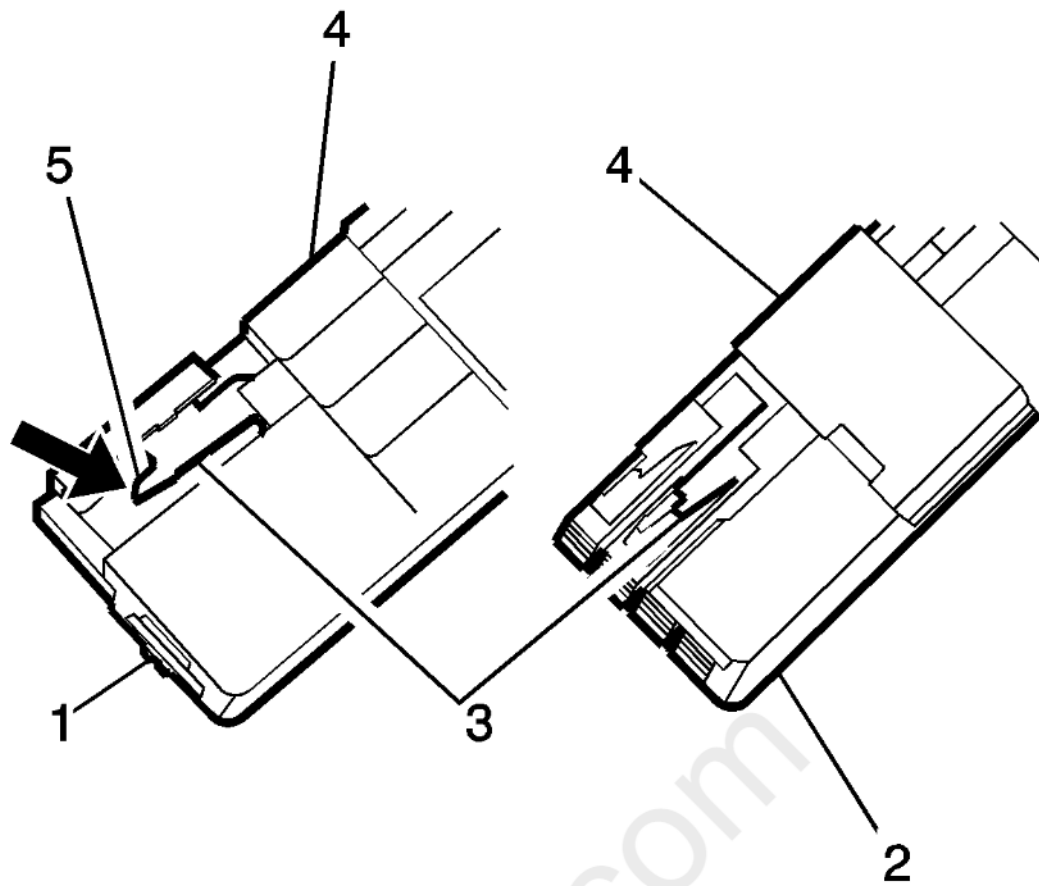


Fig. 98: Connector Lance And TPA

Courtesy of GENERAL MOTORS COMPANY

- The cavity on the left (1) is a 2.8 mm² cavity and the cavity on the right (2) is a 0.64 mm² cavity.
 - Place the tip of the connector terminal release tool onto the connector lance (3) and deflect the lance to the right (5) to release the lock. Hold this released position.
 - Holding the lance in the released position, slightly pull on the suspect terminal to remove it from the connector housing. The side TPA (4) is a secondary lock.
4. Repair the terminal by following the [Repairing Connector Terminals \(Terminated Lead Repair\)](#) procedure.
 5. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

KOSTAL CONNECTORS (GLOW PLUG CONTROL MODULE)

Special Tools

- EL-38125-550 Terminal Release Tool Kit
- EL-38125-580 Terminal Release Tool Kit
- J-38125-24 Terminal Release Tool
- J-38125-560 Terminal Release Tool

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

Terminal Removal Procedure

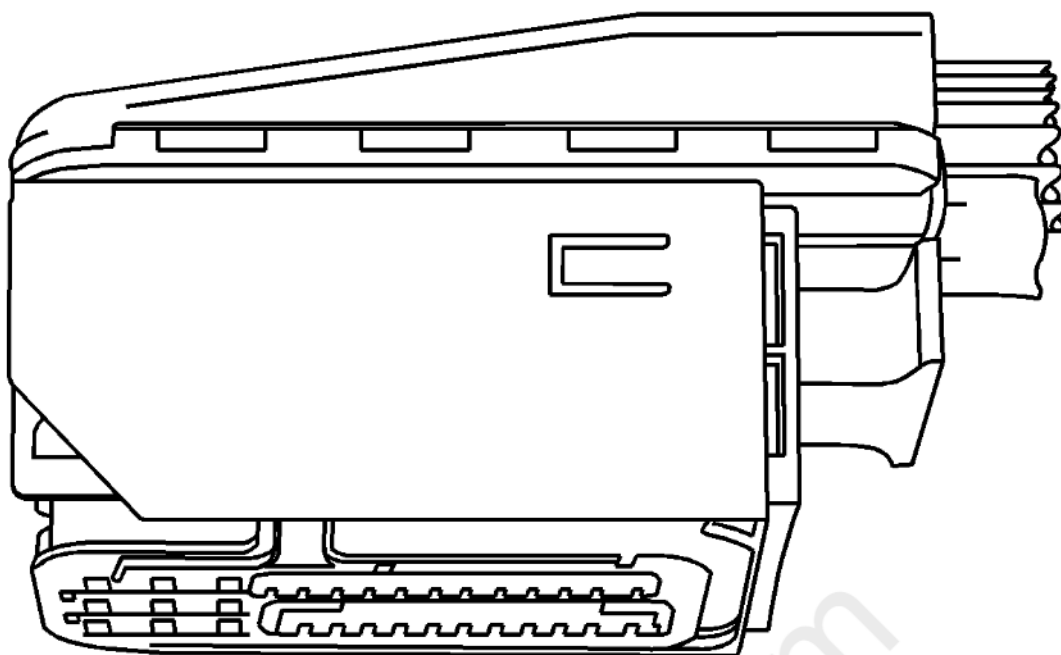


Fig. 99: View Of Typical Kostal Connector

Courtesy of GENERAL MOTORS COMPANY

View of typical connector.

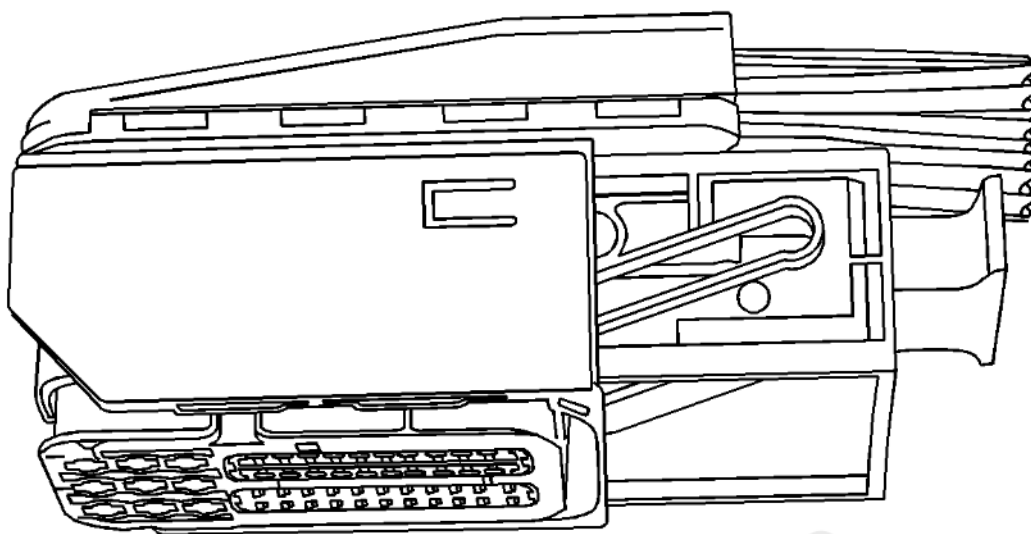


Fig. 100: View Of Connector In Released Position

Courtesy of GENERAL MOTORS COMPANY

View of connector in released position.

1. Locate the assist lever at the back of the connector. Move the assist lever to the rear position.
2. Disconnect the connector from the component.

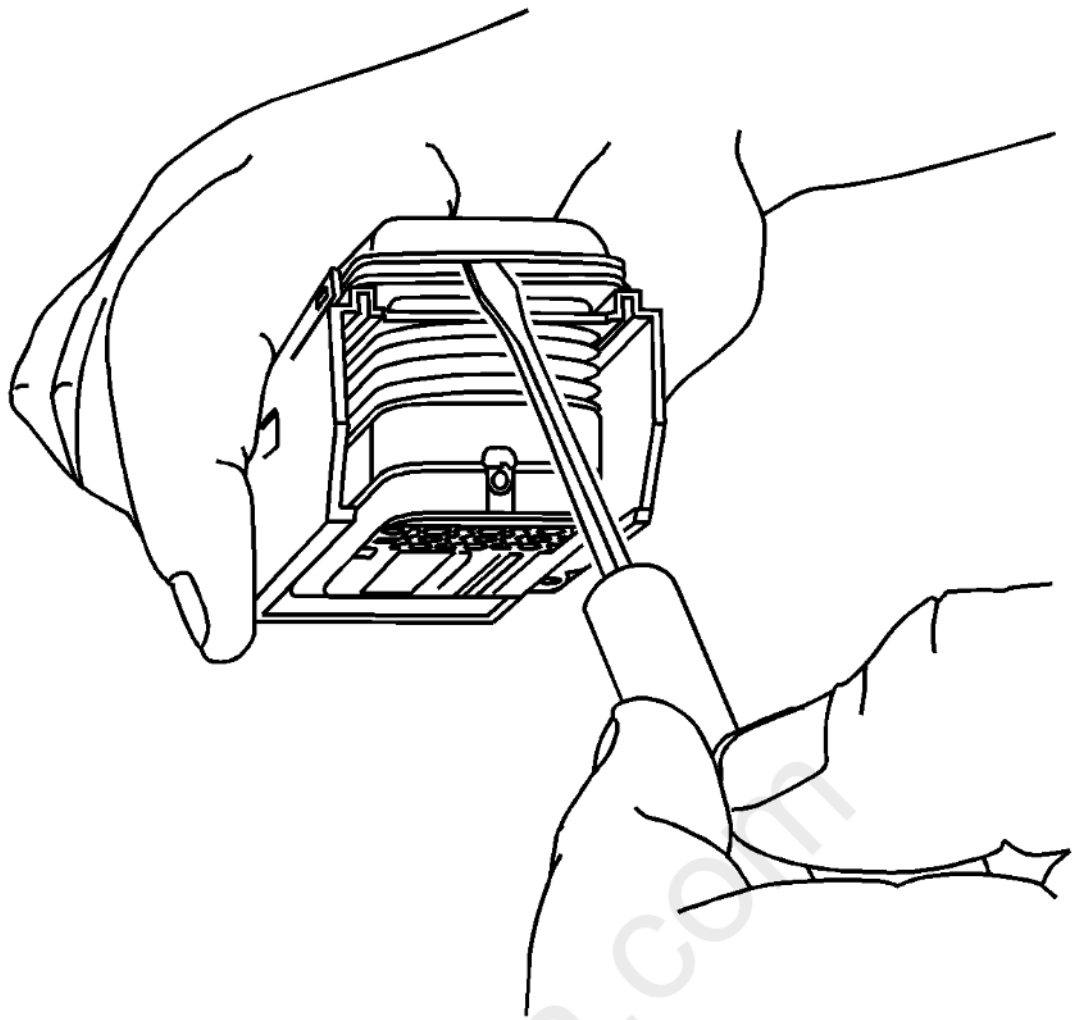


Fig. 101: Using Small Flat-Blade Tool To Remove Dress Cover
Courtesy of GENERAL MOTORS COMPANY

3. Use a small flat-blade tool to remove the dress cover.

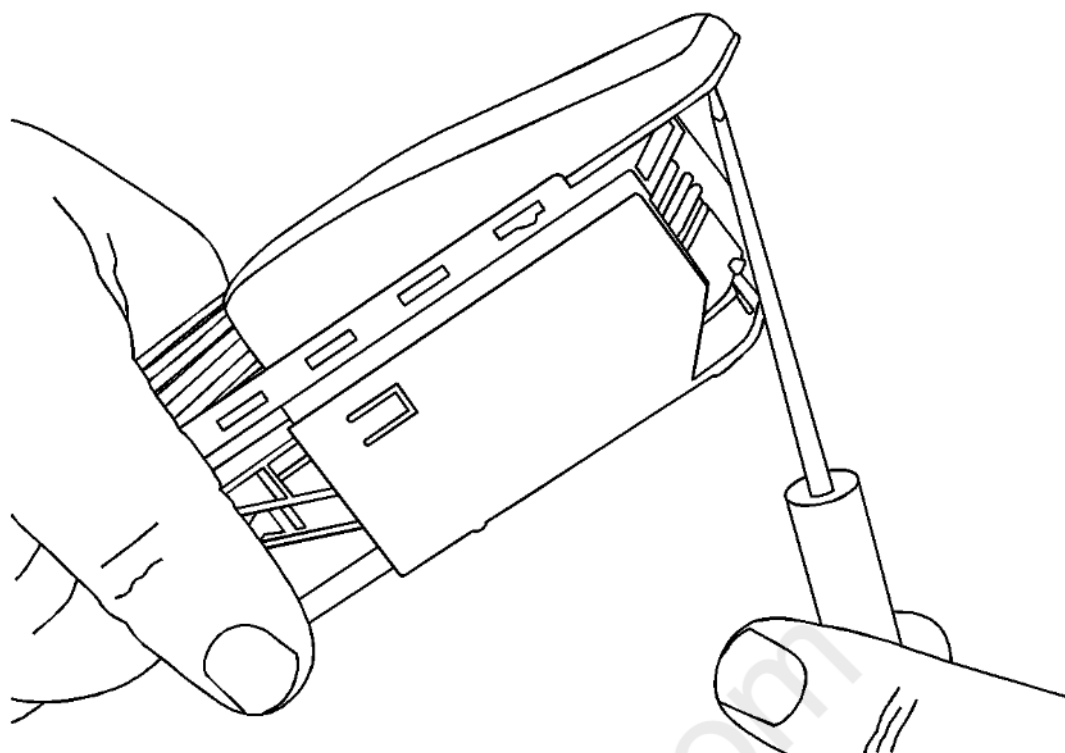


Fig. 102: Sliding Dress Cover Forward & Off Of Kostal Connector (Glow Plug Control Module)

Courtesy of GENERAL MOTORS COMPANY

4. Slide the dress cover forward and off of the connector.

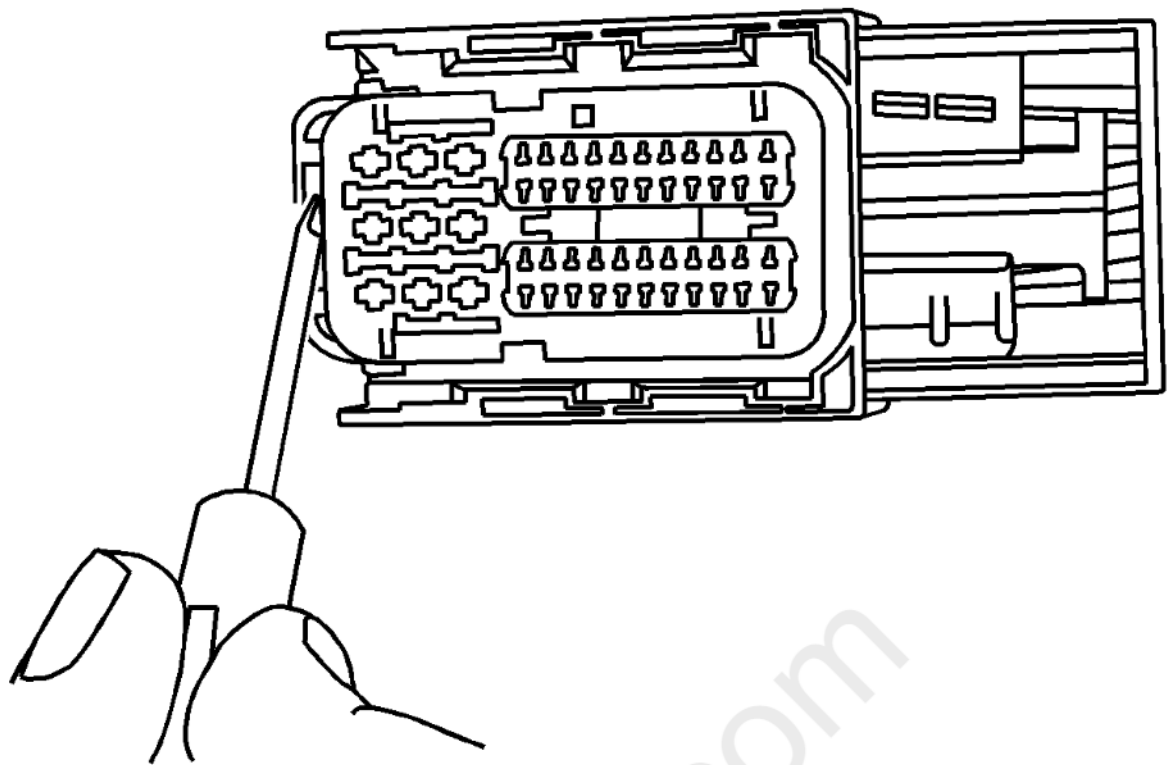


Fig. 103: Locating TPA In Front & Rear Of Connector

Courtesy of GENERAL MOTORS COMPANY

5. The terminal positive assurance (TPA) is located in the front and rear of the connector.

NOTE: The front TPA cannot be removed from the connector. Only move it to the preset position.

6. Use a small flat-blade tool to move the front TPA to the preset position, outboard approximately 0.125 in. (3 mm).

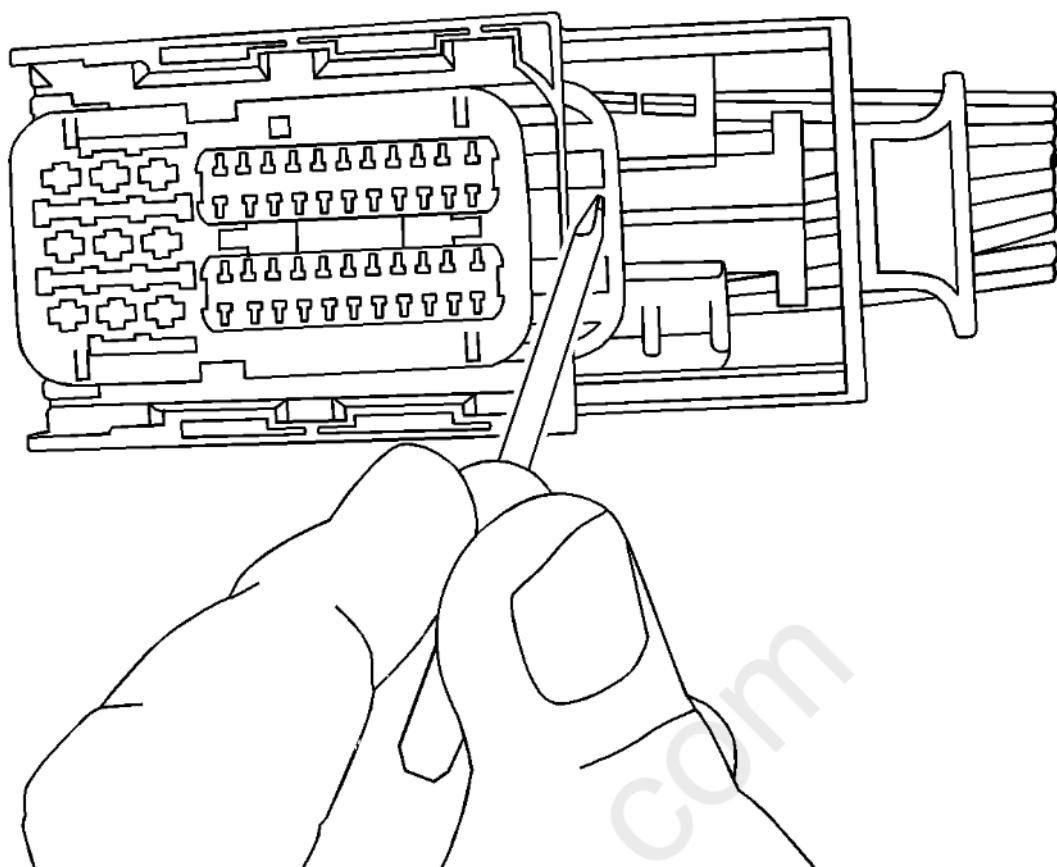


Fig. 104: Using Small Flat-Blade Tool To Remove Rear TPA

Courtesy of GENERAL MOTORS COMPANY

7. Use a small flat-blade tool to completely remove the rear TPA from the connector.

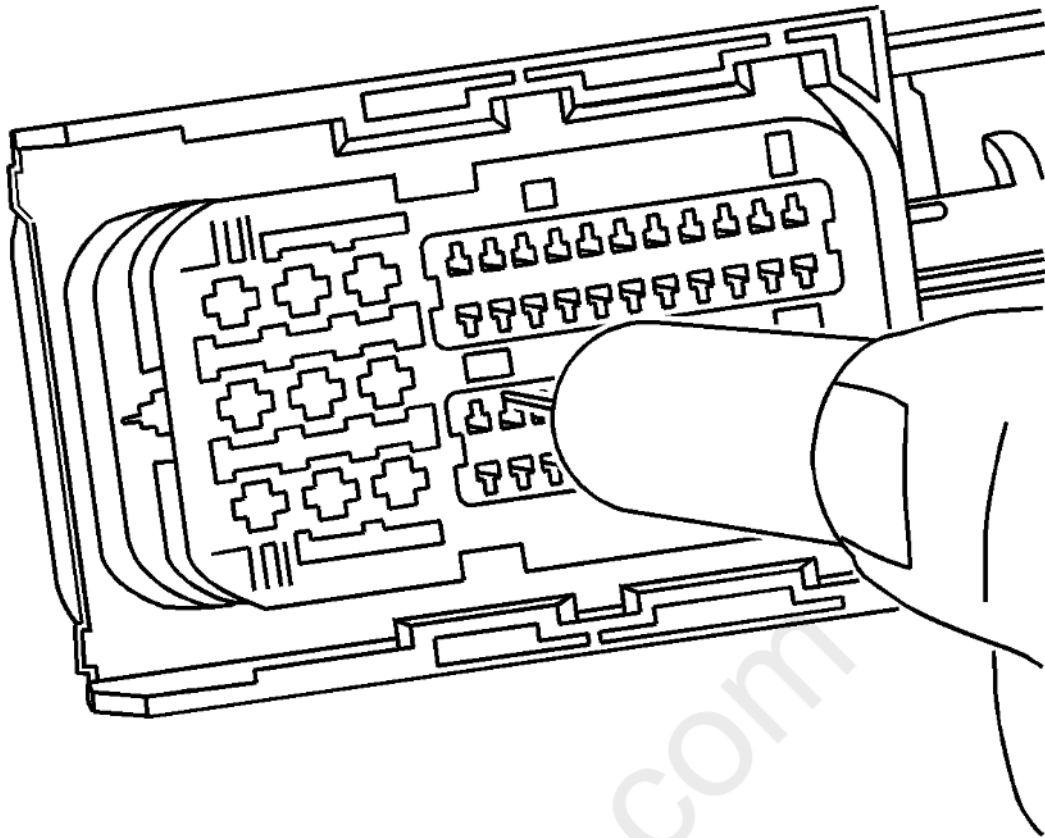


Fig. 105: Using Special Tool To Release Terminals

Courtesy of GENERAL MOTORS COMPANY

8. Use the J-38125-24 or the J-38125-560 tool to release the terminals by inserting the tool into the terminal release cavity.
9. While holding the removal tool in place, gently pull the wire out of the back of the connector. Always remember never use force when pulling a terminal out of a connector.
10. Repair the terminal by following the [Repairing Connector Terminals \(Terminated Lead Repair\)](#)[Repairing Connector Terminals \(Terminal Repair\)](#) procedure.

KOSTAL CONNECTORS (TRANSMISSION)

Special Tools

- **EL-38125-550** Terminal Release Tool Kit
- **EL-38125-580** Terminal Release Tool Kit
- **J-38125-28** Terminal Release Tool

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

Terminal Removal Procedure

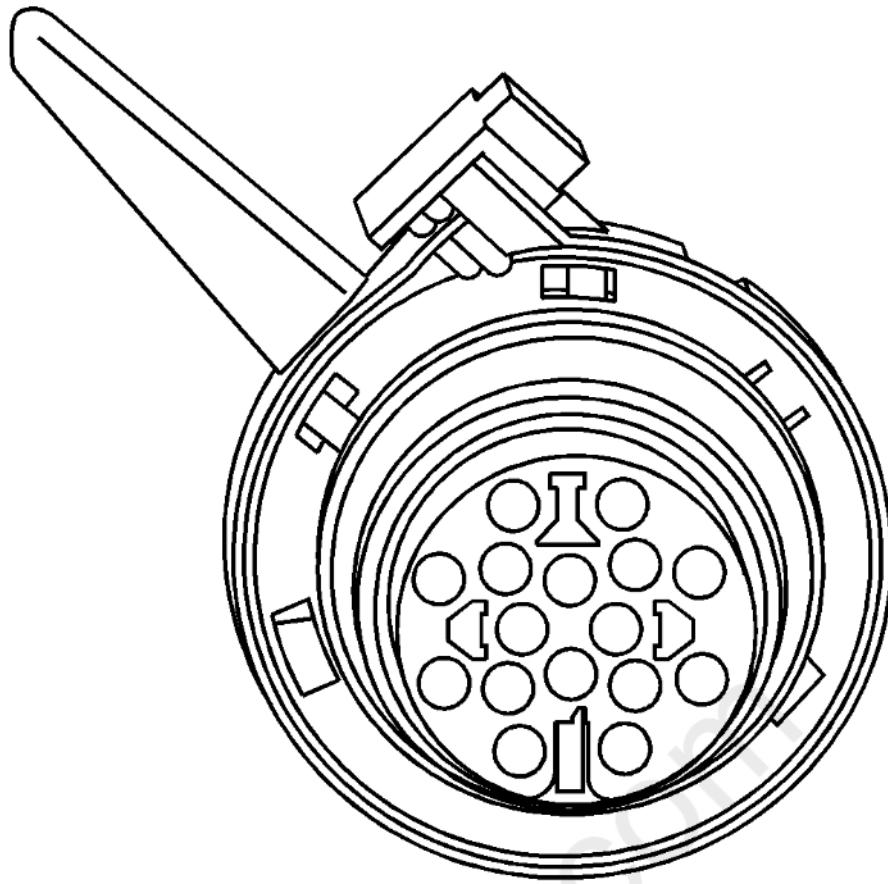


Fig. 106: View Of Connector & Lock

Courtesy of GENERAL MOTORS COMPANY

1. While depressing the lock, twist and remove the connector from the component.

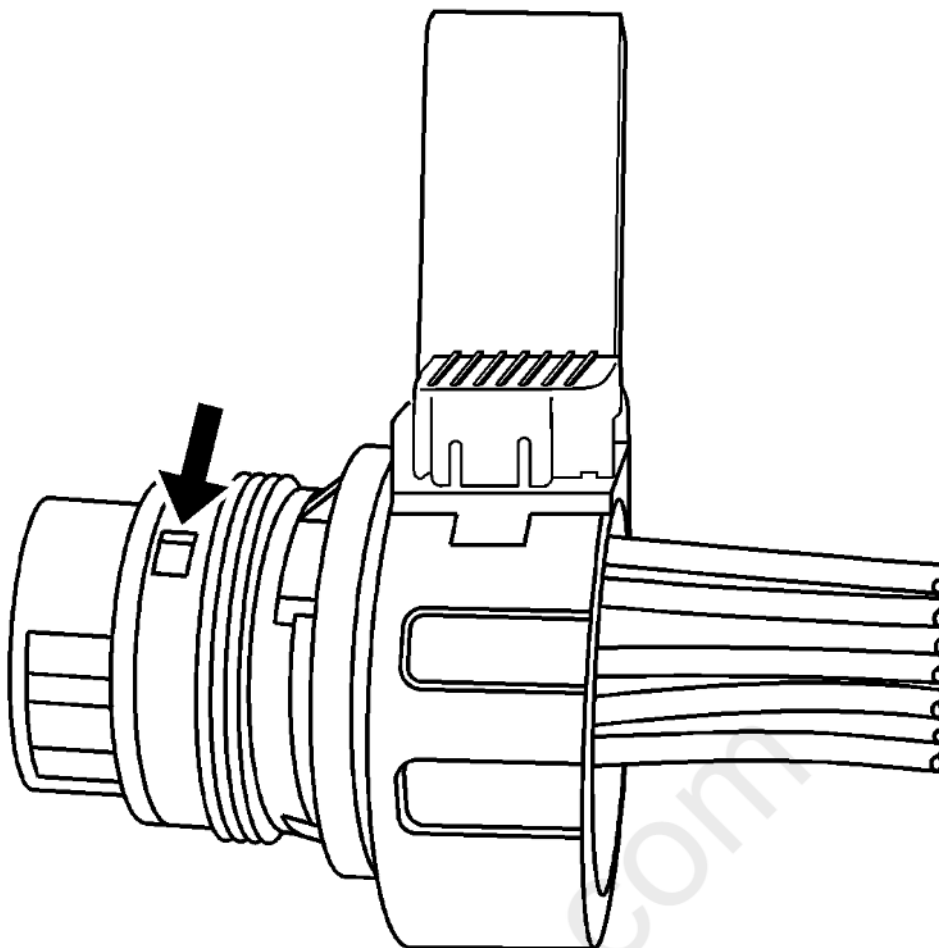


Fig. 107: View Of Terminal Position Assurance (TPA)

Courtesy of GENERAL MOTORS COMPANY

2. Locate the terminal position assurance (TPA).

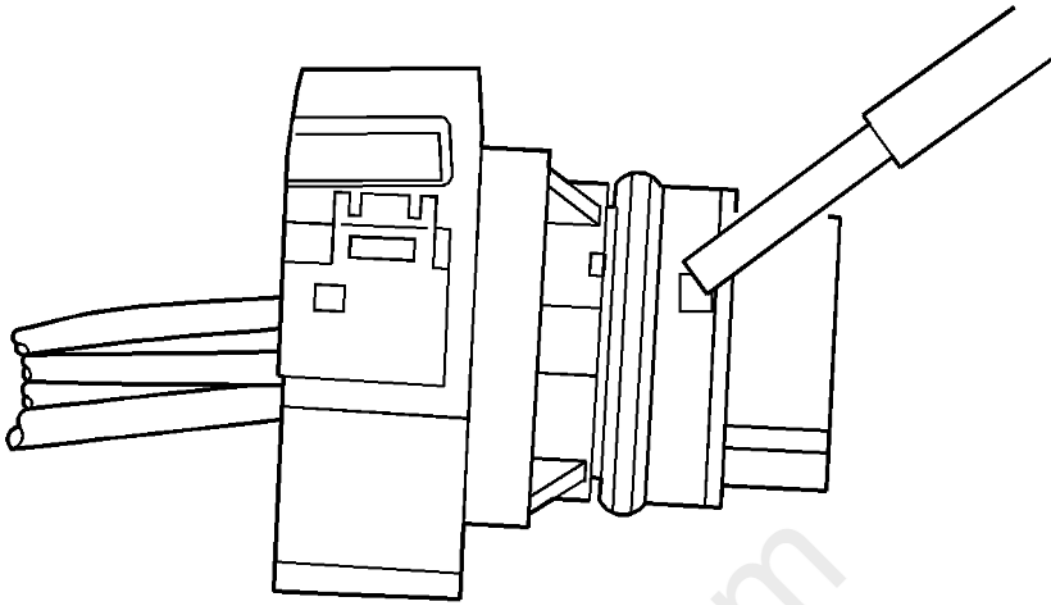


Fig. 108: View Of TPA & Flat-Bladed Tool
Courtesy of GENERAL MOTORS COMPANY

NOTE: The TPA cannot be removed from the connector while there are terminals present in the connector body.

3. Use a small flat-blade tool to push the TPA until it bottoms out.

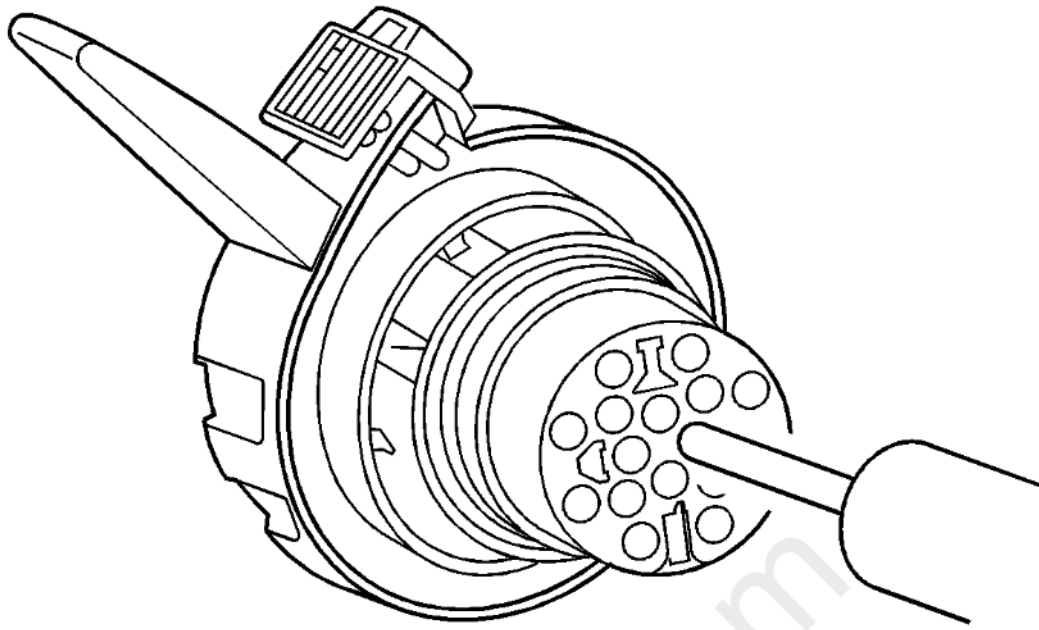


Fig. 109: Using J 38125-28 Tool To Release Terminals

Courtesy of GENERAL MOTORS COMPANY

4. Use the J-38125-28 tool to release the terminals by inserting the tool into the terminal cavity as shown in the graphic.
5. While holding the removal tool in place, gently pull the wire out of the back of the connector. Always remember never use force when pulling a terminal out of a connector.
6. Repair the terminal by following the **Repairing Connector Terminals (Terminated Lead Repair)** procedure.

Terminal Insertion Procedure

After the terminal is replaced, perform the following procedure in order to insert the terminal.

1. Slide the new terminal into the correct cavity at the back of the connector.
2. Push the terminal into the connector until it locks into place. The new terminal should be even with the other terminals. Ensure that the terminal is locked in place by gently pulling on the wire.

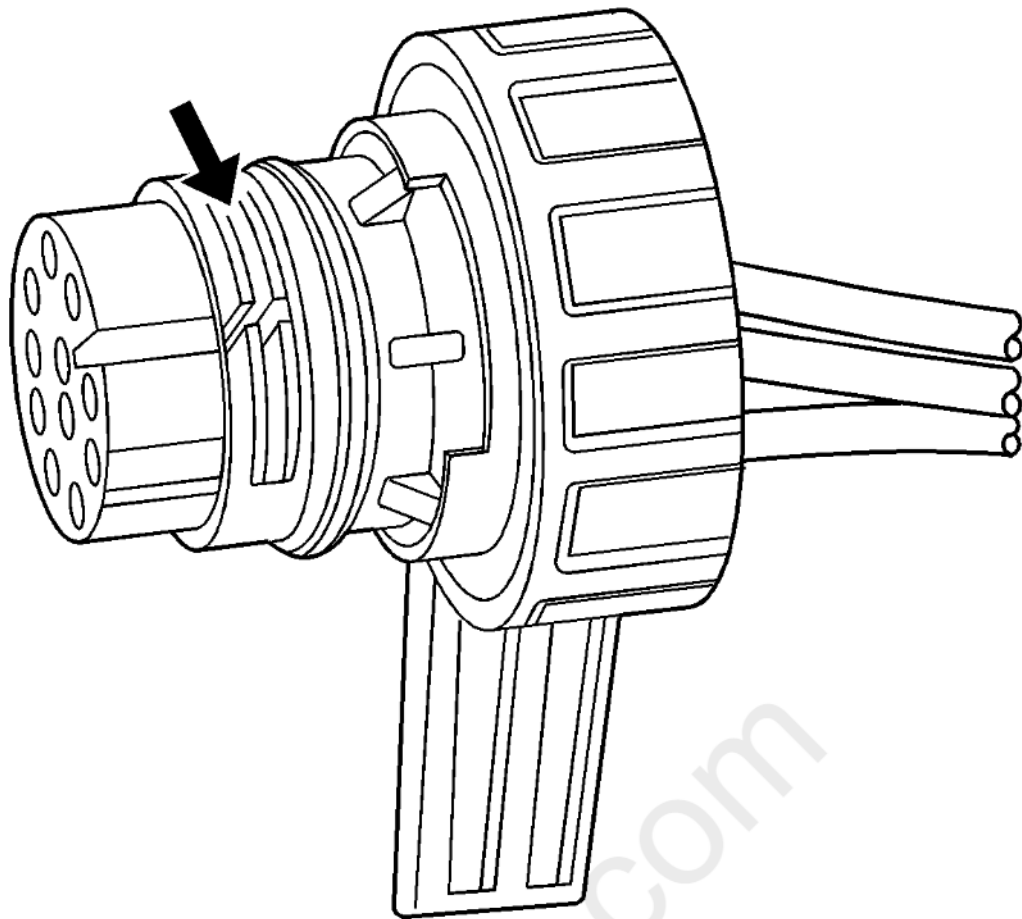


Fig. 110: Locating Terminal Position Assurance (TPA)
Courtesy of GENERAL MOTORS COMPANY

3. Locate the TPA.

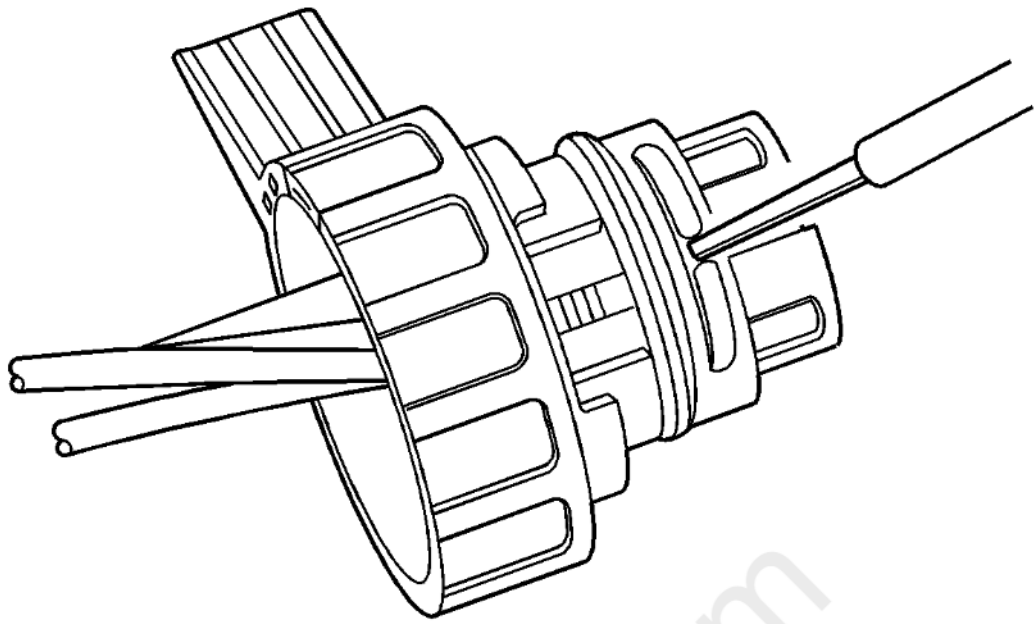


Fig. 111: View Of TPA & Flat-Bladed Tool
Courtesy of GENERAL MOTORS COMPANY

4. Use a small flat-blade tool to push the TPA until it bottoms out.

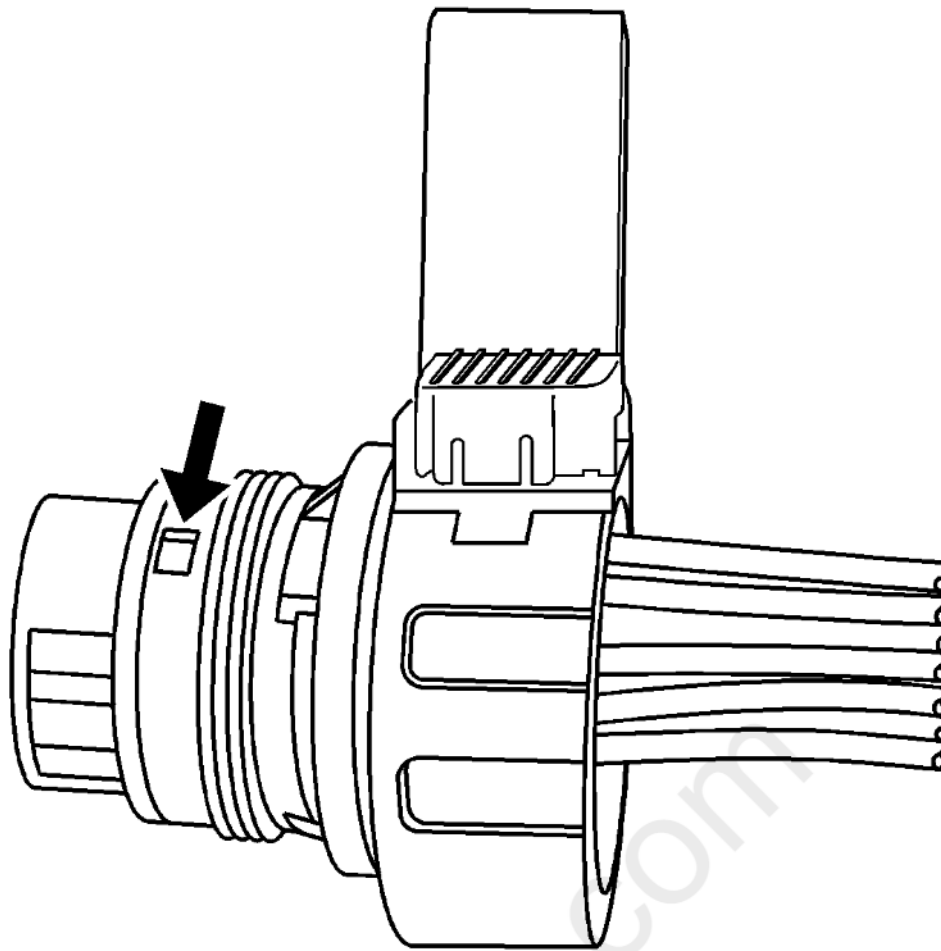


Fig. 112: View Of Terminal Position Assurance (TPA)

Courtesy of GENERAL MOTORS COMPANY

5. Ensure the TPA is fully seated. The TPA should be centered and flush with the connector body when viewed.

MOLEX CONNECTORS (LEVER LOCK)

Special Tools

- **EL-38125-550** Terminal Release Tool Kit
- **EL-38125-580** Terminal Release Tool Kit
- **J-38125-213** Terminal Release Tool

For equivalent regional tools, refer to **Special Tools** .

Terminal Removal Procedure

1. Locate the connector position assurance (CPA) on the top of the wire dress cover. Slide the CPA forward.

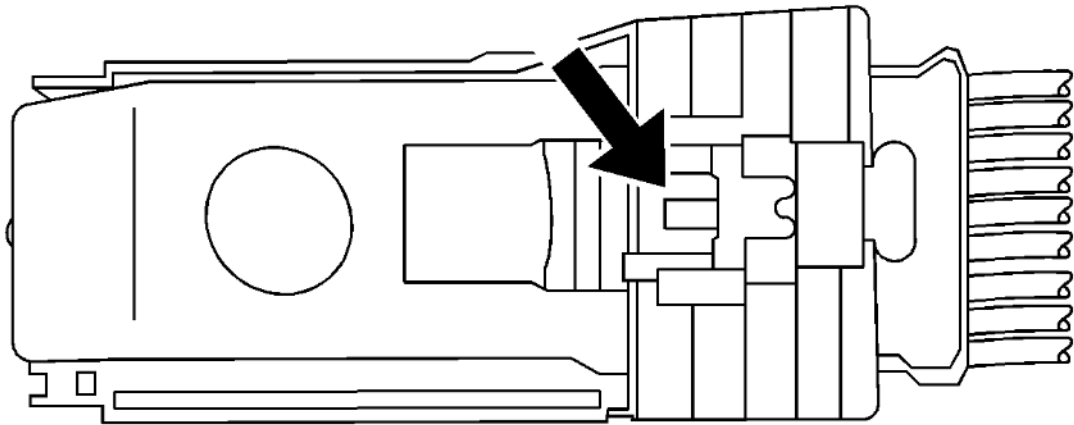


Fig. 113: Identifying Lever Lock Release Tab

Courtesy of GENERAL MOTORS COMPANY

2. Slide the lever lock forward while pressing down on the lever lock release tab.

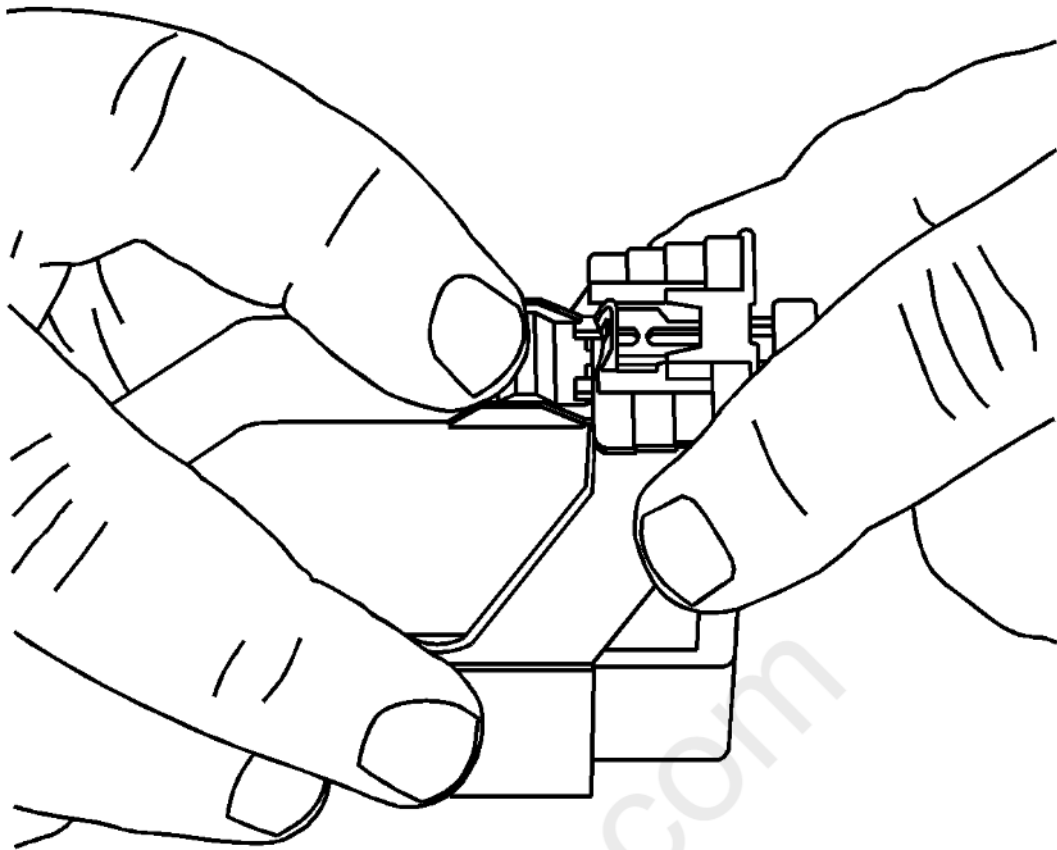


Fig. 114: View Of Lever In Full Forward Position
Courtesy of GENERAL MOTORS COMPANY

3. The lever should be in the full forward position.

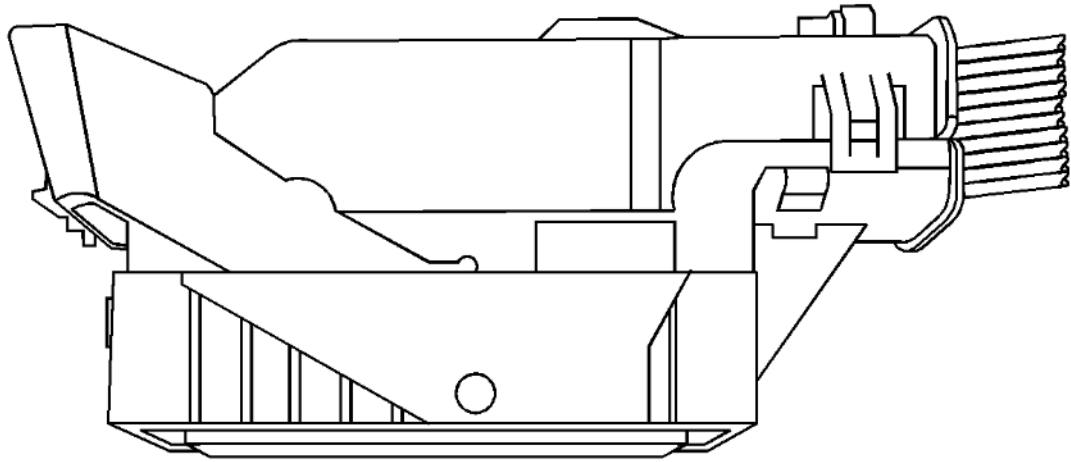


Fig. 115: View Of CPA Connector
Courtesy of GENERAL MOTORS COMPANY

4. Disconnect the connector from the component.

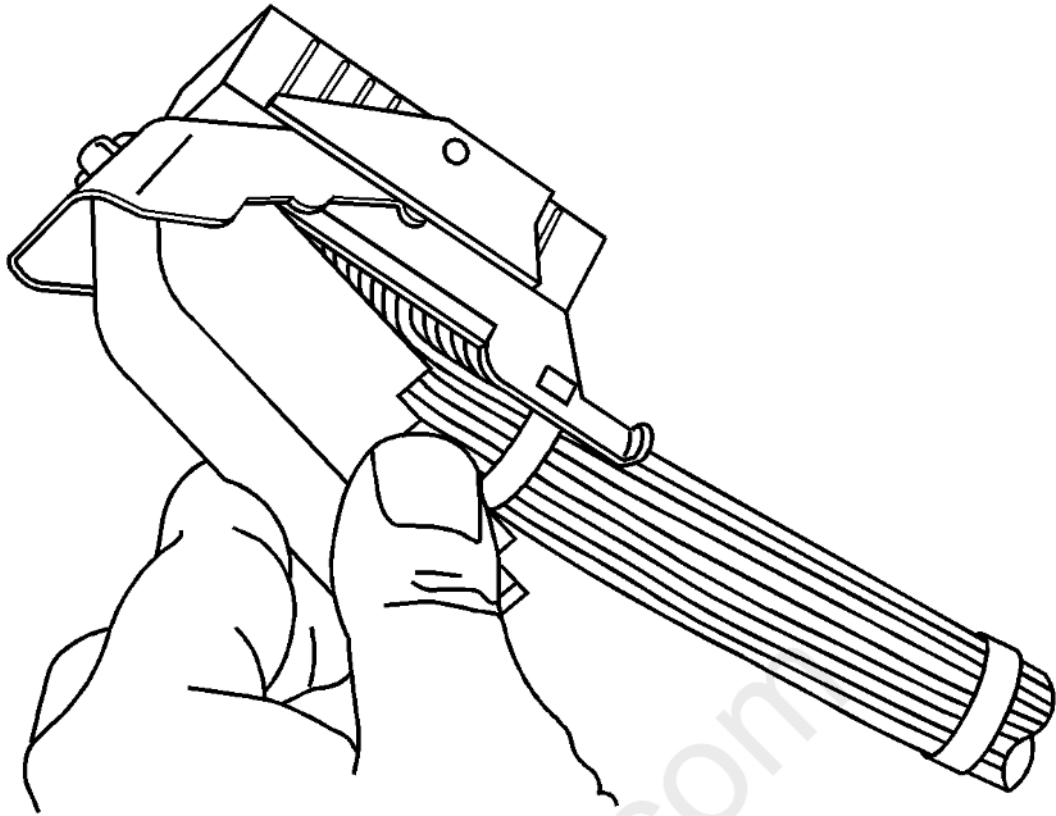


Fig. 116: View Of Dress Cover

Courtesy of GENERAL MOTORS COMPANY

5. Remove the dress cover by using a flat bladed tool to release the dress cover locking tabs and lift up on the dress cover.
6. Cut the tie wrap that holds the wires to the connector body.

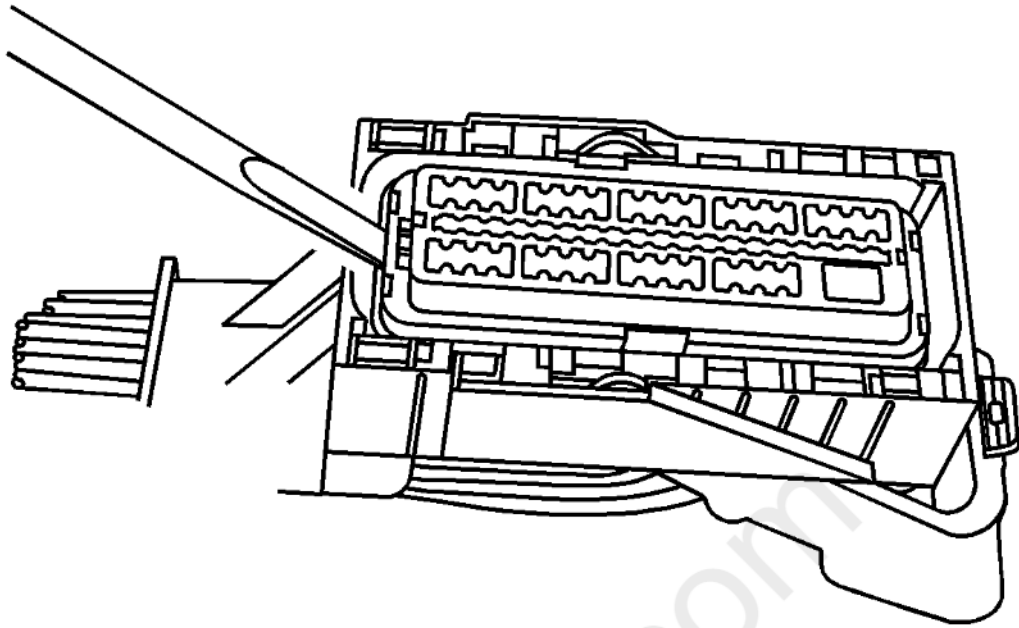


Fig. 117: Prying One Side Of Nose Piece

Courtesy of GENERAL MOTORS COMPANY

7. Use a small flat-blade tool to pry one side of the nose piece up to the pre-stage position. When the nose piece is in the pre-staged position, the nose piece will be raised above the connector body the length of the step in the nose piece.

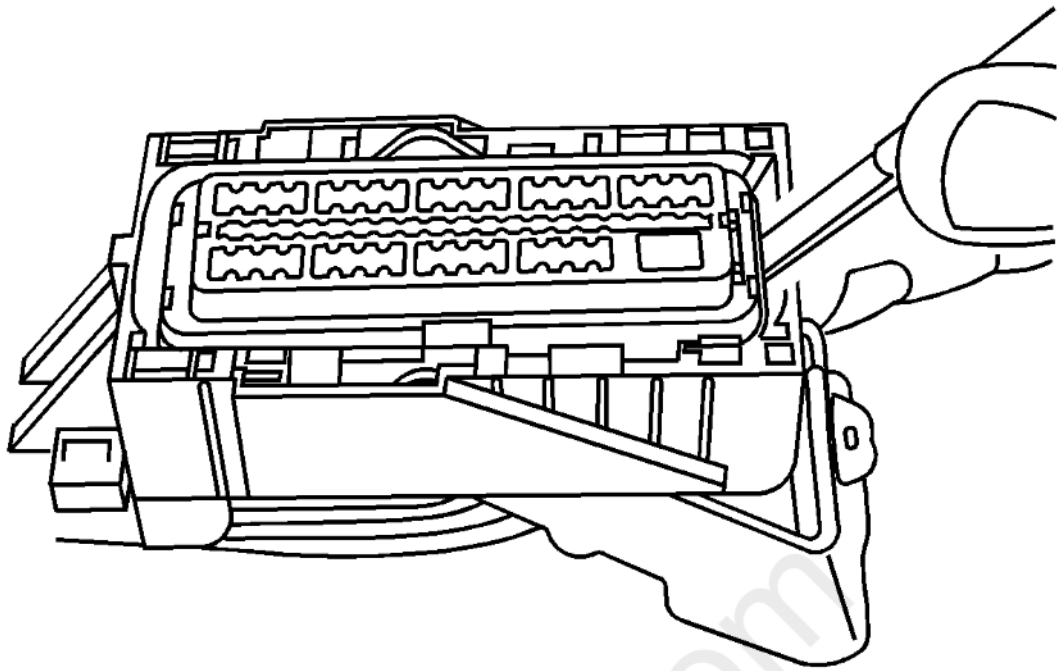


Fig. 118: Prying Side Of Nose Piece

Courtesy of GENERAL MOTORS COMPANY

8. Use a small flat-blade tool to pry the other side of the piece to the pre-stage position. If the nose piece is higher than the first step in the nose piece, gently push down on the nose piece until it meets with resistance from the connector body, you should feel the nose piece click into position.

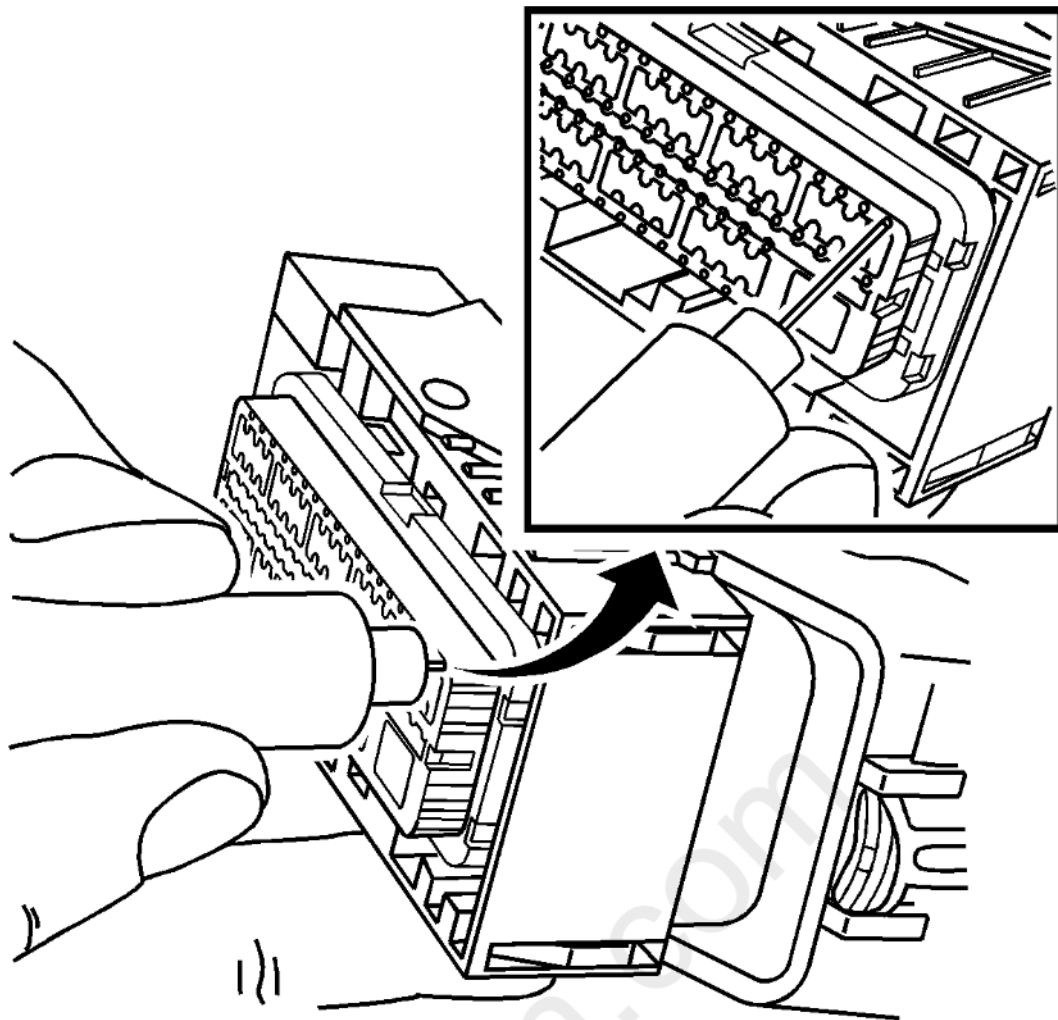


Fig. 119: Releasing Terminal

Courtesy of GENERAL MOTORS COMPANY

9. Insert the J-38125-213 into the small terminal release hole on the nose piece and gently pull on the back of the wire.
10. Repair the terminal by following the **Repairing Connector Terminals (Terminated Lead Repair)** procedure.
11. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

Terminated Lead Repair

1. Remove the terminal.
2. Find the appropriate terminated lead.
3. Use the appropriate splice sleeves depending on the gauge size.
4. Refer to **Wire to Wire Repair**.

Terminal Insertion Procedure

After the terminal is replaced, perform the following procedure in order to insert the terminal.

1. Slide the new terminal into the correct cavity at the back of the connector.
2. Push the terminal into the connector until it locks into place. The new terminal should be even with the other terminals. Insure that the terminal is locked in place by gently pulling on the wire.
3. To assemble the connector, reverse the connector disassembly procedure.

MOLEX CONNECTORS (SIR)

Removal Procedure

NOTE:

The orange or yellow connector position assurance (CPA) must be released first to disconnect or to connect the connector.

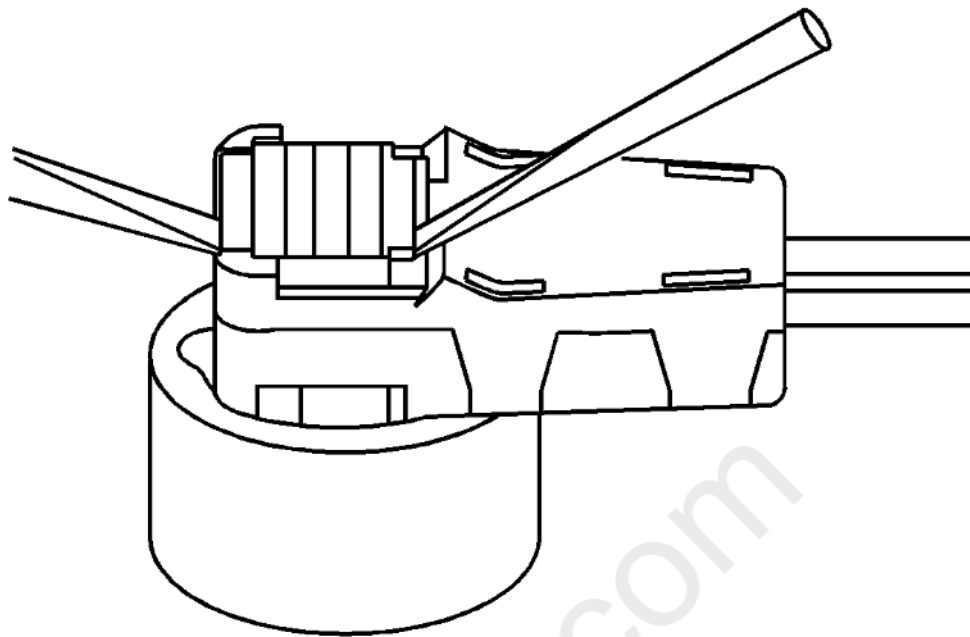


Fig. 120: Lifting Orange CPA

Courtesy of GENERAL MOTORS COMPANY

1. Lift the orange or yellow CPA vertically (avoid lifting on an angle to the connector) approximately 4 mm to release the connector. Use a small flat-bladed tool to help release the CPA. The CPA may also be released manually without any tools.

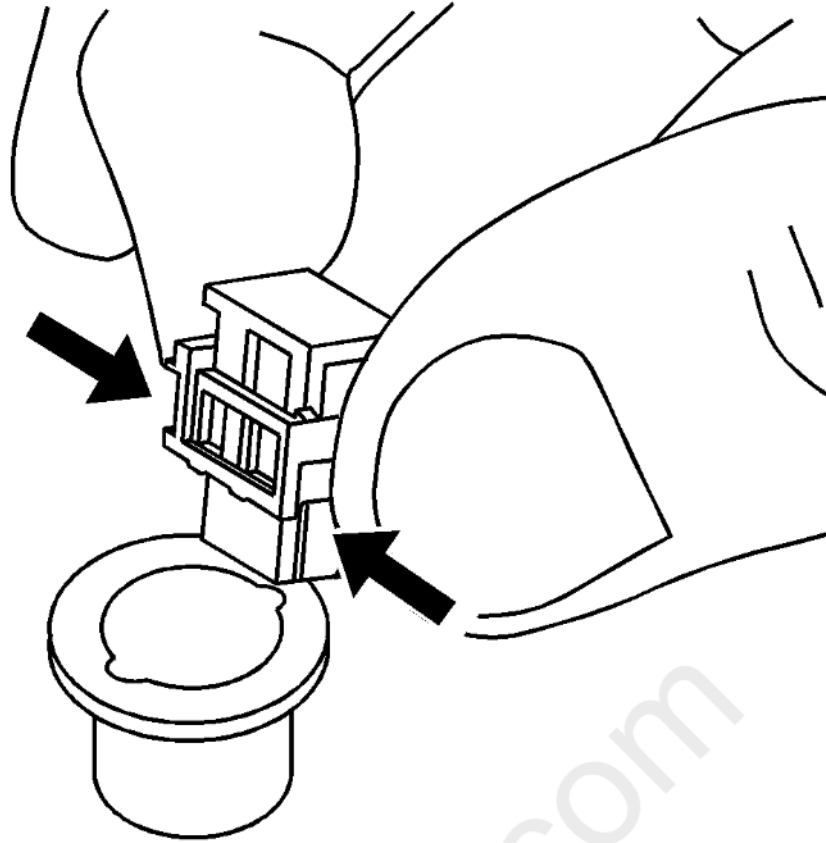


Fig. 121: Grabbing Connector On Both Sides
Courtesy of GENERAL MOTORS COMPANY

2. Grab the connector on both sides and lift vertically to disconnect the connector.

Installation Procedure

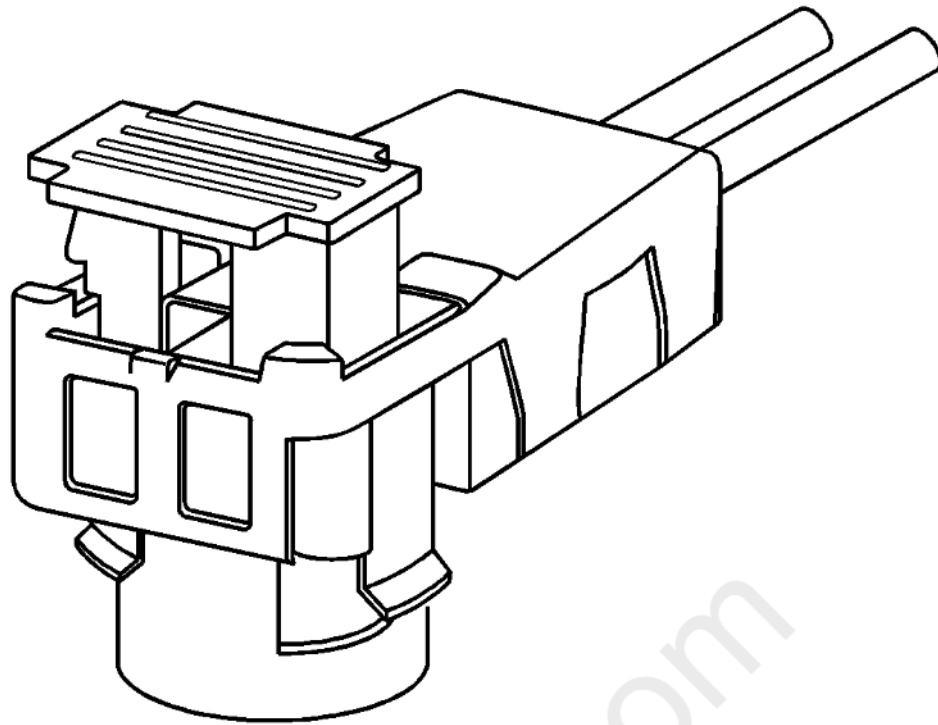


Fig. 122: Lifting Orange CPA

Courtesy of GENERAL MOTORS COMPANY

1. The CPA should be approximately 4 mm above the yellow cover before installing the connector. If not, use a small flat-bladed tool to help release the CPA. The CPA may also be released manually without any tools.

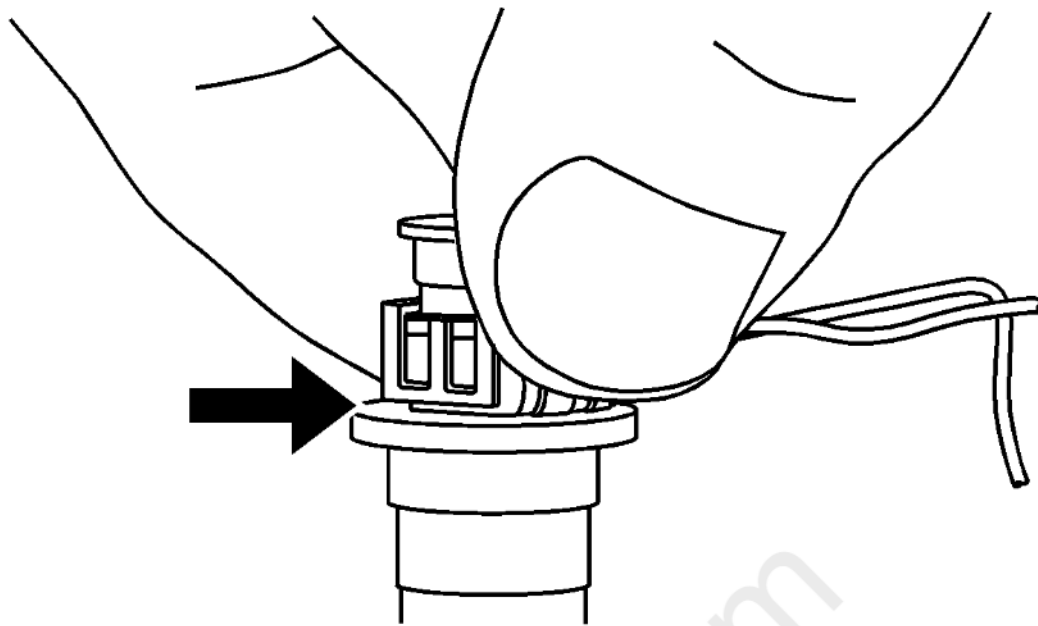


Fig. 123: Seating Connector Sub-Assembly

Courtesy of GENERAL MOTORS COMPANY

2. Line up the connector key tabs with the initiator key slots. Grab the connector on both sides and push down into the initiator connector sub assembly until fully seated.

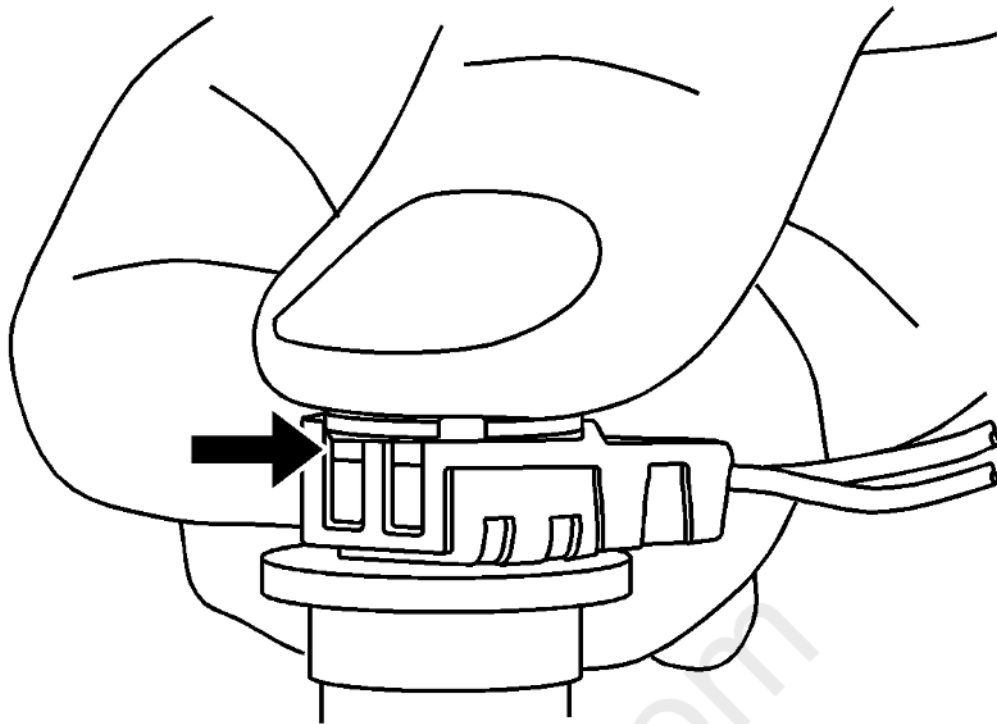


Fig. 124: Pushing CPA Down

Courtesy of GENERAL MOTORS COMPANY

3. After the connector is fully seated, push the CPA down with your thumb until the CPA is touching the yellow cover on the connector.

SUMITOMO CONNECTORS

Special Tools

- EL-38125-550 Terminal Release Tool Kit
- EL-38125-580 Terminal Release Tool Kit
- J-38125-12A Terminal Release Tool
- J-38125-552 Terminal Release Tool
- J-38125-553 Terminal Release Tool

For equivalent regional tools, refer to **Special Tools** .

Terminal Removal Procedure

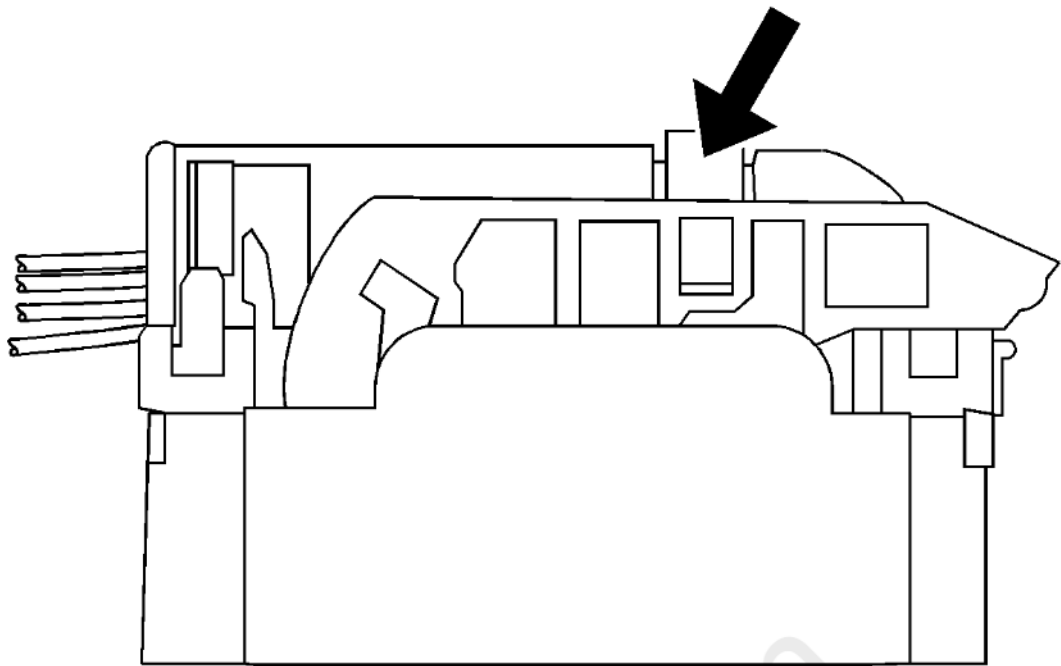


Fig. 125: Identifying Lever Lock
Courtesy of GENERAL MOTORS COMPANY

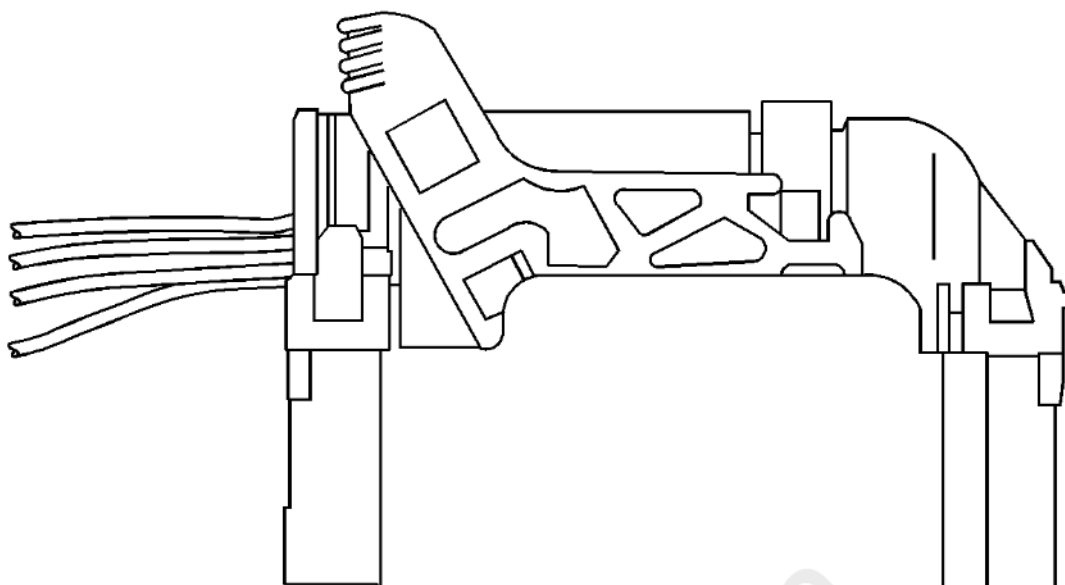


Fig. 126: View Of Lever Lock In Forward Position

Courtesy of GENERAL MOTORS COMPANY

1. Slide the lever lock forward while pressing down on the lever lock release tab.
2. Disconnect the connector from the component.

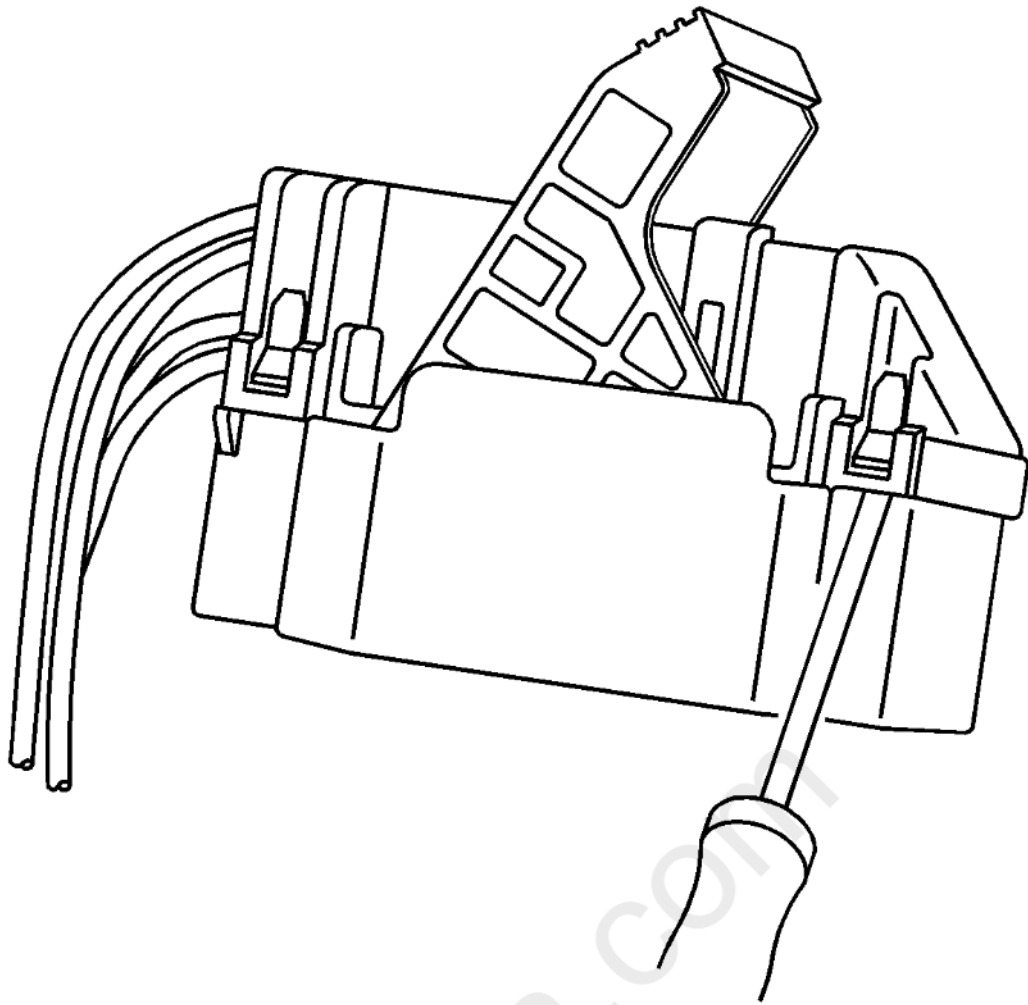


Fig. 127: View Of Connector Locking Tabs

Courtesy of GENERAL MOTORS COMPANY

3. Remove the dress cover by using a flat-blade tool to release the connector locking tabs and pulling off the dress cover.

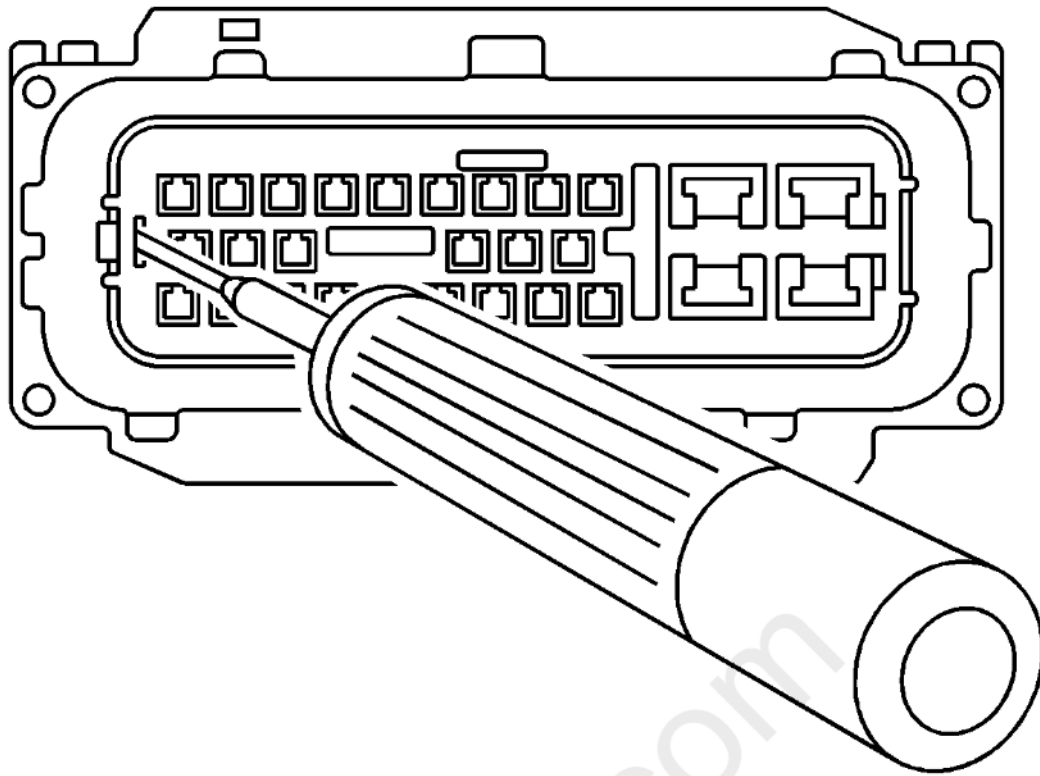


Fig. 128: Identifying Nose Piece Locking Tabs

Courtesy of GENERAL MOTORS COMPANY

4. Relieve the tension on the nose piece retainers by inserting J-38125-12A into the single retainer slot on the end of the nose piece and gently prying out the locking tab. Repeat the process for both of the nose piece locking tabs on the opposite side of the nose piece.

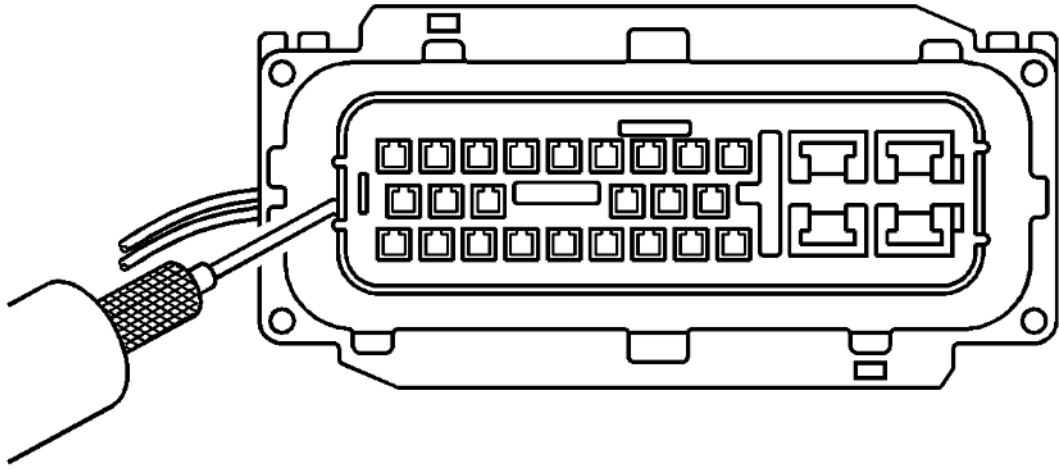


Fig. 129: Pulling Up One End Of Nose Piece (1st Side)

Courtesy of GENERAL MOTORS COMPANY

5. Once the nose piece retainers are relaxed, use the J-38125-552 to pull up the nose piece by hooking the tool under the nose piece and pulling up. The nose piece should raise slightly.

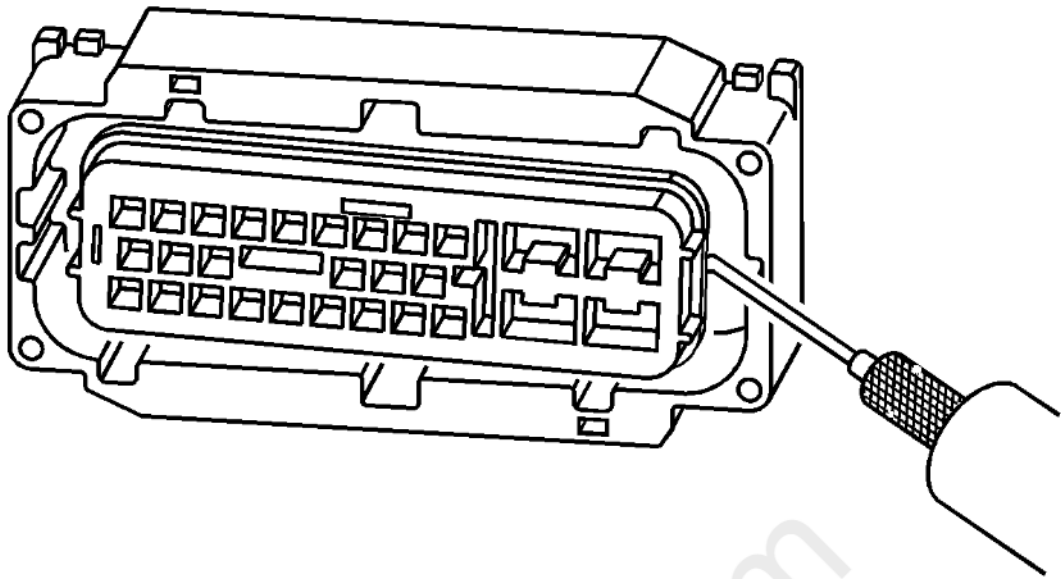


Fig. 130: Pulling Up One End Of Nose Piece (2nd Side)

Courtesy of GENERAL MOTORS COMPANY

6. On the opposite side of the nose piece, use the J-38125-552 pull up the nose piece by hooking the tool under the nose piece and pulling up. The nose piece should release completely. If the nose piece does not come off, repeat the procedure on the opposite side.

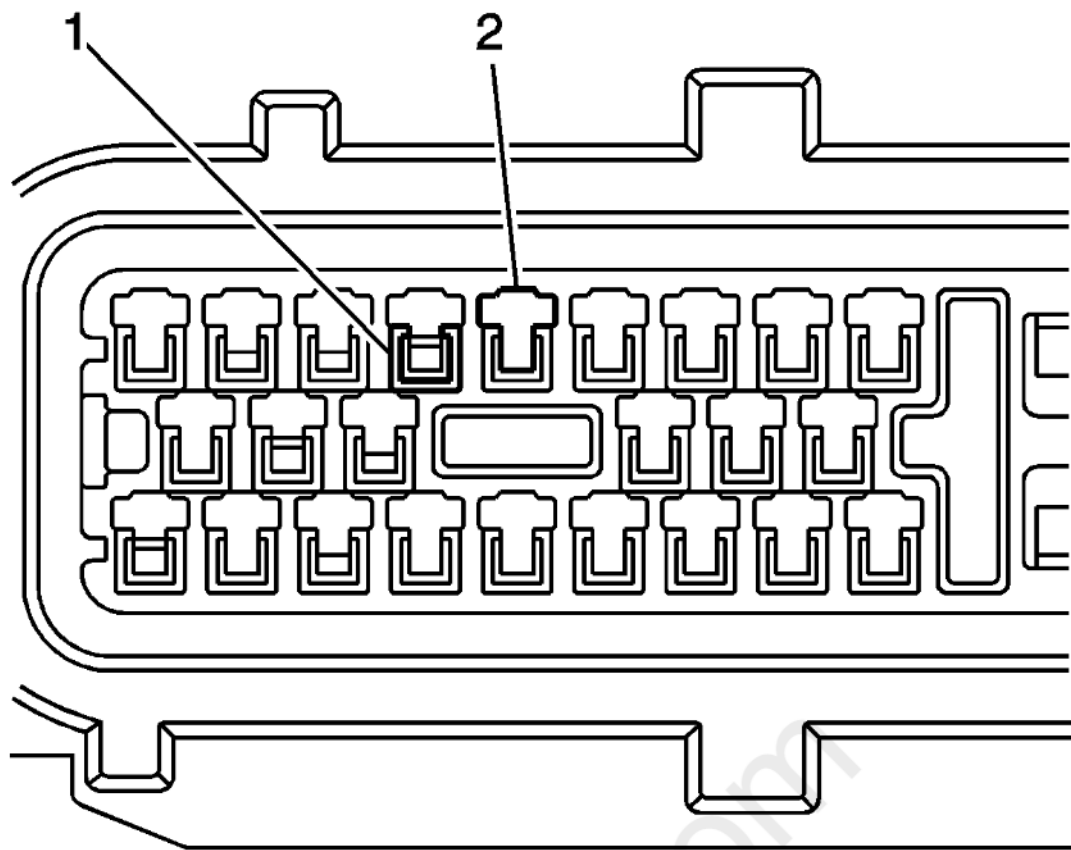


Fig. 131: View Of Terminal & Entry Canal

Courtesy of GENERAL MOTORS COMPANY

7. The illustration above identifies the entry canal where the terminal release tool will be inserted, and the terminal cavity.
- Terminal (1)
 - Entry Canal (2)

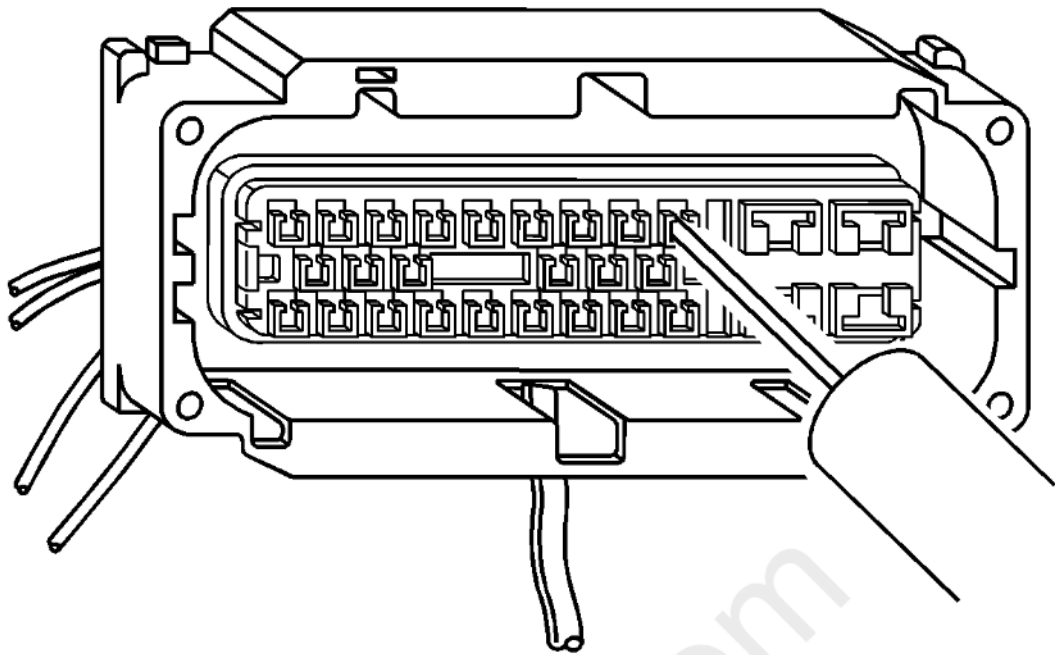


Fig. 132: Inserting J-38125-553 (15315247) Tool Into Entry Canal

Courtesy of GENERAL MOTORS COMPANY

8. Insert the J-38125-553 tool into the entry canal and pry up on the terminal retainer. The terminal retainer is a small plastic piece on the top of the terminal. The terminal retainer must be held up while the terminal is pulled out of the connector.

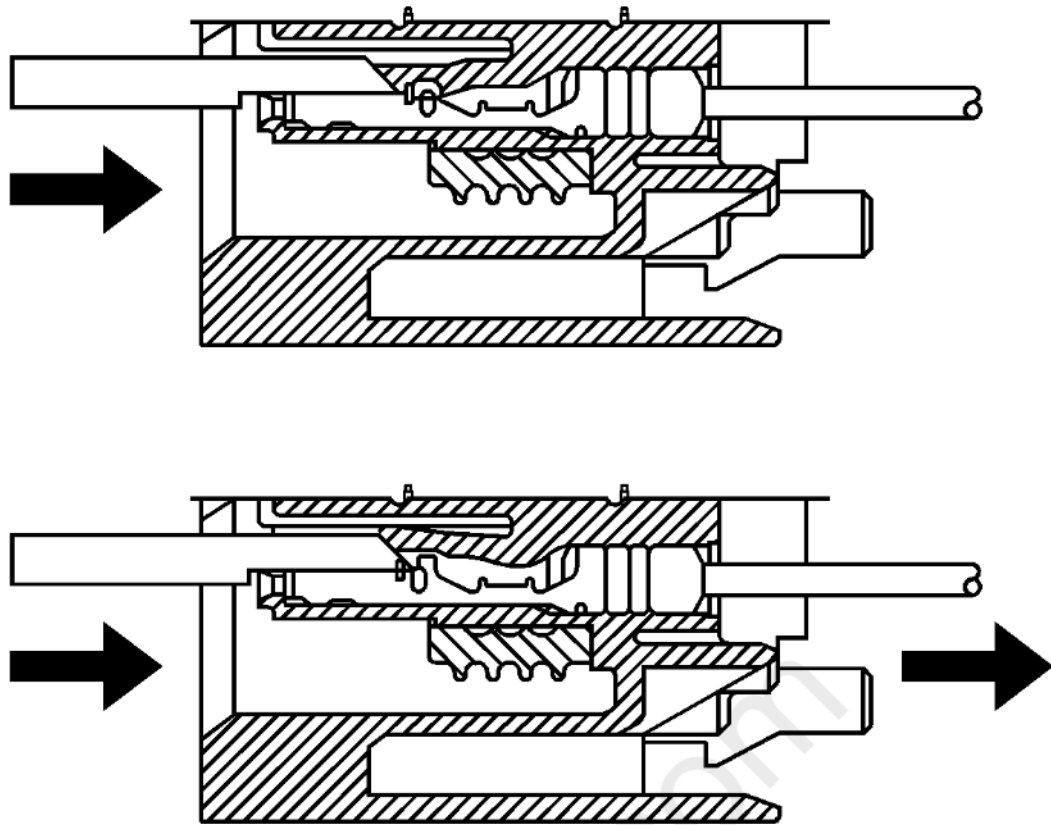


Fig. 133: Cutaway View Of Connector

Courtesy of GENERAL MOTORS COMPANY

9. The illustration shows a cutaway view of the connector to aid the technician in releasing the terminal retainer.
10. Repair the terminal by following the [Repairing Connector Terminals \(Terminated Lead Repair\)](#) procedure.
11. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

Terminal Insertion Procedure

After the terminal is replaced, perform the following procedure in order to insert the terminal.

1. Slide the new terminal into the correct cavity at the back of the connector.
2. Push the terminal into the connector until it locks into place. The new terminal should be even with the other terminals. Ensure that the terminal is locked in place by gently pulling on the wire.
3. To assemble the connector, reverse the connector disassembly procedure.

TYCO/AMP CONNECTORS (CM 42-WAY)

Special Tools

- EL-38125-550 Terminal Release Tool Kit
- EL-38125-580 Terminal Release Tool Kit
- J-38125-12A Terminal Release Tool

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

Terminal Removal Procedure

1. Locate the connector position assurance (CPA) on the connector body and pull the CPA out. The CPA is on the wire harness side of connector.
2. Disconnect the connector from the component.

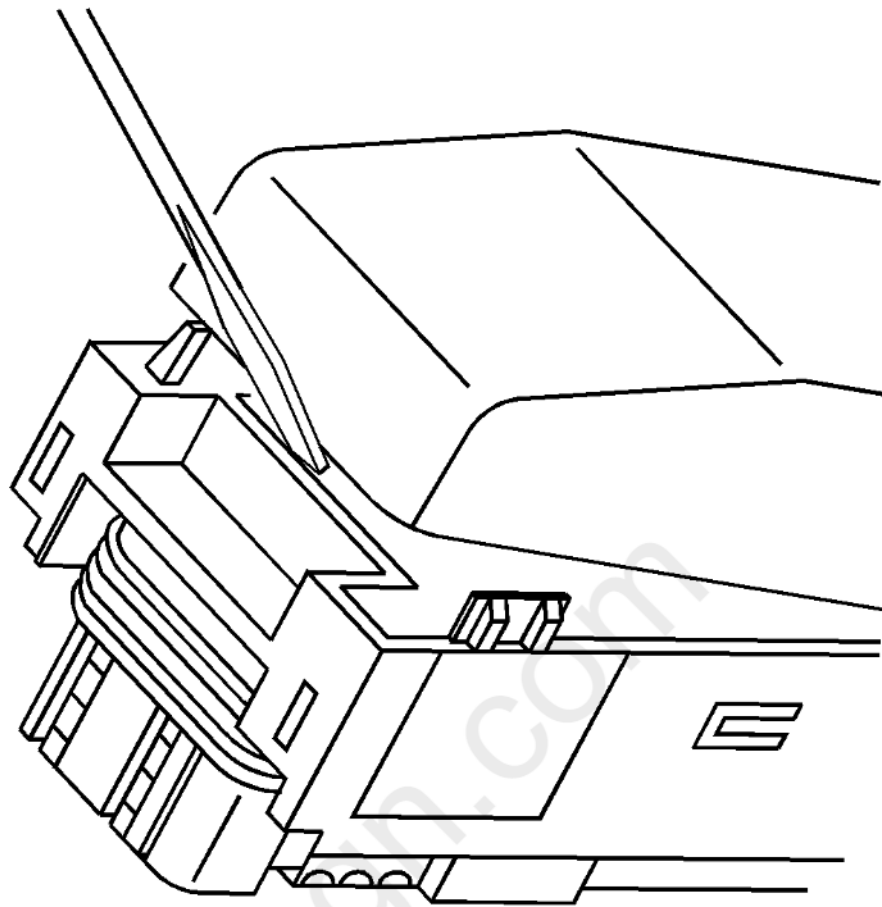


Fig. 134: View Of Dress Cover

Courtesy of GENERAL MOTORS COMPANY

3. Use a small flat-bladed tool to gently pry off the dress cover by inserting the tool under the cover opposite the harness side and prying up.
4. Remove the cover.

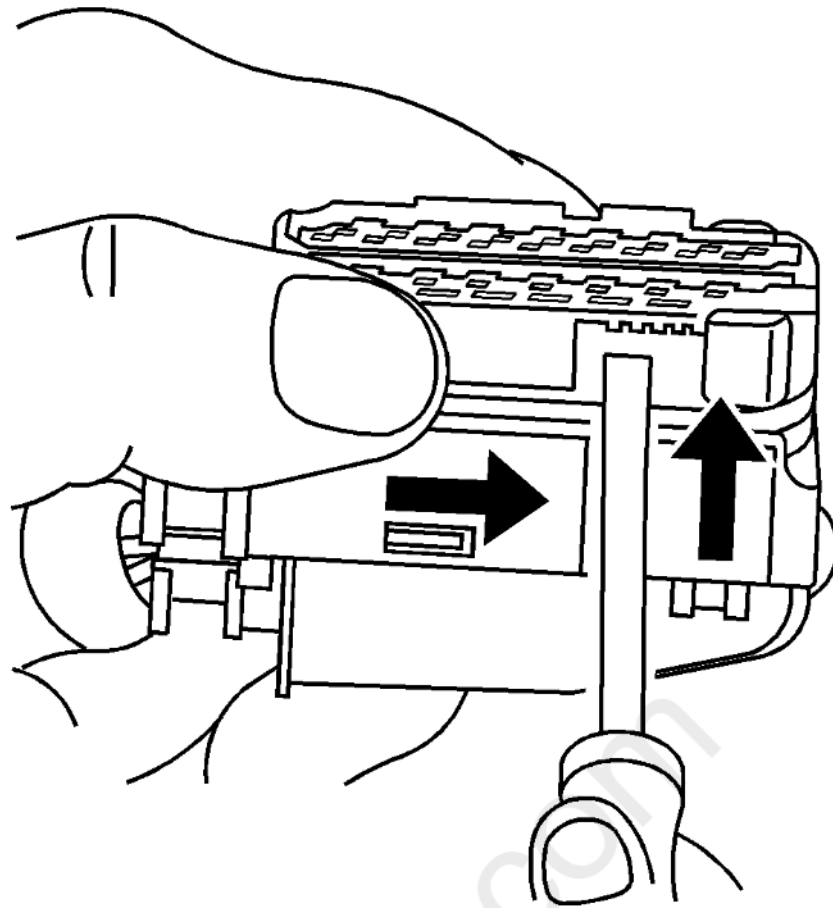


Fig. 135: View Of Terminal Position Assurance (TPA)

Courtesy of GENERAL MOTORS COMPANY

5. Using a small flat-bladed tool, push on the side of the nose piece retainer while pushing the nose piece forward with your thumb. This will release the terminal position assurance (TPA).

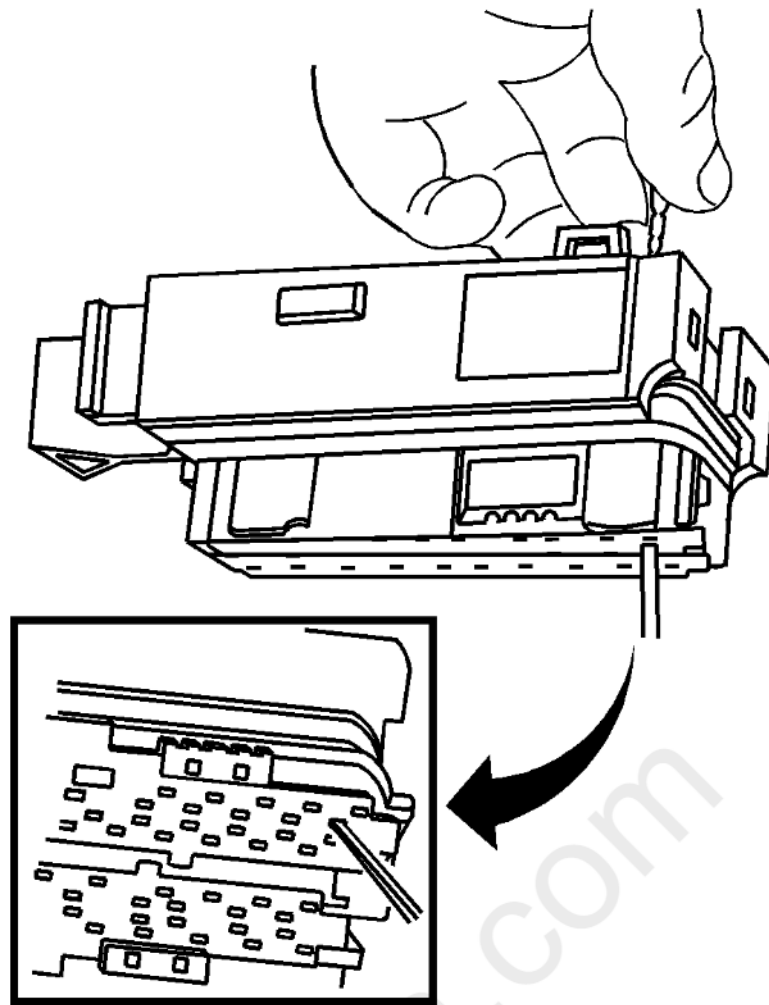


Fig. 136: Inserting Special Tool Into Terminal Release Cavity.

Courtesy of GENERAL MOTORS COMPANY

6. Insert the **J-38125-12A** tool into the corresponding terminal release cavity. The release cavities are the 2 center rows of cavities on one half of the connector.

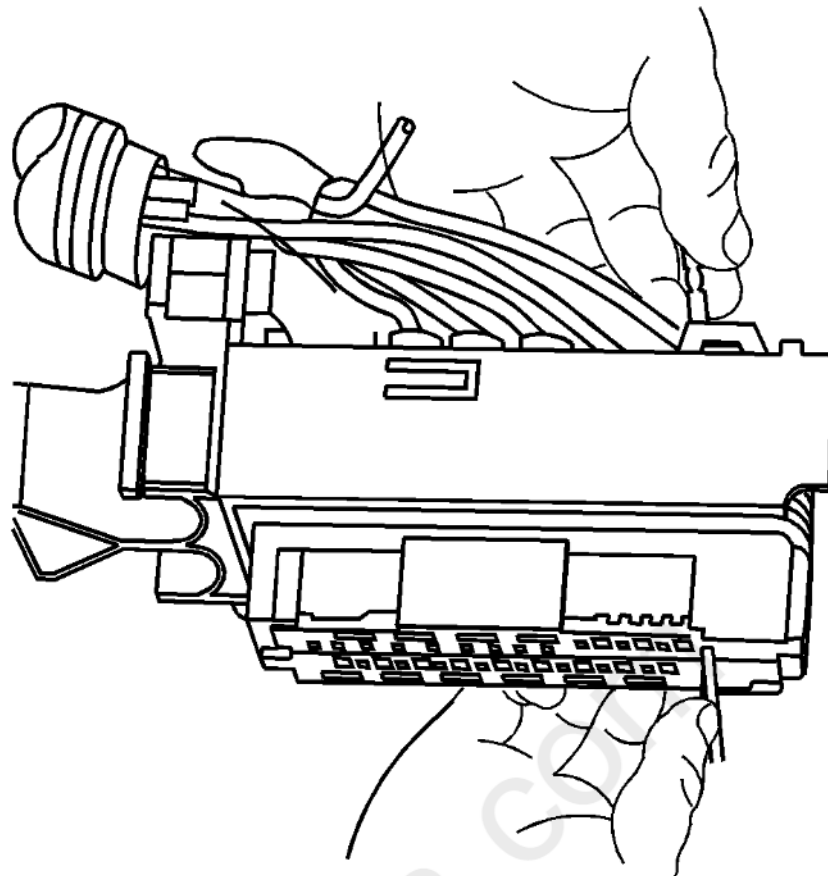


Fig. 137: Identifying Special Tool & Release Cavity

Courtesy of GENERAL MOTORS COMPANY

7. Pressing the **J-38125-12A** tool in the release cavity of the terminal you are removing, gently pull the wire out of the back of the connector. Always remember never use force when pulling a terminal out of a connector.
8. Repair the terminal by following the **Repairing Connector Terminals (Terminated Lead Repair)** procedure.
9. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

TYCO/AMP CONNECTORS (SENSOR)

Special Tools

- **EL-38125-550** Terminal Release Tool Kit
- **EL-38125-580** Terminal Release Tool Kit
- **J-38125-11A** Terminal Release Tool

For equivalent regional tools, refer to **Special Tools** .

Terminal Removal Procedure

1. Disconnect the connector from the component.

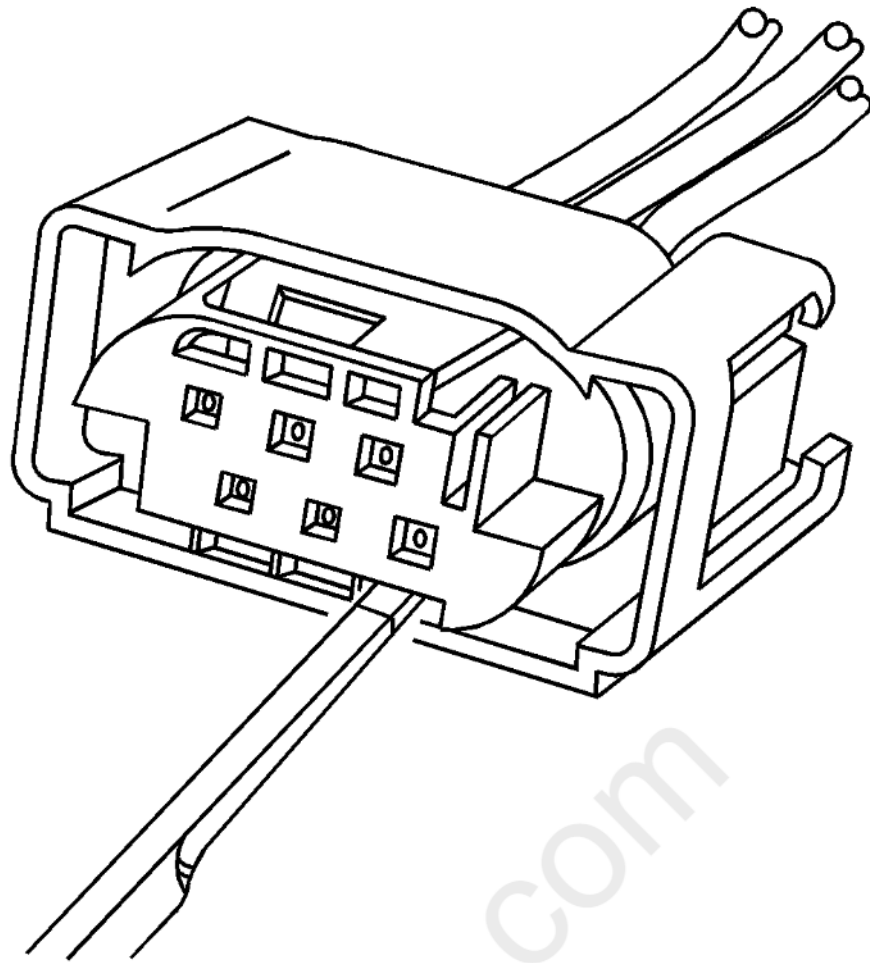


Fig. 138: View Of Inserting Special Tool Into Lower Right Face Cavity

Courtesy of GENERAL MOTORS COMPANY

2. Insert the J-38125-11A tool into the cavity on the lower right hand face of the connector until the terminal release tang access panel slides over.

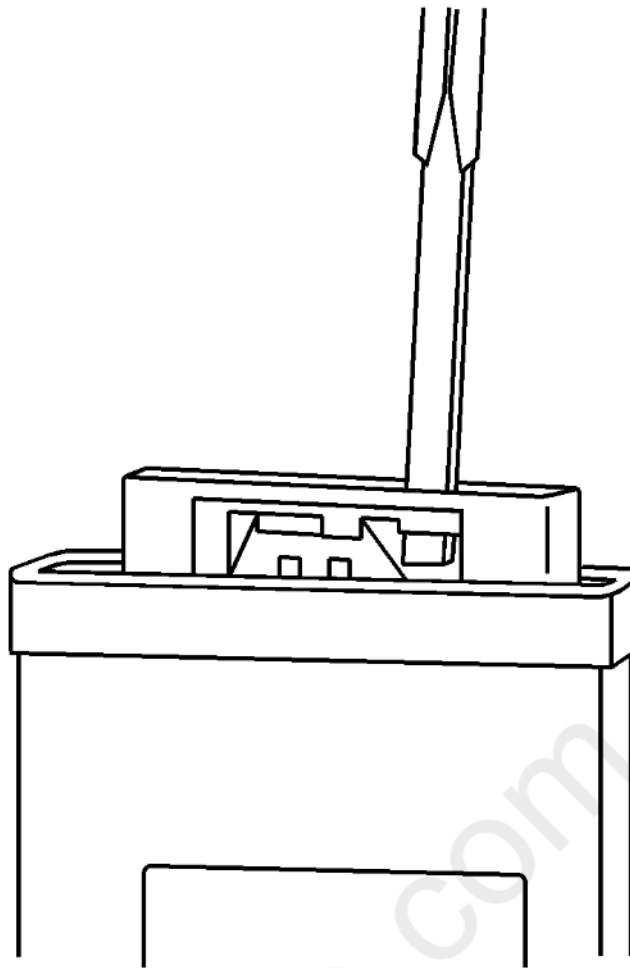


Fig. 139: Pushing Wire Side Of Terminal Toward Connector

Courtesy of GENERAL MOTORS COMPANY

3. Ensure that the terminal release tang access panel is in the correct location to access the terminals.
4. Push the wire side of the terminal that is being removed toward the connector and hold it in position.

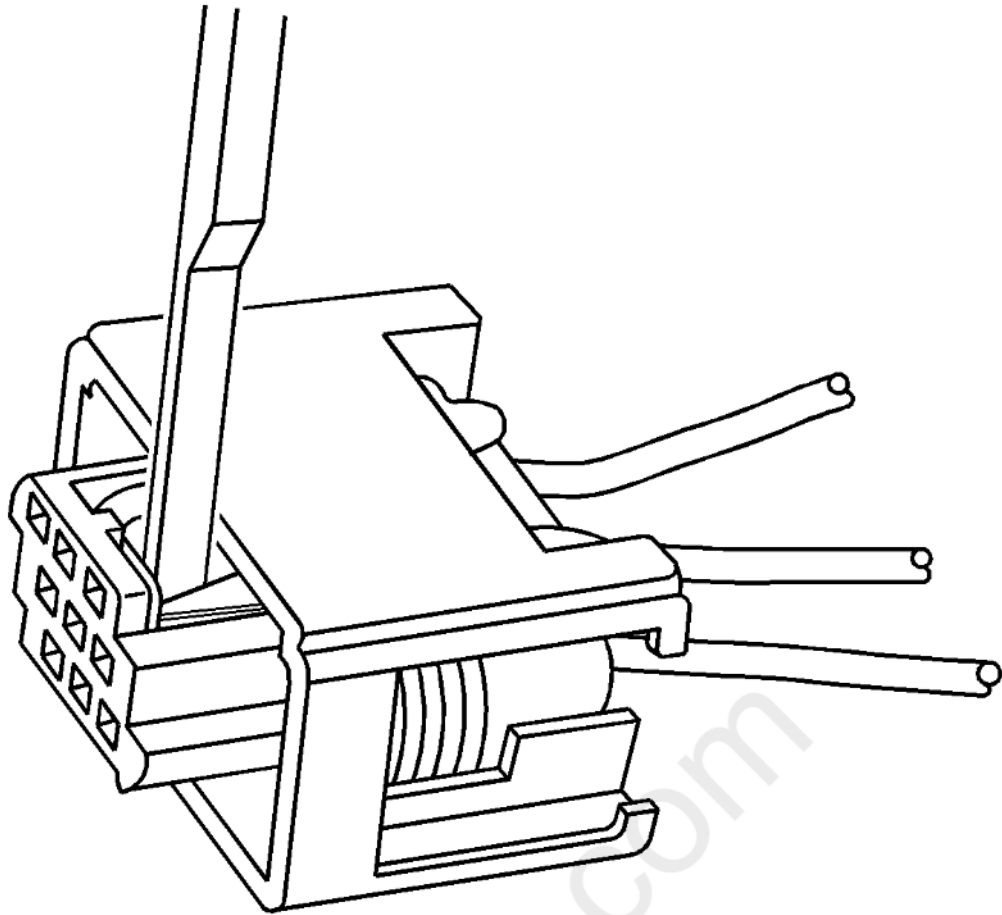


Fig. 140: View Of Inserting Tool Into Terminal Release Tang Access Slot (Sensor)
Courtesy of GENERAL MOTORS COMPANY

5. Insert the J-38125-11A into the terminal release tang access slot located behind the access panel of the connector and press down on the terminal while carefully pulling the terminal out of the connector. Always remember never use force when pulling a terminal out of a connector. If the terminal is difficult to remove, repeat the entire procedure.
6. Repair the terminal by following the [Repairing Connector Terminals \(Terminated Lead Repair\)](#)[Repairing Connector Terminals \(Terminal Repair\)](#) procedure.
7. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

TYCO/AMP CONNECTORS (0.25 CAP)

Special Tools

- **EL-38125-550** Terminal Release Tool Kit
- **EL-38125-580** Terminal Release Tool Kit
- **J-38125-24** Terminal Release Tool

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

Terminal Removal Procedure

1. Disconnect the connector from the component by pressing down on the connector position assurance (CPA).

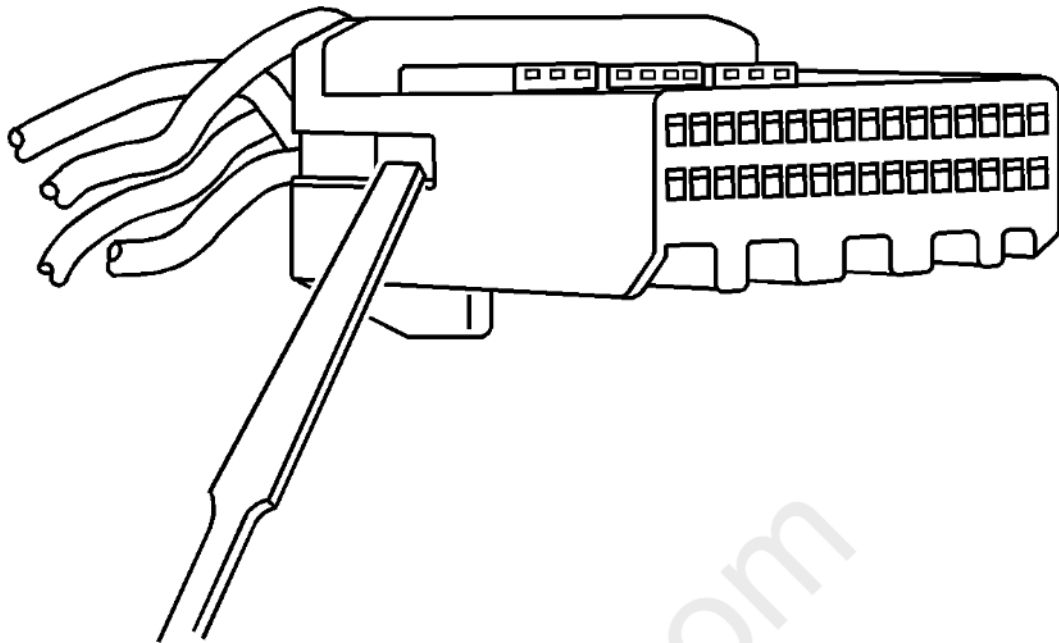


Fig. 141: Releasing TPA Using Small Flat-Bladed Tool

Courtesy of GENERAL MOTORS COMPANY

NOTE: The TPA on this connector cannot be removed unless the terminals are removed first. The TPA will come out of the connector body, but only slightly. When the TPA is slightly raised the terminals can be removed. Using excessive force to remove the TPA with the terminals still in the connector will damage the connector.

2. Use a small flat-bladed tool to release the terminal position assurance (TPA) by inserting the tool in the small recess on the side of the connector and pushing up until the TPA releases from the connector body. The TPA should raise just slightly. Do not try to remove the TPA.
3. Repeat the process for the other side of the connector.

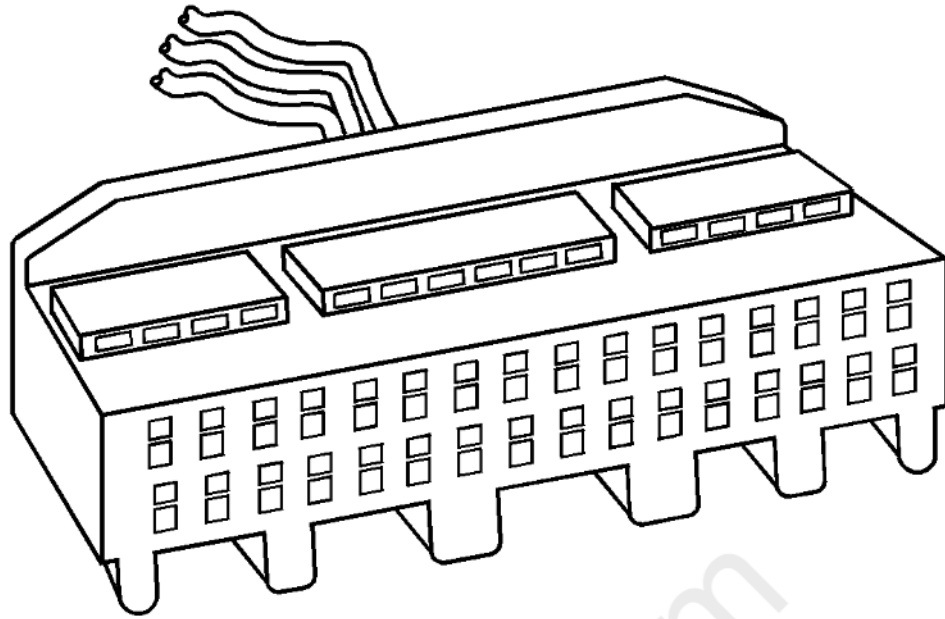


Fig. 142: View Of Terminal Position Assurance

Courtesy of GENERAL MOTORS COMPANY

4. Ensure that the TPA is in the proper position to remove the terminals.

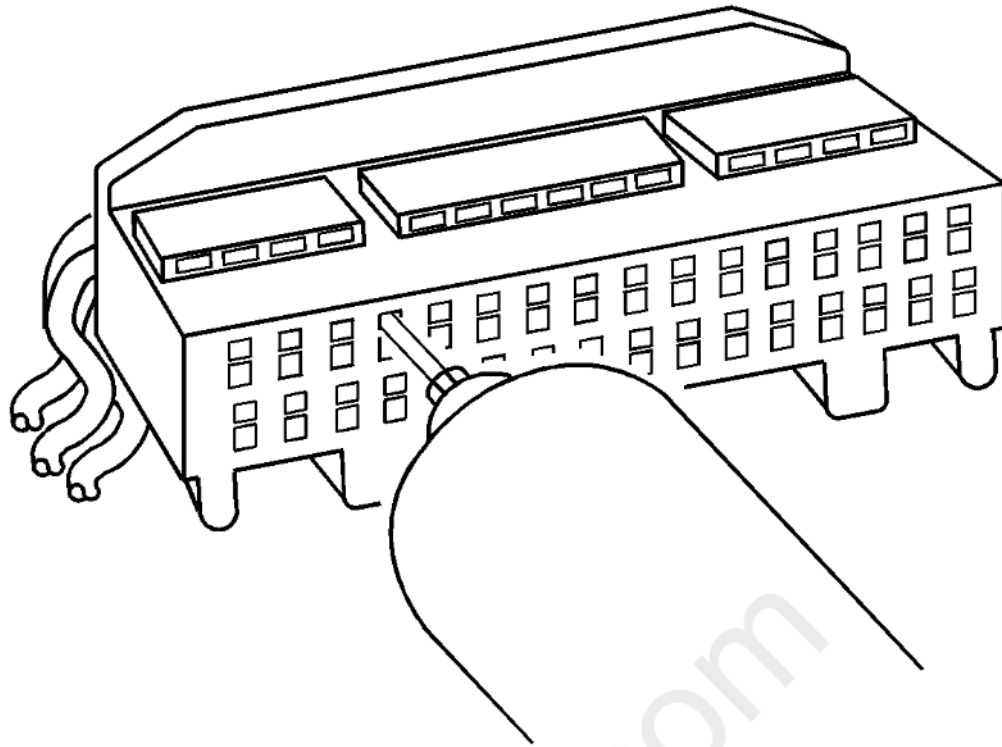


Fig. 143: Identifying Special Tool & Release Cavity
Courtesy of GENERAL MOTORS COMPANY

5. While pushing the terminal forward, insert the J-38125-24 in the release cavity above the terminal you are removing, gently pull the wire out of the back of the connector. Always remember never use force when pulling a terminal out of a connector.
6. Repair the terminal by following the [Repairing Connector Terminals \(Terminated Lead Repair\)](#) procedure.
7. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

TYCO/AMP CONNECTORS (43-WAY)

Special Tools

- **EL-38125-550** Terminal Release Tool Kit
- **EL-38125-580** Terminal Release Tool Kit
- **J-38125-12A** Terminal Release Tool
- **J-38125-13A** Terminal Release Tool

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

Terminal Removal Procedure

Follow the steps below in order to remove terminals from the connector.

1. Locate the lever lock on the wire dress cover. Slide the lever lock away from the connector body.
2. Disconnect the connector from the component.
3. Locate the dress cover locking tabs on the dress cover of the connector. Using a small flat-bladed tool release all of the locking tabs.

4. Once the locks are unlocked, lift the dress cover off.

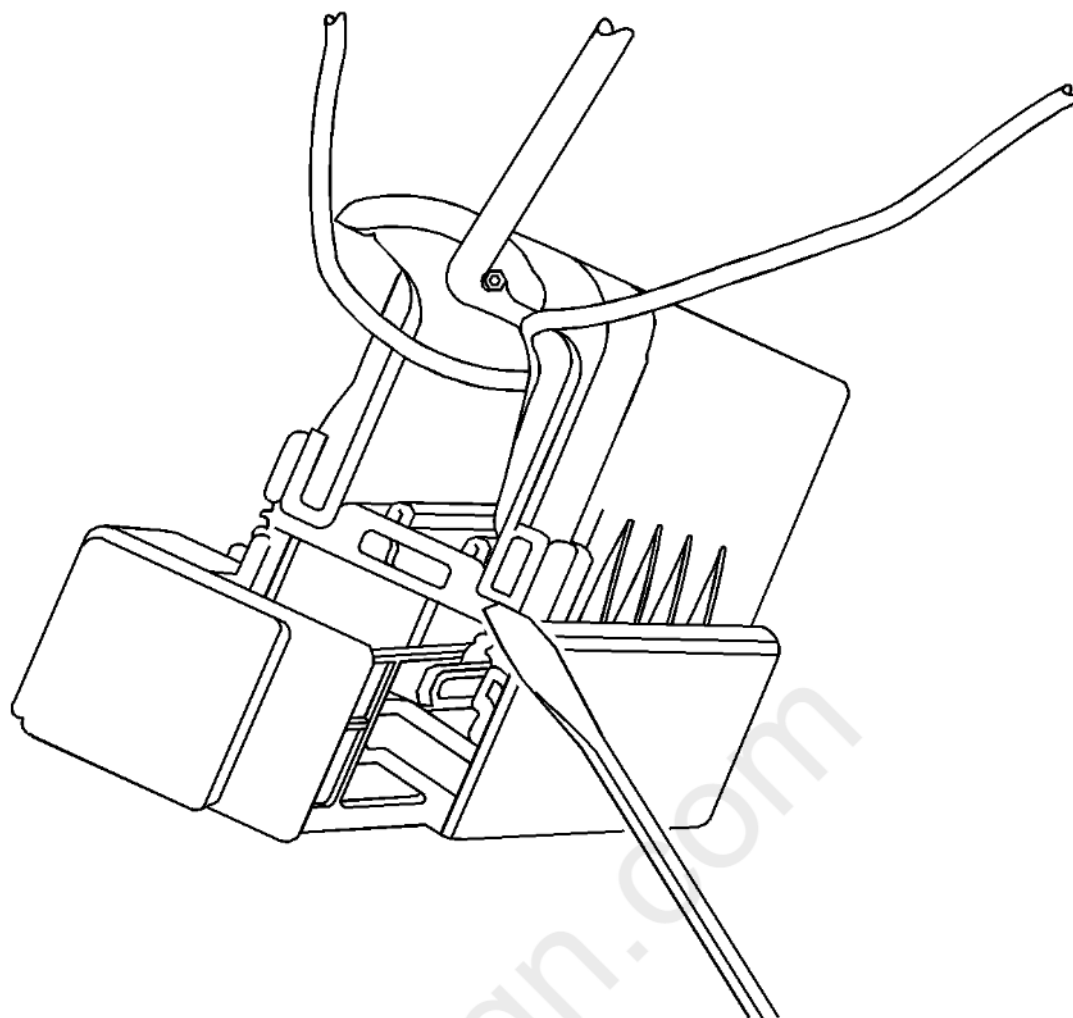


Fig. 144: Releasing TPA

Courtesy of GENERAL MOTORS COMPANY

NOTE: Always use care when removing a terminal position assurance (TPA) in order to avoid damaging it.

5. Release the TPA by inserting a small flat-bladed tool into the blue locking tabs on both ends of the connector. Gently slide the TPA up to the released position on both ends.

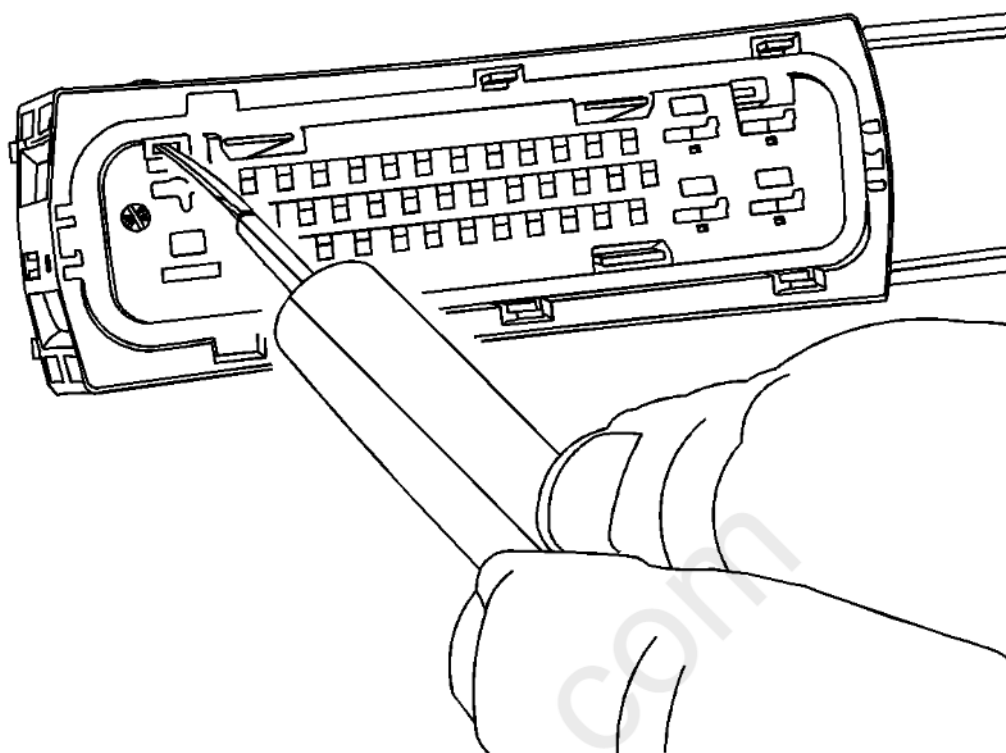


Fig. 145: View Of Inserting Tool Into Terminal Release Cavity.
Courtesy of GENERAL MOTORS COMPANY

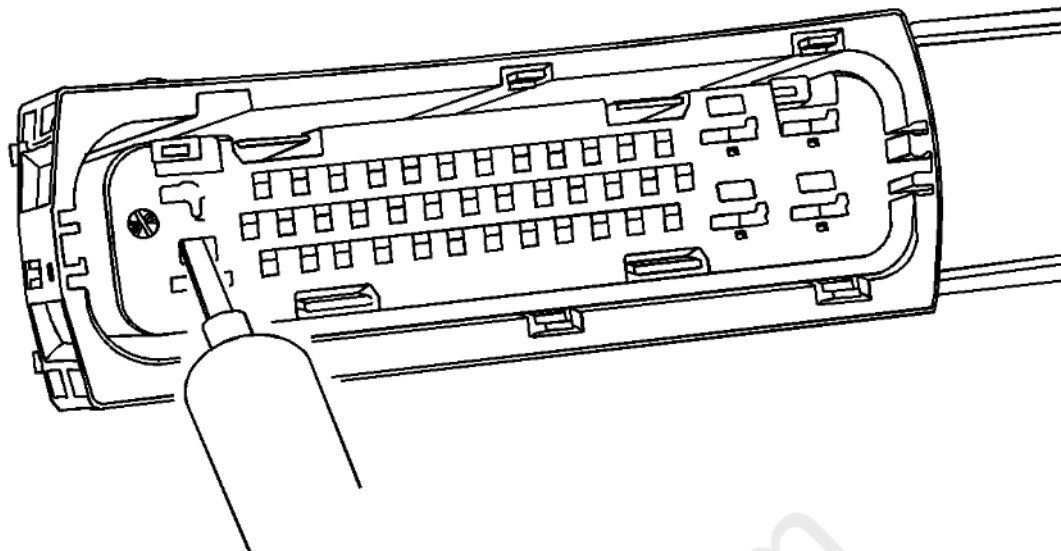


Fig. 146: View Of Release Tool Being Used For Larger Terminals
Courtesy of GENERAL MOTORS COMPANY

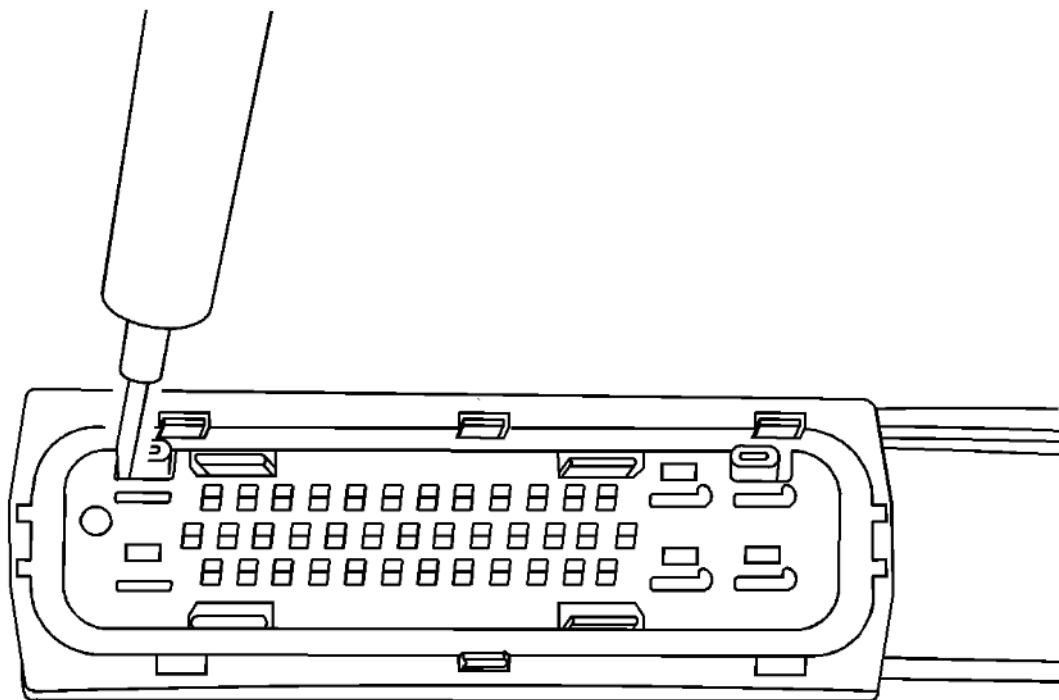


Fig. 147: View Of Release Tool Being Used For Larger Terminals
Courtesy of GENERAL MOTORS COMPANY

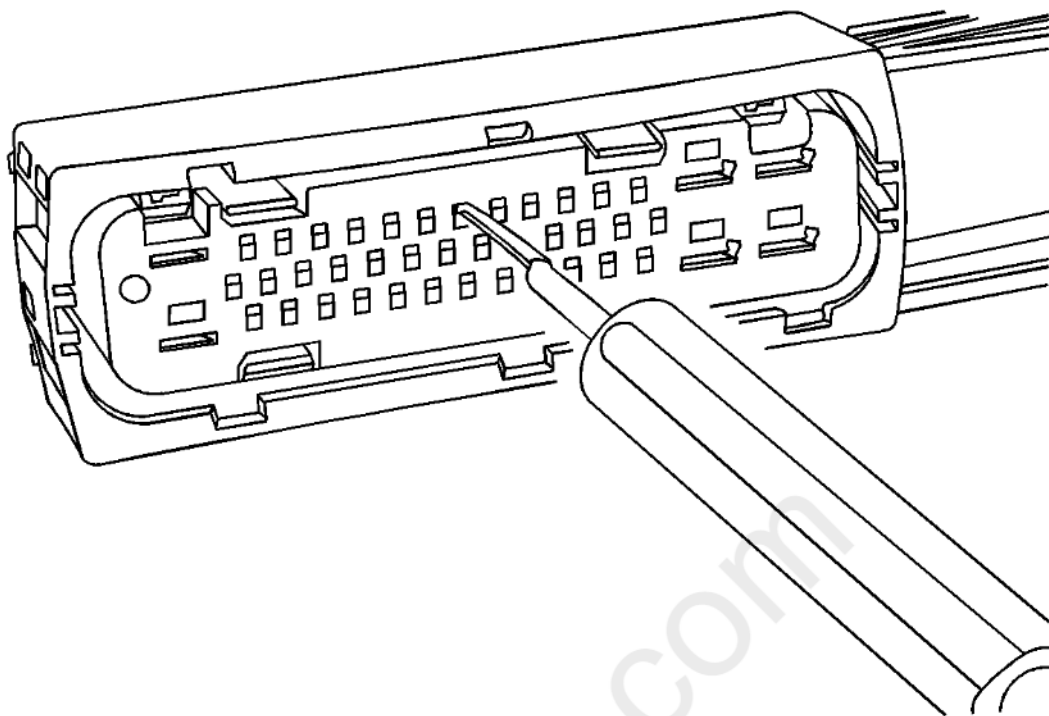


Fig. 148: View Of Release Tool Being Used For Smaller Terminals
Courtesy of GENERAL MOTORS COMPANY

6. For the larger terminals insert the **J-38125-13A** tool to release the terminals by inserting the tool into the terminal release cavity. For the smaller terminals insert the **J-38125-12A** tool to release the terminals by inserting the tool into the terminal release cavity.

View of the release tool being used for the larger terminals.

View of the release tool being used for the larger terminals.

View of the release tool being used for the smaller terminals.

7. While holding the removal tool in place, gently pull the wire out of the back of the connector. Always remember never use force when pulling a terminal out of a connector.
8. Repair the terminal by following the **Repairing Connector Terminals (Terminated Lead Repair)** procedure.
9. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

TYCO/AMP CONNECTORS (DOOR MODULE)

Special Tools

- **EL-38125-550** Terminal Release Tool Kit
- **EL-38125-580** Terminal Release Tool Kit
- **J-38125-12A** Terminal Release Tool

For equivalent regional tools, refer to **Special Tools** .

Terminal Removal Procedure

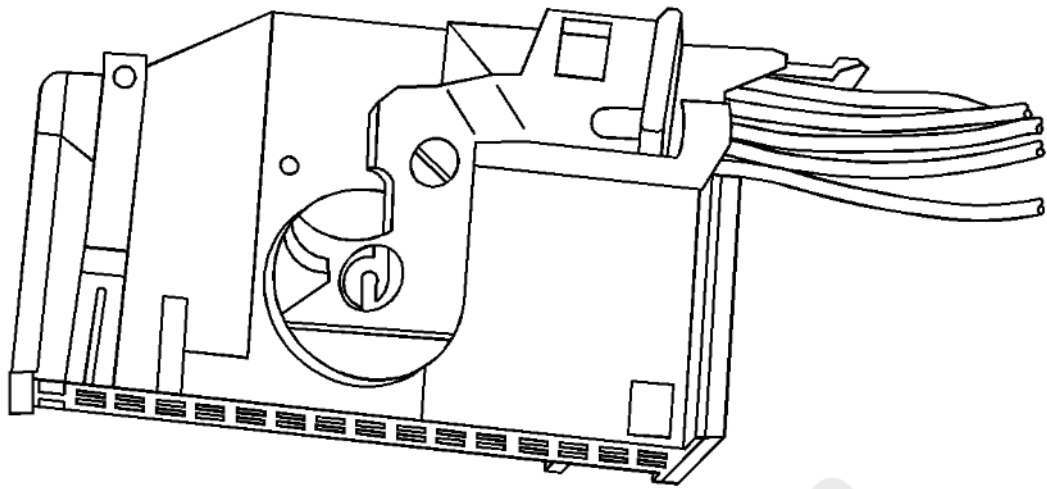


Fig. 149: Side View Of Tyco/AMP Connector
Courtesy of GENERAL MOTORS COMPANY

Side view of connector.

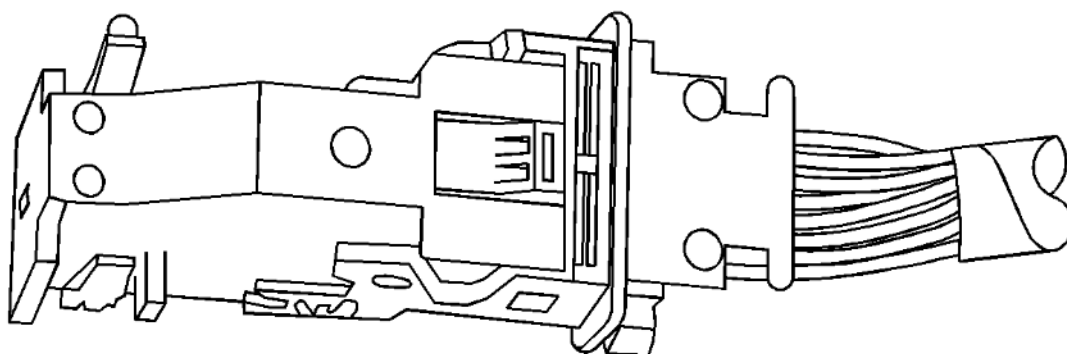


Fig. 150: Top View Of Tyco/AMP Connector
Courtesy of GENERAL MOTORS COMPANY

View of top of connector.

1. Locate the assist lever and lock on the top of the connector.

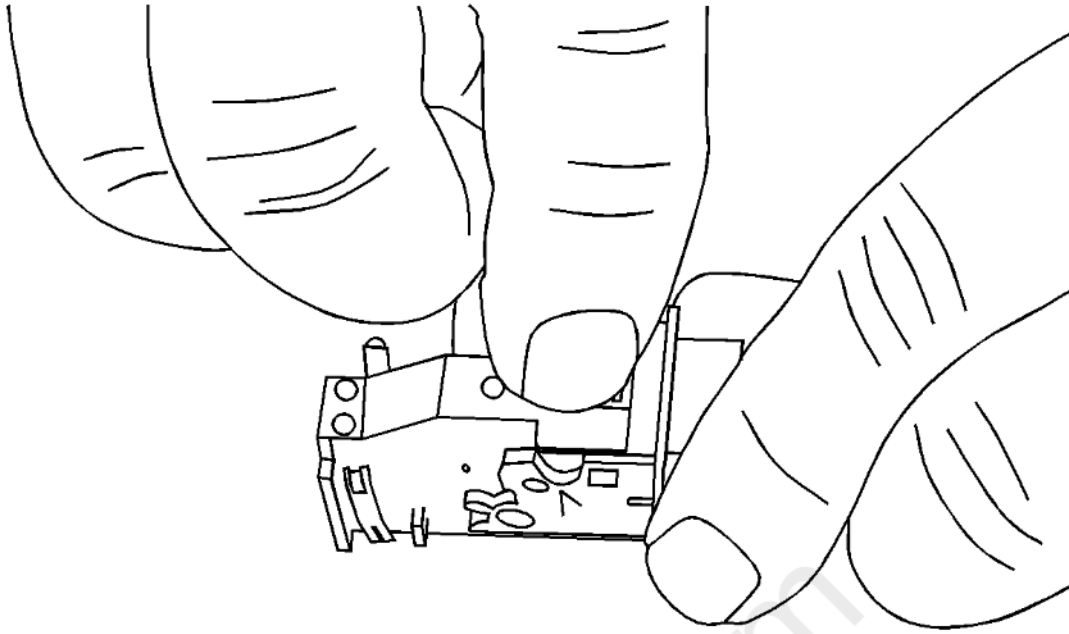


Fig. 151: View Of Depressing Lock & Pulling Assist Lever
Courtesy of GENERAL MOTORS COMPANY

2. While depressing the lock, pull the lever over and past the lock.

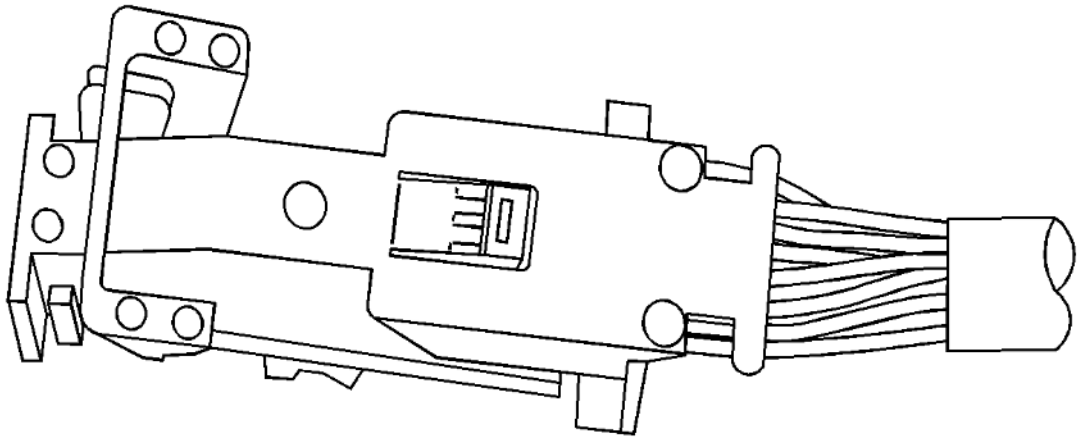


Fig. 152: View Of Component Connector
Courtesy of GENERAL MOTORS COMPANY

3. Disconnect the connector from the component.

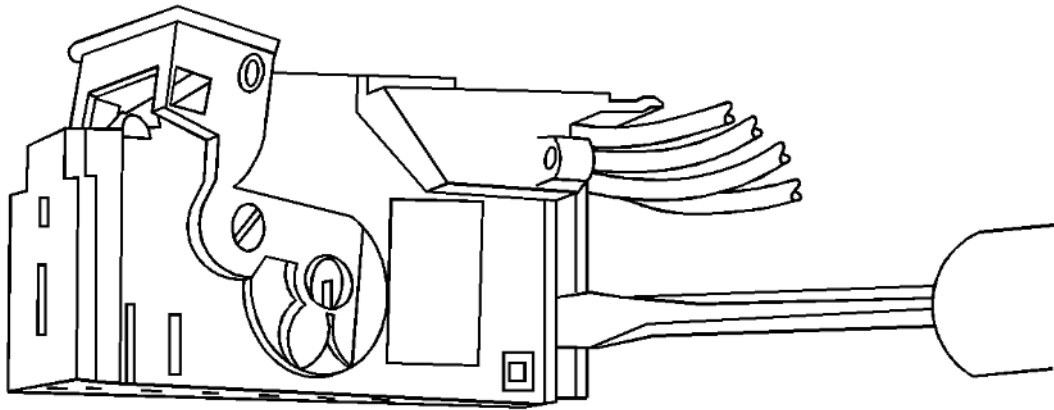


Fig. 153: Identifying Locking Tabs

Courtesy of GENERAL MOTORS COMPANY

4. Locate the dress cover locking tabs at the rear of the connector. Use a small flat-blade tool to release the locking tabs. Repeat this procedure for the other locking tab.

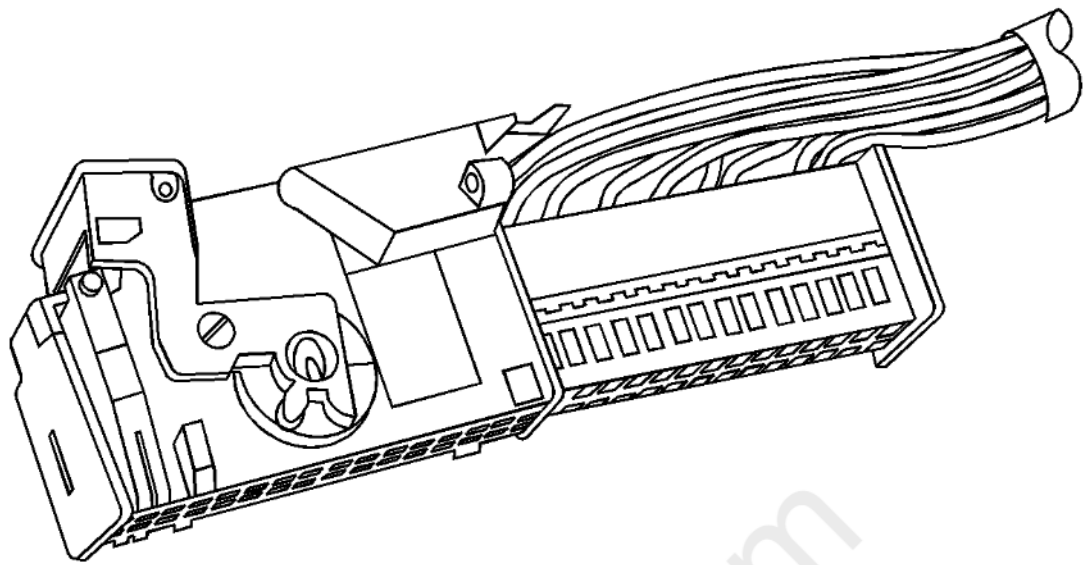


Fig. 154: Sliding Inner Connector Out Of Connector Housing

Courtesy of GENERAL MOTORS COMPANY

5. Once the locking tabs are unlocked, slide the inner connector out of the rear of the connector housing.

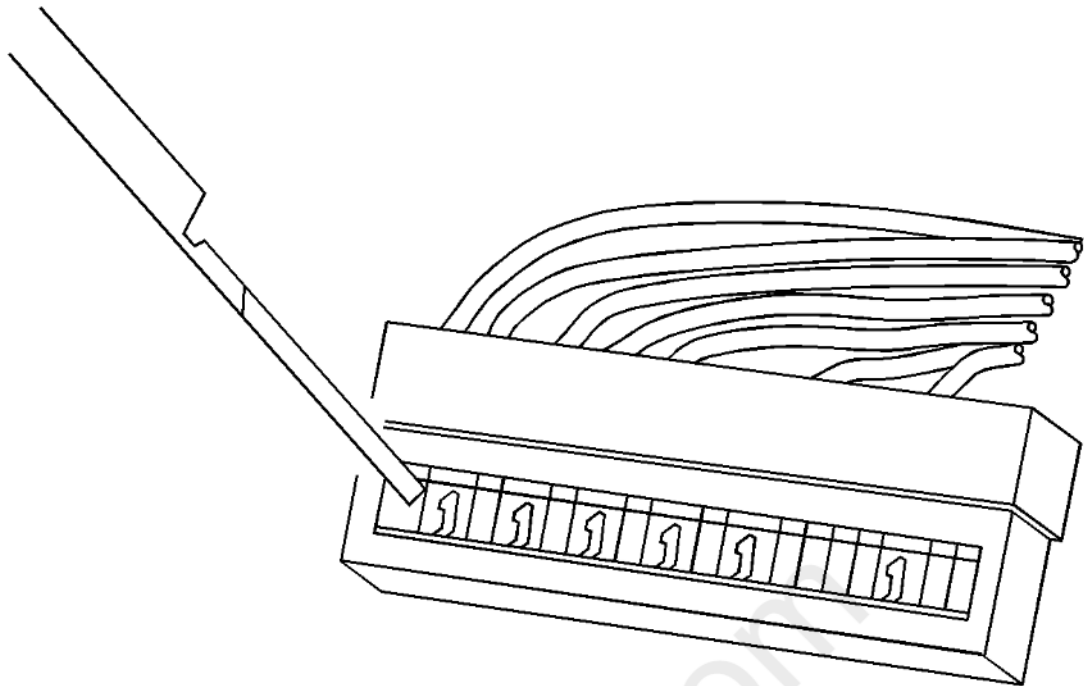


Fig. 155: Using Special Tool To Release Terminals

Courtesy of GENERAL MOTORS COMPANY

6. Use the J-38125-12A tool to release the terminals by pressing on the tang.
7. While holding the removal tool in place, gently pull the wire out of the back of the connector. Always remember never use force when pulling a terminal out of a connector.
8. Repair the terminal by following the **Repairing Connector Terminals (Terminated Lead Repair)** procedure.
9. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

TYCO/AMP CONNECTORS (SEAT)

Special Tools

- EL-38125-550 Terminal Release Tool Kit
- EL-38125-580 Terminal Release Tool Kit
- J-38125-11A Terminal Release Tool
- J-38125-212 Terminal Release Tool
- J-38125-556 Terminal Release Tool
- J-38125-560 Terminal Release Tool

For equivalent regional tools, refer to **Special Tools** .

Terminal Removal Procedure

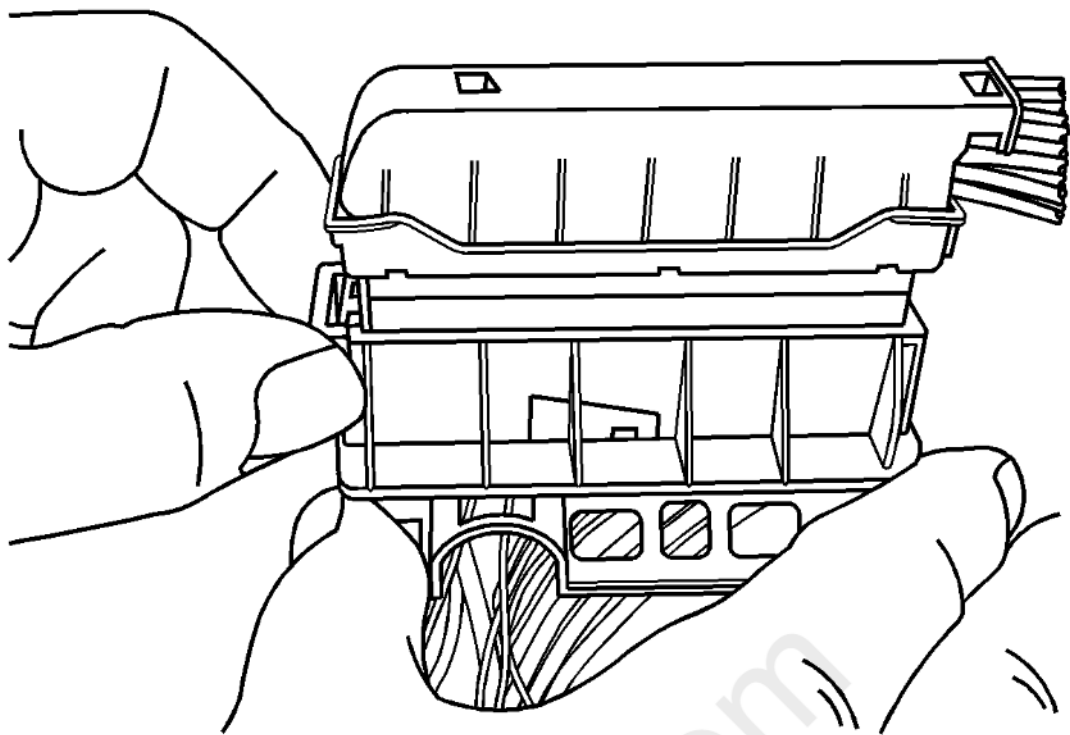


Fig. 156: Locating Locking Slide Lever

Courtesy of GENERAL MOTORS COMPANY

1. Grasp the locking slide lever and pull outward from the end of the connector.

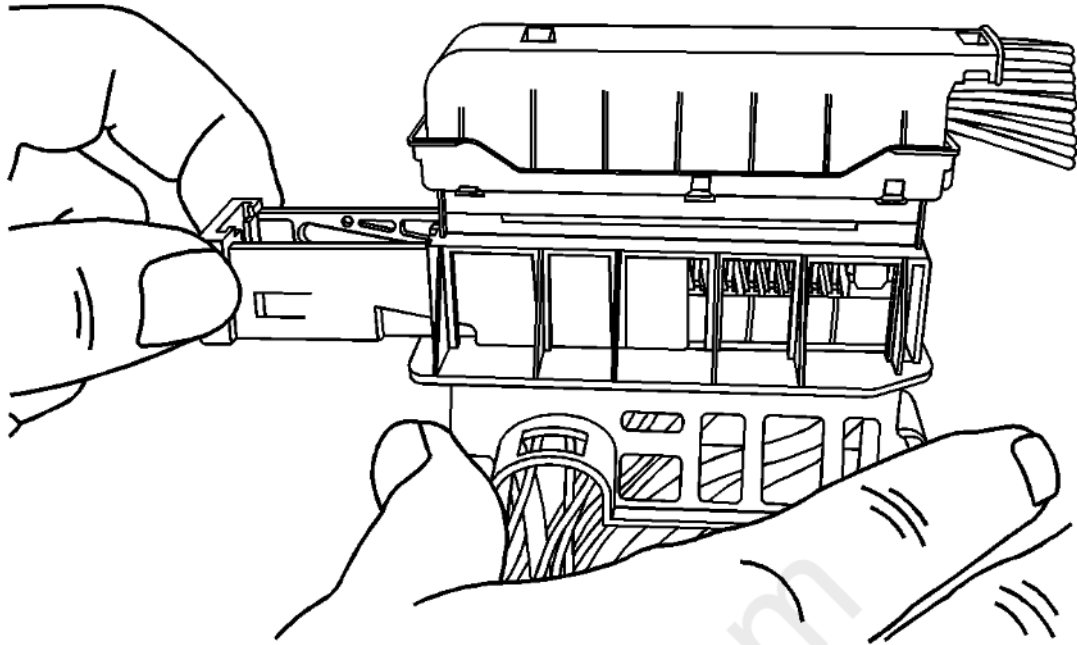


Fig. 157: Pulling Slide Lever Out Of Mating Connector
Courtesy of GENERAL MOTORS COMPANY

2. As the slide lever is pulled out the mating connector is lifted from the seated position.

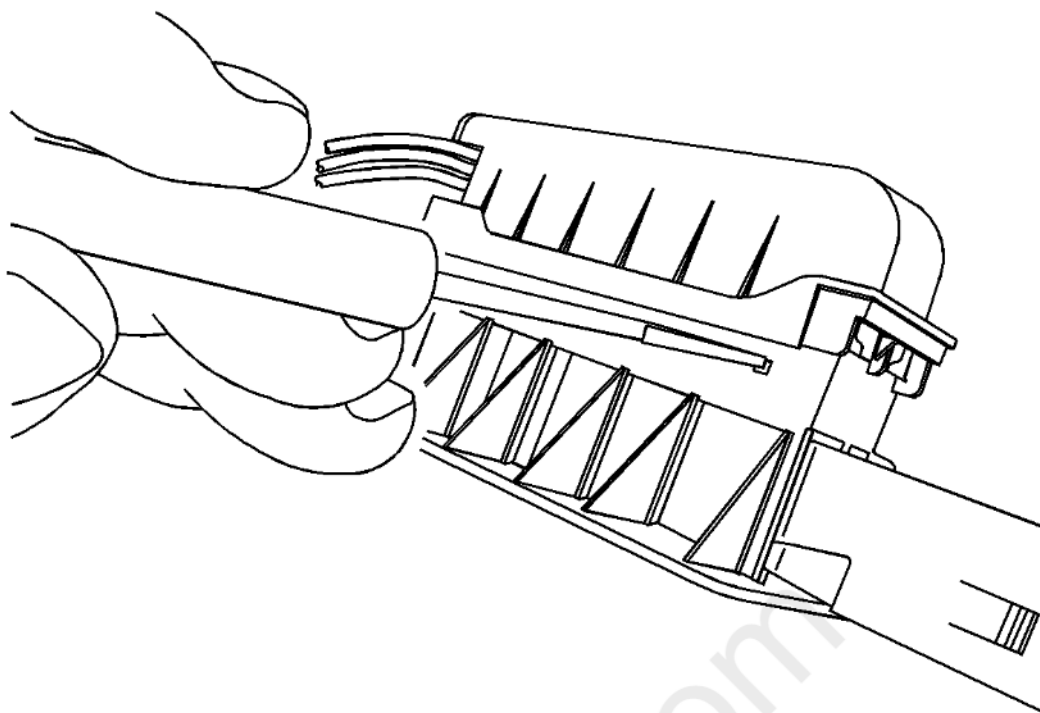


Fig. 158: Pushing TPA Tabs Into Connector Body.

Courtesy of GENERAL MOTORS COMPANY

NOTE: Terminal position assurance (TPA) is keyed and can only be inserted in one direction.

3. Using terminal release tool J-38125-11A or equivalent, push the TPA tabs into the connector body.

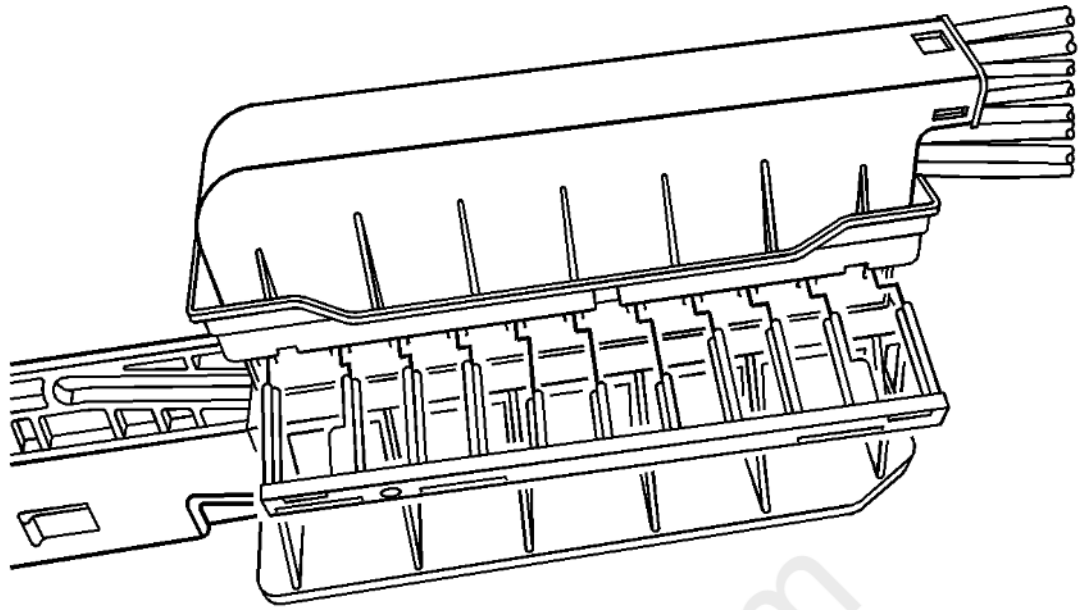


Fig. 159: Pulling TPA From Connector Body

Courtesy of GENERAL MOTORS COMPANY

4. Pull the TPA from the connector body.

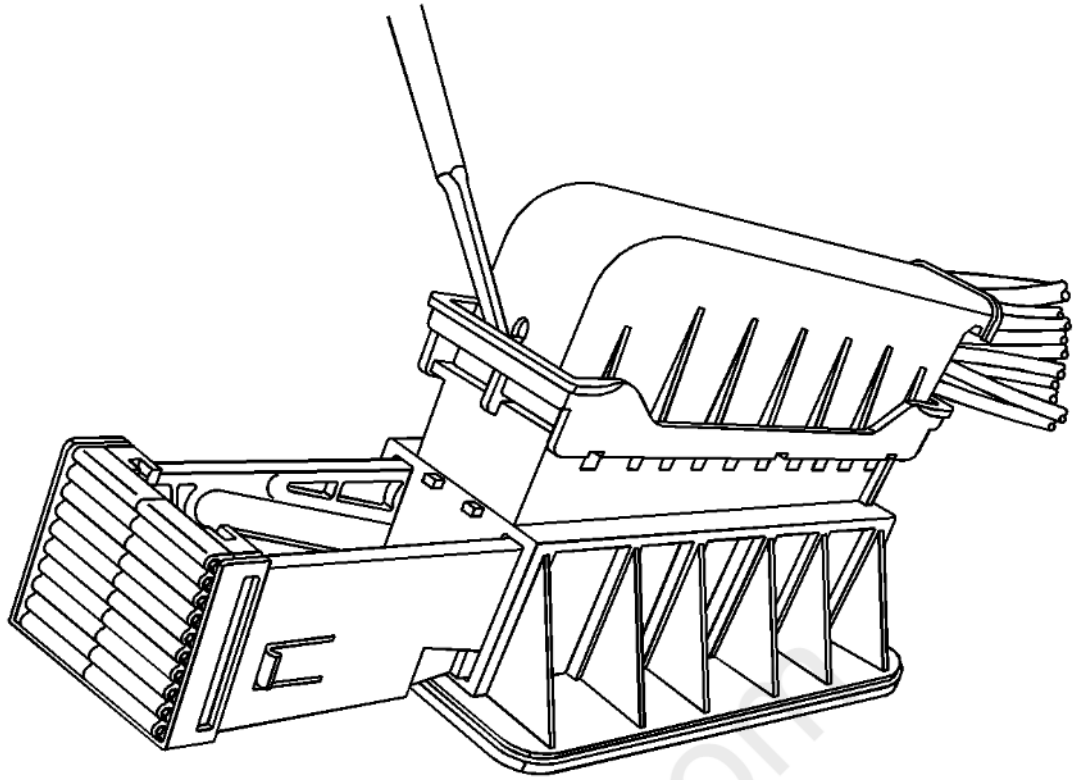


Fig. 160: Releasing Connector Wire Dress Cover Locking Tab

Courtesy of GENERAL MOTORS COMPANY

5. Using terminal release tool J-38125-11A or equivalent, release the connector wire dress cover locking tab.

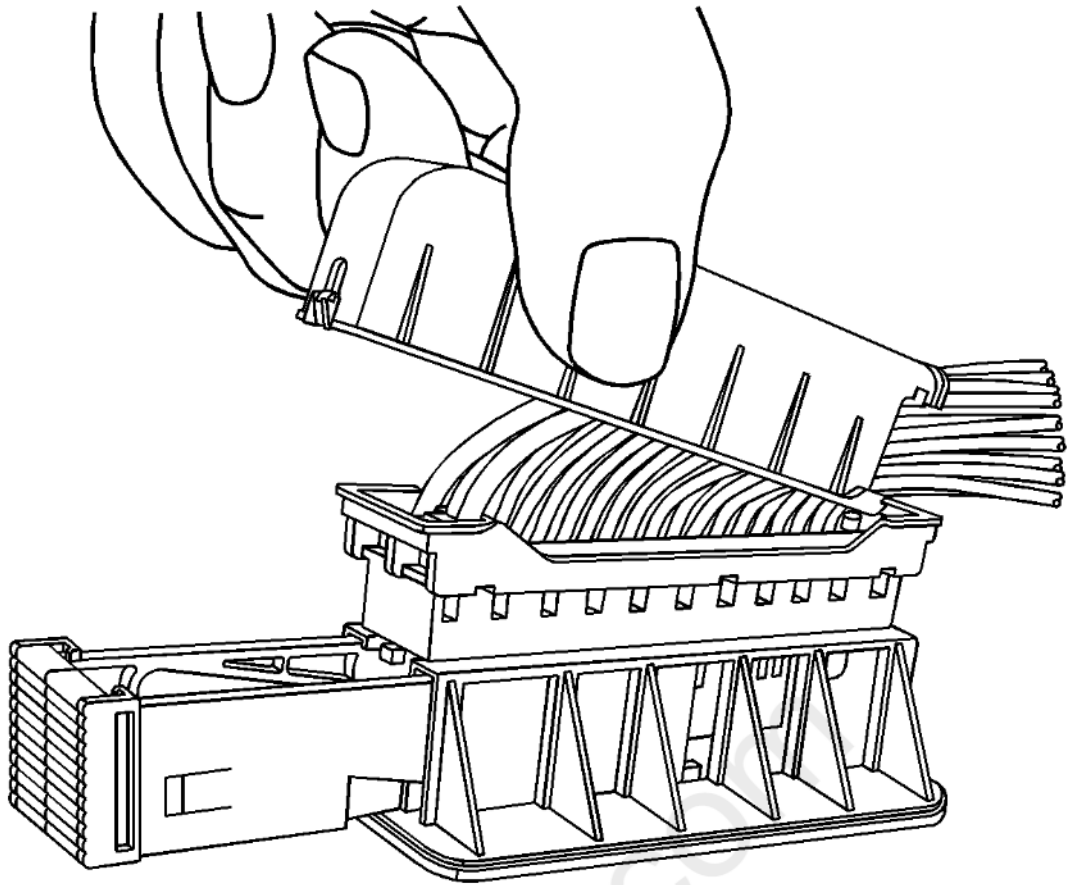


Fig. 161: Lifting Connector Wire Dress Cover From Connector Body

Courtesy of GENERAL MOTORS COMPANY

6. With the lock tab released, lift the connector wire dress cover from the connector body.

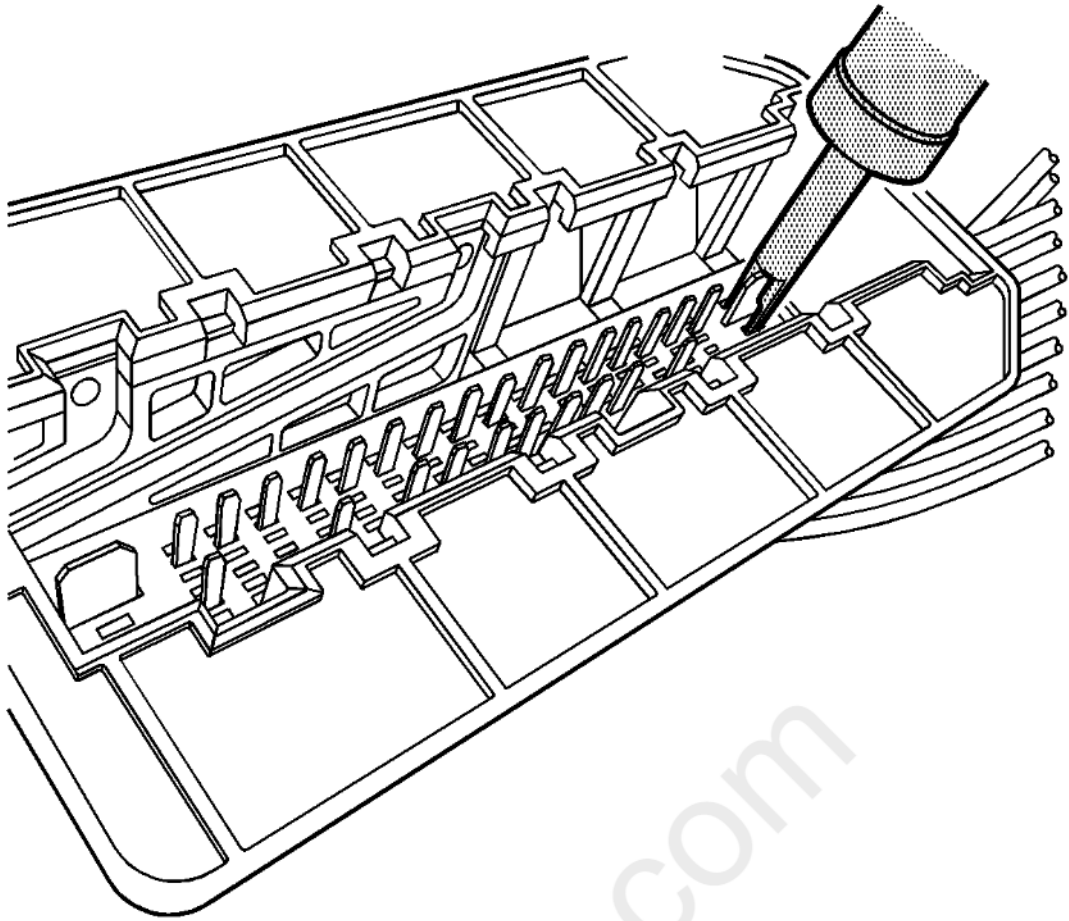


Fig. 162: Using Terminal Release Tool

Courtesy of GENERAL MOTORS COMPANY

7. Using terminal release tool J-38125-212, press the prongs into the holes each side of the terminal to be removed to release the lock tabs and pull the terminal out of the connector body.

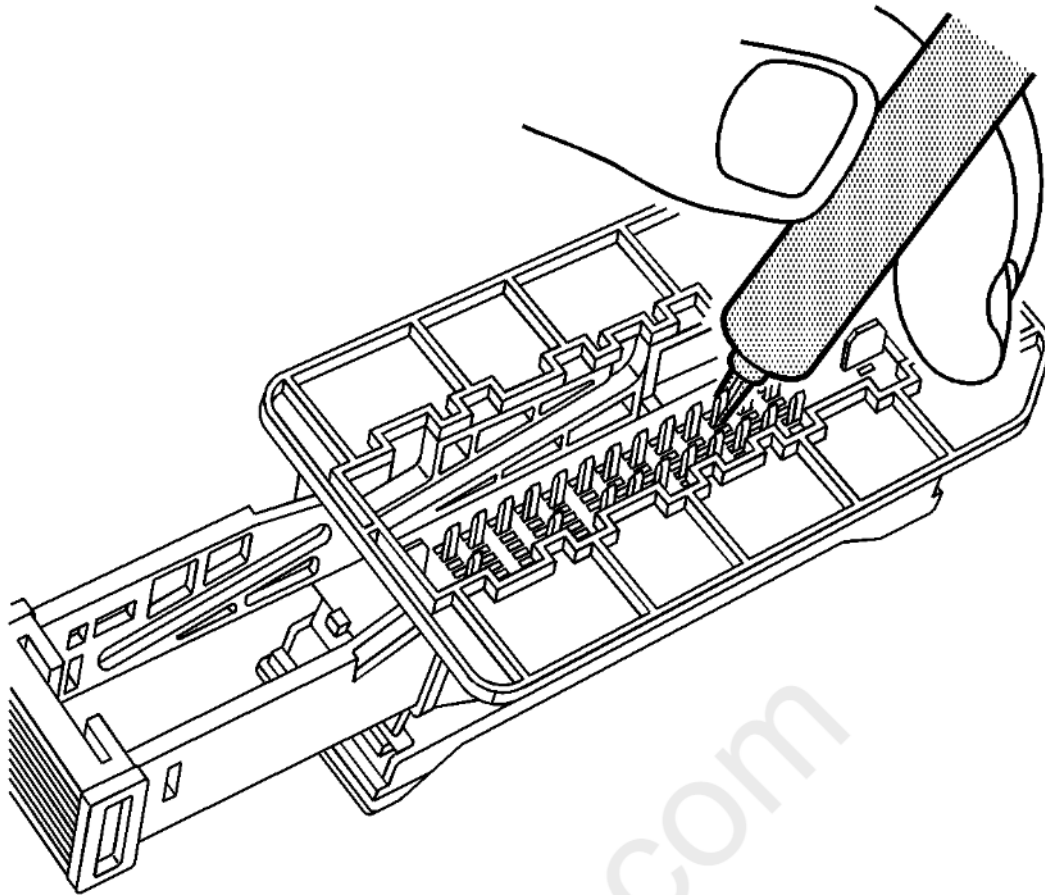


Fig. 163: Using Terminal Release Tool

Courtesy of GENERAL MOTORS COMPANY

8. Using terminal release tool J-38125-560, press the prongs into the holes on each side of the terminal to be removed to release the lock tabs and pull the terminal out of the connector body.

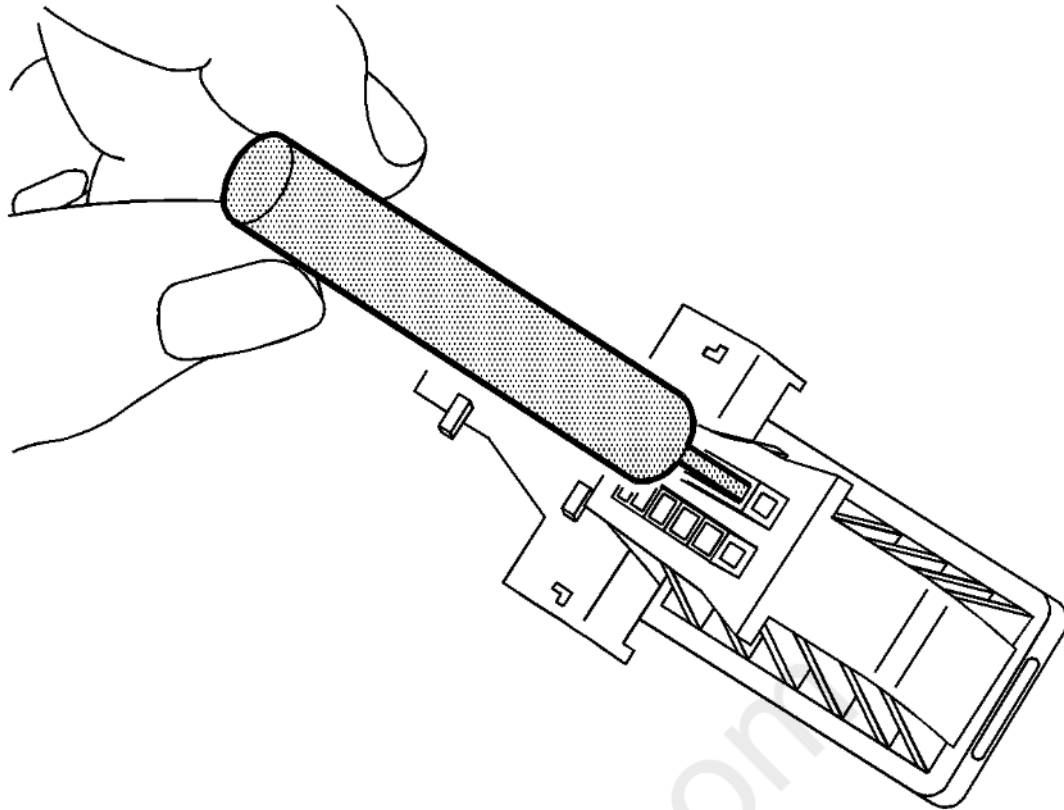


Fig. 164: Using Terminal Release Tool
Courtesy of GENERAL MOTORS COMPANY

9. Using terminal release tool J-38125-556, press the prongs into the holes on each side of the terminal to be removed to release the lock tabs and pull the terminal out of the connector body.
10. Repair the terminal by following the **Repairing Connector Terminals (Terminated Lead Repair)** procedure.
11. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

TYCO/AMP CONNECTORS (102-WAY INLINE)

Special Tools

- **EL-38125-550** Terminal Release Tool Kit
- **EL-38125-580** Terminal Release Tool Kit
- **J-38125-11A** Terminal Release Tool
- **J-38125-212** Terminal Release Tool
- **J-38125-216** Terminal Release Tool
- **J-38125-221** Terminal Release Tool
- **J-38125-560** Terminal Release Tool
- **J-38125-566** Terminal Release Tool

For equivalent regional tools, refer to **Special Tools** .

Terminal Removal Procedure

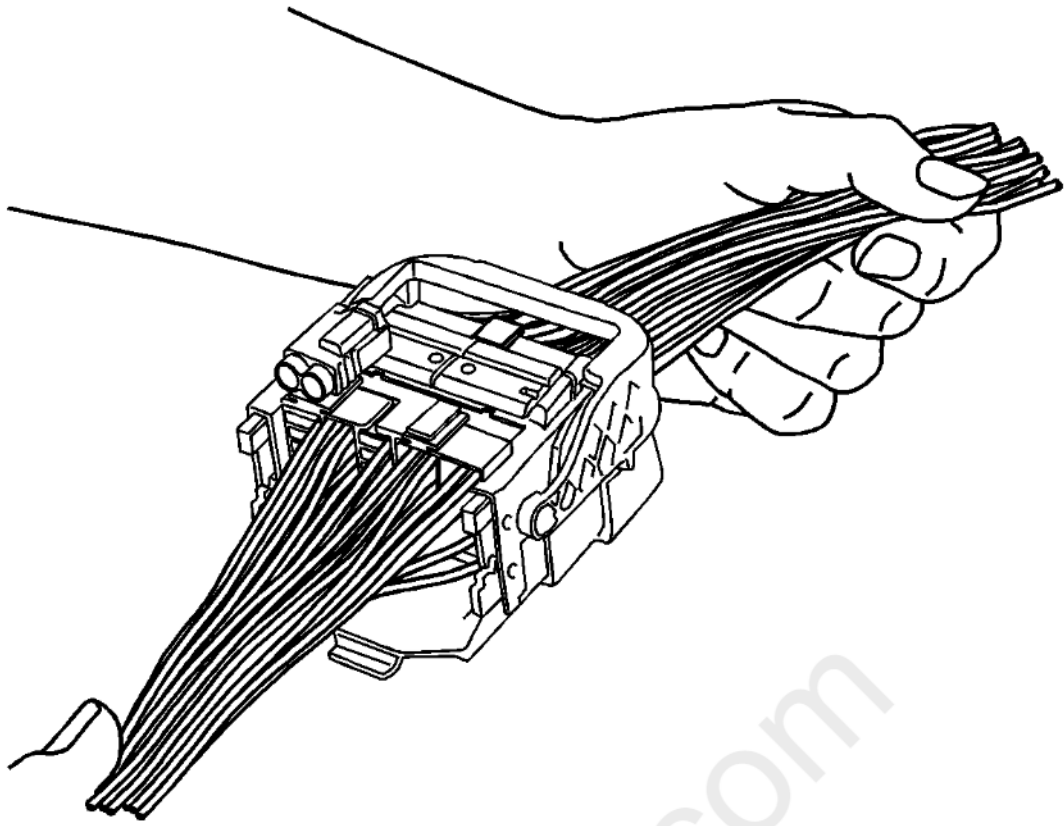


Fig. 165: View Of Typical Connector In Assembled Position

Courtesy of GENERAL MOTORS COMPANY

View of a typical connector in the assembled position.

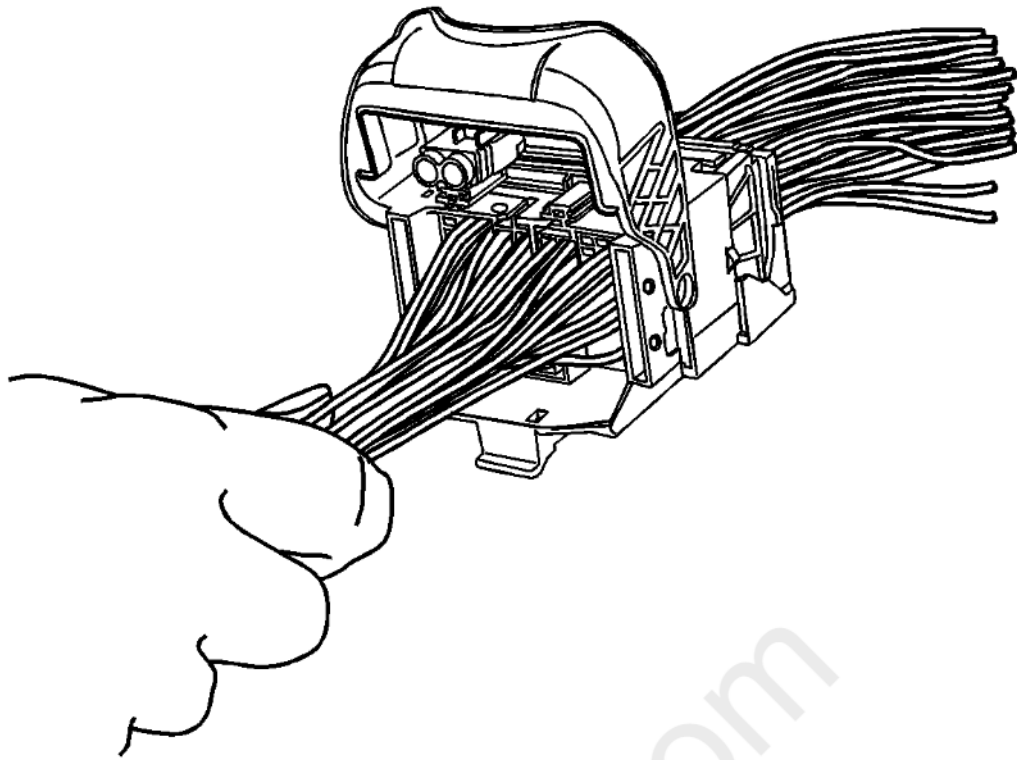


Fig. 166: View Of Locking Lever At 90 Degrees From Connector Body.
Courtesy of GENERAL MOTORS COMPANY

1. Pull the locking lever to the 90 degree position from the connector body.

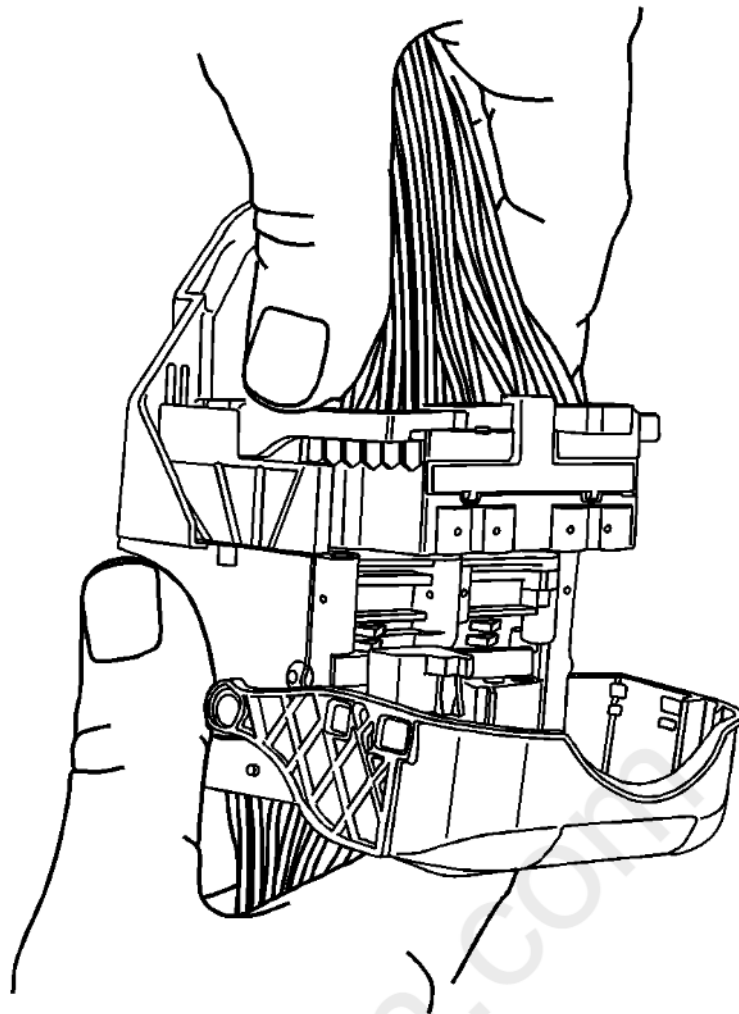


Fig. 167: Assembled View Of Connector - Tyco/AMP (102-Way Inline)
Courtesy of GENERAL MOTORS COMPANY

2. With the locking lever in the 90 degree position and the male connector body separated, it can be slid outward for removal.

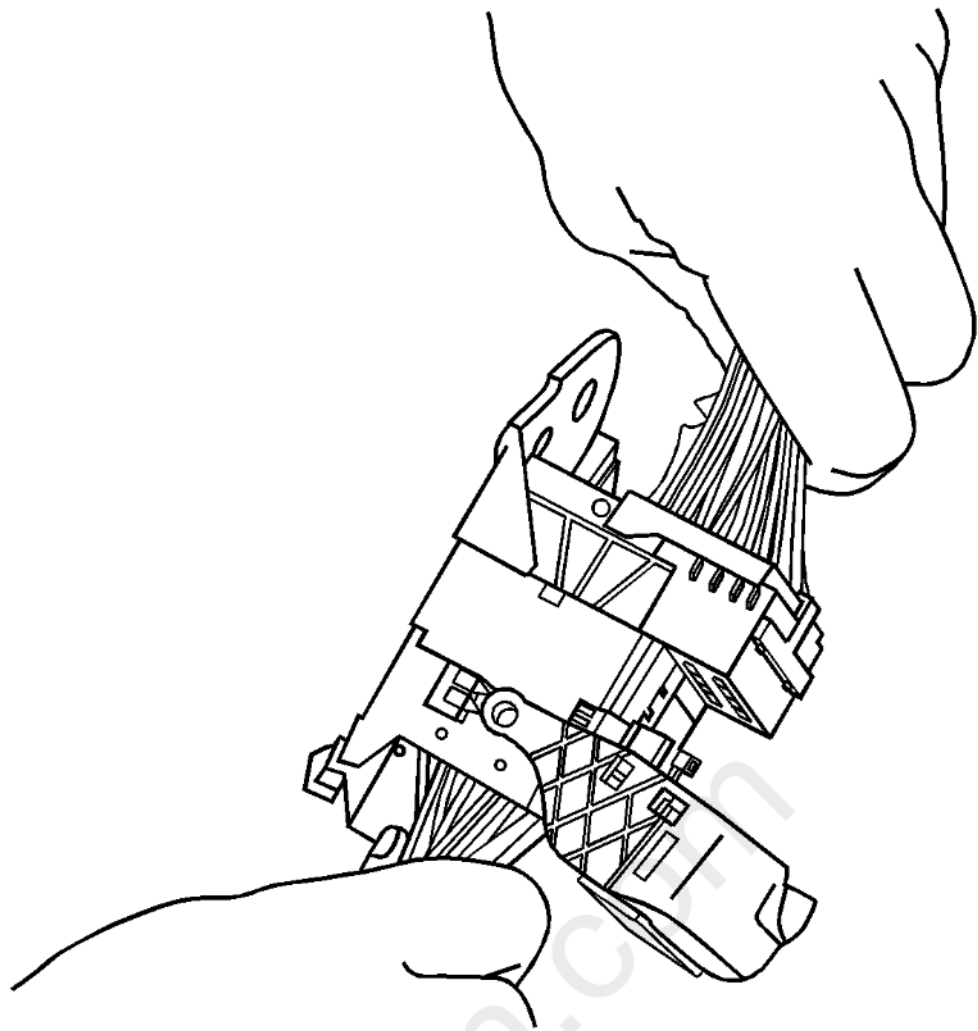


Fig. 168: Sliding Male Connector Body Away From Guide Plates
Courtesy of GENERAL MOTORS COMPANY

3. Slide the male connector body out away from the guide plates.

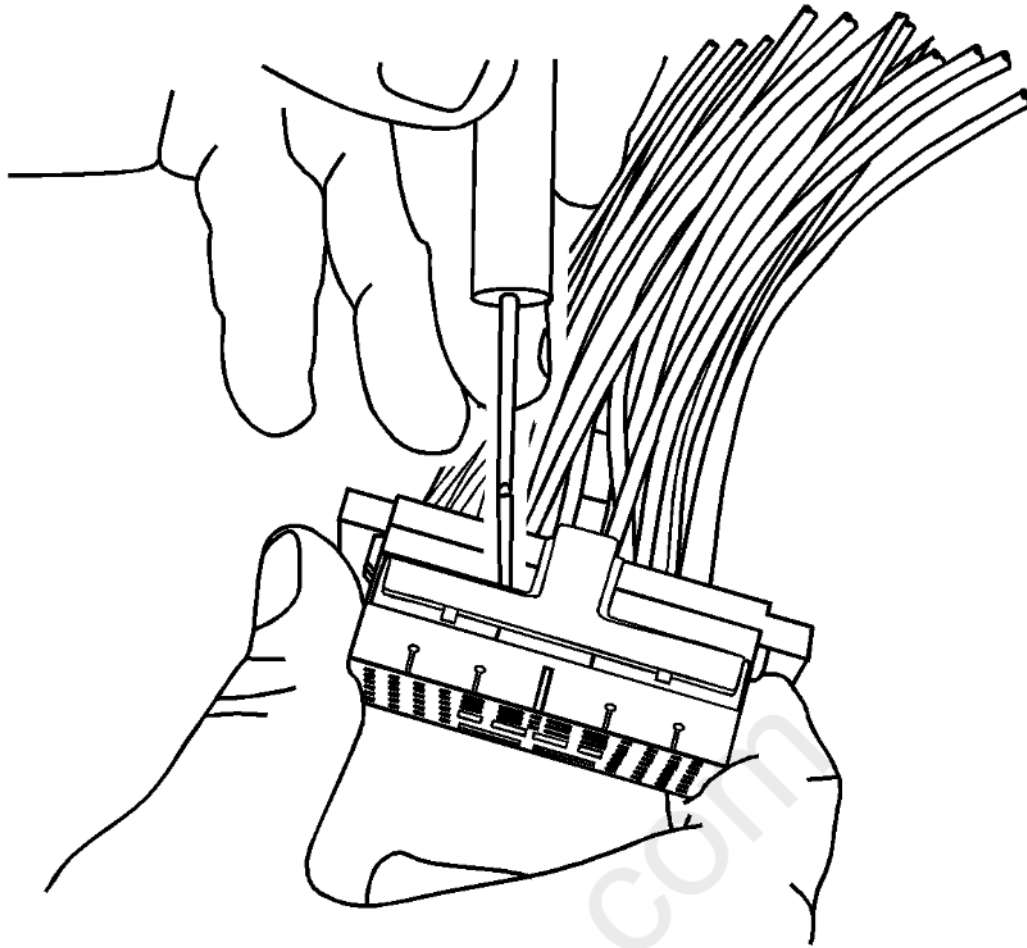


Fig. 169: View of Terminal Release Tool And TPA

Courtesy of GENERAL MOTORS COMPANY

NOTE: During assembly the terminal position assurance (TPA) will not fully seat if any terminal is not fully seated.

4. Using terminal release tool J-38125-11A or equivalent, remove the TPA from the connector body.

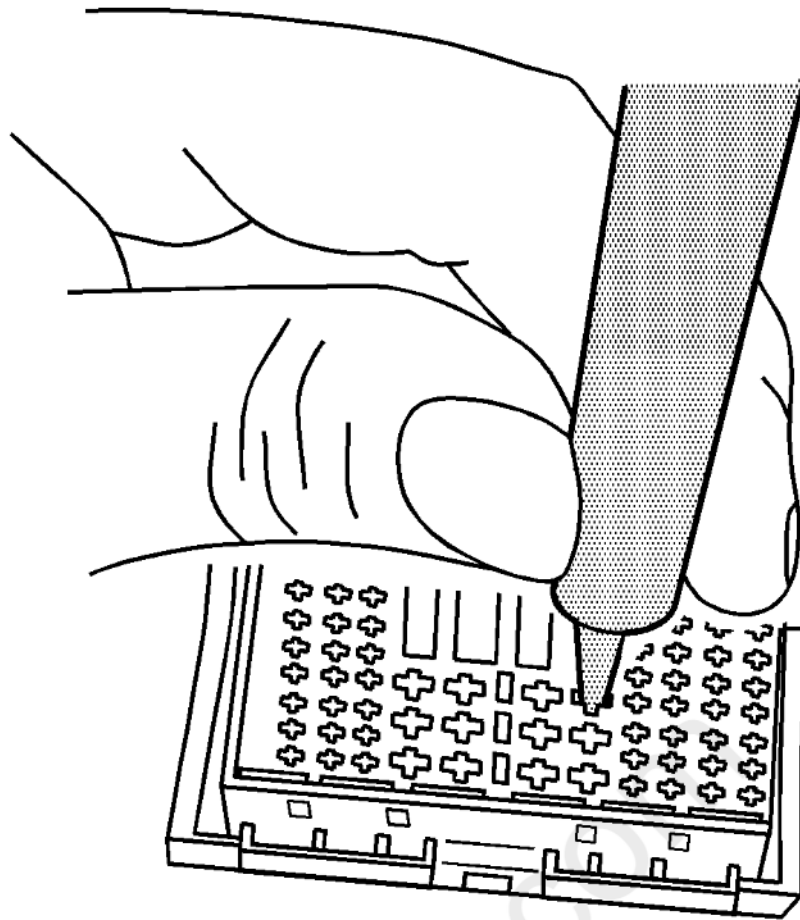


Fig. 170: Releasing Lock Tabs

Courtesy of GENERAL MOTORS COMPANY

5. Using terminal release tool J-38125-566, press the prongs into the holes on each side of the terminal to be removed to release the lock tabs and pull the terminal out of the connector body.

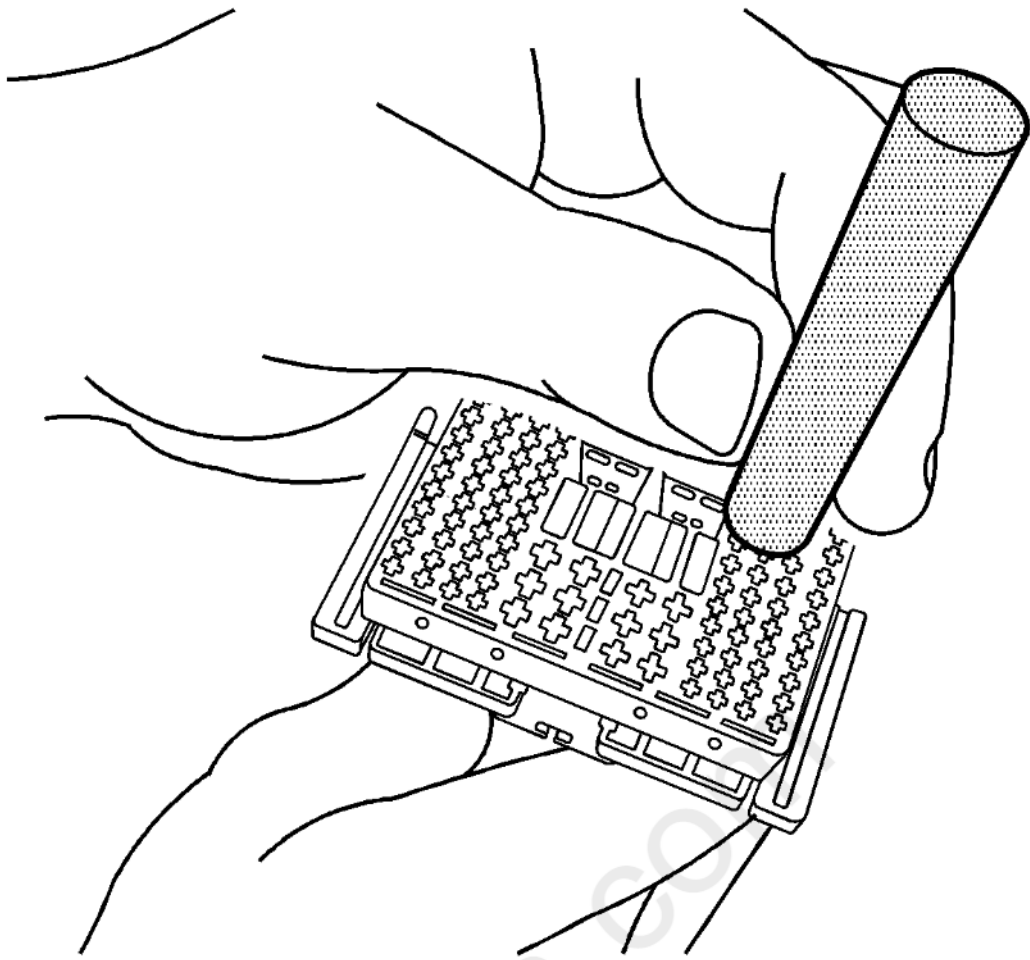


Fig. 171: Using Terminal Release Tool

Courtesy of GENERAL MOTORS COMPANY

6. Using terminal release tool J-38125-560, press the prongs into the holes on each side of the terminal to be removed to release the lock tabs and pull the terminal out of the connector body.

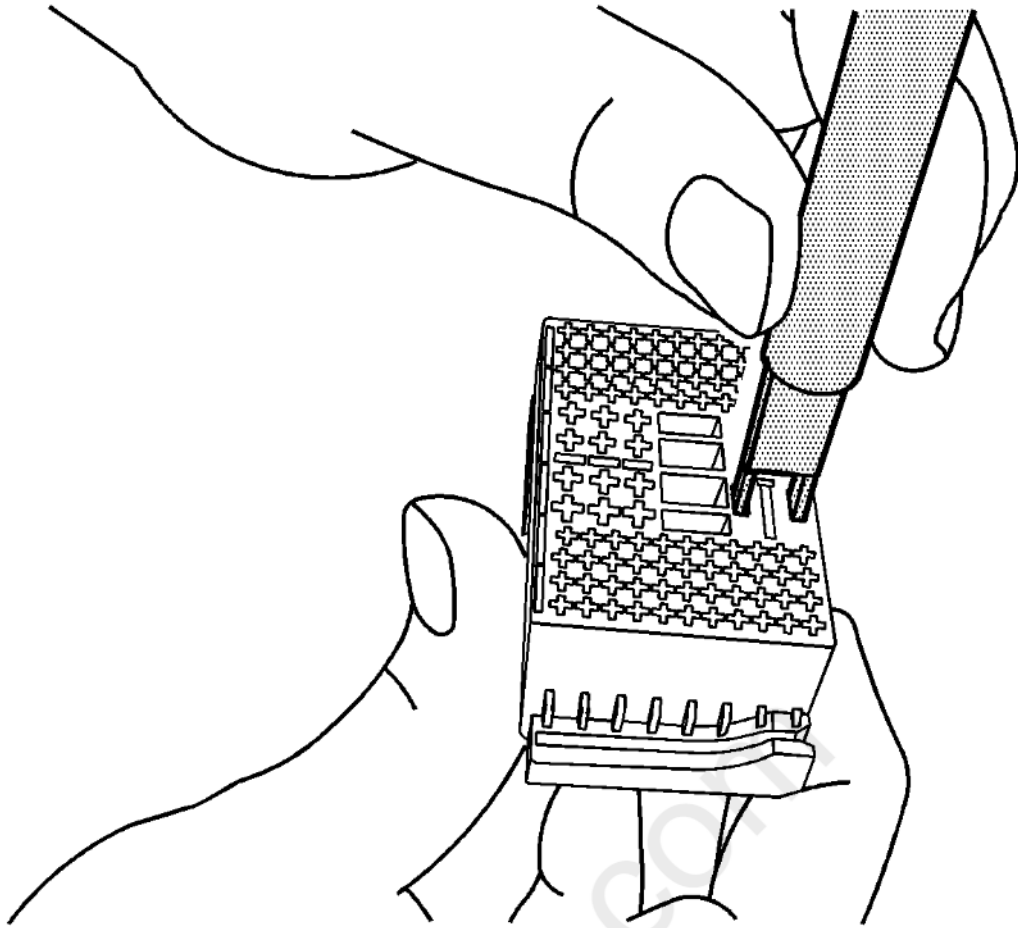


Fig. 172: Releasing Lock Tabs - Tyco/AMP (102-Way Inline)

Courtesy of GENERAL MOTORS COMPANY

7. Using terminal release tool J-38125-221, press the prongs into the holes on each side of the terminal to be removed to release the lock tabs and pull the terminal out of the connector body.

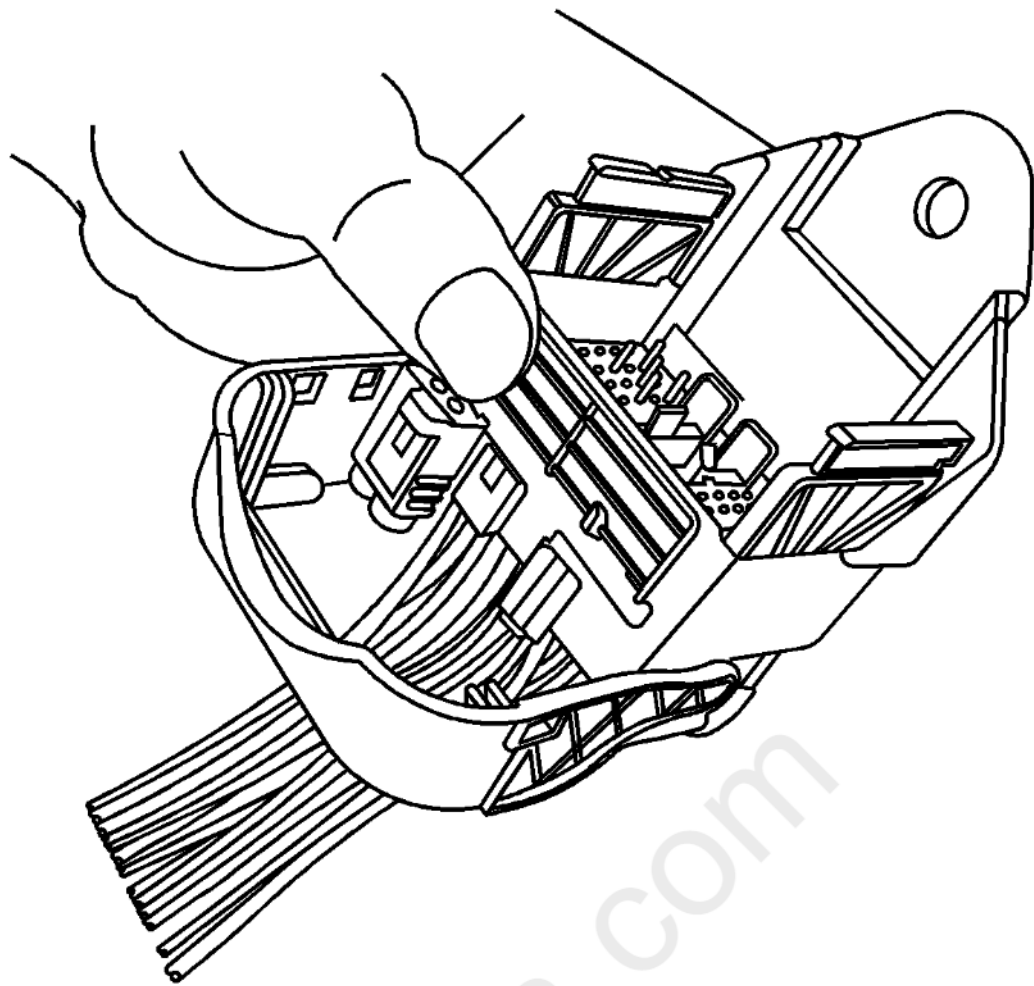


Fig. 173: View Of Female Connector Body - Tyco/AMP (102-Way Inline)

Courtesy of GENERAL MOTORS COMPANY

8. The female connector body may have an additional connector hooked to the edge of the body. Use terminal release tool J-38125-11A or equivalent to release the locking tab and slide the connector off the female body.

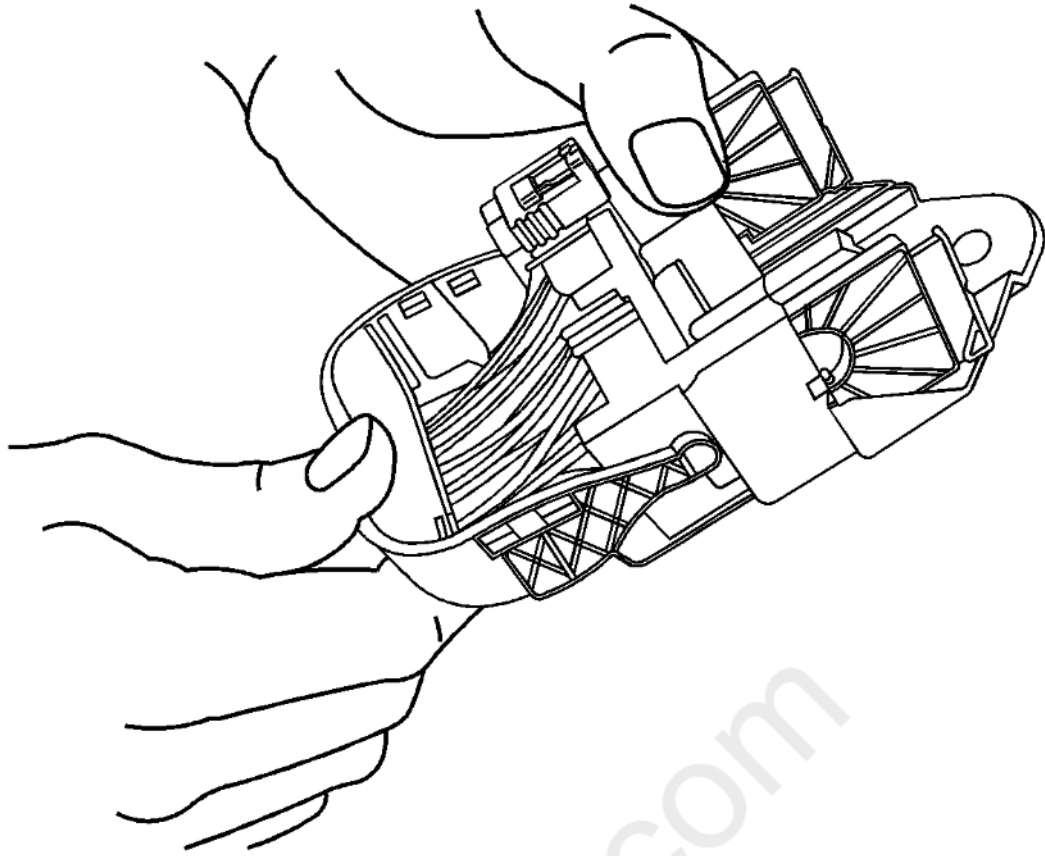


Fig. 174: Moving Locking Lever

Courtesy of GENERAL MOTORS COMPANY

9. Move the locking lever 180 degrees from the connected position.

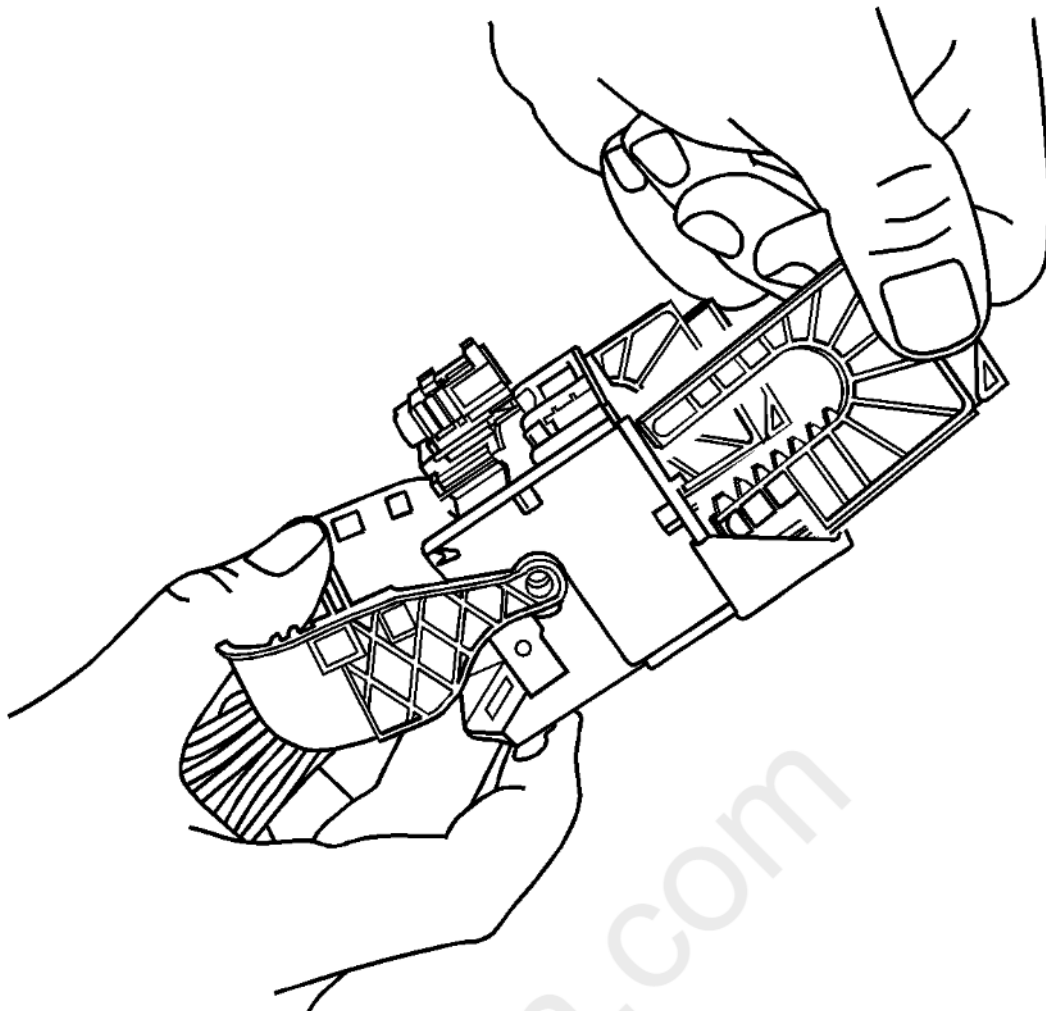


Fig. 175: Guide Plates And Connector Body
Courtesy of GENERAL MOTORS COMPANY

10. With the locking lever in the 180 degree position the guide plates can be removed from the connector body.

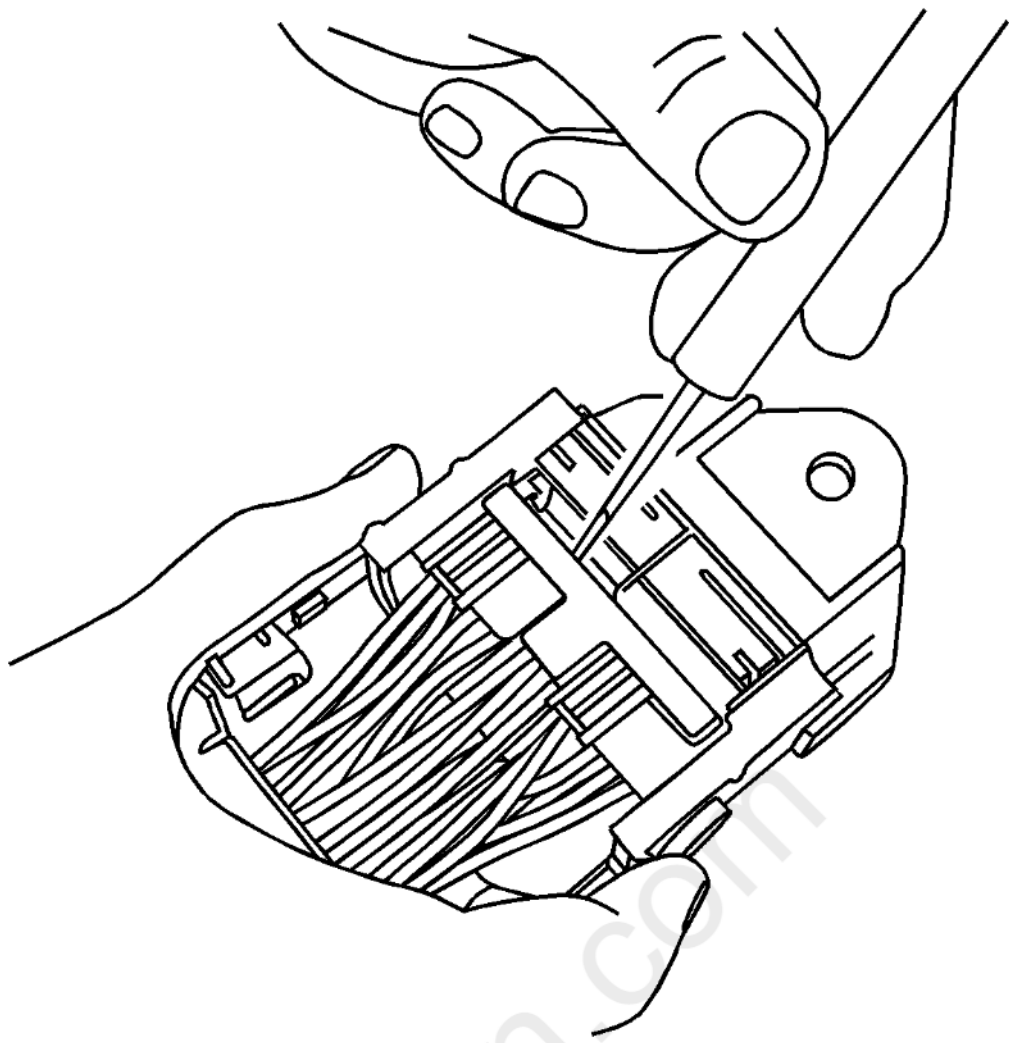


Fig. 176: Removing TPA

Courtesy of GENERAL MOTORS COMPANY

NOTE: During assembly the TPA will not fully seat if any terminal is not fully seated.

11. Using terminal release tool J-38125-11A or equivalent, remove the TPA from the connector body.

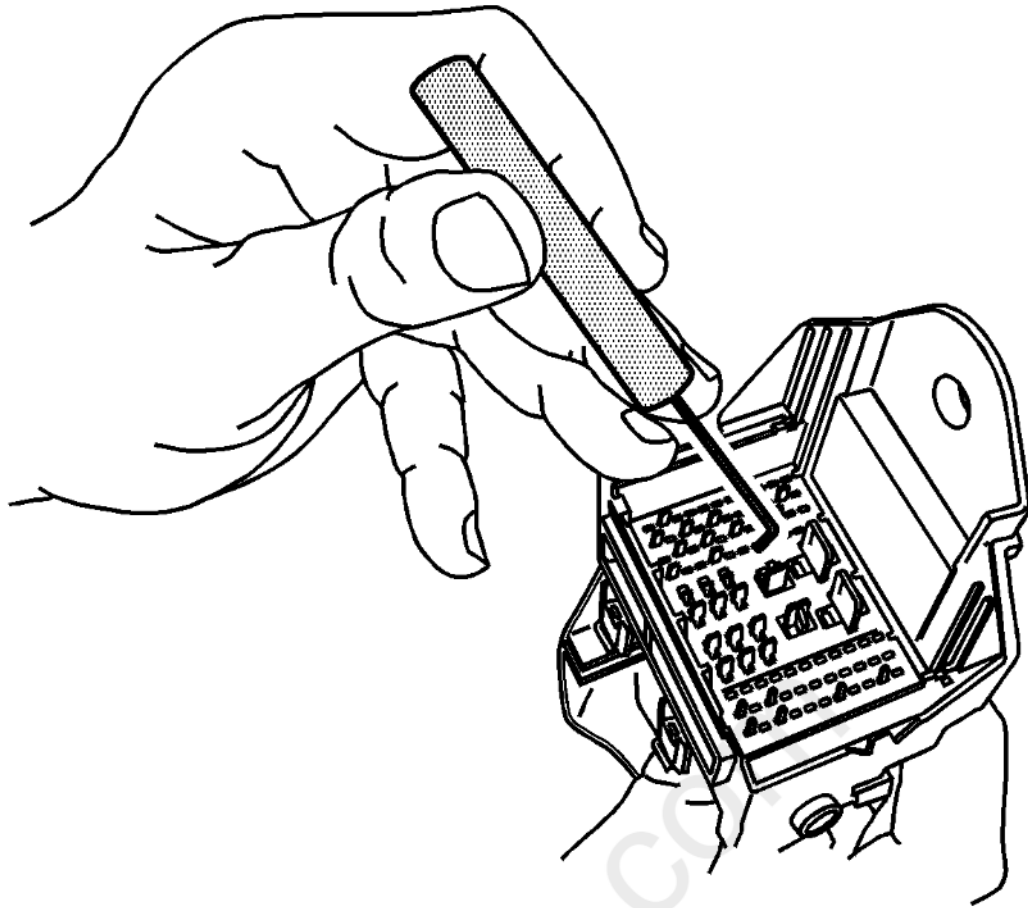


Fig. 177: Lifting Terminal Plate

Courtesy of GENERAL MOTORS COMPANY

12. Using terminal release tool J-38125-216, lift the terminal plate past the terminals and out of the connector body cavity.

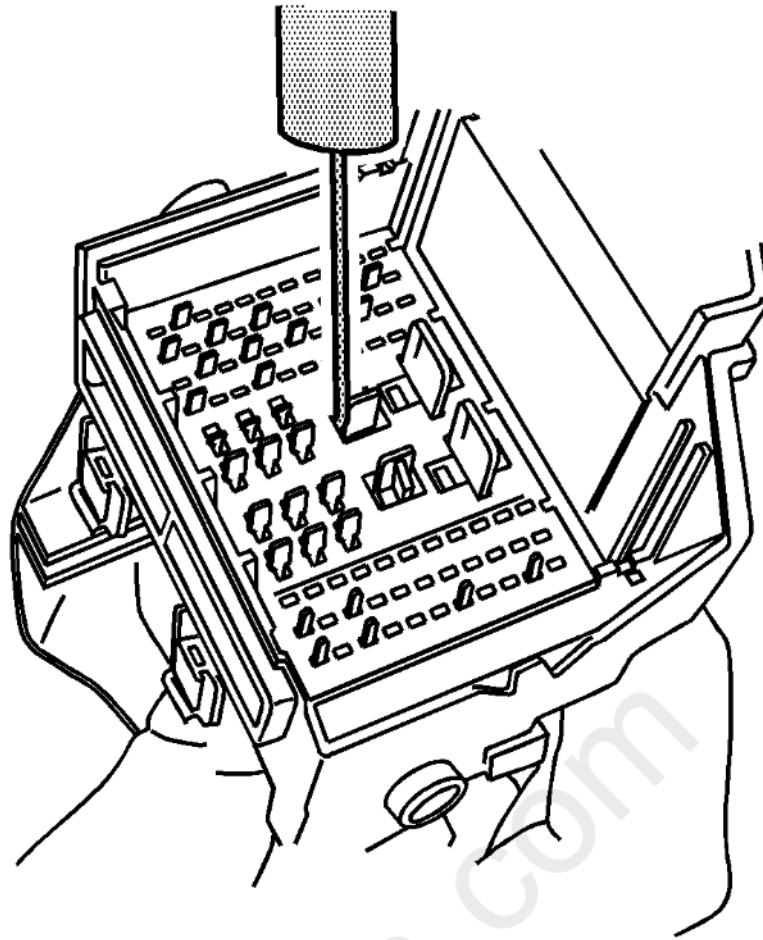


Fig. 178: View Of Terminal Plate

Courtesy of GENERAL MOTORS COMPANY

13. Terminal plate will bind slightly on each corner.

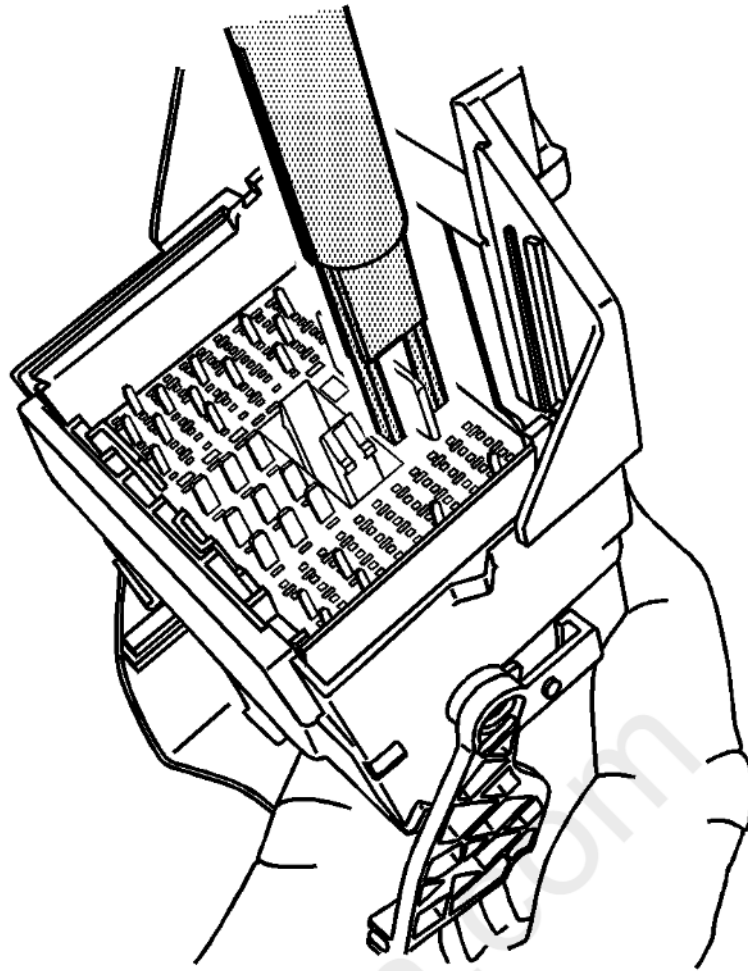


Fig. 179: Releasing Lock Tabs

Courtesy of GENERAL MOTORS COMPANY

14. Using terminal release tool J-38125-221, press the prongs into the holes on each side of the terminal to be removed to release the lock tabs and pull the terminal out of the connector body.

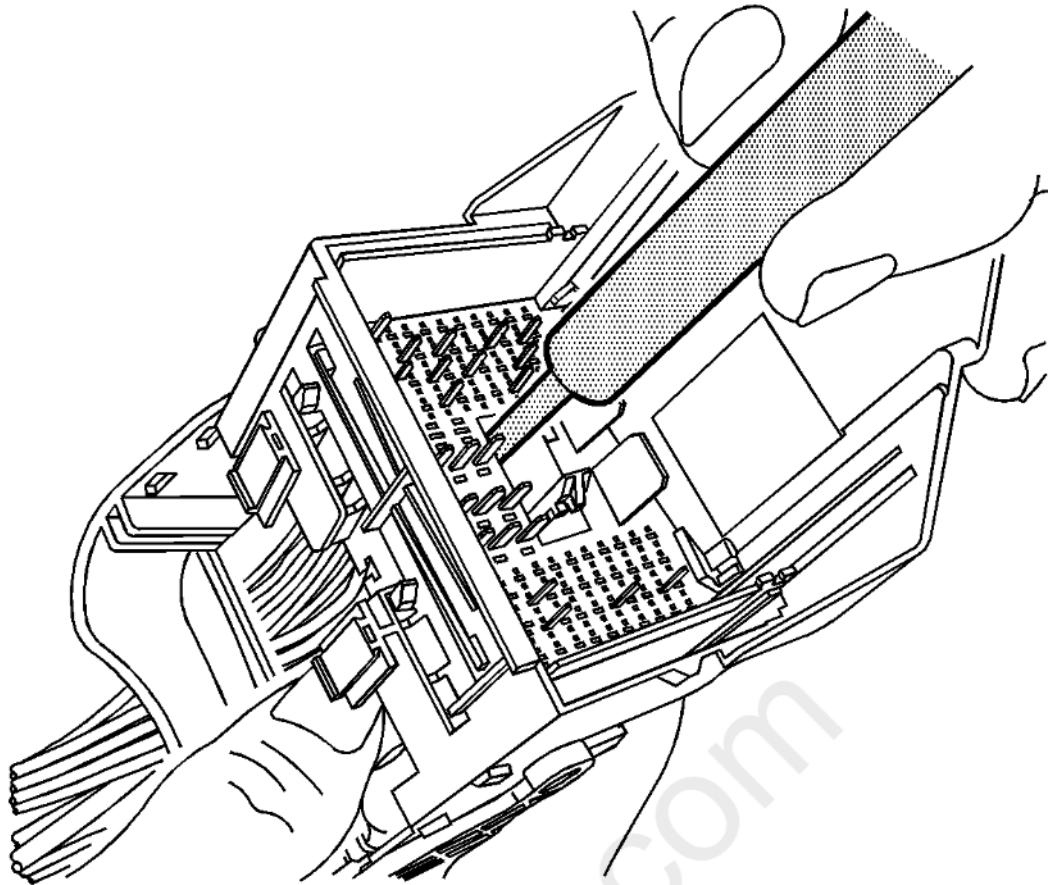


Fig. 180: View of Pressing Prongs On Each Side Of Terminal
Courtesy of GENERAL MOTORS COMPANY

15. Using terminal release tool J-38125-212, press the prongs into the holes on each side of the terminal to be removed to release the lock tabs and pull the terminal out of the connector body.

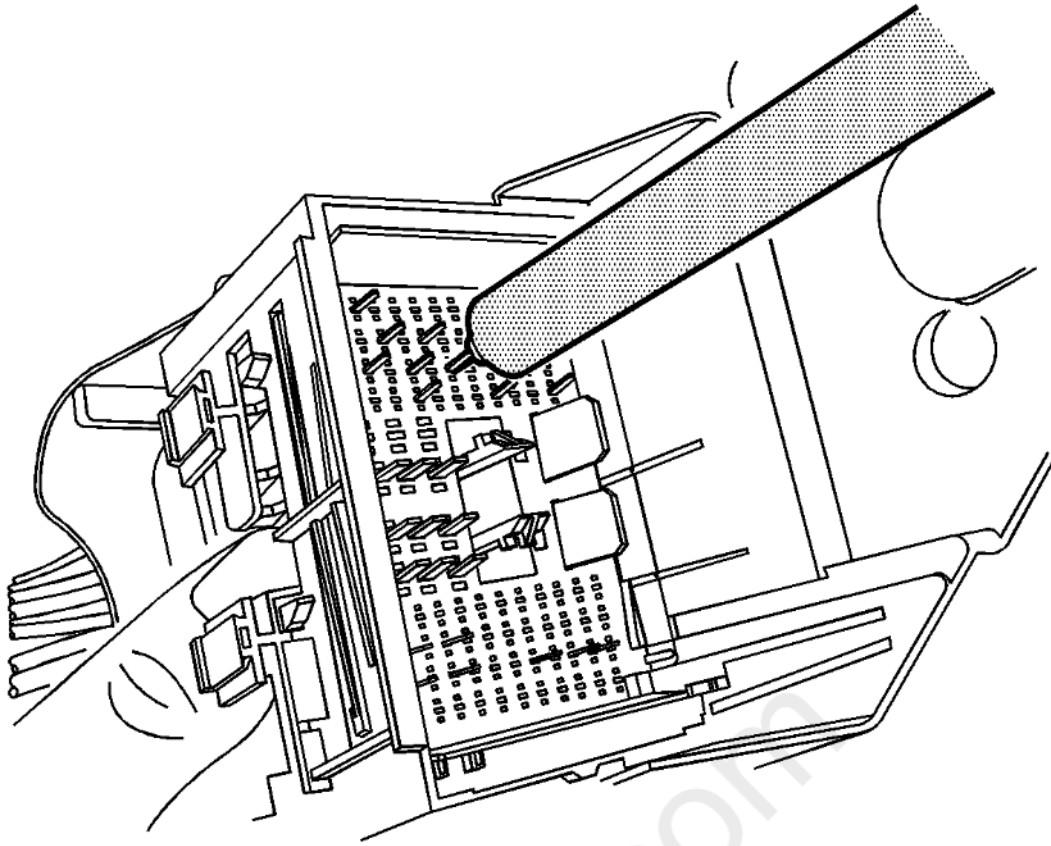


Fig. 181: Pressing Prongs On Each Side Of Terminal - Tyco/AMP (102-Way Inline)
Courtesy of GENERAL MOTORS COMPANY

16. Using terminal release tool J-38125-560, press the prongs into the holes on each side of the terminal to be removed to release the lock tabs and pull the terminal out of the connector body.

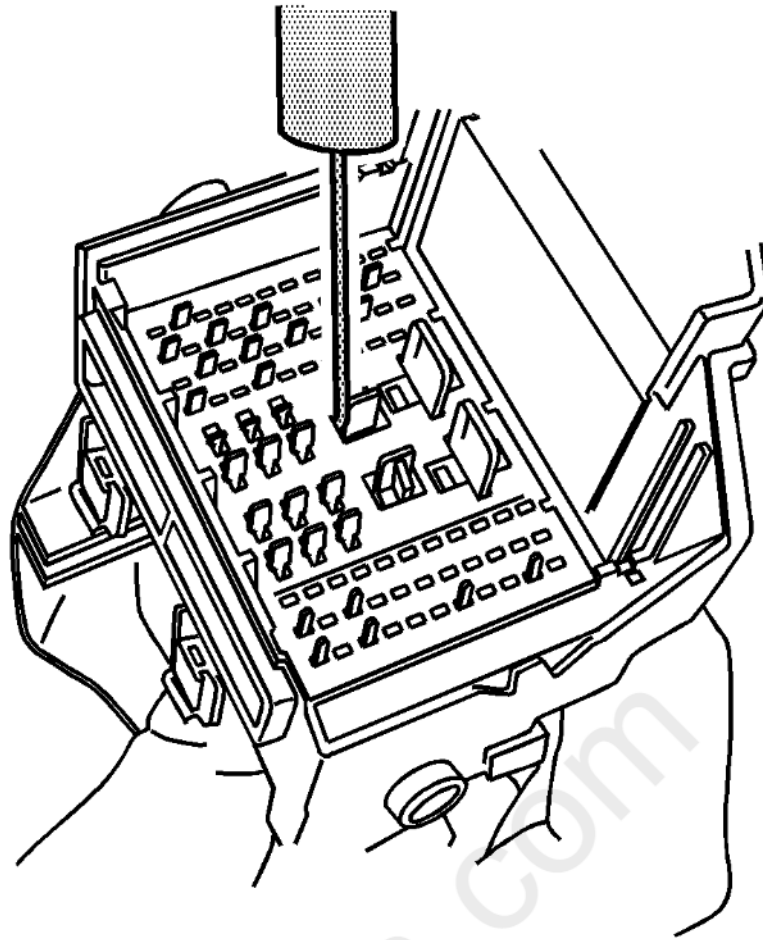


Fig. 182: View Of Terminal Plate

Courtesy of GENERAL MOTORS COMPANY

17. Press the terminal plate back into the female connector to the preset position. The plate will bind slightly on each corner.

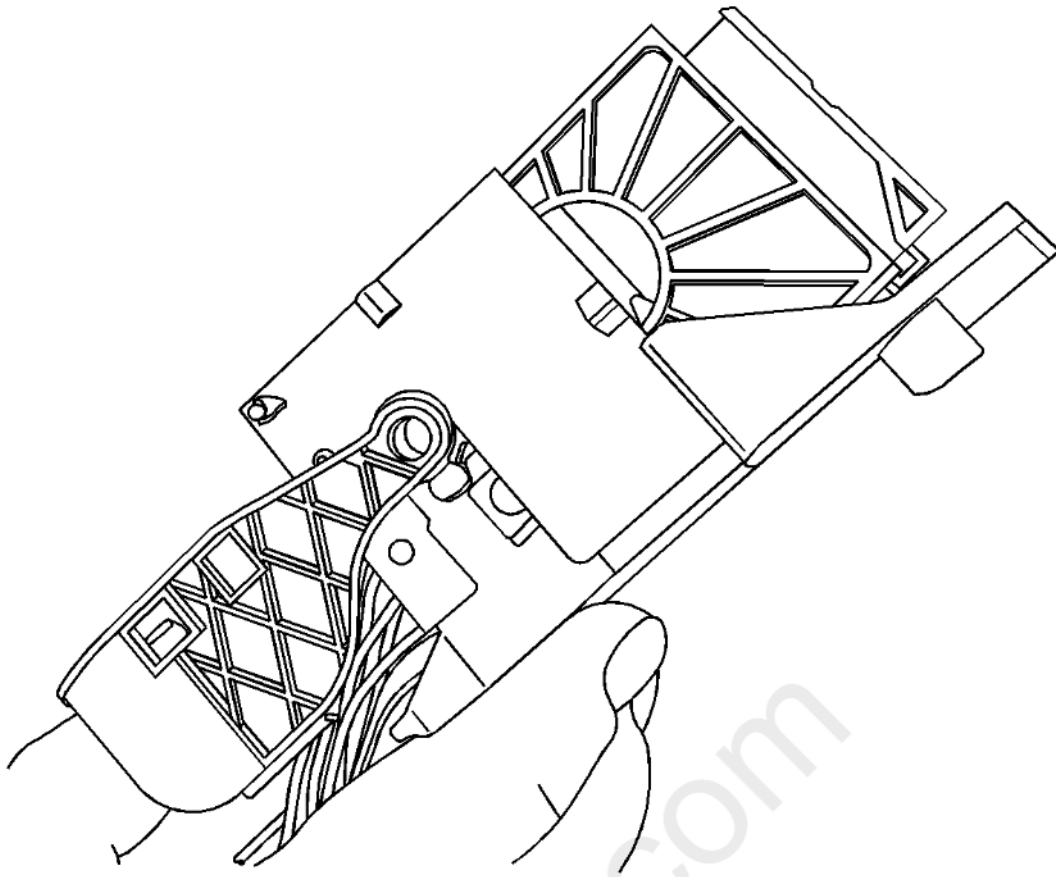


Fig. 183: Aligning Guide Plates To Mesh With Locking Lever Gears
Courtesy of GENERAL MOTORS COMPANY

18. With the locking lever in the 180 degree position, align the guide plates to mesh with the gears on the locking lever.

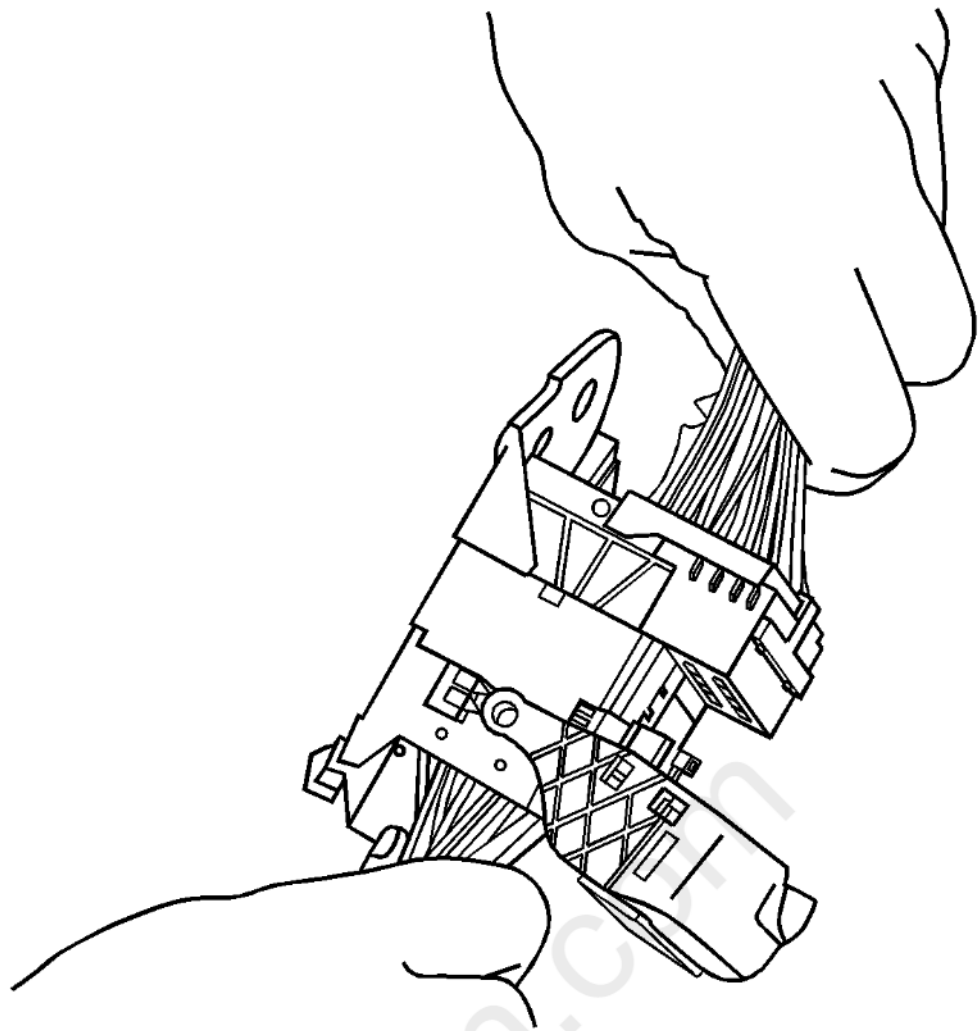


Fig. 184: Sliding Male Connector Body Away From Guide Plates
Courtesy of GENERAL MOTORS COMPANY

19. Slide the male connector body back inward toward the guide plates.

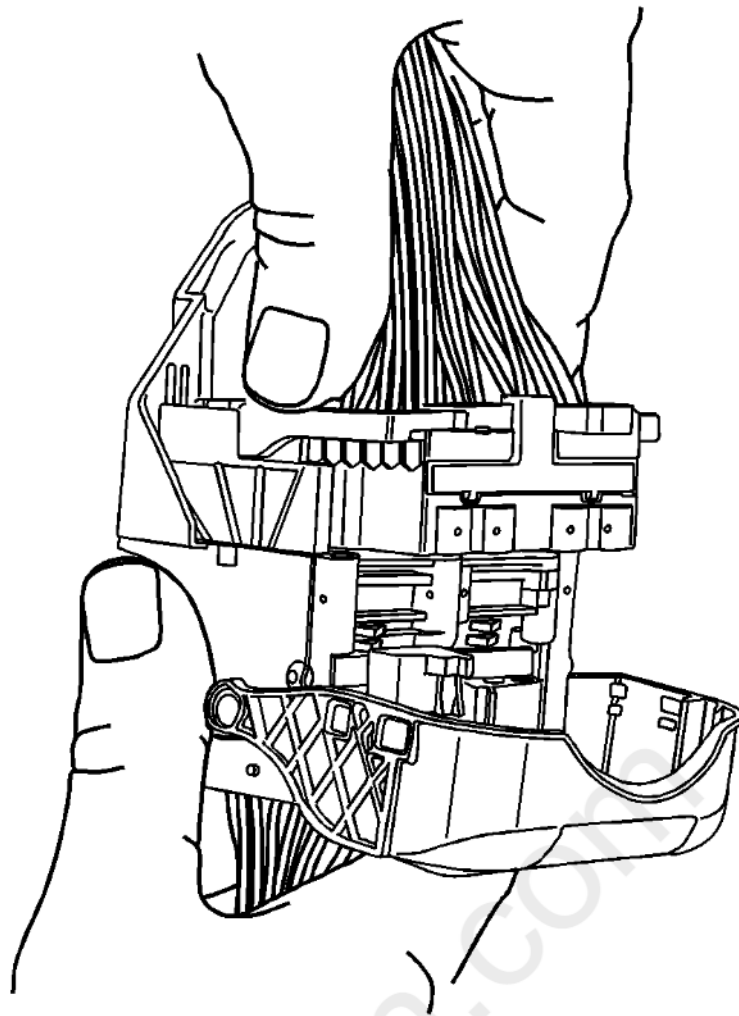


Fig. 185: Assembled View Of Connector - Tyco/AMP (102-Way Inline)
Courtesy of GENERAL MOTORS COMPANY

20. With the locking lever in the 90 degree position and the male connector body connected, it can be slid inward for assembly.

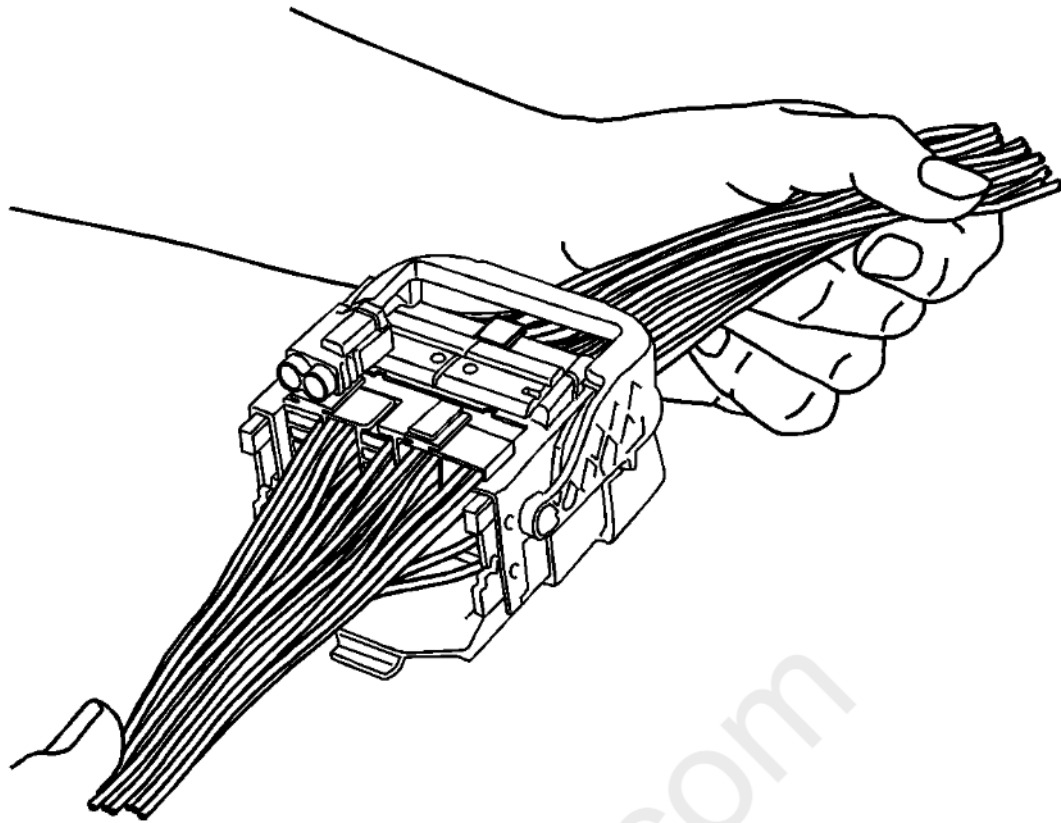


Fig. 186: View Of Typical Connector In Assembled Position

Courtesy of GENERAL MOTORS COMPANY

21. Move the lever into the locked position or in the assembled position. This will pull the male connector down into the female connector.
22. Repair the terminal by following the [Repairing Connector Terminals \(Terminated Lead Repair\)](#)[Repairing Connector Terminals \(Terminal Repair\)](#) procedure.
23. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

TYCO/AMP CONNECTORS (SIR)

Special Tools

- **EL-38125 - 550** Terminal Release Tool Kit
- **EL-38125 - 580** Terminal Release Tool Kit
- **J-38125 - 11A** Terminal Release Tool
- **J-38125-215A** Terminal Release Tool

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

Removal Procedure

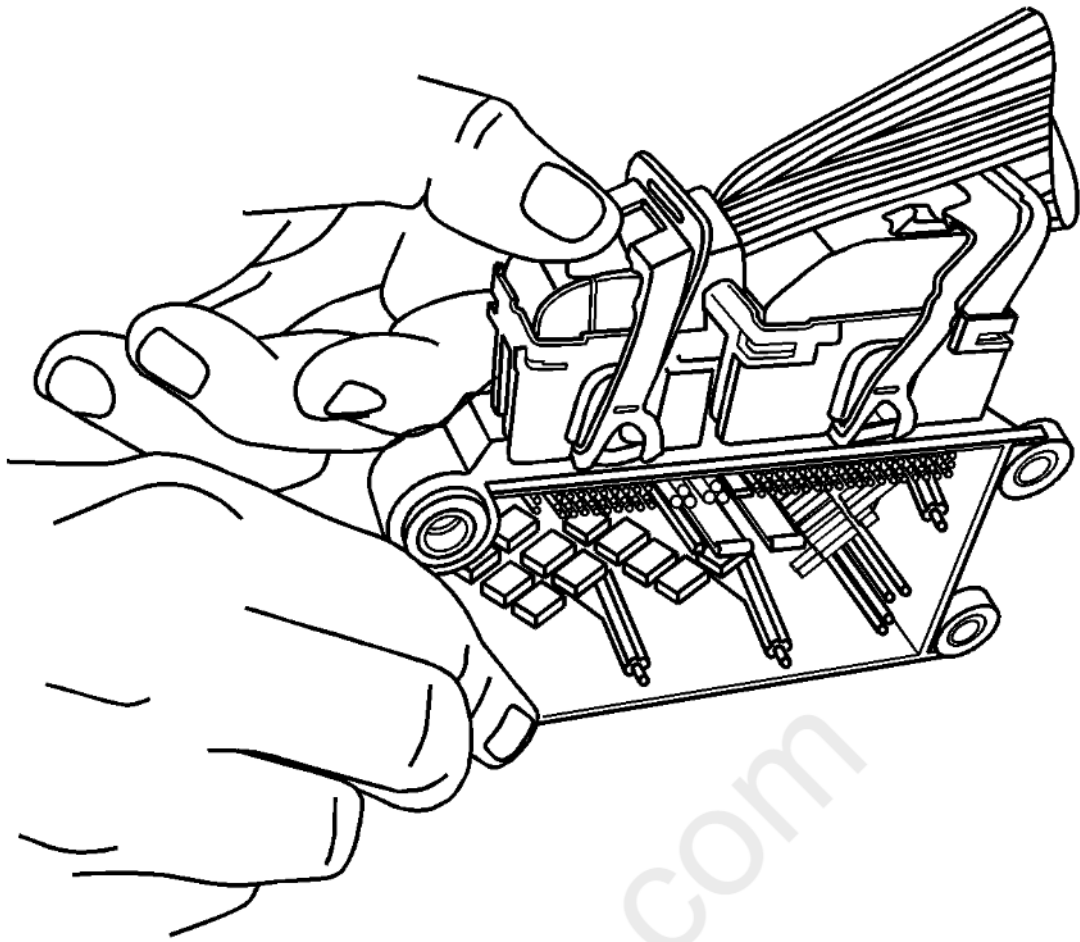


Fig. 187: Sliding Red CPA Away From Connector Lever

Courtesy of GENERAL MOTORS COMPANY

1. Using your thumbs press down and slide the red CPA away from the connector lever.

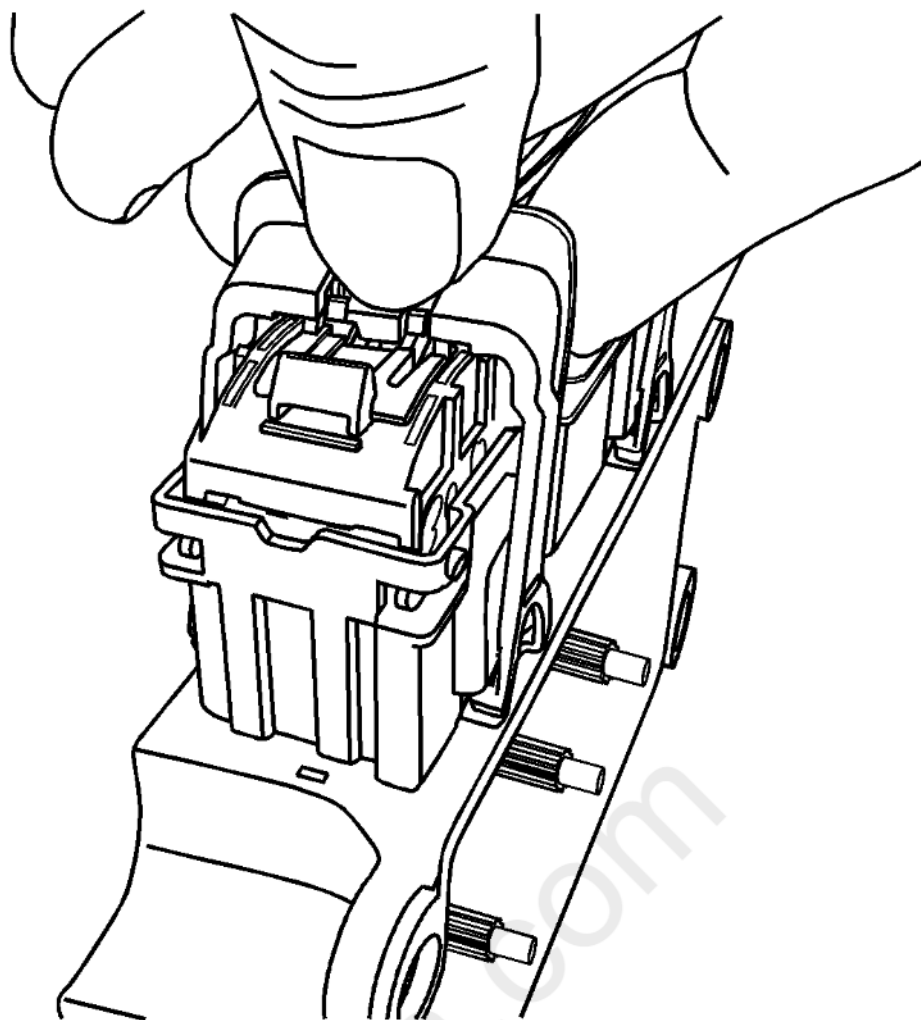


Fig. 188: Pressing Down On Locking Tab - Tyco/AMP Connectors (SIR)
Courtesy of GENERAL MOTORS COMPANY

2. Using your thumb press down on the locking tab and move the lever to the released position.

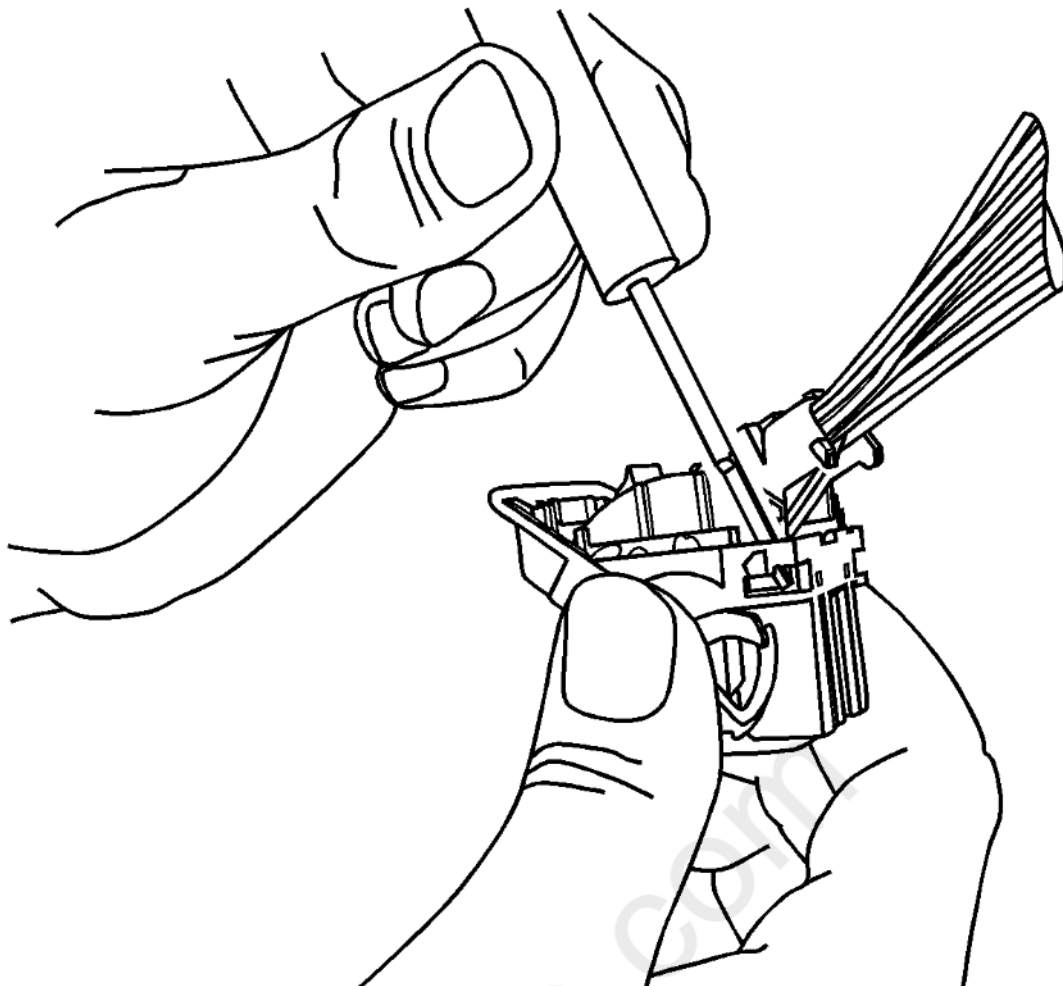


Fig. 189: Releasing Wire Dress Cover Locking Tabs

Courtesy of GENERAL MOTORS COMPANY

3. Using terminal tool J-38125-11A or equivalent, release the wire dress cover locking tabs.

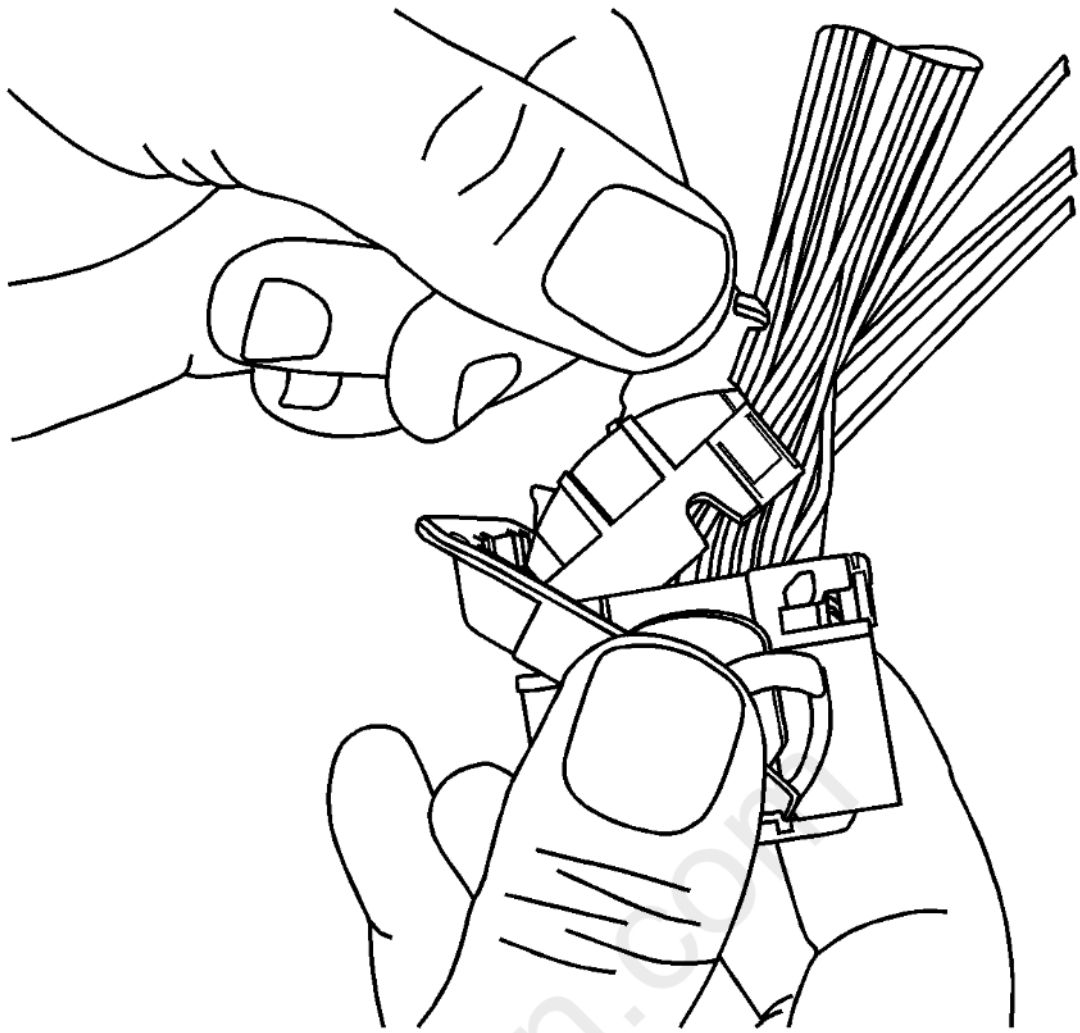


Fig. 190: Pivoting Connector Wire Dress Cover

Courtesy of GENERAL MOTORS COMPANY

4. Pivot connector wire dress cover while removing from the connector body.

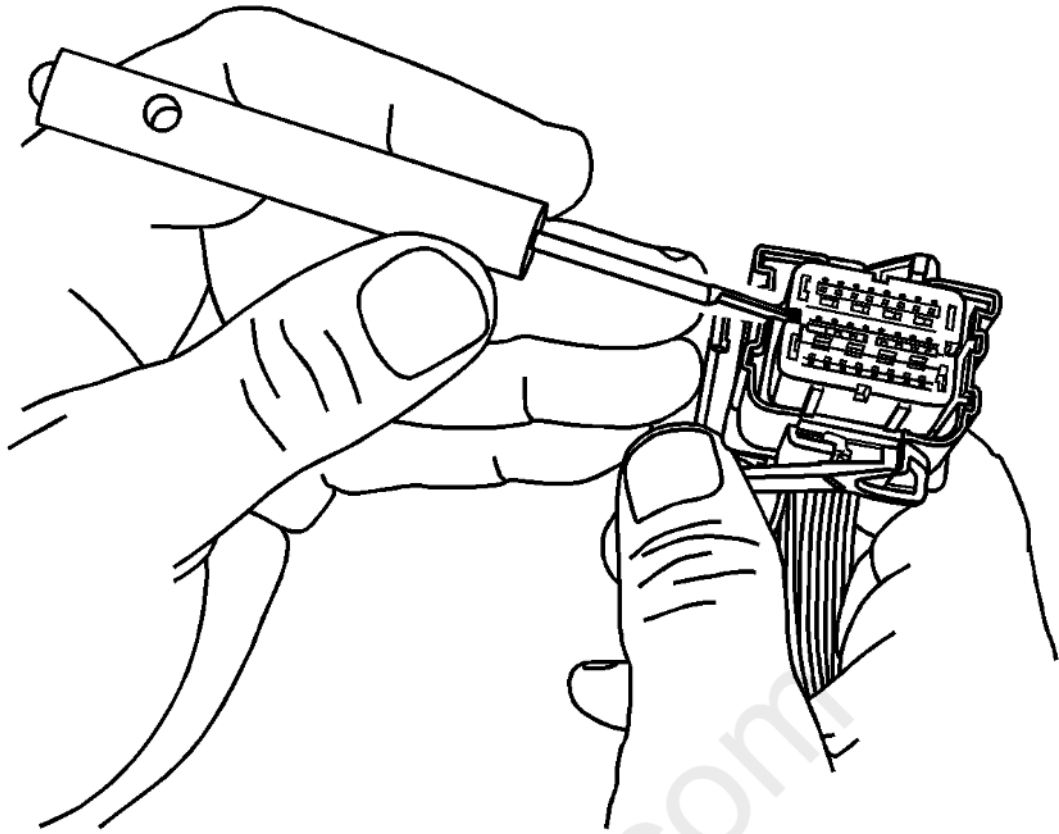


Fig. 191: Removing TPA

Courtesy of GENERAL MOTORS COMPANY

5. Using terminal tool J-38125-11A or equivalent, remove the TPA by lifting straight off the connector body.

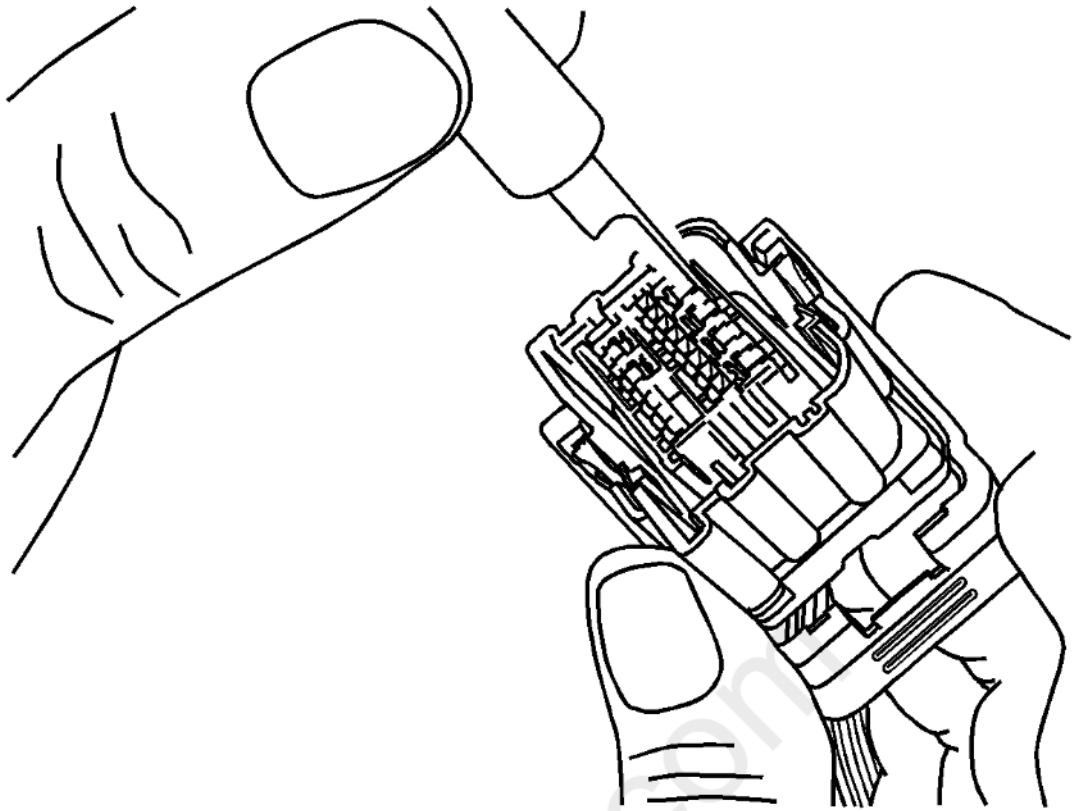


Fig. 192: View of Terminal Release Tool & Rear of Connector Body
Courtesy of GENERAL MOTORS COMPANY

6. Using terminal release tool J-38125-215A, place the tip of the tool on the outside edge next to the terminal and depress the lock tab and remove the rear of the connector body.

Terminal Repair Procedure

Use the appropriate terminal and crimper in order to replace the terminal.

YAZAKI CONNECTORS (2-WAY)

Special Tools

- **EL-38125-550** Terminal Release Tool Kit
- **EL-38125-580** Terminal Release Tool Kit
- **J-38125-553** Terminal Release Tool

For equivalent regional tools, refer to **Special Tools** .

Terminal Removal Procedure

1. Disconnect the connector from the component.

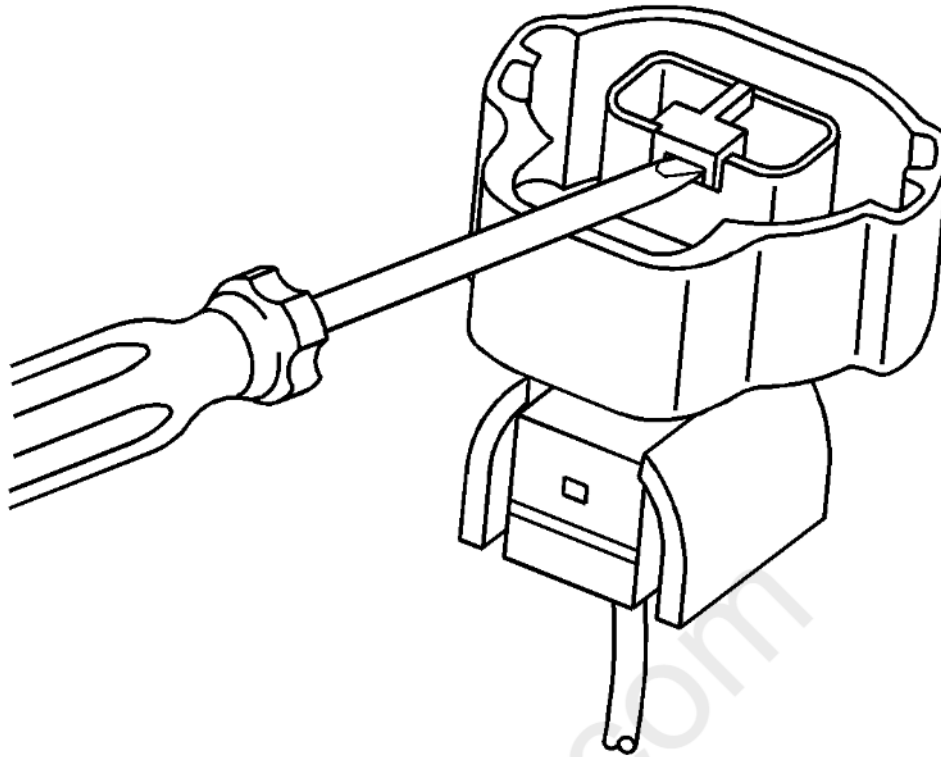


Fig. 193: Identifying Terminal Position Assurance (Yakazi)

Courtesy of GENERAL MOTORS COMPANY

2. Insert a small flat-blade tool in the slot below the front loaded terminal position assurance (TPA) and pry up.
3. Remove the TPA by pulling it out of the connector.
4. Push the wire side of the terminal that is being removed toward the connector and hold it in position.

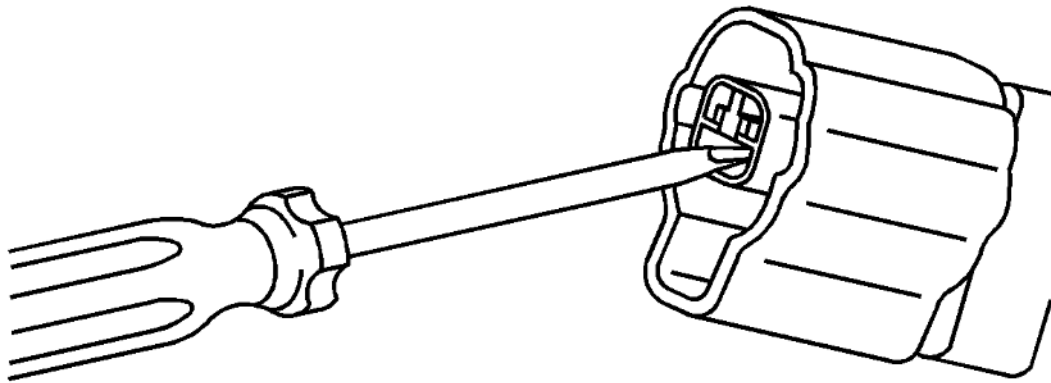


Fig. 194: View Of Inserting Tool Into Terminal Cavity_(Yakazi)

Courtesy of GENERAL MOTORS COMPANY

5. Insert the J-38125-553 on a slight upward angle into the cavity below the terminal to be removed. Ensure that the pointed on the end of the tool is facing the bottom of the terminal and it stays in contact with the terminal until it stops on the plastic terminal retainer.

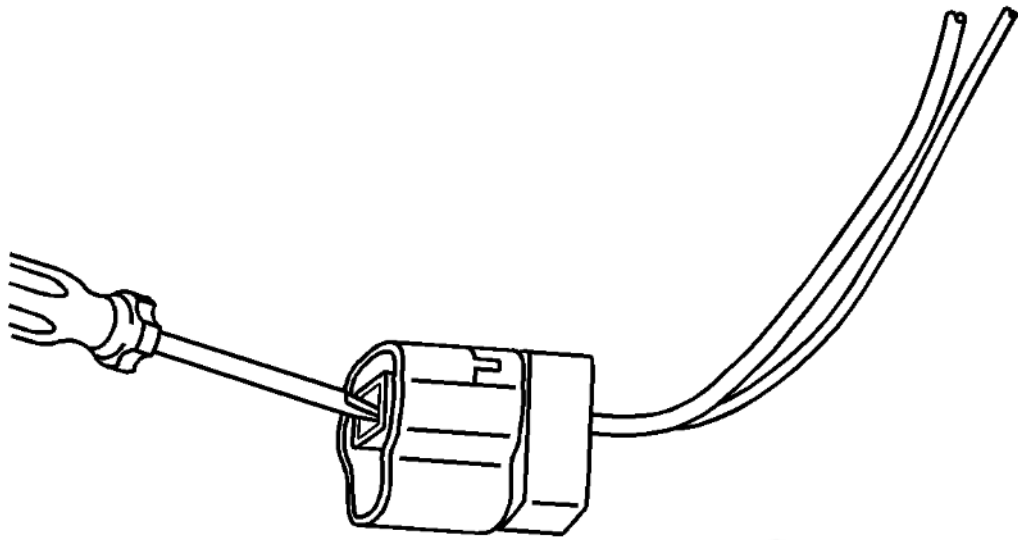


Fig. 195: View Of Pulling Terminal Out Of Connector (Yakazi)

Courtesy of GENERAL MOTORS COMPANY

6. Gently pry the plastic terminal retainer down and carefully pull the terminal out of the connector. Always remember never use force when pulling a terminal out of a connector. If the terminal is difficult to remove, repeat the entire procedure.
7. Repair the terminal by following the **Repairing Connector Terminals (Terminated Lead Repair)** procedure.
8. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

YAZAKI CONNECTORS (16-WAY)

Special Tools

- **EL-38125-550** Terminal Release Tool Kit
- **EL-38125-580** Terminal Release Tool Kit
- **J-38125-215** Terminal Release Tool

For equivalent regional tools, refer to **Special Tools** .

Terminal Removal Procedure

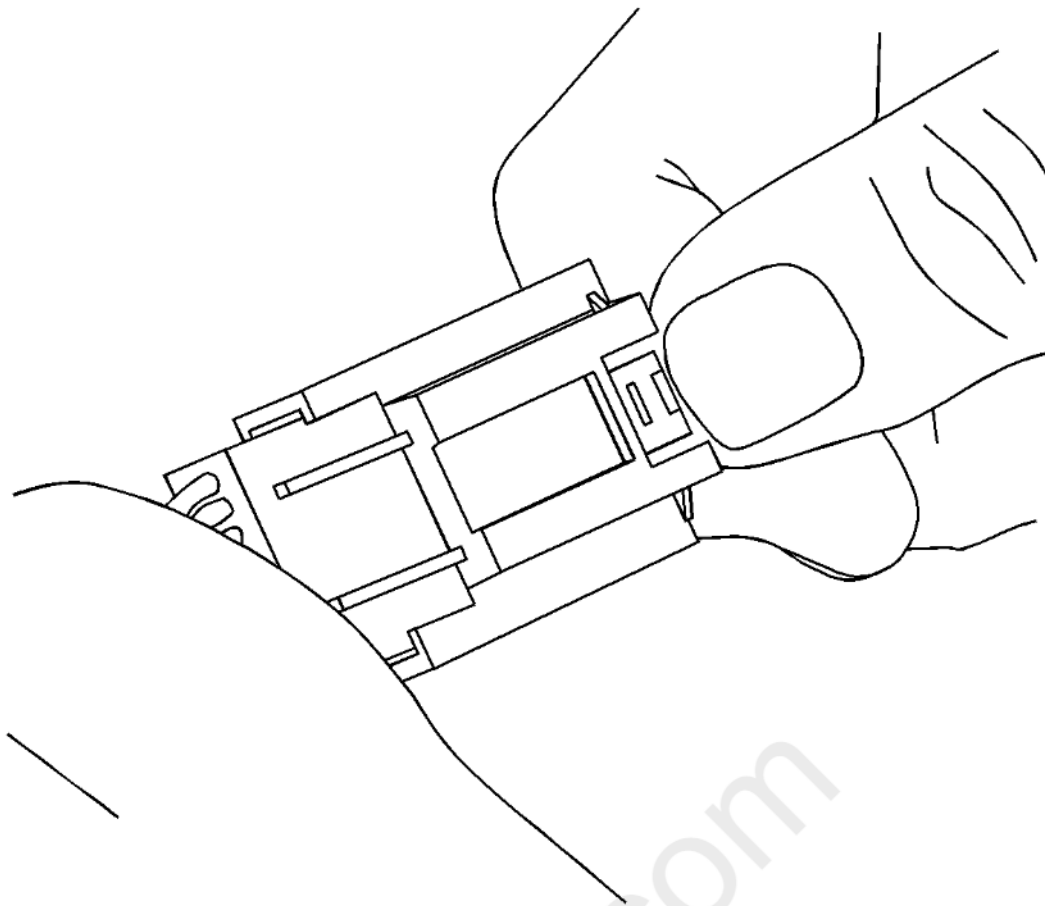


Fig. 196: Pulling Two Connector Halves Apart
Courtesy of GENERAL MOTORS COMPANY

1. While depressing the lock, pull the two connector halves apart.

NOTE: The terminal position assurance (TPA) is fragile and may break if not done carefully.

2. Use a small flat-blade tool to very carefully push the TPA towards the face of the connector on both sides of the connector.

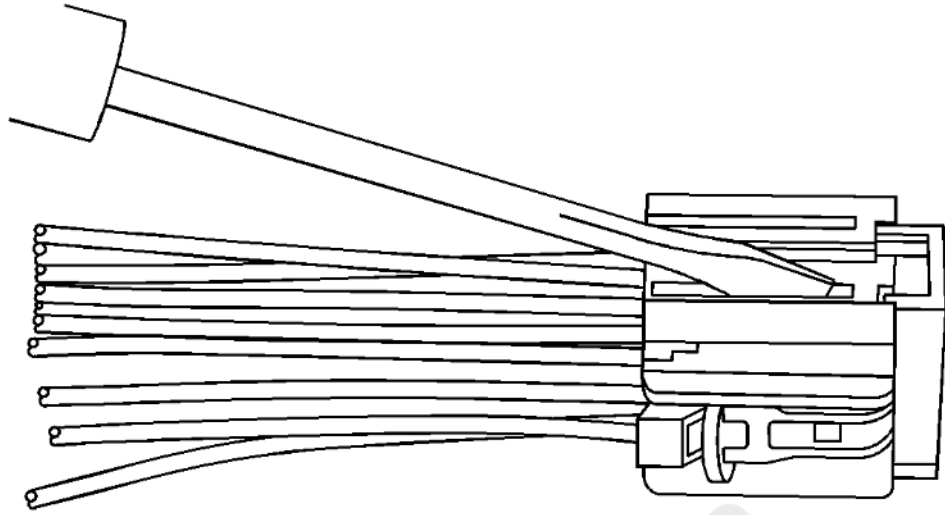


Fig. 197: View Of Male Connector Half & Female Terminals
Courtesy of GENERAL MOTORS COMPANY

3. View of the male half of the connector with female terminals.

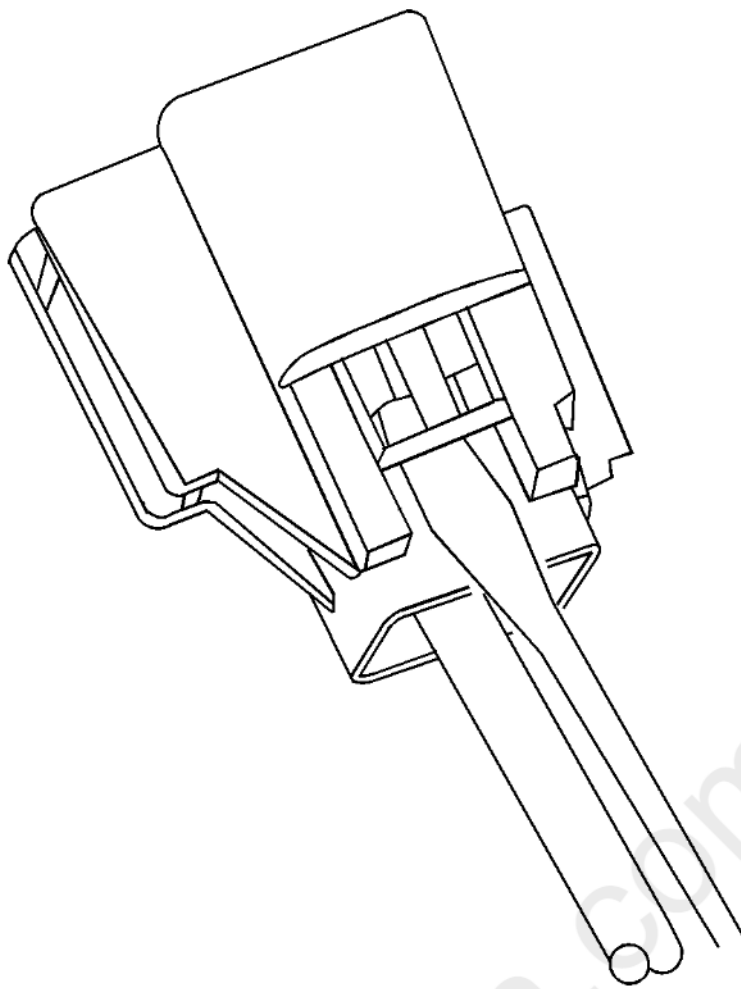


Fig. 198: View Of Female Half Of Connector With Male Terminals
Courtesy of GENERAL MOTORS COMPANY

4. View of the female half of the connector with male terminals.
5. Use the J-38125-215 tool to release the terminals by inserting the tool into the terminal release cavity.

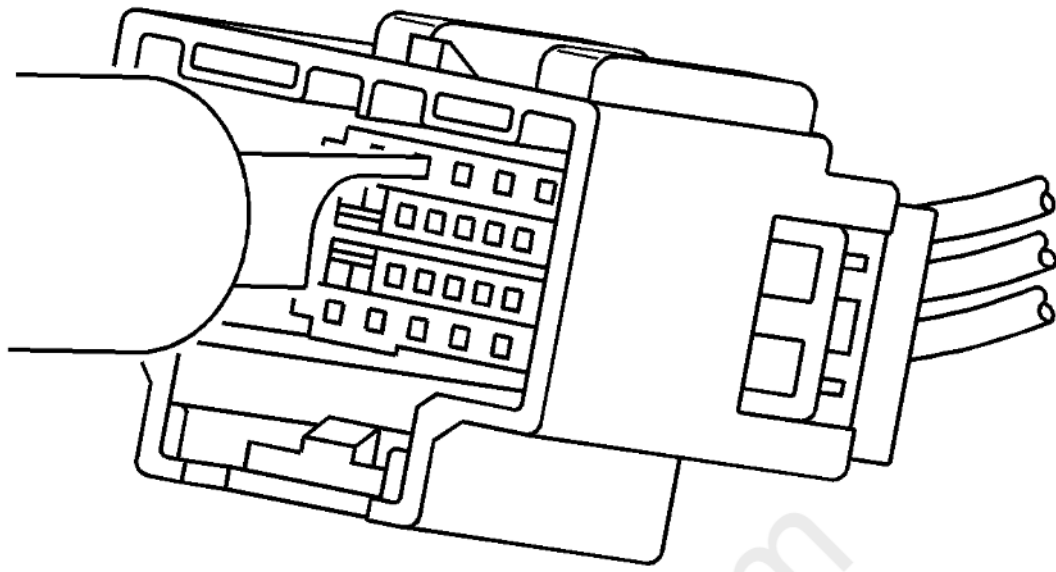


Fig. 199: Using Removal Tool On Female Half Of Connector
Courtesy of GENERAL MOTORS COMPANY

6. View of the female half of the connector with male terminals.

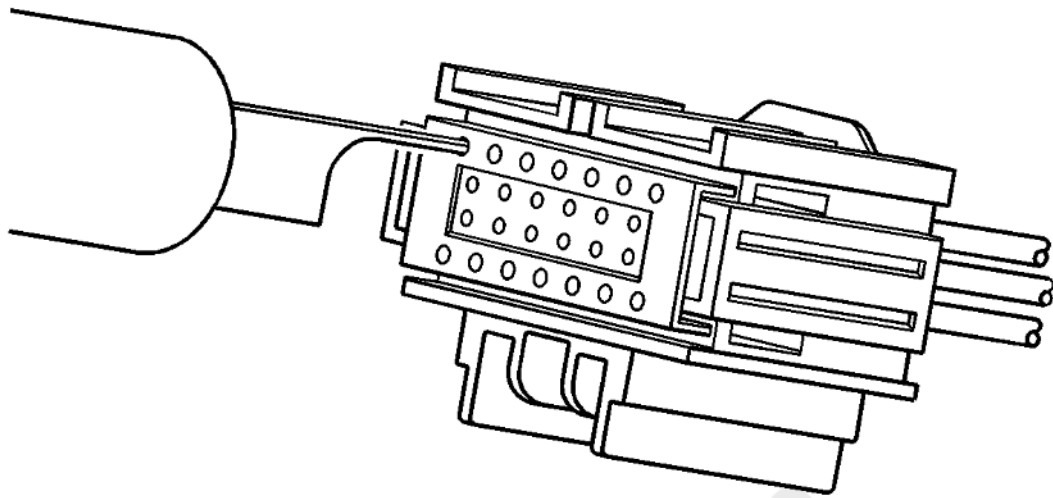


Fig. 200: Using Removal Tool On Male Half Of Connector
 Courtesy of GENERAL MOTORS COMPANY

7. View of the male half of the connector with female terminals.
8. While holding the removal tool in place, gently pull the wire out of the back of the connector. Always remember never use force when pulling a terminal out of a connector.
9. Repair the terminal by following the [Repairing Connector Terminals \(Terminated Lead Repair\)](#) procedure.
10. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

REPAIRING CONNECTOR TERMINALS (TERMINATED LEAD REPAIR)

Special Tools

EL-38125-10 Splice Sleeve Crimp Tool

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

NOTE: All repairs near the engine manifold, turbo engine and all exhaust pipes should follow the High Temperature Wiring Repairs procedures.

For high temperature wiring repairs, refer to [High Temperature Wiring Repairs](#).

Terminated leads are terminals that are crimped onto wires. The terminated lead can be used throughout the vehicle since it is designed for temperatures up to 150°C. The length of the wire is 450 mm.

1. Use the connector end view to identify the correct terminated lead.
2. The terminated lead package should include a DuraSeal splice sleeve. If not, use the chart to in Splicing Copper Wire Using Splice Sleeves to identify the correct DuraSeal splice sleeve, refer to

REPAIRING CONNECTOR TERMINALS (TERMINAL REPAIR)

Special Tools

- **J-38125 - 580** Terminal Repair Kit
- **J-38125-6** Crimp Tool
- **J-38125-7** Crimp Tool
- **J-38125-8** Crimp Tool
- **J-38125-64** Crimp Tool
- **J-38125-101** Crimp Tool
- **J-38125-641** Crimp Tool
- **J-38125-642** Crimp Tool
- **J-38125-643** Crimp Tool

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

Use the following repair procedures to repair each type of terminal:

- For push to seat terminals, refer to [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 \(Steering Gear\)](#).
- For pull to seat terminals, refer to [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 \(Steering Gear\)](#).

NOTE: **The first step for all terminal repairs is to find the connector end view in SI.**

Cable Seal Terminals

1. Cut off the terminal between the core and the insulation crimp to minimize any wire loss.
2. Remove the old seal.
3. Apply the correct cable seal, per the wire gauge size, from the kit. Slide the seal back along the wire to enable removal of the insulation.
4. To minimize wire loss, remove only the insulation required.
5. Using the connector end view, determine the correct crimp tool and crimp jaw.
6. Align the seal with the end of the cable insulation.
7. Position the stripped wire and seal in the terminal.
8. Hand Crimp the core wings first.
9. Hand Crimp the insulation wings around the seal and the cable.

Unsealed Terminals

1. Cut off the terminal between the core and the insulation crimp to minimize any wire loss.
2. To minimize wire loss, remove only the insulation required.
3. Position the stripped wire in the terminal.
4. Hand Crimp the core wings first.
5. Hand Crimp the insulation wings around the cable.

Micro-Pack 100W Size Terminal

The Micro-Pack 100W connectors have small terminals that are difficult to handle and hold when crimping. In order to aid the technician when crimping these terminals, a new crimping tool was developed. The J 38125-101 (W jaw) crimping tool was developed to crimp Micro-Pack 100W terminals. The J 38125-101 (W jaw) crimping tool has a terminal holding block that will hold the terminal in place

while the terminal is being crimped. After the terminal is removed from the connector perform the following procedure in order to repair Micro-Pack 100 terminals.

1. Cut the wire as close to the terminal as possible.

NOTE: After cutting the damaged terminal from the wire, determine if the remaining wire is long enough to reach the connector without putting a strain on the wire. If the wire is not long enough, splice a small length of the same gauge wire to the existing wire, then crimp the new terminal on the added wire.

2. Strip 5 mm (3/16 in) of insulation from the wire.

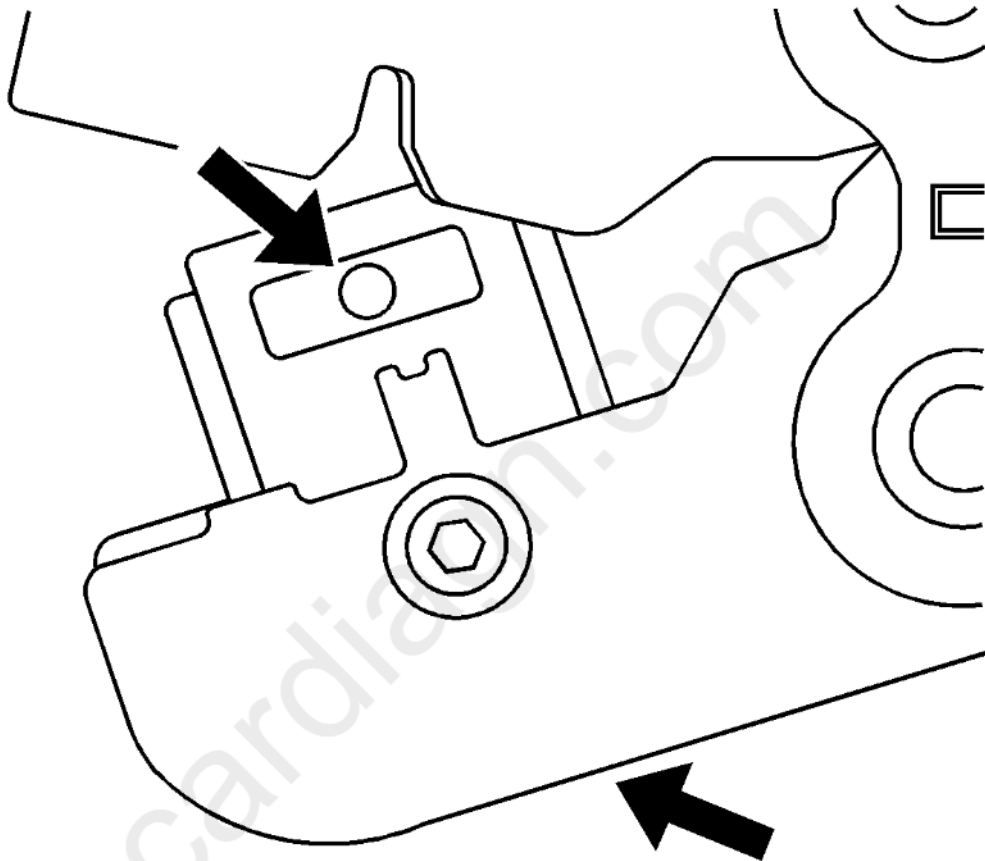


Fig. 201: Identifying Crimping Tool Spring Loaded Locator
Courtesy of GENERAL MOTORS COMPANY

3. Depress the spring loaded locator of the J 38125-101 (W jaw) crimping tool until the terminal holder is completely visible.

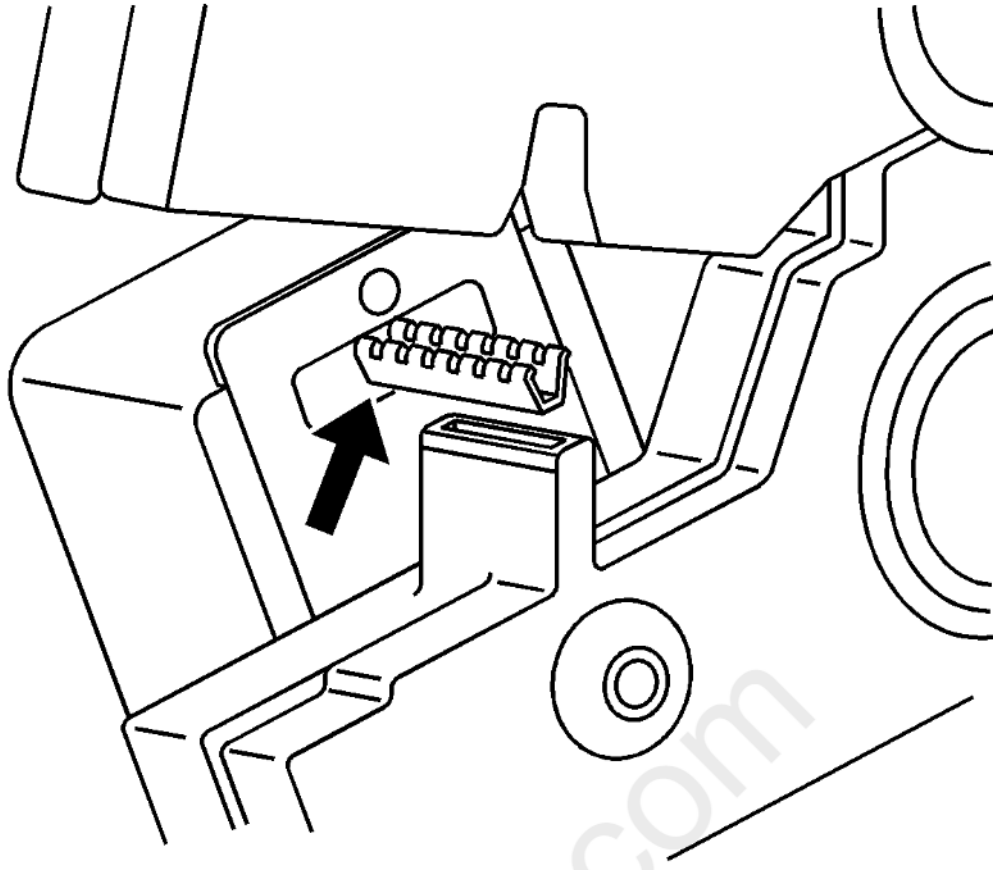


Fig. 202: Locating Terminal In Crimping Tool
 Courtesy of GENERAL MOTORS COMPANY

4. Insert the terminal into the crimp tool until the core wings are flush with the anvil on the crimp tool. Be sure that the wings are pointed toward the crimp tool former and release the spring locator. The locator will hold the terminal in place. Inspect the alignment of the terminal wings with the crimp tool former. If the terminal wings are wider than the crimp tool former, remove the terminal and bend the terminal wings in slightly.
5. Place stripped wire into terminal.
6. Crimp the new terminal to the wire. If a jam occurs, press the emergency release to open applicator.

Micro 0.64 Size Terminal

The Micro 64 connectors have small terminals that are difficult to handle and hold when crimping. In order to aid the technician when crimping these terminals, a new crimping tool was developed. The J 38125-64 (M jaw) was developed to crimp Micro 64 terminals. The J-38125-64 crimping tool has a terminal holding block that will hold the terminal in place while the terminal is being crimped. The J-38125-64 crimping tool is also designed to crimp both the wire and the insulation at the same time.

After the terminal is removed from the connector perform the following procedure in order to repair Micro 64 terminals.

NOTE: After cutting the damaged terminal from the wire, determine if the remaining wire is long enough to reach the connector without putting a strain on the wire. If the wire is not long enough, splice a small length of the same gauge wire to the existing wire, then crimp the new terminal on the added wire.

1. Cut the wire as close to the damaged terminal as possible.
2. Strip 5 mm (3/16 in) of insulation from the wire.

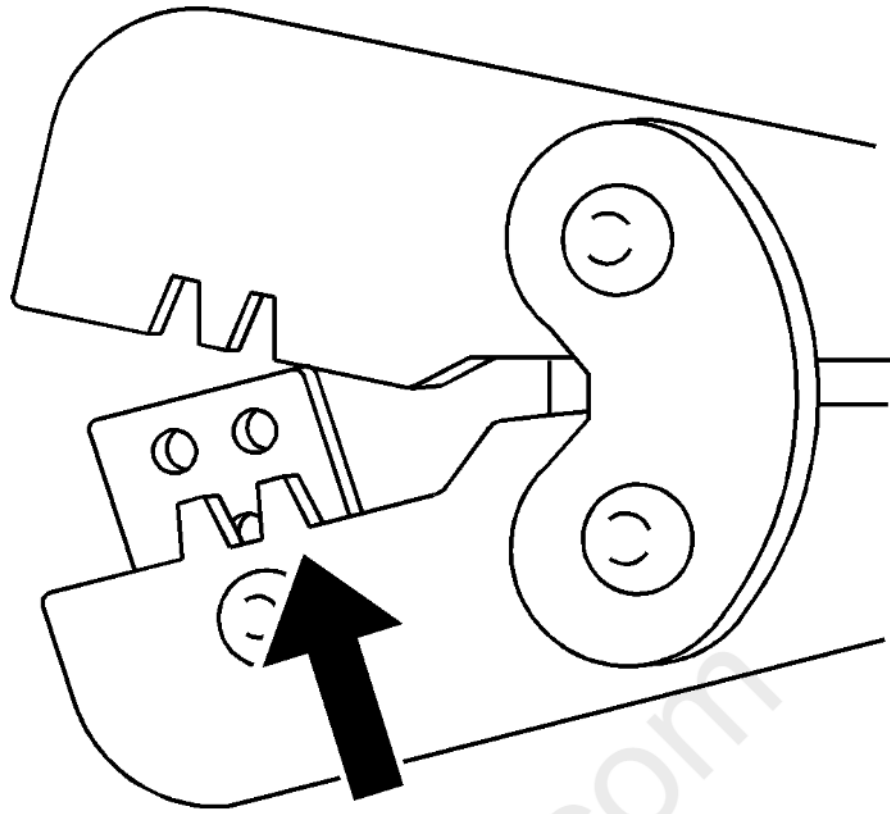


Fig. 203: Identifying Crimping Tool Spring Loaded Locator

Courtesy of GENERAL MOTORS COMPANY

3. Depress the spring loaded locator of the crimping tool until the terminal holder is completely visible.

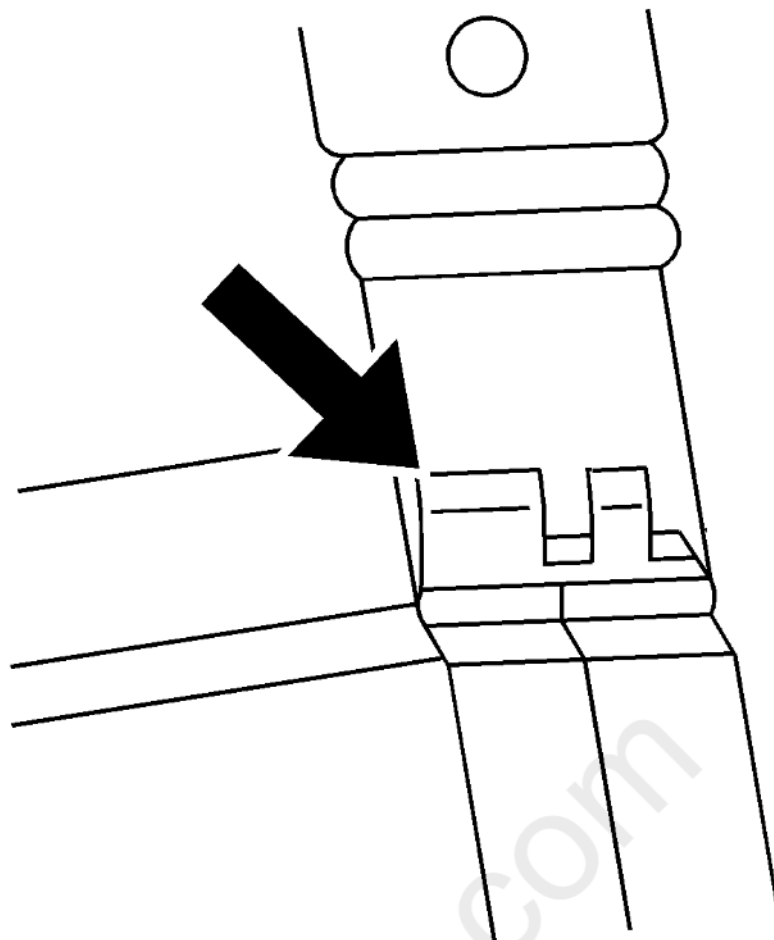


Fig. 204: Identifying Terminal Holder

Courtesy of GENERAL MOTORS COMPANY

4. Insert terminal into the appropriate terminal holder until it hits bottom and stops. The correct terminal holder is determined by the wire size. Also ensure that the terminal wings are pointing towards the former on the tool and the release locator.
5. Insert the stripped cable into the terminal. Insulation should be visible on both sides of the terminal insulation wings.
6. Compress the handles until the ratchet automatically releases.
7. Place the terminal into the appropriate cavity and assemble the connector.

TERMINAL REMOVAL

Special Tools

- **EL-38125-550** Terminal Release Tool Kit
- **EL-38125-580** Terminal Release Tool Kit
- **EL-35616** Terminal Test Probe Kit

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

NOTE: **All repairs near the engine manifold, turbo engine and all exhaust pipes should follow the High Temperature Wiring Repair procedures.**

1. Find the appropriate connector end view within the connector end view section. The connector end view has the following information:
 - Diagnostic probe tool
 - Terminal release tool
 - Terminal/terminated lead part numbers

NOTE: Not using the proper test kit probe may cause damage to the terminal(s) that are probed.

2. Determine if a terminal is damaged.
 1. Locate the diagnostic probe tool from the connector end view. The connector end view describes the color and part number to help the technician find and use the correct tool.
 2. Connect the probe tool to the Digital Multimeter.
 3. Insert the probe tool into the cavity and follow the procedures from the [Troubleshooting with a Digital Multimeter](#).
3. Disconnect the connector body to perform the repair.
4. Use the following procedure to remove the terminal from the connector body.

NOTE: Several procedures for specific connector bodies are called out in the Wiring Repairs section.

1. The terminal position assurance (TPA) and connector position assurance (CPA) should be removed before releasing the terminal for the connector body.
2. Look at the connector end view to locate the cavity of the damaged terminal and find the proper terminal release tool from the terminal release tool kit.

NOTE: Using the incorrect terminal release tool can damage the connector body.

NOTE: Some terminals have a lever that must be disengaged before the terminal can be released.

3. Insert the terminal release tool into the cavity.

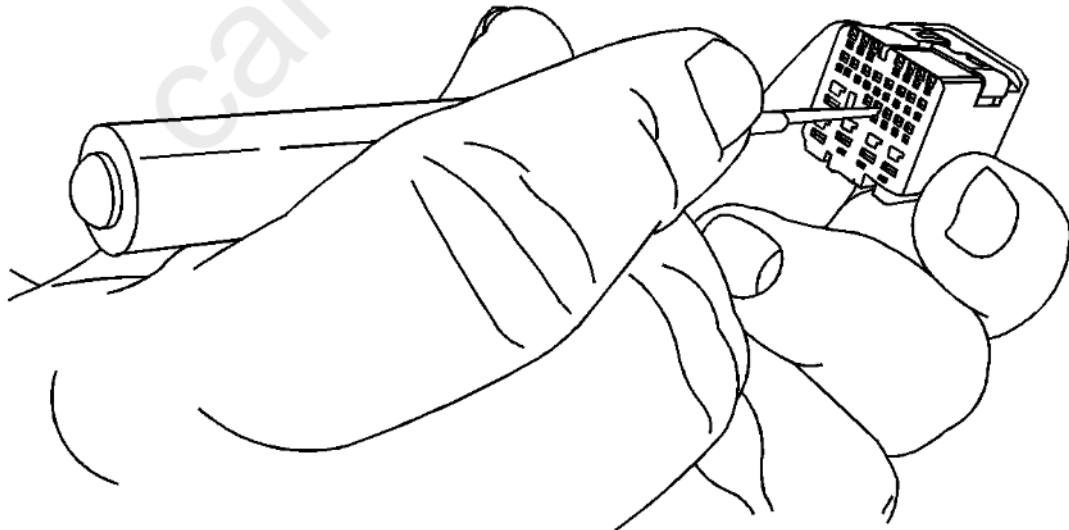


Fig. 205: Gently Pulling Wire Out Of Back Of Connector
Courtesy of GENERAL MOTORS COMPANY

5. Gently pull the wire out of the back of the connector.
6. Repair the terminal by following the [Repairing Connector Terminals \(Terminated Lead Repair\)](#)[Repairing Connector Terminals \(Terminal Repair\)](#) procedure.
7. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

RELAY REPLACEMENT (ATTACHED TO WIRE HARNESS)

Removal Procedure

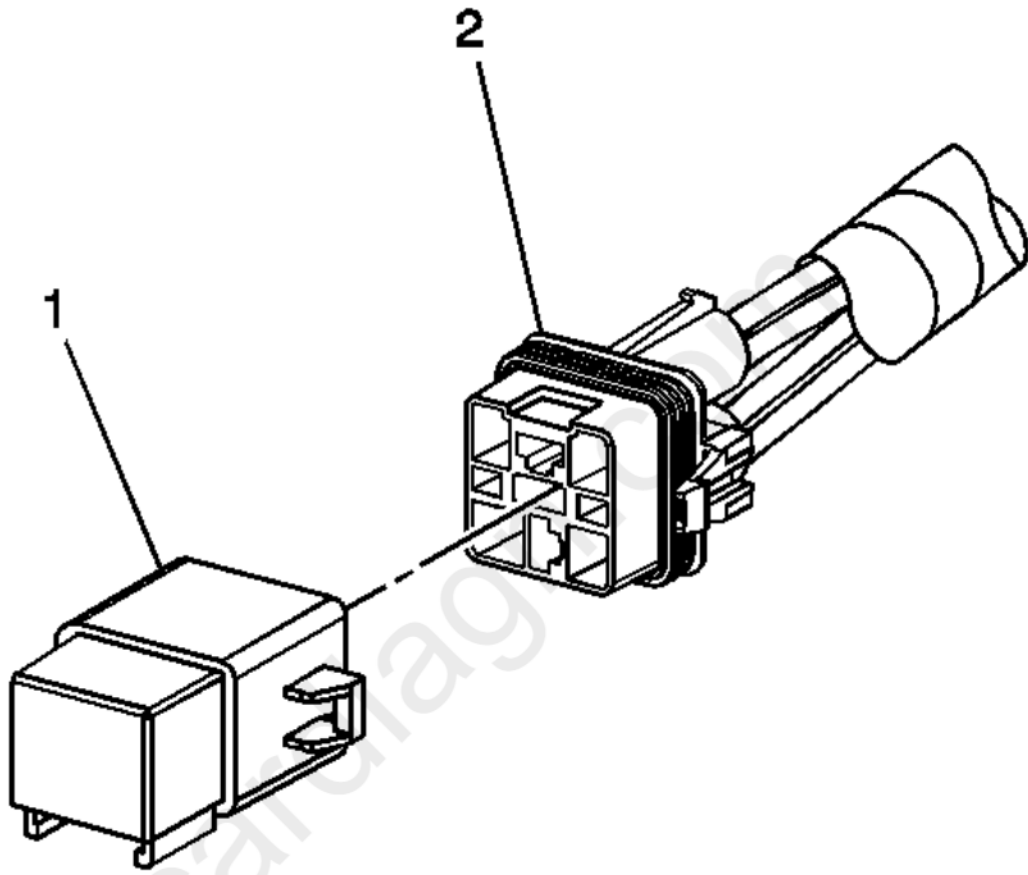


Fig. 206: Identifying Relay & Wire Harness Connector
Courtesy of GENERAL MOTORS COMPANY

1. Locate the relay. Refer to the [Master Electrical Component List](#) to locate the relay in the vehicle.
2. Remove any fasteners which hold the relay in place.
3. Remove any connector position assurance (CPA) devices or secondary locks.

NOTE: Use care when removing a relay in a wiring harness when the relay is secured by fasteners or tape.

4. Separate the relay (1) from the wire harness connector (2).

Installation Procedure

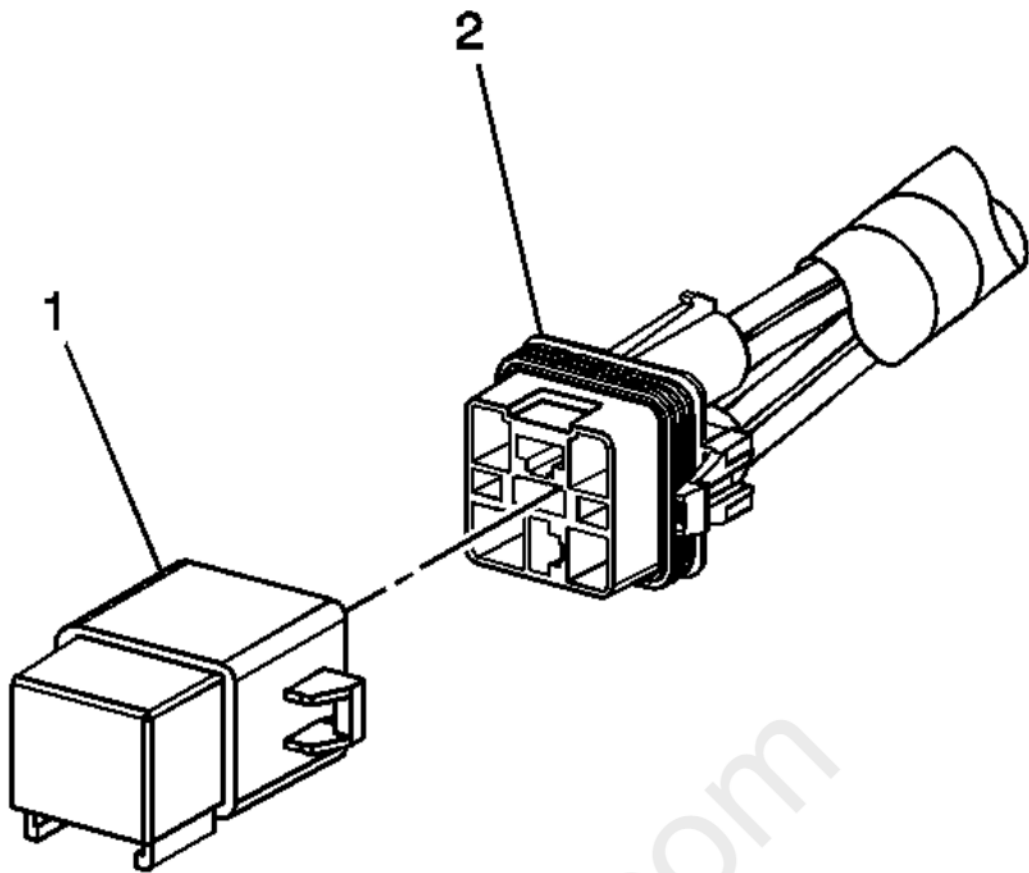


Fig. 207: Identifying Relay & Wire Harness Connector
Courtesy of GENERAL MOTORS COMPANY

1. Connect the relay (1) to the wire harness connector (2).
2. Install any connector position assurance (CPA) devices or secondary locks.
3. Install the relay using any fasteners or tape that originally held the relay in place.

RELAY REPLACEMENT (WITHIN AN ELECTRICAL CENTER)

Special Tools

EL-43244 Relay Puller Pliers

Removal Procedure

1. Remove the electrical center cover.

NOTE:

- Always note the orientation of the relay.
 - If equipped with a notch style relay; observe the location of the notch on the old relay to verify the new relay is installed with the notch in the same location.
 - Ensure that the electrical center is secure, as not to put added stress on the wires or terminals.
2. Locate the relay. Refer to [Electrical Center Identification Views](#) to locate the electrical center where the relay exists.

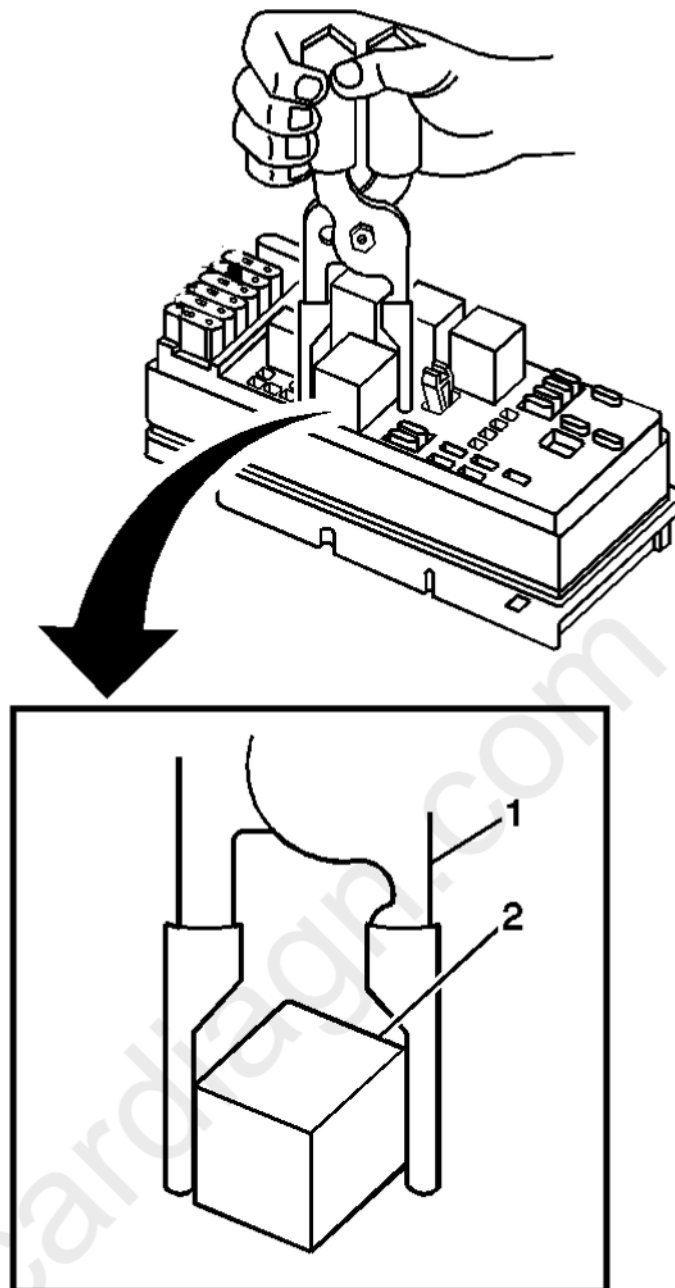


Fig. 208: Identifying Relay And Special Tool

Courtesy of GENERAL MOTORS COMPANY

3. Using the EL-43244 (1) position the tool on opposing corners of the relay (2).

CAUTION: Use EL-43244 to pull the relay straight out from the electrical center terminals. The use of pliers or a flat bladed tool could damage the electrical center.

4. Remove the relay (2) from the electrical center.

Installation Procedure

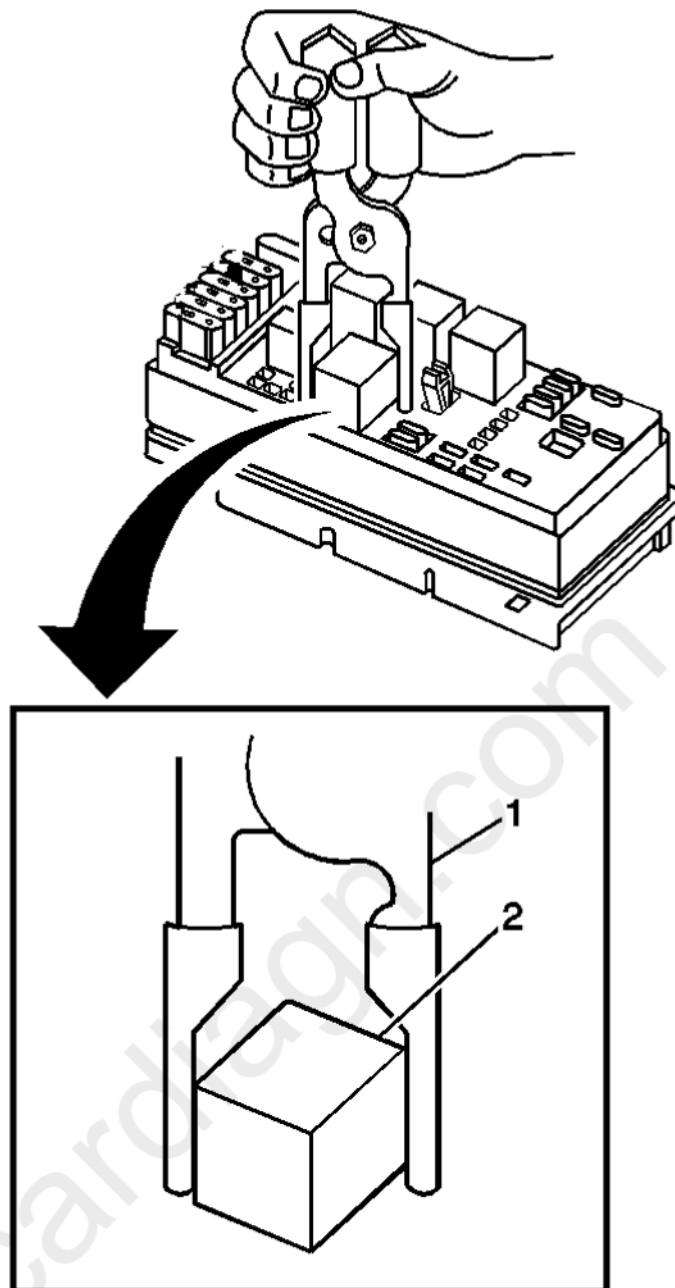


Fig. 209: Identifying Relay And Special Tool
Courtesy of GENERAL MOTORS COMPANY

1. Install the relay (2) in the same position as removed.
2. Install the electrical center cover.

GROUND REPAIR

Electrical Grounds

Proper electrical system function relies on secure, positive, corrosion-free ground connections. Loose, stripped, or corroded connections increase the possibility of improper system function and loss of module communication. These conditions may also lead to unnecessary repairs and component replacements.

In general, electrical ground connections are accomplished using one, or a combination of, three attachment methods:

- Welded M6 stud and nut
- Welded M6 nut and bolt
- Welded M8 nut and bolt

CAUTION: Use GM approved replacement fasteners with conductive finish for electrical ground repair.

Determine which attachment method is used, and carry out the appropriate repair.

M6 Weld Stud Replacement

1. Select a location adjacent the damaged or missing M6 ground stud having 20 mm (0.79 in) clearance behind the panel surface and 20 mm (0.79 in) clearance surrounding the M6 rivet stud flange.
2. Using GM approved residue-free solvent or equivalent, remove any grease from the repair site and allow to dry.

NOTE: Ensure 20 mm (0.79 in) clearance is maintained behind the panel to be drilled.

3. Drill a 10 mm (0.40 in) diameter hole through the panel.
4. Carefully remove paint and primer from the area surrounding the rivet stud flange until bare metal is visible.

CAUTION: Use GM approved replacement fasteners with conductive finish for electrical ground repair.

5. Select a replacement conductive M6 rivet stud. Reference the GM parts catalog for the correct part number and application.
6. Using a rivet stud installer, install the replacement conductive M6 rivet stud.
7. Ensure the new rivet stud is securely fastened, with no detectable movement.

NOTE: The rivet stud and surrounding panel area must be properly refinished prior to the installation of the ground terminal and nut to maintain positive electrical grounding.

8. Completely wrap the threads of the rivet stud with painters tape or equivalent.
9. Refinish the repair area using an anti-corrosion primer.
10. Allow the refinished repair area to cure sufficiently before removing the protective material applied to the rivet stud threads.
11. Remove the painters tape or equivalent from the rivet stud threads.
12. Using GM approved residue-free solvent or equivalent, thoroughly clean the rivet stud threads to remove any adhesive and allow to dry.
13. Carefully remove any corrosion from the electrical ground wire terminal. [Testing for Intermittent Conditions and Poor Connections](#)
14. Using a small brush, apply Dielectric Lubricant GM P/N 12377900 (Canadian P/N 10953529) to the new conductive M6 rivet stud threads.
15. Install the ground terminal to the new rivet stud.
16. Select a new, conductive M6 nut. Reference the GM parts catalog for the correct part number and application.

CAUTION: [Fastener Caution](#)

17. Install the conductive M6 nut and tighten to 8 N.m (71 lb in).
18. Check for proper system operation.

M6 Weld Nut

CAUTION: Use GM approved replacement fasteners with conductive finish for electrical ground repair.

1. If the M6 weld nut at the electrical ground location is damaged or stripped, a new, conductive self-threading M7 bolt may be used to secure the ground terminal. Reference the GM parts catalog for the correct part number and application.
2. Using GM approved residue-free solvent or equivalent, remove any grease from the surface surrounding the weld nut and allow to dry.
3. Remove any loose metal particles from the damaged or stripped weld nut with a stiff brush.
4. Using a small brush, apply Dielectric Lubricant GM P/N 12377900 (Canadian P/N 10953529) to the new, conductive, self-threading M7 bolt threads.
5. Carefully remove any corrosion from the electrical ground terminal. [Testing for Intermittent Conditions and Poor Connections](#)
6. Install the electrical ground terminal to the new, conductive M7 bolt.

CAUTION: [Fastener Caution](#)

7. Install the conductive M7 bolt and tighten to 9 N.m (80 lb in).
8. Check for proper system operation.

M6 Weld Nut (Alternative Repair)

CAUTION: Use GM approved replacement fasteners with conductive finish for electrical ground repair.

1. If the electrical ground location is accessible from both sides of the panel, a conductive M6 bolt and a conductive M6 nut may be used to secure the electrical ground terminal. Reference the GM parts catalog for the correct part number and application.
2. Select a location adjacent the damaged M6 weld nut having 20 mm (0.79) clearance behind the panel surface and 20 mm (0.79 in) clearance surrounding the new electrical ground site.
3. Using GM approved residue-free solvent or equivalent, remove any grease from the surface surrounding the ground location and allow to dry.

NOTE: Ensure 20 mm (0.79 in) clearance is maintained behind the panel to be drilled.

4. Drill a 10 mm (0.40 in) diameter hole through the panel.
5. Carefully remove paint and primer from the area surrounding the new ground site until bare metal is visible.
6. Using a small brush, apply Dielectric Lubricant GM P/N 12377900 (Canadian P/N 10953529) to the new, conductive M6 bolt threads.
7. Carefully remove any corrosion from the electrical ground terminal. [Testing for Intermittent Conditions and Poor Connections](#)
8. Install the electrical ground terminal and new, conductive M6 bolt to the ground location.

CAUTION: [Fastener Caution](#)

9. Install the conductive M6 nut and tighten to 8 N.m (71 lb in).

NOTE: The repair area must be properly refinished to maintain positive electrical grounding.

10. Refinish the repair area using an anti-corrosion primer.
11. Check for proper system operation.

M8 Weld Nut

CAUTION: Use GM approved replacement fasteners with conductive finish for

electrical ground repair.

1. If the M8 weld nut electrical ground location is accessible from both sides of the panel, a conductive M8 bolt and a conductive M8 nut may be used to secure the ground terminal. Reference the GM parts catalog for the correct part number and application.
2. Select a location adjacent to M8 weld nut having 20 mm (0.79 in) clearance behind the panel surface and 20 mm (0.79 in) clearance surrounding the new electrical ground site.
3. Using GM approved residue-free solvent or equivalent, remove any grease from the surface surrounding the ground location and allow to dry.

NOTE: Ensure 20 mm (0.79 in) clearance is maintained behind the panel to be drilled.

4. Drill a 10 mm (0.40 in) diameter hole through the panel.
5. Carefully remove paint and primer from the area surrounding the new ground site until bare metal is visible.
6. Using a small brush, apply Dielectric Lubricant GM P/N 12377900 (Canadian P/N 10953529) to the new, conductive M8 bolt threads.
7. Carefully remove any corrosion from the electrical ground terminal. [Testing for Intermittent Conditions and Poor Connections](#)
8. Install the electrical ground terminal and new, conductive M8 bolt to the ground location.

CAUTION: [Fastener Caution](#)

9. Install the conductive M8 nut and tighten to 22 N.m (16 lb ft).

NOTE: The repair area must be properly refinished to maintain positive electrical grounding.

10. Refinish the repair area using an anti-corrosion primer.
11. Check for proper system operation.

M8 Weld Nut (Alternative Repair)

CAUTION: Use GM approved replacement fasteners with conductive finish for electrical ground repair.

1. If the M8 weld nut electrical ground location is not accessible from both sides of the panel, a conductive M6 rivet stud and a conductive M6 nut may be used to secure the ground terminal. Reference the GM parts catalog for the correct part number and application.
2. Select a location adjacent the damaged M8 weld nut having 20 mm (0.79 in) clearance behind the panel surface and 20 mm (0.79 in) clearance surrounding the new, conductive M6 rivet stud flange.
3. Using GM approved residue-free solvent or equivalent, remove any grease from the repair site and allow to dry.

NOTE: Ensure 20 mm (0.79 in) clearance is maintained behind the panel to be drilled.

4. Drill a 10 mm (0.40 in) diameter hole through the panel.
5. Carefully remove paint and primer from the area surrounding the rivet stud flange until bare metal is visible.
6. Using a rivet stud installer, install the replacement conductive M6 rivet stud.
7. Ensure the new rivet stud is securely fastened, with no detectable movement.

NOTE: The rivet stud and surrounding panel area must be properly refinished prior to the installation of the ground terminal and nut to maintain positive electrical grounding.

8. Completely wrap the threads of the rivet stud with painters tape or equivalent.
9. Refinish the repair area using an anti-corrosion primer.
10. Allow the refinished repair area to cure sufficiently before removing the protective material applied to the rivet stud threads.
11. Remove the painters tape or equivalent from the rivet stud threads.
12. Using GM approved residue-free solvent or equivalent, thoroughly clean the rivet stud threads to remove any adhesive and allow to dry.
13. Carefully remove any corrosion from the electrical ground wire terminal. [Testing for Intermittent Conditions and Poor Connections](#)
14. Using a small brush, apply Dielectric Lubricant GM P/N 12377900 (Canadian P/N 10953529) to the new conductive M6 rivet stud threads.
15. Install the ground terminal to the new, conductive M6 rivet stud.

CAUTION: [Fastener Caution](#)

16. Install the conductive M6 nut and tighten to 8 N.m (71 lb in).
17. Check for proper system operation.

Securing Loose Electrical Ground Connections

If the electrical ground connection is loose and the ground attachments are not damaged, properly securing the loose electrical ground may be all that is necessary. Carry out the following procedure to secure loose electrical ground connections.

CAUTION: Use GM approved replacement fasteners with conductive finish for electrical ground repair.

1. Using GM approved residue-free solvent or equivalent, thoroughly clean the ground stud threads and allow to dry.
2. Carefully remove any corrosion from the electrical ground wire terminal. [Testing for Intermittent Conditions and Poor Connections](#)
3. Using a small brush, apply Dielectric Lubricant GM P/N 12377900 (Canadian P/N 10953529) to the ground stud threads.
4. Install the ground wire terminal to the ground stud.

CAUTION: [Fastener Caution](#)

5. Install the appropriate conductive nut.
 - Conductive M6 nut: Tighten to 8 N.m (71 lb in)
 - Conductive M8 nut: Tighten to 22 N.m (16 lb ft)
 - Conductive M10 nut: Tighten to 45 N.m (33 lb ft)
6. Check for proper system operation.

FUSE BLOCK REPLACEMENT

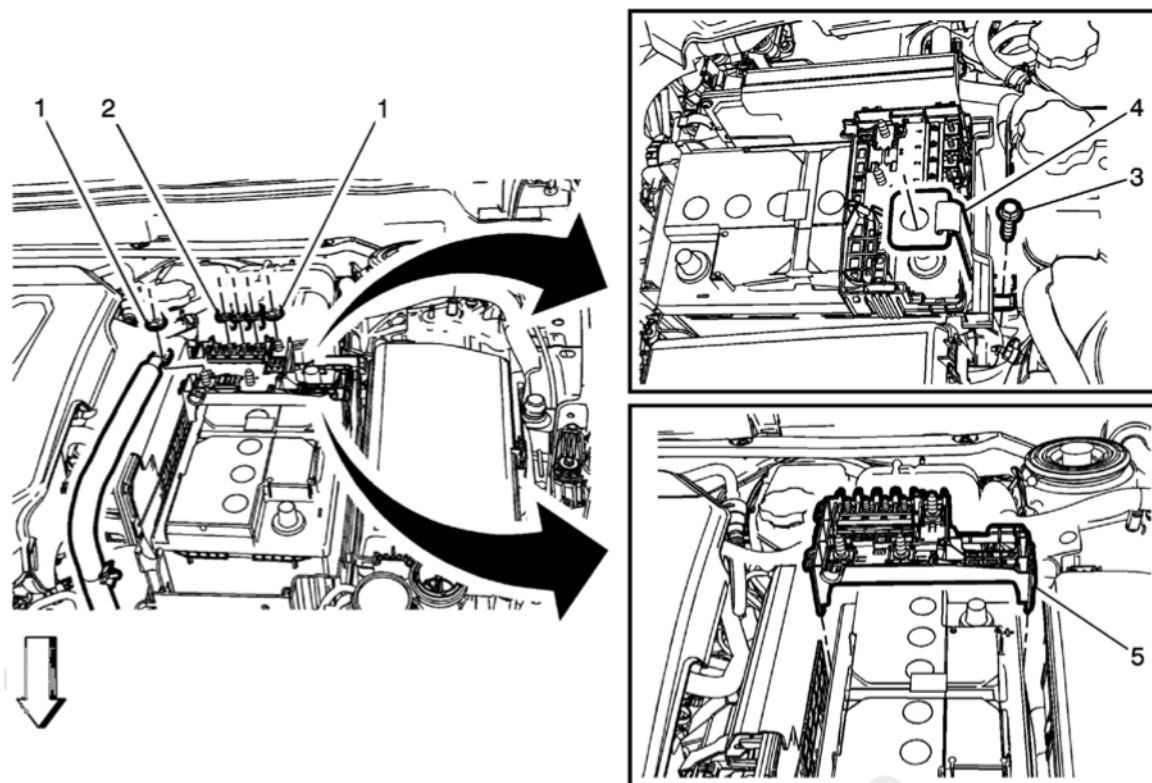


Fig. 210: Fuse Block Components

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Disconnect the battery negative cable. Refer to Battery Negative Cable Replacement (without KL9) Battery Negative Cable Replacement (with KL9) . 2. Disconnect the auxiliary battery negative cable. Refer to Auxiliary Battery Negative Cable Replacement (With Start/Stop) 3. Remove the battery positive fuse block cable. Refer to Battery Positive Fuse Block Cable Replacement	
1	Fuse Block Positive Cable and Engine Power Supply Cable Nut (Qty: 2) CAUTION: Refer to Fastener Caution . Tighten 12 N.m (106 lb in)
2	Fuse Block Terminal Wiring Harness Nut (Qty: 3) Tighten 4.7 N.m (42 lb in)
3	Battery Hold Down Retainer Bolt Tighten 15 N.m (11 lb ft)
4	Battery Hold Down Retainer
5	Fuse Block Procedure Unclip and remove the fuse block from the battery.

FRONT COMPARTMENT FUSE BLOCK REPLACEMENT

Removal Procedure

1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#) .

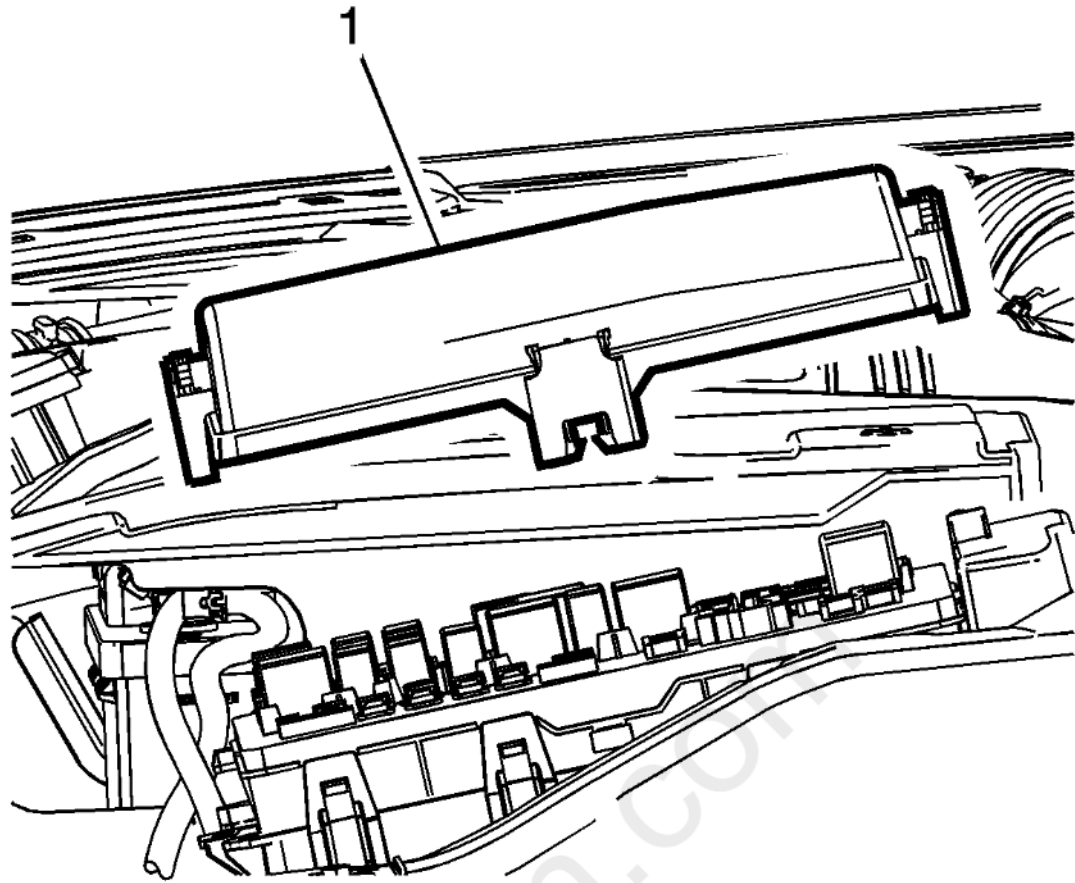


Fig. 211: Front Compartment Fuse Block Cover
Courtesy of GENERAL MOTORS COMPANY

2. Remove front compartment fuse block covers (1).

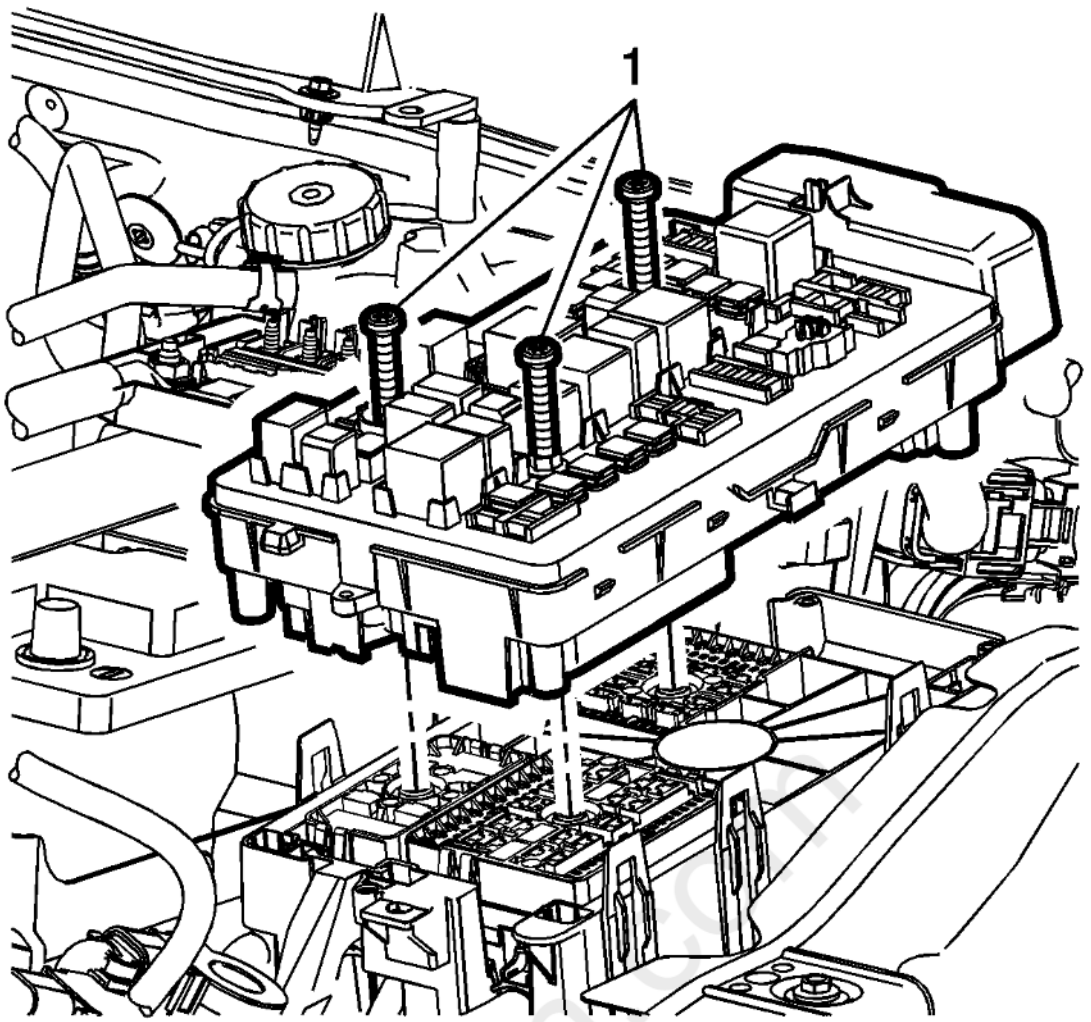


Fig. 212: Junction Block Bolts

Courtesy of GENERAL MOTORS COMPANY

3. Loosen the junction block bolts (1).
4. Unclip the front compartment fuse block from the front compartment fuse block housing.

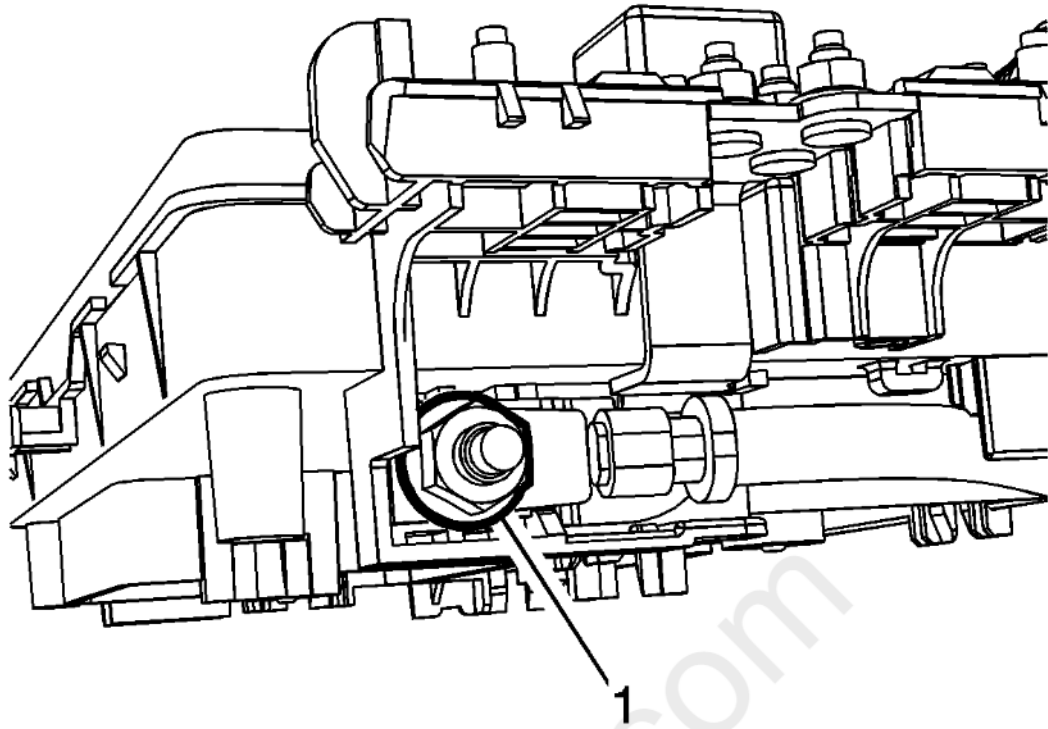


Fig. 213: Positive Battery Cable

Courtesy of GENERAL MOTORS COMPANY

5. Disconnect the positive battery cable (1).

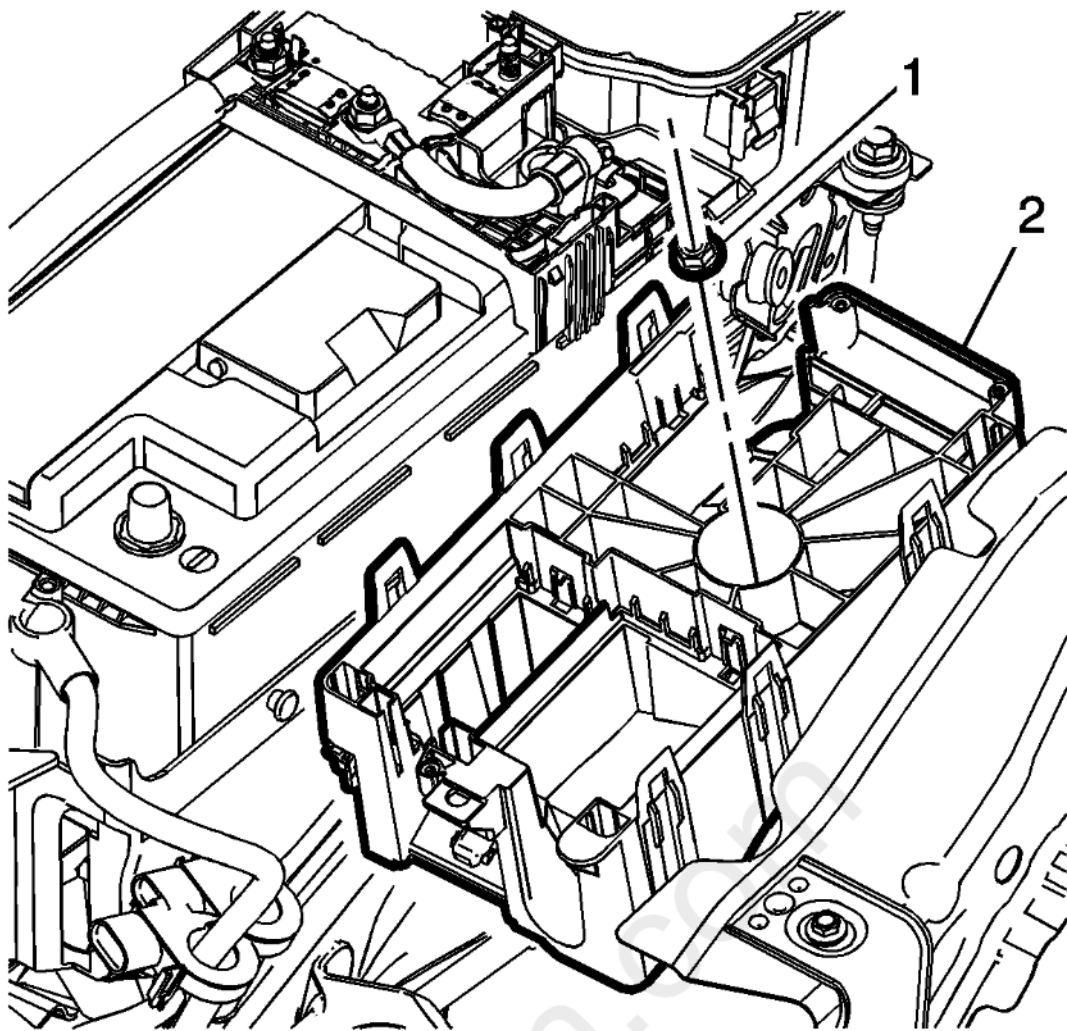


Fig. 214: Junction Block Base & Nut

Courtesy of GENERAL MOTORS COMPANY

6. Remove the electrical connectors from the front compartment fuse block housing.
7. Remove the windshield washer solvent container filler tube. Refer to [**Windshield Washer Solvent Container Filler Tube Replacement**](#) .
8. Disconnect the wiring harness from the junction block base.
9. Remove the junction block nut (1) from the block base.
10. Remove the junction block base (2) from the inner wheelhouse.

Installation Procedure

1. Connect the wiring harness to the junction block base.

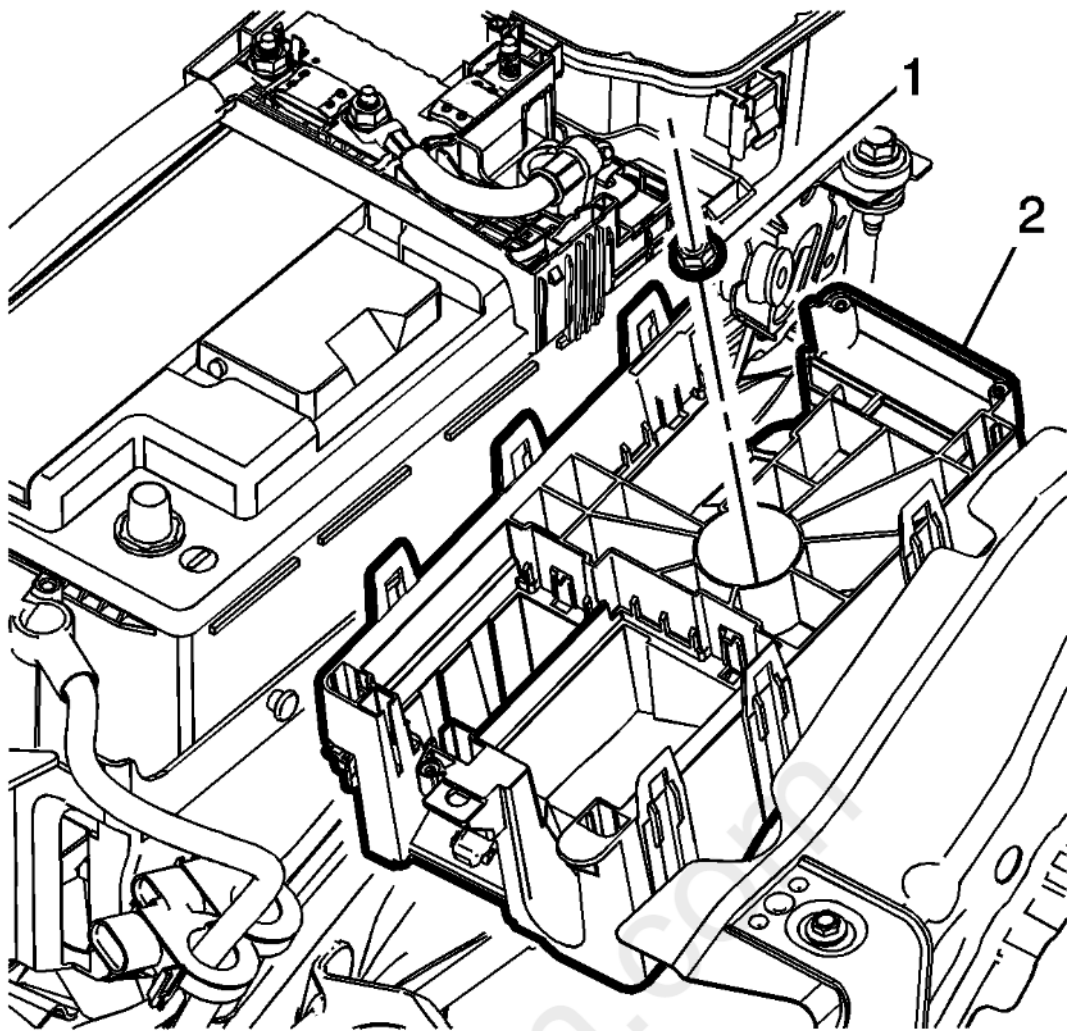


Fig. 215: Junction Block Base & Nut

Courtesy of GENERAL MOTORS COMPANY

2. Position the junction block base (2) to the inner wheelhouse stud.

CAUTION: Refer to **Fastener Caution** .

3. Install the junction block base nut (1) and tighten to 22 N.m (16 lb ft).
4. Install the electrical connectors to the front compartment fuse block housing.

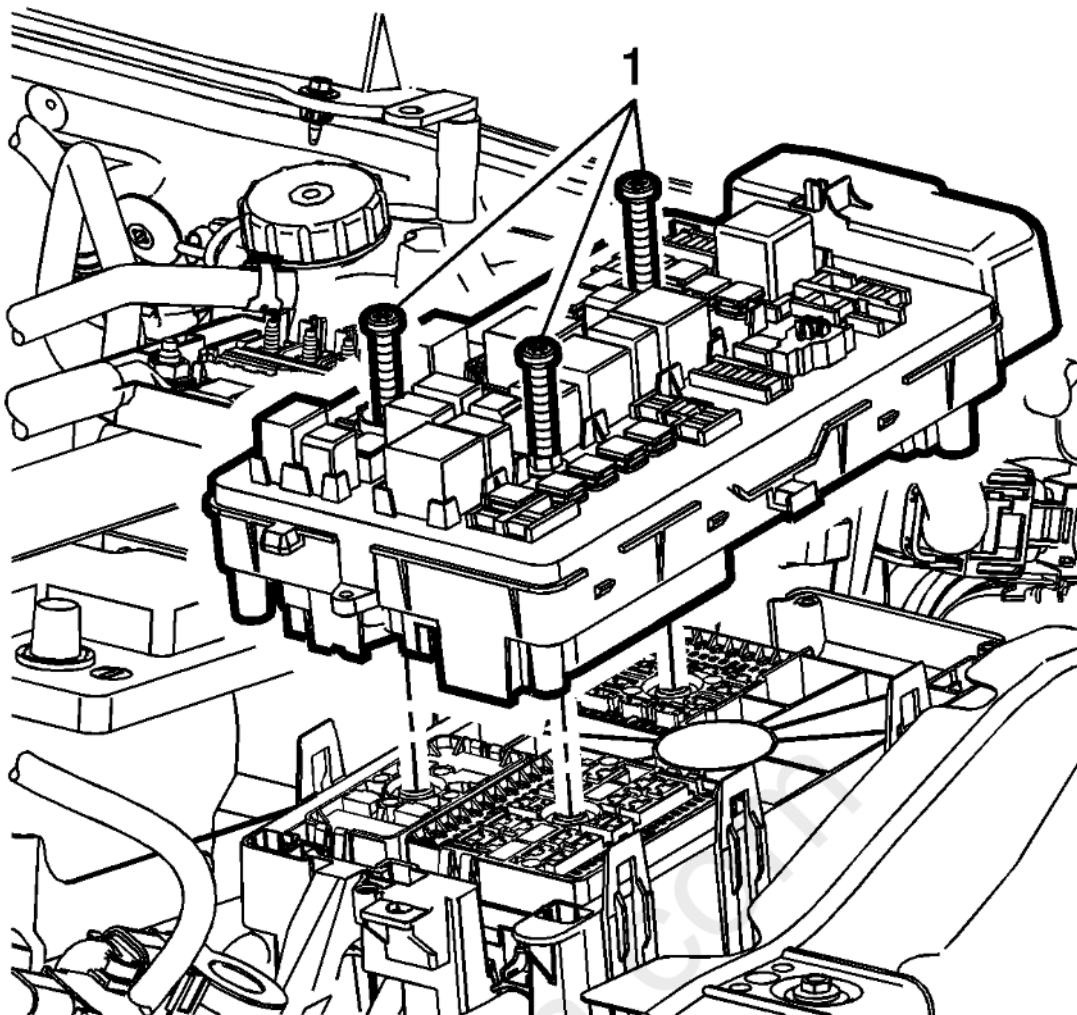


Fig. 216: Junction Block Bolts

Courtesy of GENERAL MOTORS COMPANY

5. Install the junction block to the base.
6. Install the junction block bolts (1) and tighten to 7 N.m (63 lb in).

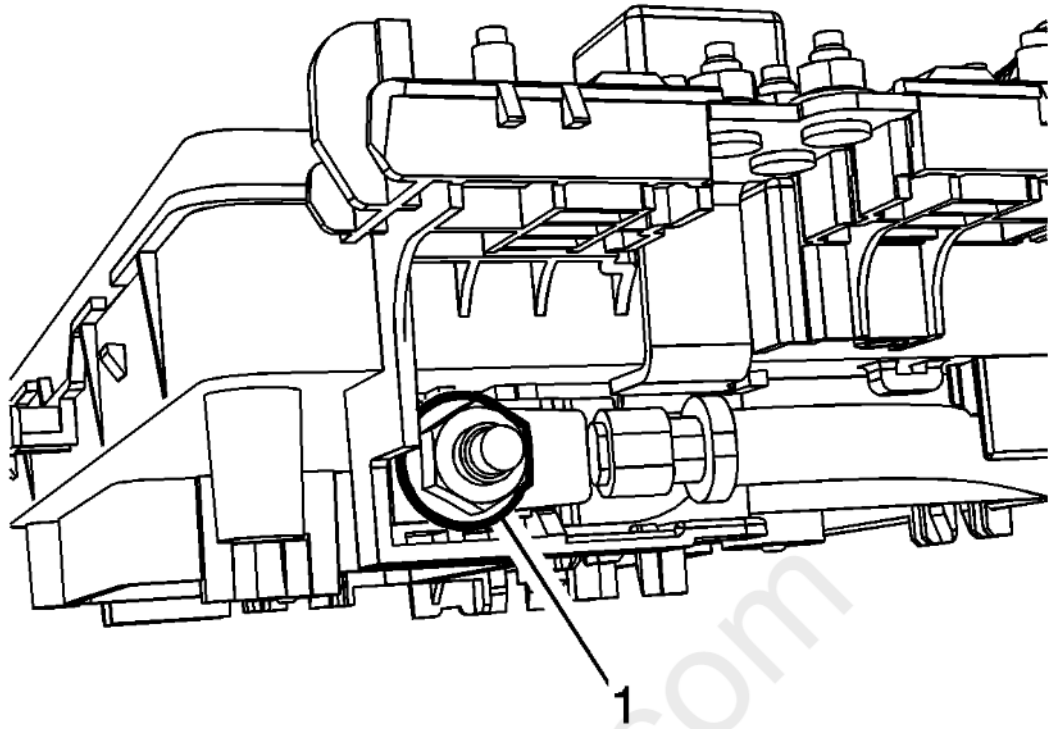


Fig. 217: Positive Battery Cable

Courtesy of GENERAL MOTORS COMPANY

7. Position the positive battery cable to the junction block.
8. Install the positive battery cable nut (1) and tighten to 12 N.m (106 lb in).

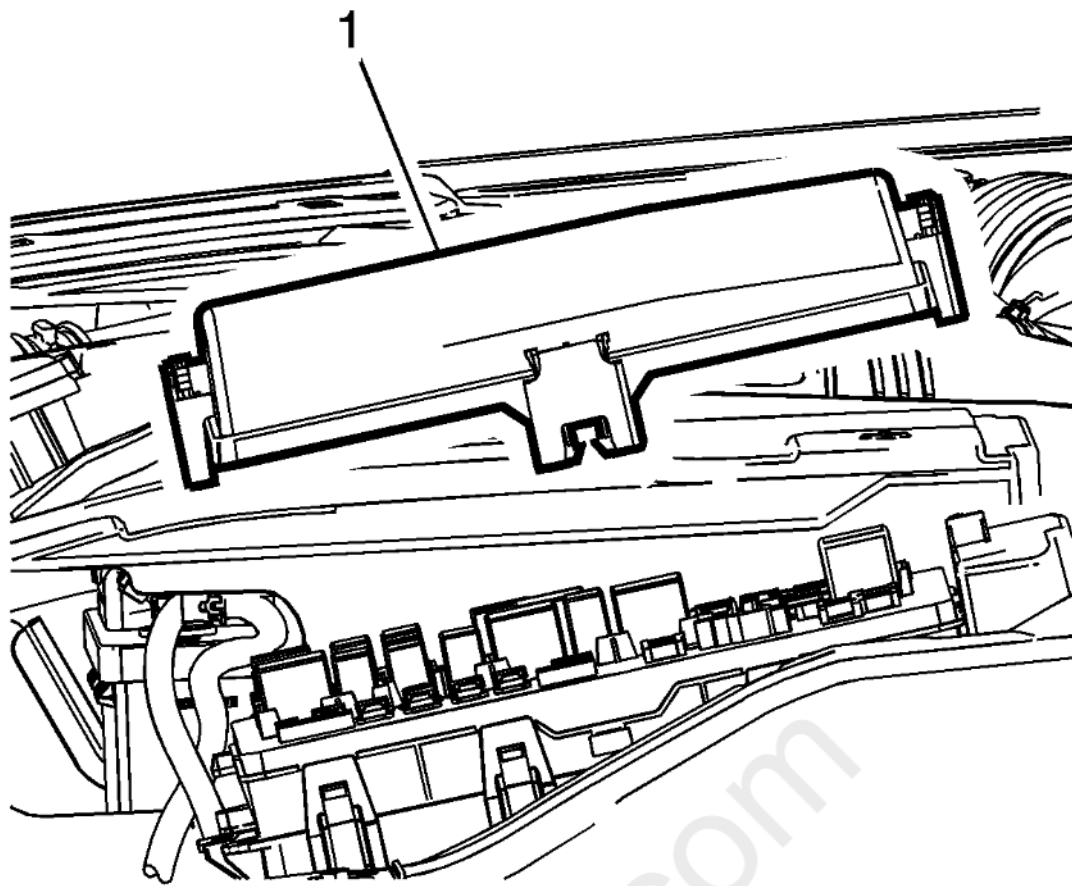


Fig. 218: Front Compartment Fuse Block Cover
Courtesy of GENERAL MOTORS COMPANY

9. Install both front compartment fuse block covers (1).
10. Install the windshield washer solvent container filler tube. Refer to [Windshield Washer Solvent Container Filler Tube Replacement](#) .
11. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#) .

IGNITION LOCK CYLINDER REPLACEMENT

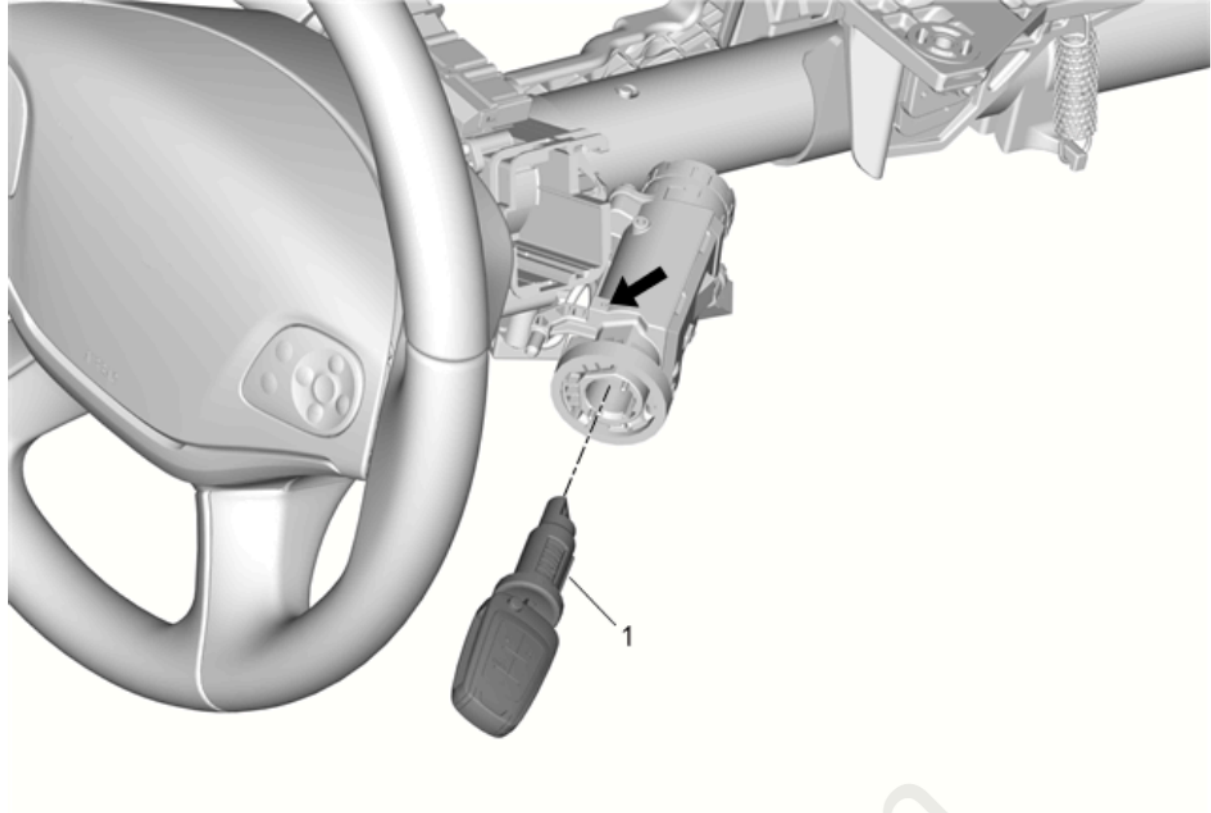


Fig. 219: Ignition Lock Cylinder

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures <u>Battery Negative Cable Disconnection and Connection</u> <u>Steering Column Lower Trim Cover Replacement (N38)</u> <u>Steering Column Lower Trim Cover Replacement (N37)</u>	
1	Ignition Lock Cylinder Procedure - Turn the ignition key to the RUN position. - Insert a pick-type tool into the proper hole on the ignition and start switch housing and press the lock tab on the ignition lock cylinder down while turning the cylinder to the START position. - Pull the ignition lock cylinder out of the ignition and start switch housing. - Code the NEW ignition lock cylinder. <u>Lock Cylinder Coding - Ignition</u>

IGNITION AND START SWITCH REPLACEMENT (WITHOUT BTM)

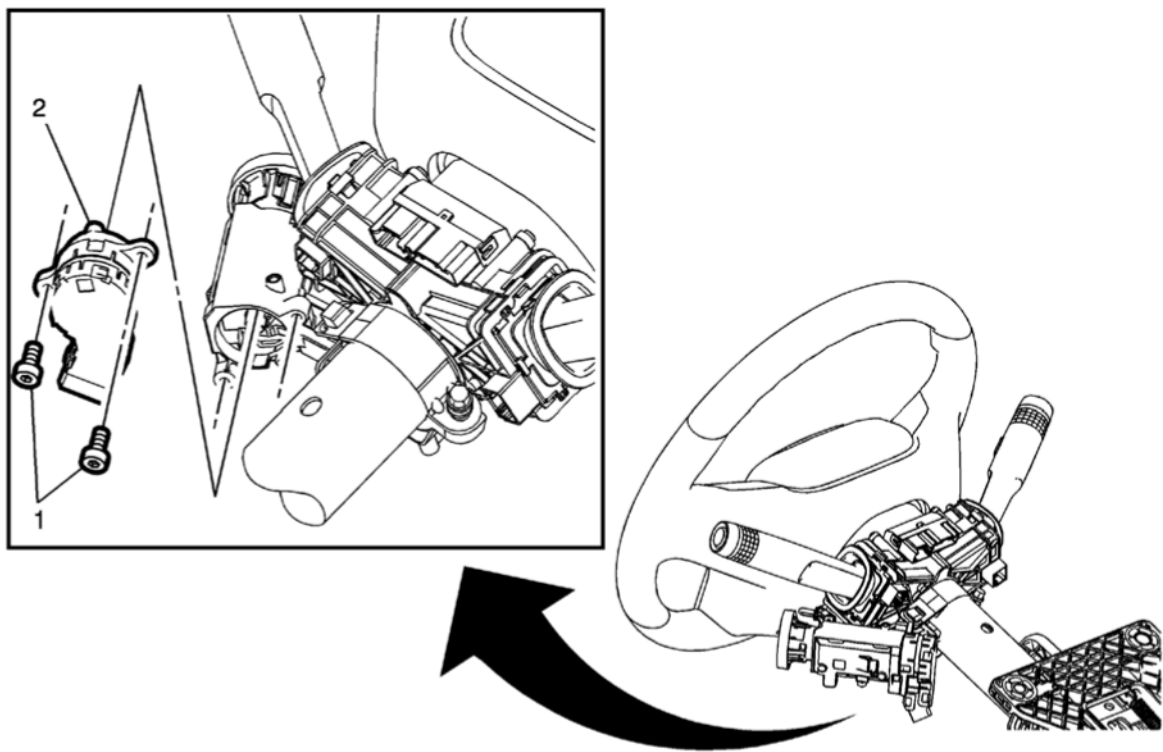


Fig. 220: Ignition And Start Switch (Without BTM)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures <u>Battery Negative Cable Disconnection and Connection</u> <u>Steering Column Lower Trim Cover Replacement (N38) Steering Column Lower Trim Cover Replacement (N37)</u>	
1	Ignition and Start Switch Bolt (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> .
2	Ignition and Start Switch Procedure Disconnect the ignition and start switch electrical connector.

IGNITION AND START SWITCH REPLACEMENT (WITH BTM)

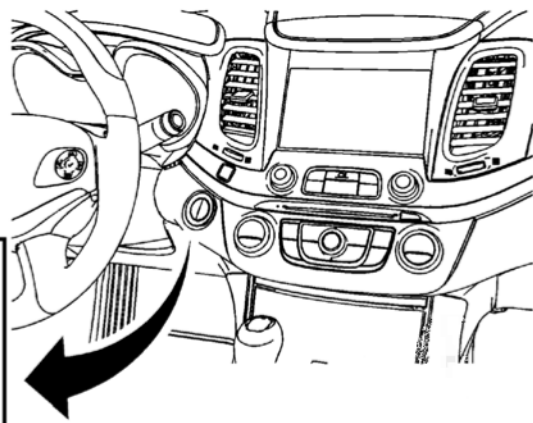
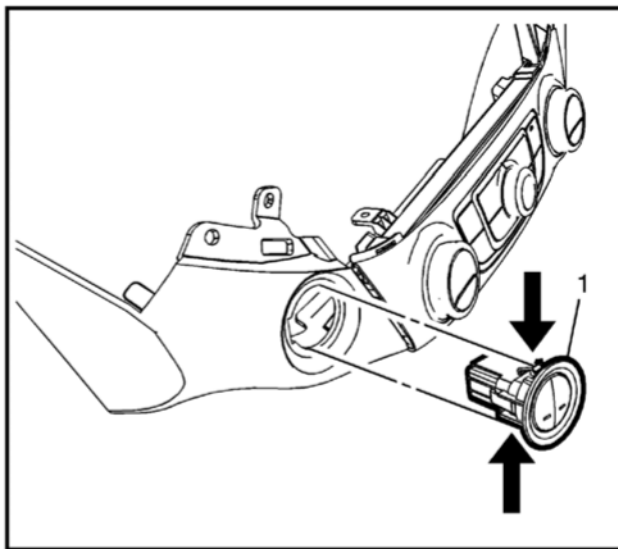


Fig. 221: Ignition and Start Switch (With BTM)
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure	
Instrument Panel Center Trim Pad Replacement	
1	Ignition and Start Switch Procedure Release the retaining tabs and remove the ignition and start switch from the trim piece.

IGNITION AND START SWITCH HOUSING REPLACEMENT

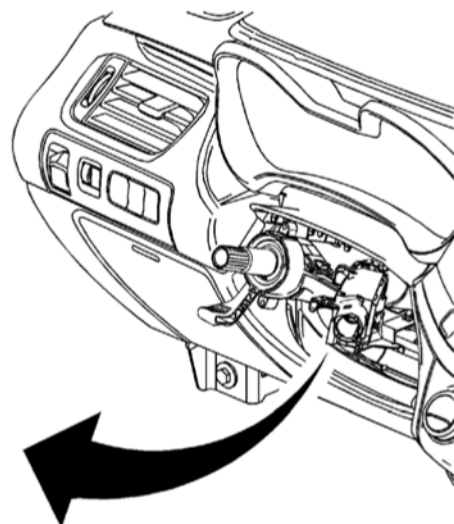
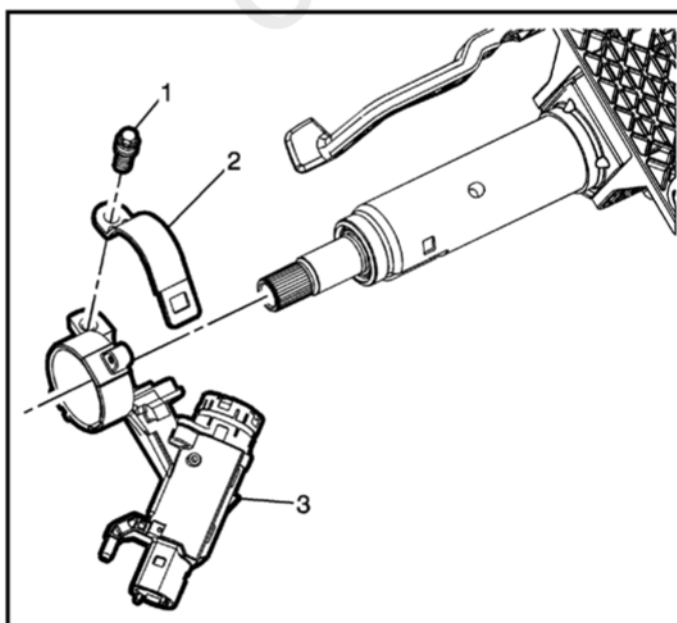


Fig. 222: Ignition & Start Switch Housing
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Turn Signal Switch Bracket Replacement (With BTM)</u> <u>Turn Signal Switch Bracket Replacement (Without BTM)</u>	
1	Ignition and Start Switch Housing Bolt CAUTION: Refer to <u>Fastener Caution</u> . Procedure 1. Use a small hammer and chisel to remove the OLD ignition and start switch housing bolt. DISCARD the bolt. 2. Install the NEW ignition and start switch housing bolt and tighten until the bolt head breaks off.
2	Ignition and Start Switch Housing Strap
3	Ignition and Start Switch Housing Procedure 1. Disconnect the electrical connector. 2. Transfer components as necessary.

2017 ELECTRICAL

Wiring Systems and Power Management - Schematic and Routing Diagrams - Impala

SCHEMATIC WIRING DIAGRAMS

WIRING HARNESS ROUTING VIEWS

Front Bumper Harness Routing

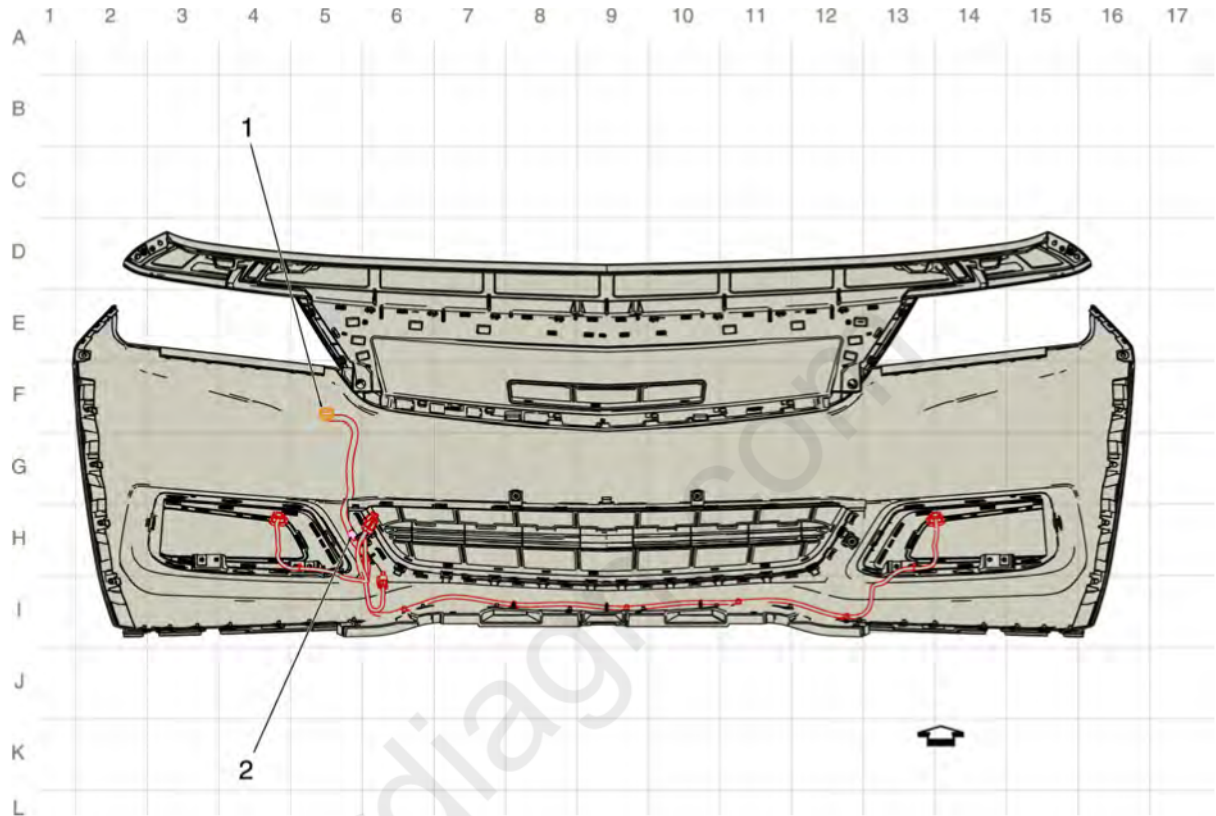


Fig. 1: Front Bumper Harness Routing

Courtesy of GENERAL MOTORS COMPANY

Items

- 1: X105 Forward Lamp Harness to Front Fascia Harness (8 Cavities) X105 Forward Lamp Harness to Front Fascia Harness (-9H8-VRI) X105 Forward Lamp Harness to Front Fascia Harness (9H8) X105 Forward Lamp Harness to Front Fascia Harness (VRI)
- 2: J105 Front Bumper (9H8)

Body and Forward Lamp Harness Routing - Left Side of Engine Compartment

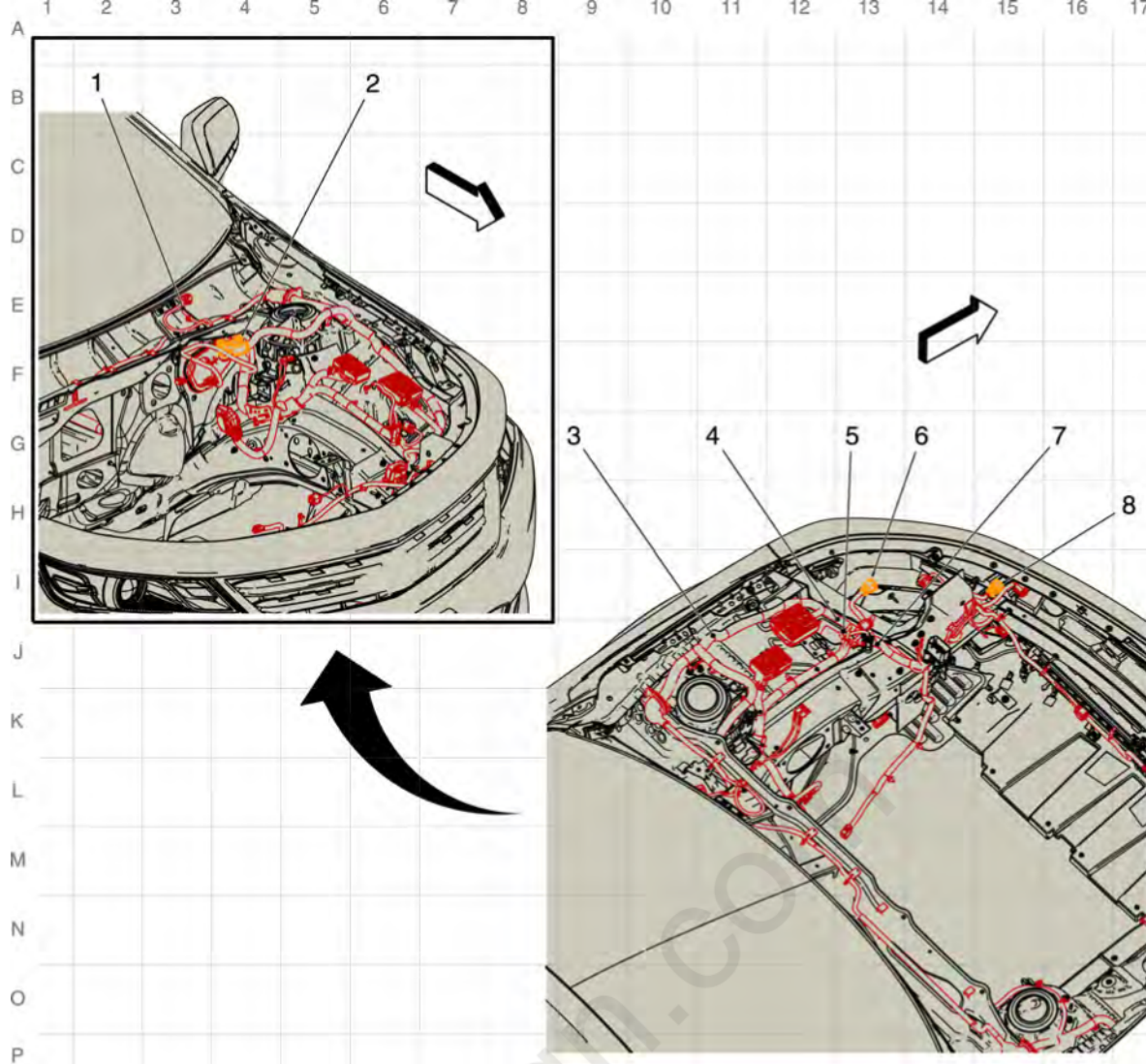


Fig. 2: Body and Forward Lamp Harness Routing - Left Side of Engine Compartment
 Courtesy of GENERAL MOTORS COMPANY

Items
1: J109 Forward Lamp Harness
2: X150 Forward Lamp Harness to Body Harness (40 Cavities) <u>X150 Forward Lamp Harness to Body Harness</u>
3: J100 Forward Lamp Harness
4: J151 Forward Lamp Harness
5: J150 Forward Lamp Harness
6: X110 Forward Lamp Harness to Left Headlamp Harness (8 Cavities) <u>X110 Forward Lamp Harness to Left Headlamp Harness (T4A)</u> <u>X110 Forward Lamp Harness to Left Headlamp Harness (T4F)</u>
7: J101 Forward Lamp Harness
8: X105 Forward Lamp Harness to Front Fascia Harness (8 Cavities) <u>X105 Forward Lamp Harness to Front Fascia Harness (-9H8-VRI)</u> <u>X105 Forward Lamp Harness to Front Fascia Harness (9H8)</u> <u>X105 Forward Lamp Harness to Front Fascia Harness (VRI)</u>

Forward Lamp Harness Routing - Right Side of Engine Compartment

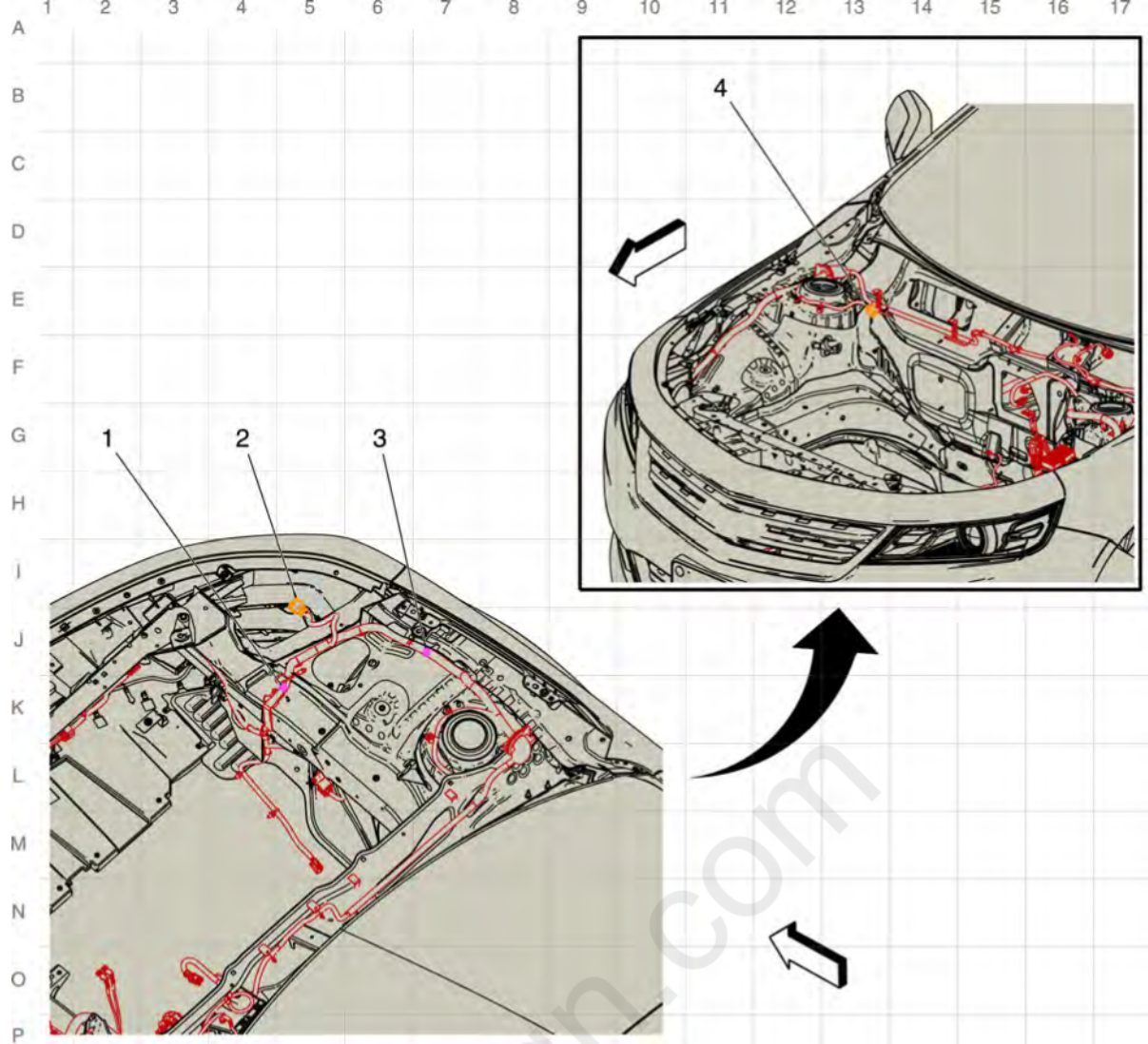


Fig. 3: Forward Lamp Harness Routing - Right Side of Engine Compartment
 Courtesy of GENERAL MOTORS COMPANY

Items
1: J102 Forward Lamp Harness
2: X120 Forward Lamp Harness to Right Headlamp Harness (8 Cavities) <u>X120 Forward Lamp Harness to Right Headlamp Harness (T4A)</u> <u>X120 Forward Lamp Harness to Forward Lamp Harness (T4F)</u>
3: J152 Forward Lamp Harness
4: X190 Forward Lamp Harness to Fuel Composition Jumper Harness (3 Cavities) (FHS) <u>X190 Forward Lamp Harness to Fuel Composition Sensor Jumper Harness</u>

Cooling Fan Harness Routing

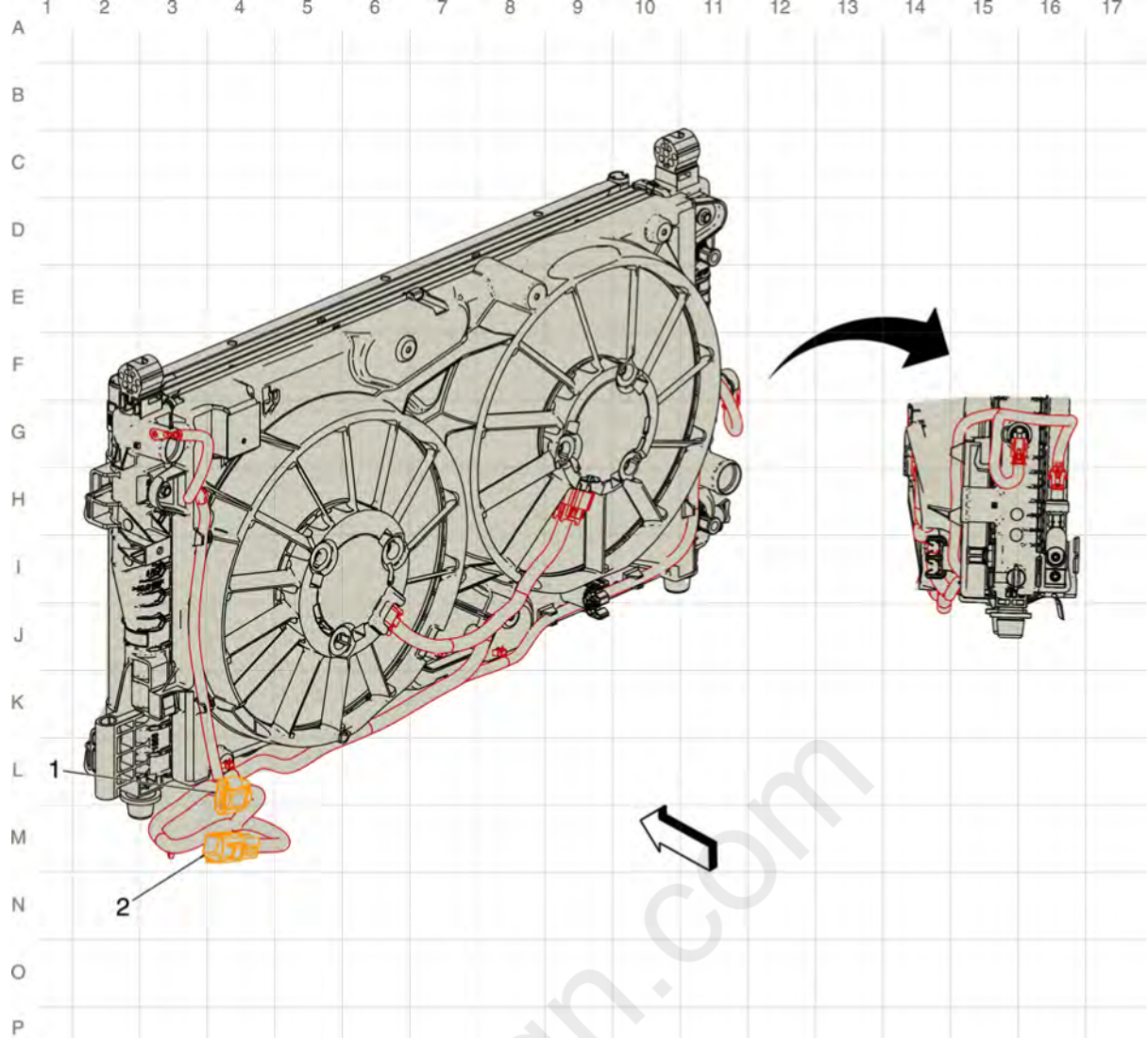


Fig. 4: Cooling Fan Harness Routing

Courtesy of GENERAL MOTORS COMPANY

Items

- 1: X117 Cooling Fan Harness to Forward Lamp Harness (5 Cavities) [X117 Cooling Fan Harness to Forward Lamp Harness](#)
2: X116 Forward Lamp Harness to Cooling Fan Harness (4 Cavities) [X116 Forward Lamp Harness to Cooling Fan Harness](#)

Engine Harness Routing - Left Front (LFR)

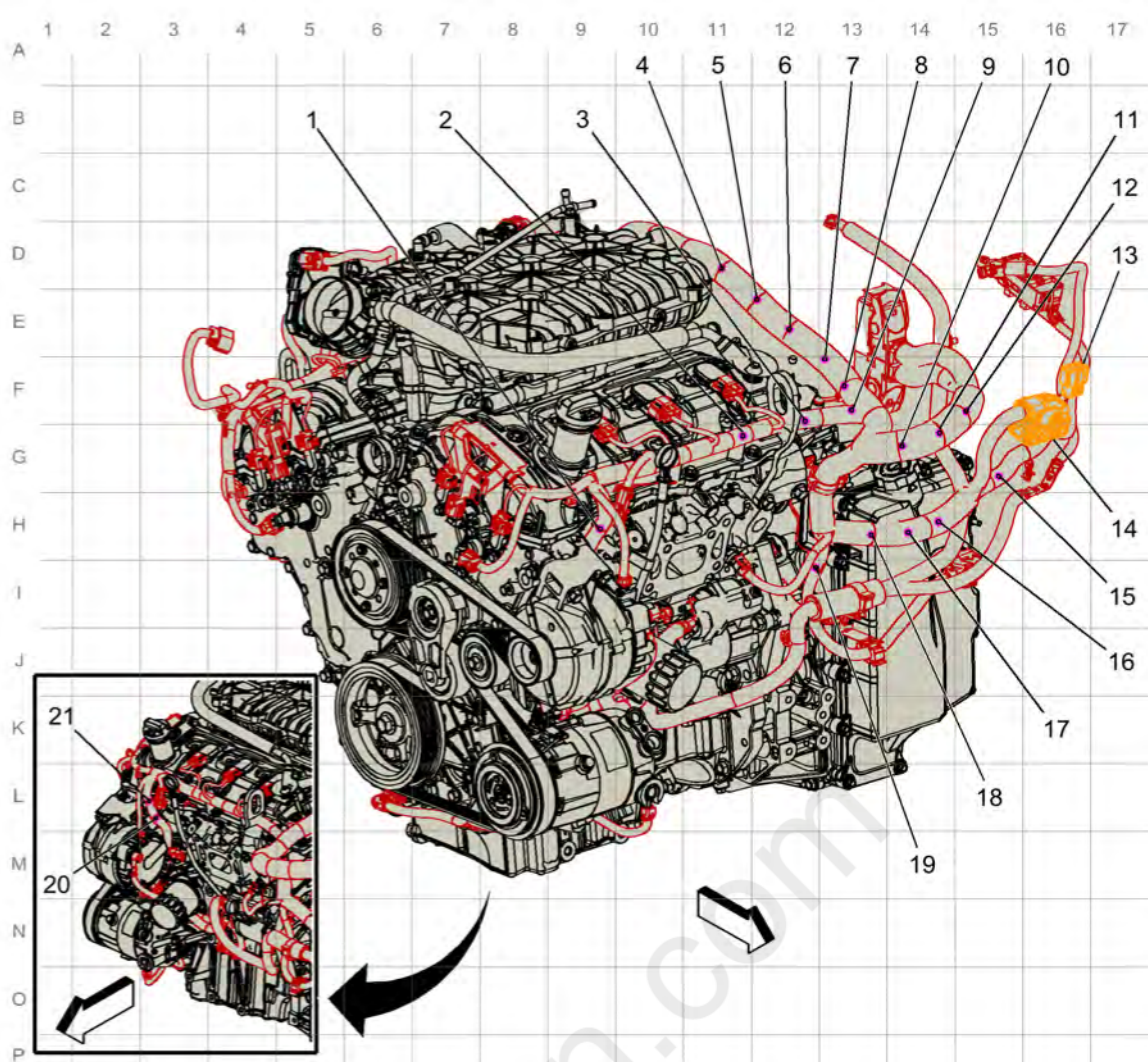


Fig. 5: Engine Harness Routing - Left Front (LFR)

Courtesy of GENERAL MOTORS COMPANY

Items

- 1: J120 Engine Harness
- 2: J122 Engine Harness
- 3: J119 Engine Harness
- 4: J107 Engine Harness
- 5: J108 Engine Harness
- 6: J133 Engine Harness
- 7: J121 Engine Harness
- 8: J191 Engine Harness (LFR)
- 9: J123 Engine Harness
- 10: J149 Engine Harness (LFR)
- 11: J154 Engine Harness (LFR)
- 12: J192 Engine Harness (LFR)
- 13: X113 Engine Harness to Body Harness (8 Cavities) (LFR) **X113 Engine Harness to Body Harness**
- 14: X115 Engine Harness to Body Harness (40 Cavities) **X115 Engine Harness to Body Harness**
- 15: J163 Engine Harness (LFR)
- 16: J106 Engine Harness
- 17: J194 Engine Harness (LFR)
- 18: J104 Engine Harness
- 19: J140 Engine Harness (LFR)
- 20: J162 Engine Harness (LFR)
- 21: J176 Engine Harness (LFR)

Engine Harness Routing - Right Rear (LFR)

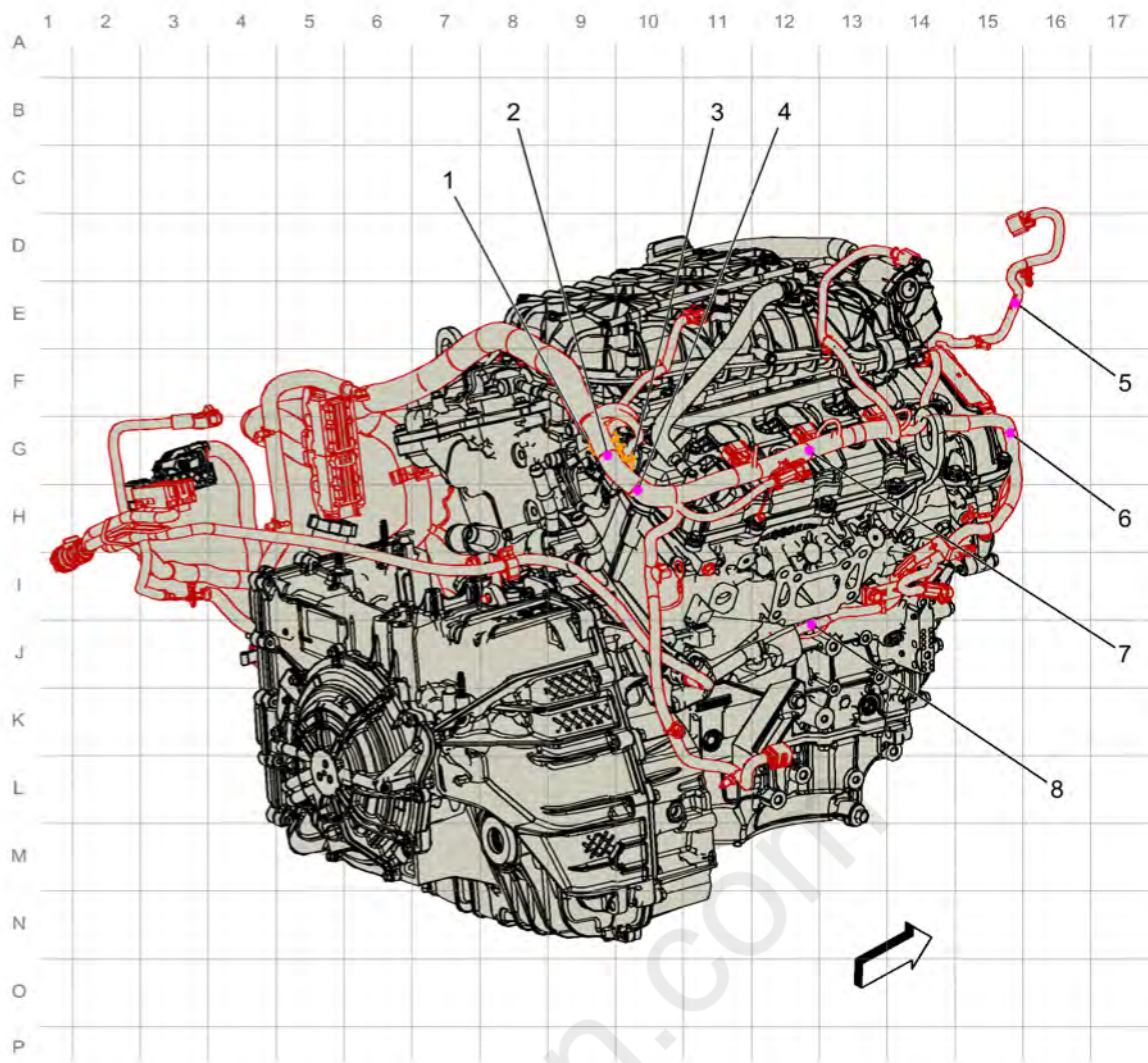


Fig. 6: Engine Harness Routing - Right Rear (LFR)

Courtesy of GENERAL MOTORS COMPANY

Items

- 1: X160 Engine Harness to Fuel Rail Bank 1 Harness (12 Cavities) **X160 Engine Harness to Fuel Rail Harness (LFR)**
- 2: J153 Engine Harness (LFR)
- 3: X161 Engine Harness to Alternative Fuel Rail Harness (12 Cavities) **X161 Engine Harness to Alternative Fuel Rail Harness (LFR)**
- 4: J103 Engine Harness
- 5: J142 Engine Harness (LFR)
- 6: J141 Engine Harness (LFR)
- 7: J193 Engine Harness (LFR)
- 8: J175 HVAC-Automatic (LFR)

Engine Harness Routing - Left Front (LFX)

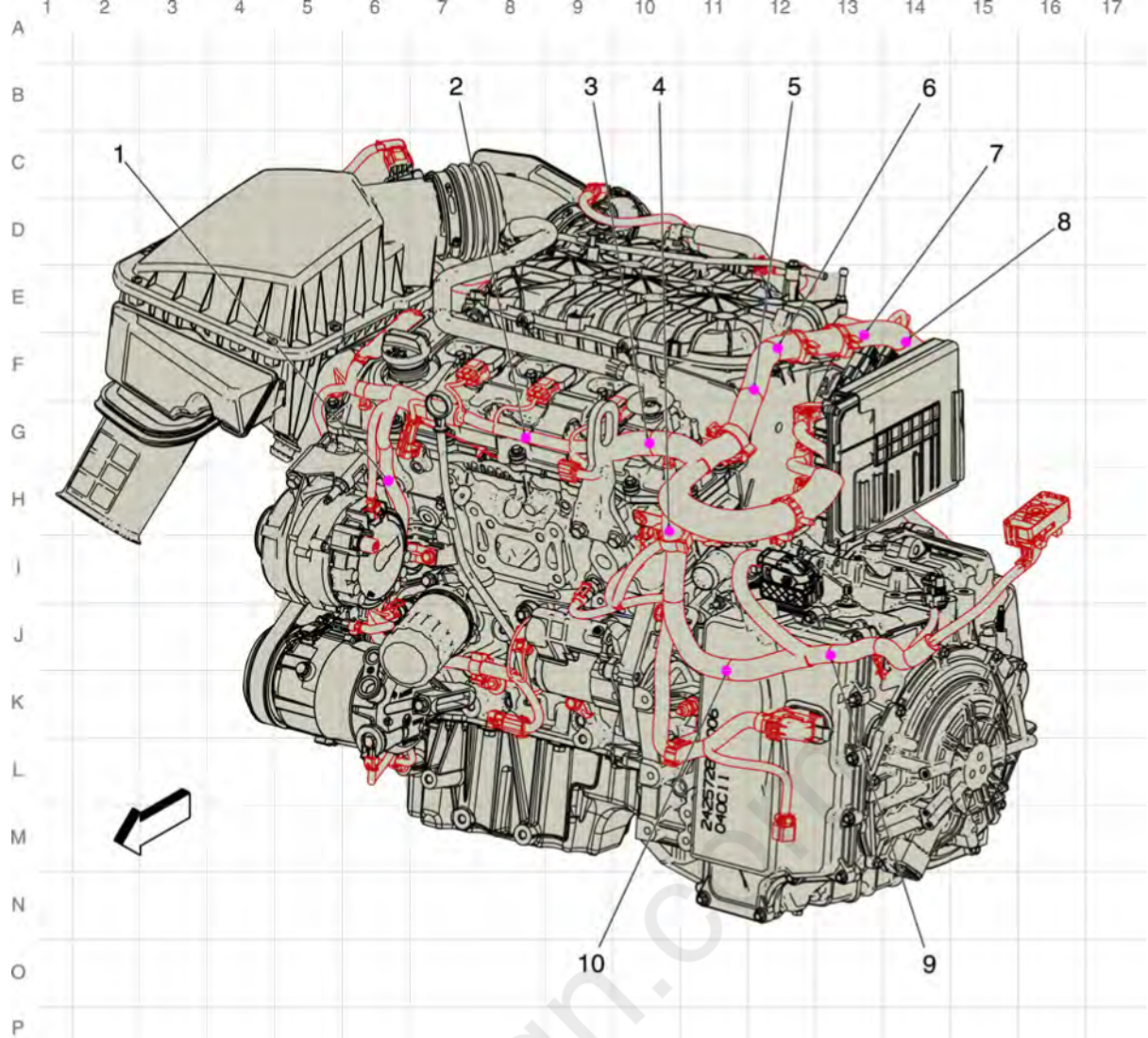


Fig. 7: Engine Harness Routing - Left Front (LFX)
Courtesy of GENERAL MOTORS COMPANY

Items
1: J120 Engine Harness
2: J122 Engine Harness
3: J119 Engine Harness
4: J123 Engine Harness
5: J121 Engine Harness
6: J133 Engine Harness
7: J108 Engine Harness
8: J107 Engine Harness
9: J106 Engine Harness
10: J104 Engine Harness

Engine Harness Routing - Right Rear (LFX)

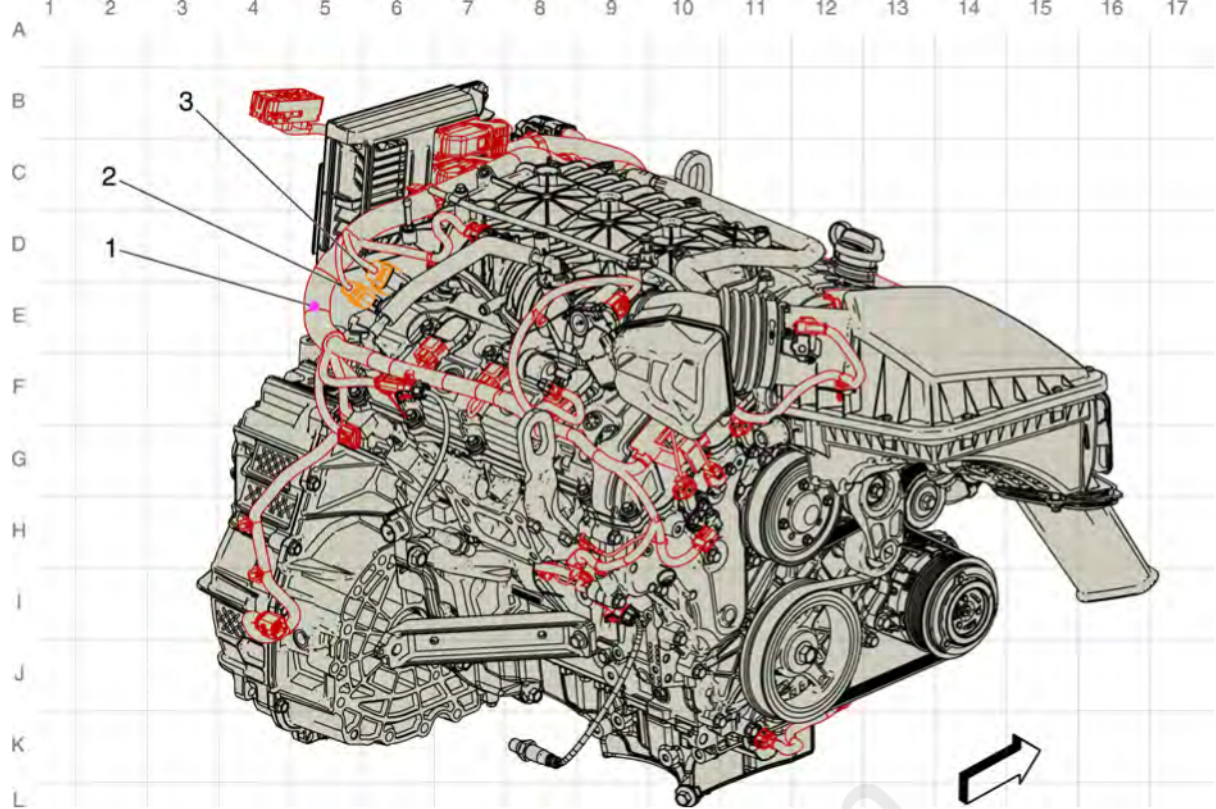


Fig. 8: Engine Harness Routing - Right Rear (LFX)

Courtesy of GENERAL MOTORS COMPANY

Items

- 1: J103 Engine Harness
- 2: X160 Engine Harness to Fuel Rail Bank 1 Harness (12 Cavities) **X160 Engine Harness to Fuel Rail Bank 1 Harness (LFX)**
- 3: X161 Engine Harness to Alternative Fuel Rail Harness (12 Cavities) **X161 Engine Harness to Fuel Rail Bank 2 Harness (LFX)**

Engine Harness Routing - Right Front (LCV)

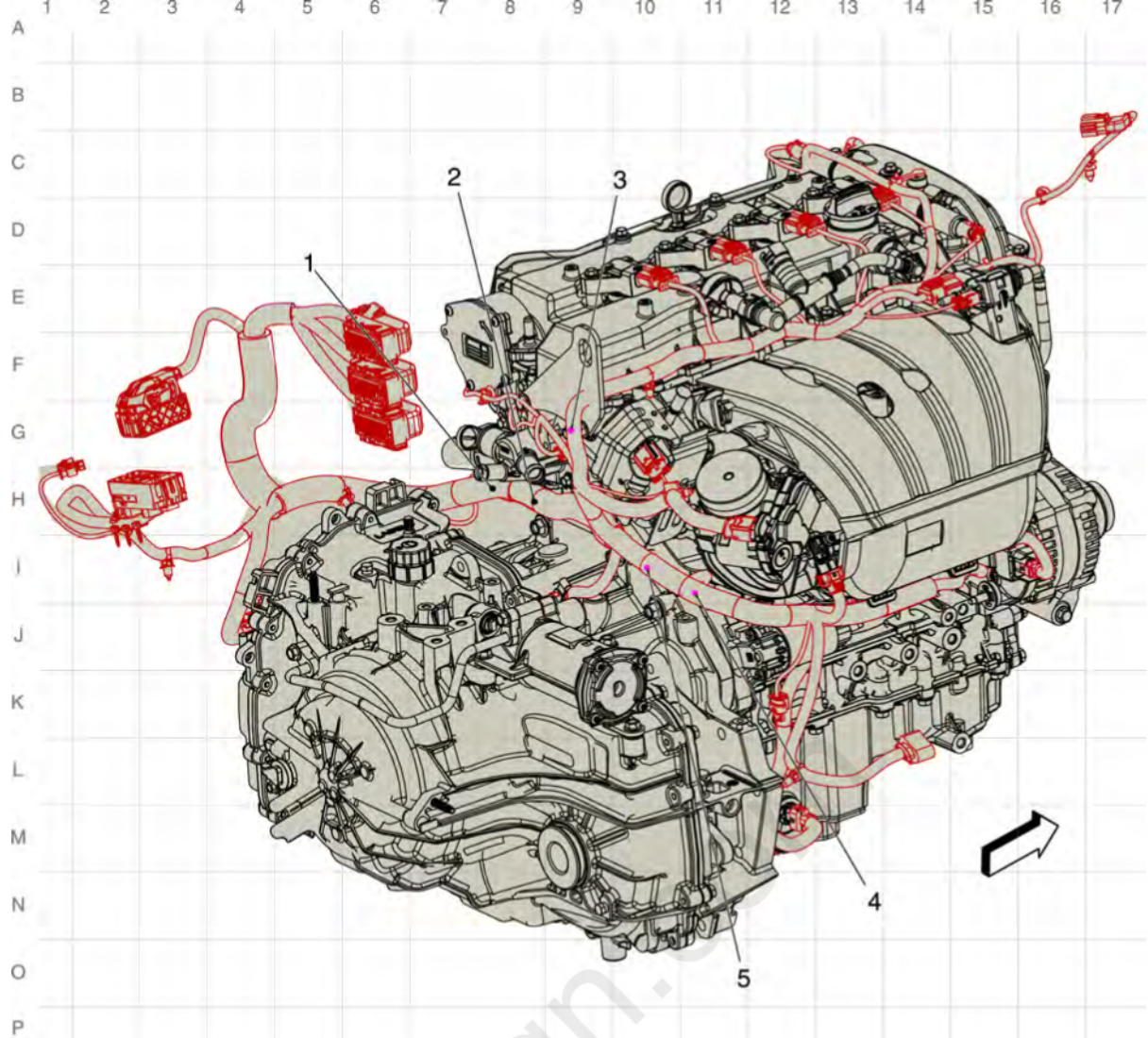


Fig. 9: Engine Harness Routing - Right Front (LCV)
Courtesy of GENERAL MOTORS COMPANY

Items
1: J121 Engine Harness
2: J107 Engine Harness
3: J108 Engine Harness
4: J106 Engine Harness
5: J120 Engine Harness

Engine Harness Routing - Left Rear (LCV)

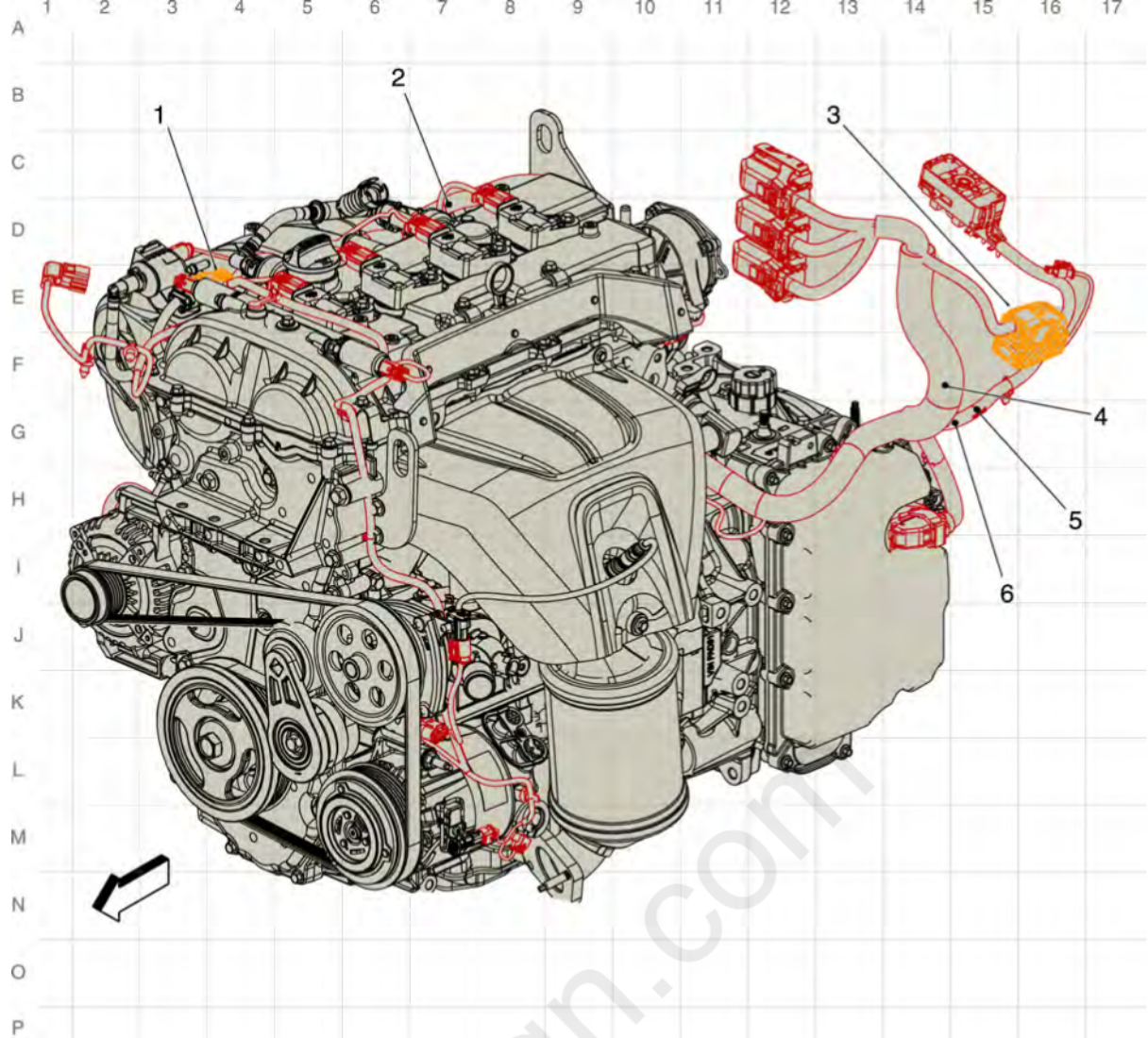


Fig. 10: Engine Harness Routing - Left Rear (LCV)

Courtesy of GENERAL MOTORS COMPANY

Items

- 1: X160 Engine Harness to Fuel Rail Bank 1 Harness (12 Cavities) **X160 Engine Harness to Fuel Rail Harness (LCV)**
- 2: J122 Engine Harness
- 3: X115 Engine Harness to Body Harness (40 Cavities) **X115 Engine Harness to Body Harness**
- 4: J104 Engine Harness
- 5: J103 Engine Harness
- 6: J139 Body Harness (KL9)

Fuel Composition Sensor Harness Routing (FHS)

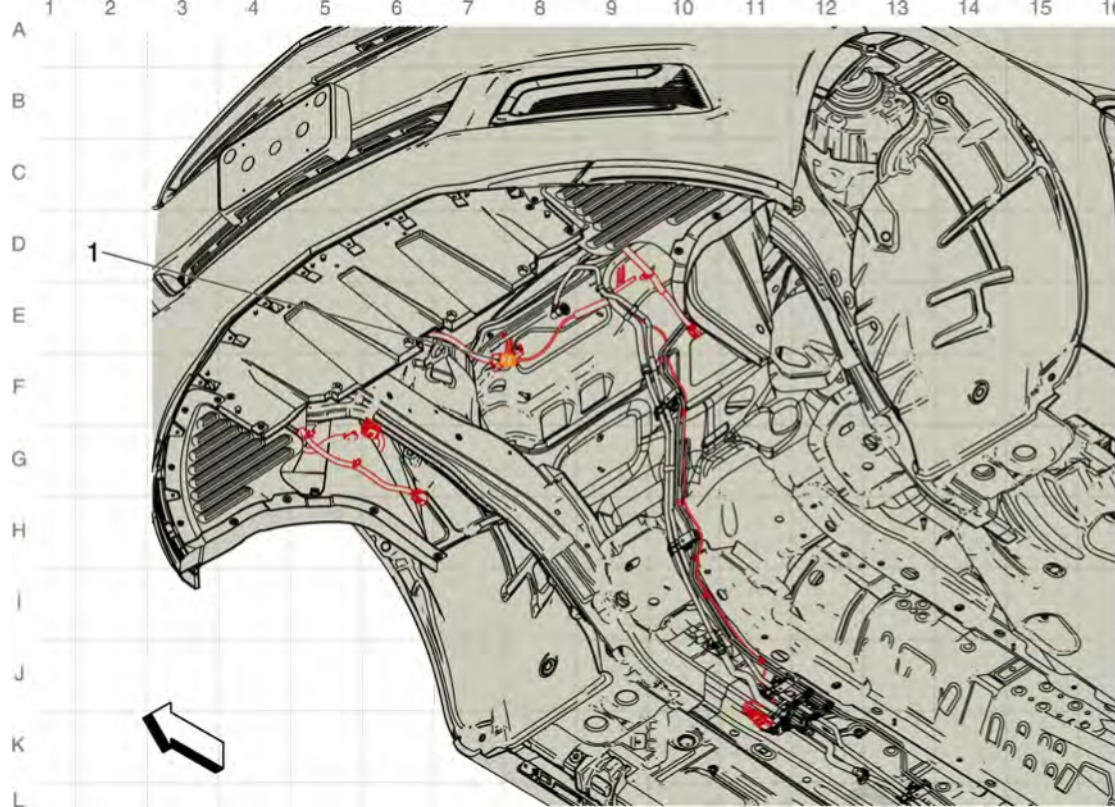


Fig. 11: Fuel Composition Sensor Harness Routing (FHS)

Courtesy of GENERAL MOTORS COMPANY

Items

1: X190 Forward Lamp Harness to Fuel Composition Jumper Harness (3 Cavities) (FHS) **X190 Forward Lamp Harness to Fuel Composition Sensor Jumper Harness**

Instrument Panel Harness Routing - Rear of Instrument Panel

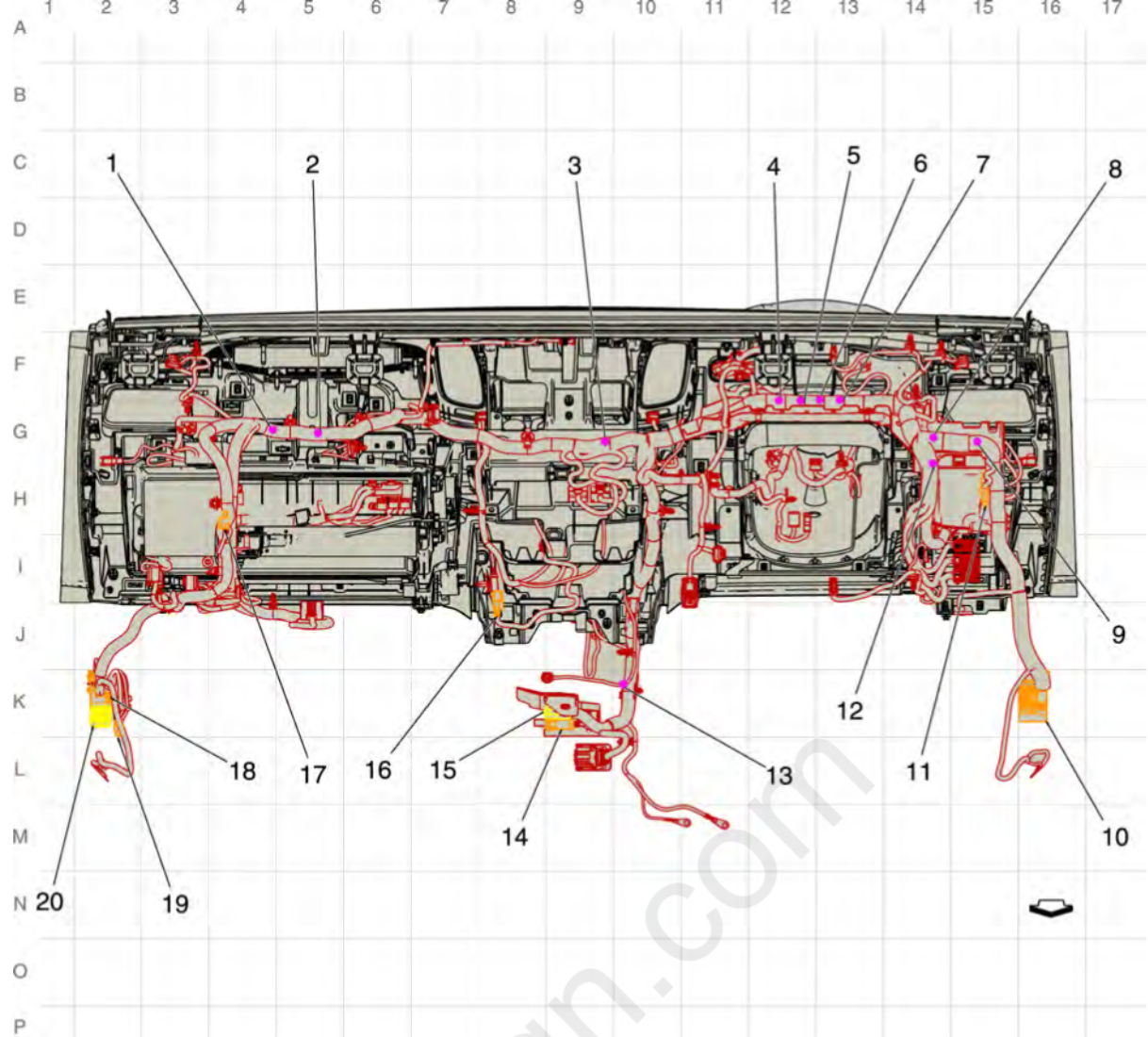


Fig. 12: Instrument Panel Harness Routing - Rear of Instrument Panel
 Courtesy of GENERAL MOTORS COMPANY

Items

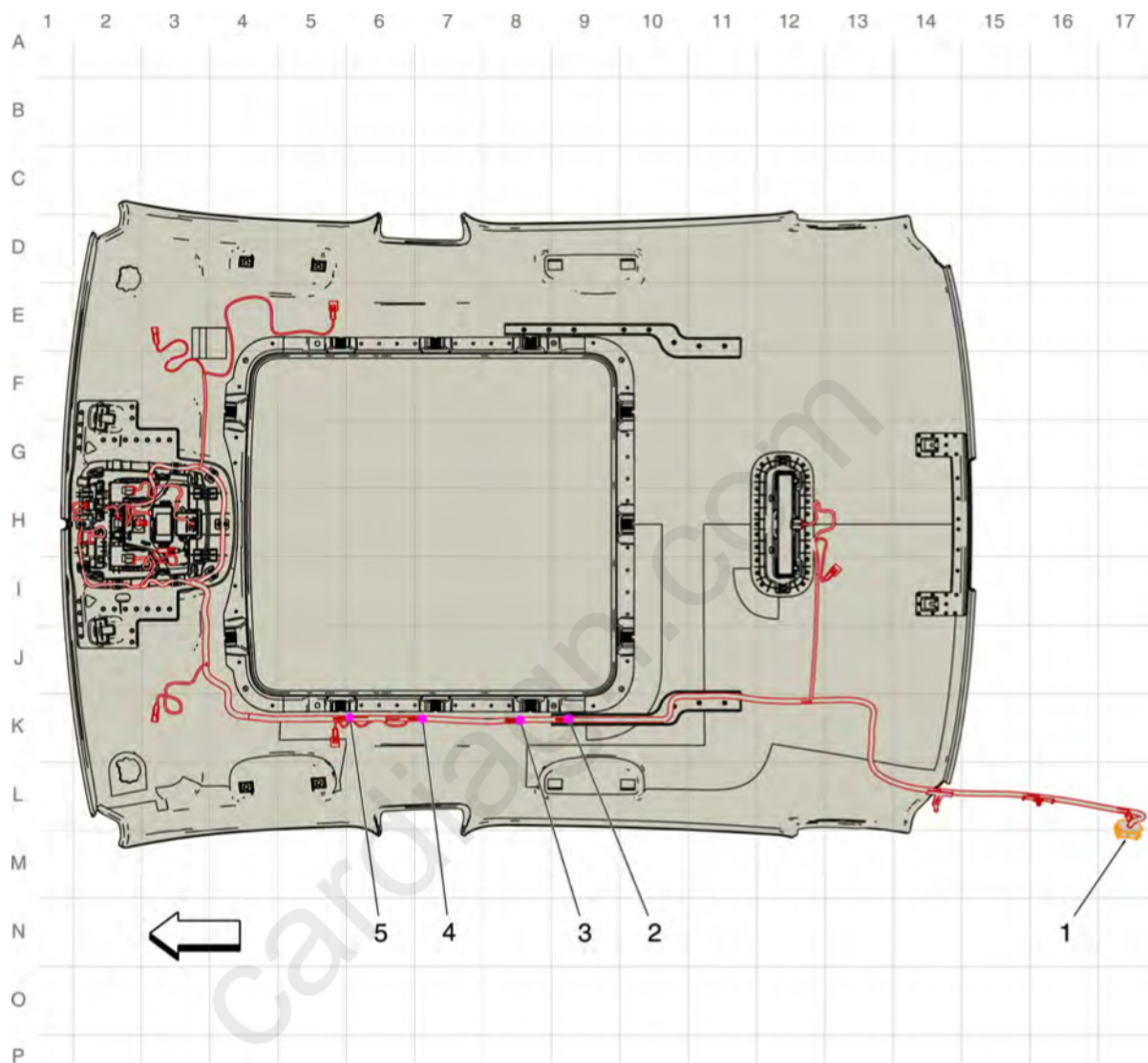
- 1: J202 Instrument Panel Harness
- 2: J200 Instrument Panel Harness
- 3: J206 Instrument Panel Harness
- 4: J207 Instrument Panel Harness
- 5: J204 Instrument Panel Harness
- 6: J210 Instrument Panel Harness (UEU)
- 7: J203
- 8: J209 Instrument Panel Harness
- 9: J205 Instrument Panel Harness (C9J)
- 10: X210 Instrument Panel Harness to Body Harness (102 Cavities) **X210 Instrument Panel Harness to Body Harness**
- 11: JX200 Instrument Panel Harness **JX200 Splice Pack**
- 12: J201 Instrument Panel Harness
- 13: J208 Instrument Panel Harness
- 14: X301 Console Harness USB to Instrument Panel Harness USB **X301 Instrument Panel Harness to Console Harness**
- 15: X300 Console Harness to Instrument Panel Harness (52 Cavities) **X300 Console Harness to Instrument Panel Harness**
- 16: X240
- 17: X205 Instrument Panel Harness to Passenger Air Bag Harness (6 Cavities) **X205 Instrument Panel Harness to Passenger Air Bag Harness**
- 18: X221 Body Harness COAX to Instrument Panel Harness COAX (1 Cavity) **X221 Body Harness to Instrument Panel Harness**

Items

19: X222 Body Harness COAX to Instrument Panel Harness COAX (2 Cavities) [X222 Body Harness COAX to Instrument Panel Harness COAX \(IO6 with U2K or U2M\)](#) [X222 Body Harness COAX to Instrument Panel Harness COAX \(IO6 without U2K or U2M\)](#) [X222 Body Harness COAX to Instrument Panel Harness COAX \(U2K or U2M without IO6\)](#) [X222 Body Harness to Instrument Panel Harness](#)

20: X220 Instrument Panel Harness to Body Harness (54 Cavities) [X220 Instrument Panel Harness to Body Harness](#)

Headliner Harness Routing (C3U)



[Fig. 13: Headliner Harness Routing \(C3U\)](#)

Courtesy of GENERAL MOTORS COMPANY

Items

- 1: X400 Headliner Harness to Body Harness (40 Cavities) [X400 Headliner Harness to Body Harness](#)
- 2: J398 Headliner Harness
- 3: J397 Headliner Harness
- 4: J396 Headliner Harness
- 5: J399 Headliner Harness

Headliner Harness Routing (without C3U)

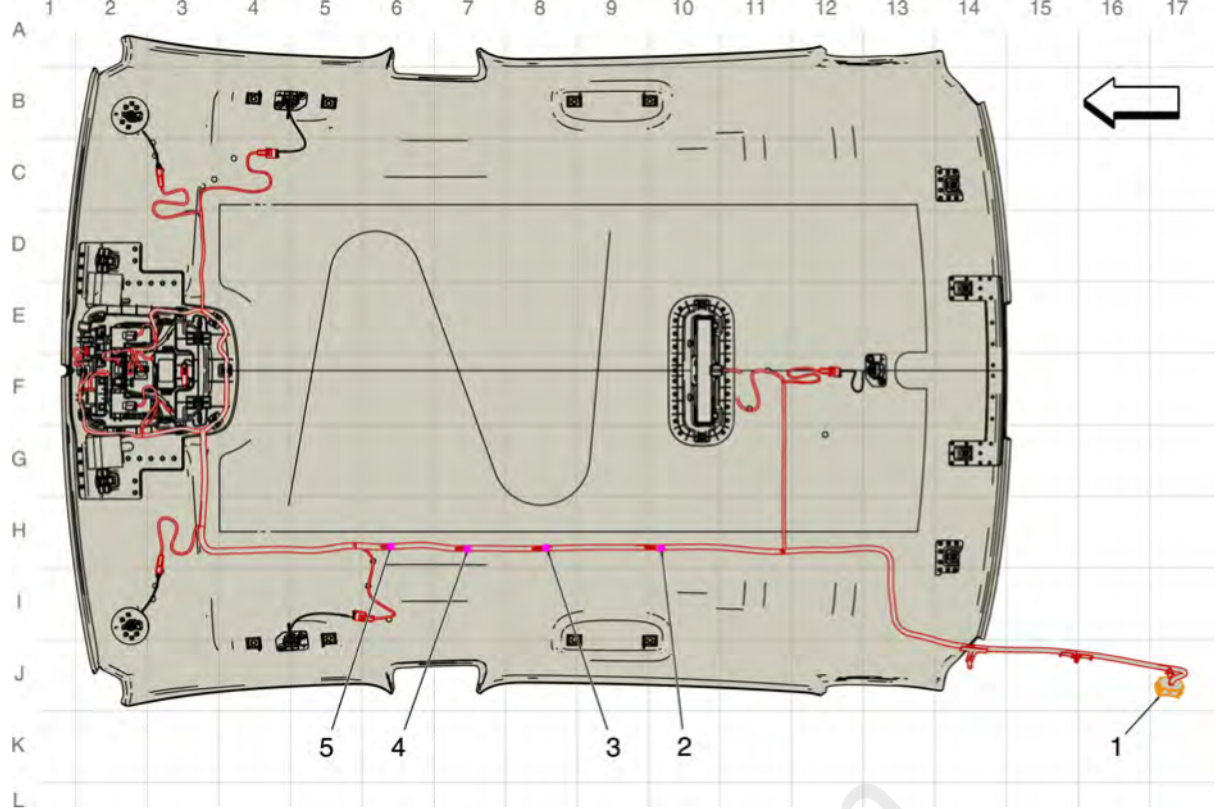


Fig. 14: Headliner Harness Routing (without C3U)

Courtesy of GENERAL MOTORS COMPANY

Items

- 1: X400 Headliner Harness to Body Harness (40 Cavities) **X400 Headliner Harness to Body Harness**
- 2: J398 Headliner Harness
- 3: J397 Headliner Harness
- 4: J396 Headliner Harness
- 5: J399 Headliner Harness

HVAC Assembly Harness Routing

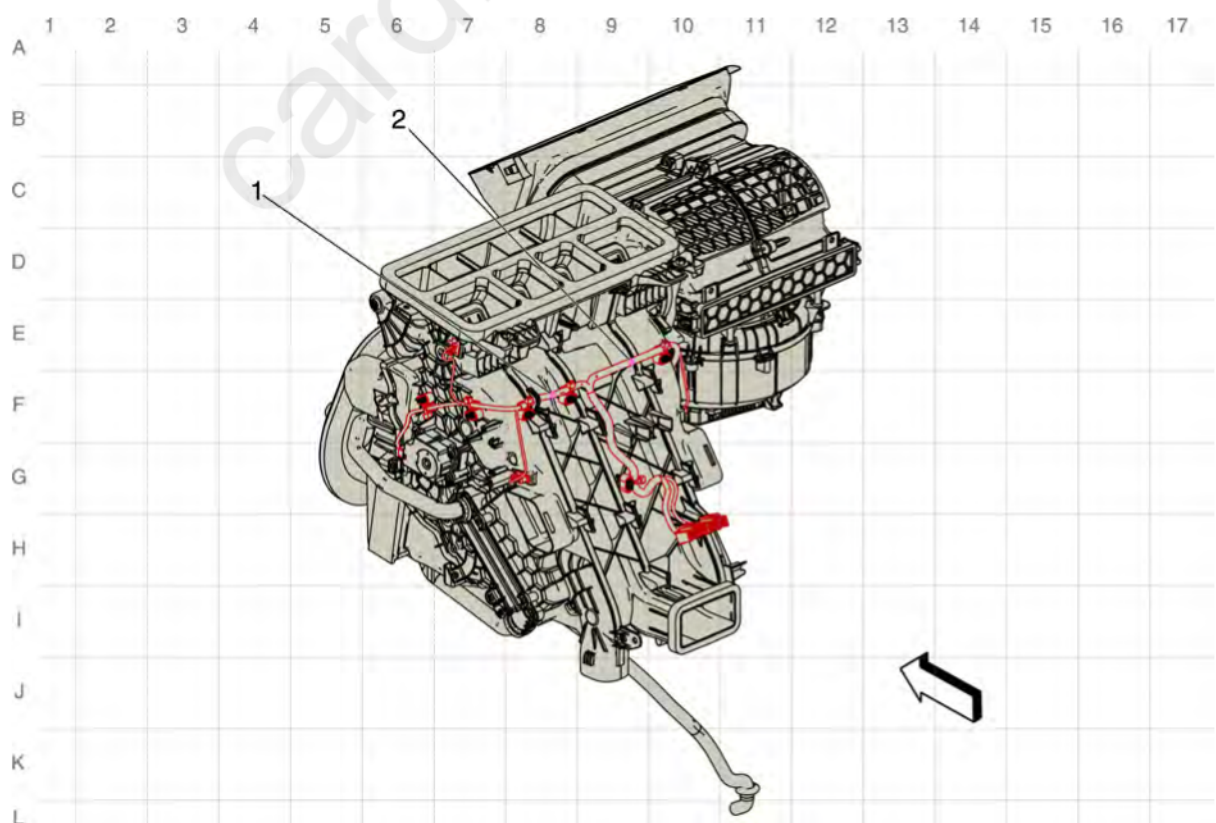


Fig. 15: HVAC Assembly Harness Routing

Courtesy of GENERAL MOTORS COMPANY

Items

- 1: J217 HVAC Assembly Harness (CJ2)
- 2: J216 HVAC Assembly Harness

Floor Console Harness Routing

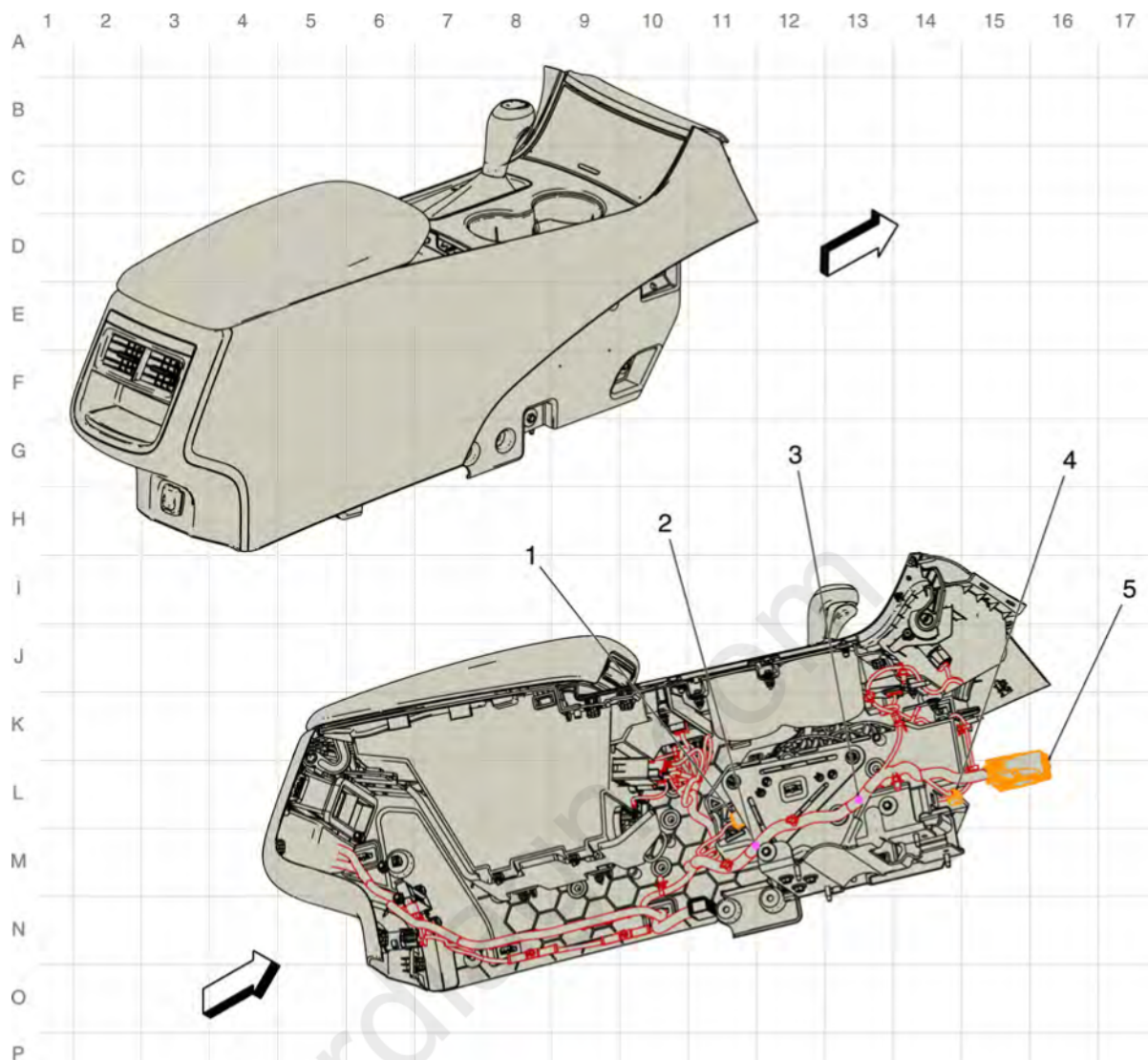


Fig. 16: Floor Console Harness Routing

Courtesy of GENERAL MOTORS COMPANY

Items

- 1: X305 Instrument Panel Harness to Transmission Shift Lever Harness (6 Cavities) [X305 Console Harness to Shifter Harness](#)
- 2: J301 Console Harness
- 3: J300 Console Harness
- 4: X301 Console Harness USB to Instrument Panel Harness USB [X301 Instrument Panel Harness to Console Harness](#)
- 5: X300 Console Harness to Instrument Panel Harness (52 Cavities) [X300 Console Harness to Instrument Panel Harness](#)

Body Harness Routing - Left Front of Passenger Compartment

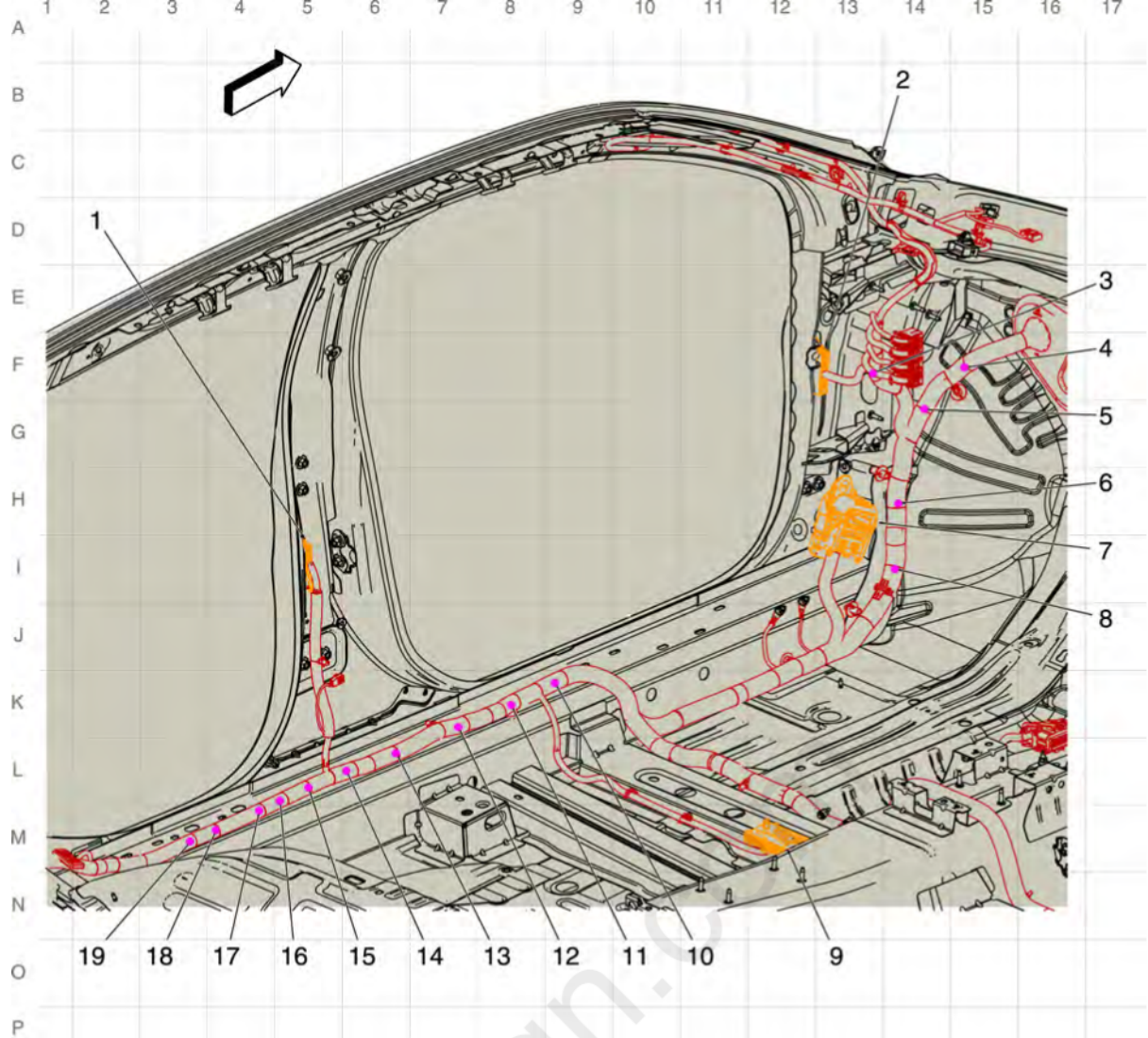


Fig. 17: Body Harness Routing - Left Front of Passenger Compartment
Courtesy of GENERAL MOTORS COMPANY

Items

- 1: X700 Left Rear Door Harness to Body Harness (20 Cavities) **X700 Left Rear Door Harness to Body Harness**
- 2: X500 Driver Door Harness to Body Harness (41 Cavities) **X500 Driver Door Harness to Body Harness**
- 3: J231 Body Harness
- 4: J227
- 5: J228 Body Harness (UG1)
- 6: J229 Body Harness
- 7: X210 Instrument Panel Harness to Body Harness (102 Cavities) **X210 Instrument Panel Harness to Body Harness**
- 8: J230 Body Harness
- 9: X310 Body Harness to Driver Seat Cushion Harness (48 Cavities) **X310 Body Harness to Driver Seat Cushion Harness**
- 10: J331 Body Harness (KU1, KU3 or UVD)
- 11: J332 Body Harness
- 12: J333 Body Harness
- 13: J334 Body Harness
- 14: J335 Body Harness
- 15: J336 Body Harness (DD8 or UVC)
- 16: J337 Body Harness (KA1)
- 17: J338 Body Harness
- 18: J339 Body Harness (EF7)
- 19: J340 Body Harness

Body Harness Routing - Right Front of Passenger Compartment

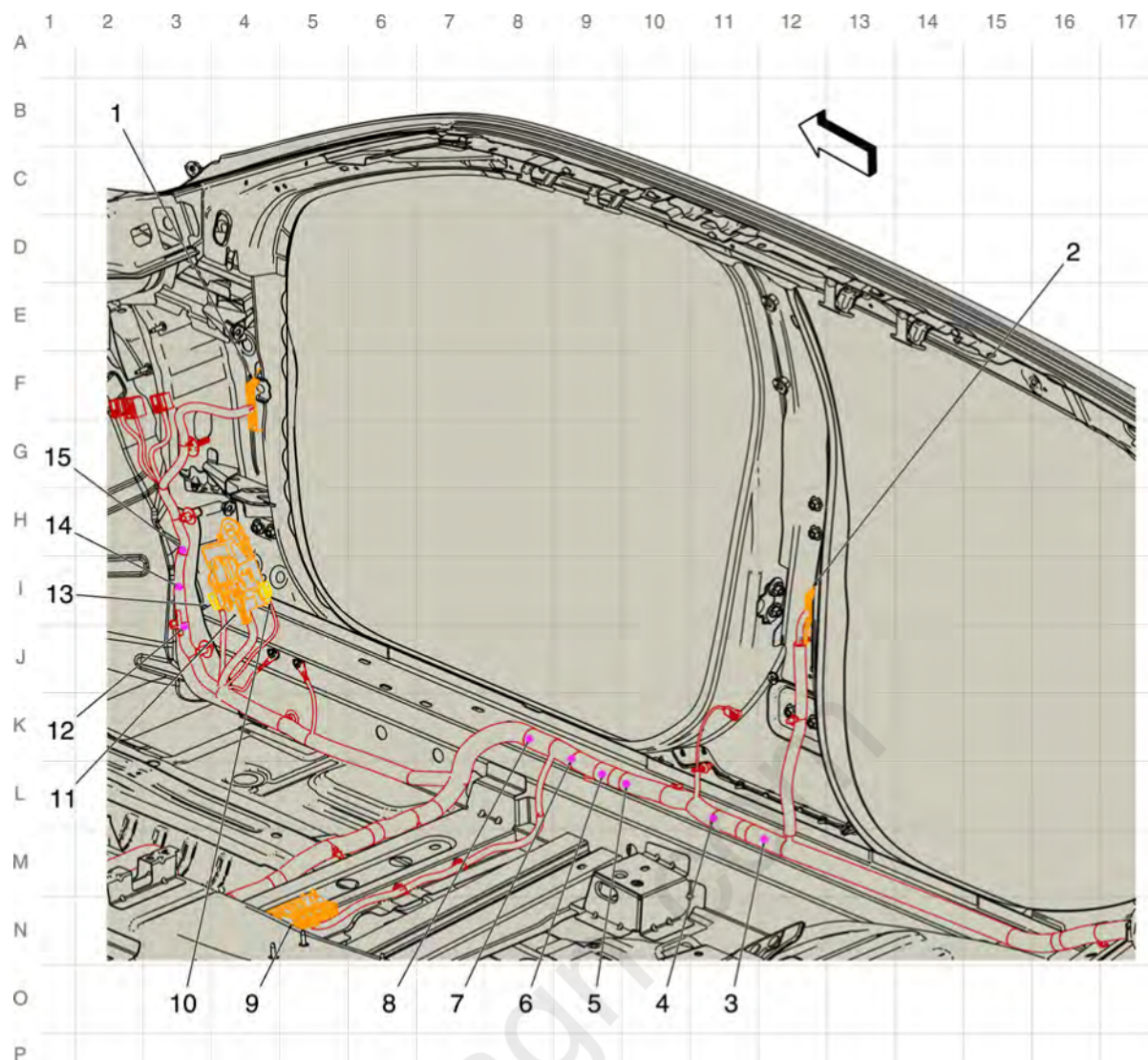


Fig. 18: Body Harness Routing - Right Front of Passenger Compartment

Courtesy of GENERAL MOTORS COMPANY

Items

- 1: X600 Passenger Door Harness to Body Harness (41 Cavities) **X600 Passenger Door Harness to Body Harness**
- 2: X800 Right Rear Door Harness to Body Harness (20 Cavities) **X800 Right Rear Door Harness to Body Harness**
- 3: J346 Body Harness
- 4: J345 Body Harness
- 5: J344 Body Harness
- 6: J343 Body Harness (A45)
- 7: J342
- 8: J341 Body Harness (DLG or DLL)
- 9: X320 Body Harness to Passenger Seat Cushion Harness (48 Cavities) **X320 Body Harness to Passenger Seat Cushion Harness**
- 10: X221 Body Harness COAX to Instrument Panel Harness COAX (1 Cavity) **X221 Body Harness to Instrument Panel Harness**
- 11: X220 Instrument Panel Harness to Body Harness (54 Cavities) **X220 Instrument Panel Harness to Body Harness**
- 12: J235 Body Harness
- 13: X222 Body Harness COAX to Instrument Panel Harness COAX (2 Cavities) **X222 Body Harness COAX to Instrument Panel Harness COAX (IO6 with U2K or U2M) X222 Body Harness COAX to Instrument Panel Harness COAX (IO6 without U2K or U2M) X222 Body Harness COAX to Instrument Panel Harness COAX (U2K or U2M without IO6) X222 Body Harness to Instrument Panel Harness**
- 14: J234 Body Harness

Items

15: J233 Body Harness (DLG or DLL)

Body Harness Routing - Front of Passenger Compartment above Windshield

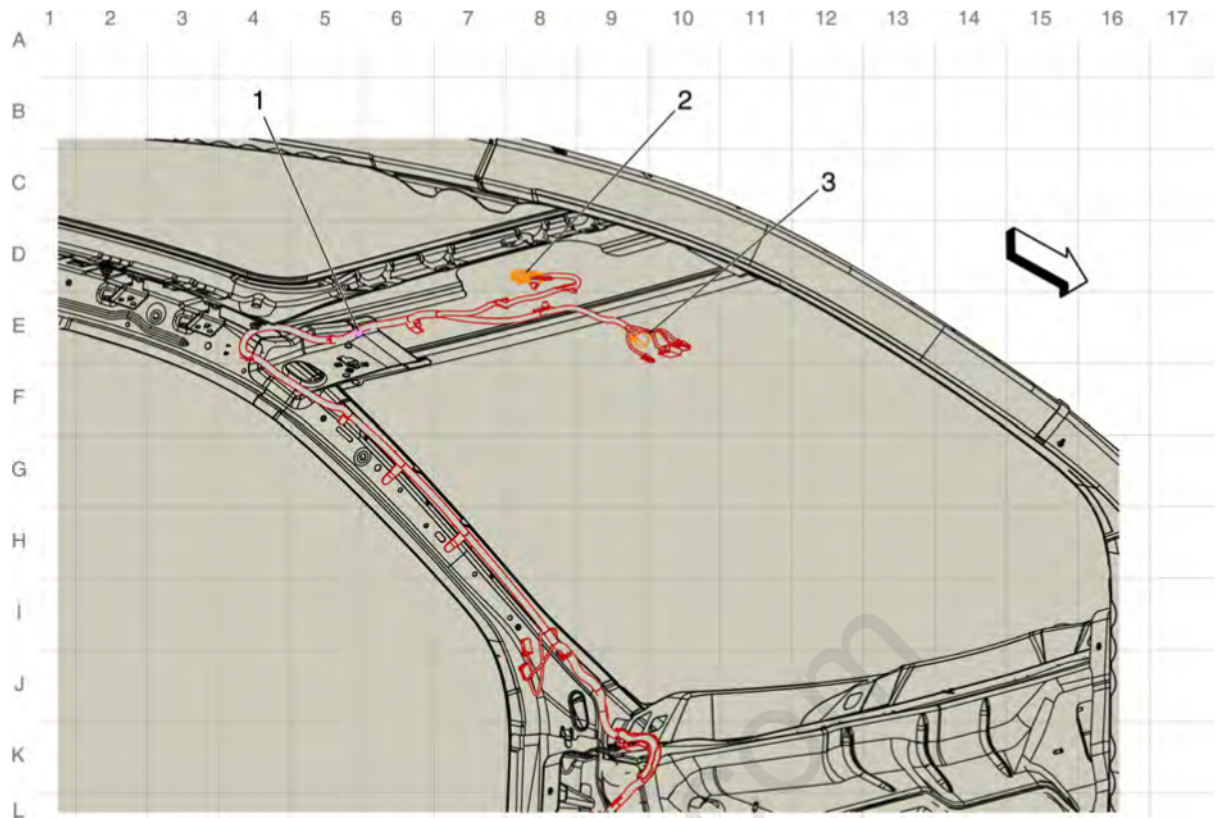


Fig. 19: Body Harness Routing - Front of Passenger Compartment above Windshield
 Courtesy of GENERAL MOTORS COMPANY

Items

1: J232 Body Harness (C3U)

2: X390 Sunroof Harness to Body Harness (8 Cavities) (C3U) [X390 Sunroof Harness to Body Harness](#)

3: X200 Windshield Sensor Harness to Body Harness (6 Cavities) (ASV) [X200 Windshield Sensor Harness to Body Harness](#)

Driver Door Harness Routing

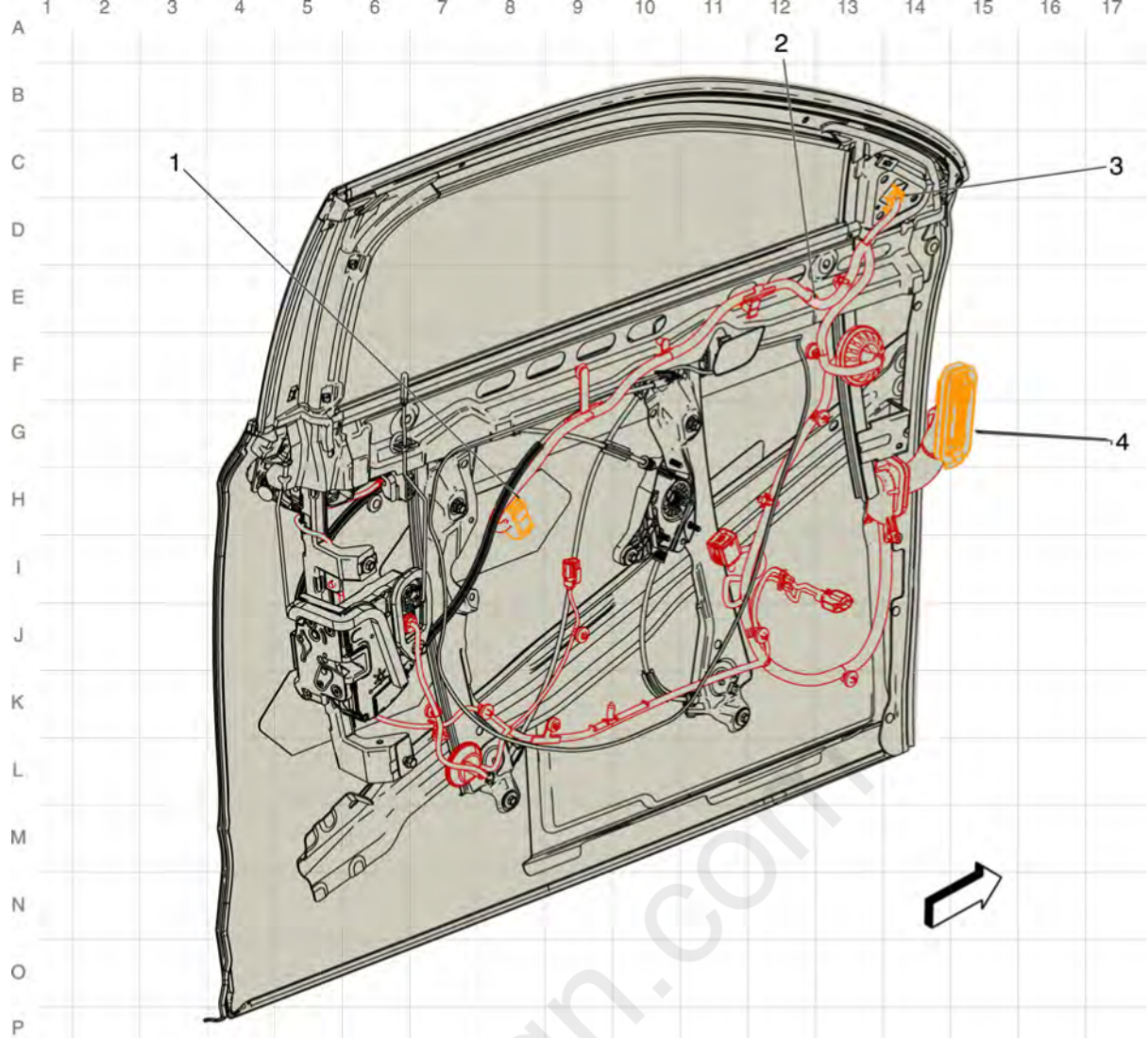


Fig. 20: Driver Door Harness Routing
 Courtesy of GENERAL MOTORS COMPANY

Items

- 1: X505 Driver Door Harness to Driver Door Trim Harness (40 Cavities) [X505 Driver Door Harness to Driver Door Trim Harness](#)
- 2: J500 Driver Door Harness
- 3: X510 Driver Door Harness to OSRVM - Driver Harness (18 Cavities) [X510 Driver Door Harness to Outside Rearview Mirror - Driver Harness](#)
- 4: X500 Driver Door Harness to Body Harness (41 Cavities) [X500 Driver Door Harness to Body Harness](#)

Driver Door Trim Harness Routing

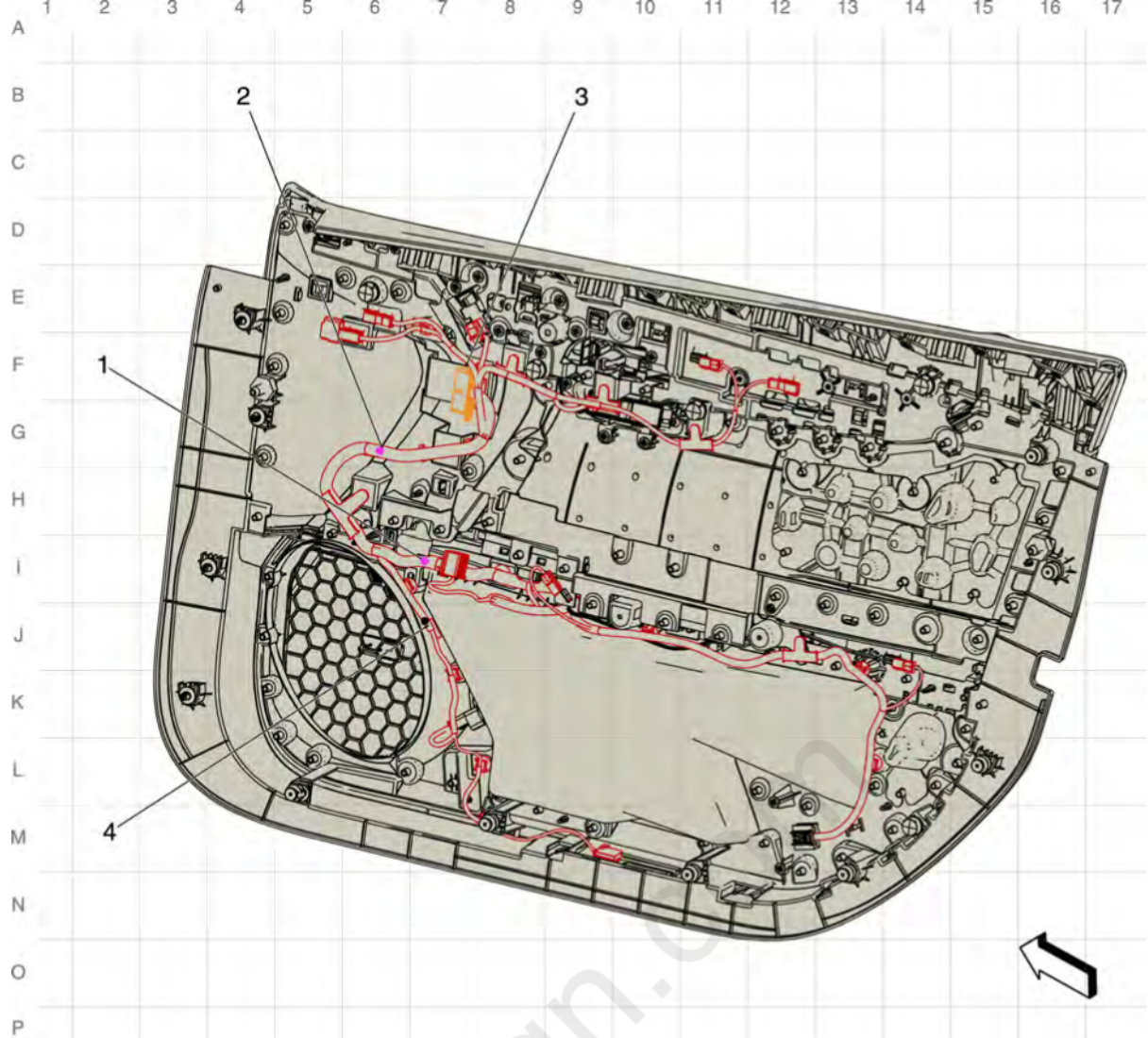


Fig. 21: Driver Door Trim Harness Routing
 Courtesy of GENERAL MOTORS COMPANY

Items

- 1: J506 Driver Door Trim Harness (1LT or 1LZ)
- 2: J507 Driver Door Trim Harness
- 3: X505 Driver Door Harness to Driver Door Trim Harness (40 Cavities) **X505 Driver Door Harness to Driver Door Trim Harness**
- 4: J505 Driver Door Trim Harness

Passenger Door Harness Routing

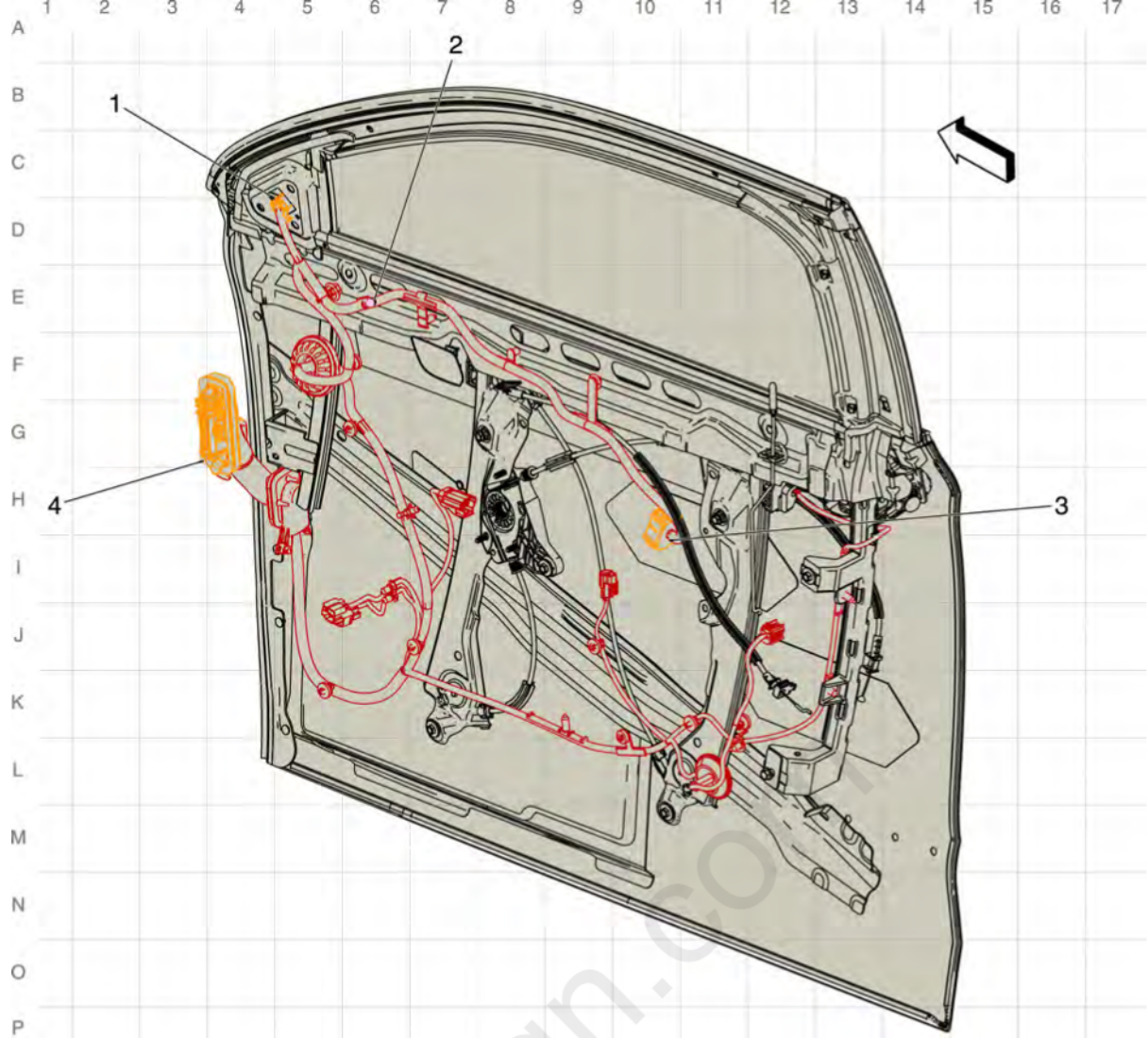


Fig. 22: Passenger Door Harness Routing
Courtesy of GENERAL MOTORS COMPANY

Items

- 1: X610 Passenger Door Harness to OSRVM Passenger Harness (18 Cavities) **X610 Passenger Door Harness to Outside Rearview Mirror - Passenger Harness**
- 2: J600 Passenger Door Harness
- 3: X605 Passenger Door Harness to Passenger Door Trim Harness (40 Cavities) **X605 Passenger Door Harness to Passenger Door Trim Harness**
- 4: X600 Passenger Door Harness to Body Harness (41 Cavities) **X600 Passenger Door Harness to Body Harness**

Passenger Door Trim Harness Routing

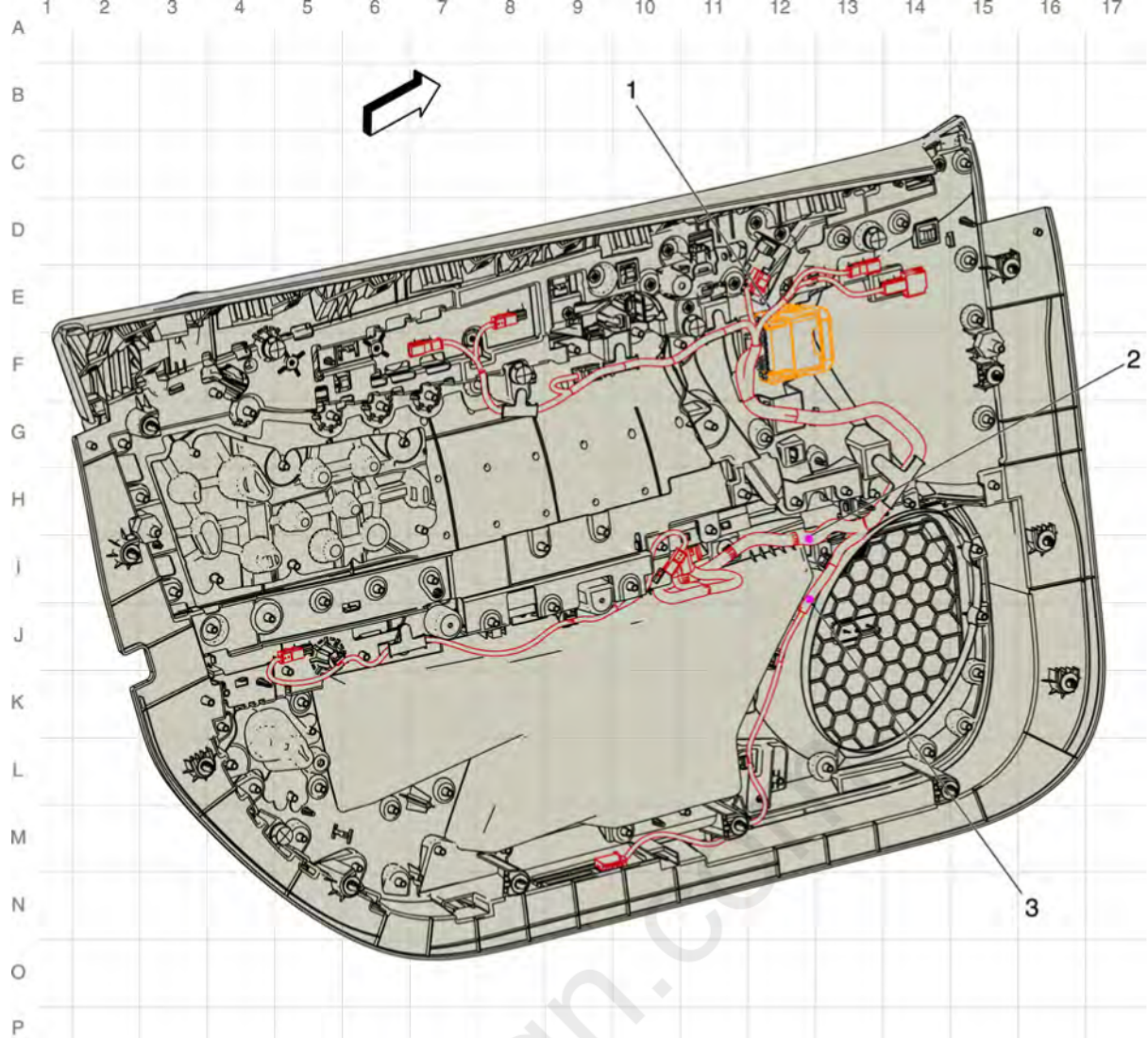


Fig. 23: Passenger Door Trim Harness Routing
Courtesy of GENERAL MOTORS COMPANY

Items

- 1: X605 Passenger Door Harness to Passenger Door Trim Harness (40 Cavities) **X605 Passenger Door Harness to Passenger Door Trim Harness**
- 2: J605 Passenger Door Trim Harness
- 3: J606 Passenger Door Trim Harness (1LT or 1LZ)

Left Rear Door Harness Routing

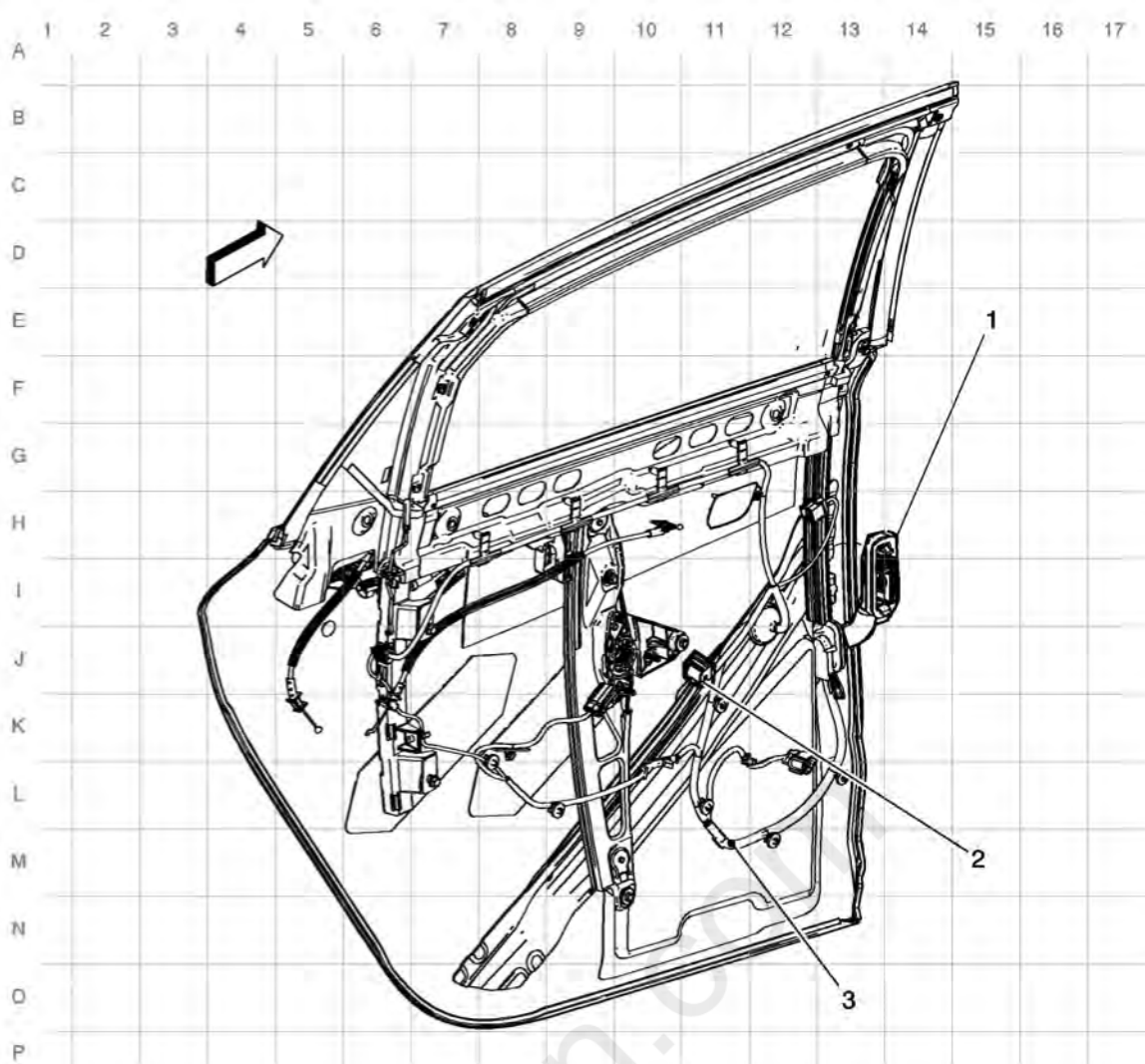


Fig. 24: Left Rear Door Harness Routing

Courtesy of GENERAL MOTORS COMPANY

Items

- 1: X700 Left Rear Door Harness to Body Harness (20 Cavities) **X700 Left Rear Door Harness to Body Harness**
- 2: X705
- 3: J700 Left Rear Door Harness

Left Rear Door Trim Harness Routing (1LT or 1LZ)

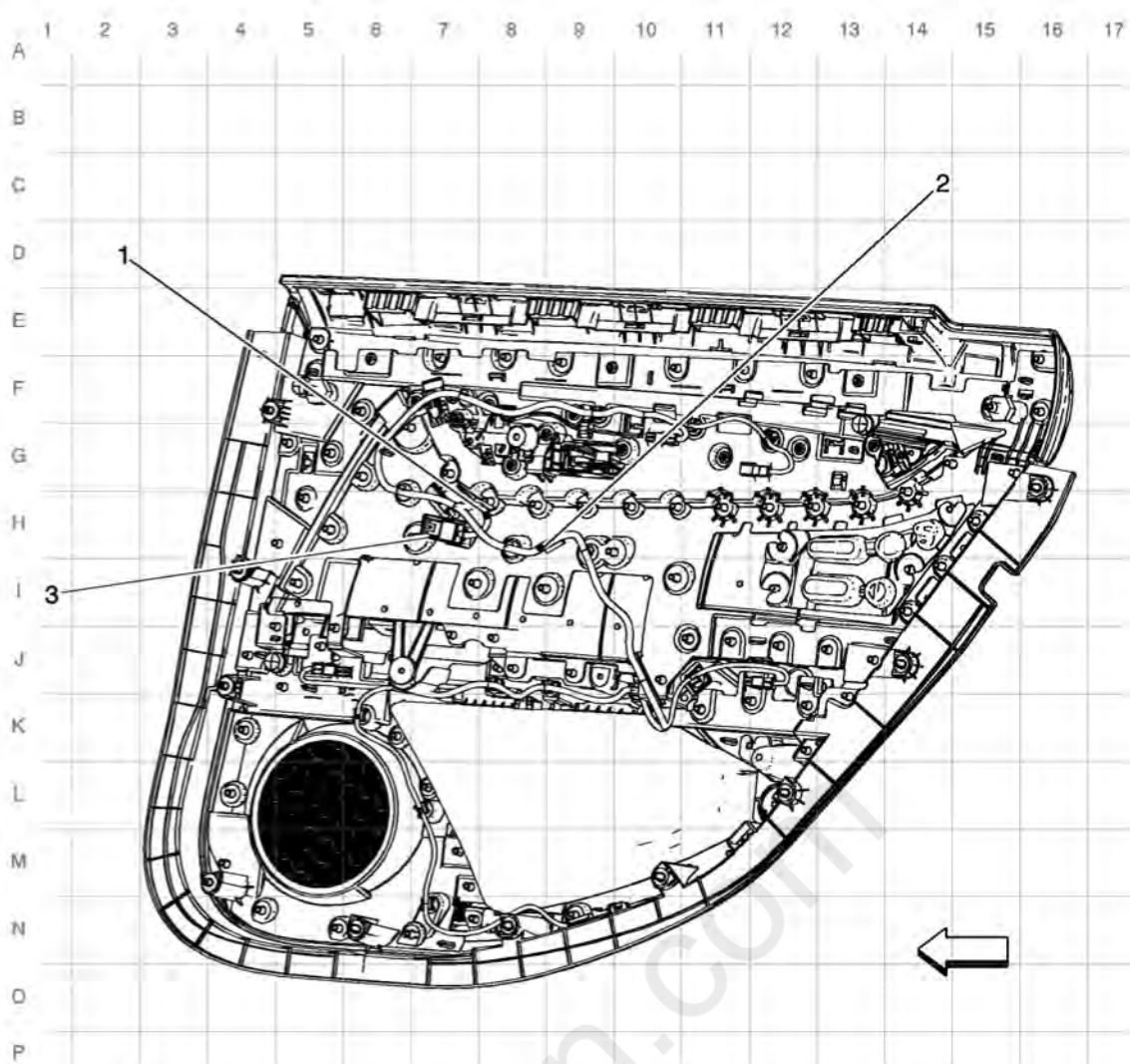


Fig. 25: Left Rear Door Trim Harness Routing (1LT or 1LZ)
Courtesy of GENERAL MOTORS COMPANY

	Items
1: J705	
2: J706	
3: X705	

Right Rear Door Harness Routing

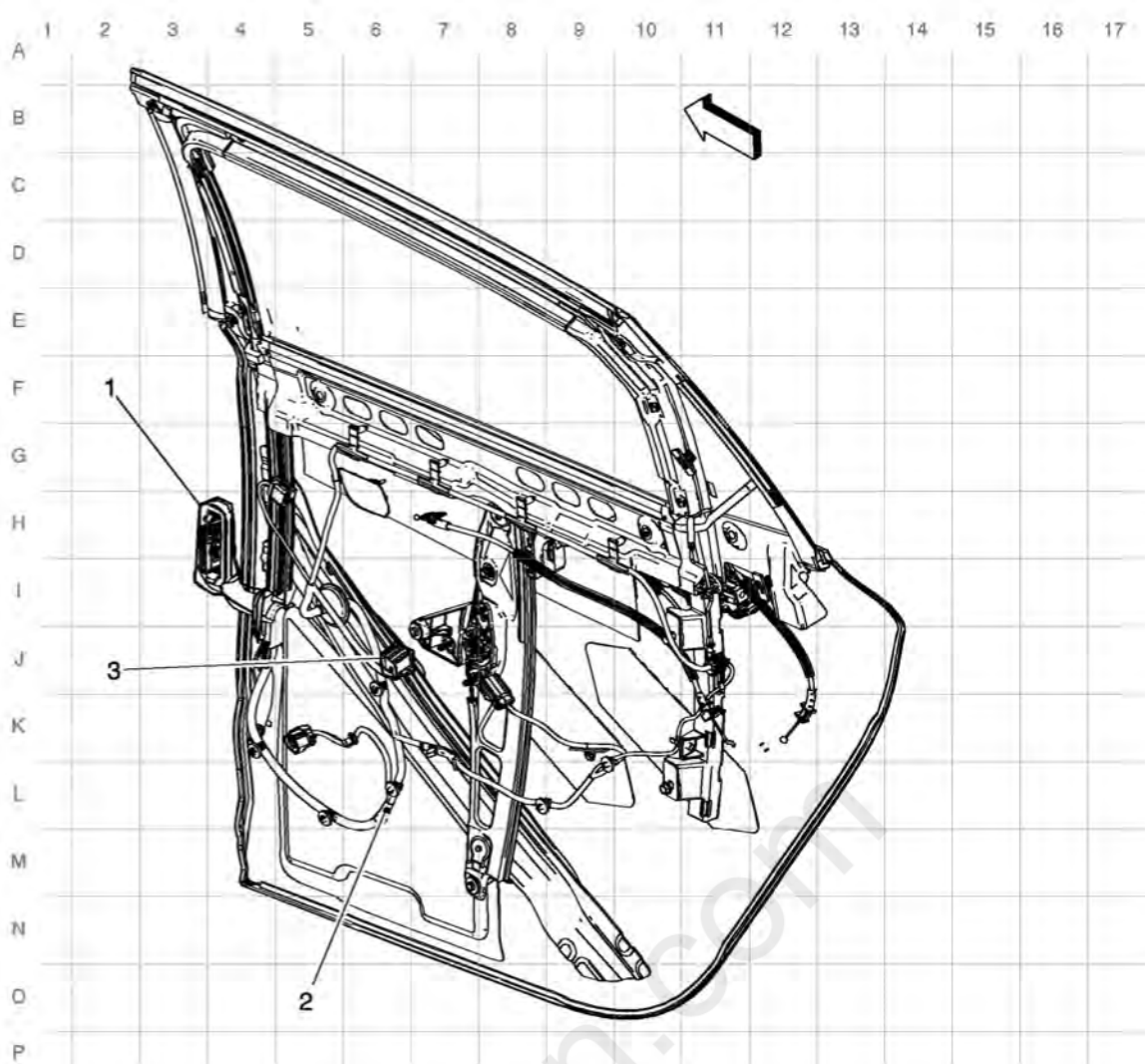


Fig. 26: Right Rear Door Harness Routing

Courtesy of GENERAL MOTORS COMPANY

Items

- 1: X800 Right Rear Door Harness to Body Harness (20 Cavities) **X800 Right Rear Door Harness to Body Harness**
- 2: J800 Right Rear Door Harness
- 3: X805

Right Rear Door Trim Harness Routing (1LT or 1LZ)

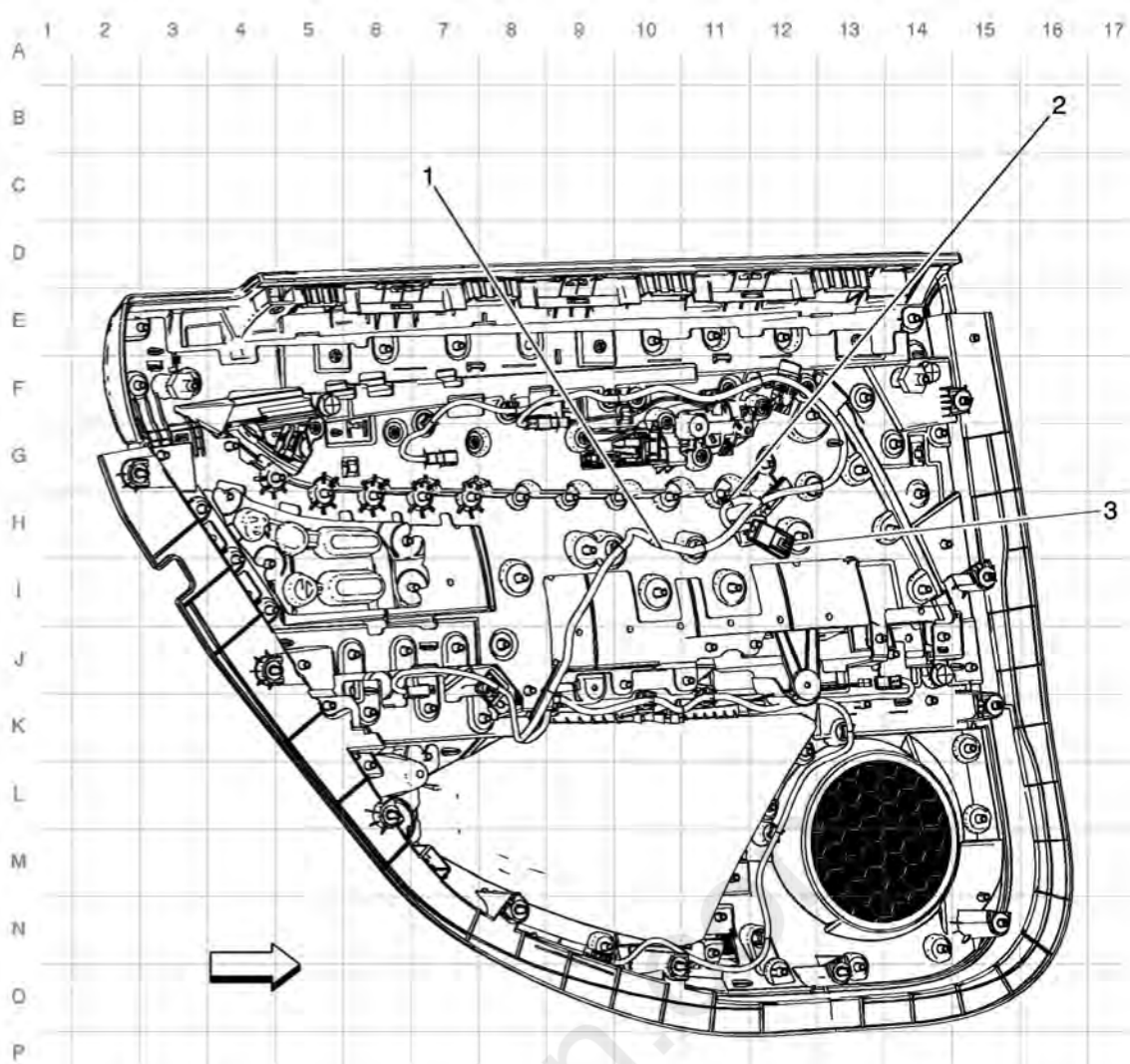


Fig. 27: Right Rear Door Trim Harness Routing (1LT or 1LZ)

Courtesy of GENERAL MOTORS COMPANY

	Items
1: J806	
2: J805	
3: X805	

Driver Seat Harness Routing

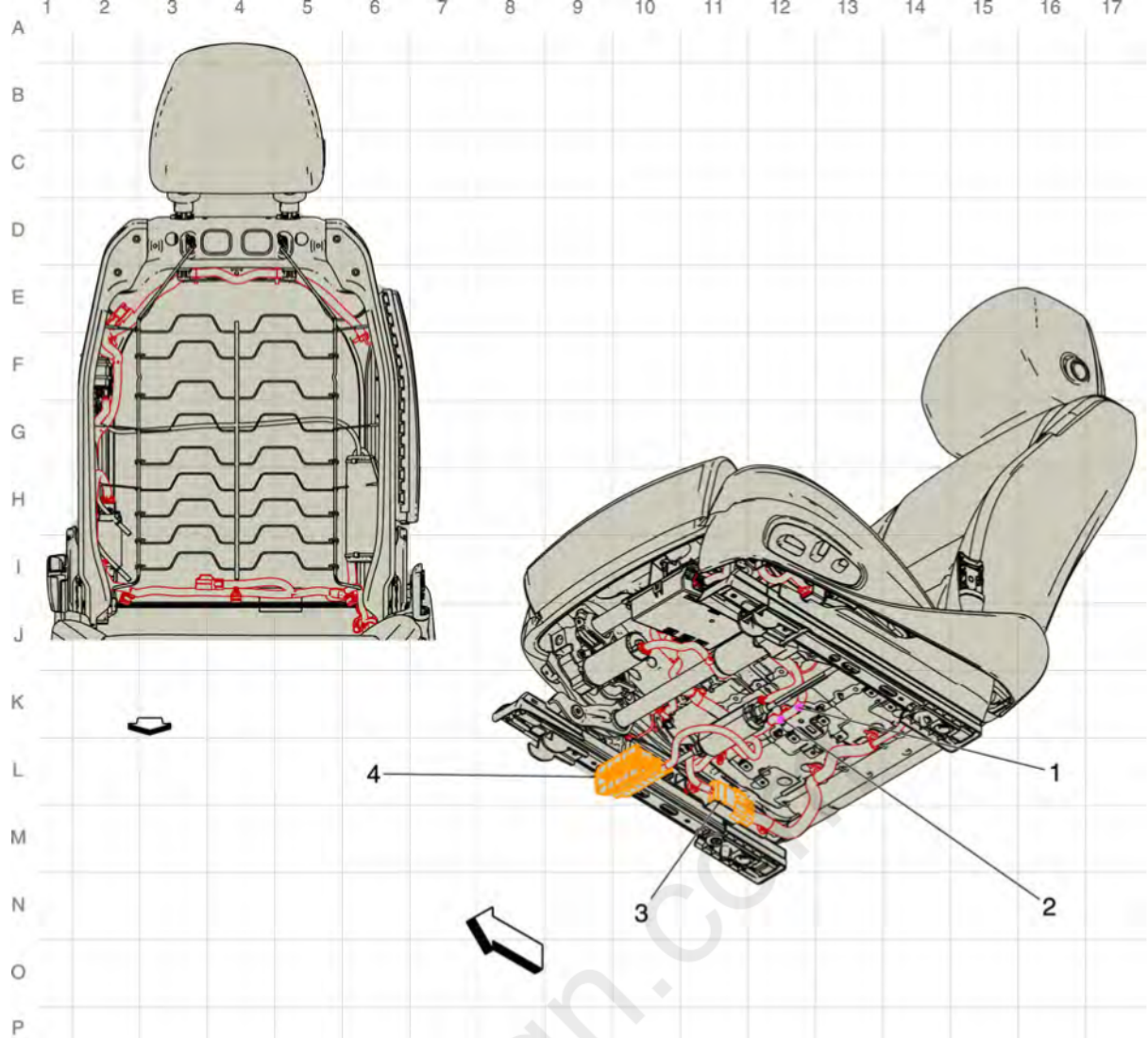


Fig. 28: Driver Seat Harness Routing
Courtesy of GENERAL MOTORS COMPANY

Items

- 1: J311 Driver Seat Cushion Harness (A45)
- 2: J310 Driver Seat Cushion Harness
- 3: X311 Driver Seat Back Harness to Driver Seat Cushion Harness (20 Cavities) **X311 Driver Seat Back Harness to Driver Seat Cushion Harness (-KA1) X311 Driver Seat Back Harness to Driver Seat Cushion Harness (KA1)**
- 4: X310 Body Harness to Driver Seat Cushion Harness (48 Cavities) **X310 Body Harness to Driver Seat Cushion Harness**

Passenger Seat Harness Routing

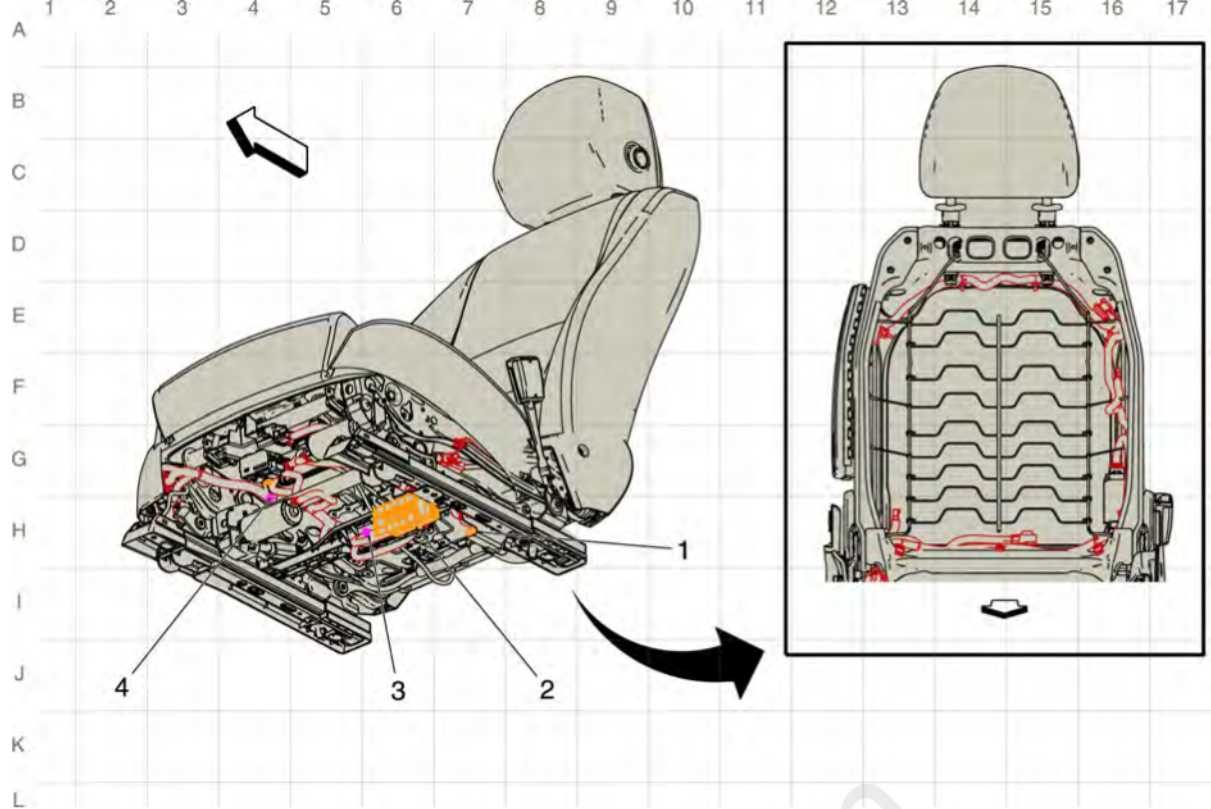


Fig. 29: Passenger Seat Harness Routing
Courtesy of GENERAL MOTORS COMPANY

Items

- 1: X321 Passenger Seat Back Harness to Passenger Seat Cushion Harness (20 Cavities) **X321 Passenger Seat Back Harness to Passenger Seat Cushion Harness (-KA1)** **X321 Passenger Seat Back Harness to Passenger Seat Cushion Harness (KA1-KU3)** **X321 Passenger Seat Back Harness to Passenger Seat Cushion Harness (KU3)**
- 2: X320 Body Harness to Passenger Seat Cushion Harness (48 Cavities) **X320 Body Harness to Passenger Seat Cushion Harness**
- 3: J320 Passenger Seat Cushion Harness
- 4: J322 Passenger Seat Cushion Harness

Body Harness Routing - Left Rear of Passenger Compartment

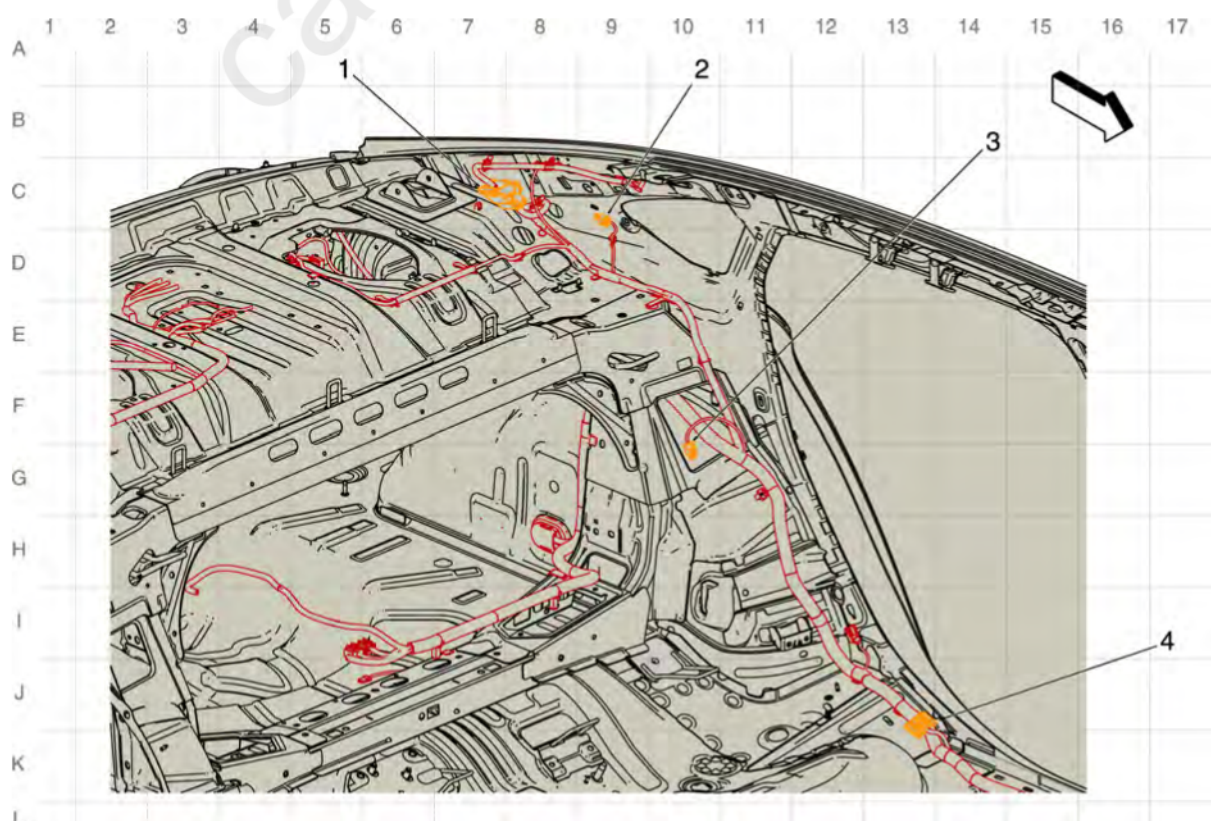


Fig. 30: Body Harness Routing - Left Rear of Passenger Compartment
 Courtesy of GENERAL MOTORS COMPANY

Items	
1: X400 Headliner Harness to Body Harness (40 Cavities)	<u>X400 Headliner Harness to Body Harness</u>
2: X330 Body Harness to Left Roof Rail Air Bag Harness (2 Cavities)	<u>X330 Body Harness to Left Roof Rail Air Bag Harness</u>
3: X370 Body Harness to Left Rear Seat Side Air Bag Harness (3 Cavities)	<u>X370 Body Harness to Left Rear Seat Side Air Bag Harness</u>
4: JX300 Body Harness	<u>JX300 Splice Pack</u>

Body Harness Routing - Right Rear of Passenger Compartment



Fig. 31: Body Harness Routing - Right Rear of Passenger Compartment
 Courtesy of GENERAL MOTORS COMPANY

Items	
1: J380 Body Harness	
2: X380 Body Harness to Right Rear Seat Side Air Bag Harness (3 Cavities)	<u>X380 Body Harness to Right Rear Seat Side Air Bag Harness</u>
3: J432 Body Harness (UQS)	
4: X340 Body Harness to Right Roof Rail Air Bag Harness (2 Cavities)	<u>X340 Body Harness to Right Roof Rail Air Bag Harness</u>
5: X360 Rear Seat Harness to Body Harness	<u>X360 Rear Seat Harness to Body Harness</u>

Body Harness Routing - Left Side of Rear Compartment

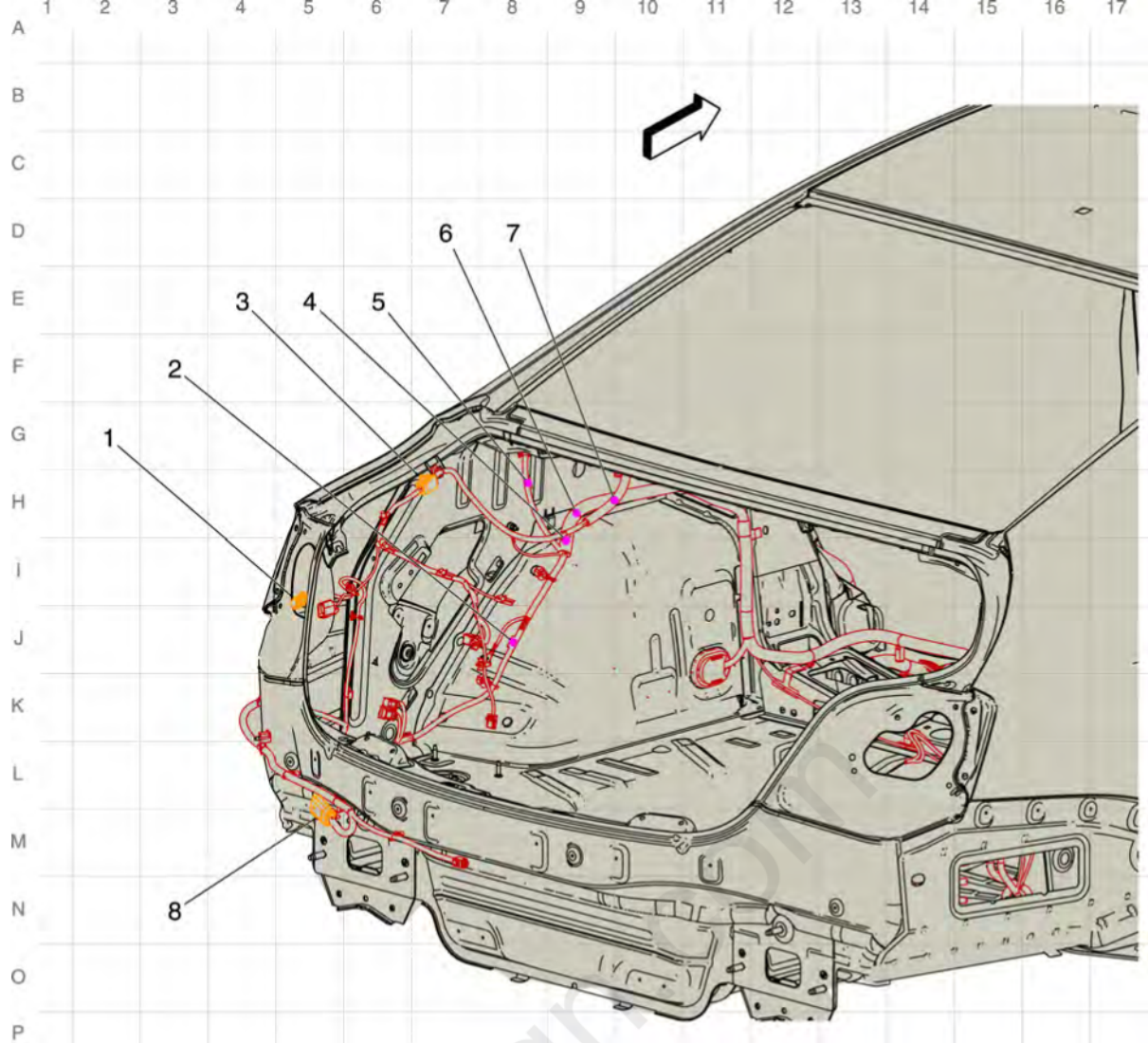


Fig. 32: Body Harness Routing - Left Side of Rear Compartment
Courtesy of GENERAL MOTORS COMPANY

Items

- 1: X410 Body Harness to Left Tail Lamp Assembly Harness (4 Cavities) **X410 Body Harness to Left Tail Lamp Assembly Harness**
- 2: J405 Body Harness
- 3: X900 Body Harness to Rear Compartment Lid Harness (18 Cavities) **X900 Body Harness to Rear Compartment Lid Harness**
- 4: J404
- 5: J403 Body Harness (UVC)
- 6: J402 Body Harness
- 7: J401 Body Harness (UD7, UEU, UFG, UFL or UFT)
- 8: X415 Rear Fascia Harness to Body Harness (12 Cavities) (UD7, UFG or UFT) **X415 Rear Bumper Harness to Body Harness**

Body Harness Routing - Right Side of Rear Compartment

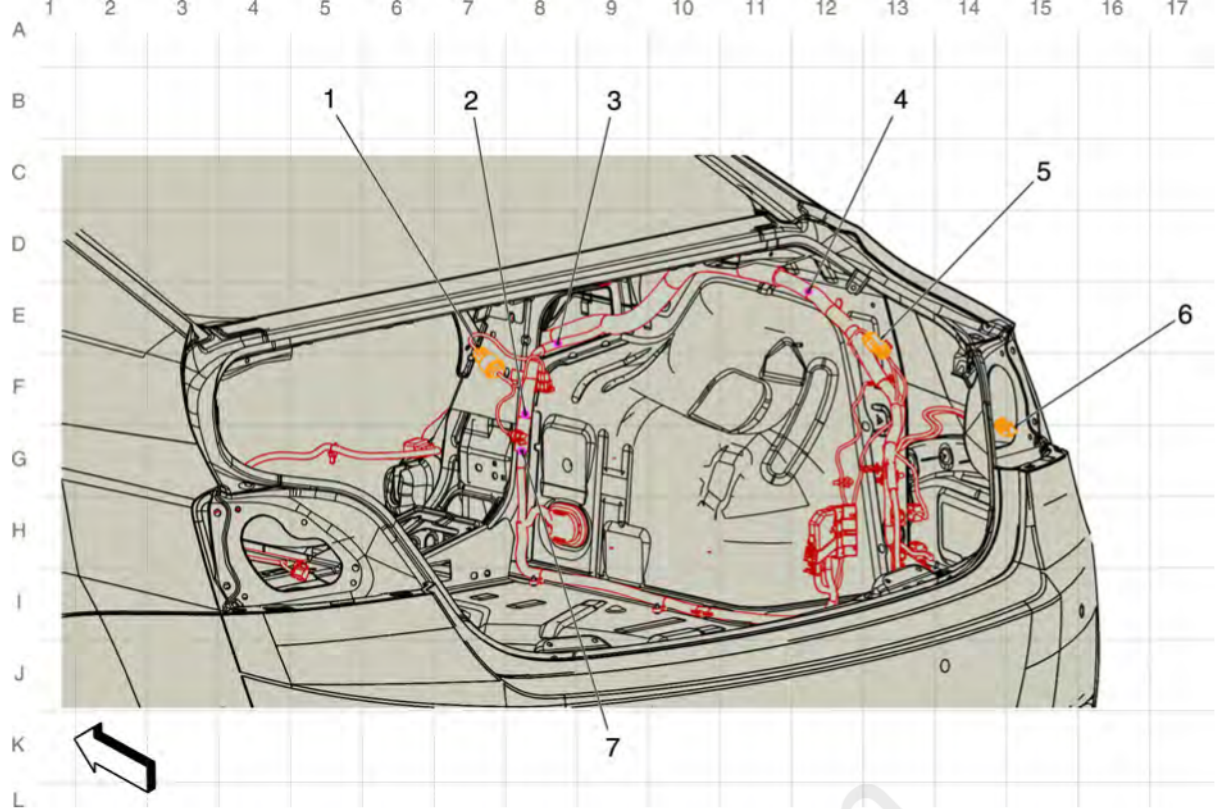


Fig. 33: Body Harness Routing - Right Side of Rear Compartment

Courtesy of GENERAL MOTORS COMPANY

Items

- 1: X351 Body Harness to Body Harness (4 Cavities) (FHV) **X351 Body Harness to Body Harness (LFR)**
- 2: J433 Body Harness (VRI with LKW)
- 3: J435 Body Harness (UQS)
- 4: J436 Body Harness
- 5: X495 Body Harness to Body Harness (2 Cavities) **X495 Body Harness to Body Harness**
- 6: X420 Body Harness to Right Tail Lamp Assembly Harness (4 Cavities) **X420 Body Harness to Right Tail Lamp Assembly Harness**
- 7: J434 Body Harness

Rear Compartment Lid Harness Routing

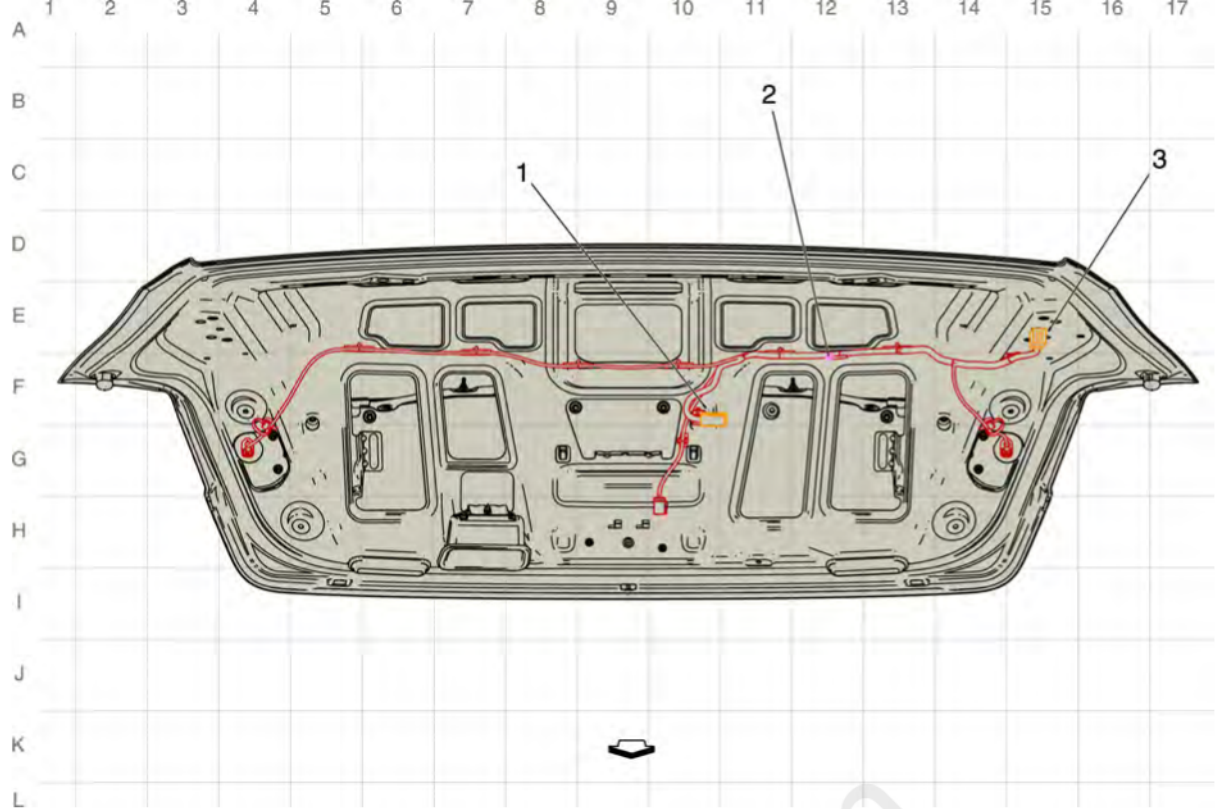


Fig. 34: Rear Compartment Lid Harness Routing
Courtesy of GENERAL MOTORS COMPANY

Items

- 1: X915 License Lamp Harness to Rear Compartment Lid Harness (10 Cavities) [X915 License Lamp Harness to Rear Compartment Lid Harness](#)
- 2: J900 Rear Compartment Lid Harness
- 3: X900 Body Harness to Rear Compartment Lid Harness (18 Cavities) [X900 Body Harness to Rear Compartment Lid Harness](#)

Rear Bumper Harness Routing (UD7, UFG or UFT)

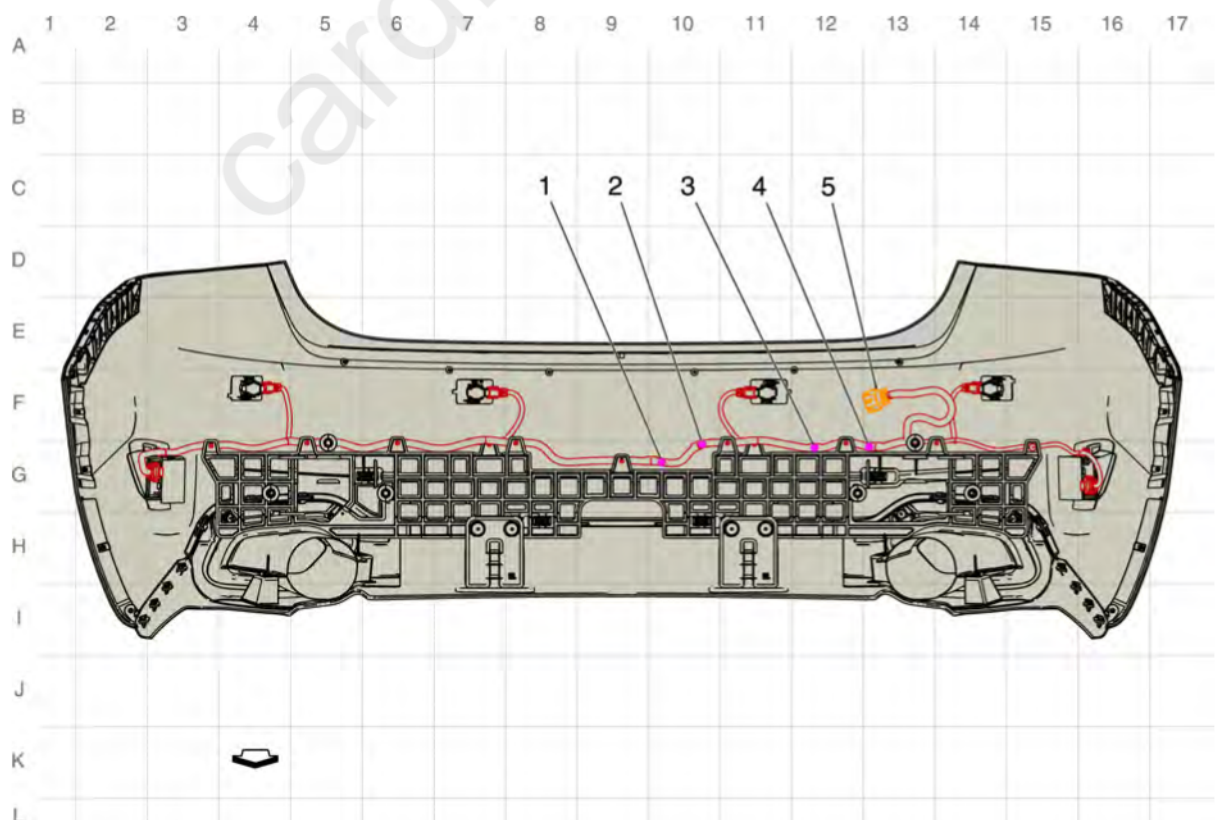


Fig. 35: Rear Bumper Harness Routing (UD7, UFG or UFT)
Courtesy of GENERAL MOTORS COMPANY

Items

- 1: J415 Rear Bumper Harness (UD7)
- 2: J417 Rear Bumper Harness (UFG or UFT)
- 3: J416 Rear Bumper Harness (UD7)
- 4: J418 Rear Bumper Harness (UFG or UFT)
- 5: X415 Rear Fascia Harness to Body Harness (12 Cavities) (UD7, UFG or UFT) **X415 Rear Bumper Harness to Body Harness**

Body Harness Routing - Right Rear Underbody

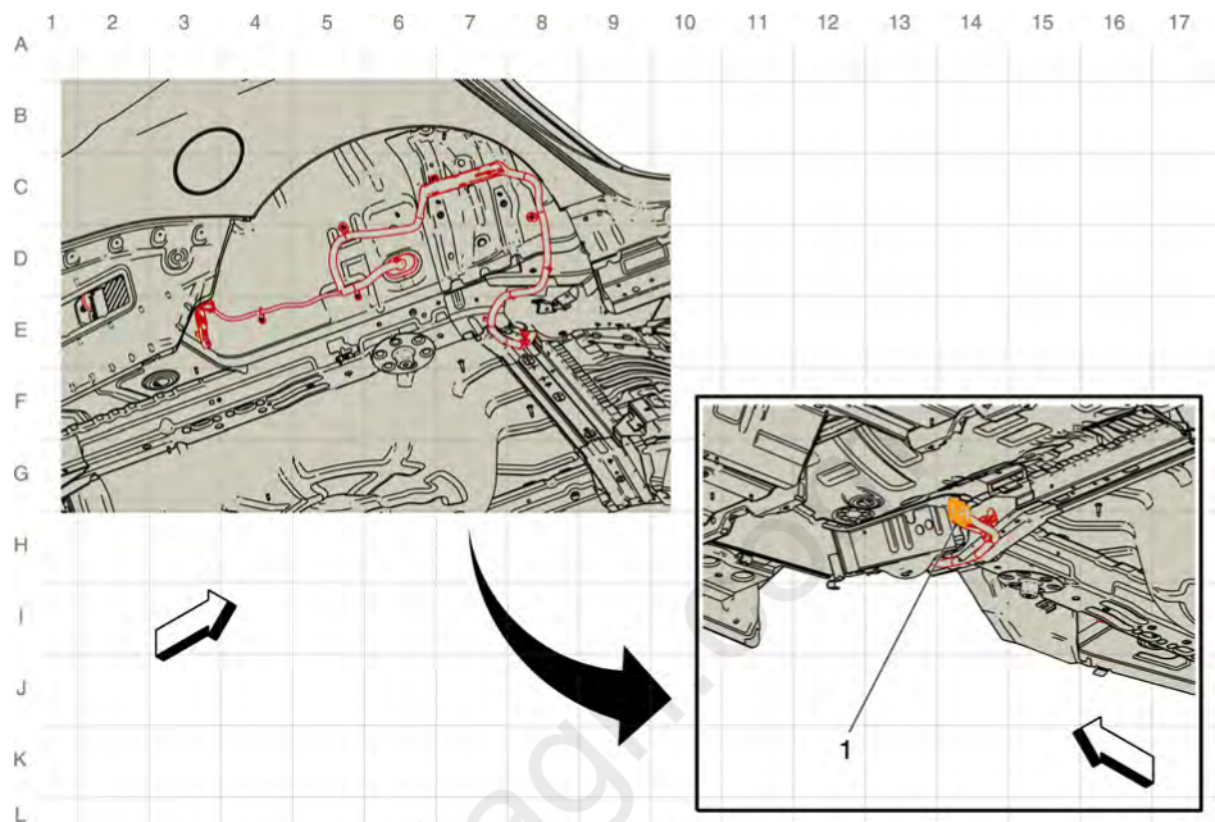


Fig. 36: Body Harness Routing - Right Rear Underbody
Courtesy of GENERAL MOTORS COMPANY

Items

- 1: X350 Fuel Tank Harness to Body Harness (16 Cavities) **X350 Fuel Tank Harness to Body Harness**

HOW TO USE ELECTRICAL SCHEMATICS

Information Overview

The following explains some of the key parts of the GM wiring diagrams. Included are:

- Color Abbreviations

Color Abbreviations

The following sequence is used when depicting wire colors:

1. Color modifier of the wire, such as light or dark (if applicable)
2. Primary color of the wire
3. Secondary color of the wire (tracer/stripe)

Wire insulation and connector body colors in schematic information are abbreviated with a two character code as listed below.

Abbreviation	Color	Abbreviation	Color
AM	Amber	OG	Orange
BARE	Bare	PK	Pink

Abbreviation	Color	Abbreviation	Color
BG	Beige	PU	Purple
BK	Black	RD	Red
BN	Brown	RU	Rust
BU	Blue	SR	Silver
CL	Clear	TL	Teal
CR	Cream	TN	Tan
CU	Curry	TQ	Turquoise
GD	Gold	VT	Violet
GN	Green	WH	White
GY	Gray	YE	Yellow
NA	Natural	-	-
Color Modifiers			
L	Light	D	Dark

Additionally, industry standard cable types are not identified by color, but are listed by cable type as follows:

Abbreviation	Cable Type
COAX	Coax Cable
ENET	Ethernet
FW	Flat Wire
HDMI	High Definition Multimedia Interface
LDVS	Low-voltage Differential Signaling
TWINAX	Twinax Cable
USB	Universal Serial Bus

ELECTRICAL SCHEMATIC SYMBOLS

Voltage Indicators

Symbol	Description
	Battery Voltage

Symbol	Description
B+ cardiagn.com	

Symbol	Description
 cardiagn.com	Ignition Switch - Off Position

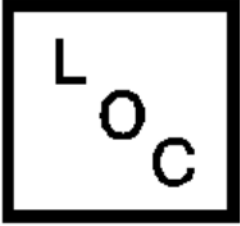
Symbol	Description
 cardiagn.com	Ignition Switch - Accessory Position

Symbol	Description
 cardiagn.com	Ignition Switch - Run Position

Symbol	Description
	Ignition Switch - Start Position

General Icons

Symbol	Description

Symbol	Description
	Master Component List Icon This icon is used on the schematic to link to the Master Electrical Component List.

Symbol	Description
	Description and Operation Icon This icon is used on the schematic to link to the Description and Operation of that particular system.

Symbol	Description
 The icon consists of a double-headed horizontal arrow, a curved arrow pointing upwards and to the right, and a wrench. A large, light gray watermark 'cardiagn.com' is visible diagonally across the background of the table.	Computer Programming Icon This icon is used on the schematic to link to Control Module References, which identifies which components need programming upon replacement.

Symbol	Description
	Next Schematic Page Icon This icon is used on the schematic to navigate to the next schematic in the subsystem.

Symbol	Description
	Previous Schematic Page Icon This icon is used on the schematic to navigate to the previous schematic in the subsystem.

Symbol	Description
 The image shows a black triangular warning symbol. Inside the triangle is a white silhouette of a person sitting in a car seat, wearing a seatbelt. This is the standard icon for Supplemental Inflatable Restraint (SIR) or Supplemental Restraint System (SRS).	Supplemental Inflatable Restraint (SIR) or Supplemental Restraint System (SRS) Icon This icon is used to alert the technician that the system contains SIR/SRS components that require certain precautions before servicing.

Symbol	Description
	Information Icon This icon is used to alert the technician that there is additional information that will aid in servicing a system.

Symbol	Description
	Danger Icon This icon is intended to alert the technician that a component within the system contains labeling with the same icon. This icon is used when a source component has potential for 60 volts DC or greater or has potential for 42 volts AC or greater.

Symbol	Description
	High Voltage Icon This icon is intended to alert the technician that a component within the system contains labeling with the same icon. This icon is used when a component/circuit has potential for 60 volts DC or greater or has potential for 42 volts AC or greater.

cardiagn.com

Symbol	Description
	Caution Icon This icon is used to advise the technician to use caution when servicing this component. This icon may be used when a component/circuit has a voltage range potential between 30-60 volts DC or 15-42 volts AC.

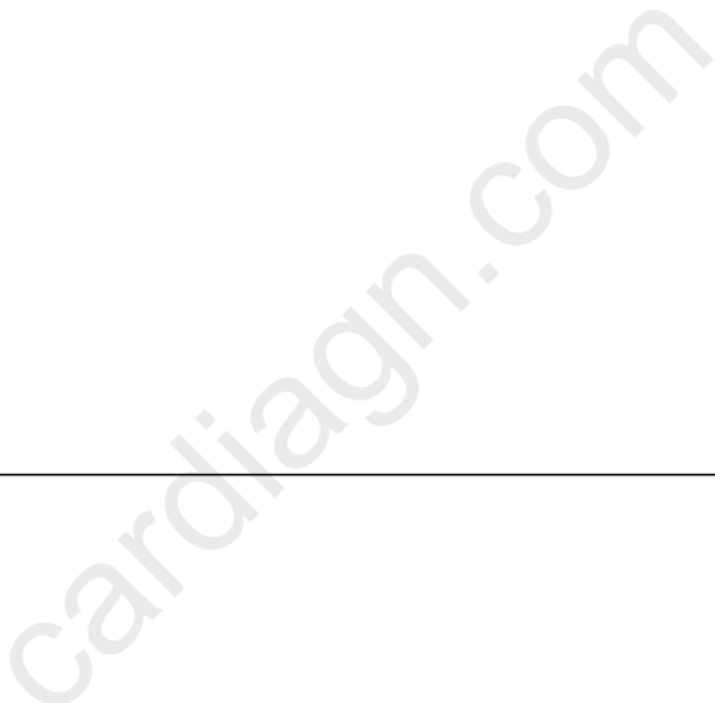
cardiagn.com

Symbol	Description
	Functional Serial Data Communication This icon is used to show the technician that the serial data circuit detail is shown incomplete. It also provides an active link to the Data Communication Schematics where the circuit is shown complete.

Switch Position Icons

Symbol	Description

Symbol	Description
  	Generic Up Arrows
cardiagn.com	

Symbol	Description
  	Generic Down Arrows
	

Symbol	Description
  	Generic Left Arrows
cardiagn.com	

Symbol	Description
  	Generic Right Arrows

Symbol	Description
	Generic Express Down Arrows

Symbol	Description
	On/Off Icon

Symbol	Description
	Generic Lock Icon

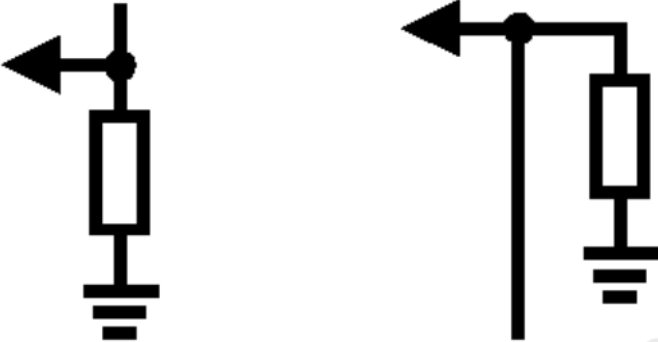
Symbol	Description
	Generic Unlock Icon

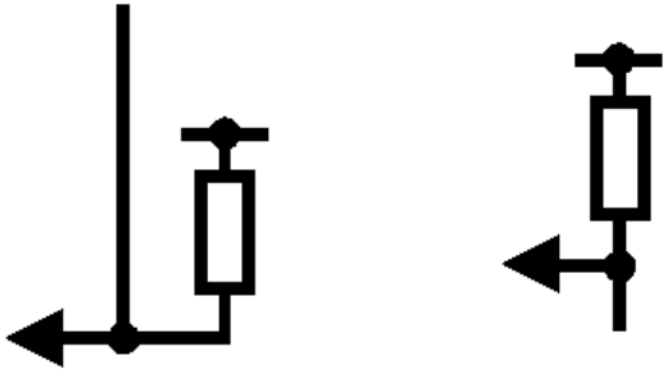
Symbol	Description
	Generic Window Switch Positions - 4 Door

Symbol	Description
	Generic Window Switch Positions - 2 Door

Module Circuit Function Icons

Symbol	Description

Symbol	Description
	I/O Pull-Down Resistors (-)

Symbol	Description
 The image contains two circuit symbols for I/O pull-up resistors. The left symbol consists of a vertical line with a horizontal branch to the left ending in an arrow, and a resistor connected to the top of the vertical line. The right symbol consists of a vertical line with a horizontal branch to the left ending in an arrow, and a resistor connected to the top of the vertical line.	I/O Pull-Up Resistors (+)

Symbol	Description
	I/O High-Side Drive Switch (+)

Symbol	Description
 The image contains two circuit symbols. The left symbol depicts a switch connected to a ground symbol (three horizontal lines of decreasing width). The right symbol depicts a switch connected to a load (represented by a rectangle) and a ground symbol. A large, light gray watermark 'cardiagn.com' is oriented diagonally across the center of the table.	I/O Low-Side Drive Switch (+)

Symbol	Description
	I/O Bidirectional Switch (+/-)

Symbol	Description
 A black waveform symbol representing a pulse-width modulated signal, consisting of a series of rectangular pulses of varying widths.	Pulse-Width Modulation Symbol
cardiagn.com	

Symbol	Description
B+	Battery Voltage

Symbol	Description
IGN	Ignition Voltage

Symbol	Description
5V	Voltage Reference

Symbol	Description
5V AC	A/C Voltage

Symbol	Description
	Low Reference
	

Symbol	Description
	Ground
	

Symbol	Description
 cardiagn.com	Serial Data

Symbol	Description
 The image displays two ECG lead symbols side-by-side. The left symbol consists of a vertical line with a downward-pointing arrow to its left, and a horizontal line with a downward-pointing arrow below it. The right symbol consists of a vertical line with an upward-pointing arrow to its left, and a horizontal line with an upward-pointing arrow above it. A large, light gray watermark 'cardiagn.com' is oriented diagonally across the center of the table.	Antenna Signal - In

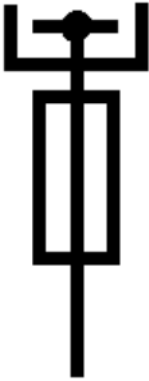
Symbol	Description
 The image contains two antenna symbols. The symbol on the left consists of a vertical line connected to an inverted triangle, with an upward-pointing arrow to its left. The symbol on the right consists of a vertical line connected to a triangle, with a downward-pointing arrow to its left. A large, light gray watermark 'cardiagn.com' is oriented diagonally across the center of the table.	Antenna Signal - Out

Symbol	Description
	Brake Apply

Harness Components

Symbol	Description

Symbol	Description
	Fuse

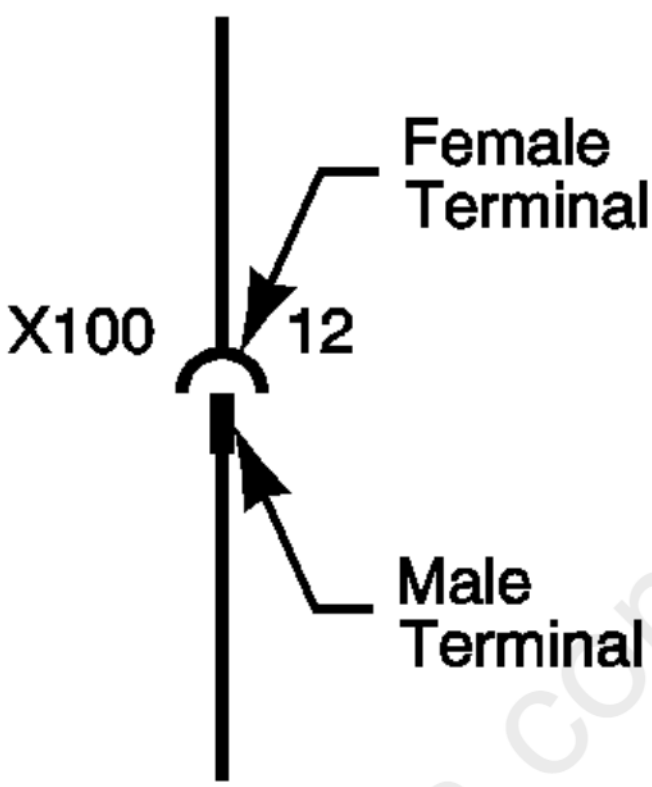
Symbol	Description
PWR/TRN Relay 	Fuse Supplied by a Relay

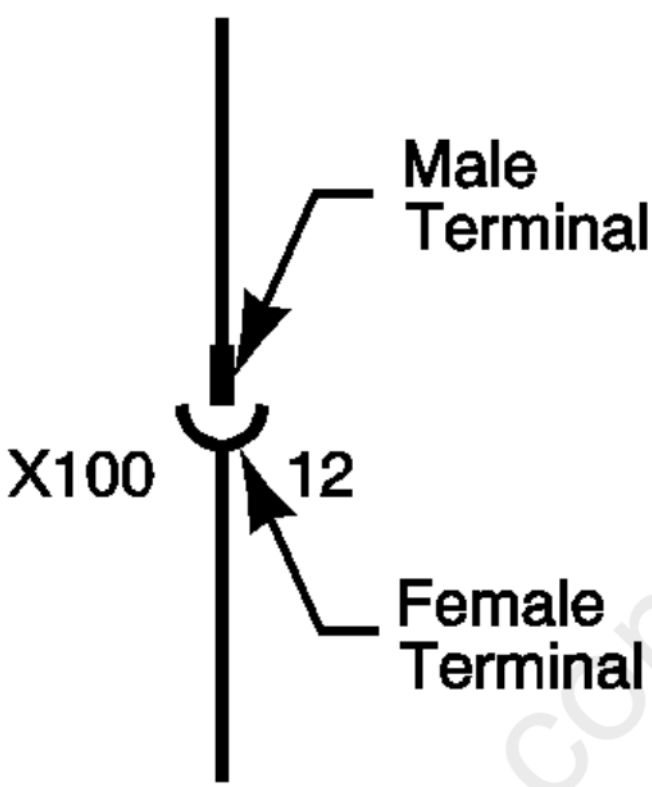
Symbol	Description
 The symbol for a circuit breaker is a vertical line with a diagonal line crossing it at an angle, and a small 'x' mark at the intersection. This symbol is used to represent a circuit breaker in electrical diagrams.	Circuit Breaker

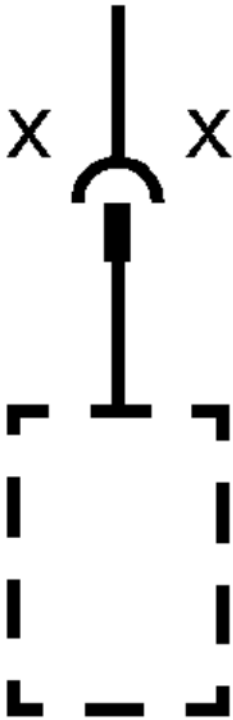
Symbol	Description
	Fusible Link

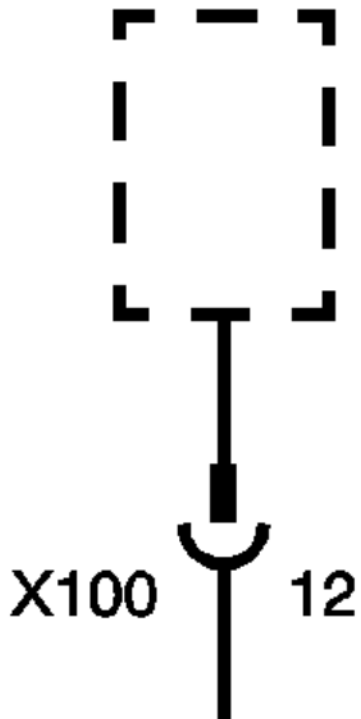
Symbol	Description
 cardiagn.com	Ground

Symbol	Description
 cardiagn.com	Case Ground

Symbol	Description
 The diagram illustrates the symbol for an inline harness connector. It consists of a vertical line with a semi-circular protrusion on the left side and a rectangular notch on the right side. An arrow points from the label "Female Terminal" to the semi-circular protrusion. Another arrow points from the label "Male Terminal" to the rectangular notch. The number "12" is placed near the protrusion, and "X100" is placed to the left of the symbol.	Inline Harness Connector

Symbol	Description
 The diagram illustrates an inline harness connector symbol. A vertical line represents the main cable. A semi-circular bump on the left side of this line indicates a connection point. An arrow points from the text "Male Terminal" to the top of the bump. Another arrow points from the text "Female Terminal" to the bottom of the bump. The label "X100" is positioned to the left of the bump, and the number "12" is positioned to the right of the bump.	Inline Harness Connector

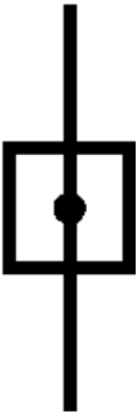
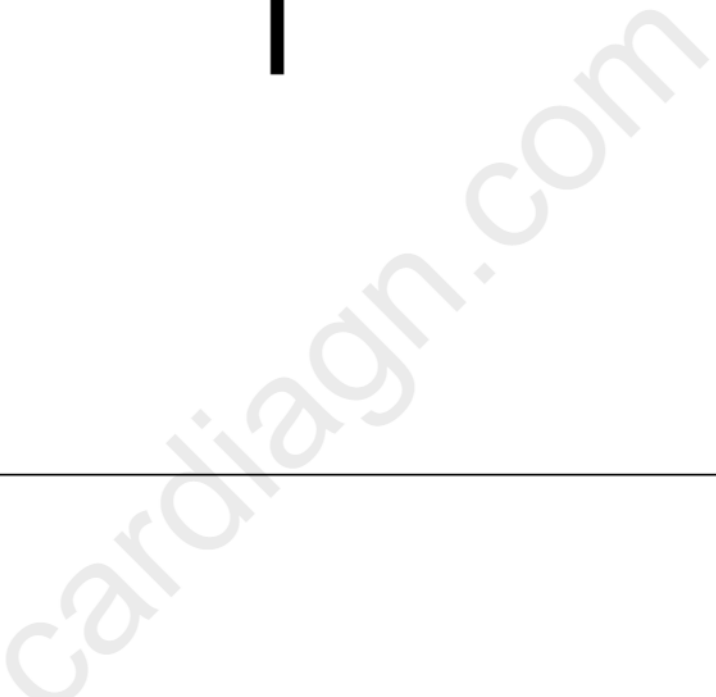
Symbol	Description
 The diagram shows a vertical line with a semi-circular hook at its base. Two 'X' marks are positioned on either side of the hook. Below the hook is a dashed rectangular box. A diagonal watermark 'cardiagn.com' is visible across the lower portion of the diagram.	Pigtail Connection

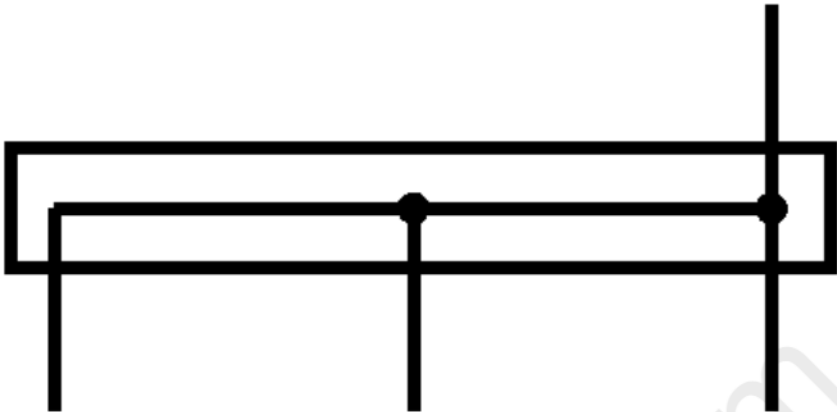
Symbol	Description
 The diagram shows a symbol for a pigtail connection. It consists of a dashed rectangular box at the top. A solid vertical line extends downwards from the center of the bottom edge of this box. This line passes through a small solid black square. Below the square is a semi-circular arc, resembling a U-shaped connector. To the left of this arc is the text 'X100' and to the right is the number '12'. A solid vertical line continues downwards from the bottom of the arc. A large, light gray watermark 'cardiagn.com' is oriented diagonally across the lower half of the page.	Pigtail Connection

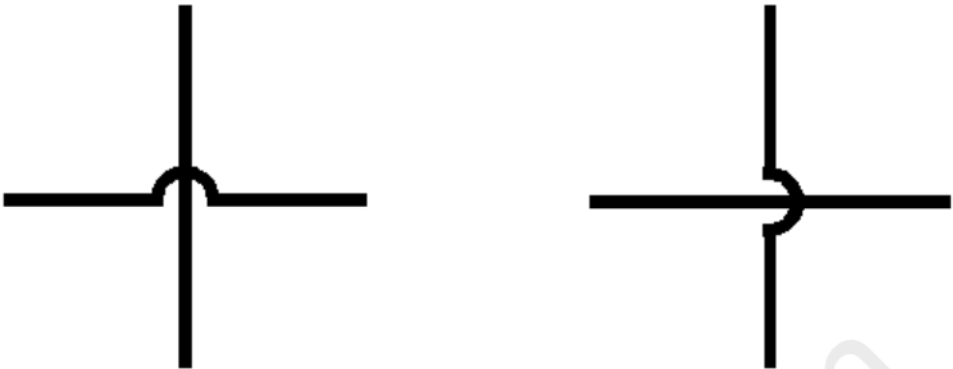
Symbol	Description
 The image contains two symbols. The first symbol on the left consists of a vertical line with a semi-circle at its base. The second symbol on the right consists of a vertical line with a semi-circle at its top. A large, light gray watermark 'cardiagn.com' is oriented diagonally across the entire page.	Provisional or Diagnostic Connector

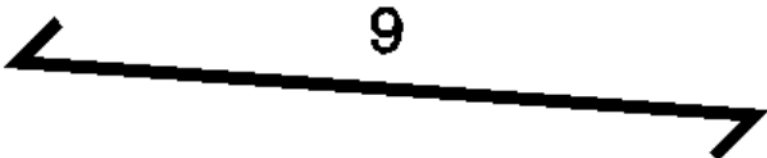
Symbol	Description
 The image shows two symbols for 'Blunt Cut Wire'. The first symbol on the left consists of a vertical line with a small square at the bottom. The second symbol on the right consists of a vertical line with a small square at the top. A large, light gray watermark 'cardiagn.com' is diagonally across the entire table.	Blunt Cut Wire

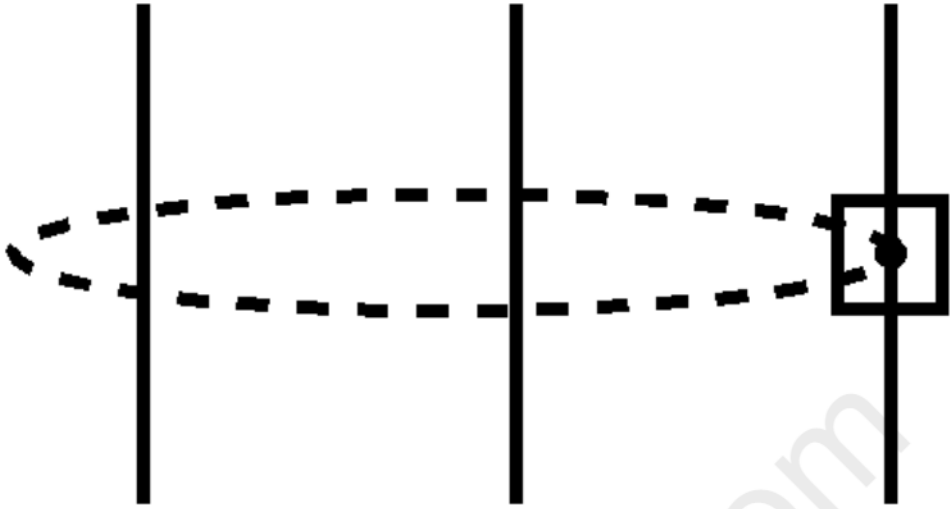
Symbol	Description
 The symbol consists of a solid vertical line with a small horizontal tick mark on its left side. This vertical line is enclosed within a dashed rectangular box. A small black dot is positioned at the center of the vertical line, where it intersects the horizontal tick mark.	Incomplete Physical Splice

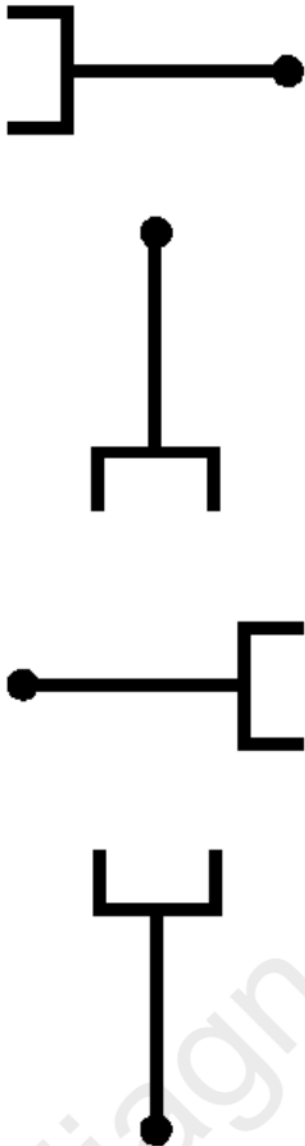
Symbol	Description
	Complete Physical Splice - 2 Wires
	

Symbol	Description
 The symbol consists of a horizontal line with three vertical lines extending downwards from it. A rectangular box encloses the top portion of the horizontal line, with the top and bottom lines of the box extending slightly beyond the vertical lines. Two solid black dots are placed on the horizontal line, one between the first and second vertical lines, and another between the second and third vertical lines. A diagonal watermark reading 'cardiagn.com' is visible across the lower half of the page.	Complete Physical Splice - 3 or more wires

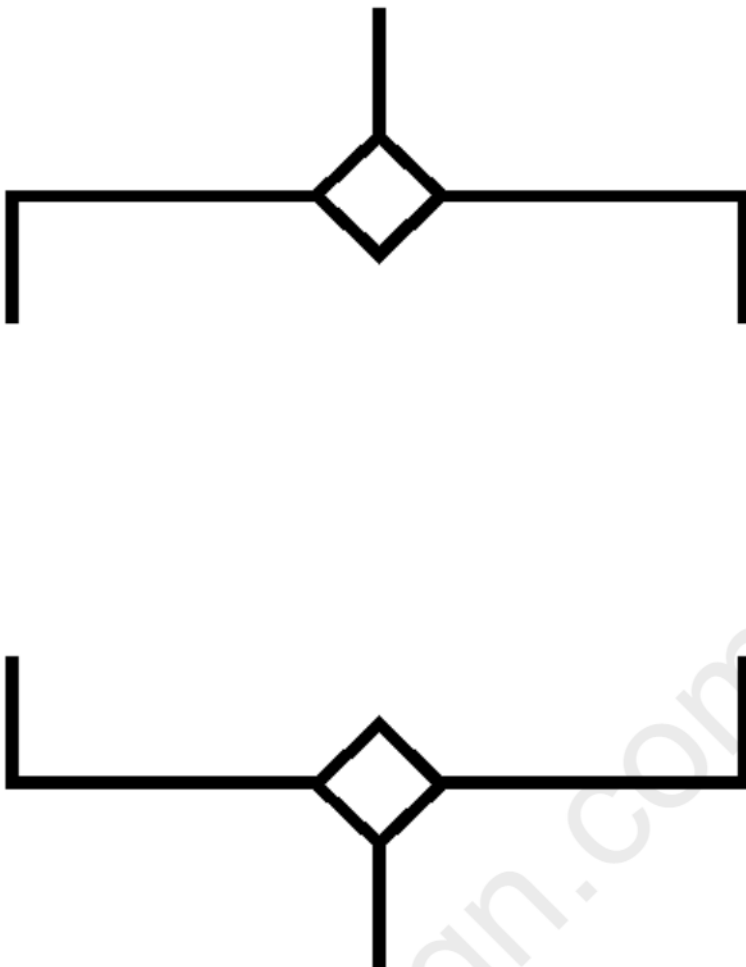
Symbol	Description
 cardiagn.com	Wire Crosses

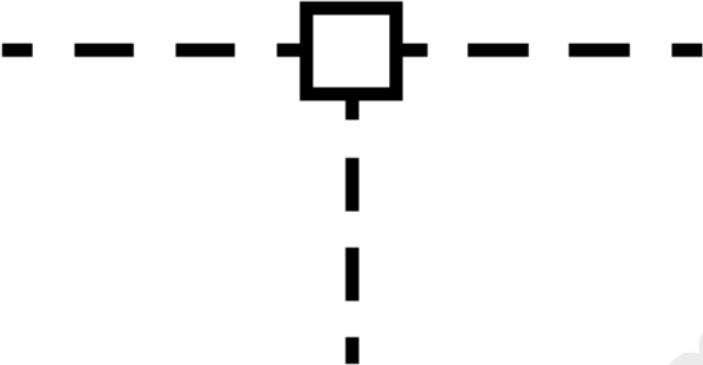
Symbol	Description
 9	Twisted Wires

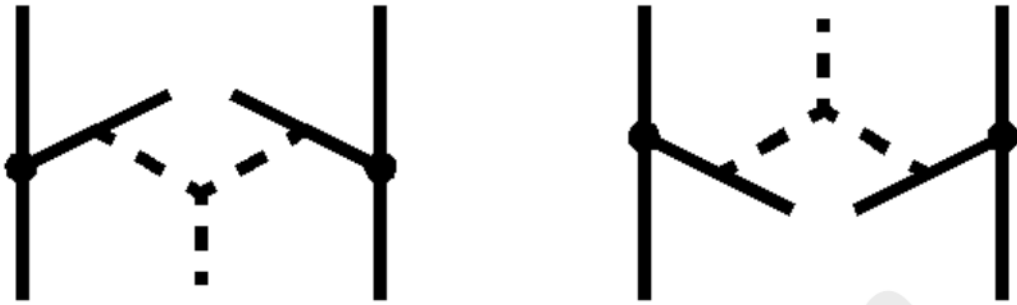
Symbol	Description
 The symbol for ECG lead II is depicted. It features a dashed horizontal line that tapers to a point on the left and terminates in a square box containing a solid black dot on the right. Three vertical solid lines intersect this horizontal line. A large, light-gray watermark 'cardiagn.com' is oriented diagonally across the lower half of the table.	Shield

Symbol	Description
 The image displays four ECG symbols arranged vertically. From top to bottom: 1. A bracket symbol with a terminal dot on the right. 2. An inverted T-wave symbol, consisting of a vertical line with a horizontal base. 3. A Q-wave symbol, consisting of a horizontal line with a bracket on the right and a terminal dot on the left. 4. A T-wave symbol, consisting of a vertical line with a horizontal base and a terminal dot at the bottom. A large, light gray watermark 'cardiagn.com' is oriented diagonally across the center of the table.	Circuit References

Symbol	Description
 The image displays four distinct symbols used for circuit continuation, arranged vertically. Each symbol is a hollow triangle with a thick black outline. From top to bottom, the triangles point in the following directions: up, down, left, and right. A faint, diagonal watermark reading 'cardiagn.com' is visible across the lower portion of the symbols.	Circuit Continuation Arrowheads

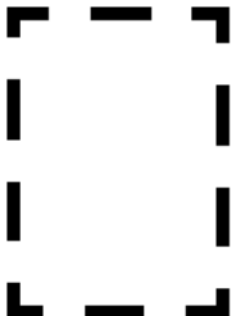
Symbol	Description
 The image displays two symbols for an 'Option Breakpoint'. Each symbol consists of a horizontal line with a diamond shape centered on it. A vertical line segment extends from the top of the diamond in the first symbol and from the bottom of the diamond in the second symbol. Short vertical line segments are present at both ends of the horizontal line in both symbols.	Option Breakpoint

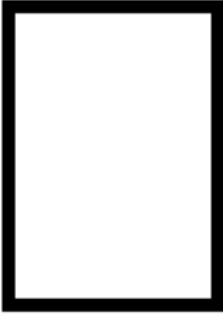
Symbol	Description
 cardiagn.com	Ground Circuit Connection

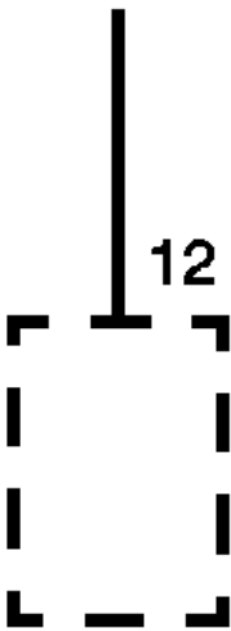
Symbol	Description
	Connector Shorting Clip

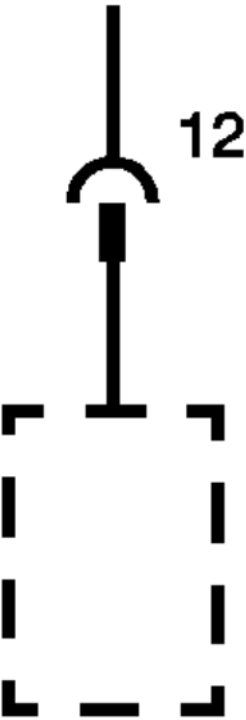
Component Parts

Symbol	Description

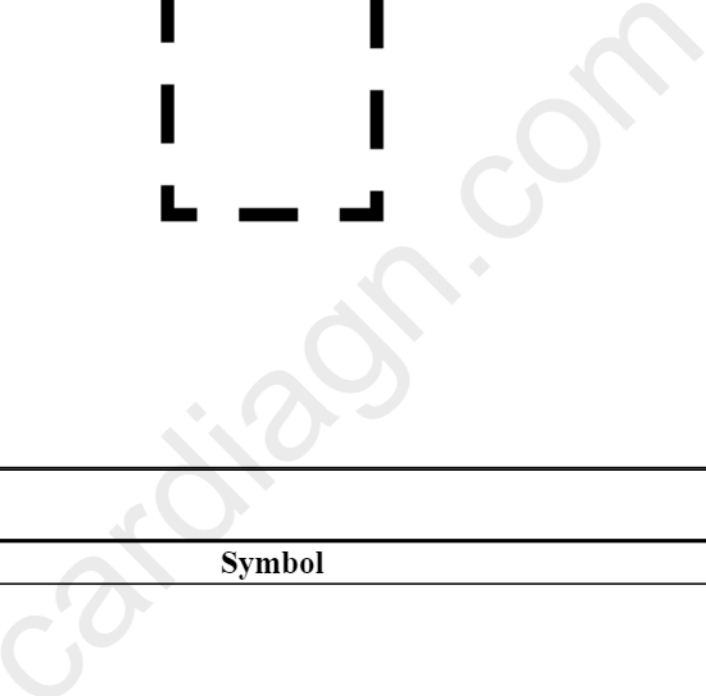
Symbol	Description
	Partial Component When a component is represented in a dashed box, the component or its wiring is not shown in its entirety.

Symbol	Description
	Entire Component When a component is represented in a solid box the component or its wiring is shown in its entirety.

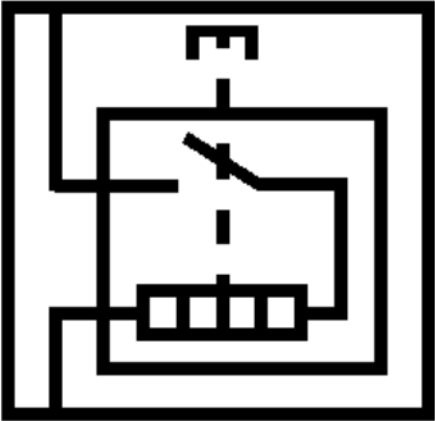
Symbol	Description
	Connector Directly Attached to Component

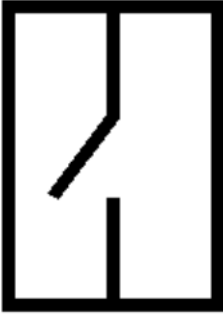
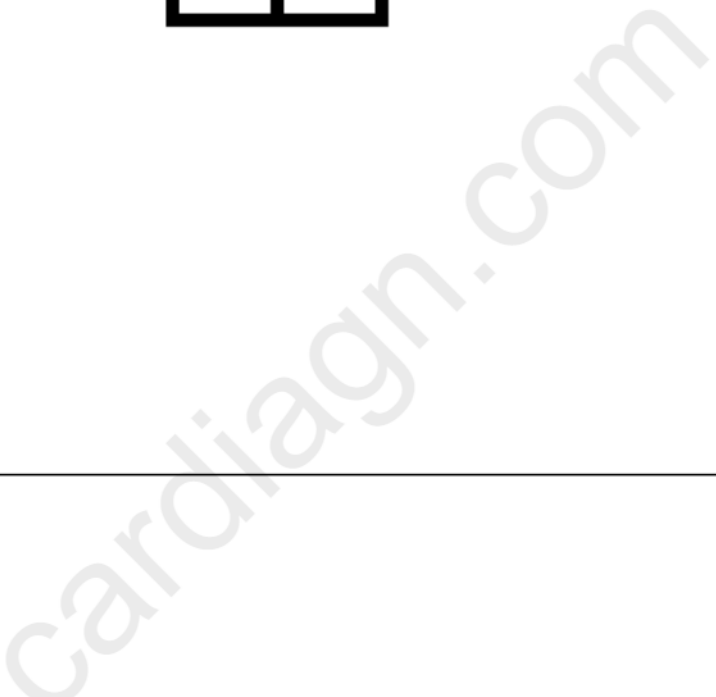
Symbol	Description
	Pigtail Connector

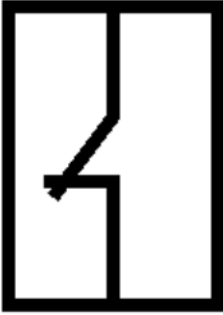
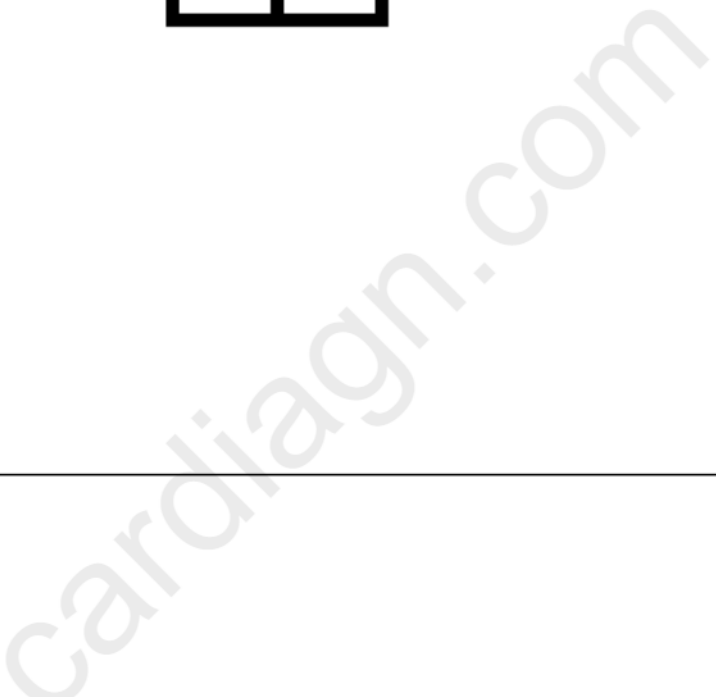
Switches and Relays

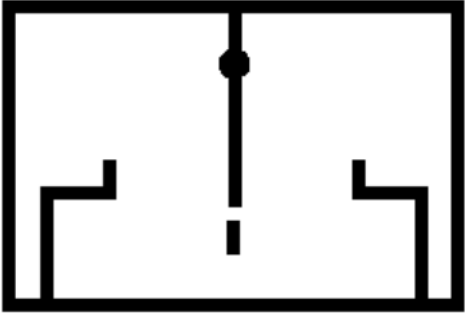
Symbol	Description
	

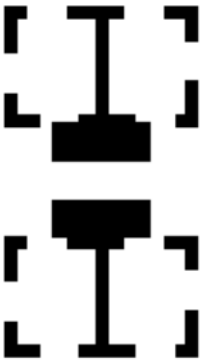
Symbol	Description
	Accessory Power Outlet

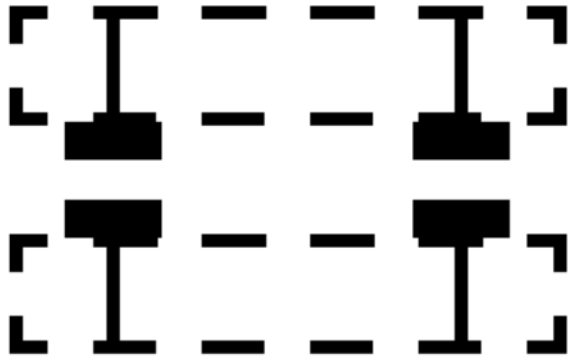
Symbol	Description
 The symbol is a rectangular circuit diagram. It features a battery symbol at the bottom, represented by four small rectangles. A switch symbol, consisting of a diagonal line with a small circle at one end, is positioned in the center. The circuit is completed by a series of lines forming a loop that includes a small rectangular component at the top, possibly representing a fuse or a lamp. The entire symbol is enclosed in a double-line rectangular border.	Cigar Lighter

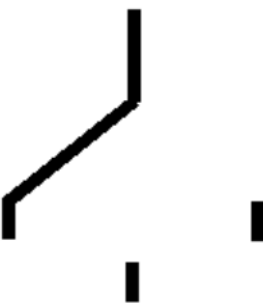
Symbol	Description
	Switch - 2 Position Normally Open
	

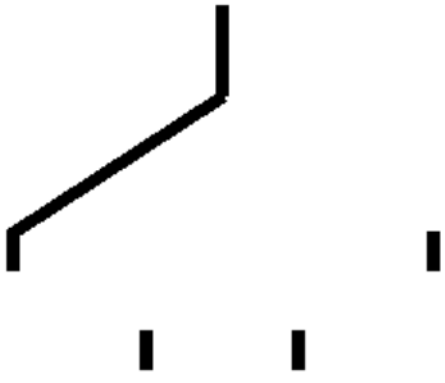
Symbol	Description
	Switch - 2 Position Normally Closed
	

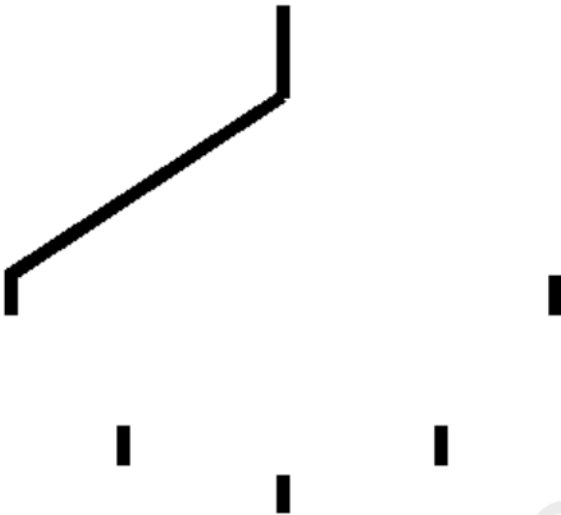
Symbol	Description
 The symbol is a schematic representation of a rocker switch. It consists of a rectangular frame. Inside the frame, there is a central vertical line. At the top of this line is a solid black circle. Below the circle, the line is dashed. On either side of the central line, there are two horizontal lines that extend from the left and right sides of the frame towards the center, forming a shape similar to a 'Z' or a rocker mechanism.	Switch - Rocker

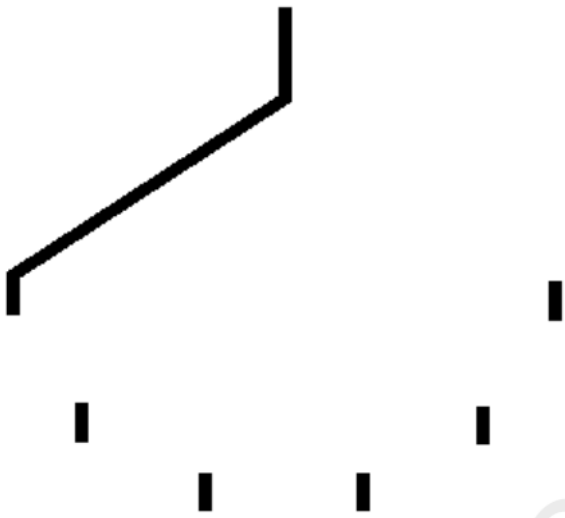
Symbol	Description
 cardiagn.com	Switch - Contact Plate (1 Wire)

Symbol	Description
	Switch - Contact Plate (2 Wire)

Symbol	Description
 The symbol represents a 3-position switch. It consists of a horizontal line with a diagonal branch extending upwards and to the right, ending in a vertical segment. Below this main structure are three short vertical lines, each aligned with one of the three possible positions of the switch's contact: the left position, the middle position, and the right position.	Switch - 3 Position

Symbol	Description
 cardiagn.com	Switch - 4 Position

Symbol	Description
 cardiagn.com	Switch - 5 Position

Symbol	Description
 cardiagn.com	Switch - 6 Position

Symbol	Description
	Switch Actuator - Push (Momentary)

Symbol	Description
	Switch Actuator - Push (Latching)
	

Symbol	Description
	Switch Actuator - Pull (Momentary)

Symbol	Description
	Switch Actuator - Pull (Latching)

Symbol	Description
	Switch Actuator - Rotate (Momentary)

Symbol	Description
	Switch Actuator - Rotate (Latching)
	

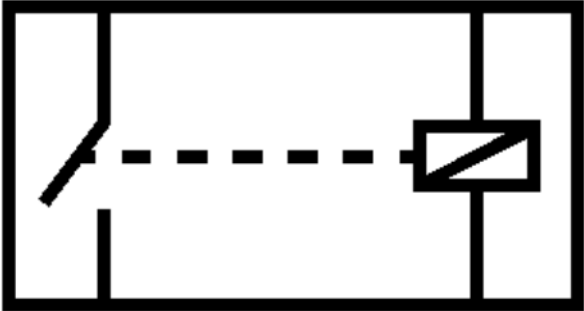
Symbol	Description
	Switch Actuator - Slide (Momentary)

Symbol	Description
	Switch Actuator - Slide (Latching)

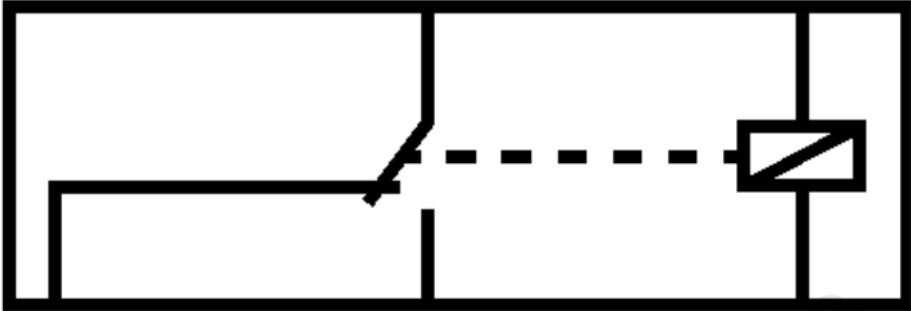
Symbol	Description
	Switch Actuator - Pressure (Momentary)

Symbol	Description
	Switch Actuator - Temperature (Momentary)

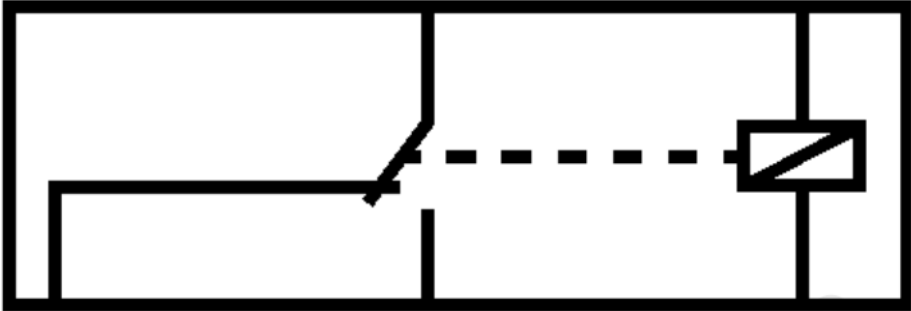
Symbol	Description
	Switch Actuator - Volume (Latching)
	

Symbol	Description
 The diagram shows a 4-pin single pole/throw relay symbol. It consists of a rectangular frame with two vertical lines on the left and two on the right. A horizontal dashed line connects the two vertical lines. On the right side, there is a small rectangle with a diagonal line from the bottom-left to the top-right corner, representing a switch or relay contact.	4-Pin Single Pole/Throw Relay - Normally Open

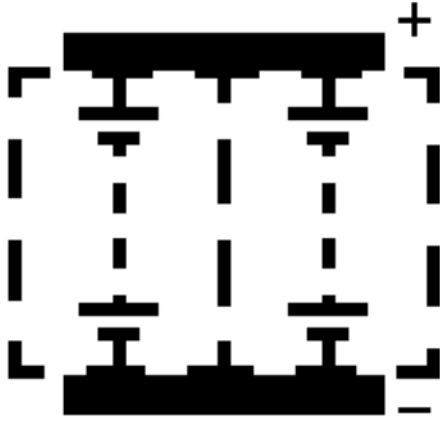
cardiagn.com

Symbol	Description
	5-Pin Relay - Normally Closed

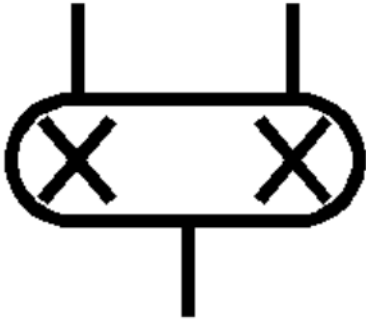
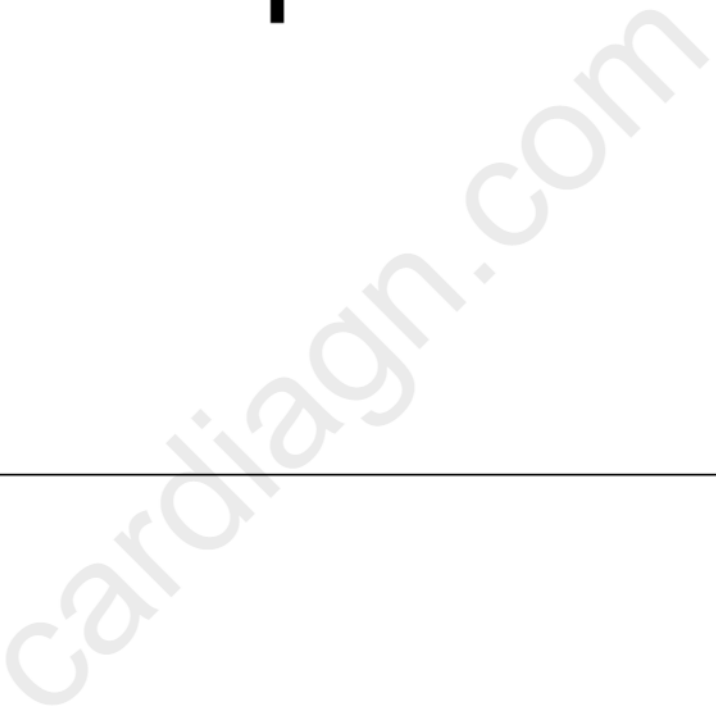
Devices and Sensors

Symbol	Description
	

Symbol	Description
 The image shows a standard circuit symbol for a battery. It consists of a rectangular box. Inside the box, there is a dashed vertical line. On either side of this dashed line, there are two sets of parallel horizontal lines of different lengths, representing the positive and negative terminals of the cells. Above the top of the rectangle is a '+' sign, and below the bottom of the rectangle is a '-' sign.	Battery

Symbol	Description
 The symbol is a schematic representation of a battery assembly. It consists of a rectangular frame with a dashed border. Inside the frame, there are two horizontal solid lines at the top and bottom, connected by three vertical dashed lines. At the top right corner, there is a '+' sign, and at the bottom right corner, there is a '-' sign.	Battery Assembly - Hybrid

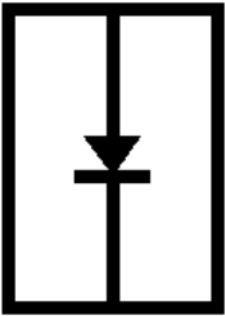
Symbol	Description
	Single Filament Light Bulb

Symbol	Description
	Double Filament Light Bulb
	

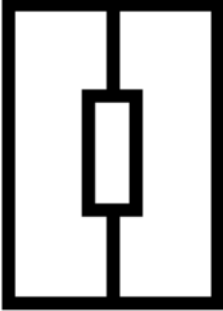
Symbol	Description
	Light Emitting Diode (LED)

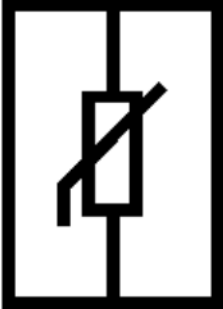
Symbol	Description
	Photo Sensor

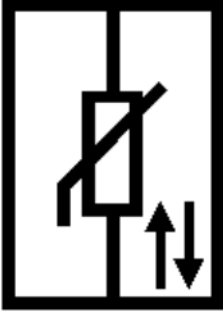
Symbol	Description
	Gauge
cardiagn.com	

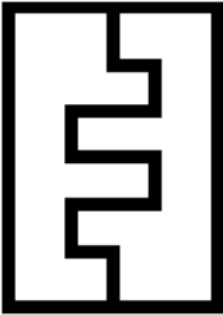
Symbol	Description
 The image shows a standard electronic symbol for a diode. It consists of a rectangle divided by a vertical line. On the left side of the vertical line, there is a horizontal bar. On the right side, there is an arrow pointing downwards. This symbol represents a diode in a circuit diagram.	Diode
cardiagn.com	

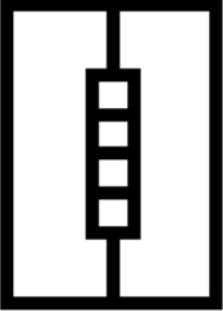
Symbol	Description
 cardiagn.com	Capacitor

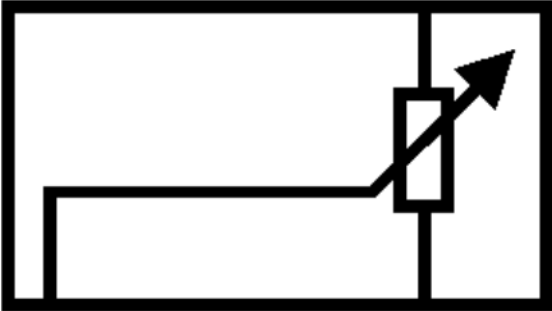
Symbol	Description
 cardiagn.com	Resistor

Symbol	Description
	Variable Resistor

Symbol	Description
 The symbol consists of a vertical rectangle. A diagonal arrow points from the bottom-left corner towards the top-right corner. To the right of the rectangle is a vertical double-headed arrow. The entire symbol is enclosed in a square frame.	Variable Resistor - NTC

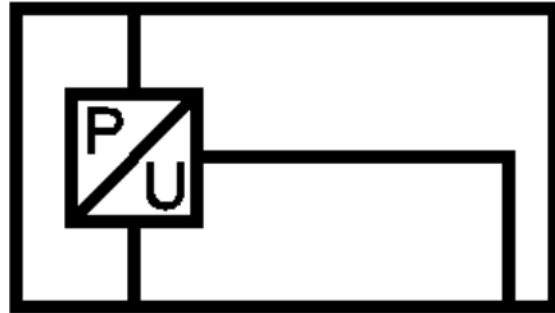
Symbol	Description
	Breakable Wire
	

Symbol	Description
	Heating Element
cardiagn.com	

Symbol	Description
 The symbol consists of a large rectangle. Inside, there is a horizontal line that starts from the left edge, moves right, then has a small vertical step up, continues right, then has another small vertical step up, followed by a small rectangle. From the top-right corner of this small rectangle, an arrow points diagonally upwards and to the right.	Position Sensor
cardiagn.com	

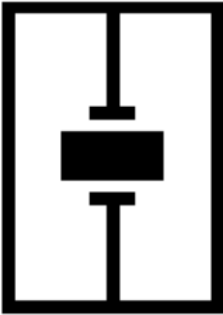
Symbol

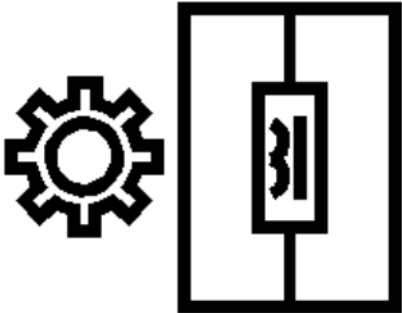
Description

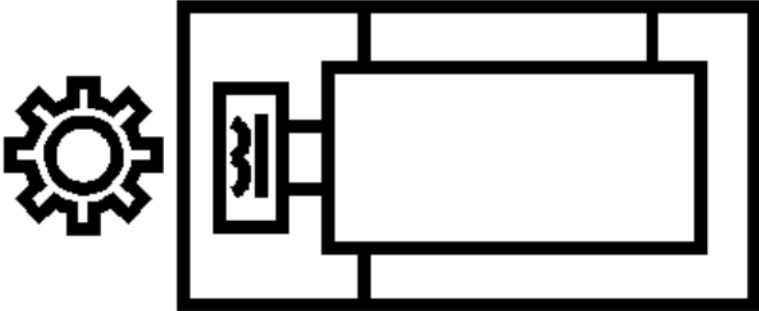


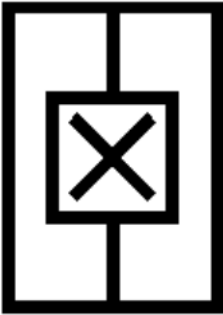
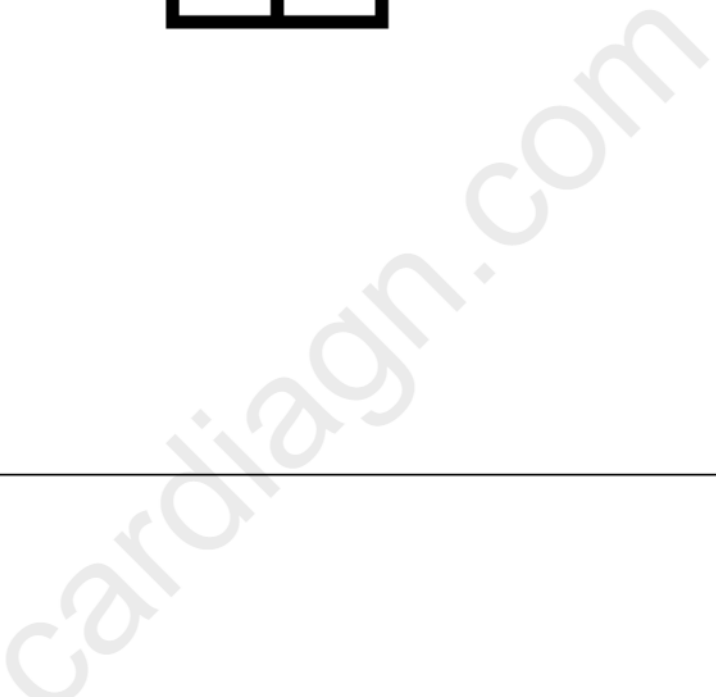
Pressure
Sensor

cardiagn.com

Symbol	Description
 A schematic symbol for a knock sensor. It consists of a vertical rectangle. Inside the rectangle, there is a vertical line that runs from the top to the bottom. In the center of this line is a solid black rectangle. The symbol is centered within the cell.	Knock Sensor
cardiagn.com	

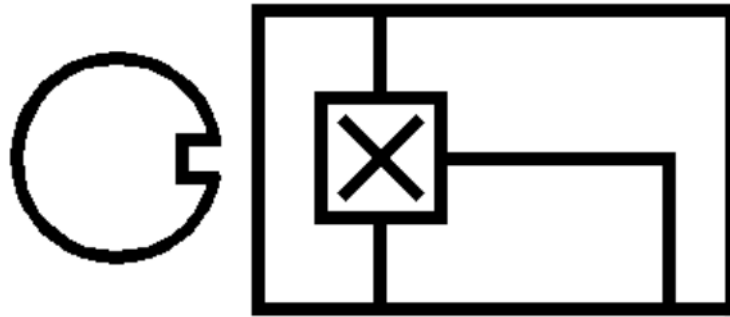
Symbol	Description
 The symbol consists of a gear icon to the left of a rectangular frame. Inside the frame, there is a vertical line with a small rectangular box in the center containing a stylized 'S' or '3' shape, representing an inductive sensor.	Inductive Type Sensor - 2-Wire

Symbol	Description
 The symbol consists of a gear icon on the left, followed by a rectangular box containing a stylized inductor symbol (a vertical line with a semi-circular loop on the left). This box is connected to a larger rectangular box representing the sensor body. The entire assembly is enclosed within a larger rectangular frame with horizontal lines at the top and bottom.	Inductive Type Sensor - 3-Wire
cardiagn.com	

Symbol	Description
	Hall Effect Sensor - 2-Wire
	

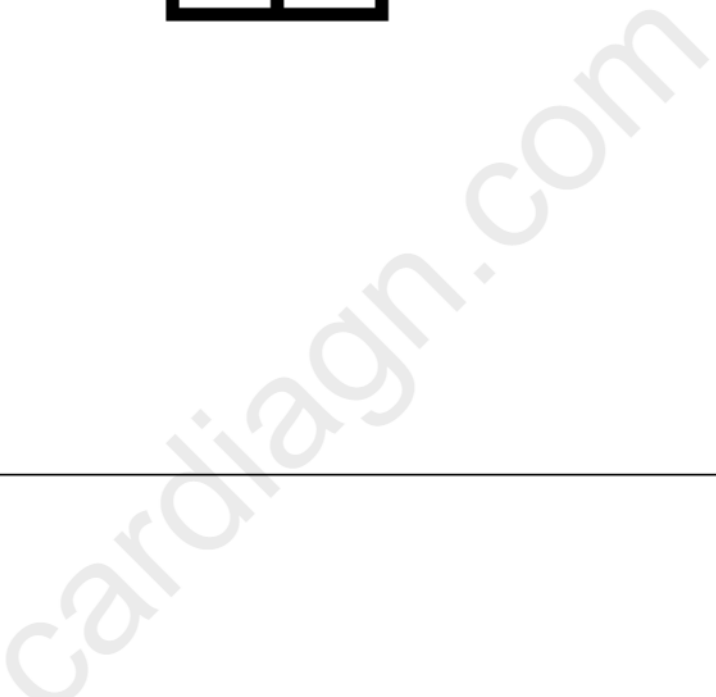
Symbol

Description



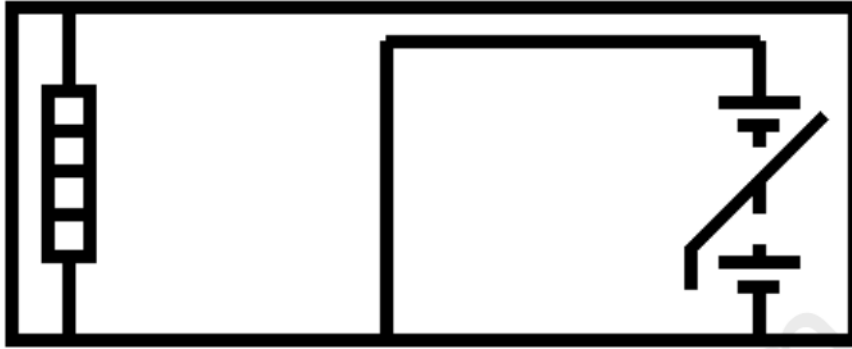
Hall Effect
Sensor - 3-
Wire

cardiagn.com

Symbol	Description
	Oxygen Sensor - 2- Wire
	

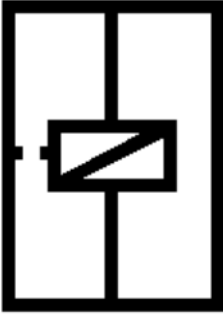
Symbol

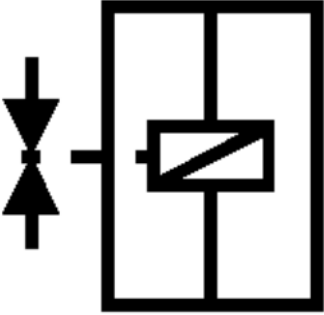
Description

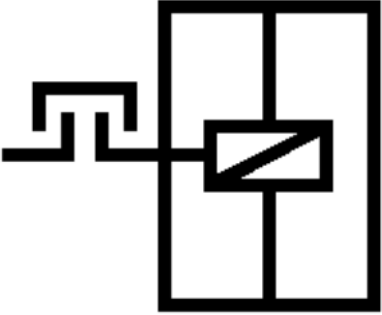


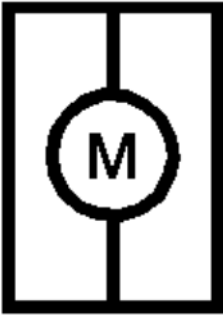
Heated
Oxygen
Sensor - 4-
Wire

cardiagn.com

Symbol	Description
 The symbol for a solenoid actuator is a square divided into four quadrants by a vertical line. In the center, there is a smaller square with a diagonal line from the bottom-left to the top-right. A small circle is located on the left side of this central square, with a horizontal line segment extending from it to the left edge of the main square.	Solenoid - Actuator

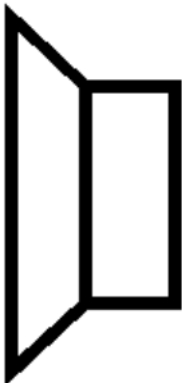
Symbol	Description
 The symbol consists of a square box divided into four quadrants by a vertical line. A horizontal line enters from the left, passing through a solenoid coil symbol (two triangles pointing towards each other with a dot in the center). This line then enters the left side of the square box. Inside the box, there is a rectangular element with a diagonal line from the bottom-left to the top-right, representing a valve spool. A diagonal line also extends from the top-right of the box.	Solenoid - Valve

Symbol	Description
 The symbol consists of a rectangular frame divided into four quadrants by a vertical line. A horizontal line enters from the left, passes through a small square, and then through a diagonal line (from bottom-left to top-right) in the center of the frame. To the left of the horizontal line is a zigzag line representing a spring. A diagonal line also passes through the center of the frame, from the top-left to the bottom-right.	Clutch

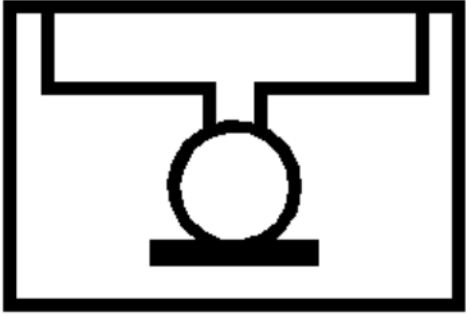
Symbol	Description
 The symbol consists of a circle with the letter 'M' inside. This circle is connected to a vertical line that passes through a rectangular frame. The entire symbol is centered within the cell.	Motor

Symbol	Description
	Motor with PTC

Symbol	Description
 A black line drawing of an antenna symbol. It consists of a vertical line with a horizontal bar at the top, forming a Y-shape. This symbol is enclosed within a rectangular border.	Antenna
cardiagn.com	

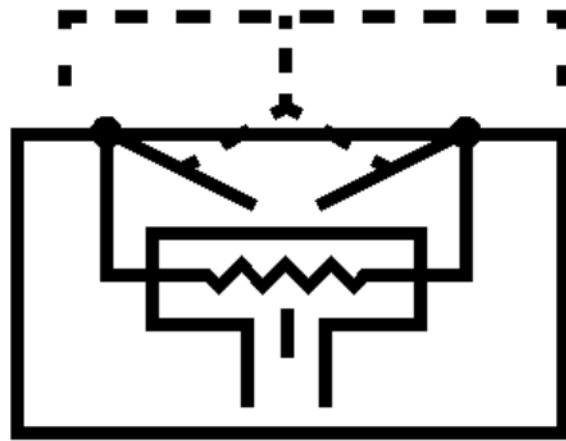
Symbol	Description
 A black outline symbol of a speaker, consisting of a trapezoidal shape with a smaller rectangle inside, representing a sound source.	Speaker

Symbol	Description
 A black outline symbol of a horn, consisting of a trapezoidal bell and a short, flared tube.	Horn
cardiagn.com	

Symbol	Description
 A black line-art symbol of a microphone. It features a circular head with a small circle inside, mounted on a rectangular base. The entire microphone is enclosed within a rectangular frame that has a horizontal bar across the top, resembling a stand or a mounting bracket.	Microphone
cardiagn.com	

Symbol

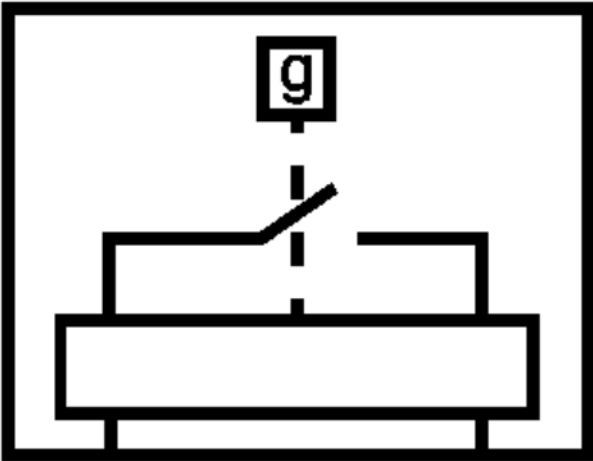
Description



Airbag

cardiagn.com

Symbol	Description
	SIR Coil
cardiagn.com	

Symbol	Description
	SIR Impact Sensor

VEHICLE ZONING STRATEGY

All grounds, in-line connectors, and splices have identifying numbers that correspond to where they are located in the vehicle. The following table explains the numbering system.

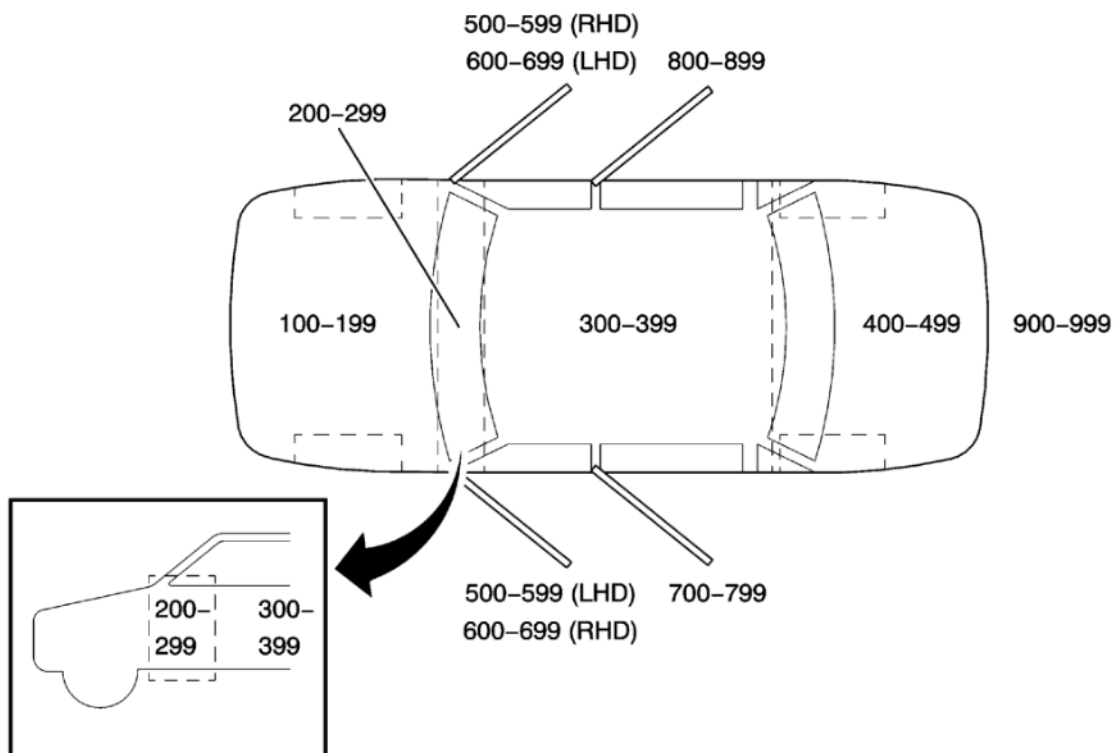


Fig. 37: Passenger Car Zoning View
Courtesy of GENERAL MOTORS COMPANY

Callout Numbers	Zone Description
100-199	Engine compartment (all forward of the instrument panel)
200-299	Within the instrument panel area (between the bulkhead and the front plane of the instrument panel)
300-399	Passenger compartment (from instrument panel to the back of the rear seats)
400-499	Luggage compartment (from the back of the rear seats to the rear of the vehicle)
500-599	Inline harness connectors to or within the driver door
600-699	Inline harness connectors to or within the front passenger door
700-799	Inline harness connectors to or within the left rear door
800-899	Inline harness connectors to or within the right rear door
900-999	Inline harness connectors to or within the luggage compartment lid or hatch

SCHEMATICS RPO CODE LIST

RPO	Option Name	Country Group
9H8	LAMP SYSTEM-DAYTIME RUNNING, AUXILIARY	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM)
A45	MEMORY-SEAT ADJUSTER, MIRROR, POWER, DRIVER, PERSONALIZATION	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
A90	LOCK CONTROL RR CMPT-LID, REM CONT ELEC RELEASE	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)

RPO	Option Name	Country Group
AB5	LOCK CONTROL-RR CMPT LID, REM CONT ELEC, TOUCH RELEASE	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
AED	WINDOW REG PASS DR-POWER OPERATED, EXPRESS DOWN	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
AEQ	WINDOW REG REAR DR-POWER OPERATED, EXPRESS DOWN	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
AG1	ADJUSTER FRT ST-POWER, MULTI-DIRECTIONAL, DRIVER (DO NOT USE ON NEW PROGRAMS AFTER MY18)	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
AG2	ADJUSTER PASS ST-POWER, MULTI-DIRECTIONAL (DO NOT USE ON NEW PROGRAMS AFTER MY18)	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
AL0	SENSOR INDICATOR-INFLATABLE RESTRAINT, FRT PASS/CHILD PRESENCE DETECTOR	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
APG	CONTROL-SEAT, POWER LUMBAR, LH (DO NOT USE FOR NEXT NEW MAJOR)	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
APH	CONTROL-SEAT, POWER LUMBAR, RH (DO NOT USE FOR NEXT NEW MAJOR)	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
AQQ	LOCK CONTROL, ENTRY-REMOTE ENTRY, EXTENDED RANGE (MY 09 AND FUTURE)	U.S.A., PR and USVI (MAH), Canada (MBC), Mid-East (MAM), Israel (MBI)
ASV	EQUIPMENT-SENSOR AIR MOISTURE and W/S TEMP	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
ATH	LOCK CONTROL, ENTRY-REMOTE ENTRY, EXTENDED RANGE, PASSIVE ENTRY, ALL DOORS	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
AXG	WINDOW REG DRVR DR-POWER OPERATED, EXPRESS UP/DOWN	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
AYF	RESTRAINT SYSTEM-SEAT, INFLATABLE, DRIVER and PASS FRT, FRT SEAT SIDE and RR SEAT SIDE, ROOF SIDE, KNEE	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
BTM	SWITCH-ENGINE START, KEYLESS	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
BTT	ALARM-REMOTE PANIC	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
BTV	REMOTE START-ENGINE	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
C3U	ROOF-SUN, GLASS, SLIDING, ELEC, TRANSPARENT GLASS FIXED	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
C4P	HVAC SYSTEM-AIR CONDITIONER FRT, SEMIAUTOMATIC, ELECTRONIC CONTROLS	U.S.A., PR and USVI (MAH), Canada (MBC)

RPO	Option Name	Country Group
C59	VENT-AIR, CONSOLE, RR	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
C67	HVAC SYSTEM-AIR CONDITIONER FRT, ELECTRONIC CONTROLS	U.S.A., PR and USVI (MAH), Canada (MBC), Mid-East (MAM)
C9B	LAMP-INTR, AMBIENT, DOOR	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
C9J	LAMP-INTR, AMBIENT, I/P	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
CE1	WIPER SYS WINDSHIELD-PULSE, MOISTURE SENSITIVE	Korea (MAW)
CJ2	HVAC SYSTEM-AIR CONDITIONER FRT, AUTO TEMP CONT, AUX TEMP CONT	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
D31	MIRROR I/S R/V-TILT	U.S.A., PR and USVI (MAH), Canada (MBC), Mid-East (MAM), Israel (MBI)
D49	MIRROR O/S-LH and RH, REMOTE CONTROL, ELECTRIC, MANUAL FOLD	U.S.A., PR and USVI (MAH)
DD8	MIRROR I/S R/V-LT SENSITIVE	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
DH6	MIRROR I/S FRT VAN-LH and RH, SUNSHADE, ILLUM	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
DLG	MIRROR O/S-LH and RH, RC, ELEC, HEAT, MAN FOLD, FLAT/DRVR, CNVX/PASS, LT SENS, TURN SIG IND, PERM LIGHT	U.S.A., PR and USVI (MAH), Canada (MBC), Israel (MBI)
DLL	MIRROR O/S-LH and RH, RC, ELEC, HEAT, MAN FOLD, FLAT/DRVR, CNVX/PASS, TURN SIG IND, PERM LIGHT	U.S.A., PR and USVI (MAH), Canada (MBC), Israel (MBI)
DMD	MIRROR O/S-LH and RH, RC, ELEC, HEAT, PWR FOLD, FLAT/DRVR, CNVX/PASS, TURN SIG IND, PERM LIGHT	Korea (MAW)
DMN	MIRROR O/S-LH and RH, RC, ELEC, HEAT, PWR FOLD, FLAT/DRVR, CNVX/PASS, LT SENS, TURN SIG IND, PERM LIGHT	Korea (MAW)
DXB	MIRROR O/S-LH and RH, RC, ELEC, HEAT, CNVX/DRVR, MANFOLD, CNVX/PASS, TURN SIG IND, PERM LIGHT	Mid-East (MAM)
DXG	MIRROR O/S-LH and RH, RC, ELEC, CNVX/DRVR, MANFOLD, CNVX/PASS	Mid-East (MAM)
DXO	MIRROR O/S-LH and RH, RC, ELEC, HEAT, CNVX/DRVR, MANFOLD, CNVX/PASS, LT SENS DRVR, TURN SIG IND, PERM LIGHT	Mid-East (MAM)
FHO	VEHICLE FUEL-GASOLINE E10	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW)
FHS	VEHICLE FUEL-GASOLINE E85	U.S.A., PR and USVI (MAH), Canada (MBC), Mid-East (MAM), Israel (MBI)
FHV	VEHICLE FUEL-BIFUEL and MONOVALENT PLUS CNG	U.S.A., PR and USVI (MAH), Canada (MBC)

RPO	Option Name	Country Group
FX3	RIDE AND HANDLING-AUTOMATIC ELECTRONIC CONTROLLED	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
IO3	RADIO-INFOTAINMENT SYSTEM - BASE HMI	U.S.A., PR and USVI (MAH), Canada (MBC), Mid-East (MAM)
IO5	RADIO-INFOTAINMENT SYSTEM - UPLEVEL HMI, ENHANCED CONNECTIVITY	U.S.A., PR and USVI (MAH), Canada (MBC), Mid-East (MAM), Israel (MBI)
IO6	RADIO-INFOTAINMENT SYSTEM - UPLEVEL HMI, ENHANCED CONNECTIVITY, EMBEDDED NAVIGATION	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM)
J61	BRAKE SYSTEM-POWER, FRT and RR DISC, ABS, 17"	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
J71	BRAKE PARKING-POWER OPERATED	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
K05	HEATER ENG-BLOCK	U.S.A., PR and USVI (MAH), Canada (MBC)
K34	CRUISE CONTROL-AUTOMATIC, ELECTRONIC	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
K4C	CHARGER-INDUCTIVE PORTABLE WIRELESS DEVICE	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
K4F	BATTERY-LN4, AGM, 12V, 80AH, 800 ENCCA	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW)
KA1	HEATER SEAT FRT-DRVR and PASS	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
KA6	HEATER SEAT-REAR	Korea (MAW)
KD4	RECEPTACLE-ELECTRICAL, FRT CONSOLE	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
KG4	GENERATOR-150 AMP	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
KI6	RECEPTACLE-ELECTRICAL, FRT CONSOLE RR 110 VOLT	U.S.A., PR and USVI (MAH), Canada (MBC)
KI7	RECEPTACLE-ELECTRICAL, FRT CONSOLE RR 230 VOLT	Korea (MAW), Mid-East (MAM), Israel (MBI)
KL9	ENG CONTROL-STOP/START SYS, CONVENTIONAL AT, CONVENTIONAL MT OR BRAKE RELEASE LATE RESTART	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW)
KPA	RECEPTACLE-ELECTRICAL, FRT CONSOLE RR	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
KSG	CRUISE CONTROL-AUTOMATIC, ADAPTIVE, WITH STOP/GO	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW)
KU1	VENTILATED SEAT DRVR-FRONT	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
KU3	VENTILATED SEAT PASS-FRONT	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)

RPO	Option Name	Country Group
LCV	ENGINE-GAS, 4 CYL, 2.5L, L4, SIDI, DOHC, DCVCP, VVT, E85 MAX, E0-E100, ALUM	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW)
LFR	ENGINE-GAS, 6 CYL, 3.6L, V6, PFI, DOHC, VVT, ALUM, GEN 1	U.S.A., PR and USVI (MAH), Canada (MBC)
LFX	ENGINE-GAS, 6 CYL, 3.6L, SIDI, DOHC, VVT, E85 MAX, ALUM, GM	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
LHD	VEHICLE DRIVE-LEFTHAND DRIVE	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
M7W	TRANSMISSION-AUTO 6 SPD, 6T70, FWD, GEN 2	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
MCR	RECEPTACLE-MEMORY CARD	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
MCY	PORT, ELEK DEVICE-USB ONLY	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
MHG	TRANSMISSION-AUTO 6 SPD, HMD, GM, BAS+, 6T45, HYBRID, FWD	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW)
N08	LOCK CONTROL-FUEL FILLER DR, REM CONT	Korea (MAW)
N37	STEERING COLUMN-TILT, TELESCOPING	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
N38	STEERING COLUMN-TILT, TELESCOPING, POWER	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
NCG	LOCK-ELECTRICAL CHILD LOCK SYSTEM (REAR DOOR LATCH)	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
NE1	CERTIFICATION-EMISSION, GEOGRAPHICALLY RESTRICTED REGISTRATION FOR VEHICLES UP TO 14,000 LBS GVW (USE 2003 MDL YR)	U.S.A., PR and USVI (MAH)
NE8	EVAPORATIVE SYSTEM-LEVEL 3 EMISSIONS	U.S.A., PR and USVI (MAH)
NJ1	STEERING-POWER, NON-VARIABLE RATIO, ELECTRIC	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW)
NJ2	STEERING-ELECTRIC, BELT DRIVE	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
NKC	NOISE CONTROL-ACTIVE NOISE CANCELLATION, ENGINE	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW)
NT7	EMISSION SYSTEM-FEDERAL, TIER 2	U.S.A., PR and USVI (MAH), Canada (MBC), Mid-East (MAM), Israel (MBI)
NU5	EMISSION SYSTEM-CALIFORNIA, BIN 4	U.S.A., PR and USVI (MAH)
NU6	EMISSION SYSTEM-CALIFORNIA, PZEV	U.S.A., PR and USVI (MAH)
T4A	HEADLAMPS-HALOGEN	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
T4F	HEADLAMPS-HIGH INTENSITY DISCHARGE	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM)

RPO	Option Name	Country Group
T67	BATTERY-LN3, FLA, 12V, 70AH, 512 ENCCA	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
T83	CONTROL, HEADLAMPS-AUTOMATIC ON-OFF	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
TG5	PLAYER-COMPACT DISC AND MP3	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
TU2	LAMP-MARKER, SIDE	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
U19	SPEEDOMETER-INST, KILO and MILES, KILO ODOMETER	Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
U2J	DIGITAL AUDIO SYSTEM-S-BAND - NONE	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
U2K	DIGITAL AUDIO SYSTEM-S-BAND	U.S.A., PR and USVI (MAH), Canada (MBC)
U77	ANTENNA-RR WINDOW, RADIO	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
U80	DISPLAY-COMPASS	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
UD7	PARK ASSIST-REAR	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
UDD	DISPLAY INSTRUMENT-DRIVER INFO ENHANCED (MULTI COLOR STANDARD GRAPHIC)	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
UDT	INFOTAINMENT DISPLAY-COLOR INFO DISPLAY (CID) 8", WVGA, TOUCH SCREEN	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
UE1	COMMUNICATION SYSTEM-VEHICLE, ONSTAR	U.S.A., PR and USVI (MAH), Canada (MBC)
UEU	SENSOR INDICATOR-FORWARD COLLISION ALERT	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
UFG	SENSOR INDICATOR-REAR CROSS TRAFFIC ALERT	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
UFL	LANE ACTIVE SAFETY-DEPARTURE WARNING	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
UG1	OPENER-GARAGE DOOR, UNIVERSAL	U.S.A., PR and USVI (MAH), Canada (MBC)
UGN	COLL IMMINENT BRK-ALL SPEED, VEH FWD MOVEMENT, BRAKE PREFILL, INTEGRATED BRAKE ASSIST	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW)
UH1	INDICATOR-SEAT BELT WARNING, RH	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
UHI	INFOTAINMENT DISPLAY-COLOR INFO DISPLAY (CID) 4.2"	U.S.A., PR and USVI (MAH), Canada (MBC), Mid-East (MAM)

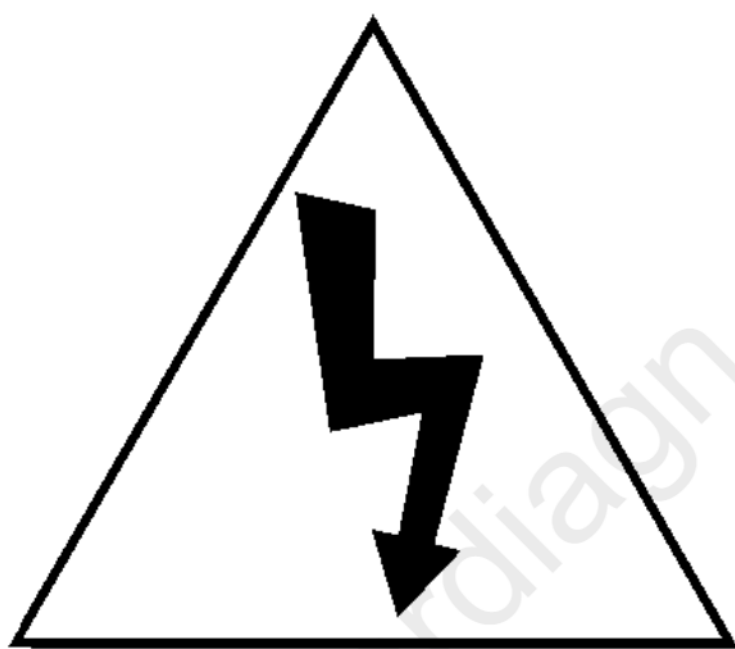
RPO	Option Name	Country Group
UJM	TIRE PRESS INDICATOR-MANUAL LEARN	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
UKC	SIDE ACTIVE SAFETY-OBSTACLE DETECTION ENHANCED	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
ULG	AUDIO CONTROL-RR SEAT, DISPLAY, CHAUFFEUR MODE	Korea (MAW)
UMN	SPEEDOMETER-INST, MILES and KILO, MILES ODOMETER	U.S.A., PR and USVI (MAH)
UPF	WIRELESS INTERFACE-SHORT RANGE, VOICE REC	U.S.A., PR and USVI (MAH), Canada (MBC)
UQG	SPEAKER SYSTEM-ENHANCED AUDIO, AMPLIFIER	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
UQS	SPEAKER SYSTEM-PREMIUM AUDIO, BRANDED SURROUND AMPLIFIER	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
USR	RECEPTACLE-USB	U.S.A., PR and USVI (MAH), Canada (MBC), Mid-East (MAM)
UTJ	THEFT DETERENT-ELECTRICAL, UNAUTHORIZED ENTRY	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
UVC	VISION-REAR VIEW, MONO, ANALOG	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
UVD	STEERING WHEEL HEAT-MANUAL	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW)
VRI	SHUTTERS-FRONT GRILLE, ACTIVE, LWR	U.S.A., PR and USVI (MAH), Canada (MBC)
VV4	COMMUNICATION EQUIP-MOBILE INTERNET CONNECTIVITY	U.S.A., PR and USVI (MAH), Canada (MBC)
W1Y	CONTROL-STEERING WHEEL, RADIO, REDUNDANT CONTROLS	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW), Mid-East (MAM), Israel (MBI)
XFE	FUEL ECONOMY-EXTRA FUEL ECONOMY	U.S.A., PR and USVI (MAH), Canada (MBC), Korea (MAW)
XL7	FREQUENCIES RATING-315 MHZ, LONG DISTANCE	U.S.A., PR and USVI (MAH), Canada (MBC)
YF5	CERTIFICATION-EMISSION, CALIFORNIA	U.S.A., PR and USVI (MAH)

MASTER ELECTRICAL SCHEMATIC ICONS

Icon	Icon Definition

**WARNING:**

When performing service on or near the SIR components or the SIR wiring, the SIR system must be disabled. Refer to SIR Disabling and Enabling. Failure to observe the correct procedure could cause deployment of the SIR components, personal injury, or unnecessary SIR system repairs.

**WARNING:**

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

The High Voltage Disabling procedure will perform the following tasks:

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

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

WARNING:

The high intensity discharge system produces high voltage and current. To reduce the risk of severe shocks and burns:

- Never open the high intensity discharge system ballast or the arc tube assembly starter.
- Never probe between the high intensity discharge system ballast output connector and the arc tube assembly.

WARNING:

To help avoid personal injury, always treat the accessory power receptacle, accessory DC/AC power inverter module, AC circuit wires, and connectors as if AC high-voltage is present.

**WARNING:**

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

The High Voltage Disabling procedure includes the following steps:

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

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

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

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

Icon	Icon Definition
	NOTE: Twisted wires provide an effective shield that helps protect sensitive electronic components from electrical interference. In order to prevent electrical interference from degrading the performance of the connected components, you must maintain the proper specification when making any repairs to the twisted wires shown : • The wires must be twisted a minimum of 16 turns per 31 cm (12 in) as measured anywhere along the length of the wires. • The outside diameter of the twisted wires must not exceed 6.0 mm (0.25 in).

POWER DISTRIBUTION WIRING SCHEMATICS

B+ Bus X50D Fuse Block - Battery (without KL9)

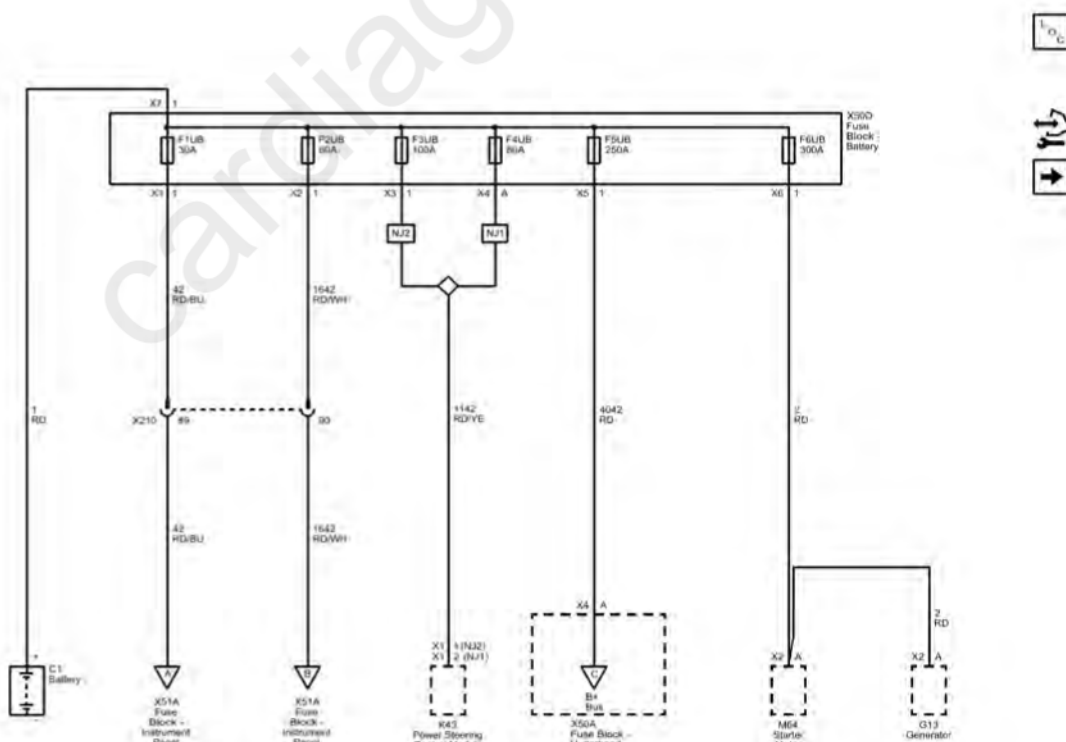


Fig. 38: B+ Bus X50D Fuse Block - Battery (without KL9)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Unfused Battery Positive Voltage

Callout	Component Name
1_RD	1 RD
CAV_1	1
CONN_X7	X7
42	Battery Positive Voltage
42_RD/BU	42 RD/BU
CAV_1	1
CONN_X1	X1
1642	Battery Positive Voltage
1642_RD/WH	1642 RD/WH
CAV_1	1
CONN_X2	X2
1142	Battery Positive Voltage
1142_RD/YE	1142 RD/YE
CAV_2	2
CONN_X1	X1
CAV_1	1
CONN_X3	X3
CAV_A	A
CONN_X4	X4
42_RD/BU	42 RD/BU
1642_RD/WH	1642 RD/WH
4042	Battery Positive Voltage
4042_RD	4042 RD
CAV_A	A
CONN_X4	X4
CAV_1	1
CONN_X5	X5
2	Battery Positive Voltage
2_RD	2 RD
CAV_A	A
CONN_X2	X2
CAV_1	1
CONN_X6	X6
2_RD	2 RD
CAV_A	A
CONN_X2	X2
CAV_1	1
CONN_X1	X1
NJ2	STEERING-ELECTRIC, BELT DRIVE
NJ1	STEERING-POWER, NON-VARIABLE RATIO, ELECTRIC
NJ2	STEERING-ELECTRIC, BELT DRIVE
NJ1	STEERING-POWER, NON-VARIABLE RATIO, ELECTRIC
X210	X210
CAV_89	89
CAV_90	90
F1UB	F1UB 30A
F2UB	F2UB 60A
F3UB	F3UB 100A
F4UB	F4UB 80A
F5UB	F5UB 250A
F6UB	F6UB 300A
B_REF	B

Callout	Component Name
A_REF	A
C_REF	C
X210	X210
C1	C1 Battery
G13	G13 Generator
X50D	X50D Fuse Block - Battery
K43	K43 Power Steering Control Module
X51A	X51A Fuse Block - Instrument Panel
X51A	X51A Fuse Block - Instrument Panel
M64	M64 Starter Motor
X50A	X50A Fuse Block - Underhood

B+ Bus X50D Fuse Block - Battery (KL9)

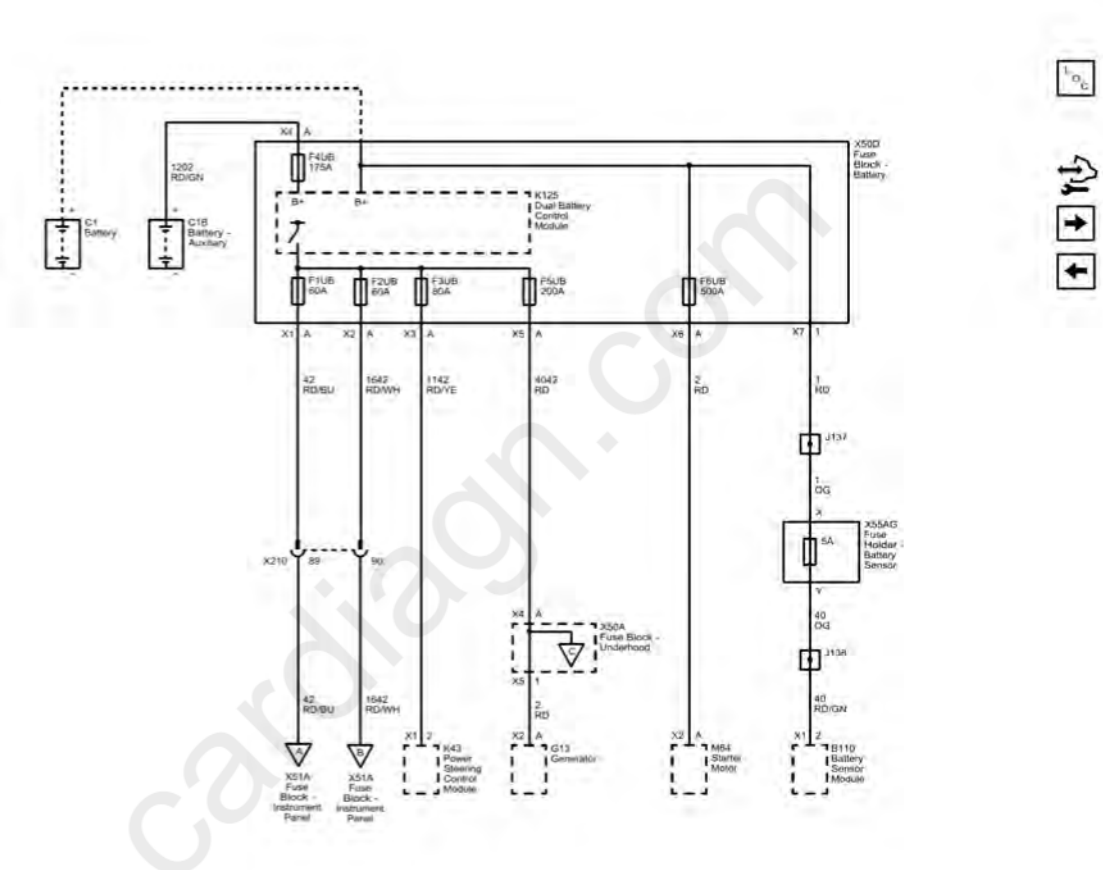


Fig. 39: B+ Bus X50D Fuse Block - Battery (KL9)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
42	Battery Positive Voltage
42_RD/BU	42 RD/BU
CAV_A	A
CONN_X1	X1
1642	Battery Positive Voltage
1642_RD/WH	1642 RD/WH
CAV_A	A
CONN_X2	X2
42_RD/BU	42 RD/BU
1642_RD/WH	1642 RD/WH
4042	Battery Positive Voltage
4042_RD	4042 RD
CAV_A	A

Callout	Component Name
CONN_X4	X4
CAV_A	A
CONN_X5	X5
2	Battery Positive Voltage
2_RD	2 RD
CAV_A	A
CONN_X2	X2
1142	Battery Positive Voltage
CAV_2	2
CONN_X1	X1
1142_RD/YE	1142 RD/YE
1202	Battery Positive Voltage
1202_RD/GN	1202 RD/GN
CAV_A	A
CONN_X4	X4
1	Unfused Battery Positive Voltage
1_RD	1 RD
CAV_1	1
CONN_X7	X7
CAV_A	A
CONN_X6	X6
CAV_A	A
CONN_X3	X3
40	Battery Positive Voltage
40_RD/GN	40 RD/GN
CAV_2	2
CONN_X1	X1
CAV_A	A
CONN_X2	X2
2_RD	2 RD
CAV_1	1
CONN_X5	X5
1_OG	1 OG
40_OG	40 OG
CAV_X	X
CAV_Y	Y
X210	X210
CAV_89	89
CAV_90	90
A_REF	A
B_REF	B
F6UB	F6UB 500A
F3UB	F3UB 80A
F5UB	F5UB 200A
F2UB	F2UB 60A
F1UB	F1UB 60A
F4UB	F4UB 175A
5A	5A
C_REF	C
J138	J138
X210	X210
C1	C1 Battery

Callout	Component Name
M64	M64 Starter Motor
X50D	X50D Fuse Block - Battery
X51A	X51A Fuse Block - Instrument Panel
X51A	X51A Fuse Block - Instrument Panel
K43	K43 Power Steering Control Module
X50A	X50A Fuse Block - Underhood
C1B	C1B Battery - Auxiliary (KL9)
B110	B110 Battery Sensor Module (KL9)
G13	G13 Generator
X55AG	X55AG Fuse Holder - Battery Sensor (KL9)
K125	K125 Dual Battery Control Module (KL9)

B+ Bus X50A Fuse Block - Underhood (1 of 2)

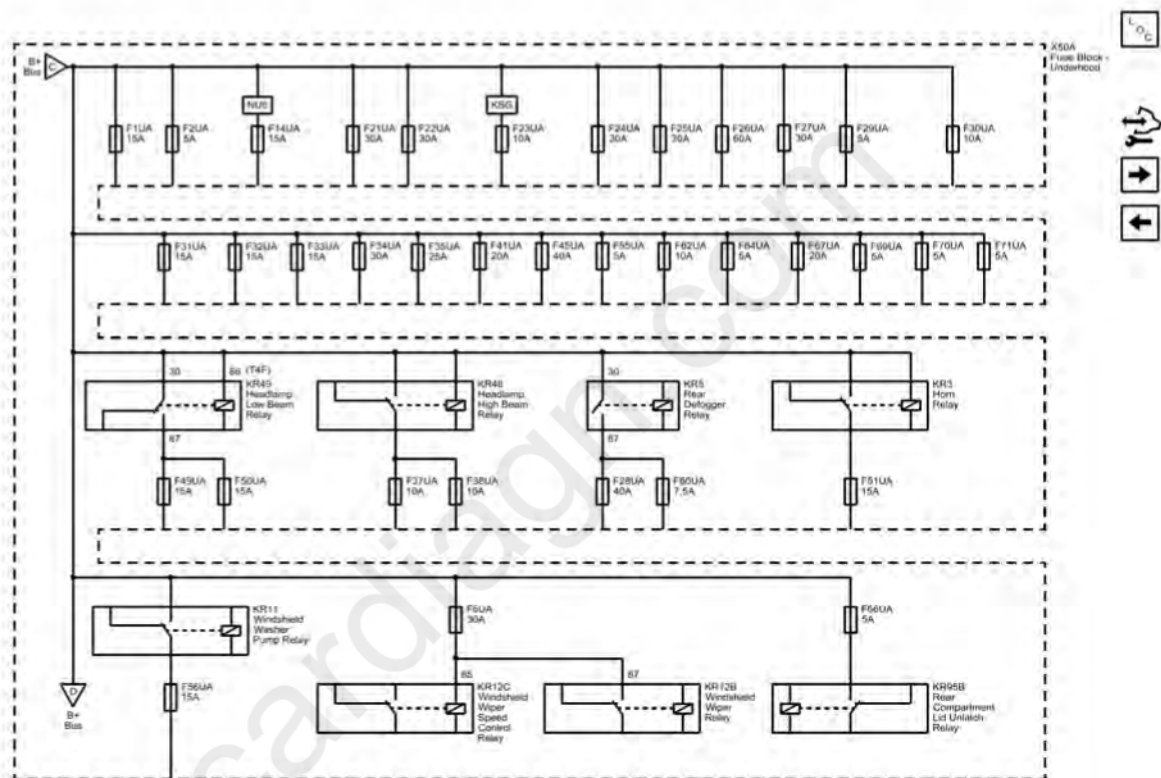


Fig. 40: B+ Bus X50A Fuse Block - Underhood (1 of 2)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
CAV_85	85
CAV_87	87
CAV_30	30
CAV_87	87
CAV_87	87
CAV_86	86
CAV_30	30
T4F	HEADLAMPS-HIGH INTENSITY DISCHARGE
KSG	CRUISE CONTROL-AUTOMATIC, ADAPTIVE, WITH STOP/GO
NU6	EMISSION SYSTEM-CALIFORNIA, PZEV/TZEV
C_REF	C
D_REF	D
F56UA	F56UA 15A

Callout	Component Name
F6UA	F6UA 30A
F66UA	F66UA 5A
F49UA	F49UA 15A
F50UA	F50UA 15A
F37UA	F37UA 10A
F38UA	F38UA 10A
F28UA	F28UA 40A
F60UA	F60UA 7.5A
F51UA	F51UA 15A
F32UA	F32UA 15A
F33UA	F33UA 15A
F34UA	F34UA 30A
F35UA	F35UA 25A
F41UA	F41UA 20A
F45UA	F45UA 40A
F55UA	F55UA 5A
F62UA	F62UA 10A
F67UA	F67UA 20A
F69UA	F69UA 5A
F70UA	F70UA 5A
F71UA	F71UA 5A
F1UA	F1UA 15A
F2UA	F2UA 5A
F21UA	F21UA 30A
F22UA	F22UA 30A
F24UA	F24UA 30A
F25UA	F25UA 30A
F26UA	F26UA 60A
F27UA	F27UA 30A
F29UA	F29UA 5A
F31UA	F31UA 15A
F14UA	F14UA 15A
F23UA	F23UA 10A
F30UA	F30UA 10A
F64UA	F64UA 5A
X50A	X50A Fuse Block - Underhood
KR48	KR48 Headlamp High Beam Relay
KR49	KR49 Headlamp Low Beam Relay
KR5	KR5 Rear Defogger Relay
KR11	KR11 Windshield Washer Pump Relay
KR12B	KR12B Windshield Wiper Relay
KR12C	KR12C Windshield Wiper Speed Control Relay
KR3	KR3 Horn Relay
KR95B	KR95B Rear Compartment Lid Unlatch Relay

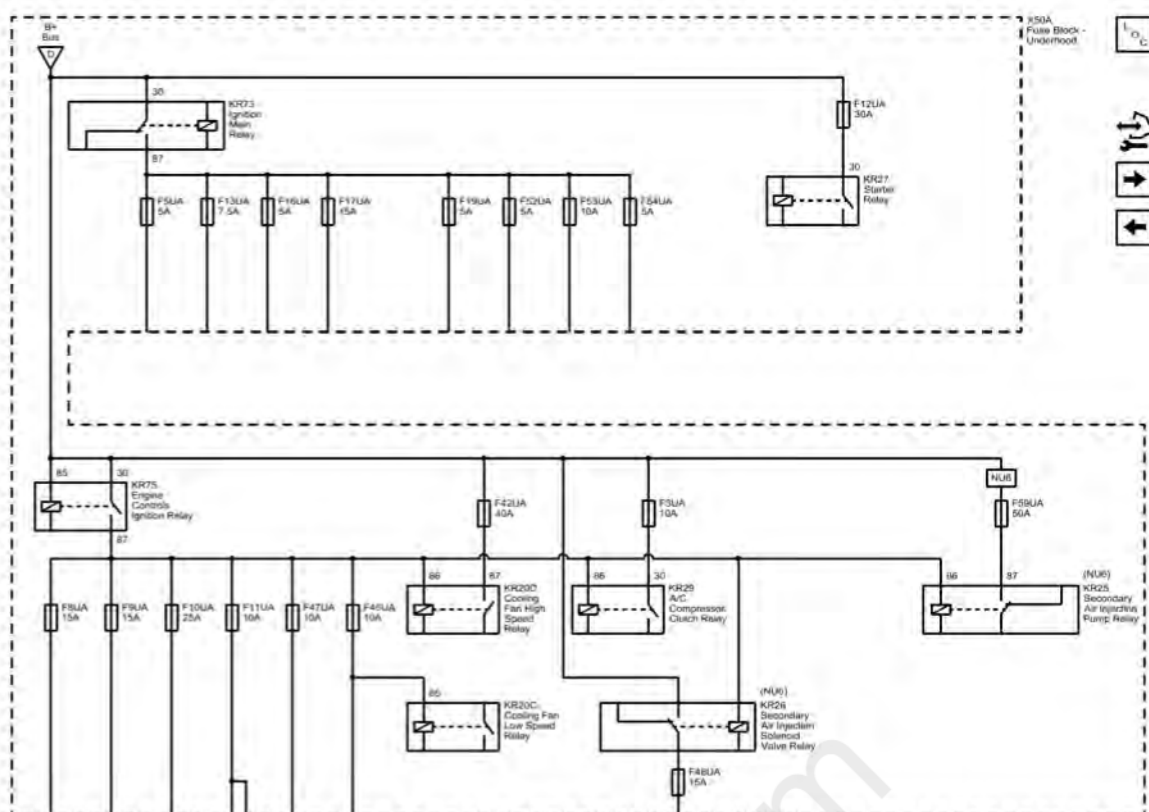


Fig. 41: B+ Bus X50A Fuse Block - Underhood (2 of 2)
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
CAV_30	30
CAV_30	30
CAV_87	87
CAV_85	85
CAV_86	86
CAV_87	87
CAV_86	86
CAV_30	30
CAV_86	86
CAV_87	87
CAV_85	85
CAV_30	30
CAV_87	87
NU6	EMISSION SYSTEM-CALIFORNIA, PZEV/TZEV
NU6	EMISSION SYSTEM-CALIFORNIA, PZEV/TZEV
NU6	EMISSION SYSTEM-CALIFORNIA, PZEV/TZEV
D_REF	D
F12UA	F12UA 30A
F5UA	F5UA 5A
F13UA	F13UA 7.5A
F16UA	F16UA 5A
F17UA	F17UA 15A
F19UA	F19UA 5A
F52UA	F52UA 5A
F53UA	F53UA 10A
F54UA	F54UA 5A
F42UA	F42UA 40A

Callout	Component Name
F3UA	F3UA 10A
F59UA	F59UA 50A
F48UA	F48UA 15A
F8UA	F8UA 15A
F9UA	F9UA 15A
F10UA	F10UA 25A
F11UA	F11UA 10A
F47UA	F47UA 10A
F46UA	F46UA 10A
X50A	X50A Fuse Block - Underhood
KR29	KR29 A/C Compressor Clutch Relay
KR20D	KR20D Cooling Fan High Speed Relay
KR25	KR25 Secondary Air Injection Pump Relay
KR20C	KR20C Cooling Fan Low Speed Relay
KR26	KR26 Secondary Air Injection Solenoid Valve Relay
KR27	KR27 Starter Relay
KR73	KR73 Ignition Main Relay
KR75	KR75 Engine Controls Ignition Relay

F1UA, F2UA, F22UA, F23UA, F29UA, F30UA and F70UA Fuses

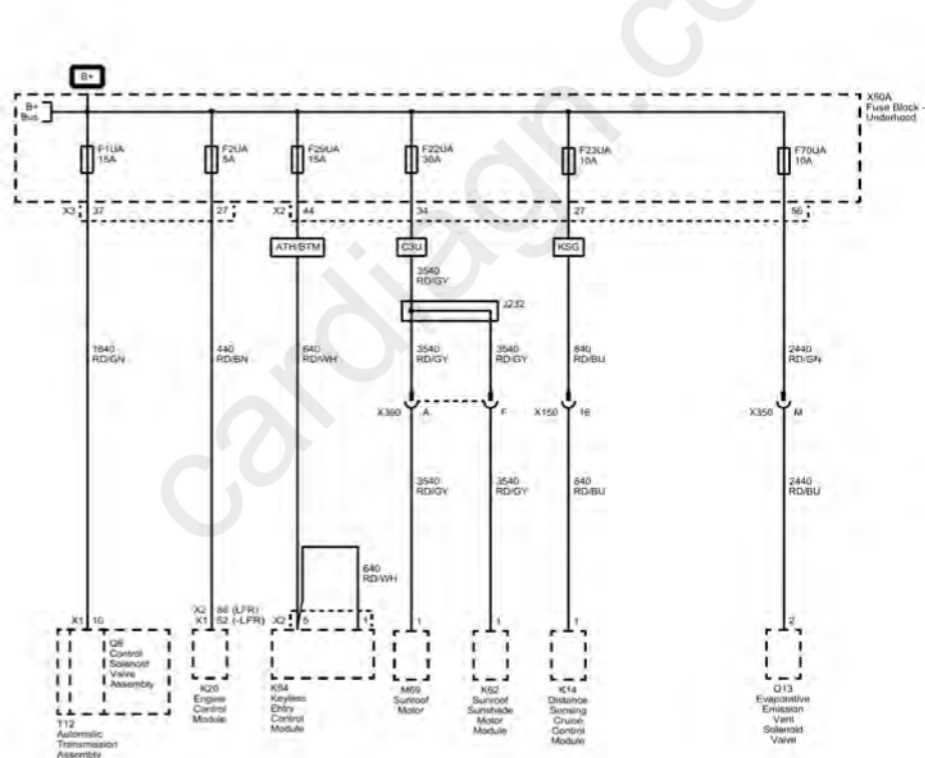


Fig. 42: F1UA, F2UA, F22UA, F23UA, F29UA, F30UA and F70UA Fuses
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
CAV_56	56
CAV_2	2
2440_RD/GN	2440 RD/GN
3540	Battery Positive Voltage
3540_RD/GY	3540 RD/GY
CAV_1	1

Callout	Component Name
CAV_34	34
3540_RD/GY	3540 RD/GY
3540_RD/GY	3540 RD/GY
3540_RD/GY	3540 RD/GY
CAV_1	1
3540_RD/GY	3540 RD/GY
C3U	ROOF-SUN, GLASS, SLIDING, ELEC, TRANSPARENT GLASS FIXED
640	Battery Positive Voltage
640_RD/WH	640 RD/WH
CAV_5	5
CONN_X2	X2
CAV_44	44
CONN_X2	X2
ATH	LOCK CONTROL, ENTRY-REMOTE ENTRY, EXTENDED RANGE, PASSIVE ENTRY, ALL DOORS
BTM	SWITCH-ENGINE START, KEYLESS
640_RD/WH	640 RD/WH
CAV_1	1
440	Battery Positive Voltage
440_RD/BN	440 RD/BN
CAV_52	52
CONN_X1	X1
CAV_27	27
1840	Battery Positive Voltage
1840_RD/GN	1840 RD/GN
CONN_X1	X1
CAV_37	37
CONN_X3	X3
CAV_1	1
2440	Battery Positive Voltage
2440_RD/BU	2440 RD/BU
CAV_M	M
840	Battery Positive Voltage
840_RD/BU	840 RD/BU
CAV_16	16
KSG	CRUISE CONTROL-AUTOMATIC, ADAPTIVE, WITH STOP/GO
840_RD/BU	840 RD/BU
CAV_27	27
CAV_10	10
CAV_86	86
CONN_X2	X2
LFR	ENGINE-GAS, 6 CYL, 3.6L, V6, PFI, DOHC, VVT, ALUM, GEN 1
LFR	ENGINE-GAS, 6 CYL, 3.6L, V6, PFI, DOHC, VVT, ALUM, GEN 1
X390	X390
CAV_F	F
CAV_A	A
F1UA	F1UA 15A
F2UA	F2UA 5A
F29UA	F29UA 15A
F22UA	F22UA 30A
J232	J232
X350	X350

Callout	Component Name
F70UA	F70UA 10A
X150	X150
F23UA	F23UA 10A
X390	X390
K20	K20 Engine Control Module
K62	K62 Sunroof Sunshade Motor Module (C3U)
Q8	Q8 Control Solenoid Valve Assembly (M7W)
Q13	Q13 Evaporative Emission Vent Solenoid Valve
M69	M69 Sunroof Motor (C3U)
T12	T12 Automatic Transmission Assembly
K84	K84 Keyless Entry Control Module (ATH or BTM)
X50A	X50A Fuse Block - Underhood
K14	K14 Distance Sensing Cruise Control Module (KSG)

F26UA, F27UA, F34UA, F41UA, F55UA, F62UA and F67UA Fuses

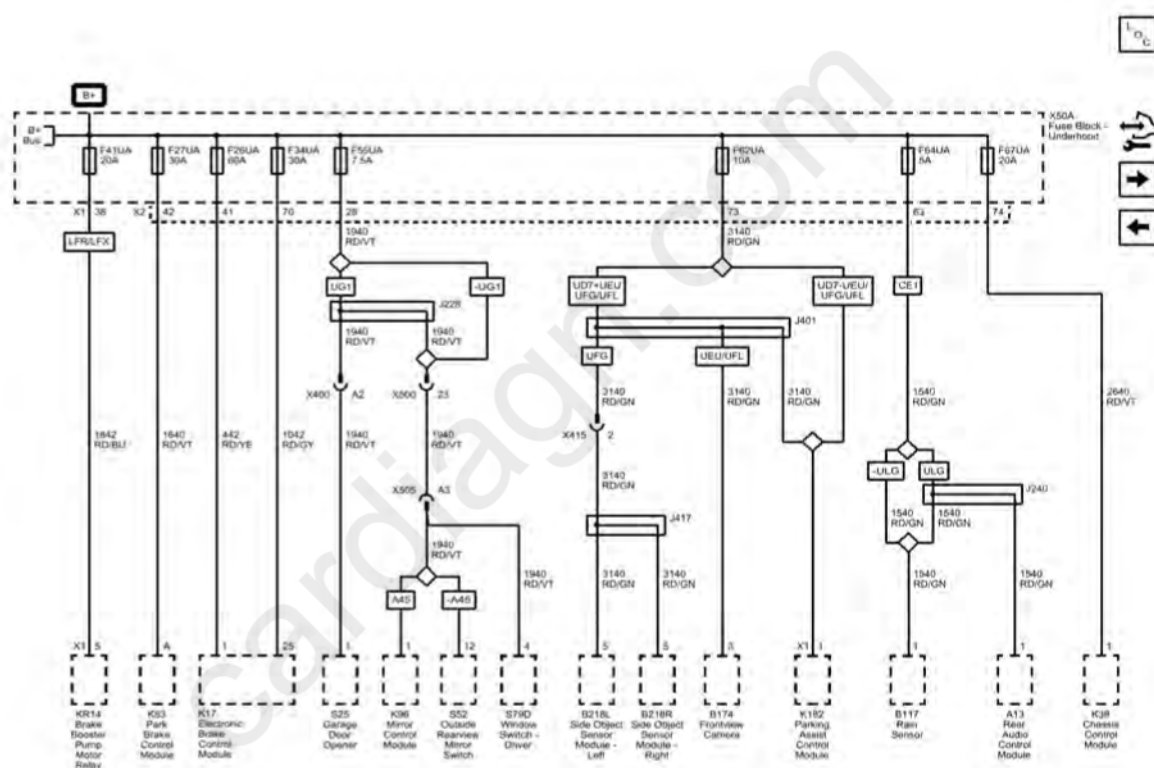


Fig. 43: F26UA, F27UA, F34UA, F41UA, F55UA, F62UA and F67UA Fuses

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
2640	Battery Positive Voltage
2640_RD/VT	2640 RD/VT
CAV_1	1
CAV_74	74
3140	Battery Positive Voltage
3140_RD/GN	3140 RD/GN
CAV_73	73
3140_RD/GN	3140 RD/GN
CAV_5	5
3140_RD/GN	3140 RD/GN
3140_RD/GN	3140 RD/GN

Callout	Component Name
3140_RD/GN	3140 RD/GN
CAV_5	5
CAV_2	2
3140_RD/GN	3140 RD/GN
3140_RD/GN	3140 RD/GN
CAV_3	3
CAV_1	1
CONN_X1	X1
UEU	SENSOR INDICATOR-FORWARD COLLISION ALERT
UFL	LANE ACTIVE SAFETY-DEPARTURE WARNING
1940	Battery Positive Voltage
1940_RD/VT	1940 RD/VT
CAV_1	1
CAV_28	28
1940_RD/VT	1940 RD/VT
1940_RD/VT	1940 RD/VT
1940_RD/VT	1940 RD/VT
1940_RD/VT	1940 RD/VT
1940_RD/VT	1940 RD/VT
CAV_A2	A2
CAV_23	23
CAV_A3	A3
1940_RD/VT	1940 RD/VT
CAV_4	4
UG1	OPENER-GARAGE DOOR, UNIVERSAL
1042	Battery Positive Voltage
1042_RD/GY	1042 RD/GY
CAV_25	25
CAV_70	70
442	Battery Positive Voltage
442_RD/YE	442 RD/YE
CAV_1	1
CAV_41	41
1640	Battery Positive Voltage
1640_RD/VT	1640 RD/VT
CAV_A	A
CAV_42	42
CONN_X2	X2
1842	Battery Positive Voltage
1842_RD/BU	1842 RD/BU
CAV_5	5
CONN_X1	X1
CAV_38	38
CONN_X1	X1
UG1	OPENER-GARAGE DOOR, UNIVERSAL
1540	Battery Positive Voltage
1540_RD/GN	1540 RD/GN
CAV_1	1
CAV_63	63
1540_RD/GN	1540 RD/GN
1540_RD/GN	1540 RD/GN
1540_RD/GN	1540 RD/GN

Callout	Component Name
CE1	WIPER SYS WINDSHIELD-PULSE, MOISTURE SENSITIVE
1540_RD/GN	1540 RD/GN
CAV_1	1
CAV_1	1
CAV_12	12
A45	MEMORY-SEAT ADJUSTER, MIRROR, POWER, DRIVER, PERSONALIZATION
A45	MEMORY-SEAT ADJUSTER, MIRROR, POWER, DRIVER, PERSONALIZATION
UD7	PARK ASSIST-REAR
UEU	SENSOR INDICATOR-FORWARD COLLISION ALERT
UFG	SENSOR INDICATOR-REAR CROSS TRAFFIC ALERT
UFL	LANE ACTIVE SAFETY-DEPARTURE WARNING
UD7	PARK ASSIST-REAR
UEU	SENSOR INDICATOR-FORWARD COLLISION ALERT
UFG	SENSOR INDICATOR-REAR CROSS TRAFFIC ALERT
UFL	LANE ACTIVE SAFETY-DEPARTURE WARNING
UFG	SENSOR INDICATOR-REAR CROSS TRAFFIC ALERT
LFR	ENGINE-GAS, 6 CYL, 3.6L, V6, PFI, DOHC, VVT, ALUM, GEN 1
LFX	ENGINE-GAS, 6 CYL, 3.6L, SIDI, DOHC, VVT, E85 MAX, ALUM, GM
ULG	AUDIO CONTROL-RR SEAT, DISPLAY, CHAUFFEUR MODE
ULG	AUDIO CONTROL-RR SEAT, DISPLAY, CHAUFFEUR MODE
F41UA	F41UA 20A
F27UA	F27UA 30A
F26UA	F26UA 60A
F34UA	F34UA 30A
F55UA	F55UA 7.5A
F62UA	F62UA 10A
J417	J417
X415	X415
J401	J401
X400	X400
X500	X500
X505	X505
J228	J228
F64UA	F64UA 5A
F67UA	F67UA 20A
J240	J240
X50A	X50A Fuse Block - Underhood
S79D	S79D Window Switch - Driver
K83	K83 Park Brake Control Module
S25	S25 Garage Door Opener (UG1)
KR14	KR14 Brake Booster Pump Motor Relay
B218L	B218L Side Object Sensor Module - Left (UFG or UFT)
B218R	B218R Side Object Sensor Module - Right (UFG or UFT)
K17	K17 Electronic Brake Control Module
K38	K38 Chassis Control Module
B117	B117 Rain Sensor (CE1)
A13	A13 Rear Audio Control Module (ULG)
K96	K96 Mirror Control Module (A45)
S52	S52 Outside Rearview Mirror Switch
K182	K182 Parking Assist Control Module

Callout	Component Name
B174	B174 Frontview Camera (UEU or UFL)

F21UA, F24UA, F25UA, F31UA, F32UA, F33UA, F35UA, F69UA, F71UA and F73UA Fuses

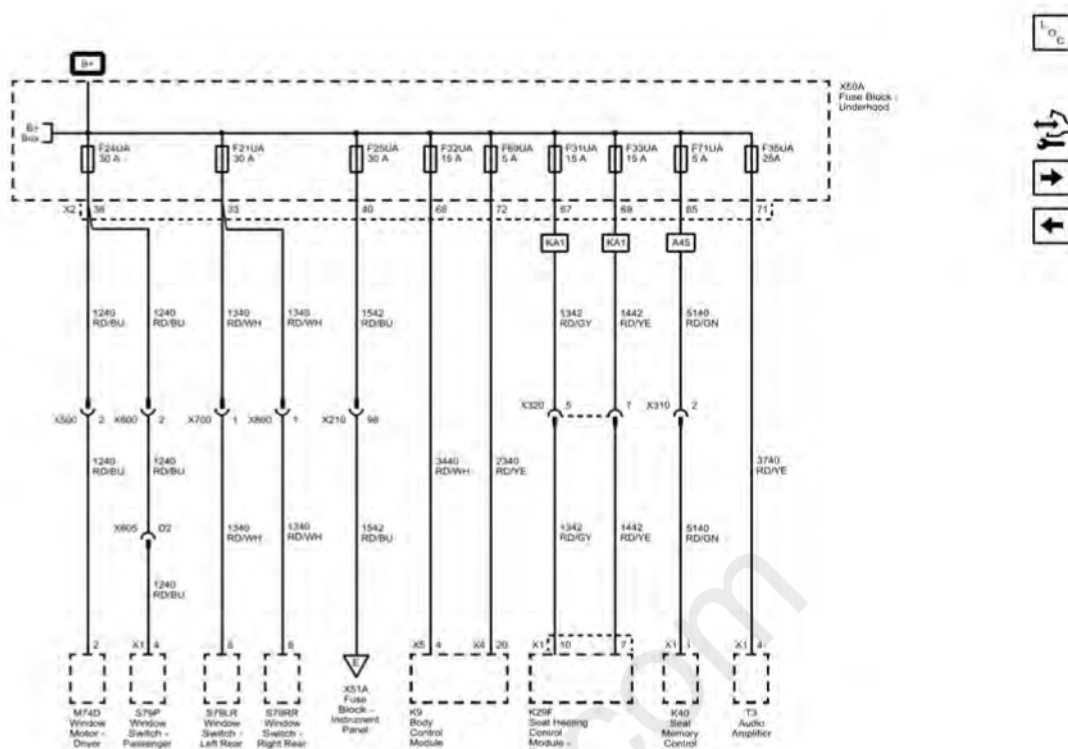


Fig. 44: F21UA, F24UA, F25UA, F31UA, F32UA, F33UA, F35UA, F69UA, F71UA and F73UA Fuses
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1240	Battery Positive Voltage
CAV_2	2
CAV_36	36
CONN_X2	X2
CAV_4	4
CONN_X1	X1
1240_RD/BU	1240 RD/BU
1240_RD/BU	1240 RD/BU
1340	Battery Positive Voltage
CAV_8	8
CAV_33	33
CAV_8	8
1240_RD/BU	1240 RD/BU
1240_RD/BU	1240 RD/BU
1240_RD/BU	1240 RD/BU
1340_RD/WH	1340 RD/WH
1340_RD/WH	1340 RD/WH
1340_RD/WH	1340 RD/WH
1340_RD/WH	1340 RD/WH
1542	Battery Positive Voltage
CAV_40	40
1542_RD/BU	1542 RD/BU
1542_RD/BU	1542 RD/BU

Callout	Component Name
3440	Battery Positive Voltage
3440_RD/WH	3440 RD/WH
CAV_4	4
CONN_X5	X5
CAV_68	68
2340	Battery Positive Voltage
2340_RD/YE	2340 RD/YE
CAV_20	20
CONN_X4	X4
CAV_72	72
1342	Battery Positive Voltage
CAV_10	10
CONN_X1	X1
CAV_67	67
1342_RD/GY	1342 RD/GY
1342_RD/GY	1342 RD/GY
1442	Battery Positive Voltage
CAV_7	7
CAV_69	69
1442_RD/YE	1442 RD/YE
1442_RD/YE	1442 RD/YE
5140	Battery Positive Voltage
5140_RD/GN	5140 RD/GN
CAV_65	65
1940	Battery Positive Voltage
5140_RD/GN	5140 RD/GN
CAV_1	1
CONN_X1	X1
3740	Battery Positive Voltage
3740_RD/YE	3740 RD/YE
CAV_4	4
CONN_X1	X1
CAV_71	71
CAV_2	2
CAV_2	2
CAV_1	1
CAV_1	1
CAV_98	98
CAV_D2	D2
CAV_2	2
KA1	HEATER SEAT FRT-DRVR and PASS
KA1	HEATER SEAT FRT-DRVR and PASS
A45	MEMORY-SEAT ADJUSTER, MIRROR, POWER, DRIVER, PERSONALIZATION
X320	X320
CAV_5	5
CAV_7	7
E_REF	E
X500	X500
X600	X600
X700	X700
X800	X800

Callout	Component Name
X210	X210
X605	X605
X310	X310
F33UA	F33UA 15 A
F71UA	F71UA 5 A
F35UA	F35UA 25A
F31UA	F31UA 15 A
F69UA	F69UA 5 A
F32UA	F32UA 15 A
F25UA	F25UA 30 A
F21UA	F21UA 30 A
F24UA	F24UA 30 A
X320	X320
X50A	X50A Fuse Block - Underhood
M74D	M74D Window Motor - Driver
T3	T3 Audio Amplifier
K40	K40 Seat Memory Control Module (A45)
S79LR	S79LR Window Switch - Left Rear
S79RR	S79RR Window Switch - Right Rear
S79P	S79P Window Switch - Passenger
K9	K9 Body Control Module
K29F	K29F Seat Heating Control Module - Front (KA1)
X51A	X51A Fuse Block - Instrument Panel

F5UA, F13UA, F16UA, F52UA and F53UA Fuses

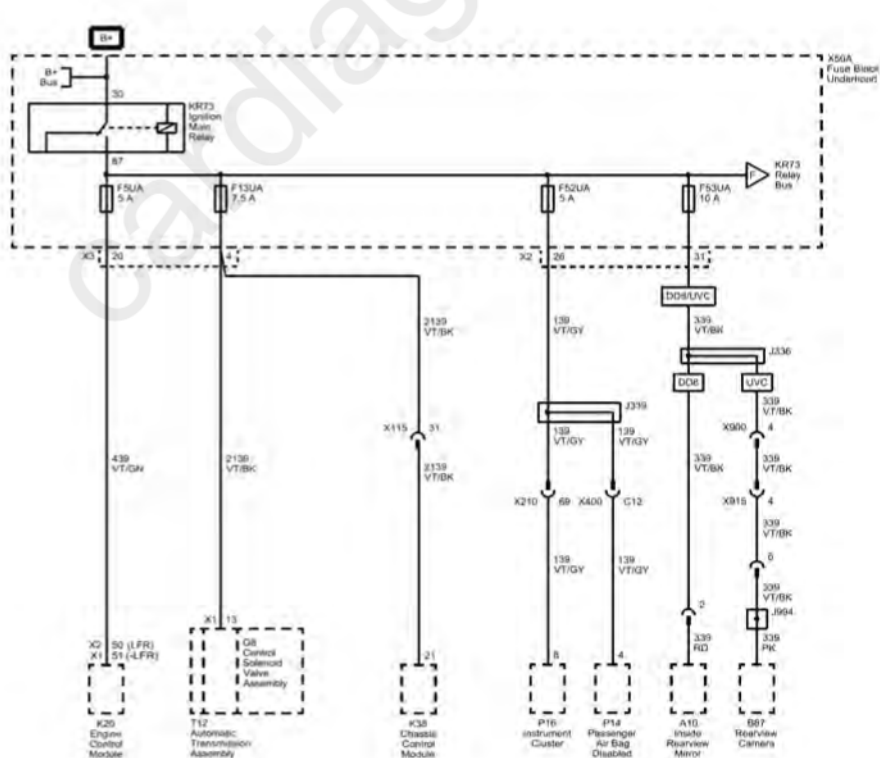


Fig. 45: F5UA, F13UA, F16UA, F52UA and F53UA Fuses

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
439	Run/Crank Ignition 1 Voltage

Callout	Component Name
439_VT/GN	439 VT/GN
CAV_51	51
CONN_X1	X1
CAV_20	20
CONN_X3	X3
2139	Run/Crank Ignition 1 Voltage
2139_VT/BK	2139 VT/BK
CONN_X1	X1
CAV_4	4
CAV_30	30
CAV_87	87
CAV_21	21
CAV_21	21
CONN_X2	X2
139_VT/GY	139 VT/GY
CAV_8	8
CAV_26	26
139	Run/Crank Ignition 1 Voltage
139_VT/GY	139 VT/GY
CAV_8	8
CAV_69	69
139_VT/GY	139 VT/GY
CAV_26	26
CAV_4	4
139_VT/GY	139 VT/GY
139_VT/GY	139 VT/GY
CAV_C12	C12
339	Run/Crank Ignition 1 Voltage
339_VT/BK	339 VT/BK
CAV_31	31
339_RD	339 RD
CAV_2	2
339_VT/BK	339 VT/BK
339_VT/BK	339 VT/BK
339_VT/BK	339 VT/BK
339_VT/BK	339 VT/BK
339_PK	339 PK
CAV_4	4
CAV_4	4
339_VT/BK	339 VT/BK
DD8	MIRROR I/S R/V-LT SENSITIVE
UVC	VISION-REAR VIEW, MONO, ANALOG
DD8	MIRROR I/S R/V-LT SENSITIVE
UVC	VISION-REAR VIEW, MONO, ANALOG
2139_VT/BK	2139 VT/BK
2139_VT/BK	2139 VT/BK
CAV_31	31
CAV_13	13
CAV_50	50
CONN_X2	X2
LFR	ENGINE-GAS, 6 CYL, 3.6L, V6, PFI, DOHC, VVT, ALUM, GEN 1
LFR	ENGINE-GAS, 6 CYL, 3.6L, V6, PFI, DOHC, VVT, ALUM, GEN 1

Callout	Component Name
CAV_6	6
X210	X210
X400	X400
J994	J994
X915	X915
X900	X900
J336	J336
F13UA	F13UA 7.5 A
F5UA	F5UA 5 A
F52UA	F52UA 5 A
F53UA	F53UA 10 A
F_REF	F
X115	X115
J339	J339
P16	P16 Instrument Cluster
A10	A10 Inside Rearview Mirror (DD8)
B87	B87 Rearview Camera (UVC)
K20	K20 Engine Control Module
Q8	Q8 Control Solenoid Valve Assembly (M7W)
T12	T12 Automatic Transmission Assembly
P14	P14 Passenger Air Bag Disabled Indicator
X50A	X50A Fuse Block - Underhood
K38	K38 Chassis Control Module
KR73	KR73 Ignition Main Relay

F17UA, F19UA and F54UA Fuses

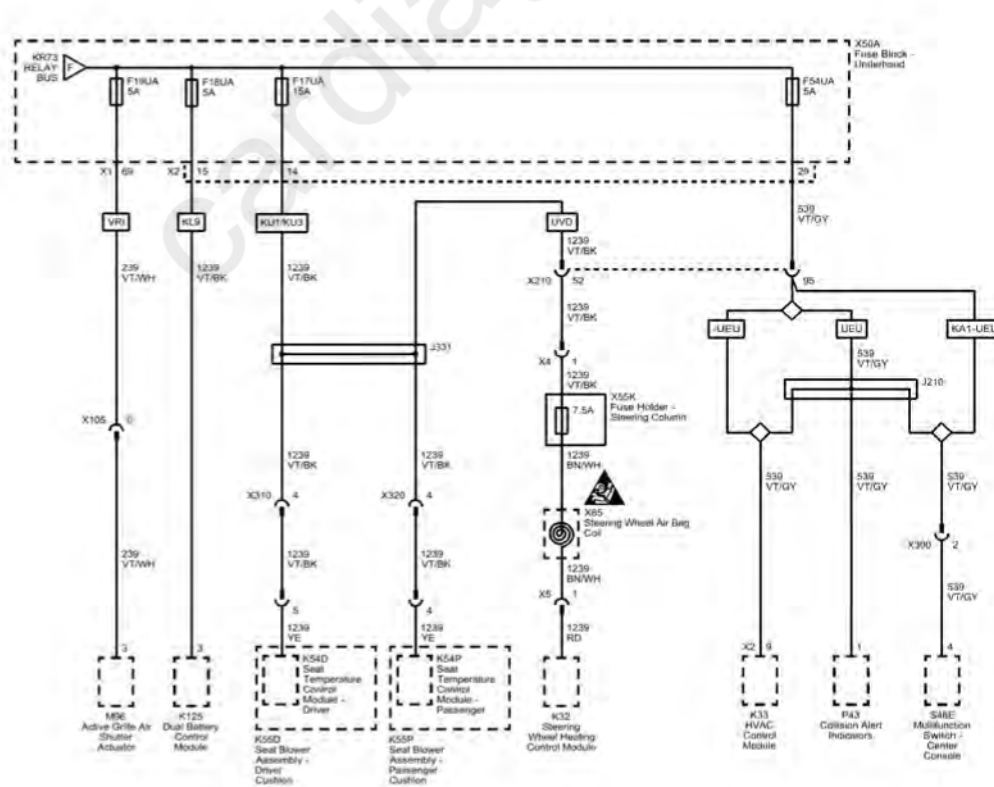


Fig. 46: F17UA, F19UA and F54UA Fuses
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
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Callout	Component Name
239	Run/Crank Ignition 1 Voltage
239_VT/WH	239 VT/WH
CAV_3	3
CAV_69	69
CONN_X1	X1
1239	Run/Crank Ignition 1 Voltage
1239_VT/BK	1239 VT/BK
CAV_14	14
1239_VT/BK	1239 VT/BK
1239_VT/BK	1239 VT/BK
1239_VT/BK	1239 VT/BK
1239_VT/BK	1239 VT/BK
1239_VT/BK	1239 VT/BK
1239_VT/BK	1239 VT/BK
1239_VT/BK	1239 VT/BK
239_VT/WH	239 VT/WH
1239_YE	1239 YE
1239_YE	1239 YE
CAV_5	5
CAV_4	4
CAV_6	6
1239_BN/WH	1239 BN/WH
1239_RD	1239 RD
1239_BN/WH	1239 BN/WH
CAV_1	1
539	Run/Crank Ignition 1 Voltage
539_VT/GY	539 VT/GY
CAV_9	9
CONN_X2	X2
CAV_29	29
539_VT/GY	539 VT/GY
539_VT/GY	539 VT/GY
CAV_1	1
539_VT/GY	539 VT/GY
CAV_4	4
539_VT/GY	539 VT/GY
539_VT/GY	539 VT/GY
CAV_2	2
VRI	SHUTTERS-FRONT GRILLE, ACTIVE, LWR
UEU	SENSOR INDICATOR-FORWARD COLLISION ALERT
UEU	SENSOR INDICATOR-FORWARD COLLISION ALERT
KA1	HEATER SEAT FRT-DRVR and PASS
UEU	SENSOR INDICATOR-FORWARD COLLISION ALERT
KU1	VENTILATED SEAT DRVR-FRONT
KU3	VENTILATED SEAT PASS-FRONT
CAV_4	4
CAV_4	4
CAV_1	1
UVD	STEERING WHEEL HEAT-MANUAL
1239_VT/BK	1239 VT/BK
CAV_3	3
CAV_15	15

Callout	Component Name
CONN_X2	X2
KL9	ENG CONTROL-STOP/START SYS, CONVENTIONAL AT, CONVENTIONAL MT OR BRAKE RELEASE LATE RESTART
X210	X210
CAV_52	52
CAV_95	95
F_REF	F
F19UA	F19UA 5A
F17UA	F17UA 15A
F54UA	F54UA 5A
7.5A	7.5A
X310	X310
X105	X105
X5	X5
X300	X300
J210	J210
X320	X320
X4	X4
J331	J331
F18UA	F18UA 5A
X210	X210
M96	M96 Active Grille Air Shutter Actuator
K32	K32 Steering Wheel Heating Control Module (UVD)
K33	K33 HVAC Control Module
P43	P43 Collision Alert Indicators (UEU or UFL)
S48E	S48E Multifunction Switch - Center Console
X50A	X50A Fuse Block - Underhood
X85	X85 Steering Wheel Air Bag Coil
K54D	K54D Seat Temperature Control Module - Driver (KU1)
K54P	K54P Seat Temperature Control Module - Passenger (KU3)
K55D	K55D Seat Blower Assembly - Driver Cushion
K55P	K55P Seat Blower Assembly - Passenger Cushion
X55K	X55K Fuse Holder - Steering Column (UVD)
K125	K125 Dual Battery Control Module (KL9)

F8UA, F9UA, F10UA, and LFR Fuses

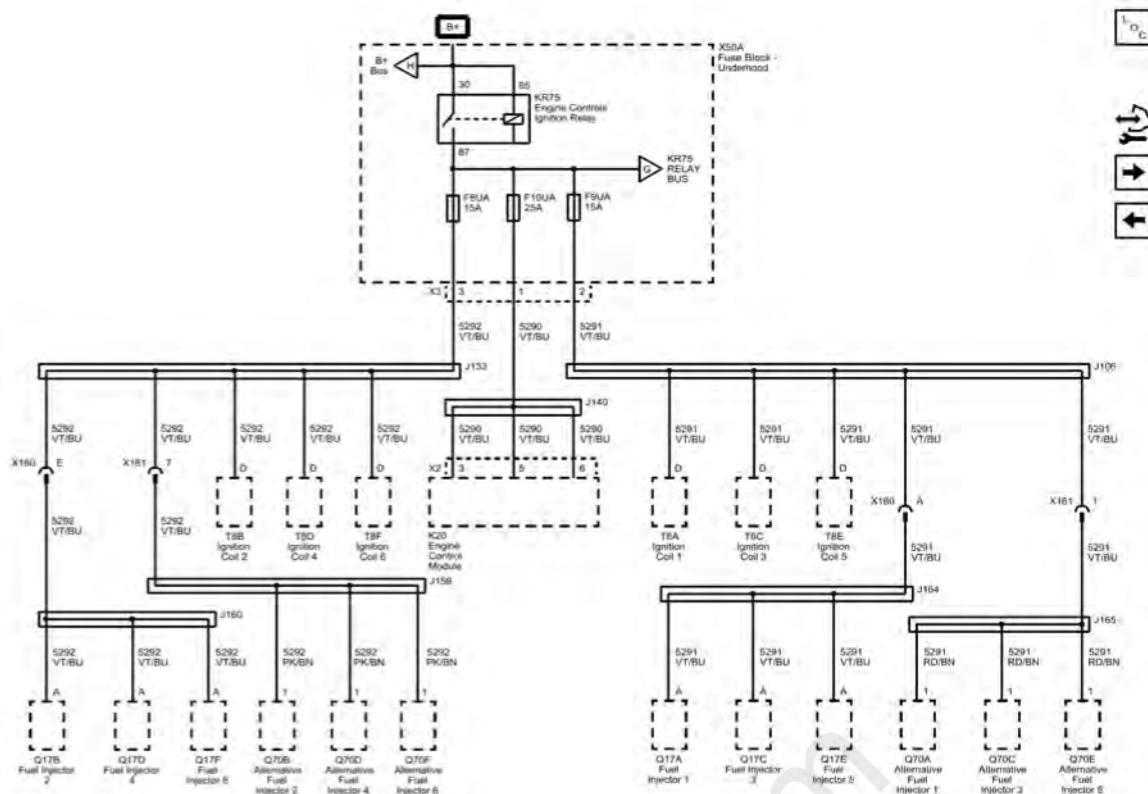


Fig. 47: F8UA, F9UA, F10UA, and LFR Fuses
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
5290_VT/BU	5290 VT/BU
CAV_3	3
CONN_X2	X2
CAV_3	3
CONN_X3	X3
5290	Powertrain Main Relay Fused Supply 1
5290_VT/BU	5290 VT/BU
CAV_5	5
CAV_1	1
5290_VT/BU	5290 VT/BU
CAV_6	6
CAV_2	2
5292	Powertrain Main Relay Fused Supply 3
5292_VT/BU	5292 VT/BU
CAV_D	D
5292_VT/BU	5292 VT/BU
CAV_D	D
5292_VT/BU	5292 VT/BU
CAV_D	D
5292_VT/BU	5292 VT/BU
5291_VT/BU	5291 VT/BU
5291	Powertrain Main Relay Fused Supply 2
5291_VT/BU	5291 VT/BU
CAV_D	D
5291_VT/BU	5291 VT/BU
CAV_D	D
5291_VT/BU	5291 VT/BU

Callout	Component Name
CAV_D	D
CAV_30	30
CAV_85	85
CAV_87	87
5290_VT/BU	5290 VT/BU
5292_PK/BN	5292 PK/BN
CAV_1	1
5292_PK/BN	5292 PK/BN
CAV_1	1
CAV_1	1
5292_VT/BU	5292 VT/BU
CAV_A	A
5292_VT/BU	5292 VT/BU
CAV_A	A
CAV_A	A
5291_VT/BU	5291 VT/BU
CAV_A	A
5291_VT/BU	5291 VT/BU
CAV_A	A
5291_VT/BU	5291 VT/BU
CAV_A	A
5291_RD/BN	5291 RD/BN
CAV_1	1
5291_RD/BN	5291 RD/BN
CAV_1	1
5291_RD/BN	5291 RD/BN
CAV_1	1
5291_VT/BU	5291 VT/BU
5291_VT/BU	5291 VT/BU
CAV_A	A
CAV_1	1
5291_VT/BU	5291 VT/BU
5291_VT/BU	5291 VT/BU
5292_VT/BU	5292 VT/BU
5292_VT/BU	5292 VT/BU
5292_PK/BN	5292 PK/BN
5292_VT/BU	5292 VT/BU
CAV_E	E
CAV_7	7
5292_VT/BU	5292 VT/BU
5292_VT/BU	5292 VT/BU
G_REF	G
F8UA	F8UA 15A
F10UA	F10UA 25A
F9UA	F9UA 15A
J140	J140
J106	J106
J164	J164
J165	J165
X160	X160
X161	X161
J160	J160

Callout	Component Name
J159	J159
X160	X160
X161	X161
J133	J133
H_REF	H
T8A	T8A Ignition Coil 1
T8C	T8C Ignition Coil 3
T8E	T8E Ignition Coil 5
K20	K20 Engine Control Module
T8B	T8B Ignition Coil 2
T8D	T8D Ignition Coil 4
T8F	T8F Ignition Coil 6
KR75	KR75 Engine Controls Ignition Relay
Q17A	Q17A Fuel Injector 1
Q17C	Q17C Fuel Injector 3
Q17E	Q17E Fuel Injector 5 (LFR or LFX)
Q70A	Q70A Alternative Fuel Injector 1 (FHV)
Q70C	Q70C Alternative Fuel Injector 3 (FHV)
Q70E	Q70E Alternative Fuel Injector 5 (FHV)
Q70F	Q70F Alternative Fuel Injector 6 (FHV)
Q70D	Q70D Alternative Fuel Injector 4 (FHV)
Q70B	Q70B Alternative Fuel Injector 2 (FHV)
Q17F	Q17F Fuel Injector 6 (LFR or LFX)
Q17D	Q17D Fuel Injector 4
Q17B	Q17B Fuel Injector 2
X50A	X50A Fuse Block - Underhood

F11UA and F47UA Fuses

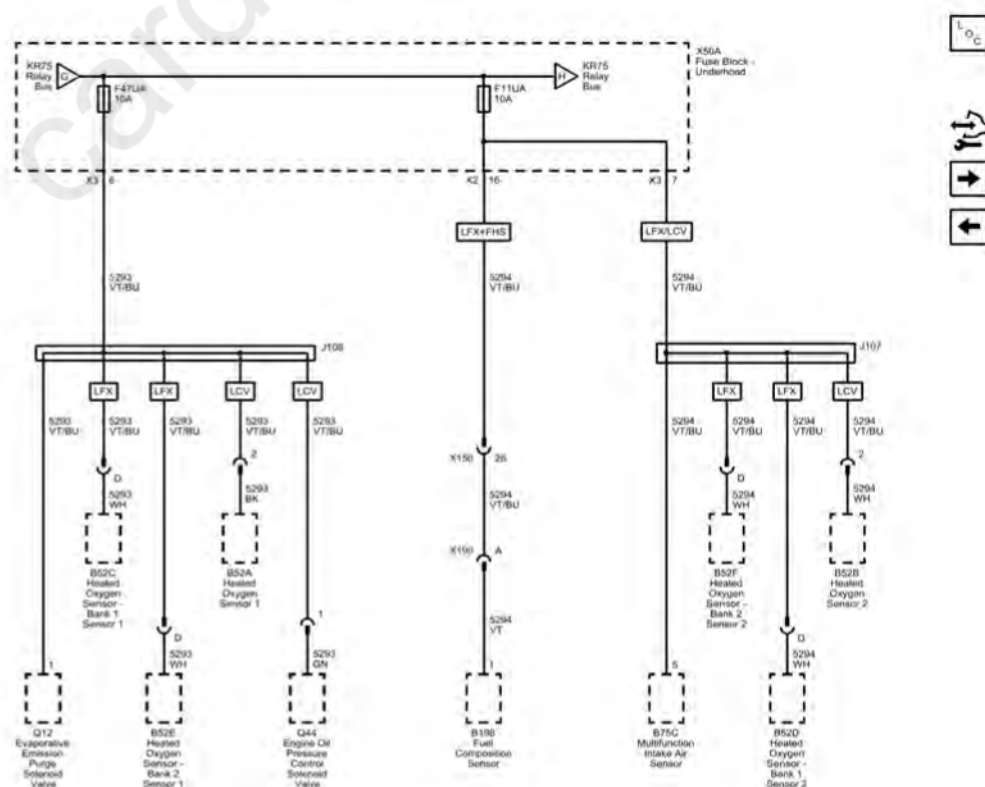


Fig. 48: F11UA and F47UA Fuses

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
5294	Powertrain Main Relay Fused Supply 5
CAV_5	5
CAV_7	7
CONN_X3	X3
5294_VT/BU	5294 VT/BU
5294_VT/BU	5294 VT/BU
5294_VT/BU	5294 VT/BU
5294_WH	5294 WH
5294_VT/BU	5294 VT/BU
5294_WH	5294 WH
5294_VT/BU	5294 VT/BU
CAV_D	D
CAV_2	2
CAV_D	D
LFX	ENGINE-GAS, 6 CYL, 3.6L, SIDI, DOHC, VVT, E85 MAX, ALUM, GM
LFX	ENGINE-GAS, 6 CYL, 3.6L, SIDI, DOHC, VVT, E85 MAX, ALUM, GM
CAV_16	16
CONN_X2	X2
5294_VT/BU	5294 VT/BU
5294_VT/BU	5294 VT/BU
CAV_1	1
5294_VT	5294 VT
CAV_26	26
CAV_A	A
5293	Powertrain Main Relay Fused Supply 4
5293_VT/BU	5293 VT/BU
CAV_6	6
CONN_X3	X3
5293_VT/BU	5293 VT/BU
5293_WH	5293 WH
CAV_D	D
5293_VT/BU	5293 VT/BU
CAV_1	1
5293_WH	5293 WH
5293_VT/BU	5293 VT/BU
5293_VT/BU	5293 VT/BU
CAV_2	2
CAV_D	D
5293_GN	5293 GN
5293_VT/BU	5293 VT/BU
CAV_1	1
LFX	ENGINE-GAS, 6 CYL, 3.6L, SIDI, DOHC, VVT, E85 MAX, ALUM, GM
LFX	ENGINE-GAS, 6 CYL, 3.6L, SIDI, DOHC, VVT, E85 MAX, ALUM, GM
5294_WH	5294 WH
LFX	ENGINE-GAS, 6 CYL, 3.6L, SIDI, DOHC, VVT, E85 MAX, ALUM, GM
FHS	VEHICLE FUEL-GASOLINE E85
5293_BK	5293 BK
LFX	ENGINE-GAS, 6 CYL, 3.6L, SIDI, DOHC, VVT, E85 MAX, ALUM, GM
LCV	ENGINE-GAS, 4 CYL, 2.5L, L4, SIDI, DOHC, DCVCP, VVT, E85 MAX, E0-E100, ALUM
LCV	ENGINE-GAS, 4 CYL, 2.5L, L4, SIDI, DOHC, DCVCP, VVT, E85 MAX, E0-E100, ALUM

Callout	Component Name
LCV	ENGINE-GAS, 4 CYL, 2.5L, L4, SIDI, DOHC, DCVCP, VVT, E85 MAX, E0-E100, ALUM
LCV	ENGINE-GAS, 4 CYL, 2.5L, L4, SIDI, DOHC, DCVCP, VVT, E85 MAX, E0-E100, ALUM
H_REF	H
F47UA	F47UA 10A
F11UA	F11UA 10A
J107	J107
X150	X150
X190	X190
J108	J108
G_REF	G
Q12	Q12 Evaporative Emission Purge Solenoid Valve
B52F	B52F Heated Oxygen Sensor - Bank 2 Sensor 2 (LFR or LFX)
B52D	B52D Heated Oxygen Sensor - Bank 1 Sensor 2 (LFR or LFX)
X50A	X50A Fuse Block - Underhood
B52E	B52E Heated Oxygen Sensor - Bank 2 Sensor 1 (LFR or LFX)
B52C	B52C Heated Oxygen Sensor - Bank 1 Sensor 1 (LFR or LFX)
B52A	B52A Heated Oxygen Sensor 1 (LCV)
B198	B198 Fuel Composition Sensor (FHS)
B75C	B75C Multifunction Intake Air Sensor (LCV or LFX)
Q44	Q44 Engine Oil Pressure Control Solenoid Valve (LCV)
B52B	B52B Heated Oxygen Sensor 2 (LCV)

F6UA, F48UA, F51UA, and F56UA Fuses

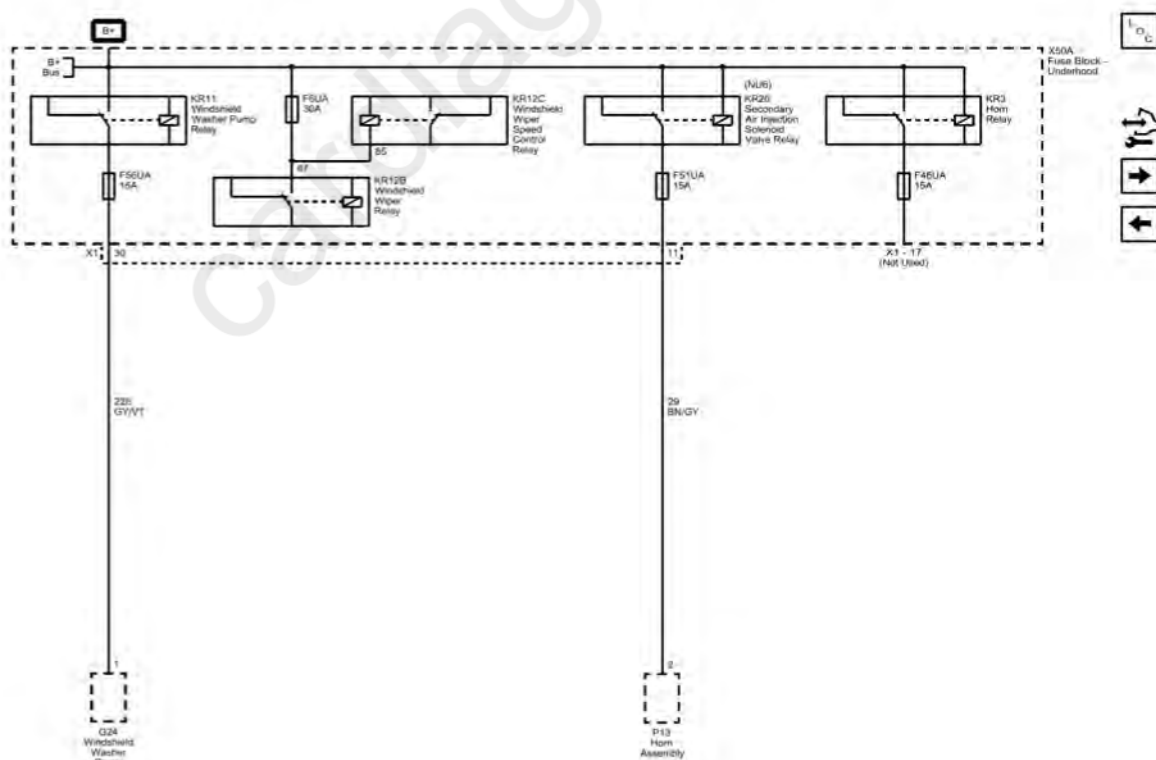


Fig. 49: F6UA, F48UA, F51UA, and F56UA Fuses

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
228	Windshield Washer Pump Control

Callout	Component Name
228_GY/VT	228 GY/VT
CAV_1	1
CAV_30	30
CONN_X1	X1
29	Horn Control
29_BN/GY	29 BN/GY
CAV_2	2
CAV_11	11
CAV_87	87
CAV_85	85
F56UA	F56UA 15A
F6UA	F6UA 30A
F48UA	F48UA 15A
F51UA	F51UA 15A
G24	G24 Windshield Washer Pump
P13	P13 Horn Assembly
KR12B	KR12B Windshield Wiper Relay
KR3	KR3 Horn Relay
KR11	KR11 Windshield Washer Pump Relay
X50A	X50A Fuse Block - Underhood
KR26	KR26 Secondary Air Injection Solenoid Valve Relay
KR12C	KR12C Windshield Wiper Speed Control Relay

Callout	Component Name
CONN_X210	X210
CAV_49	49
CAV_36	36
CAV_34	34
CAV_33	33
CAV_26	26
CAV_35	35
CAV_38	38
CAV_37	37
542	Battery Positive Voltage
542_RD/VT	542 RD/VT
CAV_1	1
2540	Battery Positive Voltage
2540_RD/BK	2540 RD/BK
CAV_2	2
CONN_X1	X1
2740	Battery Positive Voltage
2740_RD/WH	2740 RD/WH
CAV_1	1
CONN_X2	X2
2940	Battery Positive Voltage
2940_RD	2940 RD
CAV_3	3
4040	Battery Positive Voltage
4040_RD/VT	4040 RD/VT
CAV_4	4
3840	Battery Positive Voltage
3840_RD/GN	3840 RD/GN
CAV_3	3
CONN_X5	X5
5040	Battery Positive Voltage
5040_RD/YE	5040 RD/YE
1440	Battery Positive Voltage
1440_RD/BN	1440 RD/BN
CAV_10	10
CONN_X1	X1
1440_RD/BN	1440 RD/BN
1440_RD/BN	1440 RD/BN
CAV_G	G
CAV_E	E
3840_RD/GN	3840 RD/GN
5040_RD/YE	5040 RD/YE
1440_RD/BN	1440 RD/BN
5040_RD/YE	5040 RD/YE
1440_RD/BN	1440 RD/BN
CAV_1	1
CAV_1	1
AG2	ADJUSTER PASS ST-POWER, MULTI-DIRECTIONAL (DO NOT USE ON NEW PROGRAMS AFTER MY18)
A6C	ADJUSTER PASS ST-MANUAL, 4 WAY, PWR VERT (DO NOT USE ON NEW PROGRAMS AFTER MY18)

Callout	Component Name
APH	CONTROL-SEAT, POWER LUMBAR, RH (DO NOT USE FOR NEXT NEW MAJOR)
A6C	ADJUSTER PASS ST-MANUAL, 4 WAY, PWR VERT (DO NOT USE ON NEW PROGRAMS AFTER MY18)
AG2	ADJUSTER PASS ST-POWER, MULTI-DIRECTIONAL (DO NOT USE ON NEW PROGRAMS AFTER MY18)
CAV_2	2
CONN_X1	X1
CAV_6	6
CONN_X1	X1
CAV_21	21
A45	MEMORY-SEAT ADJUSTER, MIRROR, POWER, DRIVER, PERSONALIZATION
A45	MEMORY-SEAT ADJUSTER, MIRROR, POWER, DRIVER, PERSONALIZATION
A6C	ADJUSTER PASS ST-MANUAL, 4 WAY, PWR VERT (DO NOT USE ON NEW PROGRAMS AFTER MY18)
APH	CONTROL-SEAT, POWER LUMBAR, RH (DO NOT USE FOR NEXT NEW MAJOR)
X210	X210
CAV_41	41
CAV_94	94
CAV_97	97
F8DA	F8DA 15A
F9DA	F9DA 15A
F3DA	F3DA 15A
F10DA	F10DA 30A
F13DA	F13DA 25A
F12DA	F12DA 25A
B_REF	B
F11DA	F11DA 40A
X310	X310
X320	X320
F2DA	F2DA 15A
J322	J322
X210	X210
S64P	S64P Seat Adjuster Switch - Passenger
M8	M8 Blower Motor
K9	K9 Body Control Module
X51A	X51A Fuse Block - Instrument Panel
S65P	S65P Seat Lumbar Support Switch - Passenger (A6C with APH)
K40	K40 Seat Memory Control Module (A45)
S64D	S64D Seat Adjuster Switch - Driver

F14DA, F15DA, F16DA, F17DA, F18DA, F19DA, F20DA, F21DA, F22DA, F23DA, F24DA, F25DA and F26DA Fuses

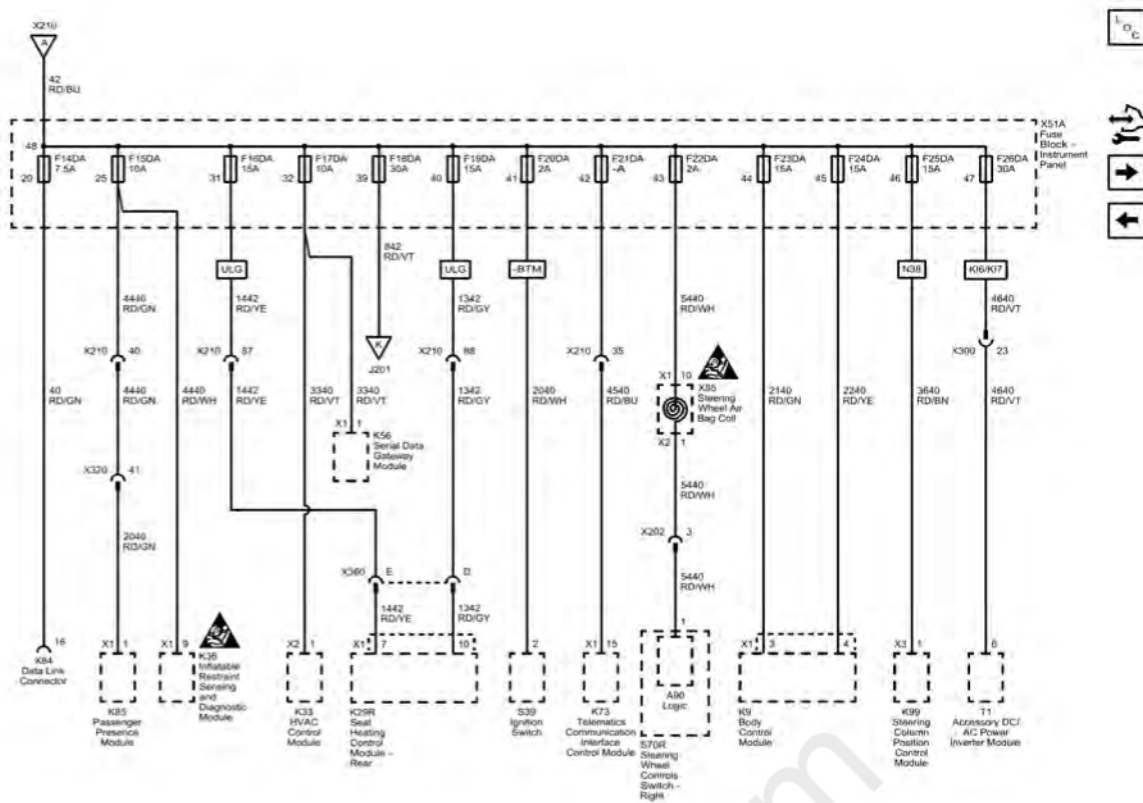


Fig. 51: F14DA, F15DA, F16DA, F17DA, F18DA, F19DA, F20DA, F21DA, F22DA, F23DA, F24DA, F25DA and F26DA Fuses

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
42	Battery Positive Voltage
42_RD/BU	42 RD/BU
40	Battery Positive Voltage
40_RD/GN	40 RD/GN
CAV_16	16
4440	Battery Positive Voltage
4440_RD/GN	4440 RD/GN
CAV_1	1
CONN_X1	X1
4440_RD/GN	4440 RD/GN
2040_RD/GN	2040 RD/GN
CAV_40	40
CAV_41	41
4440_RD/WH	4440 RD/WH
CAV_9	9
CONN_X1	X1
3340	Battery Positive Voltage
3340_RD/VT	3340 RD/VT
CAV_1	1
CONN_X2	X2
842	Battery Positive Voltage
842_RD/VT	842 RD/VT
2040	Battery Positive Voltage
2040_RD/WH	2040 RD/WH
5440	Battery Positive Voltage
5440_RD/WH	5440 RD/WH

Callout	Component Name
CAV_10	10
CONN_X1	X1
5440_RD/WH	5440 RD/WH
CAV_1	1
CAV_1	1
CONN_X2	X2
5440_RD/WH	5440 RD/WH
CAV_3	3
2140	Battery Positive Voltage
2140_RD/GN	2140 RD/GN
CAV_3	3
CONN_X1	X1
2240	Battery Positive Voltage
2240_RD/YE	2240 RD/YE
CAV_4	4
3640	Battery Positive Voltage
3640_RD/BN	3640 RD/BN
CAV_1	1
CONN_X3	X3
4640	Battery Positive Voltage
4640_RD/VT	4640 RD/VT
CAV_6	6
4640_RD/VT	4640 RD/VT
CAV_23	23
N38	STEERING COLUMN-TILT, TELESCOPING, POWER
KI6	RECEPTACLE-ELECTRICAL, FRT CONSOLE RR 110 VOLT
KI7	RECEPTACLE-ELECTRICAL, FRT CONSOLE RR 230 VOLT
BTM	SWITCH-ENGINE START, KEYLESS
CAV_48	48
CAV_20	20
CAV_25	25
CAV_31	31
CAV_32	32
CAV_39	39
CAV_40	40
CAV_41	41
CAV_42	42
CAV_43	43
CAV_44	44
CAV_45	45
CAV_46	46
CAV_47	47
CAV_2	2
4540	Battery Positive Voltage
4540_RD/BU	4540 RD/BU
CAV_15	15
CONN_X1	X1
CAV_35	35
1342	Battery Positive Voltage
1342_RD/GY	1342 RD/GY
CAV_10	10
1442	Battery Positive Voltage

Callout	Component Name
1442_RD/YE	1442 RD/YE
CAV_7	7
CONN_X1	X1
CAV_87	87
CAV_88	88
1342_RD/GY	1342 RD/GY
1342_RD/GY	1342 RD/GY
1442_RD/YE	1442 RD/YE
1442_RD/YE	1442 RD/YE
ULG	AUDIO CONTROL-RR SEAT, DISPLAY, CHAUFFEUR MODE
ULG	AUDIO CONTROL-RR SEAT, DISPLAY, CHAUFFEUR MODE
3340_RD/VT	3340 RD/VT
CAV_1	1
CONN_X1	X1
X360	X360
CAV_E	E
CAV_D	D
A_REF	A
K_REF	K
X210	X210
X320	X320
X202	X202
X300	X300
F14DA	F14DA 7.5A
F15DA	F15DA 10A
F16DA	F16DA 15A
F17DA	F17DA 10A
F18DA	F18DA 30A
F19DA	F19DA 15A
F20DA	F20DA 2A
F21DA	F21DA -A
F22DA	F22DA 2A
F23DA	F23DA 15A
F24DA	F24DA 15A
F25DA	F25DA 15A
F26DA	F26DA 30A
X210	X210
X210	X210
X210	X210
X360	X360
X84	X84 Data Link Connector
X51A	X51A Fuse Block - Instrument Panel
K9	K9 Body Control Module
K85	K85 Passenger Presence Module
K36	K36 Inflatable Restraint Sensing and Diagnostic Module
K33	K33 HVAC Control Module
A90	A90 Logic
S70R	S70R Steering Wheel Controls Switch - Right
X85	X85 Steering Wheel Air Bag Coil
T1	T1 Accessory DC/AC Power Inverter Module (KI6 or KI7)
K99	K99 Steering Column Position Control Module (N38)
S39	S39 Ignition Switch (without BTM)

Callout	Component Name
K73	K73 Telematics Communication Interface Control Module (UE1)
K29R	K29R Seat Heating Control Module - Rear (KA6)
K56	K56 Serial Data Gateway Module

F1DA, F4DA, F5DA, F6DA and F7DA Fuses

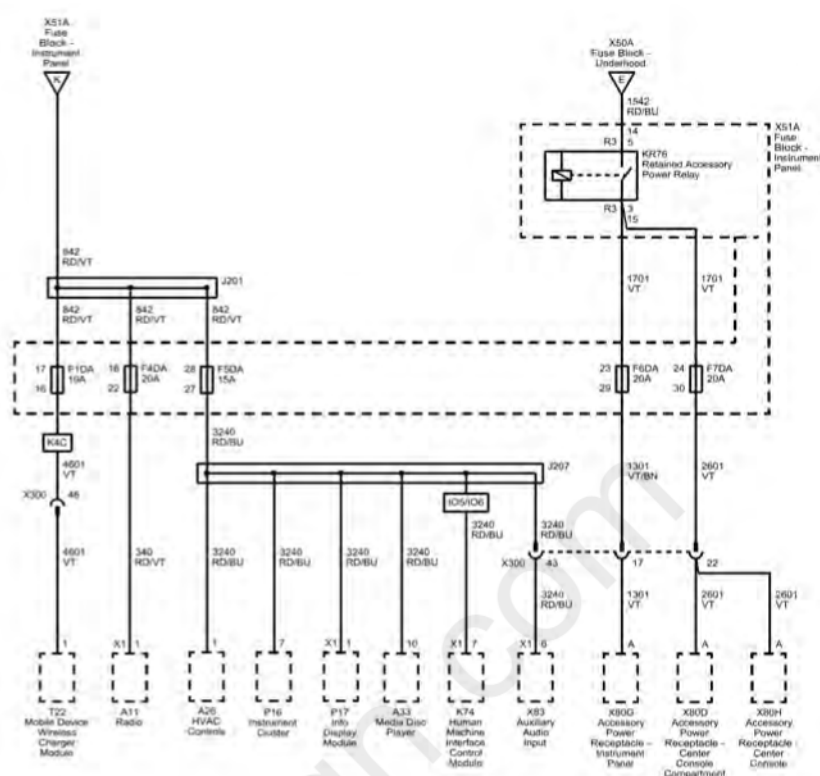


Fig. 52: F1DA, F4DA, F5DA, F6DA and F7DA Fuses
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
842	Battery Positive Voltage
842_RD/VT	842 RD/VT
1542	Battery Positive Voltage
1542_RD/BU	1542 RD/BU
CAV_5	5
CAV_3	3
1701	Retained Accessory Power Ignition
1701_VT	1701 VT
1701_VT	1701 VT
842_RD/VT	842 RD/VT
842_RD/VT	842 RD/VT
842_RD/VT	842 RD/VT
4601	Retained Accessory Power Fused Control
4601_VT	4601 VT
CAV_1	1
3240	Battery Positive Voltage
3240_RD/BU	3240 RD/BU
CAV_1	1
3240_RD/BU	3240 RD/BU
CAV_7	7
CAV_1	1

Callout	Component Name
CONN_X1	X1
340	Battery Positive Voltage
3240_RD/BU	3240 RD/BU
CAV_10	10
340_RD/VT	340 RD/VT
CAV_1	1
3240_RD/BU	3240 RD/BU
CAV_7	7
CONN_X1	X1
3240_RD/BU	3240 RD/BU
CAV_6	6
CONN_X1	X1
4601_VT	4601 VT
3240_RD/BU	3240 RD/BU
CAV_46	46
1301	Retained Accessory Power Fuse Control
1301_VT/BN	1301 VT/BN
CAV_A	A
2601	Retained Accessory Power Fuse Control
2601_VT	2601 VT
CAV_A	A
2601_VT	2601 VT
CAV_A	A
3240_RD/BU	3240 RD/BU
1301_VT	1301 VT
2601_VT	2601 VT
3240_RD/BU	3240 RD/BU
IO5	RADIO-INFOTAINMENT SYSTEM - UPLEVEL HMI, ENHANCED CONNECTIVITY
IO6	RADIO-INFOTAINMENT SYSTEM - UPLEVEL HMI, ENHANCED CONNECTIVITY, EMBEDDED NAVIGATION
CONN_R3	R3
CONN_R3	R3
CAV_14	14
CAV_15	15
K4C	CHARGER-INDUCTIVE PORTABLE WIRELESS DEVICE
CAV_17	17
CAV_16	16
CAV_28	28
CAV_27	27
CAV_18	18
CAV_22	22
CAV_23	23
CAV_29	29
CAV_24	24
CAV_30	30
CONN_X1	X1
X300	X300
CAV_43	43
CAV_17	17
CAV_22	22
K_REF	K

Fig. 53: Ignition Mode Switch (BTM)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
5199	Run/Crank Relay Coil Control
5985	Accessory Wakeup Serial Data
3	Run/Crank Ignition 1 Voltage
4	Accessory Ignition Voltage
5719	Ignition Mode Switch Start LED Signal
5720	Ignition Mode Switch Accessory LED Signal
CAV_12	12
CONN_X1	X1
CONN_X2	X2
CAV_5	5
CONN_X3	X3
CAV_6	6
CAV_7	7
CAV_3	3
CAV_17	17
CONN_X2	X2
CAV_6	6
CAV_8	8
CONN_X1	X1
CAV_20	20
CAV_2	2
CAV_5	5
CAV_15	15
CONN_X4	X4
CAV_22	22
CAV_8	8
CAV_70	70
CONN_X1	X1
CONN_X1	X1
CAV_14	14
4_YE	4 YE
4_VT/YE	4 VT/YE
3_VT	3 VT
3_VT/BK	3 VT/BK
3559_BK/GY	3559 BK/GY
3558_GN/BK	3558 GN/BK
5723_BU	5723 BU
5720_BN	5720 BN
5719_BU/BK	5719 BU/BK
5199_GN/VT	5199 GN/VT
5985_VT/YE	5985 VT/YE
5985_VT/YE	5985 VT/YE
5985_VT/YE	5985 VT/YE
5985_VT/YE	5985 VT/YE
5985_VT/YE	5985 VT/YE
1650	Ground
1650_BK	1650 BK
CAV_4	4
3559	Passive Start Switch 2 Low Reference

Callout	Component Name
3559_BK	3559 BK
3558	Passive Start Switch Signal 2
3558_WH	3558 WH
CAV_11	11
5985_VT/YE	5985 VT/YE
5723	Ignition Mode Switch Mode Voltage
CAV_15	15
CAV_4	4
CAV_3	3
X210	X210
CAV_21	21
CAV_20	20
X210	X210
CAV_28	28
CAV_13	13
M_REF	M
X115	X115
J104	J104
G203	G203
J231	J231
F8DA	F8DA
F8DA	F8DA
X210	X210
X210	X210
X50A	X50A Fuse Block - Underhood
S38	S38 Ignition Mode Switch (BTM)
K9	K9 Body Control Module
K84	K84 Keyless Entry Control Module (ATH or BTM)
K38	K38 Chassis Control Module
K20	K20 Engine Control Module
Q8	Q8 Control Solenoid Valve Assembly (M7W)
T12	T12 Automatic Transmission Assembly

Ignition Switch (without BTM) and Ignition Power

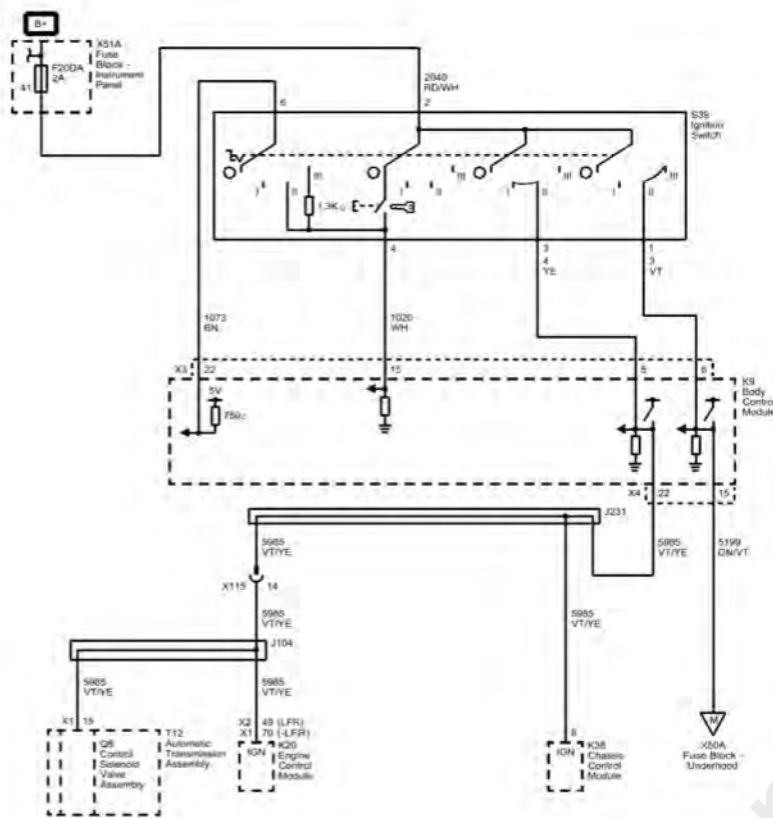


Fig. 54: Ignition Switch (without BTM) and Ignition Power
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
2040_RD/WH	2040 RD/WH
CAV_2	2
1073	Ignition Key Resistor Signal
1073_BN	1073 BN
CAV_22	22
CONN_X3	X3
CAV_6	6
1020	Off/Run/Crank Ignition Voltage
1020_WH	1020 WH
CAV_15	15
CAV_4	4
4	Accessory Ignition Voltage
CAV_5	5
CAV_3	3
3	Run/Crank Ignition 1 Voltage
CAV_6	6
CAV_1	1
4_YE	4 YE
3_VT	3 VT
5199	Run/Crank Relay Coil Control
5199_GN/VT	5199 GN/VT
CAV_15	15
5985	Accessory Wakeup Serial Data
5985_VT/YE	5985 VT/YE
CAV_22	22
CONN_X4	X4
5985_VT/YE	5985 VT/YE

Callout	Component Name
CAV_8	8
5985_VT/YE	5985 VT/YE
CONN_X1	X1
5985_VT/YE	5985 VT/YE
CAV_70	70
CONN_X1	X1
5985_VT/YE	5985 VT/YE
5985_VT/YE	5985 VT/YE
CAV_14	14
CAV_41	41
2040	Battery Positive Voltage
CAV_15	15
CAV_49	49
CONN_X2	X2
LFR	ENGINE-GAS, 6 CYL, 3.6L, V6, PFI, DOHC, VVT, ALUM, GEN 1
LFR	ENGINE-GAS, 6 CYL, 3.6L, V6, PFI, DOHC, VVT, ALUM, GEN 1
M_REF	M
X115	X115
J104	J104
F20DA	F20DA 2A
J231	J231
Q8	Q8 Control Solenoid Valve Assembly (M7W)
T12	T12 Automatic Transmission Assembly
S39	S39 Ignition Switch (without BTM)
K9	K9 Body Control Module
K38	K38 Chassis Control Module
K20	K20 Engine Control Module
X51A	X51A Fuse Block - Instrument Panel
X50A	X50A Fuse Block - Underhood

Ignition Main Relay

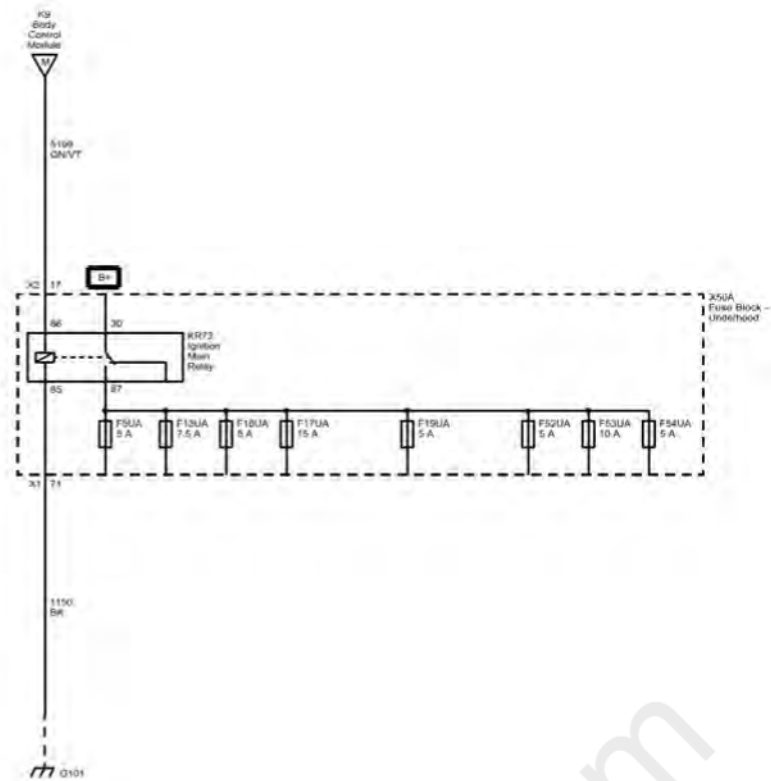


Fig. 55: Ignition Main Relay

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
5199	Run/Crank Relay Coil Control
5199_GN/VT	5199 GN/VT
CAV_17	17
CONN_X2	X2
CAV_86	86
CAV_30	30
CAV_85	85
CAV_87	87
1150	Ground
1150_BK	1150 BK
CAV_71	71
CONN_X1	X1
G101	G101
F5UA	F5UA 5 A
F13UA	F13UA 7.5 A
F16UA	F16UA 5 A
F17UA	F17UA 15 A
F19UA	F19UA 5 A
F52UA	F52UA 5 A
F53UA	F53UA 10 A
F54UA	F54UA 5 A
M_REF	M
X50A	X50A Fuse Block - Underhood
KR73	KR73 Ignition Main Relay
K9	K9 Body Control Module

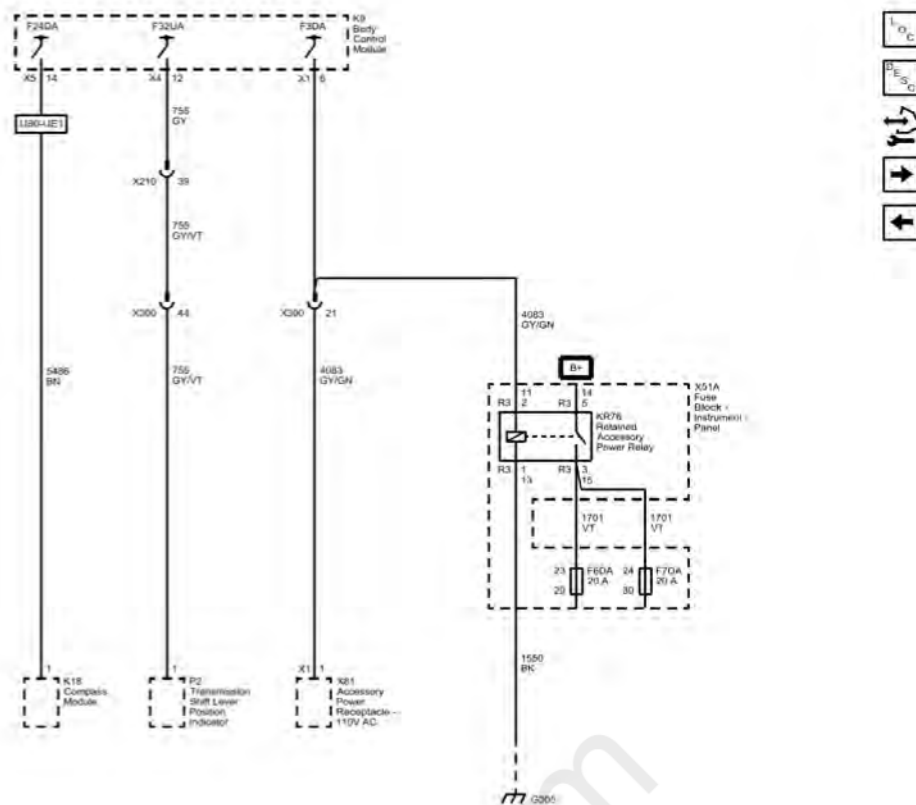


Fig. 56: Accessory Power

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
5486	Run Relay Coil Control
5486_BN	5486 BN
CAV_1	1
CAV_14	14
CONN_X5	X5
U80	DISPLAY-COMPASS
UE1	COMMUNICATION SYSTEM-VEHICLE, ONSTAR
755	RAP Relay Coil Control
755_GY	755 GY
CAV_12	12
CONN_X4	X4
CAV_1	1
755_GY/VT	755 GY/VT
755_GY/VT	755 GY/VT
CAV_39	39
CAV_44	44
4083	RAP Relay 2 Coil Control
4083_GY/GN	4083 GY/GN
1550	Ground
1550_BK	1550 BK
1701	Retained Accessory Power Ignition
1701_VT	1701 VT
1701_VT	1701 VT
CAV_5	5
CONN_R3	R3
CAV_2	2
CONN_R3	R3

Callout	Component Name
CAV_1	1
CONN_R3	R3
CAV_3	3
CONN_R3	R3
CAV_14	14
CAV_11	11
CAV_13	13
CAV_15	15
CAV_23	23
CAV_29	29
CAV_24	24
CAV_30	30
4083_GY/GN	4083 GY/GN
CAV_6	6
CONN_X1	X1
CAV_1	1
CONN_X1	X1
CAV_21	21
G305	G305
F24DA	F24DA
F32UA	F32UA
X210	X210
X300	X300
F6DA	F6DA 20 A
F7DA	F7DA 20 A
X300	X300
F3DA	F3DA
K18	K18 Compass Module (U80 without UE1)
P2	P2 Transmission Shift Lever Position Indicator
X81	X81 Accessory Power Receptacle - 110V AC (KI6)
X51A	X51A Fuse Block - Instrument Panel
KR76	KR76 Retained Accessory Power Relay
K9	K9 Body Control Module

Battery Saver Relay (MAM or MBI)

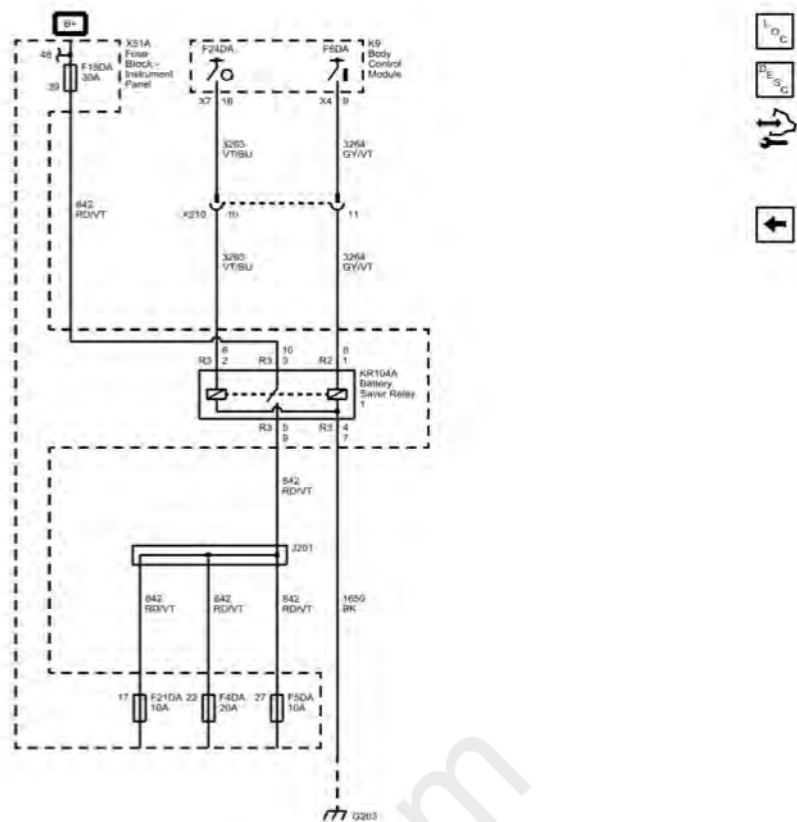


Fig. 57: Battery Saver Relay (MAM or MBI)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
CAV_39	39
CAV_48	48
842	Battery Positive Voltage
842_RD/VT	842 RD/VT
3263	Logistic Mode Relay Open Control
3263_VT/BU	3263 VT/BU
CAV_16	16
CONN_X7	X7
3264	Logistic Mode Relay Close Control
3264_GY/VT	3264 GY/VT
CAV_9	9
CONN_X4	X4
3263_VT/BU	3263 VT/BU
3264_GY/VT	3264 GY/VT
842_RD/VT	842 RD/VT
1650	Ground
1650_BK	1650 BK
842_RD/VT	842 RD/VT
842_RD/VT	842 RD/VT
842_RD/VT	842 RD/VT
CAV_1	1
CONN_R2	R2
CAV_3	3
CONN_R3	R3
CAV_2	2
CONN_R3	R3
CAV_5	5

Callout	Component Name
CONN_R3	R3
CAV_4	4
CONN_R3	R3
CAV_8	8
CAV_10	10
CAV_6	6
CAV_9	9
CAV_7	7
CAV_17	17
CAV_22	22
CAV_27	27
X210	X210
CAV_10	10
CAV_11	11
G203	G203
F18DA	F18DA 30A
F24DA	F24DA
F8DA	F8DA
F21DA	F21DA 10A
F4DA	F4DA 20A
F5DA	F5DA 10A
J201	J201
X210	X210
X51A	X51A Fuse Block - Instrument Panel
K9	K9 Body Control Module
KR104A	KR104A Battery Saver Relay 1

IGNITION LOCK WIRING SCHEMATICS

Ignition Lock

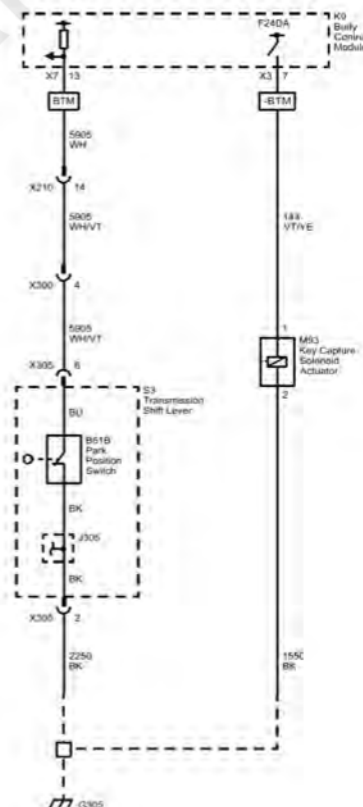


Fig. 58: Ignition Lock

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
5905	Key Capture/Column Lock Shift Position Signal
5905_WH	5905 WH
5905_WH/VT	5905 WH/VT
143	Accessory Ignition Voltage
143_VT/YE	143 VT/YE
CAV_1	1
CAV_14	14
5905_WH/VT	5905 WH/VT
CAV_2	2
CAV_4	4
CAV_6	6
BTM	SWITCH-ENGINE START, KEYLESS
BTM	SWITCH-ENGINE START, KEYLESS
2250	Ground
2250_BK	2250 BK
CAV_2	2
BU	BU
BK	BK
BK	BK
CAV_13	13
CONN_X7	X7
CAV_7	7
CONN_X3	X3
1550	Ground
1550_BK	1550 BK
G305	G305
X210	X210
X300	X300
X305	X305
X305	X305
J305	J305
F24DA	F24DA
S3	S3 Transmission Shift Lever
M93	M93 Key Capture Solenoid Actuator (without BTM)
B81B	B81B Park Position Switch
K9	K9 Body Control Module

GROUND DISTRIBUTION WIRING SCHEMATICS**G100, G103, G106, G109, G110, and G111**

Callout	Component Name
1450_BK	1450 BK
CAV_38	38
750	Ground
750_BK	750 BK
CAV_1	1
CONN_X1	X1
CAV_2	2
CONN_X1	X1
NJ1	STEERING-POWER, NON-VARIABLE RATIO, ELECTRIC
NJ2	STEERING-ELECTRIC, BELT DRIVE
150	Ground
150_BK	150 BK
CAV_4	4
150_BK	150 BK
CAV_-	-
CAV_+	+
CAV_26	26
CONN_X1	X1
KL9	ENG CONTROL-STOP/START SYS, CONVENTIONAL AT, CONVENTIONAL MT OR BRAKE RELEASE LATE RESTART
KL9	ENG CONTROL-STOP/START SYS, CONVENTIONAL AT, CONVENTIONAL MT OR BRAKE RELEASE LATE RESTART
CAV_1	1
CONN_X2	X2
KL9	ENG CONTROL-STOP/START SYS, CONVENTIONAL AT, CONVENTIONAL MT OR BRAKE RELEASE LATE RESTART
150_BK	150 BK
50	Ground
50_BK	50 BK
G106	G106
G110	G110
G111	G111
G109	G109
X190	X190
J109	J109
G103	G103
G100	G100
G104	G104
G10L	G10L Cooling Fan Motor - Left
M75	M75 Windshield Wiper Motor
B198	B198 Fuel Composition Sensor (FHS)
KR12C	KR12C Windshield Wiper Speed Control Relay
KR12B	KR12B Windshield Wiper Relay
K17	K17 Electronic Brake Control Module
K43	K43 Power Steering Control Module
X50A	X50A Fuse Block - Underhood
C1	C1 Battery
K9	K9 Body Control Module
B110	B110 Battery Sensor Module (KL9)
A90	A90 Logic
K125	K125 Dual Battery Control Module (KL9)
X50D	X50D Fuse Block - Battery

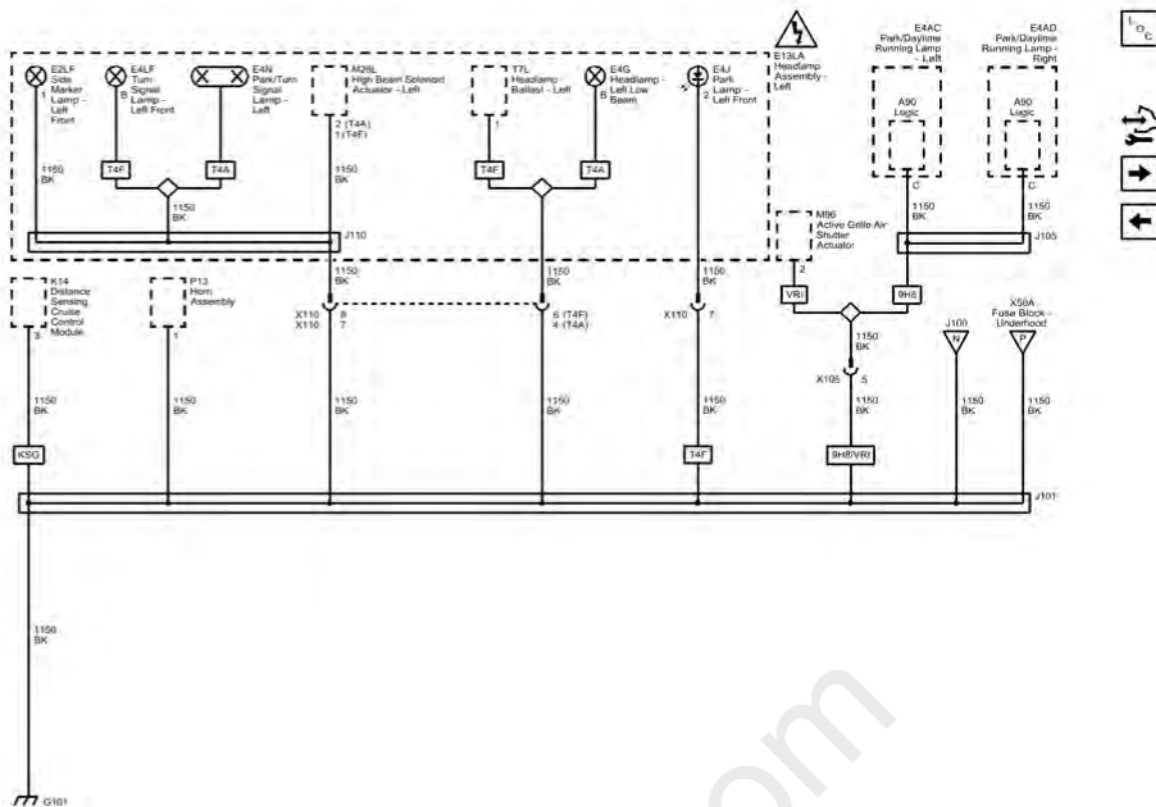


Fig. 60: G101 (1 of 2)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1150	Ground
1150_BK	1150 BK
CAV_1	1
1150_BK	1150 BK
CAV_B	B
T4F	HEADLAMPS-HIGH INTENSITY DISCHARGE
T4A	HEADLAMPS-HALOGEN
1150_BK	1150 BK
CAV_2	2
1150_BK	1150 BK
1150_BK	1150 BK
1150_BK	1150 BK
CAV_1	1
1150_BK	1150 BK
CAV_3	3
1150_BK	1150 BK
KSG	CRUISE CONTROL-AUTOMATIC, ADAPTIVE, WITH STOP/GO
CAV_7	7
CAV_1	1
CAV_B	B
T4F	HEADLAMPS-HIGH INTENSITY DISCHARGE
T4A	HEADLAMPS-HALOGEN
1150_BK	1150 BK
1150_BK	1150 BK
CAV_4	4
T4F	HEADLAMPS-HIGH INTENSITY DISCHARGE

Callout	Component Name
T4A	HEADLAMPS-HALOGEN
1150_BK	1150 BK
1150_BK	1150 BK
CAV_7	7
T4F	HEADLAMPS-HIGH INTENSITY DISCHARGE
1150_BK	1150 BK
CAV_2	2
1150_BK	1150 BK
CAV_C	C
1150_BK	1150 BK
9H8	LAMP SYSTEM-DAYTIME RUNNING, AUXILIARY
1150_BK	1150 BK
CAV_C	C
1150_BK	1150 BK
1150_BK	1150 BK
T4A	HEADLAMPS-HALOGEN
CAV_1	1
T4F	HEADLAMPS-HIGH INTENSITY DISCHARGE
CAV_2	2
CAV_5	5
9H8	LAMP SYSTEM-DAYTIME RUNNING, AUXILIARY
VRI	SHUTTERS-FRONT GRILLE, ACTIVE, LWR
VRI	SHUTTERS-FRONT GRILLE, ACTIVE, LWR
X110	X110
CAV_8	8
CAV_6	6
G101	G101
N_REF	N
J110	J110
X110	X110
P_REF	P
J100	J100
X105	X105
J101	J101
J105	J105
X110	X110
E13LA	E13LA Headlamp Assembly - Left
E4J	E4J Park Lamp - Left Front (T4F)
E4G	E4G Headlamp - Left Low Beam
T7L	T7L Headlamp Ballast - Left (T4F)
E4N	E4N Park/Turn Signal Lamp - Left (T4A)
E4LF	E4LF Turn Signal Lamp - Left Front (T4F)
E2LF	E2LF Side Marker Lamp - Left Front
P13	P13 Horn Assembly
A90	A90 Logic
A90	A90 Logic
M96	M96 Active Grille Air Shutter Actuator
X50A	X50A Fuse Block - Underhood
K14	K14 Distance Sensing Cruise Control Module (KSG)
E4AD	E4AD Park/Daytime Running Lamp - Right (9H8)
E4AC	E4AC Park/Daytime Running Lamp - Left (9H8)
M28L	M28L High Beam Solenoid Actuator - Left

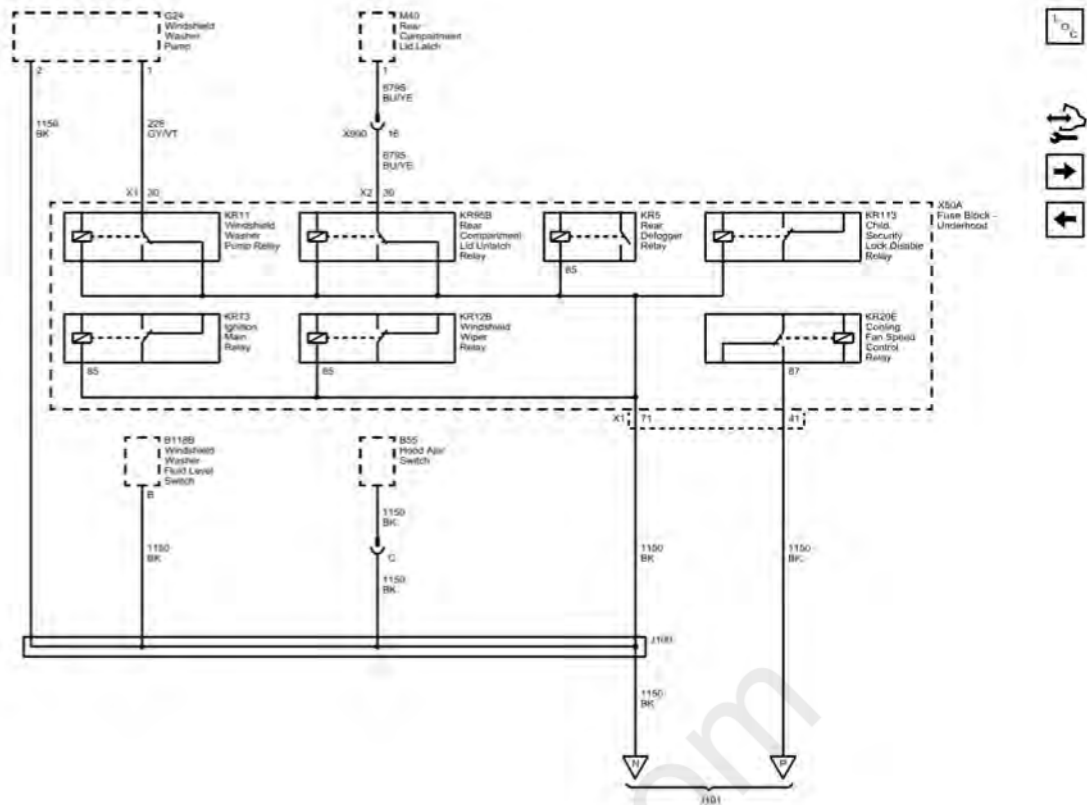


Fig. 61: G101 (2 of 2).

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1150	Ground
1150_BK	1150 BK
CAV_2	2
228	Windshield Washer Pump Control
228_GY/VT	228 GY/VT
CAV_30	30
CONN_X1	X1
CAV_1	1
6795	Lift Glass/Rear Compartment Lid Motor Release Control 2
6795_BU/YE	6795 BU/YE
CAV_30	30
CONN_X2	X2
CAV_1	1
CAV_16	16
6795_BU/YE	6795 BU/YE
CAV_85	85
CAV_85	85
CAV_85	85
1150_BK	1150 BK
CAV_B	B
1150_BK	1150 BK
CAV_C	C
1150_BK	1150 BK
1150_BK	1150 BK
CAV_71	71
CONN_X1	X1

Callout	Component Name
1150_BK	1150 BK
CAV_41	41
CAV_87	87
1150_BK	1150 BK
X900	X900
J100	J100
J101	J101
P_REF	P
N_REF	N
X50A	X50A Fuse Block - Underhood
KR20E	KR20E Cooling Fan Speed Control Relay
KR12B	KR12B Windshield Wiper Relay
KR11	KR11 Windshield Washer Pump Relay
KR95B	KR95B Rear Compartment Lid Unlatch Relay
M40	M40 Rear Compartment Lid Latch
G24	G24 Windshield Washer Pump
KR5	KR5 Rear Defogger Relay
KR113	KR113 Child Security Lock Disable Relay
B55	B55 Hood Ajar Switch
B118B	B118B Windshield Washer Fluid Level Switch
KR73	KR73 Ignition Main Relay

G102

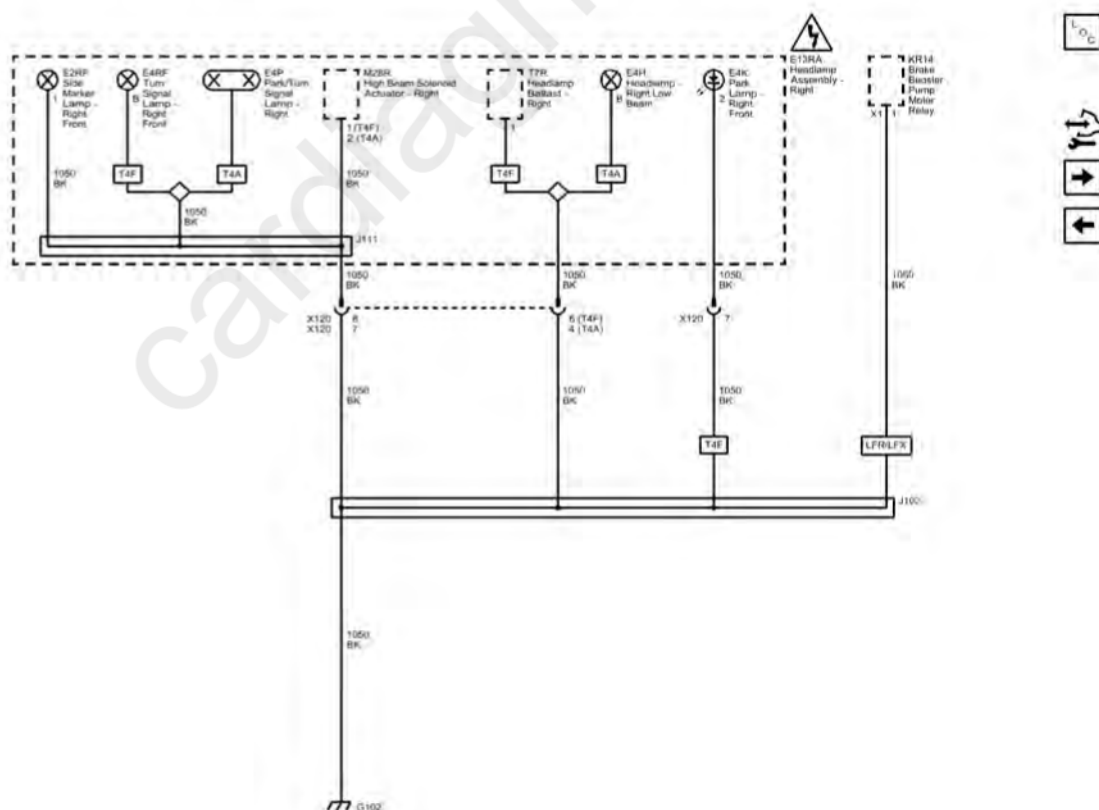


Fig. 62: G102

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1050	Ground
1050_BK	1050 BK
CAV_1	1

Callout	Component Name
1050_BK	1050 BK
CAV_B	B
T4A	HEADLAMPS-HALOGEN
T4F	HEADLAMPS-HIGH INTENSITY DISCHARGE
1050_BK	1050 BK
1050_BK	1050 BK
1050_BK	1050 BK
1050_BK	1050 BK
CAV_7	7
1050_BK	1050 BK
1050_BK	1050 BK
1050_BK	1050 BK
1050_BK	1050 BK
CAV_4	4
T4F	HEADLAMPS-HIGH INTENSITY DISCHARGE
T4A	HEADLAMPS-HALOGEN
1050_BK	1050 BK
CAV_1	1
CONN_X1	X1
CAV_7	7
T4A	HEADLAMPS-HALOGEN
T4F	HEADLAMPS-HIGH INTENSITY DISCHARGE
CAV_1	1
CAV_B	B
T4F	HEADLAMPS-HIGH INTENSITY DISCHARGE
CAV_1	1
CAV_2	2
CAV_2	2
T4F	HEADLAMPS-HIGH INTENSITY DISCHARGE
T4A	HEADLAMPS-HALOGEN
LFR	ENGINE-GAS, 6 CYL, 3.6L, V6, PFI, DOHC, VVT, ALUM, GEN 1
LFX	ENGINE-GAS, 6 CYL, 3.6L, SIDI, DOHC, VVT, E85 MAX, ALUM, GM
X120	X120
CAV_8	8
CAV_6	6
G102	G102
X120	X120
J111	J111
J102	J102
X120	X120
KR14	KR14 Brake Booster Pump Motor Relay
E13RA	E13RA Headlamp Assembly - Right
E4K	E4K Park Lamp - Right Front (T4F)
E4H	E4H Headlamp - Right Low Beam
T7R	T7R Headlamp Ballast - Right (T4F)
E2RF	E2RF Side Marker Lamp - Right Front
E4RF	E4RF Turn Signal Lamp - Right Front (T4F)
E4P	E4P Park/Turn Signal Lamp - Right (T4A)
M28R	M28R High Beam Solenoid Actuator - Right

G120, G122 and G123 (LFR or LFX)

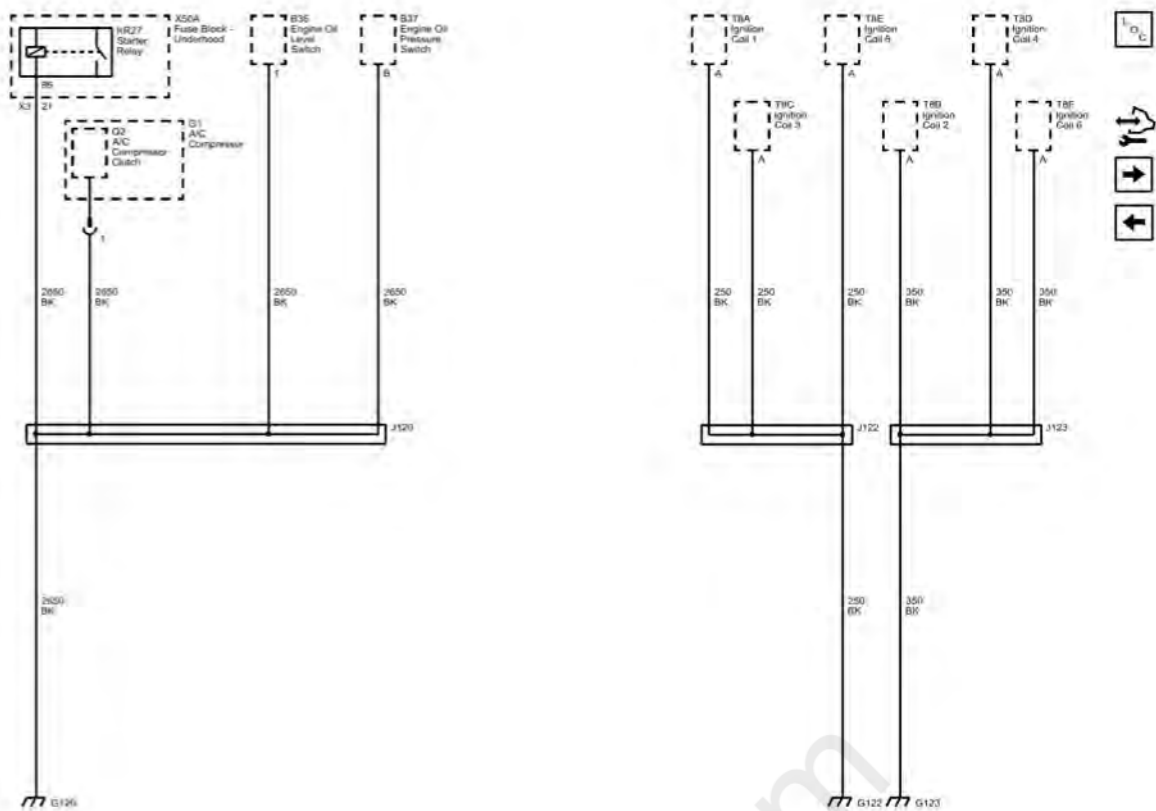


Fig. 63: G120, G122 and G123 (LFR or LFX)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
CAV_86	86
2650	Ground
2650_BK	2650 BK
CAV_21	21
CONN_X3	X3
2650_BK	2650 BK
2650_BK	2650 BK
2650_BK	2650 BK
CAV_1	1
CAV_1	1
2650_BK	2650 BK
CAV_B	B
250	Ground
250_BK	250 BK
CAV_A	A
250_BK	250 BK
CAV_A	A
250_BK	250 BK
CAV_A	A
350_BK	350 BK
CAV_A	A
350	Ground
350_BK	350 BK
CAV_A	A
350_BK	350 BK
CAV_A	A
250_BK	250 BK

Callout	Component Name
350_BK	350 BK
G120	G120
G122	G122
J122	J122
G123	G123
J123	J123
J120	J120
T8A	T8A Ignition Coil 1
T8C	T8C Ignition Coil 3
T8E	T8E Ignition Coil 5
T8B	T8B Ignition Coil 2
T8D	T8D Ignition Coil 4
T8F	T8F Ignition Coil 6
B35	B35 Engine Oil Level Switch
B37	B37 Engine Oil Pressure Switch (LFR or LFX)
KR27	KR27 Starter Relay
X50A	X50A Fuse Block - Underhood
Q2	Q2 A/C Compressor Clutch
G1	G1 A/C Compressor

G121

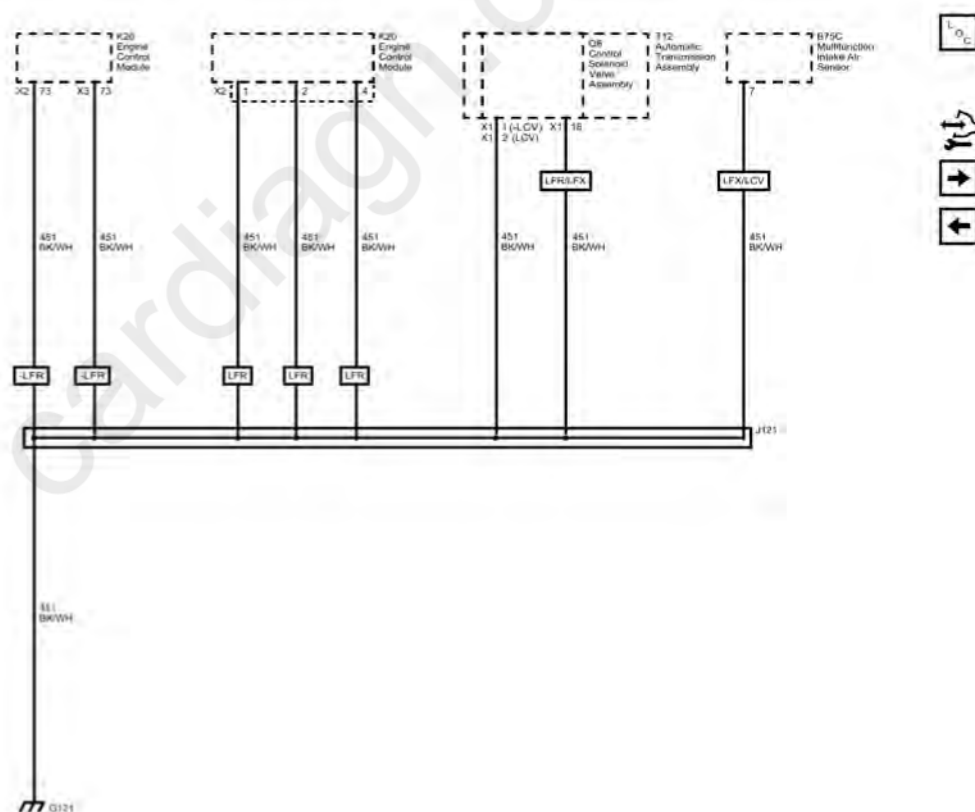


Fig. 64: G121

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
451	Signal Ground
451_BK/WH	451 BK/WH
CAV_73	73
CONN_X2	X2
451_BK/WH	451 BK/WH

Callout	Component Name
451_BK/WH	451 BK/WH
CAV_73	73
CONN_X3	X3
CAV_1	1
451_BK/WH	451 BK/WH
451_BK/WH	451 BK/WH
CAV_7	7
451_BK/WH	451 BK/WH
CAV_18	18
451_BK/WH	451 BK/WH
CAV_2	2
451_BK/WH	451 BK/WH
CAV_4	4
451_BK/WH	451 BK/WH
CAV_1	1
CONN_X2	X2
LFR	ENGINE-GAS, 6 CYL, 3.6L, V6, PFI, DOHC, VVT, ALUM, GEN 1
LFR	ENGINE-GAS, 6 CYL, 3.6L, V6, PFI, DOHC, VVT, ALUM, GEN 1
LFR	ENGINE-GAS, 6 CYL, 3.6L, V6, PFI, DOHC, VVT, ALUM, GEN 1
LFR	ENGINE-GAS, 6 CYL, 3.6L, V6, PFI, DOHC, VVT, ALUM, GEN 1
LFR	ENGINE-GAS, 6 CYL, 3.6L, V6, PFI, DOHC, VVT, ALUM, GEN 1
LFR	ENGINE-GAS, 6 CYL, 3.6L, V6, PFI, DOHC, VVT, ALUM, GEN 1
LFX	ENGINE-GAS, 6 CYL, 3.6L, SIDI, DOHC, VVT, E85 MAX, ALUM, GM
CONN_X1	X1
CONN_X1	X1
LCV	ENGINE-GAS, 4 CYL, 2.5L, L4, SIDI, DOHC, DCVCP, VVT, E85 MAX, E0-E100, ALUM
LFX	ENGINE-GAS, 6 CYL, 3.6L, SIDI, DOHC, VVT, E85 MAX, ALUM, GM
LCV	ENGINE-GAS, 4 CYL, 2.5L, L4, SIDI, DOHC, DCVCP, VVT, E85 MAX, E0-E100, ALUM
CAV_2	2
CONN_X1	X1
LCV	ENGINE-GAS, 4 CYL, 2.5L, L4, SIDI, DOHC, DCVCP, VVT, E85 MAX, E0-E100, ALUM
G121	G121
J121	J121
K20	K20 Engine Control Module
T12	T12 Automatic Transmission Assembly
B75C	B75C Multifunction Intake Air Sensor (LCV or LFX)
Q8	Q8 Control Solenoid Valve Assembly (M7W)
K20	K20 Engine Control Module

G122 (LCV)

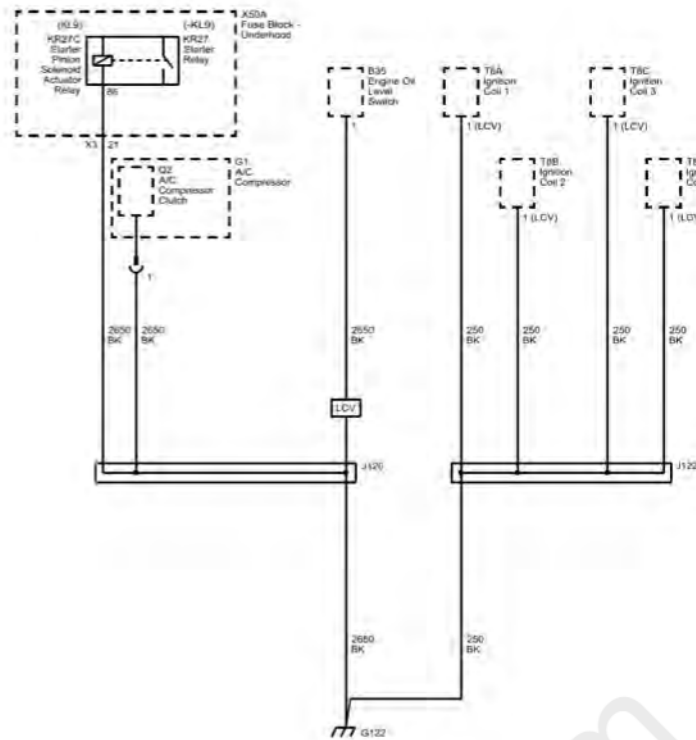


Fig. 65: G122 (LCV)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
2650_BK	2650 BK
CAV_21	21
CONN_X3	X3
CAV_86	86
2650	Ground
2650_BK	2650 BK
2650_BK	2650 BK
CAV_1	1
2650_BK	2650 BK
CAV_1	1
CAV_1	1
250	Ground
250_BK	250 BK
250_BK	250 BK
250_BK	250 BK
250_BK	250 BK
CAV_1	1
CAV_1	1
CAV_1	1
250_BK	250 BK
KL9	ENG CONTROL-STOP/START SYS, CONVENTIONAL AT, CONVENTIONAL MT OR BRAKE RELEASE LATE RESTART
KL9	ENG CONTROL-STOP/START SYS, CONVENTIONAL AT, CONVENTIONAL MT OR BRAKE RELEASE LATE RESTART
LCV	ENGINE-GAS, 4 CYL, 2.5L, L4, SIDI, DOHC, DCVCP, VVT, E85 MAX, E0-E100, ALUM
LCV	ENGINE-GAS, 4 CYL, 2.5L, L4, SIDI, DOHC, DCVCP, VVT, E85 MAX, E0-E100, ALUM

Callout	Component Name
1650_BK	1650 BK
CAV_1	1
CONN_X1	X1
1650_BK	1650 BK
CAV_2	2
CONN_X2	X2
1650_BK	1650 BK
CAV_19	19
1650_BK	1650 BK
CAV_4	4
1650_BK	1650 BK
CAV_4	4
1650_BK	1650 BK
CAV_2	2
1650_BK	1650 BK
CAV_10	10
1650_BK	1650 BK
CAV_A	A
1650_BK	1650 BK
CAV_8	8
CONN_X2	X2
UD7	PARK ASSIST-REAR
UFL	LANE ACTIVE SAFETY-DEPARTURE WARNING
1650_BK	1650 BK
CAV_4	4
1650_BK	1650 BK
CAV_5	5
UEU	SENSOR INDICATOR-FORWARD COLLISION ALERT
BTM	SWITCH-ENGINE START, KEYLESS
UD7	PARK ASSIST-REAR
UFL	LANE ACTIVE SAFETY-DEPARTURE WARNING
1650_BK	1650 BK
CONN_R3	R3
CAV_4	4
1650_BK	1650 BK
CAV_7	7
1650_BK	1650 BK
CONN_X1	X1
CAV_6	6
CONN_X2	X2
G203	G203
J209	J209
S78	S78 Turn Signal/Multifunction Switch
S48A	S48A Multifunction Switch - Instrument Panel (FHV, UD7, UEU and/or UFL)
B99	B99 Steering Wheel Angle Sensor
K9	K9 Body Control Module
S36	S36 Instrument Panel Dimmer Switch
P43	P43 Collision Alert Indicators (UEU or UFL)
A26	A26 HVAC Controls
X84	X84 Data Link Connector
P16	P16 Instrument Cluster
S26	S26 Hazard Warning Switch

Callout	Component Name
K33	K33 HVAC Control Module
S38	S38 Ignition Mode Switch (BTM)
KR104A	KR104A Battery Saver Relay 1
X51A	X51A Fuse Block - Instrument Panel
K56	K56 Serial Data Gateway Module

G203 (2 of 3)

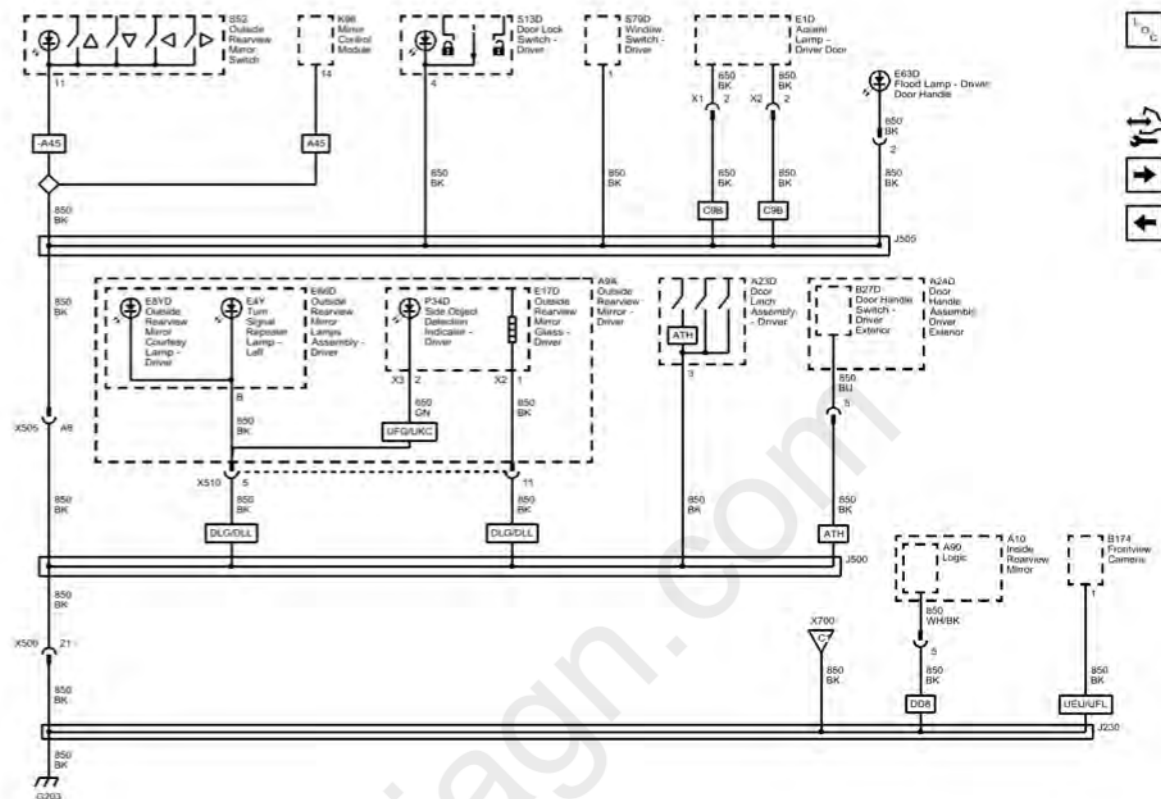


Fig. 67: G203 (2 of 3)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
850	Ground
850_BK	850 BK
CAV_11	11
A45	MEMORY-SEAT ADJUSTER, MIRROR, POWER, DRIVER, PERSONALIZATION
850_BK	850 BK
850_BK	850 BK
850_BK	850 BK
850_BK	850 BK
850_BK	850 BK
CAV_A8	A8
CAV_21	21
CAV_14	14
A45	MEMORY-SEAT ADJUSTER, MIRROR, POWER, DRIVER, PERSONALIZATION
850_BK	850 BK
CAV_4	4
850_BK	850 BK
CAV_1	1

Callout	Component Name
850_BK	850 BK
850_BK	850 BK
850_BK	850 BK
C9B	LAMP-INTR, AMBIENT, DOOR
C9B	LAMP-INTR, AMBIENT, DOOR
850_BK	850 BK
850_GN	850 GN
CAV_2	2
CONN_X3	X3
850_BK	850 BK
CAV_1	1
CONN_X2	X2
850_BK	850 BK
850_BK	850 BK
DLG	MIRROR O/S-LH and RH, RC, ELEC, HEAT, MAN FOLD, FLAT/DRVR, CNVX/PASS, LT SENS, TURN SIG IND, PERM LIGHT
DLL	MIRROR O/S-LH and RH, RC, ELEC, HEAT, MAN FOLD, FLAT/DRVR, CNVX/PASS, TURN SIG IND, PERM LIGHT
DLG	MIRROR O/S-LH and RH, RC, ELEC, HEAT, MAN FOLD, FLAT/DRVR, CNVX/PASS, LT SENS, TURN SIG IND, PERM LIGHT
DLL	MIRROR O/S-LH and RH, RC, ELEC, HEAT, MAN FOLD, FLAT/DRVR, CNVX/PASS, TURN SIG IND, PERM LIGHT
ATH	LOCK CONTROL, ENTRY-REMOTE ENTRY, EXTENDED RANGE, PASSIVE ENTRY, ALL DOORS
850_BK	850 BK
CAV_3	3
850_BU	850 BU
850_BK	850 BK
CAV_5	5
ATH	LOCK CONTROL, ENTRY-REMOTE ENTRY, EXTENDED RANGE, PASSIVE ENTRY, ALL DOORS
850_BK	850 BK
CONN_X700	X700
850_WH/BK	850 WH/BK
850_BK	850 BK
CAV_5	5
850_BK	850 BK
CAV_1	1
DD8	MIRROR I/S R/V-LT SENSITIVE
UEU	SENSOR INDICATOR-FORWARD COLLISION ALERT
UFL	LANE ACTIVE SAFETY-DEPARTURE WARNING
CAV_2	2
CAV_2	2
CAV_2	2
850_BK	850 BK
850_BK	850 BK
850_BK	850 BK
CAV_B	B
UFG	SENSOR INDICATOR-REAR CROSS TRAFFIC ALERT
UKC	SIDE ACTIVE SAFETY-OBSTACLE DETECTION ENHANCED
X510	X510
CAV_5	5
CAV_11	11

Callout	Component Name
X505	X505
X500	X500
C1_REF	C1
J230	J230
X2	X2
X1	X1
J500	J500
G203	G203
J505	J505
X510	X510
S52	S52 Outside Rearview Mirror Switch
S13D	S13D Door Lock Switch - Driver
B27D	B27D Door Handle Switch - Driver Exterior (ATH)
A24D	A24D Door Handle Assembly - Driver Exterior (ATH)
E1D	E1D Accent Lamp - Driver Door (C9B)
S79D	S79D Window Switch - Driver
E17D	E17D Outside Rearview Mirror Glass - Driver
A9A	A9A Outside Rearview Mirror - Driver
A90	A90 Logic
A23D	A23D Door Latch Assembly - Driver
P34D	P34D Side Object Detection Indicator - Driver (UFG or UFT)
K96	K96 Mirror Control Module (A45)
E4Y	E4Y Turn Signal Repeater Lamp - Left (DLG or DLL)
E8YD	E8YD Outside Rearview Mirror Courtesy Lamp - Driver (DLG or DLL)
E66D	E66D Outside Rearview Mirror Lamps Assembly - Driver (DLG or DLL)
A10	A10 Inside Rearview Mirror (DD8)
E63D	E63D Flood Lamp - Driver Door Handle
B174	B174 Frontview Camera (UEU or UFL)

G203 (3 of 3)

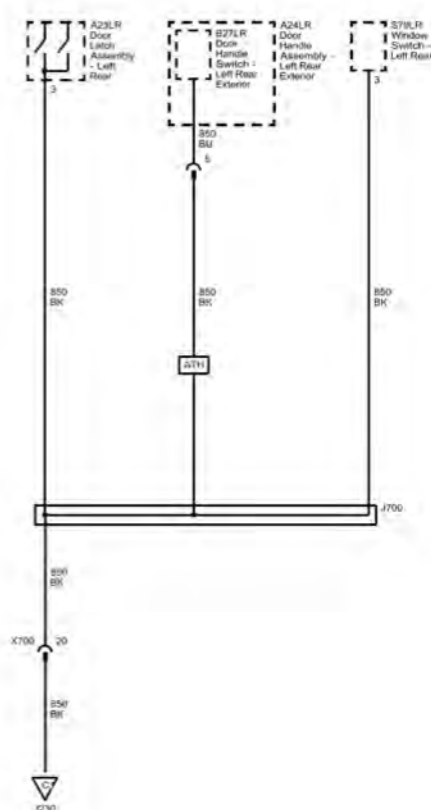


Fig. 68: G203 (3 of 3)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
850_BK	850 BK
850_BK	850 BK
850	Ground
850_BK	850 BK
CAV_3	3
850_BK	850 BK
850_BK	850 BK
CAV_3	3
850_BU	850 BU
CAV_5	5
ATH	LOCK CONTROL, ENTRY-REMOTE ENTRY, EXTENDED RANGE, PASSIVE ENTRY, ALL DOORS
CAV_20	20
C1_REF	C1
J230	J230
J700	J700
X700	X700
S79LR	S79LR Window Switch - Left Rear
A23LR	A23LR Door Latch Assembly - Left Rear
B27LR	B27LR Door Handle Switch - Left Rear Exterior (ATH)
A24LR	A24LR Door Handle Assembly - Left Rear Exterior (ATH)

G205

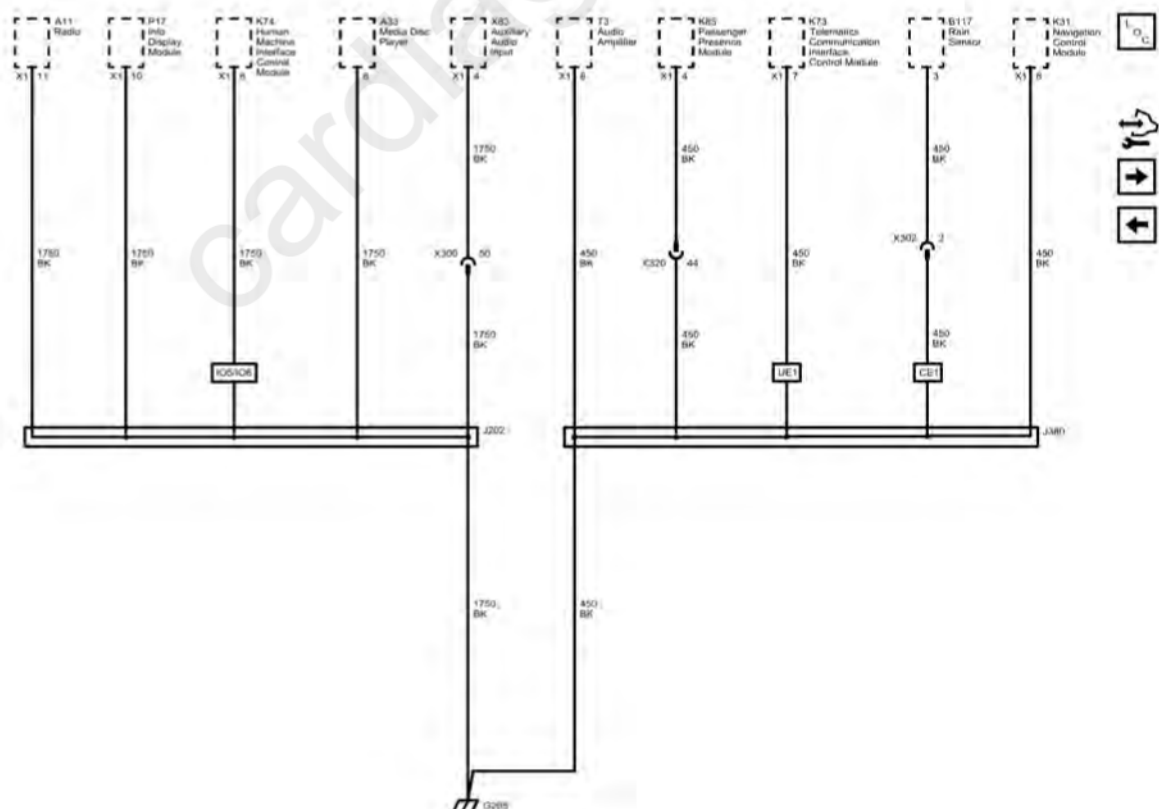


Fig. 69: G205

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name

Callout	Component Name
1750	Ground
1750_BK	1750 BK
CAV_11	11
CONN_X1	X1
1750_BK	1750 BK
CAV_10	10
CONN_X1	X1
1750_BK	1750 BK
CAV_8	8
CONN_X1	X1
1750_BK	1750 BK
CAV_8	8
1750_BK	1750 BK
CAV_4	4
CONN_X1	X1
450	Ground
450_BK	450 BK
CAV_8	8
CONN_X1	X1
450_BK	450 BK
CAV_4	4
CONN_X1	X1
450_BK	450 BK
CAV_7	7
CONN_X1	X1
1750_BK	1750 BK
1750_BK	1750 BK
450_BK	450 BK
450_BK	450 BK
CAV_44	44
CAV_50	50
IO5	RADIO-INFOTAINMENT SYSTEM - UPLEVEL HMI, ENHANCED CONNECTIVITY
IO6	RADIO-INFOTAINMENT SYSTEM - UPLEVEL HMI, ENHANCED CONNECTIVITY, EMBEDDED NAVIGATION
UE1	COMMUNICATION SYSTEM-VEHICLE, ONSTAR
450_BK	450 BK
CAV_3	3
CAV_3	3
450_BK	450 BK
CE1	WIPER SYS WINDSHIELD-PULSE, MOISTURE SENSITIVE
450_BK	450 BK
CAV_8	8
CONN_X1	X1
G205	G205
X320	X320
X300	X300
J202	J202
X302	X302
J380	J380
T3	T3 Audio Amplifier
K85	K85 Passenger Presence Module

Callout	Component Name
2050_BK	2050 BK
2050_BK	2050 BK
2050_BK	2050 BK
CAV_A	A
CONN_X2	X2
2050_BK	2050 BK
CAV_6	6
CONN_X2	X2
2050_BK	2050 BK
CAV_2	2
ATH	LOCK CONTROL, ENTRY-REMOTE ENTRY, EXTENDED RANGE, PASSIVE ENTRY, ALL DOORS
BTM	SWITCH-ENGINE START, KEYLESS
2050_BK	2050 BK
CAV_3	3
2050_BK	2050 BK
CAV_E	E
2050_BK	2050 BK
2050_BK	2050 BK
CAV_8	8
CONN_X1	X1
A6C	ADJUSTER PASS ST-MANUAL, 4 WAY, PWR VERT (DO NOT USE ON NEW PROGRAMS AFTER MY18)
KA1	HEATER SEAT FRT-DRVR and PASS
2050_YE	2050 YE
2050_BK	2050 BK
CAV_3	3
2050_BK	2050 BK
2050_BK	2050 BK
2050_BK	2050 BK
2050_BK	2050 BK
2050_BK	2050 BK
2150	Ground
2050_BK	2050 BK
CAV_2	2
CAV_1	1
CAV_3	3
CAV_13	13
CAV_3	3
2050_BK/WH	2050 BK/WH
5060_BK/WH	5060 BK/WH
2050_BK	2050 BK
2050_BK	2050 BK
KU3	VENTILATED SEAT PASS-FRONT
A6C	ADJUSTER PASS ST-MANUAL, 4 WAY, PWR VERT (DO NOT USE ON NEW PROGRAMS AFTER MY18)
APH	CONTROL-SEAT, POWER LUMBAR, RH (DO NOT USE FOR NEXT NEW MAJOR)
2050_BK	2050 BK
CAV_8	8
CONN_X1	X1
2050_BK	2050 BK

Callout	Component Name
CAV_7	7
CONN_X2	X2
2050_BK	2050 BK
AG2	ADJUSTER PASS ST-POWER, MULTI-DIRECTIONAL (DO NOT USE ON NEW PROGRAMS AFTER MY18)
A6C	ADJUSTER PASS ST-MANUAL, 4 WAY, PWR VERT (DO NOT USE ON NEW PROGRAMS AFTER MY18)
APH	CONTROL-SEAT, POWER LUMBAR, RH (DO NOT USE FOR NEXT NEW MAJOR)
CAV_48	48
G302	G302
X380	X380
D1_REF	D1
E1_REF	E1
F1_REF	F1
G1_REF	G1
X321	X321
J322	J322
X321	X321
J320	J320
J325	J325
J360	J360
J234	J234
X320	X320
M8	M8 Blower Motor
S65P	S65P Seat Lumbar Support Switch - Passenger (A6C with APH)
F106RR	F106RR Seat Side Air Bag - Right Rear
K84	K84 Keyless Entry Control Module (ATH or BTM)
M73B	M73B Seat Blower Motor - Passenger Back (KU3)
S64P	S64P Seat Adjuster Switch - Passenger
A14P	A14P Seat Lumbar Support Pump - Passenger (APH)
K29F	K29F Seat Heating Control Module - Front (KA1)
M73D	M73D Seat Blower Motor - Passenger Cushion (KU3)
K54P	K54P Seat Temperature Control Module - Passenger (KU3)
K55P	K55P Seat Blower Assembly - Passenger Cushion
K29R	K29R Seat Heating Control Module - Rear (KA6)

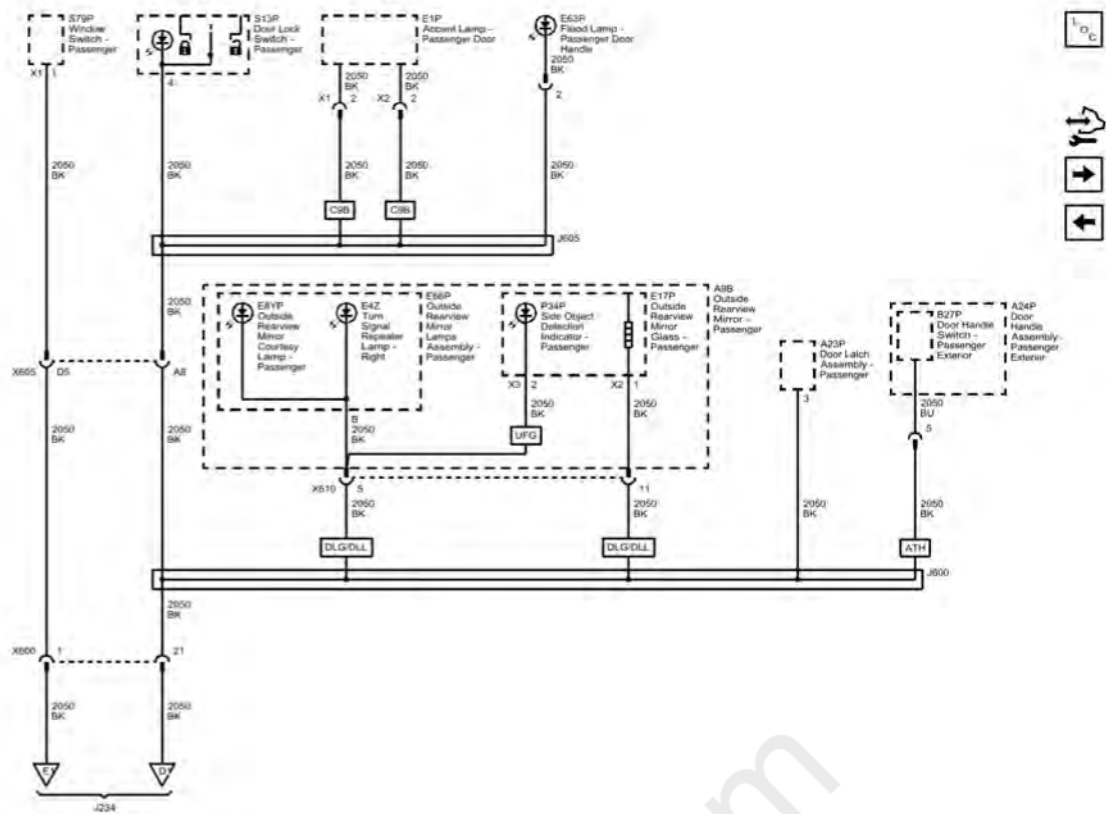


Fig. 71: G302 (2 of 3)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
2050	Ground
2050_BK	2050 BK
CAV_1	1
CONN_X1	X1
2050_BK	2050 BK
2050_BK	2050 BK
CAV_4	4
2050_BK	2050 BK
2050_BK	2050 BK
2050_BK	2050 BK
2050_BK	2050 BK
2050_BK	2050 BK
2050_BK	2050 BK
2050_BK	2050 BK
2050_BK	2050 BK
2050_BK	2050 BK
C9B	LAMP-INTR, AMBIENT, DOOR
C9B	LAMP-INTR, AMBIENT, DOOR
2050_BK	2050 BK
2050_BK	2050 BK
CAV_2	2
CONN_X3	X3
2050_BK	2050 BK
CAV_1	1
CONN_X2	X2
2050_BK	2050 BK
CAV_3	3
2050_BU	2050 BU

Callout	Component Name
2050_BK	2050 BK
2050_BK	2050 BK
2050_BK	2050 BK
CAV_5	5
ATH	LOCK CONTROL, ENTRY-REMOTE ENTRY, EXTENDED RANGE, PASSIVE ENTRY, ALL DOORS
DLG	MIRROR O/S-LH and RH, RC, ELEC, HEAT, MAN FOLD, FLAT/DRVR, CNVX/PASS, LT SENS, TURN SIG IND, PERM LIGHT
DLL	MIRROR O/S-LH and RH, RC, ELEC, HEAT, MAN FOLD, FLAT/DRVR, CNVX/PASS, TURN SIG IND, PERM LIGHT
DLG	MIRROR O/S-LH and RH, RC, ELEC, HEAT, MAN FOLD, FLAT/DRVR, CNVX/PASS, LT SENS, TURN SIG IND, PERM LIGHT
DLL	MIRROR O/S-LH and RH, RC, ELEC, HEAT, MAN FOLD, FLAT/DRVR, CNVX/PASS, TURN SIG IND, PERM LIGHT
CAV_2	2
CAV_2	2
CAV_2	2
2050_BK	2050 BK
2050_BK	2050 BK
2050_BK	2050 BK
CAV_B	B
UFG	SENSOR INDICATOR-REAR CROSS TRAFFIC ALERT
X605	X605
CAV_D5	D5
CAV_A8	A8
X600	X600
CAV_1	1
CAV_21	21
X610	X610
CAV_5	5
CAV_11	11
E1_REF	E1
D1_REF	D1
J234	J234
J600	J600
X1	X1
X2	X2
J605	J605
X605	X605
X600	X600
X610	X610
S13P	S13P Door Lock Switch - Passenger
B27P	B27P Door Handle Switch - Passenger Exterior (ATH)
A24P	A24P Door Handle Assembly - Passenger Exterior (ATH)
A23P	A23P Door Latch Assembly - Passenger
S79P	S79P Window Switch - Passenger
E17P	E17P Outside Rearview Mirror Glass - Passenger
A9B	A9B Outside Rearview Mirror - Passenger
P34P	P34P Side Object Detection Indicator - Passenger (UFG or UFT)
E1P	E1P Accent Lamp - Passenger Door (C9B)
E63P	E63P Flood Lamp - Passenger Door Handle
E4Z	E4Z Turn Signal Repeater Lamp - Right (DLG or DLL)
E8YP	E8YP Outside Rearview Mirror Courtesy Lamp - Passenger (DLG or DLL)

Callout	Component Name
E66P	E66P Outside Rearview Mirror Lamps Assembly - Passenger (DLG or DLL)

G302 (3 of 3)

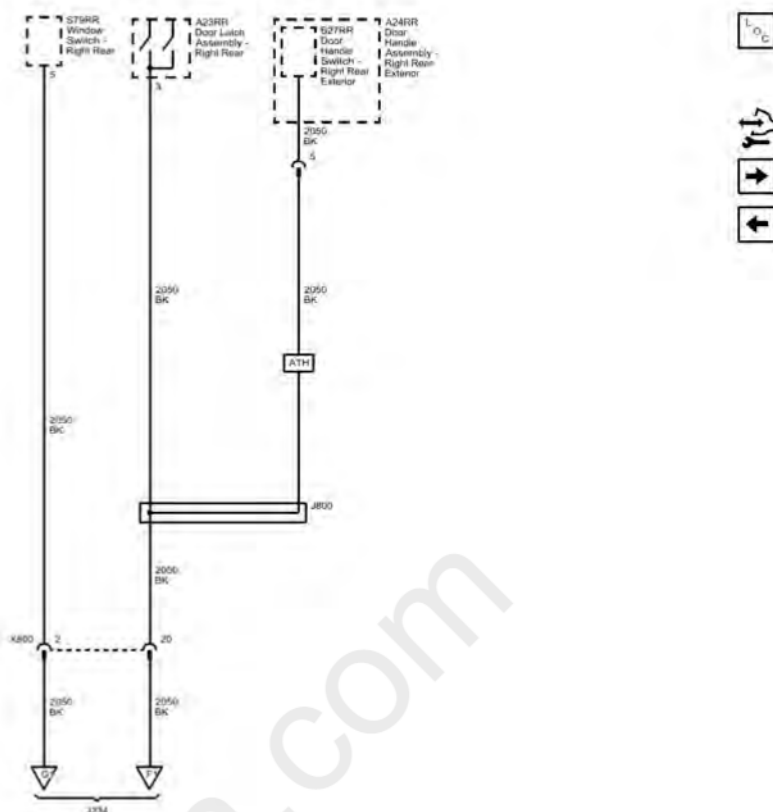


Fig. 72: G302 (3 of 3)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
2050	Ground
2050_BK	2050 BK
CAV_5	5
2050_BK	2050 BK
2050_BK	2050 BK
2050_BK	2050 BK
2050_BK	2050 BK
CAV_3	3
2050_BK	2050 BK
ATH	LOCK CONTROL, ENTRY-REMOTE ENTRY, EXTENDED RANGE, PASSIVE ENTRY, ALL DOORS
2050_BK	2050 BK
CAV_5	5
X800	X800
CAV_2	2
CAV_20	20
G1_REF	G1
F1_REF	F1
J800	J800
X800	X800
A23RR	A23RR Door Latch Assembly - Right Rear
B27RR	B27RR Door Handle Switch - Right Rear Exterior (ATH)
A24RR	A24RR Door Handle Assembly - Right Rear Exterior (ATH)

Callout	Component Name
2250_BK	2250 BK
KA1	HEATER SEAT FRT-DRVR and PASS
KA1	HEATER SEAT FRT-DRVR and PASS
KU1	VENTILATED SEAT DRVR-FRONT
KU3	VENTILATED SEAT PASS-FRONT
KU1	VENTILATED SEAT DRVR-FRONT
KU3	VENTILATED SEAT PASS-FRONT
CAV_2	2
CAV_2	2
2250_BK	2250 BK
2250_BK	2250 BK
2250_BK	2250 BK
CAV_1	1
CAV_2	2
2250_BK	2250 BK
X300	X300
CAV_34	34
CAV_19	19
G303	G303
G404	G404
G307	G307
X305	X305
J300	J300
J301	J301
J208	J208
J305	J305
X300	X300
K36	K36 Inflatable Restraint Sensing and Diagnostic Module
R14R	R14R Rear Window Defogger Noise Filter - Right
A90	A90 Logic
S48E	S48E Multifunction Switch - Center Console
P2	P2 Transmission Shift Lever Position Indicator
E28	E28 Center Console Compartment Lamp
X80D	X80D Accessory Power Receptacle - Center Console Compartment
X80H	X80H Accessory Power Receptacle - Center Console
X80G	X80G Accessory Power Receptacle - Instrument Panel
M7	M7 Transmission Shift Lock Control Solenoid Actuator
B81B	B81B Park Position Switch
S3	S3 Transmission Shift Lever
S2	S2 Transmission Manual Shift Switch

Callout	Component Name
1550	Ground
1550_BK	1550 BK
1550_BK	1550 BK
1550_BK	1550 BK
1550_BK	1550 BK
1550_BK/WH	1550 BK/WH
CAV_A	A
CAV_2	2
1550_BK	1550 BK
CAV_9	9
CONN_X2	X2
CAV_4	4
1550_BK	1550 BK
CAV_1	1
1550_BK	1550 BK
1550_BK	1550 BK
1550_BK	1550 BK
CAV_A	A
CONN_X2	X2
1550_BK	1550 BK
CAV_A	A
CONN_X2	X2
1550_BK	1550 BK
CAV_A	A
CONN_X3	X3
1550_BK	1550 BK
CAV_10	10

Callout	Component Name
CAV_1	1
1550_BK	1550 BK
UVD	STEERING WHEEL HEAT-MANUAL
1550_BK	1550 BK
CAV_1	1
1550_BK	1550 BK
CAV_2	2
1550_BK	1550 BK
1550_BK	1550 BK
1550_BK/WH	1550 BK/WH
CAV_2	2
UD7	PARK ASSIST-REAR
UFL	LANE ACTIVE SAFETY-DEPARTURE WARNING
1550_BK	1550 BK
CAV_2	2
CONN_X1	X1
1550_BK	1550 BK
CAV_1	1
CONN_X3	X3
1550_BK	1550 BK
CAV_11	11
1550_BK	1550 BK
CAV_8	8
1550_BK	1550 BK
CAV_2	2
CONN_X3	X3
1550_BK	1550 BK
1550_BK	1550 BK
CAV_2	2
1550_BK	1550 BK
CAV_B	B
1550_BK	1550 BK
CAV_B	B
1550_BK	1550 BK
CAV_4	4
KI6	RECEPTACLE-ELECTRICAL, FRT CONSOLE RR 110 VOLT
KI7	RECEPTACLE-ELECTRICAL, FRT CONSOLE RR 230 VOLT
N38	STEERING COLUMN-TILT, TELESOPING, POWER
C9J	LAMP-INTR, AMBIENT, I/P
C9J	LAMP-INTR, AMBIENT, I/P
1550_BK	1550 BK
1550_BN	1550 BN
CAV_3	3
CAV_24	24
850	Ground
850_BK	850 BK
1550_BK	1550 BK
1550_BK	1550 BK
CAV_2	2
1550_BK	1550 BK
1550_BK	1550 BK
1550_BK	1550 BK

Callout	Component Name
CAV_2	2
1550_BK	1550 BK
CAV_1	1
CONN_R3	R3
CAV_13	13
CAV_2	2
1550_BK	1550 BK
1550_BK	1550 BK
CAV_2	2
CAV_2	2
G305	G305
P_REF	P
J229	J229
X5	X5
X202	X202
X4	X4
X205	X205
X300	X300
X214	X214
J204	J204
J299	J299
J289	J289
J214	J214
J279	J279
K32	K32 Steering Wheel Heating Control Module (UVD)
X85	X85 Steering Wheel Air Bag Coil
S33L	S33L Horn Switch - Left
S33R	S33R Horn Switch - Right
F107	F107 Steering Wheel Air Bag
S70L	S70L Steering Wheel Controls Switch - Left
A90	A90 Logic
F101	F101 Passenger Instrument Panel Air Bag
T1	T1 Accessory DC/AC Power Inverter Module (KI6 or KI7)
S91	S91 Park Brake Control Switch
S58B	S58B Rear Compartment Lid Unlatch Switch - Interior (without UD7, UEU or UFL)
KR76	KR76 Retained Accessory Power Relay
X51A	X51A Fuse Block - Instrument Panel
E27	E27 Instrument Panel Compartment Lamp
E8J	E8J Instrument Panel Courtesy Lamp - Left
E8K	E8K Instrument Panel Courtesy Lamp - Right
X84	X84 Data Link Connector
K99	K99 Steering Column Position Control Module (N38)
S70R	S70R Steering Wheel Controls Switch - Right
E1H	E1H Accent Lamp - Right Instrument Panel (C9J)
S70E	S70E Steering Wheel Controls Switch - Radio Presets
S70F	S70F Steering Wheel Controls Switch - Radio Volume
E1G	E1G Accent Lamp - Left Instrument Panel (C9J)
E1GA	E1GA Accent Lamp - Left Middle Instrument Panel (C9J)
T22	T22 Mobile Device Wireless Charger Module (K4C)
E15	E15 Steering Wheel Heater (UVD)

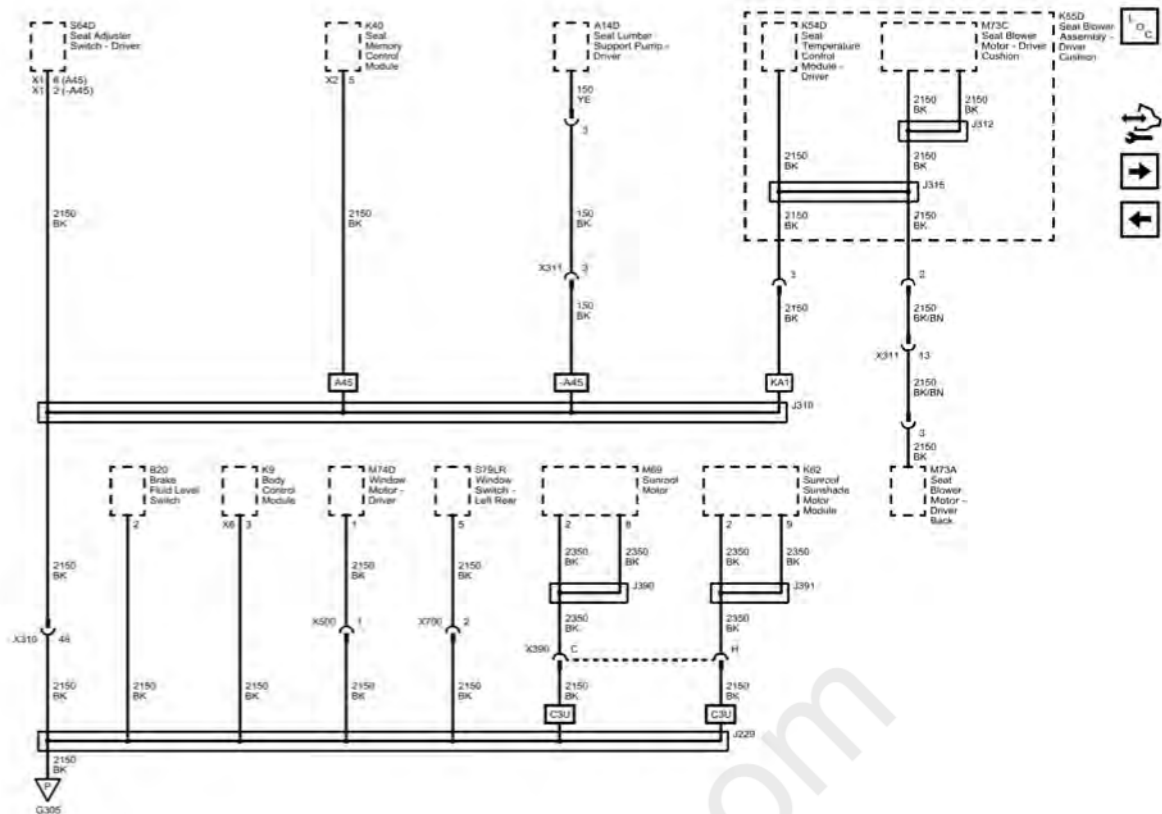


Fig. 75: G305 (2 of 2)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
2150	Ground
2150_BK	2150 BK
CAV_5	5
CONN_X2	X2
2150_BK	2150 BK
CAV_6	6
CONN_X1	X1
CAV_2	2
CONN_X1	X1
A45	MEMORY-SEAT ADJUSTER, MIRROR, POWER, DRIVER, PERSONALIZATION
A45	MEMORY-SEAT ADJUSTER, MIRROR, POWER, DRIVER, PERSONALIZATION
2150_BK	2150 BK
2150_BK	2150 BK
2150_BK	2150 BK
CAV_48	48
150_YE	150 YE
150	Ground
150_BK	150 BK
150_BK	150 BK
CAV_3	3
A45	MEMORY-SEAT ADJUSTER, MIRROR, POWER, DRIVER, PERSONALIZATION
2350	Ground
CAV_2	2

Callout	Component Name
CAV_2	2
2350_BK	2350 BK
2350_BK	2350 BK
CAV_8	8
CAV_9	9
2350_BK	2350 BK
2350_BK	2350 BK
2350_BK	2350 BK
2350_BK	2350 BK
2150_BK	2150 BK
2150_BK	2150 BK
2150_BK	2150 BK
CAV_2	2
2150_BK	2150 BK
CAV_3	3
CONN_X6	X6
2150_BK	2150 BK
CAV_1	1
2150_BK	2150 BK
CAV_5	5
CAV_1	1
CAV_2	2
2150_BK	2150 BK
2150_BK	2150 BK
C3U	ROOF-SUN, GLASS, SLIDING, ELEC, TRANSPARENT GLASS FIXED
C3U	ROOF-SUN, GLASS, SLIDING, ELEC, TRANSPARENT GLASS FIXED
A45	MEMORY-SEAT ADJUSTER, MIRROR, POWER, DRIVER, PERSONALIZATION
2150_BK	2150 BK
2150_BK	2150 BK
2150_BK	2150 BK
2150_BK	2150 BK
2150_BK	2150 BK
2150_BK	2150 BK
CAV_3	3
2150_BK	2150 BK
CAV_2	2
2150_BK/BN	2150 BK/BN
CAV_13	13
CAV_3	3
2150_BK	2150 BK
2150_BK/BN	2150 BK/BN
CAV_3	3
KA1	HEATER SEAT FRT-DRVR and PASS
X390	X390
2150	Ground
CAV_C	C
CAV_H	H
X310	X310
P_REF	P
X311	X311
X500	X500

Callout	Component Name
X700	X700
J390	J390
J391	J391
J312	J312
J315	J315
X311	X311
J310	J310
G305	G305
J229	J229
X390	X390
K40	K40 Seat Memory Control Module (A45)
M69	M69 Sunroof Motor (C3U)
S79LR	S79LR Window Switch - Left Rear
M74D	M74D Window Motor - Driver
K9	K9 Body Control Module
B20	B20 Brake Fluid Level Switch
K54D	K54D Seat Temperature Control Module - Driver (KU1)
M73C	M73C Seat Blower Motor - Driver Cushion (KU1)
M73A	M73A Seat Blower Motor - Driver Back (KU1)
K55D	K55D Seat Blower Assembly - Driver Cushion
K62	K62 Sunroof Sunshade Motor Module (C3U)
S64D	S64D Seat Adjuster Switch - Driver
A14D	A14D Seat Lumbar Support Pump - Driver

G401

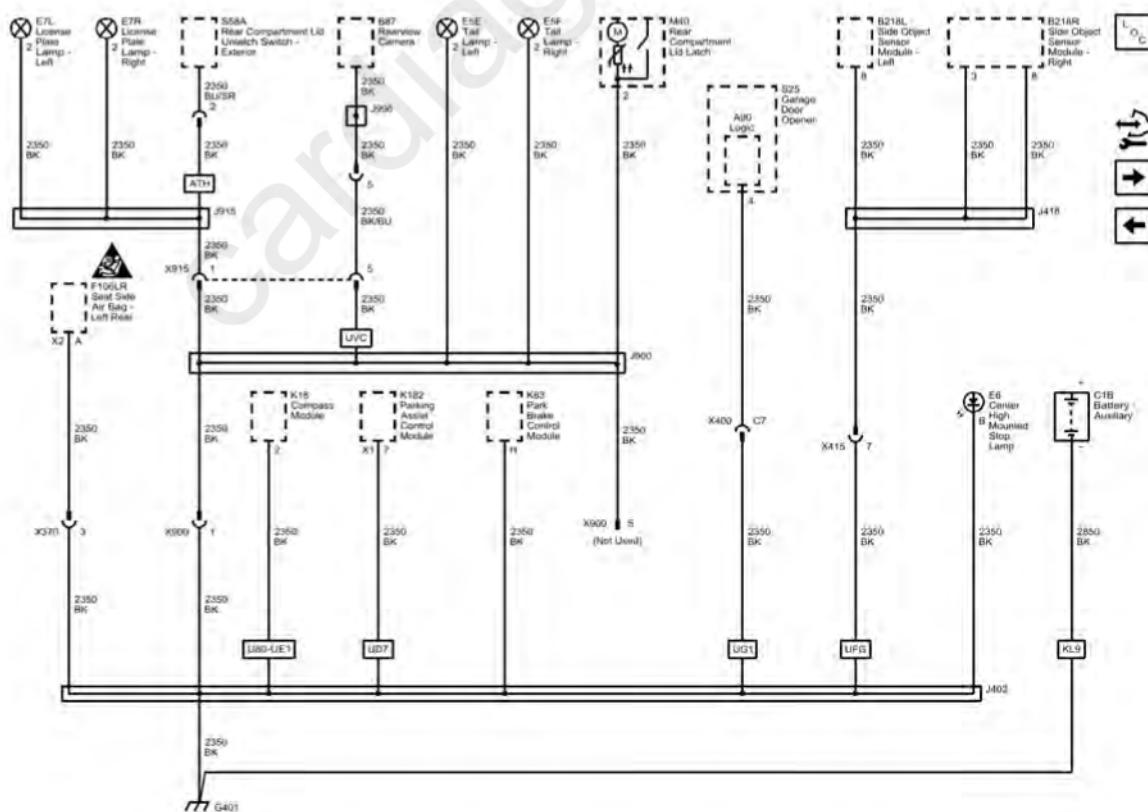


Fig. 76: G401

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
2350	Ground

Callout	Component Name
2350_BK	2350 BK
CAV_2	2
2350_BK	2350 BK
CAV_2	2
2350_BU/SR	2350 BU/SR
2350_BK	2350 BK
2350_BK	2350 BK
CAV_A	A
CONN_X2	X2
2350_BK/BU	2350 BK/BU
2350_BK	2350 BK
CAV_2	2
2350_BK	2350 BK
CAV_2	2
2350_BK	2350 BK
CAV_2	2
2350_BK	2350 BK
2350_BK	2350 BK
2350_BK	2350 BK
2350_BK	2350 BK
2350_BK	2350 BK
2350_BK	2350 BK
2350_BK	2350 BK
2350_BK	2350 BK
CAV_3	3
CAV_1	1
CAV_2	2
2350_BK	2350 BK
CAV_5	5
ATH	LOCK CONTROL, ENTRY-REMOTE ENTRY, EXTENDED RANGE, PASSIVE ENTRY, ALL DOORS
UVC	VISION-REAR VIEW, MONO, ANALOG
2350_BK	2350 BK
CAV_7	7
CONN_X1	X1
2350_BK	2350 BK
CAV_H	H
2350_BK	2350 BK
CAV_2	2
2350_BK	2350 BK
CAV_4	4
CAV_C7	C7
2350_BK	2350 BK
2350_BK	2350 BK
CAV_8	8
2350_BK	2350 BK
2350_BK	2350 BK
CAV_7	7
2350_BK	2350 BK
CAV_3	3
2350_BK	2350 BK

Callout	Component Name
CAV_8	8
2350_BK	2350 BK
CAV_B	B
UD7	PARK ASSIST-REAR
U80	DISPLAY-COMPASS
UE1	COMMUNICATION SYSTEM-VEHICLE, ONSTAR
UG1	OPENER-GARAGE DOOR, UNIVERSAL
2850	Ground
2850_BK	2850 BK
KL9	ENG CONTROL-STOP/START SYS, CONVENTIONAL AT, CONVENTIONAL MT OR BRAKE RELEASE LATE RESTART
UFG	SENSOR INDICATOR-REAR CROSS TRAFFIC ALERT
CAV_5	5
X915	X915
CAV_1	1
CAV_5	5
G401	G401
X370	X370
X900	X900
X400	X400
X415	X415
J915	J915
J996	J996
J418	J418
J900	J900
J402	J402
X915	X915
B218R	B218R Side Object Sensor Module - Right (UFG or UFT)
B218L	B218L Side Object Sensor Module - Left (UFG or UFT)
E7L	E7L License Plate Lamp - Left
E5E	E5E Tail Lamp - Left
E5F	E5F Tail Lamp - Right
M40	M40 Rear Compartment Lid Latch
B87	B87 Rearview Camera (UVC)
F106LR	F106LR Seat Side Air Bag - Left Rear
E6	E6 Center High Mounted Stop Lamp
K18	K18 Compass Module (U80 without UE1)
K83	K83 Park Brake Control Module
A90	A90 Logic
S25	S25 Garage Door Opener (UG1)
E7R	E7R License Plate Lamp - Right
S58A	S58A Rear Compartment Lid Unlatch Switch - Exterior (ATH)
C1B	C1B Battery - Auxiliary (KL9)
K182	K182 Parking Assist Control Module

G403 and G405

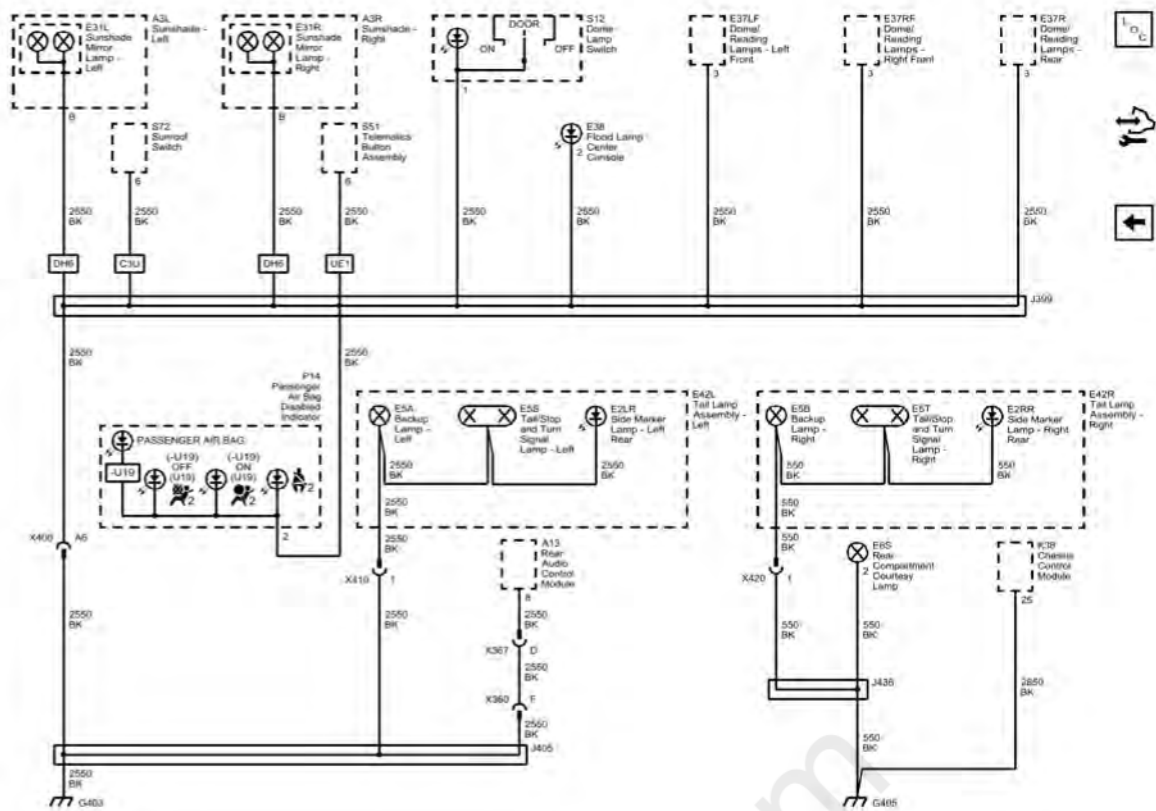


Fig. 77: G403 and G405

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
2550	Ground
2550_BK	2550 BK
CAV_B	B
2550_BK	2550 BK
2550_BK	2550 BK
CAV_A6	A6
2550_BK	2550 BK
CAV_6	6
2550_BK	2550 BK
CAV_B	B
2550_BK	2550 BK
CAV_2	2
CAV_6	6
2550_BK	2550 BK
CAV_1	1
2550_BK	2550 BK
2550_BK	2550 BK
CAV_3	3
2550_BK	2550 BK
CAV_3	3
2550_BK	2550 BK
CAV_3	3
2550_BK	2550 BK
DH6	MIRROR I/S FRT VAN-LH and RH, SUNSHADE, ILLUM
C3U	ROOF-SUN, GLASS, SLIDING, ELEC, TRANSPARENT GLASS FIXED
DH6	MIRROR I/S FRT VAN-LH and RH, SUNSHADE, ILLUM
UE1	COMMUNICATION SYSTEM-VEHICLE, ONSTAR

Callout	Component Name
CAV_1	1
2550_BK	2550 BK
2550_BK	2550 BK
2550_BK	2550 BK
550	Ground
550_BK	550 BK
550_BK	550 BK
CAV_2	2
2850	Ground
2850_BK	2850 BK
CAV_25	25
550_BK	550 BK
550_BK	550 BK
550_BK	550 BK
CAV_1	1
CAV_2	2
2550_BK	2550 BK
2550_BK	2550 BK
550_BK	550 BK
550_BK	550 BK
2550_BK	2550 BK
2550_BK	2550 BK
CAV_8	8
CAV_D	D
CAV_F	F
2550_BK	2550 BK
2550_BK	2550 BK
U19	SPEEDOMETER-INST, KILO and MILES, KILO ODOMETER
G405	G405
G403	G403
X400	X400
J399	J399
X410	X410
X420	X420
J436	J436
X367	X367
X360	X360
J405	J405
E5B	E5B Backup Lamp - Right
E5T	E5T Tail/Stop and Turn Signal Lamp - Right
E42R	E42R Tail Lamp Assembly - Right
K38	K38 Chassis Control Module
E42L	E42L Tail Lamp Assembly - Left
E5A	E5A Backup Lamp - Left
E5S	E5S Tail/Stop and Turn Signal Lamp - Left
S12	S12 Dome Lamp Switch
E31L	E31L Sunshade Mirror Lamp - Left
A3L	A3L Sunshade - Left
A3R	A3R Sunshade - Right
E31R	E31R Sunshade Mirror Lamp - Right
E37LF	E37LF Dome/Reading Lamps - Left Front
E37RF	E37RF Dome/Reading Lamps - Right Front

Callout	Component Name
S72	S72 Sunroof Switch (C3U)
E37R	E37R Dome/Reading Lamps - Rear
S51	S51 Telematics Button Assembly (UE1)
E8S	E8S Rear Compartment Courtesy Lamp
E38	E38 Flood Lamp - Center Console
E2LR	E2LR Side Marker Lamp - Left Rear
E2RR	E2RR Side Marker Lamp - Right Rear
A13	A13 Rear Audio Control Module (ULG)
P14	P14 Passenger Air Bag Disabled Indicator

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Wiring Systems and Power Management - Special Tools and Equipment - Special Tools - Impala

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

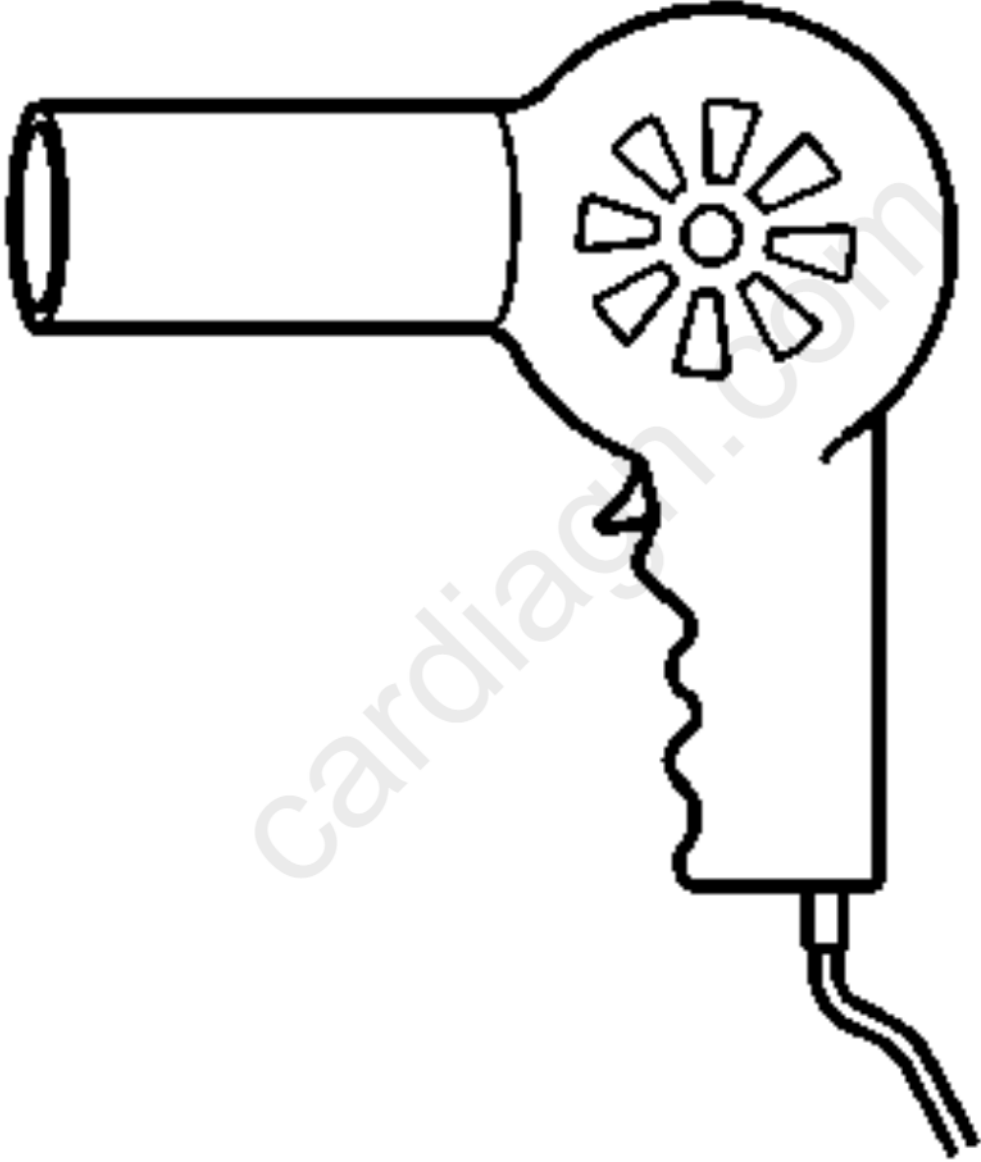
Illustration	Tool Number / Description
	EL-25070 EL-38125-5A J-38125-5A Heat Gun 500 - 700 F

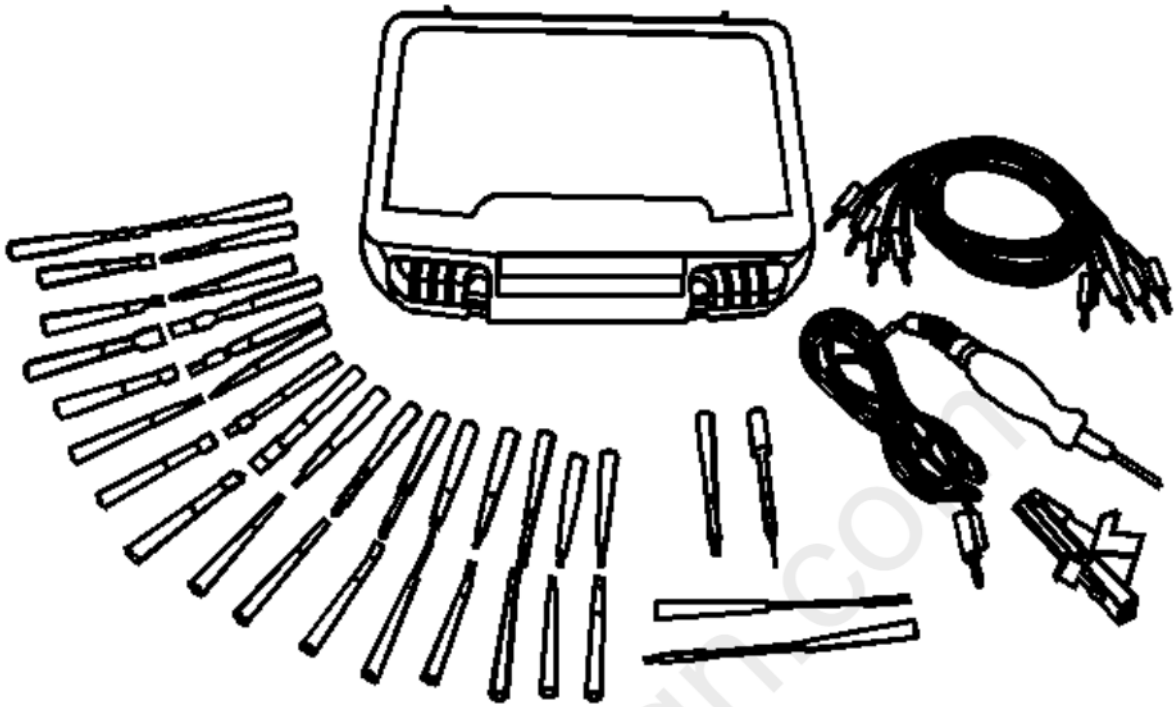
Illustration	Tool Number / Description
	EL-35616 KM-609 Tyco Electronic Tool (5 - 1579007 - 3) Terminal Test Probe Kit

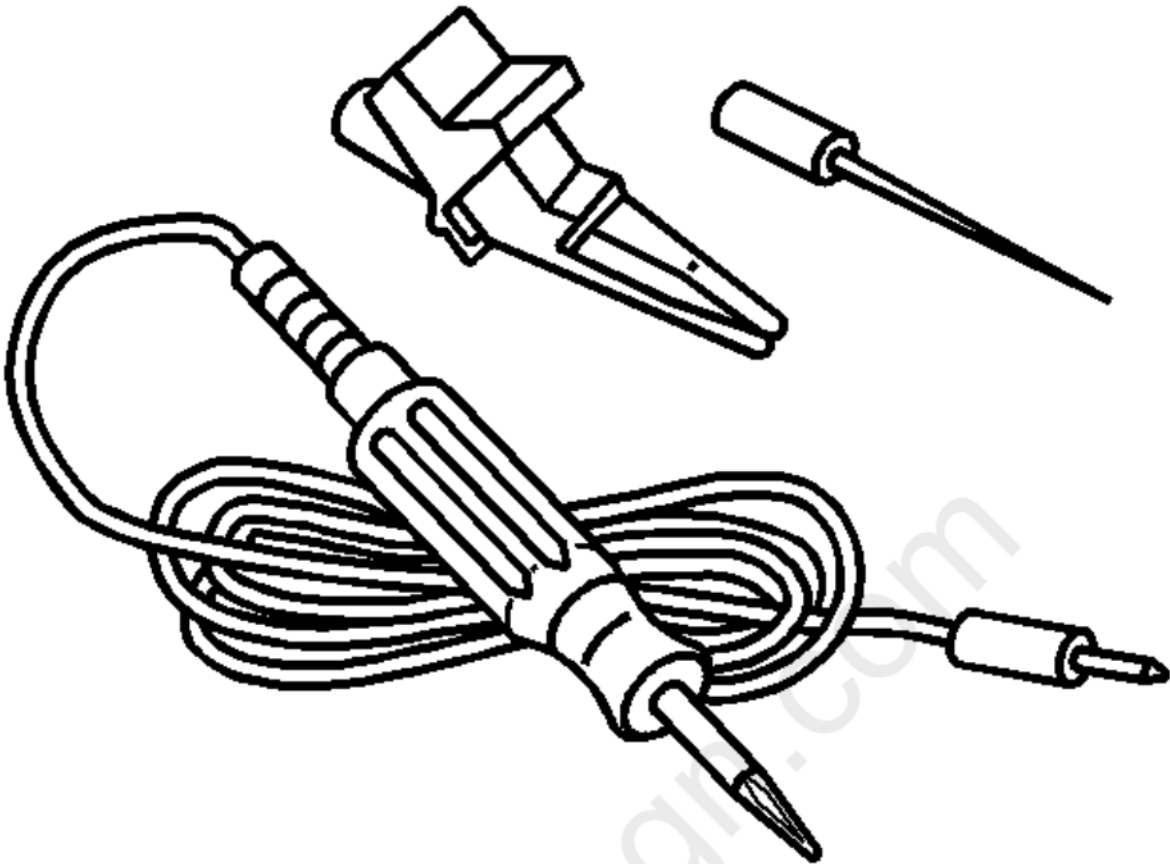
Illustration	Tool Number / Description
	EL-35616-200 KM-J-34142 - B Test Light - Probe Kit

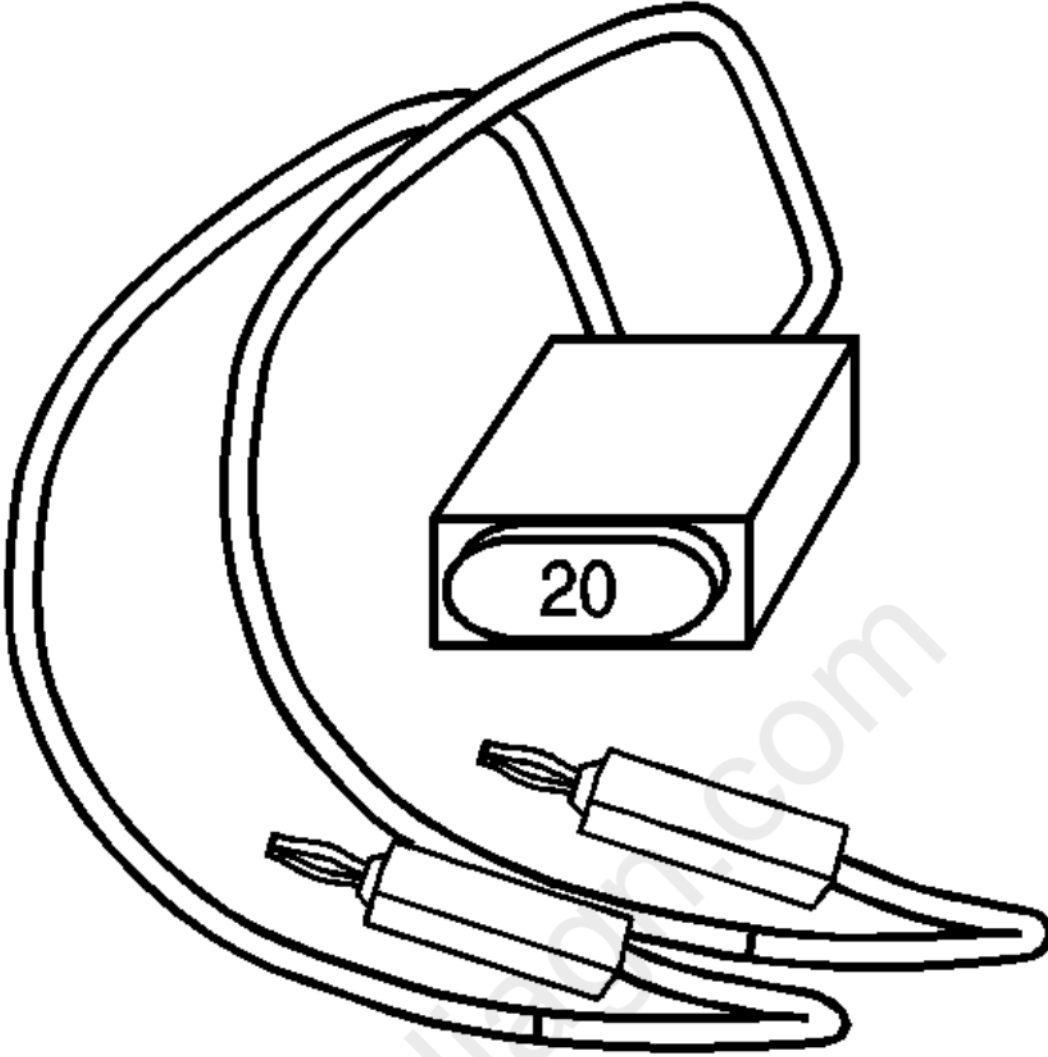
Illustration	Tool Number / Description
	EL-35616- 20F KM-963 Fused Jumper Wire

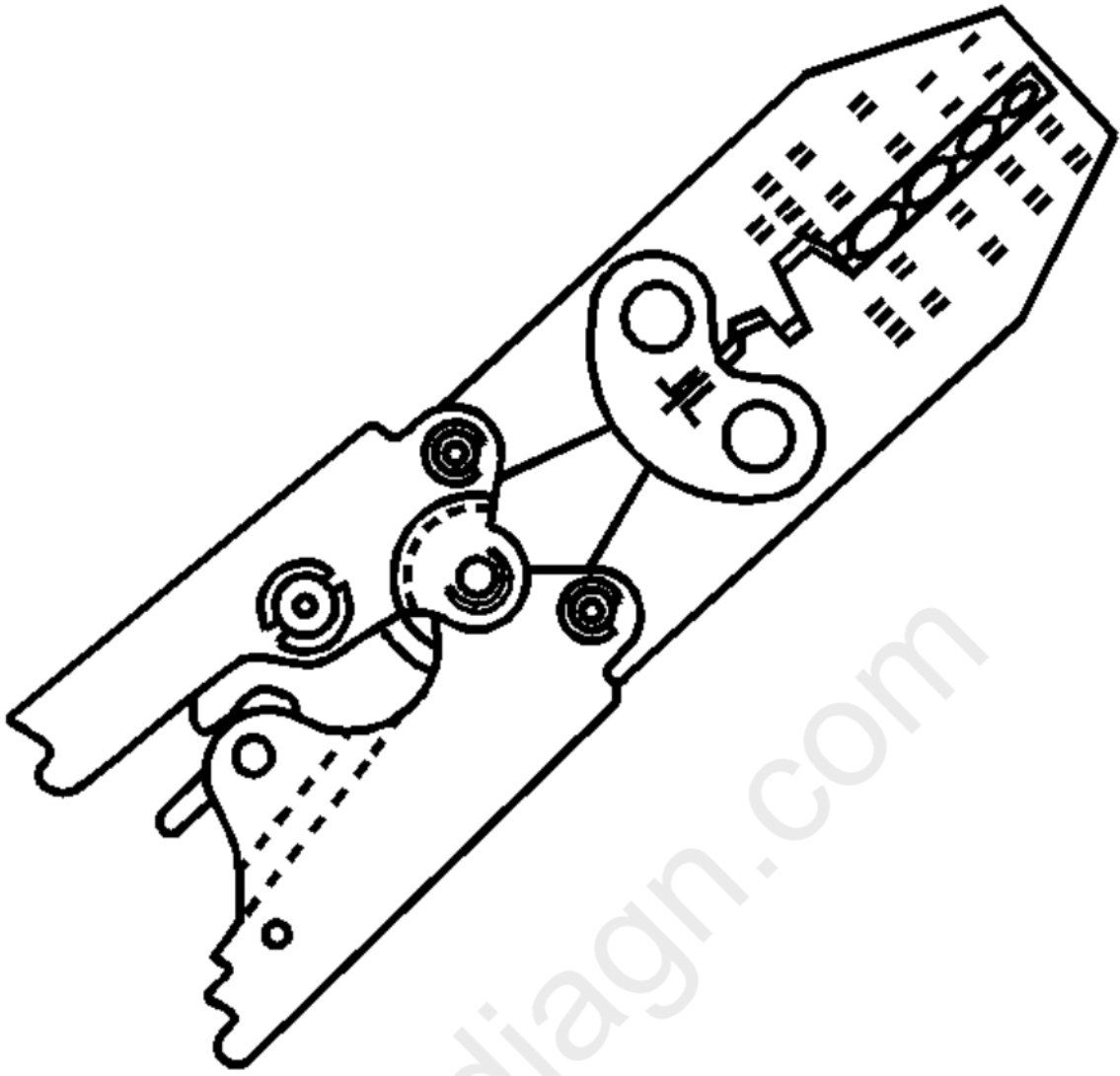
Illustration	Tool Number / Description
	EL-38125 - EU (Europe) J-38125-8 (North America Only) EL-38125 - 10 (Non- North America/Non Europe) Splice Sleeve Crimp Tool

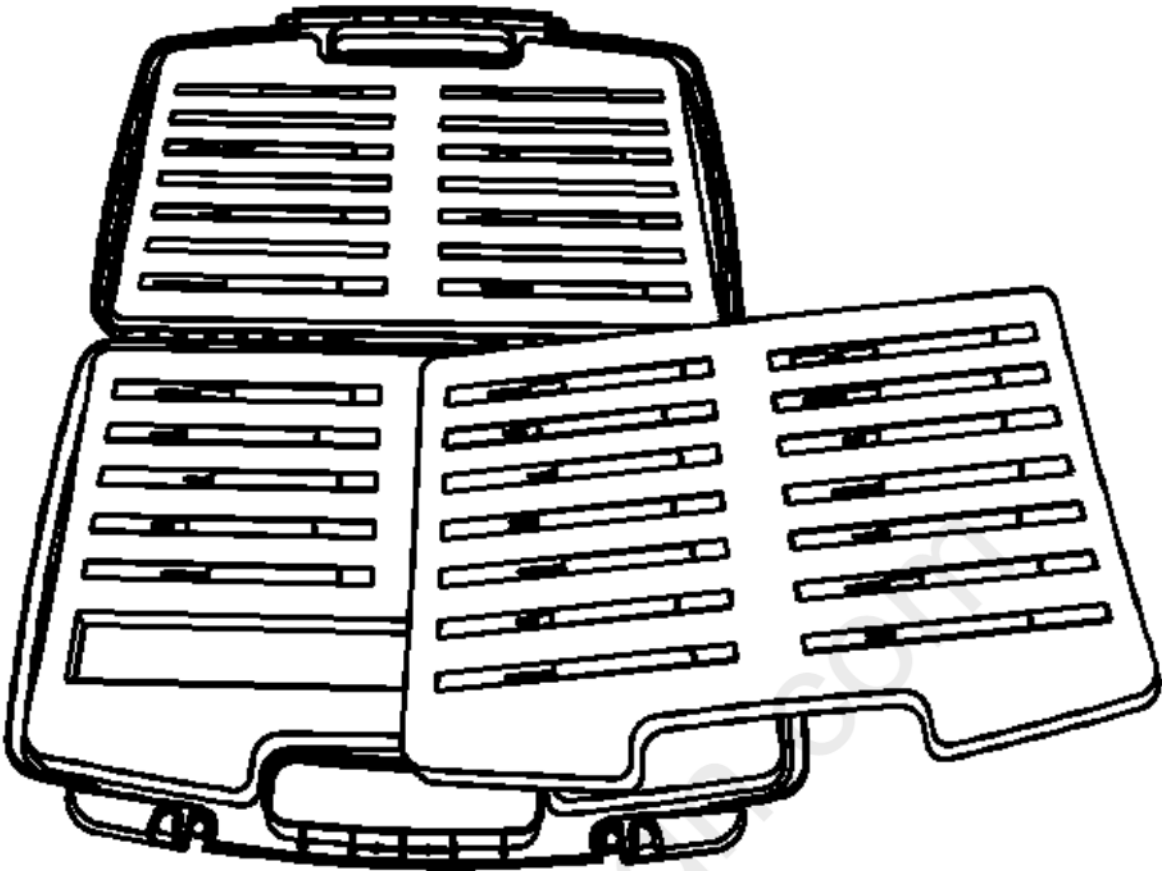
Illustration	Tool Number / Description
	EL-38125-550 (North America Only) Terminal Release Tool Kit

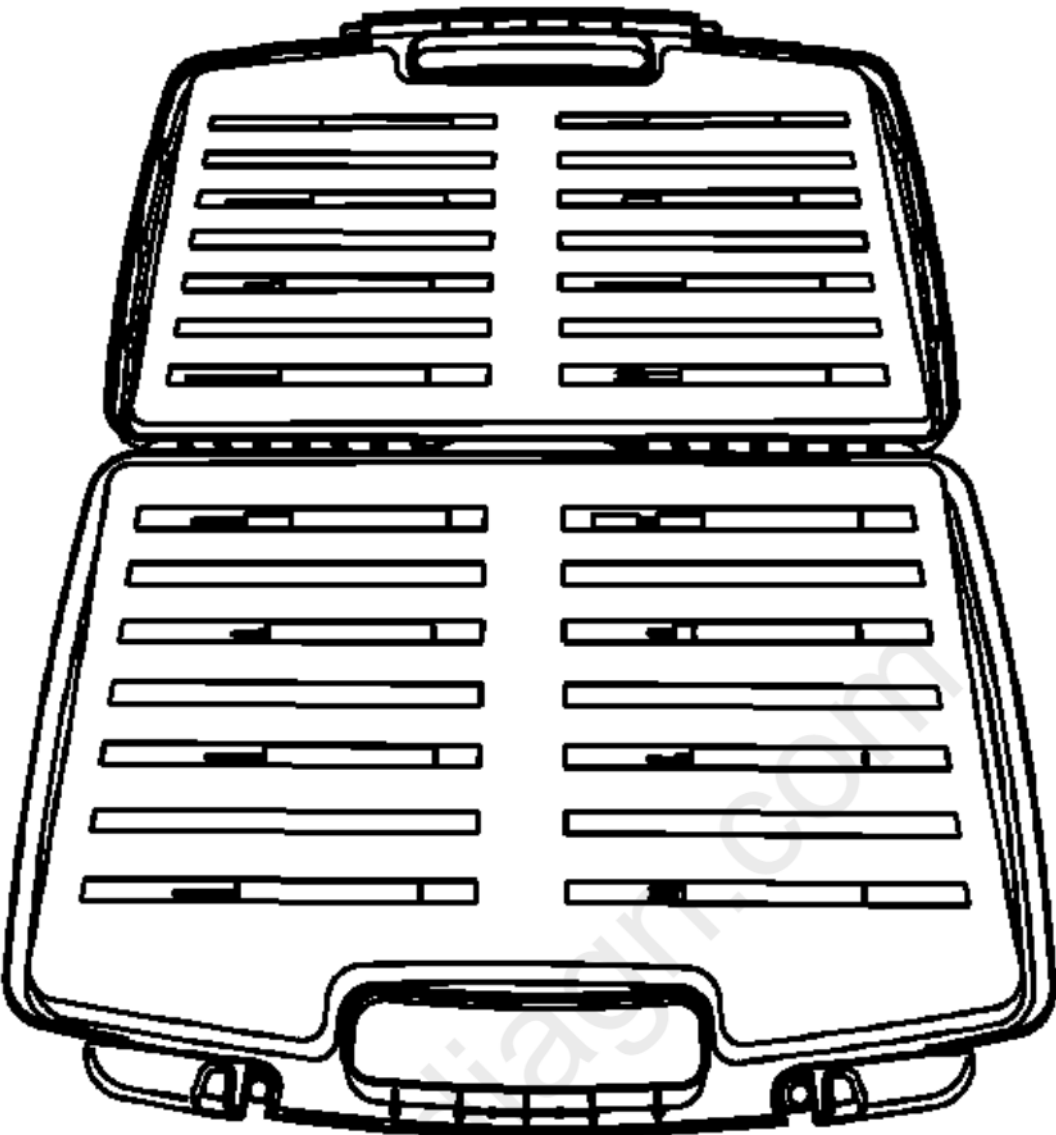
Illustration	Tool Number / Description
	EL-38125-580 (Non-North America) Terminal Release Tool Kit
	EL-39200 Digital Multimeter

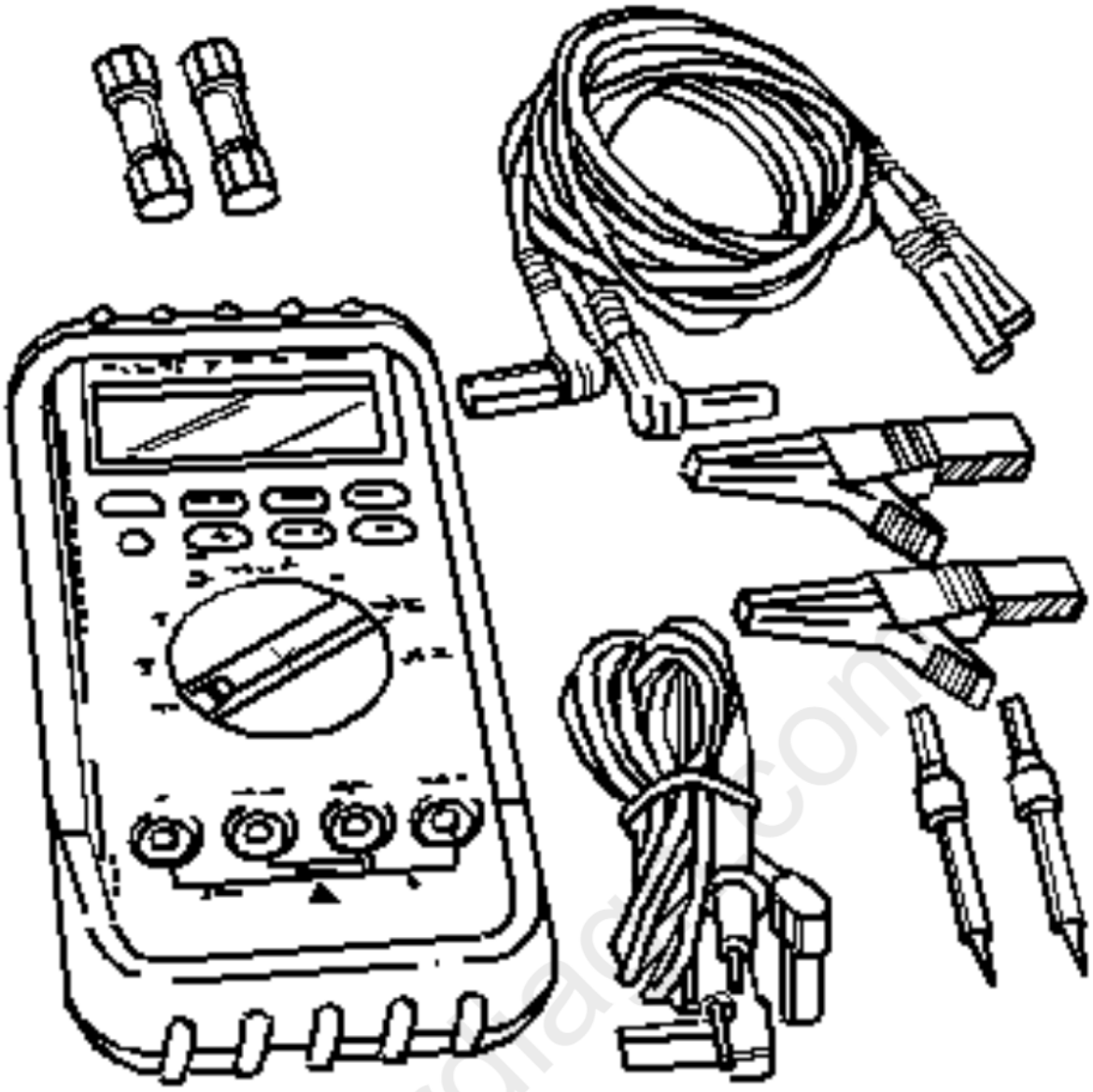
Illustration	Tool Number / Description
	

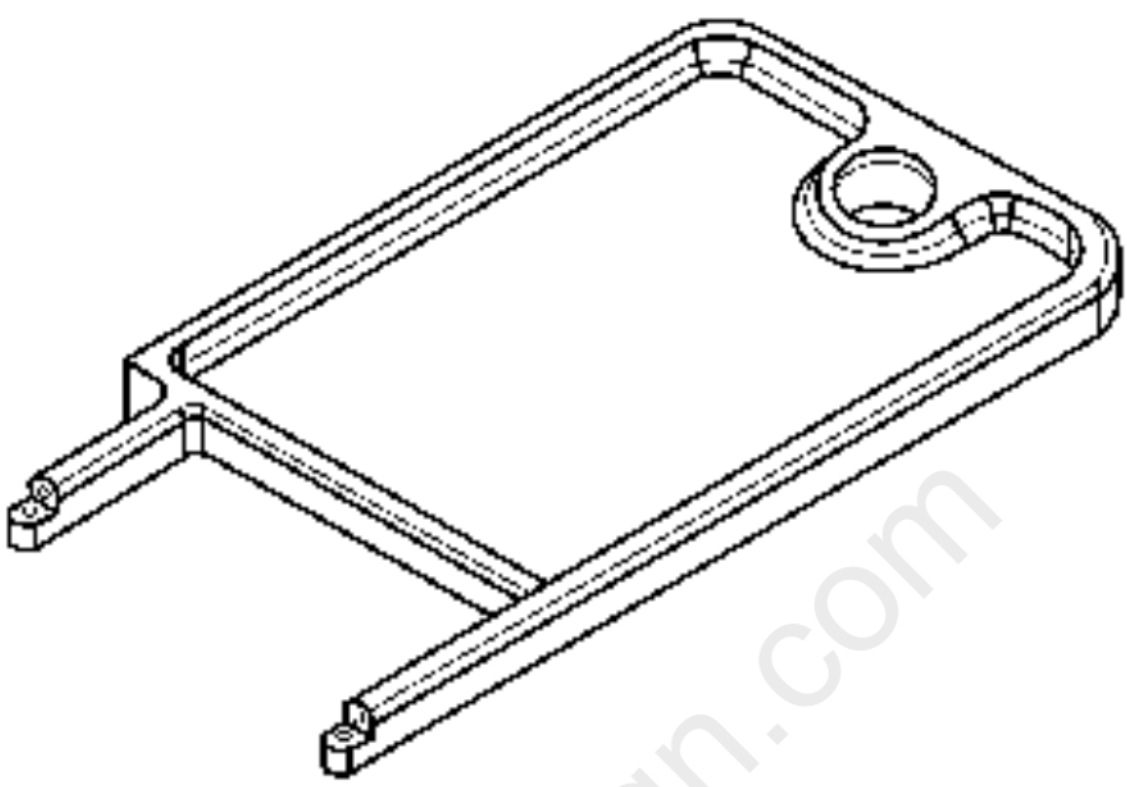
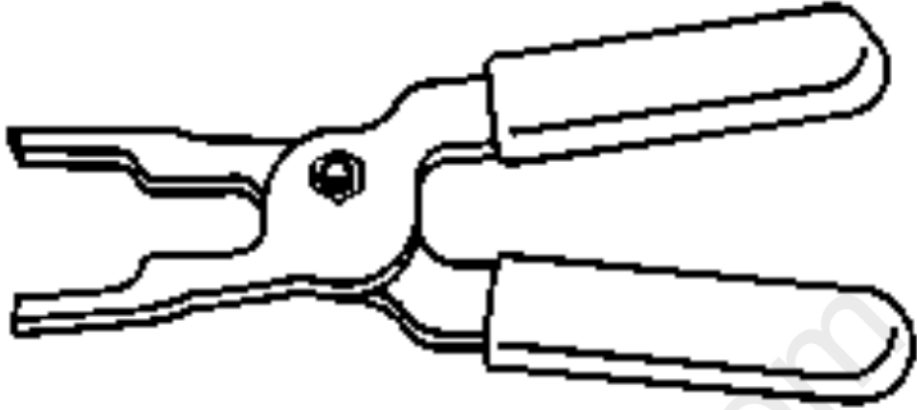
Illustration	Tool Number / Description
	EL-42759 Ignition Switch Connector Release Tool

Illustration	Tool Number / Description
	EL-43244 Relay Puller Pliers

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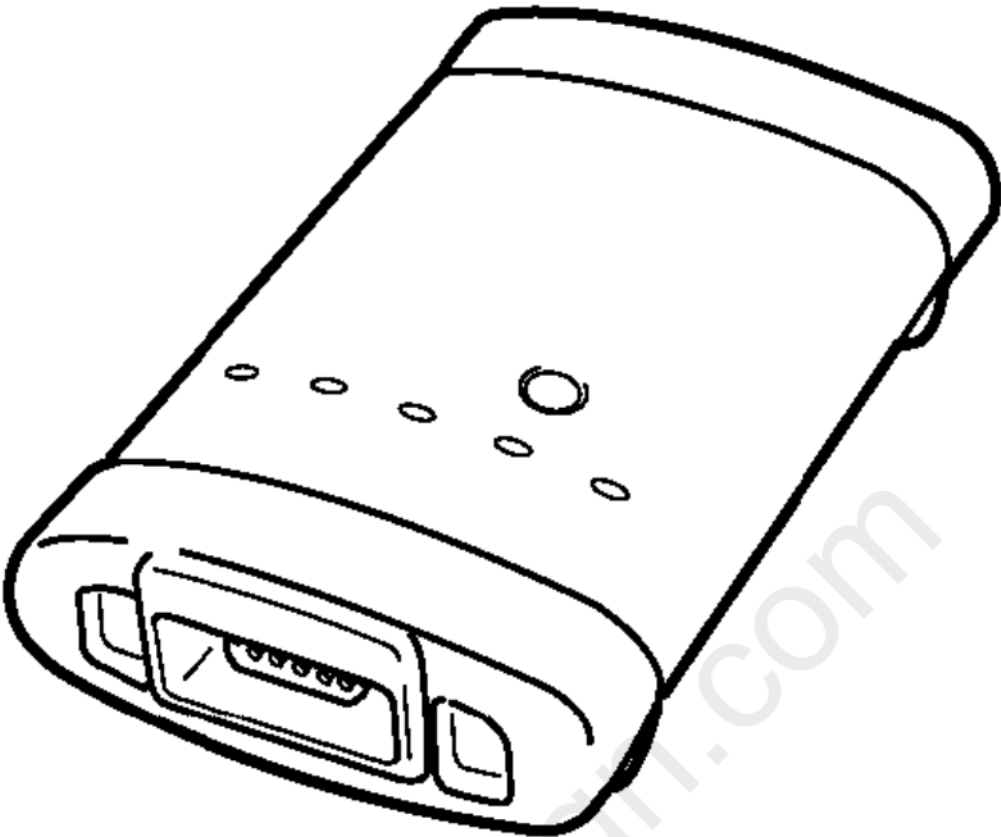
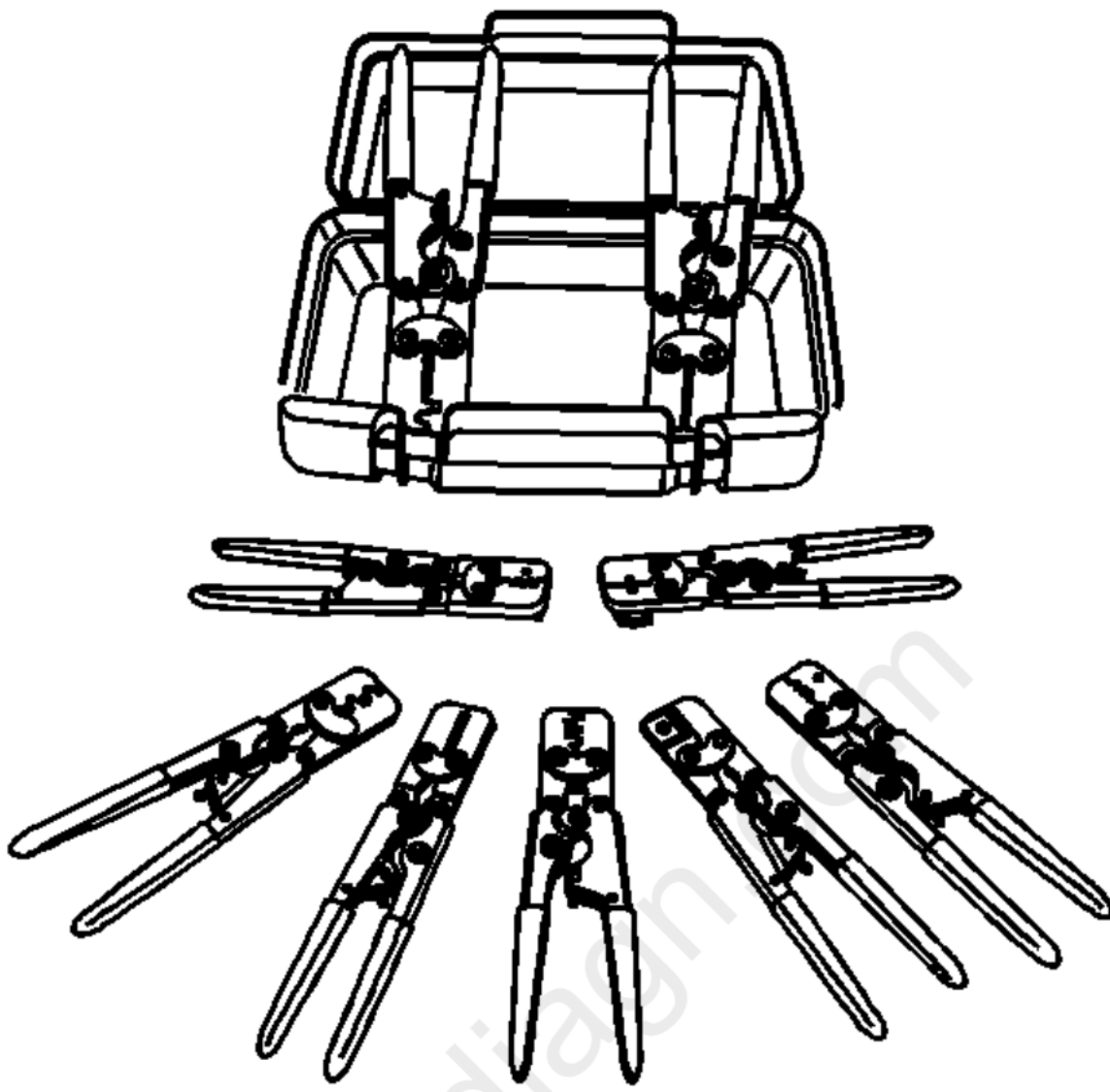
Illustration	Tool Number / Description
	EL-47955 J-2534 Multi Diagnostic Interface MDI

Illustration	Tool Number / Description
	EL-50040 (Holden Only) Crimping Tool Kit

2017 ELECTRICAL

Wiring Systems and Power Management - Specifications - Fastener Specifications - Impala

SPECIFICATIONS

FASTENER SPECIFICATIONS

Reusable Threaded Fastener Tightening Specifications

NOTE: <i>All fasteners listed in this table can be reused after removal.</i>	
Application	Specification
	Metric (English)
Battery Hold Down Retainer Bolt Rear	15 N.m (11 lb ft)
Fuse Block Positive Cable and Engine Power Supply Cable Nut	12 N.m (106 lb in)
Fuse Block Terminal Wiring Harness Nut	4.7 N.m (42 lb in)
Junction Block Base Nut	22 N.m (16 lb ft)
Junction Block Bolt	7 N.m (62 lb in)
Positive Battery Cable Nut	12 N.m (106 lb in)