

2017 ACCESSORIES & EQUIPMENT

Wiring Systems and Power Management - Diagnostic Information and Procedures - Bolt EV

DIAGNOSTIC INFORMATION AND PROCEDURES

DTC B097B: POWER MODE START SWITCH CIRCUIT

Diagnostic Instructions

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

DTC Descriptors

DTC B097B

Power Mode Start Switch Circuit

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

Diagnostic Fault Information

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

Circuit/System Description

The vehicle ON/OFF switch has a single LED that indicate the vehicle power mode. When the vehicle is in the off mode, the LED is not illuminated. Pressing and holding the vehicle ON/OFF switch up to 10 s, without the brake pedal applied will enter the Ignition ON/Vehicle Service Mode and the LED will illuminate. With the Ignition OFF/Vehicle OFF and the brake pedal applied, pressing the vehicle ON/OFF switch once will enter Ignition ON/Vehicle ON mode and the LED will illuminate.

The vehicle ON/OFF switch contains two individual switches that provide redundant inputs to both the body control module (BCM) and the keyless entry control module. The BCM supplies the vehicle ON/OFF switch a constant B+ signal. The BCM monitors this signal to determine if the switch is released or pressed. When the vehicle ON/OFF switch is not pressed, voltage on the signal circuit is pulled down through two resistors in the switch. When the vehicle ON/OFF switch is pressed, voltage on the signal circuit is pulled down through only one resistor, changing the voltage seen at the BCM and indicating that the vehicle ON/OFF switch is pressed.

The keyless entry control module monitors voltage on the switch in the same manner as the BCM. The keyless entry control module also controls the backup power for the ignition main relay 1 through the control circuit by applying voltage to the ignition voltage circuit. This circuit is a pass-thru in the BCM and will energize the ignition circuit when the vehicle is in Service Mode, the vehicle is ON, or when a remote start is requested.

Conditions for Running the DTC

Control module voltage is 9 - 16 V.

Conditions for Setting the DTC

B097B 00

- The voltage seen at the BCM monitored switch does not match the voltage seen at the keyless entry control module monitored switch.
- The above condition exists for more than 1 s

B097B 02

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

B097B 04

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

B097B 05

- The control module detects an open in the vehicle ON/OFF switch signal 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 vehicle ON/OFF switch
- The above condition exists for more than 1 min

Action Taken When the DTC Sets

No action is taken.

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](#)

Electrical Information Reference

- [Circuit Testing](#)

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

Scan Tool Reference

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

Circuit/System Verification

1. Verify DTC B097B 08 or B097B 61 is not set.
 - **If either DTC is set**
 Test or replace the S83 Vehicle On/Off Switch.
 - **If the DTCs are not set**
2. Refer to Circuit/System Testing.

Circuit/System Testing

1. Ignition OFF/Vehicle OFF and all vehicle systems OFF, disconnect the harness connector at the S83 Vehicle On/Off 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 S83 Vehicle On/Off Switch, Ignition ON/Vehicle in Service Mode.
5. Disconnect the S83 Vehicle On/Off 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 S83 Vehicle On/Off Switch.
 2. Ignition OFF/Vehicle OFF, disconnect the X2 harness connector at the K9 Body Control Module.
 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 S83 Vehicle On/Off Switch.
10. Verify the scan tool K9 Body Control Module Push Button Ignition Switch Voltage parameter is 8 - 10 V, with the S83 Vehicle On/Off Switch released.
 - **If not between 8 - 10 V**
Test or replace the S83 Vehicle On/Off 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 S83 Vehicle On/Off Switch pressed.
 - **If not between 4 - 7 V**
Test or replace the S83 Vehicle On/Off Switch.
 - **If between 4 - 7 V**
12. Disconnect the X1 harness connector at the K84 Keyless Entry Control Module.
13. Test for infinite resistance between the signal circuit terminal 11 and ground.
 - **If less than infinite resistance**
Repair the short to ground on the circuit.
 - **If infinite resistance**
14. Ignition ON/Vehicle in Service Mode.
15. Test for less than 1 V between the signal circuit terminal 11 and ground.
 - **If 1 V or greater**
Repair the short to voltage on the circuit.
 - **If less than 1 V**
16. Test for 4.5 - 5.5 k Ω between the signal circuit terminal 11 and the low reference circuit terminal 12, with the S83 Vehicle On/Off Switch released.
 - **If not between 4.5 - 5.5 k Ω**
 1. Ignition OFF/Vehicle OFF, disconnect the harness connector at the S83 Vehicle On/Off 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 S83 Vehicle On/Off 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 S83 Vehicle On/Off Switch pressed.
 - **If not between 1 - 1.5 k Ω**
Test or replace the S83 Vehicle On/Off Switch.
 - **If between 1 - 1.5 k Ω**
18. Replace the K84 Keyless Entry Control Module.

Component Testing

vehicle ON/OFF Switch

1. Ignition OFF/Vehicle OFF, disconnect the harness connector at the S83 Vehicle ON/OFF Switch.

2. Test for 4.5 - 5.5 k Ω between the terminal listed below with the S83 Vehicle ON/OFF 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 S83 Vehicle On/Off Switch.

- **If between 4.5 - 5.5 k Ω**

3. Test for 1 - 1.5k Ω between the terminals listed below with the S83 Vehicle On/Off 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 S83 Vehicle On/Off Switch.

- **If between 1 - 1.5 k Ω**

4. All OK.

Repair Instructions

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

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

DTC B1370: CONTROL MODULE IGNITION ON AND START CIRCUIT

Diagnostic Instructions

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

DTC Descriptors

DTC B1370

Control Module Ignition On and Start Circuit

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

Diagnostic Fault Information

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

Circuit/System Description

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

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

Conditions for Running the DTC

B1370 01

Ignition is in Accessory mode.

B1370 06

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

Conditions for Setting the DTC

B1370 01

Ignition circuit is shorted to voltage.

B1370 06

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

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

Instrument Cluster Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

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

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Verify that DTC B144B or B1380 is not set.

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

Refer to **Diagnostic Trouble Code (DTC) List - Vehicle** .

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

2. Refer to Circuit/System Testing.

Circuit/System Testing

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

- **If the test lamp illuminates**

Repair the short to voltage on the ignition circuit.

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

3. Ignition ON/Vehicle in Service Mode.
4. Verify that a test lamp illuminates between the ignition terminal 8 and ground.

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

1. Ignition OFF/Vehicle OFF, remove the test lamp.
2. Test for less than 2 Ω in the ignition circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , refer to [Power Mode Mismatch](#).

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

1. Ignition OFF/Vehicle OFF, remove the test lamp.
2. Test for infinite resistance between the ignition circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the P16 Instrument Cluster.

- **If the test lamp illuminates**

5. Replace the P16 Instrument Cluster.

Repair Instructions

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

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

DTC B1445: CONTROL MODULE VOLTAGE OUTPUT CIRCUIT

Diagnostic Instructions

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

DTC Descriptor

DTC B1445

Control Module Voltage Output Circuit

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

Diagnostic Fault Information

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

Circuit/System Description

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

Conditions for Running the DTC

- The system voltage is between 9 - 16 V.

Conditions for Setting the DTC

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

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

Power Moding Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Retained Accessory Power Description and Operation

Electrical Information Reference

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

Scan Tool Reference

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

Circuit/System Testing

1. Ignition OFF/Vehicle OFF and all vehicle systems OFF, disconnect the X80 Accessory Power Receptacle.
2. Connect a test lamp between the ignition circuit terminal A and ground, Ignition ON/Vehicle in Service Mode.
3. Verify the test lamp turns ON and OFF when commanding the Accessory/Retained Accessory Power Relay On and Off with a scan tool.
 - **If the test lamp is always OFF**
 1. Ignition OFF/Vehicle OFF, remove test lamp, disconnect the harness connector at the K9 Body Control Module.
 2. Test for infinite resistance between the ignition circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance.
 3. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K9 Body Control Module.

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

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

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

4. Test or replace the X80 Accessory Power Receptacle.

Repair Instructions

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

- [Control Module References](#) for 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.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptor

DTC B144A

Run Power Relay Circuit

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Run Ignition 3 Voltage	B144A 02	-	-	-

Circuit/System Description

The body control module (BCM) feeds the ignition circuit by applying voltage when the vehicle is in Ignition ON/Vehicle in Service Mode or Ignition ON/Vehicle ON mode.

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 ignition circuit.

Action Taken When the DTC Sets

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

HVAC 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 Testing

1. Ignition OFF/Vehicle OFF, disconnect the X2 harness connector at the K33 HVAC control module.
2. Connect a test lamp between the ignition circuit terminal 9 and ground.
3. Verify the test lamp turns ON and OFF when cycling the S83 vehicle ON/OFF switch between Ignition ON/Vehicle in Service Mode and Ignition OFF/Vehicle OFF.
 - **If the test lamp is always OFF**
 1. Ignition OFF/Vehicle OFF, remove the test lamp.
 2. Test for infinite resistance between the ignition circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for less than 2 Ω in the ignition circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K9 Body Control Module.
 - **If the test lamp is always ON**
 1. Ignition OFF/Vehicle OFF, remove the test lamp.
 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**
4. Test or replace the K33 HVAC control module.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair.

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

DTC B144B: RUN/CRANK POWER RELAY CIRCUIT

Diagnostic Instructions

- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.

- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptors

DTC B144B

Run/Crank Power Relay Circuit

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ignition	B144B 02*	B144B 05*	B144B 01*	-
Control	B144B 02**	-	-	-
* DTC set in keyless entry control module				
** DTC Set in BCM				

Circuit/System Description

The body control module (BCM) controls the ignition main relay 1 and the ignition main relay 2 through their control circuits by applying voltage to the ignition run/crank relay coil control circuit. The ignition main relay 1 and ignition main relay 2 are energized when the ignition is ON, or when a remote start is requested.

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

Conditions for Running the DTC

System voltage greater than 9 V.

Conditions for Setting the DTC

B144B 01

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

B144B 02

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

B144B 05

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

Action Taken When the DTC Sets

B144B 01, B144B 05

No action is taken.

B144B 02

The ignition main relay 1 and the ignition main relay 2 are deactivated when the fault is set. After 100 ms, the ignition main relay 1 and the ignition main relay 2 will be activated. If the fault is still set, the relays will be deactivated. The ignition main relay 1 and the ignition main relay 2 will again be activated after 100 ms. If this also results in a fault, the ignition main relay 1 and the ignition main relay 2 will be deactivated until a new ignition request is received.

Conditions for Clearing the DTC

- The current DTC will clear when the malfunction is no longer present and an ignition request is received.
- A history DTC will clear after 50 malfunction-free ignition cycles.

Diagnostic Aids

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

Reference Information

Schematic Reference

Power Moding Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Power Mode Description and Operation

Electrical Information Reference

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

Scan Tool Reference

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

Circuit/System Verification

1. Ignition ON/Vehicle in Service Mode.
2. Verify the KR73A Ignition Main Relay 1 and the KR73B Ignition Main Relay 2 click ON and OFF when commanding the Run/Crank relay On and Off with a scan tool.
 - **If the KR73A Ignition Main Relay 1 or the KR73B Ignition Main Relay 2 do not click ON and OFF**

Refer to Circuit/System Testing.
 - **If the KR73A Ignition Main Relay 1 and the KR73B Ignition Main Relay 2 click ON and OFF**
3. All OK.

Circuit/System Testing

1. Ignition ON/Vehicle in Service Mode, disconnect the X1 harness connector at the K84 Keyless Entry Control Module.
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. Ignition OFF/Vehicle OFF, remove the test lamp.
 2. Test for less than 2 Ω in the B+ circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.

- If less than 2 Ω , verify the fuse is good and there is voltage at the fuse.
- **If the test lamp does not illuminate and the circuit fuse is open**
 1. Ignition OFF/Vehicle OFF, remove the test lamp.
 2. Test for infinite resistance between the 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/Vehicle OFF, connect the X2 harness connector at the K84 Keyless Entry Control Module and disconnect the X3 harness connector at the K9 Body Control Module.
- 4. Test for less than 1 V between the ignition circuit terminal 6 and ground.
 - **If 1 V or greater**

Repair the short to voltage on the circuit.
 - **If less than 1 V**
- 5. Ignition ON/Vehicle in Service Mode.
- 6. Verify a test lamp illuminates between the ignition circuit terminal 6 and ground.
 - **If the test lamp does not illuminate**
 1. Ignition OFF/Vehicle OFF, remove the test lamp.
 2. Test for infinite resistance between the ignition circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance.
 3. Test for less than 2 Ω in the ignition circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K84 Keyless Entry Control Module.
 - **If the test lamp illuminates**
- 7. Ignition OFF/Vehicle OFF, connect the X3 harness connector at the K9 Body Control Module.
- 8. Disconnect the KR73A Ignition Main Relay 1 and the KR73B Ignition Main Relay 2. It may take up to 2 min for all vehicle systems to power down.
- 9. Test for less than 10 Ω between the ground circuits listed below and ground.
 - KR73A Ignition Main Relay 1 - Ground circuit terminal 86
 - KR73B Ignition Main Relay 2 - Ground circuit terminal 86
 - **If 10 Ω or greater**
 1. Ignition OFF/Vehicle OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **If less than 10 Ω**
- 10. Ignition ON/Vehicle in Service Mode, connect a test lamp between the control circuits listed below and ground.
 - KR73A Ignition Main Relay 1 - Control circuit terminal 85
 - KR73B Ignition Main Relay 2 - Control 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/Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module.
 2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for less than 2 Ω in the control circuit end to end.

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

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

1. Ignition OFF/Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module, ignition ON.
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 KR73A Ignition Main Relay 1 or the KR73B Ignition Main Relay 2.

Repair Instructions

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

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

DTC B1451: ACCESSORY POWER CIRCUIT

Diagnostic Instructions

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

DTC Descriptors

DTC B1451

Accessory Power Circuit

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

Diagnostic Fault Information

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

Circuit/System Description

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

Conditions for Running the DTC

B1451 01, B1451 04

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

B1451 02

- Vehicle power mode is ACCESSORY or Ignition ON mode
- Module is awake
- The DTC is only run when the output is active
- DTC B1451 is not already set

- System voltage between 6 and 16 V

Conditions for Setting the DTC

B1451 01

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

B1451 02

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

B1451 04

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

Action Taken When the DTC Sets

B1451 02

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

B1451 01, B1451 04

No action is taken.

Conditions for Clearing the DTC

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

Diagnostic Aids

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

Reference Information

Schematic Reference

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

Connector End View Reference

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

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

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

1. Ignition OFF/Vehicle OFF, remove the test lamp.

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

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

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

1. Ignition OFF/Vehicle OFF, remove the test lamp.

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

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

- **If the test lamp illuminates**

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

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

- **If 1 V or greater**

Repair the short to voltage on the circuit.

- **If less than 1 V**

5. Ignition ON/Vehicle in Service Mode.

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

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

1. Ignition OFF/Vehicle OFF, remove the test lamp.

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

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

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

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the K84 Keyless Entry Control Module.

- **If the test lamp illuminates**

7. Replace the K9 Body Control Module.

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

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

DTC B147E OR B147F: BATTERY SAVER RELAY SET/RESET SECONDARY CIRCUIT

Diagnostic Instructions

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

DTC Descriptors

DTC B147E

Battery Saver Relay Set Secondary Circuit

DTC B147F

Battery Saver Relay Reset Secondary Circuit

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

Diagnostic Fault Information

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

Circuit/System Description

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 keyless entry or content theft features. Battery saver mode is initiated by turning on the hazard flashers, applying the brake pedal, and then turning the ignition key to the start position or pushing the ignition mode switch with the foot on the brake for greater than 15 s. The mode is disengaged by repeating the previous process. The DIC (if equipped) will display transport mode is ON when battery saver mode is enabled and transport mode is OFF when battery saver mode is disabled. For vehicles not equipped with a DIC, the battery indicator light will constantly flash on the instrument cluster when battery saver mode is enabled. This feature can be used as many times as necessary if the vehicle is to be stored for an extended period of time.

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

Conditions for Running the DTC

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

Conditions for Setting the DTC

B147E 01 or B147F 01

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

B147E 02 or B147F 02

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

B147E 04 or B147F 04

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

Action Taken When the DTC Sets

B147E 01, B147E 04, B147F 01, and B147F 04

No action is taken.

B147E 02 and B147F 02

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

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

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

Connector End View Reference

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

Scan Tool Reference

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

Circuit/System Verification

1. Enable battery saver mode (transport mode) in the vehicle.
2. Verify that the appropriate devices controlled by the KR104A Battery Saver Relay 1 turn ON and OFF after enabling battery saver mode (transport mode).
 - **If the devices do not turn ON and OFF**

Refer to Circuit/System Testing.

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

3. All OK.

Circuit/System Testing

1. Ignition OFF/Vehicle OFF and all vehicle systems OFF, disconnect the KR104A Battery Saver Relay 1. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 6 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF/Vehicle OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **If less than 10 Ω**
3. Ignition ON/Vehicle in Service Mode.
4. Verify a test lamp illuminates between the B+ circuit terminal 3 and ground.
 - **If the test lamp does not illuminate and the fuse is not open**
 1. Ignition OFF/Vehicle OFF, remove the test lamp.
 2. Test for less than 2 Ω in the B+ circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , verify the circuit breaker is not open and there is voltage at the fuse.
 - **If the test lamp does not illuminate and the fuse is open**
 1. Ignition OFF/Vehicle OFF, remove the test lamp.
 2. Test for infinite resistance between the B+ circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, test or replace the KR104A Battery Saver Relay 1.
 - **If the test lamp illuminates**
5. Enable battery saver mode (transport mode).
6. Ignition OFF/Vehicle OFF.
7. Connect a test lamp between the control circuit terminal 1 and ground.
8. Verify the test lamp momentarily flashes ON and OFF when turning the Ignition ON/Vehicle in Service Mode.
 - **If the test lamp is always OFF**
 1. Ignition OFF/Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module.
 2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K9 Body Control Module.
 - **If the test lamp is always ON**
 1. Ignition OFF/Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module, Ignition ON/Vehicle in Service Mode.
 2. Test for less than 1 V between the control circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K9 Body Control Module.
 - **If the test lamp turns ON and OFF**
9. Connect a test lamp between the control circuit terminal 2 and ground.
10. Verify the test lamp momentarily flashes ON and OFF after turning the Ignition OFF/Vehicle OFF.

NOTE:

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

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

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

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

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

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

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

- **If the test lamp illuminates**

Repair the short to voltage on the ignition circuit

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

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

- **If the device does not activate**

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

- **If the device activates**

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

Component Testing

Relay Test

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

Replace the relay.

- **If between 70 - 150 Ω**

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

4. Test for infinite resistance between the following terminals:

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

Replace the relay.

- **If infinite resistance**

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

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

- **If 5.0 Ω or greater**

Replace the relay.

- **If less than 5.0 Ω**

7. All OK

Repair Instructions

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

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

DTC B305E: INTERRUPTIBLE RAP RELAY CIRCUIT

Diagnostic Instructions

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

DTC Descriptor

DTC B305E

Interruptible RAP Relay Circuit

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Relay Coil Control	B305E 02	B305E 05	B305E 01, B305E 05	-

Circuit/System Description

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

Conditions for Running the DTC

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

Conditions for Setting the DTC

B305E 01

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

B305E 02

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

B305E 05

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

Action Taken When the DTC Sets

B305E 01, B305E 05

No action is taken.

B305E 02

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

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

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

Connector End View Reference

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Description and Operation

Retained Accessory Power Description and Operation

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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

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Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify the KR76 Retained Accessory Power Relay clicks ON and OFF when cycling the S83 vehicle ON/OFF switch between Vehicle in Service Mode and Vehicle OFF with the door open.
 - **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. Vehicle OFF and all vehicle systems OFF, disconnect the KR76 Retained Accessory Power Relay. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 85 and ground.
 - **If 10 Ω or greater**
 1. Vehicle OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **If less than 10 Ω**
3. Vehicle in Service Mode, connect a test lamp between the control circuit terminal 86 and ground circuit terminal 85.
4. Verify the test lamp turns ON and OFF when cycling the S83 vehicle ON/OFF switch between Vehicle in Service Mode and Vehicle OFF with the door open.
 - **If the test lamp is always OFF**
 1. Vehicle OFF, remove the test lamp, disconnect the harness connector at the K84 Keyless Entry Control Module.
 2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K84 Keyless Entry Control Module.
 - **If the test lamp is always ON**
 1. Vehicle OFF, remove the test lamp, disconnect the harness connector at the K84 Keyless Entry Control Module, Vehicle in Service Mode.
 2. Test for less than 1 V between the control circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K84 Keyless Entry Control Module.
 - **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.

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

DTC P15B9 OR P15BA: ELECTRIC A/C COMPRESSOR CONTROL MODULE IGNITION ON/START SWITCH CIRCUIT 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.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptors

DTC P15B9

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

DTC P15BA

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

Diagnostic Fault Information

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

Circuit/System Description

The body control module (BCM) controls the ignition main relay by applying voltage to the run/crank coil control circuit. The ignition circuit is energized when the vehicle power mode is Vehicle ON or Vehicle in Service Mode. The hybrid powertrain control module 2 receives the power mode status from the A/C compressor over serial data and compares this status to its own internal power mode status.

Conditions for Running the DTC

P15B9

- Vehicle power mode is Vehicle ON or Vehicle in Service Mode.
- Hybrid powertrain control module 2 is awake.
- DTC's P2534, P2535, or U016B is not set.
- System voltage greater than 10.2 V.

P15BA

- Vehicle power mode is Vehicle OFF.
- Hybrid powertrain control module 2 is awake.
- DTC's P2534, P2535, or U016B is not set.
- System voltage greater than 10.2 V.

Conditions for Setting the DTC

P15B9

- Vehicle power mode is Vehicle ON or Vehicle in Service Mode.
- Hybrid powertrain control module 2 ignition input is active.
- A/C compressor ignition input is not active for more than 2 s.

P15BA

- Vehicle power mode is Vehicle OFF.
- Hybrid powertrain control module 2 is awake.
- Hybrid powertrain control module 2 ignition input is not active.
- A/C compressor ignition input is active for more than 2 s

Action Taken When the DTC Sets

P15B9, P15BA

DTCs P15B9 and P15BA are type B DTCs.

Conditions for Clearing the DTC

P15B9 or P15BA

DTCs P15B9 and P15BA, are type B DTCs.

Diagnostic Aids

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

Reference Information

Schematic Reference

Power Distribution Schematics

Connector End View Reference

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- **Connector Repairs**
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- **Wiring Repairs**

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Verify DTC B144B is not set.

- **If the DTC is set**

Refer to **DTC B144B**.

- **If the DTC is not set**

2. Refer to Circuit/System Testing.

Circuit/System Testing

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

The High Voltage Disabling procedure 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.

1. Vehicle OFF, disconnect the X1 harness connector at the G1 A/C Compressor.
2. 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**
3. Vehicle in Service Mode
4. Verify a test lamp illuminates between the ignition circuit terminal 3 and ground.
 - **If the test lamp does not illuminate and the circuit fuse is good**
 1. Vehicle OFF.
 2. Test for less than 2 Ω in the ignition circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , refer to [Power Mode Mismatch](#).
 - **If the test lamp does not illuminate and the circuit fuse is open**
 1. Vehicle OFF, disconnect the harness connector at the G1 A/C Compressor and all devices that share the same ignition circuit.
 2. Test for infinite resistance between the ignition circuit terminal 3 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance.
 3. Connect each of the devices one at a time and test for greater than 10 Ω between the ignition circuit terminal 3 and ground.
 - If 10 Ω or less, disconnect the appropriate device and retest to verify if the short is in the circuit or the component.
 - If greater than 10 Ω replace the appropriate device.
 - **If the test lamp illuminates**
5. Replace the G1 A/C Compressor.

Repair Instructions

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

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

DTC P16E8: ENGINE CONTROLS IGNITION RELAY SIGNAL MESSAGE COUNTER INCORRECT

Diagnostic Instructions

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

DTC Descriptors

DTC P16E8

Engine Controls Ignition Relay Signal Message Counter Incorrect

Diagnostic Fault Information

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

Circuit/System Description

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

Conditions for Running the DTC

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

Conditions for Setting the DTC

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

Action Taken When the DTC Sets

DTC P16E8 is a Type B DTC.

Conditions for Clearing the DTC

DTC P16E8 is a Type B DTC.

Reference Information

Schematic Reference

Electronic Transmission Range Selector Schematics

Connector End View Reference

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- **Wiring Repairs**

Description and Operation

- **Electronic Transmission Range Selector Description**

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Verify that DTC P17B3 or P13B4 is not set.

- **If DTC P17B3 or P13B4 is set**

Refer to **DTC P17B3 or P17B4**.

- **If DTC P17B3 or P13B4 is not set**

2. Refer to Circuit/System Testing.

Circuit/System Testing

1. Ignition OFF/Vehicle OFF, and all vehicle systems OFF, disconnect the harness connector at the K173 Transmission Range Control Module. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between ground circuit terminal 8 and ground.
 - **If 10 Ω or greater**
 1. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **If less than 10 Ω**
3. Test for less than 1 V between the ignition circuit terminal 1 and ground.
 - **If 1 V or greater**

Repair the short to voltage on the circuit.
 - **If less than 1 V**
4. Ignition ON/Vehicle in Service Mode.
5. Verify a test lamp illuminates between terminal 1 and ground.
 - **If the test lamp does not illuminate and the circuit fuse is good**
 1. Ignition OFF/Vehicle OFF.
 2. Test for less than 2 Ω in the ignition circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , refer to [Power Mode Mismatch](#).
 - **If the test lamp does not illuminate and the circuit fuse is open**
 1. Ignition OFF/Vehicle OFF.
 2. Test for infinite resistance between the ignition circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - **If the test lamp illuminates**
6. Replace the K173 Transmission Range Control Module.

Repair Instructions

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

DTC P17B3 OR P17B4: TRANSMISSION RANGE CONTROL MODULE IGNITION 1 SWITCH CIRCUIT LOW 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.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptors

DTC P17B3

Transmission Range Control Module Ignition 1 Switch Circuit Low Voltage

DTC P17B4

Transmission Range Control Module Ignition 1 Switch Circuit High Voltage

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Diagnostic Fault Information

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

Circuit/System Description

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

Conditions for Running the DTC

P17B3

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

P17B4

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

Conditions for Setting the DTC

P17B3

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

P17B4

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

Action Taken When the DTC Sets

DTCs P17B3 and P17B4 are Type B DTCs.

Conditions for Clearing the DTC

DTCs P17B3 and P17B4 are Type B DTCs.

Reference Information

Schematic Reference

Electronic Transmission Range Selector Schematics

Connector End View Reference

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- [Wiring Repairs](#)

Description and Operation

- [Electronic Transmission Range Selector Description](#)

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Control Module References for scan tool information

Circuit/System Testing

1. Ignition OFF/Vehicle OFF, and all vehicle systems OFF, disconnect the X1 harness connector at the K173 Transmission Range Control Module. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between ground circuit terminal 8 and ground.
 - **If 10 Ω or greater**
 1. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **If less than 10 Ω**
3. Ignition ON/Vehicle in Service Mode, verify a test lamp illuminates between B+ circuit terminal 16 and ground.
 - **If the test lamp does not illuminate and the circuit fuse is good**
 1. Ignition OFF/Vehicle OFF.
 2. Test for less than 2 Ω in the B+ circuit end to end
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , verify the fuse is good and there is voltage at the fuse.
 - **If the test lamp does not illuminate and the circuit fuse is open**
 1. Ignition OFF/Vehicle OFF.
 2. Test for infinite resistance between the B+ circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - **If the test lamp illuminates**
4. Test for less than 1 V between the ignition circuit terminal 2 and ground.
 - **If 1 V or greater**

Repair the short to voltage on the circuit.
 - **If less than 1 V**
5. Ignition ON/Vehicle in Service Mode.
6. Verify a test lamp illuminates between terminal 2 and ground.
 - **If the test lamp does not illuminate and the circuit fuse is good**
 1. Ignition OFF/Vehicle OFF.
 2. Test for less than 2 Ω in the ignition circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , refer to **Power Mode Mismatch**.
 - **If the test lamp does not illuminate and the circuit fuse is open**
 1. Ignition OFF/Vehicle OFF.
 2. Test for infinite resistance between the ignition circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - **If the test lamp illuminates**
7. Replace the K173 Transmission Range Control Module.

Repair Instructions

- Perform the **Diagnostic Repair Verification** after completing the repair.
- Refer to **Control Module References** for control module replacement, programming, and setup.

Diagnostic Instructions

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

DTC Descriptor

DTC P17B5

Transmission Range Control Module Ignition Switch Accessory Position Circuit Low Voltage

Diagnostic Fault Information

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

Circuit/System Description

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

Conditions for Running the DTC

The ignition is in the ACCESSORY or RUN position.

Conditions for Setting the DTC

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

Action Taken When the DTC Sets

DTC P17B5 is a Type C DTC.

Conditions for Clearing the DTC

DTC P17B5 is a Type C DTC.

Reference Information

Schematic Reference

Data Communication Schematics

Connector End View Reference

- **COMPONENT CONNECTOR END VIEWS - INDEX**
- **INLINE HARNESS CONNECTOR END VIEWS - INDEX**

Description and Operation

Data Link Communications Description and Operation

Electrical Information Reference

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

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Verify DTC U1814 or U2099 is not set.

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

Refer to **Diagnostic Trouble Code (DTC) List - Vehicle** .

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

2. Refer to Circuit/System Testing.

Circuit/System Testing

1. Ignition OFF/Vehicle OFF, disconnect the harness X1 connector at the K173 Transmission Range Control Module.

2. Ignition ON/Vehicle in Service Mode.

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

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

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

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

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

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

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

- **If the test lamp illuminates**

4. Replace the K173 Transmission Range Control Module.

Repair Instructions

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

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

DTC P1A5E OR P1A5F: BATTERY ENERGY CONTROL MODULE 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.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptors

DTC P1A5E

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

DTC P1A5F

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

Diagnostic Fault Information

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

Circuit/System Description

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

Conditions for Running the DTC

P1A5E

- Hybrid powertrain control module 2 is awake.
- Vehicle power mode is Vehicle ON or Vehicle in Service Mode.
- Battery energy control module is awake.
- System voltage greater than 9 V.

P1A5F

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

Conditions for Setting the DTC

P1A5E

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

P1A5F

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

Action Taken When the DTC Sets

P1A5E, P1A5F

DTCs P1A5E and P1A5F are type B DTCs.

Conditions for Clearing the DTC

P1A5E, P1A5F

DTCs P1A5E and P1A5F are type B DTCs.

Diagnostic Aids

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

Reference Information

Schematic Reference

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Power Distribution Schematics

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Power Mode Description and Operation

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

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

Refer to **DTC B144B**.
 - **If the DTC is not set**
2. Refer to Circuit/System Testing.

Circuit/System Testing

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

The High Voltage Disabling procedure 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.

1. Vehicle OFF, disable the high voltage at the A4 Hybrid/EV Battery Pack. Refer to **High Voltage Disabling**
2. Connect the 12 V battery, disconnect the X358 harness connector at the A4 Hybrid/EV Battery Pack.
3. Verify that a test lamp does not illuminate between the ignition circuit terminal 4 and ground.
 - **If the test lamp illuminates**

Repair the short to voltage on the ignition circuit.
 - **If the test lamp does not illuminate**
4. Vehicle in Service Mode

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

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

1. Vehicle OFF.

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

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

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

1. Vehicle OFF, disconnect the harness connector at all devices that share the same ignition circuit.

2. Test for infinite resistance between the ignition circuit terminal 4 and ground.

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

3. Vehicle OFF, remove the A4 Hybrid/EV Battery Pack cover. Refer to [Battery Upper Cover Replacement](#)

4. Connect the **EL-52014** low voltage jumper harness extension.

5. Disconnect the X8 harness connector at the K16 Battery Energy Control Module.

6. Test for infinite resistance between the ignition circuit terminal 9 and ground.

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

7. Connect each of the devices that share the same ignition circuit one at a time and test for greater than 100 Ω between the ignition circuit terminal 9 and ground.

- If 100 Ω or less, disconnect the appropriate device and retest to verify if the short is in the circuit or the component.
- If greater than 100 Ω replace the appropriate device.

- **If the test lamp illuminates**

6. Vehicle OFF, remove the A4 Hybrid/EV Battery Pack cover. Refer to [Battery Upper Cover Replacement](#)

7. Connect the **EL-52014** low voltage jumper harness extension.

8. Disconnect the X8 harness connector at the K16 Battery Energy Control Module.

9. Verify that a test lamp does not illuminate between the ignition circuit terminal 9 and ground.

- **If the test lamp illuminates**

Repair the short to voltage on the ignition circuit.

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

10. Vehicle in Service Mode

11. Verify a test lamp illuminates between the ignition circuit terminal 9 and ground.

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

1. Vehicle OFF.

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

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

- **If the test lamp illuminates**

12. Replace the K16 Battery Energy Control Module.

Repair Instructions

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

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

DTC P1A60: BATTERY ENERGY CONTROL MODULE IGNITION ACCESSORY SWITCH CIRCUIT LOW VOLTAGE

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Diagnostic Instructions

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

DTC Descriptors

DTC P1A60

Battery Energy Control Module Ignition Accessory Switch Circuit Low Voltage

Diagnostic Fault Information

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

Circuit/System Description

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

Conditions for Running the DTC

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

Conditions for Setting the DTC

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

Action Taken When the DTC Sets

DTC P1A60 is a type B DTC.

Conditions for Clearing the DTC

DTC P1A60 is a type B DTC.

Diagnostic Aids

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

Reference Information

Schematic Reference

Data Communication Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Power Mode Description and Operation

Electrical Information Reference

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

DTC Type Reference

[Powertrain Diagnostic Trouble Code \(DTC\) Type Definitions](#)

Scan Tool Reference

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

Circuit/System Verification

1. Verify DTC U1814, U2099, or P06E4 is not set.

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

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

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

2. Refer to Circuit/System Testing.

Circuit/System Testing

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

The High Voltage Disabling procedure 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.

1. Vehicle OFF, disable the high voltage at the A4 Hybrid/EV Battery Pack. Refer to [High Voltage Disabling](#)

2. Connect the 12 V battery, disconnect the X357 harness connector at the A4 Hybrid/EV Battery Pack.

3. Connect a test lamp between the serial data wake-up circuit terminal 5 and ground.

4. Verify the test lamp turns ON and OFF when cycling the S39 Ignition Mode Switch between Vehicle in Service Mode and Vehicle OFF.

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

1. Vehicle OFF, disconnect the harness connector at the K114B Hybrid/EV Powertrain Control Module 2.

2. Test for less than 2 Ω in the serial data wake-up circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the K114B Hybrid/EV Powertrain Control Module 2.

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

1. Vehicle OFF, disconnect the harness connector at the K114B Hybrid/EV Powertrain Control Module 2.

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

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

- If less than 1 V, replace the K114B Hybrid/EV Powertrain Control Module 2.

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

5. Vehicle OFF, remove the A4 Hybrid/EV Battery Pack cover. Refer to [Battery Upper Cover Replacement](#)
6. Connect the **EL-52014** low voltage jumper harness extension.
7. Disconnect the X8 harness connector at the K16 Battery Energy Control Module.
8. Connect a test lamp between the serial data wake-up circuit terminal 3 and ground.
9. Verify the test lamp turns ON and OFF when cycling the S39 Ignition Mode Switch between Vehicle in Service Mode and Vehicle OFF.

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

1. Vehicle OFF, disconnect the **EL-52014** low voltage jumper harness extension.
2. Test for less than 2 Ω in the serial data wake-up circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.

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

1. Vehicle OFF, disconnect the **EL-52014** low voltage jumper harness extension.
2. Test for less than 1 V between the ignition circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.

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

10. Replace the K16 Battery Energy Control Module.

Repair Instructions

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

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

DTC P2534 OR P2535: IGNITION ON/START SWITCH CIRCUIT 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.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptors

DTC P2534

Ignition On/Start Switch Circuit Low Voltage

DTC P2535

Ignition On/Start Switch Circuit High Voltage

Diagnostic Fault Information

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

Circuit/System Description

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

Conditions for Running the DTC

P2534, P2535

The control module is awake.

Conditions for Setting the DTC

P2534

The control module detects 2 V or less on the ignition voltage circuit.

P2535

The control module detects greater than 5 V or greater on the ignition voltage circuit, with the ignition turned OFF.

Action Taken When the DTC Sets

P2534, P2535

DTCs P2534 and P2535 are type A DTCs.

Conditions for Clearing the DTC

P2534, P2535

DTCs P2534 and P2535 are type A DTCs.

Diagnostic Aids

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

Reference Information

Schematic Reference

Power Distribution Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Power Mode Description and Operation

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Verify DTC B144B is not set.

- **If the DTC is set**

Refer to **DTC B144B**.

- If the DTC is not set

2. Refer to Circuit/System Testing.

Circuit/System Testing

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

The High Voltage Disabling procedure 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.

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

2. Verify that a test lamp does not illuminate between the ignition circuit and ground.

- **If the test lamp illuminates**

Repair the short to voltage on the ignition circuit.

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

3. Vehicle in Service Mode.

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

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

1. Vehicle OFF, remove the test lamp.

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

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

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

1. Vehicle OFF, remove the test lamp.

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

- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance, replace the control module setting the DTC.

- **If the test lamp illuminates**

5. Replace the control module setting the DTC.

Repair Instructions

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

[Control Module References](#) for the appropriate 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.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category. cardiagn.com

DTC Descriptors

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, P06E4, U1814, U2099	P2537	-	-

Circuit/System Description

The control module continuously monitors the voltage on the ignition accessory circuit every 0.1s. Higher or lower than normal voltage may cause erratic vehicle operation.

Conditions for Running the DTC

P2537

Propulsion system is active for 5 s.

Conditions for Setting the DTC

P2537

The device detects the accessory voltage circuit is open for 0.1 s.

Action Taken When the DTC Sets

P2537

P2537 is a Type B DTC.

Conditions for Clearing the DTC

P2537

P2537 is a Type B DTC.

Diagnostic Aids

Short to ground may set multiple no communication codes for high speed GMLAN devices.

Reference Information

Schematic Reference

Data Communication 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**](#)

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Verify DTC U1814, U2099, or P06E4 is not set.

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

Refer to Diagnostic Trouble Code (DTC) List - Vehicle .

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

2. Refer to Circuit/System Testing.

Circuit/System Testing

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

The High Voltage Disabling procedure 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.

Hybrid/EV Powertrain Control Module 2 Circuit Malfunction

1. Vehicle OFF, disconnect the X2 harness connector at the K114B Hybrid/EV Powertrain Control Module 2.
2. Vehicle in Service Mode.
3. Verify a test lamp illuminates between the accessory wake up serial data circuit terminal 67 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 K114B Hybrid/EV Powertrain Control Module 2.

Engine Control Module Circuit Malfunction

1. Vehicle OFF and all vehicle systems off, disconnect the X1 harness connector at the K20 Engine Control Module.
2. Vehicle in Service Mode.
3. Verify a test lamp illuminates between the Accessory Wake up Serial Data 2 circuit terminal 43 and ground.

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

1. Vehicle OFF, remove the test lamp, disconnect the harness connector at the KR114B Hybrid/EV Powertrain Control Module 2.
2. Test for less than 2 Ω on the Accessory Wake up Serial Data 2 circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the KR114B Hybrid/EV Powertrain Control Module 2.
- **If the test lamp illuminates**
4. Replace the control module setting the K20 Engine Control Module.

Repair Instructions

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

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

SYMPTOMS - WIRING SYSTEMS

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

1. Perform the [Diagnostic System Check - Vehicle](#) before using the symptom tables in order to verify that all of the following are true:
 - There are no DTCs set.
 - The control modules can communicate via the serial data links.
2. Review the system operation in order to familiarize yourself with the system functions. Refer to:
 - [Power Mode Description and Operation](#)
 - [Retained Accessory Power Description and Operation](#)

Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the systems. 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](#)
- [Vehicle ON/OFF Switch Indicator Malfunction](#)
- [Vehicle Will Not Change Power Mode](#)

POWER MODE MISMATCH

Diagnostic Instructions

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

Circuit/System Description

The body control module (BCM) controls the ignition main relay by applying voltage to their individual relay control circuits. The BCM controls the ignition main relay through the control circuit by applying

voltage to the run/crank relay coil control circuit. The ignition main relay is energized when the vehicle is in Service Mode, the vehicle is ON, or when a remote start is requested.

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

The engine control module (ECM) controls the engine controls the ignition relay by applying voltage to the engine controls relay control circuit.

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

1. Vehicle in Service Mode.
2. Verify that the appropriate devices controlled by the KR73A Ignition Main Relay 1 turn ON and OFF when commanding the Run/Crank Relay On and Off with a scan tool.
 - **If the devices do not turn ON and OFF**

Refer to Circuit/System Testing - Diagnostic A.

- **If the devices turn ON and OFF**
3. Verify that the appropriate devices controlled by the KR73B Ignition Main Relay 2 turn ON and OFF when commanding the Run/Crank Relay On and Off with a scan tool.
 - **If the devices do not turn ON and OFF**

Refer to Circuit/System Testing - Diagnostic B.

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

4. Verify that the appropriate devices controlled by the KR76 Retained Accessory Power Relay turn ON and OFF when cycling the between Vehicle in Service Mode and Vehicle OFF.

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

Refer to Circuit/System Testing - Diagnostic C.

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

5. All OK.

Circuit/System Testing

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

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

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

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

Diagnostic A

1. Vehicle OFF and all vehicle systems OFF, disconnect the KR73A Ignition Main Relay 1. It may take up to 2 min for all vehicle systems to power down.

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

- **If 10 Ω or greater**

1. Vehicle OFF.

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

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

- **If less than 10 Ω**

3. Vehicle in Service Mode.

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

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

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

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

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

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

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

- **If the test lamp illuminates**

Repair the short to voltage on the ignition circuit.

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

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

- Ignition circuit terminal 87
- Ignition circuit terminal 87A

9. Verify the device is activated.

- **If the device does not activate**

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

- **If the device activates**

10. Test or replace the KR73A Ignition Main Relay 1.

Diagnostic B

1. Vehicle OFF and all vehicle systems OFF, disconnect the KR73B Ignition Main Relay 2. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 85 and ground.
 - **If 10 Ω or greater**
 1. Vehicle OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **If less than 10 Ω**
3. Vehicle in Service Mode.
4. Verify a test lamp illuminates between the B+ circuit terminal 30 and ground.

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

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

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

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

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

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

- **If the test lamp illuminates**

Repair the short to voltage on the ignition circuit.

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

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

- **If the device activates**

10. Test or replace the KR73B Ignition Main Relay 2.

Diagnostic C

1. Vehicle OFF and all vehicle systems OFF, disconnect the KR76 Retained Accessory Power Relay. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 85 and ground.

- **If 10 Ω or greater**

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

- If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **If less than 10 Ω**
3. Vehicle in Service Mode.
 4. Verify a test lamp illuminates between the B+ circuit terminal 30 and ground.
 - **If the test lamp does not illuminate**
Replace the X51A Fuse Block - Instrument Panel
 - **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 cycling the between Vehicle in Service Mode and Vehicle OFF.
 - **If the test lamp is always OFF**
 1. Vehicle OFF, remove the test lamp, disconnect the harness connector at the K84 Keyless Entry Control Module.
 2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance.
 3. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K84 Keyless Entry Control Module.
 - **If the test lamp is always ON**
 1. Vehicle OFF, remove the test lamp, disconnect the harness connector at the K84 Keyless Entry Control Module, Vehicle in Service Mode.
 2. Test for less than 1 V between the control circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K84 Keyless Entry Control Module.
 - **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. Vehicle in Service Mode, connect a 40 A fused jumper wire between the B+ circuit terminal 30 and the ignition circuit terminal 87.
 9. Verify device is activated.
 - **If the device does not activate**
 1. Vehicle OFF, disconnect the harness connector at the device.
 2. Test for infinite resistance between the ignition circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for less than 2 Ω in the ignition circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the device.
 - **If the device activates**
 10. Test or replace the KR76 Retained Accessory Power Relay.

Component Testing

Relay Test

1. Vehicle OFF, disconnect the appropriate relay.

2. Test for 70 - 150 Ω between terminals (85 or 1) and (86 or 2).

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

Replace the relay.

- **If between 70 - 150 Ω**

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

- (30 or 3) and (86 or 2)
- (30 or 3) and (87 or 5)
- (30 or 3) and (85 or 1)
- (85 or 1) and (87 or 5)
- (86 or 2) and (87 or 5)

- **If less than infinite resistance**

Replace the relay.

- **If infinite resistance**

4. Install a 3 A fused jumper wire between relay terminal (85 or 1) and 12 V. Install a jumper wire between relay terminal (86 or 2) and ground.

5. Test for less than 5.0 Ω between terminals (30 or 3) and (87 or 5).

- **If 5.0 Ω or greater**

Replace the relay.

- **If less than 5.0 Ω**

6. All OK

Repair Instructions

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

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

RETAINED ACCESSORY POWER MALFUNCTION

Diagnostic Instructions

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

Diagnostic Fault Information

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

Circuit/System Description

The keyless entry control module controls the retained accessory power relay by applying voltage to the interruptible retained accessory power relay coil control circuit. The retained accessory power relay is energized during all power modes, except OFF-awake. The relay is also energized for approximately 10

min after shutting the vehicle OFF providing no door is opened. and during transmitter authentication. The keyless entry control module will deactivate components that may cause radio frequency (RF) interference when the vehicle on/off switch is pressed which may result in NO REMOTE DETECTED displayed on the driver information center. The relay is also energized for approximately 10 min after shutting the vehicle OFF, providing no door is opened.

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

Electrical Information Reference

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

Scan Tool Reference

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

Circuit/System Verification

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

1. Ignition ON.
2. Verify the appropriate devices controlled by the KR76 Retained Accessory Power Relay turn ON and OFF when cycling the S83 vehicle ON/OFF switch between Vehicle in Service Mode and Vehicle OFF with the door open.
 - **If the devices do not turn ON and OFF**

Refer to Circuit/System Testing

- **If the devices turn ON and OFF**
3. All OK.

Circuit/System Testing

1. Vehicle OFF and all vehicle systems OFF, disconnect the KR76 Retained Accessory Power Relay. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 85 and ground.
 - **If 10 Ω or greater**
 1. Vehicle OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.

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

- **If less than 10 Ω**

3. Vehicle in Service Mode.

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

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

Replace the X51A Fuse Block - Instrument Panel

- **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 cycling the S83 vehicle ON/OFF switch between Vehicle in Service Mode and Vehicle OFF with the door open.

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

1. Vehicle OFF, remove the test lamp, disconnect the harness connector at the K84 Keyless Entry Control Module.

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

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

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

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the K84 Keyless Entry Control Module.

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

1. Vehicle OFF, remove the test lamp, disconnect the harness connector at the K84 Keyless Entry Control Module, Vehicle in Service Mode.

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 K84 Keyless Entry 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 or T22 Mobile Device Wireless Charger Module.

9. Vehicle OFF.

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

- X80H Accessory Power Receptacle - Center Console - Ignition circuit terminal A
- X80L Accessory Power Receptacle - Center Console Rear - Ignition circuit terminal A
- T22 Mobile Device Wireless Charger Module - Ignition circuit terminal 1

- **If the test lamp illuminates**

Repair the short to voltage on the ignition circuit.

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

11. Vehicle in Service Mode.

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

- X80H Accessory Power Receptacle - Center Console - Ignition circuit terminal A
- X80L Accessory Power Receptacle - Center Console Rear - Ignition circuit terminal A
- T22 Mobile Device Wireless Charger Module - Ignition circuit terminal 1

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

1. Vehicle OFF, remove the test lamp.

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

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , test or replace the K84 Keyless Entry Control Module.

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

1. Vehicle OFF, remove the test lamp.

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

- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance, test or replace the appropriate X80 Accessory Power Receptacle or T22 Mobile Device Wireless Charger Module.

- **If the test lamp illuminates**

13. Test or replace the appropriate X80 Accessory Power Receptacle or T22 Mobile Device Wireless Charger Module.

Component Testing

Relay Test

1. Vehicle 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 following terminals:

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

- **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 41 and 12 V. Install a jumper wire between relay terminal 40 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

Repair Instructions

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

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

VEHICLE ON/OFF SWITCH INDICATOR MALFUNCTION

Diagnostic Instructions

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

Diagnostic Fault Information

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

Circuit/System Description

The vehicle ON/OFF switch has a single LED that indicates the vehicle power mode. When the vehicle is in the OFF mode, the LED is not illuminated. Pressing and holding the vehicle ON/OFF switch for at least 5 s, without the brake pedal applied, will enter the Vehicle Service Mode and the blue LED will illuminate. With the vehicle OFF and the brake pedal applied, pressing the vehicle ON/OFF switch once, the vehicle will enter the Vehicle ON mode and the blue LED will illuminate.

The vehicle ON/OFF switch contains two individual switches that provides redundant switch inputs to both the body control module (BCM) and the keyless entry control module. The BCM supplies the vehicle ON/OFF switch a constant B+ signal. The BCM monitors this signal to determine if the switch is released or pressed. When the vehicle ON/OFF switch is not pressed, voltage on the signal circuit is pulled down through two resistors in the switch. When the vehicle ON/OFF switch is pressed, voltage on the signal circuit is pulled down through only one resistor, changing the voltage seen at the BCM and indicating that the vehicle ON/OFF switch is pressed.

The keyless entry control module monitors voltage on the switch in the same manner as the BCM, but monitors the second switch located in the vehicle ON/OFF switch.

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. Verify the blue LED illuminates when the S83 Vehicle ON/OFF Switch is pressed and held for at least 5 s, with the brake pedal released.
 - **If the blue LED does not illuminate**

- **If the blue LED illuminates**

2. All OK.

Circuit/System Testing

1. Vehicle OFF and all vehicle systems OFF, disconnect the harness connector at the S83 Vehicle ON/OFF Switch. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the low reference circuit terminal 4 and ground.
 - **If 10 Ω or greater**
 1. Vehicle OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **If less than 10 Ω**
3. Test for less than 1 V between the control circuit terminal 5 and ground.
 - **If 1 V or greater**
 1. Vehicle OFF, disconnect the harness connector at the K9 Body Control Module, Vehicle in Service Mode.
 2. Test for less than 1 V between the control circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V
 3. Test for less than 2 Ω in 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 less than 1 V**
4. Vehicle OFF, connect the harness connector at the S83 Vehicle ON/OFF Switch.
5. Vehicle in Service Mode, disconnect the harness connector at the S83 Vehicle ON/OFF Switch.
6. Verify a test lamp illuminates between the control circuit terminal 5 and ground.
 - **If the test lamp does not illuminate**
 1. Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module.
 2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K9 Body Control Module.
 - **If the test lamp illuminates**
7. Test or replace the S83 Vehicle ON/OFF Switch.

Component Testing

1. Vehicle OFF, disconnect the harness at the S83 Vehicle ON/OFF Switch.
2. Connect a jumper wire between the S83 Vehicle ON/OFF Switch terminal 4 and ground.
3. Connect a 3 A fused jumper wire between the S83 Vehicle ON/OFF Switch terminal 5 and B+.
4. Verify the blue LED illuminates.
 - **If the LED does not illuminate**

Replace the S83 vehicle ON/OFF switch.
 - **If the LED illuminates**

Repair Instructions

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

- [Control Module References](#) for the 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.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal - Terminal 3	B097B 02*	B097B 05*	B097B 05*	-
Signal - Terminal 6	2	B097B 05*	2	-
Low Reference	-	B097B 05*	-	-
Ground	-	1	-	-
1. Vehicle ON/OFF Switch Indicator Always Off 2. Power Mode Mismatch * DTC set in keyless entry control module				

Circuit/System Description

The vehicle ON/OFF switch has a single LED that indicate the vehicle power mode. When the vehicle is in the off mode, the LED is not illuminated. Pressing and holding the vehicle ON/OFF switch for up to 10 s, without the brake pedal applied, will enter the Vehicle Service Mode and the blue LED will illuminate. With the vehicle OFF and the brake pedal applied, pressing the vehicle ON/OFF switch once, the vehicle will enter the Vehicle ON mode and the blue LED will illuminate.

The vehicle ON/OFF switch contains 2 individual switches that provides redundant switch inputs to both the body control module (BCM) and the keyless entry control module. The BCM supplies the vehicle ON/OFF switch a constant B+ signal. The BCM monitors this signal to determine if the switch is released or pressed. When the vehicle ON/OFF switch is not pressed, voltage on the signal circuit is pulled down through 2 resistors in the switch. When the vehicle ON/OFF switch is pressed, voltage on the signal circuit is pulled down through only one resistor, changing the voltage seen at the BCM and indicating that the vehicle ON/OFF switch is pressed.

The keyless entry control module monitors voltage on the switch in the same manner as the BCM, but monitors the second switch located in the vehicle ON/OFF switch. The keyless entry control module also controls the backup power for the ignition run relay through the control circuit by applying voltage to the ignition voltage circuit. This circuit is a pass-thru in the BCM and will energize the ignition circuit when the vehicle is in Service Mode, the vehicle is ON, or when a remote start is requested.

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](#)

Electrical Information Reference

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

Scan Tool Reference

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

Circuit/System Verification

1. Verify DTC B097B 08 or B097B 61 is not set.
 - **If either DTC is set**
Test or replace the S83 Vehicle On/Off Switch.
 - **If the DTCs are not set**
2. Verify the blue LED illuminates when the S83 Vehicle On/Off Switch is pressed and held for up to 10 s, with the brake pedal released.
 - **If the blue LED does not illuminate**
Refer to Circuit/System Testing.
 - **If the blue LED illuminates**
3. All OK.

Circuit/System Testing

1. Vehicle OFF and all vehicle systems OFF, disconnect the harness connector at the S83 Vehicle On/Off 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 S83 Vehicle On/Off Switch, Vehicle in Service Mode.
5. Disconnect the S83 Vehicle On/Off 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 S83 Vehicle On/Off Switch.
 2. Vehicle OFF, disconnect the X2 harness connector at the K9 Body Control Module and S83 Vehicle On/Off 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 S83 Vehicle On/Off Switch.
 10. Verify the scan tool K9 Body Control Module Push Button Ignition Switch Voltage parameter is 8 - 10 V, with the S83 Vehicle On/Off Switch released.
 - **If not between 8 - 10 V**
Test or replace the S83 Vehicle On/Off 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 S83 Vehicle On/Off Switch pressed.
 - **If not between 4 - 7 V**
Test or replace the S83 Vehicle On/Off 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. Vehicle in Service Mode.
 15. Test for less than 1 V between the signal circuit terminal 11 and ground.
 - **If 1 V or greater**
Repair the short to voltage on the circuit.
 - **If less than 1 V**
 16. Test for 4.5 - 5.5 k Ω between the signal circuit terminal 11 and the low reference circuit terminal 12, with the S83 Vehicle On/Off Switch released.
 - **If not between 4.5 - 5.5 k Ω**
 1. Vehicle OFF, disconnect the harness connector at the S83 Vehicle On/Off 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 S83 Vehicle On/Off 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 S83 Vehicle On/Off Switch pressed.

- **If not between 1 - 1.5 k Ω**

Test or replace the S83 Vehicle On/Off Switch.

- **If between 1 - 1.5 k Ω**

18. Replace the K84 Keyless Entry Control Module.

Component Testing

Ignition Mode Switch Test

1. Vehicle OFF, disconnect the harness connector at the S83 vehicle ON/OFF switch.
2. With the S83 vehicle ON/OFF switch released, test for 4.5 - 5.5 k Ω between the terminal 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 S83 Vehicle On/Off Switch.

- **If between 4.5 - 5.5 k Ω**

3. With the S83 Vehicle On/Off Switch pressed, test for 1 - 1.5k 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 S83 Vehicle On/Off Switch.

- **If between 1 - 1.5 k Ω**

4. All OK.

Repair Instructions

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

- [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:

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- 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

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)

Test Adapter	Description
J-35616-31	500 Male Probe Adapter (orange)
J-35616-32	500 Female Probe Adapter (orange)
J-35616-33	160/180 Male Probe Adapter (yellow)
J-35616-34	160/180 Female Probe Adapter (yellow)
J-35616-35	280 Male Probe Adapter (violet)
J-35616-40	480 Male Probe Adapter (dk blue)
J-35616-41	480 Female Probe Adapter (dk blue)
J-35616-42	630 Male Probe Adapter (red)
J-35616-43	630 Female Probe Adapter (red)
J-35616-44	800 Male Probe Adapter (yellow)
J-35616-45	800 Female Probe Adapter (yellow)
J-35616-54	280 Male (round) Probe Adapter (tan)
J-35616-55	280 Female (round) Probe Adapter (tan)
J-35616-64B	0.64 Male Probe Adapter (lt blue)
J-35616-65B	0.64 Female Probe Adapter (lt blue)
J-35616-66	150 Male (round) Probe Adapter (yellow)
J-35616-67	150 Female (round) Probe Adapter (yellow)

Backprobe

NOTE:

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

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

TROUBLESHOOTING WITH A DIGITAL MULTIMETER

Special Tools

EL-39200 Digital Multimeter (DMM)

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.

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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.

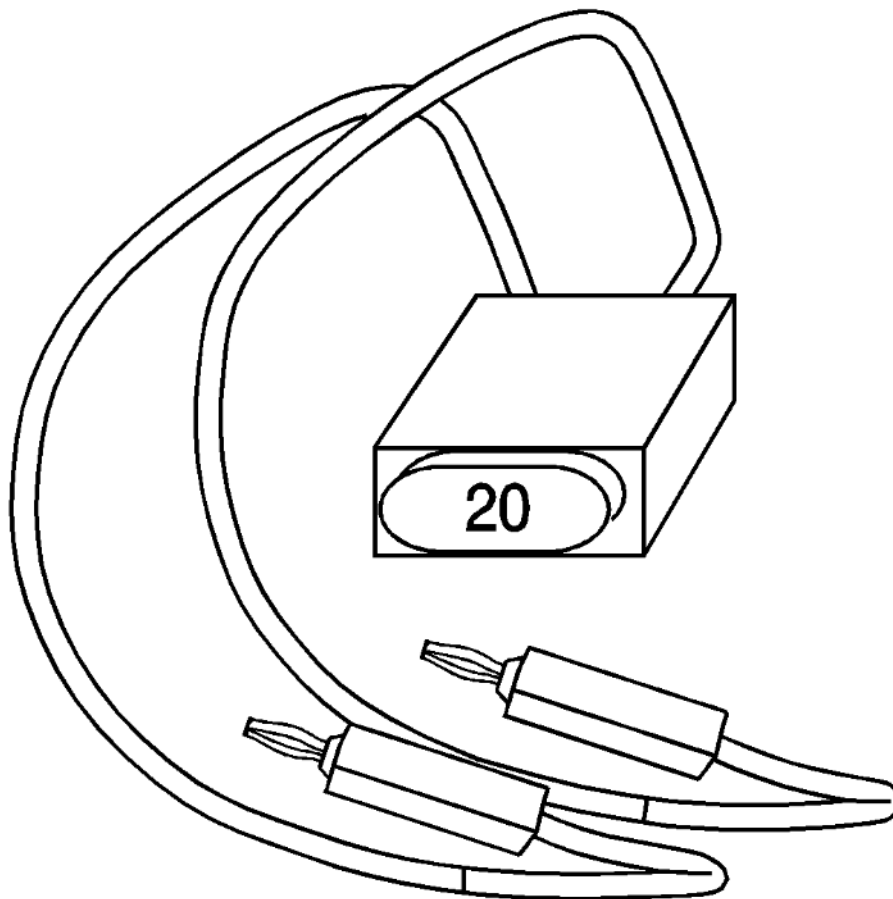


Fig. 1: Fused Jumper Wire

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:
 - Vehicle power mode to Vehicle in Service Mode or Vehicle On.
 - 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.

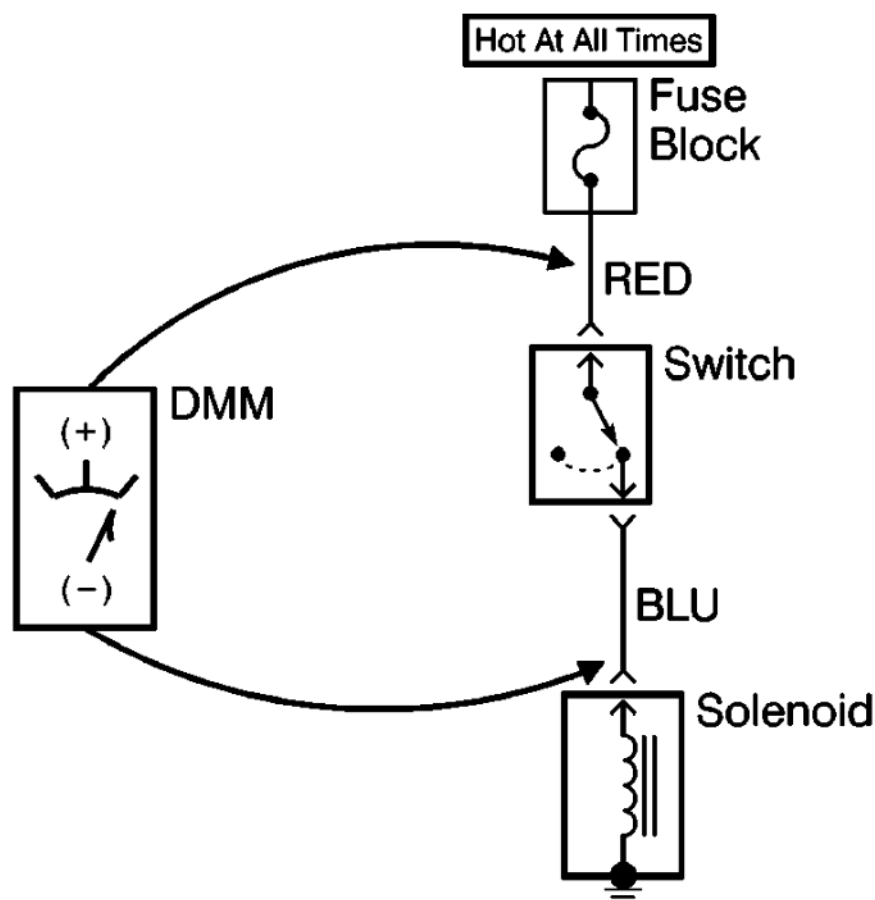


Fig. 2: Measuring Voltage Drop
Courtesy of GENERAL MOTORS COMPANY

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), door jamb striker (if attached to metal), 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 vehicle power mode in Vehicle ON or Vehicle in Service Mode, and drop to 15 - 25 Ω after switching the vehicle off. The reading will drop below 10 Ω after 30 - 40 s, then below 5 Ω after 60 s. Once the vehicle completely goes to sleep (generally 3-10 min) 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:

- Vehicle off
- Transmitter out of range of the vehicle
- Retained Accessory Power off (open and close the driver door after vehicle 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 vehicle power mode is Vehicle OFF
- Wait up to 60 s (after all other listed conditions are met)

Locking the doors with a remote transmitter can greatly reduce the time to achieve a valid ground or low reference continuity test result.

There are some low reference circuits that use a driver to isolate the circuit while the ignition is off. This is done in most cases for accidental reverse battery connections or reverse polarity jump starting. When this driver is present, the ignition will need to be on to validate the circuit.

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. Switch the vehicle power mode to Vehicle in Service Mode and operate all accessories.cardiagn.com
7. If the voltage measured is greater than 1 V, there is a short to voltage in the circuit.

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.**

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- 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

INDUCING INTERMITTENT FAULT CONDITIONS

Special Tools

EL-25070 Heat Gun

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.

Many intermittent open or shorted circuits are affected by harness/connector movement that is caused by vibration, 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 vehicle ON, move related connectors and wiring while monitoring vehicle operation. If harness or connector movement affects the data displayed, component/system operation, or vehicle 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.

If the complaint tends to be heat related, you can simulate the condition using the **EL-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. Switch the vehicle power mode to Vehicle 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](#) .

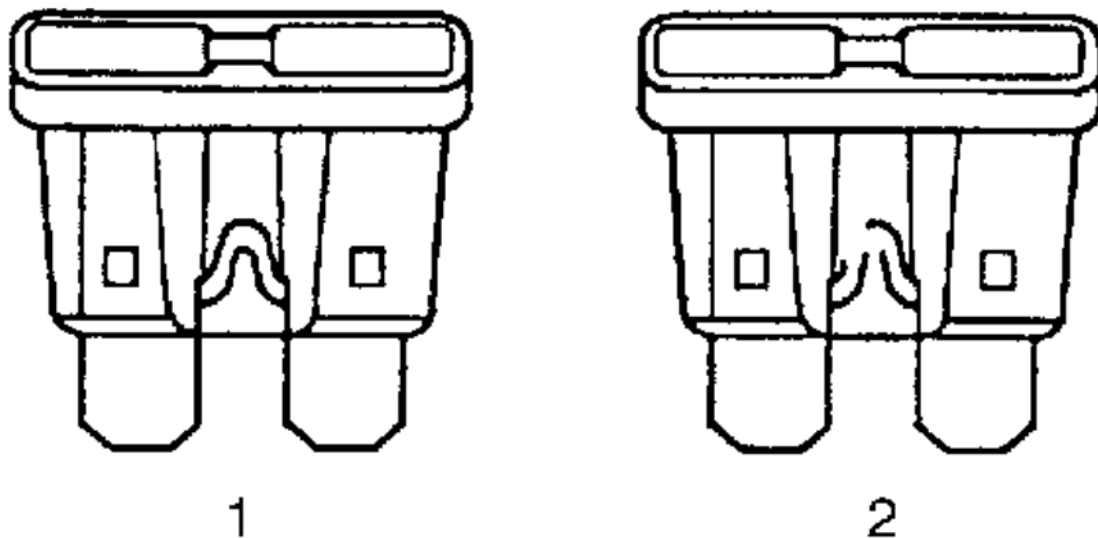


Fig. 3: Identifying Open Fuse Element

Courtesy of GENERAL MOTORS COMPANY

The fuse is the most common method of an automotive wiring circuit protection. Whenever there is an excessive amount of current flowing through a circuit the fusible element will melt and create an open or

incomplete circuit. Fuses are a one time protection device and must be replaced each time the circuit is overloaded. To determine if a fuse is open, remove the suspected fuse and examine if the element in the fuse is broken (2). If not broken (1), also check for continuity using a Digital Multimeter (DMM) or a continuity tester. If the element is broken or continuity is suspect, replace the fuse with one of equal current rating.

Fuse Types

Current Rating Amperes	Color
Auto Fuses, Mini Fuses	
2	Gray
3	Violet
5	Tan
7.5	Brown
10	Red
15	Blue
20	Yellow
25	White or Natural
30	Green
Maxi Fuses	
20	Yellow
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 circuit breaker will not reset until the circuit is opened, by removing the voltage from its terminals. Once the voltage is removed the circuit breaker will re-close within a second or 2.

CIRCUIT PROTECTION - FUSIBLE LINKS

Special Tools

EL - 39200 Digital Multimeter (DMM)

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

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

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

WIRING REPAIRS

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

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

CONNECTOR REPAIRS

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

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

- [Repairing Connector Terminals \(Terminated Lead Repair\) Repairing Connector Terminals \(Terminal Repair\)](#)

Connector Anatomy

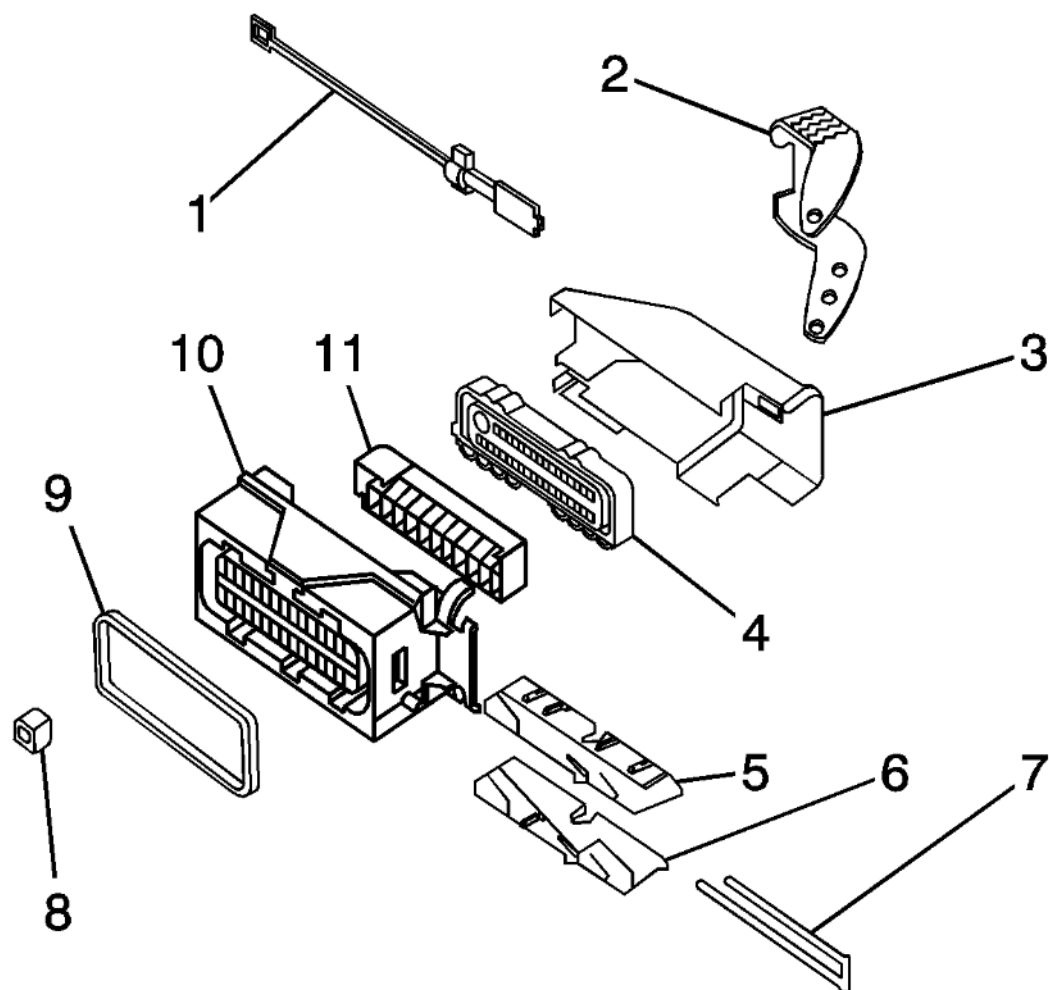


Fig. 4: Identifying Typical Connector Components

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.

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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.

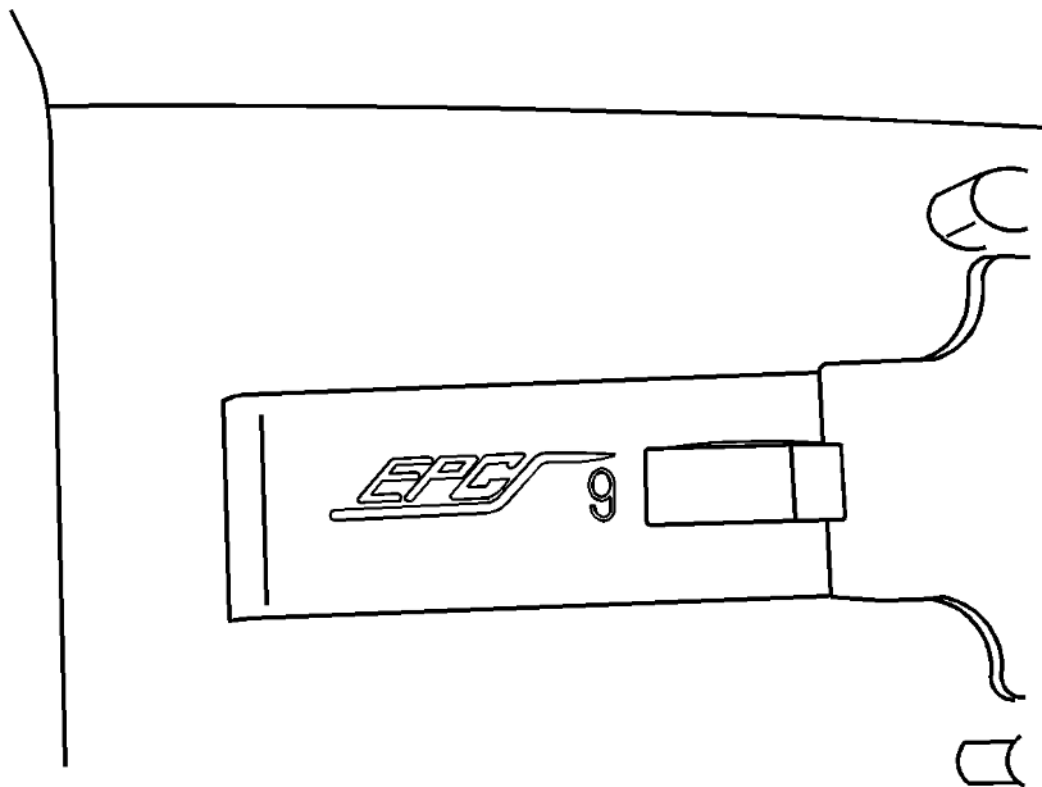


Fig. 5: View Of EPC Identification On Connector Body
Courtesy of GENERAL MOTORS COMPANY

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

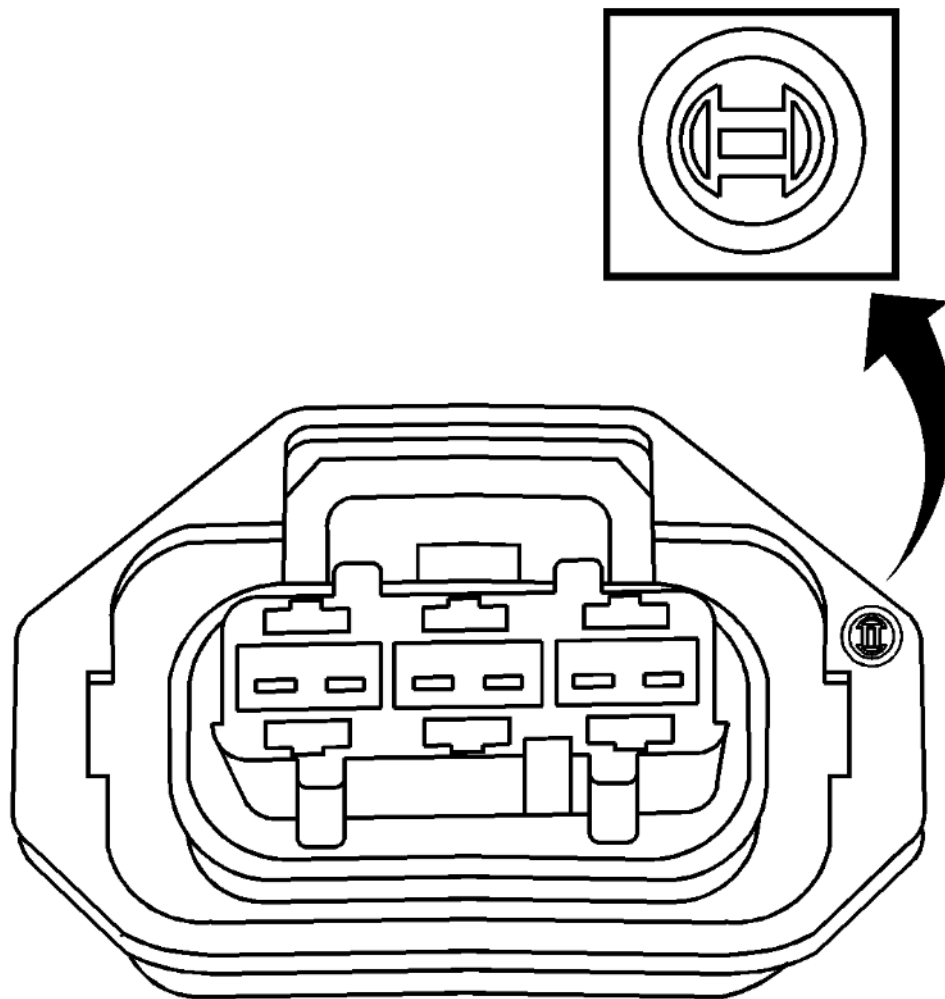


Fig. 6: View Of Bosch Identification On Connector Body

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.

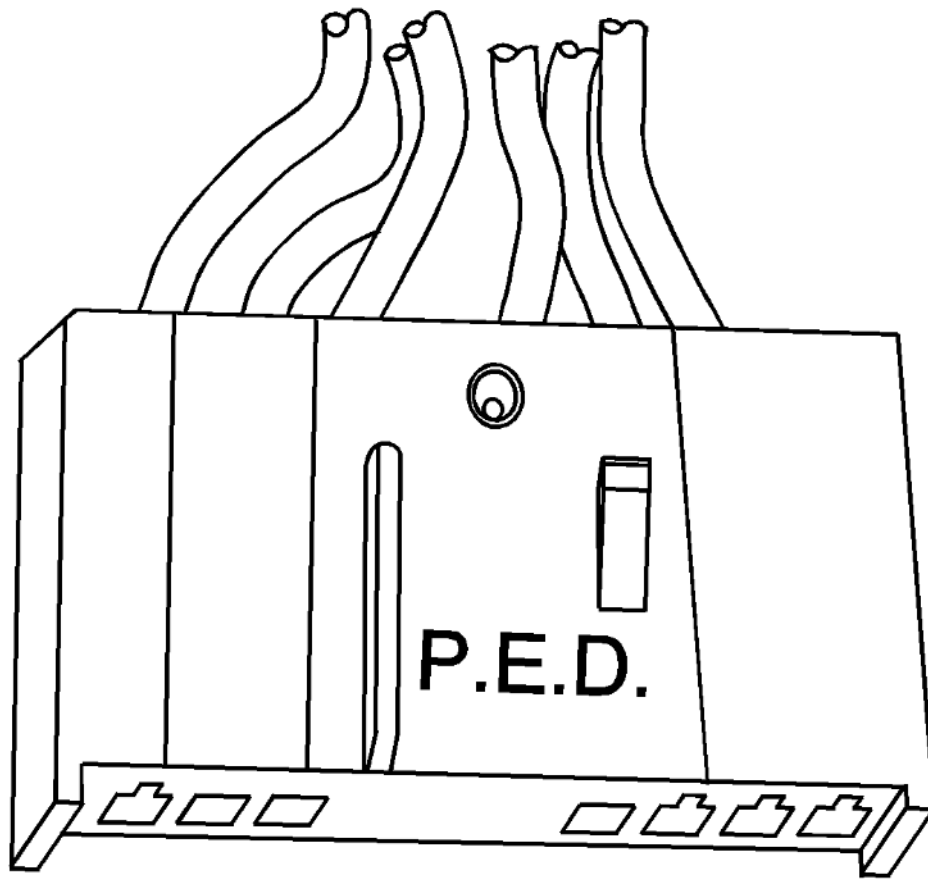


Fig. 7: View Of PED Identification On Connector Body.

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.

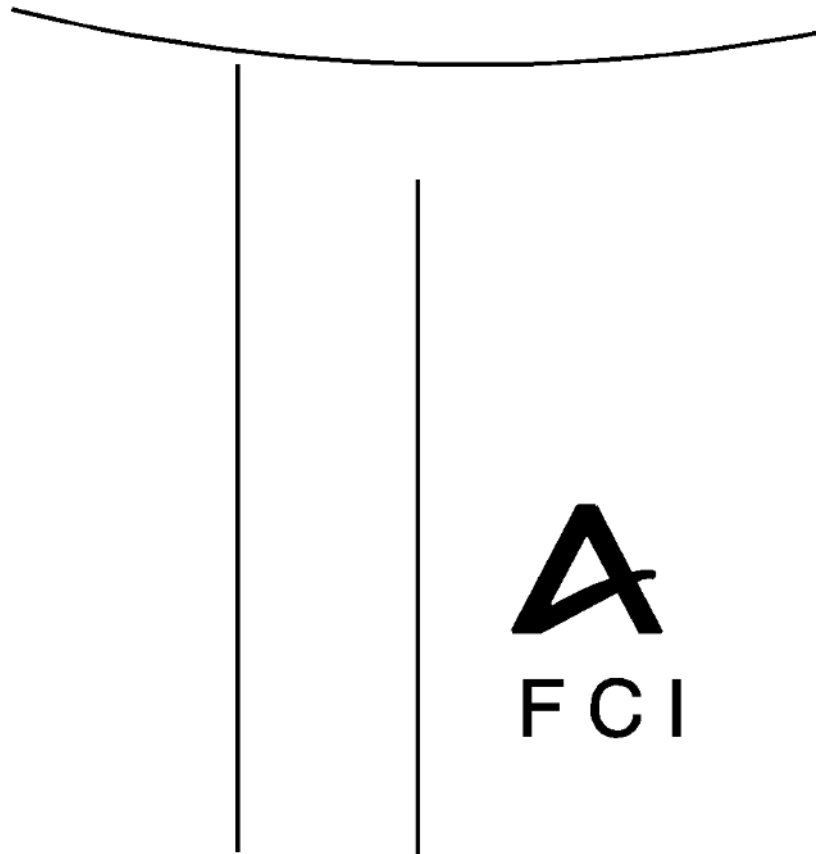


Fig. 8: View Of FCI Identification On Connector Body.

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.

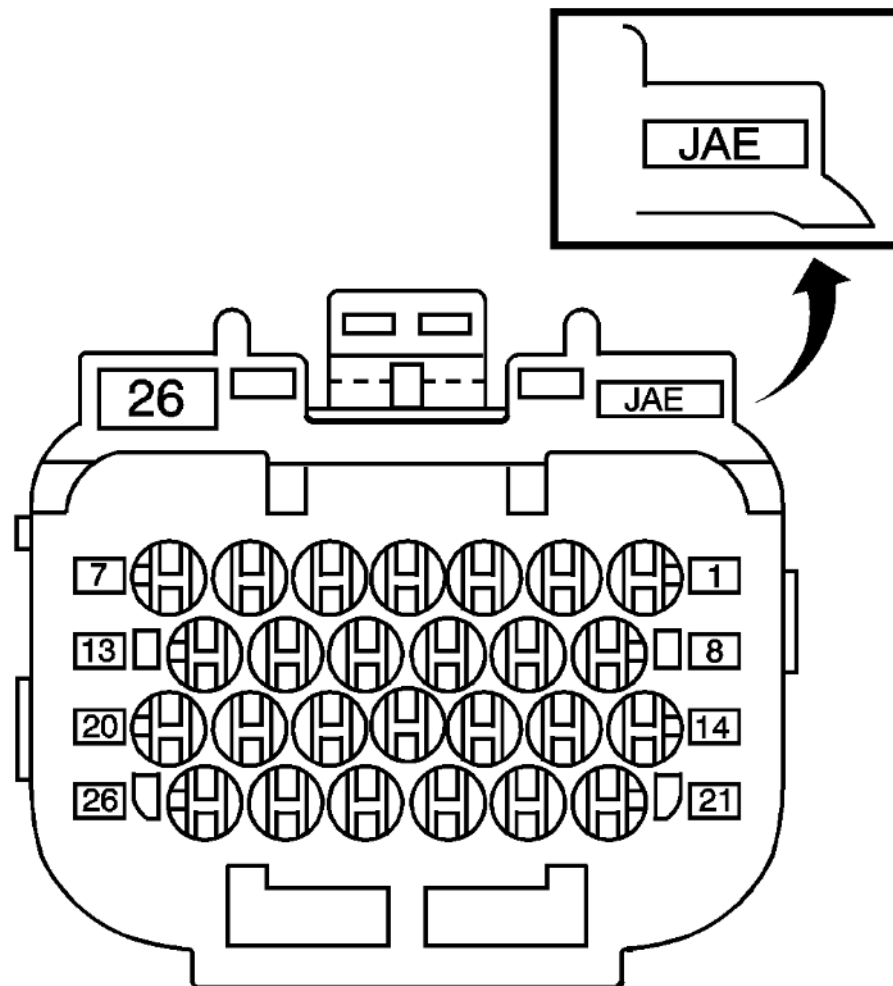


Fig. 9: View Of JAE Identification On Connector Body
Courtesy of GENERAL MOTORS COMPANY

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

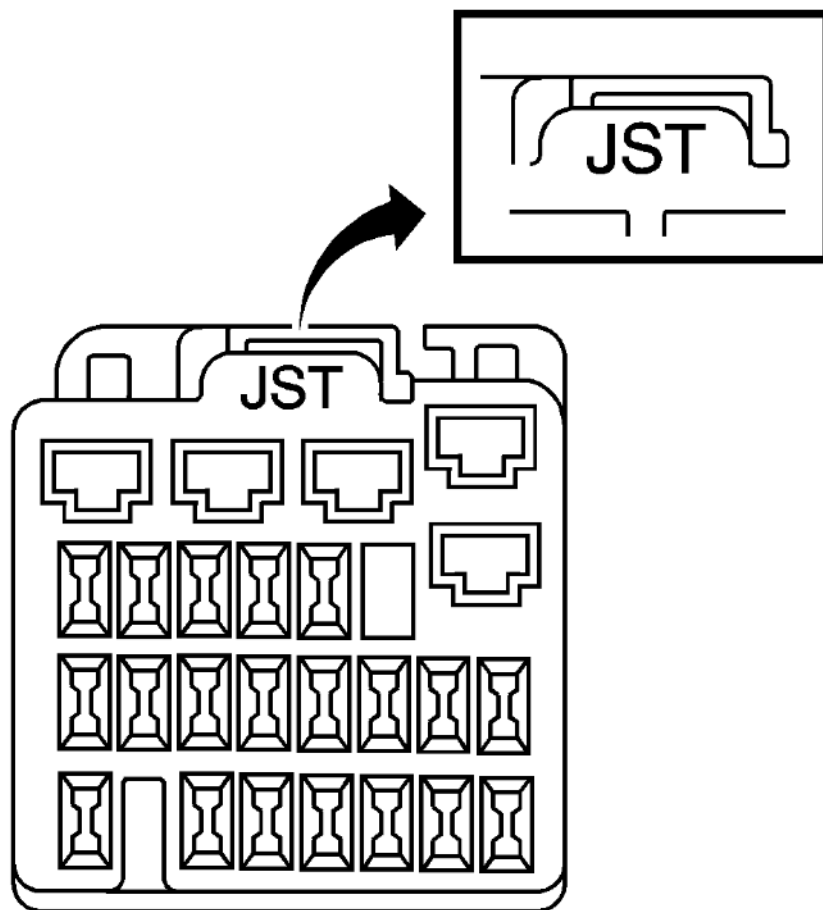


Fig. 10: View Of JST Identification On Connector Body.

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.

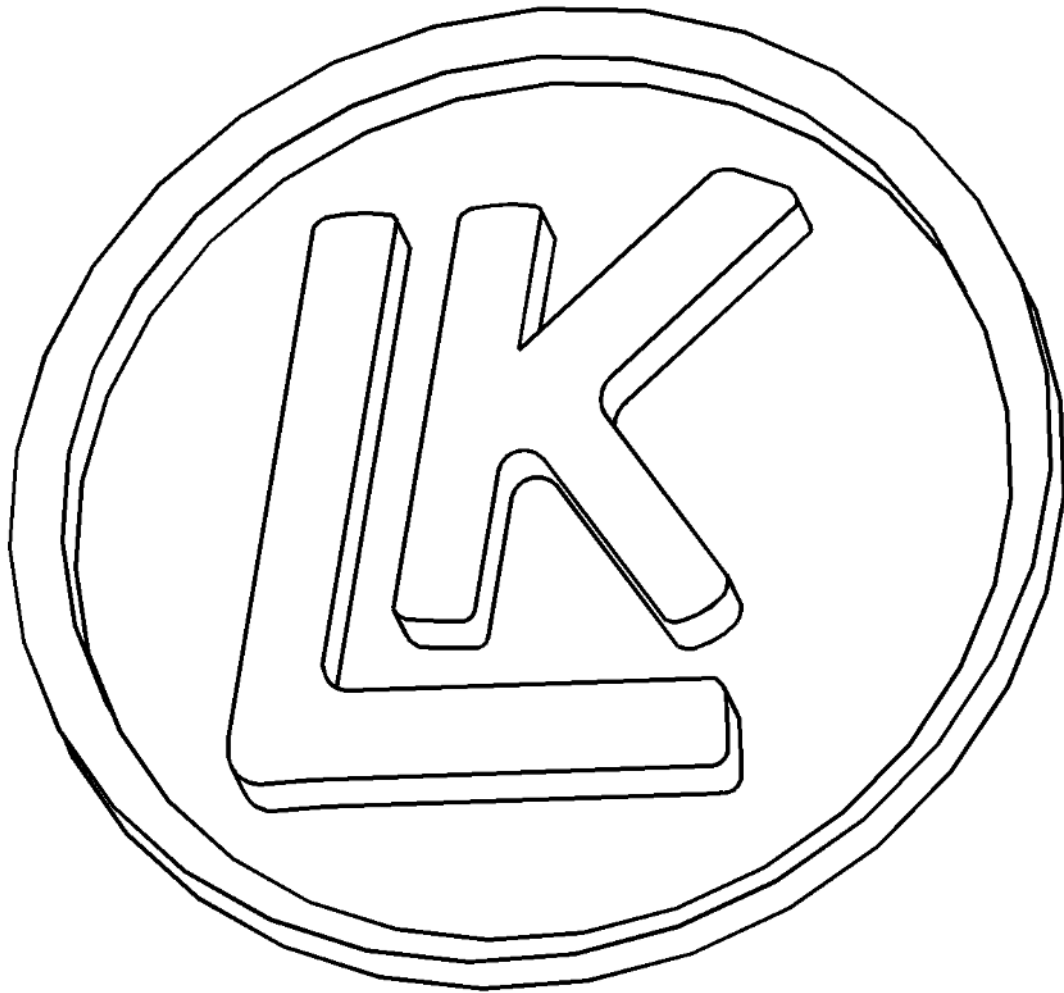


Fig. 11: View Of Kostel Connector Identifier

Courtesy of GENERAL MOTORS COMPANY

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

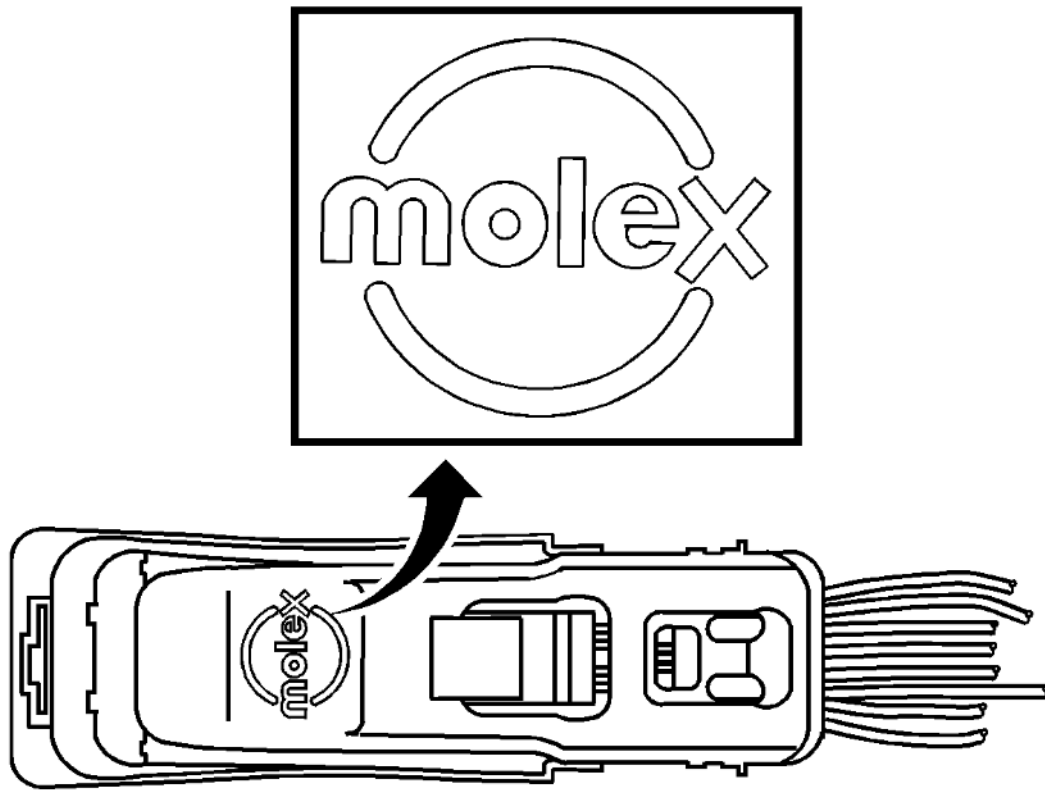


Fig. 12: View Of Molex Identification On Connector Body.
Courtesy of GENERAL MOTORS COMPANY

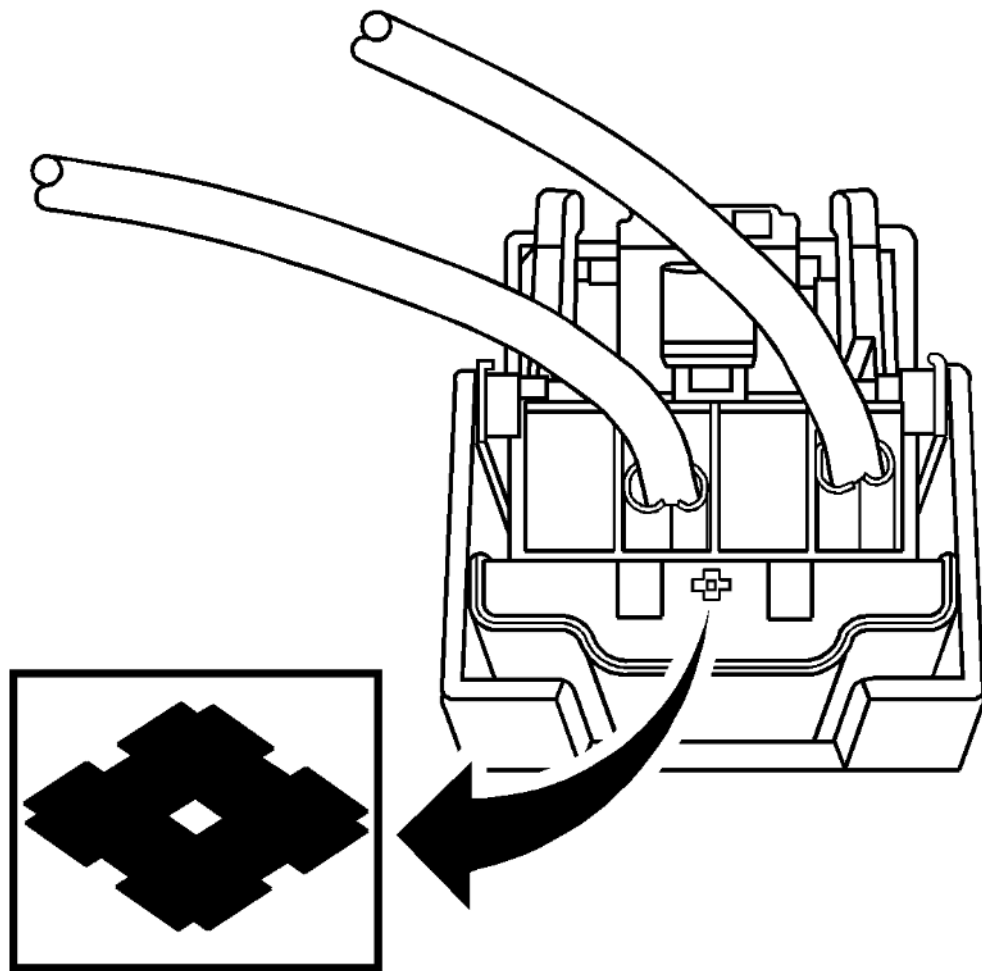


Fig. 13: Sumitomo Identification On Connector Body
Courtesy of GENERAL MOTORS COMPANY

- 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.

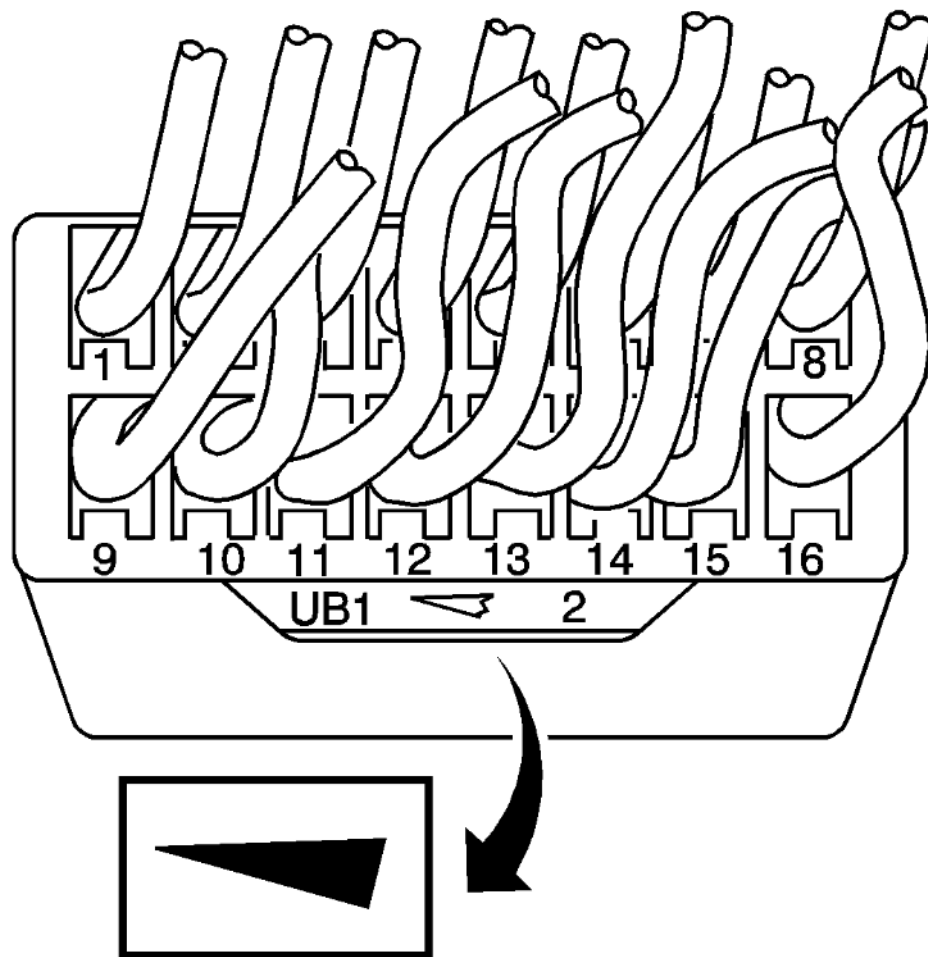


Fig. 14: View Of Yazaki Identification On Connector Body
Courtesy of GENERAL MOTORS COMPANY

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

2017 ACCESSORIES & EQUIPMENT

Wiring Systems and Power Management - Repair Instructions - Bolt EV

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 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.

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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.

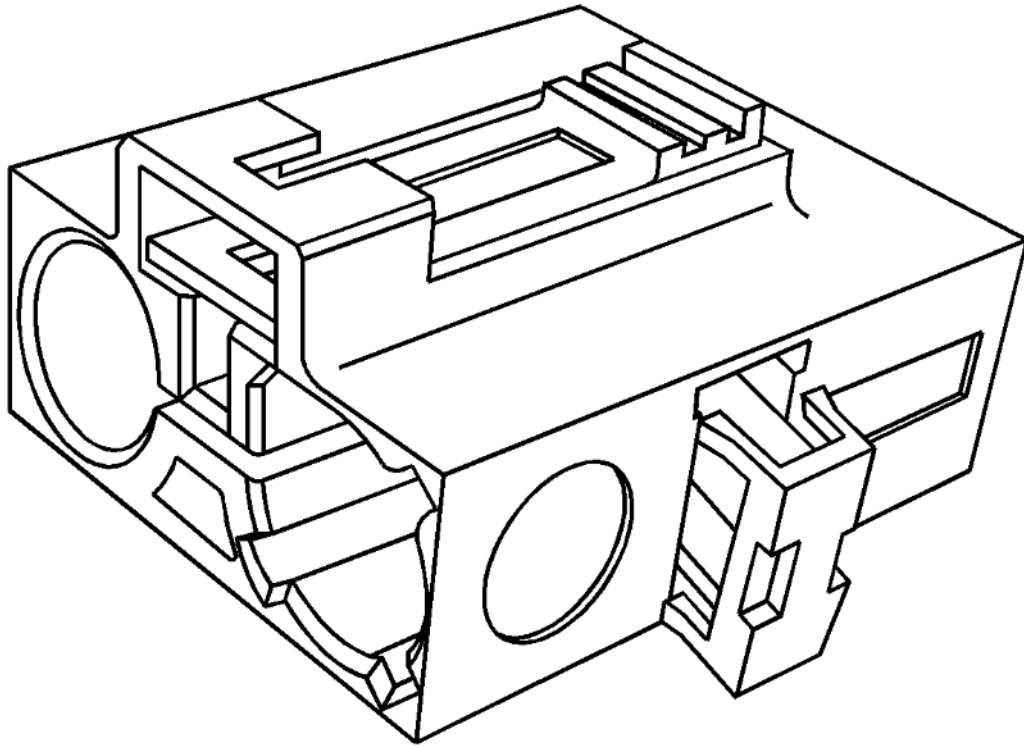


Fig. 1: Connector Housing

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.

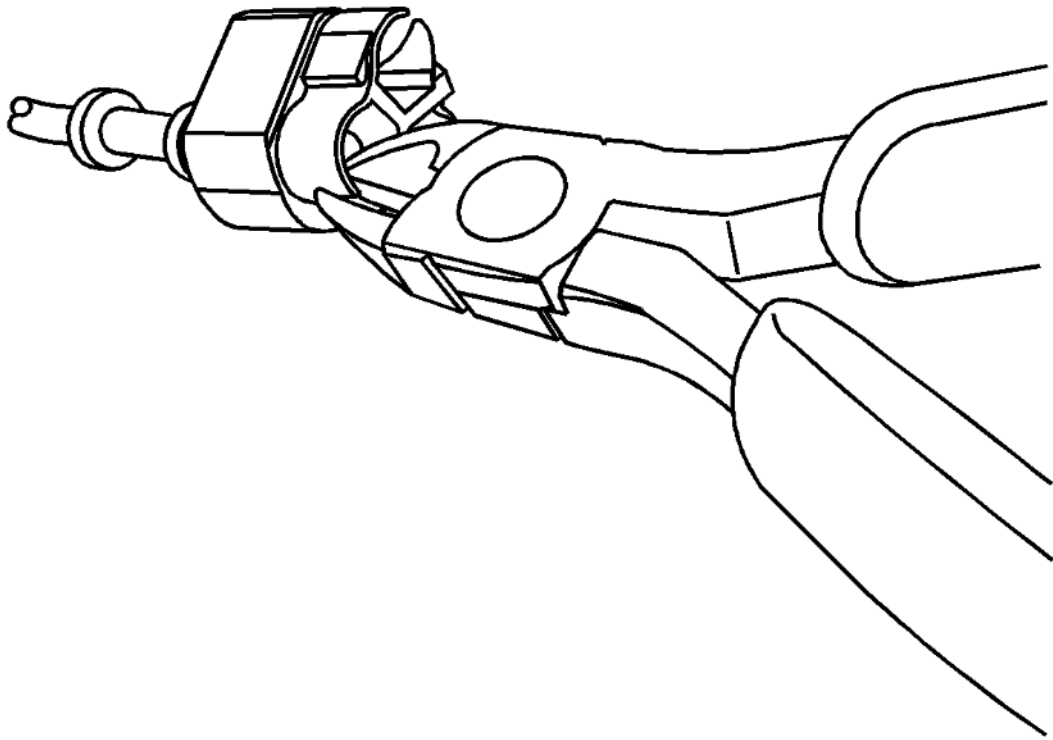


Fig. 2: Using Side/Diagonal Cutters To Nip And Break Away Connector Housing
Courtesy of GENERAL MOTORS COMPANY

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.

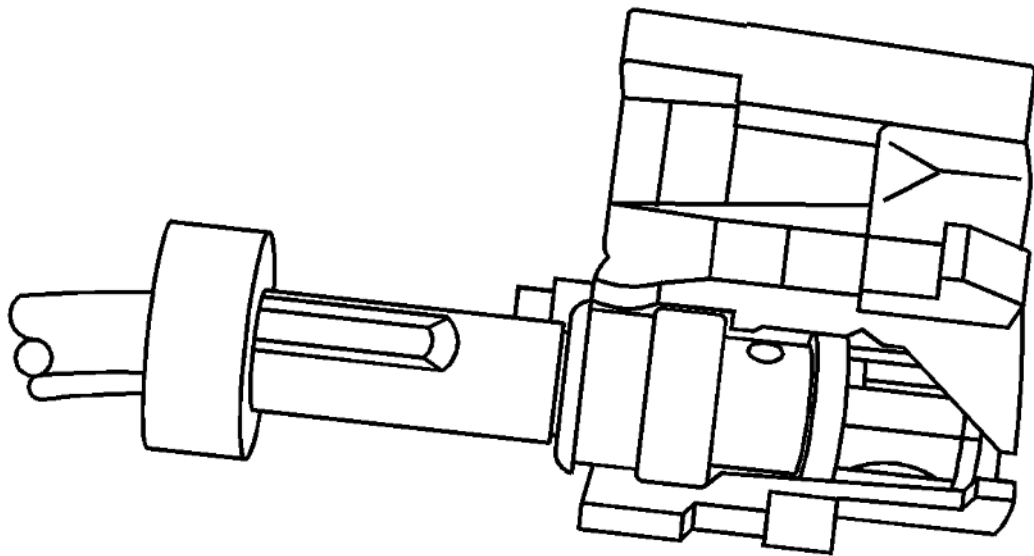


Fig. 3: Connecting New Service Coaxial Cable To New 3-Way Connector Housing
Courtesy of GENERAL MOTORS COMPANY

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.

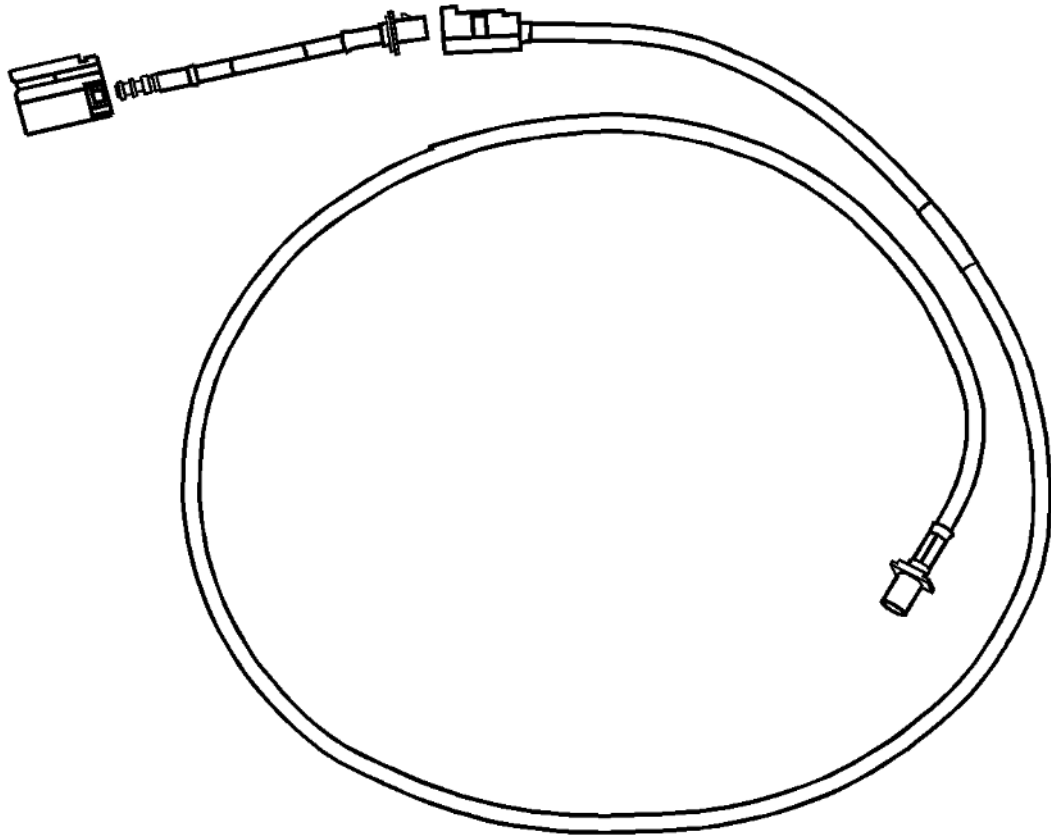


Fig. 4: Coaxial Cable

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 vehicle in Service Mode.

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.

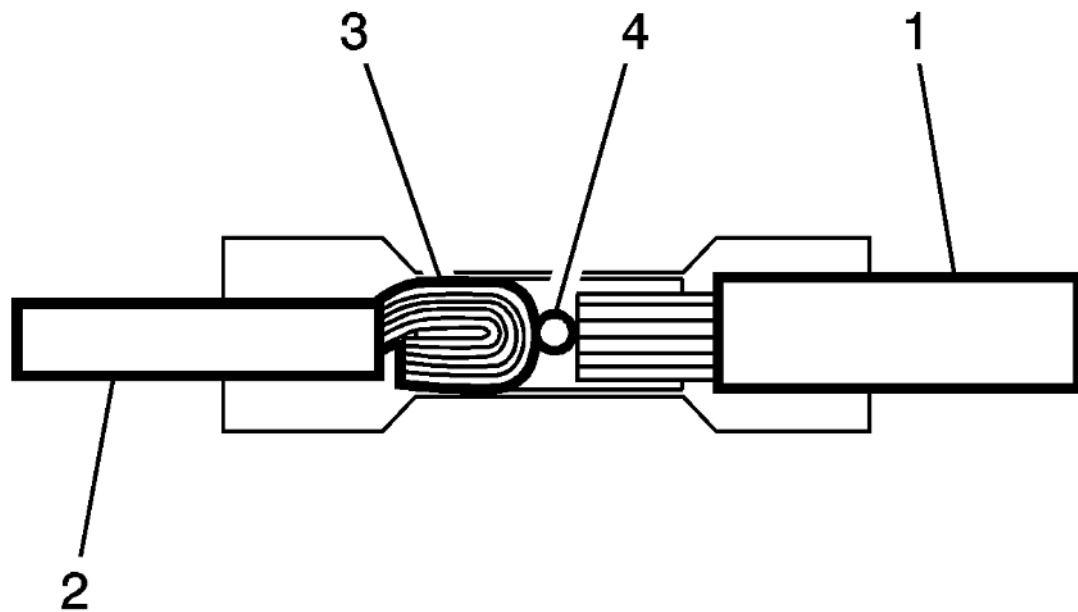


Fig. 5: View Of Stripped Wires In Splice Sleeve Connector

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.

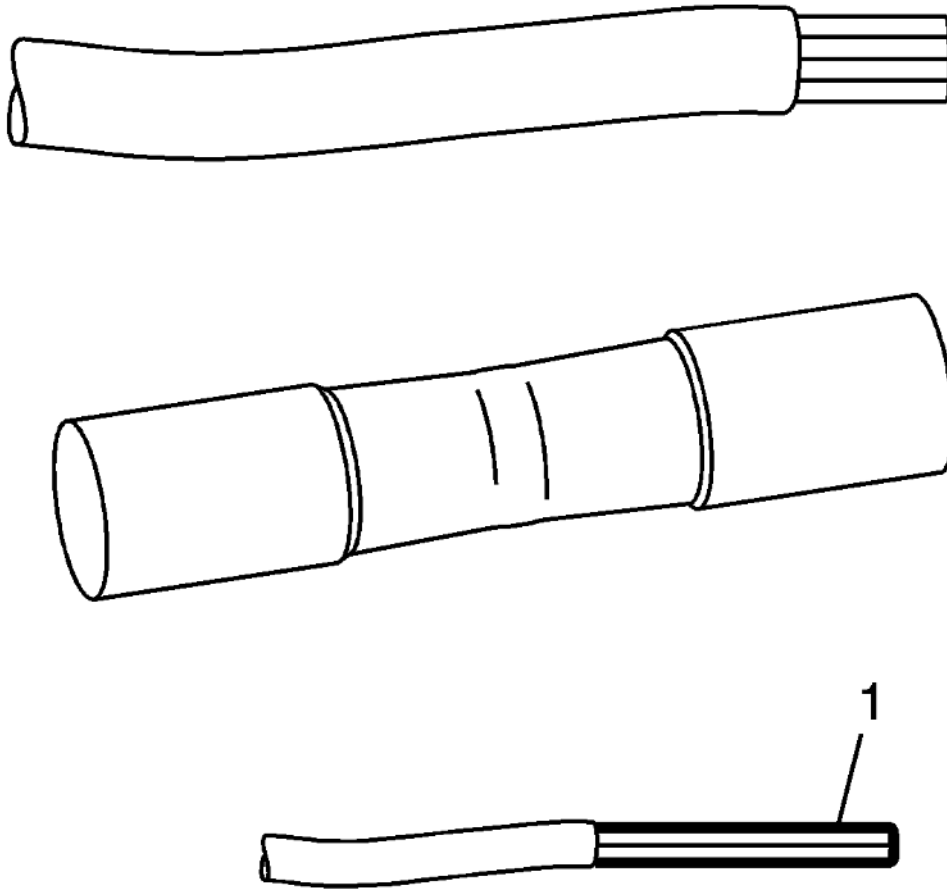


Fig. 6: View Of Stripped Wires

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.

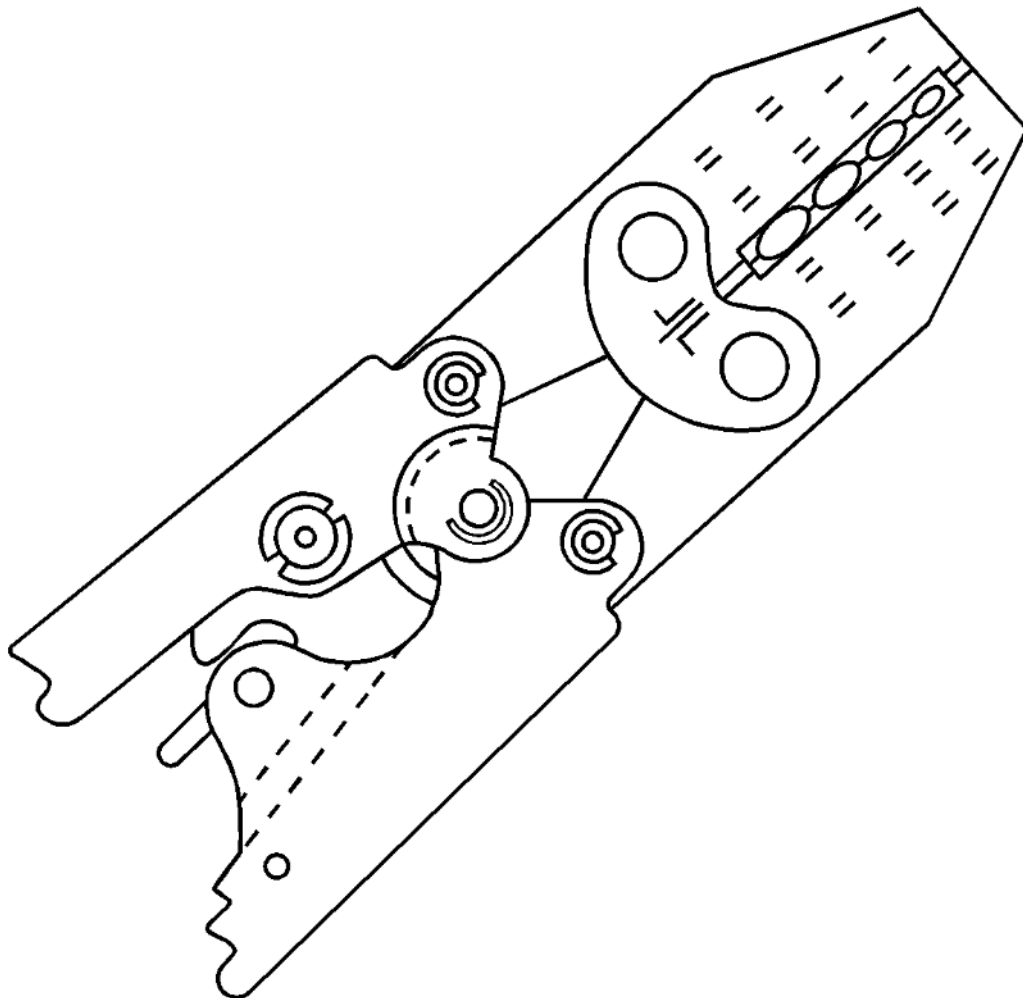


Fig. 7: Splice Sleeve Crimping Tool

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](#).

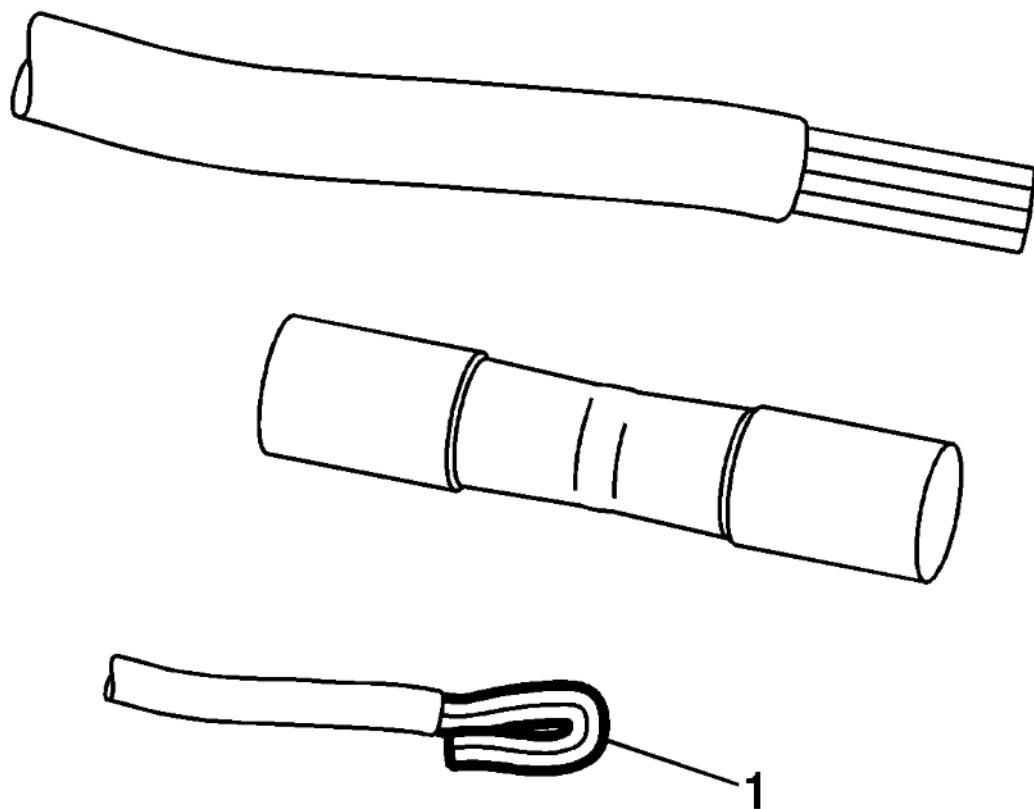


Fig. 8: View Of Twisted And Folded Wire To Length

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.

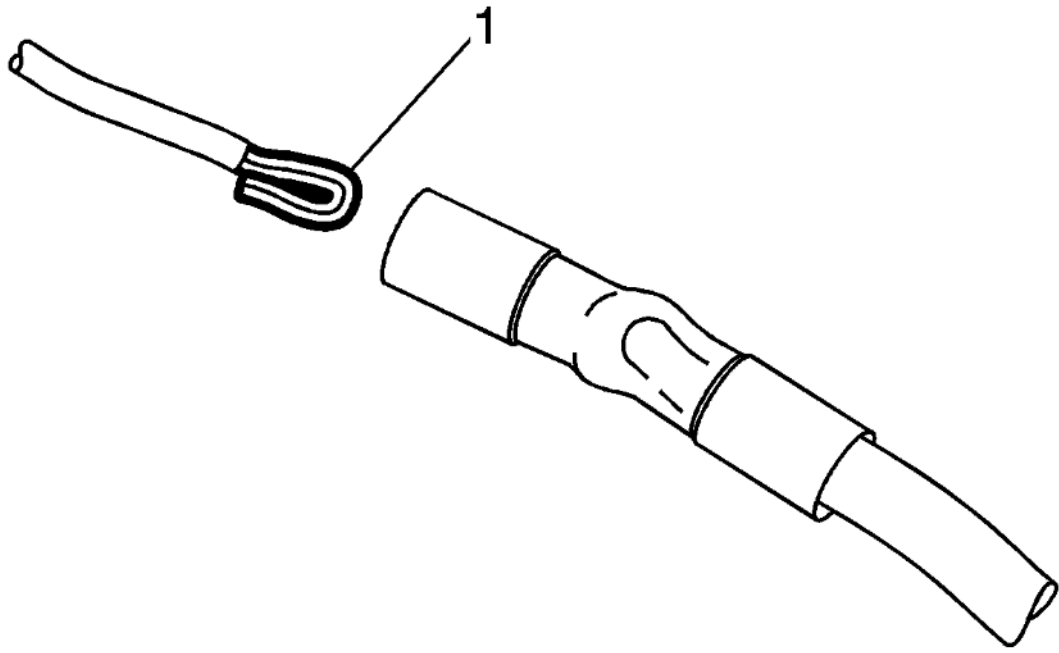


Fig. 9: View Of Folded Wire & Splice Sleeve
Courtesy of GENERAL MOTORS COMPANY

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

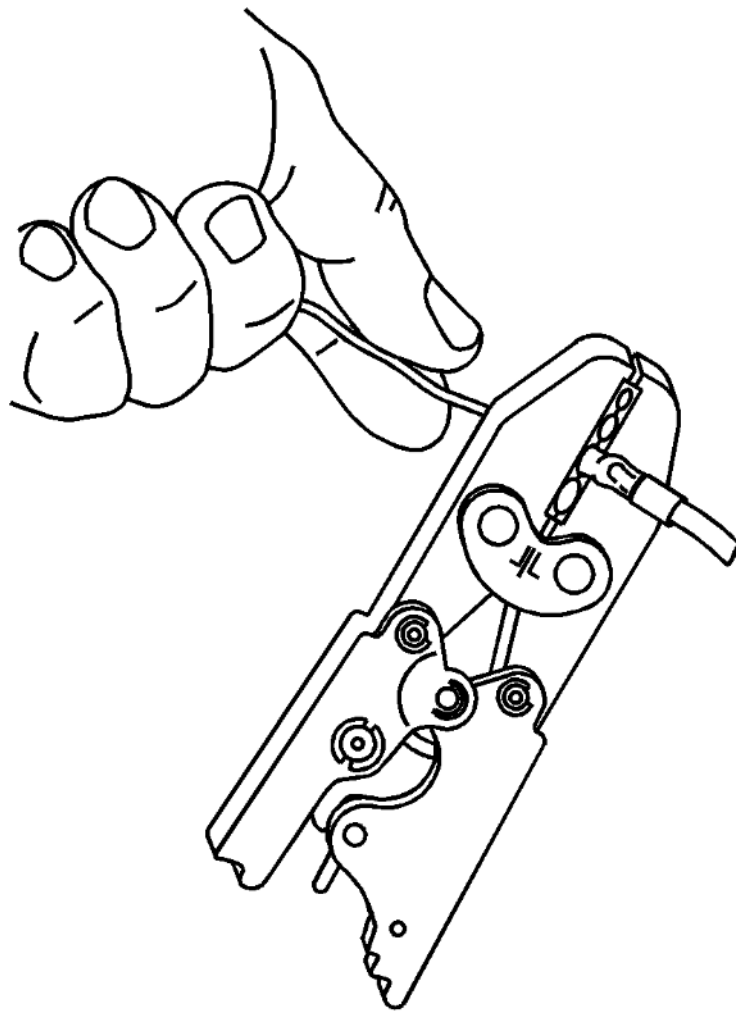


Fig. 10: Crimping The Splice Sleeve

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.

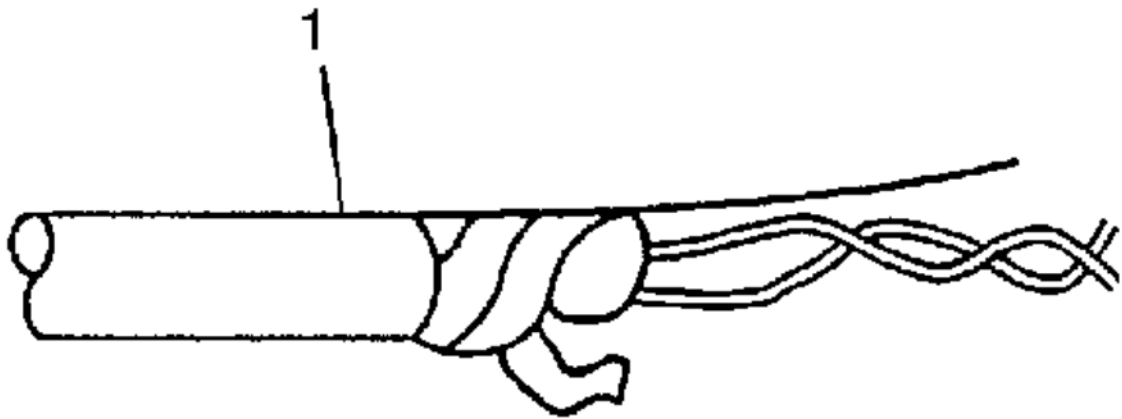


Fig. 11: View Of Outer Wiring Jacket
Courtesy of GENERAL MOTORS COMPANY

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: Preparing Splice

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.

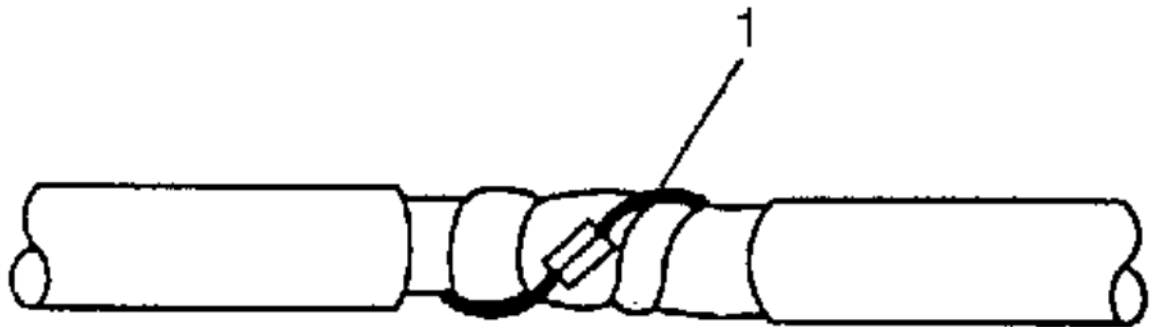


Fig. 13: Identifying Diode On Wire

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.

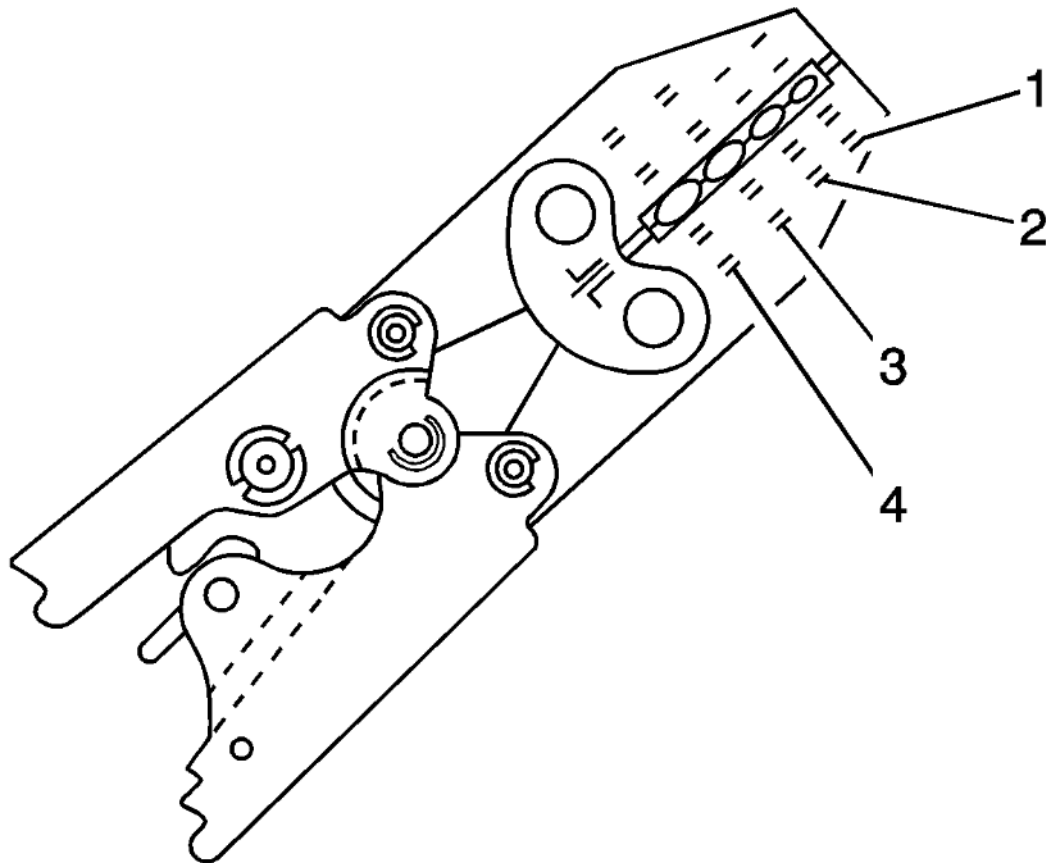


Fig. 15: Splice Sleeve Crimping Tool With 4 Crimp Nests

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.

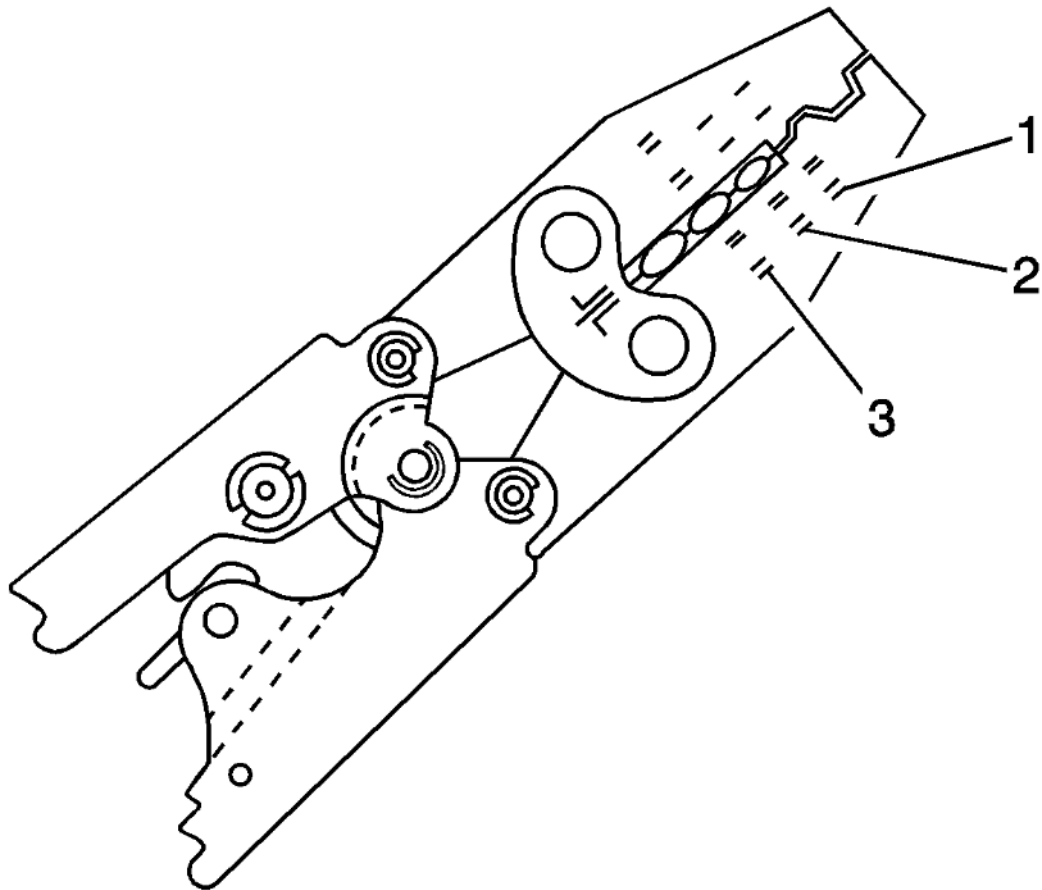


Fig. 16: Splice Sleeve Crimping Tool With 3 Crimp Nests
Courtesy of GENERAL MOTORS COMPANY

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).

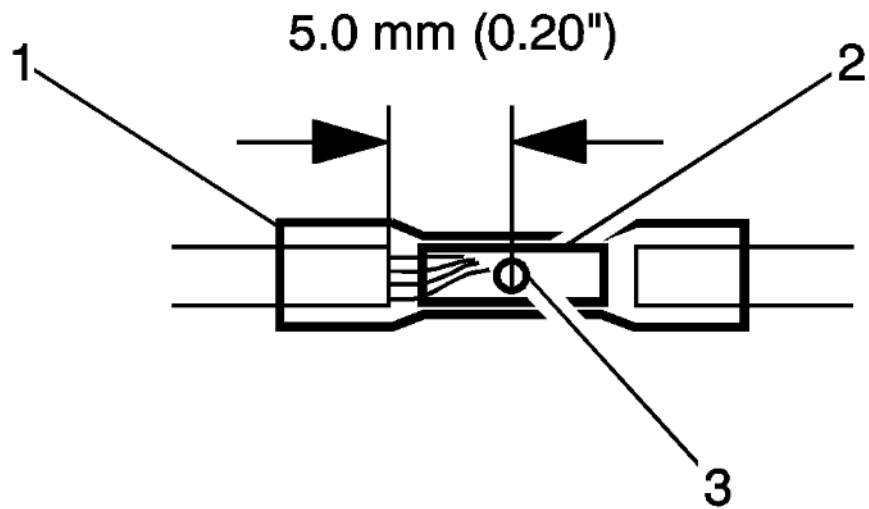


Fig. 17: Identifying Duraseal Splice Sleeve

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.

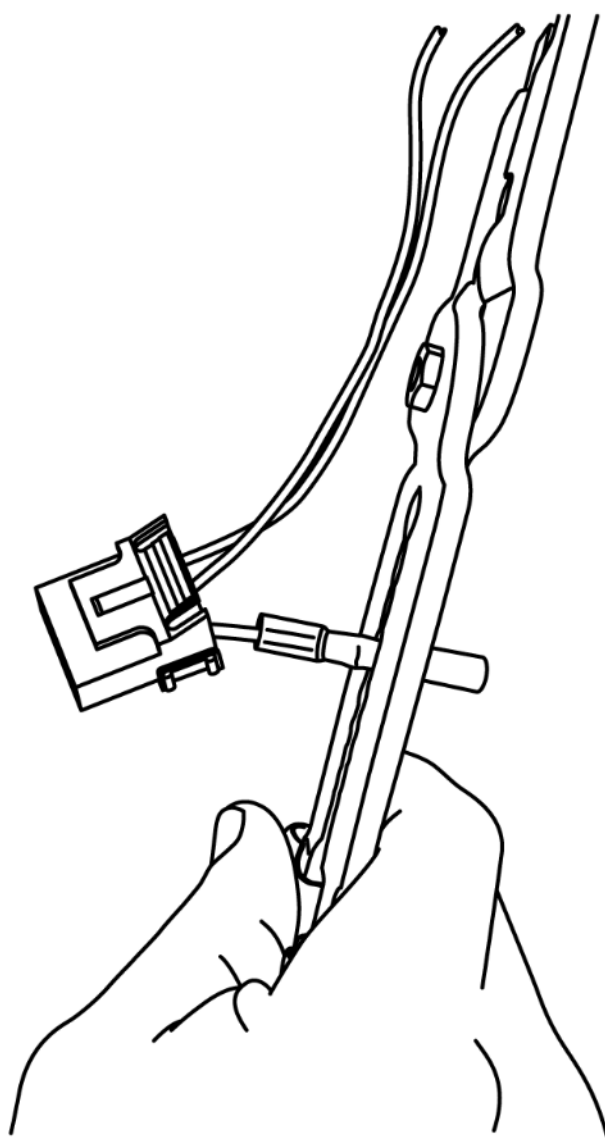


Fig. 20: Tightly Close Handles Of Crimp Tool
Courtesy of GENERAL MOTORS COMPANY

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.

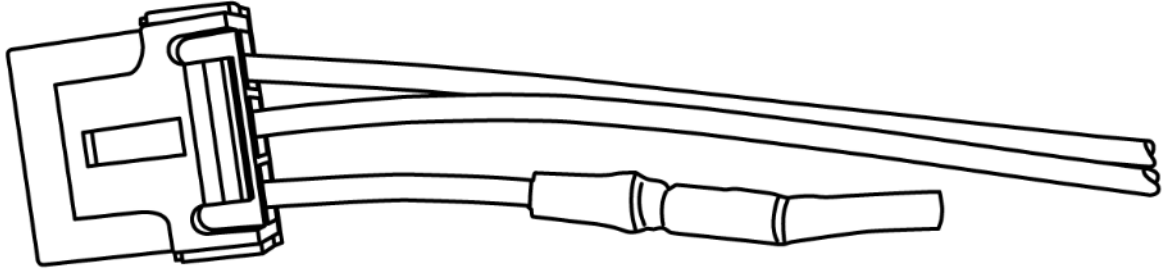


Fig. 21: Heat To Crimped Area Of Barrel

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.

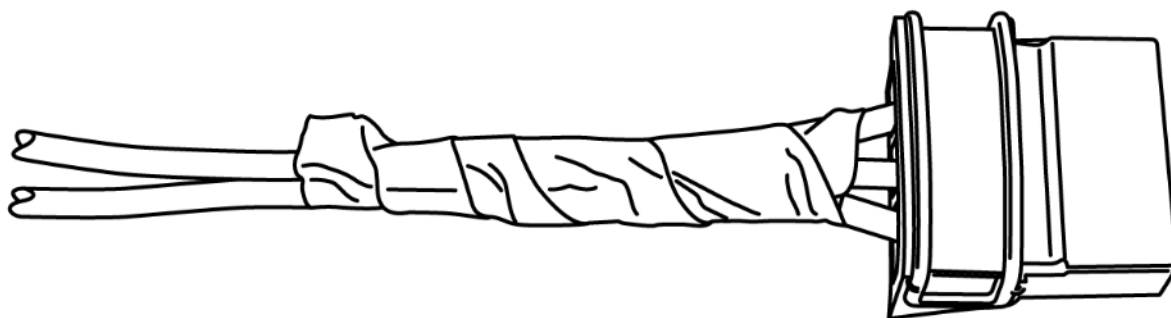


Fig. 22: Taping Extra Terminated Leads Back Into Harness
Courtesy of GENERAL MOTORS COMPANY

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.

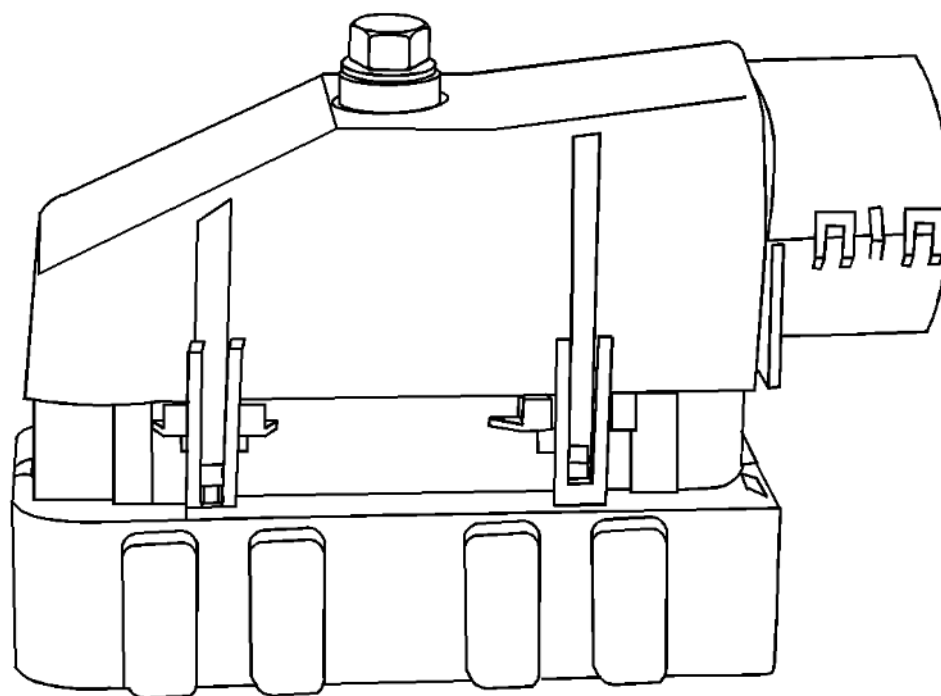


Fig. 23: View Of Bolt On Connector Cover

Courtesy of GENERAL MOTORS COMPANY

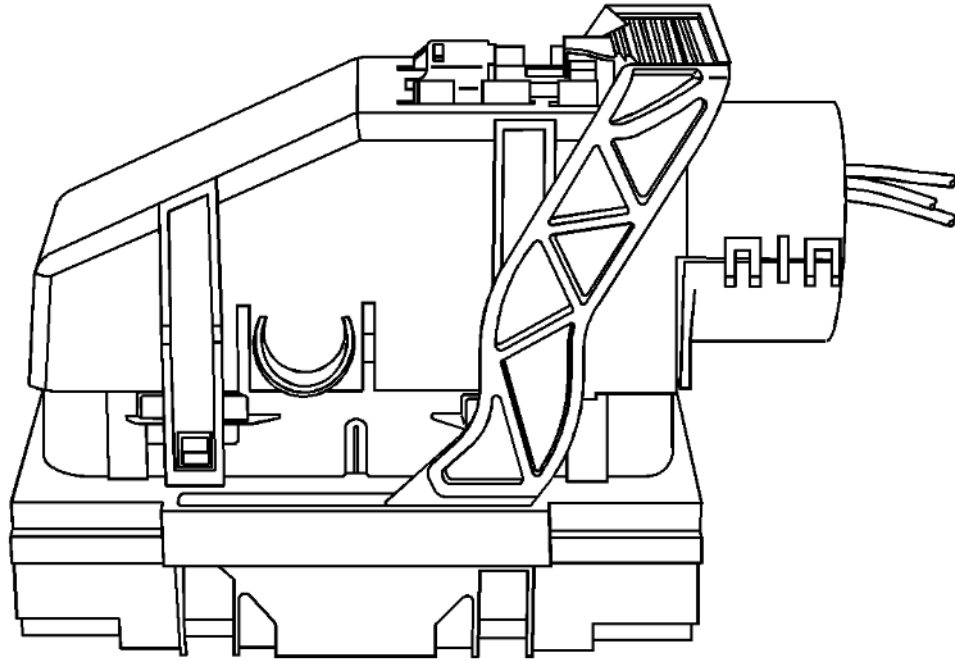


Fig. 24: Identifying Connector Position Assurance (CPA)

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.

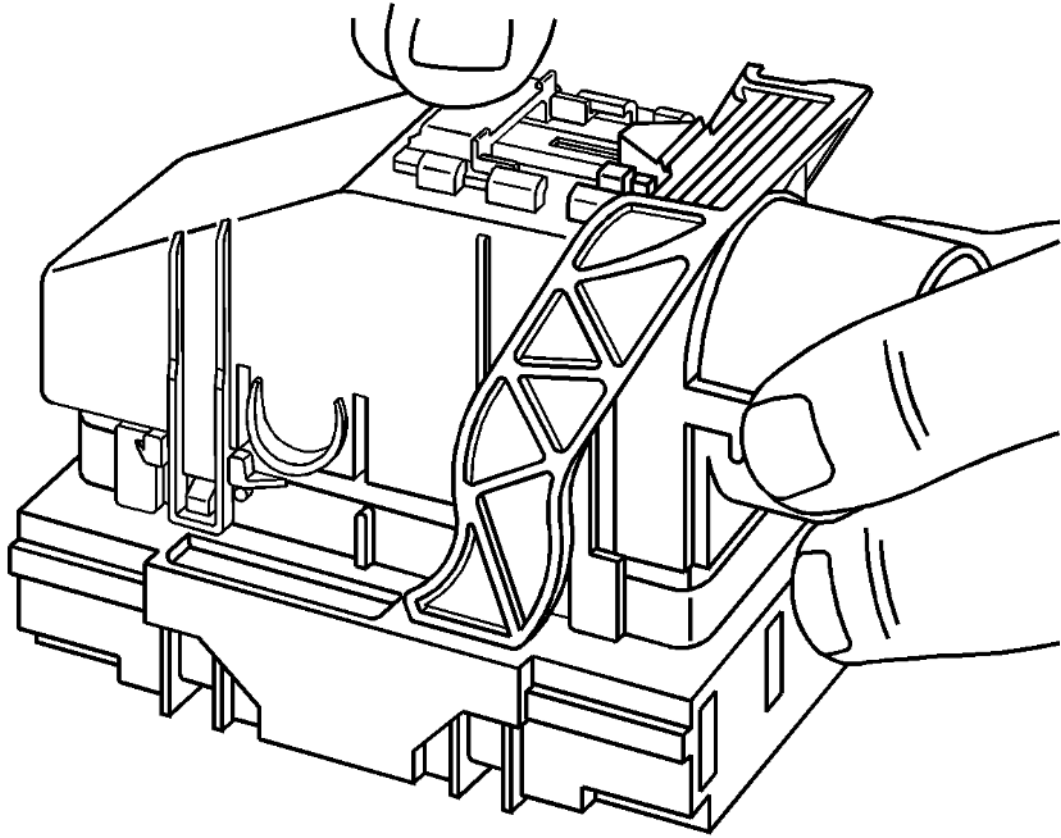


Fig. 25: Identifying Lever Lock & Lever Lock Release Tab

Courtesy of GENERAL MOTORS COMPANY

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

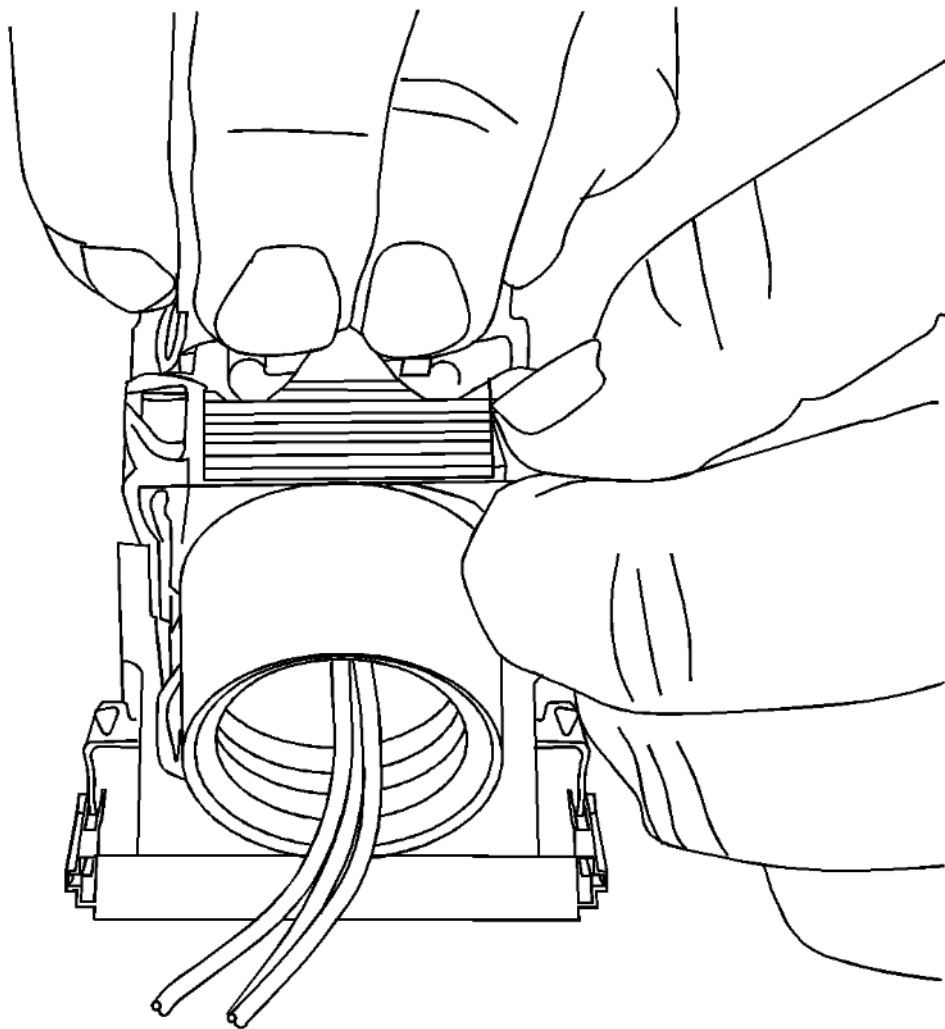


Fig. 26: View Showing Depressing Lever Lock Release Tab
Courtesy of GENERAL MOTORS COMPANY

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

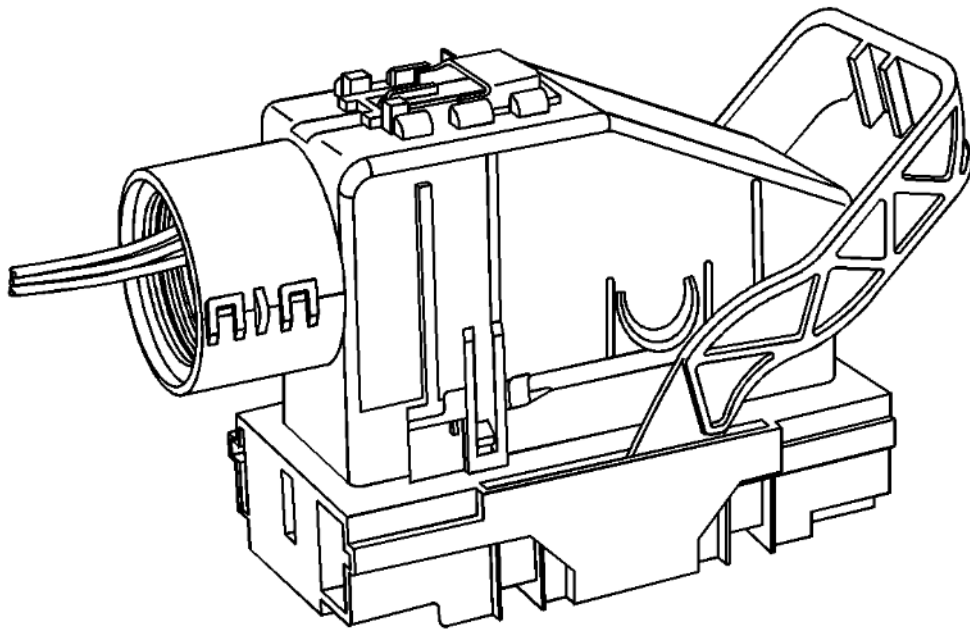


Fig. 27: View Of Connector In Released Position
Courtesy of GENERAL MOTORS COMPANY

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.

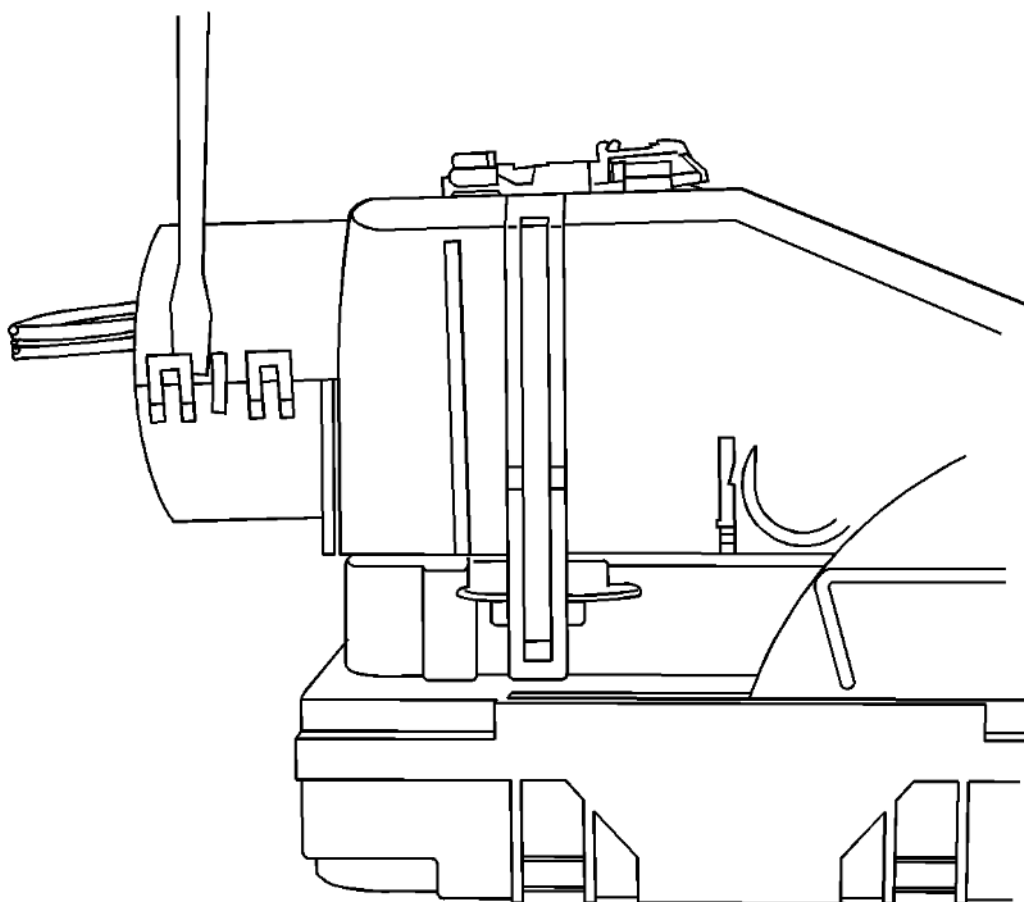


Fig. 28: View Of Connector In Released Position
Courtesy of GENERAL MOTORS COMPANY

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

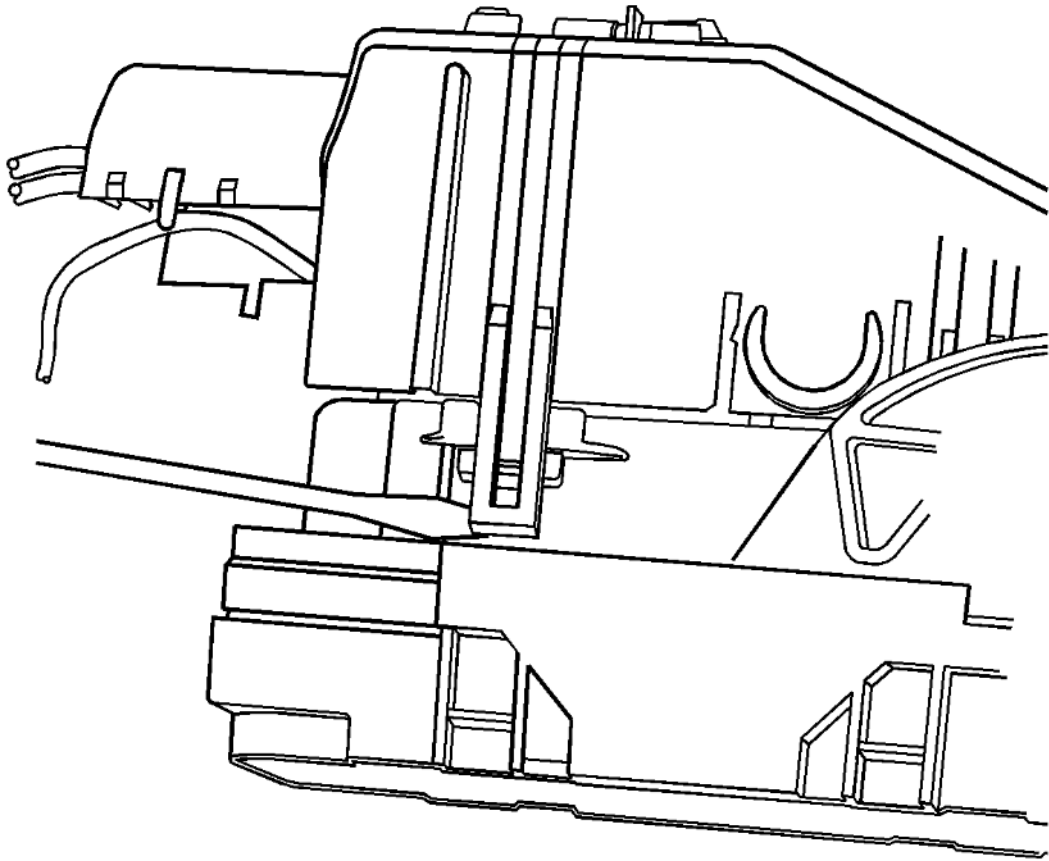


Fig. 29: Identifying Tabs Holding Wiredress Cover

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.

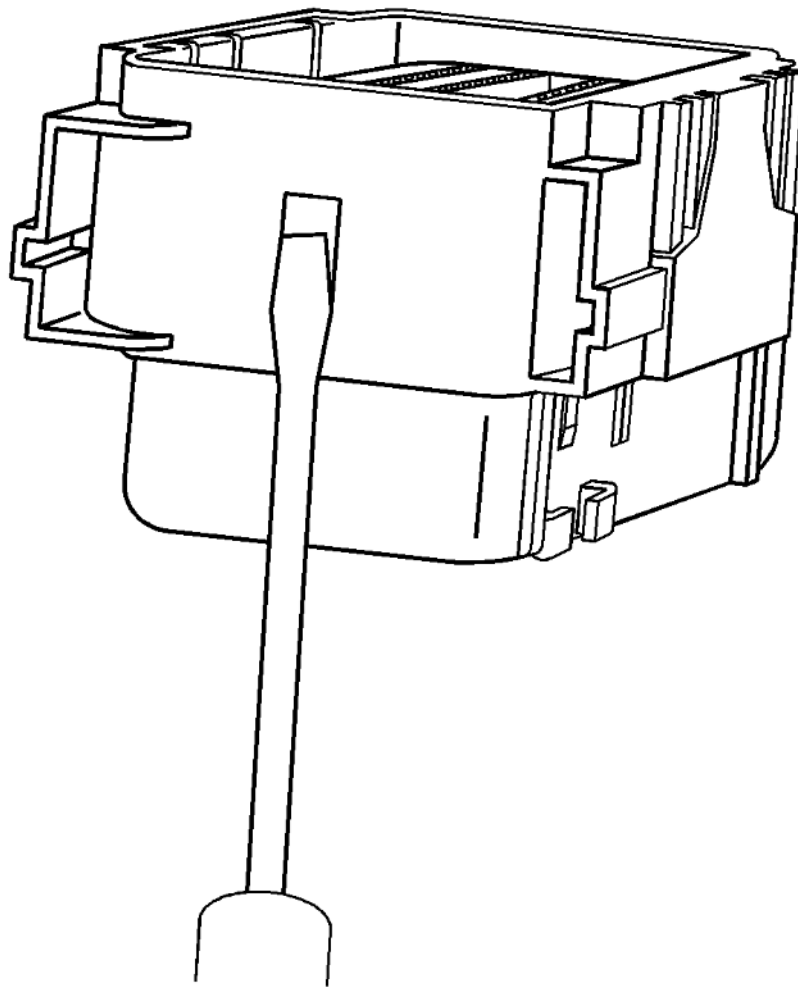


Fig. 30: Lifting Terminal Retaining Tabs

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.

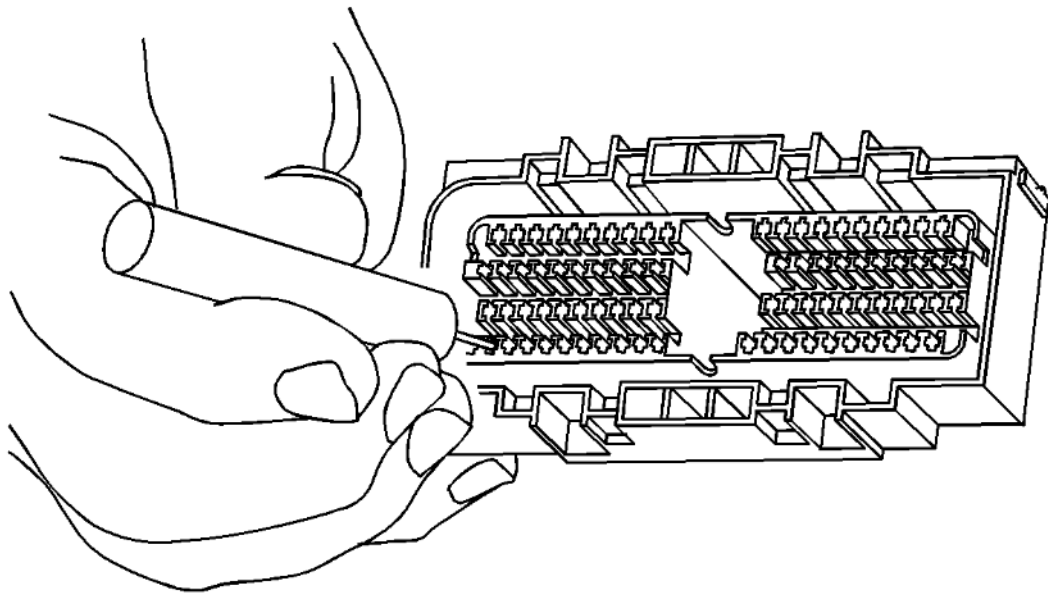


Fig. 31: Pulling Wire Out Of Back Of Connector

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.

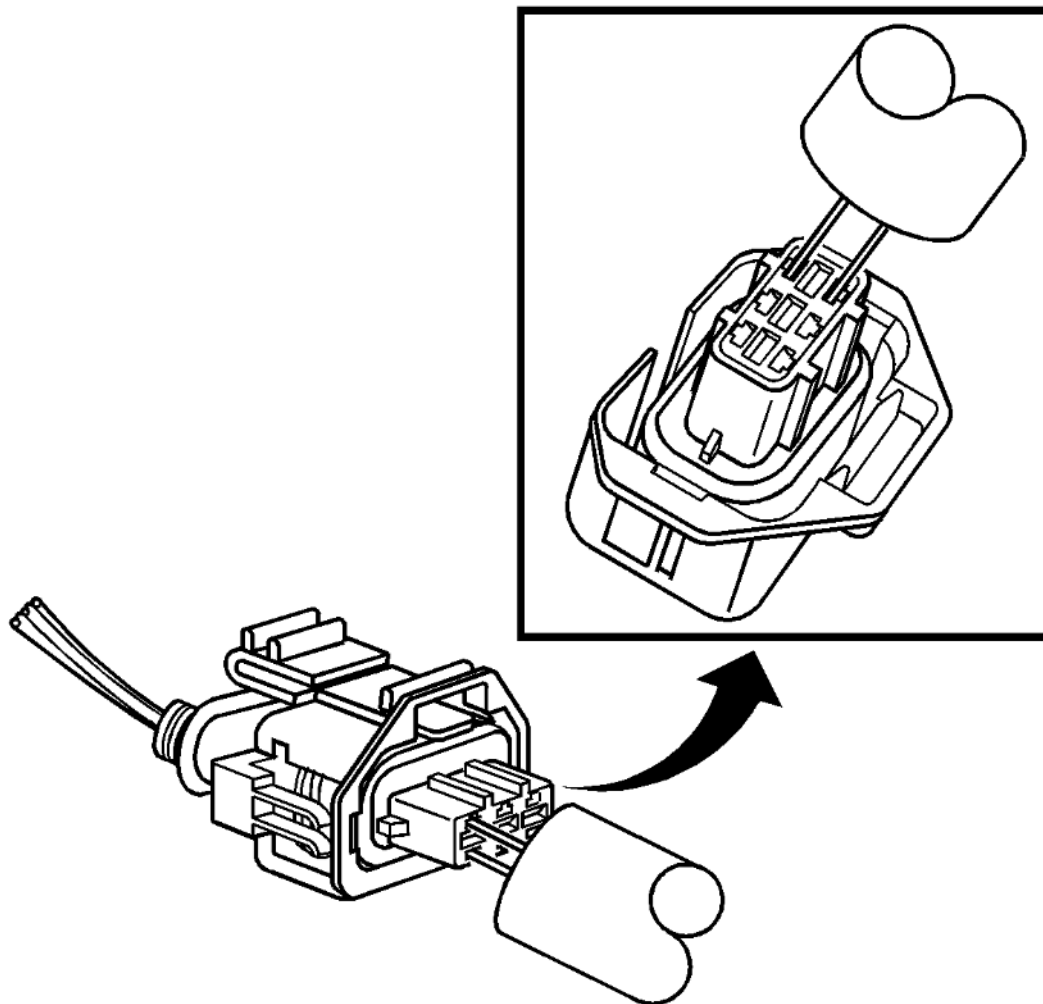


Fig. 32: View Of Bosch Connector Terminals (BSK)

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.

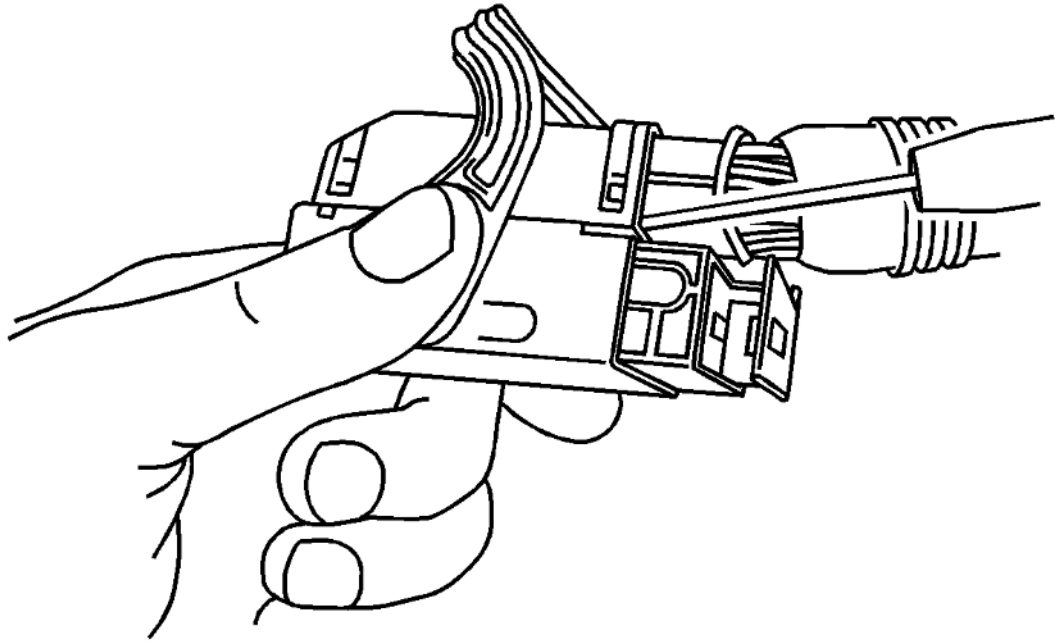


Fig. 33: View Of Flat-Bladed Tool Being Inserted Between Cover & Connector Body.
Courtesy of GENERAL MOTORS COMPANY

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.

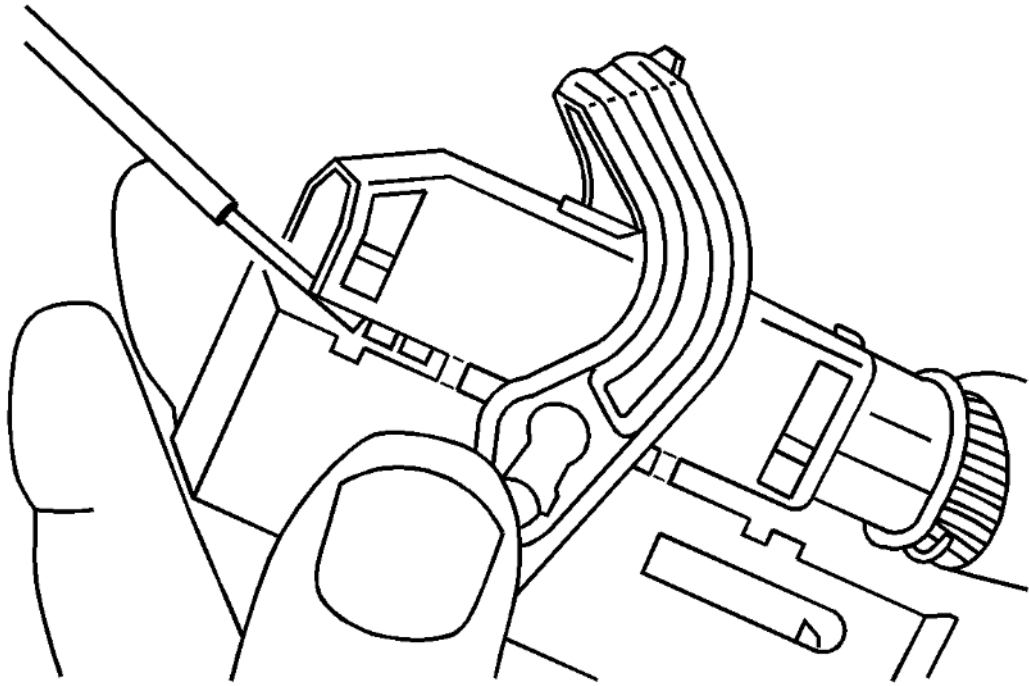


Fig. 34: View Of Flat-Bladed Tool Between Cover & Connector End

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.

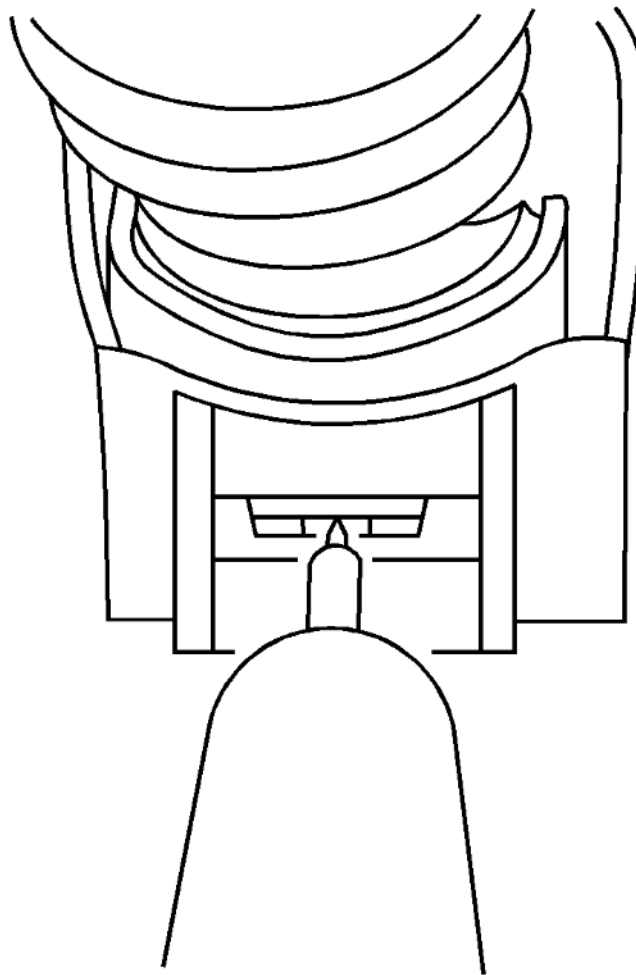


Fig. 35: View Of Terminal Position Assurance (TPA)

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.

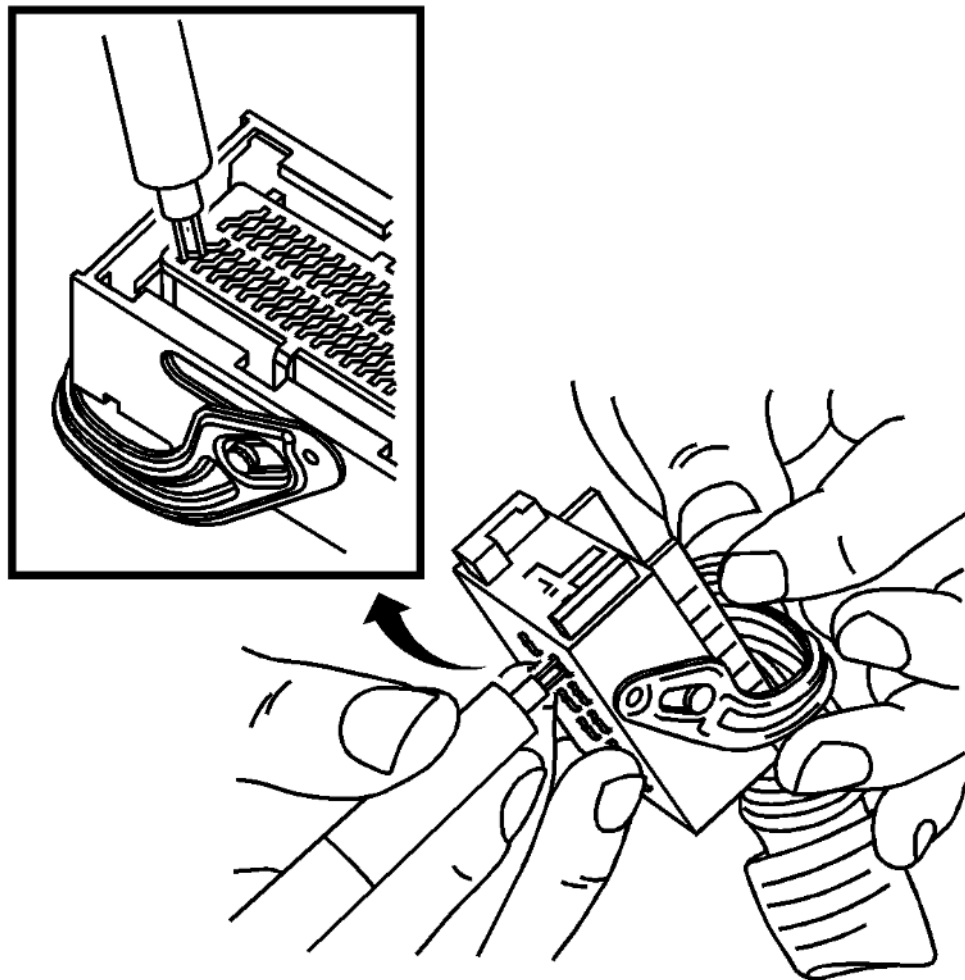


Fig. 36: View Of J 38125-560 Being Inserted Into Triangular Cavities
Courtesy of GENERAL MOTORS COMPANY

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

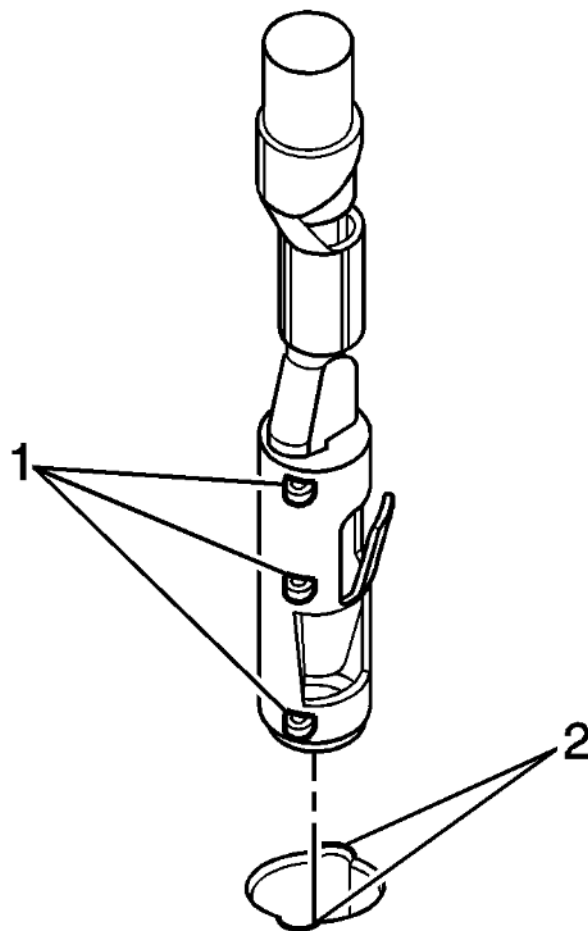


Fig. 37: Aligning Coding Lugs With Connector Coding Grooves
 Courtesy of GENERAL MOTORS COMPANY

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.

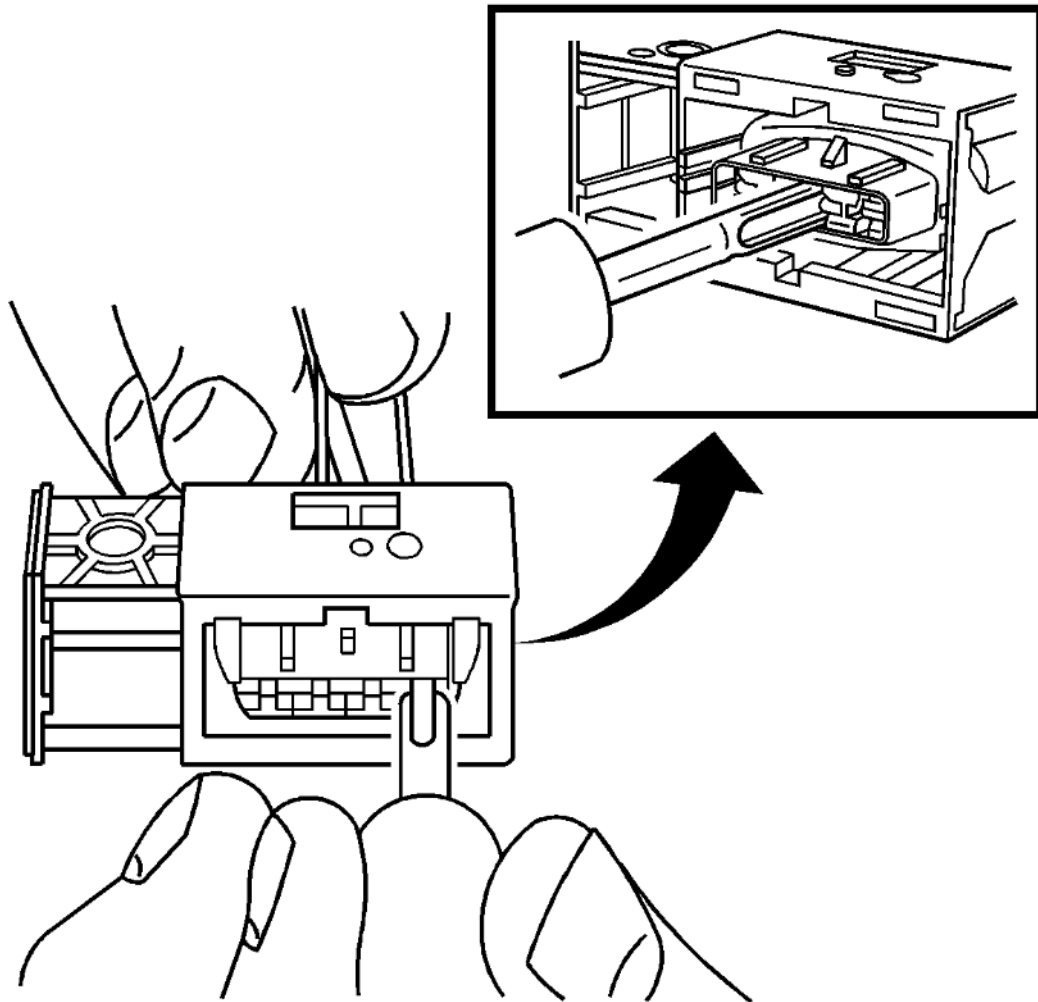


Fig. 38: View Of Bosch Connector Terminals (2.8 JPT)

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

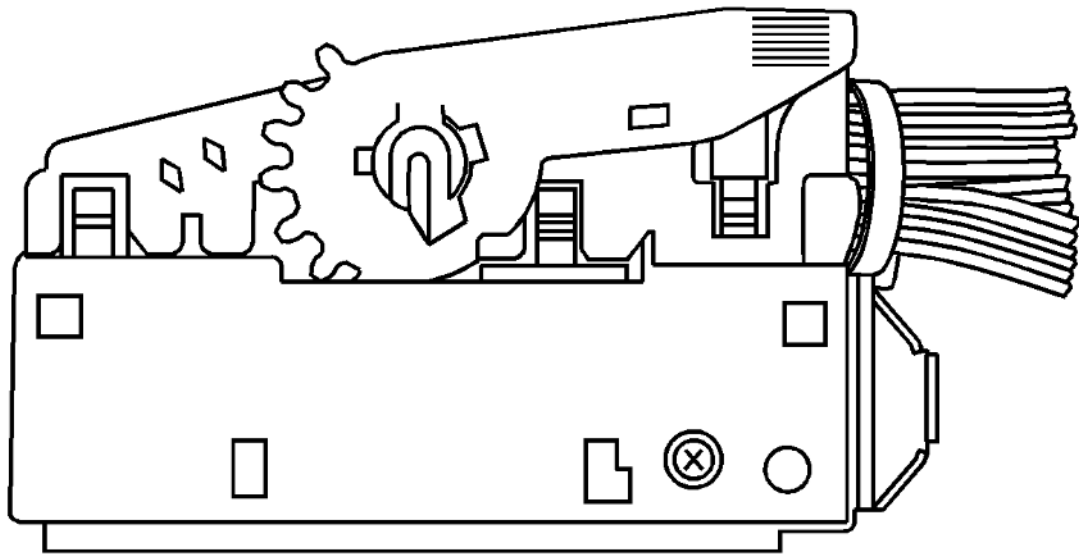


Fig. 39: View Of Bosch Connectors

Courtesy of GENERAL MOTORS COMPANY

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

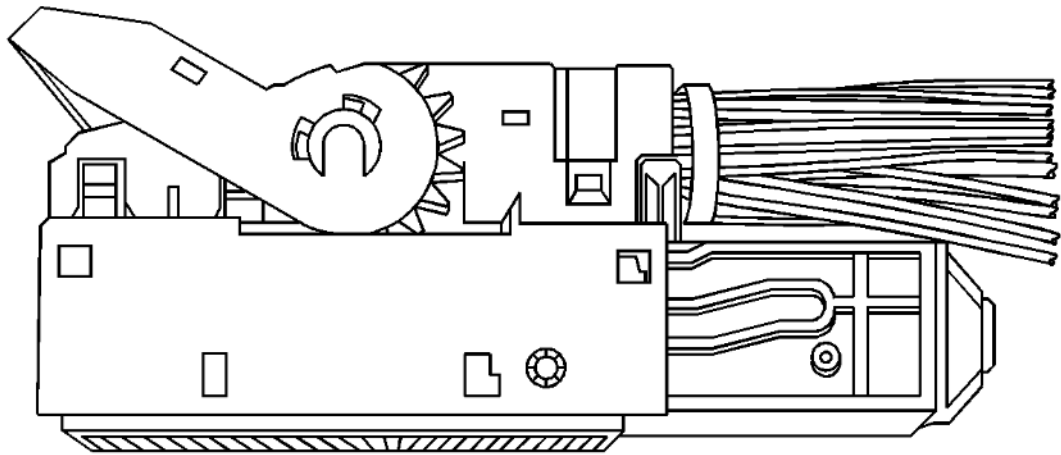


Fig. 40: Identifying Assist Lever In Forward Position
Courtesy of GENERAL MOTORS COMPANY

2. Disconnect the connector from the component.

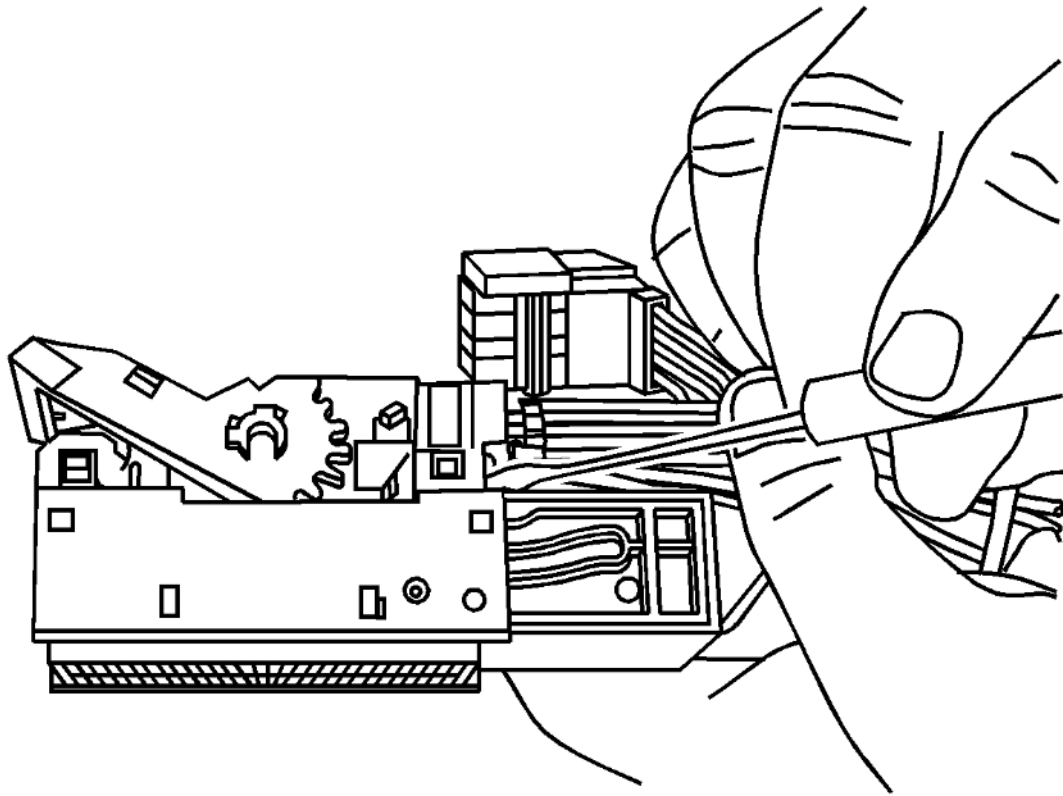


Fig. 41: View Of Releasing Locking Tabs

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.

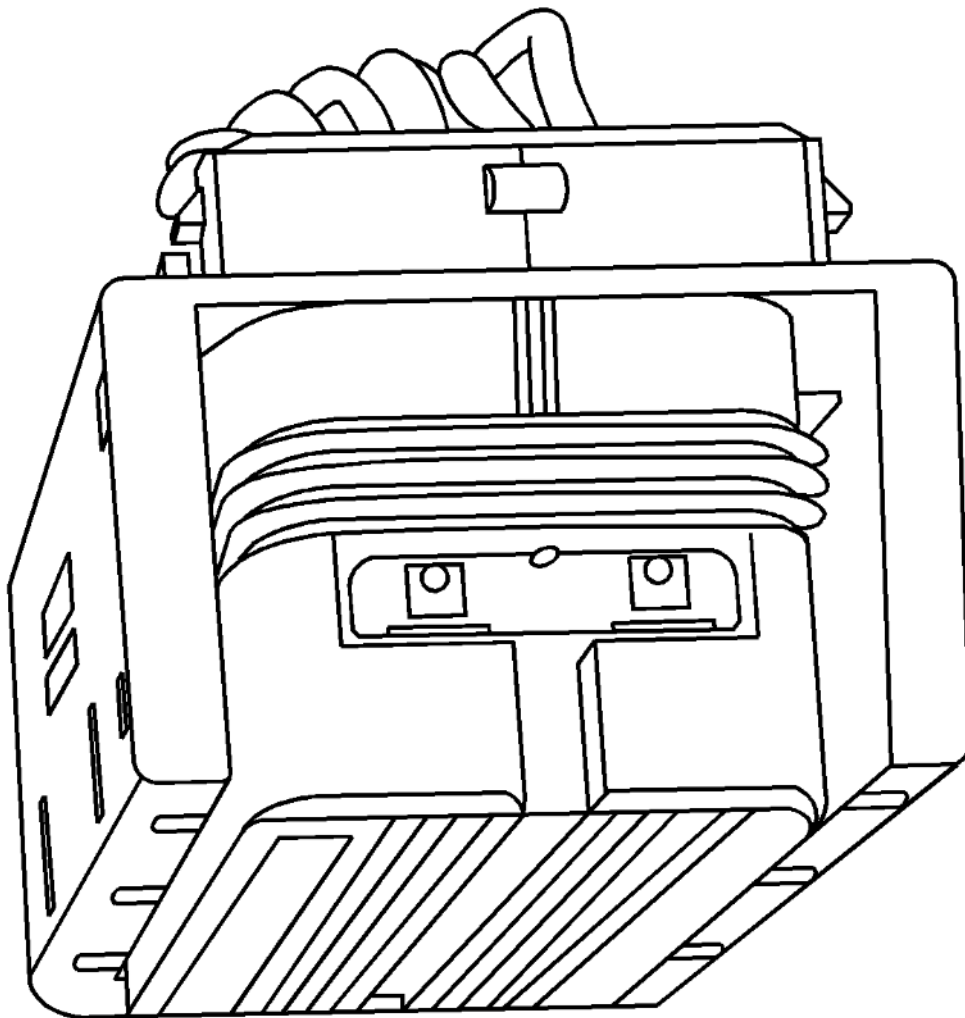


Fig. 42: View Of Terminal Positive Assurance (TPA) Connector
Courtesy of GENERAL MOTORS COMPANY

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

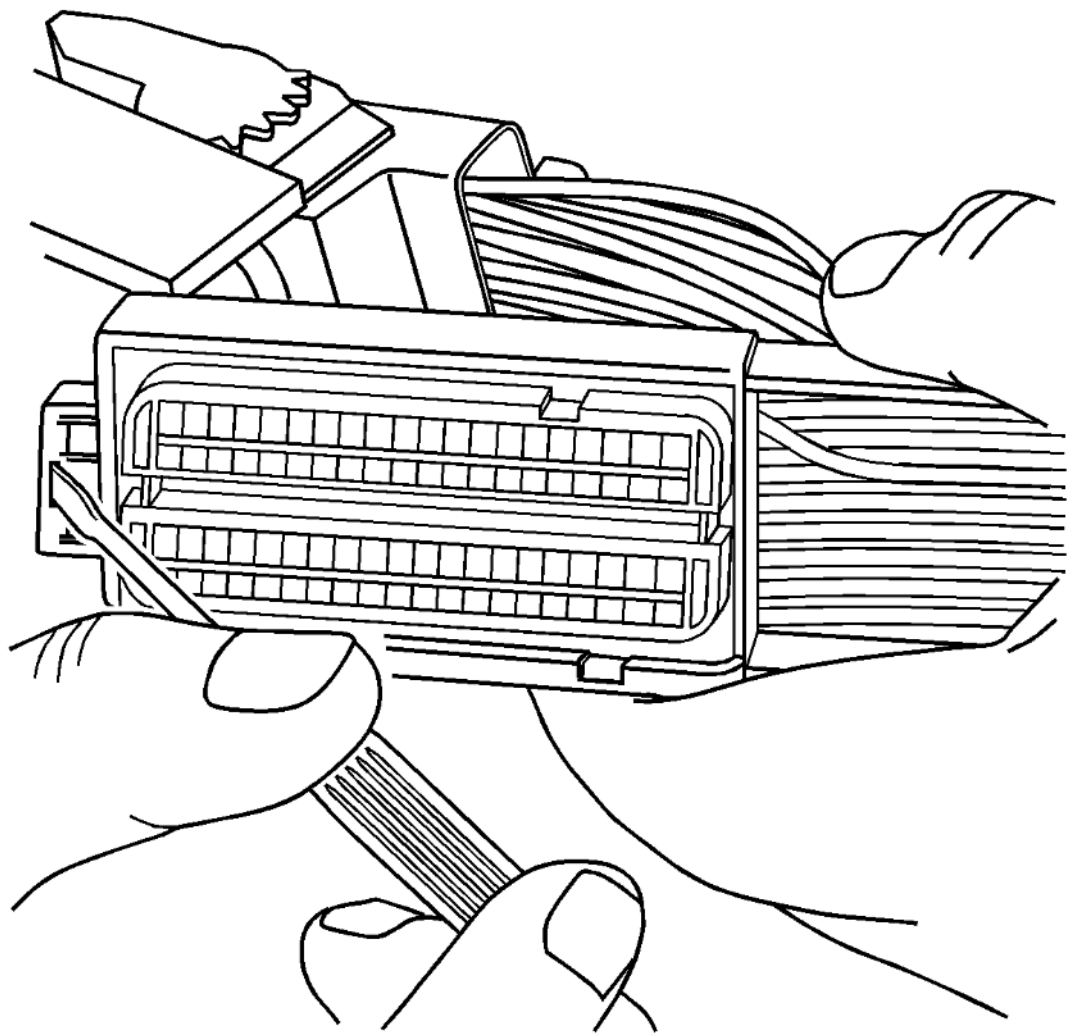


Fig. 43: View Of Removing TPA From Connector

Courtesy of GENERAL MOTORS COMPANY

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

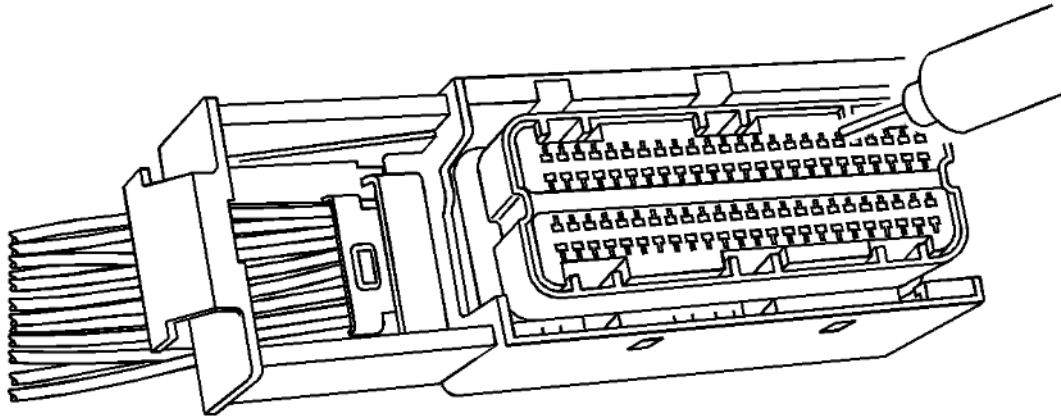


Fig. 44: View Of Special Tools And Terminals
Courtesy of GENERAL MOTORS COMPANY

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.

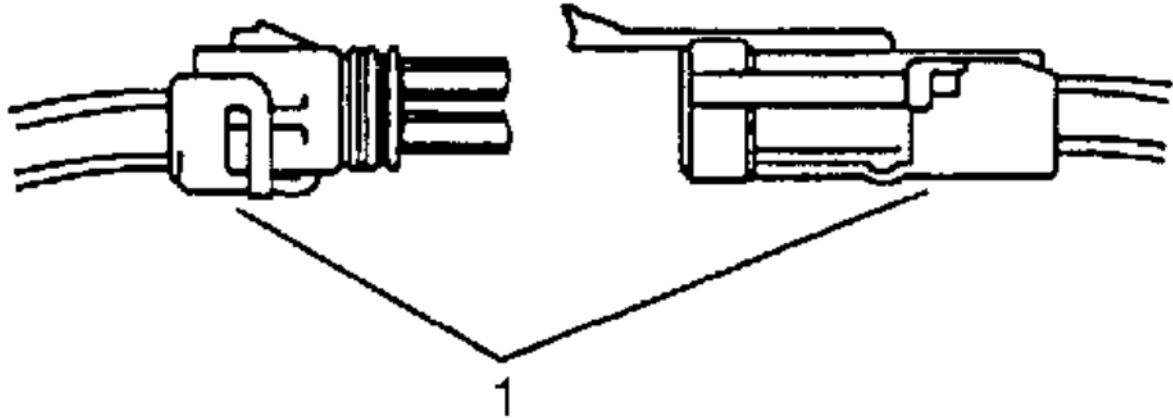


Fig. 45: View Of Connector Halves

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.

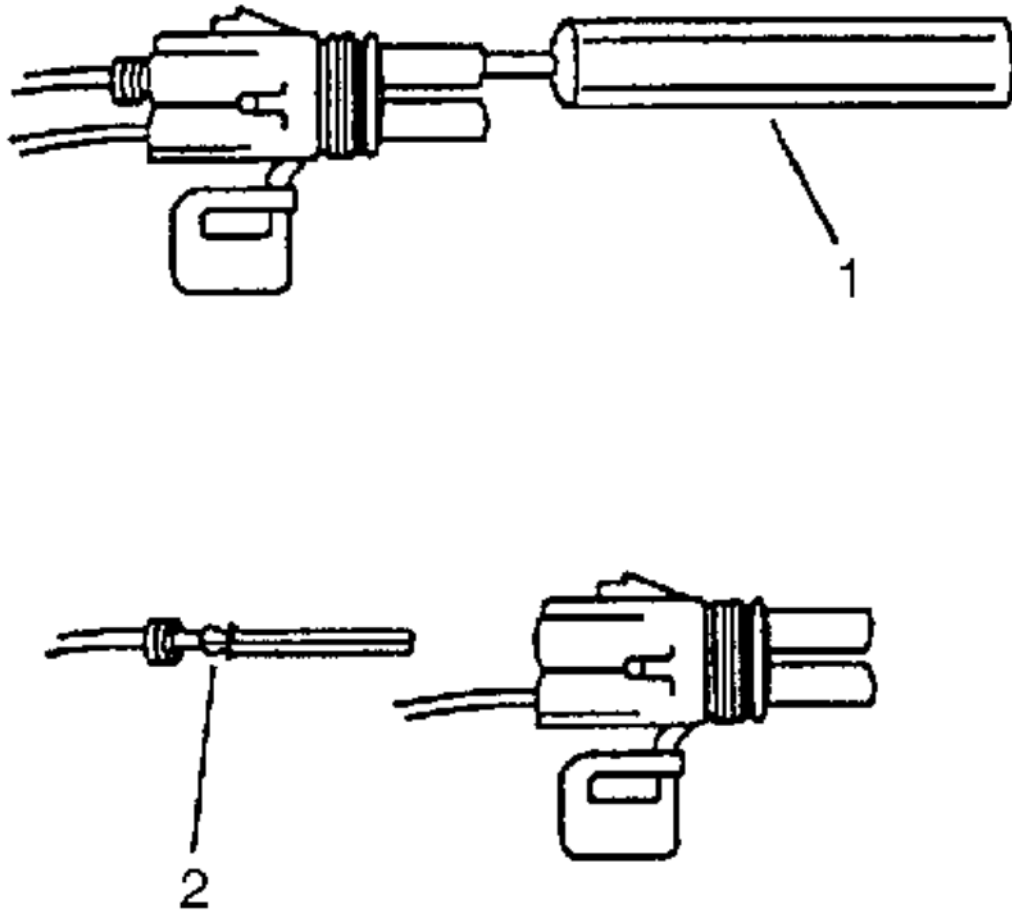


Fig. 46: Identifying Removal Tool & Terminal
 Courtesy of GENERAL MOTORS COMPANY

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.

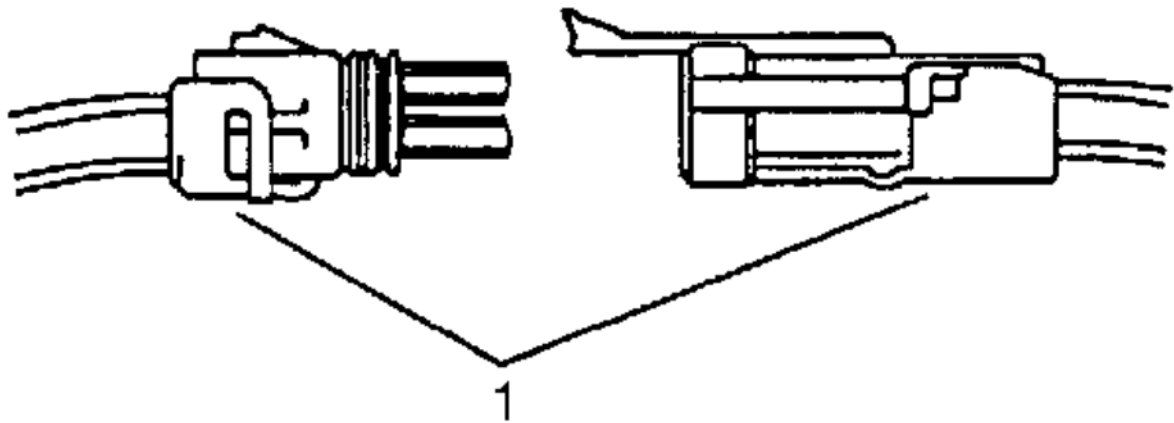


Fig. 47: View Of Connector Halves

Courtesy of GENERAL MOTORS COMPANY

2. Separate the connector halves (1).

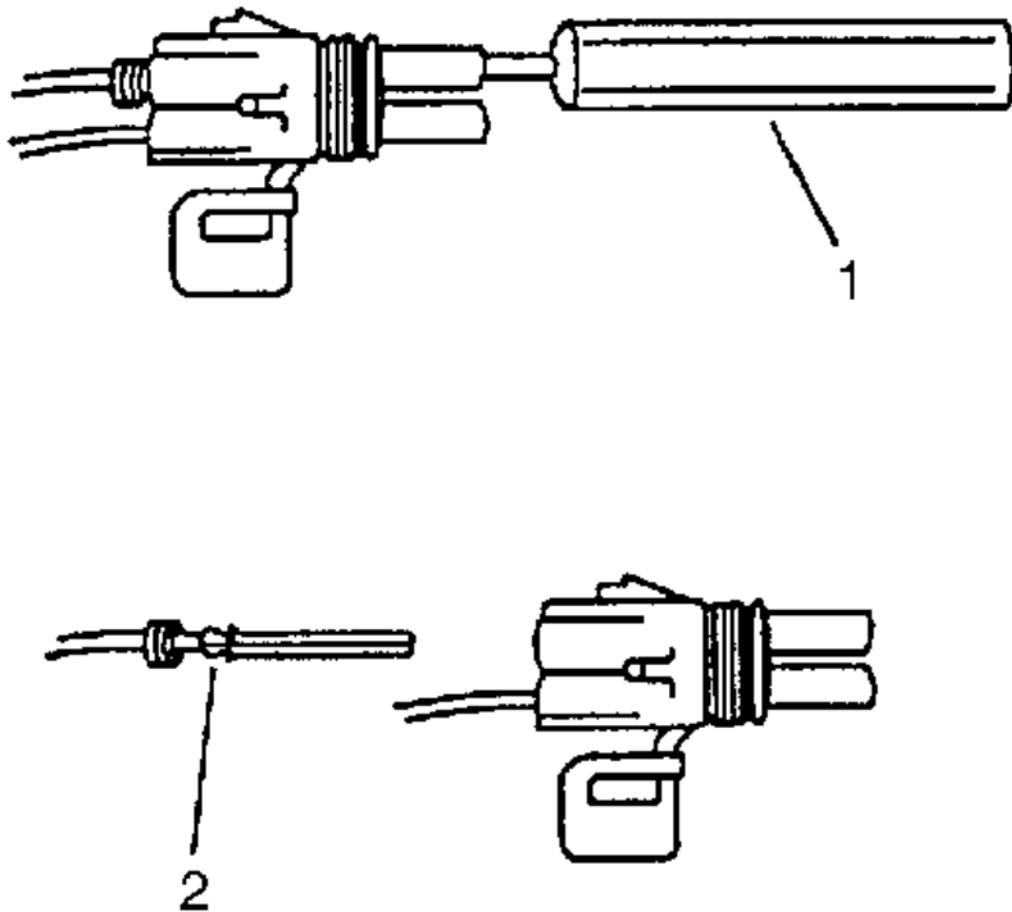


Fig. 48: Identifying Removal Tool & Terminal
Courtesy of GENERAL MOTORS COMPANY

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.

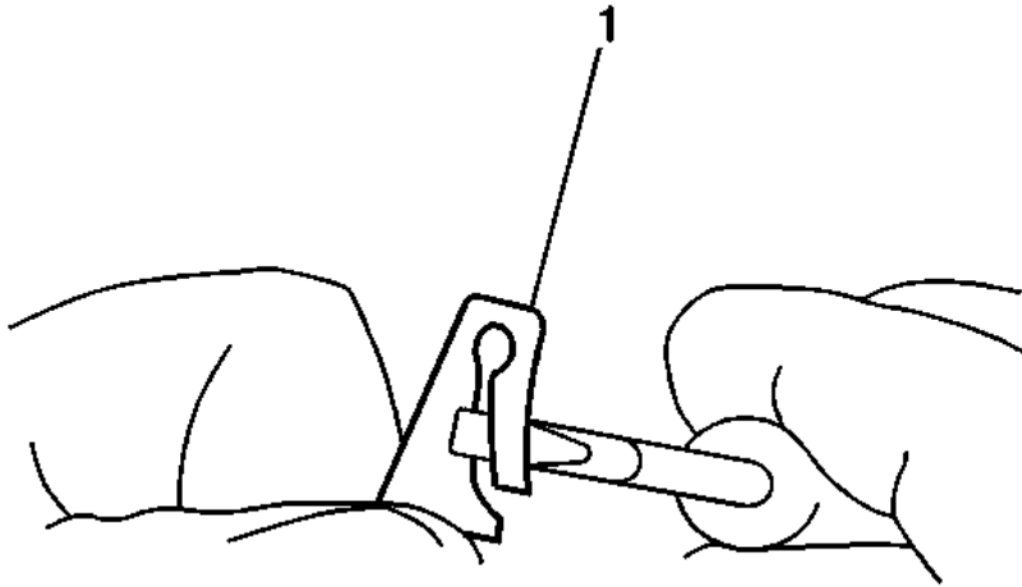


Fig. 49: Identifying Locking Device

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 \(Terminated Lead Repair\)](#)[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.

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.

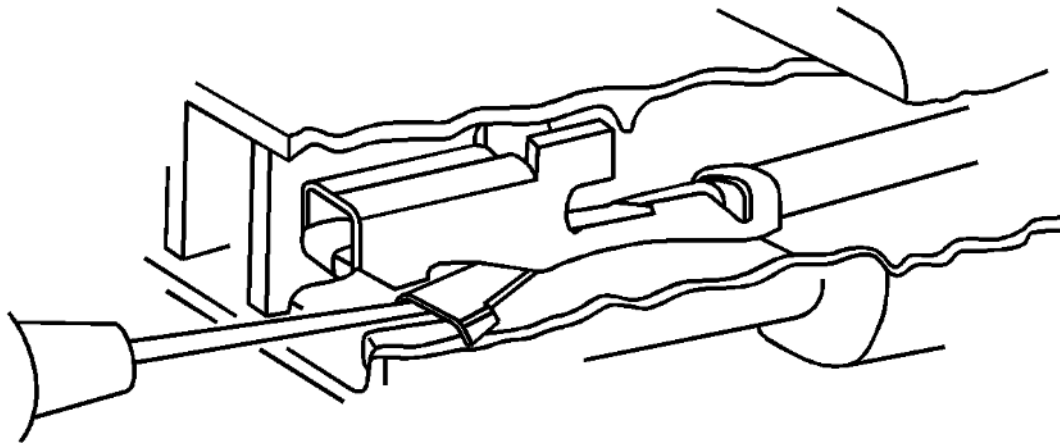


Fig. 50: Aligning Removal Tool - Delphi (Pull To Seat)
Courtesy of GENERAL MOTORS COMPANY

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.

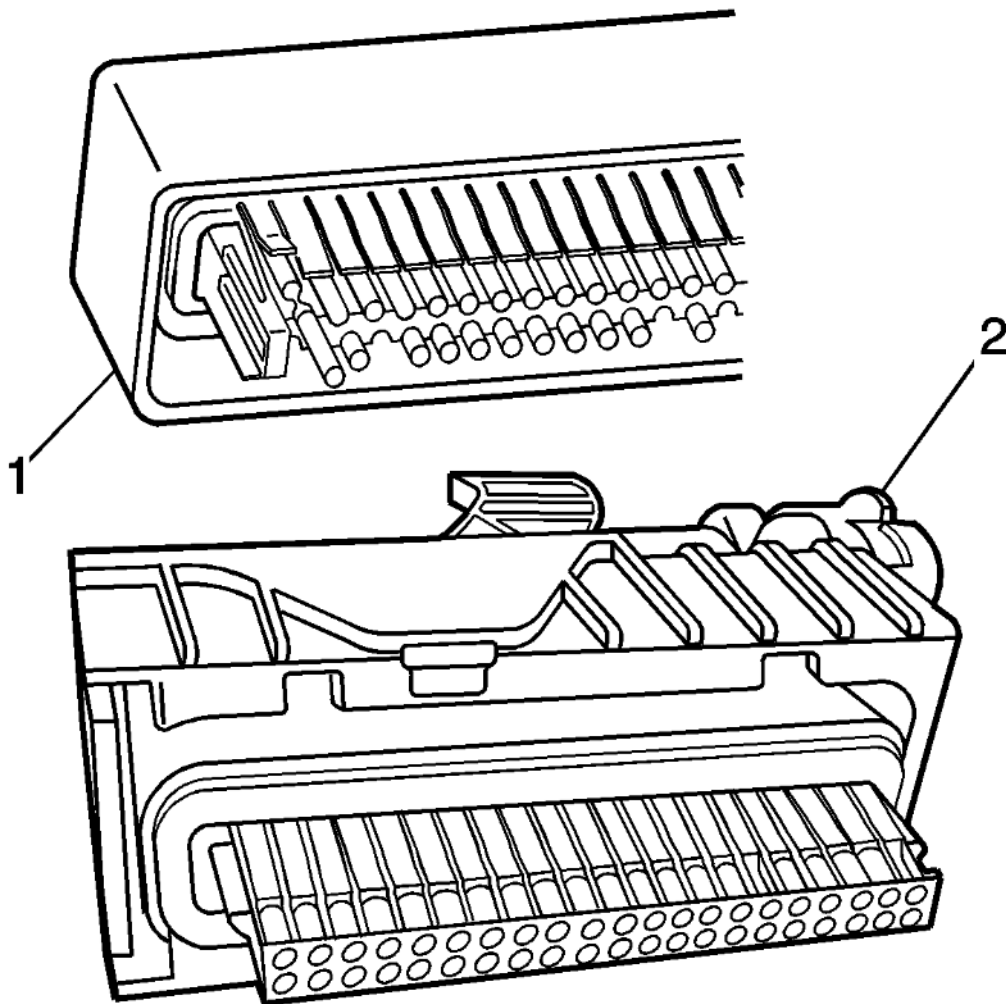


Fig. 51: Identifying Micro-Pack 100W First & Second Connector Designs

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.

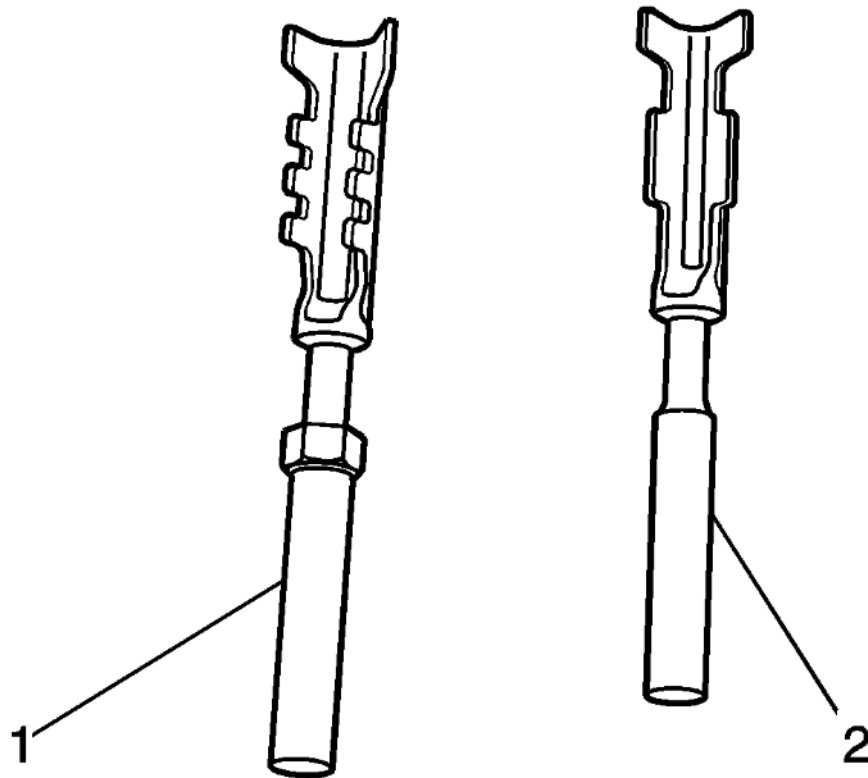


Fig. 52: Identifying Micro-Pack 100W Short & Long Terminals

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.

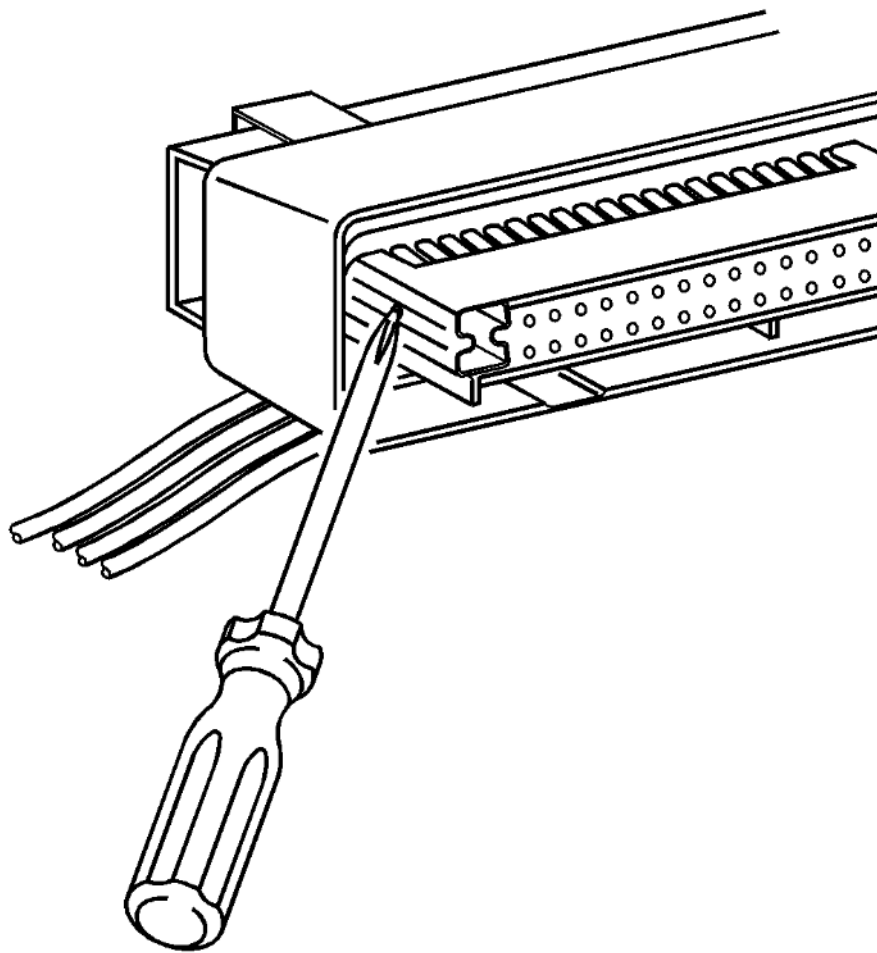


Fig. 53: Locating Nose Piece Locking Tabs

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.

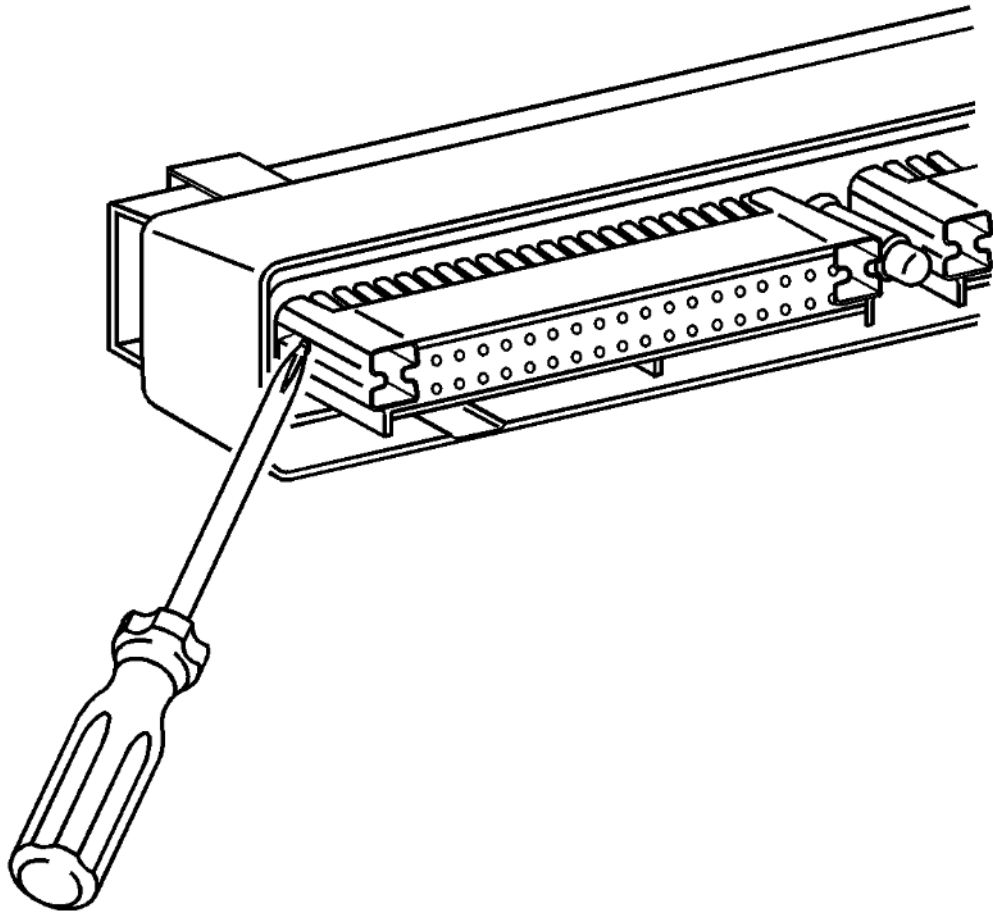


Fig. 54: Loosening Nose Piece Locking Tabs

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.

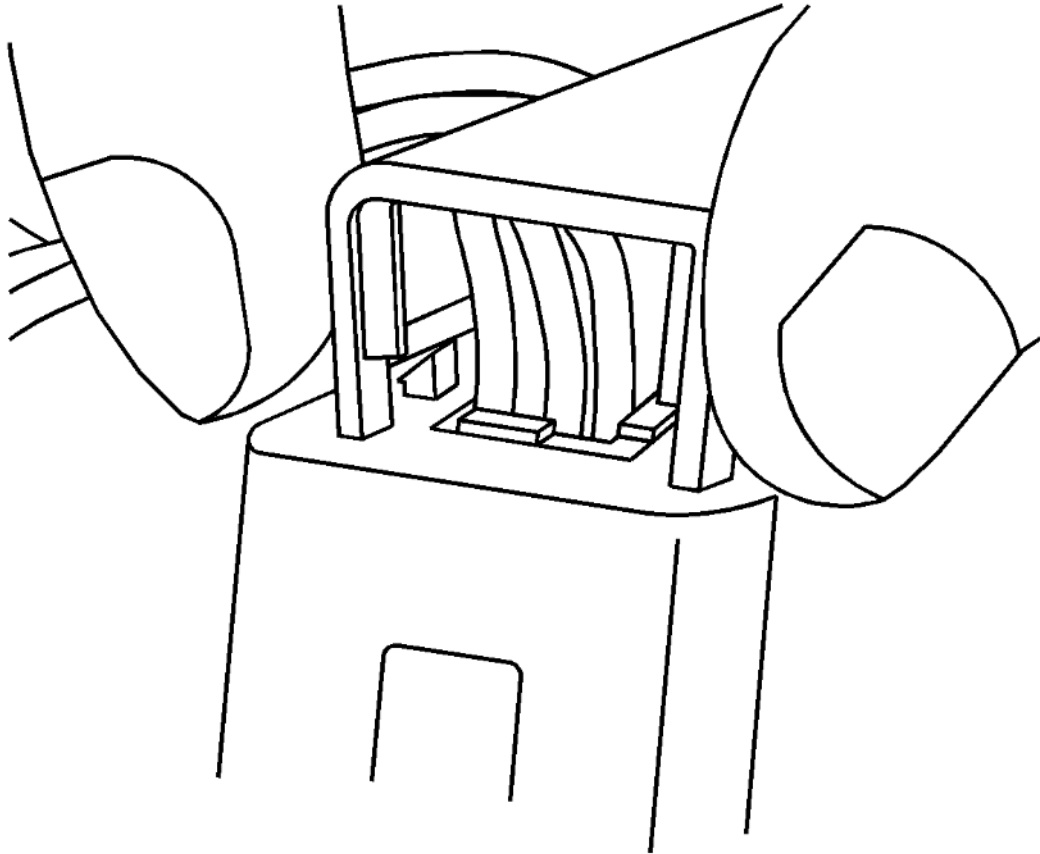


Fig. 55: Squeezing Cover Locking Legs
Courtesy of GENERAL MOTORS COMPANY

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

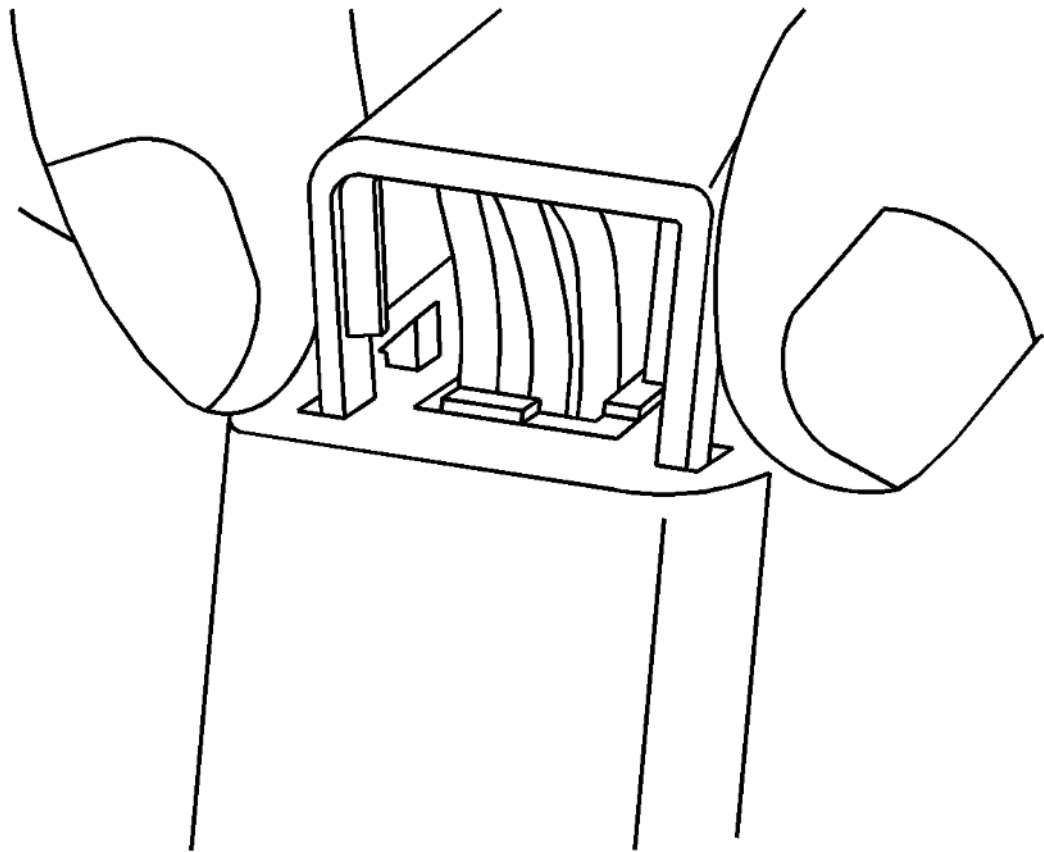


Fig. 56: Unseating Locking Leg
Courtesy of GENERAL MOTORS COMPANY

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

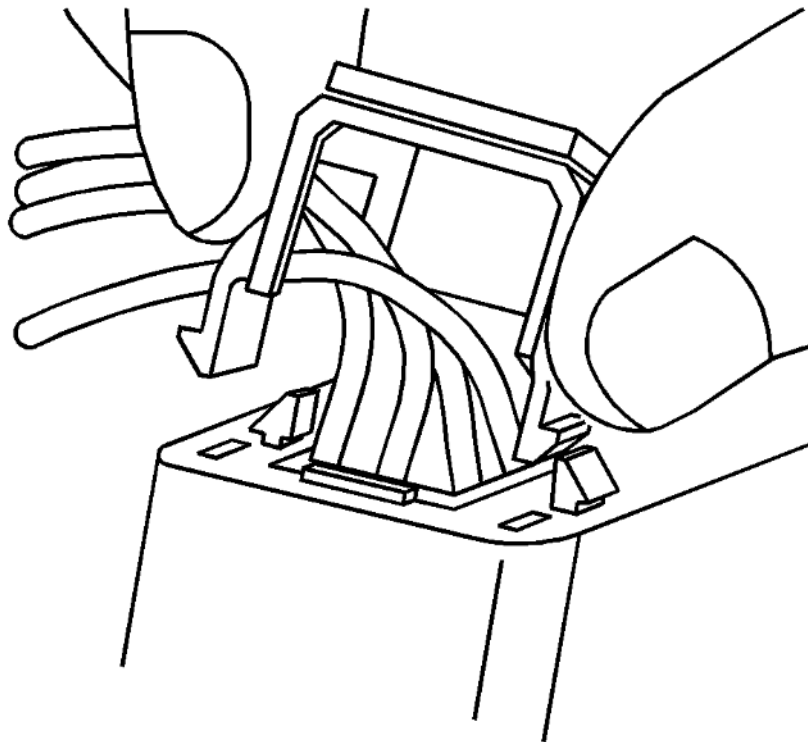


Fig. 57: Removing Cover

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.

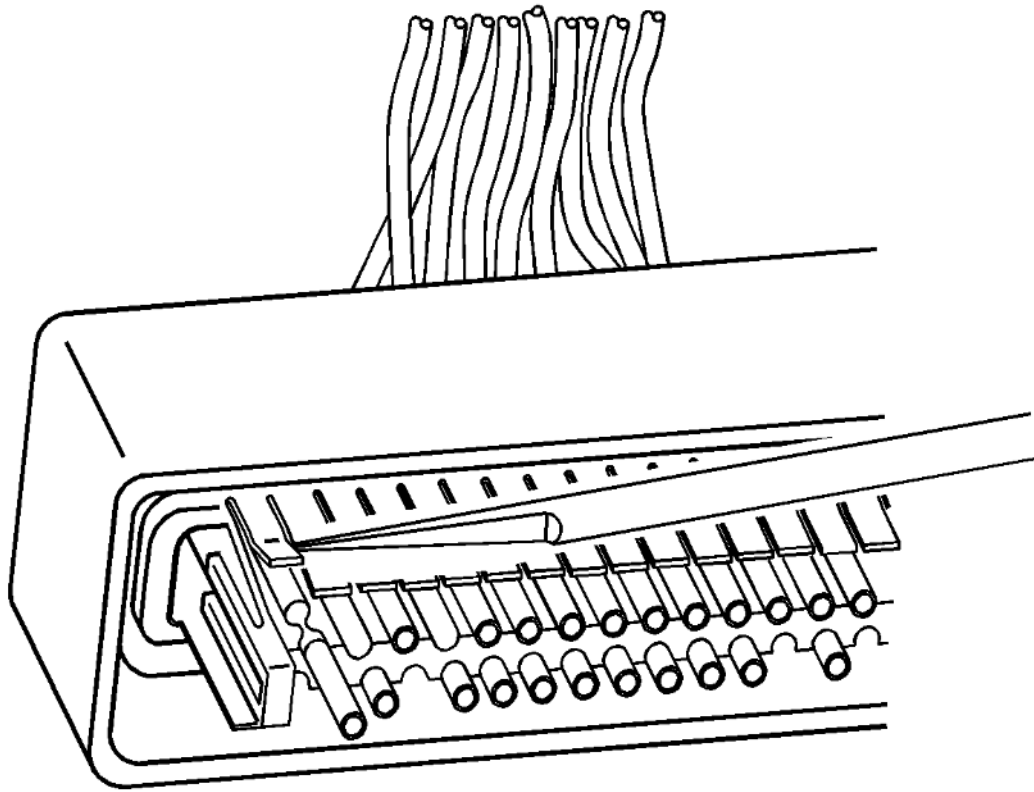


Fig. 58: Identifying Terminal Retaining Tab

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 \(Terminated Lead Repair\)](#)[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.

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.

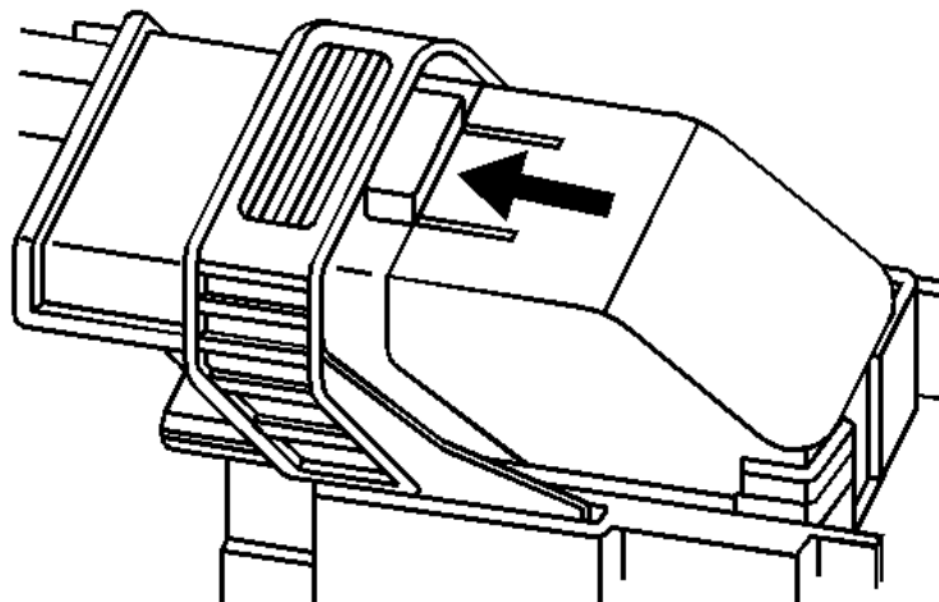


Fig. 59: Identifying Wire Dress Cover Lever Lock
Courtesy of GENERAL MOTORS COMPANY

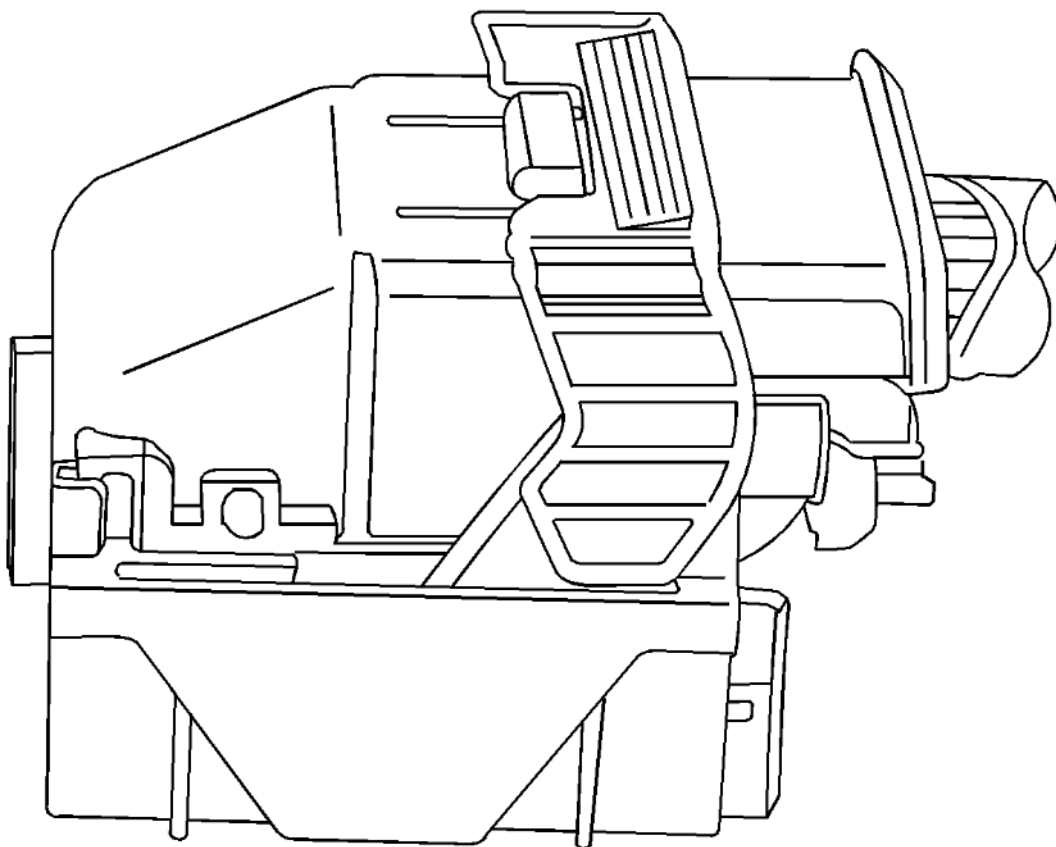


Fig. 60: View Of Typical Micro 64 Connector
Courtesy of GENERAL MOTORS COMPANY

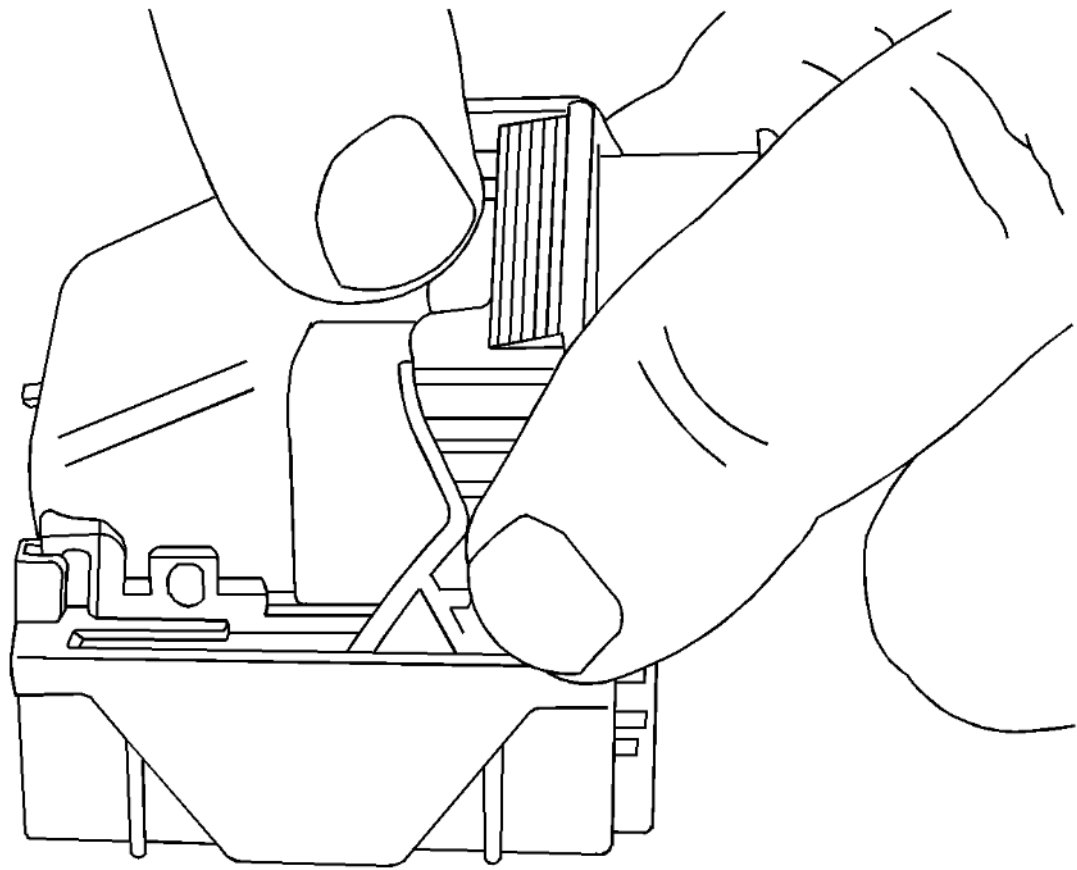


Fig. 61: Depressing Lock And Pulling Lever
Courtesy of GENERAL MOTORS COMPANY

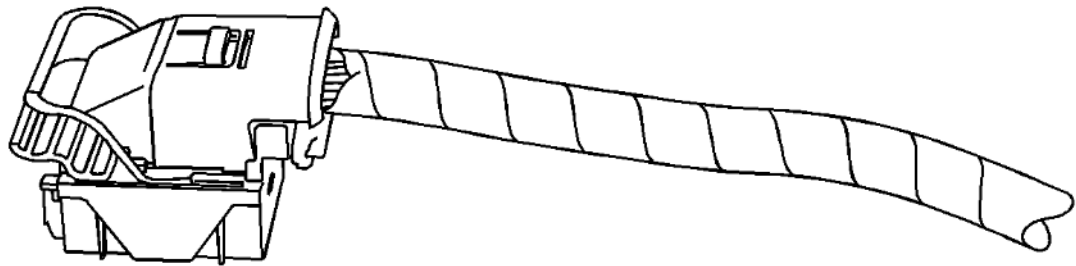


Fig. 62: View Of Connector When Released From Component
Courtesy of GENERAL MOTORS COMPANY

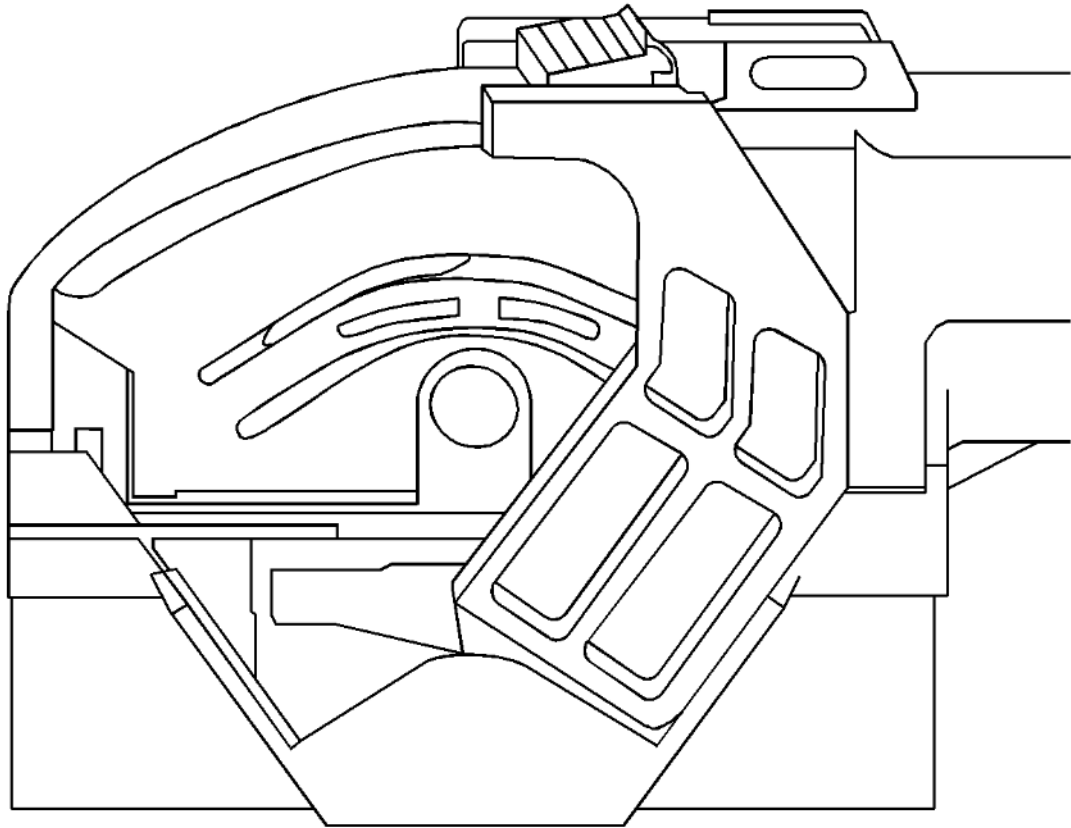


Fig. 63: View Of Another Type Of Micro 64 Connector
Courtesy of GENERAL MOTORS COMPANY

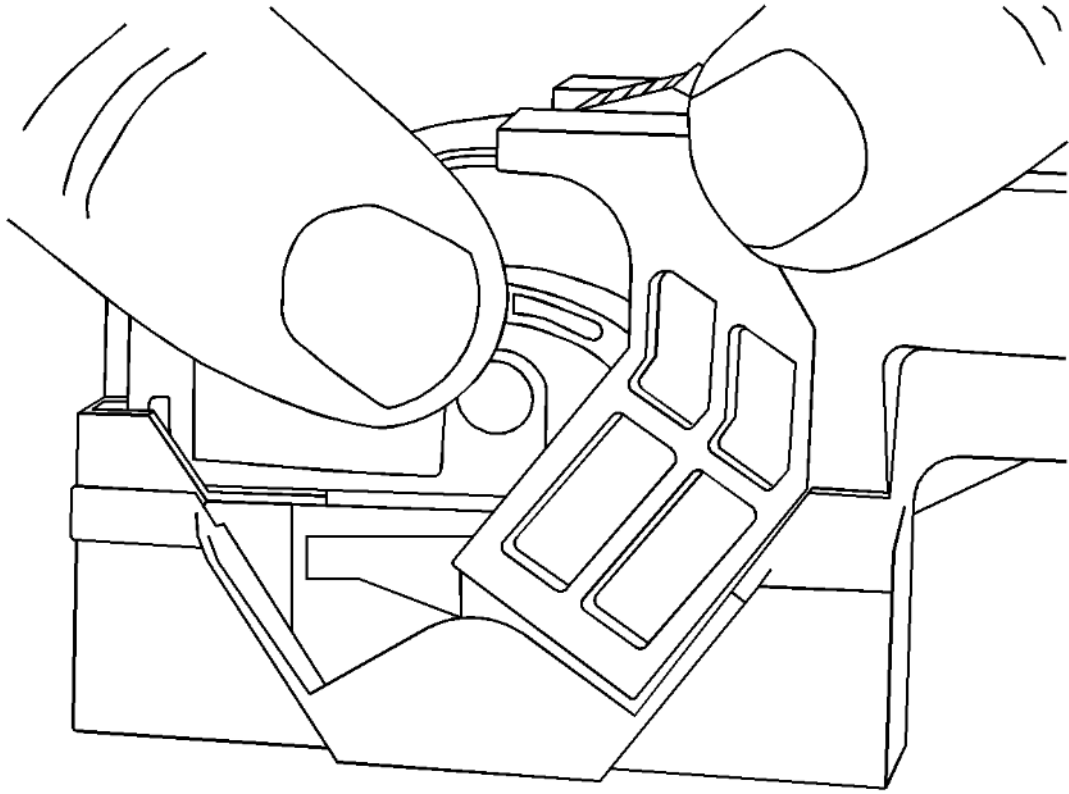


Fig. 64: Locating Locks On Both Sides Of Wiredress Cover
Courtesy of GENERAL MOTORS COMPANY

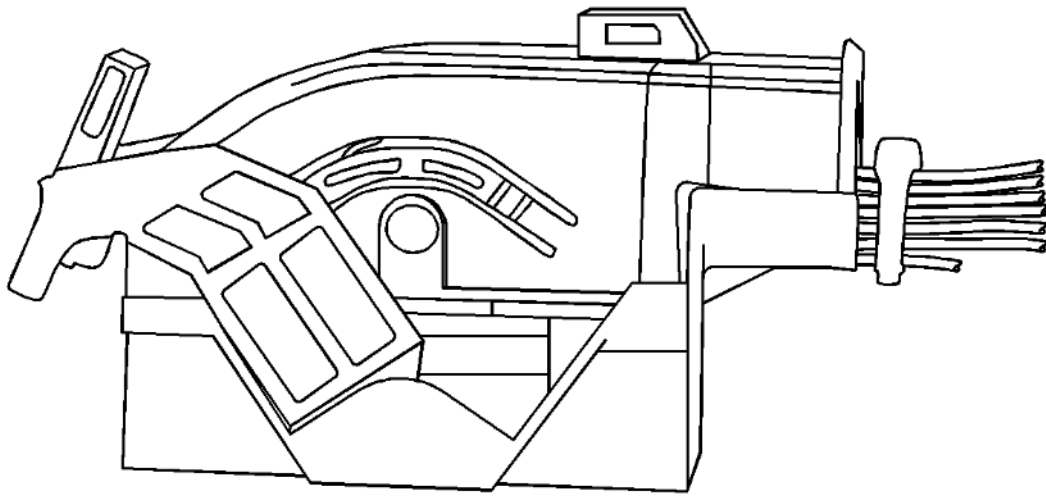


Fig. 65: View Of Connector When Released From Component

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.

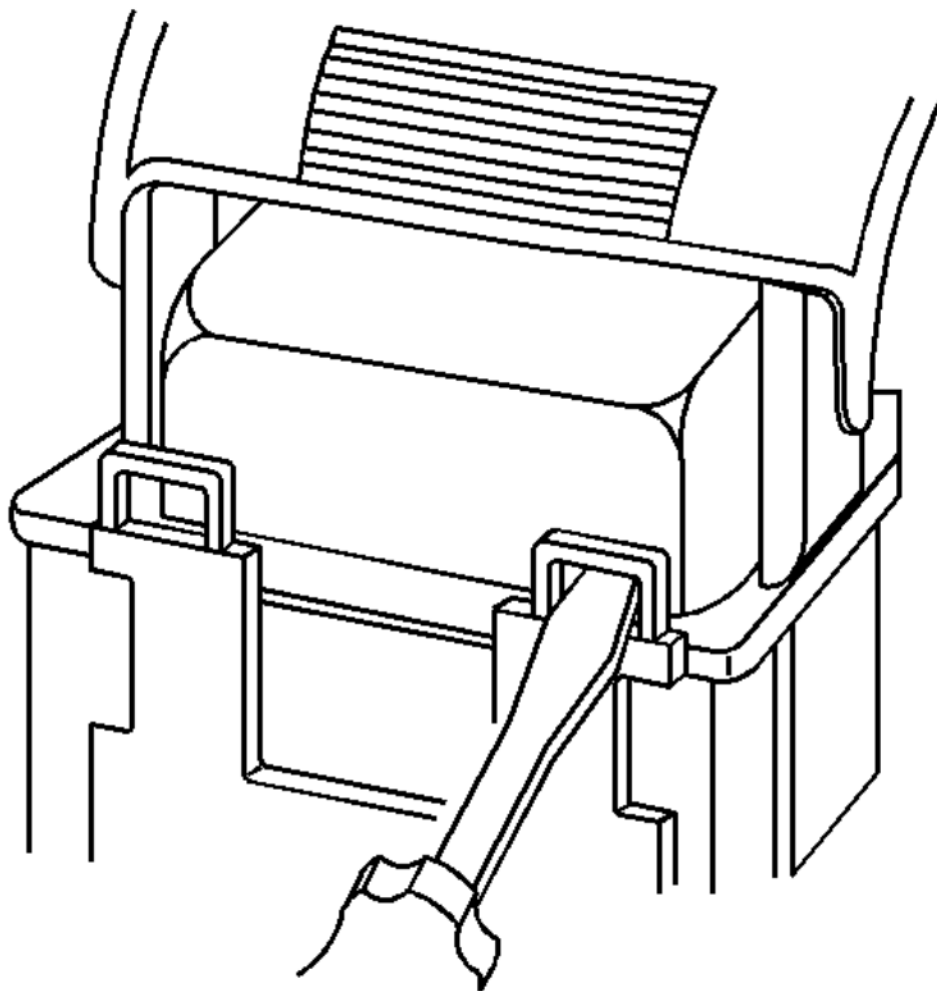


Fig. 66: View Of Releasing Locking Tabs

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.

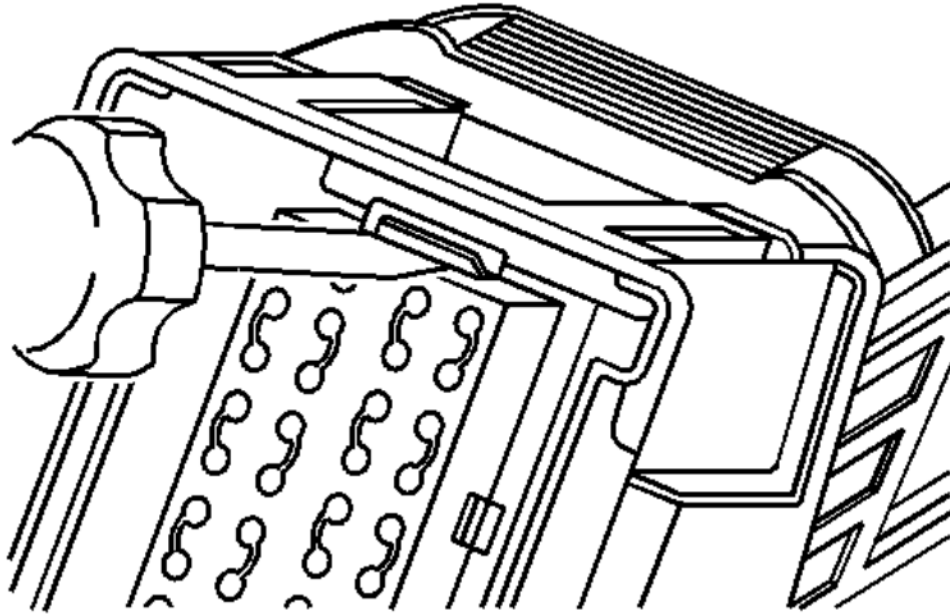


Fig. 67: View Of Removing Terminal Position Assurance

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.

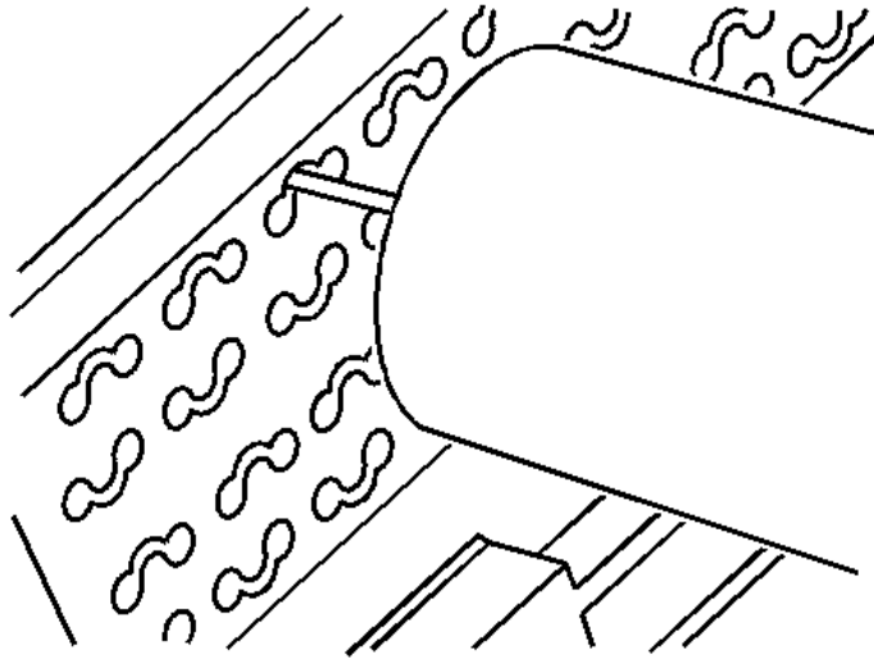


Fig. 68: Identifying Terminal Release Tool

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.

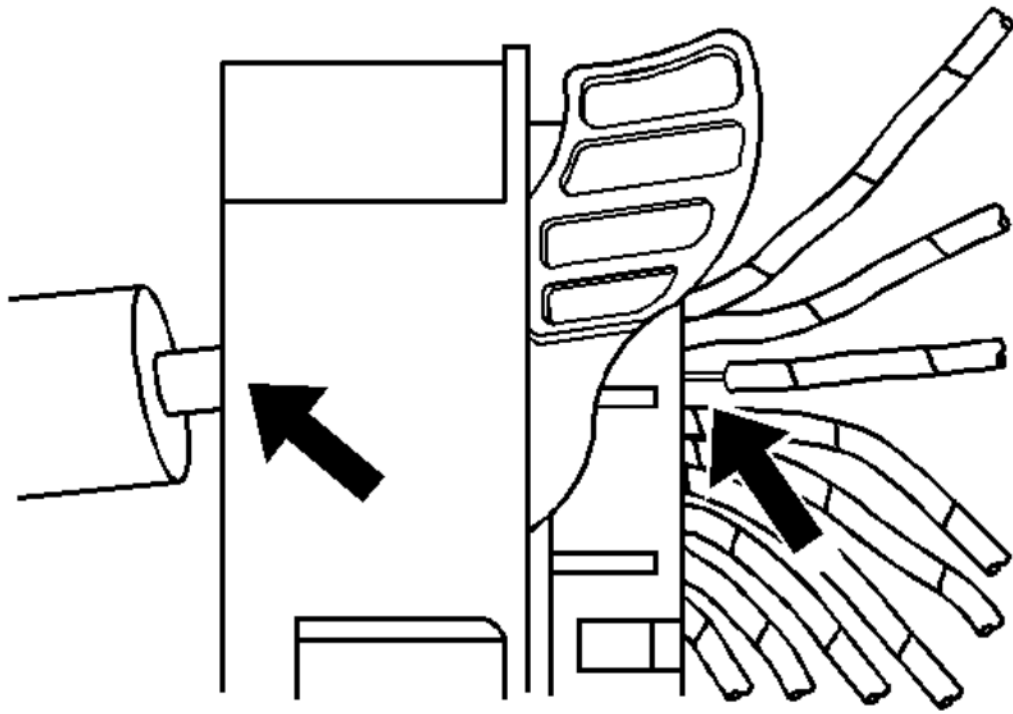


Fig. 69: Removing Wire From Back Of Connector

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.

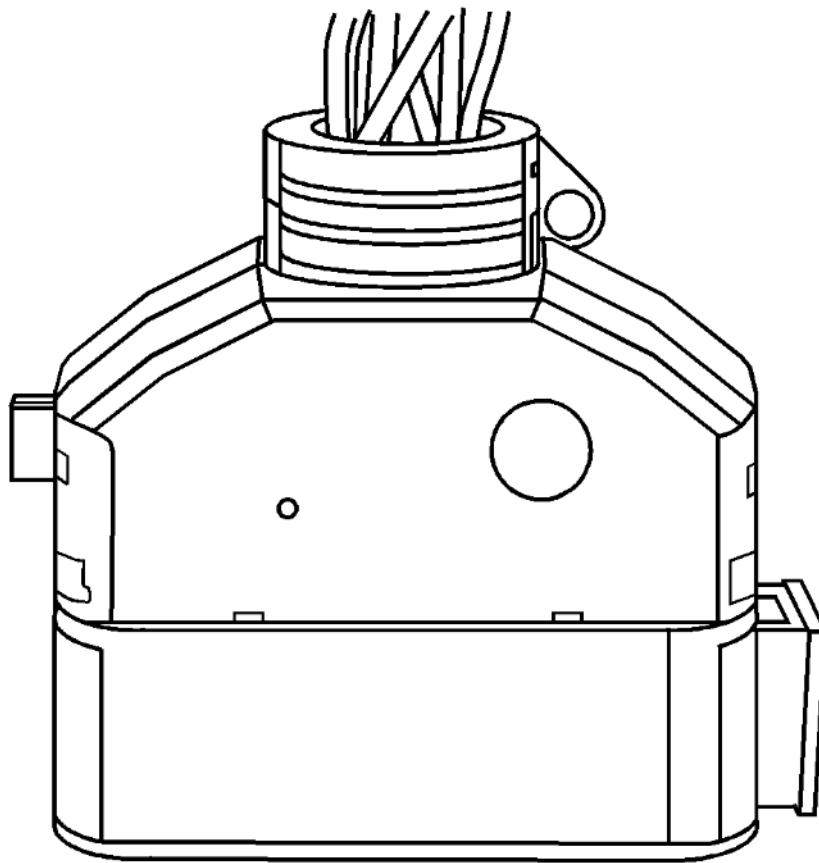


Fig. 70: Identifying Lever Lock

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.

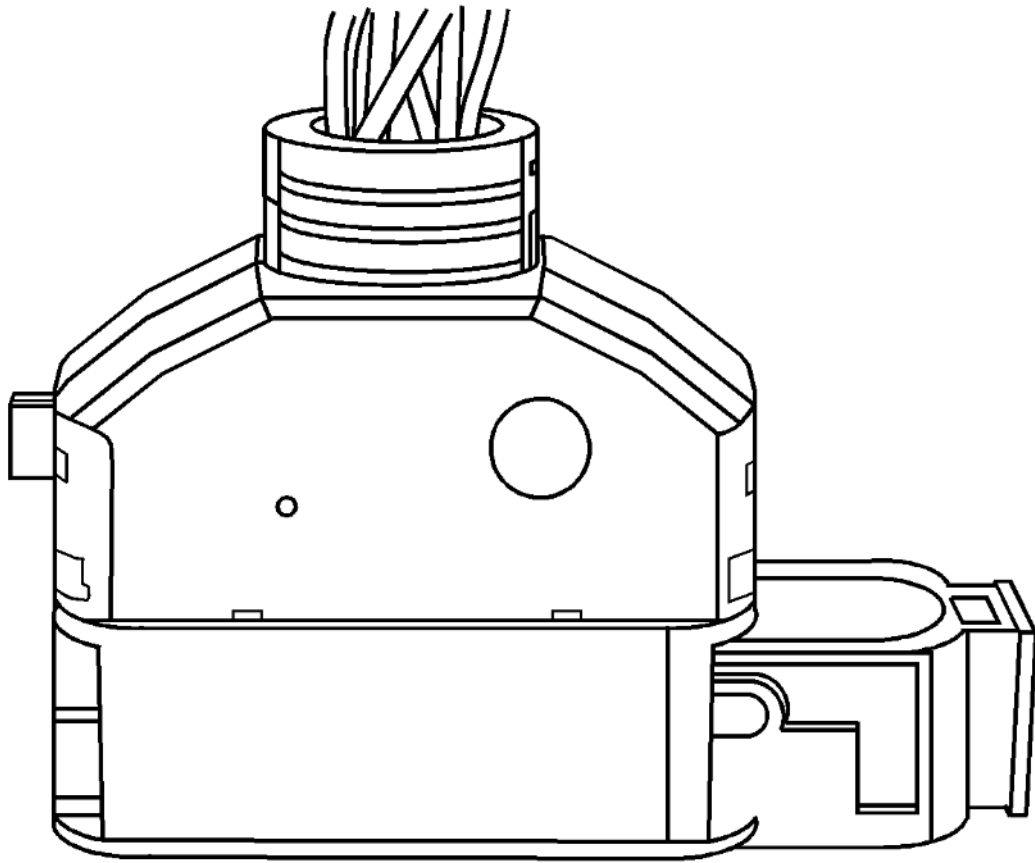


Fig. 71: Identifying Dress Cover Locking Tabs

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.

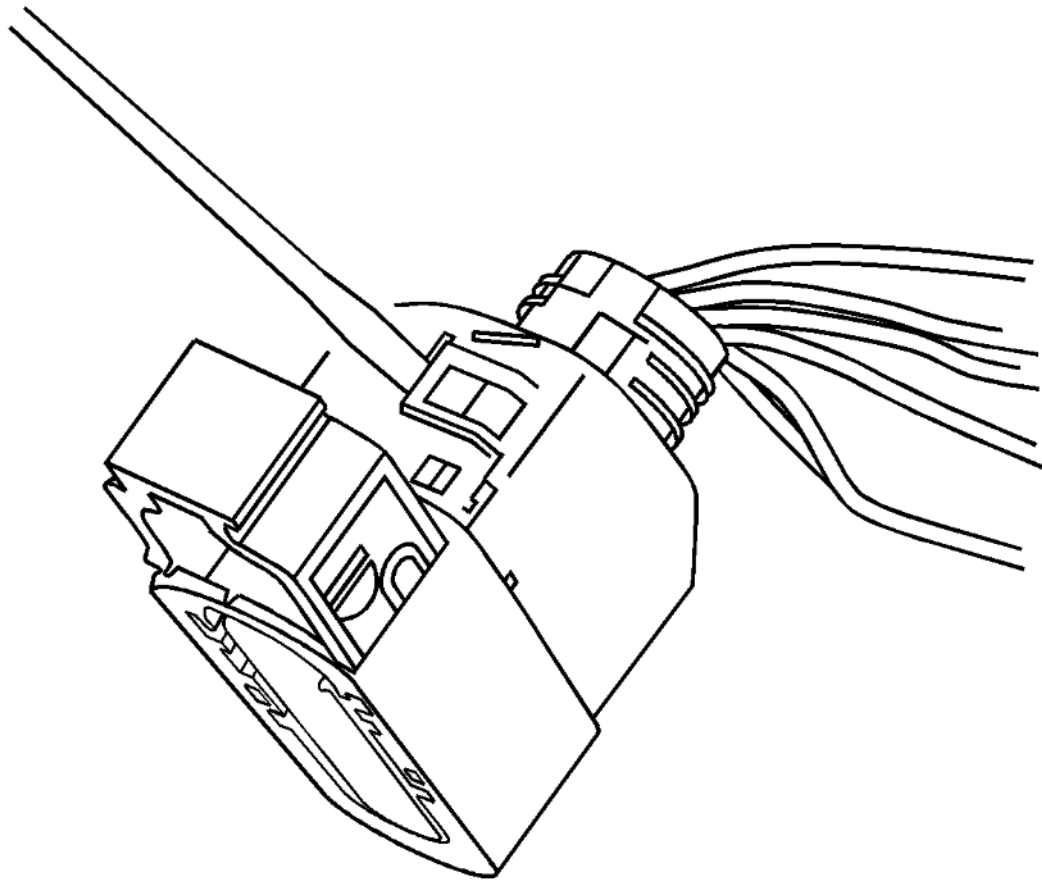


Fig. 72: Identifying Lower Wire Dress Cover Locking Tab
Courtesy of GENERAL MOTORS COMPANY

4. Release the lower wire dress cover locking tab.

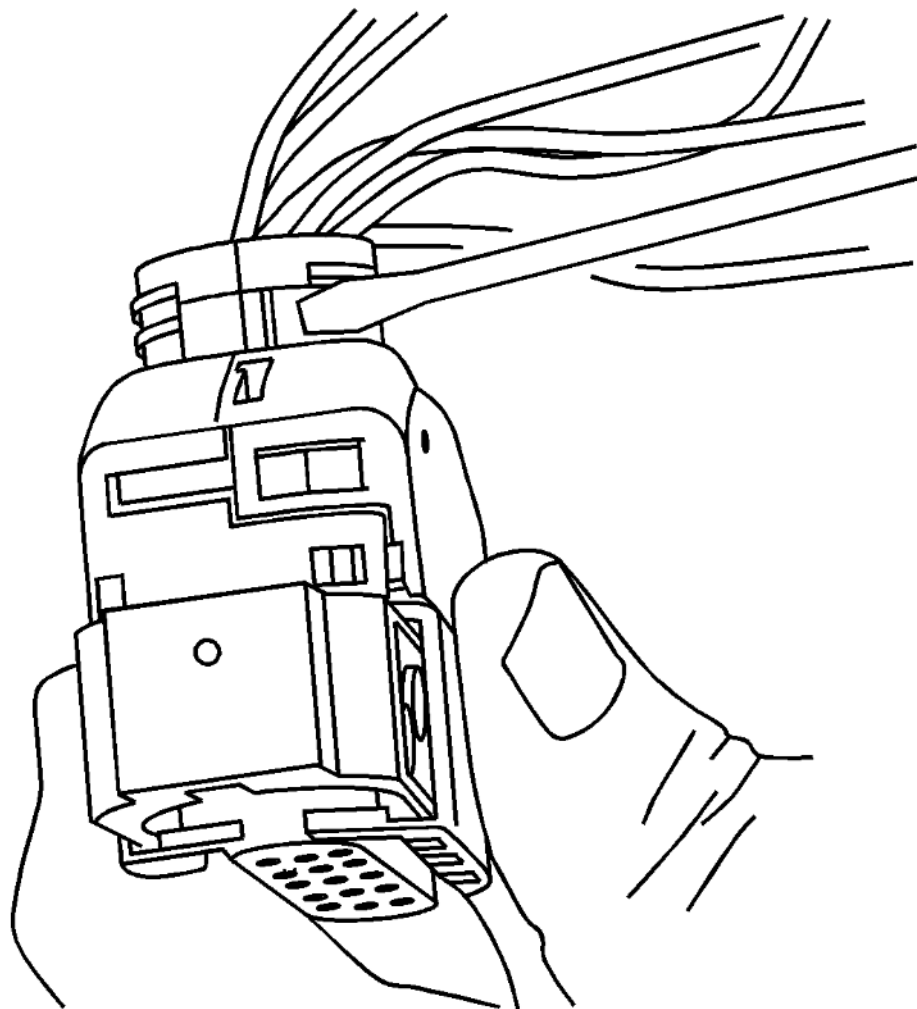


Fig. 73: Identifying Upper Wire Dress Cover Locking Tab
Courtesy of GENERAL MOTORS COMPANY

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

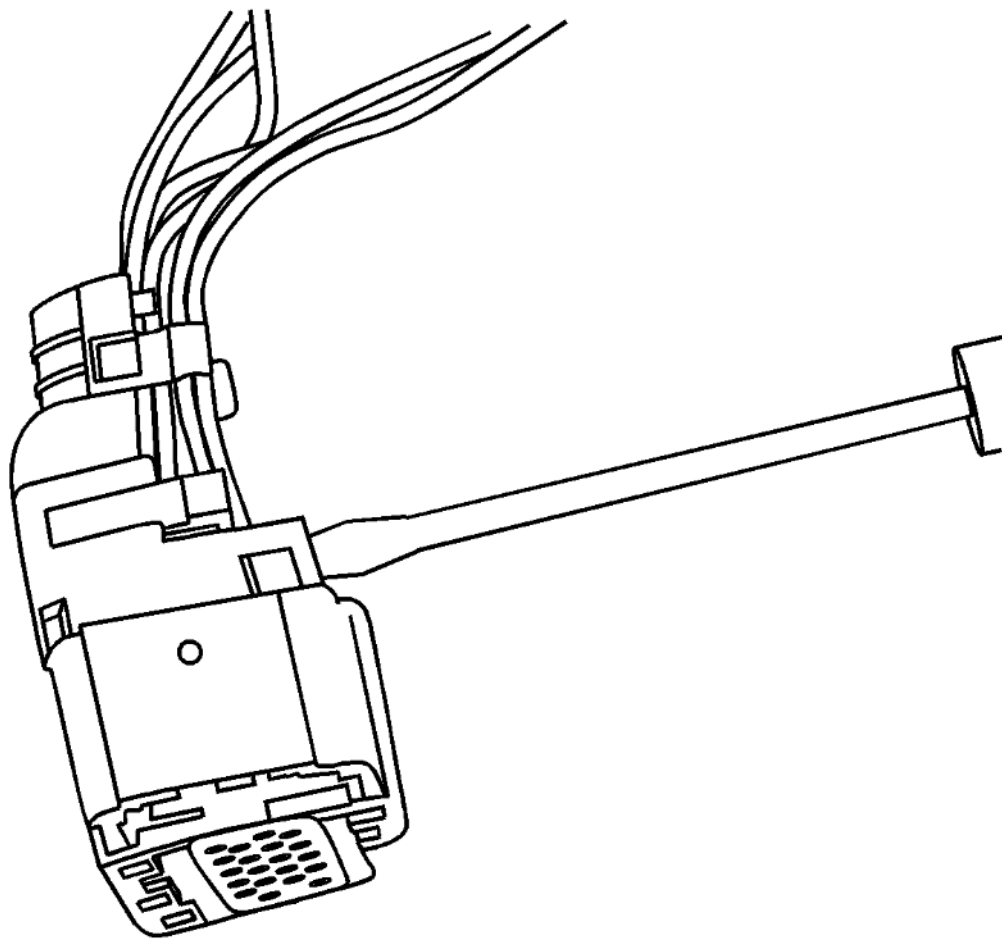


Fig. 74: View Of TPA Being Pried Out Of Connector

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.

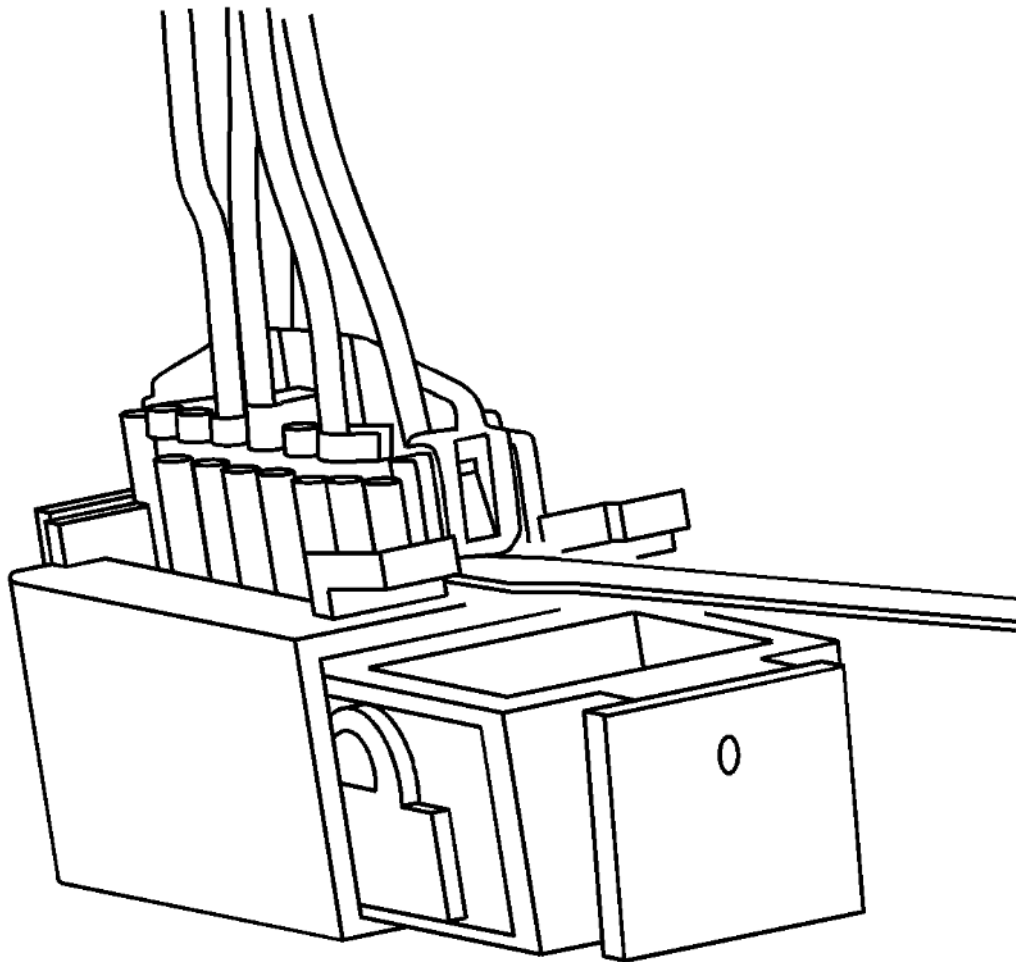


Fig. 75: Removing Nose Piece

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.

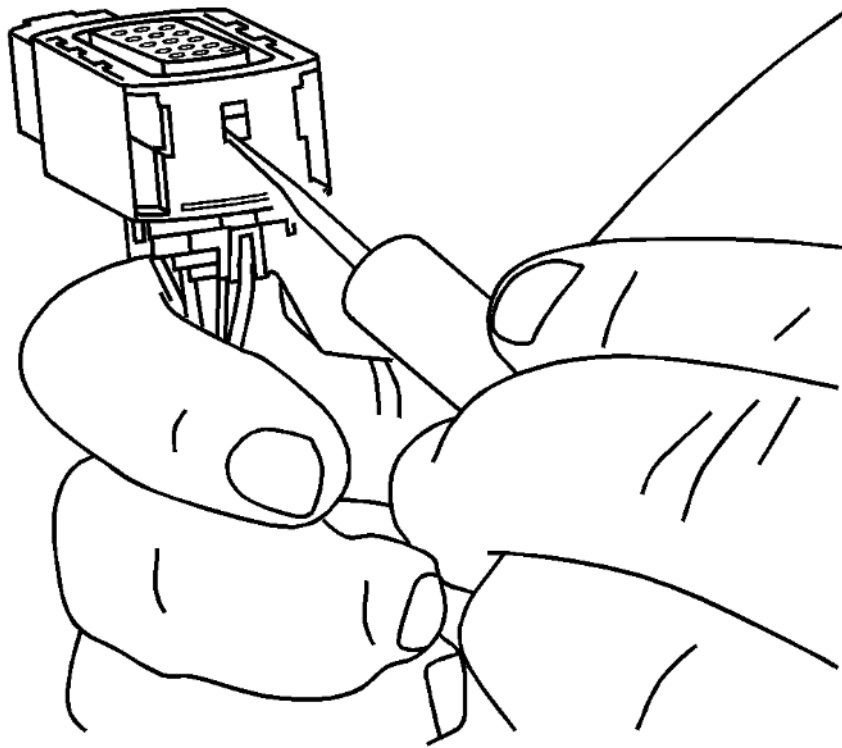


Fig. 76: Inserting Special Tool Into Terminal Release Cavity.

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.

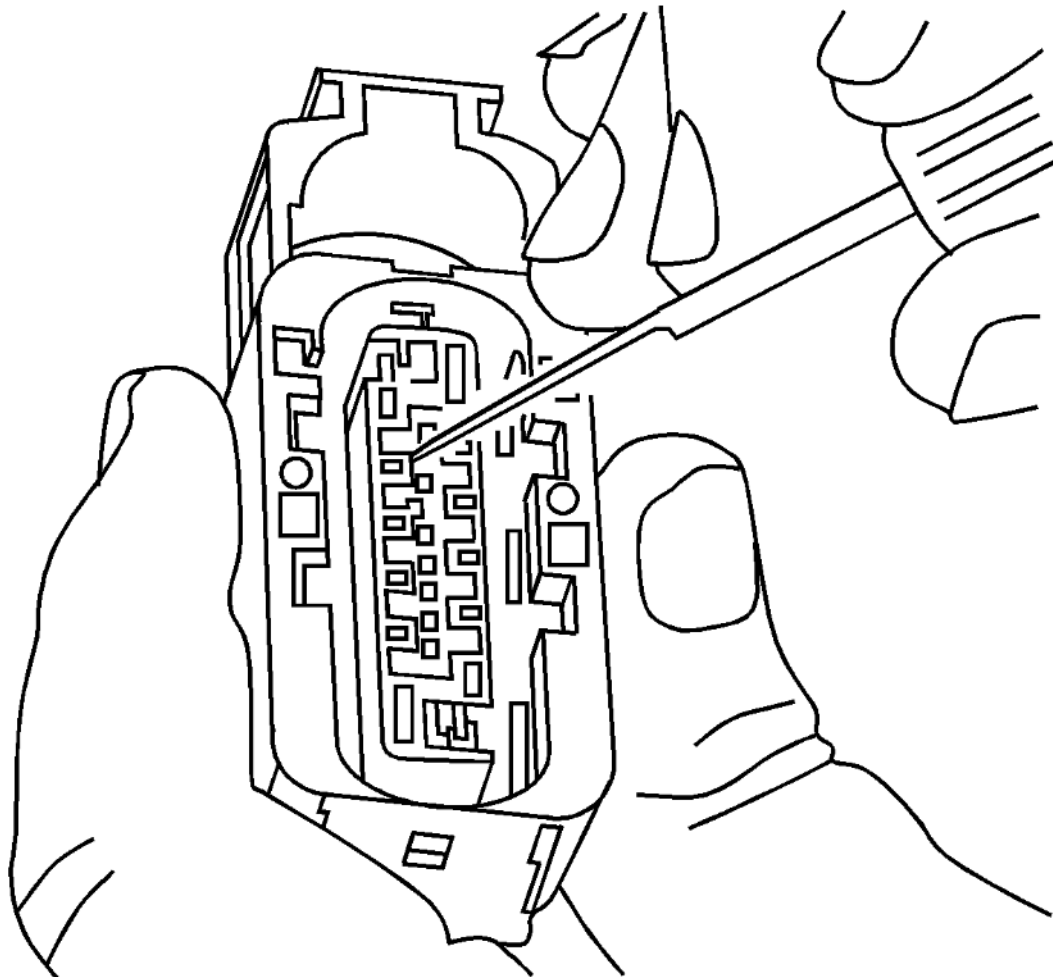


Fig. 77: Pulling Wire Out Of Back Of Connector

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

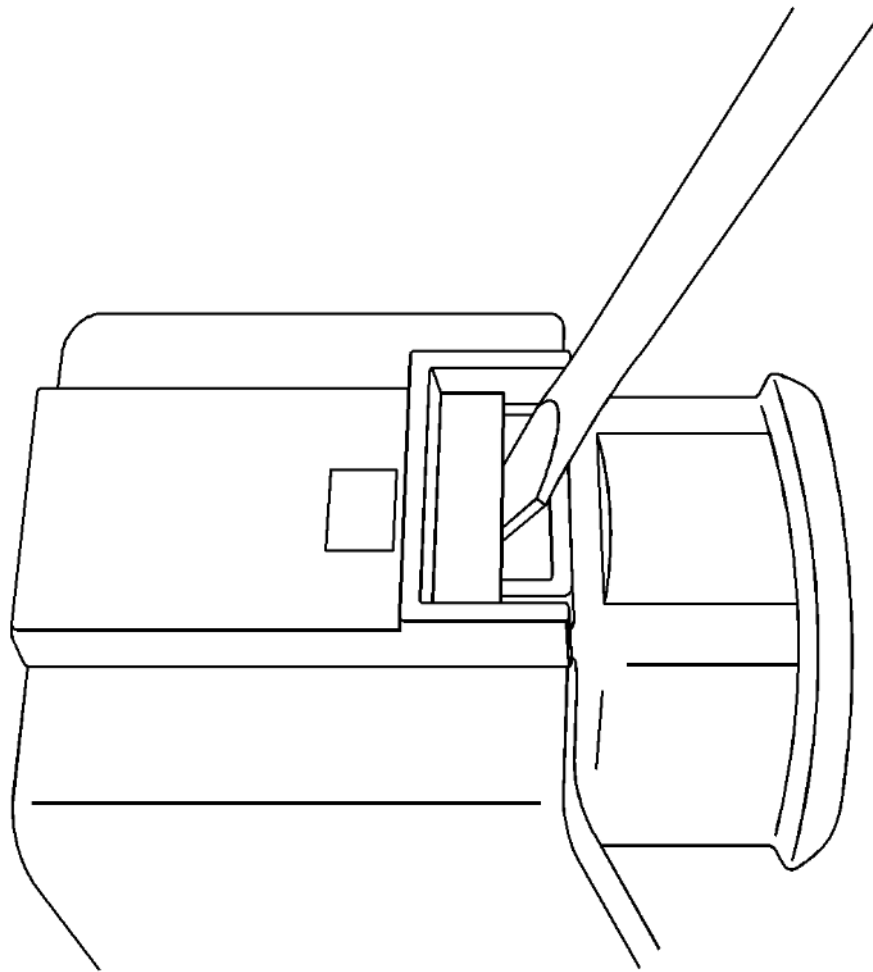


Fig. 78: Releasing Locking Tab On Connector
Courtesy of GENERAL MOTORS COMPANY

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

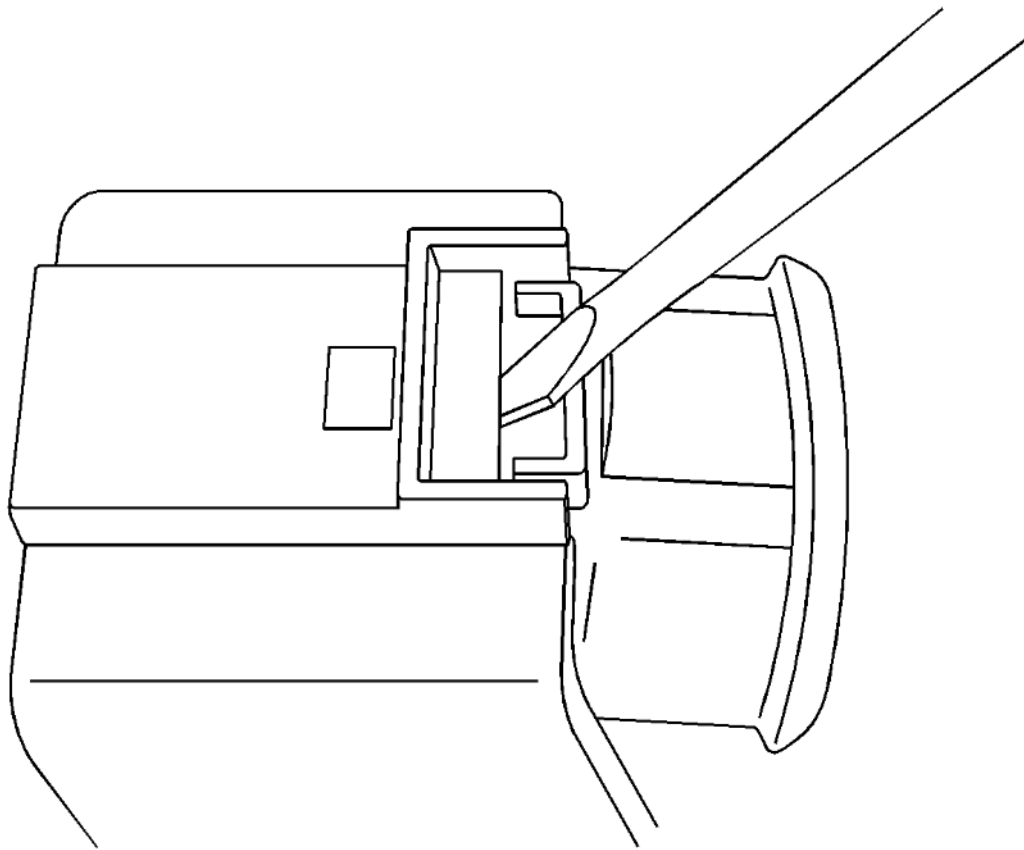


Fig. 79: Releasing Connector

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.

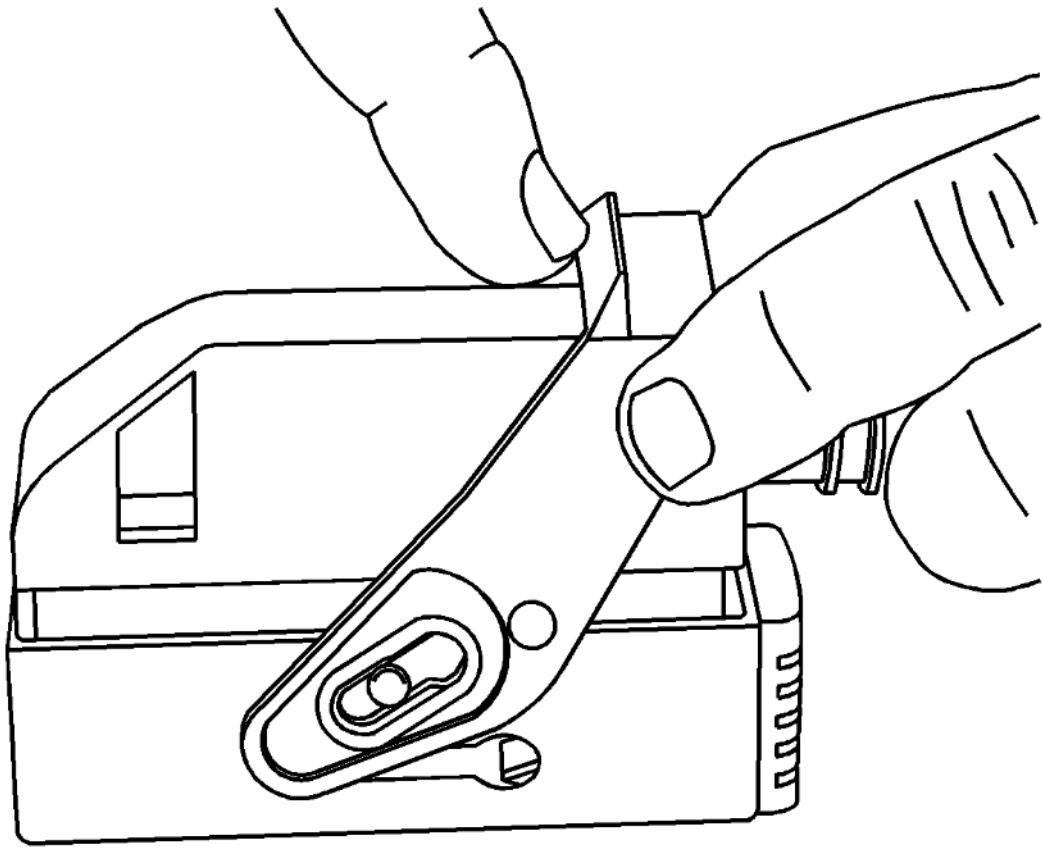


Fig. 80: Identifying Release Tab

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.

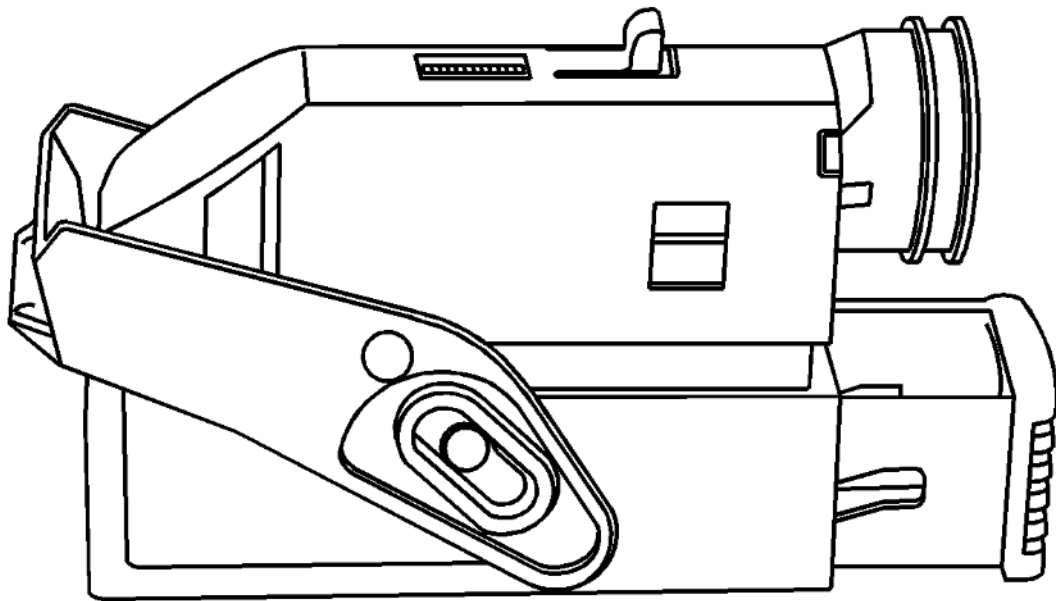


Fig. 81: View Of Connector In Released Position
Courtesy of GENERAL MOTORS COMPANY

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.

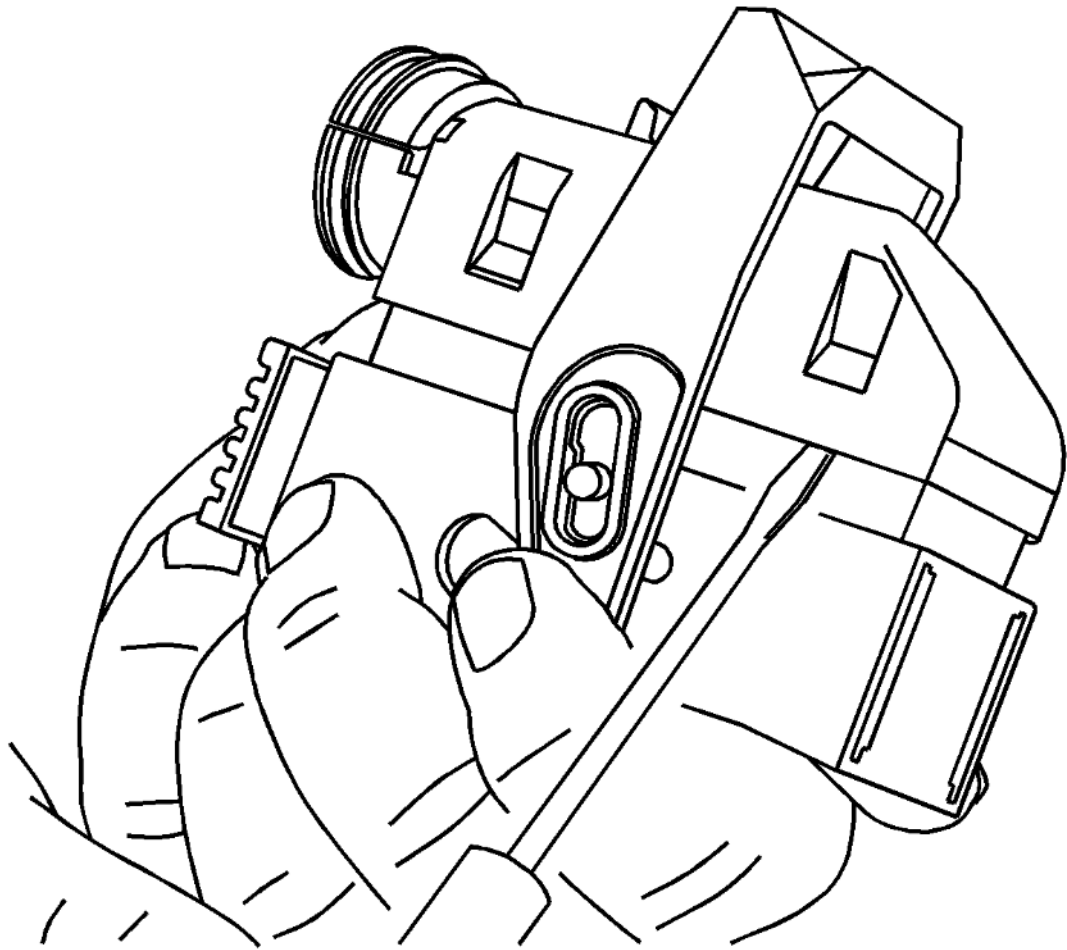


Fig. 82: View Of Sliding Terminal Position Assurance (TPA) Up One Notch
Courtesy of GENERAL MOTORS COMPANY

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.

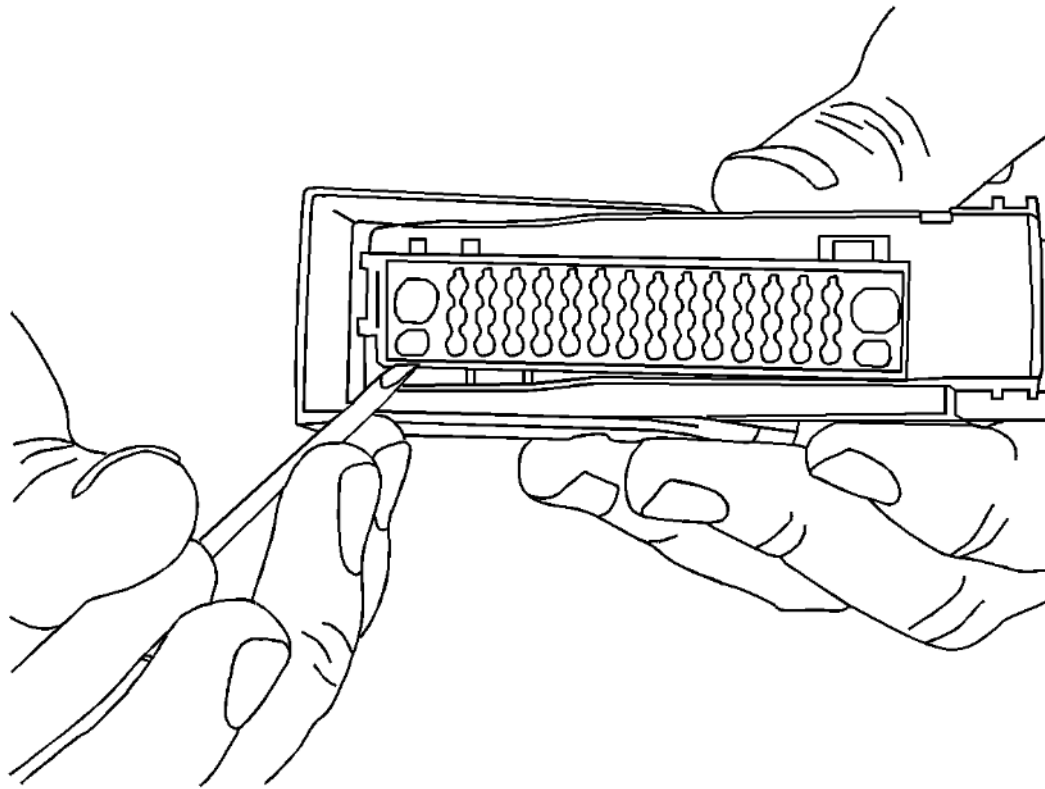


Fig. 83: View Of Releasing Terminals

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.

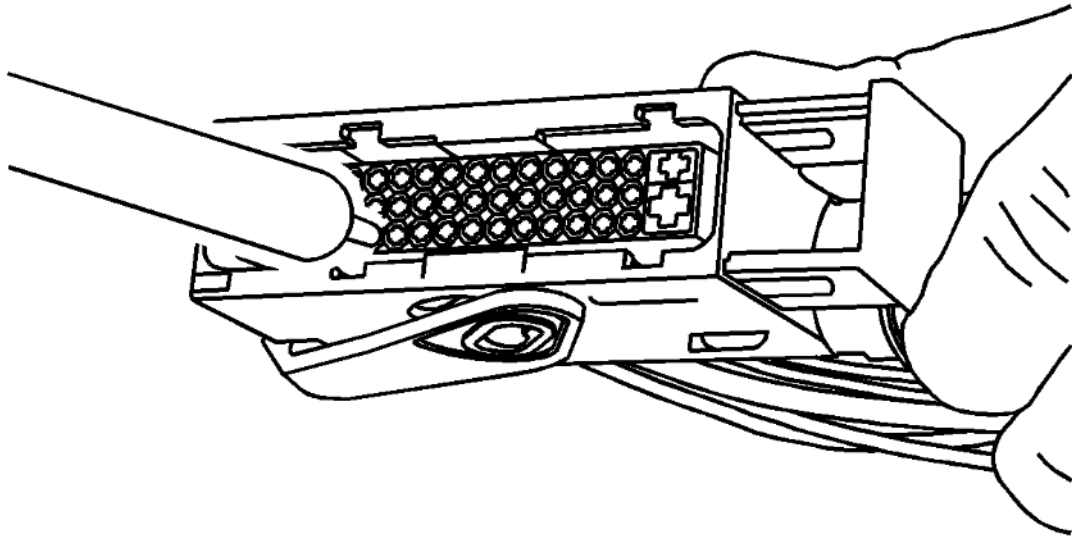


Fig. 84: View Of Wire Being Pulled Out Of Back Of Connector While Holding Removal Tool In Place

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.

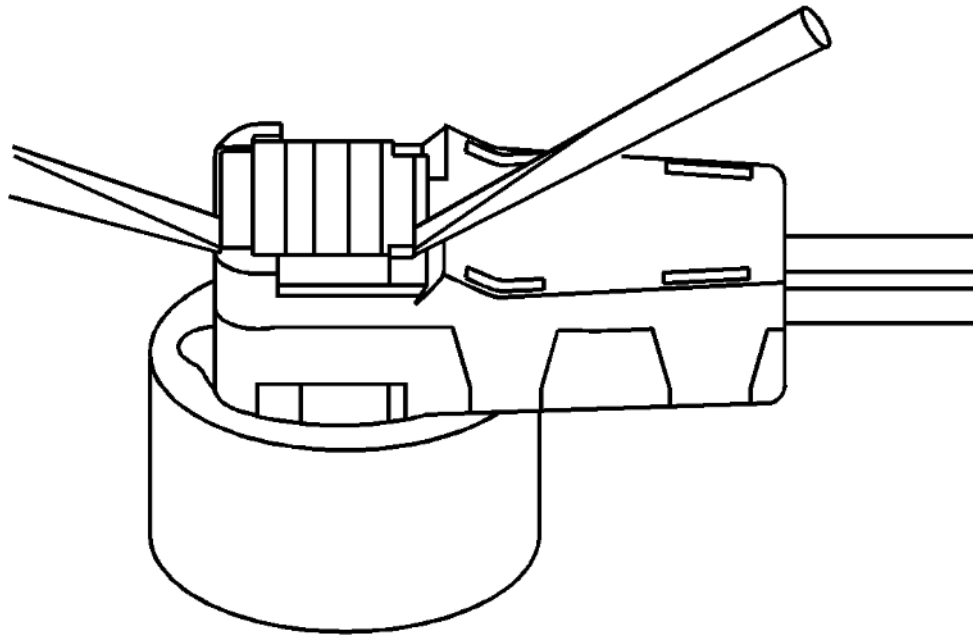


Fig. 85: Lifting Orange CPA

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.

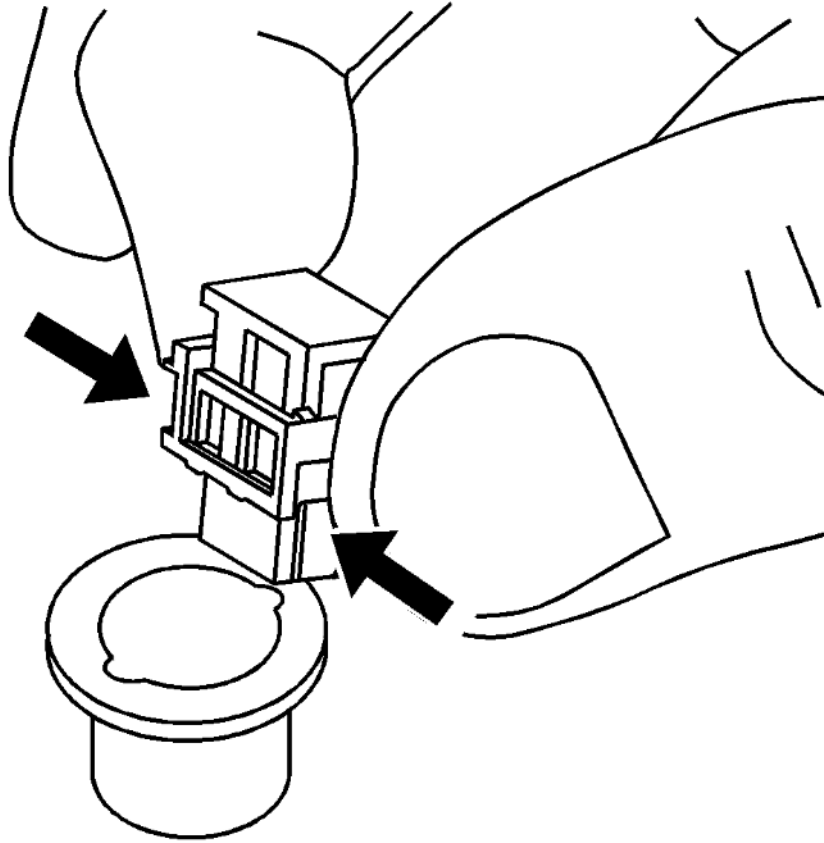


Fig. 86: Grabbing Connector On Both Sides

Courtesy of GENERAL MOTORS COMPANY

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

Installation Procedure

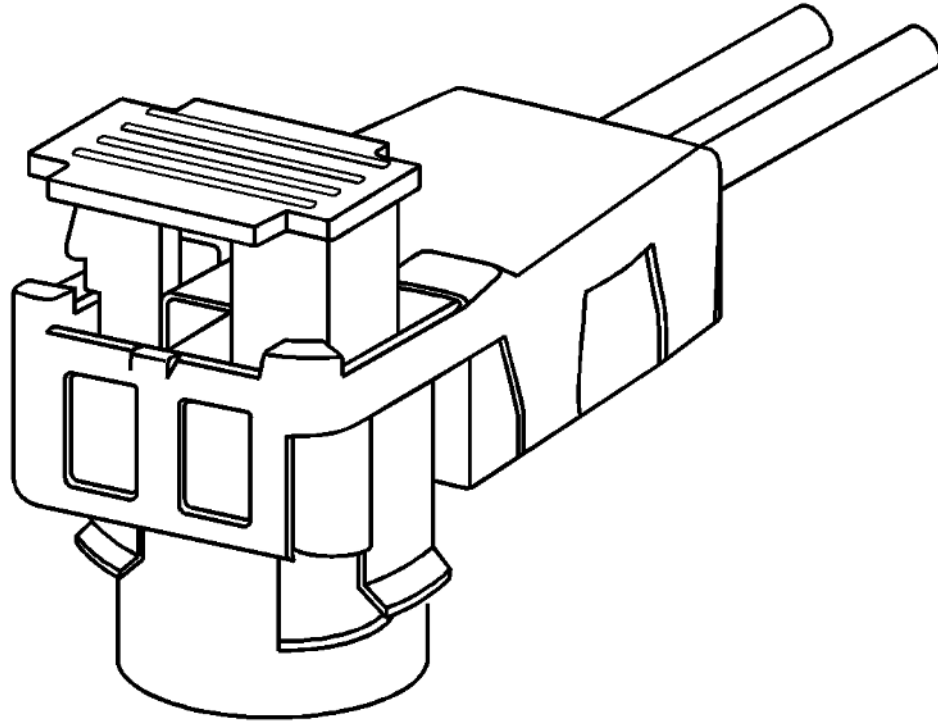


Fig. 87: Lifting Orange CPA

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.

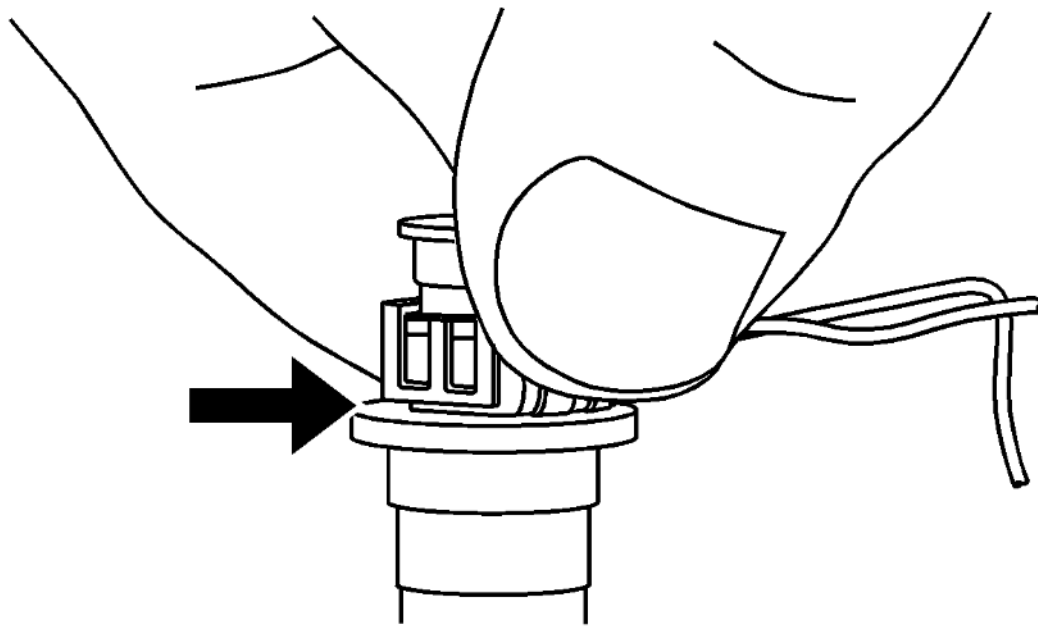


Fig. 88: Seating Connector Sub-Assembly

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.

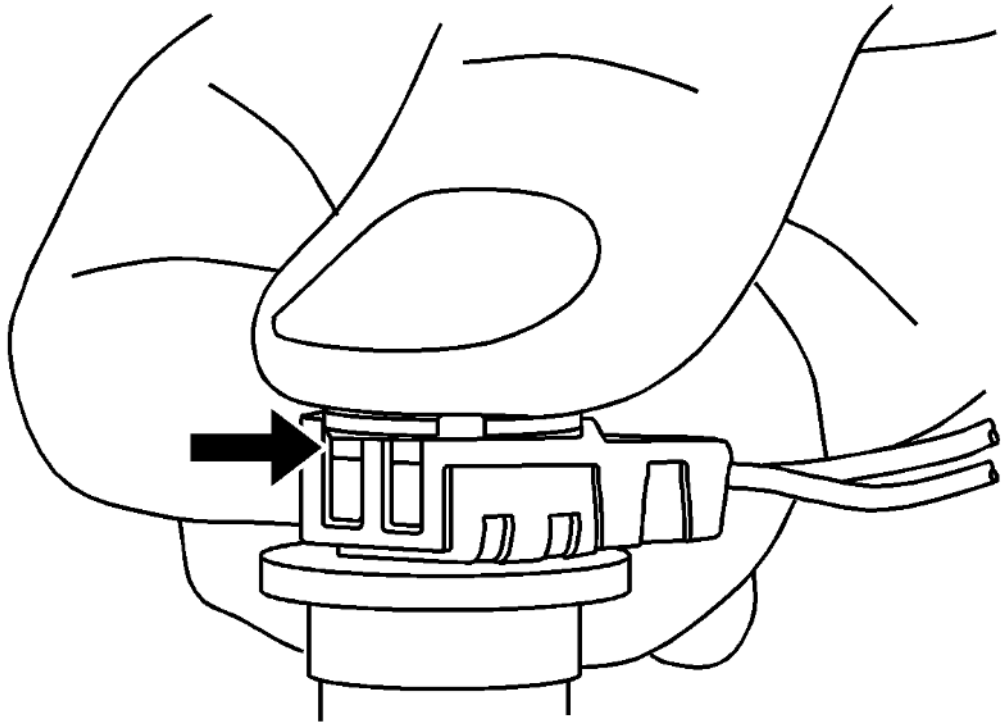


Fig. 89: Pushing CPA Down

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

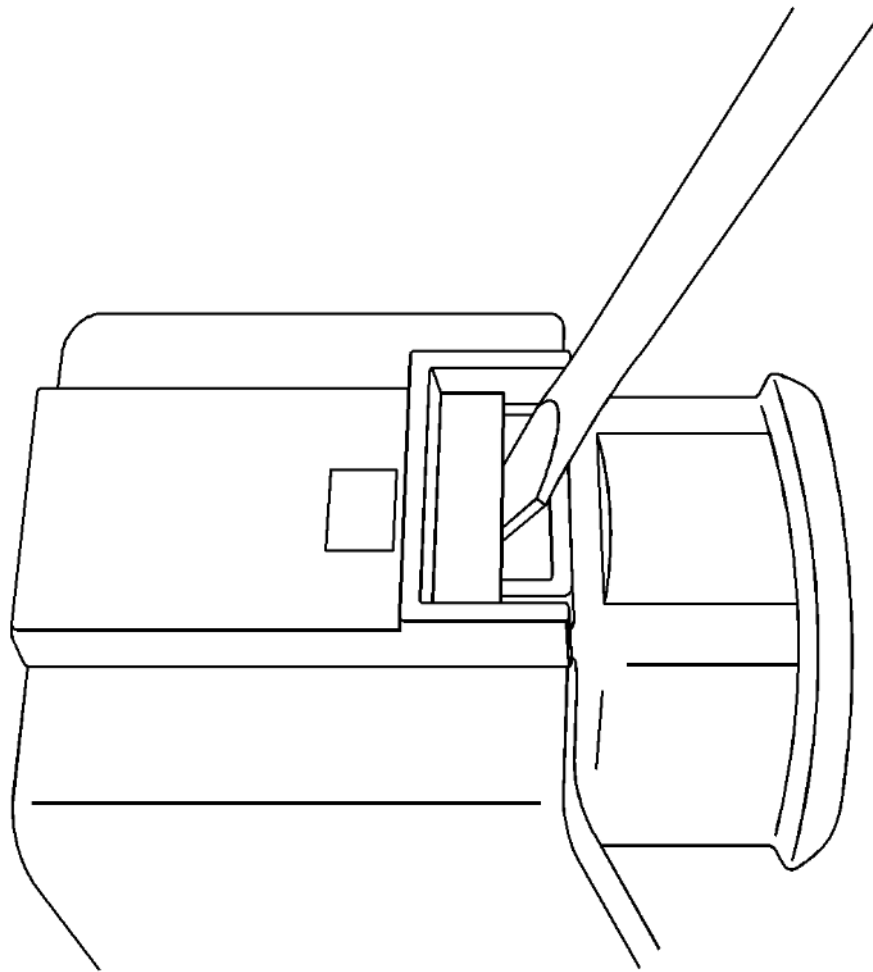


Fig. 90: Releasing Locking Tab On Connector
Courtesy of GENERAL MOTORS COMPANY

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

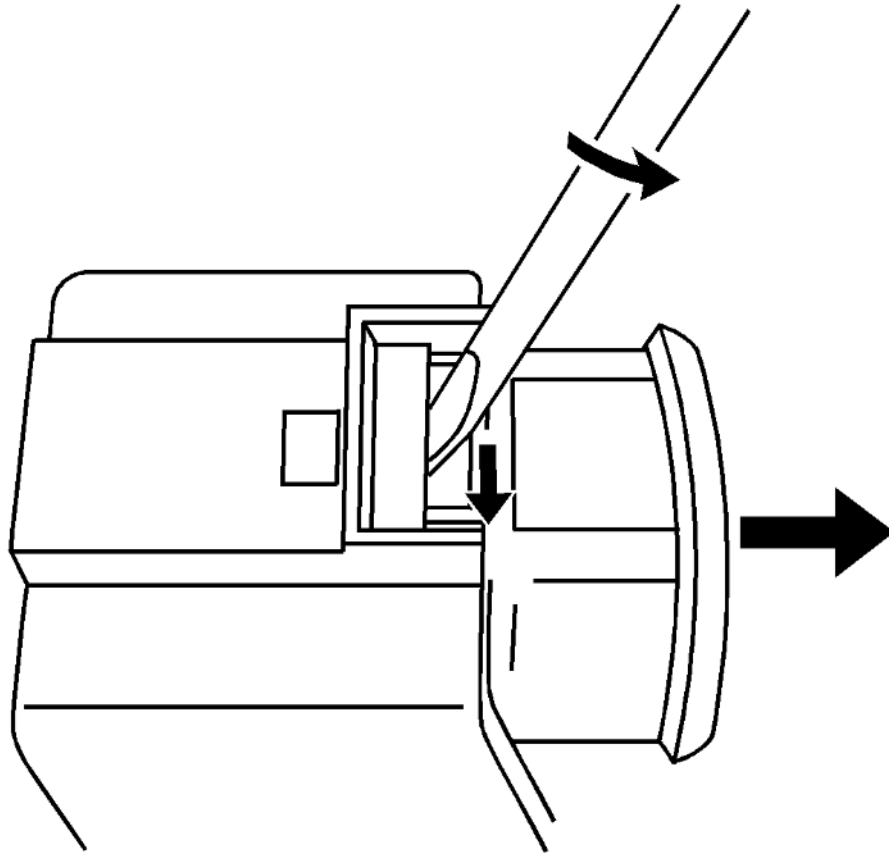


Fig. 91: Twisting Flat-Bladed Tool To Push Top Of Locking Tab Inward
Courtesy of GENERAL MOTORS COMPANY

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

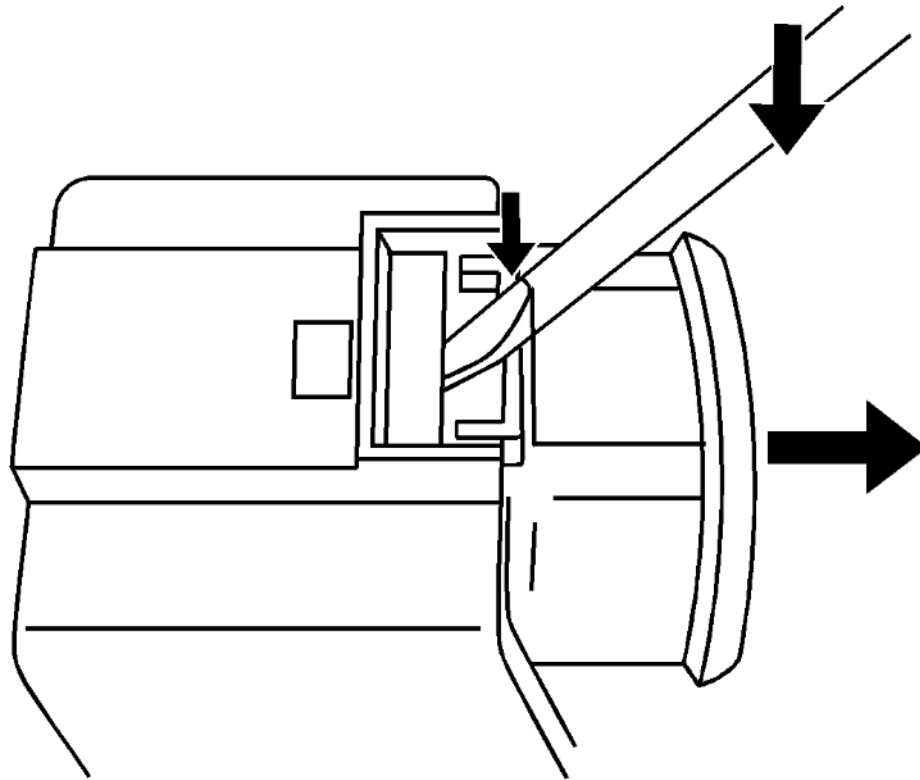


Fig. 92: Using Flat-Bladed Tool To Depress Locking Tab
 Courtesy of GENERAL MOTORS COMPANY

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

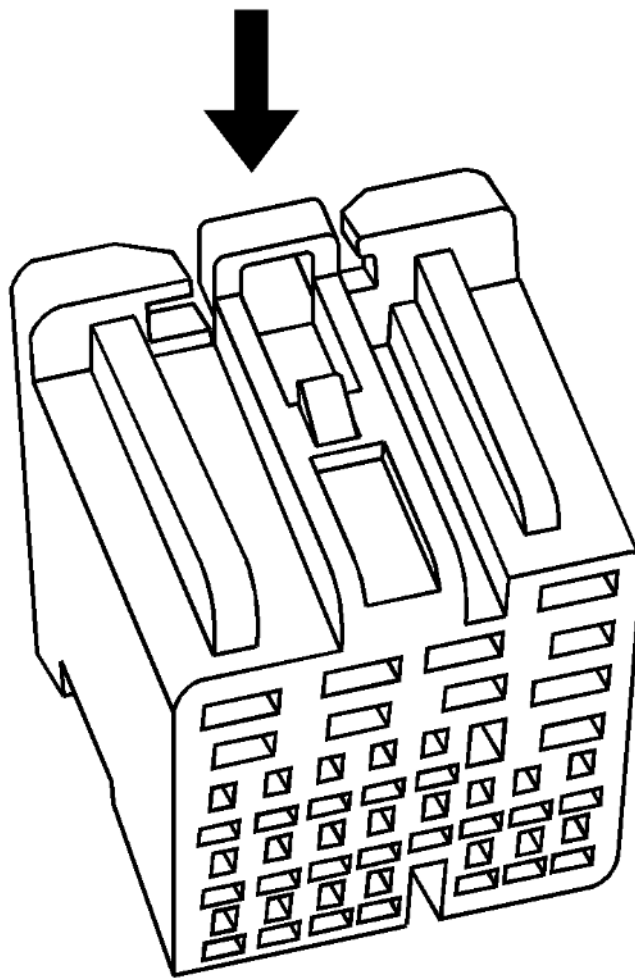


Fig. 93: Identifying Terminal Position Assurance (TPA)

Courtesy of GENERAL MOTORS COMPANY

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

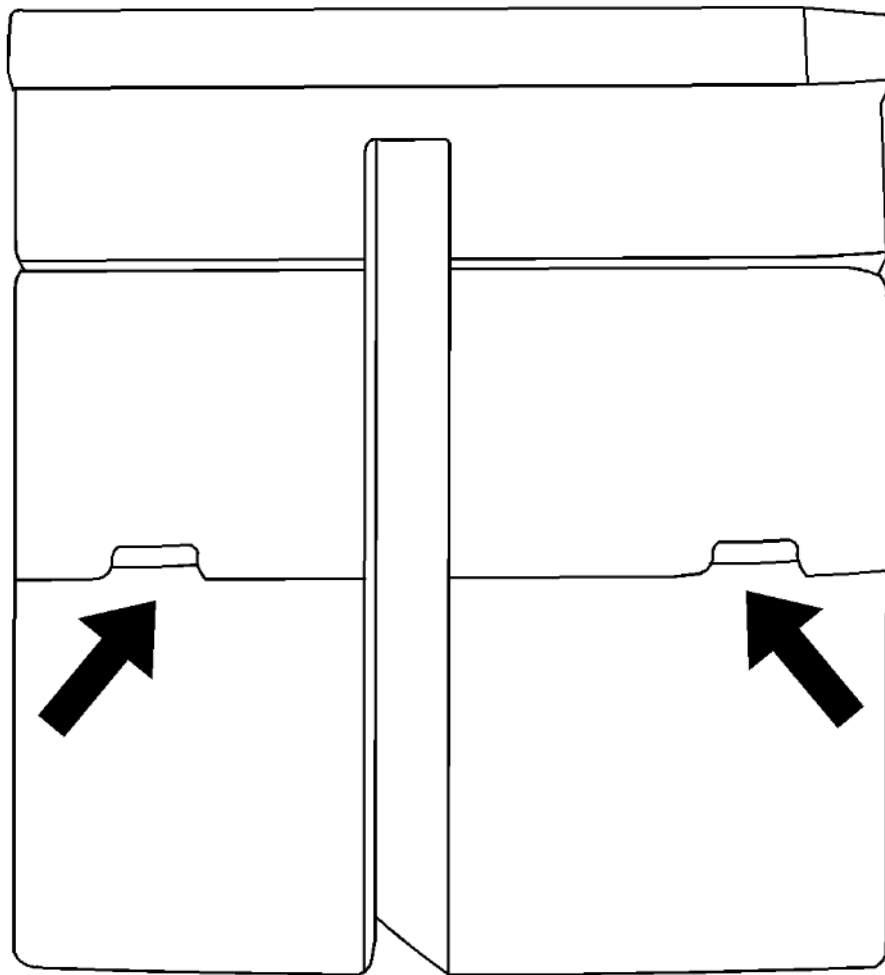


Fig. 94: Identifying TPA On Both Sides Of Connector

Courtesy of GENERAL MOTORS COMPANY

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

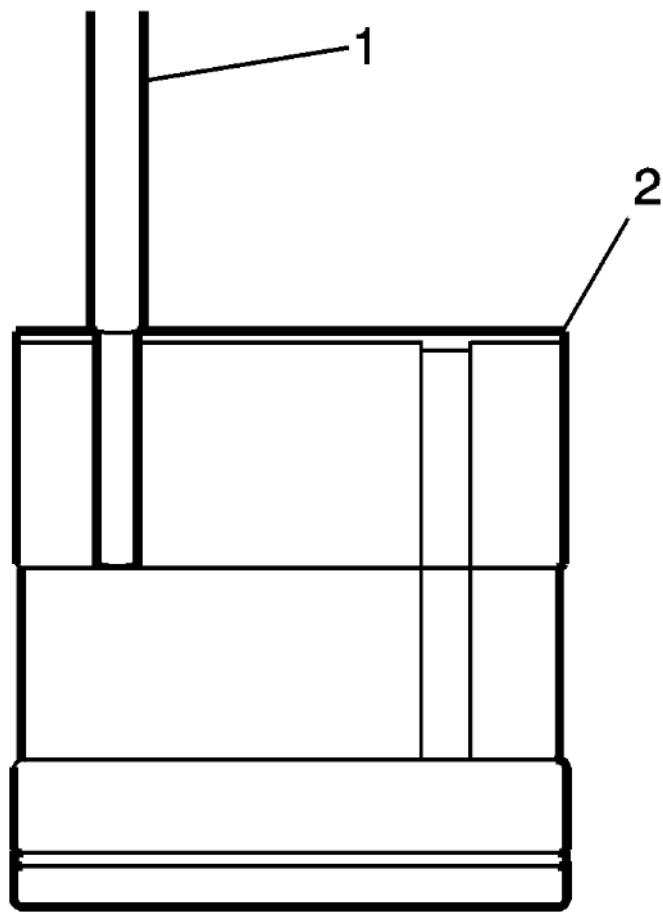


Fig. 95: Terminal Release Tool

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.

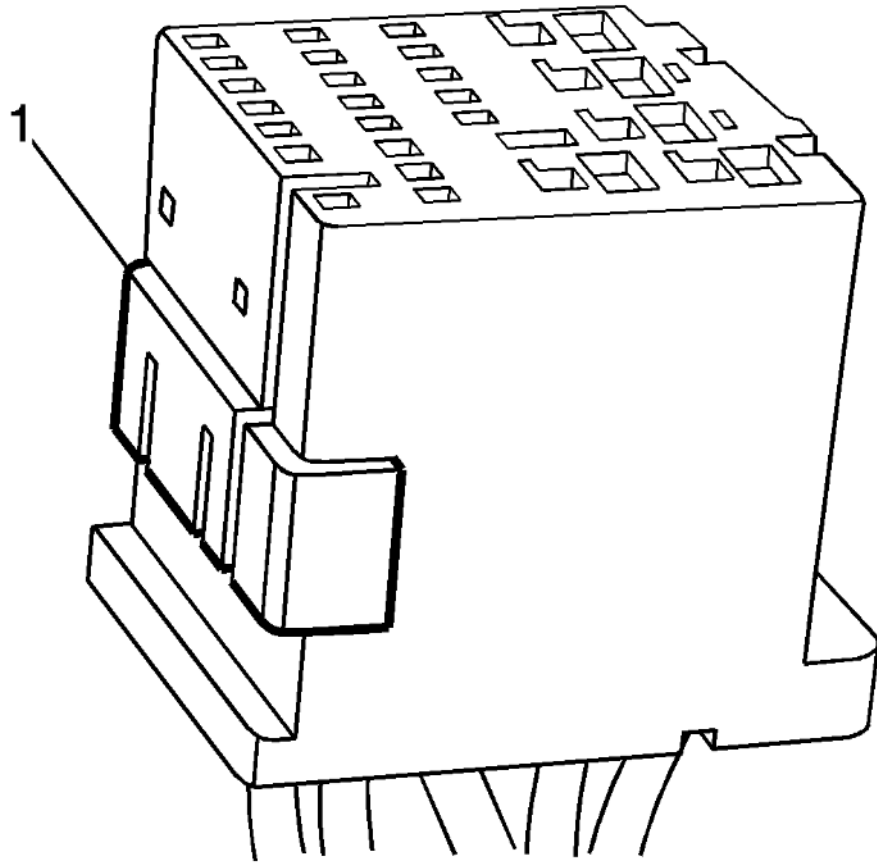


Fig. 96: TPA In Staged Position

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.

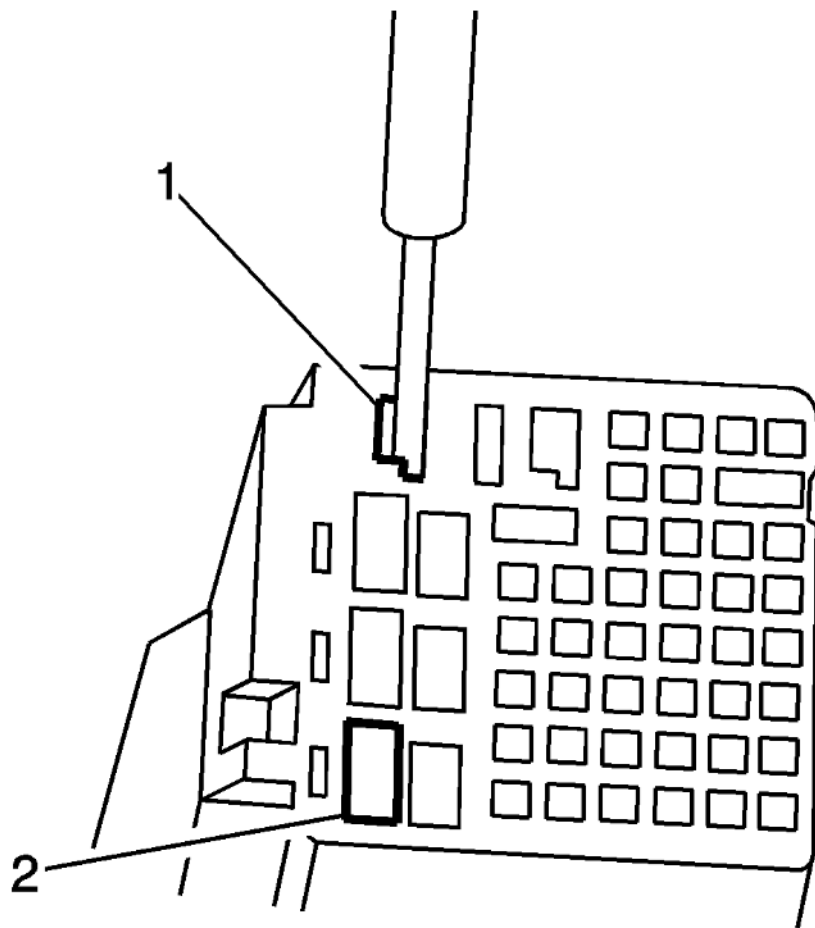


Fig. 97: Connector Terminal Release Tool

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).

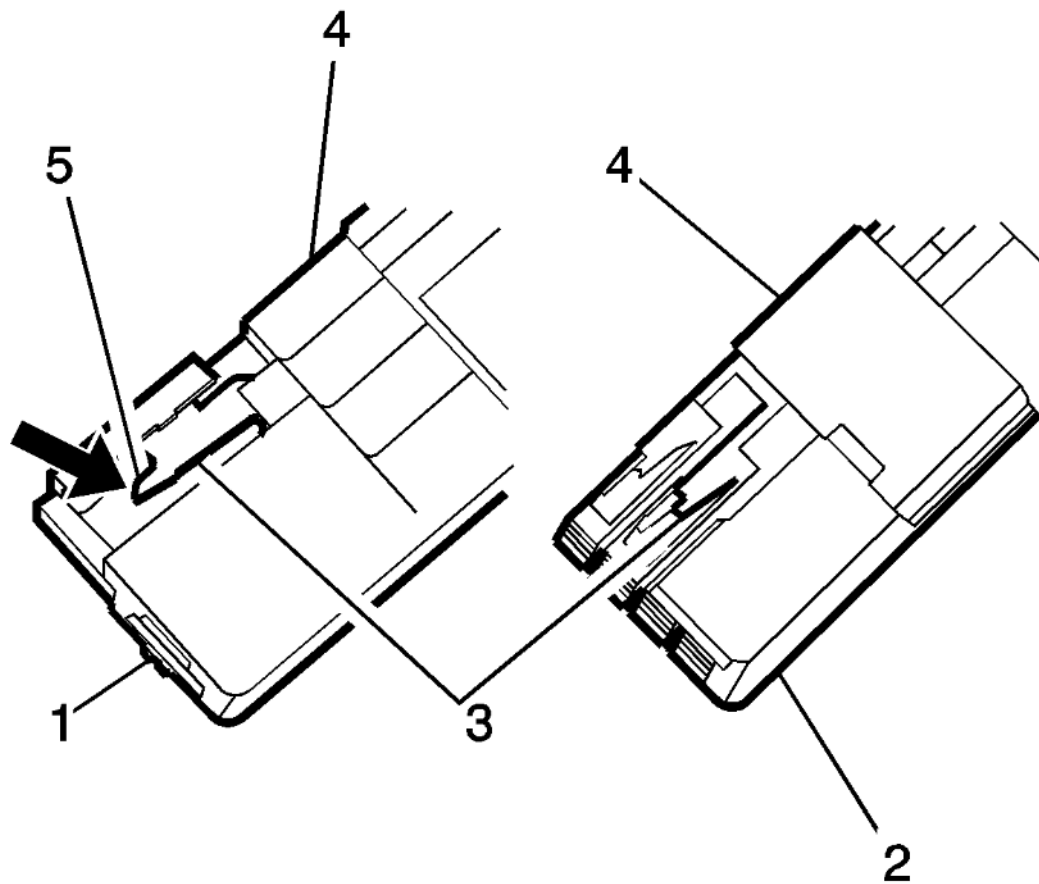


Fig. 98: Connector Lance And TPA

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

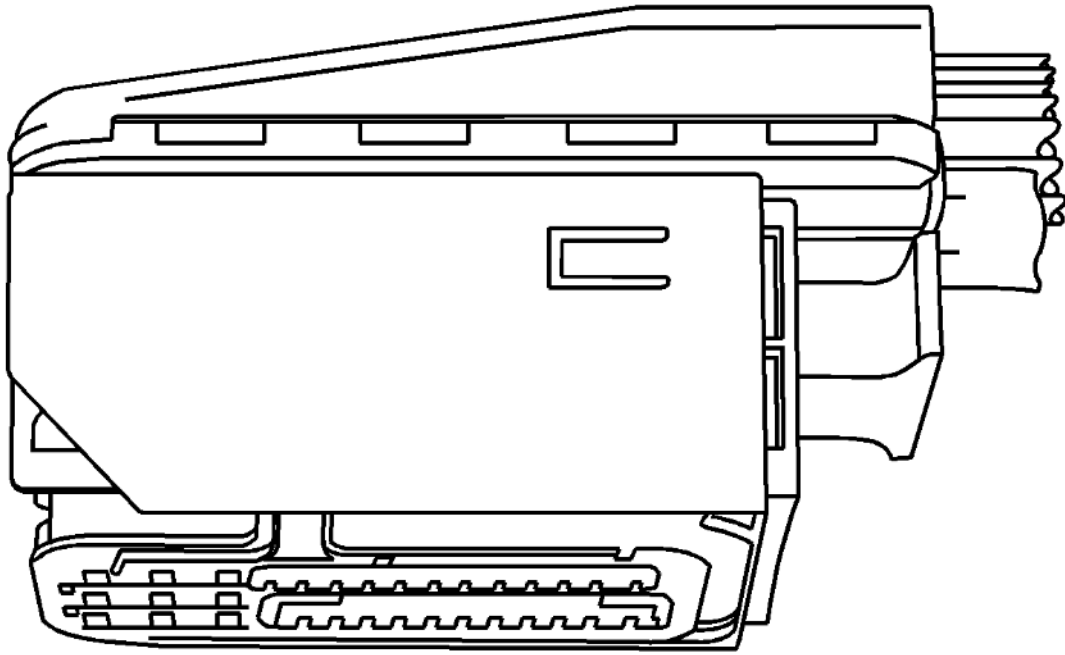


Fig. 99: View Of Typical Kostal Connector
Courtesy of GENERAL MOTORS COMPANY

View of typical connector.

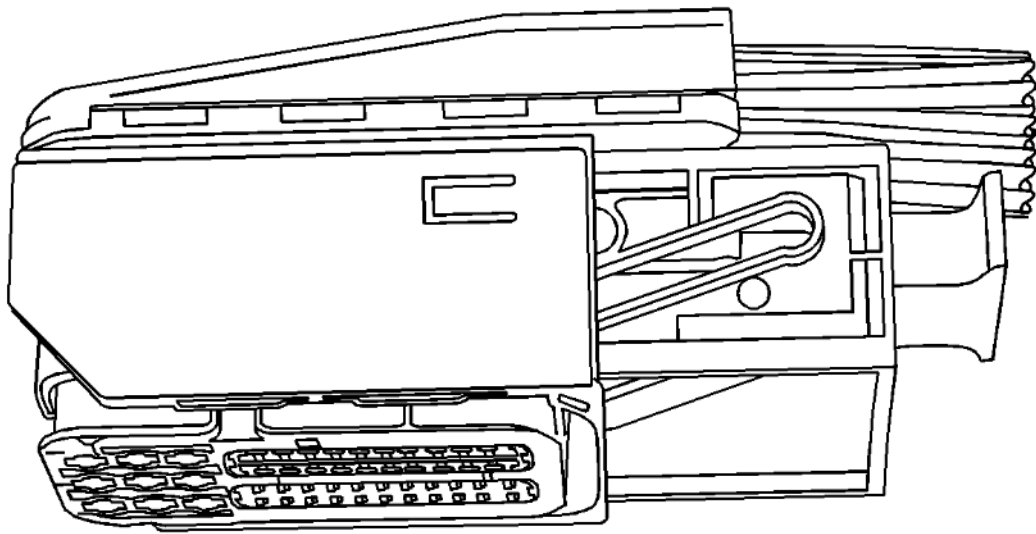


Fig. 100: View Of Connector In Released Position
Courtesy of GENERAL MOTORS COMPANY

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.

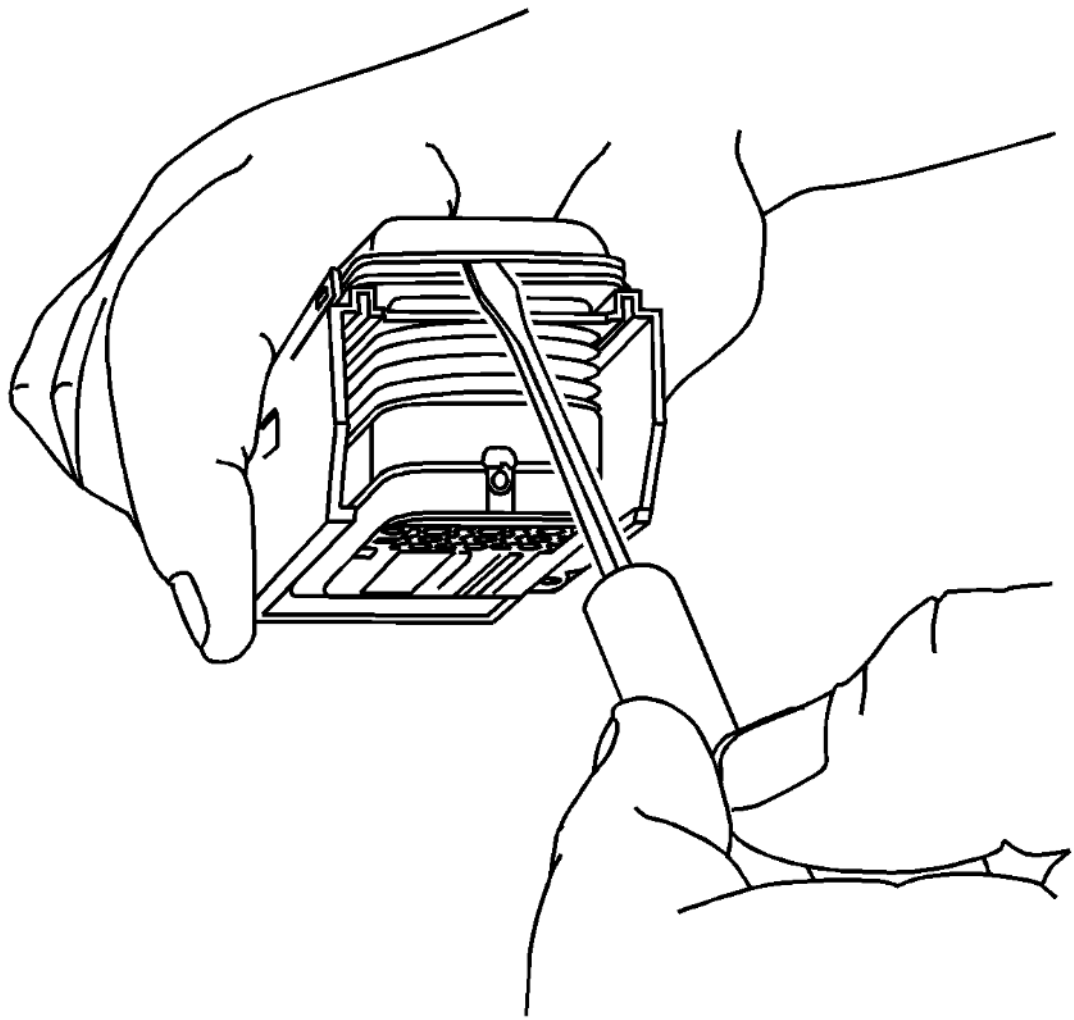


Fig. 101: Using Small Flat-Blade Tool To Remove Dress Cover
Courtesy of GENERAL MOTORS COMPANY

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

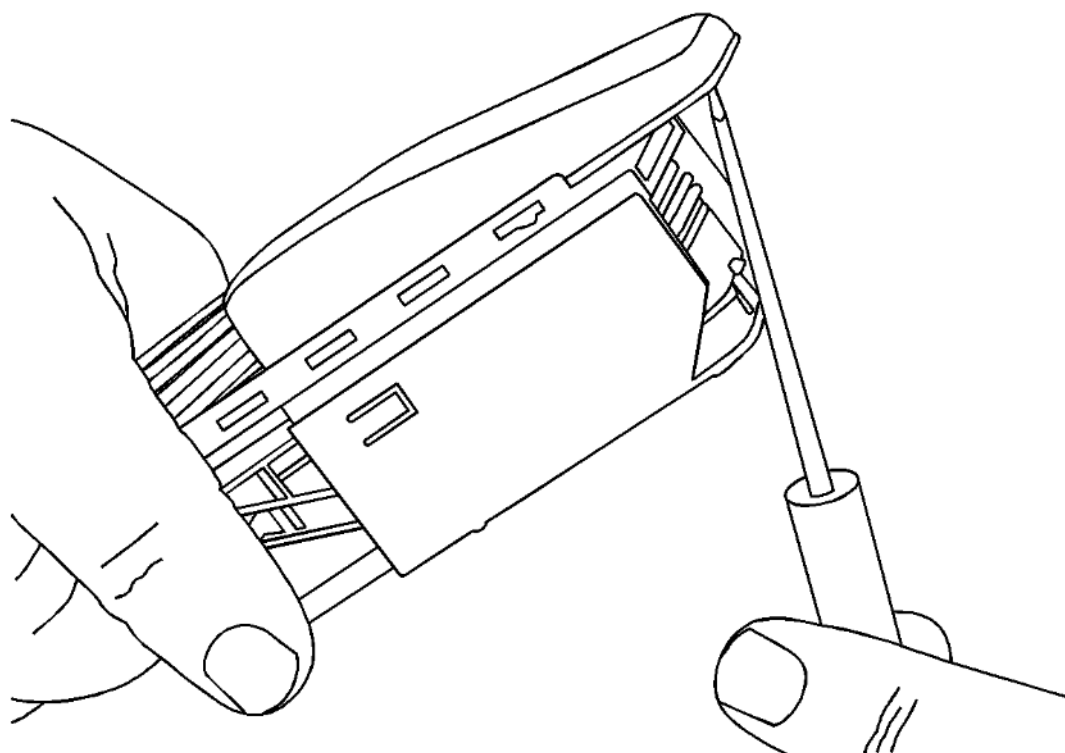


Fig. 102: Sliding Dress Cover Forward & Off Of Kostal Connector (Glow Plug Control Module)

Courtesy of GENERAL MOTORS COMPANY

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

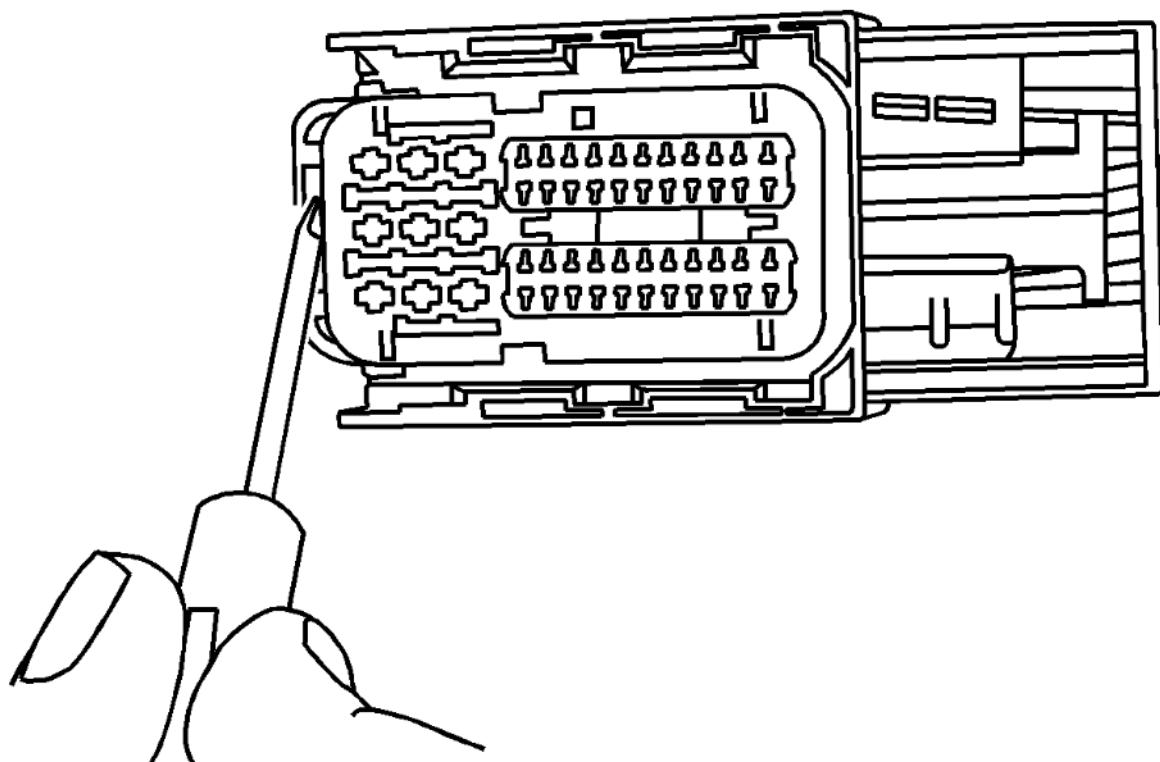


Fig. 103: Locating TPA In Front & Rear Of Connector

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).

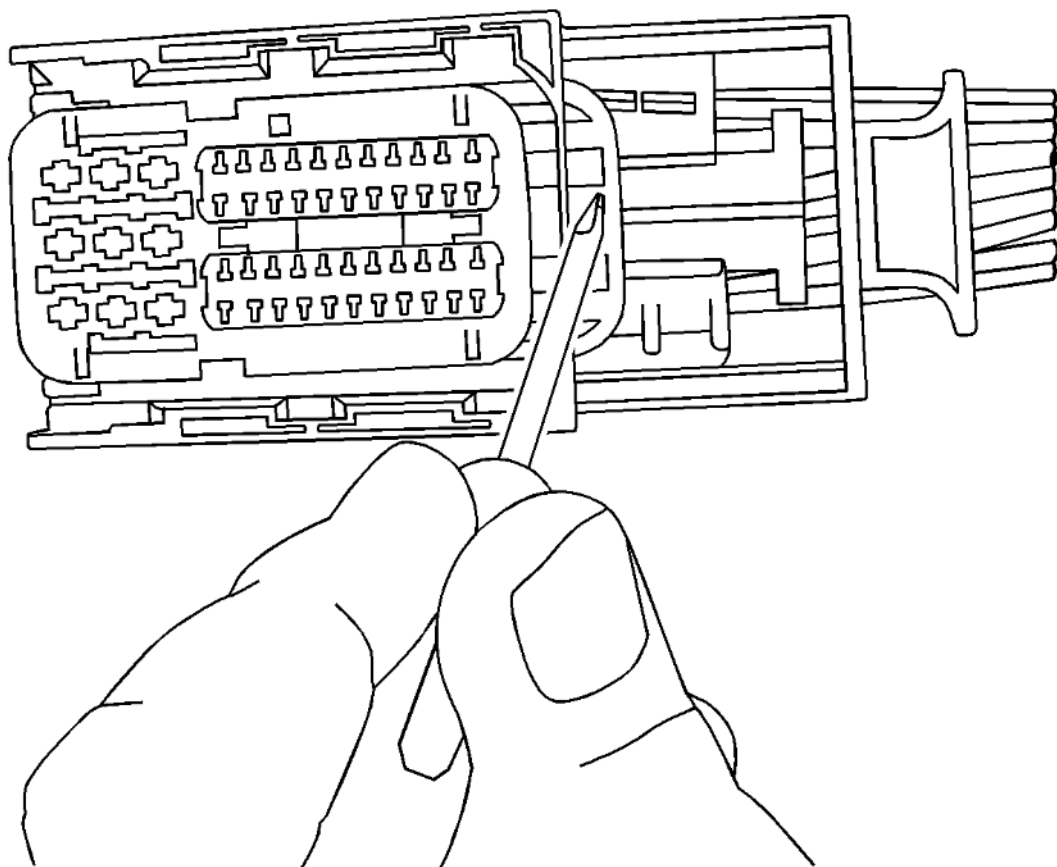


Fig. 104: Using Small Flat-Blade Tool To Remove Rear TPA

Courtesy of GENERAL MOTORS COMPANY

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

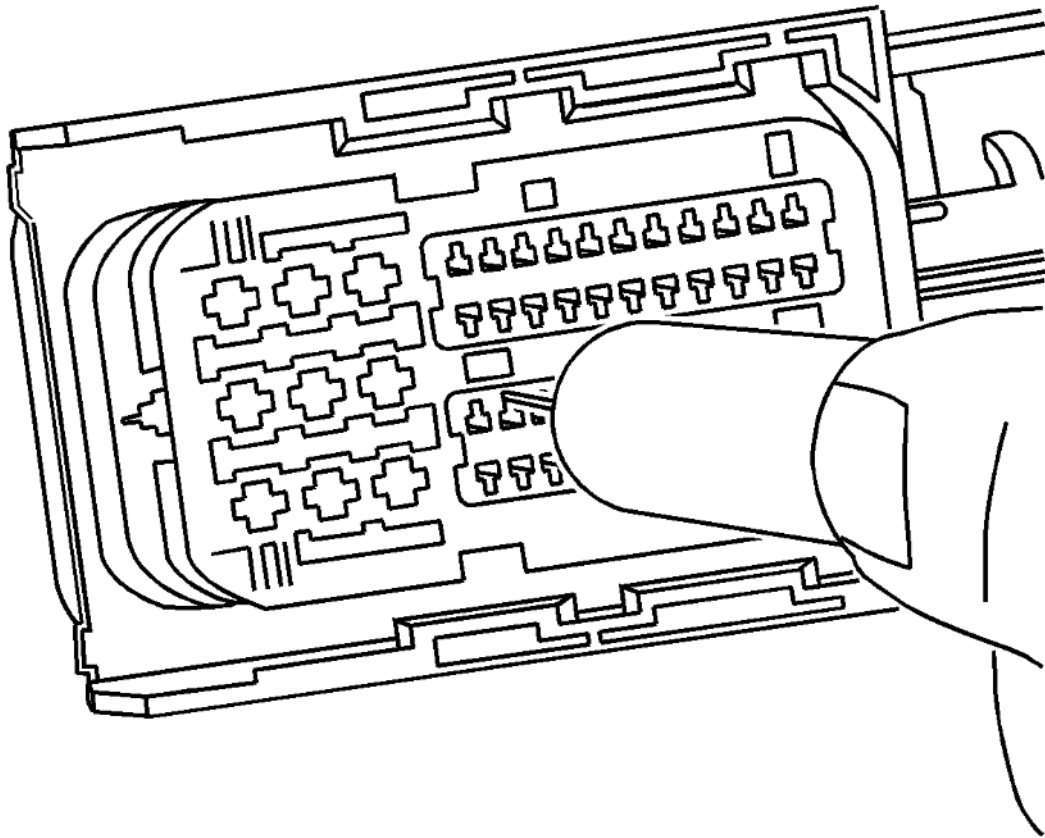


Fig. 105: Using Special Tool To Release Terminals

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

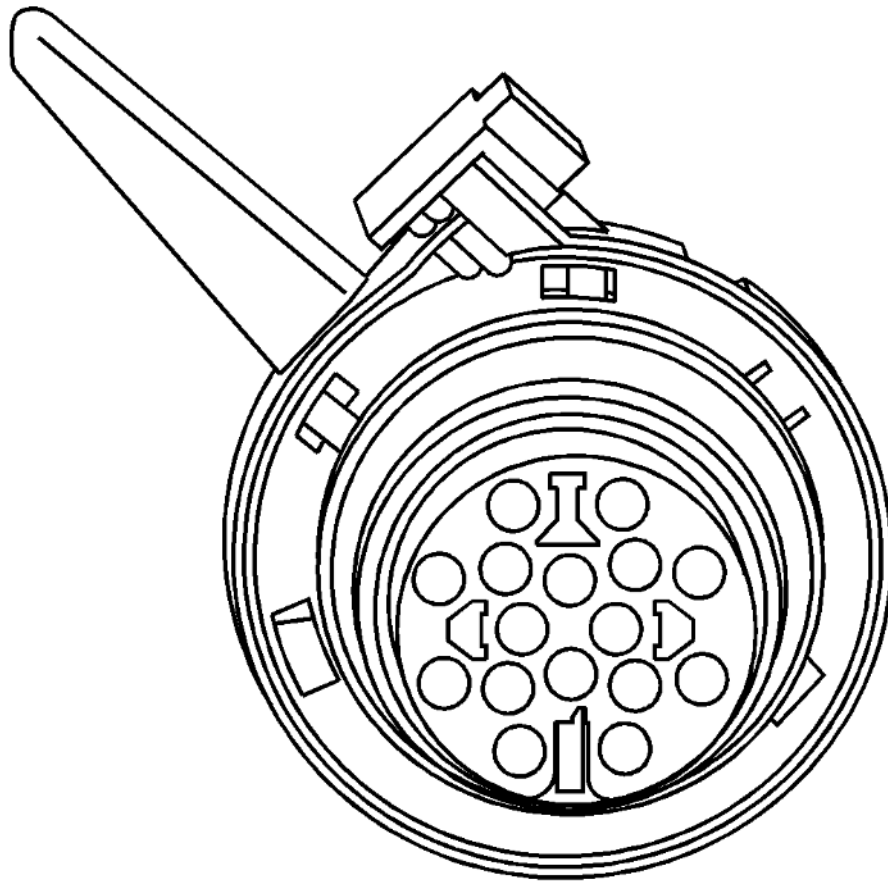


Fig. 106: View Of Connector & Lock

Courtesy of GENERAL MOTORS COMPANY

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

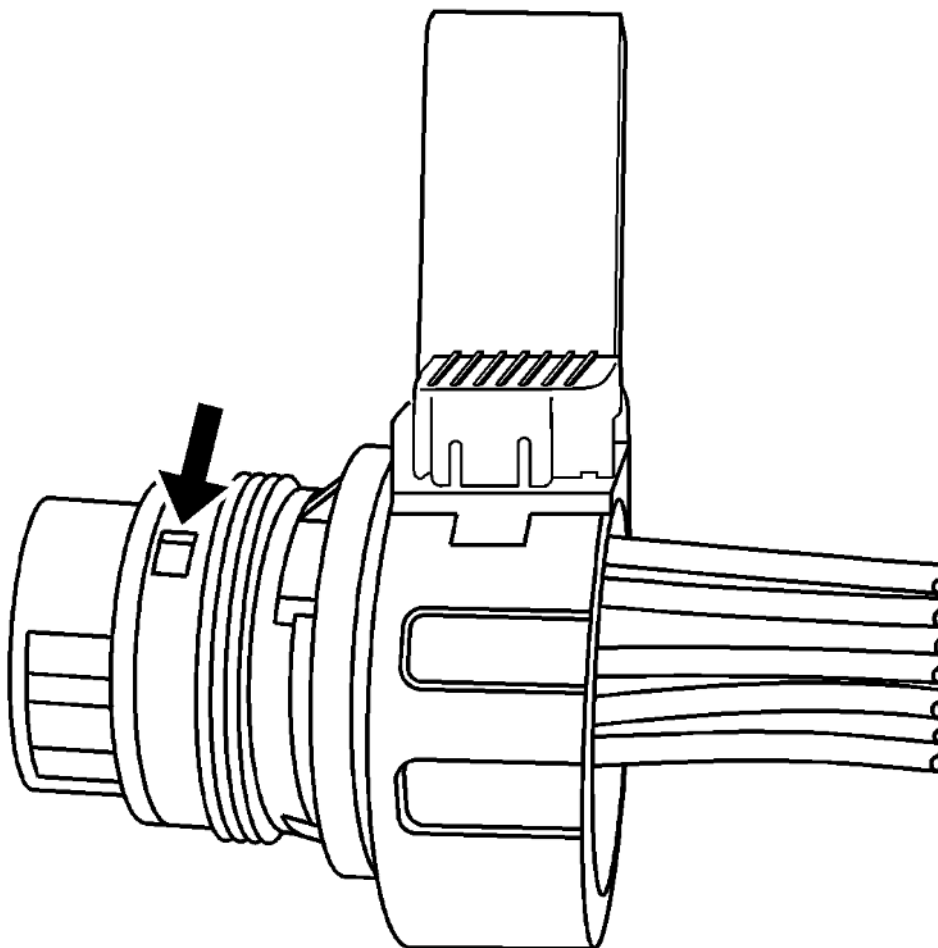


Fig. 107: View Of Terminal Position Assurance (TPA)

Courtesy of GENERAL MOTORS COMPANY

2. Locate the terminal position assurance (TPA).

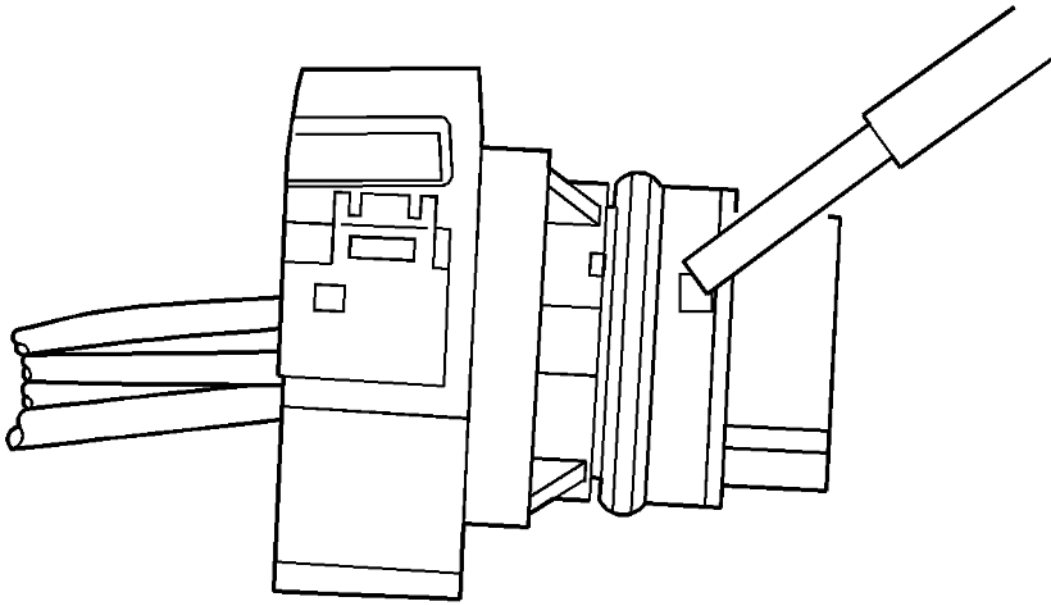


Fig. 108: View Of TPA & Flat-Bladed Tool
Courtesy of GENERAL MOTORS COMPANY

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.

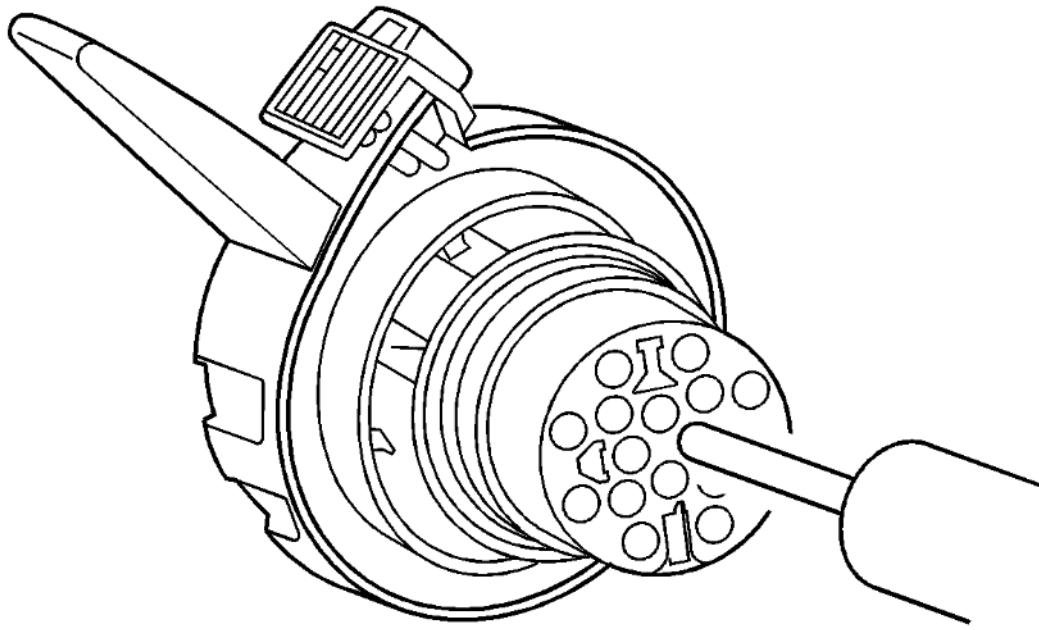


Fig. 109: Using J 38125-28 Tool To Release Terminals
Courtesy of GENERAL MOTORS COMPANY

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.

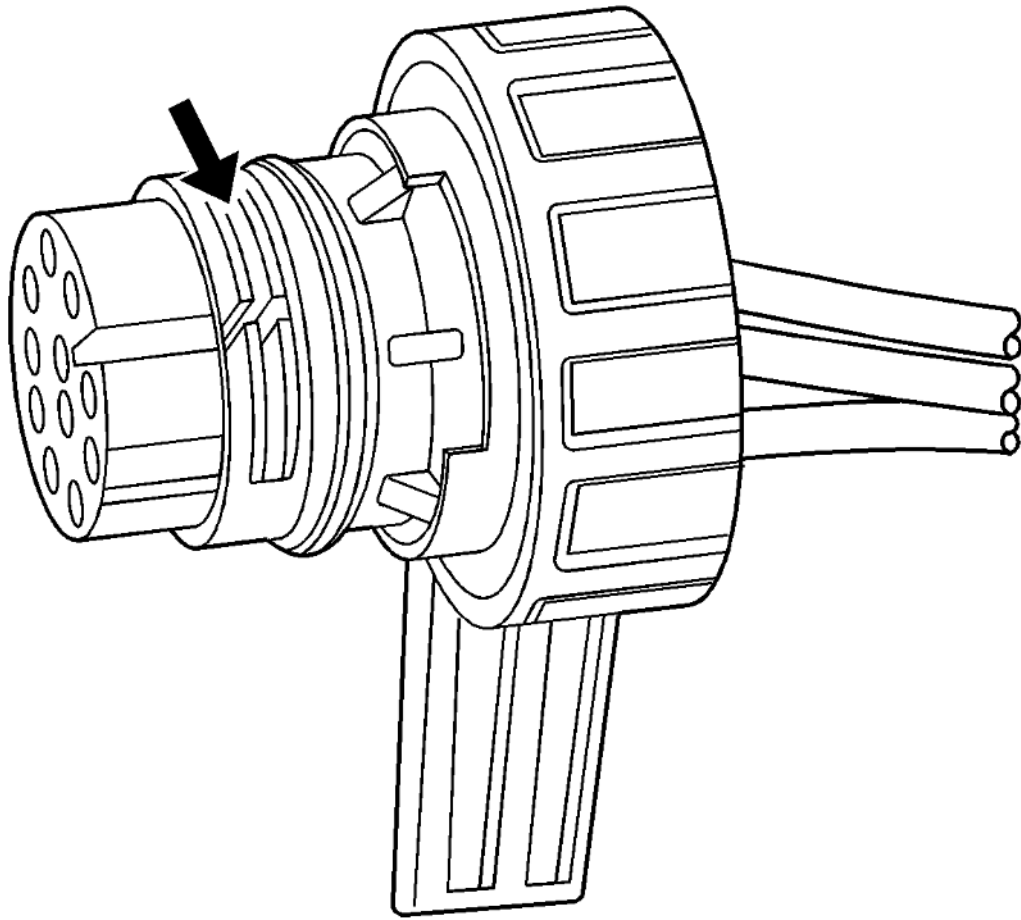


Fig. 110: Locating Terminal Position Assurance (TPA)
Courtesy of GENERAL MOTORS COMPANY

3. Locate the TPA.

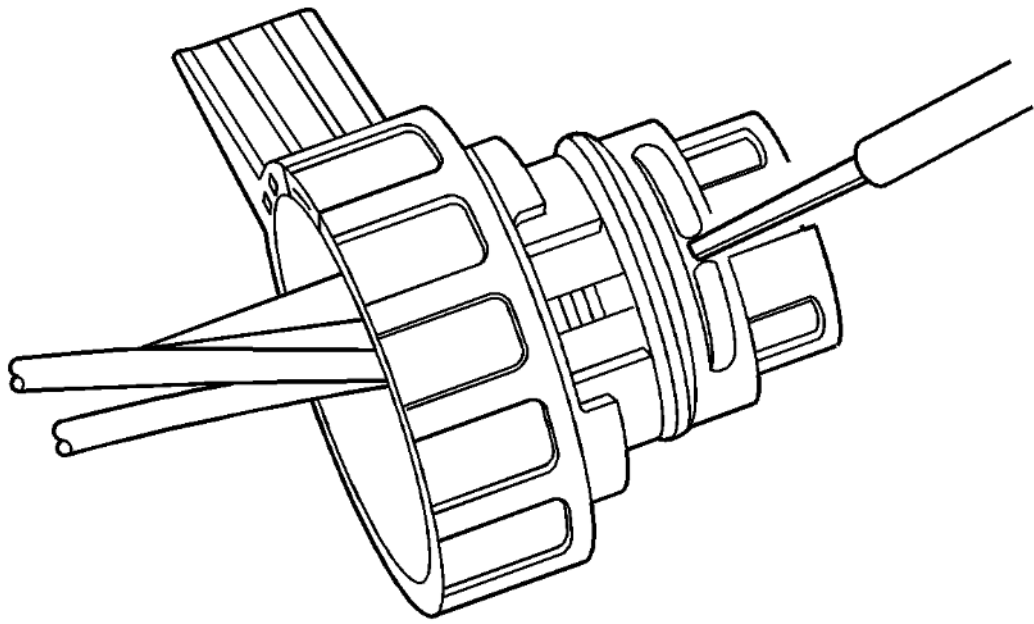


Fig. 111: View Of TPA & Flat-Bladed Tool
Courtesy of GENERAL MOTORS COMPANY

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

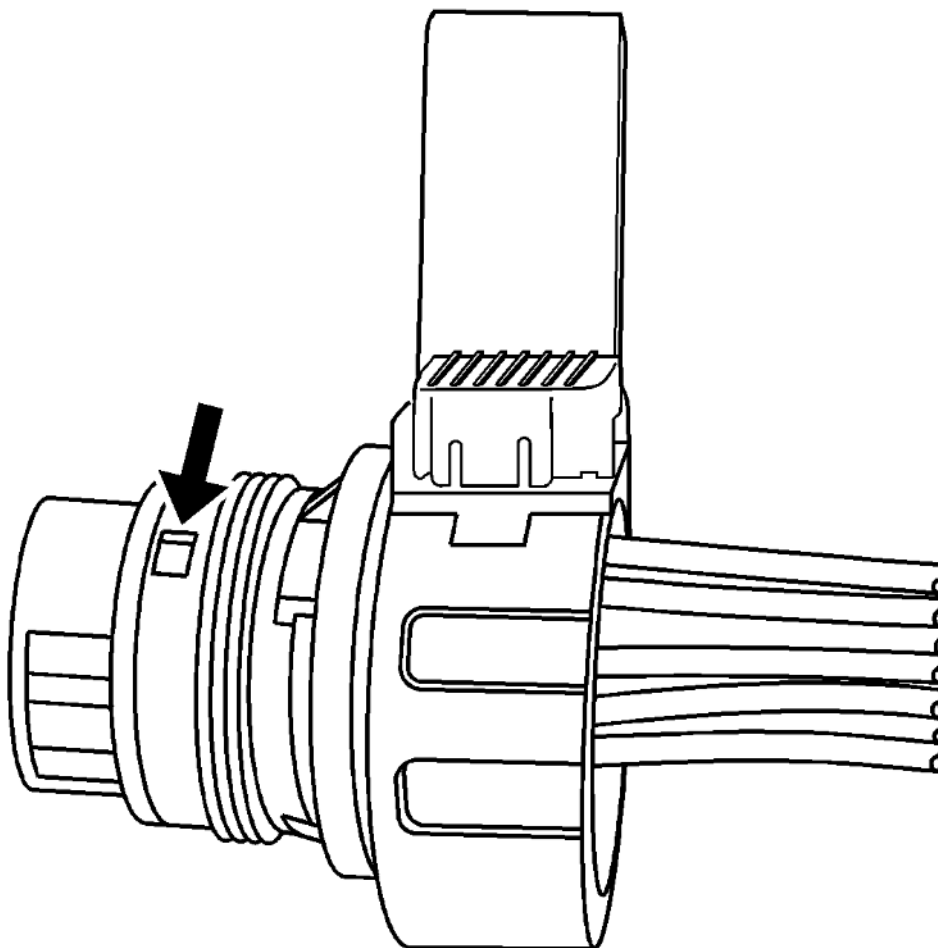


Fig. 112: View Of Terminal Position Assurance (TPA)

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.

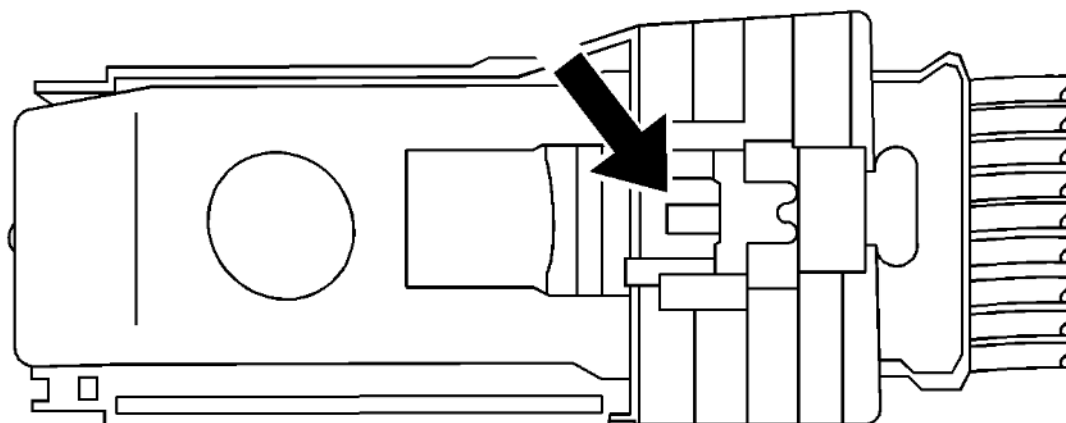


Fig. 113: Identifying Lever Lock Release Tab

Courtesy of GENERAL MOTORS COMPANY

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

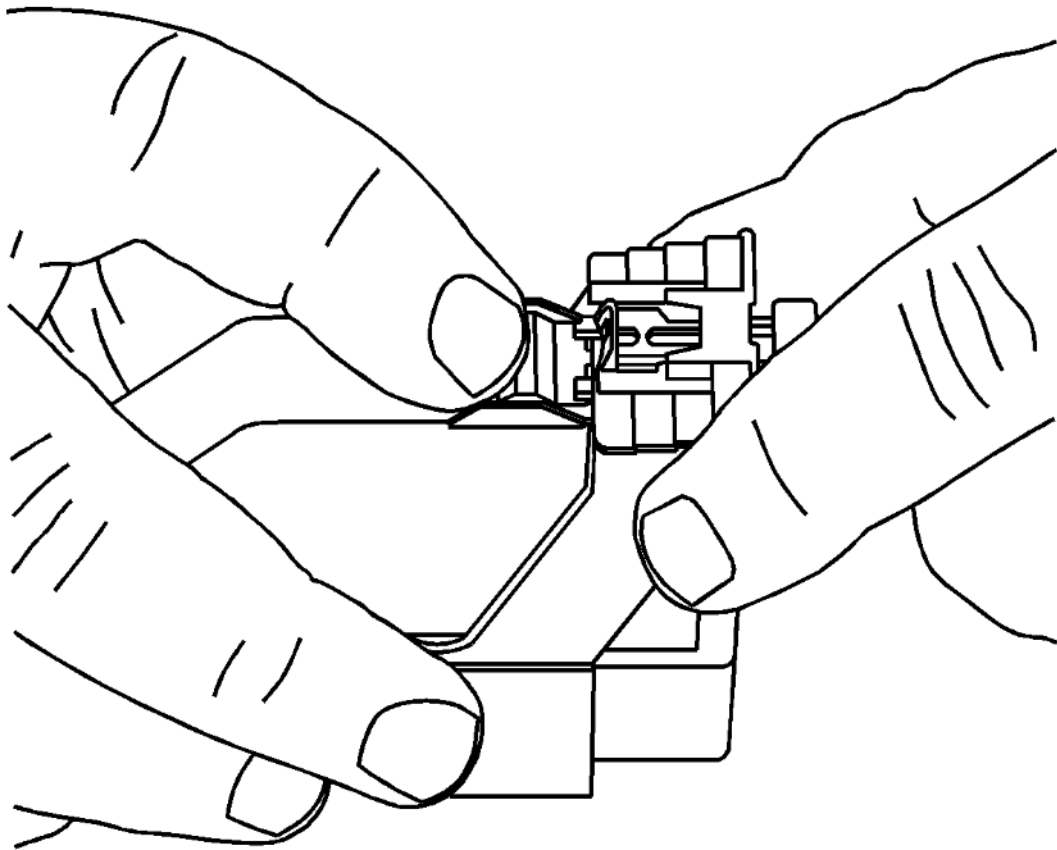


Fig. 114: View Of Lever In Full Forward Position
Courtesy of GENERAL MOTORS COMPANY

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

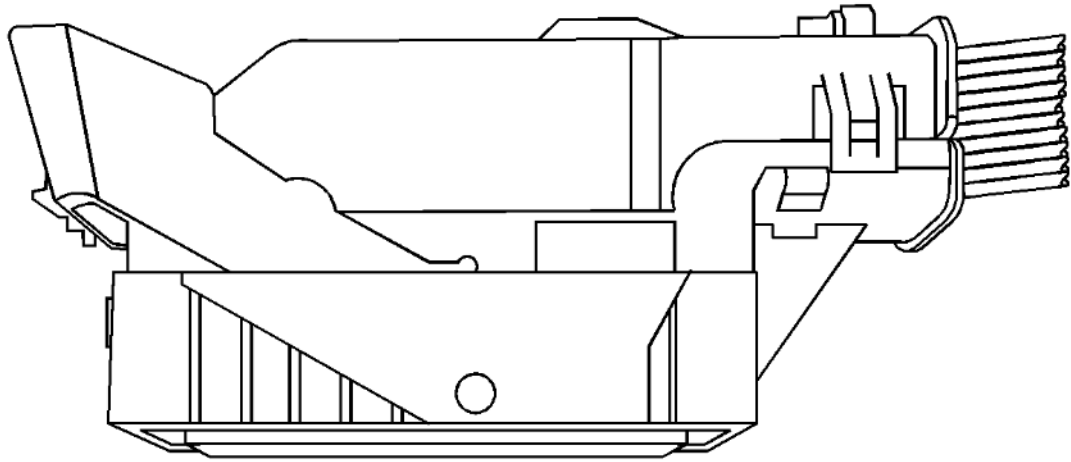


Fig. 115: View Of CPA Connector
Courtesy of GENERAL MOTORS COMPANY

4. Disconnect the connector from the component.

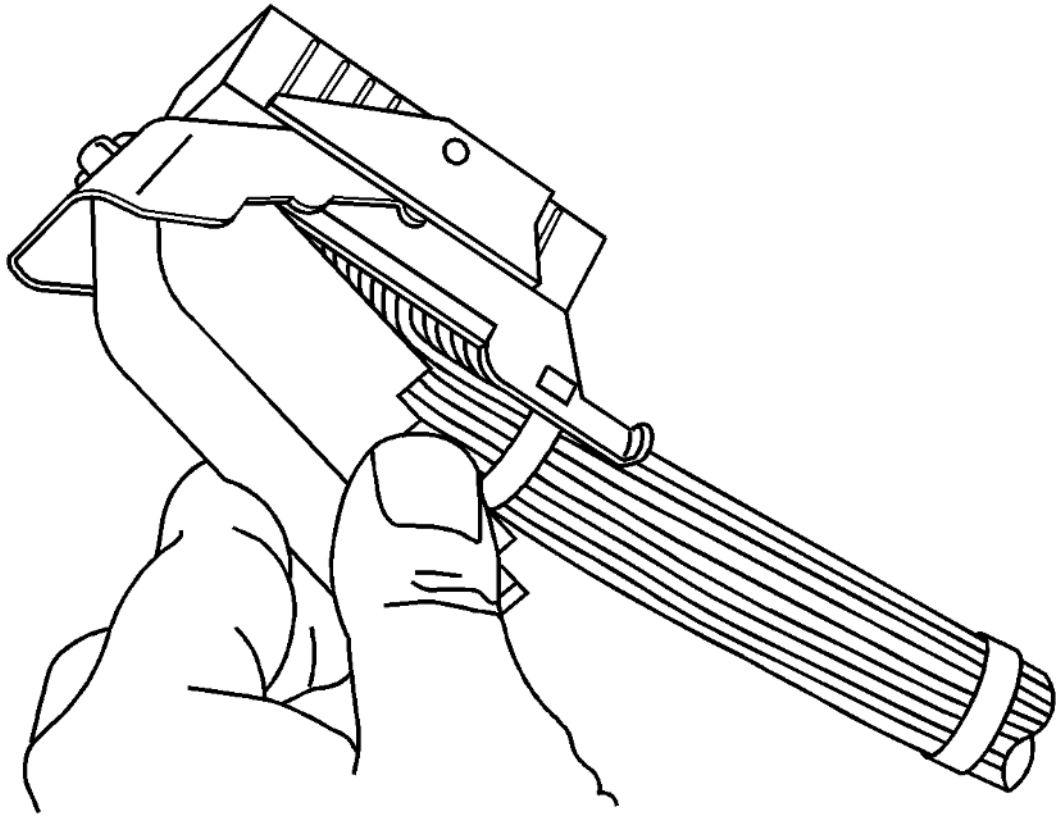


Fig. 116: View Of Dress Cover

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.

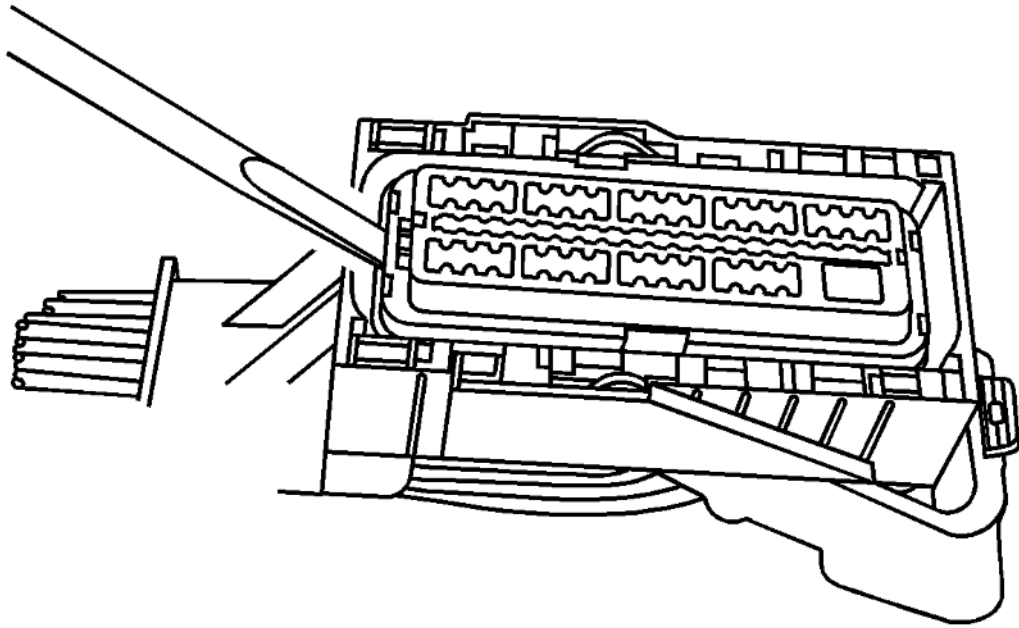


Fig. 117: Prying One Side Of Nose Piece

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.

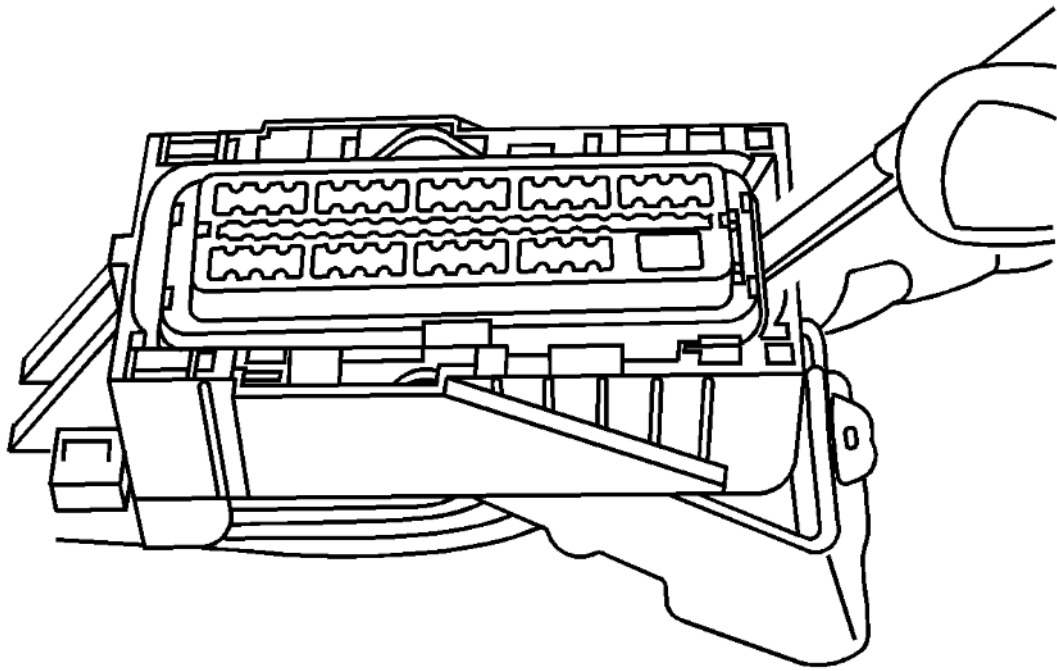


Fig. 118: Prying Side Of Nose Piece

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.

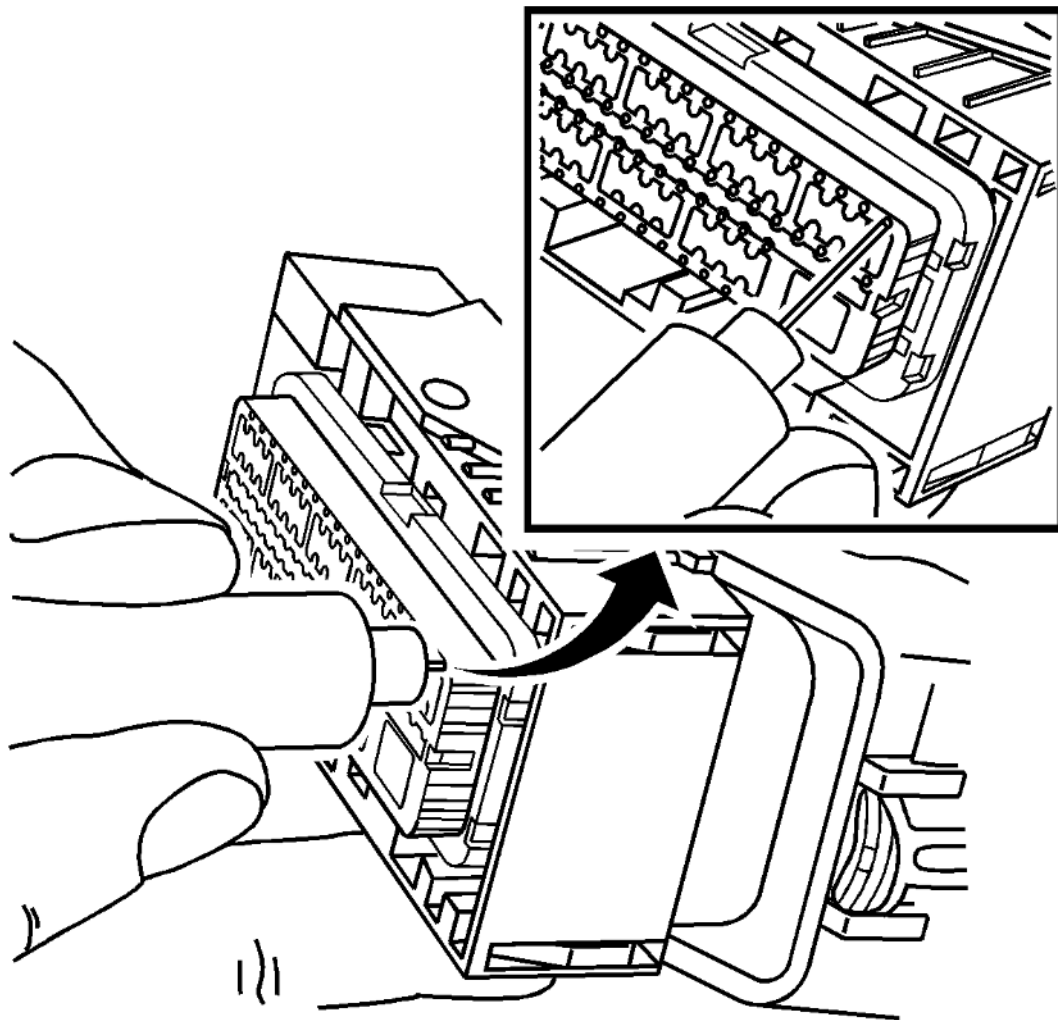


Fig. 119: Releasing Terminal

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.

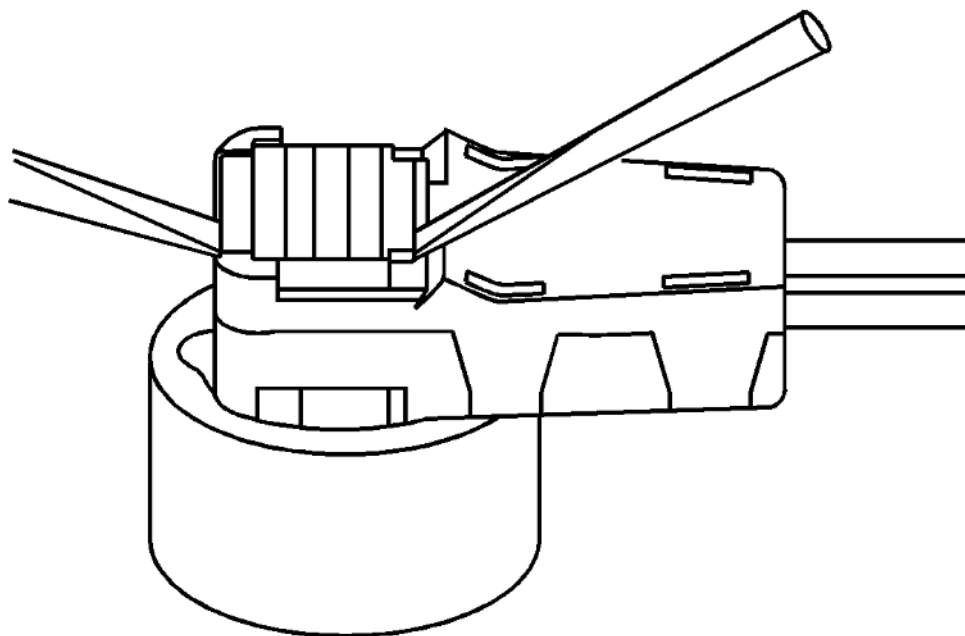


Fig. 120: Lifting Orange CPA

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.

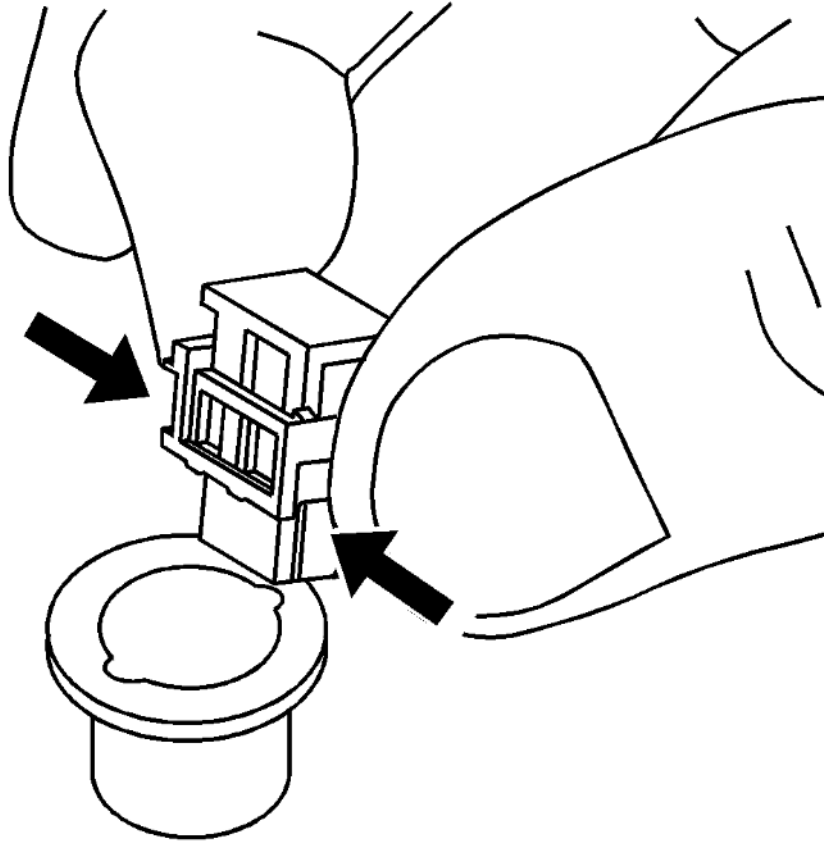


Fig. 121: Grabbing Connector On Both Sides
Courtesy of GENERAL MOTORS COMPANY

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

Installation Procedure

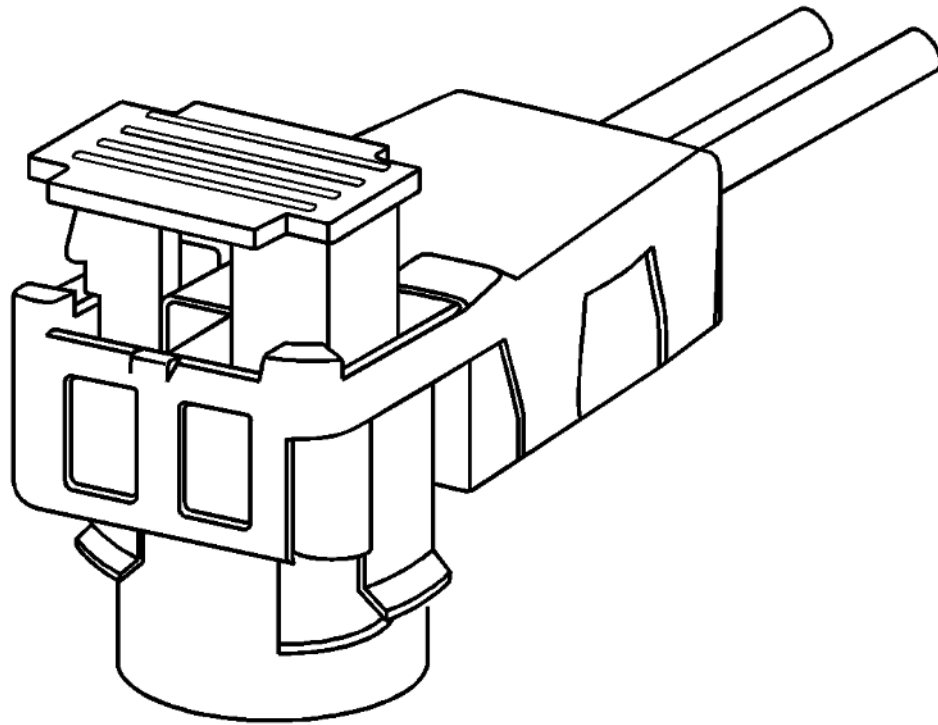


Fig. 122: Lifting Orange CPA

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.

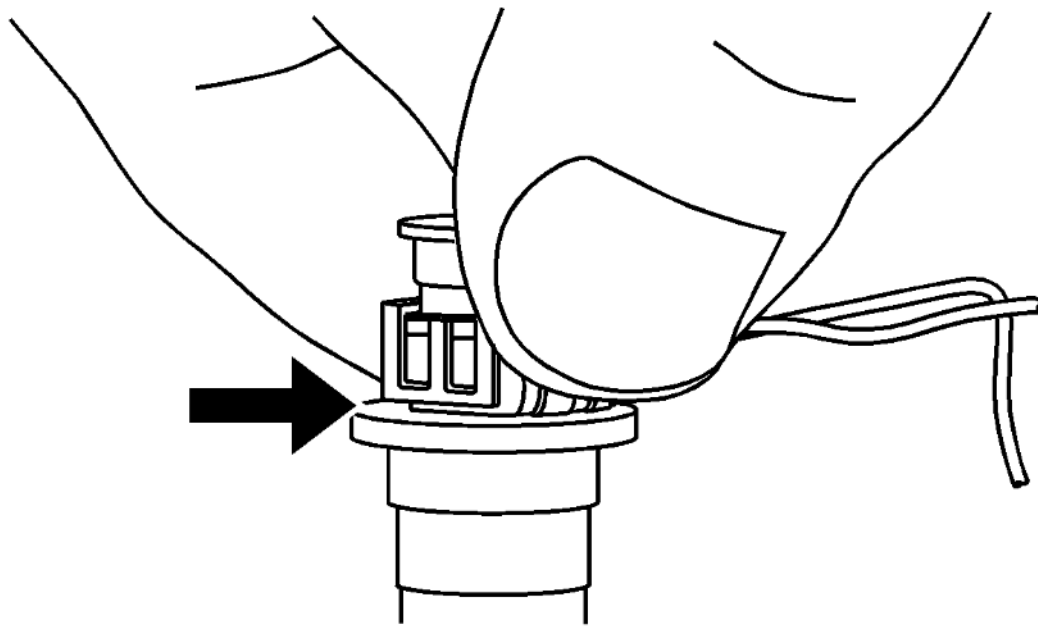


Fig. 123: Seating Connector Sub-Assembly

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.

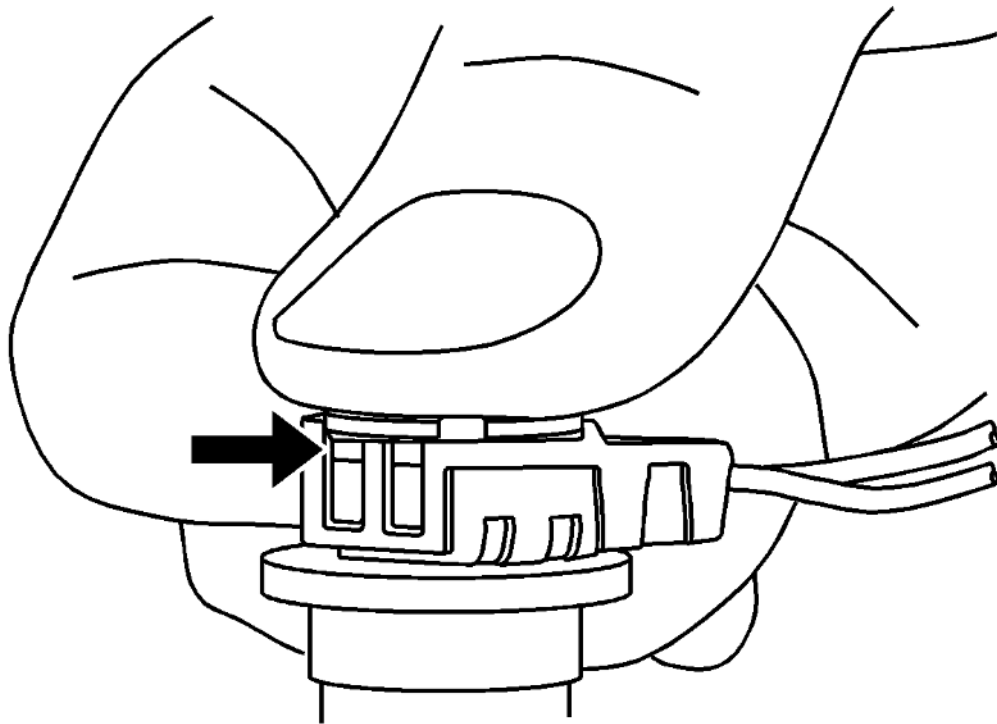


Fig. 124: Pushing CPA Down

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

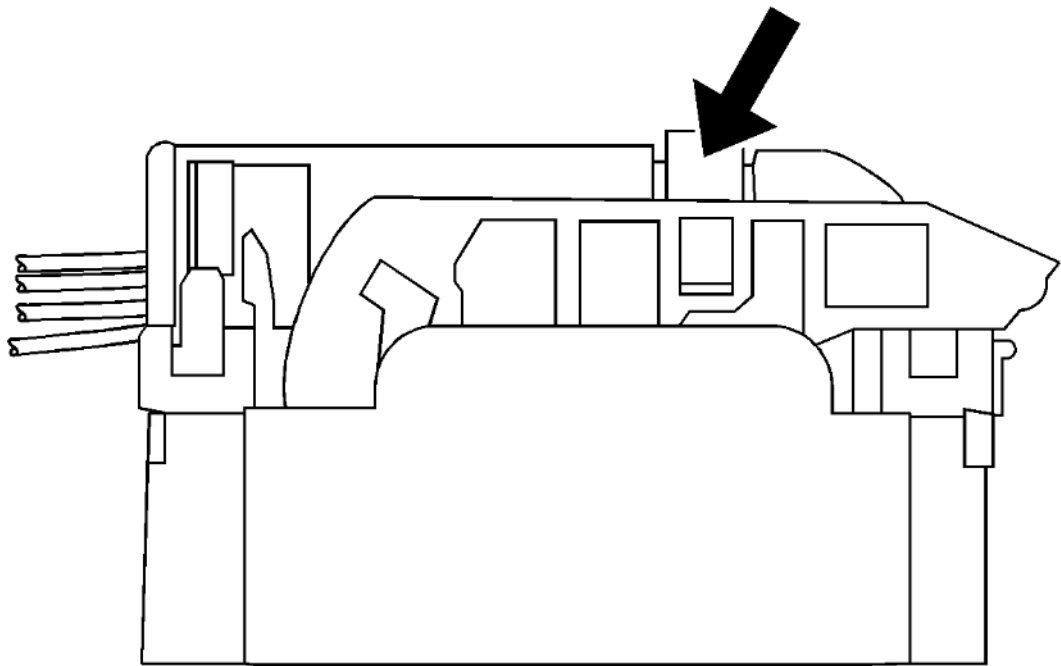


Fig. 125: Identifying Lever Lock
Courtesy of GENERAL MOTORS COMPANY

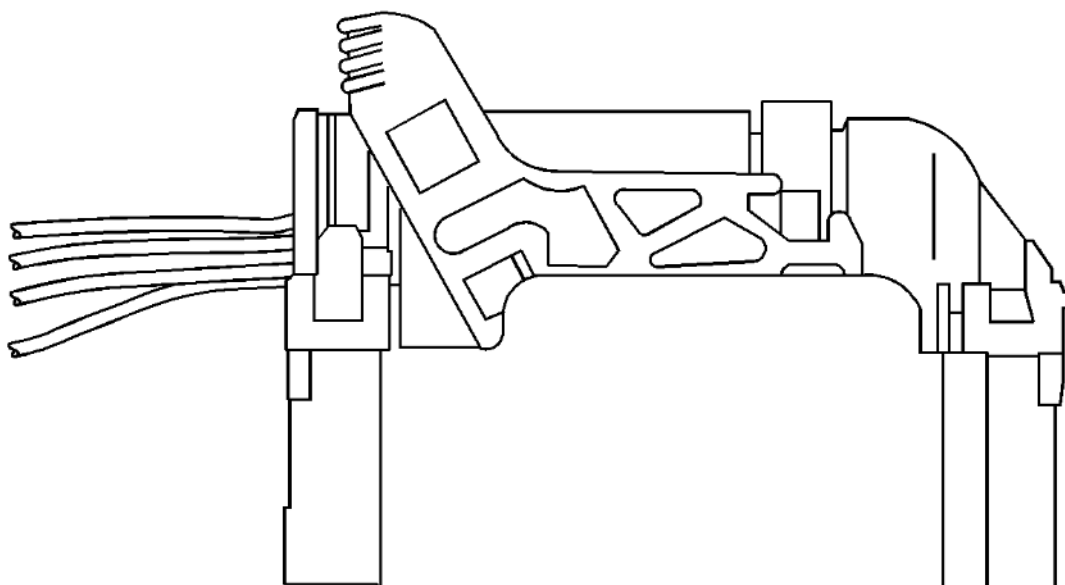


Fig. 126: View Of Lever Lock In Forward Position

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.

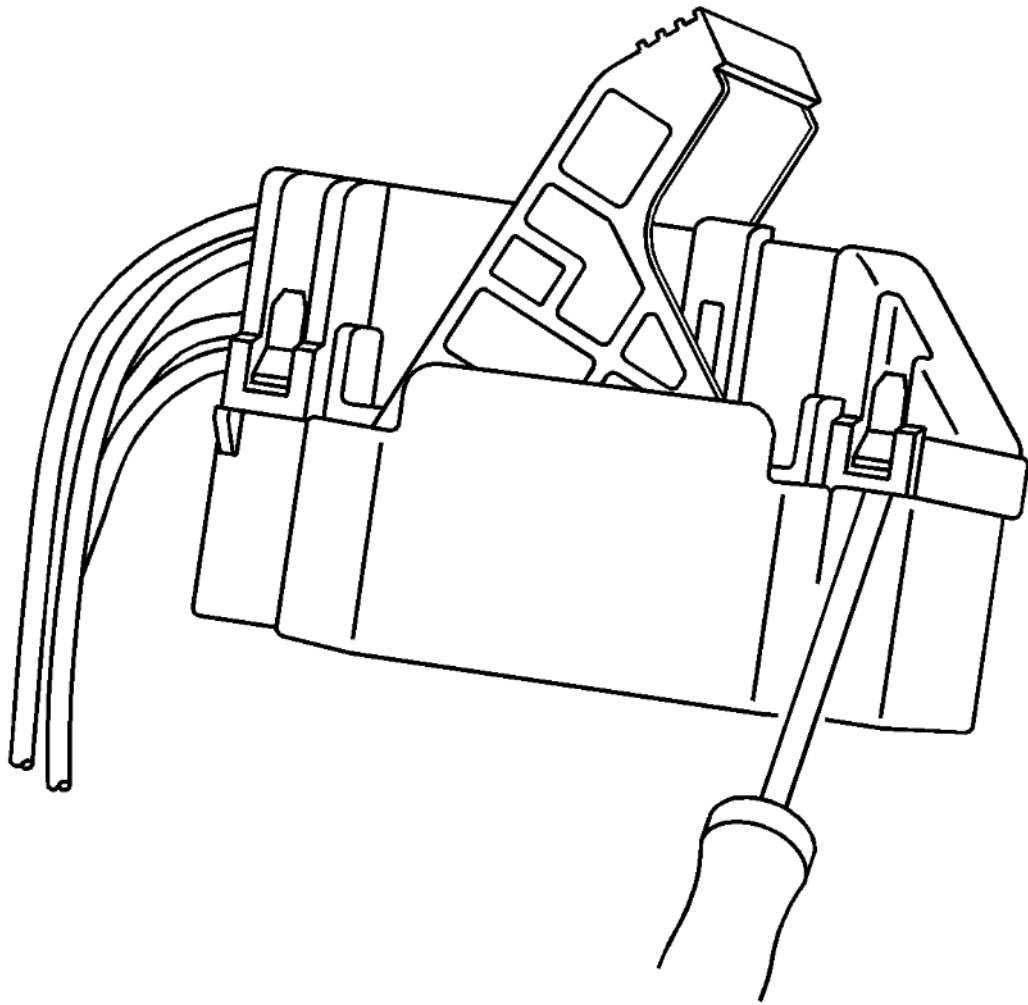


Fig. 127: View Of Connector Locking Tabs

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.

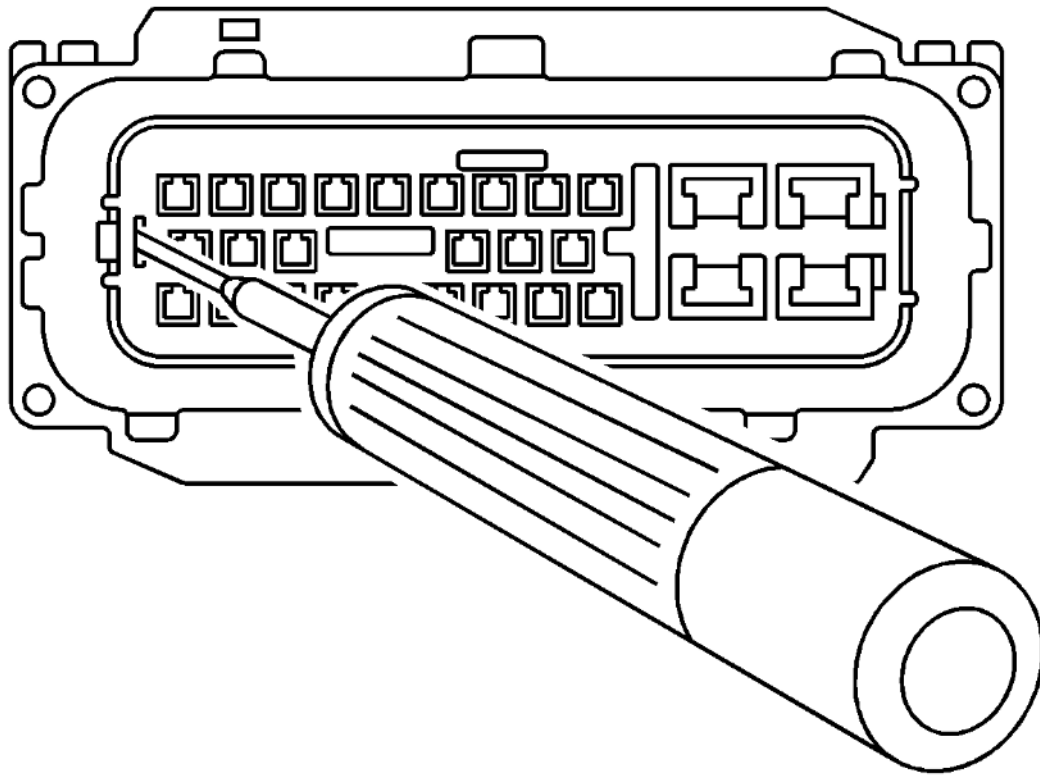


Fig. 128: Identifying Nose Piece Locking Tabs

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.

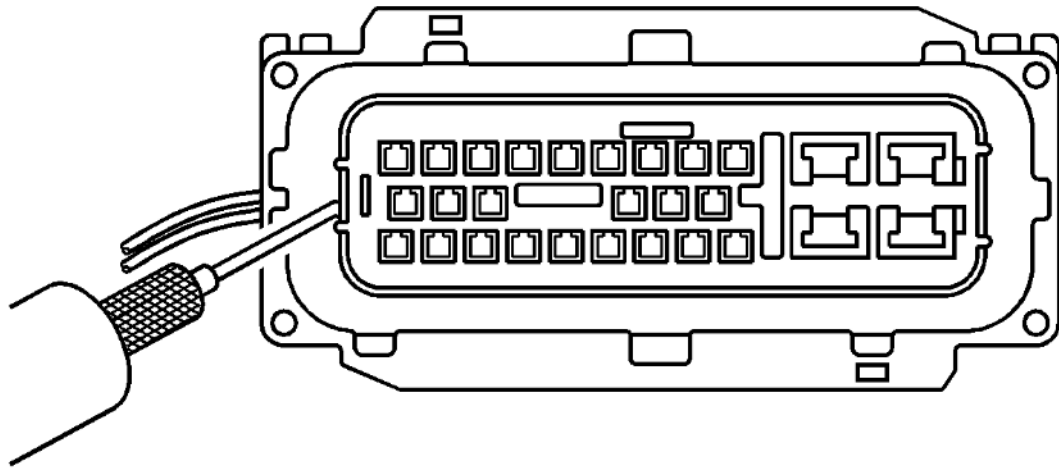


Fig. 129: Pulling Up One End Of Nose Piece (1st Side)

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.

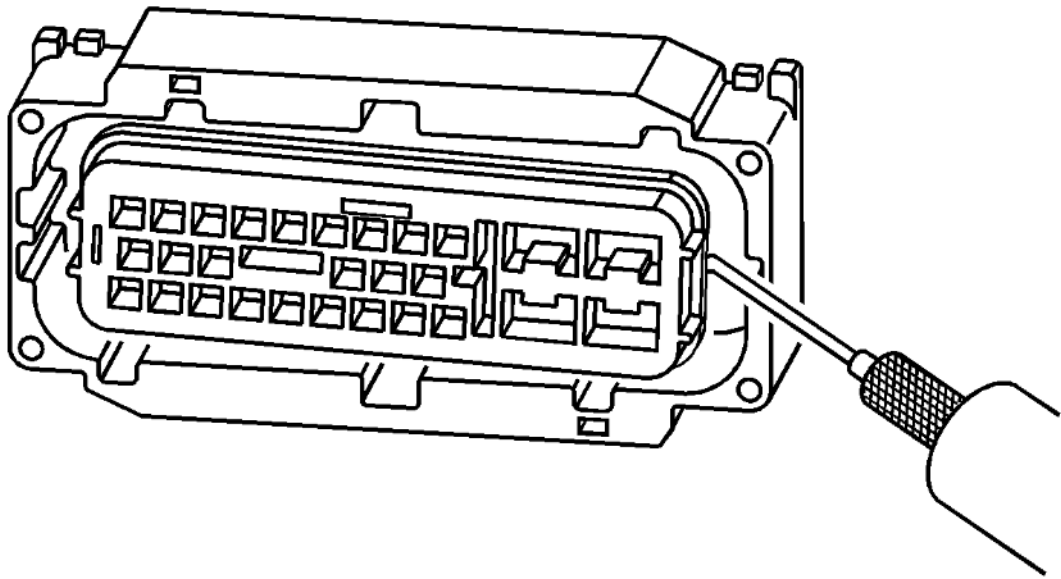


Fig. 130: Pulling Up One End Of Nose Piece (2nd Side)

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.

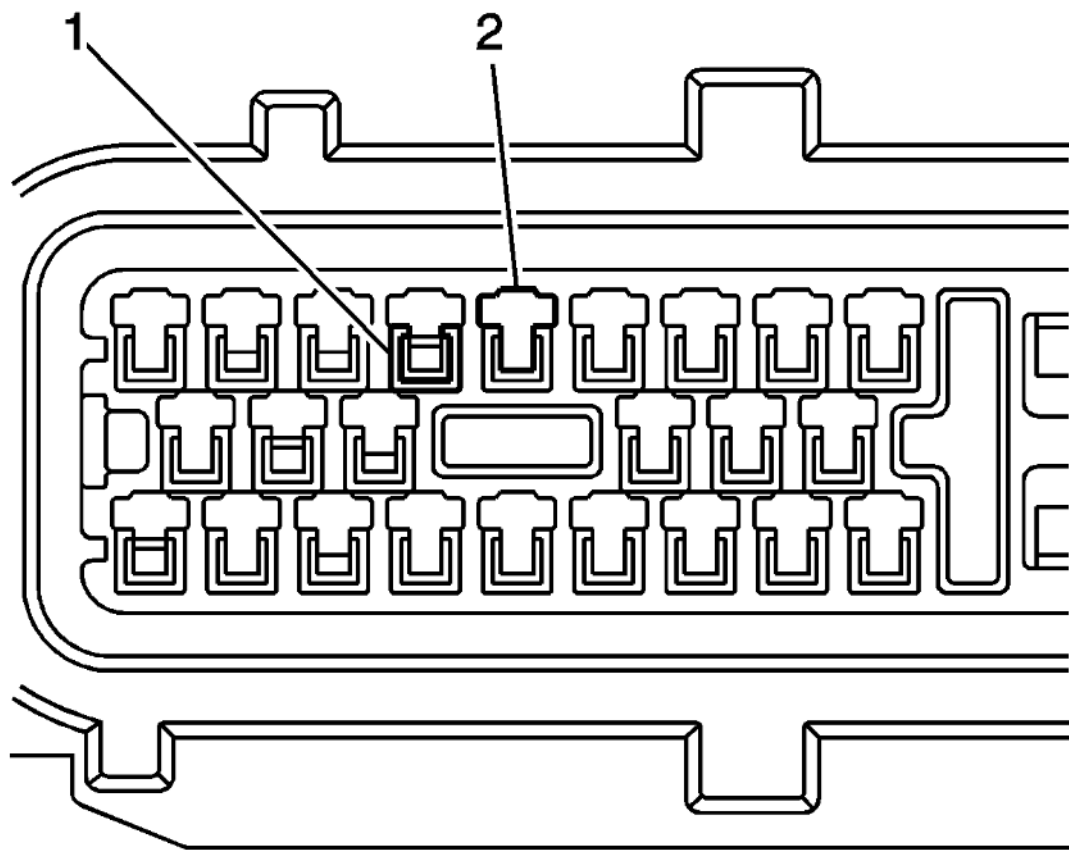


Fig. 131: View Of Terminal & Entry Canal

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)

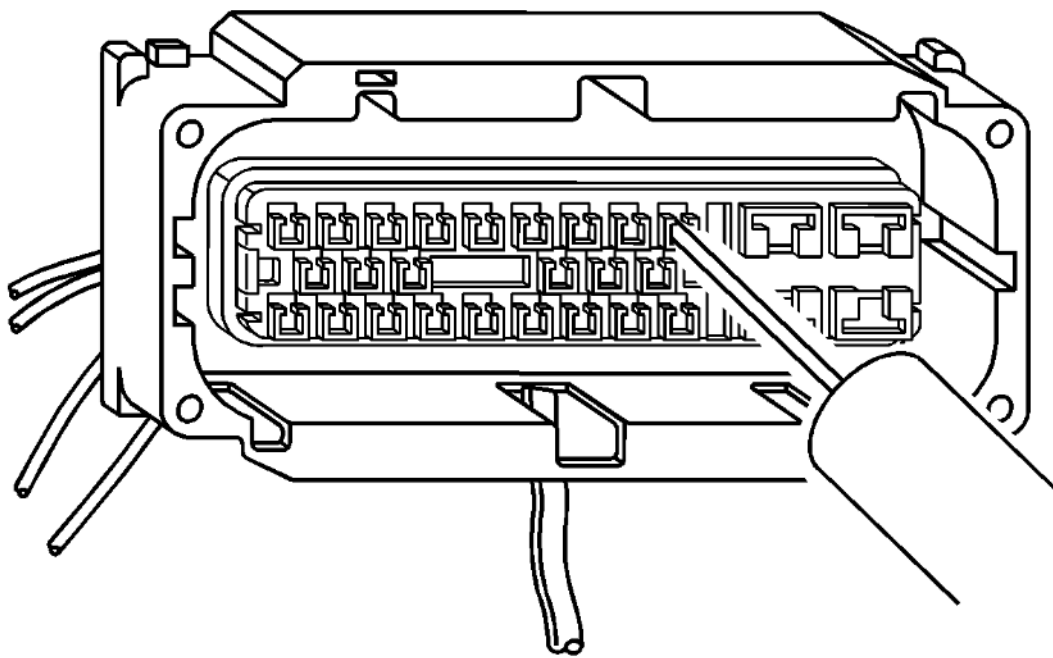


Fig. 132: Inserting J-38125-553 (15315247) Tool Into Entry Canal

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.

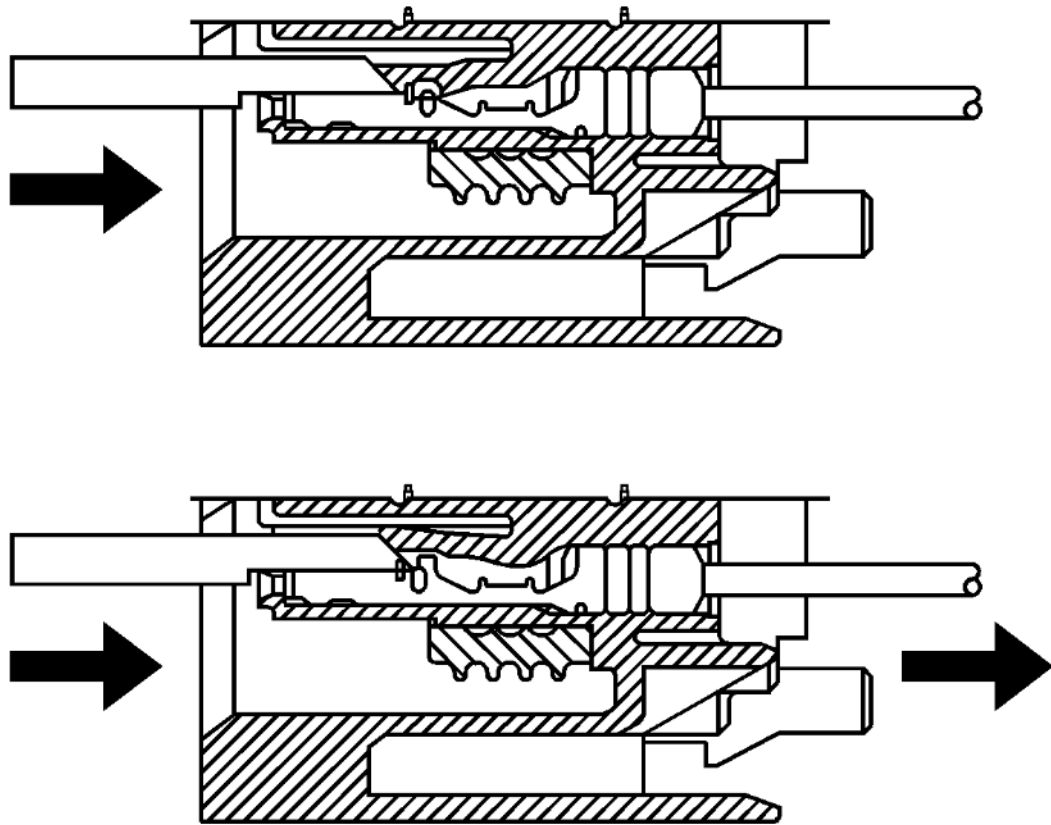


Fig. 133: Cutaway View Of Connector

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.

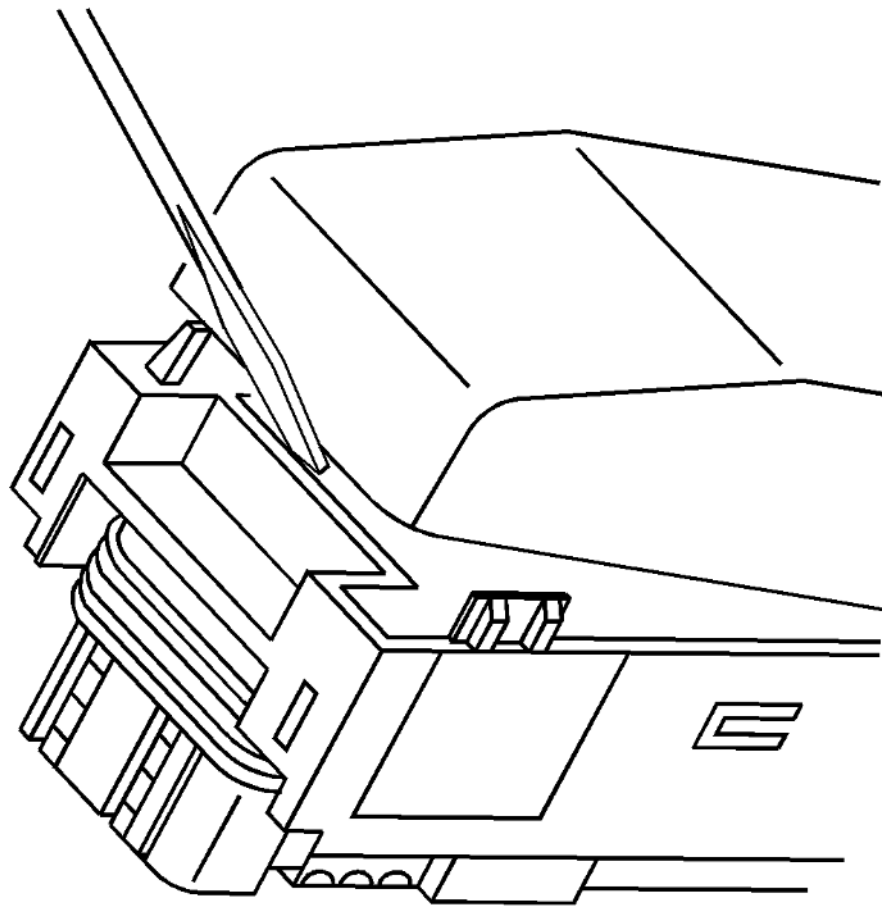


Fig. 134: View Of Dress Cover

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.

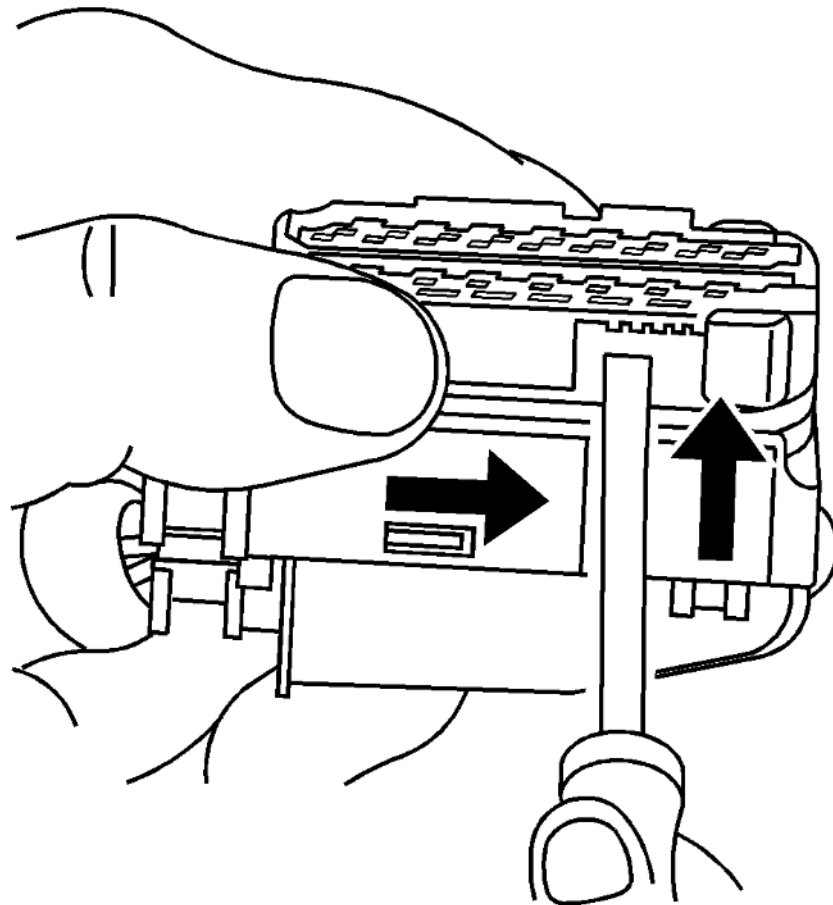


Fig. 135: View Of Terminal Position Assurance (TPA)

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).

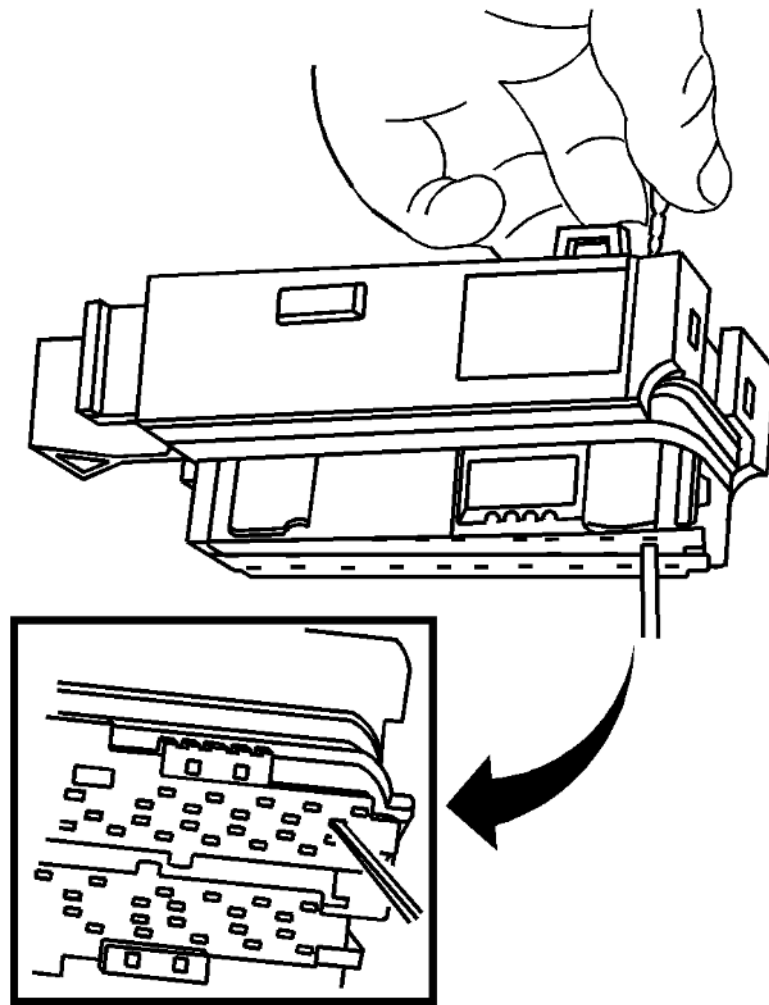


Fig. 136: Inserting Special Tool Into Terminal Release Cavity.

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.

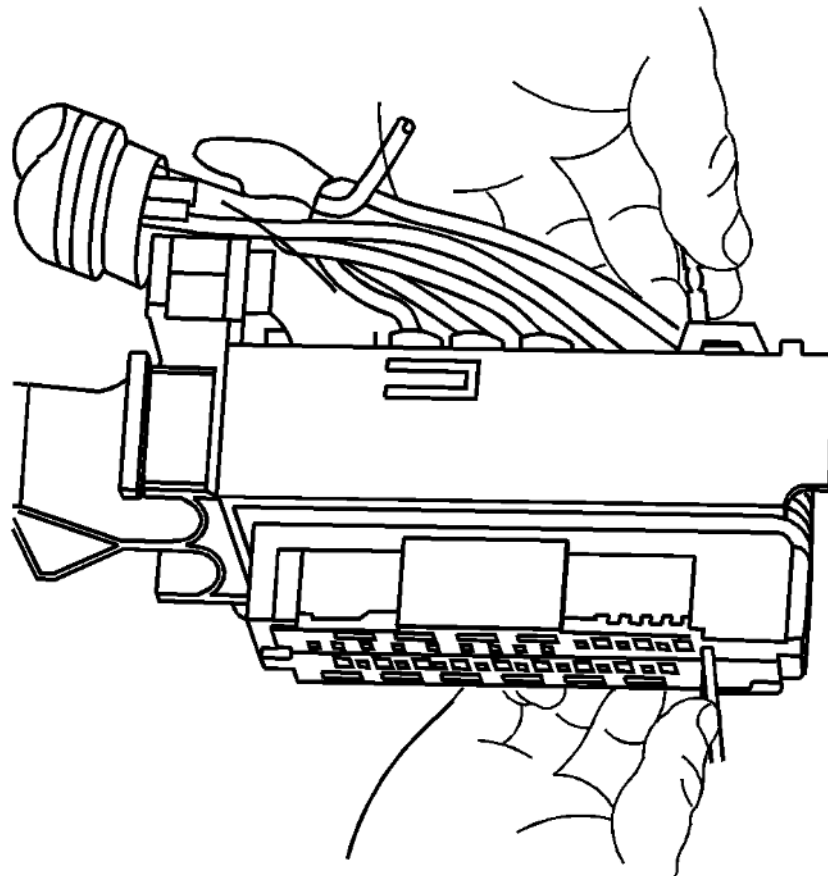


Fig. 137: Identifying Special Tool & Release Cavity
Courtesy of GENERAL MOTORS COMPANY

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)****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.

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.

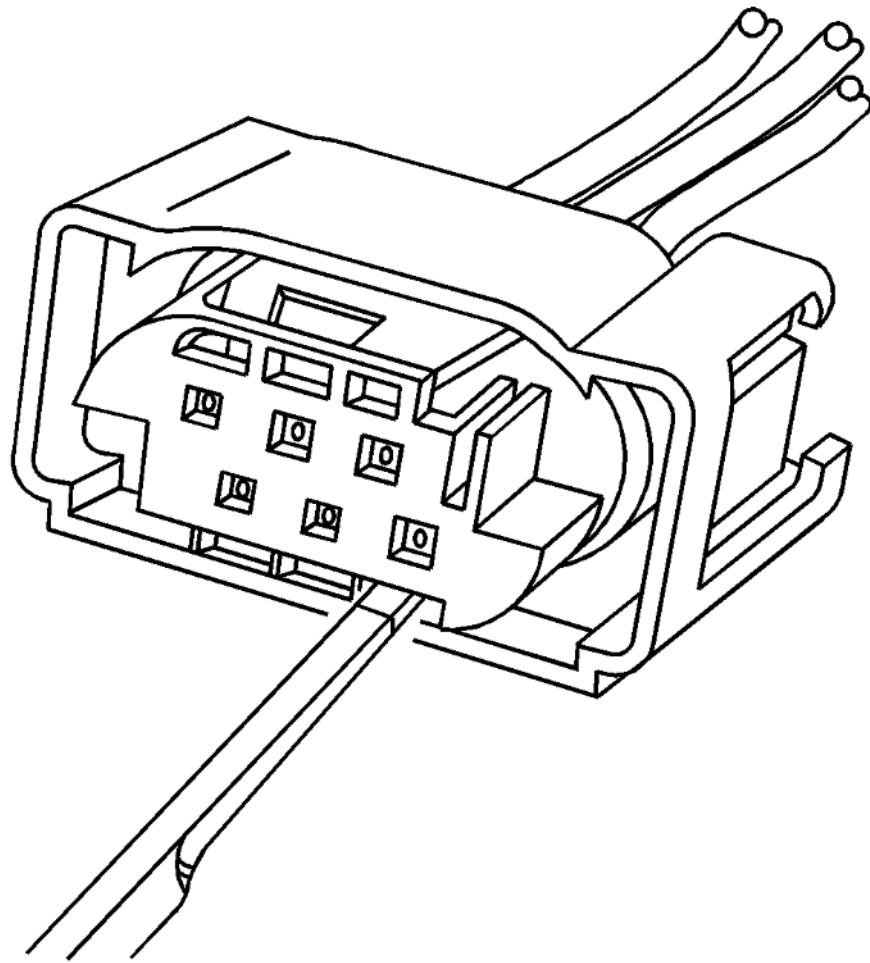


Fig. 138: View Of Inserting Special Tool Into Lower Right Face Cavity

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.

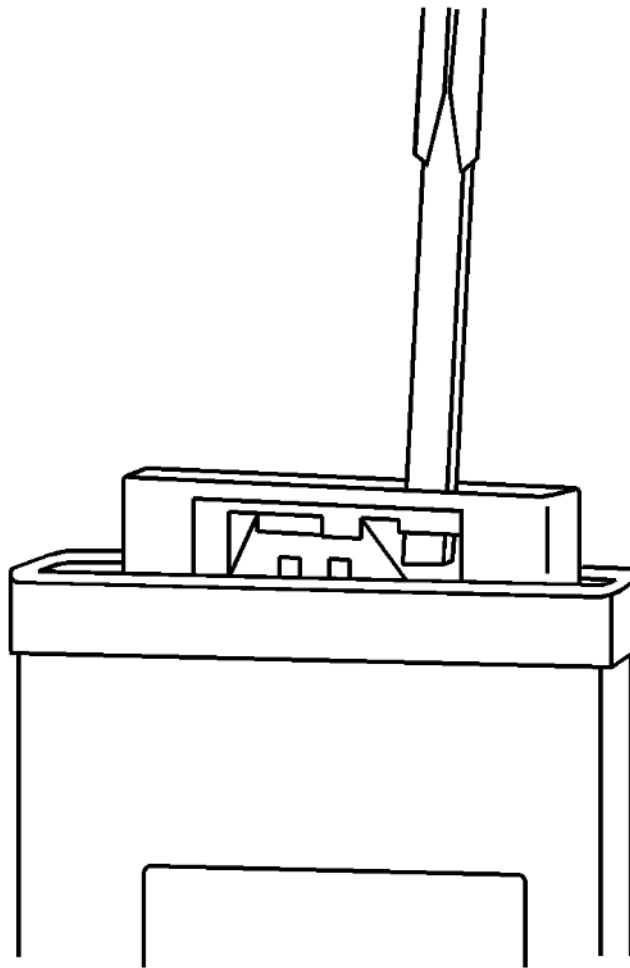


Fig. 139: Pushing Wire Side Of Terminal Toward Connector
Courtesy of GENERAL MOTORS COMPANY

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.

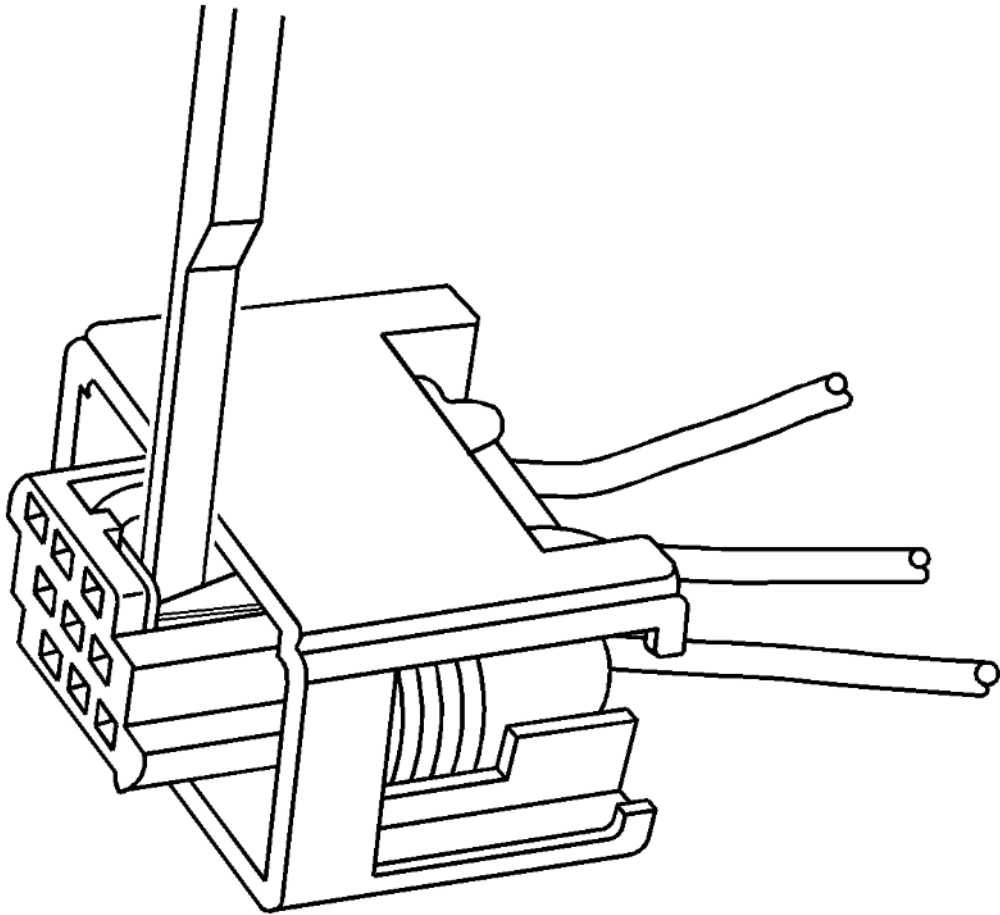


Fig. 140: View Of Inserting Tool Into Terminal Release Tang Access Slot (Sensor)
Courtesy of GENERAL MOTORS COMPANY

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).

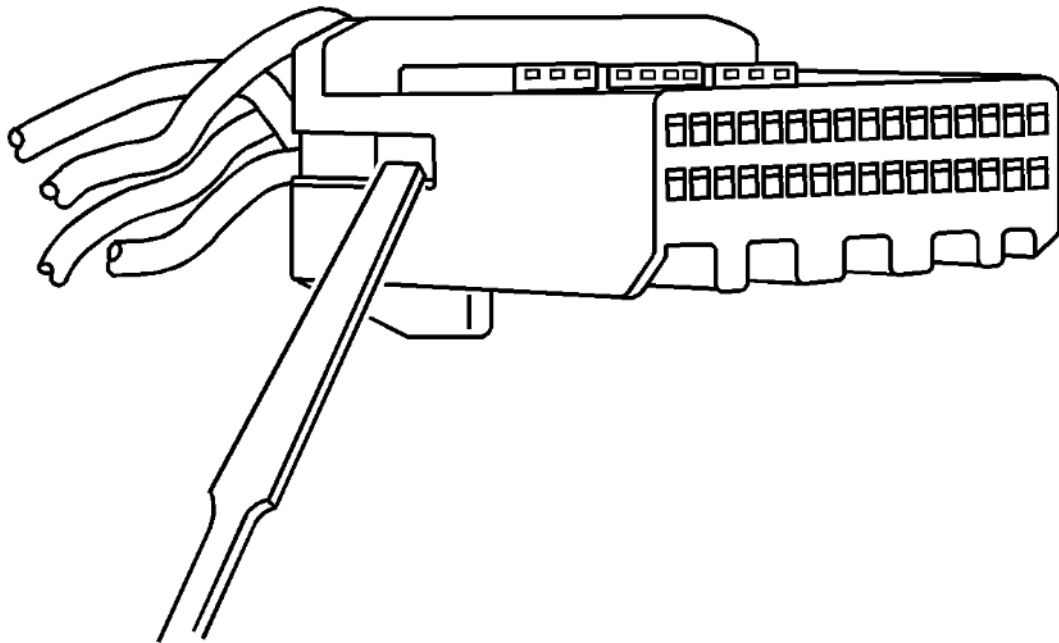


Fig. 141: Releasing TPA Using Small Flat-Bladed Tool

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.

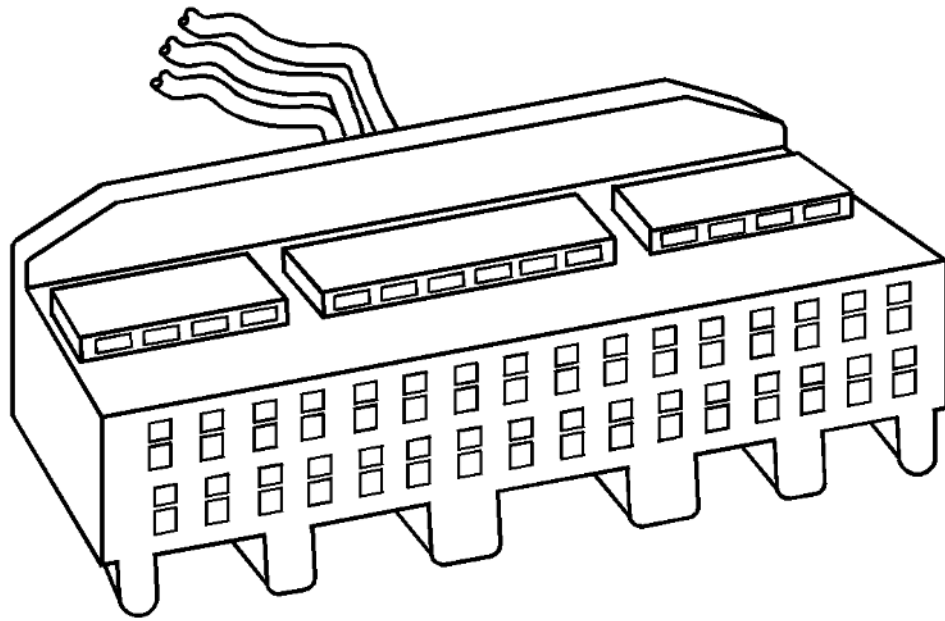


Fig. 142: View Of Terminal Position Assurance

Courtesy of GENERAL MOTORS COMPANY

4. Ensure that the TPA is in the proper position to remove the terminals.

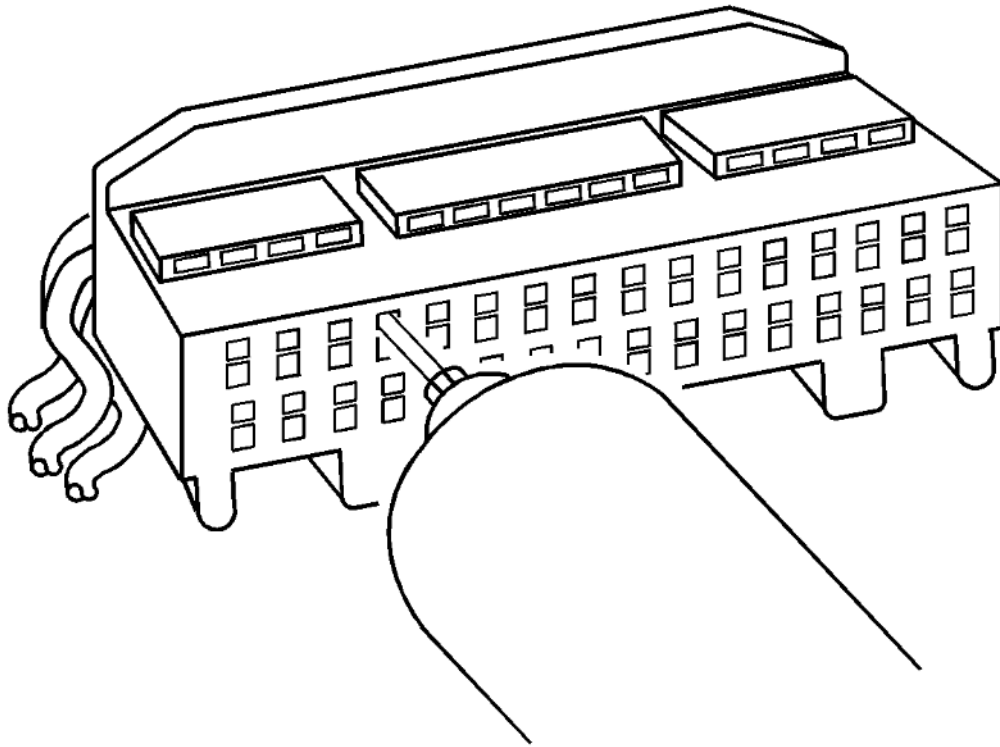


Fig. 143: Identifying Special Tool & Release Cavity
Courtesy of GENERAL MOTORS COMPANY

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 \(Terminated Lead Repair\)](#)[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 (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.

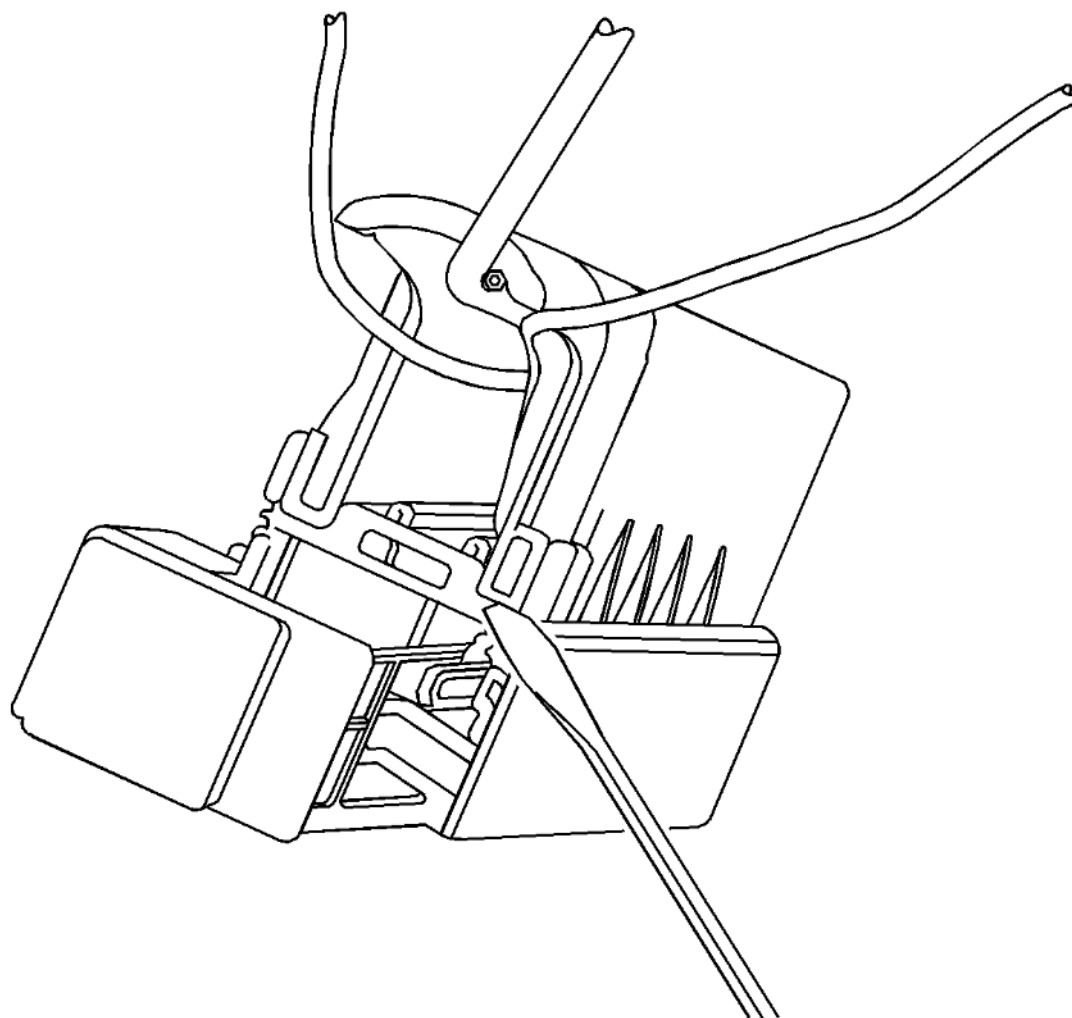


Fig. 144: Releasing TPA

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.

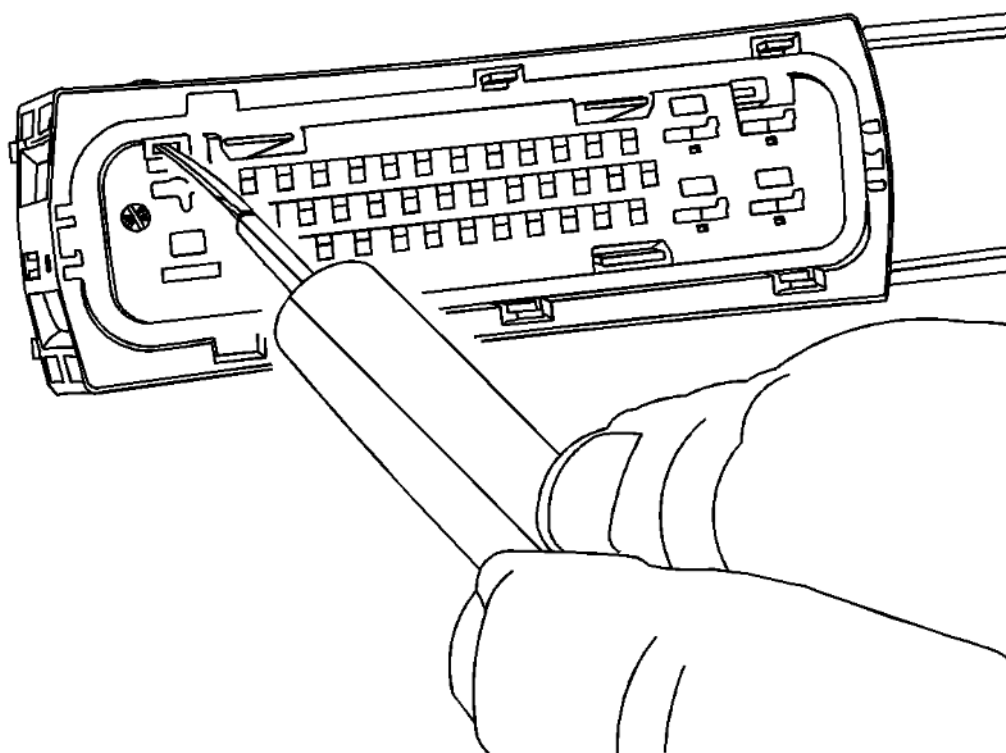


Fig. 145: View Of Inserting Tool Into Terminal Release Cavity.
Courtesy of GENERAL MOTORS COMPANY

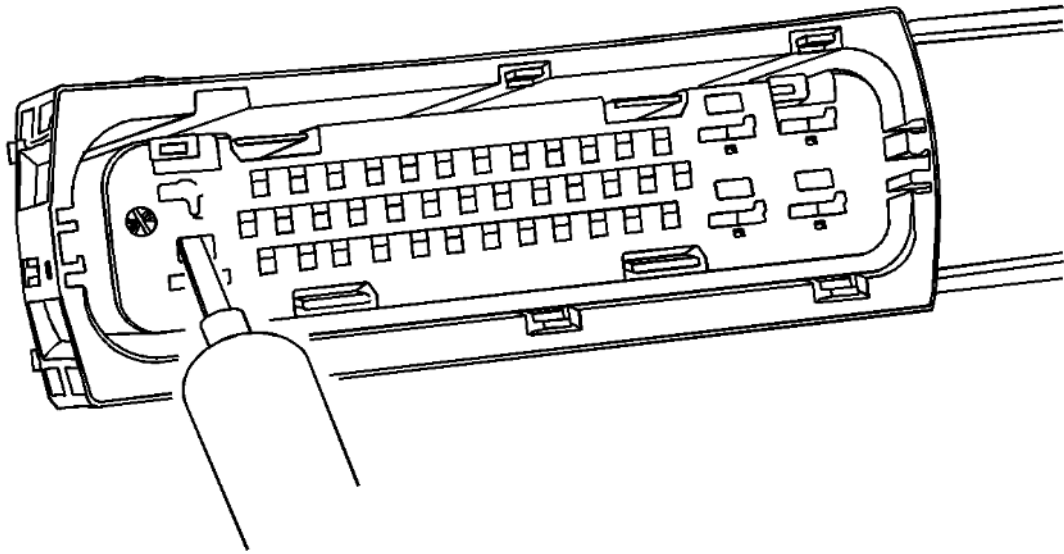


Fig. 146: View Of Release Tool Being Used For Larger Terminals
Courtesy of GENERAL MOTORS COMPANY

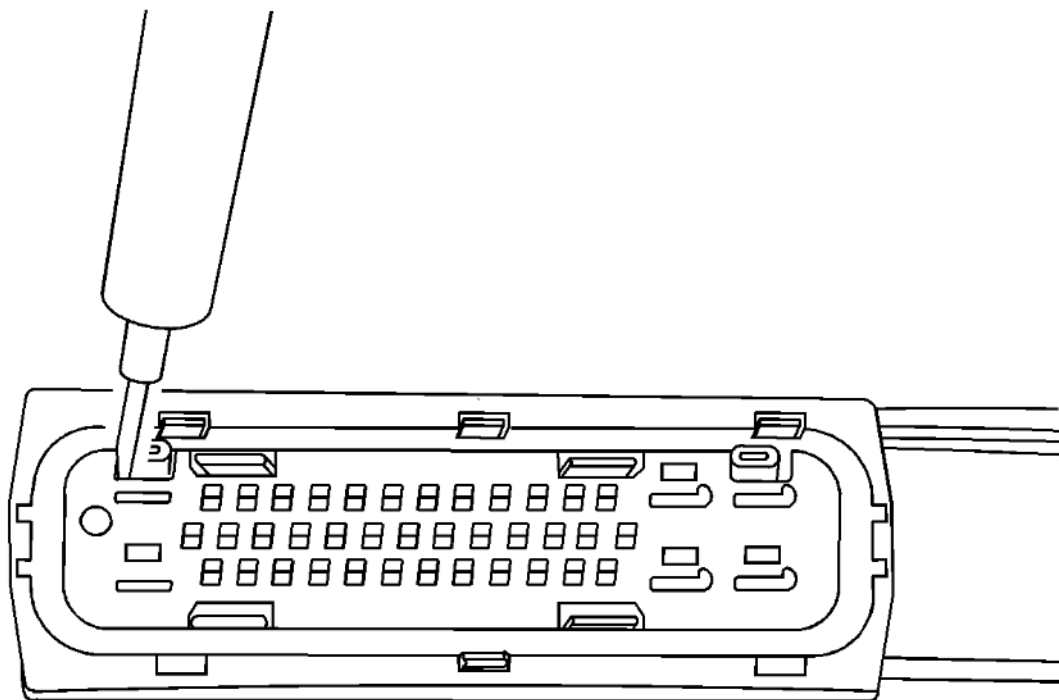


Fig. 147: View Of Release Tool Being Used For Larger Terminals
Courtesy of GENERAL MOTORS COMPANY

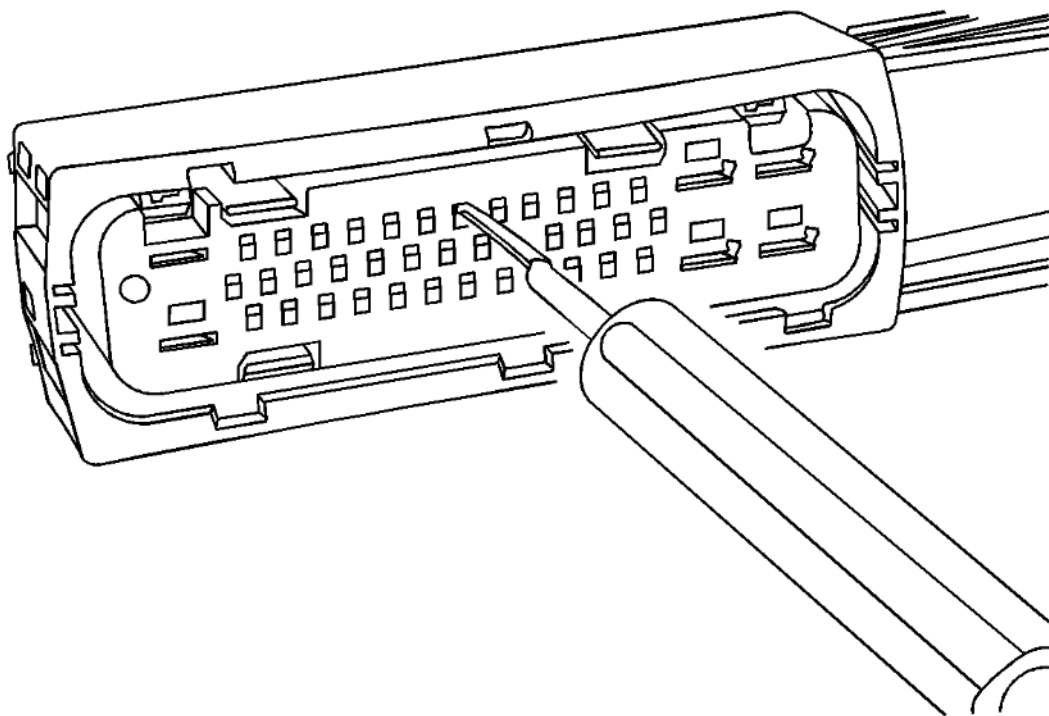


Fig. 148: View Of Release Tool Being Used For Smaller Terminals
 Courtesy of GENERAL MOTORS COMPANY

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

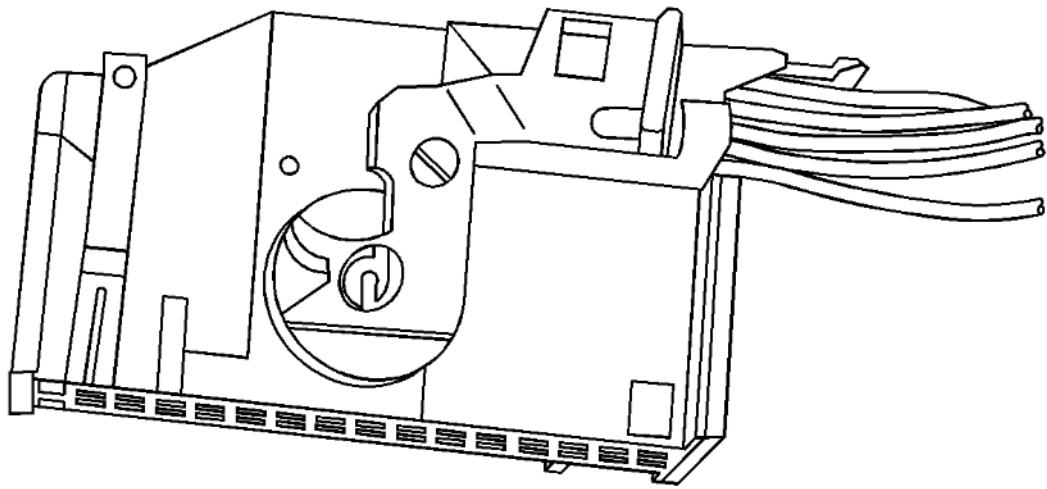


Fig. 149: Side View Of Tyco/AMP Connector
Courtesy of GENERAL MOTORS COMPANY

Side view of connector.

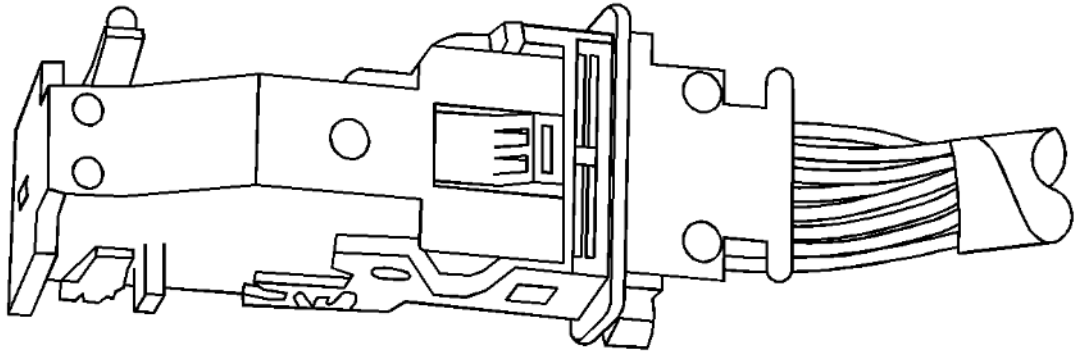


Fig. 150: Top View Of Tyco/AMP Connector
Courtesy of GENERAL MOTORS COMPANY

View of top of connector.

1. Locate the assist lever and lock on the top of the connector.

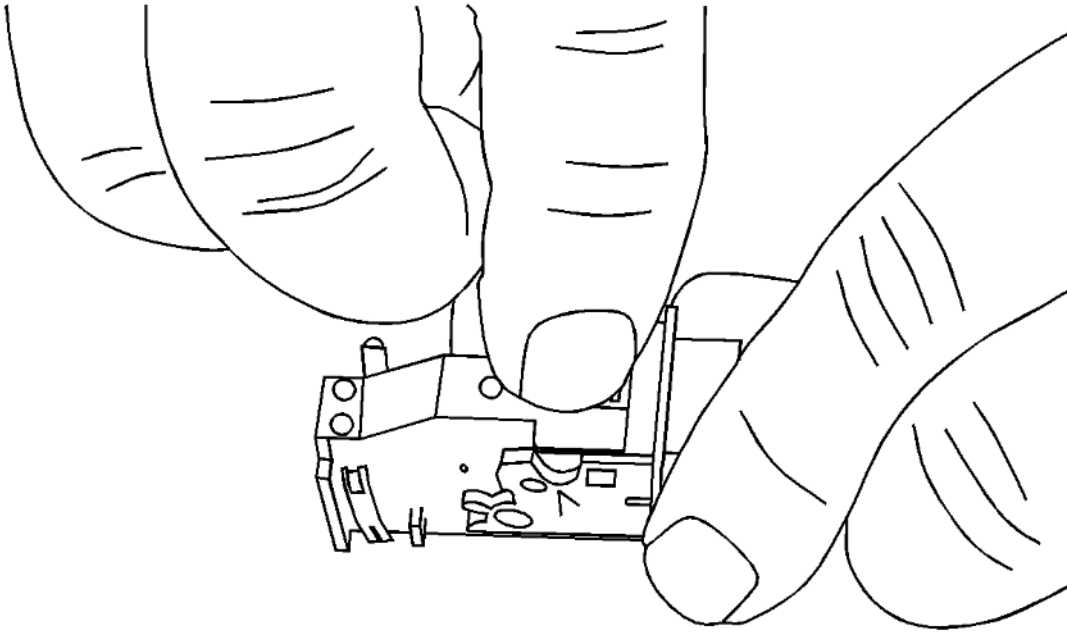


Fig. 151: View Of Depressing Lock & Pulling Assist Lever
Courtesy of GENERAL MOTORS COMPANY

2. While depressing the lock, pull the lever over and past the lock.

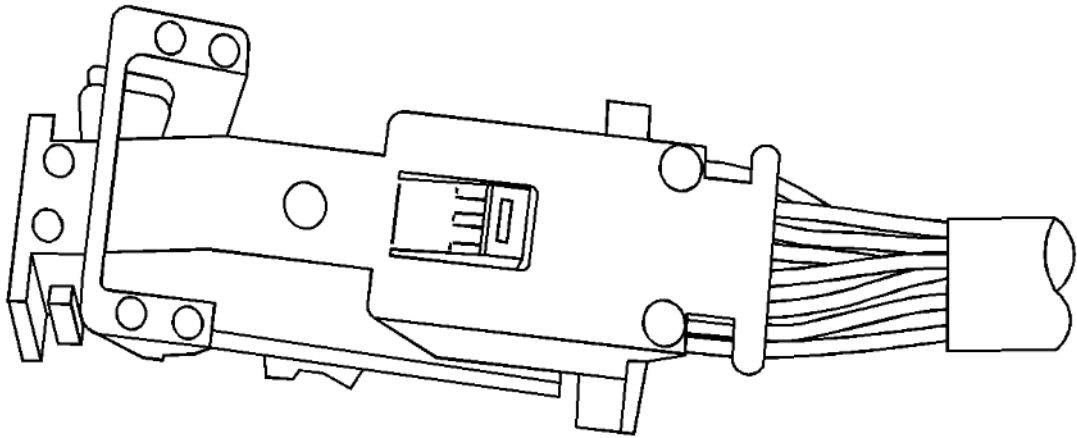


Fig. 152: View Of Component Connector
Courtesy of GENERAL MOTORS COMPANY

3. Disconnect the connector from the component.

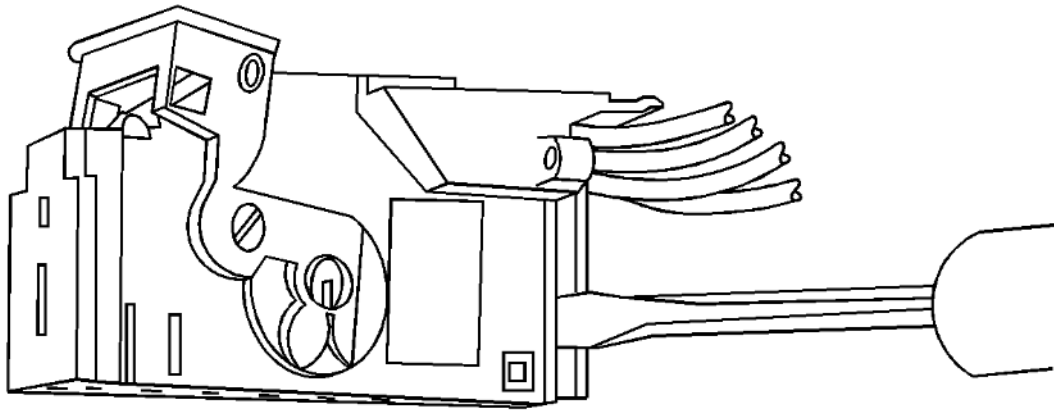


Fig. 153: Identifying Locking Tabs

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.

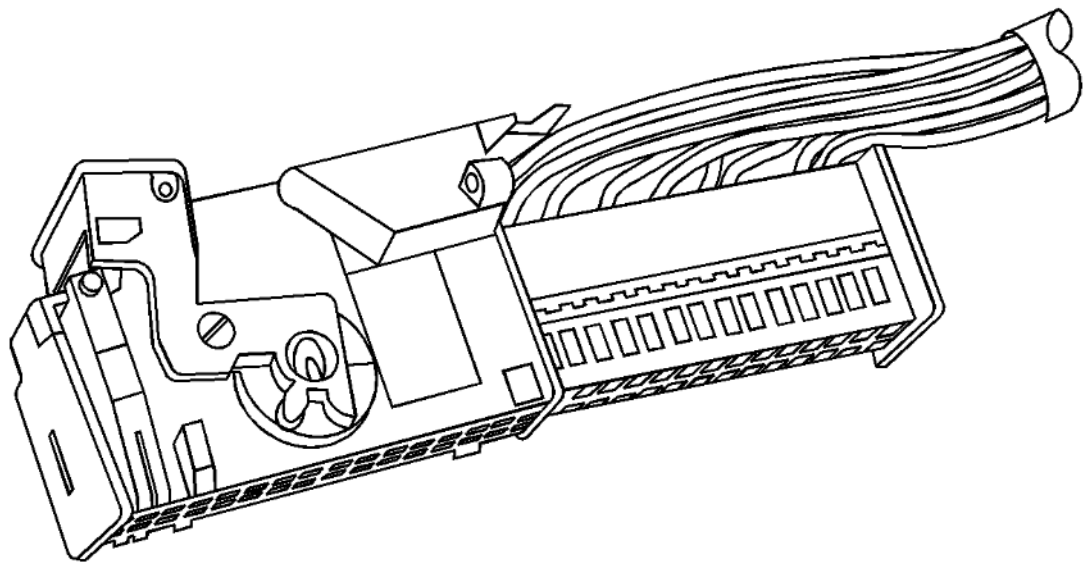


Fig. 154: Sliding Inner Connector Out Of Connector Housing

Courtesy of GENERAL MOTORS COMPANY

5. Once the locking tabs are unlocked, slide the inner connector out of the rear of the connector housing.

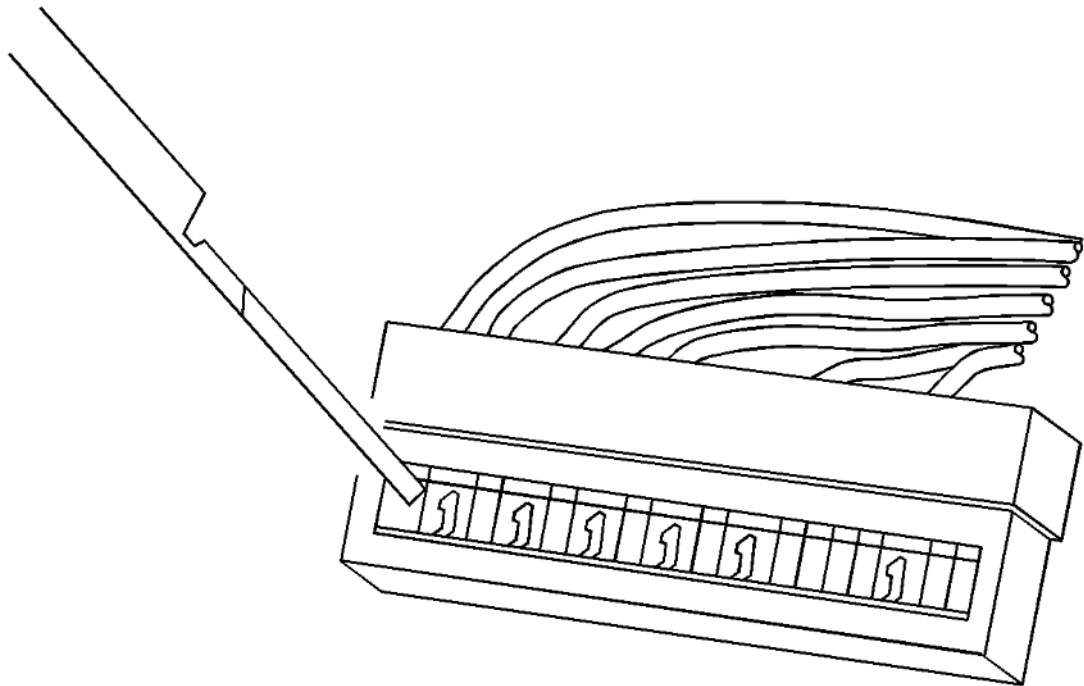


Fig. 155: Using Special Tool To Release Terminals
Courtesy of GENERAL MOTORS COMPANY

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

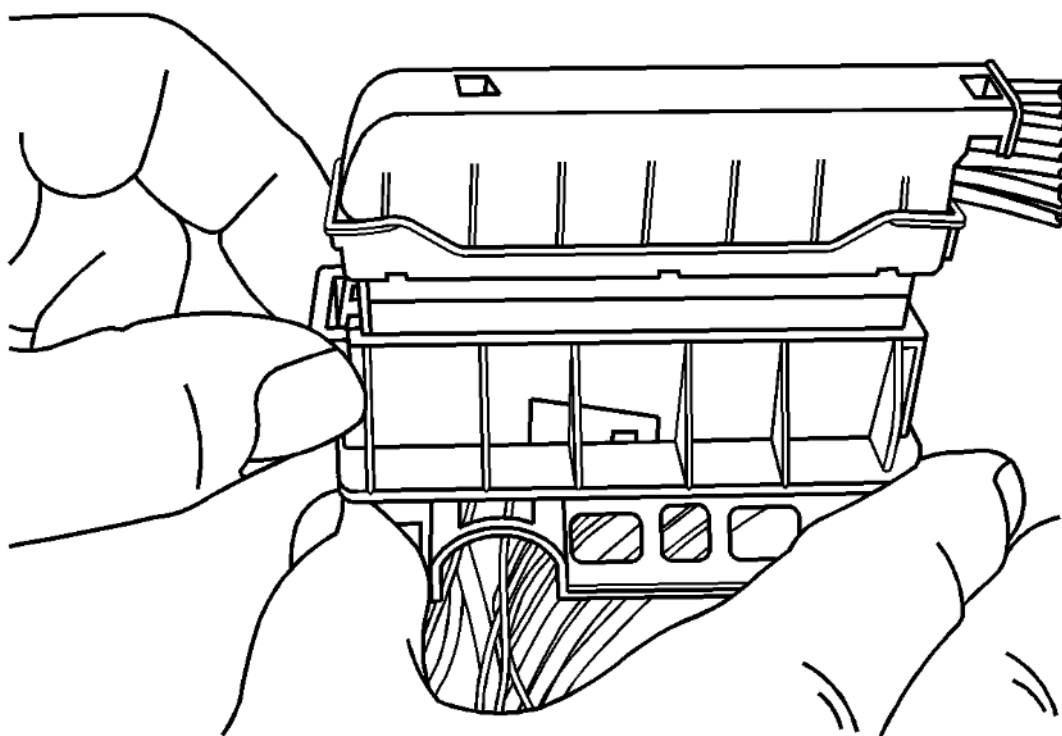


Fig. 156: Locating Locking Slide Lever

Courtesy of GENERAL MOTORS COMPANY

1. Grasp the locking slide lever and pull outward from the end of the connector.

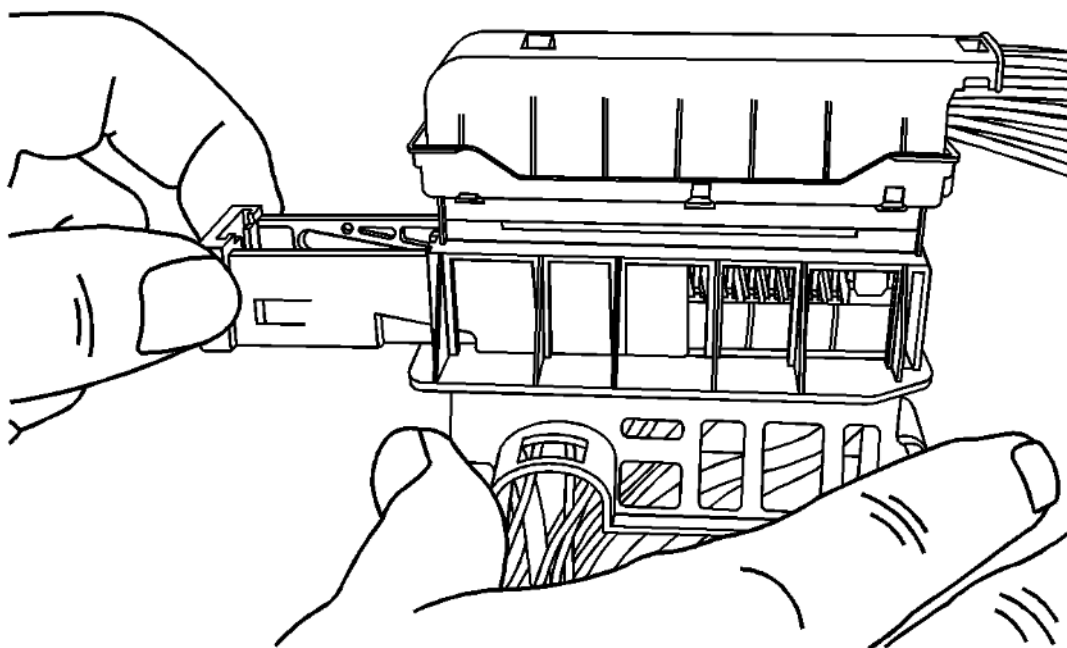


Fig. 157: Pulling Slide Lever Out Of Mating Connector
Courtesy of GENERAL MOTORS COMPANY

2. As the slide lever is pulled out the mating connector is lifted from the seated position.

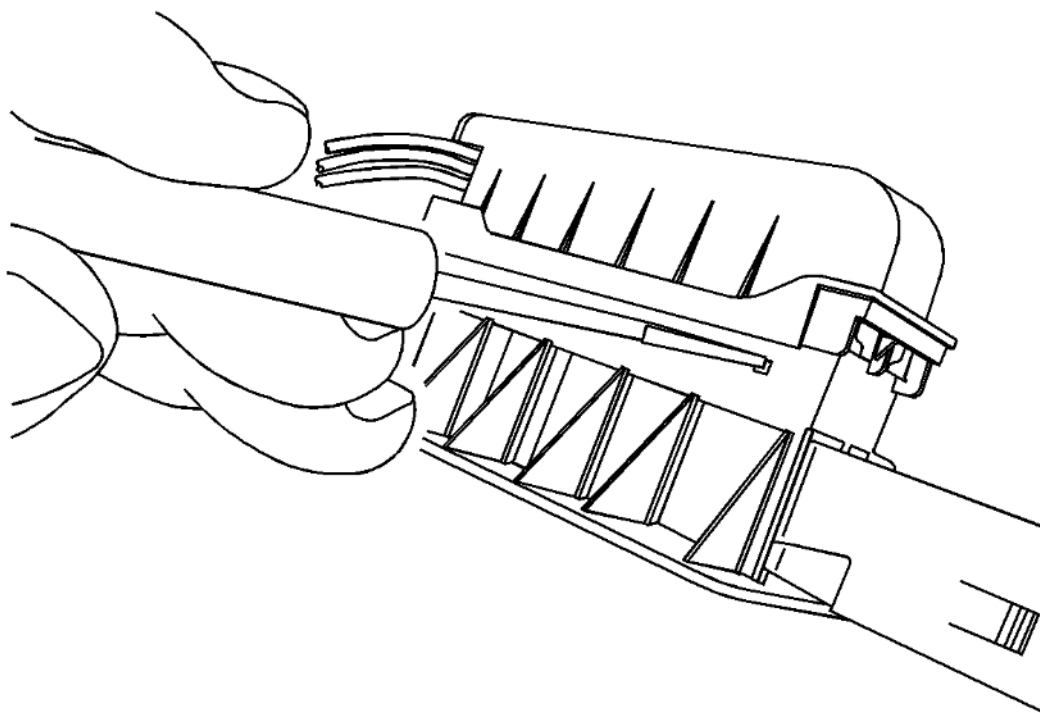


Fig. 158: Pushing TPA Tabs Into Connector Body

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.

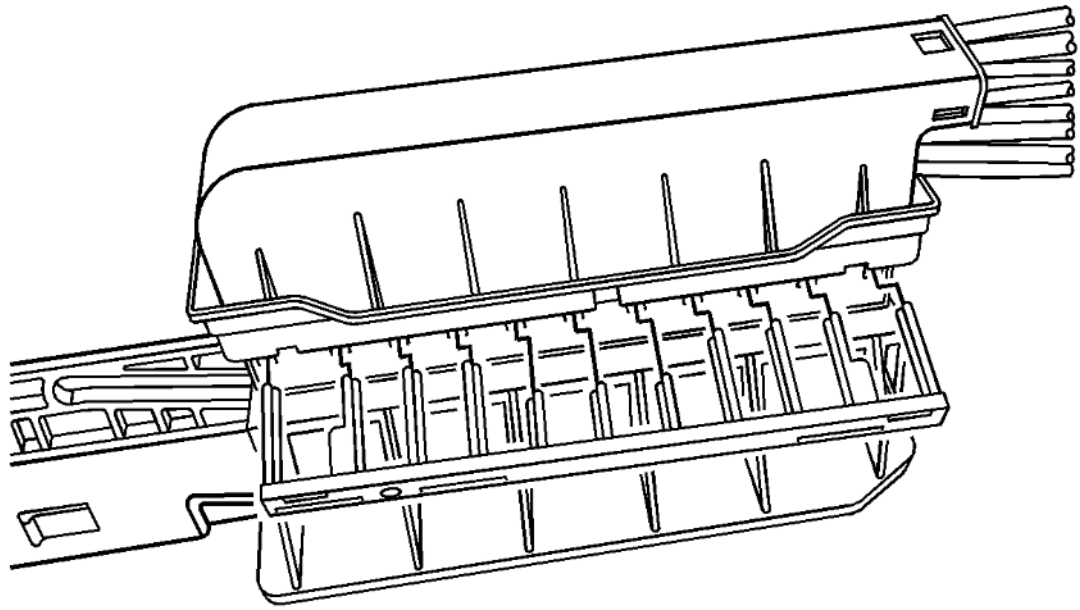


Fig. 159: Pulling TPA From Connector Body

Courtesy of GENERAL MOTORS COMPANY

4. Pull the TPA from the connector body.

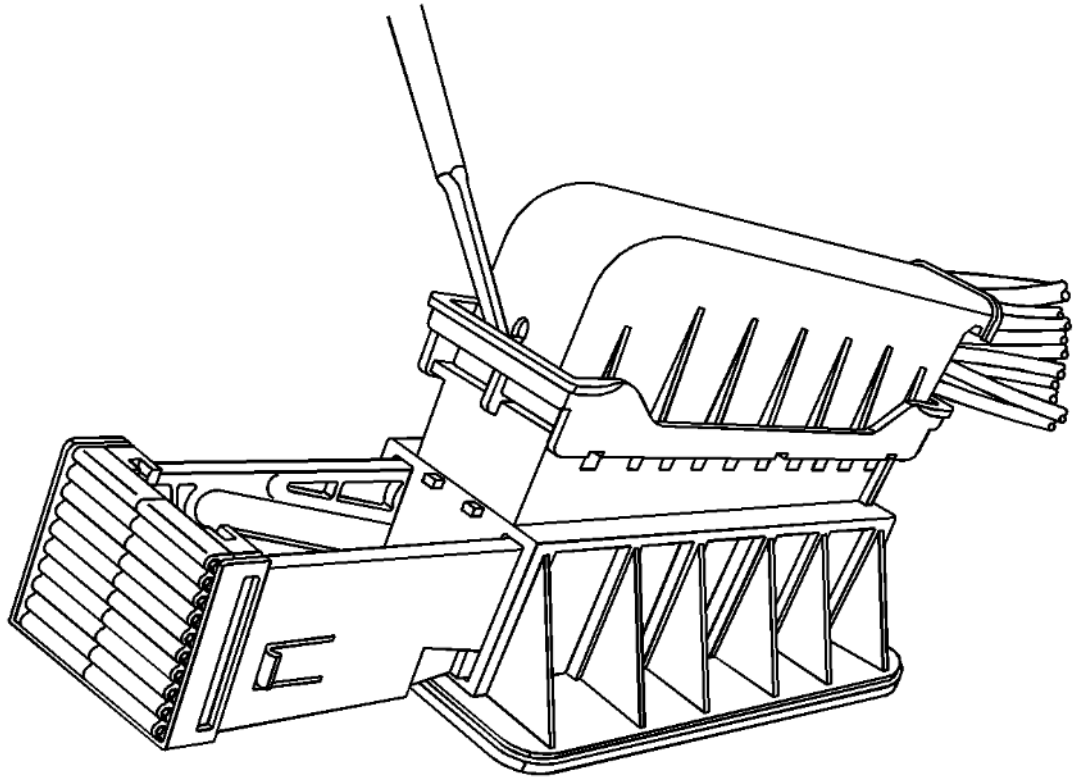


Fig. 160: Releasing Connector Wire Dress Cover Locking Tab

Courtesy of GENERAL MOTORS COMPANY

5. Using terminal release tool J-38125-11A or equivalent, release the connector wire dress cover locking tab.

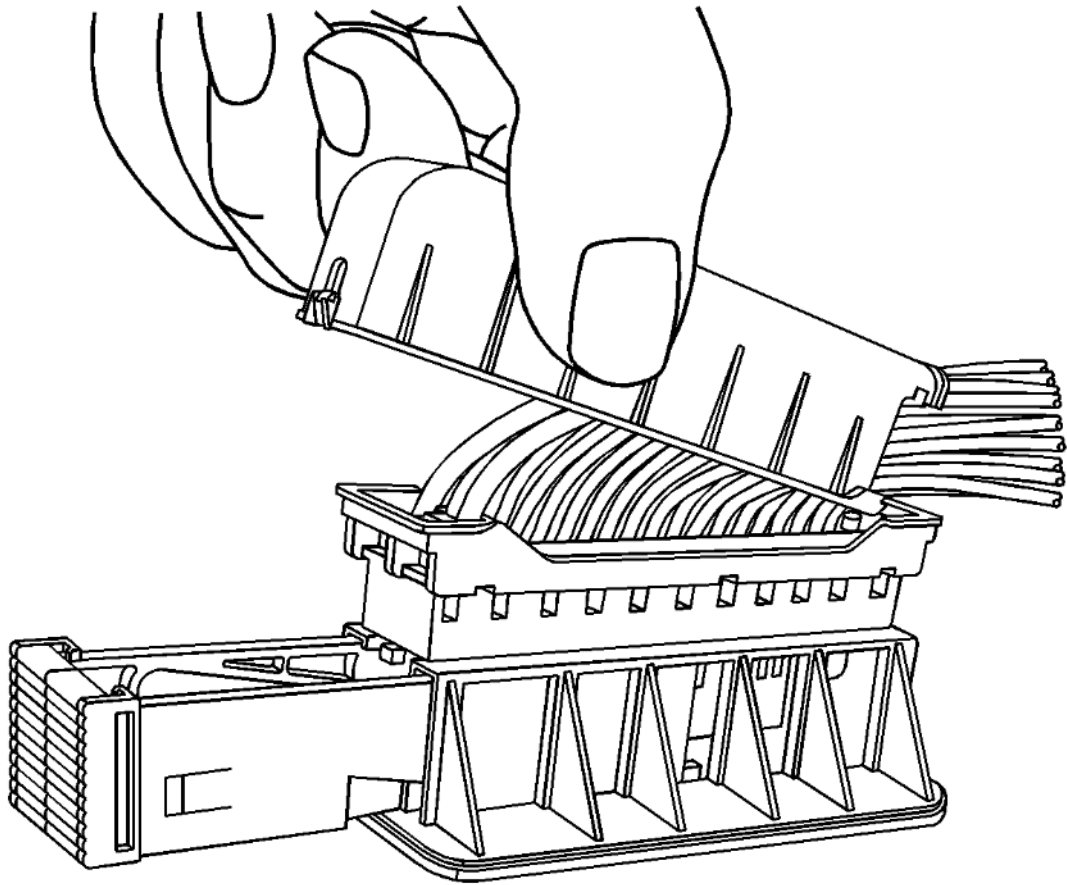


Fig. 161: Lifting Connector Wire Dress Cover From Connector Body

Courtesy of GENERAL MOTORS COMPANY

6. With the lock tab released, lift the connector wire dress cover from the connector body.

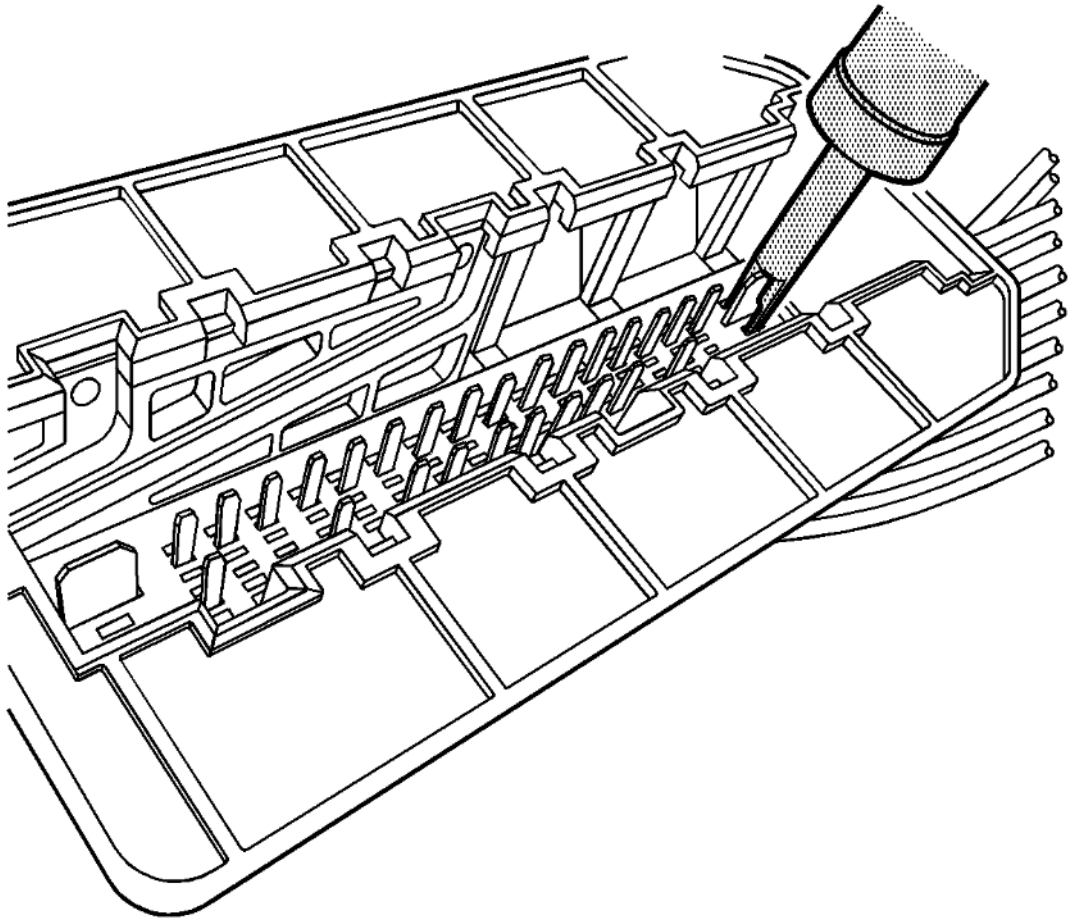


Fig. 162: Using Terminal Release Tool

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.

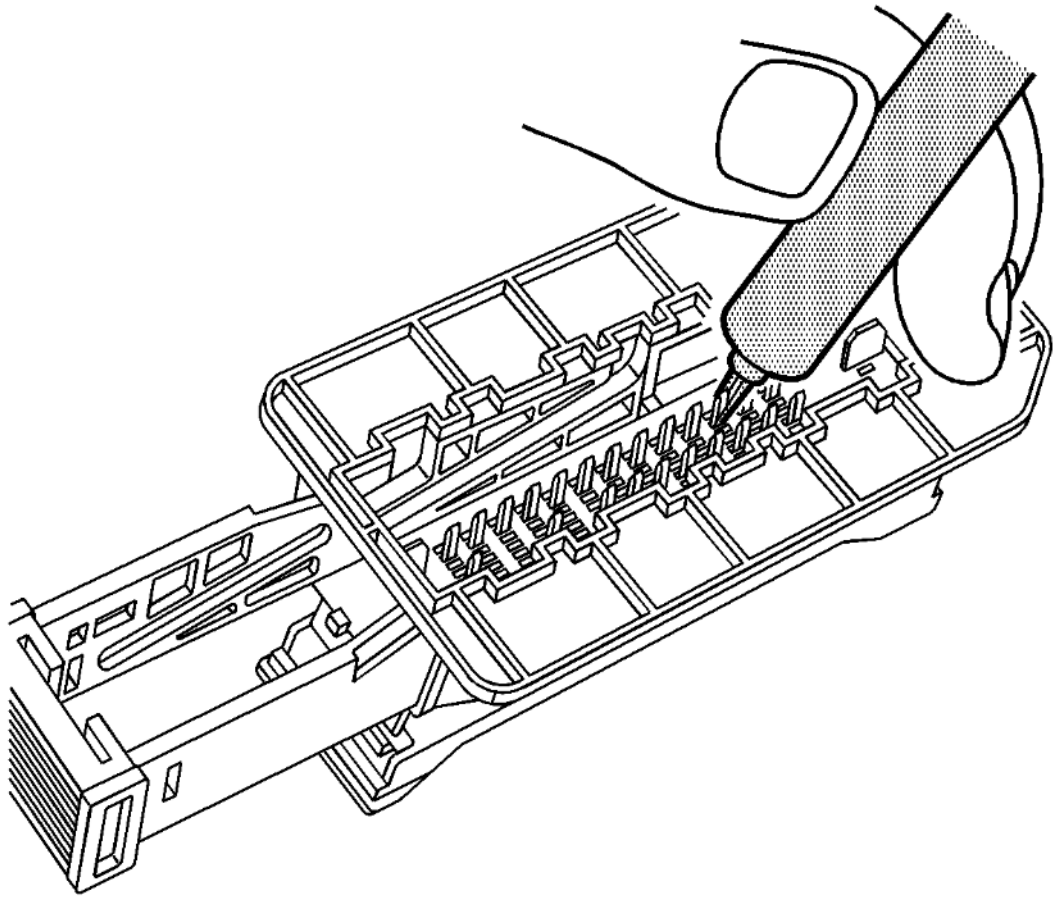


Fig. 163: Using Terminal Release Tool

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.

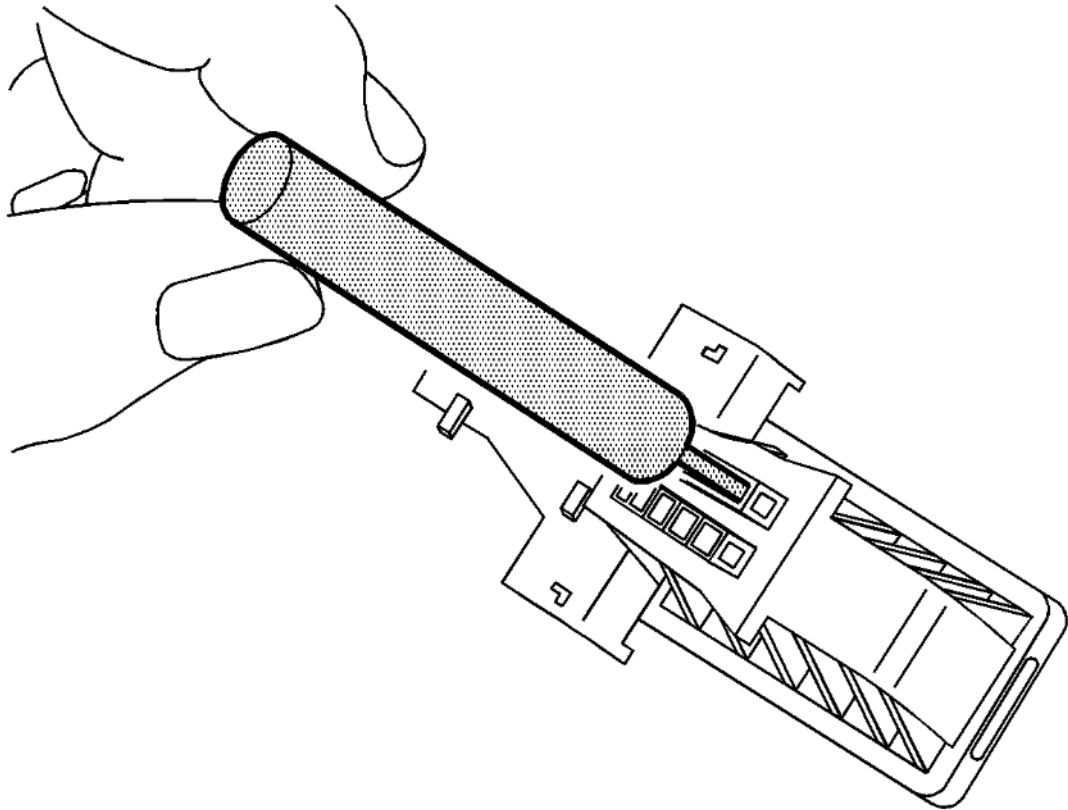


Fig. 164: Using Terminal Release Tool
Courtesy of GENERAL MOTORS COMPANY

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 \(Terminated Lead Repair\)](#)[Repairing Connector Terminals \(Terminal Repair\)](#) 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

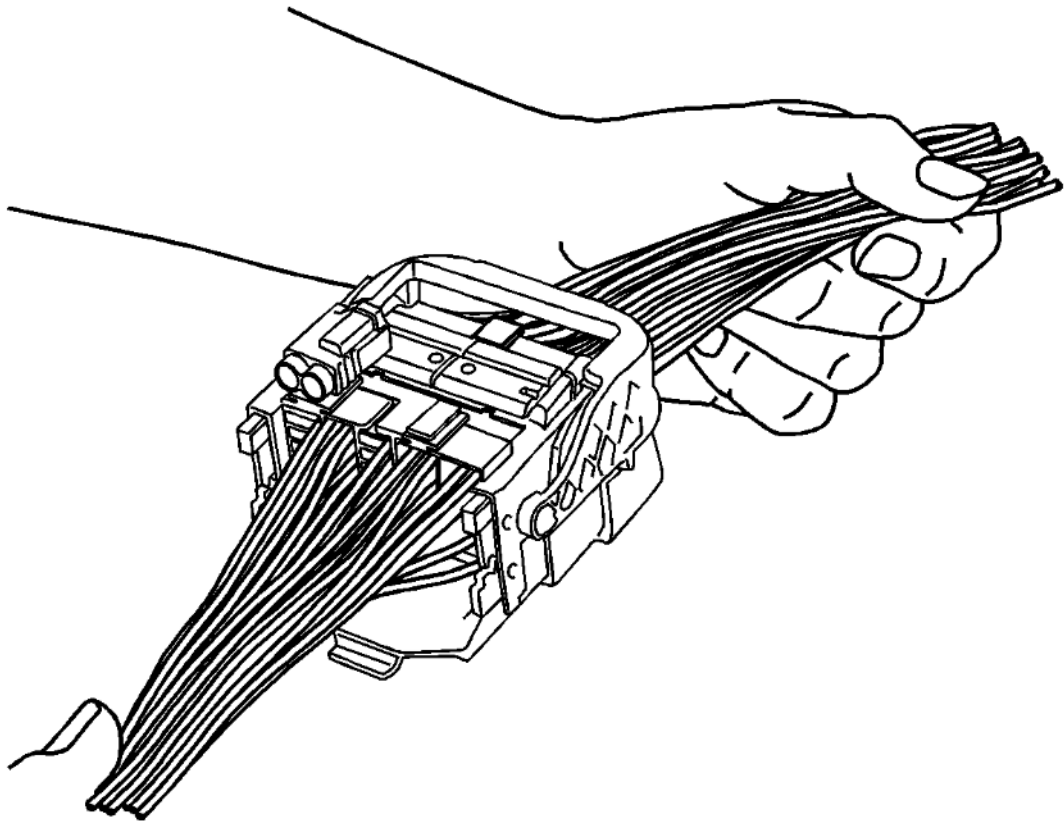


Fig. 165: View Of Typical Connector In Assembled Position
Courtesy of GENERAL MOTORS COMPANY

View of a typical connector in the assembled position.

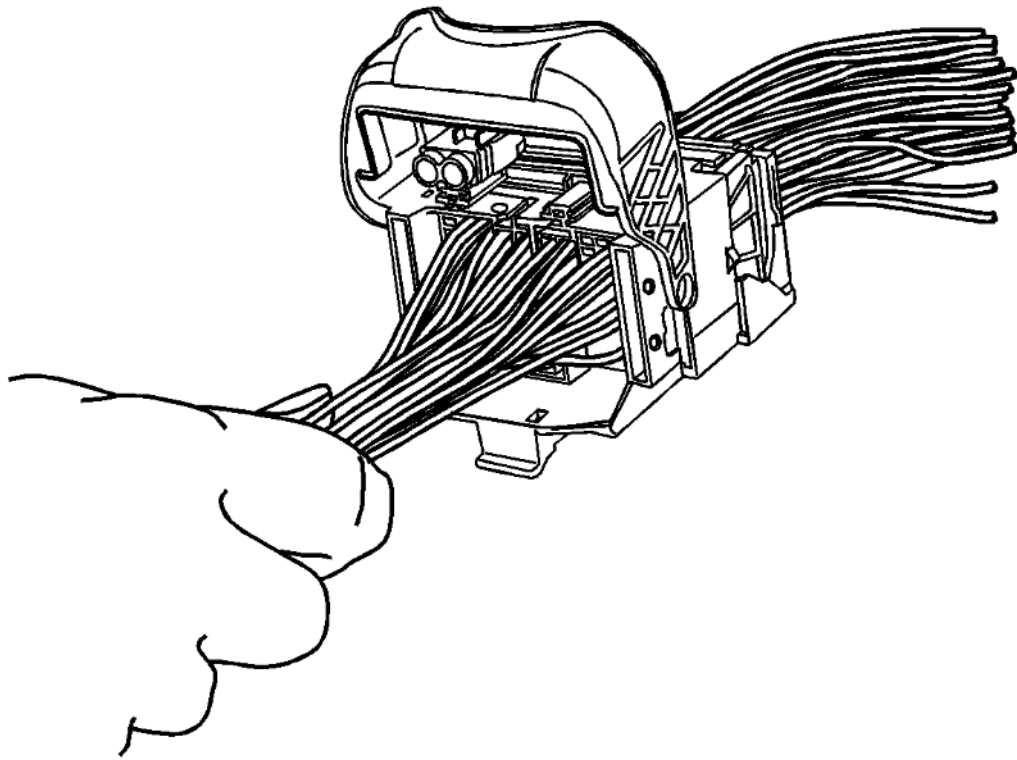


Fig. 166: View Of Locking Lever At 90 Degrees From Connector Body.
Courtesy of GENERAL MOTORS COMPANY

1. Pull the locking lever to the 90 degree position from the connector body.

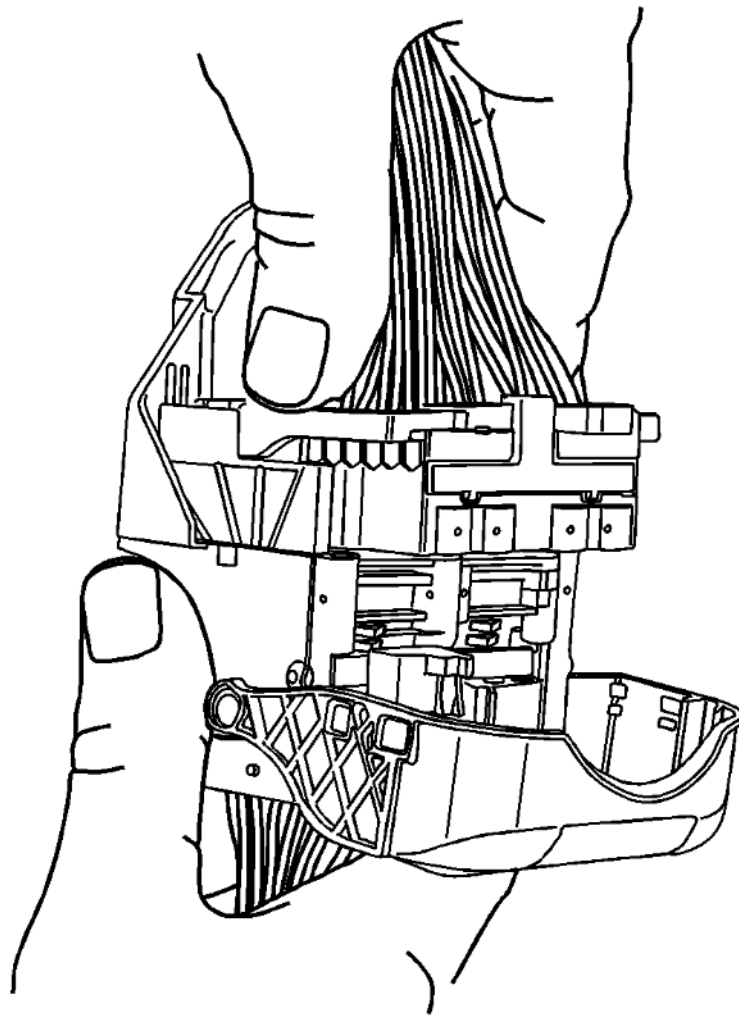


Fig. 167: Assembled View Of Connector - Tyco/AMP (102-Way Inline)
Courtesy of GENERAL MOTORS COMPANY

2. With the locking lever in the 90 degree position and the male connector body separated, it can be slid outward for removal.

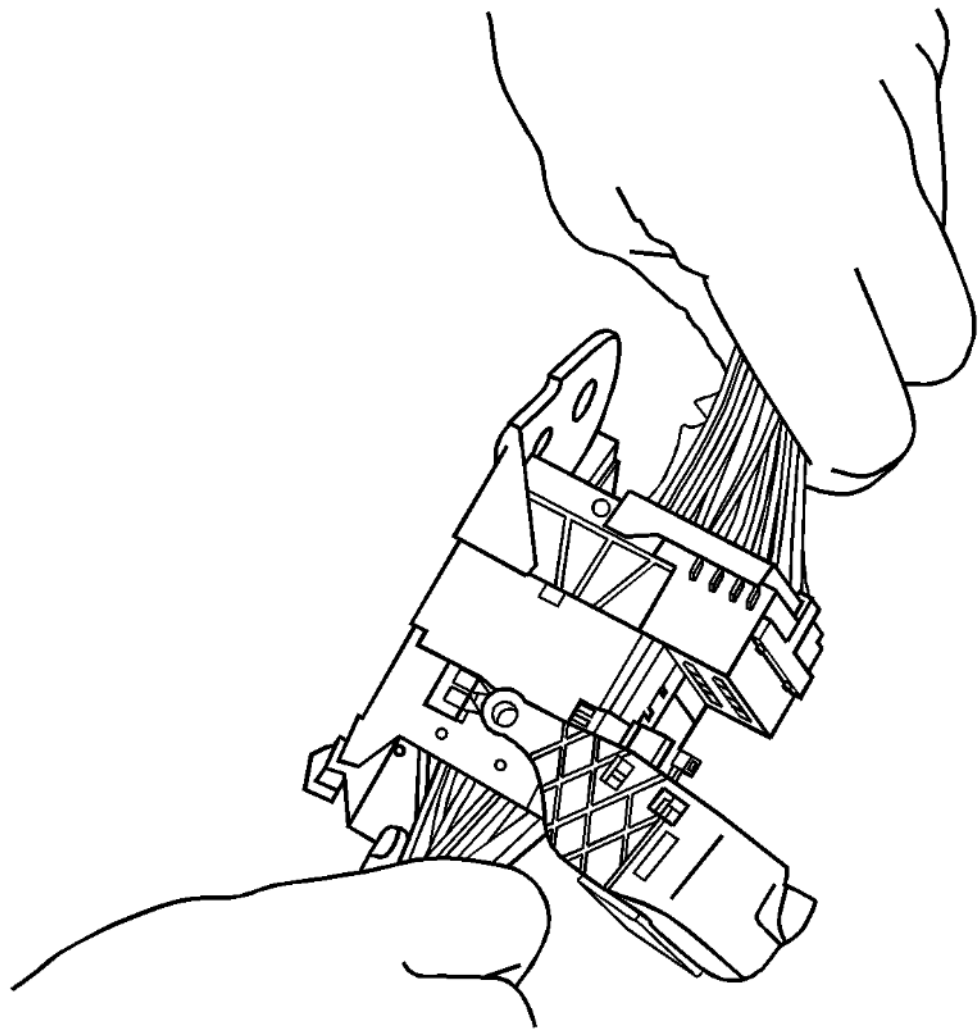


Fig. 168: Sliding Male Connector Body Away From Guide Plates
Courtesy of GENERAL MOTORS COMPANY

3. Slide the male connector body out away from the guide plates.

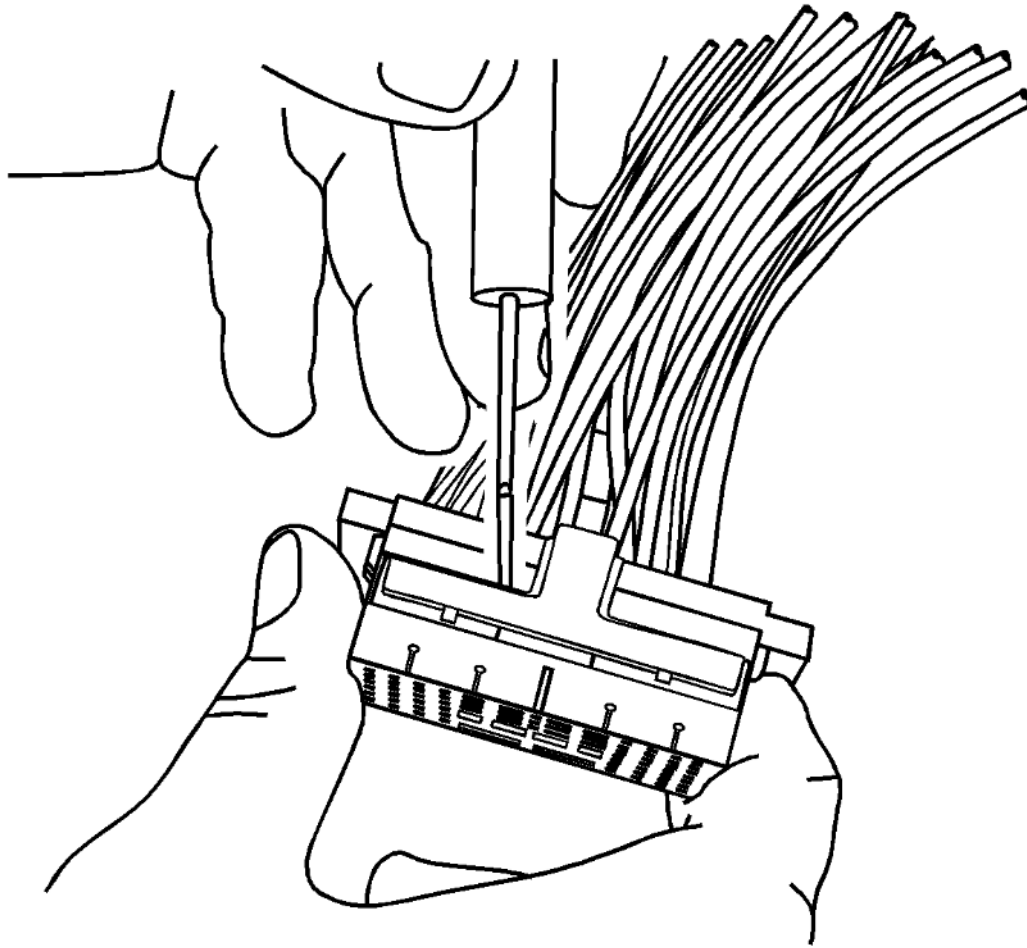


Fig. 169: View of Terminal Release Tool And TPA

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.

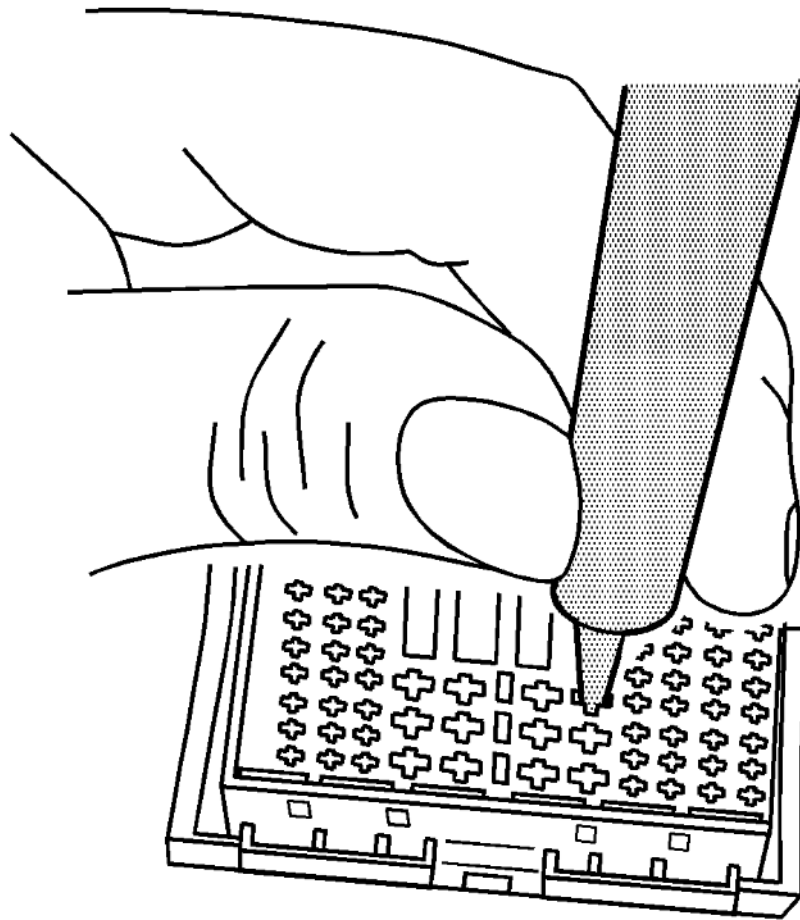


Fig. 170: Releasing Lock Tabs

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.

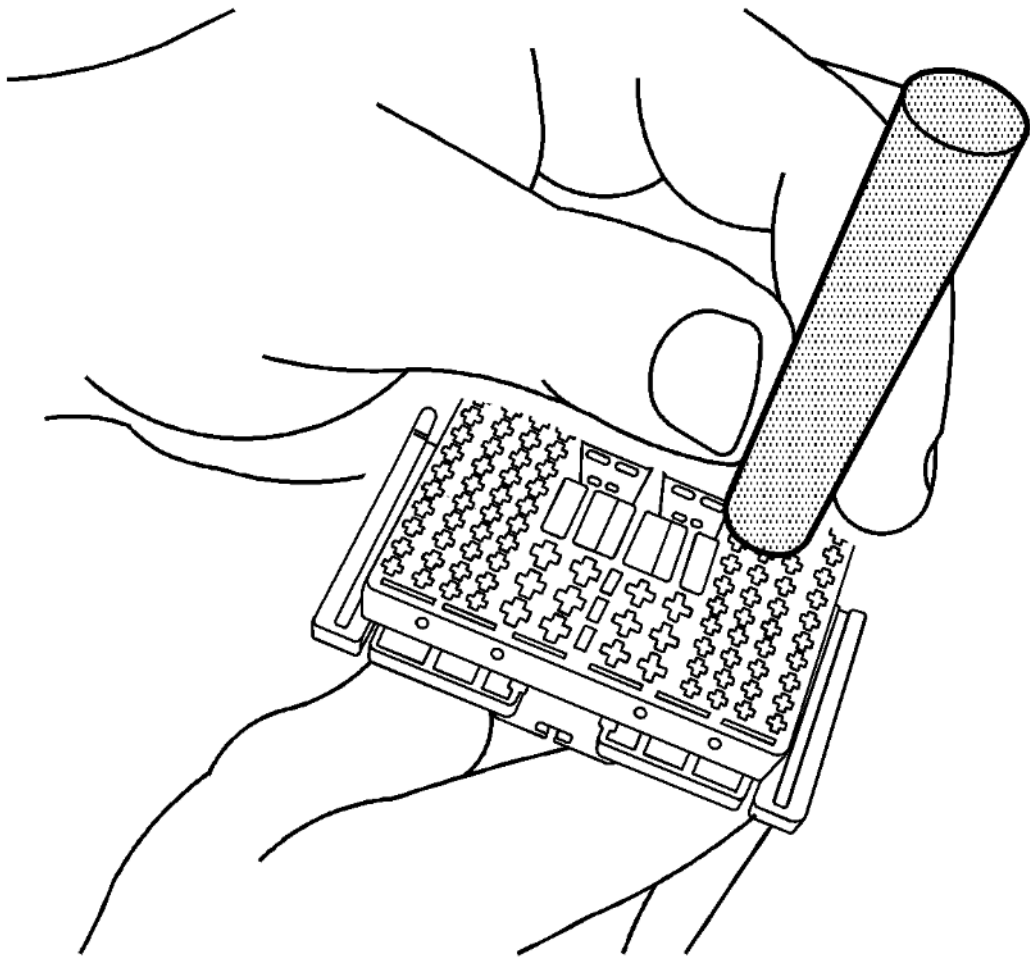


Fig. 171: Using Terminal Release Tool

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.

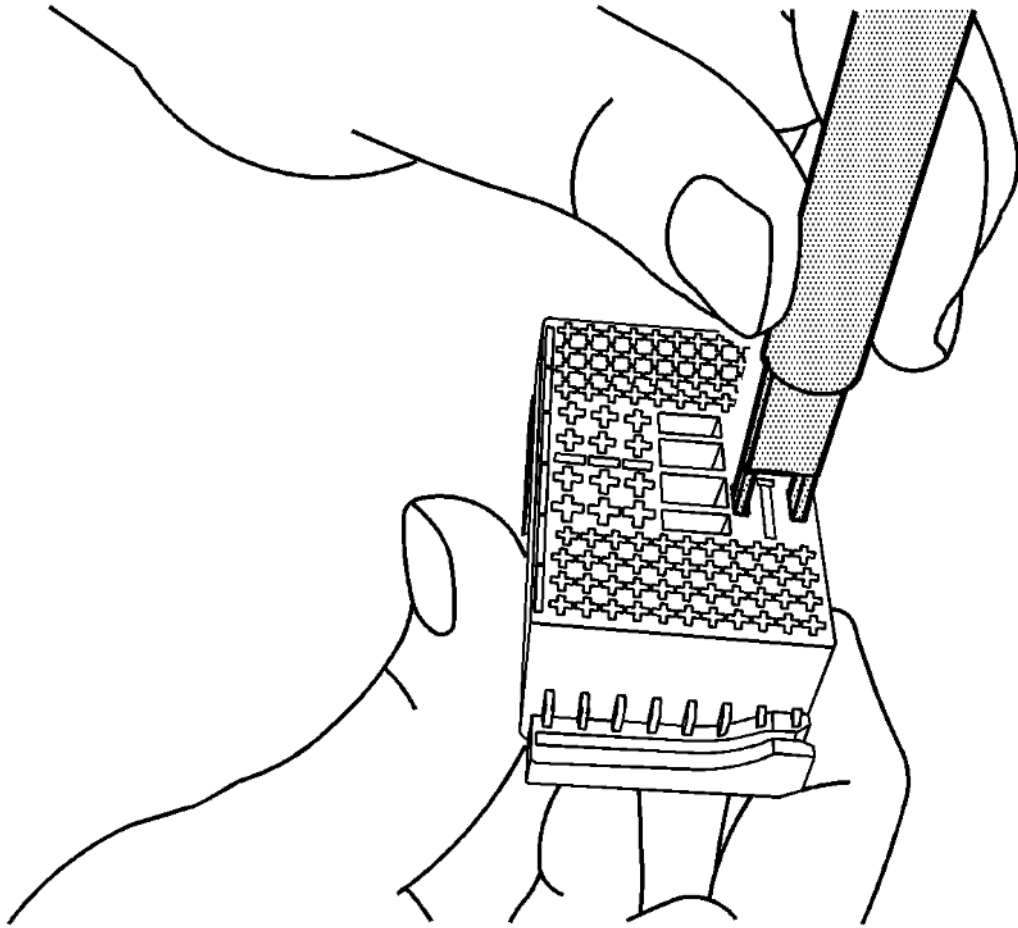


Fig. 172: Releasing Lock Tabs - Tyco/AMP (102-Way Inline)

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.

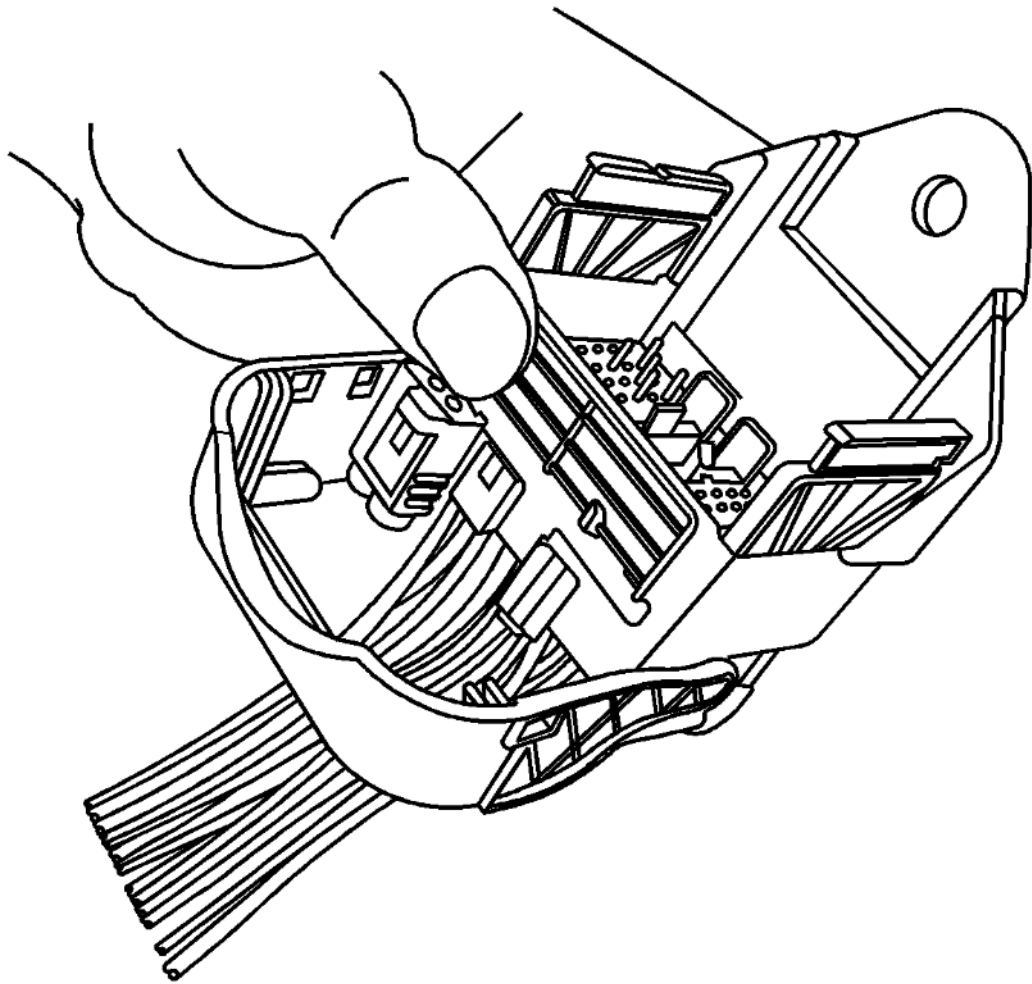


Fig. 173: View Of Female Connector Body - Tyco/AMP (102-Way Inline)
Courtesy of GENERAL MOTORS COMPANY

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.

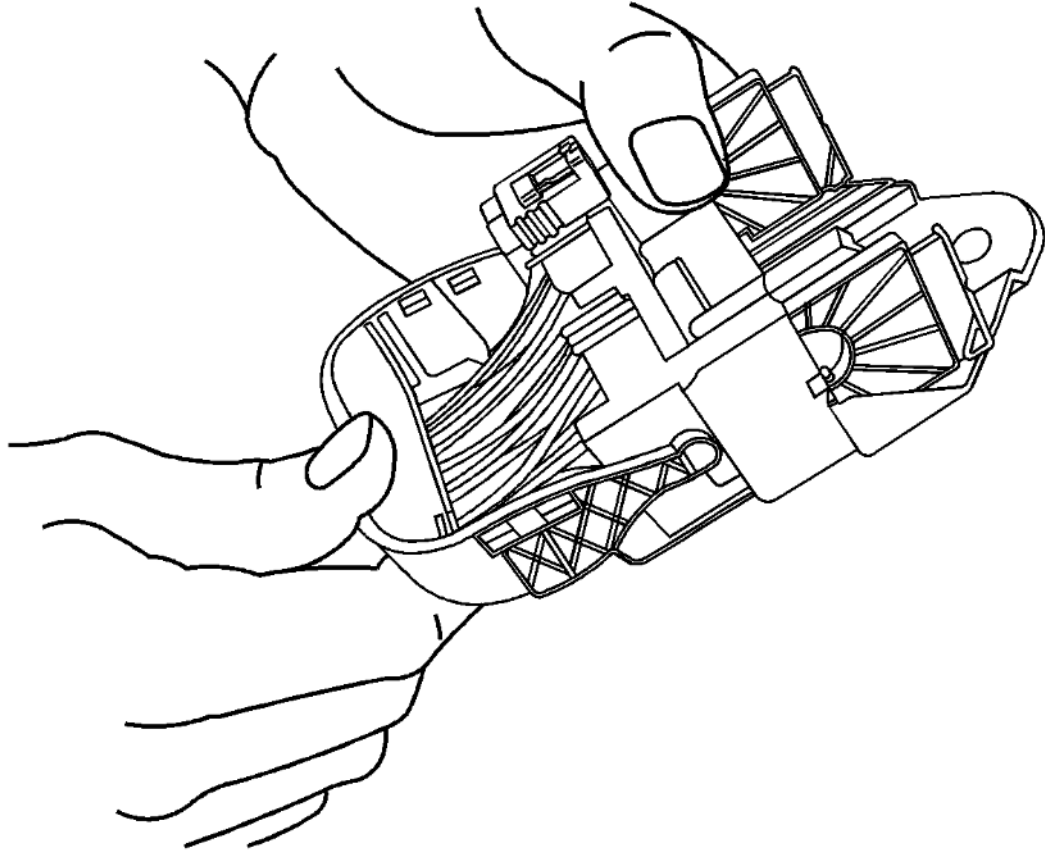


Fig. 174: Moving Locking Lever

Courtesy of GENERAL MOTORS COMPANY

9. Move the locking lever 180 degrees from the connected position.

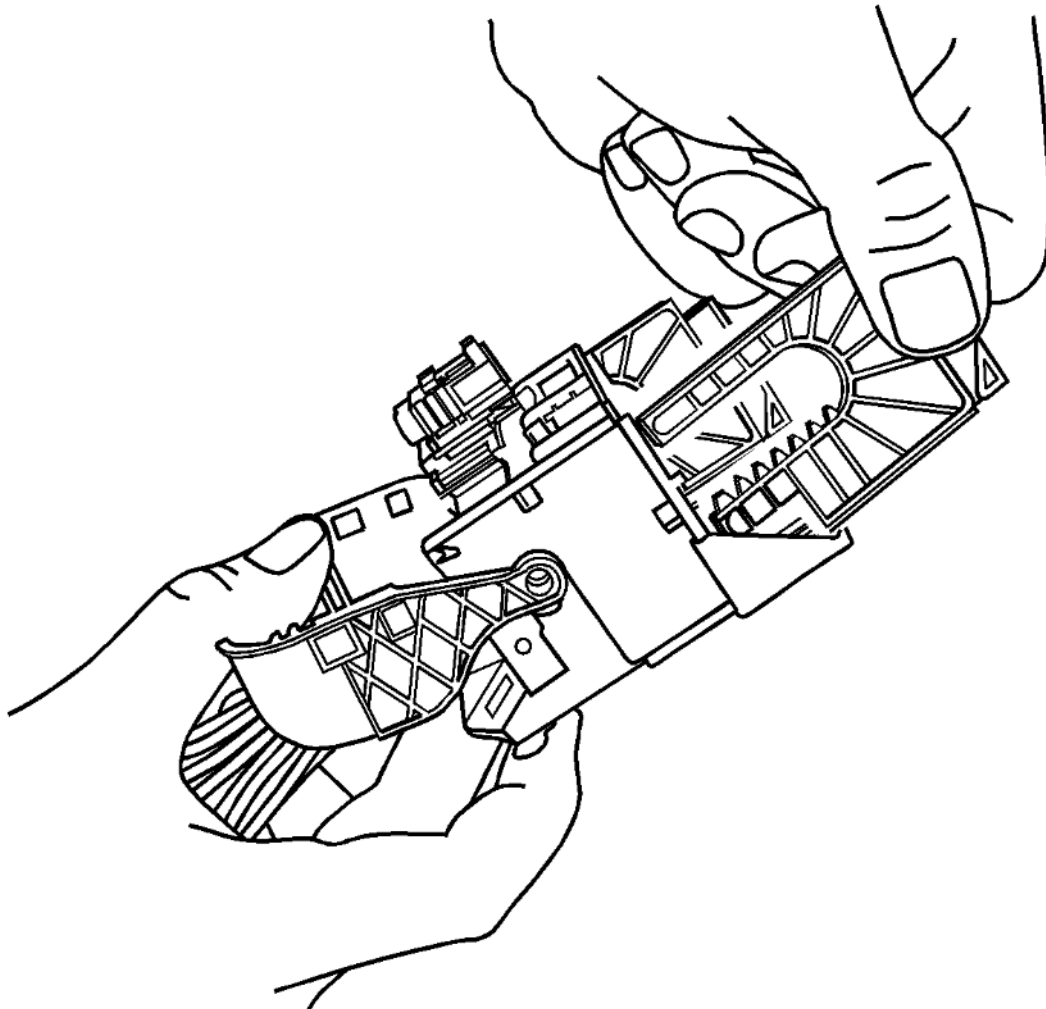


Fig. 175: Removing Guide Plates From Connector Body.

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.

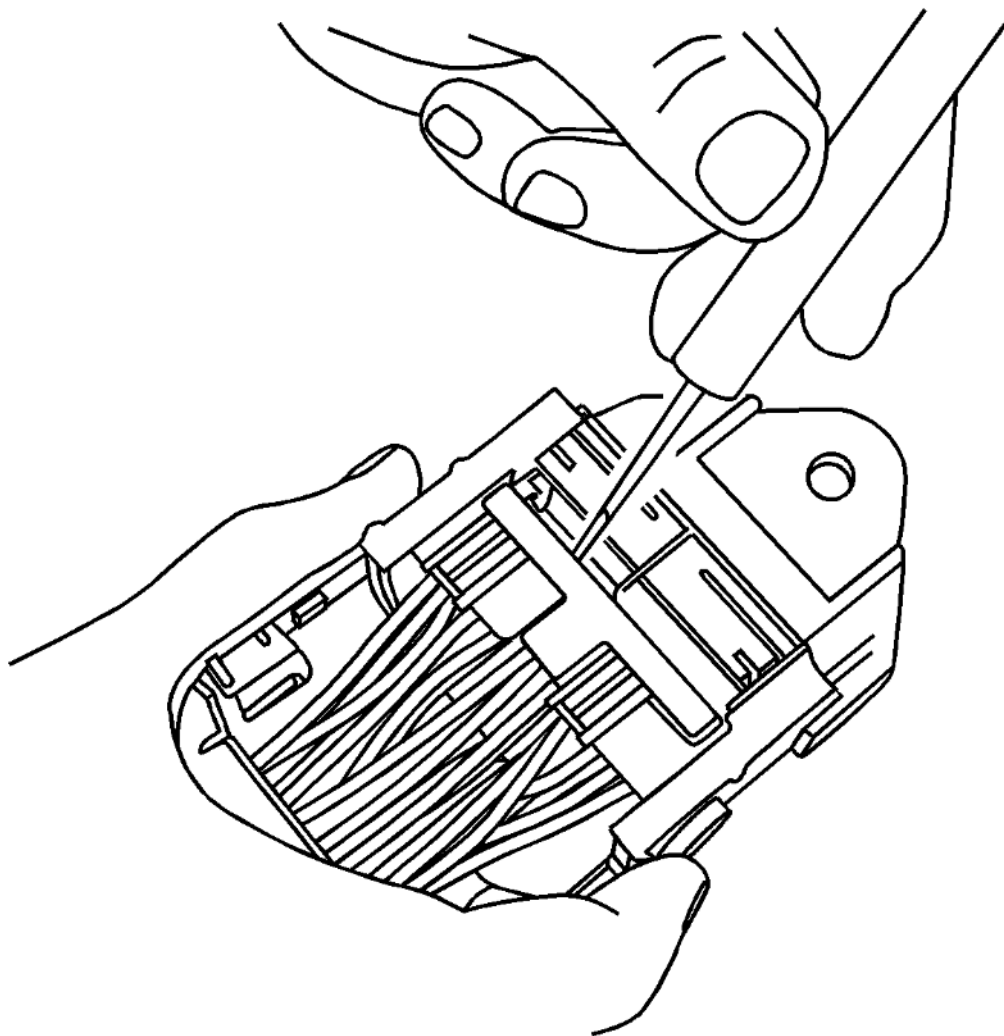


Fig. 176: Removing TPA

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.

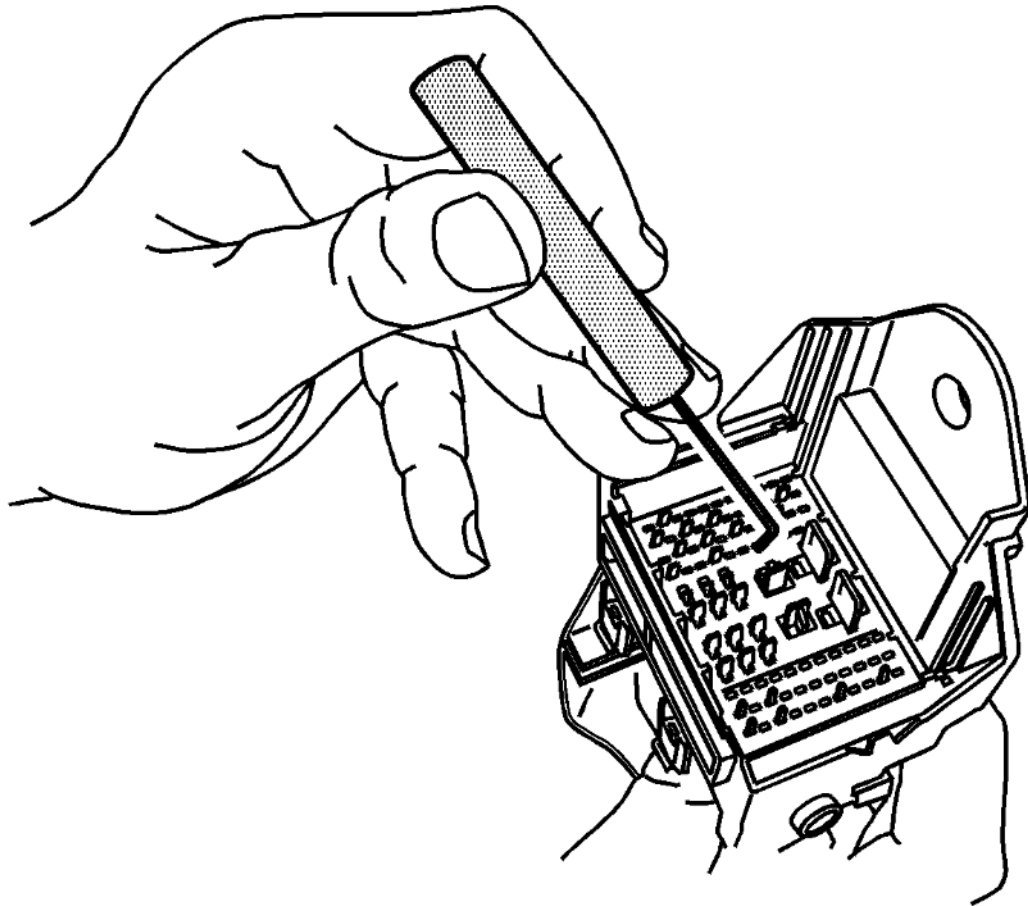


Fig. 177: Lifting Terminal Plate Past The Terminals

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.

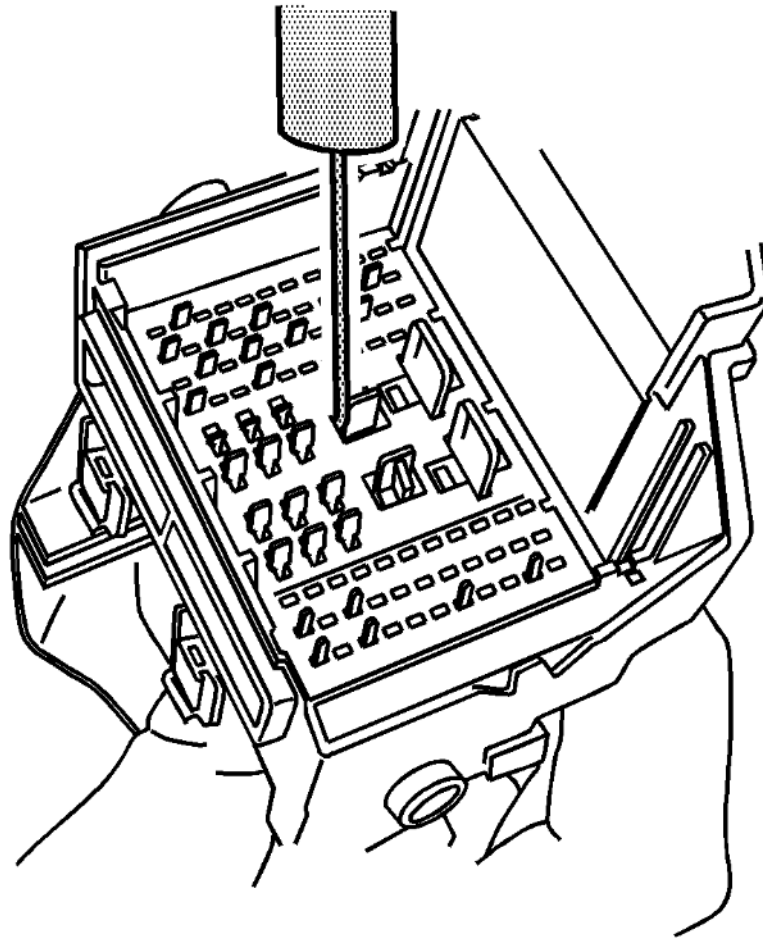


Fig. 178: View Of Terminal Plate

Courtesy of GENERAL MOTORS COMPANY

13. Terminal plate will bind slightly on each corner.

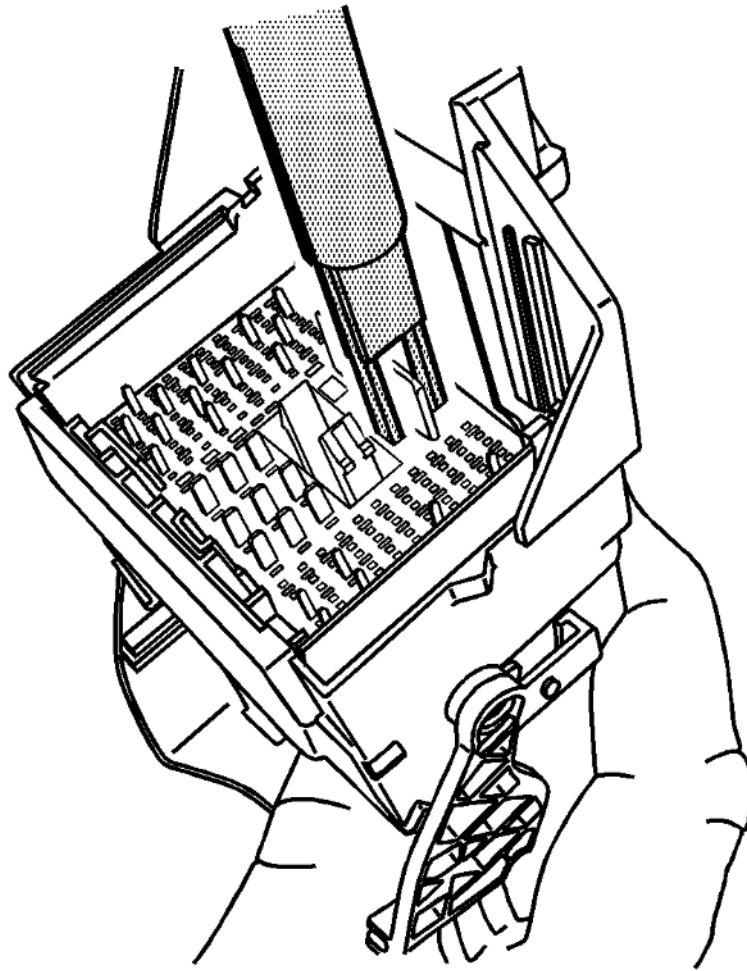


Fig. 179: Releasing Lock Tabs

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.

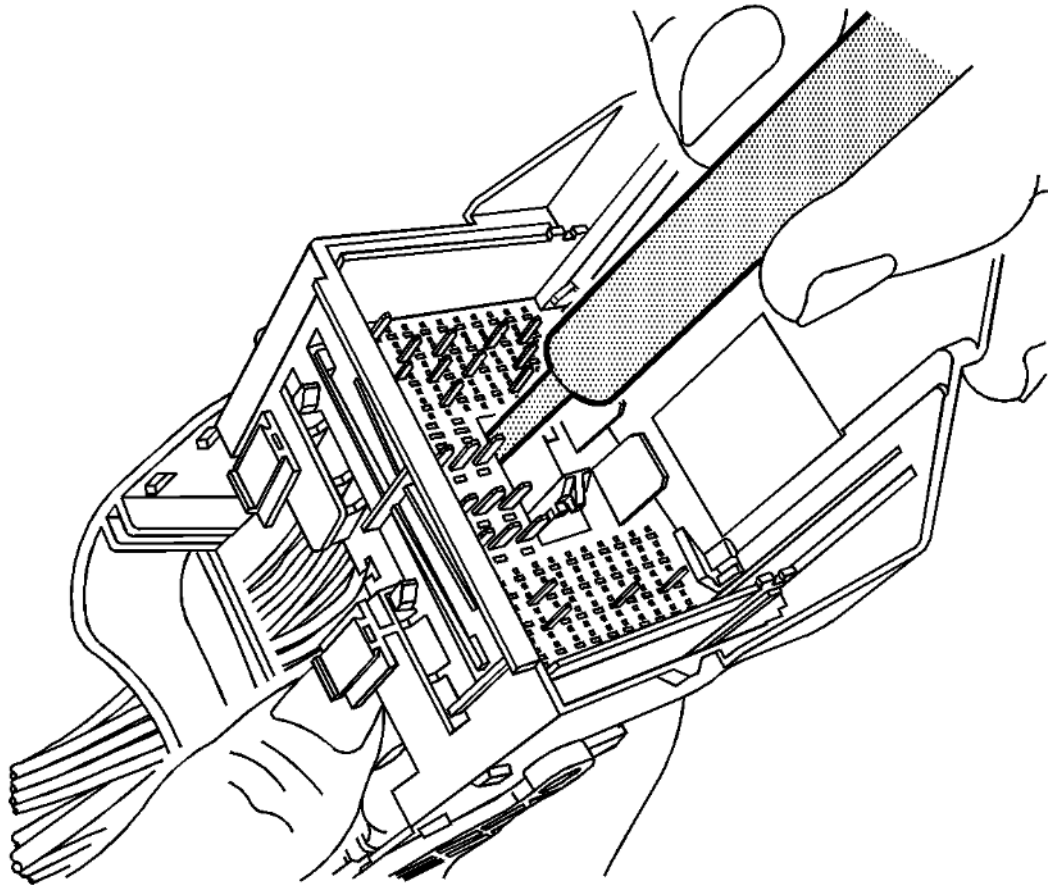


Fig. 180: View of Pressing Prongs On Each Side Of Terminal

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.

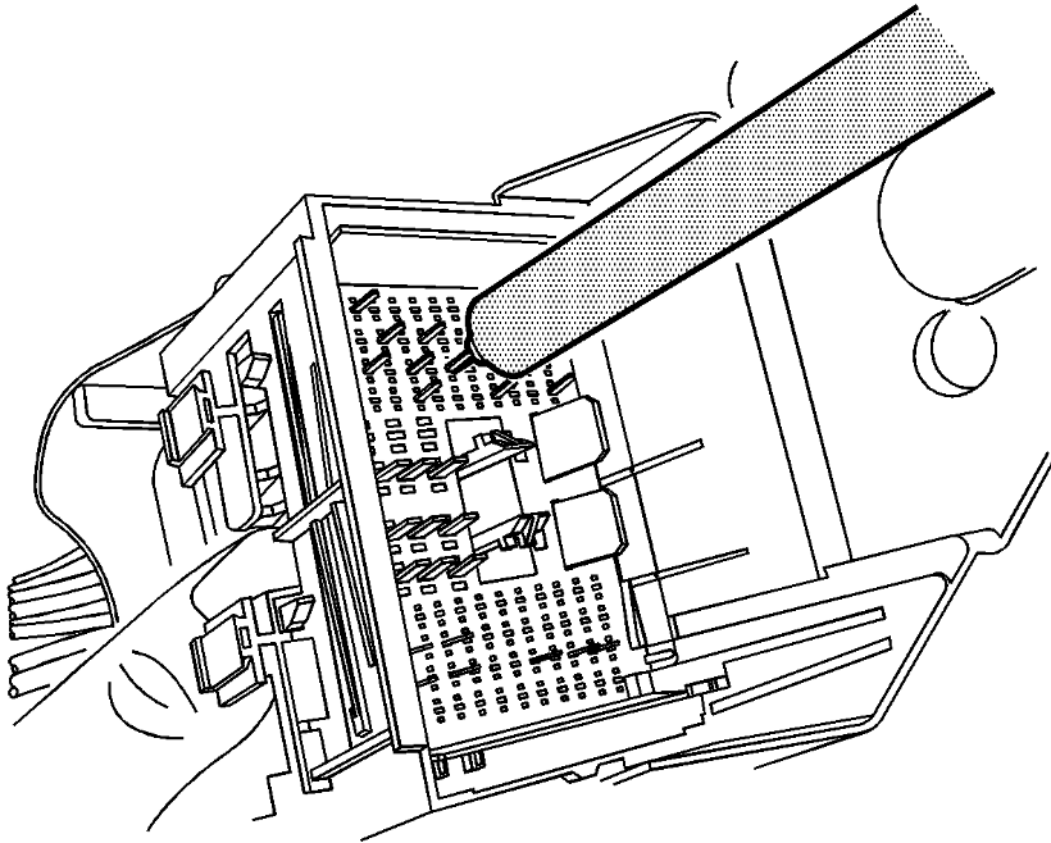


Fig. 181: Pressing Prongs On Each Side Of Terminal - Tyco/AMP (102-Way Inline)
Courtesy of GENERAL MOTORS COMPANY

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.

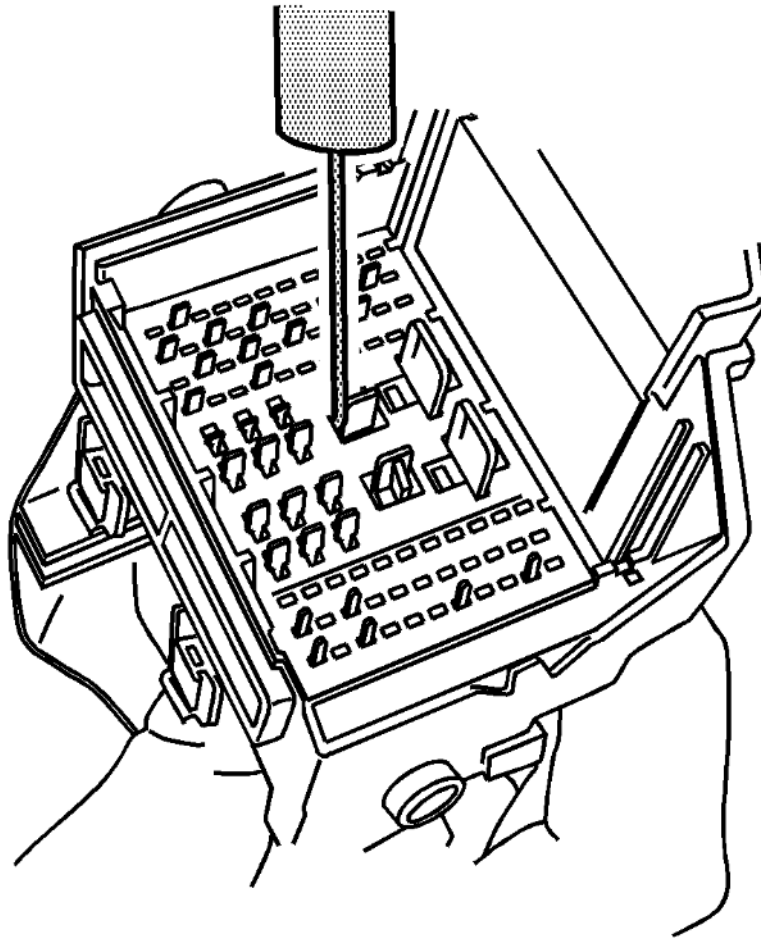


Fig. 182: View Of Terminal Plate

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.

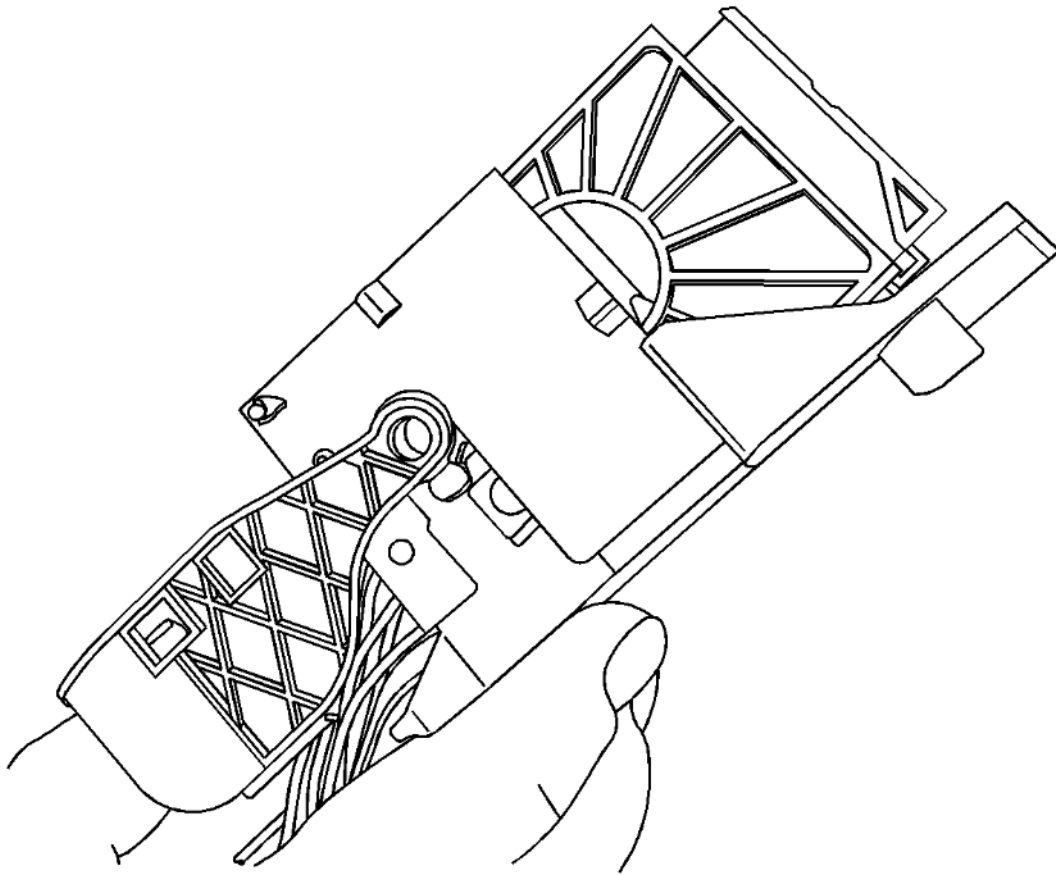


Fig. 183: Aligning Guide Plates To Mesh With Locking Lever Gears
Courtesy of GENERAL MOTORS COMPANY

18. With the locking lever in the 180 degree position, align the guide plates to mesh with the gears on the locking lever.

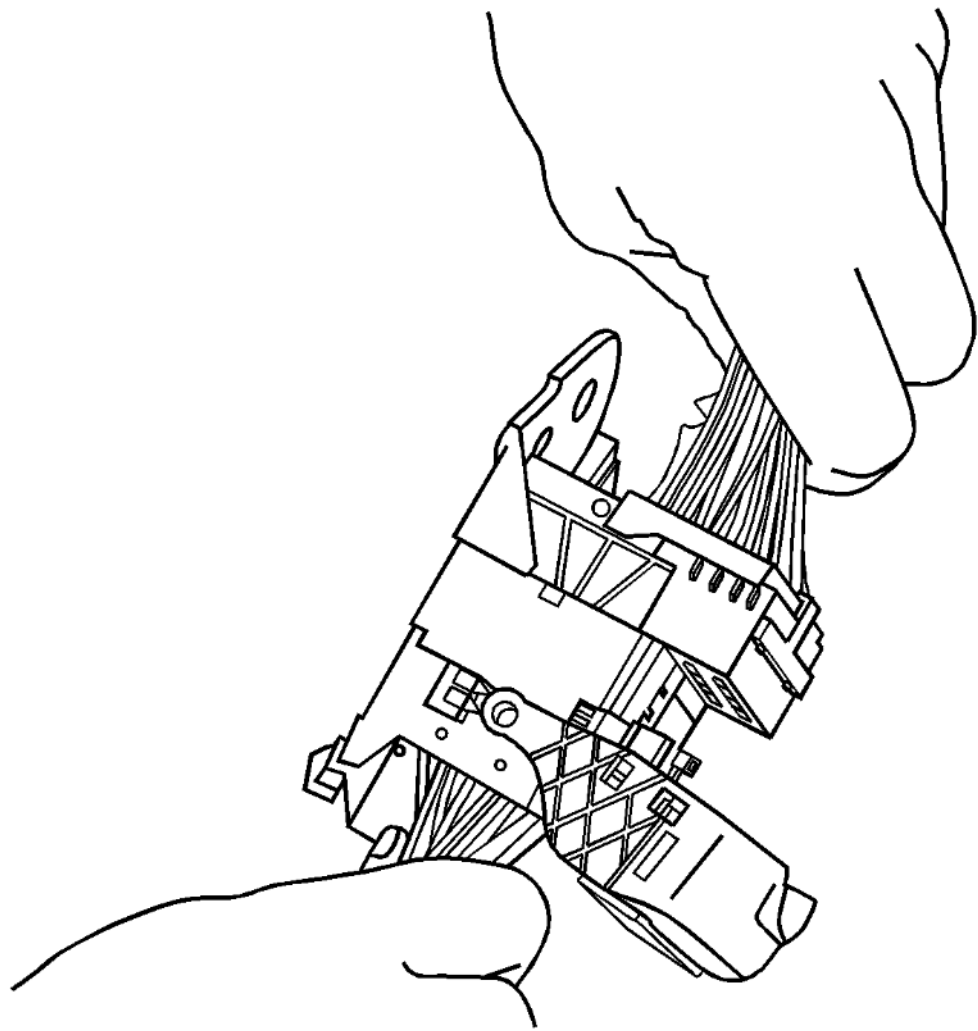


Fig. 184: Sliding Male Connector Body Away From Guide Plates
Courtesy of GENERAL MOTORS COMPANY

19. Slide the male connector body back inward toward the guide plates.

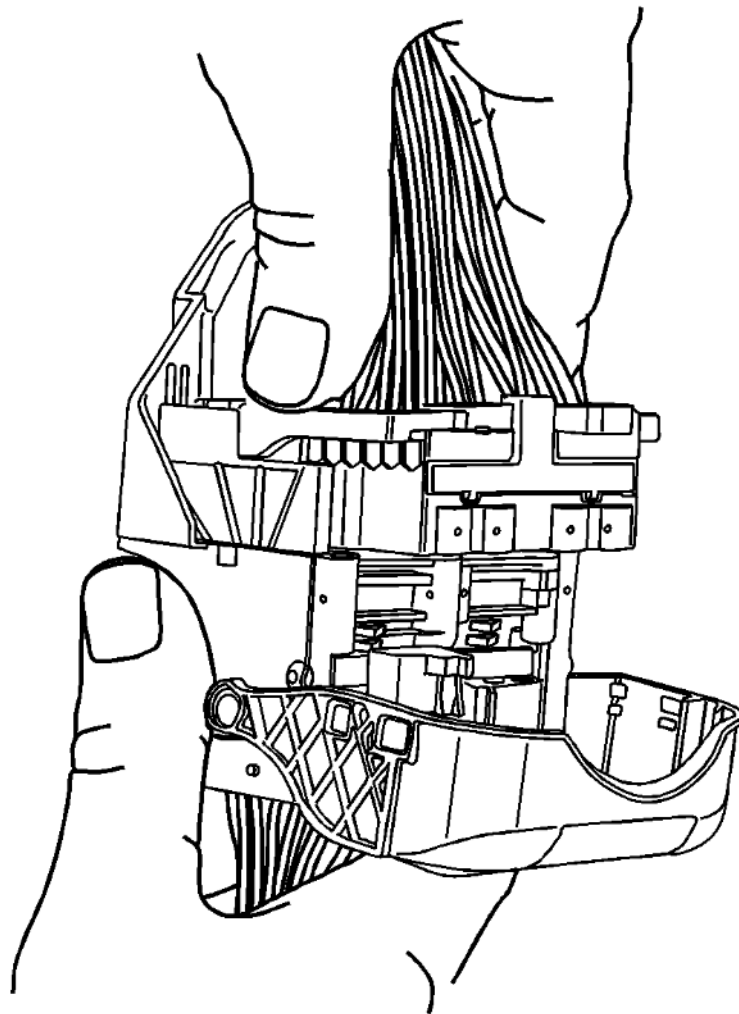


Fig. 185: Assembled View Of Connector - Tyco/AMP (102-Way Inline)
Courtesy of GENERAL MOTORS COMPANY

20. With the locking lever in the 90 degree position and the male connector body connected, it can be slid inward for assembly.

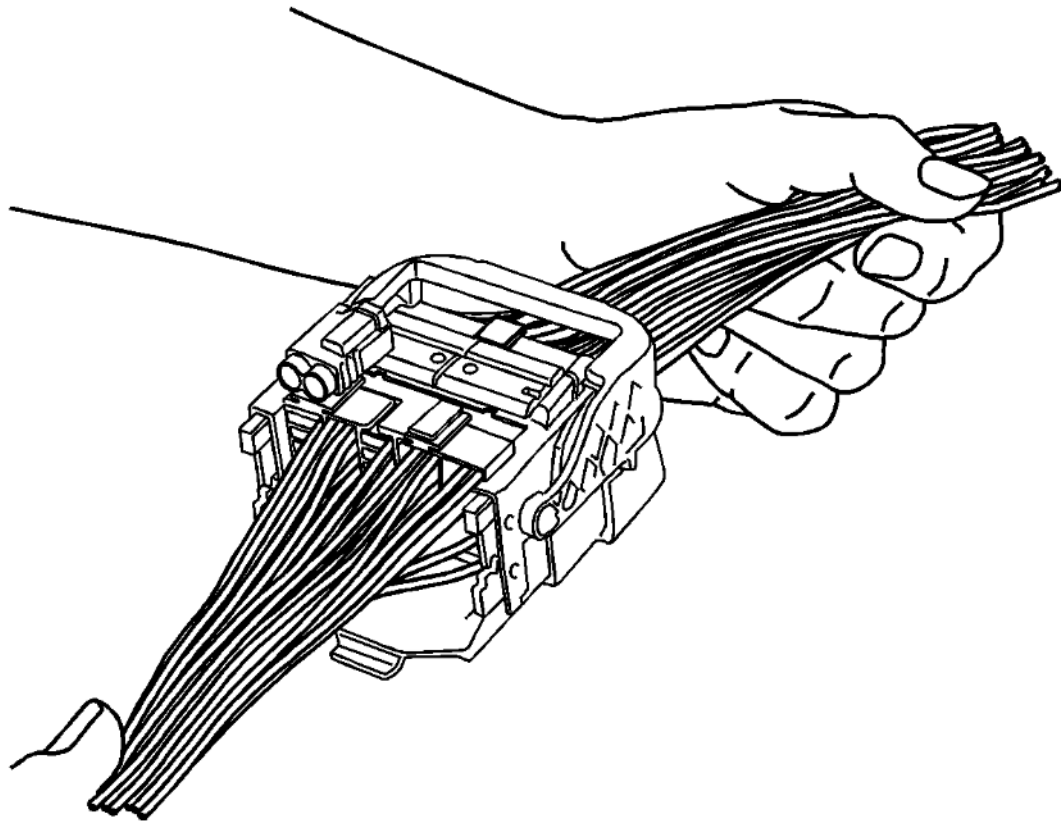


Fig. 186: View Of Typical Connector In Assembled Position

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

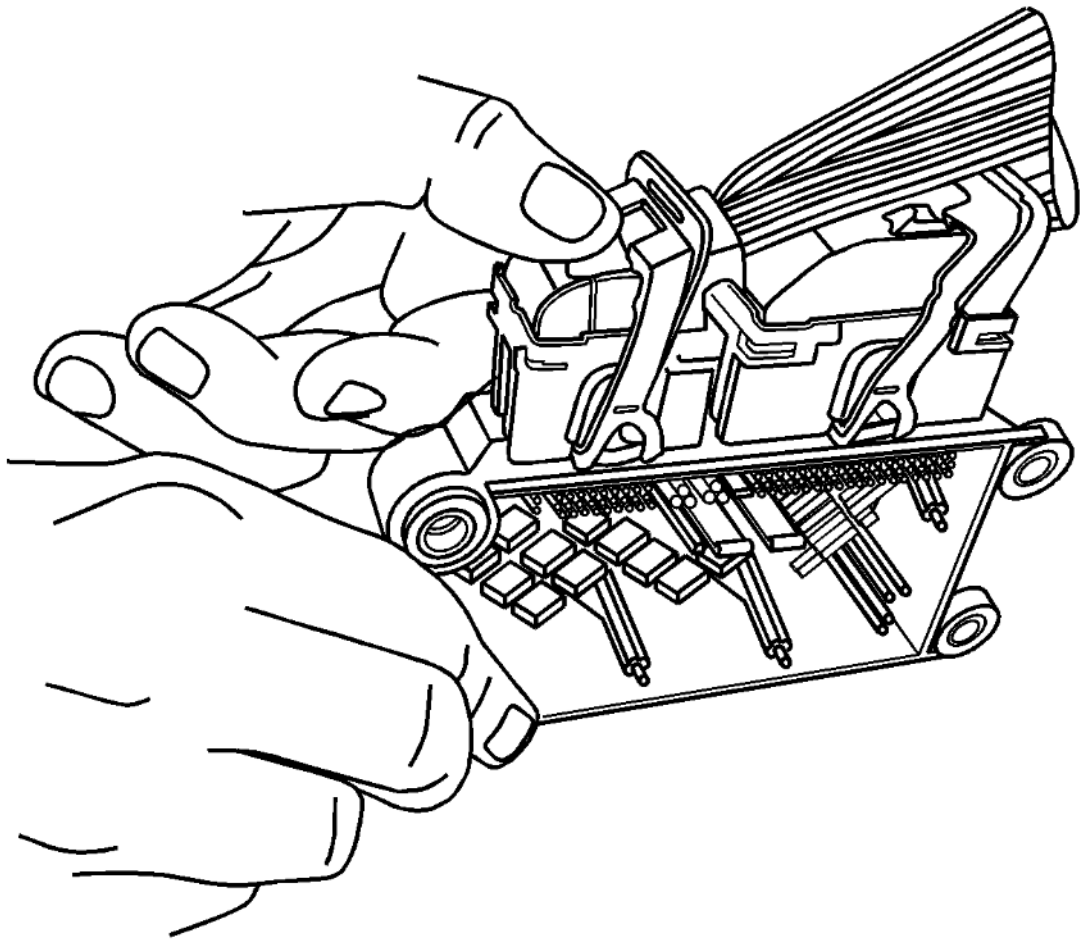


Fig. 187: Sliding Red CPA Away From Connector Lever

Courtesy of GENERAL MOTORS COMPANY

1. Using your thumbs press down and slide the red CPA away from the connector lever.

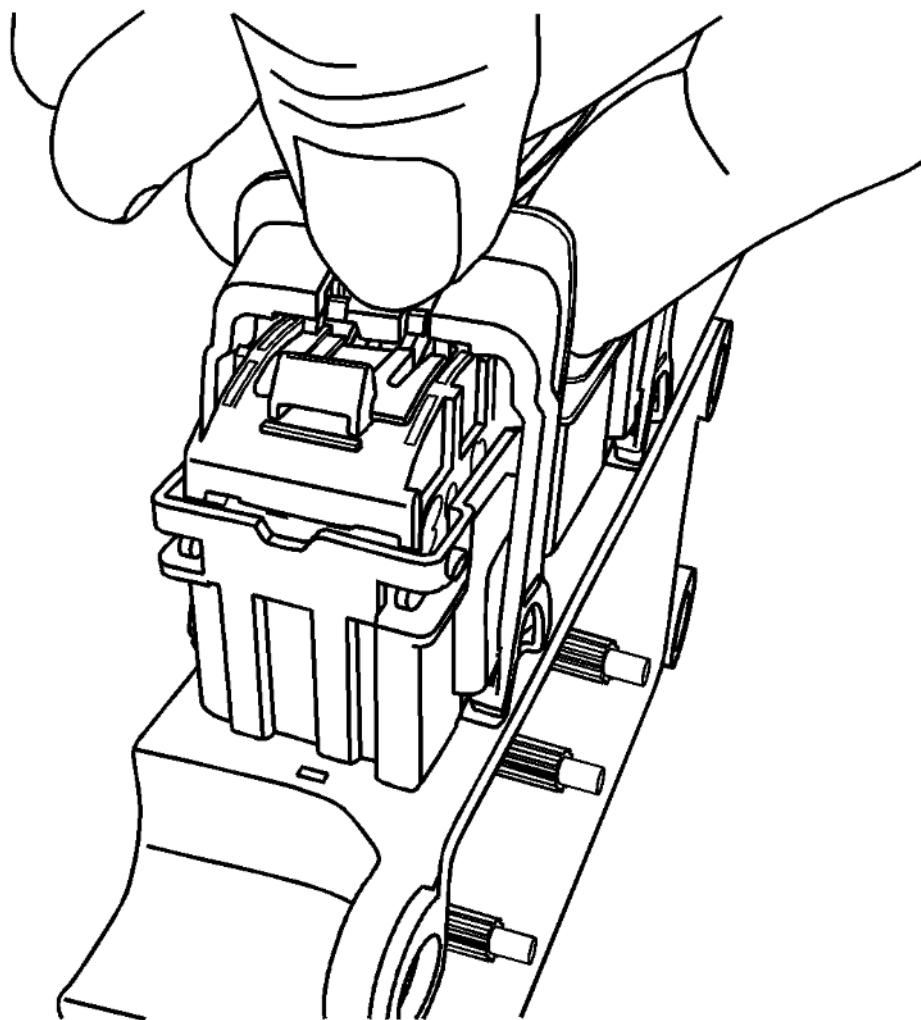


Fig. 188: Pressing Down On Locking Tab - Tyco/AMP Connectors (SIR)
Courtesy of GENERAL MOTORS COMPANY

2. Using your thumb press down on the locking tab and move the lever to the released position.

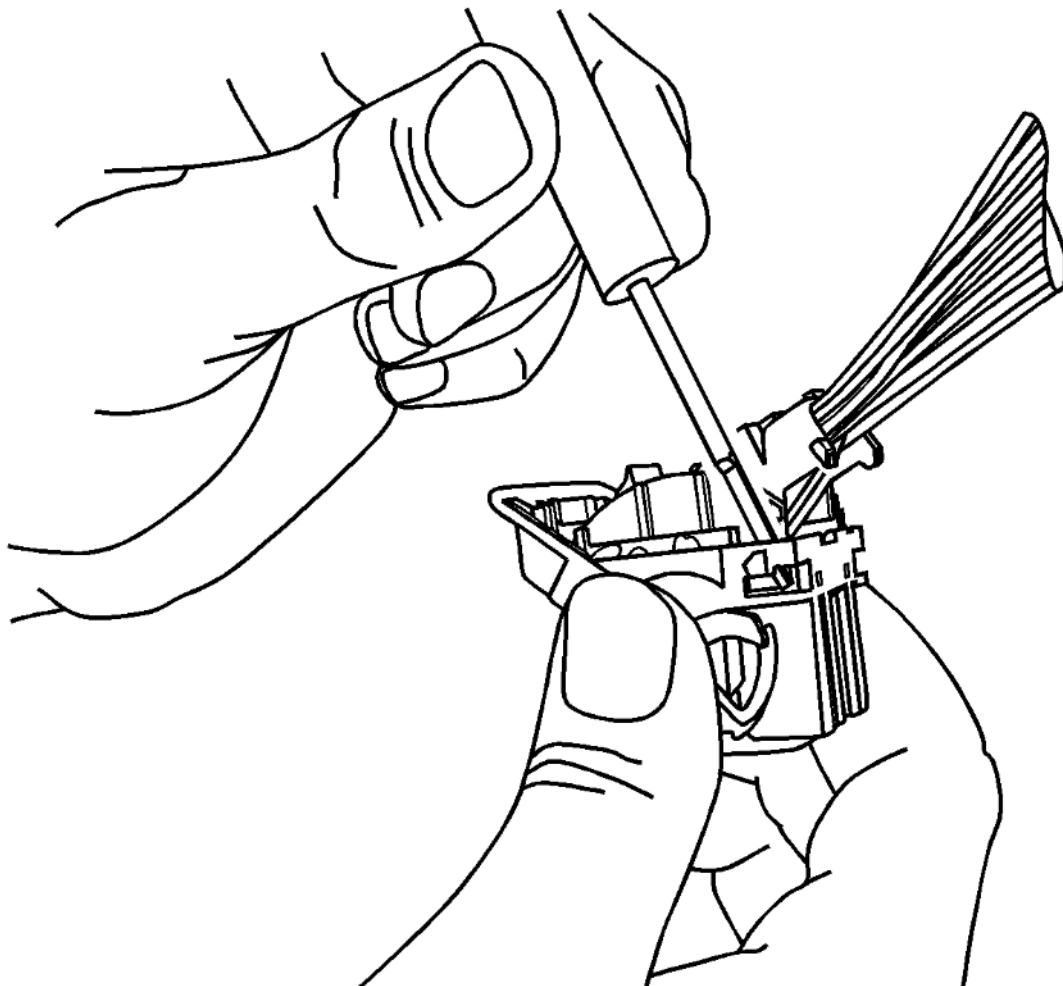


Fig. 189: Releasing Wire Dress Cover Locking Tabs

Courtesy of GENERAL MOTORS COMPANY

3. Using terminal tool J-38125-11A or equivalent, release the wire dress cover locking tabs.

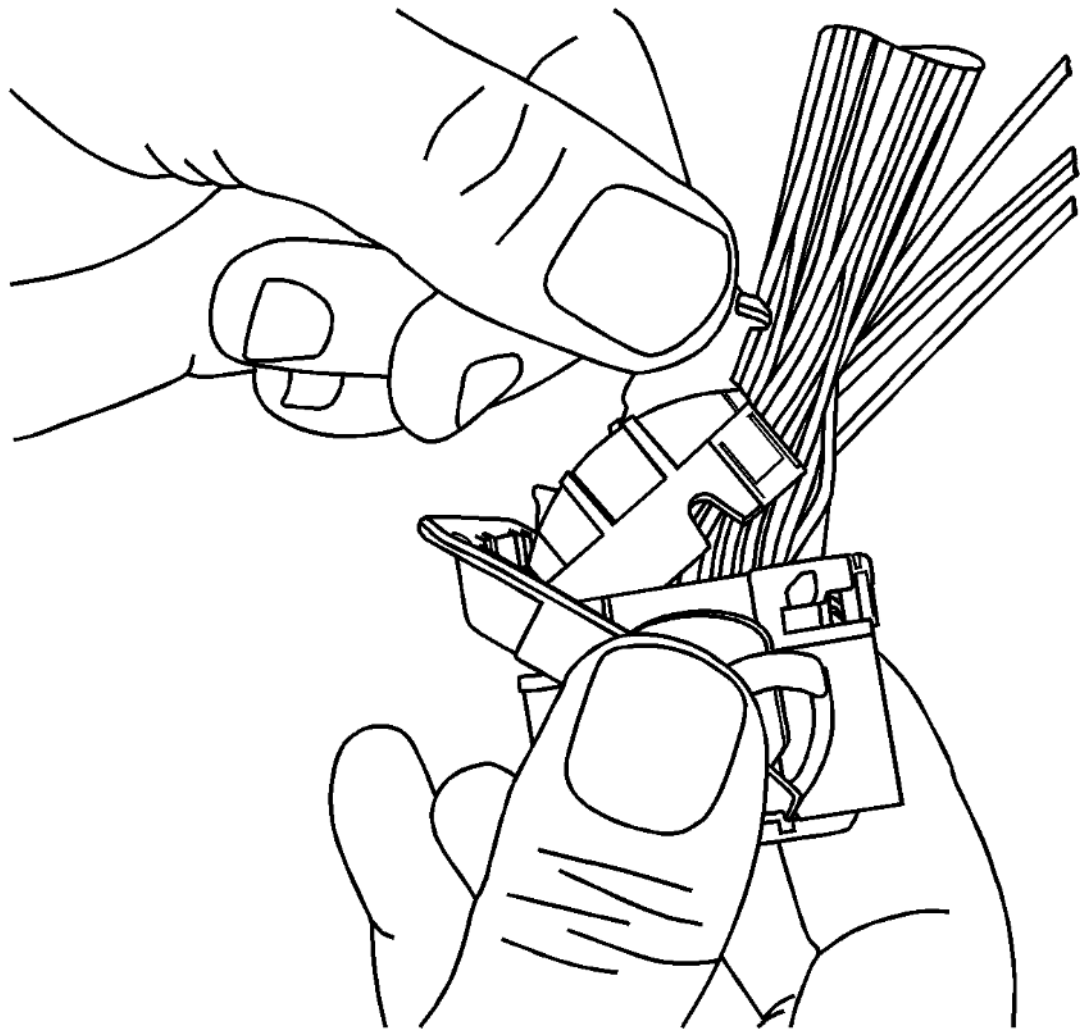


Fig. 190: Pivoting Connector Wire Dress Cover
Courtesy of GENERAL MOTORS COMPANY

4. Pivot connector wire dress cover while removing from the connector body.

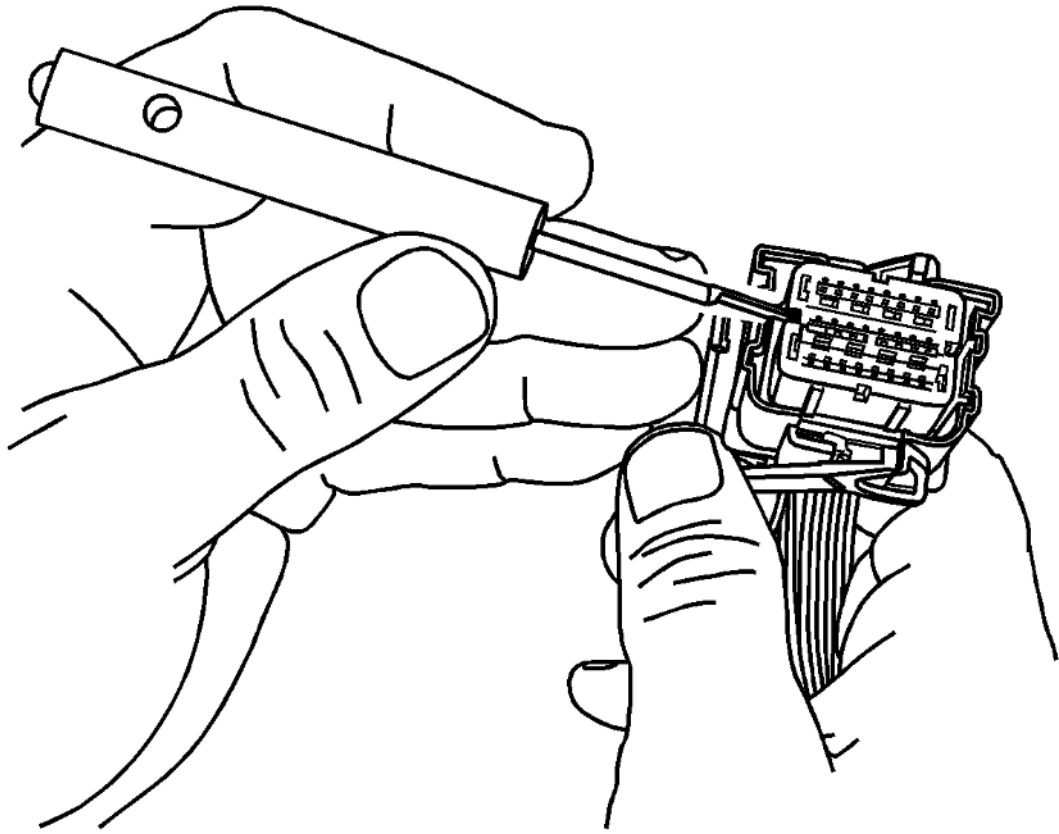


Fig. 191: Removing TPA

Courtesy of GENERAL MOTORS COMPANY

5. Using terminal tool J-38125-11A or equivalent, remove the TPA by lifting straight off the connector body.

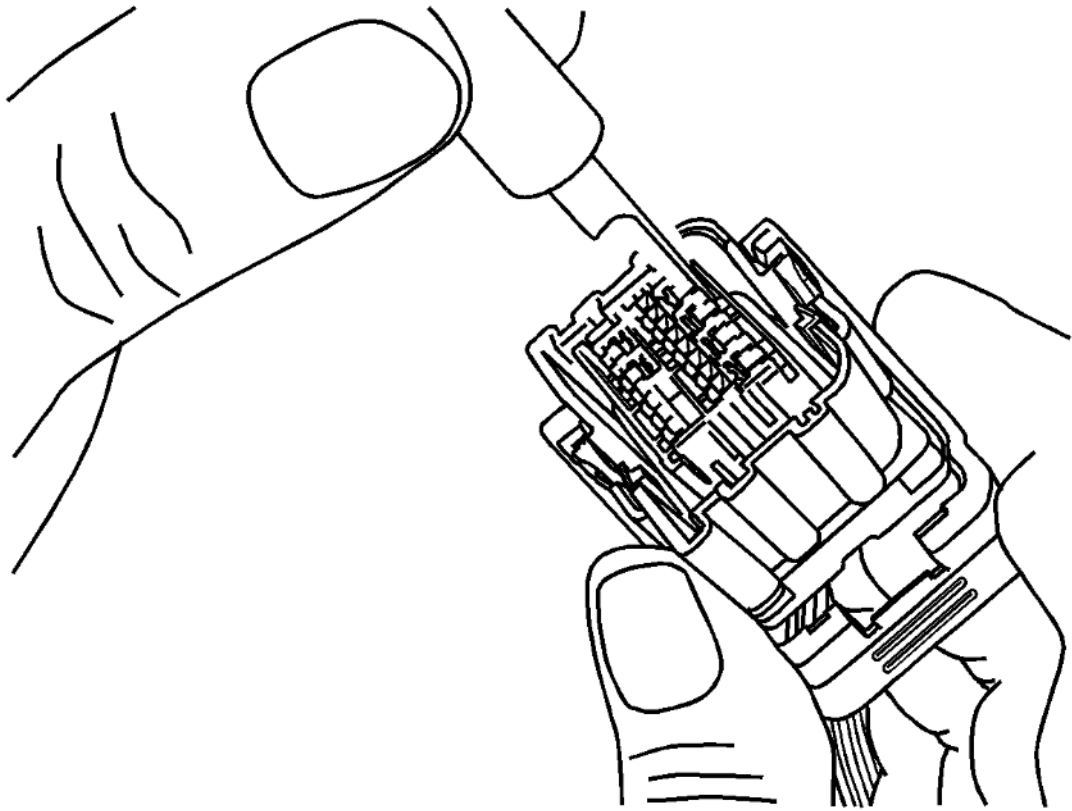


Fig. 192: View of Terminal Release Tool & Rear of Connector Body
Courtesy of GENERAL MOTORS COMPANY

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.

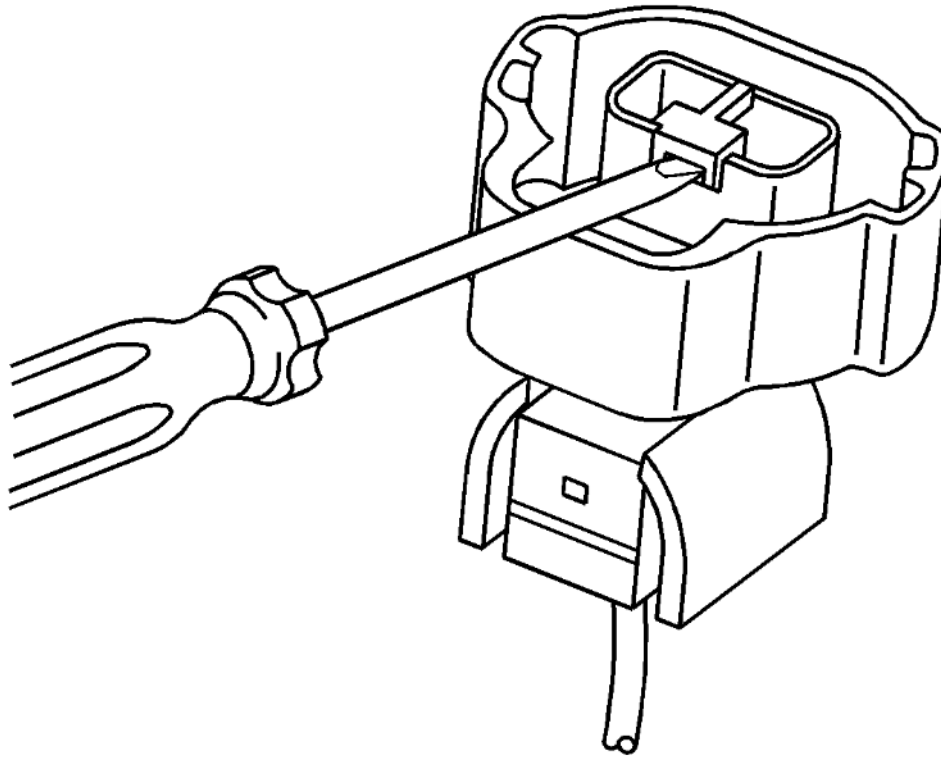


Fig. 193: Identifying Terminal Position Assurance
Courtesy of GENERAL MOTORS COMPANY

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.

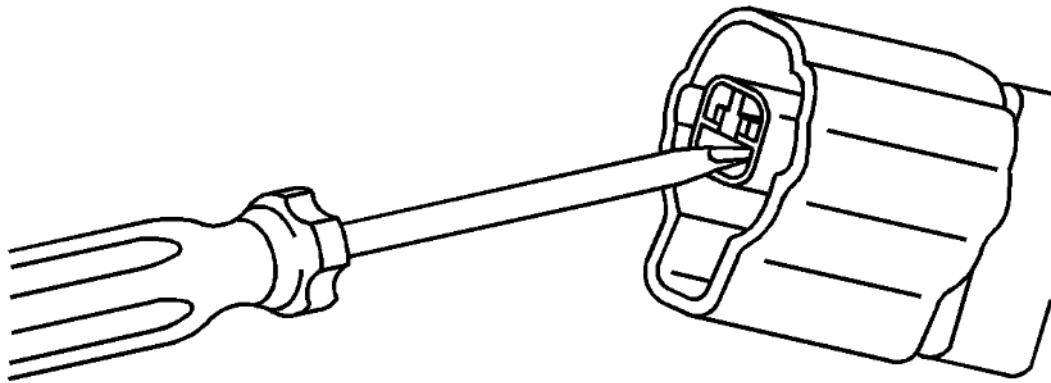


Fig. 194: Inserting Tool Into Terminal Cavity_(Yazaki)

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.

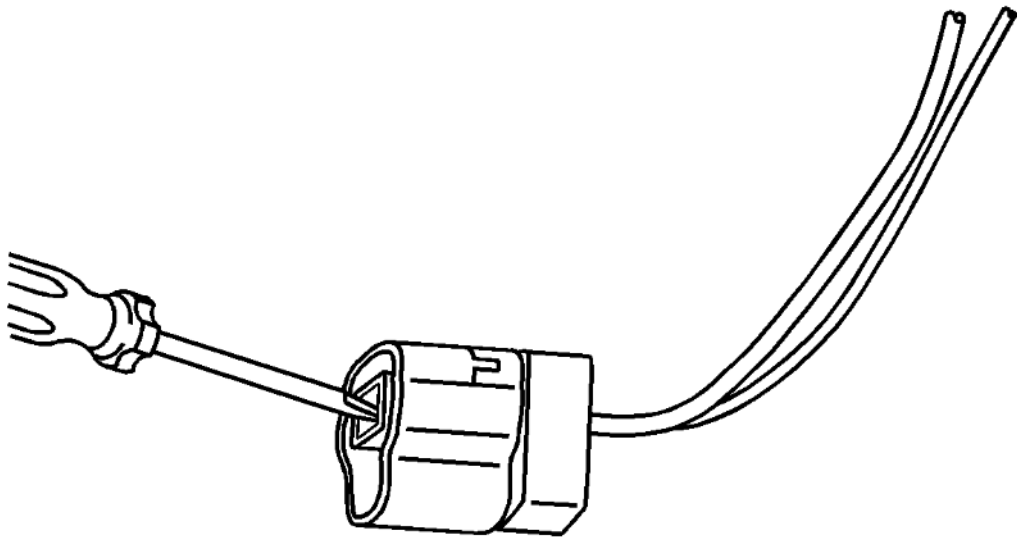


Fig. 195: Pulling Terminal Out Of Connector

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 \(Terminated Lead Repair\)](#)[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.

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

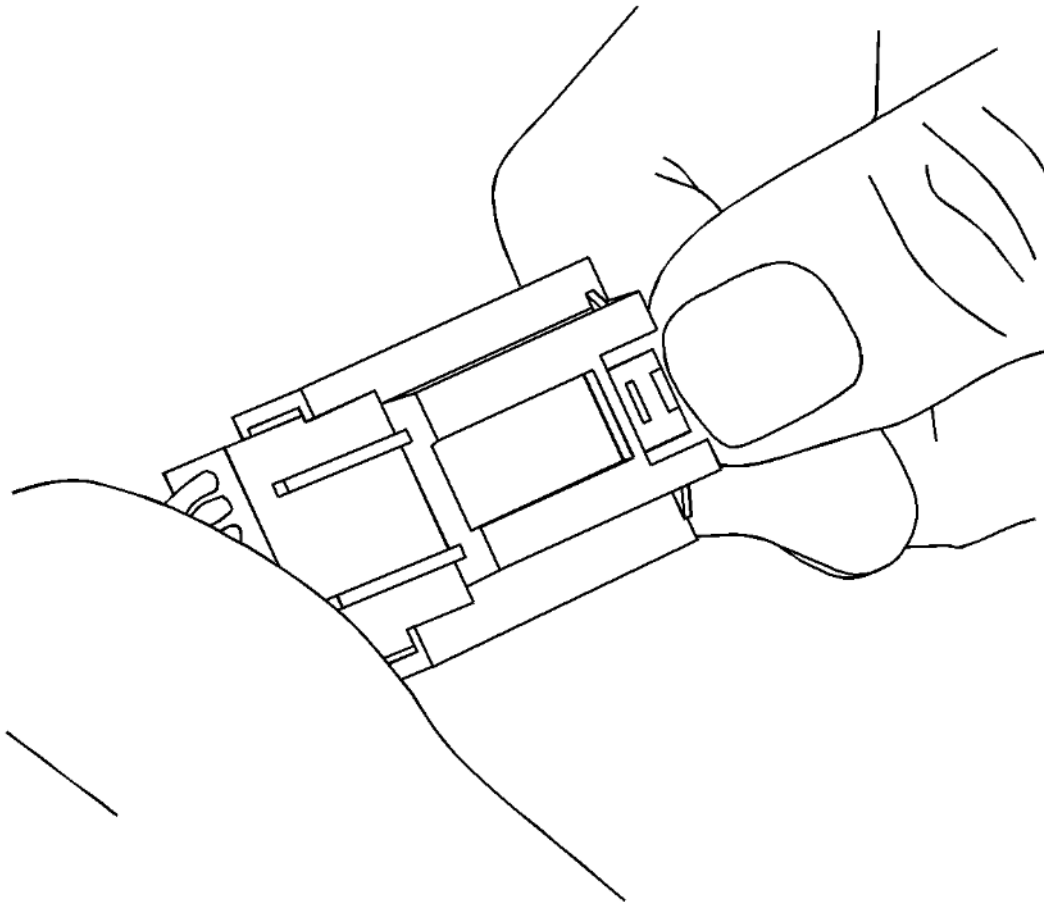


Fig. 196: Pulling Two Connector Halves Apart
Courtesy of GENERAL MOTORS COMPANY

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.

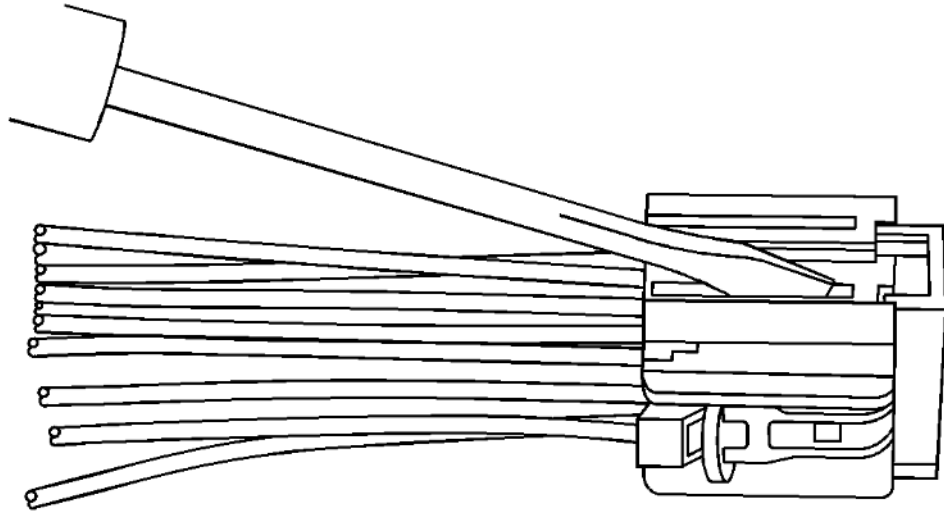


Fig. 197: View Of Male Connector Half & Female Terminals
Courtesy of GENERAL MOTORS COMPANY

3. View of the male half of the connector with female terminals.

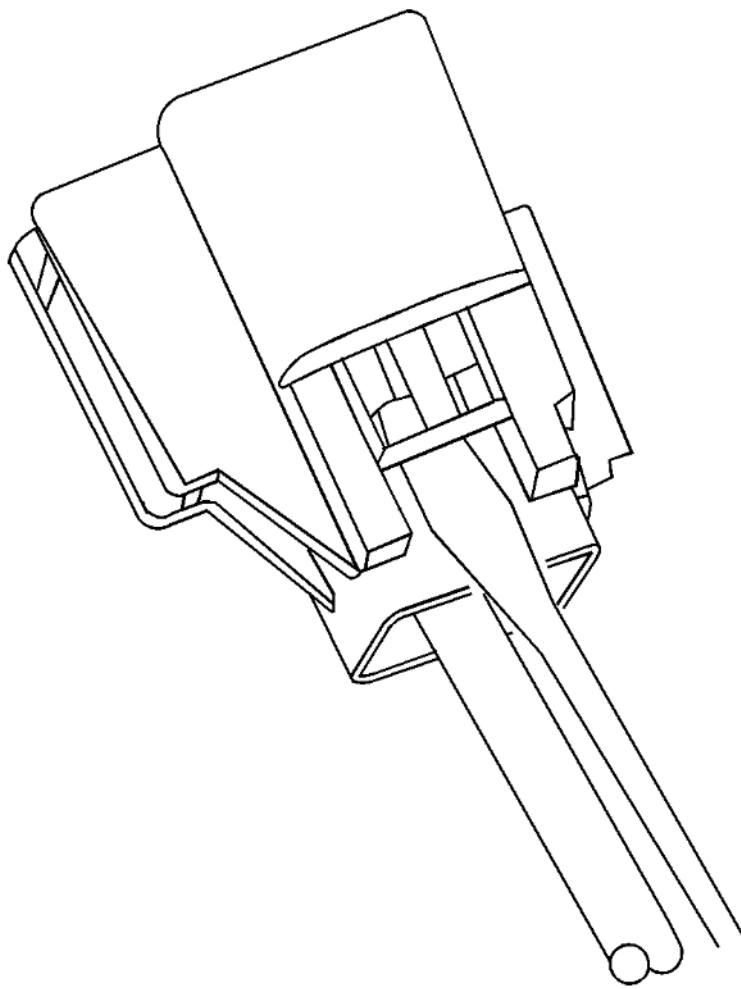


Fig. 198: View Of Female Half Of Connector With Male Terminals
Courtesy of GENERAL MOTORS COMPANY

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.

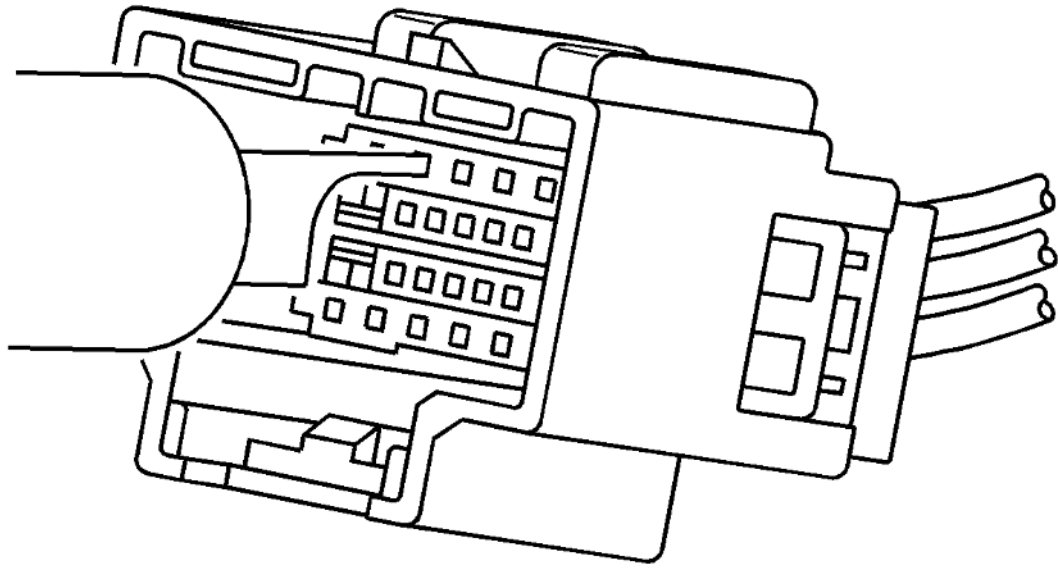


Fig. 199: Using Removal Tool On Female Half Of Connector
Courtesy of GENERAL MOTORS COMPANY

6. View of the female half of the connector with male terminals.

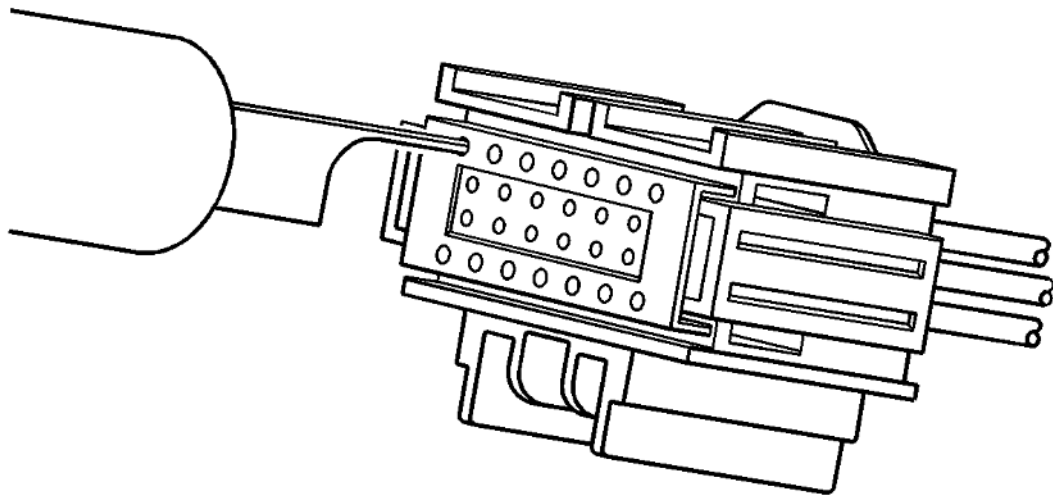


Fig. 200: Using Removal Tool On Male Half Of Connector
 Courtesy of GENERAL MOTORS COMPANY

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 identify the correct splice sleeve. Splicing Copper Wire Using Splice Sleeves to identify the correct DuraSeal splice sleeve, refer to [Wiring Diagrams](#).

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.

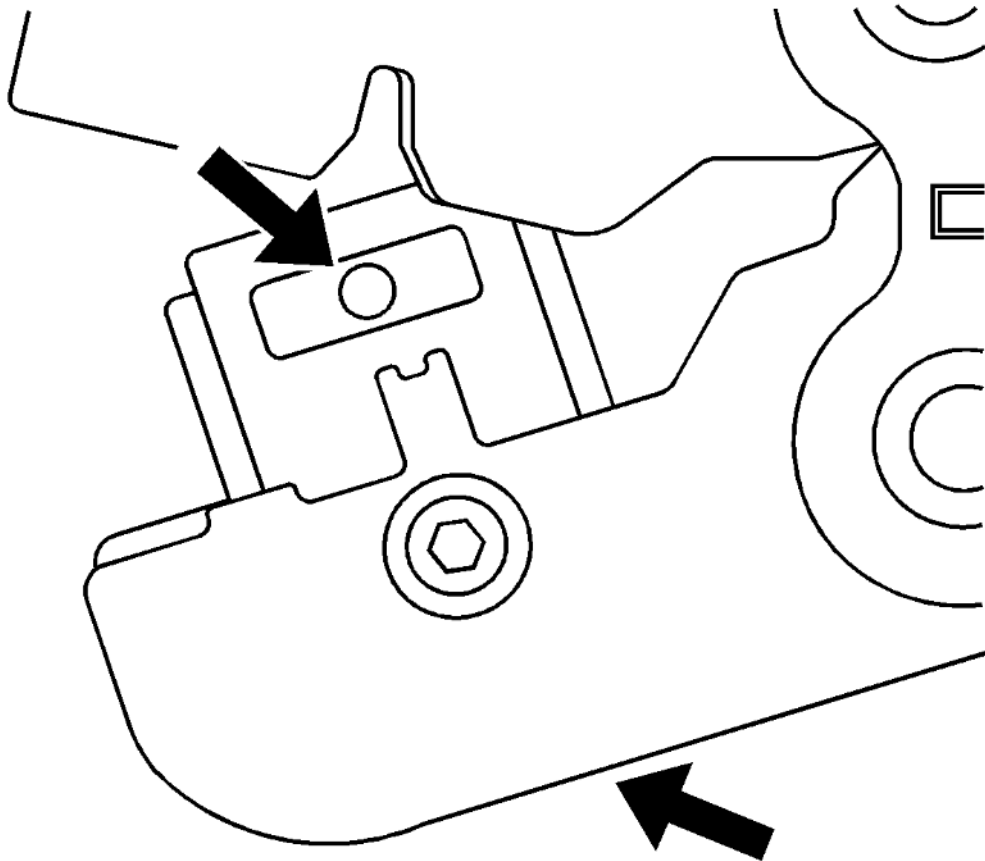


Fig. 201: Identifying Crimping Tool Spring Loaded Locator
Courtesy of GENERAL MOTORS COMPANY

3. Depress the spring loaded locator of the J 38125-101 (W jaw) crimping tool until the terminal holder is completely visible.

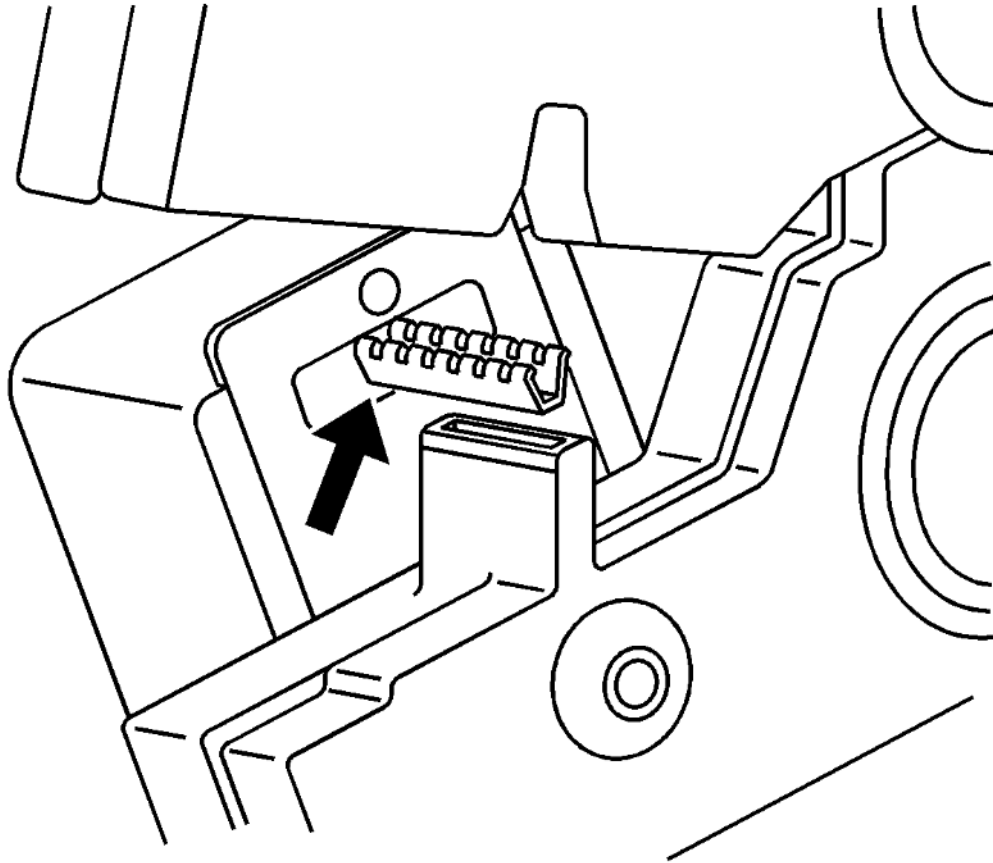


Fig. 202: Locating Terminal In Crimping Tool
Courtesy of GENERAL MOTORS COMPANY

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.

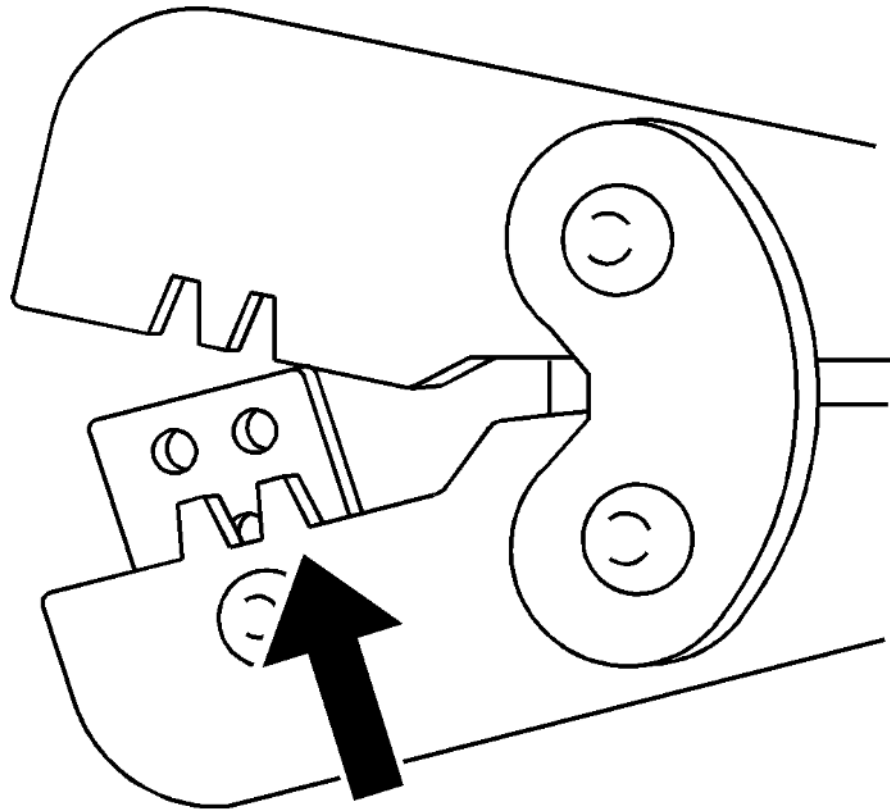


Fig. 203: Identifying Crimping Tool Spring Loaded Locator

Courtesy of GENERAL MOTORS COMPANY

3. Depress the spring loaded locator of the crimping tool until the terminal holder is completely visible.

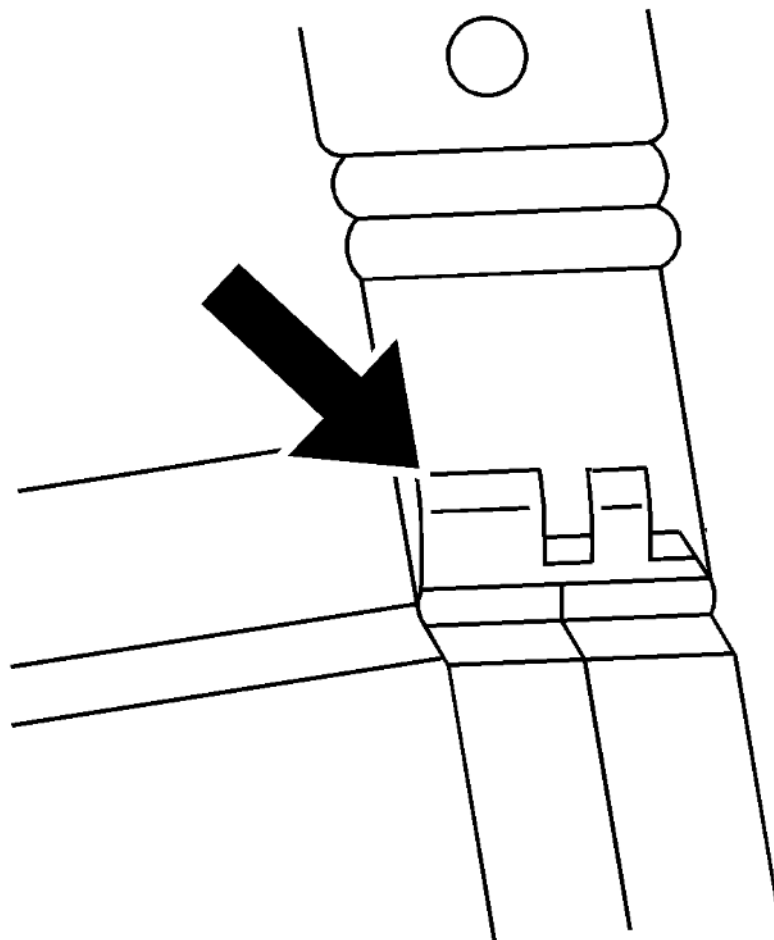


Fig. 204: Identifying Terminal Holder

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.

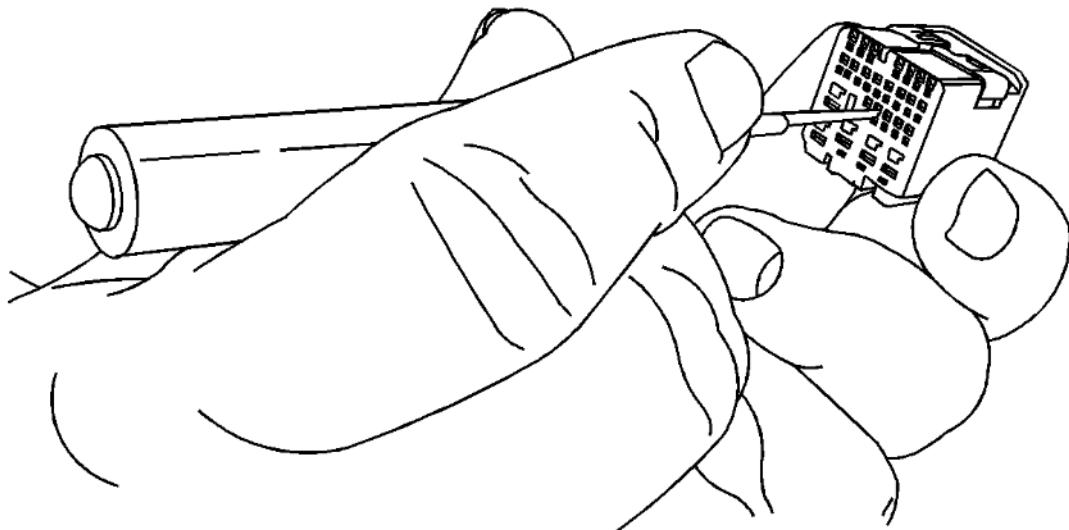


Fig. 205: Gently Pulling Wire Out Of Back Of Connector
Courtesy of GENERAL MOTORS COMPANY

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

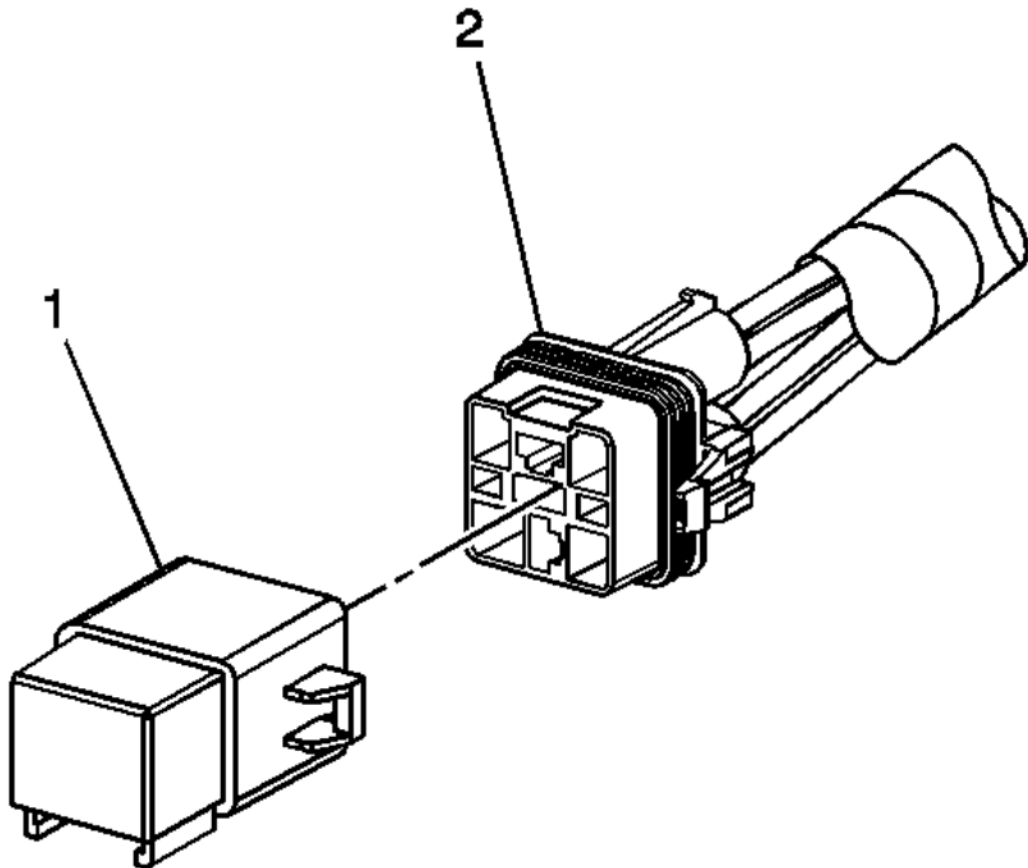


Fig. 206: Identifying Relay & Wire Harness Connector
Courtesy of GENERAL MOTORS COMPANY

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

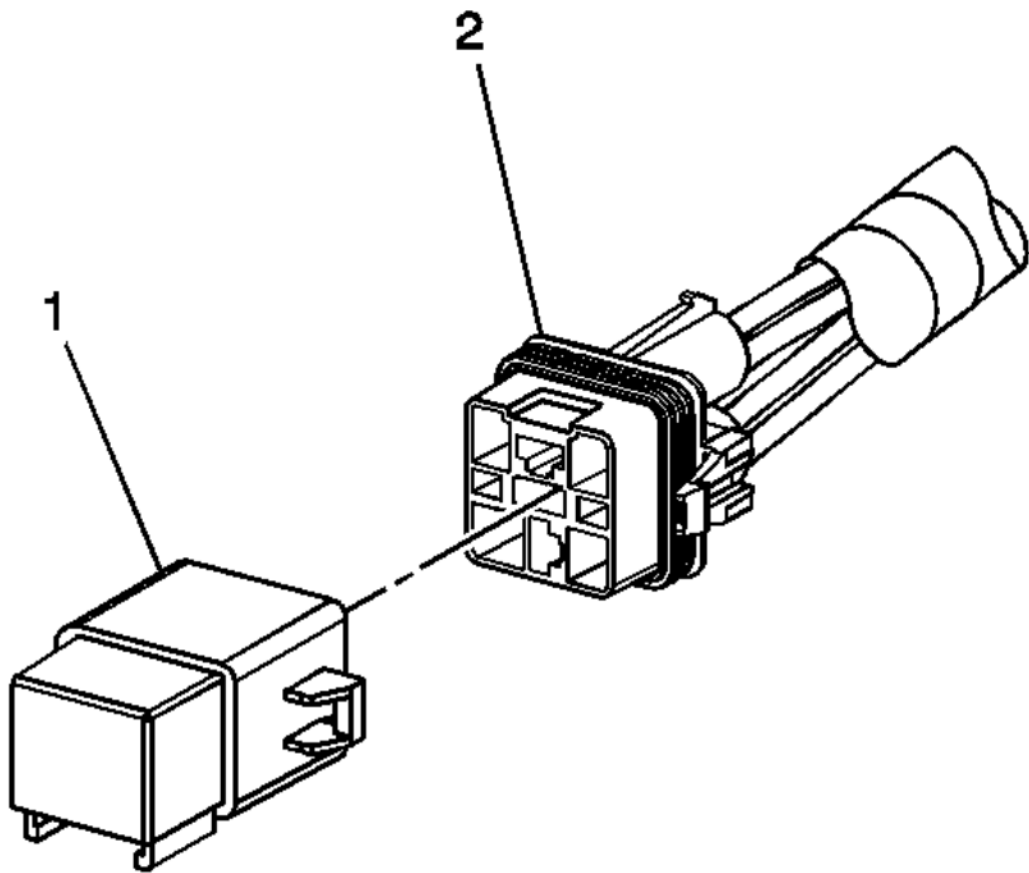


Fig. 207: Identifying Relay & Wire Harness Connector
Courtesy of GENERAL MOTORS COMPANY

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.

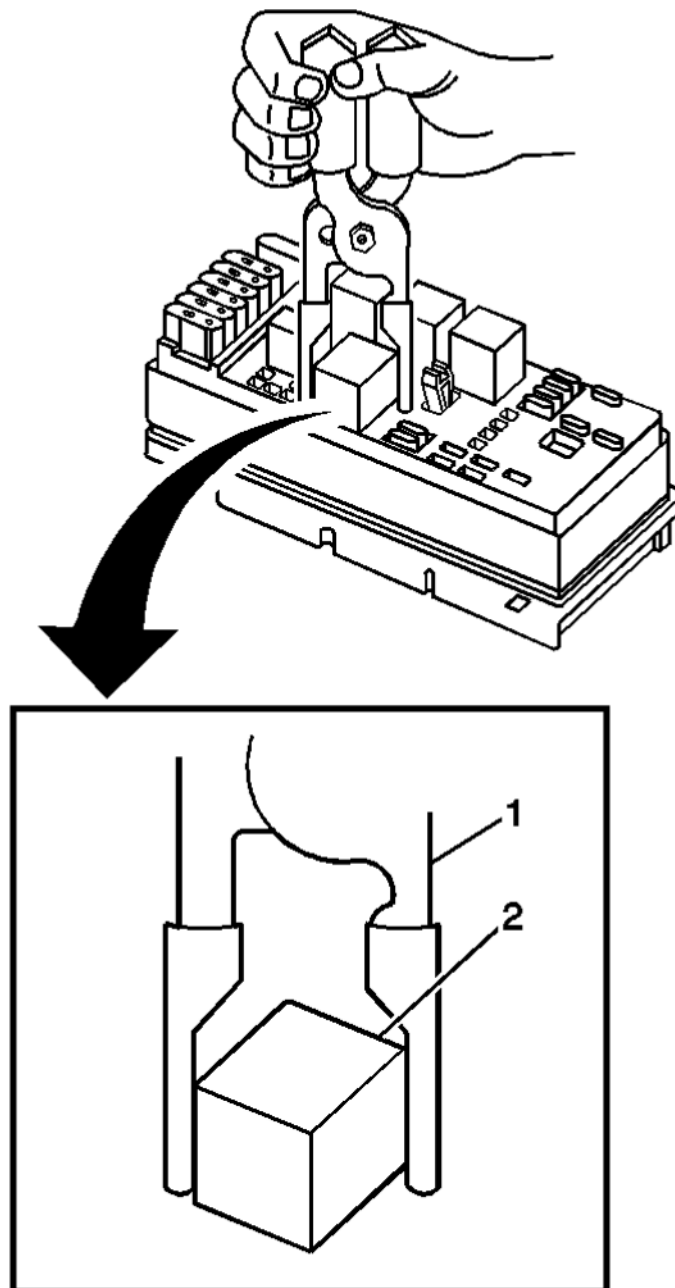


Fig. 208: Removing/Installing Relay

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

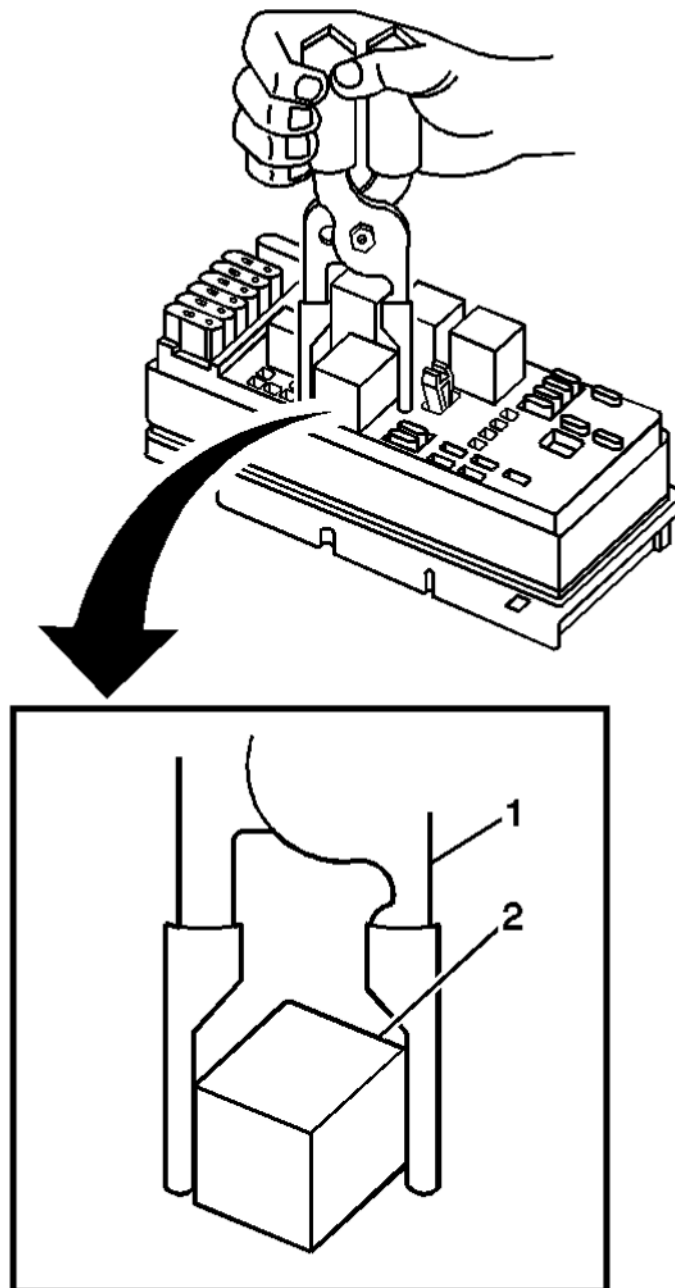


Fig. 209: Removing/Installing Relay

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

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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.

ON/OFF VEHICLE SWITCH REPLACEMENT

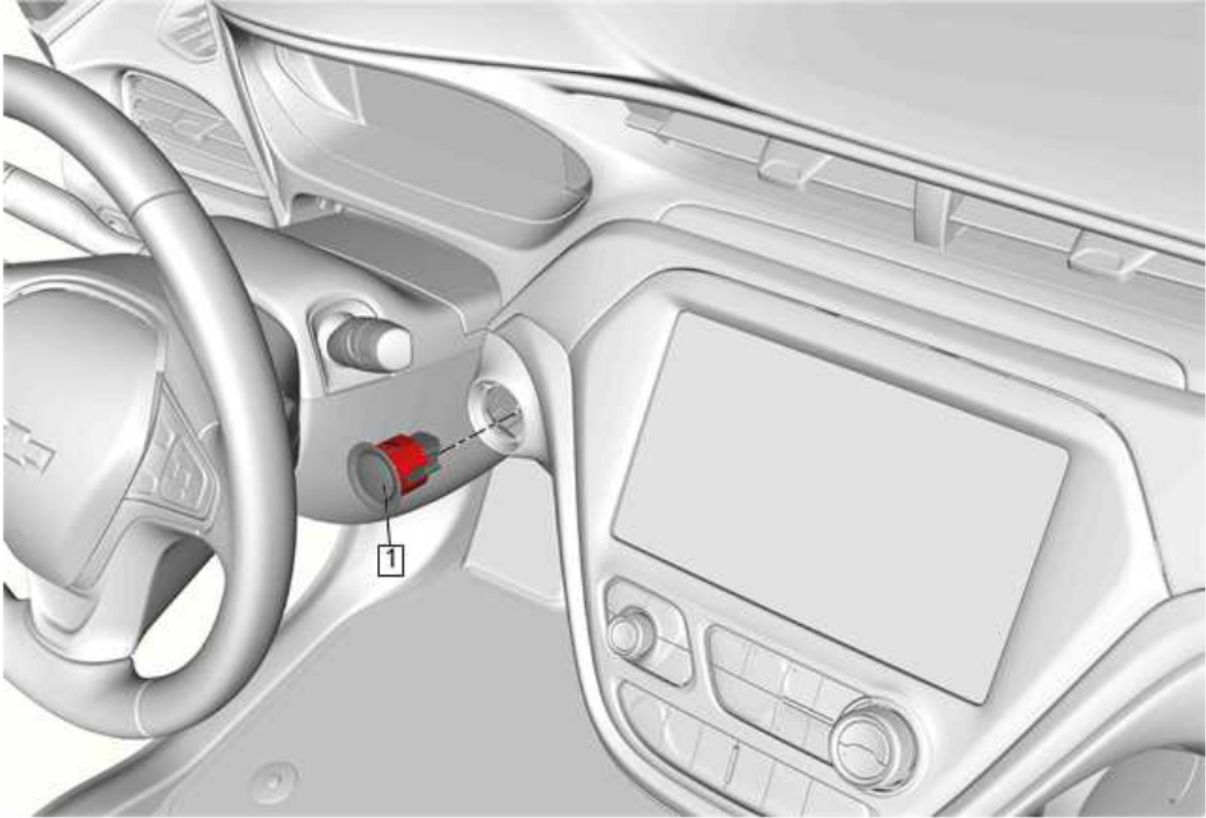


Fig. 210: On/Off Vehicle Switch

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	On/Off Vehicle Switch Procedure 1. Using a plastic trim tool, release the switch bezel from the trim pad and remove. 2. Disconnect the electrical connector.