

DIAGNOSTIC INFORMATION AND PROCEDURES

DTC B0560 (WITHOUT IOR)

Diagnostic Instructions

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

DTC Descriptor

DTC B0560

Tachometer Circuit

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal circuit	B0560 08	B0560 08	-	B0560 08

Circuit/System Description

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

Circuit	Description
Signal circuit	The control module input circuit has an internal resistance connected to ground.

Component	Description
K108 Active Noise Cancellation Module	The active noise cancellation system uses microphones and the vehicle speakers to acoustically cancel out certain unpleasant frequencies.
T3 Audio Amplifier	The Audio Amplifier receives audio inputs which it then outputs as amplified signals to the appropriate speakers.

Conditions for Running the DTC

Microphone 2 Input Signal Circuit

DTC B127D

Microphone 3 Input Signal Circuit

DTC B126F

Microphone 4 Input Signal Circuit

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Microphone [+] Signal - 1 Left Front	B127C 02	B127C 04	-	-
Microphone [-] - 1 Left Front	B127C 02	B127C 04	-	-
Microphone [+] Signal - 2 Right Front	B127D 02	B127D 04	-	-
Microphone [-] - 2 Right Front	B127D 02	B127D 04	-	-
Microphone [+] Signal - 3 Rear	B126F 02	B126F 04	-	-
Microphone [-] - 3 Rear	B126F 02	B126F 04	-	-

Circuit/System Description

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

Circuit	Description
Microphone [+] Signal	The control module input circuit has an internal resistance connected to 8 V.
Microphone [-]	Grounded through the control module.

Component	Description
A11 Radio	The radio is used for entertainment and may contain other functions like navigation.
B77LF Radio Volume Compensator Interior Noise Microphone - Left Front	The microphone converts an acoustic signal into an electrical signal.
B77RF Radio Volume Compensator Interior Noise Microphone - Right Front	The microphone converts an acoustic signal into an electrical signal.
B77R Radio Volume Compensator Interior Noise Microphone - Rear	The microphone converts an acoustic signal into an electrical signal.

Conditions for Running the DTC

Ignition - On/Vehicle - In Service Mode

Battery Voltage = 9.5 to 15.5 V

Conditions for Setting the DTC

B127C 02, B127D 02, B126F 02

The control module detects a short to ground. - Microphone [+] Signal/Microphone [-]

B127C 04, B127D 04, B126F 04

- **If the application does not launch**

1. Perform the 3 vehicle Factory Resets located in Setting>System>Return to Factory Settings.

- **Go to next step: If the application does launch**

Go to next step: All OK.

Repair Instructions

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

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

PHONE PROJECTION MALFUNCTION (ANDROID AUTO)

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

Android Auto is a phone integration feature that enables Android users to display certain apps and functionality from their phone on the vehicles infotainment display. Users can control the apps and functions via the vehicle's infotainment system touchscreen, button control or voice commands. Vehicles equipped with RPO PPW have wireless phone projection.

Diagnostic Aids

- Listed below are some common Android Auto Error Messages or Error Codes-

NOTE: For vehicles equipped with radio RPO IOR, error messages will not be displayed on the vehicle or device screen.

- Google Play Services error: Android Auto could not connect with Google Play Services

Likely cause: Something went wrong while setting up Android Auto.

Suggested solutions:

- Connect your phone to your vehicle with a USB cable first, before attempting to open the Android Auto app on your phone.
- After you have connected your phone to the vehicle open Android Auto and follow the getting started flow and accept all permissions.
- If it still does not work, uninstall Google Play Services update and re-update then follow the steps above.
- Communication error 6: If phone battery below 20% Android Auto will not work.

Likely cause: Radio software or Google Play version out of date.

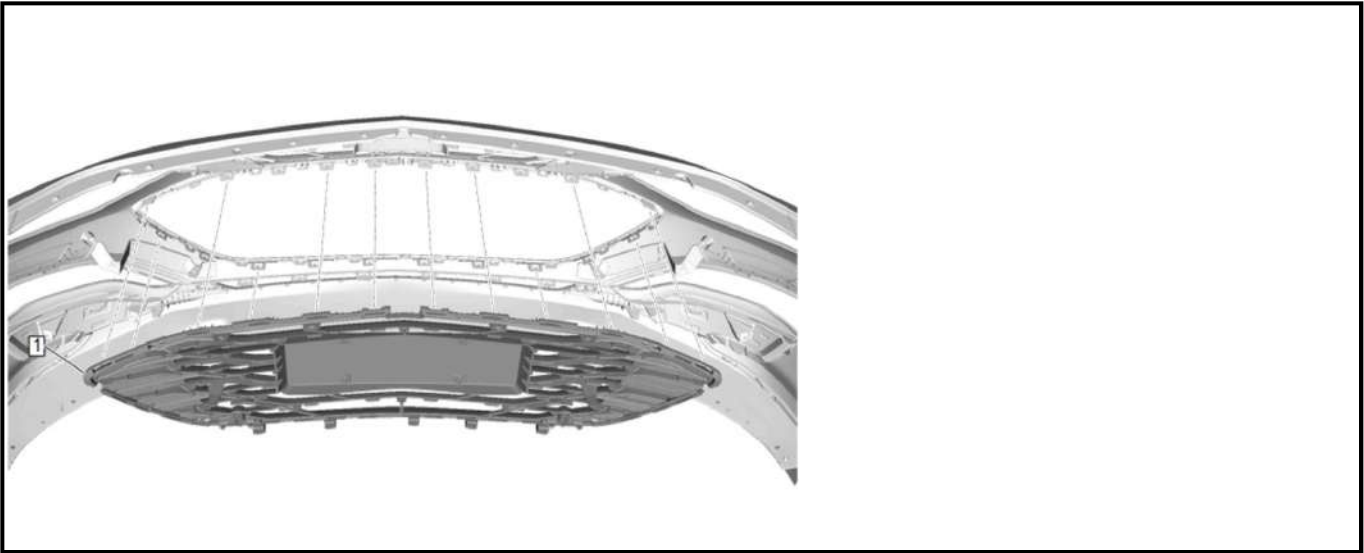
Suggested solutions: Update to Google Play version 12.6.85 or beyond and check for any radio updates.

- Communication error code 7: Android Auto failed to set up a secured communication with the head unit.

Suggested solution: Make sure Google Play services is up to date and try a different recommended USB cable.

- Communication error 8: Authentication failed between the car and the phone.

Likely cause: This is most likely caused by the incorrect date on the radio.



Callout	Component Name
<p>Preliminary Procedures</p> <ol style="list-style-type: none"> 1. Front Bumper Fascia Lower Stiffener Replacement 2. Front Bumper Energy Absorber Replacement 	
<p>1</p>	<p>Front Grille</p> <p>NOTE: Each individual front bumper fascia tab must be secure to each slot in the radiator grille prior to reassembly of the fascia to the vehicle.</p> <p>Procedure</p> <ol style="list-style-type: none"> 1. Place the bumper fascia face down on a clean protected surface. 2. Disconnect and reposition harness as necessary. 3. Using a suitable trim tool, release the locking tabs while carefully pulling the front grille from the front fascia. 4. Transfer components as necessary.

FRONT GRILLE INSERT REPLACEMENT

Removal Procedure

1. Front Grille - Remove - [Front Grille Replacement](#)

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

DTC Descriptor

DTC B0010 00

Reverse Gear Status Not Plausible

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Backup Signal	B0010 00	B0010 00	B0010 00	-

Circuit/System Description

The Radio receives a signal from the BCM when the vehicle is placed in reverse. The reverse gear status is used to determine when to activate the rearview camera display. The Radio compares reverse signal to the serial data message to verify the plausibility of the signal.

Conditions for Running the DTC

Ignition ON/Vehicle in Service Mode.

Conditions for Setting the DTC

The Radio has determined the reverse message states do not match and are therefore not plausible.

Action Taken When the DTC Sets

The Radio may not activate the rearview camera display.

Conditions for Clearing the DTC

The Radio no longer detects a malfunction.

Reference Information

Schematic Reference

Image Display Camera Wiring Schematics

Connector End View Reference

[Master Electrical Component List](#) , or [COMPONENT CONNECTOR END VIEWS - INDEX](#)

Description and Operation

[Rear Vision Camera Description and Operation \(UVC\)](#), or [Rear Vision Camera Description and Operation \(UVB\)](#).

Electrical Information Reference

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

Scan Tool Reference

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

Circuit/System Verification

NOTE: The following steps must be completed before using a symptom table.

- Perform the [Diagnostic System Check - Vehicle](#) before using a symptom table in order to verify that all of the following conditions are true:
 - There are no DTCs set.
 - The control modules can communicate via the serial data link.
- Review the system description and operation in order to familiarize yourself with the system functions. Refer to the following:
 - [Exterior Lighting Systems Description and Operation](#)
 - [Interior Lighting Systems Description and Operation](#)

Visual/Physical Inspection

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

Intermittent

Thoroughly inspect the wiring and connectors. An incomplete inspection of the wiring and connectors may result in misdiagnosis causing part replacement with the reappearance of the malfunction. If an intermittent malfunction exists, 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:

- [Adaptive Forward Lighting Malfunction](#)
- [Backup Lamps Malfunction](#)
- [Courtesy Lamps Malfunction](#)
- [Daytime Running Lamps Malfunction](#)
- [Dome Lamps Malfunction](#)
- Rear Fog Lamps Malfunction
- [Hazard Lamps Malfunction](#)
- [Headlamps Malfunction](#)
- [Headlamp Leveling Malfunction \(Manual Headlamp Leveling\)](#), or [Headlamp Leveling Malfunction \(Automatic Headlamp Leveling\)](#)
- [Interior Accent Lighting Malfunction](#)
- [Interior Backlighting Malfunction](#)
- [Park, License, and/or Tail Lamps Malfunction](#)
- [Rear Compartment Lamp Malfunction](#)
- [Stop Lamps Malfunction](#)
- [Turn Signal Lamps and/or Indicators Malfunction](#), or [Turn Signal Lamps and/or Indicators Malfunction](#)

ADAPTIVE FORWARD LIGHTING MALFUNCTION

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: [Diagnostic System Check - Vehicle](#)
- Review the description of Strategy Based Diagnosis: [Strategy Based Diagnosis](#)

NOTE: Select "Refresh Characterization Data" at the MCVM Characterization selection screen.

Replace TCM

To perform solenoid characterization after a transmission component replacement:

1. Document the new Transmission Unique Number (TUN) or Part Unique Number (PUN) as required.
 - The TUN location may be found here: [Transmission Identification Information](#) . Since the TUN can be difficult to access when the transmission is installed in the vehicle, ensure you document the 16-digit TUN prior to installing the transmission in the vehicle.
 - The PUN location may be found here: [Control Valve Solenoid Body Identification Information](#) . Before installing the control valve solenoid body onto the transmission, document the 16-digit PUN. If the control valve solenoid body PUN has not been saved for reference, it may be necessary to disassemble the control valve solenoid body from the transmission to clearly read the control valve solenoid body PUN.
 2. Log into TIS2Web/SPS.
 3. Type the vehicle identification number (VIN).
 4. Perform the SPS Transmission Control Module programming event.
 - Select "Transmission Control Module - Programming" to update TCM calibrations and Solenoid Characterization data.
- OR
- Select "Transmission Control Module - MCVM Operations" to update Solenoid Characterization data only.
5. From the "MCVM (Mechanical Characterization and Virtual Matching) Operation Selection" screen, select the applicable service procedure to be performed. You will be prompted to provide the necessary Transmission Unique Number (TUN) or Part Unique Number (PUN) when replacing a transmission part.

At this point, the system will read the VIN from the engine control module (ECM) using the multiple diagnostic interface (MDI) and then retrieve the applicable genealogy data tree from the cloud. This data tree accesses the original characterization data so that it may be updated with the new component information. The system acquires characterization data for the given TUN/PUN via the cloud and updates the genealogy tree. The TCM is updated with the correct solenoid characterization data, and the cloud is updated with the new genealogy relationship.

Q77 TRANSMISSION CONTROL SOLENOID VALVE CHARACTERIZATION PROGRAMMING (VT40)

The solenoids in this transmission require unique performance characteristic data in order to function at maximum efficiency. This data is programmed and stored in the vehicle's transmission control module (TCM). When a transmission assembly, TCM, or valvebody are replaced during service, the performance characteristic data for the solenoids must be retrieved from a web server "cloud" repository and reprogrammed into the TCM.

Reprogramming also ensures that the characteristic data relationship is properly matched between the solenoids, valve body, and transmission.

Solenoid characterization reprogramming is performed using the TIS2Web Service Programming System (SPS).

Solenoid Reprogramming Procedure

Perform solenoid characterization reprogramming after one of the following service procedures:

NOTE: Select "Replace Transmission" at the MCVM Characterization selection screen.

- If 1 V or greater - Repair the short to voltage on the circuit.
- Go to next step: If less than 1 V

5. Ignition/Vehicle - Off

6. Test for infinite resistance between the test points: Control circuit terminal 14 @ Control module harness & Ground

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

7. Test for less than 2 ohms between the test points: Control circuit terminal 14 @ Control module harness & The other end of the circuit @ Control circuit terminal K6 X1 @ X50A Fuse Block - Underhood

- If 2 ohms or greater - Repair the open/high resistance in the circuit.
- If less than 2 ohms - Test or replace the component: X50A Fuse Block - Underhood

• **Go to next step: If the component turns On and Off**

8. Replace the component: K9 Body Control Module

Repair Instructions

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

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

SYMPTOMS - WIPER/WASHER SYSTEMS

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

1. Perform [Diagnostic System Check - Vehicle](#) , in order to verify that all of the following conditions are true:
 - No DTCs are set.
 - The control modules can communicate via the serial data link.
2. Refer to [Wiper/Washer System Description and Operation](#) in order to familiarize yourself with the system functions.

Visual/Physical Inspection

- Inspect for aftermarket devices which may affect the operation of the windshield wiper/washer system.
- Inspect the easily accessible or visible system components for obvious damage or conditions which may cause the symptom.
- Inspect the washer fluid reservoir for the proper fluid level.

Intermittent

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

Symptom List

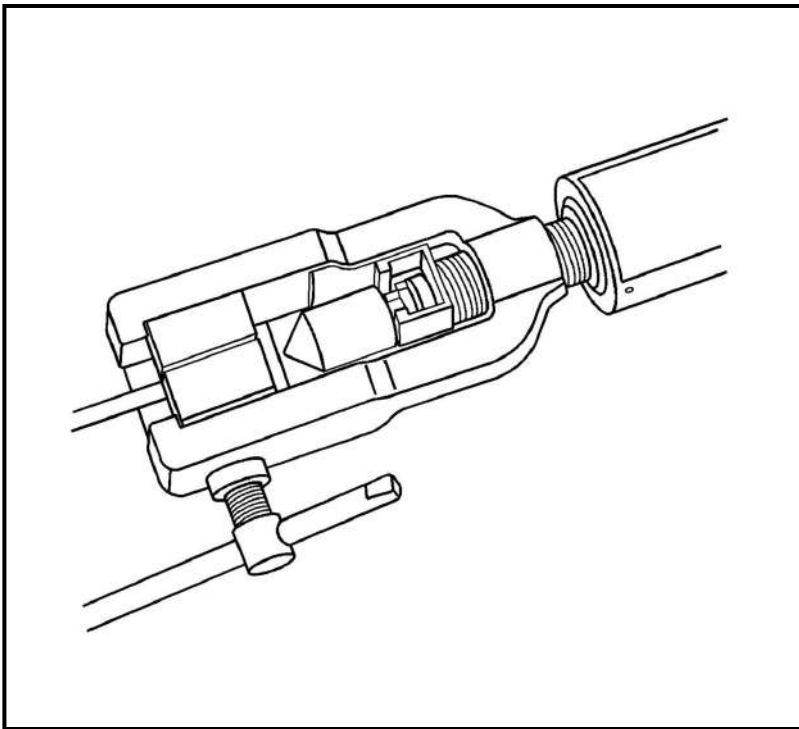
Refer to a symptom diagnostic procedure from the following list in order to diagnose the symptom:

- [Windshield Wiper System Malfunction](#)
- [Washer Malfunction](#)

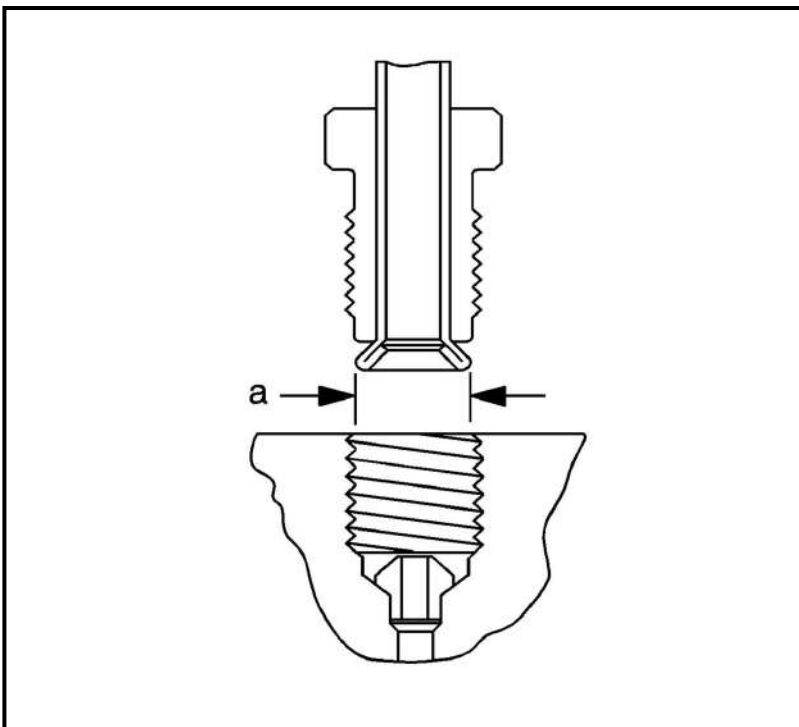
WINDSHIELD WIPER SYSTEM MALFUNCTION

Diagnostic Instructions

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



25. Insert the finishing cone into the forming ram.
26. Rotate the hydraulic fluid control valve clockwise to the closed position.
27. Rotate the body of the **CH-45405** Brake Pipe Flaring Tool Kit until it bottoms against the die cage.
28. While guiding the finishing cone into the exposed end of pipe to be flared, operate the lever of the **CH-45405** Brake Pipe Flaring Tool Kit until the finishing cone bottoms against the dies.
29. Rotate the hydraulic fluid control valve counterclockwise to the open position to allow the hydraulic forming ram to retract.
30. Loosen the die clamping screw and remove the dies and pipe.
31. If necessary, lightly tap the dies until the die halves separate.



32. Inspect the brake pipe flare for correct shape and diameter (a).

Specification

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

PROACTIVE ALERT IDENTIFIER SAC001

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](#) for an overview of the diagnostic approach.

Proactive Alert Identifier Descriptor

Proactive Alert Identifier Service Message Identifier SAC001

Predicted Starting and Charging - Battery - Low Cranking Capacity Due to Shorted Cell

Conditions for Running the Proactive Alert Identifier

Service message present.

Conditions for Setting the Proactive Alert Identifier

Battery low cranking capacity due to shorted cell detected.

Diagnostic Aids

- Proactive Alert SAC001 does not require any Battery Charging, Testing or inspections.
- Battery testing is NOT required, therefore a print out of the Warranty Code when the battery is replaced for SAC001 is not required.
- OBD system DTCs may have set as a result of a low voltage condition. The DTCs need to be cleared with the scan tool.
- If the customer cannot provide the SAC001 Proactive Alert, it can be obtained through Service Workbench Alerts.

Reference Information

Schematic Reference

[Starting and Charging Wiring Schematics](#)

Description and Operation

[Proactive Alerts Description and Operation](#)

Electrical Information Reference

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

Special Tools

Equivalent regional tools [Special Tools \(Removal and Installation\)](#)

Circuit/System Verification

NOTE: No Diagnosis Time for Battery charging and testing is allowed. Battery charging and testing is NOT required

- Description: Battery Cable

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	35	BK	50	Ground	I	-

C1 BATTERY (LTG)

Connector Part Information

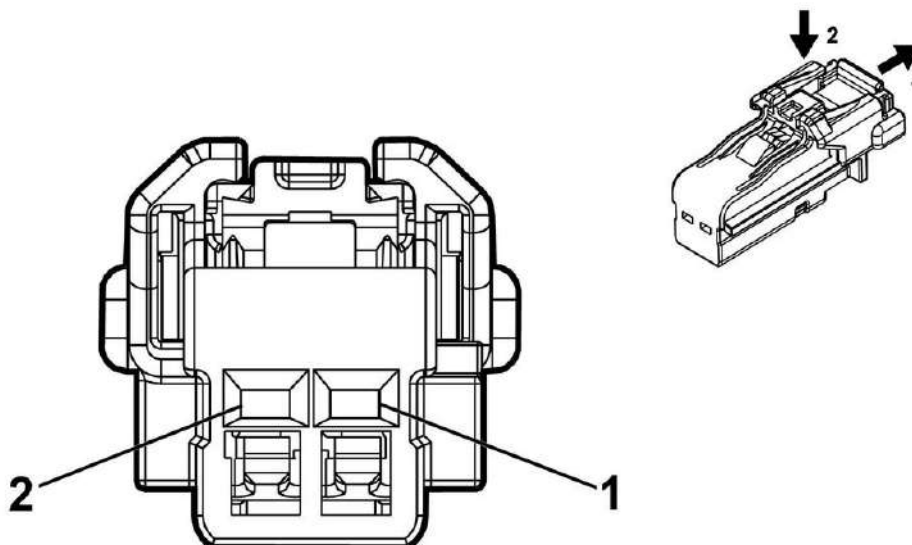
- Harness Type: Battery Cable
- OEM Connector: 33205599
- Service Connector: Service by Harness - See Part Catalog
- Description: Battery Cable

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	Not Available	No Tool Required

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
-	-	BK	50	Ground	I	-
+	-	RD	1	Unfused Battery Positive Voltage	I	-

E1W ACCENT LAMP - INSTRUMENT PANEL



Component Name	Callout
S38 Ignition Mode Switch S38 Ignition Mode Switch	8
X85 Steering Wheel Air Bag Coil X85 Steering Wheel Air Bag Coil X1 , or X85 Steering Wheel Air Bag Coil X2	9
S78 Turn Signal/Multifunction Switch S78 Turn Signal/Multifunction Switch	10
S30 Headlamp Switch S30 Headlamp Switch	11

Instrument Panel Components - Lower

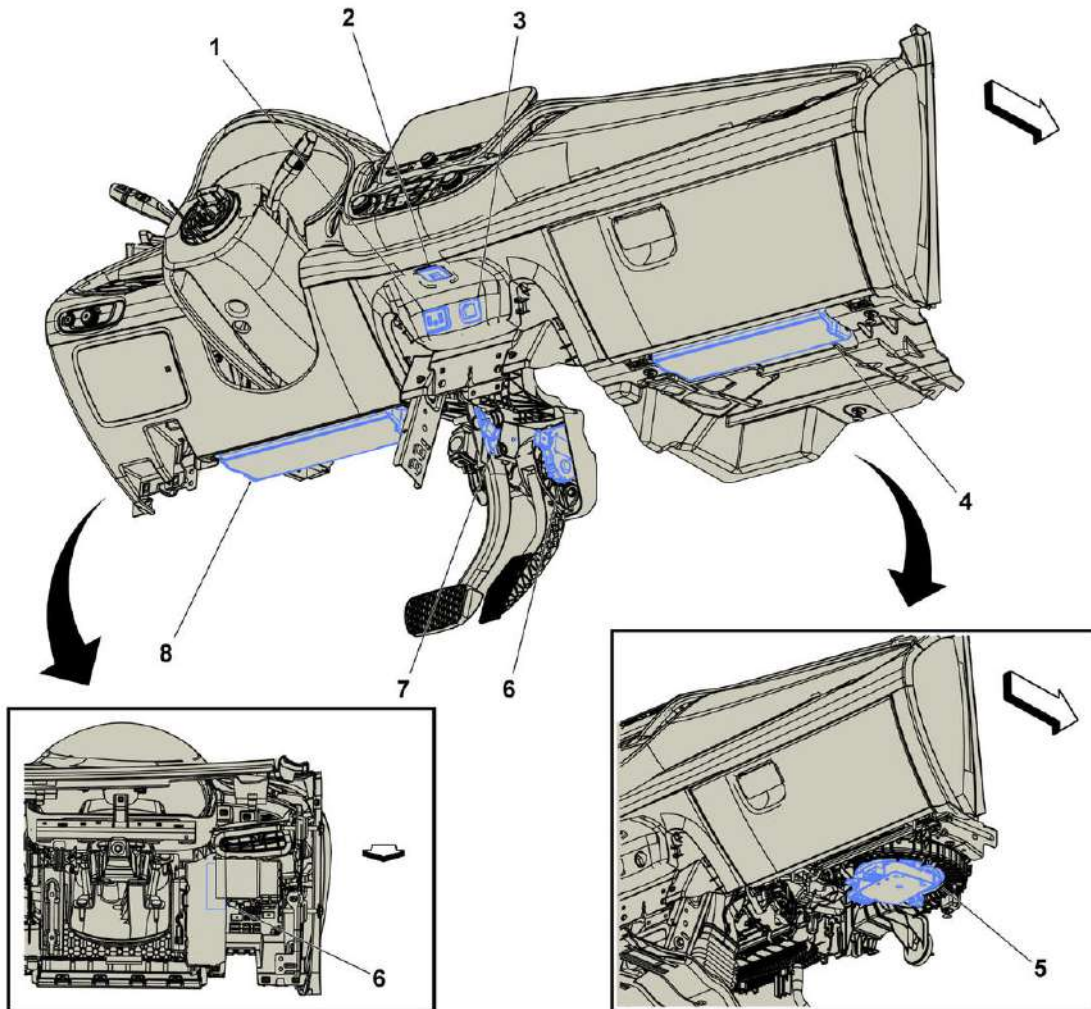


Fig. 22: Instrument Panel Components Location - Lower

Courtesy of GENERAL MOTORS COMPANY

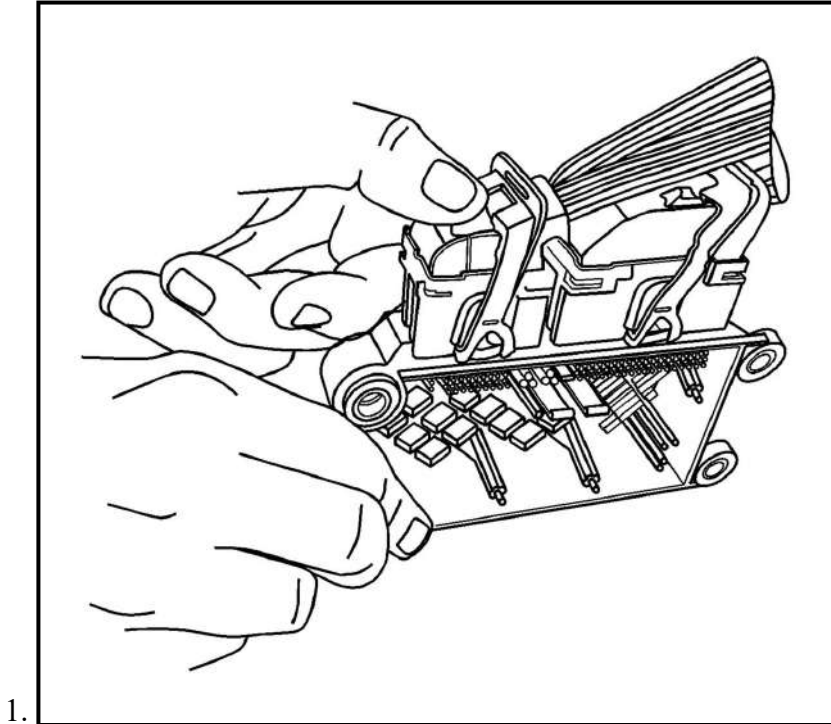
Instrument Panel Components - Lower

Component Name	Callout
X83 Auxiliary Audio Input X83 Auxiliary Audio Input X1 (IOR) , or X83 Auxiliary Audio Input X2 (IOR)	1
E38 Flood Lamp - Center Console E38 Flood Lamp - Center Console	2
X80G Accessory Power Receptacle - Instrument Panel X80G Accessory Power Receptacle - Instrument Panel	3
F114P Knee Air Bag - Passenger F114P Knee Air Bag - Passenger	4
M8 Blower Motor M8 Blower Motor	5
B107 Accelerator Pedal Position Sensor B107 Accelerator Pedal Position Sensor	6
K56 Serial Data Gateway Module K56 Serial Data Gateway Module X1 , or K56 Serial Data Gateway Module X2	7
B22 Brake Pedal Position Sensor B22 Brake Pedal Position Sensor	8

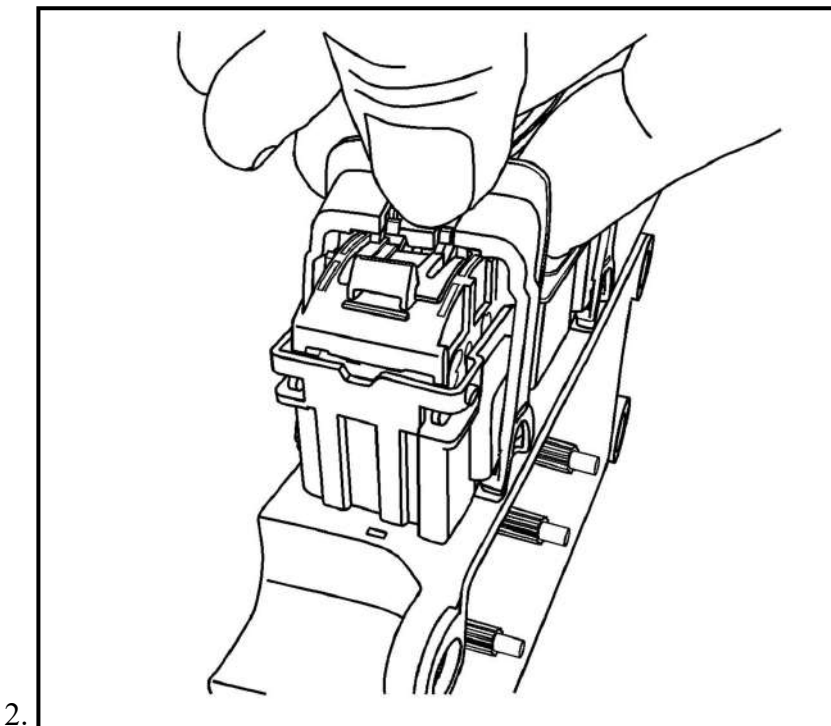
- **EL-38125 - 580** Terminal Release Tool Kit
- **J-38125 - 11A** Terminal Release Tool
- **J-38125-215A** Terminal Release Tool

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

Removal Procedure



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



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

Condition	Action
Internal rattle	<ol style="list-style-type: none"> 1. Test the components by tapping with a rubber mallet to confirm a rattle. 2. Repair or replace the affected component. Refer to the affected component's service procedure.

REPAIR INSTRUCTIONS

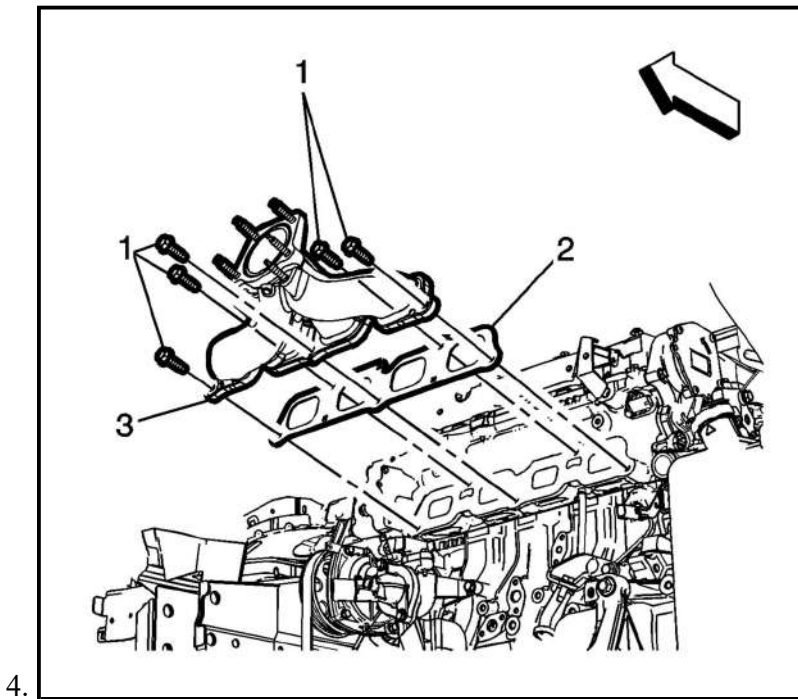
EXHAUST MANIFOLD REPLACEMENT (LTG)

Removal Procedure

WARNING: Refer to [Exhaust Service Warning](#) .

WARNING: Refer to [Eye Protection Warning](#) .

1. Remove the exhaust manifold heat shield. Refer to [Exhaust Manifold Heat Shield Replacement \(LTG\)](#).
2. Remove the turbocharger. Refer to [Compressor Air Intake Turbocharger Replacement](#) .
3. Remove the exhaust manifold brace. Refer to [Exhaust Manifold Brace Replacement \(LTG\)](#).



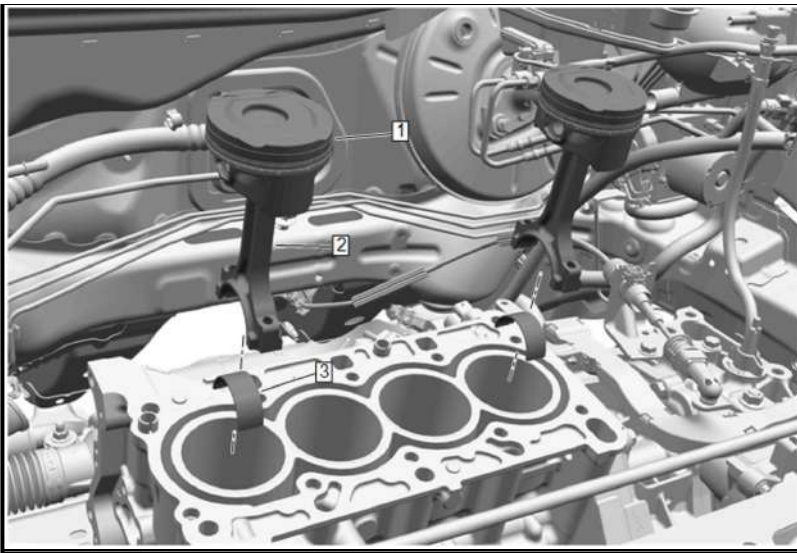
4. Remove the exhaust manifold fasteners (1) and discard.

5. Remove the exhaust manifold (3) and discard the exhaust manifold gasket (2).

Installation Procedure

1. Clean all mating surfaces.

177.



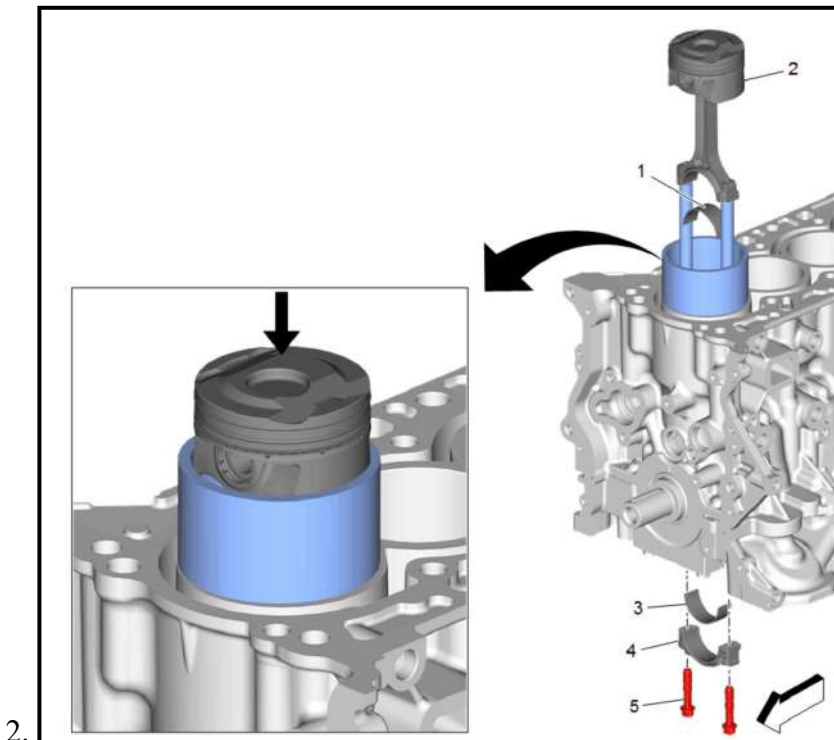
Push the 2 pistons (1) with the 2 connecting rods (2) out of the cylinder 1 and the cylinder 4 upwards.

178. Connecting Rod Bearing (3) - Remove [2x]

179. Piston and Connecting Rod Assembly - Disassemble - [Piston and Connecting Rod Disassemble](#)

Installation Procedure

1. Piston and Connecting Rod Assembly - Assemble - [Piston and Connecting Rod Assemble](#).



2.

Install the **EN-51454** guides into the connecting rod bolt holes. This protects the crankshaft journal during piston and connecting rod installation.

3. Install the **EN-52490 - 74** Piston Ring Compressor or equivalent on the piston.

4. Lubricate the pistons, the cylinder bore and the piston ring compressor with engine oil.