

1. PREFACE
2. PREFACE
3. INTRODUCTION
- 4.

Error and Suggestion Reporting

If you find an error in a GM Service manual, or if you have a suggestion about a GM service manual, we want to hear from you.

When calling, be prepared with the following information:

- Your name
- The name of your dealership
- The phone number of your dealership
- The model year and the vehicle line
- The publication part number, if present
- The vehicle identification number of the vehicle on which you are working
- The service category and page numbers
- Any applicable electronic information element identification numbers
- A descriptive explanation of your concern

The GM service manual phone personnel will respond to your concerns in the following ways:

- By delivering your concern to the author of the information
- By eliciting a response from the author
- By supplying you with an answer to your concerns

For paper manual users: The GM service manual phone personnel will also explain how to send in examples or marked-up pages.

For Electronic Manual users: Be prepared to provide any applicable identification numbers pertaining to the electronic information in question.

The GM service manual comment telephone numbers do not provide technical assistance. For technical assistance, contact your regular technical assistance source.

United States and Canada General Motors Dealer Employees

Please call the following number with your comments: 1-800-828-6860.

You may call Monday through Saturday, 8a.m.â€”8p.m. Eastern Time. In order to send a fax, use the following number: 248-285-3045.

Canada, French Speaking General Motors Dealer Employees

Please call the following number with your comments: 1-800-503-3222.

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International English Speaking General Motors Dealer Employees

Please call the following number with your comments: 248-365-2590.

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United States and Canadian Vehicle Owner/Operator

Vehicle owners or operators are encouraged to address their comments and concerns to the applicable Customer Assistance Center. The phone number and address of the Customer Assistance Center are in the Owner's Manual.

1. GENERAL INFORMATION
2. GENERAL INFORMATION
3. INTRODUCTION
- 4.

RPO Code List

The following table provides the description of the Regular Production Option (RPO) codes that are available on the vehicle. The vehicle's RPO list is printed on the Service Parts Identification Label.

RPO	Description
1SB	PACKAGE-OPTION 02
1SD	PACKAGE-OPTION 04
1SE	PACKAGE-OPTION 05
1SF	PACKAGE-OPTION 06
4AA	INTERIOR TRIM-JET BLACK
4GP	INTERIOR TRIM-JET BLACK/LIGHT VANILLA
4HT	INTERIOR TRIM-JET BLACK/MAPLE SUGAR
4JC	INTERIOR TRIM-JET BLACK / SEDONA SAUVAGE
4JO	INTERIOR TRIM-JET BLACK/WHISPER BEIGE INTERIOR
53S	STEERING WHEEL COLOR-SUEDE
57M	WHEEL-19 X 8.5, J, ALUMINUM, DESIGN 12
57R	WHEEL-18 X 8.5, J, ALUMINUM, DESIGN 14
5A7	WHEEL SPARE-NONE
5AZ	ACCESSORY-SAFETY KIT - UNIVERSAL
5CS	KNOB-SUEDE
5V5	ACCESSORY-SPOILER DESIGN 1
5WF	ACCESSORY-BATTERY PROTECTION PACKAGE
5XR	ACCESSORY-GRILLE / GRILLE INSERTS - DARK FINISH
9L3	TIRE SPARE-NONE
A2X	ADJUSTER DRIVER SEAT-8WAY, PWR RECLINE, PWR FORE/AFT, PWR HEIGHT, PWR TILT
A45	MEMORY-SEAT ADJUSTER, MIRROR, POWER, DRIVER, PERSONALIZATION
A7J	ADJUSTER PASS ST-6WAY, PWR RECLINE, PWR FORE/AFT, PWR HEIGHT
A7K	ADJUSTER PASS ST-8WAY, PWR RECLINE, PWR FORE/AFT, PWR HEIGHT, PWR TILT
ACO	IDENTIFICATION-ACCESSORY CATALOG OFFERING
AEF	WINDOW REG PASS DR-POWER OPERATED, EXPRESS UP/DOWN
AER	WINDOW REG REAR DR-POWER OPERATED, EXPRESS UP/DOWN
AF6	CONTROL-SEAT, MASSAGE, DRIVER
AF8	LOCK CONTROL-SIDE DOOR, ANTI THEFT PROTECTION
AHC	CONTROL-SEAT, MANUAL CUSHION EXTN, DRIVER
AHE	BOLSTER DRVR-SEAT, POWER
AHF	CONTROL-SEAT, MANUAL CUSHION EXTN, PASS
AHH	BOLSTER PASS-SEAT, POWER
AHP	WINDSHIELD ACOUSTIC-ACOUSTIC PVB
AJC	RESTRAINT-HEAD, FRT SEAT, UP/DOWN ADJUSTMENT
AJW	WINDOW STYLE-LAMINATED
AKE	CONTROL-SEAT, MASSAGE, PASSENGER
AKP	WINDOW TYPE-SOLAR ABSORBING
AL0	SENSOR INDICATOR-INFLATABLE RESTRAINT, FRT PASS/CHILD PRESENCE DETECTOR
AL9	LUMBAR DRIVER-SEAT, POWER, 2 WAY
AM9	SEAT RR-SPLIT BACK, FOLDING
AQ9	SEAT-FRT BKT, LUXURY
ASV	EQUIPMENT-SENSOR AIR MOISTURE & W/S TEMP
AT8	RESTRAINT PROVISIONS-CHILD, RR SEAT, RR FACING
AT9	LUMBAR PASSENGER-SEAT, POWER, 2 WAY

sure the taping does not cause strain on the wiring and terminals, Improper taping can cause wire and terminal fretting.

High Temperature Wiring Repairs

Use the following procedures to perform high temperature wiring repairs:

Note:

All wiring repairs need to be 200mm 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 heat shrink tubing (Raychen SCT1) to protect the splice sleeves
- Terminated leads or pigtails
- The correct tools to remove the terminals from the connectors

Note:

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.

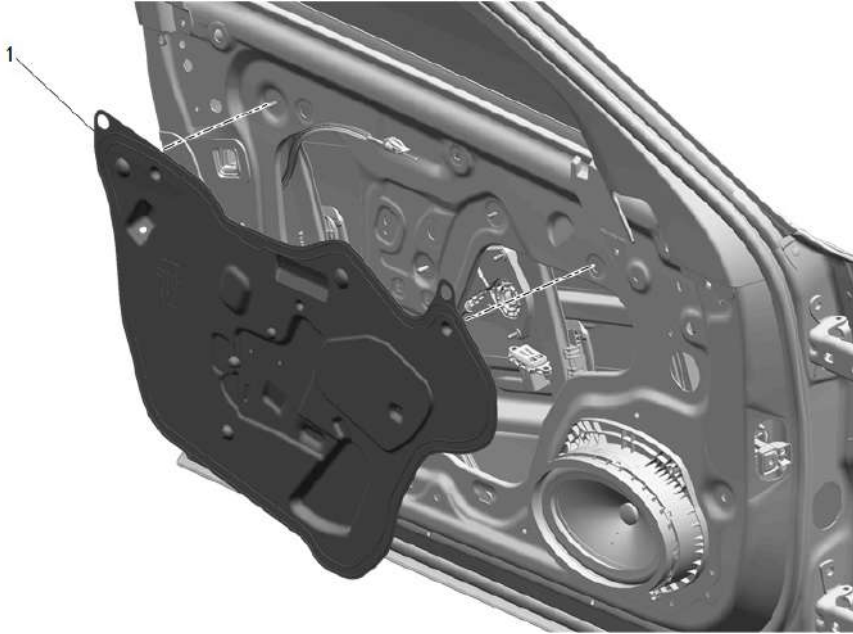
Wiring that is exposed to high temperatures 150°C (302°F) continuous or 175°C (347°F) excursion for prolonged periods of time may use materials i.e. wires, connectors, and shielding that has a higher heat rating than typical wiring. When making a repair in a high temperature area observe the following:

Wire to Wire Repair Incl High Temp

- Use GM approved 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 high temperature heat shrink tubing (Raychen SCT1).
- After making a wiring repair, ensure that the location of the wiring is not moved closer to the heat source.

1. BODY HARDWARE AND TRIM
2. INTERIOR TRIM AND PANELING
3. REPAIR INSTRUCTIONS
- 4.

Front Side Door Water Deflector Replacement - Driver Side



[Click here for full size](#)

Callout	Component Name
<p>Warning:</p> <p>When installing the water deflector, ensure that the water deflector is securely fastened to the door inner before installing the door trim. An improper seal of the water deflector against the door inner may affect the ability of the front door pressure sensor to detect a side collision. This may result in improper airbag deployment and could cause bodily injury.</p> <p>Preliminary Procedure</p> <p>Front Side Door Armrest Bracket Replacement</p>	
<p>1></p>	<p>Front Side Door Water Deflector</p> <p>Note:</p> <p>When reinstalling water deflector ensure integral locators are installed properly and that water deflector is secured and leakproof.</p> <p>Procedure</p> <ol style="list-style-type: none"> 1. Route front side door inside handle cable through hole in deflector assembly while removing it from the door. 2. Supplemental Inflatable Restraint System Description and Operation

Related Part Information

Part Name	Catalog Name	Part Code
Front Side Door Water Deflector	DEFLECTOR,FRT S/D WAT	0200A

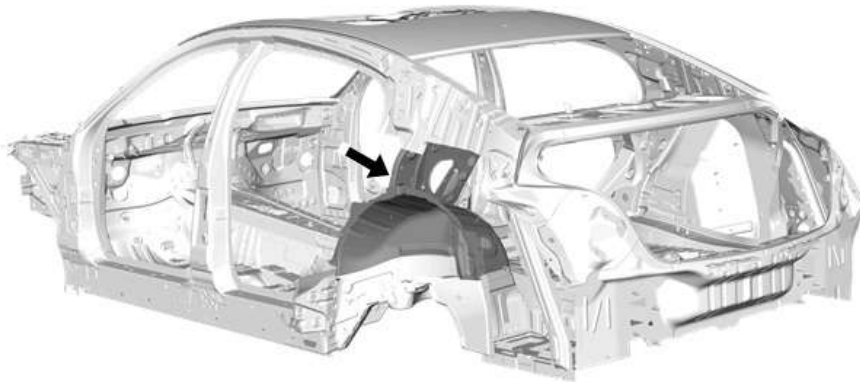
1. **BODY REPAIR**
2. **COLLISION REPAIR**
3. **REPAIR INSTRUCTIONS**
- 4.

Rear Wheelhouse Inner Panel Replacement (Lower)

Materials

- Structure Adhesive [Metal Panel Bonding](#)
- Structure Rivet (SR1 15X) [Fastener Specifications](#)

Removal Procedure



1. [Click here for full size](#)
2. Warning:
Refer to [Approved Equipment for Collision Repair Warning](#).
3. Warning:
Refer to [Collision Sectioning Warning](#).
4. Warning:
Refer to [Glass and Sheet Metal Handling Warning](#).
5. Note:
The rear wheelhouse inner panel is mild steel. [Mild Steel](#)
6. Note:
[Collision Repair Specifications](#)
7. Note:
Left shown, right similar.
8. Disable the SIR system. [SIR Disabling and Enabling](#).
9. Disconnect the battery negative cable. [Battery Negative Cable Disconnection and Connection](#)
10. Remove body side outer panel sectioning. [Body Side Outer Panel Sectioning](#)
11. Remove quarter inner panel upper reinforcement. [Quarter Inner Panel Upper Reinforcement Replacement](#)

1. BODY SYSTEMS
2. FIXED AND MOVEABLE WINDOWS
3. REPAIR INSTRUCTIONS
- 4.

Rear Side Door Window Replacement

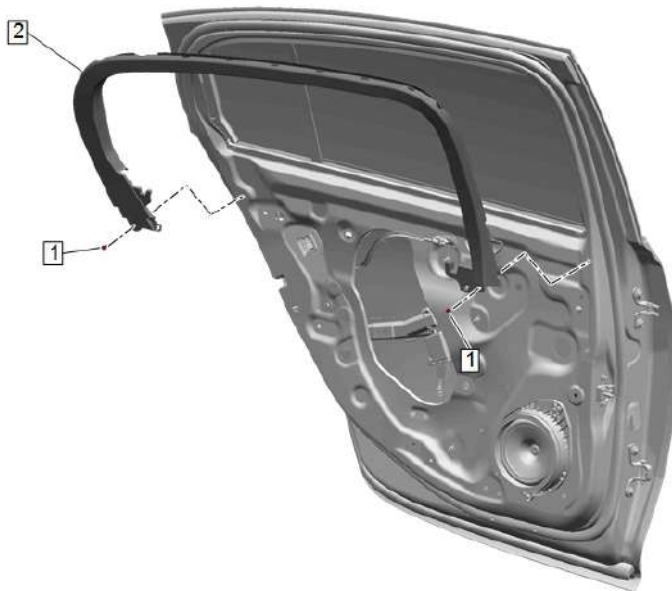
Removal Procedure

Warning:

Refer to [Glass and Sheet Metal Handling Warning](#).

Warning:

Disconnect the power window switch when working inside the door. When operated, the Express Up/Down Feature allows the door window to move very quickly, without stopping, which could cause personal injury.



1. [Click here for full size](#)
2. Rear Side Door Window Garnish Molding (2) >> Remove - [Rear Side Door Window Garnish Molding Replacement](#)

1. BRAKES
2. HYDRAULIC BRAKES
3. DIAGNOSTIC INFORMATION AND PROCEDURES
- 4.

DTC C0021

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

Brake Booster System Performance

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

Circuit/System Description

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

Conditions for Running the DTC

Ignition/Vehicle = OFF

Conditions for Setting the DTC

Ignition Off = Incomplete

The above conditions must occur for 10 consecutive ignition cycles.

Actions Taken When the DTC Sets

- ABS Indicator Control = ON
- Traction/Stability Control Indicator = ON
- Malfunction Indicator Lamp (MIL) = ON
- Brake warning indicator malfunction. = ON
- A message and/or warning indicator may be displayed to the driver.
- C0021 = Type A> DTC

Conditions for Clearing the DTC

- C0021 = Type A> DTC

Reference Information

Schematic Reference

[Antilock Brake System Schematics](#)

Connector End View Reference

[Master Electrical Component List](#)

Electrical Information Reference

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

DTC	Diagnostic Procedure
P0646	HVAC - Automatic - DTC P0645, P0646, or P0647
P0647	HVAC - Automatic - DTC P0645, P0646, or P0647
P064D	Engine Controls and Fuel - 2.0L (LSY) - DTC P026B, P0601-P0607, P060A, P060B, P0610, P061C, P062B, P062F, P0630, P064D, P064E, P134C, P160A, P160D, P160E, P161C, P16E9-P16F0, P16F3, P2610, P262B, P264F, P27B5, P30D6-P30DD, or P3186
P064D	Engine Controls and Fuel - 3.0L (LGY) - DTC P026B, P0601-P0607, P060A, P060B, P0610, P061C, P062B, P062F, P0630, P064D, P064E, P134C, P160A, P160D, P160E, P161C, P16E9-P16F0, P16F3, P2610, P262B, P264F, P27B5, P30D6-P30DD, or P3186
P064E	Engine Controls and Fuel - 2.0L (LSY) - DTC P026B, P0601-P0607, P060A, P060B, P0610, P061C, P062B, P062F, P0630, P064D, P064E, P134C, P160A, P160D, P160E, P161C, P16E9-P16F0, P16F3, P2610, P262B, P264F, P27B5, P30D6-P30DD, or P3186
P064E	Engine Controls and Fuel - 3.0L (LGY) - DTC P026B, P0601-P0607, P060A, P060B, P0610, P061C, P062B, P062F, P0630, P064D, P064E, P134C, P160A, P160D, P160E, P161C, P16E9-P16F0, P16F3, P2610, P262B, P264F, P27B5, P30D6-P30DD, or P3186
P0651	Engine Controls and Fuel - 2.0L (LSY) - DTC P0641, P0651, P0697, or P06A3
P0651	Engine Controls and Fuel - 3.0L (LGY) - DTC P0641, P0651, P0697, or P06A3
P0651	Wiring Systems and Power Management - DTC P0641, P0651, P0697, or P06A3
P0658	Automatic Transmission - 10L80 (MHS) - DTC P0658, P0659, P2812, P2814, P2815, P281B, P281D, or P281E
P0659	Automatic Transmission - 10L80 (MHS) - DTC P0658, P0659, P2812, P2814, P2815, P281B, P281D, or P281E
P0685	Engine Controls and Fuel - 2.0L (LSY) - DTC P0685-P0687, P0689, P0690, P1682, P16A7, P16AF, or P16B3
P0685	Engine Controls and Fuel - 3.0L (LGY) - DTC P0685-P0687, P0689, P0690, P1682, P16A7, P16AF, P16B3, P16BC, P16BD, or P16BF
P0686	Engine Controls and Fuel - 2.0L (LSY) - DTC P0685-P0687, P0689, P0690, P1682, P16A7, P16AF, or P16B3
P0686	Engine Controls and Fuel - 3.0L (LGY) - DTC P0685-P0687, P0689, P0690, P1682, P16A7, P16AF, P16B3, P16BC, P16BD, or P16BF
P0687	Engine Controls and Fuel - 2.0L (LSY) - DTC P0685-P0687, P0689, P0690, P1682, P16A7, P16AF, or P16B3
P0687	Engine Controls and Fuel - 3.0L (LGY) - DTC P0685-P0687, P0689, P0690, P1682, P16A7, P16AF, P16B3, P16BC, P16BD, or P16BF
P0689	Engine Controls and Fuel - 2.0L (LSY) - DTC P0685-P0687, P0689, P0690, P1682, P16A7, P16AF, or P16B3
P0689	Engine Controls and Fuel - 3.0L (LGY) - DTC P0685-P0687, P0689, P0690, P1682, P16A7, P16AF, P16B3, P16BC, P16BD, or P16BF
P0690	Engine Controls and Fuel - 2.0L (LSY) - DTC P0685-P0687, P0689, P0690, P1682, P16A7, P16AF, or P16B3
P0690	Engine Controls and Fuel - 3.0L (LGY) - DTC P0685-P0687, P0689, P0690, P1682, P16A7, P16AF, P16B3, P16BC, P16BD, or P16BF
P0697	Engine Controls and Fuel - 2.0L (LSY) - DTC P0641, P0651, P0697, or P06A3
P0697	Engine Controls and Fuel - 3.0L (LGY) - DTC P0641, P0651, P0697, or P06A3
P0697	Wiring Systems and Power Management - DTC P0641, P0651, P0697, or P06A3
P069E	Engine Controls and Fuel - 3.0L (LGY) - DTC P00FF, P069E, P06EC, P0700, P0800, P0A7C, P0AC4, P0CA1, P1700, P1E00, P2561, P25A2, P25AF, P25C9, P26C8, or P26C9
P06A3	Engine Controls and Fuel - 2.0L (LSY) - DTC P0641, P0651, P0697, or P06A3
P06A3	Engine Controls and Fuel - 3.0L (LGY) - DTC P0641, P0651, P0697, or P06A3
P06A3	Wiring Systems and Power Management - DTC P0641, P0651, P0697, or P06A3
P06AF	Engine Controls and Fuel - 3.0L (LGY) - DTC P06AF
P06AF	Automatic Transmission - 10L80 (MHS) - DTC P06AF
P06B6	Engine Controls and Fuel - 2.0L (LSY) - DTC P0324-P0333, P06B6, or P06B7
P06B6	Engine Controls and Fuel - 3.0L (LGY) - DTC P0324-P0328, P0330-P0333, P06B6, or P06B7
P06B7	Engine Controls and Fuel - 2.0L (LSY) - DTC P0324-P0333, P06B6, or P06B7
P06B7	Engine Controls and Fuel - 3.0L (LGY) - DTC P0324-P0328, P0330-P0333, P06B6, or P06B7
P06DA	Engine Mechanical - 2.0L (LSY) - DTC P06DA-P06DD or P13B1
P06DA	Engine Mechanical - 3.0L (LGY) - DTC P06DA-P06DD or P13B1
P06DB	Engine Mechanical - 2.0L (LSY) - DTC P06DA-P06DD or P13B1
P06DB	Engine Mechanical - 3.0L (LGY) - DTC P06DA-P06DD or P13B1
P06DC	Engine Mechanical - 2.0L (LSY) - DTC P06DA-P06DD or P13B1
P06DC	Engine Mechanical - 3.0L (LGY) - DTC P06DA-P06DD or P13B1

2. Note:

A low or high voltage DTC may set in multiple control modules due to a concern with the battery or charging system.

3. Verify there are no system voltage DTCs set as current or history in any control module.

4.

- **If any system voltage DTCs are set**
- Diagnose these DTCs first. Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#).

5.

- **If no system voltage DTCs are set**

6. Ignition Off and all vehicle systems OFF.

7. Note:

The battery voltage should stabilize after a few minutes of turning the ignition/vehicle Off.

8. Verify the battery voltage is within 12.4V to 12.8V at the C1 Battery.

9.

- **If not within the specified range**
- Refer to [Battery Inspection/Test](#)

10.

- **If within the specified range**

11. Engine Running with all accessories off, allow the system voltage to stabilize.

12. Test for 13V to 15V at the C1 Battery.

13.

- **If not within the specified value**
- Refer to [Charging System Test](#)

14.

- **If within the specified range**

15. Verify DTC P0615, P0616, or P0617 set.

16.

- **If any of the DTC P0615, P0616, or P0617 are set**
- Diagnose these DTCs first. Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#).

17.

- **If DTC P0615, P0616, or P0617 are not set**

18. Refer to Circuit/System Testing.

Circuit/System Testing

1. Ignition Off, disconnect the connector at the T19 Multifunction Power Supply Converter.

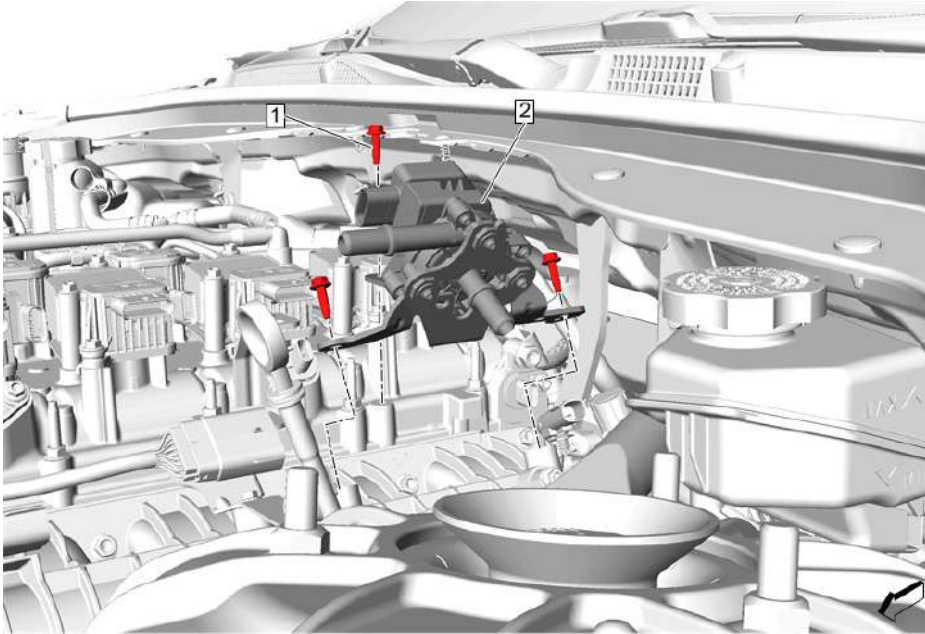
2. Verify a test lamp illuminates between ground circuit terminal 7 and B+.

3.

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

1. ENGINE/PROPULSION
2. ENGINE CONTROLS AND FUEL - 2.0L (LSY)
3. REPAIR INSTRUCTIONS
- 4.

Evaporative Emission Canister Purge Pump Replacement



[Click here for full size](#)

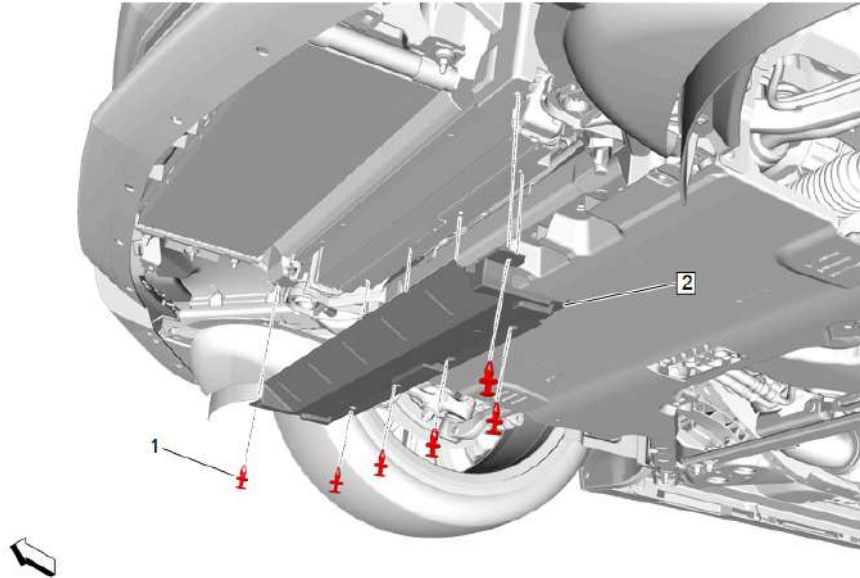
Callout	Component Name
<p>Warning:</p> <p>Refer to Diesel/Gasoline Vapors Warning.</p> <p>Warning:</p> <p>Refer to Safety Glasses Warning.</p> <p>Preliminary Procedures</p> <ol style="list-style-type: none"> 1. Upper Intake Manifold Bracket Replacement 2. Evaporative Emission Canister Purge Tube @ Evaporative Emission Canister Purge Pump >> Disconnect - Plastic Collar Quick Connect Fitting Service 3. Evaporative Emission Pipe @ Evaporative Emission Canister Purge Pump >> Disconnect - Plastic Collar Quick Connect Fitting Service 4. Remove wiring harness retainers from evaporative emission canister purge pump bracket. 	
<p>1</p>	<p>Evaporative Emission Canister Purge Pump Bolt [3>x]</p> <p>Caution:</p> <p>Refer to Fastener Caution.</p> <p>Tighten</p> <p>8.5N-m (75 lb in)</p>

1. ENGINE/PROPULSION
2. ENGINE HEATING AND COOLING
3. REPAIR INSTRUCTIONS
- 4.

Radiator Air Lower Baffle Replacement (LGY)

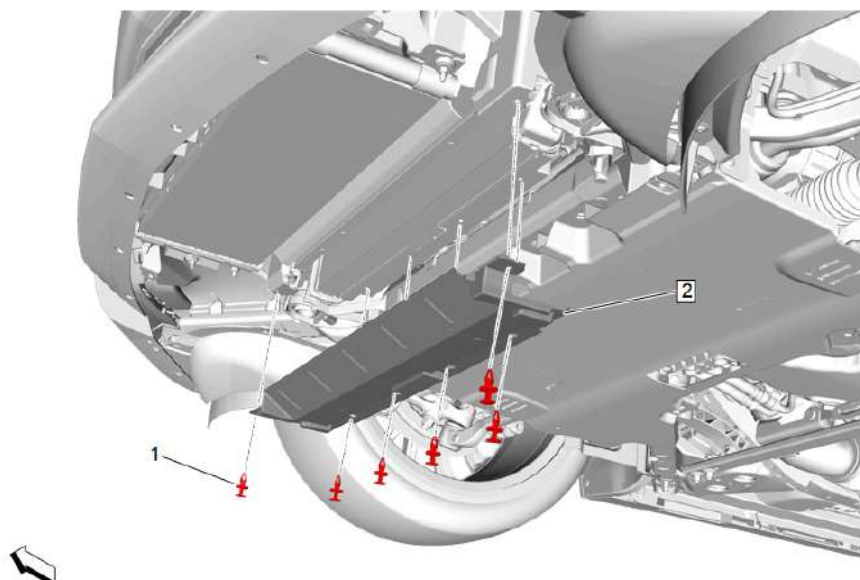
Removal Procedure

1. Front Bumper Fascia Center Air Deflector >> Remove - [Front Bumper Fascia Center Air Deflector Replacement](#)

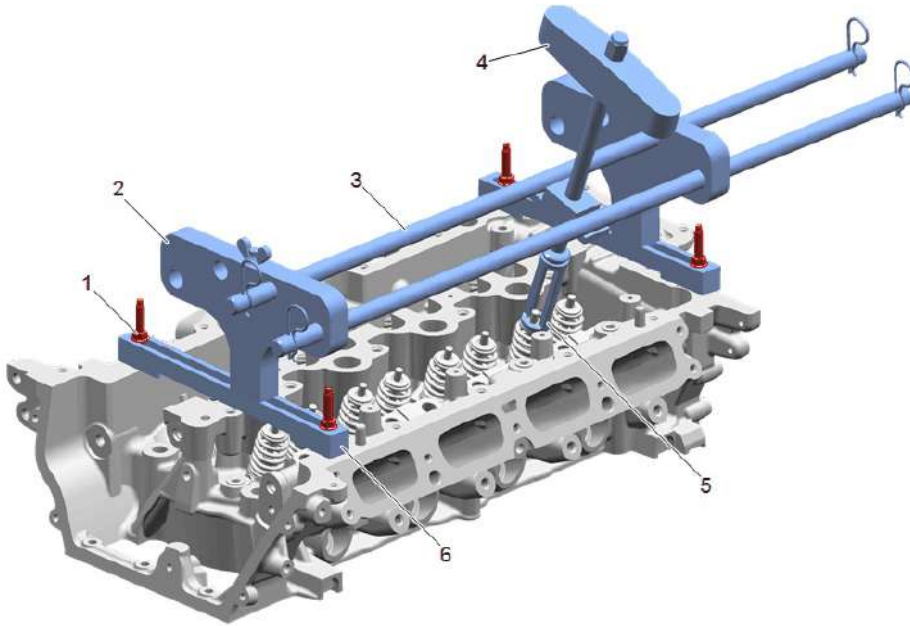


2. [Click here for full size](#)
3. Radiator Air Lower Baffle Retainer (1) >> Remove [6x]
4. Radiator Air Lower Baffle (2) >> Remove

Installation Procedure



1. [Click here for full size](#)
2. Radiator Air Lower Baffle (2) >> Install
3. Radiator Air Lower Baffle Retainer (1) >> Install [6x]
4. Front Bumper Fascia Center Air Deflector >> Install - [Front Bumper Fascia Center Air Deflector Replacement](#)



35.

[Click here for full size](#)

36. Remove *EN-50717* Valve Spring Compressor from the cylinder head.

Related Part Information

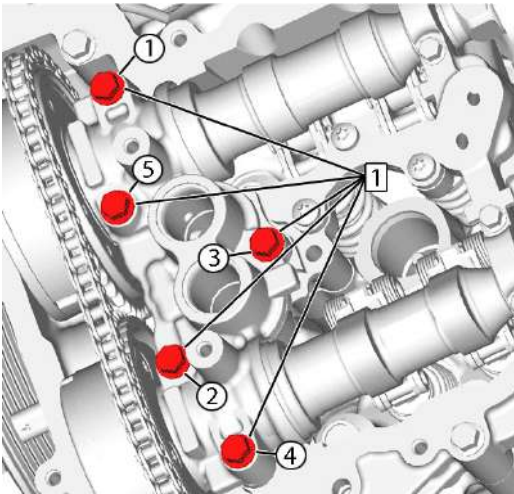
Part Name	Catalog Name	Part Code
Cylinder Head	HEAD,CYL	X0001
Cylinder Head	HEAD,CYL	X0016
Cylinder Head	HEAD,CYL(MCHG)	X0017
Cylinder Head	HEAD,CYL(CSTG)	X0018
Cylinder Head	HEAD,CYL (W/VLVS)	X0019
Cylinder Head	HEAD,CYL(MCHG)	X0020
Cylinder Head	HEAD KIT,CYL	X0032
Cylinder Head	HEAD,CYL(CSTG)	X0034
Cylinder Head	HEAD,CYL	X0042
Cylinder Head	HEAD,CYL(W/EXH VLV ST)	X0055
Cylinder Head	HEAD,CYL (SERV PARTIAL)	X0063
Cylinder Head	HEAD,CYL (W/VLV & CVR)	X0066
Cylinder Head	HEAD,CYL (PARTIAL MCHG)	X0067
Cylinder Head	HEAD,CYL	SS067
Cylinder Head	HEAD,CYL (CSTG)	SJ303
Cylinder Head	HEAD,CYL (W/ VLV)	SJ304
Cylinder Head	HEAD,CYL	SS083
Cylinder Head	HEAD,CYL(MCHG)	SS198

12. Note:

Marking the relationship of the timing chain to actuators is critical for timing alignment.

13. Mark the position of the chain to the camshaft position actuator "intake."

14. Mark the position of the chain to the camshaft position actuator "exhaust."



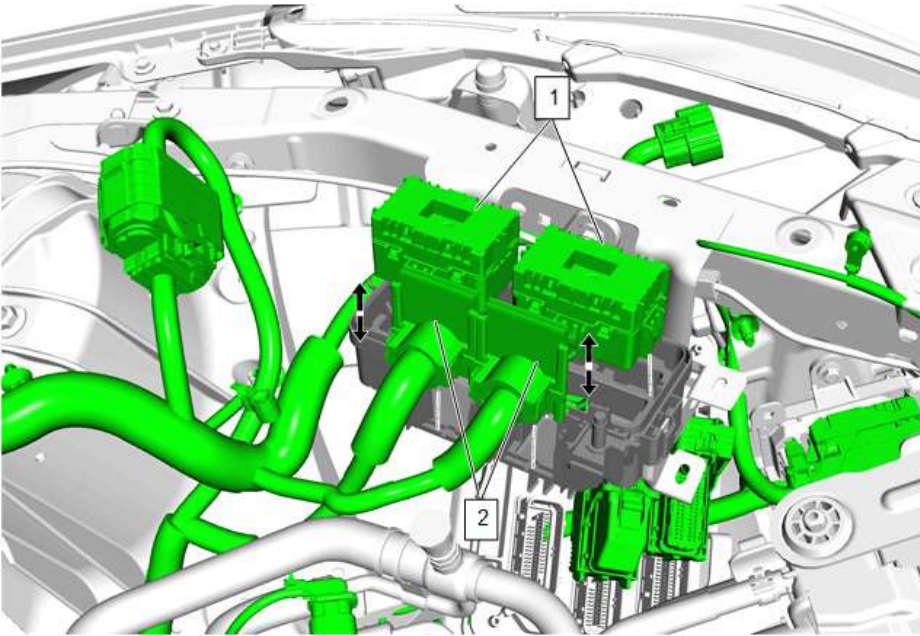
15.

[Click here for full size](#)

16. Note:

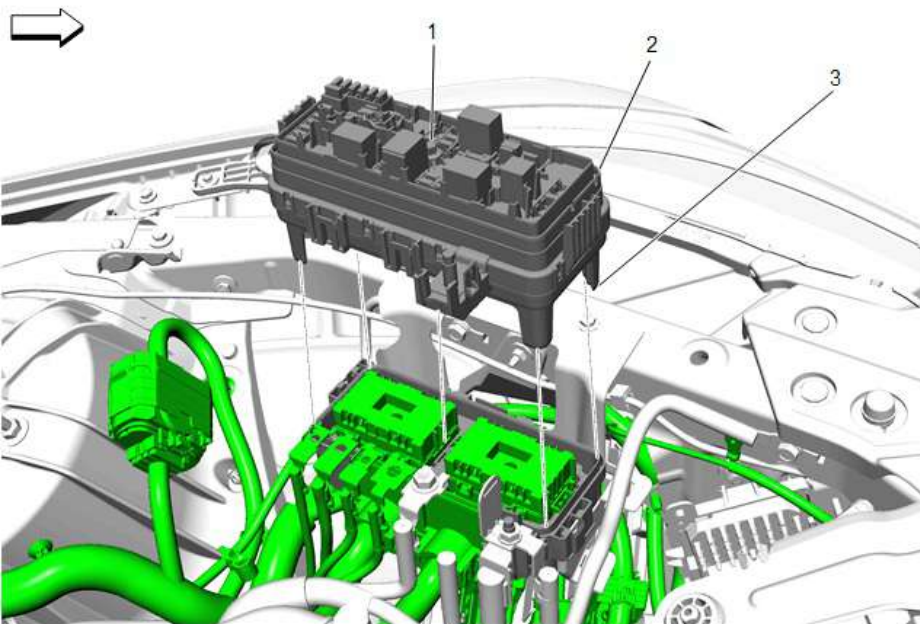
Do NOT remove or loosen any other camshaft bearing caps at this time, even if you intend to eventually remove the camshaft.

17. Remove the 5 camshaft front cap bolts(1).



47. [Click here for full size](#)

48. Engage the 2 retaining covers (2), and install the electrical connectors (1).



49. [Click here for full size](#)

50. Engine Wiring Harness Junction Block (2) >> Install - [Engine Wiring Harness Junction Block Replacement](#)

1. SAFETY AND SECURITY
2. SUPPLEMENTAL RESTRAINTS
3. DIAGNOSTIC INFORMATION AND PROCEDURES
- 4.

DTC B1A33

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

B1A33

Deployment Commanded Circuit

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

Circuit/System Description

Component	Description
K36 Restraints Control Module	The control module monitors several sensors that can detect a collision. When a collision is detected, the control module will trigger certain airbags and seat belt pretensioners, depending on the angle and severity of the impact.

Conditions for Running the DTC

- Ignition = On
- Ignition Voltage = 9> to 16 V

Conditions for Setting the DTC

Deployment Commanded

Actions Taken When the DTC Sets

Airbag Indicator = On

Conditions for Clearing the DTC

Use a scan tool.

Reference Information

Schematic Reference

[SIR Schematics](#)

Connector End View Reference

[Master Electrical Component List](#)

Description and Operation

[Supplemental Inflatable Restraint System Description and Operation](#)

Electrical Information Reference

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